



Wood Buffalo Environmental Association

DECEMBER 2016 MONTHLY REPORT

CONTINUOUS MONITORING
INTEGRATED MONITORING
January 25, 2017

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta



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January 25, 2017

Director, Environmental Monitoring and Evaluation Branch
Alberta Environment and Parks
11th Floor, Oxbridge Place
9820 106 Street
Edmonton, Alberta T5K 2J6

**RE: Monthly Ambient Air Quality Monitoring Report December 2016
Wood Buffalo Environmental Association**

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Enclosed is the December 2016 Ambient Air Quality Monitoring Report for the continuous ambient air quality monitoring stations of the Wood Buffalo Environmental Association regional air quality monitoring network.

The continuous ambient air quality monitoring network stations are:

AMS 1 - Fort McKay – Bertha Ganter
AMS 2 - Mildred Lake
AMS 3 - Lower Camp B (meteorology)
AMS 4 - Buffalo Viewpoint
AMS 5 - Mannix
AMS 6 - Patricia McInnes
AMS 7 - Athabasca Valley
AMS 8 - Fort Chipewyan
AMS 9 - Barge Landing
AMS 11 - Lower Camp (air quality)
AMS 13 - Fort McKay South
AMS 14 - Anzac
AMS 15 - CNRL Horizon
AMS 16 - Shell Muskeg River
AMS 17 - Wapasu
AMS 18 - Stony Mountain
AMS 19 - Firebag
AMS 20 - Brion MacKay River
AMS 21 - Conklin Community
AMS 500 - Cenovus Christina Lake
AMS 502 - ConocoPhillips Surmont

This report is submitted by WBEA on behalf its members and for some members to satisfy the requirements contained in their EPEA Approvals:

Member	EPEA Approval No.
Athabasca Oil Corporation	289664-00-00
Brion Energy	254465-00-00
Canadian Natural Resources Ltd.	149968-00-01



Member	EPEA Approval No.
Cenovus Energy	48522-01-00
Connacher Oil and Gas Ltd.	240008-00-03
ConocoPhillips Canada	48263-01-00
Devon Canada Corporation	224816-00-03
Finning Canada Ltd.	Not Applicable
Hammerstone Corporation	189942-00-02
Husky Oil Operations Ltd.	206355-00-00
Imperial Oil Ltd.	00046586-00-00
MEG Energy Corporation	00216466-00-04
Nexen Energy ULC.	137467-00-00; 236394-00-00
Shell Canada Energy	20809-01-00
Statoil Canada Ltd.	241311-00-02
Suncor Energy Inc.	094-02-00
Sunshine Oilsands Ltd.	305529-00-00
Syncrude Canada Ltd.	026-02-00
Teck Resources Ltd.	EIA Application
Total E&P Canada Ltd.	228044-00-00
Williams Energy (Canada) Inc.	73203-01-00

Aboriginal Communities

Chipewyan Prairie Dene First Nation
Christina River Dene Nation Council
Fort McKay First Nation
Fort McKay Métis Local 63
Fort McMurray First Nation 468
Fort McMurray Métis Local 1935

Government and Non-Industrial Organizations

Alberta Energy Regulator
Alberta Environment & Parks
Alberta Health Services
Alberta Health & Wellness
Environment Canada
Health Canada
Parks Canada
Pembina Institute for Appropriate Development
Regional Municipality of Wood Buffalo
Saskatchewan Environment

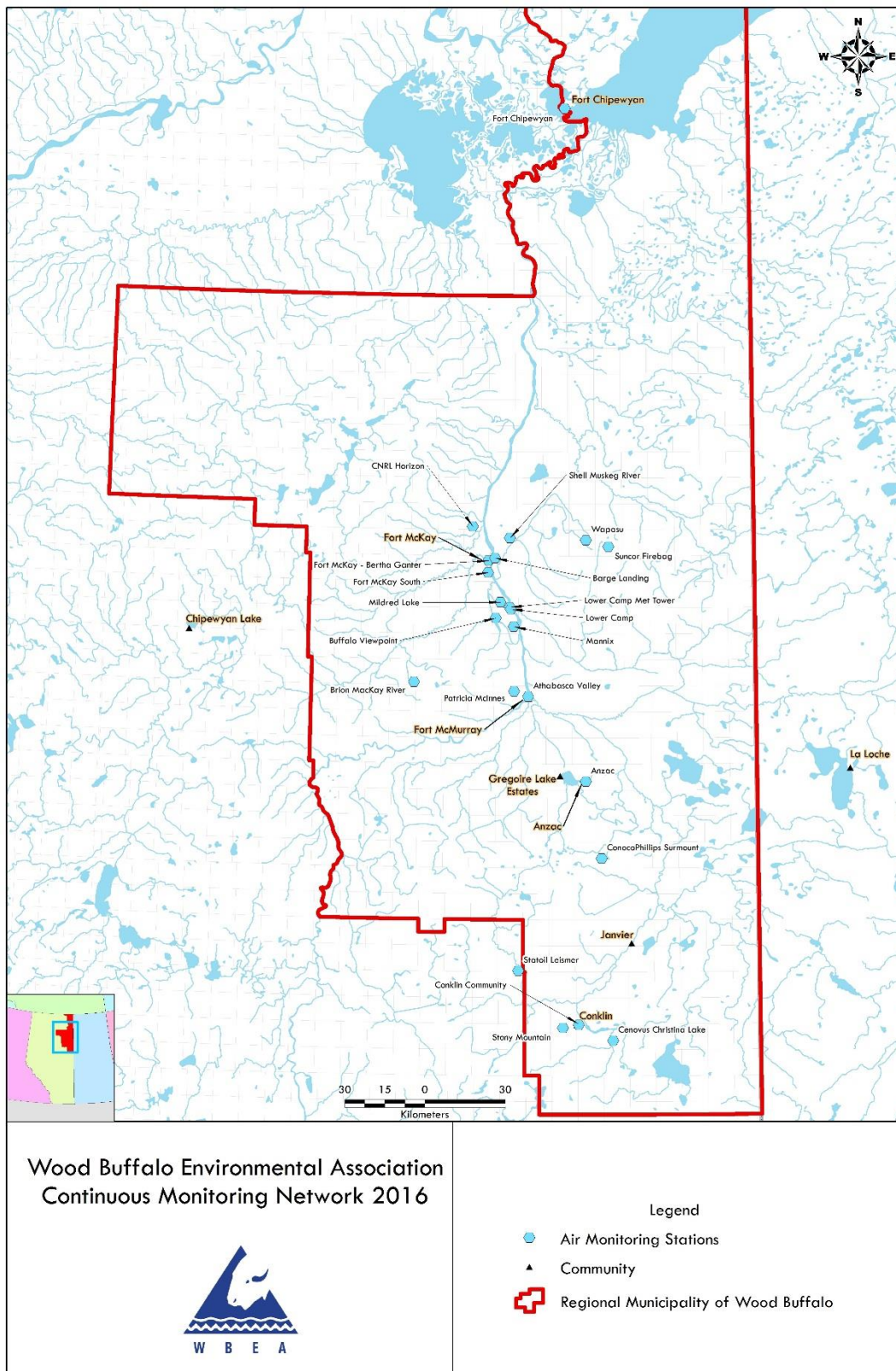


Figure 1: Map of WBEA Air Monitoring Network.

The following operational notes are provided as per the Air Monitoring Directive requirements.

1.0 Concentrations in Excess of Alberta Ambient Air Quality Objectives

There were no ambient concentrations in excess of the air quality objectives as indicated in the Air Monitoring Directive Section III.A.3 (a & b) for SO₂, CO, NO₂, O₃, and NH₃.

There was 1 H₂S ambient ground level concentrations in excess of the 1-hour H₂S air quality objective reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were no concentrations in excess of the 1-hour H₂S air quality objective.

There was 1 PM_{2.5} ambient ground level concentrations in excess of the 24-hour PM_{2.5} air quality objective reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were no concentrations in excess of the 24-hour PM_{2.5} air quality objective.

The following table provides the status of the incidents and final data averages.

<u>Site</u>	<u>Parameter</u>	<u>Date / Time</u>	<u>Reference</u>	<u>Period</u>	Concentration ppb or ug/m ³		<u>Status</u>
					<u>Reported</u>	<u>Final</u>	
AMS 1 Fort McKay	TRS	10Dec16, 06:00	319088	1hr	11	-	ret
AMS 15 CNRL Horizon	PM _{2.5}	23Dec16, 24:00	319509	24hr	35	-	ret

*status legend:

- late exceedance, raw values were not found to be in exceedance in real time, and/or were not reported, but final values were found to be an exceedance after data processing.
- exc exceedance, raw values reported in real time were confirmed to be in exceedance after data processing.
- nae not an exceedance, raw values reported in real time were found not in exceedance after data processing.
- ret retracted, reported exceedance was found to be not an exceedance after investigation of measurement system status and/or validation of raw data in conjunction with all associated measurement parameters.

1.1 Data Processing and Validation

Concentrations reported in near real-time were raw values. The final values were determined after processing of data for reporting. For all parameters except PM_{2.5}, the final 5-minute data values were determined by subtracting from the raw 5-minute data values, the daily zero responses interpolated to the time of each raw 5-minute value. The final 5-minute data values were then rounded to one decimal place greater than the reporting precision indicated in the Air Monitoring Directive (AMD). The final 1-hour data values were calculated from final 5-minute data values and then rounded to reporting precision. The final 24-hour data values were calculated from final 1-hour values.

After data processing and validation, NO₂ concentrations were re-calculated from baseline-corrected NO_x and NO concentrations. Specifically, the NO concentration was subtracted from the NO_x concentration to determine the NO₂ concentration. In cases where the NO_x and/or NO values exceeded the operating range of the analyzer, values reported for NO₂ were determined as the largest of either the difference between baseline-corrected NO_x and NO values, or the NO₂ value reported by the data acquisition system with baseline correction applied.

1.2 Revisions to AEP Airdata Warehouse

- i. H₂S data has been revised and resubmitted to the AEP Airdata Warehouse for Buffalo Viewpoint air monitoring station (AMS 4) for September 2016. Revised summary tables for Buffalo Viewpoint AMS and Network Summary for September 2016 have been submitted with this report.

The WBEA performed a thorough six-month review of the ambient air data at AMS 4 and found that the H₂S analyzer has performed in accordance with AMD criteria up until the AEP audit conducted on September 27, 2016. All the calibrations between April 2016 and September 2016 met AMD requirements for response and linearity. As such, the WBEA has invalidated the data between the last daily span that occurred on 02:00 MST September 27, 2016 and 16:00 MST September 28, 2016 when the SO₂ scrubber was replaced and the analyzer was recalibrated.

AEP supports the removal of the above data in a letter dated January 11, 2017, File No(s). 2016-206A/297A, Subject: 2016 WBEA Ambient Air Monitoring Network Audit Results.

- ii. Precipitation collector data has been revised and resubmitted to the AEP Airdata Warehouse for Fort Chipewyan air monitoring station (AMS 8) for November 2016. The precipitation collector was found to be unresponsive on January 5, 2017 and was removed from site for repairs. Data was invalidated back to the last precipitation event on November 28, 2016. Revised summary tables for Fort Chipewyan AMS for November 2016 have been submitted with this report.

2.0 Operational Status

Continuous Monitoring

In December 2016, there was 1 incident resulting in compliance monitoring instruments operating less than 90% of the time:

The Total Hydrocarbon (THC) analyzer at Buffalo Viewpoint AMS operated less than 90% of the time in December 2016, which is a contravention of Chapter 6, Clause DQ 4-C, of the Air Monitoring Directive.

A component failure occurred on December 22 following the daily zero/span sequence. Daily system checks indicated that the analyzer performance was within AMD criteria throughout this time period. On site investigation on December 26 determined that due to a failed solenoid

control relay, the analyzer was sampling through the zero/span lines rather than the ambient air sample line. The solenoid control was repaired and the analyzer was returned to normal operation.

During the data validation process, the THC data was invalidated for a total of 143 hours between December 21 to 27, 2016. This resulted in the THC analyzer data at Buffalo Viewpoint AMS being available for 81% of December. This incident was reported to Alberta Environment and Parks on January 4, 2017 (AEP Reference #319668).

In December 2016, there were 3 incidents of a monitoring instrument not required for air quality compliance operating less than 90% of the time.

1. The precipitation collector at Fort Chipewyan (AMS 8) had 744 hours of invalid data due to sensor failure discovered during a routine function check. The unit has been removed from site for repairs and will be returned to service in February, 2017.
2. The precipitation collector at CNRL Horizon (AMS 15) had 323 hours of invalid data due to snow and ice blocking the tipping mechanism.
3. The precipitation collector at Wapasu (AMS 17) had 178 hours of invalid data due to a data collection issue.

Intermittent Monitoring

The results for passive and integrated monitoring of PAH, VOC, RSC, PM_{2.5} and PM₁₀ samples were not available in time for submission with this report. These results will be submitted at a later date.

3.0 Monitoring Notes

General Network Notes

The Ammonia (NH₃) analyzer currently operates on a 0 to 2500 ppb operating range with a detection level of 5 ppb in the WBEA network. In data processing, values less than 5 ppb have been considered below detection levels and are reported as zero.

Monitoring notes for the continuous monitoring stations are provided on a station by station basis.

Station 1, Fort McKay - Bertha Ganter

The NH₃ analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily spans and routine monthly multipoint calibrations. Additional time for stabilization after exposure to high concentrations of NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 1 hour following the daily spans have been reported as invalid for a total of 31 hours this month.

The SO₂ sample pump failed to operate on December 8 resulting in 9 hours of invalid data. The pump was replaced and a multipoint calibration was performed.

Maintenance to change the calibration gas cylinder and verify analyzer responses on December 12 interrupted the routine operations of the SO₂ and THC analyzers for 6 hours.

The TRS sample pump failed to operate on December 9 resulting in 31 hours of invalid data. The pump was replaced and a multipoint calibration was performed.

Maintenance to replace the fuel cylinder on December 20 interrupted the routine operation of the THC analyzer for 2 hours.

The temperature sensors at 2 and 10 m are independent sensors and are not an integrated delta-t system. Although reported values are representative of ambient temperatures, they may not be suitable as measurements of vertical temperature gradients.

Station 2, Mildred Lake

Maintenance to replace the sample pump on December 7 interrupted the routine operation of the THC analyzer for 25 hours.

Station 3, Lower Camp B - Meteorology

No operational issues to report this month.

Station 4, Buffalo Viewpoint

The THC analyzer did not sample ambient air from the sample manifold due to a failed control relay from December 21 to 27 until a repair was made, resulting in 143 hours of invalid data.

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 5, Mannix

Maintenance and cleaning of the sample manifold on December 1 interrupted the normal operation of the H₂S analyzer for 1 hour.

Maintenance to the daily zero/span system on December 6 interrupted the routine operations of all air quality analyzers for 1 to 2 hours.

Maintenance to reset the data logger on December 21 interrupted the routine operations of all air quality analyzers for 1 hour.

Flat lines in output signals of the temperature and relative humidity sensors at the 20 m elevation resulted in 58 hours of invalid data this reporting period.

Flat lines in output signals of the sonic wind sensors at 20 and 75 m elevations resulted in 59 and 6 hours of downtime for each respective sensor.

Station 6, Patricia McInnes

The NH₃ analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily span and routine monthly multipoint calibration periods. Additional time for stabilization after exposure to high concentrations of the NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 1 to 2 hours following each daily span has been reported as invalid for a total of 34 hours this month.

Maintenance to replace the carrier gas cylinder on December 22 interrupted the routine operation of the THC analyzer for 2 hours.

The filter tape in the PM_{2.5} analyzer failed to advance on December 7 resulting in 9 hours of invalid data. Maintenance to advance the filter tape and verify analyzer operation on December 7 affected the normal operation of the PM_{2.5} analyzer for 4 hours.

Station 7, Athabasca Valley

Maintenance to collect diagnostic information and replace the detector signal cable on December 5 interrupted the routine operation of the THC analyzer for 4 hours.

Three instances of unstable operation due to baseline drift on December 21 and 22 affected the normal operation of the PM_{2.5} analyzer for a total of 7 hours. Maintenance to verify analyzer flow and zero response on December 22 interrupted the routine operation of the PM_{2.5} analyzer for 1 hour.

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 8, Fort Chipewyan

Maintenance and cleaning of the sample manifold on December 1 interrupted the normal operation of the O₃ analyzer for 1 hour.

Flat-lines in the output signal of the wind sensor resulted in 3 hours of invalid data this reporting period.

The precipitation collector was found to be unresponsive on January 5, 2017 and was removed from site for repairs. Data was invalidated back to the last precipitation event on November 28 resulting in 744 hours of invalid data.

Station 9, Barge Landing

Flat-lines in the output signal of the wind sensor resulted in 6 hours of invalid data this reporting period.

Station 11, Lower Camp

Flat-lines in the output signal of the wind sensor resulted in 3 hours of invalid data this reporting period.

Station 13, Fort McKay South

Station operator activities on December 7 affected the normal operation of the NO₂ analyzer for 2 hours. Maintenance to replace the sample/calibration valve on December 13 affected the normal operation of the NO₂ analyzer for 24 hours.

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 14, Anzac

Unstable operation due to fluctuating shelter temperature from December 17 to 19 affected the normal operations of the SO₂ and O₃ analyzers for 65 and 61 hours, respectively.

Maintenance activities required the removal of the THC analyzer on December 1 for repairs in the shop. After repairs and testing, the THC analyzer was re-installed at the station on December 3, resulting in 47 hours of invalid data.

Maintenance on the in-situ calibrator and confirmation of all air quality analyzer responses to daily span checks on December 31 interrupted the normal operations of these analyzers for 1 hour.

Flat-lines in the output signal of the wind sensor resulted in 11 hours of invalid data this reporting period.

Station 15, CNRL Horizon

Unstable operation due to fluctuating shelter temperature on December 6 affected the normal operations of the THC and NO₂ analyzers for 5 hours.

Unstable operation due to lamp voltage fluctuation on December 13 affected the normal operation of the SO₂ analyzer for 19 hours. Unstable operation due to baseline drift on December 18 affected the normal operation of the SO₂ analyzer for 2 hours.

The TRS sample pump failed to operate on December 9 resulting in 33 hours of invalid data. The pump was replaced and a multipoint calibration was performed. A subsequent calibration to adjust the baseline response on December 14 interrupted the normal operation of the TRS analyzer for 5 hours.

Unstable operation due to spurious analyzer response on December 23 affected the normal operation of the PM_{2.5} analyzer for 33 hours. Diagnostics indicate debris may have been in the sample chamber. On site investigation on December 24 revealed no operational issues and once analyzer response was verified, the analyzer was returned to routine operation.

Flat-lines in the output signal of the wind sensor resulted in 8 hours of invalid data this reporting period.

Precipitation collector data was not collected from November 14 to December 14 due to snow and ice blocking the tipping mechanism, resulting in 323 hours of invalid data this reporting period.

Station 16, Shell Muskeg River

Maintenance to the data logger and station wiring on December 22 interrupted the routine operations of all parameters for 2 to 3 hours.

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 17, Wapasu

Two instance of unstable operation due to lamp voltage fluctuation on December 15 and 19 affected the normal operation of the O₃ analyzer for 1 and 17 hours, respectively.

Three instances of unstable operation due to baseline drift on December 8 affected the normal operation of the PM_{2.5} analyzer for 8 hours.

Precipitation collector data was not collected from November 15 to December 8 due to a data collection issue with the data logger, resulting in 178 hours of invalid data this reporting period. Maintenance to clear built up snow and ice from the collection bucket on December 20 interrupted the routine operation of the precipitation collector for 1 hour.

Flat-lines in the output signal of the wind sensor resulted in 3 hours of invalid data this reporting period.

Station 18, Stony Mountain

Two instances of unstable operation due to baseline drift on December 7 and 8 affected the normal operation of the PM_{2.5} analyzer for 10 hours.

Maintenance to replace the carrier gas cylinder on December 8 interrupted the routine operation of the THC analyzer for 2 hours.

Station 19, Firebag

Flat-lines in the output signal of the wind sensor resulted in 2 hours of invalid data this reporting period.

Station 20, Brion MacKay River

Three instances of intermittent unstable operation due to baseline drift affected the normal operation of the H₂S analyzer for a total of 3 hours this reporting period.

Flat-lines in the output signal of the wind sensor resulted in 2 hours of invalid data this reporting period.

Station 21, Conklin Community

Six instances of unstable operation due to baseline drift affected the normal operation of the PM_{2.5} analyzer for 25 hours this reporting period.

Flat-lines in the output signal of the wind sensor resulted in 8 hours of invalid data this reporting period.

Station 500, Cenovus Christina Lake

Maintenance and cleaning of the sample manifold on December 6 interrupted the normal operation of the H₂S analyzer for 1 hour. Maintenance to verify the daily span response on December 20 interrupted the normal operation of the H₂S analyzer for 2 hours.

Station 502, ConocoPhillips Surrmont

Unstable operation due to baseline drift on December 8 affected the normal operation of the SO₂ analyzer for 2 hours.

Two instances of unstable operation due to baseline drift affected the normal operation of the H₂S analyzer for 2 hours this reporting period.

If additional information is required, please contact either Mike Martineau at (780) 715 1770 ext. 222 or the Wood Buffalo Environmental Association at (780) 799 4420.

Yours sincerely,

Wood Buffalo Environmental Association

Mike Martineau
Data Technician

Sanjay Prasad
Air Quality Scientist

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION
MONTHLY AIR MONITORING SUMMARY
for AMD SECTION III.B.1(c)

DECEMBER 2016

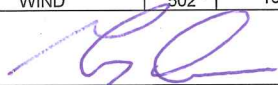
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Prepared: Jan 24 2017 10:56

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	12	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01							
48522-01-00							
240008-00-03				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
48263-00-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
224816-00-03	SO2(ppm)	1	97.98	0.020	0	0.003	0
189942-00-02	SO2(ppm)	2	100.00	0.032	0	0.013	0
206355-00-00	SO2(ppm)	4	100.00	0.015	0	0.003	0
46586-00-00	SO2(ppm)	5	99.60	0.036	0	0.009	0
216466-00-04	SO2(ppm)	6	100.00	0.013	0	0.003	0
137467-00-00	SO2(ppm)	7	100.00	0.010	0	0.002	0
20809-01-00	SO2(ppm)	8	100.00	0.021	0	0.006	0
241311-00-00	SO2(ppm)	11	100.00	0.064	0	0.010	0
094-02-00	SO2(ppm)	13	100.00	0.011	0	0.002	0
305529-00-00	SO2(ppm)	14	91.13	0.009	0	0.002	0
026-02-00	SO2(ppm)	15	97.18	0.015	0	0.005	0
228044-00-00	SO2(ppm)	16	99.73	0.029	0	0.006	0
73203-01-00	SO2(ppm)	17	100.00	0.026	0	0.008	0
236394-00-00	SO2(ppm)	18	100.00	0.005	0	0.001	0
	SO2(ppm)	19	100.00	0.032	0	0.009	0
	SO2(ppm)	20	100.00	0.046	0	0.010	0
	SO2(ppm)	21	100.00	0.006	0	0.001	0
	SO2(ppm)	500	100.00	0.017	0	0.010	0
	SO2(ppm)	502	99.73	0.016	0	0.005	0
	H2S(ppm)	2	100.00	0.006	0	0.001	0
	H2S(ppm)	4	100.00	0.004	0	0.001	0
	H2S(ppm)	5	99.60	0.007	0	0.002	0
	H2S(ppm)	11	100.00	0.009	0	0.002	0
	H2S(ppm)	17	100.00	0.001	0	0.000	0
	H2S(ppm)	19	100.00	0.001	0	0.000	0
	H2S(ppm)	20	99.60	0.003	0	0.001	0
	H2S(ppm)	500	99.60	0.001	0	0.000	0
	H2S(ppm)	502	99.73	0.004	0	0.001	0
	TRS(ppm)	1	95.83	0.002	0	0.001	0
	TRS(ppm)	6	100.00	0.001	0	0.001	0
	TRS(ppm)	7	100.00	0.002	0	0.001	0
	TRS(ppm)	9	100.00	0.002	0	0.001	0
	TRS(ppm)	13	100.00	0.002	0	0.001	0
	TRS(ppm)	14	99.87	0.001	0	0.001	0
	TRS(ppm)	15	94.89	0.001	0	0.001	0
	TRS(ppm)	18	100.00	0.001	0	0.000	0
	TRS(ppm)	21	100.00	0.001	0	0.000	0
	THC(ppm)	1	98.92	3.9	-	2.7	-
	THC(ppm)	2	96.64	5.2	-	3.2	-
	THC(ppm)	4	80.78	4.8	-	3.2	-
	THC(ppm)	5	99.60	5.7	-	3.1	-
	THC(ppm)	6	99.73	3.1	-	2.5	-
	THC(ppm)	7	99.46	3.7	-	2.7	-
	THC(ppm)	9	100.00	4.7	-	3.1	-
	THC(ppm)	11	100.00	5.0	-	3.3	-
	THC(ppm)	13	100.00	4.0	-	3.0	-
	THC(ppm)	14	93.55	3.2	-	2.4	-
	THC(ppm)	15	99.33	4.6	-	3.0	-
	THC(ppm)	16	99.73	12.3	-	3.4	-
	THC(ppm)	17	100.00	3.5	-	2.5	-
	THC(ppm)	18	99.73	2.4	-	2.1	-
	THC(ppm)	19	100.00	2.7	-	2.4	-
	THC(ppm)	20	100.00	4.0	-	2.6	-
	THC(ppm)	21	100.00	2.3	-	2.1	-
	O3(ppm)	1	100.00	0.039	0	0.034	-
	O3(ppm)	6	100.00	0.044	0	0.038	-
	O3(ppm)	7	100.00	0.042	0	0.036	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION
MONTHLY AIR MONITORING SUMMARY
for AMD SECTION III.B.1(c)

DECEMBER 2016
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149968-00-01							
48522-01-00							
240008-00-03				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
48263-00-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
224816-00-03	O3(ppm)	8	99.87	0.040	0	0.038	-
189942-00-02	O3(ppm)	13	100.00	0.038	0	0.034	-
206355-00-00	O3(ppm)	14	91.67	0.042	0	0.040	-
46586-00-00	O3(ppm)	17	97.58	0.037	0	0.034	-
216466-00-04	O3(ppm)	18	100.00	0.045	0	0.042	-
137467-00-00	O3(ppm)	21	100.00	0.044	0	0.040	-
20809-01-00	NO2(ppm)	1	100.00	0.036	0	0.024	-
241311-00-02	NO2(ppm)	6	100.00	0.034	0	0.020	-
094-02-00	NO2(ppm)	7	100.00	0.042	0	0.027	-
305529-00-00	NO2(ppm)	8	100.00	0.030	0	0.014	-
026-02-00	NO2(ppm)	13	96.51	0.035	0	0.022	-
228044-00-00	NO2(ppm)	14	99.60	0.025	0	0.011	-
73203-01-00	NO2(ppm)	15	99.33	0.042	0	0.020	-
236394-00-00	NO2(ppm)	16	99.73	0.047	0	0.032	-
	NO2(ppm)	17	100.00	0.035	0	0.013	-
	NO2(ppm)	18	100.00	0.018	0	0.008	-
	NO2(ppm)	19	100.00	0.029	0	0.009	-
	NO2(ppm)	20	100.00	0.030	0	0.015	-
	NO2(ppm)	21	100.00	0.019	0	0.010	-
	NO2(ppm)	500	100.00	0.032	0	0.014	-
	NO2(ppm)	502	100.00	0.018	0	0.010	-
	CO(ppm)	7	100.00	0.9	0	0.4	-
	NH3(ppm)	1	95.83	0.000	0	0.000	-
	NH3(ppm)	6	95.43	0.000	0	0.000	-
	PM2.5(ug/m3)	1	100.00	48.6	-	16.1	0
	PM2.5(ug/m3)	6	98.25	21.2	-	14.7	0
	PM2.5(ug/m3)	7	98.92	23.6	-	16.6	0
	PM2.5(ug/m3)	8	100.00	16.4	-	8.4	0
	PM2.5(ug/m3)	13	100.00	17.9	-	13.8	0
	PM2.5(ug/m3)	14	100.00	49.9	-	24.0	0
	PM2.5(ug/m3)	15	95.56	22.9	-	15.4	0
	PM2.5(ug/m3)	16	99.73	31.0	-	12.7	0
	PM2.5(ug/m3)	17	98.92	19.6	-	11.1	0
	PM2.5(ug/m3)	18	98.66	29.6	-	16.5	0
	PM2.5(ug/m3)	21	96.64	59.8	-	16.3	0
	WIND	1	100.00	-	-	-	-
	WIND	2	100.00	-	-	-	-
	WIND	4	99.87	-	-	-	-
	WIND	5	92.07	-	-	-	-
	WIND	6	100.00	-	-	-	-
	WIND	7	99.87	-	-	-	-
	WIND	8	99.60	-	-	-	-
	WIND	9	99.19	-	-	-	-
	WIND	11	99.60	-	-	-	-
	WIND	13	99.87	-	-	-	-
	WIND	14	98.52	-	-	-	-
	WIND	15	98.92	-	-	-	-
	WIND	16	99.46	-	-	-	-
	WIND	17	99.60	-	-	-	-
	WIND	18	100.00	-	-	-	-
	WIND	19	99.73	-	-	-	-
	WIND	20	99.73	-	-	-	-
	WIND	21	98.92	-	-	-	-
	WIND	500	100.00	-	-	-	-
	WIND	502	100.00	-	-	-	-
							
SIGNATURE OF ASSOCIATION REPRESENTATIVE				FOR ALBERTA ENVIRONMENT USE ONLY			



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 1
BERTHA GANTER FORT MCKAY
DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY - BERTHA GANTER (AMS 1)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	693	36	51	97.98	20	0	3	0
TRS(ppb) Average	682	31	62	95.83	2	0	1	0
THC(ppm) Average	700	36	44	98.92	3.9	-	2.7	-
NMHC(ppm) Average	700	36	44	98.92	0.534	-	0.172	-
CH4(ppm) Average	700	36	44	98.92	3.6	-	2.6	-
O3 (ppb) Average	709	35	35	100.00	39	0	34	-
NO2 (ppb) Average	707	37	37	100.00	36	0	24	-
NO (ppb) Average	707	37	37	100.00	91	-	24	-
NOX (ppb) Average	707	37	37	100.00	126	-	48	-
NH3 (ppb) Average	670	43	74	95.83	0	0	0	-
PM2.5 (ug/m3) Average	740	4	4	100.00	48.6	-	16.1	0
Wind Speed 10 m (km/h) Average	744	0	0	100.00	21	-	12	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	0.5	-	-1.5	-
Temperature 10 m (C) Average	744	0	0	100.00	0.7	-	-1.3	-
Relative Humidity (%) Average	744	0	0	100.00	95	-	89	-
Precipitation (mm) Total	744	0	0	100.00	0.8	-	5.9	-
Leaf Wetness (% of range) Average	744	0	0	100.00	3	-	2	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	206	-	34	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER FORT MCKAY (AMS 1)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	693	0.6	1	-	0	0	0	0	1	2	20
TRS (ppb) Average	682	0.6	0	-	0	0	0	0	1	1	2
THC (ppm) Average	700	2.24	0.3	-	1.9	2	2	2.2	2.4	2.6	3.9
NMHC(ppm) Average	700	0.054	0.075	-	0	0	0	0	0.1	0.2	0.534
CH4(ppm) Average	700	2.18	0.2	-	1.9	2	2	2.2	2.3	2.4	3.6
O3 (ppb) Average	709	15.4	11	-	1	2	5	13	25	33	39
NO2 (ppb) Average	707	13.3	9	-	0	1	5	13	21	26	36
NO (ppb) Average	707	6.7	12	-	0	0	0	1	8	23	91
NOX (ppb) Average	707	20	19	-	0	1	5	15	30	48	126
NH3 (ppb) Average	670	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	740	6.58	5.3	-	0.2	2	2.9	5	8.8	13.4	48.6
Wind Speed 10 m (km/h) Average	744	5.8	4	-	0	2	3	5	8	11	21
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-18.1	9.2	-	-38.3	-30.5	-24.6	-18.4	-12.5	-4.1	0.5
Temperature 10 m (C) Average	744	-17.54	9	-	-37.3	-29.4	-23.6	-18	-12.1	-3.6	0.7
Relative Humidity (%) Average	744	77.1	7	-	59	69	72	77	82	86	95
Precipitation (mm) Total	744	-	-	16.98	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	744	0.9	1	-	0	0	0	1	1	2	3
Global Solar Radiation (W/m2) Average	744	17.7	38	-	0	0	0	0	10	71	206

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER Fort McKAY (AMS 1)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	08 Dec 2016 02:00	08 Dec 2016 10:00	9	Analyzer Failure - pump failure
SO2	12 Dec 2016 11:00	12 Dec 2016 16:00	6	Maintenance - changed cal gas cylinder
TRS	09 Dec 2016 05:00	10 Dec 2016 11:00	31	Analyzer Failure - pump failure
NMHC, CH4, THC	12 Dec 2016 11:00	12 Dec 2016 16:00	6	Maintenance - changed cal gas cylinder
NMHC, CH4, THC	20 Dec 2016 11:00	20 Dec 2016 12:00	2	Maintenance - replaced fuel cylinder
NH3	01 Dec 2016 10:00	31 Dec 2016 10:00	31	Stabilization after daily span



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 20 ppb on Dec 2 13:00	Maximum Daily Average: 3.5 ppb on Dec 2		Hours of Data:	693
Minimum Value: 0 ppb on Dec 4 08:00	Minimum Daily Average: 0.0 ppb on Dec 7		Hours of Missing Data:	51
Maximum Diurnal Average: 1.5 ppb at hour 15	Minimum Diurnal Average: 0.3 ppb at hour 2		Hours of Calibration:	36
Monthly Average: 0.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 6		Percent Operational Time:	98.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0.4	1
2-Dec	Z	1	1	2	3	2	2	1	1	1	2	6	20	4	3	1	1	3	5	1	3	4	5	9	3.5	20
3-Dec	6	Z	2	3	3	3	2	2	2	3	2	3	4	3	1	1	2	2	1	0	0	0	0	1.9	6	
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.1	1	
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.1	1	
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
8-Dec	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	2	4	2	3	2	3	1	1	1	1	1.0	4	
10-Dec	1	1	Z	1	2	1	1	1	3	3	3	2	1	1	2	2	1	1	1	1	1	1	1	1.3	3	
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
12-Dec	0	0	0	0	Z	0	0	0	0	0	M	M	M	M	M	M	2	1	1	0	0	0	0	--	2	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
14-Dec	Z	0	0	0	0	0	1	1	1	6	4	2	1	1	1	1	0	0	0	0	0	0	0	1.0	6	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
16-Dec	0	0	Z	0	0	0	0	0	0	0	1	2	3	8	4	1	1	1	0	1	0	0	0	1.0	8	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	4	4	2	1	0	0	0	0	1	1	0.7	4	
18-Dec	0	0	1	1	Z	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	2	2	2	0.8	2	
19-Dec	2	2	2	1	1	Z	3	3	3	3	4	4	3	2	2	3	4	2	1	1	0	0	0	2.0	4	
20-Dec	Z	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
21-Dec	0	Z	0	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	0	1	1	1	1	0.6	2	
22-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0.2	1	
25-Dec	1	1	1	1	0	Z	0	0	0	0	0	0	1	3	1	1	2	1	1	1	0	2	2	0.8	3	
26-Dec	Z	1	1	1	0	0	0	0	1	2	2	2	3	6	6	3	1	1	1	1	1	1	0	1.5	6	
27-Dec	1	Z	2	2	2	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.7	2	
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0.2	1	
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0.3	2	
31-Dec	0	0	0	0	0	Z	0	1	1	1	1	1	2	2	2	1	0	0	0	0	0	0	0	0.6	2	

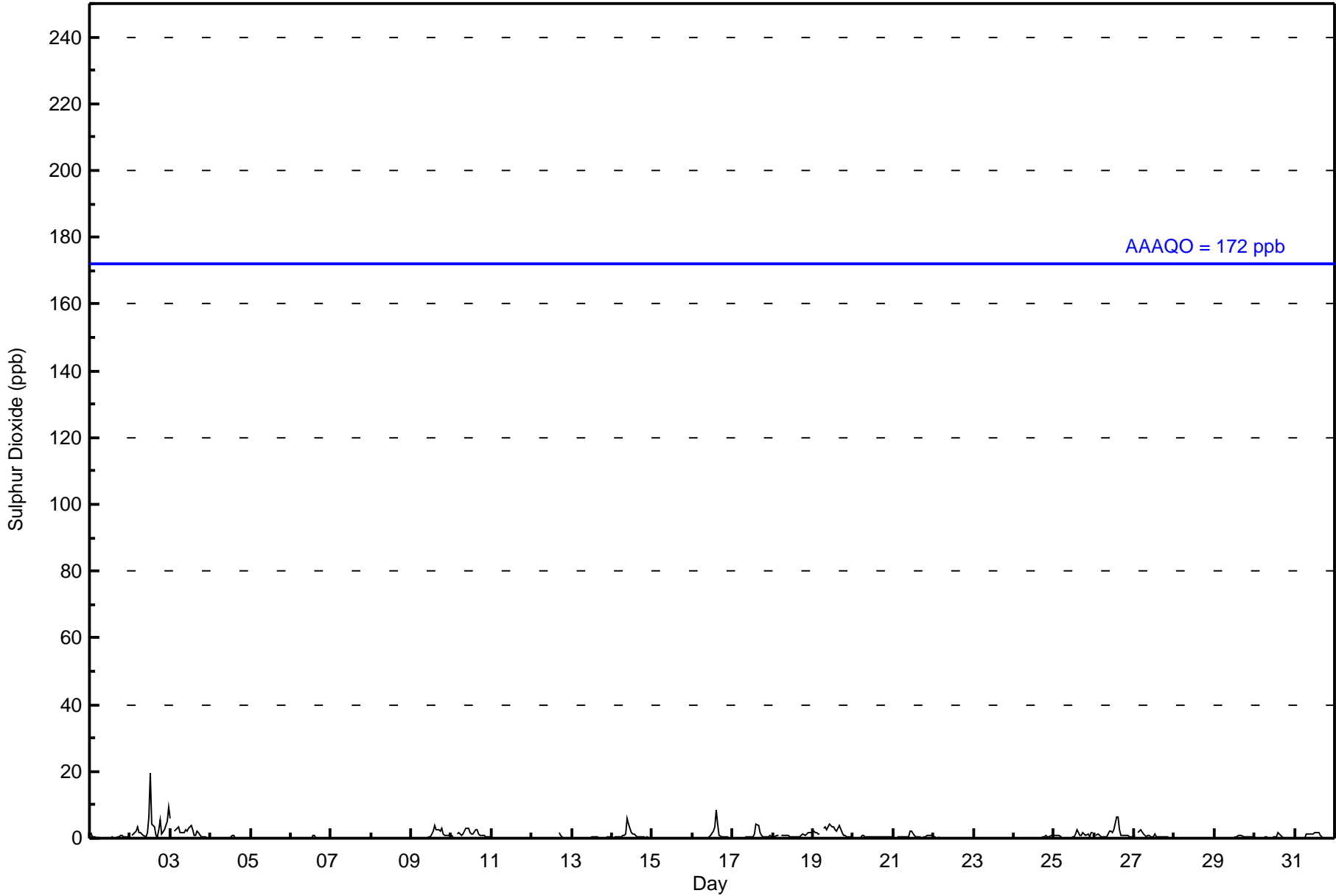
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6	2	2	3	3	3	3	3	3	6	4	6	20	6	8	4	4	3	5	1	3	4	5	9	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	692	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 693

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	58	22	7	5	8	6	7	73	147	42	43	39	42	104	53	36	692
11 - 20	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	22	7	5	8	6	7	74	147	42	43	39	42	104	53	36	693

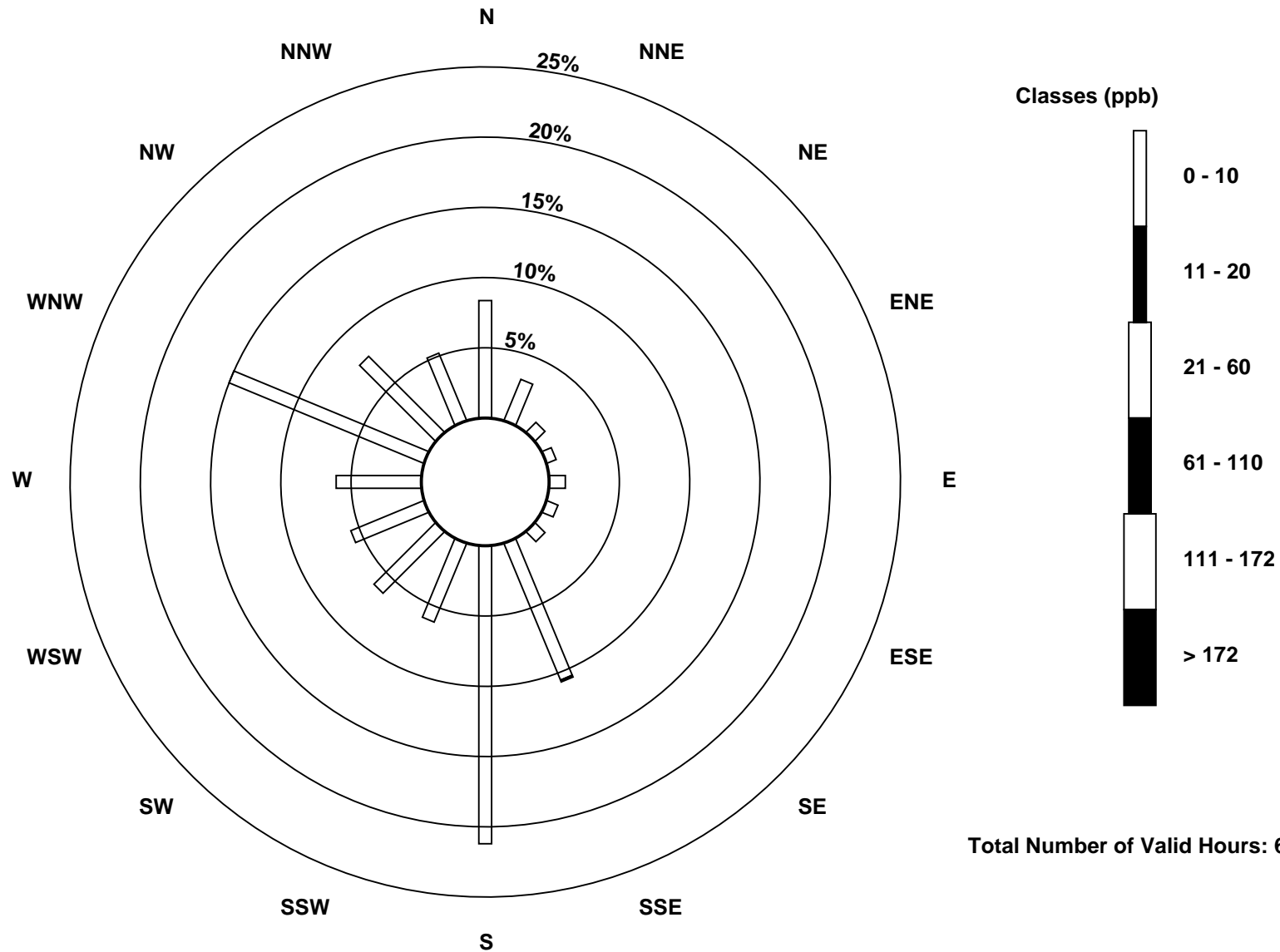
Total Number of Valid Hours: 693

Total Number of Hours: 744

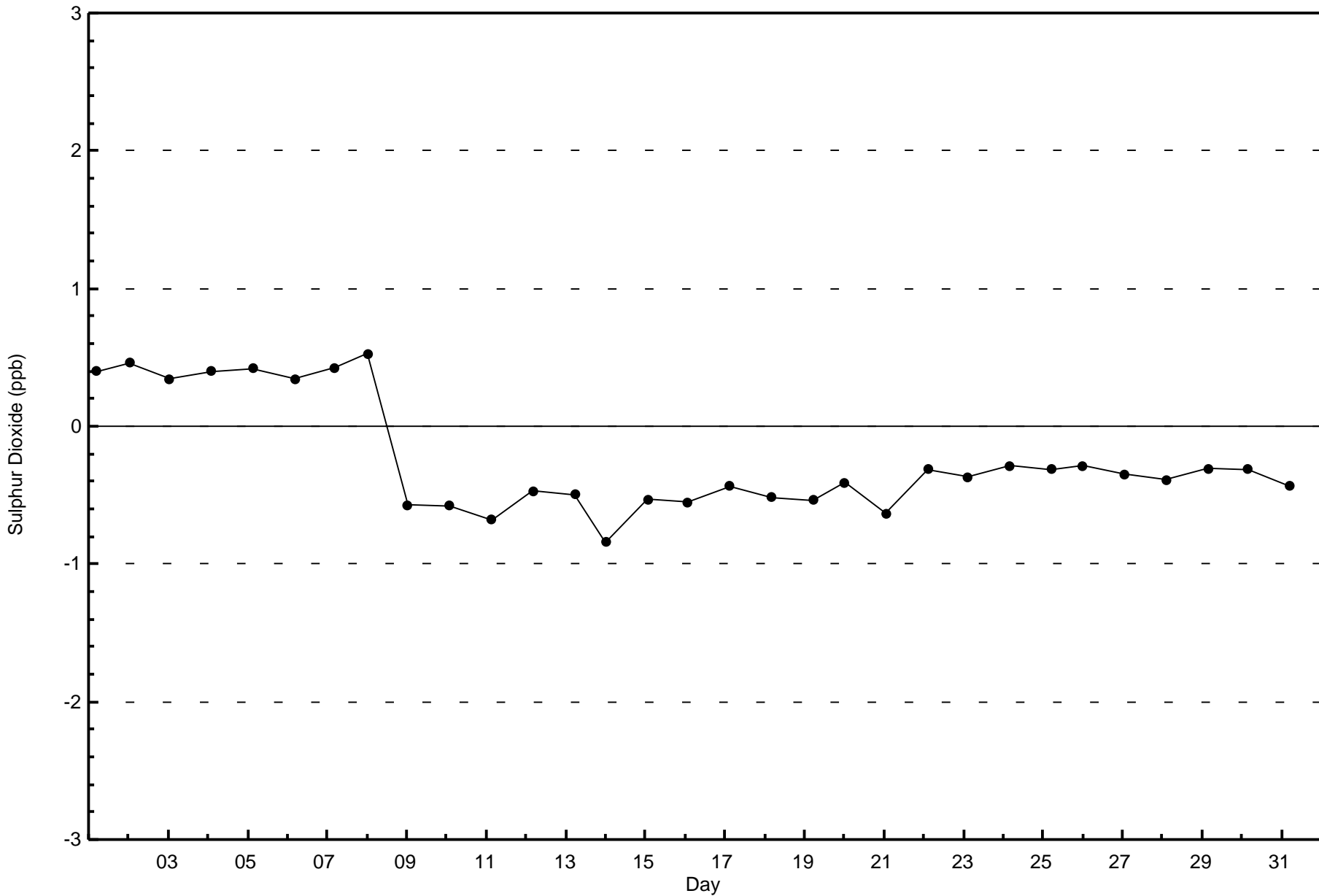


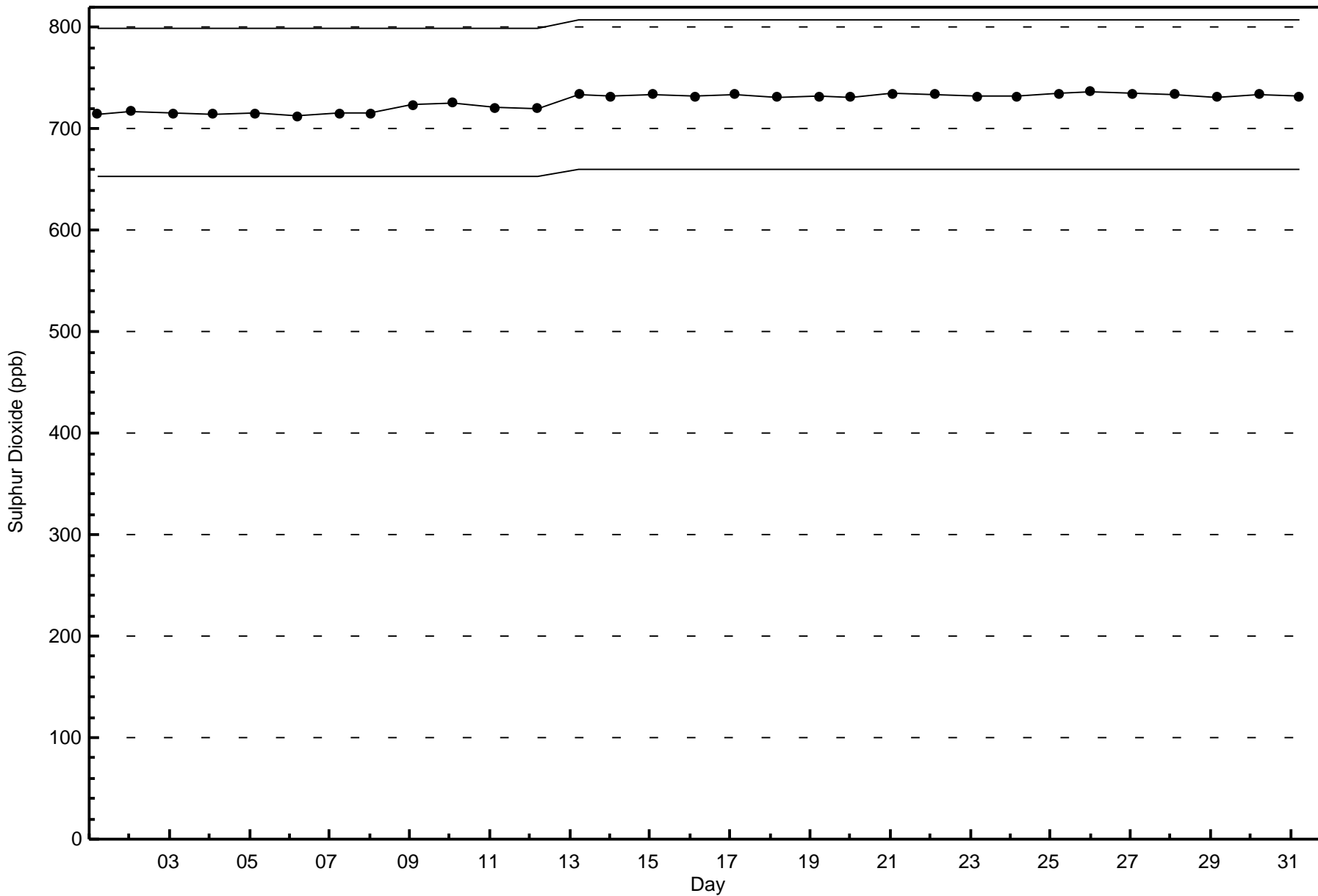
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter (AMS 1)



Total Number of Valid Hours: 693







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2 ppb on Dec 16 15:00	Maximum Daily Average: 1.0 ppb on Dec 2		Hours of Data:	682
Minimum Value: 0 ppb on Dec 3 23:00	Minimum Daily Average: 0.4 ppb on Dec 6		Hours of Missing Data:	62
Maximum Diurnal Average: 0.7 ppb at hour 15	Minimum Diurnal Average: 0.5 ppb at hour 4		Hours of Calibration:	31
Monthly Average: 0.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 2		Percent Operational Time:	95.8

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	1
2-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
3-Dec	1	1	1	Z	1	1	1	1	1	2	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0.9	2
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
7-Dec	0	0	0	0	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	1	0	1	1	0	0.5	1
8-Dec	1	1	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0.5	1
9-Dec	0	0	0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0	
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	1	1	1	2	2	2	1	2	2	1	1	--	2	
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0.6	1
13-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
14-Dec	0	0	Z	0	0	0	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	0	0	0.9	2
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
16-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	1	1	0.8	2
17-Dec	1	1	1	1	0	Z	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	0.9	2
18-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
19-Dec	1	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.8	1
20-Dec	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	1
21-Dec	1	1	1	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0.6	1
22-Dec	1	1	1	1	Z	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0.7	1
23-Dec	0	0	1	0	0	Z	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.5	1
24-Dec	0	0	0	0	0	0	Z	1	0	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	0.6	1
25-Dec	1	1	1	1	1	1	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
26-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	0.6	1
27-Dec	1	1	1	Z	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
28-Dec	0	0	0	1	Z	1	1	1	1	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0.6	1
29-Dec	0	1	0	0	1	Z	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
30-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0.6	1
31-Dec	1	0	1	1	1	1	0	Z	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1

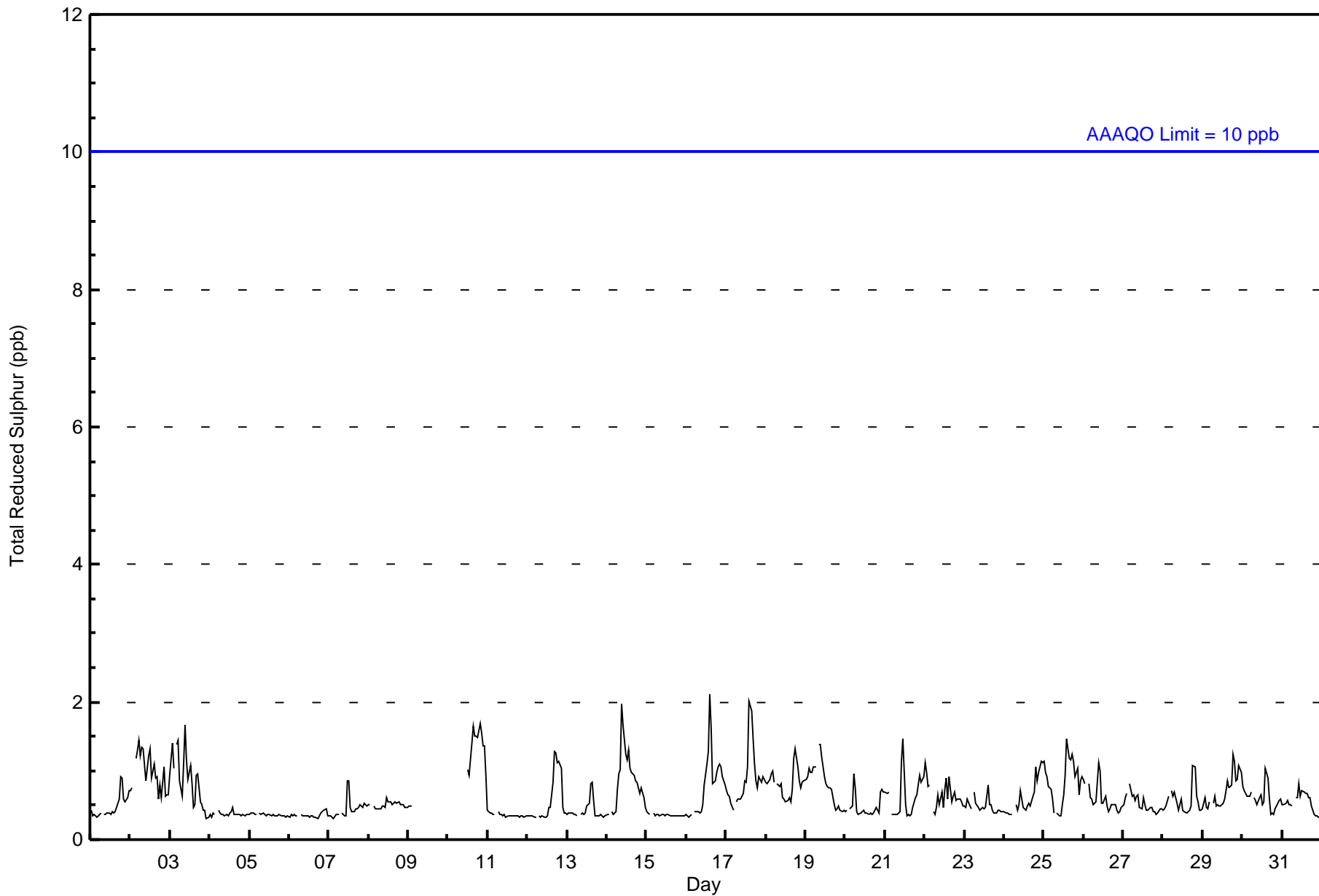
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1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	2	2	2	2	1	2	2	1	1	Diurnal Maximum

Z - zerospan C - Calibration AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	682	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	60	22	7	5	9	7	8	72	128	38	42	39	46	109	55	35	682
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	22	7	5	9	7	8	72	128	38	42	39	46	109	55	35	682

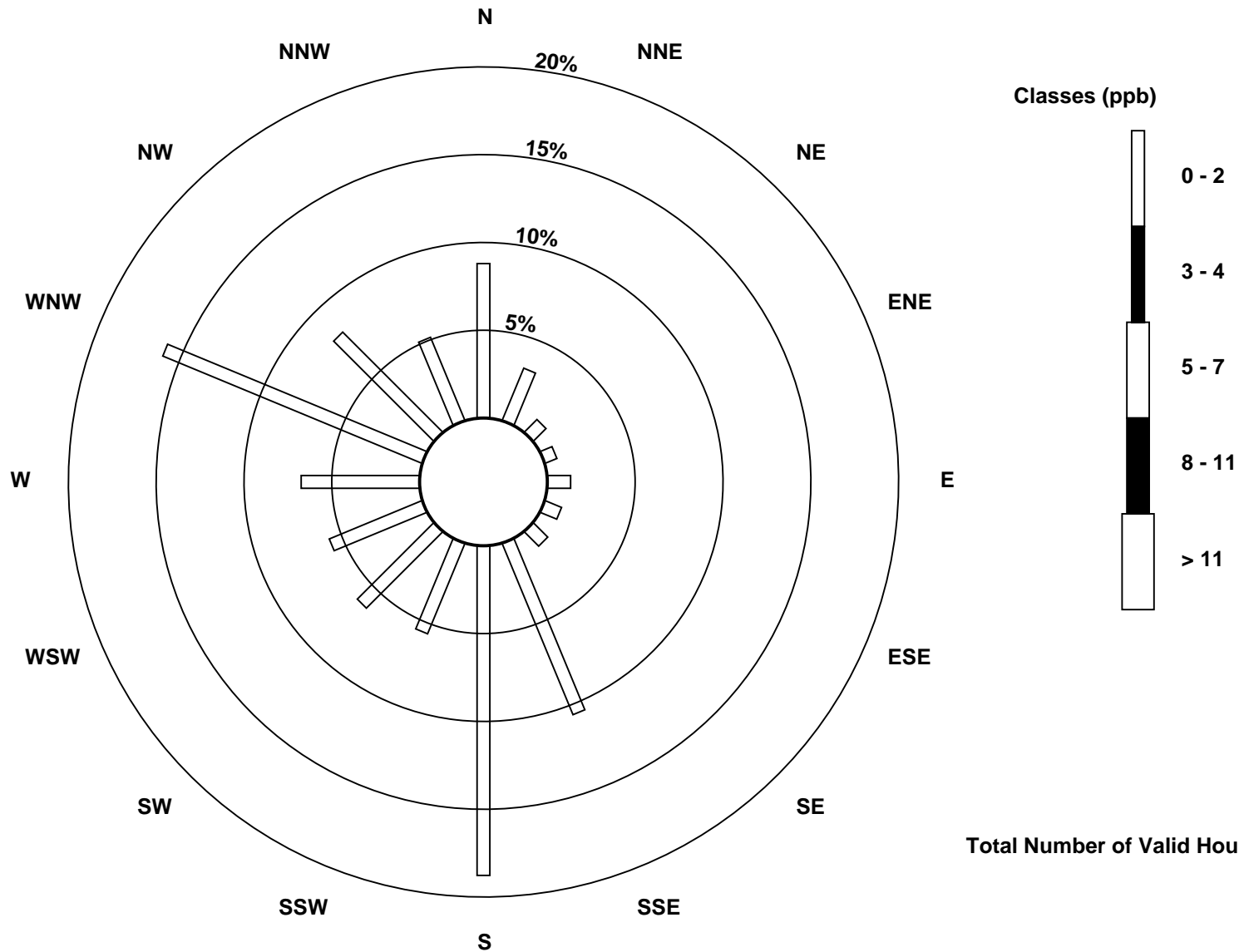
Total Number of Valid Hours: 682

Total Number of Hours: 744

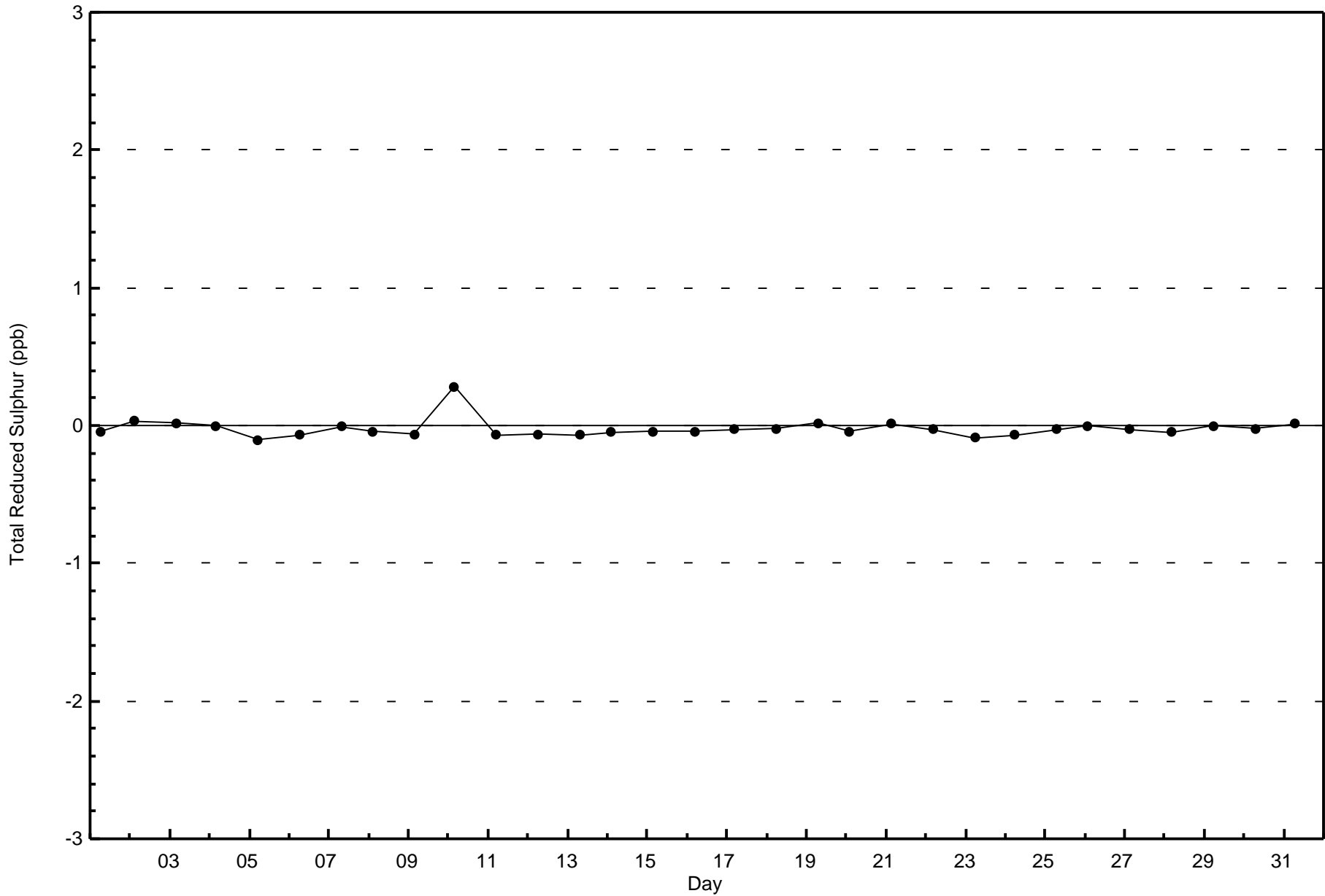


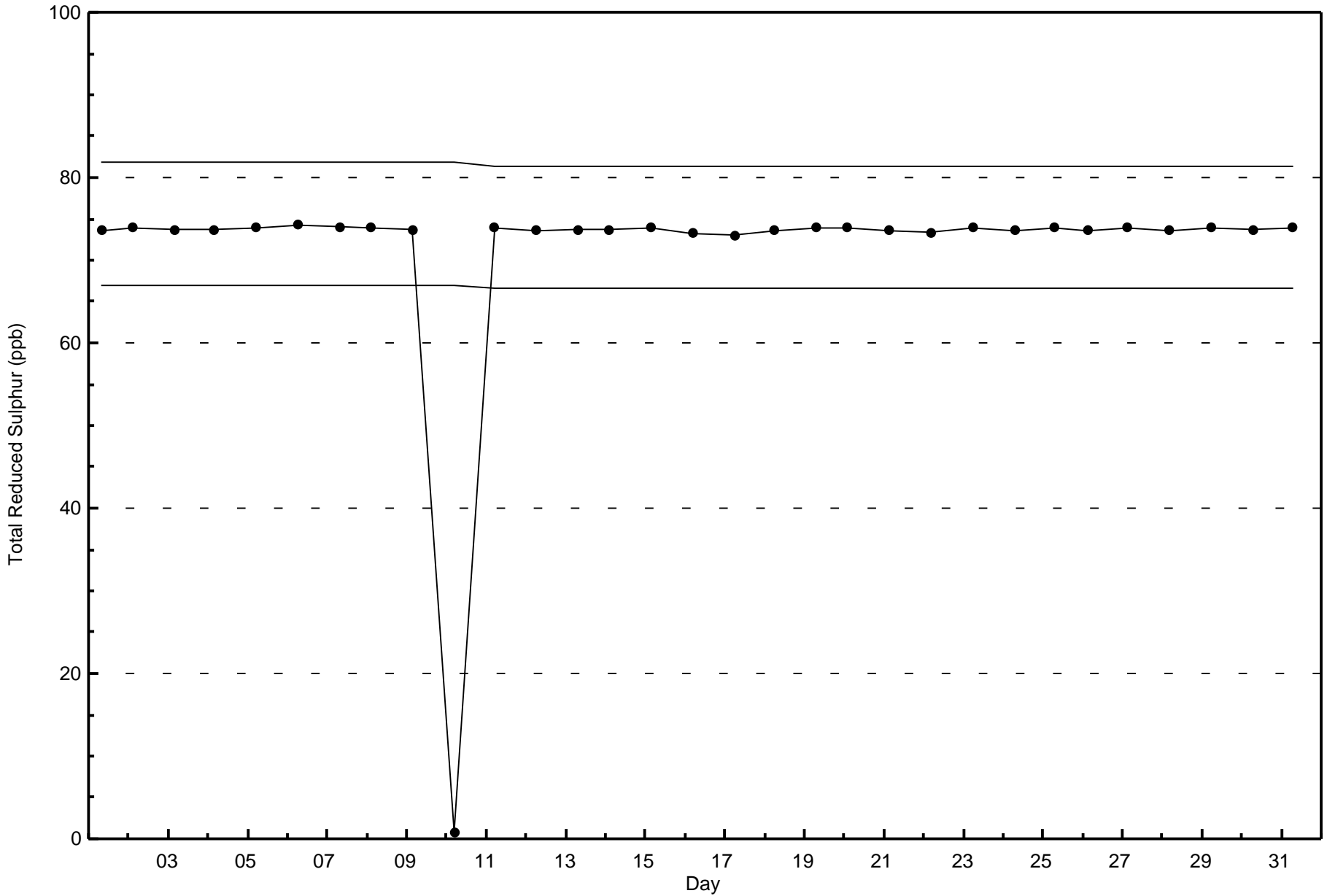
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter (AMS 1)



Total Number of Valid Hours: 682

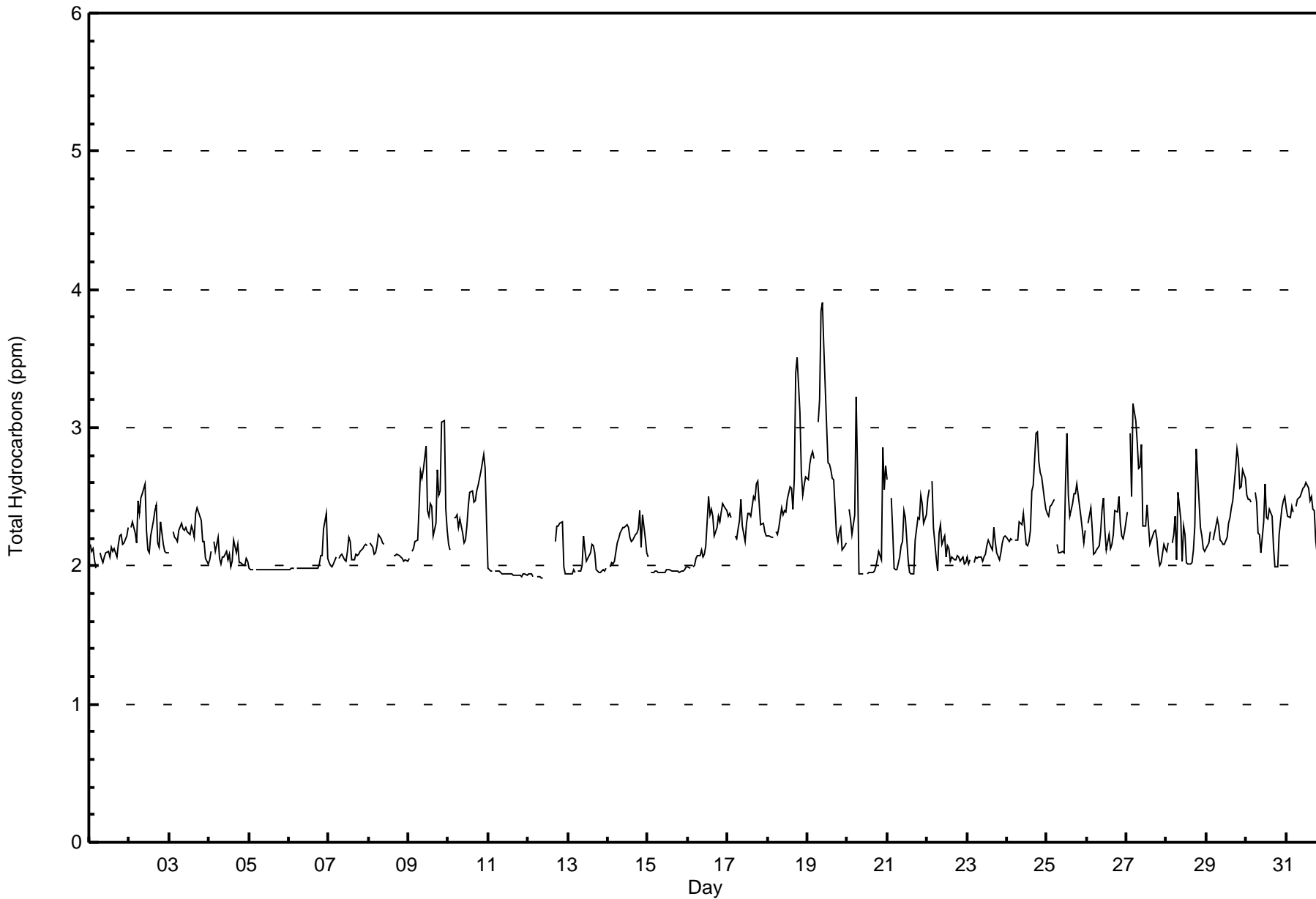






Maximum Value: 3.9 ppm on Dec 19 10:00		Maximum Daily Average: 2.7 ppm on Dec 19		Hours in Service: 744																							
Minimum Value: 1.9 ppm on Dec 12 10:00		Minimum Daily Average: 1.9 ppm on Dec 11		Hours of Data: 700																							
Maximum Diurnal Average: 2.3 ppm at hour 19		Minimum Diurnal Average: 2.2 ppm at hour 2		Hours of Missing Data: 44																							
Monthly Average: 2.24 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.2 Q ₃ = 2.4 P ₉₀ = 2.6 P ₉₉ = 3.2		Hours of Calibration: 36																							
				Percent Operational Time: 98.9																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2.2	2.1	2.1	2.0	2.0	Z	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.1	2.3	
2-Dec	Z	2.3	2.3	2.2	2.2	2.5	2.4	2.5	2.5	2.6	2.3	2.1	2.1	2.2	2.3	2.4	2.4	2.2	2.1	2.3	2.2	2.1	2.1	2.1	2.3	2.6	
3-Dec	2.1	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.2	2.4	2.4	2.4	2.3	2.2	2.2	2.1	2.0	2.2	2.4		
4-Dec	2.0	2.1	Z	2.2	2.1	2.2	2.1	2.0	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.2	2.1	2.2	2.0	2.0	2.0	2.1	2.0	2.1	2.2		
5-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
6-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.4	2.1	2.0	2.4	
7-Dec	2.0	2.0	2.0	2.0	2.1	Z	2.1	2.1	2.1	2.0	2.0	2.1	2.2	2.2	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	
8-Dec	Z	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.2	
9-Dec	2.1	Z	2.1	2.1	2.2	2.2	2.4	2.7	2.6	2.7	2.9	2.4	2.4	2.5	2.4	2.2	2.3	2.7	2.5	2.5	3.0	3.1	2.4	2.3	2.5	3.1	
10-Dec	2.2	2.1	Z	2.3	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.3	2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.7	2.7	2.8	2.7	2.3	2.4	2.8	
11-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	M	M	M	M	M	M	2.2	2.3	2.3	2.3	2.3	2.0	1.9	1.9	--	2.3	
13-Dec	1.9	1.9	1.9	2.0	2.0	Z	2.0	2.0	2.0	2.2	2.1	2.0	2.1	2.1	2.2	2.1	2.1	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.2	
14-Dec	Z	2.0	2.0	2.0	2.0	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.1	2.4	2.2	2.1	2.2	2.4	
15-Dec	2.1	Z	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
16-Dec	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.5	2.4	2.4	2.4	2.2	2.3	2.4	2.3	2.4	2.5	2.4	2.4	2.2	2.5	
17-Dec	2.4	2.4	2.3	Z	2.2	2.2	2.3	2.3	2.5	2.3	2.2	2.3	2.4	2.4	2.4	2.5	2.5	2.6	2.6	2.5	2.3	2.3	2.2	2.2	2.4	2.6	
18-Dec	2.2	2.2	2.2	2.2	Z	2.3	2.2	2.3	2.4	2.4	2.4	2.4	2.5	2.6	2.6	2.4	2.6	3.4	3.5	3.1	2.7	2.5	2.6	2.6	2.5	3.5	
19-Dec	2.6	2.7	2.8	2.8	2.8	Z	3.0	3.2	3.8	3.9	3.6	3.0	2.7	2.7	2.7	2.6	2.6	2.2	2.2	2.2	2.3	2.1	2.1	2.2	2.7	3.9	
20-Dec	Z	2.4	2.3	2.2	2.4	3.2	2.7	1.9	1.9	1.9	M	M	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.9	2.6	2.7	2.2	3.2	
21-Dec	2.6	Z	2.5	2.3	2.0	2.0	2.0	2.1	2.1	2.2	2.4	2.3	2.0	1.9	1.9	1.9	1.9	2.2	2.3	2.3	2.5	2.4	2.3	2.4	2.2	2.6	
22-Dec	2.5	2.6	Z	2.6	2.3	2.1	2.0	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.1	2.0	2.0	2.2	2.6	
23-Dec	2.1	2.0	2.0	Z	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.2	2.1	2.1	2.3	2.2	2.1	2.0	2.1	2.2	2.2	2.2	2.1	2.3	
24-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.4	2.2	2.1	2.2	2.3	2.5	2.6	3.0	3.0	2.8	2.7	2.6	2.5	2.4	2.4	3.0	
25-Dec	2.4	2.4	2.4	2.4	2.5	Z	2.2	2.1	2.1	2.1	2.1	2.6	3.0	2.5	2.4	2.5	2.5	2.5	2.6	2.5	2.4	2.3	2.2	2.3	2.4	3.0	
26-Dec	Z	2.3	2.4	2.3	2.1	2.1	2.1	2.1	2.2	2.4	2.5	2.3	2.1	2.2	2.1	2.2	2.2	2.4	2.4	2.5	2.3	2.2	2.2	2.2	2.3	2.5	
27-Dec	2.4	Z	3.0	2.5	3.2	3.0	2.9	2.7	2.7	2.9	2.3	2.3	2.4	2.3	2.2	2.2	2.3	2.3	2.2	2.1	2.0	2.0	2.2	2.1	2.4	3.2	
28-Dec	2.1	2.2	Z	2.2	2.2	2.4	2.0	2.5	2.3	2.0	2.3	2.2	2.0	2.0	2.0	2.0	2.1	2.3	2.8	2.5	2.3	2.2	2.1	2.1	2.2	2.8	
29-Dec	2.1	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.7	2.8	2.8	2.6	2.6	2.7	2.6	2.4	2.8
30-Dec	2.5	2.5	2.5	2.5	Z	2.5	2.5	2.2	2.2	2.1	2.3	2.6	2.4	2.3	2.4	2.4	2.1	2.0	2.0	2.0	2.2	2.4	2.5	2.5	2.3	2.6	
31-Dec	2.4	2.4	2.4	2.4	2.4	Z	2.4	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.5	2.5	2.4	2.4	2.2	2.0	2.0	2.0	2.0	2.0	2.3	2.6	
																								Diurnal Average			
																								Diurnal Maximum			
																								Diurnal Average			
																								Diurnal Maximum			

Z - zerospan C - Calibration M - Maintenance





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	194	27.71	27.71
2.1 - 3.0	496	70.86	98.57
3.1 - 10.0	10	1.43	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	13	2	0	1	2	0	1	2	8	4	14	21	28	73	17	8	194
2.1 - 3.0	43	20	7	4	6	6	6	71	138	36	28	19	15	36	37	24	496
3.1 - 10.0	2	0	0	0	0	0	0	0	1	1	1	0	0	0	0	5	10
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	22	7	5	8	6	7	73	147	41	43	40	43	109	54	37	700

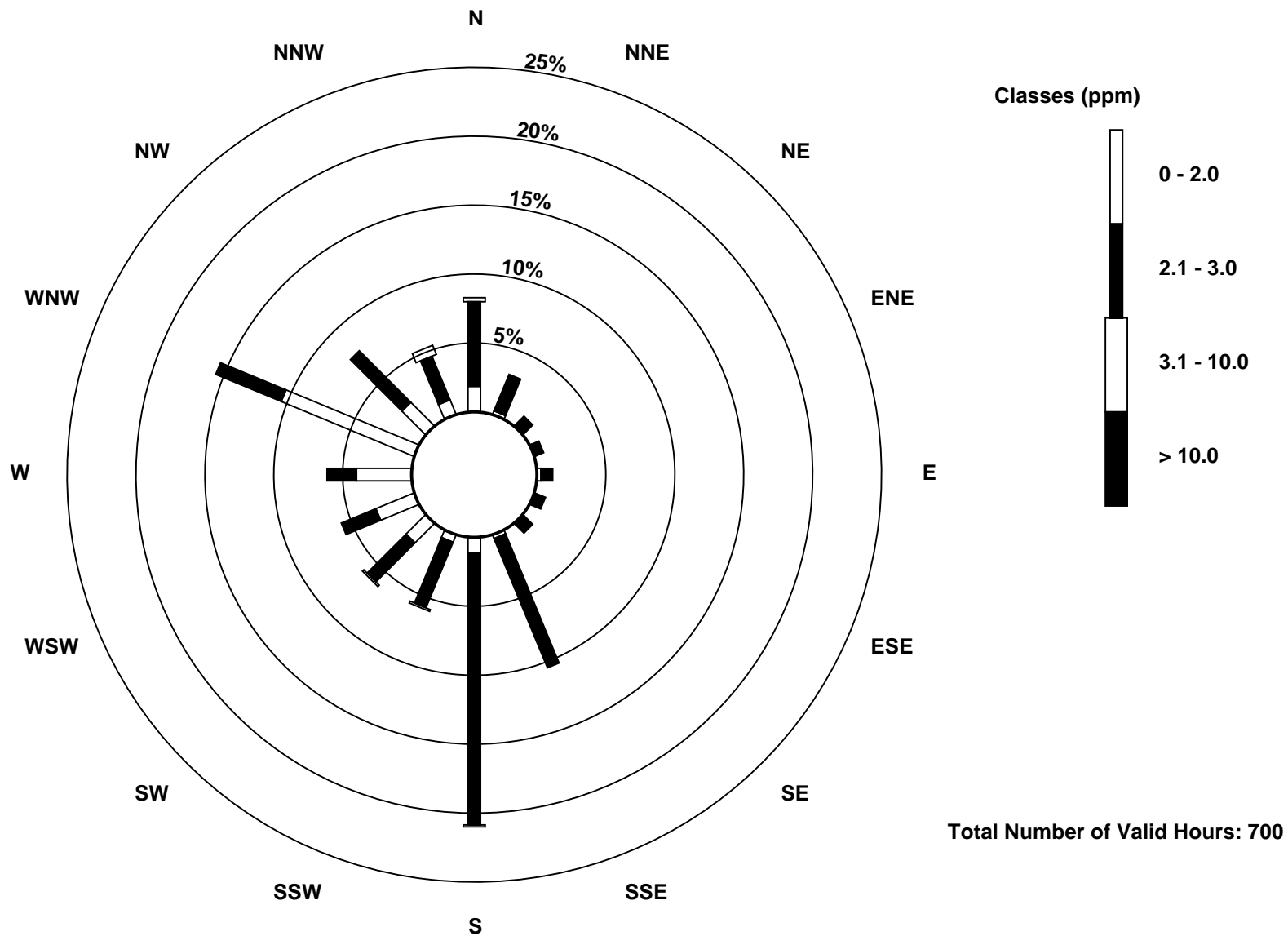
Total Number of Valid Hours: 700

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter (AMS 1)



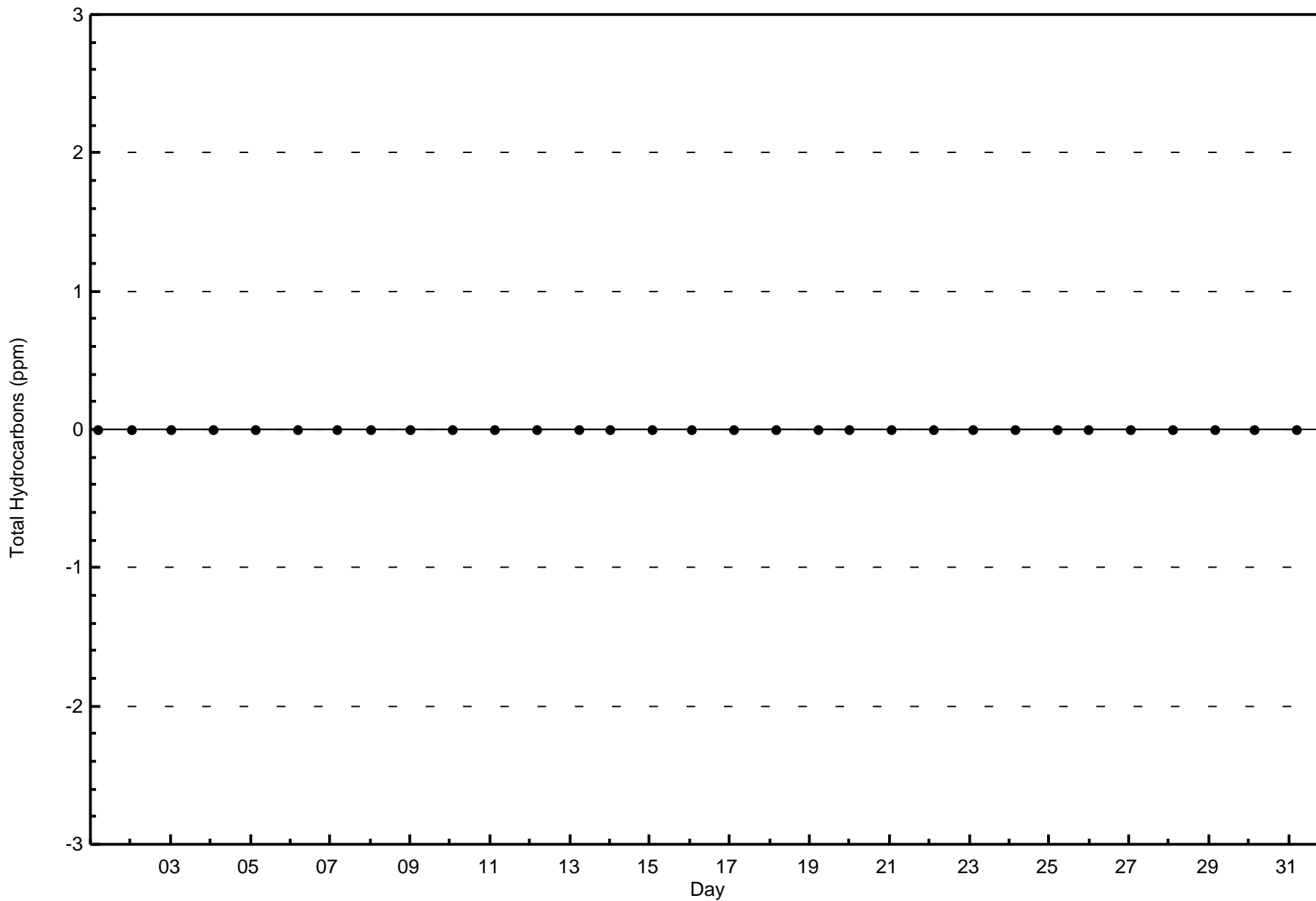


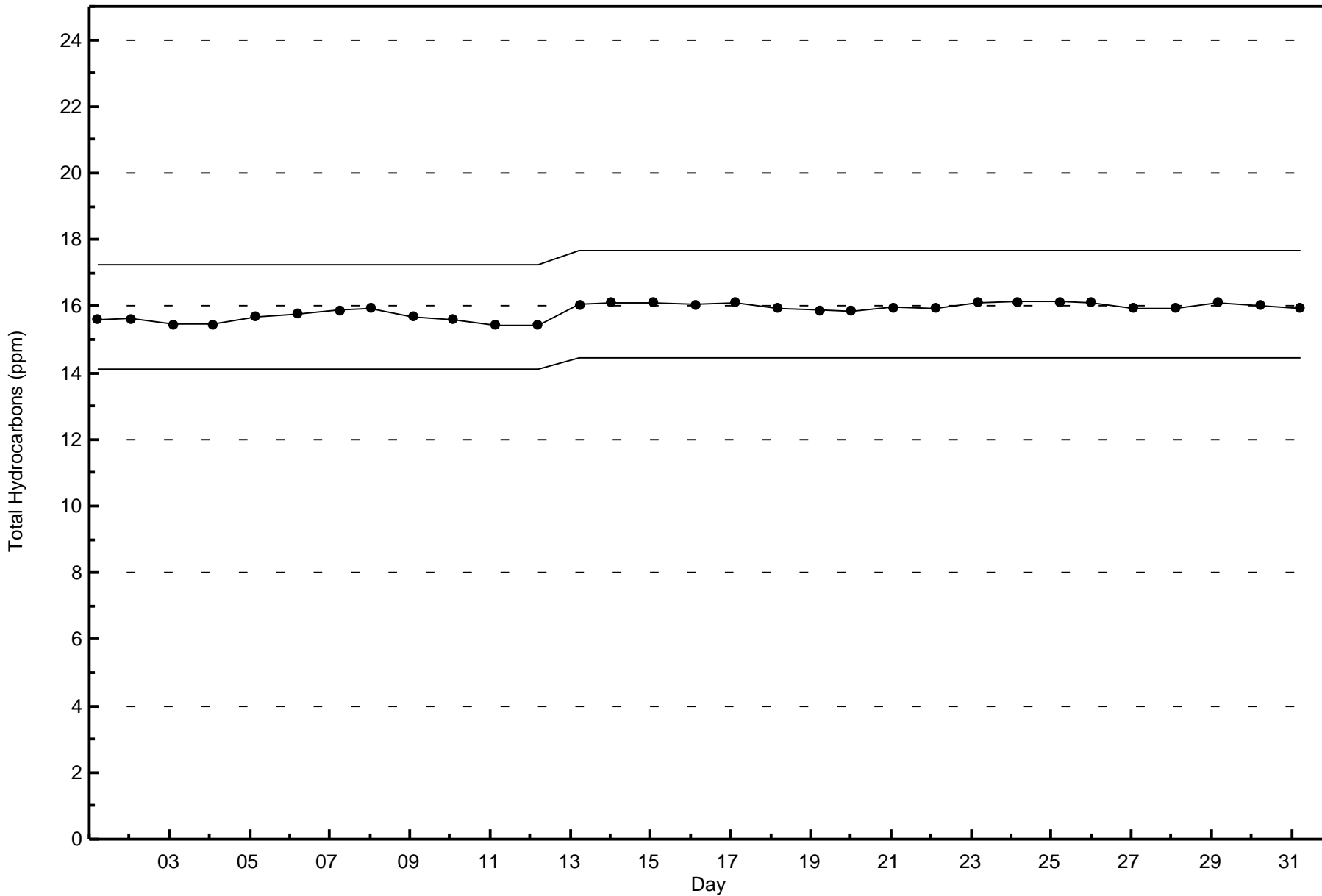
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

Fort McKay - Bertha Ganter - December 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Non Methane Hydrocarbons (NMHC) - ppm

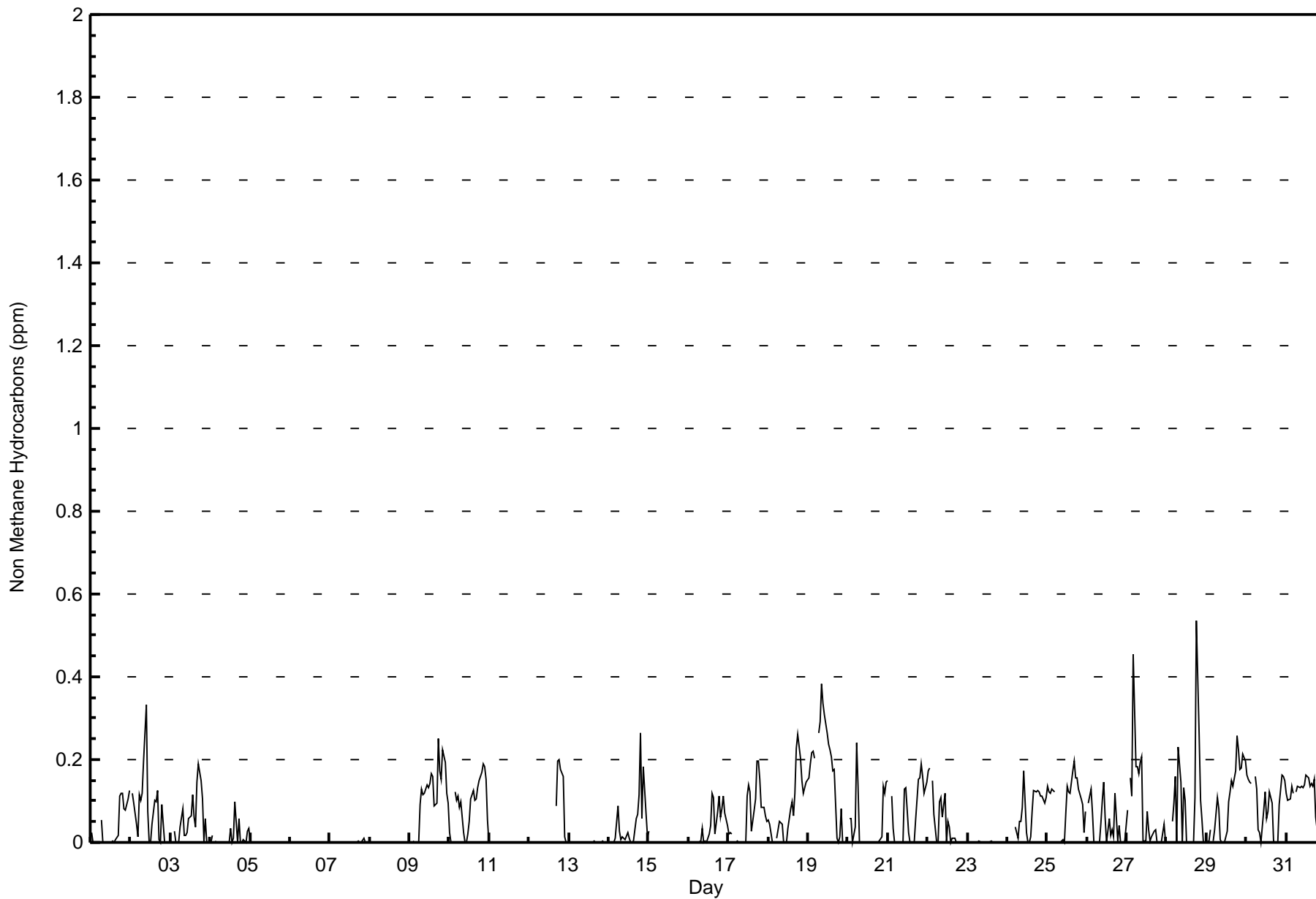
Fort McKay - Bertha Ganter - December 2016

Maximum Value: 0.534 ppm on Dec 28 19:00		Maximum Daily Average: 0.172 ppm on Dec 19		Hours in Service:	744																					
Minimum Value: 0.000 ppm on Dec 1 02:00		Minimum Daily Average: 0.000 ppm on Dec 5		Hours of Data:	700																					
Maximum Diurnal Average: 0.089 ppm at hour 19		Minimum Diurnal Average: 0.043 ppm at hour 2		Hours of Missing Data:	44																					
Monthly Average: 0.054 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.1 P ₉₀ = 0.2 P ₉₉ = 0.3		Hours of Calibration:	36																					
				Percent Operational Time:	98.9																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.023	0.000	0.000	0.000	0.000	Z	0.055	0.001	0.000	0.000	0.000	0.000	0.004	0.000	0.007	0.016	0.112	0.118	0.119	0.082	0.078	0.104	0.124	0.037	0.124	
2-Dec	Z	0.120	0.094	0.044	0.014	0.117	0.102	0.120	0.198	0.332	0.076	0.000	0.000	0.043	0.103	0.100	0.124	0.008	0.000	0.091	0.000	0.000	0.000	0.073	0.332	
3-Dec	0.000	Z	0.027	0.000	0.000	0.000	0.036	0.082	0.018	0.016	0.025	0.059	0.065	0.115	0.062	0.037	0.145	0.190	0.148	0.105	0.003	0.057	0.000	0.052	0.190	
4-Dec	0.000	0.016	Z	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.000	0.009	0.097	0.000	0.057	0.000	0.000	0.006	0.000	0.027	0.012	0.097	
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.012	0.000	0.000	0.001	0.012	
8-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
9-Dec	0.000	Z	0.003	0.000	0.000	0.000	0.093	0.130	0.115	0.118	0.140	0.133	0.142	0.165	0.158	0.087	0.093	0.250	0.175	0.152	0.224	0.192	0.120	0.112	0.250	
10-Dec	0.025	0.000	Z	0.121	0.103	0.113	0.085	0.099	0.024	0.000	0.000	0.020	0.053	0.104	0.127	0.102	0.105	0.131	0.149	0.169	0.191	0.182	0.154	0.092	0.191	
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	M	M	M	M	M	M	0.089	0.198	0.200	0.178	0.161	0.012	0.000	--	0.200	
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.003	
14-Dec	Z	0.000	0.000	0.000	0.012	0.089	0.027	0.007	0.012	0.009	0.005	0.023	0.009	0.000	0.000	0.003	0.056	0.068	0.117	0.264	0.058	0.184	0.067	0.045	0.264	
15-Dec	0.026	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.026	
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.003	0.035	0.000	0.002	0.000	0.020	0.040	0.117	0.107	0.021	0.074	0.112	0.061	0.080	0.111	0.071	0.039	0.117	
17-Dec	0.021	0.025	0.020	Z	0.001	0.005	0.000	0.000	0.000	0.001	0.000	0.112	0.139	0.121	0.029	0.080	0.104	0.198	0.198	0.154	0.084	0.086	0.065	0.065	0.198	
18-Dec	0.053	0.045	0.001	0.000	Z	0.012	0.032	0.050	0.044	0.001	0.002	0.001	0.032	0.080	0.097	0.064	0.120	0.226	0.263	0.203	0.148	0.120	0.133	0.081	0.263	
19-Dec	0.155	0.189	0.215	0.220	0.204	Z	0.264	0.292	0.382	0.337	0.308	0.265	0.236	0.224	0.205	0.174	0.175	0.010	0.000	0.013	0.080	0.000	0.000	0.172	0.382	
20-Dec	Z	0.059	0.058	0.000	0.036	0.239	0.137	0.000	0.000	0.000	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.013	0.137	0.120	0.045	0.239	
21-Dec	0.150	Z	0.111	0.032	0.000	0.000	0.000	0.000	0.000	0.001	0.128	0.133	0.024	0.000	0.000	0.000	0.000	0.055	0.153	0.158	0.188	0.160	0.118	0.068	0.188	
22-Dec	0.173	0.181	Z	0.149	0.067	0.000	0.000	0.098	0.110	0.062	0.118	0.000	0.050	0.038	0.000	0.009	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.181	
23-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
24-Dec	0.000	0.000	0.002	0.000	Z	0.038	0.010	0.052	0.051	0.086	0.172	0.022	0.001	0.000	0.014	0.076	0.124	0.124	0.127	0.122	0.114	0.111	0.096	0.063	0.172	
25-Dec	0.136	0.123	0.119	0.129	0.121	Z	0.000	0.000	0.000	0.006	0.000	0.072	0.137	0.123	0.118	0.173	0.198	0.156	0.154	0.128	0.106	0.091	0.023	0.095	0.198	
26-Dec	Z	0.095	0.129	0.071	0.000	0.000	0.001	0.048	0.100	0.145	0.062	0.000	0.059	0.016	0.031	0.015	0.120	0.004	0.039	0.000	0.000	0.000	0.004	0.041	0.145	
27-Dec	0.076	Z	0.156	0.112	0.453	0.183	0.183	0.165	0.194	0.206	0.004	0.003	0.074	0.031	0.002	0.013	0.029	0.032	0.000	0.000	0.000	0.046	0.004	0.085	0.453	
28-Dec	0.000	0.000	Z	0.051	0.094	0.159	0.000	0.231	0.145	0.000	0.131	0.102	0.000	0.000	0.000	0.000	0.109	0.534	0.258	0.102	0.053	0.001	0.000	0.086	0.534	
29-Dec	0.000	0.002	0.032	Z	0.004	0.032	0.108	0.081	0.008	0.000	0.000	0.000	0.029	0.098	0.123	0.148	0.136	0.172	0.258	0.225	0.177	0.179	0.213	0.096	0.258	
30-Dec	0.162	0.151	0.147	0.141	Z	0.158	0.128	0.032	0.023	0.000	0.077	0.123	0.057	0.074	0.122	0.096	0.004	0.000	0.000	0.000	0.091	0.163	0.161	0.089	0.163	
31-Dec	0.119	0.102	0.105	0.135	0.119	Z	0.122	0.136	0.133	0.135	0.133	0.139	0.161	0.156	0.136	0.143	0.136	0.153	0.061	0.000	0.000	0.000	0.000	0.101	0.161	
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	357	51.00	51.00
0.006 - 0.05	90	12.86	63.86
0.06 - 0.1	173	24.71	88.57
> 0.1	80	11.43	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	38	8	0	3	4	4	3	17	38	15	19	31	33	92	36	16	357
0.006 - 0.05	4	3	3	1	0	0	1	15	30	8	6	1	2	7	8	1	90
0.06 - 0.1	6	8	4	1	4	2	1	35	61	9	11	4	6	6	8	7	173
> 0.1	10	3	0	0	0	0	2	6	18	9	7	4	2	4	2	13	80
Totals	58	22	7	5	8	6	7	73	147	41	43	40	43	109	54	37	700

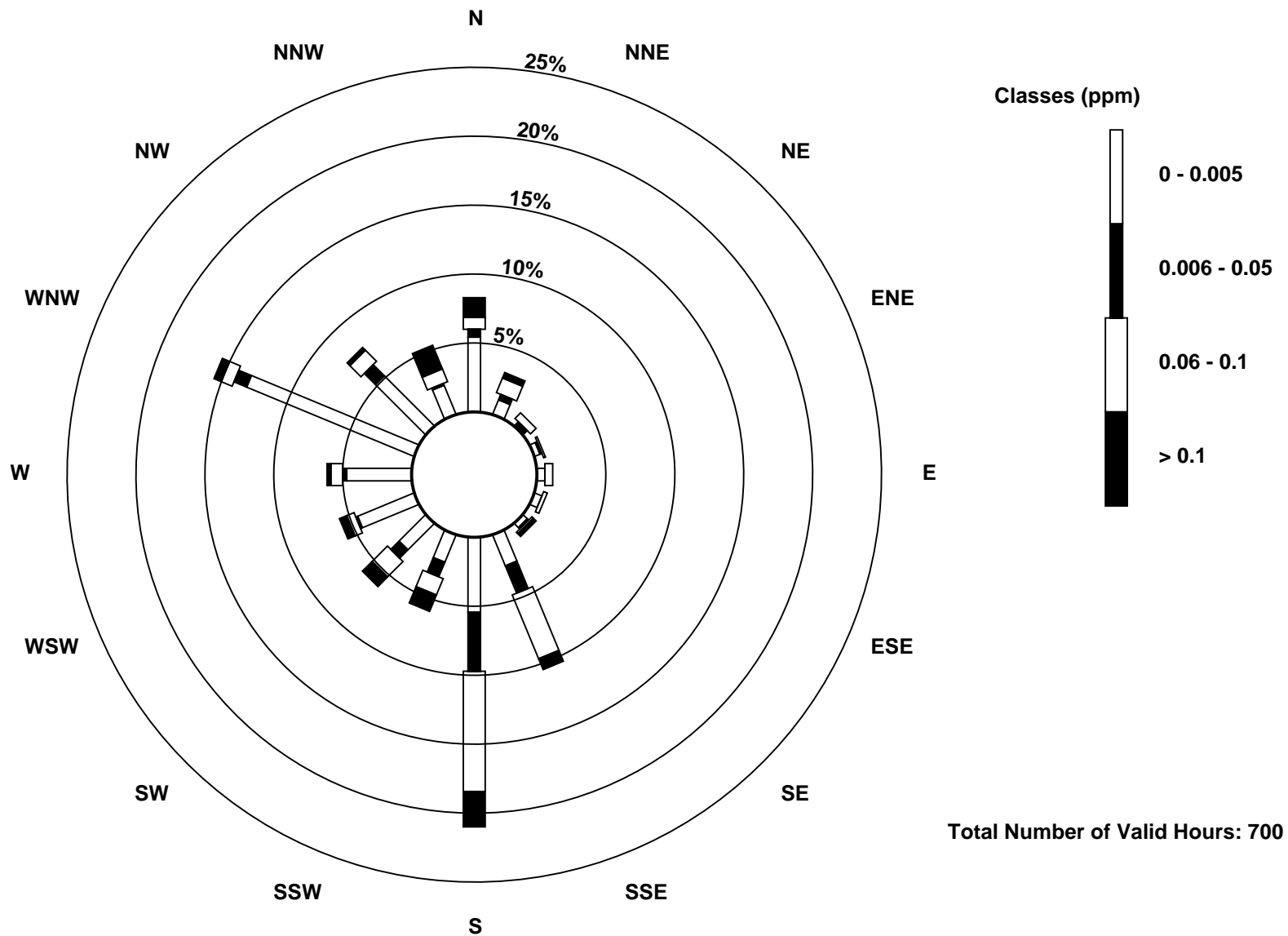
Total Number of Valid Hours: 700

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

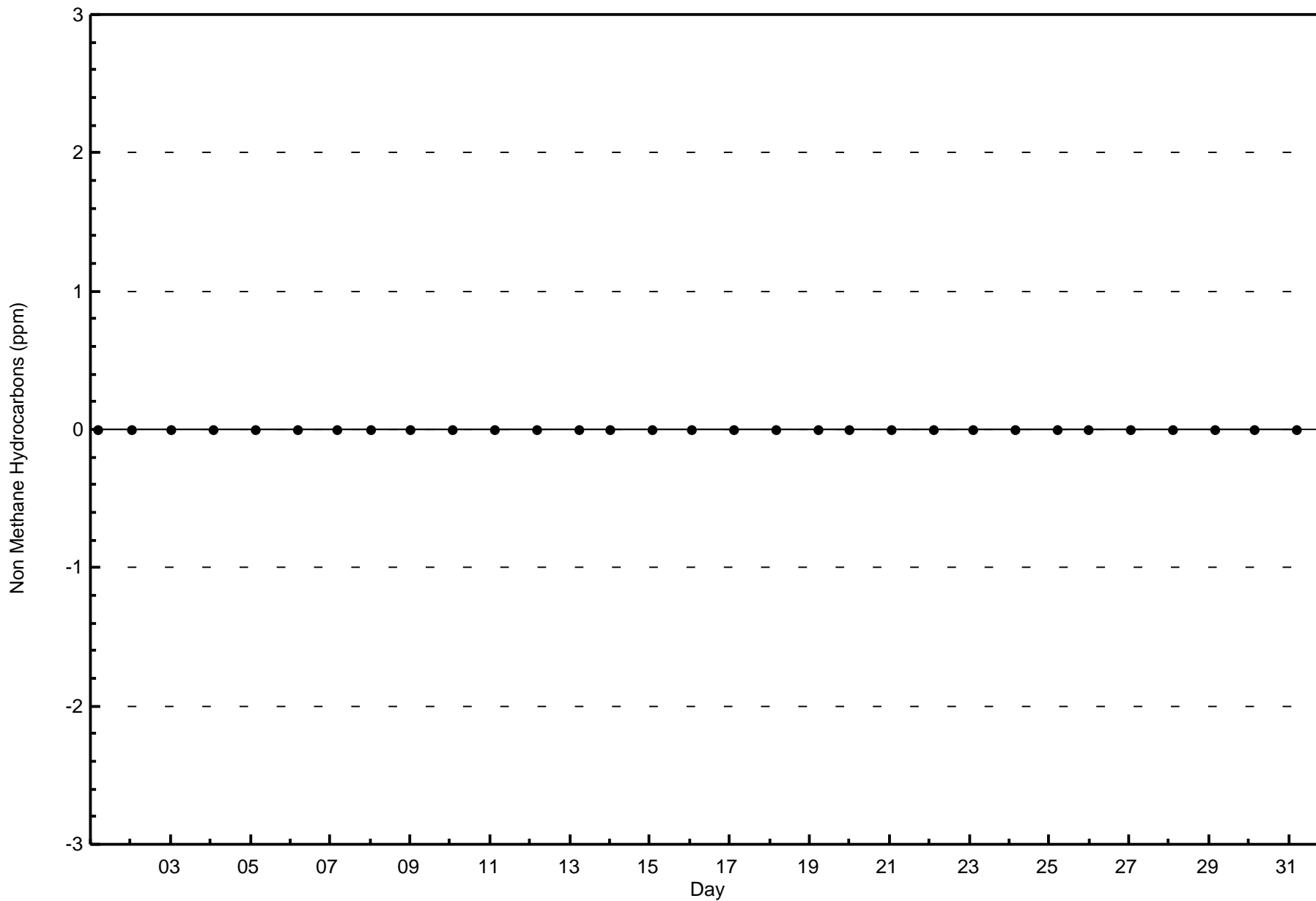
Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter (AMS 1)

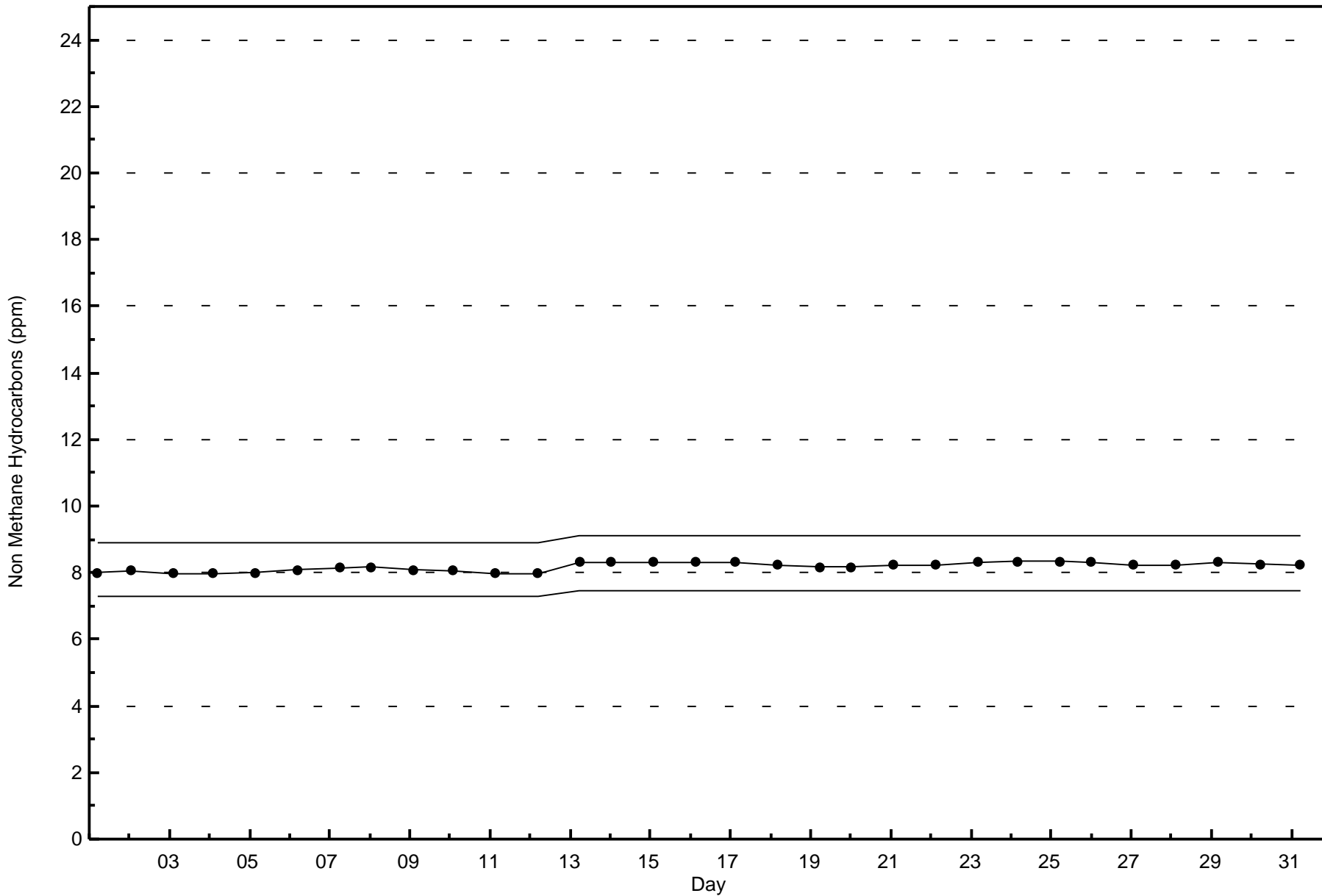




Wood Buffalo Environmental Association
Zero Responses

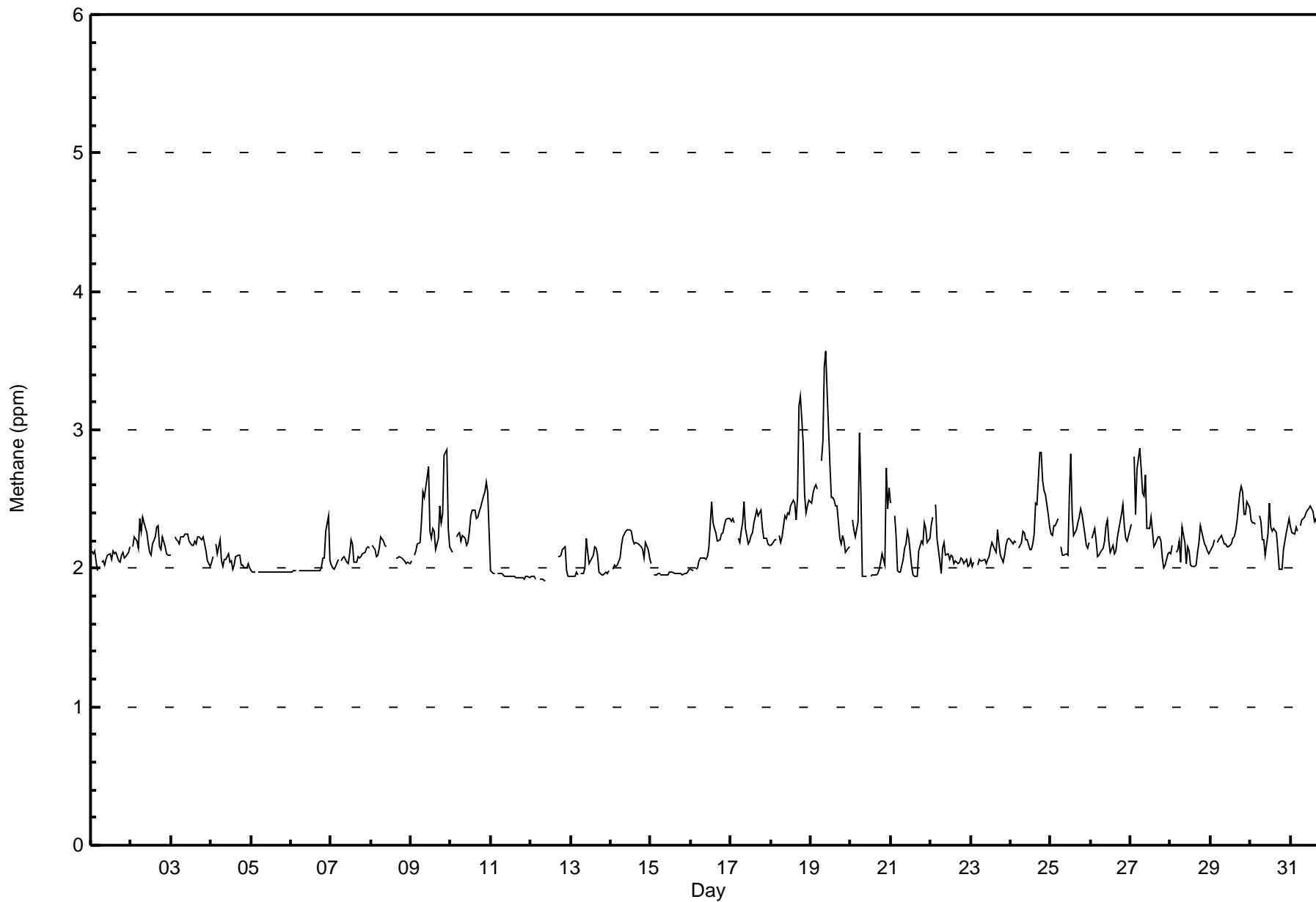
Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - December 2016







Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																		Daily Average	Daily Maximum																															
Maximum Value: 3.6 ppm on Dec 19 10:00		Maximum Daily Average: 2.6 ppm on Dec 19																		Hours of Data: 700																																		
Minimum Value: 1.9 ppm on Dec 12 10:00		Minimum Daily Average: 1.9 ppm on Dec 11																		Hours of Missing Data: 44																																		
Maximum Diurnal Average: 2.2 ppm at hour 19		Minimum Diurnal Average: 2.1 ppm at hour 2																		Hours of Calibration: 36																																		
Monthly Average: 2.18 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.2 Q ₃ = 2.3 P ₉₀ = 2.4 P ₉₉ = 2.9																		Percent Operational Time: 98.9																																		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																														
1-Dec	2.1	2.1	2.1	2.0	2.0	Z	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2																												
2-Dec	Z	2.2	2.2	2.2	2.1	2.4	2.3	2.4	2.3	2.3	2.2	2.1	2.1	2.2	2.2	2.3	2.3	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.4																											
3-Dec	2.1	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.2	2.2																											
4-Dec	2.0	2.1	Z	2.2	2.1	2.2	2.1	2.0	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2																										
5-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																										
6-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.4	2.1	2.0	2.4	2.1	2.2																										
7-Dec	2.0	2.0	2.0	2.0	2.1	Z	2.1	2.1	2.1	2.0	2.0	2.1	2.2	2.2	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2																									
8-Dec	Z	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.2	2.2	2.2																										
9-Dec	2.1	Z	2.1	2.1	2.2	2.2	2.3	2.6	2.5	2.6	2.7	2.3	C	2.3	2.3	2.1	2.2	2.4	2.3	2.4	2.8	2.9	2.3	2.2	2.4	2.9	2.4	2.9																										
10-Dec	2.1	2.1	Z	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.6	2.6	2.6	2.3	2.3	2.6	2.6	2.6																										
11-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																									
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	M	M	M	M	M	M	2.1	2.1	2.1	2.1	2.2	2.0	1.9	1.9	--	2.2	2.2	2.2																										
13-Dec	1.9	1.9	1.9	2.0	2.0	Z	2.0	2.0	2.0	2.2	2.1	2.0	2.1	2.1	2.2	2.1	2.1	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																									
14-Dec	Z	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3																								
15-Dec	2.0	Z	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
16-Dec	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.5	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.2	2.5	2.2	2.5																									
17-Dec	2.3	2.4	2.3	Z	2.2	2.2	2.3	2.3	2.5	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5																							
18-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.3	2.5	3.2	3.2	2.9	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2																							
19-Dec	2.5	2.5	2.6	2.6	2.6	Z	2.8	2.9	3.5	3.6	3.3	2.7	2.5	2.5	2.5	2.5	2.4	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.6	3.6	2.6	3.6	2.6	3.6																								
20-Dec	Z	2.4	2.3	2.2	2.3	3.0	2.5	1.9	1.9	1.9	M	M	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.7	2.4	2.6	2.2	3.0	2.2	3.0	2.2	3.0																								
21-Dec	2.5	Z	2.4	2.2	2.0	2.0	2.0	2.1	2.1	2.2	2.3	2.2	2.0	1.9	1.9	1.9	1.9	2.1	2.2	2.2	2.3	2.3	2.2	2.2	2.1	2.5	2.1	2.5	2.1	2.5																								
22-Dec	2.3	2.4	Z	2.5	2.2	2.1	2.0	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.5																							
23-Dec	2.1	2.0	2.0	Z	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.3	2.2	2.1	2.0	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.3																							
24-Dec	2.2	2.2	2.2	2.2	Z	2.1	2.2	2.3	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.5	2.5	2.8	2.8	2.8	2.6	2.6	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.8																							
25-Dec	2.2	2.2	2.3	2.3	2.4	Z	2.2	2.1	2.1	2.1	2.1	2.5	2.8	2.4	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.2	2.2	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.8																							
26-Dec	Z	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.1	2.2	2.1	2.1	2.2	2.3	2.4	2.5	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5																							
27-Dec	2.3	Z	2.8	2.4	2.7	2.9	2.7	2.5	2.5	2.7	2.3	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	2.1	2.1	2.4	2.4	2.4	2.4	2.4	2.9																							
28-Dec	2.1	2.2	Z	2.1	2.1	2.2	2.0	2.3	2.2	2.0	2.2	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3																							
29-Dec	2.1	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.5	2.6	2.5	2.4	2.4	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.6																							
30-Dec	2.4	2.3	2.3	2.3	Z	2.4	2.3	2.2	2.2	2.1	2.2	2.5	2.3	2.3	2.3	2.3	2.3	2.1	2.0	2.0	2.0	2.1	2.3	2.3	2.4	2.2	2.2	2.2	2.2	2.2	2.5																							
31-Dec	2.3	2.3	2.2	2.3	2.3	Z	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.3	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.4																							
																								2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	Diurnal Average
																								2.5	2.5	2.8	2.6	2.7	3.0	2.8	2.9	3.5	3.6	3.3	2.7	2.8	2.5	2.5	2.5	2.5	3.2	3.2	2.9	2.8	2.9	2.6	2.6	2.2	2.2	2.2	2.2	2.2	2.2	Diurnal Maximum
Z - zerospan																								C - Calibration				M - Maintenance																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	198	28.29	28.29
2.1 - 3.0	497	71.00	99.29
3.1 - 10.0	5	0.71	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	13	2	0	1	2	0	1	2	10	4	14	21	28	74	18	8	198
2.1 - 3.0	43	20	7	4	6	6	6	71	137	37	29	19	15	35	36	26	497
3.1 - 10.0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	22	7	5	8	6	7	73	147	41	43	40	43	109	54	37	700

Total Number of Valid Hours: 700

Total Number of Hours: 744

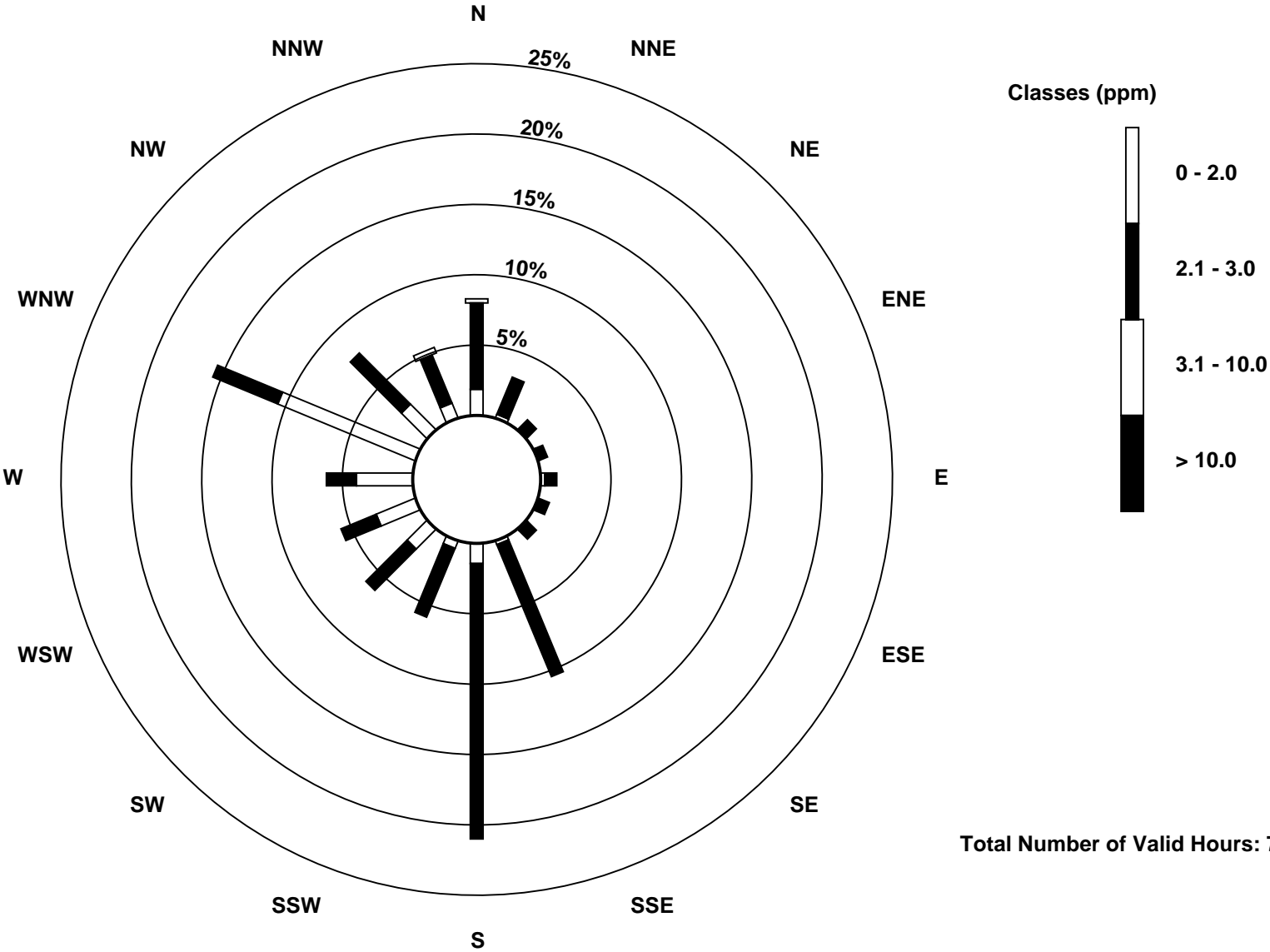


Wood Buffalo Environmental Association

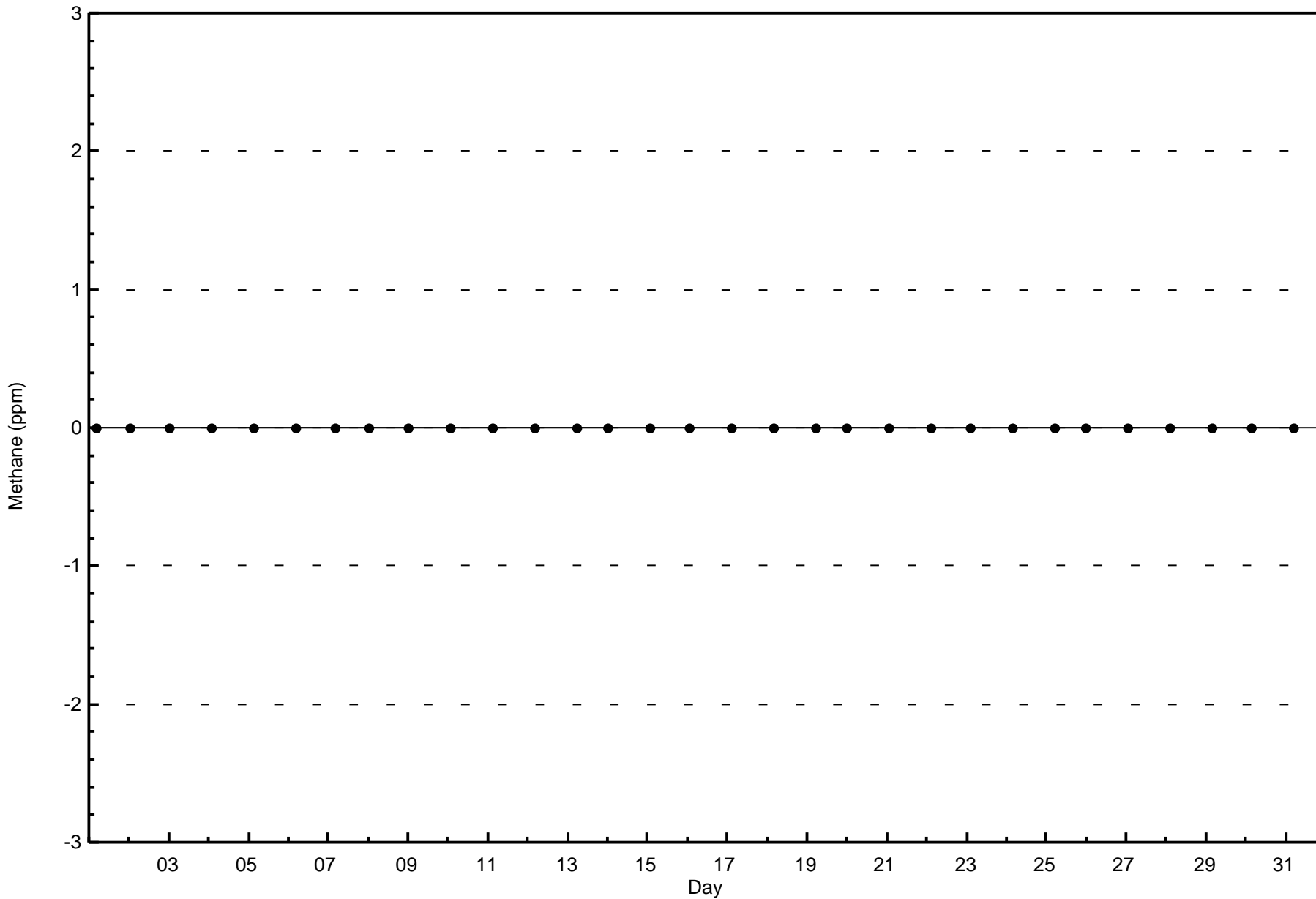
Wind Rose Dec 2016

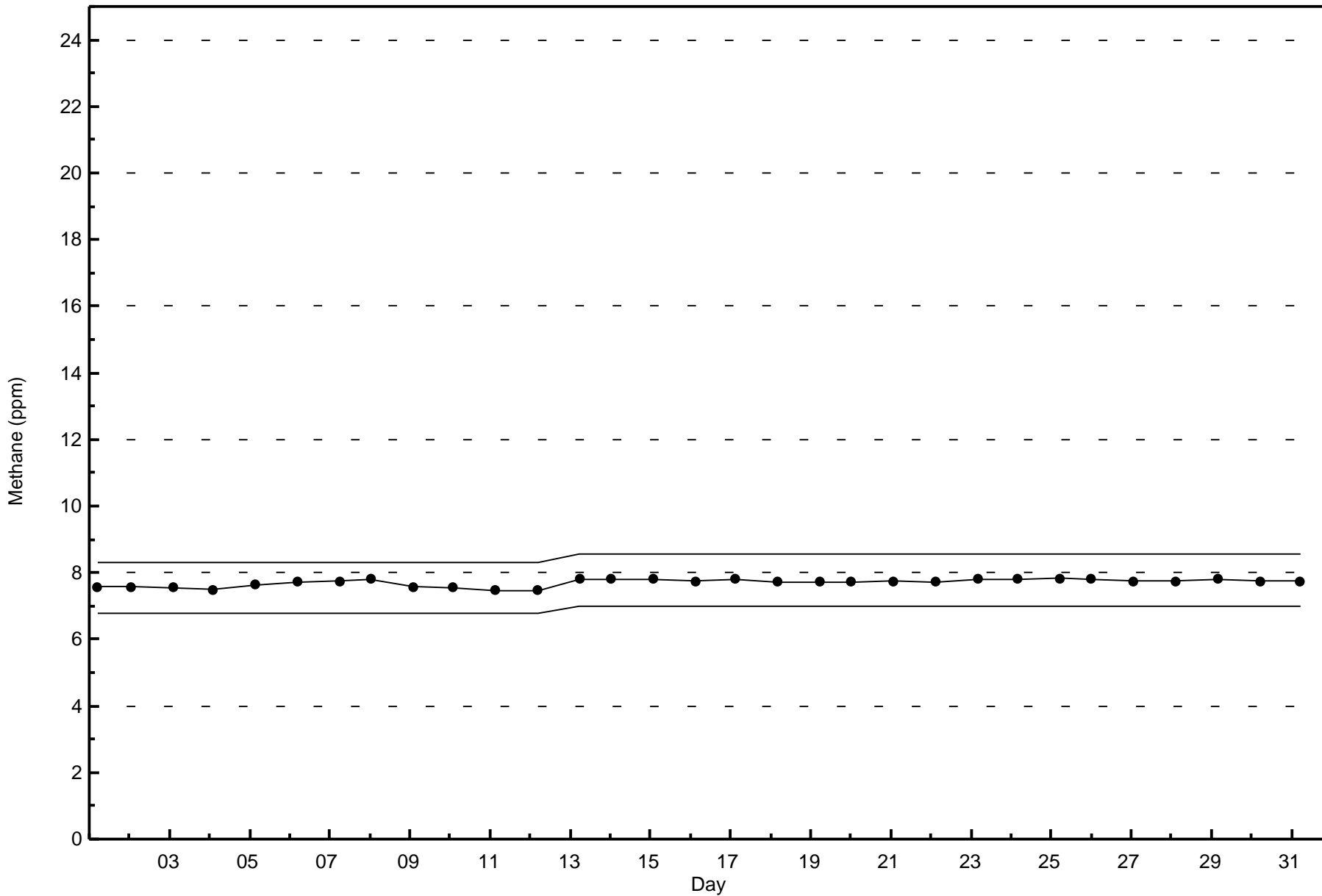
Methane (CH₄) - ppm

Fort McKay - Bertha Ganter (AMS 1)



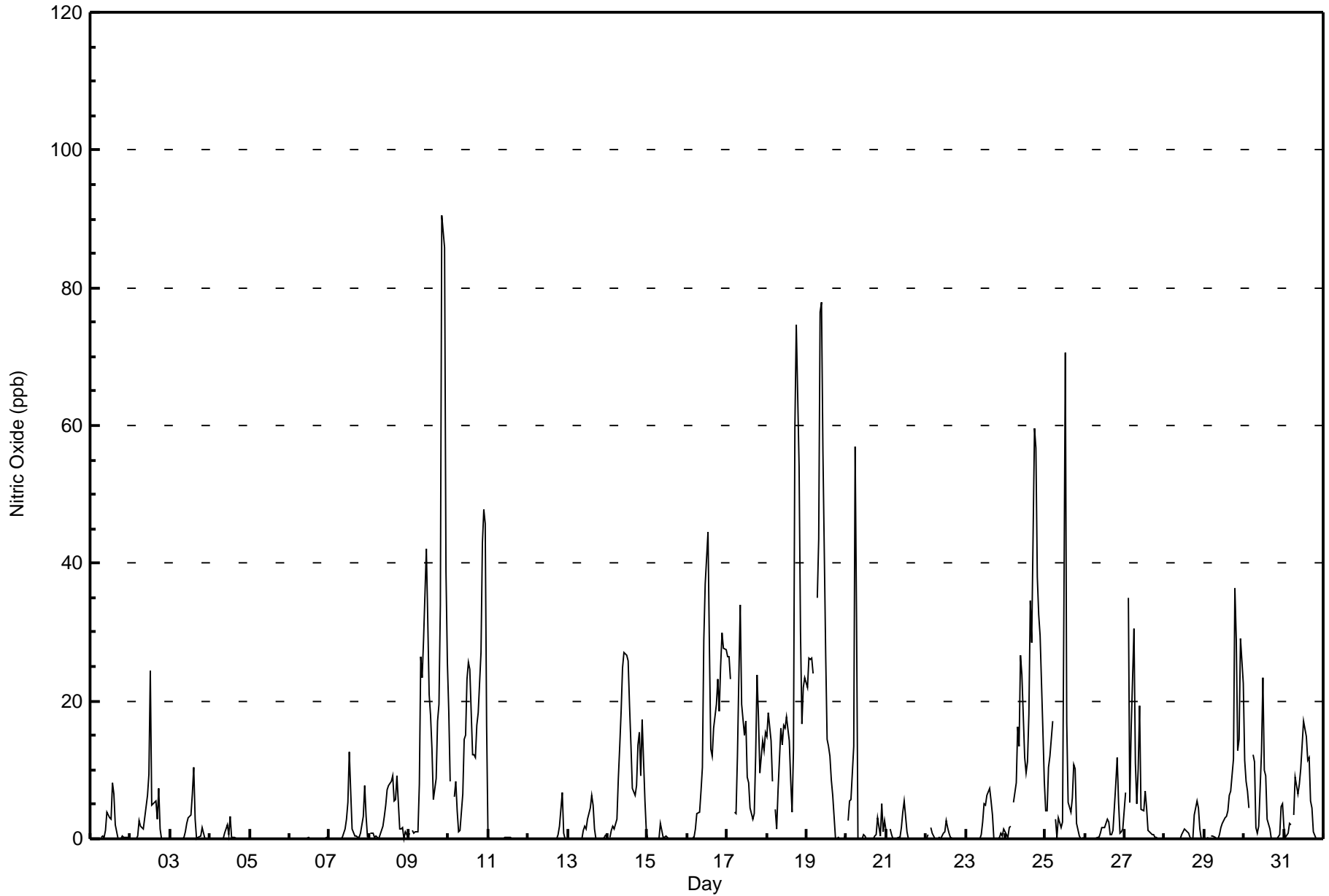
Total Number of Valid Hours: 700







Maximum Value: 91 ppb on Dec 9 21:00																		Maximum Daily Average: 23.6 ppb on Dec 9						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 1 01:00																		Minimum Daily Average: 0.0 ppb on Dec 5						Hours of Data: 707		
Maximum Diurnal Average: 11.5 ppb at hour 13																		Minimum Diurnal Average: 3.0 ppb at hour 4						Hours of Missing Data: 37		
Monthly Average: 6.7 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 8 P ₉₀ = 23 P ₉₉ = 54						Hours of Calibration: 37		
																		Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	1	4	3	3	8	7	2	0	0	0	0	0	0	0	0	1.3	8
2-Dec	Z	0	0	0	0	3	2	2	1	5	6	9	24	5	5	5	3	7	1	0	0	0	0	0	3.5	24
3-Dec	0	Z	0	0	0	0	0	0	0	1	2	3	4	7	10	3	0	0	0	2	1	0	0	0	1.4	10
4-Dec	0	0	Z	0	0	0	0	0	0	1	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0.3	3
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	Z	0	0	0	1	3	5	13	7	1	0	0	0	0	1	3	8	3	0	2.1	13
8-Dec	Z	1	1	0	0	0	0	1	2	3	5	7	8	8	9	6	6	9	1	2	2	0	1	0	3.1	9
9-Dec	1	Z	1	1	1	1	8	26	23	29	42	32	21	18	13	6	9	17	20	34	91	86	39	26	23.6	91
10-Dec	19	8	Z	6	8	4	1	1	7	14	15	23	26	25	12	12	12	16	18	27	43	48	46	16	17.7	48
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	C	C	0	0	1	2	7	1	0	0	--	7
13-Dec	0	0	0	0	0	Z	0	0	0	1	2	1	3	5	6	5	1	0	0	0	0	0	0	1	1.1	6
14-Dec	Z	0	1	2	1	3	9	13	18	25	27	27	26	19	14	7	6	8	14	15	9	17	5	1	11.7	27
15-Dec	0	Z	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2
16-Dec	0	0	Z	0	0	2	4	4	7	10	29	37	45	28	13	12	16	19	23	19	25	30	28	28	16.4	45
17-Dec	26	26	23	Z	4	4	12	23	34	20	15	17	9	8	4	3	4	12	24	18	10	14	13	15	14.7	34
18-Dec	15	18	14	8	Z	4	1	7	16	14	16	16	18	14	9	4	13	60	75	54	30	17	22	23	20.4	75
19-Dec	22	26	26	26	24	Z	35	44	77	78	56	27	15	14	12	9	6	0	0	0	0	0	0	1	21.6	78
20-Dec	Z	3	6	6	13	57	32	0	0	0	1	0	0	0	0	0	0	0	1	3	0	5	1	3	5.7	57
21-Dec	1	Z	2	1	0	0	0	0	0	2	4	6	1	0	0	0	0	0	0	0	0	0	0	0	0.7	6
22-Dec	0	1	Z	2	1	0	0	0	0	0	1	1	3	2	1	0	0	0	0	0	0	0	0	0	0.5	3
23-Dec	0	0	0	Z	0	0	0	0	0	1	2	5	5	6	7	6	3	0	0	0	0	1	0	1	1.7	7
24-Dec	1	0	2	2	Z	5	8	16	13	27	24	12	10	11	18	34	28	60	57	38	32	30	16	8	19.6	60
25-Dec	4	4	10	12	17	Z	3	0	3	2	2	34	70	17	5	4	6	11	10	2	0	0	0	0	9.5	70
26-Dec	Z	0	0	0	0	0	0	0	0	1	2	2	2	3	3	1	1	1	8	12	5	1	1	1	1.8	12
27-Dec	7	Z	35	5	16	31	11	5	10	19	4	4	7	4	1	1	1	1	0	0	0	0	0	0	7.1	35
28-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	3	5	4	1	0	0	0.9	5
29-Dec	0	0	0	Z	0	0	0	0	0	1	2	2	3	3	4	6	7	12	36	29	13	14	29	22	8.1	36
30-Dec	11	8	7	4	Z	12	11	2	1	2	13	23	10	9	3	1	0	0	0	0	0	1	5	5	5.6	23
31-Dec	2	0	1	2	2	Z	3	9	7	8	10	14	17	15	11	12	5	4	1	0	0	0	0	0	5.4	17
4.2 3.7 5.0 3.0 3.4 5.0 4.5 5.0 7.2 8.5 9.7 10.4 11.5 7.9 5.7 4.6 4.1 7.7 9.5 8.5 8.9 8.8 6.7 4.9																								Diurnal Average		
26 26 35 26 24 57 35 44 77 78 56 37 70 28 18 34 28 60 75 54 91 86 46 28																								Diurnal Maximum		
Z - zerospan C - Calibration																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	632	89.39	89.39
21 - 40	57	8.06	97.45
41 - 80	16	2.26	99.72
81 - 159	2	0.28	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	52	22	6	5	9	7	6	58	130	33	35	38	42	108	52	29	632
21 - 40	4	0	1	0	0	0	2	13	11	9	7	2	1	2	2	3	57
11 - 80	2	0	0	0	0	0	0	3	4	1	1	0	0	0	0	5	16
81 - 159	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	22	7	5	9	7	8	74	147	43	43	40	43	110	54	37	707

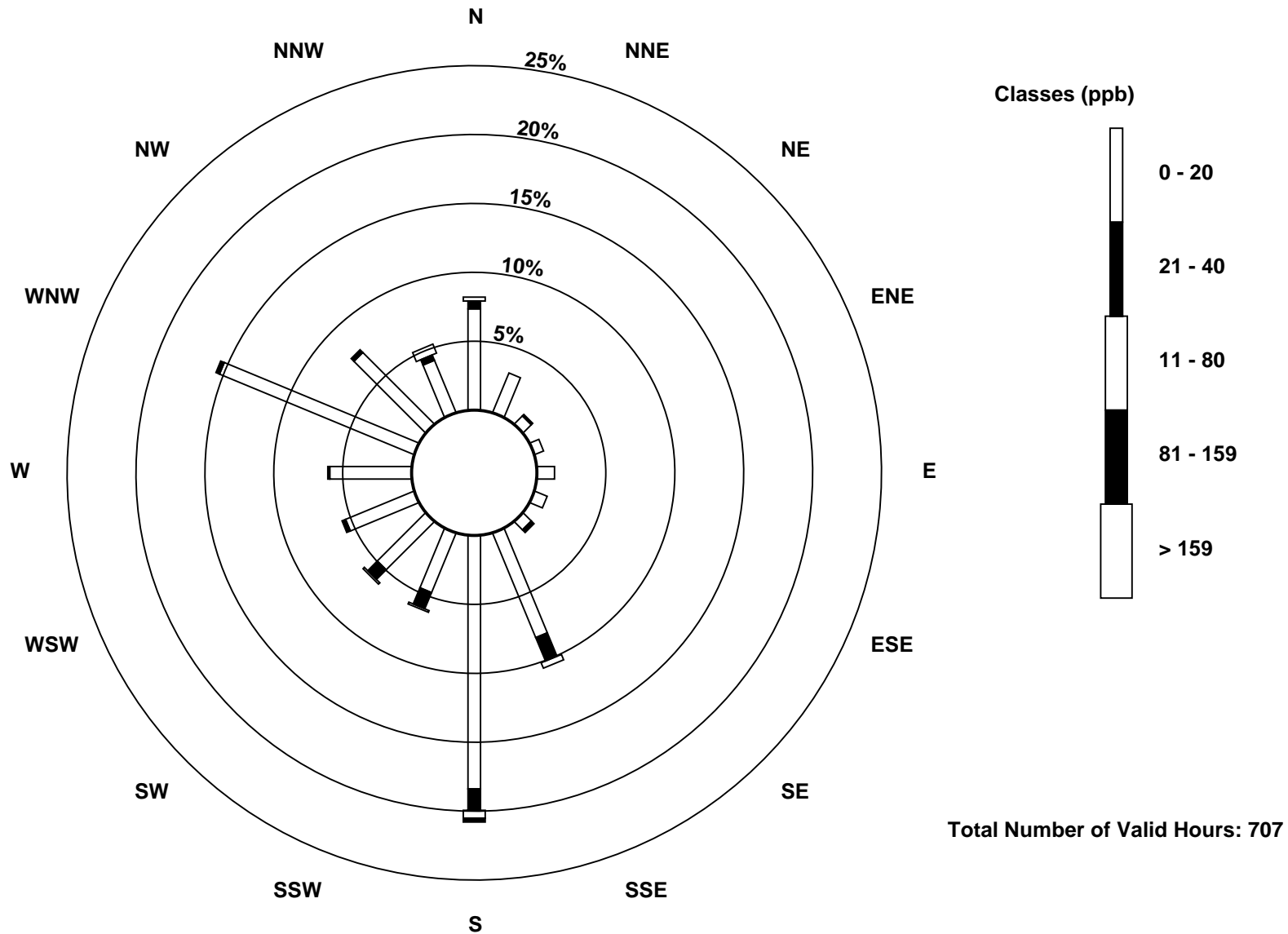
Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter (AMS 1)



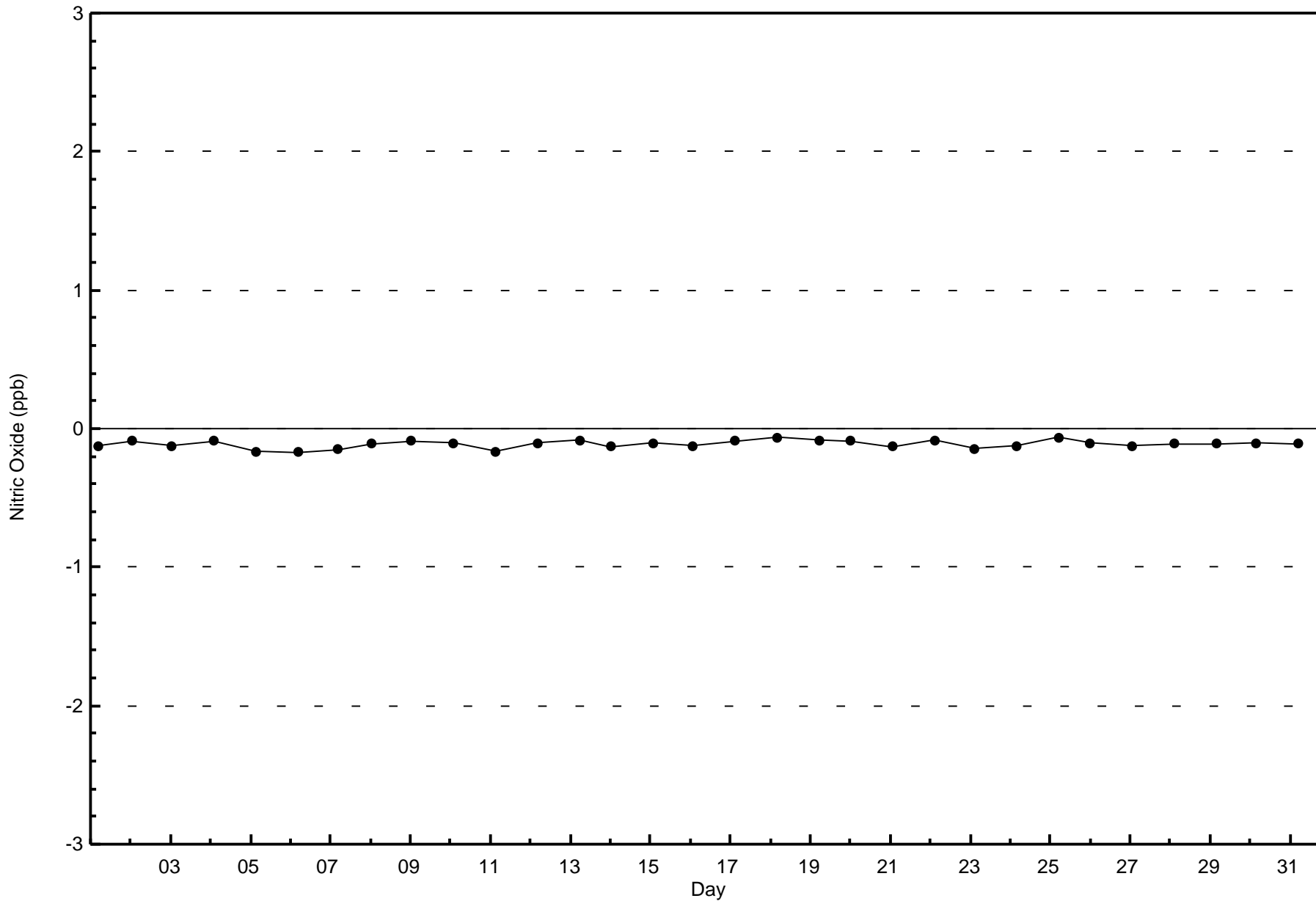


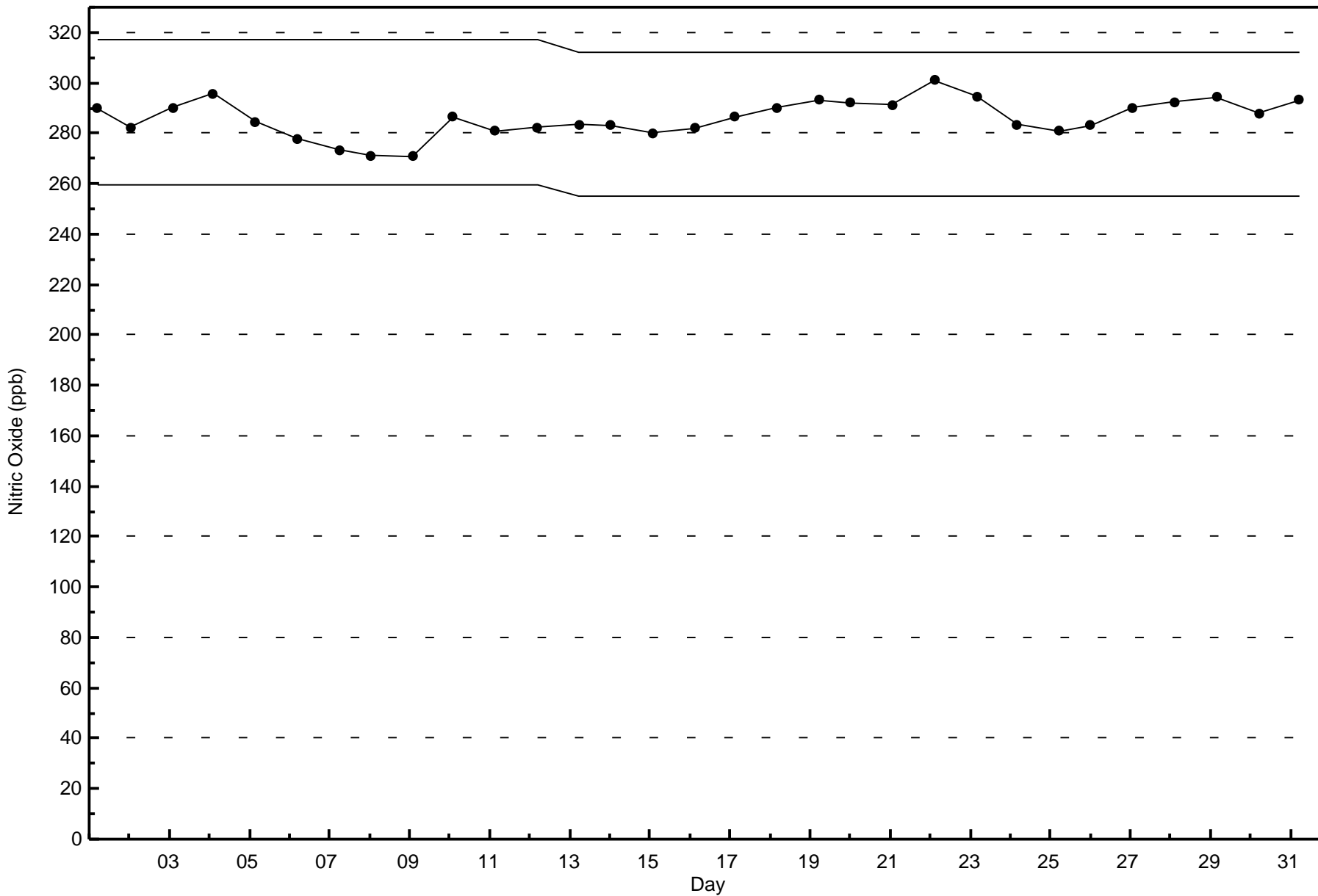
Wood Buffalo Environmental Association

Zero Responses

Nitric Oxide (NO) - ppb

Fort McKay - Bertha Ganter - December 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort McKay - Bertha Ganter - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 36 ppb on Dec 9 22:00	Maximum Daily Average: 24.2 ppb on Dec 10
Minimum Value: 0 ppb on Dec 5 03:00	Hours of Data: 707
Maximum Diurnal Average: 16.7 ppb at hour 19	Hours of Missing Data: 37
Monthly Average: 13.3 ppb	Hours of Calibration: 37
Minimum Daily Average: 0.1 ppb on Dec 5	Percent Operational Time: 100.0
Minimum Diurnal Average: 10.9 ppb at hour 12	
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 5 Median = 13 Q ₃ = 21 P ₉₀ = 26 P ₉₉ = 32	

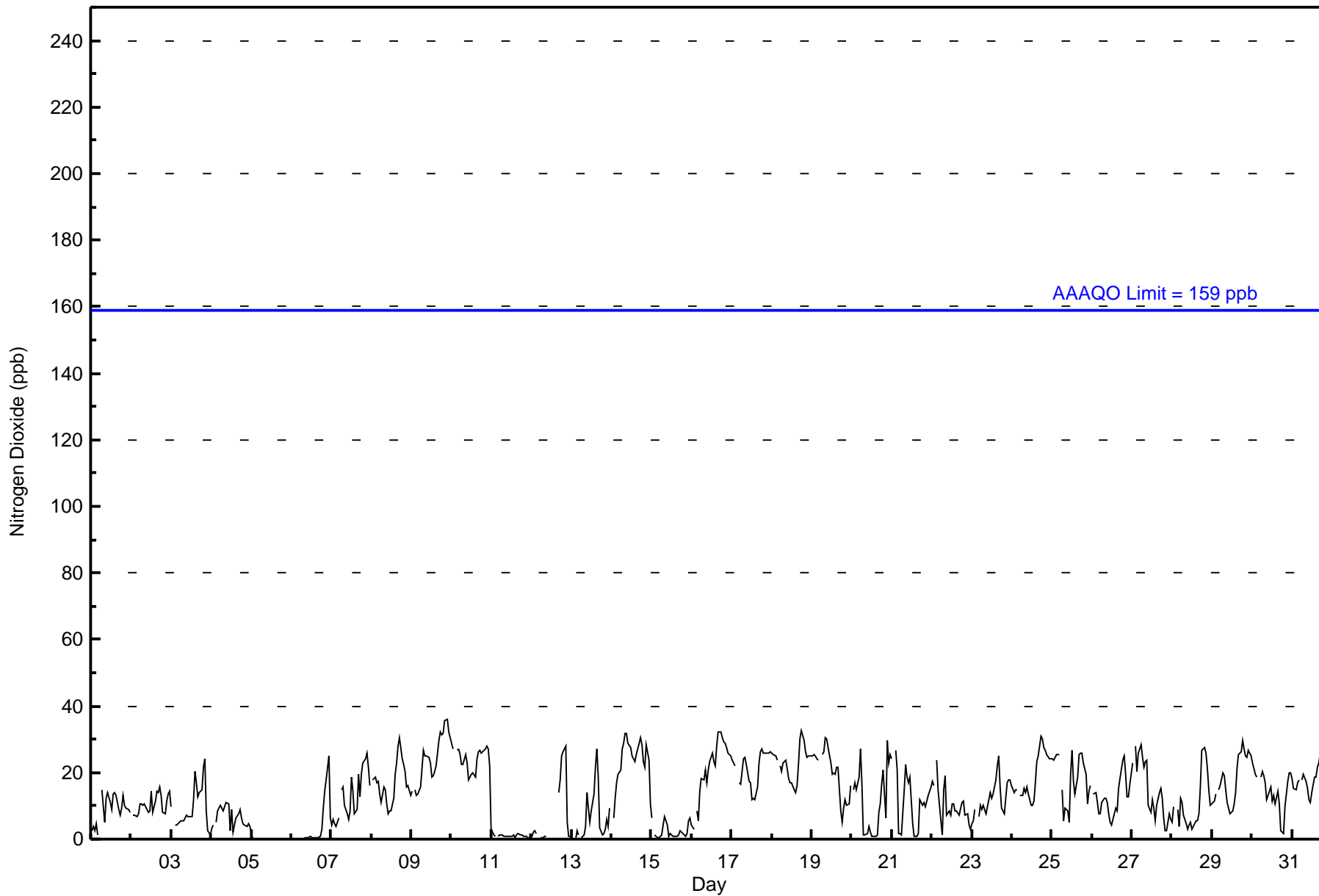
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	3	4	3	5	1	Z	15	10	5	12	14	11	9	14	14	13	9	7	9	13	10	9	9	8	9.0	15																							
2-Dec	Z	7	7	7	8	11	11	10	11	9	8	9	14	8	12	14	14	16	13	8	8	12	14	15	10.5	16																							
3-Dec	10	Z	4	4	5	5	5	5	7	7	7	7	7	12	20	17	13	14	15	21	24	8	3	1	9.6	24																							
4-Dec	3	4	Z	5	8	10	9	8	10	11	11	3	9	2	4	6	8	9	6	5	4	4	5	4	6.4	11																							
5-Dec	2	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2																							
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	1	3	10	15	18	25	6	3.5	25																							
7-Dec	4	6	5	4	6	Z	15	16	10	8	6	9	19	15	8	9	20	13	20	23	24	26	22	16	13.0	26																							
8-Dec	Z	18	19	17	17	14	11	16	15	11	8	9	9	12	19	23	28	31	24	22	20	16	16	13	16.8	31																							
9-Dec	15	Z	15	13	14	16	21	27	25	25	24	23	19	19	20	22	30	32	31	32	36	36	32	31	24.2	36																							
10-Dec	29	27	Z	27	27	25	22	23	25	23	18	19	19	20	19	24	26	27	26	27	27	28	27	22	24.2	29																							
11-Dec	3	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1.1	3																							
12-Dec	1	2	2	2	Z	0	1	0	1	1	C	C	C	C	C	C	14	18	25	26	28	5	1	1	--	28																							
13-Dec	1	0	0	3	1	Z	1	1	4	14	9	5	8	14	22	27	19	3	1	2	3	6	4	9	6.8	27																							
14-Dec	Z	6	12	17	20	21	27	29	32	32	29	27	25	24	23	26	29	30	29	24	22	29	24	11	23.7	32																							
15-Dec	6	Z	1	0	1	1	1	4	7	4	1	2	1	1	1	1	1	2	2	2	1	2	5	6	2.3	7																							
16-Dec	4	3	Z	8	6	15	18	18	21	17	21	23	26	23	22	28	32	32	31	29	29	28	26	25	21.0	32																							
17-Dec	24	23	22	Z	17	17	21	24	25	23	18	17	12	12	12	16	23	26	27	26	26	26	26	26	21.1	27																							
18-Dec	26	26	25	24	Z	22	20	23	24	21	18	17	17	15	14	16	23	30	33	30	26	25	25	25	22.7	33																							
19-Dec	25	26	25	24	24	Z	26	26	30	30	27	23	20	20	19	21	22	8	5	10	12	10	11	16	20.0	30																							
20-Dec	Z	15	17	15	19	27	17	1	1	2	4	2	1	1	1	1	8	11	16	21	6	30	23	26	11.5	30																							
21-Dec	24	Z	27	21	2	2	1	15	22	19	17	19	5	1	1	1	2	12	10	11	10	12	13	16	11.3	27																							
22-Dec	17	16	Z	24	15	6	1	15	19	7	9	7	11	11	9	8	7	9	11	11	7	8	4	3	10.2	24																							
23-Dec	5	5	9	Z	7	10	9	10	8	10	12	14	12	14	18	22	25	16	9	8	12	17	18	18	12.4	25																							
24-Dec	16	14	15	15	Z	13	13	15	14	16	14	10	10	12	17	23	25	31	30	28	27	25	24	24	18.7	31																							
25-Dec	24	24	25	26	25	Z	15	6	9	8	5	19	27	17	14	19	26	26	26	23	20	11	15	16	18.4	27																							
26-Dec	Z	14	14	11	8	8	11	12	12	11	8	5	4	8	9	9	15	18	24	25	20	13	13	17	12.5	25																							
27-Dec	23	Z	28	20	26	29	24	22	23	24	10	8	12	9	6	10	14	15	12	7	2	3	8	6	14.8	29																							
28-Dec	5	10	Z	9	4	12	11	7	5	3	4	5	3	4	6	5	8	16	27	27	26	21	15	10	10.5	27																							
29-Dec	10	12	14	Z	15	16	20	19	15	11	9	8	9	10	14	21	26	26	30	27	25	25	27	25	17.9	30																							
30-Dec	23	21	20	19	Z	19	21	19	17	12	15	16	11	13	11	14	11	2	2	2	10	18	20	20	14.5	23																							
31-Dec	18	15	15	17	18	Z	18	20	17	15	12	11	14	19	19	21	23	26	19	4	1	2	1	1	14.1	26																							
																								12.3	11.5	12.5	12.9	11.3	11.9	12.5	13.0	13.3	12.4	11.2	10.9	11.1	11.0	11.8	14.0	16.1	16.4	16.7	16.2	15.5	15.1	14.6	13.4	Diurnal Average	
																								29	27	28	27	27	29	27	29	32	32	29	27	27	24	23	28	32	32	33	32	36	36	32	31	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	520	73.55	73.55
21 - 40	187	26.45	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	46	21	4	3	8	6	7	56	81	27	25	31	39	99	45	22	520
21 - 40	12	1	3	2	1	1	1	18	66	16	18	9	4	11	9	15	187
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	22	7	5	9	7	8	74	147	43	43	40	43	110	54	37	707

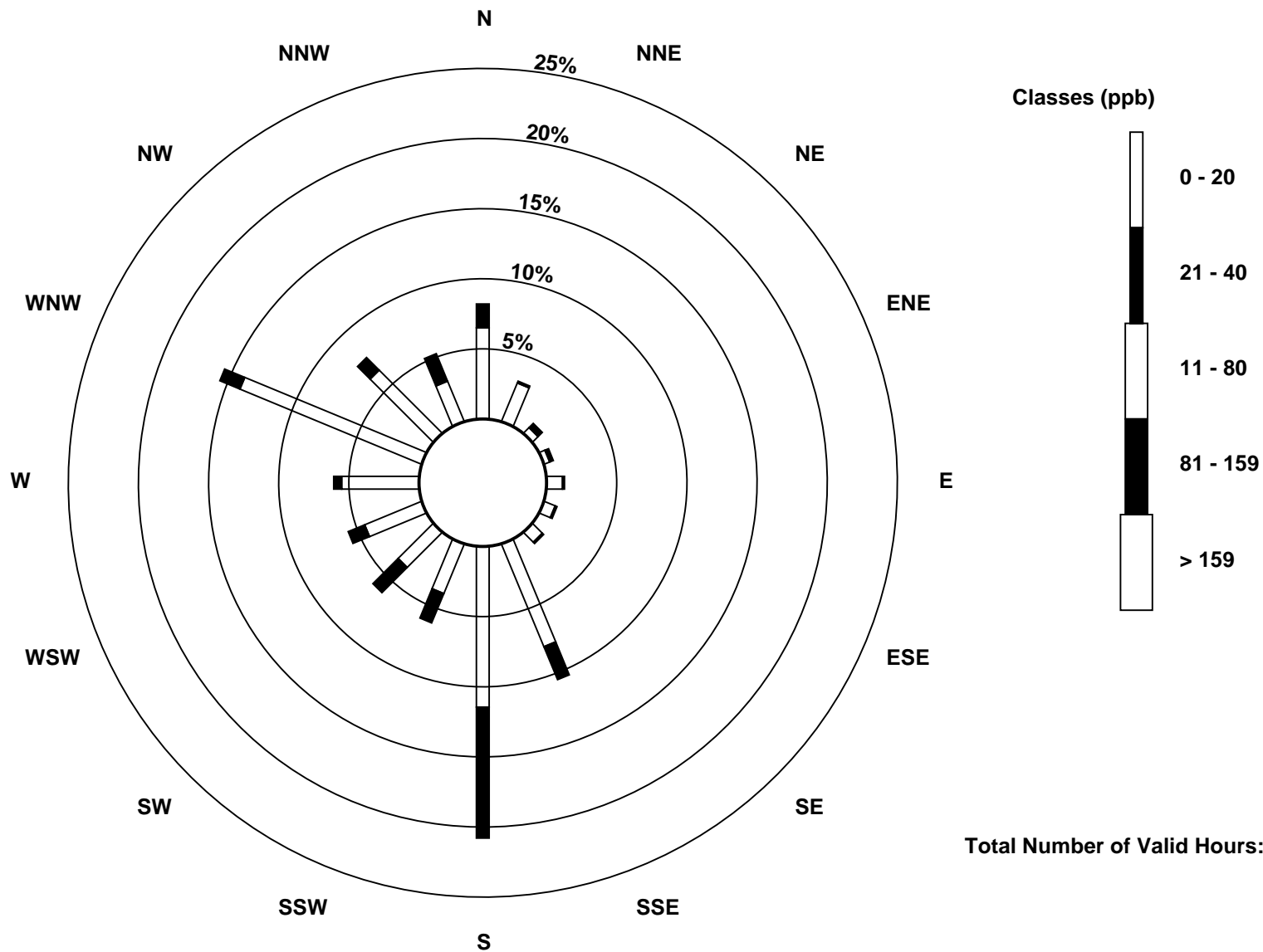
Total Number of Valid Hours: 707

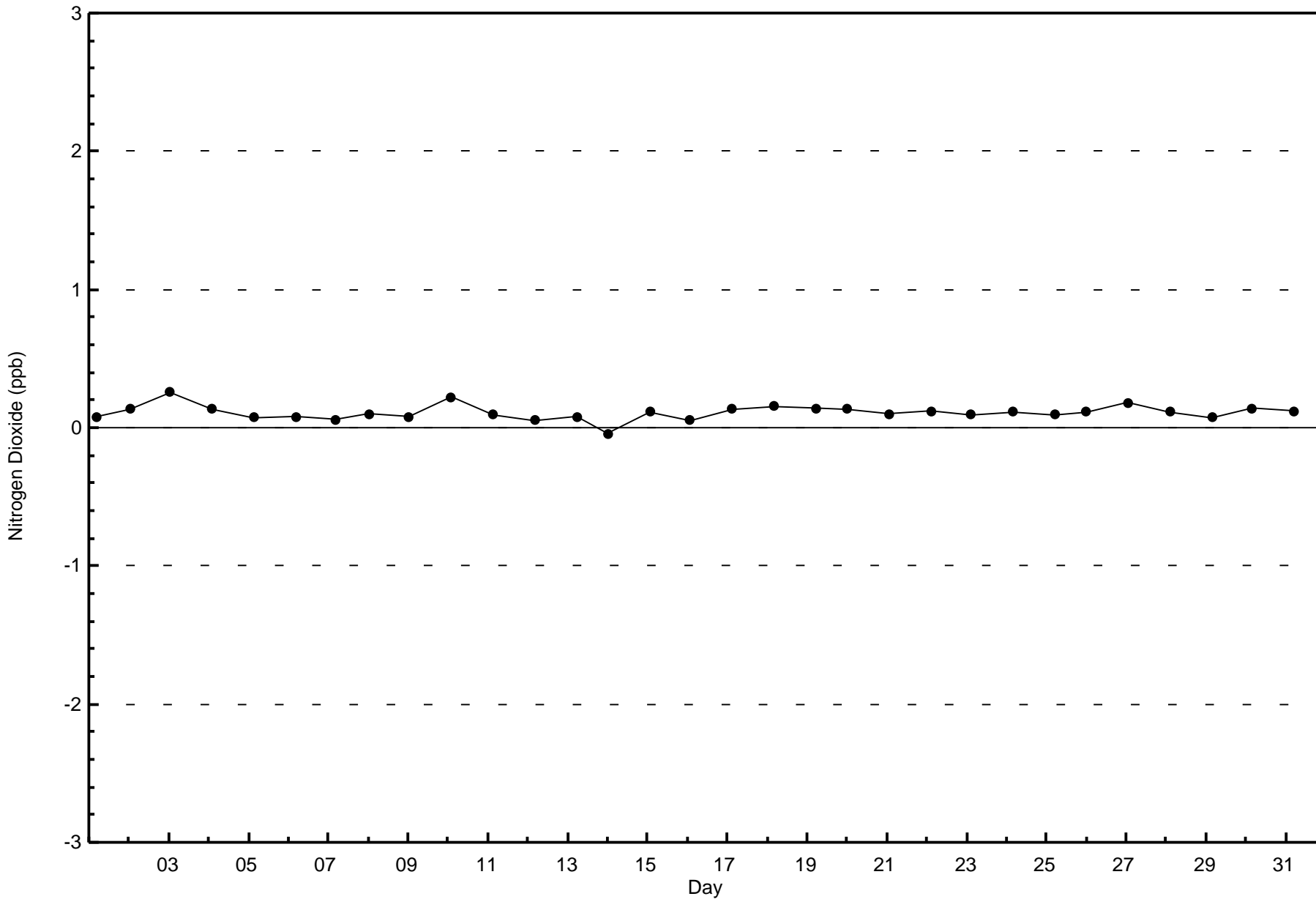
Total Number of Hours: 744

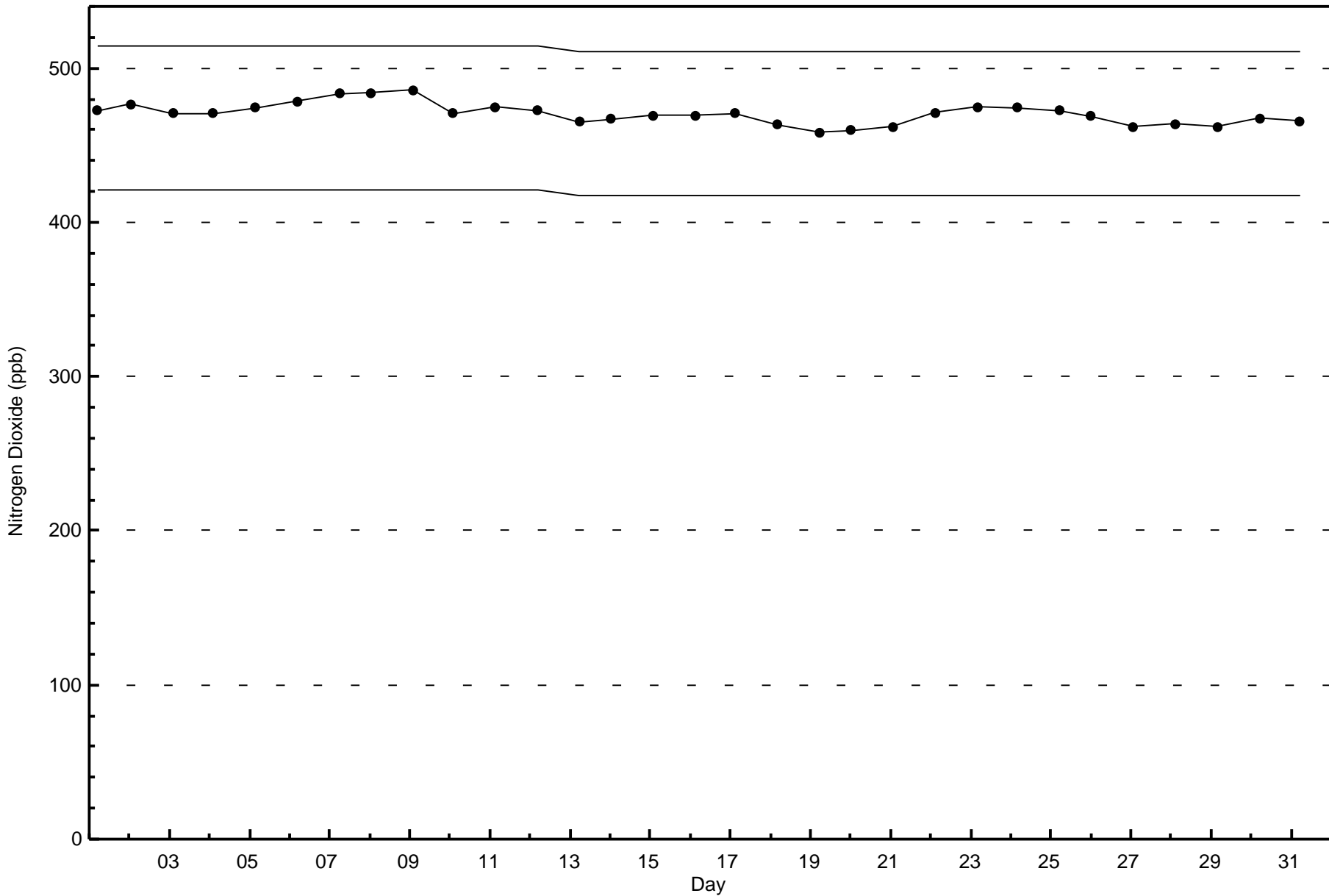


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter (AMS 1)







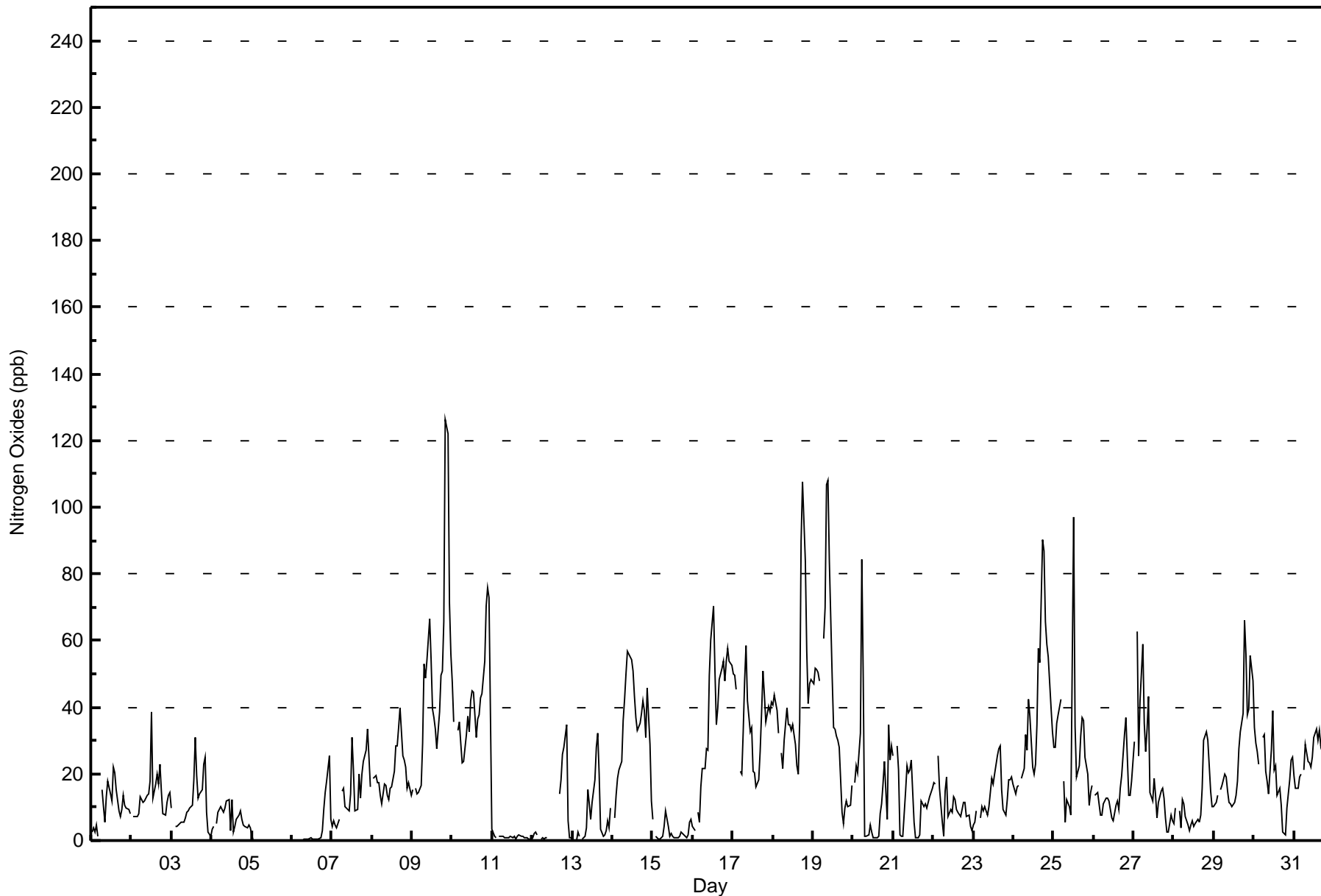


Maximum Value: 126 ppb on Dec 9 21:00																			Maximum Daily Average: 47.8 ppb on Dec 9					Hours in Service: 744		
Minimum Value: 0 ppb on Dec 5 03:00																			Minimum Daily Average: 0.1 ppb on Dec 5					Hours of Data: 707		
Maximum Diurnal Average: 26.2 ppb at hour 19																			Minimum Diurnal Average: 14.7 ppb at hour 5					Hours of Missing Data: 37		
Monthly Average: 20.0 ppb																			Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 5 Median = 15 Q ₃ = 30 P ₉₀ = 48 P ₉₉ = 87					Hours of Calibration: 37		
																								Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	4	3	4	1	Z	15	10	5	13	18	14	12	22	21	15	9	7	9	13	10	10	9	8	10.3	22
2-Dec	Z	7	7	7	8	13	12	12	12	14	14	18	39	13	17	20	17	23	15	8	8	12	14	15	14.0	39
3-Dec	10	Z	4	4	5	5	5	5	7	8	9	10	10	18	31	20	13	14	15	23	25	8	3	1	11.0	31
4-Dec	3	4	Z	5	8	10	9	8	10	12	12	3	12	3	4	6	8	9	6	5	4	4	5	4	6.8	12
5-Dec	2	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	1	3	9	15	18	25	6	3.5	25
7-Dec	4	6	5	4	6	Z	15	16	10	9	9	14	31	21	9	9	20	13	20	24	27	34	25	16	15.1	34
8-Dec	Z	19	19	17	18	14	11	17	17	14	12	16	16	21	28	28	34	40	26	24	22	16	17	13	19.9	40
9-Dec	15	Z	16	14	14	17	29	53	49	54	66	54	40	37	33	28	38	49	51	66	126	122	71	56	47.8	126
10-Dec	48	36	Z	33	36	29	23	24	32	37	33	42	45	44	31	36	38	43	44	54	70	76	73	39	41.9	76
11-Dec	3	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1.1	3
12-Dec	1	2	2	2	Z	0	1	0	1	1	C	C	C	C	C	C	14	18	26	28	35	6	1	1	--	35
13-Dec	0	0	0	3	1	Z	1	1	4	15	11	6	11	18	28	32	20	3	1	2	3	6	4	10	7.9	32
14-Dec	Z	7	14	19	21	24	36	42	50	57	56	54	51	43	37	33	35	38	42	39	31	46	29	12	35.4	57
15-Dec	6	Z	1	0	1	1	1	4	9	4	1	2	1	1	1	1	1	2	2	2	1	2	5	6	2.5	9
16-Dec	4	3	Z	9	6	16	22	22	27	27	50	60	71	51	35	40	48	52	54	48	54	58	54	52	37.4	71
17-Dec	50	49	45	Z	21	20	33	48	58	42	33	34	21	20	16	18	27	38	51	44	35	40	39	42	35.8	58
18-Dec	41	44	39	32	Z	26	22	30	40	35	35	33	35	29	22	20	36	90	108	84	57	41	47	48	43.1	108
19-Dec	47	52	51	51	48	Z	61	70	107	108	84	49	34	33	31	30	28	8	5	10	12	10	11	17	41.6	108
20-Dec	Z	17	22	21	32	84	49	1	1	2	5	3	1	1	1	1	8	11	17	24	7	35	24	28	17.2	84
21-Dec	25	Z	28	21	2	1	1	15	23	20	21	24	6	1	1	1	2	12	10	11	10	12	13	16	12.0	28
22-Dec	17	17	Z	26	16	6	1	15	19	7	9	8	13	12	9	9	7	9	11	11	7	8	4	3	10.7	26
23-Dec	4	5	9	Z	7	10	9	10	8	10	14	19	17	20	25	27	28	15	9	8	12	18	18	19	14.0	28
24-Dec	17	14	16	17	Z	19	22	32	27	42	37	22	20	23	35	58	53	90	87	66	59	55	40	32	38.3	90
25-Dec	28	28	35	38	42	Z	18	6	12	10	8	54	97	34	19	22	31	37	36	25	20	11	15	17	27.9	97
26-Dec	Z	14	14	11	8	8	11	13	13	12	9	7	6	10	12	9	16	19	32	37	25	14	14	18	14.3	37
27-Dec	30	Z	63	26	42	59	35	27	33	43	14	12	19	14	7	11	15	16	13	7	2	2	8	6	21.9	63
28-Dec	5	10	Z	9	4	12	11	7	5	3	5	6	4	5	7	5	8	16	30	33	30	23	15	10	11.4	33
29-Dec	10	12	14	Z	15	17	20	19	15	12	11	10	12	14	18	28	33	38	66	56	38	39	56	48	26.0	66
30-Dec	34	29	27	23	Z	31	32	21	18	14	27	39	21	22	14	16	11	2	2	2	10	18	24	25	20.0	39
31-Dec	20	16	16	19	20	Z	21	29	24	23	22	25	31	34	30	33	28	30	20	4	1	2	1	1	19.5	34
																								Diurnal Average	Diurnal Maximum	
16.5 15.2 17.4 15.9 14.7 16.9 17.0 18.0 20.5 20.9 20.9 21.4 22.5 18.9 17.4 18.6 20.2 24.1 26.2 24.7 24.4 24.0 21.4 18.4																								50	56	
Z - zerospan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	446	63.08	63.08
21 - 40	168	23.76	86.85
41 - 80	81	11.46	98.30
81 - 159	12	1.70	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	43	17	2	3	6	6	4	44	57	21	23	30	35	94	43	18	446
21 - 40	9	5	4	1	3	1	3	15	63	9	9	7	7	14	8	10	168
11 - 80	4	0	1	1	0	0	1	13	24	13	10	3	1	2	3	5	81
81 - 159	2	0	0	0	0	0	0	2	3	0	1	0	0	0	0	4	12
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	22	7	5	9	7	8	74	147	43	43	40	43	110	54	37	707

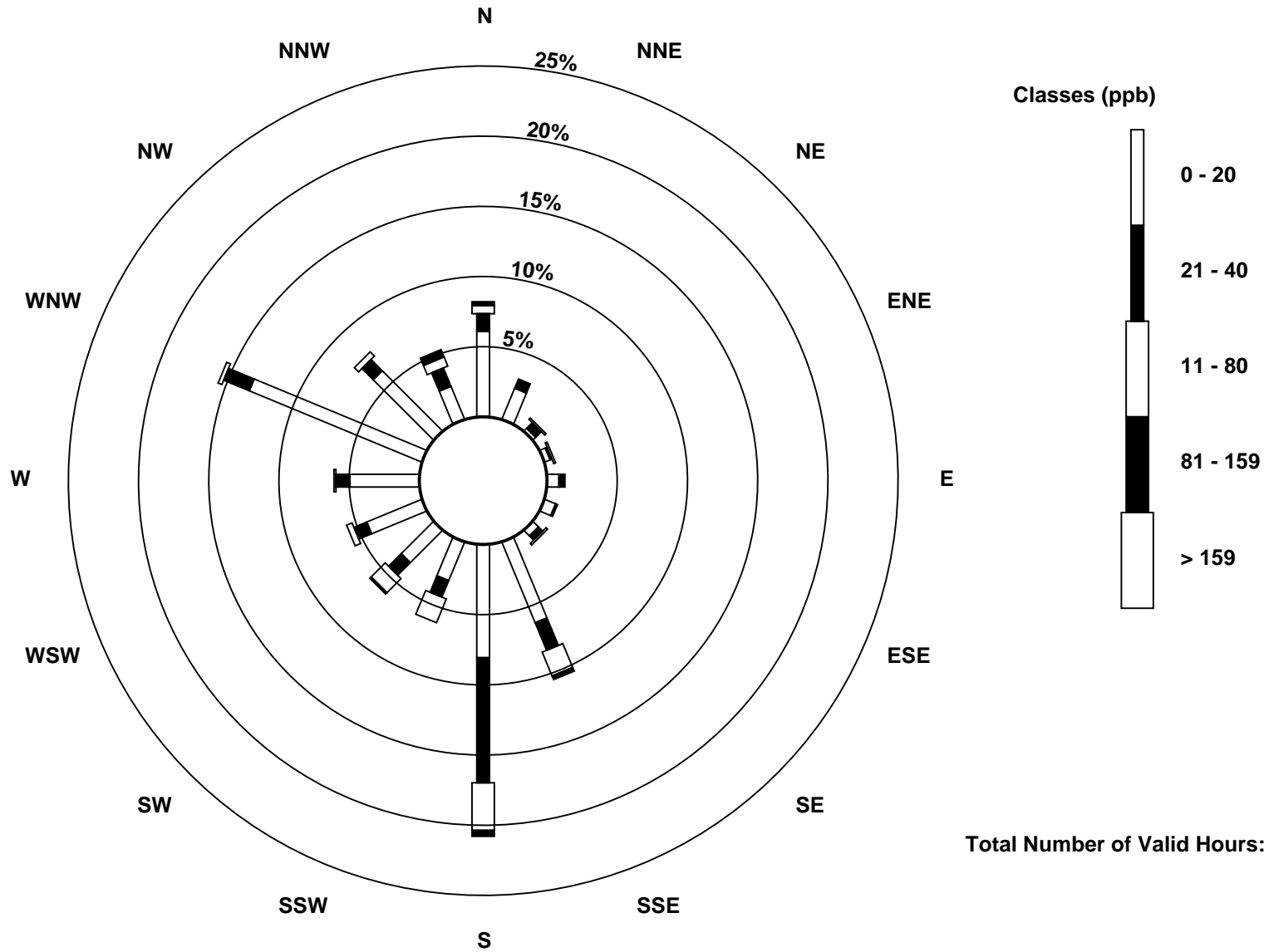
Total Number of Valid Hours: 707

Total Number of Hours: 744

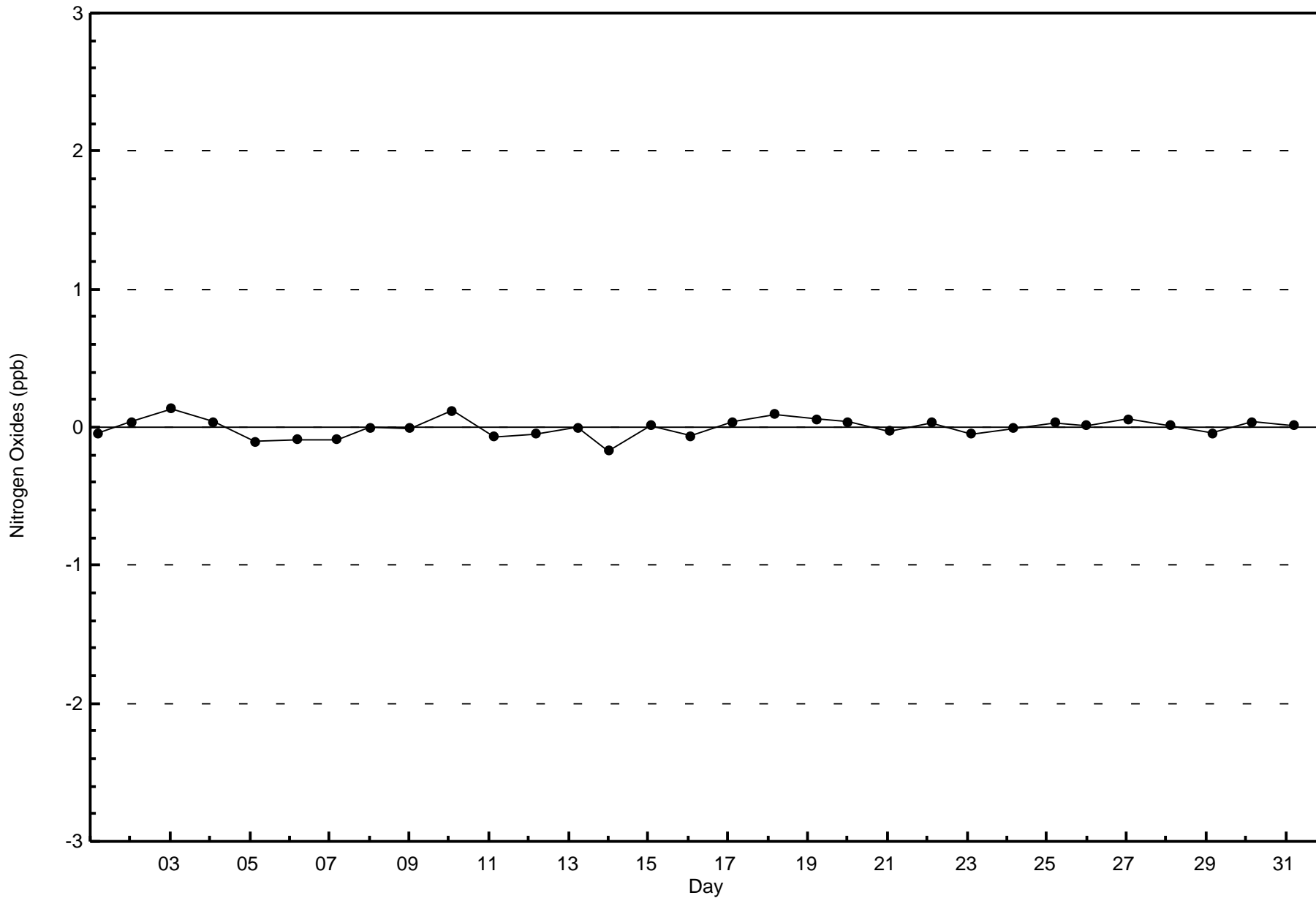


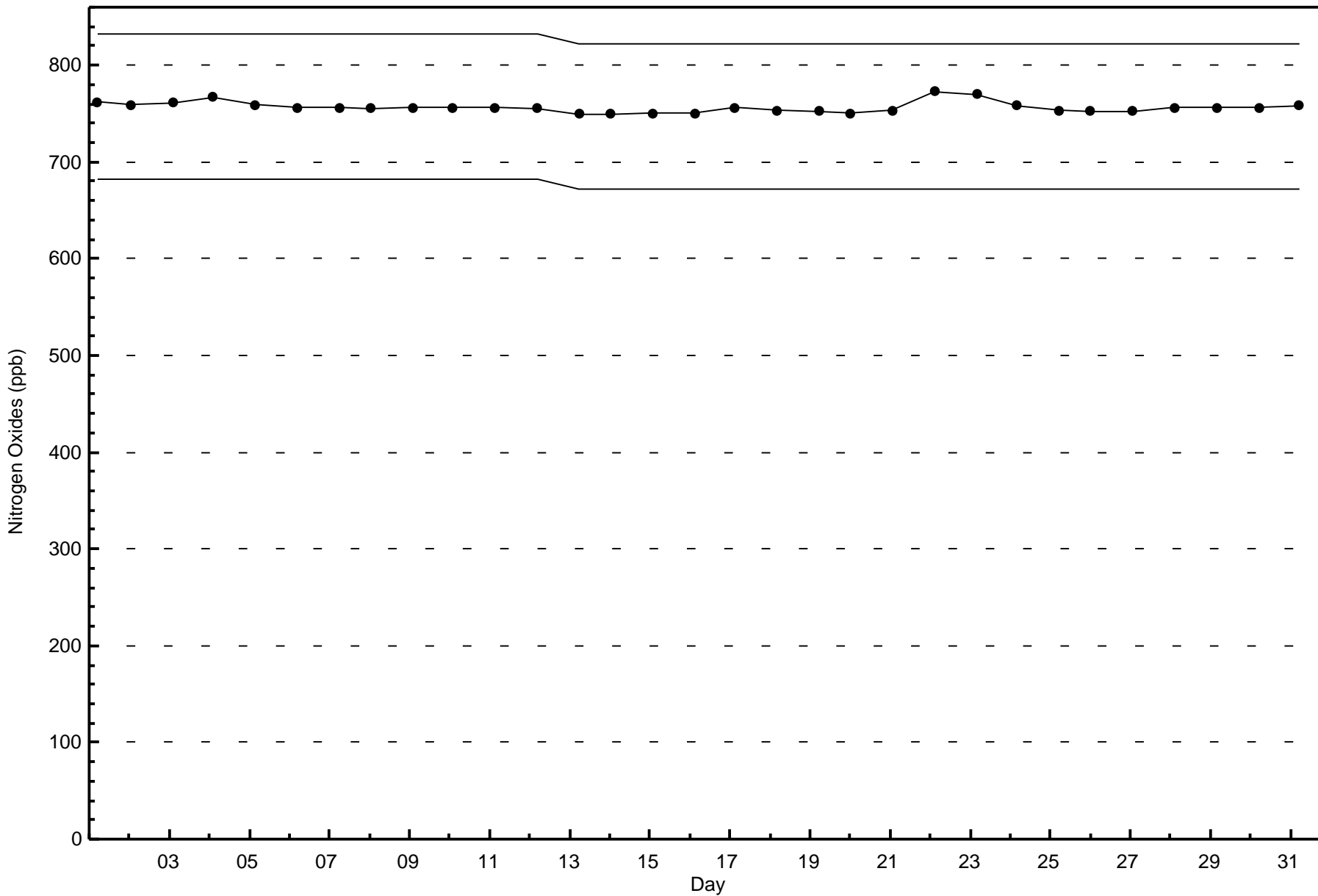
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter (AMS 1)



Total Number of Valid Hours: 707







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Fort McKay - Bertha Ganter - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 39 ppb on Dec 21 15:00	Maximum Daily Average: 34.1 ppb on Dec 5		Hours of Data:	709
Minimum Value: 1 ppb on Dec 2 18:00	Minimum Daily Average: 3.6 ppb on Dec 18		Hours of Missing Data:	35
Maximum Diurnal Average: 18.7 ppb at hour 14	Minimum Diurnal Average: 13.6 ppb at hour 19		Hours of Calibration:	35
Monthly Average: 15.4 ppb	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 5 Median = 13 Q ₃ = 25 P ₉₀ = 33 P ₉₉ = 37		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	27	26	28	26	28	21	Z	18	21	14	11	13	14	9	7	7	12	12	9	5	6	6	6	6	14.4	28
2-Dec	6	Z	6	6	5	3	2	3	3	4	7	8	6	10	8	4	2	1	5	13	15	11	11	11	6.5	15
3-Dec	15	18	Z	17	16	16	15	16	14	14	15	16	16	13	8	12	14	12	9	5	6	15	15	17	13.7	18
4-Dec	13	12	9	Z	9	9	12	15	16	15	16	23	19	25	24	23	23	22	26	28	27	27	28	29	19.6	29
5-Dec	32	32	33	33	Z	34	34	34	34	35	35	35	35	35	35	35	35	35	35	34	34	34	34	34	34.1	35
6-Dec	34	34	33	33	33	Z	33	33	33	32	32	32	34	34	34	34	34	32	28	21	16	15	9	26	29.5	34
7-Dec	26	24	25	24	22	18	Z	14	15	15	16	18	18	23	29	27	15	19	11	7	4	2	4	7	16.6	29
8-Dec	4	Z	7	12	9	10	12	6	4	8	11	13	13	15	14	9	4	2	5	5	5	9	6	9	8.3	15
9-Dec	7	7	Z	7	7	6	3	2	2	4	6	10	13	12	11	8	3	2	2	2	2	2	2	2	5.2	13
10-Dec	2	2	2	Z	2	2	4	4	2	6	10	10	10	9	10	5	2	2	2	3	2	2	2	6	4.4	10
11-Dec	26	27	27	26	Z	25	26	27	28	29	30	31	32	32	34	33	32	33	33	33	34	33	32	32	30.2	34
12-Dec	32	31	32	34	37	Z	37	37	37	37	37	36	33	16	23	25	21	17	10	6	4	32	37	37	28.2	37
13-Dec	37	37	38	35	36	35	Z	35	32	C	C	C	C	23	16	10	17	31	34	33	31	28	29	24	29.6	38
14-Dec	20	Z	17	14	8	6	3	2	2	4	7	9	10	10	9	7	3	2	3	8	12	5	8	23	8.5	23
15-Dec	29	32	Z	36	35	35	35	32	29	30	33	33	33	33	34	33	32	32	32	33	32	31	27	26	32.1	36
16-Dec	26	27	24	Z	21	12	8	7	4	6	7	9	9	10	12	6	2	2	2	1	1	2	1	1	8.7	27
17-Dec	1	2	1	2	Z	4	2	1	2	4	9	12	16	15	14	11	4	2	2	2	2	2	2	2	4.8	16
18-Dec	2	2	2	2	2	Z	4	2	2	4	6	7	8	9	9	7	3	2	2	2	2	2	2	2	3.6	9
19-Dec	2	2	2	2	2	2	Z	2	2	3	4	5	7	7	6	4	4	15	18	15	15	17	16	10	7.1	18
20-Dec	12	Z	5	5	3	3	16	35	36	35	32	34	36	35	35	35	28	23	16	11	27	5	10	7	21.0	36
21-Dec	9	11	Z	15	35	35	35	23	15	19	21	20	33	38	39	38	37	27	29	27	29	27	22	18	26.1	39
22-Dec	14	10	10	Z	15	25	32	19	13	29	28	27	22	20	23	22	23	20	18	18	22	21	25	26	21.0	32
23-Dec	25	24	21	23	Z	20	22	20	23	21	19	18	19	18	14	9	5	12	17	18	13	7	5	5	16.3	25
24-Dec	5	6	3	2	2	Z	2	2	2	3	5	9	11	10	7	3	2	2	2	2	2	2	2	2	3.9	11
25-Dec	2	3	2	2	2	2	Z	14	11	12	16	6	5	11	15	11	3	2	3	6	9	18	14	12	7.9	18
26-Dec	13	Z	14	17	19	19	16	15	14	16	20	23	24	22	20	20	11	9	4	3	6	11	12	9	14.6	24
27-Dec	5	3	Z	9	5	3	4	4	4	5	14	16	16	19	21	16	12	10	13	22	28	26	20	20	12.9	28
28-Dec	22	22	22	Z	31	23	23	25	26	27	25	24	25	25	23	23	20	14	5	3	3	7	11	14	19.3	31
29-Dec	13	11	8	7	Z	6	6	6	10	14	18	19	18	17	14	7	3	3	3	3	3	3	3	3	8.6	19
30-Dec	3	3	3	3	3	Z	3	4	5	10	8	7	13	14	20	18	21	29	29	28	16	4	3	3	10.8	29
31-Dec	4	6	6	4	3	3	Z	3	3	5	8	9	9	9	9	5	5	5	16	33	36	34	35	34	12.3	36

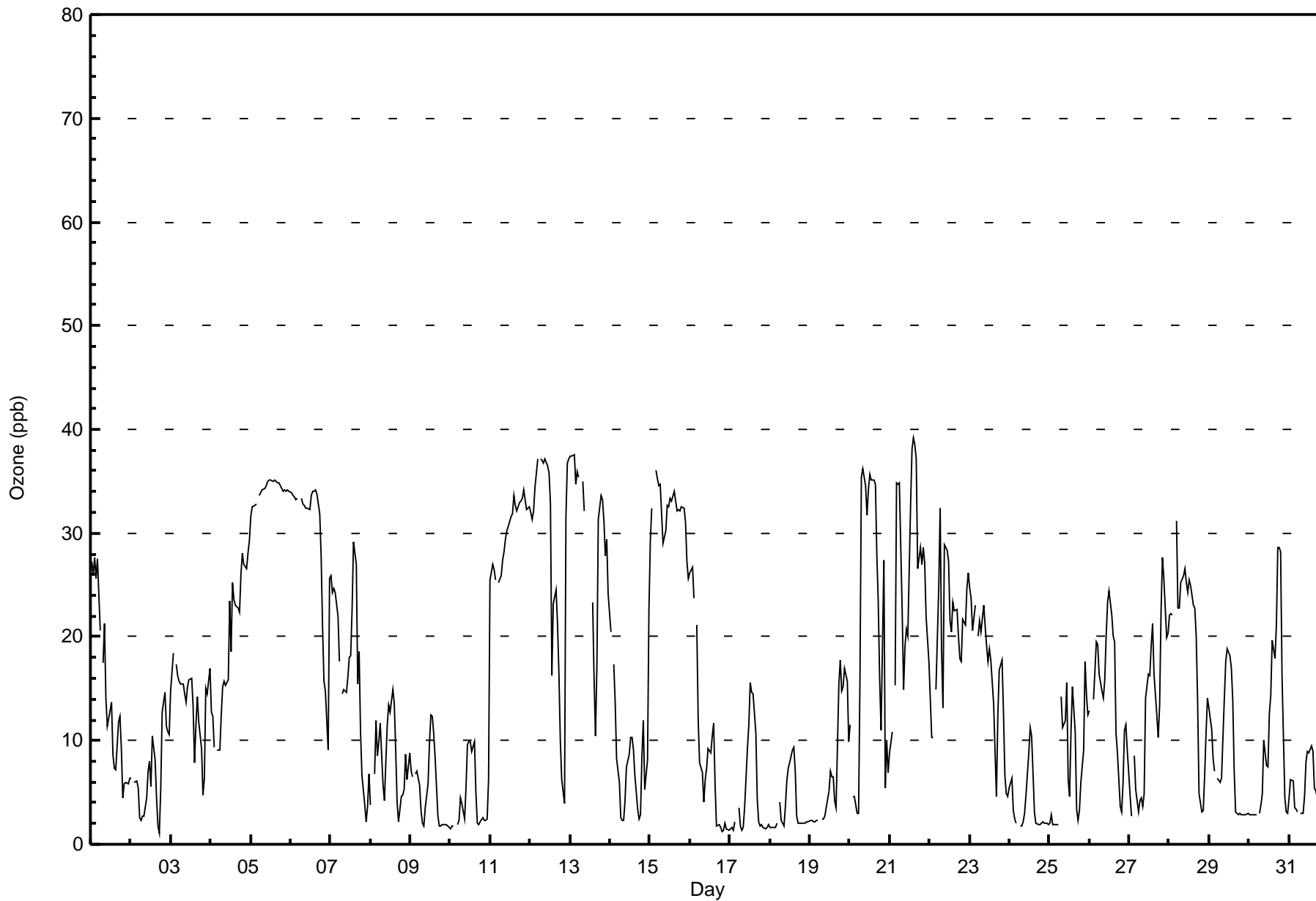
15.1	16.0	14.6	15.2	15.1	14.4	15.6	14.9	14.4	15.3	16.8	17.8	18.5	18.7	18.6	16.4	13.9	13.9	13.6	13.9	14.3	14.2	13.9	14.7	Diurnal Average
37	37	38	36	37	35	37	37	37	37	37	37	36	38	39	38	37	35	35	34	36	34	37	37	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	475	67.00	67.00
21 - 50	234	33.00	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	39	13	6	4	7	3	7	63	137	39	29	18	16	38	31	25	475
21 - 50	20	9	1	1	1	2	1	12	14	3	15	21	30	72	21	11	234
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	22	7	5	8	5	8	75	151	42	44	39	46	110	52	36	709

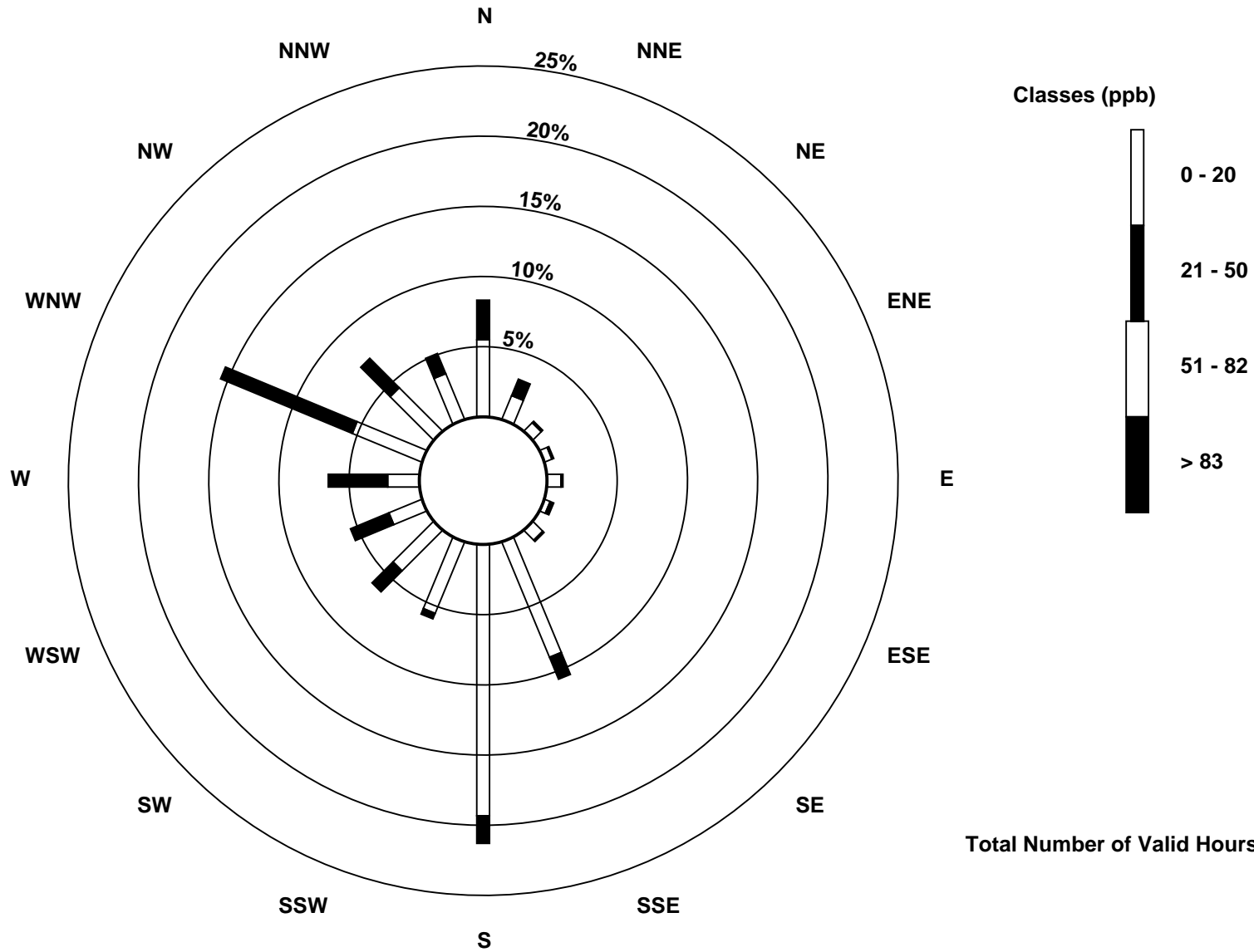
Total Number of Valid Hours: 709

Total Number of Hours: 744

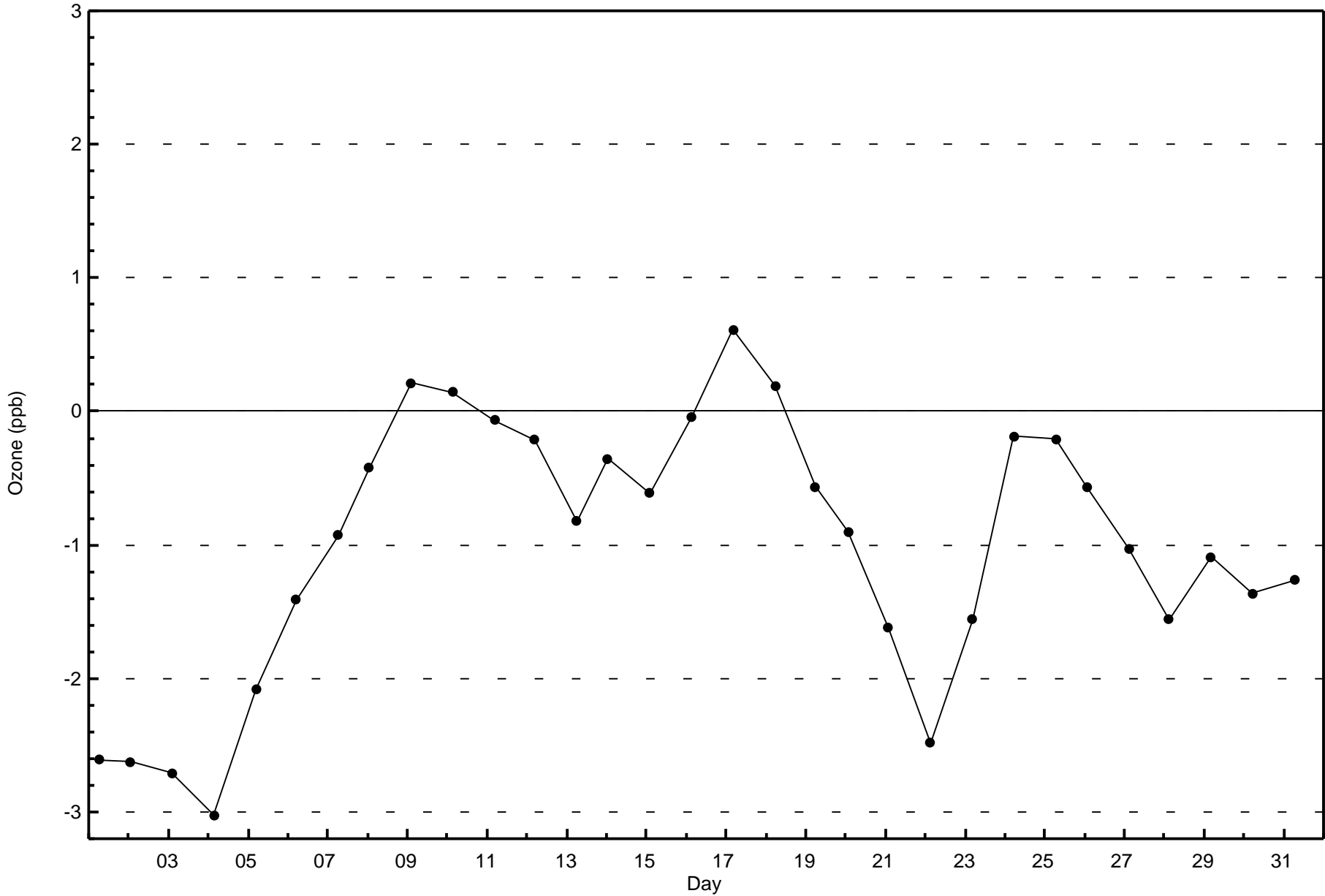


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter (AMS 1)



Total Number of Valid Hours: 709



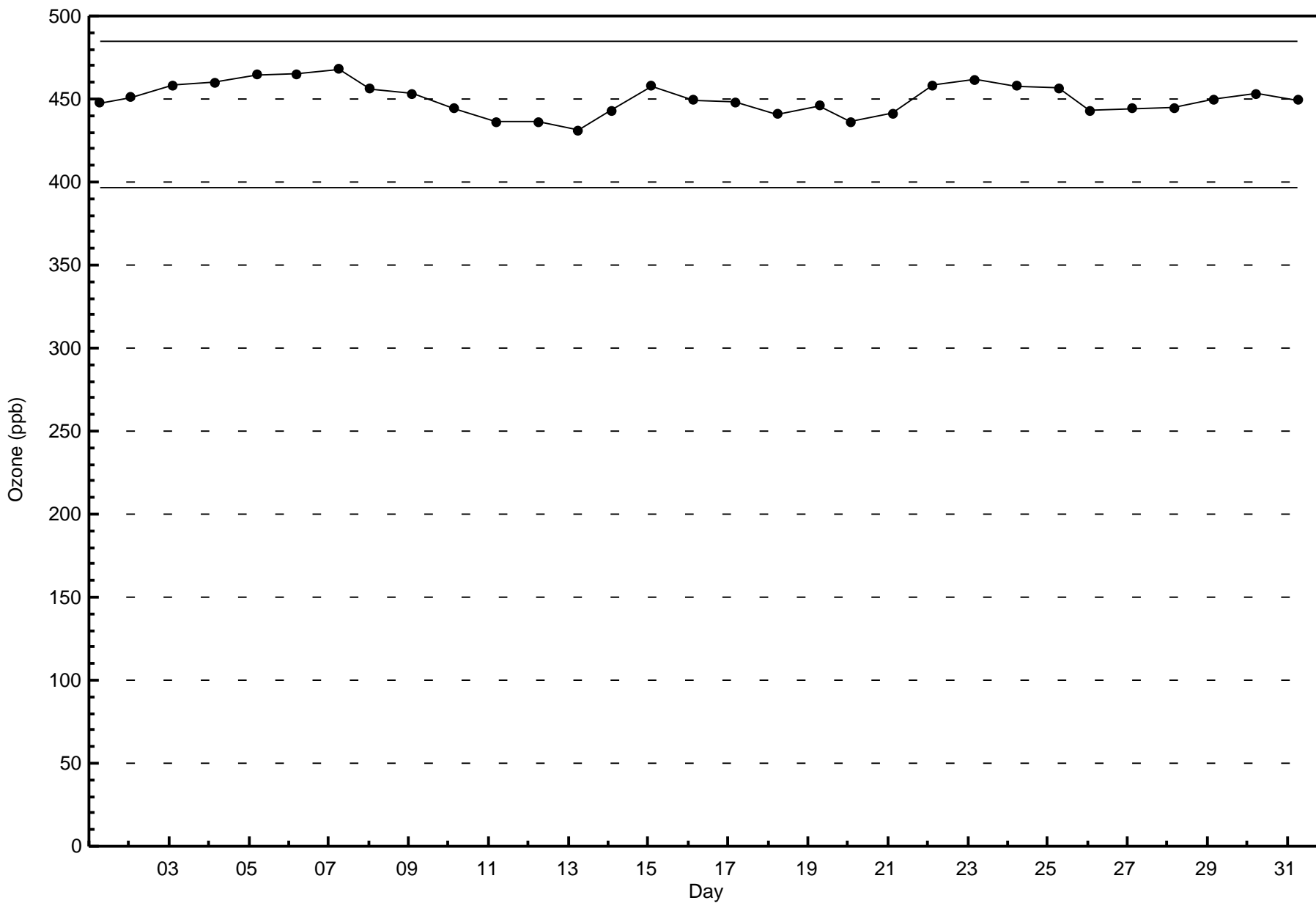


Wood Buffalo Environmental Association

Span Responses

Ozone (O₃) - ppb

Fort McKay - Bertha Ganter - December 2016



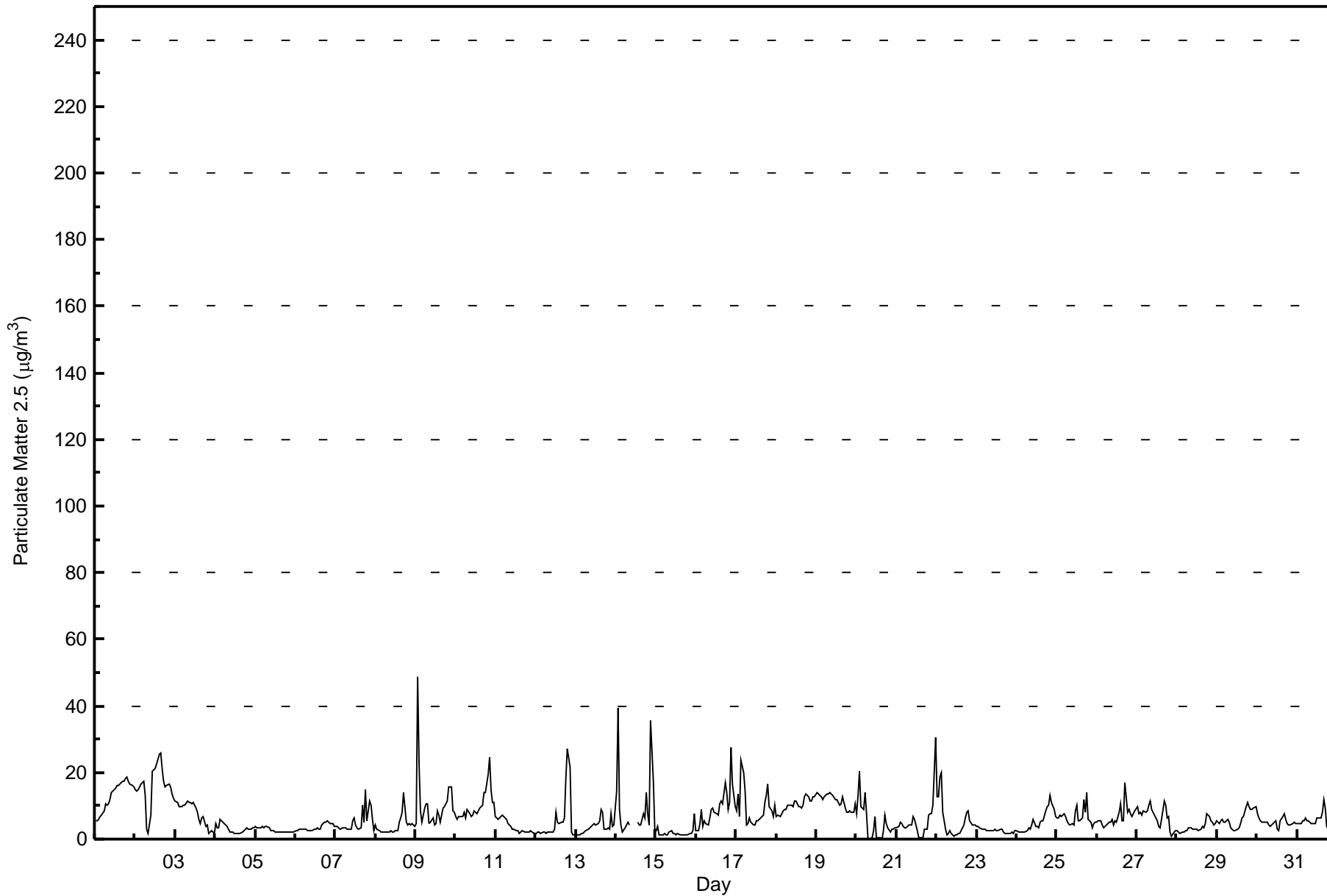


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 48.6 µg/m ³ on Dec 9 02:00 Minimum Value: 0.2 µg/m ³ on Dec 20 09:00 Maximum Diurnal Average: 8.5 µg/m ³ at hour 2 Monthly Average: 6.58 µg/m ³		Maximum Daily Average: 16.1 µg/m ³ on Dec 2 Minimum Daily Average: 2.0 µg/m ³ on Dec 15 Minimum Diurnal Average: 4.9 µg/m ³ at hour 9 Percentiles: P ₁ = 0.4 P ₁₀ = 2.0 Q ₁ = 2.9 Median = 5.0 Q ₃ = 8.8 P ₉₀ = 13.4 P ₉₉ = 24.5		Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 4 Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	5.5	5.5	5.9	6.6	7.4	8.4	10.6	10.4	10.7	11.8	14.1	14.8	15.1	16.1	15.9	16.7	17.2	17.5	18.1	18.5	17.3	16.4	15.9	15.7	13.0	18.5
2-Dec	14.9	14.5	14.9	16.4	17.1	17.3	13.0	3.0	1.8	7.4	20.4	20.7	21.3	22.5	25.6	25.8	21.3	17.3	15.7	16.2	16.6	15.7	13.6	12.3	16.1	25.8
3-Dec	11.6	11.1	9.7	9.8	9.9	10.0	10.3	11.3	11.0	11.2	10.6	11.1	9.3	8.1	5.8	4.7	6.2	6.6	3.7	4.3	1.6	2.3	2.6	1.9	7.7	11.6
4-Dec	4.5	3.5	3.5	6.1	5.5	4.5	4.4	3.8	2.9	2.3	2.1	1.7	1.9	1.8	1.8	2.0	2.4	2.9	3.2	3.1	3.1	3.2	3.5	3.1	6.1	
5-Dec	3.8	3.3	3.5	3.6	3.7	3.4	3.8	3.6	3.2	2.7	2.4	2.4	2.3	2.3	2.1	2.0	2.0	2.0	2.0	2.2	2.1	2.0	2.1	2.3	2.7	3.8
6-Dec	2.7	2.7	2.8	2.8	2.8	3.0	2.8	2.5	2.4	2.4	2.6	2.8	3.1	3.2	2.9	2.9	4.1	5.0	5.0	5.5	4.9	4.7	4.7	3.8	3.4	5.5
7-Dec	3.8	3.9	3.5	2.9	3.4	3.4	3.5	3.1	3.1	3.1	5.5	6.4	4.1	3.5	3.1	3.5	10.0	5.2	14.9	5.5	11.3	10.2	6.1	2.7	5.2	14.9
8-Dec	4.1	3.0	2.7	2.3	2.1	2.0	2.0	2.2	2.1	2.4	2.0	2.0	2.4	2.6	5.0	6.3	8.1	14.0	5.0	4.4	4.5	4.1	4.8	3.9	3.9	14.0
9-Dec	4.8	48.6	22.8	8.5	5.0	9.2	10.7	10.6	4.6	5.0	6.3	4.1	4.8	8.7	7.0	5.2	9.2	9.8	10.5	11.3	15.7	15.5	8.5	8.2	10.6	48.6
10-Dec	6.8	6.0	6.6	6.8	6.9	7.8	6.5	8.9	7.5	7.0	7.2	8.5	7.9	7.7	9.2	9.6	10.0	13.9	13.8	19.6	24.6	14.8	10.9	11.2	10.0	24.6
11-Dec	6.8	5.7	6.5	7.0	7.1	6.9	6.0	4.8	4.3	3.8	3.2	2.9	2.4	2.7	1.7	1.9	2.7	2.2	2.1	2.1	2.2	2.7	2.2	1.9	3.8	7.1
12-Dec	1.8	1.9	2.0	1.8	2.0	2.0	1.9	2.1	2.0	2.2	1.9	3.1	8.0	5.1	4.6	5.1	5.3	6.3	18.1	27.3	21.6	1.9	1.3	1.4	5.4	27.3
13-Dec	1.3	1.2	1.2	1.7	1.8	2.2	2.6	2.9	3.5	3.9	4.3	4.6	4.3	4.5	5.6	8.8	8.1	3.0	2.9	3.5	3.1	7.5	3.9	4.0	3.8	8.8
14-Dec	14.6	39.3	8.9	4.2	2.2	3.2	4.1	5.2	4.1	C	C	C	C	4.9	4.1	4.3	7.5	6.5	14.1	7.5	4.4	35.8	17.5	3.0	9.8	39.3
15-Dec	2.6	3.8	1.4	1.3	1.5	1.6	1.3	1.5	2.0	2.5	1.5	1.5	1.4	1.7	1.4	1.3	1.3	1.3	1.3	1.4	1.5	1.8	2.4	7.4	2.0	7.4
16-Dec	2.6	2.6	4.8	9.0	3.6	5.4	4.6	4.3	6.3	8.8	9.2	8.2	7.7	7.2	10.4	11.6	10.7	16.8	13.8	8.8	11.1	27.4	16.6	9.6	9.2	27.4
17-Dec	8.6	13.6	6.7	23.7	20.0	14.3	4.4	4.8	6.2	5.0	4.1	4.2	5.4	5.3	6.0	6.7	7.0	11.1	13.3	16.3	9.8	8.3	6.9	10.3	9.3	23.7
18-Dec	6.9	7.3	7.0	7.6	8.5	9.0	8.9	10.1	10.4	10.3	9.9	11.5	11.6	9.9	9.8	9.2	10.1	12.8	13.7	12.5	11.6	11.5	12.8	12.9	10.2	13.7
19-Dec	14.2	13.7	13.3	12.7	12.0	12.6	13.4	13.6	13.9	13.4	13.0	11.9	11.8	11.0	10.4	10.7	12.7	9.4	8.1	8.1	8.6	7.9	8.1	10.6	11.5	14.2
20-Dec	7.7	13.1	20.5	9.7	8.9	13.9	7.5	0.4	0.2	0.3	2.5	6.7	0.4	0.4	0.5	0.2	2.6	7.1	4.6	3.3	2.2	3.1	2.8	3.5	5.1	20.5
21-Dec	3.5	4.0	4.9	4.7	3.7	3.5	3.5	4.2	4.4	4.4	6.8	6.1	2.6	0.5	0.2	0.2	0.5	3.0	2.8	7.0	7.6	7.8	10.0	30.3	5.3	30.3
22-Dec	12.5	12.6	18.6	19.9	7.8	2.8	1.2	1.6	2.4	1.6	0.9	1.1	1.3	1.7	1.7	2.5	4.4	6.3	8.2	8.5	5.7	4.3	4.3	4.4	5.7	19.9
23-Dec	4.0	3.9	3.4	3.1	3.0	3.0	2.7	2.5	2.4	2.5	2.5	2.8	2.6	2.7	2.9	3.1	2.2	1.7	1.7	1.6	1.7	2.0	1.8	2.4	2.6	4.0
24-Dec	2.6	2.1	2.0	2.1	2.0	2.2	2.7	3.5	3.0	4.4	6.0	3.8	3.8	3.4	4.9	5.3	5.5	8.6	9.6	10.1	13.1	11.1	8.8	6.8	5.3	13.1
25-Dec	6.2	6.2	7.1	6.8	7.5	6.6	5.7	4.7	4.4	4.6	4.3	8.3	10.1	5.5	5.6	6.2	12.0	8.2	14.0	5.8	4.9	3.6	4.6	5.2	6.6	14.0
26-Dec	5.2	5.4	5.7	4.4	3.5	3.8	4.2	5.1	5.2	6.1	4.4	5.3	5.1	8.2	10.6	5.4	5.4	17.1	7.9	9.0	7.4	6.7	7.8	8.6	6.6	17.1
27-Dec	9.9	7.5	8.1	7.1	8.7	8.1	8.7	10.3	11.6	9.0	7.8	6.4	5.5	4.0	3.4	6.0	11.6	10.2	6.4	7.0	2.2	0.7	2.0	2.4	6.9	11.6
28-Dec	2.4	2.1	1.9	2.0	2.1	2.7	2.6	3.3	3.3	3.0	3.1	3.0	2.8	2.6	3.1	4.0	3.2	4.7	7.4	6.7	5.5	5.1	4.3	4.6	3.6	7.4
29-Dec	5.5	4.5	5.4	6.0	5.3	5.1	6.1	5.2	3.5	2.9	2.6	2.6	2.8	3.4	4.8	6.5	6.9	9.7	11.0	9.9	9.0	8.8	9.5	9.7	6.1	11.0
30-Dec	7.5	6.2	5.4	4.9	5.0	5.0	5.2	4.3	4.0	4.1	5.3	5.5	3.0	2.7	5.5	6.6	7.7	5.9	4.8	4.3	4.4	4.6	5.1	4.7	5.1	7.7
31-Dec	4.7	4.5	4.6	5.6	5.7	6.5	5.4	5.5	4.8	4.7	4.6	4.7	6.3	6.4	6.3	8.2	11.9	9.1	3.9	2.1	2.5	2.0	1.4	2.7	5.2	11.9
																								Diurnal Average		
																								Diurnal Maximum		
6.2 8.5 6.9 6.8 6.0 6.1 5.5 5.1 4.9 5.1 5.7 6.0 5.7 5.5 5.9 6.2 7.4 8.2 8.4 8.2 7.8 8.2 6.7 6.8 14.9 48.6 22.8 23.7 20.0 17.3 13.4 13.6 13.9 13.4 20.4 20.7 21.3 22.5 25.6 25.8 21.3 17.5 18.1 27.3 24.6 35.8 17.5 30.3																										
C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay - Bertha Ganter - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	397	53.65	53.65
6 - 15	281	37.97	91.62
16 - 25	41	5.54	97.16
26 - 80	8	1.08	98.24
> 81.0	0	0.00	98.24

Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	43	16	3	3	3	6	4	19	49	13	17	19	32	104	46	20	397
6 - 15	19	6	4	2	5	1	3	47	83	26	22	15	12	11	7	18	281
16 - 25	0	0	0	0	1	0	0	11	17	4	3	3	0	1	1	0	41
26 - 80	0	0	0	0	0	0	1	0	2	4	1	0	0	0	0	0	8
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	62	22	7	5	9	7	8	77	151	47	43	37	44	116	54	38	727

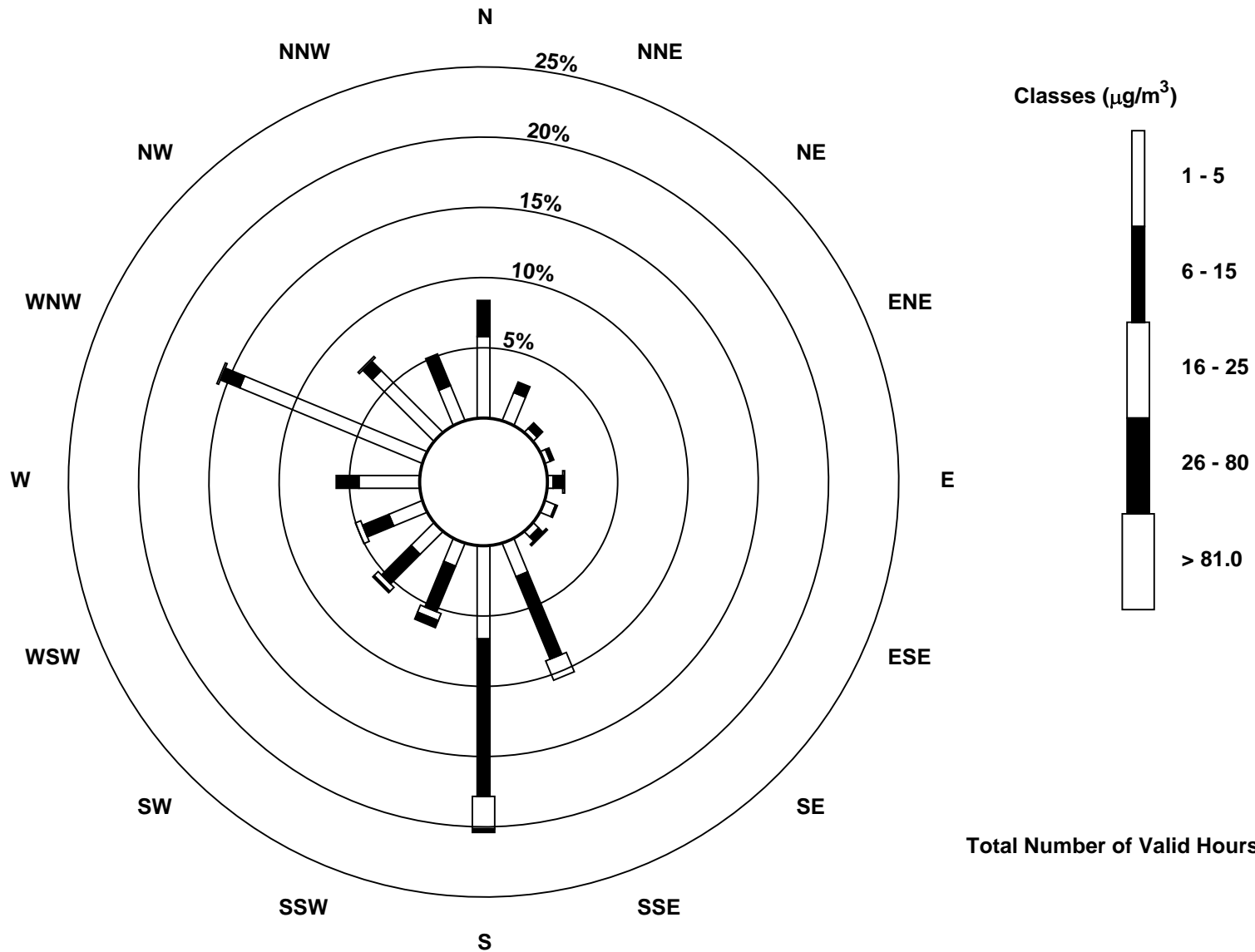
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay - Bertha Ganter (AMS 1)





Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	Hours in Service:	744
Maximum Value: 0 ppb on Dec 1 01:00	Maximum Daily Average: 0.0 ppb on Dec 1	Hours of Data:	670
Minimum Value: 0 ppb on Dec 1 01:00	Minimum Daily Average: 0.0 ppb on Dec 1	Hours of Missing Data:	74
Maximum Diurnal Average: 0.0 ppb at hour 1	Minimum Diurnal Average: 0.0 ppb at hour 1	Hours of Calibration:	43
Monthly Average: 0.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 0	Percent Operational Time:	95.8

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	Z	RE	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	0	0	0	Z	RE	0	C	C	C	C	C	C	C	0	0	0	0	0	0	0	--	0
13-Dec	0	0	0	0	0	0	0	0	Z	RE	0	0	C	C	C	C	C	C	0	0	0	0	0	0	--	0
14-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
19-Dec	0	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	0	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	0	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

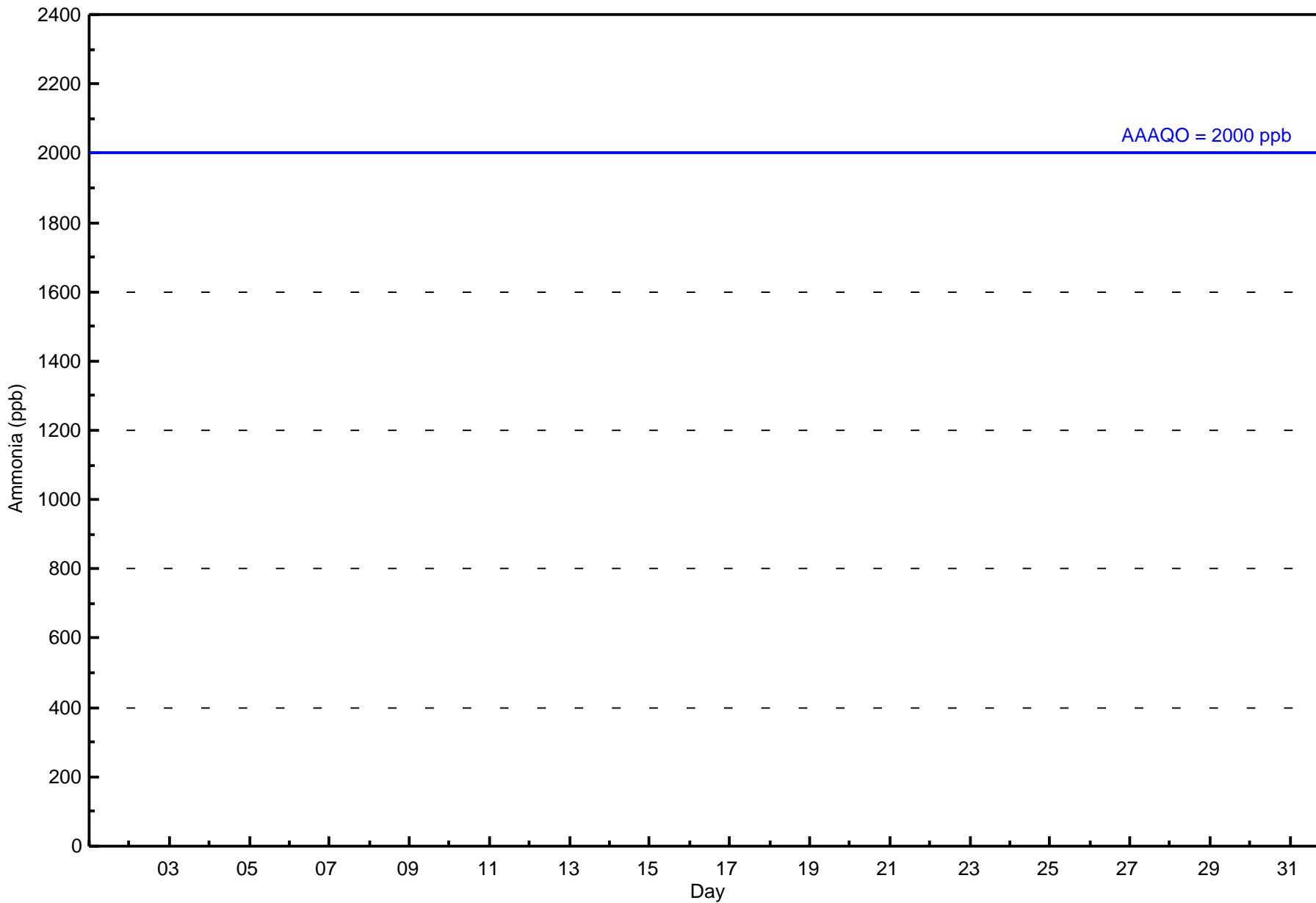
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

Z - zerospan C - Calibration RE - Recovery
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	670	100.00	100.00
6 - 10	0	0.00	100.00
11 - 15	0	0.00	100.00
16 - 20	0	0.00	100.00
21 - 25	0	0.00	100.00
> 26	0	0.00	100.00

Total Number of Valid Hours: 670

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	53	22	5	5	8	4	8	71	139	44	42	36	44	103	50	36	670
6 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	53	22	5	5	8	4	8	71	139	44	42	36	44	103	50	36	670

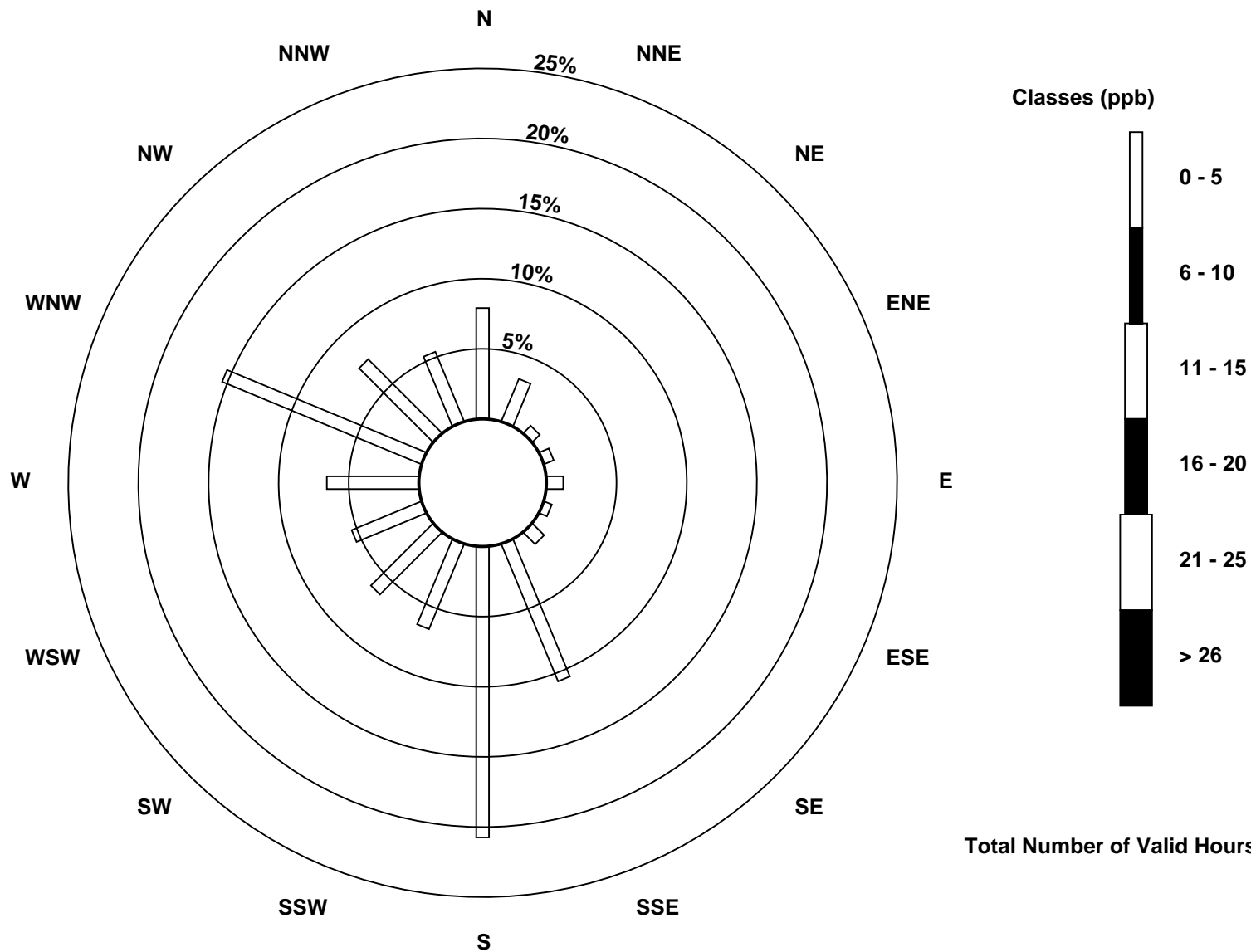
Total Number of Valid Hours: 670

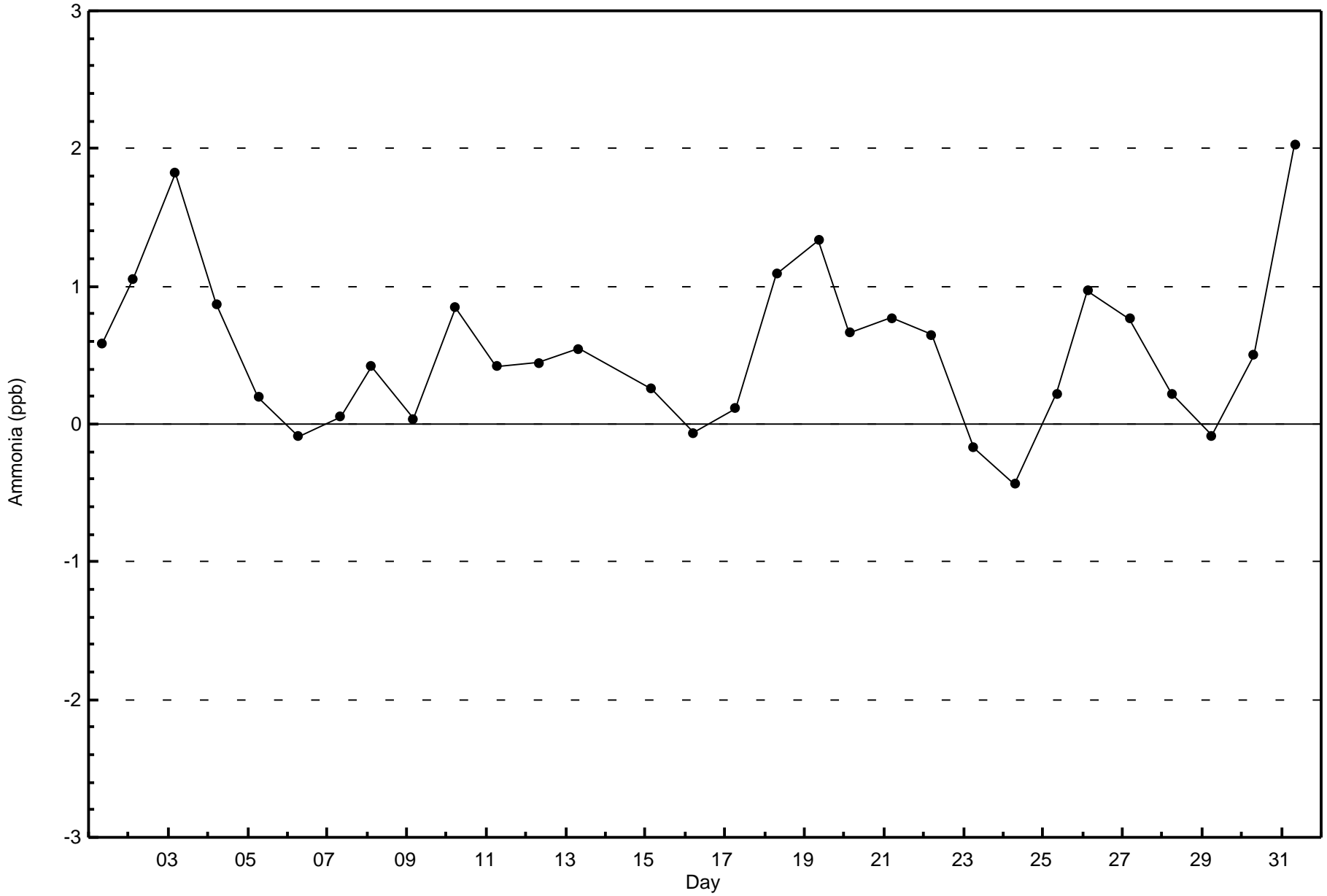
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter (AMS 1)

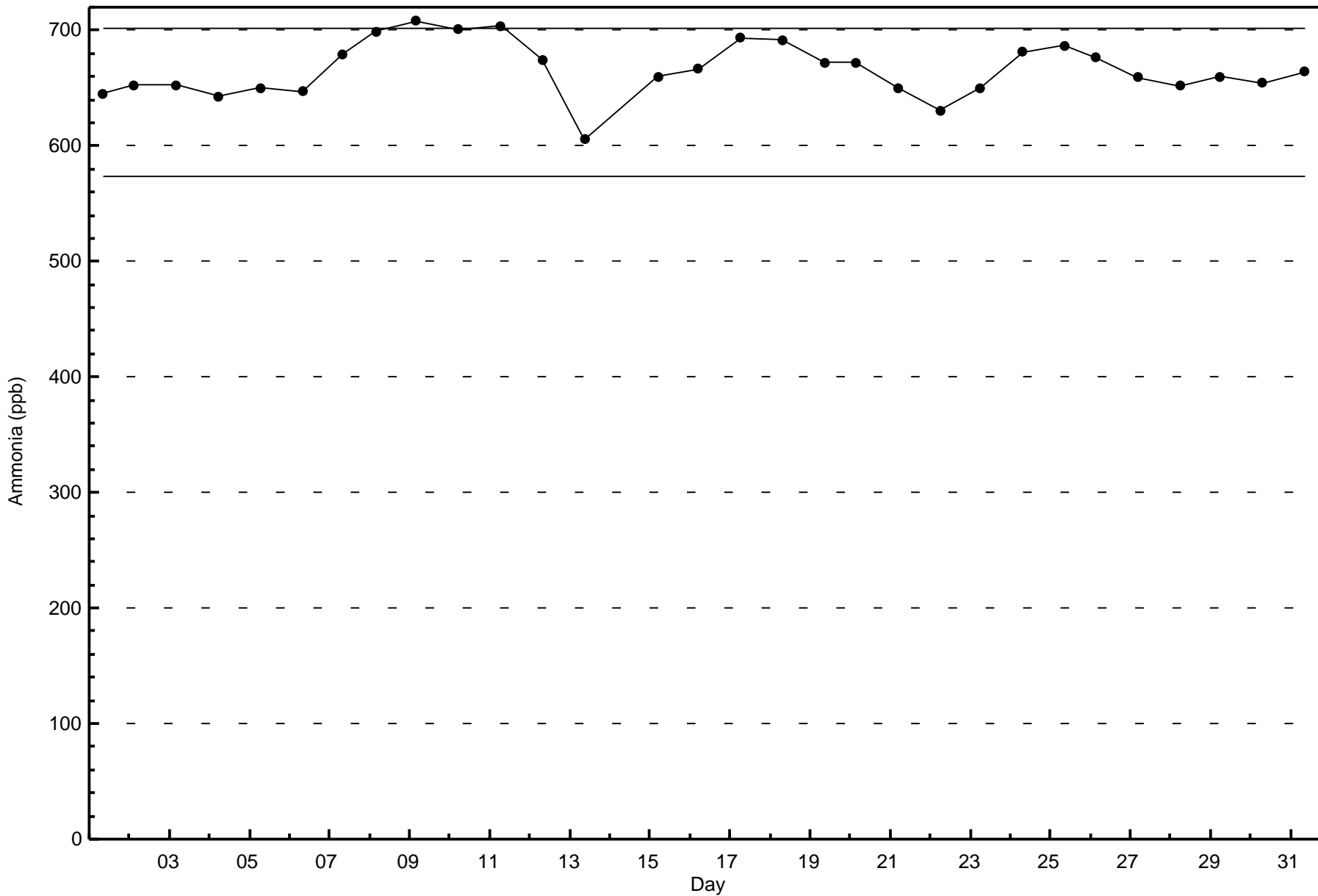






Wood Buffalo Environmental Association
Span Responses

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - December 2016



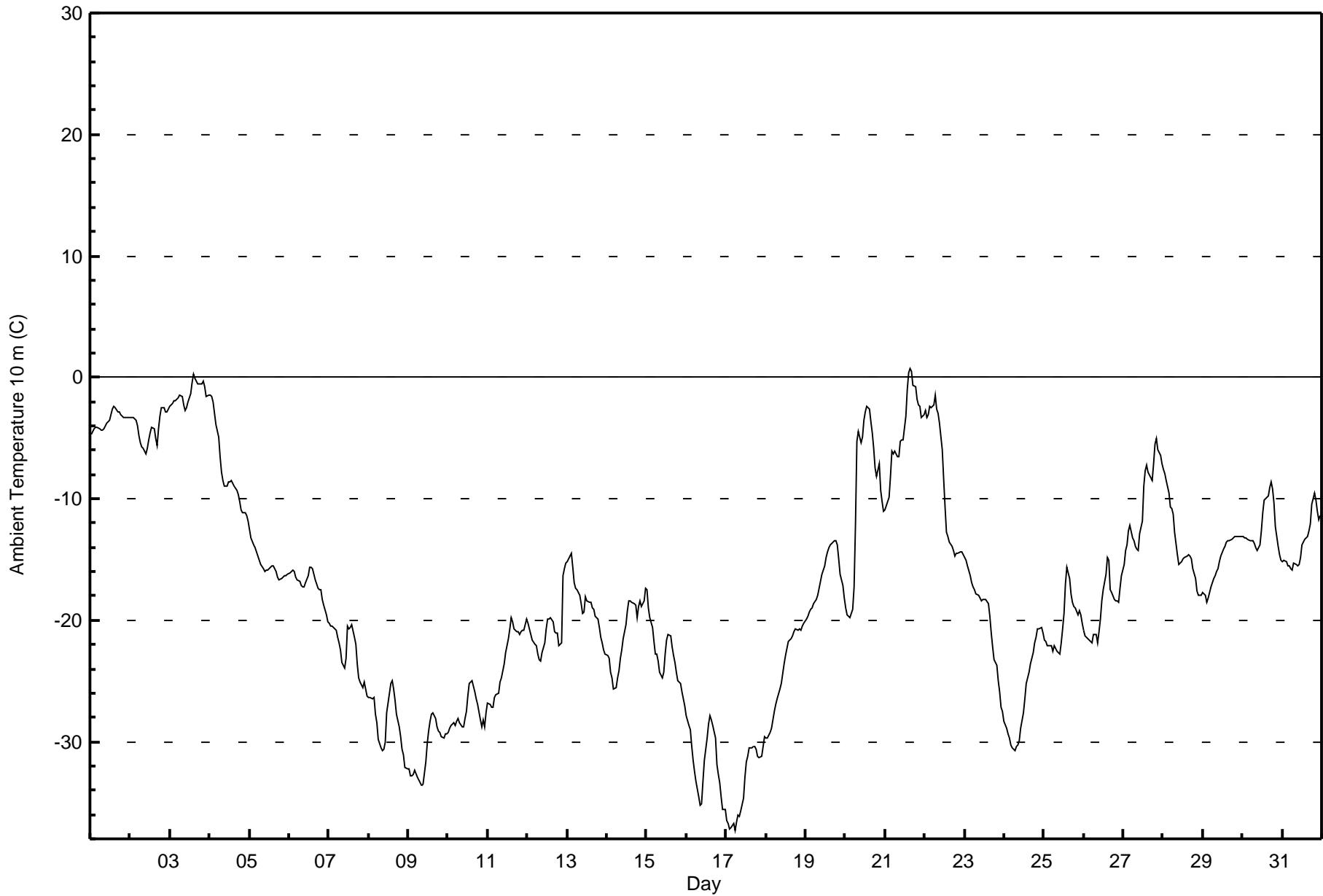


Maximum Value: 0.7 C on Dec 21 16:00 Maximum Daily Average: -1.3 C on Dec 3																							Hours in Service: 744 Hours of Data: 744			
Minimum Value: -37.3 C on Dec 17 06:00 Minimum Daily Average: -33.4 C on Dec 17 Maximum Diurnal Average: -15.6 C at hour 15 Minimum Diurnal Average: -18.7 C at hour 10 Monthly Average: -17.54 C Percentiles: P ₁ = -36.2 P ₁₀ = -29.4 Q ₁ = -23.6 Median = -18.0 Q ₃ = -12.1 P ₉₀ = -3.6 P ₉₉ = -0.3																							Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.7	-4.4	-4.2	-4.1	-4.1	-4.3	-4.4	-4.4	-4.2	-4.0	-3.8	-3.5	-3.1	-2.6	-2.4	-2.5	-2.8	-2.9	-3.1	-3.2	-3.3	-3.3	-3.3	-3.3	-3.6	-2.4
2-Dec	-3.3	-3.3	-3.3	-3.5	-4.0	-4.9	-5.4	-5.7	-5.8	-6.3	-5.8	-5.1	-4.6	-4.1	-4.2	-5.0	-5.6	-4.2	-3.2	-2.5	-2.5	-2.8	-2.9	-2.7	-4.2	-2.5
3-Dec	-2.4	-2.2	-2.0	-1.9	-1.8	-1.6	-1.5	-1.6	-2.3	-2.7	-2.5	-2.0	-1.4	-0.4	0.3	-0.1	-0.3	-0.5	-0.5	-0.6	-0.3	-0.7	-1.6	-1.5	-1.3	0.3
4-Dec	-1.5	-1.6	-2.1	-2.9	-3.9	-5.0	-6.5	-7.7	-8.5	-9.0	-8.9	-8.6	-8.6	-8.5	-8.7	-8.9	-9.3	-9.6	-10.2	-11.0	-11.1	-11.1	-11.4	-11.9	-7.8	-1.5
5-Dec	-12.5	-13.2	-13.7	-14.1	-14.3	-14.7	-15.1	-15.4	-15.8	-16.0	-15.9	-15.9	-15.7	-15.6	-15.5	-15.7	-16.0	-16.4	-16.7	-16.6	-16.4	-16.4	-16.3	-16.2	-15.4	-12.5
6-Dec	-16.1	-15.9	-15.8	-16.0	-16.4	-16.7	-16.8	-17.1	-17.3	-17.3	-16.9	-16.3	-15.6	-15.6	-15.8	-16.2	-16.6	-17.3	-17.5	-17.5	-18.2	-18.8	-19.5	-20.1	-17.0	-15.6
7-Dec	-20.2	-20.5	-20.4	-20.5	-20.9	-21.4	-21.8	-22.5	-23.5	-23.9	-23.1	-20.4	-20.8	-20.6	-20.3	-21.4	-22.0	-23.6	-24.7	-25.1	-25.6	-25.1	-25.7	-26.2	-22.5	-20.2
8-Dec	-26.4	-26.3	-26.5	-26.4	-27.7	-28.4	-29.9	-30.5	-30.7	-30.6	-30.1	-27.7	-26.8	-25.2	-25.0	-25.7	-26.6	-27.8	-28.8	-29.6	-30.6	-31.1	-32.1	-32.3	-28.4	-25.0
9-Dec	-32.2	-32.9	-32.8	-32.7	-32.3	-32.9	-33.2	-33.4	-33.7	-33.5	-31.7	-30.1	-29.1	-28.4	-27.7	-27.6	-28.1	-28.7	-29.1	-29.3	-29.6	-29.7	-29.4	-29.4	-30.7	-27.6
10-Dec	-29.3	-28.9	-28.6	-28.5	-28.6	-28.3	-28.1	-28.4	-28.7	-28.7	-28.1	-27.5	-26.3	-25.2	-25.0	-25.4	-25.9	-26.4	-26.9	-28.2	-28.8	-28.2	-28.7	-27.6	-27.7	-25.0
11-Dec	-26.9	-27.0	-27.2	-27.2	-26.4	-26.1	-26.0	-25.1	-24.7	-24.2	-23.6	-22.7	-21.6	-20.7	-19.8	-20.2	-20.7	-20.9	-20.9	-21.2	-21.0	-20.9	-20.8	-19.9	-23.1	-19.8
12-Dec	-20.3	-20.7	-21.1	-21.6	-22.0	-22.1	-22.8	-23.2	-23.4	-22.6	-21.9	-20.7	-19.9	-19.8	-19.8	-20.2	-20.9	-21.1	-21.1	-22.1	-21.9	-16.4	-15.8	-15.4	-20.7	-15.4
13-Dec	-15.1	-14.9	-14.5	-15.6	-16.9	-17.3	-17.5	-17.9	-18.7	-19.5	-19.3	-18.1	-18.4	-18.5	-18.5	-19.0	-19.1	-19.7	-19.9	-20.6	-21.4	-21.8	-22.4	-22.8	-18.6	-14.5
14-Dec	-22.9	-23.1	-24.2	-24.8	-25.6	-25.6	-24.7	-24.2	-23.2	-22.4	-21.5	-20.4	-19.2	-18.5	-18.4	-18.5	-18.7	-18.8	-19.8	-18.9	-18.5	-18.8	-18.4	-17.4	-21.1	-17.4
15-Dec	-17.5	-19.0	-19.8	-20.6	-21.7	-22.8	-22.8	-23.3	-24.2	-24.8	-24.3	-22.8	-21.6	-21.1	-21.3	-22.2	-23.0	-23.5	-24.3	-25.0	-25.2	-25.9	-26.5	-27.0	-22.9	-17.5
16-Dec	-27.9	-28.7	-29.0	-30.4	-31.6	-32.4	-33.3	-34.5	-35.2	-35.1	-33.3	-31.5	-29.7	-28.6	-27.9	-28.2	-28.7	-29.7	-31.9	-32.7	-33.4	-34.6	-35.5	-35.5	-31.6	-27.9
17-Dec	-36.5	-36.7	-37.1	-37.1	-36.8	-37.3	-36.6	-36.6	-36.2	-35.7	-34.7	-33.0	-31.7	-31.2	-30.6	-30.5	-30.4	-30.4	-30.6	-31.2	-31.3	-31.1	-30.4	-29.6	-33.4	-29.6
18-Dec	-29.7	-29.7	-29.2	-28.9	-28.2	-27.5	-26.9	-26.5	-25.7	-25.2	-24.4	-23.6	-22.9	-21.8	-21.7	-21.5	-21.2	-21.0	-20.7	-20.8	-20.7	-20.9	-20.5	-20.2	-24.1	-20.2
19-Dec	-19.9	-19.6	-19.4	-19.1	-19.0	-18.7	-18.3	-18.0	-17.4	-16.8	-16.3	-15.6	-14.8	-14.4	-14.0	-13.8	-13.7	-13.5	-13.5	-13.7	-15.0	-16.2	-17.1	-18.1	-16.5	-13.5
20-Dec	-19.0	-19.6	-19.7	-19.8	-19.0	-17.3	-12.0	-5.2	-4.5	-5.3	-4.9	-3.5	-2.8	-2.4	-2.7	-3.6	-4.6	-5.8	-7.5	-8.1	-7.1	-9.3	-10.2	-11.0	-9.4	-2.4
21-Dec	-10.9	-10.2	-9.9	-8.1	-6.1	-6.3	-6.1	-6.6	-6.5	-5.2	-5.2	-5.1	-3.2	-1.0	0.3	0.7	0.4	-0.6	-0.7	-1.8	-2.3	-2.3	-3.3	-3.1	-4.3	0.7
22-Dec	-2.7	-3.3	-3.1	-2.4	-2.5	-2.3	-1.5	-2.6	-3.0	-3.8	-5.9	-8.3	-10.7	-12.8	-13.1	-13.6	-13.9	-14.2	-14.8	-14.5	-14.4	-14.4	-14.4	-14.6	-8.6	-1.5
23-Dec	-14.8	-15.1	-15.5	-16.3	-16.9	-17.2	-17.5	-17.8	-18.0	-18.2	-18.4	-18.3	-18.3	-18.3	-18.6	-19.7	-21.0	-22.2	-23.2	-23.7	-25.0	-25.9	-27.1	-27.6	-19.8	-14.8
24-Dec	-28.3	-28.9	-29.3	-29.7	-30.3	-30.6	-30.7	-30.5	-30.3	-29.9	-28.9	-27.7	-26.4	-25.2	-24.8	-24.3	-23.6	-22.7	-21.9	-21.4	-20.7	-20.7	-20.6	-21.0	-26.2	-20.6
25-Dec	-21.6	-21.7	-22.0	-22.1	-22.0	-22.6	-22.0	-22.3	-22.5	-22.8	-21.8	-20.7	-19.4	-17.0	-15.6	-16.5	-17.9	-18.5	-18.9	-19.0	-19.5	-19.2	-19.5	-20.2	-20.2	-15.6
26-Dec	-20.8	-21.3	-21.5	-21.6	-21.7	-21.8	-21.2	-21.2	-21.9	-21.0	-19.8	-18.5	-17.5	-16.2	-14.8	-15.1	-17.5	-17.7	-18.2	-18.4	-18.4	-18.5	-17.3	-16.4	-19.1	-14.8
27-Dec	-15.5	-14.3	-13.7	-12.6	-12.2	-13.2	-13.4	-13.9	-14.1	-14.2	-12.9	-11.8	-8.9	-7.7	-7.2	-7.8	-8.3	-8.5	-7.1	-5.5	-5.0	-5.9	-6.4	-7.1	-10.3	-5.0
28-Dec	-7.6	-7.9	-8.4	-9.6	-10.6	-10.8	-11.3	-12.8	-14.6	-15.4	-15.3	-15.1	-14.9	-14.8	-14.8	-14.6	-14.7	-15.0	-15.8	-16.6	-17.6	-17.9	-17.9	-18.0	-13.8	-7.6
29-Dec	-17.7	-18.0	-18.5	-18.1	-17.7	-17.3	-16.5	-16.4	-16.0	-15.7	-15.2	-14.7	-14.2	-13.9	-13.6	-13.5	-13.4	-13.4	-13.2	-13.1	-13.1	-13.1	-13.1	-13.1	-15.1	-13.1
30-Dec	-13.1	-13.2	-13.2	-13.4	-13.5	-13.4	-13.5	-13.7	-14.0	-14.3	-13.8	-12.6	-11.1	-10.2	-10.0	-9.8	-9.1	-8.6	-9.2	-10.3	-12.3	-14.0	-14.6	-15.0	-12.3	-8.6
31-Dec	-15.2	-15.0	-15.1	-15.5	-15.5	-15.8	-15.9	-15.3	-15.5	-15.5	-15.4	-14.9	-13.8	-13.3	-13.2	-13.1	-12.6	-12.0	-10.5	-9.6	-10.1	-11.0	-11.7	-11.3	-13.6	-9.6
																							Diurnal Average			
																							Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 10 m (AT 10m) - C
Fort McKay - Bertha Ganter - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 10 m (AT 10m) - C
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	302	40.59	40.59
-20 - 0	438	58.87	99.46
0 - 10	4	0.54	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



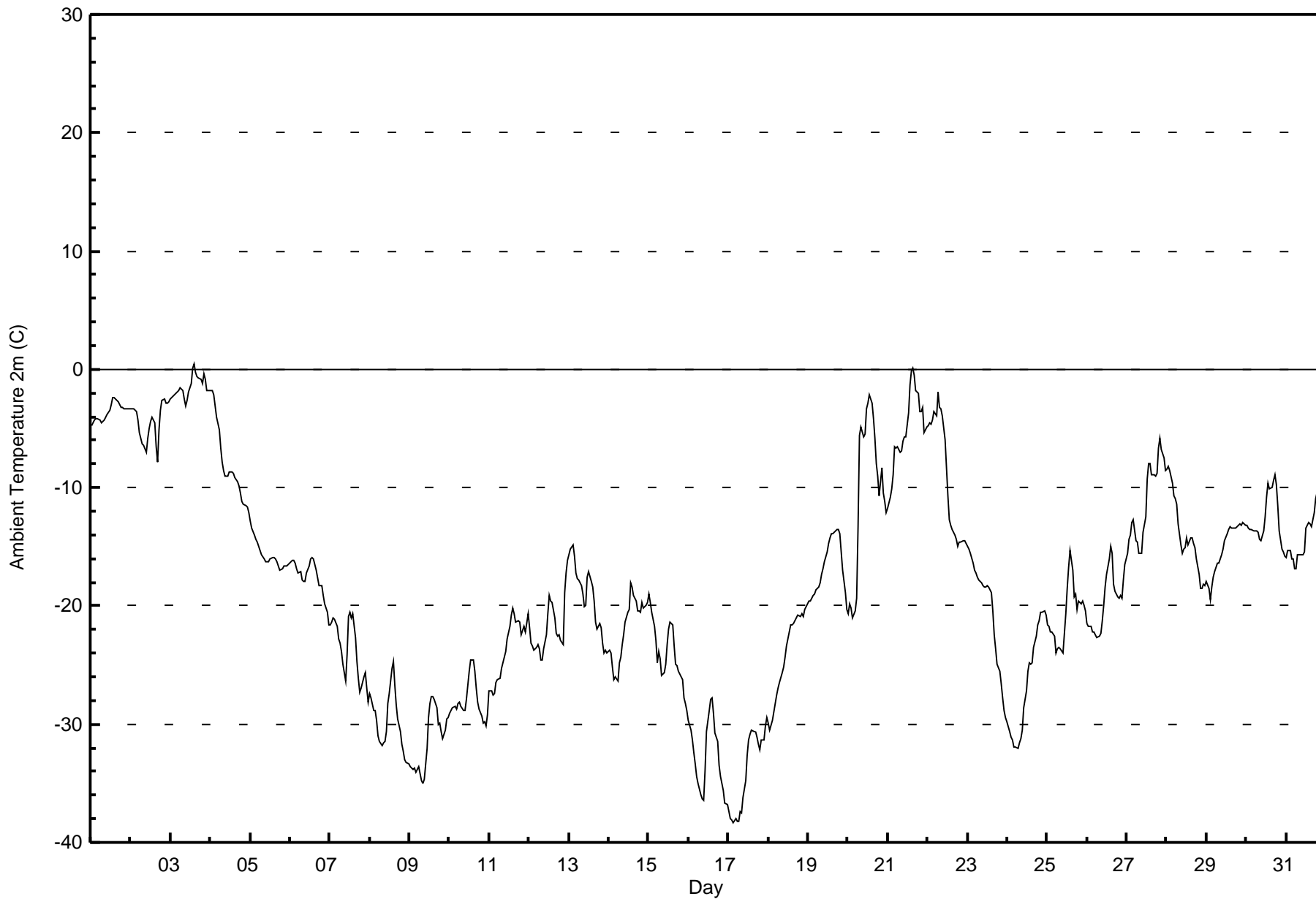
Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 2m (AT 2m) - C

Fort McKay - Bertha Ganter - December 2016

Maximum Value: 0.5 C on Dec 3 15:00 Maximum Daily Average: -1.5 C on Dec 3 Minimum Value: -38.3 C on Dec 17 04:00 Minimum Daily Average: -34.0 C on Dec 17 Maximum Diurnal Average: -15.7 C at hour 15 Minimum Diurnal Average: -19.4 C at hour 6 Monthly Average: -18.10 C Percentiles: P ₁ = -37.4 P ₁₀ = -30.5 Q ₁ = -24.6 Median = -18.4 Q ₃ = -12.5 P ₉₀ = -4.1 P ₉₉ = -0.6		Hours in Service:	744																							
		Hours of Data:	744																							
		Hours of Missing Data:	0																							
		Hours of Calibration:	0																							
		Percent Operational Time:	100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.8	-4.5	-4.3	-4.2	-4.2	-4.3	-4.5	-4.4	-4.2	-4.1	-3.8	-3.5	-3.0	-2.4	-2.4	-2.5	-2.8	-2.9	-3.2	-3.2	-3.3	-3.3	-3.3	-3.3	-3.6	-2.4
2-Dec	-3.3	-3.3	-3.4	-3.6	-4.3	-5.4	-5.8	-6.2	-6.5	-7.0	-5.9	-5.0	-4.4	-4.0	-4.5	-6.5	-7.8	-5.2	-3.4	-2.6	-2.5	-2.9	-2.9	-2.7	-4.6	-2.5
3-Dec	-2.5	-2.3	-2.1	-2.0	-1.9	-1.7	-1.6	-1.8	-2.5	-3.1	-2.7	-1.9	-1.2	0.1	0.5	-0.3	-0.6	-0.7	-0.9	-1.2	-0.4	-0.9	-1.8	-1.7	-1.5	0.5
4-Dec	-1.8	-1.8	-2.2	-3.1	-4.0	-5.1	-6.6	-7.8	-8.5	-9.1	-9.0	-8.7	-8.7	-8.7	-8.8	-9.1	-9.5	-9.9	-10.5	-11.2	-11.4	-11.5	-11.7	-12.1	-7.9	-1.8
5-Dec	-12.8	-13.4	-14.0	-14.3	-14.6	-14.9	-15.3	-15.6	-16.0	-16.3	-16.2	-16.3	-16.0	-15.9	-15.9	-16.0	-16.3	-16.7	-17.0	-16.9	-16.7	-16.7	-16.6	-16.5	-15.7	-12.8
6-Dec	-16.3	-16.2	-16.1	-16.4	-16.9	-17.2	-17.1	-17.8	-17.9	-17.9	-17.2	-16.6	-16.0	-15.9	-16.0	-16.5	-17.0	-18.3	-18.2	-18.3	-19.1	-19.9	-20.6	-21.7	-17.5	-15.9
7-Dec	-21.6	-21.3	-21.0	-21.1	-21.7	-22.8	-23.1	-23.9	-25.0	-26.4	-24.1	-20.9	-20.6	-21.0	-20.6	-22.7	-24.7	-26.2	-27.3	-26.9	-26.0	-25.6	-26.9	-28.1	-23.7	-20.6
8-Dec	-27.5	-27.8	-28.8	-28.8	-29.6	-31.0	-31.5	-31.8	-31.6	-31.4	-30.6	-28.3	-27.4	-25.3	-24.7	-26.8	-28.3	-29.6	-30.6	-31.7	-32.3	-33.0	-33.2	-33.4	-29.8	-24.7
9-Dec	-33.6	-33.7	-33.8	-33.7	-34.1	-33.6	-34.2	-34.8	-35.0	-34.7	-32.1	-29.5	-28.2	-27.7	-27.6	-27.9	-28.7	-30.0	-29.9	-30.7	-31.2	-30.5	-29.5	-29.4	-31.4	-27.6
10-Dec	-29.1	-28.9	-28.6	-28.5	-28.7	-28.3	-28.2	-28.5	-28.9	-28.8	-27.9	-26.7	-25.5	-24.5	-24.6	-25.5	-26.9	-28.1	-28.7	-29.3	-29.9	-29.8	-30.2	-29.2	-28.1	-24.5
11-Dec	-27.1	-27.2	-27.5	-27.4	-26.5	-26.3	-26.2	-25.2	-24.8	-24.3	-23.8	-22.8	-21.7	-20.8	-20.2	-20.6	-21.4	-21.2	-21.4	-22.4	-22.1	-21.7	-22.2	-20.7	-23.6	-20.2
12-Dec	-21.9	-23.2	-23.3	-23.7	-23.5	-23.3	-23.6	-24.6	-24.5	-23.6	-22.4	-20.7	-19.1	-19.6	-19.8	-21.0	-22.4	-22.6	-22.4	-23.0	-23.2	-18.9	-17.2	-16.2	-21.8	-16.2
13-Dec	-15.6	-15.2	-14.9	-15.8	-17.2	-17.7	-17.8	-18.3	-19.0	-20.1	-20.0	-17.6	-17.2	-17.9	-18.4	-19.6	-21.4	-22.0	-21.5	-21.9	-23.2	-24.0	-23.7	-23.9	-19.3	-14.9
14-Dec	-23.7	-24.0	-25.1	-26.2	-26.0	-26.3	-24.8	-24.3	-23.3	-22.5	-21.4	-20.6	-20.3	-18.1	-18.4	-19.1	-19.5	-20.4	-20.5	-20.5	-19.7	-20.2	-19.9	-19.7	-21.9	-18.1
15-Dec	-19.0	-19.7	-20.6	-21.7	-22.9	-24.8	-23.9	-24.4	-25.9	-25.7	-24.9	-23.3	-21.9	-21.4	-21.6	-23.4	-24.9	-25.0	-25.6	-25.8	-26.2	-27.8	-28.2	-28.8	-24.1	-19.0
16-Dec	-29.7	-30.5	-31.4	-32.4	-33.4	-34.4	-35.0	-36.0	-36.4	-36.5	-33.9	-30.7	-28.9	-28.0	-27.7	-29.1	-30.7	-31.4	-33.5	-34.4	-35.0	-35.6	-36.7	-36.8	-32.8	-27.7
17-Dec	-37.3	-38.0	-38.1	-38.3	-37.9	-38.3	-38.3	-37.4	-37.6	-36.2	-34.8	-32.7	-31.3	-30.9	-30.5	-30.7	-30.6	-31.1	-31.7	-32.1	-31.4	-31.3	-30.2	-29.5	-34.0	-29.5
18-Dec	-29.9	-30.5	-29.7	-29.0	-28.2	-27.5	-26.9	-26.4	-25.6	-25.2	-24.4	-23.4	-22.8	-21.6	-21.6	-21.5	-21.3	-21.0	-20.8	-20.9	-20.7	-20.9	-20.3	-20.1	-24.2	-20.1
19-Dec	-19.6	-19.5	-19.4	-19.1	-19.0	-18.7	-18.4	-18.0	-17.4	-16.9	-16.2	-15.5	-14.7	-14.2	-13.9	-13.9	-13.7	-13.6	-13.6	-13.9	-15.5	-17.0	-18.9	-20.3	-16.7	-13.6
20-Dec	-20.6	-19.8	-20.2	-21.1	-20.4	-19.4	-13.3	-5.5	-4.9	-5.8	-5.5	-3.3	-2.9	-2.2	-2.9	-4.2	-5.8	-8.0	-9.0	-10.7	-8.3	-10.4	-11.1	-12.1	-10.3	-2.2
21-Dec	-11.7	-10.8	-10.1	-8.9	-6.6	-6.7	-6.6	-7.0	-6.9	-6.1	-5.7	-5.7	-3.7	-1.3	-0.1	0.2	-0.5	-1.8	-2.1	-3.5	-3.6	-3.2	-5.4	-4.9	-5.1	0.2
22-Dec	-4.8	-4.5	-4.7	-4.2	-3.6	-3.9	-1.9	-3.2	-3.3	-3.9	-6.0	-8.4	-10.7	-12.8	-13.2	-13.6	-14.0	-14.4	-15.0	-14.6	-14.6	-14.5	-14.5	-14.8	-9.1	-1.9
23-Dec	-15.0	-15.2	-15.6	-16.4	-17.0	-17.3	-17.6	-17.9	-18.1	-18.3	-18.4	-18.4	-18.3	-18.4	-18.8	-20.4	-22.4	-23.7	-25.0	-25.5	-26.6	-27.8	-28.8	-29.5	-20.4	-15.0
24-Dec	-29.8	-30.6	-31.1	-31.4	-31.9	-32.0	-32.0	-31.6	-31.2	-30.5	-28.7	-27.1	-25.6	-24.8	-24.9	-24.8	-23.5	-22.5	-21.6	-21.3	-20.5	-20.6	-20.5	-20.8	-26.6	-20.5
25-Dec	-21.6	-21.7	-22.2	-22.2	-22.6	-24.0	-23.6	-23.4	-23.7	-24.0	-22.4	-20.6	-18.6	-16.7	-15.4	-17.0	-19.2	-19.1	-20.3	-19.6	-19.9	-19.6	-19.9	-20.4	-20.7	-15.4
26-Dec	-21.5	-21.7	-21.7	-22.2	-22.2	-22.4	-22.7	-22.5	-22.3	-21.2	-20.0	-18.5	-17.4	-16.1	-15.0	-15.5	-18.2	-18.7	-19.3	-19.3	-19.2	-19.4	-17.8	-16.5	-19.6	-15.0
27-Dec	-15.6	-14.4	-14.0	-13.0	-12.7	-14.5	-14.6	-15.6	-15.6	-15.6	-13.8	-12.4	-9.3	-8.0	-8.0	-9.0	-8.9	-9.1	-8.7	-6.7	-5.8	-6.8	-7.5	-8.5	-11.2	-5.8
28-Dec	-8.4	-8.2	-8.6	-9.6	-10.7	-10.9	-11.4	-13.1	-14.9	-15.6	-15.2	-15.0	-14.3	-14.9	-14.3	-14.2	-14.7	-15.1	-16.0	-17.3	-18.6	-18.5	-18.2	-18.3	-14.0	-8.2
29-Dec	-17.9	-18.5	-19.5	-18.4	-17.6	-17.1	-16.4	-16.4	-16.0	-15.7	-15.2	-14.5	-13.9	-13.6	-13.4	-13.5	-13.5	-13.4	-13.2	-13.2	-13.1	-13.2	-12.9	-13.1	-15.1	-12.9
30-Dec	-13.1	-13.4	-13.5	-13.5	-13.6	-13.6	-13.7	-13.8	-14.4	-14.5	-13.7	-12.5	-10.8	-9.6	-10.2	-10.0	-9.3	-8.9	-9.7	-11.5	-13.6	-15.2	-15.5	-15.8	-12.6	-8.9
31-Dec	-15.9	-15.3	-15.3	-16.0	-16.0	-16.8	-16.9	-15.6	-15.6	-15.6	-15.7	-15.4	-13.4	-13.0	-13.1	-13.3	-12.7	-12.2	-11.0	-9.9	-10.3	-11.4	-12.4	-12.1	-14.0	-9.9
	-18.5	-18.6	-18.7	-18.9	-19.0	-19.4	-19.1	-19.1	-19.3	-19.2	-18.4	-17.3	-16.4	-15.8	-15.7	-16.4	-17.1	-17.5	-17.8	-18.1	-18.2	-18.5	-18.7	-18.7		Diurnal Average
	-1.8	-1.8	-2.1	-2.0	-1.9	-1.7	-1.6	-1.8	-2.5	-3.1	-2.7	-1.9	-1.2	0.1	0.5	0.2	-0.5	-0.7	-0.9	-1.2	-0.4	-0.9	-1.8	-1.7		Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Fort McKay - Bertha Ganter - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	322	43.28	43.28
-20 - 0	419	56.32	99.60
0 - 10	3	0.40	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

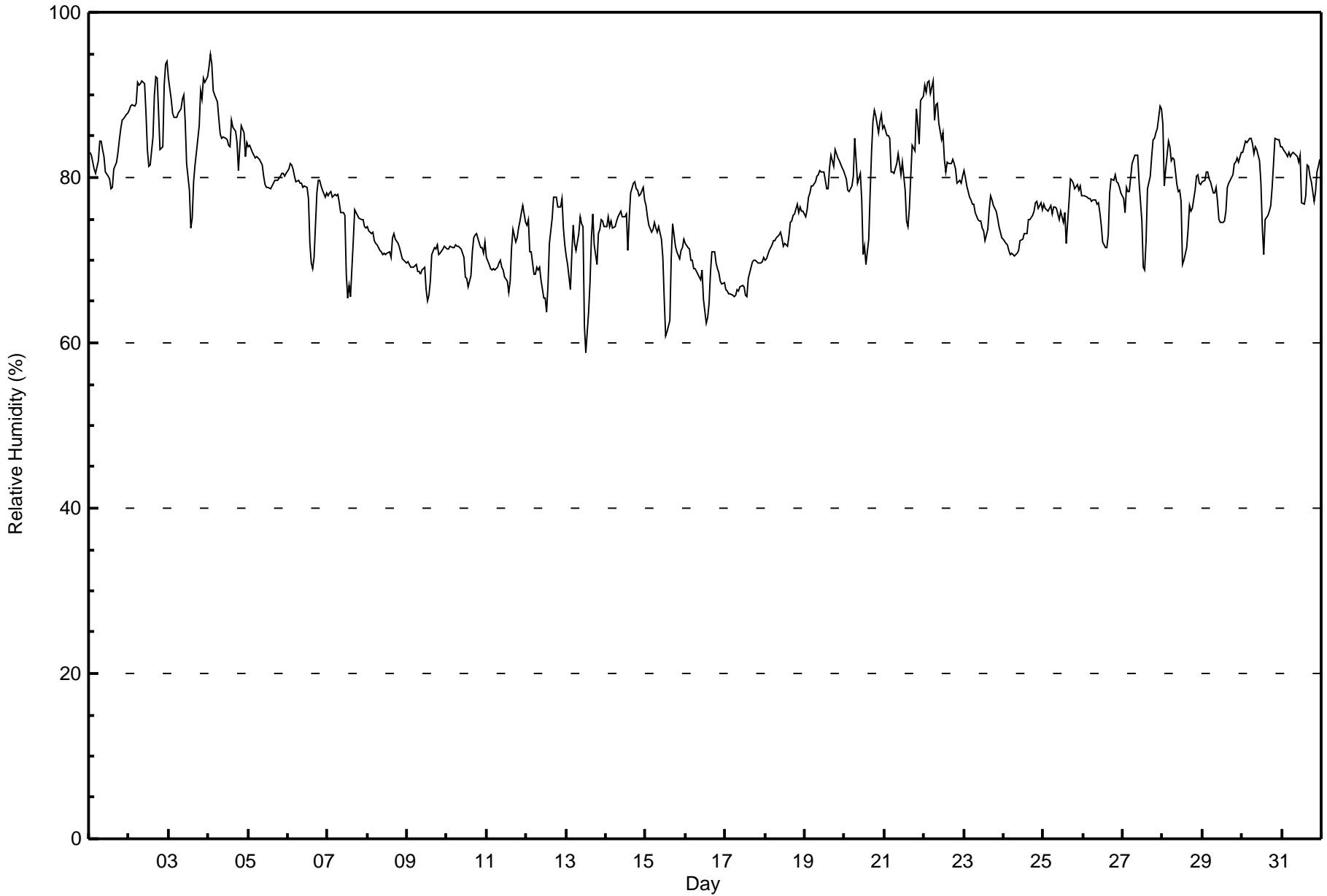
Fort McKay - Bertha Ganter - December 2016

Maximum Value: 95 % on Dec 4 02:00 Maximum Daily Average: 88.7 % on Dec 2																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																																																																			
Minimum Value: 59 % on Dec 13 13:00 Minimum Daily Average: 67.6 % on Dec 17 Maximum Diurnal Average: 79.0 % at hour 23 Minimum Diurnal Average: 71.8 % at hour 14 Monthly Average: 77.1 % Percentiles: P ₁ = 64 P ₁₀ = 69 Q ₁ = 72 Median = 77 Q ₃ = 82 P ₉₀ = 86 P ₉₉ = 92																																																																																																																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																																																																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																																																																														
1-Dec	83	83	82	81	81	82	84	84	83	83	81	80	80	79	79	81	82	83	85	86	87	87	88	88	82.9	88																																																																																												
2-Dec	88	89	89	89	89	92	91	91	92	91	88	83	81	82	85	90	92	92	88	83	84	91	94	94	88.7	94																																																																																												
3-Dec	92	89	88	87	87	87	88	88	90	90	87	82	78	74	75	79	82	83	86	90	90	92	92	92	86.2	92																																																																																												
4-Dec	93	95	94	91	90	89	87	85	85	85	85	84	84	87	86	86	84	81	84	86	85	83	84	86.5	95																																																																																													
5-Dec	84	84	83	83	82	82	82	82	82	80	79	79	79	79	79	79	80	80	80	80	81	80	80	80.8	84																																																																																													
6-Dec	81	82	82	81	80	79	80	79	79	79	79	79	77	72	70	69	70	78	80	80	79	78	78	77.9	82																																																																																													
7-Dec	78	78	78	78	78	78	78	77	76	76	75	68	65	67	66	72	76	76	75	75	75	75	74	74	74.5	78																																																																																												
8-Dec	74	74	73	73	72	72	72	71	71	71	71	71	71	71	70	73	73	73	72	71	71	70	70	70	71.6	74																																																																																												
9-Dec	70	69	69	69	69	69	69	69	68	69	69	66	65	66	67	71	72	71	72	71	71	71	72	72	69.4	72																																																																																												
10-Dec	71	71	72	71	72	72	72	72	71	71	70	68	68	67	68	71	73	73	73	72	72	71	71	72	71.0	73																																																																																												
11-Dec	70	69	69	69	69	69	69	70	70	69	69	68	67	66	68	71	74	72	73	74	75	76	77	75	70.7	77																																																																																												
12-Dec	74	75	71	71	68	68	69	69	69	68	65	66	64	67	72	75	78	78	78	76	77	77	74	72	71.7	78																																																																																												
13-Dec	71	70	66	71	74	72	71	73	75	74	74	62	59	64	67	73	76	72	70	73	74	75	75	74	71.0	76																																																																																												
14-Dec	74	75	74	75	74	74	75	75	76	76	75	75	76	71	75	78	79	80	79	78	78	78	79	77	76.1	80																																																																																												
15-Dec	77	75	74	73	74	75	74	73	74	72	70	65	61	61	63	70	74	73	72	71	70	71	72	73	71.2	77																																																																																												
16-Dec	72	72	71	70	70	69	69	68	68	68	69	65	62	63	65	69	71	71	70	69	68	68	67	67	68.4	72																																																																																												
17-Dec	66	66	66	66	66	66	66	66	66	67	67	67	66	66	68	69	70	70	70	70	70	70	70	70	67.6	70																																																																																												
18-Dec	70	70	71	71	72	72	72	73	73	73	73	72	72	72	73	75	75	75	76	77	76	76	76	76	73.4	77																																																																																												
19-Dec	75	76	78	78	79	79	79	80	80	81	81	81	80	79	79	81	83	81	83	83	82	82	81	81	80.1	83																																																																																												
20-Dec	80	80	79	78	79	80	85	82	79	81	77	71	72	69	72	78	83	87	88	88	85	87	88	86	80.6	88																																																																																												
21-Dec	86	85	85	85	81	81	80	82	83	82	80	82	78	75	74	76	80	84	83	88	86	84	89	90	82.5	90																																																																																												
22-Dec	91	90	91	92	90	92	87	89	89	87	85	85	82	81	82	82	82	82	82	81	79	80	79	80	85.0	92																																																																																												
23-Dec	81	80	79	78	77	77	77	76	75	75	75	74	73	72	74	76	78	77	77	76	75	74	73	73	75.9	81																																																																																												
24-Dec	73	72	72	71	71	71	71	71	71	71	72	73	73	73	73	75	75	75	76	77	77	76	77	76	73.4	77																																																																																												
25-Dec	77	76	76	76	77	76	77	77	76	75	76	75	75	76	72	77	80	80	79	79	79	78	79	78	76.8	80																																																																																												
26-Dec	78	78	78	77	78	77	77	77	77	77	76	74	72	71	72	73	78	80	80	80	79	79	79	78	76.9	80																																																																																												
27-Dec	77	76	79	78	78	82	82	83	83	83	80	75	69	69	72	79	80	83	85	85	85	86	89	88	80.2	89																																																																																												
28-Dec	86	79	81	84	84	82	82	82	79	78	79	77	69	70	72	74	77	76	76	79	80	80	79	79	78.6	86																																																																																												
29-Dec	79	80	81	81	80	80	78	78	79	77	75	75	75	75	76	79	79	80	80	82	82	82	82	83	79.0	83																																																																																												
30-Dec	83	84	84	84	85	85	84	83	84	83	82	79	74	71	75	75	76	77	79	82	85	85	85	84	81.1	85																																																																																												
31-Dec	84	83	83	83	83	83	83	83	83	82	82	83	77	77	78	82	81	80	79	77	78	81	81	82	81.1	84																																																																																												
																			78.7				78.2				78.0				77.9				77.7				77.8				77.8				77.7				77.6				77.2				76.3				74.3				72.4				71.8				73.1				76.1				77.8				78.2				78.2				78.6				78.6				79.0				79.0				78.9				Diurnal Average			
																			93				95				94				92				90				92				91				91				92				91				88				85				84				84				87				90				92				92				88				90				90				92				94				94				Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Fort McKay - Bertha Ganter - December 2016



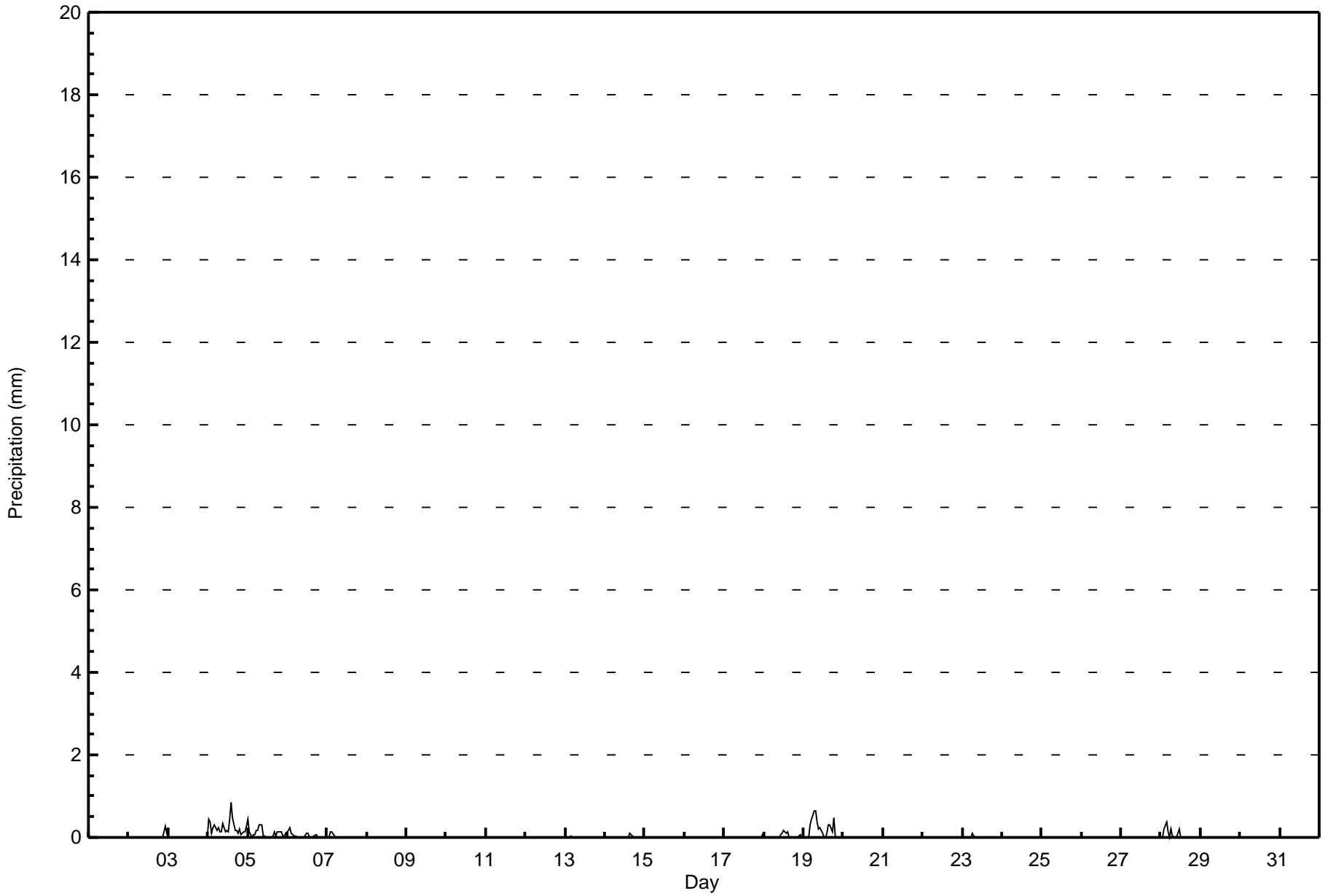


Maximum Value: 0.8 mm on Dec 4 15:00 Maximum Daily Total: 5.9 mm on Dec 4		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																														
Minimum Value: 0.0 mm on Dec 1 01:00 Maximum Diurnal Total: 1.4 mm at hour 7 Monthly Total: 16.98 mm		Minimum Daily Total: 0.0 mm on Dec 1 Minimum Diurnal Total: 0.2 mm at hour 21 Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.1 P ₉₉ = 0.5																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24								
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4-Dec	0.5	0.4	0.1	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.3	0.1	0.2	0.1	0.4	0.8	0.5	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.3	0.0	0.0	0.0	0.0	0.0	5.9	0.8
5-Dec	0.5	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	2.6	0.5	
6-Dec	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.2	
7-Dec	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.2	0.0
19-Dec	0.0	0.0	0.0	0.0	0.3	0.4	0.7	0.6	0.4	0.2	0.3	0.1	0.0	0.0	0.1	0.3	0.3	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.7	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.2	0.4	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.4	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
																								Diurnal Average								
																								Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Fort McKay - Bertha Ganter - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Precipitation (PC) - mm
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	732	98.39	98.39
0.4 - 0.5	9	1.21	99.60
0.6 - 0.7	2	0.27	99.87
0.8 - 1.4	1	0.13	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Summary of Hour Averages

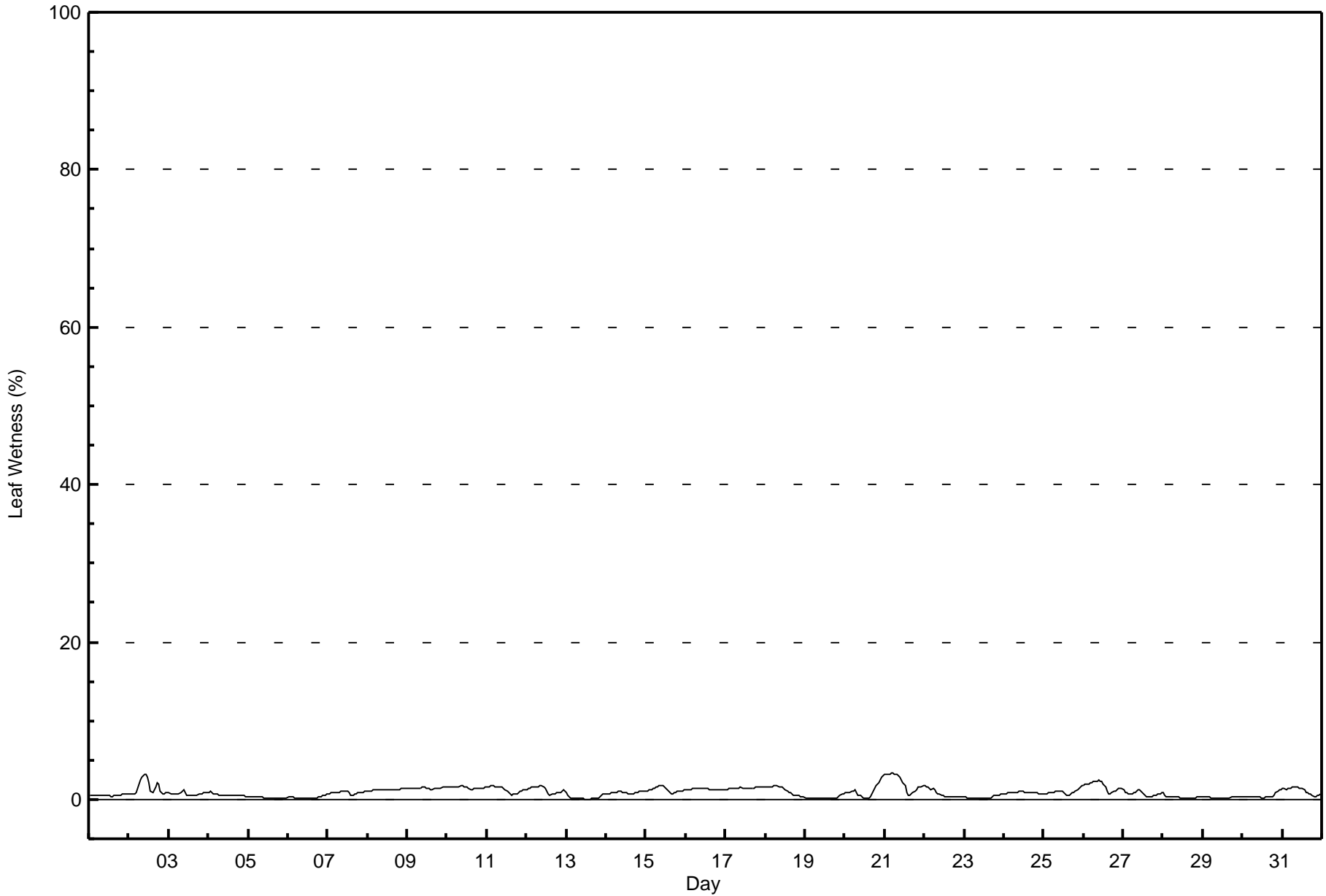
Fort McKay - Bertha Ganter - December 2016

Maximum Value: 3 % on Dec 21 05:00																	Maximum Daily Average: 2.1 % on Dec 21																	Hours in Service: 744			
Minimum Value: 0 % on Dec 13 12:00																	Minimum Daily Average: 0.2 % on Dec 13																	Hours of Data: 744			
Maximum Diurnal Average: 1.1 % at hour 10																	Minimum Diurnal Average: 0.6 % at hour 15																	Hours of Missing Data: 0			
Monthly Average: 0.9 %																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 3																	Hours of Calibration: 0			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	1											
2-Dec	1	1	1	1	1	1	2	2	3	3	3	3	2	1	1	1	2	2	2	1	1	1	1	1	1.5	3											
3-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0.7	1											
4-Dec	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.6	1											
5-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0											
6-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1											
7-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1											
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1											
9-Dec	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1.4	2											
10-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	1.5	2											
11-Dec	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2											
12-Dec	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2											
13-Dec	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1											
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1											
15-Dec	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2											
16-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	1											
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.5	2											
18-Dec	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	0	0	0	0	1.1	2											
19-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.2	1											
20-Dec	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	2	2	2	3	3	1.1	3											
21-Dec	3	3	3	3	3	3	3	3	3	3	2	2	2	1	0	0	1	1	1	1	2	2	2	2	2.1	3											
22-Dec	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2											
23-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.3	1											
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1											
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1.0	2											
26-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1.7	2											
27-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0.7	1											
28-Dec	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1											
29-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0											
30-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1											
31-Dec	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1.1	2											
1.0																	1.0																	Diurnal Average			
3																	3																	Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (LW) - %
Fort McKay - Bertha Ganter - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (LW) - %
Fort McKay - Bertha Ganter - December 2016

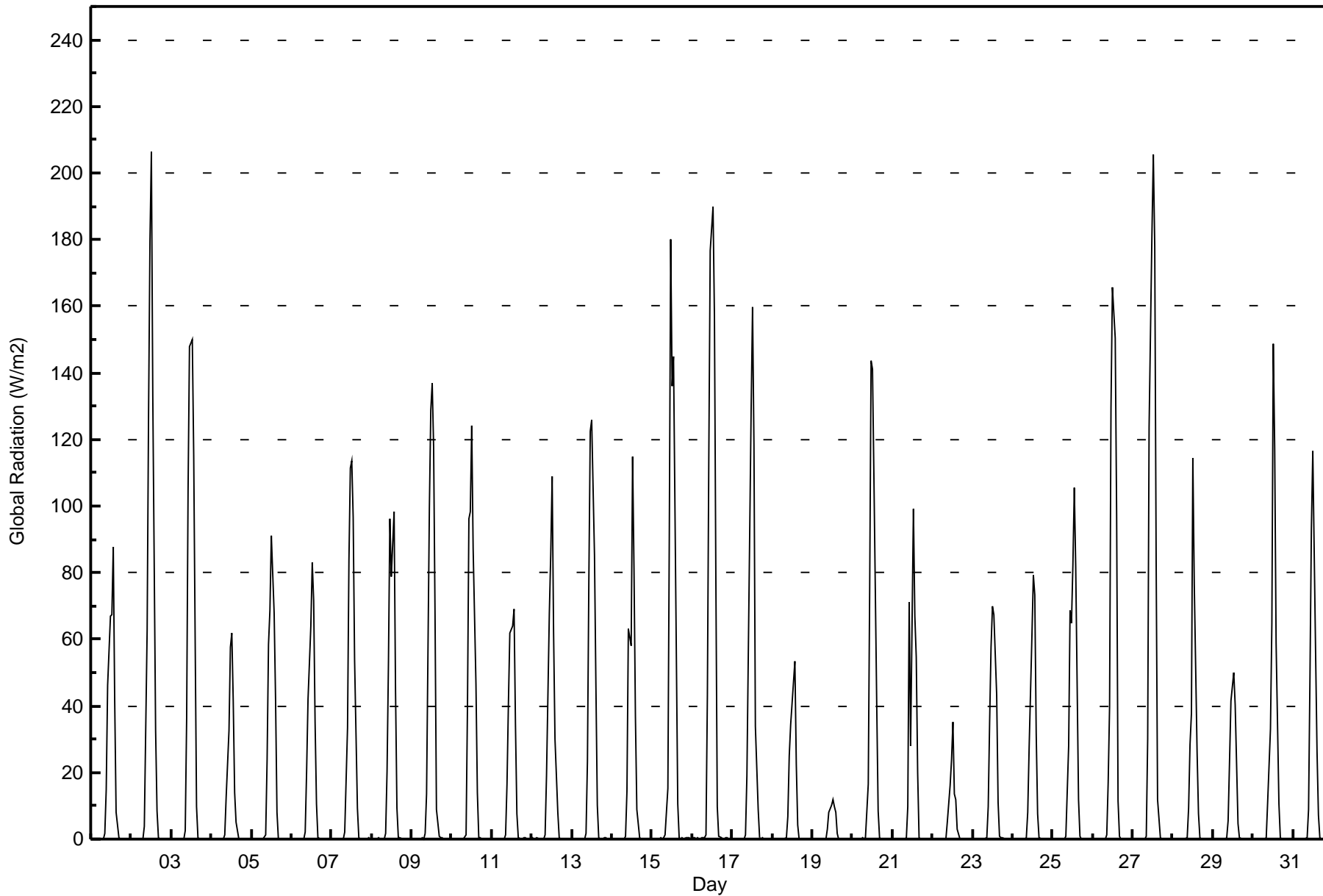
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	163	22.00	22.00
0.4 - 0.5	90	12.15	34.14
0.6 - 0.7	80	10.80	44.94
0.8 - 1.4	272	36.71	81.65
1.5 - 10	114	15.38	97.03
> 10	0	0.00	97.03

Total Number of Valid Hours: 741

Total Number of Hours: 744



Maximum Value: 206 W/m2 on Dec 2 13:00																			Maximum Daily Average: 34.0 W/m2 on Dec 27						Hours in Service: 744																							
Minimum Value: 0 W/m2 on Dec 1 01:00																			Minimum Daily Average: 2.2 W/m2 on Dec 19						Hours of Data: 744																							
Maximum Diurnal Average: 108.8 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 24						Hours of Missing Data: 0																							
Monthly Average: 17.7 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 10 P ₉₀ = 71 P ₉₉ = 176						Hours of Calibration: 0																							
																									Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0	0	0	0	0	0	0	0	2	15	46	67	67	88	42	8	0	0	0	0	0	0	0	0	14.0	88																						
2-Dec	0	0	0	0	0	0	0	0	4	63	127	180	206	133	33	9	0	0	0	0	0	0	0	0	31.4	206																						
3-Dec	0	0	0	0	0	0	0	0	3	37	104	148	150	115	61	10	0	0	0	0	0	0	0	0	26.2	150																						
4-Dec	0	0	0	0	0	0	0	0	1	13	33	58	62	42	14	5	0	0	0	0	0	0	0	0	9.5	62																						
5-Dec	0	0	0	0	0	0	0	0	1	24	58	68	91	68	42	8	0	0	0	0	0	0	0	0	15.0	91																						
6-Dec	0	0	0	0	0	0	0	0	2	20	42	64	83	72	35	10	0	0	0	0	0	0	0	0	13.7	83																						
7-Dec	0	0	0	0	0	0	0	0	2	33	84	111	113	97	54	9	1	0	0	0	0	0	0	0	21.0	113																						
8-Dec	0	0	0	0	0	0	0	0	2	21	53	96	79	98	45	9	1	0	0	0	0	0	0	0	16.9	98																						
9-Dec	0	0	0	0	0	0	0	0	2	14	100	129	137	118	67	9	1	1	0	0	0	0	0	0	24.1	137																						
10-Dec	0	0	0	0	0	0	0	0	1	40	96	98	124	87	47	14	0	0	0	0	0	0	0	0	21.2	124																						
11-Dec	0	0	0	0	0	0	0	0	1	17	41	62	64	69	34	8	0	0	0	0	0	0	0	0	12.3	69																						
12-Dec	0	0	0	0	0	0	0	0	1	19	68	86	109	62	30	8	0	0	0	0	0	0	0	0	16.0	109																						
13-Dec	0	0	0	0	0	0	0	0	2	23	78	122	126	85	46	10	0	0	0	0	0	0	0	0	20.6	126																						
14-Dec	0	0	0	0	0	0	0	0	1	14	63	58	115	81	37	9	0	0	0	0	0	0	0	0	15.7	115																						
15-Dec	0	0	0	0	0	0	0	0	1	15	90	180	136	145	56	11	1	0	0	0	0	0	0	0	26.6	180																						
16-Dec	0	0	0	0	0	0	0	0	1	43	114	177	190	157	78	10	1	0	0	0	0	0	0	0	32.3	190																						
17-Dec	0	0	0	0	0	0	0	0	1	19	92	129	160	118	34	9	0	0	0	0	0	0	0	0	23.5	160																						
18-Dec	0	0	0	0	0	0	0	0	0	7	25	34	41	53	22	4	0	0	0	0	0	0	0	0	7.8	53																						
19-Dec	0	0	0	0	0	0	0	0	0	3	8	10	12	10	8	1	0	0	0	0	0	0	0	0	2.2	12																						
20-Dec	0	0	0	0	0	0	0	0	0	17	75	144	141	109	40	9	0	0	0	0	0	0	0	0	22.3	144																						
21-Dec	0	0	0	0	0	0	0	0	0	10	71	28	99	67	55	20	0	0	0	0	0	0	0	0	14.6	99																						
22-Dec	0	0	0	0	0	0	0	0	0	5	16	24	35	14	12	3	0	0	0	0	0	0	0	0	4.5	35																						
23-Dec	0	0	0	0	0	0	0	0	0	10	35	58	70	67	43	11	1	0	0	0	0	0	0	0	12.3	70																						
24-Dec	0	0	0	0	0	0	0	0	0	8	27	61	79	73	32	7	0	0	0	0	0	0	0	0	12.1	79																						
25-Dec	0	0	0	0	0	0	0	0	1	28	69	65	82	105	82	12	1	0	0	0	0	0	0	0	18.5	105																						
26-Dec	0	0	0	0	0	0	0	0	1	17	40	130	166	150	97	12	1	0	0	0	0	0	0	0	25.6	166																						
27-Dec	0	0	0	0	0	0	0	0	1	30	124	181	206	178	83	12	0	0	0	0	0	0	0	0	34.0	206																						
28-Dec	0	0	0	0	0	0	0	0	1	9	28	38	114	77	26	8	0	0	0	0	0	0	0	0	12.6	114																						
29-Dec	0	0	0	0	0	0	0	0	0	6	23	41	50	40	22	5	0	0	0	0	0	0	0	0	7.8	50																						
30-Dec	0	0	0	0	0	0	0	0	1	11	33	65	149	117	59	10	0	0	0	0	0	0	0	0	18.6	149																						
31-Dec	0	0	0	0	0	0	0	0	0	9	49	93	117	56	26	7	0	0	0	0	0	0	0	0	14.9	117																						
																								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	19.3	61.7	90.5	108.8	88.7	43.9	8.9	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	Diurnal Average
																								0	0	0	0	0	0	0	0	4	63	127	181	206	178	97	20	1	1	0	0	0	0	0	0	Diurnal Maximum





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Fort McKay - Bertha Ganter - December 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	588	79.03	79.03
21 - 100	113	15.19	94.22
101 - 300	43	5.78	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

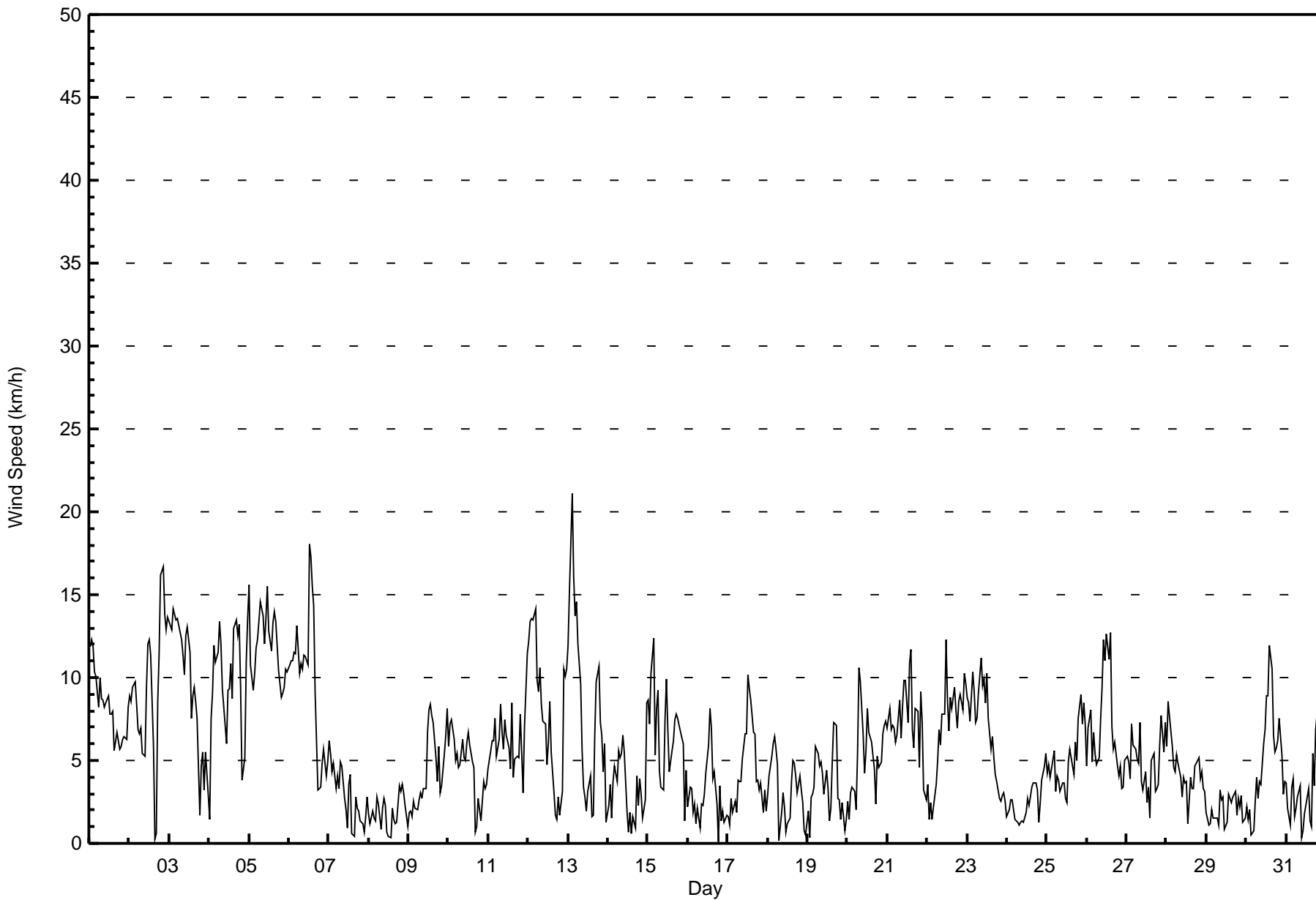


Maximum Speed: 21 km/h on Dec 13 03:00	Maximum Daily Speed Average: 12.0 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 16 19:00	Minimum Daily Speed Average: 0.1 km/h on Dec 18	Hours of Data: 744
Maximum Diurnal Speed Average: 2.7 km/h at hour 1	Minimum Diurnal Speed Average: 1.6 km/h at hour 13	Hours of Missing Data: 0
Monthly Average Velocity: 2.0 km/h 246.3 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 3 Median = 5 Q ₃ = 8 P ₉₀ = 11 P ₉₉ = 15	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S12	S12	S12	S10	S10	S8	S10	S9	S9	S8	S8	S9	S8	S8	S8	S6	SSE7	S6	S6	SSE6	S6	SSE6	S6	SSE8	S8.2	S12
2-Dec	S9	SSE9	S9	SSE10	S8	SSE7	S7	S7	SSW5	SSW5	SSE9	SSE12	S12	S11	S6	SE0	E1	S8	S11	S16	SSE17	SSE14	SSE13	SSE14	S9.1	SSE17
3-Dec	SSE13	SSE13	SSE14	SSE14	SSE14	SSE14	SSE13	SSE12	S11	S10	SSE13	SSE13	SSE12	SSE8	SSE9	SSE9	S9	S8	SW2	SSE5	S6	SSW3	NW6	WNW3	S8.9	SSE14
4-Dec	S1	NW8	N9	N12	N11	N12	N13	N12	NNE9	N8	N6	NNW9	NW9	NW11	NW9	NW13	NW13	NW13	NW13	NW9	NW4	NW5	NW11	WNW14	NNW8.7	WNW14
5-Dec	WNW16	WNW11	WNW9	WNW10	WNW12	WNW12	WNW13	WNW13	WNW15	WNW14	WNW12	WNW13	WNW13	WNW12	WNW13	WNW14	WNW13	WNW13	WNW12	WNW10	W9	W9	WNW9	WNW11	WNW12.0	WNW16
6-Dec	WNW11	WNW11	WNW11	WNW12	WNW11	WNW13	WNW10	WNW11	WNW10	WNW11	WNW11	NW11	NNW18	NNW17	NNW16	NNW14	NW9	NW3	NW3	NNW3	N5	N6	NNW4	NW5	NW9.1	NNW18
7-Dec	NW6	WNW5	WNW4	WNW5	WNW3	NW4	NW3	WNW5	WNW5	W3	W2	SE1	NNE4	NNW4	WNW1	SW0	WSW3	W2	WNW2	WNW1	SSW1	SW1	WNW2	WNW3	WNW2.5	NW6
8-Dec	WSW2	W1	WNW2	NW2	WNW1	WNW3	NNW2	WSW1	WNW2	WNW3	WNW2	E1	ESE0	SSW0	SE2	ENE1	WNW1	WNW1	WNW3	WNW3	WNW4	WNW3	WSW2	SW1	WNW1.4	WNW4
9-Dec	SW2	SSW2	SW2	SSW3	WSW2	SSW2	SW3	WSW3	SSW3	SW3	SSW3	SSE7	SSE8	SSE8	S8	S7	S5	S4	S6	SSW3	S3	S5	S7	S8	S4.1	SSE8
10-Dec	SSE6	S7	S7	S6	S5	S5	S5	S5	S6	S5	S5	SSE6	SSE7	SSE6	SSE5	S5	E1	SW1	SW3	SSW1	S3	S4	S3	S4	S4.4	S7
11-Dec	SW5	W6	W6	W6	WSW8	SW5	WSW6	WSW8	WSW7	SW6	W7	WSW6	WSW6	WSW4	W8	WSW4	WSW5	WSW5	WSW5	WNW8	W6	W3	WNW7	WNW11	W6.0	WNW11
12-Dec	WNW12	WNW13	WNW14	WNW13	WNW14	WNW10	W9	WNW11	WNW8	W7	W7	SW5	SSE6	SSE9	SSE6	S3	ESE2	NW1	SW3	SSW2	WSW3	WNW10	WNW10	WNW10	W6.0	WNW14
13-Dec	WNW12	WNW15	WNW21	NNW16	N14	NNW15	N12	NNW10	N6	N3	NW3	E2	ESE3	ESE4	ESE2	SSE2	WNW6	WNW10	WNW11	W7	WNW7	W4	W6	WSW1	NNW6.1	WNW21
14-Dec	SSW2	SSW4	SSW2	S4	S5	S4	S6	S5	S5	S6	S2	S1	ENE2	N1	NW2	W1	W4	SW2	WNW4	WNW3	S2	NW3	WNW9	SSW2.0	WNW9	
15-Dec	WNW9	W7	WNW10	WNW12	NW5	WNW8	WNW9	W4	NW3	WSW3	W7	WNW10	W7	W4	W6	WNW6	WNW7	WNW8	WNW8	WNW7	WNW6	WNW6	SSW1	W4	WNW6.5	WNW12
16-Dec	W2	WNW3	WNW3	WNW2	WNW2	NW1	S2	W1	SSW2	SSW2	S3	SSE4	SSE6	SSE8	S7	S4	SSW4	SSW2	NW0	NW3	WSW1	SW2	WNW1	SW2	SSW1.8	SSE8
17-Dec	SSW2	SW1	SSW3	SSW2	SSW3	SSW2	S4	SW4	SSW4	S5	S7	S7	SSE10	SSE9	S9	S7	S7	S4	SSW4	S3	S4	SSE2	S3	S2	S4.2	SSE10
18-Dec	S3	S4	S5	S6	S6	SSE6	S5	NE0	NE2	NW3	NNW2	E1	N1	NE2	NNE4	N5	N5	NNW4	NNW3	NNW4	NNW3	NNW2	SSE1	NE0	WNW0.1	S6
19-Dec	SE2	N0	NNW3	N3	N3	N6	NNW5	N5	NNW5	N4	N3	N4	N3	NNE1	NNW2	N5	NNW7	NNW7	NW3	ENE3	NNE1	NNE2	E1	W1	N3.0	NNW7
20-Dec	WNW3	SSW1	S3	S3	S3	SW2	SW5	WSW11	WSW10	SW6	SSE4	SSW6	W8	SW7	SW6	WSW5	S4	SSW2	SSE5	S5	SW5	S7	S7	S7	SSW4.4	WSW11
21-Dec	S7	S8	S7	S7	SW7	WSW6	SW7	S9	S6	S8	S10	S10	SW7	WSW11	W12	W7	S6	SSE8	SSE8	SSE5	SSE9	S7	SSE3	SSW3	SSW6.1	W12
22-Dec	SW4	SSW1	SW2	WSW1	WNW2	WSW4	NW5	N7	N6	N8	NNE8	N12	NNE9	NNE7	N9	N8	N9	N8	N7	N9	N9	N8	N10	N10	N5.8	N12
23-Dec	N9	N8	NNE7	N10	N9	N7	N8	N9	N11	N10	N10	N8	N10	N8	NNE6	N6	NW5	NW4	NW4	NW3	NW3	WNW3	NW3	NW3	N6.5	N11
24-Dec	NW2	NW2	WNW3	WNW3	W2	SW1	SSW1	SSW1	W1	S1	SE1	SE2	SE3	SSE2	S3	S3	S4	S4	SSE3	S1	SSE2	SSE4	S5	S5	S1.7	S5
25-Dec	S4	S5	S4	SSE4	S6	S3	SSW4	SSW4	S3	S4	SSW4	SSW3	SSE2	S5	S6	S5	S4	S6	S5	S8	S9	S7	S8	SSE7	S4.9	S9
26-Dec	S5	S7	S8	S5	S7	SSW5	SSW5	S5	S8	S9	SSE12	S11	SSE13	SSE11	S13	SSW7	SW6	WSW6	WSW5	WSW4	WSW5	WSW3	WSW3	SW5	S6.1	S13
27-Dec	SW5	SSW5	SSW4	S7	SSW6	SW6	SW5	WSW5	SW7	WSW4	WSW3	W4	W2	WNW3	SW1	S5	SSE5	S3	SW3	WSW4	W6	NW8	NW5	NW7	WSW3.4	NW8
28-Dec	NNW6	N9	N8	NNE6	NNE5	NNE4	N5	NNE5	NNE4	ENE3	NNE4	NE4	E4	NNE1	SE4	SE3	NNE3	NNE5	N5	NNW5	NW4	WNW4	NNW3	NW3	N3.3	N9
29-Dec	NNW2	W1	NW1	SW2	ESE2	S2	E2	NNW1	N3	NW3	N3	NNE1	NE1	ENE3	ESE3	NNE2	NNW3	NNW3	NW2	WNW3	WSW2	N3	SSE1	W2	NNW0.9	N3
30-Dec	W2	NW1	WNW2	W0	WNW1	WNW3	NNW4	NW3	WNW4	S4	S6	S7	S9	SSE9	S12	SSE10	S6	SW6	W6	NW6	NNW8	NNW5	WNW3	WNW4	SW2.0	S12
31-Dec	WNW4	NW2	SSW1	SSE3	S4	NNE2	NW2	SW3	N3	W0	NE1	NNW2	S2	SSE3	E1	SSW1	SW5	SW3	W7	W9	SW7	SW6	WSW6	W5	WSW2.2	W9

WSW2.7	SSW2.6	SSW2.5	SSW2.0	SSW2.0	W2.2	W2.2	W2.4	W2.2	SSW2.0	SSW1.9	SSW1.8	SSW1.6	SSW1.9	SSW2.0	SSW1.6	SSW2.0	SSW2.3	SSW2.3	SSW2.1	SSW2.2	SSW1.8	SSW2.1	SSW2.6	SSW2.6	Diurnal Average
WNW16	WNW15	WNW21	NNW16	WNW14	NNW15	NNW13	NNW15	NNW14	NNW12	NNW14	NNW15	NNW18	NNW17	NNW16	NNW14	NW13	NW13	NW13	S16	SSE17	SSE14	SSE13	SSE14	Diurnal Maximum	

All monthly, daily, and diurnal averages have been calculated using vector methods





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	403	54.17	54.17
6 - 11	271	36.42	90.59
12 - 19	69	9.27	99.87
20 - 28	1	0.13	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	20	16	7	5	9	7	8	22	70	44	34	28	23	47	38	25	403
6 - 11	36	7	0	0	0	0	0	37	79	3	12	13	23	42	13	6	271
12 - 19	6	0	0	0	0	0	0	19	6	0	0	0	1	26	4	7	69
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	62	23	7	5	9	7	8	78	155	47	46	41	47	116	55	38	744

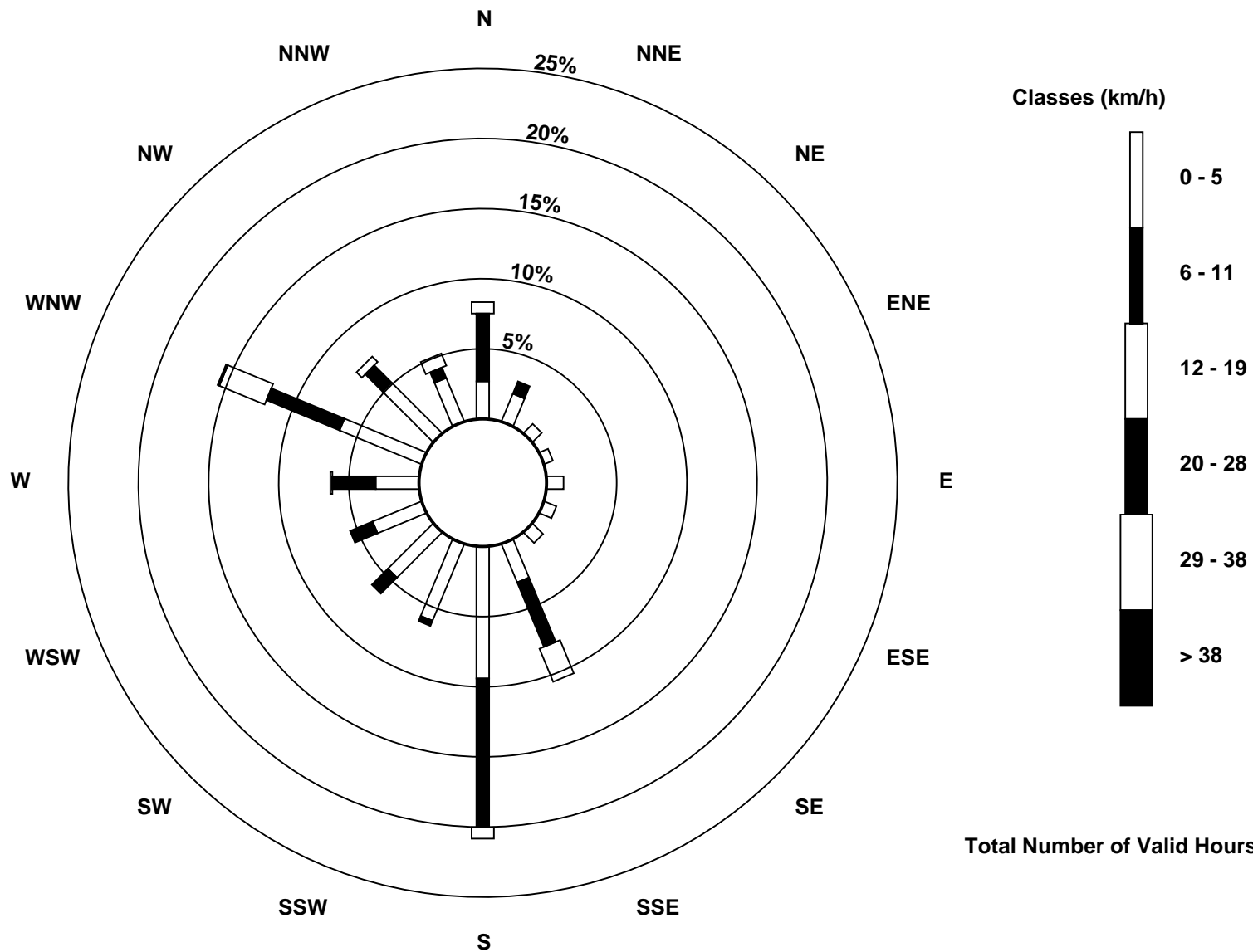
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter (AMS 1)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Dec 13 06:00 Minimum Value: 0 km/h on Dec 8 16:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 4																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	3	3	3	3	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	2	3
2-Dec	2	2	2	2	3	1	1	2	1	2	3	2	3	3	1	1	1	2	4	4	4	3	2	3	4
3-Dec	3	3	3	3	3	3	3	3	2	2	3	2	2	1	2	2	2	2	2	2	1	1	1	2	3
4-Dec	1	3	2	4	3	4	4	4	3	2	1	3	2	2	2	2	2	2	2	3	1	2	2	2	4
5-Dec	2	3	2	3	2	3	3	3	3	3	4	4	3	3	3	4	4	3	3	3	2	2	3	3	4
6-Dec	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2	3	1	1	1	1	1	1	1	3
7-Dec	1	1	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1	2	1	1	1	1	1	1	2
8-Dec	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	0	1	1	1	1	2	1	1	1	2
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	2
10-Dec	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2
11-Dec	2	2	2	2	3	2	3	4	3	3	3	3	2	2	3	2	2	2	2	3	2	2	3	3	4
12-Dec	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	1	2	2	2	2
13-Dec	3	4	5	5	3	5	2	2	2	1	1	1	1	1	1	1	3	2	2	2	2	1	2	1	5
14-Dec	1	1	1	1	1	1	2	2	2	1	2	1	1	1	1	1	1	1	1	2	3	1	1	2	3
15-Dec	2	2	3	2	3	3	2	2	2	1	3	3	2	2	2	1	1	2	3	2	2	2	1	3	3
16-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	2
17-Dec	1	1	1	1	1	1	2	1	2	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2
18-Dec	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
19-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	2
20-Dec	2	1	1	1	1	1	4	4	4	2	1	2	3	2	2	2	1	1	1	2	2	1	1	1	4
21-Dec	2	1	2	2	3	2	3	2	2	2	1	2	3	4	5	3	2	2	2	2	3	2	2	2	5
22-Dec	1	1	1	1	3	2	3	2	2	3	4	3	3	3	3	3	3	3	2	2	2	2	3	4	4
23-Dec	2	2	3	3	3	2	3	3	3	2	2	2	3	2	1	1	1	1	1	1	1	1	1	1	3
24-Dec	1	2	1	1	2	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	1	1	2
26-Dec	1	1	2	1	1	1	1	2	1	2	2	2	3	3	3	3	1	1	1	1	1	1	1	2	3
27-Dec	2	2	1	3	1	1	1	1	2	1	1	2	1	1	2	1	1	1	1	1	2	3	3	2	3
28-Dec	2	2	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
29-Dec	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2
30-Dec	1	1	1	1	1	1	2	1	3	1	1	2	2	2	3	2	3	2	2	2	1	1	1	1	3
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	3	3	2	2	3	3
Diurnal Maximum																									



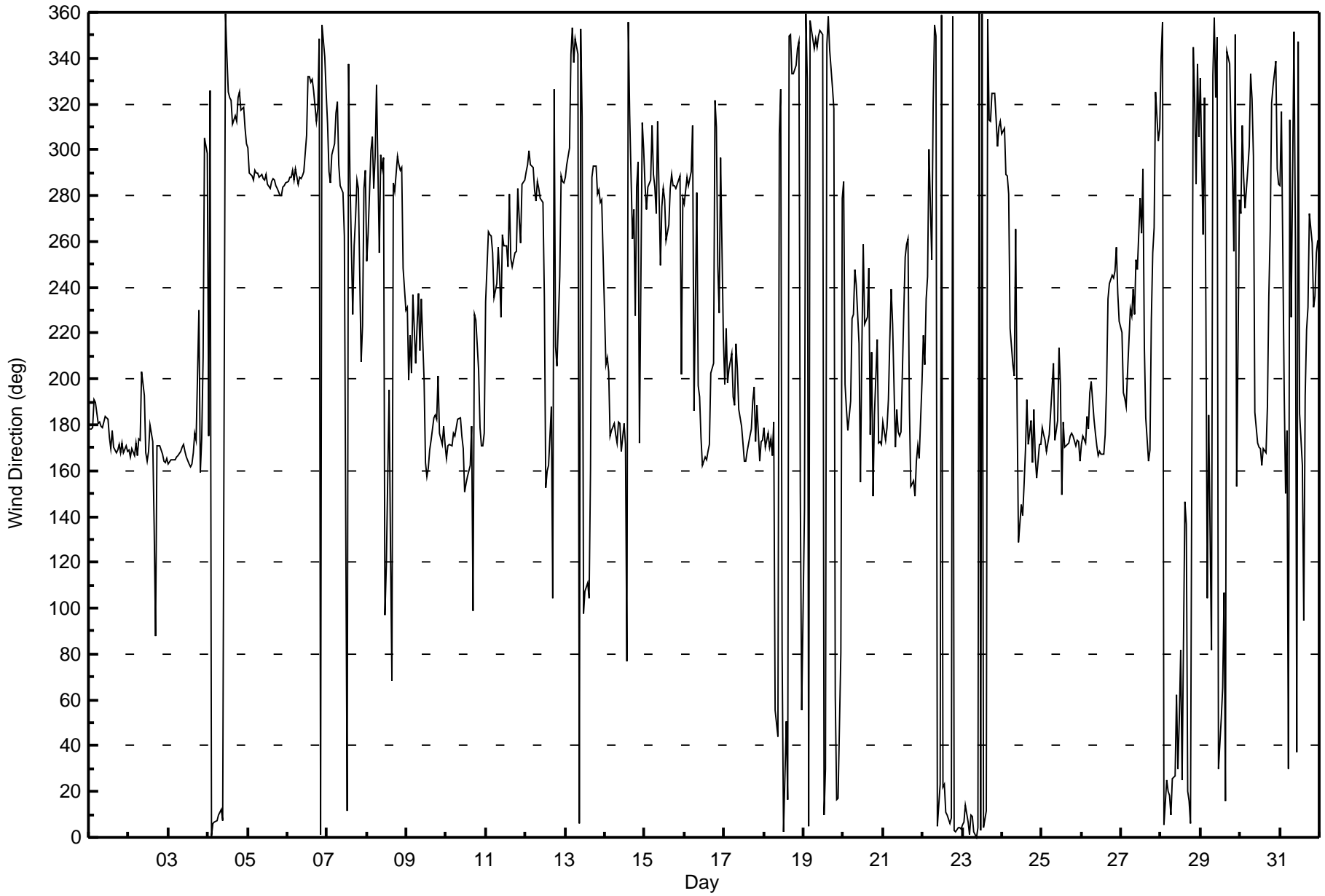
Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort McKay - Bertha Ganter - December 2016

Direction of Maximum Speed: 301 deg on Dec 13 03:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 287.4 deg on Dec 5	Hours of Data: 744
Direction of Minimum Speed: 322 deg on Dec 16 19:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 0.1 deg on Dec 18	Percent Operational Time: 100.0
Monthly Average Direction: 259.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	178	178	178	191	189	180	181	179	179	181	184	183	174	169	178	170	168	169	171	168	172	168	171	168	177.3
2-Dec	169	166	169	166	172	166	174	173	203	193	168	164	169	180	173	135	88	171	171	171	167	164	163	165	169.9
3-Dec	163	165	165	164	164	166	167	168	170	171	168	166	163	162	163	168	176	173	230	159	174	209	305	298	169.1
4-Dec	175	326	1	6	6	7	10	11	12	8	359	341	325	323	322	311	315	312	323	325	317	319	309	303	337.5
5-Dec	301	290	289	287	291	290	290	288	289	288	287	289	285	283	286	287	287	284	283	280	280	284	284	286	287.4
6-Dec	286	288	288	291	287	292	285	288	287	288	291	306	332	332	330	330	326	312	318	348	1	354	341	324	308.3
7-Dec	311	291	285	298	302	316	321	294	285	281	262	135	12	338	288	228	258	270	287	283	207	223	283	291	296.3
8-Dec	251	264	300	306	283	297	328	255	297	291	296	97	119	195	125	69	286	282	297	294	291	292	248	230	288.4
9-Dec	231	200	219	202	237	207	223	237	213	235	200	163	157	161	169	173	183	184	182	201	176	172	179	172	183.5
10-Dec	166	171	171	171	176	175	179	182	183	175	170	151	154	157	162	179	99	228	225	204	179	171	171	176	171.9
11-Dec	234	265	263	262	255	236	242	258	245	227	263	258	258	249	281	253	249	255	256	283	271	259	285	287	260.4
12-Dec	290	294	300	294	293	282	278	286	283	279	277	235	152	160	162	188	104	326	214	206	244	289	286	285	277.0
13-Dec	288	293	301	342	353	338	349	342	6	353	314	98	107	111	104	160	288	293	293	281	283	277	278	254	315.6
14-Dec	206	209	203	175	178	181	176	172	181	181	169	181	171	77	355	315	261	274	228	284	295	172	312	300	208.3
15-Dec	284	274	284	287	311	289	284	272	313	250	275	283	278	261	267	283	289	284	285	283	287	288	202	279	282.4
16-Dec	276	288	285	288	291	311	186	281	197	192	174	162	166	165	169	171	202	207	322	310	250	229	297	218	205.7
17-Dec	198	222	198	205	211	192	189	215	204	186	179	172	164	164	169	175	178	190	196	173	188	164	173	173	180.7
18-Dec	179	170	177	170	174	167	181	56	44	307	327	81	3	51	17	350	350	333	333	337	344	347	151	56	288.7
19-Dec	143	359	331	5	357	352	344	349	345	349	352	350	10	30	346	358	344	327	318	62	16	17	80	279	351.3
20-Dec	286	198	187	178	190	226	228	247	241	216	155	212	259	224	227	248	176	211	149	185	217	172	172	171	210.2
21-Dec	181	173	179	191	217	239	224	170	187	177	175	177	229	253	259	261	188	153	155	149	164	171	165	198	193.4
22-Dec	219	206	235	245	300	252	320	355	350	5	23	359	22	23	11	10	6	9	358	3	3	4	4	4	0.4
23-Dec	5	7	14	7	1	10	9	3	0	5	360	3	359	4	12	357	313	312	325	325	313	302	310	312	356.8
24-Dec	307	309	289	289	280	222	207	201	266	188	129	145	140	154	169	191	171	182	164	187	166	157	172	171	185.4
25-Dec	179	176	173	168	176	186	196	207	173	182	213	197	149	181	170	171	172	175	176	175	171	173	173	164	176.7
26-Dec	171	175	172	184	178	194	199	183	176	171	166	169	167	167	176	197	235	241	245	244	247	258	238	225	188.3
27-Dec	220	194	192	188	203	231	228	239	228	252	248	279	264	292	214	183	164	169	226	255	266	325	304	310	236.9
28-Dec	340	356	6	25	20	18	10	25	27	62	30	52	82	25	146	137	20	16	6	345	320	285	337	306	11.2
29-Dec	331	263	323	231	104	184	82	332	358	323	349	30	52	65	107	16	343	337	307	292	256	350	153	278	344.2
30-Dec	272	311	288	274	291	301	333	322	297	186	172	170	169	162	170	168	188	236	265	320	328	339	292	285	221.5
31-Dec	285	316	194	150	177	30	313	227	351	260	37	347	185	162	95	193	221	231	272	259	231	236	255	260	244.3
247.9 248.9 252.6 252.2 250.9 264.6 262.4 263.1 261.3 236.9 223.0 213.4 197.8 196.7 207.2 240.5 256.1 257.6 258.2 263.0 241.9 251.5 253.9 258.3																									
Diurnal Average																									

All monthly, daily, and diurnal averages have been calculated using vector methods





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Fort McKay - Bertha Ganter - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Dec 16 19:00 Minimum Value: 6 deg on Dec 12 03:00 Percentiles: P ₁ = 9 P ₁₀ = 11 Q ₁ = 13 Median = 20 Q ₃ = 41 P ₉₀ = 60 P ₉₉ = 96																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	14	12	14	20	18	13	14	13	12	13	17	14	14	12	14	14	11	11	11	11	11	11	11	12	20
2-Dec	12	14	13	13	15	15	14	21	21	29	13	13	14	14	22	94	88	14	12	14	12	12	12	13	94
3-Dec	13	13	13	13	12	13	12	12	12	11	12	12	12	10	11	10	11	14	77	15	12	47	12	66	77
4-Dec	57	16	16	19	18	17	17	18	18	18	15	20	17	13	11	11	10	10	9	11	13	15	11	9	57
5-Dec	9	14	14	16	14	13	14	15	15	17	18	15	20	20	17	17	17	20	20	22	20	18	18	16	22
6-Dec	17	14	14	12	13	11	15	12	13	11	11	13	13	11	10	9	8	19	23	17	16	15	19	24	24
7-Dec	9	12	16	11	16	15	23	12	11	54	56	70	48	21	85	60	25	76	58	42	68	73	59	21	85
8-Dec	33	47	27	29	26	15	19	42	36	15	18	68	69	94	29	43	38	39	9	10	21	9	19	68	94
9-Dec	36	21	33	17	28	24	17	20	25	18	21	13	11	12	13	11	11	21	11	14	14	8	10	12	36
10-Dec	12	13	12	13	13	11	13	10	13	11	13	11	13	13	13	13	86	55	40	56	35	32	28	34	86
11-Dec	45	44	48	45	45	50	53	46	51	57	44	54	55	45	24	41	41	50	40	21	26	46	20	15	57
12-Dec	9	8	6	9	9	14	16	12	14	15	21	39	17	11	13	58	50	78	44	83	37	11	13	15	83
13-Dec	13	13	11	30	14	12	13	12	16	35	38	59	20	23	58	84	30	9	9	14	16	22	19	83	84
14-Dec	34	23	68	18	15	19	17	18	14	14	16	73	88	38	70	71	78	21	49	60	79	59	66	13	88
15-Dec	13	16	15	12	33	23	15	52	52	51	26	15	28	49	34	17	12	11	13	14	16	27	64	39	64
16-Dec	70	16	21	38	45	81	32	60	24	28	18	16	13	11	16	23	12	16	101	18	60	35	48	44	101
17-Dec	34	55	25	24	22	41	12	16	17	10	13	14	12	13	12	14	10	14	14	24	15	51	26	43	55
18-Dec	19	21	20	16	19	25	16	89	59	25	38	92	75	78	32	15	20	24	25	26	44	42	86	96	96
19-Dec	65	92	37	32	39	15	14	13	13	15	19	16	25	69	46	12	13	13	35	52	88	41	73	55	92
20-Dec	68	71	20	30	36	30	58	48	45	40	28	43	52	44	41	51	35	64	19	46	35	11	8	13	71
21-Dec	13	12	12	25	41	49	50	13	14	13	10	12	47	47	45	42	22	11	21	39	15	13	79	71	79
22-Dec	31	84	45	73	61	49	63	17	18	27	37	15	29	32	21	20	17	19	15	16	15	17	16	15	84
23-Dec	18	17	23	16	15	23	20	17	14	14	13	19	14	20	22	14	12	20	16	13	26	19	21	49	49
24-Dec	60	32	34	32	38	37	47	37	48	34	52	26	16	21	19	21	13	18	21	65	13	13	11	10	65
25-Dec	10	10	8	9	7	22	18	18	11	15	23	42	29	15	12	12	18	12	13	9	11	12	9	10	42
26-Dec	9	11	11	13	12	19	17	14	12	14	12	15	13	13	13	42	17	18	20	28	31	37	46	35	46
27-Dec	33	30	30	26	18	17	28	30	22	35	38	28	61	42	76	26	19	36	49	46	33	28	44	17	76
28-Dec	18	14	20	37	33	30	24	40	46	65	42	47	38	86	15	50	35	28	17	11	21	13	38	23	86
29-Dec	61	79	78	51	62	51	91	95	40	42	38	90	68	46	59	80	55	29	42	41	65	69	74	68	95
30-Dec	51	67	51	97	96	43	40	56	39	38	17	24	12	14	12	12	24	45	37	45	12	13	37	16	97
31-Dec	23	50	98	40	10	67	37	43	30	99	99	56	42	35	61	95	47	43	26	39	37	33	32	33	99
70 92 98 97 96 81 91 95 59 99 99 92 88 94 85 95 88 78 101 83 88 73 86 96 Diurnal Maximum																									



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 8, 2016	Last Calibration	November 10, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	14:15
Gas Cert Reference	LL107945	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	9/08/2018
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
ZAG Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-614	-614
Analyzer IP address	192.168.1.43		Lamp voltage	813	818
Calculated slope	0.999526	1.001285	Chamber temp	45.2	45.1
Calculated intercept	1.635588	1.626535	Pressure	695.1	709.6
Analyzer Background	13.6	14.6	Flow	0.464	0.518
Analyzer Coefficient	0.934	0.957	Intensity	91	91
Analyzer make	Thermo 43i		Analyzer serial #	JC1501301448	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
calibrator zero	5500	0.0	0.0	-0.3	----
high point	5500	81.3	734.7	732.8	1.002
second point	5500	45.6	412.1	409.3	1.007
third point	5500	22.8	206.0	202.7	1.016
as left zero	5500	0.0	0.0	-0.3	----
as left span	5500	81.3	734.7	729.8	1.007
Average Correction Factor					1.009

Corrected As found NA Previous response NA % change NA

Notes:

As founds could not be completed because the pump failed at 04:20 MST. New pump installed. Zero and span adjusted.

Calibration Performed By:

Devin Russell



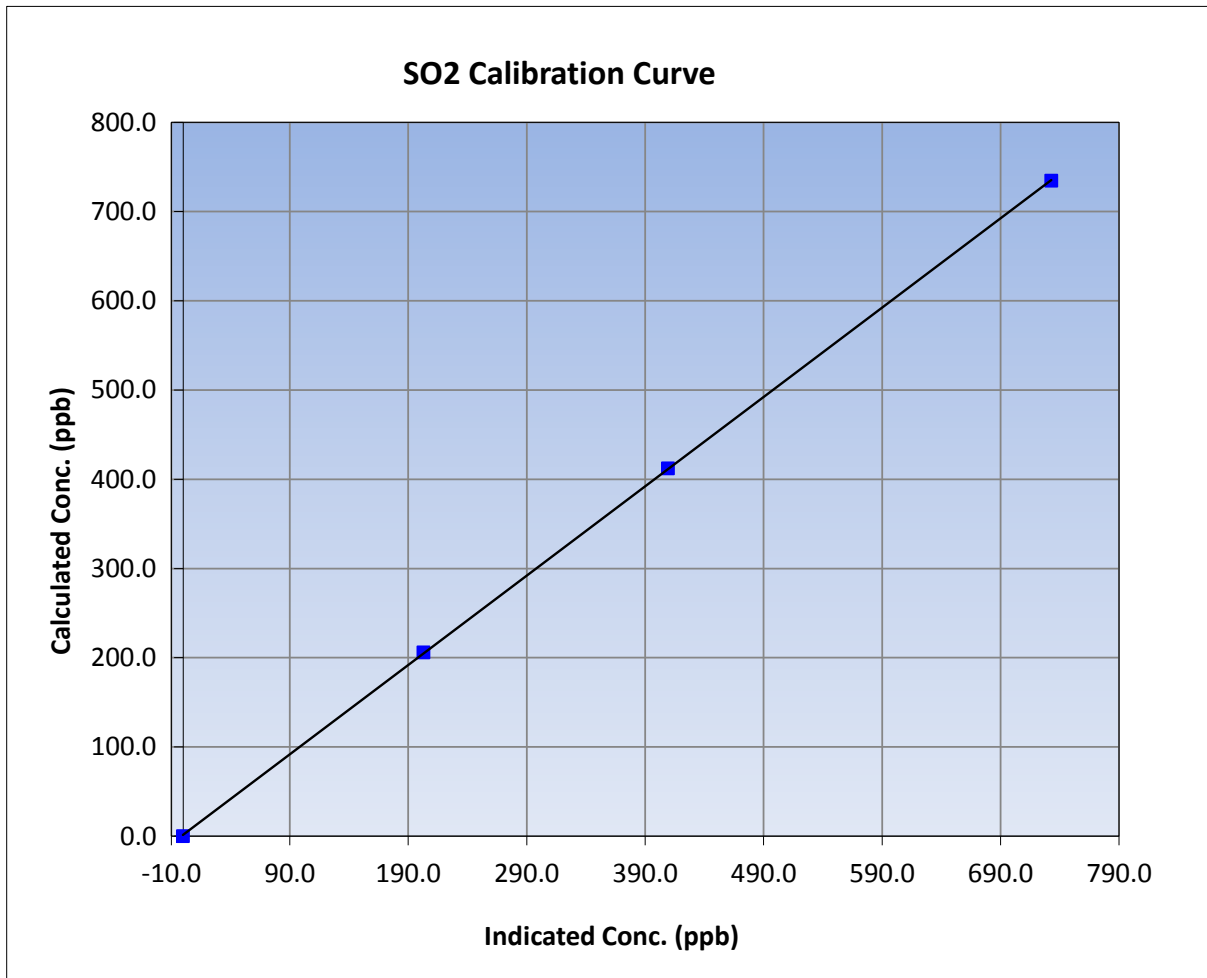
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 24, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:50	End Time (MST)	14:15
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

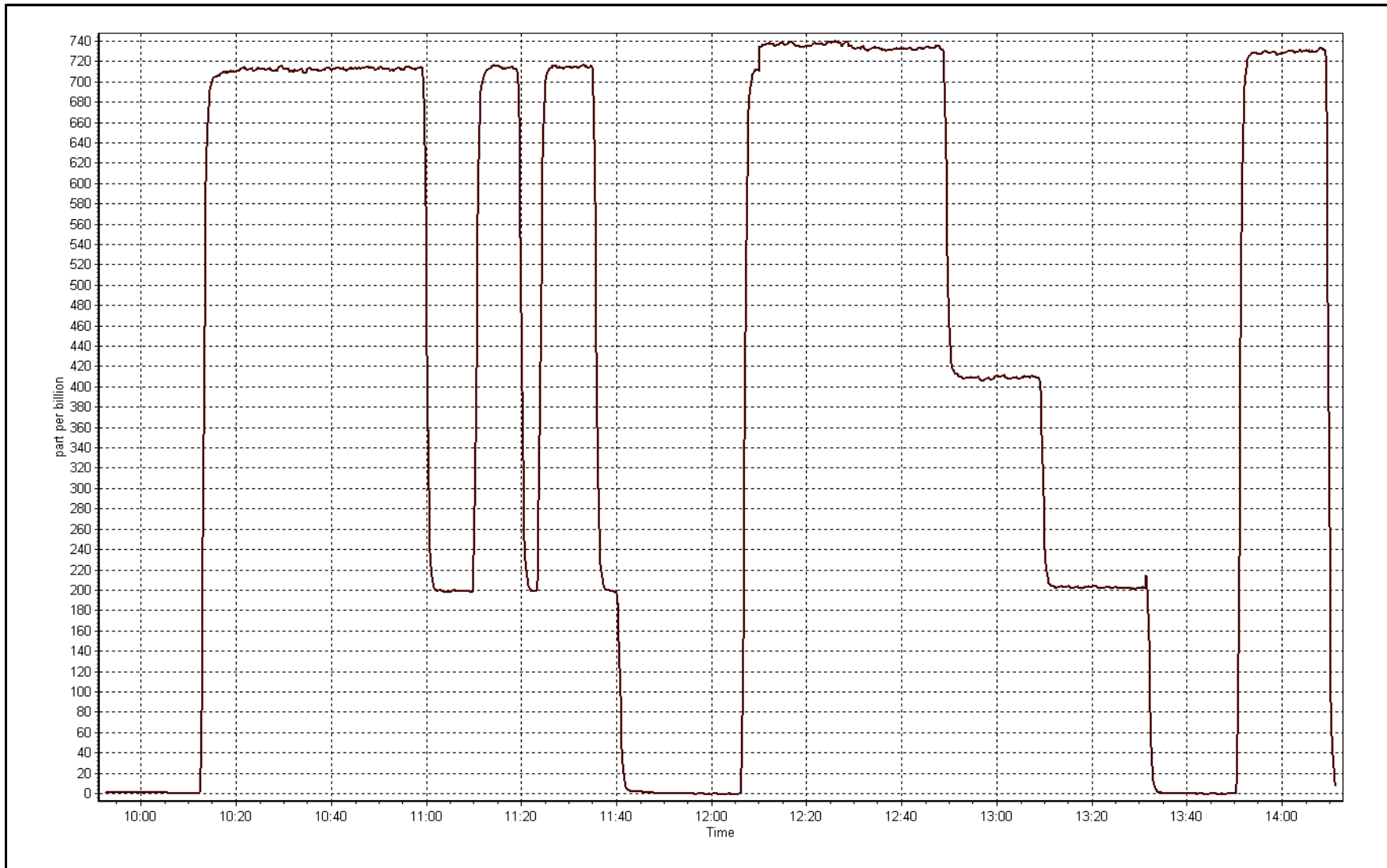
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999984
734.7	732.8	1.0025		
412.1	409.3	1.0068	Slope	1.001285
206.0	202.7	1.0164		
			Intercept	1.626535



SO2 Calibration Plot

Date: December 8, 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	December 8, 2016		
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1		
Reason:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Other:</td> <td>Cylinder Change</td> </tr> </table>			Other:	Cylinder Change
Other:	Cylinder Change				
Start Time (MST)	10:20	End Time (MST)	11:15		
Gas Cert Reference	LL107945	Station temp.	21 Deg C		
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	9/08/2018		
Calibrator Make/Model	Sabio 4010	Serial Number	1730512		
ZAG Make/Model	API 701	Serial Number	587		
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036		

Analyzer Information

	Before	After		Before	After	
Analyzer Range	0 - 1000 ppb		PMT voltage	-614	NA	
Analyzer IP address	192.168.1.43		Lamp voltage	818	NA	
Calculated slope	1.001285	1.009643	Chamber temp	45.1	NA	
Calculated intercept	1.626535	0.726943	Pressure	709.6	NA	
Analyzer Background	14.6	14.6	Flow	0.518	NA	
Analyzer Coefficient	0.957	0.957	Intensity	91	NA	
Analyzer make			Thermo 43i	Analyzer serial #		JC1501301448

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.0	-0.7	----
as found span	5500	81.3	734.7	726.9	1.011
calibrator zero	5500	0.0	0.0	-0.7	----
high point	5500	81.3	734.7	726.9	1.011
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.011

Corrected As found 727.6 Previous response 732.1 % change 0.6%

Notes:

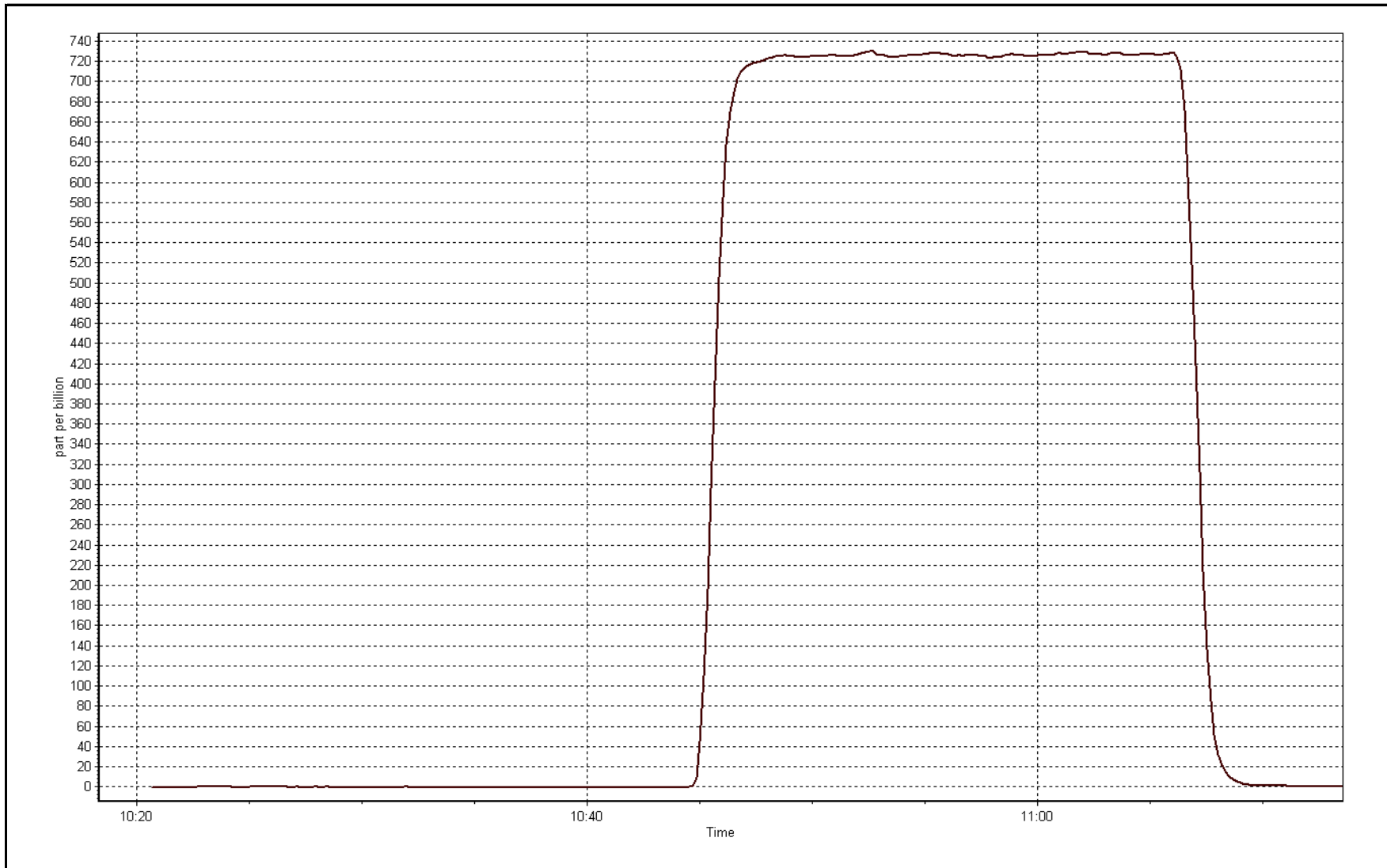
As founds before mix cylinder change.

Calibration Performed By:

Devin Russell

SO2 Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	December 8, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	14:20
Gas Cert Reference	EY0000683	Station temp.	21 Deg C
Cal Gas Concentration	49.3 ppm	Cal Gas Exp Date	11/04/2019
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
ZAG Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-614	-614
Analyzer IP address	192.168.1.43		Lamp voltage	813	819
Calculated slope	1.001285	0.996293	Chamber temp	45.2	45.0
Calculated intercept	1.626535	1.347462	Pressure	695.1	687.8
Analyzer Background	14.6	14.6	Flow	0.464	0.508
Analyzer Coefficient	0.957	0.957	Intensity	91	91
Analyzer make	Thermo 43i		Analyzer serial #	JC1501301448	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
calibrator zero	5500	0.0	0.0	-0.4	----
high point	5500	83.0	744.0	745.4	0.998
second point	5500	46.4	415.9	417.0	0.997
third point	5500	23.3	208.9	206.4	1.012
as left zero	5500	0.0	0.0	0.5	----
as left span	5500	83.0	744.0	741.9	1.003
Average Correction Factor					1.002

Corrected As found NA Previous response NA % change NA

Notes:

Span adjusted after mix cylinder change.

Calibration Performed By:

Devin Russell



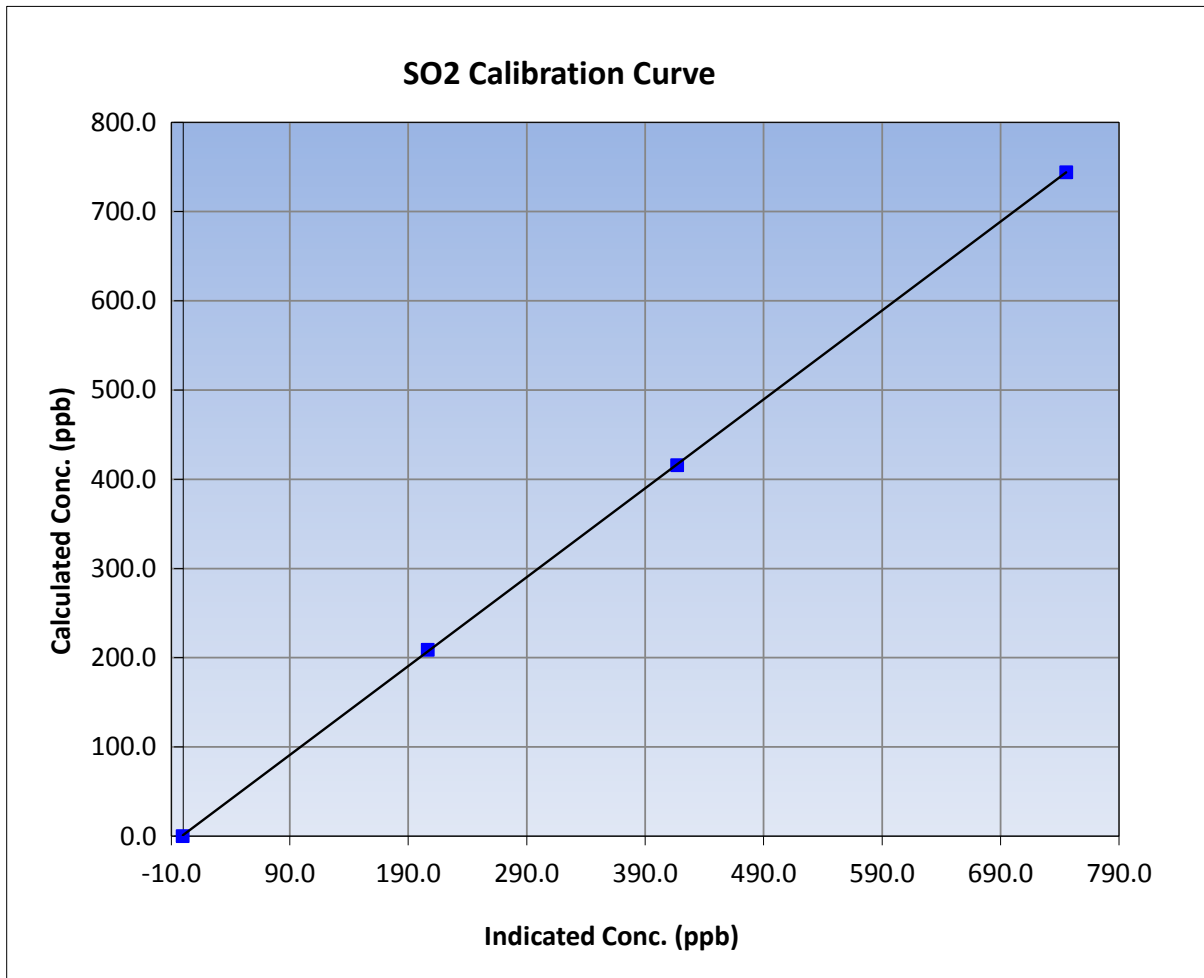
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	December 8, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

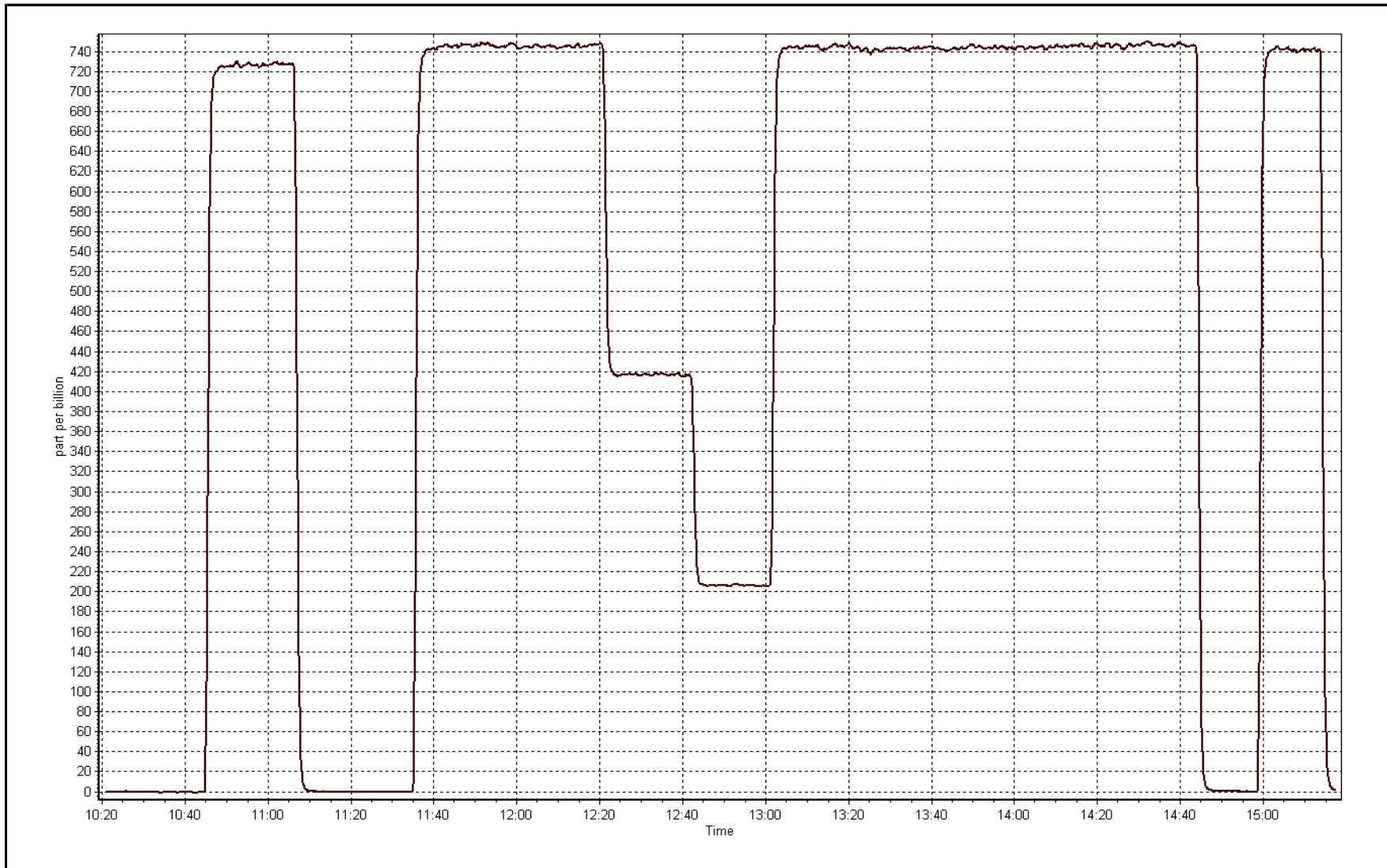
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999982
744.0	745.4	0.9981		
415.9	417.0	0.9973	Slope	0.996293
208.9	206.4	1.0120		
			Intercept	1.347462



SO2 Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 10, 2016	Last Calibration	November 16, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Other: Pump failed		
Start Time (MST)	10:20	End Time (MST)	11:50
Gas Cert Reference	ET0005004	Station temp.	21 Deg C
Cal Gas Concentration	4.94 ppm	Cal Gas Exp Date	2/12/2019
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
Dil air Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	LL107945 8/Sep/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-860	-859
Analyzer IP address	192.168.1.44		Lamp voltage	1137	1143
Calculated slope	1.004408	1.007036	Chamber temp	45	45
Calculated intercept	-0.031622	-0.049525	Pressure	674.2	676.0
Analyzer Background	1.71	1.7	Flow	0.439	0.442
Analyzer Coefficient	0.925	0.925	Intensity	80	80
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153461	
Converter make/model	CDN-101		Converter serial #	470	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
SO2 scrubber check					
calibrator zero	6000	0.0	0.0	-0.1	----
high point	6000	91.1	75.0	74.5	1.007
second point	6000	48.6	40.0	39.8	1.004
third point	6000	24.3	20.0	20.0	0.999
as left zero					
as left span					
Average Correction Factor					1.003

Corrected As found NA Previous response NA % change NA

Notes:

Pump failed overnight. As founds could not be completed. Pump replaced. No adjustments required. As lefts not completed.

Calibration Performed By: Devin Russell



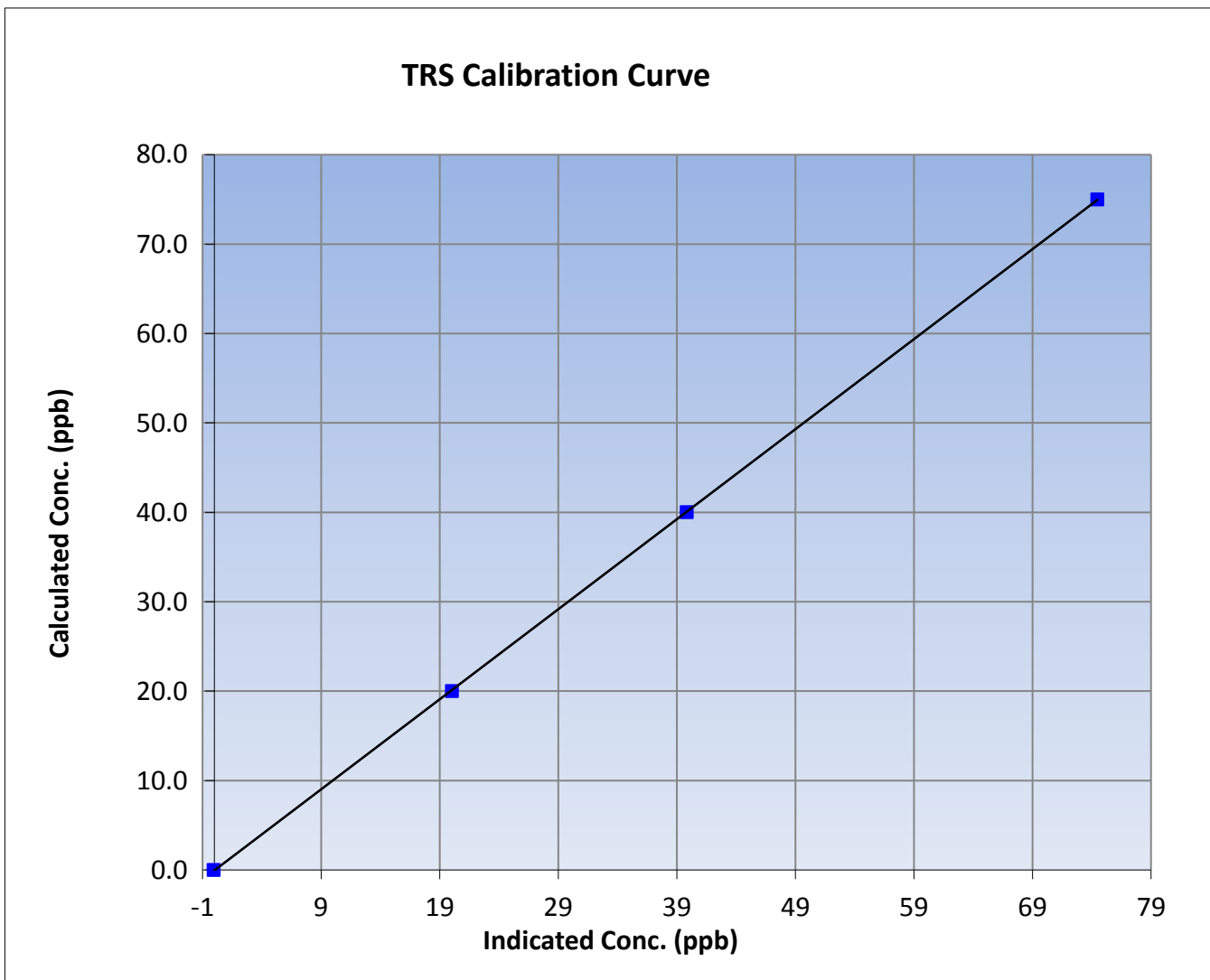
Wood Buffalo Environmental Association TRS Calibration Report

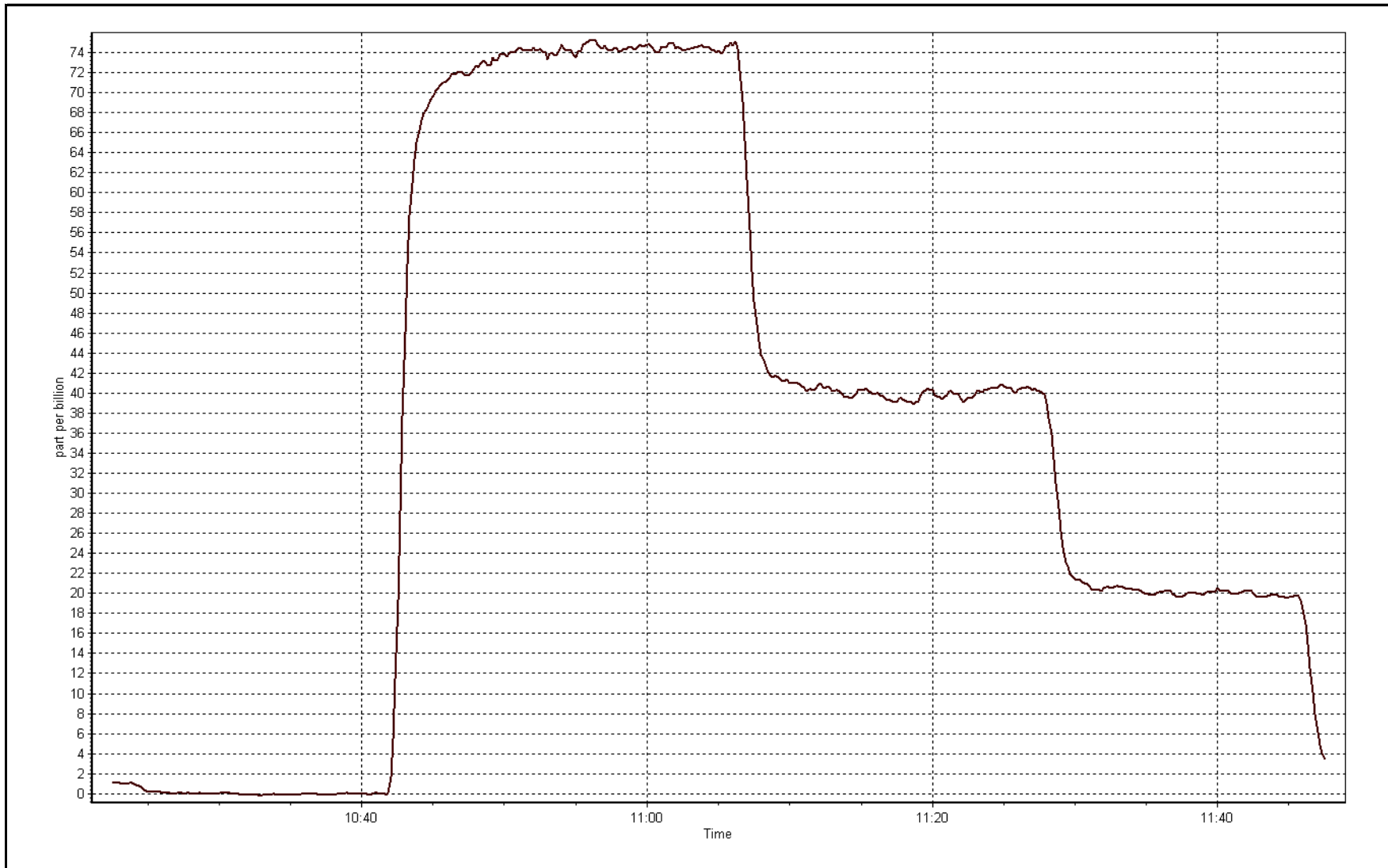
Station Information

Calibration Date	December 10, 2016	Previous Calibration	November 16, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	11:50
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153461

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999990
75.0	74.5	1.0072		
40.0	39.8	1.0044	Slope	1.007036
20.0	20.0	0.9989		
			Intercept	-0.049525







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	December 8, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Other:	Cylinder Change	
Start Time (MST)	10:20	End Time (MST)	11:15
Gas Cert Reference	LL107945	Cal Gas Expiry Date	September-08-18
CH4 Cal Gas Conc.	515.0 ppm	CH4 Equiv Conc.	1065.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	21 Deg C
Calibrator Model	Sabio 4010	Serial Number	1730512
ZAG make/model	Teledyne API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	Serial Number	9036

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
THC Range (ppm)	0 - 100 ppm		Column Temp	74.9	74.9
NMHC Range (ppm)	0 - 50 ppm		Detector Temp	175.1	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.999372	1.016310	Carrier Pressure	36.7	36.7
THC Calc intercept	0.066356	0.000000	Fuel Pressure	47.7	47.7
NMHC Calc slope	0.999024	1.017522	Air Pressure	39.0	39.0
NMHC Calc intercept	0.021134	0.000000			

Analyzer make Thermo 55i Analyzer serial # 1152430012

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.00	0.00	----
as found span	5500	81.3	15.74	15.49	1.016
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.49	1.016
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.016

Corrected As found 15.49 Previous response 15.69 % change 1.3%

Notes:

As founds before mix cylinder change.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	8.13	7.99	1.018
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	8.13	7.99	1.018
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.018

Corrected As found 7.99 Previous response 8.12 % change 1.6%

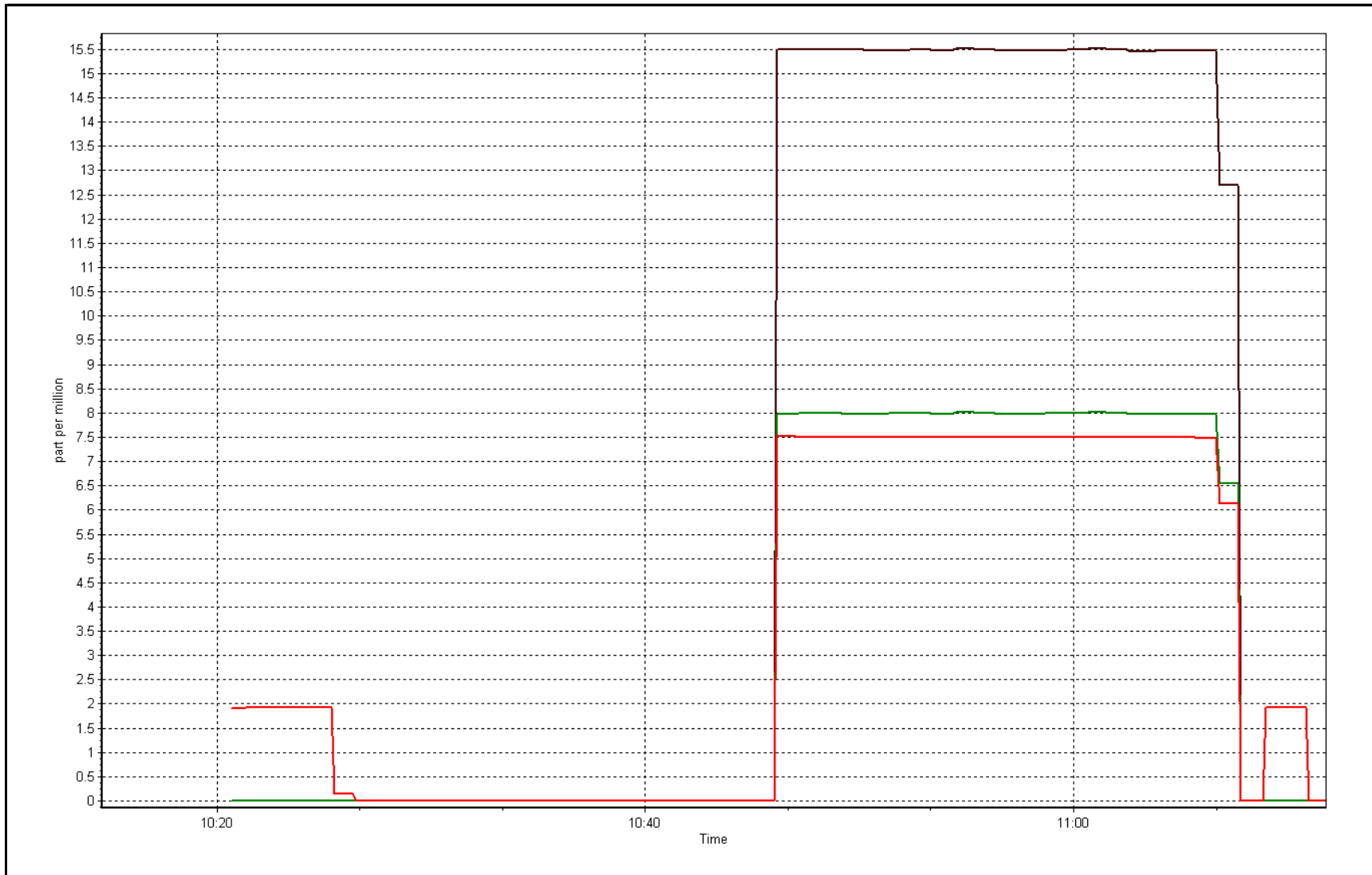
CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	7.61	7.50	1.015
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	7.61	7.50	1.015
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.015

Corrected As found 7.50 Previous response 7.57 % change 0.9%

THC Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 8, 2016	Last Calibration	November 10, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	14:15
Gas Cert Reference	LL107945	Cal Gas Expiry Date	September-08-18
CH4 Cal Gas Conc.	515.0 ppm	CH4 Equiv Conc.	1065.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	21 Deg C
Calibrator Model	Sabio 4010	Serial Number	1730512
ZAG make/model	Teledyne API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	Serial Number	9036

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
THC Range (ppm)	0 - 100 ppm		Column Temp	75.0	74.9
NMHC Range (ppm)	0 - 50 ppm		Detector Temp	175.1	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.000442	0.999372	Carrier Pressure	37.3	36.7
THC Calc intercept	0.063668	0.066356	Fuel Pressure	47.7	47.7
NMHC Calc slope	0.999439	0.999024	Air Pressure	39.0	39.0
NMHC Calc intercept	0.017091	0.021134			

Analyzer make Thermo 55i Analyzer serial # 1152430012

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.00	0.00	----
as found span	5500	81.3	15.74	15.96	0.986
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.73	1.001
second point	5500	45.6	8.83	8.72	1.013
third point	5500	22.8	4.41	4.29	1.029
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	15.74	15.72	1.001
Average Correction Factor					1.014

Corrected As found 15.96 Previous response 15.67 % change -1.8%

Notes:

Inlet filter changed after as founds. Carrier pressure adjusted multiple times to find best setpoint for linearity. Final carrier pressure setpoint was 36.8 psi, from 37.4 psi. Span adjusted.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	8.13	8.18	0.994
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	8.13	8.13	1.000
second point	5500	45.6	4.56	4.53	1.007
third point	5500	22.8	2.28	2.24	1.018
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	8.13	8.12	1.001
Average Correction Factor					1.008

Corrected As found 8.18 Previous response 8.12 % change -0.8%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	7.61	7.79	0.977
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	7.61	7.60	1.002
second point	5500	45.6	4.27	4.19	1.019
third point	5500	22.8	2.13	2.05	1.041
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	7.61	7.60	1.002
Average Correction Factor					1.021

Corrected As found 7.79 Previous response 7.55 % change -3.0%



Wood Buffalo Environmental Association

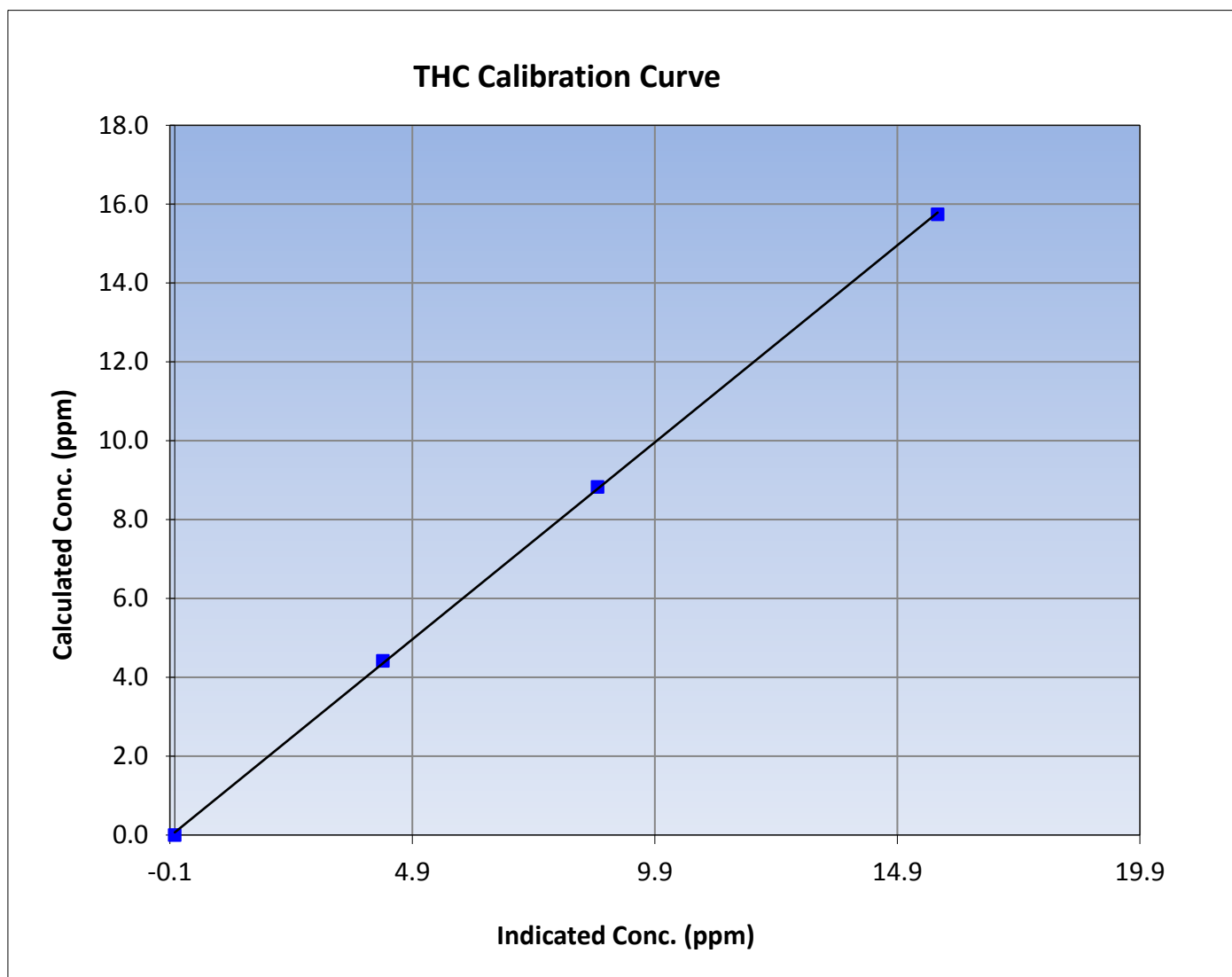
THC Calibration Summary

Station Information

Calibration Date	December 8, 2016	Previous Calibration	November 10, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:50	End Time (MST)	14:15
Analyzer make	Thermo 55i	Analyzer serial #	1152430012
8:17			

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999908
15.74	15.73	1.0008		
8.83	8.72	1.0126	Slope	0.999372
4.41	4.29	1.0291		
			Intercept	0.066356





Wood Buffalo Environmental Association

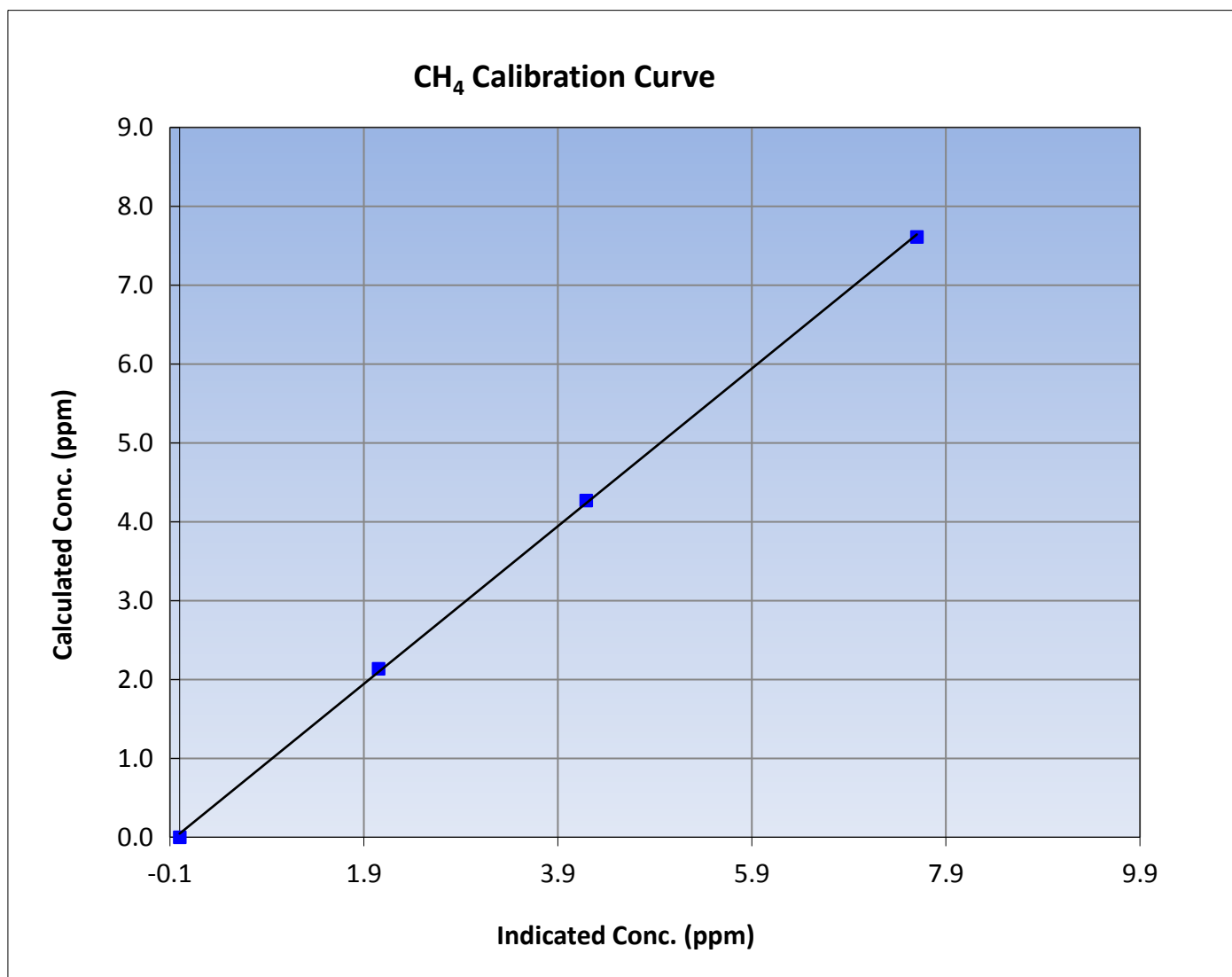
CH₄ Calibration Summary

Station Information

Calibration Date	December 8, 2016	Previous Calibration	November 10, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:50	End Time (MST)	14:15
Analyzer make	Thermo 55i	Analyzer serial #	1152430012
8:17			

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999814
7.61	7.60	1.0017		
4.27	4.19	1.0190	Slope	0.999711
2.13	2.05	1.0414		
			Intercept	0.045341





Wood Buffalo Environmental Association

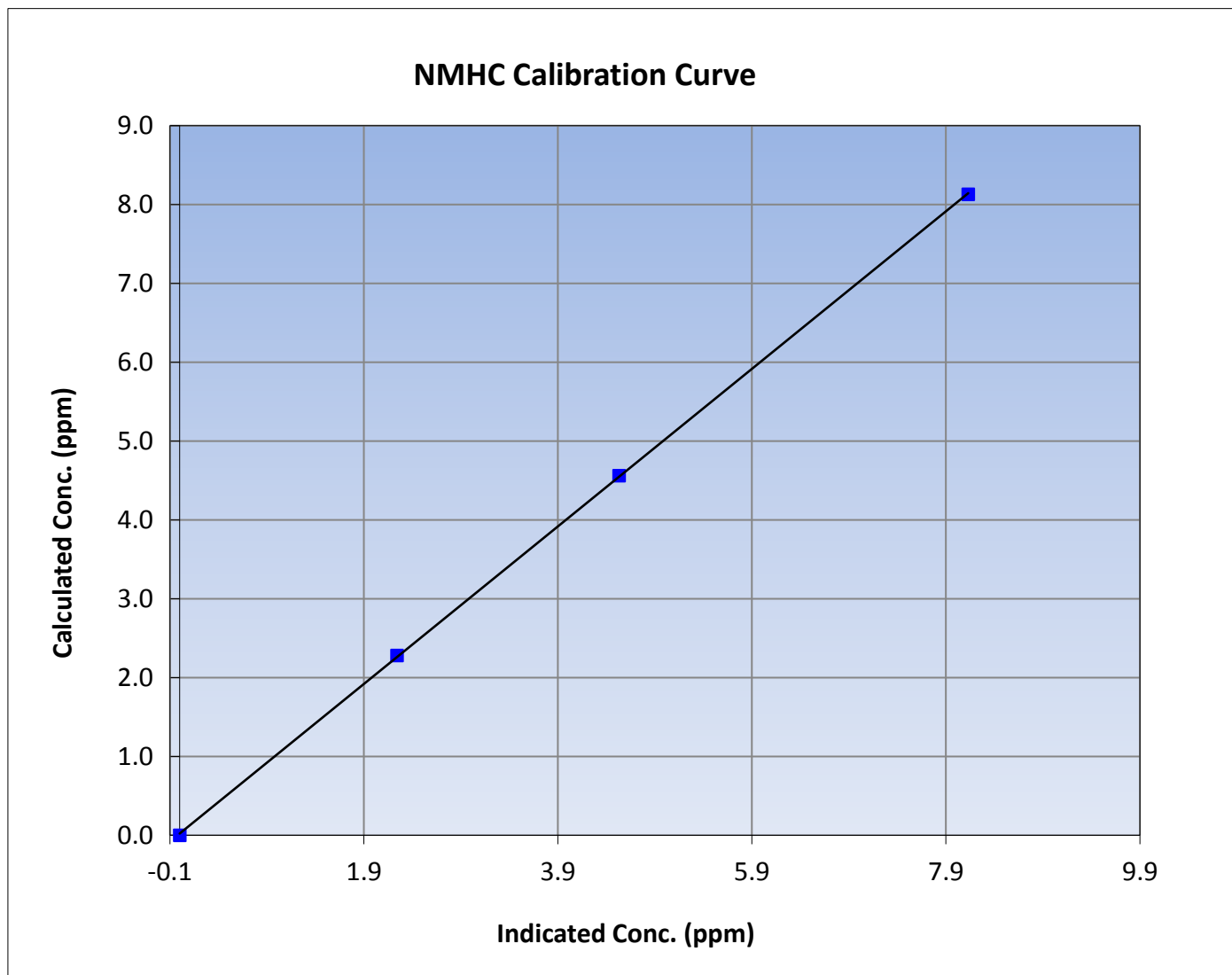
NMHC Calibration Summary

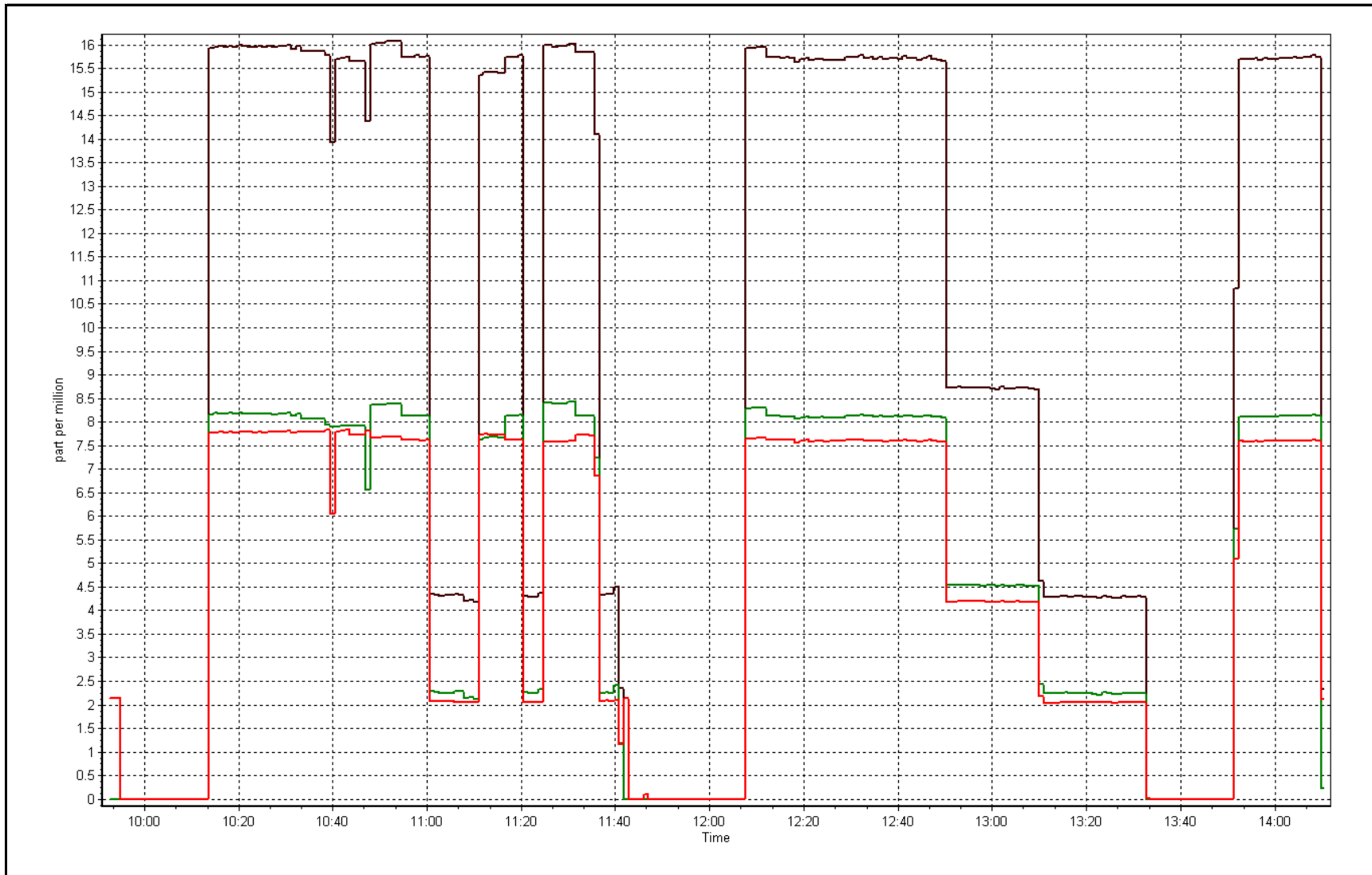
Station Information

Calibration Date	December 8, 2016	Previous Calibration	November 10, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:50	End Time (MST)	14:15
Analyzer make	Thermo 55i	Analyzer serial #	1152430012
	8:17		

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999966
8.13	8.13	1.0000		
4.56	4.53	1.0066	Slope	0.999024
2.28	2.24	1.0179		
			Intercept	0.021134







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 16, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	12:00
NO2 GPT Ref date	December-12-16	Transfer Standard	N/A
Calibrator Make/Model	Sabio 4010	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	1730512
DACS make/model	Campbell Scientific CR3000	Serial Number	587
		Serial Number	9036

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.1	30.7
Analyzer IP address	192.168.1.49		Lamp temp.	53.6	53.7
Calculated slope	0.998165	1.004411	Pressure	723.7	722.5
Calculated intercept	-1.524111	-1.835749	Flow cell A	0.769	0.767
Analyzer Background	-1.3	-1.3	Flow cell B	0.822	0.819
Analyzer Coefficient	1.052	1.076	Cell A Intensity	71xxx	68xxx
			Cell B Intensity	85xxx	84xxx

Analyzer make	Thermo 49i	Analyzer serial #	1152220026
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.6	----
as found span	5000	0.88	427.6	418.6	1.022
calibrator zero	5000	0.00	0.0	0.6	----
high point	5000	0.88	427.6	426.5	1.003
second point	5000	0.56	253.9	255.9	0.992
third point	5000	0.34	131.5	133.8	0.983
As Left Zero	5000	0.00	0.0	0.4	----
As Left Span	5000	0.88	427.6	434.6	0.984
Average Correction Factor					0.993

Corrected As found	418.0	Previous response	429.9	% change	2.9%
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Notes:

No maintenance completed. Span adjusted.

Calibration Performed By: Devin Russell



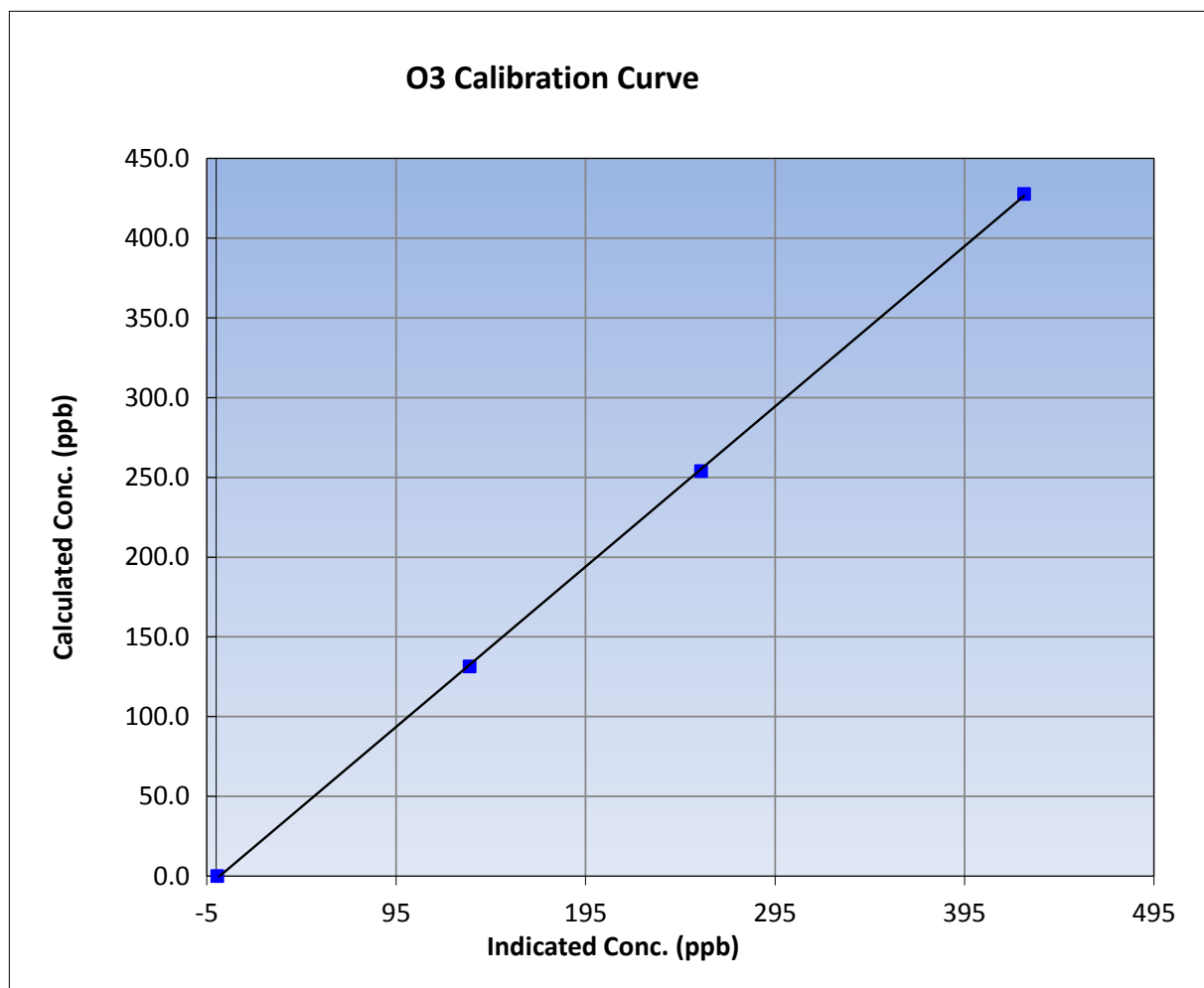
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	December-13-16	Previous Calibration	November-16-16
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:10	End Time (MST)	12:00
Analyzer make	Thermo 49i	Analyzer serial #	1152220026

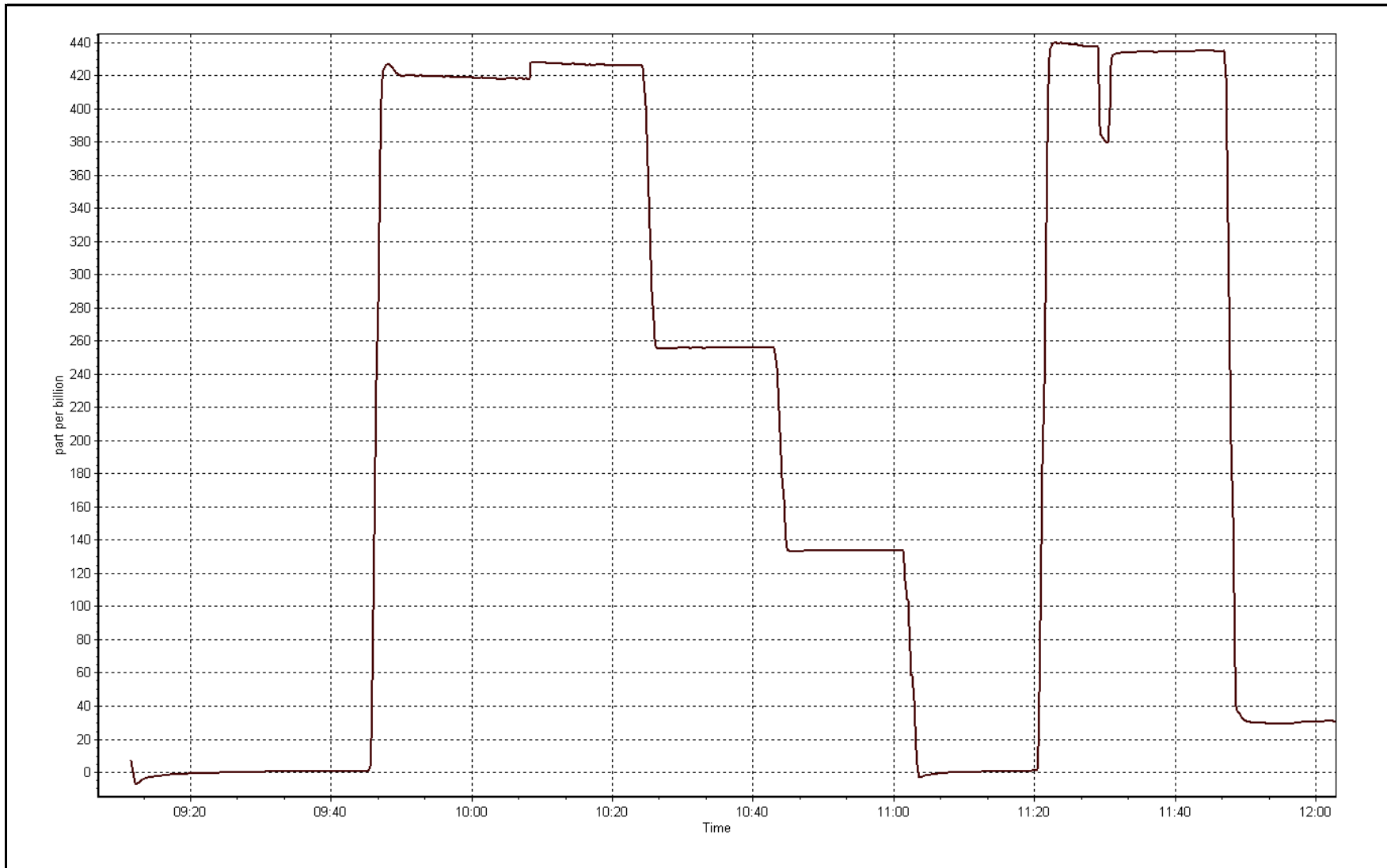
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999945
427.6	426.5	1.0027		
253.9	255.9	0.9921	Slope	1.004411
131.5	133.8	0.9831		
			Intercept	-1.835749



O3 Calibration Plot

Date: December 13, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	11:15
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL107945
NOX Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	9/08/2018
Calibrator	Sabio 4010	Serial Number	1730512
Zero air Generator	Teledyne API T701	Serial Number	587

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997480	0.997243	1.003165
	Data Offset	0.808606	1.022354	0.215063
Current Calibration	Data Slope	0.996613	0.996573	
	Data Offset	-0.029898	0.019931	

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153357
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.179		NA	
NOX coefficient	1.003		NA	
NO2 coefficient	1.000		NA	
NO bkgnd	6.0		NA	
NOX bkgnd	6.2		NA	
Chamber Temp	50.6	Deg C	NA	Deg C
Moly Temp	325.5	Deg C	NA	Deg C
PMT voltage	-791.8	V	NA	V
PMT Temp	-2.9	Deg C	NA	Deg C
O3 flow	ok	ccm	NA	ccm
R Cell press NO	169.3	mmHg	NA	mmHg
R Cell Press Nox	169.3	mmHg	NA	mmHg
NO sample flow	0.586	lpm	NA	lpm
Nox sample Flow	0.586	lpm	NA	lpm

Notes:

As founds before mix cylinder change.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 12, 2016 Station Number: AMS 1

Calibration Data

Set Point	Routine	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.0	0.0	0.1	----	----
as found span	5500	81.4	753.3	750.4	3.0	755.9	752.9	3.0	0.9966	0.9966
calibrator zero	5500	0.0	0.0	0.0	0.0	0.0	0.0	0.1	----	----
high point	5500	81.4	753.3	750.4	3.0	755.9	752.9	3.0	0.9966	0.9966
second point										
third point										
as left zero										
as left span										
Average Correction Factor									0.9966	0.9966

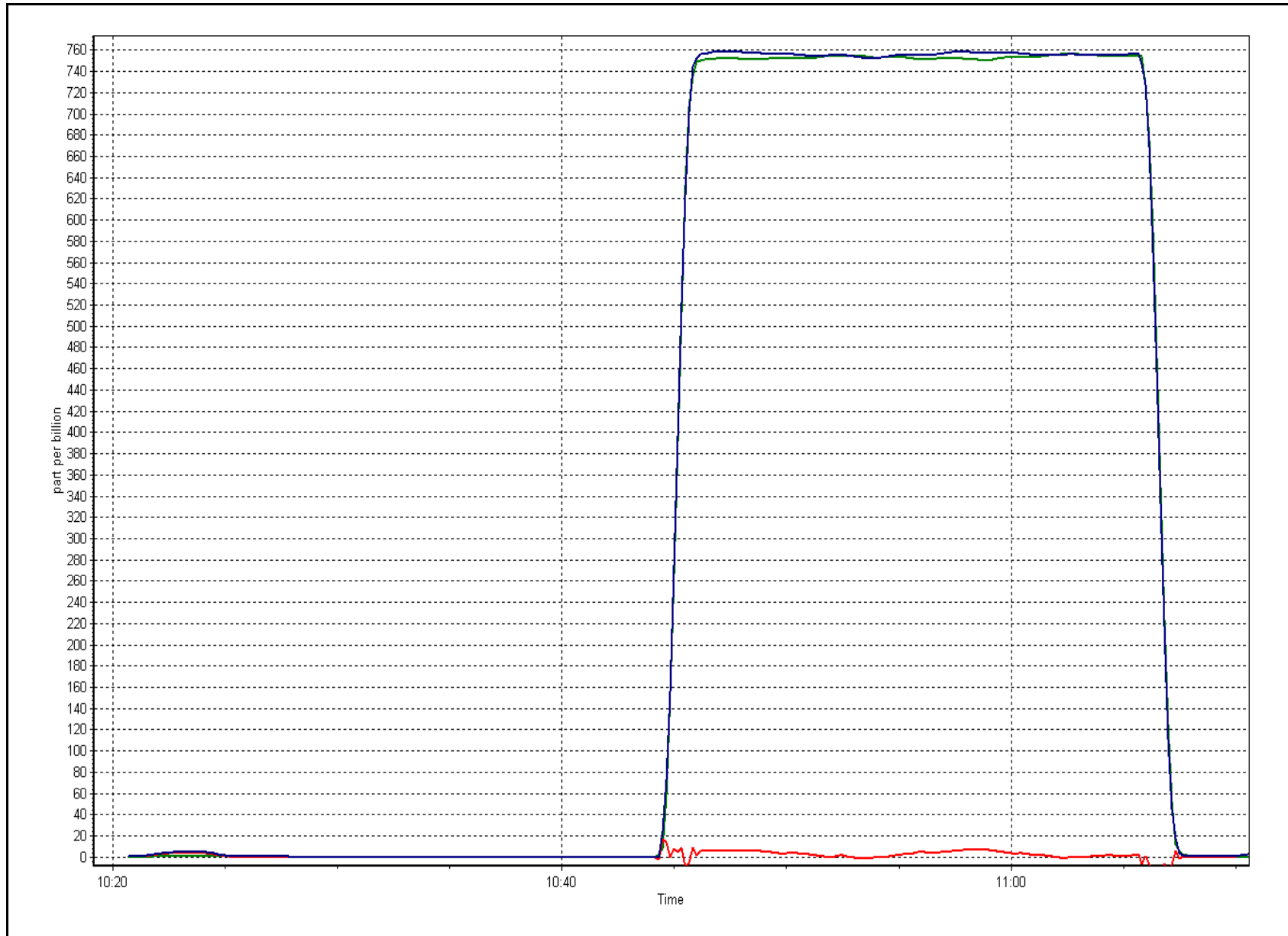
Corrced As found NO_x= 755.9 NO= 752.9 Percent Change NO_x= -0.2% NO= -0.2%
 Previous Response NO_x= 754.4 NO= 751.4

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 81.40 ccm NOx ref calc conc = 753.3 ppb NO ref calc conc = 750.4 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		3.0			0.1			----	
1st NO2 (300)									
2nd NO2 (200)									
3rd NO2 (100)									
2nd NO ref point		3.0							
Average Correction Factor									

Calibration Performed By: Devin Russell





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	14:20
NO Cal Gas Conc	49.7 ppm	Gas Cert Reference	EY0000683
NOX Cal Gas Conc	49.7 ppm	Cal Gas Expiry Date	11/04/2019
Calibrator	Sabio 4010	Serial Number	1730512
Zero air Generator	Teledyne API T701	Serial Number	587

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997480	0.997243	1.003165
	Data Offset	0.808606	1.022354	0.215063
Current Calibration	Data Slope	0.994666	0.999695	0.999116
	Data Offset	1.268723	1.437863	-0.806909

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153357
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.179		1.157	
NOX coefficient	1.003		1.005	
NO2 coefficient	1.000		1.000	
NO bkgrnd	6.0		5.9	
NOX bkgrnd	6.2		6.0	
Chamber Temp	50.6	Deg C	50.5	Deg C
Moly Temp	325.5	Deg C	325.3	Deg C
PMT voltage	-791.8	V	-791.4	V
PMT Temp	-2.9	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	169.3	mmHg	172	mmHg
R Cell Press Nox	169.3	mmHg	172	mmHg
NO sample flow	0.586	lpm	0.592	lpm
Nox sample Flow	0.586	lpm	0.592	lpm

Notes:

Span adjusted after mix cylinder change.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 12, 2016 Station Number: AMS 1

Calibration Data

Set Point	Routine	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero										
as found span										
calibrator zero	5500	0.0	0.0	0.0	0.0	0.1	0.0	0.1	----	----
high point	5500	83.0	750.0	750.0	0.0	753.0	749.1	3.9	0.9960	1.0012
second point	5500	46.4	419.3	419.3	0.0	420.9	418.6	2.3	0.9962	1.0017
third point	5500	23.3	210.5	210.5	0.0	208.1	206.8	1.3	1.0116	1.0179
as left zero	5500	0.0	0.0	0.0	0.0	0.3	0.1	0.2	----	----
as left span	5500	83.0	750.0	320.5	429.5	748.0	311.1	436.9	1.0027	1.0304
Average Correction Factor									1.0013	1.0069

Corrected As found NO_x= NA NO= NA Percent Change NO_x= N/A NO= N/A
 Previous Response NO_x= NA NO= NA

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 83.00 ccm NOx ref calc conc = 750.0 ppb NO ref calc conc = 750.0 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	751.7	748.1	0.1	0.9977	1.0026	----	----
1st NO2 (300)	320.5	427.6	748.7	320.5	428.2	1.0017	----	0.9984	100.2%
2nd NO2 (200)	494.2	253.9	749.6	494.2	255.4	1.0006	----	0.9940	100.6%
3rd NO2 (100)	616.6	131.5	749.7	616.6	133.1	1.0004	----	0.9878	101.2%
2nd NO ref point	----	0.0	748.8	745.1	3.7	1.0016	1.0066	----	----
Average Correction Factor						1.0011		0.9934	100.7%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

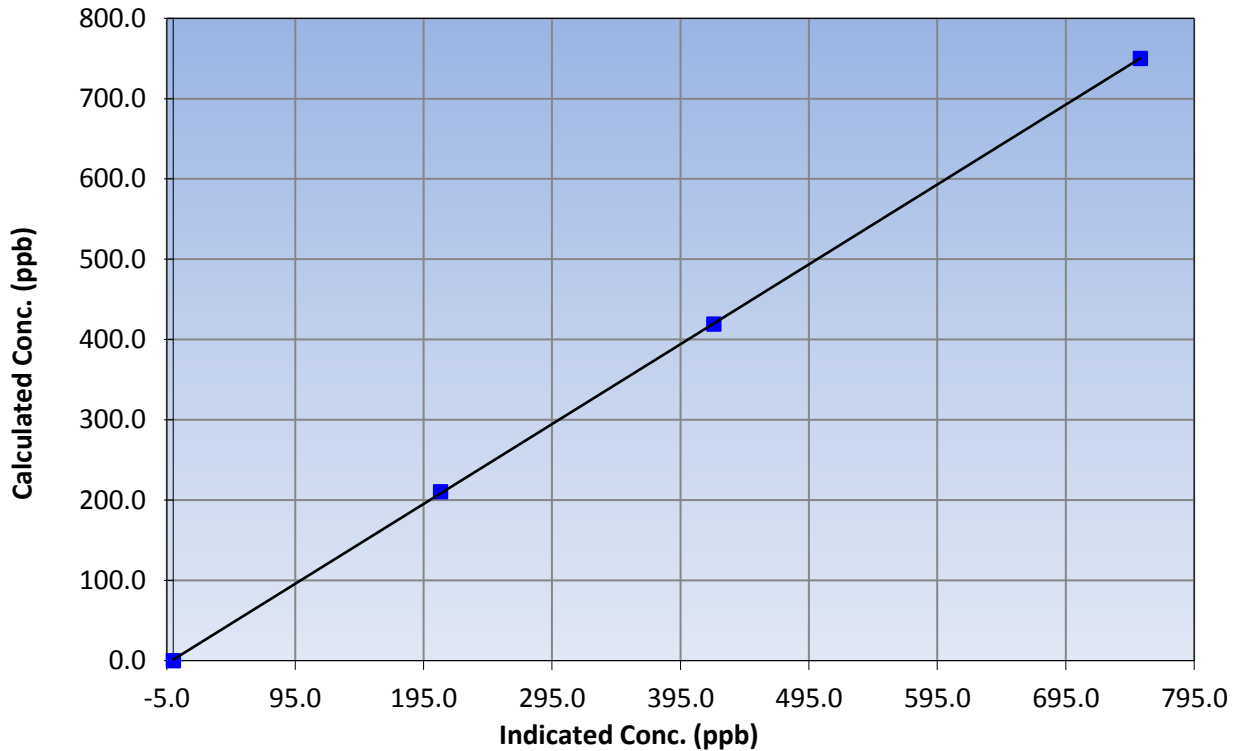
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	Routine	Analyzer serial #	1218153357

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999976
750.0	753.0	0.9960		
419.3	420.9	0.9962	Slope	0.994666
210.5	208.1	1.0116		
			Intercept	1.268723

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

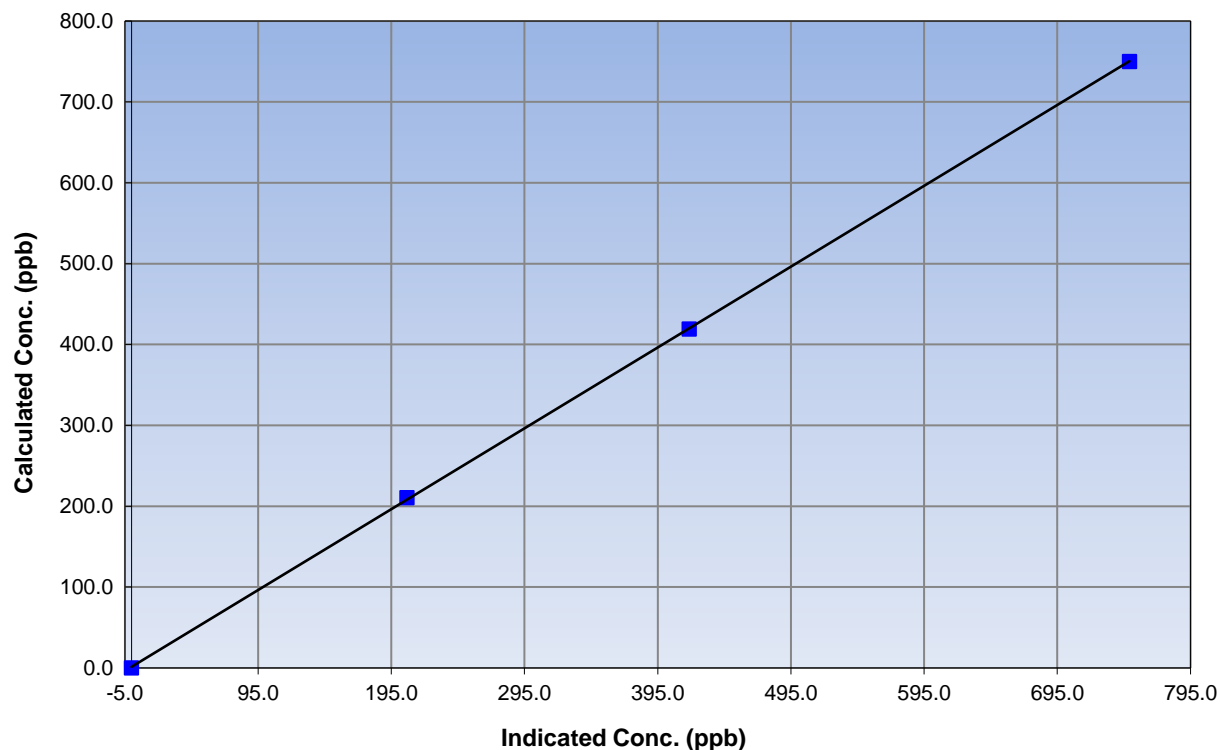
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	Routine	Analyzer serial #	1218153357

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999974
750.0	749.1	1.0012		
419.3	418.6	1.0017	Slope	0.999695
210.5	206.8	1.0179		
			Intercept	1.437863

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

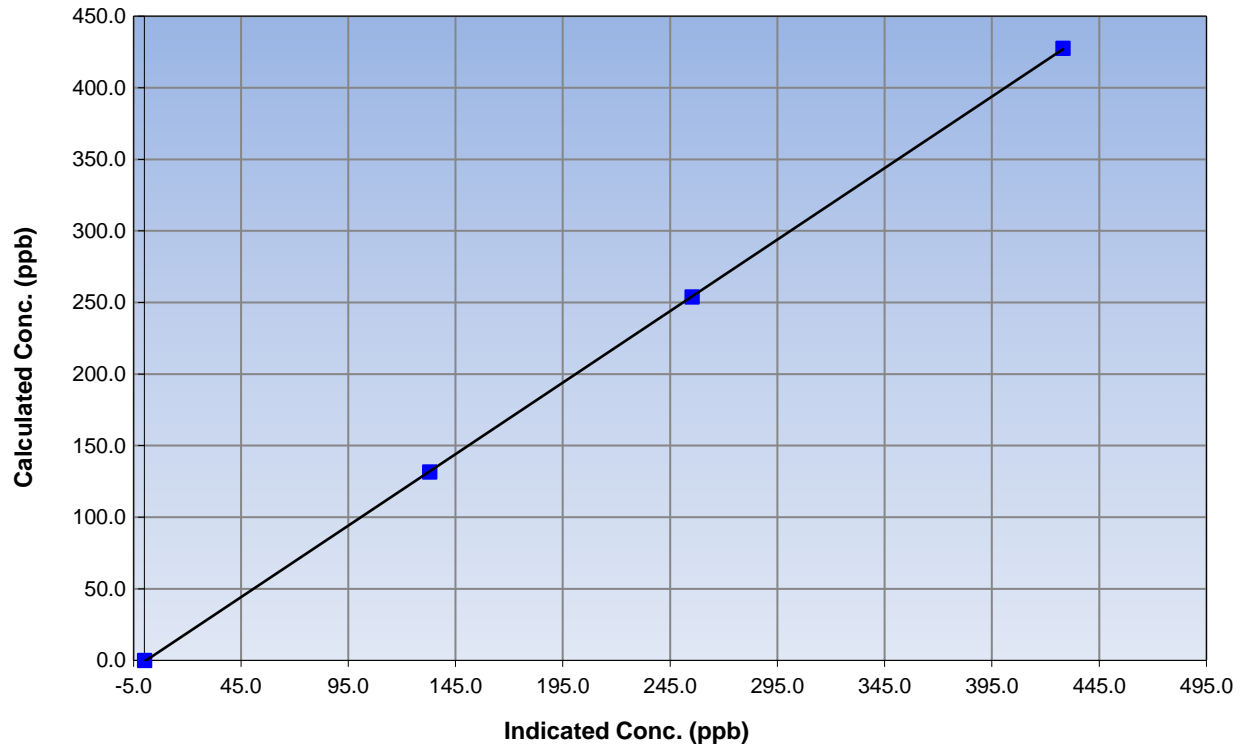
Station Information

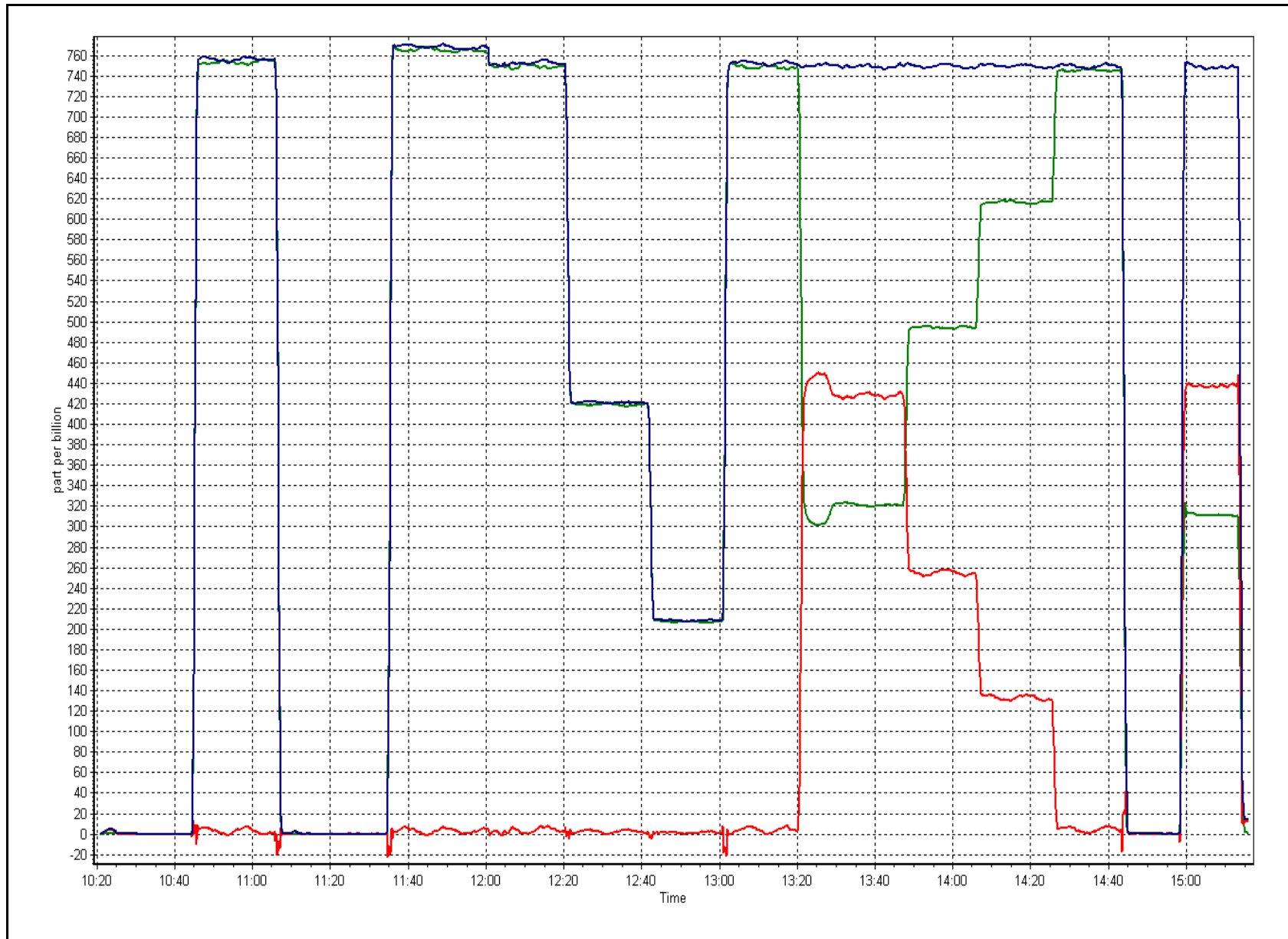
Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Number	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	Routine	Analyzer serial #	1218153357

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999985
427.6	428.2	0.9984		
253.9	255.4	0.9940	Slope	0.999116
131.5	133.1	0.9878		
			Intercept	-0.806909

NO₂ Calibration Curve







Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
NOX Calibration Date	December 12, 2016	NOX Previous Cal Date	November 14, 2016
NH3 Calibration Date	NA	NH3 Previous Cal Date	November 15, 2016
Reason:	Cylinder Change		
Start Time (MST)	10:20	End Time (MST)	11:15
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	95.5 ppm	Serial Number	14300410
NOx Cal Gas Conc	50.9 ppm	NH3 Expiry Date / SN	24/May/2017 LL23123
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	8/Sep/2018 LL107945

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
-------------------	----------------------------	-----------------	------

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.011487	1.000389	0.997956	0.997687	1.007721
	Data Offset	-12.36836	-12.673034	1.731690	1.368045	-0.861258
Cal Stats After	Data Slope			0.962562	0.956275	
	Data Offset			-0.077005	0.114753	
IP address		192.168.1.77				

Analyzer Information

Analyzer make/model	API T201	Analyzer serial #	152	
Converter	API 501 NH3	Converter serial #	147	
Test Point	before		after	
NH3 Conc range	0-2500	ppb	2500	ppb
NOX Conc range	0-1000	ppb	1000	ppb
NO BKG	0.0		NA	
NOx BKG	0.0		NA	
Nt BKG	0.0		NA	
NO coefficient	1.195		NA	
NO2 coefficient	1.000		NA	
NOx coefficient	1.337		NA	
NH3 coefficient	0.870		NA	
Nt coefficient	1.376		NA	
NH3 conv temp	825	DegC	NA	Deg C
Chamber Temp	50.0	Deg C	NA	Deg C
Moly Temp	314.7	Deg C	NA	Deg C
PMT Temp	7.0	Deg C	NA	Deg C
O3 flow	84.0	ccm	NA	ccm
R Cell Press	5.3	mmHg	NA	mmHg
PMT Voltage	645.0	v	NA	v
Sample Flow 1 NO	540.0	ccm	NA	ccm
Sample Flow 2 Nox	519.0	ccm	NA	ccm
Sample Flow 3 Nt	510.0	ccm	NA	ccm

Notes:

As founds before mix cylinder change. AS founds nearly 5% high. Response drifted after major maintenance completed last month.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

NA

Station Number:

AMS 1

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero										
as found NO										
calibrator zero	5500	0.0	0.0	0.0	0.0	0.1	0.1	0.1	----	----
high NO point	5500	81.4	753.3	753.3	----	800.2	782.7	17.5	0.941	----
NO/O ₃ point										
as found NH ₃										
first NH ₃										
second NH ₃										
third NH ₃										
Average Correction Factor									0.9414	

Nt Corrected As Found Nt = NA ppb
 NOx Corrected As Found NOx = NA ppb
 NH₃ Previous Converter Efficiency = 87.0 %

Previous Response Nt = NA ppb
 Previous Response NOx = NA ppb
 NH₃ Current Converter Efficiency = %

Nt percent change NA
 NOx percent change NA
 NH₃ percent change



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date: December 12, 2016 Station Number: AMS 1

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	----	----
as found span	5500	81.4	753.3	750.4	753.3	782.7	784.6	800.2	0.9625	0.9564
calibrator zero	5500	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	----	----
high point	5500	81.4	753.3	750.4	753.3	782.7	784.6	800.2	0.9625	0.9564
second point										
third point										
Average Correction Factor									0.9625	0.9564

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	800.1	782.6	784.7	----
Previous Response	765.7	753.1	750.7	----
Percent Change	-4.3%	-3.8%	-4.3%	0.6%

GPT Calibration Data

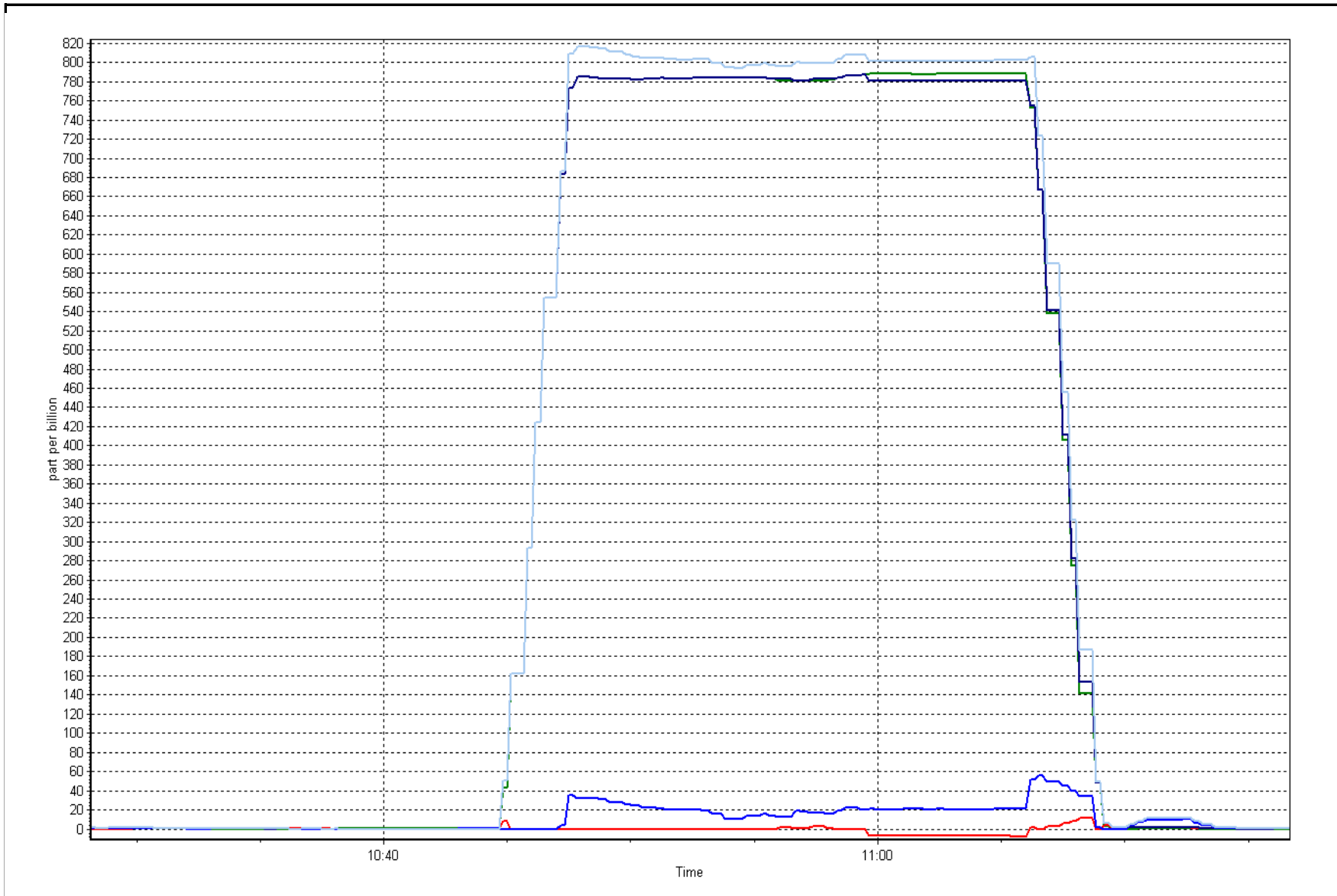
Dilution Flow (total) 5500 ccm Source Gas Flow 81.4 ccm NO_x ref calc conc = 753.3 ppb NO ref calc conc = 750.4 ppb

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point									
1st NO ₂ (300)									
2nd NO ₂ (200)									
3rd NO ₂ (100)									
2nd NO ref point									
Average Correction Factor									

Calibration Performed By: Devin Russell

NOX Calibration Plot

Date: 12-Dec-2016





Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
NOX Calibration Date	December 12, 2016	NOX Previous Cal Date	November 14, 2016
NH3 Calibration Date	December 13, 2016	NH3 Previous Cal Date	November 15, 2016
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	14:20
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	95.5 ppm	Serial Number	14300410
NOx Cal Gas Conc	49.7 ppm	NH3 Expiry Date / SN	24/May/2017 LL23123
NO Cal Gas Conc	49.7 ppm	NO Expiry Date / SN	4/Nov/2019 EY0000683

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
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Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.011487	1.000389	0.962562	0.956275	1.007721
	Data Offset	-12.36836	-12.673034	-0.077005	0.114753	-0.861258
Cal Stats After	Data Slope	1.001636	0.989520	0.997722	0.997105	1.010174
	Data Offset	-10.25	-11.00	0.803858	0.994442	1.769413
IP address		192.168.1.77				

Analyzer Information

Analyzer make/model	API T201	Analyzer serial #	152
Converter	API 501 NH3	Converter serial #	147

Test Point	before		after	
NH3 Conc range	0-2500	ppb	2500	ppb
NOX Conc range	0-1000	ppb	1000	ppb
NO BKG	0.0		0.0	
NOx BKG	0.0		0.0	
Nt BKG	0.0		0.0	
NO coefficient	1.195		1.127	
NO2 coefficient	1.000		1.000	
NOx coefficient	1.337		1.268	
NH3 coefficient	0.870		0.859	
Nt coefficient	1.376		1.271	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	314.7	Deg C	314.6	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	84.0	ccm	85.0	ccm
R Cell Press	5.3	mmHg	5.8	mmHg
PMT Voltage	645.0	v	645.0	v
Sample Flow 1 NO	540.0	ccm	553.0	ccm
Sample Flow 2 Nox	519.0	ccm	524.0	ccm
Sample Flow 3 Nt	510.0	ccm	514.0	ccm

Notes:

Span adjusted after mix cylinder change. Second High NO point used as GPT reference. NH3 span adjusted.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

December 13, 2016

Station Number:

AMS 1

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as found NO	5500	83.0	750.0	750.0	----	745.4	744.3	1.1	1.006	----
calibrator zero	5500	0.0	0.0	0.0	0.0	0.6	0.3	0.3	----	----
high NO point	5500	83.0	750.0	750.0	----	749.8	750.9	-1.2	1.000	----
NO/O ₃ point	5500	81.4	735.6	735.6	----	751.7	749.4	2.3	0.979	----
as found NH ₃	5000	94.2	1799.2	NA	1799.2	1789.8	22.6	1767.1	1.005	1.018
first NH ₃	5000	94.2	1799.2	NA	1799.2	1818.3	22.3	1796.0	0.990	1.002
second NH ₃	5000	52.4	1000.8	NA	1000.8	1039.8	14.0	1025.8	0.963	0.976
third NH ₃	5000	26.2	500.4	NA	500.4	521.2	7.2	514.0	0.960	0.974
Average Correction Factor									0.9894	0.9837

Nt Corrected As Found Nt = 745.5 ppb
 NOx Corrected As Found NOx = 744.4 ppb
 NH₃ Previous Converter Efficiency = 87.0 %

Previous Response Nt = 762.4 ppb
 Previous Response NOx = 779.3 ppb
 NH₃ Current Converter Efficiency = 85.9 %

Nt percent change 2.3%
 NOx percent change 4.7%
 NH₃ percent change -1.1%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date: December 12, 2016 Station Number: AMS 1

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero										
as found span										
calibrator zero	5500	0.0	0.0	0.0	0.0	0.3	0.1	0.6	----	----
high point	5500	83.0	750.0	750.0	750.0	750.9	750.8	749.8	0.9988	0.9990
second point	5500	46.4	419.3	419.3	419.3	420.6	421.6	420.6	0.9970	0.9945
third point	5500	23.3	210.5	210.5	210.5	208.0	207.4	209.1	1.0124	1.0153
Average Correction Factor									1.0027	1.0029

	<u>Nt</u>	<u>NO_x</u>	<u>NO</u>	<u>NO₂</u>
Corrected As found	NA	NA	NA	NA
Previous Response	NA	NA	NA	NA
Percent Change	NA	NA	NA	NA

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 83.0 ccm NO_x ref calc conc = 750.0 ppb NO ref calc conc = 750.0 ppb

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point	----	0.0	749.4	748.9	0.7	1.0008	1.0016	----	----
1st NO ₂ (300)	317.2	431.7	743.0	317.2	425.8	1.0094	----	1.0137	98.6%
2nd NO ₂ (200)	492.2	256.7	743.9	492.2	251.7	1.0083	----	1.0198	98.1%
3rd NO ₂ (100)	616.5	132.3	746.2	616.5	129.6	1.0052	----	1.0208	98.0%
2nd NO ref point	----	0.0	750.1	751.8	-1.7	0.9999	0.9976	----	----
Average Correction Factor						1.0057	0.9996	1.0181	98.2%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

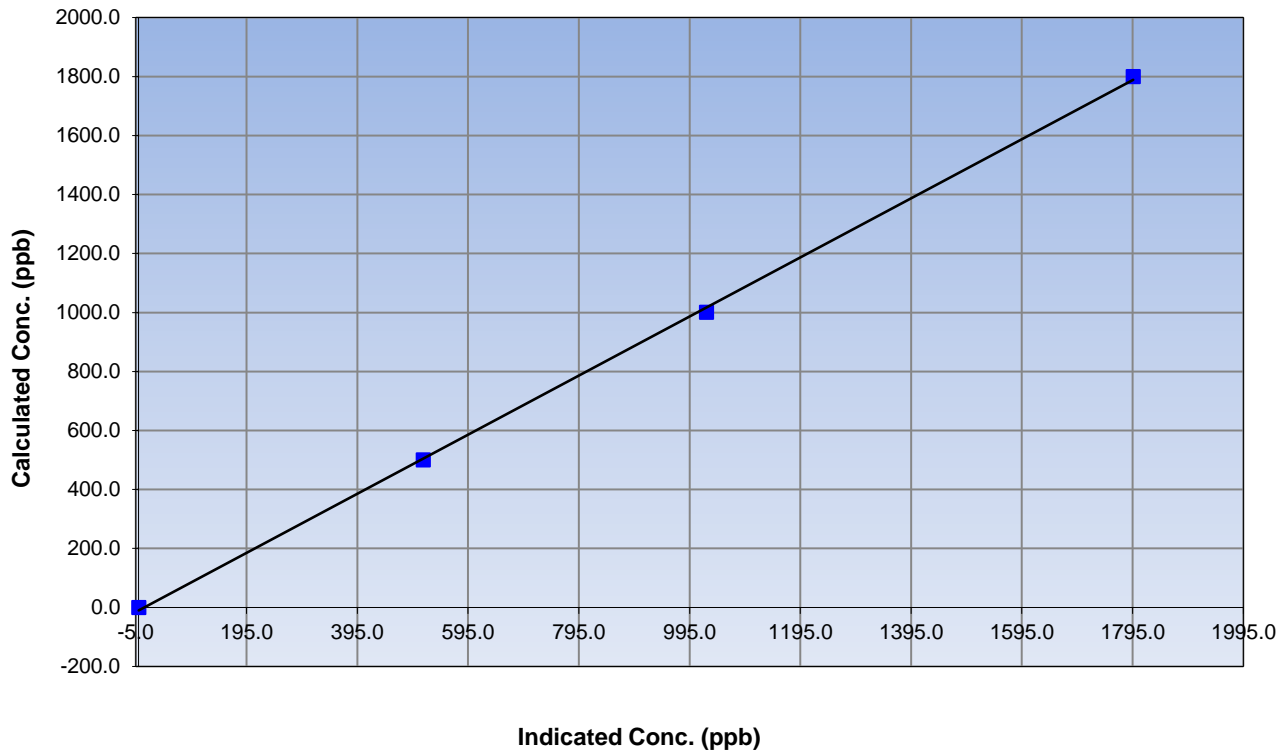
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	API T201	Analyzer serial #	152

NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999719
1799.2	1796.0	1.0018		
1000.8	1025.8	0.9757	Slope	1.001636
500.4	514.0	0.9736		
			Intercept	-10.252199

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

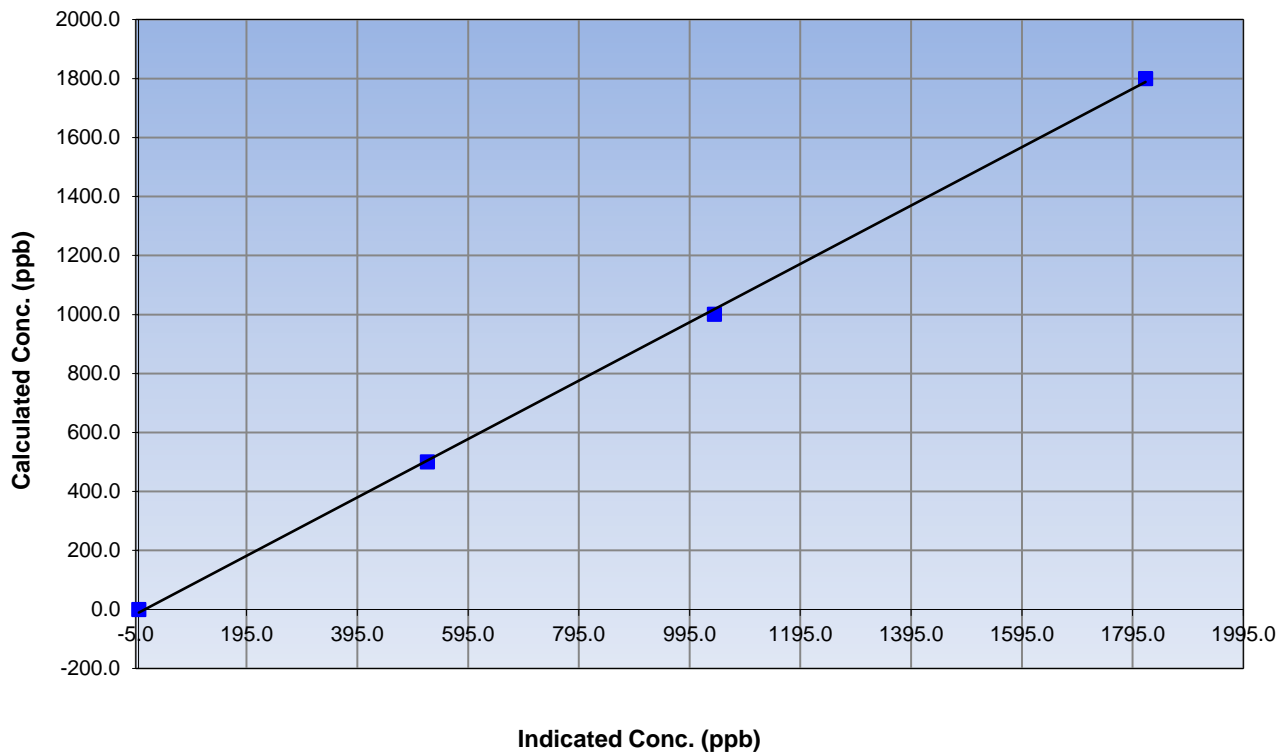
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	API T201	Analyzer serial #	152

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999696
1799.2	1818.3	0.9895		
1000.8	1039.8	0.9626	Slope	0.989520
500.4	521.2	0.9601		
			Intercept	-11.001861

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

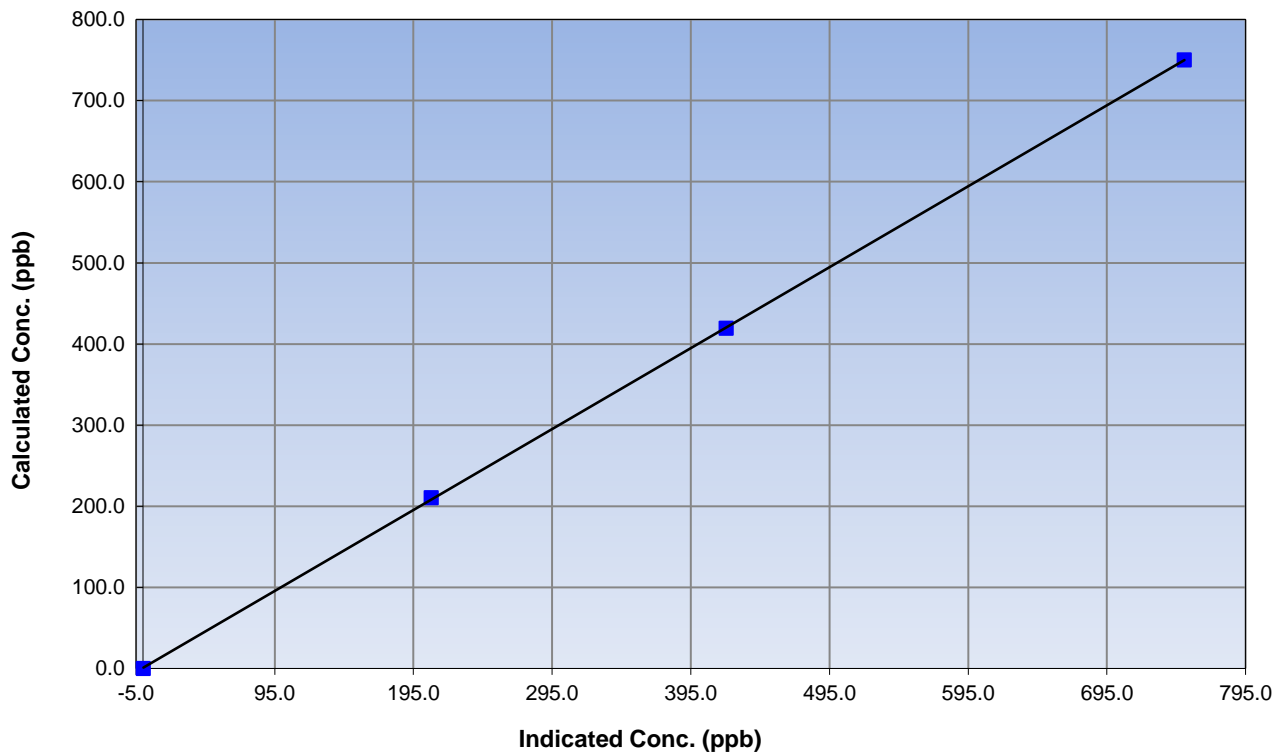
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	API T201	Analyzer serial #	152

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999975
750.0	750.9	0.9988		
419.3	420.6	0.9970	Slope	0.997722
210.5	208.0	1.0124		
			Intercept	0.803858

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

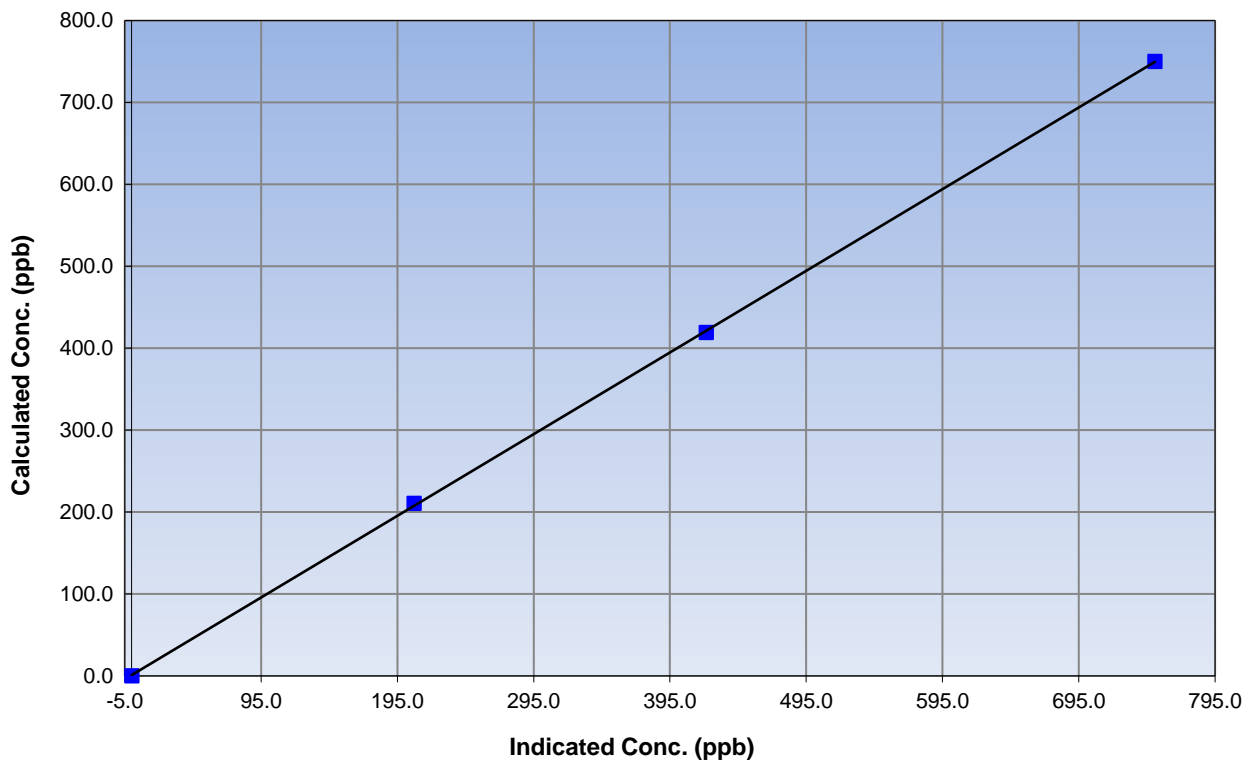
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999956
750.0	750.8	0.9990		
419.3	421.6	0.9945	Slope	0.997105
210.5	207.4	1.0153		
			Intercept	0.994442

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

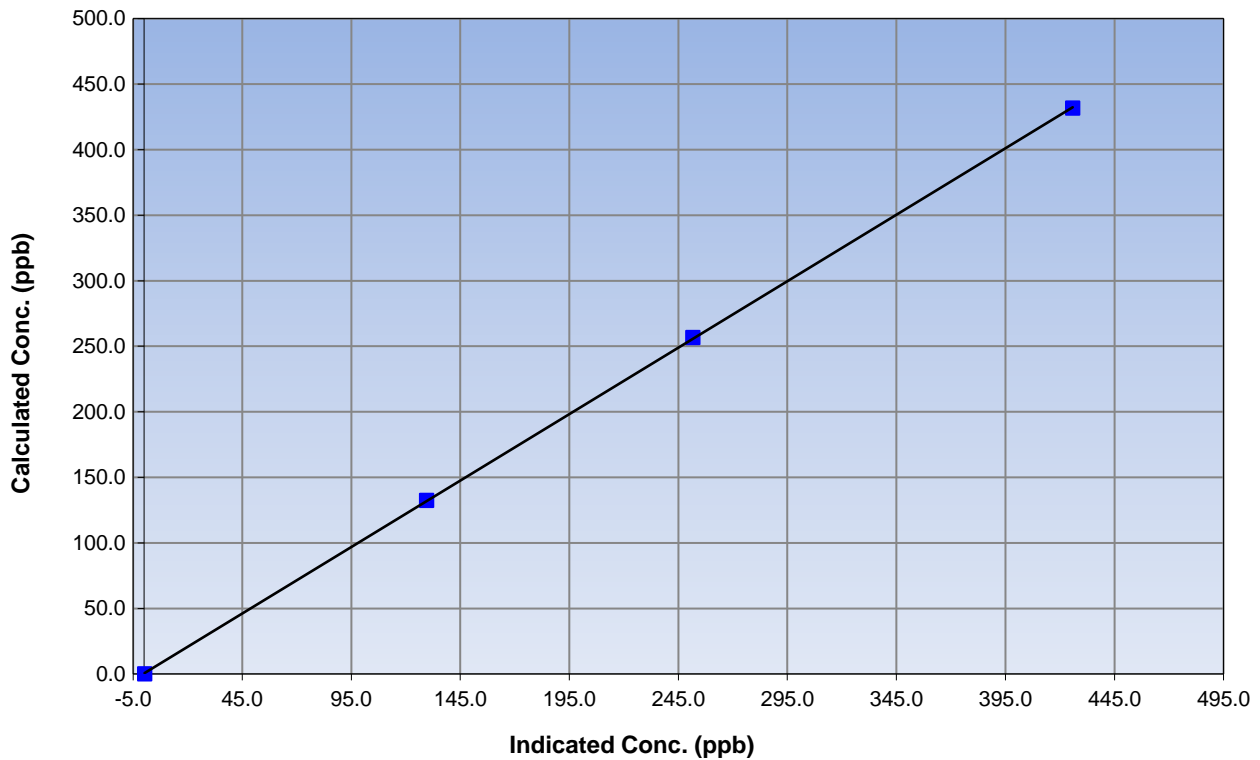
Station Information

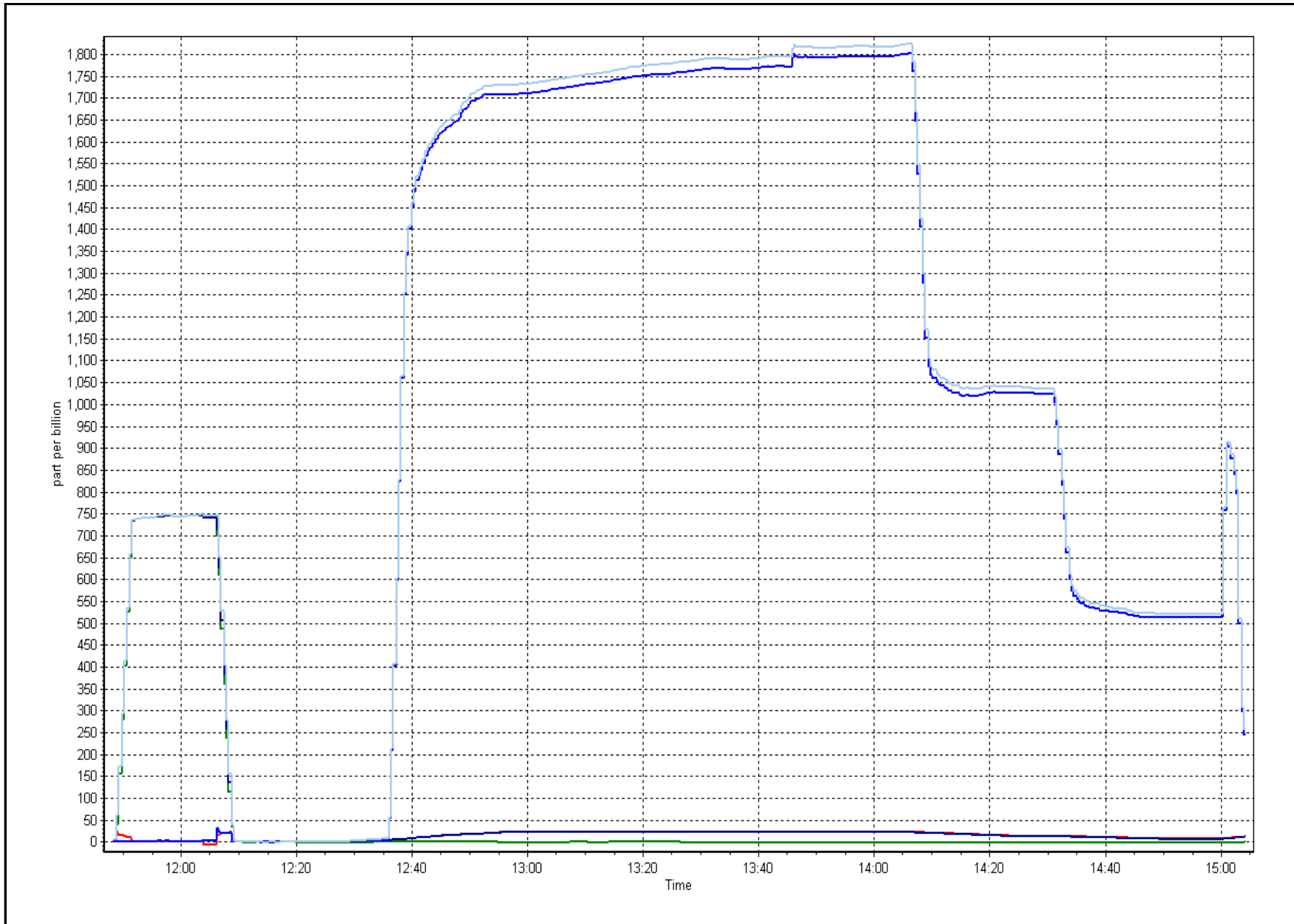
Calibration Date	December 12, 2016	Previous Calibration	November 14, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:20	End Time (MST)	14:20
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
	0.2		Correlation Coefficient	0.999985
431.7	425.8	1.0137		
256.7	251.7	1.0198	Slope	1.010174
132.3	129.6	1.0208		
			Intercept	1.769413

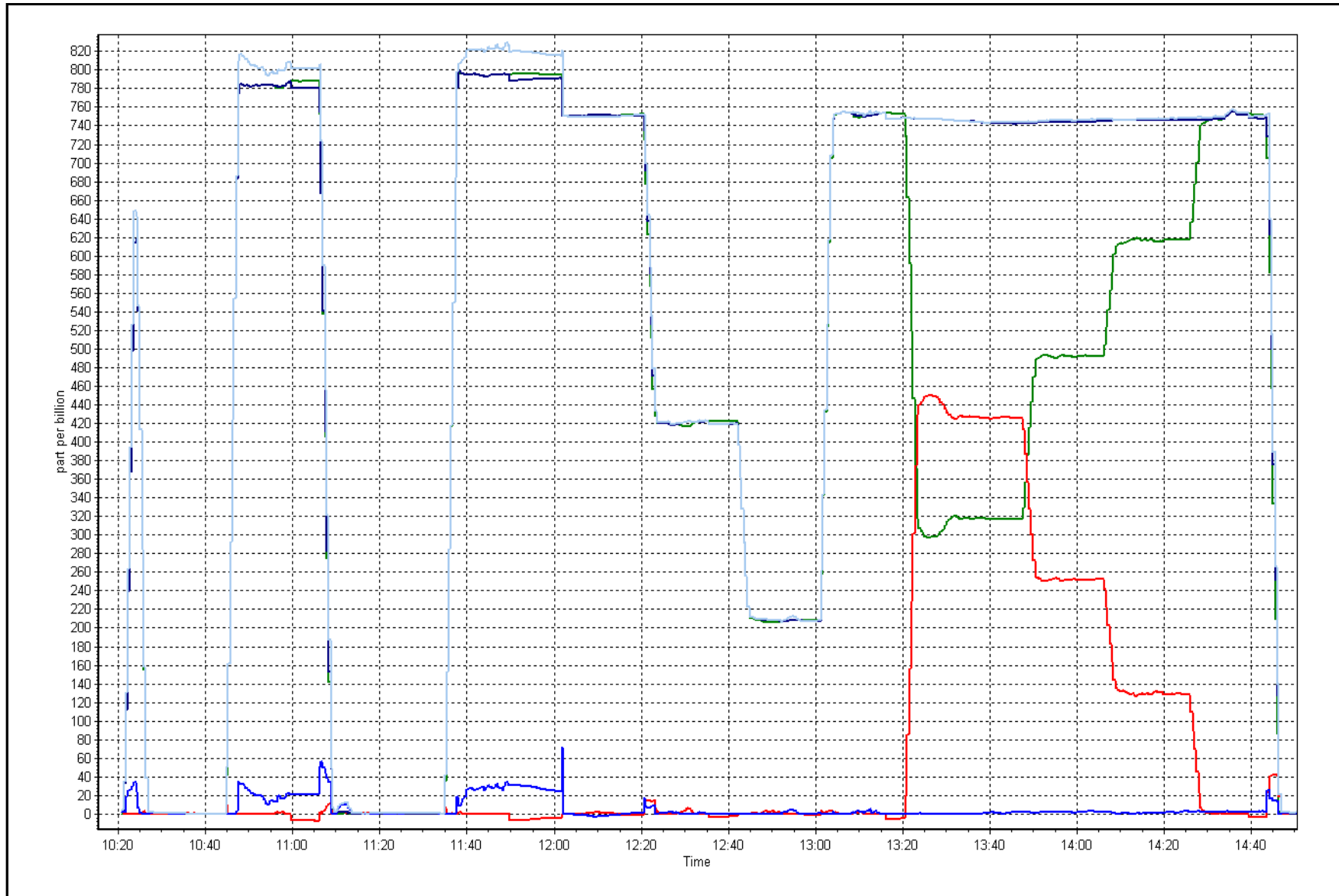
NO₂ Calibration Curve





NOx Calibration Plot

Date: 12-Dec-2016





Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Bertha Ganter - Fort McKay	Station number:	AMS 1
Calibration Date:	December 14, 2016	Last Cal Date:	November 17, 2016
Start time (MST):	9:35	End time (MST):	12:02
Sharp Model:	Thermo 5030 SHARP	S/N:	E-1486
Particulate Fraction:	PM2.5	C14 Source S/N:	5691
Flow Standard Model:	Delta-Cal	S/N:	1451
Temp/RH standard:	Delta-Cal	S/N:	1451

Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T1 (°C)	-21	-22.3	-21	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	988	983.6	988	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1009.8	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.6	-----	0	<input type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date:	<u>June 8, 2016</u>	<u>Tolerance</u>
	Flow w/o adaptor: _____	Flow w/ adaptor: _____		0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: _____	S/N: _____
	Date of check: _____	Last Cal Date: <u>November 17, 2016</u>
	New Correction Factor: _____	Previous Correction Factor: _____

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T2 (°C)	-----	-----	-----	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	-----	-----	-----	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	-----	-----	-----	<input type="checkbox"/>	+/- 2 °C
RH (%)	-----	-----	-----	<input type="checkbox"/>	+/- 10%

Notes: Cyclone head replaced with a clean head.No adjustments to T1, RH or P3. Nephelometer zero adjusted.

Calibration by: Devin Russell



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 2
MILDRED LAKE
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	37	37	100.00	32	0	13	0
H2S (ppb) Average	708	36	36	100.00	6	0	1	0
THC (ppm) Average	684	35	60	96.64	5.2	-	3.2	-
Temperature (C) Average	744	0	0	100.00	2.4	-	-1.6	-
Relative Humidity (%) Average	744	0	0	100.00	97	-	90	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	20	-	16	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	2	5	-	0	0	0	0	1	6	32
H2S (ppb) Average	708	0.7	1	-	0	0	0	0	1	2	6
THC (ppm) Average	684	2.6	0.5	-	2.1	2.2	2.3	2.4	2.8	3.2	5.2
Temperature 2 m (C) Average	744	-17.11	8.7	-	-35.1	-28.6	-22.9	-17.5	-11.5	-3.6	2.4
Relative Humidity (%) Average	744	79.7	6	-	63	73	76	80	84	87	97
Wind Speed 10 m (km/h) Average	744	8.1	4	-	0	3	5	7	11	15	20
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	07 Dec 2016 12:00	08 Dec 2016 12:00	25	Maintenance - replace sample pump



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	As Found		
Start Time (MST)	10:06	End Time (MST)	15:35
Gas Cert Reference	LL107930	Station temp.	22 Deg C
Cal Gas Concentration	51.2 ppm	Cal Gas Exp Date	2/19/2018
Calibrator Make/Model	API T700	Serial Number	1185
ZAG Make/Model	API 701	Serial Number	4767
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8790

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-653	-653
Analyzer IP address	192.168.1.43		Lamp voltage	805	805
Calculated slope	1.001354	1.002813	Chamber temp	45.2	45.2
Calculated intercept	-2.992743	1.271164	Pressure	716.9	717.5
Analyzer Background	19.4	20.5	Flow	0.509	0.510
Analyzer Coefficient	0.927	0.977	Intensity	91	91

Analyzer make TEI 43i Analyzer serial # JC1404901075

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	76.4	782.3	740.4	1.057
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	76.4	782.3	779.8	1.003
second point	5000	38.3	392.2	388.5	1.010
third point	5000	19.2	196.6	193.9	1.014
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	76.4	782.3	789.7	0.991
Average Correction Factor					1.009

Corrected As found 740.4 Previous response 784.3 % change 5.9%

Notes:

Changed inlet filter after as founds. Adjusted the span.

Calibration Performed By: Jayne Marcoux



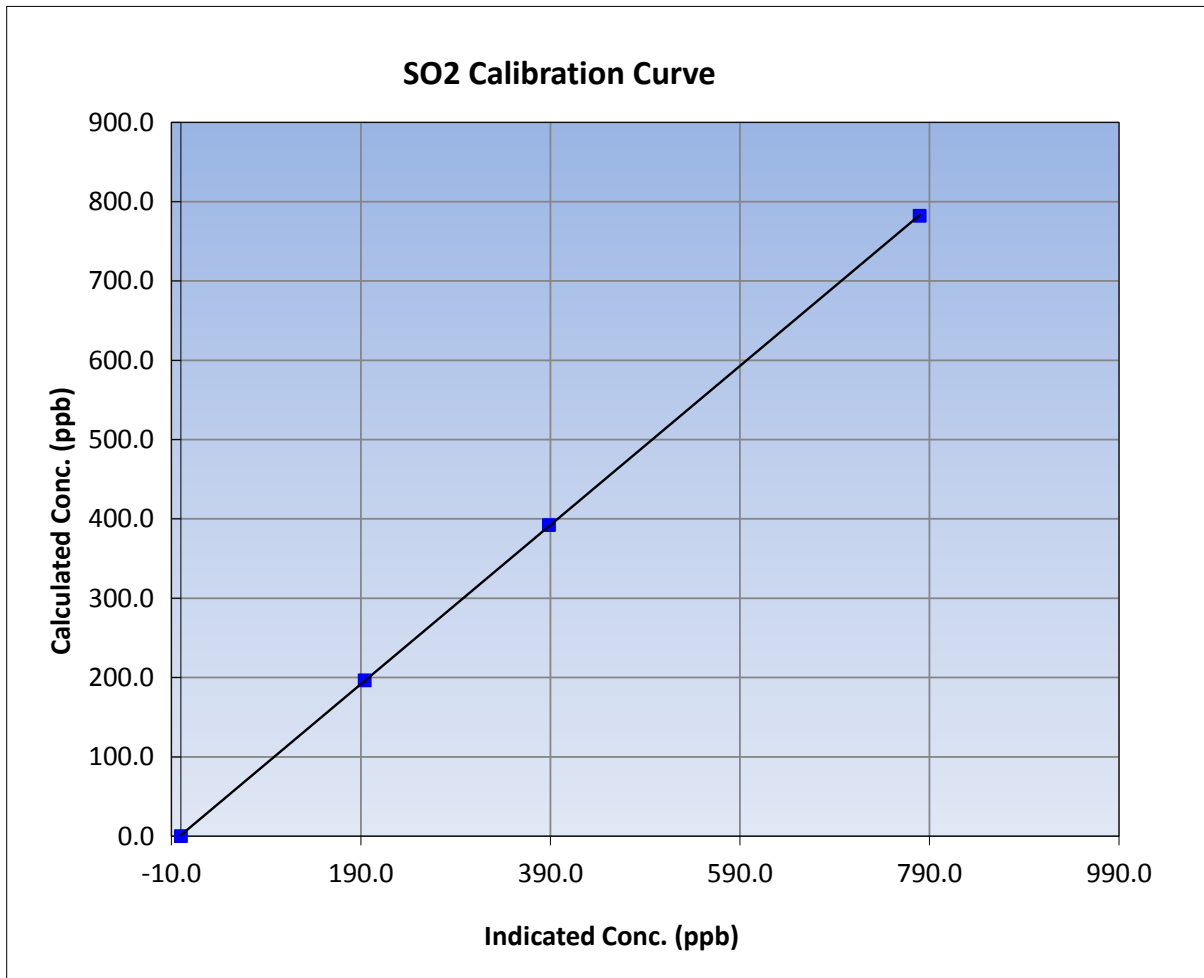
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	10:06	End Time (MST)	15:35
Analyzer make	TEI 43i	Analyzer serial #	JC1404901075

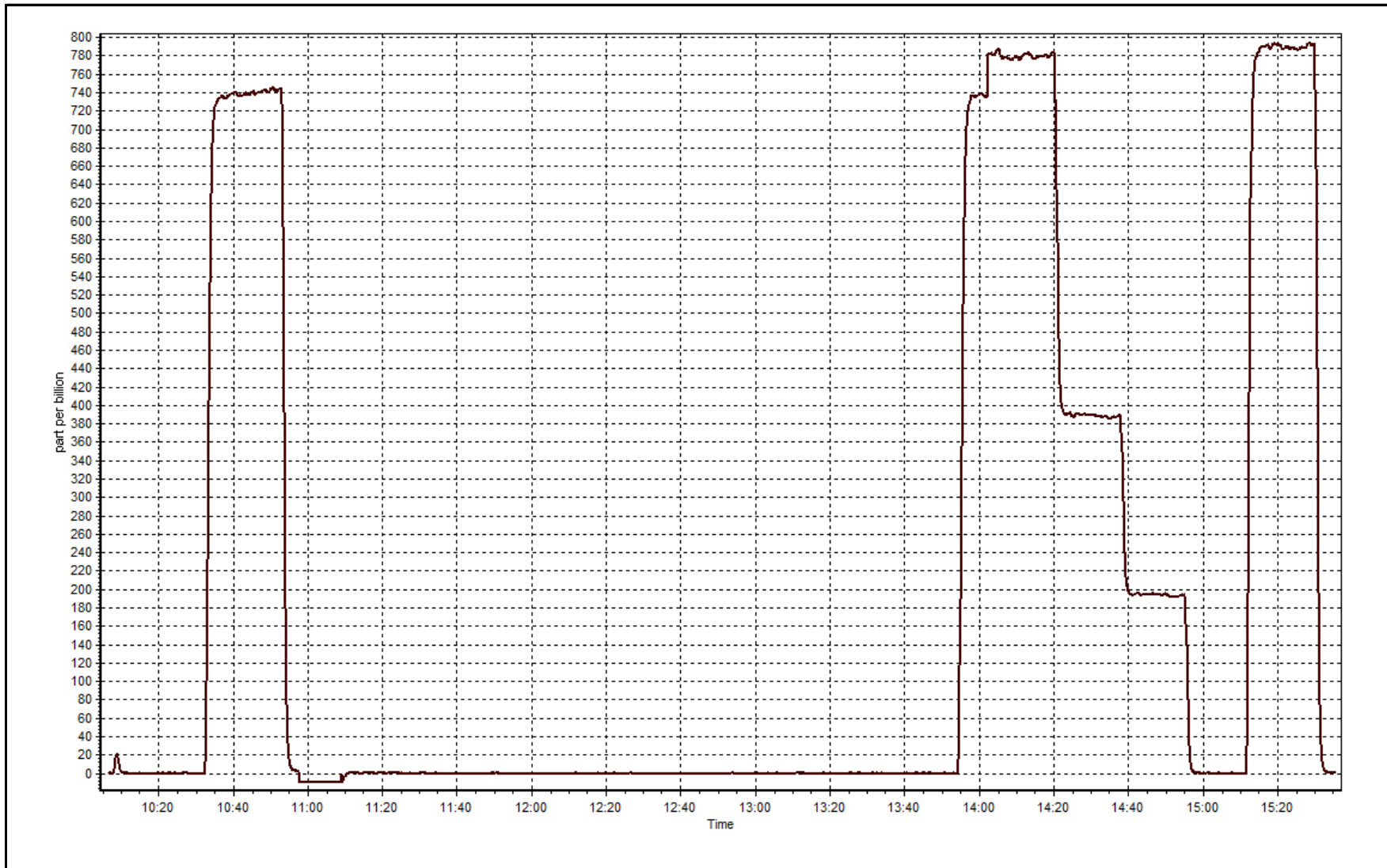
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999985
782.3	779.8	1.0033		
392.2	388.5	1.0096	Slope	1.002813
196.6	193.9	1.0139		
			Intercept	1.271164



SO2 Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 6, 2016	Last Calibration	November 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	9:43	End Time (MST)	14:13
Gas Cert Reference	ALM028262	Station temp.	22 Deg C
Cal Gas Concentration	5.04 ppm	Cal Gas Exp Date	September 9, 2017
Calibrator Make/Model	API T700	Serial Number	1185
ZAG air Make/Model	API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	Serial Number	8790
SO2 gas concentration	51.2 ppm	SO2 gas cert/exp	LL107930 19-Feb-18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-601	-601
Analyzer IP address	192.168.1.42		Lamp voltage	788	786
Calculated slope	0.999980	0.980731	Chamber temp	45	45
Calculated intercept	0.136920	-0.253553	Pressure	558.8	558.8
Analyzer Background	15.7	16.8	Flow	1.033	1.033
Analyzer Coefficient	0.925	0.967	Intensity	88	88
			Converter temp.	326	324

Analyzer make/model	TEI 450i	Analyzer serial #	815129107
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5048	0.0	0.0	0.2	----
as found span	5048	79.0	78.9	77.1	1.023
SO2 scrubber check	5048	19.1	193.7	1.7	----
calibrator zero	5048	0.0	0.0	0.0	----
high point	5048	79.0	78.9	80.5	0.979
second point	5048	38.7	38.6	39.8	0.970
third point	5048	18.5	18.5	19.3	0.956
as left zero	5048	0.0	0.0	-0.2	----
as left span	5048	79.0	78.9	80.1	0.984
Average Correction Factor					0.968

Corrected As found	76.9	Previous response	78.7	% change	2.5%
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Notes:

Changed inlet filter after as founds. Completed scrubber check. Adjusted zero and span.

Calibration Performed By: Jayme Marcoux



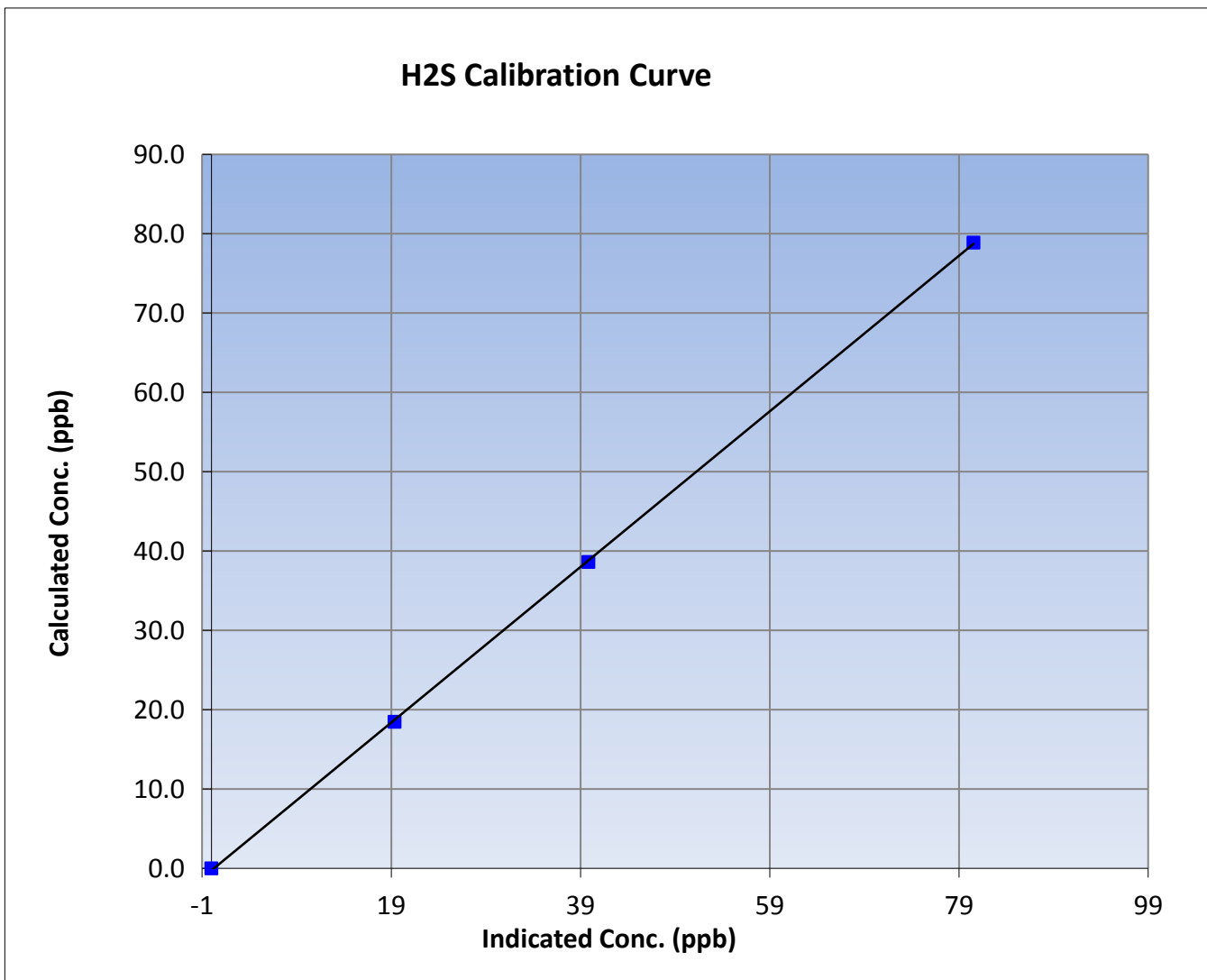
Wood Buffalo Environmental Association H2S Calibration Report

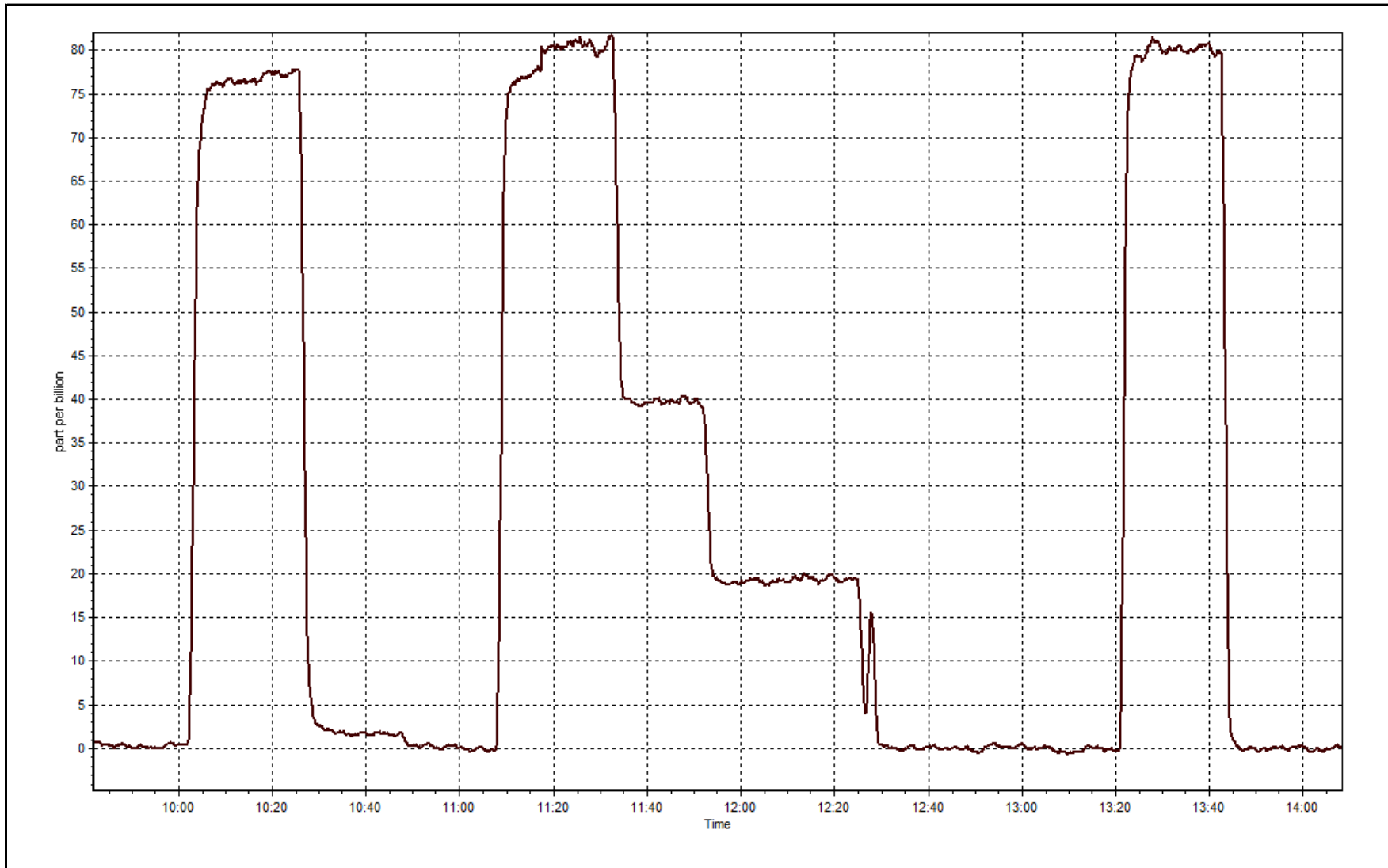
Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	9:43	End Time (MST)	14:13
Analyzer make	TEI 450i	Analyzer serial #	815129107

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999950
78.9	80.5	0.9793		
38.6	39.8	0.9701	Slope	0.980731
18.5	19.3	0.9555		
			Intercept	-0.253553







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 17, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance		
Start Time (MST)	10:06	End Time (MST)	11:00
Gas Cert Reference	LL107930	Cal Gas Expiry Date	2/9/2018
CH4 Cal Gas Conc.	509 ppm	CH4 Equiv Conc.	1081.0 ppm
C3H8 Cal Gas Conc.	208 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1185
ZAG make/model	Teledyne API 701	Serial Number	4767
DACS make/model	Campbell Scientific CR3000	Serial Number	8790

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	6.9	
Analyzer IP address	192.168.1.51		Air or Bypass Press	39.8	
Calculated slope	0.997014		Fuel Pressure	25.9	
Calculated intercept	-0.010577		Analyzer Coeff	4.843	
			Analyzer BKG	1.74	

Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.07	----
as found span	5000	76.4	16.52	17.29	0.955
calibrator zero					
high point					
second point					
third point					
as left zero					
as left span					
Average Correction Factor					

Corrected As found	17.36	Previous response	16.58	% change	-4.5%
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Notes:

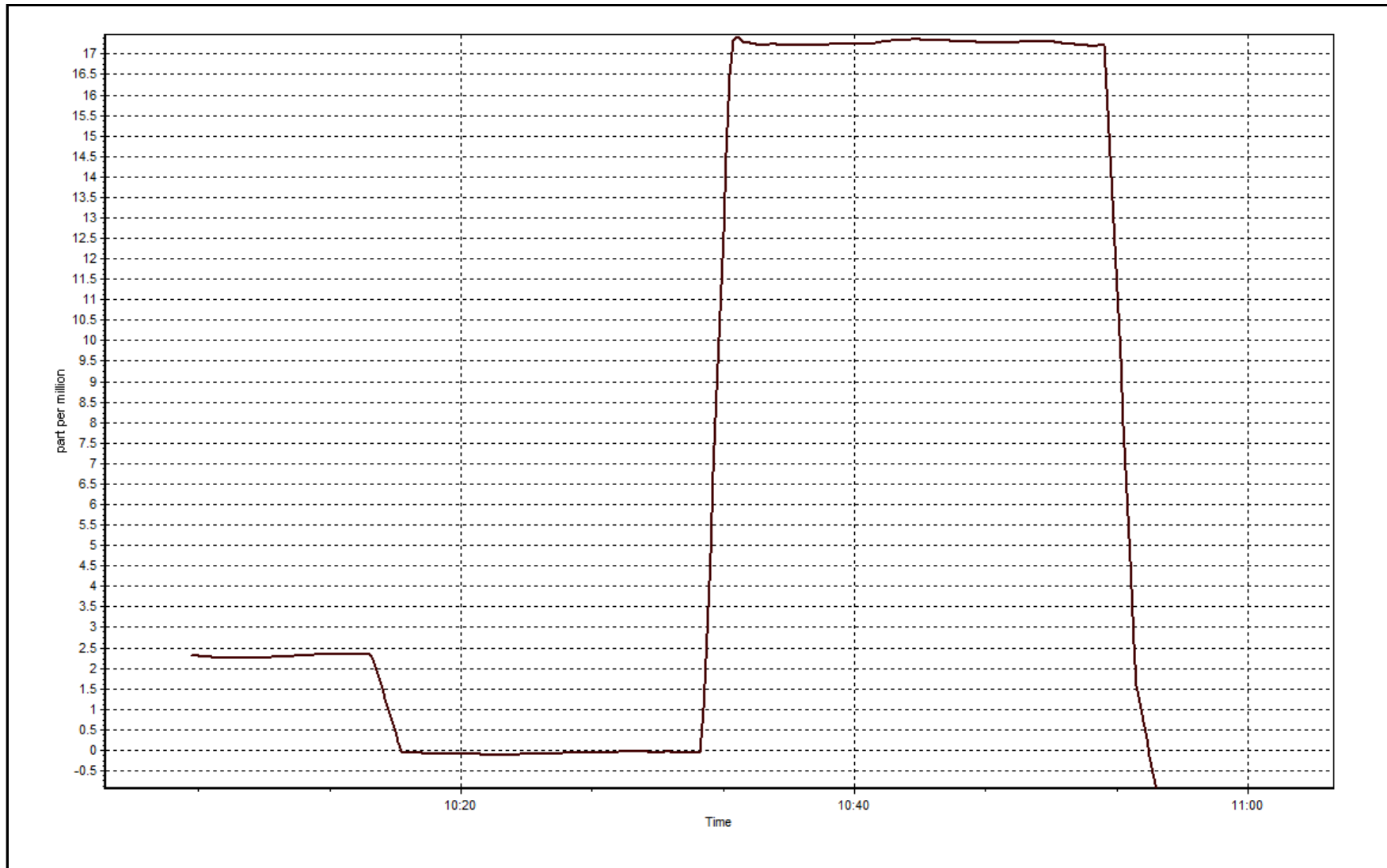
Could not complete three point as founds before the removal due to the analyzer not working. Changed inlet filter after as founds.

Calibration Performed By:

Jayme Marcoux

THC Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 8, 2016	Last Calibration	December 7, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Other:	Maintenance	
Start Time (MST)	12:00	End Time (MST)	15:38
Gas Cert Reference	LL107930	Cal Gas Expiry Date	2/9/2018
CH4 Cal Gas Conc.	509 ppm	CH4 Equiv Conc.	1081.0 ppm
C3H8 Cal Gas Conc.	208 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1185
ZAG make/model	Teledyne API 701	Serial Number	4767
DACS make/model	Campbell Scientific CR3000	Serial Number	8790

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	7.3	7.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	40.1	39.8
Calculated slope	1.001152	1.000061	Fuel Pressure	25.8	25.6
Calculated intercept	-0.095742	-0.030650	Analyzer Coeff	4.897	4.843
			Analyzer BKG	2.45	1.74

Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
calibrator zero	5000	0.0	0.00	-0.01	----
high point	5000	76.4	16.52	16.54	0.999
second point	5000	38.3	8.28	8.29	0.999
third point	5000	19.2	4.15	4.25	0.977
as left zero					
as left span					
Average Correction Factor					0.991

Corrected As found	NA	Previous response	NA	% change	NA
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Notes:

Install calibration. Adjusted the zero and span. During as left, zero was high, called senior tech and advised to recalibrate the zero and span and not to do the as lefts zero and span.

Calibration Performed By:

Jayme Marcoux



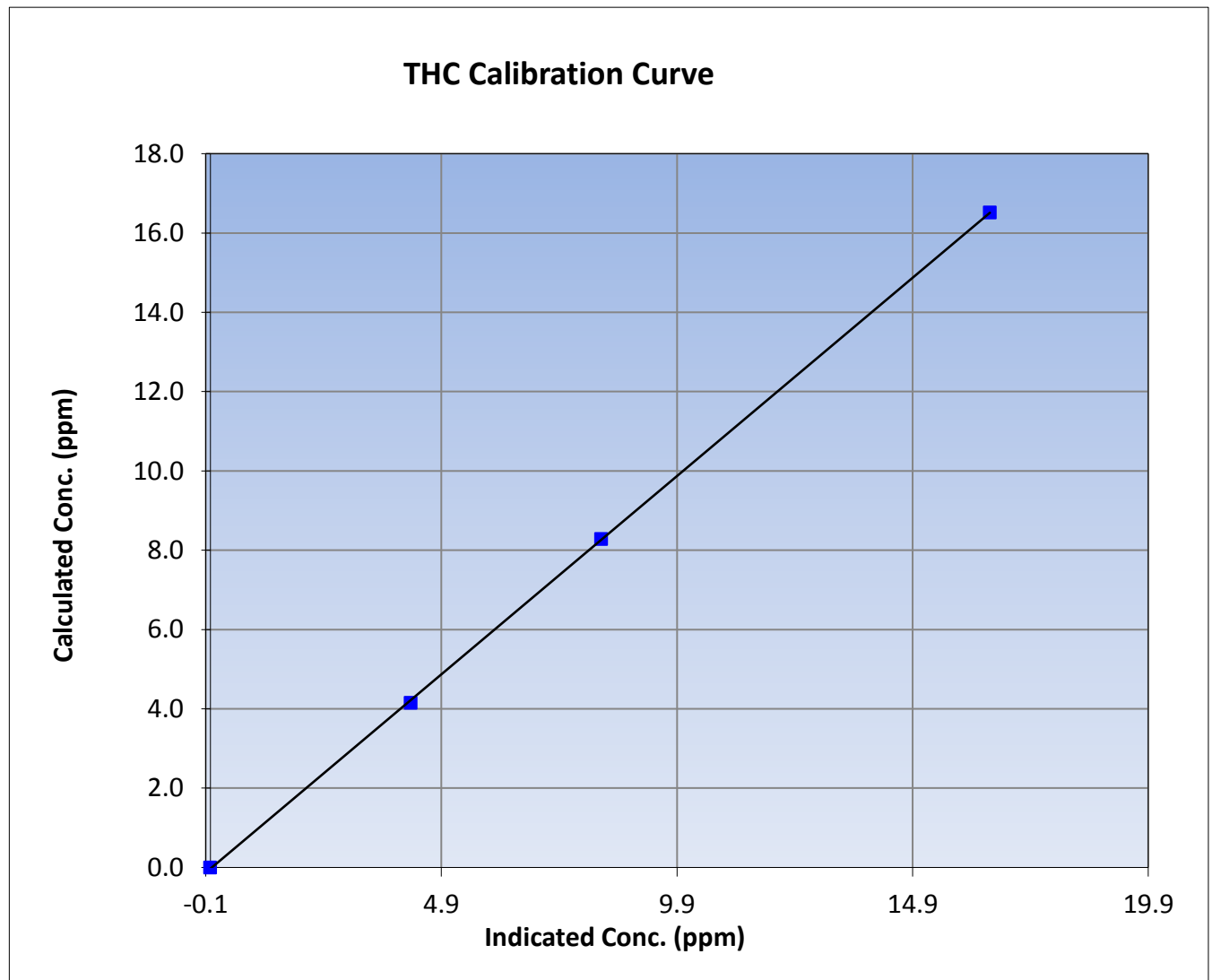
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 8, 2016	Previous Calibration	December 7, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	12:00	End Time (MST)	15:38
Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231

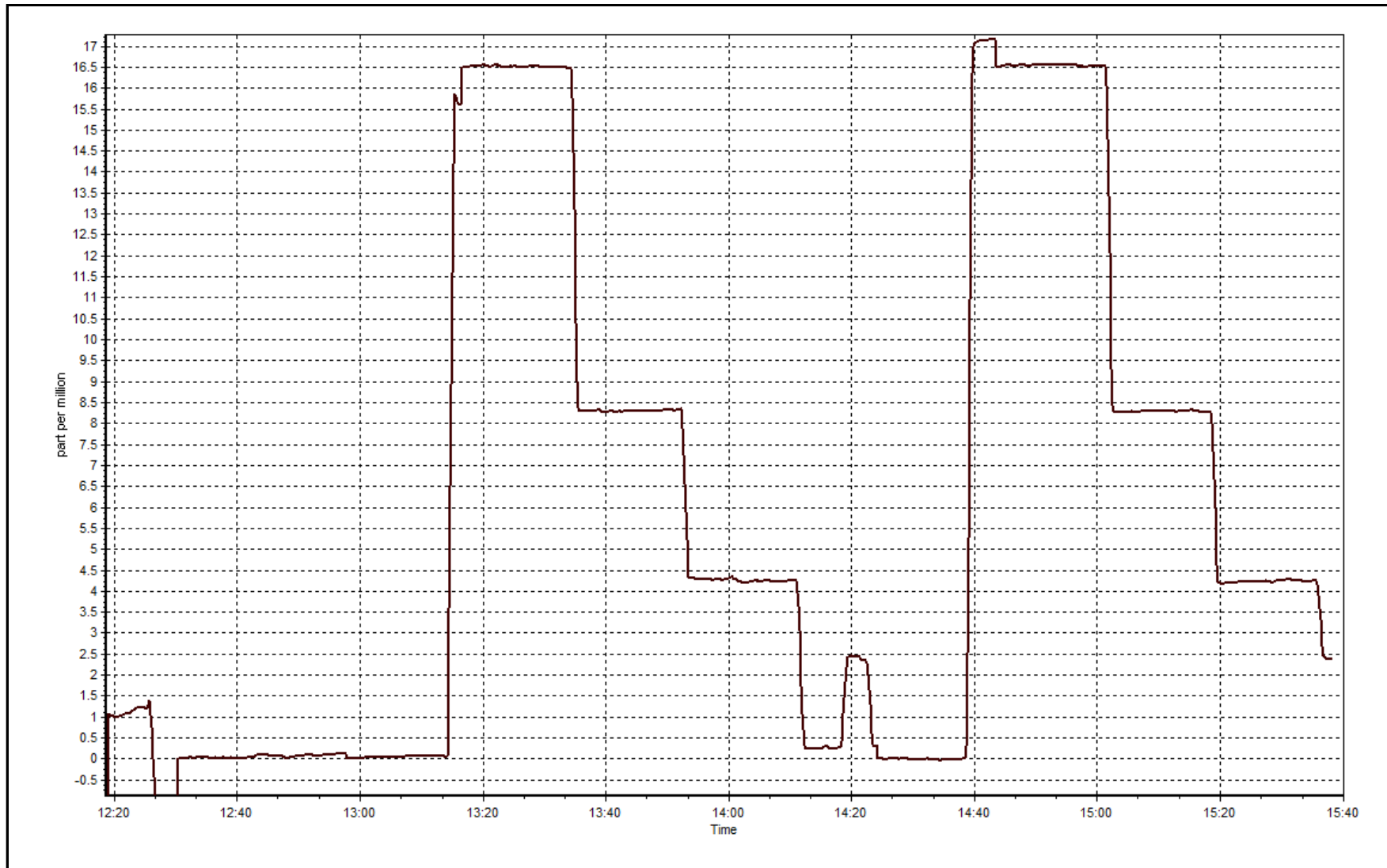
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.01	----	Correlation Coefficient	0.999954
16.52	16.54	0.9987		
8.28	8.29	0.9988		
4.15	4.25	0.9767		
			Slope	1.000061
			Intercept	-0.030650



THC Calibration Plot

Date: December 8, 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

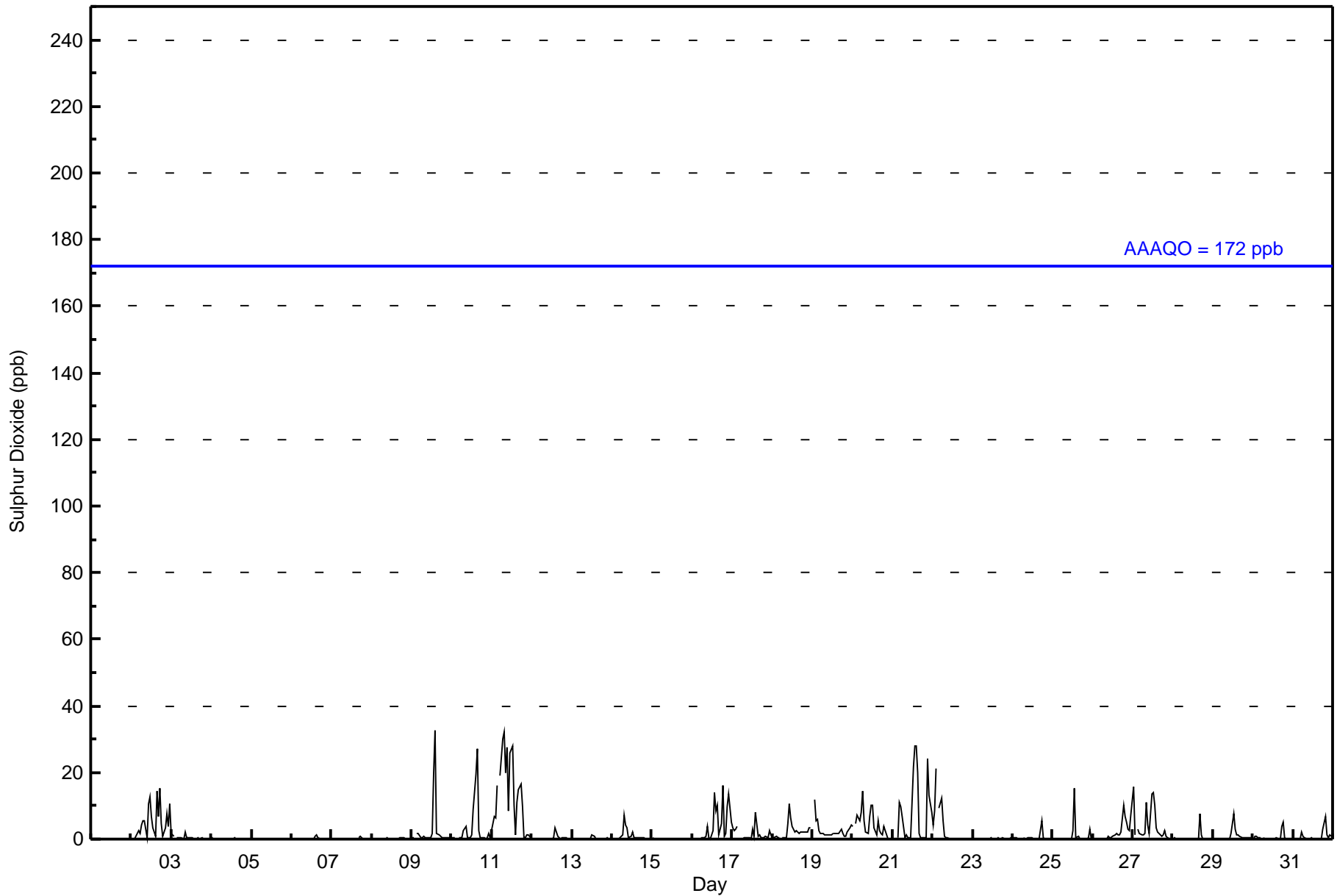
Sulphur Dioxide (SO₂) - ppb
Mildred Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 32 ppb on Dec 9 15:00										Maximum Daily Average: 12.6 ppb on Dec 11										Hours of Data: 707						
Minimum Value: 0 ppb on Dec 1 02:00										Minimum Daily Average: 0.0 ppb on Dec 5										Hours of Missing Data: 37						
Maximum Diurnal Average: 4.1 ppb at hour 14										Minimum Diurnal Average: 0.7 ppb at hour 21										Hours of Calibration: 37						
Monthly Average: 2.0 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 6 P ₉₉ = 27										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	Z	0	2	3	2	4	6	5	1	10	13	7	3	1	15	7	15	5	1	4	8	4	10	5.3	15
3-Dec	2	1	Z	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
4-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.1	1
7-Dec	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	C	0	1	1	0	0	0	0	--	1	
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Dec	0	0	Z	2	2	0	1	1	0	1	0	0	2	19	32	2	1	1	1	1	0	0	0	0	2.9	32
10-Dec	0	0	1	Z	0	0	0	3	4	0	0	1	9	20	27	2	1	0	0	0	0	0	2	1	3.2	27
11-Dec	3	7	6	16	Z	19	30	32	20	28	8	26	28	10	1	11	15	16	10	1	0	1	1	0	12.6	32
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	3	1	1	1	0	0	0	0	0	0	0	0.3	3
13-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
14-Dec	0	Z	0	0	0	1	1	7	4	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0	1.0	7
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	0	Z	0	0	0	0	1	4	0	0	3	14	8	10	1	5	16	1	2	10	13	5	4.1	16
17-Dec	3	2	3	4	Z	0	0	0	0	1	1	0	3	1	8	1	1	0	0	0	1	0	3	1	1.5	8
18-Dec	0	0	1	1	0	Z	0	0	0	5	10	6	4	2	3	2	2	2	2	2	2	2	3	3	2.4	10
19-Dec	Z	12	6	6	2	2	2	1	1	1	1	1	2	2	2	2	2	3	2	1	1	2	4	4	2.6	12
20-Dec	4	Z	5	7	6	8	14	5	2	2	7	10	10	3	1	5	3	2	1	4	1	0	0	0	4.4	14
21-Dec	0	0	Z	1	11	10	7	1	1	1	0	0	21	28	28	20	2	0	0	0	1	24	13	8	7.7	28
22-Dec	4	9	21	Z	9	12	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7	21
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0.4	6
25-Dec	Z	0	0	0	0	0	0	0	0	0	0	2	15	1	1	0	0	0	0	0	0	3	0	0	1.0	15
26-Dec	0	Z	0	0	0	0	0	0	0	1	0	1	1	1	2	1	1	2	10	7	5	3	3	7	2.0	10
27-Dec	16	1	Z	3	2	1	1	2	11	4	2	14	14	10	3	2	1	1	1	3	1	0	0	0	4.0	16
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	0.4	8
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	2	7	3	1	1	1	0	0	0	0	0	0	0	0.8	7
30-Dec	0	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0	0	0	0.6	5
31-Dec	Z	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3	7	1	1	1	1	0.8	7
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Mildred Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Mildred Lake - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	670	94.77	94.77
11 - 20	25	3.54	98.30
21 - 60	12	1.70	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Mildred Lake - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	71	80	32	10	10	12	8	69	97	87	30	25	9	36	56	38	670
11 - 20	0	0	0	0	0	1	3	8	2	1	0	1	6	3	0	0	25
21 - 60	0	0	0	0	0	0	0	3	0	1	0	0	6	2	0	0	12
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	71	80	32	10	10	13	11	80	99	89	30	26	21	41	56	38	707

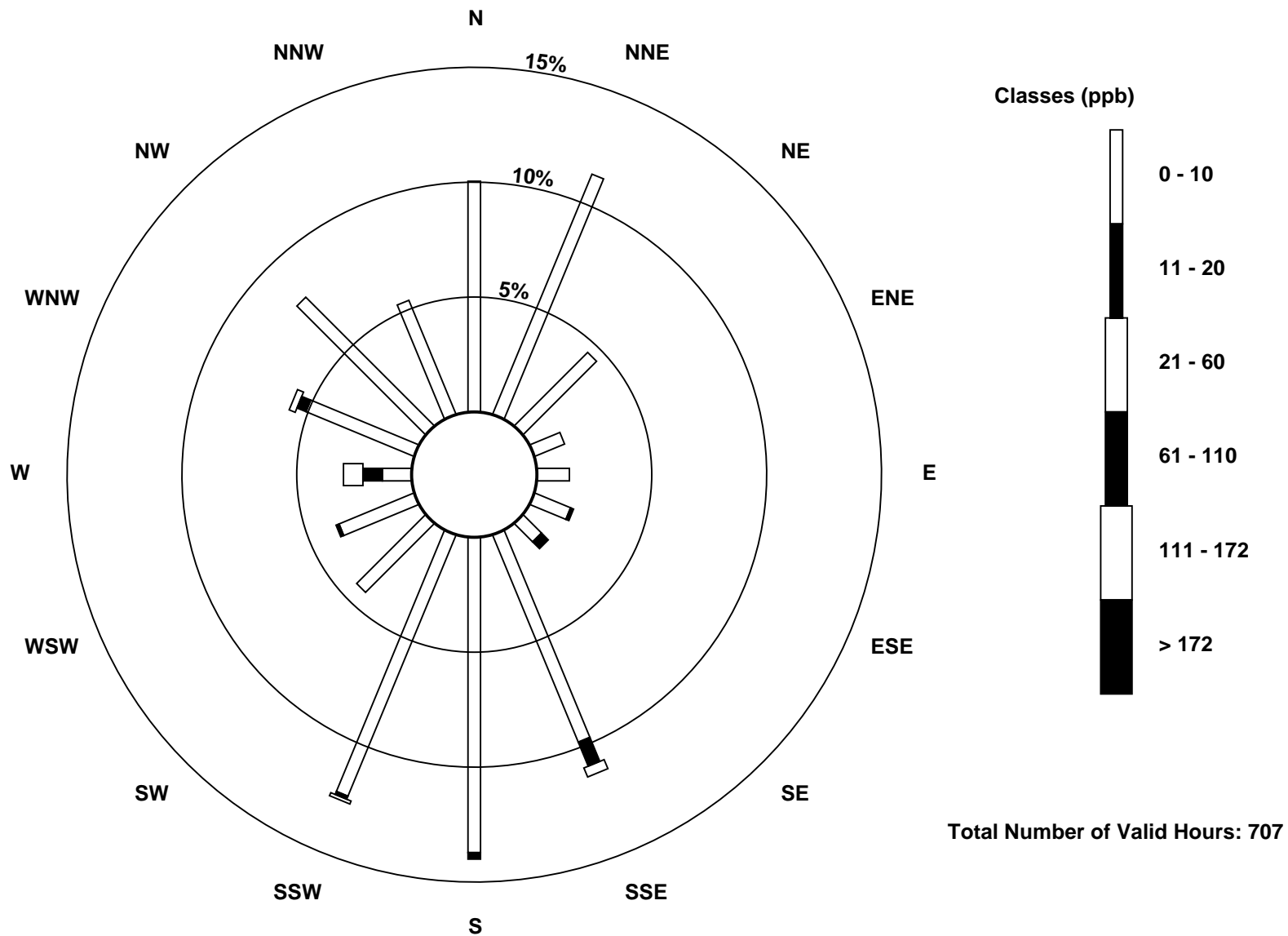
Total Number of Valid Hours: 707

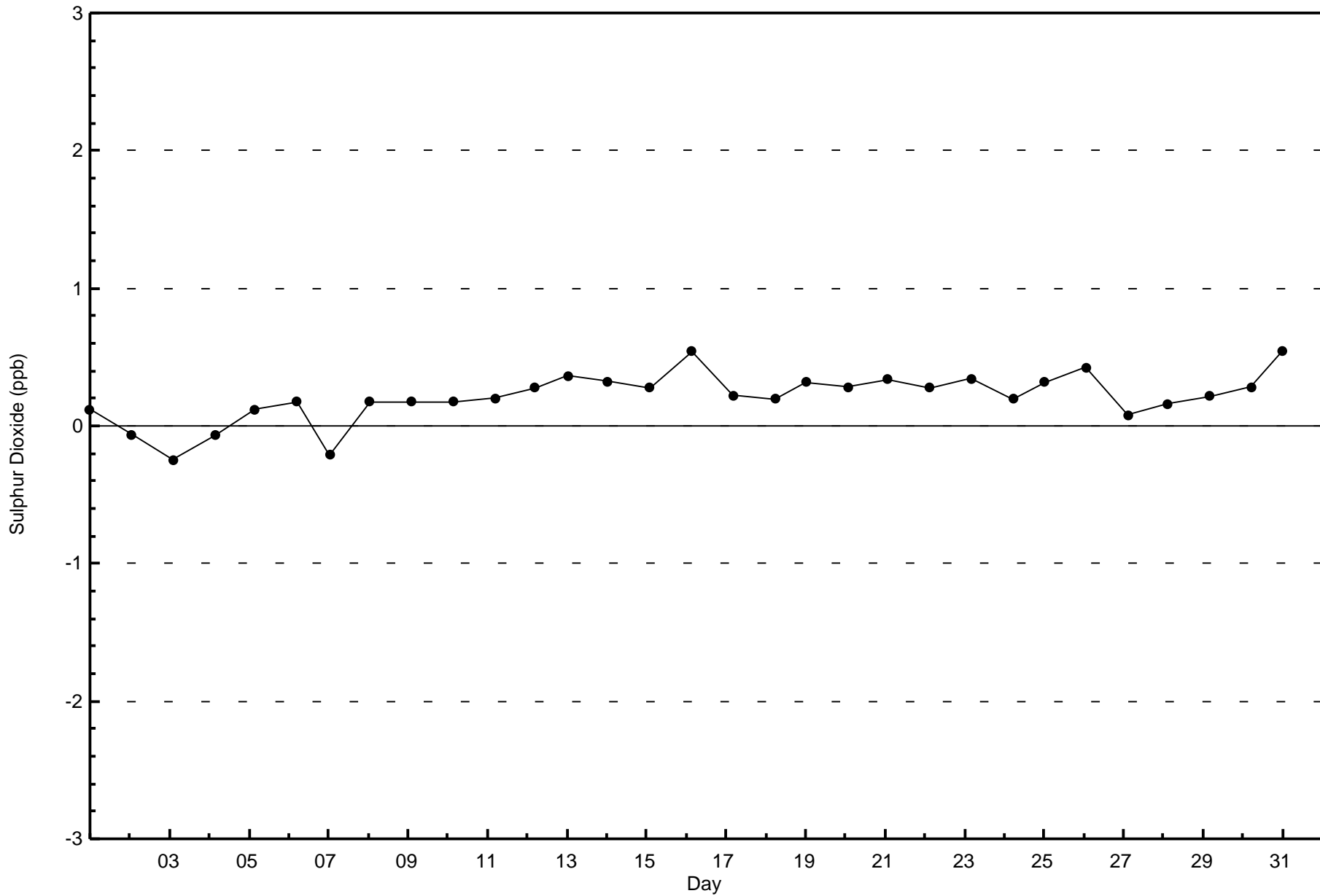
Total Number of Hours: 744

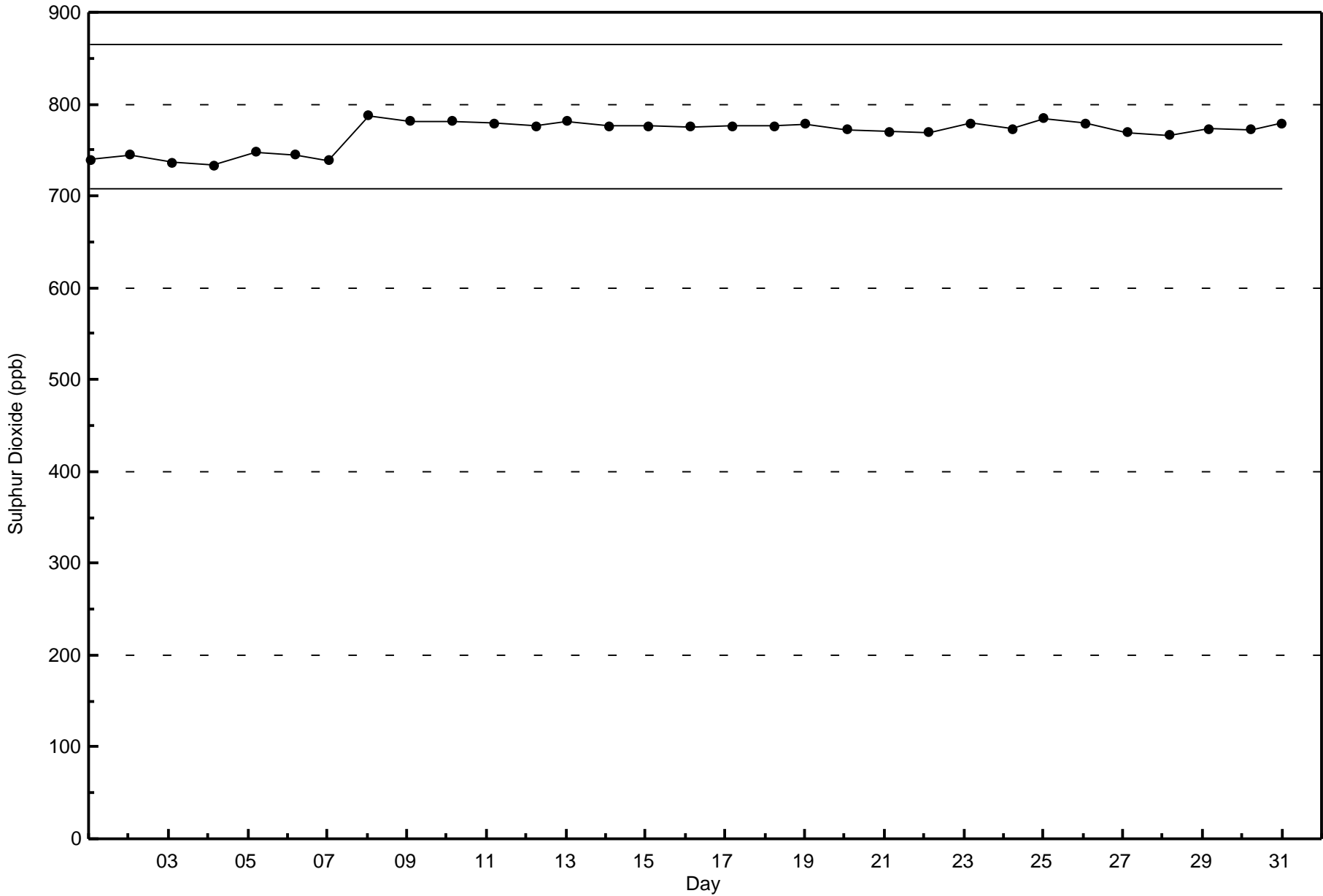


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Mildred Lake (AMS 2)









Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

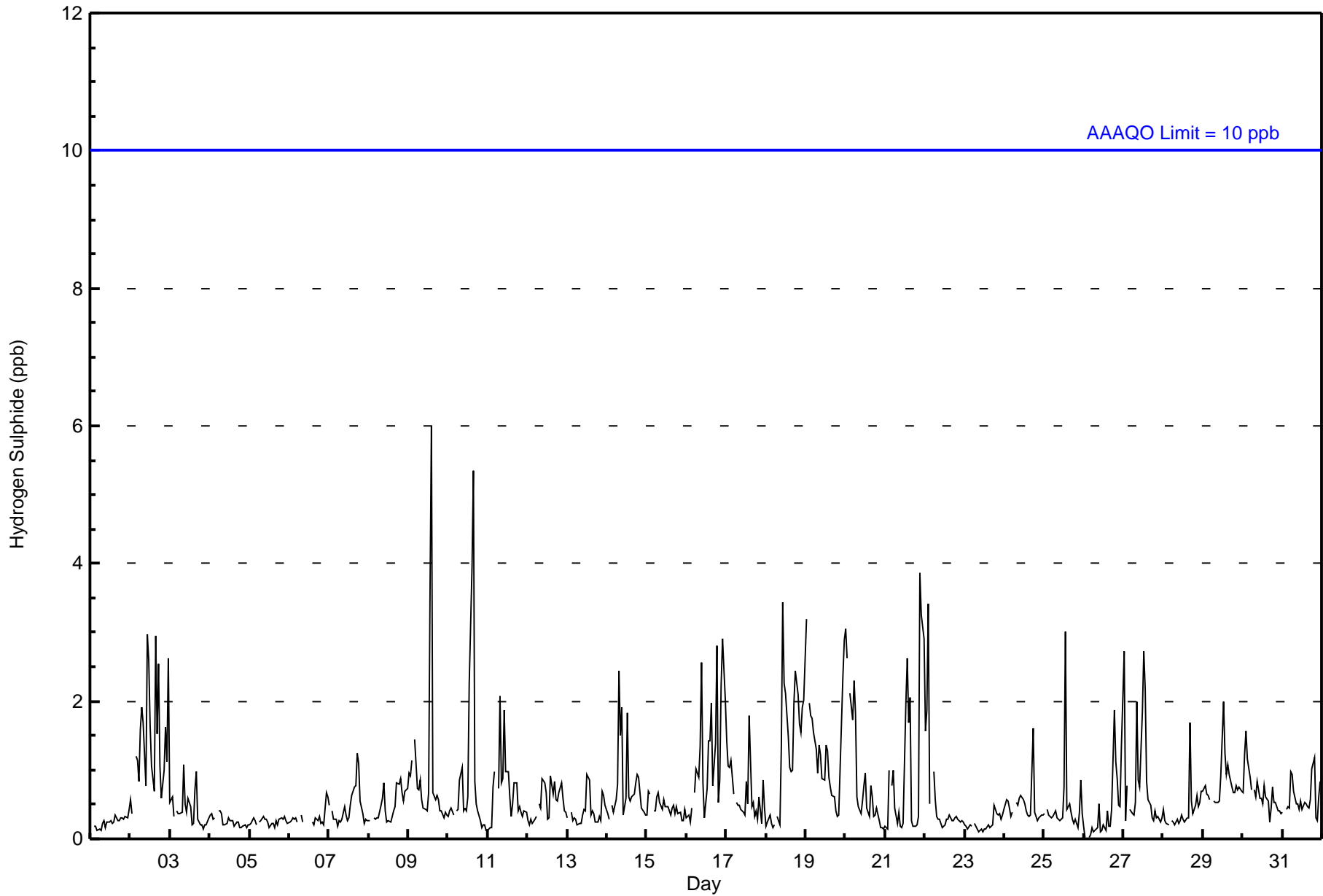
Mildred Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 ppb on Dec 9 15:00 Maximum Daily Average: 1.5 ppb on Dec 2																	Hours in Service: 744 Hours of Data: 708									
Minimum Value: 0 ppb on Dec 26 04:00 Minimum Daily Average: 0.2 ppb on Dec 23 Maximum Diurnal Average: 0.9 ppb at hour 14 Minimum Diurnal Average: 0.5 ppb at hour 21 Monthly Average: 0.7 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 2 P ₉₉ = 3																	Hours of Missing Data: 36 Hours of Calibration: 36 Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	1	0	Z	1	1	1	2	2	2	1	3	3	2	1	1	3	2	3	1	1	1	2	1	3	1.5	3
3-Dec	1	1	0	Z	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0.4	1	
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
6-Dec	0	0	0	0	0	0	Z	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	1	1	0.3	1
7-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0.5	1
8-Dec	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.5	1
9-Dec	1	1	1	Z	1	1	1	1	1	0	0	0	1	4	6	1	1	1	1	0	0	0	0	1.0	6	
10-Dec	0	0	0	0	Z	0	0	1	1	0	0	0	1	2	4	5	1	0	0	0	0	0	0	0.9	5	
11-Dec	0	0	0	1	1	Z	1	2	1	1	2	1	1	1	0	1	1	1	0	0	0	0	0	0.7	2	
12-Dec	0	0	0	0	0	0	Z	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0.5	1	
13-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0.4	1	
14-Dec	0	0	Z	0	0	1	1	2	2	2	0	1	2	1	1	1	1	1	1	1	1	0	0	0.8	2	
15-Dec	0	1	1	Z	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
16-Dec	0	0	0	0	Z	1	1	1	1	3	1	0	1	1	1	2	1	1	3	1	1	2	3	2	1.2	3
17-Dec	1	1	1	1	1	Z	1	0	0	0	0	0	1	1	2	0	1	0	0	0	1	0	1	0.7	2	
18-Dec	0	0	0	0	0	0	Z	0	0	1	3	2	2	1	1	1	1	2	2	2	2	2	2	2	1.3	3
19-Dec	3	Z	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	2	3	1.3	3
20-Dec	3	3	Z	2	2	2	2	1	0	0	1	1	1	0	0	1	1	0	0	0	0	0	0	0.9	3	
21-Dec	0	0	1	Z	1	1	0	0	0	0	0	0	2	3	2	2	0	0	0	0	0	4	3	3	1.1	4
22-Dec	2	2	3	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3	
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
24-Dec	0	1	1	0	0	0	Z	1	0	1	1	1	1	0	0	0	2	0	0	0	0	0	0	0.5	2	
25-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	3	0	1	0	0	0	0	0	0	1	0.5	3	
26-Dec	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	1	1	0	0	1	0.4	2
27-Dec	3	0	1	Z	0	0	0	1	2	1	1	2	3	2	1	1	0	0	0	0	0	0	0	0.9	3	
28-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	1	1	0.4	2
29-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	0.8	2
30-Dec	1	1	2	1	1	1	Z	1	1	1	1	1	0	1	1	1	0	0	1	1	1	0	0	0.7	2	
31-Dec	0	Z	0	0	0	1	1	1	1	1	0	1	0	1	1	0	0	1	1	1	0	0	1	1	0.6	1
0.7 0.6 0.7 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.7 0.6 0.8 0.9 0.9 0.8 0.6 0.6 0.7 0.5 0.5 0.6 0.7 0.8																								Diurnal Average		
3 3 3 2 2 2 2 2 2 2 3 3 3 3 4 6 5 2 3 3 2 2 4 3 3																								Diurnal Maximum		
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Mildred Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Mildred Lake - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	683	96.47	96.47
3 - 4	23	3.25	99.72
5 - 7	2	0.28	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Mildred Lake - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	72	83	32	10	8	10	6	70	98	86	29	27	19	41	55	37	683
3 - 4	0	0	0	0	1	4	3	9	3	2	0	0	1	0	0	0	23
5 - 7	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	72	83	32	10	9	14	9	81	101	88	29	27	20	41	55	37	708

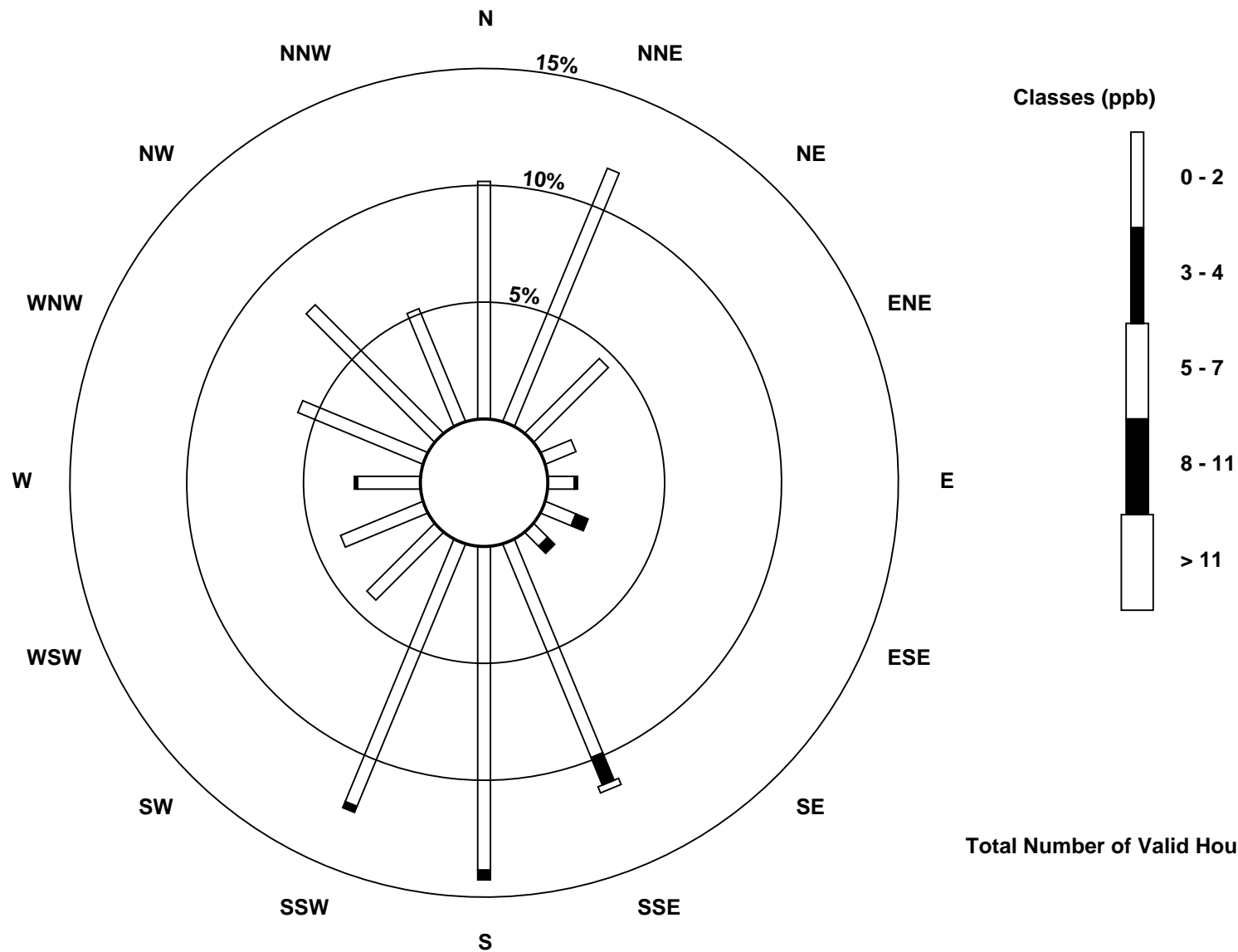
Total Number of Valid Hours: 708

Total Number of Hours: 744

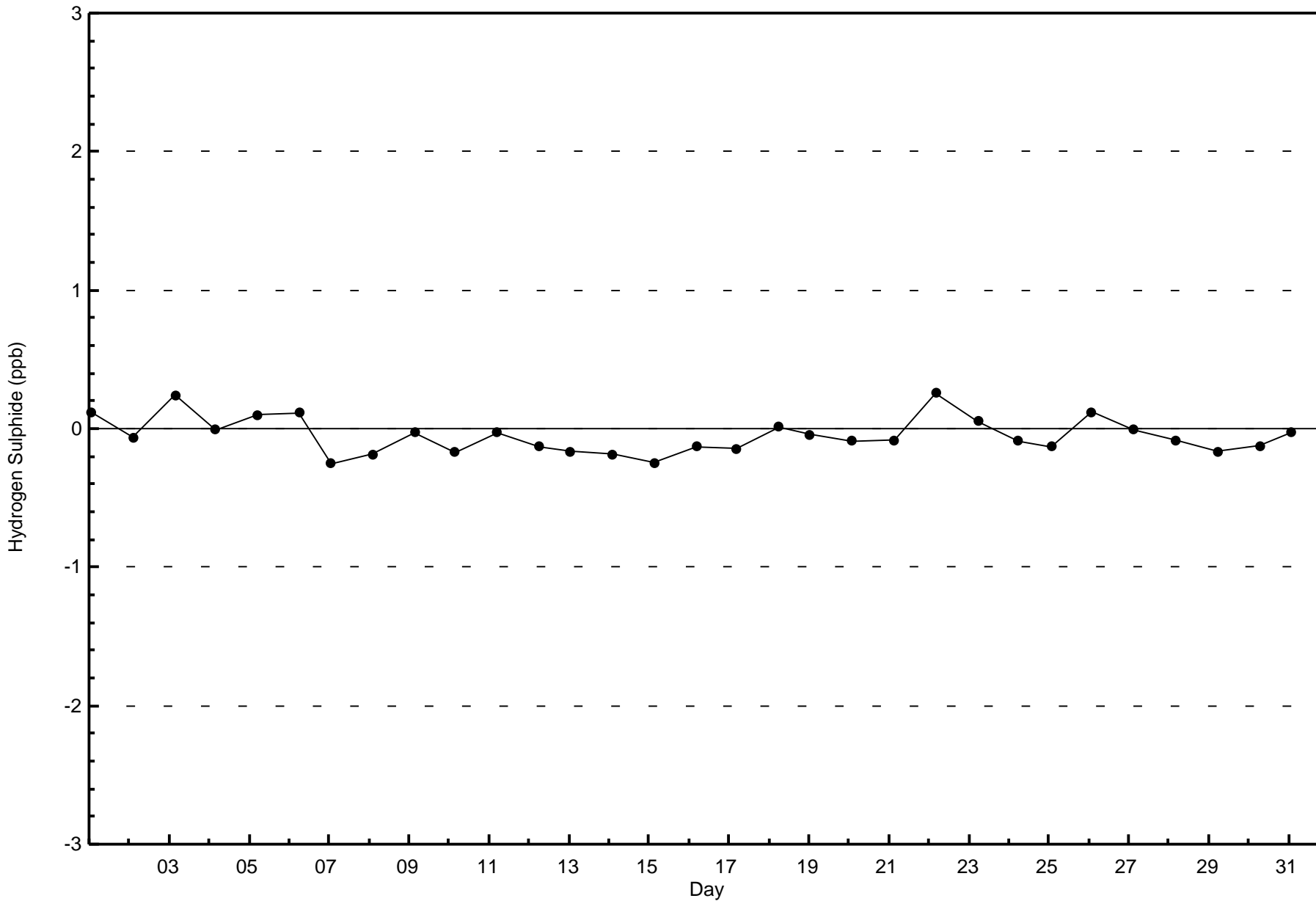


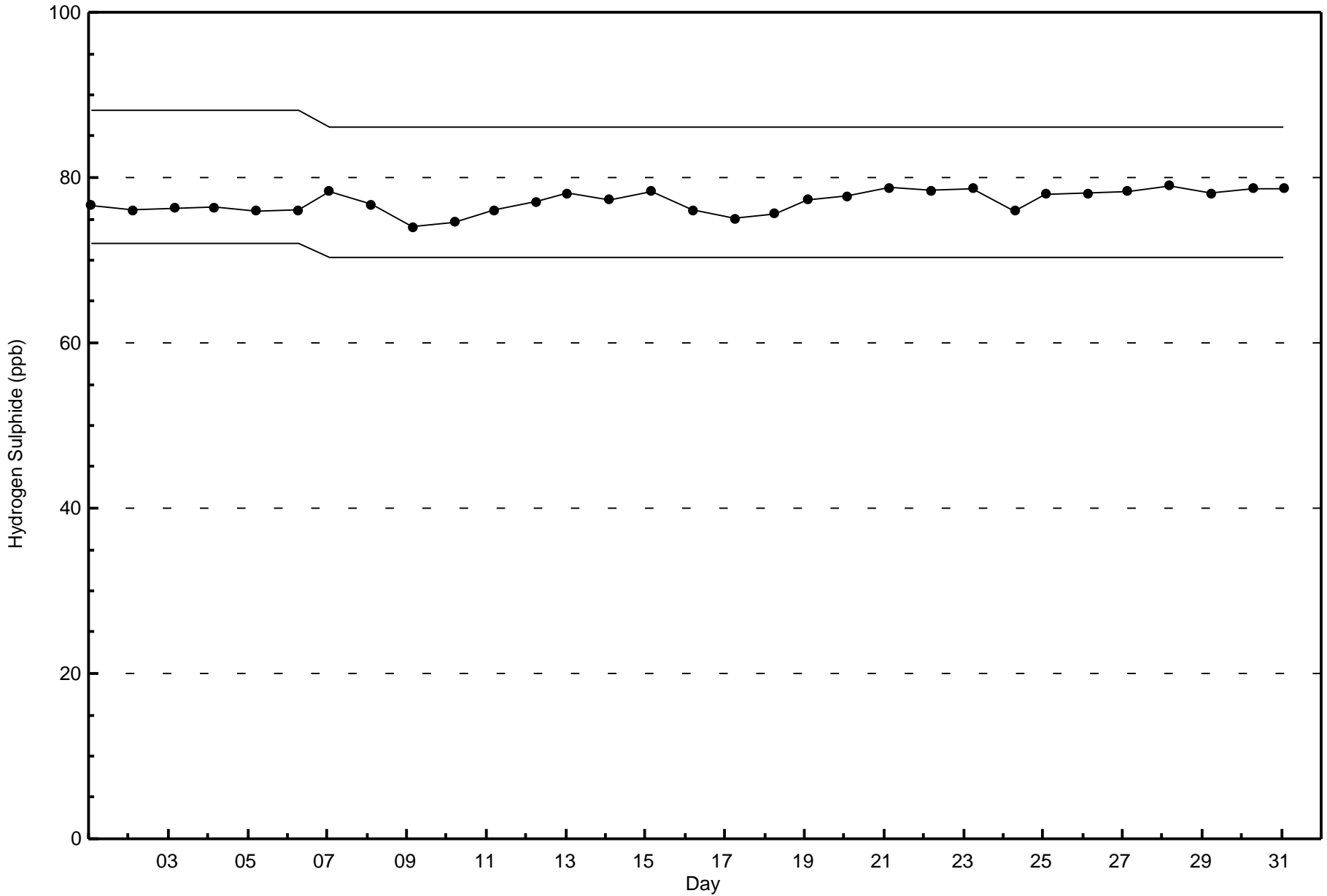
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Mildred Lake (AMS 2)



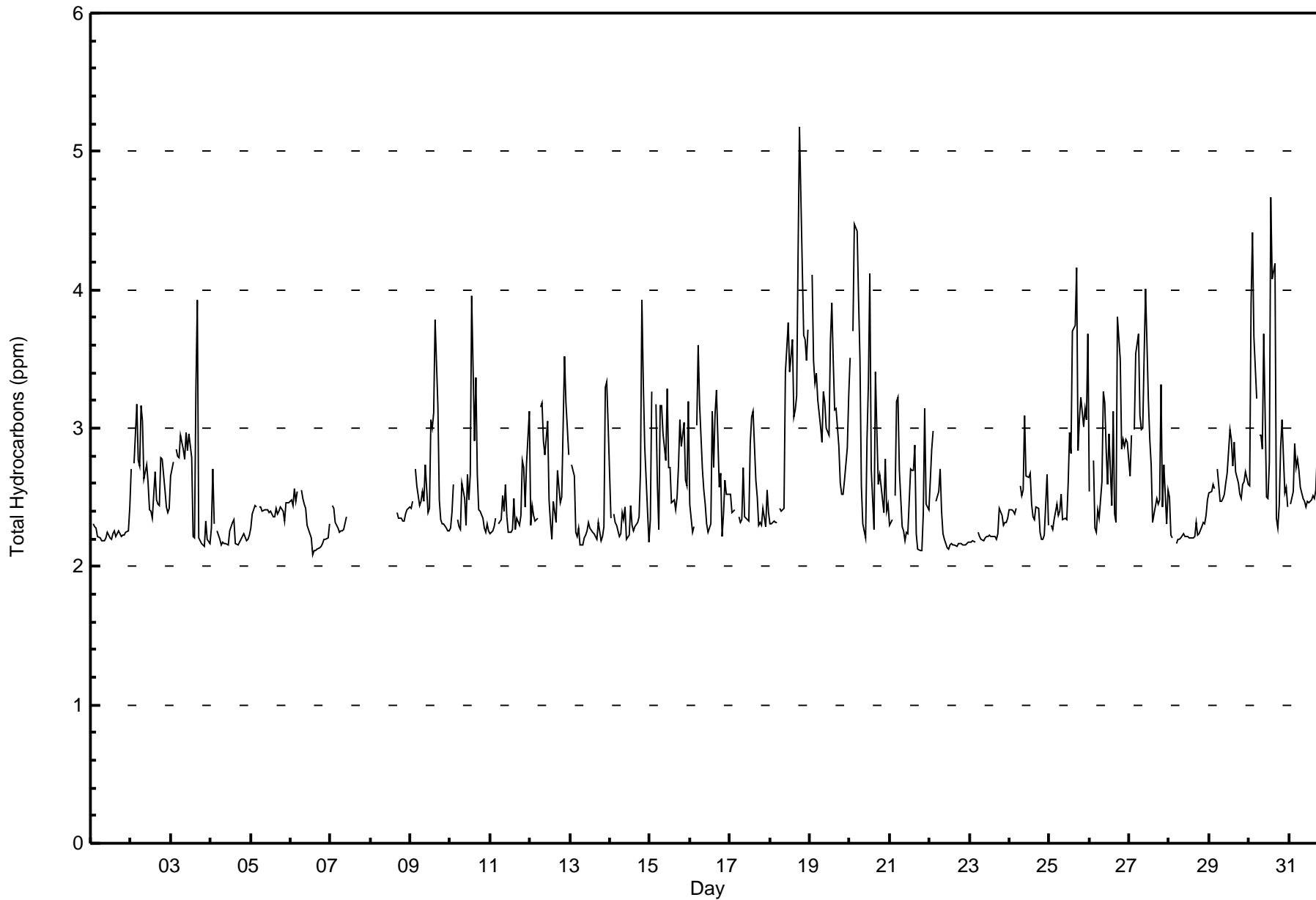
Total Number of Valid Hours: 708







Maximum Value: 5.2 ppm on Dec 18 19:00																				Maximum Daily Average: 3.2 ppm on Dec 18					Hours in Service: 744		
Minimum Value: 2.1 ppm on Dec 6 14:00																				Minimum Daily Average: 2.2 ppm on Dec 4					Hours of Data: 684		
Maximum Diurnal Average: 2.7 ppm at hour 16																				Minimum Diurnal Average: 2.5 ppm at hour 1					Hours of Missing Data: 60		
Monthly Average: 2.60 ppm																				Percentiles: P ₁ = 2.1 P ₁₀ = 2.2 Q ₁ = 2.3 Median = 2.4 Q ₃ = 2.8 P ₉₀ = 3.2 P ₉₉ = 4.2					Hours of Calibration: 35		
																									Percent Operational Time: 96.6		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.4	
2-Dec	2.7	Z	2.7	3.2	2.8	2.7	3.2	3.1	2.6	2.7	2.6	2.4	2.4	2.4	2.7	2.5	2.5	2.4	2.8	2.8	2.6	2.4	2.4	2.4	2.6	3.2	
3-Dec	2.7	2.8	Z	2.9	2.8	2.8	3.0	2.8	2.8	3.0	2.8	3.0	2.8	2.2	2.2	3.3	3.9	2.2	2.2	2.2	2.1	2.3	2.2	2.2	2.7	3.9	
4-Dec	2.3	2.7	2.3	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.7	
5-Dec	2.3	2.4	2.4	2.4	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.5	2.5	2.5	2.4	2.5	
6-Dec	2.5	2.4	2.6	2.5	2.5	Z	2.6	2.5	2.5	2.4	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.6	
7-Dec	Z	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	C	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	2.4
8-Dec	M	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	2.4	2.3	2.3	2.3	2.3	2.4	2.4	2.4	--	2.4	
9-Dec	2.4	2.5	Z	2.7	2.6	2.4	2.5	2.5	2.5	2.7	2.4	2.4	3.1	3.0	3.1	3.8	3.2	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.6	3.8	
10-Dec	2.3	2.4	2.6	Z	2.3	2.3	2.3	2.6	2.5	2.3	2.7	2.5	2.7	4.0	2.9	3.4	2.7	2.4	2.4	2.3	2.3	2.2	2.3	2.3	2.5	4.0	
11-Dec	2.2	2.3	2.3	2.3	Z	2.3	2.3	2.5	2.4	2.6	2.4	2.2	2.2	2.3	2.5	2.3	2.3	2.3	2.4	2.8	2.7	2.4	2.7	3.1	2.4	3.1	
12-Dec	2.3	2.4	2.4	2.3	2.4	Z	3.2	3.2	2.9	2.8	3.1	2.5	2.3	2.2	2.5	2.3	2.7	2.6	2.5	2.5	3.5	3.2	3.0	2.8	2.7	3.5	
13-Dec	Z	2.7	2.7	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	3.3	3.3	3.0	2.4	3.3	
14-Dec	2.4	Z	2.4	2.3	2.3	2.2	2.2	2.4	2.3	2.4	2.2	2.2	2.4	2.3	2.3	2.3	2.3	2.4	2.7	3.9	3.3	2.9	2.4	2.2	2.5	3.9	
15-Dec	2.3	3.3	Z	3.2	2.6	2.3	3.2	3.2	3.0	2.8	3.3	2.7	2.7	2.5	2.5	2.4	2.5	2.7	3.1	2.9	3.0	2.6	2.6	3.2	2.8	3.3	
16-Dec	2.5	2.2	2.3	Z	3.0	3.6	3.2	2.7	2.5	2.5	2.3	2.2	2.3	3.1	2.7	3.1	3.3	2.6	2.7	2.2	2.4	2.6	2.5	2.5	2.7	3.6	
17-Dec	2.5	2.4	2.4	2.4	Z	2.4	2.3	2.3	2.7	2.4	2.3	2.3	2.9	3.1	3.1	2.6	2.5	2.3	2.3	2.3	2.4	2.3	2.6	2.4	2.5	3.1	
18-Dec	2.3	2.3	2.3	2.3	2.3	Z	2.4	2.4	2.4	3.4	3.6	3.8	3.4	3.6	3.1	3.1	3.2	4.3	5.2	4.2	3.7	3.6	3.5	3.7	3.2	5.2	
19-Dec	Z	4.1	3.5	3.3	3.4	3.2	3.0	2.9	3.3	3.2	3.0	2.9	3.6	3.9	3.5	3.1	3.1	2.9	2.6	2.5	2.5	2.6	2.9	3.2	3.1	4.1	
20-Dec	3.5	Z	3.7	4.5	4.4	3.9	3.5	2.6	2.3	2.2	2.9	3.3	4.1	2.7	2.3	3.4	3.0	2.6	2.7	2.6	2.4	2.8	2.4	2.5	3.1	4.5	
21-Dec	2.3	2.3	Z	2.5	3.2	3.2	2.7	2.3	2.3	2.2	2.2	2.2	2.7	2.7	2.7	2.9	2.2	2.1	2.1	2.1	2.4	3.1	2.5	2.4	2.5	3.2	
22-Dec	2.6	2.8	3.0	Z	2.5	2.5	2.7	2.4	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	3.0	
23-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.3	2.3	2.3	2.3	2.2	2.4	
24-Dec	2.4	2.4	2.4	2.4	2.4	Z	2.6	2.5	2.5	3.1	2.7	2.6	2.7	2.5	2.4	2.3	2.4	2.4	2.2	2.2	2.2	2.7	2.3	2.3	2.5	3.1	
25-Dec	Z	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.3	2.3	2.3	2.6	3.0	2.8	3.7	3.7	4.2	2.8	3.1	3.2	3.0	3.1	3.1	3.7	2.9	4.2	
26-Dec	2.5	Z	2.8	2.3	2.3	2.4	2.3	2.6	3.3	3.2	2.9	2.6	3.0	2.4	3.1	2.4	2.3	3.8	3.5	2.8	2.9	2.9	2.9	2.9	2.8	3.8	
27-Dec	2.6	3.0	Z	3.0	3.5	3.7	3.1	3.0	3.0	3.5	4.0	3.2	2.9	2.7	2.3	2.4	2.5	2.5	2.5	3.3	2.4	2.7	2.3	2.6	2.9	4.0	
28-Dec	2.5	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.5	2.3	2.5	
29-Dec	2.5	2.5	2.6	2.6	Z	2.7	2.5	2.5	2.5	2.5	2.6	2.7	3.0	2.9	2.7	2.9	2.7	2.6	2.5	2.5	2.6	2.6	2.7	2.6	2.6	3.0	
30-Dec	2.6	3.9	4.4	3.7	3.2	Z	2.9	2.9	2.8	3.7	2.5	2.5	2.8	4.7	4.1	4.2	2.3	2.3	2.4	2.9	3.1	2.5	2.6	2.4	3.1	4.7	
31-Dec	Z	2.4	2.5	2.9	2.7	2.8	2.7	2.6	2.5	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.8	2.4	2.3	2.3	2.2	2.3	2.3	2.5	2.9	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mildred Lake - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	579	84.65	84.65
3.1 - 10.0	105	15.35	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mildred Lake - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	54	73	19	7	6	10	8	59	74	85	29	21	18	39	39	38	579
3.1 - 10.0	14	3	1	1	3	3	3	21	25	4	1	5	2	2	17	0	105
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	68	76	20	8	9	13	11	80	99	89	30	26	20	41	56	38	684

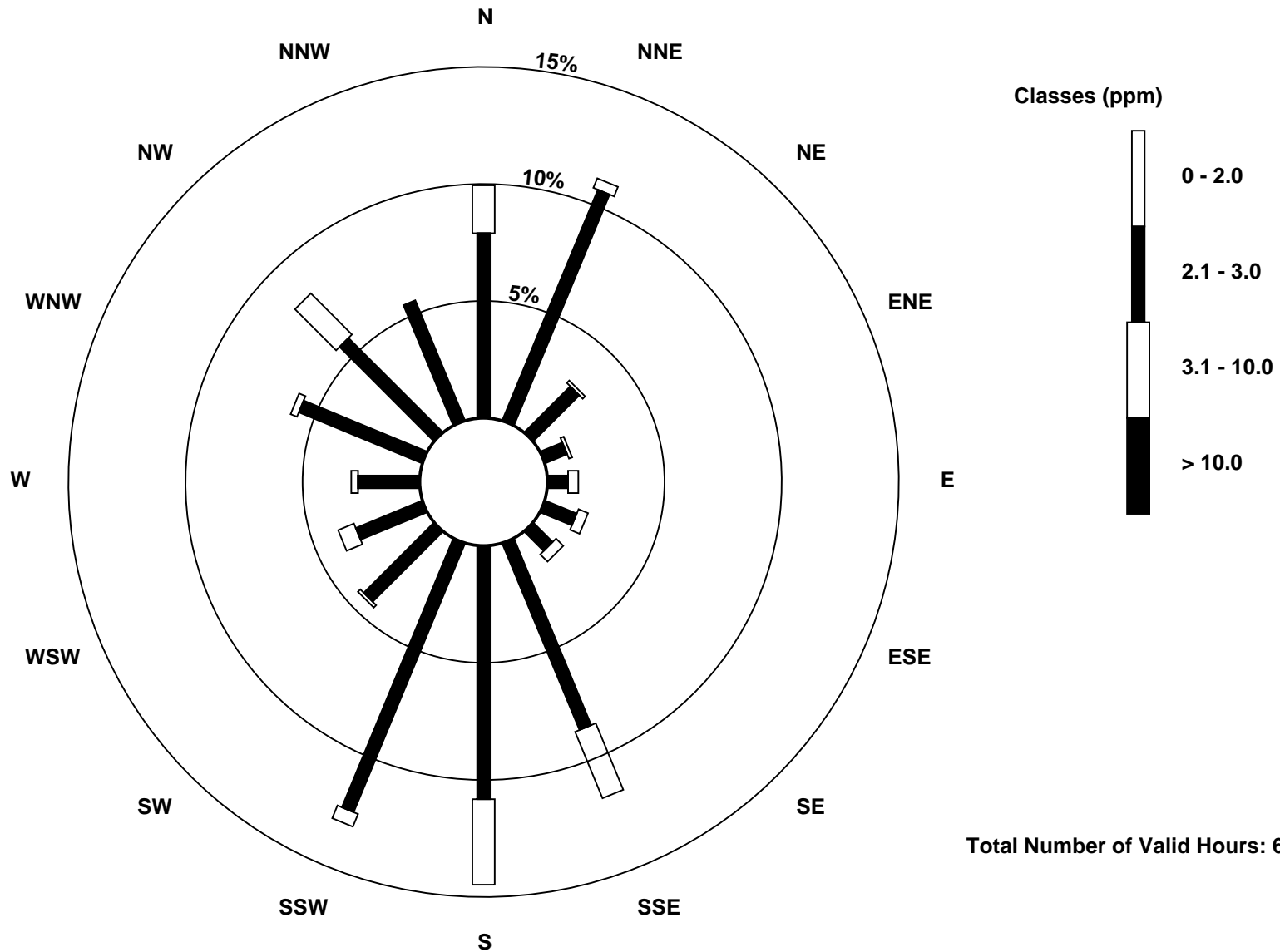
Total Number of Valid Hours: 684

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

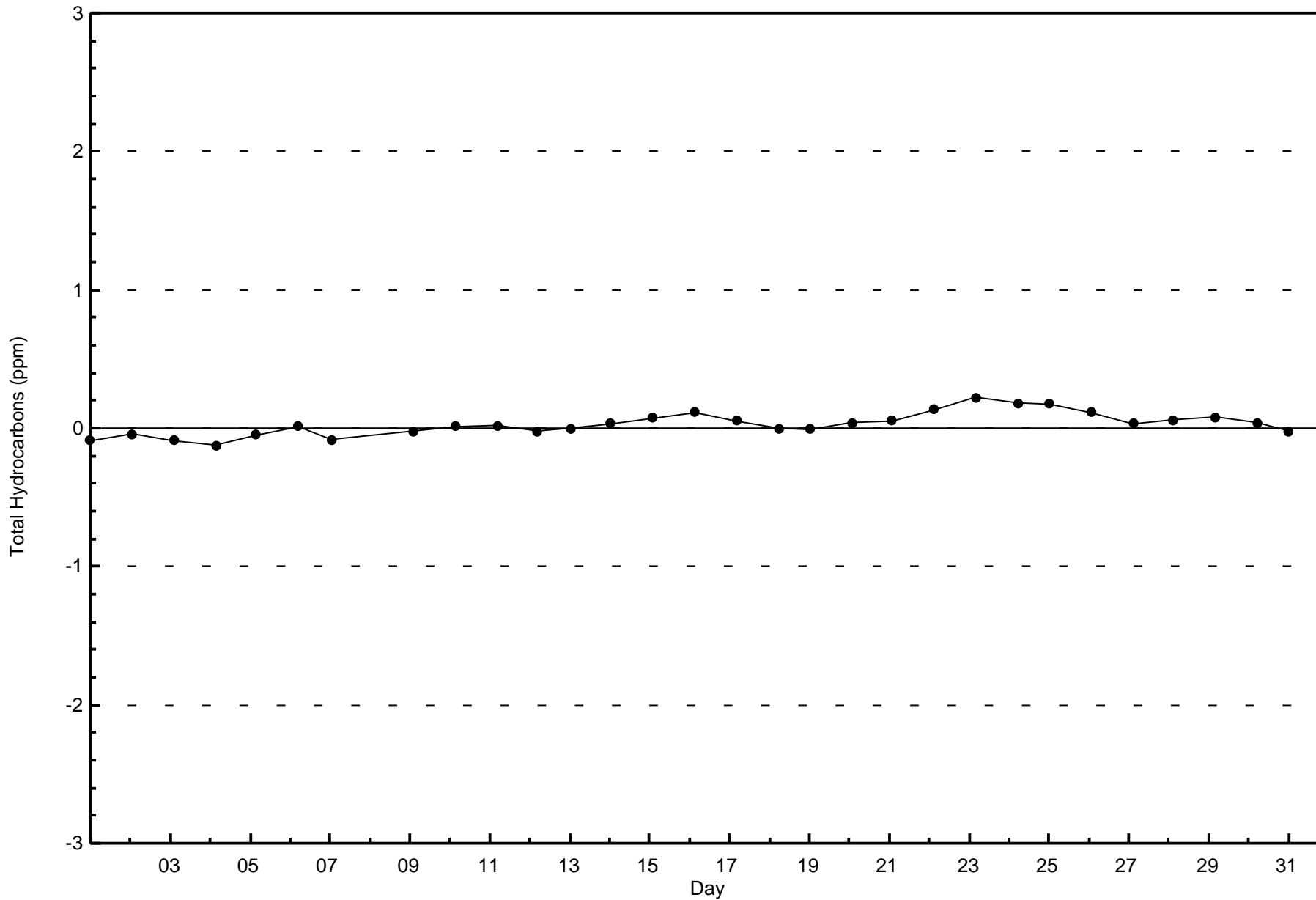
Total Hydrocarbons (THC) - ppm
Mildred Lake (AMS 2)

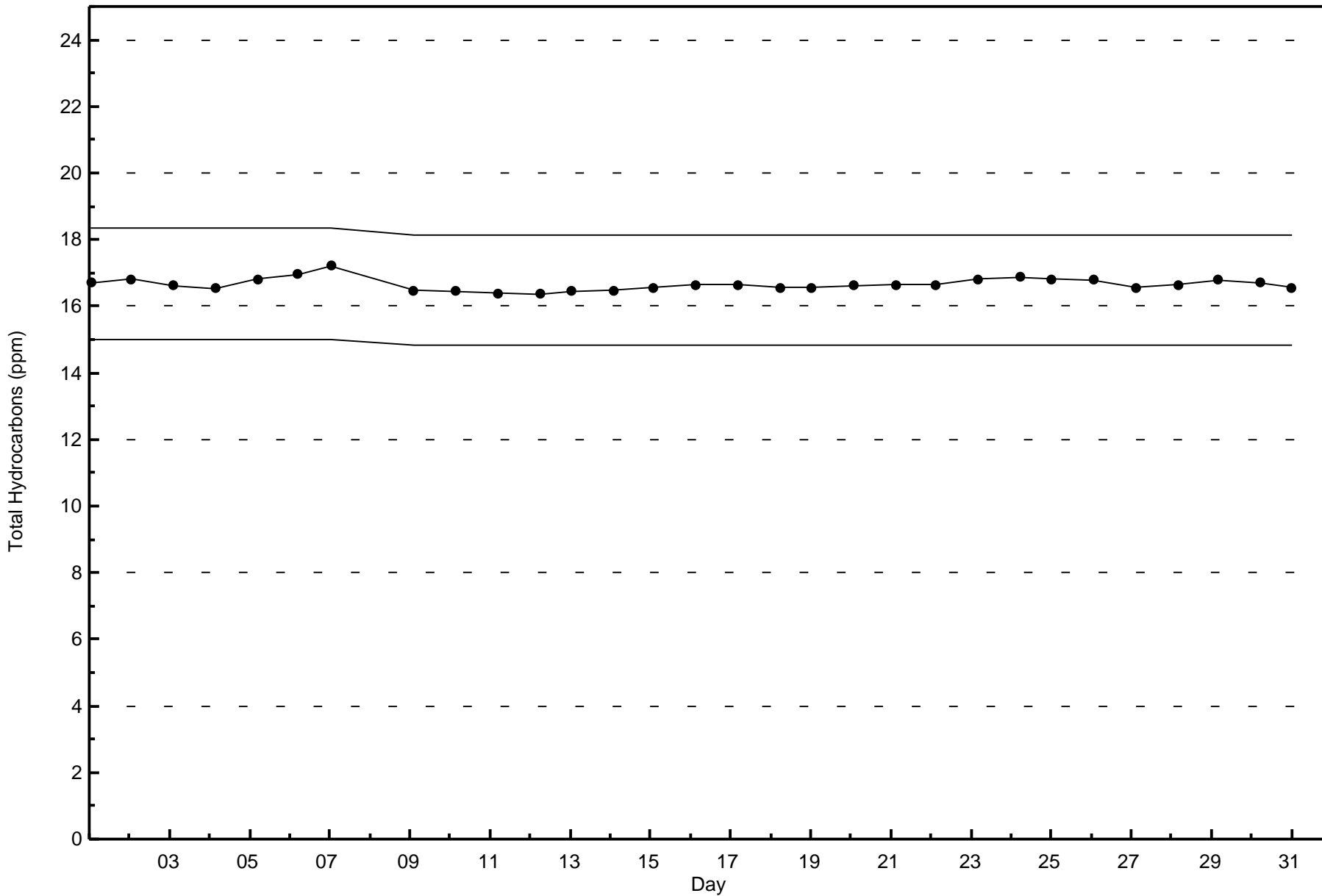




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Mildred Lake - December 2016



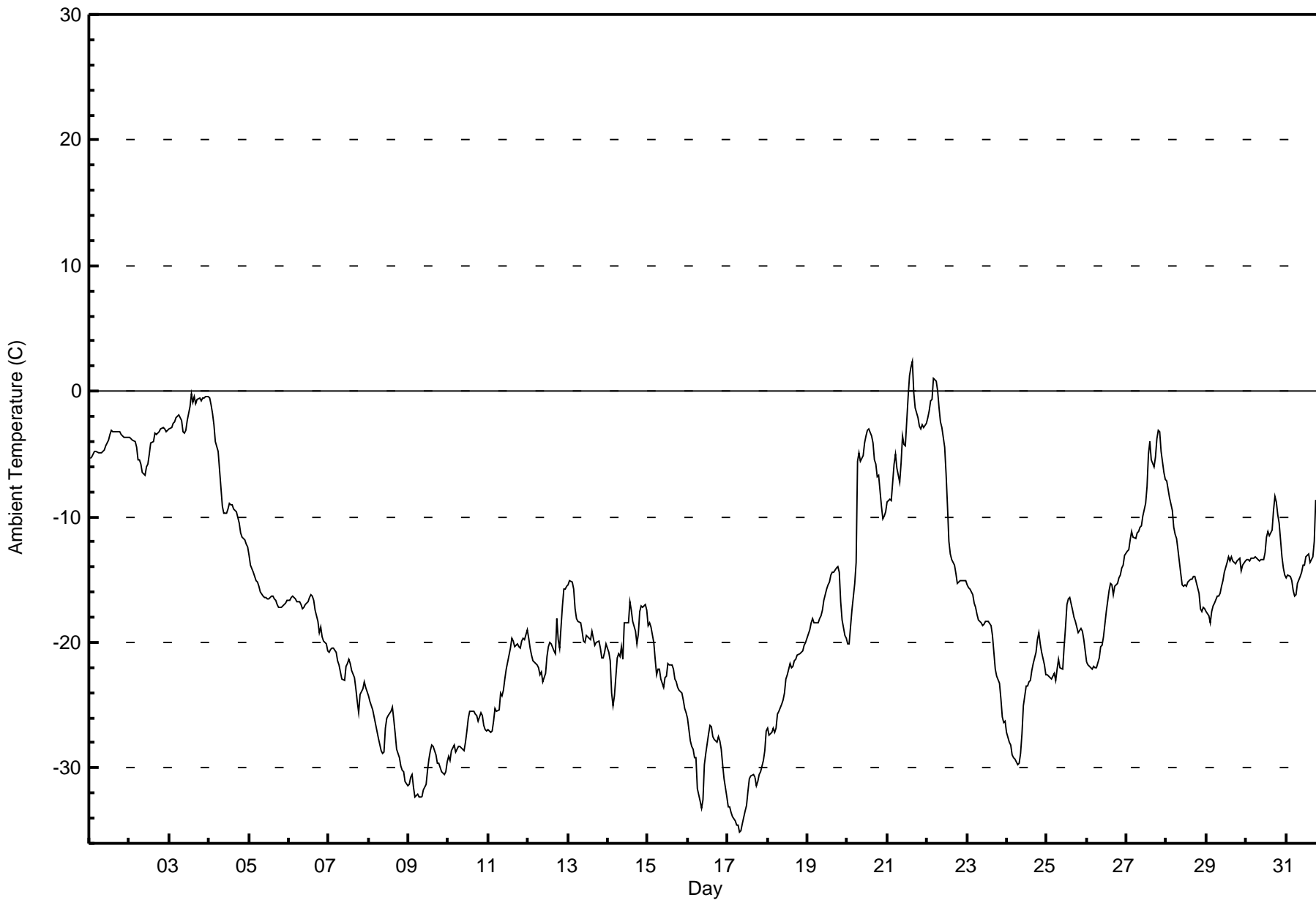




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Mildred Lake - December 2016

Maximum Value: 2.4 C on Dec 21 16:00 Maximum Daily Average: -1.6 C on Dec 3																								Hours in Service:	744	
Minimum Value: -35.1 C on Dec 17 08:00 Minimum Daily Average: -32.1 C on Dec 17																								Hours of Data:	744	
Maximum Diurnal Average: -15.8 C at hour 15 Minimum Diurnal Average: -18.1 C at hour 9																								Hours of Missing Data:	0	
Monthly Average: -17.11 C Percentiles: P₁ = -33.6 P₁₀ = -28.6 Q₁ = -22.9 Median = -17.5 Q₃ = -11.5 P₉₀ = -3.6 P₉₉ = -0.2																								Hours of Calibration:	0	
																								Percent Operational Time:	100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.3	-5.2	-5.0	-4.8	-4.8	-4.9	-4.9	-4.9	-4.8	-4.7	-4.3	-3.9	-3.5	-3.1	-3.2	-3.2	-3.2	-3.2	-3.3	-3.4	-3.6	-3.7	-3.7	-3.7	-4.1	-3.1
2-Dec	-3.7	-3.8	-3.9	-4.0	-4.4	-5.4	-5.5	-5.7	-6.5	-6.7	-6.0	-5.8	-5.0	-4.1	-4.0	-3.4	-3.5	-3.4	-3.2	-3.0	-2.9	-3.0	-3.2	-3.1	-4.3	-2.9
3-Dec	-3.0	-2.8	-2.6	-2.4	-2.2	-2.0	-1.8	-2.3	-3.2	-3.4	-3.1	-2.3	-1.2	-0.2	-0.9	-0.4	-0.9	-0.7	-0.5	-0.7	-0.5	-0.6	-0.5	-0.4	-1.6	-0.2
4-Dec	-0.6	-1.1	-1.8	-2.7	-4.0	-4.8	-6.2	-7.7	-9.1	-9.7	-9.8	-9.3	-8.9	-9.0	-9.0	-9.4	-9.6	-10.1	-10.5	-11.3	-11.6	-11.8	-12.1	-12.4	-8.0	-0.6
5-Dec	-13.0	-13.9	-14.5	-14.8	-15.1	-15.2	-15.5	-15.9	-16.3	-16.5	-16.5	-16.5	-16.5	-16.3	-16.3	-16.5	-16.7	-17.0	-17.2	-17.2	-17.1	-17.0	-16.8	-16.7	-16.0	-13.0
6-Dec	-16.6	-16.4	-16.3	-16.4	-16.5	-16.7	-16.8	-17.0	-17.3	-17.2	-17.0	-16.7	-16.5	-16.2	-16.3	-16.7	-17.5	-18.4	-19.2	-18.8	-19.6	-19.9	-20.1	-20.6	-17.5	-16.2
7-Dec	-20.8	-20.5	-20.5	-20.5	-20.8	-21.4	-21.8	-22.4	-22.9	-23.1	-22.0	-21.7	-21.3	-21.7	-22.3	-22.9	-23.7	-24.7	-25.5	-24.1	-23.7	-23.2	-23.6	-23.9	-22.5	-20.5
8-Dec	-24.3	-24.7	-25.4	-25.9	-26.5	-27.0	-27.7	-28.6	-28.9	-28.8	-26.8	-26.1	-25.8	-25.4	-25.2	-26.2	-27.3	-28.5	-29.2	-29.9	-30.2	-30.3	-31.1	-31.4	-27.5	-24.3
9-Dec	-31.3	-30.8	-30.5	-31.5	-32.3	-32.0	-32.3	-32.4	-32.3	-31.7	-31.3	-30.2	-29.3	-28.6	-28.1	-28.3	-28.9	-29.6	-29.6	-30.0	-30.3	-30.6	-30.3	-29.5	-30.5	-28.1
10-Dec	-29.1	-29.4	-28.6	-28.2	-28.8	-28.5	-28.2	-28.2	-28.5	-28.6	-28.0	-27.1	-26.1	-25.5	-25.5	-25.5	-25.7	-25.9	-26.2	-25.5	-25.8	-26.6	-26.9	-27.0	-27.2	-25.5
11-Dec	-27.0	-27.2	-27.0	-26.3	-25.2	-25.5	-25.4	-24.0	-24.2	-23.8	-23.0	-22.1	-21.0	-20.5	-19.7	-19.8	-20.3	-20.1	-20.4	-20.4	-19.9	-19.7	-19.8	-19.0	-22.6	-19.0
12-Dec	-19.6	-20.4	-21.1	-21.5	-21.6	-21.7	-22.0	-22.6	-22.4	-23.2	-22.5	-21.1	-20.4	-20.0	-20.1	-20.6	-20.9	-18.1	-19.7	-20.4	-17.0	-15.7	-15.8	-15.6	-20.2	-15.6
13-Dec	-15.4	-15.1	-15.1	-15.8	-17.3	-18.1	-18.3	-18.5	-19.1	-19.9	-20.0	-19.5	-19.5	-19.8	-19.1	-19.7	-20.3	-20.0	-19.9	-20.5	-21.2	-21.3	-20.8	-20.1	-18.9	-15.1
14-Dec	-20.8	-21.4	-24.0	-25.1	-24.2	-21.3	-20.9	-21.2	-20.3	-21.3	-18.5	-18.4	-18.4	-16.7	-17.4	-18.4	-19.2	-20.1	-19.4	-17.5	-17.1	-17.3	-17.0	-17.5	-19.7	-16.7
15-Dec	-18.6	-18.4	-18.7	-20.0	-21.3	-22.5	-22.1	-22.1	-22.9	-23.6	-22.8	-22.7	-21.7	-21.8	-21.8	-22.2	-22.9	-23.2	-23.6	-23.9	-24.0	-24.5	-25.2	-25.6	-22.3	-18.4
16-Dec	-26.1	-27.8	-28.3	-28.5	-29.2	-29.2	-31.6	-32.7	-33.2	-32.5	-29.8	-28.8	-27.3	-26.6	-26.7	-27.4	-27.7	-27.9	-27.5	-27.8	-28.5	-29.8	-30.8	-32.3	-29.1	-26.1
17-Dec	-33.1	-33.1	-33.5	-33.9	-34.2	-34.5	-34.6	-35.1	-35.0	-34.4	-33.4	-33.0	-31.8	-30.9	-30.6	-30.5	-30.7	-31.4	-31.0	-30.5	-30.3	-29.4	-28.6	-27.0	-32.1	-27.0
18-Dec	-26.8	-27.4	-27.2	-26.9	-27.2	-26.8	-25.8	-25.5	-24.9	-24.6	-24.0	-22.9	-22.6	-21.7	-22.0	-21.9	-21.4	-21.3	-21.0	-20.9	-20.7	-20.7	-20.2	-20.0	-23.5	-20.0
19-Dec	-19.4	-19.0	-18.5	-18.1	-18.4	-18.4	-18.5	-18.1	-17.8	-17.4	-16.7	-15.8	-15.4	-15.2	-14.7	-14.4	-14.4	-14.1	-14.0	-14.4	-16.8	-18.2	-19.5	-19.7	-16.9	-14.0
20-Dec	-20.1	-20.1	-18.7	-17.4	-15.3	-13.6	-5.6	-4.9	-5.6	-5.1	-4.1	-3.5	-3.1	-3.0	-3.6	-4.1	-5.4	-5.8	-6.8	-6.7	-9.2	-10.2	-10.0	-9.6	-8.8	-3.0
21-Dec	-8.8	-8.6	-8.7	-7.3	-5.8	-5.0	-6.1	-7.3	-5.7	-3.6	-4.2	-4.4	-0.4	1.3	2.0	2.4	-0.1	-1.3	-2.2	-2.8	-3.0	-2.7	-2.9	-2.5	-3.7	2.4
22-Dec	-2.1	-1.6	-0.7	-0.6	1.1	0.7	0.0	-1.3	-2.4	-2.9	-4.5	-6.5	-9.1	-11.9	-13.0	-13.4	-13.9	-14.5	-15.3	-15.1	-15.1	-15.0	-15.1	-15.1	-7.8	1.1
23-Dec	-15.5	-15.6	-15.8	-16.2	-16.9	-17.2	-17.7	-18.2	-18.5	-18.6	-18.6	-18.4	-18.3	-18.3	-18.6	-19.5	-20.8	-22.2	-22.7	-23.3	-24.4	-26.0	-26.4	-26.3	-19.7	-15.5
24-Dec	-27.1	-27.9	-28.2	-29.0	-29.2	-29.3	-29.7	-29.6	-28.8	-27.2	-25.0	-23.5	-23.4	-23.2	-23.0	-22.2	-21.6	-20.8	-19.8	-19.2	-20.1	-20.8	-21.8	-22.6	-24.7	-19.2
25-Dec	-22.6	-22.7	-22.8	-22.9	-22.4	-23.0	-22.1	-21.4	-22.0	-22.1	-20.3	-18.8	-17.0	-16.5	-16.4	-17.4	-18.0	-18.3	-18.8	-19.2	-18.9	-19.1	-19.7	-20.7	-20.1	-16.4
26-Dec	-21.6	-21.8	-22.0	-22.2	-22.0	-22.0	-22.0	-21.2	-20.4	-20.2	-19.6	-18.5	-17.5	-15.9	-15.4	-15.4	-16.2	-15.5	-15.3	-14.8	-14.6	-14.1	-13.8	-13.1	-18.1	-13.1
27-Dec	-12.8	-12.7	-11.9	-11.1	-11.6	-11.8	-11.3	-11.2	-10.9	-10.7	-9.9	-9.0	-7.6	-5.0	-4.0	-5.5	-6.0	-5.2	-3.8	-3.1	-3.2	-4.8	-6.5	-7.0	-8.2	-3.1
28-Dec	-7.2	-7.8	-8.5	-9.5	-10.9	-11.4	-11.7	-12.6	-14.5	-15.4	-15.6	-15.4	-15.5	-15.1	-14.9	-15.0	-14.8	-14.7	-15.2	-16.0	-17.3	-17.5	-17.2	-17.3	-13.8	-7.2
29-Dec	-17.5	-17.9	-18.5	-17.5	-17.1	-16.9	-16.3	-16.3	-16.0	-15.6	-15.1	-14.4	-13.6	-13.2	-13.5	-13.2	-13.5	-13.7	-13.6	-13.4	-13.3	-14.3	-13.9	-13.6	-15.1	-13.2
30-Dec	-13.4	-13.5	-13.5	-13.3	-13.3	-13.2	-13.3	-13.4	-13.5	-13.4	-13.4	-12.9	-11.6	-11.2	-11.5	-11.1	-9.5	-8.3	-8.8	-9.9	-10.5	-13.2	-14.1	-14.6	-12.3	-8.3
31-Dec	-14.9	-14.7	-14.7	-15.1	-15.8	-16.3	-16.2	-15.3	-14.7	-14.4	-13.9	-13.9	-13.2	-13.0	-13.6	-13.3	-13.2	-12.0	-8.8	-8.7	-10.8	-11.5	-11.4	-10.0	-13.3	-8.7
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Mildred Lake - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	298	40.05	40.05
-20 - 0	440	59.14	99.19
0 - 10	6	0.81	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

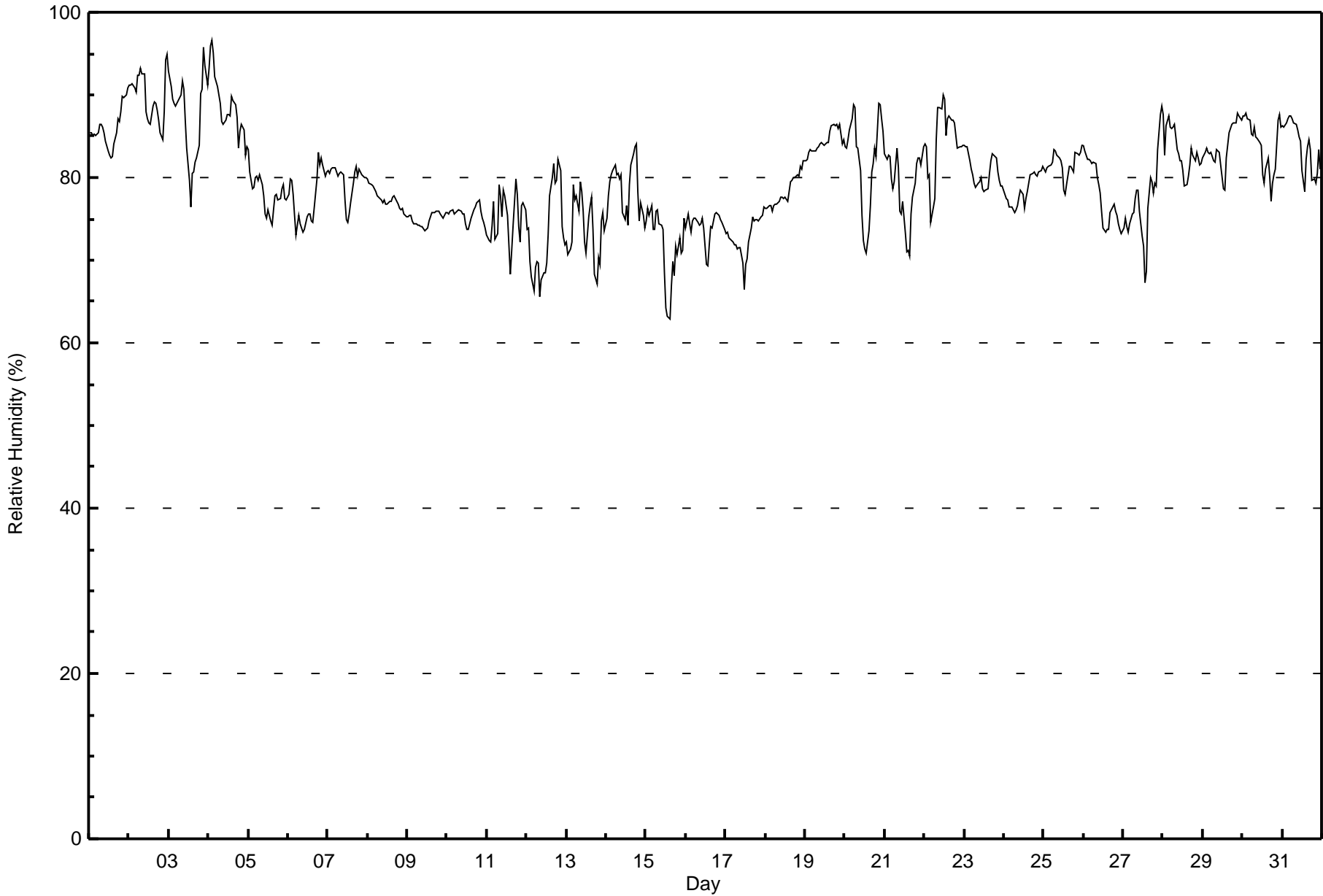
**Relative Humidity (RH) - %
Mildred Lake - December 2016**

Maximum Value: 97 % on Dec 4 03:00 Maximum Daily Average: 89.8 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 63 % on Dec 15 15:00 Minimum Daily Average: 71.7 % on Dec 15 Maximum Diurnal Average: 81.0 % at hour 22 Minimum Diurnal Average: 76.1 % at hour 14 Monthly Average: 79.7 % Percentiles: P ₁ = 67 P ₁₀ = 73 Q ₁ = 76 Median = 80 Q ₃ = 84 P ₉₀ = 87 P ₉₉ = 93																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	85	85	85	85	85	85	86	86	86	85	84	83	83	82	83	84	85	87	87	88	90	90	90	91	86.0	91
2-Dec	91	91	91	91	90	92	92	93	93	93	88	87	87	86	89	89	89	88	87	86	85	88	94	95	89.8	95
3-Dec	93	91	90	89	89	89	89	90	92	91	87	84	80	76	81	81	82	82	84	90	91	96	94	91	87.5	96
4-Dec	93	96	97	95	92	91	90	89	87	87	87	88	87	90	89	89	87	84	86	86	86	86	83	84	88.7	97
5-Dec	83	81	79	79	80	80	80	80	79	78	76	75	76	75	74	76	78	78	77	77	79	79	77	77	78.1	83
6-Dec	78	80	80	78	75	73	75	74	74	73	74	75	76	76	75	75	76	80	83	81	82	82	80	81	77.3	83
7-Dec	81	81	81	81	81	81	80	80	81	80	77	75	75	76	77	79	81	81	80	81	80	80	80	80	79.6	81
8-Dec	80	79	79	79	79	78	78	77	77	77	77	77	77	77	77	78	78	77	77	76	76	76	76	75	77.4	80
9-Dec	75	75	75	75	74	74	74	74	74	74	74	74	74	75	75	76	76	76	76	76	76	75	75	76	74.9	76
10-Dec	76	76	76	76	76	76	76	76	76	76	76	74	74	74	75	76	76	76	77	77	76	75	75	74	75.5	77
11-Dec	73	72	72	74	77	73	73	79	78	75	79	78	75	72	68	71	74	80	78	74	72	77	77	76	74.9	80
12-Dec	74	74	70	68	66	69	70	70	66	68	69	68	70	73	78	80	82	79	80	82	81	74	73	72	73.1	82
13-Dec	72	71	71	72	79	77	78	76	79	78	76	72	71	75	77	78	74	68	67	70	70	75	76	74	74.0	79
14-Dec	75	78	80	80	81	81	80	81	80	80	76	75	77	74	79	82	83	84	84	78	75	77	75	74	78.7	84
15-Dec	75	76	75	77	74	74	76	76	74	74	74	68	64	63	63	67	70	68	72	71	73	71	71	75	71.7	77
16-Dec	74	76	74	73	75	75	75	75	74	74	75	74	70	69	72	74	74	76	76	76	75	75	75	74	74.1	76
17-Dec	73	73	73	72	72	72	72	71	72	72	70	66	70	70	72	74	75	75	75	75	75	75	75	76	72.7	76
18-Dec	76	76	77	77	76	77	77	77	77	77	78	78	77	78	77	78	79	80	80	80	80	81	81	82	78.3	82
19-Dec	82	82	83	83	83	83	83	84	84	84	84	84	84	84	84	86	86	86	86	86	86	86	84	85	84.3	86
20-Dec	84	84	85	86	87	89	88	84	84	81	75	72	71	71	74	77	81	82	84	83	89	89	87	86	82.1	89
21-Dec	83	82	83	83	80	79	80	84	81	76	76	77	73	71	71	70	76	78	79	82	82	82	81	84	78.8	84
22-Dec	84	84	80	80	75	76	78	85	88	88	88	90	90	85	87	87	87	87	87	85	83	84	84	84	84.4	90
23-Dec	84	84	84	82	81	80	79	79	79	80	80	79	78	79	79	81	82	83	83	82	81	80	79	79	80.6	84
24-Dec	78	77	77	76	76	76	76	76	77	78	78	76	77	78	79	80	81	81	81	80	80	81	81	81	78.4	81
25-Dec	81	81	81	81	82	82	83	83	83	82	82	81	78	78	79	81	81	81	81	83	83	83	83	84	81.6	84
26-Dec	84	83	82	82	82	82	82	82	80	79	78	76	74	73	74	74	76	76	77	76	75	74	74	73	77.8	84
27-Dec	74	75	74	73	74	76	76	78	78	78	76	73	72	67	69	76	80	80	78	79	79	83	88	89	76.9	89
28-Dec	88	83	86	87	86	86	86	86	86	83	83	82	82	81	79	79	80	82	84	83	82	83	82	82	83.2	88
29-Dec	82	83	84	83	83	83	82	82	83	83	83	82	79	79	82	84	85	86	87	87	87	88	87	87	83.8	88
30-Dec	87	88	88	87	87	85	85	86	85	85	84	84	80	79	81	82	80	77	79	80	81	87	88	86	83.9	88
31-Dec	86	86	87	87	87	87	87	87	86	86	85	84	81	78	82	84	85	83	80	80	79	81	83	81	83.9	87
80.8 80.7 80.6 80.5 80.2 80.1 80.2 80.6 80.3 79.9 78.9 77.9 76.7 76.1 77.5 79.0 80.1 80.2 80.2 80.3 80.3 81.0 80.9 80.8																		Diurnal Average								
93 96 97 95 92 92 92 93 93 93 93 88 90 90 87 90 89 89 88 87 90 91 96 94 95																		Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Mildred Lake - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Mildred Lake - December 2016

Maximum Speed: 20 km/h on Dec 2 18:00	Maximum Daily Speed Average: 15.8 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 29 14:00	Minimum Daily Speed Average: 0.9 km/h on Dec 18	Hours of Data: 744
Maximum Diurnal Speed Average: 2.5 km/h at hour 20	Minimum Diurnal Speed Average: 1.2 km/h at hour 13	Hours of Missing Data: 0
Monthly Average Velocity: 1.7 km/h 272.4 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 7 Q ₃ = 11 P ₉₀ = 15 P ₉₉ = 18	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S14	S11	S11	SSW10	SW9	SSW10	S9	S9	S8	S8	S9	SSW9	S10	S8	S8	S6	SSE3	E1	S3	S5	SSE5	S6	S6	SSE6	S7.4	S14	
2-Dec	SSE6	S7	SSE8	SSE9	S9	SSE8	SSE10	SSE12	S11	S12	SSE15	SSE16	SSE15	SSE12	SSE10	SSE15	SSE16	SSE20	S15	SSE19	SSE18	SSE17	SSE17	SSE16	SSE13.0	SSE20	
3-Dec	S15	SSE15	SSE16	SSE16	SSE17	SSE16	SSE15	SSE14	SSE12	SSE13	SSE15	SSE12	S8	SSW8	SSW8	S9	S10	SSW9	SSW9	SSW8	SW6	WSW7	WSW8	WSW5	S10.4	SSE17	
4-Dec	W4	N7	N12	NNE13	NNE17	NNE14	NNE14	NNE14	NNE14	NNE13	NNE11	N9	N11	NNW13	NNW9	NNW14	NNW13	NNW16	NNW17	NNW15	NNW10	NNW8	NNW14	NNW16	N11.5	NNW17	
5-Dec	NW16	NW18	NW16	NW17	NW15	NW16	NW16	NW18	NW17	NW17	NW17	NW17	NW17	NNW16	NNW15	NNW16	NNW15	NNW15	NNW15	NNW14	NNW14	NNW14	NNW14	NNW14	NW15.8	NW18	
6-Dec	NW14	NW15	NW16	NW16	NW15	NW16	NW15	NW16	NW15	NW15	NW16	NNW14	NNW14	NNW15	NNW15	N13	N8	NNW6	NNE5	NNE5	N5	N7	N7	N6	NNW11.3	NW16	
7-Dec	N5	N6	N6	NNE7	NNE6	NNE6	NNE5	N5	NNE6	NNE6	NNE6	NNE9	NNE7	NNW7	NNW5	N4	N5	N4	NE4	NE6	NE5	NE5	NNE6	NE5	NNE5.5	NNE9	
8-Dec	NE6	NE6	NE7	NE5	NE4	NE4	ENE4	NE3	N2	NNE2	NNE3	E4	ENE4	NE2	W1	NNE4	NNE5	NNE5	NNE4	NE3	N4	NNE5	N1	SSE2	NE3.4	NE7	
9-Dec	ESE2	ESE3	SSE2	S2	S3	S5	SSW4	S5	SSW6	SSW6	SSW7	S6	SSE6	SSE7	SSE6	S4	SSW5	S6	SSW6	SSW6	SSW5	SSW4	S8	S8	S4.8	S8	
10-Dec	S8	SSW7	SSW5	SSW8	SSW9	SSW9	SSW10	SSE5	S6	S6	SSW6	S7	S5	SSE4	ESE3	SSE4	SSW7	SSW6	WSW3	WSW6	SW7	SSW6	SW6	WSW10	SSW5.8	WSW10	
11-Dec	WSW13	WSW12	WSW11	W10	W15	W13	W12	W17	W11	W10	NNW12	NNW18	NNW15	NNW15	NNW15	NNW15	NNW13	NNW14	NNW11	NW12	NNW13	NNW8	NNW12	NW13	NNW12.4	NNW18	
12-Dec	NW12	NNW12	NNW14	NW15	NW16	NW16	NW14	NW13	NW12	NNW12	NNW11	NNW10	SSW6	SSE6	ESE6	ESE3	N5	NNW9	NNE6	NW3	NW10	NW13	NNW13	NNW14	NW8.4	NW16	
13-Dec	NW16	NW17	NW19	NNW17	N15	N14	N13	N13	N8	N5	N7	NNE6	SSE1	ENE2	N4	N5	NNW7	NNW12	NNW13	NNW10	NNW8	NW8	NW11	NNW7	NNW8.7	NW19	
14-Dec	N3	SSE4	SE3	W2	S5	SSW5	S7	SSW4	SSW5	SSE3	SSW7	S5	NNE3	N8	N5	NNE4	N2	N5	NW5	NW7	NW9	N7	NNW10	NNW10	NW1.4	NNW10	
15-Dec	NNW9	NW11	NNW12	NW13	NW14	NNW9	NW10	NNW11	NNW11	N6	NW11	NW12	NNW7	NW8	NNW11	NNW10	NW10	NW11	NW11	NW12	NNW10	NW10	NW11	NW8	NW8	NW10.0	NW14
16-Dec	NNW8	N6	NNW8	NNW8	NNW6	NW3	SSE3	S2	SSW3	S4	SW6	SSW7	S7	SSE7	SSE6	SSE6	SSE5	ESE3	S4	SSW5	SE3	SSE3	SSW4	ESE3	S1.5	NNW8	
17-Dec	SSE3	SSW5	S4	S4	SSW4	SSW5	SSW5	SSW7	S6	SSW7	SW7	SSW5	SSE7	S6	S5	S6	SSW6	SSW4	SSW6	SSW7	SSW7	SSW6	SSW5	SSW6	SSW5.3	SSW7	
18-Dec	SSW5	SSW5	SSW5	S6	SSW6	S7	S8	S7	S4	ESE1	ESE3	SE1	E2	NNE4	N5	N7	N6	N3	N4	N2	NNE3	NE1	SSE2	E2	S0.9	S8	
19-Dec	ESE2	SE2	E2	ENE3	NNE4	N6	N7	NNE5	N7	N7	NNE5	N6	N7	N6	N5	N6	N7	N9	N6	NE3	SSE3	SSE2	SSE2	ESE4	NNE3.6	N9	
20-Dec	SE1	S2	SSE3	S7	S7	S6	W12	WSW13	WSW13	WSW14	WSW12	WSW11	WSW10	SW9	WSW11	WSW8	SSW7	SW7	SSW6	WSW6	SSW4	SSW6	SW7	SW9	SW7.1	WSW14	
21-Dec	SW9	SSW10	S9	SW9	WSW12	W19	SW11	S6	SW7	SSW10	S10	SW9	W19	W20	W15	W13	SW10	SSW10	SSW10	S7	SE6	SSE9	SE2	E3	SW7.7	W20	
22-Dec	ESE4	SE3	SSW4	WSW9	W12	W13	W11	N12	NNE7	NNE8	NNE13	NNE15	NNE18	NE15	NNE14	NNE13	NNE12	NNE11	NNE9	NNE11	NNE10	NNE8	NNE9	NNE11	N7.2	NNE18	
23-Dec	NNE11	NNE8	NNE8	NE11	NNE10	NNE9	NE10	NNE11	NNE10	NNE9	NNE9	NNE9	NNE11	NNE8	NNE9	NNE9	NNE7	NNE8	N7	NNE8	NNE4	SSE1	ESE3	SSE4	NNE7.5	NNE11	
24-Dec	SSE1	ESE2	ENE1	NE2	N2	WSW1	WSW2	WSW3	SSE1	SSW3	SW2	SW3	SW3	SW3	SW2	SSW2	SSW4	SSW1	SSW4	SSW5	SSW3	S5	S6	SSW5	SSW2.1	S6	
25-Dec	SW5	SSW6	SSW7	SW6	SW6	SSW7	SSW7	SSW7	SSW8	SSW7	SSW7	S6	SSE8	SSE8	S4	S7	S9	S9	S9	S10	SSE12	S11	SSE6	S6	S7.0	SSE12	
26-Dec	S7	S9	SSW7	S7	S9	S7	SSW6	SSE10	S12	S13	S16	S12	SSE14	S11	S12	S9	S9	SSE13	SSE13	SSE17	SSE17	SSE17	SSE16	S14	S11.4	SSE17	
27-Dec	S10	S9	S14	S16	SSE16	SSE15	SSE16	S13	S13	S15	S14	SSE8	SE6	SSW6	SSW6	SSW5	SSW6	S3	SW6	WSW7	WSW8	WNW5	N10	N8	S7.2	S16	
28-Dec	N11	NNE11	NNE10	NNE10	NE10	NNE9	NNE7	NE9	NNE8	NE8	NE7	NE7	ENE5	NNE2	S2	SE2	ENE4	NNE6	NNE9	NNE6	N6	N7	N5	N4	NNE6.4	N11	
29-Dec	N5	N3	NNE5	ENE1	NE4	E2	NE3	E3	NE4	N2	N5	N2	SW2	SSE0	NNE3	NE1	NNE5	NNE7	NE4	WNW1	N3	NE4	NNE4	NE2	NNE2.7	NNE7	
30-Dec	NNW2	SSW3	SSW2	S2	S4	SSW5	SW4	SSW4	W4	SW3	SSW8	S7	S7	S9	S11	S6	SSW10	WSW10	W8	NNW11	NW10	N10	NNE6	N5	SW2.9	S11	
31-Dec	NW6	NNE5	NNW4	SW4	S4	SE4	E4	NE3	NNW1	NNW4	SSE1	ENE3	NE6	SW1	E2	ENE3	WSW6	SW7	NNW12	NNW13	W11	WSW11	NNW12	NNW15	NNW2.9	NNW15	

WNW2.0	W1.8	W1.6	W1.9	W2.0	W2.2	WSW2.2	W1.7	W1.7	WSW1.6	WSW1.7	W1.2	WSW1.2	W1.6	NNW1.5	NNW1.3	W1.3	NNW1.9	NNW2.2	W2.5	W1.9	W1.5	NNW1.9	NNW2.1	Diurnal Average	
NW16	NW18	NNW19	NNW17	SSE17	W19	NW16	NW18	NW17	NW17	NNW17	NNW18	W19	W20	NNW16	NNW16	NNW16	SSE20	NNW17	SSE19	SSE18	SSE17	SSE17	NNW16	Diurnal Maximum	

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

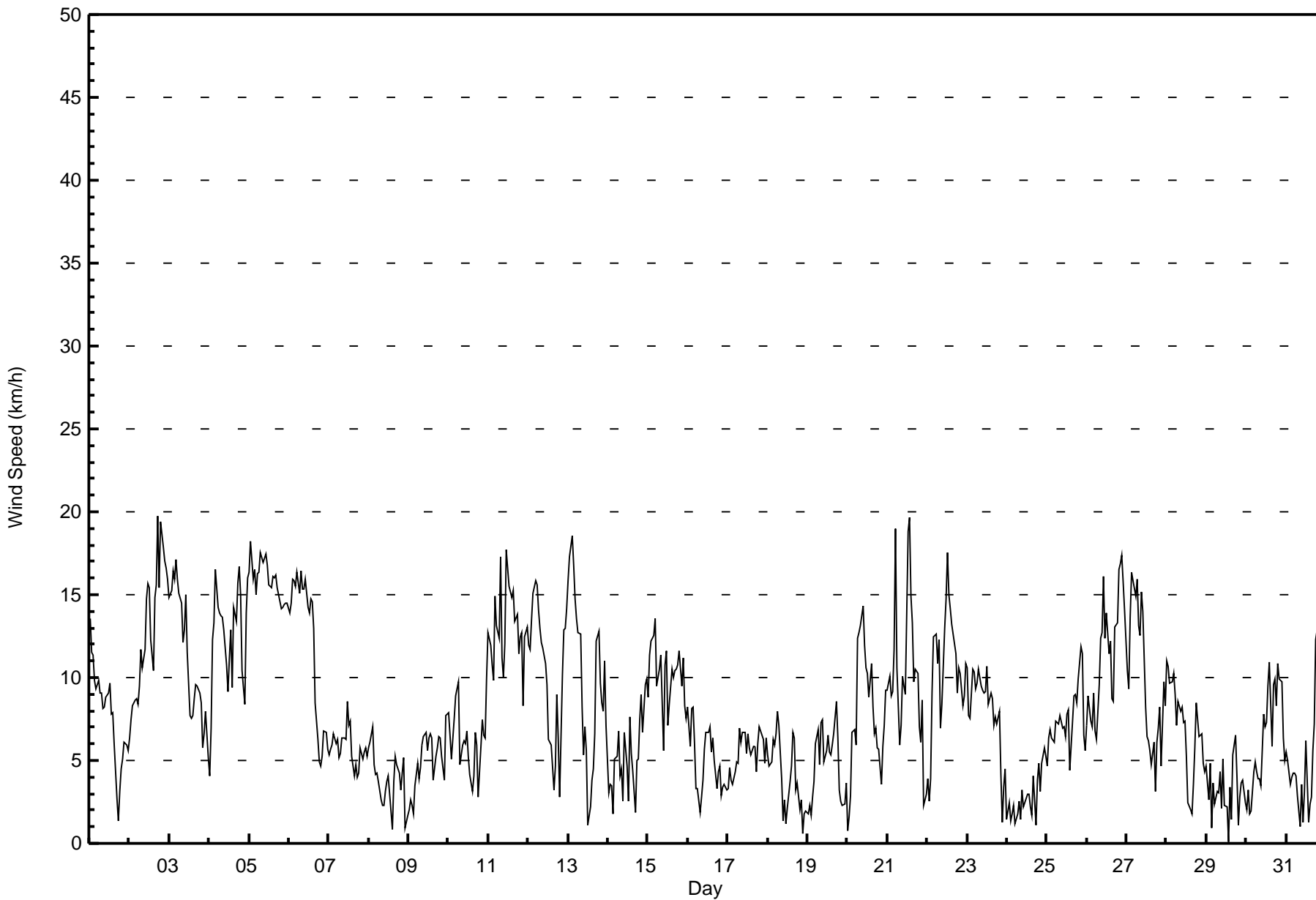
Wind Speed (WS) - km/h
Mildred Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 21 13:00 Minimum Value: 1 km/h on Dec 7 18:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																														
Day	Hourly Period Ending At (MST)																								Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	3	3	2	3	2	2	2	2	2	1	2	1	1	2	1	1	2	1	1	1	1	1	1	1	3																						
2-Dec	1	2	2	2	2	3	2	3	2	4	3	3	3	3	2	3	3	4	4	4	3	3	3	3	4																						
3-Dec	3	3	3	2	3	2	2	3	2	3	3	3	2	2	2	2	2	2	2	2	3	2	3	2	3																						
4-Dec	2	2	3	4	4	4	4	4	4	4	3	3	2	2	2	2	2	3	3	3	2	1	3	4	4																						
5-Dec	3	5	4	4	4	4	4	4	5	4	5	5	5	5	5	4	5	5	4	4	4	4	4	4	5																						
6-Dec	4	4	4	4	4	4	4	4	3	4	4	3	3	3	3	3	2	1	1	1	1	2	1	1	4																						
7-Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2																						
8-Dec	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2																						
9-Dec	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	2	2	1	1	2																						
10-Dec	2	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	1	2	2	2	2	3	3																						
11-Dec	3	3	3	3	4	4	4	5	4	4	4	5	5	4	4	4	5	4	4	3	3	3	4	3	5																						
12-Dec	3	3	2	3	4	4	3	3	4	3	3	4	2	1	1	1	2	2	2	2	3	3	3	4	4																						
13-Dec	4	4	5	5	4	3	3	3	2	2	1	1	1	1	1	2	1	2	2	2	2	2	2	2	5																						
14-Dec	2	1	1	2	1	1	2	3	2	2	2	2	2	2	1	1	1	1	1	2	2	1	2	2	3																						
15-Dec	2	3	3	3	3	2	3	3	3	2	3	3	2	3	3	3	3	3	3	3	2	2	2	2	3																						
16-Dec	2	1	1	1	1	2	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	2																						
17-Dec	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	2	2	1	1	2																						
18-Dec	1	1	1	2	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2																						
19-Dec	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	2																						
20-Dec	2	1	1	1	2	1	5	4	4	4	4	3	4	3	4	3	3	3	2	3	1	2	2	2	5																						
21-Dec	2	2	3	3	4	6	5	1	2	3	2	3	7	6	5	5	3	2	2	2	2	2	2	2	7																						
22-Dec	1	1	2	2	4	4	3	3	2	2	3	4	4	4	3	4	3	4	2	3	3	2	2	3	4																						
23-Dec	3	2	2	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	1	1	3	1	1	1	3																						
24-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	2																						
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	3	3	2	3	1	3																						
26-Dec	1	2	2	1	1	1	1	3	3	2	3	5	3	2	2	2	2	2	2	3	2	3	3	3	5																						
27-Dec	2	2	3	3	3	2	2	2	2	3	2	3	2	2	2	1	1	2	2	2	3	4	2	2	4																						
28-Dec	2	2	2	3	3	3	2	2	2	2	2	2	1	1	2	1	1	1	2	1	1	1	1	1	3																						
29-Dec	1	2	1	2	1	1	2	1	1	1	2	2	1	2	2	2	2	2	1	1	1	2	2	1	2																						
30-Dec	1	2	1	1	1	2	2	2	2	3	2	1	2	2	2	2	3	4	4	3	3	2	1	2	4																						
31-Dec	1	1	2	2	1	1	1	1	1	2	1	2	2	2	2	2	3	2	5	4	3	3	5	5	5																						
Diurnal Maximum																								4	5	5	5	4	6	5	5	4	5	5	5	7	6	5	5	5	4	5	4	4	4	5	5



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Mildred Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Mildred Lake - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	235	31.59	31.59
6 - 11	331	44.49	76.08
12 - 19	176	23.66	99.73
20 - 28	2	0.27	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Mildred Lake - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	32	24	21	10	10	13	9	26	24	36	11	5	4	2	3	5	235
6 - 11	34	49	12	0	0	1	2	21	67	56	20	16	6	9	19	19	331
12 - 19	7	13	1	0	0	0	0	36	14	0	0	7	11	30	40	17	176
20 - 28	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	86	34	10	10	14	11	84	105	92	31	28	22	41	62	41	744

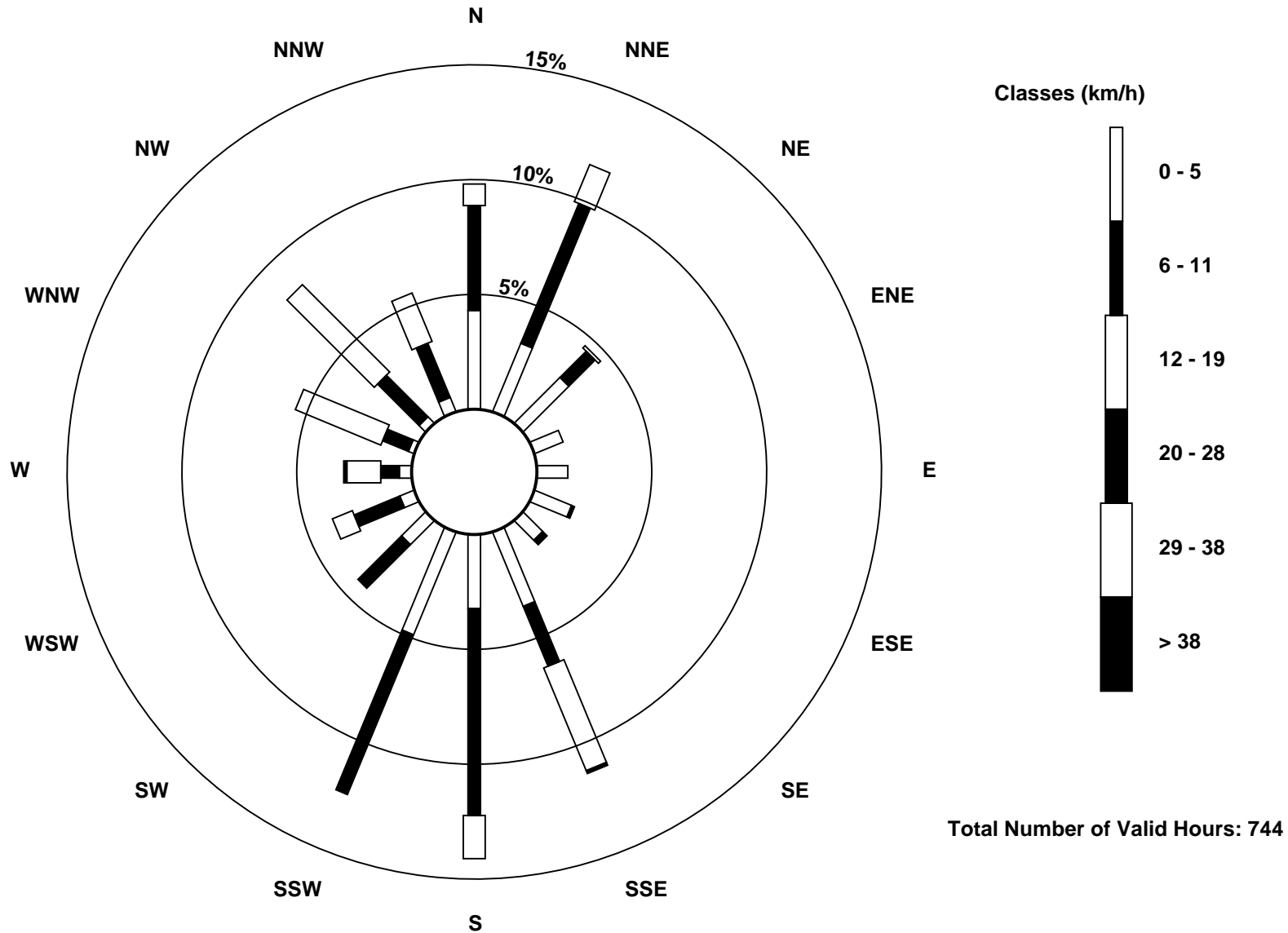
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Mildred Lake (AMS 2)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Mildred Lake - December 2016

Direction of Maximum Speed: 160 deg on Dec 2 18:00 Direction of Maximum Daily Speed Average: 305.8 deg on Dec 5	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 150 deg on Dec 29 14:00 Direction of Minimum Daily Speed Average: 0.9 deg on Dec 18	Percent Operational Time: 100.0
Monthly Average Direction: 252.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	189	188	188	208	218	199	189	184	183	188	189	192	191	177	175	181	158	84	181	177	162	181	174	159	186.6
2-Dec	168	177	166	159	172	156	166	157	178	173	162	163	164	168	166	154	159	160	169	168	164	162	161	160	164.0
3-Dec	169	168	167	168	167	167	167	164	158	156	157	158	169	203	207	169	174	196	207	205	218	238	241	239	176.7
4-Dec	275	354	2	15	24	25	26	23	24	18	16	8	350	336	348	338	340	337	338	338	341	338	334	327	355.5
5-Dec	322	316	311	310	309	310	307	307	307	309	309	311	302	301	301	301	300	301	300	297	298	300	300	303	305.8
6-Dec	304	308	314	313	313	313	311	313	313	314	317	330	330	339	348	350	353	348	16	20	9	9	8	2	327.1
7-Dec	3	6	7	13	22	14	17	358	19	14	17	20	17	338	331	359	8	5	36	35	43	38	32	39	14.7
8-Dec	43	49	45	39	40	51	61	43	3	16	12	80	58	51	261	23	23	27	24	37	9	13	11	167	36.4
9-Dec	102	120	149	190	191	181	195	189	209	203	200	181	166	154	161	180	195	179	195	207	201	192	184	179	183.8
10-Dec	189	192	205	192	196	197	198	163	180	190	197	186	182	154	123	168	193	194	241	245	224	202	225	246	198.0
11-Dec	256	258	252	264	277	259	262	281	261	262	288	292	294	296	299	296	286	283	285	305	302	291	302	312	282.7
12-Dec	322	329	332	326	315	310	304	304	305	298	302	297	211	158	118	108	359	345	19	321	305	306	302	300	312.7
13-Dec	306	310	309	340	10	7	0	358	11	8	357	28	151	78	9	352	340	328	333	328	332	304	305	328	338.1
14-Dec	0	165	129	261	182	198	183	193	195	151	198	173	25	349	10	32	2	356	322	310	312	352	339	346	318.0
15-Dec	328	310	307	304	325	334	315	306	301	349	317	323	298	308	300	298	323	319	306	312	307	317	322	315	313.6
16-Dec	335	355	337	334	329	318	167	182	196	189	215	202	181	161	162	152	151	104	169	194	144	165	199	122	190.0
17-Dec	149	199	172	189	206	206	194	205	180	197	214	203	162	174	173	189	199	202	192	194	200	198	194	206	192.7
18-Dec	196	210	199	189	203	179	178	190	174	118	111	141	95	14	6	2	4	357	355	7	28	40	163	79	171.9
19-Dec	105	126	101	65	16	9	9	16	7	6	20	7	1	359	355	10	10	353	356	47	161	162	148	117	16.6
20-Dec	125	183	155	177	187	185	263	255	247	249	251	248	243	229	248	247	211	235	208	254	205	211	215	225	233.3
21-Dec	218	205	184	217	248	266	236	183	223	204	182	228	275	277	279	270	227	208	213	186	146	147	134	83	230.3
22-Dec	115	145	202	237	272	277	263	357	26	14	19	18	13	38	20	15	19	24	22	21	23	18	22	21	8.0
23-Dec	30	27	31	35	28	21	36	22	23	21	18	18	17	20	18	12	15	13	11	13	30	147	117	147	24.6
24-Dec	167	109	59	53	352	240	248	249	162	195	223	226	232	225	231	195	192	212	212	202	197	185	185	200	202.7
25-Dec	218	213	213	220	218	217	193	202	204	204	199	184	164	164	174	169	170	174	180	170	166	169	162	170	185.6
26-Dec	189	177	192	186	178	187	198	168	170	172	170	179	167	182	169	188	184	163	161	167	165	165	166	169	172.9
27-Dec	182	184	169	170	168	166	166	172	171	169	169	151	130	193	207	196	202	182	233	258	254	286	358	351	180.0
28-Dec	6	17	27	33	44	28	25	38	32	40	36	40	68	20	183	141	66	25	28	17	6	4	11	1	28.3
29-Dec	6	6	18	58	47	86	40	84	43	359	9	9	224	150	14	34	17	14	34	284	9	39	29	39	25.2
30-Dec	341	197	194	182	181	198	226	200	274	227	194	186	190	176	171	172	192	251	279	290	322	7	29	357	223.1
31-Dec	326	16	348	220	173	127	93	40	338	337	158	66	48	214	85	64	240	231	290	286	260	256	285	295	286.2

281.9 270.1 278.9 272.2 274.3 266.2 252.1 272.4 261.5 249.7 243.6 263.0 255.3 266.1 282.9 294.3 272.1 292.0 288.0 275.2 272.5 262.2 286.0 292.2
 Diurnal Average

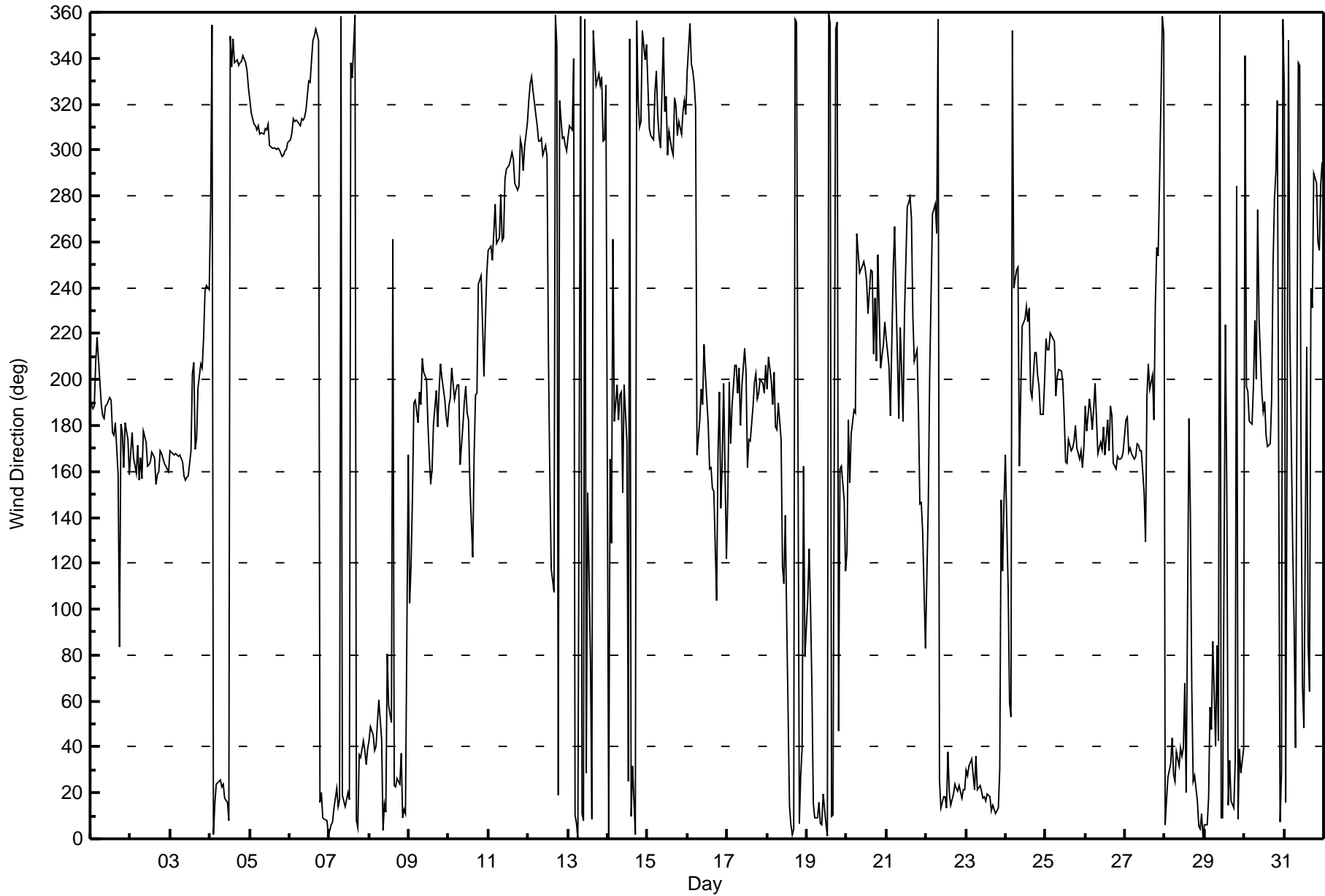
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Mildred Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 105 deg on Dec 29 14:00 Minimum Value: 6 deg on Dec 16 04:00 Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 13 Median = 16 Q ₃ = 23 P ₉₀ = 40 P ₉₉ = 78		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	12	14	13	18	19	15	12	15	16	11	13	11	11	16	13	15	59	76	38	19	15	15	11	14	76
2-Dec	12	14	15	14	19	18	14	14	15	13	13	13	12	13	11	14	12	12	12	11	11	12	12	14	19
3-Dec	15	12	11	11	10	10	10	12	14	14	13	15	18	17	16	19	13	18	17	18	50	28	27	35	50
4-Dec	46	16	13	15	17	17	19	18	18	15	15	14	9	13	9	8	9	8	8	8	10	8	12	46	
5-Dec	13	14	15	15	16	14	16	16	16	16	16	16	17	17	16	16	17	17	17	17	16	16	15	17	
6-Dec	15	15	14	14	15	14	14	14	14	15	14	11	12	13	12	10	9	9	20	14	9	11	12	11	20
7-Dec	21	11	10	12	14	12	17	11	12	10	13	15	21	16	9	15	10	9	13	11	13	14	14	15	21
8-Dec	15	15	16	16	14	17	16	24	12	19	18	21	20	30	49	14	10	11	16	12	9	7	76	74	76
9-Dec	37	18	27	21	13	16	15	14	14	17	15	17	14	15	13	51	12	8	7	8	9	13	12	11	51
10-Dec	14	13	14	13	12	14	11	32	28	17	16	19	23	24	31	27	15	19	35	22	20	22	19	24	35
11-Dec	20	20	20	26	22	19	23	18	22	24	24	17	18	18	16	16	22	19	23	15	16	27	19	16	27
12-Dec	13	11	10	12	14	14	14	15	16	15	17	22	18	25	15	29	31	16	13	47	15	15	16	16	47
13-Dec	15	15	15	32	16	14	13	13	15	17	16	21	71	30	16	27	10	12	9	10	12	13	13	23	71
14-Dec	53	29	29	76	23	21	20	54	54	57	23	32	51	16	13	22	60	9	17	13	14	15	17	10	76
15-Dec	14	13	15	16	15	11	17	16	17	36	14	15	19	17	16	17	15	14	15	15	15	16	14	14	36
16-Dec	19	22	8	6	9	85	27	36	28	16	22	15	19	22	23	17	33	37	18	16	40	19	18	25	85
17-Dec	29	14	16	17	13	14	13	14	17	10	15	21	14	15	16	11	12	13	13	12	13	17	16	14	29
18-Dec	15	22	15	17	18	20	15	15	33	42	21	55	71	20	19	12	14	29	25	50	28	92	52	38	92
19-Dec	60	32	63	25	22	12	11	17	11	11	17	9	11	15	18	15	13	13	12	31	57	44	38	15	63
20-Dec	76	45	39	16	15	19	27	21	23	21	24	26	30	27	26	26	30	29	28	43	36	25	23	20	76
21-Dec	21	14	16	33	32	22	39	22	28	24	16	19	20	18	19	23	26	17	14	19	36	17	73	50	73
22-Dec	40	49	40	23	24	23	23	17	24	15	19	16	17	17	16	16	18	19	17	16	18	16	15	16	49
23-Dec	18	18	21	19	19	17	19	17	15	14	14	15	15	16	14	12	13	12	12	12	33	46	25	11	46
24-Dec	71	34	55	52	27	50	23	23	42	30	33	31	11	14	47	41	16	47	24	13	17	12	15	9	71
25-Dec	10	8	6	6	9	6	10	10	8	13	11	14	15	14	21	10	9	11	13	8	15	9	29	14	29
26-Dec	9	13	17	13	10	11	16	16	11	13	11	17	11	15	11	18	15	10	10	11	9	11	12	13	18
27-Dec	17	16	13	15	11	9	10	12	13	11	10	16	14	23	19	12	10	64	25	23	22	48	12	10	64
28-Dec	14	15	16	17	17	16	15	19	17	18	20	20	26	57	63	51	29	16	15	15	11	12	18	20	63
29-Dec	14	66	29	71	28	36	39	33	19	58	19	52	67	105	66	90	25	18	29	83	68	54	36	42	105
30-Dec	64	63	54	61	32	27	38	36	36	80	18	15	48	12	12	21	15	34	32	22	30	14	19	35	80
31-Dec	20	21	56	33	19	29	29	58	69	26	58	28	23	89	68	47	38	24	23	20	22	21	24	16	89
	76	66	63	76	32	85	39	58	69	80	58	55	71	105	68	90	60	76	38	83	68	92	76	74	
	Diurnal Maximum																								





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 3 LOWER CAMP METEOROLOGY DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
Temperature 20 m (C) Average	744	0	0	100.00	1.6	-	-0.9	-
Temperature 45 m (C) Average	744	0	0	100.00	2.1	-	-0.9	-
Temperature 100 m (C) Average	744	0	0	100.00	3.1	-	-0.9	-
Temperature 167 m (C) Average	744	0	0	100.00	2.8	-	-1.2	-
Relative Humidity 20 m (%) Average	744	0	0	100.00	95	-	87.0	-
Relative Humidity 45 m (%) Average	744	0	0	100.00	95	-	85.0	-
Relative Humidity 100 m (%) Average	744	0	0	100.00	96	-	87.0	-
Relative Humidity 167 m (%) Average	744	0	0	100.00	97	-	88.0	-
Wind Speed 20 m (km/h) Average	744	0	0	100.00	21	-	17.0	-
Wind Speed 45 m (km/h) Average	744	0	0	100.00	29	-	22.0	-
Wind Speed 100 m (km/h) Average	744	0	0	100.00	39	-	31.0	-
Wind Speed 167 m (km/h) Average	744	0	0	100.00	44	-	35.0	-
Wind Direction 20 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 45 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 100 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 167 m (deg) Average	744	0	0	100.00	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	744	0	0	100.00	1	-	0.4	-
Vertical Wind Speed 45 m (km/h) Average	744	0	0	100.00	2.7	-	0.9	-
Vertical Wind Speed 100 m (km/h) Average	744	0	0	100.00	3.9	-	2.0	-
Vertical Wind Speed 167 m (km/h) Average	744	0	0	100.00	4.1	-	2.1	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
Temperature 20 m (C) Average	744	-17.52	9	-	-35.8	-29.8	-24	-17.8	-12.1	-3.3	1.6
Temperature 45 m (C) Average	744	-17.22	9	-	-35.5	-29.5	-23.4	-17.7	-11.5	-3.2	2.1
Temperature 100 m (C) Average	744	-16.51	8.7	-	-35.2	-27.9	-22.4	-17.3	-10.6	-3	3.1
Temperature 167 m (C) Average	744	-16.29	8.4	-	-32.7	-27	-22.4	-17.2	-10.6	-3.1	2.8
Relative Humidity 20 m (%) Average	744	78.5	6	-	60	71	75	79	82	86	95
Relative Humidity 45 m (%) Average	744	76.9	6	-	58	70	73	77	81	84	95
Relative Humidity 100 m (%) Average	744	76.9	6	-	56	68	73	77	82	85	96
Relative Humidity 167 m (%) Average	744	76.9	7	-	51	67	73	76	83	86	97
Wind Speed 20 m (km/h) Average	744	7	5	-	0	2	3	6	10	15	21
Wind Speed 45 m (km/h) Average	744	9.5	6	-	0	2	4	8	14	20	29
Wind Speed 100 m (km/h) Average	744	13.3	9	-	0	4	6	11	19	28	39
Wind Speed 167 m (km/h) Average	744	17.4	10	-	1	6	10	15	24	33	44
Wind Direction 20 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 100 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 167 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	744	-0.03	0.2	-	-0.7	-0.3	-0.1	0	0.1	0.2	1
Vertical Wind Speed 45 m (km/h) Average	744	0.11	0.6	-	-1.5	-0.6	-0.2	0	0.5	0.9	2.7
Vertical Wind Speed 100 m (km/h) Average	744	0.2	0.7	-	-1.5	-0.4	-0.1	0.1	0.3	0.9	3.9
Vertical Wind Speed 167 m (km/h) Average	744	0.43	0.8	-	-1.9	-0.3	0	0.2	0.7	1.4	4.1

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
<hr/>				
No operational issues to report				



Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 20 m (AT20m) - C

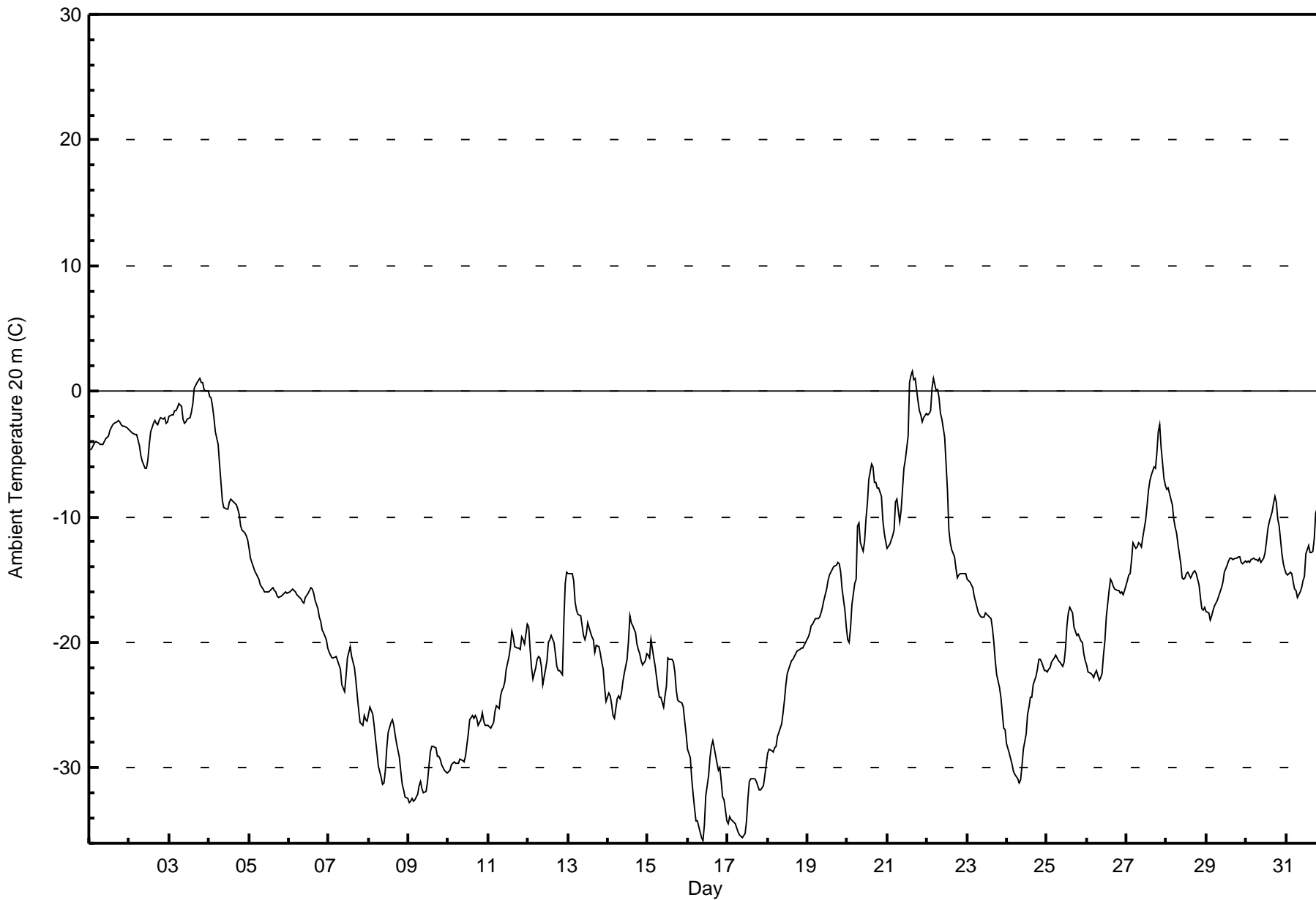
Lower Camp Met Tower - December 2016

Maximum Value: 1.6 C on Dec 21 16:00 Maximum Daily Average: -0.9 C on Dec 3																						Hours in Service: 744				
Minimum Value: -35.8 C on Dec 16 10:00 Minimum Daily Average: -32.9 C on Dec 17																						Hours of Data: 744				
Maximum Diurnal Average: -15.8 C at hour 15 Minimum Diurnal Average: -18.9 C at hour 10																						Hours of Missing Data: 0				
Monthly Average: -17.52 C Percentiles: P₁ = -35.1 P₁₀ = -29.8 Q₁ = -24.0 Median = -17.8 Q₃ = -12.1 P₉₀ = -3.3 P₉₉ = 0.6																						Hours of Calibration: 0				
																						Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.7	-4.5	-4.4	-4.1	-4.0	-4.1	-4.2	-4.2	-4.2	-4.0	-3.8	-3.5	-3.1	-2.9	-2.7	-2.6	-2.4	-2.3	-2.4	-2.7	-2.8	-2.8	-2.9	-3.0	-3.4	-2.3
2-Dec	-3.1	-3.2	-3.4	-3.5	-3.5	-3.9	-4.3	-5.2	-5.6	-6.1	-6.2	-5.5	-4.3	-3.2	-2.5	-2.3	-2.6	-2.6	-2.3	-2.1	-2.2	-2.1	-2.6	-2.5	-3.5	-2.1
3-Dec	-2.0	-1.9	-1.9	-1.6	-1.5	-1.3	-1.0	-1.2	-2.3	-2.6	-2.4	-2.2	-2.1	-1.6	-1.0	0.2	0.5	0.7	1.1	0.7	0.7	0.2	0.0	0.1	-0.9	1.1
4-Dec	-0.5	-0.6	-1.2	-2.1	-3.3	-4.3	-5.8	-7.3	-8.7	-9.2	-9.3	-8.8	-8.6	-8.7	-8.8	-9.0	9.3	-9.8	-10.7	-11.0	-11.3	-11.6	-11.8	-11.8	-7.5	-0.5
5-Dec	-12.5	-13.3	-13.9	-14.3	-14.6	-14.8	-15.0	-15.4	-15.7	-15.9	-16.0	-16.0	-16.0	-15.8	-15.7	-15.9	-16.0	-16.3	-16.4	-16.3	-16.2	-16.1	-16.0	-16.1	-15.4	-12.5
6-Dec	-16.0	-15.9	-15.8	-15.9	-15.9	-16.2	-16.4	-16.6	-16.8	-16.8	-16.4	-16.1	-15.8	-15.6	-15.7	-16.1	-16.6	-17.3	-18.0	-18.3	-19.0	-19.2	-19.8	-20.4	-16.9	-15.6
7-Dec	-20.8	-21.0	-21.2	-21.2	-21.1	-21.5	-21.8	-22.1	-23.3	-23.9	-22.7	-21.3	-20.7	-20.3	-21.1	-22.0	-23.1	-24.2	-25.4	-26.4	-26.7	-25.8	-26.1	-26.3	-22.9	-20.3
8-Dec	-25.7	-25.1	-25.7	-26.7	-27.7	-28.7	-29.8	-30.8	-31.3	-31.2	-30.2	-28.4	-27.1	-26.3	-26.1	-26.6	-27.4	-28.1	-29.2	-30.2	-31.3	-31.8	-32.3	-32.4	-28.8	-25.1
9-Dec	-32.8	-32.6	-32.4	-32.6	-32.5	-32.1	-31.4	-31.1	-31.6	-31.9	-31.8	-31.0	-29.9	-28.8	-28.3	-28.2	-28.4	-29.1	-29.1	-29.2	-29.7	-30.2	-30.3	-30.4	-30.6	-28.2
10-Dec	-30.3	-30.2	-29.8	-29.5	-29.6	-29.6	-29.7	-29.3	-29.4	-29.5	-29.0	-28.2	-27.3	-26.2	-25.9	-26.1	-25.8	-26.0	-26.6	-26.2	-25.6	-26.2	-26.7	-26.6	-27.9	-25.6
11-Dec	-26.6	-26.8	-26.6	-26.4	-25.5	-25.1	-25.2	-24.2	-23.9	-23.6	-23.1	-22.2	-21.2	-20.4	-19.1	-19.6	-20.3	-20.5	-20.4	-20.6	-19.6	-19.8	-20.2	-18.6	-22.5	-18.6
12-Dec	-18.8	-20.6	-22.0	-22.9	-22.1	-21.3	-21.1	-21.3	-21.9	-23.4	-22.2	-21.4	-20.0	-19.8	-19.5	-20.0	-20.9	-21.9	-22.2	-22.2	-22.6	-18.3	-15.4	-14.4	-20.7	-14.4
13-Dec	-14.6	-14.6	-14.5	-15.1	-16.8	-17.5	-17.8	-17.9	-18.7	-19.5	-19.8	-19.4	-18.4	-19.3	-19.5	-19.7	-20.8	-20.3	-20.4	-20.9	-21.6	-22.1	-23.6	-24.7	-19.1	-14.5
14-Dec	-24.0	-24.3	-24.9	-25.8	-26.1	-24.5	-24.3	-24.5	-24.0	-23.1	-22.5	-21.3	-19.9	-17.9	-18.5	-18.7	-19.3	-20.1	-20.6	-20.9	-21.4	-21.8	-21.4	-21.0	-22.1	-17.9
15-Dec	-21.0	-21.2	-19.8	-21.3	-21.9	-22.8	-23.7	-24.3	-24.3	-25.1	-24.3	-23.4	-21.3	-21.4	-21.5	-22.3	-23.8	-24.6	-24.7	-24.9	-25.1	-26.3	-27.3	-23.2	-19.8	
16-Dec	-28.5	-29.2	-30.8	-32.1	-33.2	-34.2	-34.2	-35.1	-35.6	-35.8	-34.6	-32.2	-30.6	-29.1	-28.3	-27.9	-28.4	-29.6	-30.2	-29.9	-31.1	-32.3	-32.5	-34.2	-31.7	-27.9
17-Dec	-34.5	-33.9	-34.1	-34.2	-34.4	-34.7	-35.1	-35.3	-35.4	-35.5	-35.3	-34.2	-32.5	-31.1	-30.8	-30.9	-30.8	-31.1	-31.4	-31.8	-31.7	-31.4	-30.7	-29.7	-32.9	-29.7
18-Dec	-28.9	-28.5	-28.7	-28.7	-28.4	-28.3	-27.5	-27.1	-26.5	-25.6	-24.6	-23.4	-22.5	-21.8	-21.5	-21.4	-21.1	-20.9	-20.6	-20.6	-20.5	-20.5	-20.2	-20.0	-24.1	-20.0
19-Dec	-19.6	-19.2	-18.6	-18.5	-18.3	-18.1	-18.1	-17.9	-17.6	-17.2	-16.6	-15.7	-15.1	-14.7	-14.4	-14.2	-14.0	-13.8	-13.6	-13.8	-14.5	-15.7	-17.5	-18.7	-16.5	-13.6
20-Dec	-19.8	-20.0	-18.8	-17.0	-15.3	-15.0	-10.8	-10.5	-12.1	-12.7	-11.9	-10.2	-8.9	-7.0	-5.8	-6.0	-7.2	-7.3	-7.7	-7.7	-8.3	-10.3	-11.3	-11.9	-11.4	-5.8
21-Dec	-12.5	-12.2	-11.9	-11.5	-11.1	-8.8	-8.6	-10.4	-9.4	-7.8	-6.1	-5.4	-3.6	0.7	1.2	1.6	0.9	1.0	-0.7	-1.6	-1.8	-2.5	-2.1	-1.8	-5.2	1.6
22-Dec	-1.8	-1.8	-1.6	0.2	1.1	0.0	0.2	-0.5	-1.8	-2.2	-3.6	-5.8	-7.9	-11.0	-12.1	-12.6	-13.1	-14.0	-14.9	-14.6	-14.5	-14.5	-14.5	-14.6	-7.3	1.1
23-Dec	-15.0	-15.1	-15.2	-15.6	-16.3	-16.8	-17.2	-17.6	-18.0	-18.0	-18.0	-17.7	-17.8	-17.8	-18.1	-18.9	-20.0	-21.5	-22.6	-23.6	-24.4	-25.6	-26.9	-26.9	-19.3	-15.0
24-Dec	-28.0	-28.9	-29.2	-29.8	-30.3	-30.5	-30.8	-31.2	-31.0	-29.9	-28.5	-27.3	-25.7	-25.1	-24.4	-24.4	-23.4	-22.6	-22.1	-21.3	-21.3	-21.6	-22.2	-22.3	-26.3	-21.3
25-Dec	-22.4	-22.1	-22.0	-21.6	-21.3	-21.0	-21.2	-21.5	-21.5	-21.9	-21.6	-20.4	-18.6	-17.7	-17.2	-17.7	-18.7	-19.1	-19.4	-19.4	-19.9	-20.0	-20.9	-21.5	-20.4	-17.2
26-Dec	-21.8	-22.3	-22.5	-22.5	-22.8	-22.5	-22.2	-23.0	-22.8	-22.4	-21.0	-19.9	-18.0	-15.9	-14.9	-15.2	-15.5	-15.7	-15.8	-15.9	-16.1	-16.0	-16.2	-15.8	-19.0	-14.9
27-Dec	-15.1	-14.6	-14.6	-13.4	-12.1	-12.5	-12.5	-12.0	-12.2	-12.4	-11.7	-10.3	-9.1	-7.9	-7.1	-6.7	-6.1	-6.1	-5.0	-3.2	-2.6	-4.5	-7.0	-7.4	-9.4	-2.6
28-Dec	-7.8	-7.7	-8.2	-9.0	-10.2	-10.9	-11.3	-12.2	-13.8	-14.9	-15.0	-14.8	-14.5	-14.4	-14.9	-14.6	-14.4	-14.3	-14.5	-15.4	-16.5	-17.3	-17.5	-17.3	-13.4	-7.7
29-Dec	-17.5	-17.6	-18.2	-17.9	-17.5	-17.1	-16.6	-16.3	-16.0	-15.6	-15.1	-14.4	-13.8	-13.5	-13.3	-13.3	-13.3	-13.4	-13.3	-13.3	-13.2	-13.1	-13.6	-13.8	-15.0	-13.1
30-Dec	-13.6	-13.5	-13.6	-13.4	-13.3	-13.4	-13.4	-13.5	-13.3	-13.6	-13.3	-12.8	-11.9	-11.0	-10.4	-9.6	-8.9	-8.4	-8.8	-10.2	-10.8	-13.0	-13.8	-14.2	-12.1	-8.4
31-Dec	-14.6	-14.7	-14.5	-14.5	-15.2	-15.7	-15.9	-16.5	-16.0	-15.7	-15.1	-14.7	-13.0	-12.3	-12.9	-12.8	-12.7	-11.7	-9.7	-8.9	-10.1	-10.8	-11.7	-11.2	-13.4	-8.9
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 20 m (AT20m) - C
Lower Camp Met Tower - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C
Lower Camp Met Tower - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	313	42.07	42.07
-20 - 0	413	55.51	97.58
0 - 10	18	2.42	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

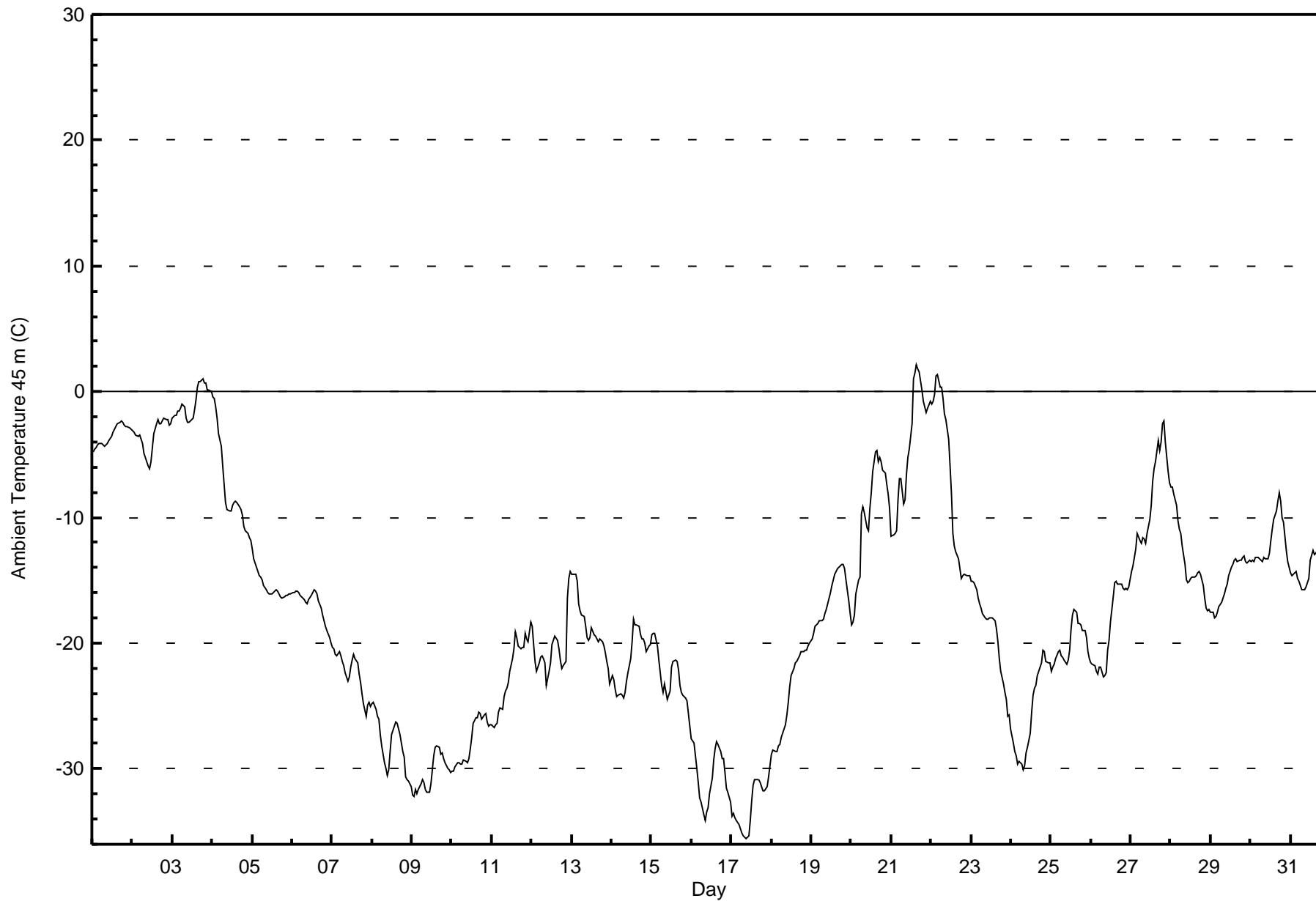


Maximum Value: 2.1 C on Dec 21 16:00 Maximum Daily Average: -0.9 C on Dec 3																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: -35.5 C on Dec 17 10:00 Minimum Daily Average: -32.9 C on Dec 17 Maximum Diurnal Average: -15.7 C at hour 16 Minimum Diurnal Average: -18.6 C at hour 10 Monthly Average: -17.22 C Percentiles: P ₁ = -34.1 P ₁₀ = -29.5 Q ₁ = -23.4 Median = -17.7 Q ₃ = -11.5 P ₉₀ = -3.2 P ₉₉ = 1.0																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.8	-4.6	-4.5	-4.2	-4.1	-4.2	-4.3	-4.3	-4.3	-4.1	-3.9	-3.6	-3.2	-2.9	-2.7	-2.6	-2.4	-2.3	-2.4	-2.7	-2.8	-2.8	-2.9	-3.0	-3.5	-2.3
2-Dec	-3.1	-3.3	-3.4	-3.5	-3.5	-3.8	-4.1	-5.0	-5.3	-5.9	-6.2	-5.6	-4.4	-3.4	-2.5	-2.2	-2.6	-2.6	-2.4	-2.1	-2.2	-2.2	-2.6	-2.5	-3.5	-2.1
3-Dec	-2.1	-1.9	-1.9	-1.6	-1.5	-1.3	-1.0	-1.2	-2.2	-2.5	-2.4	-2.3	-2.1	-1.4	-0.7	0.3	0.8	0.8	1.1	0.7	0.7	0.1	0.1	0.1	-0.9	1.1
4-Dec	-0.4	-0.6	-1.3	-2.1	-3.3	-4.3	-5.9	-7.4	-8.8	-9.3	-9.5	-9.5	-9.0	-8.8	-8.8	-8.9	-9.1	-9.4	-9.9	-10.7	-11.1	-11.3	-11.6	-11.9	-7.6	-0.4
5-Dec	-12.5	-13.3	-14.0	-14.3	-14.6	-14.8	-15.0	-15.5	-15.8	-16.0	-16.1	-16.1	-16.1	-15.9	-15.7	-15.9	-16.0	-16.3	-16.4	-16.3	-16.2	-16.2	-16.0	-16.1	-15.5	-12.5
6-Dec	-16.0	-16.0	-15.8	-15.9	-15.9	-16.2	-16.4	-16.5	-16.8	-16.8	-16.5	-16.2	-16.0	-15.7	-15.9	-16.1	-16.6	-17.2	-17.8	-18.2	-18.7	-19.0	-19.6	-20.1	-16.9	-15.7
7-Dec	-20.4	-20.5	-20.9	-21.0	-20.7	-21.0	-21.5	-21.8	-22.4	-23.0	-22.7	-22.0	-21.4	-20.9	-21.2	-21.6	-22.4	-23.2	-24.0	-24.8	-25.8	-24.9	-24.7	-25.0	-22.4	-20.4
8-Dec	-24.8	-24.6	-25.2	-25.8	-26.1	-27.2	-28.1	-29.5	-30.0	-30.5	-30.1	-28.7	-27.3	-26.6	-26.3	-26.4	-26.8	-27.3	-28.6	-29.0	-30.6	-30.8	-31.0	-31.4	-28.0	-24.6
9-Dec	-32.1	-32.2	-31.6	-32.0	-31.6	-31.1	-30.9	-31.1	-31.6	-31.9	-31.8	-31.1	-30.0	-28.9	-28.3	-28.2	-28.3	-28.8	-28.8	-29.2	-29.5	-30.0	-30.1	-30.3	-30.4	-28.2
10-Dec	-30.2	-30.2	-29.8	-29.5	-29.5	-29.6	-29.7	-29.3	-29.4	-29.5	-29.1	-28.4	-27.5	-26.4	-25.9	-25.9	-25.4	-25.6	-26.1	-25.7	-25.6	-26.2	-26.6	-26.5	-27.8	-25.4
11-Dec	-26.5	-26.8	-26.5	-26.3	-25.5	-25.1	-25.2	-24.3	-23.9	-23.6	-23.2	-22.3	-21.3	-20.5	-19.2	-19.6	-20.3	-20.4	-20.3	-20.4	-19.3	-19.7	-19.9	-18.3	-22.4	-18.3
12-Dec	-18.6	-20.1	-21.4	-22.2	-21.6	-21.1	-21.0	-21.2	-21.6	-23.4	-22.2	-21.5	-20.1	-19.8	-19.5	-19.8	-20.5	-21.4	-22.0	-21.8	-21.4	-16.4	-14.9	-14.3	-20.3	-14.3
13-Dec	-14.6	-14.6	-14.5	-15.1	-16.8	-17.4	-17.8	-17.9	-18.7	-19.5	-19.8	-19.6	-18.8	-19.3	-19.5	-19.6	-19.9	-19.7	-19.9	-20.2	-20.8	-21.4	-22.0	-23.3	-18.8	-14.5
14-Dec	-22.6	-22.9	-23.7	-24.3	-24.2	-24.0	-24.1	-24.3	-23.9	-23.0	-22.4	-21.2	-19.9	-18.0	-18.5	-18.6	-18.7	-19.3	-19.7	-19.7	-20.0	-20.7	-20.2	-20.2	-21.4	-18.0
15-Dec	-19.3	-19.2	-19.2	-20.3	-21.3	-22.3	-23.4	-24.0	-23.2	-24.5	-24.2	-23.8	-21.9	-21.4	-21.4	-21.5	-22.1	-23.4	-24.0	-24.2	-24.3	-24.6	-25.6	-26.6	-22.7	-19.2
16-Dec	-27.6	-28.0	-28.9	-29.9	-31.0	-32.3	-32.6	-33.6	-34.1	-33.5	-33.1	-32.0	-30.7	-29.3	-28.4	-27.8	-28.1	-28.7	-29.2	-29.2	-30.3	-31.6	-31.9	-32.6	-30.6	-27.6
17-Dec	-33.7	-33.5	-33.9	-34.1	-34.5	-34.8	-35.1	-35.3	-35.4	-35.5	-35.3	-34.1	-32.5	-31.3	-30.9	-30.8	-30.8	-31.1	-31.4	-31.8	-31.7	-31.4	-30.6	-29.7	-32.9	-29.7
18-Dec	-28.9	-28.5	-28.6	-28.6	-28.1	-28.1	-27.6	-27.1	-26.5	-25.7	-24.7	-23.4	-22.6	-22.0	-21.6	-21.5	-21.2	-21.0	-20.7	-20.7	-20.5	-20.5	-20.3	-20.1	-24.1	-20.1
19-Dec	-19.6	-19.2	-18.6	-18.6	-18.4	-18.2	-18.2	-18.1	-17.7	-17.3	-16.8	-16.0	-15.4	-14.9	-14.6	-14.3	-14.1	-13.8	-13.7	-13.7	-14.1	-15.0	-16.6	-17.6	-16.4	-13.7
20-Dec	-18.6	-18.4	-17.7	-16.1	-15.0	-14.7	-9.7	-9.2	-9.6	-10.8	-11.0	-9.3	-8.0	-6.3	-4.8	-4.7	-5.5	-5.2	-5.6	-6.3	-6.5	-7.3	-8.2	-9.2	-9.9	-4.7
21-Dec	-11.5	-11.4	-11.2	-11.0	-8.6	-7.0	-7.0	-9.0	-8.5	-6.6	-5.3	-4.6	-2.6	1.0	1.5	2.1	1.8	1.6	0.1	-0.8	-1.2	-1.6	-1.3	-0.8	-4.2	2.1
22-Dec	-0.9	-0.8	-0.2	1.2	1.3	0.4	0.3	-0.5	-1.8	-2.3	-3.8	-5.9	-8.1	-11.2	-12.3	-12.7	-13.2	-14.1	-14.8	-14.6	-14.6	-14.6	-14.6	-14.6	-7.2	1.3
23-Dec	-15.0	-15.1	-15.2	-15.7	-16.4	-16.8	-17.3	-17.7	-18.0	-18.1	-18.1	-17.9	-18.0	-18.0	-18.2	-18.9	-19.9	-21.2	-22.3	-23.2	-23.9	-24.5	-25.8	-25.7	-19.2	-15.0
24-Dec	-26.9	-28.0	-28.6	-28.9	-29.6	-29.4	-29.6	-30.1	-29.7	-28.8	-28.3	-27.2	-25.4	-24.2	-23.6	-23.4	-22.6	-21.9	-21.6	-20.6	-20.7	-21.4	-21.6	-21.6	-25.6	-20.6
25-Dec	-22.3	-21.9	-21.7	-21.2	-20.7	-20.6	-21.0	-21.1	-21.3	-21.7	-21.4	-20.5	-18.8	-17.7	-17.3	-17.5	-18.5	-18.5	-18.5	-19.0	-19.1	-19.6	-20.7	-21.2	-20.1	-17.3
26-Dec	-21.5	-21.7	-21.8	-22.3	-22.5	-21.9	-21.9	-22.7	-22.6	-22.3	-20.5	-19.8	-18.3	-16.3	-15.1	-15.1	-15.3	-15.3	-15.3	-15.6	-15.7	-15.6	-15.8	-15.6	-18.8	-15.1
27-Dec	-14.3	-13.9	-13.2	-12.5	-11.3	-11.8	-12.1	-11.7	-11.8	-12.1	-11.3	-10.2	-9.0	-7.2	-6.1	-5.6	-3.9	-4.7	-4.0	-2.6	-2.4	-4.0	-6.4	-7.3	-8.7	-2.4
28-Dec	-7.6	-7.6	-8.2	-9.1	-10.2	-10.9	-11.3	-12.2	-13.8	-15.0	-15.2	-15.0	-14.9	-14.8	-14.8	-14.7	-14.5	-14.3	-14.6	-15.4	-16.4	-17.2	-17.5	-17.3	-13.4	-7.6
29-Dec	-17.5	-17.6	-17.9	-17.9	-17.5	-17.1	-16.7	-16.4	-16.1	-15.7	-15.3	-14.6	-14.0	-13.8	-13.5	-13.3	-13.5	-13.4	-13.4	-13.2	-13.1	-13.5	-13.6	-13.5	-15.1	-13.1
30-Dec	-13.5	-13.5	-13.5	-13.2	-13.2	-13.3	-13.4	-13.5	-13.2	-13.3	-13.3	-12.9	-11.9	-10.9	-10.2	-9.5	-8.7	-8.1	-8.7	-10.0	-10.4	-12.7	-13.5	-14.0	-12.0	-8.1
31-Dec	-14.4	-14.6	-14.4	-14.3	-14.9	-15.0	-15.5	-15.8	-15.8	-15.5	-15.2	-14.8	-13.4	-12.6	-13.0	-12.8	-12.6	-11.4	-9.5	-8.9	-10.1	-10.7	-11.6	-11.1	-13.2	-8.9
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 45 m (AT45m) - C
Lower Camp Met Tower - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C
Lower Camp Met Tower - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	302	40.59	40.59
-20 - 0	423	56.85	97.45
0 - 10	19	2.55	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 100 m (AT100m) - C

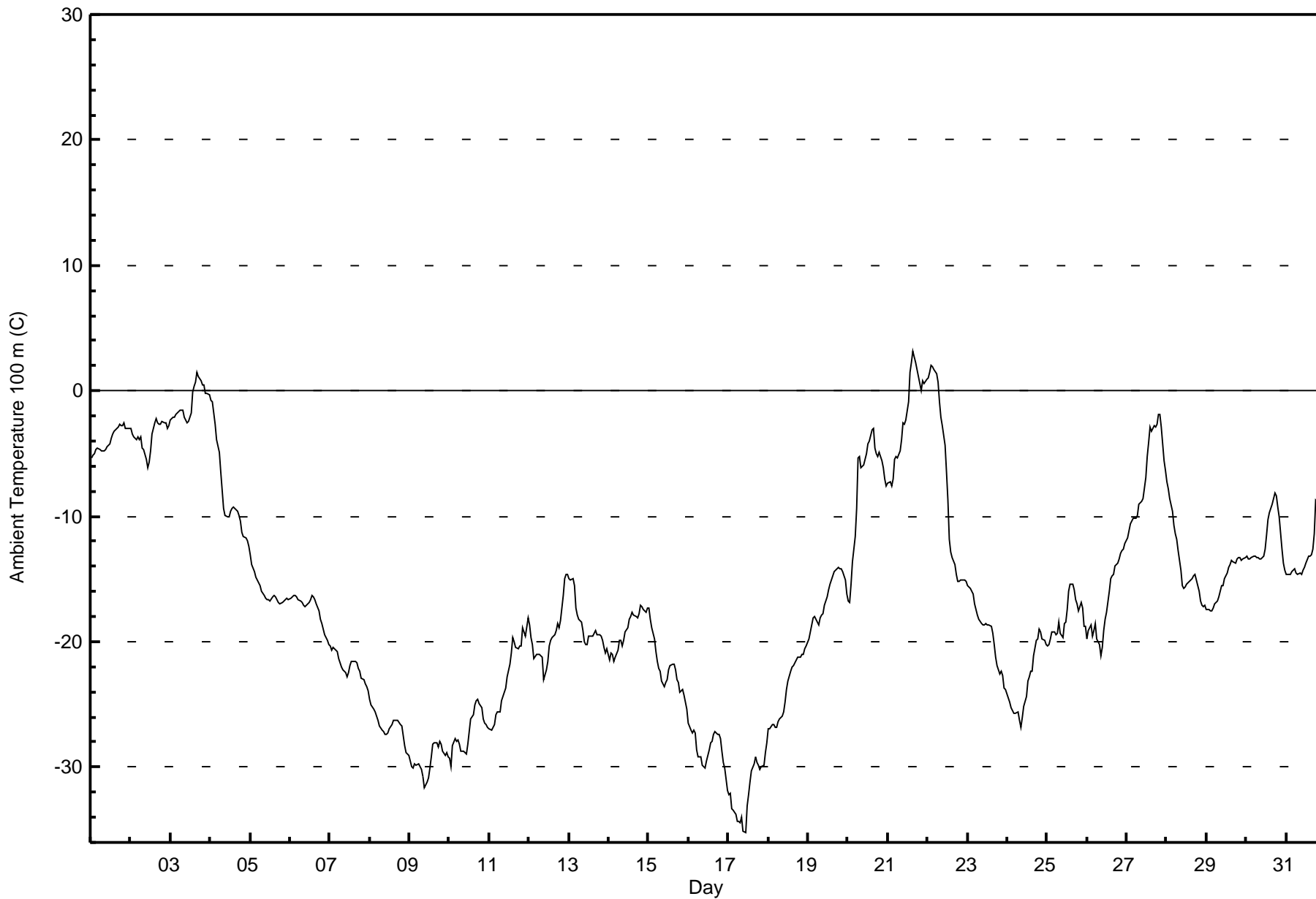
Lower Camp Met Tower - December 2016

Maximum Value: 3.1 C on Dec 21 16:00 Maximum Daily Average: -0.9 C on Dec 3																						Hours in Service: 744				
Minimum Value: -35.2 C on Dec 17 11:00 Minimum Daily Average: -31.8 C on Dec 17																						Hours of Data: 744				
Maximum Diurnal Average: -15.5 C at hour 16 Minimum Diurnal Average: -17.7 C at hour 10																						Hours of Missing Data: 0				
Monthly Average: -16.51 C Percentiles: P₁ = -33.4 P₁₀ = -27.9 Q₁ = -22.4 Median = -17.3 Q₃ = -10.6 P₉₀ = -3.0 P₉₉ = 1.4																						Hours of Calibration: 0				
																						Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.3	-5.1	-5.0	-4.6	-4.6	-4.7	-4.8	-4.8	-4.8	-4.7	-4.4	-4.2	-3.8	-3.5	-3.3	-3.1	-2.9	-2.6	-2.8	-2.8	-2.6	-3.0	-3.1	-3.0	-3.9	-2.6
2-Dec	-3.0	-3.5	-3.7	-3.9	-3.7	-3.9	-3.7	-4.5	-4.7	-5.5	-6.2	-5.7	-4.8	-3.5	-2.5	-2.2	-2.6	-2.6	-2.6	-2.5	-2.6	-2.6	-3.0	-2.7	-3.6	-2.2
3-Dec	-2.3	-2.1	-2.1	-1.9	-1.8	-1.6	-1.5	-1.5	-2.1	-2.4	-2.5	-2.5	-1.8	-0.1	0.4	0.7	1.4	1.1	0.8	0.5	0.4	-0.2	-0.3	-0.3	-0.9	1.4
4-Dec	-0.8	-0.9	-1.8	-2.7	-3.9	-4.8	-6.4	-8.0	-9.4	-9.9	-10.1	-10.1	-9.6	-9.3	-9.3	-9.4	-9.6	-9.9	-10.4	-11.3	-11.6	-11.7	-11.9	-12.4	-8.1	-0.8
5-Dec	-13.0	-13.9	-14.4	-14.8	-15.1	-15.3	-15.5	-16.0	-16.3	-16.5	-16.7	-16.7	-16.7	-16.5	-16.3	-16.4	-16.6	-16.8	-16.9	-16.8	-16.8	-16.7	-16.5	-16.6	-16.0	-13.0
6-Dec	-16.5	-16.5	-16.3	-16.3	-16.4	-16.6	-16.8	-16.9	-17.1	-17.2	-17.1	-16.9	-16.7	-16.4	-16.4	-16.6	-17.0	-17.5	-18.2	-18.6	-18.9	-19.4	-19.9	-20.2	-17.4	-16.3
7-Dec	-20.3	-20.6	-20.5	-20.6	-20.8	-21.3	-21.7	-22.0	-22.2	-22.5	-22.7	-22.4	-22.0	-21.6	-21.6	-21.6	-21.7	-22.1	-22.4	-23.0	-23.0	-23.4	-23.6	-23.9	-22.0	-20.3
8-Dec	-24.6	-25.0	-25.4	-25.6	-26.0	-26.3	-26.8	-27.0	-27.2	-27.4	-27.4	-27.3	-27.0	-26.5	-26.3	-26.3	-26.2	-26.2	-26.6	-26.8	-27.5	-28.3	-28.8	-29.0	-26.7	-24.6
9-Dec	-29.5	-30.0	-30.1	-29.7	-29.8	-29.8	-30.0	-30.2	-30.7	-31.6	-31.2	-30.8	-30.0	-29.1	-28.2	-28.1	-28.1	-28.4	-27.9	-28.1	-28.7	-29.0	-28.8	-29.1	-29.5	-27.9
10-Dec	-29.2	-30.0	-28.3	-27.7	-27.9	-27.9	-28.2	-28.7	-28.8	-28.9	-29.0	-28.1	-27.2	-26.2	-25.8	-25.0	-24.7	-24.6	-25.0	-25.2	-26.1	-26.5	-26.6	-26.8	-27.2	-24.6
11-Dec	-27.0	-27.1	-26.8	-26.6	-25.9	-25.6	-25.6	-24.7	-24.3	-24.1	-23.6	-22.8	-21.8	-20.9	-19.6	-20.0	-20.5	-20.5	-20.4	-20.3	-18.9	-19.2	-19.5	-18.1	-22.7	-18.1
12-Dec	-18.6	-19.7	-20.2	-21.3	-21.0	-21.0	-21.0	-21.1	-21.2	-23.0	-22.3	-21.5	-20.3	-19.9	-19.6	-19.5	-19.1	-18.5	-18.8	-18.3	-16.3	-15.0	-14.6	-14.6	-19.4	-14.6
13-Dec	-15.0	-15.0	-15.0	-15.5	-17.4	-17.9	-18.2	-18.4	-19.2	-20.0	-20.2	-20.2	-19.6	-19.6	-19.6	-19.4	-19.1	-19.4	-19.5	-19.6	-19.9	-20.4	-20.9	-20.5	-18.7	-15.0
14-Dec	-21.4	-20.9	-21.0	-21.6	-21.2	-20.6	-19.9	-19.9	-20.4	-19.9	-19.3	-18.9	-18.2	-18.0	-17.6	-17.8	-18.0	-18.1	-17.8	-17.1	-17.2	-17.4	-17.7	-17.3	-19.1	-17.1
15-Dec	-17.3	-18.3	-18.9	-19.7	-20.8	-21.6	-22.2	-22.3	-23.1	-23.5	-23.2	-23.0	-22.3	-21.9	-21.8	-21.8	-22.2	-23.0	-23.3	-24.0	-23.8	-24.3	-24.8	-25.4	-22.2	-17.3
16-Dec	-26.5	-27.1	-27.3	-27.0	-27.2	-28.6	-29.1	-29.2	-29.8	-30.0	-30.0	-29.5	-28.7	-28.1	-27.9	-27.4	-27.2	-27.3	-27.4	-27.8	-28.7	-29.6	-30.0	-31.9	-28.5	-26.5
17-Dec	-32.2	-32.1	-33.3	-33.4	-33.8	-34.4	-34.4	-34.4	-34.0	-35.2	-35.2	-33.1	-32.2	-31.2	-30.3	-29.8	-29.2	-29.6	-29.8	-30.2	-30.0	-29.9	-28.9	-28.0	-31.8	-28.0
18-Dec	-27.0	-27.0	-26.6	-26.6	-26.8	-26.8	-26.4	-26.2	-25.9	-25.6	-24.8	-23.8	-23.1	-22.3	-22.0	-21.9	-21.7	-21.4	-21.2	-21.2	-21.0	-21.0	-20.6	-20.4	-23.8	-20.4
19-Dec	-19.8	-19.3	-18.6	-18.1	-17.9	-18.2	-18.6	-18.1	-17.8	-17.7	-17.1	-16.4	-15.9	-15.4	-15.1	-14.8	-14.4	-14.2	-14.1	-14.1	-14.2	-14.4	-15.0	-16.2	-16.5	-14.1
20-Dec	-16.7	-16.9	-15.4	-13.6	-11.6	-9.3	-5.4	-5.3	-6.1	-5.9	-5.5	-5.0	-4.2	-4.0	-3.2	-3.0	-4.5	-5.0	-5.2	-4.9	-5.5	-6.2	-7.1	-7.6	-7.4	-3.0
21-Dec	-7.4	-7.3	-7.6	-7.1	-5.5	-5.3	-5.4	-4.8	-3.9	-2.6	-2.7	-2.3	-0.9	1.5	2.2	3.1	2.7	2.3	1.1	0.6	0.0	0.8	0.6	0.9	-2.0	3.1
22-Dec	1.1	1.4	2.0	1.9	1.6	1.4	0.7	-0.8	-2.2	-2.7	-4.3	-6.5	-8.7	-11.9	-12.9	-13.3	-13.8	-14.7	-15.2	-15.1	-15.1	-15.1	-15.2	-7.2	2.0	
23-Dec	-15.5	-15.7	-15.8	-16.3	-16.9	-17.4	-17.8	-18.2	-18.6	-18.7	-18.7	-18.6	-18.6	-18.6	-18.8	-19.3	-20.3	-21.2	-21.9	-22.6	-22.4	-22.7	-23.6	-23.8	-19.3	-15.5
24-Dec	-24.1	-24.8	-25.2	-25.4	-25.8	-25.7	-25.7	-26.2	-26.8	-26.0	-25.2	-24.3	-23.1	-22.8	-22.4	-22.4	-21.1	-19.9	-19.8	-19.0	-19.3	-19.8	-19.9	-20.2	-23.1	-19.0
25-Dec	-20.4	-20.2	-19.8	-19.3	-19.2	-19.4	-19.4	-18.5	-19.4	-19.7	-18.6	-18.5	-17.5	-16.0	-15.5	-15.4	-15.8	-16.6	-17.0	-17.6	-16.9	-17.3	-18.8	-18.8	-18.1	-15.4
26-Dec	-19.8	-19.1	-18.6	-19.5	-19.2	-18.5	-19.8	-20.2	-21.1	-20.4	-19.1	-18.2	-17.6	-16.0	-15.0	-14.7	-14.6	-14.0	-13.8	-13.4	-12.9	-12.7	-12.6	-12.2	-16.8	-12.2
27-Dec	-11.7	-11.1	-10.6	-10.4	-10.2	-10.1	-9.9	-9.1	-8.9	-8.8	-8.6	-6.9	-5.3	-4.1	-2.9	-3.2	-2.8	-2.9	-1.9	-1.8	-2.8	-5.6	-6.4	-6.6	-1.8	
28-Dec	-7.2	-7.8	-8.6	-9.6	-10.8	-11.4	-11.8	-12.7	-14.3	-15.5	-15.8	-15.7	-15.4	-15.3	-15.1	-15.0	-14.7	-14.6	-15.1	-15.9	-16.7	-17.1	-17.2	-17.1	-13.8	-7.2
29-Dec	-17.4	-17.5	-17.6	-17.5	-17.3	-17.0	-16.8	-16.4	-15.9	-15.6	-15.5	-15.0	-14.5	-14.1	-13.9	-13.5	-13.6	-13.7	-13.4	-13.3	-13.3	-13.5	-13.4	-13.3	-15.1	-13.3
30-Dec	-13.1	-13.4	-13.4	-13.3	-13.2	-13.1	-13.3	-13.3	-13.4	-13.4	-13.1	-12.6	-11.5	-10.3	-9.7	-9.0	-8.6	-8.1	-8.4	-9.3	-10.0	-12.6	-13.8	-14.3	-11.8	-8.1
31-Dec	-14.6	-14.6	-14.6	-14.4	-14.3	-14.2	-14.5	-14.7	-14.5	-14.6	-14.3	-14.1	-13.7	-13.2	-13.2	-13.1	-12.6	-11.4	-8.7	-8.9	-9.9	-9.9	-10.5	-9.8	-12.9	-8.7
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 100 m (AT100m) - C
Lower Camp Met Tower - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 100 m (AT100m) - C
Lower Camp Met Tower - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	262	35.22	35.22
-20 - 0	457	61.42	96.64
0 - 10	25	3.36	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 167 m (AT167m) - C

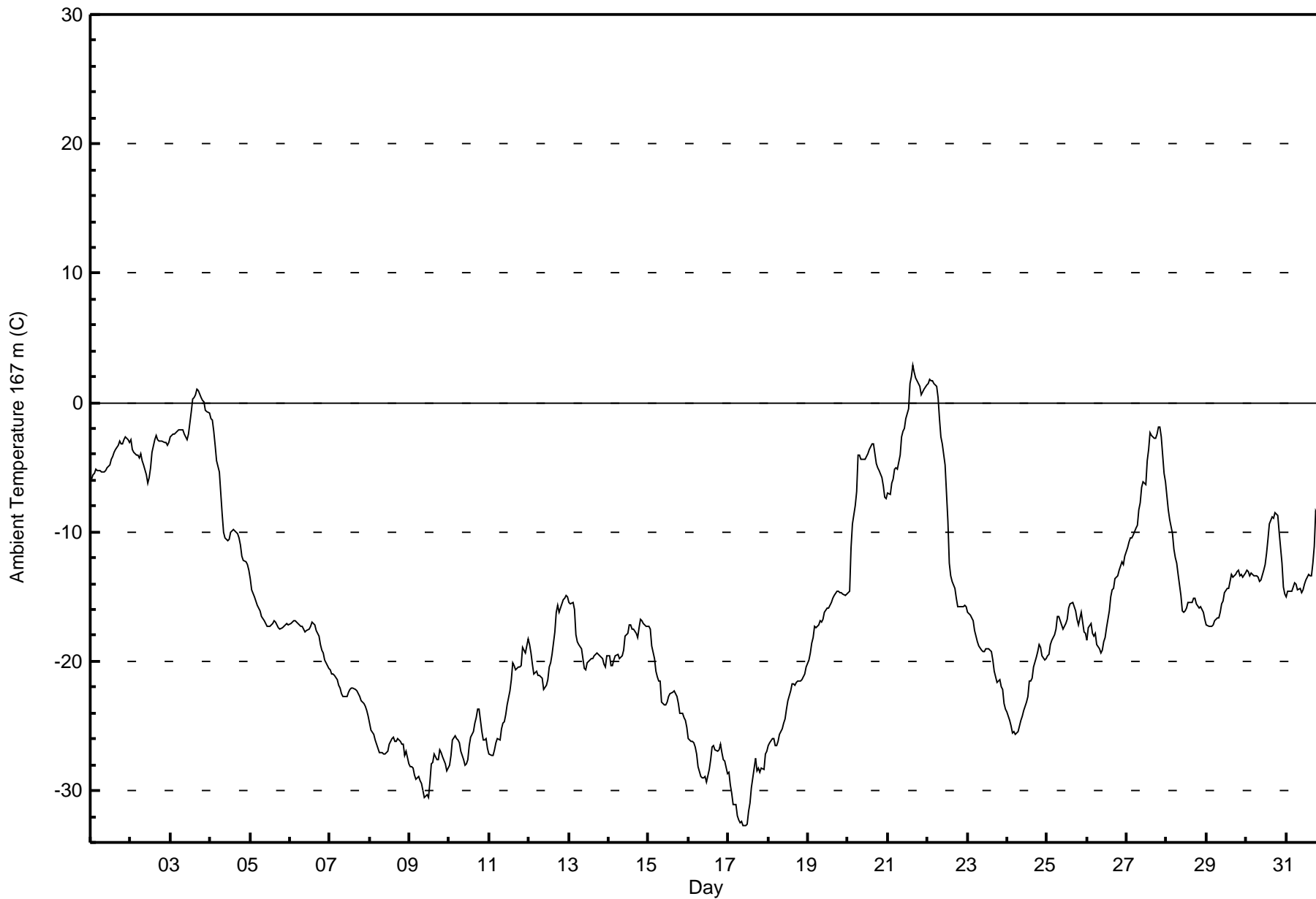
Lower Camp Met Tower - December 2016

Maximum Value: 2.8 C on Dec 21 16:00 Maximum Daily Average: -1.2 C on Dec 3																						Hours in Service: 744				
Minimum Value: -32.7 C on Dec 17 10:00 Minimum Daily Average: -30.1 C on Dec 17																						Hours of Data: 744				
Maximum Diurnal Average: -15.4 C at hour 16 Minimum Diurnal Average: -17.3 C at hour 10																						Hours of Missing Data: 0				
Monthly Average: -16.29 C Percentiles: P₁ = -31.7 P₁₀ = -27.0 Q₁ = -22.4 Median = -17.2 Q₃ = -10.6 P₉₀ = -3.1 P₉₉ = 1.7																						Hours of Calibration: 0				
																						Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.9	-5.6	-5.5	-5.2	-5.2	-5.3	-5.4	-5.4	-5.4	-5.2	-5.0	-4.8	-4.4	-4.1	-3.9	-3.6	-3.3	-3.0	-3.2	-3.1	-2.9	-2.7	-2.9	-3.0	-4.3	-2.7
2-Dec	-2.9	-3.6	-3.8	-4.0	-4.1	-4.3	-4.0	-4.5	-4.8	-5.6	-6.2	-5.8	-5.0	-3.8	-2.8	-2.5	-2.9	-3.0	-3.0	-2.9	-3.1	-3.1	-3.3	-3.0	-3.8	-2.5
3-Dec	-2.7	-2.4	-2.4	-2.3	-2.2	-2.1	-2.1	-2.1	-2.4	-2.7	-2.9	-2.4	-0.7	0.3	0.4	0.6	1.1	1.0	0.4	0.1	0.0	-0.6	-0.7	-0.8	-1.2	1.1
4-Dec	-1.2	-1.4	-2.2	-3.3	-4.5	-5.4	-7.0	-8.6	-10.0	-10.5	-10.6	-10.5	-10.1	-9.9	-9.8	-9.9	-10.1	-10.5	-11.0	-11.9	-12.2	-12.3	-12.5	-12.9	-8.7	-1.2
5-Dec	-13.6	-14.5	-15.0	-15.4	-15.7	-15.9	-16.1	-16.6	-16.9	-17.1	-17.3	-17.3	-17.0	-16.9	-17.0	-17.2	-17.4	-17.5	-17.4	-17.3	-17.2	-17.1	-17.2	-16.6	-16.6	-13.6
6-Dec	-17.1	-17.0	-16.8	-16.8	-16.9	-17.1	-17.2	-17.3	-17.5	-17.7	-17.7	-17.5	-17.3	-17.0	-17.0	-17.2	-17.6	-18.1	-18.8	-19.1	-19.4	-19.9	-20.3	-20.6	-17.9	-16.8
7-Dec	-20.6	-21.0	-21.0	-21.1	-21.4	-21.8	-22.1	-22.5	-22.7	-22.7	-22.7	-22.4	-22.1	-22.1	-22.1	-22.1	-22.2	-22.5	-22.7	-23.1	-23.2	-23.5	-23.8	-24.2	-22.3	-20.6
8-Dec	-24.8	-25.3	-25.7	-26.0	-26.4	-26.7	-27.0	-27.1	-27.2	-27.2	-27.1	-26.9	-26.4	-25.9	-25.9	-26.2	-26.2	-26.0	-26.2	-26.4	-26.5	-27.3	-27.0	-27.9	-26.5	-24.8
9-Dec	-28.1	-28.1	-28.2	-28.8	-29.1	-28.9	-29.2	-29.4	-30.0	-30.5	-30.3	-30.5	-29.4	-27.9	-27.9	-27.2	-27.6	-27.7	-26.9	-27.1	-27.3	-27.9	-28.4	-28.3	-28.5	-26.9
10-Dec	-28.0	-27.3	-26.1	-25.8	-25.9	-26.0	-26.3	-26.9	-27.6	-28.0	-27.9	-27.6	-26.5	-25.9	-25.4	-24.8	-24.4	-23.7	-23.7	-25.4	-26.1	-26.1	-26.0	-26.7	-26.2	-23.7
11-Dec	-27.2	-27.3	-27.3	-26.9	-26.3	-26.0	-26.1	-25.2	-24.8	-24.6	-24.1	-23.4	-22.3	-21.4	-20.1	-20.4	-20.6	-20.4	-20.4	-20.3	-18.9	-19.2	-19.4	-18.2	-23.0	-18.2
12-Dec	-18.7	-19.4	-20.2	-21.0	-20.8	-21.1	-21.1	-21.2	-21.3	-22.2	-21.8	-21.4	-20.4	-20.1	-19.5	-17.7	-16.2	-15.7	-16.2	-15.9	-15.2	-15.1	-14.9	-15.1	-18.8	-14.9
13-Dec	-15.5	-15.5	-15.5	-16.0	-18.0	-18.4	-18.7	-19.0	-19.7	-20.6	-20.7	-20.1	-20.0	-19.8	-19.8	-19.6	-19.4	-19.4	-19.5	-19.6	-19.8	-20.2	-20.5	-19.5	-19.0	-15.5
14-Dec	-19.5	-20.3	-20.4	-20.0	-19.6	-19.5	-19.7	-19.7	-19.6	-19.2	-18.1	-17.9	-17.2	-17.2	-17.5	-17.5	-17.8	-18.1	-17.4	-16.7	-16.9	-17.1	-17.3	-17.3	-18.4	-16.7
15-Dec	-17.3	-17.5	-18.8	-19.7	-20.8	-21.2	-21.5	-21.5	-23.1	-23.4	-23.4	-23.2	-22.7	-22.5	-22.4	-22.3	-22.5	-22.7	-23.2	-24.0	-24.0	-24.4	-24.6	-25.1	-22.2	-17.3
16-Dec	-26.0	-26.2	-26.2	-26.3	-26.6	-27.1	-28.2	-28.9	-29.0	-29.0	-28.9	-29.3	-28.3	-27.6	-26.6	-26.5	-26.8	-27.0	-26.8	-26.4	-27.0	-27.6	-27.7	-28.7	-27.5	-26.0
17-Dec	-28.5	-29.6	-30.2	-31.1	-31.0	-32.0	-32.3	-32.5	-32.4	-32.7	-32.7	-32.6	-31.6	-30.9	-29.8	-28.3	-27.5	-28.4	-28.3	-28.6	-28.3	-28.4	-27.1	-27.0	-30.1	-27.0
18-Dec	-26.5	-26.3	-26.0	-26.0	-26.5	-26.5	-26.1	-25.7	-25.2	-24.8	-24.5	-23.7	-23.1	-22.3	-21.7	-21.7	-21.8	-21.6	-21.6	-21.5	-21.4	-21.2	-21.0	-20.5	-23.6	-20.5
19-Dec	-19.9	-19.4	-18.6	-18.2	-17.3	-17.4	-17.2	-16.9	-17.0	-16.8	-16.2	-15.8	-15.9	-15.6	-15.5	-15.1	-14.9	-14.6	-14.6	-14.7	-14.7	-14.8	-14.9	-14.8	-16.3	-14.6
20-Dec	-14.7	-14.6	-11.2	-9.3	-8.0	-6.9	-4.1	-4.1	-4.4	-4.4	-4.4	-4.2	-4.0	-3.6	-3.2	-3.2	-3.9	-4.7	-5.1	-5.2	-5.8	-6.4	-7.3	-7.4	-6.2	-3.2
21-Dec	-7.0	-7.0	-6.3	-5.9	-5.2	-5.1	-5.2	-4.1	-2.7	-2.2	-2.0	-1.2	-0.5	1.4	2.0	2.8	2.3	2.0	1.4	1.3	0.6	0.8	1.0	1.3	-1.5	2.8
22-Dec	1.5	1.8	1.7	1.7	1.5	1.3	0.4	-1.2	-2.7	-3.2	-4.9	-7.0	-9.2	-12.4	-13.3	-13.8	-14.4	-15.2	-15.8	-15.7	-15.8	-15.8	-15.7	-15.8	-7.6	1.8
23-Dec	-16.2	-16.3	-16.4	-16.9	-17.6	-18.0	-18.5	-18.9	-19.2	-19.3	-19.2	-19.0	-19.0	-19.1	-19.2	-19.9	-20.7	-21.2	-21.6	-21.4	-21.9	-22.2	-23.2	-23.7	-19.5	-16.2
24-Dec	-24.0	-24.6	-25.0	-25.5	-25.5	-25.4	-25.0	-24.5	-24.2	-23.8	-23.2	-22.7	-21.6	-21.5	-21.3	-20.4	-19.7	-19.3	-18.7	-18.9	-19.6	-19.9	-19.8	-22.5	-18.7	
25-Dec	-19.6	-19.4	-18.7	-18.4	-17.9	-17.6	-16.5	-16.5	-16.8	-17.5	-17.3	-17.1	-16.8	-15.9	-15.6	-15.5	-15.8	-16.1	-16.8	-17.2	-16.3	-16.9	-17.8	-17.8	-17.2	-15.5
26-Dec	-18.4	-17.4	-17.0	-17.9	-18.1	-17.9	-18.7	-19.1	-19.4	-19.2	-18.5	-18.1	-17.4	-16.1	-15.0	-14.5	-14.4	-13.6	-13.4	-13.0	-12.6	-12.3	-12.5	-11.9	-16.1	-11.9
27-Dec	-11.2	-10.8	-10.5	-10.4	-10.2	-9.7	-9.5	-8.3	-7.8	-6.5	-6.1	-6.4	-4.5	-3.6	-2.3	-2.5	-2.7	-2.8	-2.5	-1.9	-1.9	-2.7	-5.4	-6.1	-6.1	-1.9
28-Dec	-7.2	-8.2	-9.1	-10.1	-11.3	-12.0	-12.4	-13.3	-14.9	-16.1	-16.2	-16.1	-15.9	-15.5	-15.5	-15.5	-15.2	-15.1	-15.5	-15.9	-15.8	-16.0	-16.2	-16.8	-14.0	-7.2
29-Dec	-17.2	-17.3	-17.3	-17.3	-17.2	-16.9	-16.7	-16.6	-16.2	-15.5	-15.3	-14.7	-14.4	-14.3	-13.8	-13.3	-13.5	-13.2	-13.1	-13.0	-13.4	-13.3	-13.4	-13.2	-15.0	-13.0
30-Dec	-12.9	-13.1	-13.4	-13.1	-13.4	-13.4	-13.4	-13.5	-13.8	-13.7	-13.0	-12.5	-11.7	-10.6	-9.4	-8.8	-8.9	-8.5	-8.6	-8.7	-10.0	-12.4	-14.2	-14.8	-11.9	-8.5
31-Dec	-15.0	-14.6	-14.6	-14.6	-14.2	-14.0	-14.0	-14.4	-14.4	-14.7	-14.5	-14.1	-13.7	-13.3	-13.4	-13.4	-12.4	-11.1	-8.4	-9.0	-9.7	-9.5	-9.9	-9.3	-12.8	-8.4
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 167 m (AT167m) - C
Lower Camp Met Tower - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 167 m (AT167m) - C
Lower Camp Met Tower - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	254	34.14	34.14
-20 - 0	464	62.37	96.51
0 - 10	26	3.49	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

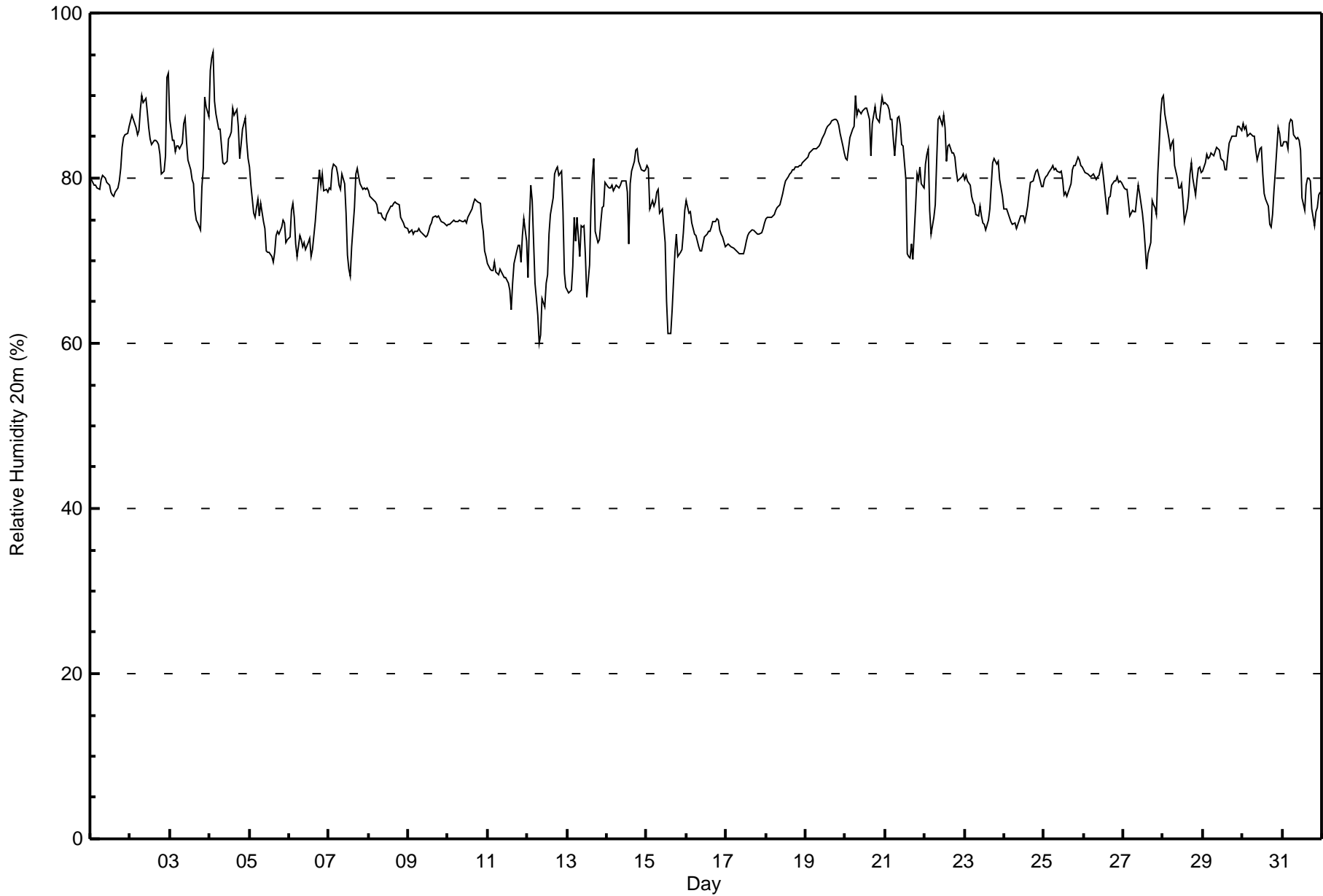


Maximum Value: 95 % on Dec 4 03:00																	Maximum Daily Average: 86.9 % on Dec 20										Hours in Service: 744																																									
Minimum Value: 60 % on Dec 12 08:00																	Minimum Daily Average: 69.4 % on Dec 11										Hours of Data: 744																																									
Maximum Diurnal Average: 79.8 % at hour 23																	Minimum Diurnal Average: 75.7 % at hour 14										Hours of Missing Data: 0																																									
Monthly Average: 78.5 %																	Percentiles: P ₁ = 64 P ₁₀ = 71 Q ₁ = 75 Median = 79 Q ₃ = 82 P ₉₀ = 86 P ₉₉ = 90										Hours of Calibration: 0																																									
																											Percent Operational Time: 100.0																																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																												
1-Dec	80	79	79	79	79	79	80	80	80	80	80	79	78	78	78	78	79	80	81	84	85	85	85	86	80.5	86																																										
2-Dec	87	88	87	86	85	86	88	90	89	90	88	86	85	84	85	85	84	84	83	80	81	83	92	93	86.2	93																																										
3-Dec	87	85	84	83	84	84	84	84	87	87	84	82	81	80	79	76	75	75	74	79	81	90	89	88	82.6	90																																										
4-Dec	93	95	95	89	88	86	86	84	82	82	82	85	85	86	88	88	88	86	82	84	86	87	84	82	86.4	95																																										
5-Dec	81	79	76	75	76	77	75	77	75	74	71	71	71	71	70	71	73	74	73	74	75	75	72	72	74.1	81																																										
6-Dec	73	76	77	75	72	70	73	73	72	72	71	72	73	70	71	73	75	79	81	79	81	78	79	78	74.8	81																																										
7-Dec	79	79	81	82	81	81	79	79	80	79	76	71	69	68	72	76	81	81	80	79	79	79	79	79	77.8	82																																										
8-Dec	79	78	77	77	77	77	76	76	75	75	75	76	76	77	77	77	77	77	77	75	75	75	74	74	76.1	79																																										
9-Dec	73	73	74	73	74	74	74	74	73	73	73	73	74	74	75	75	75	75	75	75	75	75	74	74	74.1	75																																										
10-Dec	74	74	75	75	75	75	75	75	75	75	75	75	75	76	76	77	77	77	77	77	75	74	71	70	75.0	77																																										
11-Dec	70	69	69	69	70	69	68	69	69	68	68	68	67	66	64	67	70	71	72	72	70	73	75	72	69.4	75																																										
12-Dec	68	75	79	77	67	66	63	60	61	65	64	67	68	73	76	78	80	81	81	80	81	76	68	67	71.8	81																																										
13-Dec	66	66	66	69	75	72	75	71	74	74	74	71	66	69	77	80	82	74	72	73	75	76	77	80	73.1	82																																										
14-Dec	79	79	79	79	79	79	79	79	79	80	80	80	78	72	79	81	82	83	83	82	82	81	81	81	79.8	83																																										
15-Dec	82	81	76	77	77	77	78	79	76	76	74	72	65	61	61	64	68	71	73	70	71	71	73	76	73.0	82																																										
16-Dec	77	76	76	75	74	73	73	72	71	71	72	73	73	74	74	74	75	75	75	75	74	73	73	72	73.7	77																																										
17-Dec	72	72	72	72	72	71	71	71	71	71	71	71	72	73	73	74	74	74	74	73	73	73	73	74	75	72.4	75																																									
18-Dec	75	75	75	75	75	76	76	76	77	77	78	79	80	80	81	81	81	81	81	81	82	82	82	82	78.7	82																																										
19-Dec	82	83	83	83	83	84	83	84	84	84	85	85	86	86	86	87	87	87	87	87	86	85	84	83	84.8	87																																										
20-Dec	82	82	84	85	86	86	90	88	88	88	88	88	89	88	87	83	87	88	89	87	87	88	90	89	86.9	90																																										
21-Dec	89	89	88	87	87	85	83	87	87	87	84	84	80	71	70	70	72	70	77	81	80	81	79	79	81.1	89																																										
22-Dec	82	83	84	76	73	75	77	82	87	87	86	88	86	82	84	84	83	83	83	81	80	80	80	81	81.9	88																																										
23-Dec	80	80	80	79	78	77	77	76	75	77	75	75	74	74	75	76	79	82	82	82	82	80	79	78	78.0	82																																										
24-Dec	76	76	76	75	74	74	74	74	75	75	75	75	76	77	78	79	80	80	80	81	81	80	79	79	76.9	81																																										
25-Dec	80	80	80	81	81	81	81	81	81	81	81	80	78	78	78	79	79	81	82	82	82	82	82	81	80.5	82																																										
26-Dec	81	81	80	80	80	80	80	80	80	80	81	82	80	77	76	78	78	79	80	80	80	80	80	80	79.7	82																																										
27-Dec	79	79	79	77	75	76	76	76	78	79	78	76	74	72	69	71	72	77	77	76	76	81	88	90	77.0	90																																										
28-Dec	90	88	87	85	84	84	85	81	80	79	79	79	77	75	76	78	81	82	80	78	80	81	81	81	81.2	90																																										
29-Dec	81	82	83	82	83	83	83	83	84	84	83	82	82	81	81	83	84	85	85	85	85	86	86	86	83.4	86																																										
30-Dec	87	86	86	85	85	85	85	85	83	82	84	84	81	78	77	77	74	74	76	79	81	86	85	84	82.1	87																																										
31-Dec	84	84	84	84	87	87	87	85	85	85	84	83	78	76	79	80	80	80	76	74	76	77	78	78	81.3	87																																										
																	79.6		79.7		79.7		79.0		78.6		78.4		78.6		78.4		78.5		78.6		78.1		77.8		76.6		75.7		76.5		77.3		78.4		78.9		79.0		78.9		79.2		79.8		79.8		79.6		Diurnal Average			
																	93		95		95		89		88		87		90		90		89		90		88		88		89		88		88		88		88		88		88		89		87		87		90		92		93		Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity 20m (RH20m) - %
Lower Camp Met Tower - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 20m (RH20m) - %
Lower Camp Met Tower - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	442	59.41	59.41
80 - 100	302	40.59	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 45m (RH45m) - %

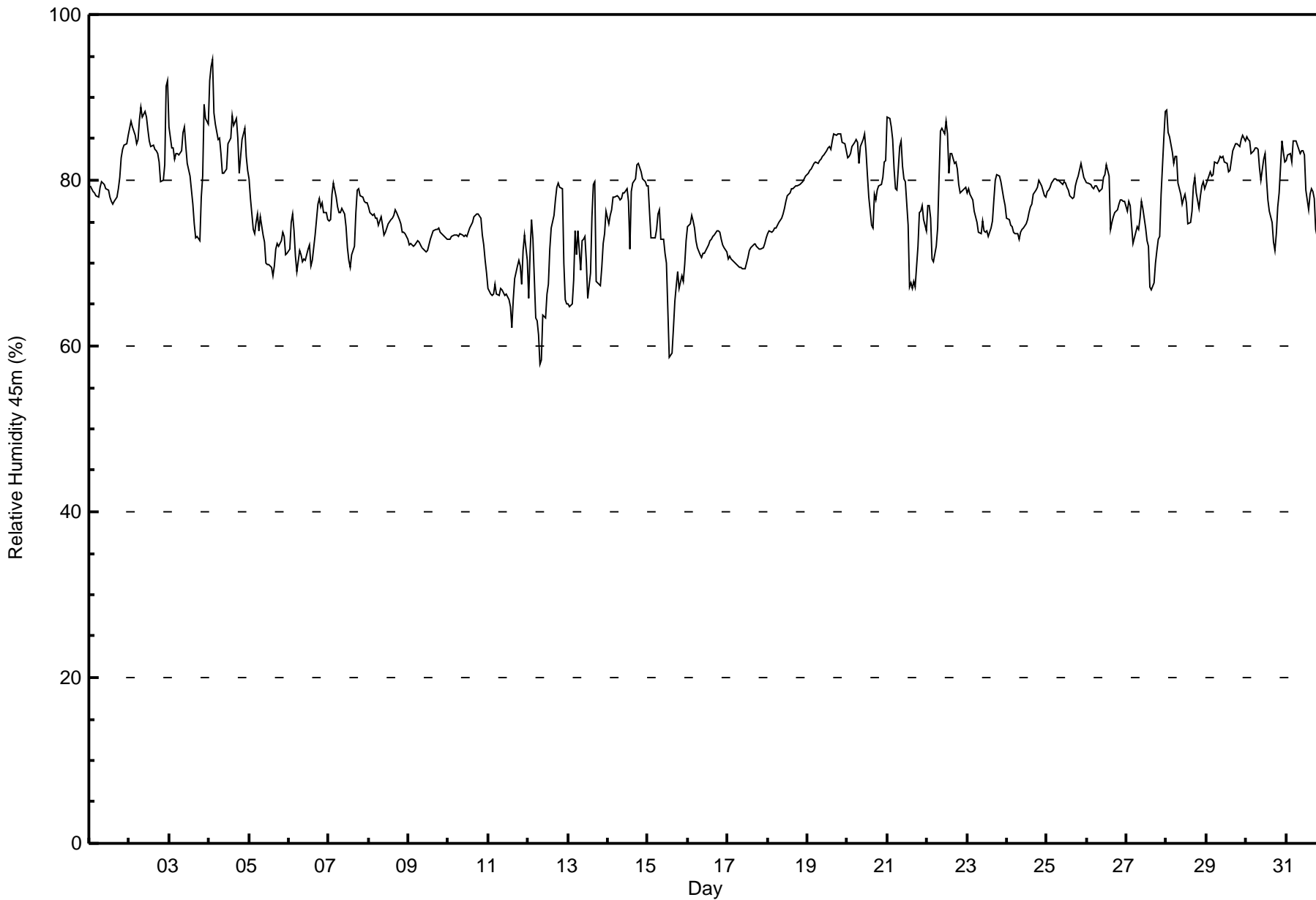
Lower Camp Met Tower - December 2016

Maximum Value: 95 % on Dec 4 03:00 Maximum Daily Average: 85.5 % on Dec 4																	Hours in Service: 744 Hours of Data: 744										
Minimum Value: 58 % on Dec 12 08:00 Minimum Daily Average: 67.4 % on Dec 11 Maximum Diurnal Average: 78.0 % at hour 2 Minimum Diurnal Average: 74.7 % at hour 14 Monthly Average: 76.9 % Percentiles: P ₁ = 63 P ₁₀ = 70 Q ₁ = 73 Median = 77 Q ₃ = 81 P ₉₀ = 84 P ₉₉ = 89																	Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	79	79	79	78	78	78	79	80	80	79	79	79	78	77	77	77	78	79	80	83	84	84	84	85	79.8	85	
2-Dec	86	87	86	86	84	85	87	89	88	88	88	86	85	84	84	84	84	83	82	80	80	82	91	92	85.5	92	
3-Dec	86	84	84	83	83	83	83	84	86	86	84	82	81	79	77	75	73	73	73	78	80	89	88	87	81.7	89	
4-Dec	92	94	95	88	87	85	85	83	81	81	81	84	85	85	88	87	87	85	81	83	85	86	83	81	85.5	95	
5-Dec	80	78	74	74	75	76	74	76	73	73	70	70	70	69	69	70	72	72	72	73	74	73	71	71	72.8	80	
6-Dec	72	75	76	74	71	69	71	71	70	71	70	72	72	70	70	72	73	77	78	77	77	76	76	75	73.2	78	
7-Dec	75	75	78	80	78	77	76	76	77	76	74	72	70	70	71	72	76	79	79	78	78	78	77	77	75.8	80	
8-Dec	77	76	76	76	75	75	75	76	75	73	74	74	75	75	75	76	76	76	75	75	74	74	74	73	75.0	77	
9-Dec	72	72	72	72	72	73	73	72	72	72	71	72	72	73	73	74	74	74	74	74	74	73	73	73	72.8	74	
10-Dec	73	73	73	73	73	73	73	74	73	73	73	73	74	74	75	76	76	76	76	75	73	72	70	69	73.6	76	
11-Dec	67	66	66	66	68	66	66	67	67	66	66	66	66	65	62	66	68	70	70	70	67	72	73	70	67.4	73	
12-Dec	66	71	75	73	63	63	61	58	58	64	63	66	67	72	74	76	78	79	80	79	79	70	66	65	69.5	80	
13-Dec	65	65	65	68	74	71	74	69	73	73	70	66	69	76	79	80	80	68	67	67	69	72	74	76	71.0	80	
14-Dec	75	76	76	78	78	78	78	78	78	78	79	79	77	72	79	80	80	82	82	82	81	80	80	79	78.5	82	
15-Dec	79	76	73	73	73	74	76	76	73	73	71	70	64	59	59	62	65	67	69	67	69	68	70	73	70.0	79	
16-Dec	74	75	76	75	74	73	72	71	71	71	71	72	72	73	73	73	73	74	74	74	73	72	72	71	72.9	76	
17-Dec	71	71	71	70	70	70	70	69	69	69	69	70	71	72	72	72	72	72	72	72	72	72	72	73	70.9	73	
18-Dec	74	74	74	74	74	74	75	75	75	76	77	77	78	79	79	79	79	79	79	79	80	80	80	80	77.1	80	
19-Dec	81	81	81	82	82	82	82	82	83	83	83	84	84	84	84	85	86	85	86	86	86	86	85	84	84	83.4	86
20-Dec	83	83	83	84	85	85	85	82	84	85	86	84	81	78	75	74	78	78	79	79	79	80	82	82	81.4	86	
21-Dec	88	88	86	85	81	79	79	84	85	82	80	80	75	67	68	67	68	67	72	76	76	77	75	74	77.4	88	
22-Dec	77	77	75	70	70	72	74	80	86	86	86	87	86	81	83	83	82	82	81	79	78	79	79	79	79.8	87	
23-Dec	79	79	78	78	76	76	75	74	74	75	74	74	74	73	74	75	78	80	81	81	80	79	78	77	76.6	81	
24-Dec	76	75	75	74	74	74	74	73	74	74	74	75	75	76	77	77	78	79	79	80	80	79	78	78	76.1	80	
25-Dec	79	79	79	80	80	80	80	80	80	80	80	80	80	79	79	78	78	78	79	80	81	82	81	80	79.6	82	
26-Dec	80	80	80	79	79	79	79	79	79	79	80	81	82	81	74	75	76	76	76	77	78	78	78	77	78.3	82	
27-Dec	76	77	77	75	72	74	74	74	75	77	77	74	73	72	67	67	68	70	72	73	73	78	85	88	74.6	88	
28-Dec	89	86	85	83	82	83	83	80	78	77	78	78	77	75	75	76	79	80	78	77	78	79	80	79	79.8	89	
29-Dec	79	80	81	81	81	82	82	82	83	83	83	82	82	81	81	82	84	84	84	84	84	85	85	85	82.6	85	
30-Dec	85	85	85	83	84	84	84	84	81	80	83	83	80	78	76	75	72	71	74	77	79	85	83	82	80.5	85	
31-Dec	82	83	83	82	85	85	85	84	83	84	84	83	79	76	78	79	79	78	74	72	74	75	76	77	80.0	85	
	77.9	78.0	78.0	77.3	76.9	76.7	76.9	76.8	76.9	77.0	76.8	76.7	75.8	74.7	74.9	75.6	76.5	76.7	76.8	77.0	77.3	77.9	78.0	77.9		Diurnal Average	
	92	94	95	88	87	85	87	89	88	88	88	87	86	85	88	87	87	85	86	86	86	89	91	92		Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity 45m (RH45m) - %
Lower Camp Met Tower - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 45m (RH45m) - %
Lower Camp Met Tower - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	4	0.54	0.54
60 - 80	523	70.30	70.83
80 - 100	217	29.17	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

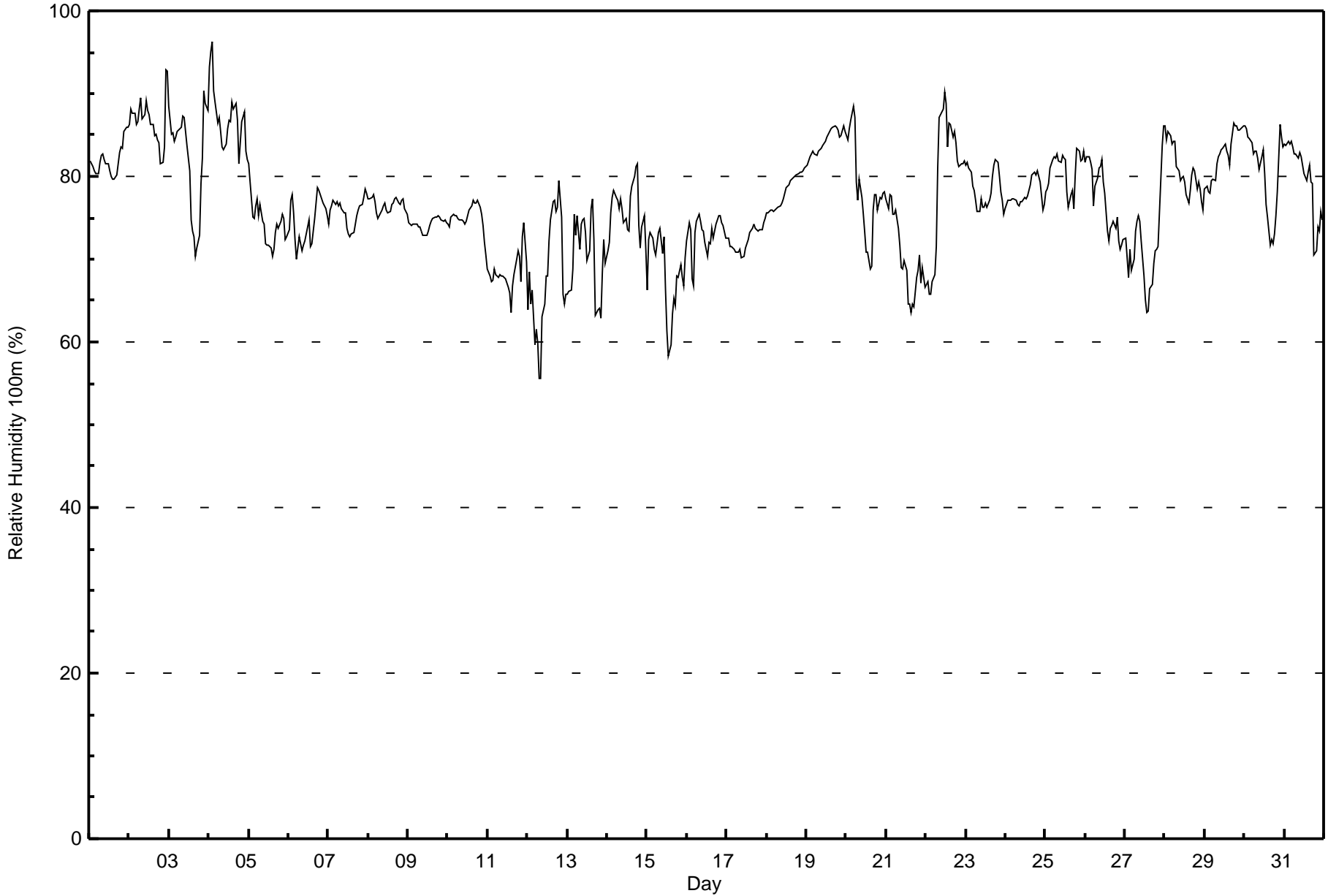
**Relative Humidity 100m (RH100m) - %
Lower Camp Met Tower - December 2016**

Maximum Value: 96 % on Dec 4 03:00 Maximum Daily Average: 87.1 % on Dec 4																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 56 % on Dec 12 08:00 Minimum Daily Average: 67.6 % on Dec 12 Maximum Diurnal Average: 77.8 % at hour 23 Minimum Diurnal Average: 75.0 % at hour 14 Monthly Average: 76.9 % Percentiles: P ₁ = 61 P ₁₀ = 68 Q ₁ = 73 Median = 77 Q ₃ = 82 P ₉₀ = 85 P ₉₉ = 90																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	82	81	81	81	80	80	82	83	83	82	82	82	81	80	80	80	80	81	83	84	83	85	86	86	81.9	86	
2-Dec	86	88	88	88	86	87	88	90	87	87	89	88	87	86	86	85	85	84	84	81	82	84	93	93	86.8	93	
3-Dec	88	85	85	84	85	85	86	86	87	87	85	84	81	75	73	73	70	71	73	79	82	90	89	88	82.2	90	
4-Dec	93	95	96	90	89	86	87	86	84	83	84	86	87	87	89	88	89	87	82	84	87	88	83	82	87.1	96	
5-Dec	81	79	75	75	76	77	75	77	75	74	72	72	72	71	70	71	73	74	74	75	75	75	72	73	74.4	81	
6-Dec	74	77	78	76	72	70	73	72	71	72	72	74	75	71	72	73	75	79	78	78	77	77	76	75	74.4	79	
7-Dec	74	76	76	77	77	77	76	77	76	76	76	74	73	73	73	73	74	75	76	77	77	77	78	78	75.7	78	
8-Dec	77	77	77	78	77	76	75	76	76	76	77	76	76	76	77	77	77	77	77	77	77	77	76	75	76.5	78	
9-Dec	74	74	74	74	74	74	74	74	73	73	73	73	73	74	75	75	75	75	75	75	75	75	75	74	74.2	75	
10-Dec	74	74	75	75	75	75	75	75	75	75	74	75	75	76	76	77	77	77	77	76	75	74	72	70	75.0	77	
11-Dec	69	68	67	67	69	68	68	68	68	68	68	68	67	66	64	67	68	70	71	70	67	73	74	70	68.4	74	
12-Dec	64	68	65	66	60	62	60	56	56	63	65	68	68	72	75	77	77	76	76	79	75	66	64	66	67.6	79	
13-Dec	66	66	66	69	76	73	75	71	74	75	73	70	71	76	77	72	63	64	64	63	68	72	69	70.4	77		
14-Dec	71	72	76	77	78	77	77	76	77	76	74	75	74	73	78	79	80	81	82	74	71	74	75	71	75.8	82	
15-Dec	66	72	73	73	71	70	72	73	74	71	73	67	61	58	60	63	65	64	68	68	69	68	67	70	68.2	74	
16-Dec	72	74	74	68	67	73	75	75	75	74	73	72	70	72	72	74	72	74	75	75	75	74	74	73	73.0	75	
17-Dec	73	72	72	72	71	71	71	71	71	70	70	71	72	72	73	74	74	74	74	74	73	74	74	75	72.4	75	
18-Dec	76	76	76	76	76	76	76	76	76	76	77	77	78	79	79	80	80	80	80	80	80	80	81	81	78.1	81	
19-Dec	81	82	82	83	83	83	83	83	83	83	84	84	85	85	85	86	86	86	86	86	86	85	85	86	85	84.2	86
20-Dec	85	84	86	87	88	87	79	77	80	77	75	73	71	71	69	69	76	78	78	76	77	77	78	78	78.2	88	
21-Dec	77	76	78	78	75	76	76	74	72	69	69	70	69	65	65	64	65	64	68	69	71	67	69	67	70.4	78	
22-Dec	67	67	66	66	67	68	71	81	87	87	88	90	89	84	86	86	85	85	84	82	81	81	82	82	79.8	90	
23-Dec	81	82	81	80	79	78	77	76	76	77	76	76	77	76	77	78	80	81	82	82	80	78	77	75	78.5	82	
24-Dec	76	77	77	77	77	77	77	77	76	77	77	78	77	78	78	79	80	80	80	81	80	79	76	77	77.9	81	
25-Dec	78	78	79	81	82	82	82	83	82	82	82	82	82	82	76	78	78	76	80	83	83	82	82	83	80.7	83	
26-Dec	82	82	82	82	81	76	79	80	81	81	82	79	78	73	72	74	74	75	74	75	72	71	72	72	77.1	82	
27-Dec	72	70	68	71	69	70	73	75	75	74	72	68	65	64	64	66	67	69	71	71	71	76	84	86	71.4	86	
28-Dec	86	84	85	85	84	84	84	81	81	79	80	80	79	78	77	78	80	81	81	78	79	78	77	76	80.7	86	
29-Dec	78	79	78	78	80	80	80	81	82	83	83	83	84	83	83	81	84	86	86	86	86	86	86	86	82.6	86	
30-Dec	86	86	85	85	84	83	83	83	82	81	82	83	80	77	75	72	72	72	73	75	78	86	85	84	80.5	86	
31-Dec	84	84	84	84	84	84	83	83	82	83	82	81	80	80	81	81	79	79	70	71	74	73	76	75	79.9	84	
	77.3	77.7	77.6	77.4	77.2	77.0	77.2	77.2	77.3	77.2	77.2	76.8	76.0	75.0	75.3	75.9	76.5	76.7	76.8	76.9	76.9	77.4	77.8	77.3	Diurnal Average		
	93	95	96	90	89	87	88	90	87	87	89	90	89	87	89	88	89	87	86	86	87	90	93	93	Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity 100m (RH100m) - %
Lower Camp Met Tower - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 100m (RH100m) - %
Lower Camp Met Tower - December 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	6	0.81	0.81
60 - 80	493	66.26	67.07
80 - 100	245	32.93	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 167m (RH167m) - %

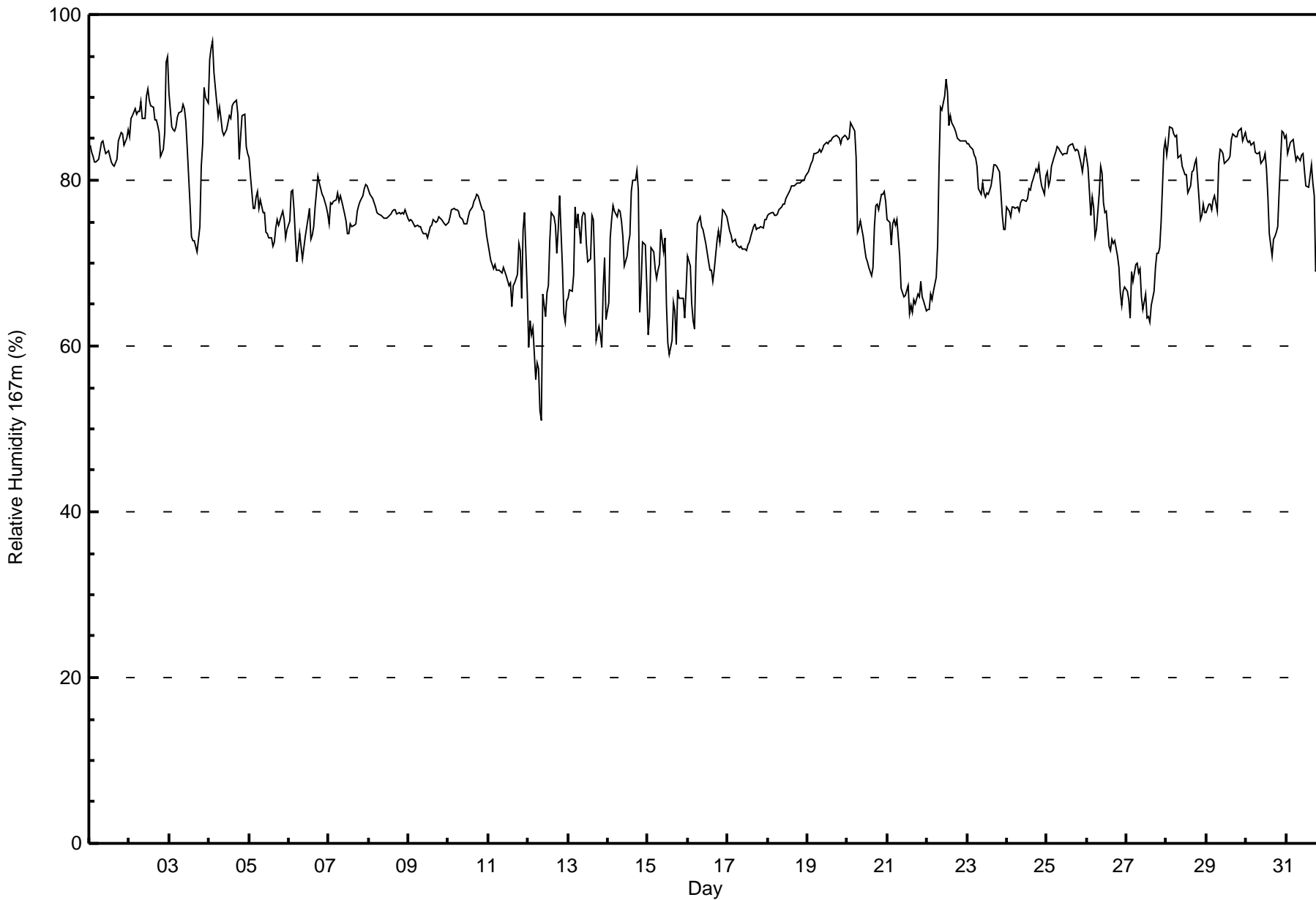
Lower Camp Met Tower - December 2016

Maximum Value: 97 % on Dec 4 03:00 Maximum Daily Average: 88.4 % on Dec 4																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 51 % on Dec 12 09:00 Minimum Daily Average: 65.4 % on Dec 12 Maximum Diurnal Average: 77.7 % at hour 23 Minimum Diurnal Average: 75.6 % at hour 14 Monthly Average: 76.9 % Percentiles: P ₁ = 60 P ₁₀ = 67 Q ₁ = 73 Median = 76 Q ₃ = 83 P ₉₀ = 86 P ₉₉ = 91																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	84	83	83	82	82	82	84	85	85	84	83	84	83	82	82	82	82	85	85	86	86	84	85	86	83.7	86
2-Dec	85	87	88	89	88	88	88	90	88	88	90	91	90	89	89	87	87	87	86	83	84	86	94	95	88.1	95
3-Dec	91	86	86	86	87	88	88	88	89	89	87	84	77	73	73	73	72	71	74	82	84	91	90	89	83.3	91
4-Dec	95	96	97	93	91	88	89	88	86	85	86	87	88	88	89	90	88	83	85	88	88	84	83	88.4	97	
5-Dec	83	81	77	77	78	79	77	78	76	76	74	74	73	73	72	89	74	75	75	76	76	75	73	74	75.7	83
6-Dec	75	79	79	76	73	70	74	72	71	72	73	75	77	73	73	74	77	80	80	79	78	78	77	76	75.5	80
7-Dec	75	77	77	77	78	78	77	78	77	76	75	73	74	75	74	75	75	76	77	78	78	79	79	79	76.6	79
8-Dec	79	78	78	77	77	76	76	76	76	75	75	75	76	76	76	76	76	76	76	76	76	76	76	75	76.3	79
9-Dec	75	75	75	75	74	75	74	74	74	74	74	73	74	74	75	75	75	75	76	75	75	75	75	75	74.6	76
10-Dec	75	76	76	77	76	76	76	76	75	75	75	75	76	76	77	77	78	78	78	77	76	76	75	73	76.1	78
11-Dec	72	70	70	69	70	69	69	69	69	70	69	68	67	68	65	67	68	69	72	72	66	74	76	66	69.3	76
12-Dec	60	63	61	62	56	58	57	52	51	66	64	66	67	73	76	76	75	71	74	78	69	64	63	65	65.4	78
13-Dec	66	67	67	69	77	74	76	72	76	76	76	72	70	70	76	75	69	61	62	61	60	67	71	63	69.7	77
14-Dec	65	73	75	77	76	76	76	76	75	73	70	71	72	73	79	80	80	81	79	64	67	73	72	67	73.8	81
15-Dec	61	64	72	71	69	68	69	70	74	71	73	65	60	59	61	65	64	60	67	66	66	66	63	67	66.3	74
16-Dec	71	70	65	63	62	70	75	76	74	74	73	72	70	69	69	68	69	73	74	72	74	76	76	76	71.3	76
17-Dec	75	74	73	73	73	72	72	72	72	72	72	72	72	72	73	74	75	74	74	74	74	74	75	75	73.3	75
18-Dec	76	76	76	76	76	76	76	76	76	77	77	77	78	78	79	79	79	79	80	80	80	80	80	81	77.9	81
19-Dec	81	81	82	82	83	83	83	84	83	84	84	85	84	85	85	85	85	85	85	85	84	85	85	85	84.0	85
20-Dec	85	85	87	87	86	83	74	74	75	73	72	71	70	70	68	69	74	77	77	77	78	78	79	77	76.9	87
21-Dec	75	75	72	75	75	75	75	71	67	66	66	66	67	64	65	64	66	65	66	66	68	66	65	64	68.5	75
22-Dec	64	64	66	66	67	68	72	82	89	88	90	92	91	87	88	87	86	86	85	85	85	85	85	85	80.9	92
23-Dec	84	84	84	84	83	83	82	79	78	80	78	78	78	78	79	81	82	82	82	81	78	76	74	74	80.1	84
24-Dec	77	76	76	77	77	77	77	76	77	78	78	78	78	78	79	80	80	81	81	82	80	79	78	81	78.4	82
25-Dec	81	79	80	82	83	83	84	84	84	83	83	83	83	84	84	84	84	84	84	84	82	81	82	84	82.9	84
26-Dec	83	81	76	78	77	73	74	78	82	81	77	76	76	72	72	73	72	73	71	69	66	65	67	67	74.1	83
27-Dec	67	66	63	69	68	70	70	69	69	66	64	66	63	64	63	65	67	70	71	71	72	75	84	85	69.0	85
28-Dec	83	84	87	86	86	85	85	83	83	82	81	81	81	78	79	81	81	82	82	78	75	76	77	76	81.4	87
29-Dec	76	77	77	76	78	78	76	82	84	83	83	82	82	82	83	85	86	85	85	86	86	86	85	86	82.1	86
30-Dec	85	85	85	84	85	83	83	83	83	82	83	83	83	81	78	73	71	73	73	74	74	79	86	85	80.7	86
31-Dec	86	83	85	85	85	84	82	83	82	83	83	81	79	79	81	82	80	78	69	71	75	74	76	75	80.0	86
																		77.0 77.3 77.2 77.4 77.2 77.1 77.2 77.2 77.5 77.5 77.1 76.7 76.1 75.6 76.0 76.6 76.8 76.8 76.9 76.5 76.4 77.2 77.7 77.1						Diurnal Average		
																		95 96 97 93 91 88 89 90 89 90 89 90 92 91 89 89 89 90 88 86 86 88 91 94 95						Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity 167m (RH167m) - %
Lower Camp Met Tower - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 167m (RH167m) - %
Lower Camp Met Tower - December 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	8	1.08	1.08
60 - 80	482	64.78	65.86
80 - 100	254	34.14	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 20 m (WS20m) - km/h

Lower Camp Met Tower - December 2016

Maximum Speed: 21 km/h on Dec 31 22:00	Maximum Daily Speed Average: 16.7 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 24 13:00	Minimum Daily Speed Average: 0.7 km/h on Dec 24	Hours of Data: 744
Maximum Diurnal Speed Average: 2.3 km/h at hour 11	Minimum Diurnal Speed Average: 0.8 km/h at hour 4	Hours of Missing Data: 0
Monthly Average Velocity: 1.1 km/h 208.0 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 3 Median = 6 Q ₃ = 10 P ₉₀ = 15 P ₉₉ = 19	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S11	S13	SSE13	S9	SW8	SSW7	S9	S11	SSE11	S7	S7	S6	S8	S9	S8	SSE8	SSE8	SSE8	SSE4	SE5	SE6	SE4	SE4	SE7	S7.6	S13	
2-Dec	SE7	SSE7	SSE7	SSE9	SSE10	SSE11	SSE12	SSE8	SSE11	SSE15	SSE18	SSE11	SE13	SE14	SSE9	SSE15	SSE16	SE15	SSE13	SSE17	SSE19	SSE19	SSE18	SSE17	SSE12.7	SSE19	
3-Dec	SSE17	SSE16	SSE14	SSE15	SSE16	SSE16	SSE19	SSE17	SSE13	SSE12	SSE13	SSE15	SSE16	SSE12	ESE9	SSE12	SSE14	S10	SSW8	S6	SSW7	WSW14	WSW8	SW5	SSE11.5	SSE19	
4-Dec	SSE3	NNW2	NNW6	N11	NNE11	NNE11	NNE10	N11	N8	N9	N8	N8	N7	NNW7	NNW8	NNW8	NNW8	NNW10	NNW10	NNW10	NNW7	NNW5	NW8	NW12	NNW7.4	NW12	
5-Dec	NW16	NW13	WNW15	WNW16	WNW15	WNW16	WNW18	WNW19	WNW20	WNW15	NW16	NW16	NW19	NW17	NW17	NW19	WNW18	WNW16	WNW16	WNW18	WNW17	WNW17	WNW15	WNW16.7	WNW20		
6-Dec	WNW16	WNW14	NW12	NW12	NW12	NW10	NW7	NW8	NNW7	N5	NNW9	NW10	NW11	NNW12	NNW11	NNW8	NNW7	NNW4	NNW4	NNW3	NNW4	NNW5	NW4	NNW4	NW8.1	WNW16	
7-Dec	NNW4	NNW3	NNW2	N4	NNW3	NNW4	NNW3	NW4	N4	N5	NNW3	N5	N7	NNW7	NW6	N3	WNW2	NNW3	NNW2	NNW3	NW2	NW2	NNW2	NW3	NNW3.5	N7	
8-Dec	NW3	NW3	NW3	NW3	NNW3	NNW2	NNW2	NW3	NNW3	NNW2	NNW1	NNW1	NNW1	N1	N2	N3	NW2	NNW2	NW3	NNW3	NW1	NW3	NNW2	NNW2	NNW2.1	NNW3	
9-Dec	NNW2	NW2	NW2	NNW2	WNW1	SE2	SSE7	SSE8	SSE6	SSE6	SSE11	SSE9	SSE8	SSE7	SSE8	SSE6	SSE5	SSE1	S2	S4	SSE6	SSE7	SSE7	SSE6	SSE4.4	SSE11	
10-Dec	SSE6	SSE4	SSE9	SE7	SE8	SE9	SSE11	SE8	SSE8	SSE9	SSE8	SSE8	SSE8	SSE6	SSE5	SSE5	SSE4	SSE7	SSE4	SSE6	S5	SW6	SW12	WSW13	SSE6.1	WSW13	
11-Dec	WSW17	W17	W16	W16	W15	W20	W19	W19	W18	W17	W15	W12	W16	W14	WNW15	W14	W15	W16	W13	NW5	WNW10	W9	WNW6	NW11	W13.8	W20	
12-Dec	NNW9	N7	NNW4	NNW5	NW9	NW12	WNW15	WNW16	NNW7	NW5	WNW5	W6	SW3	SE6	SE5	NE1	N2	N3	WNW2	N1	SSE0	NW8	NW14	WNW17	NW5.4	WNW17	
13-Dec	WNW19	NW15	WNW19	NNW14	N11	N9	NNW9	NNW9	N6	NNW5	NNE2	ENE3	SW0	W2	WNW2	WSW2	NW1	NW4	NNW4	N4	N2	WNW2	NW2	NW1	NW5.4	WNW19	
14-Dec	WSW1	SSE2	NW1	SSE1	SSE5	SSE10	SSE11	SSE12	SSE11	SE14	SE4	SSE9	SSE4	WSW1	WNW2	WNW2	NNW3	NNW3	NW1	SE2	ESE2	SSE2	SSE1	NNW1	SSE3.6	SE14	
15-Dec	WNW1	SE2	NNE3	N6	N6	NNW4	NNW1	W1	NNE2	WNW1	NNW2	N2	NW2	WNW7	WNW9	WNW10	NW7	N4	NNE2	N4	N5	N5	N4	NW3	NNW3.3	WNW10	
16-Dec	NW3	NW2	NNW3	NNW3	NNW2	W0	S1	SSE1	SE1	SSE1	SSE6	SSE7	SSE8	SSE6	SSE5	SE7	SE3	NNW1	WSW1	SSE3	SSE1	SE0	SSE1	NNW3	SSE1.4	SSE8	
17-Dec	WNW1	SSE3	SSE2	SE4	SSE7	SSE6	SSE9	SSE8	SSE9	SSE5	SSE7	SSE9	SSE11	SE7	SE5	SSE6	SSE7	SSE7	SSE7	SSE8	SSE6	SSE7	SSE3	SSE6.1	SSE11		
18-Dec	SSE4	SSE5	SSE7	SSE9	SSE6	SE5	SSE6	SSE5	SE3	SSW1	SE1	NNW0	NW1	N4	NNW4	NNW4	NNW4	NW4	NNW3	NNW3	N2	NW2	NE2	N1	SE0.8	SSE9	
19-Dec	NNW2	N2	NNW4	N5	NNW4	N4	NNW4	NNW4	N4	NNW4	NNW3	NNW3	N4	NNW4	NNW4	N5	NNW4	NNW6	NNW5	NNW1	S2	W1	NW1	NNW1	NNW3.2	NNW6	
20-Dec	NNW2	NW2	SSW0	SSE7	SSE13	SSE11	SSW9	SSE12	SE18	SE20	SE12	SSE12	SSE11	SSE8	SSE6	SW4	S6	SSE7	SSE8	SSE6	SSE9	SE11	SE13	SE14	SSE8.6	SE20	
21-Dec	SE12	SE15	SSE12	SE14	SE12	S6	SSE7	SSE12	SSE13	SE14	SE13	SE14	SSW4	WNW14	W10	W11	SSW6	SSW7	SE10	SE13	SE11	SSE10	SE4	ESE2	SSE7.7	SE15	
22-Dec	SSE2	SSE4	SSE7	SW4	W11	W13	W12	NNW7	N3	NNW4	N9	N11	N13	NNE10	N9	N9	N10	N10	N10	N7	N7	N6	N6	NNE6	NNW5.3	W13	
23-Dec	N7	NNE5	NNE6	NNE7	NNE7	NNE7	NNE6	N8	N8	NNE6	NNE6	N6	N9	N8	N7	N7	N5	N4	NNW3	NNW3	WNW1	NNW2	NNW3	NNW2	N5.4	N9	
24-Dec	NNW2	NNW2	NNW3	NNW3	NW3	NNW3	NW3	NW2	NNW2	NNW2	NW2	NW1	NNE0	W1	NW1	NW1	WNW0	NNW2	NNW1	NW1	NW1	SSE2	SSE9	SSE7	NW0.7	SSE9	
25-Dec	SSE2	SSE4	SW1	WSW1	S1	SSE4	SSE3	S2	SSE4	SSE2	SSE5	SSE4	SSE5	SSE7	SSE6	SSE7	SSE7	SSE7	SSE6	SSE6	SSE9	SSE16	SSE10	SSE4	SE5	SSE4.9	SSE16
26-Dec	SSE8	SSE15	SSE12	SSE11	SSE11	SE13	SE3	ESE3	SE5	SSE12	SSE11	SSE10	SSE7	SSE7	SSE6	SSE3	SSE8	SE10	SE13	SE15	SE16	SE16	SSE17	SSE9.7	SSE17		
27-Dec	SSE17	SSE18	SSE17	SSE18	SSE17	SSE18	SSE19	SSE19	SSE16	SE17	SSE14	SE16	SSE15	SSE15	SSE14	SSE10	SSE7	SSE5	S4	W10	WSW10	NW4	NNW7	NW4	SSE10.6	SSE19	
28-Dec	NNW3	NNW3	N6	N7	NNE6	N7	NNE5	NNE6	N4	N5	N5	N6	N3	NW3	WSW3	W0	N2	N3	N6	NNW6	NNW5	NNW3	N4	NNW3	N4.0	N7	
29-Dec	N3	NW2	NNW1	W2	N2	WNW2	N3	NW2	NNW4	NNW2	N3	NNW3	N1	NNE3	NNW3	N2	N4	NNW3	NNW2	WNW2	N3	N1	WNW2	NNW1	NNW2.2	N4	
30-Dec	NW2	NW0	WNW1	ESE1	SSE4	SE6	SSE3	SE4	SSE4	SSW4	SSE6	SE6	SSE10	SSE13	SSE13	SSE10	SSE12	SW4	W9	WNW5	NNW5	N6	NNW3	NW4	SSE2.7	SSE13	
31-Dec	NW4	N4	WNW3	WSW1	SE1	SSE2	N1	NW3	NNW3	N3	NNW2	NW2	NW3	NW3	WNW1	NNW2	WSW3	ENE1	W9	W18	W18	W21	W16	W12	W4.9	W21	

WSW1.3SSW1.4 SW1.2 SW0.8SSW0.9SSW1.5SSW1.7SSW1.2 SSE1.5 SSE1.5 SSE2.3 SSE1.8 SSE1.5SSW0.9SSW1.0 SW1.3 SW1.1WSW0.8 W1.3WSW1.1SSW1.5 SW1.8WSW1.4 W1.4	Diurnal Average
WNW19 SSE18WNW19 SSE18 SSE17 W20 SSE19 W19WNW20 SE20 SSE18 NW16 NW19 NW17WNW17 NW19WNW18WNW16WNW16 W18 SSE19 W21 SSE18WNW17	Diurnal Maximum

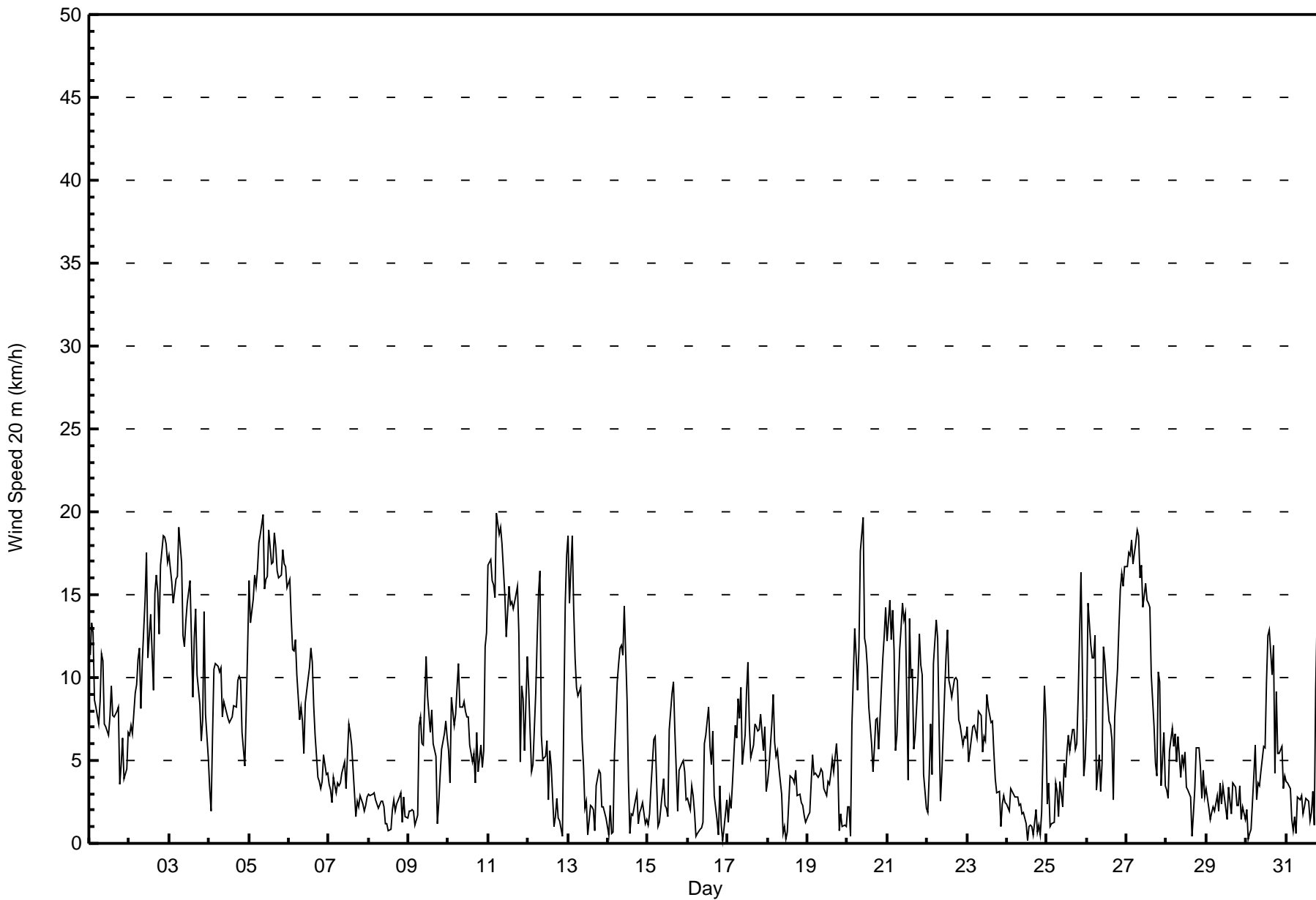
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 11 05:00 Minimum Value: 0 km/h on Dec 16 19:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 6																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	3
2-Dec	2	2	3	3	4	3	3	3	3	3	5	4	4	5	3	5	4	5	4	4	4	5	5	5	5
3-Dec	4	5	3	4	4	4	5	5	4	4	4	6	4	4	2	4	3	3	3	2	3	3	3	3	6
4-Dec	2	2	2	4	5	5	4	4	4	3	3	3	3	3	3	3	3	3	4	4	2	2	3	4	5
5-Dec	5	5	5	6	5	6	6	6	7	6	6	6	6	6	6	6	7	6	6	6	6	6	5	6	7
6-Dec	5	5	4	4	4	4	3	4	4	3	4	3	3	4	4	3	2	1	1	1	1	1	1	1	5
7-Dec	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	0	1	1	2
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9-Dec	1	1	1	1	1	2	2	2	2	2	3	2	2	2	2	2	1	1	1	1	2	2	1	2	3
10-Dec	3	3	3	2	3	3	3	3	2	2	2	2	2	3	2	2	1	1	2	2	2	3	3	4	4
11-Dec	5	5	4	5	7	5	5	6	6	5	5	5	5	5	6	5	5	5	4	2	4	4	3	4	7
12-Dec	4	2	1	1	3	4	5	6	4	4	3	3	2	1	1	1	1	1	1	1	1	4	5	6	6
13-Dec	6	5	6	7	4	3	4	4	3	2	1	1	1	1	1	1	1	2	1	1	1	2	2	1	7
14-Dec	1	1	1	1	2	2	3	3	3	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	3
15-Dec	1	1	1	2	3	1	1	1	1	2	1	1	2	2	3	3	3	1	1	2	1	1	2	1	3
16-Dec	1	1	1	1	1	1	0	0	1	1	3	2	3	2	2	1	2	1	0	2	2	1	1	1	3
17-Dec	1	1	2	2	2	2	2	2	3	2	3	3	3	3	2	2	2	2	2	2	2	2	2	1	3
18-Dec	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	2	2	1	2	1	1	1	1	1	2
19-Dec	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	1	1	1	1	2
20-Dec	2	1	1	3	4	3	5	4	6	5	5	5	4	4	3	3	3	2	2	3	4	3	3	3	6
21-Dec	3	3	4	3	3	4	4	3	3	5	3	2	4	4	3	2	2	2	2	2	3	3	2	2	5
22-Dec	1	2	2	3	3	4	4	3	2	2	4	5	4	4	4	3	4	4	3	3	3	2	2	3	5
23-Dec	3	2	2	3	3	3	3	3	3	2	3	2	3	2	2	2	2	2	1	1	1	1	1	1	3
24-Dec	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	3	3
25-Dec	2	1	1	0	1	1	2	1	1	2	2	2	2	2	2	2	2	1	2	3	5	5	2	3	5
26-Dec	3	5	5	4	4	3	3	2	3	3	6	4	3	3	4	3	2	3	2	2	2	3	3	4	6
27-Dec	4	3	3	3	3	3	3	4	4	4	4	4	5	3	3	3	2	1	2	3	4	4	2	1	5
28-Dec	2	2	2	3	3	2	2	3	2	2	2	2	2	1	1	1	1	1	2	2	2	1	2	2	3
29-Dec	1	2	1	1	1	1	1	1	1	1	2	2	1	2	2	2	2	2	1	1	2	1	1	1	2
30-Dec	1	1	1	1	2	2	2	2	2	2	2	2	4	3	3	4	3	3	4	4	3	2	1	1	4
31-Dec	1	1	1	2	1	1	1	1	2	2	1	1	2	1	1	1	2	1	6	6	5	6	6	5	6
Diurnal Maximum																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	348	46.77	46.77
6 - 11	243	32.66	79.44
12 - 19	149	20.03	99.46
20 - 28	4	0.54	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

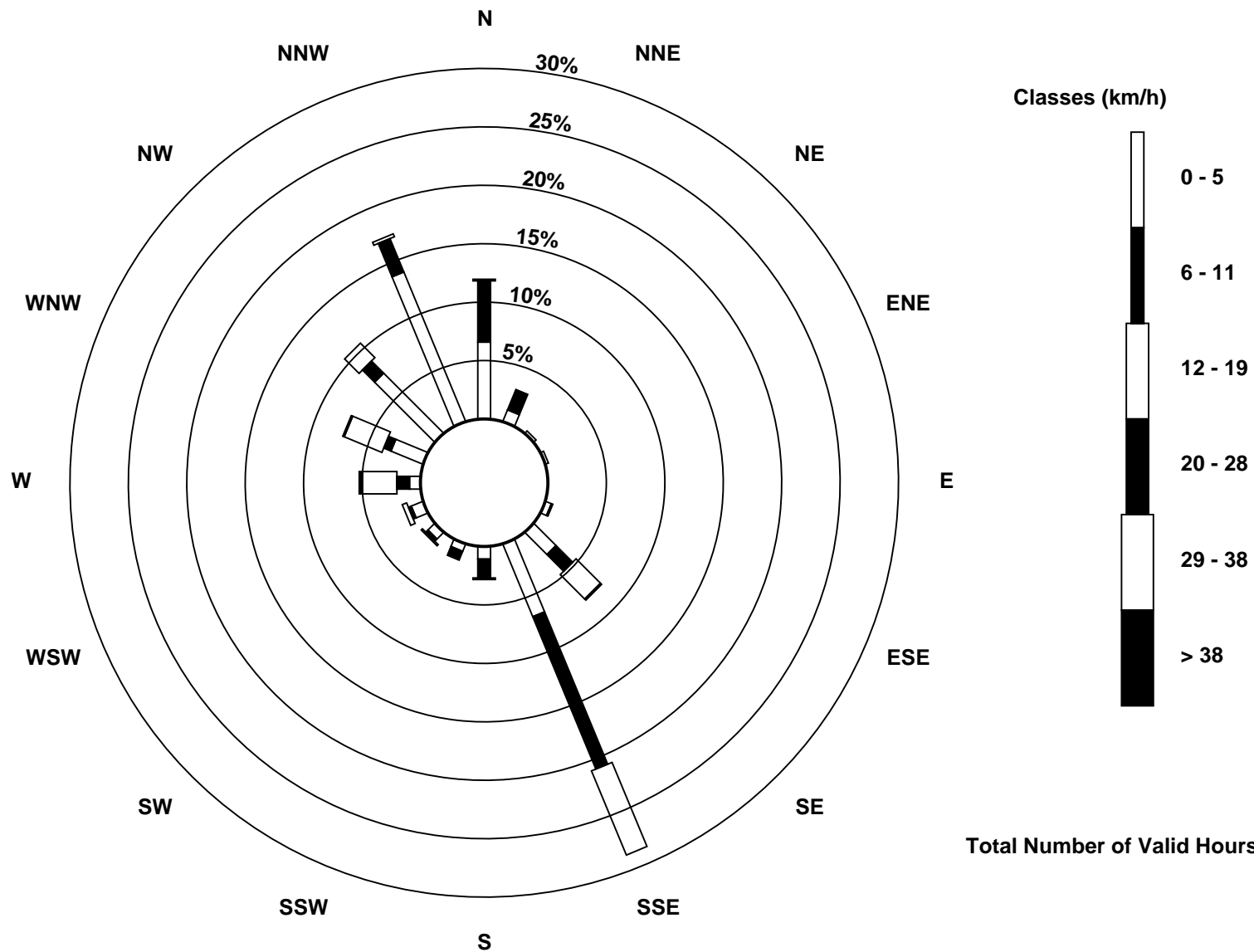
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower (AMS 3)





Maximum Speed: 29 km/h on Dec 31 22:00	Maximum Daily Speed Average: 21.8 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 13 13:00	Minimum Daily Speed Average: 0.9 km/h on Dec 18	Hours of Data: 744
Maximum Diurnal Speed Average: 2.8 km/h at hour 11	Minimum Diurnal Speed Average: 0.6 km/h at hour 4	Hours of Missing Data: 0
Monthly Average Velocity: 1.1 km/h 208.3 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 8 Q ₃ = 14 P ₉₀ = 20 P ₉₉ = 25	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S12	SSE14	SSE13	S10	SSW10	S9	S10	SSE12	SSE12	S8	SSE8	S8	S8	SSE10	SSE8	SSE8	SSE9	SSE9	SSE5	SE6	SE9	SE5	SE6	SE9	SSE8.8	SSE14
2-Dec	SE9	SE10	SE10	SE13	SSE13	SSE14	SSE16	SE12	SSE14	SSE18	SE23	SE17	SE17	SE19	SE13	SE21	SE21	SE20	SSE15	SSE19	SSE22	SSE23	SE23	SE23	SE16.7	SE23
3-Dec	SSE21	SSE19	SSE17	SSE17	SSE18	SSE19	SSE22	SSE20	SE18	SE17	SE19	SE20	SE21	SE17	ESE11	SSE15	SSE16	S13	S11	S8	SSW10	SW17	SW12	SW7	SSE14.4	SSE22
4-Dec	SSE4	WNW3	NNW9	N16	N17	NNE16	NNE15	N14	N11	N12	N11	N11	NNW10	NNW11	NNW10	NNW12	NW10	NW13	NNW14	NW13	NW9	NNW7	NW10	NW15	NNW10.3	N17
5-Dec	NNW20	NNW17	NNW19	NNW21	NNW20	NNW22	NNW24	NNW25	NNW26	NNW20	NNW21	NNW21	NNW24	NNW22	NNW22	NNW25	NNW24	NNW22	NNW21	NNW23	NNW22	NNW22	NNW21	NNW21	NNW21.8	NNW26
6-Dec	NNW21	NNW18	NNW15	NNW15	NNW16	NNW14	NNW11	NNW12	NNW10	NNW8	NNW11	NNW12	NNW13	NNW16	NNW14	NNW11	NNW9	NNW6	NNW6	NNW5	NNW6	NNW8	NW6	NNW7	NNW10.9	NNW21
7-Dec	NNW6	NNW6	NNW5	N7	NNW6	NNW6	NNW6	NNW7	N9	NW6	NNW7	N9	NNW8	NW8	NNW6	N2	NNW3	NW2	NNW5	NNW4	NNW2	NW2	NNW3	NNW3	NNW5.4	N9
8-Dec	NNW3	NNW3	NNW4	NW4	NW4	NNW3	NNW4	NW4	NNW5	NNW4	NW2	NW2	NW1	NW2	N3	NNW5	NNW3	NNW3	NW2	NNW5	NW3	NNW4	NW3	NW2	NNW3.2	NNW5
9-Dec	NW3	NW3	NNW1	NNW2	SE1	SE5	SE11	SE10	SE7	SE7	SE13	SE11	SE10	SE9	SE9	SSE7	SE6	SE3	SSE6	SSE6	SSE7	SE8	SE8	SE8	SE6.0	SE13
10-Dec	SE7	SE5	SE12	SE10	SE10	SE12	SE14	SE11	SE10	SE11	SE10	SE9	SE10	SE7	SSE6	SE8	SE5	SE9	SE7	SSE6	S6	SW7	SW15	WSW19	SSE7.7	WSW19
11-Dec	WSW26	WSW26	WSW22	WSW22	WSW21	WSW29	WSW25	W26	W24	W23	W21	W17	W21	W20	NNW20	W19	W20	W21	WSW18	NNW8	NNW14	WSW13	W10	NW16	W19.6	WSW29
12-Dec	NW13	NNW10	NNW8	NNW7	NW14	NNW18	NNW21	NNW23	NW10	W8	NNW7	W8	SW4	SE8	SE6	E1	NNE2	NNW4	NNW2	NNW1	WSW1	NNW15	NNW20	NNW23	NNW7.9	NNW23
13-Dec	NNW25	NNW19	NNW24	NW18	N16	NNW13	NNW13	NNW13	N9	NNW6	N4	NE4	SE0	NW2	NW2	NNW1	NW2	NW6	NW7	NNW7	NNW5	W4	W4	NE0	NNW7.6	NNW25
14-Dec	NNW2	SE2	SE2	SE3	SSE10	SE13	SE16	SE16	SE15	SE15	SE18	SE11	SSE5	W1	NW2	NNW2	NNW4	NNW5	NW2	SE2	SE4	SSE5	SE1	NNW3	SE4.9	SE18
15-Dec	N4	N2	N6	N11	NNW11	NNW6	N3	NNW2	NNW3	NNW4	NNW3	N5	NW3	NNW9	NNW12	W13	NW10	N7	N5	NNW7	NNW7	NNW7	N8	NNW4	NNW5.6	W13
16-Dec	NNW4	NNW2	NW3	NW3	W3	NW0	SSE3	SE3	SE5	SE7	SE11	SE9	SE12	SE8	SE6	SE9	SE5	NE1	SSE0	SSE6	SSE4	SSE4	SSE4	SSE1	SE3.4	SE12
17-Dec	SE2	SSE5	SE5	SE6	SE8	SE7	SE10	SE9	SE11	SE6	SE7	SSE10	SE14	SE9	SE6	SE7	SE9	SE9	SE8	SE8	SSE9	SE7	SE8	SE4	SE7.6	SE14
18-Dec	SSE4	SE5	SE10	SE11	SE7	SE6	SE7	SE6	SE4	SSW1	ESE1	N0	NW1	N5	NNW6	NNW6	NNW5	NW6	NW4	NW4	N4	NW3	NE2	N2	ESE0.9	SE11
19-Dec	NNW2	N2	NNW4	N7	NNW6	NNW6	NNW6	NNW6	NNW6	NNW6	NNW5	NNW4	NNW5	NW5	NNW6	NNW8	NNW7	NNW9	NNW7	N2	SSE2	SSE2	NW1	NNW2	NNW4.4	NNW9
20-Dec	NNW2	NNW2	SSE4	SE11	SE16	SE15	SSW12	SSE12	SE19	SE21	SE15	SE15	SE13	SE10	SSE5	WSW9	SSE6	SSE6	SSE5	SSW3	SSE6	SSE8	SE12	SE15	SSE8.8	SE21
21-Dec	SE15	SE17	SE16	SE17	SE11	SW8	S4	SE14	SE17	SE18	SE16	SE16	SSW5	W18	W14	WSW15	SSW9	SSW10	SSE10	SE14	SE14	SE15	SE8	SE6	SSE9.0	W18
22-Dec	SE5	SE8	SSE11	SW8	WSW15	W20	W18	NW10	NNW4	NNW6	N13	N17	N19	NNE15	N13	NNW12	N14	N15	N15	N11	N11	N9	N10	N10	NNW7.2	W20
23-Dec	N11	N8	N9	NNE10	N11	NNE10	NNE10	N12	N12	N9	N10	N8	N12	N11	N11	N11	N8	N7	NNW6	NNW5	NW2	NNW3	NNW5	NNW2	N8.1	N12
24-Dec	NW4	NW4	NNW5	NW5	NNW5	NNW5	NNW3	NW3	NW4	NNW3	NNW2	NW2	W1	SW1	NNW2	NNW2	SSE0	NW2	NW1	SE1	SSE2	SSE4	SE12	SE10	NW1.0	SE12
25-Dec	SE4	SE5	SSE2	SSE2	SE4	SE5	SE5	SE3	SE6	SE4	SE8	SE5	SE7	SE9	SE7	SE9	SE9	SE7	SSE11	SE12	SE14	SE14	SE7	SE8	SE7.4	SE21
26-Dec	SE10	SE20	SSE16	SE16	SE17	SE17	ESE5	SE7	ESE5	SE7	SE15	SE14	SE13	SSE10	SSE9	SE9	SE4	SSE11	SE13	SE15	SE18	SE20	SE19	SE21	SE12.9	SE21
27-Dec	SE21	SE22	SE21	SSE21	SSE20	SE22	SE23	SE24	SE22	SE22	SE22	SE22	SE22	SE15	SE16	SSE15	SSE8	SE9	S6	WSW17	WSW16	NNW7	NNW11	NW5	SSE13.4	SE24
28-Dec	NNW6	NNW5	NNW8	N10	NNE9	N9	N8	NNE10	N6	N8	N7	N8	N4	NW4	WSW2	W1	N2	N5	N9	NNW8	NNW7	NNW4	N7	NNW4	N5.9	NNE10
29-Dec	NNW5	NW3	N4	W2	N3	NNW2	NNW4	NW2	NNW5	NNW3	N5	NNW3	NNW2	N5	NNW3	NNW3	NNW5	NNW5	NNW3	NNW3	NNW5	NNW3	NW3	NW2	NNW3.3	NNW5
30-Dec	NW3	WSW1	NW1	SSW1	SE5	SE7	SE4	SE5	S3	SW6	SE7	SE8	SE12	SE15	SE16	SE14	SSE14	SW7	W14	W9	NNW9	NNW10	NNW5	NW6	SSE2.9	SE16
31-Dec	NNW6	NNW6	NW4	WSW2	SE1	SE3	SE1	NW4	NNW4	N5	NNW3	NW3	NW3	NW3	NW2	N2	SW3	ESE1	W15	W25	WSW25	WSW29	WSW24	W18	W6.5	WSW29

WSW1.6	SSW1.5	SSW1.2	SSW0.6	SSW0.8	SSW1.6	SSW1.7	S1.0	SE1.5	SE1.7	SE2.8	SE2.3	SSE1.9	S0.9	WSW1.1	SW1.4	SW1.0	W1.2	W1.9	WSW1.7	SW1.8	SW2.5	WSW1.9	WSW1.9	Diurnal Average
WSW26	WSW26	NNW24	WSW22	WSW21	WSW29	WSW25	W26	NNW26	W23	SE23	SE22	NNW24	NNW22	NNW22	NNW25	NNW24	NNW22	NNW21	W25	WSW25	WSW29	WSW24	NNW23	Diurnal Maximum

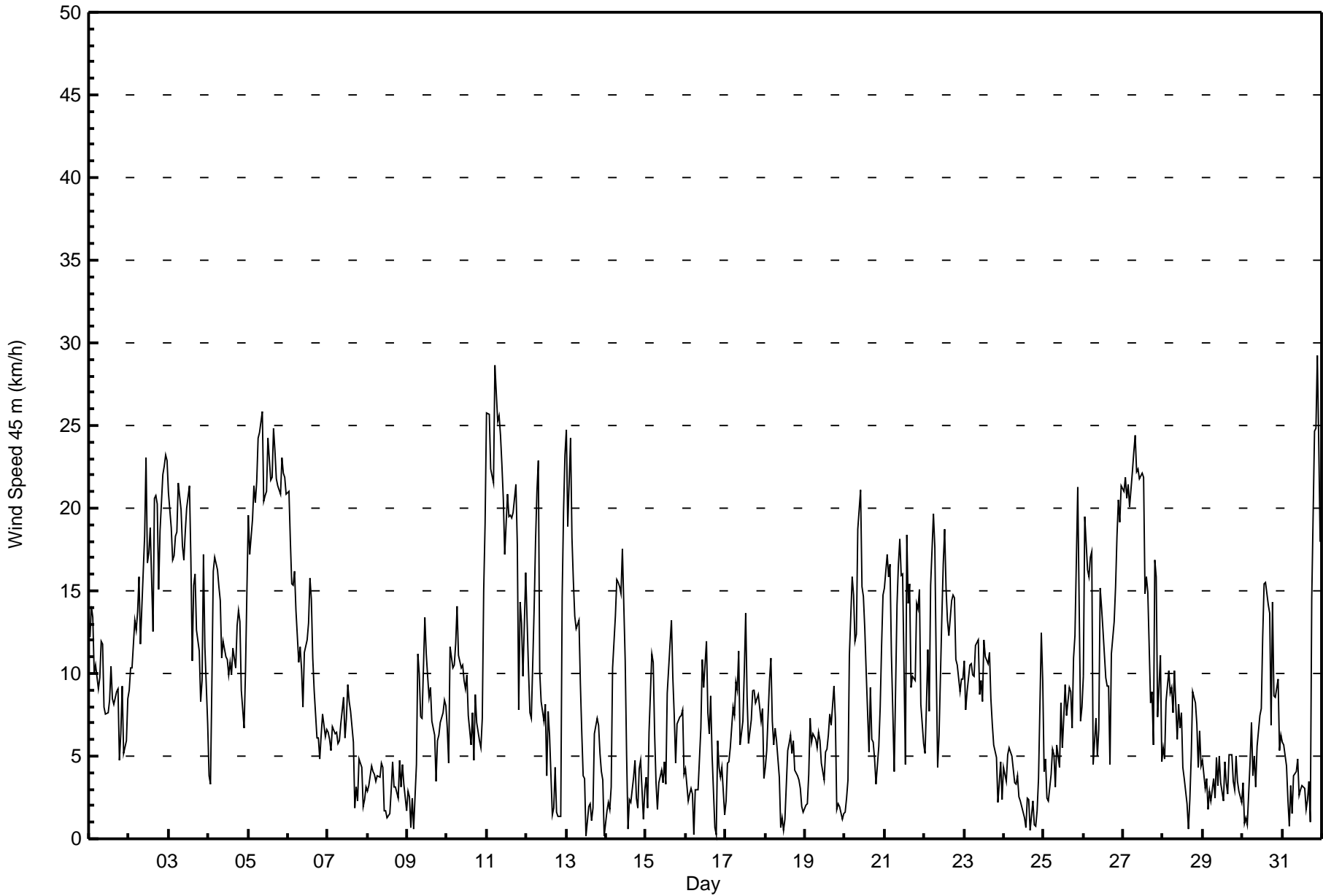
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 11 05:00 Minimum Value: 0 km/h on Dec 8 22:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 6																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	4	3	2	3	2	2	3	2	2	2	2	3	2	2	2	2	2	2	2	1	1	2	2	4
2-Dec	2	2	3	3	4	3	2	3	3	3	5	5	5	5	4	6	5	6	4	5	5	5	5	6	6
3-Dec	5	6	3	4	3	4	5	5	3	3	4	6	3	4	2	4	3	3	3	3	4	3	3	3	6
4-Dec	2	2	3	5	5	5	5	4	4	4	3	3	4	3	3	3	3	3	4	4	2	2	4	4	5
5-Dec	5	4	5	5	5	5	5	6	6	6	6	6	6	5	6	6	6	5	5	5	5	5	6	6	
6-Dec	5	5	4	4	4	4	4	4	4	3	4	3	3	4	4	3	3	1	1	2	2	2	1	2	5
7-Dec	2	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	2	1	1	1	1	1	1	1	2
8-Dec	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2
9-Dec	1	1	1	2	1	4	2	2	2	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	4
10-Dec	3	3	2	2	3	3	2	3	2	1	2	1	1	2	2	1	1	1	1	2	2	4	2	4	4
11-Dec	4	4	4	4	8	4	4	6	5	5	4	5	4	5	5	5	5	5	4	3	4	4	4	5	8
12-Dec	4	3	2	2	4	5	5	5	4	6	4	4	2	1	1	1	1	2	2	1	2	4	5	6	6
13-Dec	6	5	7	7	4	4	4	5	3	2	2	2	1	1	0	1	1	2	2	1	1	2	2	1	7
14-Dec	1	1	1	2	2	2	2	2	2	2	3	2	1	1	1	1	1	1	2	1	1	2	1	1	3
15-Dec	2	1	2	2	3	1	1	1	2	1	2	2	3	2	3	3	3	1	1	2	1	2	2	2	3
16-Dec	1	2	1	1	1	1	2	1	2	1	2	2	2	3	2	2	2	1	1	1	2	1	1	1	3
17-Dec	1	1	2	2	1	2	2	2	3	2	3	3	3	3	2	2	1	1	2	2	2	2	2	1	3
18-Dec	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	2	2	1	2	2	1	1	1	1	2
19-Dec	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	2	1	1	2
20-Dec	2	1	3	3	3	3	7	4	5	3	3	3	3	4	2	5	2	2	2	1	2	2	3	3	7
21-Dec	2	1	3	3	4	6	4	4	2	4	2	2	5	5	3	3	3	3	2	2	2	2	3	3	6
22-Dec	2	2	1	3	3	3	4	3	2	2	4	5	5	4	4	3	4	4	4	4	3	2	2	4	5
23-Dec	3	2	3	3	3	3	3	3	4	3	3	2	3	2	2	2	3	2	1	1	2	2	1	1	4
24-Dec	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
25-Dec	2	1	2	1	1	1	2	2	2	2	2	2	2	2	3	3	2	1	3	4	3	5	2	3	5
26-Dec	4	4	4	4	4	3	4	3	4	4	5	4	3	4	4	3	2	3	2	2	3	3	3	3	5
27-Dec	2	2	2	3	3	2	2	2	3	3	4	4	5	3	3	2	2	1	2	3	3	5	3	2	5
28-Dec	2	2	3	3	4	2	2	3	2	3	2	2	2	1	1	1	1	1	2	2	2	2	2	2	4
29-Dec	2	2	2	1	2	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	2	2	1	2	2
30-Dec	2	1	1	1	3	2	2	2	1	2	2	3	4	2	3	3	3	4	5	4	3	3	2	1	5
31-Dec	2	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	3	2	7	5	5	5	7	4	7
Diurnal Maximum																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	248	33.33	33.33
6 - 11	262	35.22	68.55
12 - 19	153	20.56	89.11
20 - 28	79	10.62	99.73
29 - 38	2	0.27	100.00
> 38	0	0.00	100.00

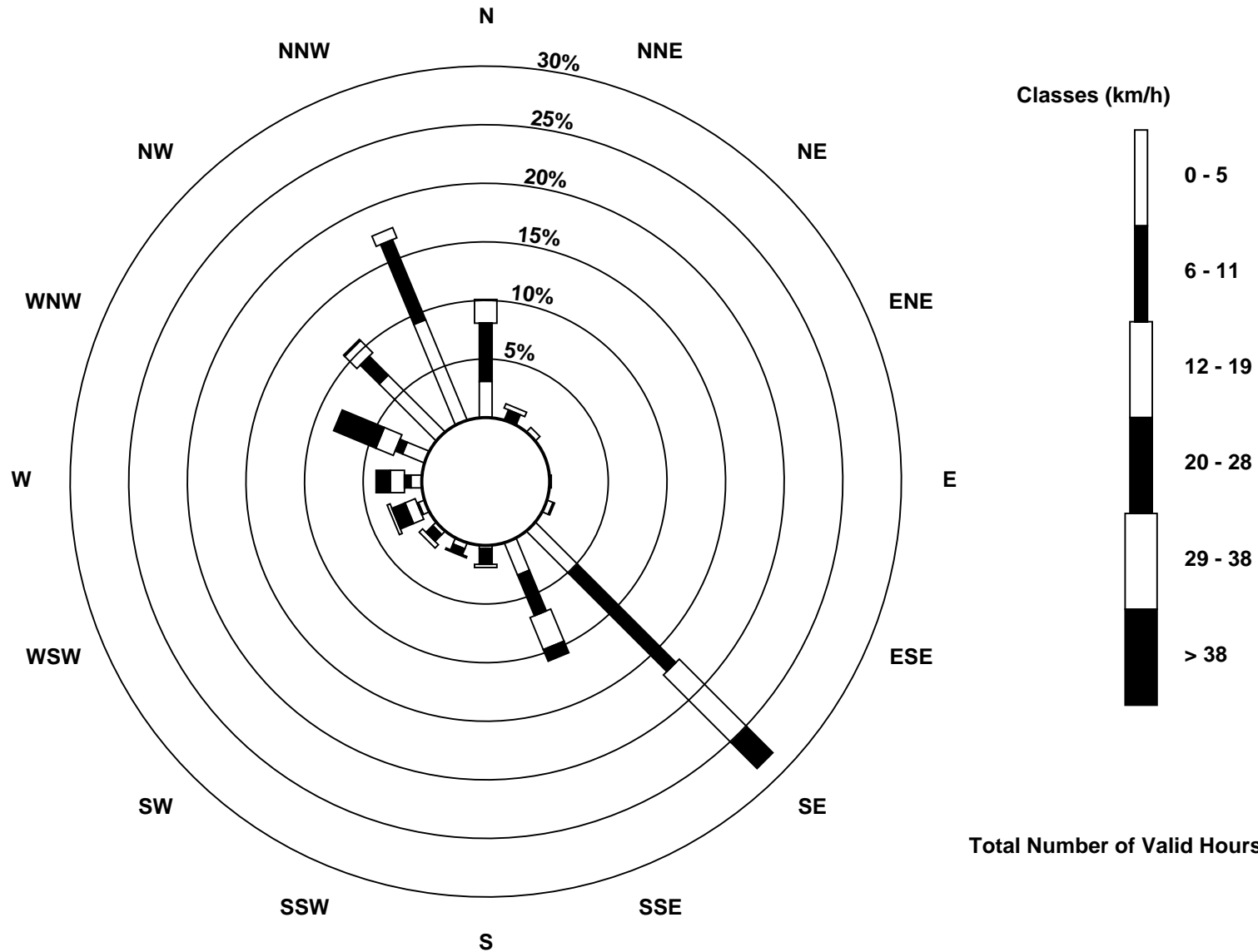
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower (AMS 3)





Maximum Speed: 39 km/h on Dec 12 08:00	Maximum Daily Speed Average: 31.3 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 28 15:00	Minimum Daily Speed Average: 0.4 km/h on Dec 18	Hours of Data: 744
Maximum Diurnal Speed Average: 5.7 km/h at hour 20	Minimum Diurnal Speed Average: 1.6 km/h at hour 12	Hours of Missing Data: 0
Monthly Average Velocity: 3.4 km/h 257.1 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 11 Q ₃ = 19 P ₉₀ = 28 P ₉₉ = 36	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S15	S16	S14	S12	SW14	S11	S12	SSE13	SSE11	S10	S9	S10	S9	SSE10	S9	S8	S9	S9	S5	S6	S9	S7	SSE5	SSE8	S9.8	S16
2-Dec	SSE8	SSE12	SSE16	SE19	SSE19	SSE16	SSE19	SE20	SSE22	SSE21	SSE32	SE30	SE28	SE33	SE24	SE34	SSE32	SE35	SSE22	SSE25	SSE29	SSE31	SE33	SE35	SSE24.7	SE35
3-Dec	SSE27	SSE26	SSE20	SSE21	SSE21	SSE22	SSE26	SSE25	SSE23	SSE23	SSE26	SSE25	SSE22	S12	SSW11	S18	S22	SSW18	SSW17	SSW16	SW18	SW24	WSW18	SW13	S18.3	SSE27
4-Dec	SSW4	WNW7	NNW16	N22	NNE23	NNE25	NNE21	N20	N17	N18	N16	N15	NNW14	NNW16	NNW15	NNW18	NW16	NW19	NNW21	NW20	NNW14	NNW11	NW17	NW23	NNW15.4	NNE25
5-Dec	NW27	WNW25	WNW30	WNW31	WNW30	WNW31	WNW35	WNW37	WNW38	WNW30	WNW30	WNW30	WNW35	WNW30	WNW31	WNW35	WNW33	WNW31	WNW30	WNW29	WNW31	WNW31	WNW31	WNW32	WNW31.3	WNW38
6-Dec	WNW32	WNW27	WNW24	WNW25	WNW25	WNW24	WNW22	WNW23	WNW22	NW16	NW19	NW18	NW18	NNW23	NNW22	NNW17	NNW15	NNW11	N9	N9	N12	N11	N11	N12	NW17.1	WNW32
7-Dec	N14	NNW10	NNW10	N12	N11	N11	N12	N11	N12	N14	N10	N12	N13	NNW10	NNW9	NNW10	N7	N6	NNE6	NNE11	NNE10	NNE7	NNE5	NNE9	N9.7	N14
8-Dec	NE8	NNE8	NNE9	NNE5	NNE6	NNE6	NE2	NE1	N3	NNW5	NNW5	NNW5	NNW5	NW4	WNW4	NNW5	N7	NNE6	NNE6	NNE6	N6	N7	N3	ENE1	N4.6	NNE9
9-Dec	SE5	SE7	SE7	SSE5	SSE4	SSE7	SSE8	SSE10	SSE7	SSE9	SSE9	SSE7	SE9	SE12	SE8	SE7	SSE4	SSE4	SSE6	SSE5	SSE3	S3	S6	SSW5	SSE6.3	SE12
10-Dec	S5	SE5	SSE9	SSE9	SSE10	SSE13	SSE12	SSE13	S8	S6	SSE5	SSE5	SE6	SE4	SE7	SSE8	S7	S6	SSW3	SW11	SW10	WSW15	WSW21	WSW25	S7.3	WSW25
11-Dec	WSW31	WSW32	WSW31	WSW30	WSW30	WSW32	WSW31	W36	WSW31	WSW30	W29	W27	W27	W27	WNW27	W26	W30	W32	WSW26	WNW18	WNW28	W21	W22	WNW31	W27.8	W36
12-Dec	NW26	NW19	NW18	NW17	WNW32	WNW32	WNW37	WNW39	WNW27	W19	WNW14	W11	WSW8	SSE7	SE10	SE6	ENE1	NNW8	N6	WNW4	WNW16	WNW29	WNW34	WNW35	WNW16.2	WNW39
13-Dec	WNW37	WNW28	WNW35	NW26	N22	N21	NNW21	NNW21	N15	NNW11	NNW8	NE4	NNE1	N4	N6	NNW6	NNW9	NW14	NW19	NW16	NW15	WNW11	WNW11	NW9	NW14.0	WNW37
14-Dec	NNE3	S3	SSW3	SW5	SSW5	SSW6	S8	S9	S11	S8	S8	SSE5	SSE1	N7	N10	NNE5	NNW5	NW5	WNW6	WNW12	WNW12	NW10	NNW11	NNW16	WNW2.1	NNW16
15-Dec	NW15	WNW13	NW9	NW17	NW16	NW13	NW10	WNW11	WNW10	NW9	W10	NW13	WNW11	WNW13	W17	W20	WNW19	NW16	WNW16	WNW14	WNW19	WNW17	NW14	NW10	WNW13.4	W20
16-Dec	N10	N8	NNW8	NW8	NW8	W2	SE2	S2	SSW4	SW6	SW7	SSW3	SSE6	SSE10	SE10	SSE12	SSE13	SE12	SSE6	S3	SE10	SE11	SSE6	SE11	SSE3.4	SSE13
17-Dec	SE14	SSE6	SE9	SSE4	SSE5	SE6	SSE6	S5	SSE8	SSE6	SSE8	S10	SSE10	SSE7	SSW4	SSE10	S9	S4	S5	SSE6	SSE7	S5	SSE6	S3	SSE6.7	SE14
18-Dec	S6	S6	S6	S8	SSW7	S6	S6	S4	ESE1	ESE3	SE4	ESE3	ESE2	N5	NNW7	NNW11	NNW9	NNW7	NNW5	NNW4	N3	NW2	WSW1	ENE2	SW0.4	NNW11
19-Dec	ESE2	SE4	SE2	E4	ENE3	N7	N8	N6	N9	N9	N7	N7	NNW6	NNW7	NNW8	NNW13	N11	NNW16	NNW12	N5	ESE4	SE7	SE4	SE10	N4.5	NNW16
20-Dec	SSE9	SE11	SE16	SSE16	SSE17	SSE10	WSW26	WSW19	SW12	SW8	WSW12	SW12	WSW10	SW11	WSW20	WSW23	WSW10	WSW7	WSW11	WSW16	WSW13	SW14	SW10	SW11	SW10.6	WSW26
21-Dec	S7	S9	SSE16	S8	WSW11	WSW25	WSW14	S6	SSW7	S13	SSE15	SSW9	WSW15	W33	W28	WSW28	SW18	SW23	SSW16	S11	SSE14	SSE15	SSE15	SE11	SW11.6	W33
22-Dec	SE10	SSE9	SSW8	WSW18	WSW25	WSW32	WSW29	NW15	N7	NNW10	N18	N22	N24	NNE20	N19	N18	N19	N20	N22	N16	N15	N13	N13	N14	NNW10.0	WSW32
23-Dec	NNE15	NNE11	NNE12	NNE14	NNE15	NNE13	NNE13	N16	N16	NNE12	NNE13	N11	N14	N12	N13	N14	N13	N11	NNW11	NNW11	NE3	SE7	SE5	SE7	N10.3	N16
24-Dec	SE7	ESE2	ENE1	NW1	NNW4	NW2	W1	WNW2	W5	WSW5	WSW5	SW5	SSW6	S2	SE1	N1	SSE4	SSE4	SSW2	SSE6	SSE5	SSE6	S7	S7	SSW2.2	S7
25-Dec	SSE5	S5	S4	S4	S4	S5	SSE10	SSE8	S4	SSE5	SSE9	SSE11	SE12	SSE14	S7	SSE11	SSE19	SE21	SSE21	SSE17	SSE24	SSE18	SSE13	SSE13	SSE10.9	SSE24
26-Dec	SSE8	SSE19	SSE21	SSE16	SSE21	SSE21	SSE12	SSE13	SSE15	SE20	SSE23	SSE17	SSE18	SSE19	SSE17	SSE15	SSE12	SSE16	SSE20	SSE23	SSE28	SSE28	SSE26	SSE27	SSE18.9	SSE28
27-Dec	SSE26	SSE26	SSE25	SSE26	SSE28	SSE29	SSE28	SSE28	SSE27	SSE32	SSE28	SSE18	SSE16	SSE10	SSW5	SSW7	SW13	SSW5	WSW10	WSW25	WSW25	W19	NNW19	NNW15	S13.8	SSE32
28-Dec	NNW16	NNW10	N13	NNE14	NNE13	N12	NNE11	NNE15	NNE8	NNE11	NNE9	N10	NNE5	NNW3	SW0	SE2	E5	NNE7	N11	N11	N12	N8	N9	N8	N8.7	NNW16
29-Dec	NNW8	NNW6	N8	NNE4	NE5	ENE5	NE4	E3	NE4	NW2	NNW6	NW4	WNW3	NW4	NNW4	NW2	N7	N9	NNE5	NNW2	NW5	N5	N4	ENE3	N3.8	N9
30-Dec	NNW2	SW5	SW5	WSW4	S3	S4	SSE3	SW5	SW6	SW9	SSE8	SSE9	S7	S11	SSE15	S13	S12	WSW14	W28	W25	NW15	N16	NNE9	NNW10	SW4.8	W28
31-Dec	NW9	N11	NNW8	WSW5	S4	SE7	ESE6	NE5	NNE3	NW5	W2	N3	N5	NNW3	NNE3	ENE5	SW4	SW6	W28	W37	WSW36	WSW39	W35	W31	W8.8	WSW39

W2.9	WSW2.8	WSW2.8	WSW2.9	W3.4	WSW3.8	WSW4.0	W3.3	WSW2.6	SW2.6	SSW2.4	SW1.6	WSW2.0	WSW2.5	W3.5	W3.2	WSW3.0	W3.3	W5.1	W5.7	W5.1	WSW5.2	W4.8	W4.2	Diurnal Average
WNW37	WSW32	WNW35	WNW31	WNW32	WSW32	WNW37	WNW39	WNW38	SSE32	SSE32	SE30	NNW35	W33	WNW31	WNW35	WNW33	SE35	WNW30	W37	WSW36	WSW39	W35	SE35	Diurnal Maximum

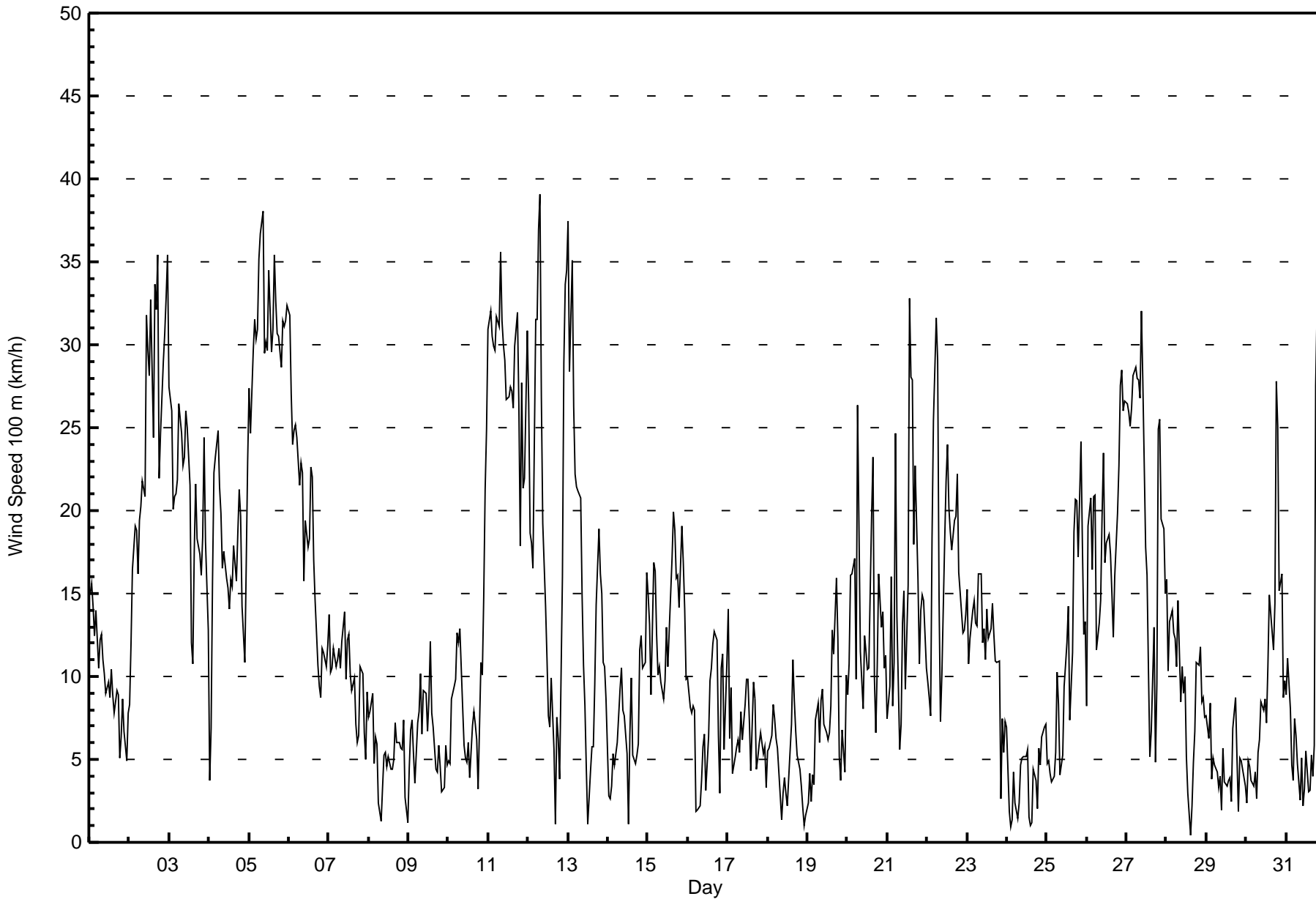
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Dec 21 13:00 Minimum Value: 0 km/h on Dec 7 18:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 8																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	3	3	4	3	3	3	2	2	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	4
2-Dec	3	2	2	2	4	4	2	3	5	5	3	2	2	4	4	4	5	5	6	6	4	5	3	3	6	
3-Dec	5	7	5	5	5	5	5	5	3	4	4	4	4	3	3	3	2	4	4	4	5	2	3	3	7	
4-Dec	2	2	3	4	4	4	5	4	4	3	3	2	4	4	4	3	2	4	4	4	2	1	5	3	5	
5-Dec	4	4	4	3	4	4	4	4	3	5	5	5	4	4	5	4	5	4	4	5	4	4	4	3	5	
6-Dec	3	4	4	3	3	4	4	4	4	4	4	3	3	4	4	3	2	1	2	2	2	2	2	2	4	
7-Dec	2	1	1	1	1	2	2	2	2	2	1	2	2	2	1	0	1	0	2	1	1	1	2	2	2	
8-Dec	2	3	3	1	2	2	1	1	1	1	1	1	1	1	2	0	1	1	1	1	2	2	1	1	3	
9-Dec	2	1	1	1	1	3	2	3	2	2	3	3	2	1	3	1	1	1	2	1	1	1	2	2	3	
10-Dec	2	1	2	2	2	2	3	2	2	2	1	1	2	2	1	2	2	2	1	2	2	4	1	3	4	
11-Dec	2	2	2	3	7	3	3	6	4	3	3	5	3	4	5	5	4	4	3	5	4	5	5	4	7	
12-Dec	4	3	3	4	4	4	3	2	4	7	3	4	3	2	1	2	1	3	2	2	9	3	4	5	9	
13-Dec	4	5	6	7	4	4	5	6	3	2	2	1	1	1	0	2	1	4	2	3	2	2	3	2	7	
14-Dec	1	1	1	2	1	2	2	2	2	2	2	2	1	3	2	1	1	1	1	2	3	3	2	1	3	
15-Dec	1	4	4	3	4	2	3	3	3	2	3	3	3	2	3	2	4	3	3	4	2	3	2	1	4	
16-Dec	1	2	1	1	1	1	1	1	1	1	2	1	2	2	4	2	1	1	2	1	3	1	2	2	4	
17-Dec	2	2	2	1	2	1	2	2	2	2	2	3	2	2	2	2	3	1	1	2	3	1	1	1	3	
18-Dec	2	2	2	2	2	2	2	2	1	1	1	2	2	2	1	3	2	1	1	1	1	1	2	1	3	
19-Dec	1	3	3	2	3	3	1	1	2	1	1	1	1	1	3	2	2	1	2	1	2	3	2	1	3	
20-Dec	3	2	1	2	3	3	10	8	5	4	4	4	3	4	3	4	4	3	3	2	2	3	4	4	10	
21-Dec	2	2	4	4	4	9	8	3	2	5	4	3	12	4	4	3	4	3	5	3	3	2	3	3	12	
22-Dec	3	3	3	2	4	2	3	3	2	3	4	4	2	4	3	3	3	4	3	4	3	2	2	3	4	
23-Dec	3	2	3	2	2	3	3	3	3	2	2	2	2	1	1	1	3	1	2	1	3	2	3	2	3	
24-Dec	2	1	2	1	1	1	1	2	1	1	1	3	1	1	1	2	2	1	2	1	2	1	2	1	3	
25-Dec	1	1	1	1	1	2	4	3	1	1	3	2	1	1	2	5	3	3	2	4	3	5	2	3	5	
26-Dec	2	5	4	5	4	3	7	5	4	3	4	5	3	5	5	3	3	3	4	4	4	4	4	3	7	
27-Dec	3	3	4	5	5	4	3	2	3	4	3	4	3	3	2	3	3	2	7	2	3	4	3	2	7	
28-Dec	3	1	2	3	4	2	3	3	2	2	2	1	2	1	1	1	1	2	1	1	1	1	1	2	4	
29-Dec	2	2	2	3	3	1	1	1	1	1	2	2	2	2	3	2	3	1	1	2	2	3	2	1	3	
30-Dec	2	2	1	1	1	2	1	2	2	2	3	3	2	2	3	3	4	6	2	5	8	3	4	2	8	
31-Dec	1	1	2	3	1	1	2	2	2	2	1	1	1	1	1	2	3	4	8	3	3	2	4	3	8	
Diurnal Maximum																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	155	20.83	20.83
6 - 11	245	32.93	53.76
12 - 19	175	23.52	77.28
20 - 28	103	13.84	91.13
29 - 38	64	8.60	99.73
> 38	2	0.27	100.00

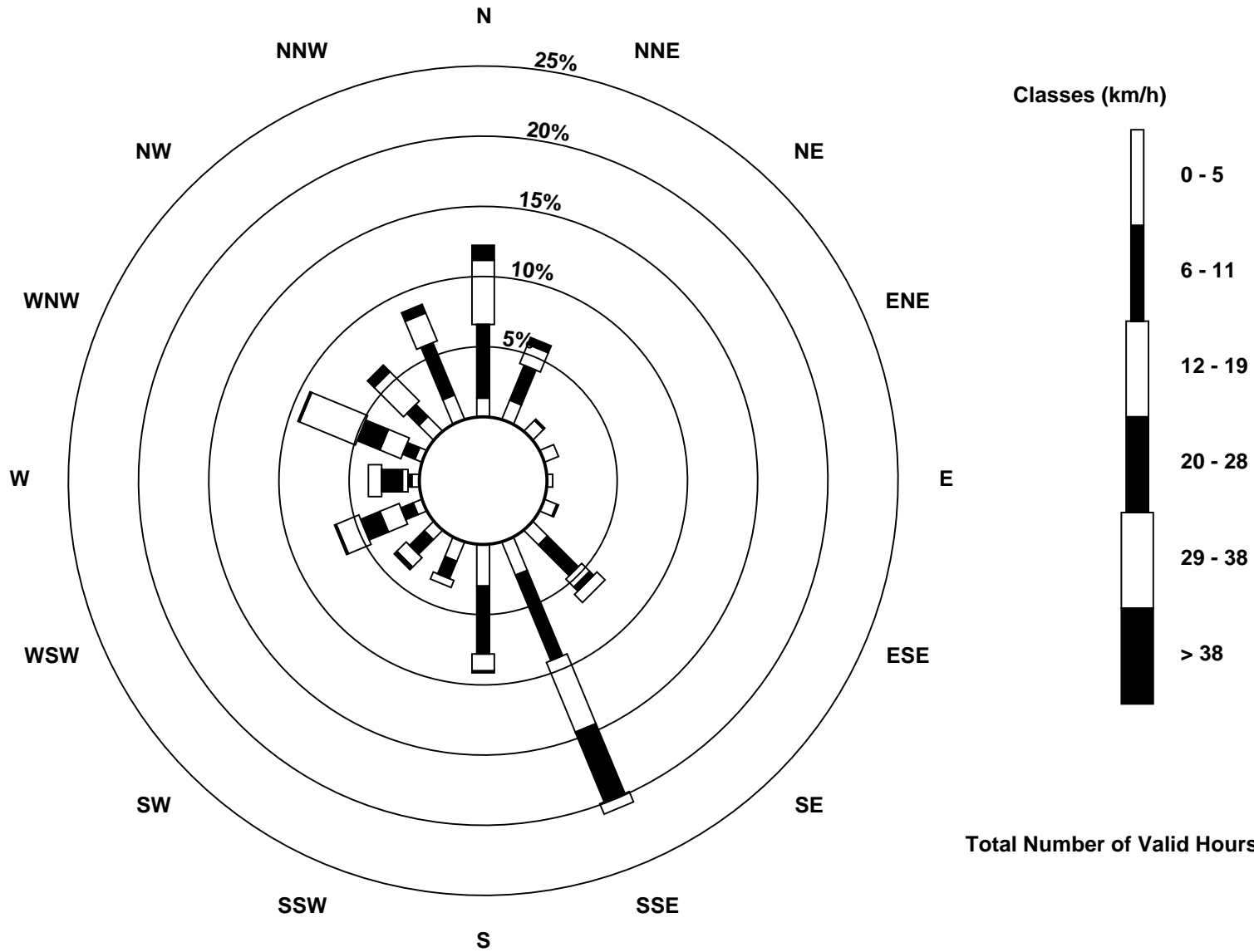
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower (AMS 3)





Maximum Speed: 44 km/h on Dec 20 07:00	Maximum Daily Speed Average: 35.2 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 9 01:00	Minimum Daily Speed Average: 1.9 km/h on Dec 29	Hours of Data: 744
Maximum Diurnal Speed Average: 8.2 km/h at hour 20	Minimum Diurnal Speed Average: 4.2 km/h at hour 12	Hours of Missing Data: 0
Monthly Average Velocity: 5.8 km/h 259.3 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 10 Median = 15 Q ₃ = 24 P ₉₀ = 33 P ₉₉ = 42	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S18	S19	S19	SSW16	SW16	SSW13	S14	S16	S14	S12	S12	S11	S10	S11	S10	S9	SSW13	SW14	SW10	SSW8	SSW8	SSW8	SSW8	SSW7	SSW12.1	S19
2-Dec	SSW9	S11	SSE14	SSE17	SSE18	SSE17	SSE22	SSE22	S25	S26	SSE29	SSE30	SE29	SSE32	SSE23	SSE33	SSE30	SSE38	SSE25	SSE29	SSE28	SSE30	SSE30	SSE33	SSE24.8	SSE38
3-Dec	SSE28	SSE29	SSE24	SSE26	SSE25	SSE25	SSE27	SSE27	SSE24	SSE28	SSE29	S27	SSW25	SW21	SSW21	SSW16	SSW20	SSW25	SW24	SW23	SW25	SW29	WSW25	WSW18	S21.5	SSE29
4-Dec	WSW9	WNW10	NNW18	NNE25	NNE25	NNE30	NNE24	NNE22	NNE19	N19	N17	N16	NNW17	NNW19	NNW20	NNW21	NNW19	NNW22	NNW25	NNW23	NNW17	NNW13	NW21	NW28	NNW17.8	NNE30
5-Dec	NW32	WNW30	WNW33	WNW34	WNW34	WNW35	WNW38	WNW40	WNW33	WNW35	WNW33	WNW37	WNW33	WNW35	WNW39	WNW37	WNW36	WNW36	WNW35	WNW35	WNW36	WNW36	WNW36	WNW35	WNW35.2	WNW40
6-Dec	WNW34	WNW31	WNW29	WNW31	WNW31	WNW31	WNW27	WNW30	NW29	NW24	NW24	NW21	NW21	NNW26	NNW25	NNW21	NNW17	N12	NNE13	NNE14	NNE17	NNE17	NNE19	NW20.7	WNW34	
7-Dec	NNE22	N13	N14	NNE15	NNE14	NNE16	NNE19	NNE15	NNE17	NNE19	NNE16	NNE16	N14	NNW11	NNW10	N11	N10	NNE9	NNE12	NNE16	NNE17	NNE14	NNE13	NE16	NNE14.2	NNE22
8-Dec	NE17	NE16	NE17	NE9	NE11	NE11	ENE8	ENE9	ENE9	ENE7	ENE7	ENE8	NE7	NNE5	N4	NNE5	NNE8	NE9	NE10	NE10	NE9	ENE6	SE4	S3	NE8.1	NE17
9-Dec	SSW1	SSW1	S5	SSW6	S8	S9	S8	S16	S15	S15	S13	S6	S5	S4	SSE9	SSE7	S8	S11	S10	SSW10	SSW12	SSW10	S12	S11	S8.6	S16
10-Dec	S13	S13	S12	SSW11	S14	S15	SSW14	SSW10	S8	SSW6	SSW6	SSW7	S5	SE8	SSE10	SSE10	S9	SW8	SW13	WSW17	WSW17	W19	W26	WSW33	SSW9.9	WSW33
11-Dec	WSW39	W39	WSW38	W36	W37	WSW37	WSW38	W41	W37	W34	W35	W32	W31	W31	WNW32	W31	W36	W38	W32	WNW28	WNW34	W26	WNW29	WNW39	W33.7	W41
12-Dec	NW34	NW27	NW28	NW27	NW42	NW40	NW42	NW42	NW34	WNW24	NW22	WNW12	WSW8	SSW5	S5	W11	WNW21	NW26	NNW18	NW17	WNW31	WNW38	WNW42	WNW41	NW25.4	NW42
13-Dec	WNW43	WNW36	WNW42	NW33	N26	N27	N26	N25	N18	N14	NNW11	NNE4	NNW3	NNW9	NNW9	NW11	NNW15	NW23	NW28	NW23	NW21	WNW16	WNW21	NW22	NW19.4	WNW43
14-Dec	NW14	WSW9	W8	WNW11	WSW12	WSW16	SW12	SW12	SW14	SW14	WSW19	WSW13	WNW12	NW15	NNW15	N11	NNE9	NNE8	NW12	NW19	NW23	NW19	NW19	NNW22	WNW9.9	NW43
15-Dec	NNW22	NW20	WNW19	WNW29	NW25	NW21	NW23	WNW23	WNW18	NW16	WNW14	NW20	WNW13	WNW14	W19	WNW23	NW25	NW27	WNW26	WNW24	WNW24	NW24	NW20	NW18	NW20.8	WNW29
16-Dec	NW15	NW17	NNW15	NNW15	NW13	WNW9	W9	W10	W9	WSW7	WSW8	SW9	SSW7	S7	SSW8	S14	S13	S8	SW9	WSW9	WSW4	S7	S9	S7	WSW5.4	NW17
17-Dec	S11	S14	SSE11	S10	S14	S12	S15	S17	S17	S16	S17	S14	SSE9	S7	S11	S18	S16	S12	SSE12	SSE13	SSE13	S12	SSE13	S9	S12.8	SSE18
18-Dec	S10	SSW11	S12	SSE13	S13	S11	S9	S6	SSE5	SSE5	SSE2	SSE3	SE4	N3	NNE7	N9	N10	NNE6	N5	NNE4	NE3	E3	SW3	SE4	SSE2.7	S13
19-Dec	SE6	SE10	SE9	SE8	SE13	ESE7	ESE3	SE10	ESE3	NNE2	N2	NNW3	NNW8	NNW8	NNW10	NNW15	N15	N20	N13	NNE7	E6	SE6	S6	S10	NE2.3	N20
20-Dec	S16	S18	S16	SSW11	SSW15	WSW20	W44	WSW37	WSW32	WSW28	WSW29	WSW27	WSW24	WSW24	WSW30	W31	WSW24	WSW20	WSW24	WSW23	WSW20	WSW23	WSW21	WSW23	WSW22.3	W44
21-Dec	SW16	SW15	SSW15	WSW19	WSW25	WSW41	WSW26	SW16	SW20	SSW22	SSW22	SW21	W31	W44	W36	W36	WSW24	SW25	SW25	SW22	SSW16	S12	S8	SSW5	WSW21.1	W44
22-Dec	SSW5	SW7	SW12	WSW28	W35	W40	W36	NW17	NNE10	N11	N18	NNE21	N23	NNE20	N19	N18	N20	NNE20	NNE25	N18	NNE17	NNE13	NNE14	NNE13	NNW11.0	W40
23-Dec	NNE17	NNE11	NNE13	NNE15	NNE15	NNE13	NNE14	N17	NNE17	NNE12	NNE13	NNE11	N13	N12	N12	N14	N14	NNE10	NNE10	E6	SE11	SE17	SE16	SE14	NNE9.9	SE17
24-Dec	SE12	SE11	SE10	SE5	SE3	SSE3	SSE5	S7	SE6	SSE6	SSE7	SSE6	S9	SSE9	S7	S5	SSE10	SSE9	S8	SSE9	SSE11	S10	S14	S14	SSE7.9	S14
25-Dec	S12	S16	S15	S14	S14	S16	SSE18	SSE16	SSE13	SSE12	SSE15	SSE15	SSE16	SSE16	SSE13	SSE17	SSE23	SSE24	SSE21	SSE20	S33	S26	SSE21	SSE18	SSE17.5	S33
26-Dec	SSE17	S27	S31	S28	S33	S34	S24	S25	SSE23	SSE26	SSE31	SSE26	SSE24	S29	SSE26	SSE23	S19	SSE24	S28	S31	S32	S31	S31	S29	S27.1	S34
27-Dec	S26	S26	S29	S28	S32	S27	S32	S29	S27	S26	SSW23	SSW17	SSW14	SW11	SW16	SW18	SW21	WSW14	WSW22	W33	W30	W27	NNW20	N16	SSW16.4	W33
28-Dec	N20	N11	N16	NNE16	NNE14	NNE13	NNE11	NNE16	NNE11	NNE12	NNE10	NNE10	NE5	NNE2	ESE2	S3	E4	NE7	NNE11	NNE10	NE14	NE13	NE12	ENE11	NNE9.8	N20
29-Dec	NE7	NE4	NNE4	ENE3	E6	ESE7	E3	SE5	E4	SE3	NNE2	NNE1	W1	WNW3	NNE3	SSE2	NNE3	NNE4	NE2	S1	W5	WNW1	NNE5	NE2	ENE1.9	NE7
30-Dec	WSW4	SW10	SW10	WSW8	SW6	SW8	SW8	SW10	WSW10	WSW14	SSW10	SSW11	SW9	SSW11	S13	SSW18	SSW19	WSW20	W33	W32	WNW20	N19	NE14	N12	WSW8.9	W33
31-Dec	NNW11	N13	NNW11	W4	SSW6	SSE6	E11	NE12	NE9	N6	N4	NNE8	NNE9	N3	NE4	NE5	WSW10	WSW17	W33	W40	W38	W38	W36	WNW35	WNW9.5	W40

W5.1	WSW5.3	WSW5.1	W5.4	WSW5.8	WSW6.8	WSW7.2	WSW5.6	WSW4.7	WSW5.1	SW4.9	WSW4.2	WSW4.6	W5.2	W5.4	W5.8	WSW5.7	W6.2	W8.0	W8.2	W7.6	W6.6	W6.4	W6.4	Diurnal Average
WNW43	W39	WNW42	W36	NW42	WSW41	W44	NW42	WNW40	W34	WNW35	WNW33	WNW37	W44	W36	WNW39	WNW37	W38	WNW36	W40	W38	WNW38	WNW42	WNW41	Diurnal Maximum

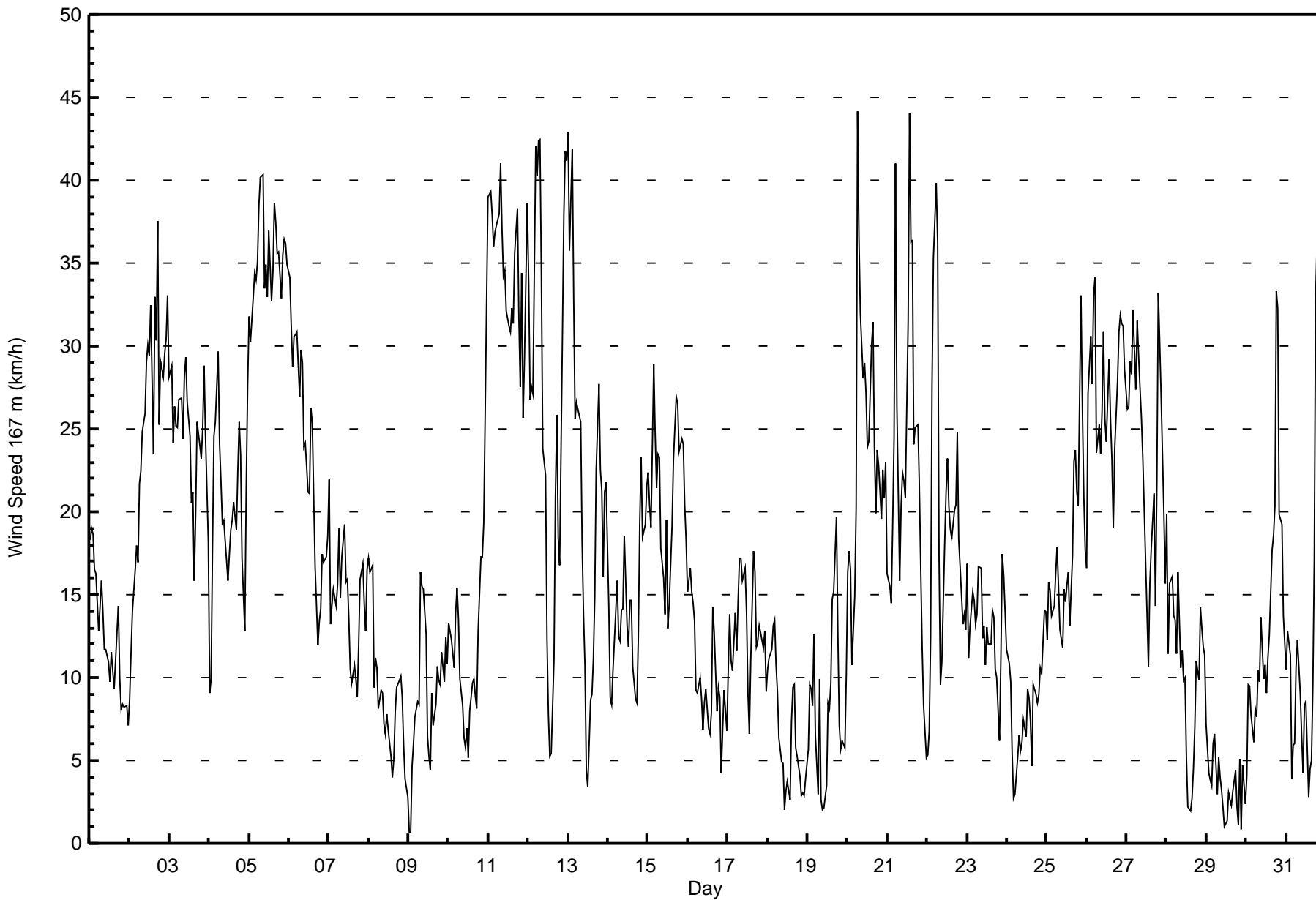
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 167 m (WS167m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Dec 21 13:00 Minimum Value: 0 km/h on Dec 9 02:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 7																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	2	3	3	2	2	2	2	2	2	2	2	2	1	3	2	1	1	1	1	1	1	2	3
2-Dec	2	1	2	2	3	4	3	3	3	3	3	4	3	4	6	6	7	6	6	6	4	5	5	5	7
3-Dec	5	5	4	4	5	5	3	4	4	3	4	3	3	4	3	2	4	3	3	2	2	3	4	5	
4-Dec	3	3	3	4	4	5	5	4	5	3	4	2	3	4	3	3	3	3	4	4	2	1	6	3	6
5-Dec	4	5	4	2	3	2	2	2	2	4	4	4	2	4	4	3	4	4	3	4	3	2	2	2	5
6-Dec	2	2	3	2	3	3	3	3	3	4	4	3	3	3	3	3	3	1	2	2	3	2	2	3	4
7-Dec	2	2	2	1	2	2	2	3	2	2	2	2	2	2	1	1	1	1	4	2	1	2	2	2	4
8-Dec	1	3	4	2	2	3	2	1	1	2	1	1	1	1	0	1	1	1	1	1	1	1	1	2	4
9-Dec	1	0	2	1	1	1	1	2	3	3	2	3	1	1	2	2	2	1	1	2	1	1	1	1	3
10-Dec	2	2	2	1	2	2	2	3	1	2	2	1	1	2	1	1	1	2	2	2	1	2	2	2	3
11-Dec	2	1	1	3	6	3	3	5	3	2	2	4	3	3	5	5	2	2	3	8	6	2	6	4	8
12-Dec	4	2	3	6	2	2	2	2	4	2	4	4	3	1	1	5	3	3	1	2	9	3	3	4	9
13-Dec	3	5	5	9	4	4	5	6	3	2	2	1	2	1	1	3	2	6	2	3	2	3	3	2	9
14-Dec	4	3	2	3	2	3	2	2	2	2	1	2	1	3	2	2	1	1	2	2	2	4	3	2	4
15-Dec	2	3	6	3	4	2	2	3	4	2	2	3	2	2	3	2	2	2	2	3	2	2	2	2	6
16-Dec	2	2	1	1	1	3	2	1	2	1	2	1	2	1	1	3	2	2	2	1	2	2	2	2	3
17-Dec	1	2	2	2	3	2	2	2	2	2	2	3	3	2	2	3	4	2	2	2	4	2	3	2	4
18-Dec	1	2	2	2	2	2	2	1	1	1	1	1	2	2	1	1	1	1	2	1	1	2	2	2	2
19-Dec	2	3	5	4	4	3	2	3	2	1	1	1	1	1	3	1	2	2	2	1	1	3	2	3	5
20-Dec	3	3	2	2	4	5	5	3	3	3	2	3	2	3	2	3	2	3	2	2	2	3	5	4	5
21-Dec	3	3	4	6	3	7	10	4	2	3	3	3	12	3	4	3	6	3	2	3	4	2	3	3	12
22-Dec	2	3	3	4	4	2	4	4	2	2	3	4	2	3	3	2	3	4	3	3	4	2	2	3	4
23-Dec	3	3	3	3	3	3	4	3	3	2	2	2	1	1	1	3	1	1	1	2	3	1	4	3	4
24-Dec	2	2	4	2	1	1	2	2	2	2	1	2	2	2	2	1	2	2	1	2	2	2	2	2	4
25-Dec	1	2	2	2	2	1	3	3	2	2	3	2	2	2	2	5	4	2	3	6	3	5	3	2	6
26-Dec	3	3	3	4	4	3	7	5	3	4	5	5	4	4	7	4	4	3	4	3	2	3	3	3	7
27-Dec	3	3	3	4	2	2	2	3	3	3	3	3	3	3	2	4	2	4	6	2	3	3	5	3	6
28-Dec	3	2	2	3	4	3	3	3	3	2	2	2	3	1	1	1	1	2	2	2	1	1	1	3	4
29-Dec	2	2	1	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	1	1	2	3	3	1	3
30-Dec	1	2	2	3	2	3	3	1	1	2	3	2	2	3	2	3	4	5	2	2	7	2	5	2	7
31-Dec	2	1	3	1	1	2	2	2	3	2	1	2	2	1	1	1	6	8	4	2	1	1	2	5	8
Diurnal Maximum																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 167 m (WS167m) - km/h
Lower Camp Met Tower - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	72	9.68	9.68
6 - 11	180	24.19	33.87
12 - 19	222	29.84	63.71
20 - 28	146	19.62	83.33
29 - 38	104	13.98	97.31
> 38	20	2.69	100.00

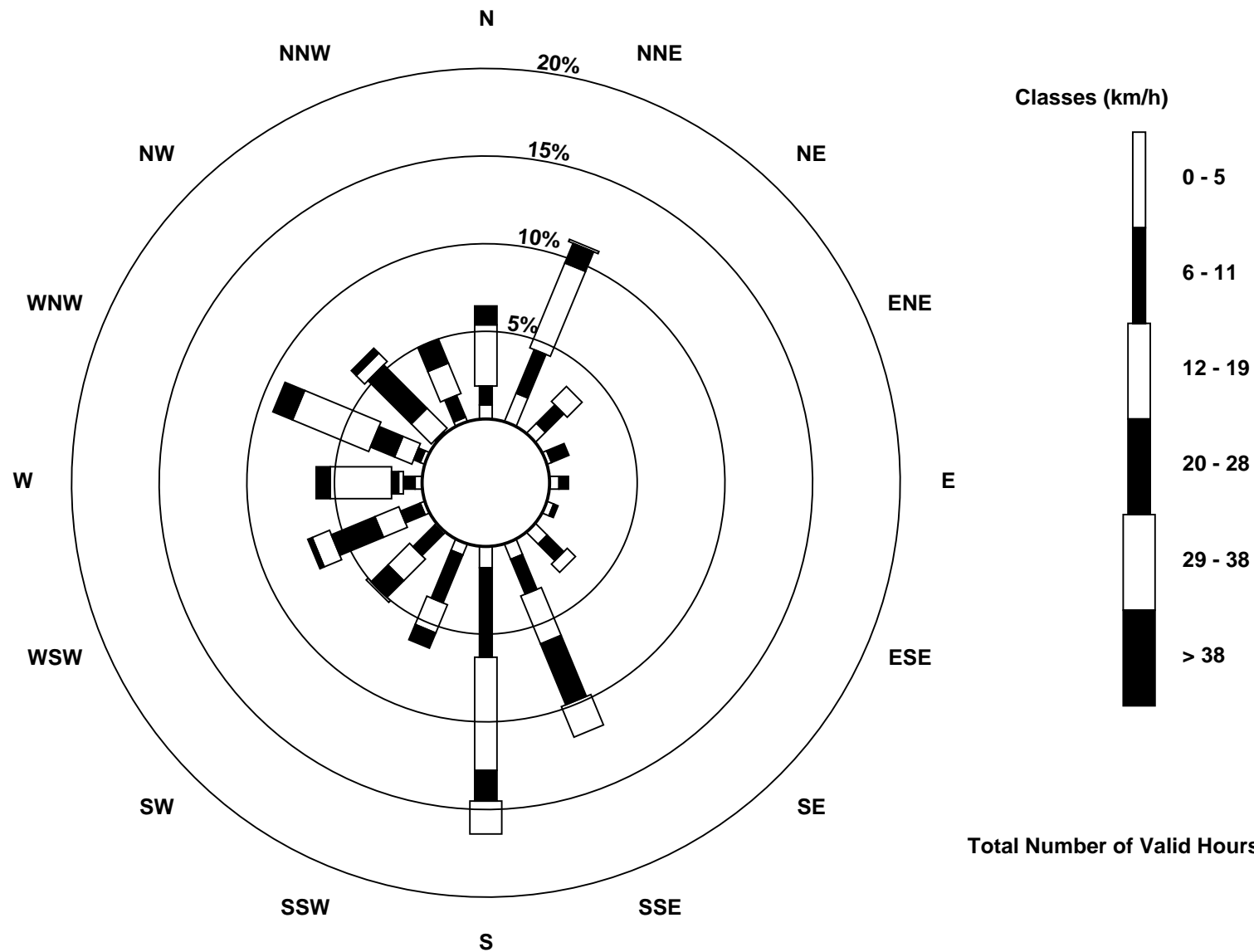
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 167 m (WS167m) - km/h
Lower Camp Met Tower (AMS 3)





Wood Buffalo Environmental Association

Summary of Hour Averages

**Wind Direction 20 m (WD20m) - deg
Lower Camp Met Tower - December 2016**

Direction of Maximum Speed: 266 deg on Dec 31 22:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 302.4 deg on Dec 5		Hours of Data:	744
Direction of Minimum Speed: 12 deg on Dec 24 13:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 0.7 deg on Dec 24		Percent Operational Time:	100.0
Monthly Average Direction: 309.2 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	176	170	167	183	220	195	179	169	167	178	173	186	180	169	171	163	162	161	164	141	143	139	140	146	170.3
2-Dec	142	154	151	151	163	159	157	147	157	156	156	148	145	143	154	150	155	145	166	168	159	161	155	148	154.4
3-Dec	159	161	162	164	159	160	166	162	153	149	152	149	151	150	122	157	163	180	201	190	211	238	244	225	166.1
4-Dec	163	299	347	8	15	18	19	2	359	354	4	1	353	344	332	335	327	330	333	332	332	333	320	320	347.7
5-Dec	317	311	301	302	303	303	302	301	300	303	304	306	305	305	304	304	299	302	299	297	298	296	298	302	302.4
6-Dec	301	301	304	306	310	317	322	319	331	349	330	322	324	331	332	331	329	334	333	332	331	328	325	341	320.4
7-Dec	339	346	346	353	344	343	331	325	0	356	329	354	359	337	321	349	288	327	344	338	318	306	332	325	339.6
8-Dec	315	321	325	326	328	331	344	325	336	336	333	330	333	352	7	350	321	331	305	330	321	320	340	338	329.8
9-Dec	340	324	323	333	294	144	147	147	147	153	155	151	154	151	158	163	159	165	179	172	167	161	150	151	155.8
10-Dec	148	159	152	143	146	143	148	146	148	147	152	151	149	152	164	153	148	148	154	165	191	216	232	248	162.7
11-Dec	258	259	265	269	268	260	265	273	269	271	275	279	271	275	294	272	271	272	267	316	299	268	290	319	273.0
12-Dec	329	350	340	327	324	306	304	301	329	304	293	271	227	133	136	45	4	352	284	5	156	316	307	302	311.1
13-Dec	301	307	302	329	357	351	343	346	356	332	13	69	225	269	287	258	322	310	345	358	358	285	319	324	326.2
14-Dec	238	148	326	162	147	148	153	153	155	146	152	168	241	291	296	328	340	315	135	119	151	151	292	153.4	
15-Dec	287	129	25	2	354	339	345	262	29	303	336	357	317	293	295	284	324	358	24	5	1	349	357	310	332.5
16-Dec	304	309	329	333	330	269	173	157	141	148	152	147	149	149	146	128	345	256	167	151	144	162	330	152.7	
17-Dec	283	149	157	142	159	160	157	155	153	148	161	160	152	146	146	147	151	154	154	152	160	150	158	161	154.4
18-Dec	163	155	157	156	154	143	148	149	146	211	134	347	307	3	329	339	330	316	328	330	2	316	51	2	144.4
19-Dec	347	351	336	5	339	351	345	340	349	339	343	343	350	328	336	350	341	332	331	347	175	265	309	332	341.2
20-Dec	330	326	200	156	151	154	195	156	145	142	146	149	150	149	159	225	169	154	148	151	153	143	143	145	152.3
21-Dec	146	145	148	146	140	183	154	147	147	143	143	142	198	283	271	262	200	197	143	139	139	149	140	123	157.5
22-Dec	153	156	153	221	270	272	272	331	350	335	2	9	6	16	359	351	1	7	359	358	6	0	4	12	345.6
23-Dec	11	14	14	33	16	17	25	1	10	13	12	2	354	358	355	3	357	352	342	346	299	341	345	334	4.9
24-Dec	334	329	330	327	317	328	318	323	330	337	321	321	12	278	317	317	287	331	336	313	305	151	152	149	316.3
25-Dec	154	160	214	242	191	161	158	174	165	167	160	154	157	149	155	153	149	152	147	153	154	156	154	140	155.4
26-Dec	147	154	158	159	148	142	133	134	123	134	152	153	157	156	156	160	155	162	143	131	139	143	146	148	147.9
27-Dec	148	151	151	158	155	156	156	152	149	146	149	146	148	151	151	161	154	152	185	260	258	312	348	315	156.6
28-Dec	327	332	352	9	17	0	13	19	11	10	3	4	357	315	248	270	1	354	353	348	346	348	1	346	356.8
29-Dec	356	315	346	264	360	295	349	312	343	332	354	348	5	15	330	351	356	338	338	300	353	354	284	328	339.2
30-Dec	321	312	288	107	155	141	149	143	159	211	151	144	150	153	153	155	160	223	281	291	338	351	329	318	168.0
31-Dec	317	353	302	257	144	162	352	320	330	357	332	309	312	311	289	337	247	73	278	275	267	266	268	275	281.0

252.5 205.4 226.2 215.4 205.1 203.4 203.7 196.7 158.6 163.2 156.6 151.4 167.8 196.0 238.8 231.2 214.0 256.5 260.3 238.9 208.1 229.1 240.0 263.7
Diurnal Average

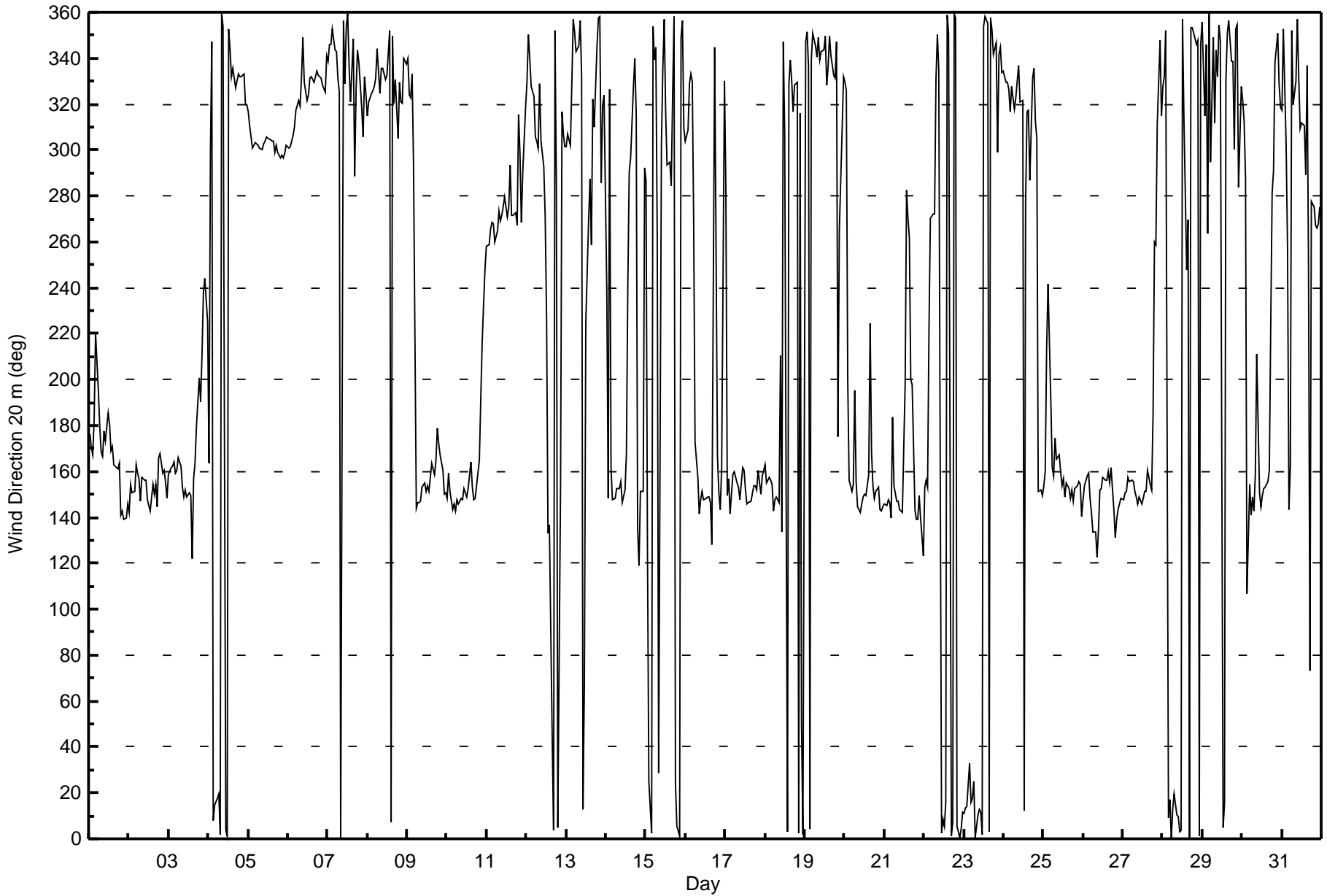
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 20 m (WD20m) - deg
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Dec 31 07:00 Minimum Value: 6 deg on Dec 27 07:00 Percentiles: P ₁ = 7 P ₁₀ = 11 Q ₁ = 15 Median = 19 Q ₃ = 30 P ₉₀ = 56 P ₉₉ = 95																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	13	10	8	20	15	18	14	9	9	14	15	16	15	13	13	9	9	9	25	14	11	14	11	11	25
2-Dec	13	18	23	18	18	12	9	15	12	8	12	19	17	18	19	16	13	18	15	12	11	12	13	15	23
3-Dec	12	14	10	12	9	11	10	12	12	15	14	17	11	13	10	18	9	18	19	23	27	9	17	30	30
4-Dec	24	65	18	21	22	23	27	20	30	20	21	19	20	18	17	16	14	15	16	15	17	17	12	16	65
5-Dec	15	17	16	16	16	17	16	17	17	18	17	18	16	17	17	17	17	16	17	17	16	16	16	18	18
6-Dec	17	18	17	17	17	22	25	25	28	27	22	16	16	16	16	15	14	15	14	22	18	13	18	29	29
7-Dec	21	21	18	14	15	16	22	21	19	28	25	18	15	22	12	18	43	21	29	22	11	21	19	13	43
8-Dec	15	33	27	30	27	42	57	18	15	19	34	59	77	60	24	20	20	24	16	15	54	19	36	49	77
9-Dec	45	19	16	37	26	75	11	12	11	15	9	13	14	15	10	11	11	41	22	13	12	9	7	11	75
10-Dec	16	27	12	15	15	13	11	13	9	9	12	12	13	14	12	11	15	7	22	19	28	30	8	15	30
11-Dec	15	13	14	14	20	13	13	16	14	16	18	24	15	17	21	19	15	14	15	38	30	18	38	22	38
12-Dec	19	15	24	16	19	16	15	16	33	73	41	30	56	16	17	79	47	32	52	62	89	26	15	15	89
13-Dec	16	17	15	36	18	17	18	18	20	17	29	30	98	59	13	25	58	41	16	16	63	47	60	46	98
14-Dec	81	22	79	73	15	9	11	9	10	9	8	13	48	72	22	49	29	15	60	56	49	33	78	42	81
15-Dec	64	54	20	18	18	27	66	60	65	24	35	51	96	15	20	15	28	15	56	15	14	17	19	40	96
16-Dec	25	53	29	26	22	81	72	41	52	43	11	12	14	17	14	10	54	37	68	15	97	96	59	25	97
17-Dec	51	22	54	18	9	12	10	12	12	22	15	13	11	20	19	21	12	12	16	17	11	15	10	23	54
18-Dec	21	23	12	11	14	17	16	19	23	83	66	94	96	28	21	26	25	19	34	35	39	46	56	72	96
19-Dec	50	35	35	22	30	27	28	24	20	24	33	35	27	29	22	24	20	20	21	71	46	76	73	63	76
20-Dec	55	42	95	17	14	13	47	37	13	11	17	15	15	20	22	49	30	9	12	25	11	11	10	9	95
21-Dec	9	9	12	11	13	49	39	11	11	10	10	8	64	16	13	9	39	22	16	8	13	13	58	86	86
22-Dec	73	36	12	45	16	13	15	23	50	24	23	21	19	24	21	18	20	22	19	23	22	21	21	24	73
23-Dec	22	26	29	25	27	27	26	20	21	22	23	21	17	15	15	18	16	27	19	15	63	28	28	18	63
24-Dec	22	44	22	16	17	10	16	19	15	38	26	31	100	39	49	45	82	22	90	51	83	42	11	14	100
25-Dec	49	10	53	29	31	11	43	51	16	23	21	21	13	17	15	11	14	8	18	12	10	14	22	23	53
26-Dec	20	12	16	13	19	14	75	16	80	56	18	13	13	24	25	37	45	18	14	7	7	10	9	11	80
27-Dec	11	9	7	8	7	6	6	8	11	11	14	13	15	7	9	9	12	15	27	17	18	75	18	29	75
28-Dec	39	42	19	22	31	19	24	26	27	25	26	22	36	20	21	92	41	18	18	16	20	38	26	39	92
29-Dec	30	57	88	49	44	35	33	43	25	48	35	41	85	42	73	85	41	24	30	49	38	83	26	56	88
30-Dec	50	98	92	66	24	23	69	31	34	50	20	19	16	8	9	18	18	52	29	53	36	14	31	21	98
31-Dec	22	21	30	73	88	66	101	30	51	51	45	42	43	44	51	41	71	92	36	16	15	13	23	22	101
81 98 95 73 88 81 101 60 80 83 66 94 100 72 73 92 82 92 90 71 97 96 78 86																									
Diurnal Maximum																									





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction 45 m (WD45m) - deg
Lower Camp Met Tower - December 2016

Direction of Maximum Speed: 255 deg on Dec 31 22:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 292.7 deg on Dec 5	Hours of Data: 744
Direction of Minimum Speed: 128 deg on Dec 13 13:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 0.9 deg on Dec 18	Percent Operational Time: 100.0
Monthly Average Direction: 313.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	169	163	161	177	210	184	171	161	159	169	165	176	170	159	163	157	157	157	160	136	136	137	135	137	162.6
2-Dec	135	142	140	141	152	149	147	137	150	147	144	137	136	135	141	140	143	138	154	159	148	148	142	139	143.5
3-Dec	148	151	152	155	150	152	158	153	142	140	143	142	143	141	123	151	160	173	189	185	202	228	236	222	158.0
4-Dec	155	290	340	4	10	13	15	357	358	351	358	357	347	339	328	330	322	325	328	326	325	330	312	310	343.5
5-Dec	308	301	292	292	294	293	292	291	290	292	294	296	295	295	293	293	290	292	289	288	289	288	290	291	292.7
6-Dec	291	291	294	295	298	303	306	305	313	334	319	315	318	325	328	327	327	331	336	332	331	327	325	337	312.4
7-Dec	339	334	346	351	338	335	339	325	346	349	326	347	353	330	317	335	352	306	326	333	332	302	315	287	335.4
8-Dec	287	327	347	313	324	337	337	325	328	333	325	319	312	318	350	346	328	329	307	331	326	328	326	305	327.6
9-Dec	324	326	291	327	145	144	139	137	136	140	143	141	142	139	146	149	144	142	149	152	149	143	132	137	141.8
10-Dec	135	142	140	135	135	134	138	136	139	136	141	139	137	140	151	142	145	140	142	167	189	217	229	241	153.7
11-Dec	249	250	255	258	257	250	255	263	259	261	265	268	260	265	284	261	261	262	257	299	286	255	270	304	262.2
12-Dec	315	336	340	331	308	294	293	291	307	280	285	264	223	128	126	97	14	345	303	348	241	299	296	291	299.4
13-Dec	291	297	292	322	350	345	338	341	352	328	356	54	128	304	310	300	325	308	322	335	346	280	278	42	320.4
14-Dec	292	138	136	132	147	139	139	140	139	141	136	137	150	273	307	335	328	335	323	131	133	148	130	332	138.8
15-Dec	353	352	0	353	343	343	358	328	348	327	337	354	307	285	284	273	312	350	349	346	338	328	351	331	328.9
16-Dec	337	288	313	322	280	319	149	139	141	146	146	139	140	138	135	136	129	47	159	150	148	147	148	154	142.9
17-Dec	143	147	143	136	145	146	142	141	140	136	146	151	142	136	133	133	137	140	141	140	147	137	144	146	141.3
18-Dec	147	138	144	142	139	131	133	137	130	209	113	358	304	357	327	334	328	311	322	324	359	312	46	3	105.0
19-Dec	347	357	331	0	335	347	340	336	345	335	342	344	343	324	330	345	336	327	327	360	159	161	309	340	338.6
20-Dec	334	303	151	140	139	140	201	154	140	132	130	133	133	142	168	251	162	159	158	193	167	150	142	140	148.0
21-Dec	132	133	136	134	134	216	178	136	134	131	129	131	199	271	265	255	204	196	153	131	126	141	137	136	152.5
22-Dec	143	142	148	224	258	261	260	324	344	331	359	4	2	12	356	347	357	6	356	353	2	357	0	8	342.4
23-Dec	8	10	8	27	11	12	21	359	7	10	11	358	349	355	351	1	355	350	341	345	312	330	331	296	1.0
24-Dec	326	321	336	324	332	332	328	309	317	333	337	312	267	220	286	290	168	323	326	142	158	147	140	138	319.7
25-Dec	140	143	153	163	143	138	134	139	145	145	146	141	143	137	136	137	139	140	147	142	144	142	143	133	141.7
26-Dec	137	144	147	146	140	136	121	125	115	128	143	143	145	149	150	145	146	150	136	127	134	137	137	139	139.4
27-Dec	142	143	146	149	150	146	144	141	138	136	137	137	140	146	142	147	147	144	171	253	251	283	337	321	149.0
28-Dec	327	328	348	5	12	355	11	19	7	4	2	3	358	313	247	262	10	350	350	342	339	336	352	336	353.7
29-Dec	345	319	357	280	356	289	346	312	339	330	349	341	345	4	333	346	345	335	334	298	344	344	308	325	336.8
30-Dec	326	257	304	196	144	133	134	138	178	216	139	137	139	143	145	146	153	233	266	278	328	340	334	319	167.9
31-Dec	303	347	312	247	125	130	145	326	336	352	348	318	316	307	310	1	228	119	266	264	257	255	256	264	271.5

256.1 208.2 212.0 209.6 212.2 205.5 199.5 186.9 144.6 144.9 136.2 132.0 149.9 185.3 256.3 233.8 217.0 264.1 262.9 253.5 220.0 230.8 243.9 252.9
 Diurnal Average

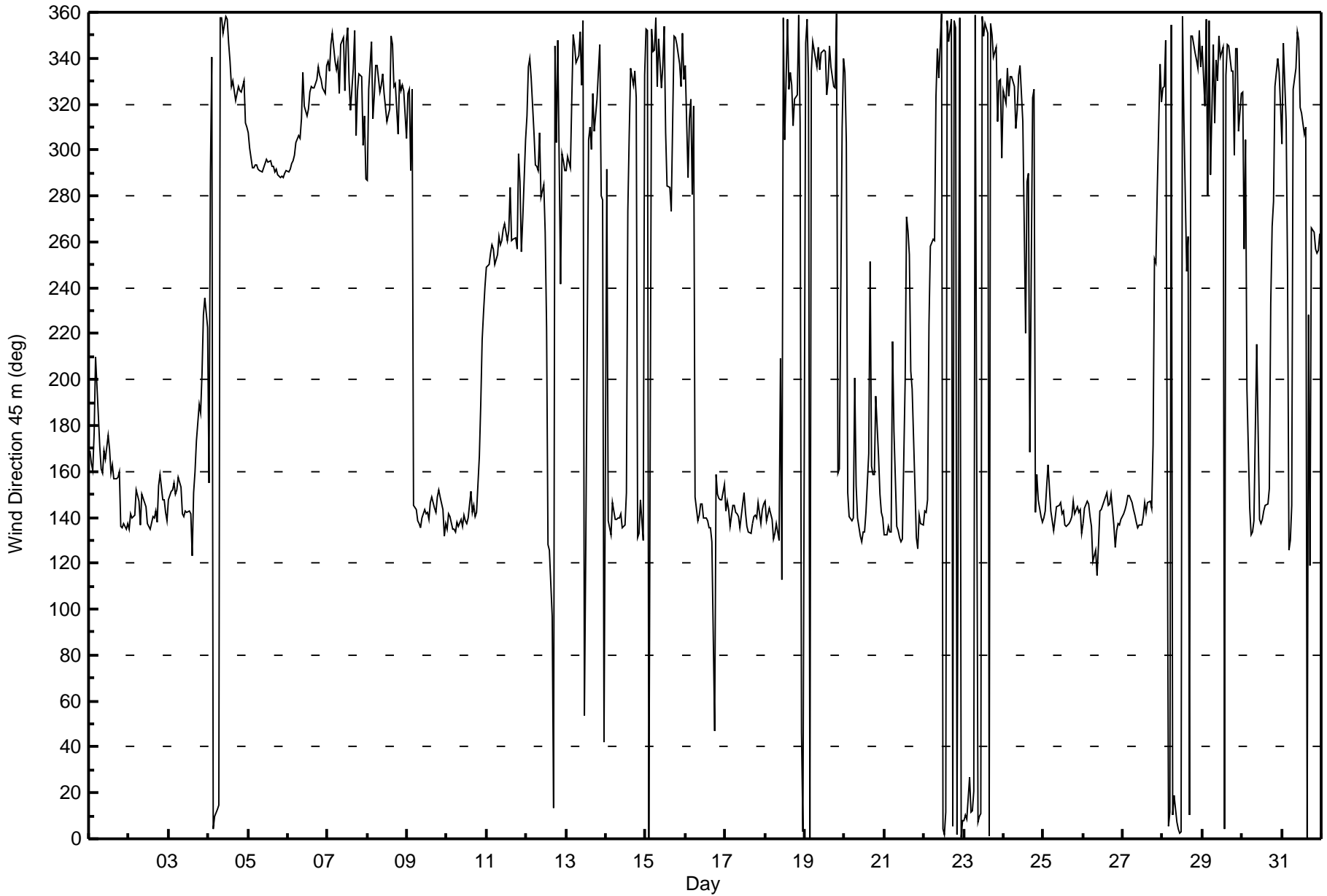
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 45 m (WD45m) - deg
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 97 deg on Dec 14 00:00 Minimum Value: 2 deg on Dec 16 11:00 Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 10 Median = 14 Q ₃ = 22 P ₉₀ = 43 P ₉₉ = 88																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	9	8	7	15	15	13	10	8	7	10	12	12	10	10	11	9	8	7	14	11	6	11	7	7	15
2-Dec	8	10	14	10	13	8	6	10	11	7	9	13	12	13	14	11	10	13	15	10	9	10	10	11	15
3-Dec	10	12	9	11	8	10	8	11	8	9	10	12	7	5	12	14	7	13	14	17	23	7	9	25	25
4-Dec	22	57	14	15	15	16	21	15	21	15	16	14	15	14	13	13	11	13	13	13	13	13	10	13	57
5-Dec	12	14	12	11	12	12	11	12	11	13	13	14	11	12	12	12	12	12	12	12	10	11	11	12	14
6-Dec	12	12	12	13	13	16	20	18	24	22	17	14	14	12	13	12	11	11	10	15	12	10	12	20	24
7-Dec	13	13	9	9	8	10	14	11	15	18	13	14	12	19	9	11	40	14	31	13	11	28	30	18	40
8-Dec	13	35	26	13	15	24	16	11	6	10	27	48	54	28	16	10	9	16	13	7	17	15	11	46	54
9-Dec	16	22	61	44	67	35	5	7	10	10	5	7	10	11	7	9	10	13	6	7	10	5	5	7	67
10-Dec	11	18	6	8	10	9	7	8	6	4	7	7	6	8	8	5	11	4	8	24	25	25	6	8	25
11-Dec	7	6	8	8	11	6	7	10	8	9	11	14	9	11	16	14	9	9	8	31	24	13	28	17	31
12-Dec	15	12	17	14	15	11	11	10	26	63	33	25	46	11	7	51	33	19	66	47	72	9	11	11	72
13-Dec	11	13	11	35	14	14	14	15	16	15	22	24	96	43	15	45	31	24	12	13	16	31	56	97	97
14-Dec	53	36	47	42	4	5	4	4	5	5	4	8	21	78	22	36	19	8	23	68	16	22	52	47	78
15-Dec	18	73	13	10	15	15	22	49	63	29	29	20	74	13	17	11	24	11	24	14	15	13	17	33	74
16-Dec	22	66	26	17	23	85	27	23	14	5	2	6	6	10	10	7	15	68	91	5	13	10	9	50	91
17-Dec	22	11	12	8	7	8	7	7	9	17	14	17	6	15	15	16	8	8	11	11	8	10	8	19	22
18-Dec	20	19	9	8	12	18	14	12	18	80	55	88	72	18	14	17	18	16	28	28	34	37	53	68	88
19-Dec	43	43	52	17	25	18	16	16	13	17	20	23	16	16	17	16	13	15	14	40	56	66	46	50	66
20-Dec	80	38	55	8	8	7	47	37	10	7	8	8	10	14	35	44	20	18	21	36	20	16	12	10	80
21-Dec	4	5	7	6	13	48	59	10	7	5	5	6	66	12	8	7	28	17	19	7	9	7	19	41	66
22-Dec	24	9	5	38	12	8	10	21	35	20	19	16	13	17	17	13	15	16	14	16	16	15	14	16	38
23-Dec	16	17	18	18	20	22	17	16	14	15	16	17	11	11	10	12	13	9	10	12	34	14	10	28	34
24-Dec	18	18	12	11	11	7	16	21	15	32	30	19	83	70	30	17	83	36	88	66	49	15	4	5	88
25-Dec	14	7	40	20	14	6	17	29	9	8	11	12	9	9	10	7	10	9	8	7	4	7	10	14	40
26-Dec	11	5	7	7	10	7	56	11	62	38	13	9	10	19	19	17	23	11	10	6	6	6	6	5	62
27-Dec	5	7	5	7	7	5	3	4	5	5	6	6	7	5	7	6	11	7	36	6	7	50	9	29	50
28-Dec	19	20	15	17	23	16	15	16	20	19	20	17	24	20	33	89	39	12	12	11	16	19	19	32	89
29-Dec	24	48	48	39	43	31	28	37	19	39	26	40	67	27	56	78	22	15	17	41	36	66	18	42	78
30-Dec	33	79	68	89	22	18	64	15	32	42	14	13	9	5	7	10	17	41	14	31	30	11	24	14	89
31-Dec	14	13	28	70	85	29	76	17	39	31	36	32	36	34	40	38	67	92	22	10	8	7	15	14	92
80 79 68 89 85 85 76 49 63 80 55 88 96 78 56 89 83 92 91 68 72 66 56 97																									
Diurnal Maximum																									





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 100 m (WD100m) - deg

Lower Camp Met Tower - December 2016

Direction of Maximum Speed: 296 deg on Dec 12 08:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 291.9 deg on Dec 5		Hours of Data:	744
Direction of Minimum Speed: 232 deg on Dec 28 15:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 0.4 deg on Dec 18		Percent Operational Time:	100.0
Monthly Average Direction: 274.7 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	175	170	169	190	214	190	176	168	168	175	174	177	173	164	171	172	178	191	188	169	171	174	167	156	176.4
2-Dec	160	155	151	145	154	155	155	146	156	159	147	141	139	142	145	144	148	143	153	157	149	148	146	144	148.0
3-Dec	150	153	158	159	158	158	159	157	152	151	153	160	180	196	171	180	195	207	209	215	230	237	234	173.1	
4-Dec	202	292	342	10	13	16	18	6	8	358	1	0	347	336	331	332	325	326	327	326	327	332	314	309	344.9
5-Dec	305	299	293	293	293	294	292	292	291	293	294	295	292	291	291	291	290	290	288	288	288	289	289	290	291.9
6-Dec	291	292	296	295	297	299	299	298	299	308	309	316	319	327	330	332	337	346	359	5	360	352	1	1	314.3
7-Dec	9	345	346	358	4	359	11	352	4	8	356	9	0	333	333	348	359	4	15	25	29	28	15	31	2.8
8-Dec	36	29	24	12	16	31	47	43	351	344	345	334	338	324	286	335	353	12	28	32	11	355	354	70	6.0
9-Dec	131	130	137	152	168	158	160	161	162	147	159	149	146	137	146	137	156	147	157	163	166	174	190	194	153.0
10-Dec	184	143	161	166	166	167	160	148	171	170	148	157	142	142	140	160	175	183	198	228	223	239	243	244	188.5
11-Dec	248	251	253	256	254	249	252	260	256	257	261	265	261	266	284	263	259	259	258	287	286	263	273	296	262.3
12-Dec	312	317	320	319	303	299	295	296	298	268	289	277	237	150	136	142	78	343	11	291	291	296	291	289	297.0
13-Dec	292	296	294	322	355	351	345	345	359	341	346	37	19	353	357	332	328	312	314	315	317	283	293	317	321.7
14-Dec	23	185	203	233	200	195	174	173	169	171	184	166	150	351	354	25	344	326	302	295	302	326	330	334	284.1
15-Dec	319	300	304	310	318	315	310	302	297	317	275	309	294	286	279	275	300	307	300	302	296	299	310	313	301.0
16-Dec	352	350	331	314	316	270	130	191	206	223	219	196	159	147	141	152	152	140	160	176	140	142	162	134	158.3
17-Dec	141	167	142	160	155	146	154	178	167	154	147	171	158	150	197	155	169	190	173	168	168	176	168	184	161.1
18-Dec	172	180	183	172	196	184	178	175	103	118	126	119	120	0	346	341	340	332	331	330	351	310	253	64	230.5
19-Dec	116	126	124	84	66	2	351	7	355	351	1	353	339	342	329	348	357	337	338	11	108	139	145	140	3.7
20-Dec	148	143	145	151	154	163	247	245	227	225	237	236	239	234	252	258	243	241	247	244	237	229	225	218	222.3
21-Dec	191	183	160	188	240	249	243	183	198	181	168	192	256	263	262	257	224	219	211	188	157	157	148	139	214.3
22-Dec	145	153	210	238	255	257	258	326	10	348	4	8	5	17	3	355	4	10	5	3	10	4	6	10	341.6
23-Dec	12	14	15	26	15	14	21	5	8	13	14	6	356	359	359	5	360	354	345	346	42	131	128	132	11.1
24-Dec	135	119	67	326	327	313	269	282	265	247	239	225	211	180	145	360	148	167	200	154	166	157	173	177	191.9
25-Dec	168	175	180	180	177	172	155	159	177	165	163	152	144	147	169	157	149	141	148	151	157	157	157	154	155.4
26-Dec	167	157	158	160	160	160	160	161	147	146	153	160	153	164	160	156	154	159	158	159	158	158	158	153	157.2
27-Dec	149	153	159	157	160	160	156	154	153	155	153	160	158	167	207	202	220	213	250	257	255	260	344	333	173.8
28-Dec	342	346	360	15	18	7	13	24	20	15	13	10	27	333	232	142	79	21	5	352	353	354	351	353	6.5
29-Dec	340	330	352	15	37	74	35	95	37	318	345	323	292	320	331	307	353	356	19	345	317	354	11	60	356.9
30-Dec	329	233	236	244	179	188	165	214	224	233	162	164	169	169	160	171	188	247	263	268	311	354	12	341	234.2
31-Dec	313	350	347	244	191	128	104	34	17	310	268	352	6	328	17	63	228	221	263	262	256	258	262	271	270.9

268.4 242.6 246.4 257.0 262.0 253.1 250.5 262.6 254.9 234.1 211.5 230.2 239.6 253.4 273.4 259.4 248.0 264.5 274.5 267.6 259.4 252.2 264.6 271.7
Diurnal Average

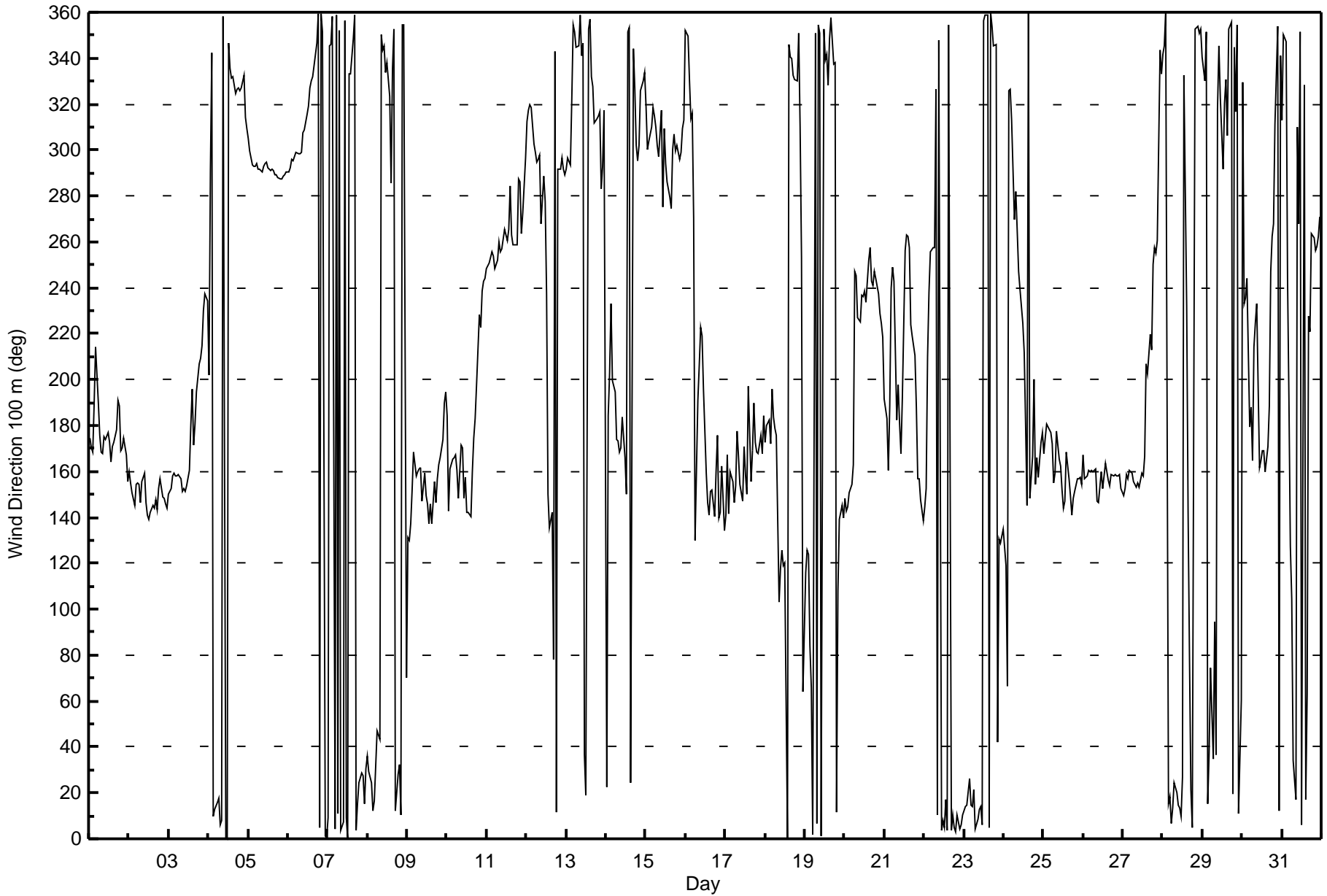
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 100 m (WD100m) - deg
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Dec 18 23:00 Minimum Value: 2 deg on Dec 12 08:00 Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 7 Median = 10 Q ₃ = 16 P ₉₀ = 27 P ₉₉ = 81																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	7	9	7	14	11	12	9	8	9	9	12	11	10	9	11	11	9	12	14	10	9	15	16	13	16
2-Dec	12	7	6	4	7	7	6	7	10	8	5	3	3	4	6	4	6	5	10	8	7	7	5	4	12
3-Dec	8	9	8	9	9	9	7	8	7	7	6	8	6	16	21	11	4	12	9	12	11	3	5	10	21
4-Dec	36	43	10	8	10	10	13	10	14	11	8	6	9	10	9	9	7	9	9	9	7	7	6	7	43
5-Dec	7	7	5	5	5	6	5	5	4	7	8	8	5	6	6	5	7	7	6	7	6	6	6	5	8
6-Dec	5	5	7	6	6	6	7	7	8	14	10	8	9	8	8	7	6	9	10	12	9	9	12	13	14
7-Dec	10	6	7	9	8	9	9	11	13	10	10	8	9	13	6	7	4	4	15	8	3	7	9	7	15
8-Dec	8	13	16	21	16	20	28	32	13	6	10	6	7	21	8	27	7	5	8	4	23	11	35	65	65
9-Dec	7	3	7	13	15	16	11	8	12	13	14	16	8	4	13	9	20	16	10	11	13	17	13	17	20
10-Dec	15	18	9	11	12	11	7	8	13	10	12	13	14	20	7	7	8	11	21	7	11	11	3	4	21
11-Dec	3	3	3	3	5	4	3	4	4	4	6	8	5	6	12	11	4	4	4	20	11	10	15	8	20
12-Dec	6	6	6	11	6	5	4	2	7	16	22	14	27	18	6	23	75	24	16	24	12	5	6	6	75
13-Dec	5	9	7	35	9	9	9	9	11	11	14	19	81	12	8	17	8	11	8	6	5	12	14	15	81
14-Dec	69	34	30	9	32	19	11	8	11	12	12	22	82	14	7	18	16	22	19	7	9	20	12	5	82
15-Dec	8	10	17	11	11	7	9	17	26	25	17	9	10	10	14	10	10	8	10	10	4	6	6	10	26
16-Dec	13	11	12	5	4	67	40	33	25	11	16	13	11	8	6	9	8	3	15	16	6	6	15	3	67
17-Dec	3	10	13	23	17	16	19	19	11	19	11	16	11	18	16	12	18	17	15	19	23	19	10	28	28
18-Dec	10	26	22	11	19	20	14	17	83	21	10	48	66	17	9	7	10	18	27	28	35	48	98	57	98
19-Dec	23	26	82	41	64	30	8	21	8	8	9	8	12	14	13	10	5	10	6	22	33	18	16	4	82
20-Dec	12	8	5	7	10	12	17	20	23	25	18	15	16	21	6	3	25	27	14	5	9	11	16	14	27
21-Dec	23	15	9	31	17	15	20	34	15	20	8	21	45	6	3	5	18	7	11	14	19	8	9	15	45
22-Dec	14	15	15	8	8	4	3	28	21	14	14	9	7	9	10	8	9	9	7	11	12	8	9	8	28
23-Dec	9	11	14	12	14	15	11	9	7	8	9	11	7	7	5	6	7	6	3	5	59	11	35	19	59
24-Dec	12	33	84	54	9	25	61	43	18	26	11	7	17	31	76	28	21	14	28	10	13	10	9	10	84
25-Dec	11	10	14	16	17	15	14	10	17	9	8	7	4	6	10	9	8	3	6	6	5	5	5	7	17
26-Dec	10	7	5	6	4	5	18	11	11	6	7	9	8	12	11	10	12	8	8	6	5	5	5	6	18
27-Dec	5	7	4	7	5	4	4	4	6	5	6	11	8	10	26	32	6	25	12	3	4	28	7	4	32
28-Dec	9	7	10	11	16	12	9	9	16	12	12	10	19	23	84	34	24	13	10	5	6	12	14	12	84
29-Dec	10	15	17	25	21	18	21	28	15	58	16	37	36	43	58	67	21	11	19	78	32	66	20	31	78
30-Dec	70	27	22	21	28	28	41	18	15	24	17	13	14	9	8	14	19	19	3	7	24	15	20	15	70
31-Dec	12	9	41	35	19	10	25	17	76	27	34	35	14	18	29	10	56	51	8	4	3	3	8	5	76
																		70 43 84 54 64 67 61 43 83 58 34 48 82 43 84 67 75 51 28 78 59 66 98 65							
Diurnal Maximum																									





Maximum Value: 1.0 km/h on Dec 20 10:00		Maximum Daily Average: 0.4 km/h on Dec 20		Hours in Service: 744																																														
Minimum Value: -0.7 km/h on Dec 21 14:00		Minimum Daily Average: -0.4 km/h on Dec 5		Hours of Data: 744																																														
Maximum Diurnal Average: 0.0 km/h at hour 18		Minimum Diurnal Average: -0.1 km/h at hour 14		Hours of Missing Data: 0																																														
Monthly Average: -0.03 km/h		Percentiles: P ₁ = -0.6 P ₁₀ = -0.3 Q ₁ = -0.1 Median = 0.0 Q ₃ = 0.1 P ₉₀ = 0.2 P ₉₉ = 0.7		Hours of Calibration: 0																																														
				Percent Operational Time: 100.0																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	0.2	0.2	0.1	0.1	-0.2	0.0	0.1	0.1	0.2	0.2	0.1	0.1	0.0	0.1	0.2	0.1	0.2	0.3	0.1	0.0	-0.1	-0.1	0.0	0.0	0.1	0.3																								
2-Dec	-0.1	-0.4	0.0	-0.1	0.1	-0.2	0.0	-0.2	0.1	-0.1	-0.3	-0.1	0.0	-0.1	0.0	-0.1	0.0	0.0	0.2	0.2	-0.2	-0.1	-0.2	0.0	-0.1	0.2																								
3-Dec	-0.1	0.1	-0.1	0.0	-0.1	0.0	0.1	0.0	-0.3	0.0	-0.1	0.0	-0.3	0.0	-0.1	0.0	0.4	0.3	0.1	0.2	0.1	-0.1	0.1	0.1	0.0	0.4																								
4-Dec	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.3	-0.4	-0.1	-0.3	-0.1	-0.3	-0.3	-0.1	0.0	-0.1	-0.2	-0.2	0.1	-0.1	0.0	0.0	-0.2	-0.2	-0.1	0.1																								
5-Dec	-0.6	-0.2	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.4	-0.3	-0.3	-0.4	-0.5	-0.4	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5	-0.7	-0.6	-0.5	-0.1	-0.4	-0.1																								
6-Dec	-0.2	-0.4	-0.2	-0.2	-0.3	-0.1	0.0	0.2	0.1	0.3	0.0	-0.3	-0.3	-0.1	0.1	-0.1	0.1	0.0	-0.2	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0.3																								
7-Dec	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.2	-0.2	0.0	-0.2	-0.4	-0.3	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.1																								
8-Dec	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	0.0	0.2	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2																								
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.2	0.2	0.2	0.1	0.1	0.2																								
10-Dec	0.3	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.0	0.0	-0.1	-0.1	0.0	0.3																								
11-Dec	-0.4	-0.3	-0.3	-0.5	-0.4	-0.4	-0.5	-0.7	-0.6	-0.5	-0.5	-0.3	-0.6	-0.5	-0.3	-0.4	-0.6	-0.5	-0.4	0.0	-0.2	-0.3	0.0	0.0	-0.4	0.0																								
12-Dec	-0.1	0.1	-0.1	-0.2	-0.1	-0.1	-0.2	-0.2	0.1	-0.1	-0.2	-0.4	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.2	-0.3	-0.5	-0.1	0.1																								
13-Dec	-0.3	-0.2	-0.4	-0.5	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	-0.1	0.2																								
14-Dec	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2																								
15-Dec	0.0	0.1	0.0	-0.2	-0.1	-0.2	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.2	-0.4	-0.2	-0.2	-0.1	0.1	-0.1	-0.2	-0.2	-0.1	0.0	-0.1	0.1																								
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1																								
17-Dec	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2	-0.1	-0.1	0.1	0.0	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.1	0.1	0.3																								
18-Dec	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.1	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.2																								
19-Dec	-0.1	0.0	-0.1	-0.3	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	-0.1	0.1																								
20-Dec	0.0	0.0	0.1	0.1	0.3	0.4	0.1	0.4	1.0	1.0	0.4	0.4	0.2	0.0	0.2	0.2	0.3	0.6	0.6	0.4	0.8	0.5	0.2	0.8	0.4	1.0																								
21-Dec	0.6	0.8	0.3	0.6	0.1	0.4	0.4	0.6	0.6	0.7	0.5	0.7	0.1	-0.7	-0.4	-0.3	0.1	0.5	0.2	0.4	0.1	0.4	0.1	0.1	0.3	0.8																								
22-Dec	0.1	0.1	0.1	0.0	-0.4	-0.4	-0.4	-0.1	0.0	0.0	-0.2	-0.4	-0.5	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.1	-0.1	-0.1	-0.2	0.0	-0.2	0.1																								
23-Dec	-0.3	0.0	0.0	-0.3	-0.2	-0.3	-0.2	-0.2	-0.2	0.0	0.0	-0.4	-0.6	-0.6	-0.3	-0.3	-0.1	-0.1	-0.1	-0.2	0.0	0.1	0.1	0.0	-0.2	0.1																								
24-Dec	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.4	0.5	0.0	0.5																								
25-Dec	0.2	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.2	0.2	0.1	-0.1	0.0	0.2																								
26-Dec	0.0	0.3	0.4	0.4	0.3	0.0	0.1	0.0	0.0	-0.2	0.1	0.0	-0.1	-0.2	0.1	0.1	0.0	0.2	0.1	-0.2	-0.1	0.0	0.0	-0.3	0.0	0.4																								
27-Dec	-0.4	-0.2	0.2	0.1	0.1	0.2	0.0	-0.3	-0.4	-0.3	-0.2	-0.1	-0.1	0.0	0.4	0.2	0.1	0.1	0.1	-0.2	-0.2	0.1	0.0	-0.2	0.0	0.4																								
28-Dec	0.0	0.0	0.0	-0.3	-0.1	-0.3	-0.1	-0.3	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	-0.2	0.0	-0.1	0.0																								
29-Dec	-0.1	0.0	0.0	0.0	-0.1	0.0	-0.2	0.0	-0.2	-0.1	-0.1	-0.2	0.1	-0.2	-0.1	-0.1	-0.1	0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.1																								
30-Dec	-0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.1	-0.2	-0.1	-0.2	0.0	-0.1	-0.1	0.1	0.3																								
31-Dec	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7	-0.7	-0.6	-0.3	-0.4	-0.1	0.1																								
																								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average	
																								0.6	0.8	0.4	0.6	0.3	0.4	0.4	0.6	1.0	1.0	0.5	0.7	0.2	0.2	0.4	0.2	0.4	0.6	0.6	0.4	0.8	0.5	0.4	0.8	0.0	0.8	Diurnal Maximum



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 20 m (VW20m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.6 km/h on Dec 5 09:00 Minimum Value: 0.1 km/h on Dec 9 05:00 Percentiles: P ₁ = 0.1 P ₁₀ = 0.2 Q ₁ = 0.5 Median = 1.0 Q ₃ = 1.7 P ₉₀ = 2.5 P ₉₉ = 3.4																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.5	1.5	1.4	1.3	1.1	1.2	1.2	1.3	1.2	1.1	1.1	1.1	1.1	1.3	1.1	0.8	0.9	0.8	0.7	0.6	0.8	0.5	0.4	0.7	1.5
2-Dec	0.9	1.4	1.6	1.9	1.7	1.3	1.4	1.3	1.5	1.6	2.6	2.5	2.9	2.9	1.9	2.8	2.8	3.1	2.0	2.3	2.6	2.8	3.1	3.4	3.4
3-Dec	2.5	2.3	1.8	1.9	1.9	2.1	2.3	2.3	2.0	2.1	2.3	2.7	2.3	1.8	1.1	1.5	1.4	1.5	1.5	1.3	1.4	1.6	1.3	0.9	2.7
4-Dec	0.5	0.8	1.4	2.5	2.8	2.8	2.5	2.4	2.0	1.8	1.9	1.7	1.6	1.7	1.6	1.7	1.5	1.8	2.1	2.0	1.3	0.8	1.4	2.3	2.8
5-Dec	2.7	2.6	2.7	2.9	3.0	3.0	3.4	3.4	3.6	2.9	3.1	3.2	3.5	3.2	3.3	3.5	3.4	3.2	3.1	2.9	3.2	3.0	3.2	3.0	3.6
6-Dec	2.9	2.6	2.3	2.3	2.4	2.2	1.9	2.1	2.0	1.5	2.0	1.8	1.9	2.3	2.2	1.5	1.1	0.6	0.5	0.5	0.6	0.7	0.6	0.7	2.9
7-Dec	0.6	0.5	0.3	0.6	0.4	0.5	0.5	0.5	0.6	0.8	0.5	1.0	1.3	1.4	0.8	0.4	0.1	0.1	0.3	0.3	0.2	0.2	0.2	0.2	1.4
8-Dec	0.2	0.5	0.5	0.4	0.4	0.5	0.3	0.2	0.2	0.2	0.4	0.5	0.6	0.5	0.5	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.6
9-Dec	0.2	0.2	0.1	0.1	0.1	0.3	0.8	1.0	0.8	0.9	1.3	1.4	1.2	1.2	0.9	0.7	0.5	0.3	0.4	0.5	0.5	0.6	0.6	0.8	1.4
10-Dec	0.6	0.5	1.3	1.2	1.2	1.2	1.6	1.3	0.8	1.0	1.2	1.3	1.3	1.0	0.4	0.5	0.2	0.3	0.4	0.9	1.4	1.0	1.1	1.8	1.8
11-Dec	2.8	2.7	2.4	2.4	2.8	3.0	2.7	3.2	2.8	2.7	2.8	2.7	2.6	2.6	2.9	2.3	2.3	2.5	1.9	1.3	1.9	1.5	1.3	2.3	3.2
12-Dec	1.9	1.1	0.4	0.5	1.9	2.3	2.8	3.1	1.7	1.9	1.3	1.2	1.0	0.8	0.6	0.2	0.2	0.4	0.3	0.2	0.3	1.2	2.5	3.2	3.2
13-Dec	3.5	2.7	3.4	3.1	2.3	2.0	2.0	2.1	1.4	0.9	0.5	0.7	0.7	0.5	0.2	0.2	0.2	0.4	0.5	0.5	0.3	0.5	0.4	0.2	3.5
14-Dec	0.1	0.2	0.2	0.2	0.4	1.0	1.6	1.4	1.5	1.4	1.5	1.2	0.6	0.4	0.2	0.2	0.2	0.1	0.1	0.2	0.3	0.4	0.3	0.2	1.6
15-Dec	0.2	0.4	0.5	0.9	1.1	0.4	0.4	0.3	0.7	0.3	0.3	0.5	0.8	1.2	1.5	1.7	1.3	0.6	0.5	0.6	0.7	0.6	0.6	0.3	1.7
16-Dec	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.4	0.8	1.4	1.2	0.8	0.8	0.5	0.2	0.1	0.3	0.2	0.2	0.1	0.2	1.4
17-Dec	0.2	0.2	0.5	0.5	0.9	0.8	1.1	1.0	1.4	1.0	1.0	1.2	1.5	1.1	0.8	0.8	1.1	1.1	1.1	1.0	1.0	0.9	0.7	0.5	1.5
18-Dec	0.5	0.5	1.0	1.1	0.7	0.6	0.7	0.8	0.6	0.4	0.5	0.6	0.6	1.1	0.8	0.9	0.9	0.7	0.7	0.7	0.6	0.5	0.5	0.5	1.1
19-Dec	0.5	0.5	0.7	1.0	0.8	1.0	0.9	0.8	1.0	0.9	0.9	0.8	1.0	1.0	0.9	1.2	1.0	1.3	1.1	0.4	0.2	0.3	0.2	0.2	1.3
20-Dec	0.3	0.3	0.4	0.8	1.9	1.8	2.3	2.3	3.1	2.7	1.9	2.0	1.6	1.4	1.2	1.2	0.8	0.8	0.8	0.8	1.3	1.8	1.7	1.8	3.1
21-Dec	1.3	1.6	1.9	2.0	1.7	1.6	1.3	1.4	1.8	1.9	1.7	1.4	1.6	2.4	1.4	1.1	0.9	1.2	1.0	0.7	1.0	1.1	0.8	0.6	2.4
22-Dec	0.5	0.4	0.5	0.8	1.4	1.9	1.9	1.3	0.7	0.8	2.2	2.6	2.7	2.5	2.1	1.9	2.1	2.3	2.2	1.7	1.7	1.3	1.4	1.7	2.7
23-Dec	1.6	1.2	1.4	1.8	1.8	1.6	1.7	1.8	1.8	1.3	1.6	1.4	1.6	1.4	1.3	1.5	1.0	0.5	0.5	0.4	0.2	0.3	0.4	0.3	1.8
24-Dec	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.3	1.1	0.9	1.1
25-Dec	0.5	0.2	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.8	0.7	0.7	1.0	0.7	0.9	0.9	0.4	0.9	1.0	1.7	1.3	0.7	0.9	1.7
26-Dec	1.0	1.9	1.7	1.6	2.2	1.8	0.8	0.8	0.9	1.0	1.8	1.6	1.2	1.6	1.5	1.0	0.5	0.8	1.0	1.2	1.3	2.0	1.9	2.3	2.3
27-Dec	2.2	1.8	1.9	1.5	1.4	1.5	1.6	2.0	2.1	2.0	2.4	2.4	2.7	1.5	1.3	1.0	0.7	0.5	0.4	1.5	1.5	1.4	1.0	0.5	2.7
28-Dec	0.7	0.6	1.1	1.5	1.7	1.4	1.2	1.6	1.0	1.3	1.3	1.3	1.0	0.7	0.3	0.3	0.3	0.5	1.2	1.0	0.8	0.5	0.8	0.6	1.7
29-Dec	0.6	0.4	0.3	0.2	0.6	0.5	0.6	0.4	0.7	0.6	0.8	0.8	0.7	0.9	0.7	0.5	0.8	0.7	0.4	0.4	0.6	0.4	0.3	0.2	0.9
30-Dec	0.3	0.3	0.2	0.2	0.5	0.6	0.4	0.6	0.6	0.6	0.8	1.0	1.2	1.3	1.3	1.7	1.3	1.1	2.0	1.7	1.4	0.9	0.7	0.6	2.0
31-Dec	0.5	0.6	0.6	0.4	0.1	0.1	0.1	0.3	0.4	0.6	0.5	0.5	0.8	0.8	0.3	0.3	0.7	0.7	2.0	3.0	2.8	3.2	2.7	2.3	3.2
Diurnal Maximum																									



Maximum Value: 2.7 km/h on Dec 20 10:00																				Maximum Daily Average: 0.9 km/h on Dec 20					Hours in Service: 744		
Minimum Value: -1.5 km/h on Dec 5 21:00																				Minimum Daily Average: -1.1 km/h on Dec 5					Hours of Data: 744		
Maximum Diurnal Average: 0.2 km/h at hour 11																				Minimum Diurnal Average: 0.0 km/h at hour 1					Hours of Missing Data: 0		
Monthly Average: 0.11 km/h																				Percentiles: P ₁ = -1.2 P ₁₀ = -0.6 Q ₁ = -0.2 Median = 0.0 Q ₃ = 0.5 P ₉₀ = 0.9 P ₉₉ = 1.5					Hours of Calibration: 0		
																									Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.3	0.5	0.5	0.2	-0.3	0.0	0.2	0.5	0.5	0.3	0.4	0.0	0.1	0.6	0.6	0.4	0.6	0.7	0.3	0.3	0.5	0.2	0.3	0.5	0.3	0.7	
2-Dec	0.3	-0.1	0.5	0.5	0.8	0.5	0.9	0.5	0.8	0.8	0.9	0.9	1.0	1.0	0.6	1.1	1.1	1.1	0.9	1.3	0.8	0.9	0.7	1.1	0.8	1.3	
3-Dec	1.2	0.9	0.8	0.8	0.9	0.8	0.7	0.9	0.6	0.6	0.8	1.0	1.1	1.2	0.6	0.7	1.1	0.5	0.3	0.1	0.1	0.1	0.3	0.2	0.7	1.2	
4-Dec	0.2	-0.1	-0.1	-0.3	0.0	0.0	-0.1	-0.5	-0.1	-0.2	-0.2	-0.3	-0.4	-0.3	-0.2	-0.6	-0.5	-0.7	-0.5	-0.5	-0.3	-0.3	-0.5	-0.7	-0.3	0.2	
5-Dec	-1.5	-0.7	-0.9	-1.0	-1.0	-1.2	-1.5	-1.1	-1.1	-1.1	-0.9	-1.0	-1.1	-1.3	-1.2	-1.0	-1.2	-1.0	-1.0	-1.2	-1.0	-1.5	-1.2	-1.2	-0.6	-1.1	-0.6
6-Dec	-0.8	-0.6	-0.7	-0.5	-1.0	-0.6	-0.2	-0.1	-0.1	0.2	-0.3	-0.5	-0.7	-0.7	-0.4	-0.4	-0.3	-0.2	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4	0.2	
7-Dec	-0.2	-0.3	-0.1	-0.1	-0.3	-0.4	-0.2	-0.3	-0.3	-0.4	-0.3	-0.2	-0.3	-0.4	-0.3	-0.2	0.0	-0.1	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	0.0	
8-Dec	-0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.0	0.3	0.0	0.0	-0.3	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.3	
9-Dec	-0.1	0.0	0.0	0.0	0.1	0.3	0.8	0.8	0.4	0.4	0.8	0.6	0.5	0.5	0.4	0.6	0.6	0.2	0.4	0.2	0.6	0.8	0.7	0.7	0.4	0.8	
10-Dec	0.7	0.3	0.7	0.7	0.5	0.8	0.6	0.6	0.7	0.6	0.6	0.4	0.4	0.4	0.3	0.7	0.3	0.9	0.6	0.2	-0.2	0.3	0.4	0.1	0.5	0.9	
11-Dec	-0.3	-0.5	-0.7	-0.7	-0.5	-0.7	-0.8	-1.2	-1.0	-1.1	-0.9	-0.5	-0.8	-0.7	-1.2	-0.6	-0.9	-0.9	-0.5	-0.2	-0.4	-0.3	0.0	-0.4	-0.7	0.0	
12-Dec	-0.7	-0.2	-0.3	-0.4	-0.6	-0.7	-1.1	-0.9	-0.1	-0.1	-0.3	-0.6	-0.1	0.3	0.3	0.1	0.1	-0.1	0.0	0.0	0.0	-0.9	-0.9	-1.2	-0.3	0.3	
13-Dec	-1.1	-0.5	-1.1	-1.0	-0.2	-0.1	-0.2	-0.1	-0.2	0.0	0.0	0.2	0.3	0.0	-0.1	0.0	0.0	-0.3	-0.5	-0.3	-0.1	-0.1	-0.1	0.1	-0.2	0.3	
14-Dec	0.0	0.2	0.2	0.2	0.7	1.3	1.3	1.2	1.0	1.1	1.2	0.9	0.3	0.1	-0.1	0.0	-0.1	-0.1	0.0	0.2	0.4	0.3	0.1	-0.1	0.4	1.3	
15-Dec	0.0	0.0	-0.2	-0.3	-0.2	-0.3	-0.1	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	-0.4	-0.7	-0.6	-0.6	-0.3	0.0	-0.3	-0.4	-0.4	-0.3	-0.1	-0.2	0.0	
16-Dec	-0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.3	0.5	0.8	0.8	0.8	0.4	0.2	0.6	0.4	0.1	0.0	0.3	0.3	0.2	0.2	0.1	0.3	0.8	
17-Dec	0.1	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.4	0.5	0.7	0.7	0.4	0.4	0.4	0.7	0.8	0.9	0.8	0.7	0.7	0.7	0.3	0.5	0.9	
18-Dec	0.3	0.4	0.7	0.9	0.6	0.4	0.5	0.5	0.3	0.0	0.0	0.0	0.1	-0.2	-0.3	-0.1	-0.1	-0.3	-0.2	-0.1	-0.1	-0.2	0.0	-0.1	0.1	0.9	
19-Dec	-0.2	-0.1	-0.3	-0.6	-0.4	-0.2	-0.2	-0.3	-0.3	-0.3	-0.2	0.0	-0.3	-0.2	-0.2	-0.2	-0.2	-0.4	-0.3	0.0	0.2	0.2	0.1	0.1	-0.2	0.2	
20-Dec	0.0	0.1	0.2	0.8	1.4	1.4	0.5	1.2	2.3	2.7	1.5	1.5	0.9	0.7	0.4	0.3	0.5	0.5	0.5	0.0	0.4	0.7	0.9	1.8	0.9	2.7	
21-Dec	1.6	1.6	1.1	1.5	0.9	0.4	0.3	1.6	1.7	1.5	1.1	1.4	0.3	-1.1	-0.8	-0.6	0.1	0.3	0.6	1.2	0.9	1.4	0.6	0.4	0.7	1.7	
22-Dec	0.3	0.6	0.9	0.0	-0.6	-0.7	-0.7	-0.5	-0.1	-0.1	-0.3	-0.3	-0.6	-0.2	-0.3	-0.4	-0.4	-0.3	-0.5	-0.1	-0.2	-0.1	-0.3	0.0	-0.2	0.9	
23-Dec	-0.2	-0.1	0.0	-0.1	-0.1	-0.2	0.0	-0.3	-0.4	-0.1	-0.1	-0.3	-0.6	-0.6	-0.3	-0.2	-0.2	-0.2	-0.2	-0.3	0.0	0.0	0.0	0.0	-0.2	0.0	
24-Dec	-0.1	-0.1	-0.2	-0.3	-0.3	-0.2	-0.1	-0.2	-0.2	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.1	0.1	0.3	1.8	1.6	0.1	1.8	
25-Dec	0.6	0.5	0.2	0.2	0.3	0.5	0.3	0.2	0.4	0.2	0.6	0.2	0.4	0.6	0.7	0.5	0.4	0.3	0.4	0.6	1.2	1.1	0.5	0.2	0.5	1.2	
26-Dec	0.4	1.5	1.6	1.4	1.1	0.9	0.3	0.3	0.1	0.0	0.6	0.4	0.2	-0.1	0.4	0.4	0.1	0.7	0.7	0.4	0.7	1.0	1.0	0.7	0.6	1.6	
27-Dec	0.6	0.8	1.4	1.0	1.0	1.5	1.2	1.0	0.9	0.9	1.2	1.1	1.3	0.9	1.5	1.4	0.6	0.7	0.3	-0.2	-0.1	0.2	-0.3	-0.2	0.8	1.5	
28-Dec	-0.1	-0.1	-0.1	-0.3	-0.1	-0.2	-0.1	-0.2	-0.1	0.0	-0.1	-0.2	0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.3	-0.2	-0.1	-0.3	-0.1	-0.1	0.1	
29-Dec	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.3	-0.1	-0.3	-0.2	-0.2	-0.1	0.1	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	0.1	
30-Dec	-0.2	0.0	0.1	0.0	0.4	0.6	0.3	0.5	0.1	0.0	0.5	0.5	0.9	1.1	1.1	1.1	0.7	0.0	-0.4	-0.1	-0.2	-0.2	-0.3	-0.2	0.3	1.1	
31-Dec	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.1	-0.1	-0.3	-0.3	-0.1	-0.1	0.0	0.0	-0.1	0.0	0.1	0.1	-0.2	-1.1	-0.8	-0.9	-0.4	-0.6	-0.2	0.2	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 45 m (VW45m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.9 km/h on Dec 5 09:00 Minimum Value: 0.1 km/h on Dec 8 23:00 Percentiles: P ₁ = 0.1 P ₁₀ = 0.3 Q ₁ = 0.5 Median = 0.9 Q ₃ = 1.6 P ₉₀ = 2.5 P ₉₉ = 3.6																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.7	1.6	1.5	1.3	1.2	1.2	1.4	1.3	1.3	1.2	1.2	1.4	1.3	1.3	1.2	0.9	0.9	0.9	0.7	0.7	0.6	0.6	0.4	0.7	1.7
2-Dec	0.8	1.3	1.6	1.8	1.7	1.3	1.2	1.2	1.5	1.4	2.3	2.4	2.7	3.0	2.1	2.8	2.7	3.1	2.3	2.5	2.6	2.9	3.0	3.2	3.2
3-Dec	2.5	2.2	1.9	2.2	2.0	2.2	2.4	2.4	1.7	1.9	2.2	2.5	1.9	1.2	1.1	1.5	1.5	1.6	1.6	1.5	1.6	1.7	1.3	1.0	2.5
4-Dec	0.7	0.7	1.6	2.6	2.8	3.0	2.5	2.5	2.3	2.0	1.9	1.7	1.6	1.8	1.8	2.0	1.6	2.2	2.4	2.3	1.5	1.0	1.7	2.6	3.0
5-Dec	3.1	2.9	2.9	3.2	3.1	3.2	3.7	3.9	3.9	3.3	3.4	3.5	3.6	3.4	3.4	3.7	3.6	3.4	3.3	3.1	3.2	3.2	3.2	3.4	3.9
6-Dec	3.3	3.0	2.5	2.5	2.7	2.6	2.3	2.5	2.6	2.0	2.4	2.2	2.3	2.7	2.6	1.8	1.3	0.7	0.7	0.7	0.7	0.9	0.8	0.9	3.3
7-Dec	0.8	0.5	0.4	0.6	0.5	0.7	0.6	0.7	0.7	1.0	0.6	1.0	1.2	1.6	0.8	0.4	0.1	0.1	0.4	0.4	0.3	0.2	0.3	0.4	1.6
8-Dec	0.3	0.7	0.7	0.5	0.5	0.8	0.5	0.2	0.2	0.2	0.3	0.5	0.6	0.5	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.8
9-Dec	0.2	0.2	0.1	0.2	0.1	0.4	0.7	0.9	0.7	0.9	1.0	1.3	0.9	1.1	0.8	0.7	0.5	0.3	0.4	0.5	0.5	0.5	0.5	0.7	1.3
10-Dec	0.7	0.5	1.1	1.0	1.1	1.0	1.3	1.1	0.7	0.6	1.0	1.0	0.9	0.7	0.5	0.4	0.3	0.3	0.4	1.1	1.6	1.2	1.3	1.6	1.6
11-Dec	2.3	2.2	2.4	2.4	2.9	2.4	2.5	3.3	2.7	2.8	2.8	3.0	2.5	2.7	2.9	2.3	2.3	2.5	1.9	1.7	2.3	1.6	1.7	2.8	3.3
12-Dec	2.3	1.2	0.5	0.6	2.4	2.6	3.1	3.3	2.4	2.4	1.6	1.2	1.1	0.6	0.5	0.2	0.2	0.4	0.3	0.2	0.5	1.5	2.7	3.3	3.3
13-Dec	3.7	3.2	3.6	3.4	2.4	2.1	2.4	2.4	1.5	1.2	0.6	0.7	0.8	0.5	0.2	0.2	0.4	0.6	0.8	0.6	0.4	0.7	0.6	0.4	3.7
14-Dec	0.2	0.3	0.3	0.3	0.4	0.6	1.0	0.9	1.0	1.0	0.9	0.8	0.5	0.4	0.3	0.2	0.2	0.1	0.2	0.3	0.7	0.6	0.4	0.3	1.0
15-Dec	0.3	0.6	0.6	1.0	1.2	0.4	0.5	0.5	0.9	0.4	0.4	0.6	0.9	1.2	1.7	1.7	1.3	0.7	0.9	0.8	0.9	0.8	0.6	0.4	1.7
16-Dec	0.2	0.3	0.2	0.1	0.1	0.2	0.3	0.2	0.3	0.3	0.4	0.6	1.0	1.0	0.8	0.8	0.7	0.3	0.2	0.3	0.3	0.3	0.2	0.2	1.0
17-Dec	0.3	0.3	0.6	0.5	0.8	0.8	0.9	0.9	1.3	1.0	1.0	1.3	1.2	1.0	0.7	0.8	0.8	0.8	1.0	0.9	0.9	0.8	0.7	0.5	1.3
18-Dec	0.4	0.5	0.8	0.8	0.6	0.5	0.6	0.7	0.5	0.4	0.6	0.6	0.7	1.1	0.8	1.1	1.0	0.7	0.8	0.7	0.6	0.4	0.4	0.5	1.1
19-Dec	0.5	0.6	0.7	0.8	0.9	1.1	0.8	0.8	1.0	1.0	0.8	0.9	0.9	0.9	0.9	1.2	1.0	1.4	1.2	0.4	0.3	0.4	0.2	0.2	1.4
20-Dec	0.4	0.4	0.6	0.8	1.6	1.4	2.4	2.3	2.7	2.2	1.8	1.8	1.6	1.6	1.3	1.5	0.9	0.9	0.8	0.9	1.1	1.5	1.5	1.3	2.7
21-Dec	0.7	0.8	1.3	1.4	1.5	2.1	1.4	1.0	1.0	1.1	1.1	1.2	2.0	2.8	1.5	1.2	1.0	1.4	1.2	0.9	0.9	0.9	1.1	0.9	2.8
22-Dec	0.6	0.6	0.6	1.0	1.6	1.9	1.9	1.6	0.8	1.1	2.2	2.6	2.7	2.5	2.1	1.8	2.3	2.4	2.3	1.8	1.9	1.4	1.4	1.8	2.7
23-Dec	1.8	1.3	1.5	1.7	1.8	1.5	1.6	1.9	1.9	1.4	1.6	1.4	1.5	1.3	1.3	1.4	1.0	0.5	0.5	0.4	0.3	0.6	0.6	0.4	1.9
24-Dec	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.5	0.9	0.7	0.9
25-Dec	0.7	0.3	0.3	0.3	0.3	0.3	0.6	0.5	0.4	0.3	0.9	0.7	0.6	0.9	0.7	0.7	0.9	0.4	0.9	0.9	1.2	1.1	0.8	0.8	1.2
26-Dec	0.8	1.6	1.5	1.4	2.1	1.6	1.0	0.9	1.0	1.2	1.7	1.5	1.3	2.0	1.7	1.0	0.6	0.9	1.0	1.1	1.1	1.4	1.4	1.5	2.1
27-Dec	1.4	1.1	1.0	1.2	1.5	1.3	1.0	1.2	1.3	1.4	1.8	1.7	2.1	1.0	0.9	1.1	0.9	0.7	0.7	1.2	1.5	1.8	1.1	0.6	2.1
28-Dec	1.0	0.8	1.2	1.6	1.7	1.4	1.1	1.5	1.2	1.3	1.4	1.4	1.0	0.7	0.2	0.3	0.3	0.6	1.1	1.0	0.9	0.5	0.6	0.7	1.7
29-Dec	0.5	0.4	0.4	0.2	0.4	0.5	0.5	0.4	0.7	0.5	0.8	0.8	0.7	0.8	0.7	0.5	0.7	0.8	0.5	0.5	0.5	0.4	0.3	0.3	0.8
30-Dec	0.4	0.4	0.3	0.2	0.5	0.7	0.5	0.6	0.7	0.6	0.7	1.0	0.9	0.9	1.1	1.6	1.4	1.3	2.4	2.0	1.6	1.2	1.0	0.7	2.4
31-Dec	0.5	0.6	0.7	0.5	0.2	0.2	0.2	0.2	0.4	0.5	0.4	0.5	0.9	0.8	0.3	0.4	0.9	0.9	2.3	3.2	2.9	2.9	2.4	2.4	3.2
Diurnal Maximum																									



Maximum Value: 3.9 km/h on Dec 2 22:00		Maximum Daily Average: 2.0 km/h on Dec 2		Hours in Service: 744																																												
Minimum Value: -1.5 km/h on Dec 5 13:00		Minimum Daily Average: -0.9 km/h on Dec 5		Hours of Data: 744																																												
Maximum Diurnal Average: 0.4 km/h at hour 22		Minimum Diurnal Average: 0.1 km/h at hour 1		Hours of Missing Data: 0																																												
Monthly Average: 0.20 km/h		Percentiles: P ₁ = -1.1 P ₁₀ = -0.4 Q ₁ = -0.1 Median = 0.1 Q ₃ = 0.3 P ₉₀ = 0.9 P ₉₉ = 2.8		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-0.2	-0.1	-0.1	-0.1	0.2	0.0	-0.2	0.1	0.2	-0.1	0.1	-0.3	0.0	0.6	0.3	0.1	0.1	0.3	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.6																						
2-Dec	0.2	0.3	2.1	1.5	1.5	0.2	1.1	1.2	1.3	0.7	2.3	2.9	2.5	3.1	2.8	3.1	3.6	2.7	2.6	1.9	2.3	3.9	2.8	2.6	2.0	3.9																						
3-Dec	2.6	1.6	1.4	0.8	1.3	0.8	0.3	1.3	1.7	1.8	2.1	2.2	0.8	0.2	0.3	0.3	-0.2	0.3	0.8	0.6	0.8	1.3	1.5	0.9	1.1	2.6																						
4-Dec	0.0	0.2	-0.2	0.1	0.2	0.2	0.4	0.4	0.6	0.0	-0.2	-0.1	-0.2	-0.4	-0.6	-0.6	-0.5	-0.3	-0.6	-0.5	-0.4	-0.3	-0.6	-0.6	-0.2	0.6																						
5-Dec	-1.2	-0.2	-1.0	-1.1	-1.0	-1.1	-1.2	-1.1	-1.1	-0.9	-0.8	-1.1	-1.5	-0.9	-0.8	-1.3	-0.8	-0.6	-0.8	-0.7	-1.1	-0.9	-0.9	-0.6	-0.9	-0.2																						
6-Dec	-0.5	-0.5	-0.5	-0.4	-0.4	0.3	0.5	0.6	0.9	1.3	0.5	-0.2	-0.7	-0.8	-0.8	-0.4	-0.2	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	0.1	-0.1	1.3																						
7-Dec	-0.1	-0.2	-0.2	-0.1	-0.2	-0.1	0.0	-0.1	-0.2	-0.4	-0.3	0.0	-0.1	-0.1	-0.2	-0.1	0.1	0.2	0.1	0.1	0.2	0.3	0.1	0.1	-0.1	0.3																						
8-Dec	0.1	-0.1	0.1	0.0	0.0	0.2	0.0	0.1	0.1	0.1	0.0	-0.2	-0.2	-0.1	-0.2	-0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.2																						
9-Dec	0.2	0.2	0.4	0.3	0.1	0.4	0.4	0.4	0.1	0.4	0.2	0.3	0.4	0.6	0.2	0.5	0.1	0.1	0.2	0.1	0.1	0.1	-0.1	0.1	0.2	0.6																						
10-Dec	0.1	0.3	0.2	0.7	0.1	0.1	0.1	0.6	-0.1	0.0	0.3	0.2	0.1	0.3	0.2	0.2	-0.2	-0.1	0.0	-0.1	-1.3	1.3	1.4	0.9	0.2	1.4																						
11-Dec	0.6	0.4	0.4	0.5	1.1	0.1	0.1	0.1	0.3	0.1	-0.2	0.2	0.0	-0.1	-0.5	0.4	0.0	-0.1	0.4	0.2	0.1	0.5	1.1	0.0	0.2	1.1																						
12-Dec	-0.2	-0.4	-0.4	-0.6	0.0	-0.5	-0.9	-1.1	0.4	2.0	-0.2	-0.6	-0.3	0.1	0.4	0.3	0.1	-0.1	0.0	-0.1	-0.5	-1.0	-0.9	-1.2	-0.2	2.0																						
13-Dec	-1.2	-0.6	-0.9	-0.8	-0.1	0.1	-0.4	-0.1	0.2	-0.1	0.0	0.1	0.3	0.0	-0.1	-0.2	-0.3	-0.7	-0.9	-0.5	-0.6	-0.1	-0.4	-0.2	-0.3	0.3																						
14-Dec	0.0	0.0	0.0	0.0	0.1	0.0	-0.2	-0.1	0.1	0.1	-0.1	0.2	0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.2	-0.4	-0.4	-0.2	-0.1	-0.3	-0.1	0.2																						
15-Dec	-0.4	-0.3	-0.3	-0.7	0.0	-0.5	-0.2	-0.3	-0.6	-0.2	-0.3	-0.5	-0.2	-0.3	-0.1	-0.3	-0.4	-0.3	-0.1	-0.7	-0.5	-0.7	-0.6	-0.2	-0.4	0.0																						
16-Dec	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.2	0.5	0.6	0.4	0.8	0.7	0.2	0.0	0.7	0.8	0.2	0.5	0.2	0.8																						
17-Dec	1.0	0.1	0.6	0.2	0.3	0.5	0.1	0.2	0.3	0.5	0.5	0.3	0.1	0.2	0.1	0.4	0.4	0.1	0.2	0.3	0.2	0.2	0.1	0.0	0.3	1.0																						
18-Dec	-0.1	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.1	0.1	0.3	0.4	0.1	-0.2	-0.1	-0.1	0.0	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.4																						
19-Dec	0.1	0.1	0.0	-0.1	0.1	0.0	-0.4	-0.1	-0.3	-0.3	-0.1	-0.1	-0.2	0.1	-0.4	-0.3	0.0	-0.4	-0.2	0.0	0.2	0.4	0.2	0.6	0.0	0.6																						
20-Dec	0.3	0.5	1.1	0.6	1.0	0.5	1.4	1.9	0.3	0.0	-0.1	0.4	0.1	0.7	1.6	1.7	0.7	0.0	0.1	0.0	0.1	-0.2	0.4	0.6	1.9	0.6																						
21-Dec	0.1	0.0	0.6	0.3	-0.4	0.8	0.0	0.3	-0.2	0.0	0.3	0.3	-0.2	-0.6	-0.3	0.1	0.4	1.3	0.4	-0.2	0.5	1.0	1.2	0.7	0.3	1.3																						
22-Dec	0.5	0.5	0.0	0.2	-0.1	0.5	0.3	-0.2	0.0	0.0	0.3	0.1	0.0	0.2	0.1	-0.1	0.2	0.0	-0.2	0.1	0.2	0.2	0.0	0.6	0.1	0.6																						
23-Dec	0.2	0.2	0.1	0.3	0.3	0.2	0.2	0.2	-0.2	0.2	0.2	0.1	0.0	-0.3	0.1	-0.1	0.1	0.0	0.0	0.2	0.2	0.2	0.4	0.1	0.1	0.4																						
24-Dec	0.4	0.0	0.1	0.0	0.0	0.1	0.0	-0.1	-0.1	0.1	0.0	-0.2	0.0	0.1	0.0	0.3	0.1	0.1	0.2	0.1	0.3	-0.3	-0.3	0.0	0.0	0.4																						
25-Dec	0.0	-0.2	-0.2	-0.1	0.0	-0.1	0.4	0.2	-0.1	0.0	0.6	0.5	0.6	1.3	0.0	0.5	1.9	2.2	2.8	2.1	1.9	1.5	1.3	1.5	0.8	2.8																						
26-Dec	0.2	2.2	2.2	1.5	2.3	1.9	1.0	0.8	1.3	2.6	2.4	1.3	1.1	0.3	0.7	0.8	0.8	0.8	0.5	-0.4	0.0	0.6	0.7	0.7	1.1	2.6																						
27-Dec	0.9	0.6	0.8	0.7	0.1	0.5	1.1	0.8	1.0	0.7	1.2	0.5	0.6	0.2	0.0	0.1	0.1	0.0	0.3	0.9	1.5	3.1	-0.1	-0.3	0.6	3.1																						
28-Dec	-0.1	-0.1	0.0	0.0	0.2	0.2	0.0	0.0	0.2	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0.0	0.2																						
29-Dec	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.1	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	-0.1	0.0																						
30-Dec	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.1	-0.2	0.2	0.3	0.5	0.1	0.3	0.8	0.9	0.0	0.2	1.3	2.3	0.3	-0.1	0.1	-0.2	0.3	2.3																						
31-Dec	-0.2	-0.1	0.1	0.2	-0.1	0.4	0.2	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.5	1.5	0.4	0.6	0.3	0.9	0.7	0.2	1.5																						
																								0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.3	0.3	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.4	0.2	0.2	Diurnal Average
																								2.6	2.2	2.2	1.5	2.3	1.9	1.4	1.9	1.7	2.6	2.4	2.9	2.5	3.1	2.8	3.1	3.6	2.7	2.8	2.3	2.3	3.9	2.8	2.6	Diurnal Maximum



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 100 m (VW100m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.3 km/h on Dec 2 20:00 Minimum Value: 0.1 km/h on Dec 8 17:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.3 Q ₁ = 0.6 Median = 1.0 Q ₃ = 1.7 P ₉₀ = 2.2 P ₉₉ = 3.0																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.6	1.6	1.4	1.4	1.3	1.1	1.4	1.4	1.4	1.2	1.4	1.4	1.4	1.5	1.3	1.0	0.9	1.0	0.8	0.8	0.8	0.9	0.7	0.8	1.6
2-Dec	0.8	1.0	1.4	1.2	1.6	1.6	1.6	1.7	1.8	2.0	1.9	1.3	1.4	2.4	2.3	2.2	2.4	2.7	2.7	3.3	2.6	2.8	2.5	2.5	3.3
3-Dec	2.6	2.6	2.4	2.9	2.7	3.0	2.4	2.9	2.2	2.4	2.5	2.4	1.6	1.3	1.5	1.2	1.1	1.5	1.8	1.6	1.7	1.1	1.3	1.3	3.0
4-Dec	1.1	1.0	1.5	2.4	2.4	3.1	2.8	2.8	2.3	1.7	0.9	1.7	1.9	1.8	1.7	1.4	2.1	2.6	2.1	1.4	0.6	1.4	2.2	2.2	3.1
5-Dec	2.4	2.7	2.1	2.0	2.2	2.4	2.2	2.3	2.2	2.6	3.0	3.0	2.2	2.6	2.6	2.6	2.7	2.7	2.5	2.7	2.4	2.3	2.1	2.0	3.0
6-Dec	1.9	1.9	2.0	1.9	2.0	2.1	1.9	2.0	2.1	2.5	2.5	2.1	2.0	2.4	2.4	1.9	1.0	0.5	1.0	1.1	1.1	1.2	1.3	1.6	2.5
7-Dec	1.1	0.7	0.6	0.7	0.9	1.0	1.0	0.9	1.2	1.7	1.0	1.2	1.2	1.6	0.7	0.3	0.2	0.2	0.7	0.6	0.3	0.4	0.4	0.7	1.7
8-Dec	0.7	1.2	1.3	1.0	1.0	1.4	0.7	0.3	0.4	0.3	0.1	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.2	0.2	0.3	0.1	0.1	1.4
9-Dec	0.2	0.2	0.3	0.4	0.4	0.6	0.7	1.0	0.8	1.0	0.7	0.9	0.6	0.7	0.6	0.6	0.5	0.7	0.5	0.4	0.4	0.5	0.8	0.5	1.0
10-Dec	0.7	0.4	0.9	0.9	1.0	1.1	0.8	0.7	0.8	0.5	0.4	0.6	0.6	0.6	0.4	0.6	0.6	0.6	0.5	1.2	1.5	1.3	1.1	1.5	1.5
11-Dec	1.5	1.3	1.6	1.4	2.2	1.7	1.6	2.1	1.9	1.8	2.0	2.6	1.7	2.1	2.5	2.1	1.5	1.4	1.2	2.2	1.9	1.0	1.7	2.4	2.6
12-Dec	2.0	1.3	1.2	1.2	2.1	1.9	1.5	1.1	1.9	2.3	1.8	1.4	1.3	0.8	0.7	0.5	0.6	1.1	0.4	0.4	1.3	1.6	2.2	2.7	2.7
13-Dec	2.3	3.2	2.7	3.3	2.4	2.3	2.5	2.7	1.5	1.5	0.7	0.5	0.9	0.3	0.2	0.7	0.7	1.1	1.2	0.9	0.9	1.0	1.1	0.9	3.3
14-Dec	0.3	0.4	0.6	0.6	0.6	0.8	0.8	0.8	0.9	0.8	0.8	0.7	0.4	0.4	0.3	0.2	0.3	0.2	0.3	0.7	1.1	0.8	0.7	0.4	1.1
15-Dec	0.6	1.2	1.5	2.1	1.7	0.9	0.8	1.2	1.4	0.7	0.7	1.0	1.0	1.1	1.4	1.5	1.3	1.2	1.5	1.5	1.1	1.2	1.0	0.8	2.1
16-Dec	0.4	0.3	0.3	0.3	0.2	0.4	0.5	0.3	0.4	0.4	0.5	0.4	0.5	0.6	0.6	0.8	0.9	0.4	0.5	0.4	0.7	0.4	0.5	0.4	0.9
17-Dec	0.5	0.5	0.7	0.5	0.5	0.6	0.6	0.8	0.9	0.9	0.8	1.4	0.7	0.8	0.7	0.8	1.0	0.7	0.7	0.8	1.0	0.6	0.6	0.4	1.4
18-Dec	0.5	0.7	0.8	0.8	1.0	0.6	0.5	0.4	0.3	0.3	0.4	0.5	0.4	0.4	0.5	0.8	0.7	0.4	0.6	0.5	0.4	0.2	0.3	0.3	1.0
19-Dec	0.4	0.8	0.9	0.9	0.8	0.9	0.6	1.0	0.6	0.7	0.5	0.5	0.8	0.9	0.6	0.8	0.3	0.9	0.7	0.4	0.3	0.4	0.3	0.4	1.0
20-Dec	0.8	0.8	0.8	0.9	1.8	1.2	2.2	2.7	2.2	1.9	2.3	1.8	1.8	1.6	1.3	0.9	1.8	1.3	1.4	0.7	1.2	1.7	1.8	1.6	2.7
21-Dec	1.2	1.2	1.3	1.7	2.1	2.9	2.1	1.2	1.0	1.4	1.4	1.6	2.2	2.7	1.2	1.2	1.4	1.9	1.7	1.4	1.5	1.5	1.6	1.5	2.9
22-Dec	1.2	1.1	0.7	1.0	1.1	0.9	1.1	1.5	1.2	1.0	1.9	2.2	1.8	2.3	1.9	1.6	2.0	2.3	1.8	1.8	2.1	1.3	1.4	1.6	2.3
23-Dec	1.9	1.5	1.5	2.1	1.8	1.4	1.8	1.8	1.5	1.2	1.5	1.2	1.0	0.8	0.7	0.8	0.6	0.3	0.2	0.4	0.9	1.0	1.0	1.0	2.1
24-Dec	0.6	0.5	0.5	0.5	0.2	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.5	0.5	0.3	0.6	0.7	0.7	0.8	0.8	0.8
25-Dec	0.6	0.6	0.6	0.6	0.6	0.7	0.9	0.8	0.6	0.6	1.1	0.9	0.7	1.0	1.0	1.0	1.2	1.2	1.6	1.3	1.9	1.7	1.0	1.1	1.9
26-Dec	0.9	1.6	1.5	1.5	1.6	1.7	2.2	1.7	1.8	1.7	2.0	1.9	2.0	2.9	2.2	1.8	1.7	1.5	1.8	1.8	1.7	2.0	1.8	1.7	2.9
27-Dec	1.6	1.6	1.5	1.8	2.1	2.1	1.6	1.4	1.5	1.7	1.8	1.8	1.5	1.1	0.6	0.9	1.1	0.9	0.9	0.8	1.1	2.0	0.5	0.5	2.1
28-Dec	1.0	0.7	1.1	1.7	2.0	1.3	1.1	1.7	1.7	1.4	1.2	0.9	0.8	0.7	0.2	0.2	0.1	0.3	0.8	0.5	0.5	0.3	0.3	0.5	2.0
29-Dec	0.5	0.4	0.3	0.2	0.2	0.3	0.4	0.2	0.2	0.2	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.4	0.3	0.4	0.5	0.2	0.2	0.2	0.5
30-Dec	0.4	0.5	0.5	0.5	0.6	0.7	0.6	0.7	0.8	0.7	0.8	1.1	0.9	1.1	1.2	1.6	1.5	1.4	1.2	1.9	2.1	0.9	1.5	0.8	2.1
31-Dec	0.6	0.3	0.4	0.7	0.4	0.4	0.4	0.5	0.5	0.3	0.3	0.6	0.6	0.8	0.2	0.4	1.5	1.8	1.9	1.5	1.7	1.1	1.5	1.7	1.9
	2.6	3.2	2.7	3.3	2.7	3.1	2.8	2.9	2.8	2.6	3.0	3.0	2.2	2.9	2.6	2.6	2.7	2.7	2.7	3.3	2.6	2.8	2.5	2.7	
	Diurnal Maximum																								



Maximum Value: 4.1 km/h on Dec 2 22:00		Maximum Daily Average: 2.1 km/h on Dec 2		Hours in Service: 744																																												
Minimum Value: -1.9 km/h on Dec 10 21:00		Minimum Daily Average: -0.7 km/h on Dec 5		Hours of Data: 744																																												
Maximum Diurnal Average: 0.6 km/h at hour 10		Minimum Diurnal Average: 0.2 km/h at hour 2		Hours of Missing Data: 0																																												
Monthly Average: 0.43 km/h		Percentiles: P ₁ = -1.0 P ₁₀ = -0.3 Q ₁ = 0.0 Median = 0.2 Q ₃ = 0.7 P ₉₀ = 1.4 P ₉₉ = 3.1		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0.1	-0.1	-0.2	1.2	1.1	0.9	0.2	-0.1	0.1	0.5	0.5	0.5	0.4	0.3	0.4	0.6	1.7	1.4	1.3	0.8	0.8	1.0	0.7	0.5	0.6	1.7																						
2-Dec	0.7	0.1	1.5	1.5	1.4	0.1	0.9	1.2	1.2	0.6	1.9	2.8	2.7	3.2	2.9	3.2	3.7	3.2	2.8	1.6	2.8	4.1	3.0	2.5	2.1	4.1																						
3-Dec	2.5	1.2	0.8	0.2	0.3	0.3	0.1	0.8	1.4	1.4	1.8	2.0	2.5	2.1	2.8	1.3	2.2	2.8	2.9	2.6	2.9	2.1	2.5	1.8	1.7	2.9																						
4-Dec	0.4	0.3	-0.1	0.1	0.3	0.3	0.5	0.5	0.7	0.2	0.0	-0.1	0.0	-0.4	-0.4	-0.4	-0.4	-0.3	-0.2	-0.4	-0.3	-0.2	-0.4	-0.5	0.0	0.7																						
5-Dec	-0.9	-0.2	-0.6	-0.6	-0.5	-0.8	-0.9	-1.0	-0.9	-0.3	-0.6	-0.6	-1.3	-0.5	-0.6	-1.2	-0.9	-0.3	-0.7	-0.1	-0.9	-0.9	-0.7	-0.3	-0.7	-0.1																						
6-Dec	-0.2	-0.2	-0.2	-0.1	-0.1	1.0	1.4	1.3	2.1	2.3	1.0	-0.1	-0.7	-0.7	-0.8	-0.3	0.1	0.0	-0.1	0.1	0.0	-0.1	0.2	0.5	0.3	2.3																						
7-Dec	0.1	-0.1	-0.1	-0.1	-0.1	0.1	0.2	0.1	0.0	-0.1	-0.2	0.1	-0.1	0.0	-0.1	-0.1	0.1	0.3	0.2	0.2	0.4	0.4	0.3	0.2	0.1	0.4																						
8-Dec	0.3	0.2	0.5	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.5																						
9-Dec	0.1	0.1	0.2	0.5	0.4	0.4	0.3	0.3	0.0	0.4	0.4	0.2	0.2	0.2	0.4	0.4	0.1	0.2	0.3	0.8	0.7	0.7	0.5	0.1	0.3	0.8																						
10-Dec	0.0	0.2	0.3	0.9	0.1	0.0	0.9	0.8	0.2	0.6	0.5	0.6	0.3	0.6	0.5	0.4	0.1	0.6	0.7	0.3	-1.9	1.6	1.7	1.6	0.5	1.7																						
11-Dec	1.4	1.0	1.1	1.1	2.2	0.3	0.4	0.6	0.9	1.2	0.3	0.8	0.1	0.3	-0.4	0.8	0.3	0.1	0.6	0.6	0.5	0.5	1.5	0.5	0.7	2.2																						
12-Dec	-0.2	-0.5	-0.6	-0.6	0.1	-0.3	-0.7	-1.0	0.7	2.8	0.1	-0.4	0.5	0.3	0.3	-0.1	-0.4	-0.4	-0.3	-0.3	-0.3	-0.9	-0.8	-1.1	-0.2	2.8																						
13-Dec	-1.1	-0.5	-0.8	-0.6	-0.1	0.3	-0.1	0.3	0.3	-0.1	0.1	0.1	0.2	-0.3	-0.2	-0.2	-0.4	-0.6	-1.1	-0.5	-0.6	0.0	-0.2	-0.4	-0.3	0.3																						
14-Dec	-0.2	0.4	0.1	-0.1	0.4	0.8	0.5	0.5	0.9	0.8	1.1	0.5	-0.1	-0.4	-0.1	0.1	0.1	0.1	-0.1	-0.2	-0.4	-0.2	-0.2	-0.3	0.2	1.1																						
15-Dec	-0.4	0.0	-0.3	-0.7	0.1	-0.7	-0.2	-0.3	-0.3	-0.3	-0.3	-0.5	-0.2	0.0	0.5	0.2	-0.2	-0.1	0.2	-0.4	-0.4	-0.5	-0.5	-0.4	-0.2	0.5																						
16-Dec	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	0.3	0.2	0.1	0.2	0.3	0.5	0.5	0.3	0.7	0.1	0.0	0.2	0.7	0.4	0.2	0.1	0.5	0.4	0.2	0.7																						
17-Dec	0.2	-0.1	0.6	0.2	0.1	0.1	0.2	0.2	0.5	0.6	0.6	0.4	0.4	0.2	0.3	0.8	0.4	0.3	0.6	0.7	0.8	0.2	0.9	0.2	0.4	0.9																						
18-Dec	0.1	0.6	0.2	0.5	0.3	0.3	0.3	0.2	0.3	0.4	0.2	0.4	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.2	0.3	0.2	0.2	0.6																						
19-Dec	0.4	0.6	0.7	0.5	1.0	0.4	0.2	0.3	0.3	0.1	0.1	0.0	-0.1	0.1	-0.2	-0.2	-0.1	-0.2	0.0	0.1	0.2	0.5	0.1	0.2	0.2	1.0																						
20-Dec	0.3	0.1	0.1	0.5	0.8	0.5	2.4	3.3	1.9	1.3	0.8	1.0	0.6	2.0	2.7	2.5	2.4	1.1	1.0	0.5	0.6	1.1	1.0	2.0	1.3	3.3																						
21-Dec	0.9	0.8	1.3	1.0	0.0	2.2	0.9	0.8	1.0	1.5	1.7	1.4	0.5	0.3	0.2	0.8	1.4	2.2	1.9	1.2	1.2	0.7	0.4	0.2	1.0	2.2																						
22-Dec	0.4	0.3	0.6	0.9	0.5	1.1	0.9	0.0	0.1	0.3	0.4	0.1	0.1	0.4	0.1	0.2	0.3	-0.1	-0.3	0.2	0.3	0.2	0.2	1.0	0.3	1.1																						
23-Dec	0.0	0.4	0.4	0.6	0.7	0.4	0.3	0.4	-0.3	0.3	0.4	0.4	0.0	-0.3	0.1	-0.1	0.2	0.1	0.3	0.5	0.6	1.0	1.2	1.3	0.4	1.3																						
24-Dec	0.8	0.6	0.8	0.5	0.2	0.2	0.1	0.0	0.2	0.2	0.1	0.2	0.1	0.2	-0.1	0.2	0.1	0.3	0.1	0.3	0.3	0.1	0.1	0.1	0.2	0.8																						
25-Dec	0.2	-0.2	-0.4	-0.4	-0.1	0.0	0.7	0.8	0.6	0.7	1.3	0.9	0.7	1.3	0.3	1.3	1.9	1.7	1.4	1.2	0.8	0.7	1.1	1.1	0.7	1.9																						
26-Dec	1.0	1.2	1.2	1.6	2.3	1.8	0.9	1.0	1.4	2.1	2.1	1.4	0.7	0.5	0.9	0.9	0.6	0.8	0.2	-0.9	-0.4	0.0	0.4	0.6	0.9	2.3																						
27-Dec	0.7	0.3	0.3	0.4	-0.2	-0.1	0.4	0.0	0.3	-0.3	0.4	0.8	0.9	0.8	1.0	1.1	1.3	0.7	1.0	1.4	1.8	3.8	-0.1	0.0	0.7	3.8																						
28-Dec	0.3	0.0	0.1	0.1	0.3	0.2	0.2	0.4	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.0	0.3	-0.1	-0.1	-0.1	0.0	0.1	0.1	0.4																						
29-Dec	0.0	0.1	0.1	0.1	0.2	0.3	0.2	0.4	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.4																						
30-Dec	0.2	0.8	0.6	0.5	0.4	0.6	0.6	0.7	0.0	0.8	0.8	0.9	0.6	0.8	0.7	2.6	1.6	0.7	2.1	3.8	0.7	0.1	0.2	0.0	0.9	3.8																						
31-Dec	-0.1	0.1	0.1	0.2	0.5	0.6	0.5	0.1	0.2	-0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.4	2.1	2.1	0.5	0.7	0.3	0.9	0.7	0.4	2.1																						
																								0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.5	0.3	0.4	0.4	0.5	0.6	0.6	0.6	0.5	0.4	0.5	0.5	0.4	Diurnal Average
																								2.5	1.2	1.5	1.6	2.3	2.2	2.4	3.3	2.1	2.8	2.1	2.8	2.7	3.2	2.9	3.2	3.7	3.2	2.9	3.8	2.9	4.1	3.0	2.5	Diurnal Maximum



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 167 m (VW167m) - km/h
Lower Camp Met Tower - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.4 km/h on Dec 2 20:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: 0.1 km/h on Dec 9 02:00																										
Percentiles: P ₁ = 0.2 P ₁₀ = 0.4 Q ₁ = 0.6 Median = 0.9 Q ₃ = 1.5 P ₉₀ = 2.0 P ₉₉ = 3.1																										
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.1	1.1	1.0	1.3	1.1	0.8	0.8	0.9	0.9	0.8	0.9	0.8	0.8	0.9	0.8	0.7	0.9	1.1	1.0	0.6	0.7	0.6	0.8	0.7	1.3	
2-Dec	0.7	0.7	1.2	1.0	1.3	1.4	1.2	1.8	1.3	1.2	2.0	2.1	2.0	2.6	2.5	2.9	2.9	3.2	3.2	3.4	3.0	3.2	2.8	2.8	3.4	
3-Dec	3.1	2.5	2.3	2.4	2.5	2.4	1.9	2.3	2.4	2.0	2.1	1.7	1.0	1.5	1.7	1.1	1.0	1.7	2.0	1.8	1.7	1.0	1.2	1.3	3.1	
4-Dec	1.5	1.0	1.0	2.5	2.4	2.8	3.0	3.2	3.1	2.6	1.9	0.9	1.6	1.5	1.6	1.3	1.9	2.5	1.9	2.5	1.9	1.1	0.4	1.2	1.9	3.2
5-Dec	2.1	2.9	1.8	1.5	1.6	1.7	1.5	1.6	1.5	2.2	2.6	2.9	1.6	2.5	2.4	2.2	2.4	2.5	2.2	2.7	2.1	1.8	1.6	1.2	2.9	
6-Dec	1.2	1.4	2.0	1.6	1.7	2.0	1.8	1.8	1.8	2.6	2.3	1.8	2.0	2.0	1.8	1.6	0.8	0.7	1.0	1.1	1.2	1.5	1.5	1.8	2.6	
7-Dec	1.1	0.9	0.9	0.8	1.1	1.3	1.1	1.2	1.3	1.7	1.1	1.3	1.1	1.3	0.8	0.3	0.2	0.2	0.9	0.6	0.4	0.5	0.6	0.6	1.7	
8-Dec	0.6	1.2	1.2	1.4	1.3	1.6	1.1	0.5	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.2	0.1	0.2	0.3	0.3	1.6	
9-Dec	0.1	0.1	0.3	0.4	0.6	0.5	0.5	0.6	0.7	0.7	0.6	0.5	0.4	0.4	0.6	0.5	0.5	0.7	0.7	0.7	0.5	0.6	0.7	0.6	0.7	
10-Dec	0.6	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.5	0.5	0.5	0.5	0.4	0.7	0.5	0.6	0.6	0.4	0.6	0.8	1.3	0.9	0.9	1.2	1.3	
11-Dec	0.9	0.9	0.9	1.1	1.5	1.2	1.2	1.5	1.5	1.3	1.3	2.1	1.5	1.9	2.4	2.1	1.1	1.1	1.2	2.3	1.8	1.0	1.8	2.5	2.5	
12-Dec	1.8	1.1	1.6	1.4	1.2	1.4	0.9	0.8	1.5	2.3	1.9	1.4	1.3	0.6	0.8	0.8	0.6	0.9	0.5	0.6	1.3	1.5	1.6	2.2	2.3	
13-Dec	1.8	3.1	2.9	3.3	2.5	2.4	2.6	2.3	1.6	1.5	0.8	0.6	0.9	0.5	0.3	0.9	0.8	0.9	1.0	0.8	0.6	0.9	1.1	0.9	3.3	
14-Dec	0.5	0.5	0.5	0.6	0.6	0.5	0.9	0.9	0.7	0.9	0.7	0.6	0.5	0.5	0.3	0.3	0.6	0.3	0.4	0.5	0.9	0.7	1.0	0.6	1.0	
15-Dec	0.6	0.8	1.7	2.0	1.9	0.9	1.1	1.0	1.6	1.0	0.8	1.2	1.3	1.3	1.3	1.1	1.1	0.7	1.0	1.6	0.8	1.0	1.0	0.9	2.0	
16-Dec	0.7	0.5	0.3	0.3	0.3	0.5	0.5	0.3	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.7	0.6	0.5	0.4	0.2	0.3	0.4	0.6	0.4	0.7	
17-Dec	0.3	0.5	0.6	0.4	0.5	0.4	0.4	0.7	0.7	0.6	0.7	0.8	0.5	0.5	0.7	0.8	0.7	0.6	1.0	0.9	1.0	0.4	1.0	0.7	1.0	
18-Dec	0.6	0.8	0.6	0.8	0.9	0.7	0.5	0.4	0.4	0.4	0.2	0.4	0.4	0.1	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.2	0.5	0.5	0.9	
19-Dec	0.5	1.2	1.1	1.3	0.8	1.4	0.7	1.4	0.8	0.6	0.3	0.4	0.4	0.5	0.4	0.6	0.3	0.4	0.6	0.4	0.3	0.5	0.3	0.5	1.4	
20-Dec	0.8	0.7	0.8	0.9	1.9	1.3	1.7	1.5	1.5	1.7	1.3	1.3	1.6	1.2	1.0	1.0	1.0	1.1	0.9	0.7	0.9	1.2	1.9	1.4	1.9	
21-Dec	1.7	1.7	1.4	2.3	2.1	2.3	1.6	1.6	1.2	1.2	1.4	1.6	2.0	1.7	1.3	1.5	1.7	2.2	1.3	1.6	1.3	1.1	1.5	1.6	2.3	
22-Dec	1.3	1.3	1.1	0.9	1.2	0.9	1.1	1.4	1.6	1.0	1.9	2.5	1.9	2.5	2.0	1.5	2.2	2.3	1.8	2.0	2.3	1.5	1.7	1.8	2.5	
23-Dec	2.0	1.6	1.8	2.2	2.0	1.5	1.8	2.0	1.4	1.4	1.5	1.3	0.9	0.8	0.8	0.7	0.5	0.4	0.4	0.6	1.1	1.0	1.1	1.2	2.2	
24-Dec	0.9	0.7	0.8	0.8	0.3	0.3	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.4	0.5	0.6	0.6	0.4	0.6	0.9	0.6	0.7	0.6	0.9	
25-Dec	0.5	0.6	0.7	0.7	0.6	0.6	0.9	0.9	0.8	0.7	0.9	0.9	0.8	1.0	1.0	1.5	1.5	1.6	1.5	1.2	1.3	1.3	0.9	0.9	1.6	
26-Dec	0.7	0.7	1.0	1.0	0.9	0.9	1.4	1.3	1.4	1.5	1.9	1.9	1.9	1.9	1.8	1.7	1.9	1.6	1.4	1.4	1.1	1.2	1.1	1.3	1.9	
27-Dec	1.4	1.2	1.1	1.6	1.1	0.8	0.9	1.2	1.3	1.2	1.6	1.3	1.3	1.3	1.2	0.9	0.7	0.8	1.3	0.9	1.1	1.8	0.6	0.4	1.8	
28-Dec	0.7	0.5	1.3	1.7	2.0	1.5	1.3	1.4	1.8	1.4	1.2	0.9	0.7	0.6	0.2	0.3	0.2	0.3	0.7	0.4	0.3	0.3	0.3	0.6	2.0	
29-Dec	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.5	0.7	0.5	0.6	0.6	0.4	0.4	0.5	0.8	0.5	0.4	0.4	0.8	
30-Dec	0.7	0.7	0.7	0.7	0.7	0.9	0.8	0.7	0.6	0.7	0.9	1.0	1.1	1.0	1.0	1.1	1.4	1.8	1.3	1.5	2.4	1.0	1.9	1.0	2.4	
31-Dec	0.6	0.3	0.3	0.5	0.4	0.5	0.7	0.7	0.6	0.5	0.5	0.9	0.8	0.6	0.3	0.4	2.1	2.3	1.9	1.1	1.0	1.0	1.6	1.8	2.3	
	3.1	3.1	2.9	3.3	2.5	2.8	3.0	3.2	3.1	2.6	2.6	2.9	2.0	2.6	2.5	2.9	2.9	3.2	3.2	3.4	3.0	3.2	2.8	2.8		
	Diurnal Maximum																									



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 4 BUFFALO VIEWPOINT DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	710	34	34	100.00	15	0	3	0
H2S (ppb) Average	710	34	34	100.00	4	0	1	0
THC (ppm) Average	572	29	172	80.78	4.8	-	3.2	-
Temperature (C) Average	744	0	0	100.00	2.7	-	-1.7	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	91	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	27	-	22	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	710	0.5	1	-	0	0	0	0	0	1	15
H2S (ppb) Average	710	0.4	0	-	0	0	0	0	0	1	4
THC (ppm) Average	572	2.48	0.4	-	2.1	2.2	2.3	2.3	2.5	2.9	4.8
Temperature 2 m (C) Average	744	-17.26	9.1	-	-38.8	-29.2	-23.6	-17.2	-11.6	-3.3	2.7
Relative Humidity (%) Average	744	78.9	6	-	59	71	74	79	83	87	96
Wind Speed 10 m (km/h) Average	743	9.8	6	-	0	3	6	8	13	18	27
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	21 Dec 2016 03:00	27 Dec 2016 01:00	143	Analyzer Failure - solenoid relay failure
Wind Speed, Wind Direction	08 Dec 2016 23:00	08 Dec 2016 23:00	1	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 15 ppb on Dec 18 13:00	Maximum Daily Average: 2.6 ppb on Dec 18		Hours of Data:	710
Minimum Value: 0 ppb on Dec 11 11:00	Minimum Daily Average: 0.0 ppb on Dec 5		Hours of Missing Data:	34
Maximum Diurnal Average: 1.0 ppb at hour 13	Minimum Diurnal Average: 0.3 ppb at hour 7		Hours of Calibration:	34
Monthly Average: 0.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 5		Percent Operational Time:	100.0

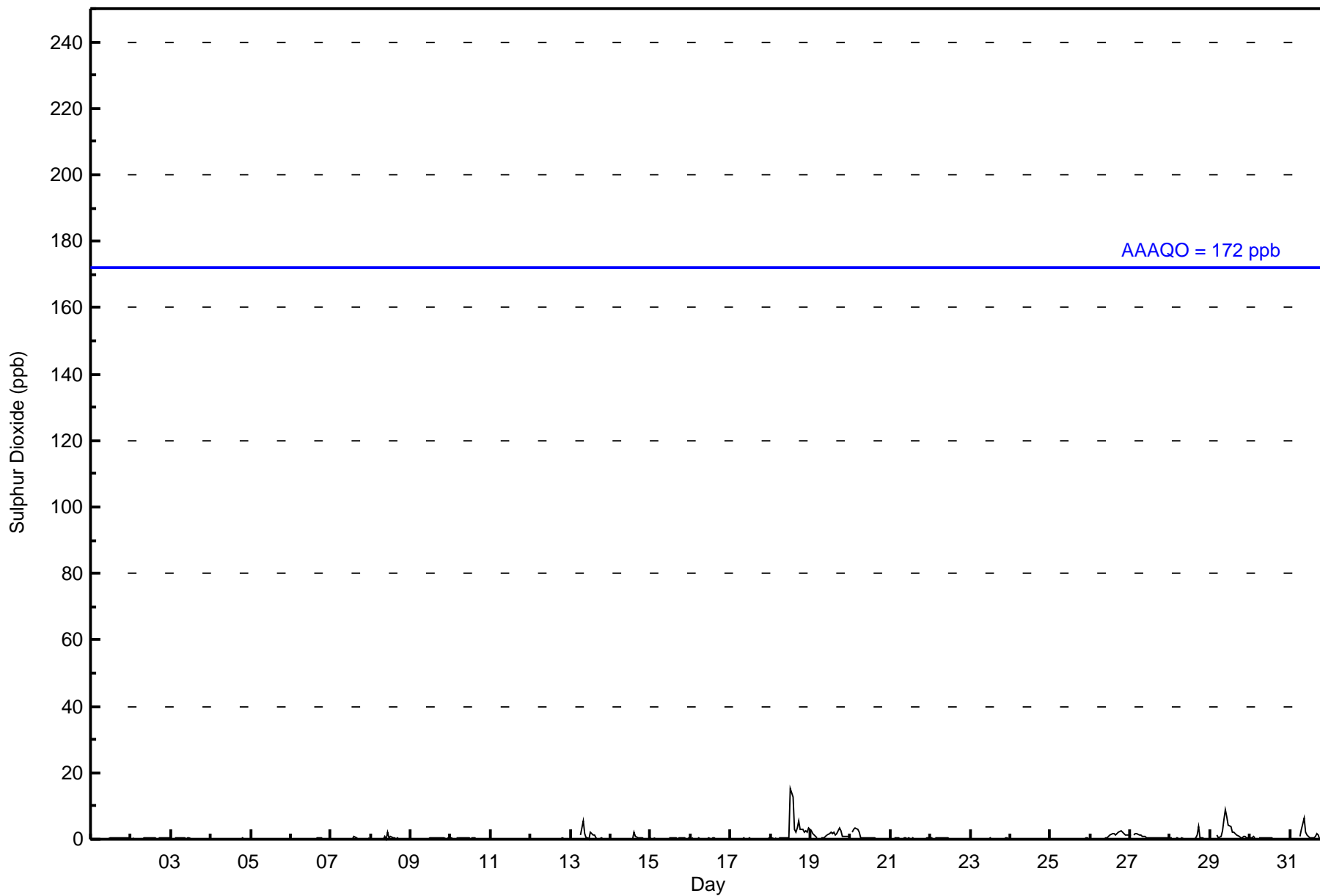
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1	1
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1
8-Dec	Z	0	0	0	0	0	0	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	2
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	Z	1	5	2	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0.7	5
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0.3	2
15-Dec	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	15	13	3	2	3	5	3	3	2	3	2	3	2.6	15
19-Dec	3	2	1	1	1	Z	0	0	0	1	1	2	2	2	2	1	2	4	2	1	1	1	1	1	1.3	4
20-Dec	Z	2	3	3	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	3
21-Dec	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	2	2	1	1	2	3	2	2	1	1	1	1.0	3
27-Dec	1	Z	1	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0.4	4
29-Dec	0	0	0	Z	1	0	1	2	6	9	7	4	4	2	2	2	1	1	0	0	1	1	1	0	2.0	9
30-Dec	0	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
31-Dec	0	0	0	0	0	Z	1	3	6	2	1	1	0	0	0	1	2	1	0	0	0	0	0	0	0.9	6
	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.5	0.7	0.6	0.6	0.4	1.0	0.8	0.6	0.4	0.5	0.7	0.4	0.4	0.3	0.3	0.3	0.3	Diurnal Average	
	3	2	3	3	3	2	1	5	6	9	7	4	15	13	3	2	3	5	3	3	2	3	2	3	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	708	99.72	99.72
11 - 20	2	0.28	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	76	46	14	6	0	7	56	199	37	23	15	54	31	77	38	28	707
11 - 20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	78	46	14	6	0	7	56	199	37	23	15	54	31	77	38	28	709

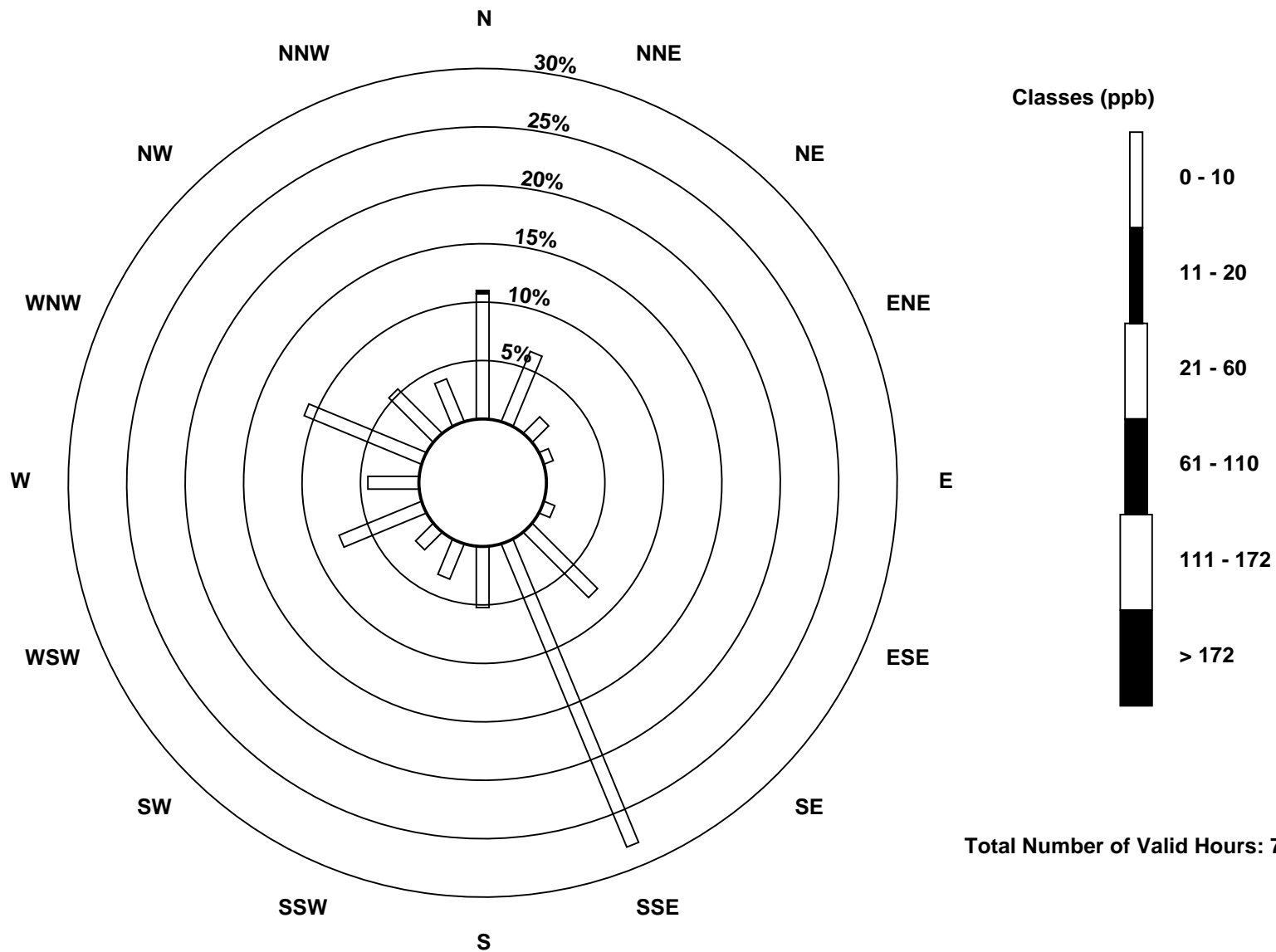
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

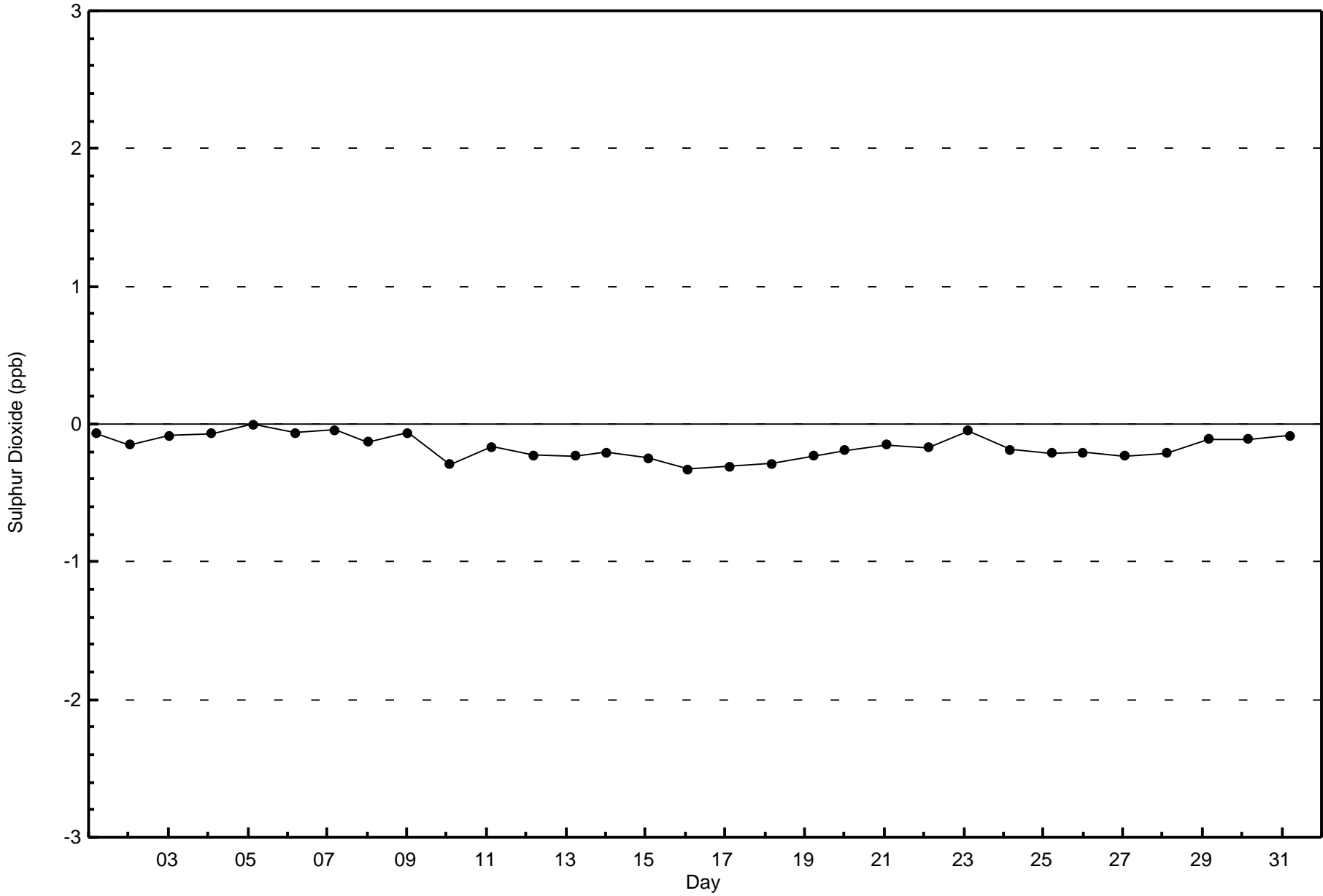
Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint (AMS 4)





WBEA Data PC
Zero Responses

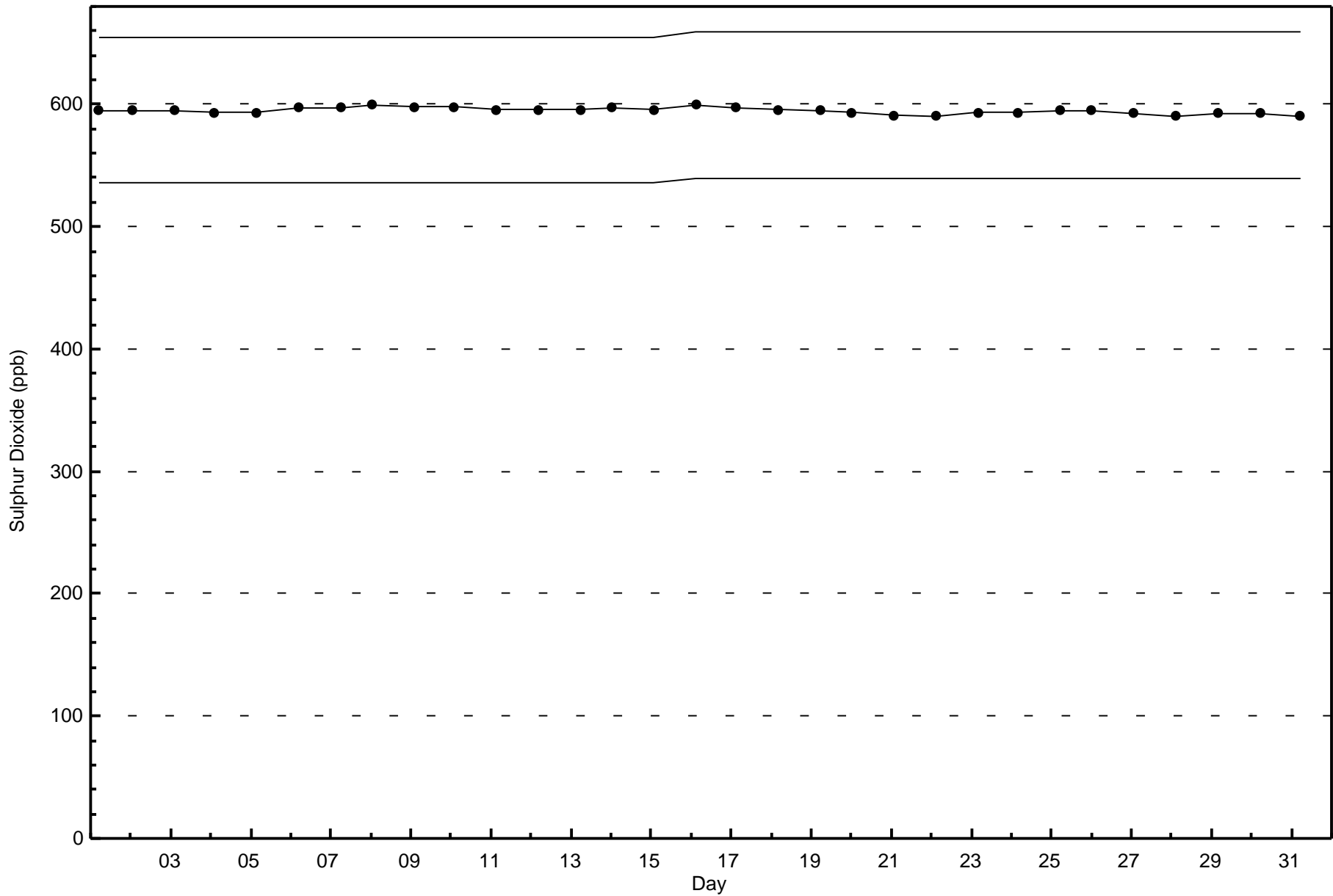
Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - December 2016





Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 ppb on Dec 18 13:00	Maximum Daily Average: 1.2 ppb on Dec 29		Hours of Data:	710
Minimum Value: 0 ppb on Dec 4 02:00	Minimum Daily Average: 0.1 ppb on Dec 4		Hours of Missing Data:	34
Maximum Diurnal Average: 0.6 ppb at hour 13	Minimum Diurnal Average: 0.3 ppb at hour 6		Hours of Calibration:	34
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 2		Percent Operational Time:	100.0

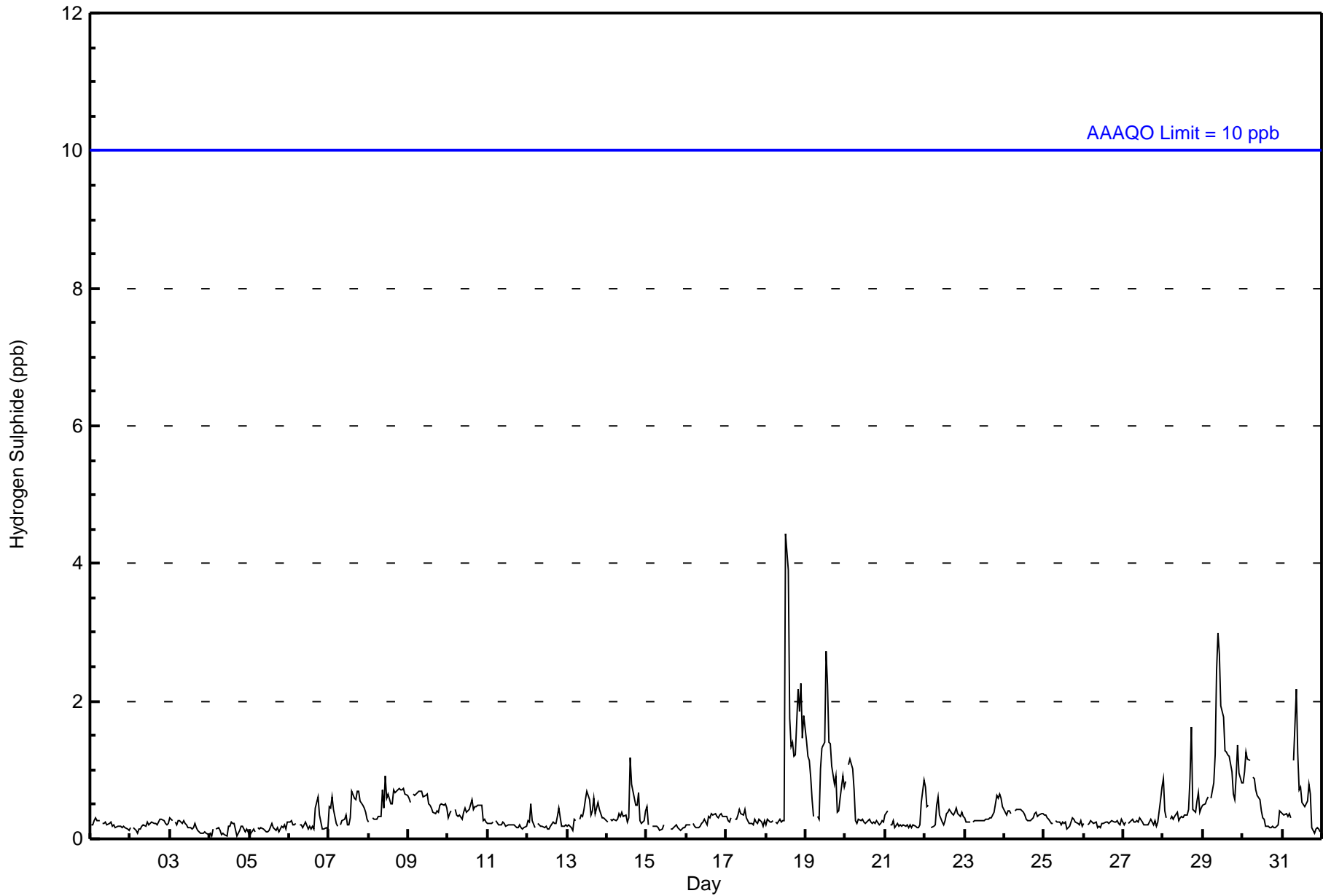
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.2	1
7-Dec	0	0	1	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0.4	1
8-Dec	0	Z	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
9-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0.5	1
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0.4	1
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0.4	1
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	4	4	2	1	1	1	1	1	2	2	2	1	2	1.2	4
19-Dec	1	1	1	1	1	0	Z	0	0	1	1	1	3	2	1	1	1	1	1	1	0	0	1	1	1	1.0	3
20-Dec	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
22-Dec	1	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0.3	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
28-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	1	0	0	0	0.5	2
29-Dec	0	1	1	1	Z	1	1	1	2	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.2	3
30-Dec	1	1	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
31-Dec	0	0	0	0	0	0	Z	1	2	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0.5	2
0.4																								Diurnal Average	0.4		
1																								Diurnal Maximum	2		

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb



WBEA Data PC
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	705	99.30	99.30
3 - 4	5	0.70	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**WBEA Data PC
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	76	44	13	6	0	7	57	197	39	23	15	54	28	78	39	28	704
3 - 4	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	79	44	13	6	0	7	57	197	39	23	15	54	28	79	39	29	709

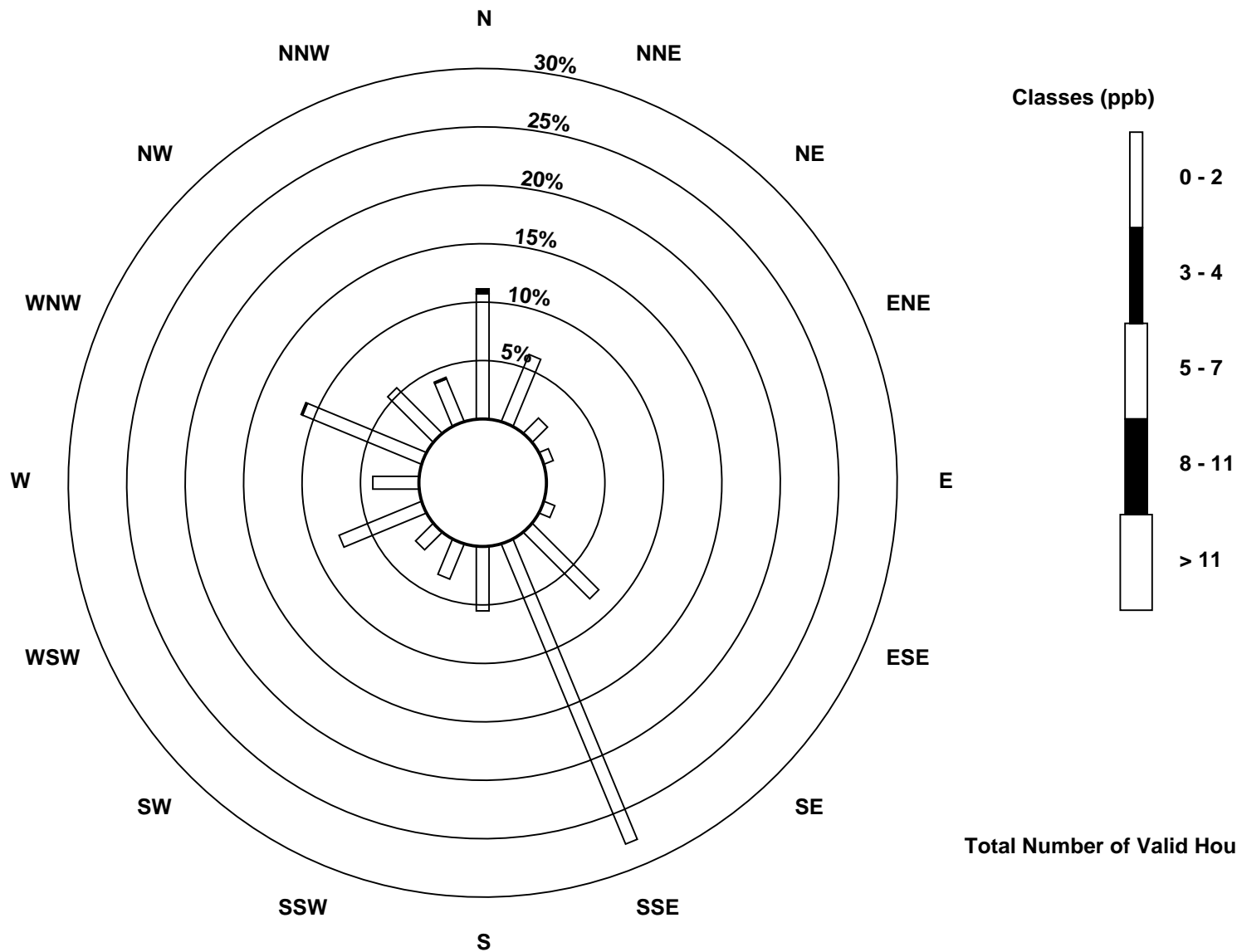
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint (AMS 4)

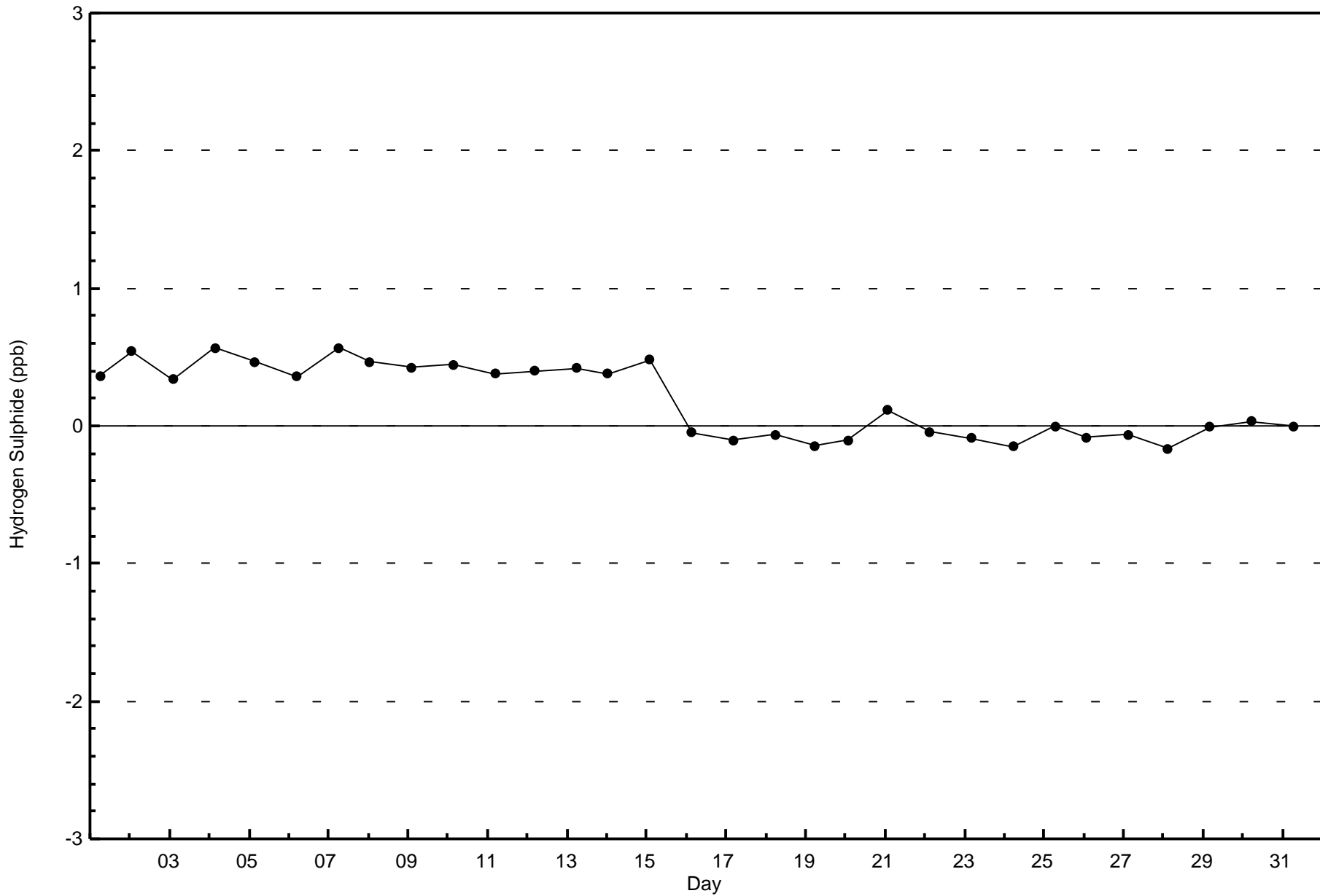


Total Number of Valid Hours: 709



WBEA Data PC
Zero Responses

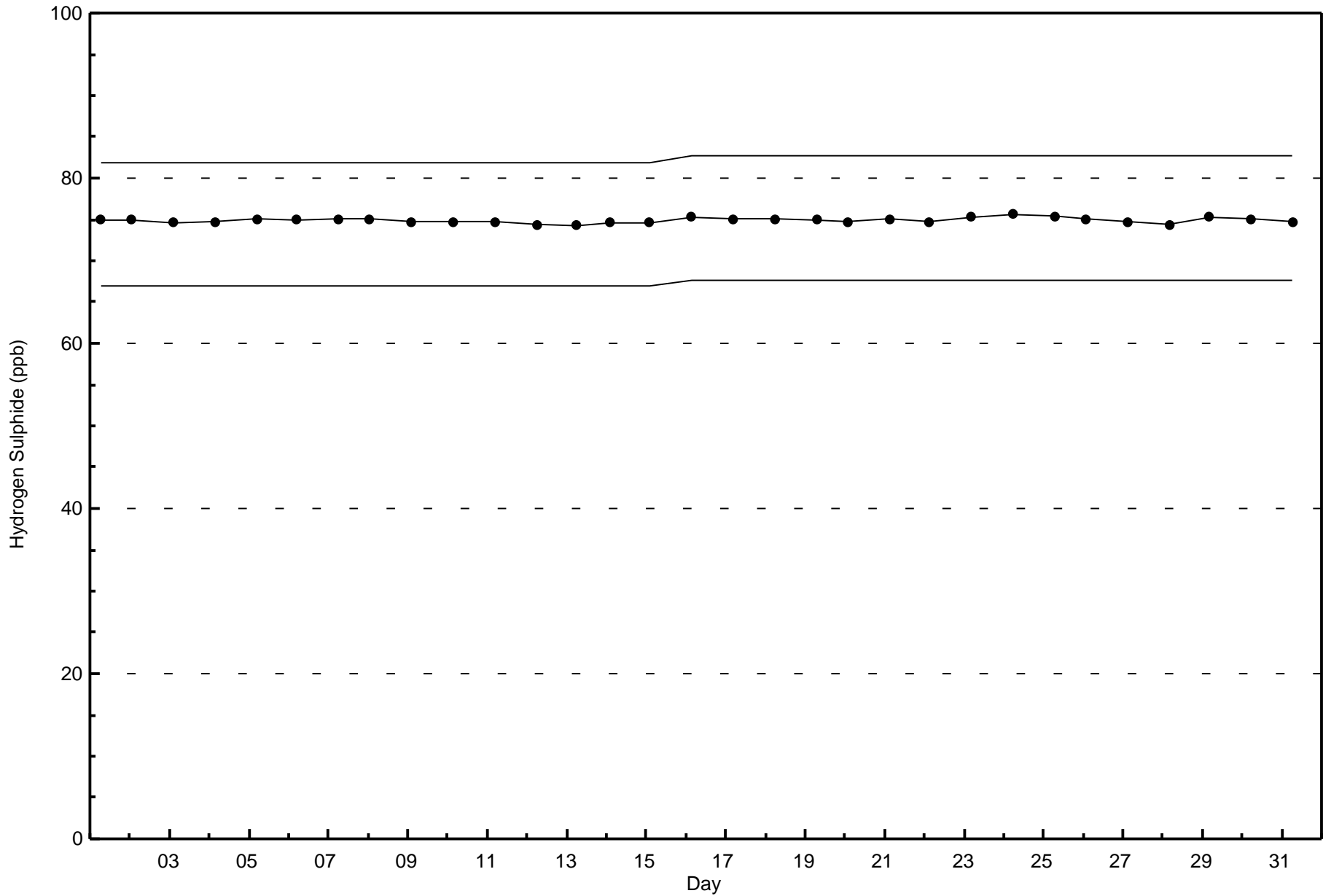
Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - December 2016





WBEA Data PC
Span Responses

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - December 2016



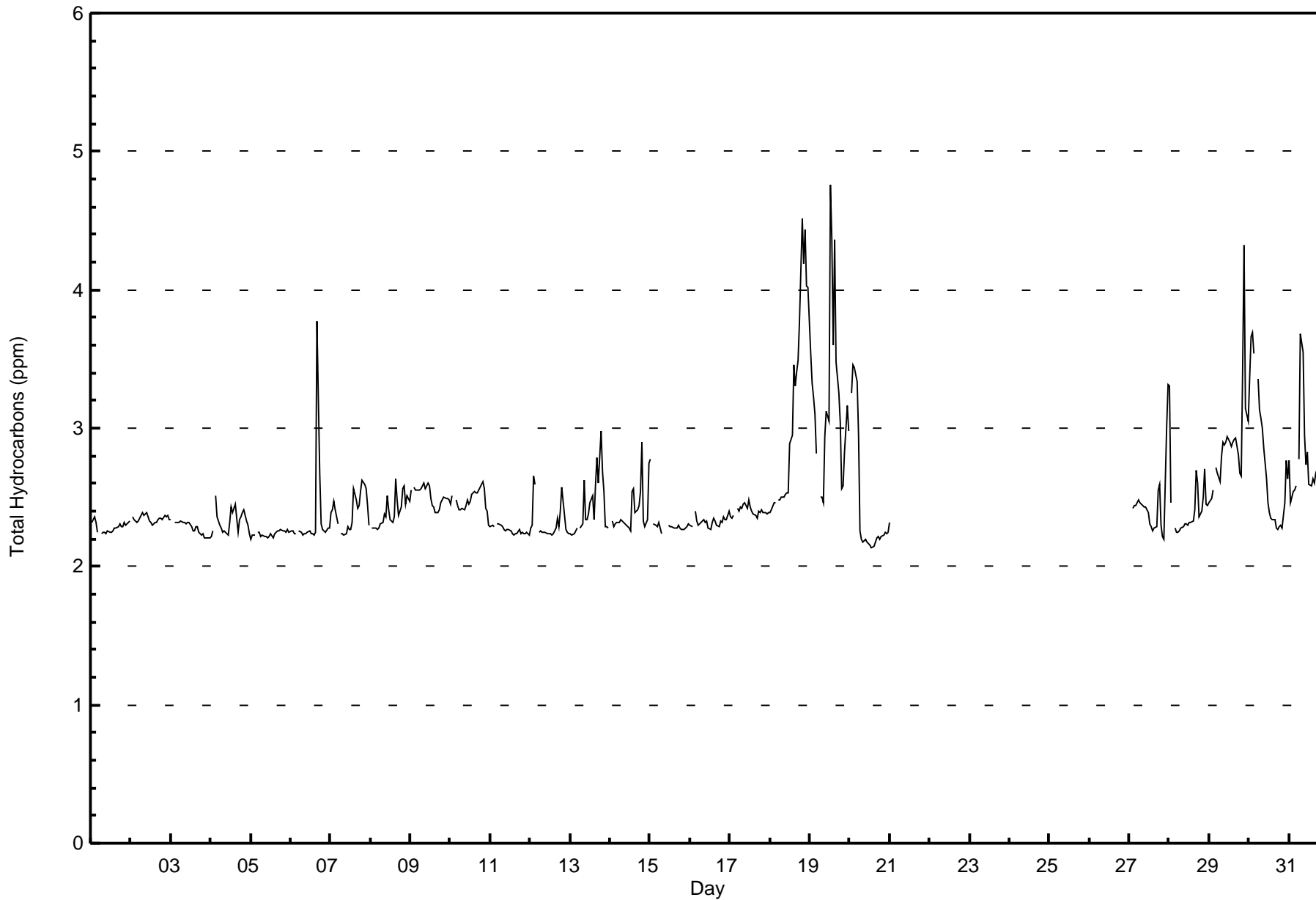


Maximum Value: 4.8 ppm on Dec 19 13:00																					Maximum Daily Average: 3.2 ppm on Dec 19						Hours in Service: 744	
Minimum Value: 2.1 ppm on Dec 20 14:00																					Minimum Daily Average: 2.2 ppm on Dec 5						Hours of Data: 572	
Maximum Diurnal Average: 2.5 ppm at hour 17																					Minimum Diurnal Average: 2.4 ppm at hour 7						Hours of Missing Data: 172	
Monthly Average: 2.48 ppm																					Percentiles: P ₁ = 2.2 P ₁₀ = 2.2 Q ₁ = 2.3 Median = 2.3 Q ₃ = 2.5 P ₉₀ = 2.9 P ₉₉ = 4.3						Hours of Calibration: 29	
																											Percent Operational Time: 80.8	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	2.3	2.3	2.4	2.3	2.3	Z	2.2	2.3	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3			
2-Dec	Z	2.4	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.4	2.4	2.4	2.3	2.3			
3-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3			
4-Dec	2.2	2.3	Z	2.5	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.4	2.4	2.4	2.5	2.2	2.3	2.4	2.4	2.3	2.3	2.2	2.2	2.3			
5-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.2			
6-Dec	2.3	2.3	2.2	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	3.8	2.7	2.3	2.3	2.3	2.2	2.3	2.3	2.3			
7-Dec	2.4	2.4	2.5	2.4	2.3	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.6	2.5	2.4	2.4	2.5	2.6	2.6	2.6	2.4	2.3	2.4			
8-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.4	2.3	2.3	2.4	2.6	2.5	2.4	2.4	2.6	2.6	2.4	2.5	2.5	2.4			
9-Dec	2.6	Z	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5			
10-Dec	2.5	2.5	Z	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.4	2.4	2.3	2.5			
11-Dec	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.3			
12-Dec	2.3	2.3	2.7	2.6	Z	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.6	2.4	2.3	2.3	2.2	2.3			
13-Dec	2.2	2.2	2.2	2.3	2.3	Z	2.3	2.3	2.6	2.3	2.3	2.4	2.5	2.5	2.3	2.6	2.8	2.6	3.0	2.7	2.5	2.3	2.3	2.3	2.4			
14-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.6	2.4	2.4	2.4	2.5	2.9	2.3	2.3	2.3	2.7	2.4			
15-Dec	2.8	Z	2.3	2.3	2.3	2.3	2.3	2.2	C	C	C	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3			
16-Dec	2.3	2.3	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.4			
17-Dec	2.4	2.4	2.4	Z	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4			
18-Dec	2.4	2.4	2.5	2.5	Z	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.9	3.0	3.5	3.3	3.4	3.5	3.8	4.5	4.2	4.4	4.0	4.0	3.1			
19-Dec	3.5	3.3	3.2	3.1	2.8	Z	2.5	2.5	2.5	2.9	3.1	3.1	4.8	4.4	3.6	4.4	3.5	3.2	3.0	2.6	2.6	2.8	3.2	3.0	3.2			
20-Dec	Z	3.3	3.5	3.4	3.3	2.9	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.4			
21-Dec	2.3	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF			
22-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF			
23-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF			
24-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF			
25-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF			
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF			
27-Dec	AF	Z	2.4	2.4	2.4	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.6	2.6	2.3	2.2	2.2	3.0	3.3	2.5			
28-Dec	3.3	2.5	Z	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.7	2.6	2.4	2.4	2.5	2.7	2.4	2.4	2.4			
29-Dec	2.5	2.5	2.6	Z	2.7	2.7	2.6	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.8	2.7	2.7	3.4	4.3	3.1	3.0			
30-Dec	3.4	3.7	3.7	3.5	Z	3.4	3.1	3.1	3.0	2.9	2.6	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.8	2.6	2.8			
31-Dec	2.8	2.5	2.5	2.6	2.6	Z	2.8	3.7	3.5	2.9	2.7	2.8	2.6	2.6	2.6	2.6	2.7	2.7	2.2	2.2	2.2	2.2	2.2	2.2	2.6			
																					Diurnal Average							
2.5 2.5 2.5 2.5 2.4 2.4 2.4 2.4 2.5 2.4 2.4 2.4 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5																					Diurnal Maximum							
3.5 3.7 3.7 3.5 3.3 3.4 3.1 3.7 3.5 2.9 3.1 3.1 4.8 4.4 3.6 4.4 3.8 3.5 3.8 4.5 4.2 4.4 4.0 4.0																												
Z - zerospan C - Calibration AF - Analyzer Failure																												



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	530	92.66	92.66
3.1 - 10.0	42	7.34	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 572

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	45	35	13	6	0	6	38	129	29	17	11	43	29	74	36	18	529
3.1 - 10.0	5	4	1	0	0	1	4	8	1	3	1	0	1	2	2	9	42
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	50	39	14	6	0	7	42	137	30	20	12	43	30	76	38	27	571

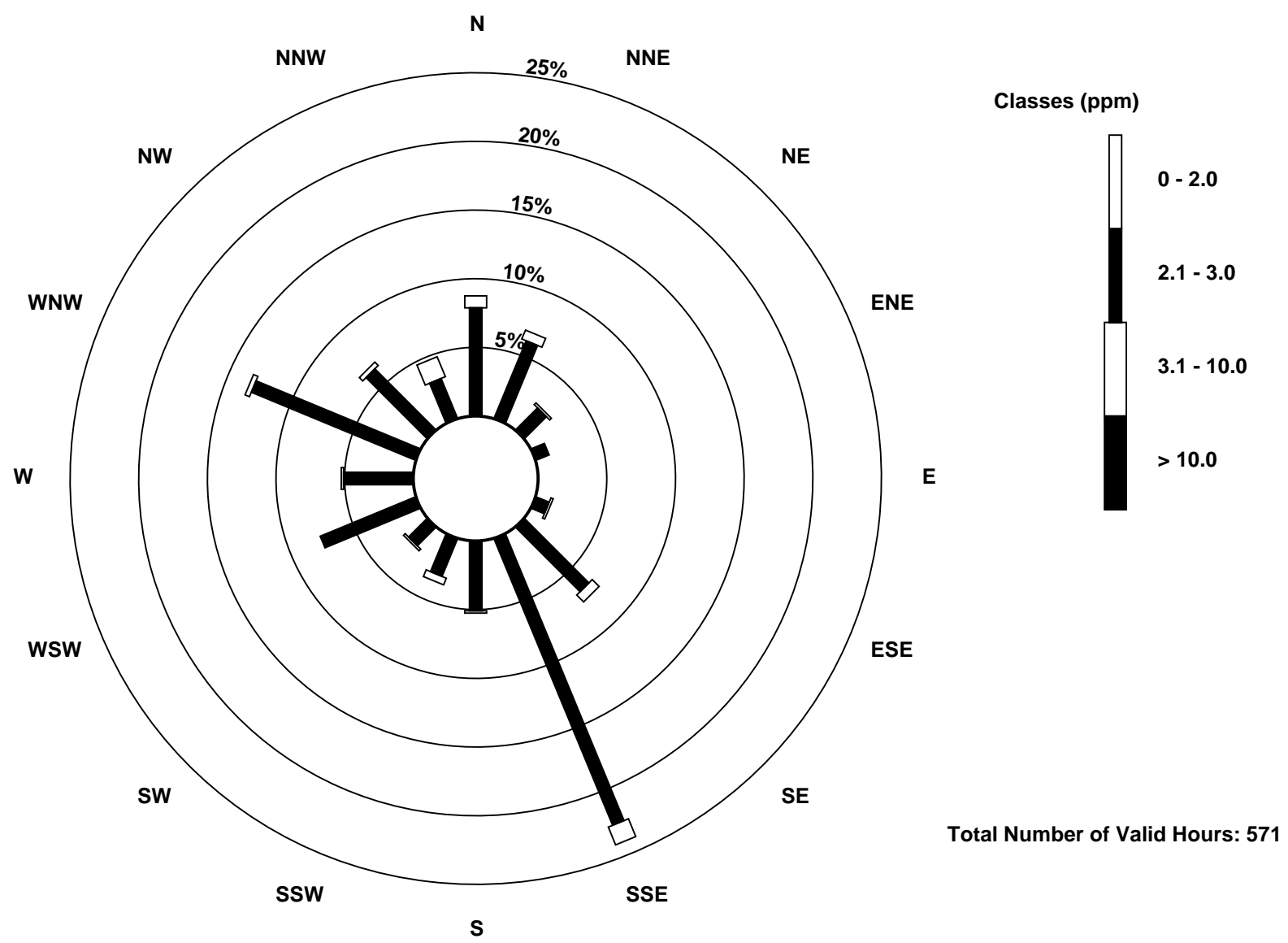
Total Number of Valid Hours: 571

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

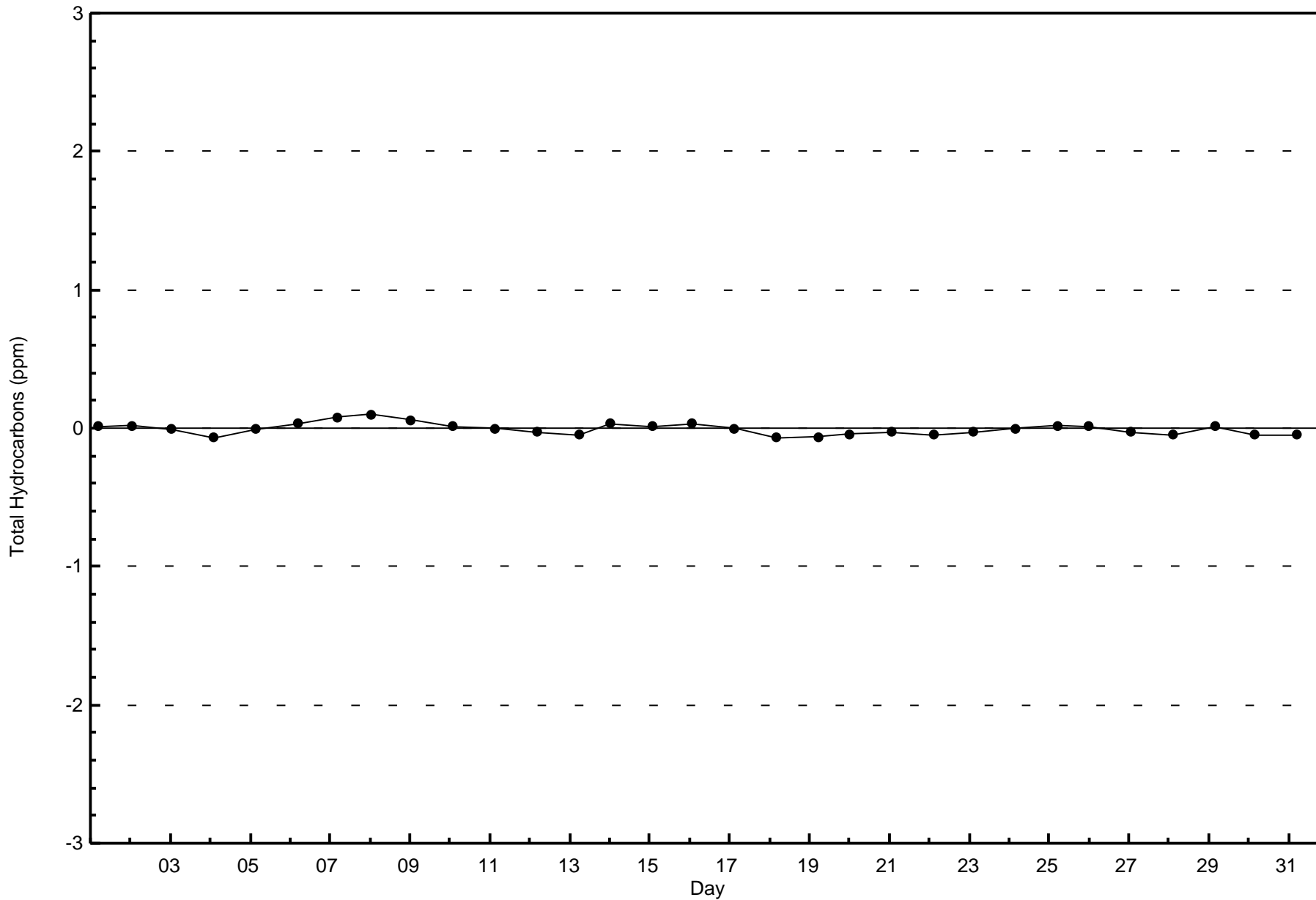
Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint (AMS 4)





WBEA Data PC
Zero Responses

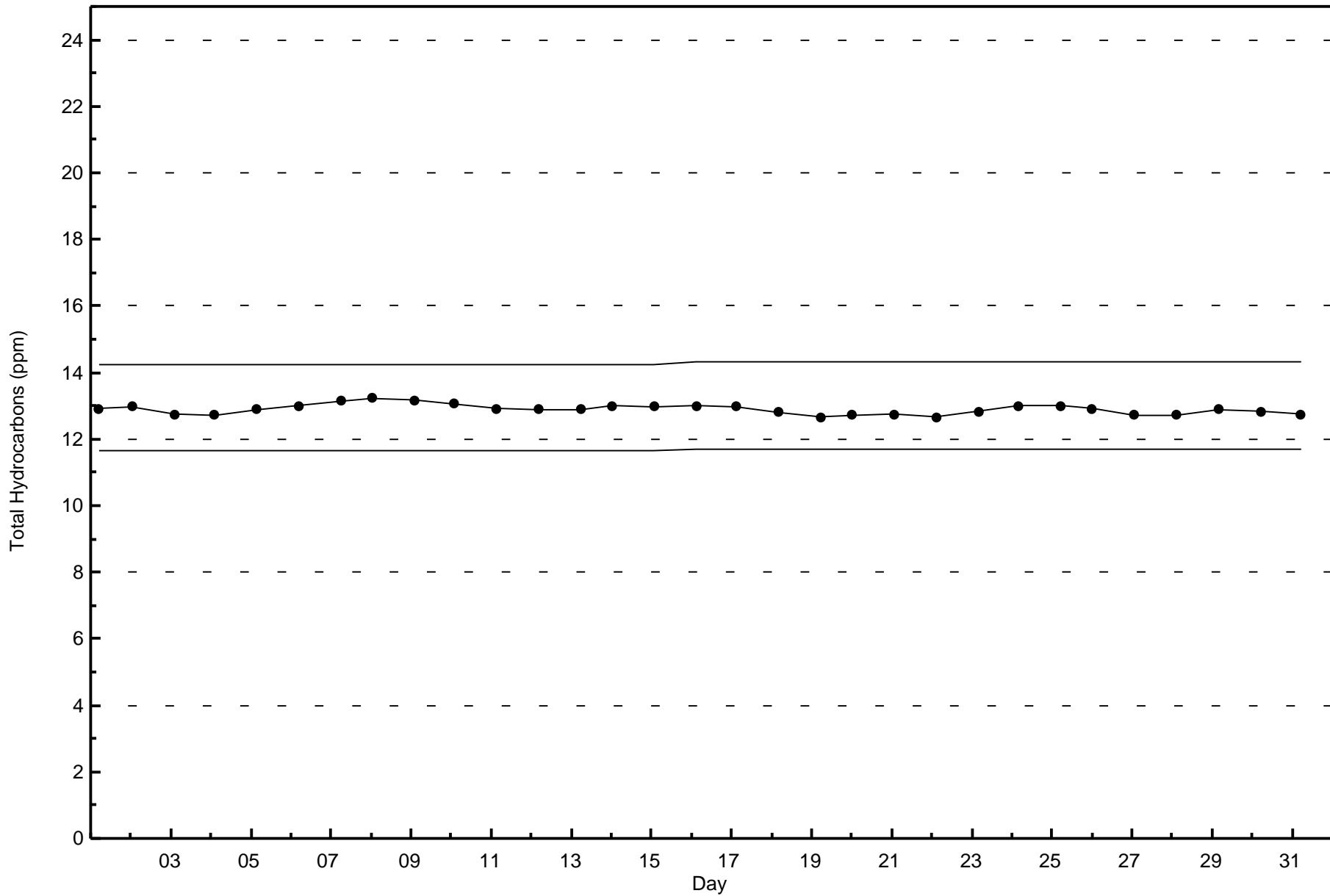
Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

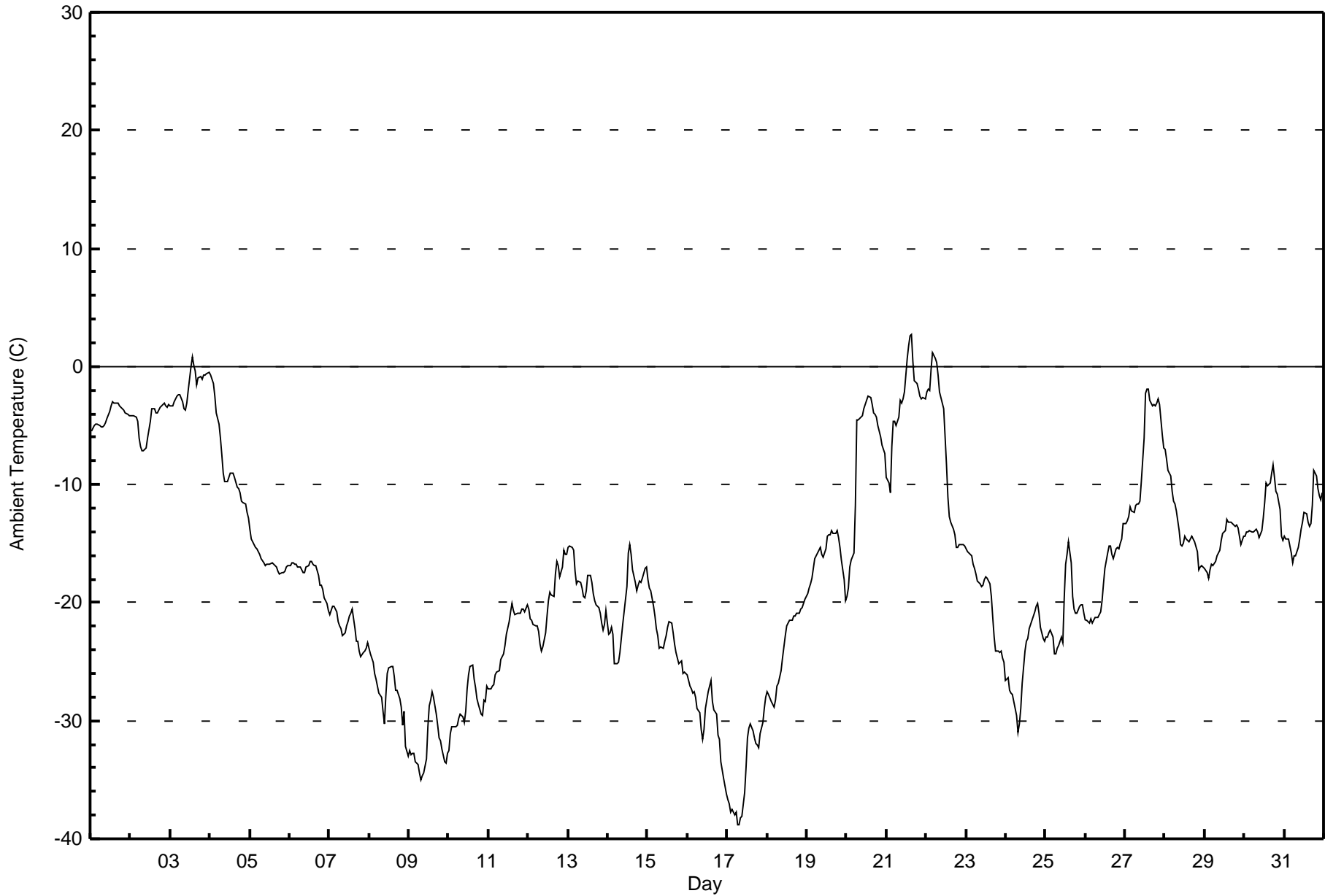
Ambient Temperature (AT) - C
Buffalo Viewpoint - December 2016

Maximum Value: 2.7 C on Dec 21 16:00 Maximum Daily Average: -1.7 C on Dec 3																							Hours in Service:	744		
Minimum Value: -38.8 C on Dec 17 07:00 Minimum Daily Average: -34.1 C on Dec 17																							Hours of Data:	744		
Maximum Diurnal Average: -15.2 C at hour 14 Minimum Diurnal Average: -18.5 C at hour 9																							Hours of Missing Data:	0		
Monthly Average: -17.26 C Percentiles: P ₁ = -37.5 P ₁₀ = -29.2 Q ₁ = -23.6 Median = -17.2 Q ₃ = -11.6 P ₉₀ = -3.3 P ₉₉ = 0.7																							Hours of Calibration:	0		
																							Percent Operational Time:	100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.4	-5.3	-5.0	-4.9	-4.9	-5.0	-5.1	-5.1	-5.0	-4.8	-4.4	-3.8	-3.3	-3.0	-3.1	-3.1	-3.1	-3.3	-3.5	-3.6	-3.7	-3.9	-4.0	-4.2	-4.2	-3.0
2-Dec	-4.2	-4.1	-4.2	-4.3	-4.7	-6.0	-6.8	-7.1	-7.1	-6.9	-6.1	-5.3	-4.7	-3.5	-3.5	-4.0	-3.9	-3.7	-3.5	-3.3	-3.1	-3.4	-3.4	-3.2	-4.6	-3.1
3-Dec	-3.3	-3.3	-3.0	-2.7	-2.5	-2.4	-2.4	-3.0	-3.5	-3.7	-3.1	-2.0	0.0	0.8	0.1	-0.4	-1.6	-1.0	-0.8	-1.1	-0.7	-0.7	-0.6	-0.5	-1.7	0.8
4-Dec	-0.8	-1.1	-1.5	-2.5	-3.9	-4.9	-6.0	-7.5	-9.0	-9.7	-9.8	-9.4	-9.1	-9.1	-9.1	-9.4	-10.2	-10.4	-10.7	-11.4	-11.6	-11.7	-12.4	-12.9	-8.1	-0.8
5-Dec	-13.8	-14.6	-15.0	-15.3	-15.5	-15.6	-15.9	-16.3	-16.6	-16.9	-16.7	-16.8	-16.8	-16.7	-16.7	-16.9	-17.0	-17.3	-17.5	-17.5	-17.5	-17.3	-17.0	-16.9	-16.4	-13.8
6-Dec	-16.8	-16.7	-16.6	-16.8	-16.8	-16.9	-17.0	-17.2	-17.5	-17.4	-17.0	-16.8	-16.5	-16.5	-16.7	-16.9	-16.9	-17.7	-18.5	-18.5	-18.9	-19.5	-20.0	-20.7	-17.5	-16.5
7-Dec	-21.0	-20.7	-20.4	-20.4	-20.7	-21.6	-22.0	-22.2	-22.8	-22.6	-21.9	-21.6	-21.1	-20.9	-20.6	-22.2	-23.3	-23.3	-24.1	-24.5	-24.3	-24.1	-23.8	-23.4	-22.2	-20.4
8-Dec	-23.8	-24.3	-25.0	-26.0	-26.4	-27.0	-27.6	-28.1	-29.2	-30.3	-27.9	-26.0	-25.5	-25.4	-25.4	-26.3	-27.4	-27.4	-28.1	-28.8	-30.4	-29.2	-32.2	-33.0	-27.5	-23.8
9-Dec	-32.5	-32.9	-32.7	-32.8	-33.5	-33.7	-34.4	-35.0	-34.6	-34.4	-33.2	-30.5	-28.7	-28.3	-27.5	-28.0	-29.5	-30.4	-31.5	-31.6	-32.4	-33.5	-33.6	-32.7	-32.0	-27.5
10-Dec	-32.6	-31.1	-30.5	-30.5	-30.6	-30.4	-29.8	-29.4	-29.7	-30.1	-29.2	-27.3	-26.1	-25.4	-25.3	-26.5	-27.2	-28.2	-28.6	-29.5	-29.5	-28.2	-28.4	-27.0	-28.8	-25.3
11-Dec	-27.3	-27.4	-27.0	-26.9	-26.1	-25.9	-25.8	-24.8	-24.6	-24.3	-23.6	-22.6	-21.6	-20.7	-20.1	-20.7	-21.0	-20.9	-20.9	-20.9	-20.5	-20.5	-20.8	-20.2	-23.1	-20.1
12-Dec	-20.6	-21.4	-21.4	-21.9	-22.0	-21.9	-22.4	-23.6	-24.1	-23.7	-22.6	-21.2	-19.9	-19.1	-19.4	-19.5	-17.6	-16.5	-16.9	-17.8	-17.0	-15.6	-15.9	-15.9	-19.9	-15.6
13-Dec	-15.3	-15.2	-15.4	-15.6	-17.3	-18.4	-18.1	-18.3	-18.8	-19.4	-19.6	-19.0	-17.7	-17.7	-18.3	-19.2	-19.8	-20.1	-20.4	-20.9	-21.7	-22.3	-21.9	-20.7	-18.8	-15.2
14-Dec	-22.7	-22.5	-22.1	-22.7	-25.2	-25.1	-25.0	-24.2	-23.0	-21.8	-20.8	-18.7	-15.8	-15.1	-15.9	-17.3	-18.3	-19.0	-18.6	-18.2	-18.3	-18.0	-17.1	-17.0	-20.1	-15.1
15-Dec	-18.1	-18.7	-19.0	-20.2	-21.1	-22.2	-22.8	-23.8	-23.7	-23.8	-23.3	-22.8	-22.0	-21.6	-21.7	-22.6	-23.6	-24.2	-24.7	-25.1	-24.9	-26.0	-25.9	-26.0	-22.8	-18.1
16-Dec	-26.2	-27.1	-27.4	-27.6	-27.5	-28.0	-28.9	-29.3	-30.8	-31.6	-30.8	-29.0	-27.5	-27.1	-26.6	-28.3	-29.1	-29.5	-31.2	-31.6	-33.5	-34.1	-34.9	-36.3	-29.7	-26.2
17-Dec	-36.7	-37.0	-37.8	-37.5	-38.0	-37.8	-38.8	-38.8	-38.2	-38.1	-36.1	-33.9	-31.5	-30.7	-30.2	-30.9	-31.4	-31.9	-32.1	-32.2	-31.1	-30.1	-28.9	-28.0	-34.1	-28.0
18-Dec	-27.5	-27.8	-28.4	-28.6	-28.8	-28.3	-27.1	-26.8	-25.8	-24.7	-23.8	-22.8	-22.0	-21.5	-21.5	-21.5	-21.1	-21.2	-20.8	-20.9	-20.6	-20.4	-20.1	-19.7	-23.8	-19.7
19-Dec	-19.2	-18.8	-18.4	-18.0	-17.1	-16.3	-15.8	-15.5	-15.3	-15.9	-16.2	-15.4	-14.3	-14.3	-14.2	-13.9	-14.2	-14.1	-13.9	-14.5	-15.3	-16.4	-18.1	-19.8	-16.0	-13.9
20-Dec	-19.5	-18.8	-17.0	-16.4	-15.8	-11.8	-4.6	-4.5	-4.5	-4.2	-3.5	-3.3	-2.9	-2.6	-2.6	-3.2	-3.9	-4.0	-4.3	-5.0	-6.0	-6.7	-7.0	-7.4	-7.5	-2.6
21-Dec	-9.4	-9.9	-10.7	-6.7	-4.7	-4.6	-5.0	-4.3	-2.9	-3.1	-2.8	-2.2	0.7	1.8	2.6	2.7	0.5	-1.2	-1.4	-1.9	-2.5	-2.8	-2.6	-2.7	-3.0	2.7
22-Dec	-2.1	-1.9	-2.1	-0.3	1.2	0.7	0.4	-0.7	-2.1	-2.6	-3.6	-5.9	-8.3	-11.0	-12.7	-13.2	-13.7	-14.3	-15.4	-15.3	-15.1	-15.1	-15.1	-15.1	-7.6	1.2
23-Dec	-15.4	-15.7	-15.7	-16.1	-16.8	-17.1	-17.6	-18.1	-18.4	-18.6	-18.5	-18.0	-17.8	-17.9	-18.4	-19.5	-21.2	-22.9	-24.1	-24.1	-24.2	-24.1	-24.8	-25.0	-19.6	-15.4
24-Dec	-26.6	-26.4	-27.5	-27.6	-27.7	-28.4	-29.5	-31.0	-30.3	-29.0	-26.8	-24.1	-23.3	-23.1	-22.3	-21.8	-21.5	-20.7	-20.3	-20.1	-20.9	-22.0	-23.0	-23.3	-24.9	-20.1
25-Dec	-22.9	-23.0	-22.6	-22.4	-23.0	-24.3	-24.3	-23.9	-23.6	-22.9	-23.3	-19.6	-16.8	-15.9	-14.9	-16.7	-19.4	-20.5	-20.9	-20.9	-20.3	-20.1	-20.2	-20.9	-21.0	-14.9
26-Dec	-21.4	-21.5	-21.8	-21.4	-21.7	-21.5	-21.3	-21.3	-21.1	-20.8	-19.9	-18.4	-17.0	-15.8	-15.2	-15.2	-15.9	-16.2	-15.5	-15.3	-15.4	-15.0	-14.6	-13.3	-18.2	-13.3
27-Dec	-13.3	-13.1	-12.8	-11.9	-12.2	-12.4	-11.7	-11.6	-11.6	-11.4	-9.7	-6.0	-2.2	-1.9	-1.9	-2.9	-3.3	-3.2	-3.3	-3.1	-2.7	-3.2	-5.9	-6.9	-7.4	-1.9
28-Dec	-7.0	-7.8	-8.8	-9.3	-10.6	-11.4	-11.7	-12.2	-13.9	-15.1	-15.2	-14.9	-14.4	-14.7	-14.9	-14.6	-14.4	-14.6	-14.8	-15.7	-17.2	-17.0	-16.8	-16.9	-13.5	-7.0
29-Dec	-17.2	-17.4	-17.9	-17.2	-16.8	-16.8	-16.5	-16.0	-15.8	-15.6	-14.8	-14.2	-13.8	-13.0	-13.2	-13.2	-13.2	-13.2	-13.4	-13.6	-13.4	-13.6	-14.4	-15.0	-15.0	-13.0
30-Dec	-14.3	-14.0	-14.0	-13.9	-14.1	-14.0	-13.9	-13.8	-14.0	-14.5	-13.9	-12.8	-11.5	-9.9	-10.1	-9.9	-9.0	-8.3	-9.4	-10.6	-10.8	-12.1	-14.4	-14.7	-12.4	-8.3
31-Dec	-14.4	-14.6	-14.6	-15.2	-15.8	-16.6	-16.1	-16.0	-15.3	-14.6	-13.8	-13.2	-12.3	-12.5	-13.2	-13.5	-13.3	-11.8	-8.8	-9.3	-10.4	-11.0	-11.2	-10.7	-13.3	-8.8
																							Diurnal Average			
																							Diurnal Maximum			



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Buffalo Viewpoint - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Buffalo Viewpoint - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	304	40.86	40.86
-20 - 0	429	57.66	98.52
0 - 10	11	1.48	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

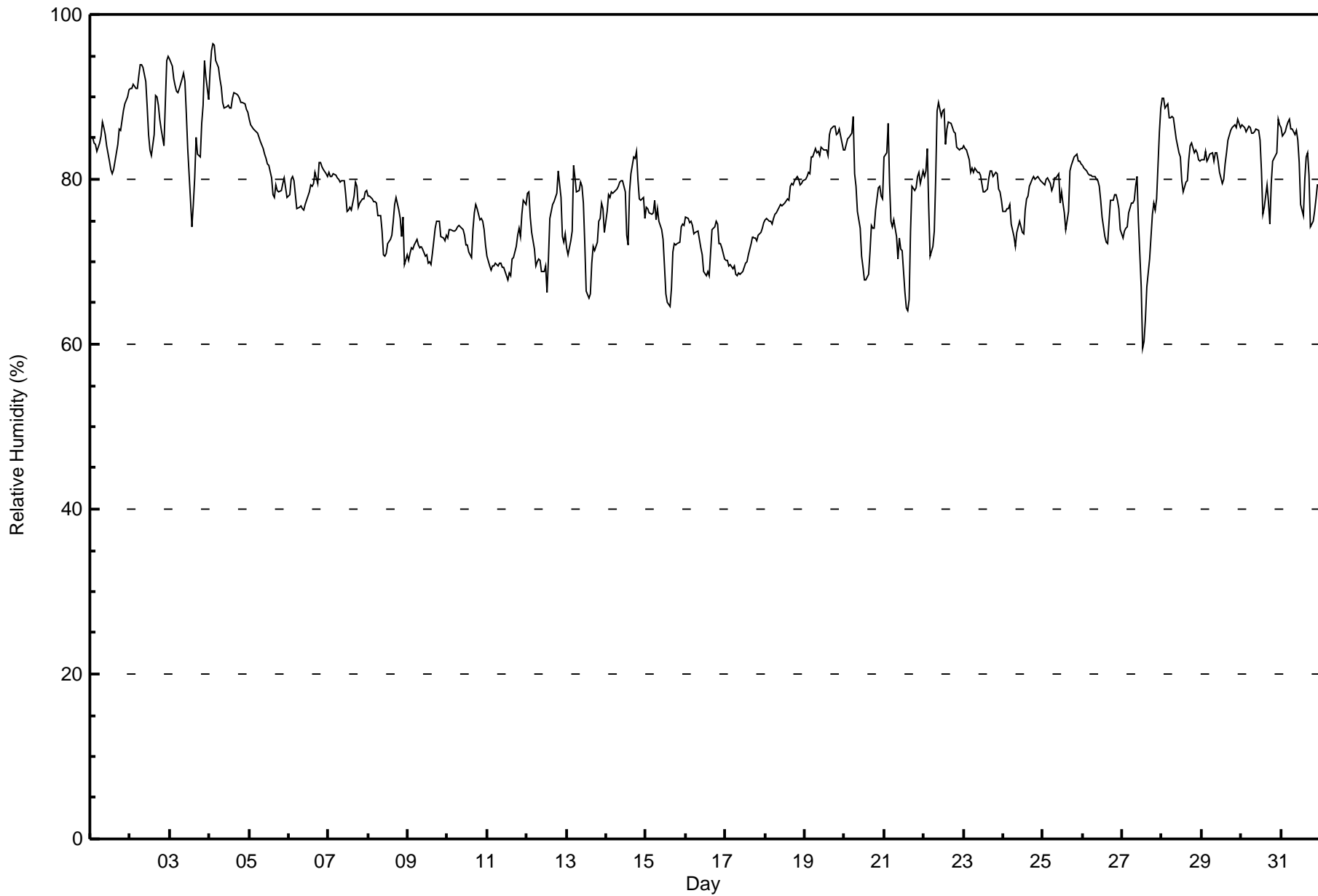
Buffalo Viewpoint - December 2016

Maximum Value: 96 % on Dec 4 03:00																		Maximum Daily Average: 90.9 % on Dec 4																		Hours in Service: 744								
Minimum Value: 59 % on Dec 27 13:00																		Minimum Daily Average: 70.8 % on Dec 17																		Hours of Data: 744								
Maximum Diurnal Average: 80.6 % at hour 3																		Minimum Diurnal Average: 74.5 % at hour 14																		Hours of Missing Data: 0								
Monthly Average: 78.9 %																		Percentiles: P ₁ = 65 P ₁₀ = 71 Q ₁ = 74 Median = 79 Q ₃ = 83 P ₉₀ = 87 P ₉₉ = 94																		Hours of Calibration: 0								
																																				Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Dec	85	85	84	84	83	84	85	87	86	85	84	82	81	81	81	82	84	86	86	87	88	89	90	91	85.2	91																		
2-Dec	91	91	91	91	91	93	94	94	93	92	89	85	84	83	85	90	90	89	87	86	84	89	94	95	89.7	95																		
3-Dec	95	94	92	91	91	90	91	92	93	92	88	84	77	74	77	80	85	83	83	87	89	94	92	90	87.7	95																		
4-Dec	93	96	96	96	94	94	92	91	89	89	89	89	89	89	90	91	90	90	90	89	89	89	89	88	90.9	96																		
5-Dec	87	87	86	86	86	86	85	85	84	83	83	82	82	80	78	78	79	79	78	79	80	80	79	78	82.0	87																		
6-Dec	78	80	80	80	78	76	77	77	76	76	77	78	79	79	79	79	81	80	82	82	82	81	81	80	79.1	82																		
7-Dec	81	80	80	81	81	80	80	80	80	80	80	78	76	76	77	76	78	80	79	77	77	78	78	79	79	78.7	81																	
8-Dec	78	78	78	77	77	77	76	76	74	71	71	71	72	73	73	75	77	78	76	75	73	75	70	71	74.6	78																		
9-Dec	70	71	72	72	72	73	72	72	72	72	71	71	70	70	70	71	74	75	75	75	73	73	73	73	72.0	75																		
10-Dec	73	74	74	74	74	74	74	74	74	74	73	72	72	71	71	74	76	77	76	75	75	75	74	72	73.8	77																		
11-Dec	71	70	69	69	69	70	69	70	70	69	69	69	68	69	68	70	71	72	73	74	73	76	78	77	70.9	78																		
12-Dec	78	78	75	73	71	70	70	70	70	69	69	70	66	70	75	77	77	78	78	81	78	73	72	73	73.5	81																		
13-Dec	72	71	73	74	82	80	78	79	80	79	77	72	66	66	66	70	72	71	72	75	75	77	76	74	74.0	82																		
14-Dec	76	78	78	79	78	79	79	79	80	80	80	78	73	72	79	81	83	83	83	80	78	77	78	75	78.5	83																		
15-Dec	77	76	76	76	76	77	75	76	75	74	73	70	66	65	65	67	71	72	72	72	74	75	74	74	72.8	77																		
16-Dec	75	75	75	75	74	73	74	74	73	72	71	69	68	69	68	71	74	74	75	75	72	72	72	70	72.5	75																		
17-Dec	70	70	70	70	69	70	68	68	69	68	69	69	70	70	71	72	73	73	73	73	73	74	74	75	70.8	75																		
18-Dec	75	75	75	75	75	75	76	76	77	77	77	77	77	78	78	79	80	79	80	80	80	79	79	80	77.4	80																		
19-Dec	80	80	81	81	83	83	84	83	83	83	84	84	84	84	83	86	86	87	86	86	86	86	84	83	83.7	87																		
20-Dec	83	84	85	85	86	88	81	79	76	74	71	69	68	68	68	71	74	74	74	76	79	79	78	78	77.0	88																		
21-Dec	83	83	87	79	75	74	75	73	70	73	72	71	66	64	64	65	74	79	79	79	80	81	80	81	75.3	87																		
22-Dec	80	81	84	77	71	72	74	80	88	89	88	88	89	84	86	87	87	86	86	86	84	83	84	84	83.2	89																		
23-Dec	84	84	84	82	81	81	81	81	81	81	81	80	78	79	79	80	81	81	80	81	81	79	78	77	80.6	84																		
24-Dec	76	76	76	76	77	75	73	72	74	74	75	74	73	76	78	79	80	80	80	80	80	80	80	80	76.8	80																		
25-Dec	79	79	80	80	79	79	79	80	80	81	77	79	77	76	74	76	81	82	82	83	83	82	82	82	79.7	83																		
26-Dec	82	81	81	81	81	80	80	80	80	80	79	77	75	73	72	72	75	77	77	78	78	77	76	74	77.9	82																		
27-Dec	73	74	74	74	76	77	77	77	79	80	75	67	59	60	63	67	70	73	76	77	76	78	86	89	74.1	89																		
28-Dec	90	90	89	89	88	88	88	87	85	84	83	83	80	79	80	80	82	84	84	83	84	83	82	82	84.4	90																		
29-Dec	82	82	83	82	83	83	83	82	83	83	82	81	80	80	82	83	85	86	86	86	87	86	87	86	83.6	87																		
30-Dec	87	87	86	86	86	86	86	86	86	86	86	85	81	76	77	79	77	75	79	82	82	83	87	87	83.2	87																		
31-Dec	86	85	86	86	87	87	86	86	85	86	85	82	77	76	80	83	83	81	74	75	76	78	79	79	82.0	87																		
																		80.3	80.5	80.6	80.1	79.8	79.8	79.4	79.6	79.5	79.2	78.2	76.9	75.0	74.5	75.3	77.2	79.1	79.4	79.4	79.8	79.6	80.1	80.3	79.9	Diurnal Average		
																		95	96	96	96	94	94	94	94	94	93	92	89	89	89	90	91	90	90	90	90	89	89	94	94	95	Diurnal Maximum	



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Buffalo Viewpoint - December 2016





Maximum Speed: 27 km/h on Dec 13 07:00	Maximum Daily Speed Average: 21.8 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 8 19:00	Minimum Daily Speed Average: 1.4 km/h on Dec 18	Hours of Data: 743
Maximum Diurnal Speed Average: 3.0 km/h at hour 24	Minimum Diurnal Speed Average: 1.3 km/h at hour 11	Hours of Missing Data: 1
Monthly Average Velocity: 2.2 km/h 260.6 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 6 Median = 8 Q ₃ = 13 P ₉₀ = 18 P ₉₉ = 24	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	S11	SSE10	S10	SSW8	SSW11	S7	SSE8	SSE9	SSE8	SSE6	SSE8	S7	S6	S7	SSE6	SSE6	SSE6	SSE6	SSE5	SSE6	SSE6	S6	SSE7	SSE7	S7.2	S11																					
2-Dec	SSE6	SSE6	SSE8	SE9	SSE7	SE9	SSE10	SSE11	SSE9	SSE12	SSE16	SSE12	SSE12	SSE13	SSE10	SSE13	SSE15	SSE16	SSE13	SSE15	SSE15	SSE16	SSE15	SSE14	SSE11.7	SSE16																					
3-Dec	SSE14	SSE14	SSE13	SSE13	SSE13	SSE14	SSE14	SSE14	SSE14	SSE15	SSE16	SSE13	S10	SSW11	S9	SE9	SSE10	SSE9	S7	SSE7	S7	SW9	SW10	SW9	SSE10.6	SSE16																					
4-Dec	WSW9	WNW8	NNW12	N17	N22	N20	N20	NNE21	NNE21	N18	N16	N13	NW16	NW17	NW19	NW19	NW17	NW19	NW21	NW22	NW22	NW15	NW18	NW20	NNW15.0	N22																					
5-Dec	WNW23	WNW24	WNW23	WNW24	WNW24	WNW23	WNW23	WNW26	WNW26	WNW24	WNW23	WNW23	WNW21	WNW22	WNW22	WNW22	WNW21	WNW20	WNW18	W18	WNW17	WNW17	WNW19	WNW22	WNW21.8	WNW26																					
6-Dec	WNW21	WNW20	WNW21	WNW20	WNW21	WNW21	WNW20	WNW20	WNW19	NW19	NW21	NW18	NW17	NW17	NW17	NW13	NNW14	N14	NNW7	NNW3	N8	NNE12	NNE11	NNE9	NW14.5	WNW21																					
7-Dec	NNE8	N7	N8	N7	NNE6	N9	NNE9	N10	N7	N7	N7	N8	N7	N8	NNW5	N6	N4	NNW3	SE2	ENE2	NE1	NE1	NE3	NE3	N5.3	N10																					
8-Dec	NE5	NE7	NE6	NNE4	NNE2	NE4	ENE3	S1	S1	SW2	WSW1	WNW1	N3	N2	NW1	N2	NNE4	NE3	SW0	SSW0	NW1	N3	AF	SSE4	NNE1.6	NE7																					
9-Dec	SE3	SSE4	SSE5	SSE5	SSE6	SE7	SSE7	SSE8	SSE8	SSE7	S7	SSE5	SSE6	SE6	SE6	SE5	SSE6	SSE6	SSE6	S6	SSE6	SSE5	SSE6	SE7	SSE6.0	SSE8																					
10-Dec	SSE6	SE7	SSE8	SSE9	SSE9	SSE8	SSE9	SSE8	SSE8	SE8	SE5	SSE4	SE5	SE4	ESE3	SE7	SSE7	SSE7	SSE7	S6	SSW6	SSW6	SSW4	WSW15	SSE6.1	WSW15																					
11-Dec	WSW15	WSW16	WSW18	WSW16	WSW18	WSW15	WSW16	WSW20	WSW17	WSW18	WSW24	WSW20	WSW20	W17	W16	WSW18	WSW17	WSW17	WSW12	WNW15	W13	WSW9	NNW12	WNW14	WSW15.8	WSW24																					
12-Dec	WNW12	WNW12	NW17	NW17	NW18	NW18	WNW16	WNW13	WNW12	W10	WNW11	W8	SSW7	SE7	SE9	SSW2	WNW11	NW13	NNW7	W5	WNW12	WNW20	W16	WNW18	WNW10.1	WNW20																					
13-Dec	WNW23	WNW25	WNW24	NW23	N25	N22	N27	NNW18	NNW12	N10	N9	NNE4	NNE3	NNW11	NW18	NW12	NW14	NW13	NW14	WNW11	WNW9	W9	WNW10	W6	NW13.0	N27																					
14-Dec	SW4	SSW5	W8	W7	SSE7	SE8	SE8	SE7	SSE8	SSE8	SE8	S5	WNW7	NW13	N9	NNE3	NNE4	N4	WNW6	W6	WNW10	W8	NW14	NW15	W2.0	NW15																					
15-Dec	NW13	WNW13	WNW13	WNW16	NW18	WNW13	WNW13	WNW11	WNW11	WNW9	W10	W8	W10	W10	W9	WNW11	WNW9	WNW11	WNW13	WNW10	W11	W8	WNW10	W11	WNW11.3	NW18																					
16-Dec	WNW10	WNW5	NW6	WNW6	WNW5	WSW4	SSW4	SW5	SSE5	SSE5	SSE6	SSE5	SSE8	SE7	SE7	SE9	SE8	SSE9	SSE8	SSE8	SSE8	SSE7	SSE8	SE9	S4.2	WNW10																					
17-Dec	SSE8	SSE9	S7	SSE8	S9	SSE9	S8	S10	SSE10	SSE9	S8	SSE7	SE8	SE7	SSE6	SSE8	SSE7	SSE7	SSE8	SSE8	SSE9	SSE7	SSE9	SSE6	SSE7.9	S10																					
18-Dec	SSE6	S5	SSE6	SSE7	S5	SE7	SSE7	SSE7	SSE6	S4	SE3	SSW0	N3	N5	NNE4	N5	NNW5	WNW5	NNW5	NNW2	N2	SSE1	SSE2	SE4	SSE1.4	SSE7																					
19-Dec	SSE5	SE5	SSE4	ESE2	SE7	ESE9	ESE10	ESE12	ESE10	NE6	NNE6	N6	NNW6	N7	WNW7	NNW10	N10	NNW14	NNW11	NNE6	SE5	SE5	SSE7	SSE8	ENE2.5	NNW14																					
20-Dec	SSE8	SSE9	SE8	SE12	SSE10	S6	W14	W9	WSW14	SW14	WSW13	WSW14	WSW18	WSW17	WSW16	W16	WSW15	WSW18	WSW19	WSW13	WSW8	WSW8	WSW11	WSW10	WSW10.1	WSW19																					
21-Dec	SSW7	S7	SSE9	SW10	WSW16	WSW23	WSW15	SSW6	SSW9	SSE10	SSE10	S7	WSW26	WSW25	WSW21	WSW18	S8	SE11	SSE10	SSE10	SSE10	SE8	SE9	SE7	SSW8.5	WSW26																					
22-Dec	SE8	SE7	SE7	SW9	WSW14	WSW15	WSW16	NNW9	N8	N16	NNE19	N21	NNE22	N20	N19	N19	N18	N13	N13	N17	N13	N12	N14	N14	N9.0	NNE22																					
23-Dec	N13	NNE9	NNE11	NNE13	NNE17	N13	NNE14	N14	N13	N12	N10	N12	N10	N10	N10	N10	N8	N9	N8	NNE3	SE5	SSE5	SSE6	SSE6	N9.0	NNE17																					
24-Dec	SE5	SE3	SE2	S2	SSW2	SSE4	S3	WSW3	W4	S3	SW2	S2	SSE3	SSE4	S2	SE1	SSE4	SSE3	SSE4	SSE5	SSE4	SSW3	SSE6	SSE8	SSE3.0	SSE8																					
25-Dec	SSE5	SSE7	SSE7	SSE7	SSE6	SSE7	SSE8	SSE8	SSE7	SSE6	SSE7	SSE6	SE7	SE7	SSE6	SSE7	SE8	SE8	SSE7	SSE10	SSE12	SSE10	SSE10	SSE7	SSE7.4	SSE12																					
26-Dec	SSE8	SSE12	SSE10	SSE11	SSE10	SSE11	SSE11	SSE11	SSE10	SSE11	SSE14	SSE12	SSE15	SSE15	SSE16	SSE14	SSE11	SSE13	SSE14	SSE13	SSE12	SSE12	SSE13	SSE12	SSE12.1	SSE16																					
27-Dec	SSE10	SSE10	SSE11	SSE13	SSE11	SSE11	SSE10	SSE10	SSE10	SSE11	SSE13	S8	SSW6	SW9	SW13	SW8	S7	WSW5	NNW2	W7	WSW7	WSW9	NNW13	NW12	S5.6	SSE13																					
28-Dec	NNW11	N9	N14	NNE12	NNE14	N10	N9	N9	NNE10	NNE11	NNE8	NNE6	NNE5	N3	ENE1	SSE3	ESE3	NNE6	N10	N8	NNW6	NNW5	N5	N2	N7.1	NNE14																					
29-Dec	NNW2	NE1	NNE3	ESE2	NE4	NE3	NNE2	SE2	NE4	WNW1	N4	N3	WSW2	NNE3	NNE5	SSW2	NNE4	NNE7	NNE6	WNW2	NNW2	NNE3	NE5	ENE1	NNE2.3	NNE7																					
30-Dec	NW3	SSW4	SW4	SSW2	SSE6	SSE6	S5	SSW5	SSE4	S4	SSE5	SSE6	SSE4	SSE6	SE7	S6	SSW8	WSW15	W13	W13	WNW16	NNW10	N8	NNW7	SW2.9	WNW16																					
31-Dec	NNW7	NNE8	NNW4	S6	SE7	SE8	ESE4	NNE4	W1	WNW3	SE0	NNE2	NNE6	N3	ENE4	NE3	SSW4	SW10	W15	WSW19	WSW19	WSW15	W18	W17	W3.8	WSW19																					
WSW2.5																								WSW2.2	W2.2	W2.3	W1.8	WSW1.7	WSW1.9	WSW1.8	WSW1.7	SW1.5	SW1.3	WSW1.6	W2.8	W3.0	W2.9	W2.4	W1.9	W2.5	W2.9	W3.0	WSW3.0	WSW2.6	W2.5	W3.0	Diurnal Average
WNW23																								WNW25	WNW24	WNW24	N25	WSW23	N27	WNW26	WNW26	WNW24	WSW24	WNW23	WSW26	WSW25	WNW22	WNW22	WNW21	WNW20	NW21	NW22	WSW19	WNW20	WNW19	WNW22	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

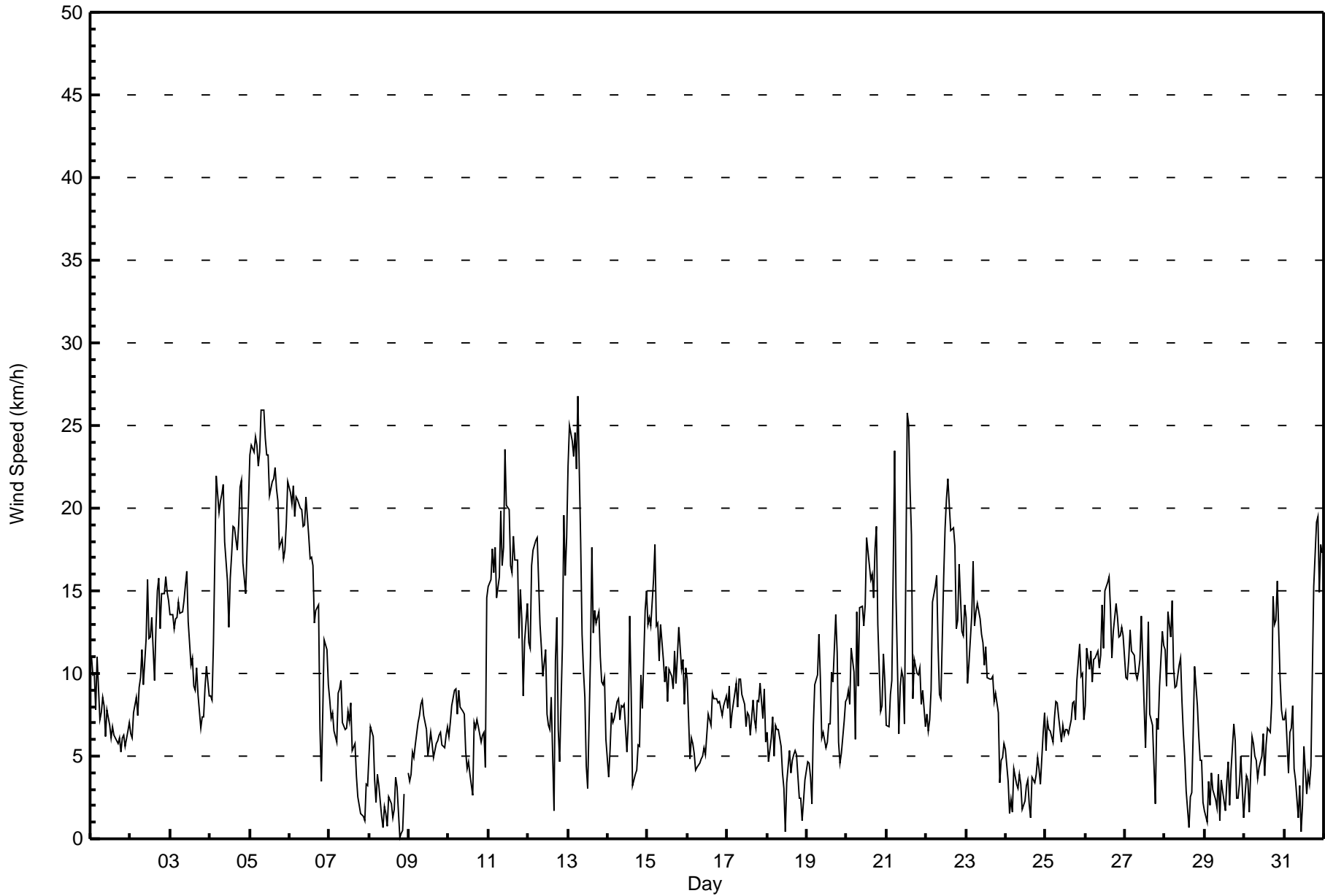
Wind Speed (WS) - km/h
Buffalo Viewpoint - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 21 05:00 Minimum Value: 0 km/h on Dec 16 19:00 Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	2	2	2	3	2	2	2	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3	
2-Dec	1	1	1	2	2	2	2	2	2	3	4	3	3	4	2	3	3	4	3	4	4	4	4	4	4	
3-Dec	3	3	3	3	3	3	3	3	3	3	4	3	2	3	2	2	2	2	1	2	2	2	3	2	4	
4-Dec	2	2	3	3	4	3	5	5	4	3	3	2	3	3	4	4	3	3	5	4	3	3	3	4	5	
5-Dec	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	5	
6-Dec	4	4	4	4	4	4	4	4	3	4	4	3	3	4	3	3	4	4	2	1	2	2	2	2	4	
7-Dec	1	1	1	1	1	2	2	2	1	1	2	1	1	2	2	1	1	1	1	1	1	1	2	2	2	
8-Dec	1	2	2	2	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	AF	1	2	
9-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2	
10-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	2	4	4	
11-Dec	4	4	4	4	5	3	4	4	4	4	4	4	3	4	4	3	3	4	3	4	3	3	5	4	5	
12-Dec	2	1	3	3	3	4	3	2	2	3	3	2	1	1	2	2	2	2	3	3	3	4	4	4	4	
13-Dec	5	5	5	5	4	4	5	4	3	2	2	1	2	6	4	3	3	2	2	1	2	1	1	1	6	
14-Dec	1	1	2	2	1	2	2	2	1	1	2	3	2	3	2	2	2	2	1	2	1	1	3	3	3	
15-Dec	2	2	2	3	3	2	2	2	3	2	2	2	3	3	2	2	2	1	2	2	2	1	2	3	3	
16-Dec	2	2	3	2	2	2	1	1	1	1	1	1	2	2	1	1	1	0	0	1	1	0	1	3	3	
17-Dec	1	1	1	1	2	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1	2	1	2	2	2	
18-Dec	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	
19-Dec	1	1	2	1	3	2	2	3	2	2	1	1	1	2	2	2	2	3	2	2	1	1	1	1	3	
20-Dec	1	1	2	2	2	2	5	3	4	4	5	5	4	4	3	4	3	4	5	4	4	3	3	3	5	
21-Dec	2	2	2	3	7	5	4	2	2	2	2	3	6	6	5	5	2	2	1	2	2	2	2	3	7	
22-Dec	2	1	2	2	4	3	3	4	2	2	3	4	3	4	4	3	3	3	4	3	3	2	2	3	4	
23-Dec	2	3	3	3	3	2	3	3	3	2	2	2	2	1	2	1	1	2	1	1	1	1	1	1	3	
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	2	2	2	2	1	2	
26-Dec	2	3	2	3	2	2	2	2	2	2	3	3	4	4	4	3	2	2	3	3	2	3	3	3	4	
27-Dec	3	3	3	3	3	2	2	2	3	2	3	3	2	3	3	2	1	2	1	2	2	2	3	2	3	
28-Dec	3	3	2	3	3	2	2	2	2	2	2	1	1	1	1	2	1	2	2	1	1	1	1	2	3	
29-Dec	1	1	1	1	2	2	1	1	1	1	1	1	1	2	2	2	2	1	2	2	1	2	2	1	2	
30-Dec	1	3	1	1	1	2	2	1	1	2	2	1	2	2	2	2	2	4	3	3	3	2	4	1	4	
31-Dec	2	2	2	1	1	2	1	1	1	1	1	2	1	1	1	2	3	3	3	4	4	3	5	4	5	
																	Diurnal Maximum									
AF - Analyzer Failure																										



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Buffalo Viewpoint - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Buffalo Viewpoint - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	165	22.21	22.21
6 - 11	339	45.63	67.83
12 - 19	184	24.76	92.60
20 - 28	55	7.40	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**WBEA Data PC
Frequency Distribution**

**Wind Speed (WS) - km/h
Buffalo Viewpoint - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	16	18	13	5	0	5	18	29	13	13	6	5	3	7	3	11	165
6 - 11	34	19	2	1	0	3	39	137	27	11	8	8	17	20	1	12	339
12 - 19	23	7	0	0	0	1	1	43	0	0	2	34	11	25	31	6	184
20 - 28	8	3	0	0	0	0	0	0	0	0	0	8	0	31	5	0	55
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	81	47	15	6	0	9	58	209	40	24	16	55	31	83	40	29	743

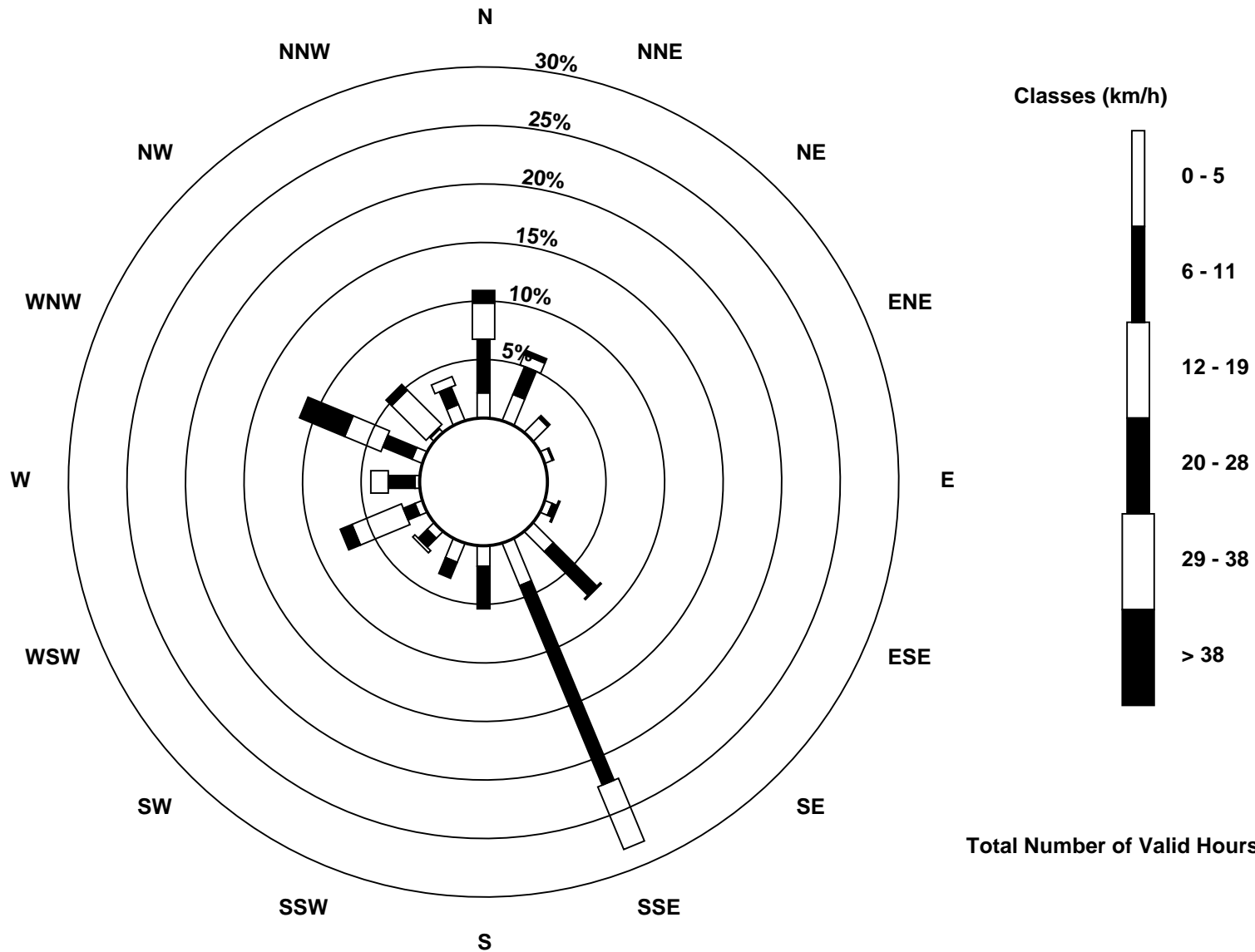
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 743



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Buffalo Viewpoint - December 2016

Direction of Maximum Speed: 354 deg on Dec 13 07:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 295.8 deg on Dec 5		Hours of Data:	743
Direction of Minimum Speed: 229 deg on Dec 8 19:00		Hours of Missing Data:	1
Direction of Minimum Daily Speed Average: 1.4 deg on Dec 18		Percent Operational Time:	99.9
Monthly Average Direction: 246.1 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	169	166	172	199	200	184	164	162	163	167	168	185	186	173	163	165	167	160	163	158	163	170	154	156	170.6
2-Dec	154	158	147	145	157	139	152	147	165	152	151	151	156	152	154	148	150	150	160	155	151	151	150	151	151.8
3-Dec	154	156	157	154	153	154	152	153	152	151	150	154	173	202	185	145	147	168	171	153	180	217	227	229	164.2
4-Dec	240	282	335	5	8	7	9	14	12	9	9	359	325	312	321	318	305	311	316	322	318	312	311	307	335.4
5-Dec	301	300	300	300	298	299	298	299	299	298	300	298	298	295	294	294	292	293	289	281	283	285	294	298	295.8
6-Dec	299	299	299	301	301	302	300	302	301	304	310	309	310	309	304	311	345	2	339	342	6	16	16	12	314.3
7-Dec	12	4	351	356	15	11	20	9	9	359	6	11	1	352	327	352	356	327	136	70	44	36	35	46	6.2
8-Dec	47	43	41	17	31	39	60	175	170	222	253	300	3	6	305	353	28	38	229	205	314	3	AF	154	33.1
9-Dec	146	163	147	151	153	145	163	159	154	158	171	168	147	139	140	133	149	154	156	169	157	154	148	142	153.1
10-Dec	158	145	158	157	163	160	159	157	157	146	146	163	144	133	115	140	154	157	159	184	197	196	194	245	164.7
11-Dec	243	244	247	251	249	243	242	255	249	249	253	257	253	268	265	254	251	251	254	289	270	239	301	289	256.0
12-Dec	294	287	314	311	313	305	295	288	289	266	287	275	209	146	135	209	301	307	333	278	295	299	275	282	292.3
13-Dec	297	300	301	320	4	2	354	343	328	355	1	32	15	332	326	321	311	309	313	300	285	278	282	280	323.9
14-Dec	227	208	259	263	157	141	141	146	147	150	146	170	297	315	355	31	30	2	301	279	294	276	308	322	270.3
15-Dec	307	298	296	297	306	298	291	285	290	290	285	281	277	273	277	269	289	290	290	289	283	279	269	289	288.9
16-Dec	293	283	311	285	285	237	200	217	167	162	157	162	148	144	141	137	143	148	155	151	156	153	165	143	169.0
17-Dec	157	166	170	157	176	163	172	174	148	162	175	168	142	138	152	147	161	155	155	147	161	157	158	161	159.4
18-Dec	163	177	168	157	172	141	152	166	159	174	144	211	10	9	12	349	333	301	330	331	4	165	166	141	155.4
19-Dec	150	141	154	118	128	122	120	121	116	56	31	8	329	356	302	345	7	345	342	28	142	144	147	159	70.6
20-Dec	157	151	141	141	150	191	268	264	239	228	250	251	249	256	258	259	248	248	249	253	239	249	246	237	237.9
21-Dec	196	176	148	228	255	254	237	211	210	166	164	188	255	253	253	246	179	146	161	157	158	127	124	125	211.8
22-Dec	139	132	145	216	249	246	249	294	334	354	1	12	3	15	2	356	356	2	4	358	5	7	6	5	351.1
23-Dec	8	14	12	12	15	2	18	7	9	7	8	5	358	360	7	4	2	360	359	358	31	146	159	158	9.3
24-Dec	136	126	145	175	199	155	189	256	259	184	214	176	151	160	177	141	160	159	168	157	150	193	167	159	168.1
25-Dec	166	160	165	166	167	168	155	147	166	156	166	157	141	143	157	148	137	134	155	157	159	155	158	164	155.8
26-Dec	160	154	164	160	161	164	162	154	162	163	158	167	164	165	159	163	162	148	152	148	149	147	149	151	157.6
27-Dec	163	160	154	150	154	153	153	158	156	159	152	179	199	218	218	223	190	242	342	277	258	252	333	322	185.0
28-Dec	340	357	8	12	21	11	2	10	22	21	18	25	29	9	74	155	106	25	6	3	348	341	11	356	10.7
29-Dec	346	42	14	123	38	52	15	132	35	298	10	6	240	15	27	194	24	21	19	284	331	12	36	66	21.2
30-Dec	311	196	214	201	147	156	180	200	167	178	163	152	160	147	141	174	199	253	270	281	283	346	1	337	226.6
31-Dec	344	16	346	188	137	134	116	20	266	302	133	32	33	10	65	46	199	228	264	258	251	245	262	265	260.1

254.6 242.0 266.7 261.8 274.0 248.6 253.2 255.6 243.5 228.0 236.0 258.4 266.3 278.1 276.5 267.5 266.2 277.6 275.0 261.8 250.7 246.9 260.5 262.4
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Buffalo Viewpoint - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 99 deg on Dec 18 12:00	Hours of Data: 743
Minimum Value: 4 deg on Dec 16 20:00	Hours of Missing Data: 1
Percentiles: P ₁ = 6 P ₁₀ = 10 Q ₁ = 13 Median = 16 Q ₃ = 21 P ₉₀ = 38 P ₉₉ = 82	Hours of Calibration: 0
	Percent Operational Time: 99.9

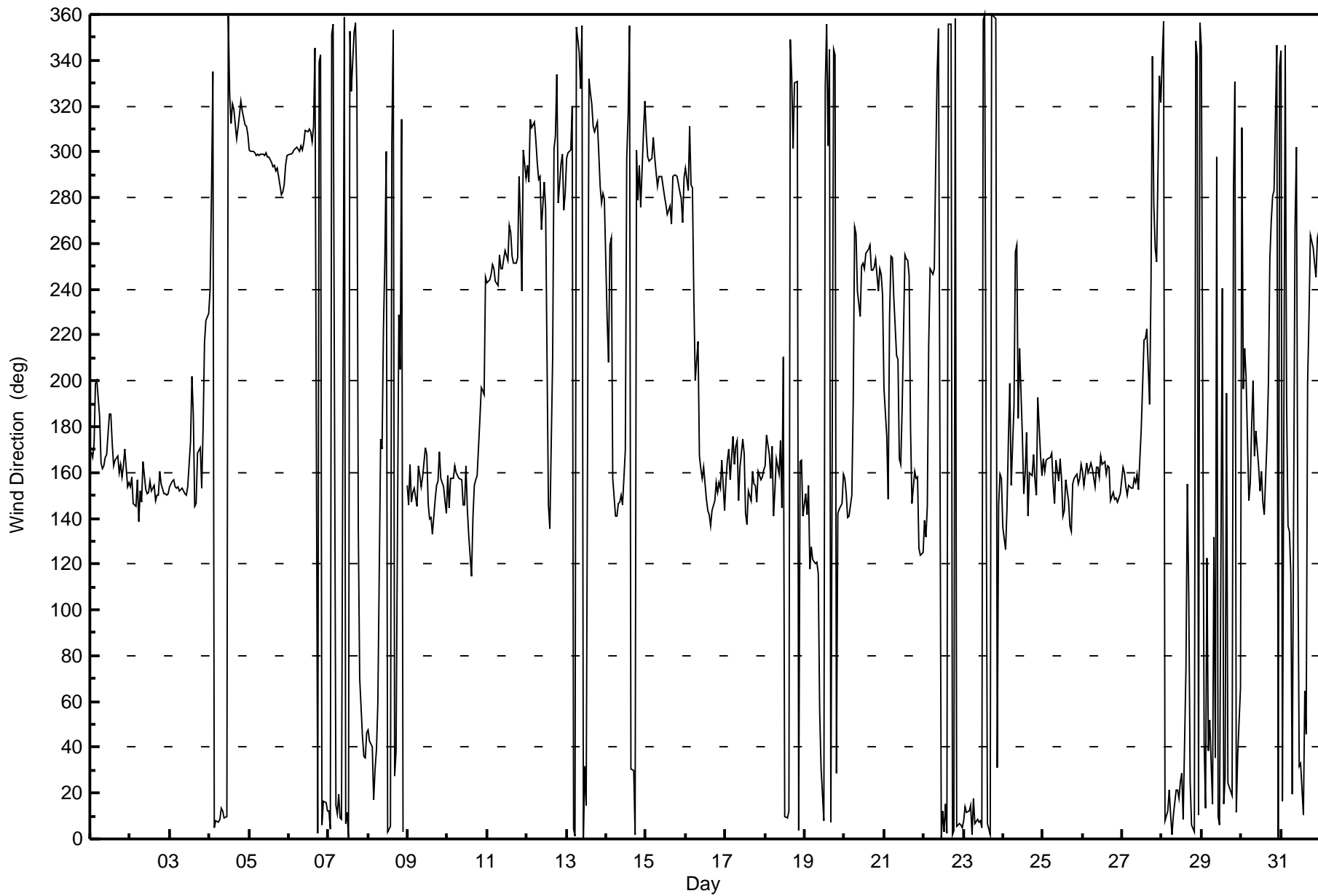
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	19	18	19	19	19	19	17	16	16	16	16	20	21	22	18	15	16	10	14	10	12	14	8	14	22
2-Dec	14	16	14	15	17	14	14	14	16	17	18	20	19	20	17	17	17	19	19	19	17	18	18	18	20
3-Dec	19	18	17	16	17	16	16	15	15	15	17	15	22	16	17	17	13	20	17	14	30	14	15	17	30
4-Dec	19	19	25	14	15	15	18	15	14	15	13	16	15	12	12	13	13	11	11	11	12	12	11	13	25
5-Dec	13	13	13	13	14	14	14	13	13	13	13	13	14	14	15	15	15	15	16	16	16	16	14	14	16
6-Dec	14	13	13	12	12	12	13	12	12	13	13	13	13	13	13	18	17	17	18	42	22	13	12	13	42
7-Dec	11	13	12	16	16	11	12	10	11	11	14	13	16	16	26	14	15	22	46	44	36	60	20	31	60
8-Dec	21	16	17	58	65	15	24	56	73	42	37	76	21	24	41	37	13	11	83	87	91	30	AF	23	91
9-Dec	23	16	11	11	10	8	7	5	8	16	13	19	17	14	14	9	7	7	6	13	12	7	11	5	23
10-Dec	12	9	9	8	8	10	8	8	6	10	12	22	19	33	46	8	6	6	9	16	16	11	47	14	47
11-Dec	15	14	13	14	13	15	15	13	15	13	11	12	12	16	15	10	11	11	17	17	17	15	28	20	28
12-Dec	10	8	11	10	10	11	15	13	13	18	15	21	19	17	15	70	8	9	46	43	11	13	16	16	70
13-Dec	13	13	14	25	16	16	19	24	22	16	22	20	52	31	12	9	9	10	11	11	15	9	8	10	52
14-Dec	31	34	10	22	17	12	12	12	11	14	13	39	30	12	21	42	45	50	28	16	9	13	15	11	50
15-Dec	11	12	12	13	11	11	11	12	14	13	14	15	18	16	15	12	12	9	12	13	12	11	13	13	18
16-Dec	14	31	45	35	29	35	24	19	34	11	13	17	16	12	11	7	8	7	4	4	5	7	6	8	45
17-Dec	8	10	10	15	12	17	11	13	7	10	13	21	15	14	13	11	11	10	12	12	15	14	14	18	21
18-Dec	13	28	22	17	33	19	17	14	18	24	28	99	38	21	28	24	27	20	19	46	71	81	42	30	99
19-Dec	23	26	31	62	19	18	18	17	18	38	15	23	24	25	23	20	19	22	16	27	29	9	9	9	62
20-Dec	8	9	18	14	22	55	22	29	17	16	25	17	14	12	13	13	15	14	13	16	35	17	16	17	55
21-Dec	22	43	22	40	18	11	14	36	19	16	15	34	12	11	12	15	33	10	12	14	13	21	11	24	43
22-Dec	16	22	13	18	16	13	14	32	33	24	23	20	22	17	22	27	26	25	23	25	22	21	20	21	33
23-Dec	20	19	23	18	15	20	16	17	16	16	15	17	19	19	15	16	15	16	10	9	49	17	14	9	49
24-Dec	15	13	66	24	29	16	14	28	25	33	44	19	23	19	54	63	14	18	15	11	16	9	9	8	66
25-Dec	12	8	6	6	9	8	5	8	7	8	8	15	15	18	17	15	12	10	12	11	15	14	15	15	18
26-Dec	13	15	17	16	17	15	15	15	16	16	17	20	18	18	17	17	16	13	15	14	14	15	17	18	20
27-Dec	21	20	17	18	17	16	18	17	16	15	15	27	34	24	13	16	18	67	79	18	21	15	32	12	79
28-Dec	26	17	12	13	14	14	18	22	16	13	16	17	18	23	83	41	32	17	15	14	15	20	16	80	83
29-Dec	55	84	40	50	26	39	35	59	21	72	45	75	82	61	35	85	63	14	15	71	68	63	20	77	85
30-Dec	55	34	47	78	13	23	28	19	38	42	26	14	69	25	18	21	22	18	15	15	14	41	32	14	78
31-Dec	20	17	65	15	8	10	46	27	79	29	91	52	16	30	19	41	56	20	14	13	10	14	19	16	91
	55	84	66	78	65	55	46	59	79	72	91	99	82	61	83	85	63	67	83	87	91	81	47	80	
	Diurnal Maximum																								

AF - Analyzer Failure



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Buffalo Viewpoint - December 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	10:58
Gas Cert Reference	LL107929	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	08-Spet-2018
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-593	-593
Analyzer IP address	192.168.1.43		Lamp voltage	841	841
Calculated slope	0.997298	1.000155	Chamber temp	45.0	45.0
Calculated intercept	0.724135	0.723869	Pressure	702.1	702.1
Analyzer Background	11.6	11.6	Flow	0.503	0.503
Analyzer Coefficient	0.819	0.819	Intensity	85	85

Analyzer make TEI 43i Analyzer serial # JC1327300932

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	60.4	600.4	598.7	1.003
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	60.4	600.4	599.5	1.001
second point	5000	30.2	300.2	300.2	1.000
third point	5000	15.1	150.1	148.0	1.014
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	60.4	600.4	600.0	1.001
Average Correction Factor					1.005

Corrected As found 598.9 Previous response 601.3 % change 0.4%

Notes:

No maintenance or adjustments done, filter changed out

Calibration Performed By: Melissa Lemay



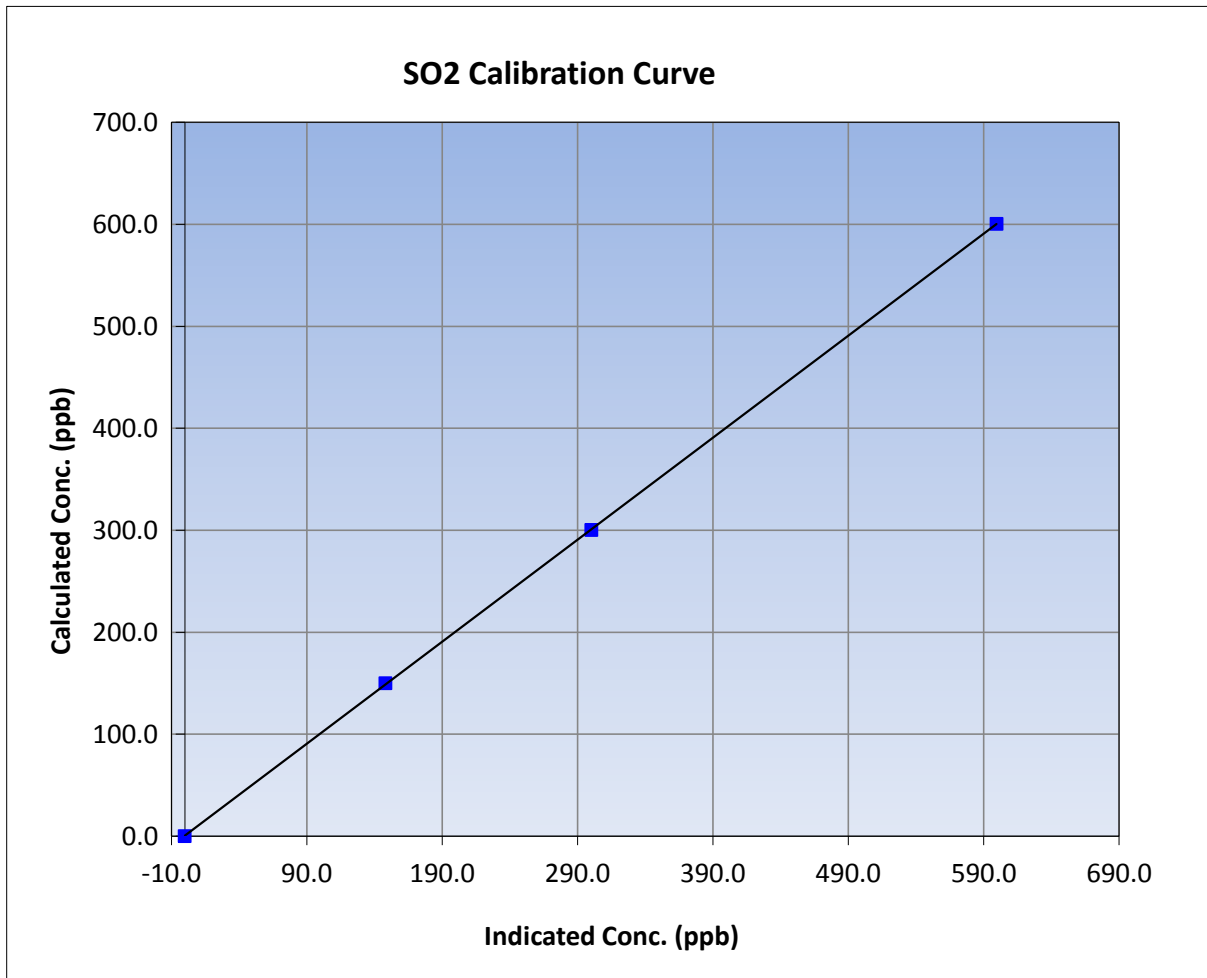
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:30	End Time (MST)	10:58
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

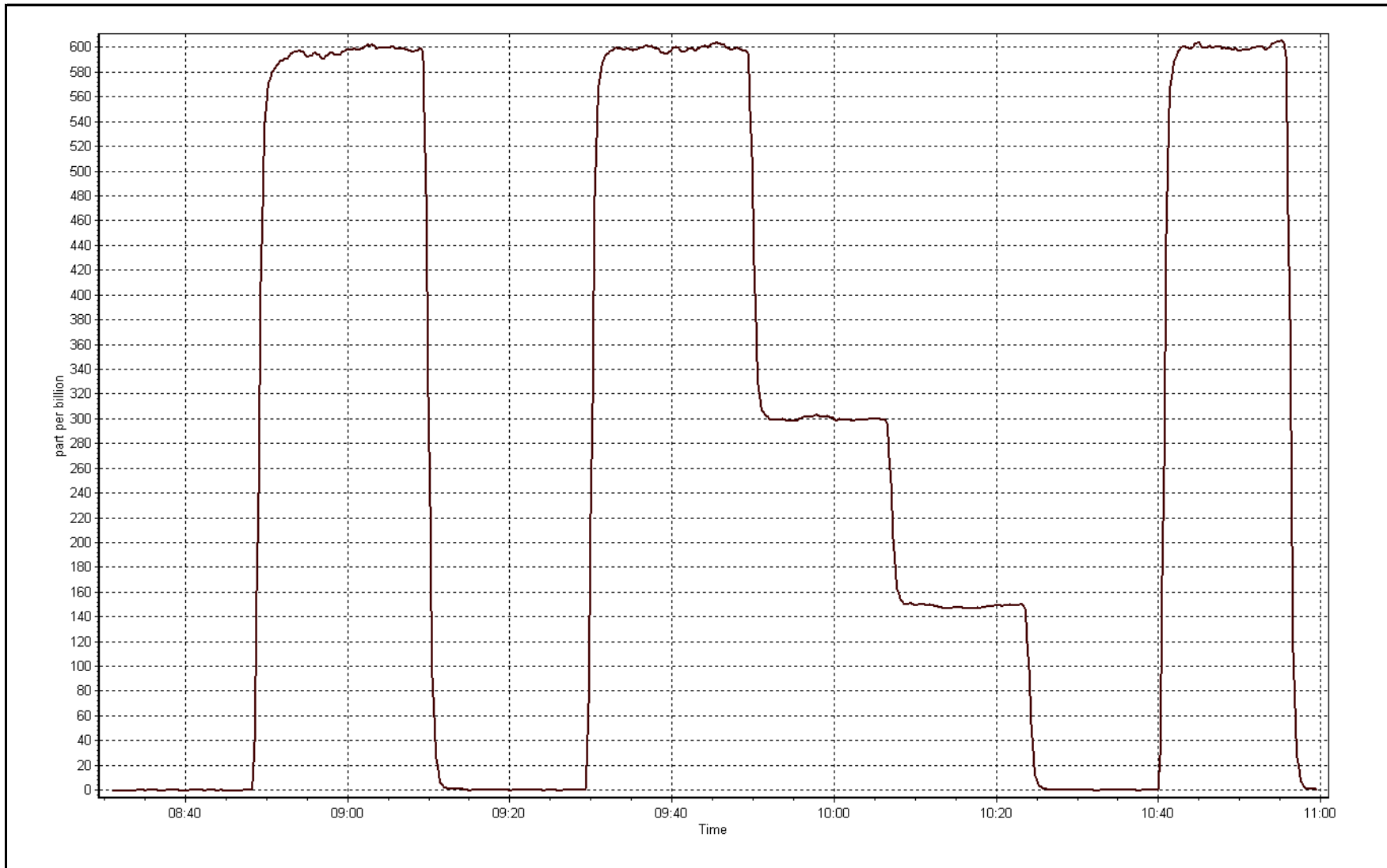
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999986
600.4	599.5	1.0015		
300.2	300.2	1.0000	Slope	1.000155
150.1	148.0	1.0141		
			Intercept	0.723869



SO2 Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	10:55	End Time (MST)	13:44
Gas Cert Reference	LL101590	Station temp.	22 Deg C
Cal Gas Concentration	9.75 ppm	Cal Gas Exp Date	2/22/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG air Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	08/09/2018 Praxair

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-618	-618
Analyzer IP address	192.168.1.42		Lamp voltage	879	879
Calculated slope	0.993960	0.989218	Chamber temp	45	45
Calculated intercept	-0.267235	0.125818	Pressure	555.3	555.3
Analyzer Background	14.1	14.7	Flow	1.054	1.054
Analyzer Coefficient	0.849	0.871	Intensity	94	94
			Converter temp.	330	330
Analyzer make/model	TEI 450i		Analyzer serial #	1336160094	
Converter make/model	na		Converter serial #	na	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.6	----
as found span	6000	46.1	74.9	73.9	1.014
SO2 scrubber check	5000	15.1	150.1	1.9	----
calibrator zero	6000	0.0	0.0	-0.1	----
high point	6000	46.1	74.9	75.6	0.991
second point	6000	25.8	41.9	42.3	0.991
third point	6000	15.4	25.0	25.1	0.997
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	46.2	75.1	75.7	0.992
Average Correction Factor					0.993

Corrected As found 73.3 Previous response 75.6 % change 3.2%

Notes:

Scrubber checked after as founds, zero and span adjusted, no maintenance done, filter changed out

Calibration Performed By:

Melissa Lemay



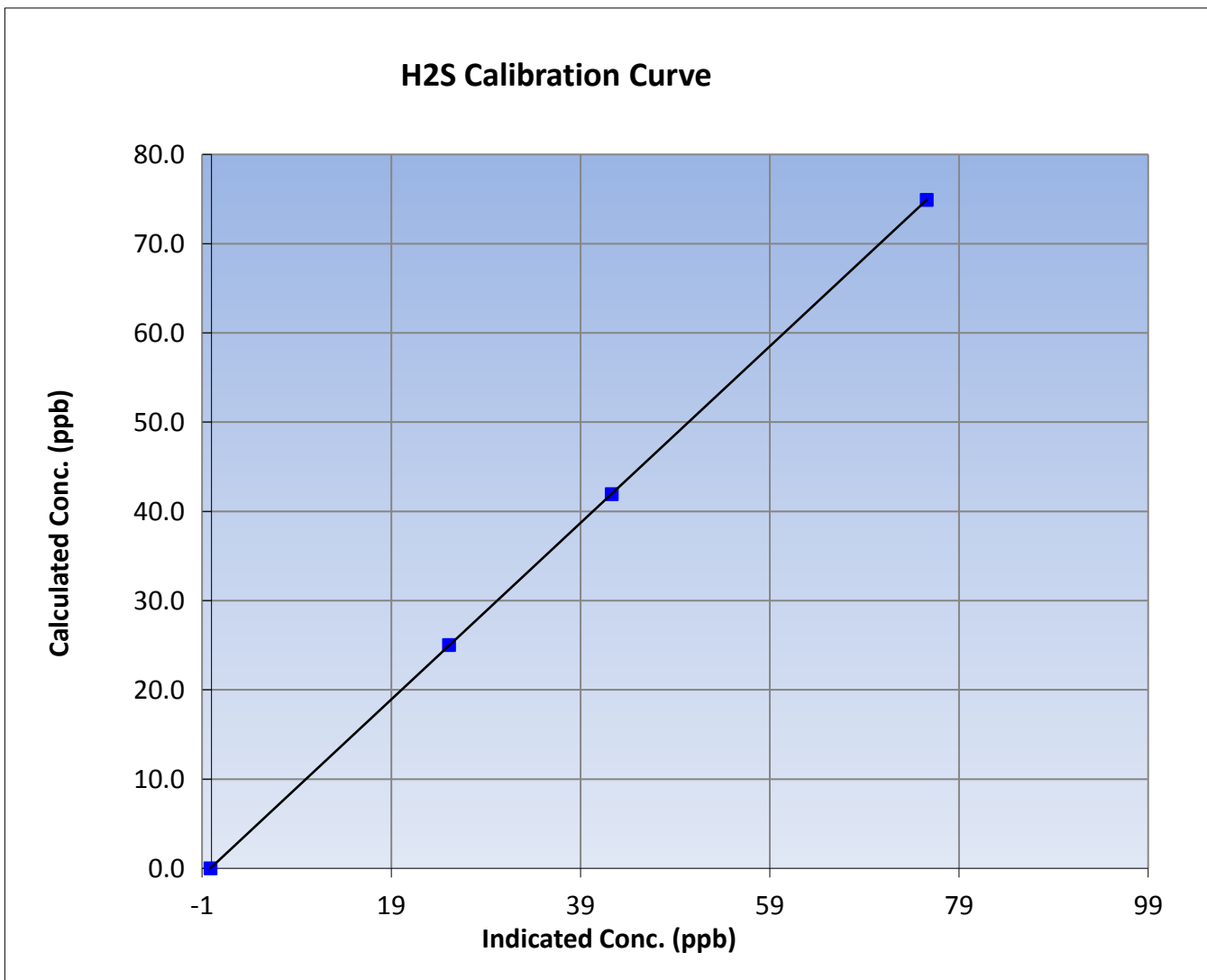
Wood Buffalo Environmental Association H2S Calibration Report

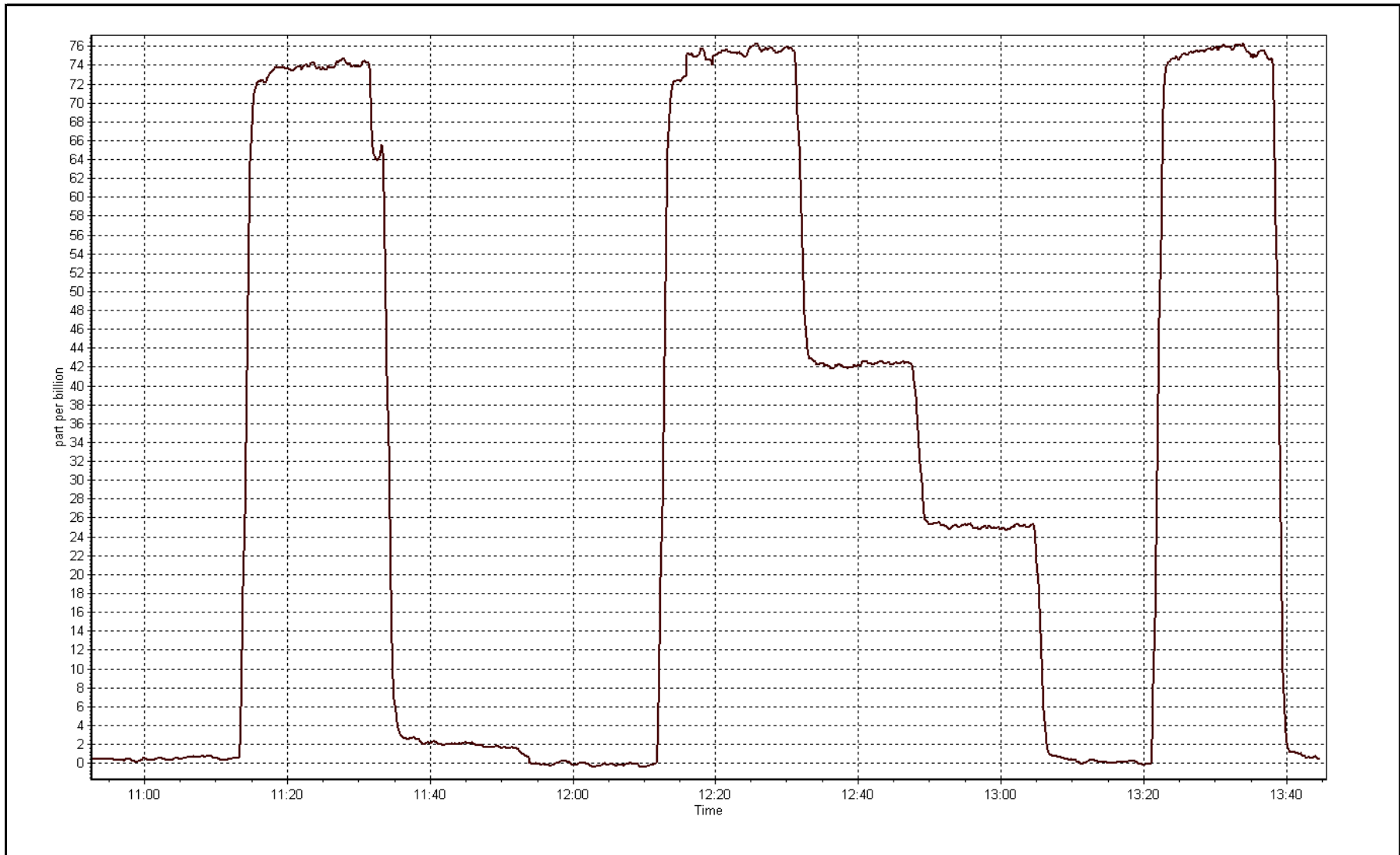
Station Information

Calibration Date	December 15, 2016	Previous Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	10:55	End Time (MST)	13:44
Analyzer make	Routine	Analyzer serial #	1336160094

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999997
74.9	75.6	0.9909		
41.9	42.3	0.9911	Slope	0.989218
25.0	25.1	0.9970		
			Intercept	0.125818







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	10:58
Gas Cert Reference	LL107929	Cal Gas Expiry Date	September 8, 2018
CH4 Cal Gas Conc.	514 ppm	CH4 Equiv Conc.	1061.3 ppm
C3H8 Cal Gas Conc.	199 ppm	Station temp.	21 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG make/model	Teledyne API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	30.4	30.4
Calculated slope	0.998141	0.992977	Fuel Pressure	19.9	19.9
Calculated intercept	0.004146	-0.021475	Analyzer Coeff	4.275	4.275
			Analyzer BKG	0.840	0.840

Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.02	----
as found span	5000	60.4	12.82	12.95	0.990
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	60.4	12.82	12.91	0.993
second point	5000	30.2	6.41	6.54	0.980
third point	5000	15.1	3.20	3.21	0.998
as left zero	5000	0.0	0.00	-0.01	----
as left span	5000	60.4	12.82	12.96	0.989
Average Correction Factor					0.991

Corrected As found	12.93	Previous response	12.84	% change	-0.7%
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Notes:

No adjustments done, filter changed out, hydrogen changed out

Calibration Performed By:

Melissa Lemay



Wood Buffalo Environmental Association THC Calibration Report

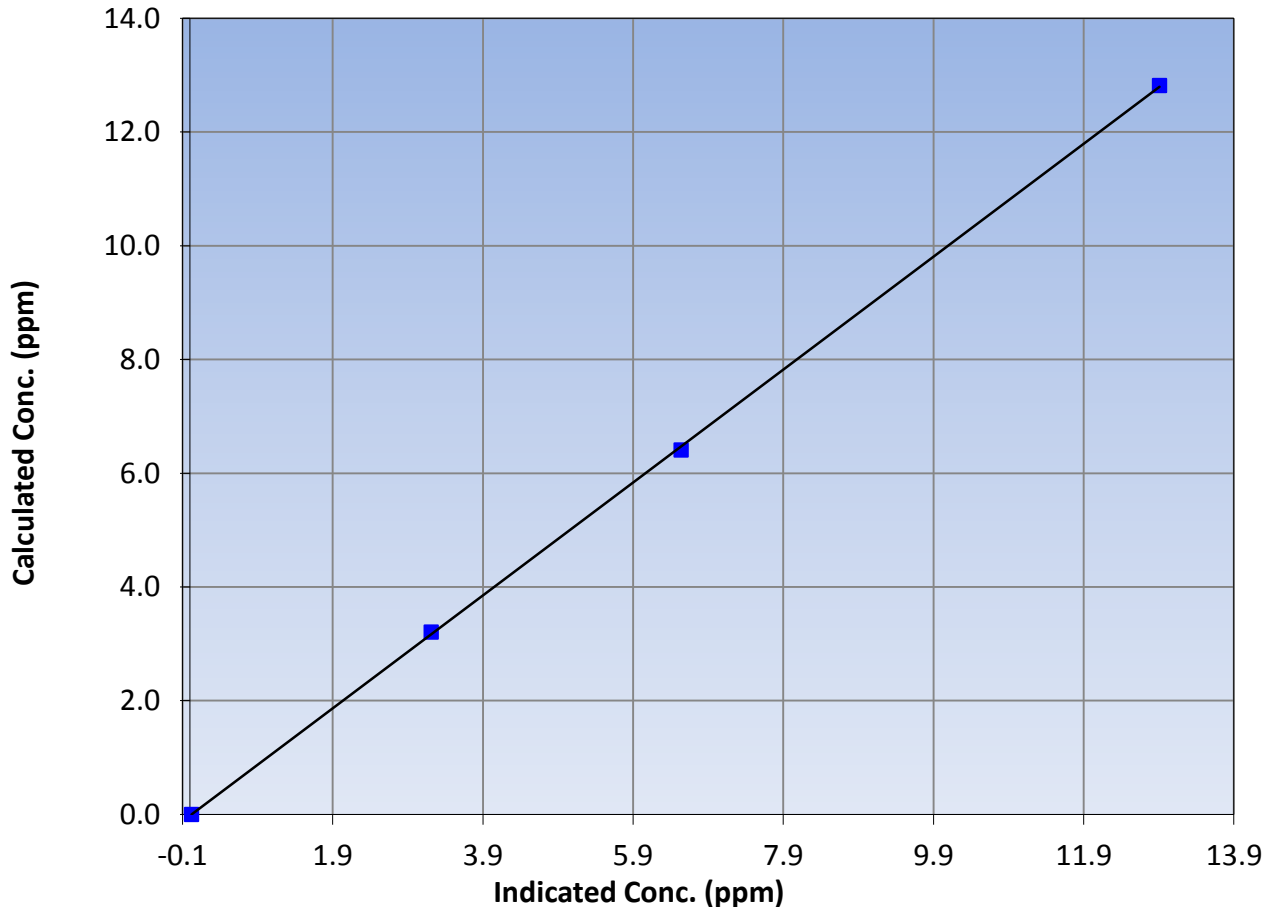
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:30	End Time (MST)	10:58
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

Calibration Data

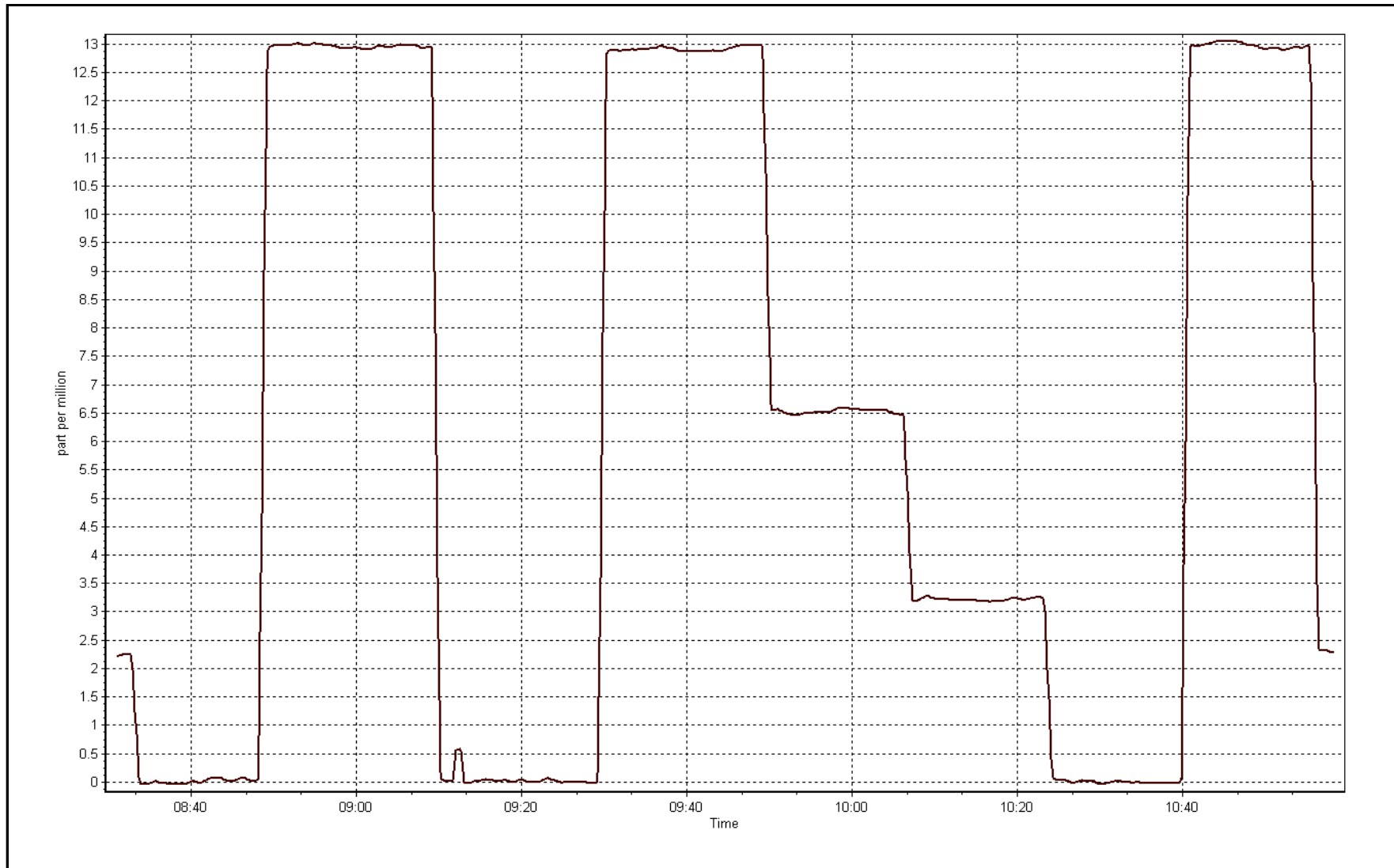
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999934
12.82	12.91	0.9930		
6.41	6.54	0.9801		
3.20	3.21	0.9984		
			Slope	0.992977
			Intercept	-0.021475

THC Calibration Curve



THC Calibration Plot

Date: December 15, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 5
MANNIX
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2016

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	34	37	99.60	36	0	9	0
H2S (ppb) Average	706	35	38	99.60	7	0	2	0
THC (ppm) Average	707	34	37	99.60	5.7	-	3.1	-
Temperature 2 m (C) Average	744	0	0	100.00	2.2	-	-2	-
Temperature 20 m (C) Average	686	0	58	92.20	2.8	-	-1.7	-
Temperature 45 m (C) Average	744	0	0	100.00	2.7	-	-1.7	-
Temperature 75 m (C) Average	744	0	0	100.00	2.6	-	-1.3	-
Temperature 90 m (C) Average	744	0	0	100.00	2.5	-	-1.3	-
Relative Humidity 2 m (%) Average	744	0	0	100.00	95	-	89	-
Relative Humidity 20 m (%) Average	686	0	58	92.20	96	-	88	-
Relative Humidity 45 m (%) Average	744	0	0	100.00	97	-	89	-
Relative Humidity 75 m (%) Average	744	0	0	100.00	97	-	89	-
Relative Humidity 90 m (%) Average	744	0	0	100.00	97	-	89	-
Wind Speed 20 m (km/h) Average	685	0	59	92.07	28	-	24	-
Wind Speed 45 m (km/h) Average	744	0	0	100.00	34	-	29	-
Wind Speed 75 m (km/h) Average	738	0	6	99.19	38	-	31	-
Wind Speed 90 m (km/h) Average	744	0	0	100.00	41	-	32	-
Wind Direction 20 m (deg) Average	685	0	59	92.07	-	-	-	-
Wind Direction 45 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 75 m (deg) Average	738	0	6	99.19	-	-	-	-
Wind Direction 90 m (deg) Average	744	0	0	100.00	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	685	0	59	92.07	1.2	-	0.8	-
Vertical Wind Speed 45 m (km/h) Average	744	0	0	100.00	2.2	-	1.5	-
Vertical Wind Speed 75 m (km/h) Average	738	0	6	99.19	1.7	-	0.8	-
Vertical Wind Speed 90 m (km/h) Average	744	0	0	100.00	3.9	-	2.5	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	1.8	4	-	0	0	0	0	1	4	36
H2S (ppb) Average	706	0.6	1	-	0	0	0	0	1	1	7
THC (ppm) Average	707	2.34	0.4	-	1.9	2.1	2.1	2.2	2.4	2.7	5.7
Temperature 2 m (C) Average	744	-17.2	8.6	-	-36.1	-29.2	-23	-17.3	-11.6	-4	2.2
Temperature 20 m (C) Average	686	-15.56	7.9	-	-30.7	-25.8	-21.1	-16.6	-10.4	-3.3	2.8
Temperature 45 m (C) Average	744	-16.55	8.6	-	-35.1	-27.5	-22.5	-17.2	-11.4	-3.5	2.7
Temperature 75 m (C) Average	744	-16.37	8.4	-	-33.8	-26.9	-22.5	-17.4	-11.2	-3.5	2.6
Temperature 90 m (C) Average	744	-16.3	8.4	-	-33.1	-26.8	-22.6	-17.4	-11.1	-3.4	2.5
Relative Humidity 2 m (%) Average	744	78.6	6	-	63	72	75	78	83	86	95
Relative Humidity 20 m (%) Average	686	77.6	6	-	61	70	74	77	82	86	96
Relative Humidity 45 m (%) Average	744	77.2	6	-	60	69	73	76	82	85	97
Relative Humidity 75 m (%) Average	744	77.4	7	-	59	68	73	77	82	86	97
Relative Humidity 90 m (%) Average	744	77.5	7	-	58	68	73	77	83	86	97
Wind Speed 20 m (km/h) Average	685	10.9	6	-	0	4	6	10	15	19	28
Wind Speed 45 m (km/h) Average	744	14.9	7	-	1	6	9	15	20	24	34
Wind Speed 75 m (km/h) Average	738	17.7	8	-	1	6	11	17	24	29	38
Wind Speed 90 m (km/h) Average	744	18.8	9	-	1	7	12	18	26	31	41
Wind Direction 20 m (deg) Average	685	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 75 m (deg) Average	738	-	-	-	-	-	-	-	-	-	-
Wind Direction 90 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	685	0.08	0.4	-	-0.8	-0.4	-0.2	0	0.3	0.7	1.2
Vertical Wind Speed 45 m (km/h) Average	744	0.14	0.8	-	-1.6	-0.8	-0.5	0	0.6	1.3	2.2
Vertical Wind Speed 75 m (km/h) Average	738	0.19	0.4	-	-0.9	-0.2	0	0.1	0.3	0.7	1.7
Vertical Wind Speed 90 m (km/h) Average	744	0.77	0.9	-	-1.6	0	0.2	0.5	1.1	2.3	3.9

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	06 Dec 2016 10:00	06 Dec 2016 11:00	2	Maintenance - tested daily zero and span system
SO2	21 Dec 2016 11:00	21 Dec 2016 11:00	1	Maintenance - data logger reset
H2S	01 Dec 2016 09:00	01 Dec 2016 09:00	1	Maintenance - sample manifold cleaned
H2S	06 Dec 2016 12:00	06 Dec 2016 12:00	1	Maintenance - tested daily zero and span system
H2S	21 Dec 2016 11:00	21 Dec 2016 11:00	1	Maintenance - data logger reset
THC	06 Dec 2016 10:00	06 Dec 2016 11:00	2	Maintenance - tested daily zero and span system
THC	21 Dec 2016 11:00	21 Dec 2016 11:00	1	Maintenance - data logger reset
Temperature, Relative Humidity 20 m	08 Dec 2016 22:00	09 Dec 2016 14:00	17	Flat line in sensor output signal
Temperature, Relative Humidity 20 m	10 Dec 2016 04:00	10 Dec 2016 06:00	3	Flat line in sensor output signal
Temperature, Relative Humidity 20 m	16 Dec 2016 06:00	16 Dec 2016 12:00	7	Flat line in sensor output signal
Temperature, Relative Humidity 20 m	16 Dec 2016 22:00	18 Dec 2016 00:00	27	Flat line in sensor output signal
Temperature, Relative Humidity 20 m	18 Dec 2016 03:00	18 Dec 2016 06:00	4	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	08 Dec 2016 10:00	08 Dec 2016 10:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	08 Dec 2016 22:00	09 Dec 2016 14:00	17	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	10 Dec 2016 04:00	10 Dec 2016 06:00	3	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	16 Dec 2016 06:00	16 Dec 2016 12:00	7	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	16 Dec 2016 22:00	18 Dec 2016 00:00	27	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	18 Dec 2016 03:00	18 Dec 2016 06:00	4	Flat line in sensor output signal
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	17 Dec 2016 17:00	17 Dec 2016 22:00	6	Flat line in sensor output signal

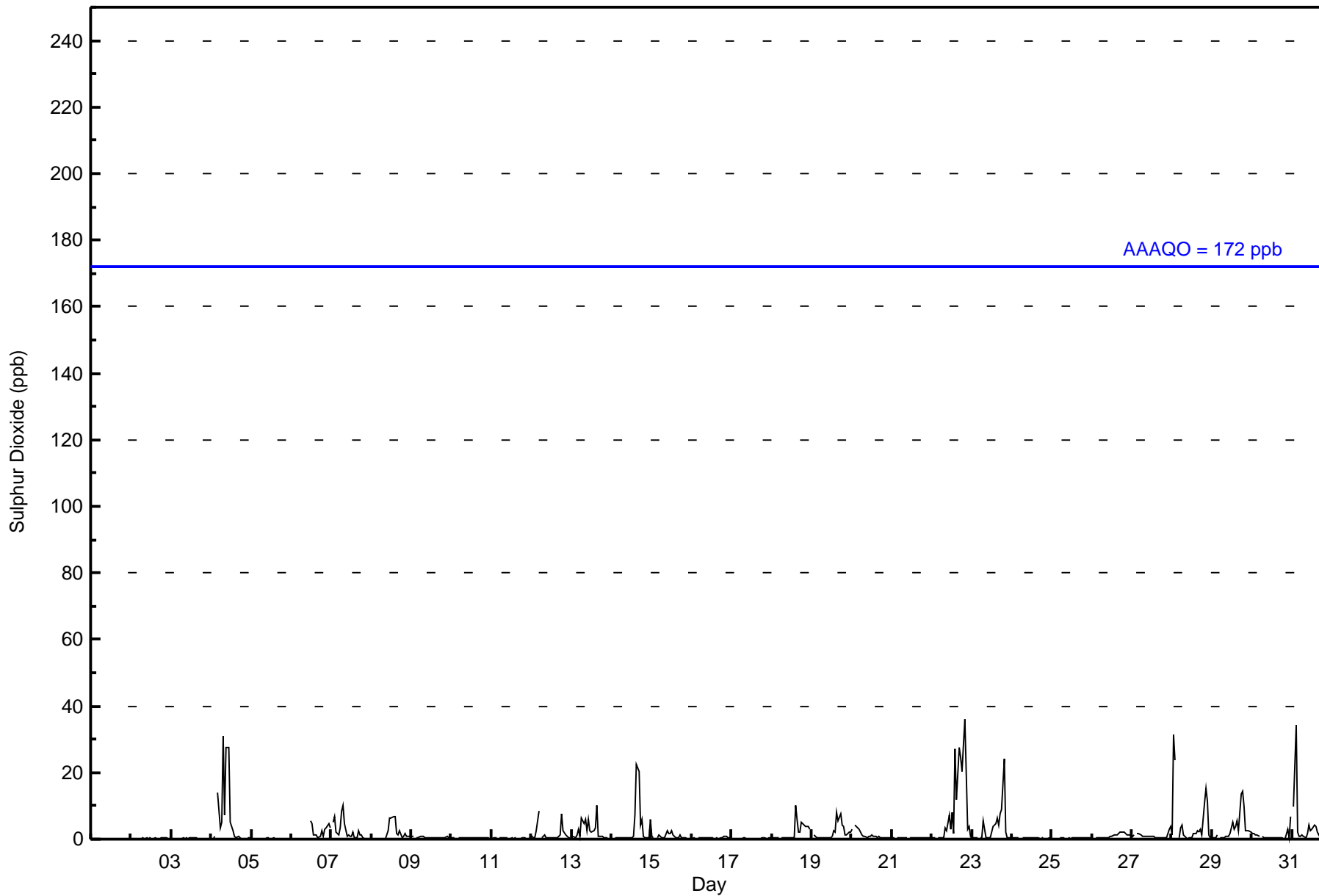


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 36 ppb on Dec 22 21:00 Maximum Daily Average: 9.2 ppb on Dec 22																	Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 34 Percent Operational Time: 99.6									
Minimum Value: 0 ppb on Dec 5 03:00 Minimum Daily Average: 0.1 ppb on Dec 5 Maximum Diurnal Average: 3.1 ppb at hour 20 Minimum Diurnal Average: 0.5 ppb at hour 1 Monthly Average: 1.8 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 4 P ₉₉ = 27																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	1	Z	14	3	5	31	7	27	27	5	4	3	1	0	1	0	0	0	0	0	0	1	5.7	31
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	Z	0	0	0	M	M	5	4	1	1	1	0	1	3	1	3	3	5	3	1.6	5
7-Dec	Z	5	7	2	1	3	9	10	4	1	1	1	1	2	0	0	2	1	1	0	0	0	0	0	2.3	10
8-Dec	0	Z	0	0	0	0	0	0	0	1	3	6	6	7	7	2	1	3	0	1	2	1	1	1	1.8	7
9-Dec	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0.5	1
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.3	1
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1
12-Dec	1	0	1	3	9	Z	0	1	1	0	0	0	0	1	0	1	1	8	3	1	1	0	0	0	1.4	9
13-Dec	Z	1	1	1	3	1	7	5	6	3	6	3	2	3	3	10	1	1	1	0	0	0	0	0	2.5	10
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	7	23	20	4	6	1	1	0	0	6	3.2	23
15-Dec	1	0	Z	0	1	1	0	0	0	2	2	2	2	1	0	0	1	1	0	0	0	0	0	0	0.8	2
16-Dec	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0.4	1
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	10	6	2	2	5	4	4	4	4	3	2.1	10
19-Dec	Z	1	1	1	1	0	0	0	0	0	0	1	1	2	2	8	6	8	4	4	1	1	2	2	2.1	8
20-Dec	3	Z	4	4	3	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1.2	4
21-Dec	0	0	Z	0	0	0	0	1	1	0	M	0	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1
22-Dec	0	0	0	Z	0	0	0	0	3	2	7	3	8	2	27	12	28	24	20	28	36	3	4	1	9.2	36
23-Dec	0	0	0	0	Z	1	0	6	1	0	0	0	2	4	5	6	4	8	9	24	2	1	0	0	3.3	24
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
25-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	1	1	1	1.0	2
27-Dec	1	1	Z	2	2	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	3	4	1.0	4
28-Dec	1	31	24	Z	0	4	4	1	0	0	0	0	0	2	2	3	2	3	1	11	15	11	1	1	5.2	31
29-Dec	1	0	1	1	Z	0	0	1	1	1	1	2	5	3	4	5	2	14	14	10	3	3	2	2	3.3	14
30-Dec	2	2	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	3	0	7	1.0	7
31-Dec	Z	10	34	2	1	1	1	1	0	2	4	3	3	4	4	2	1	2	1	0	0	0	0	0	3.3	34
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Mannix - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Mannix - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	685	96.89	96.89
11 - 20	9	1.27	98.16
21 - 60	13	1.84	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Mannix - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	43	45	7	1	2	10	55	142	55	17	26	40	77	51	31	28	630
11 - 20	5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	9
21 - 60	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	13
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	57	48	7	1	2	10	55	142	55	17	26	40	77	51	33	31	652

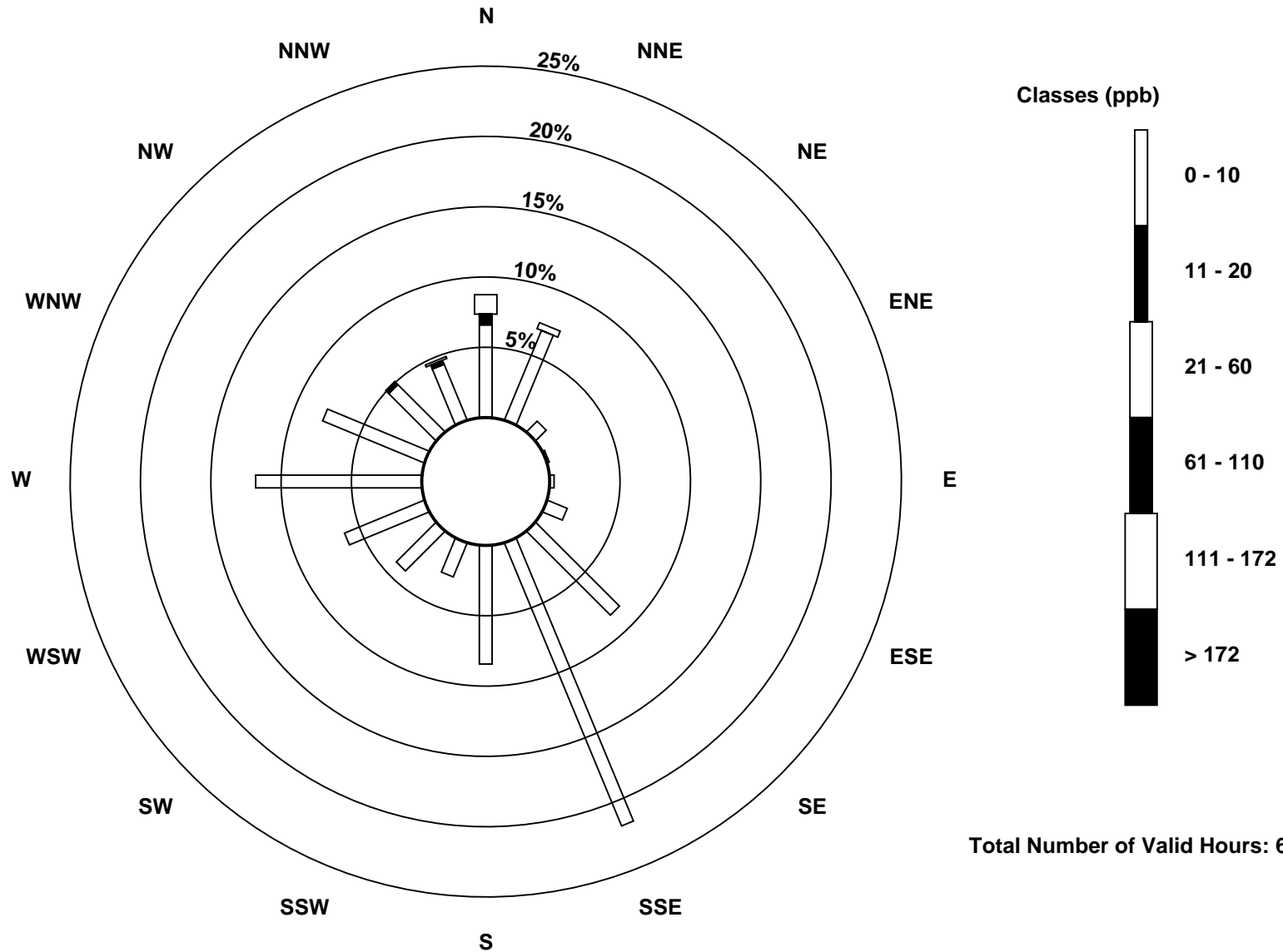
Total Number of Valid Hours: 652

Total Number of Hours: 744

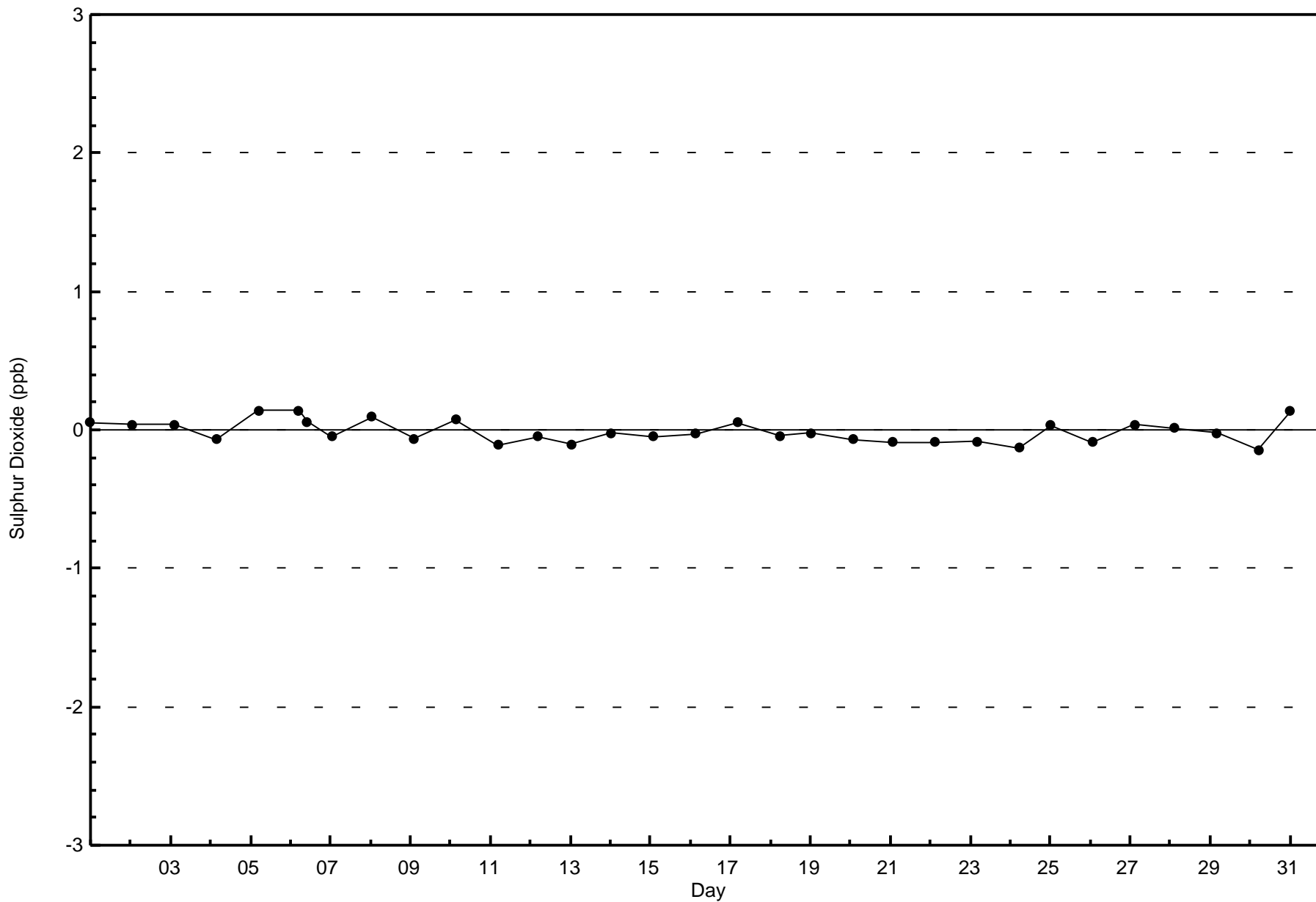


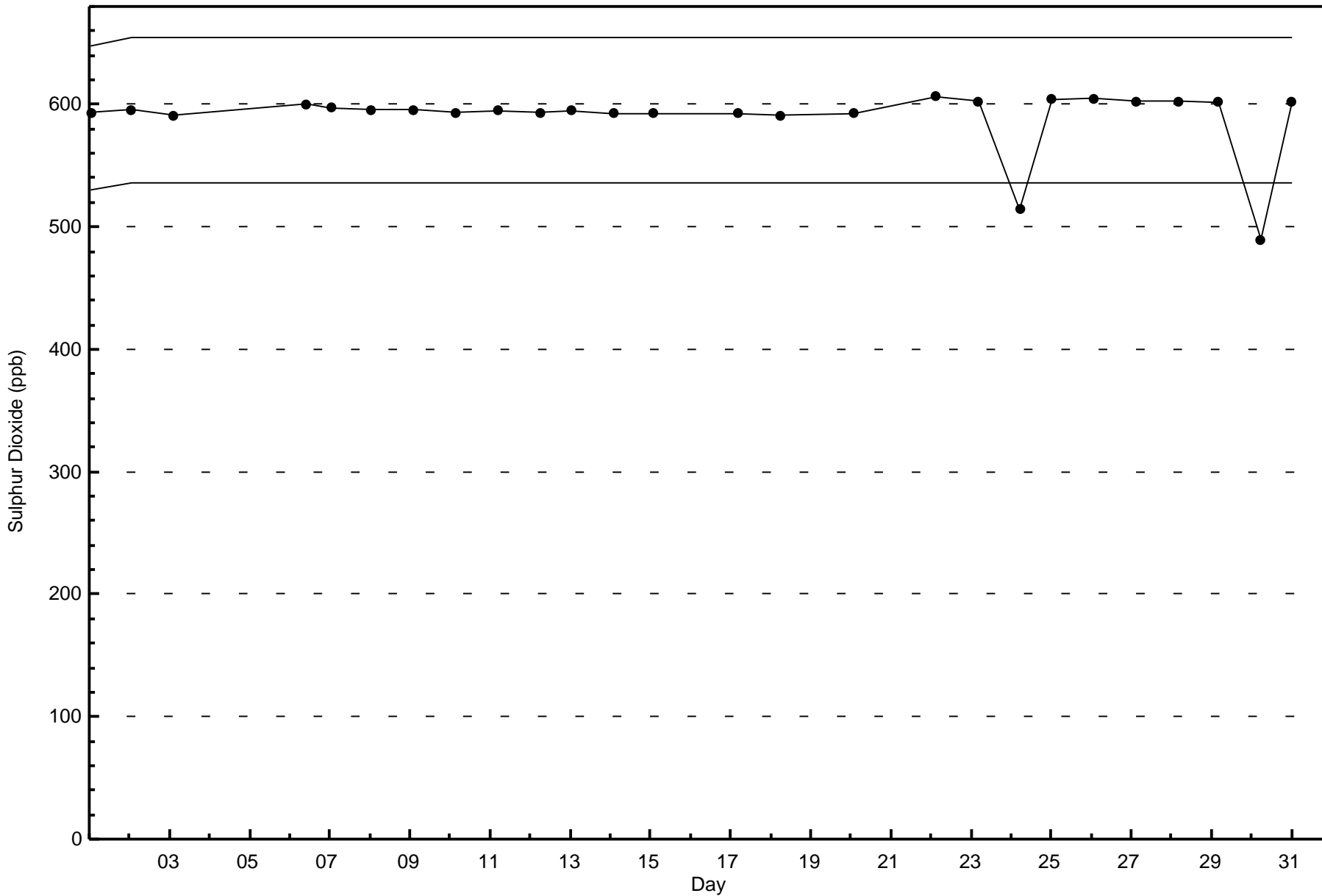
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Mannix (AMS 5)



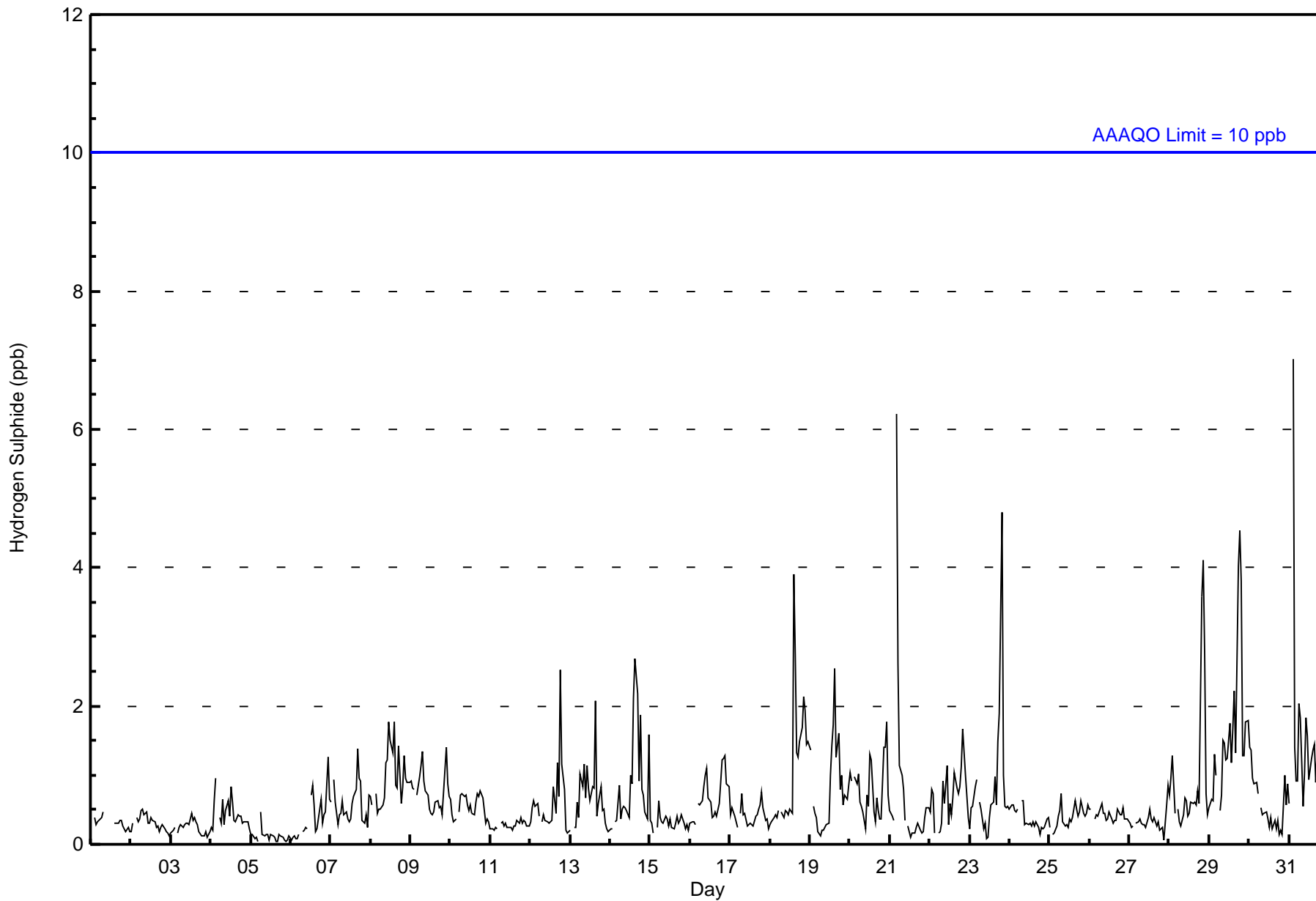
Total Number of Valid Hours: 652







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 ppb on Dec 31 03:00 Maximum Daily Average: 1.6 ppb on Dec 29																	Hours in Service: 744 Hours of Data: 706 Hours of Missing Data: 38 Hours of Calibration: 35 Percent Operational Time: 99.6									
Minimum Value: 0 ppb on Dec 5 16:00 Minimum Daily Average: 0.1 ppb on Dec 5 Maximum Diurnal Average: 0.9 ppb at hour 20 Minimum Diurnal Average: 0.5 ppb at hour 1 Monthly Average: 0.6 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 4																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	M	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
3-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	1	1	Z	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	M	1	1	1	0	0	0	1	0	0	0	1	1	0.4	1
7-Dec	1	Z	1	1	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	1	0.6	1
8-Dec	1	1	Z	1	0	1	1	1	1	1	1	2	2	1	2	1	1	1	1	1	1	1	1	1	1.0	2
9-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	1	1	1	0.8	1
10-Dec	1	0	0	0	Z	0	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	0	0	0	0.5	1
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	1	1	1	1	0	Z	0	0	0	0	0	0	1	0	1	1	3	1	1	0	0	0	0	0.6	3
13-Dec	0	Z	0	0	1	0	1	1	1	1	1	1	1	1	2	0	1	1	0	1	0	0	0	0	0.7	2
14-Dec	0	0	Z	0	0	1	0	0	1	1	0	0	1	1	2	3	2	1	2	1	1	0	0	2	0.9	3
15-Dec	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
16-Dec	0	0	0	0	Z	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0.7	1
17-Dec	0	1	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0.4	1
18-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	1	0	4	3	1	1	1	2	2	2	1	1	1.1	4
19-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	1	1	2	3	1	2	1	1	1	1	1	1	0.8	3
20-Dec	1	1	Z	1	1	1	1	1	0	0	1	1	1	1	0	0	1	0	0	0	1	1	2	1	0.8	2
21-Dec	0	0	0	Z	6	3	1	1	1	0	M	0	0	0	0	0	0	0	0	0	0	0	1	1	0.8	6
22-Dec	0	1	1	0	Z	0	0	0	1	1	1	0	1	0	1	1	1	1	1	1	2	1	1	0	0.7	2
23-Dec	0	1	1	1	1	Z	1	1	0	0	0	0	0	1	1	1	1	2	5	1	1	1	1	1	0.8	5
24-Dec	1	1	1	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
25-Dec	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0.4	1
26-Dec	0	1	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0.4	1
27-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0.3	1
28-Dec	1	1	1	0	Z	1	0	0	0	1	1	0	0	1	1	1	1	1	1	4	4	3	1	0	1.0	4
29-Dec	1	1	1	1	1	Z	0	1	2	1	1	1	2	1	2	2	1	4	5	4	1	1	2	2	1.6	5
30-Dec	1	1	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.6	1
31-Dec	1	Z	7	1	1	1	2	2	1	1	2	2	1	1	1	1	1	1	1	0	0	0	0	0	1.3	7
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Mannix - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	691	97.88	97.88
3 - 4	11	1.56	99.43
5 - 7	4	0.57	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Mannix - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	52	48	7	1	2	10	54	139	56	17	25	38	78	51	31	26	635
3 - 4	2	0	0	0	0	0	0	0	0	0	1	1	0	1	2	4	11
5 - 7	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	4
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	56	48	7	1	2	10	54	139	56	18	26	39	78	52	33	31	650

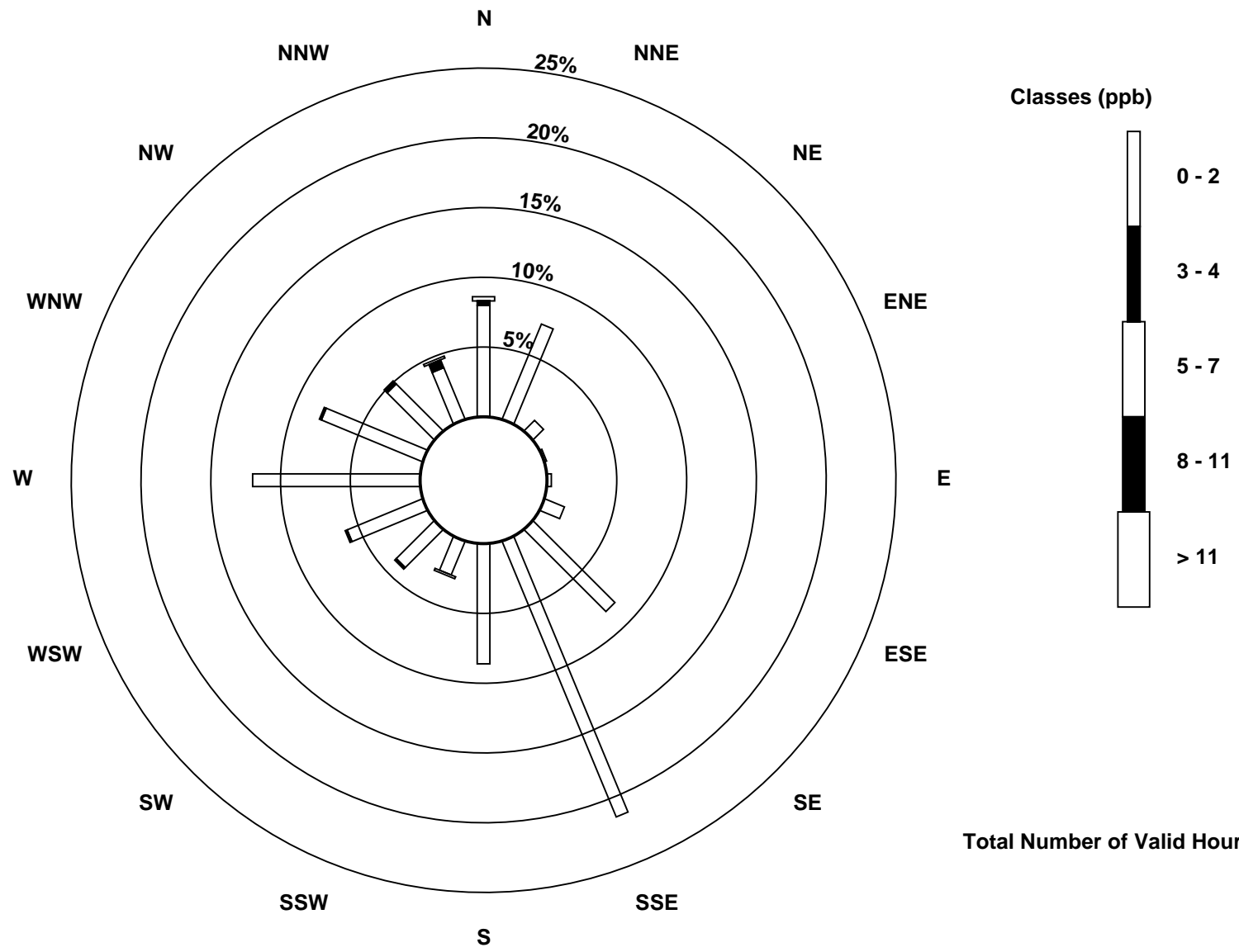
Total Number of Valid Hours: 650

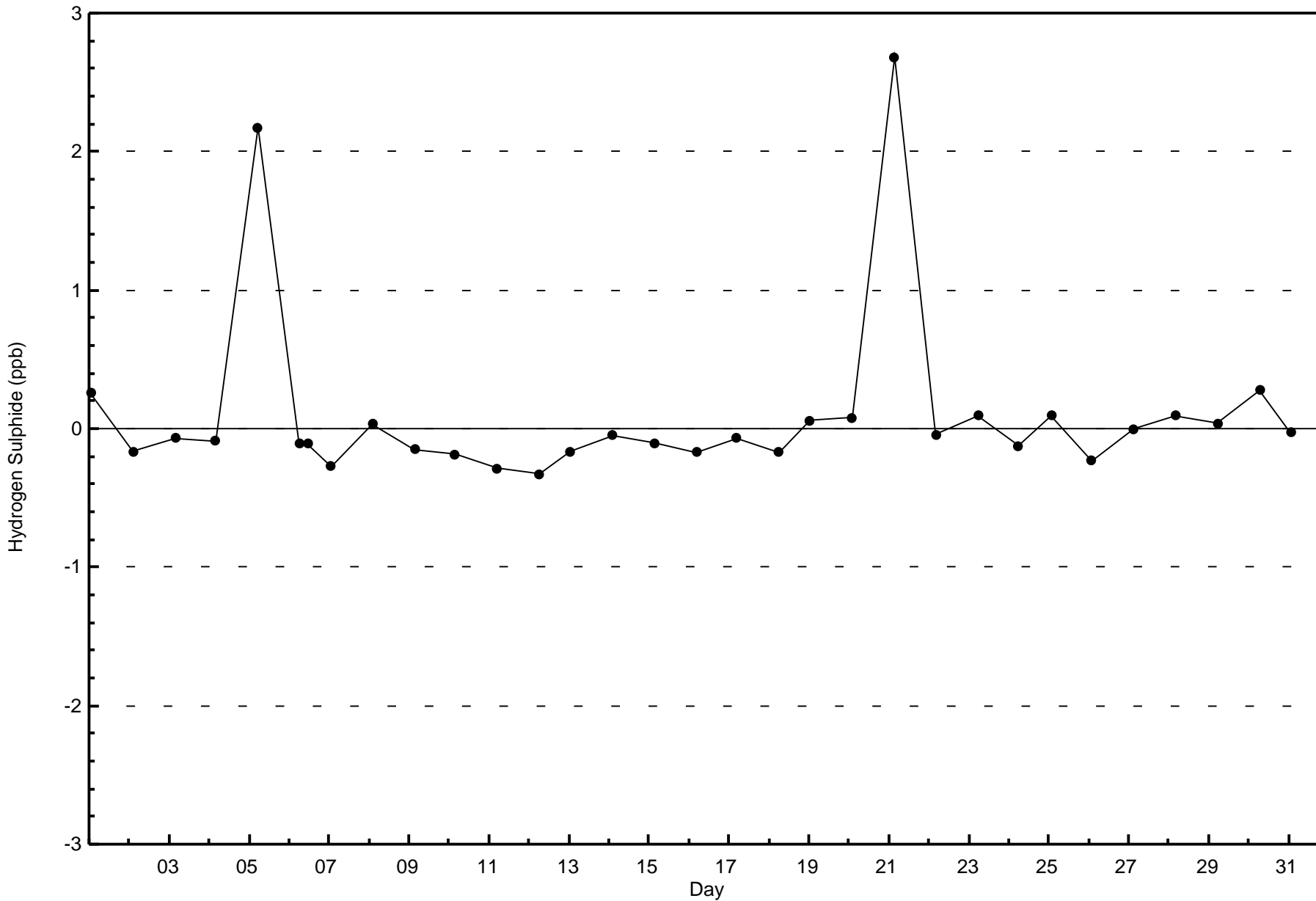
Total Number of Hours: 744

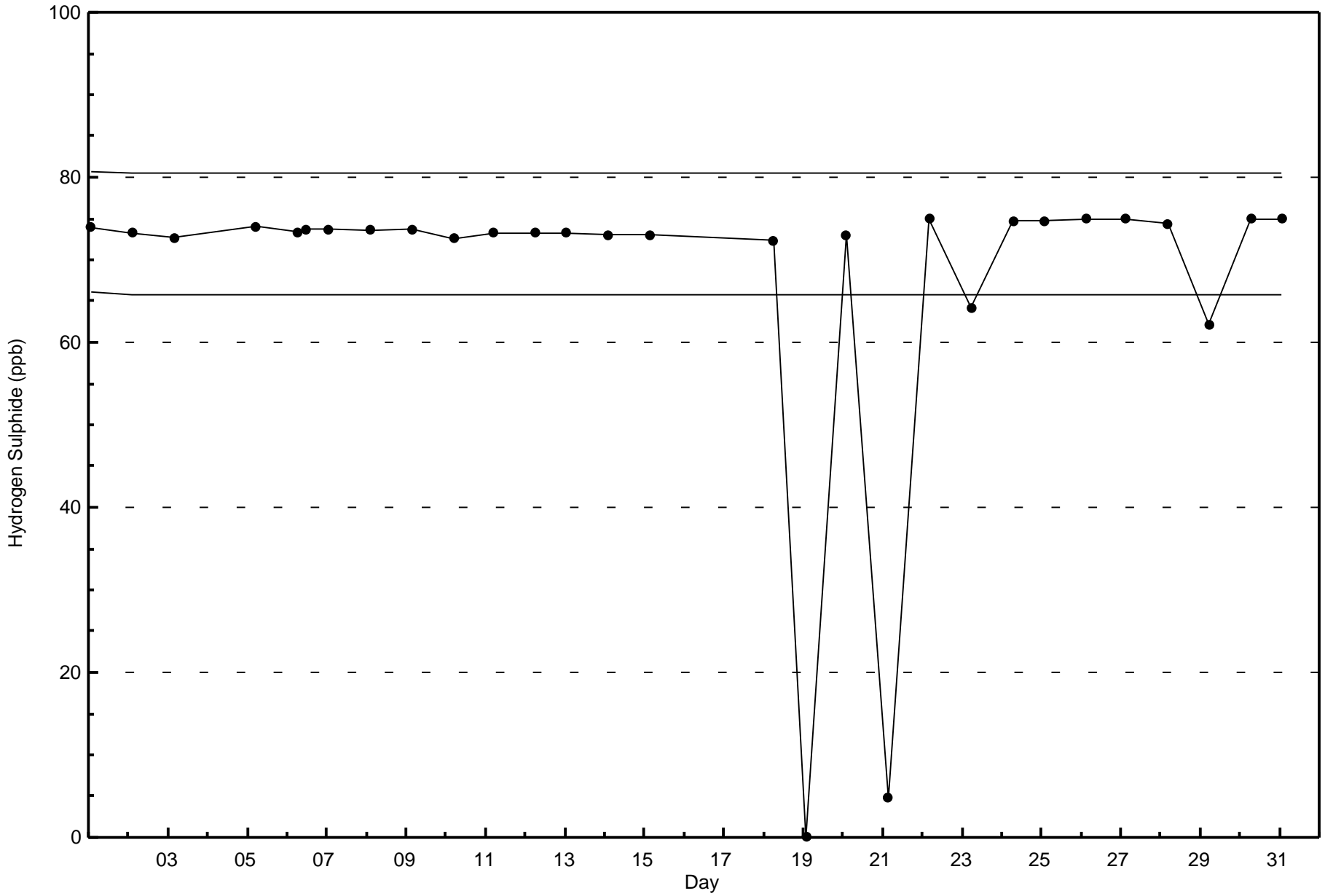


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Mannix (AMS 5)









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

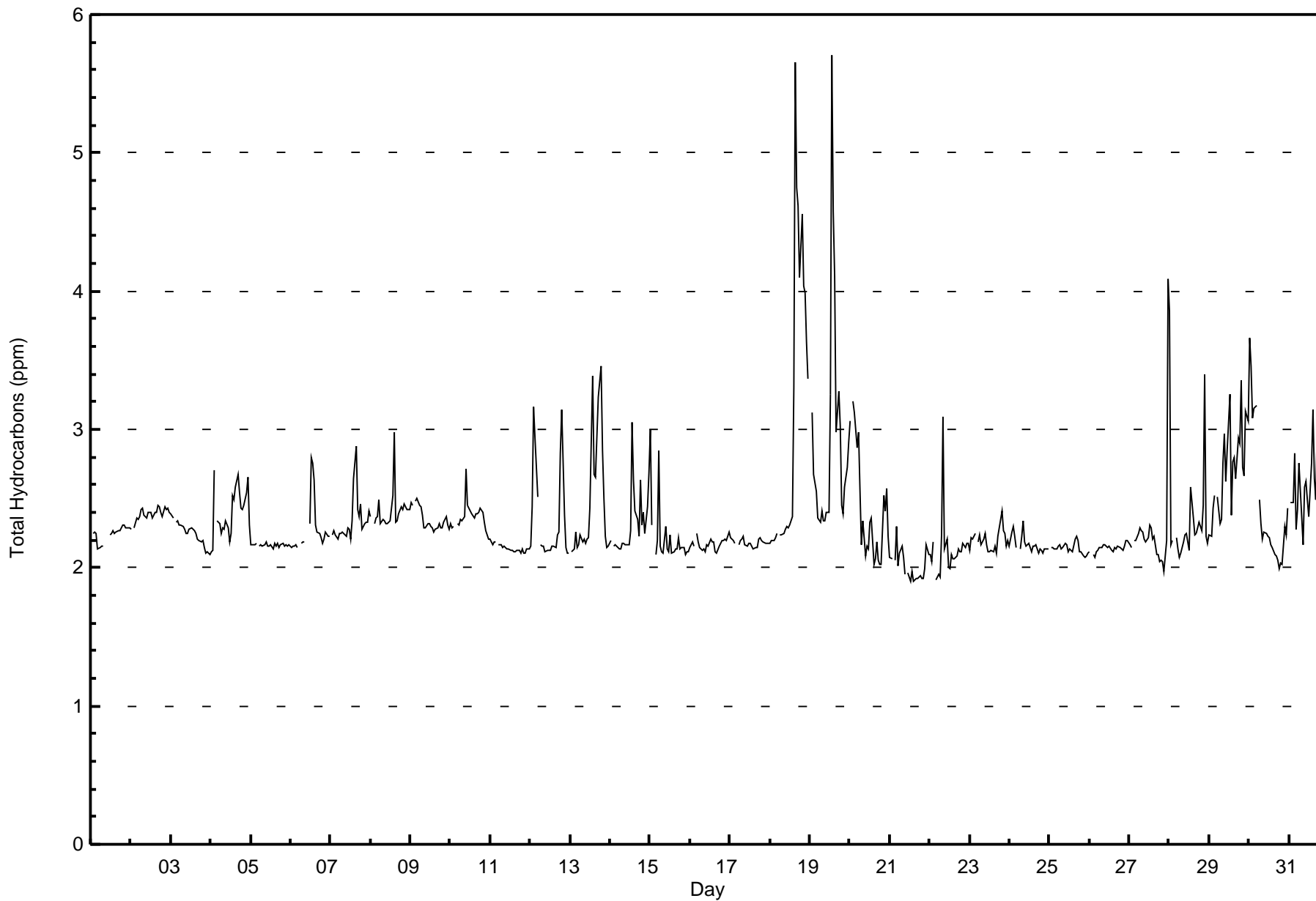
Mannix - December 2016

Maximum Value: 5.7 ppm on Dec 19 14:00		Maximum Daily Average: 3.1 ppm on Dec 18		Hours in Service: 744																						
Minimum Value: 1.9 ppm on Dec 21 13:00		Minimum Daily Average: 2.0 ppm on Dec 21		Hours of Data: 707																						
Maximum Diurnal Average: 2.5 ppm at hour 14		Minimum Diurnal Average: 2.2 ppm at hour 12		Hours of Missing Data: 37																						
Monthly Average: 2.34 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.4 P ₉₀ = 2.7 P ₉₉ = 3.9		Hours of Calibration: 34																						
				Percent Operational Time: 99.6																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	2.2	2.3	2.2	2.1	2.1	2.2	2.2	C	C	C	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3
2-Dec	2.3	Z	2.3	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
3-Dec	2.4	2.4	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.4
4-Dec	2.1	2.1	2.7	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.5	2.5	2.6	2.7	2.5	2.4	2.4	2.5	2.7	2.3	2.4	2.4	2.7
5-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
6-Dec	2.1	2.2	2.2	2.2	2.1	Z	2.2	2.2	2.2	M	M	2.3	2.8	2.8	2.6	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.8
7-Dec	Z	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.2	2.3	2.6	2.9	2.4	2.4	2.5	2.3	2.3	2.3	2.3	2.4	2.3	2.9
8-Dec	2.4	Z	2.3	2.4	2.4	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	3.0	2.3	2.3	2.4	2.4	2.4	2.5	2.4	2.4	2.4	2.4	3.0
9-Dec	2.5	2.5	Z	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.5
10-Dec	2.3	2.3	2.3	Z	2.3	2.3	2.4	2.3	2.4	2.7	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.4	2.7
11-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
12-Dec	2.2	2.4	3.2	2.9	2.5	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.3	2.8	3.1	2.4	2.1	2.1	2.1	2.3	3.2
13-Dec	Z	2.1	2.1	2.3	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	3.4	2.7	3.0	3.2	3.5	2.8	2.5	2.2	2.1	2.2	2.2	2.5	3.5
14-Dec	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	3.0	2.6	2.4	2.3	2.2	2.6	2.3	2.4	2.2	2.4	2.7	2.3	3.0
15-Dec	3.0	2.3	Z	2.1	2.2	2.9	2.2	2.1	2.1	2.3	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.0
16-Dec	2.1	2.2	2.2	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3
17-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
18-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	3.3	5.7	4.7	4.6	4.1	4.6	4.0	4.0	3.6	3.4	3.1	5.7
19-Dec	Z	3.1	2.7	2.6	2.6	2.4	2.3	2.4	2.3	2.3	2.4	2.4	3.3	5.7	4.6	4.1	3.0	3.3	3.0	2.5	2.4	2.6	2.7	2.9	2.9	5.7
20-Dec	3.1	Z	3.2	3.1	2.9	3.0	2.6	2.2	2.3	2.1	2.2	2.1	2.3	2.4	2.0	2.1	2.2	2.1	2.0	2.0	2.5	2.4	2.6	2.2	2.4	3.2
21-Dec	2.1	2.1	Z	2.1	2.3	2.0	2.1	2.2	2.1	2.0	M	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.1	2.0	2.3
22-Dec	2.1	2.0	2.2	Z	1.9	2.0	1.9	2.2	3.1	2.1	2.2	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.1	3.1
23-Dec	2.1	2.2	2.2	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.4
24-Dec	2.2	2.3	2.3	2.2	2.1	Z	2.1	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3
25-Dec	Z	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
26-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.2
27-Dec	2.2	2.1	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.2	4.1	2.3	4.1
28-Dec	3.9	2.2	2.2	Z	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.6	2.4	2.2	2.3	2.3	2.3	2.3	2.4	3.4	2.2	2.2	2.4	3.9
29-Dec	2.2	2.2	2.4	2.5	Z	2.5	2.3	2.3	2.8	3.0	2.6	2.8	3.3	2.4	2.8	2.8	2.6	2.9	2.9	3.4	2.7	2.7	3.1	3.1	2.7	3.4
30-Dec	3.7	3.5	3.1	3.2	3.2	Z	2.5	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.3	2.2	2.4	2.4	3.7
31-Dec	Z	2.5	2.5	2.8	2.3	2.4	2.8	2.6	2.2	2.6	2.6	2.5	2.4	2.8	3.1	2.6	2.5	3.1	2.4	2.0	2.0	2.0	2.0	2.0	2.5	3.1
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Mannix - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	35	4.95	4.95
2.1 - 3.0	633	89.53	94.48
3.1 - 10.0	39	5.52	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Mannix - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	2	0	0	0	0	0	2	0	6	3	2	14	6	0	0	0	35
2.1 - 3.0	55	44	7	1	2	10	50	139	48	13	22	21	70	43	25	28	578
3.1 - 10.0	0	4	0	0	0	0	3	3	1	1	2	5	1	8	8	3	39
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	57	48	7	1	2	10	55	142	55	17	26	40	77	51	33	31	652

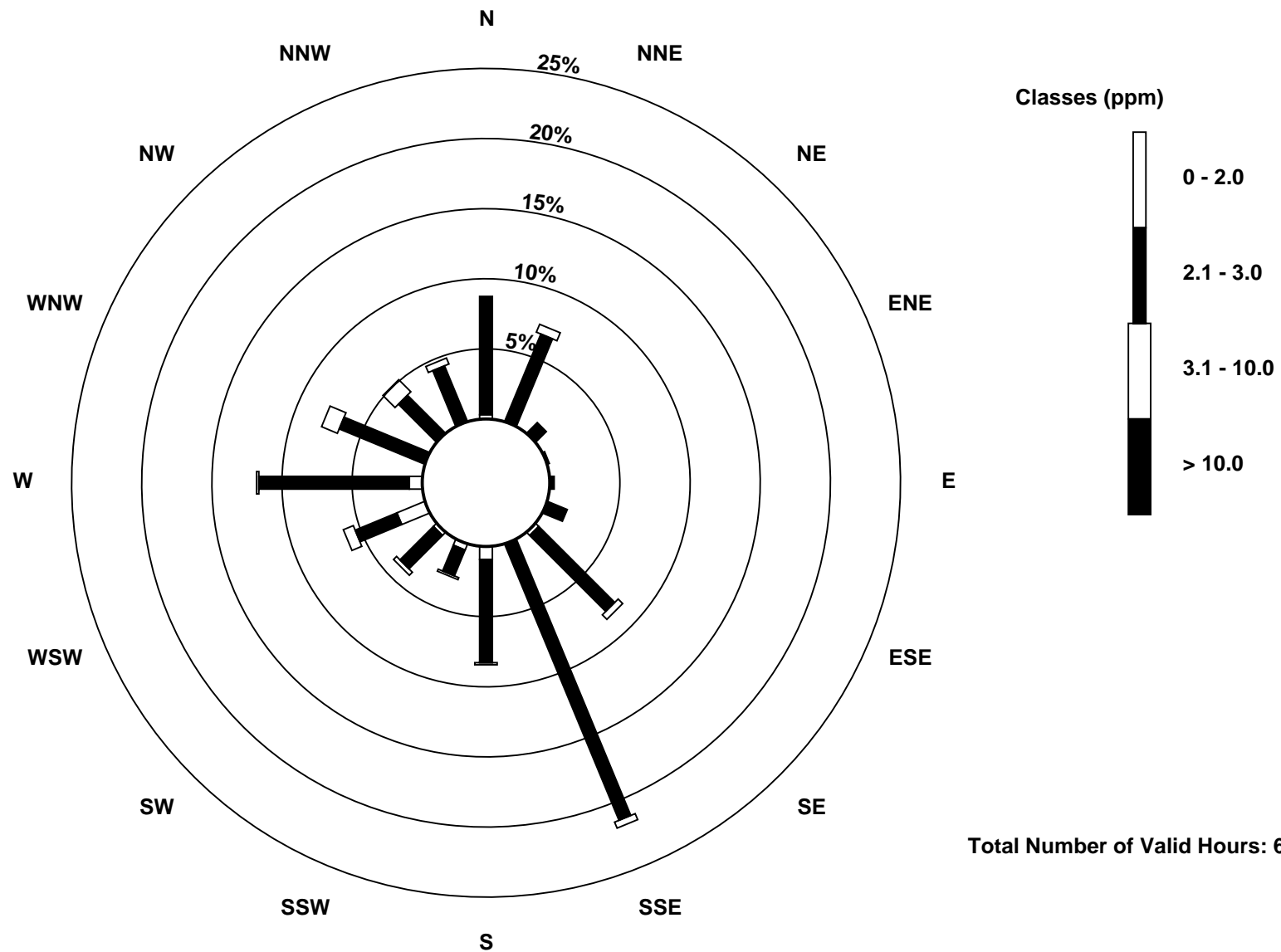
Total Number of Valid Hours: 652

Total Number of Hours: 744

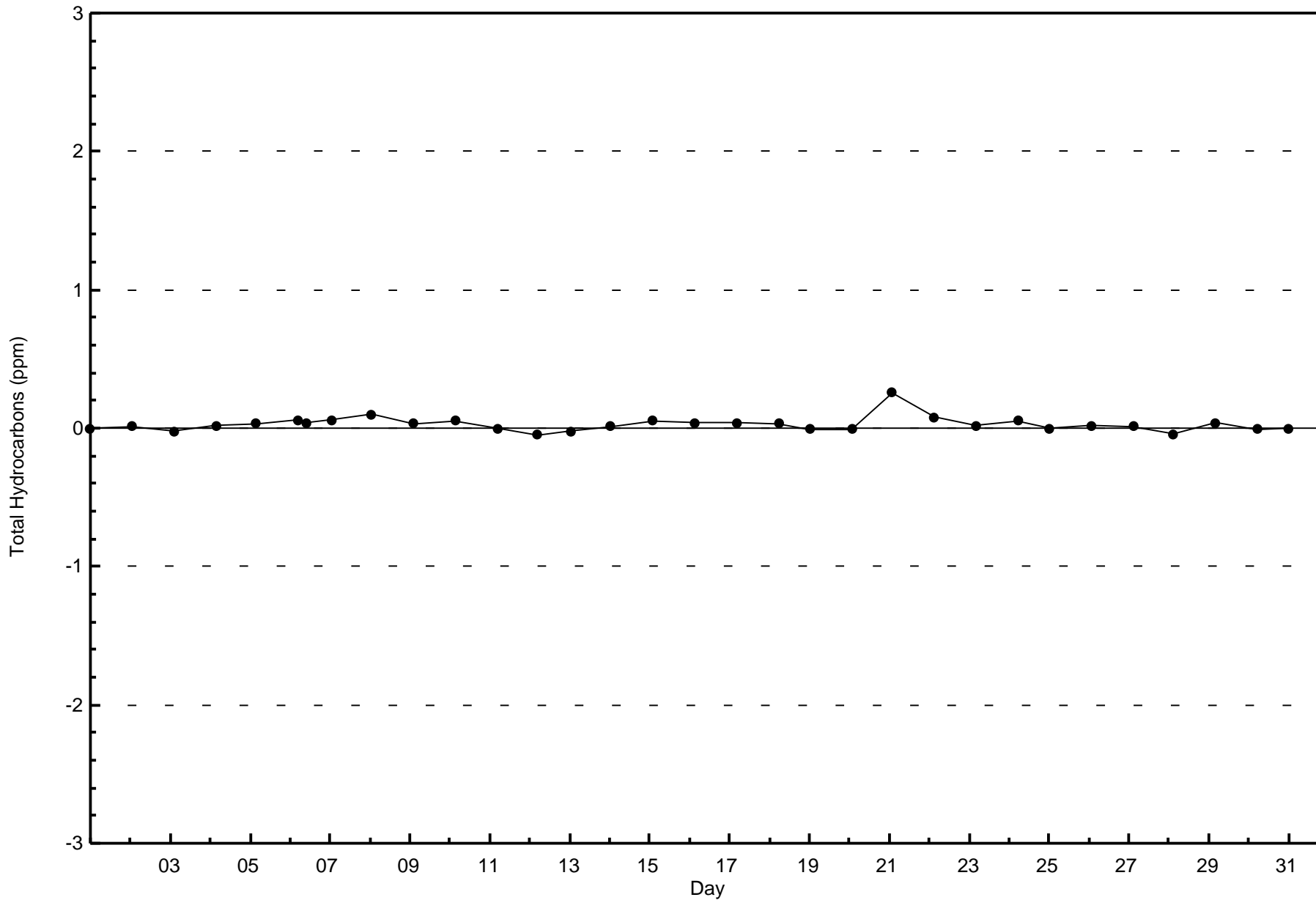


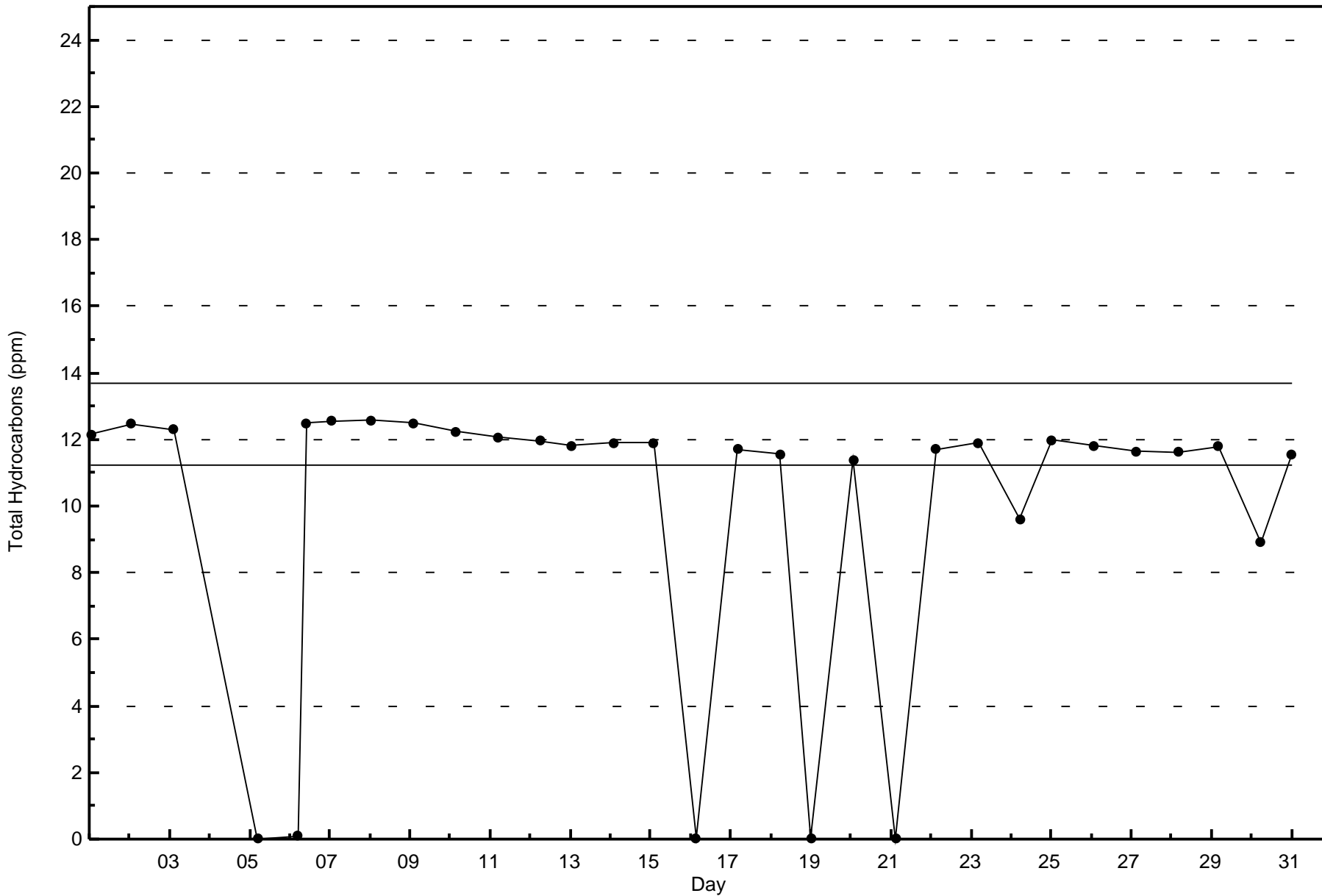
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Mannix (AMS 5)



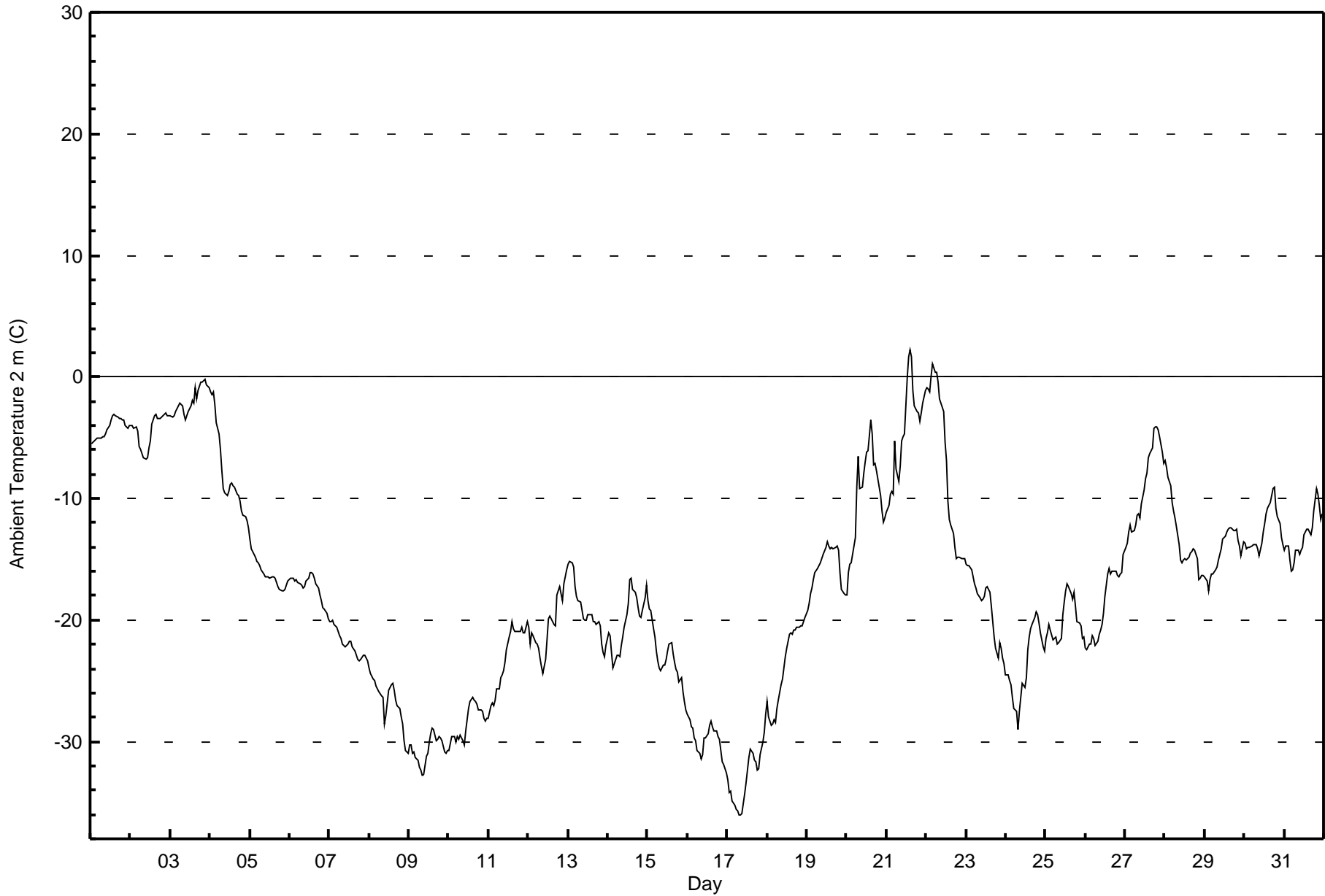
Total Number of Valid Hours: 652







Maximum Value: 2.2 C on Dec 21 15:00 Maximum Daily Average: -2.0 C on Dec 3																							Hours in Service:	744		
Minimum Value: -36.1 C on Dec 17 08:00 Minimum Daily Average: -32.9 C on Dec 17																							Hours of Data:	744		
Maximum Diurnal Average: -15.7 C at hour 15 Minimum Diurnal Average: -18.3 C at hour 10																							Hours of Missing Data:	0		
Monthly Average: -17.20 C Percentiles: P ₁ = -34.3 P ₁₀ = -29.2 Q ₁ = -23.0 Median = -17.3 Q ₃ = -11.6 P ₉₀ = -4.0 P ₉₉ = -0.2																							Hours of Calibration:	0		
																							Percent Operational Time:	100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.6	-5.4	-5.3	-5.1	-5.0	-5.0	-5.0	-5.0	-4.9	-4.7	-4.4	-4.0	-3.5	-3.2	-3.1	-3.1	-3.3	-3.4	-3.5	-3.5	-3.5	-4.0	-4.3	-4.0	-4.2	-3.1
2-Dec	-4.0	-4.0	-4.2	-4.2	-4.5	-5.7	-6.0	-6.3	-6.6	-6.8	-6.6	-5.8	-5.2	-3.9	-3.2	-3.1	-3.4	-3.4	-3.4	-3.4	-3.1	-2.9	-3.2	-3.2	-4.4	-2.9
3-Dec	-3.2	-3.3	-3.1	-2.9	-2.6	-2.3	-2.2	-2.4	-3.1	-3.5	-3.2	-2.8	-2.4	-1.9	-2.1	-0.9	-1.8	-1.1	-0.5	-0.4	-0.4	-0.2	-0.7	-0.9	-2.0	-0.2
4-Dec	-1.3	-1.5	-1.3	-2.3	-3.8	-4.6	-5.9	-7.6	-9.1	-9.6	-9.8	-9.4	-8.8	-8.8	-8.9	-9.1	-9.6	-9.8	-10.2	-11.0	-11.4	-11.5	-11.9	-12.5	-7.9	-1.3
5-Dec	-13.3	-14.1	-14.6	-14.9	-15.1	-15.3	-15.5	-15.9	-16.2	-16.5	-16.5	-16.4	-16.6	-16.4	-16.4	-16.6	-16.9	-17.2	-17.5	-17.6	-17.6	-17.5	-17.2	-16.8	-16.2	-13.3
6-Dec	-16.6	-16.6	-16.6	-16.8	-16.7	-16.9	-17.0	-17.2	-17.3	-17.3	-16.8	-16.6	-16.2	-16.1	-16.2	-16.6	-17.0	-17.4	-18.0	-18.4	-18.9	-19.0	-19.5	-20.0	-17.3	-16.1
7-Dec	-20.2	-20.1	-20.1	-20.4	-20.6	-21.0	-21.3	-21.6	-22.0	-22.2	-22.1	-21.9	-21.8	-21.8	-22.2	-22.5	-22.9	-23.3	-23.3	-23.3	-22.9	-22.9	-23.1	-23.3	-21.9	-20.1
8-Dec	-23.9	-24.4	-24.8	-25.0	-25.4	-25.6	-25.9	-26.2	-26.4	-28.5	-27.9	-26.8	-25.8	-25.3	-25.3	-25.8	-26.6	-27.0	-27.3	-28.0	-28.6	-30.0	-30.8	-31.0	-26.8	-23.9
9-Dec	-30.3	-30.3	-31.0	-30.9	-31.3	-31.6	-32.2	-32.4	-32.8	-32.7	-31.2	-31.0	-30.0	-29.3	-28.8	-29.0	-30.0	-29.8	-29.6	-29.7	-30.0	-30.9	-31.0	-30.8	-30.7	-28.8
10-Dec	-30.8	-30.1	-29.6	-29.6	-30.0	-29.6	-29.8	-29.5	-29.9	-30.3	-29.1	-28.2	-27.3	-26.7	-26.3	-26.5	-26.7	-26.9	-27.4	-27.4	-27.5	-28.1	-28.4	-28.1	-28.5	-26.3
11-Dec	-28.1	-27.0	-26.8	-27.1	-26.6	-25.6	-25.6	-24.8	-24.5	-24.2	-23.5	-22.5	-21.4	-21.0	-20.1	-20.7	-20.9	-20.9	-20.9	-21.0	-20.6	-21.0	-21.1	-20.1	-23.2	-20.1
12-Dec	-20.6	-22.0	-21.1	-21.3	-21.9	-22.0	-22.4	-23.1	-23.8	-24.4	-23.3	-21.6	-19.9	-19.6	-19.9	-20.3	-20.5	-17.9	-17.6	-17.3	-18.4	-17.0	-16.4	-15.9	-20.3	-15.9
13-Dec	-15.4	-15.2	-15.3	-15.7	-17.2	-18.1	-18.4	-18.5	-19.2	-19.9	-20.1	-20.0	-19.6	-19.6	-19.6	-20.1	-20.1	-20.3	-20.1	-20.5	-22.0	-22.7	-23.0	-22.1	-19.3	-15.2
14-Dec	-21.0	-21.2	-22.7	-24.0	-23.6	-23.0	-22.9	-23.0	-22.1	-21.4	-20.7	-19.5	-18.6	-16.6	-16.6	-17.4	-17.8	-18.2	-19.0	-19.6	-19.8	-19.2	-18.2	-17.2	-20.1	-16.6
15-Dec	-18.4	-19.1	-19.2	-20.7	-21.4	-22.5	-23.4	-24.0	-24.1	-23.7	-23.7	-23.2	-22.5	-21.9	-21.8	-22.8	-23.5	-24.0	-24.3	-25.1	-24.7	-25.9	-26.7	-27.5	-23.1	-18.4
16-Dec	-27.8	-28.2	-28.7	-28.8	-29.7	-29.9	-30.8	-31.0	-31.4	-31.1	-29.7	-29.7	-29.3	-28.7	-28.3	-28.7	-29.1	-29.2	-29.6	-29.9	-30.8	-31.6	-31.9	-32.6	-29.9	-27.8
17-Dec	-33.2	-34.1	-34.1	-34.9	-35.3	-35.6	-35.7	-36.1	-36.1	-35.9	-34.3	-33.4	-32.4	-31.3	-30.6	-30.9	-31.5	-31.7	-32.4	-32.2	-31.1	-30.0	-29.2	-27.8	-32.9	-27.8
18-Dec	-26.8	-27.9	-28.7	-28.5	-28.3	-28.5	-27.2	-26.5	-25.4	-24.9	-23.9	-23.0	-22.3	-21.1	-21.1	-21.2	-20.8	-20.9	-20.6	-20.5	-20.5	-20.4	-20.1	-19.8	-23.7	-19.8
19-Dec	-19.2	-18.6	-17.9	-17.4	-16.7	-16.2	-15.7	-15.5	-15.3	-14.9	-14.6	-14.1	-13.5	-13.9	-14.1	-14.1	-14.2	-14.0	-13.9	-14.3	-16.1	-17.5	-17.8	-18.0	-15.7	-13.5
20-Dec	-17.9	-16.1	-15.4	-15.3	-13.9	-13.2	-9.1	-6.5	-9.2	-9.1	-7.9	-7.0	-6.2	-6.0	-3.5	-4.6	-7.2	-7.1	-7.7	-8.4	-9.8	-11.1	-11.9	-11.6	-9.8	-3.5
21-Dec	-11.2	-10.6	-9.7	-9.4	-9.7	-5.3	-7.6	-8.6	-7.3	-5.2	-4.9	-4.7	-0.1	1.7	2.2	1.6	-1.1	-2.4	-2.8	-2.9	-3.6	-3.0	-2.2	-1.1	-4.5	2.2
22-Dec	-0.9	-1.1	-1.3	0.1	1.1	0.4	0.3	-0.4	-1.8	-2.1	-2.9	-5.4	-6.9	-10.2	-11.8	-12.2	-12.8	-14.0	-14.9	-14.8	-14.8	-14.9	-14.9	-15.0	-7.1	1.1
23-Dec	-15.4	-15.5	-15.5	-15.8	-16.5	-17.0	-17.4	-17.8	-18.2	-18.4	-18.3	-18.0	-17.3	-17.3	-17.8	-18.8	-20.2	-21.4	-22.3	-23.1	-21.9	-22.4	-23.1	-23.6	-18.9	-15.4
24-Dec	-24.5	-24.6	-25.0	-25.3	-26.4	-27.3	-27.5	-29.0	-27.5	-26.4	-25.2	-25.6	-24.7	-22.5	-21.4	-20.7	-20.4	-19.8	-19.3	-19.6	-20.3	-21.0	-22.2	-22.5	-23.7	-19.3
25-Dec	-21.5	-21.1	-20.4	-20.8	-21.6	-21.5	-21.3	-21.9	-21.9	-21.6	-19.6	-18.5	-17.6	-17.0	-17.3	-17.9	-18.3	-17.7	-18.8	-20.2	-20.3	-20.4	-21.5	-21.5	-20.0	-17.0
26-Dec	-22.4	-22.5	-22.0	-22.0	-21.3	-21.5	-22.1	-21.8	-21.1	-20.8	-20.4	-19.4	-18.1	-16.2	-15.8	-16.3	-16.0	-16.0	-15.9	-16.3	-16.4	-16.2	-16.2	-14.6	-18.8	-14.6
27-Dec	-14.1	-13.6	-12.8	-12.2	-12.7	-12.7	-12.1	-11.4	-11.2	-11.6	-10.4	-9.3	-8.4	-7.9	-6.7	-6.3	-5.8	-4.2	-4.1	-4.1	-4.3	-4.9	-6.1	-7.1	-8.9	-4.1
28-Dec	-6.9	-7.5	-8.2	-9.0	-10.3	-11.0	-11.6	-12.3	-13.8	-15.1	-15.3	-15.1	-15.0	-15.1	-14.8	-14.5	-14.4	-14.1	-14.3	-15.0	-16.7	-16.6	-16.3	-16.3	-13.3	-6.9
29-Dec	-16.5	-16.8	-17.6	-16.7	-16.2	-16.2	-15.8	-15.7	-15.1	-14.6	-14.2	-13.3	-13.1	-12.7	-12.5	-12.5	-12.4	-12.7	-12.6	-12.6	-13.5	-13.9	-14.8	-13.5	-14.4	-12.4
30-Dec	-13.7	-14.1	-14.1	-14.1	-13.9	-13.8	-13.8	-13.8	-14.1	-14.7	-13.7	-12.8	-12.1	-11.3	-10.8	-10.3	-9.7	-9.2	-9.1	-10.7	-11.4	-12.1	-13.2	-13.9	-12.5	-9.1
31-Dec	-14.3	-13.9	-14.0	-15.0	-16.0	-15.8	-15.2	-14.2	-14.2	-14.6	-14.3	-14.1	-13.0	-12.5	-12.6	-12.8	-12.9	-12.4	-11.1	-9.2	-9.6	-10.6	-11.8	-11.3	-13.1	-9.2
																							Diurnal Average			
																							Diurnal Maximum			





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2 m (AT2m) - C
Mannix - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	303	40.73	40.73
-20 - 0	434	58.33	99.06
0 - 10	7	0.94	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

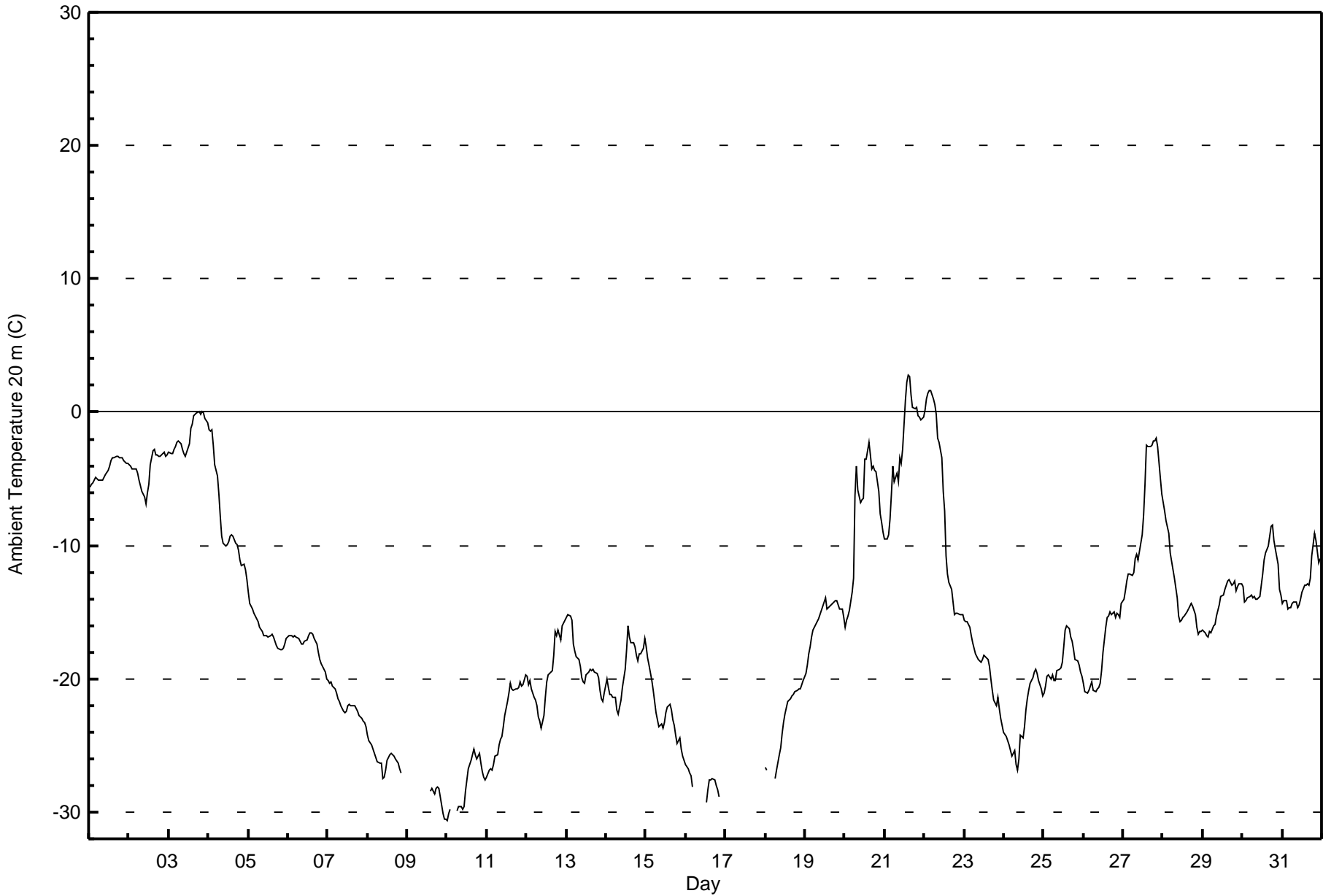
Total Number of Hours: 744



Summary of Hour Averages

Mannix - December 2016

Maximum Value: 2.8 C on Dec 21 15:00																								Hours in Service: 744				
Maximum Daily Average: -1.7 C on Dec 3																								Hours of Data: 686				
Minimum Value: -30.7 C on Dec 10 01:00																								Hours of Missing Data: 58				
Minimum Daily Average: -27.8 C on Dec 10																								Hours of Calibration: 0				
Maximum Diurnal Average: -14.9 C at hour 14																								Percent Operational Time: 92.2				
Minimum Diurnal Average: -16.4 C at hour 10																												
Monthly Average: -15.56 C																												
Percentiles: P ₁ = -29.9 P ₁₀ = -25.8 Q ₁ = -21.1 Median = -16.6 Q ₃ = -10.4 P ₉₀ = -3.3 P ₉₉ = 1.3																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	-5.6	-5.5	-5.3	-5.1	-4.9	-5.0	-5.1	-5.1	-5.1	-4.9	-4.7	-4.4	-4.0	-3.7	-3.5	-3.4	-3.3	-3.4	-3.4	-3.4	-3.4	-3.6	-3.8	-3.8	-4.3	-3.3		
2-Dec	-3.9	-4.1	-4.3	-4.2	-4.3	-4.6	-5.0	-5.5	-5.9	-6.3	-6.9	-6.1	-5.4	-4.0	-2.9	-2.8	-3.2	-3.2	-3.3	-3.3	-3.1	-3.0	-3.3	-3.2	-4.2	-2.8		
3-Dec	-3.0	-3.1	-3.1	-2.8	-2.5	-2.3	-2.2	-2.4	-2.8	-3.2	-3.4	-3.0	-2.4	-1.2	-0.9	-0.3	-0.2	0.0	0.1	-0.1	0.1	-0.1	-0.5	-0.8	-1.7	0.1		
4-Dec	-1.3	-1.4	-1.3	-2.4	-3.9	-4.8	-6.2	-7.8	-9.3	-9.8	-10.1	-10.0	-9.7	-9.3	-9.2	-9.3	-9.8	-9.9	-10.3	-11.1	-11.5	-11.4	-11.8	-12.6	-8.1	-1.3		
5-Dec	-13.5	-14.3	-14.7	-15.1	-15.3	-15.5	-15.7	-16.2	-16.5	-16.7	-16.8	-16.8	-16.9	-16.7	-16.7	-16.9	-17.1	-17.5	-17.8	-17.8	-17.8	-17.7	-17.4	-16.9	-16.4	-13.5		
6-Dec	-16.8	-16.8	-16.7	-16.8	-16.8	-16.9	-17.0	-17.2	-17.4	-17.4	-17.2	-17.0	-16.7	-16.5	-16.5	-16.7	-17.0	-17.4	-18.0	-18.5	-18.9	-19.1	-19.5	-20.0	-17.5	-16.5		
7-Dec	-20.2	-20.3	-20.2	-20.5	-20.8	-21.1	-21.4	-21.7	-22.1	-22.4	-22.5	-22.4	-22.1	-21.9	-22.0	-22.0	-22.0	-22.2	-22.5	-22.7	-23.0	-23.2	-23.3	-23.6	-21.9	-20.2		
8-Dec	-24.2	-24.6	-25.0	-25.3	-25.6	-25.9	-26.2	-26.3	-26.3	-27.4	-27.4	-26.9	-26.1	-25.7	-25.5	-25.7	-25.8	-26.0	-26.4	-26.8	-27.1	AF	AF	AF	-26.0	-24.2		
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	-28.4	-28.3	-28.6	-28.3	-28.1	-28.2	-28.9	-30.1	-30.6	-30.6	--	-28.1		
10-Dec	-30.7	-30.1	-29.8	AF	AF	AF	-29.9	-29.6	-29.5	-29.8	-29.6	-28.4	-27.6	-26.8	-26.1	-25.7	-25.3	-25.7	-26.0	-25.6	-26.3	-27.0	-27.4	-27.5	-27.8	-25.3		
11-Dec	-27.3	-26.9	-26.7	-26.9	-26.5	-25.8	-25.7	-24.9	-24.6	-24.3	-23.6	-22.7	-21.7	-21.1	-20.3	-20.7	-20.9	-20.8	-20.8	-20.7	-20.2	-20.5	-20.4	-19.8	-23.1	-19.8		
12-Dec	-19.8	-20.5	-20.1	-20.7	-21.4	-21.6	-22.0	-22.8	-23.2	-23.7	-22.8	-21.4	-20.2	-19.7	-19.6	-19.4	-18.2	-16.5	-16.7	-16.3	-17.0	-16.0	-15.8	-15.6	-19.6	-15.6		
13-Dec	-15.3	-15.2	-15.3	-15.6	-17.3	-17.9	-18.3	-18.5	-19.1	-19.9	-20.2	-20.3	-19.7	-19.5	-19.2	-19.3	-19.3	-19.5	-19.6	-19.9	-20.9	-21.5	-21.7	-21.0	-18.9	-15.2		
14-Dec	-20.0	-20.6	-21.1	-21.2	-21.4	-21.4	-22.3	-22.7	-22.1	-21.6	-20.6	-19.3	-17.8	-16.1	-16.8	-17.3	-17.3	-17.6	-18.2	-18.7	-18.1	-18.2	-17.7	-16.9	-19.4	-16.1		
15-Dec	-17.6	-18.5	-19.0	-20.1	-20.8	-21.7	-22.6	-23.0	-23.6	-23.4	-23.7	-23.3	-22.5	-22.1	-21.9	-22.4	-23.1	-23.5	-24.2	-24.9	-24.4	-25.3	-25.8	-26.1	-22.6	-17.6		
16-Dec	-26.5	-26.7	-27.1	-27.3	-28.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	-29.3	-28.3	-27.6	-27.6	-27.5	-27.6	-28.0	-28.3	-28.9	AF	AF	AF	--	-26.5
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
18-Dec	-26.7	-26.8	AF	AF	AF	AF	-27.5	-26.9	-25.7	-25.2	-24.2	-23.3	-22.7	-21.7	-21.5	-21.5	-21.3	-21.2	-21.0	-20.9	-20.8	-20.7	-20.5	-20.1	-23.0	-20.1		
19-Dec	-19.6	-18.9	-18.1	-17.6	-16.9	-16.4	-15.9	-15.7	-15.5	-15.2	-14.8	-14.3	-13.9	-14.8	-14.6	-14.6	-14.4	-14.2	-14.1	-14.2	-14.5	-14.8	-14.8	-15.4	-15.6	-13.9		
20-Dec	-16.1	-15.6	-15.3	-14.9	-13.5	-12.5	-6.2	-4.0	-5.8	-6.8	-6.6	-6.4	-3.5	-3.5	-2.3	-3.2	-4.2	-4.1	-4.3	-4.5	-5.9	-7.6	-8.3	-9.0	-7.7	-2.3		
21-Dec	-9.6	-9.5	-9.2	-8.0	-6.1	-4.0	-5.2	-4.6	-5.2	-3.4	-3.8	-2.8	0.9	2.3	2.8	2.7	1.3	0.4	0.2	0.3	-0.3	-0.4	-0.6	-0.4	-2.6	2.8		
22-Dec	0.2	1.0	1.5	1.7	1.6	1.0	0.6	-0.2	-1.9	-2.2	-3.4	-5.9	-7.4	-10.8	-12.2	-12.8	-13.3	-14.3	-15.1	-15.1	-15.1	-15.2	-15.2	-15.2	-7.0	1.7		
23-Dec	-15.6	-15.7	-15.8	-16.1	-16.8	-17.3	-17.7	-18.1	-18.5	-18.7	-18.7	-18.6	-18.2	-18.3	-18.5	-19.1	-20.0	-20.9	-21.6	-22.0	-21.4	-22.2	-22.9	-23.5	-19.0	-15.6		
24-Dec	-24.0	-24.3	-24.7	-24.9	-25.4	-25.8	-25.4	-26.4	-26.9	-26.0	-24.2	-24.4	-23.6	-22.4	-21.5	-20.8	-20.4	-20.0	-19.5	-19.3	-19.6	-20.1	-20.7	-21.3	-23.0	-19.3		
25-Dec	-21.1	-20.5	-19.8	-19.7	-20.0	-19.8	-20.1	-20.1	-19.4	-19.3	-19.1	-18.8	-17.6	-16.4	-16.0	-16.2	-16.9	-17.1	-17.8	-18.6	-18.7	-19.0	-19.5	-19.8	-18.8	-16.0		
26-Dec	-20.4	-21.0	-21.1	-20.8	-20.6	-20.3	-20.8	-21.0	-20.7	-20.6	-20.4	-19.4	-18.1	-16.1	-15.4	-15.3	-15.0	-15.2	-15.0	-15.4	-15.1	-15.2	-15.4	-14.4	-18.0	-14.4		
27-Dec	-14.0	-13.4	-12.7	-12.1	-12.1	-12.2	-12.0	-11.0	-10.7	-11.1	-10.4	-9.2	-7.7	-5.4	-2.5	-2.5	-2.6	-2.4	-2.2	-2.1	-2.0	-2.5	-5.0	-6.1	-7.7	-2.0		
28-Dec	-6.8	-7.4	-8.2	-9.1	-10.6	-11.2	-11.8	-12.4	-14.0	-15.3	-15.7	-15.6	-15.4	-15.3	-15.0	-14.8	-14.5	-14.3	-14.6	-15.2	-16.2	-16.6	-16.4	-16.4	-13.5	-6.8		
29-Dec	-16.4	-16.6	-16.8	-16.9	-16.5	-16.5	-16.1	-15.9	-15.3	-14.9	-14.4	-13.9	-13.7	-13.3	-13.0	-12.7	-12.5	-13.0	-12.8	-12.6	-13.4	-13.1	-12.9	-12.9	-14.4	-12.5		
30-Dec	-13.1	-14.2	-14.1	-13.9	-13.8	-13.7	-13.9	-13.8	-14.0	-14.0	-13.8	-13.0	-12.1	-11.1	-10.6	-10.0	-9.3	-8.5	-8.5	-9.7	-10.2	-11.4	-13.3	-13.8	-12.2	-8.5		
31-Dec	-14.3	-14.1	-14.2	-14.7	-14.7	-14.6	-14.4	-14.3	-14.2	-14.6	-14.4	-14.1	-13.5	-13.0	-13.0	-12.9	-13.0	-12.4	-10.8	-9.1	-9.7	-10.5	-11.3	-10.9	-13.0	-9.1		
																								Diurnal Average				
																								Diurnal Maximum				
AF - Analyzer Failure																												





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C
Mannix - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	226	32.94	32.94
-20 - 0	443	64.58	97.52
0 - 10	17	2.48	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 686

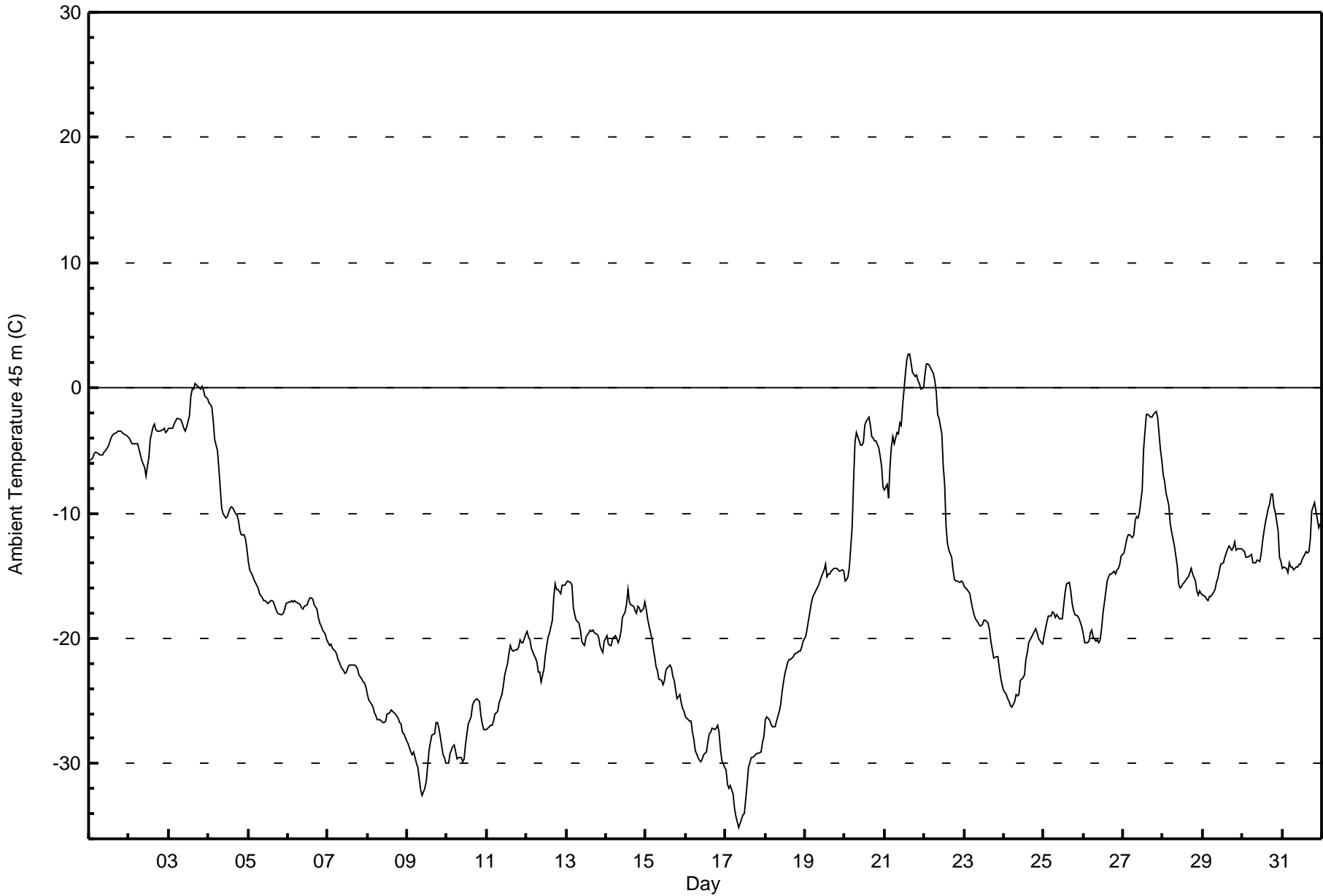
Total Number of Hours: 744



Summary of Hour Averages

Mannix - December 2016

Maximum Value: 2.7 C on Dec 21 16:00 Maximum Daily Average: -1.7 C on Dec 3																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: -35.1 C on Dec 17 09:00 Minimum Daily Average: -31.5 C on Dec 17 Maximum Diurnal Average: -15.5 C at hour 16 Minimum Diurnal Average: -17.7 C at hour 10 Monthly Average: -16.55 C Percentiles: P ₁ = -32.9 P ₁₀ = -27.5 Q ₁ = -22.5 Median = -17.2 Q ₃ = -11.4 P ₉₀ = -3.5 P ₉₉ = 1.8																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.8	-5.7	-5.5	-5.2	-5.1	-5.3	-5.3	-5.4	-5.3	-5.2	-5.0	-4.7	-4.3	-4.0	-3.8	-3.6	-3.5	-3.5	-3.5	-3.5	-3.5	-3.6	-3.8	-3.9	-4.5	-3.5
2-Dec	-4.0	-4.3	-4.5	-4.4	-4.5	-4.5	-4.9	-5.4	-5.8	-6.4	-7.0	-6.2	-5.6	-4.2	-3.1	-2.9	-3.3	-3.4	-3.5	-3.5	-3.3	-3.3	-3.6	-3.4	-4.4	-2.9
3-Dec	-3.2	-3.3	-3.2	-2.9	-2.7	-2.5	-2.4	-2.6	-2.9	-3.2	-3.5	-3.1	-2.2	-0.6	-0.1	-0.1	0.4	0.2	0.0	-0.1	0.1	-0.2	-0.6	-0.9	-1.7	0.4
4-Dec	-1.2	-1.4	-1.5	-2.6	-4.2	-5.0	-6.4	-8.1	-9.6	-10.0	-10.4	-10.2	-9.9	-9.6	-9.5	-9.6	-10.1	-10.1	-10.6	-11.4	-11.7	-11.7	-12.0	-12.8	-8.3	-1.2
5-Dec	-13.8	-14.6	-15.0	-15.3	-15.6	-15.7	-16.0	-16.4	-16.7	-17.0	-17.0	-17.1	-17.2	-17.0	-17.1	-17.4	-17.7	-18.0	-18.1	-18.1	-18.1	-18.0	-17.6	-17.2	-16.7	-13.8
6-Dec	-17.1	-17.0	-17.0	-17.1	-17.0	-17.1	-17.2	-17.3	-17.6	-17.7	-17.5	-17.4	-17.0	-16.8	-16.8	-16.9	-17.3	-17.7	-18.3	-18.8	-19.0	-19.3	-19.7	-20.2	-17.7	-16.8
7-Dec	-20.4	-20.5	-20.4	-20.8	-21.0	-21.3	-21.7	-21.9	-22.3	-22.6	-22.8	-22.7	-22.3	-22.2	-22.1	-22.2	-22.2	-22.3	-22.5	-22.9	-23.2	-23.4	-23.6	-23.9	-22.1	-20.4
8-Dec	-24.5	-24.9	-25.3	-25.5	-25.9	-26.2	-26.5	-26.5	-26.6	-26.8	-26.7	-26.6	-26.1	-25.9	-25.7	-25.8	-26.0	-26.1	-26.4	-26.7	-26.9	-27.6	-27.6	-28.1	-26.3	-24.5
9-Dec	-28.4	-28.8	-29.0	-29.2	-29.1	-30.0	-30.3	-31.1	-32.1	-32.5	-32.0	-31.4	-30.2	-28.9	-28.2	-27.7	-27.7	-26.7	-26.7	-27.1	-27.8	-29.2	-29.5	-30.0	-29.3	-26.7
10-Dec	-29.9	-29.9	-29.1	-28.6	-28.5	-29.0	-29.7	-29.5	-29.5	-29.8	-29.6	-28.5	-27.6	-26.9	-26.2	-25.4	-25.0	-25.0	-24.9	-25.0	-26.1	-26.8	-27.2	-27.3	-27.7	-24.9
11-Dec	-27.3	-27.0	-26.9	-27.0	-26.6	-26.0	-25.9	-25.2	-24.8	-24.5	-23.9	-23.0	-22.0	-21.3	-20.5	-20.9	-21.0	-20.9	-20.9	-20.7	-20.2	-20.4	-20.3	-19.7	-23.2	-19.7
12-Dec	-19.4	-19.9	-20.1	-20.8	-21.3	-21.6	-22.0	-22.7	-22.7	-23.4	-22.5	-21.3	-20.5	-19.9	-19.5	-18.5	-16.8	-15.6	-16.1	-16.1	-16.4	-15.7	-15.7	-15.7	-19.3	-15.6
13-Dec	-15.5	-15.4	-15.5	-15.7	-17.6	-18.1	-18.6	-18.8	-19.3	-20.2	-20.4	-20.5	-19.9	-19.6	-19.4	-19.4	-19.3	-19.6	-19.7	-19.9	-20.5	-20.9	-21.1	-20.2	-19.0	-15.4
14-Dec	-19.8	-20.4	-20.6	-20.6	-20.0	-19.8	-20.0	-20.3	-20.0	-19.4	-18.4	-17.9	-17.2	-16.1	-17.0	-17.4	-17.4	-17.8	-18.0	-17.5	-17.6	-17.9	-17.7	-17.1	-18.6	-16.1
15-Dec	-17.6	-18.5	-18.9	-20.0	-20.8	-21.5	-22.2	-22.5	-23.3	-23.4	-23.7	-23.4	-22.6	-22.3	-22.2	-22.4	-23.0	-23.4	-24.2	-24.8	-24.5	-25.2	-25.6	-25.9	-22.6	-17.6
16-Dec	-26.2	-26.4	-26.6	-26.6	-27.5	-28.1	-28.9	-29.5	-29.8	-29.8	-29.7	-29.2	-29.0	-28.3	-27.6	-27.5	-27.2	-27.2	-27.1	-27.0	-27.5	-28.8	-29.7	-30.3	-28.2	-26.2
17-Dec	-30.5	-31.6	-32.0	-31.7	-32.5	-33.5	-34.2	-34.7	-35.1	-34.8	-34.1	-34.0	-32.9	-31.7	-30.3	-29.5	-29.5	-29.4	-29.3	-29.2	-29.2	-29.1	-28.3	-27.9	-31.5	-27.9
18-Dec	-26.5	-26.3	-26.5	-26.8	-27.0	-27.1	-27.1	-26.6	-25.9	-25.3	-24.3	-23.5	-22.8	-21.9	-21.7	-21.7	-21.6	-21.5	-21.3	-21.1	-21.0	-21.0	-20.6	-20.2	-23.7	-20.2
19-Dec	-19.8	-19.1	-18.4	-17.8	-17.1	-16.7	-16.2	-16.0	-15.8	-15.4	-15.0	-14.5	-14.1	-15.1	-14.9	-14.8	-14.6	-14.5	-14.4	-14.4	-14.5	-14.6	-14.5	-14.6	-15.7	-14.1
20-Dec	-15.4	-15.3	-15.1	-14.4	-11.0	-7.5	-4.4	-3.5	-3.9	-4.6	-4.5	-4.4	-3.0	-2.6	-2.4	-3.0	-3.9	-4.0	-4.2	-4.2	-4.8	-5.4	-6.2	-7.9	-6.5	-2.4
21-Dec	-8.1	-7.7	-8.8	-6.3	-4.7	-3.9	-4.5	-3.5	-3.7	-2.8	-2.9	-1.4	1.1	2.3	2.7	2.7	2.0	1.3	0.9	1.1	0.6	0.3	-0.1	0.1	-1.8	2.7
22-Dec	1.2	1.9	1.9	1.9	1.6	1.1	0.6	-0.3	-2.1	-2.4	-3.6	-6.2	-7.7	-11.1	-12.4	-13.0	-13.5	-14.6	-15.3	-15.4	-15.4	-15.5	-15.4	-15.5	-7.1	1.9
23-Dec	-15.9	-16.0	-16.1	-16.4	-17.1	-17.6	-18.1	-18.4	-18.8	-19.0	-19.0	-18.8	-18.5	-18.6	-18.8	-19.3	-20.2	-21.0	-21.6	-21.5	-21.5	-22.4	-23.1	-23.7	-19.2	-15.9
24-Dec	-24.2	-24.5	-24.8	-25.0	-25.4	-25.5	-25.1	-24.5	-24.6	-24.5	-23.4	-23.1	-22.9	-21.7	-21.1	-20.4	-20.1	-19.7	-19.4	-19.2	-19.5	-20.1	-20.3	-20.4	-22.5	-19.2
25-Dec	-19.8	-19.3	-18.7	-18.3	-18.3	-17.9	-18.0	-18.4	-18.1	-18.5	-18.5	-18.4	-17.3	-16.3	-15.6	-15.6	-16.3	-17.2	-17.7	-18.1	-18.2	-18.5	-18.7	-19.1	-17.9	-15.6
26-Dec	-19.7	-20.3	-20.4	-20.3	-19.5	-19.3	-19.9	-20.3	-20.1	-20.3	-20.2	-19.3	-18.0	-16.3	-15.4	-15.1	-14.8	-14.9	-14.7	-14.9	-14.5	-14.4	-14.0	-13.4	-17.5	-13.4
27-Dec	-13.2	-12.6	-12.1	-11.7	-11.8	-12.0	-11.7	-10.6	-10.3	-10.4	-10.0	-8.1	-4.9	-3.4	-2.1	-2.1	-2.3	-2.3	-2.1	-2.0	-1.8	-2.3	-4.8	-5.8	-7.1	-1.8
28-Dec	-6.9	-7.5	-8.4	-9.4	-10.8	-11.5	-12.0	-12.7	-14.2	-15.6	-16.0	-15.8	-15.7	-15.5	-15.2	-15.1	-14.7	-14.5	-14.8	-15.4	-16.2	-16.5	-16.3	-16.5	-13.6	-6.9
29-Dec	-16.6	-16.7	-16.8	-16.9	-16.7	-16.7	-16.3	-16.1	-15.5	-15.1	-14.6	-14.1	-14.0	-13.5	-13.2	-12.8	-12.6	-12.9	-12.7	-12.3	-12.9	-12.9	-12.8	-12.9	-14.5	-12.3
30-Dec	-13.0	-13.1	-13.5	-13.5	-13.4	-13.3	-14.0	-13.9	-14.0	-13.7	-13.8	-13.2	-12.1	-11.3	-10.8	-9.6	-9.2	-8.5	-8.5	-9.5	-10.0	-11.4	-13.5	-13.9	-12.1	-8.5
31-Dec	-14.5	-14.3	-14.4	-14.7	-14.0	-14.3	-14.3	-14.5	-14.3	-14.3	-14.1	-14.1	-13.7	-13.2	-13.1	-13.2	-13.1	-12.1	-9.9	-9.1	-9.8	-10.5	-11.2	-10.8	-13.0	-9.1
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C
Mannix - December 2016**

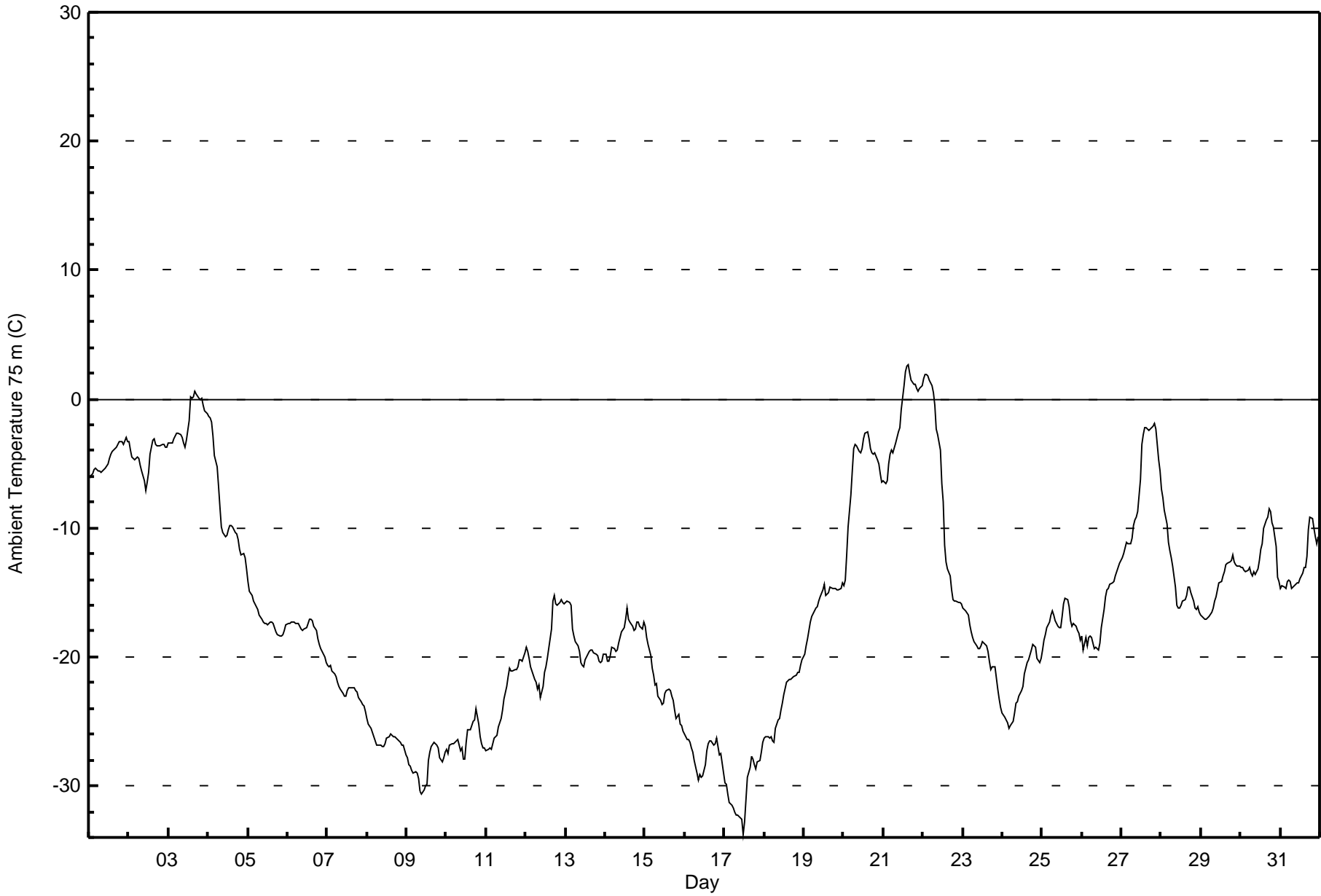
Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	270	36.29	36.29
-20 - 0	452	60.75	97.04
0 - 10	22	2.96	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 2.6 C on Dec 21 16:00 Maximum Daily Average: -1.3 C on Dec 21																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: -33.8 C on Dec 17 12:00 Minimum Daily Average: -30.2 C on Dec 17 Maximum Diurnal Average: -15.4 C at hour 17 Minimum Diurnal Average: -17.4 C at hour 10 Monthly Average: -16.37 C Percentiles: P ₁ = -31.7 P ₁₀ = -26.9 Q ₁ = -22.5 Median = -17.4 Q ₃ = -11.2 P ₉₀ = -3.5 P ₉₉ = 1.8																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.1	-5.9	-5.8	-5.5	-5.4	-5.6	-5.6	-5.7	-5.6	-5.5	-5.3	-5.1	-4.7	-4.3	-4.1	-3.9	-3.7	-3.5	-3.4	-3.3	-3.3	-3.5	-3.0	-3.3	-4.6	-3.0
2-Dec	-3.3	-3.9	-4.5	-4.7	-4.6	-4.5	-4.6	-5.1	-5.6	-6.4	-7.1	-6.4	-5.7	-4.3	-3.1	-3.1	-3.5	-3.6	-3.7	-3.7	-3.6	-3.5	-3.8	-3.7	-4.4	-3.1
3-Dec	-3.4	-3.4	-3.4	-3.1	-2.9	-2.7	-2.6	-2.8	-3.0	-3.4	-3.7	-3.2	-1.7	0.2	0.1	0.1	0.6	0.4	0.1	0.0	0.1	-0.5	-0.9	-1.1	-1.7	0.6
4-Dec	-1.3	-1.5	-1.8	-2.9	-4.4	-5.3	-6.7	-8.4	-9.9	-10.3	-10.6	-10.5	-10.2	-9.9	-9.8	-9.9	-10.3	-10.4	-10.9	-11.7	-12.1	-12.0	-12.3	-13.1	-8.6	-1.3
5-Dec	-14.1	-14.9	-15.3	-15.6	-15.9	-16.0	-16.3	-16.7	-17.1	-17.3	-17.4	-17.4	-17.5	-17.3	-17.3	-17.5	-17.7	-18.0	-18.3	-18.4	-18.4	-18.3	-17.9	-17.5	-17.0	-14.1
6-Dec	-17.4	-17.4	-17.3	-17.3	-17.3	-17.4	-17.4	-17.6	-17.9	-18.0	-17.8	-17.7	-17.4	-17.1	-17.1	-17.2	-17.6	-18.0	-18.6	-19.0	-19.3	-19.6	-20.0	-20.4	-18.0	-17.1
7-Dec	-20.6	-20.8	-20.7	-21.1	-21.3	-21.5	-22.0	-22.2	-22.5	-22.9	-23.0	-23.0	-22.6	-22.4	-22.3	-22.4	-22.4	-22.6	-22.8	-23.2	-23.5	-23.7	-23.8	-24.2	-22.4	-20.6
8-Dec	-24.8	-25.2	-25.6	-25.8	-26.2	-26.5	-26.8	-26.8	-26.9	-26.9	-27.0	-26.7	-26.3	-26.2	-26.0	-26.1	-26.2	-26.2	-26.4	-26.5	-26.7	-26.8	-26.8	-27.6	-26.4	-24.8
9-Dec	-27.8	-28.4	-28.4	-28.8	-29.1	-28.9	-29.0	-29.4	-30.4	-30.7	-30.3	-30.0	-29.9	-28.0	-27.4	-27.0	-26.7	-26.7	-26.8	-27.1	-27.8	-28.2	-27.8	-27.3	-28.4	-26.7
10-Dec	-27.1	-27.5	-26.8	-26.7	-26.7	-26.6	-26.5	-26.4	-27.3	-27.1	-28.0	-27.9	-26.7	-25.7	-25.6	-25.3	-25.0	-24.8	-24.0	-25.2	-26.2	-26.8	-27.0	-27.1	-26.4	-24.0
11-Dec	-27.3	-27.2	-27.1	-27.1	-26.8	-26.3	-26.1	-25.4	-25.1	-24.8	-24.1	-23.3	-22.3	-21.6	-20.8	-21.1	-21.1	-21.0	-21.0	-20.8	-20.2	-20.3	-20.4	-19.7	-23.4	-19.7
12-Dec	-19.2	-19.6	-20.1	-20.8	-21.4	-21.7	-22.0	-22.5	-22.2	-23.2	-22.3	-21.2	-20.8	-20.1	-19.3	-17.8	-15.7	-15.2	-15.9	-15.9	-15.8	-15.6	-15.8	-15.9	-19.2	-15.2
13-Dec	-15.8	-15.7	-15.8	-16.0	-17.9	-18.4	-18.8	-19.1	-19.6	-20.4	-20.7	-20.8	-20.2	-19.8	-19.5	-19.5	-19.5	-19.7	-19.8	-20.0	-20.3	-20.5	-20.3	-19.8	-19.1	-15.7
14-Dec	-19.8	-20.3	-20.3	-19.9	-19.2	-19.4	-19.6	-19.4	-18.9	-18.5	-18.1	-17.7	-17.1	-16.2	-17.1	-17.2	-17.6	-18.0	-17.9	-17.3	-17.3	-17.7	-17.8	-17.3	-18.3	-16.2
15-Dec	-17.6	-18.5	-19.0	-19.9	-20.9	-21.4	-22.1	-22.1	-23.0	-23.4	-23.6	-23.6	-22.8	-22.6	-22.5	-22.6	-23.1	-23.4	-24.1	-24.8	-24.5	-25.2	-25.3	-25.7	-22.6	-17.6
16-Dec	-26.0	-26.4	-26.5	-26.7	-27.0	-27.4	-28.0	-29.0	-29.6	-29.2	-29.4	-29.3	-28.3	-27.2	-26.7	-26.5	-26.6	-26.9	-26.8	-26.3	-26.9	-27.6	-27.5	-29.0	-27.5	-26.0
17-Dec	-29.7	-29.9	-30.7	-31.2	-31.5	-31.7	-32.0	-32.2	-32.2	-32.4	-32.6	-33.8	-32.8	-31.1	-29.4	-28.5	-27.7	-28.0	-28.4	-28.7	-28.1	-28.1	-27.4	-26.6	-30.2	-26.6
18-Dec	-26.3	-26.2	-26.2	-26.3	-26.2	-26.5	-26.6	-25.5	-24.9	-24.8	-24.2	-23.6	-23.0	-22.0	-21.9	-21.8	-21.8	-21.7	-21.5	-21.4	-21.2	-21.2	-20.7	-20.2	-23.6	-20.2
19-Dec	-19.8	-19.1	-18.6	-18.0	-17.3	-16.9	-16.4	-16.2	-16.1	-15.7	-15.3	-14.8	-14.3	-15.2	-15.2	-15.1	-14.6	-14.7	-14.7	-14.7	-14.7	-14.8	-14.7	-14.3	-15.9	-14.3
20-Dec	-14.5	-14.0	-12.0	-9.9	-7.5	-5.6	-3.8	-3.6	-3.6	-4.1	-4.2	-3.9	-3.1	-2.6	-2.6	-3.1	-3.8	-4.2	-4.3	-4.2	-4.7	-5.1	-5.8	-6.5	-5.7	-2.6
21-Dec	-6.4	-6.5	-6.3	-5.1	-4.3	-4.0	-4.2	-3.4	-3.0	-2.5	-2.3	-0.8	1.0	2.1	2.6	2.6	2.0	1.4	1.1	1.2	0.8	0.6	0.8	1.0	-1.3	2.6
22-Dec	1.6	1.9	1.9	1.8	1.5	1.0	0.5	-0.5	-2.4	-2.7	-4.0	-6.6	-8.0	-11.3	-12.6	-13.2	-13.7	-14.8	-15.6	-15.6	-15.7	-15.8	-15.8	-15.8	-7.2	1.9
23-Dec	-16.2	-16.3	-16.4	-16.8	-17.5	-18.0	-18.5	-18.8	-19.2	-19.3	-19.4	-19.2	-18.8	-18.9	-19.1	-19.6	-20.3	-20.9	-20.7	-20.8	-21.6	-22.5	-23.3	-23.9	-19.4	-16.2
24-Dec	-24.4	-24.7	-24.9	-25.1	-25.5	-25.3	-25.0	-24.4	-23.6	-23.5	-23.0	-22.6	-22.3	-21.3	-20.9	-20.5	-20.3	-19.5	-19.0	-19.1	-19.3	-20.1	-20.4	-20.2	-22.3	-19.0
25-Dec	-19.4	-18.7	-18.3	-17.7	-17.3	-16.8	-16.4	-16.8	-17.1	-17.6	-17.8	-17.7	-16.9	-15.9	-15.5	-15.5	-16.1	-17.2	-17.6	-17.4	-17.6	-18.0	-18.2	-18.7	-17.3	-15.5
26-Dec	-18.4	-19.4	-18.5	-19.2	-18.5	-18.3	-18.5	-19.4	-19.3	-19.4	-19.5	-18.9	-17.8	-16.3	-15.3	-14.8	-14.6	-14.4	-14.3	-14.1	-13.8	-13.4	-13.0	-12.8	-16.7	-12.8
27-Dec	-12.4	-11.9	-11.5	-11.1	-11.2	-11.2	-10.8	-9.8	-9.4	-9.2	-8.7	-6.2	-3.5	-2.8	-2.2	-2.2	-2.4	-2.3	-2.2	-2.1	-1.9	-2.4	-4.8	-5.5	-6.6	-1.9
28-Dec	-7.0	-7.7	-8.7	-9.7	-11.1	-11.8	-12.3	-13.0	-14.6	-15.9	-16.3	-16.2	-16.0	-15.7	-15.5	-15.2	-14.6	-14.6	-15.1	-15.7	-16.2	-16.3	-16.1	-16.6	-13.8	-7.0
29-Dec	-16.8	-16.9	-17.0	-17.1	-16.9	-16.9	-16.5	-16.2	-15.7	-15.3	-14.8	-14.3	-14.1	-13.8	-13.4	-12.8	-12.7	-12.7	-12.5	-12.1	-12.6	-12.8	-12.9	-12.9	-14.6	-12.1
30-Dec	-13.1	-13.1	-13.2	-13.4	-13.2	-13.1	-13.5	-13.7	-13.4	-13.6	-13.1	-12.6	-11.7	-11.2	-10.0	-9.3	-9.2	-8.5	-8.7	-9.5	-9.9	-11.4	-13.8	-14.1	-11.9	-8.5
31-Dec	-14.7	-14.5	-14.6	-14.7	-14.1	-14.0	-14.2	-14.7	-14.4	-14.4	-14.3	-14.3	-13.9	-13.5	-13.0	-13.1	-12.2	-10.1	-9.1	-9.2	-10.0	-10.6	-11.2	-10.7	-12.9	-9.1
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 75 m (AT75m) - C
Mannix - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	261	35.08	35.08
-20 - 0	457	61.42	96.51
0 - 10	26	3.49	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

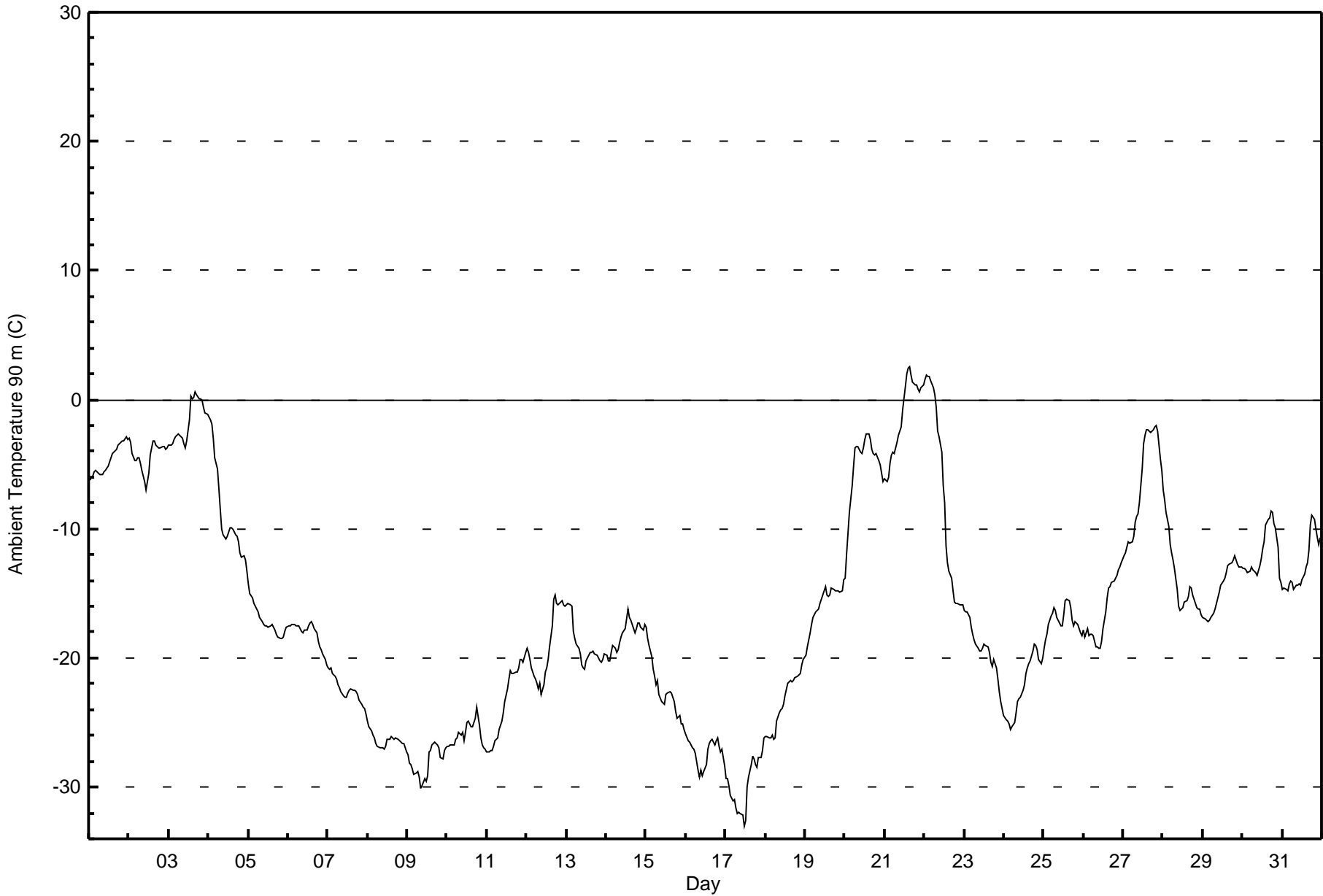
Total Number of Hours: 744



Summary of Hour Averages

Mannix - December 2016

Maximum Value: 2.5 C on Dec 21 16:00 Maximum Daily Average: -1.3 C on Dec 21																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: -33.1 C on Dec 17 12:00 Minimum Daily Average: -29.8 C on Dec 17 Maximum Diurnal Average: -15.4 C at hour 17 Minimum Diurnal Average: -17.2 C at hour 10 Monthly Average: -16.30 C Percentiles: P ₁ = -31.1 P ₁₀ = -26.8 Q ₁ = -22.6 Median = -17.4 Q ₃ = -11.1 P ₉₀ = -3.4 P ₉₉ = 1.7																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.2	-6.0	-5.9	-5.6	-5.5	-5.7	-5.7	-5.8	-5.8	-5.6	-5.4	-5.2	-4.8	-4.5	-4.2	-4.0	-3.8	-3.6	-3.4	-3.3	-3.2	-3.1	-2.8	-3.1	-4.7	-2.8
2-Dec	-3.0	-3.3	-4.2	-4.7	-4.7	-4.5	-4.5	-5.0	-5.5	-6.3	-7.0	-6.3	-5.6	-4.2	-3.1	-3.2	-3.5	-3.7	-3.7	-3.7	-3.6	-3.6	-3.9	-3.8	-4.4	-3.0
3-Dec	-3.5	-3.5	-3.4	-3.1	-2.9	-2.7	-2.7	-2.8	-3.0	-3.4	-3.8	-3.2	-1.5	0.2	0.1	0.1	0.6	0.4	0.1	0.0	0.0	-0.6	-1.0	-1.2	-1.7	0.6
4-Dec	-1.4	-1.6	-1.9	-3.0	-4.5	-5.4	-6.8	-8.5	-10.0	-10.4	-10.7	-10.6	-10.3	-10.0	-9.9	-10.0	-10.4	-10.6	-11.0	-11.8	-12.2	-12.1	-12.4	-13.2	-8.7	-1.4
5-Dec	-14.2	-15.0	-15.4	-15.7	-16.0	-16.2	-16.4	-16.9	-17.2	-17.4	-17.5	-17.5	-17.4	-17.4	-17.6	-17.8	-18.1	-18.4	-18.5	-18.5	-18.5	-18.4	-18.0	-17.6	-17.1	-14.2
6-Dec	-17.5	-17.5	-17.4	-17.4	-17.4	-17.5	-17.5	-17.7	-18.0	-18.1	-17.9	-17.8	-17.5	-17.2	-17.2	-17.4	-17.7	-18.1	-18.7	-19.1	-19.4	-19.7	-20.1	-20.5	-18.1	-17.2
7-Dec	-20.7	-20.8	-20.8	-21.2	-21.4	-21.6	-22.0	-22.3	-22.6	-22.9	-23.1	-23.1	-22.7	-22.5	-22.4	-22.5	-22.5	-22.7	-22.8	-23.3	-23.6	-23.8	-23.9	-24.3	-22.5	-20.7
8-Dec	-24.9	-25.3	-25.6	-25.9	-26.2	-26.6	-26.9	-26.9	-27.0	-27.0	-27.0	-26.8	-26.3	-26.2	-26.1	-26.2	-26.3	-26.2	-26.3	-26.4	-26.5	-26.6	-26.6	-27.3	-26.4	-24.9
9-Dec	-27.5	-28.1	-28.3	-28.6	-29.0	-28.9	-28.8	-29.2	-30.1	-29.9	-29.4	-29.6	-29.2	-27.2	-27.1	-26.8	-26.5	-26.7	-26.8	-27.0	-27.7	-27.8	-27.1	-26.9	-28.1	-26.5
10-Dec	-26.9	-26.8	-26.7	-26.7	-26.7	-26.3	-26.2	-25.8	-26.0	-25.8	-26.4	-25.8	-25.0	-24.9	-25.3	-25.3	-25.0	-24.7	-23.8	-25.2	-26.2	-26.7	-27.0	-27.0	-25.9	-23.8
11-Dec	-27.3	-27.3	-27.2	-27.2	-26.8	-26.4	-26.2	-25.5	-25.2	-24.9	-24.2	-23.4	-22.4	-21.7	-20.9	-21.2	-21.2	-21.1	-21.0	-20.8	-20.1	-20.1	-20.4	-19.6	-23.4	-19.6
12-Dec	-19.2	-19.6	-20.1	-20.8	-21.4	-21.7	-21.9	-22.4	-22.0	-22.8	-22.1	-21.1	-20.8	-20.2	-19.2	-17.5	-15.4	-15.2	-15.8	-15.9	-15.6	-15.5	-15.8	-16.0	-19.1	-15.2
13-Dec	-15.8	-15.8	-15.9	-16.0	-18.0	-18.4	-18.9	-19.2	-19.7	-20.5	-20.7	-20.8	-20.2	-19.8	-19.6	-19.5	-19.5	-19.7	-19.8	-20.0	-20.3	-20.3	-20.1	-19.7	-19.1	-15.8
14-Dec	-19.8	-20.2	-20.2	-19.6	-19.0	-19.3	-19.6	-19.3	-18.8	-18.4	-18.1	-17.7	-17.0	-16.2	-16.9	-17.1	-17.7	-18.1	-17.7	-17.3	-17.3	-17.6	-17.9	-17.4	-18.3	-16.2
15-Dec	-17.6	-18.4	-19.0	-19.9	-20.8	-21.4	-22.0	-21.8	-22.9	-23.4	-23.5	-23.5	-22.9	-22.7	-22.6	-22.7	-23.1	-23.4	-24.1	-24.7	-24.5	-25.1	-25.1	-25.6	-22.5	-17.6
16-Dec	-25.8	-26.4	-26.5	-26.7	-27.0	-27.1	-27.4	-28.6	-29.2	-28.7	-29.1	-28.7	-28.3	-27.1	-26.6	-26.4	-26.3	-26.8	-26.5	-26.2	-26.8	-27.3	-27.1	-28.4	-27.3	-25.8
17-Dec	-29.3	-29.3	-29.9	-30.6	-31.1	-30.9	-31.6	-32.0	-31.9	-32.1	-32.1	-33.1	-32.6	-30.0	-29.3	-28.3	-27.6	-27.8	-28.3	-28.5	-27.7	-27.7	-27.1	-26.2	-29.8	-26.2
18-Dec	-26.1	-26.1	-26.1	-26.2	-26.0	-26.3	-26.1	-24.9	-24.2	-24.0	-23.9	-23.5	-22.9	-22.0	-21.9	-21.7	-21.8	-21.8	-21.6	-21.5	-21.3	-21.2	-20.6	-20.1	-23.4	-20.1
19-Dec	-19.8	-19.1	-18.6	-18.0	-17.4	-16.9	-16.4	-16.3	-16.2	-15.8	-15.4	-14.8	-14.5	-15.1	-15.2	-15.1	-14.6	-14.7	-14.8	-14.8	-14.8	-14.9	-14.8	-14.0	-15.9	-14.0
20-Dec	-13.8	-12.0	-10.4	-8.7	-6.7	-5.1	-3.7	-3.6	-3.6	-4.1	-4.2	-3.8	-3.1	-2.7	-2.7	-3.1	-3.9	-4.2	-4.3	-4.2	-4.7	-5.1	-5.7	-6.4	-5.4	-2.7
21-Dec	-6.1	-6.4	-6.0	-4.9	-4.3	-4.0	-4.2	-3.3	-2.8	-2.5	-2.1	-0.8	1.0	2.0	2.5	2.5	1.9	1.4	1.2	1.2	0.9	0.6	0.9	1.1	-1.3	2.5
22-Dec	1.6	1.9	1.8	1.8	1.5	0.9	0.4	-0.6	-2.4	-2.8	-4.1	-6.6	-8.0	-11.4	-12.7	-13.3	-13.8	-14.9	-15.7	-15.7	-15.8	-15.9	-15.8	-15.9	-7.3	1.9
23-Dec	-16.3	-16.4	-16.5	-16.9	-17.6	-18.1	-18.6	-18.9	-19.3	-19.5	-19.5	-19.3	-18.9	-19.0	-19.1	-19.6	-20.3	-20.6	-20.2	-20.7	-21.7	-22.6	-23.3	-24.0	-19.5	-16.3
24-Dec	-24.5	-24.7	-24.9	-25.1	-25.5	-25.3	-25.0	-24.3	-23.4	-23.1	-23.1	-22.5	-22.1	-21.2	-20.8	-20.5	-20.3	-19.5	-18.9	-19.1	-19.3	-20.1	-20.4	-20.0	-22.2	-18.9
25-Dec	-19.3	-18.6	-18.1	-17.4	-16.8	-16.5	-16.1	-16.3	-16.8	-17.3	-17.5	-17.5	-16.7	-15.6	-15.5	-15.6	-16.1	-17.1	-17.5	-17.2	-17.4	-17.8	-18.0	-18.3	-17.1	-15.5
26-Dec	-17.8	-18.4	-17.7	-18.3	-18.2	-18.1	-18.3	-19.1	-19.1	-19.2	-19.3	-18.8	-17.7	-16.4	-15.3	-14.6	-14.5	-14.2	-14.1	-13.9	-13.6	-13.2	-12.9	-12.7	-16.5	-12.7
27-Dec	-12.1	-11.8	-11.5	-11.1	-11.1	-11.0	-10.6	-9.5	-9.1	-8.9	-8.0	-5.4	-3.4	-2.7	-2.3	-2.3	-2.5	-2.4	-2.3	-2.1	-2.0	-2.4	-4.6	-5.5	-6.4	-2.0
28-Dec	-7.0	-7.7	-8.8	-9.8	-11.2	-11.9	-12.4	-13.1	-14.7	-16.0	-16.4	-16.3	-16.1	-15.7	-15.6	-15.2	-14.5	-14.6	-15.1	-15.7	-16.2	-16.2	-16.2	-16.6	-13.9	-7.0
29-Dec	-16.9	-17.0	-17.1	-17.2	-17.0	-16.9	-16.5	-16.2	-15.8	-15.4	-14.9	-14.3	-14.1	-13.8	-13.4	-12.9	-12.7	-12.6	-12.4	-12.1	-12.5	-12.8	-13.0	-12.9	-14.6	-12.1
30-Dec	-13.1	-13.1	-13.2	-13.4	-13.3	-13.0	-13.2	-13.3	-13.4	-13.6	-12.9	-12.3	-11.5	-11.0	-9.7	-9.3	-9.2	-8.6	-8.8	-9.6	-9.9	-11.4	-13.9	-14.2	-11.9	-8.6
31-Dec	-14.7	-14.5	-14.7	-14.7	-14.2	-14.0	-14.2	-14.6	-14.3	-14.4	-14.3	-14.4	-14.0	-13.5	-13.0	-12.7	-11.6	-9.7	-8.9	-9.3	-10.1	-10.6	-11.2	-10.6	-12.8	-8.9
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 90 m (AT90m) - C
Mannix - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	261	35.08	35.08
-20 - 0	457	61.42	96.51
0 - 10	26	3.49	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

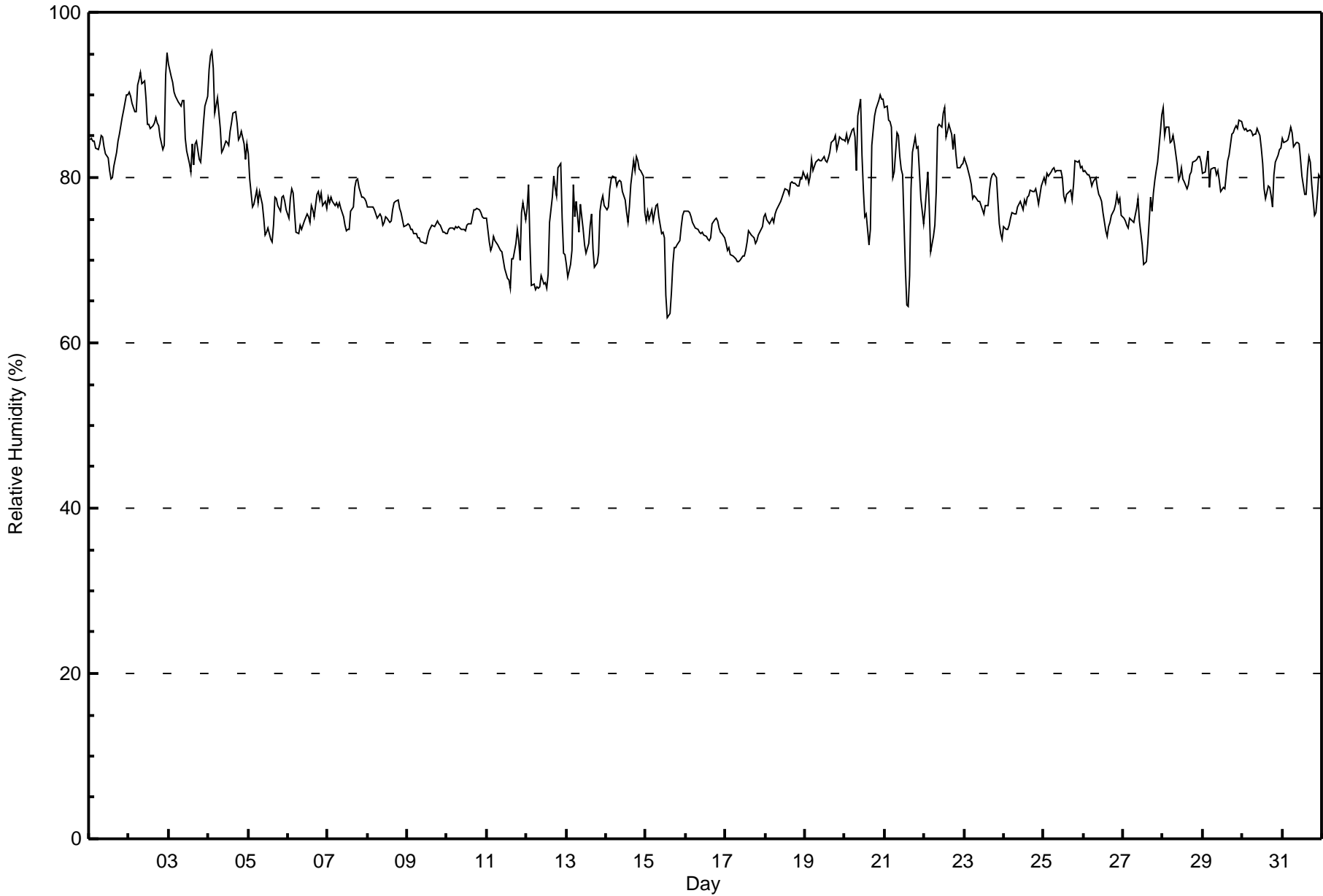
Mannix - December 2016

Maximum Value: 95 % on Dec 4 03:00 Maximum Daily Average: 88.5 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 63 % on Dec 15 14:00 Minimum Daily Average: 71.6 % on Dec 11 Maximum Diurnal Average: 80.0 % at hour 23 Minimum Diurnal Average: 75.5 % at hour 14 Monthly Average: 78.6 % Percentiles: P ₁ = 67 P ₁₀ = 72 Q ₁ = 75 Median = 78 Q ₃ = 83 P ₉₀ = 86 P ₉₉ = 92																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	84	85	84	84	84	83	84	85	85	84	83	82	81	80	80	81	83	84	85	86	87	88	90	90	84.3	90
2-Dec	90	90	89	88	88	91	92	93	91	92	89	87	86	86	86	87	87	87	86	85	83	84	92	95	88.5	95
3-Dec	94	92	91	90	90	90	89	89	89	89	85	83	82	81	84	81	84	84	82	82	84	87	89	90	86.7	94
4-Dec	93	95	95	93	88	90	88	86	83	83	84	84	86	87	88	88	87	85	85	86	84	82	84	84	86.9	95
5-Dec	83	80	76	77	78	79	77	78	77	75	73	73	74	73	72	74	78	77	77	76	78	78	77	76	76.4	83
6-Dec	75	78	79	78	76	73	73	74	74	74	75	76	75	75	77	76	75	78	78	77	78	77	77	76	76.0	79
7-Dec	78	77	78	77	77	77	77	77	76	75	74	74	74	74	76	76	79	80	80	79	78	78	77	77	76.8	80
8-Dec	76	76	76	76	76	76	75	76	75	74	75	75	75	75	75	76	77	77	77	76	76	75	74	74	75.6	77
9-Dec	74	74	74	74	73	73	73	73	72	72	72	72	73	74	74	74	74	74	75	74	74	73	73	73	73.5	75
10-Dec	73	74	74	74	74	74	74	74	74	74	74	74	74	74	74	75	76	76	76	76	76	75	75	75	74.6	76
11-Dec	75	72	71	72	73	72	72	72	71	71	70	69	68	68	67	70	70	72	74	72	70	76	77	75	71.6	77
12-Dec	76	79	72	67	67	66	67	67	67	68	67	67	67	68	75	78	80	79	78	81	82	75	71	71	72.3	82
13-Dec	70	68	70	71	79	75	77	73	77	75	74	72	71	72	74	76	71	69	70	71	76	77	78	77	73.4	79
14-Dec	76	77	79	80	80	80	79	79	80	80	78	77	76	75	76	79	82	81	83	82	81	81	80	76	79.0	83
15-Dec	75	76	75	76	75	76	77	77	75	73	73	73	66	63	64	66	70	72	71	72	72	74	75	76	72.5	77
16-Dec	76	76	76	75	75	74	74	74	73	73	73	73	73	73	72	73	74	75	75	75	74	73	73	73	74.0	76
17-Dec	72	71	72	71	71	70	70	70	70	70	71	70	71	72	74	73	73	73	72	72	73	74	74	75	71.8	75
18-Dec	76	75	74	75	75	75	76	76	77	77	78	78	79	79	78	79	79	79	79	79	79	80	80	81	77.6	81
19-Dec	80	80	79	80	82	81	82	82	82	82	82	83	82	82	82	83	84	85	85	83	84	85	85	85	82.5	85
20-Dec	84	85	84	85	86	86	85	81	88	89	83	79	75	76	72	74	84	86	87	88	89	90	89	89	83.9	90
21-Dec	88	89	87	87	86	80	81	85	85	83	81	80	69	65	64	68	79	83	85	84	84	81	77	74	80.2	89
22-Dec	76	78	81	76	71	73	74	78	86	86	86	88	88	85	86	87	85	83	85	83	81	81	82	82	81.8	88
23-Dec	82	82	81	80	79	77	78	78	77	77	77	76	76	77	77	79	80	80	81	80	77	74	73	73	77.9	82
24-Dec	74	74	74	74	75	76	76	76	76	77	77	76	77	77	78	78	78	78	78	79	78	77	79	80	76.7	80
25-Dec	80	79	81	80	81	81	81	81	81	81	81	80	78	77	78	78	79	77	79	82	82	82	81	81	80.0	82
26-Dec	81	81	80	80	80	79	79	80	79	78	78	77	76	73	73	74	75	75	76	77	78	77	77	76	77.5	81
27-Dec	75	75	74	74	75	75	75	75	76	77	75	72	69	70	70	72	78	76	78	80	81	82	86	88	76.1	88
28-Dec	88	85	86	86	84	84	85	84	82	80	80	81	80	80	79	79	80	81	82	82	82	83	83	82	82.4	88
29-Dec	80	81	82	83	79	81	81	81	80	81	80	78	79	79	80	82	83	85	85	86	86	86	87	87	82.2	87
30-Dec	86	86	86	86	86	86	85	85	85	86	85	83	82	79	77	79	79	78	77	80	82	83	83	84	82.8	86
31-Dec	85	84	84	85	85	86	85	84	84	84	84	82	80	78	78	81	83	82	79	75	76	78	80	80	81.8	86
																		79.9						Diurnal Average		
																		94						Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Mannix - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Mannix - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	458	61.56	61.56
80 - 100	286	38.44	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



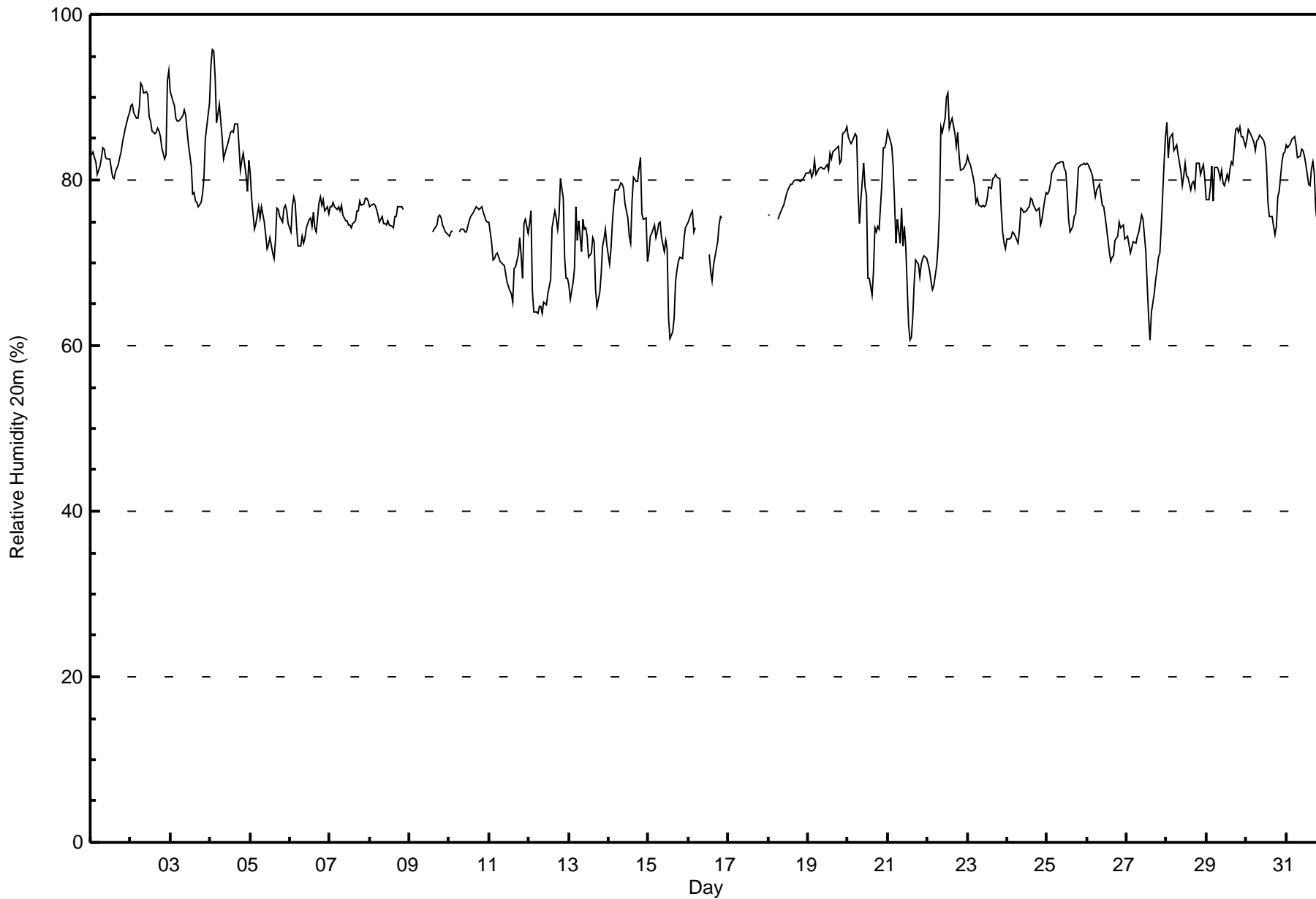
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 20m (RH20m) - %

Mannix - December 2016

Maximum Value: 96 % on Dec 4 02:00																			Maximum Daily Average: 87.9 % on Dec 2						Hours in Service: 744	
Minimum Value: 61 % on Dec 21 14:00																			Minimum Daily Average: 69.8 % on Dec 12						Hours of Data: 686	
Maximum Diurnal Average: 79.0 % at hour 1																			Minimum Diurnal Average: 74.8 % at hour 14						Hours of Missing Data: 58	
Monthly Average: 77.6 %																			Percentiles: P ₁ = 63 P ₁₀ = 70 Q ₁ = 74 Median = 77 Q ₃ = 82 P ₉₀ = 86 P ₉₉ = 91						Hours of Calibration: 0	
																									Percent Operational Time: 92.2	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	83	83	83	82	81	82	83	84	84	83	83	82	81	80	80	81	82	83	83	85	85	86	88	88	83.1	88
2-Dec	89	89	88	87	87	89	92	91	90	91	90	88	87	86	86	86	86	86	85	84	82	83	92	93	87.9	93
3-Dec	91	90	89	87	87	87	87	88	88	88	86	84	82	78	79	78	77	77	77	78	80	85	87	89	84.1	91
4-Dec	94	96	96	92	87	89	87	85	83	83	84	85	86	86	86	87	87	84	81	82	83	81	79	82	86.0	96
5-Dec	81	78	74	75	76	77	75	77	75	73	72	72	73	71	71	73	77	76	76	75	77	77	76	75	75.0	81
6-Dec	74	77	78	77	74	72	72	73	72	73	74	75	75	74	76	74	74	77	78	77	78	76	77	76	75.2	78
7-Dec	77	77	77	77	76	77	76	77	76	75	75	75	75	74	75	75	76	76	77	77	77	78	78	78	76.3	78
8-Dec	77	77	77	77	76	76	75	76	75	75	75	75	75	74	74	76	76	77	77	77	77	AF	AF	AF	75.8	77
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	74	74	75	76	76	75	75	74	73	73	--	76
10-Dec	73	74	74	AF	AF	AF	74	74	74	74	74	74	74	75	76	76	76	77	77	76	76	75	75	75.1	77	
11-Dec	75	72	70	70	71	71	70	70	70	70	69	68	67	66	65	69	69	71	73	71	68	75	75	73	70.4	75
12-Dec	75	76	67	64	64	64	65	65	64	65	65	66	67	68	74	76	75	74	76	80	78	71	68	68	69.8	80
13-Dec	67	66	68	69	77	73	75	71	75	74	74	73	71	71	73	72	67	65	67	69	72	73	74	72	71.1	77
14-Dec	70	72	75	77	79	79	79	80	79	79	77	75	73	72	77	80	80	80	82	83	76	75	75	70	76.9	83
15-Dec	71	73	74	75	73	74	75	75	73	71	73	72	63	61	62	63	68	69	70	71	71	73	74	75	70.7	75
16-Dec	75	76	76	74	74	AF	AF	AF	AF	AF	AF	AF	71	69	68	70	71	72	75	76	75	AF	AF	AF	--	76
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
18-Dec	76	76	AF	AF	AF	AF	75	76	77	77	78	78	79	79	80	80	80	80	80	80	80	80	81	81	78.6	81
19-Dec	81	81	80	81	82	81	81	82	81	81	81	82	81	83	83	83	84	84	84	82	82	86	86	87	82.5	87
20-Dec	85	85	84	85	86	85	79	75	78	82	79	78	68	68	66	69	74	74	74	74	80	84	84	85	78.3	86
21-Dec	86	85	84	82	77	72	75	72	77	72	74	72	63	61	61	64	68	70	70	68	70	71	71	70	72.3	86
22-Dec	70	69	68	67	67	70	72	76	86	86	88	90	90	86	87	87	86	84	86	83	81	81	82	82	80.2	90
23-Dec	83	82	82	80	79	77	78	77	77	77	77	77	78	79	79	80	80	81	80	80	76	74	72	72	78.2	83
24-Dec	73	73	73	74	74	73	72	74	77	76	76	76	77	77	78	78	77	76	76	77	75	75	78	78	75.5	78
25-Dec	78	79	80	81	82	82	82	82	82	82	81	81	79	75	74	74	76	76	78	82	82	82	82	82	79.7	82
26-Dec	82	82	81	81	79	78	79	79	78	77	77	76	74	71	70	71	71	73	73	75	74	74	75	73	75.9	82
27-Dec	73	72	71	72	72	72	73	74	75	76	75	71	67	63	61	64	66	68	69	71	71	74	82	85	71.7	85
28-Dec	87	83	85	86	84	84	84	83	81	79	81	82	80	80	79	80	80	79	82	82	81	81	82	80	81.9	87
29-Dec	78	78	79	82	78	81	82	81	80	81	80	79	81	80	81	82	82	86	86	86	86	85	85	84	81.8	86
30-Dec	85	86	86	85	85	84	85	85	85	85	85	84	82	77	76	76	74	73	74	78	79	82	83	83	81.5	86
31-Dec	84	84	84	85	85	85	84	83	83	84	84	83	82	80	79	81	82	81	77	73	75	77	79	78	81.3	85
																			79.0 78.9 78.7 78.6 78.2 78.2 78.1 78.0 78.4 78.2 78.0 77.7 75.9 74.8 74.9 76.0 76.5 76.8 77.3 77.5 77.4 78.2 79.0 78.9						Diurnal Average	
																			94 96 96 92 87 89 92 91 90 91 90 90 90 90 86 87 87 87 86 86 86 86 92 93						Diurnal Maximum	
AF - Analyzer Failure																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 20m (RH20m) - %
Mannix - December 2016

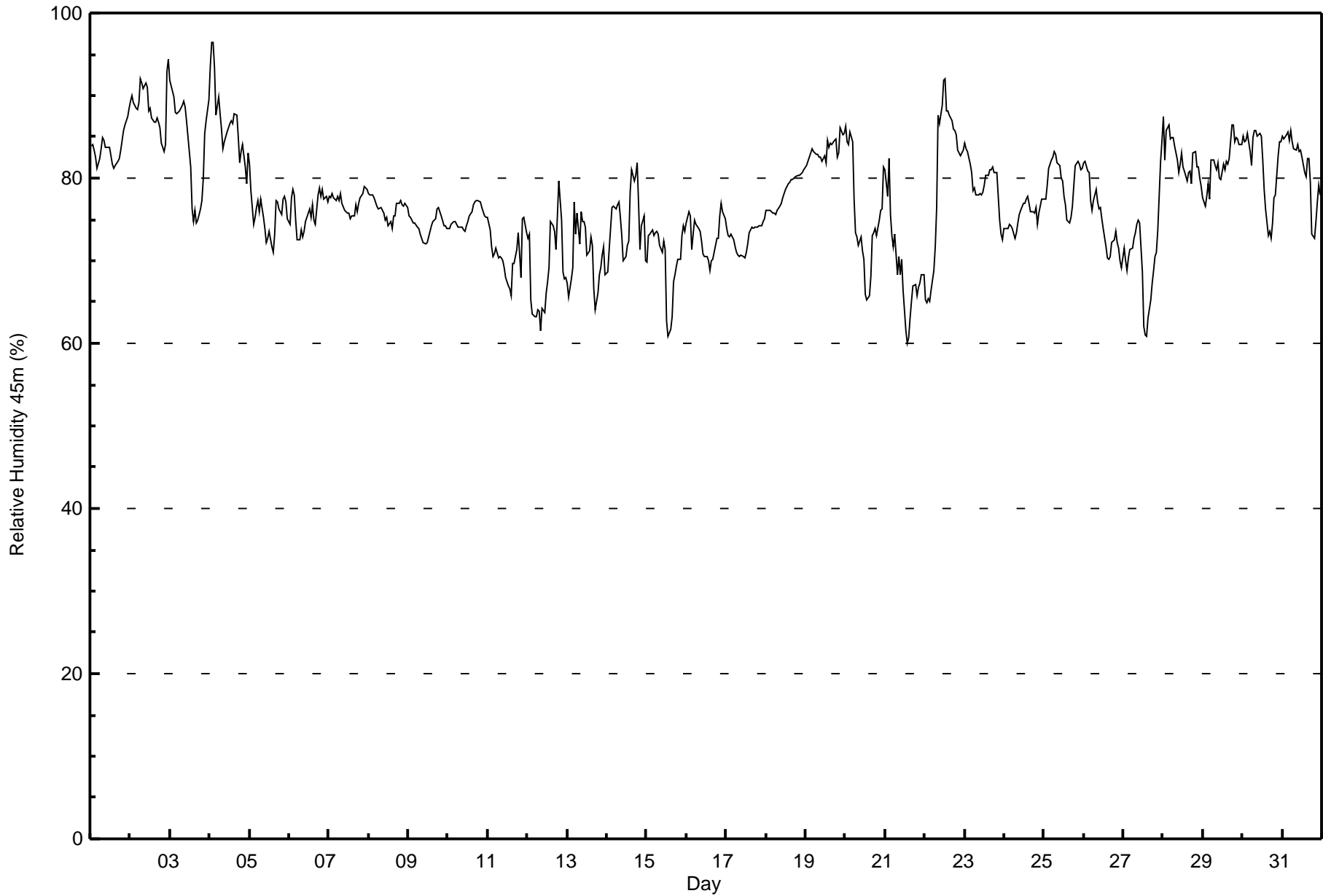
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	435	63.41	63.41
80 - 100	251	36.59	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 744



Maximum Value: 97 % on Dec 4 03:00																			Maximum Daily Average: 88.7 % on Dec 2						Hours in Service: 744																								
Minimum Value: 60 % on Dec 21 14:00																			Minimum Daily Average: 68.7 % on Dec 12						Hours of Data: 744																								
Maximum Diurnal Average: 78.6 % at hour 1																			Minimum Diurnal Average: 75.0 % at hour 14						Hours of Missing Data: 0																								
Monthly Average: 77.2 %																			Percentiles: P ₁ = 62 P ₁₀ = 69 Q ₁ = 73 Median = 76 Q ₃ = 82 P ₉₀ = 85 P ₉₉ = 91						Hours of Calibration: 0																								
																									Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	84	84	83	83	81	82	84	85	85	84	84	84	83	82	81	82	82	82	83	85	86	87	87	89	83.7	89																							
2-Dec	89	90	89	88	88	89	92	92	91	92	91	88	88	87	87	87	87	87	86	84	83	84	93	94	88.7	94																							
3-Dec	92	90	90	88	88	88	88	89	89	89	87	85	81	76	75	76	75	75	76	77	80	85	87	90	84.0	92																							
4-Dec	94	97	97	93	88	90	88	86	84	84	86	86	87	87	87	88	88	85	82	83	84	81	79	83	86.8	97																							
5-Dec	82	78	74	75	76	77	76	77	75	74	72	73	74	72	71	73	77	77	76	76	77	78	77	75	75.6	82																							
6-Dec	74	78	79	78	75	72	72	74	73	73	75	76	76	75	77	75	74	78	79	78	79	77	78	77	75.9	79																							
7-Dec	78	78	78	78	77	78	77	78	77	76	76	76	76	75	75	75	77	76	77	78	78	79	79	79	77.1	79																							
8-Dec	78	78	78	78	77	77	76	76	76	76	75	75	74	75	74	75	75	77	77	77	77	77	77	76	76.3	78																							
9-Dec	76	75	75	75	75	74	74	73	73	72	72	72	73	74	74	75	75	76	76	76	75	74	74	74	74.2	76																							
10-Dec	74	74	74	75	75	74	74	74	74	74	74	74	75	75	76	77	77	77	77	77	76	76	75	75	75.2	77																							
11-Dec	75	74	72	71	71	71	70	70	70	70	69	68	67	67	66	70	70	71	73	71	68	75	75	73	70.7	75																							
12-Dec	73	73	65	64	63	63	64	64	62	64	64	66	67	69	75	74	74	71	75	80	75	69	68	68	68.7	80																							
13-Dec	67	66	68	69	77	73	76	72	76	75	75	74	71	71	73	72	67	64	66	68	69	71	72	68	70.8	77																							
14-Dec	69	71	74	77	77	76	77	77	75	73	70	70	72	72	78	81	80	80	82	77	71	74	75	70	75.0	82																							
15-Dec	70	73	73	74	73	73	73	73	72	71	72	71	63	61	62	63	67	68	69	70	70	73	74	74	70.2	74																							
16-Dec	75	76	75	71	73	75	74	74	74	72	71	70	71	70	69	70	70	72	73	73	75	77	76	75	73.0	77																							
17-Dec	74	73	73	73	73	72	71	71	70	71	71	70	71	72	73	74	74	74	74	74	74	74	75	75	72.7	75																							
18-Dec	76	76	76	76	76	76	76	76	76	77	77	78	78	79	79	80	80	80	80	80	80	80	81	81	78.2	81																							
19-Dec	81	82	82	83	84	83	83	83	83	83	82	83	82	85	84	84	84	85	85	83	83	86	85	86	83.4	86																							
20-Dec	86	84	84	86	84	77	73	73	72	73	71	70	66	65	66	68	73	73	74	73	75	76	76	81	75.1	86																							
21-Dec	81	78	82	76	73	72	73	68	71	68	70	66	62	60	61	63	65	67	67	66	67	67	68	68	69.1	82																							
22-Dec	65	65	65	65	66	69	72	76	88	87	89	92	92	88	88	88	87	86	86	85	83	83	83	83	80.5	92																							
23-Dec	84	84	83	82	81	78	79	78	78	78	78	79	80	81	81	81	81	81	81	81	78	75	73	73	79.3	84																							
24-Dec	74	74	74	74	74	74	73	73	75	76	76	77	77	77	78	77	76	76	76	74	74	76	77	77	75.5	78																							
25-Dec	77	78	79	81	82	83	83	83	83	82	82	80	80	78	77	75	75	75	77	79	82	82	81	81	79.7	83																							
26-Dec	82	82	81	81	77	76	77	79	77	76	76	75	74	72	70	70	71	72	72	74	72	71	70	69	74.9	82																							
27-Dec	72	70	69	70	71	72	73	73	74	75	75	69	62	61	61	63	65	67	69	71	71	74	82	85	70.5	85																							
28-Dec	87	82	86	86	85	85	85	84	82	81	82	83	81	81	80	81	81	79	83	83	81	81	80	79	82.4	87																							
29-Dec	78	77	78	79	77	82	82	81	81	82	80	80	82	81	82	82	82	86	86	84	85	85	84	84	81.7	86																							
30-Dec	85	84	85	85	83	82	85	86	86	85	85	85	82	79	76	73	74	73	75	78	78	83	84	84	81.4	86																							
31-Dec	85	85	85	86	85	86	84	84	83	84	83	83	83	81	80	82	82	80	73	73	75	77	79	78	81.5	86																							
																								78.6	78.3	78.3	78.0	77.6	77.4	77.6	77.5	77.5	77.3	77.0	76.7	75.7	75.0	75.2	75.9	76.3	76.6	77.1	77.1	76.9	77.7	78.3	78.2	Diurnal Average	
																								94	97	97	93	88	90	92	92	91	92	91	92	92	88	88	88	88	87	86	85	86	87	93	94	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 45m (RH45m) - %
Mannix - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	1	0.13	0.13
60 - 80	494	66.40	66.53
80 - 100	249	33.47	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 97 % on Dec 4 03:00 Maximum Daily Average: 88.8 % on Dec 2																		Hours in Service: 744								
Minimum Value: 59 % on Dec 12 09:00 Minimum Daily Average: 67.0 % on Dec 21																		Hours of Data: 744								
Maximum Diurnal Average: 78.3 % at hour 2 Minimum Diurnal Average: 75.6 % at hour 14																		Hours of Missing Data: 0								
Monthly Average: 77.4 % Percentiles: P ₁ = 62 P ₁₀ = 68 Q ₁ = 73 Median = 77 Q ₃ = 82 P ₉₀ = 86 P ₉₉ = 93																		Hours of Calibration: 0								
																		Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	85	85	84	83	82	83	85	86	86	85	85	85	84	83	82	82	82	82	84	85	85	86	85	86	84.2	86
2-Dec	86	88	89	89	89	89	91	90	90	91	91	90	90	88	87	87	88	88	87	85	84	85	93	95	88.8	95
3-Dec	93	91	90	88	88	89	89	90	90	89	88	86	80	73	74	73	73	75	76	81	86	88	90	83.8	93	
4-Dec	93	97	97	94	88	90	88	87	85	86	87	87	88	87	88	89	86	82	84	85	82	80	84	87.5	97	
5-Dec	83	79	75	76	77	78	77	78	76	75	73	74	75	73	72	74	78	78	77	77	78	79	78	76	76.6	83
6-Dec	75	79	80	79	76	73	73	75	74	74	76	77	77	76	78	76	76	79	80	79	80	79	79	79	77.0	80
7-Dec	79	79	80	79	78	79	79	80	79	77	77	77	77	76	76	76	78	77	78	79	80	80	79	79	78.3	80
8-Dec	79	78	78	78	77	77	77	77	77	76	76	76	76	77	77	77	77	77	77	77	77	77	77	76	76.9	79
9-Dec	76	76	75	75	75	75	75	75	74	74	74	74	74	75	75	76	77	77	76	76	76	76	76	76	75.3	77
10-Dec	76	76	76	77	77	77	77	77	76	76	75	75	76	77	77	77	78	78	78	78	77	76	76	76	76.6	78
11-Dec	75	74	73	72	72	73	71	72	72	71	70	69	68	68	67	71	70	72	74	71	68	76	76	73	71.6	76
12-Dec	70	70	64	63	63	63	64	62	59	63	63	66	69	71	75	75	71	70	75	79	72	68	68	69	68.0	79
13-Dec	68	66	69	69	78	74	76	73	77	76	76	76	72	72	72	71	67	64	66	68	67	68	68	65	70.7	78
14-Dec	68	71	74	76	75	76	77	76	73	71	70	70	72	73	79	82	80	81	82	73	69	74	76	70	74.6	82
15-Dec	67	73	73	73	73	73	73	72	71	71	72	72	63	62	63	64	68	68	69	70	70	73	73	73	70.0	73
16-Dec	74	77	75	70	71	75	75	74	74	73	72	71	70	68	68	68	70	72	73	73	76	78	78	77	72.9	78
17-Dec	76	76	75	74	74	74	73	73	73	73	72	71	72	73	75	75	76	75	75	75	75	75	76	76	74.3	76
18-Dec	77	77	77	77	77	77	77	77	78	78	78	78	78	79	80	80	80	80	80	80	81	81	81	81	78.7	81
19-Dec	82	82	83	83	84	84	84	84	83	84	83	84	84	86	85	85	84	85	85	83	84	86	84	80	83.8	86
20-Dec	83	82	84	83	79	74	72	72	71	71	70	68	66	65	66	68	73	74	74	73	74	74	74	76	73.6	84
21-Dec	73	73	72	72	72	72	72	67	68	67	67	64	61	60	61	63	65	66	66	65	66	66	65	64	67.0	73
22-Dec	64	65	65	65	66	69	72	77	89	88	90	93	92	89	88	87	87	86	85	85	85	85	85	85	81.0	93
23-Dec	85	85	85	84	84	83	83	82	82	81	81	81	81	82	82	82	82	82	82	81	79	77	75	74	81.5	85
24-Dec	75	75	75	75	75	75	75	75	76	76	76	78	78	78	79	78	77	77	77	77	75	77	78	78	76.4	79
25-Dec	78	78	80	83	84	83	82	82	82	81	80	80	80	79	77	76	75	77	77	80	81	81	80	80	79.8	84
26-Dec	78	80	77	79	75	74	74	77	75	74	75	74	73	72	70	69	70	71	71	71	70	68	67	66	72.9	80
27-Dec	68	67	66	68	70	70	71	72	72	73	72	65	60	60	61	63	66	67	69	71	71	74	82	83	69.3	83
28-Dec	87	82	86	87	86	86	86	85	84	82	83	84	83	81	81	81	80	80	84	84	82	81	80	79	83.2	87
29-Dec	78	76	77	77	78	82	83	82	82	82	81	81	82	82	83	82	82	85	84	83	84	84	84	84	81.5	85
30-Dec	85	84	84	84	84	82	84	85	85	85	85	84	81	78	74	71	73	73	75	78	77	83	85	86	81.0	86
31-Dec	86	86	86	86	86	86	85	85	85	85	84	85	84	82	81	83	81	74	70	73	75	77	80	78	81.7	86
																		Diurnal Average								
																		Diurnal Maximum								

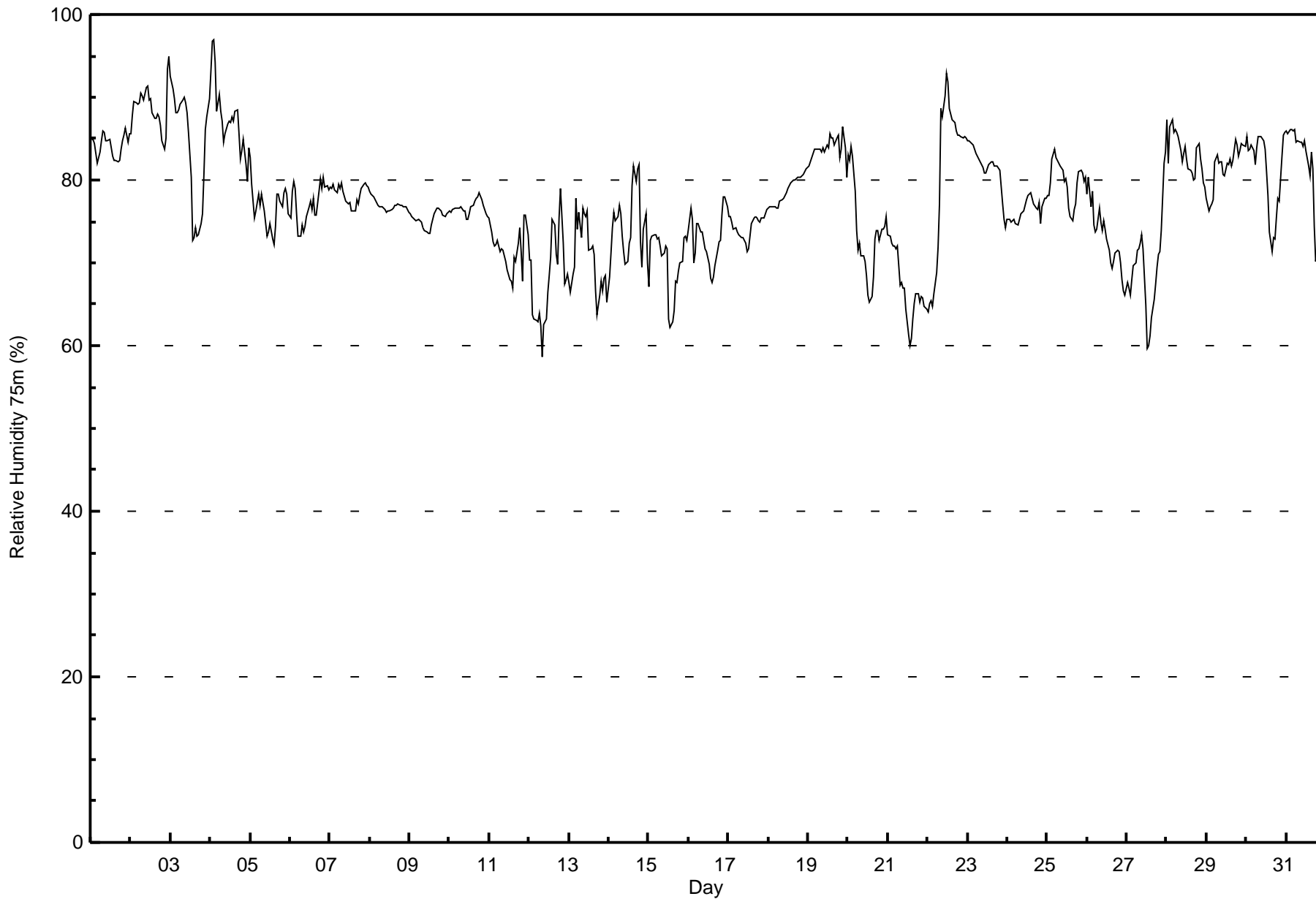


Wood Buffalo Environmental Association

Hourly Averages

Relative Humidity 75m (RH75m) - %

Mannix - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 75m (RH75m) - %
Mannix - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	3	0.40	0.40
60 - 80	486	65.32	65.73
80 - 100	255	34.27	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

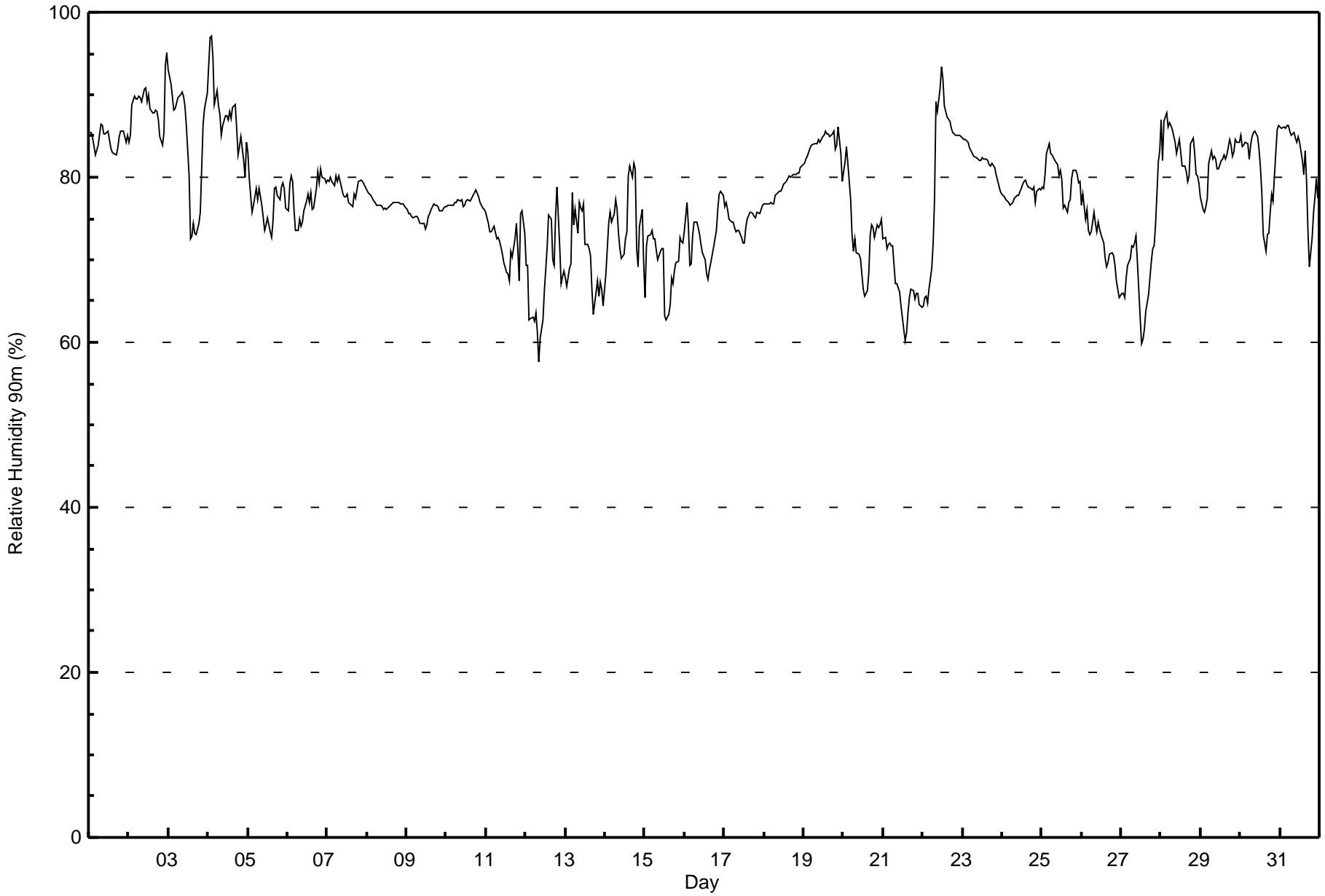


Maximum Value: 97 % on Dec 4 03:00 Maximum Daily Average: 88.6 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 58 % on Dec 12 09:00 Minimum Daily Average: 66.9 % on Dec 21 Maximum Diurnal Average: 78.4 % at hour 23 Minimum Diurnal Average: 75.9 % at hour 14 Monthly Average: 77.5 % Percentiles: P ₁ = 62 P ₁₀ = 68 Q ₁ = 73 Median = 77 Q ₃ = 83 P ₉₀ = 86 P ₉₉ = 93																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	85	85	85	84	83	84	85	86	86	85	85	86	85	83	83	83	83	84	85	86	86	86	84	85	84.6	86
2-Dec	84	85	89	90	89	90	90	90	89	91	91	89	90	88	88	88	88	88	87	85	84	85	94	95	88.6	95
3-Dec	93	91	90	88	88	89	90	90	90	89	86	80	73	73	74	73	73	74	76	81	87	88	90	84.0	93	
4-Dec	93	97	97	95	89	90	89	88	85	86	87	88	87	88	87	89	86	83	84	85	82	80	84	87.8	97	
5-Dec	83	80	76	77	78	79	77	79	77	75	74	74	75	73	73	75	79	79	78	77	79	79	76	77.0	83	
6-Dec	76	79	80	79	76	74	74	75	74	75	76	77	78	77	78	76	76	79	81	79	81	80	80	79	77.4	81
7-Dec	80	80	80	79	79	80	80	80	79	78	78	78	78	77	77	76	78	78	79	79	80	79	79	79	78.7	80
8-Dec	78	78	78	77	77	77	77	77	77	76	76	76	76	76	77	77	77	77	77	77	77	77	76	76.9	78	
9-Dec	76	76	76	75	75	75	75	75	74	74	74	74	74	75	76	76	77	77	77	76	76	76	76	76	75.5	77
10-Dec	76	77	77	77	77	77	77	77	77	77	76	77	77	77	77	78	78	78	79	78	77	77	76	76	77.0	79
11-Dec	76	74	73	73	74	74	73	73	72	71	71	70	68	68	67	71	70	72	74	71	67	76	76	73	72.1	76
12-Dec	69	69	63	63	63	63	64	61	58	61	63	66	69	71	76	75	70	69	75	79	72	67	68	69	67.5	79
13-Dec	68	67	69	70	78	74	76	73	77	76	76	77	72	72	71	70	67	63	66	67	66	67	64	70.6	78	
14-Dec	68	71	74	76	75	76	77	76	73	71	70	71	72	73	80	81	80	82	81	71	69	74	76	70	74.6	82
15-Dec	65	72	73	73	74	73	73	71	70	71	71	63	63	63	65	68	67	69	70	70	73	72	72	69.6	74	
16-Dec	73	77	74	69	70	73	75	75	74	73	72	71	70	68	68	69	70	72	72	74	76	78	78	78	72.8	78
17-Dec	76	77	76	75	75	75	74	73	74	74	73	72	72	74	75	76	76	76	75	75	76	76	76	77	74.8	77
18-Dec	77	77	77	77	77	77	77	78	78	78	78	79	79	80	80	80	80	80	80	80	81	81	81	81	78.8	81
19-Dec	82	82	83	83	84	84	84	84	84	85	84	85	85	86	85	85	85	85	86	83	84	86	83	79	84.0	86
20-Dec	81	82	84	82	77	73	71	72	71	71	70	68	66	66	66	69	73	74	74	73	74	74	75	73.3	84	
21-Dec	73	73	71	72	72	72	72	67	67	67	66	64	62	60	61	63	65	66	66	65	66	66	65	64	66.9	73
22-Dec	64	65	66	65	66	69	72	78	89	88	91	93	92	89	88	87	87	86	85	85	85	85	85	85	81.1	93
23-Dec	85	85	85	84	84	83	83	83	82	82	82	82	82	82	82	81	81	82	81	80	80	79	78	82.1	85	
24-Dec	78	78	77	77	77	77	77	77	78	78	78	79	79	80	79	79	79	78	79	77	78	79	79	79	78.1	80
25-Dec	79	79	80	83	84	83	83	82	82	82	80	81	80	76	77	76	77	77	80	81	81	80	79	80	80.0	84
26-Dec	77	78	75	76	74	73	73	76	74	73	75	74	73	72	70	69	70	71	71	70	69	67	66	65	72.2	78
27-Dec	66	66	65	68	69	70	72	72	72	73	70	63	60	60	62	64	66	68	70	71	72	74	82	83	69.0	83
28-Dec	87	82	87	88	86	87	86	86	84	83	84	85	83	81	81	81	80	80	84	85	83	80	80	79	83.4	88
29-Dec	78	76	76	76	77	82	83	82	82	82	81	81	82	82	83	82	83	85	84	82	83	85	84	84	81.5	85
30-Dec	85	84	84	84	84	82	84	85	85	86	85	83	81	78	73	71	73	73	76	78	77	83	86	86	81.1	86
31-Dec	86	86	86	86	86	86	86	85	86	85	84	85	84	82	80	83	79	73	69	73	76	78	80	78	81.7	86
																		Diurnal Average								
																		Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity 90m (RH90m) - %
Mannix - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 90m (RH90m) - %
Mannix - December 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	2	0.27	0.27
60 - 80	481	64.65	64.92
80 - 100	261	35.08	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 20 m (WS20m) - km/h

Mannix - December 2016

Maximum Speed: 28 km/h on Dec 21 14:00		Maximum Daily Speed Average: 23.9 km/h on Dec 5		Hours in Service:	744																					
Minimum Speed Value: 0 km/h on Dec 29 07:00		Minimum Daily Speed Average: 0.9 km/h on Dec 29		Hours of Data:	685																					
Maximum Diurnal Speed Average: 4.4 km/h at hour 20		Minimum Diurnal Speed Average: 1.8 km/h at hour 9		Hours of Missing Data:	59																					
Monthly Average Velocity: 2.7 km/h 243.2 deg		Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 10 Q ₃ = 15 P ₉₀ = 19 P ₉₉ = 26		Percent Operational Time:	92.1																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE14	SSE14	SSE14	S11	SSW12	S10	SSE12	SSE12	SSE12	S10	SSE11	SSE11	SSE10	SSE10	S10	S7	S6	S7	S7	S7	SSE9	S7	SSE7	SSE7	S9.7	SSE14
2-Dec	SSE9	SSE13	SSE13	SSE11	SSE13	SSE10	SSE11	SE12	SSE13	SSE16	SE15	SE13	SE15	SE14	SE16	SE19	SE18	SE21	SE16	SE18	SE17	SE17	SE17	SE20	SE14.6	SE21
3-Dec	SE17	SE15	SE14	SSE17	SSE16	SSE18	SSE21	SSE19	SSE19	SSE19	SSE20	SSE17	SSE16	SSE10	SSE12	SSE16	SSE15	S11	S10	S10	SSW10	SW11	SW10	SSW7	SSE13.7	SSE21
4-Dec	S4	S2	NW7	N18	N25	N16	NNE19	NNE23	NNE21	NNE18	NNE16	N10	NNW11	NW15	NW14	NW16	WNW17	NW20	NW22	NW21	NW17	NW16	NW16	WNW19	NNW13.6	N25
5-Dec	WNW23	WNW24	WNW24	WNW25	WNW24	WNW25	WNW25	WNW26	WNW27	WNW25	WNW26	WNW25	W25	W26	W27	W26	W24	W23	W22	W22	W22	W21	W21	W21	W23.9	WNW27
6-Dec	WNW22	W22	W22	W22	WNW21	WNW20	WNW19	WNW18	WNW18	WNW18	WNW18	WNW18	WNW16	NW18	NW16	NW14	NW14	NNW11	N10	N12	N12	N14	N12	N12	NW14.2	W22
7-Dec	N7	N10	N10	N11	N12	N15	N14	N11	N13	N13	N14	NNE11	N9	WNW10	WNW11	NW6	N4	N2	N3	N5	NNE7	NNE6	NNE8	NNE11	N8.5	N15
8-Dec	NNE11	NNE11	NNE9	NNE8	NNE9	NE8	NE8	NE4	NE4	AF	W4	W4	W4	W3	W4	NNW4	NNW5	N6	NNE6	N4	N4	AF	AF	AF	N4.5	NNE11
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SSE8	SSE7	S8	S8	S8	S7	S5	SSE6	SSE7	S4	----	SSE8
10-Dec	S3	SSE6	SSE8	AF	AF	AF	SSE9	SSE11	SSE8	SSE6	SSE6	SSE6	SSE7	SSE9	SSE8	SSE5	S5	SSW6	SSW3	SW8	SW9	SW9	SW10	SW9	S6.2	SSE11
11-Dec	SW6	WSW15	WSW16	WSW13	WSW15	WSW16	WSW13	WSW17	WSW16	WSW16	WSW15	WSW18	W20	W18	W23	W20	WSW16	W15	WSW12	W19	W19	WSW10	W16	WNW18	W15.7	W23
12-Dec	W17	W13	NW16	WNW19	WNW20	WNW20	WNW19	WNW21	WNW18	W18	W18	W12	SW6	SSE5	SSE7	SSE4	WNW5	WNW12	NNW9	WNW7	W12	W18	W21	W26	WNW12.7	W26
13-Dec	WNW25	WNW25	WNW26	NW23	N19	NNW21	NNW16	NNW17	NNW12	NNW11	NNW9	NNE6	W3	NW7	NNW8	NW9	NW10	WNW11	WNW12	WNW11	W11	WSW10	W13	W9	NW11.8	WNW26
14-Dec	W6	SSW4	SW3	WSW5	S3	SSE9	SSE9	SSE10	SSE10	SSE9	SSE10	SSE8	SW2	NW9	NNW9	N5	N5	N4	W6	W9	W11	W8	WNW6	NW11	SW2.5	W11
15-Dec	NW9	W14	W15	W17	WNW16	WNW12	W13	W14	W16	WNW12	W13	W16	W12	W14	W14	W13	W12	WNW13	W12	W13	WNW13	W14	W13	W14	W13.2	W17
16-Dec	W12	W8	W9	W11	WNW6	AF	AF	AF	AF	AF	AF	AF	SSE7	SSE7	SSE9	SSE12	SSE9	SSE7	S5	SSE5	SSE6	AF	AF	AF	----	W12
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----
18-Dec	S7	S8	AF	AF	AF	AF	S6	S6	S4	SSW3	SSE3	S2	S2	NNW3	NNW4	WNW6	NW6	WNW6	WNW5	WNW3	NNE1	SW4	S3	SSE4	SW2.1	S8
19-Dec	SSE4	SE5	SE10	ESE8	SE12	SE16	SE17	ESE13	SE13	SE10	ESE8	ESE5	NNE1	NW8	WNW9	NNW8	NNW8	NW12	NNW8	NNE6	SE3	SSE6	SSE8	SSE8	SE3.8	SE17
20-Dec	SSE10	SSE10	SSE12	SE10	SE11	SE6	WSW12	SW10	S12	S12	S9	SSE10	SW7	WSW4	WSW11	WSW9	S3	SSW4	SSW4	WSW7	ESE2	SE5	SE3	SE7	S5.8	WSW12
21-Dec	SSE10	SSE11	SSE13	SSE12	SSW6	WSW15	SW5	SSW8	S9	S14	S15	SSW11	WSW24	WSW28	WSW19	SW14	S11	S12	S11	S11	S11	SE10	SE7	ESE5	SSW9.1	WSW28
22-Dec	SE7	SE4	SSE4	SW12	WSW15	WSW15	WSW16	WNW12	NW7	N4	NNW11	N19	N14	NNE19	N16	NNW10	N16	N20	N14	N11	N16	NNE15	NNE15	NNE17	NNW7.8	N20
23-Dec	NNE16	NNE14	NNE12	NNE13	NNE14	NNE14	NNE14	N11	NNE12	NNE11	N12	N10	NNW8	NNW6	NNW7	NNW7	NNW8	N6	N5	N4	ESE9	ESE10	SE12	SE11	NNE7.7	NNE16
24-Dec	ESE5	SE10	SE8	SE8	SE4	SSE7	SSE7	SW6	W6	SW4	SSE4	SW5	SW5	SSE4	S4	S4	SSE7	S5	S5	S5	SSE12	SE9	SSE8	SSE8	SSE5.1	SSE12
25-Dec	SSE8	SE10	S9	SSE9	SSE8	SSE14	SSE14	SSE11	SSE12	SSE10	SSE12	SSE8	SSE7	SSE8	SSE8	SE10	SE12	SE12	SE11	SSE12	SSE14	SSE14	SSE11	SSE11	SSE10.6	SSE14
26-Dec	SSE12	SSE14	SSE15	SSE16	SSE16	SSE14	SSE14	SSE15	SSE17	SSE16	SSE17	SSE15	SSE15	SSE18	SSE17	SSE15	SSE14	SSE12	SSE14	SSE12	SSE13	SSE13	SSE12	SE13	SSE14.5	SSE18
27-Dec	SE11	SSE12	SSE14	SE15	SSE14	SSE14	SE14	SE15	SE14	SSE17	SSE19	SSE16	SSE8	SSE5	SSW6	SSW7	SW9	SW6	WSW7	SW7	WSW7	W12	NW10	NW10	SSE7.6	SSE19
28-Dec	NW9	N11	N8	NNE10	NNE13	NNE9	N8	N10	NNE10	NNE11	NNE9	NNE6	NNE5	W2	SSE1	S2	SE2	NE1	N7	NNW3	NW4	NW6	N7	N4	N5.8	NNE13
29-Dec	NNE3	NNE2	N5	NW1	NE6	NE3	S0	SE3	E2	SSW2	E2	WNW2	WSW3	W2	N3	S3	NNE1	N5	N5	SW3	WSW5	NE1	NNE3	SE3	NNE0.9	NE6
30-Dec	WSW3	WSW6	WSW6	W4	SSW4	S6	SSE7	S4	S4	S4	SSE8	SSE8	SE6	SSE10	SSE13	SSE10	S7	WSW9	W14	W18	W16	NNW11	NNE11	WNW6	SW3.8	W18
31-Dec	WNW8	N8	NNW3	SW6	SSW3	ESE4	ENE5	NNE7	N4	W5	SW2	NNW1	NNE6	NW3	NNE2	NNE4	SW8	WSW11	WSW13	W22	WSW21	WSW20	WSW18	W19	W5.5	W22
WSW2.8 WSW2.6 SW2.9WSW2.9WNW1.8WSW1.9 SW2.0 SW2.1 SW1.8SSW2.6SSW2.3 SW2.0WSW2.9WSW3.7WSW3.7WSW3.1WSW2.7 W3.0 W3.4WSW4.4WSW3.8WSW3.6WSW2.9 W3.0																								Diurnal Average		
WNW25WNW25WNW26WNW25 N25WNW25WNW25WNW26WNW27WNW25WNW26WNW25 W25WSW28 W27 W26 W24 W23 NW22 W22 W22 W21 W21 W26																								Diurnal Maximum		
AF - Analyzer Failure																										
All monthly, daily, and diurnal averages have been calculated using vector methods																										



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

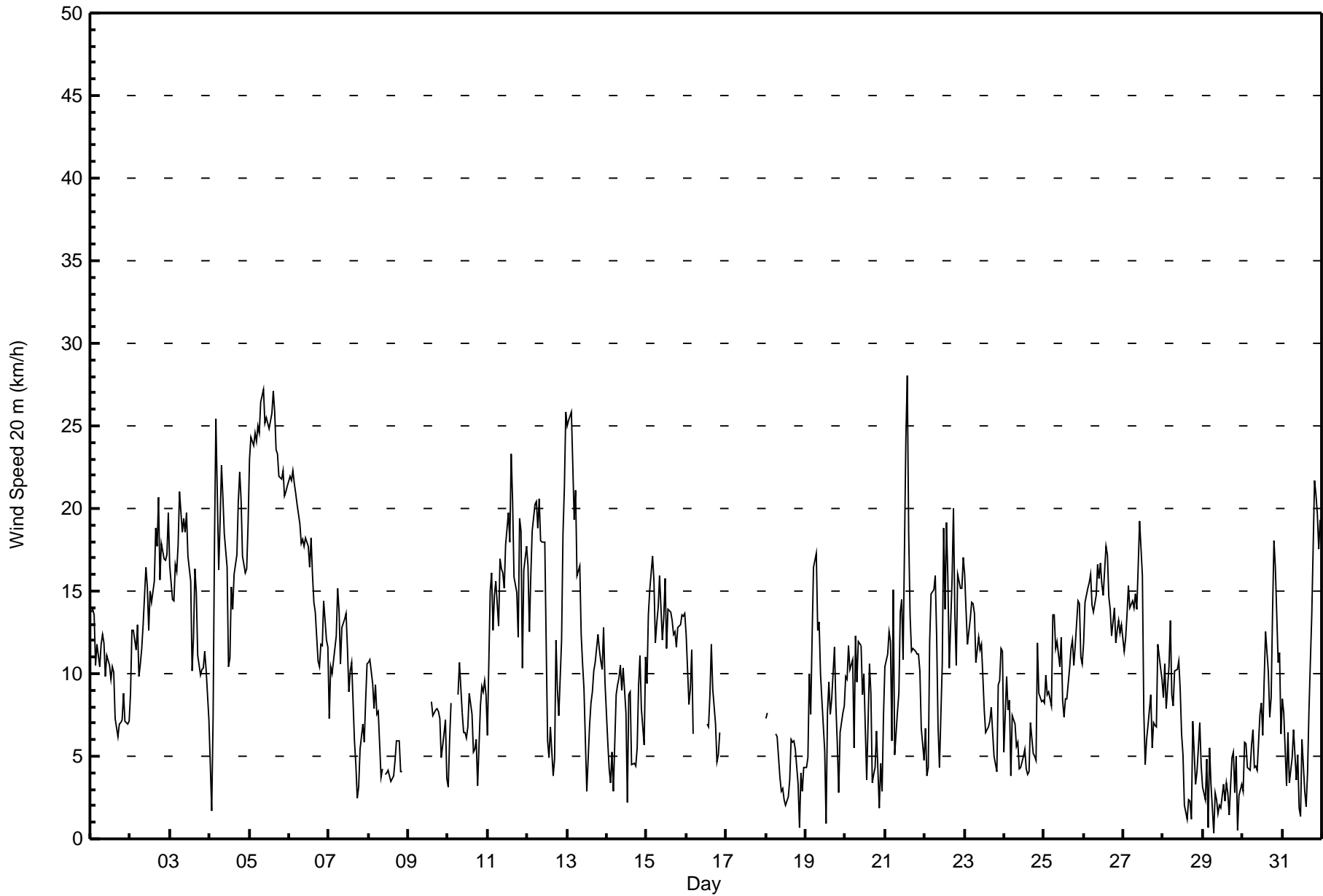
Wind Speed 20 m (WS20m) - km/h
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Dec 21 13:00 Minimum Value: 1 km/h on Dec 8 15:00 Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 6														Hours in Service: 744 Hours of Data: 685 Hours of Missing Data: 59 Hours of Calibration: 0 Percent Operational Time: 92.1											
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1	3
2-Dec	2	2	2	3	3	2	2	2	3	3	4	3	3	3	4	4	4	5	4	4	4	4	4	4	5
3-Dec	4	4	3	4	4	4	4	4	3	3	3	3	2	2	2	2	3	3	2	3	3	2	2	4	
4-Dec	1	1	3	8	7	5	5	5	6	5	4	4	3	5	3	5	4	5	5	5	4	4	4	8	
5-Dec	5	5	5	5	5	5	5	6	6	5	5	5	4	5	4	4	4	3	3	3	3	2	4	6	
6-Dec	4	4	4	3	4	4	4	4	4	3	4	4	4	4	4	3	3	3	3	3	3	4	3	4	
7-Dec	3	3	3	4	3	4	4	3	3	3	4	3	3	2	2	4	2	1	2	2	2	2	2	4	
8-Dec	3	3	3	2	2	2	2	2	1	AF	1	1	1	1	1	1	1	1	2	1	1	AF	AF	AF	
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2	2	2	1	1	1	1	1	1	2	
10-Dec	1	2	2	AF	AF	AF	2	2	2	1	1	1	1	2	1	2	1	1	2	1	1	1	1	2	
11-Dec	3	3	3	3	5	4	3	4	3	3	3	4	3	3	4	3	5	3	2	4	4	3	5	5	
12-Dec	2	2	4	3	4	4	4	4	3	1	2	3	2	2	2	2	2	3	2	1	4	2	3	4	
13-Dec	5	5	5	5	5	6	5	5	3	3	3	2	2	2	2	3	3	3	3	3	1	1	2	6	
14-Dec	1	1	2	2	2	2	1	2	1	2	3	2	1	3	3	3	2	2	2	1	2	1	3	3	
15-Dec	2	2	1	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	2	1	3	
16-Dec	1	3	2	2	4	AF	AF	AF	AF	AF	AF	AF	2	2	3	2	2	1	1	1	2	AF	AF	AF	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
18-Dec	2	2	AF	AF	AF	AF	2	2	2	2	1	2	1	2	2	1	2	2	2	2	2	2	2	2	
19-Dec	2	3	3	3	4	4	5	5	4	3	3	2	2	2	2	2	2	3	3	2	2	1	1	5	
20-Dec	3	2	3	2	2	3	8	3	3	2	2	3	4	3	4	5	2	2	1	3	1	2	1	8	
21-Dec	2	3	2	2	3	4	5	2	3	3	3	2	11	7	5	4	3	2	2	2	2	2	1	11	
22-Dec	2	1	1	3	4	3	4	4	2	2	4	5	5	5	5	3	5	5	6	4	5	4	4	6	
23-Dec	4	4	4	4	4	4	3	3	3	3	3	2	2	2	2	2	2	2	1	2	3	3	5	5	
24-Dec	2	3	3	3	2	1	2	2	1	1	2	1	1	2	1	1	1	1	1	1	2	1	1	3	
25-Dec	1	1	1	1	2	2	2	1	1	1	2	1	1	1	3	3	2	3	3	2	2	2	1	3	
26-Dec	1	2	2	2	3	2	2	3	3	3	3	3	3	3	2	3	3	3	3	2	2	3	2	3	
27-Dec	2	2	2	3	3	3	3	3	3	4	5	3	2	2	3	3	2	3	2	2	2	2	3	5	
28-Dec	3	4	3	3	3	3	3	3	3	3	2	2	2	1	1	1	1	2	3	1	2	2	3	4	
29-Dec	2	2	2	1	2	2	1	1	2	1	1	2	2	1	2	2	2	2	2	2	2	3	2	3	
30-Dec	1	2	2	1	2	2	2	2	1	3	3	2	3	2	3	2	3	4	3	2	2	3	3	4	
31-Dec	2	3	2	1	2	1	1	3	2	2	1	2	2	1	1	2	5	3	3	3	4	3	4	5	
	5	5	5	8	7	6	8	6	6	5	5	5	11	7	5	5	5	5	6	5	5	4	5	4	
Diurnal Maximum																									
AF - Analyzer Failure																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed 20 m (WS20m) - km/h
Mannix - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 20 m (WS20m) - km/h
Mannix - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	131	19.12	19.12
6 - 11	262	38.25	57.37
12 - 19	233	34.01	91.39
20 - 28	59	8.61	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h
Mannix - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	17	9	5	1	2	5	9	12	24	9	8	5	10	4	3	8	131
6 - 11	20	23	3	0	0	4	18	73	29	8	17	11	11	12	14	19	262
12 - 19	20	17	0	0	0	1	27	66	5	1	2	21	37	21	12	3	233
20 - 28	2	2	0	0	0	0	2	2	0	0	0	4	21	21	4	1	59
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	51	8	1	2	10	56	153	58	18	27	41	79	58	33	31	685

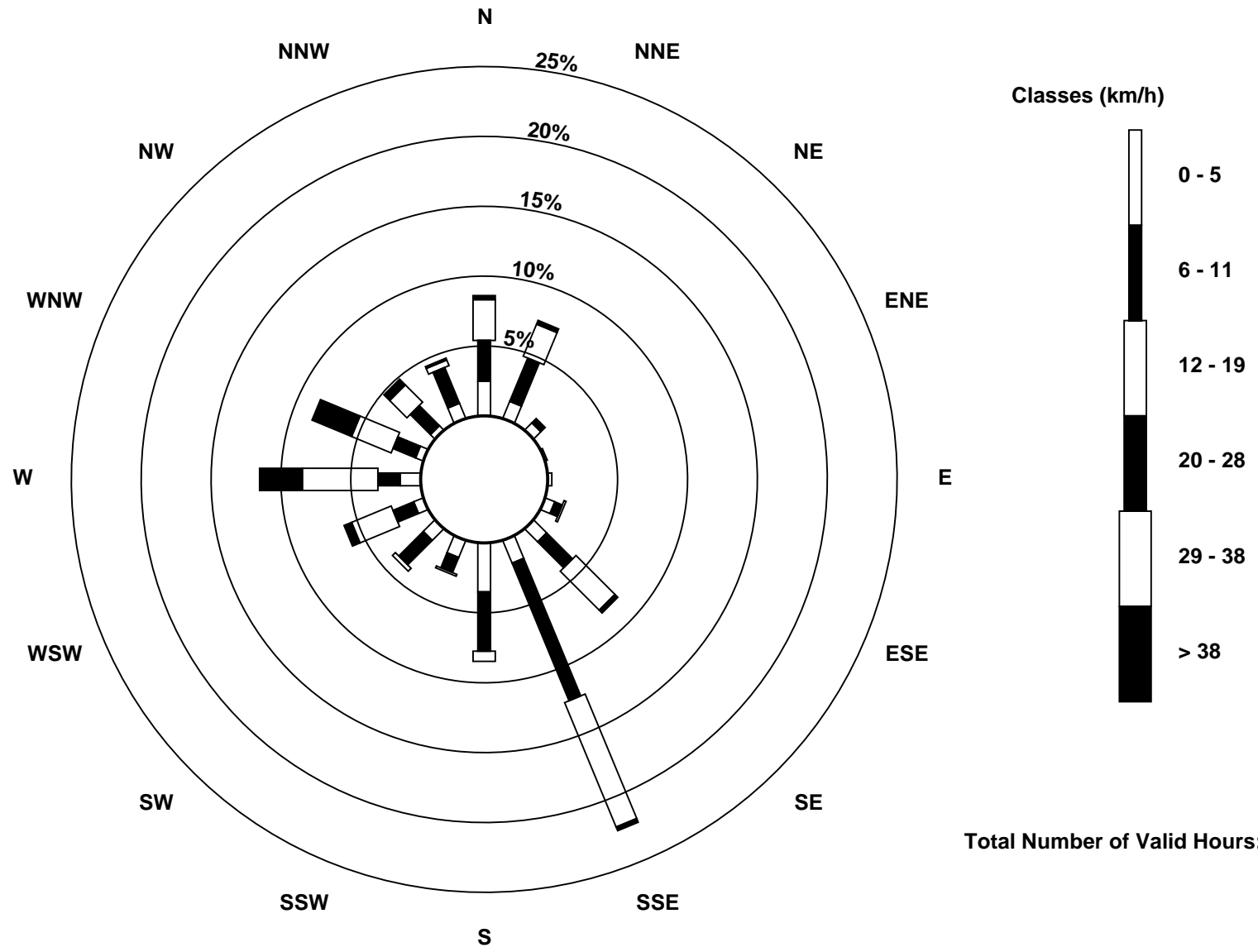
Total Number of Valid Hours: 685

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 20 m (WS20m) - km/h
Mannix (AMS 5)



Total Number of Valid Hours: 685



Maximum Speed: 34 km/h on Dec 21 14:00	Maximum Daily Speed Average: 28.6 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 29 07:00	Minimum Daily Speed Average: 1.3 km/h on Dec 29	Hours of Data: 744
Maximum Diurnal Speed Average: 5.3 km/h at hour 20	Minimum Diurnal Speed Average: 3.0 km/h at hour 5	Hours of Missing Data: 0
Monthly Average Velocity: 3.8 km/h 219.9 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 15 Q ₃ = 20 P ₉₀ = 24 P ₉₉ = 32	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SSE18	SSE18	SSE18	S15	S18	S16	SSE15	SSE16	SSE15	SSE13	SSE14	SSE13	SSE12	SSE13	SSE13	S11	S11	S12	S12	S13	SSE13	S13	S12	SSE11	SSE13.8	SSE18	
2-Dec	SSE13	SSE16	SSE17	SE15	SSE17	SSE16	SE17	SE18	SSE20	SSE22	SE20	SE16	SE19	SE19	SE21	SE25	SE23	SE27	SE21	SE24	SE22	SE21	SE21	SE24	SE19.6	SE27	
3-Dec	SE21	SE19	SE19	SE22	SE21	SE23	SSE26	SE24	SE25	SSE24	SSE25	SSE22	SSE19	SSE14	SSE17	SSE22	SSE22	S20	S18	S18	SSW17	SW15	SW15	SSW11	SSE18.6	SSE26	
4-Dec	SSW7	SW5	NW11	N25	N34	N22	N25	N29	N27	N24	N20	N14	NNW15	NW19	NW17	NW21	NNW22	NW26	NW28	NW26	NW22	NW21	NW22	NNW26	NNW18.0	N34	
5-Dec	WNW29	W30	W30	W31	W30	W32	WNW32	W33	W34	W31	W32	W31	W29	W30	W30	W30	W26	W26	W25	W24	W24	W23	W23	W26	W28.6	W34	
6-Dec	W26	W25	W26	W25	W26	W26	W25	W24	W24	WNW23	WNW24	WNW23	WNW21	NW22	NW20	NW19	NW17	NW14	N13	N15	N15	N19	N15	N15	WNW18.2	W26	
7-Dec	N10	N14	N13	N14	N16	N19	N18	N14	N17	N17	N18	N15	N11	WNW12	WNW13	NW9	N7	NNE5	N6	N8	N9	NNE7	N11	NNE13	N11.6	N19	
8-Dec	NNE13	NNE13	NNE11	NNE9	NNE11	NNE9	NE9	NE5	NE5	NNE2	NNW3	NW3	WNW3	WNW3	W3	NNW5	NNW6	N8	NNE9	NNE7	NNE5	NNE4	SE2	S3	NNE5.3	NNE13	
9-Dec	ESE2	SSE3	SSE8	SSE10	SSE13	SSE12	SSE18	SSE17	SSE13	SSE15	SSE15	SE11	SSE8	SE8	SE12	SSE12	SSE16	SSE15	S12	S12	S10	S12	S15	S11	SSE11.4	SSE18	
10-Dec	SSE12	SSE10	SSE11	SSE11	SSE15	SSE18	SSE15	SSE14	SSE12	SSE10	SSE9	SSE6	SE7	SE11	SE10	SE6	SSE7	S7	SW9	SW13	SW13	SW13	SW15	SW15	S9.2	SSE18	
11-Dec	SW11	WSW20	WSW22	WSW18	WSW20	WSW19	WSW18	WSW20	WSW20	WSW20	WSW21	WSW18	WSW21	WSW22	W20	W25	WSW24	WSW22	WSW19	WSW17	W24	W24	WSW16	W21	W24	WSW20.0	W25
12-Dec	WNW22	WNW19	NW23	WNW26	WNW29	WNW29	W26	W28	W27	W23	W23	W15	SW7	SSE5	SSE7	SW3	WNW15	WNW22	NW15	WNW11	W19	W25	W26	W30	WNW18.4	W30	
13-Dec	W31	W32	W32	WNW30	NNW25	NNW29	NNW22	NNW22	NNW18	NNW15	NNW13	NNE7	WNW4	NW10	NW12	NW14	NW14	WNW17	WNW19	WNW16	WNW14	W14	W18	WNW15	NW16.6	W32	
14-Dec	WNW9	SW7	WSW8	W11	SW9	SSW10	SSE12	SSE13	SSE14	S13	S13	S9	W8	WNW13	NNW13	N8	N8	N6	WNW8	W15	W16	W11	WNW9	NW16	WSW5.5	W16	
15-Dec	NW15	W17	W19	W20	WNW22	WNW18	W18	W19	W22	WNW17	W17	W19	W14	W15	W16	W17	W17	W17	W16	W17	WNW19	W15	W16	W17	W17.2	WNW22	
16-Dec	W16	W12	WNW12	WNW14	WNW12	W10	WSW10	WSW7	WSW5	SW5	SSW6	SSW5	SSE8	SSE9	SSE12	SSE18	SSE16	SSE12	S10	SSW7	SSE9	SSE12	SSE11	SE11	SSW5.6	SSE18	
17-Dec	SE13	SSE17	SE17	SE16	SE15	SSE17	SSE19	SSE17	SSE18	SE18	SE18	SSE16	SSE13	SSE16	SSE14	SSE17	SSE17	SSE18	SSE18	SE18	SE19	SSE17	SE19	SSE14	SSE16.6	SSE19	
18-Dec	SSE13	S13	SSE14	SSE17	SSE16	SSE13	SSE13	SSE10	SSE6	S4	SSE4	S4	S2	NNW3	NNW4	WNW7	NW7	WNW7	WNW7	WNW7	NW4	N1	SW4	S3	SE7	S4.7	SSE17
19-Dec	SE6	SE7	SE12	ESE9	ESE15	ESE19	ESE20	ESE14	ESE15	SE12	ESE10	ESE6	N1	NW9	W11	NNW10	NNW13	NW16	NW11	N8	ESE3	SSE9	SSE11	SSE14	ESE4.6	ESE20	
20-Dec	SSE18	SSE16	SSE19	SE19	SSE19	SSW12	WSW22	WSW16	SSW19	SSW19	SSW13	SSW13	SW14	WSW11	WSW15	WSW14	SW8	SW6	SW7	WSW11	WSW5	SSW5	SW7	SSE13	SSW10.4	WSW22	
21-Dec	SSE16	SSE16	SSE19	S17	SW13	WSW22	SW13	SSW15	S17	S21	S23	SSW19	WSW30	WSW34	WSW24	SW19	S19	S21	SSW20	SSW19	S20	SSE15	SE12	SE9	SSW15.5	WSW34	
22-Dec	SSE11	SSW7	SSW8	SW19	WSW20	WSW22	WSW22	W16	NW9	N7	NNW13	N25	N19	N24	N21	NNW14	N21	N26	N19	N15	N21	N19	N19	N21	NNW10.2	N26	
23-Dec	N20	NNE17	NNE15	N17	NNE18	N19	NNE17	N14	N15	NNE14	N14	N12	NNW10	NNW8	NNW9	NNW10	NNW12	N10	N9	NNE7	ESE11	ESE11	ESE12	ESE12	NNE10.4	N20	
24-Dec	ESE6	ESE10	ESE8	ESE9	ESE4	SE8	SE11	SSE8	SSE6	SE8	SE10	SE7	S8	SSE11	SSE9	SSE9	SSE10	SE7	SSE9	SSE8	SE17	SE12	SSE11	SSE15	SE8.9	SE17	
25-Dec	SSE16	SSE19	SSE16	SSE16	SSE15	SSE22	SE23	SE19	SE18	SE16	SE19	SE12	SE10	SE11	SE13	SE14	SE17	SE17	SE16	SE19	SSE22	SE20	SE17	SE18	SE16.7	SE23	
26-Dec	SSE17	SSE22	SSE22	SSE22	SE27	SSE25	SSE22	SSE22	SE25	SE24	SE24	SSE21	SE21	SSE23	SSE23	SSE21	SSE20	SSE19	SSE21	SSE20	SSE21	SSE23	SE21	SE20	SSE21.9	SE27	
27-Dec	SE17	SE19	SE21	SE23	SE21	SE21	SE22	SE23	SE23	SSE27	SSE27	SSE21	S15	SSW12	SSW14	SSW13	SW15	SW11	WSW11	WSW10	WSW11	WSW17	NW15	NNW13	SSE11.9	SSE27	
28-Dec	NW12	N16	N12	N14	NNE17	N11	N11	N13	N13	NNE13	NNE11	N8	NNE6	W2	S2	S3	SE2	NE2	N9	NNW4	NNW6	NNW8	NNE11	N7	N8.0	NNE17	
29-Dec	NNE5	NE4	N7	NE2	NE7	NE4	ESE1	SE3	E3	SSE2	E3	WNW1	SSW4	SW2	N4	SSE5	NE1	N7	NNE6	SSE3	SSW5	ESE2	E1	SE5	ENE1.3	N7	
30-Dec	SSW3	SSW9	SW10	WSW8	WSW7	SSW8	SSE9	S7	S8	SSW6	SSE10	SSE11	SE9	SE12	SE16	S15	S11	WSW13	WSW17	W22	W22	NNW15	N15	NW8	SSW5.9	W22	
31-Dec	WNW11	N10	NNW5	SW8	SW7	SE5	ENE7	NNE9	NNE5	WNW5	NNW2	N3	N7	NW4	N2	NNE4	SW9	WSW18	WSW23	WSW26	WSW27	WSW27	WSW23	W24	W7.4	WSW27	

SW3.4	SSW3.7	SSW4.1	SW3.8	SW3.0	SSW4.0	SSW4.2	SSW3.5	S3.4	S4.2	S3.8	SSW3.2	SW3.8	WSW4.5	SW4.5	SW4.2	SW4.0	WSW4.1	WSW4.5	WSW5.3	SW5.2	SW4.5	SW3.7	SW3.5	Diurnal Average	
W31	W32	W32	W31	N34	W32	WNW32	W33	W34	W31	W32	W31	WSW30	WSW34	W30	W30	W26	SE27	NW28	WSW26	WSW27	WSW27	W26	W30	Diurnal Maximum	

All monthly, daily, and diurnal averages have been calculated using vector methods



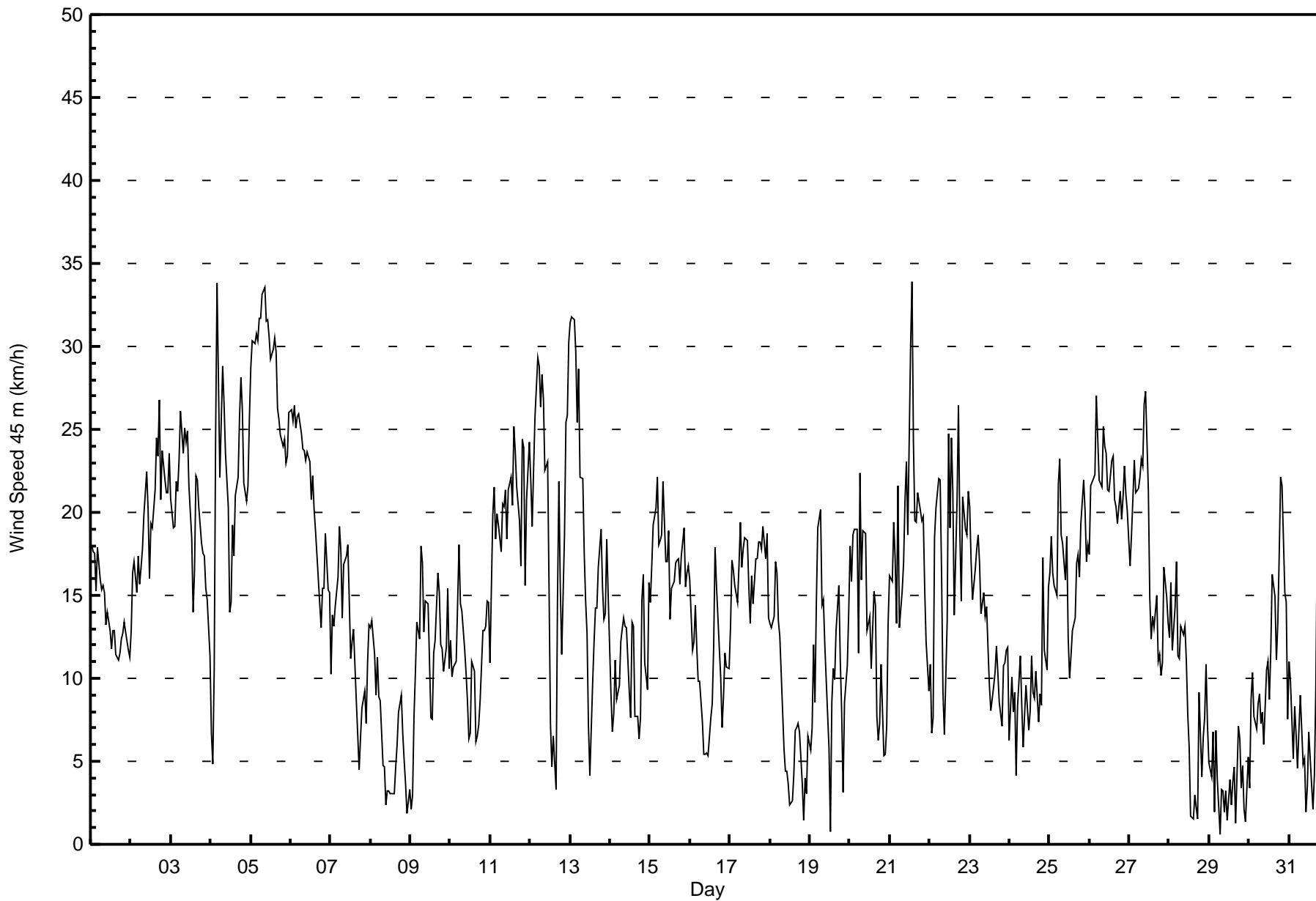
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 45 m (WS45m) - km/h

Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Dec 21 13:00 Minimum Value: 1 km/h on Dec 8 15:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	2	2	2	3	3	2	2	2	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	3
2-Dec	2	1	2	2	2	2	2	2	3	2	4	4	4	4	4	4	4	5	4	4	4	4	4	4	5
3-Dec	4	4	3	4	3	3	3	4	3	3	3	2	3	2	3	2	1	3	2	1	3	2	2	2	4
4-Dec	1	1	2	9	7	5	5	5	6	4	4	4	3	4	3	5	3	4	5	5	4	3	4	4	9
5-Dec	4	4	4	4	4	4	5	5	5	5	5	4	4	4	3	4	3	3	4	2	3	3	2	2	5
6-Dec	4	3	3	3	3	3	3	3	3	3	3	3	3	4	3	3	3	3	3	2	3	4	3	4	4
7-Dec	3	3	3	4	3	3	4	3	3	3	3	3	3	2	1	4	1	1	3	2	2	3	3	2	4
8-Dec	3	3	4	3	3	3	2	2	2	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	4
9-Dec	1	1	2	1	1	1	1	2	2	3	2	3	2	3	1	1	3	3	1	1	1	2	1	2	3
10-Dec	2	2	2	1	2	1	2	1	2	1	1	1	2	2	2	3	1	2	2	1	1	1	1	2	3
11-Dec	4	3	4	3	6	4	3	5	4	4	3	4	3	3	4	3	4	3	2	4	4	2	5	3	6
12-Dec	3	3	4	3	3	3	3	2	2	1	2	3	2	1	2	2	3	3	3	2	5	3	3	3	5
13-Dec	4	4	4	5	5	6	5	5	3	3	3	2	2	2	2	4	4	4	3	3	1	1	2	2	6
14-Dec	2	2	1	3	2	1	2	2	1	2	1	3	3	2	3	3	2	2	2	1	2	2	3	3	3
15-Dec	2	1	1	2	4	2	1	2	1	2	2	2	2	2	2	1	2	2	2	2	4	2	1	1	4
16-Dec	2	2	1	1	6	3	1	1	2	1	1	1	3	3	4	1	3	1	2	2	3	1	3	3	6
17-Dec	2	2	2	1	1	2	1	1	3	3	2	3	2	2	2	3	2	1	1	1	1	1	3	2	3
18-Dec	1	3	2	3	3	2	2	2	2	2	1	2	1	2	1	2	2	2	2	2	1	2	2	3	3
19-Dec	2	3	4	3	4	5	5	5	4	3	3	3	3	1	2	2	3	3	3	2	2	1	1	1	5
20-Dec	3	2	2	3	3	2	6	4	3	2	2	3	4	5	5	5	3	3	2	2	2	2	3	4	6
21-Dec	2	4	2	2	4	5	6	2	4	3	2	3	12	7	6	3	2	2	2	3	3	2	3	2	12
22-Dec	2	1	2	3	4	3	4	5	2	3	4	4	4	4	5	3	4	4	7	4	5	3	4	4	7
23-Dec	4	4	4	5	5	4	3	3	2	2	2	2	2	2	2	2	1	2	1	3	3	3	5	3	5
24-Dec	2	3	3	3	2	2	1	1	1	2	3	1	1	1	1	1	1	1	1	2	2	2	1	1	3
25-Dec	1	1	1	1	2	1	2	2	1	1	2	2	2	1	3	4	2	3	3	2	2	1	1	1	4
26-Dec	1	3	2	2	3	2	3	3	2	2	3	4	3	3	3	3	3	3	3	2	3	3	2	3	4
27-Dec	3	3	3	3	3	3	3	3	3	4	4	3	2	3	3	3	2	3	2	2	2	2	3	2	4
28-Dec	3	5	4	3	3	3	3	2	3	3	2	2	2	1	1	1	1	2	3	2	2	2	2	4	5
29-Dec	2	2	2	2	2	3	1	1	2	1	1	2	1	1	2	4	2	2	1	2	3	4	1	3	4
30-Dec	2	2	1	2	1	1	2	2	1	2	3	2	3	2	3	2	4	5	3	2	2	3	3	3	5
31-Dec	2	3	3	2	2	1	1	3	2	2	2	2	2	1	1	2	7	2	2	3	4	3	4	3	7
																	Diurnal Maximum								





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 45 m (WS45m) - km/h
Mannix - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	74	9.95	9.95
6 - 11	177	23.79	33.74
12 - 19	304	40.86	74.60
20 - 28	161	21.64	96.24
29 - 38	28	3.76	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h
Mannix - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	7	7	0	3	5	5	7	6	5	5	2	2	5	3	7	74
6 - 11	24	14	2	1	0	11	17	34	11	10	14	10	5	8	8	8	177
12 - 19	35	10	0	0	0	6	40	85	22	12	13	14	26	16	13	12	304
20 - 28	14	0	0	0	0	1	32	29	5	1	0	21	34	12	9	3	161
29 - 38	2	0	0	0	0	0	0	0	0	0	0	2	17	6	0	1	28
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	80	31	9	1	3	23	94	155	44	28	32	49	84	47	33	31	744

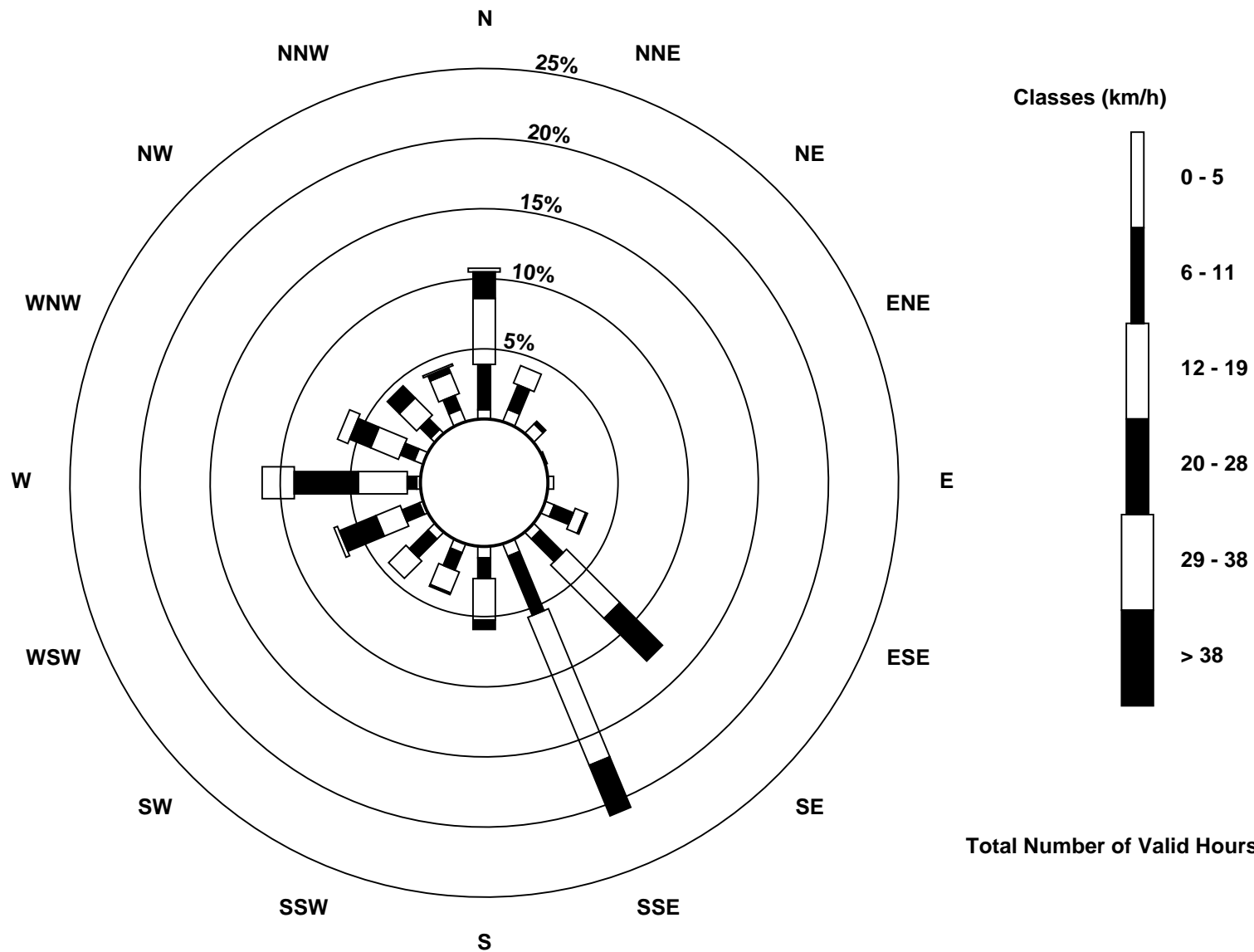
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 45 m (WS45m) - km/h
Mannix (AMS 5)





Maximum Speed: 38 km/h on Dec 21 14:00	Maximum Daily Speed Average: 30.7 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 29 12:00	Minimum Daily Speed Average: 3.1 km/h on Dec 29	Hours of Data: 738
Maximum Diurnal Speed Average: 6.2 km/h at hour 21	Minimum Diurnal Speed Average: 3.1 km/h at hour 5	Hours of Missing Data: 6
Monthly Average Velocity: 4.2 km/h 224.6 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 11 Median = 17 Q ₃ = 24 P ₉₀ = 29 P ₉₉ = 35	Percent Operational Time: 99.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE21	SSE21	SSE20	S19	S20	S19	SSE18	SSE17	SSE17	SSE15	SSE16	SSE14	SSE13	SSE14	SSE14	S13	S13	S13	S13	S13	S15	S16	S10	S12	\$15.3	SSE21
2-Dec	S15	SSE18	SSE20	SSE19	SSE21	SSE21	SSE23	SE25	SSE28	SSE27	SE25	SE20	SE24	SE25	SE27	SE29	SE29	SE31	SE26	SE29	SE27	SE24	SE25	SE27	SE24.0	SE31
3-Dec	SE25	SE23	SE24	SSE28	SE26	SSE29	SSE30	SSE28	SSE30	SSE29	SSE29	SSE24	S23	S17	S18	SSE25	S25	S25	S23	S20	SSW21	SW18	SW17	SSW14	SSE21.9	SSE30
4-Dec	SW9	WSW8	NW12	N28	N38	N27	N29	N32	N31	N27	N23	N16	NNW18	NW21	NW19	NW24	NW24	NW29	NW31	NW29	NW24	NW23	NW24	WNW28	NNW20.7	N38
5-Dec	WNW31	WNW33	WNW33	WNW33	WNW33	WNW34	WNW34	WNW36	WNW36	W34	WNW34	W32	W31	W31	W32	W31	W28	W27	W26	W26	W26	W25	W25	W28	W30.7	WNW36
6-Dec	W29	W28	W29	W28	WNW29	WNW29	WNW28	WNW27	WNW27	WNW26	WNW26	WNW25	WNW22	NW23	NW22	NW21	NW20	NNW17	N14	N18	N17	N19	N17	N16	WNW20.1	WNW29
7-Dec	N12	N16	N15	N16	N19	N21	N20	N15	N19	N21	N22	N17	N12	NW13	WNW13	NW10	N8	NNE6	NNE8	NNE10	NNE12	NNE10	NNE14	NNE16	N13.7	N22
8-Dec	NNE16	NNE16	NNE14	NNE11	NNE14	NE11	NE10	NE6	NE6	NE4	N4	NNE5	NNW4	NW3	WNW3	N5	NNW7	NNE11	NNE12	NNE10	NNE6	ENE4	SE3	SE5	NNE7.0	NNE16
9-Dec	SE5	SE7	SE10	SSE11	SSE10	SSE11	SSE15	SSE19	SSE21	SSE23	SSE21	SSE13	SSE8	SE7	SE11	SE12	SSE18	SSE15	SSE14	SSE13	S12	SSE16	SSE19	SSE20	SSE13.6	SSE23
10-Dec	SSE22	SE17	SE12	SE12	SSE15	SSE20	S22	S19	S19	S16	S14	S8	SSE7	SE12	SE15	SE11	SSE10	S9	SW13	SW14	WSW15	WSW17	WSW20	SW20	S11.9	S22
11-Dec	WSW16	WSW24	WSW26	WSW23	WSW25	WSW23	WSW22	WSW24	WSW25	WSW26	WSW21	WSW25	WSW24	W22	W26	WSW27	WSW26	WSW24	WSW21	W28	W28	WSW21	W25	W29	WSW23.8	W29
12-Dec	WNW26	WNW24	NW28	NW30	WNW34	WNW34	WNW31	WNW34	WNW33	W28	W27	W19	WSW8	S5	S6	W10	WNW24	WNW29	NW18	WNW15	WNW26	WNW31	W30	W34	WNW23.1	WNW34
13-Dec	W35	WNW35	WNW35	NW34	N29	NNW34	NNW26	NNW26	NNW21	NNW17	NNW16	NNE8	NW6	NW12	NW16	NW18	NW17	NW20	NW23	NW18	NW17	WNW16	WNW24	WNW19	NW19.9	W35
14-Dec	WNW11	WSW9	W12	W18	WSW15	SW12	SSW11	SSW11	SSW13	SSW13	SSW13	SW10	W13	WNW16	NNW17	N12	N11	N8	NW11	WNW17	WNW21	WNW14	WNW12	NW19	W8.9	WNW21
15-Dec	NW19	W19	W23	W24	WNW27	WNW21	WNW23	WNW24	W26	WNW20	WNW20	WNW20	WNW14	W16	W16	W19	W21	WNW21	W20	W22	WNW23	WNW18	WNW20	WNW19	WNW20.4	WNW27
16-Dec	WNW19	WNW13	WNW13	WNW14	NW14	WNW13	W13	W13	WSW10	WSW9	WSW6	SW7	S10	SSE10	SSE11	SSE20	S19	S13	SSW10	SW6	S6	SSE13	SSE13	SSE15	SW6.2	SSE20
17-Dec	SE16	SSE17	SE18	SSE20	SSE20	SSE22	SSE24	SSE26	SSE26	SE26	SE29	SSE21	SSE16	SSE22	SE19	SE21	AF	AF	AF	AF	AF	AF	SE21	SE17	SSE20.9	SE29
18-Dec	SSE15	SSE15	SSE17	SE19	SSE19	SSE16	SE12	SE9	SE6	SSE5	SE6	SSE5	SSE3	N2	N4	NW7	NW7	NW7	NW7	NW4	NNE2	SSW3	SSE3	SE9	SSE5.1	SE19
19-Dec	SE6	ESE7	SE13	ESE7	ESE13	ESE17	ESE16	ESE11	ESE12	SE11	ESE9	ESE5	ENE1	NW8	WNW11	NNW12	NNW17	NNW19	NNW14	N10	E4	SE8	SSE11	SSE17	ESE3.9	NNW19
20-Dec	SSE26	SSE25	SSE26	SSE18	S16	SW19	WSW29	WSW20	SW22	SW23	SW17	SW17	SW17	WSW16	WSW19	WSW19	WSW13	SW10	WSW11	WSW16	WSW10	SW8	WSW12	S12	SW14.3	WSW29
21-Dec	S13	S12	S22	SSW19	SW20	WSW27	SW20	SSW20	SSW22	S25	S26	SW23	WSW35	WSW38	WSW29	SW23	S21	SSW24	SSW25	SSW23	SSW23	SSE16	SSE12	SSE8	SSW19.5	WSW38
22-Dec	SSE7	SW10	SW11	SW23	WSW25	WSW27	WSW27	W19	NNW11	N9	NNW15	N27	N22	N26	N24	N16	N23	N30	N22	N18	N24	N21	NNE21	N23	NNW11.7	N30
23-Dec	N23	NNE20	NNE17	NNE19	NNE20	N22	NNE19	N16	NNE17	NNE16	N16	N13	N10	NNW8	NNW11	N12	N13	N12	N10	NE9	ESE8	ESE9	ESE8	ESE8	NNE12.1	N23
24-Dec	ESE6	ESE7	ESE6	ESE6	E4	ESE5	SE13	SE13	SE10	SE15	SE9	SE9	SE10	SE12	SE11	SE9	SE12	SE10	SE14	SE12	SE30	SE14	SE13	SE17	SE10.6	SE20
25-Dec	SE16	SE19	SE16	SE18	SE19	SE23	SE26	SE25	SE24	SE21	SE24	SE17	SE13	SE14	SSE14	SE15	SE18	SE22	SE21	SE27	SE30	SE26	SE24	SE21	SE20.3	SE30
26-Dec	SE22	SE24	SSE31	SE30	SSE36	SSE34	SE32	SE29	SE33	SE32	SE31	SSE27	SSE28	SSE28	SSE29	SSE27	SSE28	SSE28	SSE29	SSE28	SSE29	SSE32	SSE28	SE26	SSE29.2	SSE36
27-Dec	SE22	SE25	SE27	SE30	SSE29	SSE30	SE31	SE31	SE32	SSE34	SSE34	S27	SSW21	SSW19	SW18	SW17	SW19	SW16	WSW15	WSW14	WSW15	WSW21	NW19	NNW16	S16.0	SSE34
28-Dec	NNW16	N19	N15	NNE17	NNE20	N13	N13	N15	NNE14	NNE16	NNE12	NNE9	NNE6	W1	SSE1	S3	SSE1	NNE2	N10	N5	N10	N12	NNE15	NNE10	N9.9	NNE20
29-Dec	NNE7	NE7	NNE9	NE5	NE9	NE5	E1	SE4	E4	SE4	E4	NNE1	S4	S3	N2	SSE7	ESE2	NNE5	NE7	SE7	SSE7	SE5	SE4	SSE8	E3.1	NNE9
30-Dec	S4	SSW8	SSW10	SW7	WSW7	SW9	S12	S11	SSW8	SSW6	S13	S15	S11	SSE15	SSE19	S19	S15	WSW17	WSW20	W26	W27	NNW17	NNE18	NNW9	SW7.6	W27
31-Dec	NW12	N13	NNW7	WSW7	SW5	SE3	ENE8	NNE13	NNE7	NW6	N4	NNE5	N7	NW4	NNW3	NNE6	WSW9	WSW25	W30	WSW30	WSW32	WSW32	WSW26	W29	W9.0	WSW32

SW3.2	SSW3.4	SSW4.2	SW3.8	SW3.1	SW4.4	SSW4.8	SSW4.1	SSW4.2	S5.0	S4.5	SSW4.0	SW4.5	SW4.9	SW4.5	SW4.5	SW4.4	WSW5.0	WSW5.5	WSW5.9	WSW6.2	SW5.1	WSW3.8	SW3.4	Diurnal Average
W35	WNW35	WNW35	WNW34	N38	WNW34	WNW34	WNW36	WNW36	SSE34	SSE34	W32	WSW35	WSW38	W32	W31	SE29	SE31	NW31	WSW30	WSW32	SSE32	W30	W34	Diurnal Maximum

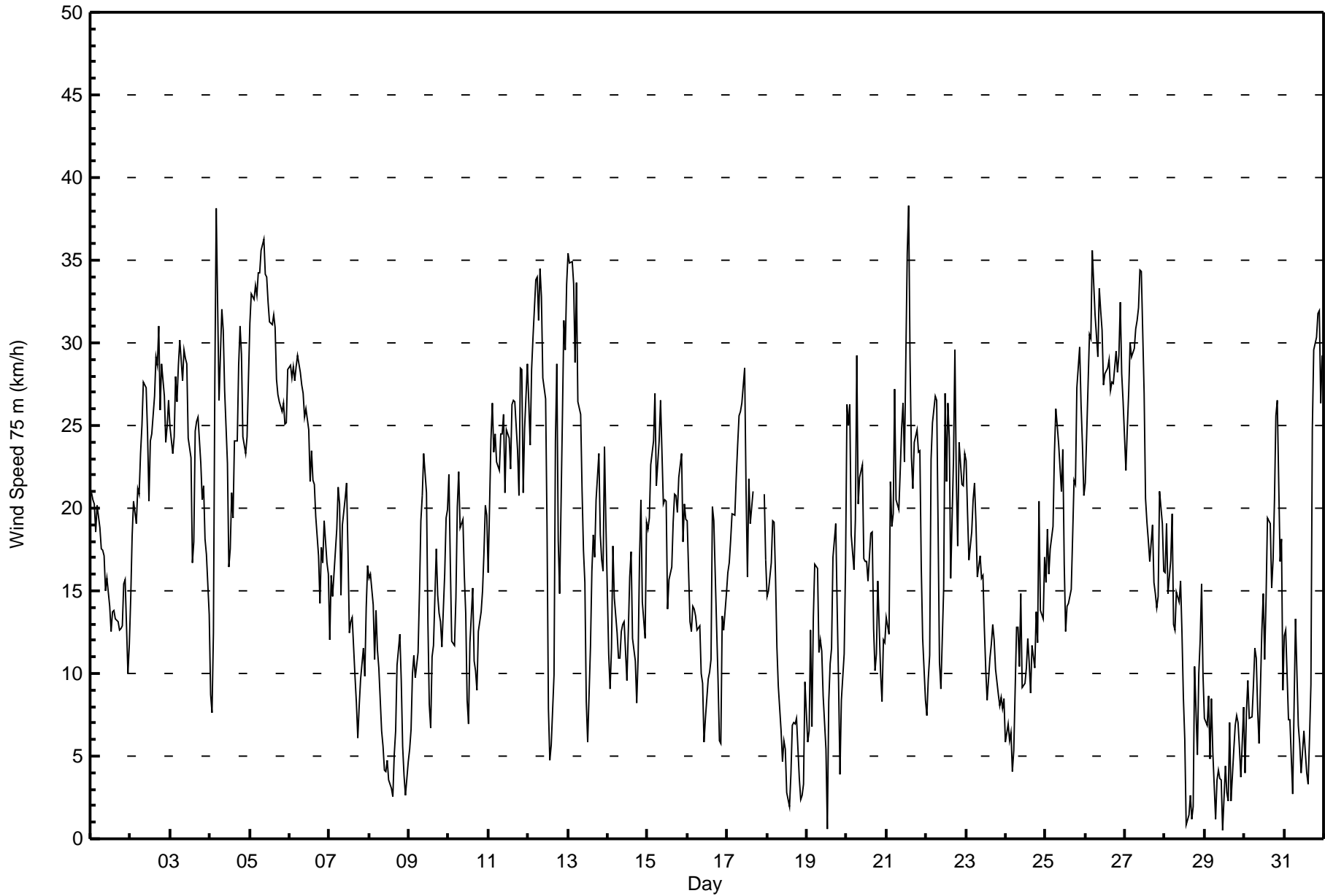
AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 75 m (WS75m) - km/h
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Dec 21 13:00 Minimum Value: 0 km/h on Dec 1 18:00 Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																	Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Hours of Calibration: 0 Percent Operational Time: 99.2										
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	3	2	2	3	3	3	3	2	2	2	2	3	2	2	2	1	1	0	1	1	1	1	1	2	3		
2-Dec	1	2	1	2	2	3	2	1	2	3	5	4	4	4	3	4	4	5	4	4	4	5	4	4	5		
3-Dec	4	5	3	4	3	3	3	3	2	2	3	2	2	3	3	1	2	2	2	1	3	2	2	2	5		
4-Dec	1	1	2	9	5	5	5	5	5	4	5	4	3	4	3	5	3	4	4	4	4	3	4	3	9		
5-Dec	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	2	4	4		
6-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	4	2	2	3	3	4	4		
7-Dec	4	4	3	5	2	4	4	3	4	3	3	3	3	2	1	3	1	1	3	2	3	3	3	2	5		
8-Dec	2	3	4	3	3	3	2	2	2	1	1	1	2	1	1	1	1	2	2	1	1	1	2	1	4		
9-Dec	1	2	2	2	1	2	2	1	2	1	3	3	2	3	1	1	1	1	1	1	1	3	1	1	3		
10-Dec	1	2	3	1	2	2	1	1	1	2	1	2	1	1	1	3	1	1	2	1	1	1	1	2	3		
11-Dec	3	4	3	3	5	3	3	4	4	3	4	4	3	3	4	3	4	3	2	5	5	3	5	3	5		
12-Dec	3	2	4	3	3	3	3	2	3	2	2	4	2	1	2	4	2	3	3	2	6	2	3	3	6		
13-Dec	4	4	4	5	5	5	4	5	3	3	3	2	3	2	3	5	5	4	2	3	2	2	2	4	5		
14-Dec	1	2	2	4	2	1	1	2	1	1	1	2	3	2	2	4	2	3	3	2	2	3	3	3	4		
15-Dec	3	1	2	2	4	2	2	2	2	3	1	2	3	2	3	1	3	2	2	3	4	3	2	1	4		
16-Dec	2	2	1	1	3	3	1	1	2	1	2	1	1	2	3	1	2	2	1	1	2	2	2	2	3		
17-Dec	2	1	3	1	1	1	1	2	1	2	1	4	4	3	1	3	AF	AF	AF	AF	AF	AF	3	3	4		
18-Dec	1	1	1	2	2	2	1	2	2	2	2	3	1	2	1	2	1	2	1	1	2	2	2	3	3		
19-Dec	3	3	4	3	6	6	5	4	4	3	3	3	2	1	2	2	2	3	4	2	2	1	2	2	6		
20-Dec	3	2	4	3	2	4	4	4	4	2	3	2	4	3	5	5	4	3	3	3	2	3	5	2	5		
21-Dec	2	3	3	2	5	5	6	2	4	4	2	3	12	7	6	3	2	2	2	3	3	2	3	1	12		
22-Dec	1	1	3	3	3	3	4	5	2	3	4	3	4	3	5	3	5	3	6	5	5	3	4	4	6		
23-Dec	4	4	4	5	4	4	2	4	2	2	2	2	2	2	1	1	2	1	2	3	3	3	3	3	5		
24-Dec	3	2	2	2	2	2	4	1	3	3	3	2	1	1	1	1	1	2	2	2	2	2	1	1	4		
25-Dec	1	1	1	1	2	2	2	1	2	3	2	2	1	2	3	3	3	3	4	1	1	2	2	2	4		
26-Dec	2	3	2	3	2	2	3	3	2	2	3	4	3	3	3	2	3	4	3	2	3	2	2	2	4		
27-Dec	2	3	2	2	4	3	2	2	2	2	2	5	3	3	3	3	3	3	3	2	2	3	3	2	5		
28-Dec	3	5	4	3	3	3	3	3	3	3	3	2	2	1	1	1	1	2	4	1	2	2	2	5	5		
29-Dec	2	2	2	2	1	3	1	2	2	2	1	2	1	1	2	4	2	1	1	3	4	5	2	3	5		
30-Dec	2	2	1	2	1	1	2	3	1	1	3	2	2	2	2	2	4	4	3	2	2	4	3	3	4		
31-Dec	2	3	3	2	2	1	2	2	2	2	2	3	2	1	2	2	7	2	1	3	3	3	4	3	7		
																	Diurnal Maximum										
AF - Analyzer Failure																											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 75 m (WS75m) - km/h
Mannix - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	54	7.32	7.32
6 - 11	135	18.29	25.61
12 - 19	244	33.06	58.67
20 - 28	219	29.67	88.35
29 - 38	86	11.65	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 738

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed 75 m (WS75m) - km/h
Mannix - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	7	6	3	2	5	3	8	6	5	1	1	0	1	1	3	2	54
6 - 11	10	16	8	1	0	12	19	15	8	7	10	11	1	2	9	6	135
12 - 19	32	20	0	0	0	4	33	38	29	7	12	14	11	16	15	13	244
20 - 28	19	4	0	0	0	0	37	40	11	8	7	28	25	25	12	3	219
29 - 38	6	0	0	0	0	0	15	17	0	0	0	7	14	22	4	1	86
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	74	46	11	3	5	19	112	116	53	23	30	60	52	66	43	25	738

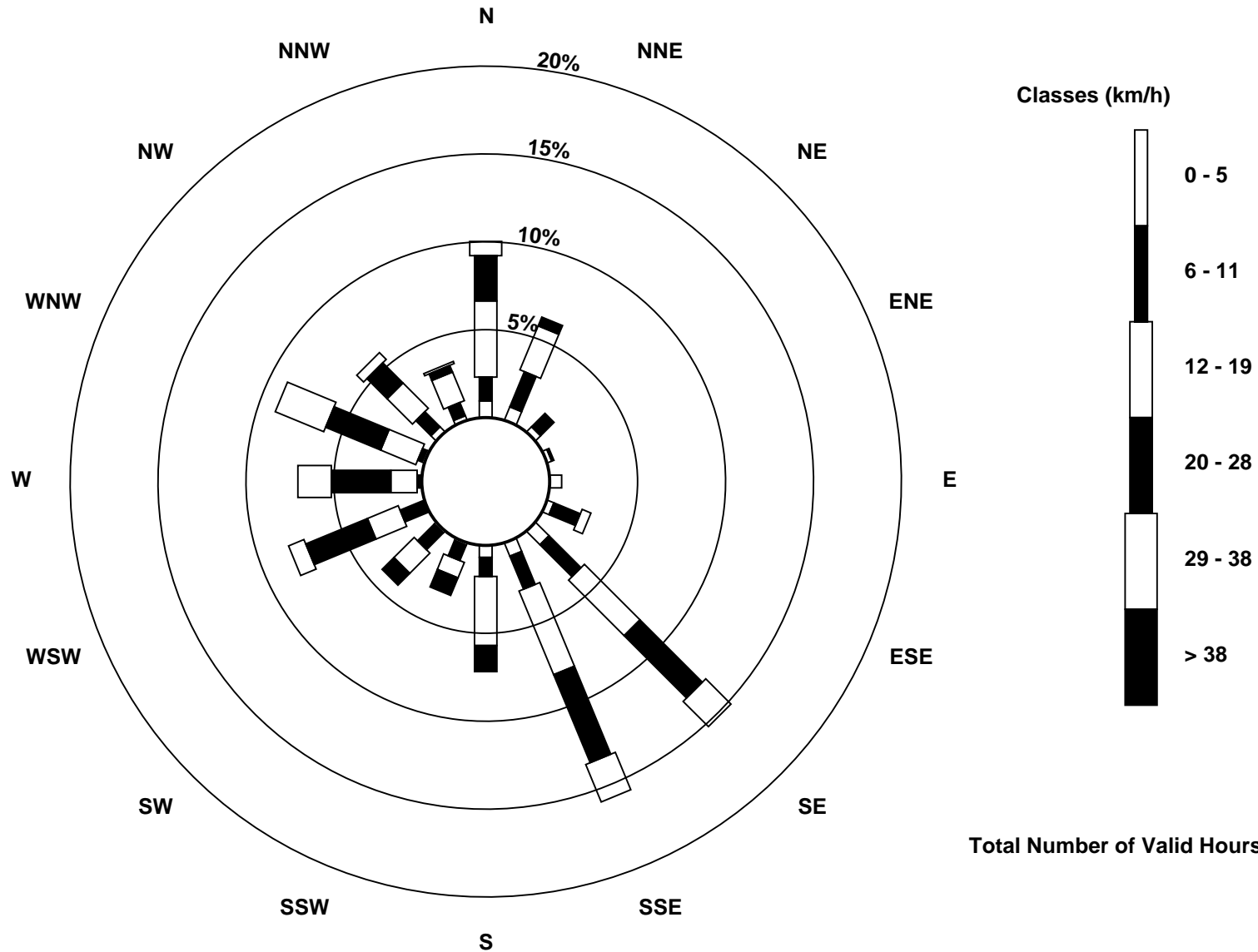
Total Number of Valid Hours: 738

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 75 m (WS75m) - km/h
Mannix (AMS 5)





Maximum Speed: 41 km/h on Dec 21 14:00	Maximum Daily Speed Average: 32.2 km/h on Dec 26	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 28 14:00	Minimum Daily Speed Average: 4.1 km/h on Dec 29	Hours of Data: 744
Maximum Diurnal Speed Average: 6.1 km/h at hour 21	Minimum Diurnal Speed Average: 3.2 km/h at hour 1	Hours of Missing Data: 0
Monthly Average Velocity: 4.4 km/h 227.6 deg	Percentiles: P ₁ = 2 P ₁₀ = 7 Q ₁ = 12 Median = 18 Q ₃ = 26 P ₉₀ = 31 P ₉₉ = 36	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE22	SSE22	SSE22	S20	SSW21	S20	SSE19	SSE19	SSE19	S16	S17	SSE15	SSE13	SSE14	S14	S14	S14	SSW13	SSW12	SSW11	S13	S14	SSW8	S9	\$15.6	SSE22
2-Dec	S12	SSE16	SSE21	SSE21	SSE24	SSE23	SSE27	SSE29	SSE32	SSE30	SE28	SE25	SE28	SE28	SE30	SE33	SE32	SE35	SE29	SSE32	SE30	SE27	SE28	SE30	\$E26.7	SE35
3-Dec	SE28	SE27	SE28	SSE32	SSE30	SSE32	SSE33	SSE31	SSE32	SSE32	SSE31	SSE26	S25	SSW18	S19	S25	S26	S27	S24	SSW21	SSW23	SW19	SW18	SW15	\$SE23.6	SSE33
4-Dec	SW10	W9	NW13	N28	N39	N28	N31	N33	N32	N28	N23	N17	NNW19	NW21	NW20	NW25	NW24	NW29	NW32	NW30	NW25	NW24	NW25	WNNW29	NNW21.6	N39
5-Dec	WNNW32	WNNW33	WNNW33	WNNW34	WNNW33	WNNW34	WNNW33	WNNW34	WNNW35	WNNW37	WNNW35	WNNW34	WNNW32	W31	W31	W32	W31	W28	W27	W27	W26	W27	W26	W26	WNNW31.0	WNNW37
6-Dec	WNNW29	WNNW28	WNNW29	WNNW28	WNNW29	WNNW30	WNNW29	WNNW28	WNNW28	WNNW26	WNNW27	WNNW25	NW22	NW24	NW22	NW22	NNW20	NNW18	N15	N19	N17	N19	N17	N16	NW20.7	WNNW30
7-Dec	N13	N17	N15	N17	N20	N22	N21	N15	N20	N22	N23	N18	N13	NW14	NW13	NNW11	N9	NNE7	NNE9	NNE10	NNE13	NNE11	NNE16	NNE18	N14.6	N23
8-Dec	NNE17	NNE17	NNE16	NNE12	NNE15	NE13	NE11	NE7	NE6	NE5	NNE5	NNE5	N4	NNW3	NW2	N5	N6	NNE10	NNE12	NNE10	NNE6	ENE4	ESE3	SSE6	NNE7.5	NNE17
9-Dec	SE7	SE7	SE9	SSE11	SSE9	S9	SSE12	SSE17	SSE23	SSE22	S19	S15	S7	SE5	SE10	SE12	SSE17	SSE15	SSE15	SSE15	SSE14	SSE18	SSE22	SSE22	\$SE13.5	SSE23
10-Dec	SSE23	SSE19	SSE14	SSE12	SSE15	S17	S19	S16	S15	S12	S11	SSW8	S7	SSE10	SSE15	SE13	SSE12	SSW10	SW13	WSW15	WSW16	WSW19	WSW22	WSW21	\$11.6	SSE23
11-Dec	WSW18	WSW26	WSW28	WSW25	WSW26	WSW24	WSW24	WSW26	WSW26	WSW27	WSW22	WSW25	W25	W23	W26	W27	WSW28	WSW25	WSW22	W30	W30	W23	W26	WNNW30	WSW25.0	WNNW30
12-Dec	NW27	NW25	NW31	NW32	WNNW35	WNNW35	WNNW33	WNNW36	WNNW34	W30	WNNW28	WNNW20	WSW8	SSW5	SSW6	W14	WNNW27	WNNW30	NW19	WNNW16	WNNW27	WNNW33	W31	W35	WNNW24.6	WNNW36
13-Dec	WNNW36	WNNW35	WNNW36	NW35	N30	N36	NNW28	NNW27	NNW22	NNW19	NNW17	NNE8	NW7	NW12	NW18	NW20	NW18	NW22	NW25	NW19	NW18	WNNW17	WNNW24	WNNW20	NW21.0	WNNW36
14-Dec	NW11	W10	W13	WNNW20	WSW17	SW14	SSW12	SW12	SW14	SW14	SW14	SW11	W14	WNNW16	NNW18	N14	N12	N9	NW13	WNNW17	WNNW21	WNNW15	WNNW13	NW20	WNNW10.2	WNNW21
15-Dec	NW20	WNNW20	WNNW24	WNNW26	WNNW28	NW22	WNNW24	WNNW26	WNNW28	WNNW21	WNNW21	WNNW14	W15	W16	W20	WNNW22	WNNW22	WNNW21	WNNW24	WNNW25	WNNW19	WNNW21	WNNW20	WNNW20	WNNW21.3	WNNW28
16-Dec	WNNW19	WNNW13	NW13	NW14	NW14	WNNW13	WNNW12	W13	W12	W10	W7	WSW8	S9	SSE10	S10	SSE19	S19	SSW13	SW10	SW6	S4	SSE11	SSE9	SSE13	WSW6.2	WNNW19
17-Dec	SSE16	SSE15	SE15	SE19	SSE21	SSE21	SSE24	SSE27	SSE26	SSE26	SSE30	SSE24	SSE17	SSE21	SSE22	SSE23	SE17	SE18	SE18	SE21	SE17	SE22	SE23	SE20	\$E20.5	SSE30
18-Dec	SE16	SSE16	SSE17	SE20	SSE20	SSE16	SE12	SE10	SE10	SE6	SE6	SSE6	SE4	NNE2	NNE4	NNW7	NNW7	NW7	NW7	NNW3	NE3	S2	SSE6	SE11	SE5.9	SE20
19-Dec	ESE8	ESE10	SE15	ESE10	ESE18	ESE20	ESE21	ESE18	ESE17	SE12	ESE12	ESE7	ESE1	NW7	WNNW10	NW12	NNW18	NNW21	NNW15	N10	ESE5	SSE9	SSE12	SSE17	ESE5.7	ESE21
20-Dec	SSE28	SSE27	S24	S14	SSW16	WSW24	WSW32	WSW22	SW23	SW24	SW19	SW18	SW18	WSW17	WSW20	WSW21	WSW15	WSW12	WSW13	WSW18	WSW12	WSW10	WSW14	SSW12	SW16.1	WSW32
21-Dec	SSW13	SSW13	S20	SW20	WSW22	WSW30	SW24	SW22	SW24	SSW26	SSW27	SW25	WSW38	WSW41	WSW31	WSW25	SSW22	SSW24	SSW26	SSW25	SSW24	S16	SSE11	SSE7	SW21.1	WSW41
22-Dec	S7	SW12	SW13	SW25	WSW27	WSW29	WSW29	W21	NNW11	N10	NNW16	N27	N23	N27	N25	N17	N24	N31	N23	N19	N25	N22	N22	N24	NNW12.5	N31
23-Dec	NNE24	NNE21	NNE17	NNE19	NNE21	N22	NNE20	N17	NNE18	NNE16	N16	N13	N11	N9	N11	N12	N13	N12	NNE9	ENE9	ESE14	ESE14	ESE13	ESE12	NNE12.2	NNE24
24-Dec	ESE8	ESE11	ESE10	ESE11	ESE6	ESE8	SE14	SE14	SE11	SE16	SE11	SE11	SE12	SE12	SE9	SE13	SE13	SE16	SE13	SE21	SE14	SE14	SE19	SE12.3	SE21	
25-Dec	SE17	SE20	SE16	SE17	SE19	SE24	SE28	SE27	SE25	SE23	SE25	SE19	SE14	SE16	SSE15	SE15	SE21	SE25	SE24	SSE30	SSE33	SSE29	SSE26	SE24	\$E22.0	SSE33
26-Dec	SSE26	SE29	SSE35	SSE35	SSE38	SSE36	SSE35	SSE32	SE35	SE34	SE33	SSE30	SSE31	SSE31	SSE32	SSE30	SSE31	SSE33	SSE32	SSE32	SSE35	SSE30	SE29	SSE32.2	SSE38	
27-Dec	SE25	SE26	SE28	SSE32	SSE32	SSE32	SSE33	SSE32	SSE33	SSE35	S34	SSW29	SSW22	SW21	SW20	SW18	SW21	SW18	WSW17	WSW16	WSW17	WSW23	NW21	N17	\$17.4	SSE35
28-Dec	NNW18	N20	N16	NNE18	NNE20	N13	N13	N15	NNE15	NNE16	NNE13	NNE9	NNE6	W1	SSE2	S2	SW1	NNE2	NNE10	N6	N12	N14	NNE16	NNE11	N10.5	NNE20
29-Dec	NNE8	NE8	NNE10	ENE6	NE9	ENE6	ESE2	SE5	E6	SE5	ESE5	E1	SSE5	S3	N2	SSE8	ESE3	NE5	ENE7	SE10	SSE9	SE8	SE5	SSE9	E4.1	SE10
30-Dec	S4	S7	SSW8	SW7	WSW8	SW10	S11	S11	SSW7	SW6	S11	S15	S11	SSE15	S19	SSW19	SSW17	WSW19	W22	W28	W30	NNW18	NNE20	NNW10	SW8.4	W30
31-Dec	NW13	N14	NNW8	WSW7	SW5	SE3	ENE8	NNE15	NNE7	NNW6	N5	NNE6	N6	NW4	NW4	N8	W11	W26	W33	W33	WSW34	WSW34	WSW29	W33	WNNW10.1	WSW34

SW3.2SSW3.6 SW4.3 SW4.0 SW3.4 SW4.7SSW5.2SSW4.5SSW4.4SSW5.0SSW4.6 SW4.6 SW5.0WSW5.3 SW4.8 SW4.7 SW4.8WSW5.0WSW5.4WSW5.8WSW6.1 SW5.0WSW3.9WSW3.6 WNNW36WNNW35WNNW36 NW35 N39 SSE36 SSE35WNNW36WNNW37 SSE35 S34WNNW32WSW38WSW41 W32 SE33 SE32 SE35 W33 W33WSW34 SSE35 W31 W35	Diurnal Average	Diurnal Maximum
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All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 90 m (WS90m) - km/h

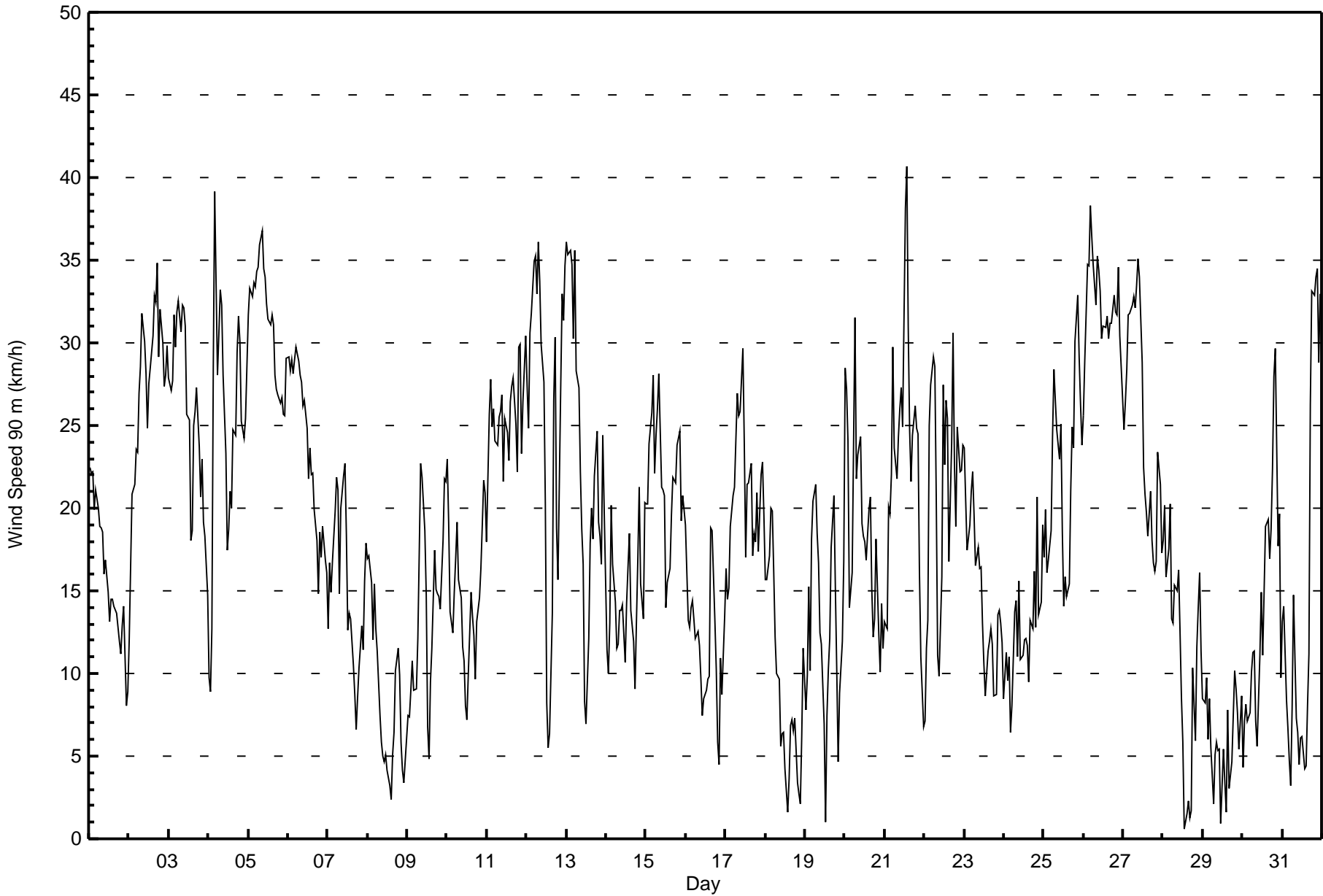
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Dec 21 13:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Dec 1 18:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	3	3	2	2	2	3	3	2	2	2	2	3	2	2	2	1	1	0	1	1	2	1	1	2	3
2-Dec	1	2	1	2	2	3	1	1	2	3	4	3	3	3	2	3	4	5	4	4	3	4	3	3	5
3-Dec	3	5	3	4	3	3	3	3	3	2	3	2	3	2	1	3	2	2	1	3	2	2	3	5	
4-Dec	1	1	2	9	5	5	5	5	5	4	5	4	3	4	3	4	4	4	4	4	3	3	4	3	9
5-Dec	4	3	3	3	4	4	4	4	4	4	4	4	3	4	3	4	4	4	3	3	3	3	3	4	4
6-Dec	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3	3	2	3	4	2	2	3	3	4	4
7-Dec	4	4	3	5	2	4	5	3	4	3	3	3	3	2	1	3	1	2	3	2	3	3	3	2	5
8-Dec	2	3	4	3	3	3	2	2	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	4
9-Dec	2	1	1	1	1	1	2	1	1	2	2	3	3	2	1	2	1	1	1	1	1	2	1	1	3
10-Dec	1	2	2	1	1	1	1	1	1	2	2	1	1	1	2	2	1	1	2	1	1	1	1	2	2
11-Dec	3	4	3	3	5	3	3	5	4	3	4	4	4	4	4	3	3	3	2	5	5	3	5	3	5
12-Dec	3	2	4	3	3	2	3	1	3	1	3	4	2	1	2	4	1	3	4	2	5	2	3	3	5
13-Dec	4	4	4	4	6	5	4	5	3	3	3	2	3	2	3	5	5	4	2	4	2	2	3	4	6
14-Dec	2	3	2	4	1	2	1	2	1	1	1	2	2	2	2	3	2	3	4	2	2	3	4	4	4
15-Dec	3	1	2	2	4	2	2	2	2	3	1	2	3	2	3	1	2	2	2	3	3	3	2	2	4
16-Dec	2	2	1	1	2	2	1	1	1	1	2	1	1	2	3	1	1	2	2	1	1	2	1	4	4
17-Dec	1	1	3	1	1	1	2	1	1	1	1	5	5	3	1	2	3	3	4	4	4	4	4	3	5
18-Dec	2	1	1	2	2	3	2	3	2	1	1	2	2	2	1	2	1	1	1	1	2	2	3	3	3
19-Dec	3	3	3	3	4	3	3	5	4	3	3	3	2	1	2	2	2	3	4	2	2	1	2	2	5
20-Dec	4	2	5	3	3	4	4	4	4	2	4	2	4	3	5	5	4	4	3	3	3	3	5	2	5
21-Dec	2	2	3	2	5	5	5	3	5	4	2	3	12	7	6	4	2	2	2	3	3	3	3	1	12
22-Dec	2	2	3	3	4	3	4	6	3	2	4	3	4	3	5	3	5	3	6	5	4	3	4	4	6
23-Dec	4	4	4	4	4	4	2	4	2	2	2	2	2	1	1	1	1	2	1	3	3	3	4	3	4
24-Dec	3	2	2	2	2	2	4	2	2	3	2	2	1	1	1	1	1	2	2	3	2	3	2	1	4
25-Dec	1	1	1	1	1	2	2	1	2	2	3	2	1	1	2	3	3	2	4	1	1	2	2	2	4
26-Dec	1	3	2	2	2	2	3	3	1	1	3	4	3	3	3	2	3	4	3	2	2	2	2	2	4
27-Dec	2	2	2	2	3	3	2	2	2	2	1	5	3	3	3	3	3	3	3	3	2	3	3	2	5
28-Dec	2	4	4	3	3	3	3	3	3	2	3	2	2	1	1	1	1	2	4	1	2	2	2	5	5
29-Dec	2	2	2	2	1	2	1	2	2	2	1	2	2	2	2	3	2	1	1	3	3	5	2	2	5
30-Dec	2	2	1	2	1	1	1	2	1	2	3	1	2	2	3	2	4	4	4	2	2	4	3	4	4
31-Dec	2	3	4	2	2	1	2	2	2	2	2	3	3	1	4	3	7	3	2	3	3	2	4	3	7
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed 90 m (WS90m) - km/h
Mannix - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 90 m (WS90m) - km/h
Mannix - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	42	5.65	5.65
6 - 11	129	17.34	22.98
12 - 19	234	31.45	54.44
20 - 28	218	29.30	83.74
29 - 38	119	15.99	99.73
> 38	2	0.27	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 90 m (WS90m) - km/h
Mannix - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	4	6	2	1	1	6	6	2	5	1	2	0	1	0	2	3	42
6 - 11	11	17	5	5	1	10	15	16	12	7	7	5	5	1	5	7	129
12 - 19	32	19	1	0	0	8	33	33	21	11	16	16	7	12	15	10	234
20 - 28	20	8	0	0	0	2	28	30	9	11	11	26	16	32	20	5	218
29 - 38	6	0	0	0	0	0	12	41	1	1	0	9	13	30	6	0	119
> 38	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
Totals	74	50	8	6	2	26	94	122	48	31	36	57	42	75	48	25	744

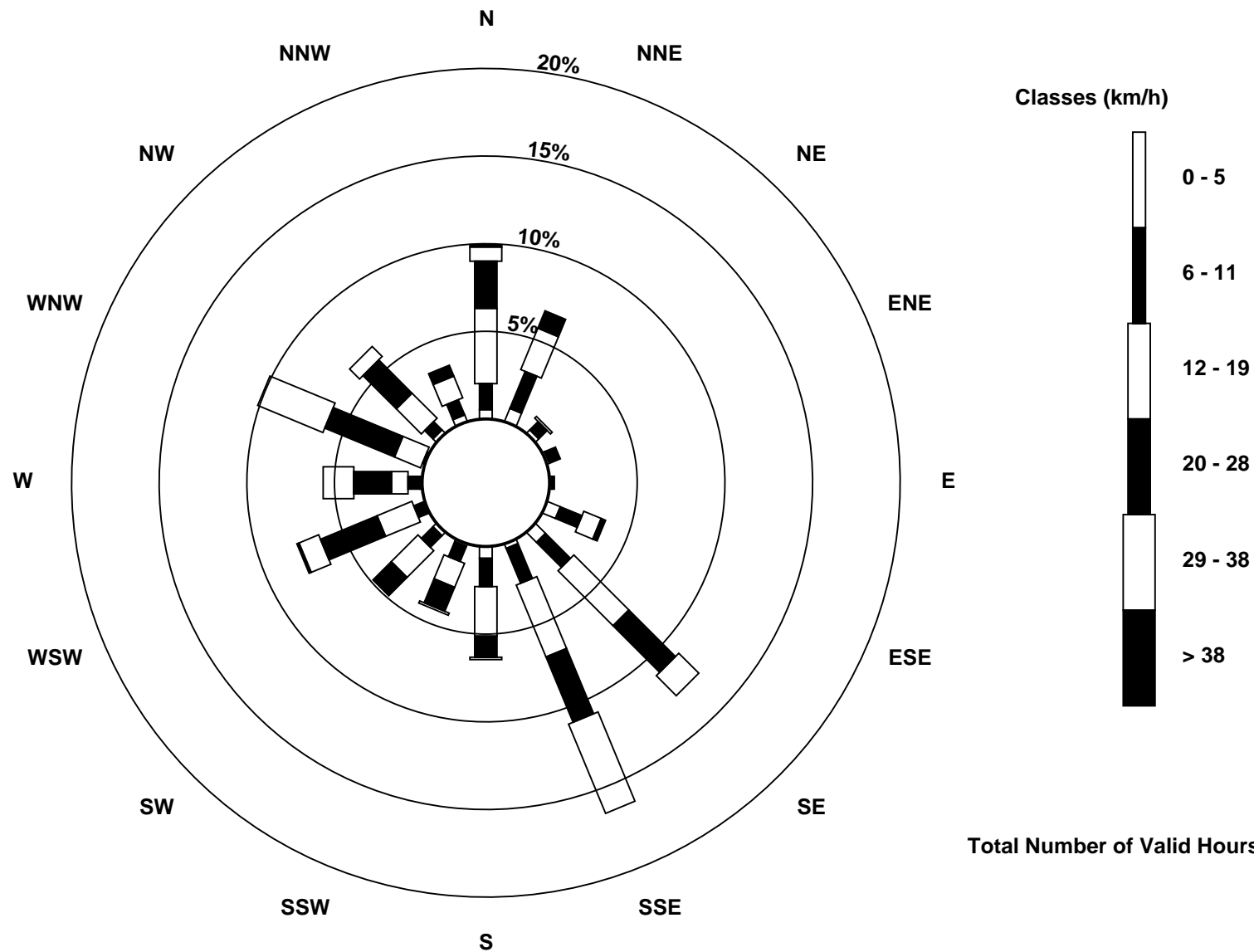
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed 90 m (WS90m) - km/h
Mannix (AMS 5)





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 20 m (WD20m) - deg

Mannix - December 2016

Direction of Maximum Speed: 257 deg on Dec 21 14:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 280.3 deg on Dec 5		Hours of Data:	685
Direction of Minimum Speed: 178 deg on Dec 29 07:00		Hours of Missing Data:	59
Direction of Minimum Daily Speed Average: 0.9 deg on Dec 29		Percent Operational Time:	92.1
Monthly Average Direction: 249.0 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	164	156	161	179	196	182	166	162	163	169	167	167	167	168	169	176	176	171	173	171	165	176	166	162	169.0
2-Dec	163	157	156	148	157	154	149	142	153	153	137	137	141	140	138	137	139	138	143	146	140	136	138	135	143.6
3-Dec	141	145	143	149	147	149	154	149	151	155	155	154	157	157	163	159	162	175	182	174	201	223	222	204	160.3
4-Dec	174	187	311	4	11	11	12	13	14	15	12	359	340	314	324	319	303	314	316	316	316	319	311	294	338.7
5-Dec	286	286	286	286	287	287	287	287	286	286	284	280	280	280	278	278	272	271	269	269	270	270	270	281	280.3
6-Dec	282	281	281	280	282	283	284	285	285	288	290	293	303	308	310	319	321	329	8	7	8	10	7	8	303.8
7-Dec	359	6	6	2	8	11	8	7	7	7	10	13	4	299	284	305	351	6	353	7	19	25	15	24	1.7
8-Dec	24	23	26	29	17	40	49	40	34	AF	279	272	267	274	262	330	343	11	20	355	3	AF	AF	AF	9.7
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	157	156	175	178	187	187	178	166	168	177	--
10-Dec	181	163	165	AF	AF	AF	158	155	156	157	155	156	151	151	150	151	171	203	202	219	221	222	226	223	178.4
11-Dec	228	255	249	251	247	251	249	254	253	250	255	255	261	267	266	262	256	262	254	274	275	254	270	283	259.1
12-Dec	279	281	310	302	297	289	283	282	283	271	278	271	231	159	150	150	295	294	334	292	272	281	273	276	282.3
13-Dec	282	285	284	306	351	345	336	336	340	334	334	24	276	306	327	319	315	302	303	295	269	258	266	279	308.1
14-Dec	280	212	225	248	187	158	149	152	155	157	163	157	227	305	331	356	353	349	275	260	276	264	294	323	235.1
15-Dec	308	272	271	264	290	292	279	271	276	288	277	279	279	271	269	264	273	282	265	264	289	264	269	272	275.6
16-Dec	279	279	274	278	293	AF	AF	AF	AF	AF	AF	AF	151	149	157	156	158	156	180	167	157	AF	AF	AF	--
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
18-Dec	179	183	AF	AF	AF	AF	173	181	178	202	155	173	191	329	332	293	305	299	297	301	12	229	189	154	220.7
19-Dec	156	137	136	114	127	130	129	123	128	137	122	122	30	316	284	339	335	324	329	12	137	167	163	149	125.7
20-Dec	158	161	149	141	144	139	251	232	191	182	171	164	221	254	246	249	185	192	207	250	104	139	140	143	185.0
21-Dec	151	148	155	161	193	242	214	193	170	176	169	197	257	257	249	230	179	184	189	189	178	140	126	117	196.7
22-Dec	138	142	164	231	249	245	250	284	323	356	337	8	358	12	9	344	1	10	4	358	11	13	17	14	348.0
23-Dec	15	21	19	18	21	12	24	8	15	16	10	10	347	332	337	341	341	352	354	7	116	120	127	126	20.2
24-Dec	121	125	124	130	136	151	148	235	264	234	165	231	230	162	172	176	155	170	181	169	148	146	155	161	161.6
25-Dec	164	164	170	167	150	153	149	154	163	165	156	154	149	154	162	145	140	138	144	148	154	155	154	149	153.8
26-Dec	156	153	155	155	149	154	159	156	147	147	152	153	149	153	155	154	152	147	152	149	151	150	155	144	152.0
27-Dec	143	147	152	145	151	148	140	140	141	149	157	155	148	157	208	211	214	221	242	224	245	263	324	317	166.5
28-Dec	326	358	353	15	22	14	353	7	17	22	21	17	20	281	163	179	139	35	9	334	326	310	10	360	5.3
29-Dec	16	31	6	318	34	41	178	142	88	194	89	293	237	259	4	180	18	360	9	228	253	56	21	144	11.8
30-Dec	256	240	240	274	212	188	164	174	170	187	154	157	144	150	149	166	169	245	260	270	271	335	15	296	217.3
31-Dec	290	6	331	228	211	115	66	33	7	271	224	347	15	314	18	32	223	241	255	261	254	253	249	264	266.3

241.1 227.5 233.7 253.2 281.3 243.9 216.5 233.8 219.3 211.8 200.9 217.9 244.1 258.3 246.1 237.2 237.2 261.0 264.9 255.9 244.7 241.3 253.8 260.8

Diurnal Average

AF - Analyzer Failure

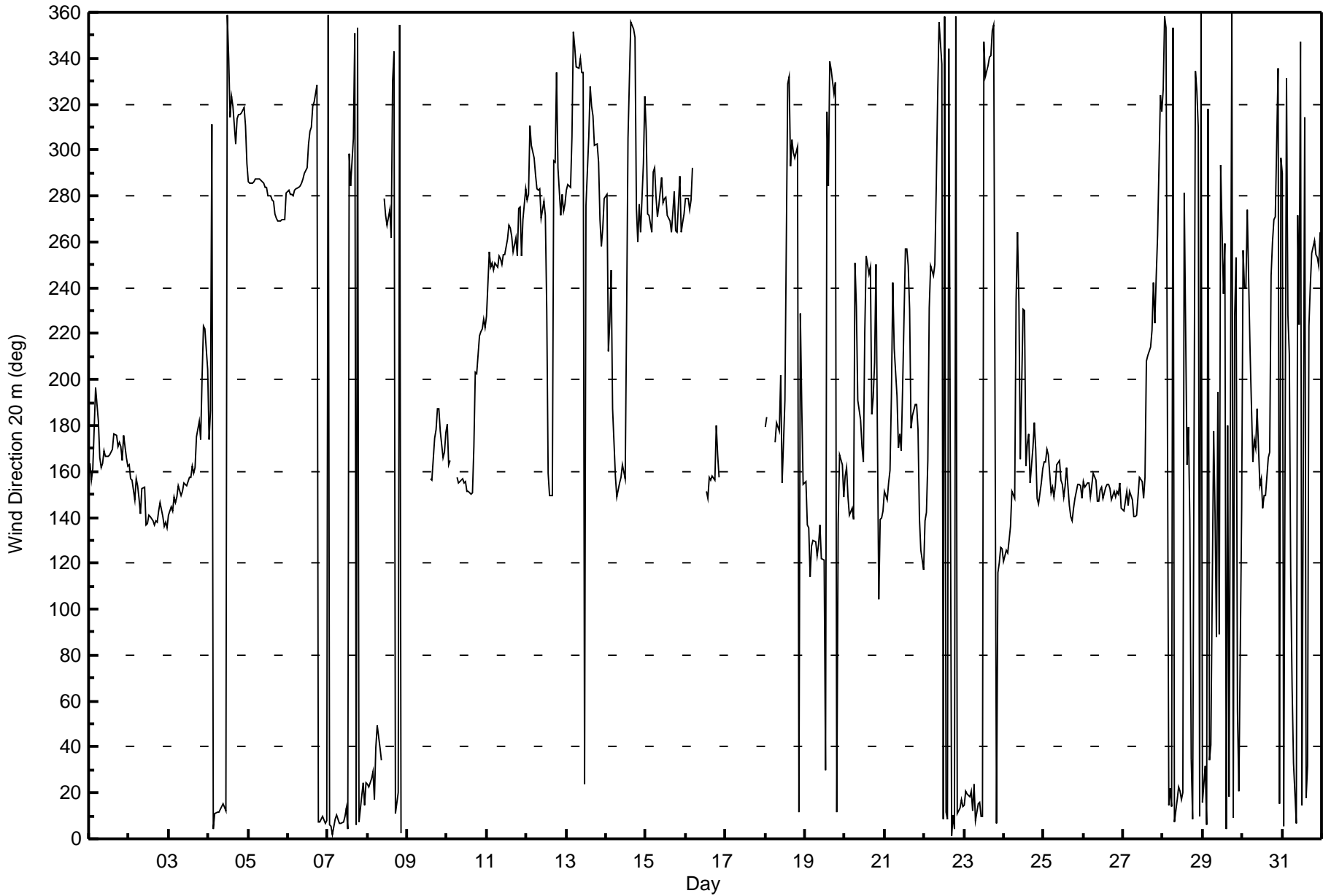
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 20 m (WD20m) - deg
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Dec 29 17:00 Minimum Value: 3 deg on Dec 15 23:00 Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 8 Median = 11 Q ₃ = 17 P ₉₀ = 32 P ₉₉ = 76		Hours in Service: 744 Hours of Data: 685 Hours of Missing Data: 59 Hours of Calibration: 0 Percent Operational Time: 92.1																							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	9	9	8	16	15	14	10	8	9	11	10	12	12	12	12	12	12	10	12	10	8	12	6	9	16
2-Dec	7	7	7	9	12	15	10	9	12	8	9	9	9	9	9	8	9	8	9	8	8	8	8	7	15
3-Dec	9	20	9	8	8	8	7	8	7	7	7	6	5	7	7	5	7	11	12	11	16	10	10	16	20
4-Dec	8	74	25	16	9	14	13	10	11	11	10	15	13	12	11	11	11	10	10	10	10	11	13	9	74
5-Dec	9	8	8	8	8	8	9	8	8	8	9	8	8	8	7	7	7	6	6	6	6	6	6	9	9
6-Dec	8	7	7	7	8	8	8	9	9	9	9	9	11	10	12	11	10	15	10	10	11	10	10	10	15
7-Dec	16	12	12	14	10	9	11	12	11	10	12	11	22	20	10	31	12	27	35	21	16	19	12	11	35
8-Dec	11	12	14	17	13	17	10	23	19	AF	14	15	16	12	10	27	8	11	10	17	16	AF	AF	AF	27
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	8	11	13	8	11	7	8	4	6	19	19
10-Dec	24	11	10	AF	AF	AF	8	7	8	9	10	10	6	8	7	15	18	9	50	14	8	5	6	8	50
11-Dec	23	10	10	10	11	10	11	10	11	10	10	10	8	10	7	7	9	12	9	9	9	10	8	10	23
12-Dec	8	14	11	11	9	9	8	7	8	4	5	10	17	26	8	36	21	10	22	15	6	7	6	6	36
13-Dec	8	9	8	32	15	12	13	12	13	14	18	19	33	11	13	19	15	12	12	20	9	6	9	12	33
14-Dec	19	31	23	24	46	7	6	8	5	7	10	17	46	13	13	26	30	25	34	10	6	8	18	14	46
15-Dec	15	7	6	5	14	10	6	4	8	11	6	6	16	8	8	8	10	7	8	8	8	6	3	4	16
16-Dec	5	21	7	5	25	AF	AF	AF	AF	AF	AF	AF	6	7	9	5	8	7	12	21	10	AF	AF	AF	25
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
18-Dec	12	19	AF	AF	AF	AF	18	19	29	49	28	42	57	39	32	13	12	19	21	32	87	47	42	41	87
19-Dec	33	36	13	16	15	9	9	13	10	10	14	18	77	13	14	18	13	13	19	13	59	10	11	7	77
20-Dec	13	10	9	10	9	16	30	22	20	8	18	12	52	78	18	49	37	33	22	26	54	28	39	13	78
21-Dec	10	8	9	6	34	12	57	21	19	21	10	21	15	10	11	15	12	9	10	14	13	11	10	15	57
22-Dec	8	15	24	14	11	9	10	26	25	35	15	10	14	10	16	15	16	10	16	16	12	11	11	11	35
23-Dec	10	12	15	15	11	11	11	15	10	11	10	9	16	17	12	12	10	14	13	39	15	12	11	11	39
24-Dec	11	11	11	11	17	10	12	25	11	27	29	13	20	18	20	15	10	14	14	13	7	6	8	4	29
25-Dec	6	4	5	5	8	5	4	5	4	5	5	6	7	7	11	8	9	8	7	7	5	6	6	6	11
26-Dec	5	6	5	5	7	6	8	10	7	8	7	9	9	8	7	7	7	8	8	7	7	8	10	9	10
27-Dec	9	8	7	10	9	8	8	8	8	7	7	7	11	34	31	19	9	22	9	12	12	9	35	14	35
28-Dec	20	16	18	13	12	20	13	15	11	11	12	16	21	37	69	23	33	84	21	21	29	20	15	32	84
29-Dec	44	54	27	73	18	44	96	36	48	65	63	66	38	76	36	64	100	30	14	75	38	90	49	43	100
30-Dec	40	27	15	18	30	15	10	22	18	39	16	9	15	7	9	17	22	34	10	5	5	30	12	45	45
31-Dec	14	22	54	16	37	26	12	18	32	31	42	95	12	32	56	18	28	12	8	7	9	9	11	6	95
	44	74	54	73	46	44	96	36	48	65	63	95	77	78	69	64	100	84	50	75	87	90	49	45	
	Diurnal Maximum																								
AF - Analyzer Failure																									





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 45 m (WD45m) - deg

Mannix - December 2016

Direction of Maximum Speed: 251 deg on Dec 21 14:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 275.6 deg on Dec 5		Hours of Data:	744
Direction of Minimum Speed: 123 deg on Dec 29 07:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 1.3 deg on Dec 29		Percent Operational Time:	100.0
Monthly Average Direction: 243.9 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	160	153	156	177	191	177	163	157	159	165	163	162	164	163	167	173	174	170	171	169	163	174	170	161	166.5
2-Dec	161	152	152	144	152	152	145	140	147	148	132	132	134	135	133	132	135	133	138	142	137	132	134	131	139.5
3-Dec	136	137	140	145	143	145	149	144	146	149	149	151	160	167	167	156	161	175	176	172	198	218	219	204	158.7
4-Dec	206	236	307	357	4	4	5	5	7	7	5	351	334	310	319	315	299	310	311	312	312	315	307	289	332.2
5-Dec	282	281	280	281	281	281	282	281	280	280	279	278	275	275	273	272	268	267	266	264	265	265	266	277	275.6
6-Dec	277	277	277	277	278	280	280	281	281	283	286	288	299	304	306	315	318	324	360	1	1	2	359	359	300.0
7-Dec	353	357	358	356	1	3	2	359	0	1	3	7	356	301	291	311	354	16	6	11	11	17	11	19	356.9
8-Dec	20	17	20	21	16	30	36	35	37	22	331	326	294	291	263	337	337	9	20	17	14	33	133	169	13.5
9-Dec	117	166	167	168	162	165	161	157	156	152	154	142	147	143	142	150	164	167	175	173	183	170	170	169	160.9
10-Dec	162	150	150	154	155	163	158	154	153	157	152	157	141	143	142	130	148	179	219	225	232	229	232	225	172.9
11-Dec	233	247	243	243	244	244	244	248	246	244	248	249	254	261	260	256	249	254	249	270	270	252	264	278	253.2
12-Dec	286	292	307	299	294	285	279	278	281	265	273	270	227	160	149	228	293	289	319	293	273	279	269	271	281.6
13-Dec	279	280	279	301	346	341	331	330	334	330	331	13	296	305	321	317	312	301	302	297	288	270	271	288	306.9
14-Dec	294	231	243	266	235	198	164	167	166	180	179	185	266	299	327	353	356	351	300	274	279	275	297	317	257.1
15-Dec	308	272	273	269	287	293	279	275	273	285	277	277	281	267	263	259	273	281	267	270	284	270	276	275	276.3
16-Dec	281	280	285	290	289	271	250	255	238	229	196	196	151	149	156	151	155	160	183	202	154	147	167	144	203.4
17-Dec	133	150	139	140	144	151	149	158	147	142	144	152	149	153	158	150	160	160	147	143	141	154	141	160	148.6
18-Dec	166	173	161	151	165	159	156	164	167	191	156	178	179	331	334	299	305	297	297	305	5	220	173	146	175.7
19-Dec	143	124	126	107	120	121	120	114	119	128	117	119	4	311	280	331	335	323	325	5	102	152	154	148	114.3
20-Dec	156	157	147	139	149	194	254	237	205	204	204	196	223	243	244	248	226	218	230	251	245	193	217	150	201.4
21-Dec	155	154	154	177	220	239	225	204	188	180	173	208	249	251	245	228	181	184	193	195	184	148	130	129	197.6
22-Dec	147	194	205	229	245	241	246	277	325	354	335	3	354	6	3	342	357	4	360	355	5	7	9	7	338.2
23-Dec	8	13	12	11	14	7	17	2	9	12	4	2	346	333	336	340	341	351	353	23	108	110	116	116	13.0
24-Dec	118	113	112	116	105	127	138	151	152	143	124	143	177	153	158	159	147	137	159	147	137	139	153	151	141.1
25-Dec	153	157	158	163	159	152	146	137	137	139	138	139	133	146	163	141	130	130	142	145	147	146	146	146	145.6
26-Dec	150	148	147	149	146	149	149	147	141	141	145	148	146	149	150	149	147	147	149	148	150	149	146	134	146.7
27-Dec	128	135	142	138	146	144	137	136	138	147	153	162	182	198	210	212	214	221	238	239	244	255	315	327	167.1
28-Dec	326	355	350	9	15	8	350	2	10	15	13	10	14	278	170	178	124	45	5	335	337	336	18	10	2.1
29-Dec	21	38	9	42	36	42	123	135	83	166	94	289	213	227	353	167	51	1	17	149	204	119	89	142	59.6
30-Dec	210	209	220	257	240	206	163	171	173	193	155	156	146	146	145	175	178	242	255	263	266	331	9	310	213.2
31-Dec	296	358	331	232	221	132	67	26	17	292	345	9	4	308	5	26	222	238	255	255	249	246	247	261	264.0

216.6 207.9 208.9 220.3 224.2 212.4 199.8 206.0 190.9 190.3 182.5 202.1 226.5 237.7 230.6 222.7 220.7 240.2 248.0 242.3 231.7 224.7 229.9 231.4
Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction 45 m (WD45m) - deg

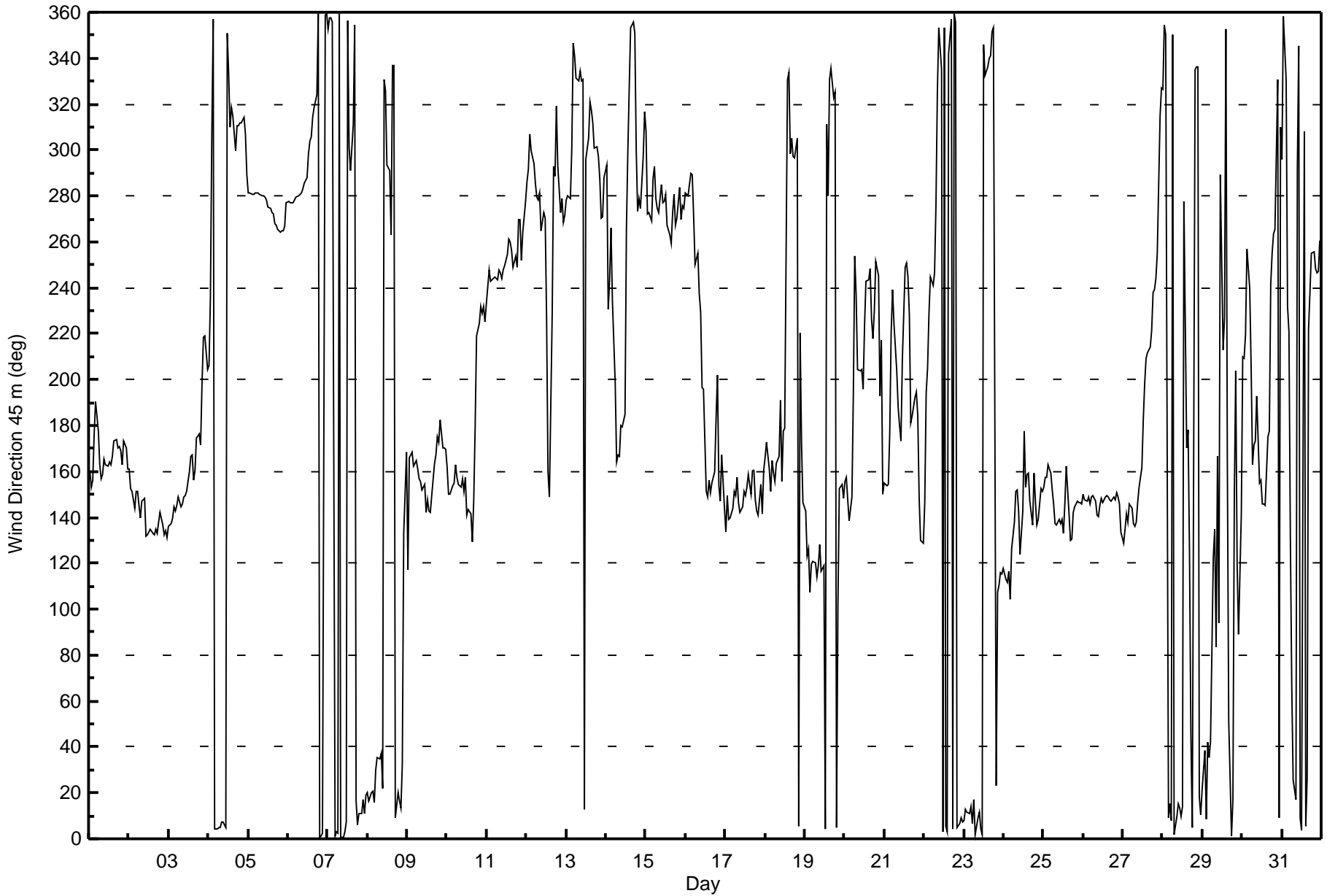
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 97 deg on Dec 29 22:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 2 deg on Dec 25 03:00																									
Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 6 Median = 8 Q ₃ = 12 P ₉₀ = 21 P ₉₉ = 75																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	7	7	6	13	10	8	7	6	6	6	7	8	8	7	7	6	5	3	5	4	4	6	5	5	13
2-Dec	5	4	5	6	8	12	6	7	8	6	7	7	6	7	7	6	7	6	7	6	7	7	7	6	12
3-Dec	7	14	6	6	6	6	5	6	4	5	5	4	7	9	11	3	5	5	6	5	11	8	7	11	14
4-Dec	10	30	20	13	6	10	9	7	9	8	7	11	11	9	8	9	10	8	7	8	8	8	10	6	30
5-Dec	7	6	6	6	6	6	6	6	6	6	7	6	6	6	5	5	7	5	5	5	5	6	5	7	7
6-Dec	6	6	6	5	6	6	6	6	7	6	7	6	9	8	10	8	8	10	7	7	8	6	7	7	10
7-Dec	12	8	8	10	6	6	8	8	8	7	8	8	18	17	7	27	8	12	11	11	12	15	9	8	27
8-Dec	9	9	11	12	10	11	9	17	14	16	21	22	26	16	14	24	9	10	8	7	13	14	38	16	38
9-Dec	16	12	8	8	6	5	2	4	4	5	8	8	11	14	5	10	9	6	6	4	2	6	4	6	16
10-Dec	5	9	8	6	4	3	4	4	5	5	8	13	7	8	7	10	12	13	8	5	5	3	4	6	13
11-Dec	13	8	7	6	8	7	8	8	8	7	8	8	7	9	6	6	7	9	6	8	9	7	7	9	13
12-Dec	6	8	8	9	5	5	6	4	7	4	4	8	16	29	17	44	6	5	14	16	4	5	5	5	44
13-Dec	7	7	7	31	11	8	9	10	10	11	14	14	29	8	10	15	11	9	8	14	7	7	4	11	31
14-Dec	16	22	11	6	20	9	10	9	6	10	6	22	21	8	10	22	18	19	24	5	4	6	16	11	24
15-Dec	14	6	5	4	11	7	4	6	5	7	5	5	16	8	7	5	11	4	6	6	5	5	3	3	16
16-Dec	6	4	8	6	19	13	7	4	10	8	29	11	18	8	12	3	4	6	14	20	13	6	5	13	29
17-Dec	7	4	7	4	12	3	5	7	4	4	5	10	7	7	7	5	5	5	7	7	7	4	6	8	12
18-Dec	6	14	11	8	12	14	11	13	22	29	21	35	51	39	28	14	11	17	19	30	82	49	46	30	82
19-Dec	26	20	11	13	13	8	8	11	9	8	13	16	92	11	13	16	8	11	13	12	47	7	7	4	92
20-Dec	5	5	6	5	14	23	8	13	15	8	12	17	11	20	11	11	24	25	15	8	27	31	25	21	31
21-Dec	10	7	10	13	16	9	18	14	11	17	8	16	12	8	8	11	9	6	6	9	8	12	8	13	18
22-Dec	14	14	10	8	8	6	7	26	20	28	13	6	10	7	11	10	13	6	12	11	9	8	8	7	28
23-Dec	7	9	11	12	8	8	8	12	8	8	7	6	12	13	8	8	6	7	8	34	11	10	9	10	34
24-Dec	10	10	10	9	14	8	5	5	10	8	7	13	15	6	6	5	4	11	7	10	4	7	4	3	15
25-Dec	3	3	2	2	4	3	3	4	4	5	4	5	6	9	8	7	7	6	7	4	3	3	3	4	9
26-Dec	4	5	5	4	3	4	5	8	5	5	4	7	7	6	5	4	5	5	5	5	4	4	5	5	8
27-Dec	5	5	4	7	6	5	5	5	6	4	6	6	13	15	11	7	6	13	7	8	8	6	35	10	35
28-Dec	16	11	12	9	9	17	10	12	9	8	9	12	14	44	63	19	25	72	17	20	21	15	10	20	72
29-Dec	21	28	21	56	12	42	92	27	34	58	38	75	30	81	36	49	75	12	15	57	51	97	70	29	97
30-Dec	63	13	13	13	13	10	8	8	11	23	10	7	13	6	8	15	18	15	9	5	4	30	9	40	63
31-Dec	12	20	44	15	10	33	11	14	11	33	68	31	12	21	55	13	70	9	3	6	6	6	9	5	70
63 30 44 56 20 42 92 27 34 58 68 75 92 81 63 49 75 72 24 57 82 97 70 40																									
Diurnal Maximum																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction 45 m (WD45m) - deg
Mannix - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 75 m (WD75m) - deg

Mannix - December 2016

Direction of Maximum Speed: 251 deg on Dec 21 14:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 278.0 deg on Dec 5		Hours of Data:	738
Direction of Minimum Speed: 14 deg on Dec 29 12:00		Hours of Missing Data:	6
Direction of Minimum Daily Speed Average: 3.1 deg on Dec 29		Percent Operational Time:	99.2
Monthly Average Direction: 248.7 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	163	157	159	179	191	179	164	159	160	167	165	164	165	164	167	176	181	183	186	182	172	180	188	174	171.0
2-Dec	171	161	157	147	153	154	148	144	148	151	133	133	133	134	133	133	136	134	139	143	138	134	136	133	141.5
3-Dec	137	137	141	147	145	148	151	147	149	149	151	159	173	188	180	164	169	181	183	183	204	219	222	211	163.6
4-Dec	226	254	311	359	5	6	7	6	8	8	6	353	336	313	322	317	304	313	314	314	315	317	311	292	334.6
5-Dec	284	284	283	283	283	283	283	282	282	281	282	280	278	276	274	275	272	271	270	267	267	268	271	280	278.0
6-Dec	280	280	280	280	282	283	284	284	285	287	289	292	303	307	311	319	324	330	1	3	2	3	1	0	303.3
7-Dec	354	358	358	359	4	5	4	0	3	3	5	9	358	312	303	324	1	19	14	17	12	18	12	22	0.6
8-Dec	24	21	23	25	23	35	37	39	44	39	7	12	345	326	295	353	345	20	26	29	29	60	127	146	24.6
9-Dec	132	142	143	151	159	165	158	151	150	154	162	164	159	132	136	139	152	160	162	154	170	154	150	148	153.2
10-Dec	152	141	138	140	147	166	173	175	169	176	170	175	162	143	141	136	152	187	234	234	244	240	241	236	178.4
11-Dec	239	248	244	245	246	245	244	249	247	245	248	251	256	262	262	257	251	254	251	273	272	256	266	280	254.5
12-Dec	299	302	312	304	299	289	282	284	290	268	280	280	238	180	180	274	290	292	312	295	282	284	271	274	286.9
13-Dec	281	282	282	304	351	346	336	333	339	338	336	13	317	309	323	320	318	306	308	306	305	286	284	299	312.8
14-Dec	302	252	260	277	248	225	193	206	204	212	204	215	276	299	335	359	6	3	320	287	287	287	300	320	277.1
15-Dec	318	281	280	279	292	301	286	283	278	289	284	285	290	271	265	262	280	288	277	279	288	282	292	287	284.2
16-Dec	295	293	303	301	306	285	273	269	256	257	248	223	170	158	159	160	170	180	205	227	174	150	168	155	224.0
17-Dec	146	154	143	147	147	150	148	153	148	143	144	154	153	153	145	143	AF	AF	AF	AF	AF	AF	129	135	146.4
18-Dec	148	157	151	138	154	152	142	130	130	153	146	163	153	0	360	319	318	305	309	325	19	203	159	141	149.4
19-Dec	128	119	127	113	122	123	123	116	120	126	120	122	73	317	285	327	342	332	330	9	95	146	147	147	105.0
20-Dec	155	157	158	153	184	233	255	241	219	220	225	220	230	242	245	249	237	233	243	252	249	233	239	182	216.8
21-Dec	189	185	175	207	232	242	228	213	205	188	187	224	250	251	246	232	190	194	202	205	195	163	151	147	211.1
22-Dec	167	222	222	231	246	243	248	277	337	3	341	6	357	9	5	350	1	7	4	1	7	10	12	11	338.6
23-Dec	11	15	15	15	17	11	19	5	12	15	7	4	354	344	348	351	353	359	8	50	109	111	113	115	15.1
24-Dec	118	109	110	110	101	117	136	133	127	129	124	127	142	139	134	142	135	130	135	132	131	140	144	139	131.3
25-Dec	133	139	137	142	143	133	136	132	130	130	130	137	134	133	156	138	129	129	143	143	145	144	144	141	137.6
26-Dec	142	139	147	146	147	149	146	144	141	141	142	147	149	151	150	148	148	149	151	149	154	152	147	139	146.6
27-Dec	136	137	141	141	148	149	144	144	145	156	163	184	205	212	214	215	217	224	239	249	247	255	314	344	174.3
28-Dec	336	1	357	12	18	11	355	5	12	18	13	14	20	281	159	177	153	31	11	349	352	358	29	27	8.0
29-Dec	31	39	20	55	44	53	100	128	85	139	98	14	172	185	358	154	103	28	53	127	149	125	136	148	89.3
30-Dec	188	195	203	233	249	223	175	175	196	205	171	172	169	154	158	187	191	243	256	264	268	331	14	329	216.3
31-Dec	307	3	344	251	225	132	70	29	18	325	359	15	358	312	334	16	256	255	261	258	251	249	253	265	275.3

218.7 209.6 206.9 223.1 230.0 220.7 205.3 206.7 191.9 188.8 187.7 209.8 226.0 233.8 230.2 225.4 233.8 253.2 258.4 251.3 244.4 236.2 239.6 233.6

Diurnal Average

AF - Analyzer Failure

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

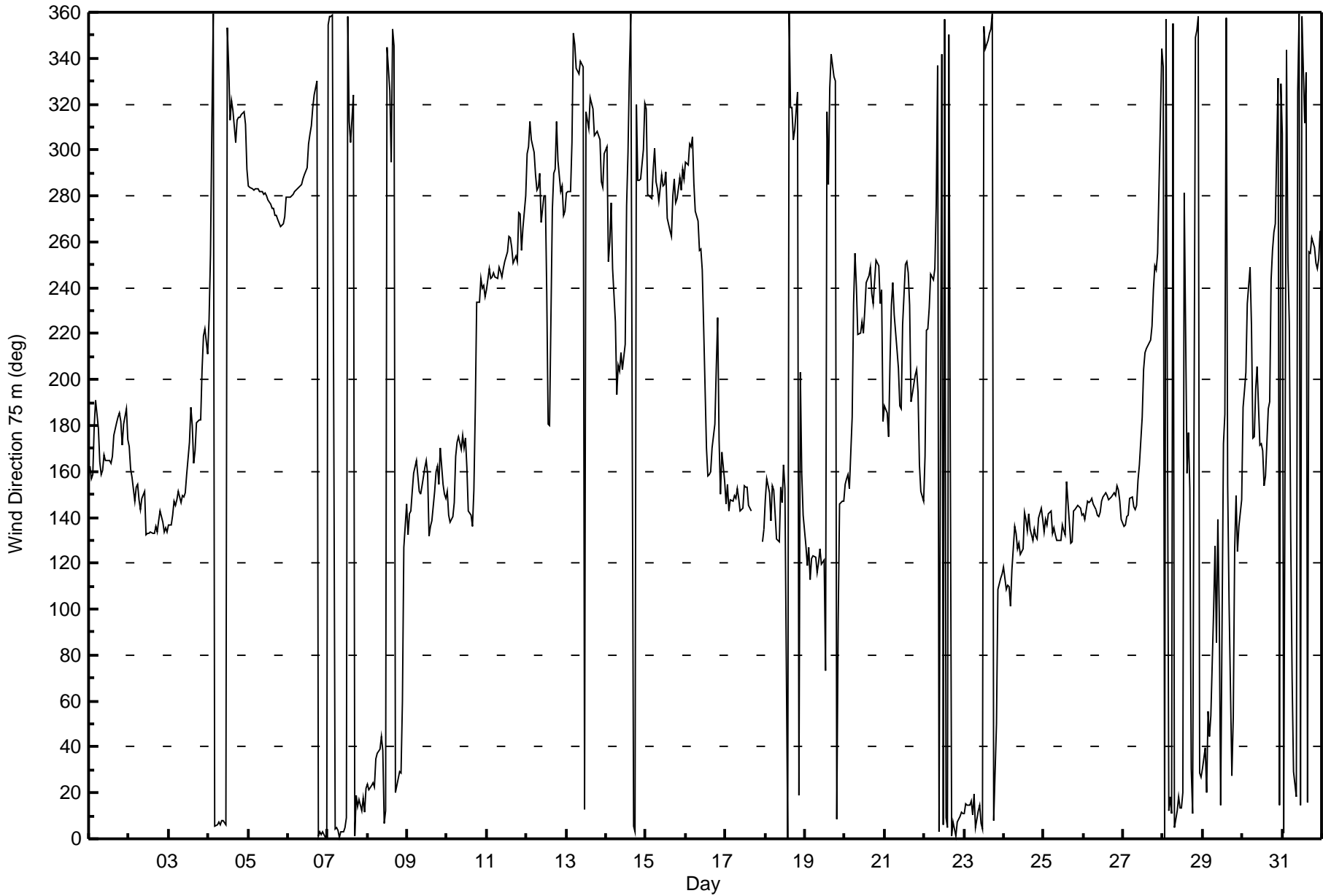
Wind Direction 75 m (WD75m) - deg
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 103 deg on Dec 29 12:00	Hours of Data: 738
Minimum Value: 1 deg on Dec 9 08:00	Hours of Missing Data: 6
Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 5 Median = 7 Q ₃ = 11 P ₉₀ = 18 P ₉₉ = 68	Hours of Calibration: 0
	Percent Operational Time: 99.2

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	6	6	6	11	9	7	7	6	5	5	6	7	7	7	6	5	3	2	7	5	3	5	5	7	11
2-Dec	3	3	4	5	8	9	4	5	6	6	6	6	5	6	5	5	5	6	6	5	6	7	6	6	9
3-Dec	6	10	5	5	5	5	4	4	4	4	5	5	7	8	14	4	5	5	6	7	8	7	6	9	14
4-Dec	9	22	19	12	4	8	7	6	7	6	7	9	9	8	7	7	9	6	6	7	7	7	9	5	22
5-Dec	6	5	5	5	5	5	5	5	5	6	6	5	5	6	5	5	6	5	5	5	5	6	6	6	6
6-Dec	6	5	5	4	5	5	5	5	5	6	5	5	8	7	9	7	7	9	7	6	7	6	6	7	9
7-Dec	11	7	7	9	5	5	7	7	6	6	6	7	16	16	7	21	8	10	8	10	10	12	7	6	21
8-Dec	7	8	8	10	8	9	8	12	13	9	17	11	28	22	20	14	14	9	4	4	6	15	20	9	28
9-Dec	8	9	5	8	4	7	3	1	4	2	5	11	16	8	4	9	3	6	6	5	7	4	5	1	16
10-Dec	2	5	7	5	4	6	4	5	4	3	7	12	11	4	3	7	7	24	8	7	3	3	2	3	24
11-Dec	8	6	5	5	6	6	6	7	7	5	7	6	6	9	7	6	5	8	6	8	8	6	7	8	9
12-Dec	6	5	6	7	5	4	6	4	8	5	7	8	22	26	30	17	2	4	11	11	3	4	5	5	30
13-Dec	6	6	7	30	10	6	7	8	8	9	11	11	21	7	7	10	10	8	7	9	5	9	3	9	30
14-Dec	13	21	12	5	14	10	10	9	8	10	7	22	15	9	11	14	11	13	17	4	4	7	16	10	22
15-Dec	12	6	4	4	8	6	3	7	5	5	4	5	16	7	7	4	12	4	5	5	4	5	4	2	16
16-Dec	5	6	6	5	9	12	9	3	5	7	29	9	21	6	8	3	3	7	13	8	31	4	8	15	31
17-Dec	9	2	6	4	7	2	3	3	3	3	2	8	5	7	5	3	AF	AF	AF	AF	AF	AF	4	10	10
18-Dec	6	11	9	5	11	11	10	8	11	32	17	25	38	67	26	15	11	18	19	29	73	60	44	15	73
19-Dec	21	13	10	15	13	8	8	13	12	10	14	16	89	13	14	13	7	11	11	15	44	9	6	4	89
20-Dec	3	4	5	5	22	11	7	11	13	6	8	13	9	8	8	7	12	17	11	6	12	17	13	21	22
21-Dec	16	15	12	11	11	7	9	11	7	14	11	11	10	7	7	10	10	6	6	8	8	15	12	9	16
22-Dec	26	9	7	7	7	5	6	28	19	20	12	4	8	5	10	9	10	5	9	9	7	6	6	7	28
23-Dec	6	7	9	10	5	6	6	10	6	6	5	5	10	11	8	6	4	6	6	25	15	13	14	14	25
24-Dec	15	14	15	15	17	13	6	6	9	5	8	7	6	5	4	5	7	7	5	6	4	7	3	3	17
25-Dec	4	3	4	3	6	3	3	3	4	4	4	3	6	6	8	8	5	5	6	2	2	4	3	2	8
26-Dec	3	4	5	2	3	3	3	5	3	3	3	5	5	5	4	3	4	4	4	3	3	3	4	4	5
27-Dec	6	4	3	5	4	4	3	4	5	3	6	7	7	8	8	6	6	10	7	8	7	5	34	10	34
28-Dec	14	7	9	6	6	14	8	9	7	7	7	10	11	63	58	17	68	81	17	14	11	7	6	12	81
29-Dec	12	18	14	20	9	35	69	27	21	38	23	103	32	62	83	24	53	18	16	26	51	32	29	14	103
30-Dec	49	15	10	11	11	18	10	7	13	29	15	8	15	6	9	14	13	11	8	4	3	33	7	33	49
31-Dec	10	16	35	18	17	31	14	11	14	34	21	19	16	16	50	16	56	4	3	5	5	5	9	4	56
	49	22	35	30	22	35	69	28	21	38	29	103	89	67	83	24	68	81	19	29	73	60	44	33	

Diurnal Maximum

AF - Analyzer Failure





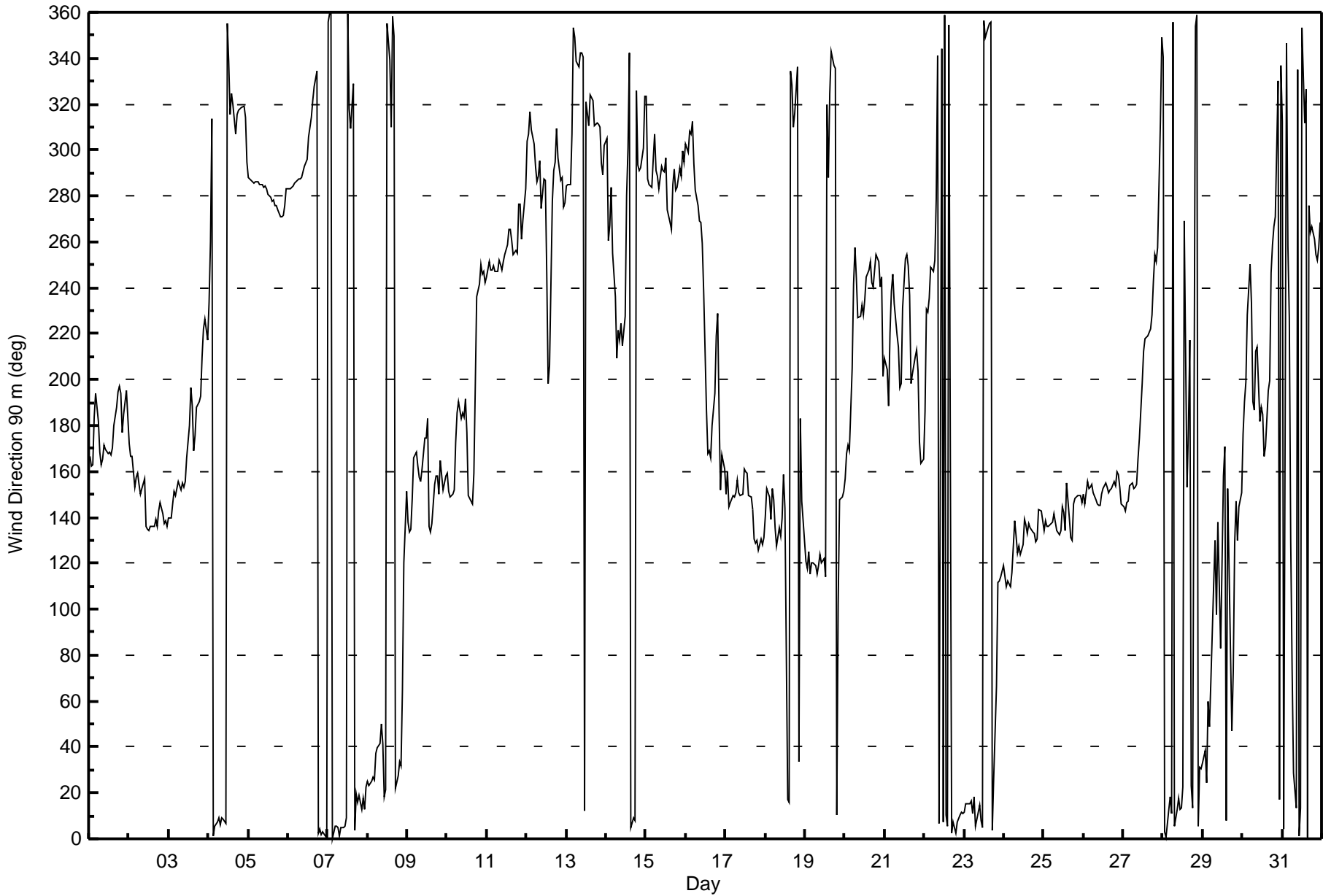
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction 90 m (WD90m) - deg

Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744																																															
Maximum Value: 87 deg on Dec 29 15:00														Hours of Data: 744																																															
Minimum Value: 1 deg on Dec 25 20:00														Hours of Missing Data: 0																																															
Percentiles: P ₁ = 2 P ₁₀ = 3 Q ₁ = 5 Median = 7 Q ₃ = 10 P ₉₀ = 16 P ₉₉ = 67														Hours of Calibration: 0																																															
														Percent Operational Time: 100.0																																															
Day	Hourly Period Ending At (MST)																								Daily Maximum																																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																					
1-Dec	6	6	5	10	9	7	6	5	5	5	5	7	7	6	6	4	5	3	7	7	4	8	8	11																																					
2-Dec	6	4	4	4	7	8	4	6	6	6	5	5	4	5	4	5	5	5	5	5	5	6	6	5																																					
3-Dec	5	9	5	4	5	4	4	4	3	4	5	5	7	8	13	4	5	5	7	7	7	7	6	8																																					
4-Dec	8	19	18	10	3	7	6	6	6	6	6	8	9	7	7	6	8	6	5	6	7	6	8	5																																					
5-Dec	6	5	5	4	5	4	5	5	5	5	5	5	5	5	5	5	6	5	5	5	5	5	6	6																																					
6-Dec	5	5	4	4	4	4	4	5	4	5	5	5	8	7	8	7	6	8	8	5	7	6	6	6																																					
7-Dec	10	7	7	9	5	5	6	6	6	5	5	6	15	15	8	17	8	9	8	10	9	10	6	5																																					
8-Dec	6	7	8	9	6	8	7	13	15	8	14	10	24	22	22	12	14	7	4	2	9	14	27	6																																					
9-Dec	8	5	6	10	6	10	4	1	1	4	6	10	22	15	5	10	2	4	5	6	6	4	2	2																																					
10-Dec	2	3	5	5	3	7	5	5	3	6	5	7	9	5	4	4	7	23	11	7	3	4	2	3																																					
11-Dec	6	6	5	4	5	6	6	6	7	5	7	6	6	9	7	5	5	7	6	8	8	7	7	8																																					
12-Dec	6	5	6	7	4	4	5	3	7	5	8	7	24	23	27	13	2	5	8	8	3	4	5	5																																					
13-Dec	5	5	6	29	9	6	7	8	8	8	10	11	18	7	6	9	9	7	6	8	5	8	2	9																																					
14-Dec	10	20	10	6	13	11	10	8	6	7	7	20	13	9	14	11	9	11	17	4	4	7	15	11																																					
15-Dec	11	5	4	4	8	6	3	6	4	4	3	5	15	7	7	4	13	4	4	5	4	5	4	3																																					
16-Dec	5	6	7	6	8	8	8	2	2	3	19	9	24	5	9	3	5	8	11	8	26	6	10	14																																					
17-Dec	5	2	9	2	5	3	3	3	4	3	3	6	5	7	3	3	9	5	7	6	6	4	4	6																																					
18-Dec	6	10	8	5	9	10	9	8	9	16	9	19	26	77	25	13	12	20	18	33	67	57	34	11																																					
19-Dec	15	8	9	9	10	5	5	9	7	8	11	11	87	13	14	10	9	10	10	16	44	10	6	8																																					
20-Dec	2	7	7	12	20	8	7	9	13	6	7	10	9	7	8	7	9	15	9	6	10	14	11	19																																					
21-Dec	15	15	11	9	9	7	7	10	6	13	12	9	9	7	7	9	10	6	5	8	7	14	16	14																																					
22-Dec	26	8	7	6	7	5	6	27	19	19	13	4	8	5	9	9	8	5	8	7	6	6	5	6																																					
23-Dec	5	6	8	9	5	6	6	9	5	5	5	5	9	10	7	6	4	8	7	24	8	8	7	8																																					
24-Dec	11	7	8	8	12	7	4	5	6	4	6	4	2	5	3	4	6	3	4	4	2	5	2	3																																					
25-Dec	3	1	3	2	2	3	1	3	2	2	4	3	6	4	7	7	4	3	6	1	2	3	2	2																																					
26-Dec	3	3	6	2	3	3	3	4	3	2	2	5	5	5	4	3	4	4	3	3	3	4	4	4																																					
27-Dec	5	4	3	5	5	4	3	5	6	4	6	7	6	7	8	6	6	9	7	7	6	4	31	10																																					
28-Dec	13	6	9	6	5	13	8	9	7	6	7	10	11	67	53	28	55	85	16	11	8	7	6	10																																					
29-Dec	10	16	11	17	8	30	52	23	17	30	15	83	29	50	87	16	46	22	12	20	39	19	21	8																																					
30-Dec	26	16	10	12	9	17	11	8	14	32	18	8	15	7	8	14	11	11	8	4	3	33	6	30																																					
31-Dec	11	14	30	19	18	26	16	11	19	32	18	16	18	14	46	16	31	4	4	5	4	4	9	5																																					
														26		20		30		29		20		30		52		27		19		32		19		83		87		77		87		28		55		85		18		33		67		57		34		30	
Diurnal Maximum																																																													





Maximum Value: 1.2 km/h on Dec 23 22:00																				Maximum Daily Average: 0.8 km/h on Dec 2					Hours in Service: 744		
Minimum Value: -0.8 km/h on Dec 31 23:00																				Minimum Daily Average: -0.4 km/h on Dec 11					Hours of Data: 685		
Maximum Diurnal Average: 0.2 km/h at hour 11																				Minimum Diurnal Average: -0.1 km/h at hour 19					Hours of Missing Data: 59		
Monthly Average: 0.08 km/h																				Percentiles: P ₁ = -0.6 P ₁₀ = -0.4 Q ₁ = -0.2 Median = 0.0 Q ₃ = 0.3 P ₉₀ = 0.7 P ₉₉ = 1.1					Hours of Calibration: 0		
																									Percent Operational Time: 92.1		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.5	0.8	0.6	0.0	-0.3	0.0	0.4	0.6	0.5	0.2	0.2	0.1	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.1	0.2	0.3	0.2	0.8	
2-Dec	0.3	0.7	0.7	0.7	0.7	0.5	0.6	0.8	0.7	0.9	0.8	0.8	0.7	0.7	0.8	0.9	0.9	0.9	0.8	1.0	1.0	0.9	1.0	0.9	0.8	1.0	
3-Dec	0.8	0.5	0.8	1.0	0.8	1.1	1.1	1.0	1.1	1.0	1.1	1.0	0.9	0.5	0.4	0.9	0.6	0.1	0.0	0.0	-0.1	-0.4	-0.3	-0.1	0.6	1.1	
4-Dec	0.0	0.0	-0.1	-0.1	-0.3	0.1	-0.1	-0.1	-0.1	-0.1	0.1	-0.1	0.0	-0.3	-0.4	-0.5	-0.4	-0.3	-0.5	-0.6	-0.4	-0.4	-0.5	-0.1	-0.4	-0.2	0.1
5-Dec	-0.5	-0.3	-0.5	-0.5	-0.6	-0.5	-0.4	-0.5	-0.5	-0.3	-0.4	-0.4	-0.5	-0.6	-0.6	-0.6	-0.4	-0.3	-0.3	-0.3	-0.4	-0.3	-0.1	-0.3	-0.4	-0.1	-0.1
6-Dec	-0.4	-0.2	-0.4	-0.5	-0.4	-0.4	-0.4	-0.2	-0.2	-0.5	-0.4	-0.3	-0.2	-0.4	-0.4	-0.2	-0.4	-0.3	-0.2	-0.1	0.0	-0.1	-0.1	-0.1	-0.3	0.0	0.0
7-Dec	0.1	0.1	0.0	-0.3	0.0	-0.2	-0.2	0.0	0.0	-0.2	0.0	0.0	-0.2	0.0	-0.1	0.0	-0.1	0.0	0.0	0.2	0.3	0.3	0.1	0.1	0.0	0.0	0.3
8-Dec	0.3	0.3	0.2	0.3	0.2	0.5	0.1	0.3	0.2	AF	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.0	AF	AF	AF	0.1	0.5	
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.3	0.3	0.1	-0.1	-0.2	-0.3	0.0	0.0	0.1	0.1	--	0.3	
10-Dec	0.1	0.1	0.2	AF	AF	AF	0.4	0.6	0.4	0.3	0.2	0.1	0.1	0.3	0.2	0.3	0.1	-0.3	-0.1	-0.2	-0.4	-0.4	-0.4	-0.4	0.1	0.6	
11-Dec	-0.2	-0.5	-0.6	-0.5	-0.5	-0.6	-0.4	-0.6	-0.4	-0.5	-0.5	-0.4	-0.4	-0.2	-0.4	-0.3	-0.4	-0.3	-0.4	-0.4	-0.4	-0.3	-0.3	-0.4	-0.4	-0.2	-0.2
12-Dec	-0.2	-0.2	-0.4	-0.5	-0.4	-0.7	-0.5	-0.6	-0.4	-0.3	-0.3	-0.2	-0.2	0.3	0.4	0.1	-0.1	-0.3	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4	-0.3	0.4	0.4
13-Dec	-0.3	-0.5	-0.6	-0.7	-0.4	-0.6	-0.2	-0.4	-0.2	-0.1	-0.2	0.2	0.0	-0.1	-0.2	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.3	-0.3	-0.2	-0.3	0.2	0.2
14-Dec	0.0	-0.1	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.0	0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	-0.3	0.0	0.2
15-Dec	-0.2	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.4	-0.3	-0.3	-0.2	-0.3	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1
16-Dec	-0.2	0.0	-0.1	-0.1	0.0	AF	AF	AF	AF	AF	AF	AF	AF	0.3	0.1	0.3	0.7	0.4	0.3	0.0	0.0	0.2	AF	AF	AF	--	0.7
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
18-Dec	0.0	-0.1	AF	AF	AF	AF	0.2	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.3	0.0	0.3	0.2	0.1	0.3	
19-Dec	0.3	0.5	0.7	0.9	0.7	0.6	0.6	1.2	0.6	0.4	0.8	0.5	0.3	0.0	-0.1	-0.1	0.0	-0.4	-0.2	0.0	0.2	0.2	0.2	0.3	0.3	1.2	
20-Dec	0.5	0.3	0.6	0.5	0.2	0.3	-0.3	-0.4	-0.3	-0.2	0.1	0.2	0.2	0.1	-0.2	-0.1	0.0	-0.1	-0.1	-0.1	0.2	0.2	0.1	0.3	0.1	0.6	
21-Dec	0.2	0.5	0.7	0.2	0.0	-0.4	0.0	-0.1	0.1	0.3	0.3	-0.2	-0.7	-0.8	-0.6	-0.3	-0.1	-0.2	-0.2	-0.2	0.1	0.9	0.7	0.2	0.0	0.9	
22-Dec	0.6	0.2	0.1	-0.5	-0.4	-0.6	-0.5	-0.2	-0.1	0.1	-0.2	-0.2	0.0	-0.1	0.0	0.0	-0.1	0.2	0.1	-0.1	0.0	-0.1	0.1	-0.1	-0.1	0.6	
23-Dec	0.0	0.2	0.1	0.2	0.3	0.2	0.2	0.1	0.0	0.1	0.0	0.0	-0.1	0.2	0.2	0.0	0.0	-0.1	-0.1	0.0	1.1	1.2	0.7	1.0	0.2	1.2	
24-Dec	0.6	0.9	0.7	0.8	0.3	0.6	0.3	-0.4	-0.3	-0.2	0.1	-0.4	-0.3	0.1	0.0	0.0	0.3	0.1	-0.1	0.0	0.5	0.6	0.3	0.3	0.2	0.9	
25-Dec	0.3	0.3	0.1	0.1	0.4	0.7	0.7	0.5	0.3	0.2	0.4	0.2	0.3	0.4	0.2	0.5	0.7	0.8	0.5	0.6	0.8	0.7	0.6	0.5	0.5	0.8	
26-Dec	0.6	0.7	0.8	0.8	0.8	0.7	0.6	0.6	0.8	0.8	0.9	0.7	0.9	1.0	0.9	0.7	0.9	0.6	0.7	0.7	0.6	0.8	0.5	0.8	0.7	1.0	
27-Dec	0.6	0.6	0.6	0.8	0.7	0.7	1.0	1.0	0.9	1.0	1.2	0.8	0.3	0.2	0.2	-0.1	-0.2	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	0.4	1.2	
28-Dec	-0.1	-0.1	0.0	0.0	0.2	0.1	-0.1	0.0	0.2	0.3	0.2	0.2	0.3	0.1	0.2	0.1	0.2	0.0	0.0	0.1	-0.1	-0.1	-0.1	0.0	0.1	0.3	
29-Dec	0.1	0.3	0.0	0.0	0.3	0.2	0.2	0.3	0.4	0.1	0.2	0.2	0.2	0.2	0.1	0.0	0.1	0.0	0.0	-0.1	-0.2	0.1	0.1	0.3	0.1	0.4	
30-Dec	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.3	0.1	0.1	0.0	0.5	0.4	0.5	0.6	0.9	0.5	0.2	-0.2	-0.2	-0.3	-0.3	-0.2	0.0	0.0	0.1	0.9	
31-Dec	-0.1	0.0	0.1	-0.1	0.0	0.3	0.3	0.3	0.1	0.0	0.0	0.1	0.0	0.2	0.2	0.4	-0.2	-0.4	-0.5	-0.5	-0.5	-0.6	-0.8	-0.5	-0.1	0.4	
																								Diurnal Average			
																								Diurnal Maximum			
AF - Analyzer Failure																											



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 20 m (VW20m) - km/h
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 3.1 km/h on Dec 21 14:00	Hours of Data: 685
Minimum Value: 0.2 km/h on Dec 14 05:00	Hours of Missing Data: 59
	Hours of Calibration: 0
	Percent Operational Time: 92.1
Percentiles: P ₁ = 0.2 P ₁₀ = 0.4 Q ₁ = 0.6 Median = 1.0 Q ₃ = 1.5 P ₉₀ = 2.0 P ₉₉ = 2.8	

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.4	1.3	1.2	1.3	1.6	1.6	1.2	1.1	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.0	0.9	0.8	0.9	0.9	0.8	0.7	0.4	0.6	1.6
2-Dec	0.7	1.0	1.1	1.2	1.3	0.9	0.9	1.3	1.3	1.4	1.7	1.5	1.7	1.8	1.9	2.1	2.1	2.4	1.8	2.0	1.9	2.0	2.1	2.2	2.4
3-Dec	1.9	1.7	1.7	1.8	1.8	1.8	1.8	1.7	1.6	1.6	1.7	1.3	1.0	0.6	0.8	1.1	1.0	1.4	1.3	1.3	1.5	1.3	1.2	1.0	1.9
4-Dec	0.3	0.3	1.0	2.4	3.1	2.3	2.7	2.8	2.7	2.5	2.0	1.6	1.6	1.8	1.6	2.0	1.9	2.3	2.4	2.3	2.0	1.9	2.1	2.1	3.1
5-Dec	2.3	2.5	2.5	2.6	2.5	2.6	2.6	2.9	2.8	2.7	2.7	2.4	2.1	2.1	2.0	2.0	1.8	1.6	1.5	1.5	1.4	1.4	1.4	2.1	2.9
6-Dec	2.0	2.0	2.0	1.7	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	1.8	1.9	1.7	1.8	1.6	1.4	1.2	1.5	1.5	1.8	1.5	1.4	2.0
7-Dec	1.2	1.4	1.3	1.5	1.5	1.8	1.8	1.4	1.8	1.7	2.0	1.7	1.3	1.0	0.7	0.7	0.4	0.3	0.6	0.9	1.2	1.0	1.1	1.5	2.0
8-Dec	1.5	1.5	1.3	1.2	1.3	1.3	1.0	0.8	0.7	AF	0.5	0.4	0.5	0.5	0.3	0.3	0.3	0.3	0.5	0.3	0.3	AF	AF	AF	1.5
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.6	0.5	0.7	0.7	0.6	0.5	0.4	0.3	0.4	0.4	0.7
10-Dec	0.4	0.6	0.7	AF	AF	AF	0.7	0.8	0.7	0.5	0.6	0.6	0.5	0.7	0.7	0.4	0.4	0.3	0.3	0.5	0.6	0.5	0.5	0.7	0.8
11-Dec	0.9	1.8	2.1	1.7	1.9	1.9	1.8	2.1	2.0	2.2	1.8	2.3	1.8	1.6	1.7	1.6	1.9	1.4	1.2	1.5	1.4	0.8	1.0	1.5	2.3
12-Dec	1.2	0.9	1.7	1.8	2.2	2.3	1.7	1.8	1.5	0.6	0.8	0.6	0.7	0.6	0.6	0.2	0.4	1.2	0.9	0.6	0.5	1.5	1.2	1.8	2.3
13-Dec	2.4	2.7	2.5	2.7	2.8	2.9	2.4	2.4	1.8	1.5	1.3	0.9	0.7	0.7	1.0	1.2	1.1	1.3	1.4	1.0	0.4	0.4	0.4	0.4	2.9
14-Dec	0.4	0.3	0.3	0.3	0.2	0.3	0.5	0.6	0.6	0.7	0.6	0.5	0.4	1.0	1.2	0.7	0.8	0.6	0.4	0.4	0.3	0.3	0.8	1.4	1.4
15-Dec	1.0	0.6	0.7	0.8	1.5	1.0	0.7	0.4	0.9	1.0	0.7	1.0	0.8	0.9	0.9	0.8	0.8	0.8	0.7	0.8	1.2	0.6	0.3	0.2	1.5
16-Dec	0.4	0.4	0.2	0.2	0.6	AF	AF	AF	AF	AF	AF	AF	0.5	0.5	0.7	0.8	0.6	0.3	0.4	0.3	0.3	AF	AF	AF	0.8
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
18-Dec	0.7	0.6	AF	AF	AF	AF	0.7	0.9	0.8	0.7	0.5	0.7	0.6	0.6	0.5	0.5	0.7	0.6	0.6	0.5	0.6	0.4	0.6	0.8	0.9
19-Dec	0.8	1.1	1.5	1.2	1.9	2.2	2.3	2.1	1.9	1.2	1.5	0.9	0.7	0.7	0.8	1.0	1.3	1.6	1.2	0.8	0.3	0.3	0.3	0.4	2.3
20-Dec	0.8	0.9	1.2	1.3	1.0	0.6	1.8	1.3	1.4	0.9	0.7	0.7	1.1	1.2	1.5	1.2	0.7	0.8	0.6	0.6	0.5	0.6	0.7	0.8	1.8
21-Dec	0.6	1.0	1.1	0.6	1.2	2.3	1.1	0.8	0.8	1.2	1.4	1.2	2.9	3.1	2.6	1.8	1.2	1.1	1.1	1.1	1.0	1.1	0.8	0.6	3.1
22-Dec	0.7	0.4	0.3	1.3	1.7	1.8	2.0	1.6	0.8	0.9	1.4	2.4	2.1	2.4	2.2	1.5	2.0	2.7	2.1	1.8	2.1	1.8	1.9	2.0	2.7
23-Dec	2.0	1.8	1.6	1.8	1.9	2.0	1.7	1.6	1.5	1.5	1.3	1.2	1.1	1.0	1.0	1.0	1.0	0.7	0.4	0.5	1.5	1.5	1.6	1.4	2.0
24-Dec	0.8	1.4	1.1	1.3	0.6	0.5	0.6	0.5	0.5	0.5	0.6	0.3	0.3	0.6	0.6	0.4	0.5	0.5	0.6	0.5	1.0	0.7	0.3	0.3	1.4
25-Dec	0.5	0.5	0.4	0.3	0.4	0.6	0.7	0.4	0.4	0.5	0.6	0.5	0.6	0.5	0.5	0.6	1.0	1.4	1.0	0.9	0.8	0.7	0.4	0.7	1.4
26-Dec	0.4	0.8	0.9	0.8	1.3	1.0	1.0	1.1	1.4	1.5	1.3	1.3	1.6	1.7	1.5	1.0	1.2	1.1	1.2	1.0	1.0	1.1	1.0	1.0	1.7
27-Dec	1.0	1.1	1.0	1.5	1.2	1.3	1.6	1.7	1.6	1.5	1.4	1.1	0.8	1.0	1.3	1.0	1.0	1.0	0.8	0.7	0.6	0.6	1.3	0.8	1.7
28-Dec	1.2	1.6	1.4	1.5	1.8	1.3	1.2	1.3	1.3	1.4	1.2	1.1	0.9	0.4	0.5	0.5	0.3	0.3	0.9	0.6	0.5	0.5	0.7	0.7	1.8
29-Dec	0.6	0.5	0.4	0.4	0.8	0.6	0.4	0.5	0.6	0.5	0.6	0.6	0.7	0.6	0.6	0.5	0.3	0.6	0.5	0.5	0.5	0.4	0.2	0.4	0.8
30-Dec	0.2	0.5	0.5	0.3	0.3	0.5	0.6	0.5	0.4	0.2	0.8	0.8	0.8	0.8	1.2	0.9	1.0	1.3	1.4	0.8	0.7	1.4	1.5	0.9	1.5
31-Dec	0.7	1.0	0.9	0.4	0.3	0.4	0.4	1.0	0.5	0.4	0.3	0.5	0.8	0.6	0.5	0.6	0.8	1.2	1.2	1.8	2.4	2.3	1.5	1.3	2.4
	2.4	2.7	2.5	2.7	3.1	2.9	2.7	2.9	2.8	2.7	2.7	2.4	2.9	3.1	2.6	2.1	2.1	2.7	2.4	2.3	2.4	2.3	2.1	2.2	
	Diurnal Maximum																								

AF - Analyzer Failure



Maximum Value: 2.2 km/h on Dec 27 10:00																				Maximum Daily Average: 1.5 km/h on Dec 26					Hours in Service: 744				
Minimum Value: -1.6 km/h on Dec 4 05:00																				Minimum Daily Average: -0.8 km/h on Dec 5					Hours of Data: 744				
Maximum Diurnal Average: 0.3 km/h at hour 11																				Minimum Diurnal Average: -0.1 km/h at hour 19					Hours of Missing Data: 0				
Monthly Average: 0.14 km/h																				Percentiles: P ₁ = -1.2 P ₁₀ = -0.8 Q ₁ = -0.5 Median = 0.0 Q ₃ = 0.6 P ₉₀ = 1.3 P ₉₉ = 1.9					Hours of Calibration: 0				
																				Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	1.1	1.3	1.3	0.5	0.2	0.6	1.0	1.0	0.9	0.7	0.7	0.7	0.6	0.7	0.6	0.4	0.4	0.4	0.5	0.5	0.8	0.5	0.3	0.6	0.7	1.3			
2-Dec	0.6	1.2	1.2	1.2	1.4	1.0	1.3	1.3	1.6	1.6	1.3	1.5	1.3	1.2	1.3	1.3	1.4	1.4	1.3	1.7	1.5	1.4	1.2	1.3	1.3	1.7			
3-Dec	1.4	1.0	1.5	1.9	1.5	1.8	1.9	1.9	2.0	1.9	1.8	1.6	1.3	0.7	0.9	1.6	1.4	0.7	0.6	0.5	0.0	0.0	-0.2	0.0	1.1	2.0			
4-Dec	0.0	-0.1	-0.4	-1.1	-1.6	-0.6	-1.2	-1.4	-1.1	-0.8	-0.7	-0.3	-0.9	-0.8	-1.0	-0.7	-0.6	-0.9	-1.1	-0.8	-0.8	-0.9	-0.4	-0.9	-0.8	0.0			
5-Dec	-0.9	-1.0	-0.9	-1.0	-1.1	-1.2	-1.0	-1.1	-1.1	-0.7	-0.9	-1.0	-0.8	-0.9	-0.9	-0.8	-0.5	-0.6	-0.5	-0.5	-0.5	-0.6	-0.4	-0.7	-0.8	-0.4			
6-Dec	-0.7	-0.5	-0.8	-0.7	-0.8	-0.8	-0.7	-0.6	-0.7	-0.8	-0.8	-0.9	-0.5	-0.7	-0.8	-0.6	-1.0	-0.6	-0.8	-0.8	-0.3	-0.8	-0.6	-0.6	-0.7	-0.3			
7-Dec	0.0	-0.6	-0.4	-0.7	-0.7	-0.9	-0.8	-0.6	-0.8	-0.9	-0.7	-0.7	-0.4	-0.4	-0.3	-0.1	-0.2	-0.1	-0.2	0.1	0.0	0.1	-0.2	-0.4	-0.4	0.1			
8-Dec	-0.3	-0.1	-0.2	0.0	-0.1	0.3	-0.3	0.3	0.1	0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.3	-0.3	-0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.3			
9-Dec	0.2	0.2	0.4	0.3	0.5	0.4	1.2	0.9	0.7	1.0	1.1	0.7	0.2	0.7	0.8	0.9	0.9	0.4	0.2	0.3	0.2	0.2	0.4	0.3	0.5	1.2			
10-Dec	0.5	0.3	0.6	0.7	0.6	0.6	0.5	0.6	0.7	0.4	0.4	0.2	0.0	0.6	0.5	0.4	0.4	0.1	0.0	-0.1	-0.3	-0.4	-0.5	-0.6	0.3	0.7			
11-Dec	-0.3	-0.5	-0.6	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.5	-0.5	-0.3	-0.5	-0.3	-0.4	-0.5	-0.5	-0.4	-0.5	-0.7	-0.7	-0.5	-0.6	-0.8	-0.5	-0.3			
12-Dec	-0.8	-0.5	-0.8	-0.8	-0.9	-1.2	-1.0	-1.1	-1.0	-0.6	-0.6	-0.4	-0.2	0.2	0.3	-0.1	-0.6	-0.8	-0.6	-0.4	-0.5	-0.8	-0.6	-0.7	-0.6	0.3			
13-Dec	-0.9	-1.0	-0.9	-1.3	-1.2	-1.6	-1.3	-0.9	-1.0	-0.7	-0.6	-0.1	0.0	-0.4	-0.8	-0.8	-0.6	-0.5	-0.7	-0.6	-0.5	-0.4	-0.5	-0.6	-0.7	0.0			
14-Dec	-0.3	-0.1	-0.1	-0.3	0.0	-0.1	0.3	0.2	0.0	0.1	0.1	0.0	-0.2	-0.3	-0.6	-0.2	-0.3	-0.4	-0.3	-0.3	-0.5	-0.3	-0.2	-0.7	-0.2	0.3			
15-Dec	-0.7	-0.3	-0.5	-0.6	-0.7	-0.8	-0.7	-0.6	-0.6	-0.8	-0.6	-0.6	-0.4	-0.4	-0.2	-0.3	-0.5	-0.6	-0.5	-0.7	-0.7	-0.3	-0.5	-0.4	-0.5	-0.2			
16-Dec	-0.5	-0.2	-0.3	-0.4	0.0	-0.2	0.1	-0.1	-0.1	-0.1	0.0	0.0	0.4	0.2	0.7	1.1	0.9	0.6	0.2	0.0	0.7	0.8	0.5	0.5	0.2	1.1			
17-Dec	1.2	1.3	1.2	0.9	1.0	1.1	1.3	0.7	1.0	1.0	1.0	1.1	0.8	0.8	0.9	1.1	0.7	0.7	1.2	0.9	1.1	0.9	1.0	0.6	1.0	1.3			
18-Dec	0.4	0.3	0.5	1.0	0.6	0.5	0.6	0.4	0.3	0.1	0.3	0.2	0.3	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.2	0.0	0.6	0.5	0.3	1.0			
19-Dec	0.6	0.9	1.0	1.0	0.9	0.7	0.6	1.4	0.6	0.5	0.9	0.6	0.5	-0.2	0.0	-0.4	-0.7	-0.9	-0.5	-0.3	0.3	0.5	0.6	0.8	0.4	1.4			
20-Dec	1.2	0.9	1.0	1.3	0.5	0.2	-0.6	-0.1	0.0	-0.2	0.1	0.2	0.4	-0.1	-0.2	-0.1	0.1	-0.1	-0.1	-0.2	0.1	0.2	0.0	0.8	0.2	1.3			
21-Dec	0.6	1.0	1.3	0.3	0.2	-0.4	0.0	0.2	0.4	0.5	0.8	-0.1	-0.6	-0.6	-0.4	-0.1	0.5	0.4	0.1	0.1	0.5	1.4	1.4	0.5	0.3	1.4			
22-Dec	1.2	0.2	0.0	-0.3	-0.5	-0.7	-0.5	-0.4	-0.4	-0.3	-0.7	-1.0	-0.6	-0.8	-0.7	-0.6	-0.8	-0.6	-0.6	-0.4	-0.7	-0.7	-0.6	-0.9	-0.5	1.2			
23-Dec	-0.9	-0.4	-0.3	-0.3	-0.3	-0.5	-0.3	-0.2	-0.5	-0.4	-0.6	-0.6	-0.2	0.0	-0.1	-0.4	-0.5	-0.4	-0.4	-0.2	1.4	1.7	0.5	1.4	-0.1	1.7			
24-Dec	0.8	0.9	0.7	0.9	0.5	0.9	0.6	0.5	0.3	0.4	0.5	0.4	0.1	0.7	0.4	0.4	0.6	0.5	0.4	0.3	1.1	0.8	0.6	1.0	0.6	1.1			
25-Dec	1.0	0.9	0.8	0.7	0.9	1.2	1.3	1.0	1.0	0.8	1.2	0.7	0.7	0.6	0.6	0.9	1.2	1.4	1.0	1.2	1.6	1.2	1.0	1.2	1.0	1.6			
26-Dec	1.2	1.4	1.2	1.3	1.8	1.5	1.4	1.2	1.7	1.8	1.8	1.5	1.6	1.8	1.7	1.4	1.6	1.2	1.5	1.2	1.2	1.4	1.2	1.6	1.5	1.8			
27-Dec	1.2	1.3	1.2	1.5	1.4	1.5	1.8	2.1	1.9	2.2	2.2	1.3	0.6	0.4	0.6	0.1	-0.1	0.1	-0.1	-0.3	-0.3	-0.4	-0.8	-0.6	0.8	2.2			
28-Dec	-0.5	-0.5	-0.5	-0.5	-0.3	-0.4	-0.5	-0.5	-0.1	-0.1	-0.2	-0.1	0.2	0.1	0.2	0.2	0.2	0.0	-0.3	0.0	-0.4	-0.2	-0.3	-0.2	-0.2	0.2			
29-Dec	0.1	0.2	-0.1	0.1	0.3	0.2	0.1	0.3	0.3	0.2	0.2	0.2	0.5	0.2	0.0	0.1	0.0	-0.2	-0.1	0.2	0.0	0.3	0.1	0.4	0.2	0.5			
30-Dec	0.0	0.0	0.1	-0.2	0.0	0.0	0.5	0.3	0.2	0.1	0.6	0.7	0.7	0.9	1.5	0.6	0.4	-0.3	-0.2	-0.5	-0.7	-0.8	-0.6	-0.2	0.1	1.5			
31-Dec	-0.5	-0.5	-0.2	0.0	0.1	0.3	0.1	0.0	0.0	-0.1	0.1	0.0	-0.2	0.0	0.0	0.4	-0.1	-0.3	-0.7	-0.6	-0.6	-0.6	-0.7	-0.7	-0.2	0.4			
																								Diurnal Average					
																								Diurnal Maximum					



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Vertical Wind Speed 45 m (VW45m) - km/h

Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.5 km/h on Dec 21 13:00 Minimum Value: 0.1 km/h on Dec 16 10:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.4 Q ₁ = 0.6 Median = 1.0 Q ₃ = 1.6 P ₉₀ = 2.1 P ₉₉ = 2.8																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.5	1.4	1.3	1.3	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.3	1.2	1.1	1.0	0.8	0.6	0.5	0.5	0.6	0.6	0.5	0.3	0.5	1.5
2-Dec	0.5	0.8	1.0	1.3	1.2	1.0	1.0	1.3	1.4	1.4	1.6	1.9	1.9	2.0	2.0	2.3	2.5	2.6	2.2	2.2	2.3	2.4	2.3	2.4	2.6
3-Dec	2.1	2.1	1.9	2.1	2.0	2.0	2.0	1.9	1.7	1.7	1.9	1.3	0.9	0.7	0.9	0.8	0.8	1.0	1.2	0.9	1.5	1.4	1.1	1.1	2.1
4-Dec	0.4	0.4	1.2	2.1	2.6	2.5	2.7	2.9	2.8	2.5	2.0	1.8	1.6	2.0	1.8	2.5	1.9	2.6	2.8	2.8	2.4	2.3	2.4	2.0	2.9
5-Dec	2.4	2.4	2.3	2.6	2.5	2.5	2.5	2.7	2.8	2.7	2.7	2.3	2.3	2.2	2.0	2.0	2.0	1.7	1.6	1.8	1.7	1.8	1.6	2.2	2.8
6-Dec	2.2	2.2	2.0	1.8	2.0	2.0	1.9	2.0	1.9	1.9	2.2	1.7	2.1	2.1	1.9	2.2	2.0	1.6	1.3	1.5	1.5	1.6	1.5	1.3	2.2
7-Dec	1.5	1.4	1.3	1.5	1.5	1.7	2.1	1.6	1.7	1.8	2.1	1.7	1.5	1.3	0.7	0.8	0.5	0.5	0.7	1.1	1.4	1.5	1.3	1.6	2.1
8-Dec	1.7	1.8	1.6	1.7	1.5	1.5	1.2	1.2	1.1	0.3	0.3	0.4	0.5	0.6	0.2	0.3	0.3	0.5	0.8	0.5	0.2	0.2	0.2	0.2	1.8
9-Dec	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.5	0.6	1.0	0.9	1.0	0.8	0.7	0.7	0.5	0.6	0.4	0.2	0.2	0.2	0.2	0.3	0.5	1.0
10-Dec	0.5	0.6	0.5	0.5	0.4	0.6	0.5	0.6	0.6	0.4	0.5	0.5	0.6	0.8	0.8	0.6	0.4	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.8
11-Dec	1.0	1.9	2.2	1.6	1.9	2.1	2.0	2.3	2.2	2.2	2.0	2.3	2.0	1.7	1.9	1.7	1.8	1.5	1.2	1.6	1.3	0.7	1.4	1.6	2.3
12-Dec	1.4	0.8	2.0	1.8	1.9	1.9	1.4	1.3	1.1	0.7	0.7	0.6	0.7	0.6	0.8	0.5	0.5	1.1	1.0	0.7	0.6	1.6	1.5	2.0	2.0
13-Dec	2.5	2.7	2.6	2.6	3.2	3.0	2.8	2.8	2.0	1.7	1.3	1.0	0.8	0.8	1.1	1.4	1.3	1.3	1.5	1.2	0.5	0.3	0.4	0.5	3.2
14-Dec	0.4	0.3	0.4	0.4	0.2	0.4	0.4	0.5	0.5	0.6	0.5	0.7	0.5	1.0	1.4	0.8	1.0	0.8	0.5	0.2	0.4	0.3	1.1	1.7	1.7
15-Dec	1.3	0.6	0.8	0.9	1.5	0.8	0.6	0.5	0.7	0.7	0.5	0.9	1.0	1.1	1.1	0.6	0.8	0.7	0.6	1.0	1.1	0.6	0.4	0.3	1.5
16-Dec	0.4	0.4	0.3	0.3	0.5	0.3	0.3	0.2	0.2	0.1	0.3	0.5	0.6	0.5	0.7	0.7	0.5	0.5	0.4	0.3	0.5	0.4	0.3	0.8	0.8
17-Dec	0.6	0.3	0.8	0.3	0.5	0.3	0.5	0.5	0.7	0.8	0.9	1.3	1.1	1.0	0.7	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.7	0.7	1.3
18-Dec	0.5	0.4	0.5	0.6	0.7	0.5	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.4	0.6	0.7	0.6	0.6	0.5	0.6	0.4	0.6	0.8
19-Dec	0.9	1.3	1.6	1.5	2.1	2.4	2.5	2.6	2.2	1.5	1.8	1.0	0.8	0.8	0.9	1.1	1.3	1.8	1.6	0.8	0.5	0.2	0.2	0.2	2.6
20-Dec	0.7	0.7	1.1	1.3	1.2	1.2	1.7	1.6	1.8	1.0	1.0	1.1	1.3	1.3	1.5	1.3	1.1	1.2	1.0	0.9	0.8	1.1	1.1	0.9	1.8
21-Dec	0.8	1.1	1.0	0.9	2.0	2.7	1.5	1.1	0.8	1.1	1.1	1.5	3.5	3.3	2.9	2.0	1.0	1.1	1.1	1.1	0.9	1.2	1.0	0.8	3.5
22-Dec	0.9	0.8	0.6	1.3	1.7	1.6	2.1	1.6	1.0	1.2	1.8	1.9	2.2	2.0	2.3	1.6	1.9	2.2	2.0	1.9	2.0	1.9	2.0	1.9	2.3
23-Dec	1.9	2.0	1.8	2.0	2.1	2.1	1.8	1.8	1.6	1.5	1.4	1.0	1.3	1.2	1.0	0.9	0.8	0.6	0.4	0.6	1.7	1.9	1.7	1.7	2.1
24-Dec	1.0	1.5	1.2	1.5	0.8	0.9	0.7	0.3	0.5	0.6	1.0	0.4	0.2	0.4	0.5	0.3	0.3	0.5	0.5	0.5	1.0	0.7	0.2	0.3	1.5
25-Dec	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.8	0.5	0.4	0.5	0.8	1.6	1.1	0.8	0.9	0.8	0.5	0.4	1.6
26-Dec	0.3	0.6	0.8	0.8	1.1	1.0	1.0	1.0	1.3	1.3	1.1	1.3	1.8	2.0	1.6	1.0	1.4	1.2	1.4	1.0	1.0	1.2	0.9	1.1	2.0
27-Dec	1.0	1.1	1.0	1.4	1.3	1.3	1.6	1.7	1.7	1.4	1.5	1.1	1.1	1.6	1.8	1.2	1.1	1.2	0.9	1.0	1.0	0.8	1.5	0.9	1.8
28-Dec	1.5	1.5	1.6	1.5	1.8	1.4	1.1	1.3	1.6	1.5	1.4	1.2	1.2	0.4	0.5	0.5	0.4	0.3	1.0	0.8	0.7	0.7	0.8	0.8	1.8
29-Dec	0.8	0.8	0.6	0.5	0.8	0.6	0.4	0.5	0.7	0.6	0.7	0.6	0.6	0.7	0.5	0.5	0.4	0.4	0.4	0.7	0.7	0.7	0.4	0.5	0.8
30-Dec	0.3	0.3	0.4	0.3	0.3	0.3	0.5	0.5	0.4	0.2	0.8	0.8	0.8	0.9	1.2	0.8	0.9	1.6	1.6	0.9	1.0	1.2	1.7	1.1	1.7
31-Dec	0.8	1.1	1.1	0.4	0.4	0.5	0.5	1.2	0.6	0.4	0.3	0.6	0.7	0.6	0.5	0.8	0.4	0.8	0.7	1.8	2.3	1.9	1.3	1.4	2.3
	2.5	2.7	2.6	2.6	3.2	3.0	2.8	2.9	2.8	2.7	2.7	2.3	3.5	3.3	2.9	2.5	2.5	2.6	2.8	2.8	2.4	2.4	2.4	2.4	
	Diurnal Maximum																								



Maximum Value: 1.7 km/h on Dec 27 10:00 Maximum Daily Average: 0.8 km/h on Dec 26		Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Hours of Calibration: 0 Percent Operational Time: 99.2																									
Minimum Value: -0.9 km/h on Dec 4 09:00 Maximum Diurnal Average: 0.3 km/h at hour 4 Monthly Average: 0.19 km/h		Minimum Daily Average: -0.1 km/h on Dec 7 Minimum Diurnal Average: 0.1 km/h at hour 19 Percentiles: $P_1 = -0.7$ $P_{10} = -0.2$ $Q_1 = 0.0$ Median = 0.1 $Q_3 = 0.3$ $P_{90} = 0.7$ $P_{99} = 1.2$																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.6	0.8	1.0	0.2	0.0	0.3	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.2	0.2	0.3	0.4	0.3	0.1	0.3	0.4	1.0	
2-Dec	0.2	0.6	0.8	0.8	0.9	0.7	1.0	0.7	1.1	1.1	0.2	0.2	0.0	0.1	0.0	-0.3	0.2	-0.2	0.2	0.5	0.2	0.1	-0.1	-0.1	0.4	1.1	
3-Dec	0.2	0.0	0.4	1.1	0.7	0.9	1.3	1.0	1.3	1.2	1.2	0.9	0.7	0.3	0.4	0.9	0.7	0.3	0.2	0.2	-0.1	0.0	-0.1	0.0	0.6	1.3	
4-Dec	0.0	0.0	0.0	-0.5	-0.9	-0.1	-0.8	-0.7	-0.9	-0.4	0.0	0.4	-0.5	0.2	-0.4	0.2	0.4	0.1	0.1	0.1	0.0	-0.1	0.5	0.2	-0.1	0.5	
5-Dec	0.2	0.1	0.3	0.2	0.0	0.0	0.3	0.2	0.1	0.5	0.2	0.1	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.5	
6-Dec	0.2	0.3	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.4	0.3	0.2	0.0	-0.3	-0.1	-0.6	-0.7	0.3	-0.1	-0.2	-0.2	0.0	0.4	
7-Dec	0.6	-0.2	0.0	-0.3	-0.4	-0.6	-0.3	-0.3	-0.4	-0.6	-0.4	-0.5	-0.2	-0.1	0.1	0.2	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.0	-0.1	0.6	
8-Dec	-0.2	0.0	-0.1	0.1	0.1	0.4	-0.1	0.2	-0.1	0.1	0.0	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.2	0.1	0.1	0.1	0.2	0.0	0.4	
9-Dec	0.1	0.3	0.4	0.4	0.3	0.3	0.8	0.8	0.7	1.1	1.0	0.4	0.1	0.2	0.2	0.3	0.8	0.3	0.2	0.4	0.2	0.4	0.5	0.5	0.4	1.1	
10-Dec	0.7	0.0	-0.1	0.1	0.2	0.2	0.2	0.3	0.5	0.4	0.4	0.0	0.2	0.4	0.2	0.0	0.3	0.2	0.1	0.0	-0.2	-0.4	-0.5	-0.5	0.1	0.7	
11-Dec	-0.2	0.1	-0.1	0.0	0.0	-0.1	0.0	0.0	0.3	-0.1	-0.1	0.2	0.3	0.3	0.2	0.1	0.1	0.1	-0.1	0.2	0.2	-0.1	-0.1	0.1	0.1	0.3	
12-Dec	0.1	0.3	0.0	0.4	0.3	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.2	0.4	0.2	0.2	0.3	0.2	0.3	0.3	0.2	0.4	
13-Dec	0.3	0.3	0.4	0.1	-0.3	-0.8	-0.7	-0.3	-0.5	-0.1	-0.2	-0.1	0.3	-0.1	-0.4	-0.1	-0.1	0.3	0.1	0.1	0.0	0.0	0.1	-0.1	0.4	0.4	
14-Dec	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	-0.2	-0.2	-0.2	-0.1	0.2	0.4	-0.2	0.1	-0.1	-0.2	-0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.4	
15-Dec	-0.1	0.2	0.1	0.1	0.3	0.0	-0.1	0.1	0.2	-0.1	-0.1	0.0	0.1	0.1	0.3	0.2	0.1	0.1	0.0	-0.1	0.2	0.1	0.0	0.1	0.1	0.3	
16-Dec	0.2	0.2	0.1	0.1	0.5	0.2	0.4	0.2	0.1	0.0	0.1	0.0	0.4	0.4	0.5	0.6	0.3	0.2	0.0	0.1	0.3	0.8	0.6	0.4	0.3	0.8	
17-Dec	0.8	1.0	0.8	0.8	0.7	1.1	1.2	0.9	1.1	0.5	0.5	1.0	0.6	0.6	0.8	0.6	AF	AF	AF	AF	AF	AF	-0.3	0.1	0.7	1.2	
18-Dec	0.5	0.4	0.5	0.4	0.6	0.4	0.3	0.1	0.1	0.1	0.3	0.3	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.3	0.0	0.2	0.3	0.2	0.6	
19-Dec	0.2	0.5	0.1	0.7	0.0	-0.6	-0.8	0.5	-0.3	-0.3	0.4	0.3	0.6	0.1	0.3	0.0	-0.4	-0.4	0.0	-0.1	0.1	0.3	0.4	0.6	0.1	0.7	
20-Dec	1.3	0.7	0.7	0.9	0.1	0.0	0.0	0.2	0.2	-0.2	0.2	0.3	0.4	0.3	0.3	0.4	0.4	-0.1	-0.1	0.0	0.3	0.1	0.4	0.4	0.3	1.3	
21-Dec	0.1	0.3	0.7	0.0	0.4	0.3	0.2	0.2	0.1	0.3	0.2	0.0	0.3	0.2	0.3	0.2	0.1	0.0	-0.1	-0.1	0.1	0.9	0.9	0.3	0.2	0.9	
22-Dec	0.5	0.1	0.0	0.0	-0.1	-0.1	0.0	0.3	-0.2	-0.2	-0.2	-0.4	0.0	-0.3	-0.2	0.1	-0.2	-0.1	-0.1	0.3	0.0	-0.4	-0.6	-0.6	-0.1	0.5	
23-Dec	-0.7	-0.2	0.0	-0.1	-0.2	-0.1	-0.1	0.3	0.1	-0.2	-0.3	-0.2	0.3	0.2	0.2	0.0	-0.1	-0.1	-0.1	0.0	1.1	1.2	0.0	0.8	0.1	1.2	
24-Dec	0.5	0.7	0.5	0.5	0.3	0.1	0.0	-0.1	0.0	-0.2	-0.3	-0.1	0.2	0.2	0.1	0.2	0.1	-0.1	0.1	-0.1	0.0	0.3	0.3	0.2	0.1	0.7	
25-Dec	0.2	0.2	0.1	0.4	0.5	0.1	0.0	-0.2	-0.2	-0.2	-0.1	0.1	0.0	0.0	0.5	0.1	0.0	0.1	0.4	0.4	0.7	0.4	0.3	0.3	0.2	0.7	
26-Dec	0.3	0.3	0.5	0.6	1.0	1.1	0.8	0.4	0.6	0.7	0.8	0.9	1.0	1.2	1.2	0.8	1.0	0.8	1.1	0.8	0.9	1.1	0.7	0.4	0.8	1.2	
27-Dec	0.1	0.2	0.2	0.3	1.0	1.0	1.2	1.2	1.2	1.7	1.6	0.5	0.4	0.4	0.8	0.1	0.0	0.4	0.1	0.0	-0.1	0.0	-0.1	-0.1	0.5	1.7	
28-Dec	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.2	0.0	-0.1	0.1	0.3	0.1	0.2	0.1	0.1	0.0	-0.1	-0.2	-0.4	0.0	0.0	0.0	0.0	0.3	
29-Dec	0.1	0.1	0.1	0.2	0.3	0.1	0.2	0.1	0.3	0.2	0.2	0.2	0.7	0.2	0.0	0.2	0.1	0.1	0.0	0.2	0.2	0.2	0.1	0.4	0.2	0.7	
30-Dec	0.1	0.1	0.2	0.0	0.2	0.1	0.3	0.2	0.0	0.0	0.3	0.3	0.4	0.6	1.0	0.3	0.2	0.0	0.2	0.1	-0.1	-0.2	-0.3	0.1	0.2	1.0	
31-Dec	-0.2	-0.2	0.0	0.1	0.2	0.1	0.0	-0.1	0.0	0.0	0.1	0.1	-0.1	0.0	0.0	0.1	0.0	0.2	0.0	0.1	0.2	0.1	-0.2	-0.1	0.0	0.2	
	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	Diurnal Average		
	1.3	1.0	1.0	1.1	1.0	1.1	1.3	1.2	1.3	1.7	1.6	1.0	1.0	1.2	1.2	0.9	1.0	0.8	1.1	0.8	1.1	1.2	0.9	0.8	Diurnal Maximum		
AF - Analyzer Failure																											



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 75 m (VW75m) - km/h
Mannix - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.8 km/h on Dec 21 13:00 Minimum Value: 0.2 km/h on Dec 9 05:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.4 Q ₁ = 0.5 Median = 1.0 Q ₃ = 1.6 P ₉₀ = 2.0 P ₉₉ = 2.7																								Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Hours of Calibration: 0 Percent Operational Time: 99.2		
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.5	1.3	1.3	1.3	1.3	1.3	1.2	1.1	1.1	0.9	1.0	1.2	1.2	1.1	1.1	0.7	0.4	0.2	0.4	0.4	0.3	0.4	0.2	0.6	1.5	
2-Dec	0.3	0.5	0.6	1.0	1.0	0.6	0.7	0.8	1.1	1.1	1.2	1.9	1.6	1.7	1.6	2.0	2.2	2.4	1.9	2.0	2.0	2.4	2.0	2.3	2.4	
3-Dec	1.8	2.3	1.6	1.9	1.8	1.8	1.6	1.7	1.3	1.5	1.6	1.0	0.8	1.0	1.1	0.8	0.7	1.0	1.0	0.9	1.3	1.3	1.2	0.9	2.3	
4-Dec	0.6	0.6	1.3	1.7	1.8	2.1	2.2	2.8	2.5	2.2	1.9	1.9	1.5	1.9	1.6	2.2	1.8	2.4	2.4	2.5	2.2	2.1	2.2	1.9	2.8	
5-Dec	2.2	2.2	2.2	2.4	2.3	2.3	2.3	2.6	2.8	2.5	2.5	2.2	2.1	2.2	2.1	2.0	2.2	1.9	1.6	1.9	1.8	1.8	1.6	2.2	2.8	
6-Dec	2.1	2.0	1.8	1.6	1.8	1.8	1.7	1.7	1.8	1.7	1.9	1.6	2.1	2.1	2.0	2.0	1.7	1.4	1.4	1.4	1.5	1.6	1.4	1.4	2.1	
7-Dec	1.8	1.4	1.4	1.6	1.4	1.6	1.9	1.5	1.7	1.7	1.9	1.6	1.7	1.3	0.9	1.0	0.6	0.6	0.8	1.3	1.4	1.4	1.2	1.2	1.9	
8-Dec	1.5	1.8	1.5	1.6	1.4	1.3	1.1	1.2	1.2	0.5	0.4	0.6	0.7	0.6	0.2	0.3	0.3	0.4	0.4	0.3	0.2	0.3	0.4	0.2	1.8	
9-Dec	0.4	0.3	0.3	0.2	0.2	0.3	0.4	0.3	0.4	0.7	0.6	0.7	0.5	0.5	0.4	0.4	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.7	
10-Dec	0.4	0.5	0.5	0.3	0.3	0.5	0.6	0.5	0.5	0.3	0.4	0.5	0.5	0.6	0.5	0.6	0.2	0.2	0.3	0.6	0.3	0.4	0.4	0.5	0.6	
11-Dec	1.0	1.9	1.9	1.4	1.7	1.8	1.8	2.1	2.0	1.8	2.0	2.1	2.1	2.0	2.1	1.6	1.5	1.6	1.2	1.4	1.2	0.8	1.6	1.7	2.1	
12-Dec	1.6	0.9	1.8	1.6	1.8	1.7	1.3	1.1	1.0	0.7	0.8	0.7	0.6	0.5	0.9	0.7	0.5	1.1	0.9	0.5	0.7	1.4	1.6	2.0	2.0	
13-Dec	2.3	2.5	2.5	2.6	3.4	2.7	2.7	2.7	1.7	1.4	1.1	1.0	1.0	0.8	1.1	1.3	1.2	1.3	1.3	1.0	0.7	0.4	0.4	0.5	3.4	
14-Dec	0.5	0.3	0.5	0.5	0.3	0.5	0.6	0.6	0.6	0.5	0.7	1.0	0.6	1.0	1.0	0.8	1.0	1.0	0.6	0.3	0.5	0.4	1.3	1.5	1.5	
15-Dec	1.1	0.6	0.9	1.0	1.3	0.7	0.7	0.6	0.7	0.8	0.5	0.9	1.1	1.2	1.2	0.6	0.8	0.7	0.6	1.0	1.0	0.8	0.6	0.3	1.3	
16-Dec	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.2	0.3	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.3	0.4	0.2	0.2	0.3	0.3	0.2	0.4	0.5	
17-Dec	0.7	0.2	0.3	0.3	0.4	0.2	0.3	0.4	0.4	0.4	0.4	0.7	0.9	0.8	0.7	0.5	0.4	AF	AF	AF	AF	AF	AF	1.3	1.0	1.3
18-Dec	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.8	0.7	0.6	0.5	0.6	0.5	0.5	0.3	0.5	0.6	0.5	0.6	0.5	0.7	0.4	0.8	0.8	0.8	
19-Dec	1.0	1.6	1.7	1.9	2.5	2.4	2.4	2.9	2.3	1.5	2.0	1.1	0.8	0.5	0.6	0.9	0.9	1.5	1.6	0.8	0.6	0.2	0.2	0.3	2.9	
20-Dec	0.5	0.8	1.1	1.0	1.3	1.6	2.0	1.8	2.3	1.3	1.5	1.2	1.3	1.4	1.6	1.5	1.3	1.5	1.3	1.2	1.3	1.4	1.3	1.1	2.3	
21-Dec	1.1	1.0	0.8	1.2	2.5	2.6	1.5	1.3	0.8	1.2	1.4	1.8	3.8	3.5	2.9	2.2	1.3	1.2	1.3	1.2	1.1	1.3	0.7	0.6	3.8	
22-Dec	0.7	0.9	0.8	1.3	1.8	1.6	1.8	1.5	1.1	1.3	1.5	1.4	1.8	1.7	2.0	1.6	1.9	2.0	1.8	1.8	1.9	1.8	1.9	1.9	2.0	
23-Dec	1.8	1.9	1.5	1.6	1.7	1.7	1.5	1.8	1.4	1.4	1.1	0.9	1.2	1.0	0.8	0.7	0.5	0.4	0.3	0.9	2.3	2.4	2.1	2.1	2.4	
24-Dec	1.3	2.0	1.6	1.9	1.2	1.2	0.4	0.7	1.2	1.0	1.4	1.0	0.2	0.4	0.3	0.3	0.6	0.7	0.6	0.7	0.8	0.4	0.3	0.3	2.0	
25-Dec	0.4	0.3	0.3	0.4	0.4	0.6	0.4	0.6	0.9	0.9	0.9	0.3	0.6	0.6	0.4	0.4	1.2	1.5	0.7	0.5	0.7	0.7	0.5	0.4	1.5	
26-Dec	0.5	0.6	0.9	0.8	0.9	0.8	1.0	1.1	1.0	0.8	0.9	1.3	1.7	2.0	1.5	1.0	1.4	1.2	1.3	1.1	0.9	1.0	0.9	0.7	2.0	
27-Dec	0.8	0.7	0.6	0.9	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.3	1.3	1.7	1.8	1.3	1.3	1.4	1.1	1.3	1.3	0.9	1.2	1.8	
28-Dec	1.4	1.3	1.5	1.4	1.5	1.6	0.9	1.2	1.6	1.2	1.2	1.2	1.3	0.3	0.6	0.4	0.3	0.3	0.8	0.8	0.7	0.7	0.5	0.7	1.6	
29-Dec	0.9	0.8	0.6	0.7	0.7	0.6	0.4	0.6	0.9	0.7	0.9	0.6	0.6	0.7	0.5	0.6	0.6	0.4	0.5	1.0	0.9	0.8	0.6	0.5	1.0	
30-Dec	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.6	0.5	0.3	0.6	0.7	0.5	0.7	0.6	0.8	1.0	1.8	1.9	1.1	1.0	1.2	1.7	1.3	1.9	
31-Dec	0.9	1.1	1.1	0.4	0.5	0.5	0.5	1.0	0.6	0.5	0.3	0.7	0.7	0.6	0.7	0.7	0.4	0.6	0.7	1.7	1.9	1.5	1.5	1.5	1.9	
2.3 2.5 2.5 2.6 3.4 2.7 2.7 2.9 2.8 2.5 2.5 2.2 3.8 3.5 2.9 2.2 2.2 2.4 2.4 2.5 2.3 2.4 2.2 2.3																										
Diurnal Maximum																										
AF - Analyzer Failure																										



Maximum Value: 3.9 km/h on Dec 12 05:00																				Maximum Daily Average: 2.5 km/h on Dec 5					Hours in Service: 744																							
Minimum Value: -1.6 km/h on Dec 19 07:00																				Minimum Daily Average: -0.1 km/h on Dec 21					Hours of Data: 744																							
Maximum Diurnal Average: 1.0 km/h at hour 4																				Minimum Diurnal Average: 0.6 km/h at hour 20					Hours of Missing Data: 0																							
Monthly Average: 0.77 km/h																				Percentiles: P ₁ = -0.6 P ₁₀ = 0.0 Q ₁ = 0.2 Median = 0.5 Q ₃ = 1.1 P ₉₀ = 2.3 P ₉₉ = 3.3					Hours of Calibration: 0																							
																				Percent Operational Time: 100.0																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0.6	0.7	0.8	0.2	-0.1	0.3	0.5	0.5	0.5	0.3	0.4	0.3	0.4	0.4	0.3	0.4	0.2	0.1	0.1	0.1	0.5	0.3	0.0	0.2	0.3	0.8																						
2-Dec	0.2	0.4	0.6	0.9	1.0	0.7	1.1	1.0	1.3	1.0	0.5	0.3	0.2	0.3	0.5	-0.1	0.3	0.0	0.4	0.6	0.5	0.1	0.2	0.1	0.5	1.3																						
3-Dec	0.5	0.1	0.6	1.3	0.9	1.0	1.3	1.0	1.3	1.2	1.1	0.7	0.6	0.2	0.2	0.7	0.7	0.2	0.0	0.1	-0.2	0.1	0.1	0.1	0.6	1.3																						
4-Dec	0.1	0.6	1.3	1.4	1.5	1.7	0.9	1.3	0.9	1.3	1.6	2.0	1.1	2.3	1.5	2.4	3.0	3.0	3.1	3.0	2.3	2.0	3.0	2.6	1.8	3.1																						
5-Dec	2.5	2.6	2.8	3.0	2.6	2.7	3.0	2.9	2.9	3.1	2.9	2.7	2.7	2.5	2.6	2.6	2.4	2.3	2.2	1.8	2.0	1.8	2.1	2.5	2.5	3.1																						
6-Dec	2.5	2.4	2.4	2.4	2.6	2.7	2.6	2.7	2.6	2.6	2.6	2.6	2.5	2.6	2.3	2.0	1.5	1.6	0.3	0.5	1.6	1.2	0.9	0.9	2.0	2.7																						
7-Dec	1.7	1.0	1.1	0.9	0.9	0.7	1.0	0.7	0.9	1.0	1.0	0.6	0.7	1.2	1.3	1.1	0.6	0.4	0.5	0.7	0.8	0.4	1.0	0.8	0.9	1.7																						
8-Dec	0.5	0.8	0.6	0.4	0.7	0.7	0.3	0.3	-0.1	0.3	0.2	0.3	0.4	0.2	0.3	0.3	0.4	0.3	0.3	0.5	0.2	0.2	0.0	0.2	0.3	0.8																						
9-Dec	0.3	0.2	0.2	0.2	0.1	0.3	0.5	0.6	0.8	0.9	0.9	0.4	0.1	0.1	0.2	0.2	0.7	0.4	0.4	0.5	0.3	0.5	0.7	0.9	0.4	0.9																						
10-Dec	1.0	0.7	0.5	0.6	0.6	0.4	0.3	0.2	0.7	0.4	0.5	0.1	0.4	0.5	0.5	0.3	0.4	0.3	0.5	0.5	0.5	0.4	0.4	0.2	0.5	1.0																						
11-Dec	0.5	1.3	1.2	1.0	1.2	0.9	0.8	1.1	1.5	1.0	0.9	1.5	1.7	1.8	1.8	1.6	1.5	1.3	0.9	2.5	2.4	1.2	1.6	2.6	1.4	2.6																						
12-Dec	2.9	2.9	2.8	3.6	3.9	3.6	3.0	3.4	3.6	2.5	2.7	1.9	0.3	0.0	0.3	1.2	2.9	3.6	2.2	1.8	2.8	3.2	2.5	2.9	2.5	3.9																						
13-Dec	3.3	3.2	3.4	3.6	2.1	1.8	1.7	2.1	1.4	1.6	1.3	0.3	1.0	1.1	1.2	1.7	1.6	2.5	2.5	1.9	1.7	1.6	2.3	2.0	2.0	3.6																						
14-Dec	1.3	0.7	1.1	2.0	1.1	0.4	0.0	0.1	-0.1	0.0	-0.2	0.1	1.4	2.0	1.4	1.1	0.6	0.4	1.2	1.9	2.2	1.6	1.5	1.9	1.0	2.2																						
15-Dec	1.7	2.1	2.2	2.3	3.2	2.2	2.2	2.6	2.6	1.9	1.8	1.8	1.4	1.1	1.4	1.4	2.2	2.3	1.9	1.8	2.6	1.9	2.3	2.3	2.0	3.2																						
16-Dec	2.2	1.7	1.3	1.4	2.0	1.6	1.6	1.3	1.1	0.8	0.6	0.2	0.3	0.4	0.5	0.4	0.5	0.0	0.0	0.1	0.2	0.6	0.4	0.5	0.8	2.2																						
17-Dec	1.0	0.7	0.7	0.6	0.8	0.8	1.1	0.8	0.8	0.7	0.7	1.1	0.5	0.5	1.0	0.8	0.6	0.2	-0.2	-0.6	-0.4	-0.3	-0.6	-0.2	0.5	1.1																						
18-Dec	0.2	0.4	0.3	0.4	0.5	0.2	0.0	-0.2	0.1	0.0	0.1	0.3	0.0	0.2	0.2	0.7	0.7	0.7	0.8	0.4	0.5	0.1	0.2	0.2	0.3	0.8																						
19-Dec	0.1	0.2	-0.3	0.2	-0.6	-1.4	-1.6	-0.3	-0.8	-0.5	-0.1	0.2	0.6	0.9	1.3	1.1	1.1	1.4	1.3	0.4	0.2	0.2	0.3	0.5	0.2	1.4																						
20-Dec	1.1	0.5	0.4	0.5	0.0	0.8	1.7	1.1	0.5	0.2	0.6	0.7	0.8	0.4	0.3	0.3	0.3	-0.3	-0.2	-0.1	0.2	0.0	0.3	0.2	0.4	1.7																						
21-Dec	-0.2	0.0	0.1	-0.2	0.2	0.1	0.0	-0.1	-0.2	-0.4	-0.4	-0.2	-0.1	-0.2	0.0	-0.1	-0.4	-0.6	-0.6	-0.6	-0.4	0.5	0.6	0.2	-0.1	0.6																						
22-Dec	0.3	0.0	-0.1	-0.3	-0.3	-0.3	-0.1	0.3	0.1	0.2	0.3	0.5	0.8	0.6	0.7	0.7	0.7	1.2	0.8	1.2	0.8	0.3	0.2	0.3	0.4	1.2																						
23-Dec	0.2	0.5	0.6	0.5	0.5	0.9	0.8	1.0	0.8	0.5	0.3	0.2	0.6	0.4	0.5	0.3	0.3	0.3	0.3	0.2	0.8	1.0	0.1	0.4	0.5	1.0																						
24-Dec	0.4	0.5	0.3	0.4	0.3	0.2	0.2	0.0	-0.3	-0.2	-0.5	-0.1	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.0	0.4	0.4	0.3	0.6	0.2	0.6																						
25-Dec	0.8	0.5	0.6	0.8	0.8	1.0	0.6	0.5	0.7	0.4	0.8	0.4	0.4	0.6	0.2	0.5	0.5	0.5	0.5	0.4	0.4	0.2	0.2	0.5	0.5	1.0																						
26-Dec	0.4	0.5	0.0	0.0	0.4	0.4	0.5	0.4	0.8	1.0	1.0	0.5	0.5	0.6	0.7	0.3	0.6	0.3	0.4	0.2	0.1	0.2	0.3	0.7	0.4	1.0																						
27-Dec	0.5	0.6	0.3	0.4	0.5	0.4	0.9	1.0	0.9	0.5	0.6	-0.2	0.1	0.2	0.5	-0.1	-0.3	0.1	-0.1	-0.2	-0.2	-0.1	0.2	0.5	0.3	1.0																						
28-Dec	0.4	0.5	0.7	0.8	0.7	0.5	0.3	0.4	0.8	0.5	0.3	0.4	0.5	0.1	0.2	0.0	0.1	0.2	0.2	-0.1	0.0	0.6	0.5	0.3	0.4	0.8																						
29-Dec	0.3	0.3	0.4	0.4	0.5	0.2	0.2	0.1	0.3	0.1	0.3	0.3	0.7	0.1	0.1	0.1	0.2	0.3	0.1	0.2	0.1	0.2	0.1	0.4	0.3	0.7																						
30-Dec	0.1	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.2	0.3	-0.2	-0.1	-0.2	0.1	-0.1	-0.3	0.3	0.4	0.3	0.0	0.4																						
31-Dec	-0.1	0.3	0.4	0.1	0.1	0.0	0.2	0.4	0.3	0.2	0.2	0.3	0.1	0.0	0.1	0.3	0.1	0.0	-0.2	-0.2	-0.1	-0.2	-0.4	-0.3	0.1	0.4																						
																								0.9	0.9	0.9	1.0	0.9	0.8	0.8	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.6	0.6	0.7	0.7	0.7	0.8	Diurnal Average
																								3.3	3.2	3.4	3.6	3.9	3.6	3.0	3.4	3.6	3.1	2.9	2.7	2.7	2.6	2.6	2.6	3.0	3.6	3.1	3.0	2.8	3.2	3.0	2.9	Diurnal Maximum



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.9 km/h on Dec 21 13:00 Minimum Value: 0.1 km/h on Dec 9 05:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.3 Q ₁ = 0.5 Median = 1.0 Q ₃ = 1.6 P ₉₀ = 2.0 P ₉₉ = 2.7																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.6	1.3	1.3	1.5	1.3	1.2	1.1	1.1	1.1	0.9	0.9	1.2	1.2	1.0	1.1	0.7	0.4	0.2	0.4	0.5	0.4	0.3	0.3	0.6	1.6	
2-Dec	0.4	0.4	0.5	0.9	1.0	0.6	0.8	0.7	0.9	1.0	0.8	1.5	1.3	1.3	1.2	1.7	2.0	2.2	1.8	2.0	1.8	2.2	1.9	2.1	2.2	
3-Dec	1.7	2.2	1.6	1.7	1.7	1.7	1.6	1.6	1.3	1.4	1.5	1.1	0.8	1.2	1.2	0.7	0.8	1.0	1.0	0.9	1.4	1.5	1.3	1.0	2.2	
4-Dec	0.6	0.7	1.2	1.7	1.9	2.1	2.2	2.9	2.6	2.5	2.0	1.9	1.3	1.8	1.6	2.1	1.8	2.3	2.3	2.4	2.1	2.1	2.2	1.8	2.9	
5-Dec	2.1	2.3	2.1	2.2	2.2	2.2	2.3	2.5	2.6	2.3	2.5	2.1	2.1	2.1	2.0	2.1	2.2	1.8	1.7	2.0	1.8	1.8	1.7	2.2	2.6	
6-Dec	2.0	2.0	1.7	1.5	1.7	1.8	1.7	1.6	1.6	1.6	1.7	1.5	2.1	2.1	2.0	1.9	1.7	1.4	1.5	1.5	1.8	1.7	1.5	1.6	2.1	
7-Dec	2.0	1.6	1.5	1.6	1.5	1.7	2.1	1.5	1.8	1.7	1.9	1.7	1.6	1.4	0.9	1.2	0.8	0.6	1.0	1.3	1.4	1.4	1.2	1.1	2.1	
8-Dec	1.3	1.8	1.4	1.5	1.3	1.2	1.0	1.2	1.1	0.6	0.5	0.6	0.8	0.6	0.3	0.4	0.4	0.3	0.3	0.2	0.3	0.2	0.2	0.2	1.8	
9-Dec	0.3	0.3	0.3	0.2	0.1	0.2	0.3	0.2	0.4	0.6	0.4	0.7	0.5	0.4	0.4	0.5	0.2	0.3	0.3	0.2	0.3	0.4	0.3	0.3	0.7	
10-Dec	0.4	0.4	0.5	0.3	0.3	0.4	0.6	0.5	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.2	0.3	0.4	0.7	0.4	0.4	0.4	0.6	0.7	
11-Dec	1.1	2.0	2.0	1.5	1.8	2.0	1.9	2.3	2.1	1.9	2.1	2.3	2.2	2.1	2.1	1.7	1.6	1.7	1.3	1.6	1.4	1.0	1.8	1.8	2.3	
12-Dec	1.8	1.1	1.8	1.6	1.9	1.6	1.4	0.9	1.2	0.8	1.0	1.0	0.5	0.5	1.0	0.8	0.6	1.2	1.2	0.7	0.8	1.4	1.8	1.9	1.9	
13-Dec	2.2	2.5	2.4	2.8	3.5	2.7	2.7	2.7	1.7	1.5	1.1	1.1	1.2	0.9	1.1	1.5	1.2	1.5	1.3	1.1	0.8	0.5	0.6	0.8	3.5	
14-Dec	0.5	0.5	0.6	0.7	0.6	0.6	0.6	0.7	0.7	0.5	0.7	1.1	0.8	1.0	0.9	1.0	1.1	1.0	0.8	0.5	0.6	0.6	1.4	1.6	1.6	
15-Dec	1.1	0.6	0.9	1.1	1.3	0.8	0.7	0.6	0.8	0.9	0.5	0.9	1.2	1.3	1.2	0.6	1.0	0.8	0.6	1.1	1.0	1.0	0.8	0.5	1.3	
16-Dec	0.6	0.6	0.6	0.7	0.8	0.6	0.3	0.2	0.5	0.2	0.6	0.3	0.4	0.3	0.3	0.4	0.3	0.4	0.2	0.2	0.3	0.4	0.2	0.4	0.8	
17-Dec	0.5	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.5	1.0	0.7	0.6	0.3	0.5	1.6	1.3	1.7	1.6	1.8	1.6	1.0	0.9	1.8
18-Dec	0.4	0.4	0.4	0.5	0.9	0.5	0.6	0.7	0.6	0.5	0.3	0.5	0.5	0.5	0.4	0.6	0.7	0.6	0.6	0.5	0.7	0.3	0.7	0.6	0.9	
19-Dec	1.0	1.4	1.4	1.5	2.0	2.1	1.8	2.5	2.0	1.3	1.7	1.0	0.8	0.5	0.6	0.9	0.8	1.4	1.6	0.8	0.5	0.2	0.2	0.3	2.5	
20-Dec	0.5	0.9	1.2	1.0	1.4	1.8	2.2	2.1	2.6	1.5	1.8	1.3	1.6	1.5	1.6	1.7	1.4	1.7	1.4	1.3	1.4	1.5	1.4	1.4	2.6	
21-Dec	1.3	0.9	0.9	1.5	2.7	2.8	1.5	1.4	0.9	1.2	1.5	2.1	3.9	3.6	2.9	2.4	1.4	1.3	1.4	1.3	1.1	1.5	0.8	0.6	3.9	
22-Dec	0.8	1.0	0.9	1.4	1.9	1.6	1.9	1.5	1.1	1.3	1.6	1.5	1.8	1.7	2.0	1.8	2.1	2.0	1.9	1.9	1.9	1.8	1.8	1.9	2.1	
23-Dec	1.8	1.8	1.5	1.5	1.4	1.8	1.6	1.8	1.2	1.2	1.1	0.8	1.2	1.0	0.8	0.6	0.5	0.5	0.3	0.5	1.7	1.9	1.6	1.7	1.9	
24-Dec	1.1	1.5	1.2	1.4	1.0	1.0	0.4	0.6	1.0	0.8	0.9	0.6	0.2	0.4	0.4	0.3	0.4	0.5	0.5	0.6	0.4	0.3	0.3	0.4	1.5	
25-Dec	0.4	0.3	0.4	0.4	0.5	0.6	0.2	0.4	0.4	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.7	1.0	0.6	0.3	0.6	0.7	0.4	0.5	1.0	
26-Dec	0.4	0.6	0.9	0.7	1.0	0.9	1.0	1.1	0.8	0.7	0.7	1.4	1.8	2.0	1.5	1.0	1.5	1.2	1.3	1.1	0.8	0.8	1.0	0.8	2.0	
27-Dec	0.8	0.8	0.7	0.9	1.1	1.0	1.0	0.9	0.9	1.0	1.0	1.4	1.5	1.7	1.9	1.3	1.4	1.5	1.2	1.4	1.4	1.0	1.1	0.9	1.9	
28-Dec	1.4	1.3	1.6	1.4	1.3	1.7	1.0	1.2	1.5	1.1	1.1	1.1	1.1	0.3	0.5	0.5	0.3	0.3	0.7	0.8	0.7	0.8	0.5	0.7	1.7	
29-Dec	0.9	0.7	0.5	0.7	0.5	0.5	0.4	0.5	0.7	0.7	0.8	0.7	0.6	0.7	0.6	0.5	0.6	0.5	0.6	0.9	1.0	0.9	0.6	0.5	1.0	
30-Dec	0.4	0.5	0.3	0.3	0.4	0.3	0.3	0.7	0.5	0.3	0.5	0.6	0.4	0.6	0.5	0.8	1.0	1.9	1.9	1.2	1.0	1.1	1.6	1.4	1.9	
31-Dec	0.8	1.1	1.1	0.4	0.5	0.5	0.4	0.8	0.6	0.6	0.4	0.8	0.7	0.6	0.8	0.6	0.4	0.6	0.6	1.7	1.8	1.5	1.6	1.6	1.8	
	2.2	2.5	2.4	2.8	3.5	2.8	2.7	2.9	2.6	2.5	2.5	2.3	3.9	3.6	2.9	2.4	2.2	2.3	2.3	2.4	2.1	2.2	2.2	2.2		
	Diurnal Maximum																									



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:15
Gas Cert Reference	S960161A	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	September 26, 2017
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG Make/Model	API 701	Serial Number	1083
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2633

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-634	-634
Analyzer IP address	192.168.1.43		Lamp voltage	821	817
Calculated slope	1.000120	1.001984	Chamber temp	45.2	45.0
Calculated intercept	0.188548	0.551272	Pressure	694.6	696.8
Analyzer Background	7.5	7.5	Flow	0.477	0.474
Analyzer Coefficient	0.995	0.995	Intensity	90	91

Analyzer make TEI 43i Analyzer serial # 1008841399

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	60.0	600.0	598.3	1.003
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.0	600.0	598.3	1.003
second point	5000	30.0	300.0	299.3	1.002
third point	5000	15.0	150.0	148.1	1.013
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	60.0	600.0	599.3	1.001
Average Correction Factor					1.006

Corrected As found 598.3 Previous response 599.7 % change 0.2%

Notes:

No maintenance or adjustments done, filter changed out,

Calibration Performed By: Melissa Lemay



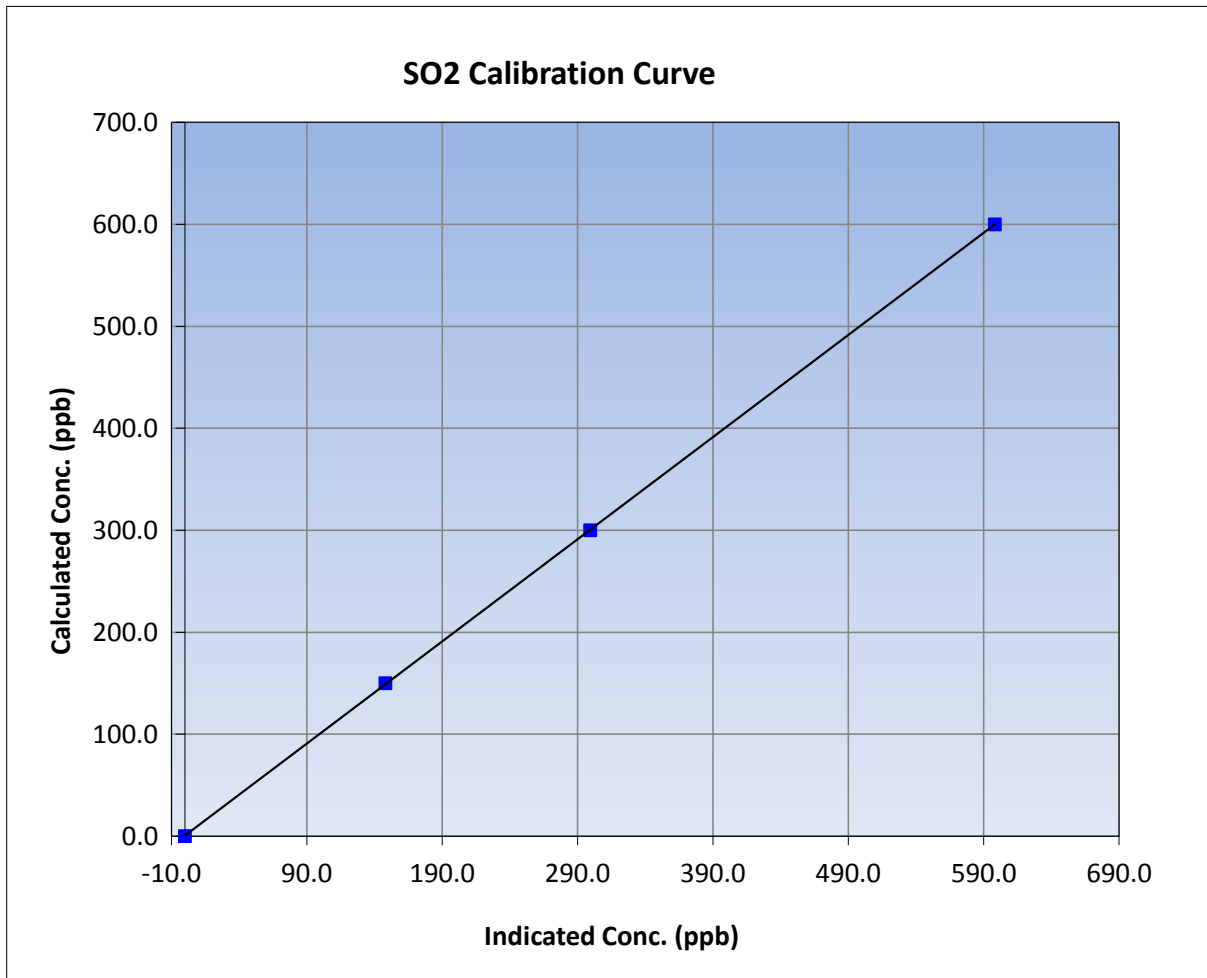
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	7:50	End Time (MST)	10:15
Analyzer make	TEI 43i	Analyzer serial #	1008841399

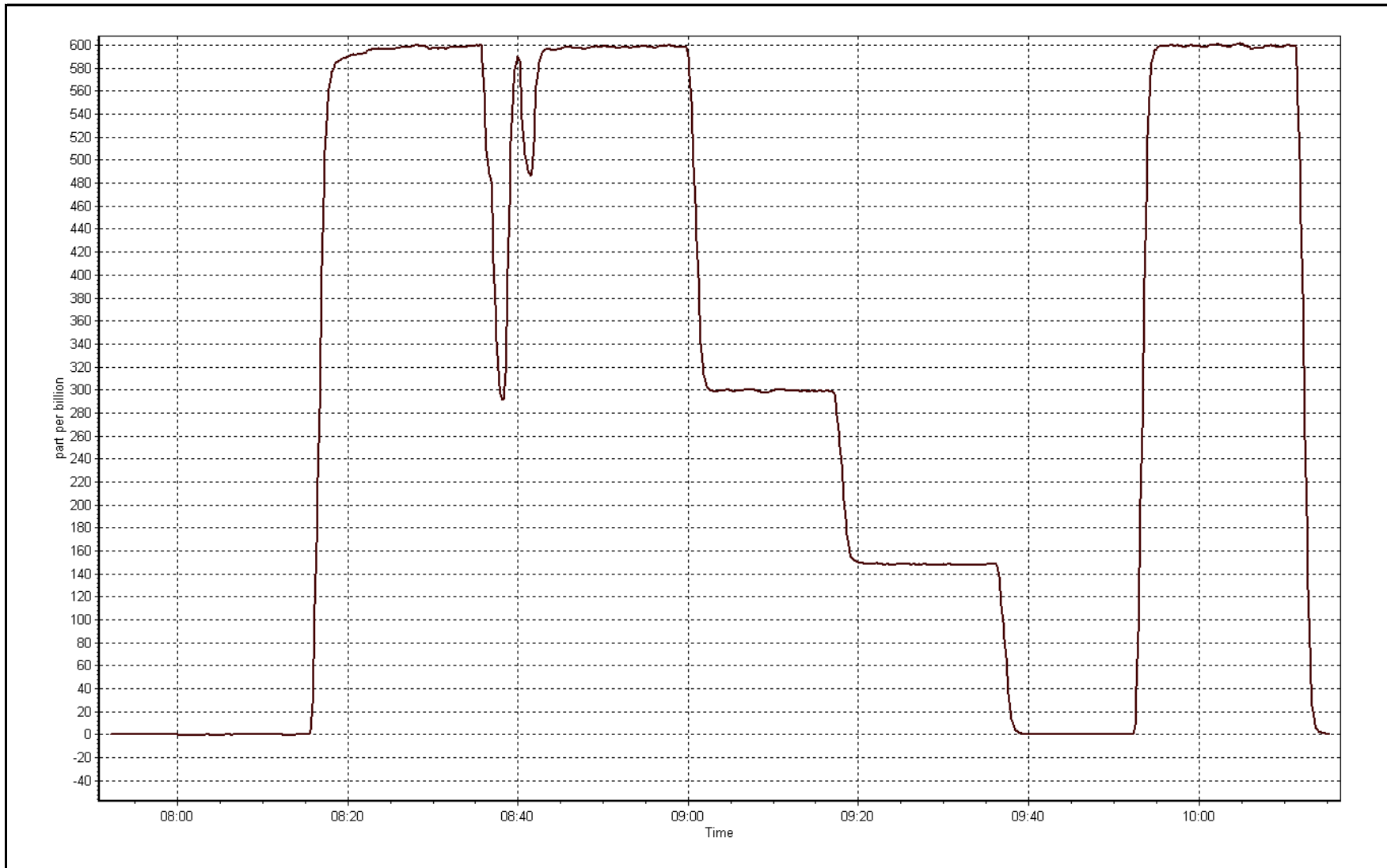
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999992
600.0	598.3	1.0028		
300.0	299.3	1.0023	Slope	1.001984
150.0	148.1	1.0128		
			Intercept	0.551272



SO2 Calibration Plot

Date: December 1, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	10:10	End Time (MST)	13:14
Gas Cert Reference	ET0005008	Station temp.	21 Deg C
Cal Gas Concentration	5.03 ppm	Cal Gas Exp Date	02/12/2019
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG air Make/Model	API 701	Serial Number	138
DACS make/model	Campbell Scientific CR3000	Serial Number	2633
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S960161A 09-Sep-17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-644	-644
Analyzer IP address	192.168.1.42		Lamp voltage	794	794
Calculated slope	1.000440	0.998423	Chamber temp	45	45
Calculated intercept	-0.311876	0.072194	Pressure	507.1	507.1
Analyzer Background	15.7	16.2	Flow	1.010	1.010
Analyzer Coefficient	0.978	0.98	Intensity	97	97
			Converter temp.	323	323

Analyzer make/model	Thermo 450i	Analyzer serial #	815129108
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	74.4	74.8	73.9	1.013
SO2 scrubber check	5000	15.0	150.0	1.6	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	74.4	74.8	75.0	0.998
second point	5000	41.7	42.0	41.7	1.006
third point	5000	24.8	24.9	25.0	0.998
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	74.4	74.8	74.6	1.003
Average Correction Factor					1.001

Corrected As found	73.6	Previous response	75.1	% change	2.1%
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Notes:

Inlet filter changed and scrubber check done after as founds. Adjusted zero and span.

Calibration Performed By: Melissa Lemay



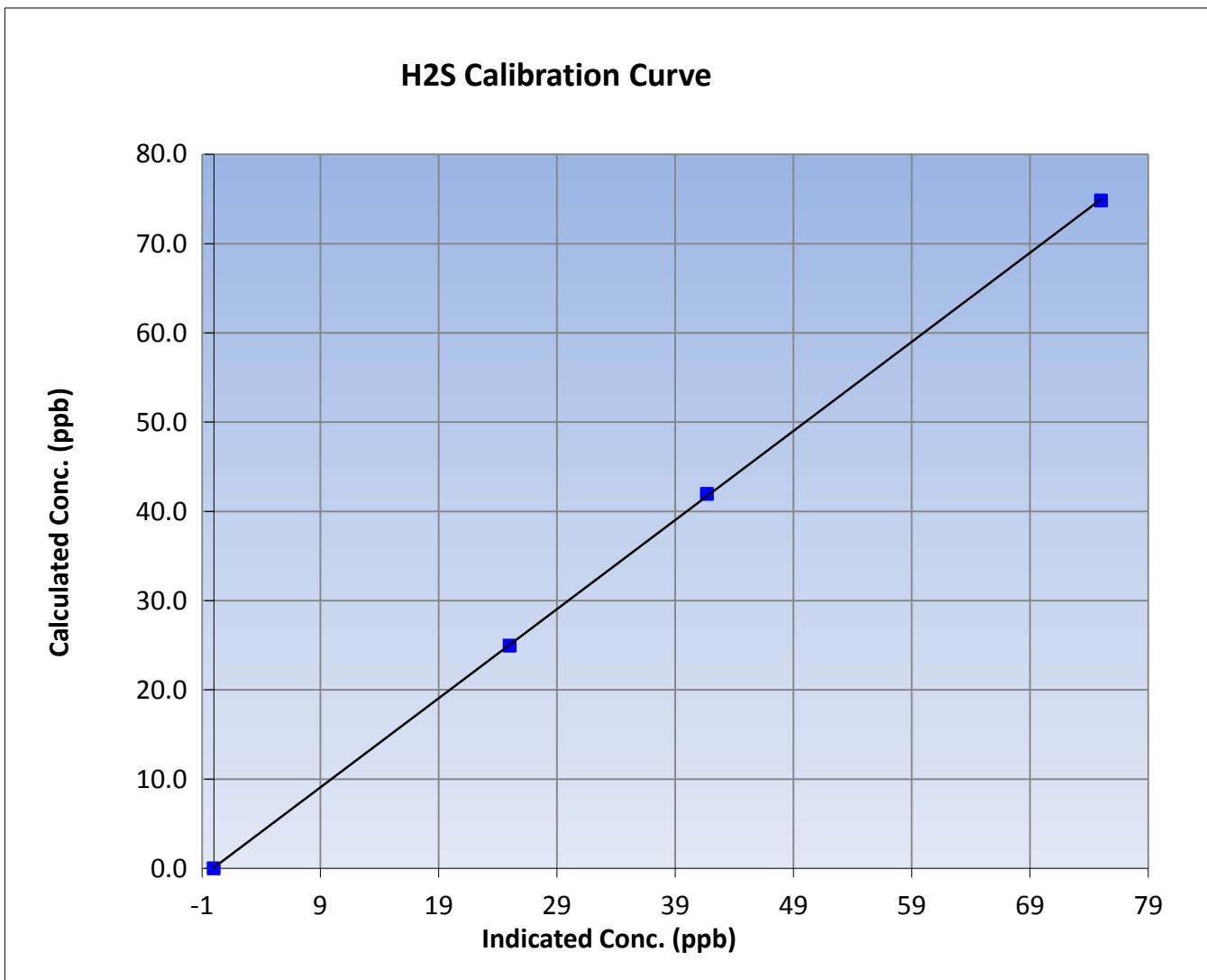
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

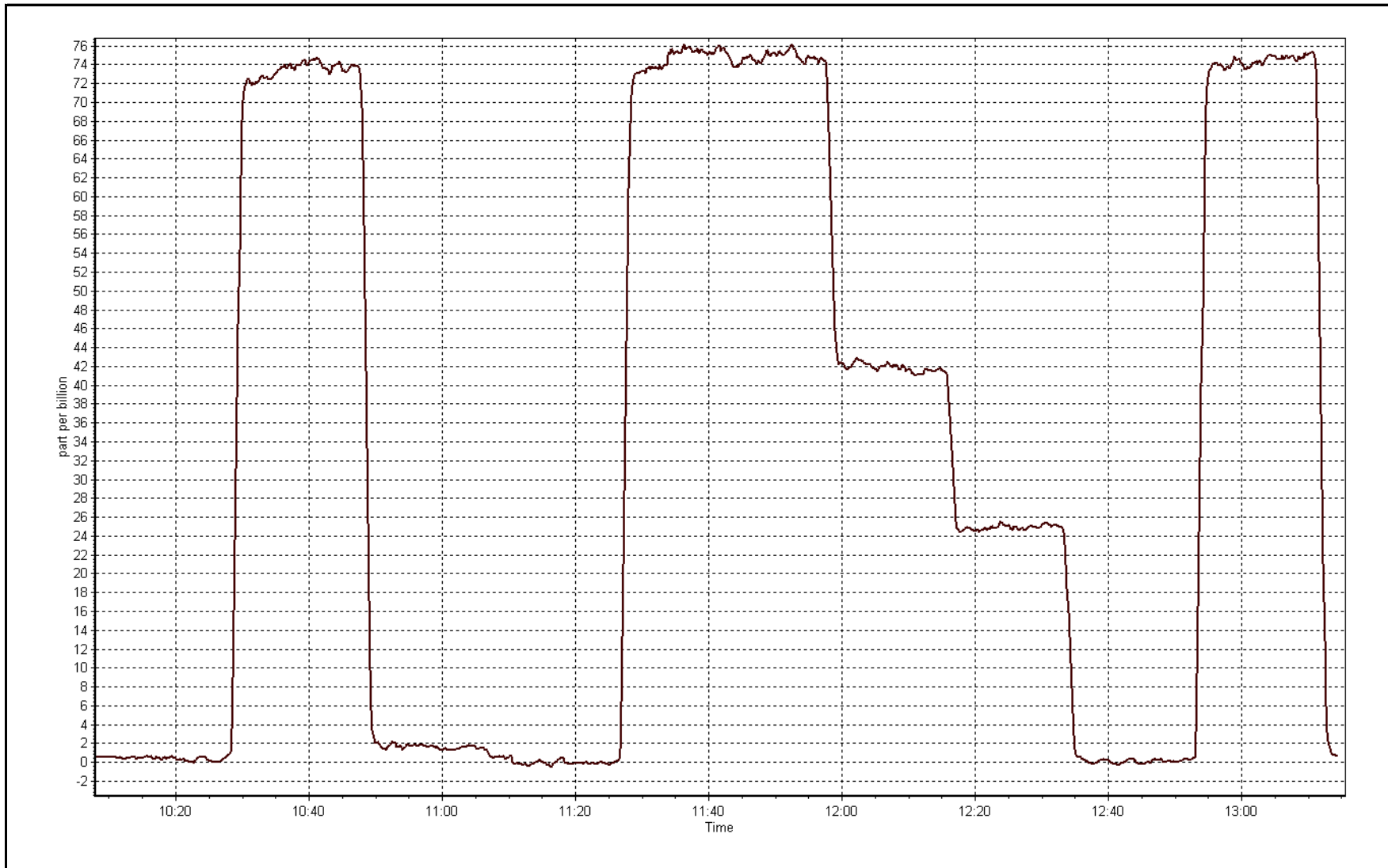
Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	10:10	End Time (MST)	13:14
Analyzer make	Thermo 450i	Analyzer serial #	815129108

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999973
74.8	75.0	0.9980		
42.0	41.7	1.0060	Slope	0.998423
24.9	25.0	0.9980		
			Intercept	0.072194



Melissa Lemay





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:14
Gas Cert Reference	S961061A	Cal Gas Expiry Date	Sept-26-2017
CH4 Cal Gas Conc.	499 ppm	CH4 Equiv Conc.	1038.0 ppm
C3H8 Cal Gas Conc.	196 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG make/model	Teledyne API 701	Serial Number	1083
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	9.4	9.4
Analyzer IP address	192.168.1.51		Air or Bypass Press	42.3	42.3
Calculated slope	1.001279	1.003591	Fuel Pressure	20.2	20.2
Calculated intercept	0.000039	-0.030106	Analyzer Coeff	3.398	3.582
			Analyzer BKG	2.96	3.12

Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.03	----
as found span	5000	60.0	12.46	12.08	1.031
calibrator zero	5000	0.0	0.00	0.03	----
high point	5000	60.0	12.46	12.44	1.001
second point	5000	30.0	6.23	6.24	0.998
third point	5000	15.0	3.11	3.13	0.995
as left zero	5000	0.0	0.00	0.02	----
as left span	5000	60.0	12.46	12.46	1.000
Average Correction Factor					0.998

Corrected As found	12.05	Previous response	12.44	% change	3.2%
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Notes:

No maintenance done, filter changed out, span adjusted

Calibration Performed By:

Melissa Lemay



Wood Buffalo Environmental Association THC Calibration Report

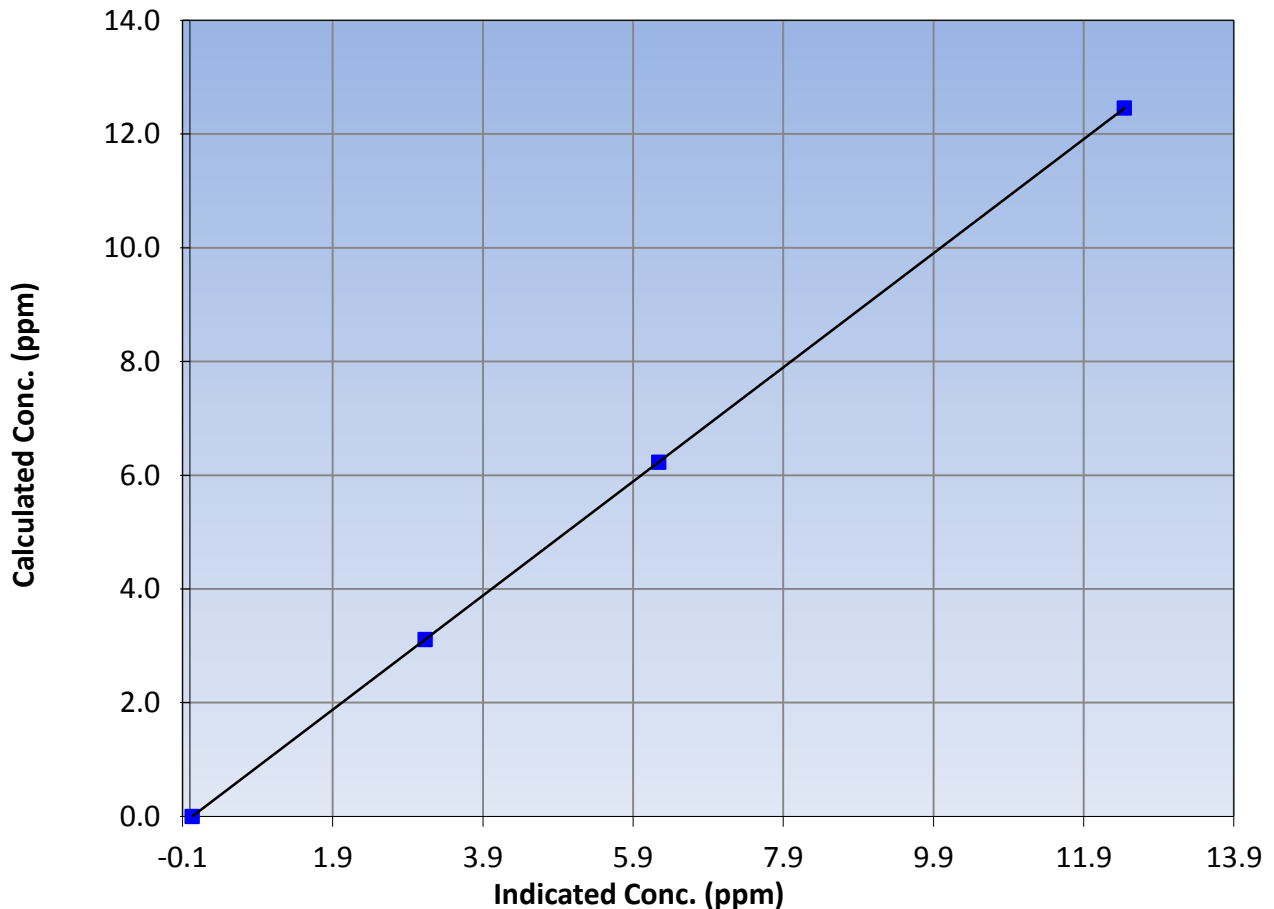
Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	7:50	End Time (MST)	10:14
Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295

Calibration Data

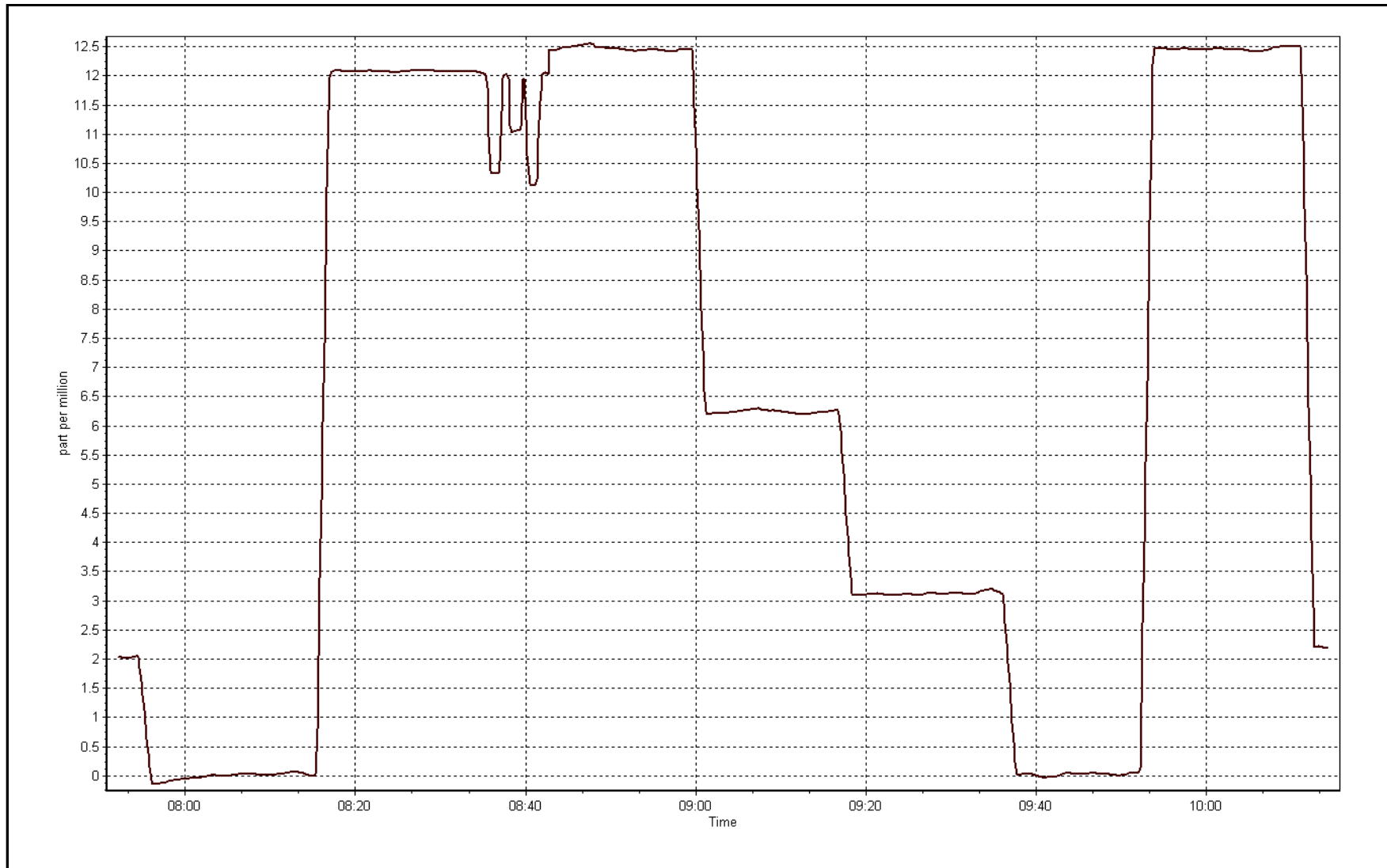
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.03	----	Correlation Coefficient	1.000000
12.46	12.44	1.0013		
6.23	6.24	0.9981	Slope	1.003591
3.11	3.13	0.9949		
			Intercept	-0.030106

THC Calibration Curve



THC Calibration Plot

Date: December 1, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 6
PATRICIA MCINNES
DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	710	34	34	100.00	13	0	3	0
TRS (ppb) Average	707	37	37	100.00	1	0	1	0
THC (ppm) Average	708	34	36	99.73	3.1	-	2.5	-
NMHC(ppm) Average	708	34	36	99.73	0.225	-	0.056	-
CH4(ppm) Average	708	34	36	99.73	2.9	-	2.4	-
O3 (ppb) Average	709	35	35	100.00	44	0	38	-
NO2 (ppb) Average	708	36	36	100.00	34	0	20	-
NO (ppb) Average	708	36	36	100.00	56	-	13	-
NOX (ppb) Average	708	36	36	100.00	86	-	33	-
NH3 (ppb) Average	670	40	74	95.43	0	0	0	-
PM2.5 (ug/m3) Average	731	0	13	98.25	21.2	-	14.7	0
Temperature 2 m (C) Average	744	0	0	100.00	3.3	-	-1.7	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	88	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	28	-	21	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	710	0.7	2	-	0	0	0	0	0	2	13
TRS (ppb) Average	707	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	708	2.05	0.2	-	1.9	1.9	1.9	2	2.1	2.2	3.1
NMHC(ppm) Average	708	0.004	0.026	-	0	0	0	0	0	0	0.225
CH4(ppm) Average	708	2.04	0.2	-	1.9	1.9	1.9	2	2.1	2.2	2.9
O3 (ppb) Average	709	22.9	11	-	3	7	14	23	33	37	44
NO2 (ppb) Average	708	9	8	-	0	0	2	7	14	21	34
NO (ppb) Average	708	3.9	7	-	0	0	0	1	4	12	56
NOX (ppb) Average	708	12.9	14	-	0	0	3	9	18	32	86
NH3 (ppb) Average	670	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	731	5.04	4.2	-	0.1	1.2	2	3.6	7	10.8	21.2
Temperature 2 m (C) Average	744	-16.78	9.1	-	-36.5	-29.1	-23	-17.1	-11.3	-3.5	3.3
Relative Humidity (%) Average	744	76.3	7	-	52	69	72	76	81	84	96
Wind Speed 10 m (km/h) Average	744	9.1	5	-	0	3	5	8	12	17	28
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	22 Dec 2016 10:00	22 Dec 2016 11:00	2	Maintenance - replaced carrier gas
NH3	01 Dec 2016 02:00	31 Dec 2016 02:00	34	Stabilization after daily span
PM2.5	07 Dec 2016 01:00	07 Dec 2016 09:00	9	Analyzer Failure - tape failed to advance
PM2.5	07 Dec 2016 10:00	07 Dec 2016 13:00	4	Maintenance - advance filter tape and verify operation



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Patricia McInnes - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 13 ppb on Dec 22 19:00	Maximum Daily Average: 2.8 ppb on Dec 22		Hours of Data:	710
Minimum Value: 0 ppb on Dec 1 01:00	Minimum Daily Average: 0.0 ppb on Dec 5		Hours of Missing Data:	34
Maximum Diurnal Average: 1.2 ppb at hour 14	Minimum Diurnal Average: 0.3 ppb at hour 10		Hours of Calibration:	34
Monthly Average: 0.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 8		Percent Operational Time:	100.0

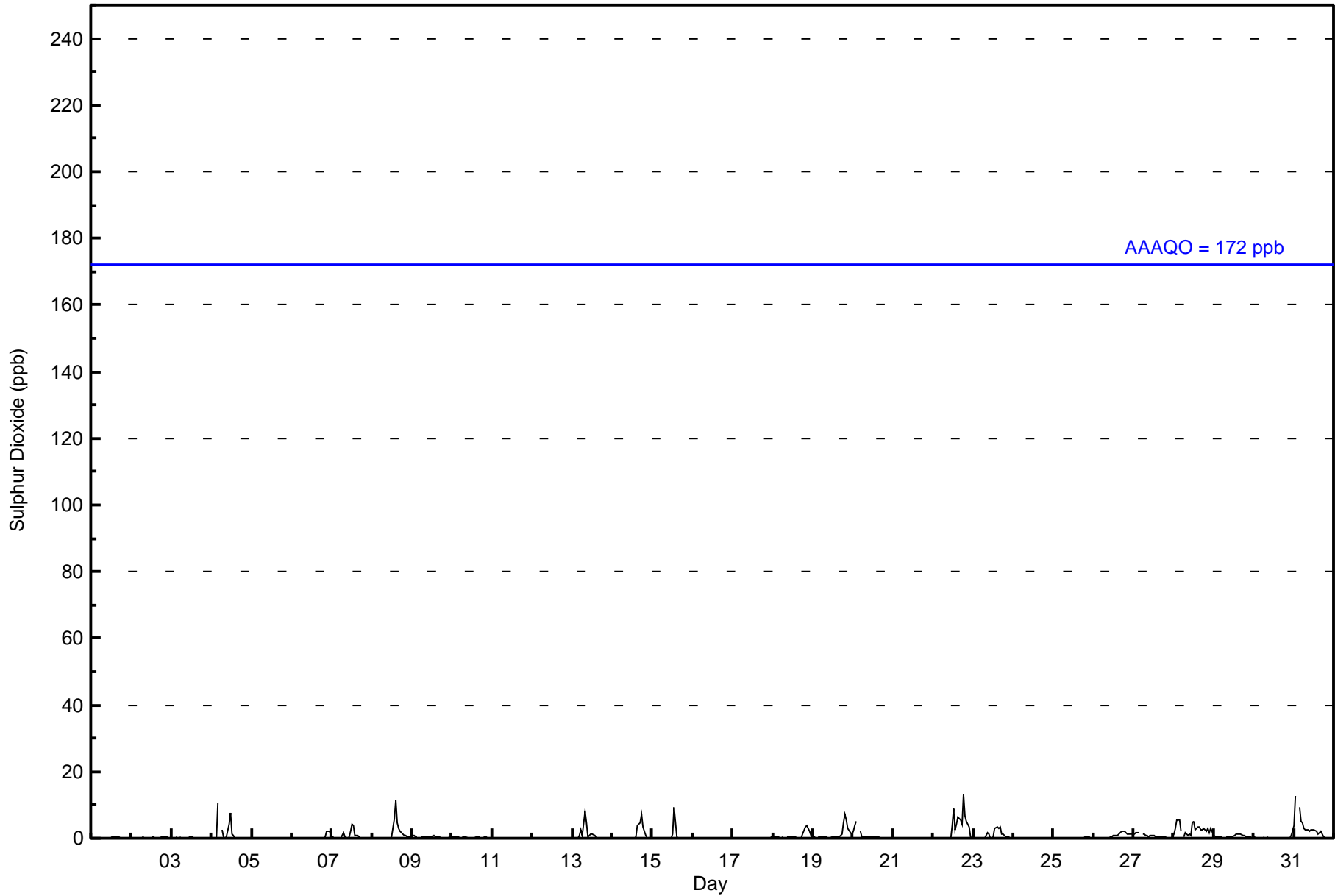
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
2-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1	
3-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
4-Dec	0	0	0	0	11	Z	3	0	0	0	4	7	1	1	0	0	0	0	0	0	0	0	0	0	1.2	11	
5-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
6-Dec	0	0	0	0	0	0	0	Z	0	C	C	C	0	0	0	0	0	0	0	0	0	2	2	1	0.3	2	
7-Dec	0	0	Z	0	0	0	1	2	1	0	0	2	4	4	1	1	0	0	0	0	0	0	0	0	0.7	4	
8-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	6	11	5	3	2	1	1	1	1	0	0	0	1.4	11	
9-Dec	1	1	1	0	Z	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1	
10-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
11-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
12-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
13-Dec	0	0	Z	0	1	2	1	8	5	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.9	8	
14-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	4	5	7	4	2	1	0	0	0	0	0	1.0	7	
15-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	9	0	0	0	0	0	0	0	0	0	0	0	0.5	9	
16-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
17-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	3	4	3	2	1	0.8	4
19-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	7	5	3	2	1	0	1.2	7	
20-Dec	2	4	5	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	5	
21-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
22-Dec	0	0	0	0	0	Z	0	0	0	0	0	4	9	3	4	6	6	4	13	7	5	3	0	0	2.8	13	
23-Dec	0	0	0	0	0	0	Z	0	2	1	0	0	0	3	3	3	3	1	1	0	1	0	0	0	0.9	3	
24-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
25-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
26-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	1	1	1	1	0.8	2	
27-Dec	1	2	2	2	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.7	2	
28-Dec	1	3	5	6	2	Z	0	2	1	1	1	5	5	3	3	3	3	3	3	2	3	2	3	2	2.7	6	
29-Dec	1	0	0	0	0	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.6	1	
30-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	2	
31-Dec	4	13	Z	9	5	5	3	3	3	2	3	3	3	2	1	2	2	1	0	0	0	0	0	0	2.8	13	
	0.4	0.8	0.6	0.7	0.9	0.4	0.4	0.7	0.5	0.3	0.4	0.9	1.0	1.2	1.0	0.9	0.9	0.8	1.0	0.9	0.8	0.6	0.4	0.3		Diurnal Average	
	4	13	5	9	11	5	3	8	5	2	4	7	9	9	11	6	6	7	13	7	5	3	3	2		Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	706	99.44	99.44
11 - 20	4	0.56	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	74	10	3	4	7	16	49	83	70	57	47	57	39	86	62	42	706
11 - 20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	86	62	44	710

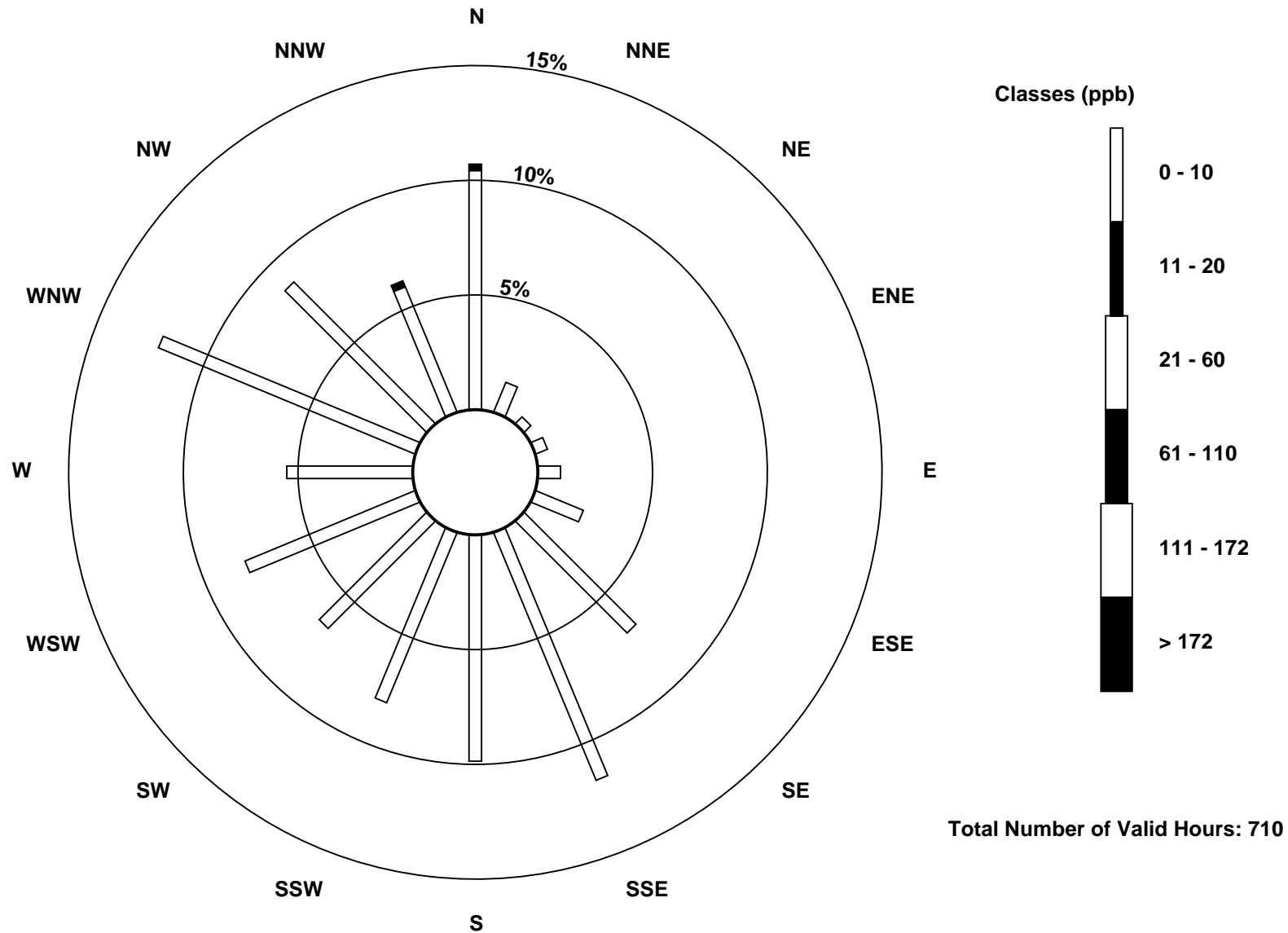
Total Number of Valid Hours: 710

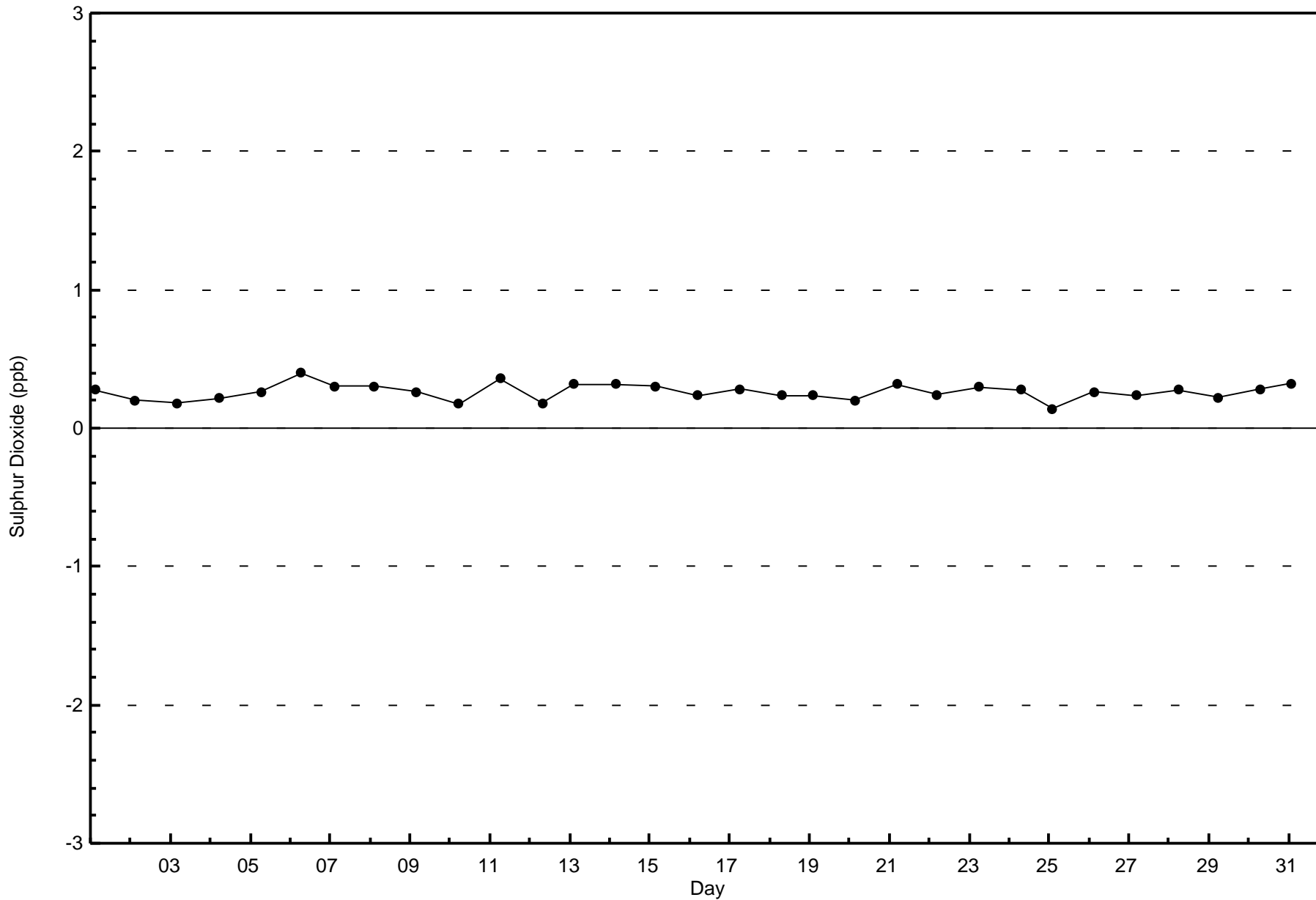
Total Number of Hours: 744

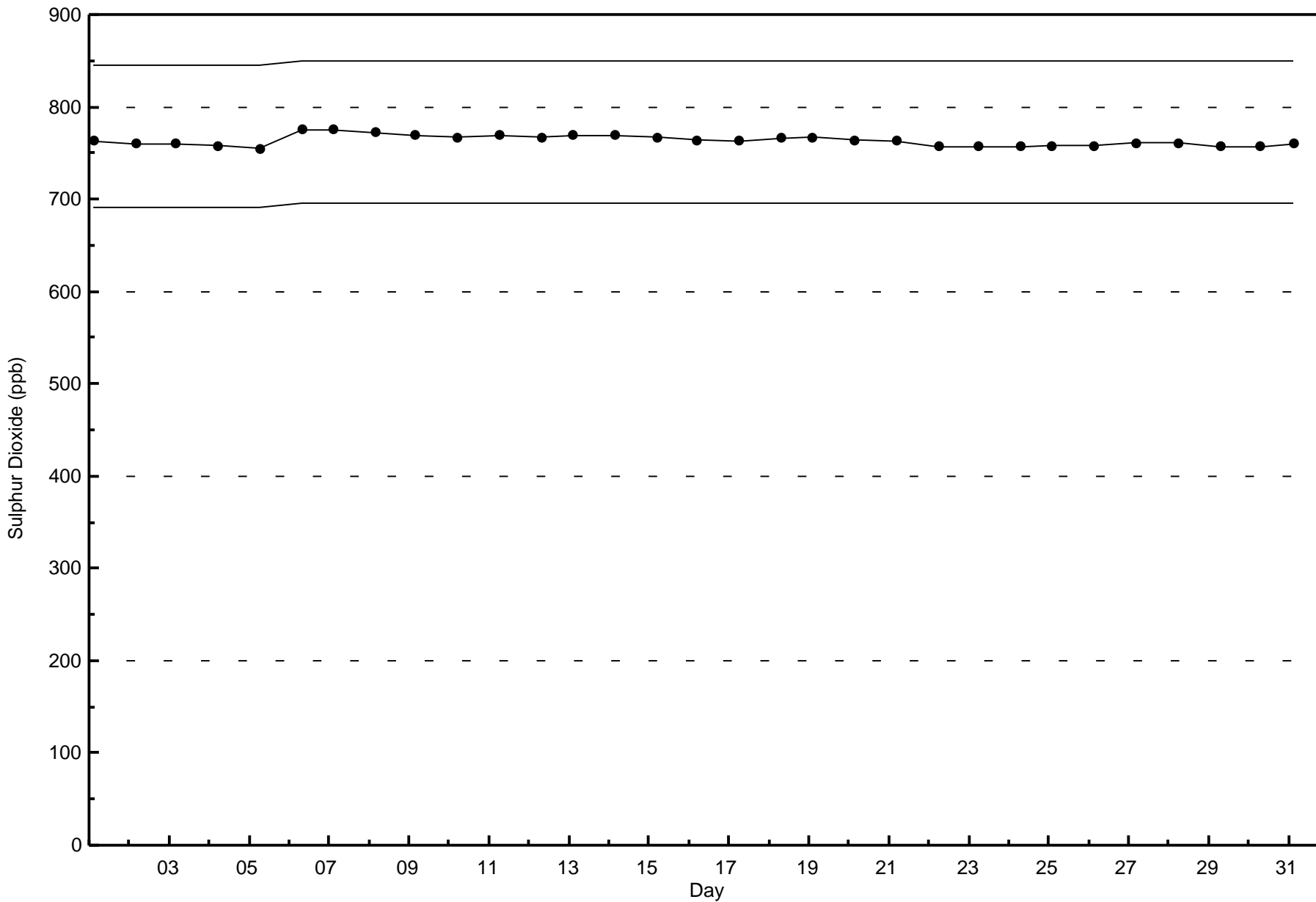


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

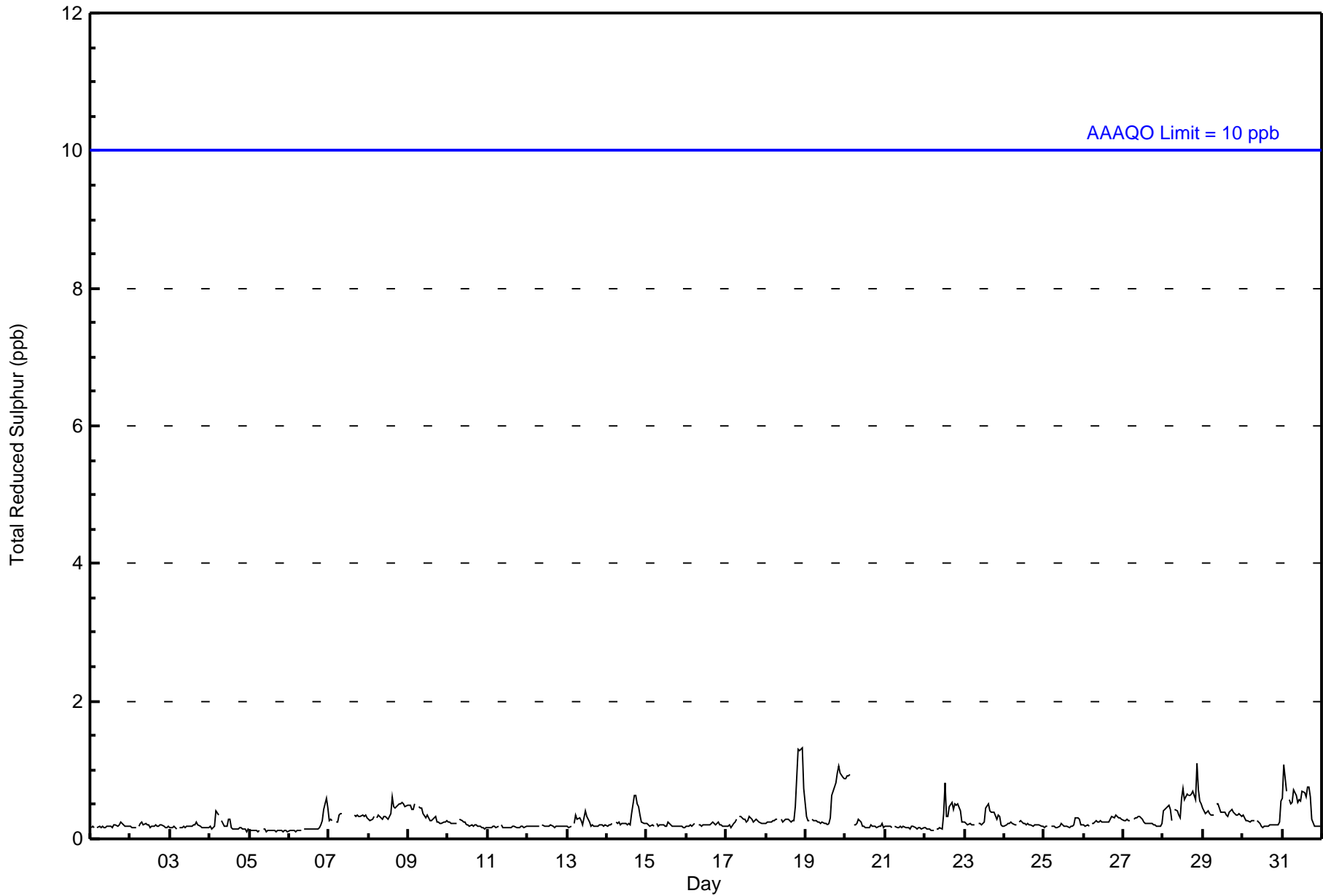
Patricia McInnes - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 1 ppb on Dec 18 23:00 Maximum Daily Average: 0.5 ppb on Dec 28										Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 37 Percent Operational Time: 100.0																
Minimum Value: 0 ppb on Dec 5 06:00 Maximum Diurnal Average: 0.3 ppb at hour 21 Monthly Average: 0.3 ppb										Minimum Daily Average: 0.1 ppb on Dec 5 Minimum Diurnal Average: 0.2 ppb at hour 6 Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 1																
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
7-Dec	0	0	0	Z	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
8-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	0	0.4	1
9-Dec	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0.3	1
15-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
18-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1
19-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1
20-Dec	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
21-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0	0	0.3	1
23-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
24-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
27-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
29-Dec	0	0	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
31-Dec	1	1	1	Z	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1
0.3 0.3 0.3 0.3 0.2 0.2 0.3 0.3 0.3 0.2 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3																								Diurnal Average		
1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1																								Diurnal Maximum		
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Patricia McInnes - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	707	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	73	10	3	5	8	15	49	84	71	54	48	56	39	87	63	42	707
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	10	3	5	8	15	49	84	71	54	48	56	39	87	63	42	707

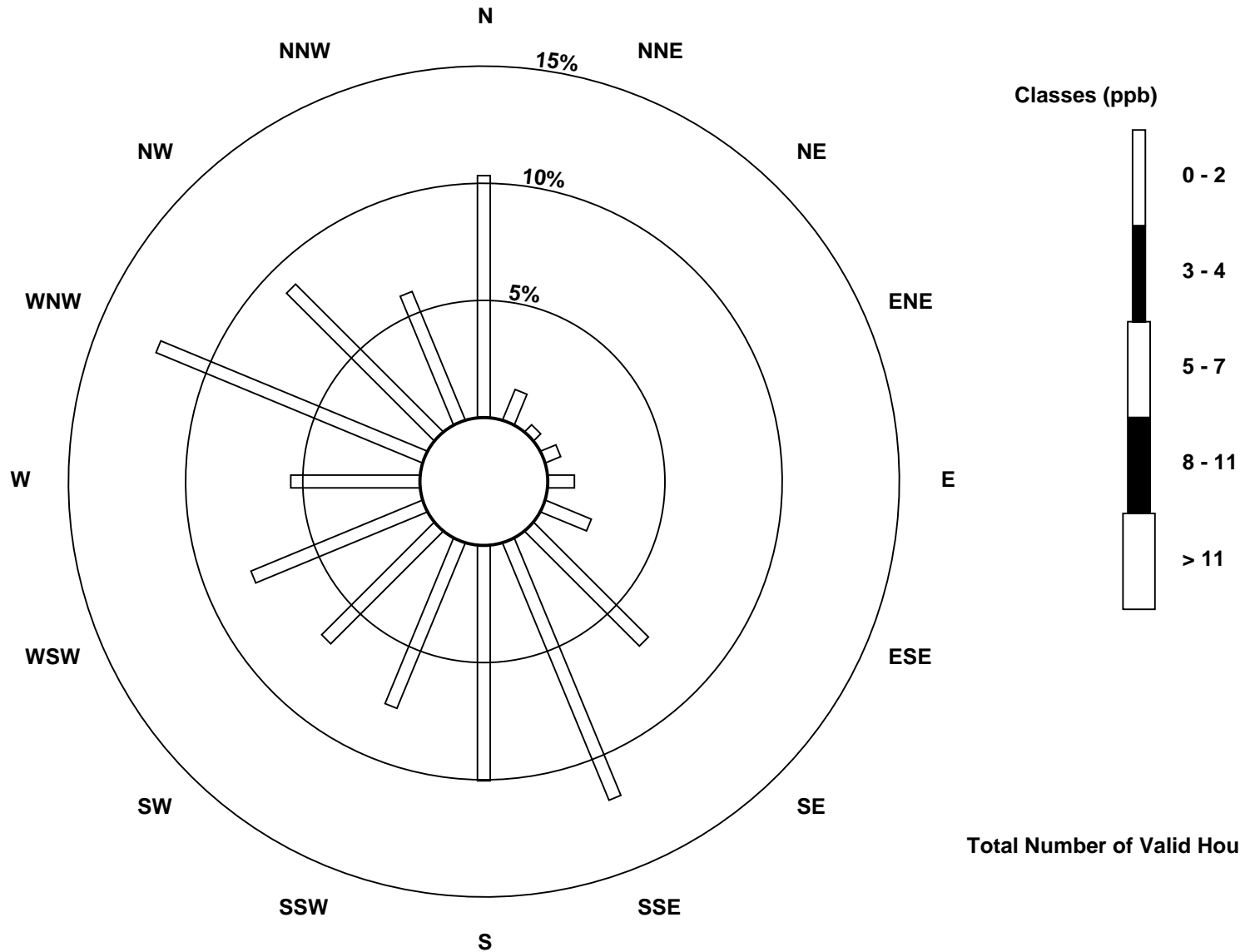
Total Number of Valid Hours: 707

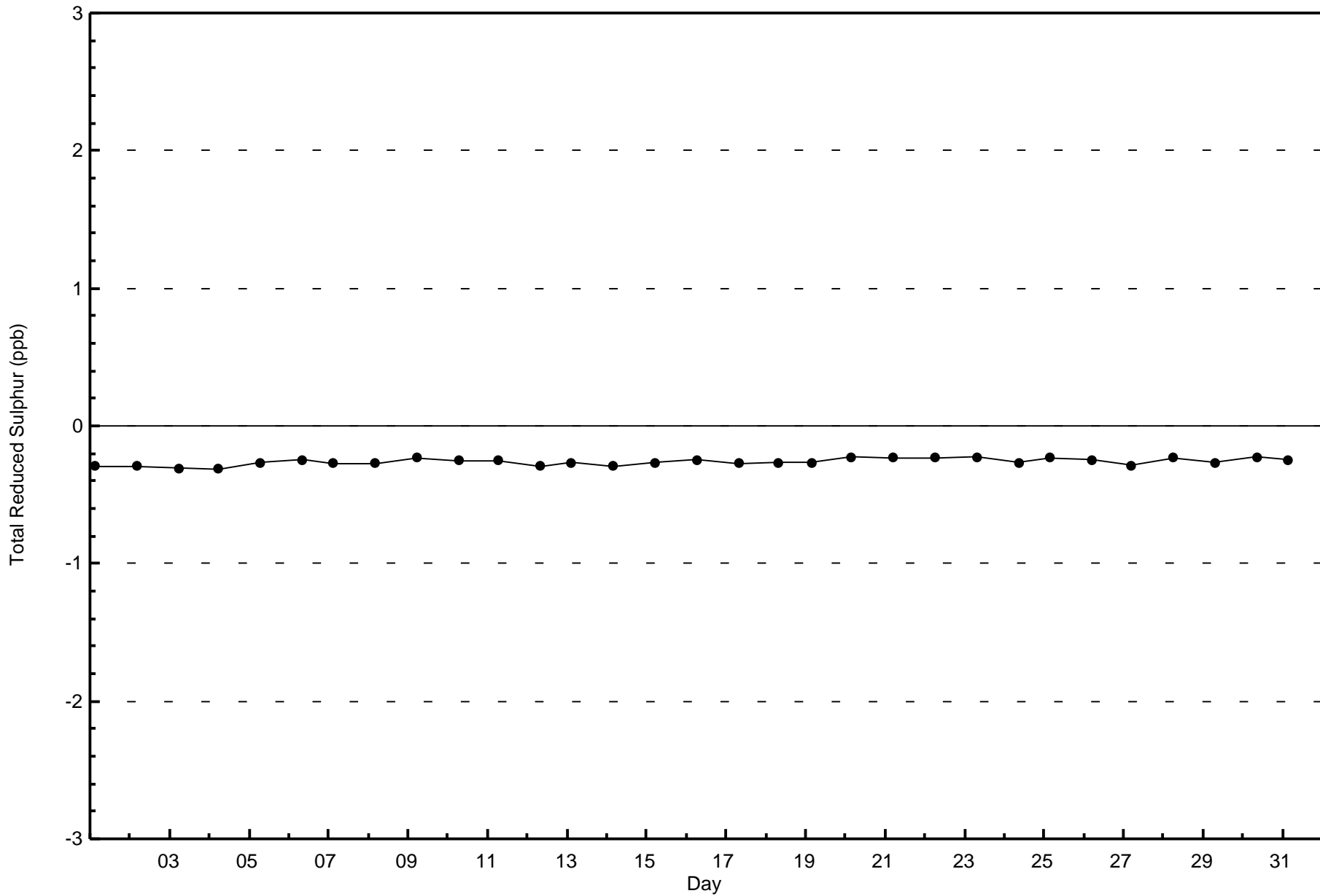
Total Number of Hours: 744

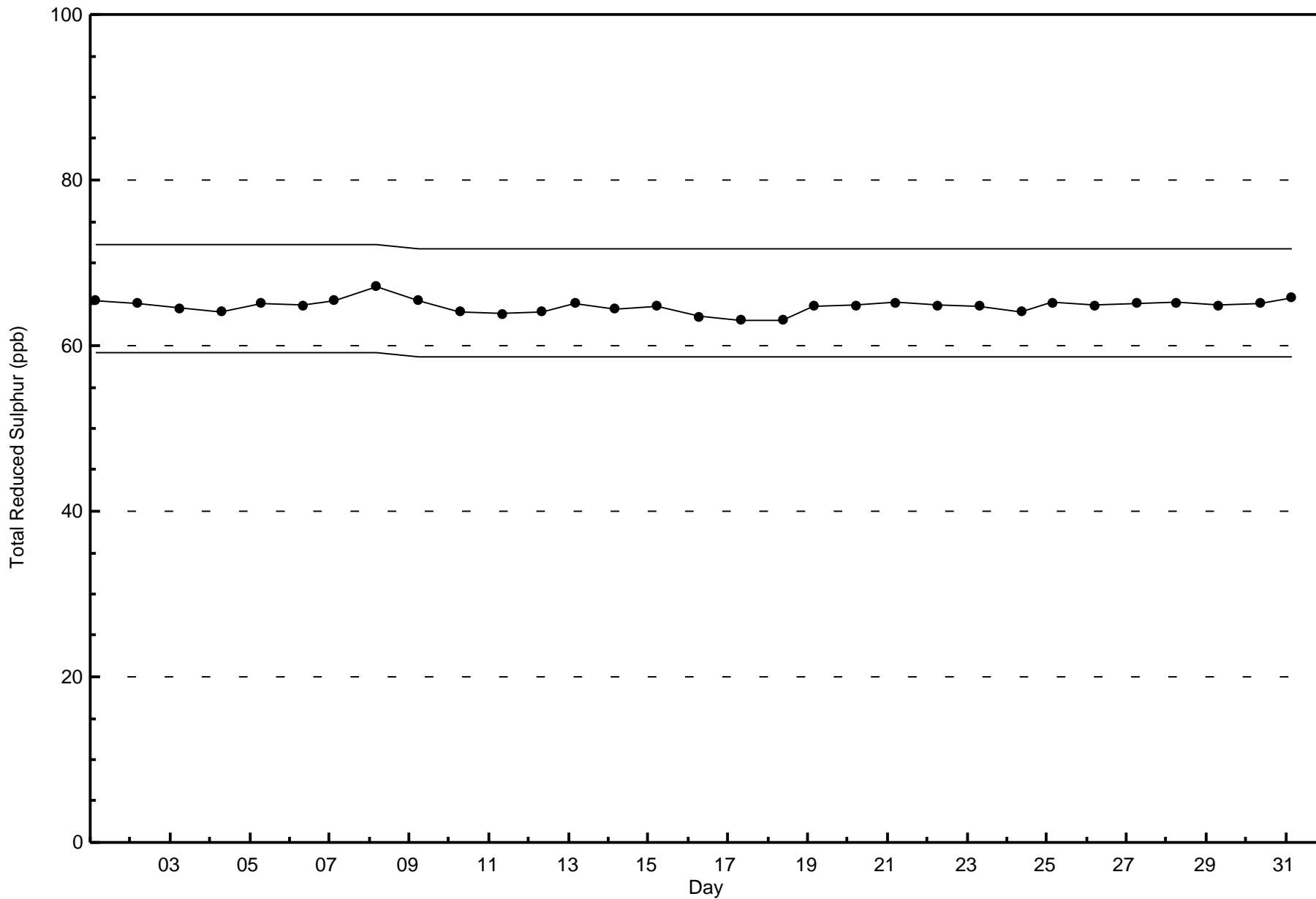


**Wood Buffalo Environmental Association
Wind Rose Dec 2016**

**Total Reduced Sulphur (TRS) - ppb
Patricia McInnes (AMS 6)**



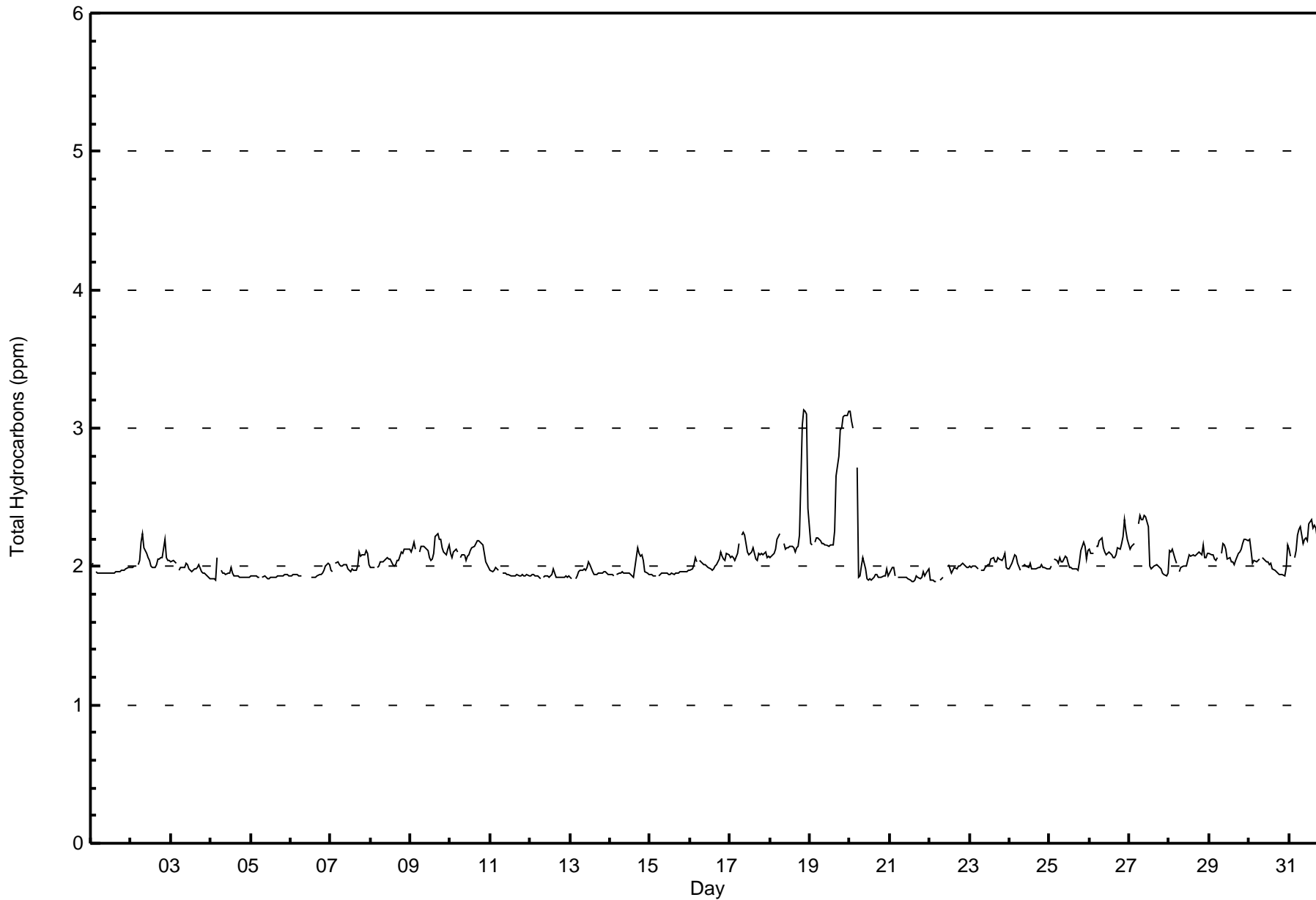






Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Patricia McInnes - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Patricia McInnes - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	450	63.56	63.56
2.1 - 3.0	250	35.31	98.87
3.1 - 10.0	8	1.13	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Patricia McInnes - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	48	2	1	1	4	1	19	35	24	41	38	52	33	77	42	32	450
2.1 - 3.0	28	7	2	3	2	14	30	48	45	14	9	5	5	8	18	12	250
3.1 - 10.0	0	1	0	0	1	1	0	0	1	2	0	0	1	1	0	0	8
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	86	60	44	708

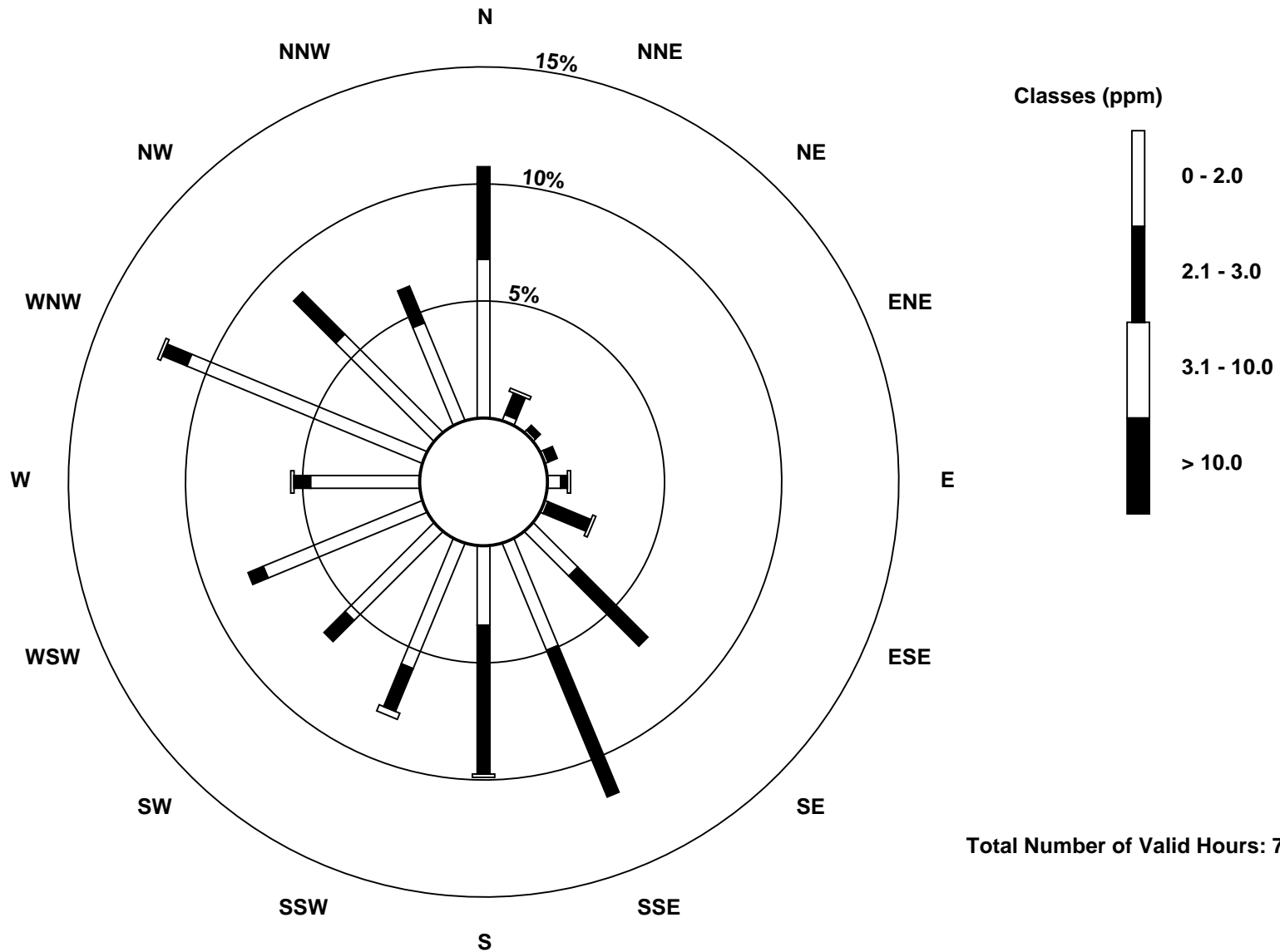
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

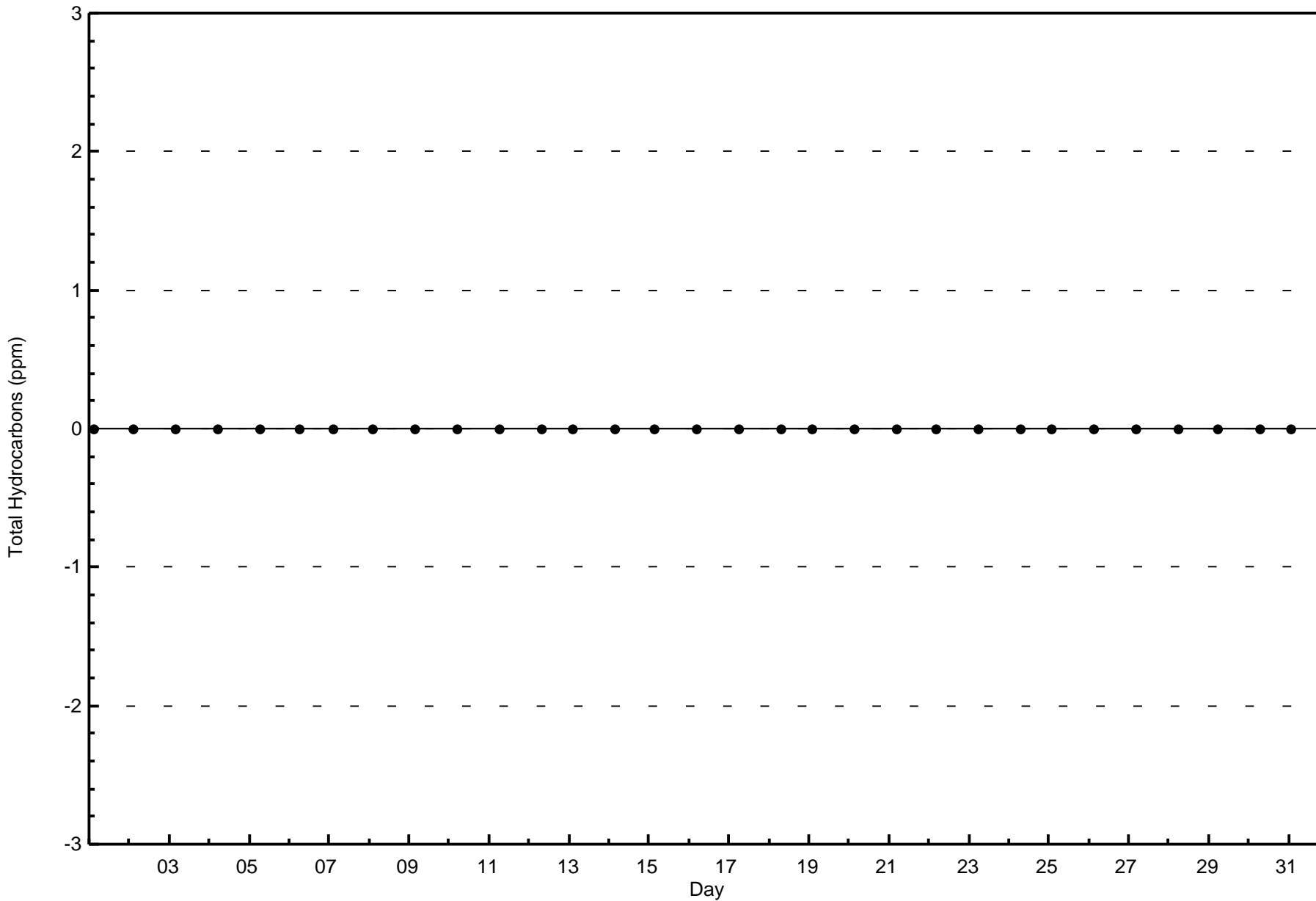
Total Hydrocarbons (THC) - ppm
Patricia McInnes (AMS 6)

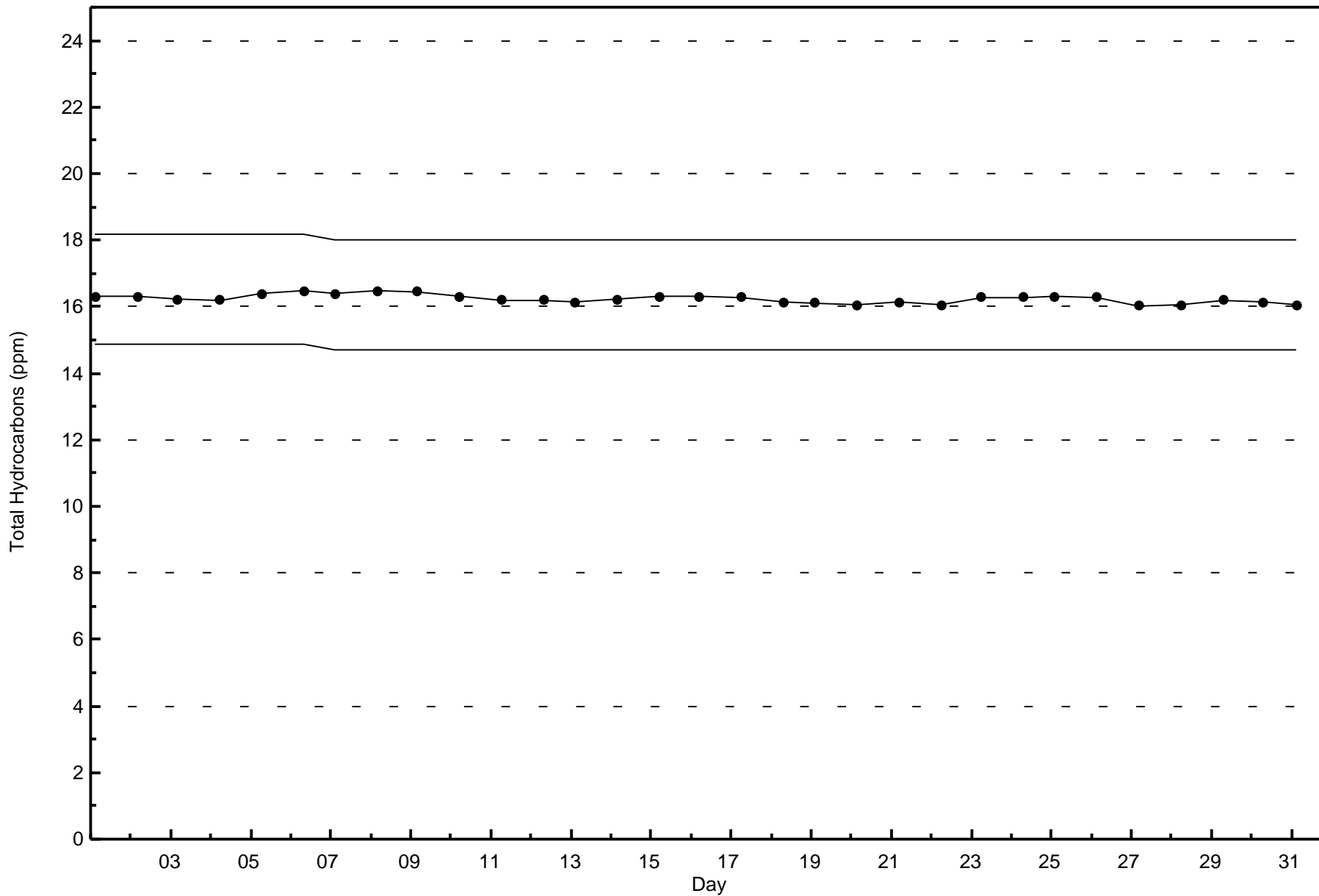




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Patricia McInnes - December 2016







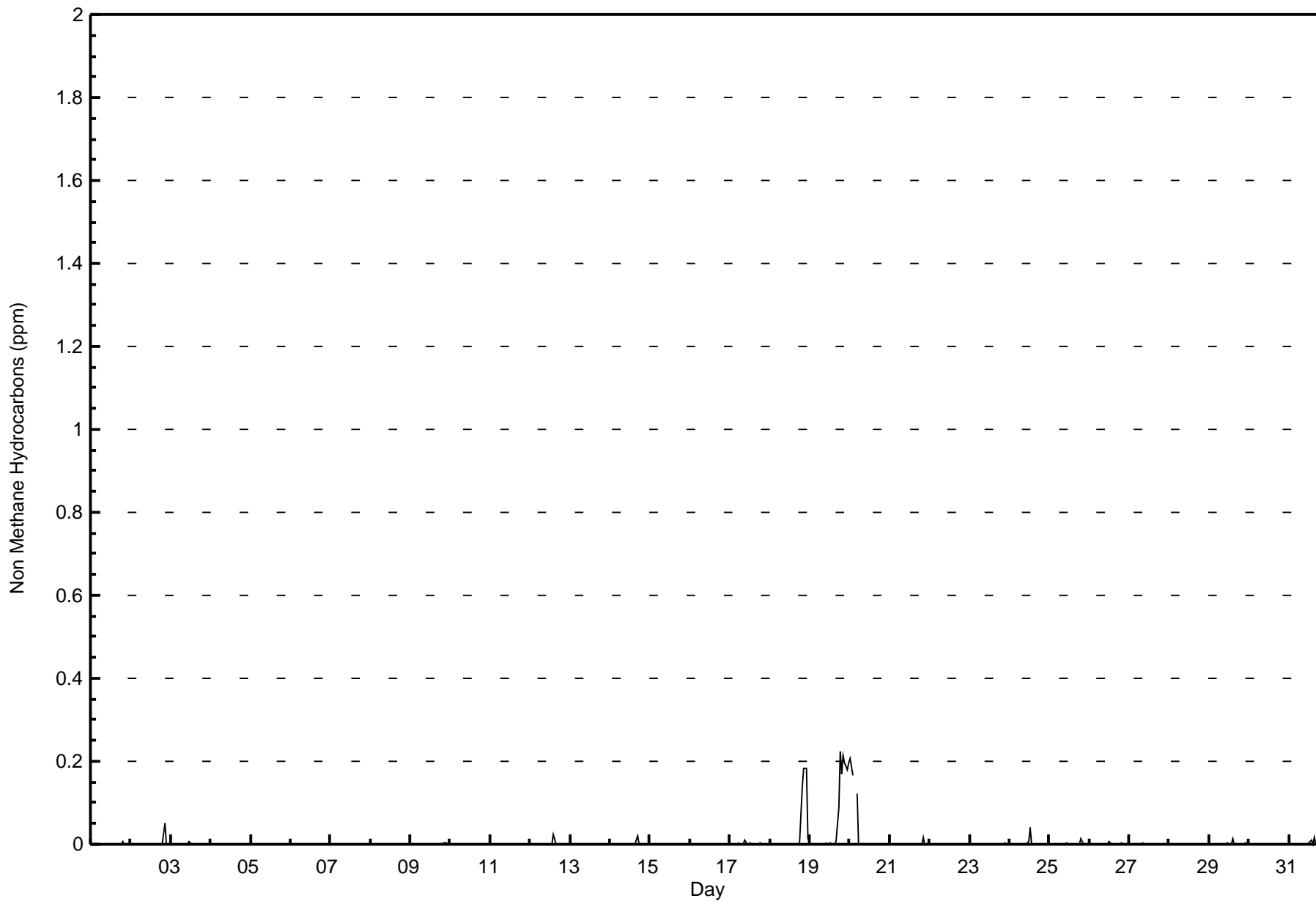
Wood Buffalo Environmental Association

Summary of Hour Averages

Non Methane Hydrocarbons (NMHC) - ppm

Patricia McInnes - December 2016

Maximum Value: 0.225 ppm on Dec 19 19:00		Maximum Daily Average: 0.056 ppm on Dec 19		Hours in Service:	744																																												
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 4		Hours of Data:	708																																												
Maximum Diurnal Average: 0.015 ppm at hour 21		Minimum Diurnal Average: 0.000 ppm at hour 4		Hours of Missing Data:	36																																												
Monthly Average: 0.004 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.2		Hours of Calibration:	34																																												
				Percent Operational Time:	99.7																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.008																			
2-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.050																				
3-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007																			
4-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
5-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
6-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
7-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
8-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
9-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.000	0.000	0.003																			
10-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001																			
11-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
12-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.023																			
13-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
14-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.020	0.020																			
15-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
16-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
17-Dec	0.000	0.000	0.000	0.000	0.000	0.005	Z	0.000	0.000	0.010	0.000	0.000	0.003	0.000	0.001	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010	0.010																			
18-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.140	0.182	0.182	0.182	0.013	0.030	0.182	0.182	0.182																				
19-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.008	0.088	0.225	0.169	0.214	0.196	0.179	0.197	0.056	0.225	0.225	0.225	0.225																				
20-Dec	0.206	0.187	0.166	Z	0.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.206	0.206	0.206	0.206																				
21-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.001	0.017	0.017	0.017	0.017																				
22-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
23-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
24-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.006	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.042	0.042	0.042	0.042	0.042																			
25-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.001	0.013	0.013	0.013	0.013	0.013																			
26-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
27-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
28-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
29-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
30-Dec	0.001	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																			
31-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.009	0.000	0.018	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.018	0.018	0.018	0.018	0.018																			
																								0.007	0.006	0.007	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.001	0.001	0.001	0.003	0.007	0.011	0.015	0.012	0.012	0.007	Diurnal Average		
																								0.206	0.187	0.166	0.000	0.124	0.005	0.000	0.000	0.003	0.010	0.003	0.007	0.042	0.009	0.023	0.018	0.020	0.088	0.225	0.169	0.214	0.196	0.182	0.197	Diurnal Maximum	
Z - zerospan			C - Calibration			M - Maintenance																																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	678	95.76	95.76
0.006 - 0.05	15	2.12	97.88
0.06 - 0.1	3	0.42	98.31
> 0.1	12	1.69	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	71	9	3	3	5	15	46	78	68	51	47	57	37	85	60	43	678
0.006 - 0.05	2	0	0	1	1	0	3	5	0	2	0	0	1	0	0	0	15
0.06 - 0.1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
> 0.1	1	1	0	0	1	1	0	0	2	3	0	0	1	1	0	1	12
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	86	60	44	708

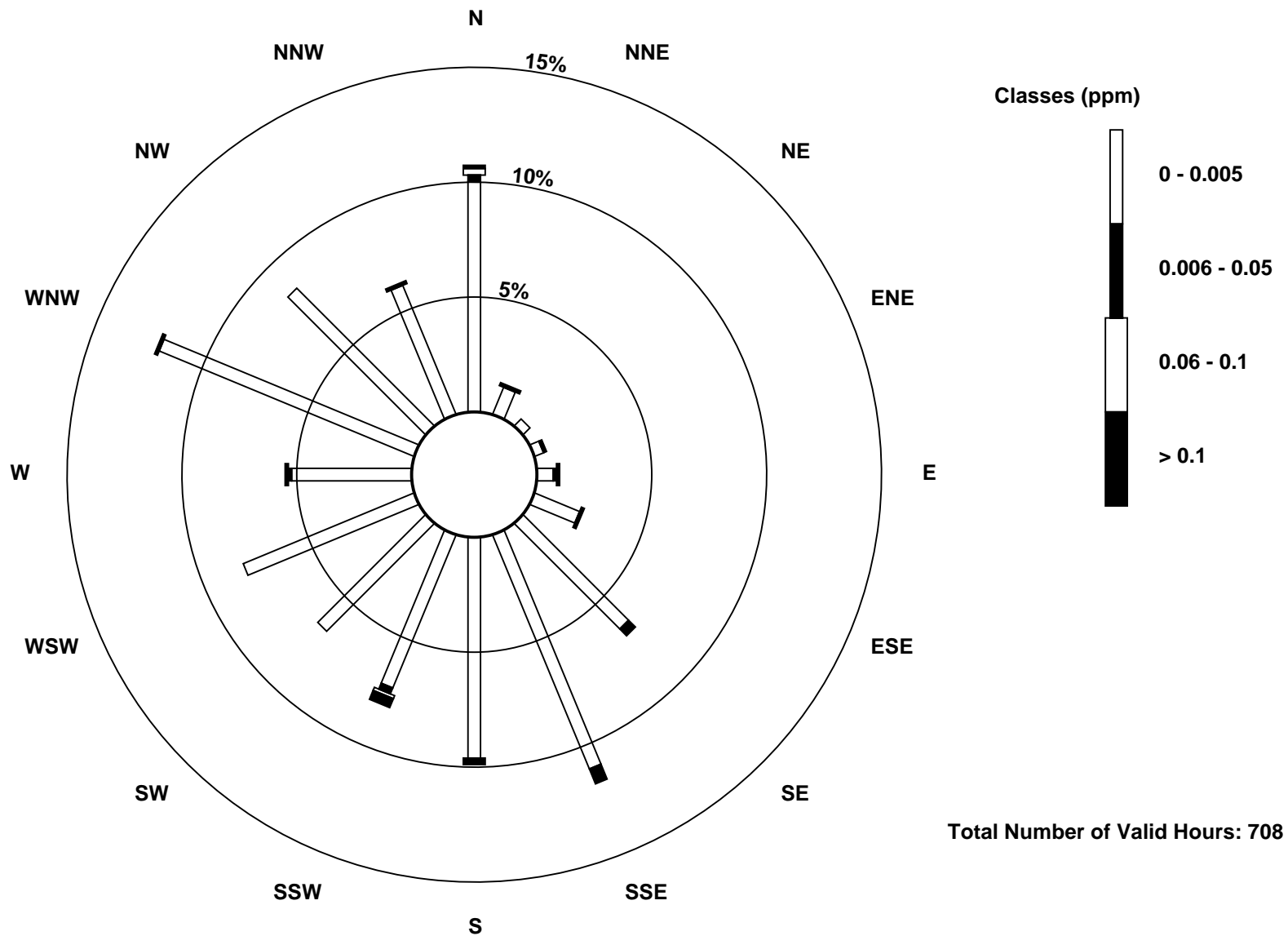
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

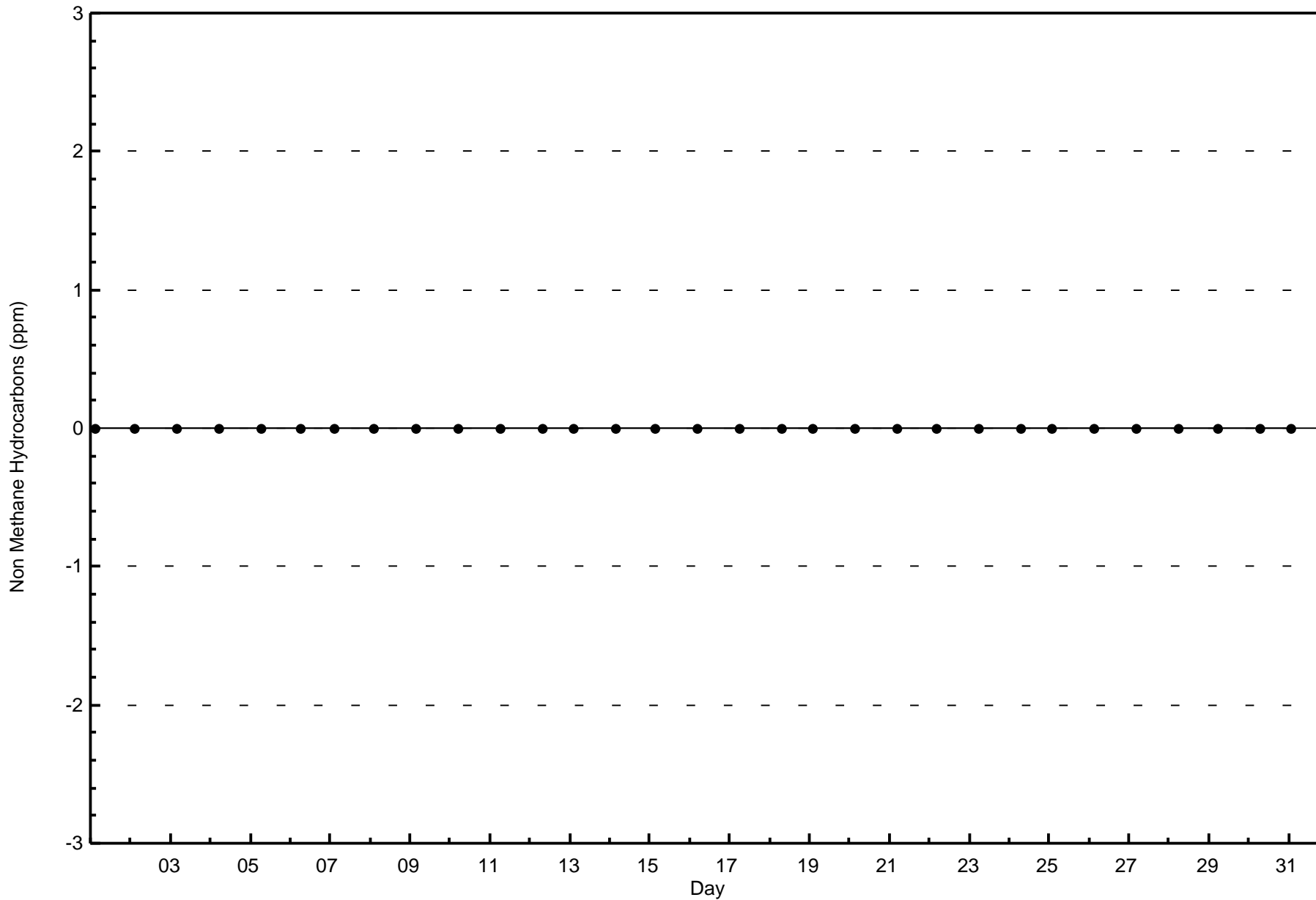
Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes (AMS 6)

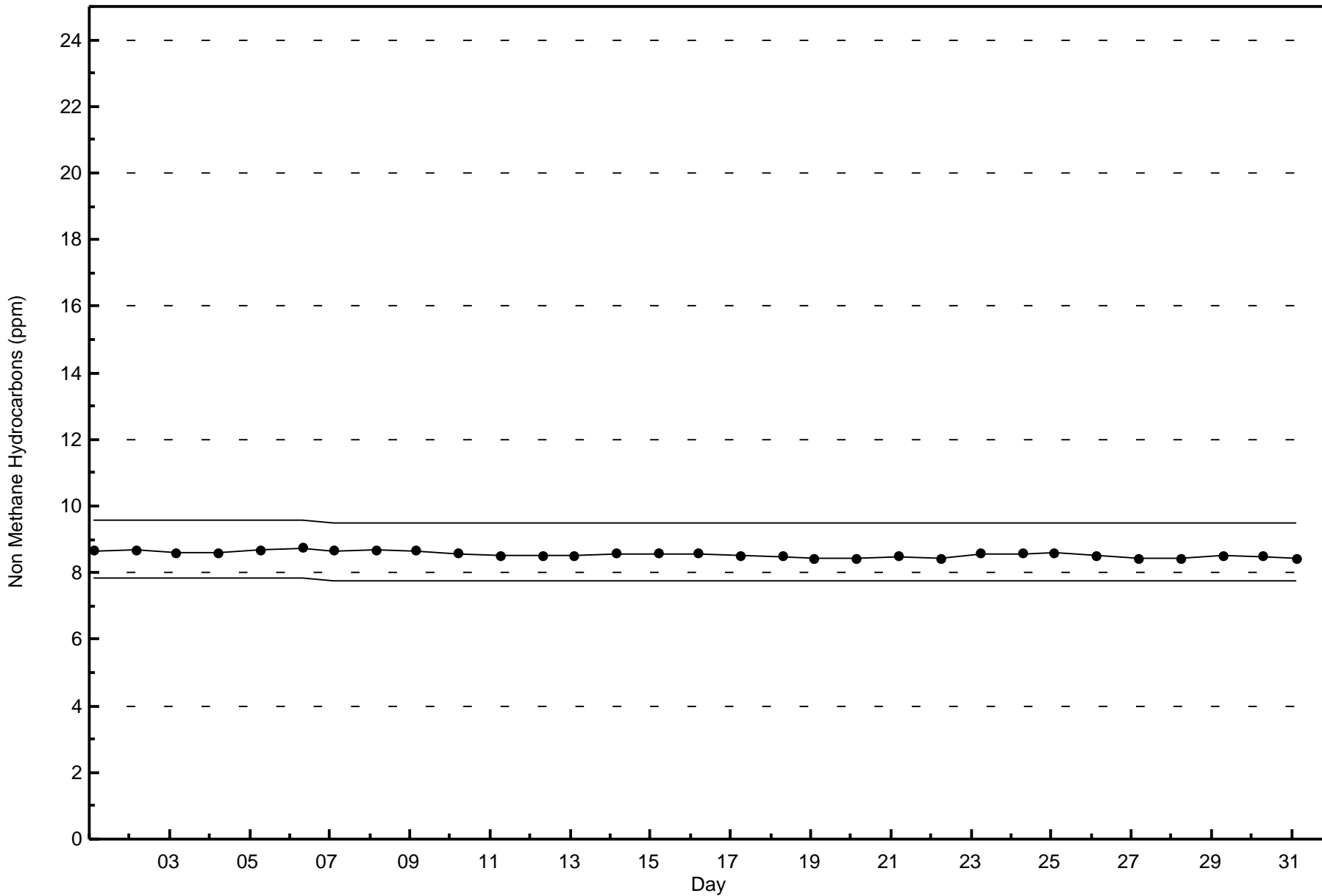


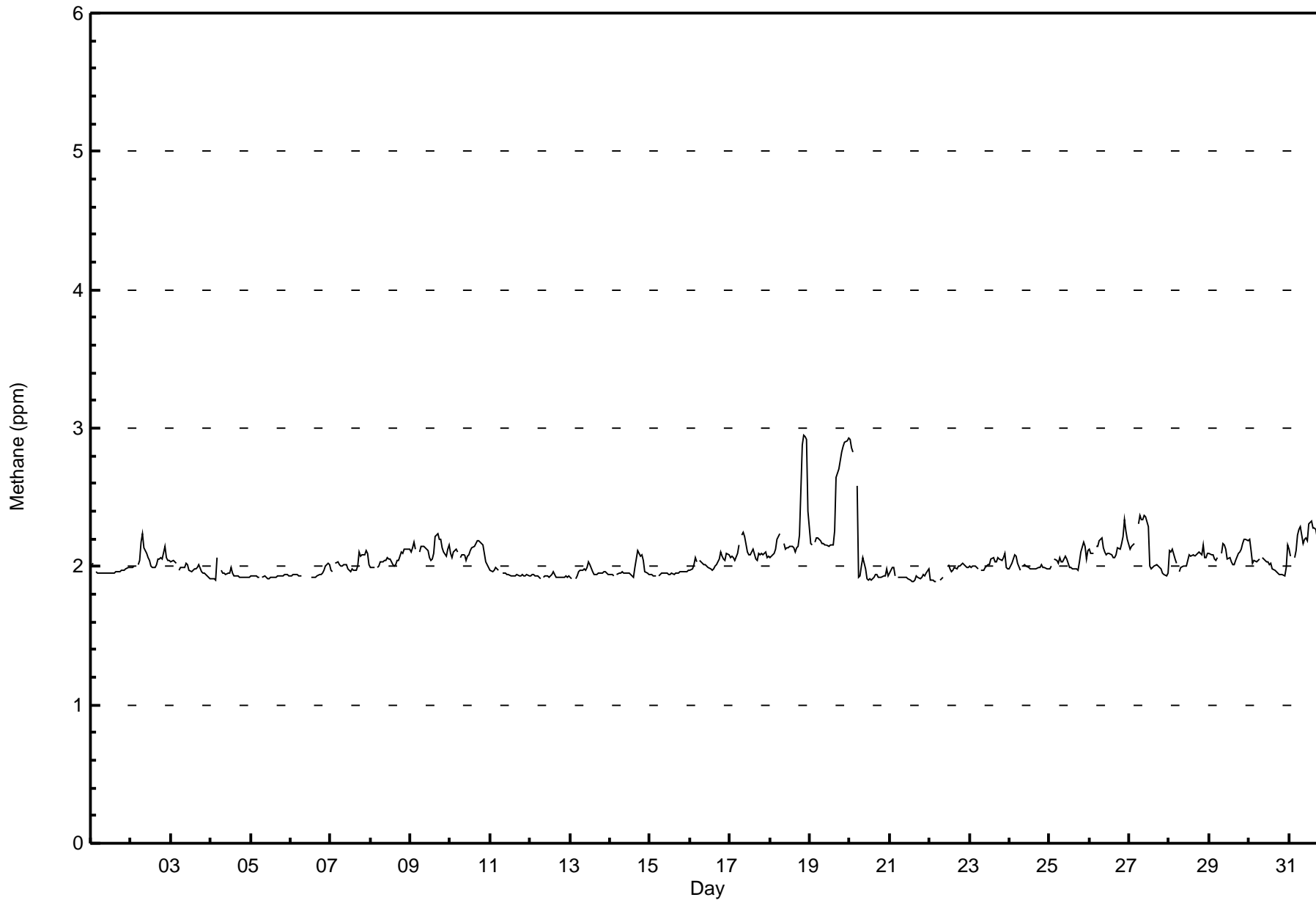


Wood Buffalo Environmental Association
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes - December 2016









Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Patricia McInnes - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	450	63.56	63.56
2.1 - 3.0	258	36.44	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Methane (CH₄) - ppm
Patricia McInnes - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	48	2	1	1	4	1	19	35	24	41	38	52	33	77	42	32	450
2.1 - 3.0	28	8	2	3	3	15	30	48	46	16	9	5	6	9	18	12	258
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	86	60	44	708

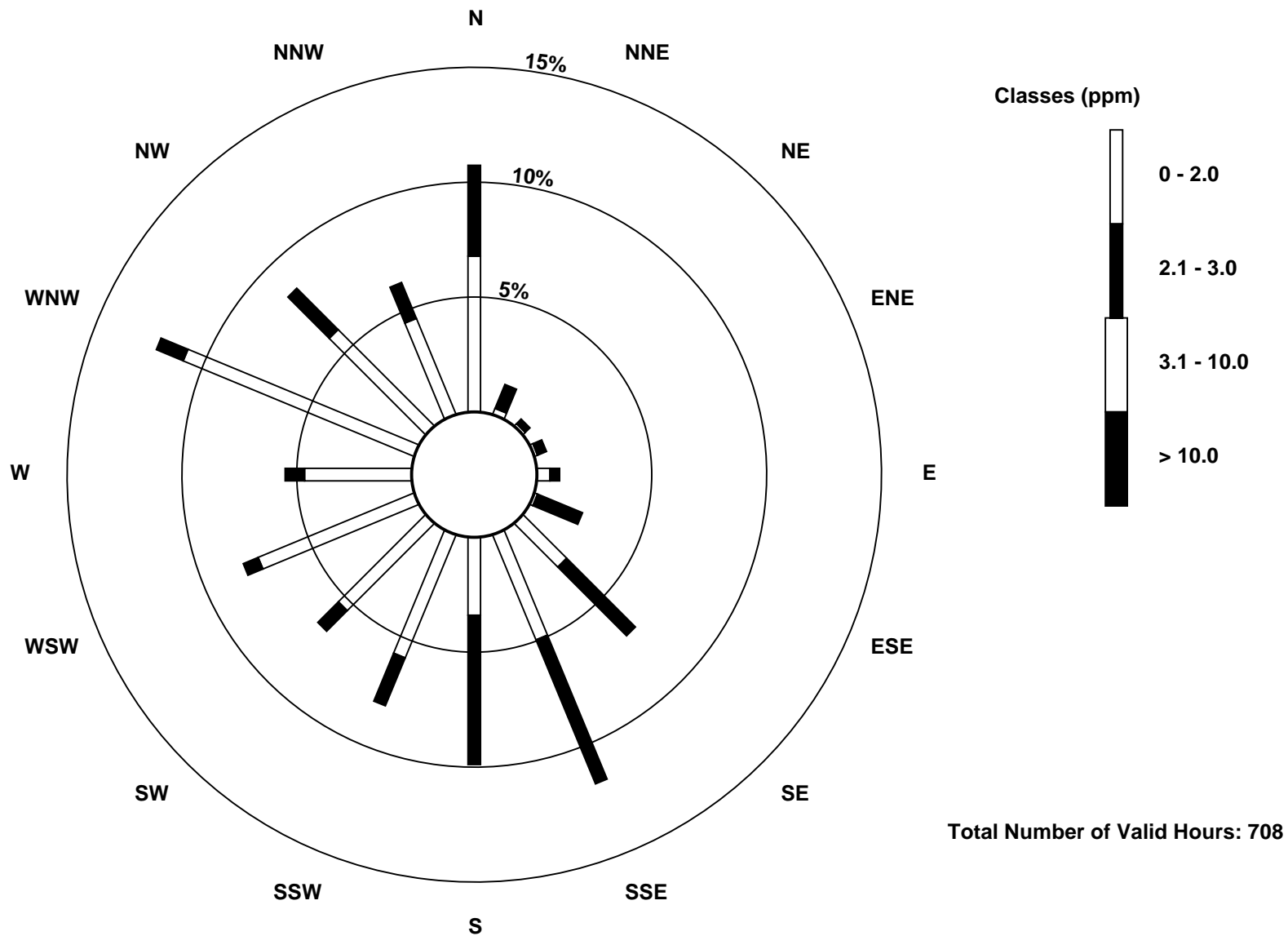
Total Number of Valid Hours: 708

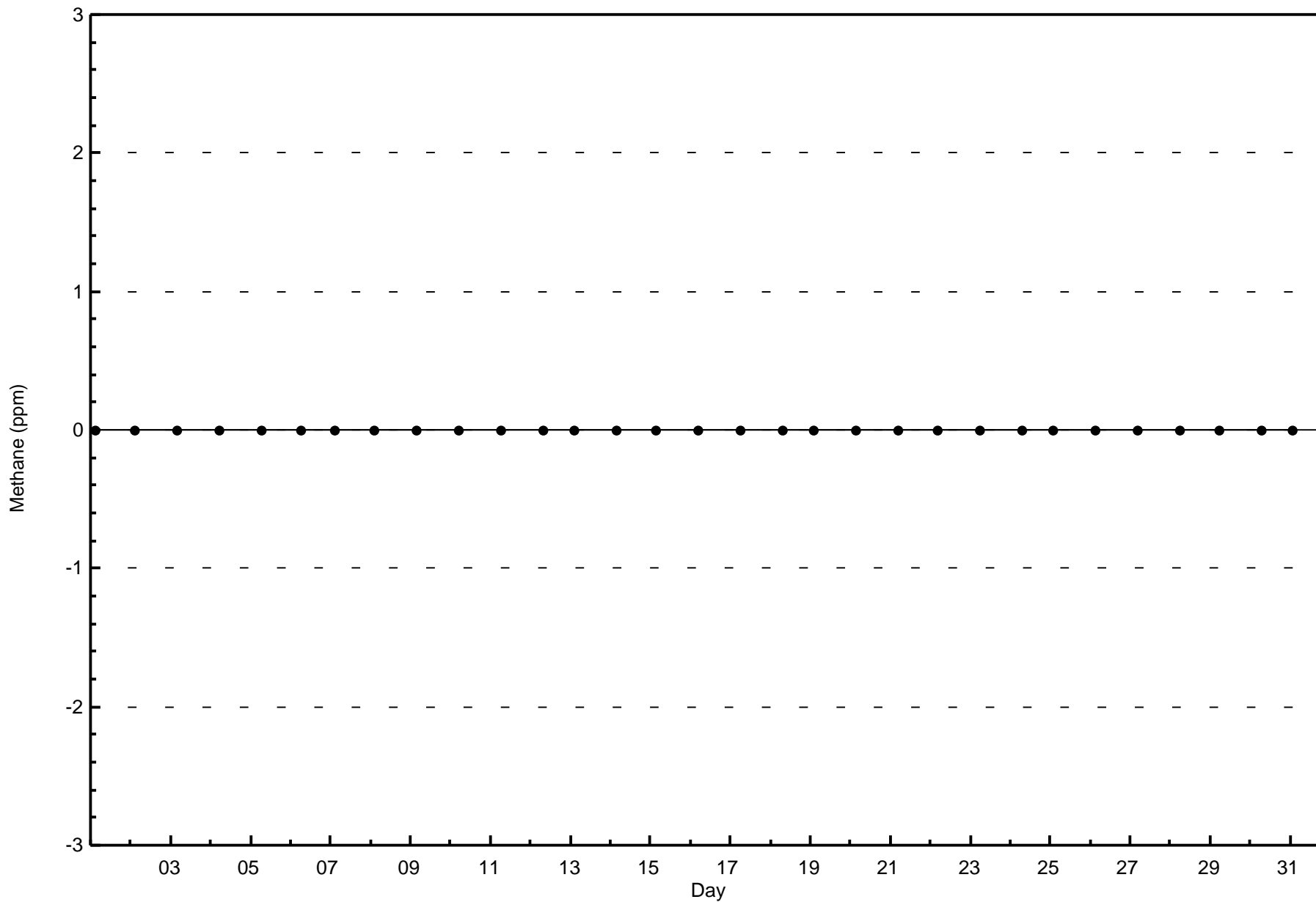
Total Number of Hours: 744

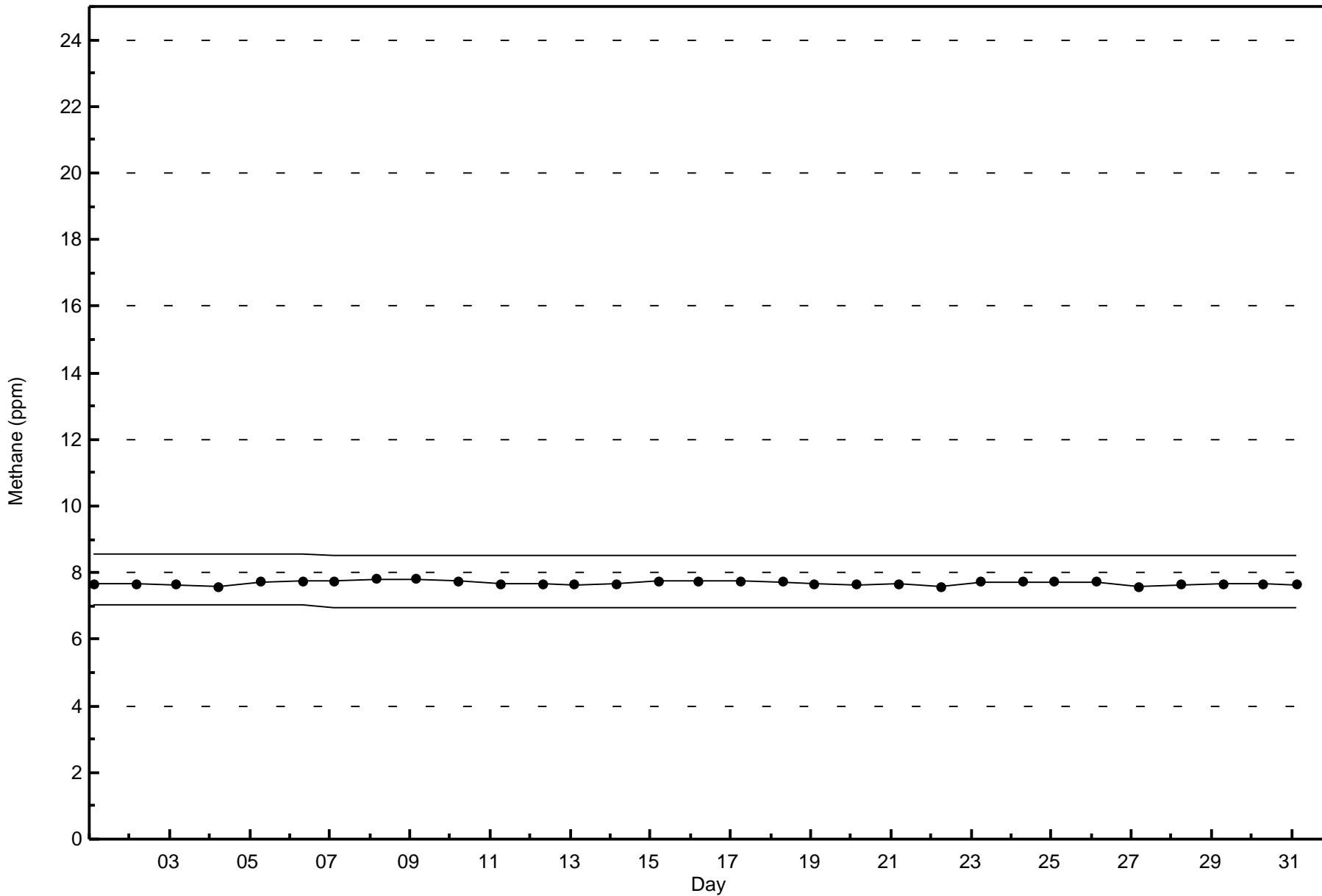


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Methane (CH₄) - ppm
Patricia McInnes (AMS 6)









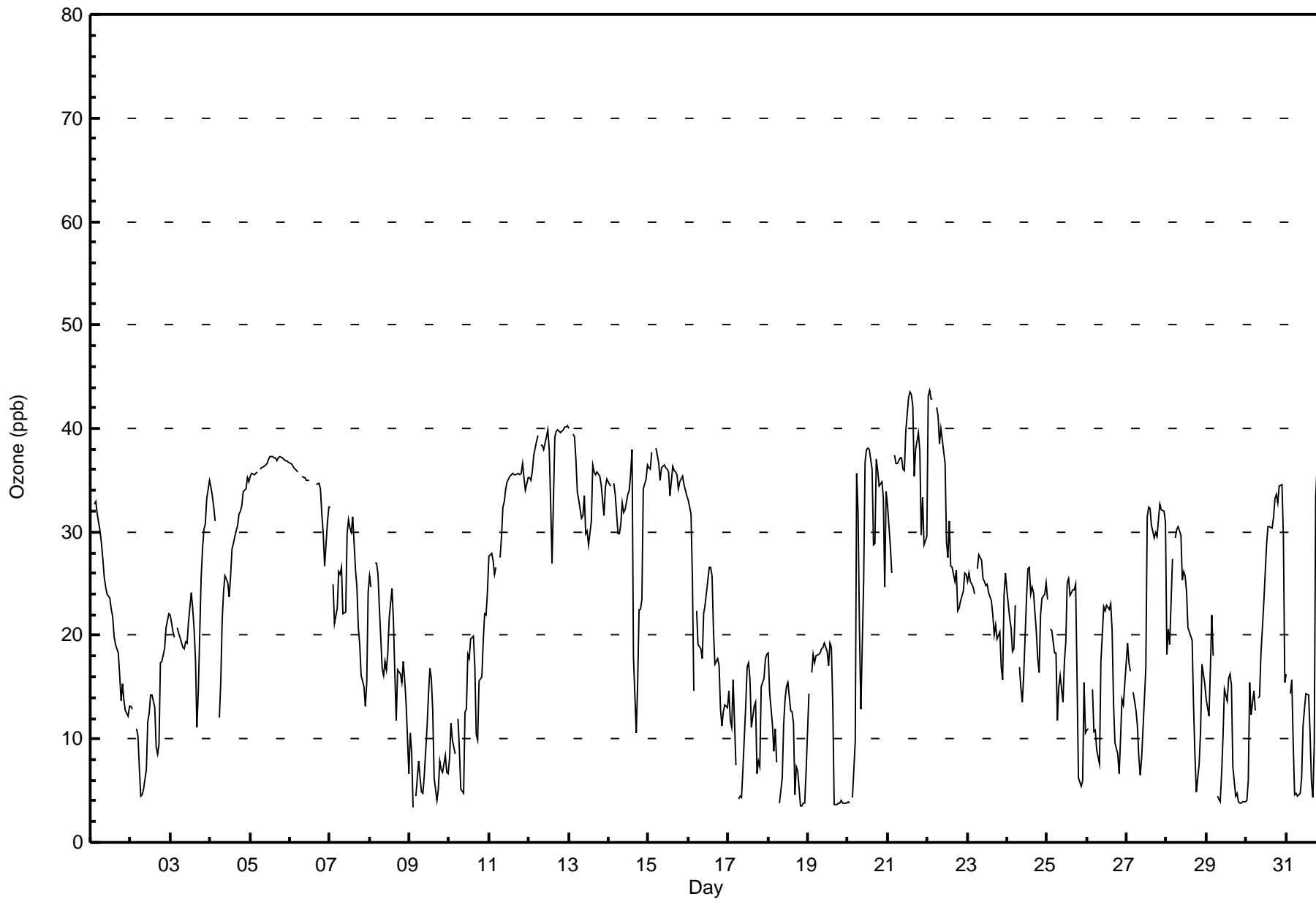
Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Patricia McInnes - December 2016

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																			Daily Average	Daily Maximum		
Maximum Value: 44 ppb on Dec 22 02:00		Maximum Daily Average: 37.9 ppb on Dec 12		Hours of Data: 709																						
Minimum Value: 3 ppb on Dec 9 03:00		Minimum Daily Average: 8.2 ppb on Dec 9		Hours of Missing Data: 35																						
Maximum Diurnal Average: 26.1 ppb at hour 14		Minimum Diurnal Average: 20.4 ppb at hour 8		Hours of Calibration: 35																						
Monthly Average: 22.9 ppb		Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 14 Median = 23 Q ₃ = 33 P ₉₀ = 37 P ₉₉ = 43		Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	32	Z	33	33	32	30	29	27	26	25	24	24	23	22	20	19	18	16	14	15	14	13	12	13	22.3	33
2-Dec	13	13	Z	11	10	7	5	5	5	7	12	12	14	14	13	9	9	10	17	18	19	21	21	22	12.5	22
3-Dec	22	20	20	Z	21	20	20	19	19	19	19	21	24	23	21	18	11	15	25	28	30	31	33	35	22.3	35
4-Dec	34	33	32	31	Z	12	15	21	24	26	25	24	26	28	29	30	31	32	32	33	34	34	35	35	28.6	35
5-Dec	35	36	36	36	36	Z	36	36	36	36	37	37	37	37	37	37	37	37	37	37	37	37	37	37	36.6	37
6-Dec	37	36	36	36	36	36	Z	35	35	35	35	35	C	C	C	C	35	35	34	32	30	27	31	32	34.1	37
7-Dec	32	Z	25	21	23	26	26	27	22	22	30	31	30	30	31	26	25	21	19	16	15	13	15	24	24.0	32
8-Dec	26	25	Z	27	27	26	23	17	16	17	17	18	22	25	21	16	12	17	16	15	18	16	14	7	19.0	27
9-Dec	11	9	3	Z	4	8	6	5	5	7	11	14	17	16	13	6	4	5	8	7	7	8	7	7	8.2	17
10-Dec	8	11	10	9	Z	12	9	5	5	13	13	18	18	20	20	17	10	10	16	16	19	22	22	24	14.2	24
11-Dec	28	28	27	26	27	Z	28	30	32	33	34	35	35	36	36	36	36	36	36	36	37	35	34	35	32.7	37
12-Dec	35	35	36	37	39	39	Z	38	38	38	39	40	38	33	27	39	40	40	40	40	40	40	40	40	37.9	40
13-Dec	40	Z	39	39	37	34	33	31	32	33	30	30	29	31	36	36	35	36	35	35	33	32	34	35	34.2	40
14-Dec	35	34	Z	35	34	30	30	31	33	32	32	34	34	36	38	18	11	15	22	23	23	34	35	36	29.7	38
15-Dec	36	36	38	Z	38	37	37	35	36	36	36	36	36	34	36	36	36	35	34	35	35	35	34	34	35.7	38
16-Dec	33	32	25	15	Z	22	19	19	18	22	23	24	27	27	26	20	17	18	17	13	11	13	13	13	20.3	33
17-Dec	15	12	11	16	7	Z	4	4	4	7	13	17	17	16	11	13	14	7	8	7	15	16	18	18	11.8	18
18-Dec	18	15	11	9	11	8	Z	4	6	11	14	15	15	13	13	12	5	7	7	4	4	4	4	7	9.3	18
19-Dec	14	Z	16	18	17	18	18	18	19	19	19	19	17	19	19	13	4	4	4	4	4	4	4	4	12.8	19
20-Dec	4	4	Z	4	10	36	32	21	13	25	37	38	38	38	36	29	29	37	36	34	35	33	25	34	27.3	38
21-Dec	33	29	26	Z	37	37	37	37	37	36	36	40	43	43	43	42	35	38	40	38	30	33	29	29	36.0	43
22-Dec	43	44	43	43	Z	42	41	38	40	39	37	29	28	31	27	27	25	26	22	23	23	24	26	26	32.5	44
23-Dec	25	26	25	25	24	Z	26	28	27	26	25	25	25	24	23	22	20	21	20	20	17	16	24	26	23.5	28
24-Dec	24	22	21	18	19	23	Z	17	15	14	16	24	26	27	24	25	24	20	18	16	22	24	24	25	21.2	27
25-Dec	23	Z	21	21	18	18	12	15	16	14	17	19	25	25	24	24	24	25	16	6	5	6	15	11	17.5	25
26-Dec	11	11	Z	15	11	11	9	8	18	20	23	22	23	22	23	20	13	10	9	7	10	14	13	15	14.7	23
27-Dec	19	17	17	Z	14	13	11	8	7	8	11	17	31	32	32	31	29	30	30	31	33	32	32	31	22.5	33
28-Dec	18	21	19	27	Z	29	30	30	30	25	26	26	24	21	20	20	13	8	5	8	11	17	16	15	20.0	30
29-Dec	14	12	17	22	18	Z	4	4	4	7	10	15	14	16	16	15	7	5	5	4	4	4	4	4	9.7	22
30-Dec	4	6	15	12	15	13	Z	14	14	18	23	26	29	31	31	30	31	33	34	33	35	35	30	16	22.9	35
31-Dec	16	Z	14	16	10	5	5	4	5	6	11	13	14	14	11	6	4	10	33	39	39	37	37	38	16.8	39
23.9 22.6 23.7 23.1 22.1 22.8 20.9 20.4 20.5 21.8 23.7 25.1 26.0 26.1 25.2 23.1 20.8 21.2 22.2 21.7 22.2 22.9 23.2 23.5																								Diurnal Average		
43 44 43 43 39 42 41 38 40 39 39 40 43 43 43 42 40 40 40 40 40 40 40 40 40																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	313	44.15	44.15
21 - 50	396	55.85	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	29	7	1	5	4	15	35	67	53	31	14	6	8	9	17	12	313
21 - 50	48	2	2	0	4	1	14	15	17	26	33	51	32	78	43	30	396
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	77	9	3	5	8	16	49	82	70	57	47	57	40	87	60	42	709

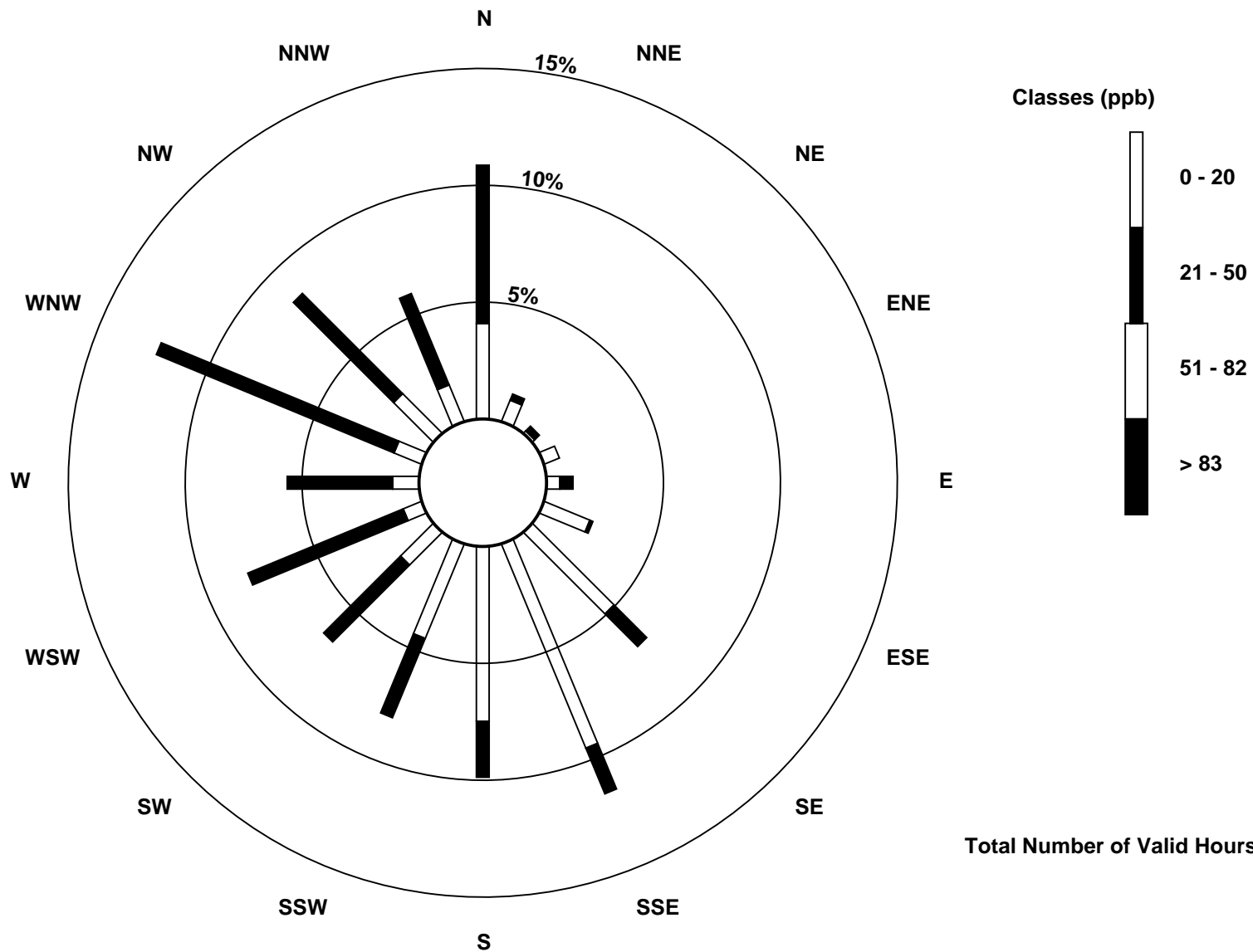
Total Number of Valid Hours: 709

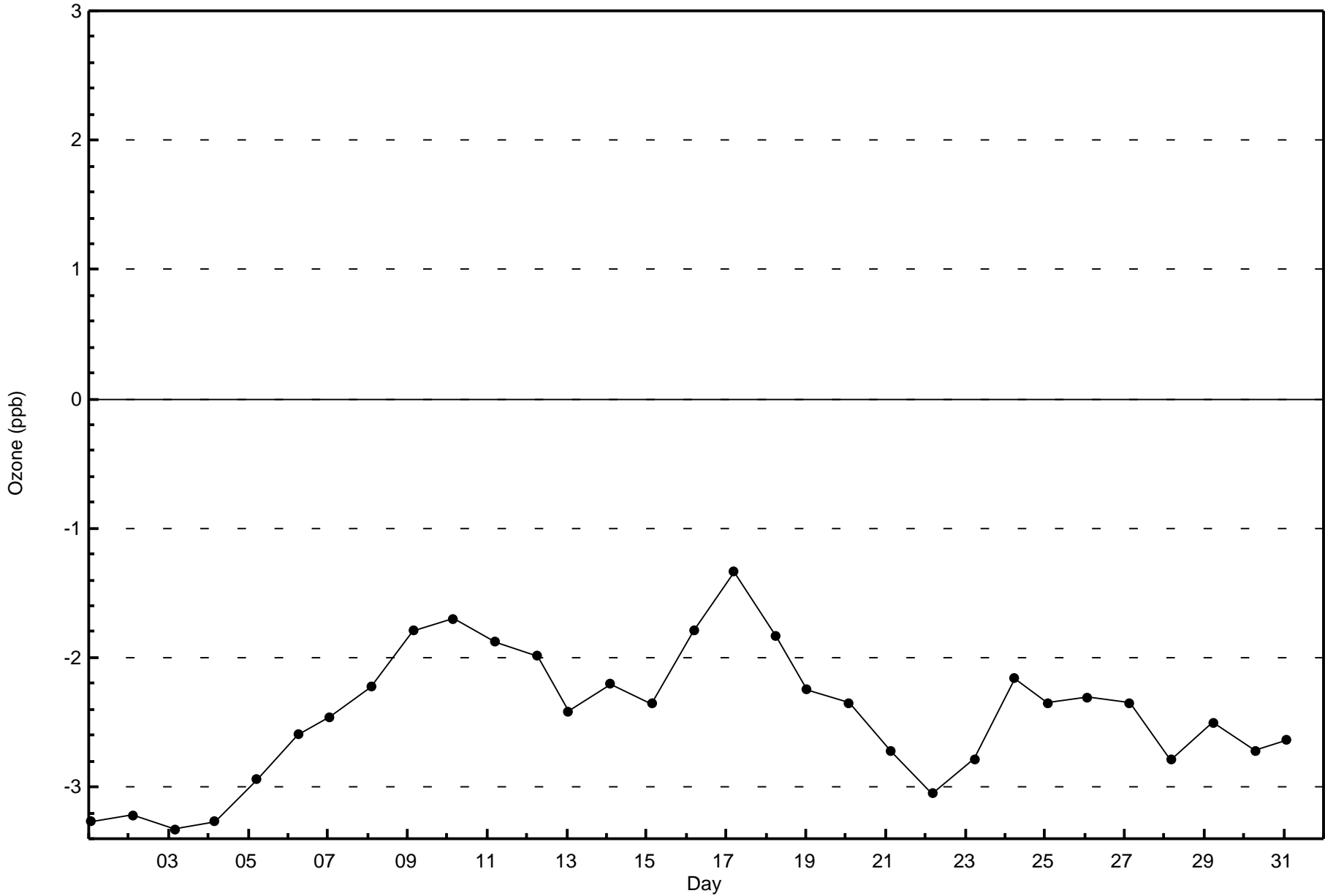
Total Number of Hours: 744

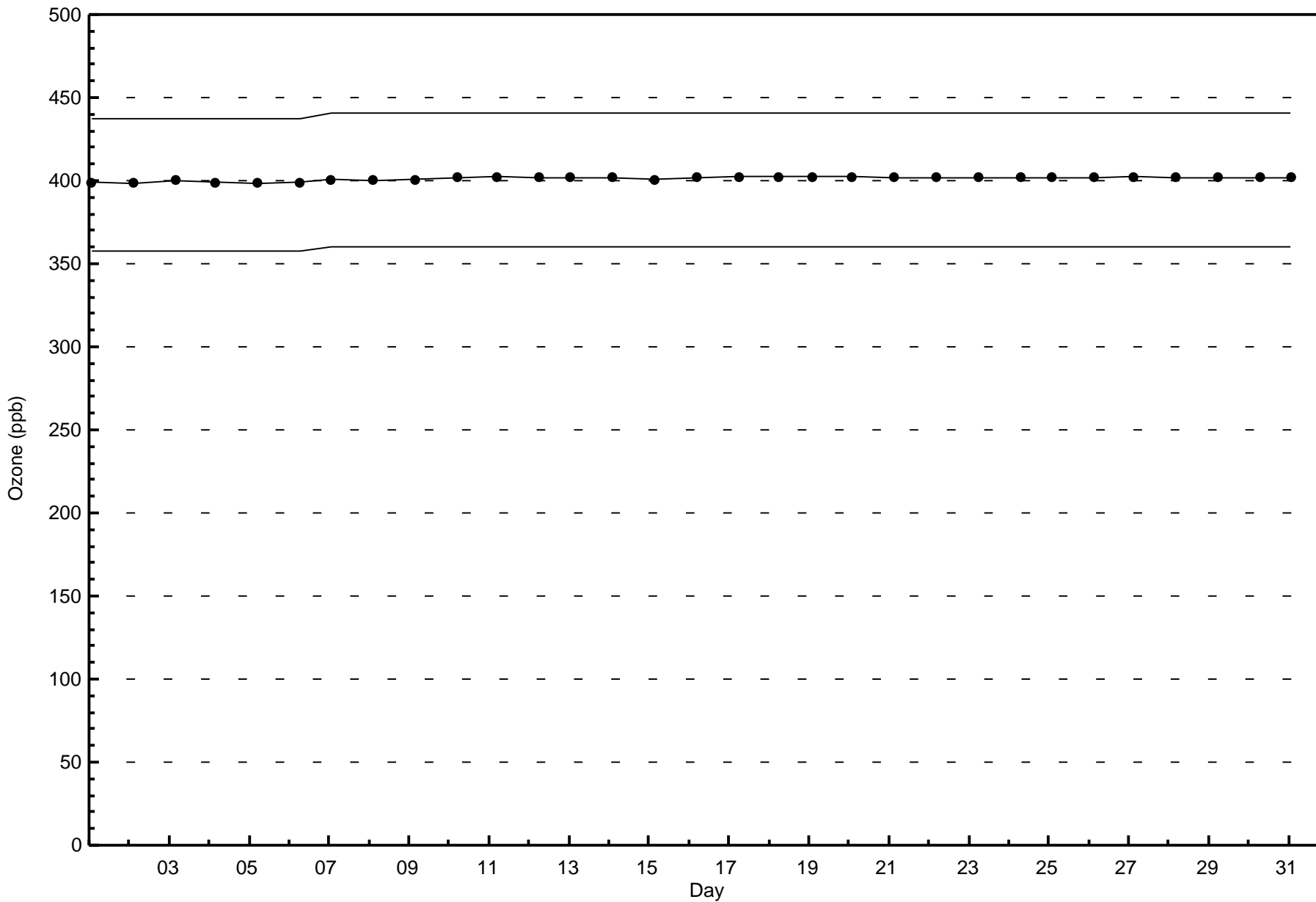


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ozone (O₃) - ppb
Patricia McInnes (AMS 6)

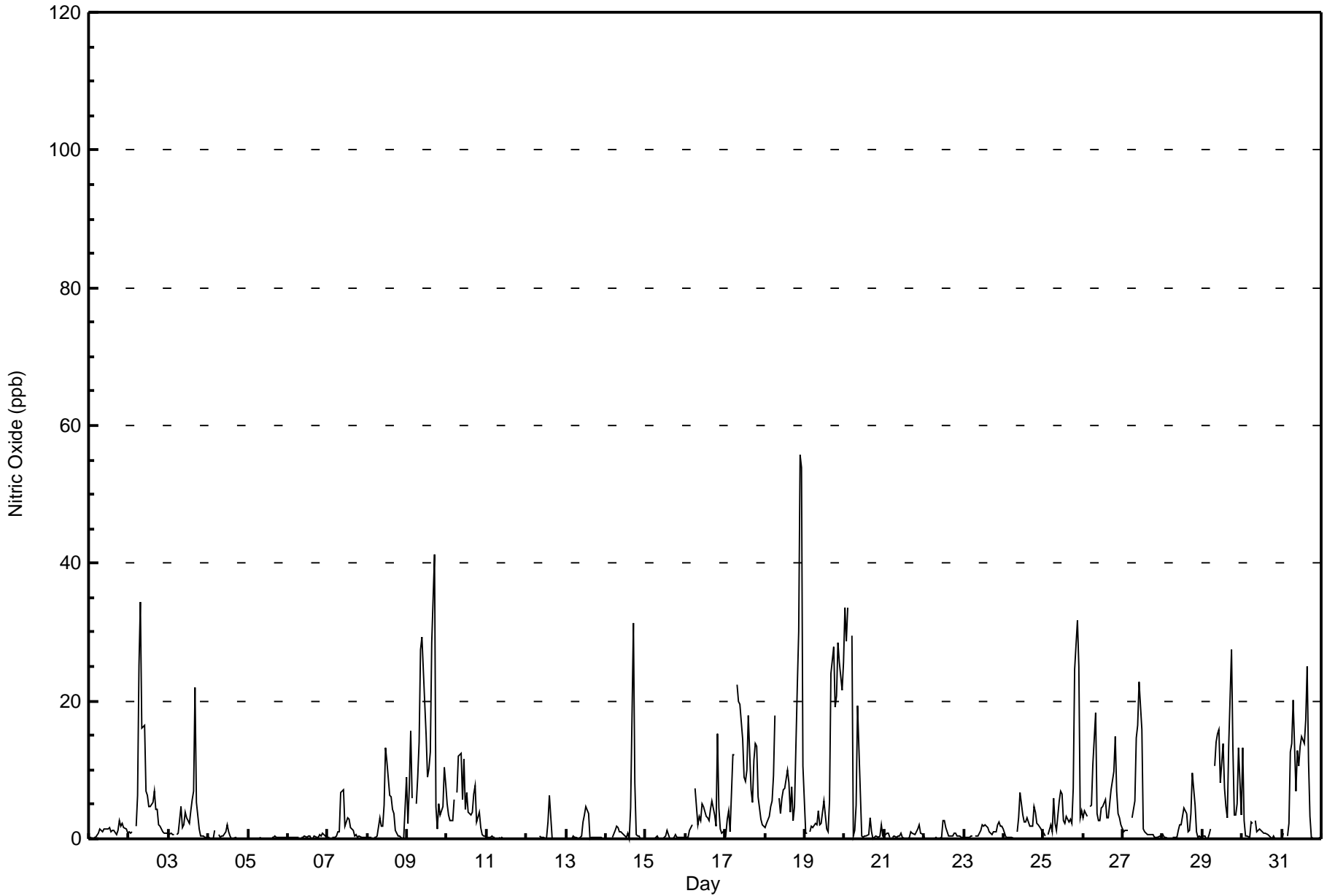








Maximum Value: 56 ppb on Dec 18 22:00																		Maximum Daily Average: 12.6 ppb on Dec 9						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 4 04:00																		Minimum Daily Average: 0.1 ppb on Dec 11						Hours of Data: 708		
Maximum Diurnal Average: 6.2 ppb at hour 8																		Minimum Diurnal Average: 0.8 ppb at hour 4						Hours of Missing Data: 36		
Monthly Average: 3.9 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 4 P ₉₀ = 12 P ₉₉ = 31						Hours of Calibration: 36		
																		Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	Z	0	0	1	1	1	1	1	1	2	1	1	1	1	1	3	2	2	2	2	1	1.2	3	
2-Dec	1	1	1	Z	2	6	25	34	16	17	7	6	5	5	5	7	4	4	2	2	1	1	1	6.7	34	
3-Dec	1	1	1	1	Z	1	1	5	2	2	4	3	2	4	6	7	22	5	1	0	0	0	0	3.0	22	
4-Dec	0	0	0	0	1	Z	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0.3	2	
5-Dec	0	0	0	0	0	0	Z	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0.2	0	
6-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0.3	1	
7-Dec	0	0	Z	0	0	0	1	1	7	7	2	2	3	3	2	1	0	1	0	0	0	0	0	1.4	7	
8-Dec	0	0	0	Z	0	0	0	3	2	2	5	13	11	6	6	4	4	1	0	0	0	0	0	3.0	13	
9-Dec	2	8	16	6	Z	5	9	14	28	29	20	15	9	10	13	28	41	5	1	5	4	5	10	12.6	41	
10-Dec	5	4	3	3	6	Z	7	12	12	6	12	4	7	4	3	4	7	8	3	4	2	1	0	5.0	12	
11-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	2	6	0	0	0	0	0	0	0	0	0.4	6	
13-Dec	0	0	Z	0	0	0	0	0	0	0	2	3	5	4	0	0	0	0	0	0	0	0	0	0.7	5	
14-Dec	0	0	0	Z	0	1	2	2	1	1	1	0	1	0	1	0	4	31	8	1	0	0	0	2.4	31	
15-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0.2	1	
16-Dec	0	0	1	2	2	Z	7	2	3	3	5	5	3	3	3	4	5	3	2	15	4	1	1	3.4	15	
17-Dec	1	3	4	1	12	12	Z	22	20	20	14	9	8	10	18	7	5	11	14	13	6	3	2	9.5	22	
18-Dec	2	2	3	5	5	9	18	Z	6	4	6	7	7	10	8	4	8	3	5	22	30	56	54	12.3	56	
19-Dec	1	1	Z	1	2	2	2	2	4	2	2	6	4	1	1	6	24	28	19	21	29	26	22	10.0	29	
20-Dec	34	29	34	Z	30	0	1	5	19	7	0	0	0	0	1	3	1	0	0	0	0	0	2	7.3	34	
21-Dec	0	1	1	0	Z	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	2	1	0.6	2	
22-Dec	0	0	0	0	0	Z	0	0	0	0	0	3	3	2	1	0	0	0	1	1	0	0	0	0.5	3	
23-Dec	0	0	0	0	0	0	Z	0	0	1	1	2	2	2	2	1	1	1	1	1	2	2	2	1.1	2	
24-Dec	1	0	0	0	0	0	0	Z	1	3	7	3	2	2	3	2	2	2	5	4	2	2	1	2.0	7	
25-Dec	1	0	Z	1	2	1	6	2	1	5	7	6	3	2	3	2	3	2	7	25	32	25	3	6.3	32	
26-Dec	3	4	3	Z	5	5	11	18	4	3	3	4	5	6	3	3	5	7	10	15	7	4	3	5.7	18	
27-Dec	1	1	1	1	Z	3	4	5	15	16	23	16	1	1	1	1	1	1	1	0	0	0	0	4.1	23	
28-Dec	1	0	0	0	0	Z	0	0	0	1	2	2	3	5	4	1	1	4	10	5	1	0	0	1.8	10	
29-Dec	0	1	0	0	1	1	Z	11	14	15	16	8	14	7	5	3	14	28	13	4	3	5	13	7.8	28	
30-Dec	13	3	0	0	0	2	2	Z	3	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1.4	13	
31-Dec	0	1	Z	0	2	13	14	20	7	13	11	13	15	14	17	25	11	3	0	0	0	0	0	7.8	25	
2.2																								Diurnal Average		
34																								Diurnal Maximum		
Z - zerospan																								C - Calibration		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	95.76	95.76
21 - 40	27	3.81	99.58
41 - 80	3	0.42	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	72	9	3	3	5	15	46	77	65	53	47	57	38	81	64	43	678
21 - 40	4	1	0	1	1	0	2	6	5	4	0	0	1	1	0	1	27
11 - 80	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	3
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	82	64	44	708

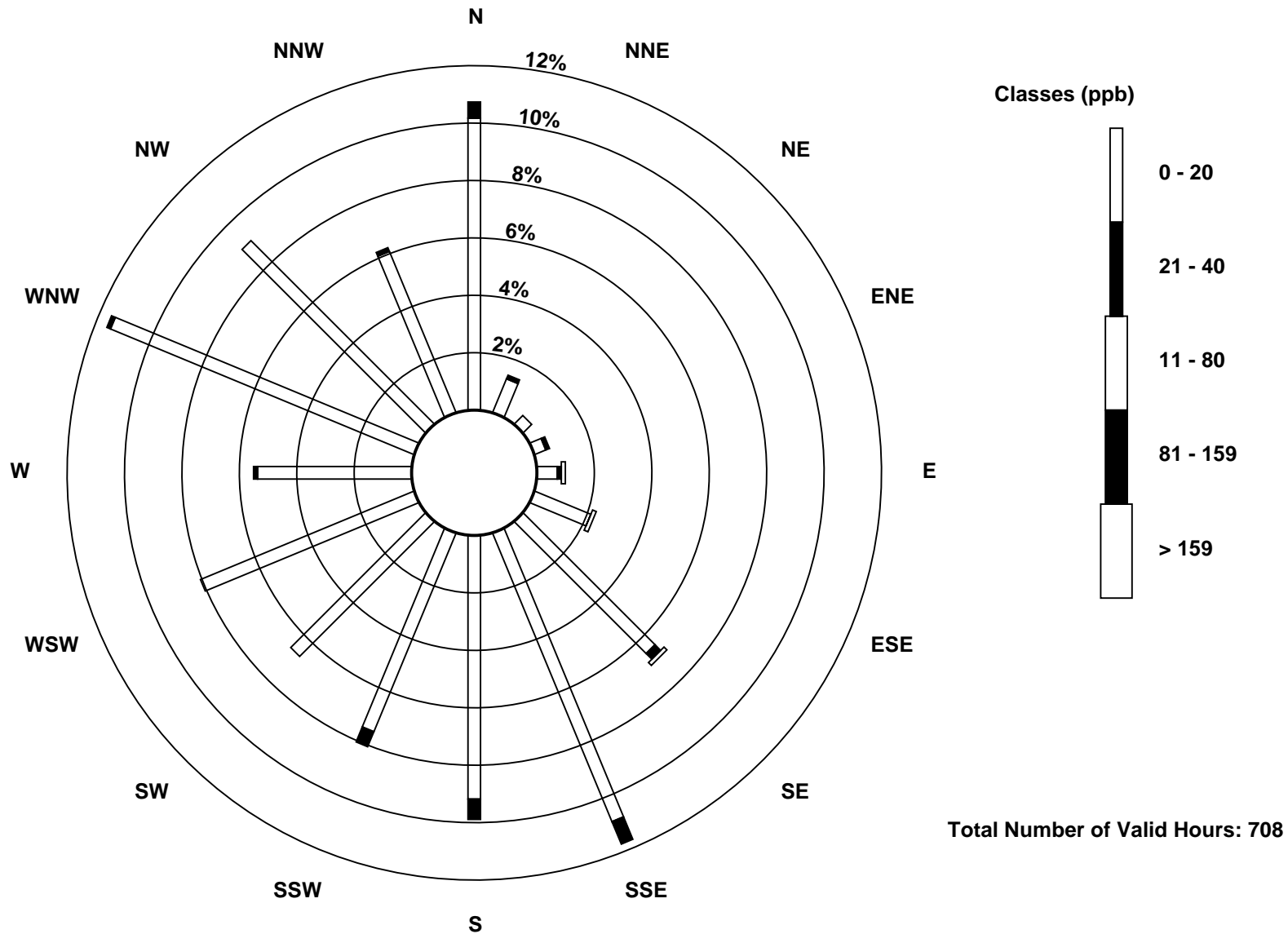
Total Number of Valid Hours: 708

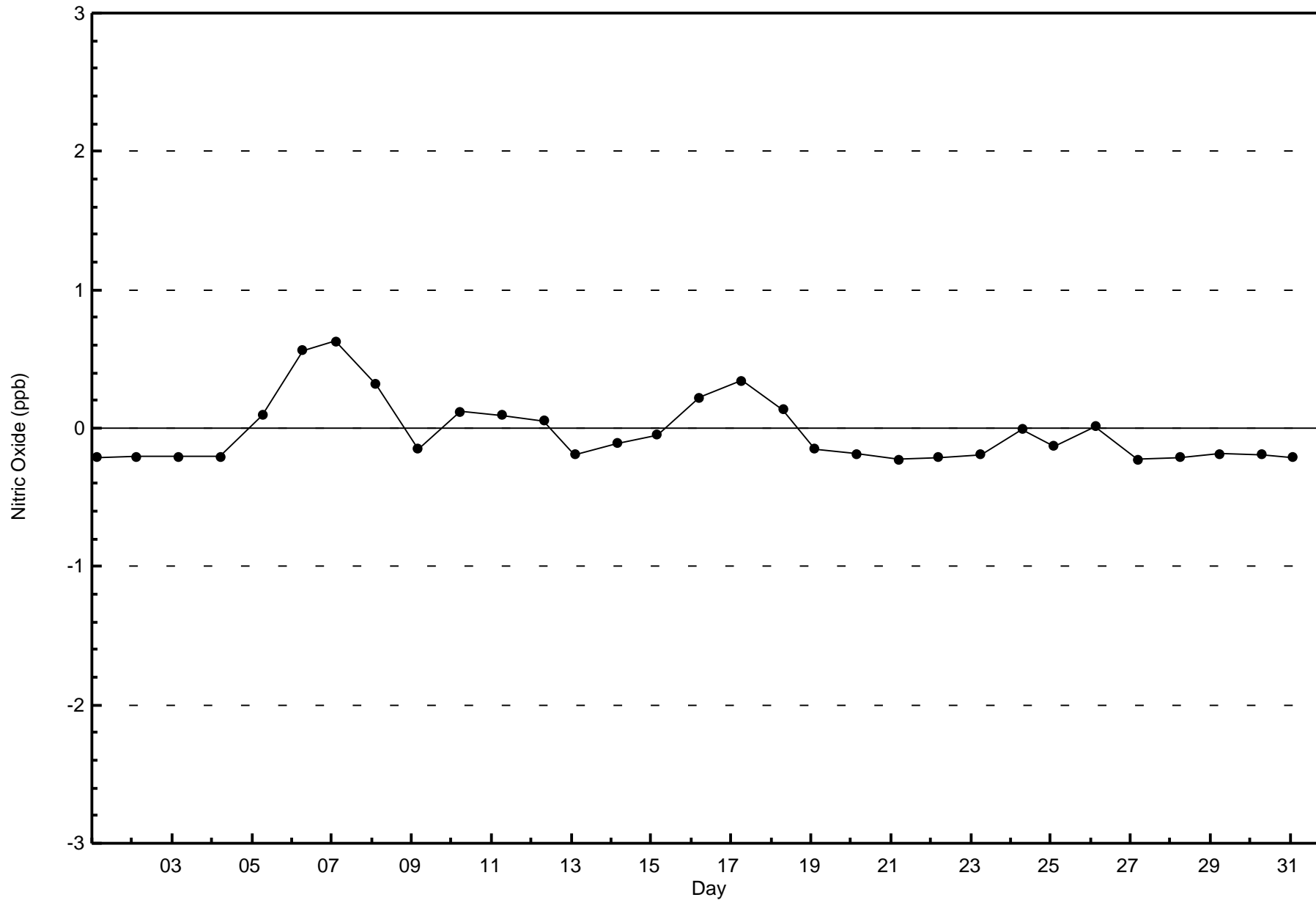
Total Number of Hours: 744

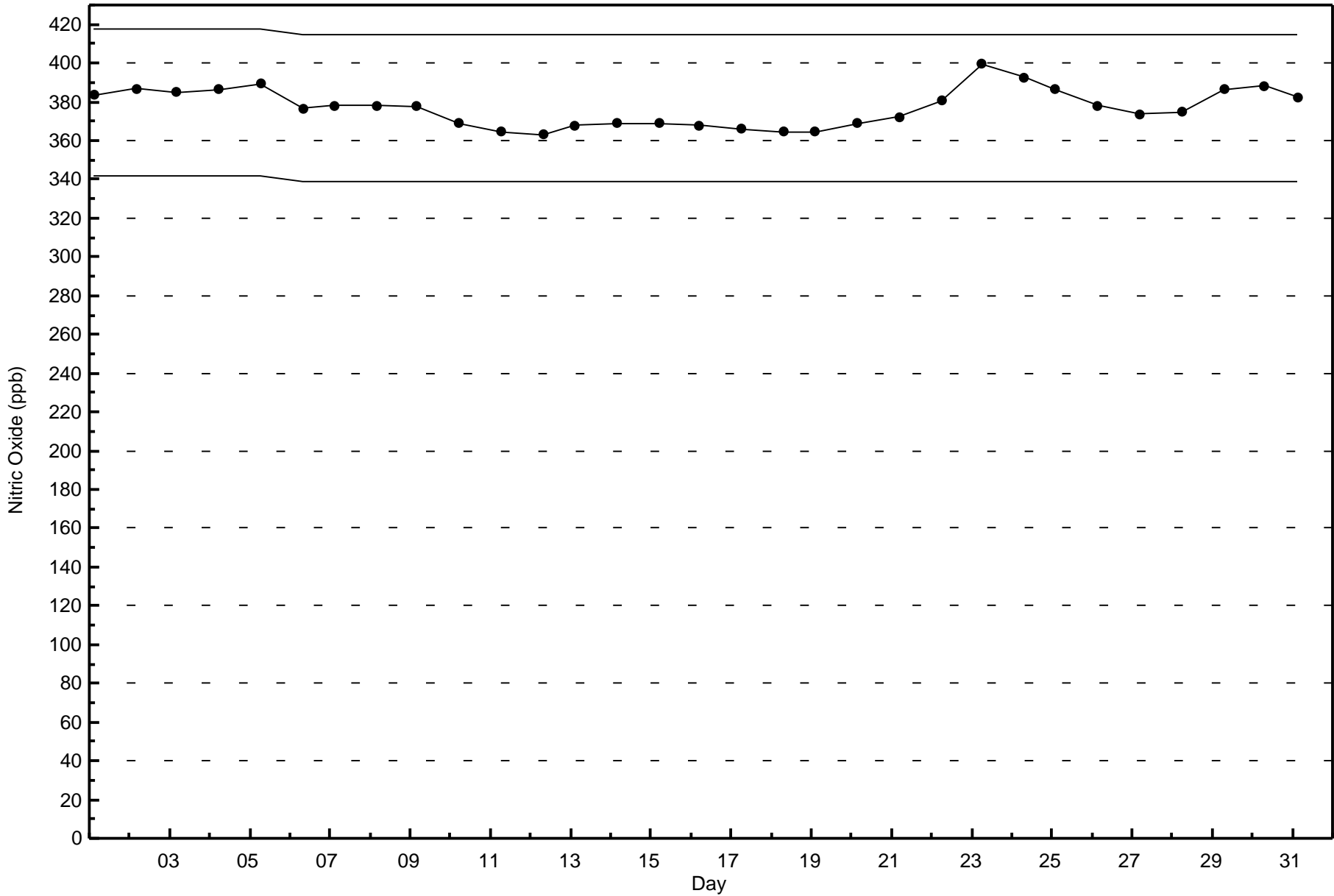


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitric Oxide (NO) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

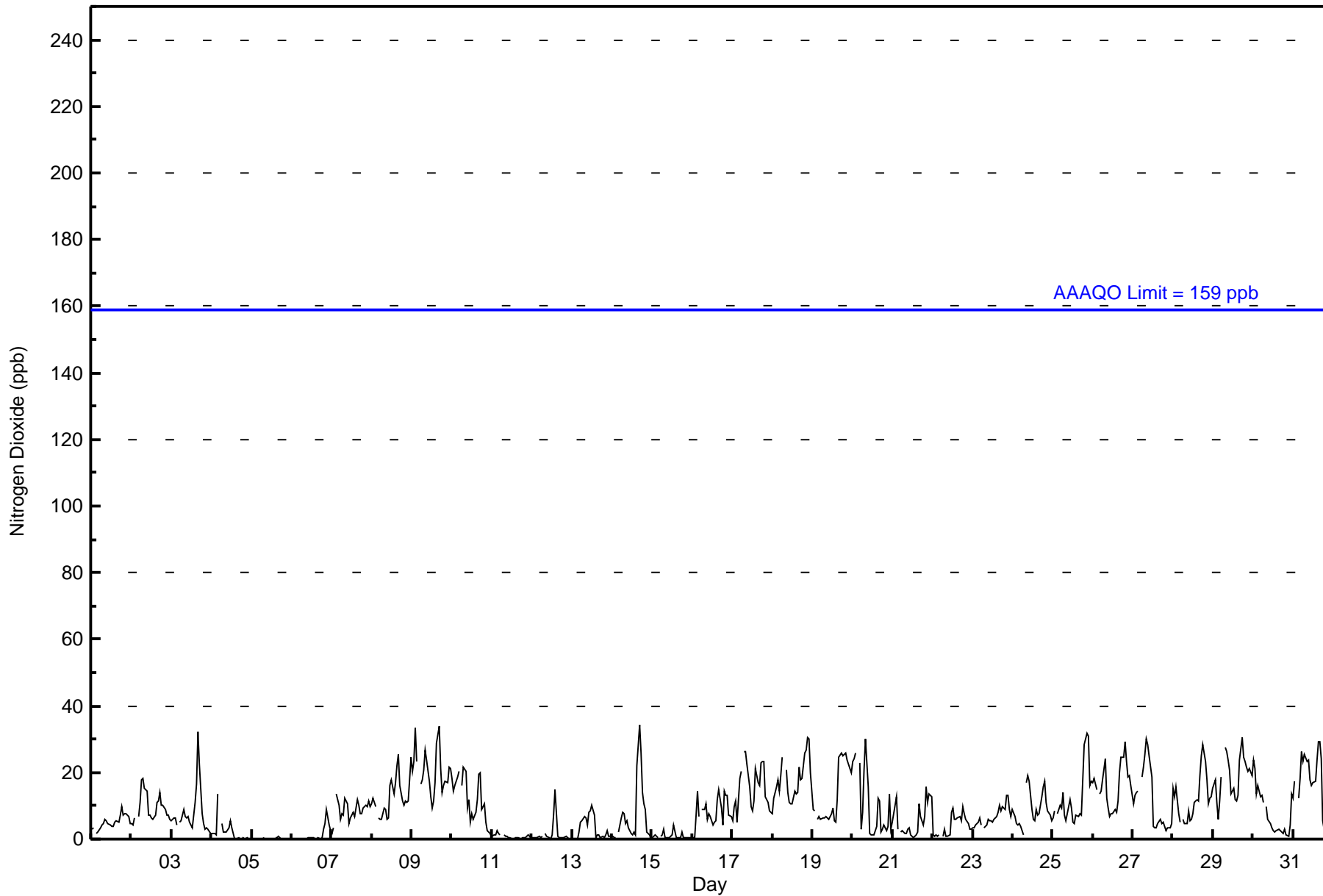
Nitrogen Dioxide (NO₂) - ppb

Patricia McInnes - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 34 ppb on Dec 14 17:00	Maximum Daily Average: 20.2 ppb on Dec 9		Hours of Data:	708
Minimum Value: 0 ppb on Dec 5 00:00	Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Missing Data:	36
Maximum Diurnal Average: 13.1 ppb at hour 17	Minimum Diurnal Average: 6.2 ppb at hour 13		Hours of Calibration:	36
Monthly Average: 9.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 7 Q ₃ = 14 P ₉₀ = 21 P ₉₉ = 30		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	4	Z	2	2	3	4	5	6	6	5	4	4	4	5	5	5	7	10	7	8	8	7	5	5.1	10
2-Dec	5	4	6	Z	7	11	18	18	15	15	7	7	6	6	7	11	11	14	10	10	9	7	7	6	9.5	18
3-Dec	6	7	6	4	Z	5	6	9	7	6	7	5	3	7	11	17	32	23	8	5	3	3	3	2	7.9	32
4-Dec	2	2	2	1	13	Z	5	2	2	2	4	6	3	2	0	0	0	0	0	0	0	0	0	0	2.0	13
5-Dec	0	0	0	0	0	0	Z	0	0	C	C	C	C	C	1	1	1	0	0	0	0	0	0	0	0.2	1
6-Dec	0	0	0	0	0	0	0	Z	0	0	1	0	0	1	0	0	1	0	0	3	5	9	4	3	1.2	9
7-Dec	2	3	Z	14	10	6	8	7	12	10	5	6	7	8	7	12	10	8	8	9	10	10	12	10	8.4	14
8-Dec	11	12	10	Z	6	6	6	10	9	6	6	16	18	13	17	22	25	16	12	10	11	11	12	25	12.6	25
9-Dec	20	23	33	23	Z	17	18	21	27	24	17	13	9	11	17	29	34	21	14	16	17	17	22	21	20.2	34
10-Dec	18	14	16	19	20	Z	16	21	21	9	12	5	8	6	8	12	19	20	9	11	5	3	2	2	12.0	21
11-Dec	1	1	1	2	2	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.7	2
12-Dec	0	0	0	1	1	1	1	Z	2	1	1	0	1	7	15	1	1	1	0	0	1	0	0	0	1.5	15
13-Dec	0	0	Z	0	2	5	6	7	6	4	8	9	10	7	1	1	1	1	1	1	1	2	1	1	3.3	10
14-Dec	1	0	1	Z	2	6	8	8	5	5	4	2	1	2	1	22	34	26	14	11	9	2	1	1	7.2	34
15-Dec	0	1	1	0	Z	1	1	3	1	0	1	1	4	0	0	0	0	2	0	0	0	0	0	0	0.9	4
16-Dec	0	0	7	15	7	Z	9	9	11	6	8	7	4	5	6	12	15	10	4	14	13	13	7	7	8.2	15
17-Dec	5	10	11	5	18	20	Z	26	26	23	16	10	9	11	21	17	16	23	23	23	13	11	9	8	15.4	26
18-Dec	8	12	16	18	15	19	24	Z	21	14	11	11	11	14	14	14	21	18	18	26	27	30	30	20	17.9	30
19-Dec	9	9	Z	6	7	6	6	6	7	7	6	8	9	6	5	12	25	26	25	25	26	24	21	20	13.0	26
20-Dec	23	24	26	Z	23	3	8	21	30	16	2	1	1	1	4	12	11	2	3	4	3	4	13	3	10.4	30
21-Dec	5	10	13	3	Z	2	2	2	2	3	4	1	1	1	1	2	11	7	4	7	16	11	14	13	5.8	16
22-Dec	1	1	1	1	1	Z	1	3	1	1	1	8	9	6	6	7	7	5	10	8	6	5	3	3	4.1	10
23-Dec	4	3	4	5	6	4	Z	4	4	6	6	5	5	6	7	8	10	9	10	9	13	13	9	7	6.8	13
24-Dec	9	7	5	4	5	4	1	Z	17	19	17	9	6	6	9	7	8	13	16	17	11	8	7	5	9.1	19
25-Dec	6	8	Z	8	10	9	14	7	6	10	12	9	5	5	7	7	8	7	18	29	32	31	16	18	12.2	32
26-Dec	17	18	15	Z	13	14	18	24	12	10	7	8	8	9	8	12	20	25	25	29	23	19	19	16	16.0	29
27-Dec	11	13	14	14	Z	19	21	26	30	29	25	19	4	4	4	5	6	5	5	4	3	3	4	5	11.7	30
28-Dec	15	13	16	8	5	Z	6	5	5	8	6	6	8	11	12	12	19	25	28	23	18	11	12	13	12.3	28
29-Dec	15	18	11	6	11	19	Z	27	26	24	21	14	15	12	11	13	24	31	25	24	22	20	21	19	18.6	31
30-Dec	24	21	14	16	13	13	11	Z	10	6	5	3	2	2	3	3	3	2	2	3	1	1	4	14	7.5	24
31-Dec	12	17	Z	12	18	26	23	25	23	24	18	16	17	17	24	29	29	24	6	1	1	0	1	1	15.9	29
	7.5	8.3	9.1	7.2	8.4	8.5	9.3	11.4	11.1	9.8	7.9	6.9	6.2	6.5	7.4	9.8	13.1	11.8	9.9	10.6	9.8	9.0	8.4	7.9		Diurnal Average
	24	24	33	23	23	26	24	27	30	29	25	19	18	17	24	29	34	31	28	29	32	31	30	25		Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	623	87.99	87.99
21 - 40	85	12.01	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	63	6	3	3	4	11	42	61	54	53	47	55	38	78	62	43	623
21 - 40	13	4	0	1	3	5	7	22	16	4	0	2	1	4	2	1	85
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	82	64	44	708

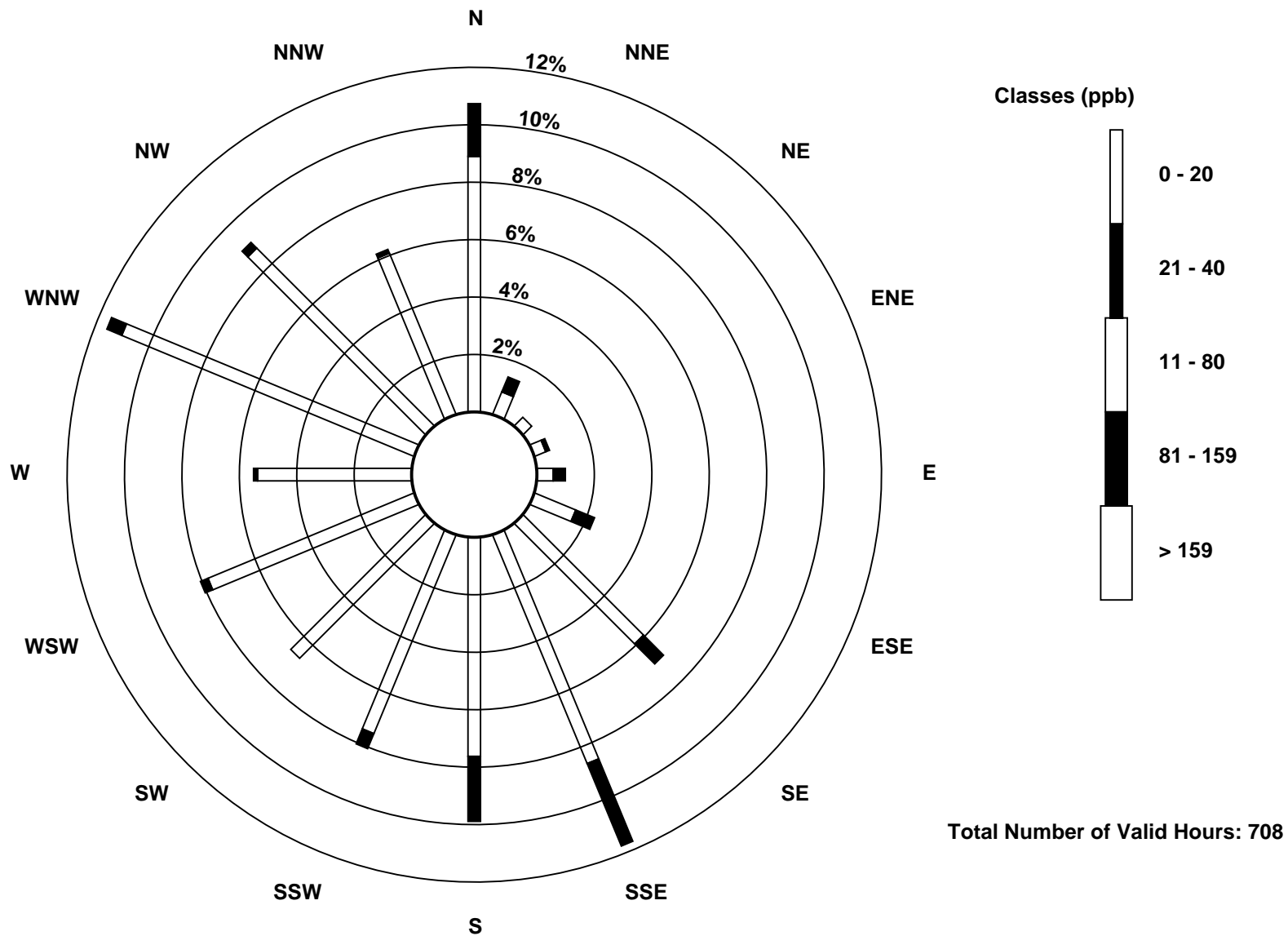
Total Number of Valid Hours: 708

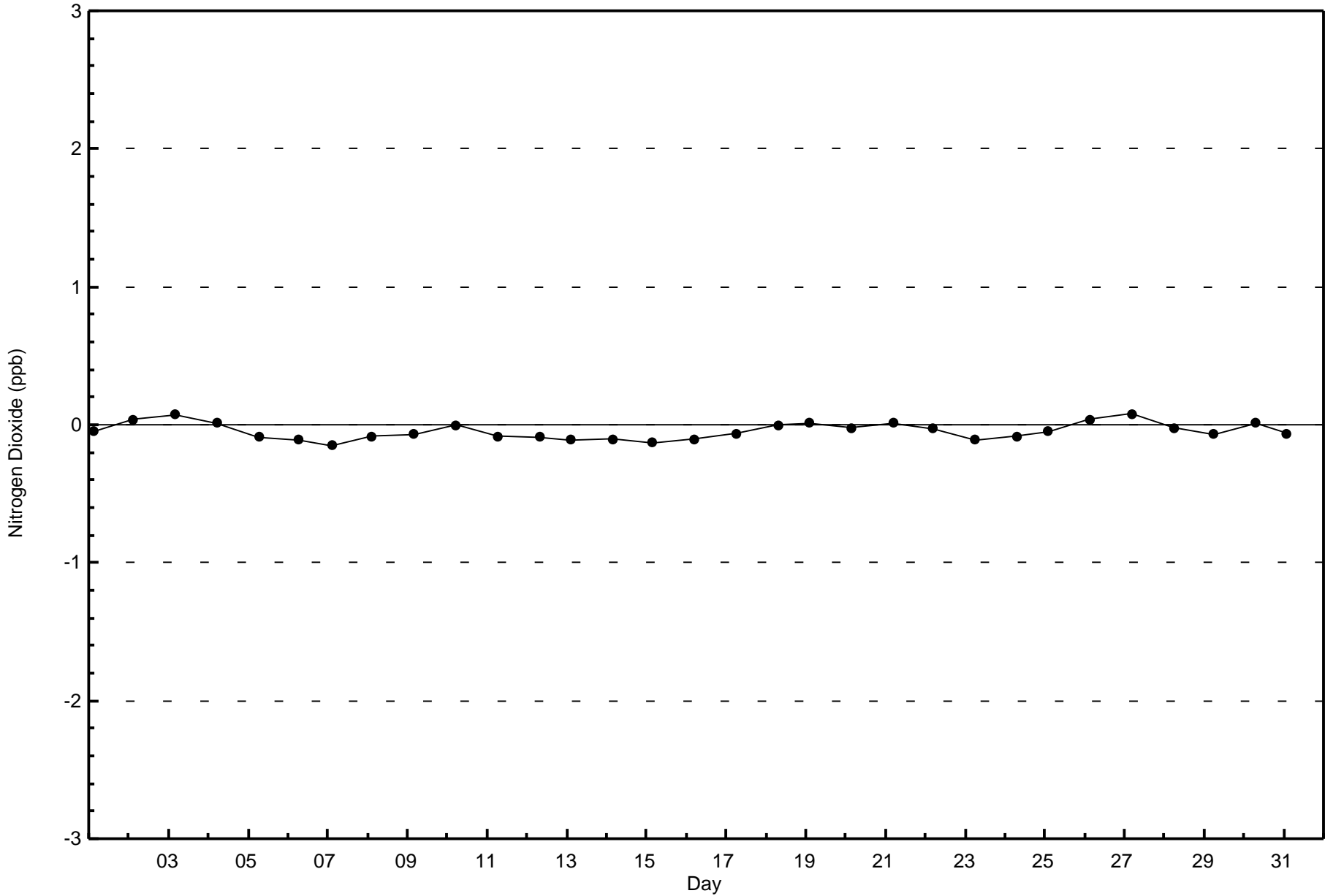
Total Number of Hours: 744

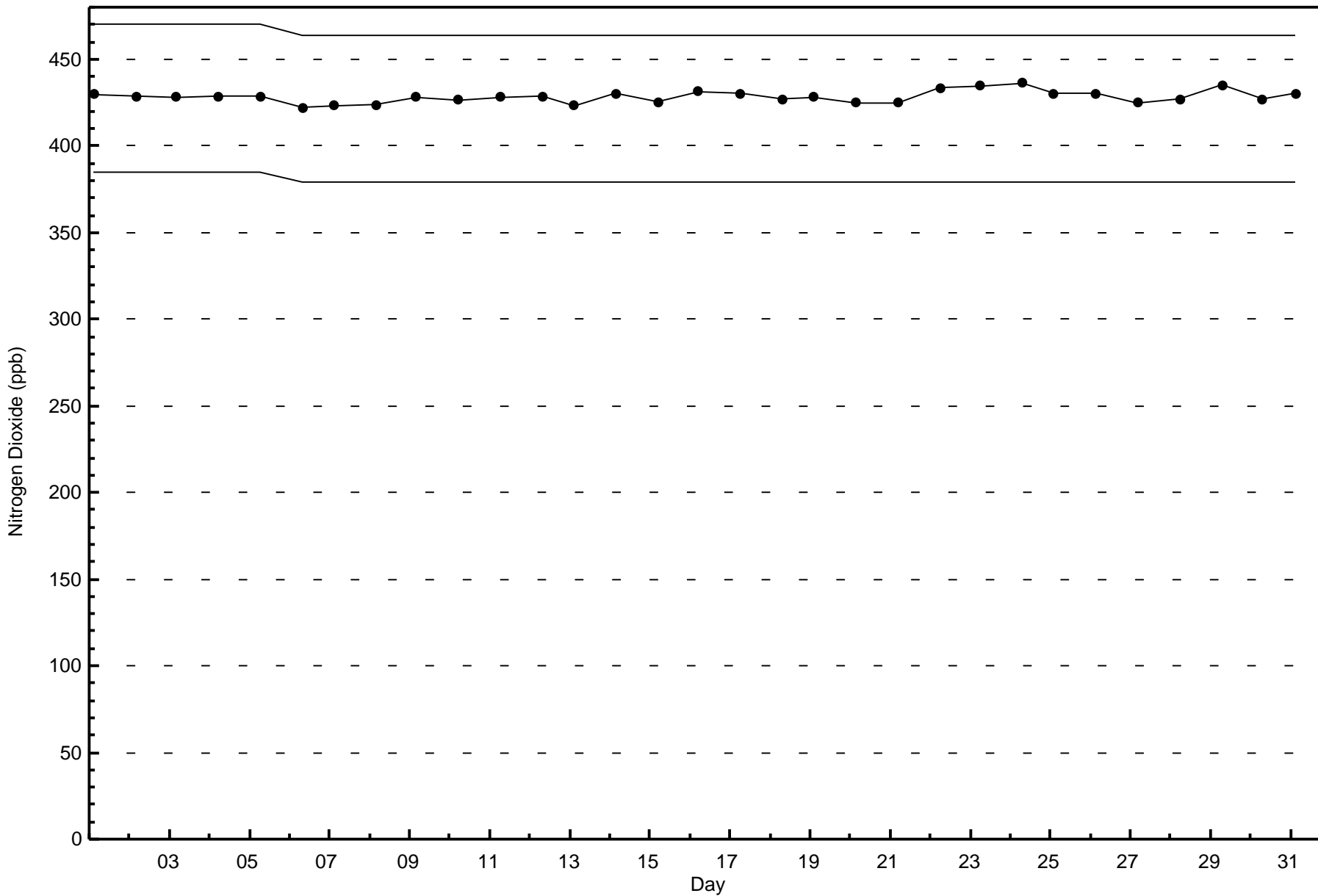


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes (AMS 6)









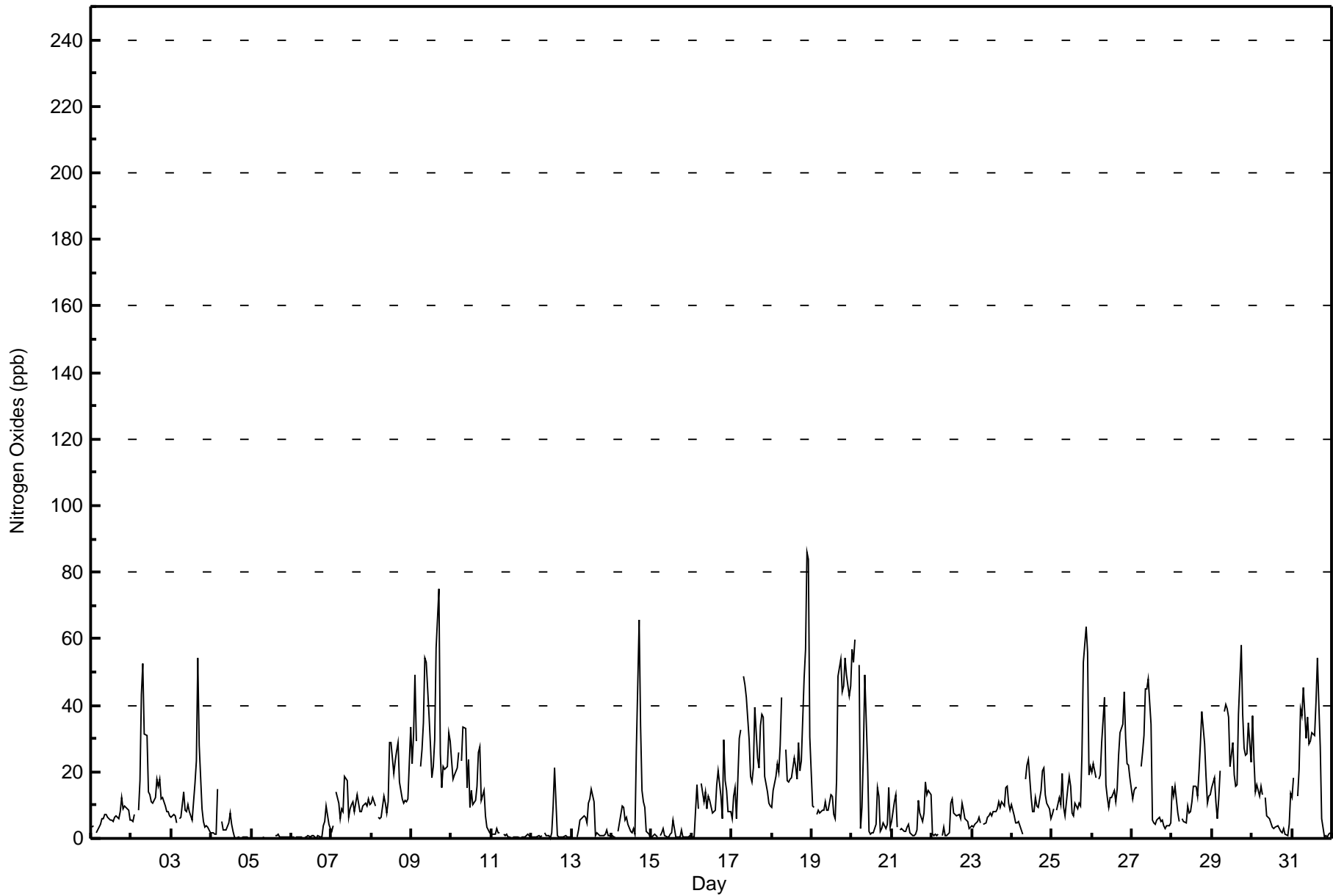
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

Patricia McInnes - December 2016

Maximum Value: 86 ppb on Dec 18 22:00																			Maximum Daily Average: 32.8 ppb on Dec 9						Hours in Service: 744	
Minimum Value: 0 ppb on Dec 5 01:00																			Minimum Daily Average: 0.3 ppb on Dec 5						Hours of Data: 708	
Maximum Diurnal Average: 19.3 ppb at hour 17																			Minimum Diurnal Average: 8.0 ppb at hour 4						Hours of Missing Data: 36	
Monthly Average: 12.9 ppb																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 3 Median = 9 Q ₃ = 18 P ₉₀ = 32 P ₉₉ = 57						Hours of Calibration: 36	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	4	Z	2	2	4	6	6	7	7	6	5	6	5	6	7	6	8	12	9	10	9	8	6	6.3	12
2-Dec	6	5	7	Z	9	17	43	53	31	31	14	13	11	11	12	18	16	18	12	12	10	8	8	7	16.2	53
3-Dec	6	7	7	5	Z	6	6	14	8	8	10	8	6	11	17	24	54	28	9	5	3	4	3	2	10.9	54
4-Dec	2	2	1	1	15	Z	5	2	2	2	5	8	4	2	0	0	0	0	0	0	0	0	0	0	2.3	15
5-Dec	0	0	0	0	0	0	Z	0	0	C	C	C	C	C	1	1	1	1	0	0	0	0	0	0	0.3	1
6-Dec	0	0	0	0	0	0	0	Z	0	0	1	1	1	1	0	0	1	0	1	4	5	10	4	3	1.5	10
7-Dec	2	4	Z	14	10	6	9	8	19	17	6	9	10	11	8	13	10	8	8	10	10	10	12	10	9.8	19
8-Dec	11	12	10	Z	6	6	6	13	11	8	11	29	29	20	23	26	29	17	12	10	12	11	12	34	15.5	34
9-Dec	22	31	49	29	Z	22	27	35	54	53	37	28	18	21	30	57	75	26	15	22	21	22	32	29	32.8	75
10-Dec	23	18	19	21	26	Z	23	33	33	15	24	9	14	10	11	16	26	28	12	14	7	3	3	2	17.0	33
11-Dec	1	1	1	3	2	2	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.8	3
12-Dec	0	0	0	1	1	1	1	Z	2	1	1	0	2	10	21	1	0	1	0	0	1	0	0	0	1.9	21
13-Dec	0	0	Z	0	3	6	6	7	6	5	11	12	15	11	1	2	1	1	1	1	1	3	1	1	4.0	15
14-Dec	1	0	1	Z	2	7	10	9	6	6	4	2	3	1	27	65	34	14	11	9	2	1	1	1	9.6	65
15-Dec	0	1	1	0	Z	1	2	3	1	0	0	1	2	5	0	0	0	3	1	1	1	1	1	1	1.1	5
16-Dec	0	1	8	16	9	Z	16	11	14	9	13	12	8	8	8	16	20	13	6	29	18	15	8	8	11.6	29
17-Dec	6	13	15	6	30	32	Z	49	46	42	30	19	17	21	39	24	21	34	37	36	19	14	11	10	24.8	49
18-Dec	9	14	19	23	20	28	42	Z	27	18	17	18	18	24	22	18	29	20	23	48	57	86	84	30	30.2	86
19-Dec	10	10	Z	7	8	8	9	9	11	9	8	13	13	7	6	17	49	54	44	46	54	49	43	46	23.0	54
20-Dec	57	53	60	Z	52	3	9	25	49	23	2	1	2	2	4	15	13	2	3	5	3	4	15	3	17.6	60
21-Dec	5	11	13	3	Z	3	3	2	2	3	4	2	1	1	1	2	11	8	5	7	17	13	14	13	6.4	17
22-Dec	1	1	1	1	1	Z	1	3	1	1	1	11	12	8	7	7	7	6	10	9	6	5	3	3	4.6	12
23-Dec	4	3	4	5	7	5	Z	4	5	7	7	7	7	8	8	9	11	9	11	10	15	16	11	9	7.9	16
24-Dec	10	7	5	5	4	1	Z	18	22	24	12	8	8	12	10	9	15	20	21	13	10	9	6	6	11.1	24
25-Dec	7	9	Z	9	12	10	20	9	7	15	19	16	8	7	11	9	11	10	25	53	64	56	19	22	18.5	64
26-Dec	20	23	18	Z	18	19	29	42	16	12	9	12	12	14	11	15	25	32	34	44	30	23	22	18	21.7	44
27-Dec	12	14	15	15	Z	22	26	31	45	45	48	34	5	5	4	5	6	5	6	4	3	4	4	5	15.8	48
28-Dec	16	13	16	8	5	Z	6	5	5	10	8	8	11	16	16	13	20	28	38	28	19	11	13	13	14.1	38
29-Dec	15	18	11	6	12	20	Z	38	40	39	37	22	29	19	16	16	37	58	37	27	25	25	35	23	26.3	58
30-Dec	37	24	14	16	13	16	13	Z	12	7	6	5	3	3	4	4	3	2	2	3	1	1	4	14	8.9	37
31-Dec	12	18	Z	13	21	39	37	45	30	36	28	29	32	31	41	54	40	28	6	1	1	0	1	1	23.7	54
9.7 10.2 11.9 8.0 11.1 11.0 13.7 17.7 16.4 15.1 13.1 11.6 10.1 10.1 11.1 13.7 19.3 15.9 13.2 15.2 14.0 13.4 12.3 10.3																								Diurnal Average		
57 53 60 29 52 39 43 53 54 53 48 34 32 31 41 57 75 58 44 53 64 86 84 46																								Diurnal Maximum		
Z - zerospan		C - Calibration																								





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	561	79.24	79.24
21 - 40	105	14.83	94.07
41 - 80	40	5.65	99.72
81 - 159	2	0.28	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	61	5	3	0	4	8	37	45	37	49	44	54	35	78	59	42	561
21 - 40	10	3	0	3	0	6	9	26	26	4	3	3	3	3	5	1	105
11 - 80	5	2	0	1	2	1	3	12	7	4	0	0	1	1	0	1	40
81 - 159	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	76	10	3	4	7	16	49	83	70	57	47	57	39	82	64	44	708

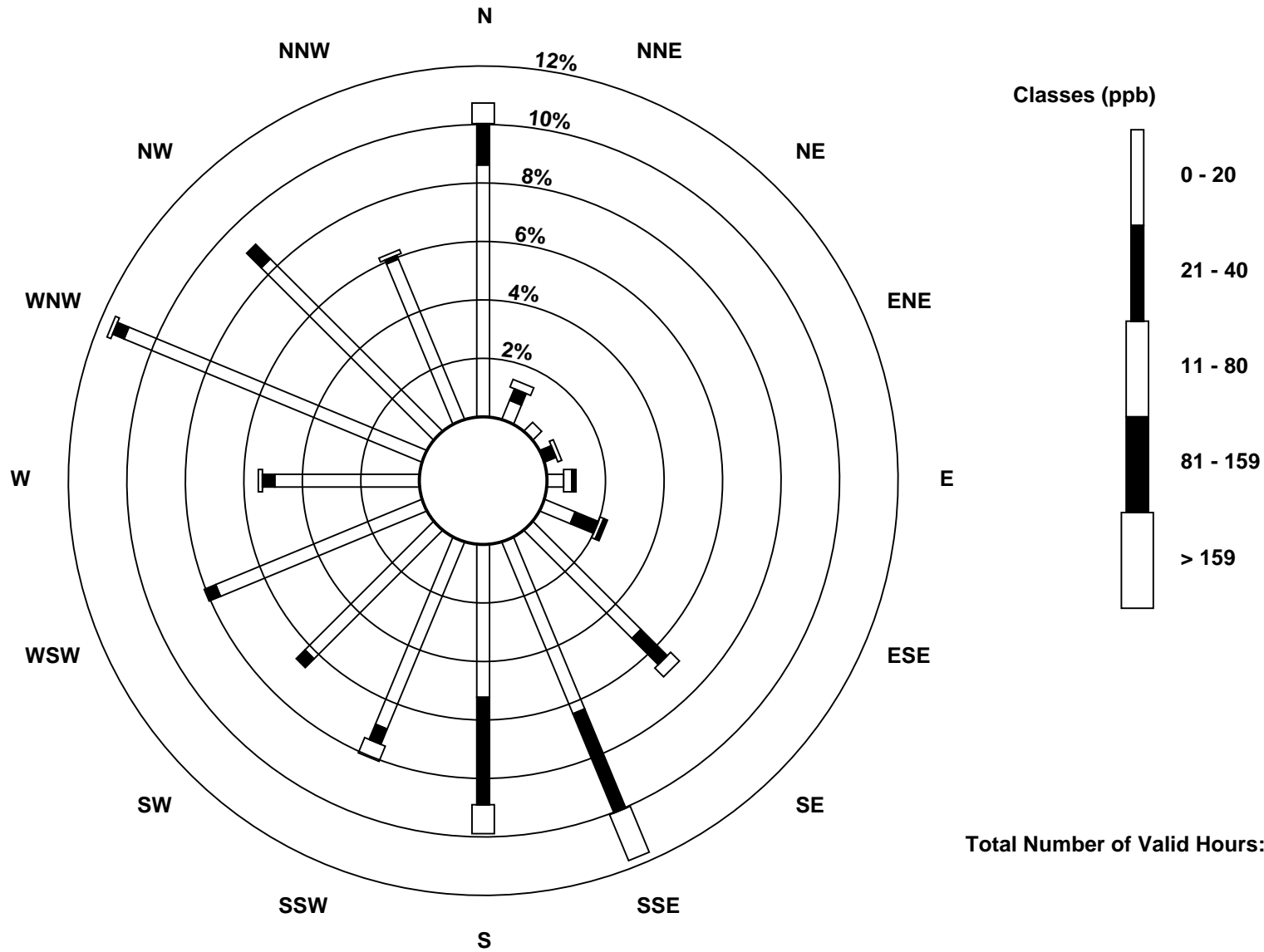
Total Number of Valid Hours: 708

Total Number of Hours: 744

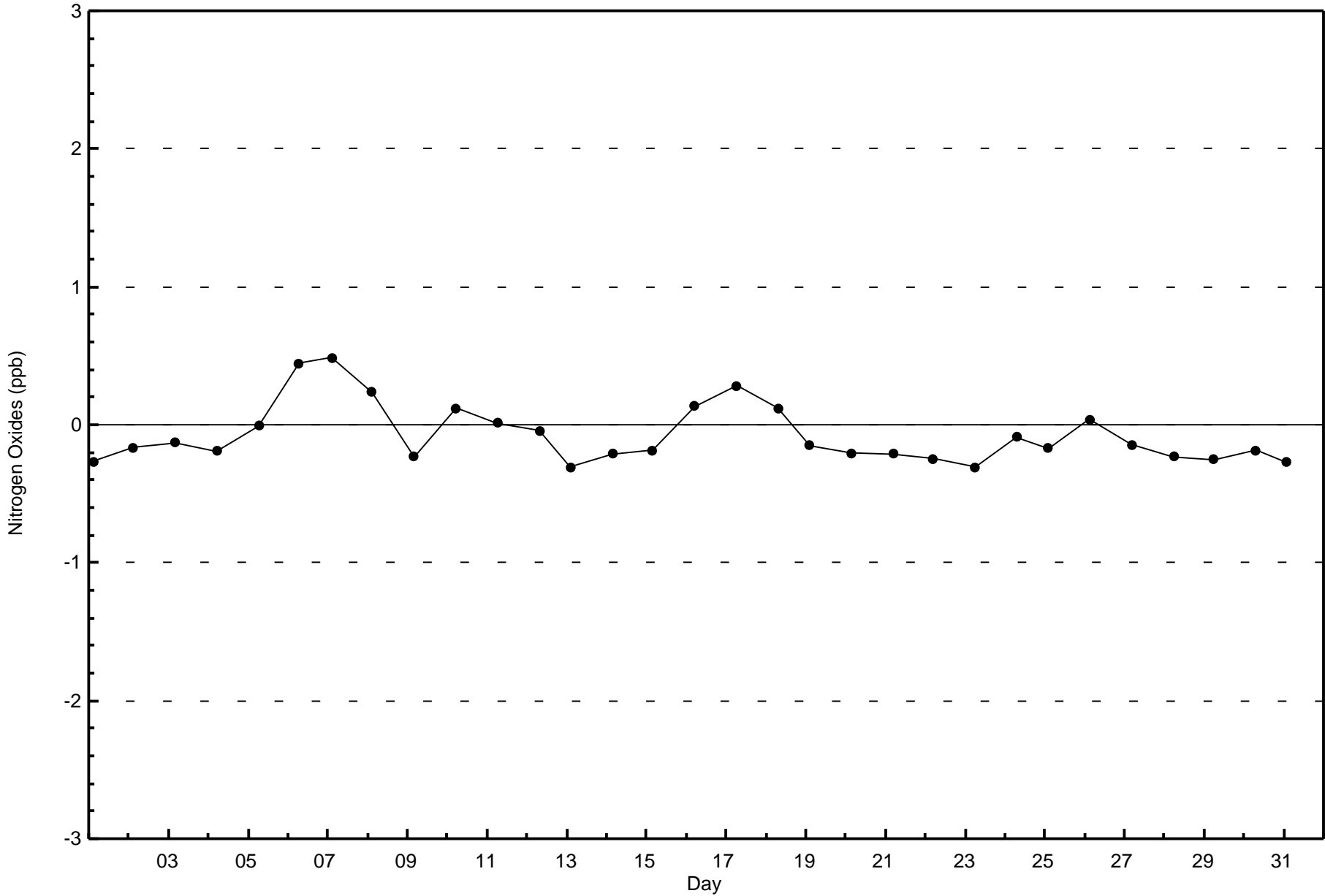


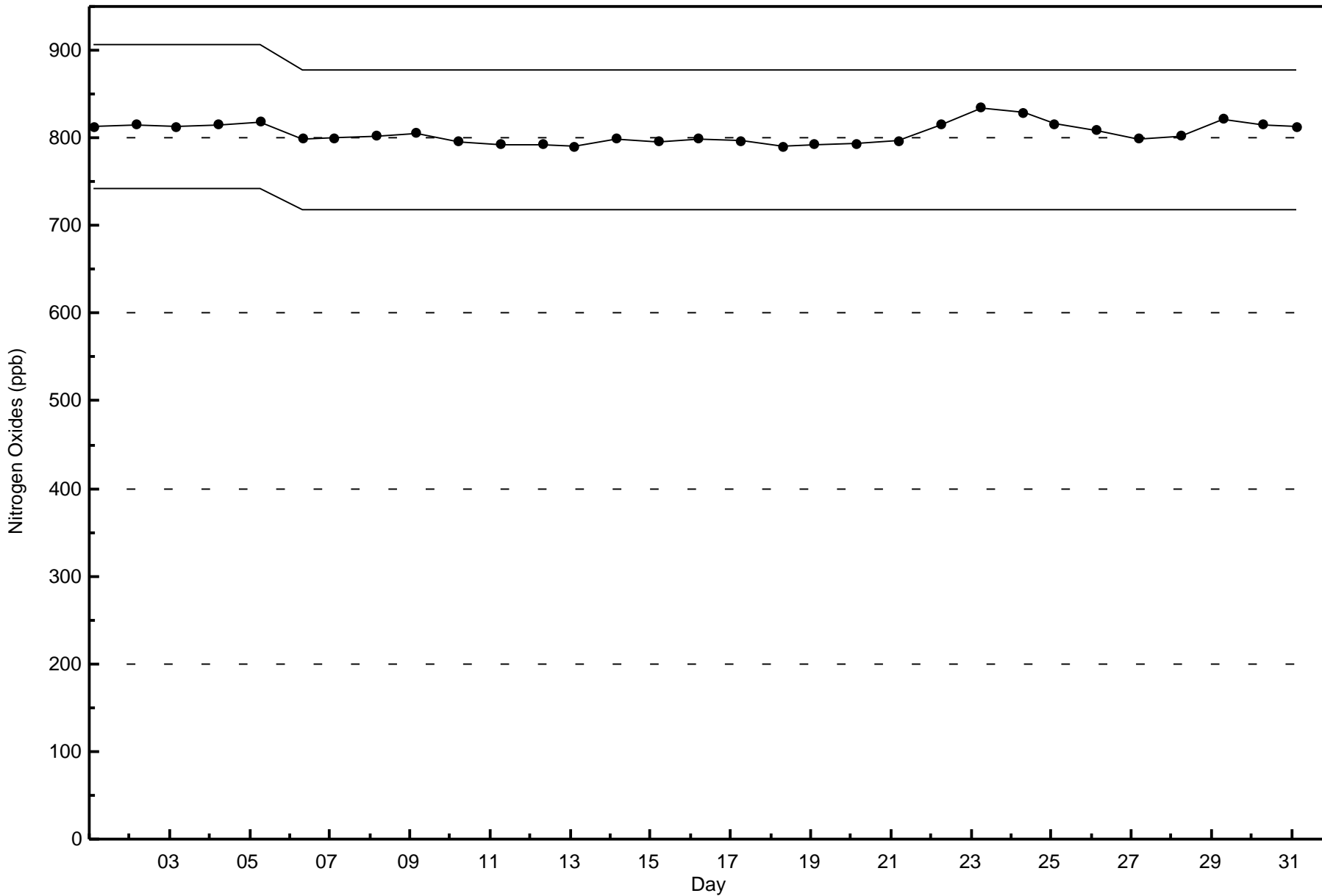
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes (AMS 6)



Total Number of Valid Hours: 708







Number of Exceedences (AAAQO): 1-hr: 0	Maximum Value: 0 ppb on Dec 1 03:00	Maximum Daily Average: 0.0 ppb on Dec 1	Hours in Service: 744
Minimum Value: 0 ppb on Dec 1 03:00	Maximum Diurnal Average: 0.0 ppb at hour 1	Minimum Daily Average: 0.0 ppb on Dec 1	Hours of Data: 670
Monthly Average: 0.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 0		Hours of Missing Data: 74
			Hours of Calibration: 40
			Percent Operational Time: 95.4

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Dec	0	0	0	0	Z	RE	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0	--	0
6-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Dec	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Dec	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
19-Dec	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Dec	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Dec	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

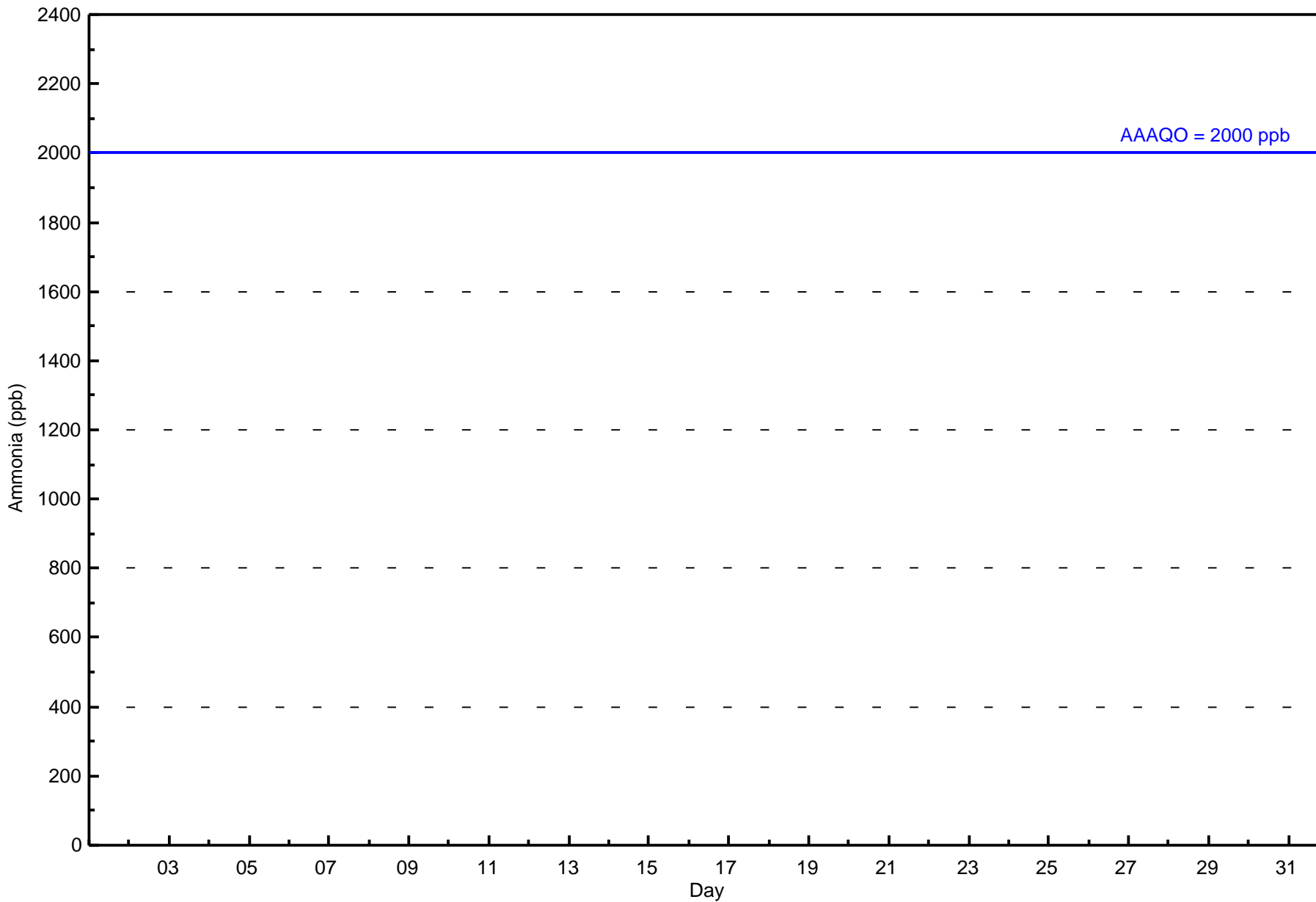
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

Z - zerospan C - Calibration RE - Recovery
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ammonia (NH₃) - ppb
Patricia McInnes - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ammonia (NH₃) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	670	100.00	100.00
6 - 10	0	0.00	100.00
11 - 15	0	0.00	100.00
16 - 20	0	0.00	100.00
21 - 25	0	0.00	100.00
> 26	0	0.00	100.00

Total Number of Valid Hours: 670

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ammonia (NH₃) - ppb
Patricia McInnes - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	74	8	3	5	8	13	49	74	66	55	47	55	37	73	61	42	670
6 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	74	8	3	5	8	13	49	74	66	55	47	55	37	73	61	42	670

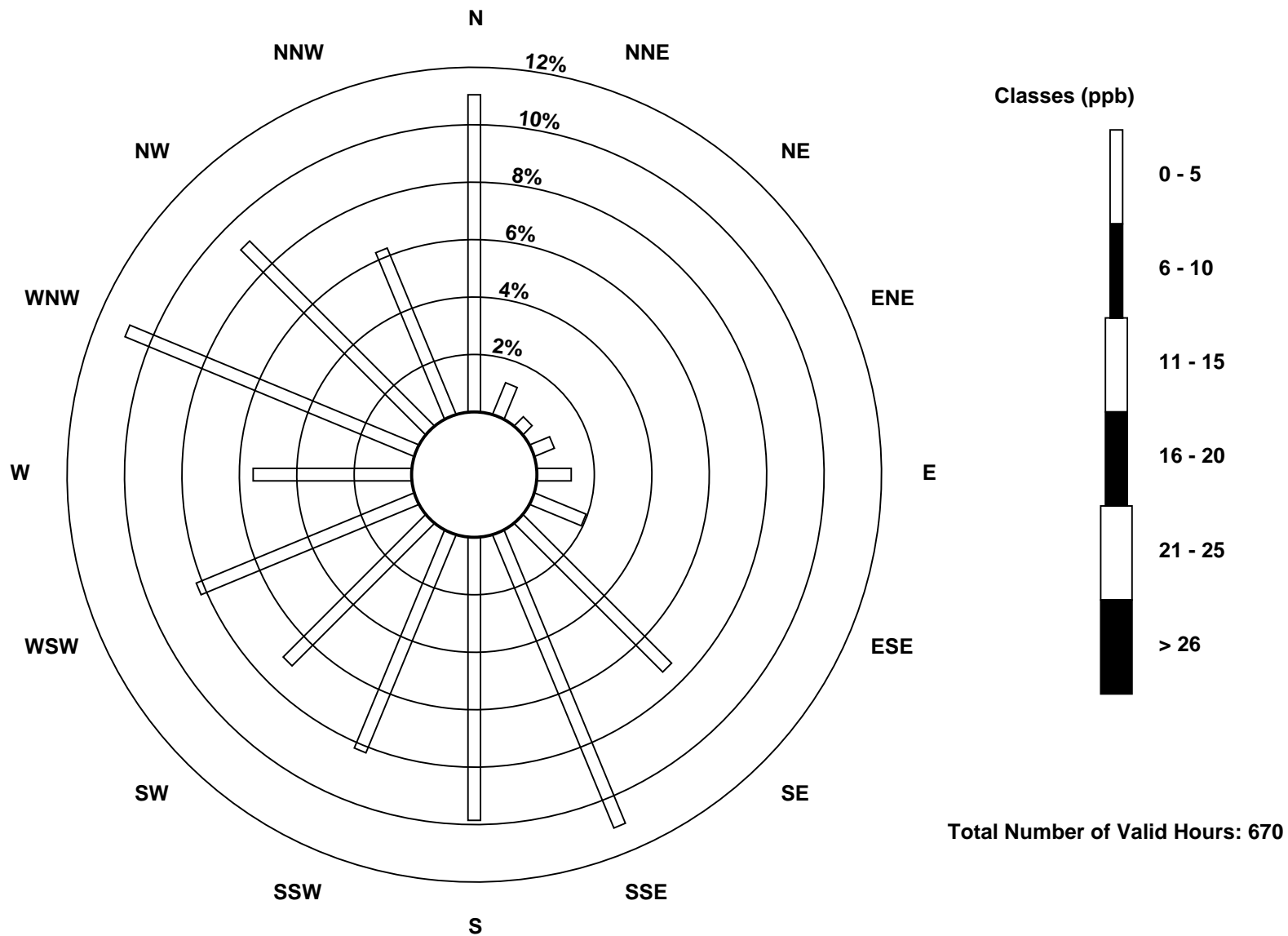
Total Number of Valid Hours: 670

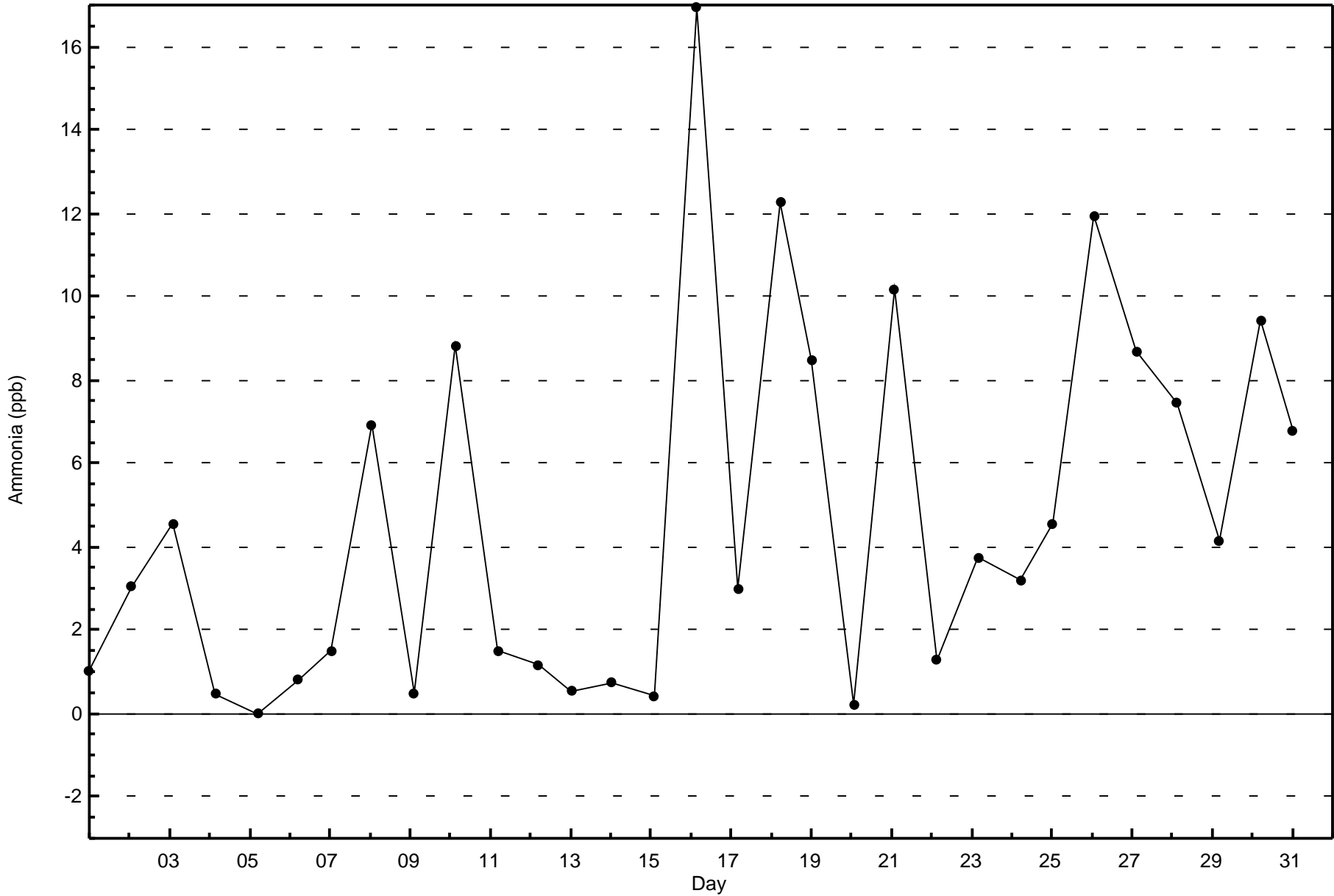
Total Number of Hours: 744

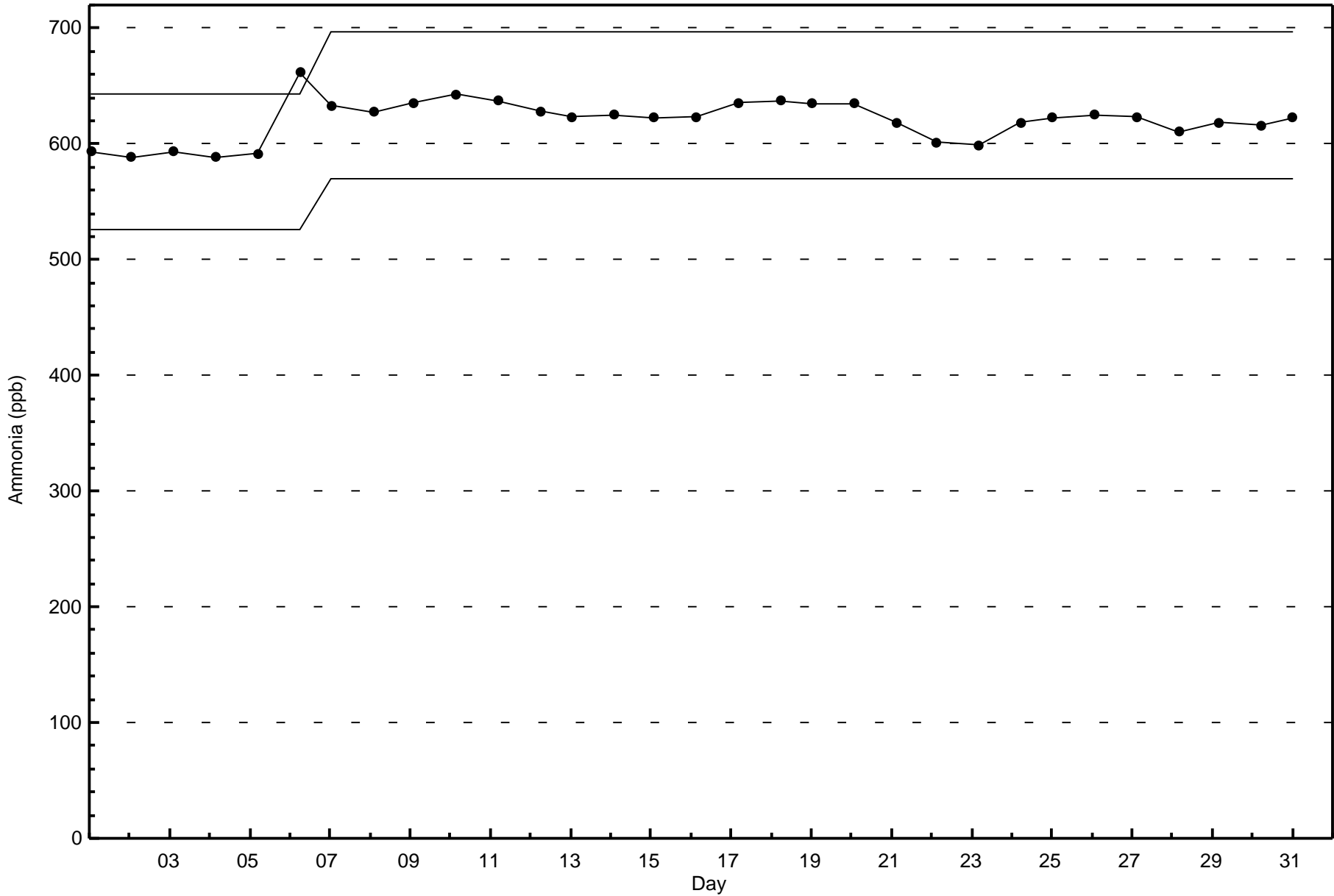


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ammonia (NH₃) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

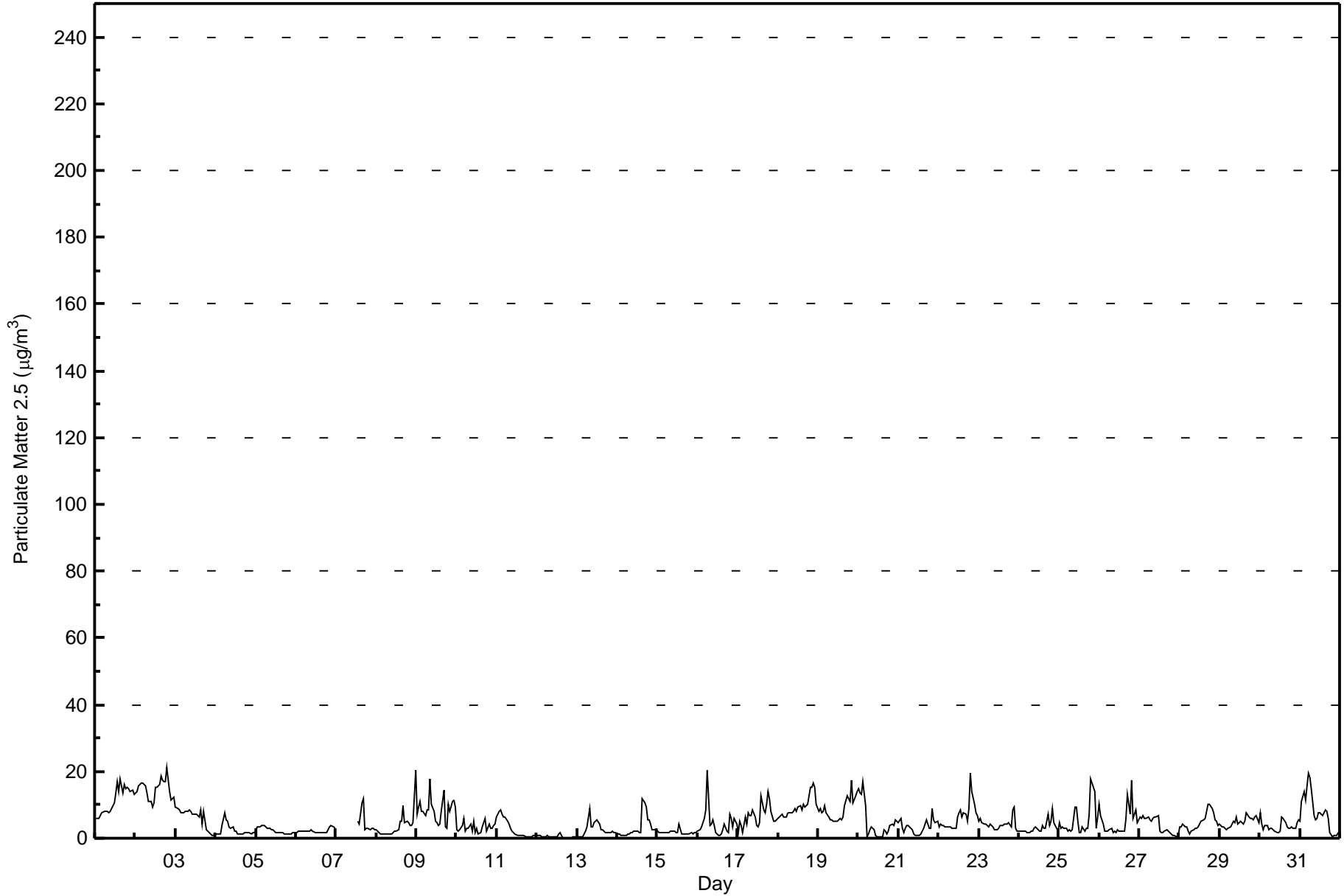
Patricia McInnes - December 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 21.2 µg/m ³ on Dec 2 20:00 Minimum Value: 0.1 µg/m ³ on Dec 12 18:00 Maximum Diurnal Average: 6.8 µg/m ³ at hour 20 Monthly Average: 5.04 µg/m ³		Maximum Daily Average: 14.7 µg/m ³ on Dec 2 Minimum Daily Average: 0.5 µg/m ³ on Dec 12 Minimum Diurnal Average: 3.9 µg/m ³ at hour 12 Percentiles: P ₁ = 0.3 P ₁₀ = 1.2 Q ₁ = 2.0 Median = 3.6 Q ₃ = 7.0 P ₉₀ = 10.8 P ₉₉ = 17.6		Hours in Service: 744 Hours of Data: 731 Hours of Missing Data: 13 Hours of Calibration: 0 Percent Operational Time: 98.3																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	5.8	5.8	6.1	6.7	7.5	8.0	7.8	8.0	7.5	7.9	8.7	10.5	13.6	16.8	14.1	17.8	13.7	16.2	14.6	15.2	15.0	13.9	14.4	13.3	11.2	17.8
2-Dec	13.5	13.8	15.8	16.7	16.5	16.1	15.9	13.6	11.0	10.9	9.5	10.7	15.1	15.3	16.2	18.8	17.2	17.1	16.9	21.2	13.8	11.6	12.1	12.4	14.7	21.2
3-Dec	9.4	8.8	8.6	7.8	7.6	7.8	8.1	8.2	8.5	7.9	7.4	7.4	7.1	6.9	6.5	8.4	4.2	8.0	2.7	2.2	1.6	1.2	1.0	0.9	6.2	9.4
4-Dec	1.1	1.3	1.3	1.3	4.0	7.5	5.7	5.1	3.4	3.2	3.3	2.3	2.3	1.4	1.1	1.2	1.4	1.5	1.6	1.6	1.7	1.4	1.7	1.8	2.4	7.5
5-Dec	2.6	3.3	3.4	3.7	4.0	3.6	3.5	3.0	2.9	2.7	2.4	2.0	1.8	1.7	1.6	1.7	1.8	1.5	1.4	1.4	1.4	1.4	1.6	1.6	2.3	4.0
6-Dec	1.9	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.4	2.1	1.8	1.7	1.7	1.7	1.8	1.8	1.8	1.8	2.5	3.4	3.7	3.2	2.8	2.2	3.7
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	M	4.9	4.2	10.7	11.8	2.4	2.9	2.9	2.7	2.9	2.9	2.4	--	11.8
8-Dec	2.6	2.2	1.4	1.2	1.1	1.1	1.1	1.3	1.4	1.1	1.7	2.2	2.1	2.4	5.1	5.0	9.5	4.8	4.9	4.7	3.9	4.0	4.5	20.4	3.7	20.4
9-Dec	7.0	9.2	10.9	8.2	8.1	6.9	8.3	8.4	17.8	10.0	7.9	5.3	4.6	3.9	4.3	8.0	14.2	3.5	3.0	10.1	8.0	11.0	11.5	9.3	8.3	17.8
10-Dec	2.6	2.3	2.7	3.7	5.8	2.1	2.9	2.9	4.2	2.1	5.3	1.7	3.0	1.2	1.7	3.5	4.6	5.7	2.3	4.1	3.0	3.2	3.7	4.2	3.3	5.8
11-Dec	6.4	8.0	8.3	7.3	6.5	6.1	5.2	4.2	2.8	2.2	1.7	1.3	1.0	0.8	0.7	0.7	0.8	0.6	0.6	0.5	0.5	0.6	0.8	0.8	2.9	8.3
12-Dec	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.6	0.6	0.5	0.4	0.3	0.3	1.5	1.9	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.5	1.9
13-Dec	0.5	0.4	0.3	0.3	1.1	2.1	3.2	9.0	3.4	3.4	4.7	5.2	5.7	4.1	2.5	2.5	2.3	1.8	1.8	1.7	1.7	2.3	1.7	1.6	2.6	9.0
14-Dec	1.4	1.2	1.0	0.9	0.7	0.8	1.1	1.2	1.5	1.6	2.2	2.0	1.9	1.9	1.8	11.9	10.8	9.3	5.5	5.6	4.3	2.4	2.4	2.4	3.2	11.9
15-Dec	2.1	1.8	1.6	1.5	1.7	1.6	1.5	1.5	1.9	1.9	2.1	1.7	1.5	4.3	1.2	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.9	1.9	1.7	4.3
16-Dec	2.1	2.4	3.2	4.7	6.0	8.6	20.5	3.7	4.1	5.4	3.7	1.6	0.9	0.9	1.1	2.6	4.0	2.1	1.9	7.2	5.7	3.5	6.1	4.1	4.4	20.5
17-Dec	1.6	5.1	3.7	1.8	6.3	4.3	7.6	6.6	6.9	8.5	6.5	3.6	3.2	4.5	12.5	8.5	7.8	10.1	14.1	12.0	7.9	4.9	5.1	5.5	6.6	14.1
18-Dec	5.9	6.2	7.4	6.2	6.3	6.3	7.7	7.5	7.8	7.9	8.9	8.2	9.4	9.7	8.4	10.2	9.3	9.8	10.3	15.3	15.4	16.5	15.3	10.3	9.4	16.5
19-Dec	8.0	9.0	7.6	7.9	9.6	7.6	6.5	5.7	5.7	4.9	5.1	5.3	5.6	6.0	5.5	6.3	9.7	12.6	11.8	11.2	17.3	10.7	12.5	13.9	8.6	17.3
20-Dec	14.8	13.7	13.0	16.7	9.9	0.6	1.2	2.4	3.5	2.6	0.6	0.5	0.5	0.4	0.6	2.6	2.2	1.3	2.0	3.9	4.0	3.8	5.5	5.1	4.6	16.7
21-Dec	4.8	5.8	3.1	1.8	3.1	4.0	3.6	2.9	2.5	1.4	0.7	0.9	1.1	1.5	2.1	2.9	4.4	5.4	3.0	3.0	9.0	5.3	4.8	4.9	3.4	9.0
22-Dec	3.5	4.4	3.8	3.8	3.4	3.5	3.2	3.5	3.1	3.1	3.1	6.6	7.7	8.4	6.4	7.5	7.4	5.0	9.1	19.4	14.2	10.2	7.8	6.6	6.4	19.4
23-Dec	5.2	6.1	4.7	4.1	4.2	4.0	3.6	4.1	3.2	2.7	2.6	2.6	3.1	3.9	3.8	4.3	4.2	4.1	4.9	3.3	8.6	9.5	2.9	2.0	4.2	9.5
24-Dec	2.1	1.9	2.1	2.0	2.0	1.8	1.6	2.1	2.2	2.8	3.4	2.6	2.1	2.0	4.0	2.9	3.1	7.2	3.6	5.1	8.9	4.7	3.0	2.3	3.1	8.9
25-Dec	4.6	3.1	3.5	2.8	3.0	2.0	2.3	2.0	2.4	9.1	9.3	5.0	1.8	1.5	3.5	2.3	2.9	3.0	7.0	17.9	15.5	14.0	2.9	6.5	5.3	17.9
26-Dec	10.0	6.8	4.0	2.0	2.1	1.9	2.4	2.9	1.7	1.9	1.9	2.5	2.0	2.0	2.0	2.1	5.8	13.1	7.1	17.2	6.1	7.3	8.6	4.7	4.9	17.2
27-Dec	6.4	6.1	6.8	5.7	6.0	6.2	5.5	5.3	6.0	6.5	6.5	6.9	2.1	1.6	1.7	2.1	2.3	2.0	1.6	1.3	0.9	0.7	0.6	1.0	3.8	6.9
28-Dec	3.4	3.6	4.4	3.2	3.3	2.2	1.5	2.2	2.5	2.8	2.8	3.5	4.4	5.1	5.6	5.9	8.2	10.2	10.3	8.9	7.6	5.6	5.1	3.7	4.8	10.3
29-Dec	4.3	3.4	3.3	3.2	2.7	3.1	3.4	4.2	5.2	4.7	6.4	4.3	4.9	4.7	4.2	5.0	7.7	6.5	6.1	5.7	5.5	6.4	6.7	4.8	4.9	7.7
30-Dec	7.5	4.0	2.6	4.0	4.0	2.6	2.9	2.8	2.7	2.2	1.8	1.6	2.0	6.4	5.8	4.6	3.4	2.9	2.9	3.3	3.1	3.0	4.5	5.5	3.6	7.5
31-Dec	5.0	10.8	14.2	11.3	15.7	19.6	18.2	14.9	6.6	5.6	6.0	7.7	7.7	6.7	7.6	8.4	7.9	6.1	1.6	0.3	1.0	1.0	1.0	1.8	7.8	19.6
																								Diurnal Average		
																								Diurnal Maximum		
4.9 5.1 5.1 4.8 5.2 4.8 5.3 4.7 4.5 4.3 4.3 3.9 4.0 4.3 4.5 5.5 6.0 5.7 5.1 6.8 6.2 5.4 5.0 5.1																										
14.8 13.8 15.8 16.7 16.5 19.6 20.5 14.9 17.8 10.9 9.5 10.7 15.1 16.8 16.2 18.8 17.2 17.1 16.9 21.2 17.3 16.5 15.3 20.4																										
M - Maintenance AF - Analyzer Failure Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	419	57.32	57.32
6 - 15	229	31.33	88.65
16 - 25	26	3.56	92.20
26 - 80	0	0.00	92.20
> 81.0	0	0.00	92.20

Total Number of Valid Hours: 731

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	44	4	1	2	5	7	21	30	29	31	35	37	23	65	52	33	419
6 - 15	32	6	2	3	2	8	25	49	40	23	8	9	4	4	4	10	229
16 - 25	1	0	0	0	1	1	4	9	4	3	1	1	1	0	0	0	26
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	77	10	3	5	8	16	50	88	73	57	44	47	28	69	56	43	674

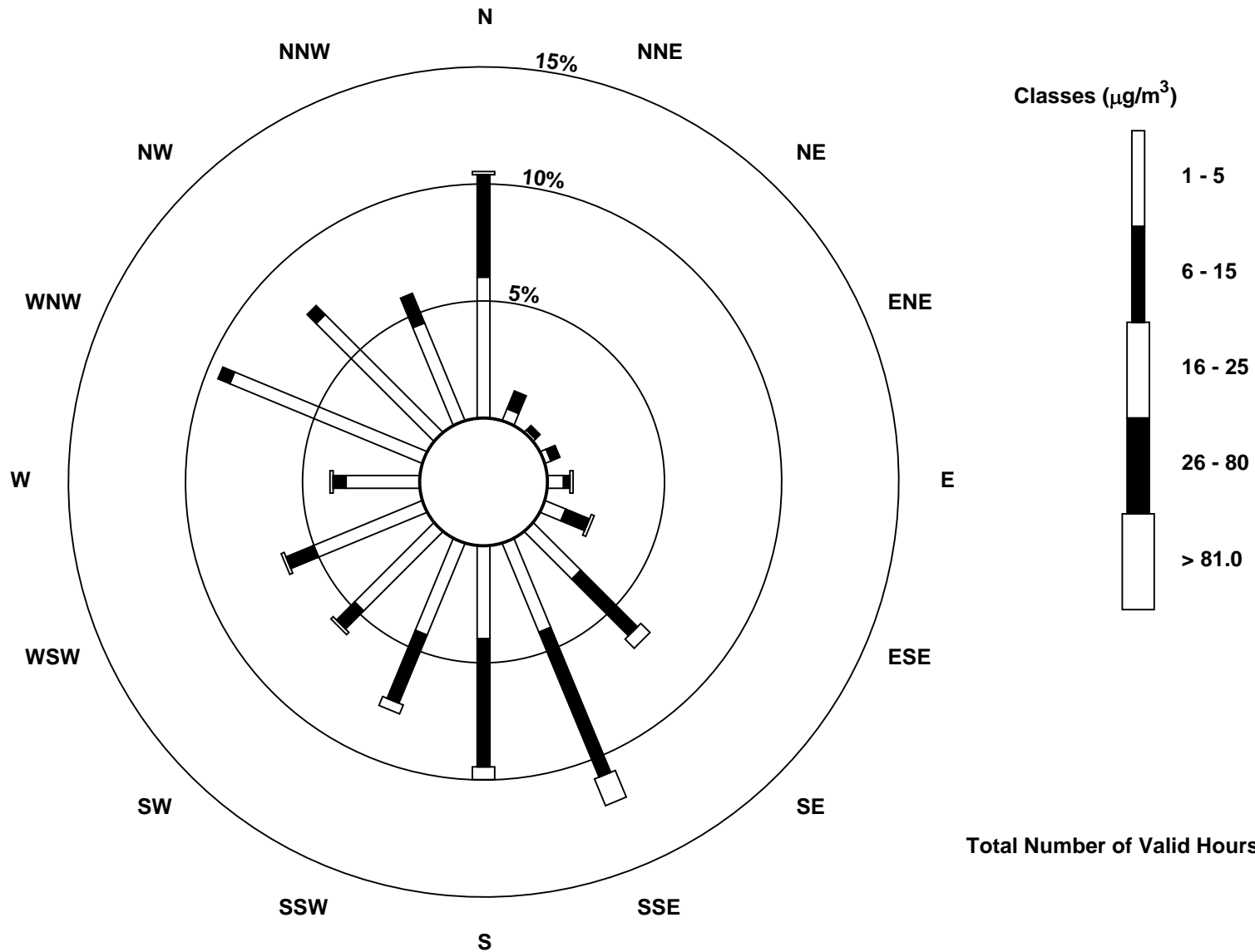
Total Number of Valid Hours: 731

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes (AMS 6)

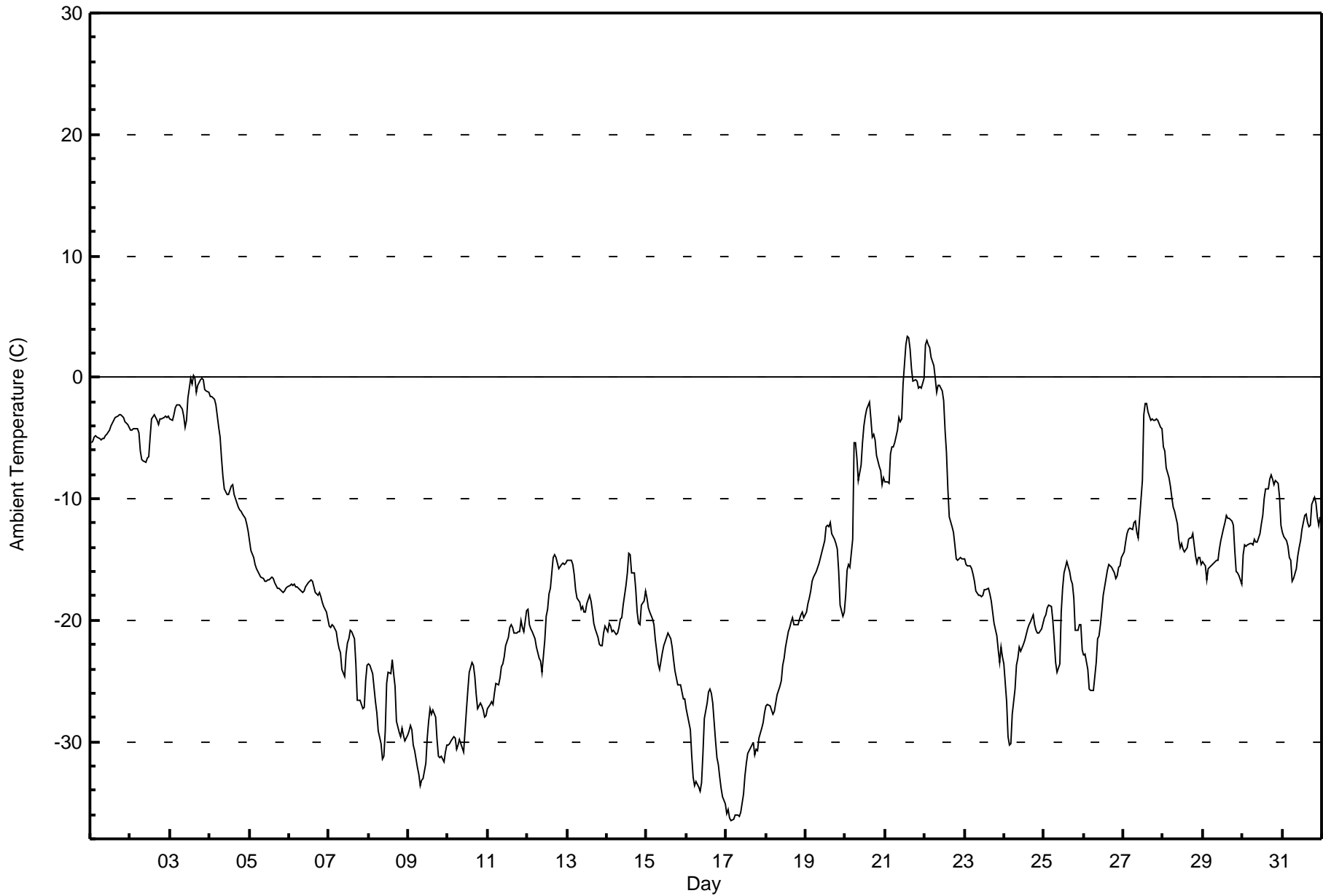




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Patricia McInnes - December 2016

Maximum Value: 3.3 C on Dec 21 14:00		Maximum Daily Average: -1.7 C on Dec 3		Hours in Service: 744																																												
Minimum Value: -36.5 C on Dec 17 04:00		Minimum Daily Average: -32.9 C on Dec 17		Hours of Data: 744																																												
Maximum Diurnal Average: -14.5 C at hour 15		Minimum Diurnal Average: -18.3 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -16.78 C		Percentiles: P ₁ = -35.9 P ₁₀ = -29.1 Q ₁ = -23.0 Median = -17.1 Q ₃ = -11.3 P ₉₀ = -3.5 P ₉₉ = 2.2		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-5.3	-5.3	-4.9	-4.8	-5.0	-5.1	-5.1	-5.1	-5.0	-4.8	-4.6	-4.4	-4.0	-3.8	-3.5	-3.3	-3.2	-3.1	-3.1	-3.2	-3.3	-3.6	-3.9	-4.2	-4.2	-3.1																						
2-Dec	-4.3	-4.3	-4.2	-4.2	-4.2	-4.6	-6.0	-6.8	-6.9	-7.0	-6.7	-6.5	-4.9	-3.4	-3.1	-3.3	-3.6	-3.9	-3.5	-3.4	-3.3	-3.2	-3.3	-3.2	-4.5	-3.1																						
3-Dec	-3.4	-3.5	-3.1	-2.5	-2.3	-2.2	-2.3	-2.7	-3.2	-4.1	-3.5	-1.7	-0.1	-0.5	0.2	0.0	-1.2	-0.6	-0.2	-0.1	-0.2	-1.0	-1.1	-1.3	-1.7	0.2																						
4-Dec	-1.6	-1.6	-1.7	-1.8	-2.3	-4.1	-5.0	-6.6	-8.2	-9.2	-9.6	-9.7	-9.3	-8.9	-8.9	-9.6	-10.3	-10.7	-10.9	-11.1	-11.2	-11.6	-12.0	-12.7	-7.9	-1.6																						
5-Dec	-13.5	-14.3	-14.9	-15.4	-15.8	-16.0	-16.2	-16.4	-16.6	-16.7	-16.8	-16.7	-16.5	-16.5	-16.9	-17.1	-17.3	-17.4	-17.7	-17.7	-17.7	-17.6	-17.4	-17.3	-16.5	-13.5																						
6-Dec	-17.1	-17.0	-17.1	-17.0	-17.2	-17.3	-17.4	-17.6	-17.7	-17.6	-17.2	-17.0	-16.8	-16.6	-16.8	-17.3	-17.7	-17.9	-17.7	-18.1	-18.5	-18.9	-19.3	-19.9	-17.6	-16.6																						
7-Dec	-20.5	-20.6	-20.3	-20.4	-20.9	-21.7	-22.3	-22.6	-24.0	-24.7	-22.8	-21.9	-21.6	-20.8	-21.0	-21.5	-23.6	-26.6	-26.6	-26.6	-27.2	-27.2	-24.9	-23.7	-23.1	-20.3																						
8-Dec	-23.6	-23.8	-24.4	-25.5	-26.7	-27.7	-29.1	-30.2	-31.5	-31.2	-29.2	-25.2	-24.2	-24.4	-23.3	-24.4	-25.4	-28.3	-29.3	-29.5	-28.9	-29.4	-29.9	-29.5	-27.3	-23.3																						
9-Dec	-29.1	-28.6	-29.0	-30.3	-30.8	-32.2	-32.7	-33.7	-33.2	-33.1	-31.8	-29.7	-28.3	-27.3	-27.7	-27.4	-28.0	-29.8	-31.2	-31.3	-31.2	-31.7	-30.8	-30.3	-30.4	-27.3																						
10-Dec	-30.3	-30.2	-29.9	-29.6	-29.7	-30.6	-30.3	-29.9	-30.5	-30.8	-29.1	-27.4	-25.8	-24.3	-23.5	-23.7	-24.6	-26.1	-27.3	-26.8	-27.1	-27.4	-28.0	-27.8	-27.9	-23.5																						
11-Dec	-27.3	-26.9	-26.8	-27.0	-26.0	-25.3	-25.3	-24.8	-23.8	-23.6	-23.0	-22.1	-21.4	-20.6	-20.4	-20.6	-21.1	-21.1	-20.9	-20.9	-20.0	-20.6	-21.0	-19.2	-22.9	-19.2																						
12-Dec	-19.1	-20.3	-20.7	-20.9	-21.5	-22.2	-22.7	-23.2	-23.3	-24.3	-21.6	-19.6	-19.2	-17.9	-17.4	-14.9	-14.6	-14.8	-15.4	-15.7	-15.4	-15.3	-15.4	-15.3	-18.8	-14.6																						
13-Dec	-15.1	-15.1	-15.1	-15.4	-16.2	-17.5	-18.2	-18.5	-19.1	-18.8	-19.3	-19.4	-18.7	-17.9	-18.4	-19.2	-20.3	-20.7	-21.3	-22.0	-22.1	-22.1	-21.0	-20.4	-18.8	-15.1																						
14-Dec	-21.0	-20.3	-20.4	-20.9	-20.8	-21.2	-21.0	-20.6	-19.9	-19.8	-18.8	-17.2	-16.1	-14.4	-14.6	-16.1	-16.1	-17.4	-19.3	-20.3	-20.4	-18.8	-18.4	-17.6	-18.8	-14.4																						
15-Dec	-18.1	-19.0	-19.3	-19.9	-20.4	-21.7	-22.6	-23.6	-24.0	-22.6	-22.1	-21.8	-21.4	-21.1	-21.5	-22.2	-23.3	-24.2	-24.7	-25.3	-25.3	-25.9	-26.4	-26.5	-22.6	-18.1																						
16-Dec	-27.3	-28.5	-29.0	-31.2	-32.9	-33.6	-33.3	-33.7	-34.1	-33.3	-31.0	-28.1	-26.8	-25.9	-25.6	-26.0	-26.8	-29.9	-31.3	-31.9	-32.9	-33.8	-34.5	-35.1	-30.7	-25.6																						
17-Dec	-35.9	-35.5	-36.2	-36.5	-36.3	-36.0	-36.0	-36.1	-36.1	-35.8	-34.3	-32.8	-31.7	-30.9	-30.7	-30.2	-30.1	-31.1	-30.7	-30.7	-29.7	-28.9	-28.4	-27.6	-32.9	-27.6																						
18-Dec	-27.0	-27.0	-27.0	-27.4	-27.7	-27.5	-26.9	-26.1	-25.5	-24.9	-23.7	-23.2	-22.2	-21.0	-20.5	-20.1	-19.8	-20.3	-20.3	-20.4	-19.9	-19.6	-19.4	-19.8	-23.2	-19.4																						
19-Dec	-19.3	-18.7	-18.2	-17.6	-16.8	-16.4	-16.0	-15.7	-15.3	-14.8	-14.3	-13.4	-12.2	-12.2	-12.4	-11.9	-12.8	-13.3	-13.6	-14.1	-15.9	-18.8	-19.6	-19.3	-15.5	-11.9																						
20-Dec	-18.0	-15.8	-15.4	-15.6	-13.3	-5.4	-5.3	-6.6	-8.6	-7.2	-5.3	-4.0	-3.2	-2.6	-2.1	-3.4	-4.9	-4.7	-5.1	-6.4	-7.3	-7.7	-8.9	-8.3	-7.7	-2.1																						
21-Dec	-8.6	-8.6	-8.7	-6.3	-5.8	-5.7	-5.4	-4.4	-3.4	-3.7	-3.5	-0.6	2.7	3.3	3.3	2.3	0.7	-0.3	-0.2	-0.3	-0.9	-0.7	-0.9	-0.1	-2.3	3.3																						
22-Dec	2.6	3.0	2.7	2.4	1.6	1.0	-0.1	-1.2	-0.7	-0.6	-1.2	-1.9	-4.3	-6.2	-9.2	-11.4	-12.3	-12.8	-13.8	-15.0	-15.0	-14.8	-14.9	-15.0	-5.7	3.0																						
23-Dec	-15.0	-15.4	-15.6	-15.5	-15.8	-16.2	-16.8	-17.6	-17.9	-18.0	-18.1	-17.9	-17.5	-17.4	-17.3	-17.8	-18.4	-19.3	-20.3	-21.3	-22.4	-23.5	-22.2	-23.0	-18.3	-15.0																						
24-Dec	-23.6	-26.7	-29.6	-30.3	-30.1	-27.7	-25.7	-23.7	-23.1	-22.2	-22.6	-22.0	-21.6	-21.2	-20.7	-20.4	-20.1	-19.6	-20.4	-20.9	-21.1	-21.1	-20.7	-20.3	-23.1	-19.6																						
25-Dec	-19.7	-19.5	-18.9	-18.8	-18.9	-20.0	-21.6	-23.5	-24.3	-23.6	-19.4	-17.4	-16.1	-15.6	-15.2	-16.0	-16.7	-17.0	-18.2	-20.9	-20.9	-20.3	-20.4	-22.4	-19.4	-15.2																						
26-Dec	-22.9	-22.8	-24.0	-25.7	-25.7	-25.8	-25.8	-23.5	-21.5	-21.2	-20.4	-19.3	-17.9	-16.5	-15.9	-15.4	-15.5	-15.6	-16.1	-16.6	-16.3	-15.7	-15.6	-14.9	-19.6	-14.9																						
27-Dec	-14.3	-13.5	-12.9	-12.6	-12.5	-11.9	-11.8	-12.8	-13.2	-11.7	-8.5	-3.1	-2.1	-2.2	-2.8	-3.5	-3.5	-3.6	-3.6	-3.4	-3.6	-4.1	-4.2	-7.8	-2.1																							
28-Dec	-5.8	-6.1	-7.4	-8.2	-8.9	-9.8	-10.6	-11.0	-12.1	-13.4	-14.0	-13.7	-14.1	-14.4	-14.0	-13.3	-13.2	-13.2	-12.9	-14.7	-15.3	-14.8	-14.9	-15.4	-12.1	-5.8																						
29-Dec	-15.2	-15.5	-16.7	-15.7	-15.7	-15.5	-15.3	-15.2	-15.1	-15.1	-14.1	-13.4	-12.4	-11.9	-11.4	-11.7	-11.6	-11.9	-12.2	-14.3	-16.0	-16.1	-16.4	-17.0	-14.4	-11.4																						
30-Dec	-14.6	-13.8	-13.9	-13.8	-13.7	-13.7	-13.8	-13.3	-13.6	-13.5	-12.9	-12.1	-11.3	-10.0	-9.2	-9.1	-8.4	-8.0	-8.4	-8.9	-8.5	-8.8	-9.9	-12.2	-11.5	-8.0																						
31-Dec	-12.7	-13.2	-13.5	-13.9	-14.9	-15.1	-16.7	-16.6	-15.7	-14.7	-14.0	-13.4	-12.6	-11.4	-11.3	-12.0	-12.3	-12.2	-10.4	-9.9	-10.3	-11.5	-12.2	-11.4	-13.0	-9.9																						
																								-17.0	-17.0	-17.3	-17.5	-17.6	-17.7	-18.0	-18.1	-18.3	-18.2	-17.3	-16.2	-15.3	-14.7	-14.5	-14.8	-15.3	-16.0	-16.3	-16.8	-17.0	-17.2	-17.3	-17.2	Diurnal Average
																								2.6	3.0	2.7	2.4	1.6	1.0	-0.1	-1.2	-0.7	-0.6	-1.2	-0.6	2.7	3.3	3.3	2.3	0.7	-0.3	-0.2	-0.1	-0.2	-0.7	-0.9	-0.1	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Patricia McInnes - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	283	38.04	38.04
-20 - 0	449	60.35	98.39
0 - 10	12	1.61	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

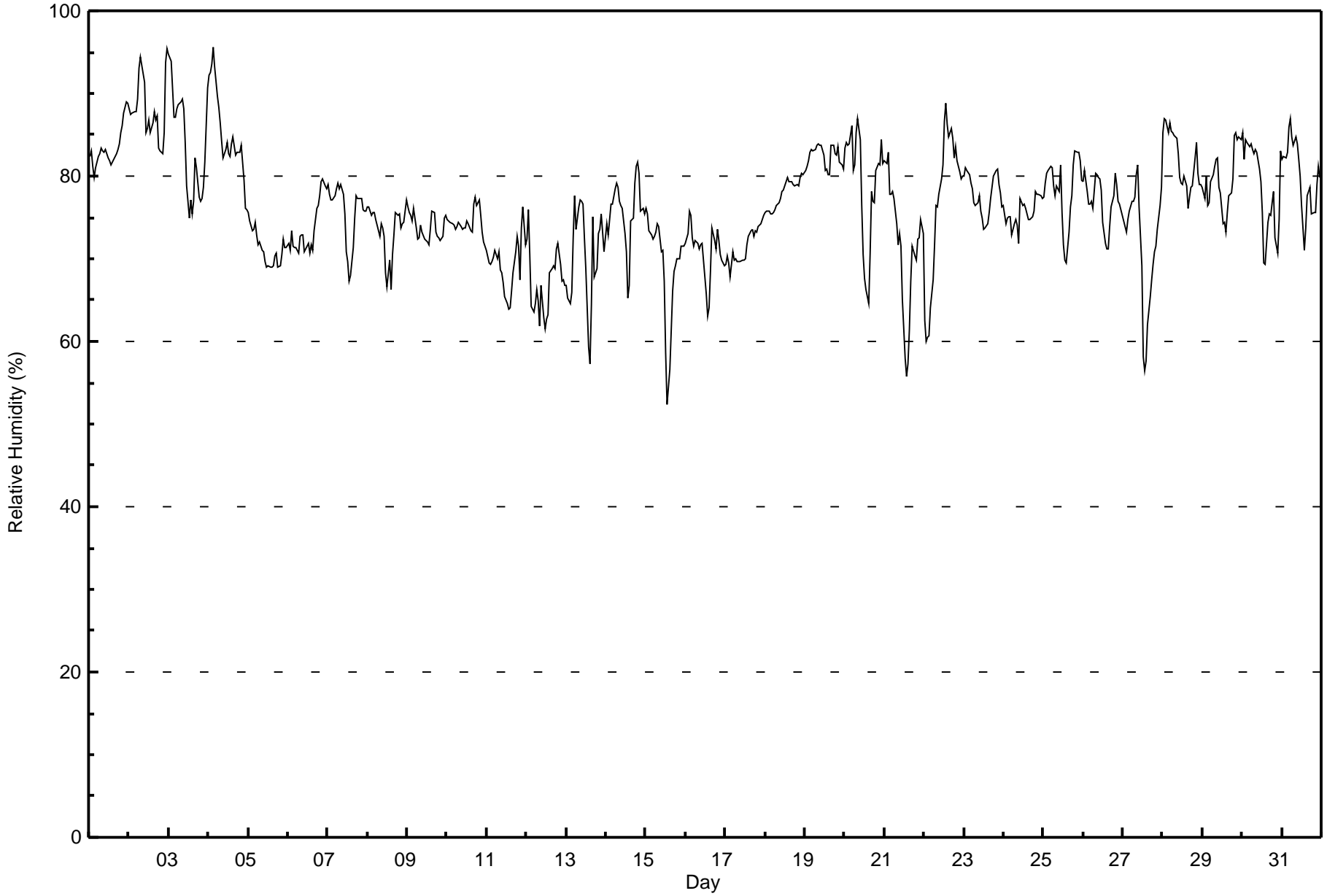
Patricia McInnes - December 2016

Maximum Value: 96 % on Dec 4 04:00 Maximum Daily Average: 88.1 % on Dec 2																	Hours in Service: 744 Hours of Data: 744																																																	
Minimum Value: 52 % on Dec 15 14:00 Minimum Daily Average: 67.1 % on Dec 12 Maximum Diurnal Average: 78.0 % at hour 8 Minimum Diurnal Average: 71.0 % at hour 14 Monthly Average: 76.3 % Percentiles: P ₁ = 58 P ₁₀ = 69 Q ₁ = 72 Median = 76 Q ₃ = 81 P ₉₀ = 84 P ₉₉ = 93																	Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																										
1-Dec	82	83	81	80	81	82	83	83	83	83	83	82	82	81	82	82	83	83	84	85	86	88	89	89	83.4	89																																								
2-Dec	88	87	88	88	88	89	93	94	93	91	85	86	87	85	86	88	87	87	83	83	83	85	94	95	88.1	95																																								
3-Dec	95	94	91	87	87	88	89	89	89	88	84	79	75	77	75	77	82	81	78	77	77	79	82	91	83.7	95																																								
4-Dec	92	92	93	96	93	90	88	86	84	82	83	84	83	82	84	85	83	83	83	83	84	80	76	76	85.2	96																																								
5-Dec	76	75	73	74	74	73	72	72	71	71	70	69	69	69	69	69	70	71	69	69	71	72	71	71	71.2	76																																								
6-Dec	72	71	73	72	71	71	71	73	73	73	71	72	72	71	72	71	73	76	77	78	79	80	79	78	73.6	80																																								
7-Dec	79	78	77	77	78	78	79	78	79	78	75	71	70	67	68	71	75	78	77	77	77	76	76	76	75.6	79																																								
8-Dec	76	76	75	76	76	75	74	73	74	74	73	68	67	70	66	71	73	76	75	75	74	74	74	77	73.4	77																																								
9-Dec	76	76	75	75	76	74	72	73	74	73	72	72	72	74	76	76	73	73	72	72	73	75	75	75	73.8	76																																								
10-Dec	75	75	74	74	74	74	74	74	74	74	74	74	75	74	73	73	77	77	76	77	75	73	72	72	74.3	77																																								
11-Dec	71	69	69	70	70	71	70	71	69	68	67	65	65	64	64	66	68	71	73	72	68	74	76	72	69.3	76																																								
12-Dec	72	76	71	64	64	65	66	65	62	67	63	62	63	63	68	69	69	69	71	72	69	67	67	67	67.1	76																																								
13-Dec	67	65	65	66	73	78	74	76	77	77	77	73	69	59	57	64	75	68	69	73	74	75	73	71	70.5	78																																								
14-Dec	74	73	75	77	77	78	79	79	77	76	76	73	71	65	67	75	75	79	81	82	80	76	76	75	75.7	82																																								
15-Dec	76	75	73	73	72	73	73	74	74	71	71	67	59	52	57	61	66	68	69	70	70	72	71	72	69.2	76																																								
16-Dec	72	73	76	75	73	72	72	72	71	72	72	70	66	63	64	69	74	72	71	74	72	71	70	69	70.9	76																																								
17-Dec	69	70	69	68	71	70	70	70	70	70	70	70	70	72	73	73	74	73	73	73	74	74	75	75	71.5	75																																								
18-Dec	76	76	76	75	75	76	76	76	77	77	78	78	79	80	79	79	79	79	79	79	79	80	80	80	77.9	80																																								
19-Dec	81	81	82	83	83	83	83	84	84	84	84	83	81	81	80	80	84	84	83	83	83	82	81	81	82.3	84																																								
20-Dec	83	84	84	84	86	81	81	85	87	84	76	71	68	66	65	71	78	77	77	81	82	81	84	82	79.0	87																																								
21-Dec	82	82	83	78	78	78	77	74	72	73	72	65	58	56	57	61	67	72	70	70	72	73	75	73	71.6	83																																								
22-Dec	63	60	61	61	64	67	72	77	76	78	80	81	87	89	86	85	86	85	82	83	82	80	80	80	76.8	89																																								
23-Dec	80	81	81	80	79	78	77	76	77	78	76	75	74	74	76	77	79	80	81	81	79	78	76	76	77.7	81																																								
24-Dec	77	74	75	75	75	73	74	75	74	72	77	76	77	76	75	75	75	75	76	78	78	78	78	77	75.6	78																																								
25-Dec	78	79	80	81	81	81	79	78	79	78	81	76	72	70	70	73	76	78	81	83	83	83	82	80	78.3	83																																								
26-Dec	79	81	78	77	77	77	76	80	80	80	80	78	74	72	71	71	74	76	78	80	79	77	77	76	77.0	81																																								
27-Dec	75	74	73	75	76	77	77	77	80	81	76	69	58	56	58	62	65	67	69	71	72	74	76	79	71.6	81																																								
28-Dec	85	87	87	85	86	85	85	85	85	83	80	79	79	80	79	76	77	79	79	82	84	80	79	79	81.9	87																																								
29-Dec	79	77	80	76	77	79	80	81	82	82	79	78	74	74	73	76	78	78	80	85	85	84	85	84	79.5	85																																								
30-Dec	85	82	84	84	84	84	83	83	83	83	81	79	76	70	69	74	76	75	77	78	73	71	75	83	78.8	85																																								
31-Dec	82	82	82	83	86	87	85	84	85	84	82	80	76	71	74	78	78	79	75	76	76	79	81	80	80.2	87																																								
																	77.9		77.7		77.6		77.0		77.6		77.6		77.6		78.0		77.9		77.6		76.4		74.3		72.4		71.0		71.3		73.4		75.8		76.3		76.4		77.5		77.2		77.0		77.6		77.8		Diurnal Average	
																	95		94		93		96		93		90		93		94		93		91		85		86		87		89		86		88		87		87		84		85		86		88		94		95		Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Patricia McInnes - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Patricia McInnes - December 2016

Maximum Speed: 28 km/h on Dec 21 13:00	Maximum Daily Speed Average: 20.4 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 24 10:00	Minimum Daily Speed Average: 1.0 km/h on Dec 18	Hours of Data: 744
Maximum Diurnal Speed Average: 4.5 km/h at hour 21	Minimum Diurnal Speed Average: 2.7 km/h at hour 8	Hours of Missing Data: 0
Monthly Average Velocity: 3.6 km/h 268.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 Q ₃ = 12 P ₉₀ = 17 P ₉₉ = 23	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE10	SSE9	S13	SSW14	SSW11	SSW10	S12	S10	S10	S9	SSW8	SSW9	SSW9	SSW9	SSW10	SW9	SW7	SSW6	S7	SSW6	S6	SSW5	SSW6	SSW7	SSW8.5	SSW14
2-Dec	S7	S6	SSE6	SSE7	SSE7	SSE6	SSE6	SSE7	SSE7	SSE7	SE9	SE9	SE10	SE10	SE10	SE9	SE12	SE11	SSE13	SSE13	SE12	SE13	SE12	SE14	SSE9.1	SE14
3-Dec	SE12	SE11	SSE12	SSE14	SSE12	SSE12	SSE11	SSE10	SSE11	SSE12	S10	SSW11	SSW12	SSW8	S8	S7	SSE7	S7	S9	SSW9	SW12	SW10	SW10	SW12	S9.1	SSE14
4-Dec	SW11	WSW10	WSW8	W6	NNW15	N20	N20	N21	N22	N18	N16	N12	NNW11	NNW13	NNW13	NNW17	NW18	NW19	NW18	NW17	NNW15	NW16	NW18	NW19	NNW12.9	N22
5-Dec	NW21	NW23	NW24	WNW24	WNW23	WNW22	WNW22	WNW21	WNW20	WNW19	WNW22	WNW22	WNW21	WNW21	WNW21	WNW20	WNW19	WNW19	WNW18	WNW18	WNW18	WNW17	WNW17	WNW17	WNW20.4	NW24
6-Dec	WNW18	WNW17	WNW16	WNW18	WNW17	WNW17	WNW18	WNW16	WNW17	WNW17	NW17	NW18	NW17	NW16	NW16	NW17	NW12	NW10	NW9	NNW10	N6	N7	NNW7	NNW6	NW13.7	WNW18
7-Dec	NW5	NW6	NW7	NW7	NW5	NW6	NW7	NNW6	WNW6	WNW6	NNW7	N10	N8	NNW8	N8	N5	NNW3	WNW4	WNW5	NW5	WNW5	NW4	NNW6	NNW5.7	N10	
8-Dec	NNW8	N8	NNW7	NW6	NW6	NNW6	NW5	WNW3	WNW3	NW5	WNW3	NW3	NW3	WNW3	NNW4	N4	N4	NNW5	NW4	NW5	NW4	NNW4	NW1	S3	NNW3.9	N8
9-Dec	SW1	SE2	ESE4	SSE3	S3	S2	SE3	SSE3	S4	S4	S5	SSE6	SSE5	SSE5	SSE5	SSE4	SE2	WNW2	W2	S3	S3	S3	SSE3	S4	SSE2.9	SSE6
10-Dec	S5	SSW5	S2	SE3	S4	SSW5	S4	S4	S3	SSW6	S7	SSW6	S5	S8	S7	S6	SSW3	SSW4	SW5	SW7	WSW8	WSW13	WSW14	WSW14	SSW5.4	WSW14
11-Dec	WSW17	WSW15	WSW15	WSW13	WSW15	WSW16	WSW15	WSW14	W18	WSW17	W20	W23	W20	W18	W17	W16	W15	W17	W15	W14	WNW15	W9	W10	W16	W15.5	W23
12-Dec	WNW13	WNW10	NW13	NW14	NW16	WNW15	W10	W10	W11	WSW12	WNW11	WNW11	WSW6	S3	W3	WNW16	WNW16	WNW14	WNW9	WNW10	WNW14	WNW17	WNW19	WNW20	WNW11.7	WNW20
13-Dec	WNW20	WNW22	WNW25	NW22	NNW17	N15	NNW15	NNW10	WNW8	NNW9	N6	NNE7	NE6	NNW10	NNW12	NW8	WNW6	NW10	WNW9	WNW8	WNW8	WNW8	W9	W7	NW10.1	WNW25
14-Dec	WSW8	W9	W9	W9	WSW10	SW8	SW8	SSW8	SW10	SSW8	SW9	WSW12	WSW11	WNW10	NNW15	N6	N4	NNE8	NW5	WNW6	W8	W8	WNW8	WNW8	W6.2	NNW15
15-Dec	NW9	WNW10	WNW11	WNW11	WNW15	NW12	WNW10	W9	W11	WNW14	NW11	NW13	NNW16	NNW10	WNW10	W10	W10	WNW11	W9	WNW10	NW11	WNW10	WNW11	WNW9	WNW10.6	NNW16
16-Dec	WNW11	NNW10	NW4	W3	WSW4	W6	W2	SSW3	SSW4	SW5	SSW4	S4	S6	S6	S7	SSW7	SSW5	SSW2	SW2	S2	S2	S2	SSW1	S2	SW2.9	WNW11
17-Dec	SW2	SSE3	S3	SSE3	SSE3	S3	SSE3	S4	S5	SSE5	S6	SSE7	SSE7	SSE6	SSE5	SE5	SSE6	SSE4	SSE6	S6	SSE8	SSE8	SSE8	SSE9	SSE5.0	SSE9
18-Dec	SSE9	S7	SSW4	SSW4	SW5	SSE3	SSE3	SSE4	SSE4	SW5	SE3	SE6	S3	ENE2	N6	N8	N7	N6	N6	N4	NNE4	E2	ESE4	SE6	SE1.0	SSE9
19-Dec	ESE5	SE5	SE8	ESE8	ESE9	ESE12	ESE12	ESE11	SE11	SE11	SE7	ESE4	NNW3	N8	NNW7	N6	N8	N10	N11	NNW4	SW3	W2	WNW1	S3	E3.1	ESE12
20-Dec	SSW3	SSW4	S6	S6	SSW8	SW15	SW9	S6	SSE5	SW11	SW14	WSW16	WSW17	WSW15	WSW6	S7	SSW6	WSW14	WSW8	WSW9	WSW11	SW6	SSW7	SW11	SW8.4	WSW17
21-Dec	SSW7	S7	S7	SW13	WSW20	WSW16	WSW16	SW18	SW17	SSW13	SSW10	WSW17	WSW28	WSW26	WSW19	SW14	SSW10	SSW11	SSW13	SSW11	SSE9	SE7	ESE3	SW5	SW11.5	WSW28
22-Dec	WSW13	WSW16	WSW15	WSW15	WSW15	WSW17	WSW13	WSW12	WNW9	NW8	NW11	N12	N17	N19	N19	NNW18	N18	NNW19	N19	N13	NNW13	N15	N15	N14	NW9.4	N19
23-Dec	N15	N13	N11	N11	N13	N14	N15	N16	N12	N11	N12	N11	N10	N10	N10	N9	N9	N9	N9	N9	N8	NNE5	E7	E6	N10.0	N16
24-Dec	E5	E3	N2	NW3	NW6	NW5	NW3	E2	NNW2	ENE0	SE4	SSE5	SSE6	SSE6	S5	SSE6	SE5	SSE4	SE4	SSE5	SSE7	SSE8	SSE7	SSE9	SSE2.8	SSE9
25-Dec	SSE8	S4	S6	SSW5	SSW6	SW4	SSW3	SSW3	SSW4	S5	S5	SSE4	SSE6	SSE7	SSE6	SE8	SE8	SE10	SE6	SSE5	SSE5	SE6	SE5	SSE5	SSE5.1	SE10
26-Dec	SSE5	SSE6	S4	S4	S4	S5	S5	SE7	SE8	SE9	SE11	SE9	SE9	SE9	SE10	SE11	SSE10	SSE9	SSE9	S10	S10	S8	SSE7	SSE7.6	SE11	
27-Dec	SSE9	SE7	SSE8	SSE9	SSE9	SSE8	SSE8	SSE8	SSE8	S8	SE6	SSW9	SW16	SW18	SW17	SW14	SW11	SW12	SW10	WSW10	WSW10	WSW10	WSW10	W6	SSW8.0	SW18
28-Dec	N6	NNW10	NNW9	N9	NNW10	N12	N8	N9	NNW9	N9	N9	N8	NNE8	NE5	NE5	NW1	SW1	S4	NNE2	N8	NNW8	NNW9	N10	NNW7	N6.7	N12
29-Dec	N8	N7	NW5	NNW3	NNE6	NNE5	ENE3	SE4	ESE5	ESE2	SE4	ESE5	ESE3	S5	SE3	SE4	SE4	ENE3	N6	NW5	NW4	NW2	WSW3	W1	NE1.3	N8
30-Dec	S1	N3	SW1	W3	WSW2	SSW6	SSW6	SW8	SSW10	WSW7	SW11	SW12	SW14	SW12	SW12	SW15	SW19	WSW18	W7	W11	WNW12	NW14	NNW14	NNW11	WSW6.9	SW19
31-Dec	NW6	N10	NNW8	W6	WSW4	S3	ESE2	NNE5	WNW5	WNW4	W3	SW2	NNE6	ENE2	E2	E5	N3	WSW9	WSW13	WSW17	W18	WSW17	WSW14	WSW15	W4.7	W18

W3.6	W3.5	W3.8	W4.3	W4.4	W4.1	W3.0	WSW2.7	WSW3.0	WSW3.3	WSW2.9	W3.3	W3.8	W3.6	W3.4	W3.4	W3.1	W4.2	W4.0	W4.5	W4.5	W4.0	W3.6	W3.8	Diurnal Average	
NW21	NW23	WNW25	WNW24	WNW23	WNW22	WNW22	N21	N22	WNW19	WNW22	W23	WSW28	WSW26	WNW21	WNW21	WNW20	NNW19	N19	WNW18	WNW18	WNW18	WNW19	WNW20	Diurnal Maximum	

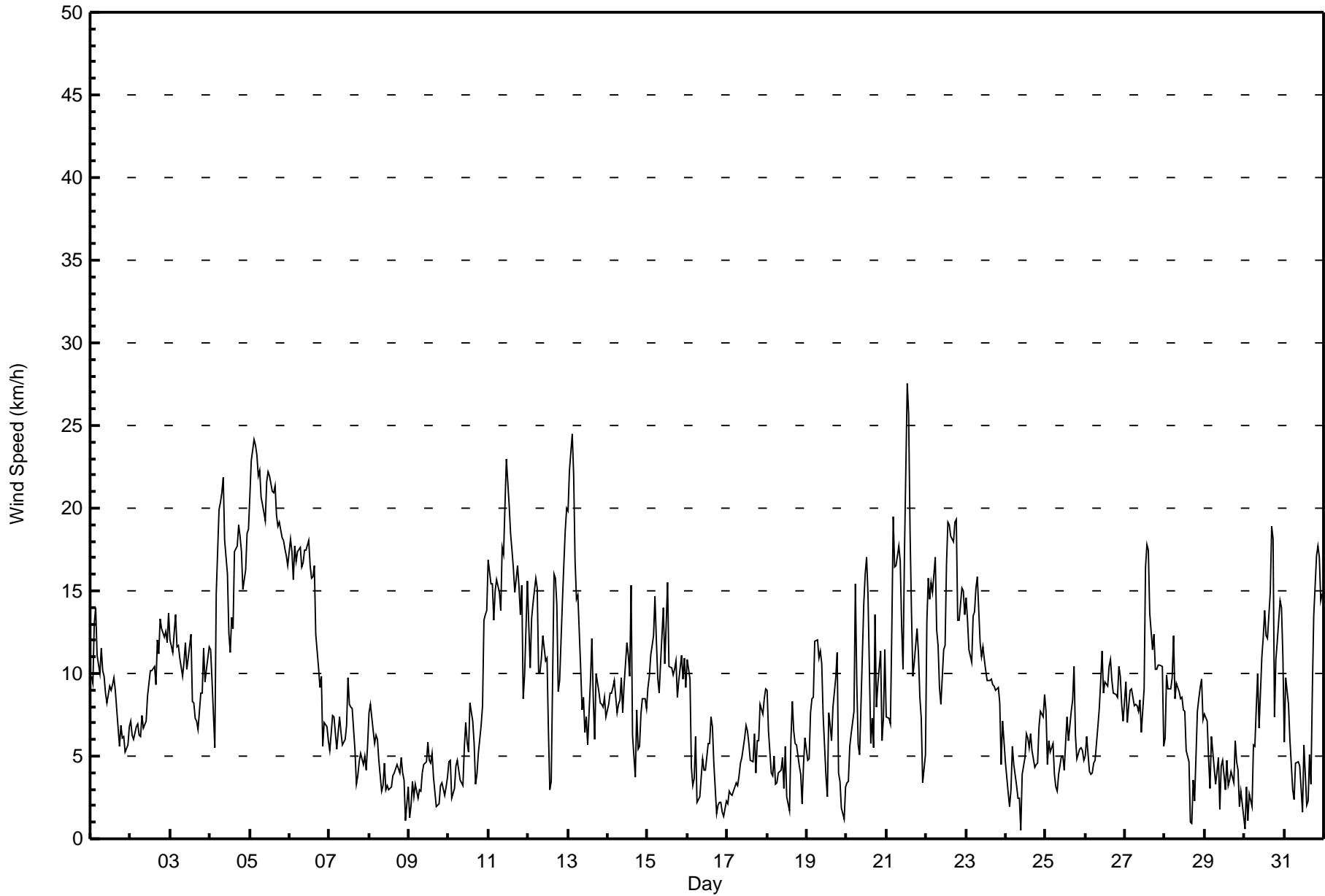
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Patricia McInnes - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 13 14:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Dec 8 19:00																									
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 3 P ₉₉ = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	2	2	3	4	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	4
2-Dec	1	1	1	1	1	1	1	1	1	1	2	2	3	3	3	2	3	2	3	3	2	3	3	3	3
3-Dec	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2	1	1	1	1	2	2	2	2	2	3
4-Dec	2	2	2	1	4	4	4	5	4	4	3	3	2	3	3	4	3	3	3	3	3	3	3	4	5
5-Dec	4	4	4	4	4	5	5	4	4	4	4	4	4	5	3	4	5	4	4	4	3	3	3	3	5
6-Dec	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	1	2	2	1	2	1	1	4
7-Dec	1	1	1	2	1	1	2	2	1	0	2	2	1	2	2	1	1	0	1	1	1	0	1	1	2
8-Dec	1	2	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	2
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10-Dec	1	1	2	2	1	1	1	1	1	1	2	1	1	1	2	1	1	1	2	1	2	2	2	3	3
11-Dec	2	2	2	3	2	2	3	3	3	3	4	4	4	4	3	3	3	3	2	3	3	1	3	3	4
12-Dec	3	2	2	3	3	2	2	2	2	1	2	3	2	1	5	3	3	3	2	4	3	3	4	4	5
13-Dec	4	5	5	4	5	4	3	3	1	3	1	2	1	7	3	3	1	1	1	1	1	1	1	1	7
14-Dec	1	2	1	1	1	2	2	2	2	1	2	2	2	5	4	2	1	2	1	1	1	1	1	2	5
15-Dec	1	1	2	2	2	2	1	1	1	3	2	3	3	3	2	2	2	2	1	2	1	1	1	2	3
16-Dec	1	1	3	1	1	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	0	3
17-Dec	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1	2	2	2
18-Dec	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	3	1	3
19-Dec	2	1	3	2	2	3	3	3	3	3	2	1	1	1	2	2	1	2	3	1	1	1	1	1	3
20-Dec	1	1	2	1	4	3	3	2	2	2	3	3	4	3	5	2	2	4	3	2	3	2	2	2	5
21-Dec	2	1	1	4	4	4	3	3	4	3	2	6	6	6	4	3	2	2	2	2	1	2	2	4	6
22-Dec	3	3	3	3	3	3	3	2	2	2	2	4	3	3	4	4	3	3	4	4	2	3	3	3	4
23-Dec	3	3	2	2	3	3	3	3	3	2	2	2	2	1	1	1	2	2	1	1	2	1	2	3	3
24-Dec	2	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	2	1	1	1	2	1	2	2	2
25-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	2	1	1	1	1	1	2
26-Dec	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2
27-Dec	2	2	2	3	2	1	1	1	1	1	2	2	3	3	3	3	2	2	2	2	1	1	1	2	3
28-Dec	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	3	2	1	2	2	2	3
29-Dec	2	2	1	2	1	1	1	2	1	2	2	3	1	2	2	1	2	2	2	1	0	1	1	1	3
30-Dec	1	1	2	2	1	2	2	2	2	2	2	3	3	3	3	3	3	4	3	3	3	3	3	2	4
31-Dec	2	2	2	1	1	2	1	1	1	1	1	1	2	2	1	1	1	2	3	3	3	2	2	3	3
Diurnal Maximum																									
4 5 5 4 5 5 5 5 4 4 4 6 6 7 5 5 4 4 4 4 3 3 4 4																									





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Patricia McInnes - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	207	27.82	27.82
6 - 11	332	44.62	72.45
12 - 19	174	23.39	95.83
20 - 28	31	4.17	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Patricia McInnes - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	8	5	2	5	6	11	15	27	41	21	12	4	8	11	23	8	207
6 - 11	44	5	1	0	2	3	29	54	32	32	18	17	22	30	18	25	332
12 - 19	23	0	0	0	0	2	6	7	2	5	18	36	9	32	22	12	174
20 - 28	4	0	0	0	0	0	0	0	0	0	0	3	3	18	3	0	31
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	79	10	3	5	8	16	50	88	75	58	48	60	42	91	66	45	744

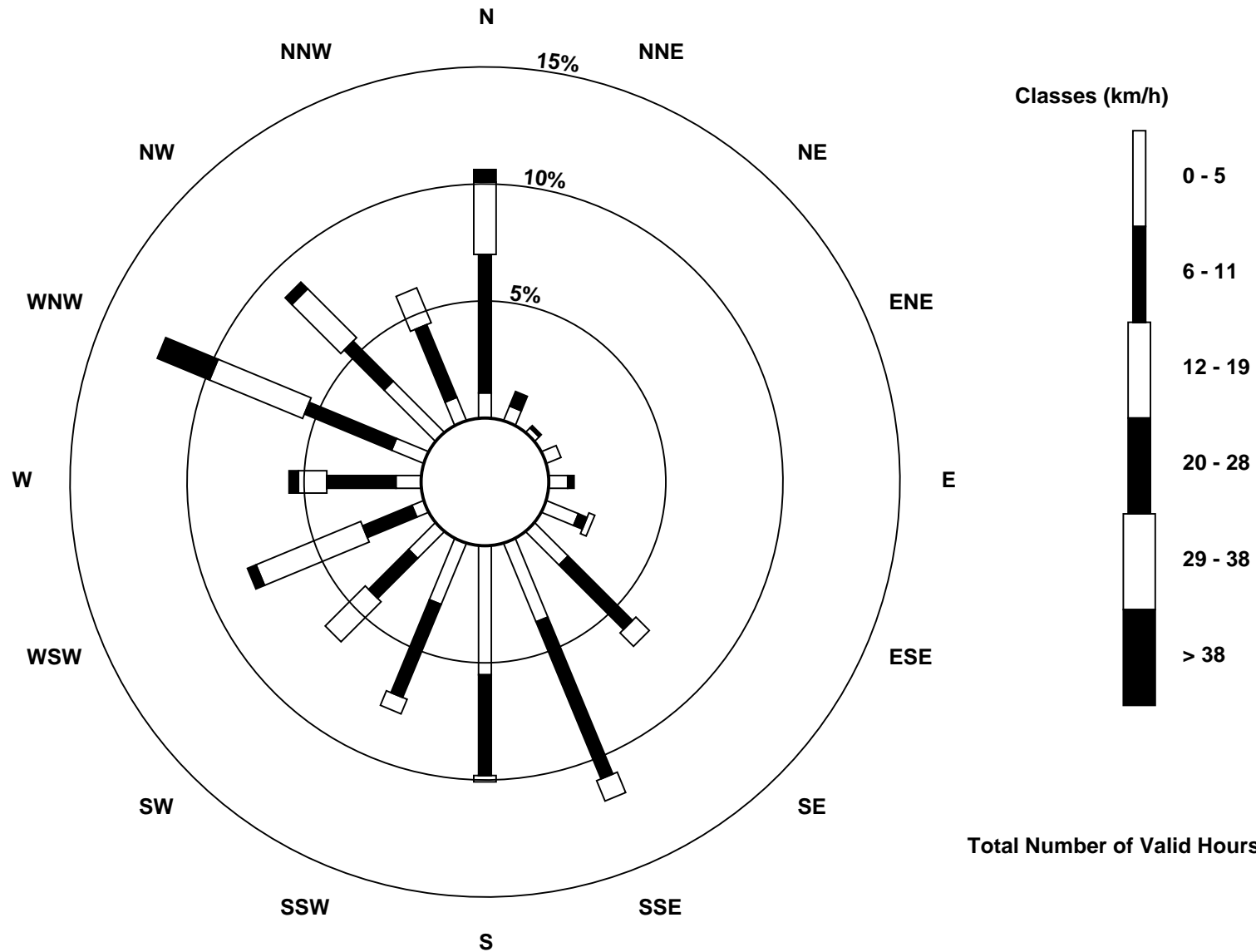
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Patricia McInnes (AMS 6)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Patricia McInnes - December 2016

Direction of Maximum Speed: 254 deg on Dec 21 13:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 297.3 deg on Dec 5	Hours of Data: 744
Direction of Minimum Speed: 78 deg on Dec 24 10:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.0 deg on Dec 18	Percent Operational Time: 100.0
Monthly Average Direction: 268.4 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	167	163	180	206	206	200	186	189	183	190	193	200	197	211	197	219	225	206	190	206	191	203	197	195	194.9
2-Dec	184	179	164	155	161	166	160	153	161	150	133	146	135	137	126	133	137	144	154	147	146	139	139	136	146.8
3-Dec	138	137	149	160	159	160	163	161	153	159	169	193	202	194	183	181	162	169	183	207	215	229	228	227	176.9
4-Dec	231	239	241	260	347	357	8	3	5	3	4	4	344	336	325	311	311	309	312	320	328	317	313	305	330.1
5-Dec	306	307	306	300	299	301	300	296	298	298	300	302	299	295	295	292	293	294	293	290	287	287	292	295	297.3
6-Dec	295	295	295	301	300	300	303	297	298	298	305	308	309	315	311	305	306	309	323	342	350	359	338	329	307.1
7-Dec	319	315	323	324	313	320	322	328	301	296	327	352	351	345	2	2	346	296	303	308	312	295	318	345	326.5
8-Dec	348	3	339	320	324	332	320	300	294	307	291	315	312	288	345	356	354	348	317	309	325	332	309	173	327.4
9-Dec	233	130	121	155	185	190	128	155	177	172	178	162	158	151	168	156	131	297	267	174	180	180	168	177	167.2
10-Dec	183	197	191	124	187	205	190	176	185	194	187	195	182	186	190	190	194	210	230	227	244	246	243	246	210.3
11-Dec	251	250	250	241	253	249	244	252	259	251	262	265	271	272	275	275	270	263	259	266	283	261	270	281	261.8
12-Dec	297	296	311	313	315	303	272	279	271	254	286	295	239	187	266	291	291	291	292	297	290	287	285	291	289.7
13-Dec	291	301	301	304	343	358	343	330	301	340	1	33	46	342	327	313	284	304	303	299	297	286	275	270	315.7
14-Dec	258	263	264	260	253	232	217	212	229	205	223	242	245	299	336	8	5	12	326	287	272	273	284	302	267.1
15-Dec	304	297	292	290	296	307	293	275	277	297	306	306	329	332	291	276	280	295	274	290	304	291	299	296	296.8
16-Dec	290	305	312	261	244	276	276	209	210	219	213	191	178	184	183	193	196	211	228	178	190	191	200	172	227.3
17-Dec	217	154	174	159	167	172	163	181	175	166	169	157	155	153	153	135	154	161	163	169	149	154	150	153	159.5
18-Dec	155	177	194	198	220	162	153	155	148	223	142	131	183	68	4	356	355	349	354	349	24	93	102	136	131.8
19-Dec	123	128	131	118	120	123	122	123	127	130	130	103	338	353	348	359	8	2	353	332	214	263	291	187	96.0
20-Dec	198	202	174	169	206	235	219	190	155	220	230	240	243	243	238	190	203	251	246	238	244	236	203	215	224.6
21-Dec	205	185	172	234	241	241	237	231	226	201	199	243	254	255	246	221	193	201	206	199	157	125	116	226	224.1
22-Dec	243	247	237	244	243	253	255	246	297	310	317	357	9	6	3	346	349	347	359	354	347	360	2	5	322.9
23-Dec	6	0	3	5	8	359	5	1	8	9	1	359	357	350	349	354	351	354	352	351	356	19	93	99	3.2
24-Dec	97	98	6	325	306	320	305	97	344	78	145	151	156	148	178	151	145	161	140	149	154	156	154	158	149.8
25-Dec	167	191	183	195	197	222	203	207	212	182	181	163	154	149	165	142	138	138	145	158	162	144	138	154	164.7
26-Dec	162	156	187	174	175	184	175	146	141	144	141	144	143	143	143	142	152	154	168	168	175	169	174	148	155.7
27-Dec	151	143	159	150	160	164	160	148	159	177	145	192	227	229	228	227	229	228	234	243	248	238	239	281	205.6
28-Dec	353	343	345	352	347	2	355	350	347	4	358	9	33	46	38	325	232	191	18	352	334	342	355	339	355.1
29-Dec	351	5	314	331	15	12	71	131	107	123	137	111	113	169	139	137	124	67	11	323	309	314	241	269	42.9
30-Dec	190	7	235	260	251	192	195	220	196	239	217	214	229	226	216	222	227	243	261	280	294	311	342	332	245.1
31-Dec	316	3	329	268	239	169	112	29	303	287	270	225	23	59	93	90	349	255	251	258	259	258	246	255	271.8

264.8 278.9 270.1 265.4 274.1 276.1 266.9 256.2 253.4 249.8 252.6 259.8 263.1 269.9 277.4 270.3 269.4 275.8 277.0 274.3 270.8 271.2 270.3 263.8
 Diurnal Average

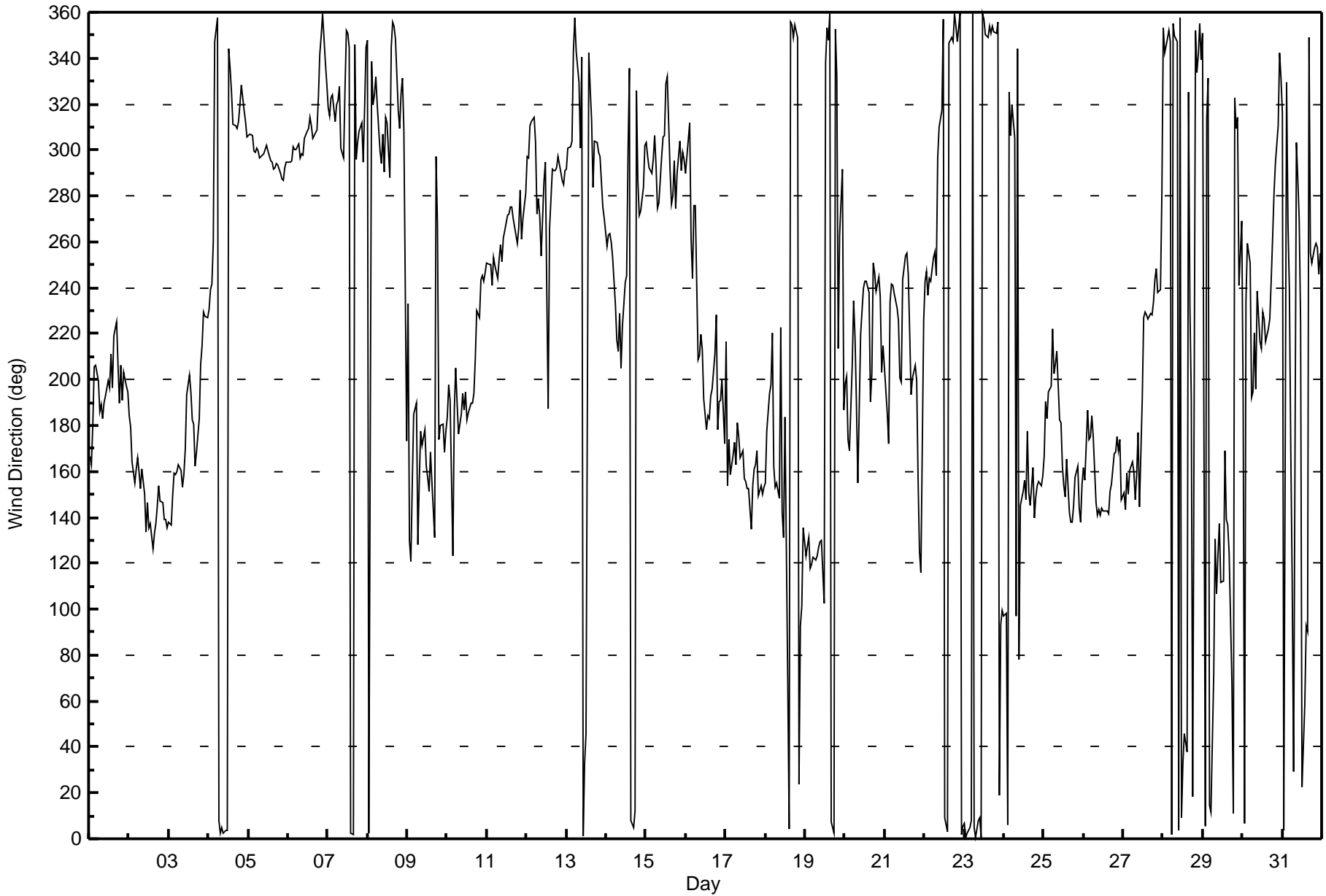
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Patricia McInnes - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Dec 30 01:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 5 deg on Dec 7 20:00																									
Percentiles: P ₁ = 6 P ₁₀ = 9 Q ₁ = 11 Median = 13 Q ₃ = 18 P ₉₀ = 31 P ₉₉ = 85																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	13	12	16	18	14	14	14	13	11	12	12	16	15	15	13	15	12	16	11	14	12	18	13	12	18
2-Dec	16	12	15	13	17	17	9	9	13	15	12	14	15	15	11	12	12	12	13	12	12	12	12	12	17
3-Dec	12	12	14	11	11	11	11	11	11	11	13	13	13	16	13	12	20	10	10	13	12	10	11	10	20
4-Dec	10	10	11	23	16	15	13	16	15	14	14	15	13	10	10	10	9	10	10	11	11	10	10	10	23
5-Dec	11	10	10	10	10	11	10	11	11	11	10	10	10	10	11	11	10	10	11	10	11	10	10	10	11
6-Dec	10	11	10	10	9	9	9	9	8	9	10	10	10	10	9	8	8	9	10	13	15	19	11	13	19
7-Dec	8	10	11	13	11	10	17	17	10	7	15	13	13	15	13	10	29	5	6	5	6	12	8	10	29
8-Dec	11	13	11	7	7	10	7	13	21	7	22	15	26	18	28	25	17	11	7	5	11	15	85	19	85
9-Dec	57	48	15	27	23	32	24	19	18	10	16	15	17	20	14	19	76	28	33	16	10	21	16	11	76
10-Dec	11	15	52	52	22	15	17	13	17	14	12	17	15	10	13	13	11	16	17	14	11	10	10	9	52
11-Dec	9	9	8	11	10	11	10	10	11	12	11	10	12	13	12	11	11	9	9	13	11	14	24	10	24
12-Dec	12	7	11	9	11	8	15	12	27	7	23	12	13	31	86	10	11	10	9	12	10	11	11	11	86
13-Dec	11	11	10	10	37	15	13	13	12	17	21	15	16	44	12	17	14	7	7	7	5	9	10	16	44
14-Dec	9	10	9	12	7	12	14	14	10	17	13	10	9	39	14	20	24	12	19	23	9	8	11	8	39
15-Dec	8	8	9	9	10	7	8	14	8	11	12	12	11	18	15	10	11	8	16	15	8	6	6	7	18
16-Dec	7	5	70	23	22	18	73	18	18	18	25	24	15	13	11	17	18	58	38	45	32	36	38	19	73
17-Dec	21	23	12	18	17	16	20	13	12	20	14	10	13	17	19	13	16	22	14	14	15	13	14	12	23
18-Dec	15	16	34	28	17	35	24	22	23	23	40	20	48	71	19	12	13	23	18	27	37	77	53	21	77
19-Dec	36	26	23	15	16	15	13	16	15	16	21	31	45	13	23	21	14	15	12	43	18	51	67	22	67
20-Dec	29	21	26	13	31	11	25	32	51	13	12	12	12	11	67	20	38	13	24	10	13	20	21	10	67
21-Dec	13	16	26	22	10	11	10	9	11	14	13	21	11	12	14	13	14	11	12	17	10	15	47	77	77
22-Dec	10	11	12	11	11	12	11	12	22	19	11	13	13	14	14	12	12	12	15	17	11	13	14	13	22
23-Dec	13	14	13	18	14	14	13	14	12	13	14	14	10	11	12	10	12	10	10	9	11	34	13	14	34
24-Dec	15	23	50	53	7	12	11	81	59	85	23	28	17	15	16	17	22	14	16	14	12	12	14	12	85
25-Dec	16	16	15	16	14	11	18	16	21	14	12	23	16	14	16	15	11	12	14	15	7	12	12	11	23
26-Dec	13	11	21	15	19	16	10	11	10	11	12	12	13	13	12	11	10	10	10	8	8	9	12	16	21
27-Dec	13	13	15	20	12	11	13	8	9	9	21	19	11	10	10	10	9	9	9	11	11	9	7	64	64
28-Dec	38	11	10	14	13	13	12	12	10	11	12	14	11	12	18	61	93	30	86	16	16	14	16	20	93
29-Dec	15	16	25	59	14	20	29	24	21	67	23	48	49	30	62	40	36	56	24	18	10	57	62	67	67
30-Dec	100	48	90	69	45	16	31	17	12	24	13	13	12	14	16	12	10	13	28	16	13	10	19	14	100
31-Dec	16	13	10	30	29	32	41	25	29	25	36	77	16	78	49	21	42	11	9	8	9	8	10	16	78
	100	48	90	69	45	35	73	81	59	85	40	77	49	78	86	61	93	58	86	45	37	77	85	77	
	Diurnal Maximum																								





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 6, 2016	Last Calibration	November 1, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	11:55
Gas Cert Reference	LL107926	Station temp.	21 Deg C
Cal Gas Concentration	50.8 ppm	Cal Gas Exp Date	February-16-19
Calibrator Make/Model	Teledyne API T700	Serial Number	2449
ZAG Make/Model	Teledyne API 701H	Serial Number	201
DACS make/model	Campbell Scientific CR3000	DACS serial No.	10957

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-678	-678
Analyzer IP address	192.168.1.43		Lamp voltage	758	763
Calculated slope	0.999052	1.000149	Chamber temp	45.0	45.0
Calculated intercept	1.685163	1.165957	Pressure	694.3	709.7
Analyzer Background	6.0	6.0	Flow	0.444	0.451
Analyzer Coefficient	1.137	1.137	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 1008841397

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.0	0.3	----
as found span	5500	84.1	776.8	775.1	1.002
calibrator zero	5500	0.0	0.0	0.6	----
high point	5500	84.1	776.8	776.4	1.001
second point	5500	42.1	388.9	386.8	1.005
third point	5500	21.1	194.9	191.9	1.016
as left zero	5500	0.0	0.0	0.5	----
as left span	5500	84.1	776.8	774.2	1.003
Average Correction Factor					1.007

Corrected As found 774.8 Previous response 775.8 % change 0.1%

Notes:

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



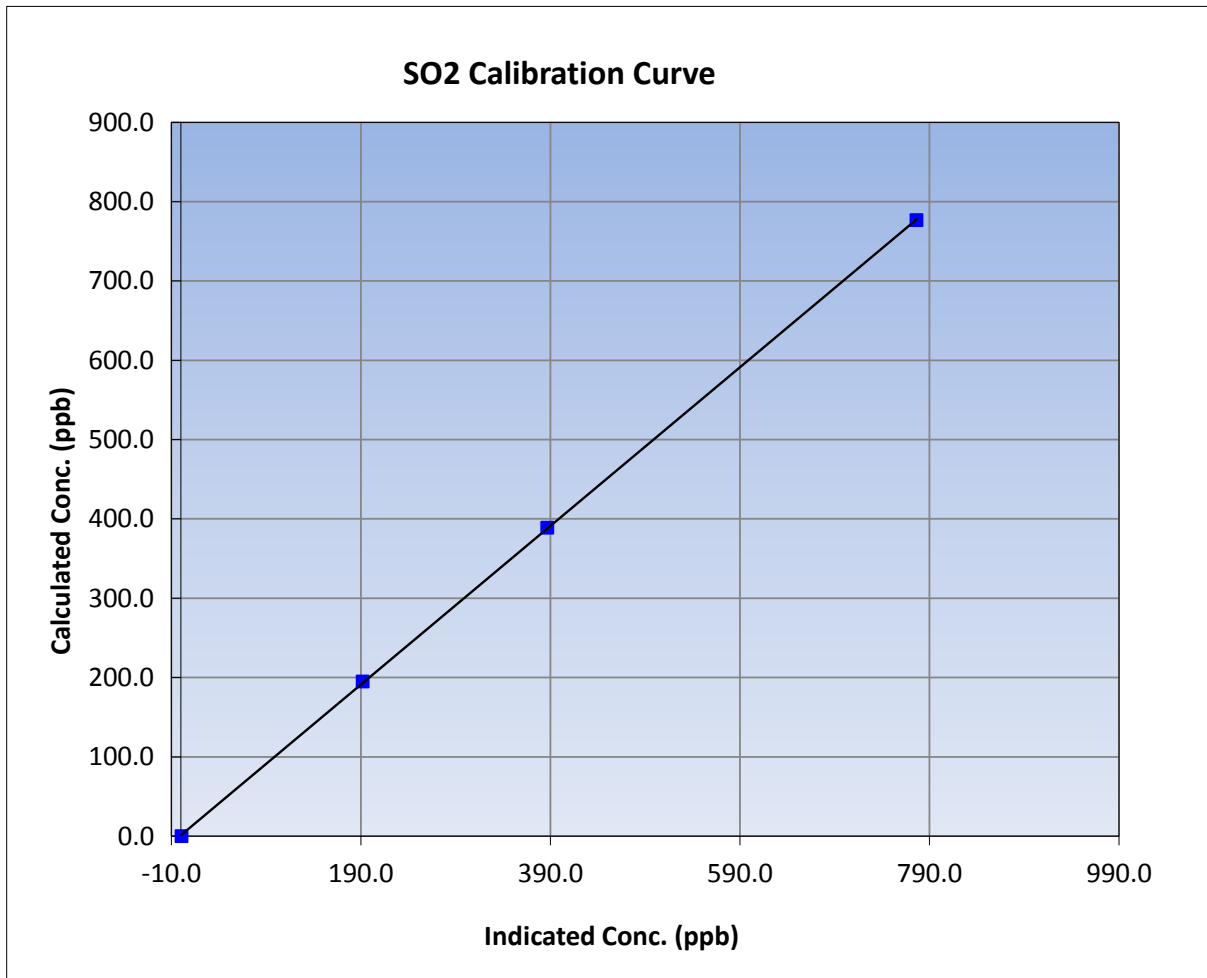
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 1, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:10	End Time (MST)	11:55
Analyzer make	Thermo 43i	Analyzer serial #	1008841397

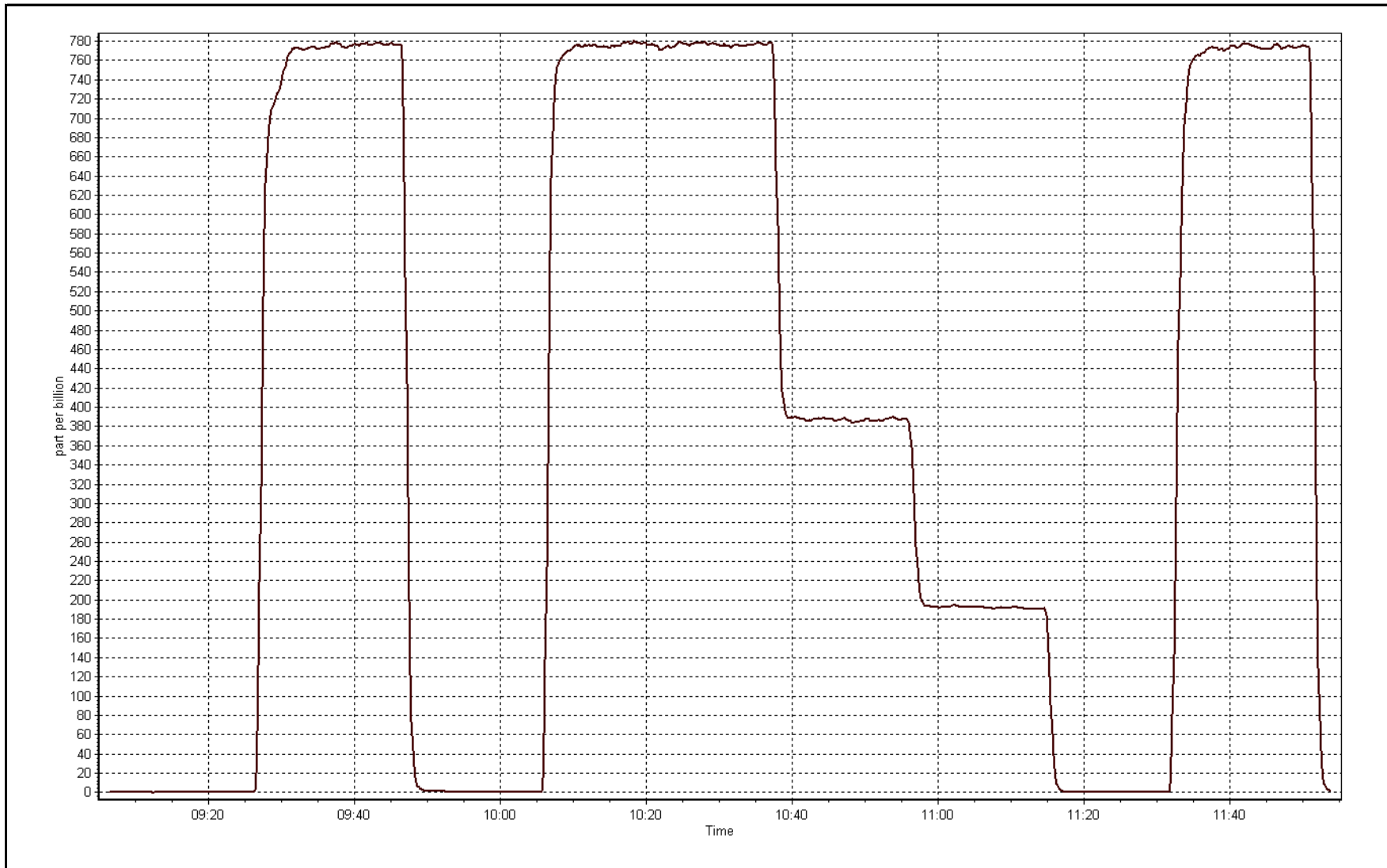
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999976
776.8	776.4	1.0005		
388.9	386.8	1.0054	Slope	1.000149
194.9	191.9	1.0156		
			Intercept	1.165957



SO2 Calibration Plot

Date: December 6, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 23, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:15	End Time (MST)	13:20
Gas Cert Reference	SA5551	Station temp.	22 Deg C
Cal Gas Concentration	5.28 ppm	Cal Gas Exp Date	2/13/18
Calibrator Make/Model	Teledyne API T700	Serial Number	2449
Dil air Make/Model	Teledyne API 701H	Serial Number	201
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036
SO2 gas concentration	49.8 ppm	SO2 gas cert/exp	LL107926 6/Feb/19

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-720	-720
Analyzer IP address	192.168.1.44		Lamp voltage	999	999
Calculated slope	1.003760	0.998877	Chamber temp	45	45
Calculated intercept	0.035042	0.268551	Pressure	683.6	702.4
Analyzer Background	2.46	2.41	Flow	0.430	0.438
Analyzer Coefficient	1.107	1.107	Intensity	91	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153358	
Converter make/model	CDN-101		Converter serial #	520	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5542	0.0	0.0	-0.3	----
as found span	5542	73.1	69.6	68.2	1.021
SO2 scrubber check	5542	21.1	189.6	0.0	----
calibrator zero	5542	0.0	0.0	-0.1	----
high point	5542	73.1	69.6	69.5	1.002
second point	5542	41.8	39.8	39.6	1.006
third point	5542	20.9	19.9	19.5	1.022
as left zero	5542	0.0	0.0	-0.2	----
as left span	5542	73.1	69.6	69.5	1.003
Average Correction Factor					1.010

Corrected As found	68.5	Previous response	69.3	% change	1.3%
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Notes:

Inlet filter changed after as founds. Scrubber check completed after as founds. No adjustments made.

Calibration Performed By:

Devin Russell



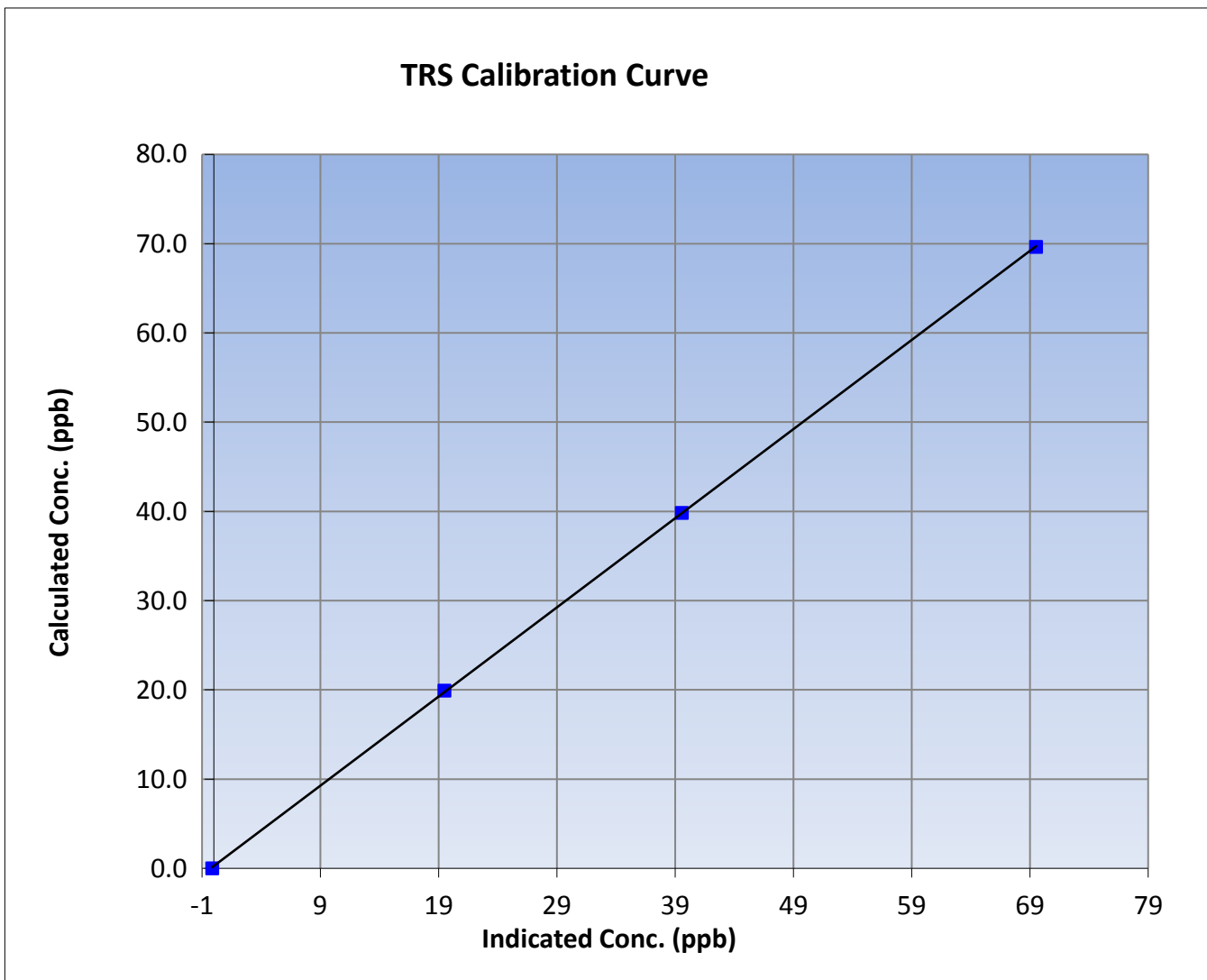
Wood Buffalo Environmental Association TRS Calibration Report

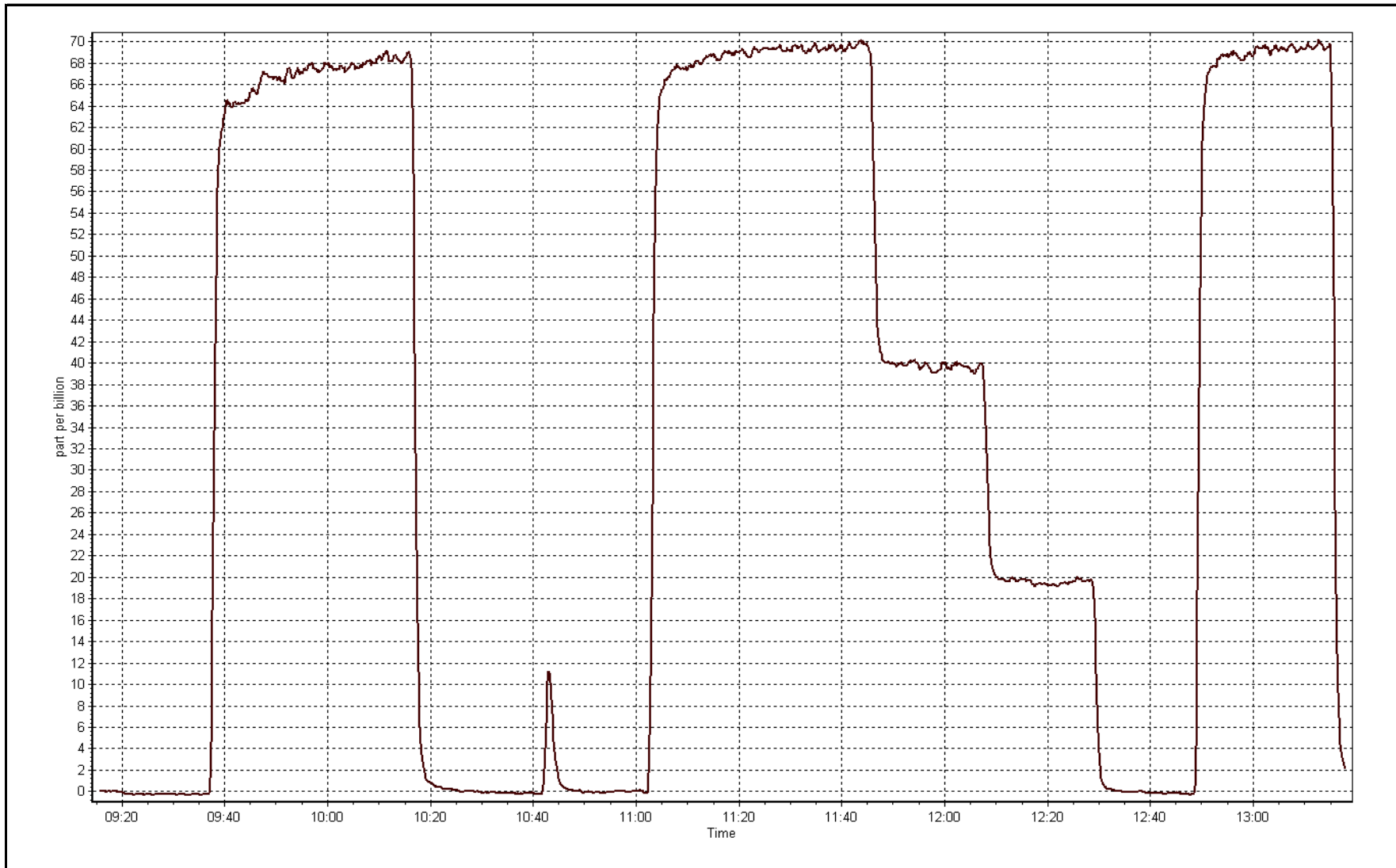
Station Information

Calibration Date	November 23, 2016	Previous Calibration	November 23, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:15	End Time (MST)	13:20
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153358

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999979
69.6	69.5	1.0018		
39.8	39.6	1.0064	Slope	0.998877
19.9	19.5	1.0216		
			Intercept	0.268551







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 6, 2016	Last Calibration	November 1, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	11:55
Gas Cert Reference	LL107926	Cal Gas Expiry Date	February-16-19
CH4 Cal Gas Conc.	505.0 ppm	CH4 Equiv Conc.	1068.8 ppm
C3H8 Cal Gas Conc.	205.0 ppm	Station temp.	21 Deg C
Calibrator Model	Teledyne API T700	Serial Number	2449
ZAG make/model	Teledyne API 701H	Serial Number	201
DACS make/model	Campbell Scientific CR3000	Serial Number	10957

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.2	75.2
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.994423	1.000863	Carrier Pressure	34.6	34.6
THC Calc intercept	0.068019	0.052140	Fuel Pressure	42.3	42.3
NMHC Calc slope	0.992521	1.002335	Air Pressure	32.4	32.4
NMHC Calc intercept	0.040203	0.028337			

Analyzer make Thermo 55i Analyzer serial # 1331259521

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.00	0.00	----
as found span	5500	84.1	16.34	16.48	0.992
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	84.1	16.34	16.31	1.002
second point	5500	42.1	8.18	8.07	1.014
third point	5500	21.1	4.10	4.01	1.022
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	84.1	16.34	16.32	1.001
Average Correction Factor					1.013

Corrected As found 16.48 Previous response 16.37 % change -0.7%

Notes:

Inlet filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	84.1	8.62	8.73	0.987
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	84.1	8.62	8.59	1.004
second point	5500	42.1	4.32	4.25	1.015
third point	5500	21.1	2.16	2.11	1.025
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	84.1	8.62	8.60	1.002
Average Correction Factor					1.015

Corrected As found 8.73 Previous response 8.65 % change -1.0%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	84.1	7.72	7.75	0.996
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	84.1	7.72	7.72	1.000
second point	5500	42.1	3.87	3.82	1.012
third point	5500	21.1	1.94	1.89	1.025
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	84.1	7.72	7.72	1.000
Average Correction Factor					1.012

Corrected As found 7.75 Previous response 7.72 % change -0.4%



Wood Buffalo Environmental Association

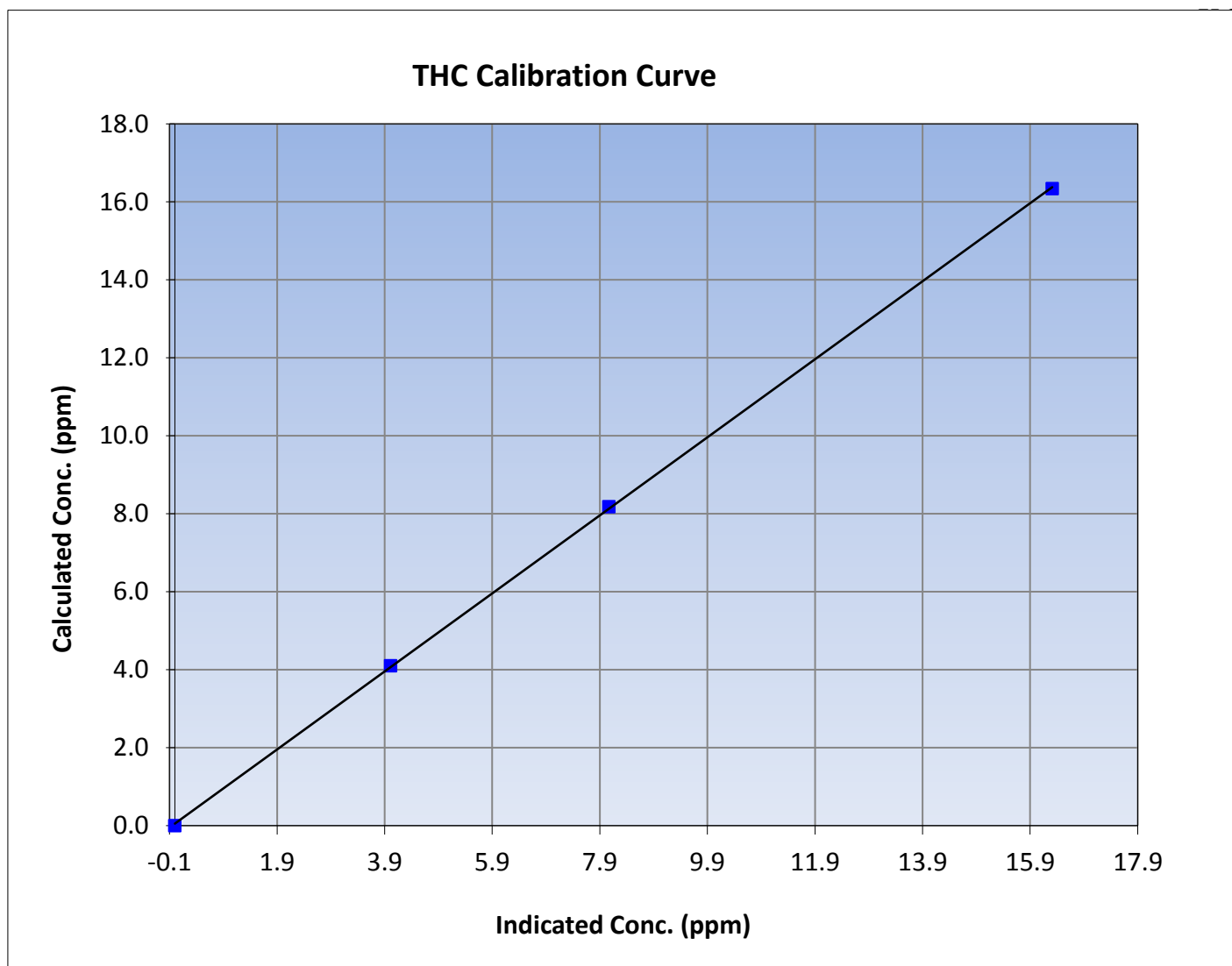
THC Calibration Summary

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 1, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:10	End Time (MST)	11:55
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999947
16.34	16.31	1.0020		
8.18	8.07	1.0137	Slope	1.000863
4.10	4.01	1.0225		
			Intercept	0.052140





Wood Buffalo Environmental Association

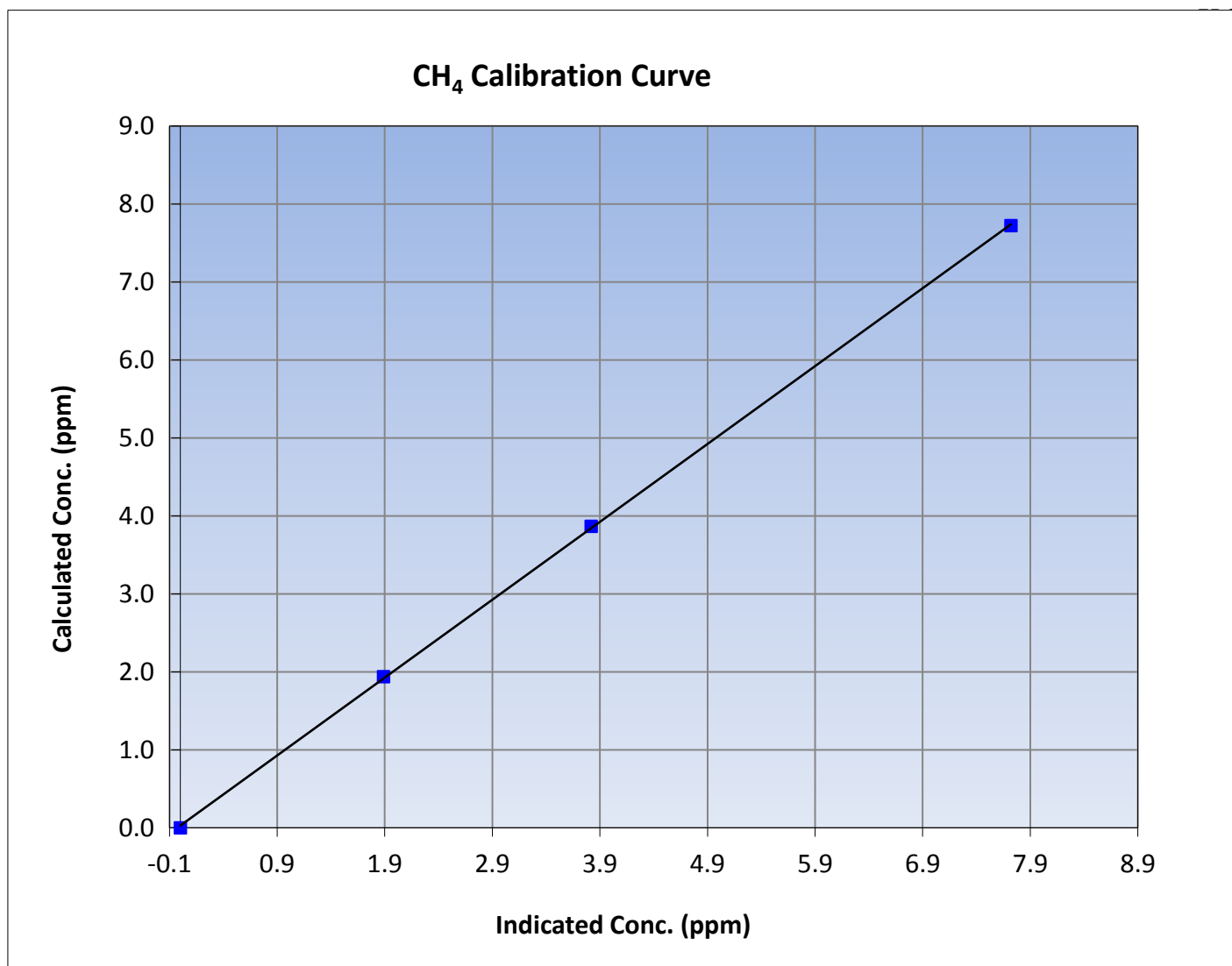
CH₄ Calibration Summary

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 1, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:10	End Time (MST)	11:55
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999938
7.72	7.72	1.0002		
3.87	3.82	1.0119	Slope	0.998772
1.94	1.89	1.0251		
			Intercept	0.027827





Wood Buffalo Environmental Association

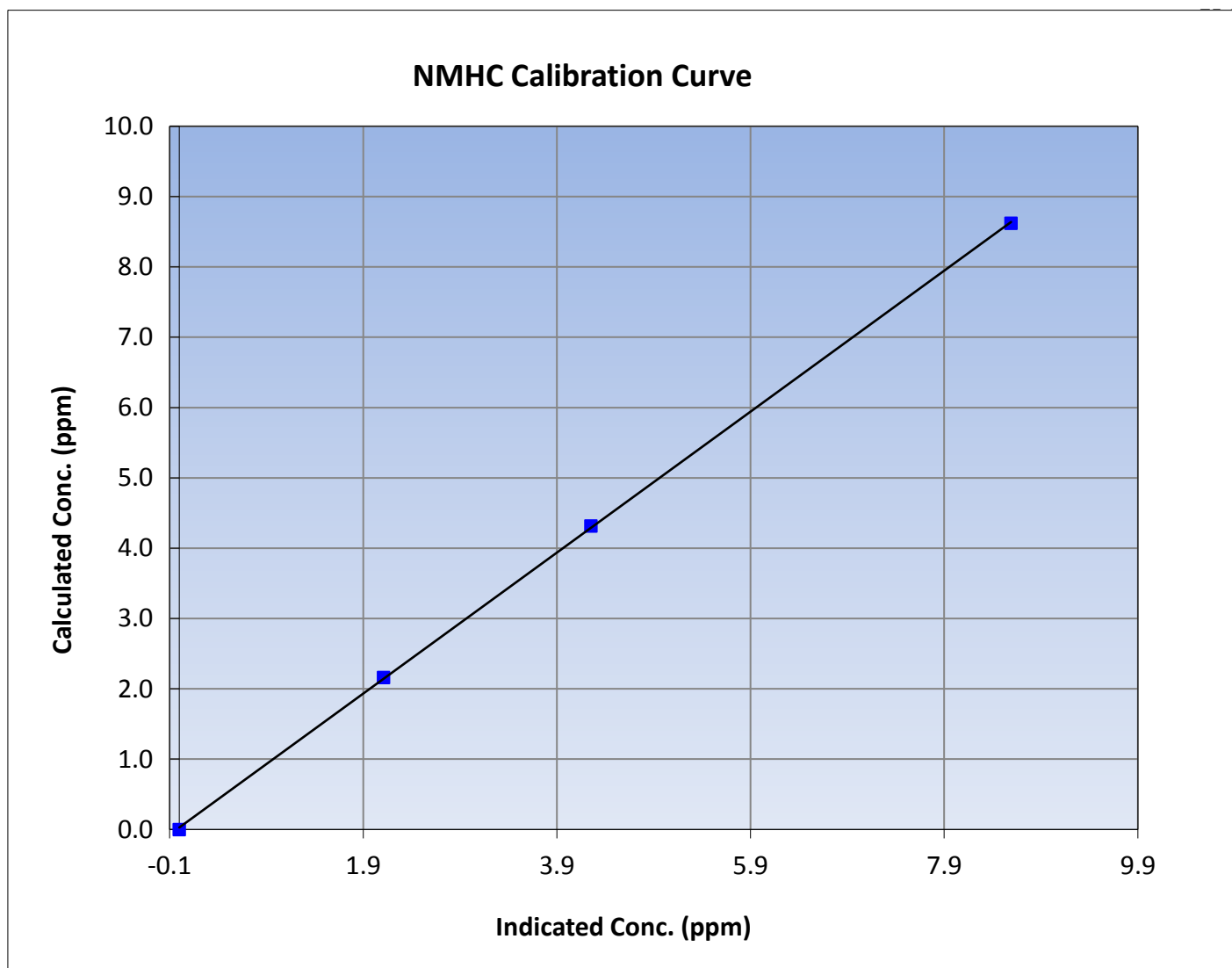
NMHC Calibration Summary

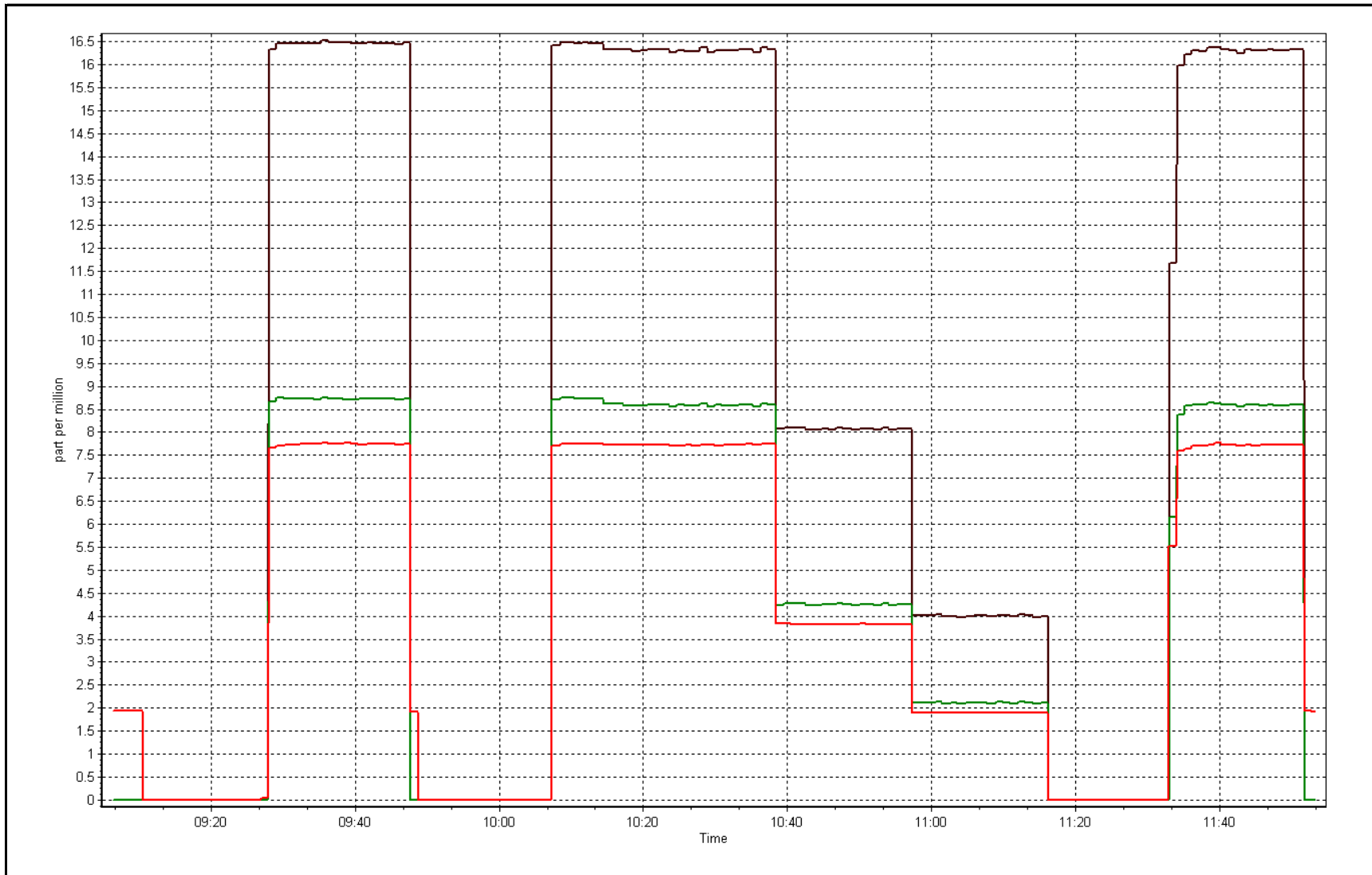
Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 1, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:10	End Time (MST)	11:55
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999945
8.62	8.59	1.0035		
4.32	4.25	1.0154	Slope	1.002335
2.16	2.11	1.0250		
			Intercept	0.028337







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	11:50	End Time (MST)	15:30
NO2 GPT Ref date	NA	Transfer Standard	API T700
Calibrator Make/Model	Teledyne API T700	Station temp.	23 Deg C
ZAG make/model	Teledyne API T701H	Serial Number	2449
DACS make/model	Campbell Scientific CR3000	Serial Number	201
		Serial Number	10957

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.8	31.2
Analyzer IP address	192.168.1.49		Lamp temp.	53.5	53.6
Calculated slope	1.002802	0.999685	Pressure	666.7	681.3
Calculated intercept	-2.345476	-1.556858	Flow cell A	0.704	0.712
Analyzer Background	-0.7	-0.7	Flow cell B	0.727	0.737
Analyzer Coefficient	0.993	0.999	Cell A Intensity	82189	80894
			Cell B Intensity	82075	81515

Analyzer make	Thermo 49i	Analyzer serial #	1300156234
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 Generator Drive Voltage (mV)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	800.0	0.0	-0.4	----
as found span	5500	1108.2	400.0	398.0	1.005
calibrator zero	5500	800.0	0.0	-0.2	----
high point	5500	1108.2	400.0	400.7	0.998
second point	5500	929.8	200.0	202.8	0.986
third point	5500	820.9	100.0	103.2	0.969
as left zero	5500	800.0	0.0	-0.5	----
as left span	5500	1108.2	400.0	401.9	0.995
Average Correction Factor					0.984

Corrected As found	398.4	Previous response	401.2	% change	0.7%
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Notes:

Inlet filter changed after as founds. Span adjusted slightly.

Calibration Performed By: Devin Russell



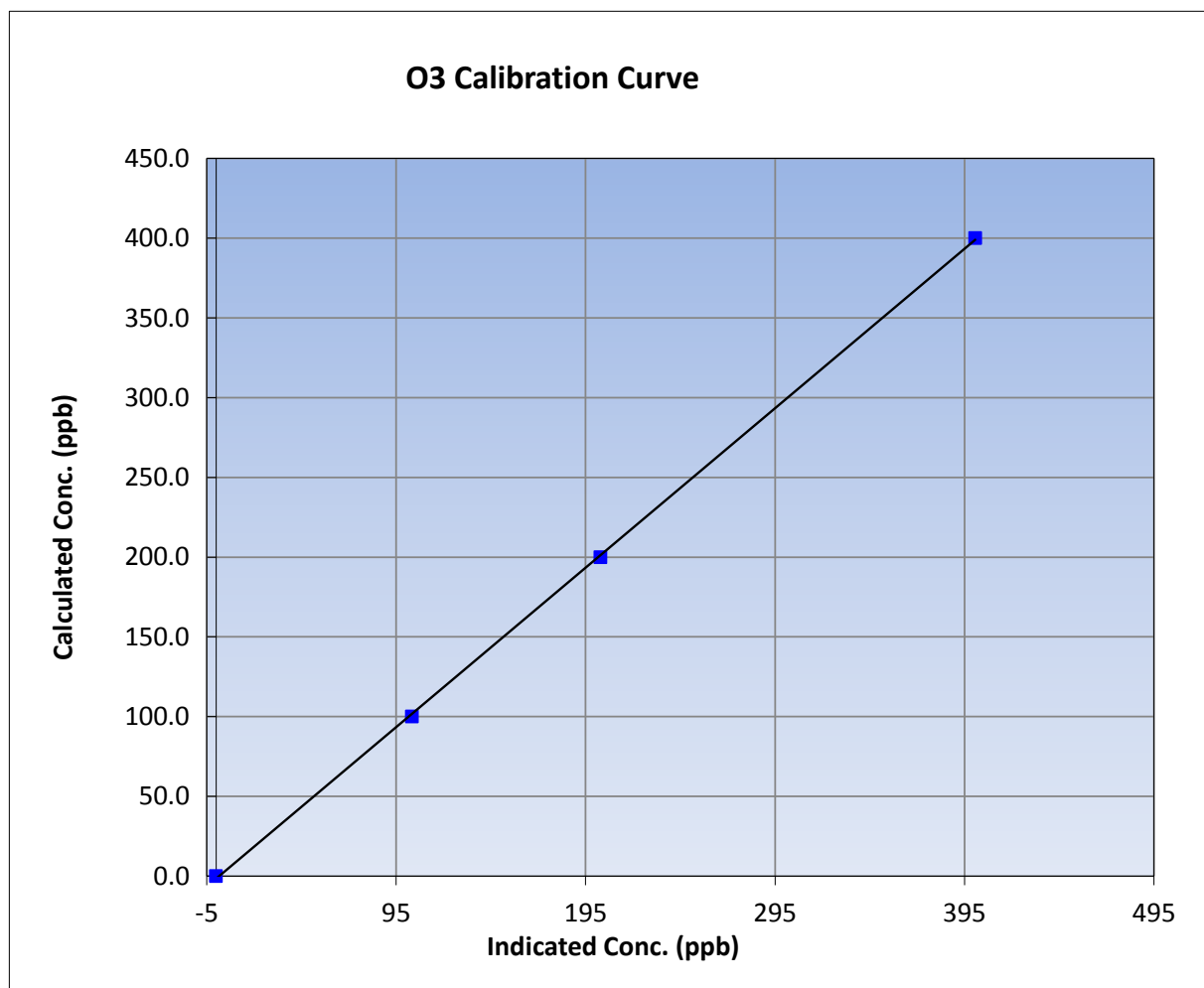
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	December-06-16	Previous Calibration	November-09-16
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	11:50	End Time (MST)	15:30
Analyzer make	Thermo 49i	Analyzer serial #	1300156234

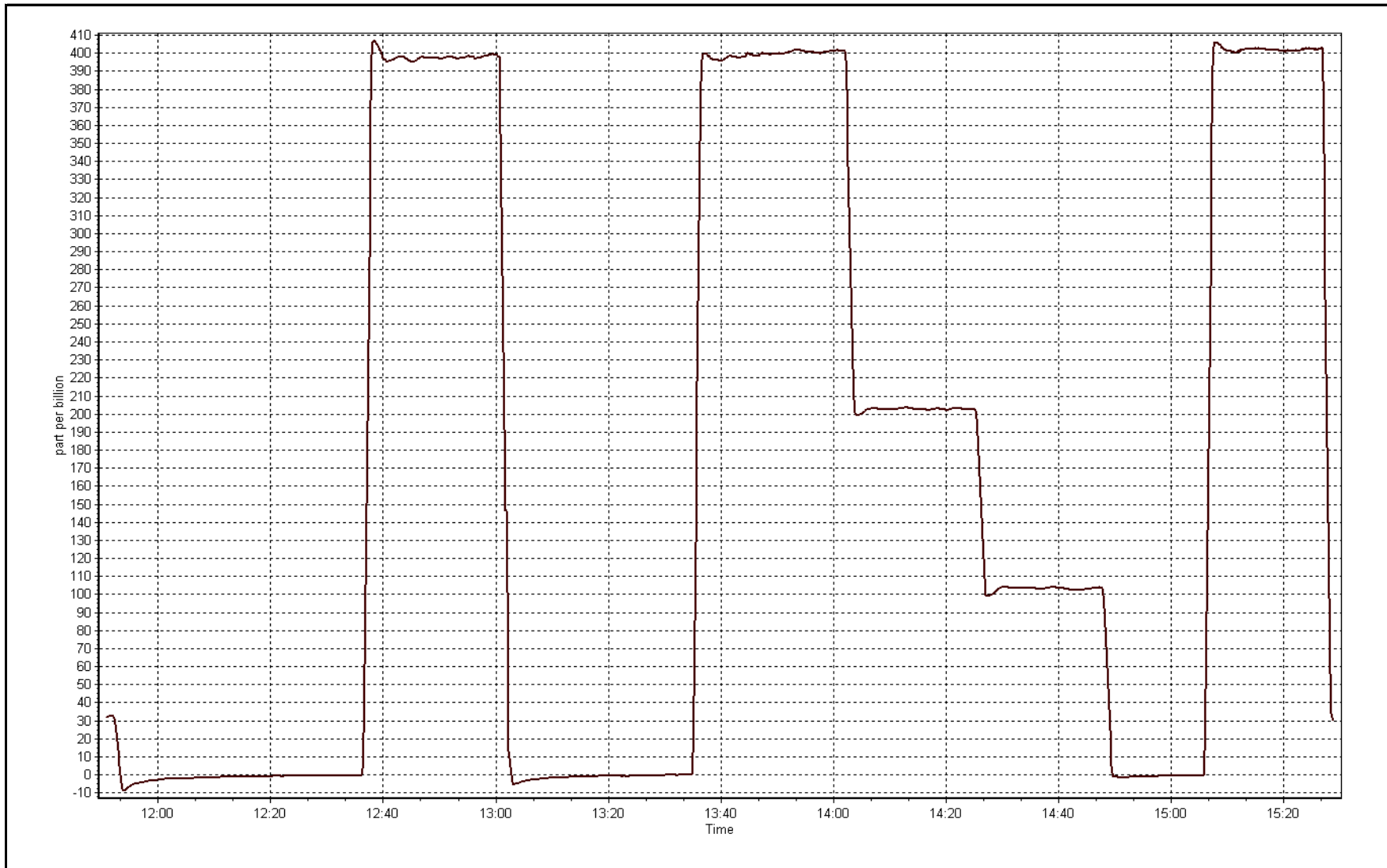
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999905
400.0	400.7	0.9983		
200.0	202.8	0.9863	Slope	0.999685
100.0	103.2	0.9686		
			Intercept	-1.556858



O3 Calibration Plot

Date: December 6, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	13:45
NO Cal Gas Conc	52.4 ppm	Gas Cert Reference	LL107926
NOX Cal Gas Conc	52.4 ppm	Cal Gas Expiry Date	2/16/19
Calibrator	Teledyne API T700	Serial Number	2449
Zero air Generator	Teledyne API 701H	Serial Number	201

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	10957
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998561	0.998496	0.998120
	Data Offset	1.827192	1.967340	-0.023471
Current Calibration	Data Slope	0.998732	0.998095	0.998255
	Data Offset	1.957371	1.975012	-0.339522

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153460
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.043		1.040	
NOX coefficient	1.000		1.000	
NO2 coefficient	1.000		1.000	
NO bkgrnd	3.1		3.1	
NOX bkgrnd	3.3		3.3	
Chamber Temp	50.4	Deg C	50.5	Deg C
Moly Temp	327.1	Deg C	323	Deg C
PMT voltage	-772.6	V	-772.6	V
PMT Temp	-3.0	Deg C	-1.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	184.8	mmHg	187.1	mmHg
R Cell Press Nox	184.8	mmHg	187.1	mmHg
NO sample flow	0.755	lpm	0.77	lpm
Nox sample Flow	0.755	lpm	0.770	lpm

Notes:

Inlet filter changed after as founds. Span adjusted. As lefts not completed.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 5, 2016 Station Number: AMS 6

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	----	----
as found span	5500	84.1	801.2	801.2	0.0	805.2	804.5	0.7	0.9951	0.9959
calibrator zero	5500	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	----	----
high point	5500	84.1	801.2	801.2	0.0	801.4	801.9	-0.5	0.9998	0.9991
second point	5500	42.1	401.1	401.1	0.0	398.3	398.5	-0.3	1.0071	1.0065
third point	5500	21.1	201.0	201.0	0.0	197.6	197.6	0.0	1.0175	1.0175
as left zero										
as left span										
Average Correction Factor									1.0081	1.0077

Corrected As found NO_x= 805.2 NO= 804.4 Percent Change NO_x= -0.6% NO= -0.5%
 Previous Response NO_x= 800.6 NO= 800.5

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 86.90 ccm NOx ref calc conc = 827.9 ppb NO ref calc conc = 827.9 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	798.2	796.6	-0.1	1.0373	1.0394	----	----
1st NO2 (400)	376.5	420.1	797.4	376.5	420.9	1.0382	----	0.9980	100.2%
2nd NO2 (200)	592.7	203.8	797.5	592.7	204.8	1.0381	----	0.9953	100.5%
3rd NO2 (100)	694.2	102.4	797.4	694.2	103.3	1.0382	----	0.9916	100.8%
2nd NO ref point	----	0.0	797.5	796.0	1.5	1.0382	1.0401	----	----
Average Correction Factor						1.0382		0.9949	100.5%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

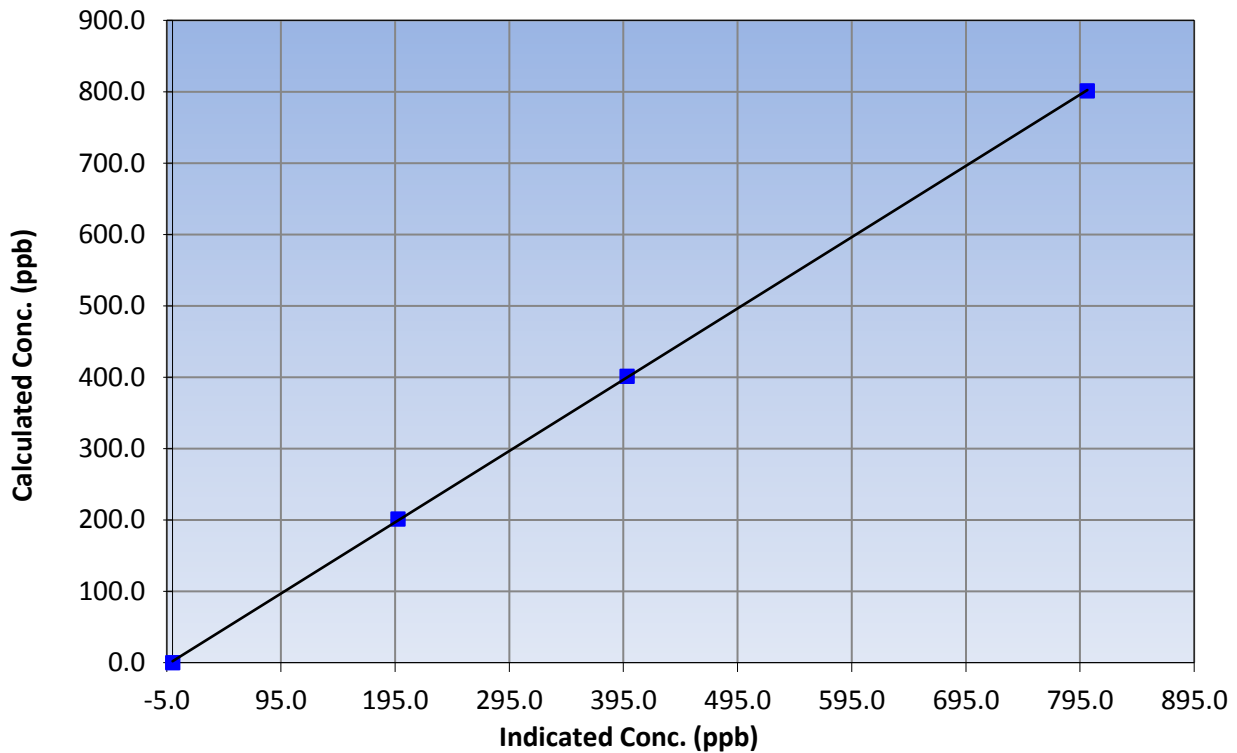
Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	13:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999971
801.2	801.4	0.9998		
401.1	398.3	1.0071	Slope	0.998732
201.0	197.6	1.0175		
			Intercept	1.957371

NO_x Calibration Curve





Wood Buffalo Environmental Association

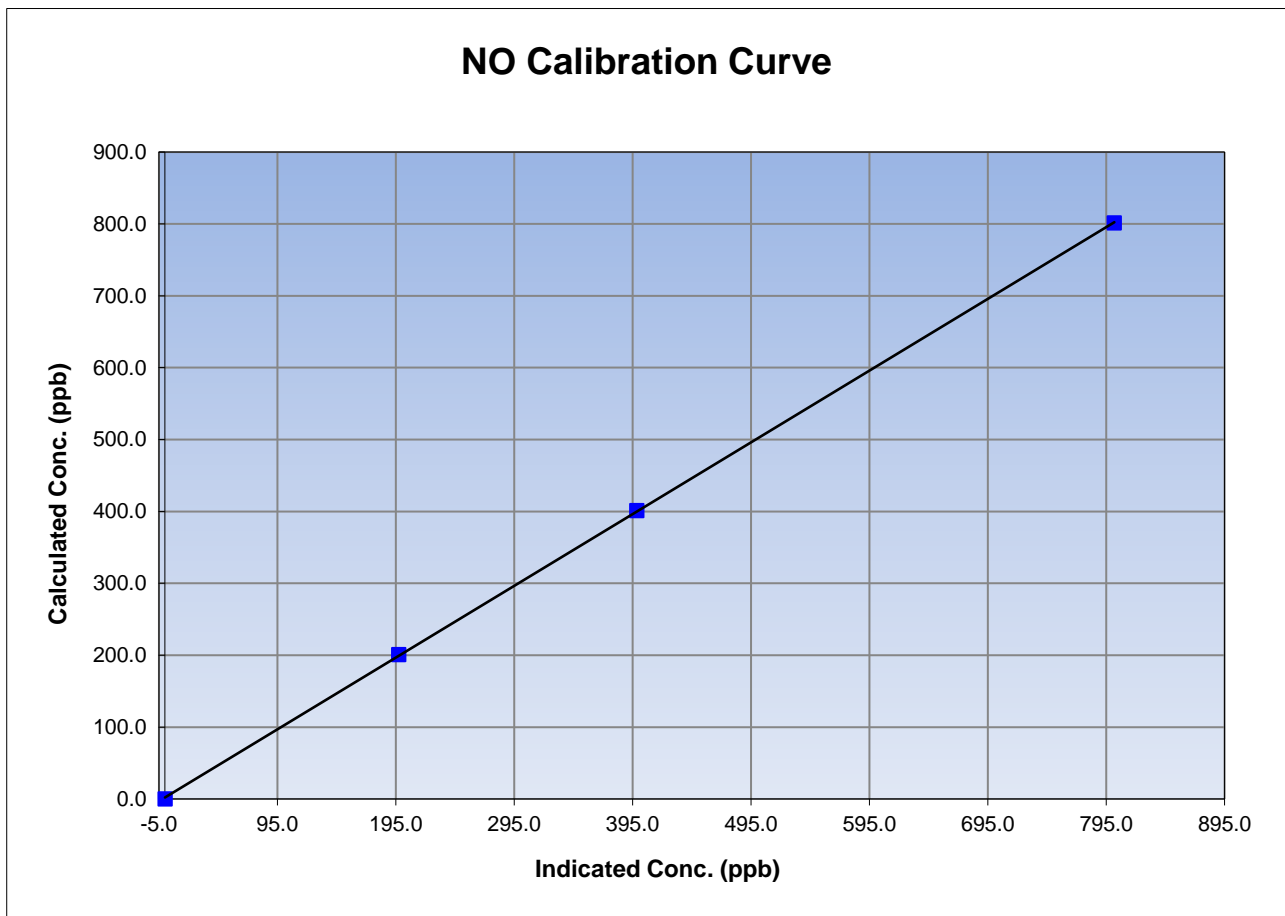
NO Calibration Summary

Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	13:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999969
801.2	801.9	0.9991		
401.1	398.5	1.0065	Slope	0.998095
201.0	197.6	1.0175		
			Intercept	1.975012





Wood Buffalo Environmental Association

NO₂ Calibration Summary

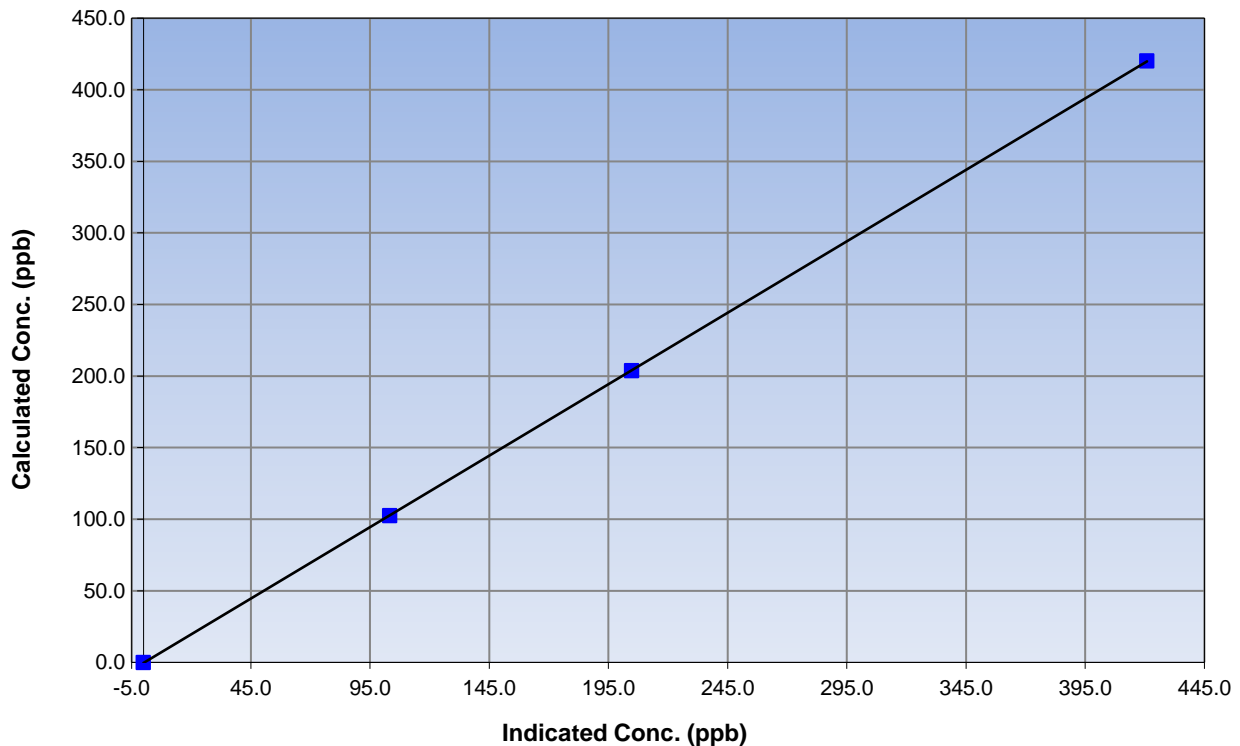
Station Information

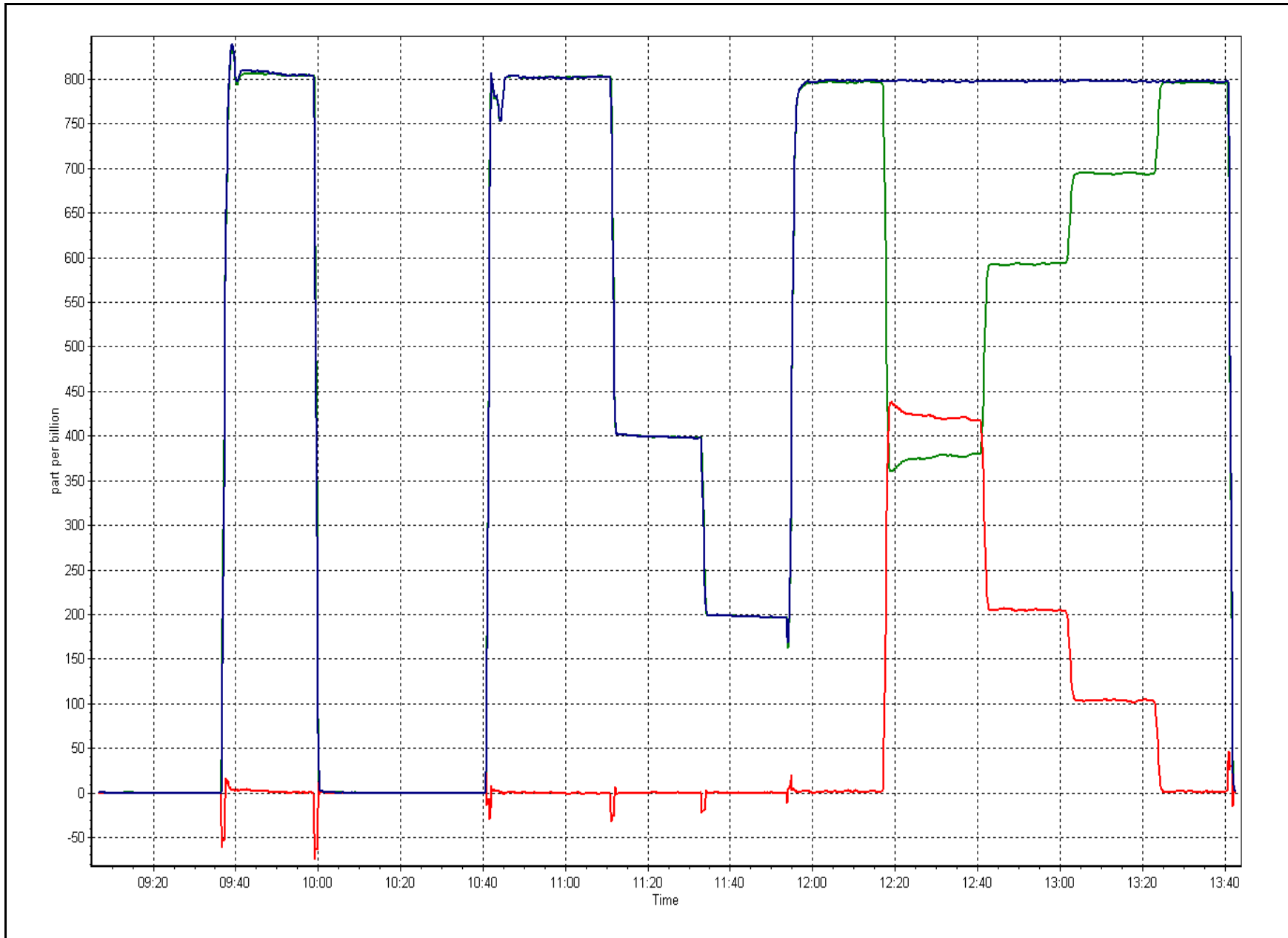
Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Number	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	13:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999996
420.1	420.9	0.9980		
203.8	204.8	0.9953	Slope	0.998255
102.4	103.3	0.9916		
			Intercept	-0.339522

NO₂ Calibration Curve







Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Patricia McInnis	Station Number	AMS 6
NOX Calibration Date	December 5, 2016	NOX Previous Cal Date	November 8, 2016
NH3 Calibration Date	December 5, 2016	NH3 Previous Cal Date	November 8, 2016
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	16:05
Calibrator	Teledyne API T700	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	95.4 ppm	Serial Number	2449
NOx Cal Gas Conc	52.4 ppm	NH3 Expiry Date / SN	24/May/2017 SA25992
NO Cal Gas Conc	52.4 ppm	NO Expiry Date / SN	16/Feb/2019 LL107926

DACs Information

DACS make & model Campbell Scientific CR3000 DACS serial No. 10957

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.005609	0.981655	1.002528	0.999921	1.005262
	Data Offset	-2.571842	-5.8124110	1.964712	2.196755	0.352616
Cal Stats After	Data Slope	0.999941	0.976055	1.000355	1.001682	0.997825
	Data Offset	-0.995341	-3.75391792	1.185372	1.111948	-0.025036
IP address		192.168.1.77				

Analyzer Information

Analyzer make/model	Teledyne T201	Analyzer serial #	215	
Converter	Teledyne 501	Converter serial #	217	
Test Point	before		after	
NH3 Conc range	2500	ppb	2500	ppb
NOx Conc range	1000	ppb	1000	ppb
NO BKG	-2.9		-2.9	ppb
NOx BKG	-3.1		-2.5	ppb
Nt BKG	-0.3		-1.9	
NO coefficient	1.061		1.057	
NO2 coefficient	1.000		1.000	ppb
NOx coefficient	1.080		1.083	
NH3 coefficient	1.080		1.003	
Nt coefficient	1.094		1.091	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	316.3	Deg C	315.8	Deg C
PMT Temp	7.0	Deg C	7.1	Deg C
O3 flow	86.0	ccm	87.0	ccm
R Cell Press	6.1	"Hg	6.1	mmHg
PMT Voltage	693.0	v	693.0	v
Sample Flow 1 NO	556.0	ccm	554.0	ccm
Sample Flow 2 Nox	556.0	ccm	549.0	ccm
Sample Flow 3 Nt	544.0	ccm	565.0	ccm

Notes:

Inlet filter changed after as founds. Zero adjusted. Nox and NO span adjusted. NH3 span adjusted



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

December 5, 2016

Station Number:

AMS 6

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.1	1.3	-1.3	----	----
as found NO	5500	84.1	801.2	801.2	----	810.7	805.5	5.2	0.988	----
calibrator zero	5500	0.0	0.0	0.0	0.0	1.1	1.0	0.1	----	----
high NO point	5500	84.1	801.2	801.2	----	802.2	800.9	1.3	0.999	----
NO/O ₃ point	5500	84.1	801.2	801.2	----	805.1	805.3	-0.3	0.995	----
as found NH ₃	3538	73.5	1981.9	NA	1981.9	2016.0	49.1	1966.3	0.983	1.008
first NH ₃	3538	73.5	1981.9	NA	1981.9	2032.6	49.9	1982.7	0.975	1.000
second NH ₃	3538	36.8	992.3	NA	992.3	1023.0	29.7	993.3	0.970	0.999
third NH ₃	3538	18.5	498.8	NA	498.8	516.9	15.8	501.1	0.965	0.995
Average Correction Factor									0.9970	0.9980

Nt Corrected As Found Nt = 810.7 ppb
 NOx Corrected As Found NOx = 804.1 ppb
 NH₃ Previous Converter Efficiency = 108.0 %

Previous Response Nt = 822.0 ppb
 Previous Response NOx = 797.3 ppb
 NH₃ Current Converter Efficiency = 100.3 %

Nt percent change 1.4%
 NOx percent change -0.9%
 NH₃ percent change -7.7%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date: December 5, 2016 Station Number: AMS 6

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	1.3	1.0	0.1	----	----
as found span	5500	84.1	801.2	801.2	801.2	805.5	804.3	810.7	0.9948	0.9962
calibrator zero	5500	0.0	0.0	0.0	0.0	1.0	1.2	1.1	----	----
high point	5500	84.1	801.2	801.2	801.2	800.9	800.1	802.2	1.0004	1.0015
second point	5500	42.1	401.1	401.1	401.1	398.5	397.7	399.8	1.0065	1.0085
third point	5500	21.1	201.0	201.0	201.0	197.7	197.5	199.0	1.0168	1.0176
Average Correction Factor									1.0079	1.0092

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	810.7	804.1	803.3	----
Previous Response	822.0	797.3	799.1	----
Percent Change	1.4%	-0.9%	-0.5%	-0.3%

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 86.9 ccm NO_x ref calc conc = 827.9 ppb NO ref calc conc = 827.9 ppb

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point	----	0.0	805.3	799.7	5.6	1.0280	1.0353	----	----
1st NO ₂ (400)	380.4	419.3	800.2	380.4	419.8	1.0347	----	0.9989	100.1%
2nd NO ₂ (200)	596.2	203.5	801.4	596.2	205.2	1.0330	----	0.9916	100.9%
3rd NO ₂ (100)	697.7	102.0	799.4	697.7	101.8	1.0357	----	1.0028	99.7%
2nd NO ref point	----	0.0	799.0	796.3	2.7	1.0361	1.0397	----	----
Average Correction Factor						1.0349	1.0375	0.9977	100.2%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

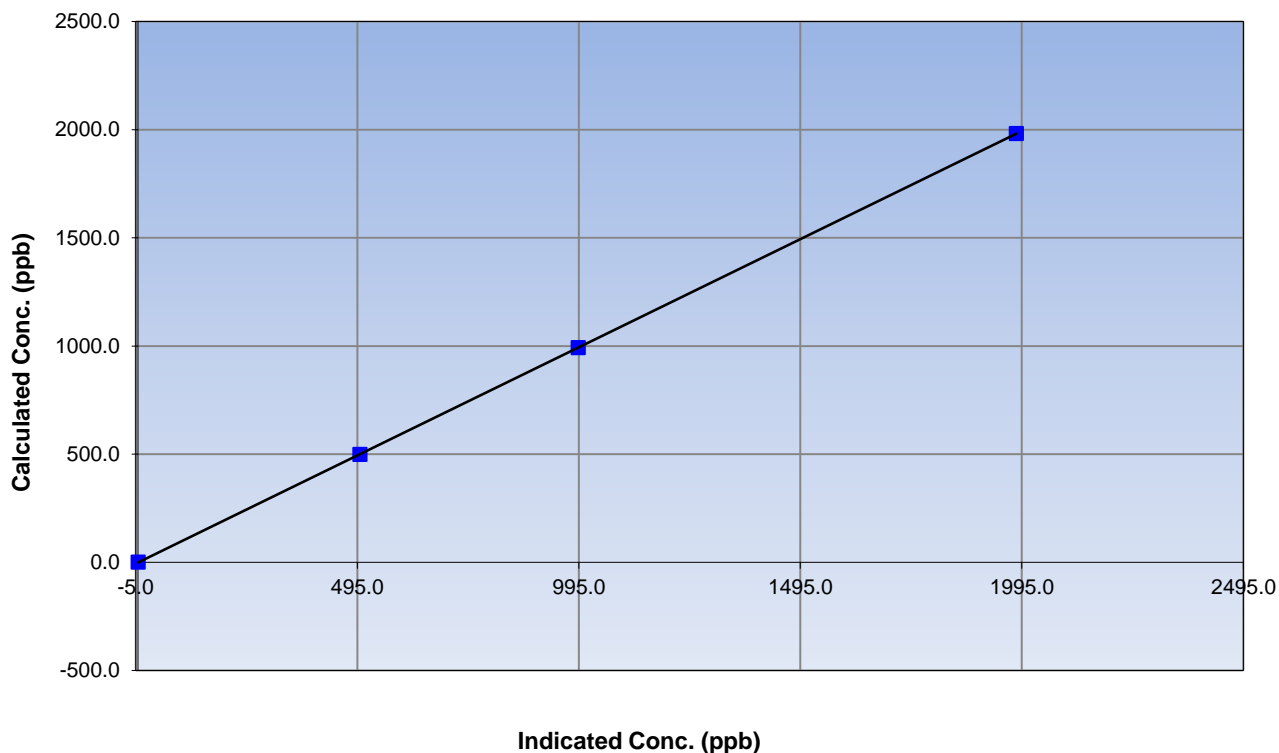
Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	16:05
Analyzer make	Teledyne T201	Analyzer serial #	215

NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999999
1981.9	1982.7	0.9996		
992.3	993.3	0.9990	Slope	0.999941
498.8	501.1	0.9955		
			Intercept	-0.995341

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

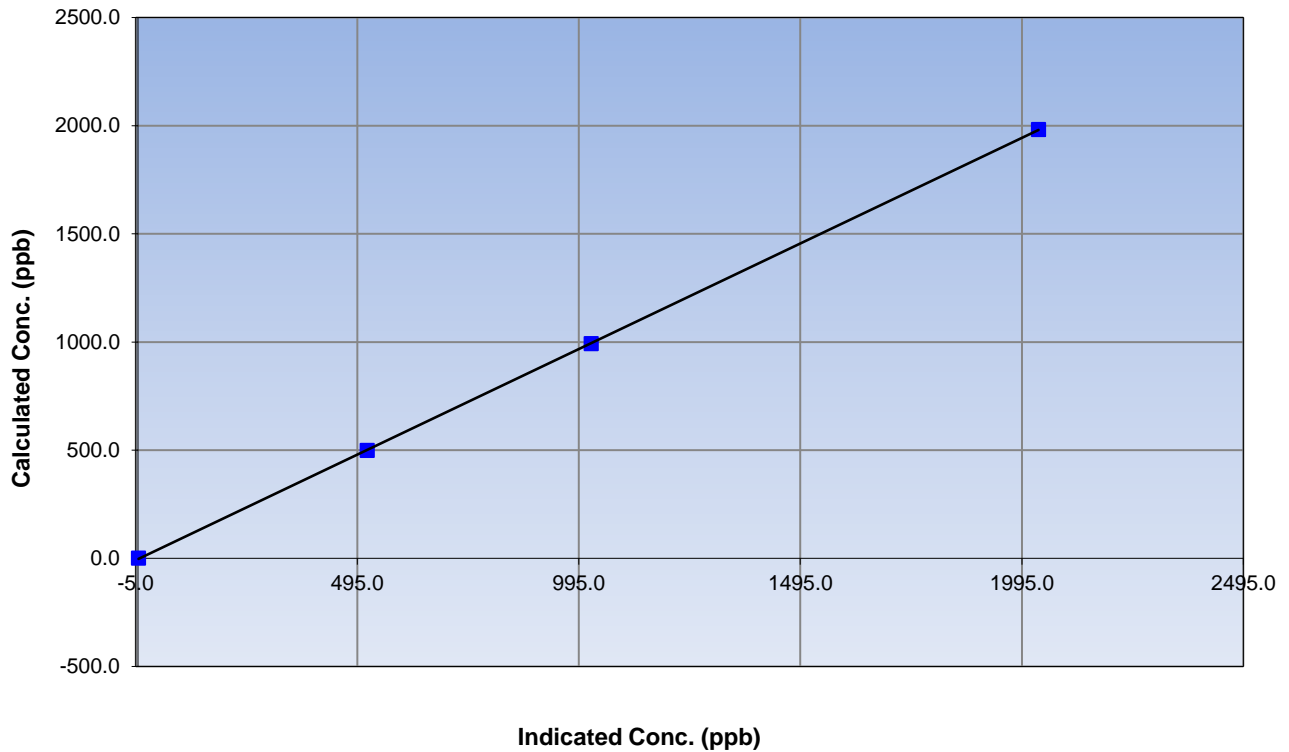
Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	16:05
Analyzer make	Teledyne T201	Analyzer serial #	215

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.1	----	Correlation Coefficient	0.999991
1981.9	2032.6	0.9751		
992.3	1023.0	0.9699		
498.8	516.9	0.9651	Slope	0.976055
			Intercept	-3.753918

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

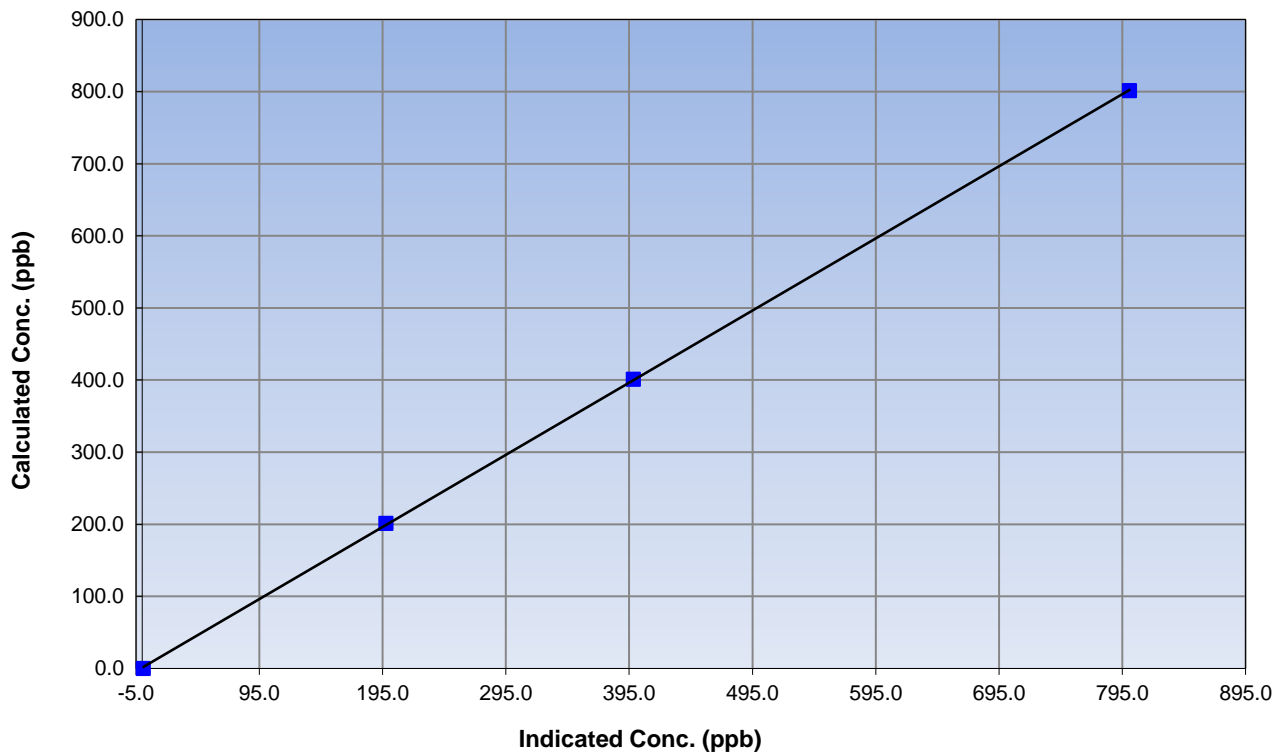
Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	16:05
Analyzer make	Teledyne T201	Analyzer serial #	215

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.0	----	Correlation Coefficient	0.999966
801.2	800.9	1.0004		
401.1	398.5	1.0065	Slope	1.000355
201.0	197.7	1.0168		
			Intercept	1.185372

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

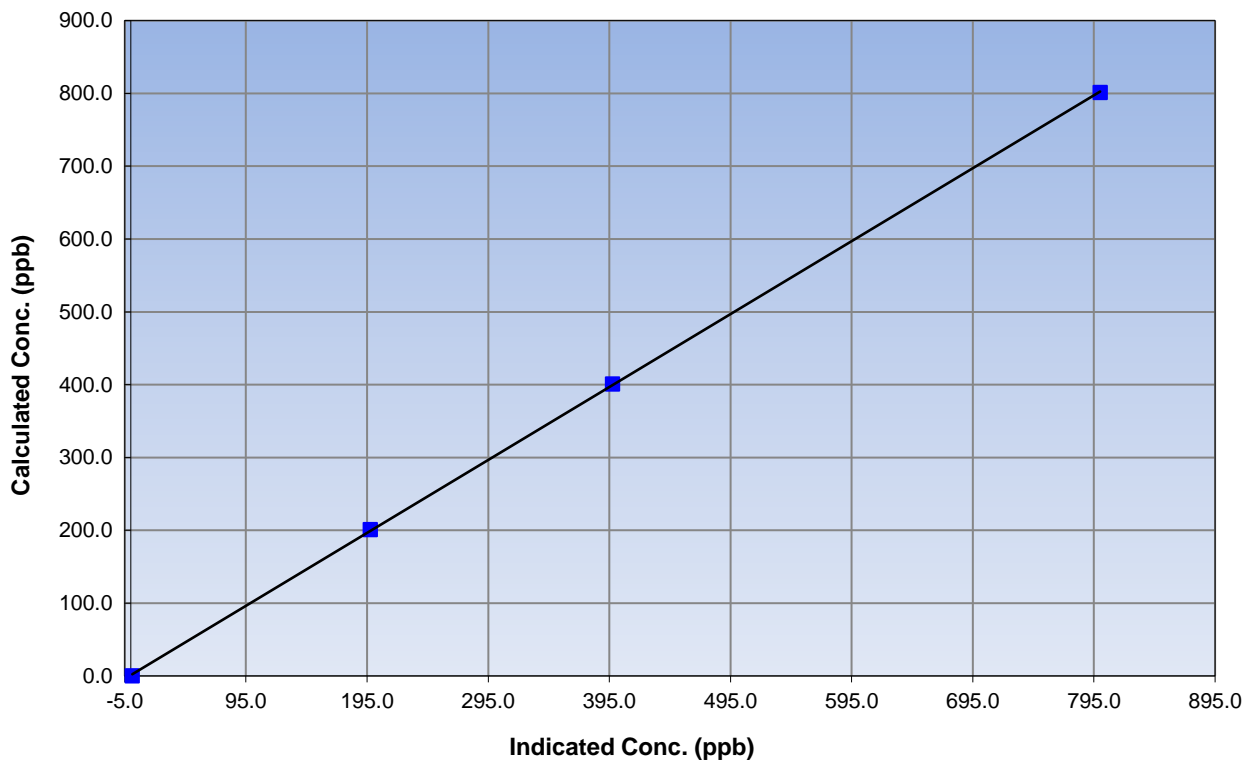
Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	16:05
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.2	----	Correlation Coefficient	0.999960
801.2	800.1	1.0015		
401.1	397.7	1.0085	Slope	1.001682
201.0	197.5	1.0176		
			Intercept	1.111948

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

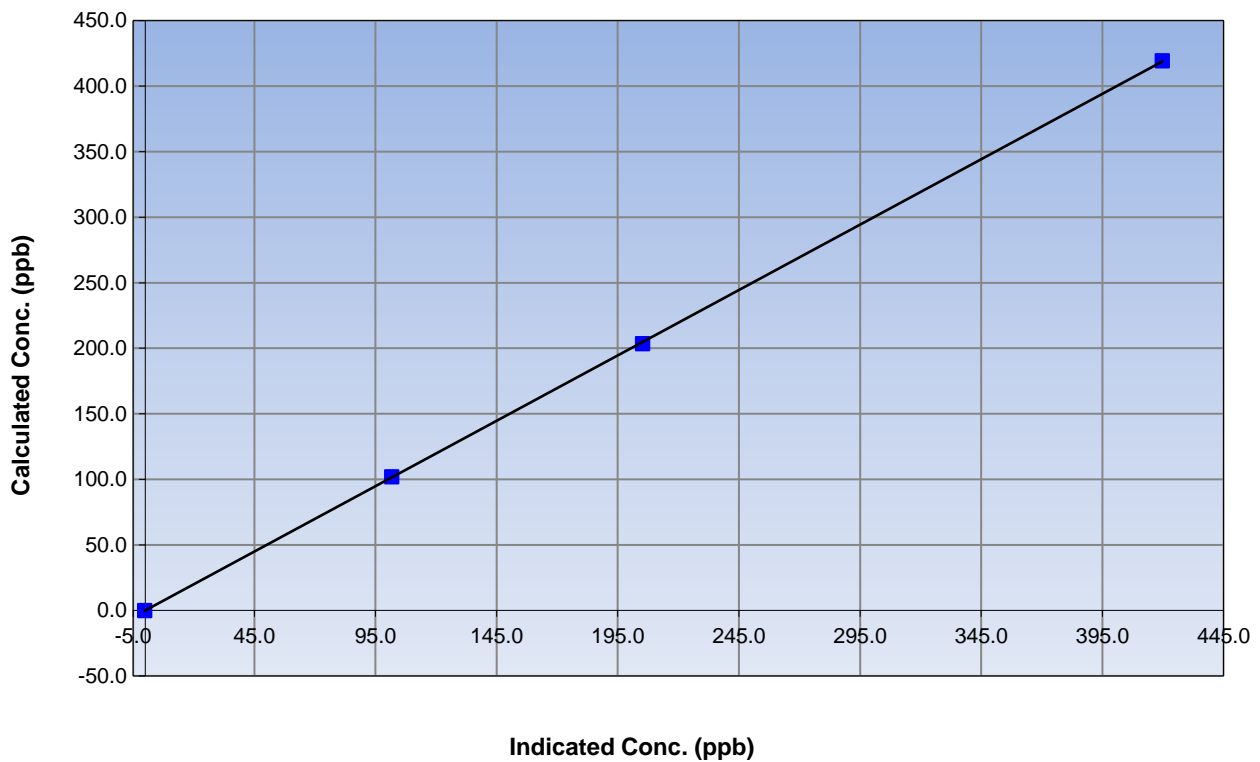
Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 8, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	16:05
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

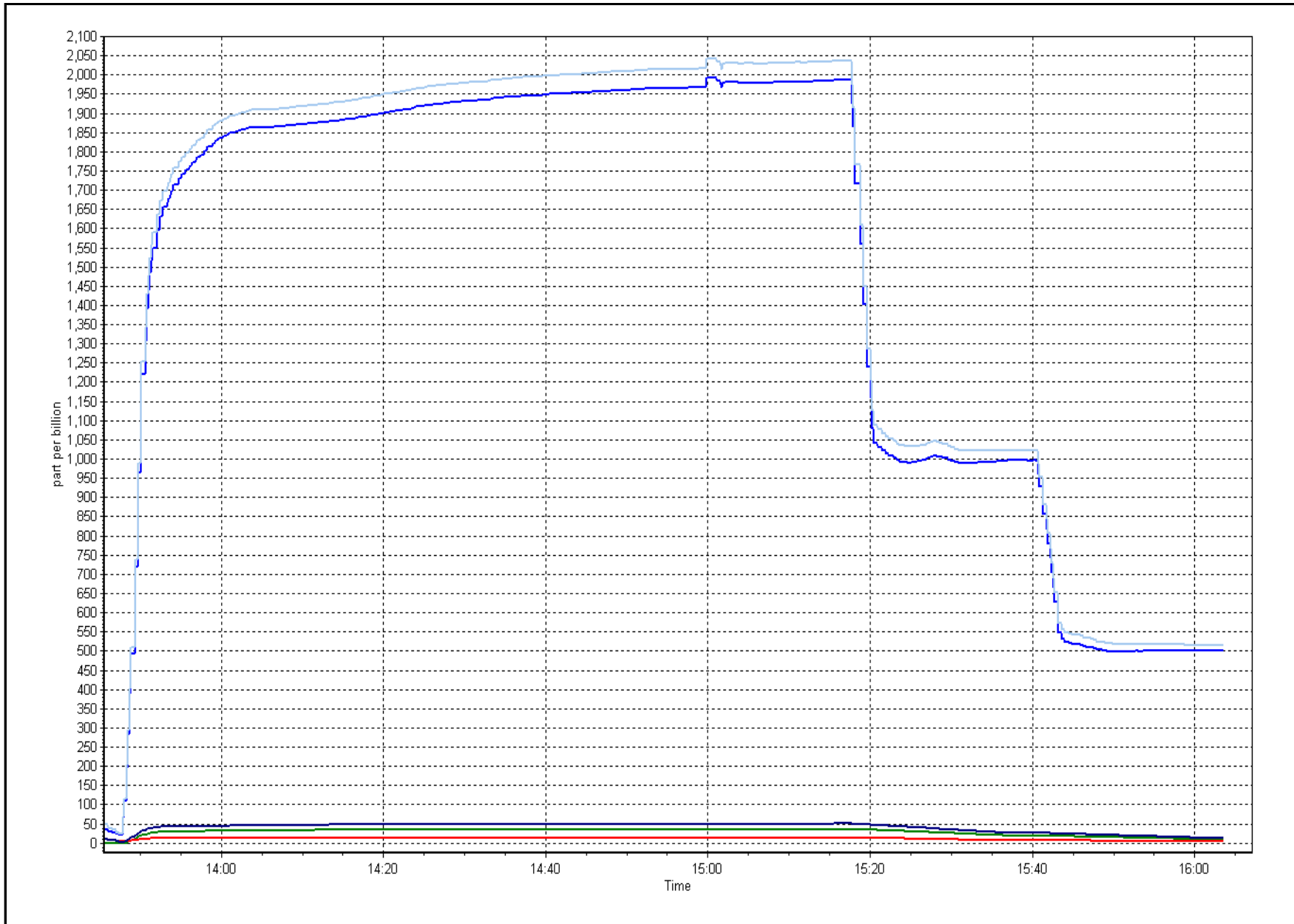
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999978
419.3	419.8	0.9989		
203.5	205.2	0.9916	Slope	0.997825
102.0	101.8	1.0028		
			Intercept	-0.025036

NO₂ Calibration Curve



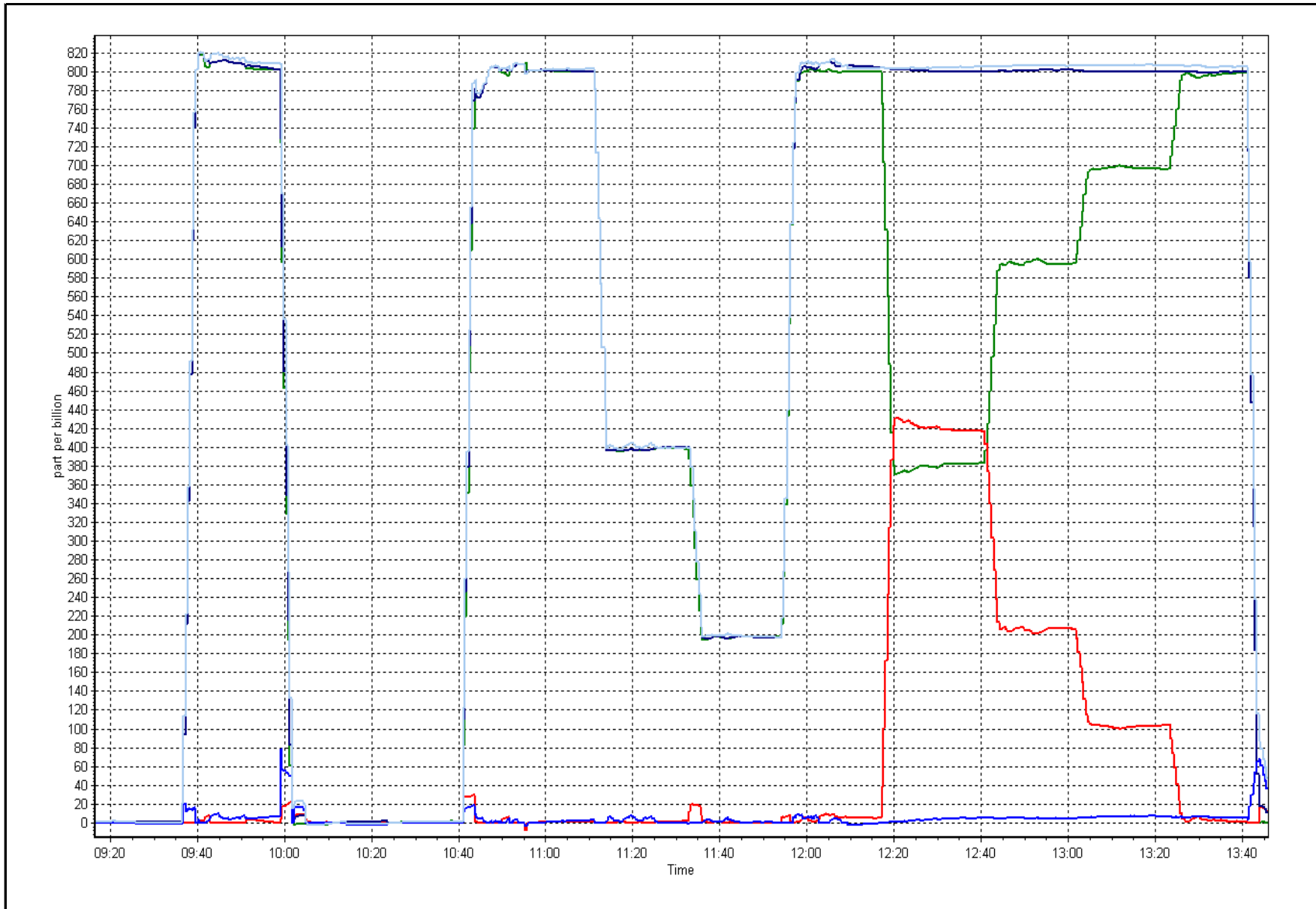
NH₃ Calibration Plot

Date: December 5, 2016



NOX Calibration Plot

Date: December 5, 2016





Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Patricia McInnis	Station number:	AMS 6
Calibration Date:	December 7, 2016	Last Cal Date:	November 1, 2016
Start time (MST):	9:20	End time (MST):	12:51
Sharp Model:	Thermo SHARP 5030	S/N:	E-1475
Particulate Fraction:	PM2.5	C14 Source S/N:	5680
Flow Standard Model:	Delta Cal	S/N:	1451
Temp/RH standard:	Delta Cal	S/N:	1451

Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T1 (°C)	-24	-24.3	-24	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	997	990.71	997	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	992.4	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	1.5	-----	-0.5	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

			<u>Tolerance</u>
Leak Test:	Date of check: _____	Last Cal Date: _____	
	Flow w/o adaptor: _____	Flow w/ adaptor: _____	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: _____	S/N: _____
	Date of check: _____	Last Cal Date: _____
	New Correction Factor: _____	Previous Correction Factor: _____

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T2 (°C)				<input type="checkbox"/>	+/- 2 °C
T3 (°C)				<input type="checkbox"/>	+/- 2 °C
T4 (°C)				<input type="checkbox"/>	+/- 2 °C
RH (%)				<input type="checkbox"/>	+/- 10%

Notes: Filter Break error present. Tape was not broken, but sample head was open. Nephelometer zero was initially showing 7 ug/m3. Cycled power and error went away and nephelometer zero went to 1.5 ug/m3. Cyclone head cleaned. Nephelometer zeroed.

Calibration by: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 7 ATHABASCA VALLEY DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100.00	10	0	2	0
TRS (ppb) Average	710	34	34	100.00	2	0	1	0
THC (ppm) Average	704	36	40	99.46	3.7	-	2.7	-
NMHC (ppm) Average	704	36	40	99.46	0.61	-	0.244	-
CH4(ppm) Average	704	36	40	99.46	3.1	-	2.5	-
O3 (ppb) Average	709	35	35	100.00	42	0	36	-
NO2 (ppb) Average	708	36	36	100.00	42	0	27	-
NO (ppb) Average	708	36	36	100.00	103	-	36	-
NOX (ppb) Average	708	36	36	100.00	145	-	63	-
PM2.5 (ug/m3) Average	734	2	10	98.92	23.6	-	16.6	0
CO(ppm) Average	710	34	34	100.00	0.9	0	0.4	-
Temperature 2 m (C) Average	744	0	0	100.00	4	-	-2	-
Barometric Pressure (inHg) Average	744	0	0	100.00	29.9	-	29.9	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	86	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	26	-	19	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	708	0.5	1	-	0	0	0	0	0	0	1	10
TRS (ppb) Average	710	0.4	0	-	0	0	0	0	0	0	1	2
THC (ppm) Average	704	2.15	0.2	-	1.9	2	2	2.1	2.2	2.4	3.7	
NMHC (ppm) Average	704	0.042	0.088	-	0	0	0	0	0	0.2	0.61	
CH4(ppm) Average	704	2.11	0.2	-	1.9	2	2	2.1	2.2	2.2	3.1	
O3 (ppb) Average	709	17.6	10	-	3	5	9	16	25	33	42	
NO2 (ppb) Average	708	13.3	9	-	1	3	6	12	20	26	42	
NO (ppb) Average	708	7.1	11	-	0	0	0	3	9	20	103	
NOX (ppb) Average	708	20.3	18	-	1	3	7	15	29	45	145	
PM2.5 (ug/m3) Average	734	6.78	4.1	-	0.2	3.1	4.1	5.8	8	12.2	23.6	
CO(ppm) Average	710	0.16	0.1	-	0.1	0.1	0.1	0.1	0.2	0.3	0.9	
Temperature 2 m (C) Average	744	-17.6	9.2	-	-36.9	-29.9	-24.5	-17.2	-12.3	-3.2	4	
Barometric Pressure (inHg) Average	744	29.03	0.4	-	28.2	28.5	28.7	29	29.3	29.5	29.9	
Relative Humidity (%) Average	744	76.9	6	-	56	69	73	77	81	85	96	
Wind Speed 10 m (km/h) Average	743	7.8	5	-	0	2	4	6	11	16	26	
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-	

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	05 Dec 2016 08:00	05 Dec 2016 08:00	1	Maintenance - collected chromatogram
NMHC, CH4, THC	05 Dec 2016 10:00	05 Dec 2016 12:00	3	Maintenance - replaced detector signal cable
PM2.5	21 Dec 2016 12:00	21 Dec 2016 15:00	4	Unstable operation - excessive baseline drift
PM2.5	22 Dec 2016 06:00	22 Dec 2016 07:00	2	Unstable operation - excessive baseline drift
PM2.5	22 Dec 2016 09:00	22 Dec 2016 09:00	1	Unstable operation - excessive baseline drift
PM2.5	22 Dec 2016 10:00	22 Dec 2016 10:00	1	Maintenance - Flow and zero check
Wind Speed, Wind Direction	07 Dec 2016 17:00	07 Dec 2016 17:00	1	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 10 ppb on Dec 28 14:00	Maximum Daily Average: 2.2 ppb on Dec 28		Hours of Data:	708
Minimum Value: 0 ppb on Dec 6 03:00	Minimum Daily Average: 0.1 ppb on Dec 5		Hours of Missing Data:	36
Maximum Diurnal Average: 0.9 ppb at hour 14	Minimum Diurnal Average: 0.2 ppb at hour 9		Hours of Calibration:	36
Monthly Average: 0.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 4		Percent Operational Time:	100.0

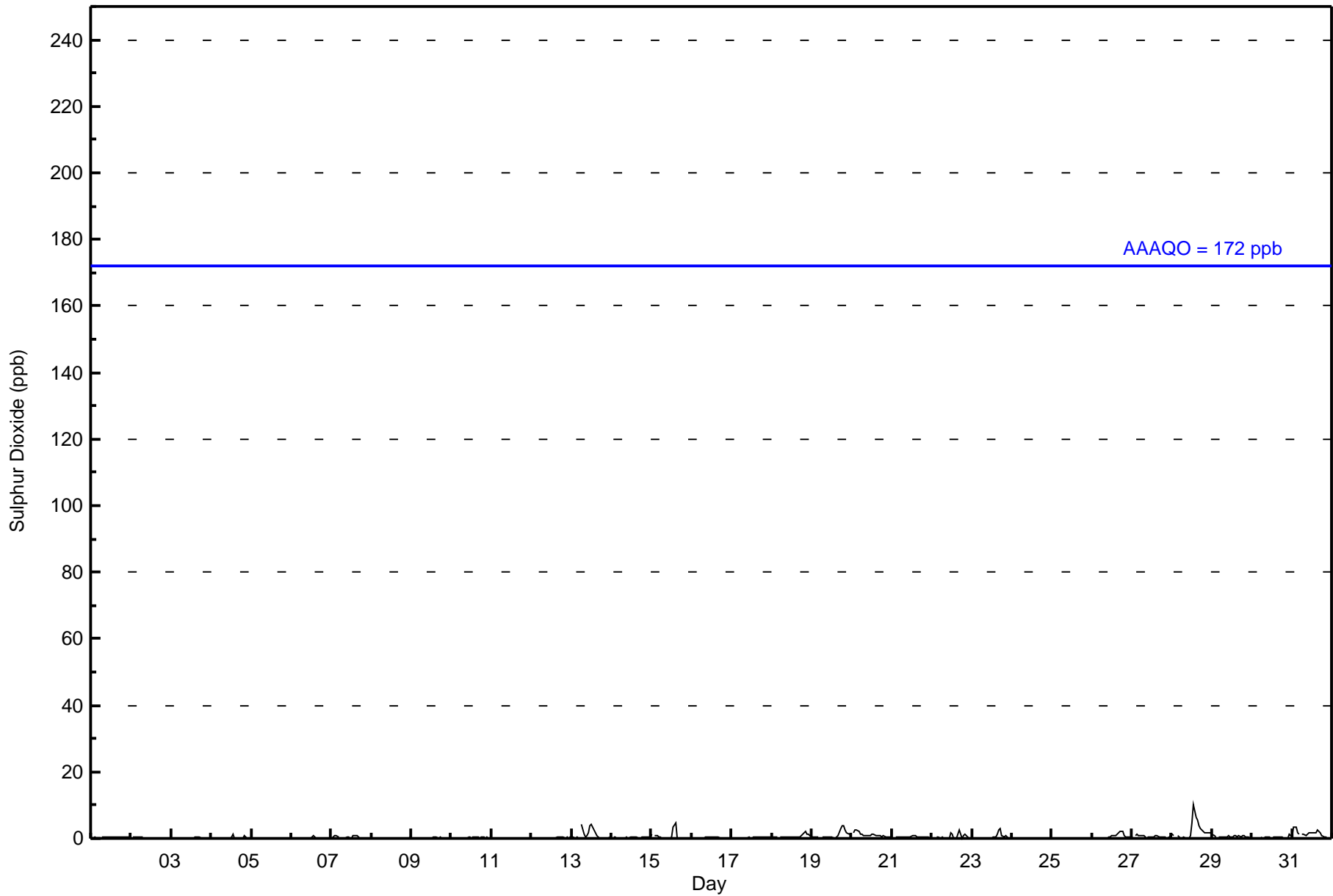
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.4	1																								
2-Dec	Z	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0.2	1																								
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1																								
7-Dec	0	0	1	1	0	Z	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.3	1																								
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
13-Dec	0	0	0	0	0	Z	4	1	1	1	2	4	4	2	2	1	0	0	0	0	0	0	0	0	1.0	4																								
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1																								
15-Dec	1	Z	1	1	1	0	0	0	0	0	0	0	0	4	5	0	0	0	0	0	0	0	0	0	0.6	5																								
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1																								
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
18-Dec	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	2	1	1	1	0.6	2																								
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	3	4	4	3	2	1	1	1.0	4																								
20-Dec	Z	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	1.1	2																								
21-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1																								
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	2	1	0	0	0	2	1	0	1	1	0	0	0	0.5	2																								
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	2	3	1	0	1	0	0	0	0	0.5	3																								
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	1	0	0	0	0	0.6	2																								
27-Dec	0	Z	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	0.6	1																								
28-Dec	1	1	Z	1	0	0	0	0	0	0	1	5	10	6	6	4	3	3	2	2	2	2	2	2	2.2	10																								
29-Dec	1	1	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.6	1																								
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1																								
31-Dec	1	3	3	2	1	Z	1	1	1	1	2	2	2	2	2	3	2	2	1	0	0	0	0	0	1.4	3																								
																								0.3	0.4	0.5	0.4	0.4	0.2	0.4	0.3	0.2	0.3	0.3	0.5	0.7	0.9	0.8	0.6	0.7	0.7	0.5	0.5	0.5	0.4	0.3	0.3	Diurnal Average		
																								1	3	3	2	2	1	4	1	1	1	2	4	5	10	6	6	4	3	4	4	4	3	2	2	2	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	708	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	32	8	5	16	17	25	125	76	31	38	52	45	34	47	47	109	707
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	25	125	76	31	38	52	45	34	47	47	109	707

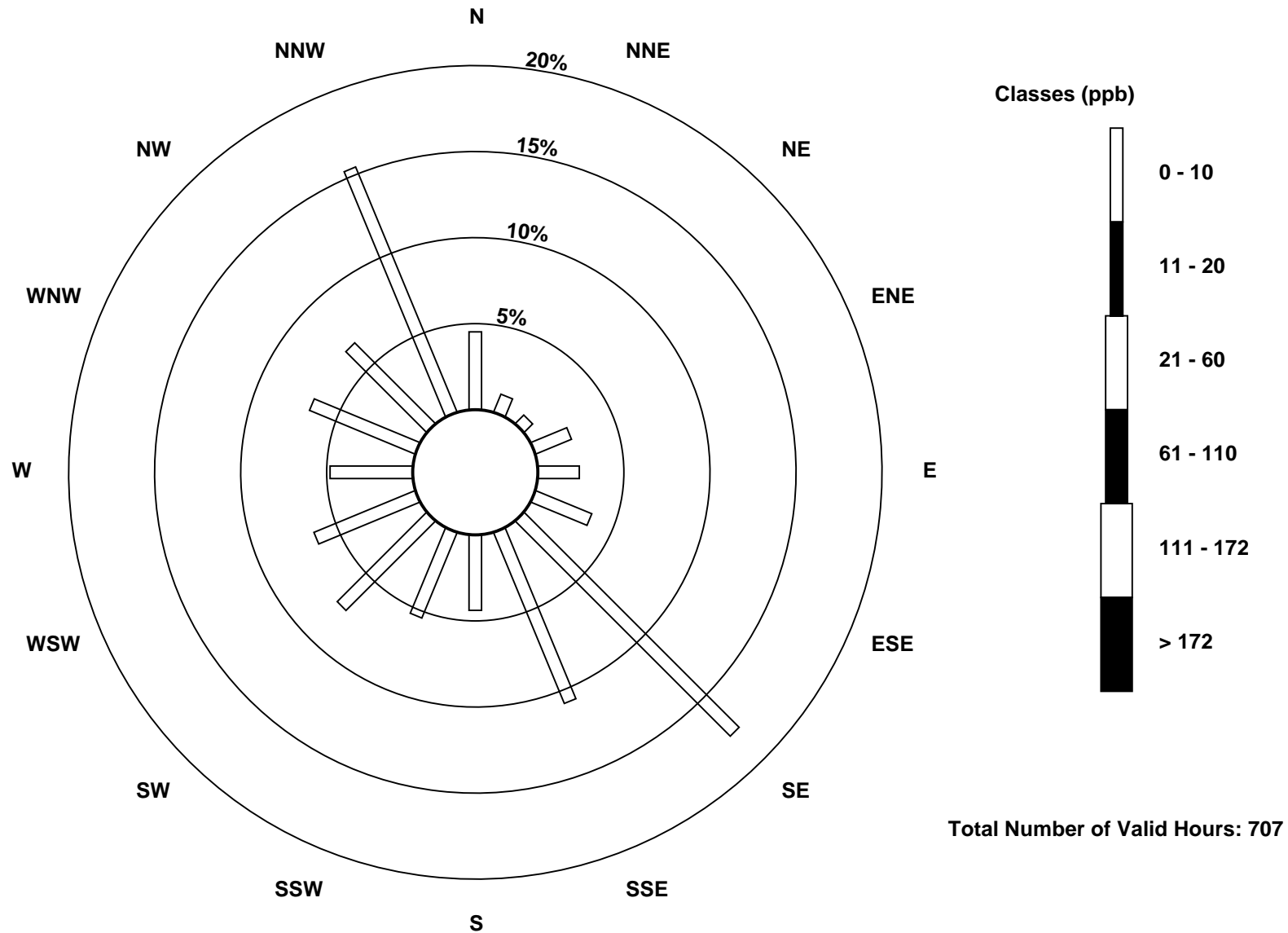
Total Number of Valid Hours: 707

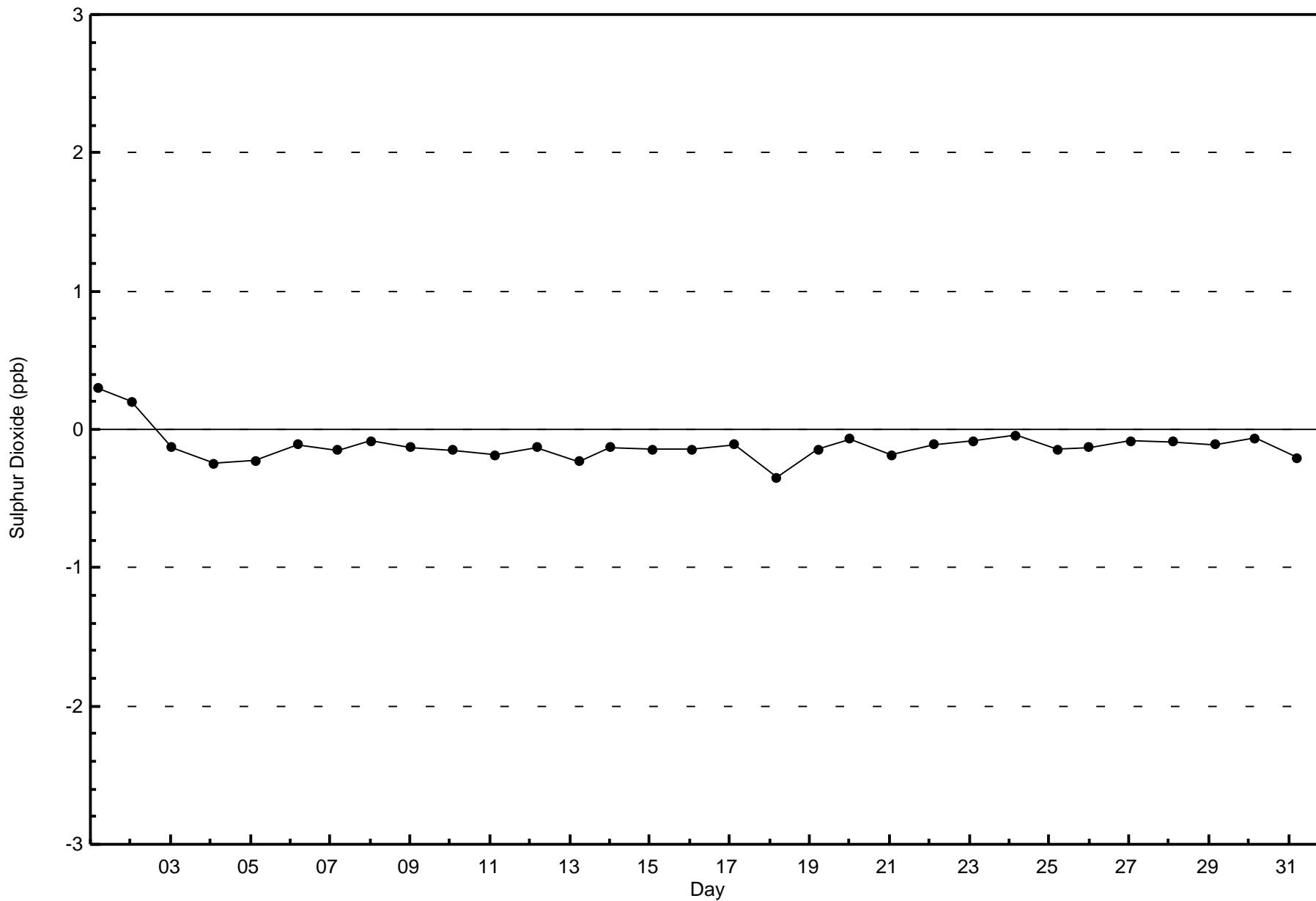
Total Number of Hours: 744

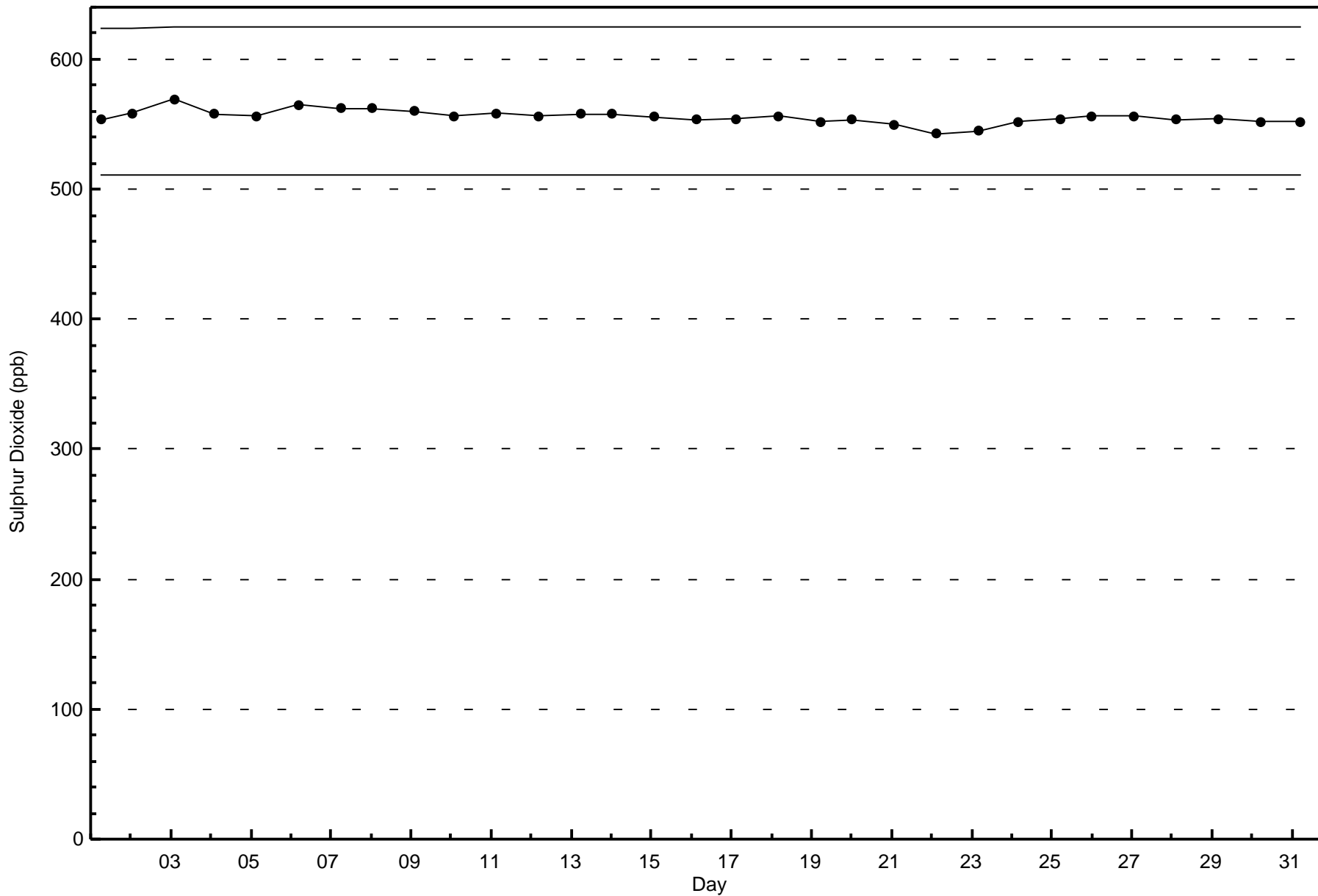


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley (AMS 7)









Wood Buffalo Environmental Association

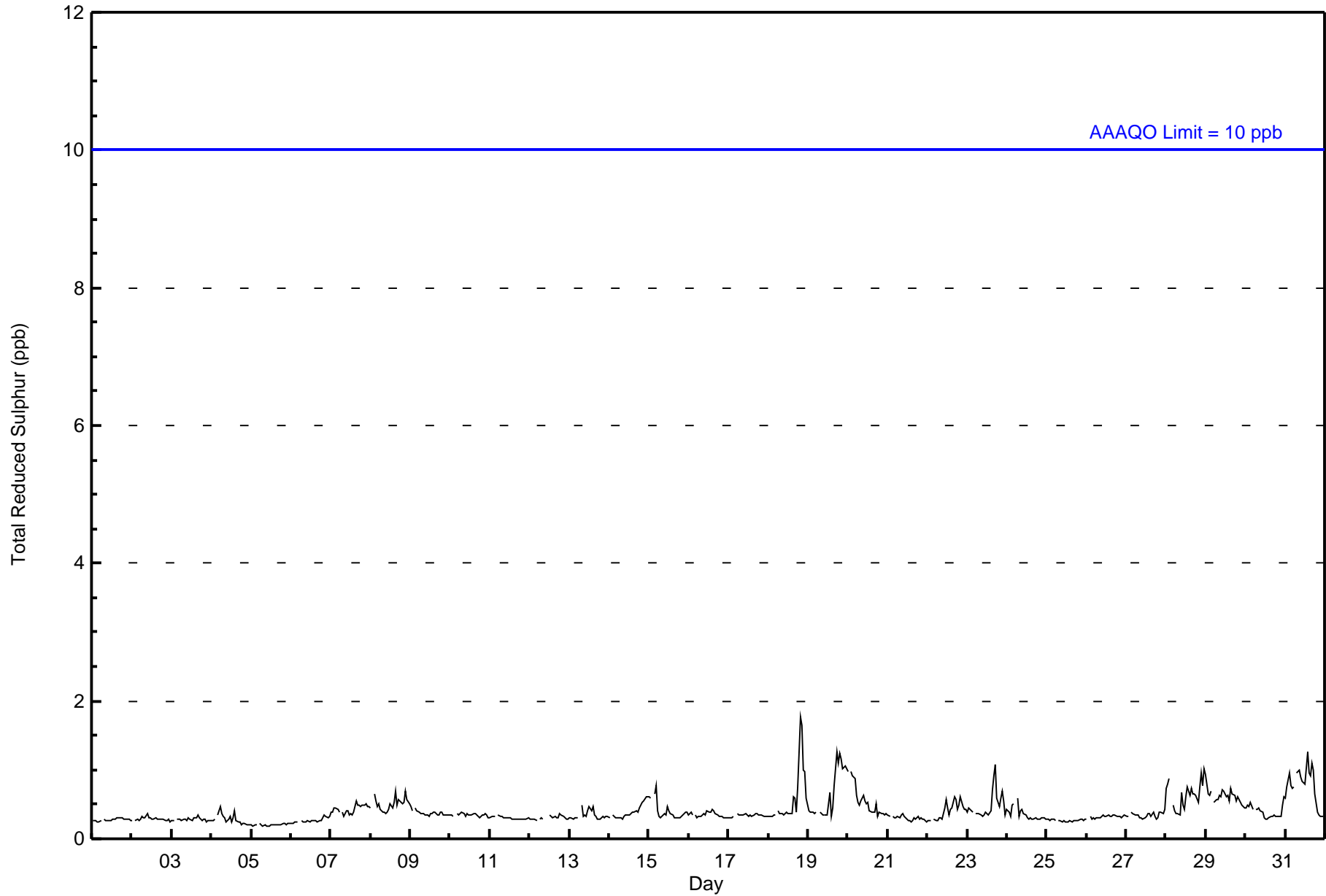
Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Athabasca Valley - December 2016

Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service: 744																																																
Maximum Value: 2 ppb on Dec 18 20:00		Maximum Daily Average: 0.8 ppb on Dec 31		Hours of Data: 710																																																
Minimum Value: 0 ppb on Dec 5 10:00		Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Missing Data: 34																																																
Maximum Diurnal Average: 0.4 ppb at hour 21		Minimum Diurnal Average: 0.4 ppb at hour 7		Hours of Calibration: 34																																																
Monthly Average: 0.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 1		Percent Operational Time: 100.0																																																
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																												
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																									
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0.4	1																									
8-Dec	0	Z	1	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	0.5	1																									
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
12-Dec	0	0	0	0	0	Z	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.4	1																									
15-Dec	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																									
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	1	0.6	2																									
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	0.6	1																									
20-Dec	1	Z	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0.5	1																									
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0.4	1																									
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	0	0	0.5	1																									
24-Dec	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																									
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
28-Dec	1	1	1	Z	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1																									
29-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.6	1																									
30-Dec	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1																									
31-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.8	1																									
																								0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	Diurnal Average	
																								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	31	8	4	16	16	26	124	83	34	39	47	43	36	46	47	109	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	31	8	4	16	16	26	124	83	34	39	47	43	36	46	47	109	709

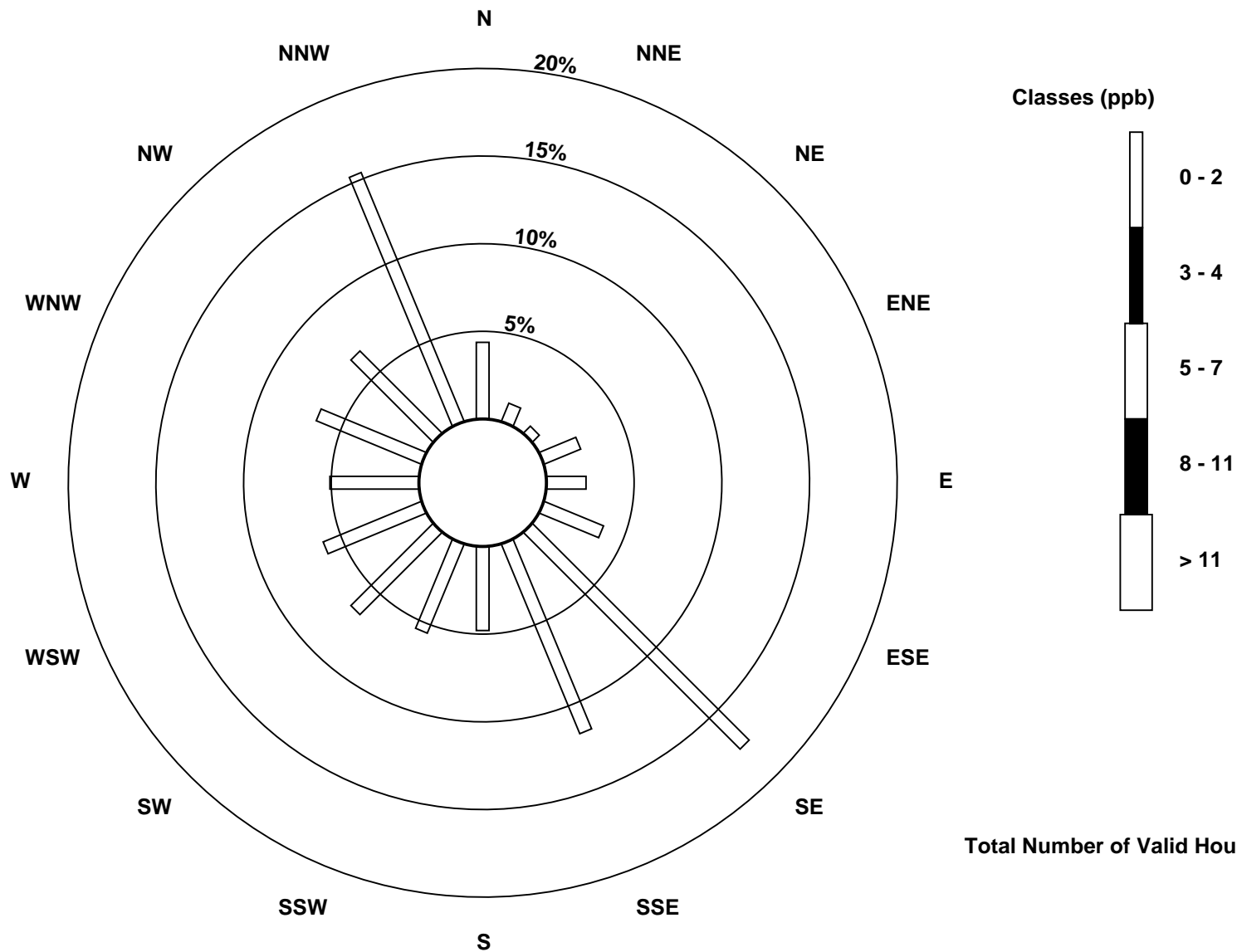
Total Number of Valid Hours: 709

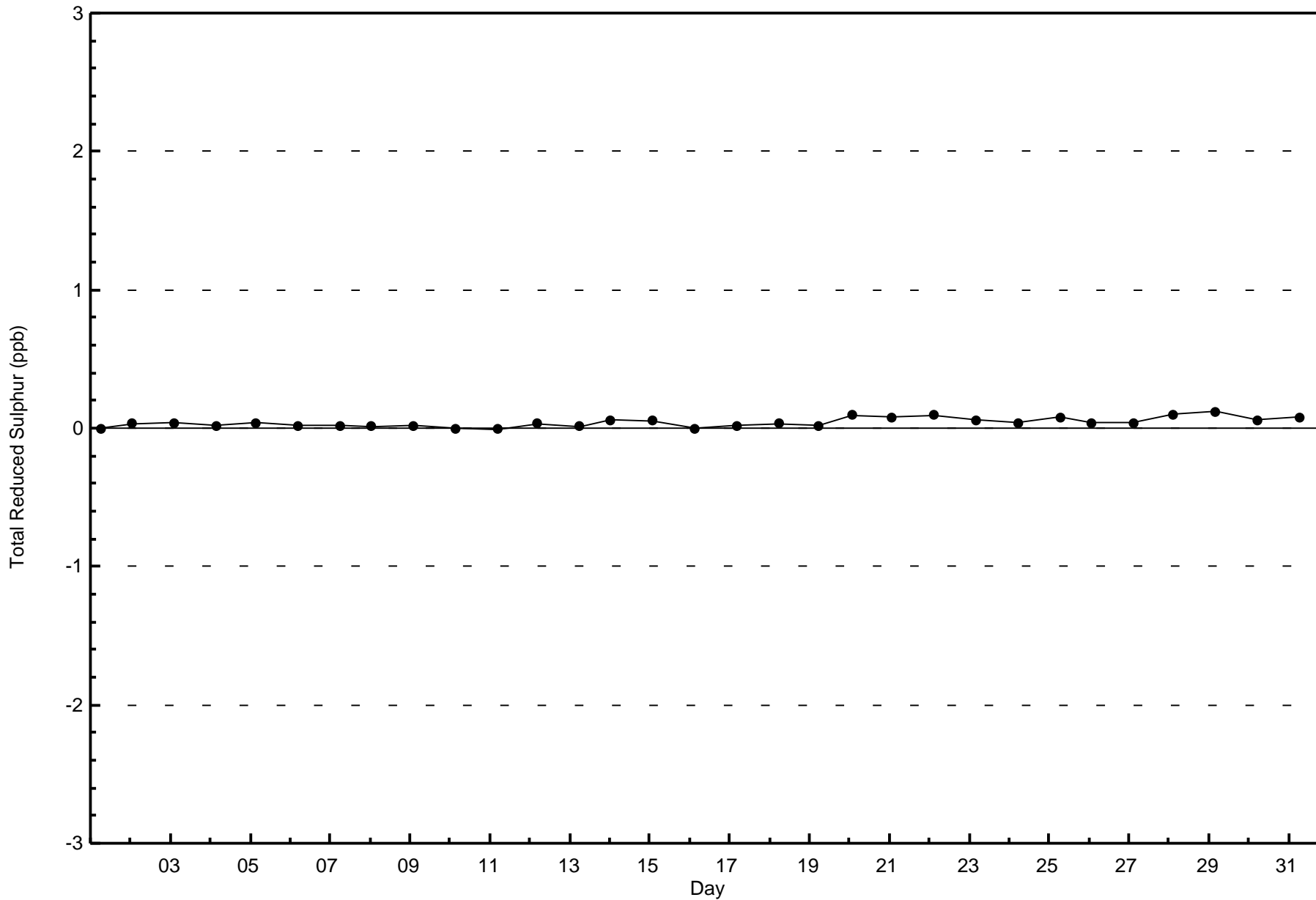
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Reduced Sulphur (TRS) - ppb
Athabasca Valley (AMS 7)

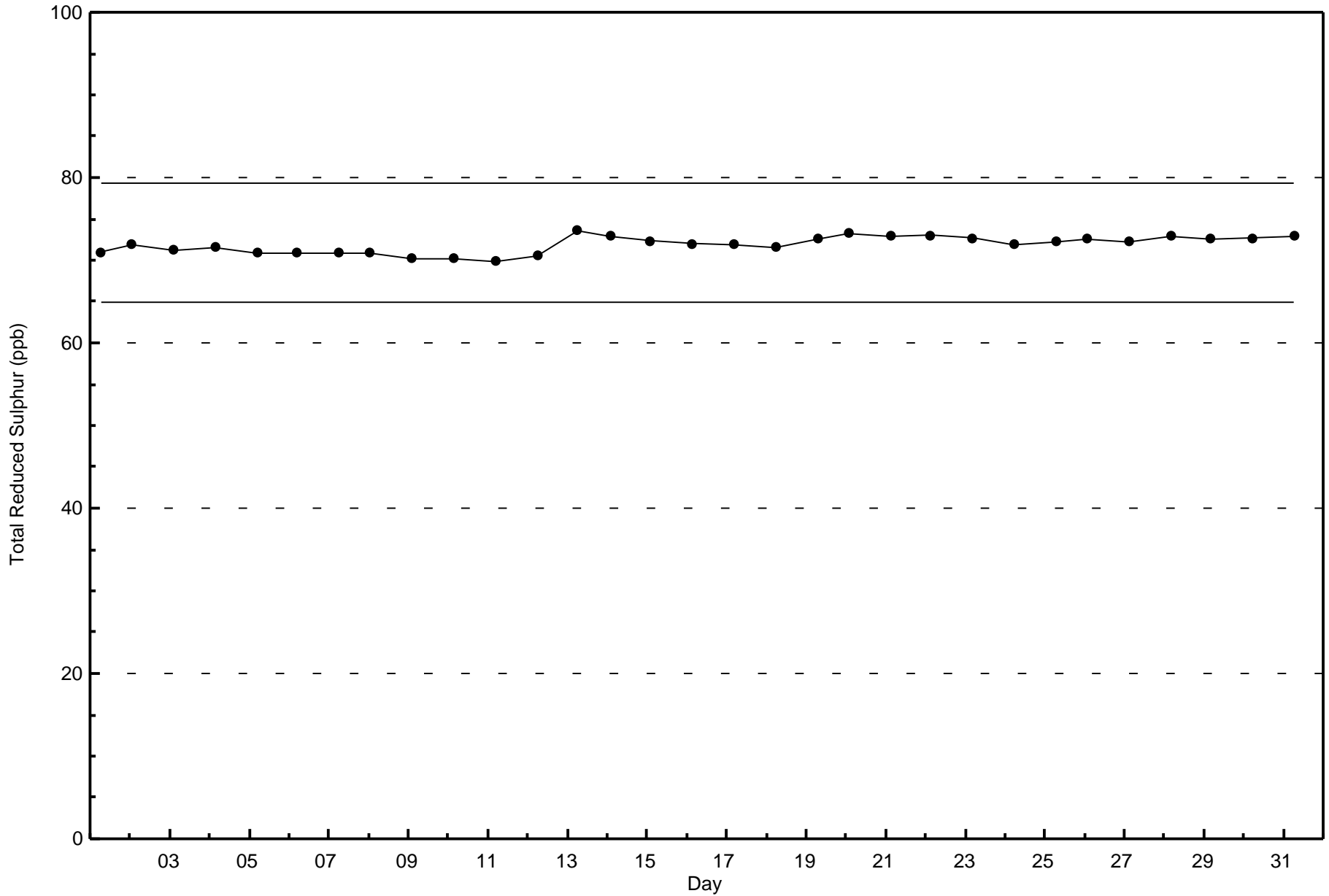






Wood Buffalo Environmental Association
Span Responses

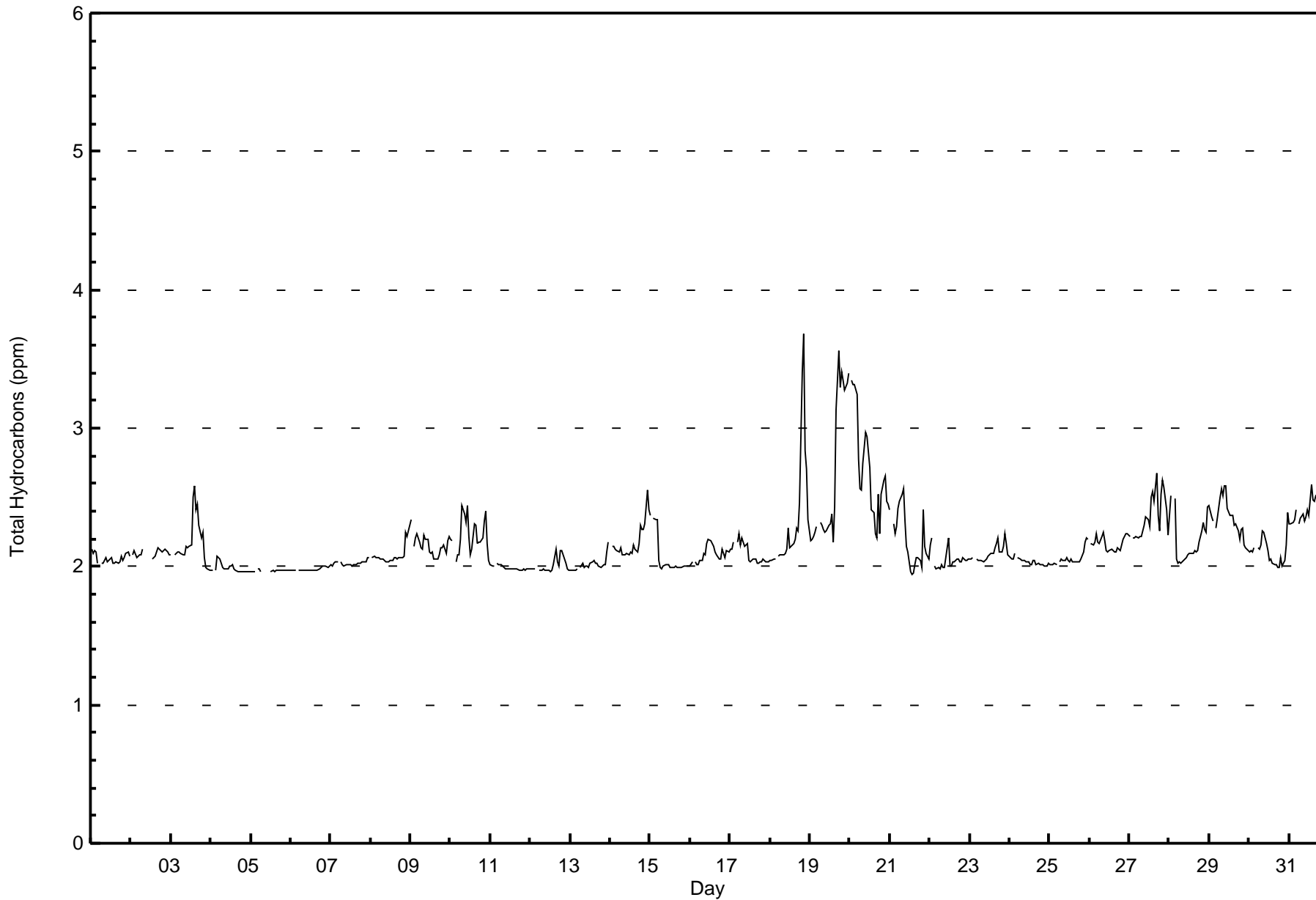
Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - December 2016





Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Athabasca Valley - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	288	40.91	40.91
2.1 - 3.0	402	57.10	98.01
3.1 - 10.0	14	1.99	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	6	3	1	2	7	5	29	6	8	16	24	37	25	35	35	48	287
2.1 - 3.0	26	5	4	13	10	20	96	68	22	21	26	7	9	8	12	55	402
3.1 - 10.0	0	0	0	1	0	0	0	2	1	1	2	1	0	0	0	6	14
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	25	125	76	31	38	52	45	34	43	47	109	703

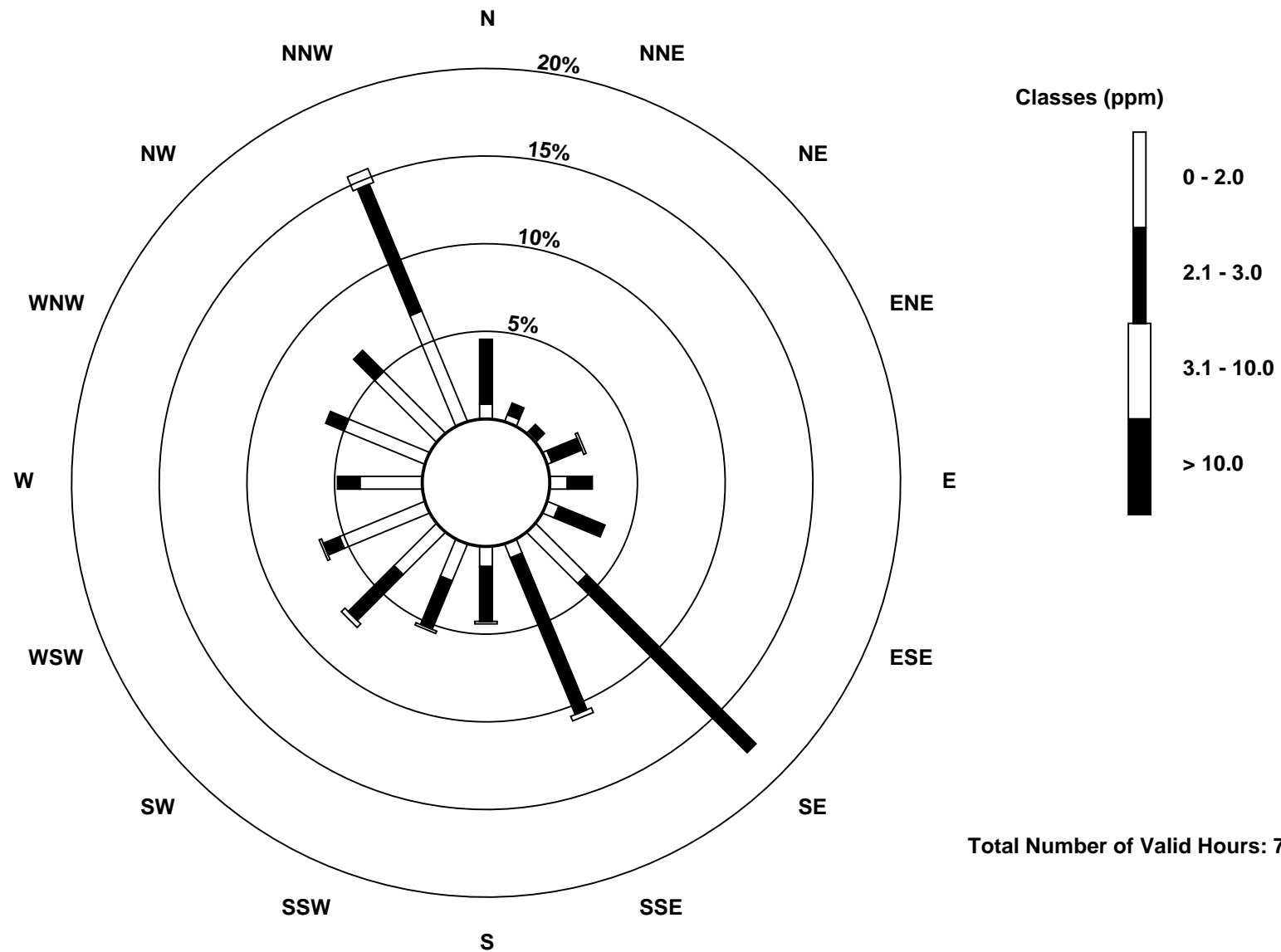
Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

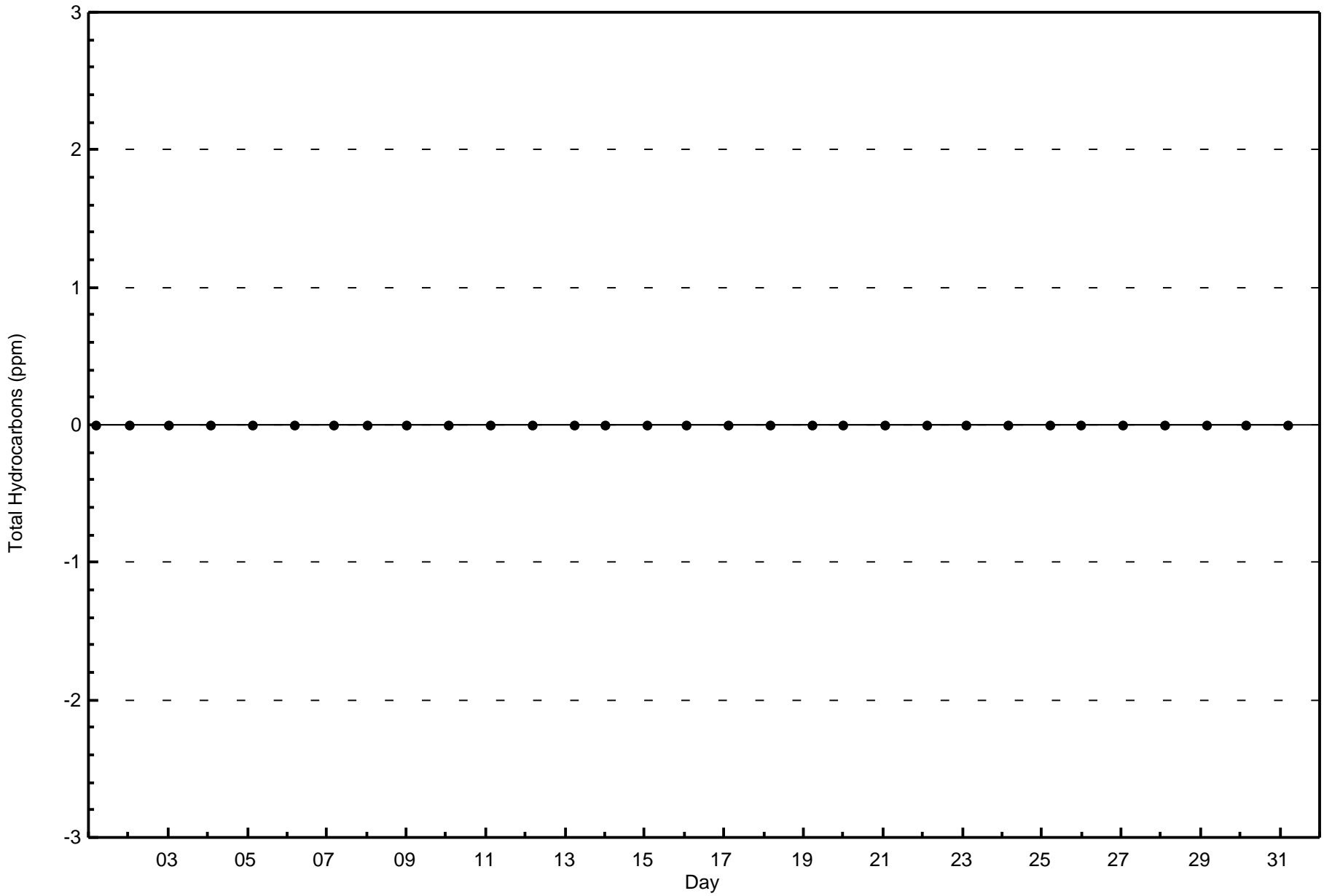
Total Hydrocarbons (THC) - ppm
Athabasca Valley (AMS 7)

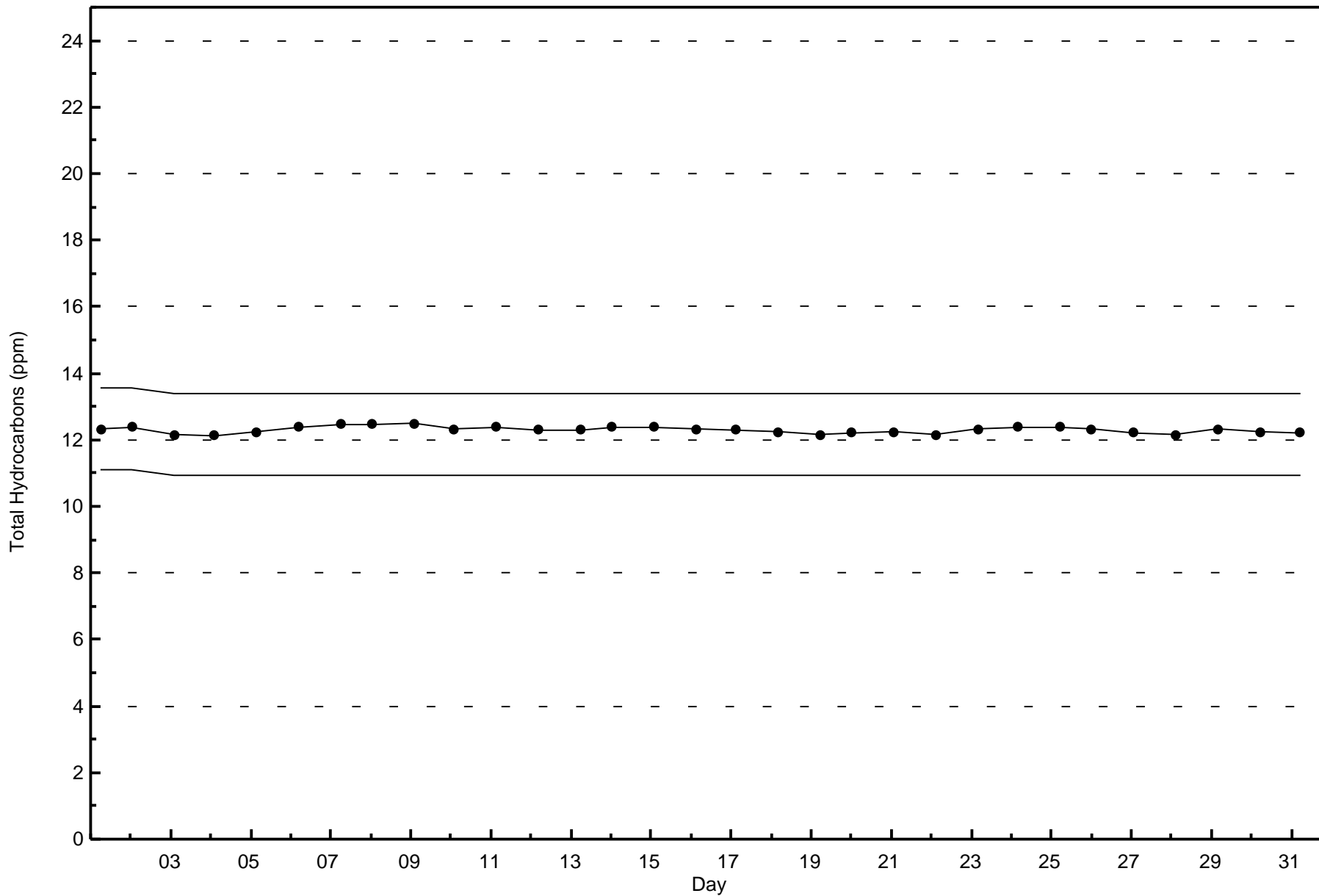




Wood Buffalo Environmental Association
Zero Responses

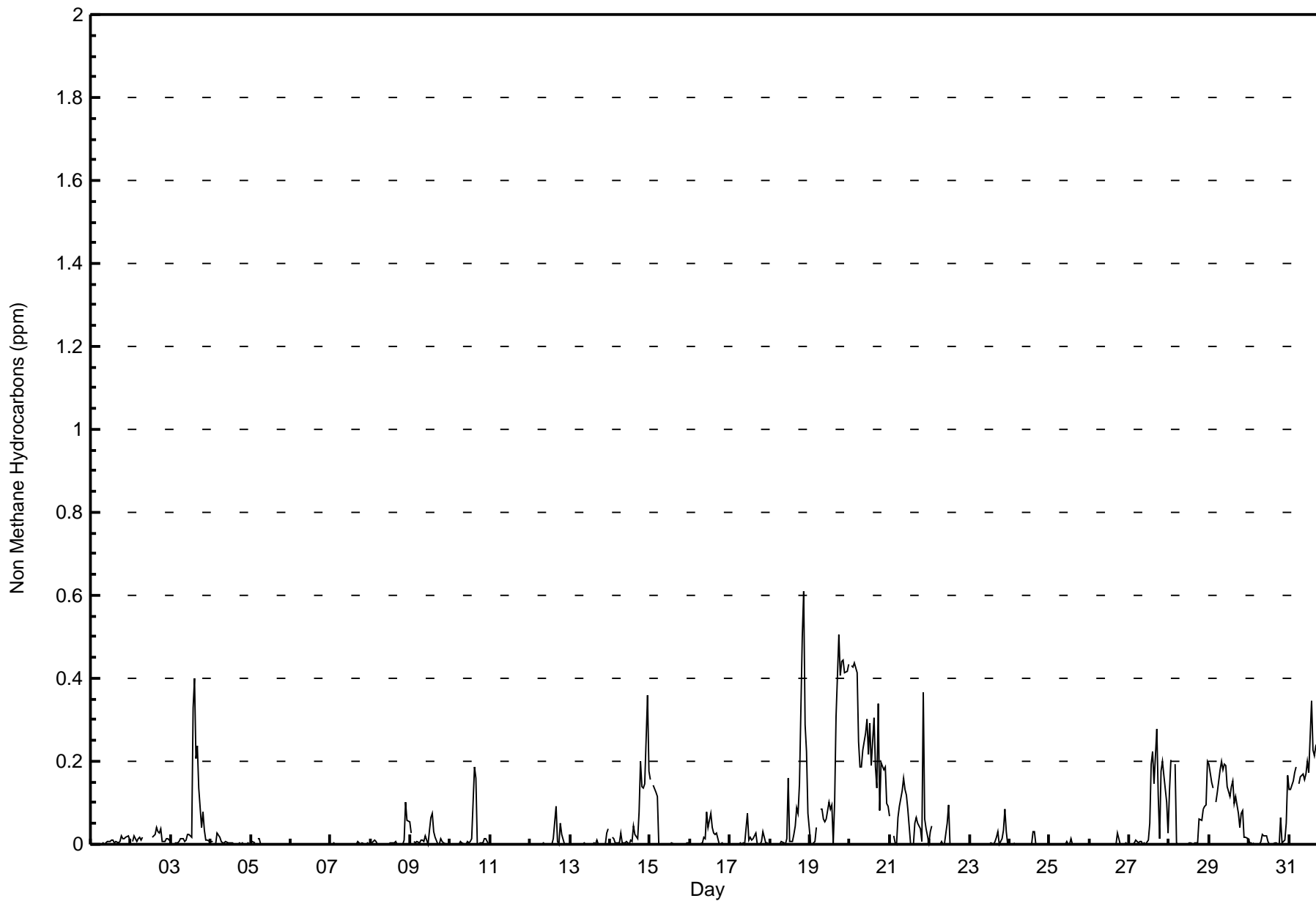
Total Hydrocarbons (THC) - ppm
Athabasca Valley - December 2016







Maximum Value: 0.610 ppm on Dec 18 21:00		Maximum Daily Average: 0.244 ppm on Dec 20		Hours in Service:	744																						
Minimum Value: 0.000 ppm on Dec 1 02:00		Minimum Daily Average: 0.000 ppm on Dec 6		Hours of Data:	704																						
Maximum Diurnal Average: 0.073 ppm at hour 21		Minimum Diurnal Average: 0.020 ppm at hour 6		Hours of Missing Data:	40																						
Monthly Average: 0.042 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.2 P ₉₉ = 0.4		Hours of Calibration:	36																						
				Percent Operational Time:	99.5																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.001	0.000	0.001	0.000	0.000	Z	0.001	0.004	0.002	0.002	0.008	0.007	0.012	0.009	0.005	0.006	0.004	0.006	0.021	0.012	0.013	0.018	0.022	0.011	0.007	0.022	
2-Dec	Z	0.008	0.021	0.006	0.013	0.015	0.010	0.018	C	C	C	C	C	0.015	0.023	0.040	0.030	0.029	0.037	0.007	0.008	0.013	0.013	0.011	0.018	0.040	
3-Dec	0.013	Z	0.004	0.002	0.003	0.007	0.014	0.012	0.008	0.011	0.023	0.025	0.016	0.330	0.400	0.206	0.236	0.135	0.040	0.076	0.035	0.009	0.009	0.007	0.071	0.400	
4-Dec	0.006	0.006	Z	0.002	0.029	0.015	0.006	0.002	0.003	0.006	0.003	0.002	0.002	0.002	0.001	0.000	0.002	0.001	0.000	0.004	0.002	0.002	0.003	0.002	0.004	0.029	
5-Dec	0.005	0.007	0.003	Z	0.013	0.015	0.000	M	0.000	M	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.015	
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
7-Dec	0.000	0.000	0.002	0.000	0.000	Z	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.006	0.003	0.001	0.002	0.001	0.000	0.004	0.000	0.001	0.006	
8-Dec	Z	0.003	0.011	0.006	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.003	0.006	0.000	0.000	0.001	0.001	0.010	0.103	0.059	0.054	0.012	0.103	
9-Dec	0.026	Z	0.006	0.003	0.008	0.002	0.011	0.009	0.006	0.021	0.002	0.035	0.063	0.074	0.030	0.017	0.001	0.000	0.014	0.006	0.002	0.000	0.000	0.001	0.015	0.074	
10-Dec	0.001	0.000	Z	0.000	0.000	0.000	0.005	0.004	0.000	0.000	0.008	0.003	0.007	0.015	0.187	0.158	0.000	0.001	0.005	0.003	0.014	0.014	0.006	0.000	0.019	0.187	
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.014	0.092	0.008	0.000	0.051	0.024	0.001	0.000	0.000	0.000	0.008	0.092	
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.002	0.000	0.009	0.000	0.000	0.000	0.001	0.000	0.027	0.036	0.003	0.036	
14-Dec	Z	0.015	0.013	0.003	0.003	0.004	0.027	0.005	0.005	0.002	0.008	0.001	0.011	0.006	0.044	0.024	0.013	0.077	0.201	0.139	0.137	0.147	0.360	0.176	0.062	0.360	
15-Dec	0.155	Z	0.141	0.125	0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.024	0.155	
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.003	0.019	0.013	0.079	0.039	0.074	0.040	0.028	0.024	0.029	0.001	0.002	0.004	0.000	0.000	0.000	0.000	0.015	0.079	
17-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.003	0.000	0.005	0.000	0.076	0.010	0.016	0.009	0.014	0.028	0.000	0.002	0.000	0.008	0.029	0.003	0.003	0.000	0.009	0.076	
18-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.006	0.002	0.000	0.014	0.159	0.007	0.007	0.025	0.045	0.089	0.073	0.145	0.500	0.610	0.287	0.225	0.076	0.099	0.610	
19-Dec	0.001	0.001	0.005	0.007	0.040	Z	0.084	0.083	0.061	0.053	0.062	0.103	0.085	0.094	0.004	0.102	0.307	0.507	0.406	0.442	0.445	0.412	0.416	0.435	0.181	0.507	
20-Dec	Z	0.429	0.426	0.439	0.413	0.249	0.187	0.185	0.226	0.269	0.303	0.218	0.291	0.189	0.304	0.186	0.134	0.338	0.081	0.196	0.181	0.186	0.099	0.091	0.244	0.439	
21-Dec	0.069	Z	0.021	0.002	0.000	0.066	0.093	0.129	0.159	0.132	0.117	0.084	0.000	0.000	0.000	0.052	0.064	0.052	0.038	0.007	0.365	0.062	0.037	0.002	0.067	0.365	
22-Dec	0.032	0.043	Z	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.051	0.094	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.094	
23-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.007	0.016	0.032	0.001	0.015	0.033	0.084	0.029	0.000	0.010	0.084	
24-Dec	0.000	0.000	0.000	0.004	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.031	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.003	0.031	
25-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.014	
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027	0.000	0.000	0.000	0.000	0.005	0.000	0.001	0.027	
27-Dec	0.001	Z	0.000	0.004	0.009	0.004	0.006	0.007	0.000	0.004	0.000	0.010	0.052	0.194	0.223	0.146	0.280	0.119	0.012	0.176	0.201	0.166	0.102	0.026	0.076	0.280	
28-Dec	0.128	0.204	Z	0.195	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003	0.001	0.004	0.002	0.003	0.063	0.056	0.083	0.091	0.095	0.200	0.049	0.204	
29-Dec	0.193	0.149	0.134	Z	0.103	0.126	0.178	0.200	0.180	0.193	0.191	0.137	0.114	0.141	0.151	0.099	0.114	0.075	0.040	0.073	0.081	0.016	0.018	0.012	0.118	0.200	
30-Dec	0.002	0.002	0.000	0.004	Z	0.000	0.000	0.006	0.024	0.020	0.022	0.008	0.000	0.000	0.000	0.003	0.002	0.000	0.000	0.063	0.004	0.010	0.050	0.166	0.017	0.166	
31-Dec	0.132	0.132	0.153	0.172	0.188	Z	0.146	0.163	0.168	0.156	0.169	0.201	0.173	0.347	0.228	0.215	0.238	0.244	0.179	0.000	0.000	0.000	0.000	0.000	0.148	0.347	
		0.029	0.038	0.036	0.037	0.036	0.020	0.025	0.028	0.029	0.030	0.039	0.039	0.031	0.048	0.055	0.048	0.051	0.056	0.043	0.059	0.073	0.052	0.051	0.042	Diurnal Average	
		0.193	0.429	0.426	0.439	0.413	0.249	0.187	0.200	0.226	0.269	0.303	0.218	0.291	0.347	0.400	0.215	0.307	0.507	0.406	0.500	0.610	0.412	0.416	0.435	Diurnal Maximum	
Z - zerospan		C - Calibration				M - Maintenance																					





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	407	57.81	57.81
0.006 - 0.05	152	21.59	79.40
0.06 - 0.1	69	9.80	89.20
> 0.1	76	10.80	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	11	5	1	3	8	6	53	25	11	23	41	40	28	38	39	75	407
0.006 - 0.05	5	0	2	1	6	10	54	25	12	9	7	3	3	4	3	7	151
0.06 - 0.1	7	1	1	7	3	5	2	15	4	4	0	1	3	0	2	14	69
> 0.1	9	2	1	5	0	4	16	11	4	2	4	1	0	1	3	13	76
Totals	32	8	5	16	17	25	125	76	31	38	52	45	34	43	47	109	703

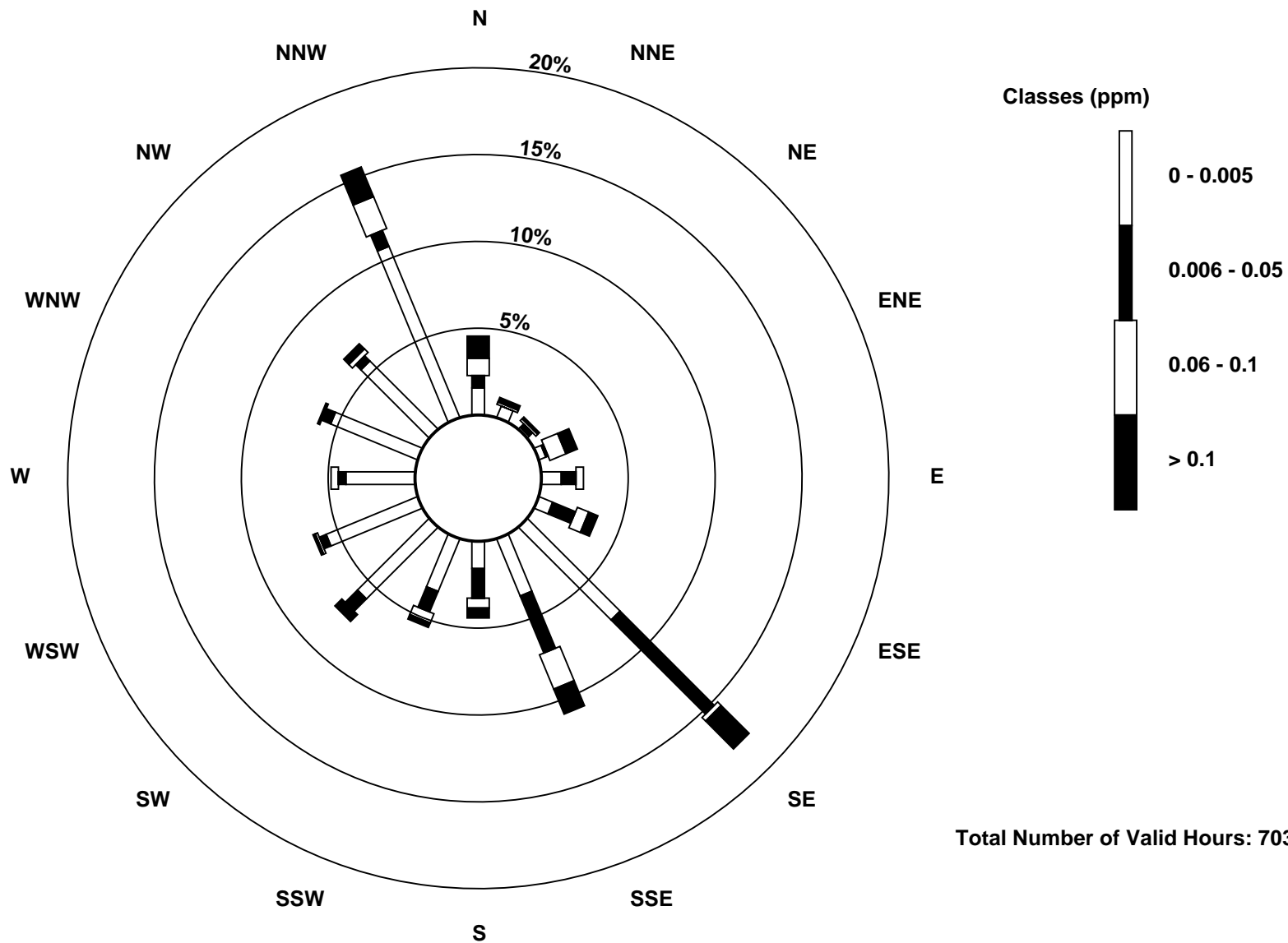
Total Number of Valid Hours: 703

Total Number of Hours: 744

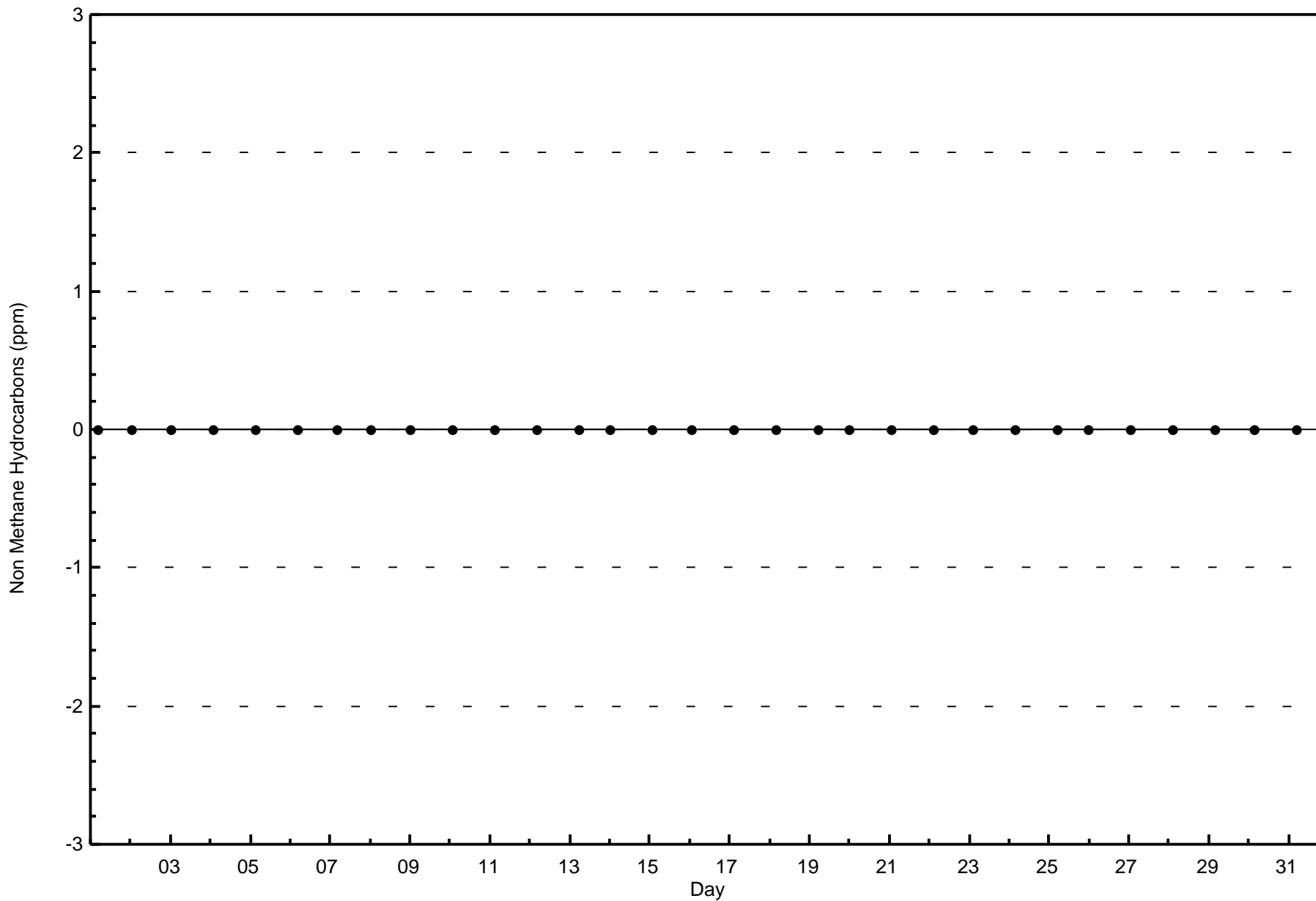


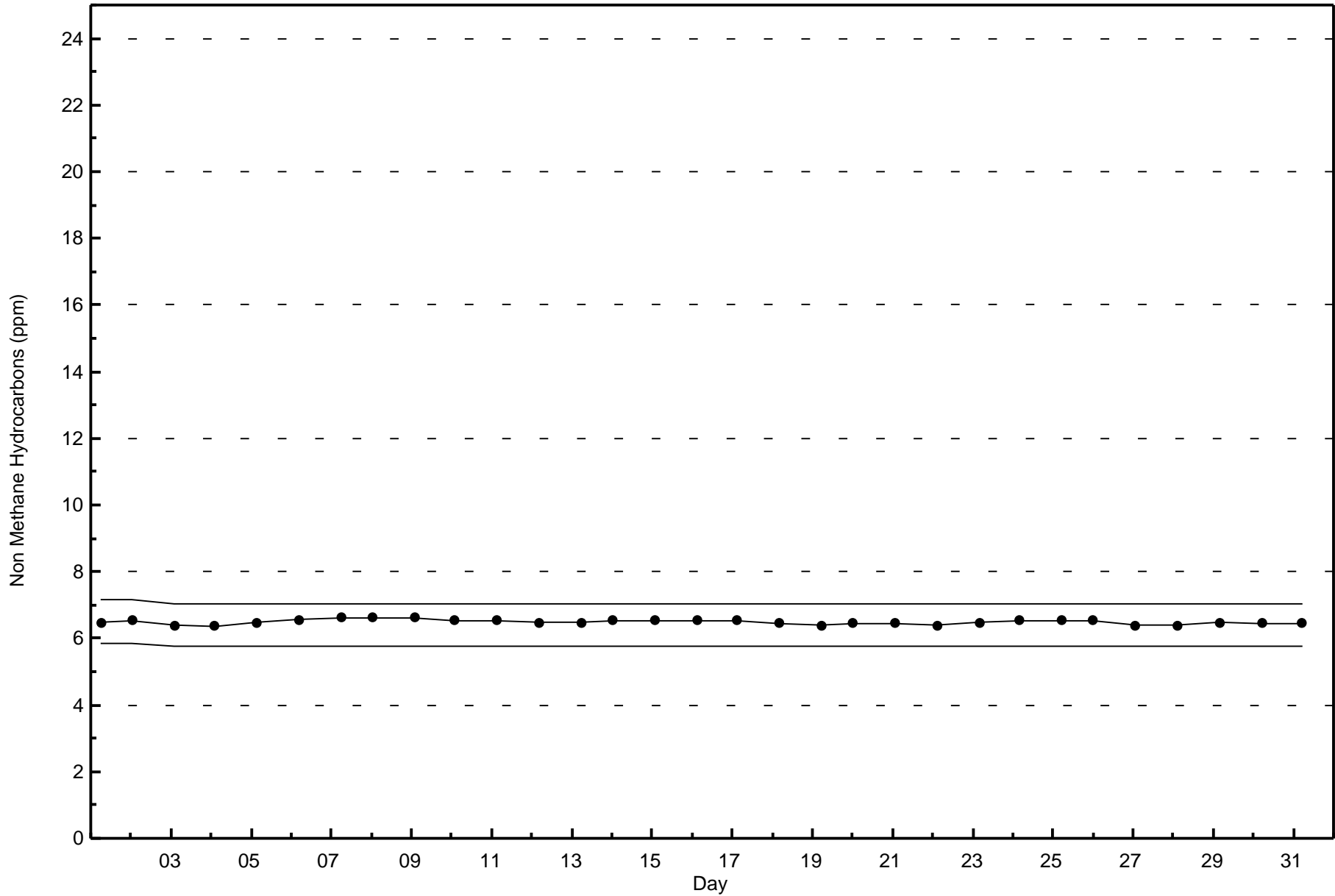
Wood Buffalo Environmental Association
Wind Rose Dec 2016

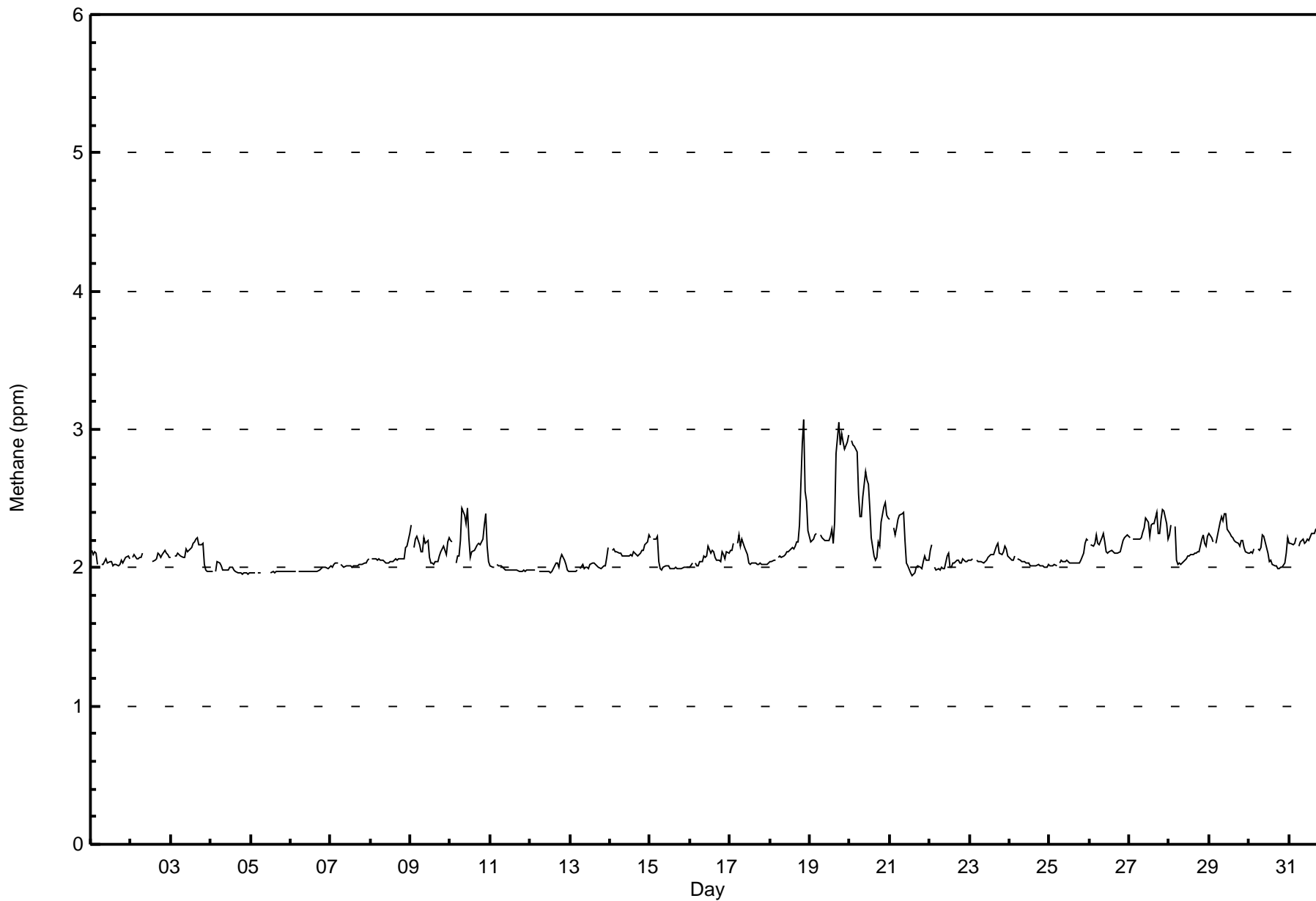
Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 703









**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	309	43.89	43.89
2.1 - 3.0	393	55.82	99.72
3.1 - 10.0	2	0.28	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	6	3	1	2	7	6	34	12	11	18	26	37	25	35	35	50	308
2.1 - 3.0	26	5	4	14	10	19	91	64	20	20	26	8	9	8	12	57	393
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	25	125	76	31	38	52	45	34	43	47	109	703

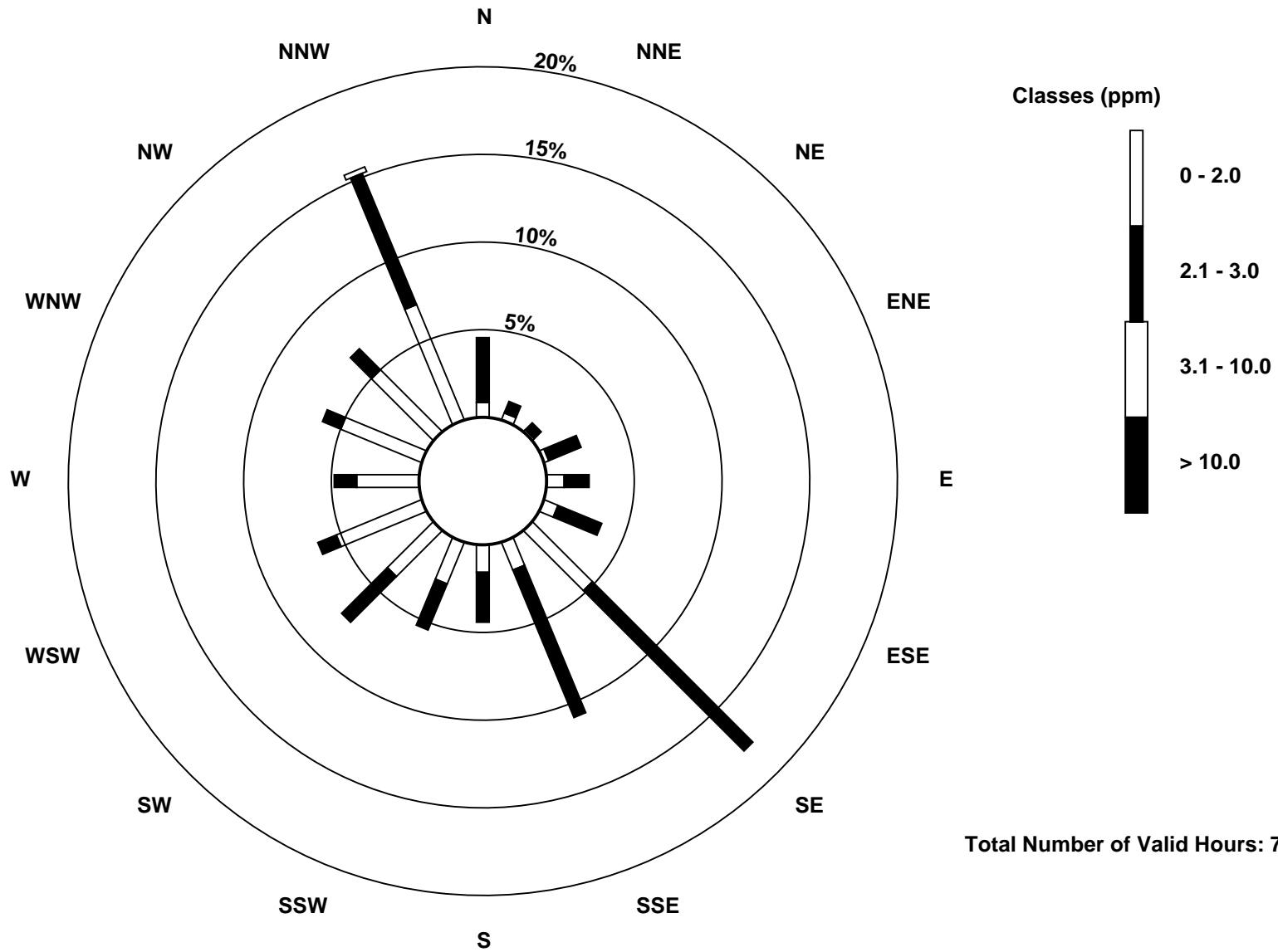
Total Number of Valid Hours: 703

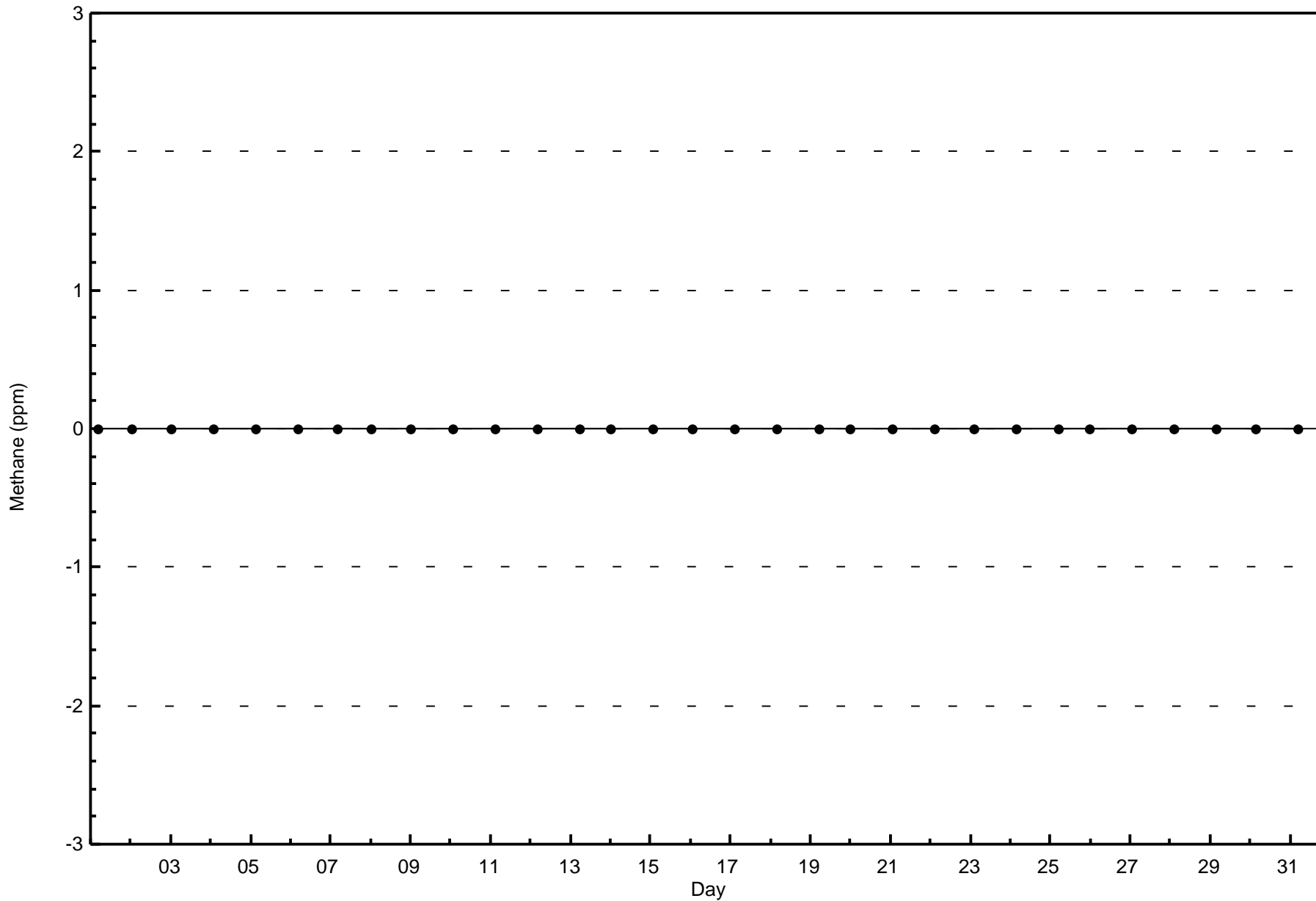
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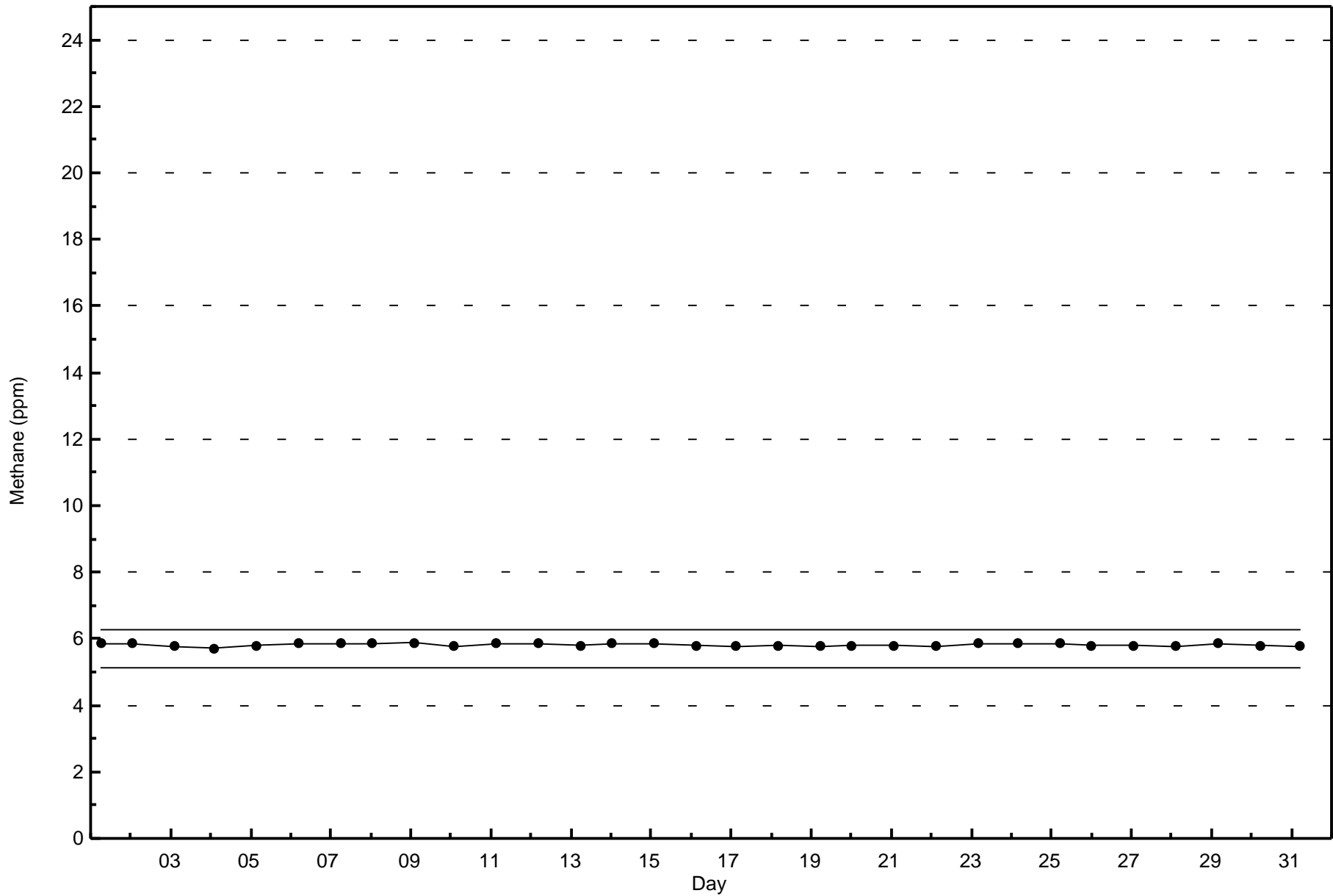


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Methane (CH₄) - ppm
Athabasca Valley (AMS 7)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 42 ppb on Dec 21 14:00	Maximum Daily Average: 35.7 ppb on Dec 5		Hours of Data:	709
Minimum Value: 3 ppb on Dec 9 20:00	Minimum Daily Average: 5.4 ppb on Dec 29		Hours of Missing Data:	35
Maximum Diurnal Average: 20.9 ppb at hour 13	Minimum Diurnal Average: 15.0 ppb at hour 17		Hours of Calibration:	35
Monthly Average: 17.6 ppb	Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 9 Median = 16 Q ₃ = 25 P ₉₀ = 33 P ₉₉ = 39		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	28	28	28	30	32	31	27	Z	22	19	22	22	17	20	17	15	15	13	12	14	12	10	11	13	19.9	32
2-Dec	14	10	Z	11	11	10	8	7	6	9	11	11	12	11	9	8	8	9	11	14	16	17	19	21	11.5	21
3-Dec	21	19	20	Z	17	17	15	14	13	12	13	15	16	11	8	6	5	9	14	9	20	28	30	32	15.9	32
4-Dec	32	34	31	31	Z	14	17	21	24	26	25	24	26	24	27	26	29	30	31	31	33	34	35	35	27.9	35
5-Dec	35	36	36	36	36	Z	35	35	35	36	36	C	C	C	C	36	36	36	36	35	35	35	36	36	35.7	36
6-Dec	36	36	36	36	35	35	Z	33	32	33	34	34	34	34	32	30	30	29	27	27	28	28	28	28	32.2	36
7-Dec	28	32	31	28	23	21	20	Z	25	23	25	29	31	32	31	20	9	11	14	15	17	16	16	15	22.3	32
8-Dec	14	10	Z	9	11	6	11	14	15	16	17	17	14	17	12	10	11	4	3	4	6	8	4	3	10.3	17
9-Dec	3	4	3	Z	5	6	9	9	7	9	12	15	15	14	12	8	12	8	3	3	6	12	12	10	8.4	15
10-Dec	11	12	14	17	Z	11	8	5	5	11	10	12	14	13	10	7	7	6	9	5	5	4	12	20	10.0	20
11-Dec	27	28	27	27	27	Z	28	29	30	32	32	33	34	33	33	32	32	34	35	34	33	34	31	33	31.3	35
12-Dec	33	32	33	35	38	37	Z	35	35	35	34	32	33	29	22	15	20	28	8	8	16	23	34	38	28.3	38
13-Dec	39	39	39	39	37	36	31	Z	31	33	34	34	32	30	19	22	18	25	23	23	19	15	11	4	27.5	39
14-Dec	5	8	Z	9	9	9	11	12	13	13	13	14	14	14	11	9	6	7	6	3	3	3	3	3	8.6	14
15-Dec	3	3	3	Z	4	8	23	28	18	16	17	18	25	32	30	28	27	26	26	27	25	22	26	23	19.9	32
16-Dec	21	16	11	13	Z	16	9	9	4	8	11	11	13	11	7	5	8	6	9	9	12	16	14	16	11.1	21
17-Dec	16	15	14	12	13	Z	12	9	9	12	15	17	17	16	15	13	13	14	14	14	16	14	16	17	14.0	17
18-Dec	16	16	16	16	14	13	Z	13	12	11	13	13	14	14	10	5	3	5	3	3	3	3	3	9	9.9	16
19-Dec	13	14	15	16	14	14	13	Z	13	14	15	17	13	10	20	9	3	3	3	3	3	3	3	3	10.2	20
20-Dec	3	3	Z	3	3	4	4	5	4	4	7	9	8	14	11	6	8	6	9	5	4	4	5	5	5.8	14
21-Dec	5	6	12	Z	15	7	5	4	4	10	15	21	37	42	42	32	20	18	18	17	16	13	21	22	17.5	42
22-Dec	20	19	23	38	Z	39	39	29	30	32	25	28	31	31	27	27	25	25	27	25	23	25	24	23	27.8	39
23-Dec	23	23	23	23	22	Z	25	24	27	27	23	21	21	22	22	21	18	18	19	19	14	6	8	18	20.3	27
24-Dec	16	17	18	12	11	11	Z	15	21	23	24	21	25	25	23	23	22	23	23	22	24	27	27	22	20.7	27
25-Dec	23	23	23	21	23	21	19	Z	17	17	16	18	18	18	18	17	16	16	18	17	18	18	16	17	18.6	23
26-Dec	17	17	Z	16	16	16	15	14	12	13	20	21	21	22	21	19	18	17	16	17	17	17	17	16	17.2	22
27-Dec	17	17	18	Z	21	20	19	17	14	16	16	16	18	12	10	11	9	15	22	9	4	5	12	17	14.6	22
28-Dec	9	8	6	14	Z	26	27	30	28	20	21	23	24	22	19	11	9	6	7	7	3	10	16	10	15.5	30
29-Dec	7	8	8	5	8	Z	3	3	3	4	6	8	10	9	8	5	3	3	3	3	3	3	4	6	5.4	10
30-Dec	6	6	6	5	7	7	Z	6	5	7	10	17	28	28	28	25	25	29	26	19	24	25	20	8	16.0	29
31-Dec	11	12	13	13	12	8	10	Z	4	5	8	9	10	11	9	6	4	3	12	34	38	37	37	37	15.0	38

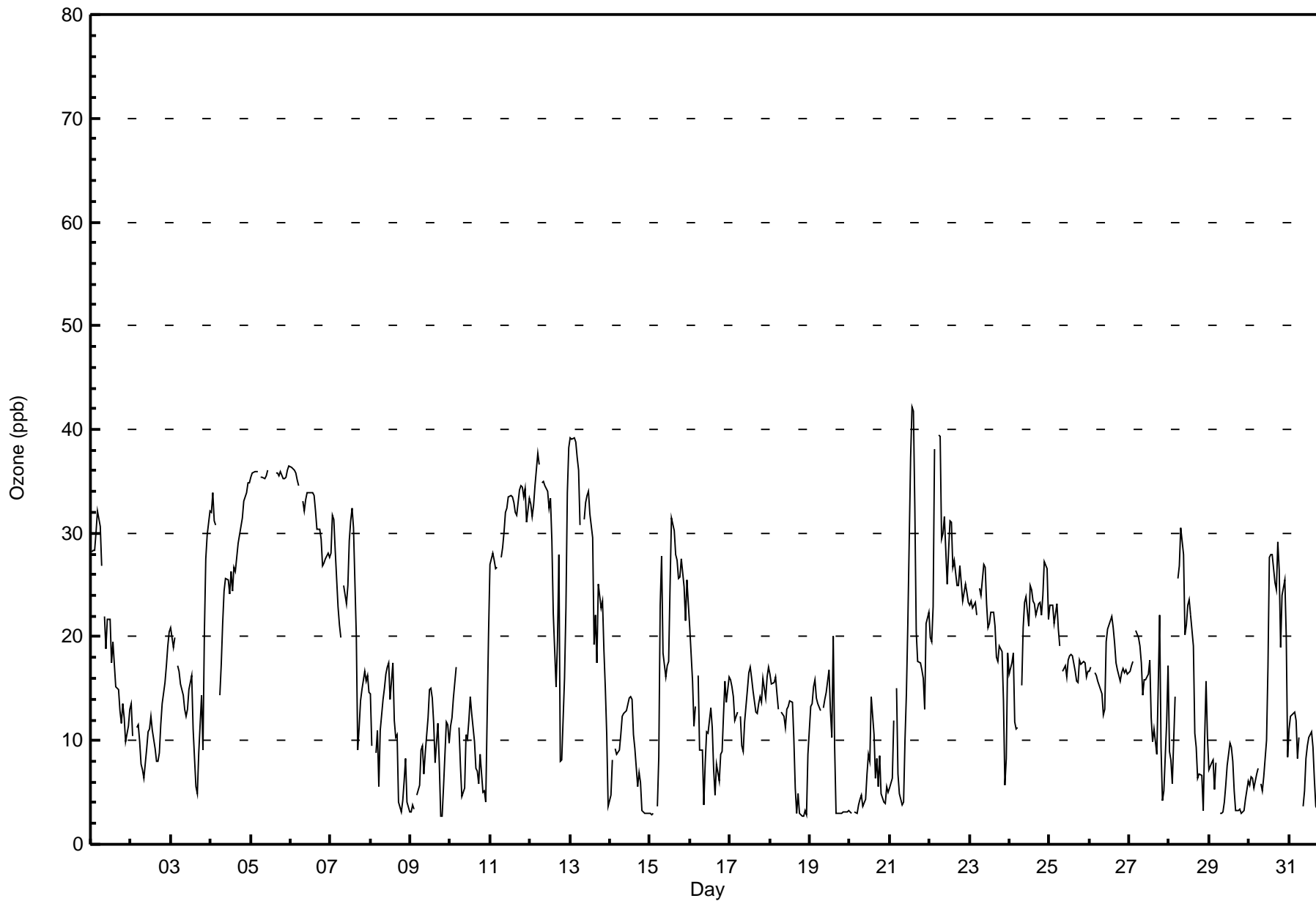
17.9	17.8	19.5	19.9	17.8	17.0	17.1	16.9	16.8	17.6	18.7	19.3	20.9	20.8	18.8	16.5	15.0	15.5	15.7	15.3	16.0	16.6	17.8	18.1	Diurnal Average	
39	39	39	39	38	39	39	39	35	35	36	36	34	37	42	42	36	36	36	36	35	38	37	37	38	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Athabasca Valley - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	452	63.75	63.75
21 - 50	257	36.25	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	22	7	4	15	14	24	103	71	27	29	33	11	16	12	15	48	451
21 - 50	8	1	0	1	2	3	22	9	7	11	16	34	19	31	32	61	257
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	30	8	4	16	16	27	125	80	34	40	49	45	35	43	47	109	708

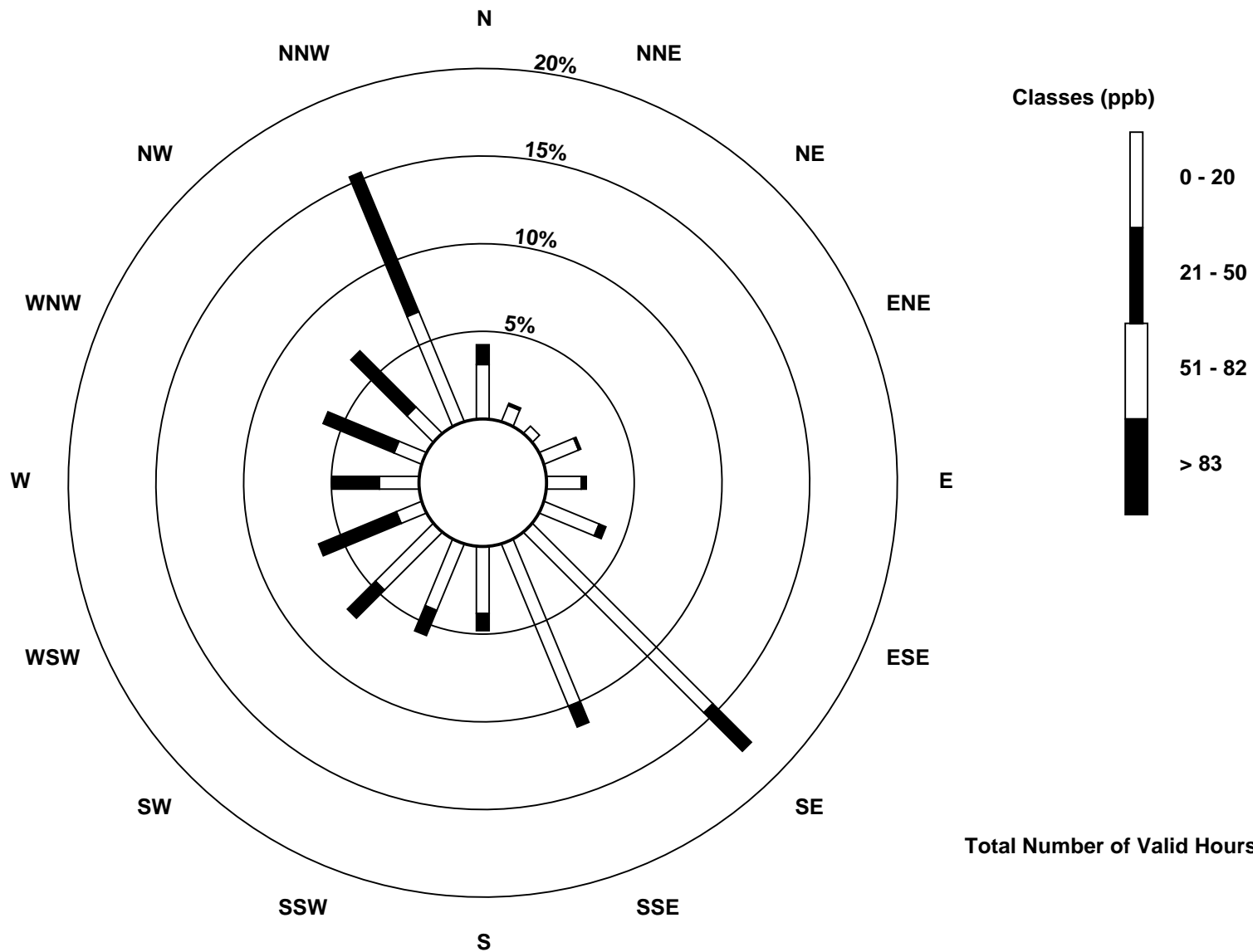
Total Number of Valid Hours: 708

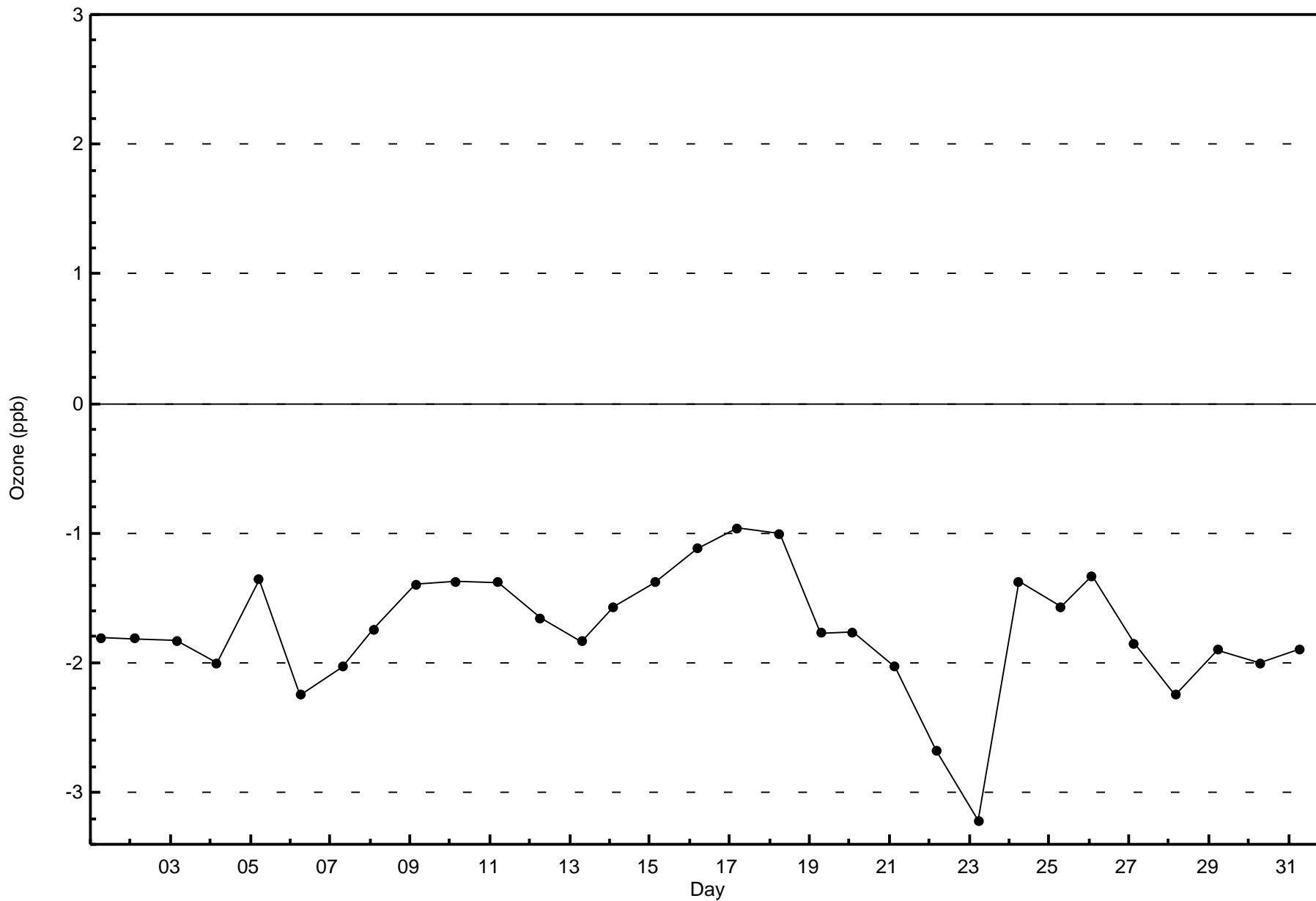
Total Number of Hours: 744

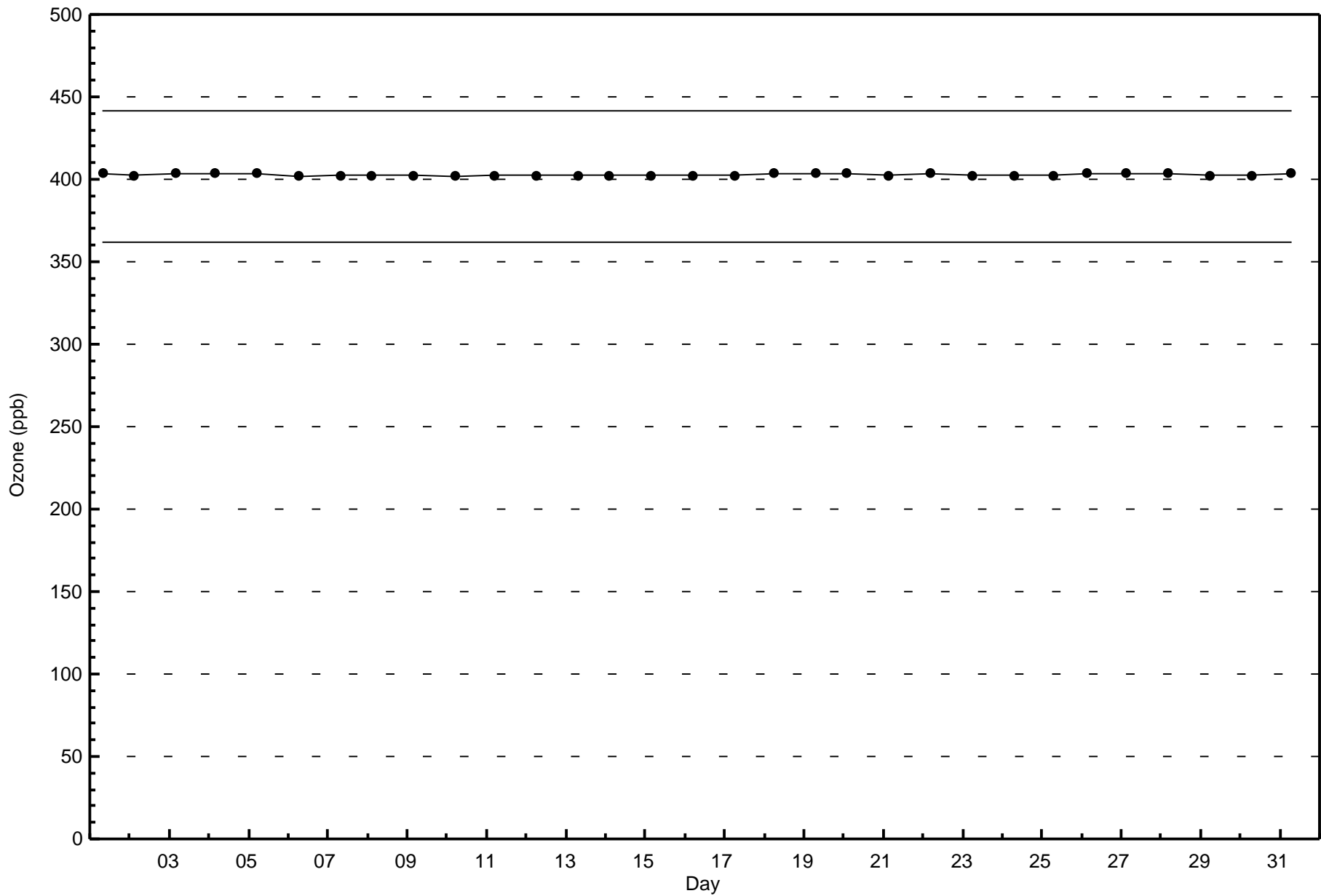


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ozone (O₃) - ppb
Athabasca Valley (AMS 7)









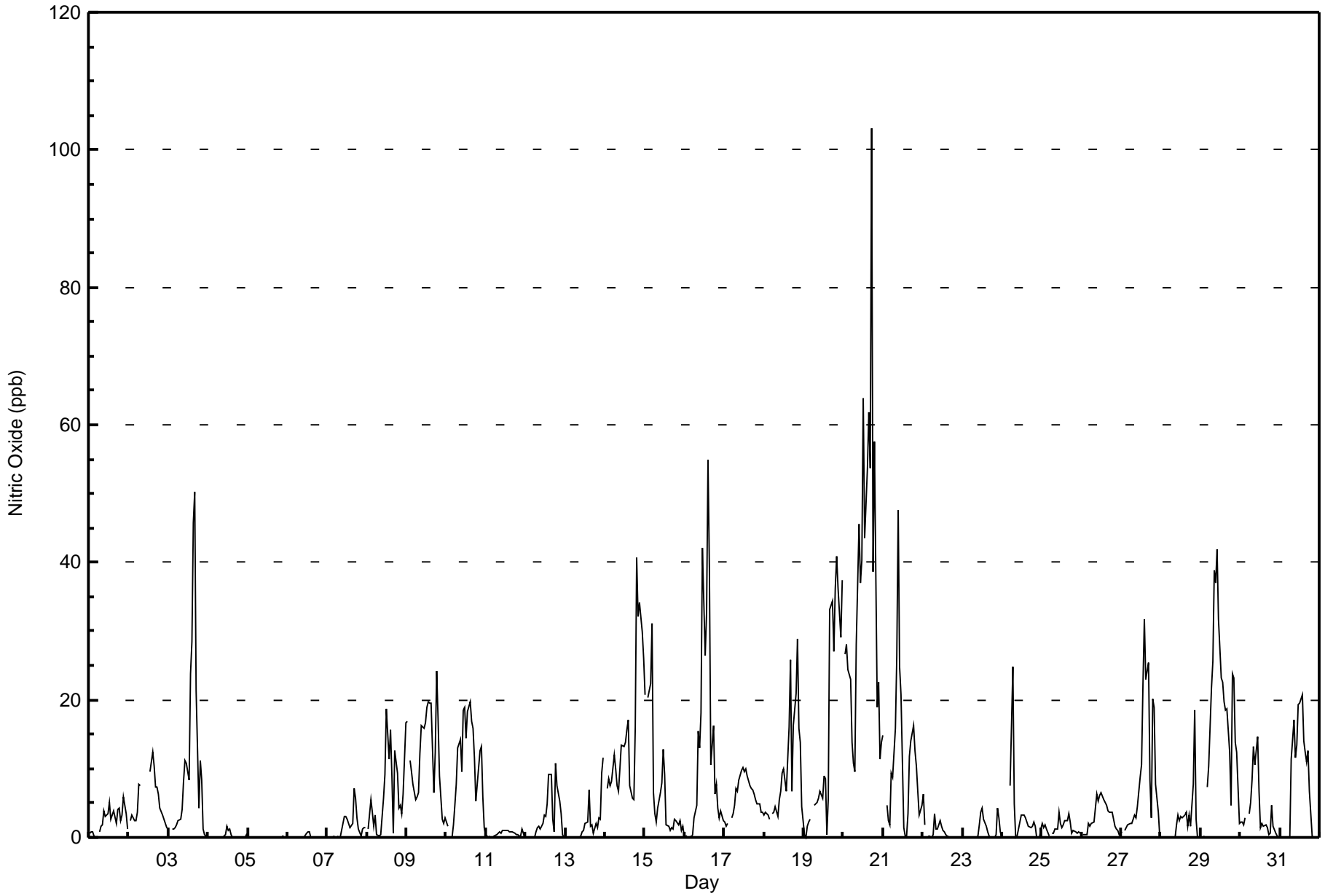
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitric Oxide (NO) - ppb

Athabasca Valley - December 2016

Maximum Value: 103 ppb on Dec 20 18:00																		Maximum Daily Average: 36.1 ppb on Dec 20																		Hours in Service: 744	
Minimum Value: 0 ppb on Dec 4 05:00																		Minimum Daily Average: 0.0 ppb on Dec 5																		Hours of Data: 708	
Maximum Diurnal Average: 11.2 ppb at hour 15																		Minimum Diurnal Average: 2.0 ppb at hour 2																		Hours of Missing Data: 36	
Monthly Average: 7.1 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 3 Q ₃ = 9 P ₉₀ = 20 P ₉₉ = 54																		Hours of Calibration: 36	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	0	0	Z	1	2	2	4	3	3	5	3	3	4	2	4	4	2	3	6	3	1	2.6	6											
2-Dec	Z	3	3	2	2	4	8	8	C	C	C	C	C	10	12	10	7	7	6	4	3	3	2	1	5.4	12											
3-Dec	1	Z	1	1	1	2	2	3	4	8	11	11	8	24	28	46	50	21	4	11	8	1	0	0	10.8	50											
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0.2	2											
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0											
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.1	1											
7-Dec	0	0	0	0	0	Z	0	0	0	2	3	3	3	2	1	2	7	6	3	1	0	1	1	1	1.6	7											
8-Dec	Z	1	5	4	2	3	0	0	0	3	6	9	19	11	16	9	1	13	9	4	5	4	6	17	6.4	19											
9-Dec	17	Z	11	10	8	6	6	7	12	16	16	17	19	20	19	20	6	12	24	17	9	3	2	3	12.1	24											
10-Dec	2	2	Z	0	2	5	8	13	14	10	19	19	14	18	20	17	16	12	5	10	13	13	6	1	10.3	20											
11-Dec	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0.6	1											
12-Dec	0	0	0	0	Z	0	1	1	2	1	2	3	3	5	9	9	3	1	11	7	5	4	0	0	2.9	11											
13-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	2	2	7	2	2	1	2	1	3	3	9	12	2.0	12											
14-Dec	Z	7	9	8	8	12	10	7	7	10	13	13	14	16	17	7	6	6	16	41	32	34	30	26	15.1	41											
15-Dec	21	Z	20	22	31	6	3	2	4	7	8	13	9	2	2	1	1	1	3	2	2	2	1	2	7.2	31											
16-Dec	0	0	Z	0	0	0	3	5	15	13	18	42	26	33	55	39	11	16	6	8	4	3	4	2	13.2	55											
17-Dec	2	2	2	Z	3	3	5	7	7	8	10	10	10	10	9	8	7	7	6	6	5	5	4	4	6.0	10											
18-Dec	3	4	3	3	Z	3	4	4	3	5	7	9	10	7	11	16	26	7	16	21	29	16	14	4	9.8	29											
19-Dec	0	0	2	2	3	Z	5	5	5	6	7	6	9	8	0	6	33	34	27	36	41	36	29	37	14.7	41											
20-Dec	Z	27	28	24	23	14	11	10	28	46	37	40	64	43	54	62	54	103	39	58	19	22	11	14	36.1	103											
21-Dec	15	Z	5	2	2	9	9	16	27	48	25	21	1	0	0	4	12	14	16	13	10	7	3	5	11.4	48											
22-Dec	6	2	Z	0	0	0	0	3	1	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.9	6											
23-Dec	0	0	0	Z	0	0	0	0	0	0	2	4	4	3	2	1	0	0	0	0	0	4	3	1	1.0	4											
24-Dec	0	0	0	0	Z	8	25	5	0	0	1	3	3	3	2	2	1	2	2	2	0	0	1	1	2.8	25											
25-Dec	2	1	2	1	0	Z	1	1	1	1	4	2	1	2	2	2	3	2	1	1	1	1	1	1	1.5	4											
26-Dec	Z	0	0	0	2	2	2	2	4	6	5	6	7	5	5	5	4	4	4	3	2	1	1	0	3.1	7											
27-Dec	1	Z	1	2	2	2	2	3	3	3	4	9	11	22	32	23	25	8	3	20	19	8	4	0	8.9	32											
28-Dec	0	0	Z	0	0	0	0	0	0	2	3	3	3	3	3	4	2	3	2	8	19	3	0	0	2.4	19											
29-Dec	0	0	0	Z	7	10	22	26	39	37	42	32	23	22	20	18	19	12	5	24	23	14	12	2	17.8	42											
30-Dec	2	2	2	3	Z	3	5	8	13	11	15	7	1	2	2	2	1	0	1	5	2	1	0	0	3.8	15											
31-Dec	0	0	0	0	0	Z	0	11	17	12	14	19	19	21	14	12	11	13	7	0	0	0	0	0	7.4	21											
2.9																		2.0																		Diurnal Average	
21																		27																		Diurnal Maximum	
3.7																		3.3																			
3.7																		3.7																			
4.2																		4.8																			
7.0																		8.7																			
9.3																		10.3																			
9.8																		9.7																			
11.2																		10.7																			
10.0																		10.0																			
7.2																		9.9																			
8.4																		6.3																			
4.8																		4.4																			
Z - zerospan																		C - Calibration																			





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	641	90.54	90.54
21 - 40	51	7.20	97.74
41 - 80	15	2.12	99.86
81 - 159	1	0.14	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	6	4	9	17	22	116	61	25	35	50	42	32	47	46	100	640
21 - 40	4	2	1	7	0	3	5	8	3	3	2	2	2	0	1	8	51
11 - 80	0	0	0	0	0	0	4	7	2	0	0	1	0	0	0	1	15
81 - 159	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	25	125	76	31	38	52	45	34	47	47	109	707

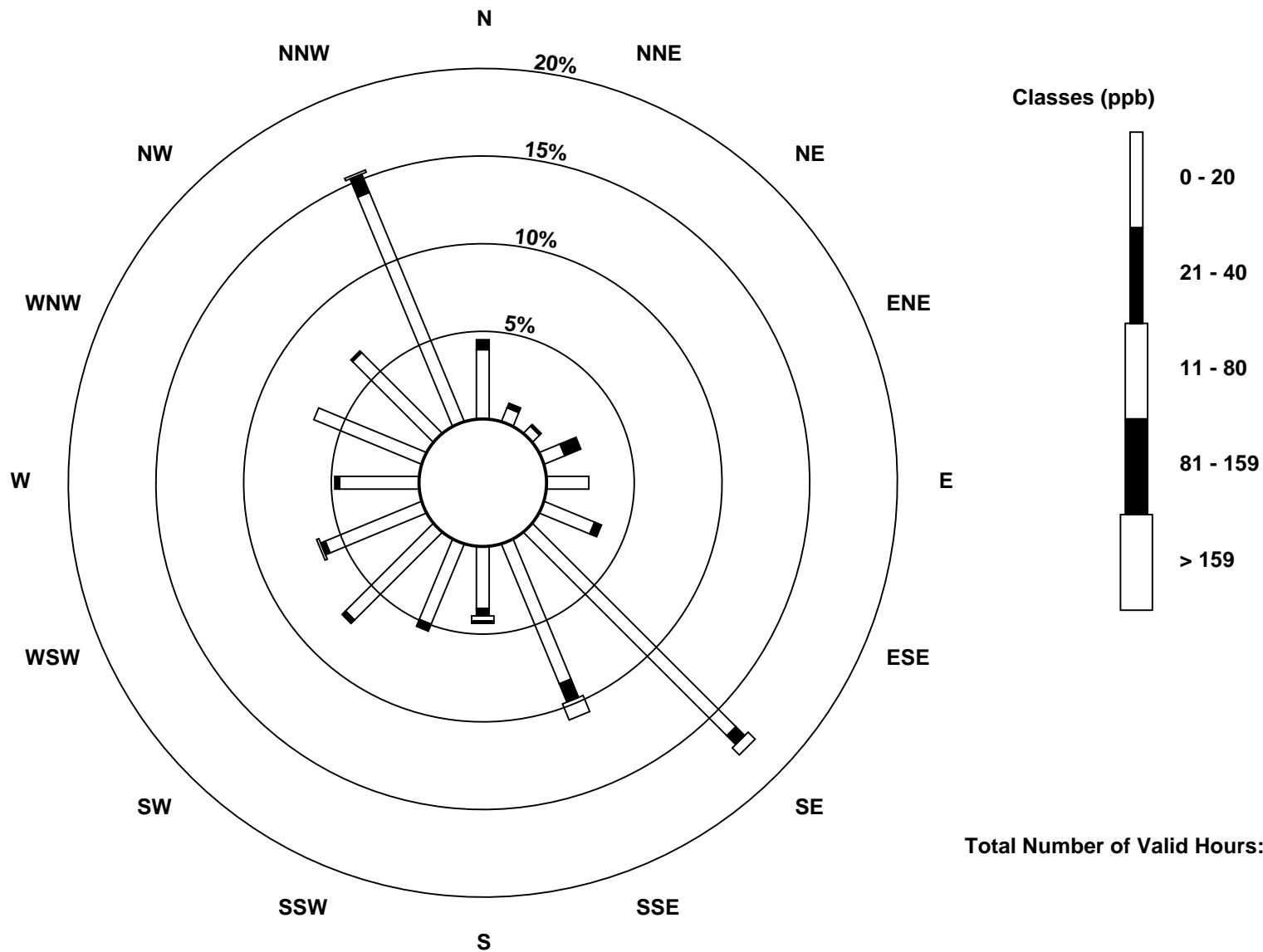
Total Number of Valid Hours: 707

Total Number of Hours: 744

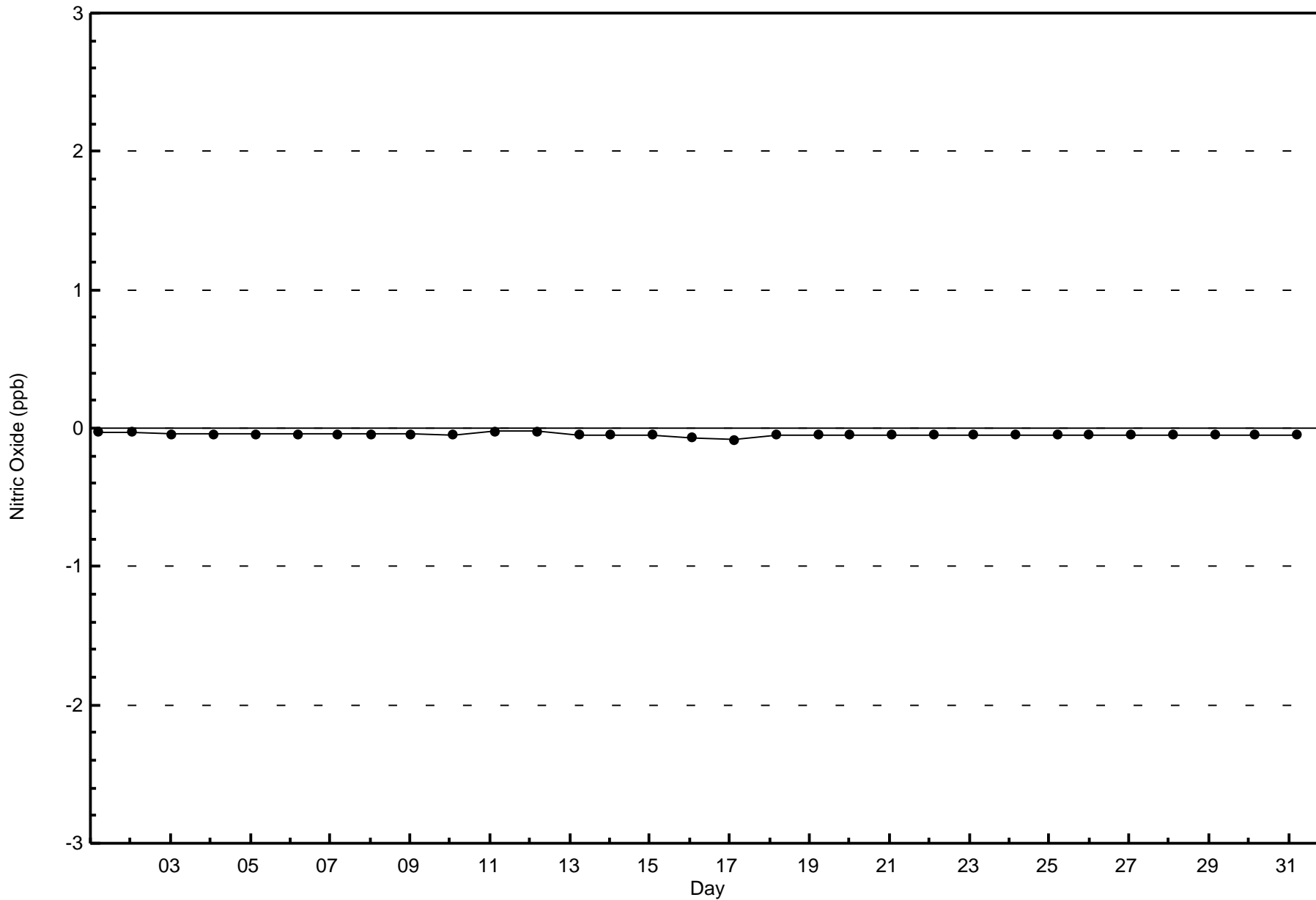


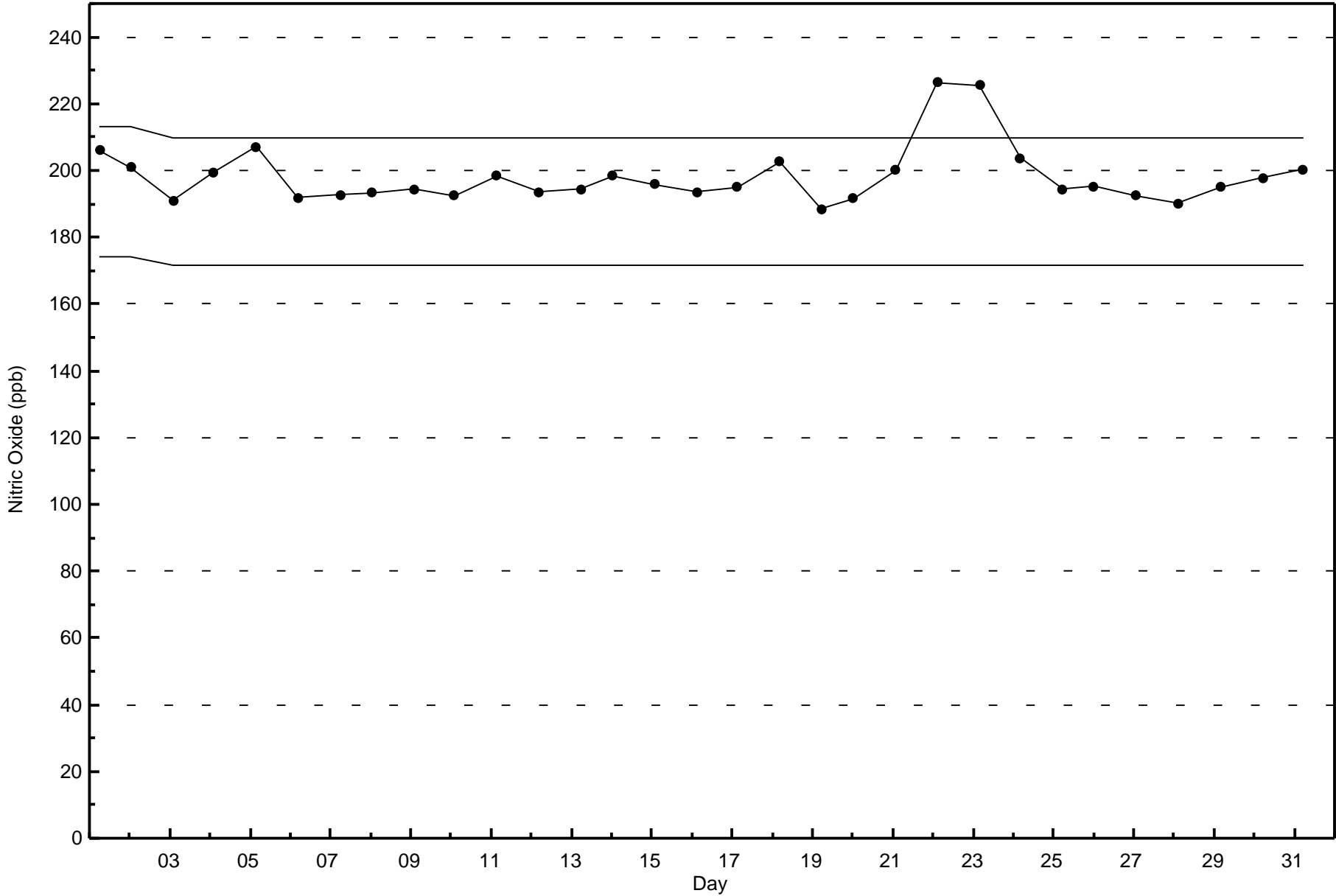
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitric Oxide (NO) - ppb
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 707







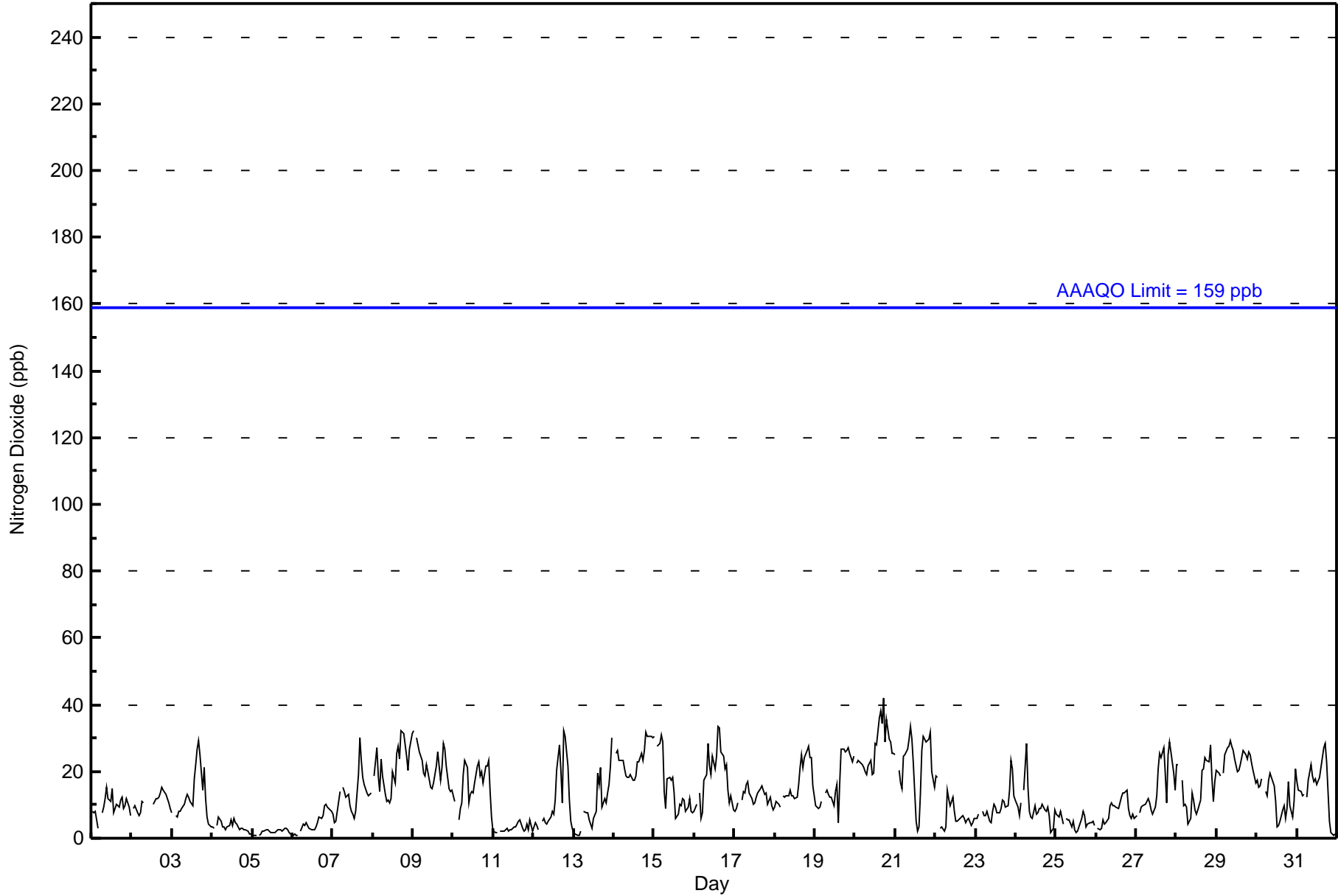
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Athabasca Valley - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 42 ppb on Dec 20 18:00 Maximum Daily Average: 26.8 ppb on Dec 20																		Hours in Service: 744 Hours of Data: 708 Hours of Missing Data: 36 Hours of Calibration: 36 Percent Operational Time: 100.0								
Minimum Value: 1 ppb on Dec 5 02:00 Minimum Daily Average: 2.0 ppb on Dec 5 Maximum Diurnal Average: 17.7 ppb at hour 17 Minimum Diurnal Average: 10.2 ppb at hour 2 Monthly Average: 13.3 ppb Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 6 Median = 12 Q ₃ = 20 P ₉₀ = 26 P ₉₉ = 33																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	8	8	8	6	3	Z	8	10	12	15	12	11	15	8	9	10	9	11	12	9	10	12	9	7	9.6	15
2-Dec	Z	9	10	8	7	8	11	10	C	C	C	C	C	10	12	12	12	14	15	14	13	12	11	9	10.9	15
3-Dec	8	Z	7	6	8	8	9	10	12	13	12	11	10	18	22	27	29	25	14	21	12	7	4	3	12.9	29
4-Dec	3	3	Z	4	6	5	3	3	3	3	4	6	4	6	5	4	3	3	3	2	3	2	1	1	3.5	6
5-Dec	1	1	1	Z	1	1	2	2	2	2	2	2	2	2	2	3	3	3	2	3	3	3	2	1	2.0	3
6-Dec	1	1	1	1	Z	2	4	4	5	4	3	3	3	3	3	5	6	6	7	10	10	10	8	8	4.6	10
7-Dec	7	5	5	8	14	Z	15	14	12	13	10	8	7	6	8	19	30	23	18	16	13	13	13	14	12.7	30
8-Dec	Z	19	27	19	14	24	19	13	11	11	11	12	20	17	26	27	24	32	31	28	24	20	27	32	21.2	32
9-Dec	32	Z	30	28	26	23	20	19	22	20	15	15	17	19	22	26	17	21	28	27	21	15	14	14	21.3	32
10-Dec	13	11	Z	6	9	11	19	23	21	11	13	14	14	17	21	23	19	20	16	22	22	23	14	6	16.0	23
11-Dec	2	2	2	Z	2	2	2	3	3	2	3	3	3	3	4	5	5	3	2	3	4	3	5	2	3.0	5
12-Dec	3	5	4	3	Z	5	6	5	4	5	6	8	7	12	20	28	20	11	32	31	22	11	5	3	11.1	32
13-Dec	2	1	1	1	2	Z	8	8	8	5	4	3	6	8	20	16	21	9	12	11	14	16	22	30	9.9	30
14-Dec	Z	26	26	23	24	23	21	19	18	18	19	18	18	19	23	23	25	23	26	32	30	31	30	30	23.7	32
15-Dec	30	Z	27	28	31	29	14	9	18	18	17	18	13	6	7	10	10	12	11	8	10	12	8	8	15.4	31
16-Dec	8	10	Z	13	6	8	17	19	29	22	19	25	21	25	34	33	26	25	21	22	15	10	13	9	18.6	34
17-Dec	8	9	10	Z	12	14	13	16	17	14	12	10	11	12	14	15	16	15	13	13	10	12	10	8	12.3	17
18-Dec	9	11	10	10	Z	13	12	13	13	14	13	13	12	12	16	21	25	21	24	26	28	24	24	16	16.5	28
19-Dec	10	9	9	9	11	Z	13	14	13	12	12	10	14	16	5	17	27	27	26	26	27	25	23	25	16.5	27
20-Dec	Z	23	24	23	22	21	20	19	22	23	19	19	29	28	36	38	34	42	29	36	30	29	26	26	26.8	42
21-Dec	25	Z	20	17	15	25	25	27	30	34	30	22	5	2	3	13	26	31	29	29	30	32	20	15	21.9	34
22-Dec	19	18	Z	3	3	2	3	14	12	10	12	8	5	5	5	6	7	6	5	5	6	4	5	6	7.3	19
23-Dec	6	6	7	Z	8	7	7	8	5	5	8	10	9	8	8	9	12	11	10	10	15	23	21	13	9.7	23
24-Dec	12	9	7	11	Z	14	28	15	8	6	6	10	7	8	9	10	9	8	9	7	2	3	9	9	9.4	28
25-Dec	7	7	6	8	4	Z	6	5	6	3	5	3	2	2	3	6	8	7	3	4	5	5	5	4	5.0	8
26-Dec	Z	3	3	3	5	4	5	6	10	11	10	10	10	9	11	12	14	14	15	9	7	6	7	6	8.1	15
27-Dec	7	Z	8	9	10	10	11	12	11	8	7	10	13	21	26	24	27	20	10	25	29	26	19	14	15.5	29
28-Dec	22	22	Z	17	10	10	9	4	6	13	12	9	7	8	11	20	21	24	23	23	28	18	11	17	15.1	28
29-Dec	20	20	19	Z	20	25	27	28	29	27	26	24	20	20	22	24	26	25	24	26	25	22	21	16	23.3	29
30-Dec	17	15	16	18	Z	14	13	17	20	18	16	11	3	4	5	9	10	6	9	17	10	6	11	21	12.4	21
31-Dec	17	15	14	13	13	Z	12	17	22	19	17	18	16	18	21	24	27	28	23	5	2	1	1	1	15.0	28
																								Diurnal Average		
																								Diurnal Maximum		
11.5 10.2 11.6 11.3 11.0 12.3 12.3 12.5 13.4 12.7 11.8 11.4 10.7 11.3 13.9 16.7 17.7 16.9 16.2 16.8 15.5 14.0 12.7 12.0 32 26 30 28 31 29 28 28 30 34 30 25 29 28 36 38 34 42 32 36 30 32 30 32																										
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	544	76.84	76.84
21 - 40	163	23.02	99.86
41 - 80	1	0.14	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	22	4	3	7	8	11	99	50	19	34	46	41	28	41	44	87	544
21 - 40	10	4	2	9	9	14	26	26	11	4	6	4	6	6	3	22	162
11 - 80	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	25	125	76	31	38	52	45	34	47	47	109	707

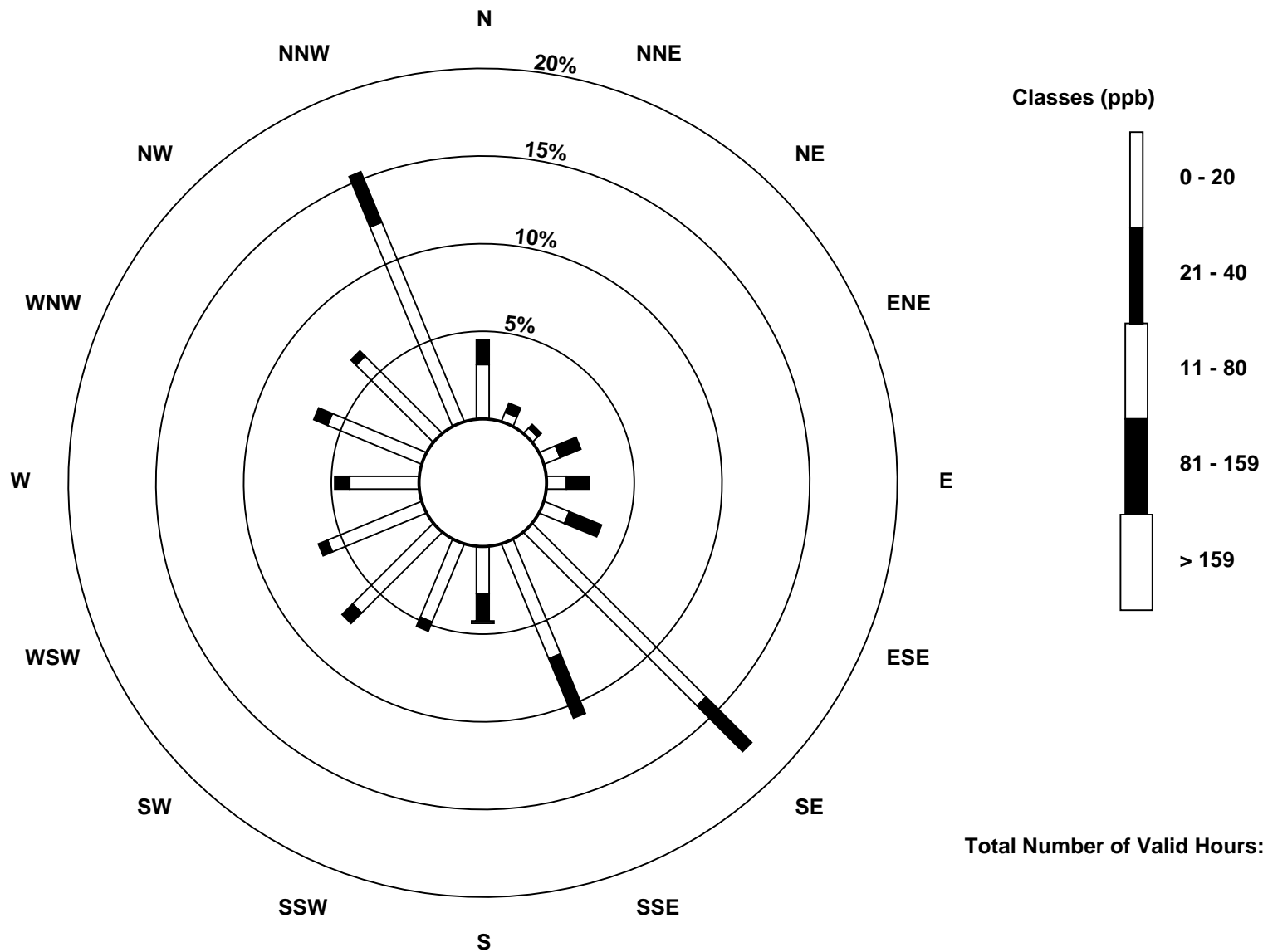
Total Number of Valid Hours: 707

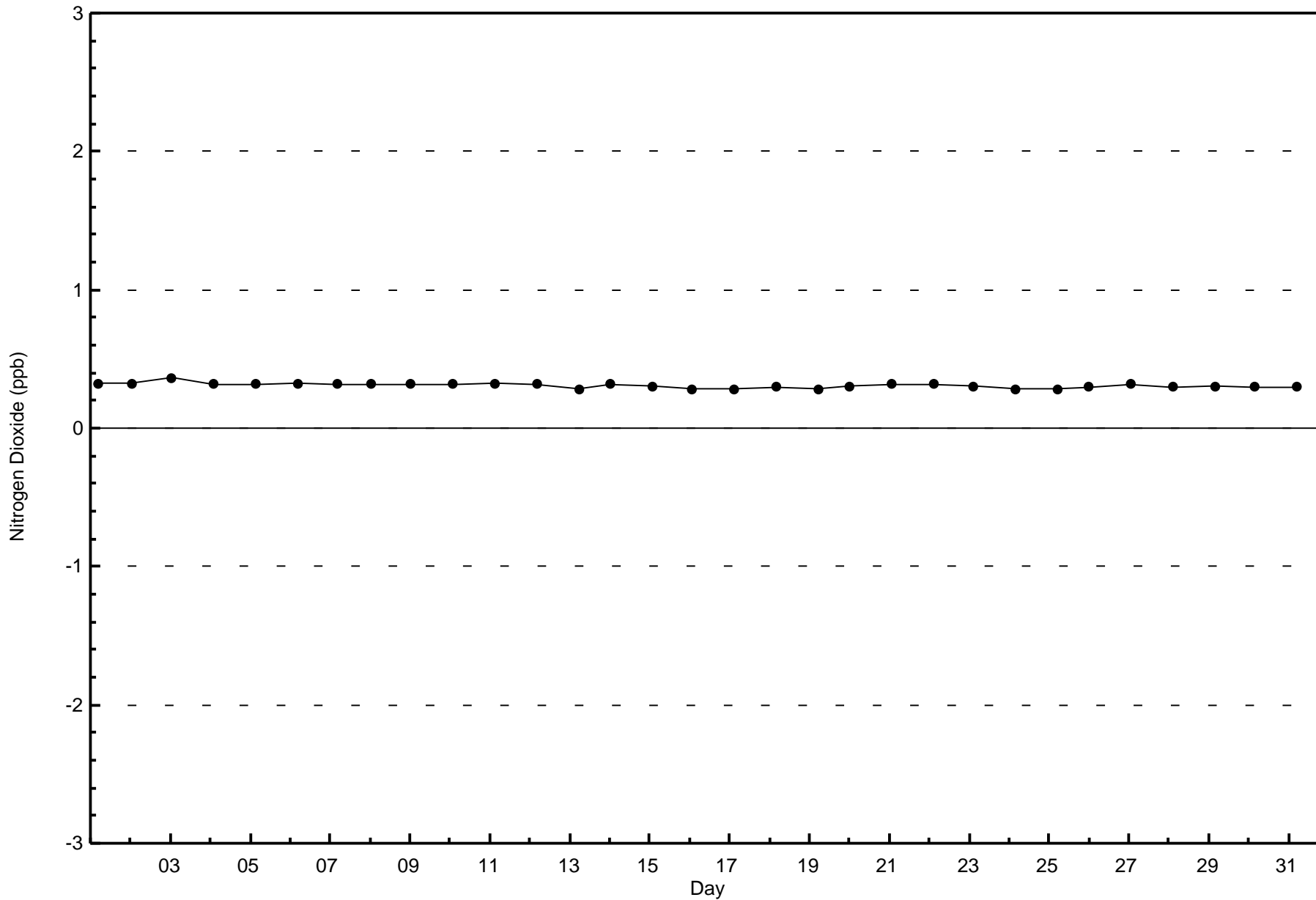
Total Number of Hours: 744

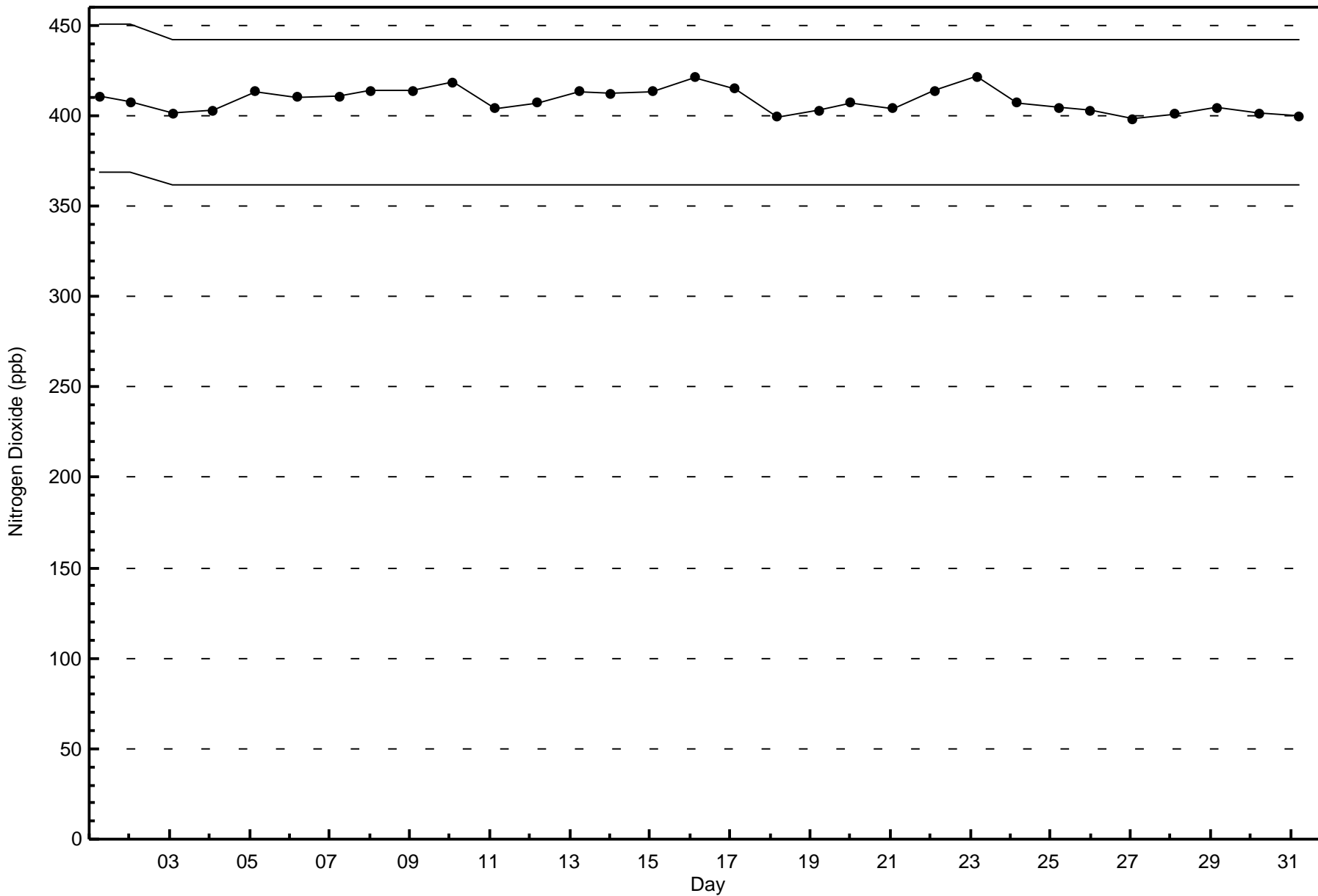


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley (AMS 7)





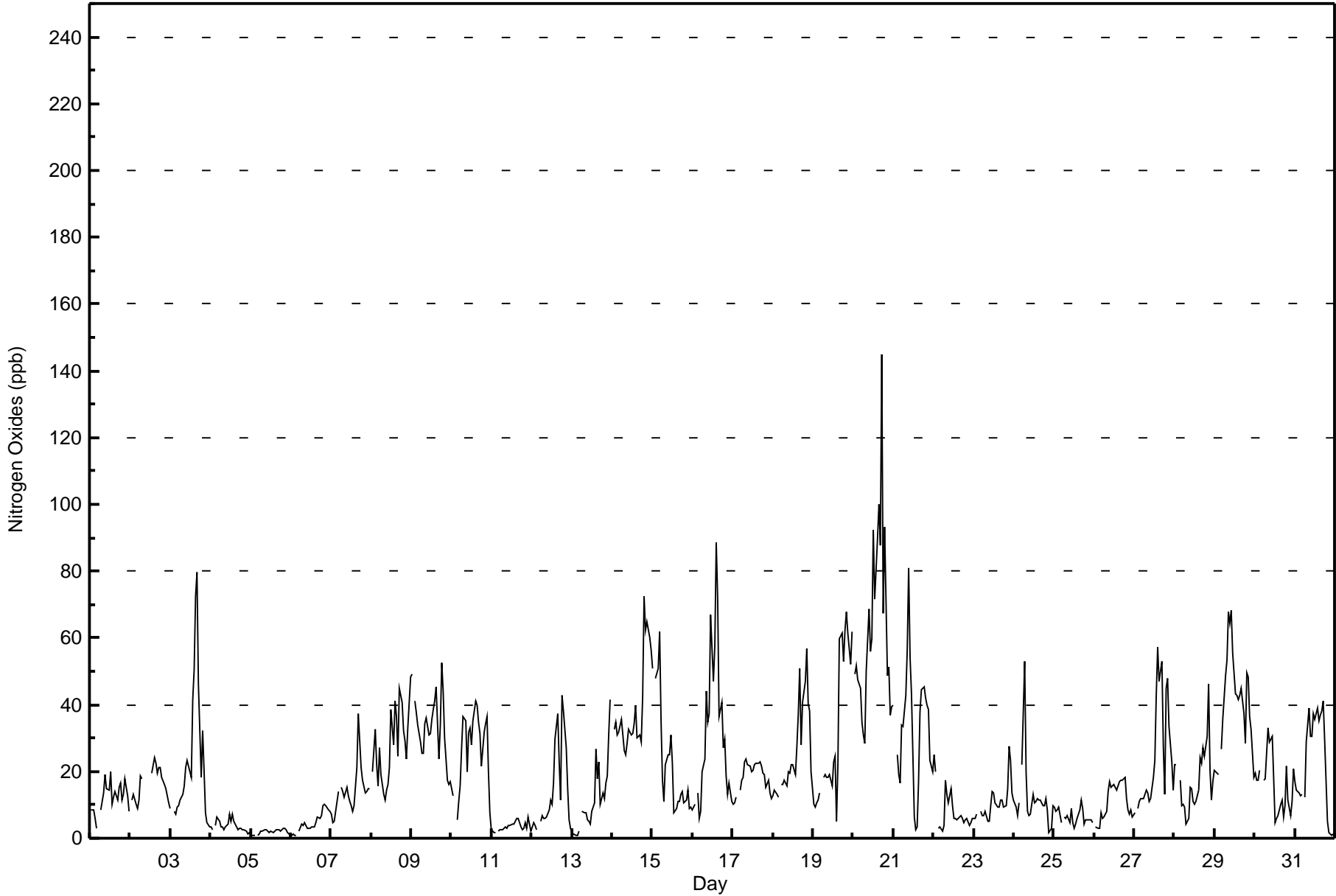




Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - December 2016

Maximum Value: 145 ppb on Dec 20 18:00		Maximum Daily Average: 62.8 ppb on Dec 20		Hours in Service: 744																																													
Minimum Value: 1 ppb on Dec 31 23:00		Minimum Daily Average: 2.0 ppb on Dec 5		Hours of Data: 708																																													
Maximum Diurnal Average: 27.7 ppb at hour 17		Minimum Diurnal Average: 12.2 ppb at hour 2		Hours of Missing Data: 36																																													
Monthly Average: 20.3 ppb		Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 7 Median = 15 Q ₃ = 29 P ₉₀ = 45 P ₉₉ = 87		Hours of Calibration: 36																																													
				Percent Operational Time: 100.0																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	9	9	9	6	3	Z	8	11	14	19	15	15	20	10	12	14	11	15	16	11	13	18	13	8	12.1	20																							
2-Dec	Z	11	13	10	9	12	19	18	C	C	C	C	C	20	24	22	20	21	21	18	16	15	13	10	16.2	24																							
3-Dec	9	Z	8	7	9	10	11	13	16	21	23	22	18	42	51	73	80	46	18	32	20	8	5	3	23.7	80																							
4-Dec	3	3	Z	4	6	5	3	3	3	4	7	5	7	5	4	3	3	3	2	3	2	1	1	1	3.7	7																							
5-Dec	1	1	1	Z	1	1	2	2	2	2	2	2	2	2	2	3	3	2	3	3	3	2	1	2.0	3																								
6-Dec	1	1	1	1	Z	2	4	4	5	4	3	3	3	3	5	6	6	7	10	10	10	8	8	4.7	10																								
7-Dec	7	4	5	8	14	Z	15	14	12	15	13	11	10	8	10	21	37	29	21	17	14	14	15	15	14.3	37																							
8-Dec	Z	20	33	22	16	27	19	13	11	14	16	21	39	28	41	36	24	45	40	32	29	24	33	48	27.5	48																							
9-Dec	49	Z	41	38	34	29	26	25	34	36	31	31	36	39	41	45	24	34	52	44	30	18	16	17	33.5	52																							
10-Dec	15	13	Z	6	11	15	27	36	35	20	32	33	28	35	41	40	35	32	22	32	34	37	20	8	26.3	41																							
11-Dec	3	2	2	Z	2	2	2	3	4	3	4	4	4	4	5	6	6	3	3	3	5	3	7	2	3.5	7																							
12-Dec	3	5	4	3	Z	5	7	6	6	6	8	11	10	16	29	37	23	12	43	38	27	15	6	3	14.1	43																							
13-Dec	2	1	1	1	2	Z	8	8	8	5	5	4	8	10	26	18	23	10	14	12	16	19	31	42	11.9	42																							
14-Dec	Z	33	35	31	32	35	31	26	25	28	33	31	31	34	40	30	31	29	42	72	62	65	60	56	38.8	72																							
15-Dec	51	Z	48	51	62	35	17	11	22	25	25	31	22	8	9	11	11	13	14	11	14	9	9	22.7	62																								
16-Dec	8	10	Z	14	6	8	20	24	44	35	37	67	47	57	89	72	37	41	27	30	19	13	17	11	31.8	89																							
17-Dec	10	11	12	Z	14	17	18	23	24	22	21	20	20	22	22	23	21	19	19	15	17	13	12	12	18.3	24																							
18-Dec	13	14	13	12	Z	16	16	17	16	20	19	22	22	19	28	37	51	28	41	47	57	40	38	20	26.3	57																							
19-Dec	10	9	11	12	14	Z	18	19	18	18	19	16	23	24	5	22	60	61	53	62	68	61	52	62	31.2	68																							
20-Dec	Z	49	52	47	45	35	31	28	50	69	56	60	92	71	90	100	88	145	67	93	49	51	37	39	62.8	145																							
21-Dec	40	Z	25	19	17	34	34	43	56	81	54	43	6	2	3	17	38	45	45	42	40	38	23	20	33.3	81																							
22-Dec	25	20	Z	3	3	2	4	18	13	11	15	10	6	6	6	6	7	6	5	5	6	4	5	6	8.2	25																							
23-Dec	6	6	7	Z	8	7	7	8	5	5	10	14	14	10	9	9	12	11	10	10	15	28	23	13	10.7	28																							
24-Dec	11	9	7	11	Z	22	53	20	8	7	7	13	11	11	12	11	12	10	10	12	9	2	3	10	12.1	53																							
25-Dec	9	8	8	9	5	Z	7	6	7	5	9	5	3	4	6	8	11	9	4	5	6	5	6	5	6.5	11																							
26-Dec	Z	3	3	3	7	6	7	8	14	17	15	16	16	15	16	17	18	17	18	12	8	7	8	6	11.2	18																							
27-Dec	8	Z	9	11	12	12	13	15	14	11	12	18	23	43	57	47	53	28	13	45	48	34	23	14	24.4	57																							
28-Dec	22	22	Z	17	10	10	9	4	6	15	15	11	10	11	15	24	23	27	25	31	46	20	11	17	17.5	46																							
29-Dec	20	20	19	Z	27	35	49	53	68	64	68	55	43	43	42	43	45	37	28	50	48	36	33	18	41.1	68																							
30-Dec	20	17	17	21	Z	17	18	26	33	29	30	18	5	6	7	10	11	6	10	22	11	7	11	21	16.2	33																							
31-Dec	17	14	14	13	13	Z	12	29	39	30	30	37	36	39	35	37	38	41	30	5	2	1	1	1	22.4	41																							
																								14.3	12.2	15.2	14.5	14.7	16.0	16.6	17.2	20.4	21.4	21.1	21.7	20.4	21.0	25.2	27.4	27.7	26.9	23.3	26.7	23.9	20.3	17.5	16.4	Diurnal Average	
																								51	49	52	51	62	35	53	53	68	81	68	67	92	71	90	100	88	145	67	93	68	65	60	62	Diurnal Maximum	
Z - zerospan		C - Calibration																																															





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	453	63.98	63.98
21 - 40	161	22.74	86.72
41 - 80	86	12.15	98.87
81 - 159	7	0.99	99.86
> 159	0	0.00	99.86

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	18	3	2	2	7	7	68	35	13	30	45	40	25	39	39	80	453
21 - 40	8	3	2	5	7	12	44	22	9	5	4	1	7	5	6	20	160
11 - 80	6	2	1	9	3	6	11	15	7	3	3	4	2	3	2	9	86
81 - 159	0	0	0	0	0	0	2	3	2	0	0	0	0	0	0	0	7
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	25	125	75	31	38	52	45	34	47	47	109	706

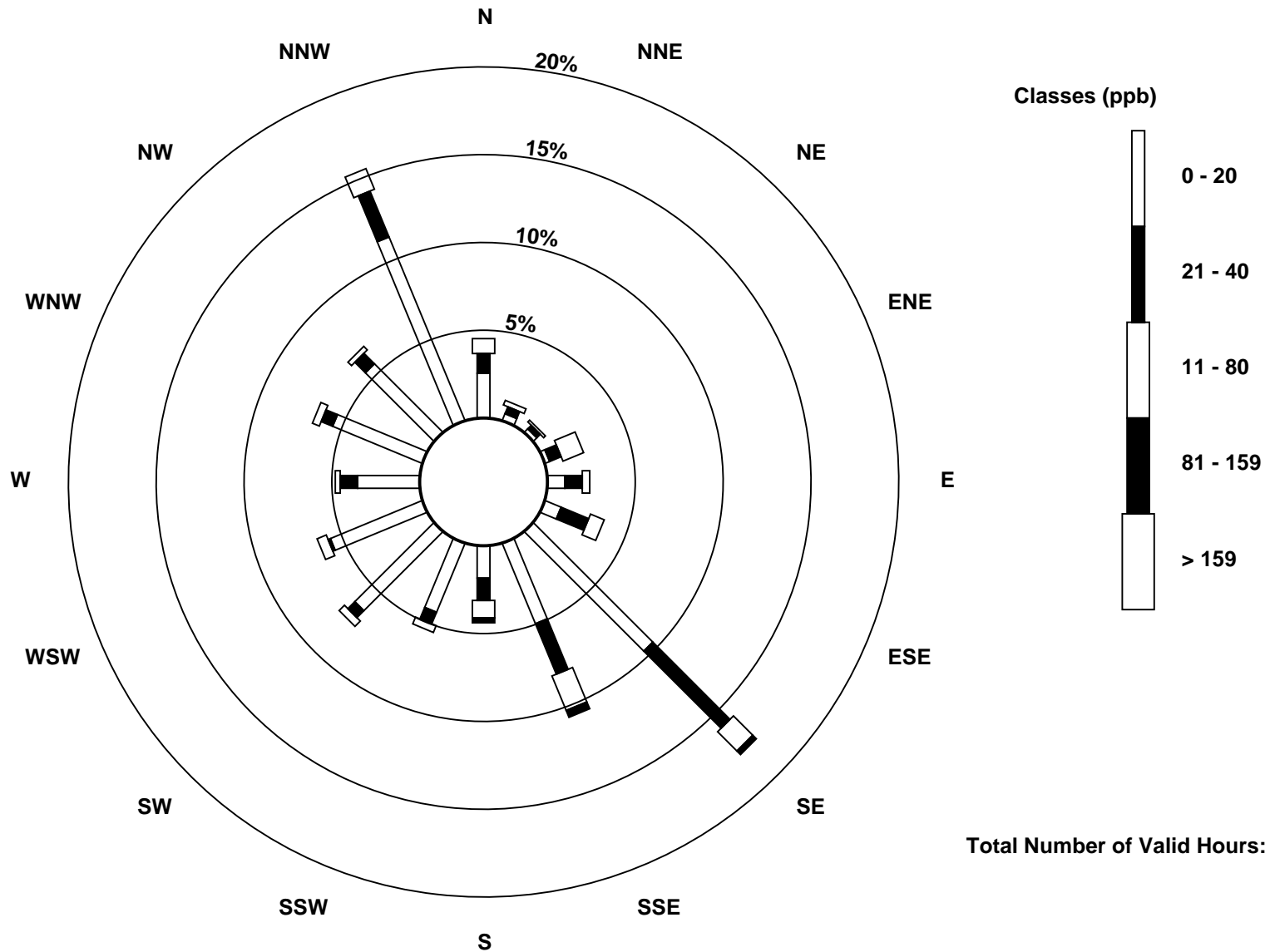
Total Number of Valid Hours: 707

Total Number of Hours: 744

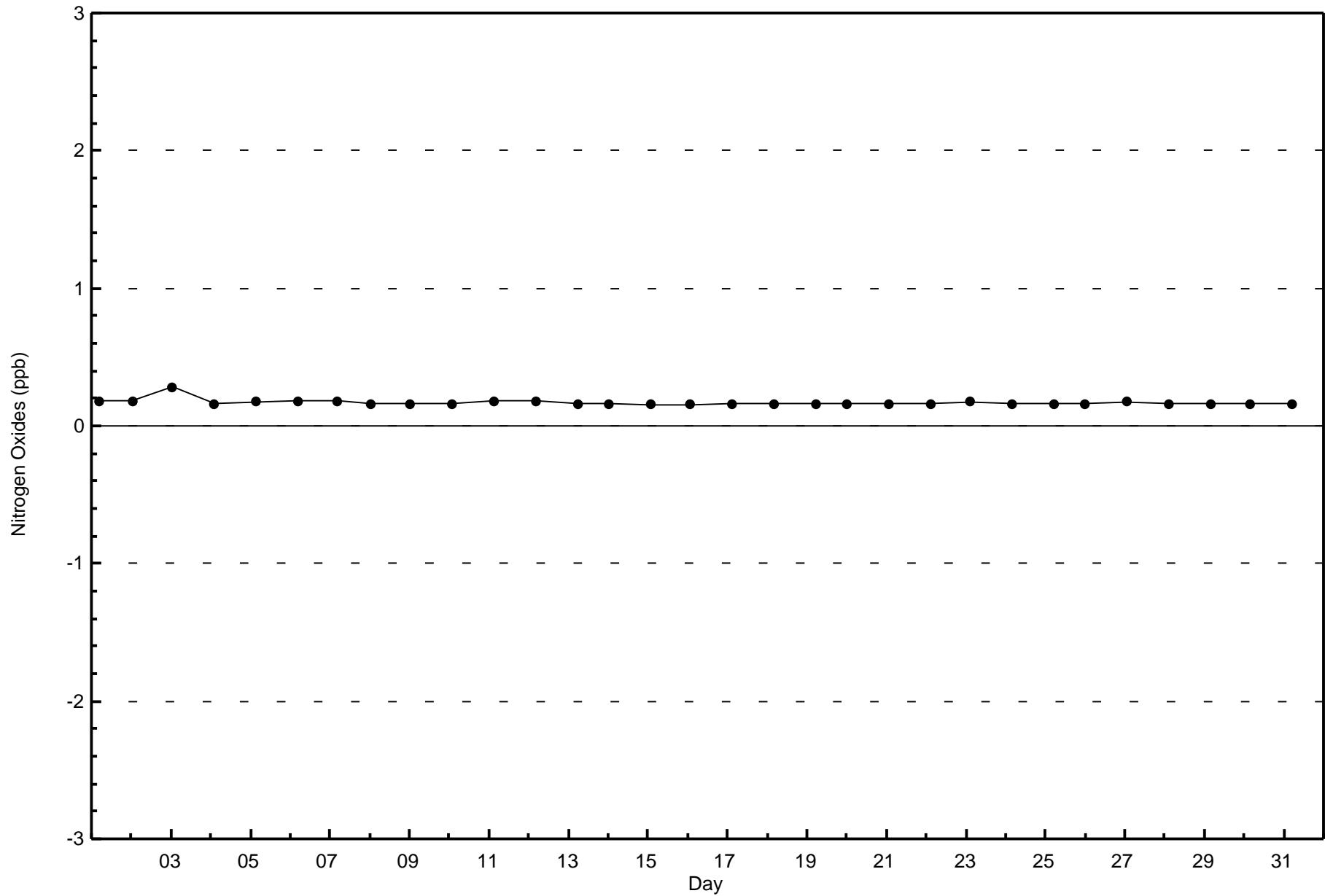


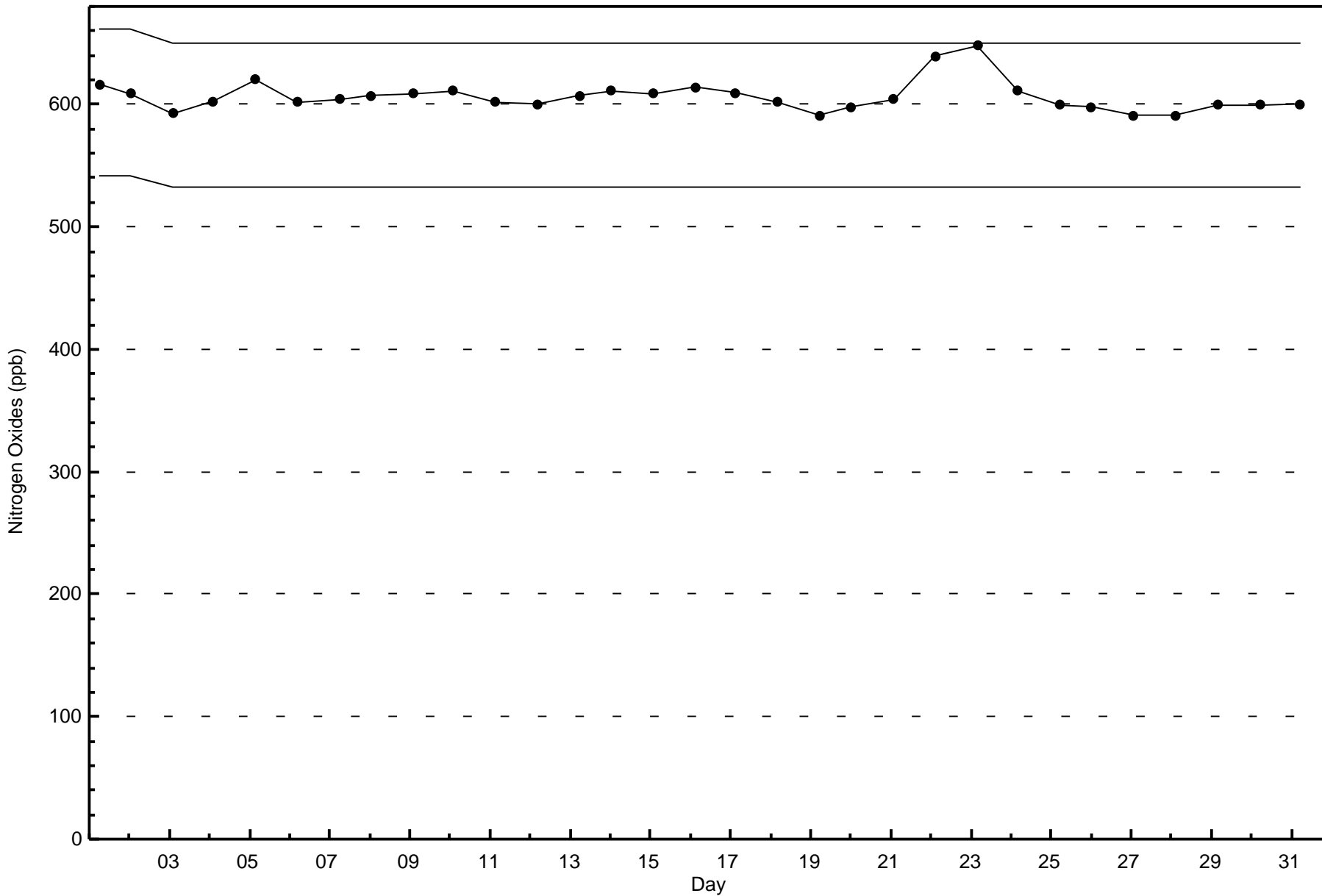
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 707





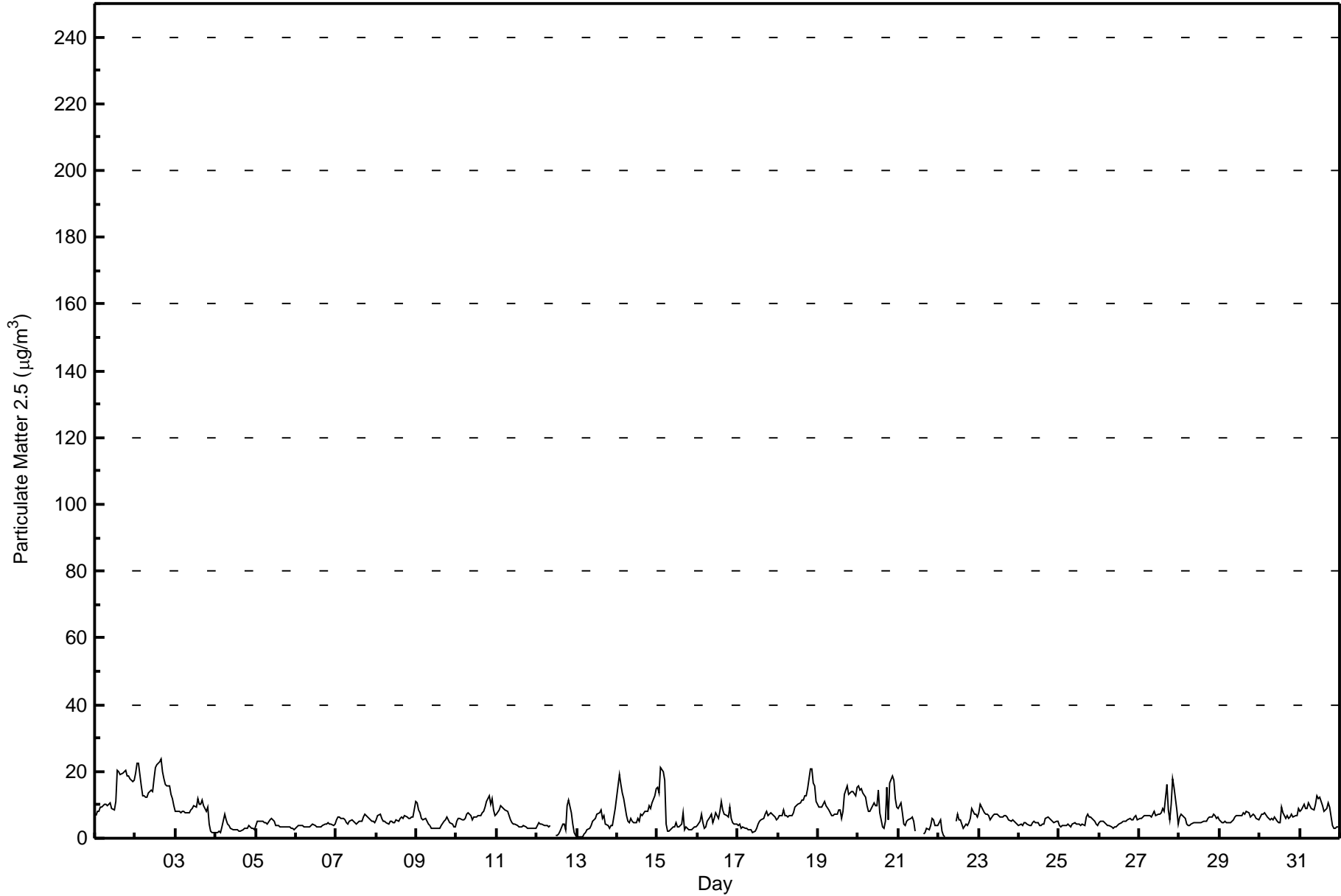


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 23.6 µg/m ³ on Dec 2 16:00 Minimum Value: 0.2 µg/m ³ on Dec 13 04:00 Maximum Diurnal Average: 8.0 µg/m ³ at hour 20 Monthly Average: 6.78 µg/m ³		Maximum Daily Average: 16.6 µg/m ³ on Dec 2 Minimum Daily Average: 3.0 µg/m ³ on Dec 4 Minimum Diurnal Average: 5.3 µg/m ³ at hour 8 Percentiles: P ₁ = 0.8 P ₁₀ = 3.1 Q ₁ = 4.1 Median = 5.8 Q ₃ = 8.0 P ₉₀ = 12.2 P ₉₉ = 20.9		Hours in Service: 744 Hours of Data: 734 Hours of Missing Data: 10 Hours of Calibration: 2 Percent Operational Time: 98.9																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	6.9	8.1	8.2	9.3	9.5	10.0	10.3	9.8	10.3	10.6	8.9	8.6	11.0	20.2	19.8	19.0	19.4	20.0	20.4	18.7	18.4	17.7	16.9	17.2	13.7	20.4
2-Dec	19.4	22.6	22.5	15.8	12.8	12.7	12.2	12.1	13.7	14.2	13.8	17.7	21.1	22.0	22.8	23.6	19.9	17.6	16.1	15.7	15.7	13.3	12.0	9.9	16.6	23.6
3-Dec	8.1	8.0	7.8	7.8	8.1	8.1	7.8	7.5	7.7	8.4	8.9	9.6	9.3	11.9	10.3	10.4	11.3	9.9	8.2	9.4	4.2	2.2	1.8	1.6	7.8	11.9
4-Dec	1.7	1.7	1.9	1.9	3.4	7.3	5.4	4.1	3.9	3.1	2.6	2.6	2.5	2.6	2.3	2.2	2.5	2.9	3.0	3.0	3.7	3.1	2.8	2.6	3.0	7.3
5-Dec	3.9	5.0	4.9	4.9	5.0	4.5	4.5	4.2	5.5	6.0	5.5	5.0	3.9	3.6	3.6	3.5	3.4	3.2	3.3	3.4	3.4	3.0	2.8	2.6	4.1	6.0
6-Dec	3.2	3.7	3.9	3.8	3.7	3.5	3.4	3.2	3.5	3.9	4.1	3.8	3.3	3.3	3.3	3.2	3.8	4.4	4.3	4.6	4.2	4.1	3.9	4.1	3.7	4.6
7-Dec	5.6	6.3	6.3	6.0	5.7	5.3	4.8	4.4	5.0	5.6	4.9	4.5	4.4	4.9	5.2	5.2	6.2	7.0	6.8	6.3	5.6	5.0	5.1	4.7	5.5	7.0
8-Dec	5.7	6.6	7.3	6.0	5.2	5.1	4.7	4.1	4.9	5.1	4.7	4.5	5.5	5.2	6.1	6.5	6.0	6.9	6.5	6.1	6.1	6.4	6.4	11.1	5.9	11.1
9-Dec	10.5	8.5	7.4	6.1	5.6	6.1	5.2	4.1	3.8	3.1	2.9	3.1	3.0	2.9	3.1	3.9	5.1	5.4	6.3	5.4	4.7	4.1	3.6	3.3	4.9	10.5
10-Dec	5.0	6.1	5.9	5.7	5.7	6.1	7.1	7.5	6.8	5.6	6.3	6.4	6.4	6.7	6.7	7.7	8.2	9.4	10.8	12.8	10.0	12.1	8.3	6.7	7.5	12.8
11-Dec	7.2	8.4	9.6	9.5	9.0	8.6	8.0	6.8	5.4	4.8	4.4	4.1	3.7	3.5	3.6	3.5	3.7	3.2	3.0	3.0	3.0	2.9	2.8	2.9	5.2	9.6
12-Dec	3.9	4.5	4.3	4.1	3.9	3.9	3.7	3.5	3.9	C	C	1.0	0.7	1.3	2.2	4.3	4.4	2.4	9.6	11.4	7.6	4.2	1.6	0.9	4.0	11.4
13-Dec	0.6	0.5	0.3	0.2	1.3	1.7	2.5	3.1	3.7	5.0	5.6	6.1	7.2	7.5	8.5	5.9	6.8	4.3	3.7	3.1	3.6	3.7	6.3	8.9	4.2	8.9
14-Dec	15.7	19.2	16.1	13.6	11.9	6.8	5.1	4.6	5.9	5.0	4.8	4.7	5.9	5.3	7.3	6.9	7.9	8.2	8.2	9.5	8.8	10.6	12.9	15.0	9.2	19.2
15-Dec	15.2	13.4	21.0	19.8	17.5	4.2	2.3	2.0	2.5	3.5	3.3	4.8	3.2	3.3	4.0	7.8	2.6	3.6	3.2	2.6	2.5	3.1	3.4	3.2	6.3	21.0
16-Dec	4.0	5.0	7.1	4.7	2.9	3.4	4.9	6.2	7.3	4.8	5.7	7.4	5.8	8.0	10.9	8.5	7.4	6.7	6.3	9.1	5.8	4.7	4.3	4.2	6.0	10.9
17-Dec	3.9	4.0	3.2	3.5	3.1	2.9	2.6	2.6	2.4	1.9	2.0	2.9	4.1	5.2	5.4	6.1	7.4	7.9	6.7	7.3	7.4	6.8	6.2	5.6	4.6	7.9
18-Dec	5.9	6.8	6.9	8.3	6.9	6.9	6.5	6.9	6.7	7.7	9.3	9.5	10.2	10.6	11.6	11.5	12.8	12.6	14.9	20.8	21.0	16.6	15.6	10.9	10.7	21.0
19-Dec	9.2	9.2	9.4	10.0	11.1	9.9	8.5	7.7	6.9	6.7	7.0	7.3	8.6	8.5	6.0	7.9	13.0	15.7	13.0	13.4	14.0	14.1	12.8	15.2	10.2	15.7
20-Dec	15.7	14.5	14.8	13.7	12.4	9.5	8.2	8.2	9.1	10.5	9.8	9.7	14.6	7.5	3.2	3.1	5.1	15.1	5.6	16.5	18.7	17.4	12.0	9.2	11.0	18.7
21-Dec	8.8	10.5	7.6	4.4	3.8	4.9	5.5	5.8	6.2	5.2	2.1	UO	UO	UO	UO	1.2	1.9	2.9	2.6	4.0	6.0	5.5	3.7	3.7	4.8	10.5
22-Dec	4.5	5.7	2.3	0.8	0.4	UO	UO	0.8	UO	M	5.3	7.1	5.5	5.5	4.1	3.0	4.1	4.0	4.5	5.9	9.1	7.2	7.2	6.3	4.7	9.1
23-Dec	7.5	10.0	9.4	7.8	7.3	7.3	6.7	5.6	6.6	7.3	7.3	7.2	6.8	6.3	6.2	6.8	6.6	6.5	5.3	5.2	5.4	5.3	4.8	4.3	6.7	10.0
24-Dec	4.0	4.1	3.9	4.6	4.5	4.2	3.8	3.8	4.6	5.0	4.6	4.8	4.0	3.8	4.3	4.4	5.8	6.5	5.9	5.7	5.0	4.6	5.1	5.1	4.7	6.5
25-Dec	3.6	3.6	3.6	3.7	3.9	4.2	4.0	3.6	4.1	4.5	4.3	4.1	4.1	3.9	4.2	4.0	6.3	7.1	6.5	6.2	5.4	5.1	4.4	4.0	4.5	7.1
26-Dec	4.6	5.3	4.9	4.6	4.4	3.9	3.7	3.6	3.1	3.2	3.5	3.9	4.3	4.6	4.9	4.9	5.1	5.6	6.0	5.7	5.3	6.2	6.9	5.5	4.7	6.9
27-Dec	5.7	6.1	6.2	6.8	6.9	6.7	6.6	6.3	7.2	7.9	7.0	7.1	7.0	7.6	8.8	8.0	16.0	8.4	5.6	10.0	17.7	15.3	8.4	4.3	8.2	17.7
28-Dec	6.3	7.3	6.9	6.0	4.1	3.9	3.8	4.0	4.5	4.9	4.8	4.6	4.6	4.7	5.1	5.3	5.2	6.1	6.5	6.5	7.1	7.0	5.8	6.3	5.5	7.3
29-Dec	5.5	4.8	4.8	5.0	4.5	4.7	4.8	4.9	5.6	6.5	6.9	6.9	6.7	7.0	7.7	7.4	7.9	7.8	6.5	6.9	7.3	6.6	6.1	5.4	6.2	7.9
30-Dec	6.4	7.0	7.0	7.6	6.4	6.1	5.6	5.8	5.6	6.5	5.3	4.7	4.5	9.2	7.8	5.9	6.8	6.1	6.3	7.2	6.4	6.6	6.9	8.7	6.5	9.2
31-Dec	8.2	8.5	10.2	9.0	8.9	10.7	9.7	8.7	8.6	10.0	12.8	11.7	12.3	9.9	8.0	8.4	8.8	10.7	9.1	4.0	3.0	3.1	3.2	3.4	8.4	12.8
																								Diurnal Average		
7.0 7.6 7.6 6.9 6.4 6.1 5.7 5.3 5.8 6.1 6.0 6.2 6.5 6.9 6.9 6.8 7.5 7.7 7.2 8.0 7.9 7.3 6.6 6.4																								Diurnal Maximum		
19.4 22.6 22.5 19.8 17.5 12.7 12.2 12.1 13.7 14.2 13.8 17.7 21.1 22.0 22.8 23.6 19.9 20.0 20.4 20.8 21.0 17.7 16.9 17.2																										
C - Calibration M - Maintenance UO - Unstable Operation Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - December 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	325	44.28	44.28
6 - 15	357	48.64	92.92
16 - 25	42	5.72	98.64
26 - 80	0	0.00	98.64
> 81.0	0	0.00	98.64

Total Number of Valid Hours: 734

Total Number of Hours: 744



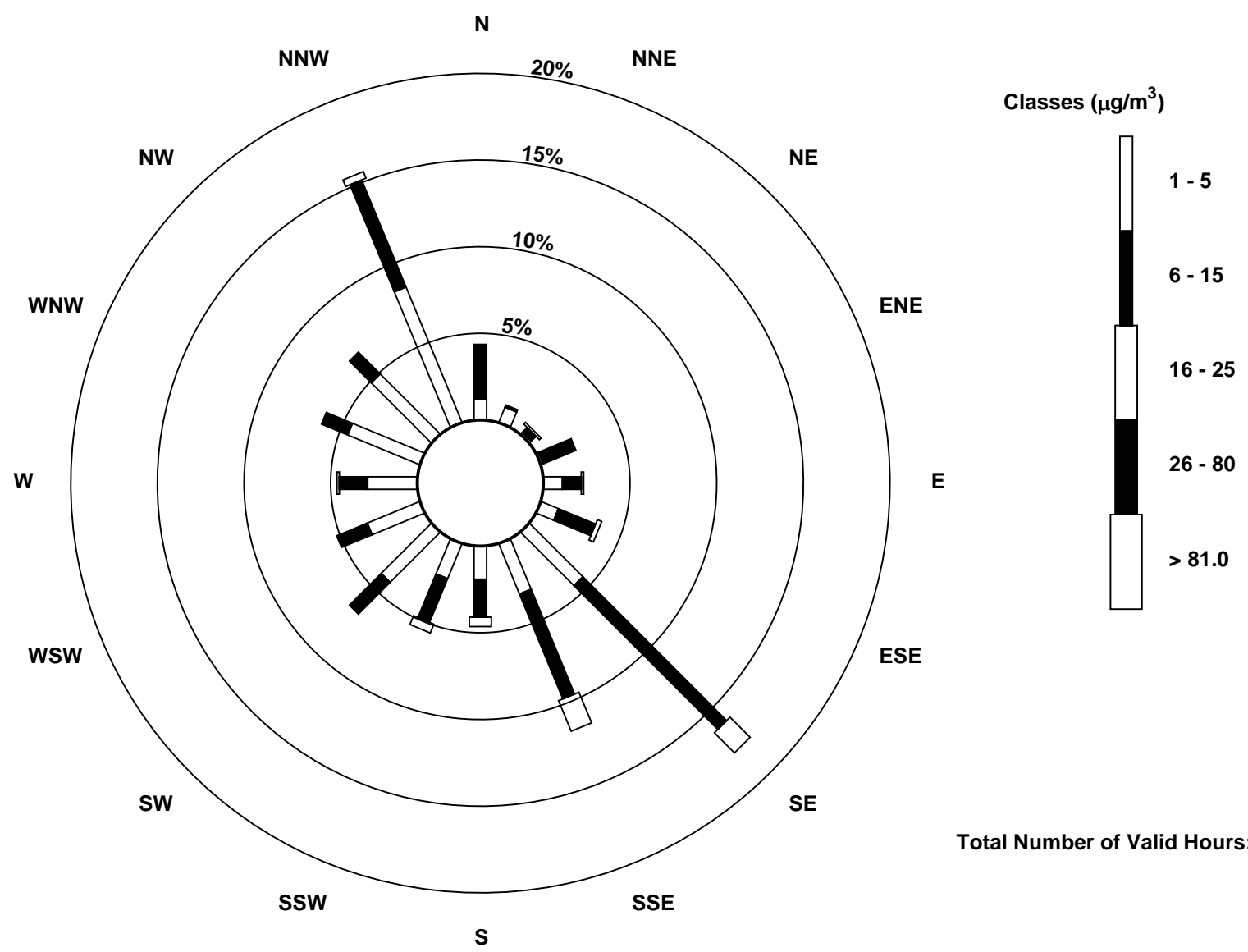
**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - December 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	9	7	1	1	8	8	32	23	14	16	30	24	21	33	36	62	325
6 - 15	23	1	3	15	8	17	86	48	16	20	19	14	12	12	13	49	356
16 - 25	0	0	1	0	1	2	12	14	4	4	0	0	1	0	0	3	42
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	27	130	85	34	40	49	38	34	45	49	114	723

Total Number of Valid Hours: 733

Total Number of Hours: 744



Total Number of Valid Hours: 733



Wood Buffalo Environmental Association
Summary of Hour Averages

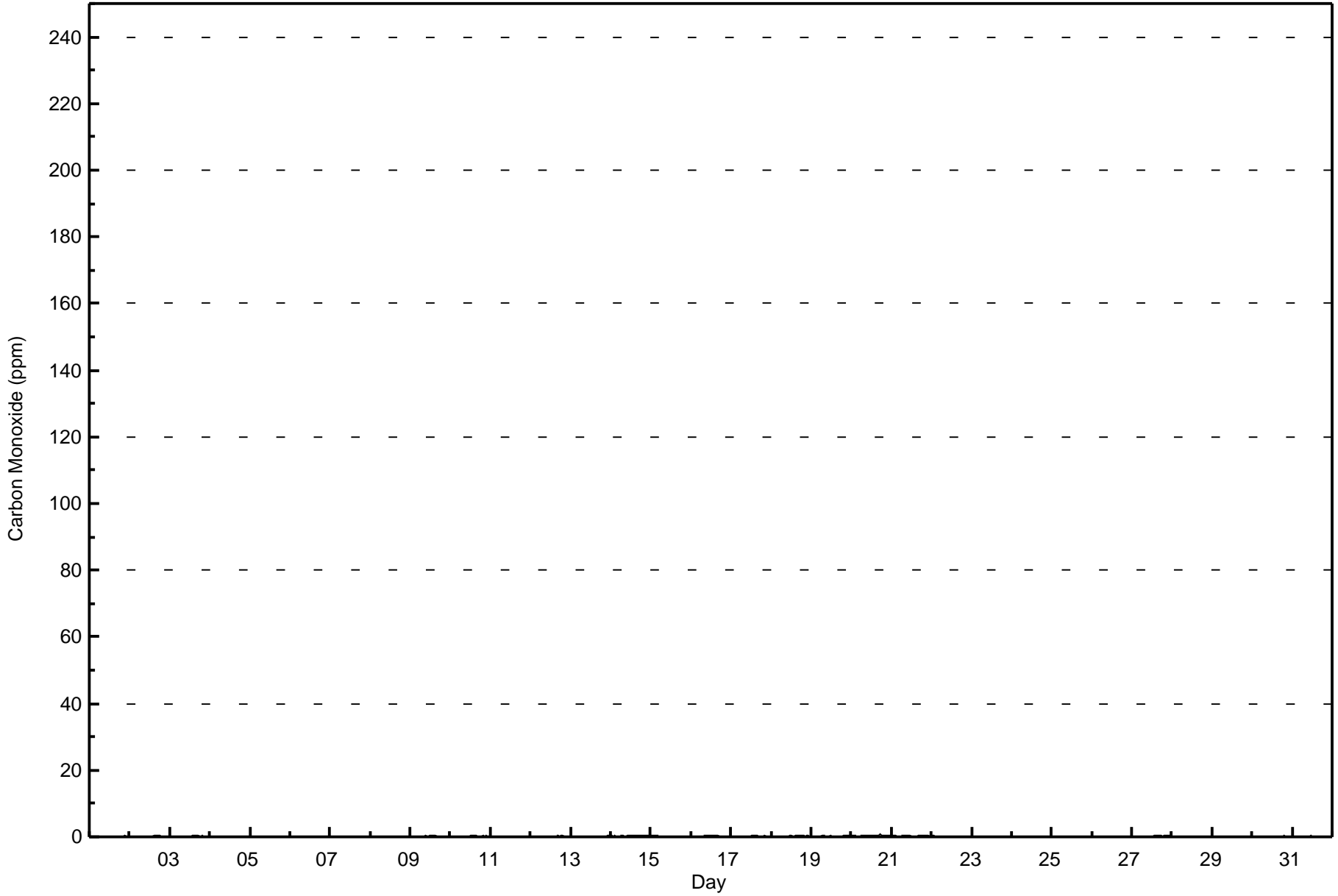
Carbon Monoxide (CO) - ppm
Athabasca Valley - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 0.9 ppm on Dec 20 18:00 Maximum Daily Average: 0.4 ppm on Dec 20													Hours in Service: 744 Hours of Data: 710													
Minimum Value: 0.1 ppm on Dec 5 04:00 Minimum Daily Average: 0.1 ppm on Dec 5 Maximum Diurnal Average: 0.2 ppm at hour 17 Minimum Diurnal Average: 0.1 ppm at hour 6 Monthly Average: 0.16 ppm Percentiles: P ₁ = 0.1 P ₁₀ = 0.1 Q ₁ = 0.1 Median = 0.1 Q ₃ = 0.2 P ₉₀ = 0.3 P ₉₉ = 0.5													Hours of Missing Data: 34 Hours of Calibration: 34 Percent Operational Time: 100.0													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	Z	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
2-Dec	0.1	0.1	0.1	0.1	Z	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
3-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.4	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.6
4-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
5-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
6-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
7-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
8-Dec	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
9-Dec	0.2	0.2	0.1	0.1	0.2	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.3
10-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.2	0.2	0.1	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.3
11-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	C	C	C	0.3	0.2	0.1	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.3
13-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3
14-Dec	0.3	0.2	0.2	0.2	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
15-Dec	0.3	0.3	0.3	0.3	0.3	Z	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
16-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.3
17-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
18-Dec	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3
19-Dec	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Z	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
20-Dec	0.3	0.2	0.2	0.2	Z	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.6	0.5	0.5	0.5	0.5	0.9	0.4	0.6	0.4	0.4	0.3	0.3	0.4	0.9
21-Dec	0.3	0.3	0.2	0.2	0.2	Z	0.3	0.4	0.4	0.4	0.3	0.3	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.4	0.4
22-Dec	0.3	0.2	0.2	0.1	0.1	0.1	Z	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3
23-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
24-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2
25-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
26-Dec	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2
27-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.4	0.5	0.4	0.6	0.3	0.2	0.5	0.5	0.4	0.3	0.2	0.3	0.6
28-Dec	0.2	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2
29-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2
30-Dec	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	Z	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.3
31-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 13 ppm																										



Wood Buffalo Environmental Association
Hourly Averages

Carbon Monoxide (CO) - ppm
Athabasca Valley - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Carbon Monoxide (CO) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.3	680	95.77	95.77
0.4 - 0.5	25	3.52	99.30
0.6 - 0.7	4	0.56	99.86
0.8 - 1.4	1	0.14	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Carbon Monoxide (CO) - ppm
Athabasca Valley - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.3	29	7	5	13	16	21	113	73	30	39	51	42	35	46	48	111	679
0.4 - 0.5	0	0	0	3	0	4	7	7	2	1	0	1	0	0	0	0	25
0.6 - 0.7	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	0	4
0.8 - 1.4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1.5 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	29	7	5	16	16	25	121	82	33	41	51	43	35	46	48	111	709

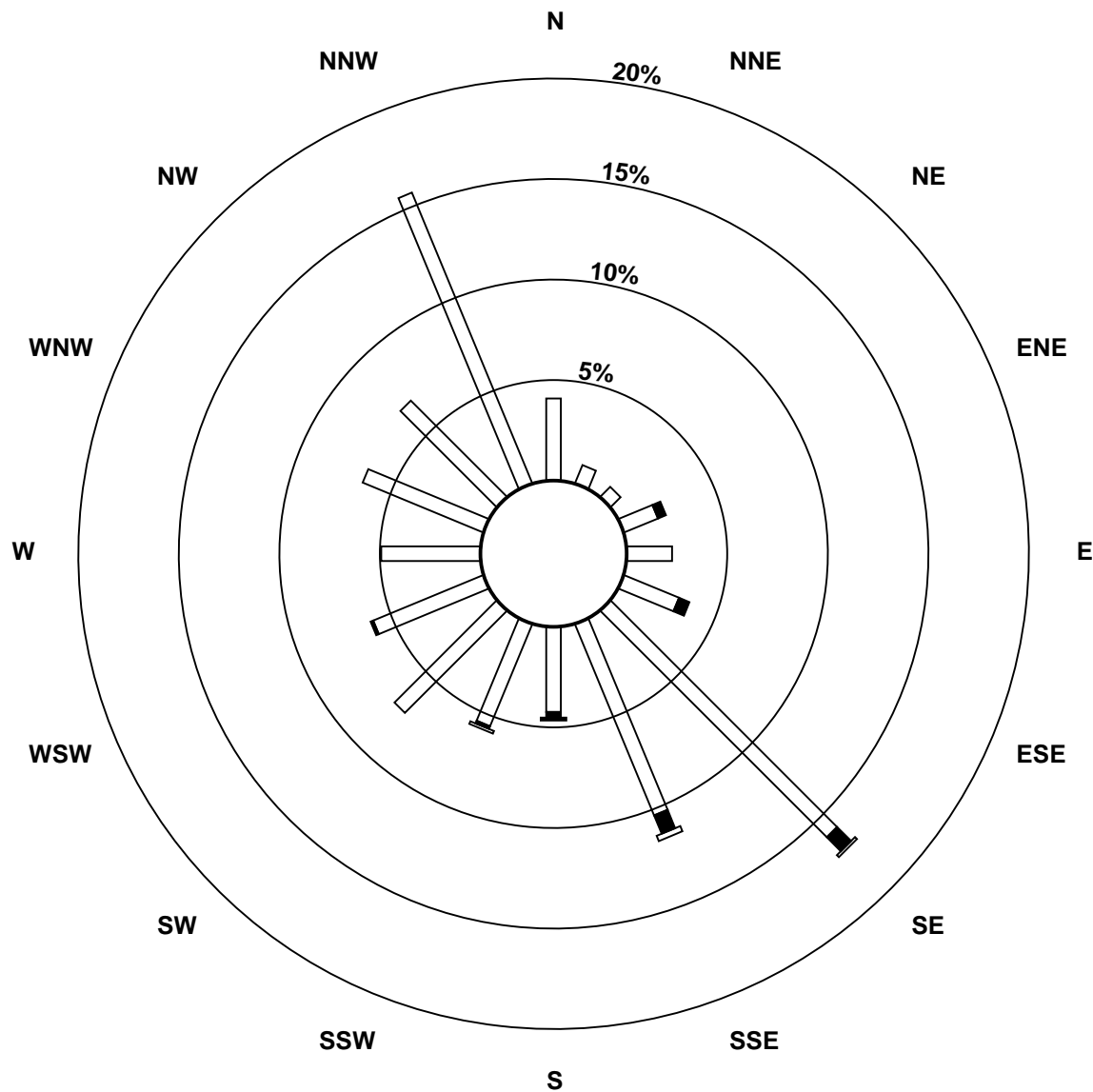
Total Number of Valid Hours: 709

Total Number of Hours: 744

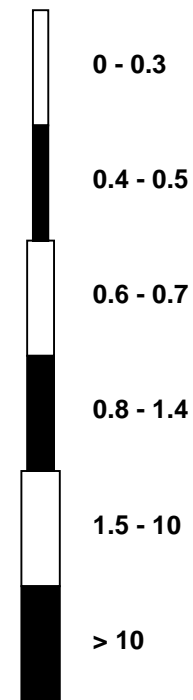


Wood Buffalo Environmental Association
Wind Rose Dec 2016

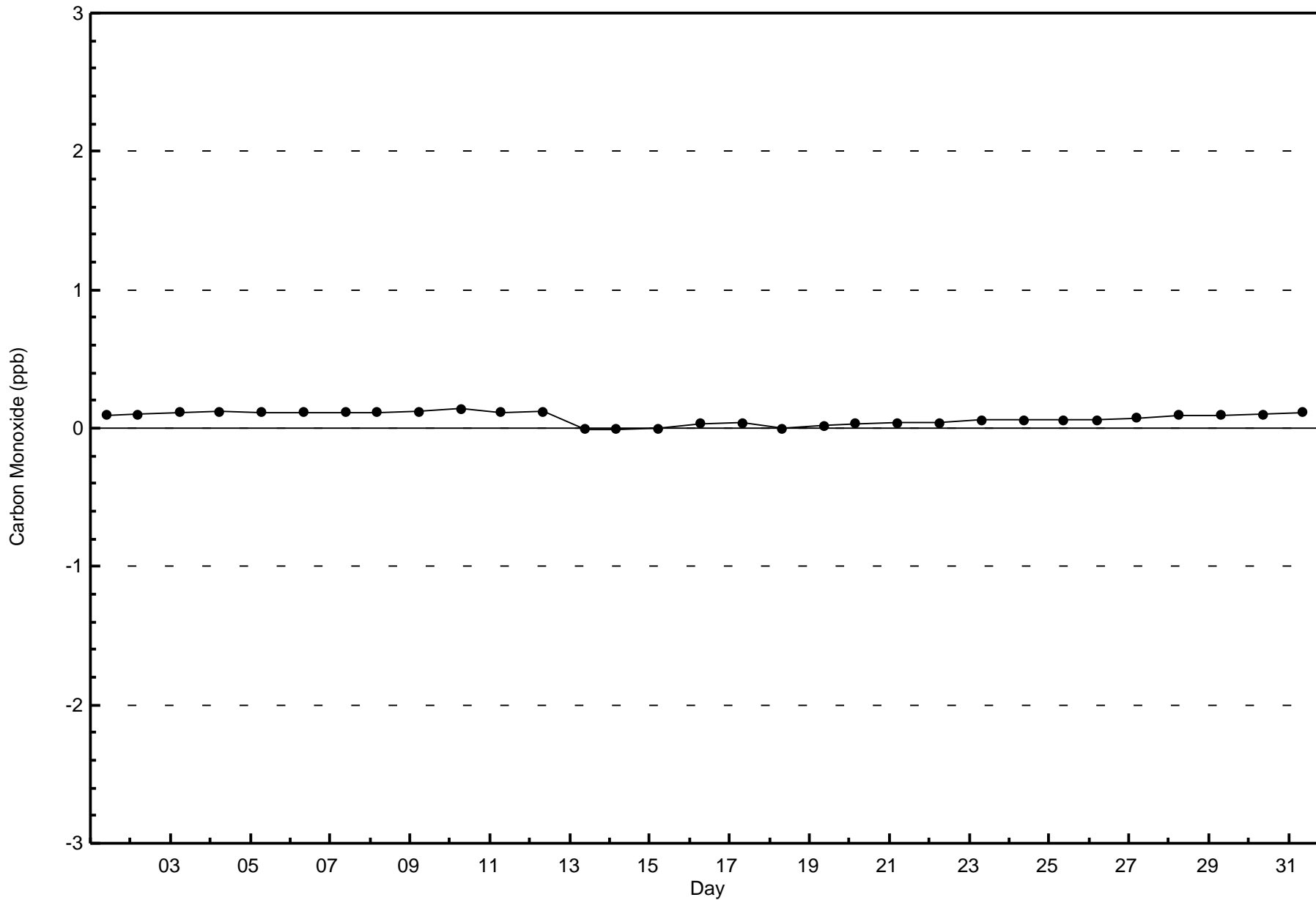
Carbon Monoxide (CO) - ppm
Athabasca Valley (AMS 7)

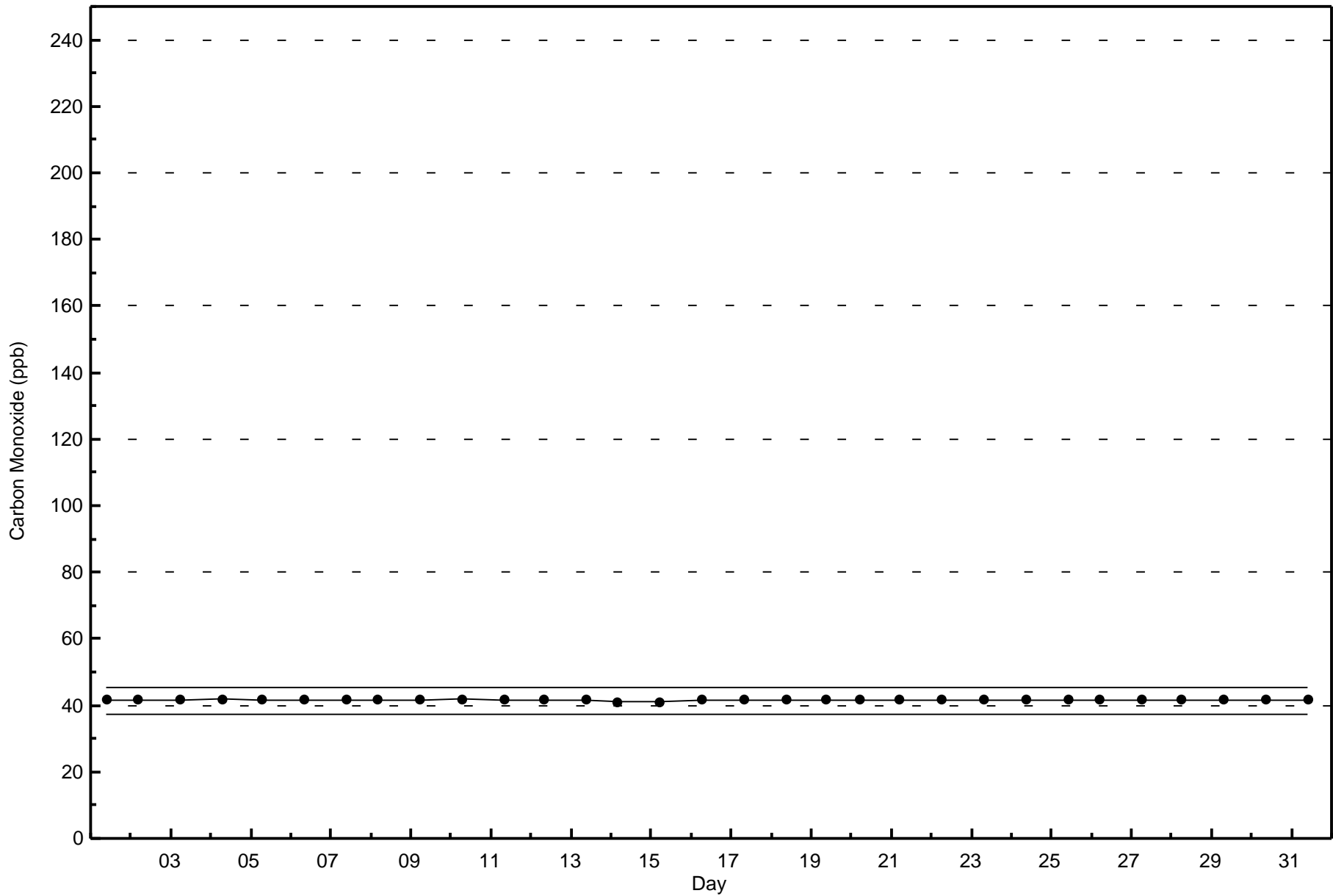


Classes (ppm)



Total Number of Valid Hours: 709



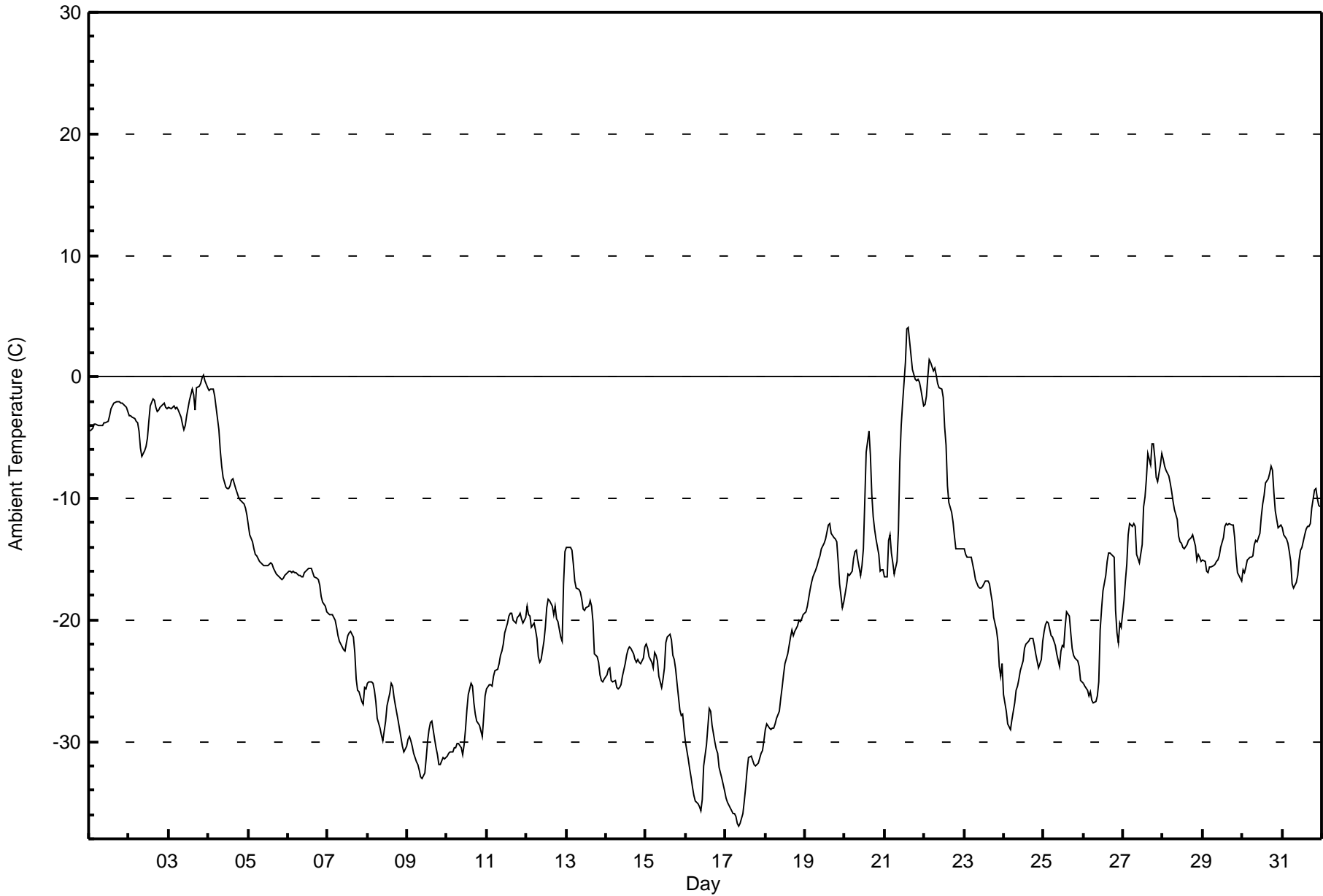




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Athabasca Valley - December 2016

Maximum Value: 4.0 C on Dec 21 15:00 Maximum Daily Average: -2.0 C on Dec 3																						Hours in Service:	744			
Minimum Value: -36.9 C on Dec 17 09:00 Minimum Daily Average: -33.7 C on Dec 17																						Hours of Data:	744			
Maximum Diurnal Average: -15.3 C at hour 15 Minimum Diurnal Average: -19.0 C at hour 9																						Hours of Missing Data:	0			
Monthly Average: -17.60 C Percentiles: P ₁ = -35.7 P ₁₀ = -29.9 Q ₁ = -24.5 Median = -17.2 Q ₃ = -12.3 P ₉₀ = -3.2 P ₉₉ = 1.1																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.4	-4.4	-4.3	-3.9	-3.9	-4.0	-4.0	-4.0	-3.9	-3.8	-3.7	-3.6	-3.2	-2.6	-2.4	-2.1	-2.1	-2.1	-2.0	-2.1	-2.1	-2.2	-2.5	-2.9	-3.2	-2.0
2-Dec	-3.1	-3.2	-3.3	-3.5	-3.6	-3.8	-4.5	-5.8	-6.6	-6.1	-5.7	-5.0	-3.6	-2.4	-1.8	-1.9	-2.4	-2.8	-2.7	-2.5	-2.3	-2.1	-2.5	-2.6	-3.5	-1.8
3-Dec	-2.6	-2.6	-2.5	-2.4	-2.6	-2.5	-2.7	-3.3	-3.9	-4.3	-4.0	-3.1	-1.9	-1.5	-0.9	-1.5	-2.8	-0.9	-0.7	-0.6	-0.1	0.1	-0.3	-0.9	-2.0	0.1
4-Dec	-1.1	-1.1	-1.0	-1.1	-1.6	-3.4	-4.4	-6.0	-7.3	-8.3	-9.0	-9.2	-9.0	-8.4	-8.4	-9.1	-9.6	-9.9	-10.1	-10.2	-10.4	-10.8	-11.4	-7.1	-1.0	
5-Dec	-12.2	-13.0	-13.6	-14.2	-14.6	-14.8	-15.0	-15.2	-15.4	-15.6	-15.6	-15.5	-15.3	-15.4	-15.7	-16.0	-16.2	-16.3	-16.5	-16.6	-16.6	-16.4	-16.2	-15.3	-12.2	
6-Dec	-16.0	-16.0	-16.1	-16.0	-16.0	-16.1	-16.3	-16.3	-16.5	-16.4	-16.1	-15.9	-15.8	-15.7	-15.7	-16.1	-16.4	-16.5	-16.7	-17.2	-18.1	-18.5	-18.8	-19.4	-16.6	-15.7
7-Dec	-19.5	-19.5	-19.5	-19.5	-20.0	-20.6	-21.2	-21.8	-22.0	-22.5	-22.6	-21.8	-21.3	-21.1	-20.9	-21.5	-22.6	-24.9	-25.8	-25.9	-26.7	-26.9	-25.6	-25.7	-22.5	-19.5
8-Dec	-25.2	-25.1	-25.1	-25.2	-25.8	-26.7	-28.1	-28.9	-29.5	-29.9	-29.2	-28.3	-27.0	-26.0	-25.2	-25.5	-26.4	-27.0	-28.3	-29.0	-29.7	-30.4	-30.8	-30.4	-27.6	-25.1
9-Dec	-29.8	-29.6	-29.9	-30.4	-31.0	-31.7	-31.9	-32.3	-33.0	-33.0	-32.6	-31.3	-29.9	-29.0	-28.4	-28.3	-29.8	-30.5	-31.1	-31.9	-31.9	-31.4	-31.4	-31.3	-30.9	-28.3
10-Dec	-31.2	-31.0	-30.8	-30.9	-30.5	-30.5	-30.1	-30.1	-30.5	-31.1	-30.3	-29.0	-27.4	-26.1	-25.3	-25.5	-26.9	-27.7	-28.3	-28.6	-29.2	-29.6	-27.9	-26.2	-28.9	-25.3
11-Dec	-25.7	-25.3	-25.3	-25.4	-24.6	-24.1	-24.0	-23.6	-22.9	-22.6	-22.0	-21.1	-20.3	-19.7	-19.5	-19.5	-20.0	-20.2	-19.8	-19.7	-19.5	-19.9	-20.3	-19.8	-21.9	-19.5
12-Dec	-18.9	-19.5	-19.7	-20.6	-20.2	-20.8	-21.5	-23.0	-23.4	-23.3	-21.8	-20.6	-18.9	-18.3	-18.4	-18.9	-19.6	-18.9	-19.9	-20.1	-21.4	-21.8	-17.0	-14.4	-20.0	-14.4
13-Dec	-14.1	-14.0	-14.0	-14.2	-15.5	-16.8	-17.3	-17.5	-17.7	-18.3	-19.1	-19.3	-19.0	-18.9	-18.4	-18.9	-20.2	-22.8	-23.0	-23.4	-24.5	-25.0	-25.1	-24.8	-19.2	-14.0
14-Dec	-24.5	-24.0	-24.0	-25.0	-25.1	-25.0	-25.5	-25.6	-25.5	-25.3	-24.6	-23.6	-22.9	-22.4	-22.2	-22.3	-22.8	-23.3	-23.5	-23.2	-23.5	-23.6	-23.2	-22.2	-23.9	-22.2
15-Dec	-22.0	-22.3	-23.1	-23.5	-23.9	-22.7	-22.9	-23.4	-24.7	-25.6	-24.9	-23.9	-21.8	-21.4	-21.2	-21.6	-22.9	-23.3	-24.0	-25.2	-27.4	-27.9	-27.8	-29.0	-24.0	-21.2
16-Dec	-30.1	-31.5	-32.3	-32.9	-33.8	-34.4	-34.9	-35.1	-35.4	-35.7	-34.8	-32.1	-30.3	-28.8	-27.2	-27.5	-28.7	-30.0	-30.7	-30.9	-32.1	-32.6	-33.0	-34.0	-32.0	-27.2
17-Dec	-34.7	-35.0	-35.2	-35.4	-35.9	-35.9	-36.1	-36.7	-36.9	-36.7	-35.9	-34.9	-33.8	-32.3	-31.3	-31.3	-31.6	-31.9	-32.0	-31.9	-31.8	-31.0	-30.8	-29.9	-33.7	-29.9
18-Dec	-29.0	-28.6	-28.8	-29.0	-28.9	-28.9	-28.5	-28.1	-27.5	-26.5	-25.5	-24.6	-23.6	-22.8	-22.1	-21.5	-20.8	-21.3	-21.0	-20.5	-20.0	-20.2	-19.9	-19.6	-24.5	-19.6
19-Dec	-19.3	-18.9	-18.2	-17.5	-16.9	-16.5	-15.9	-15.5	-15.1	-14.7	-14.2	-13.7	-13.3	-12.7	-12.2	-12.1	-12.9	-13.2	-13.3	-13.6	-15.2	-17.1	-19.0	-18.5	-15.4	-12.1
20-Dec	-17.8	-17.2	-16.3	-16.4	-16.0	-15.0	-14.4	-14.3	-15.1	-16.4	-15.5	-14.2	-10.2	-6.2	-4.5	-6.4	-9.7	-11.4	-12.6	-13.3	-14.6	-16.0	-15.9	-15.9	-13.5	-4.5
21-Dec	-16.4	-16.4	-13.4	-13.0	-14.5	-15.3	-16.2	-15.2	-12.6	-7.0	-4.0	-2.2	1.2	3.9	4.0	2.9	1.8	0.6	-0.2	-0.3	-0.2	-0.4	-1.0	-2.3	-5.7	4.0
22-Dec	-2.3	-1.6	0.0	1.5	1.1	0.5	0.8	0.2	-0.6	-0.9	-1.0	-1.6	-4.2	-5.6	-8.9	-10.4	-11.2	-11.9	-13.1	-14.1	-14.1	-14.1	-14.2	-14.2	-5.8	1.5
23-Dec	-14.2	-14.6	-14.9	-14.8	-14.9	-15.4	-16.0	-16.7	-17.3	-17.4	-17.4	-17.2	-17.0	-16.8	-16.8	-17.0	-17.8	-18.6	-19.8	-20.8	-21.8	-23.8	-24.7	-23.6	-17.9	-14.2
24-Dec	-26.2	-27.5	-28.6	-28.8	-29.1	-28.2	-26.9	-25.8	-25.4	-24.9	-24.2	-23.3	-22.3	-22.0	-21.8	-21.8	-21.5	-21.5	-22.1	-22.8	-23.3	-23.9	-23.2	-21.7	-24.5	-21.5
25-Dec	-21.0	-20.4	-20.1	-20.2	-21.3	-21.5	-21.7	-22.1	-22.8	-23.8	-22.6	-22.1	-22.2	-20.5	-19.4	-19.7	-21.1	-22.4	-22.9	-23.1	-23.4	-23.9	-25.0	-25.0	-22.0	-19.4
26-Dec	-25.2	-25.5	-25.8	-26.2	-25.9	-26.6	-26.8	-26.7	-26.2	-25.1	-20.9	-19.1	-17.6	-16.3	-15.2	-14.5	-14.4	-14.6	-14.9	-19.2	-21.1	-21.9	-20.2	-20.6	-21.3	-14.4
27-Dec	-18.4	-16.8	-15.4	-13.0	-12.0	-12.3	-12.1	-12.3	-14.6	-14.9	-15.4	-13.8	-10.7	-9.9	-8.3	-6.3	-7.3	-5.5	-5.5	-6.7	-8.3	-8.6	-7.3	-6.3	-10.9	-5.5
28-Dec	-6.7	-7.4	-7.7	-8.2	-8.7	-9.4	-10.2	-10.9	-11.7	-13.1	-13.5	-13.7	-14.0	-14.1	-13.8	-13.5	-13.4	-13.2	-13.0	-13.9	-15.0	-14.6	-14.9	-15.2	-12.1	-6.7
29-Dec	-15.1	-15.2	-16.0	-16.1	-15.7	-15.6	-15.5	-15.4	-15.2	-15.1	-14.8	-14.1	-13.2	-12.3	-12.1	-12.2	-12.1	-12.2	-12.2	-13.2	-14.8	-16.1	-16.4	-16.8	-14.5	-12.1
30-Dec	-15.9	-16.1	-15.7	-15.1	-14.8	-14.8	-14.7	-13.8	-13.5	-13.6	-12.8	-11.5	-10.5	-9.8	-8.7	-8.4	-7.9	-7.3	-7.7	-9.5	-11.0	-12.4	-12.3	-12.2	-12.1	-7.3
31-Dec	-12.4	-12.9	-13.3	-13.7	-14.3	-15.2	-17.0	-17.4	-16.9	-16.3	-15.1	-14.3	-14.0	-13.0	-12.5	-12.3	-12.3	-12.1	-10.8	-9.3	-9.2	-10.0	-10.6	-10.7	-13.1	-9.2
																						Diurnal Average				
																						Diurnal Maximum				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Athabasca Valley - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	312	41.94	41.94
-20 - 0	420	56.45	98.39
0 - 10	12	1.61	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

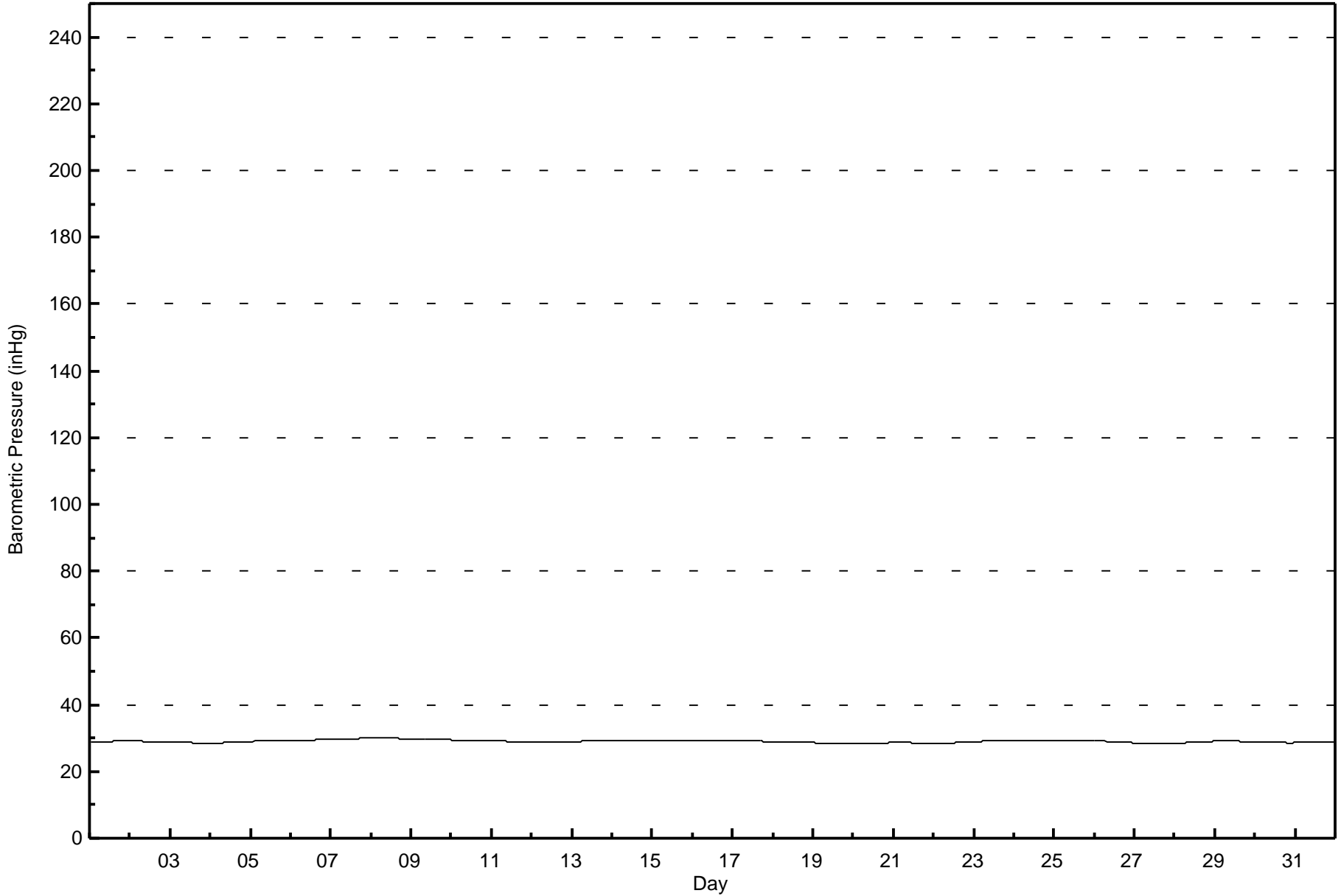
Barometric Pressure (BP) - inHg
Athabasca Valley - December 2016

Maximum Value: 29.9 inHg on Dec 8 06:00 Maximum Daily Average: 29.9 inHg on Dec 8																						Hours in Service:	744				
Minimum Value: 28.2 inHg on Dec 19 13:00 Minimum Daily Average: 28.4 inHg on Dec 27																						Hours of Data:	744				
Maximum Diurnal Average: 29.0 inHg at hour 11 Minimum Diurnal Average: 29.0 inHg at hour 15																						Hours of Missing Data:	0				
Monthly Average: 29.03 inHg Percentiles: P ₁ = 28.3 P ₁₀ = 28.5 Q ₁ = 28.7 Median = 29.0 Q ₃ = 29.3 P ₉₀ = 29.5 P ₉₉ = 29.9																						Hours of Calibration:	0				
																						Percent Operational Time:	100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.1
2-Dec	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.9	29.1
3-Dec	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.6	28.7	28.7
4-Dec	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	29.0	28.7	29.0	
5-Dec	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.3	29.3
6-Dec	29.3	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.5	29.5	29.5	29.5	29.5	29.6	29.6	29.6	29.6	29.4	29.6	
7-Dec	29.6	29.6	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.8	29.8	29.8	29.8	29.8	29.8	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.8	29.9	
8-Dec	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.8	29.8	29.8	29.8	29.9	29.9	
9-Dec	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.7	29.7	29.7	29.7	29.6	29.6	29.6	29.6	29.5	29.5	29.5	29.5	29.5	29.7	29.8	
10-Dec	29.4	29.4	29.4	29.4	29.4	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.4	
11-Dec	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.1	
12-Dec	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	29.0	29.0	29.0	28.9	28.9	29.0	29.0	
13-Dec	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.1	29.3	
14-Dec	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	
15-Dec	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	
16-Dec	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.3	29.3	
17-Dec	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	28.9	28.9	28.9	29.1	29.2	
18-Dec	28.9	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.7	28.9	
19-Dec	28.6	28.6	28.5	28.5	28.5	28.4	28.4	28.3	28.3	28.3	28.2	28.2	28.2	28.2	28.3	28.3	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.6	28.4	28.6	
20-Dec	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.5	28.7	
21-Dec	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.6	28.7	
22-Dec	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.8	28.8	28.8	28.9	28.9	28.9	28.6	28.9	
23-Dec	28.9	28.9	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.3	29.3	
24-Dec	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	
25-Dec	29.4	29.4	29.4	29.4	29.4	29.4	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.4	29.4	
26-Dec	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.9	29.1	
27-Dec	28.6	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.4	28.4	28.6	
28-Dec	28.4	28.4	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	29.0	29.0	29.0	28.7	29.0	
29-Dec	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	29.0	29.1	
30-Dec	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.9	
31-Dec	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.7	28.7	28.9	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - inHg
Athabasca Valley - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

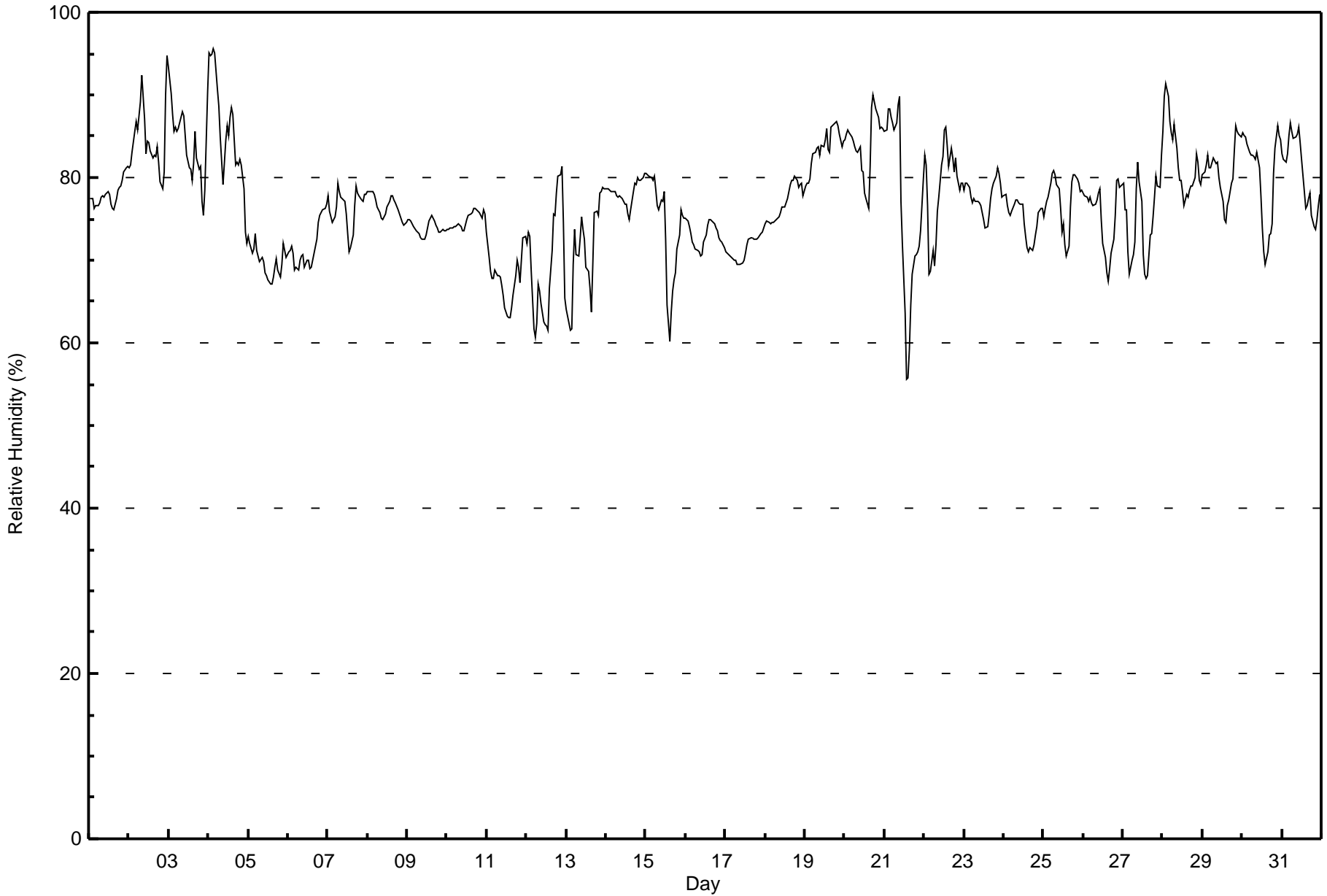
Athabasca Valley - December 2016

Maximum Value: 96 % on Dec 4 04:00 Maximum Daily Average: 85.5 % on Dec 4																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																									
Minimum Value: 56 % on Dec 21 14:00 Minimum Daily Average: 67.8 % on Dec 11 Maximum Diurnal Average: 78.7 % at hour 1 Minimum Diurnal Average: 73.2 % at hour 15 Monthly Average: 76.9 % Percentiles: P ₁ = 62 P ₁₀ = 69 Q ₁ = 73 Median = 77 Q ₃ = 81 P ₉₀ = 85 P ₉₉ = 92																																																																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																																			
1-Dec	77	78	77	76	77	77	77	78	78	78	78	78	77	76	76	77	78	79	79	80	81	81	81	78.0	81																																																		
2-Dec	81	81	83	86	87	86	88	89	92	87	83	84	84	83	82	83	83	84	82	80	79	81	90	95	84.7	95																																																	
3-Dec	93	90	88	86	86	86	86	87	88	88	85	83	81	81	80	82	86	82	81	81	77	75	78	90	84.2	93																																																	
4-Dec	95	95	95	96	95	91	89	85	82	79	85	86	85	87	88	88	82	82	81	82	82	79	73	72	85.5	96																																																	
5-Dec	73	72	71	71	73	71	70	70	70	70	68	68	68	67	67	68	69	70	69	68	69	72	71	70	69.9	73																																																	
6-Dec	71	71	72	71	69	69	69	70	70	71	69	70	70	69	69	70	71	73	75	76	76	76	76	77	71.6	77																																																	
7-Dec	78	76	75	75	75	76	79	78	78	77	77	76	73	71	72	73	77	79	78	78	77	77	78	78	76.3	79																																																	
8-Dec	78	78	78	78	78	77	76	76	75	75	75	76	76	77	78	78	77	77	76	76	75	75	74	75	76.5	78																																																	
9-Dec	75	75	75	74	74	74	73	73	73	73	72	73	74	75	75	76	75	74	74	73	73	74	74	74	73.9	76																																																	
10-Dec	74	74	74	74	74	74	74	74	74	74	74	74	75	75	76	76	76	76	76	76	75	75	76	76	74.8	76																																																	
11-Dec	73	70	69	68	68	69	68	68	68	67	66	64	63	63	63	64	66	68	70	69	67	70	73	73	67.8	73																																																	
12-Dec	72	73	73	69	62	61	62	67	66	65	62	62	62	61	67	71	76	75	78	80	80	81	75	65	69.5	81																																																	
13-Dec	64	63	61	62	70	74	71	71	73	75	74	73	69	69	67	64	69	76	76	75	78	78	79	79	71.2	79																																																	
14-Dec	79	79	79	78	78	78	78	78	78	77	77	77	76	75	76	78	79	79	80	80	80	80	81	81	78.2	81																																																	
15-Dec	81	80	80	80	80	80	79	77	76	77	77	78	73	65	60	64	66	68	68	71	73	76	75	75	74.1	81																																																	
16-Dec	75	75	74	73	72	72	71	71	71	71	71	72	73	74	75	75	75	74	74	74	73	72	72	71	72.9	75																																																	
17-Dec	71	71	71	70	70	70	70	70	69	69	70	70	71	72	73	73	73	73	73	73	73	73	73	74	71.4	74																																																	
18-Dec	74	75	75	74	75	75	75	75	75	76	76	76	77	77	78	79	80	80	80	80	79	79	79	78	77.0	80																																																	
19-Dec	79	79	79	80	82	83	83	83	84	83	84	84	85	86	83	83	86	86	87	87	86	85	84	84	83.5	87																																																	
20-Dec	85	85	86	85	85	84	84	83	83	84	81	81	78	77	76	81	88	90	89	88	87	86	86	86	84.2	90																																																	
21-Dec	86	86	88	88	87	87	86	87	89	90	77	72	64	56	56	59	64	68	70	71	71	72	74	80	76.1	90																																																	
22-Dec	83	82	77	68	69	71	69	72	76	78	82	83	86	86	84	81	83	82	81	82	80	79	79	79	78.8	86																																																	
23-Dec	79	79	79	79	78	77	77	77	77	77	77	76	75	74	74	76	77	79	79	80	81	80	79	78	77.7	81																																																	
24-Dec	78	78	77	76	75	76	77	77	77	77	77	77	74	73	72	71	72	71	72	73	74	76	76	76	75.1	78																																																	
25-Dec	75	76	77	78	79	80	81	80	79	79	76	73	74	72	71	72	76	79	80	80	80	79	78	78	77.3	81																																																	
26-Dec	78	78	78	77	78	77	77	77	77	78	79	75	72	70	68	67	69	71	73	75	80	80	79	79	75.5	80																																																	
27-Dec	79	76	76	71	68	70	71	72	79	82	79	77	71	68	68	68	73	73	75	78	80	79	79	83	74.8	83																																																	
28-Dec	86	90	91	90	87	85	84	86	84	81	80	80	78	77	78	78	79	79	79	80	83	82	80	79	82.3	91																																																	
29-Dec	80	81	81	83	81	81	82	82	82	82	80	79	77	75	75	77	77	79	80	83	86	86	85	85	80.8	86																																																	
30-Dec	85	85	85	84	83	83	83	82	82	83	81	78	74	71	69	71	73	73	74	80	83	86	85	85	80.0	86																																																	
31-Dec	83	82	82	83	85	87	86	85	85	85	86	84	82	78	76	77	77	78	75	74	74	75	77	78	80.6	87																																																	
78.7																		78.5						78.2		77.5		77.4		77.4		77.3		77.4		77.8		77.6		76.7		76.1		74.8		73.6		73.2		74.0		75.8		76.7		76.9		77.5		77.8		78.0		78.1		78.5		Diurnal Average							
95																		95						95		96		95		91		89		89		92		90		86		86		86		87		88		88		88		88		90		89		88		87		86		86		90		85		95		Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Athabasca Valley - December 2016





Maximum Speed: 26 km/h on Dec 5 04:00	Maximum Daily Speed Average: 19.4 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 17 00:00	Minimum Daily Speed Average: 1.1 km/h on Dec 19	Hours of Data: 743
Maximum Diurnal Speed Average: 2.6 km/h at hour 19	Minimum Diurnal Speed Average: 0.8 km/h at hour 12	Hours of Missing Data: 1
Monthly Average Velocity: 1.8 km/h 256.8 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 4 Median = 6 Q ₃ = 11 P ₉₀ = 16 P ₉₉ = 23	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE9	SE11	SE10	SSE7	SSW9	S8	SSE8	SSE8	SSE8	SE8	SE8	SE8	SE6	SSW6	S6	S5	SSW2	S4	SSE6	S4	SSE5	SSE5	SSE5	SSE5	SSE6.3	SE11
2-Dec	SSE6	SE7	SSE8	SE10	SE10	SE10	SE9	SE4	SSE6	SE12	SSE11	SSE10	SSE9	SSE8	SE7	SE11	SE11	SSE12	SSE11	SE13	SE12	SE11	SE11	SE12	SE9.6	SE13
3-Dec	SE14	SE12	SE16	SE16	SE15	SE15	SE16	SE16	SE16	SE17	SE14	SE13	SE12	SE9	SE6	SE4	SSE5	SE10	SE13	SSE8	SW9	SW9	SW7	SSW5	SSE10.5	SE17
4-Dec	ESE2	SSW6	S3	SSW3	NNW11	NNW23	NNW20	N19	NNW21	NNW17	NNW15	NNW14	NNW8	NNW10	NW14	NW18	NNW18	NW21	NW18	NW16	NW16	NW22	NW22	NW13.2	NNW23	
5-Dec	WNNW22	WNNW23	WNNW24	WNNW26	WNNW22	WNNW23	WNNW20	WNNW18	WNNW15	WNNW16	WNNW19	NW19	WNNW20	WNNW21	WNNW22	WNNW19	WNNW18	WNNW18	WNNW21	W20	W17	W15	W16	WNNW19.4	WNNW26	
6-Dec	WNNW15	WNNW13	WNNW10	NW11	NW11	NW12	NW11	NW11	NW11	NW13	NW16	NW18	NW18	NW17	NW18	WNNW15	WNNW15	WNNW16	NW14	NNW12	NNW9	NNW8	NNW7	NW5	NW12.5	NW18
7-Dec	NNW6	NW8	NW11	NW12	NW10	NNW7	NW4	NW6	NW6	WNNW5	NW4	NNW8	NNW8	N10	NNW7	NNW5	AF	SW3	WSW4	W3	W4	W2	WSW6	WSW2	NW5.2	NW12
8-Dec	W5	WNNW3	WNNW1	W4	W4	NW4	NW4	WNNW3	WNNW4	WNNW4	NW4	W4	WNNW3	NW3	WNNW2	NNW3	NNW4	WNNW3	W4	W5	W3	ENE3	ENE2	E3	WNNW2.5	W5
9-Dec	ESE4	SE7	SE6	SE6	SSE7	SE4	SE9	SE7	SSE5	S6	SSE6	SE8	SSE6	SSE7	SSE8	SSE5	E2	NNW1	WSW3	WSW2	N1	NNE2	NNW1	SW4	SSE4.0	SE9
10-Dec	SSW6	SSW5	SSE3	NE2	S6	SSW6	SSE6	SE6	S6	SSW6	SSW5	SSE8	SSE10	SSE9	SSE7	SE4	S2	SE0	ESE2	ESE1	SSE1	ESE3	SSW5	SW6	S4.1	SSE10
11-Dec	WSW12	WSW16	WSW13	WSW17	WSW19	WSW17	WSW21	WSW15	WSW16	WSW17	W13	W20	W24	W18	W18	W21	W18	WSW16	WSW17	WSW18	W16	WSW13	SSW7	WSW7	WSW15.8	W24
12-Dec	W9	W9	NNW6	NW11	WNNW21	WNNW16	W16	WSW16	WSW14	WSW8	SW7	WSW3	SW7	ESE2	ESE5	ESE5	ESE5	NNW3	E2	E5	SE6	ENE1	W14	W23	W5.5	W23
13-Dec	W23	WNNW23	WNNW25	WNNW25	NNW17	NNW16	NNW13	NNW14	NNW10	N9	N10	NNW7	NNW6	NW3	WNNW2	NW6	W5	WSW5	WSW4	WSW5	SW2	SW1	ESE2	SE3	NW8.0	WNNW25
14-Dec	ESE5	SE8	SE7	SE7	SE6	SE8	SE11	SE12	SE10	SE12	SE12	SE10	ESE5	E4	E5	E6	ESE1	WSW2	SSE1	ENE0	ENE1	ENE2	ENE2	SE6.2	SE13	
15-Dec	ENE2	ESE1	E1	NE1	W1	WNNW3	WSW7	SSW8	SSW4	SE1	NNW0	NNE1	NNW8	NNW7	NW8	W11	W9	W8	SW7	SW7	WSW5	SW4	SW4	SW3	W3.1	WNNW11
16-Dec	S1	E3	SSE1	ESE0	E2	E1	E1	ENE2	ENE1	E2	ENE2	SE4	ESE3	ESE1	SSE5	SSE3	SE3	WNNW1	NNE0	SE4	NW0	NNW1	SSE2	WNNW0	ESE1.3	SSE5
17-Dec	W2	ESE1	SSE4	SSE4	SSW5	SSE5	SE7	SSE5	SSE5	SSE8	SSE11	SE9	SSE9	SE8	SE8	SE9	SE8	SE9	SE9	SE8	SE10	SE7	SE10	SE11	SSE7.0	SE11
18-Dec	SE9	SE9	SE8	SE8	SE8	SE7	SE8	SE8	SE7	SE6	ESE5	SE5	SE3	NE2	NW1	N3	ENE3	E3	ENE1	NNW3	NNW3	SE4	ESE5	SSE6	SE4.1	SE9
19-Dec	E2	ENE2	SE6	SSE7	SE6	SE5	SSE7	SSE8	SSE9	SE9	SE7	ESE3	N4	NNW7	NNW8	NNW9	NNW11	NNW12	NNW10	N1	SSE1	WSW2	ENE2	SSE2	E1.1	NNW12
20-Dec	SSW1	SW1	SW2	SSW5	S5	SSE8	SE9	SE10	SSE5	S4	SSE4	SE4	SE4	SSE4	SE3	S2	SSE2	S2	SSW3	SSE6	SSE2	SE4	SSE3	SSW2	SSE3.7	SE10
21-Dec	S3	SSE3	SE7	SE6	SE6	SE6	ESE6	ESE6	ESE6	SSE7	SSE6	S6	WSW14	W23	WSW16	SSW8	S6	S7	S7	S6	SE5	SSE5	S4	SSW2	S4.6	W23
22-Dec	S4	SSW3	SSW3	SW8	SW7	WSW9	WSW8	SSW7	WSW5	WSW8	NW4	NNW11	NNW20	NNW21	NNW25	NNW19	N15	NNW17	NNW19	NNW17	NNW12	NNW15	NNW13	NNW11	NNW8.3	NNW25
23-Dec	NNW11	NNW14	NNW9	NNW10	N10	NNW13	NNW15	NNW16	NNW14	NNW12	NNW12	NNW9	NNW10	N10	NNW9	N8	N8	N9	NNW11	NNW15	N6	NNE3	NE3	ESE4	NNW9.7	NNW16
24-Dec	NNE3	NNW3	NNW3	NNW2	NW2	NNW1	N3	N6	N8	NNE3	NNW3	NNW3	SE8	SE8	SE8	SE8	SE6	SSE9	SE8	SE8	SE8	E6	E6	SE5	ESE2.5	SSE9
25-Dec	SE8	SE8	SE9	SE6	SE4	S2	SW2	SSW3	SW3	SW4	SSW3	SW4	WSW6	SW5	SW5	SSW4	SSW4	SW3	WSW5	SW6	SW6	SW5	SSW3	SW5	SSW3.7	SE9
26-Dec	SW5	SW6	SW6	SW5	S6	SW6	SW6	SW5	S5	SSE5	SE12	SE13	SSE15	SSE16	SE16	SE17	SSE15	SSE16	SSE11	S7	SW8	SW7	S7	SW5	S7.8	SE17
27-Dec	SSW4	S4	S7	SSE11	SSE13	SSE10	SSE10	SSE7	SSW4	SSW5	SSW3	S6	SSE7	SE5	SSE4	S4	SSW2	SSW3	SW4	SE3	SE2	ESE3	W2	NW7	SSE4.3	SSE13
28-Dec	NNW6	NNW7	NNW8	NNW9	NNW10	NNW14	NNW13	NNW11	NNW11	NNW10	NNW8	NNW9	NNW10	NNW8	NNW5	NW3	NNW1	N1	NNW3	NNW9	NW5	N6	NNW11	NNW7	NNW7.7	NNW14
29-Dec	N6	N6	NNW5	NNW3	NNW5	NNW6	NNE2	NNE2	N3	N3	NNW2	NNW3	N5	ENE2	N4	N4	NW1	NNW4	NNW6	NNW2	W1	SW3	SW5	WSW3	NNW2.8	N6
30-Dec	SW2	WSW5	SW4	SE2	SSW3	SW4	SW5	S3	SE2	ESE0	S3	SSW2	SW11	SW10	SSW9	S4	SSE4	SSW6	WNNW2	SSW4	SW7	W2	NNW8	N9	SW3.0	SW11
31-Dec	N5	N8	NNW7	NW2	N0	W2	NNW3	N4	WNNW3	N1	ENE0	NE1	NW3	NW4	N3	N3	NNW6	SW13	SW10	WSW15	WSW13	WSW17	WSW16	SW13	W4.1	WSW17

WSW1.9	W2.1	WSW1.5	WSW2.0	WSW2.0	W2.1	WSW1.6	WSW1.1	WSW1.6	SW1.5	SW0.9	WSW0.8	W1.7	W1.9	W1.9	W1.6	W1.5	WSW2.2	W2.6	W2.4	WSW2.4	WSW1.7	WSW2.2	WSW2.5	Diurnal Average
WNNW23	WNNW23	WNNW25	WNNW26	WNNW22	NNW23	WSW21	N19	NNW21	NNW17	WNNW19	W20	W24	W23	NNW25	W21	WNNW18	WNNW18	WNNW21	W20	W17	WSW17	NW22	W23	Diurnal Maximum

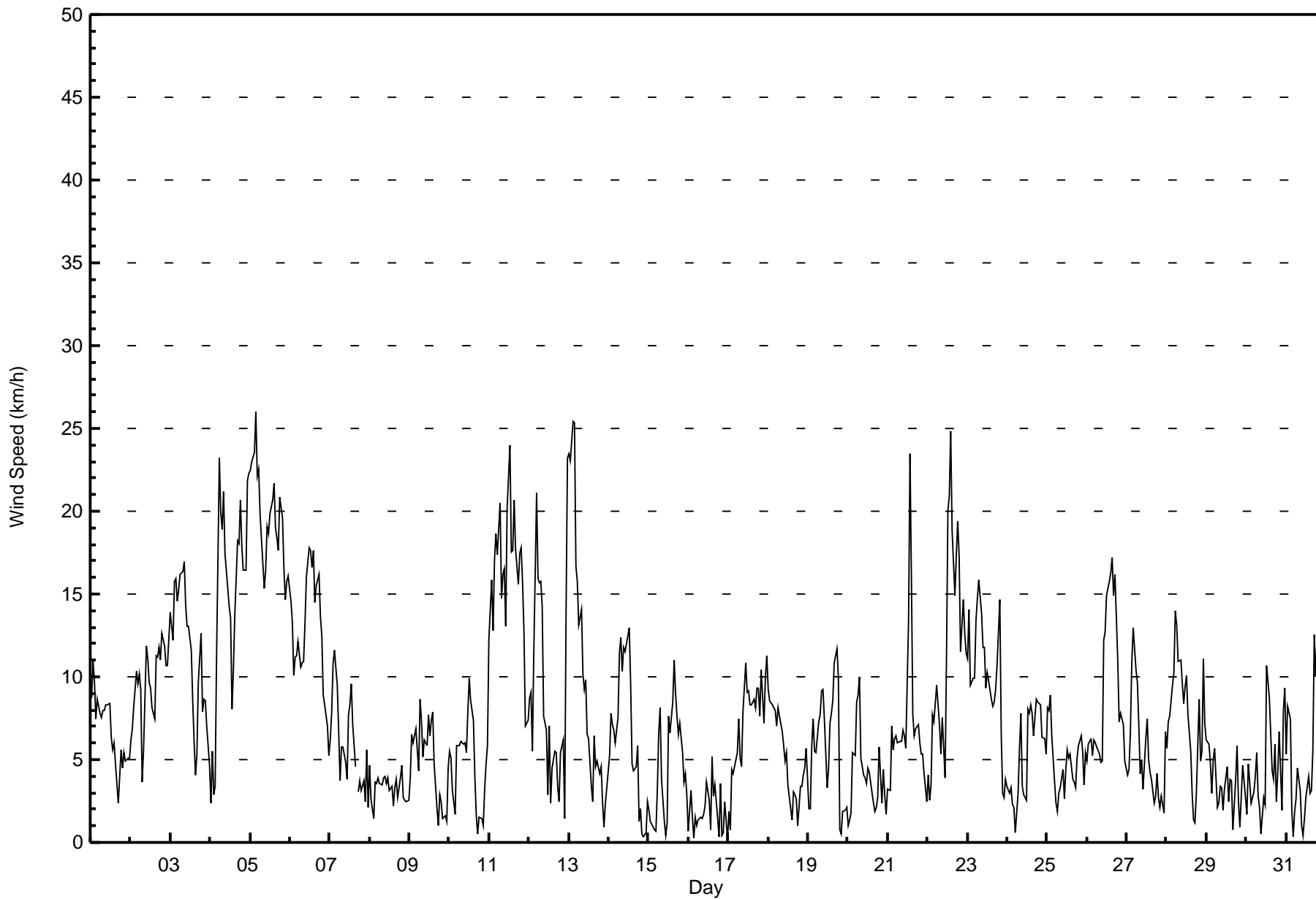
AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Athabasca Valley - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 21 13:00 Minimum Value: 1 km/h on Dec 8 08:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	3	2	3	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	3	
2-Dec	1	1	2	2	2	2	2	2	4	2	2	2	2	2	2	3	3	3	3	3	2	3	2	3	4	
3-Dec	3	2	3	3	3	3	3	3	3	2	2	3	2	2	1	2	2	2	2	2	3	3	2	3	3	
4-Dec	1	2	1	1	7	3	4	5	4	5	3	2	3	2	2	4	4	3	3	4	4	3	4	7		
5-Dec	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4	5	4	4	4	3	3	3	3	5		
6-Dec	3	3	3	3	3	3	4	3	2	3	3	4	3	3	3	3	3	3	2	2	2	2	2	4		
7-Dec	2	2	2	2	2	2	1	1	1	1	1	1	2	2	1	1	AF	2	2	1	1	1	2	2		
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
9-Dec	2	1	1	2	2	3	2	2	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	3		
10-Dec	2	2	2	1	2	1	1	2	1	1	1	3	2	2	2	2	1	2	2	1	1	1	3	3		
11-Dec	4	3	2	4	4	4	3	3	3	3	3	5	4	5	3	3	3	2	3	3	2	2	3	5		
12-Dec	4	4	2	4	4	3	3	2	3	4	3	2	1	1	1	2	1	4	2	1	2	2	6	6		
13-Dec	4	5	5	5	6	4	4	4	2	3	2	1	2	1	2	2	2	1	1	2	1	2	2	6		
14-Dec	1	1	2	1	1	2	3	2	3	3	2	2	2	3	1	1	2	1	2	1	2	1	2	3		
15-Dec	1	1	1	1	2	1	1	1	2	1	1	2	1	1	3	3	2	4	2	2	2	3	2	4		
16-Dec	1	1	1	1	1	1	1	2	1	1	2	2	2	1	3	2	2	1	1	3	1	1	2	3		
17-Dec	1	1	2	2	2	3	3	3	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	4		
18-Dec	2	2	2	2	2	2	2	2	1	2	2	2	2	1	1	1	1	2	2	2	1	2	3	3		
19-Dec	2	1	3	3	2	2	2	2	2	2	3	2	1	2	3	2	1	2	3	1	1	1	1	3		
20-Dec	2	1	1	2	2	2	2	3	2	1	2	1	2	1	1	1	1	2	1	3	1	2	2	3		
21-Dec	2	2	3	2	2	1	1	2	2	2	2	2	9	6	5	3	2	1	2	2	2	1	2	9		
22-Dec	1	1	2	2	2	2	2	3	3	2	1	5	3	5	4	5	3	4	5	3	2	3	2	5		
23-Dec	2	2	3	3	2	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3	1	1	3		
24-Dec	1	2	1	1	1	1	1	3	2	1	1	2	2	2	2	2	2	1	2	2	2	1	1	3		
25-Dec	2	2	2	1	1	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	1	2		
26-Dec	2	1	2	2	2	1	1	2	2	2	3	3	3	3	3	4	3	3	2	2	2	3	3	4		
27-Dec	3	2	3	4	3	3	3	3	1	2	1	2	2	2	3	2	2	2	2	1	1	2	1	4		
28-Dec	2	1	2	2	2	2	3	3	2	1	2	2	2	1	1	1	1	1	2	2	1	2	3	3		
29-Dec	2	1	2	2	2	2	1	1	2	2	2	3	3	2	3	2	1	2	2	1	1	2	2	3		
30-Dec	2	1	2	1	2	2	2	1	2	1	2	2	3	2	3	2	2	3	1	2	2	2	5	5		
31-Dec	1	2	2	1	1	1	1	2	2	2	1	1	1	1	1	2	1	4	3	3	4	4	4	4		
																	Diurnal Maximum									
AF - Analyzer Failure																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Athabasca Valley - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	312	41.99	41.99
6 - 11	274	36.88	78.87
12 - 19	125	16.82	95.69
20 - 28	32	4.31	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Athabasca Valley - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	16	8	5	16	14	24	26	32	20	30	28	15	17	15	18	28	312
6 - 11	14	0	0	0	3	3	78	46	15	11	23	9	3	2	14	53	274
12 - 19	2	0	0	0	0	0	26	7	0	0	2	21	10	16	14	27	125
20 - 28	0	0	0	0	0	0	0	0	0	0	0	1	6	16	3	6	32
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	8	5	16	17	27	130	85	35	41	53	46	36	49	49	114	743

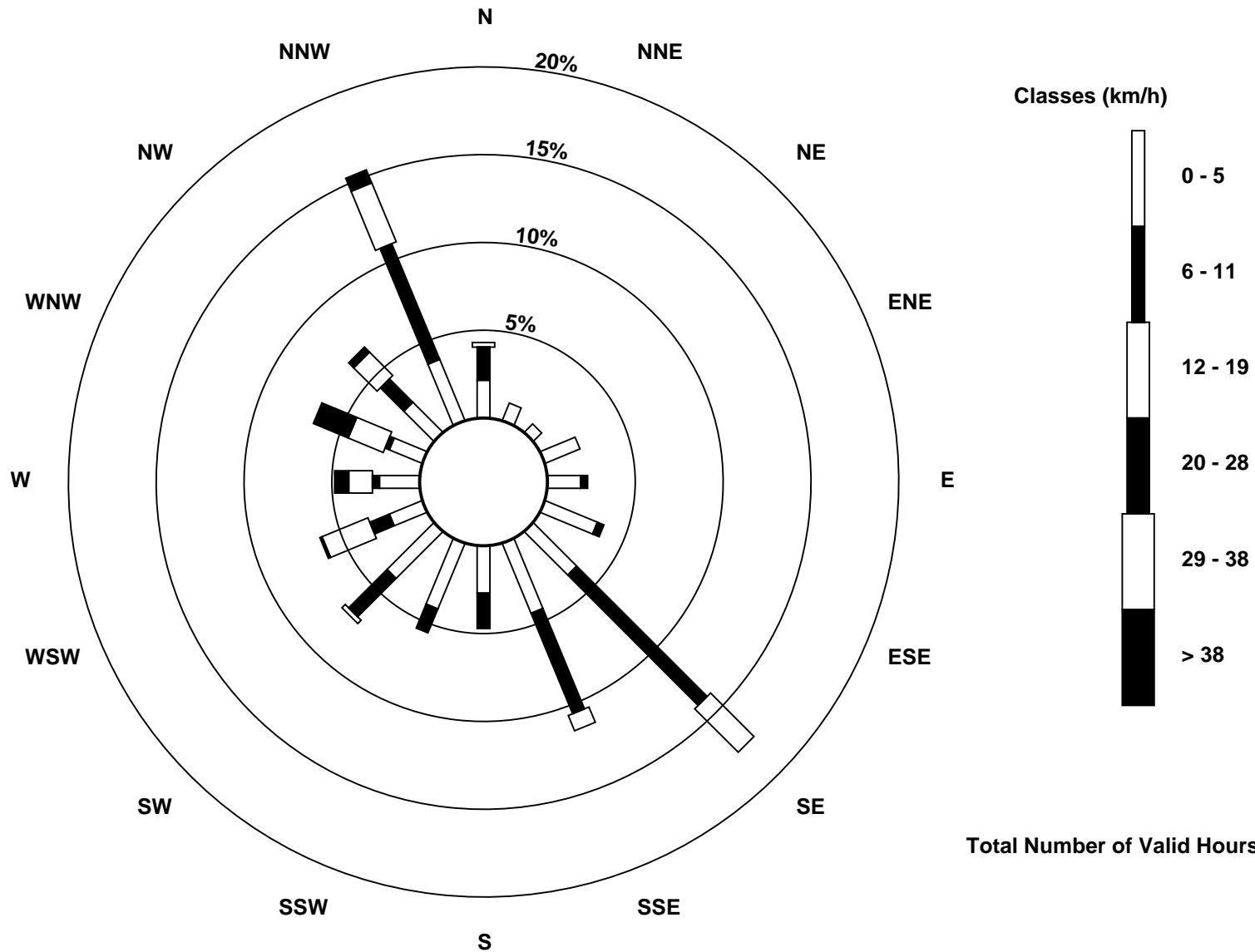
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Athabasca Valley (AMS 7)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Athabasca Valley - December 2016

Direction of Maximum Speed: 285 deg on Dec 5 04:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 290.2 deg on Dec 5	Hours of Data: 743
Direction of Minimum Speed: 299 deg on Dec 17 00:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 1.1 deg on Dec 19	Percent Operational Time: 99.9
Monthly Average Direction: 282.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	149	139	144	162	209	189	159	162	161	144	143	142	137	213	179	174	208	176	165	174	162	160	165	162	162.1
2-Dec	162	144	147	137	144	141	146	137	166	144	149	156	149	152	143	142	142	150	152	144	143	140	140	134	145.4
3-Dec	138	144	142	140	143	142	139	138	141	142	146	141	145	142	142	139	149	146	145	149	219	217	217	207	148.6
4-Dec	123	205	173	208	331	337	344	354	341	348	341	332	343	341	336	317	309	303	306	313	321	312	309	307	324.7
5-Dec	300	299	295	285	286	285	289	292	295	295	296	304	300	293	289	291	290	289	283	281	279	280	278	283	290.2
6-Dec	287	292	301	308	314	313	322	318	307	307	309	307	307	312	311	301	297	301	311	333	330	330	329	323	309.5
7-Dec	328	322	326	324	325	329	317	325	305	282	306	346	343	349	348	337	AF	232	255	277	280	277	241	239	317.7
8-Dec	263	291	299	263	263	318	326	295	298	294	310	281	288	313	303	341	329	303	264	264	263	60	73	84	297.1
9-Dec	113	140	134	143	148	126	134	132	158	174	164	141	150	154	147	151	85	338	247	251	2	27	340	219	147.7
10-Dec	201	195	148	47	173	198	161	146	172	208	203	147	162	161	162	139	183	131	108	106	164	109	202	216	170.8
11-Dec	245	252	246	247	251	251	251	253	250	252	259	267	271	276	274	269	263	253	251	255	260	244	210	250	256.3
12-Dec	272	277	329	320	300	286	265	249	237	257	225	245	224	120	120	116	109	348	93	81	129	77	267	277	268.8
13-Dec	281	288	290	294	329	344	342	333	330	356	350	344	344	316	300	317	276	240	244	244	218	218	104	126	309.6
14-Dec	112	130	131	137	126	140	143	141	135	138	137	144	140	132	112	84	91	83	114	242	163	76	75	73	130.7
15-Dec	70	119	93	42	275	285	237	235	211	146	346	14	344	339	305	281	259	275	234	231	237	227	231	223	263.4
16-Dec	183	91	150	105	85	97	85	65	72	85	73	136	106	105	162	158	128	291	15	139	323	340	164	299	121.4
17-Dec	279	121	161	166	195	151	146	164	164	162	151	145	151	142	133	137	136	140	140	135	139	136	141	141	146.5
18-Dec	133	137	133	133	140	127	133	138	125	140	109	136	127	40	311	352	66	95	69	330	345	127	108	166	126.1
19-Dec	98	62	139	149	127	146	156	154	152	143	139	112	359	341	345	345	337	341	343	349	166	240	60	156	85.7
20-Dec	196	225	215	199	184	157	146	144	163	186	152	142	131	154	146	186	167	188	206	148	148	139	163	195	161.5
21-Dec	173	151	137	126	126	134	118	116	105	160	152	183	248	262	252	213	180	183	183	180	143	148	172	193	183.8
22-Dec	184	195	199	220	227	244	243	204	250	238	313	345	343	345	341	345	352	346	344	336	343	344	341	341	327.5
23-Dec	343	339	342	344	349	346	343	340	343	346	342	345	343	349	347	352	354	349	347	344	351	22	54	107	346.9
24-Dec	12	336	327	333	321	337	353	358	353	26	343	341	142	138	138	143	130	157	138	140	132	84	92	141	110.6
25-Dec	141	133	141	135	131	175	218	213	214	217	192	230	243	235	215	209	200	225	240	228	234	231	212	226	199.1
26-Dec	220	222	226	219	190	224	221	222	189	162	146	145	147	149	146	146	148	147	152	176	218	222	186	221	170.4
27-Dec	204	180	169	151	147	154	153	150	196	209	192	173	149	143	158	189	195	209	230	125	139	118	268	325	166.6
28-Dec	338	333	335	337	335	338	340	345	341	335	343	346	343	340	330	323	340	357	342	347	310	357	339	348	339.5
29-Dec	353	349	342	347	347	341	19	16	352	2	345	343	350	61	351	10	314	346	338	328	272	234	231	255	342.6
30-Dec	218	255	216	145	201	214	219	173	144	121	173	212	235	216	202	179	165	194	298	204	218	264	328	349	219.7
31-Dec	359	350	336	320	356	260	341	356	296	350	66	36	311	326	356	350	345	227	227	247	242	243	240	228	268.4

257.8 261.9 238.7 242.1 255.1 269.6 240.5 243.8 252.4 227.4 216.1 242.5 270.6 279.7 276.7 280.6 276.2 257.6 262.5 262.1 246.9 249.3 253.2 256.5
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

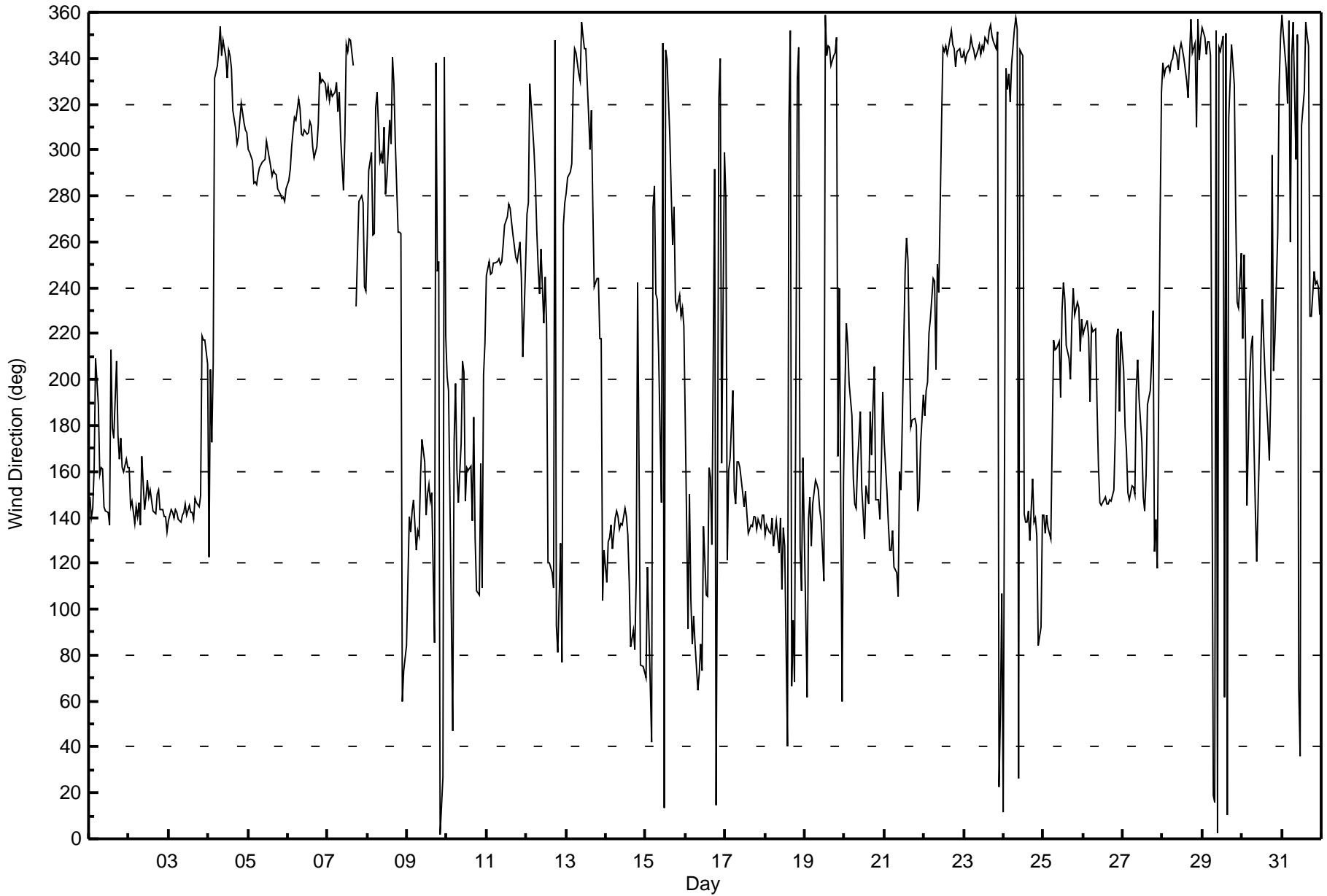
Wind Direction (WD) - deg
Athabasca Valley - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 109 deg on Dec 17 02:00	Hours of Data: 743
Minimum Value: 7 deg on Dec 23 20:00	Hours of Missing Data: 1
Percentiles: P ₁ = 9 P ₁₀ = 11 Q ₁ = 14 Median = 20 Q ₃ = 43 P ₉₀ = 71 P ₉₉ = 100	Hours of Calibration: 0
	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	17	12	15	24	23	25	18	17	17	14	12	13	18	24	30	31	39	27	16	24	19	18	15	22	39
2-Dec	21	16	14	13	16	13	18	64	37	13	16	18	17	22	19	14	16	15	15	13	13	15	14	13	64
3-Dec	12	12	12	11	11	10	11	11	10	11	12	12	11	10	14	36	16	11	11	15	17	21	18	62	62
4-Dec	64	32	47	24	42	9	14	19	13	17	11	10	13	12	10	13	12	11	11	10	10	11	9	10	64
5-Dec	11	13	12	10	12	12	14	14	14	15	14	15	13	14	12	14	13	13	10	9	10	11	10	12	15
6-Dec	14	14	20	17	16	14	22	14	14	14	12	13	13	11	10	12	11	10	11	12	13	13	18	17	22
7-Dec	13	11	10	9	13	12	36	21	16	16	30	13	14	14	12	12	AF	56	32	23	19	54	18	72	72
8-Dec	14	26	24	17	23	19	18	16	20	21	18	24	24	14	29	20	18	35	16	13	69	40	33	71	71
9-Dec	45	19	23	20	24	58	15	25	47	39	45	20	31	20	15	56	86	69	18	63	50	76	80	28	86
10-Dec	38	42	59	81	32	15	23	22	28	14	27	32	13	14	15	60	59	93	70	96	85	54	55	46	96
11-Dec	16	13	13	12	11	11	11	12	11	12	16	12	10	16	12	9	9	9	10	11	10	11	54	54	54
12-Dec	40	24	29	20	10	13	19	9	12	26	29	82	14	58	41	40	22	73	73	31	18	98	25	9	98
13-Dec	10	13	11	13	37	14	14	11	16	19	16	13	19	28	40	18	43	18	26	26	64	96	65	59	96
14-Dec	27	16	18	17	17	18	11	14	14	12	13	10	11	21	30	14	13	12	73	57	86	87	86	71	87
15-Dec	73	76	81	87	102	51	19	11	43	75	81	72	12	19	21	11	9	35	12	10	31	86	46	68	102
16-Dec	100	44	74	107	92	89	84	71	85	77	64	44	53	74	43	48	76	69	92	86	103	88	72	100	107
17-Dec	62	109	51	43	34	49	34	43	57	36	16	20	17	18	16	18	20	16	16	19	15	17	16	15	109
18-Dec	17	14	14	15	19	23	16	16	13	20	41	19	58	54	56	43	39	71	82	40	37	56	36	26	82
19-Dec	67	84	38	22	33	40	18	19	16	19	22	59	21	15	16	14	8	10	12	83	92	51	53	53	92
20-Dec	76	83	82	31	36	21	16	19	32	27	48	52	30	36	48	53	61	70	58	34	64	41	61	47	83
21-Dec	38	44	28	34	22	20	24	25	43	24	28	39	44	13	17	25	21	22	21	20	22	28	57	50	57
22-Dec	35	41	27	17	16	21	15	63	72	25	36	18	12	13	11	14	18	15	15	11	14	13	11	9	72
23-Dec	14	8	13	17	16	14	12	11	12	14	11	13	12	16	15	17	17	15	14	7	38	46	50	43	50
24-Dec	26	54	18	37	52	60	36	20	21	27	33	52	20	15	16	17	18	11	15	15	22	12	21	34	60
25-Dec	16	13	14	15	27	46	66	40	24	19	62	27	12	10	14	30	25	31	22	20	18	21	44	20	66
26-Dec	22	15	20	19	26	23	14	22	36	47	13	13	12	12	11	11	13	12	16	37	28	32	41	58	58
27-Dec	64	63	44	24	16	21	23	33	34	36	53	28	25	30	54	72	75	89	45	73	70	59	91	43	91
28-Dec	23	12	16	11	10	11	11	13	12	10	13	14	12	10	12	14	46	63	51	14	32	34	19	23	63
29-Dec	19	17	28	45	28	16	32	40	30	46	66	72	41	53	55	46	75	45	25	42	82	55	34	60	82
30-Dec	87	20	77	65	56	75	31	63	83	97	60	77	19	21	22	43	57	56	68	44	20	84	62	14	97
31-Dec	18	17	10	77	78	41	39	35	53	75	106	84	31	23	28	36	18	15	33	12	14	14	15	20	106
	100	109	82	107	102	89	84	71	85	97	106	84	58	74	56	72	86	93	92	96	103	98	91	100	

Diurnal Maximum

AF - Analyzer Failure





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 2, 2016	Last Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:20	End Time (MST)	12:35
Gas Cert Reference	LL110103	Station temp.	22 Deg C
Cal Gas Concentration	49.2 ppm	Cal Gas Exp Date	February 16, 2019
Calibrator Make/Model	API T700	Serial Number	2445
ZAG Make/Model	API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-619
Analyzer IP address	192.168.1.103		Lamp voltage	801	801
Calculated slope	0.999116	1.004189	Chamber temp	44.3	44.3
Calculated intercept	0.952306	1.096595	Pressure	695.4	695.4
Analyzer Background	17.5	18.3	Flow	0.475	0.475
Analyzer Coefficient	1.022	1.022	Intensity	43689	43689
Analyzer make	Thermo 45C		Analyzer serial #	630718530	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.6	----
as found span	5000	59.1	581.5	576.1	1.009
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	59.1	581.5	578.4	1.005
second point	5000	29.5	290.3	287.7	1.009
third point	5000	14.8	145.6	142.8	1.020
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	59.1	581.5	577.3	1.007
Average Correction Factor					1.011

Corrected As found	575.5	Previous response	581.1	% change	1.0%
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Notes:

No maintenance done, filter changed out, Zero adjusted

Calibration Performed By:

Melissa Lemay



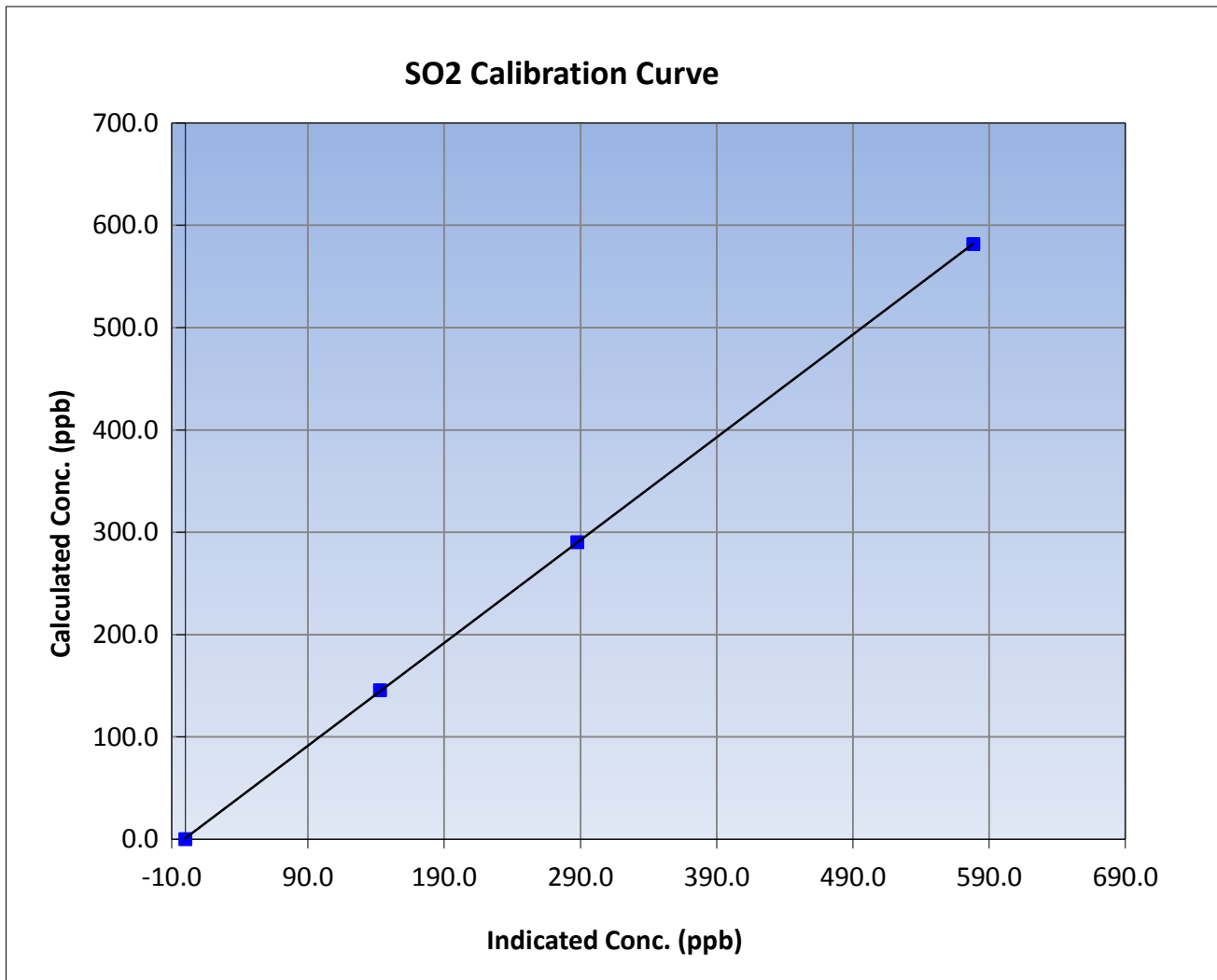
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	12:35
Analyzer make	Thermo 45C	Analyzer serial #	630718530

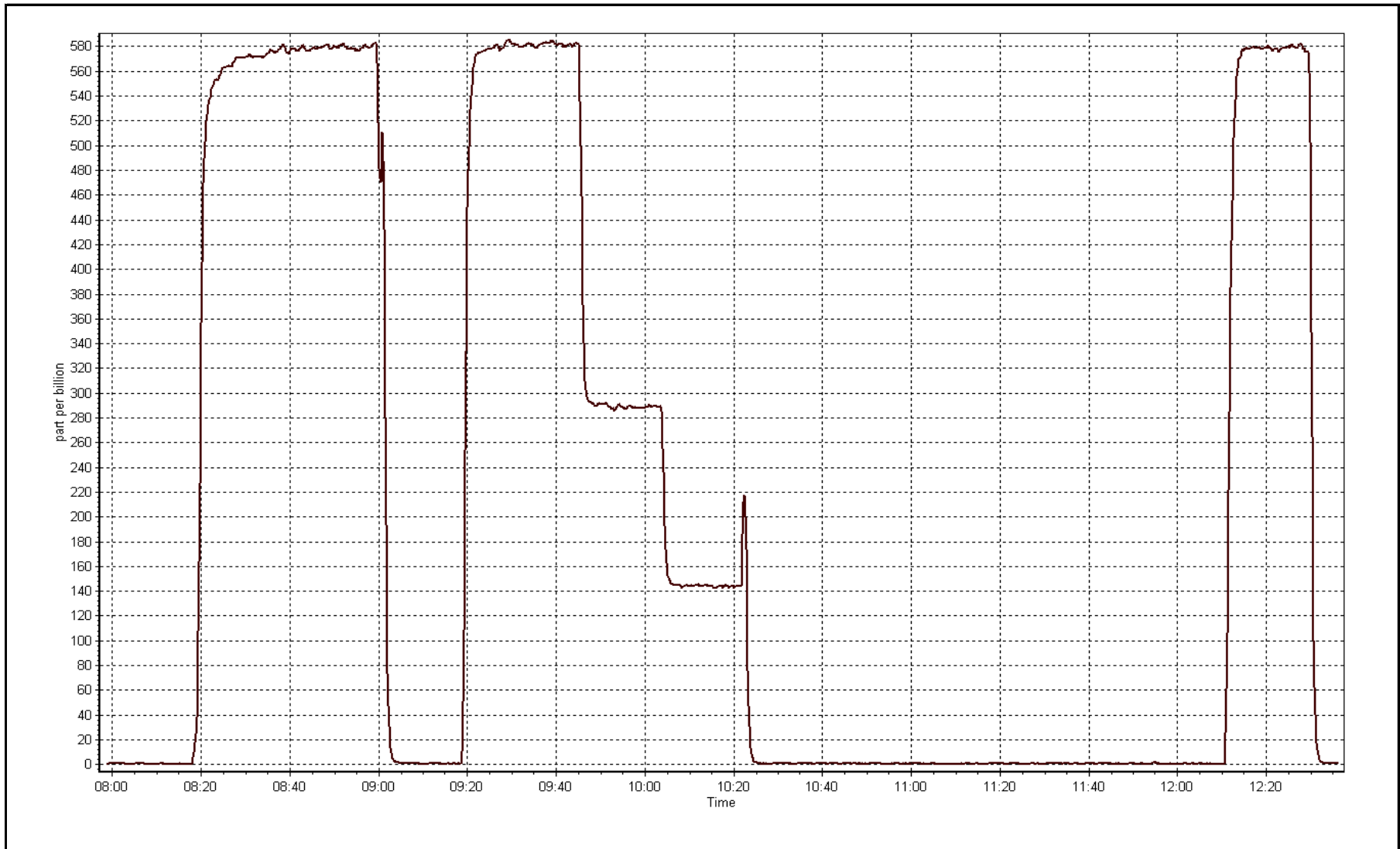
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999986
581.5	578.4	1.0054		
290.3	287.7	1.0090	Slope	1.004189
145.6	142.8	1.0198		
			Intercept	1.096595



SO2 Calibration Plot

Date: December 2, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:15	End Time (MST)	11:57
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	September 9, 2017
Calibrator Make/Model	API T700	Serial Number	2445
Dil air Make/Model	API 701-H	Serial Number	198
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S970259A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699.3	-699.3
Analyzer IP address	192.168.1.44		Lamp voltage	1138	1138
Calculated slope	1.000452	0.999560	Chamber temp	45	45
Calculated intercept	-0.155369	0.024913	Pressure	703.1	703.1
Analyzer Background	2.4	2.5	Flow	0.447	0.447
Analyzer Coefficient	1.000	1.028	Intensity	71	71
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-LTE		Analyzer serial #	1507864683	
Converter make/model	CDN-101		Converter serial #	460	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	75.0	75.3	72.5	1.039
SO2 scrubber check	5000	14.8	148.0	0.5	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	75.0	75.3	75.3	1.000
second point	5000	40.0	40.2	40.2	0.999
third point	5000	20.0	20.1	20.0	1.004
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	75.0	75.3	74.8	1.007
Average Correction Factor					1.001

Corrected As found	72.5	Previous response	75.4	% change	4.0%
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Notes:

span adjusted, no maintenance done, filter changed out, scrubber checked after the third point

Calibration Performed By:

Melissa Lemay



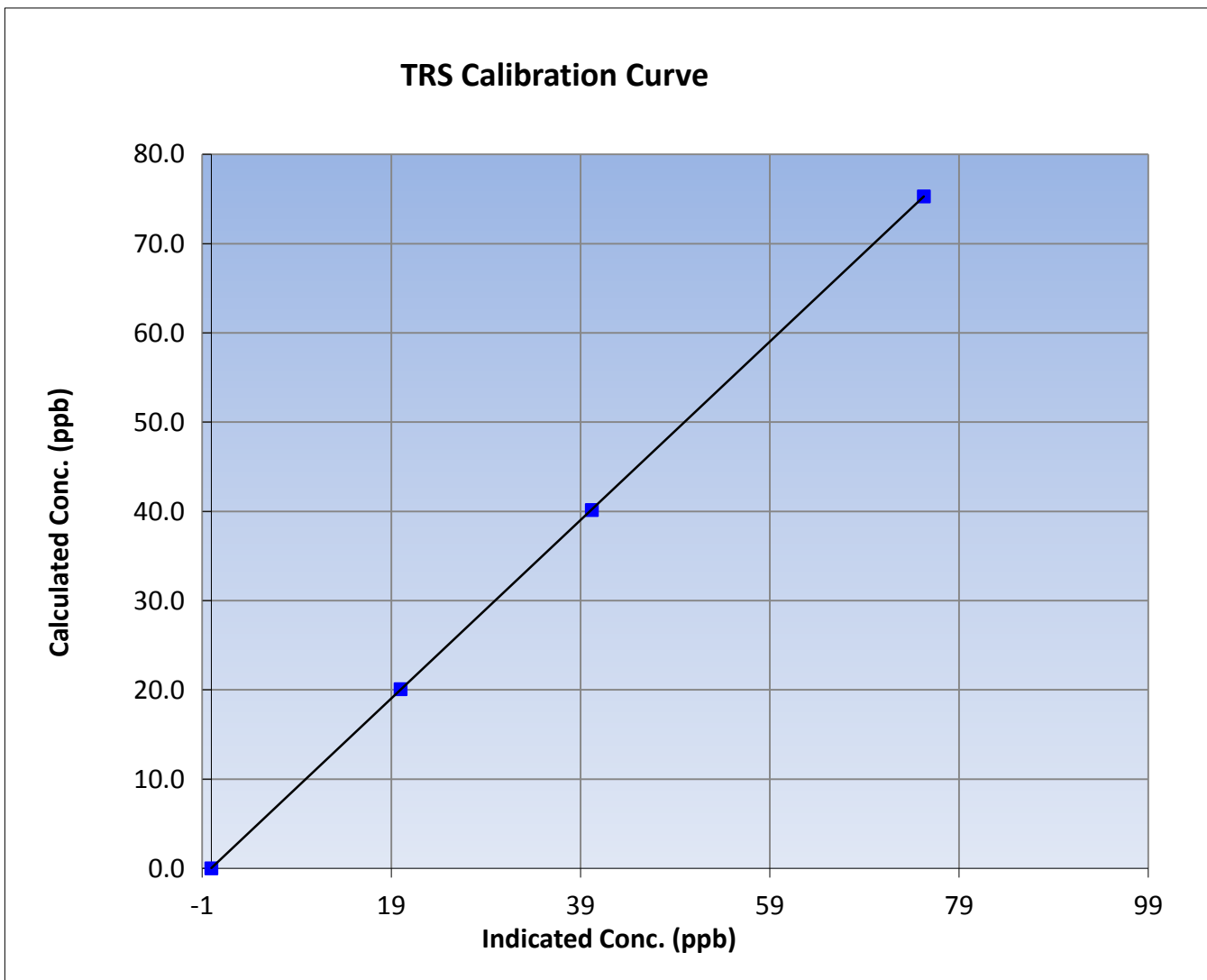
Wood Buffalo Environmental Association TRS Calibration Report

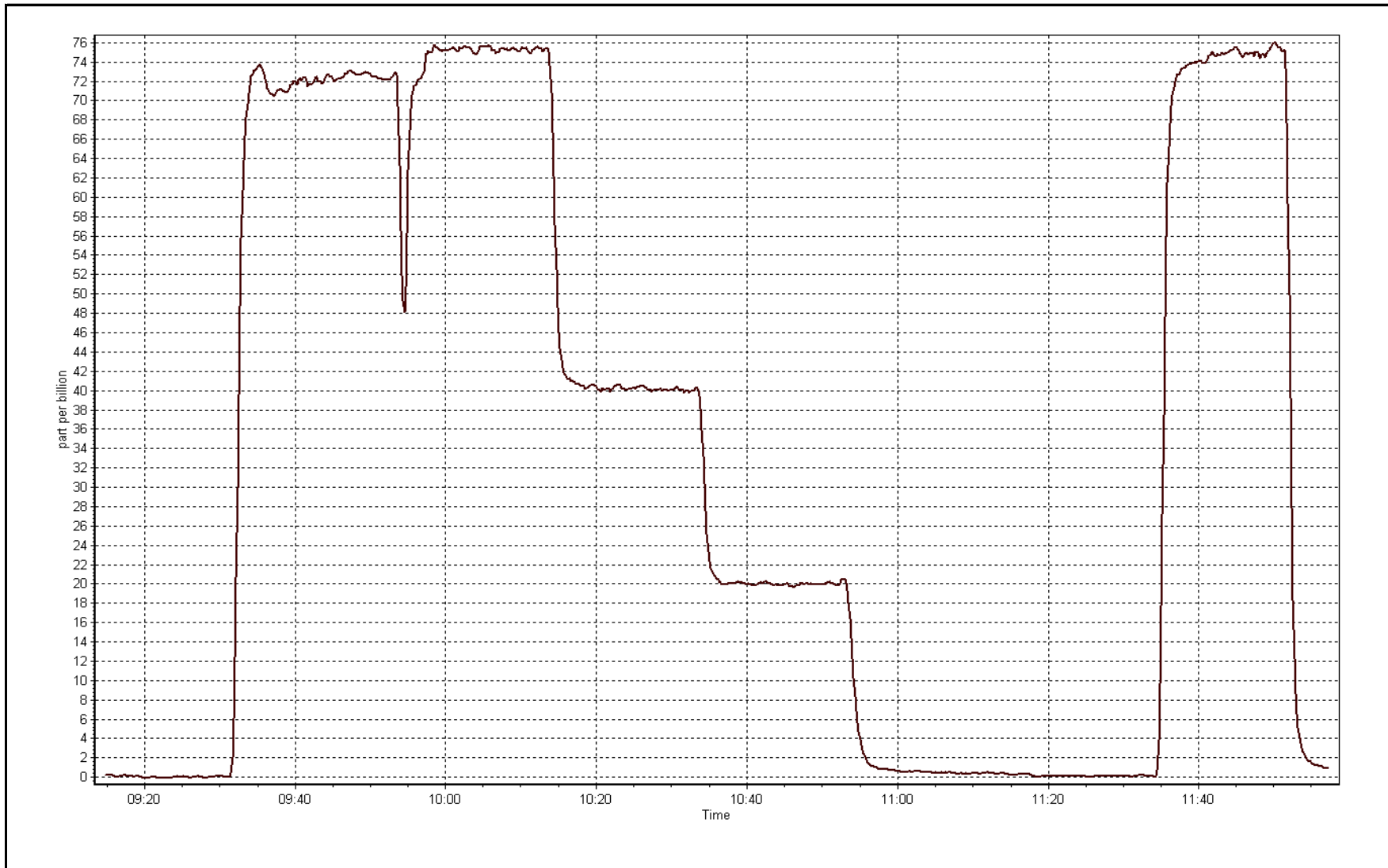
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:15	End Time (MST)	15:05
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1507864683

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999998
75.3	75.3	1.0000		
40.2	40.2	0.9990	Slope	0.999560
20.1	20.0	1.0040		
			Intercept	0.024913







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 2, 2016	Last Calibration	November 28, 2016
Station Name	Athabasca Valley	Station Number	AMS 7

Reason: Routine

Start Time (MST)	8:20	End Time (MST)	13:10
Gas Cert Reference	LL110103	Cal Gas Expiry Date	February 16, 2019
CH4 Cal Gas Conc.	488.0 ppm	CH4 Equiv Conc.	1035.3 ppm
C3H8 Cal Gas Conc.	199.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	11021107
ZAG make/model	Teledyne API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	Serial Number	5564

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.2
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.002242	1.005381	Carrier Pressure	35.9	35.9
THC Calc intercept	-0.039822	-0.044142	Fuel Pressure	44.7	44.7
NMHC Calc slope	1.004502	1.010542	Air Pressure	26.0	25.9
NMHC Calc intercept	-0.043594	-0.048236			

Analyzer make Thermo 55i Analyzer serial # 1426262594

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	59.1	12.24	12.29	0.996
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	59.1	12.24	12.20	1.003
second point	5000	29.5	6.11	6.14	0.995
third point	5000	14.8	3.06	3.11	0.985
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	12.24	12.20	1.003
Average Correction Factor					0.994

Corrected As found 12.29 Previous response 12.25 % change -0.3%

Notes:

Filter changed out, Span adjusted, no maintenance done

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	59.1	6.47	6.47	1.000
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	59.1	6.47	6.43	1.006
second point	5000	29.5	3.23	3.27	0.987
third point	5000	14.8	1.62	1.67	0.970
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	6.47	6.44	1.004
Average Correction Factor					0.988

Corrected As found 6.47 Previous response 6.48 % change 0.2%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	59.1	5.77	5.82	0.991
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	5.77	5.78	0.998
second point	5000	29.5	2.88	2.87	1.003
third point	5000	14.8	1.44	1.44	1.003
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	5.77	5.76	1.001
Average Correction Factor					1.001

Corrected As found 5.82 Previous response 5.77 % change -0.9%



Wood Buffalo Environmental Association

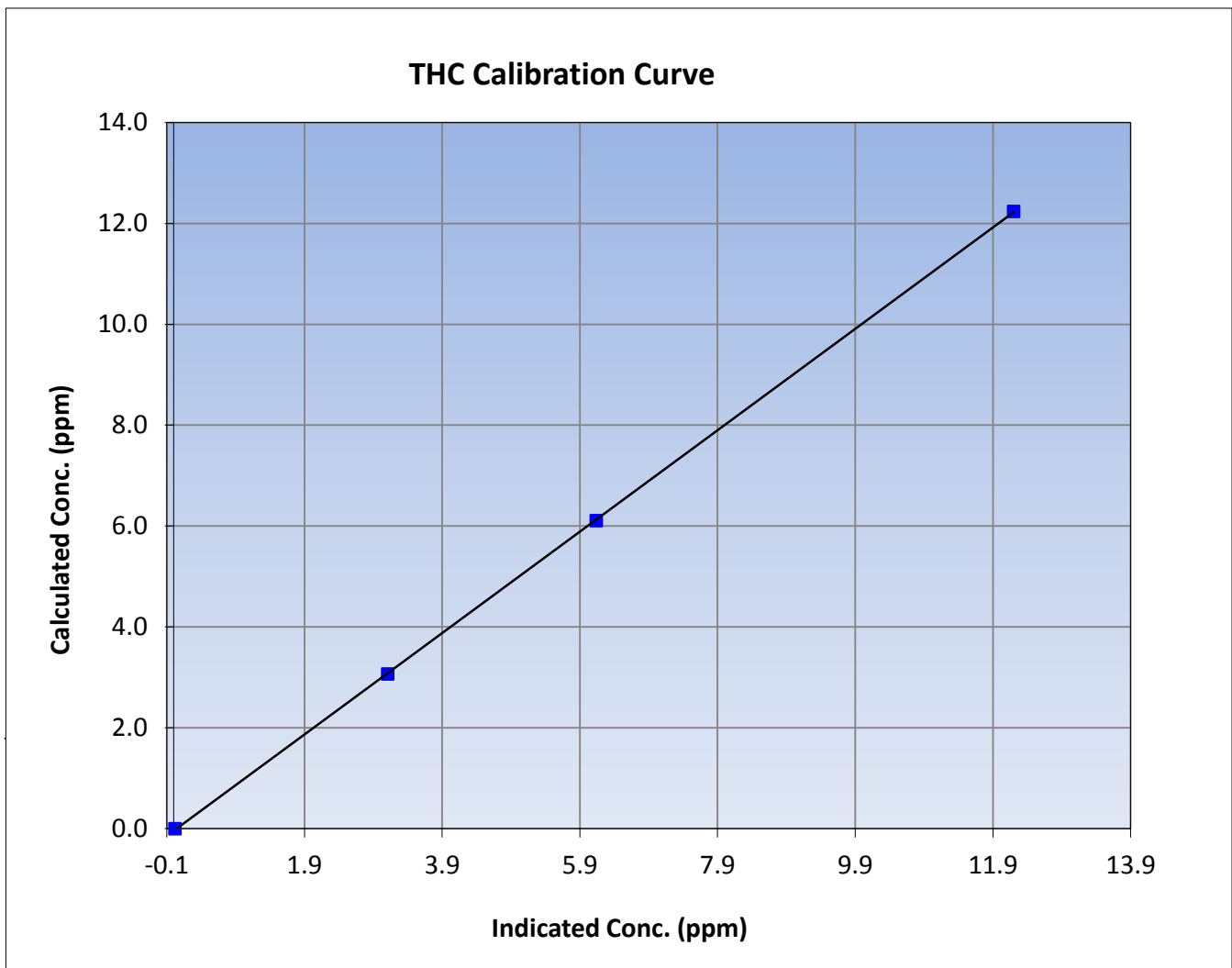
THC Calibration Summary

Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 28, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	13:10
Analyzer make	Thermo 55i	Analyzer serial #	1426262594
0.528			

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999981
12.24	12.20	1.0030		
6.11	6.14	0.9948	Slope	1.005381
3.06	3.11	0.9853		
			Intercept	-0.044142





Wood Buffalo Environmental Association

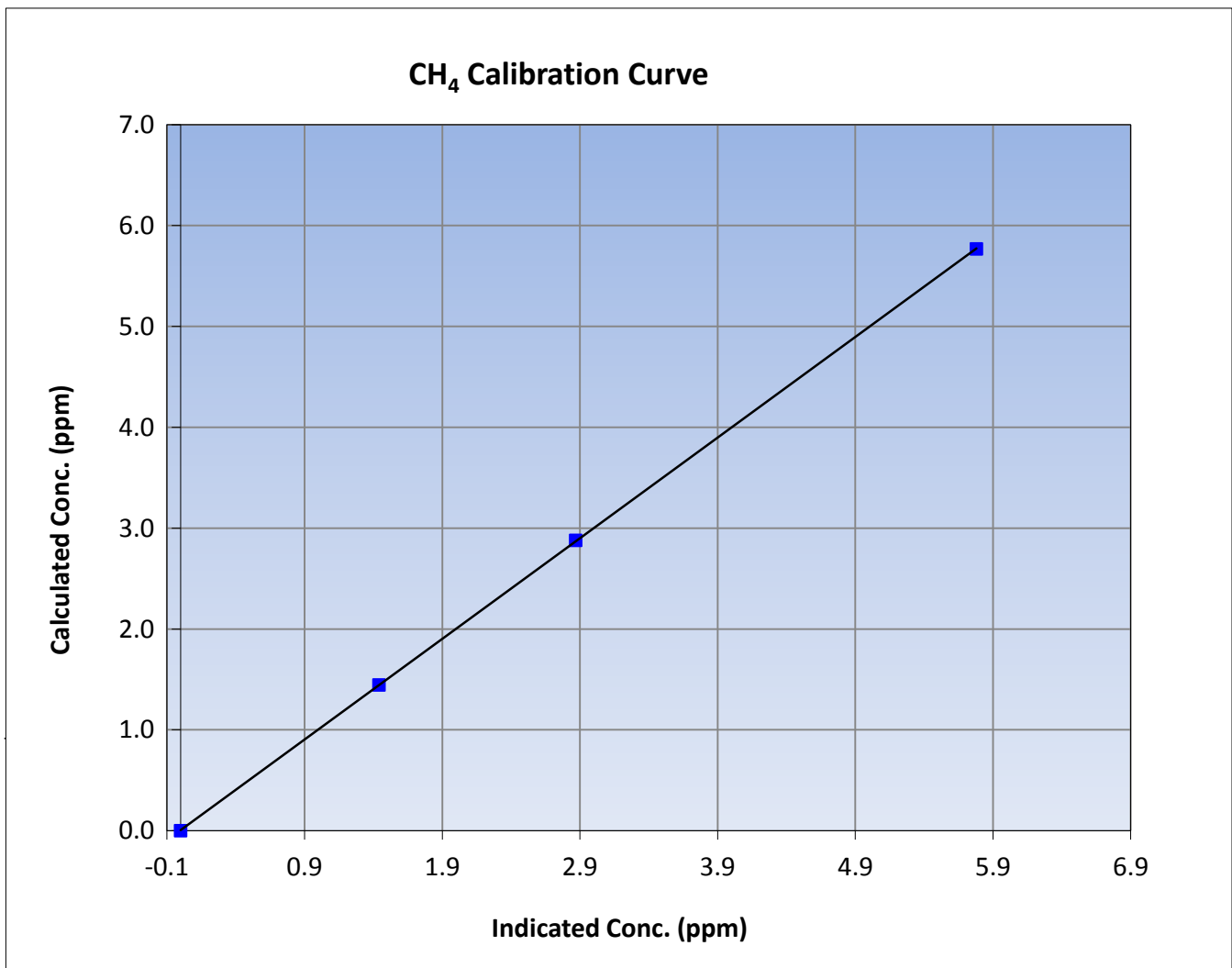
CH₄ Calibration Summary

Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 28, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	13:10
Analyzer make	Thermo 55i	Analyzer serial #	1426262594
		0.528	

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999991
5.77	5.78	0.9980		
2.88	2.87	1.0032	Slope	0.997798
1.44	1.44	1.0031		
			Intercept	0.006014





Wood Buffalo Environmental Association

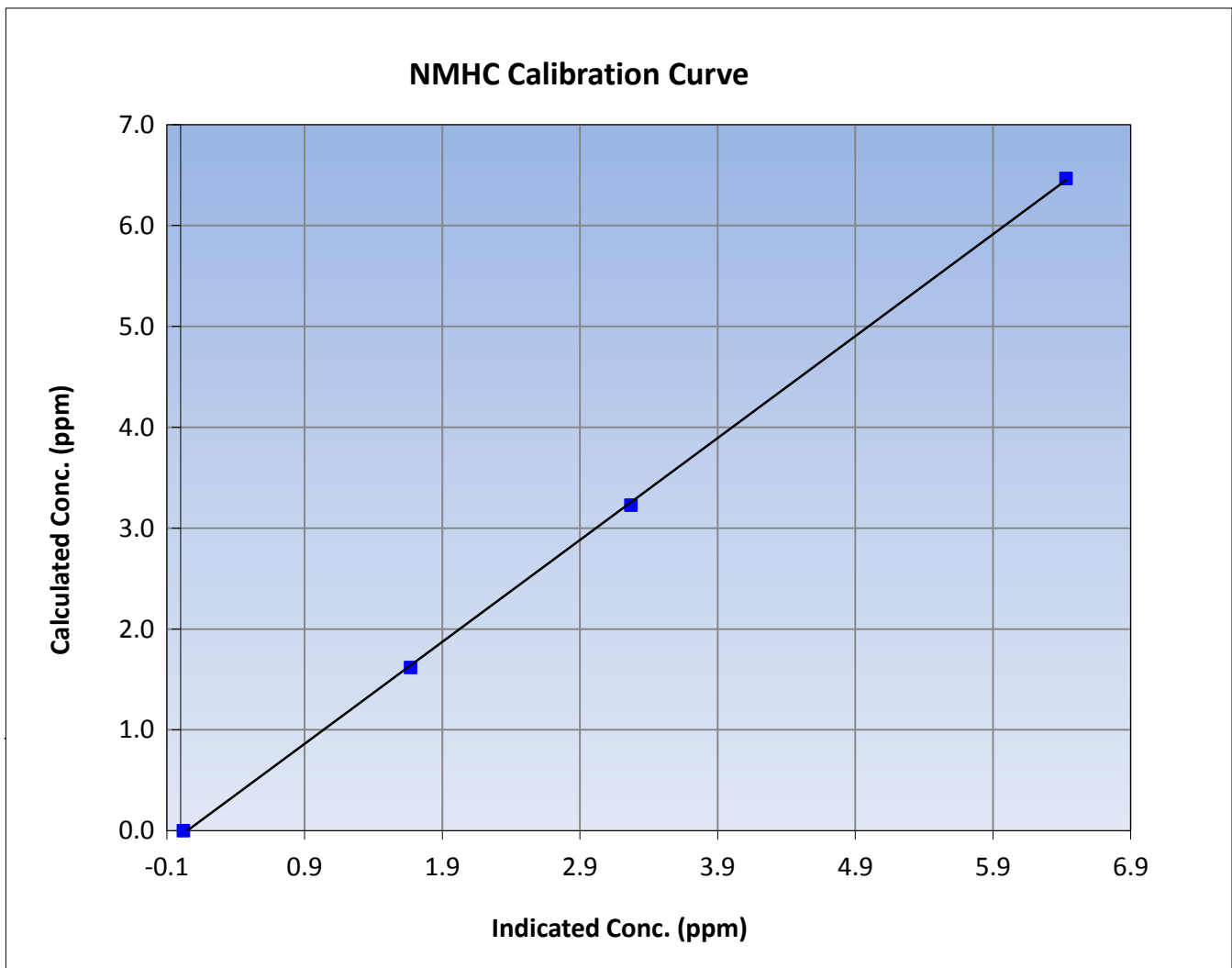
NMHC Calibration Summary

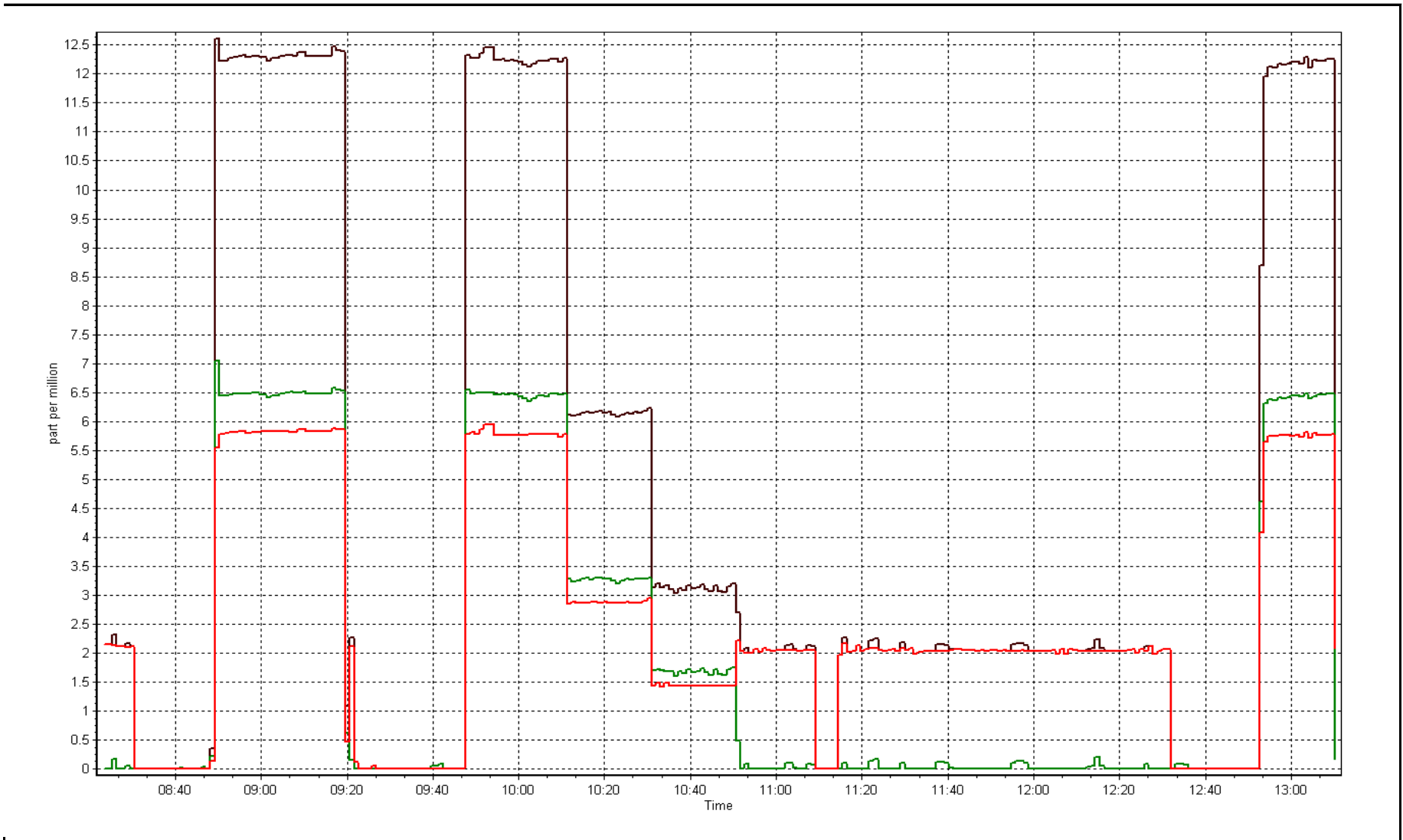
Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 28, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	13:10
Analyzer make	Thermo 55i	Analyzer serial #	1426262594
0.528			

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999900
6.47	6.43	1.0060		
3.23	3.27	0.9874	Slope	1.010542
1.62	1.67	0.9700		
			Intercept	-0.048236







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 5, 2016	Last Calibration	December 2, 2016		
Station Name	Athabasca Valley	Station Number	AMS 7		
Reason:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Other:</td> <td>Repair</td> </tr> </table>			Other:	Repair
Other:	Repair				
Start Time (MST)	8:58	End Time (MST)	11:25		
Gas Cert Reference	LL110103	Cal Gas Expiry Date	February 16, 2019		
CH4 Cal Gas Conc.	488.0 ppm	CH4 Equiv Conc.	1035.3 ppm		
C3H8 Cal Gas Conc.	199.0 ppm	Station temp.	22 Deg C		
Calibrator Model	Sabio 4010	Serial Number	11021107		
ZAG make/model	Teledyne API 701	Serial Number	1864		
DACS make/model	Campbell Scientific CR3000	Serial Number	5564		

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.005381	0.989220	Carrier Pressure	35.9	35.9
THC Calc intercept	-0.044142	0.000000	Fuel Pressure	44.7	44.7
NMHC Calc slope	1.010542	0.989067	Air Pressure	26.0	26.0
NMHC Calc intercept	-0.048236	0.000000			

Analyzer make Thermo 55i Analyzer serial # 1426262594

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	59.1	12.24	12.31	0.994
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	12.24	12.37	0.989
second point					
third point					
as left zero					
as left span					
Average Correction Factor					0.989

Corrected As found 12.31 Previous response 12.22 % change -0.8%

Notes:

Replaced detector signal Cable

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

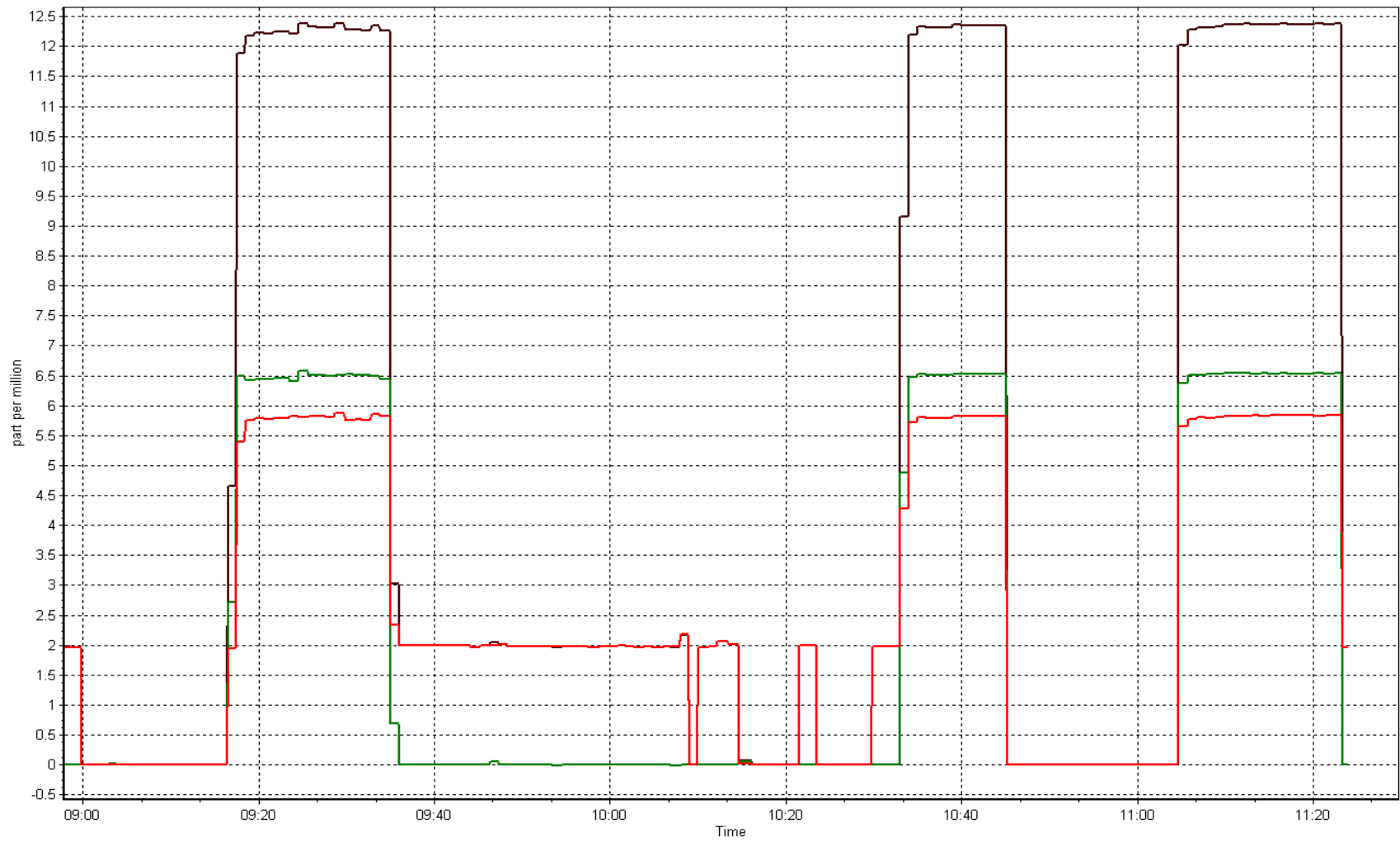
Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	59.1	6.47	6.50	0.995
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	6.47	6.54	0.989
second point					
third point					
as left zero					
as left span					
Average Correction Factor					0.989

Corrected As found 6.50 Previous response 6.45 % change -0.8%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	59.1	5.77	5.81	0.993
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	5.77	5.83	0.989
second point					
third point					
as left zero					
as left span					
Average Correction Factor					0.989

Corrected As found 5.81 Previous response 5.77 % change -0.8%





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 9, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	11:25	End Time (MST)	14:16
NO2 GPT Ref date	NA	Transfer Standard	GPTPS
Calibrator Make/Model	API T700	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	2445
DACS make/model	Campbell Scientific CR3000	Serial Number	1864
		Serial Number	5564

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.7	27.7
Analyzer IP address	192.168.1.48		Lamp temp.	67.9	67.9
Calculated slope	0.998019	0.996186	Pressure	718.3	718.3
Calculated intercept	-0.776129	-0.079680	Flow cell A	0.759	0.759
Analyzer Background	-2.2	-0.8	Flow cell B	0.778	0.778
Analyzer Coefficient	1.027	1.027	Cell A Intensity	113447	113447
			Cell B Intensity	100199	100199

Analyzer make	TEI 49i	Analyzer serial #	1507964700
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.8	----
as found span	5000	995.40	400.0	401.8	0.996
calibrator zero	5000	0.00	0.0	0.1	----
high point	5000	994.20	400.0	401.6	0.996
second point	5000	848.50	200.0	200.9	0.996
third point	5000	750.90	100.0	100.4	0.996
as left zero	5000	0.00	0.0	-0.3	----
as left span	5000	994.10	400.0	402.4	0.994
Average Correction Factor					0.996

Corrected As found	401.0	Previous response	401.6	% change	0.1%
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Notes:

No maintenance done, zero adjusted, filter changed out

Calibration Performed By:

Melissa Lemay



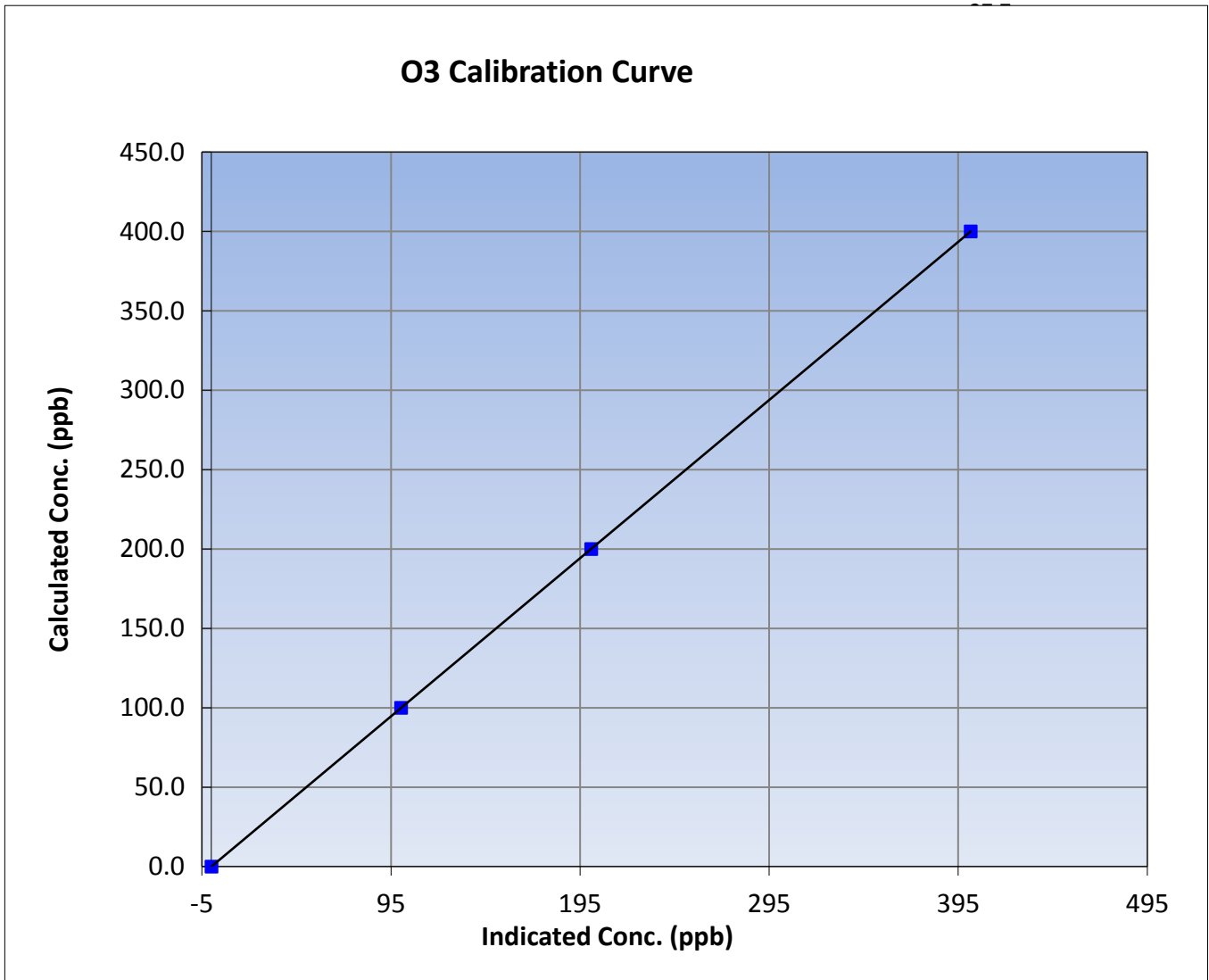
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	December-05-16	Previous Calibration	November 9, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	11:25	End Time (MST)	14:16
Analyzer make	TEI 49i	Analyzer serial #	1507964700

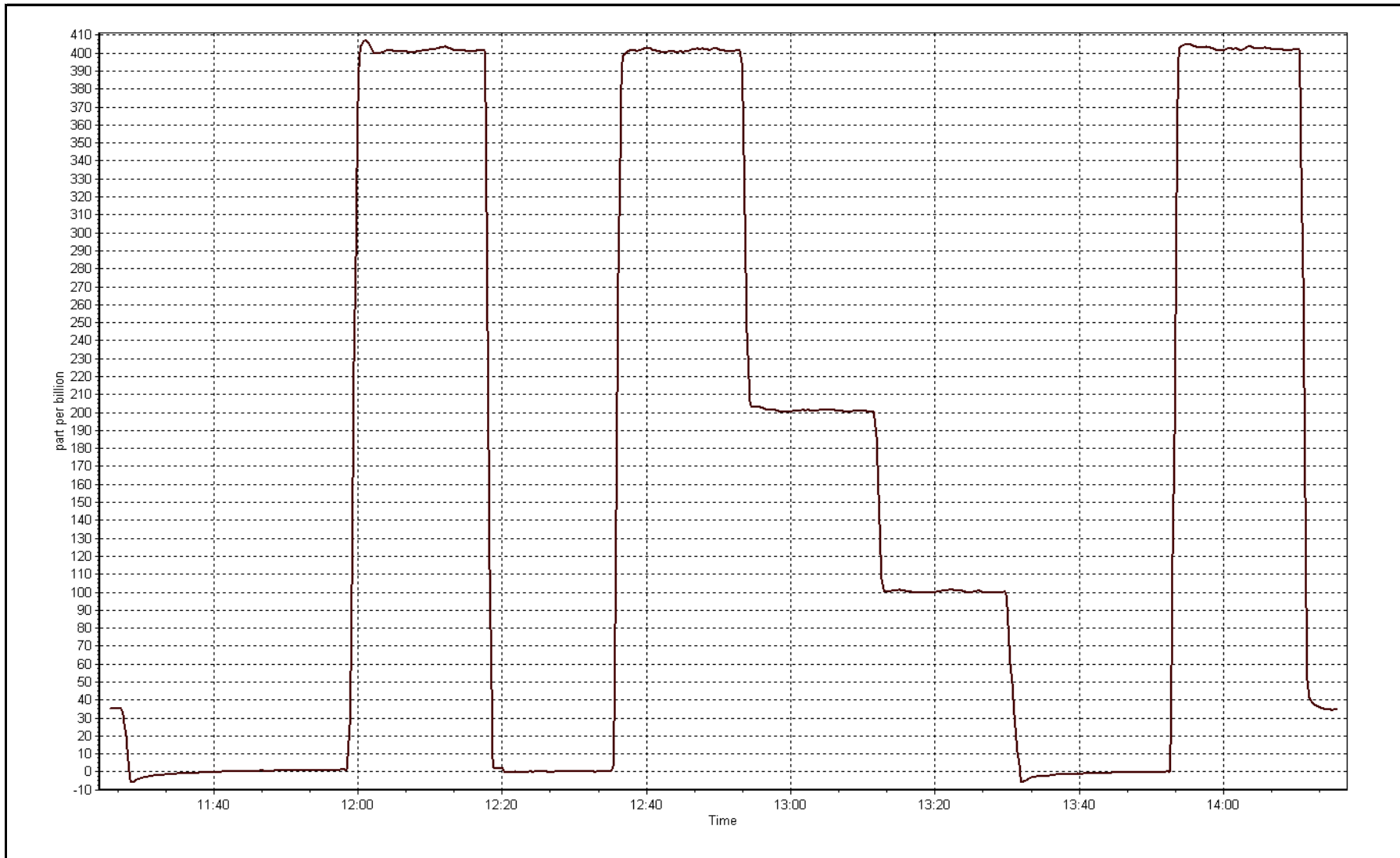
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	1.000000
400.0	401.6	0.9960		
200.0	200.9	0.9955	Slope	0.996186
100.0	100.4	0.9960		
			Intercept	-0.079680



O3 Calibration Plot

Date: December 5, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:20	End Time (MST)	13:12
NO Cal Gas Conc	50.8 ppm	Gas Cert Reference	LL110103
NOx Cal Gas Conc	50.8 ppm	Cal Gas Expiry Date	February 16, 2019
Calibrator	API T700	Serial Number	2445
Zero air Generator	Teledyne PAI T701	Serial Number	1864

DACs Information

DACs make & model	Campbell Scientific CR3000	DACs serial No.	8205
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.994290	0.995250	1.002736
	Data Offset	0.938858	1.158864	-0.204368
Current Calibration	Data Slope	1.002038	1.003456	1.006989
	Data Offset	1.229209	1.411315	-1.162295

Analyzer Information

Analyzer make/model	Thermo 42C	Analyzer serial #	601114773
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.103		192.168.1.103	
NO coefficient	1.135		1.135	
NOX coefficient	1.001		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	3.2		3.2	
NOX bkgrnd	3.3		3.3	
Chamber Temp	49.7	Deg C	49.7	Deg C
Moly Temp	324	Deg C	324	Deg C
PMT voltage	-784	V	-784	V
PMT Temp	-3.7	Deg C	-3.7	Deg C
O3 flow	ok		ok	
R Cell press NO	135.5	mmHg	135.5	mmHg
R Cell Press Nox	135.5	mmHg	135.5	mmHg
NO sample flow	0.908	lpm	0.908	lpm
Nox sample Flow	0.908	lpm	0.908	lpm

Notes:

No adjustments or maintenance done, filter changed out



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 2, 2016 Station Number: AMS 7

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.2	-0.1	0.3	----	----
as found span	5000	59.1	600.5	600.5	0.0	599.0	597.7	1.4	1.0024	1.0046
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	0.0	3.0	----	----
high point	5000	59.1	600.5	600.5	0.0	598.7	597.6	1.1	1.0029	1.0048
second point	5000	29.5	299.7	299.7	0.0	297.2	296.8	0.7	1.0085	1.0098
third point	5000	14.8	150.4	150.4	0.0	147.4	146.9	0.5	1.0201	1.0236
as left zero	5000	0.0	0.0	0.0	0.0	0.2	-0.1	0.3	----	----
as left span	5000	59.1	600.5	192.0	408.5	593.1	188.9	404.2	1.0124	1.0164
Average Correction Factor									1.0105	1.0127

Corrcted As found NO_x= 598.8 NO= 597.8 Percent Change NO_x= 0.7% NO= 0.7%
 Previous Response NO_x= 603.0 NO= 602.2

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 59.10 ccm NOX ref calc conc = 600.5 ppb NO ref calc conc = 600.5 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	598.4	598.2	3.0	1.0034	1.0038	----	----
1st NO2 (300)	192.0	406.2	597.4	192.0	405.4	1.0051	----	1.0020	99.8%
2nd NO2 (200)	387.8	210.4	597.0	387.8	209.4	1.0058	----	1.0048	99.5%
3rd NO2 (100)	492.0	106.2	596.6	492.0	104.6	1.0065	----	1.0153	98.5%
2nd NO ref point		0.0	596.9	596.9	0.2	1.0060	1.0060	----	----
Average Correction Factor						1.0058		1.0073	99.3%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

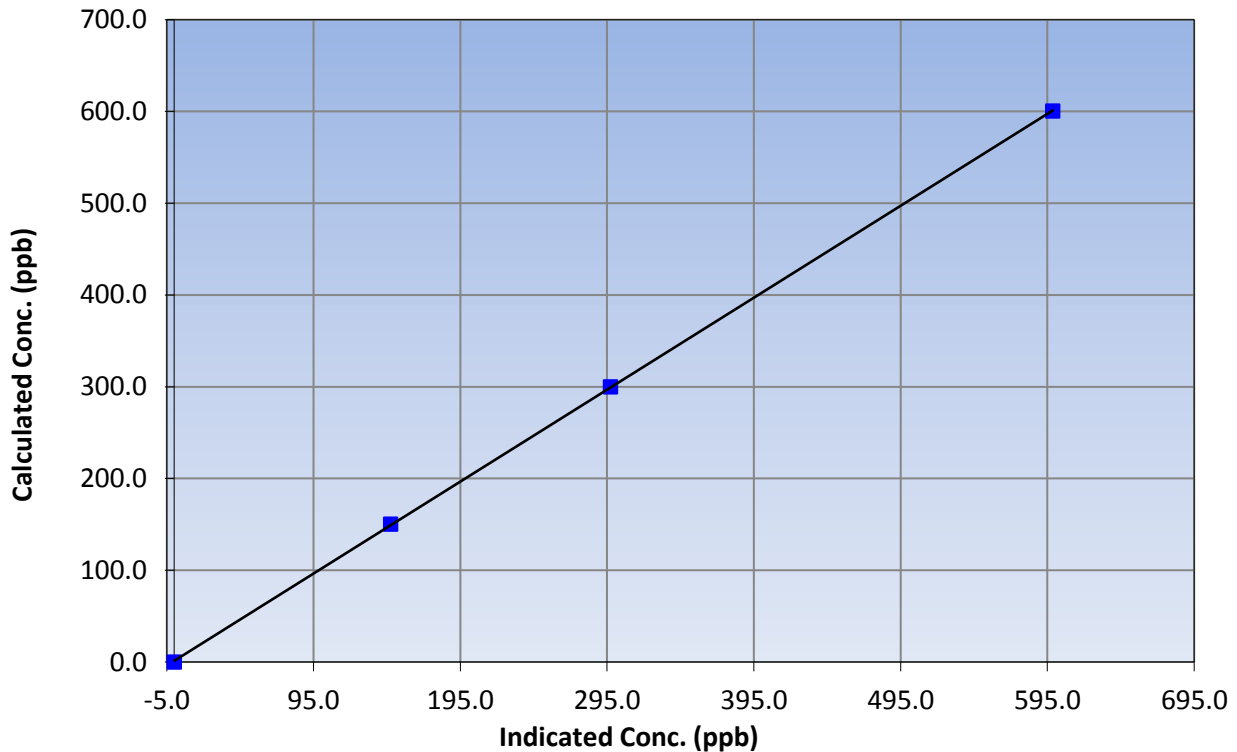
Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	13:12
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999974
600.5	598.7	1.0029		
299.7	297.2	1.0085	Slope	1.002038
150.4	147.4	1.0201		
			Intercept	1.229209

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

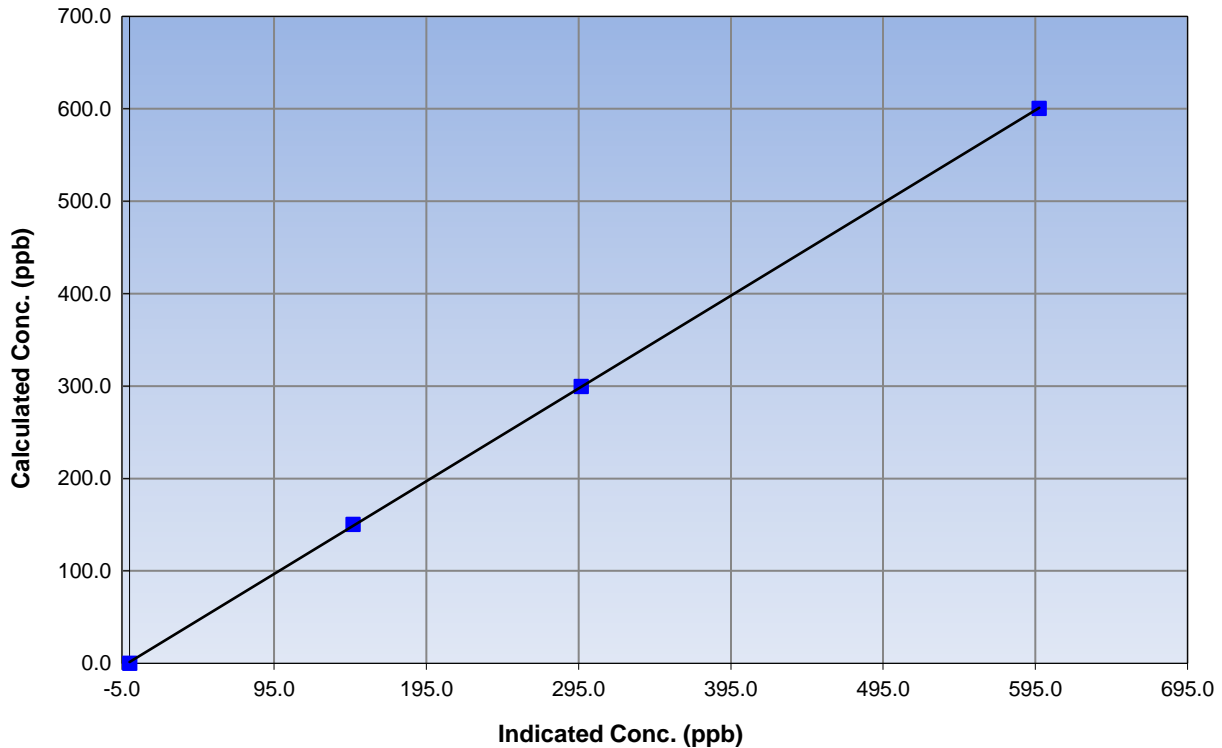
Station Information

Calibration Date	December 2, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	13:12
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999975
600.5	597.6	1.0048		
299.7	296.8	1.0098		
150.4	146.9	1.0236		
			Slope	1.003456
			Intercept	1.411315

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

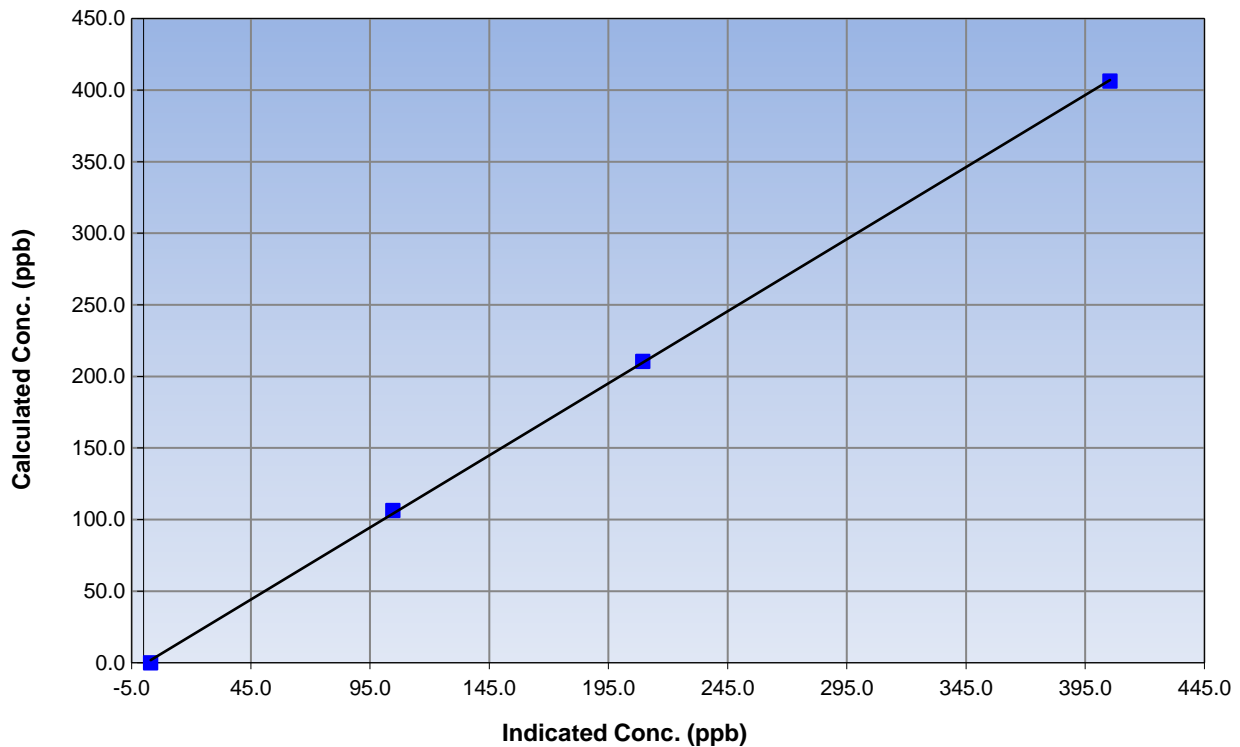
Station Information

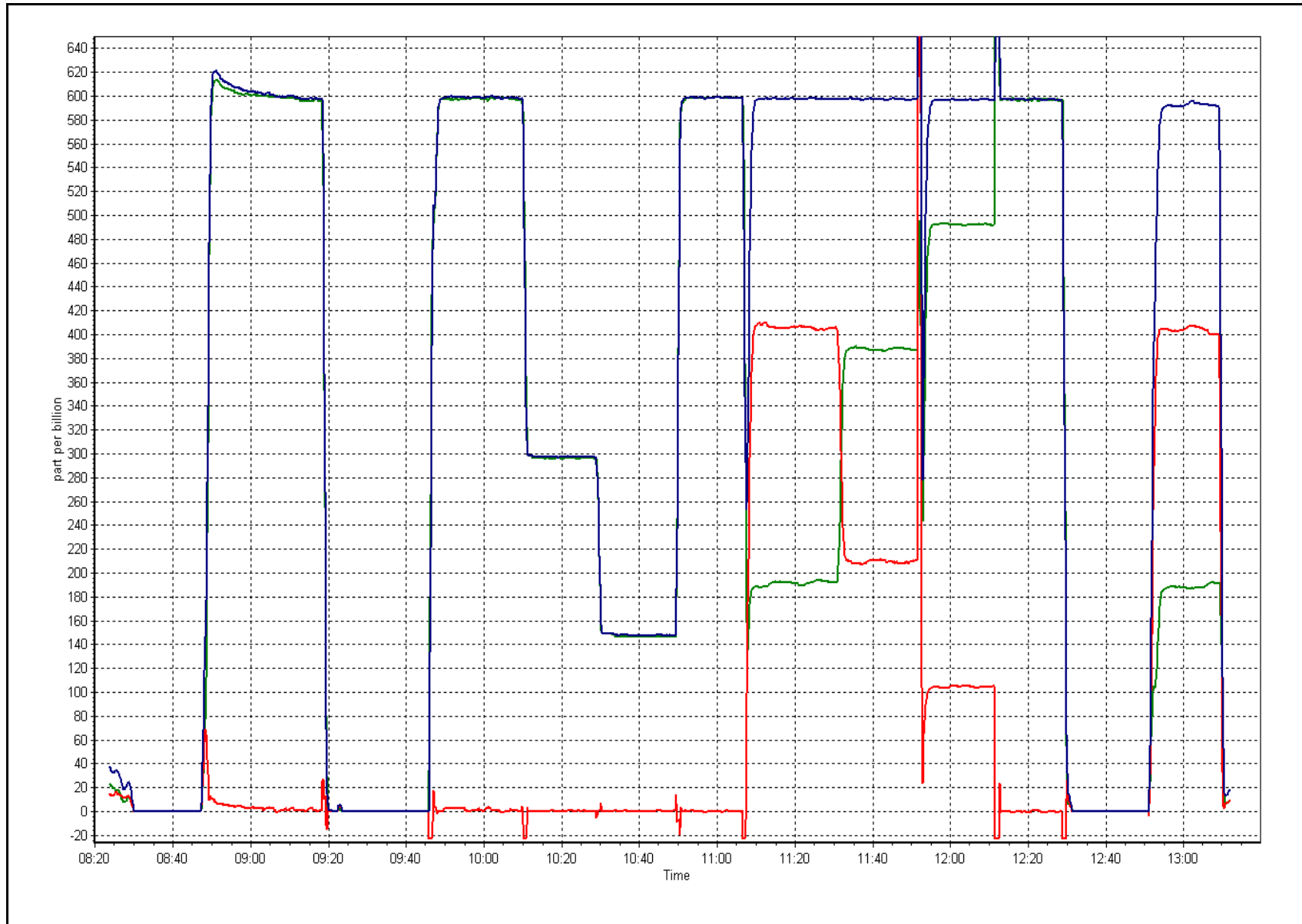
Calibration Date	December 2, 2016	Previous Calibration	November 8, 2016
Station Number	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:20	End Time (MST)	13:12
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	3.0	N/A	Correlation Coefficient	0.999902
406.2	405.4	1.0020		
210.4	209.4	1.0048	Slope	1.006989
106.2	104.6	1.0153		
			Intercept	-1.162295

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Athabasca Valley	Station number:	AMS 7
Calibration Date:	December 12, 2016	Last Cal Date:	November 19, 2016
Start time (MST):	9:21	End time (MST):	10:20
Sharp Model:	Thermo 5030	S/N:	E515
Particulate Fraction:	PM2.5	C14 Source S/N:	3256
Flow Standard Model:	Delta Cal	S/N:	1019
Temp/RH standard:	Delta Cal	S/N:	1019

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-20	-22	-20	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	987	979	987	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1000	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	2.6	-----	0	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning:	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

				Tolerance
Leak Test:	Date of check:	<u>November 19, 2016</u>	Last Cal Date:	<u>Sep 22, 2016</u>
	Flow w/o adaptor:	<u>16.57</u>	Flow w/ adaptor:	<u>16.32</u> 0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	<u>1337</u>	S/N:	<u>2518</u>
	Date of check:	<u>July 22, 2016</u>	Last Cal Date:	<u>June 2, 2016</u>
	New Correction Factor:	<u>6895</u>	Previous Correction Factor:	<u>6885</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	21			<input type="checkbox"/>	+/- 2 °C
T3 (°C)	23			<input type="checkbox"/>	+/- 2 °C
T4 (°C)	20			<input type="checkbox"/>	+/- 2 °C
RH (%)	12			<input type="checkbox"/>	+/- 10%

Notes: Nephelometer adjusted, cyclone head cleaned

Calibration by: Melissa Lemay



Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Athabasca Valley	Station number:	AMS 7
Calibration Date:	December 22, 2016	Last Cal Date:	December 12, 2016
Start time (MST):	8:33	End time (MST):	10:03
Sharp Model:	Thermo 5030	S/N:	E515
Particulate Fraction:	PM2.5	C14 Source S/N:	3256
Flow Standard Model:	Delta Cal	S/N:	1019
Temp/RH standard:	Delta Cal	S/N:	1019

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-1	-1	-1	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	967	965	967	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1000	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.5	-----	-0.2	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input type="checkbox"/>				
Cyclone cleaning:	PM10 Cyclone <input type="checkbox"/>		PM2.5 Cyclone <input type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

				Tolerance
Leak Test:	Date of check:	<u>November 19, 2016</u>	Last Cal Date:	<u>Sep 22, 2016</u>
	Flow w/o adaptor:	<u>16.57</u>	Flow w/ adaptor:	<u>16.32</u> 0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	<u>1337</u>	S/N:	<u>2518</u>
	Date of check:	<u>July 22, 2016</u>	Last Cal Date:	<u>June 2, 2016</u>
	New Correction Factor:	<u>6895</u>	Previous Correction Factor:	<u>6885</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	21			<input type="checkbox"/>	+/- 2 °C
T3 (°C)	23			<input type="checkbox"/>	+/- 2 °C
T4 (°C)	20			<input type="checkbox"/>	+/- 2 °C
RH (%)	12			<input type="checkbox"/>	+/- 10%

Notes: For first 10minutes Nephelometer -0.8ug/m3 then went up to -0.5ug/m3. With new Hepa was still getting around -0.5ug/m3

Calibration by: Melissa Lemay



Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	November 7, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	11:50	End Time (MST)	14:29
Gas Cert Reference	CC101396	Station temp.	22 Deg C
Cal Gas Concentration	2970 ppm	Cal Gas Exp Date	February 2, 2023
Calibrator Make/Model	API T700	Serial Number	2445
ZAG Make/Model	API 701	Serial Number	5564
DACS make/model	Campbell Scientific CR3000	Serial Number	1864

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Chamber temp.	48.1	48.0
Analyzer IP address	192.168.1.48		Pressure	731.6	733.1
Calculated slope	0.998683	0.999602	Flow	0.493	0.494
Calculated intercept	-0.011606	-0.023032	Intensity	199718	199688
Analyzer Background	6.609	6.794	S/R ratio	1.170175	1.170207
Analyzer Coefficient	1.088	1.088			

Analyzer make Thermo 48i-TLE Analyzer serial # 1408761381

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	69.7	41.4	41.8	0.991
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	69.7	41.4	41.4	1.000
second point	5000	35.2	20.9	21.0	0.996
third point	5000	15.2	9.0	9.1	0.997
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	69.7	41.4	41.4	1.001
Average Correction Factor					0.997

Corrected As found 41.7 Previous response 41.5 % change -0.4%

Notes:

Inlet filter changed. No maintenance done, Zero adjusted

Calibration Performed By: Melissa Lemay



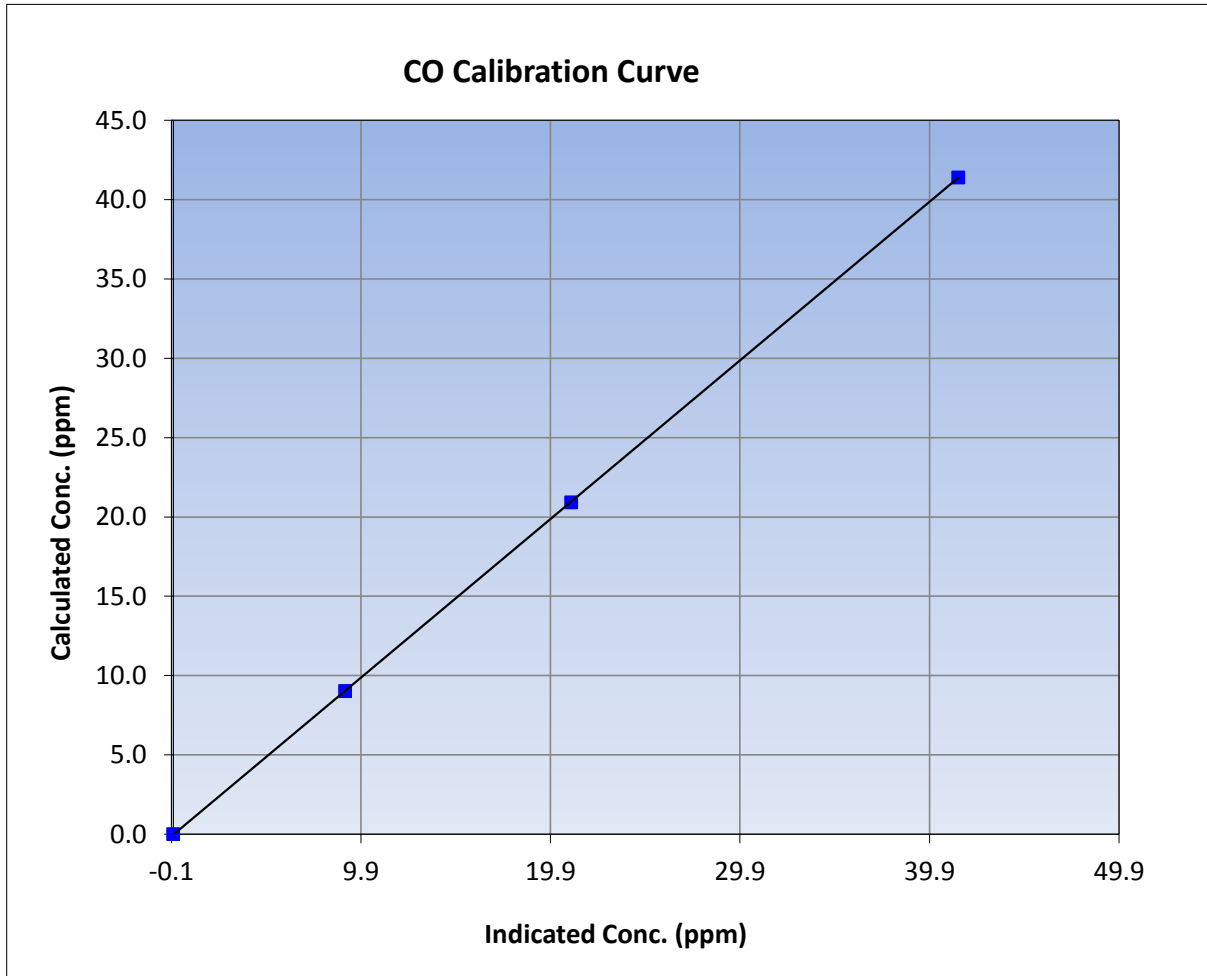
Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 7, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	11:50	End Time (MST)	14:29
Analyzer make	Thermo 48i-TLE	Analyzer serial #	1408761381

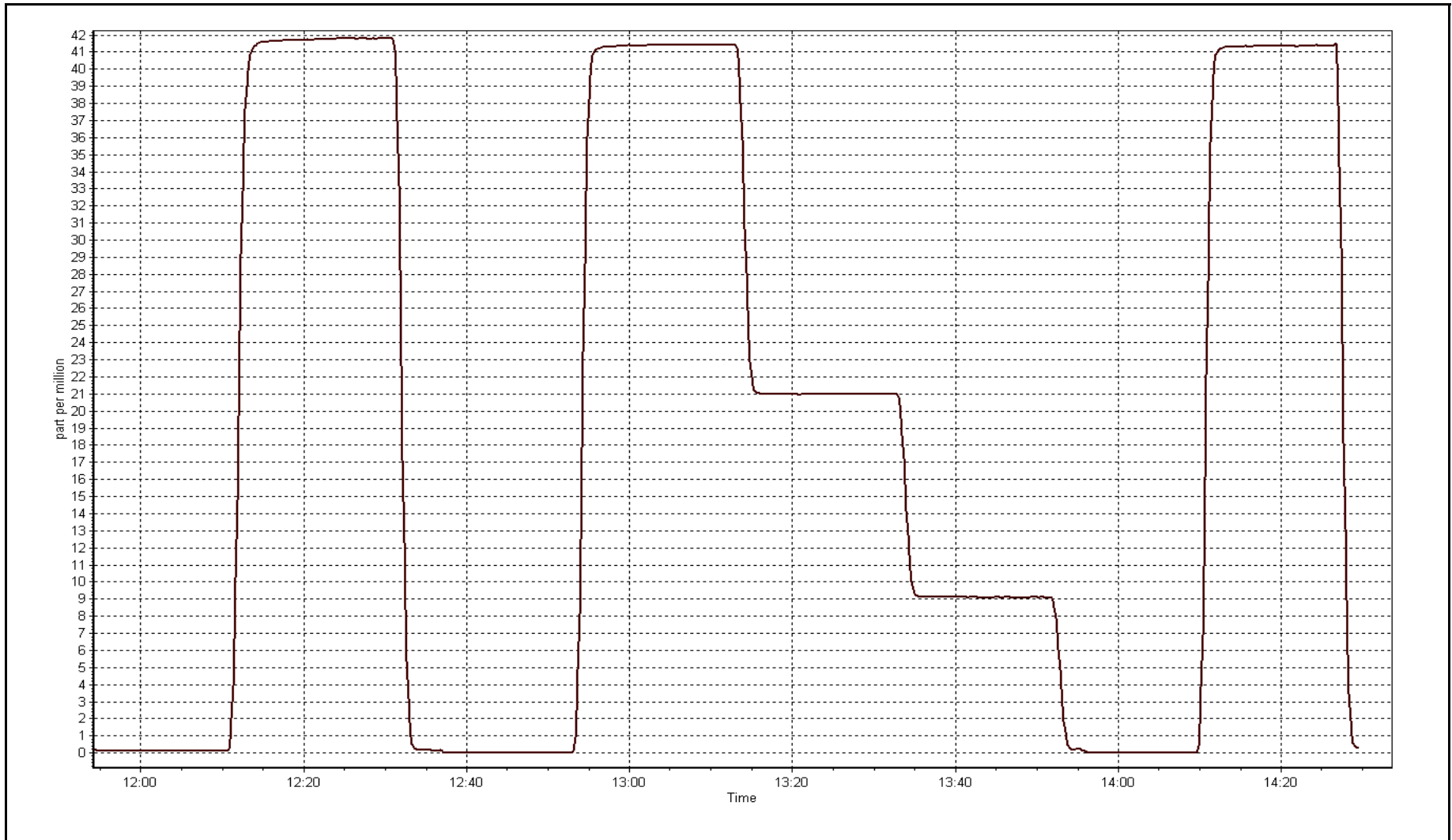
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999994
41.4	41.4	0.9998		
20.9	21.0	0.9957	Slope	0.999602
9.0	9.1	0.9966		
			Intercept	-0.023032



CO Calibration Plot

Date: December 12, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 8
FORT CHIPEWYAN
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100.00	21	0	6	0
O3(ppb) Average	706	37	38	99.87	40	0	38	-
NO2(ppb) Average	708	36	36	100.00	30	0	14	-
NO(ppb) Average	708	36	36	100.00	11	-	3	-
NOX(ppb) Average	708	36	36	100.00	41	-	16	-
PM2.5(ug/m3) Average	743	1	1	100.00	16.4	-	8.4	0
Wind Speed 10 m (km/h) Average	741	0	3	99.60	31	-	22	-
Wind Direction 10 m (deg) Average	741	0	3	99.60	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	-0.9	-	-2	-
Relative Humidity (%) Average	744	0	0	100.00	98	-	93	-
Precipitation (mm) Total	0	0	744	0.00	--	-	--	-
Leaf Wetness (% of range) Average	744	0	0	100.00	3	-	2	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	190	-	32	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	708	0.8	2	-	0	0	0	0	1	3	21
O3(ppb) Average	706	27.8	8	-	1	18	24	29	34	36	40
NO2(ppb) Average	708	2.6	5	-	0	0	0	1	2	7	30
NO(ppb) Average	708	0.3	1	-	0	0	0	0	0	0	11
NOX(ppb) Average	708	3	6	-	0	0	0	1	3	7	41
PM2.5(ug/m3) Average	743	3.47	2.5	-	0.7	1.2	1.7	2.7	4.4	7	16.4
Wind Speed 10 m (km/h) Average	741	12.3	6	-	1	5	7	12	16	21	31
Wind Direction 10 m (deg) Average	741	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-19.45	7.6	-	-33.6	-28.5	-25.4	-20	-15.3	-8.3	-0.9
Relative Humidity (%) Average	744	80.3	5	-	70	75	76	79	83	88	98
Precipitation (mm) Total	0	-	-	--	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	744	1	1	-	0	0	0	1	2	2	3
Global Solar Radiation (W/m2) Average	744	18.6	40	-	0	0	0	0	10	82	190

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
O3	01 Dec 2016 12:00	01 Dec 2016 12:00	1	Maintenance - cleaned glass manifold
Wind Speed, Wind Direction	17 Dec 2016 00:00	17 Dec 2016 00:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	22 Dec 2016 01:00	22 Dec 2016 02:00	2	Flat line in sensor output signal - Sensor frozen
Precipitation Collector	01 Dec 2016 01:00	01 Jan 2017 00:00	744	Analyzer Failure



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Fort Chipewyan - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 21 ppb on Dec 17 17:00	Maximum Daily Average: 5.6 ppb on Dec 25		Hours of Data:	708
Minimum Value: 0 ppb on Dec 4 07:00	Minimum Daily Average: 0.0 ppb on Dec 6		Hours of Missing Data:	36
Maximum Diurnal Average: 1.4 ppb at hour 18	Minimum Diurnal Average: 0.6 ppb at hour 21		Hours of Calibration:	36
Monthly Average: 0.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 3 P ₉₉ = 8		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	6	6	1	0	Z	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.9	6
2-Dec	Z	0	0	0	0	0	1	2	3	4	3	3	2	2	3	1	0	0	0	0	0	0	0	1	1.2	4
3-Dec	1	Z	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	0	1.2	2
4-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	3	3	3	0.8	3
10-Dec	4	3	Z	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	4
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	Z	0	0	0	1	1	2	2	3	4	5	5	8	21	16	4	2	2	2	2	1	3.6	21
18-Dec	1	1	1	1	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.9	2
19-Dec	0	0	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0.6	1
21-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0.7	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	12	9	1.2	12
25-Dec	6	6	5	6	4	Z	5	8	7	6	5	5	6	6	5	5	4	13	10	6	3	3	2	2	5.6	13
26-Dec	Z	2	3	3	2	3	3	4	4	3	4	4	5	6	5	6	7	8	7	6	6	5	5	5	4.6	8
27-Dec	5	Z	5	5	6	6	7	6	5	5	3	2	1	1	1	1	1	1	0	0	0	0	0	0	2.7	7
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

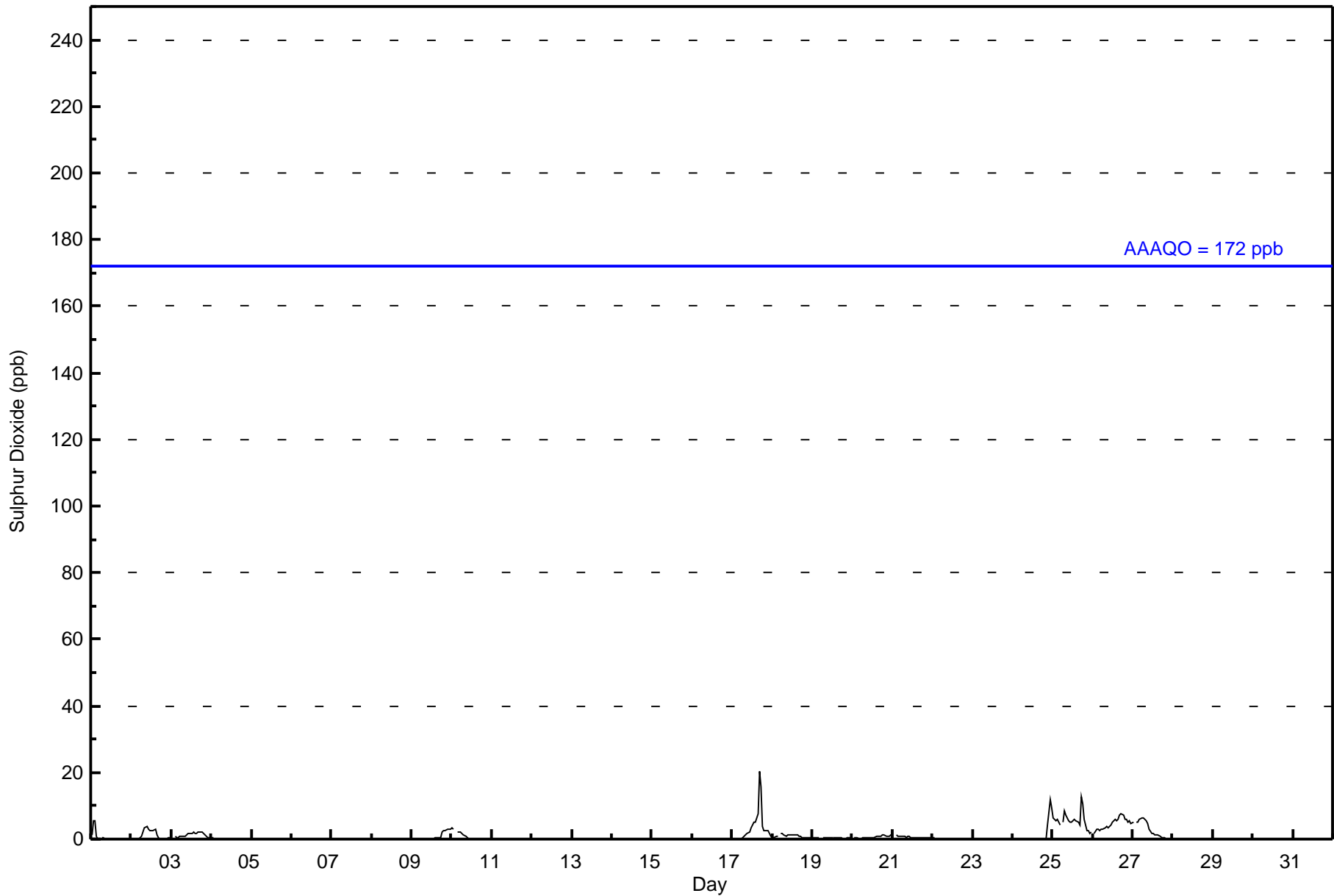
0.8	0.7	0.9	0.8	0.7	0.6	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.9	0.8	0.9	1.2	1.4	0.9	0.7	0.6	0.7	0.9	0.7	Diurnal Average
6	6	6	6	6	6	7	8	7	6	5	5	6	6	5	8	21	16	10	6	6	5	12	9	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	704	99.44	99.44
11 - 20	3	0.42	99.86
21 - 60	1	0.14	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	9	9	13	44	81	52	18	34	49	15	11	19	73	134	116	24	701
11 - 20	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	3
21 - 60	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	9	9	13	44	84	52	18	34	50	15	11	19	73	134	116	24	705

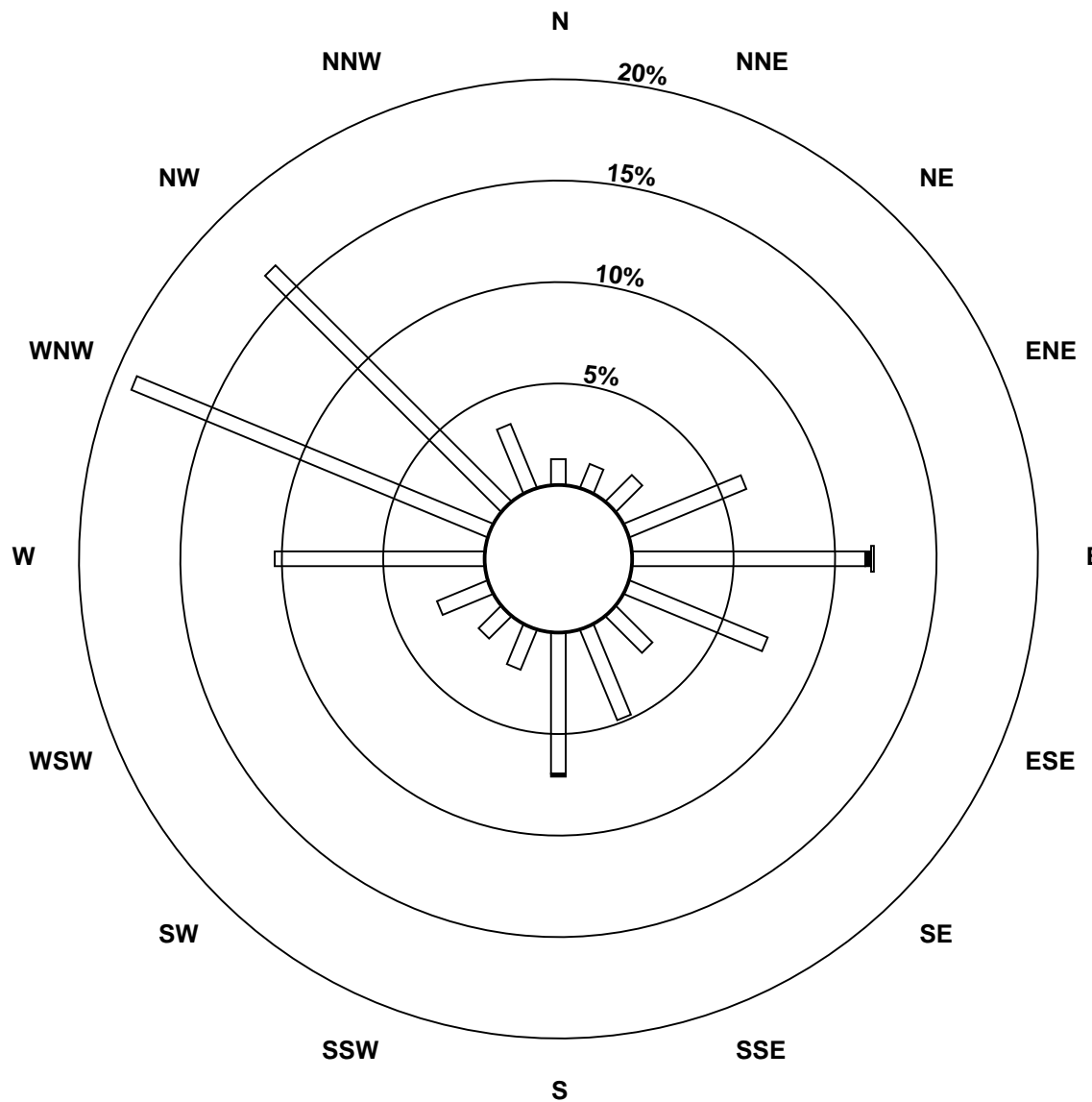
Total Number of Valid Hours: 705

Total Number of Hours: 744

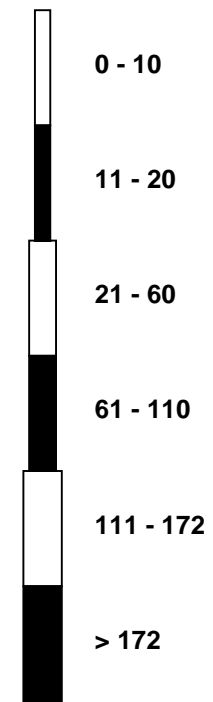


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan (AMS 8)



Classes (ppb)

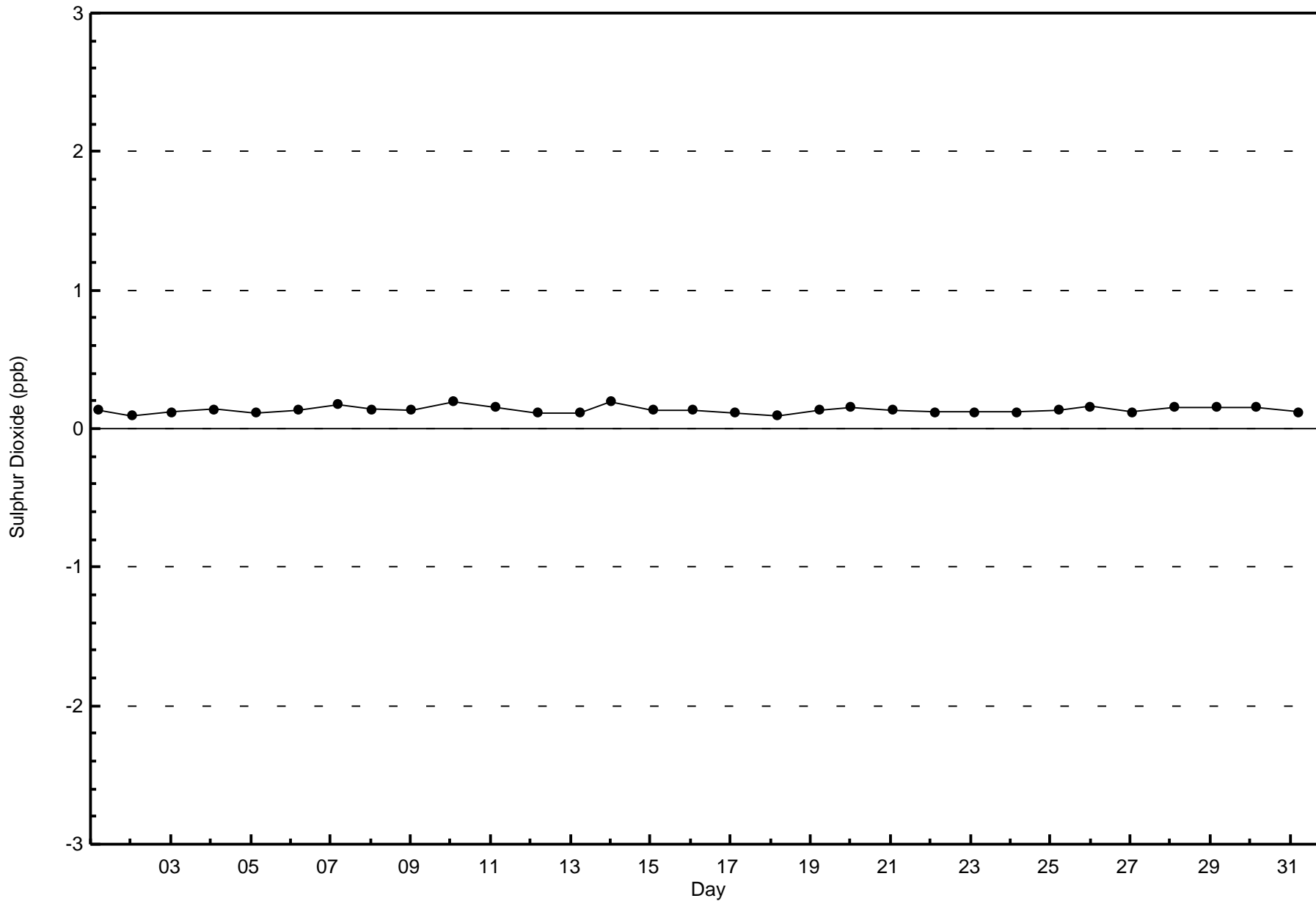


Total Number of Valid Hours: 705



WBEA Data PC
Zero Responses

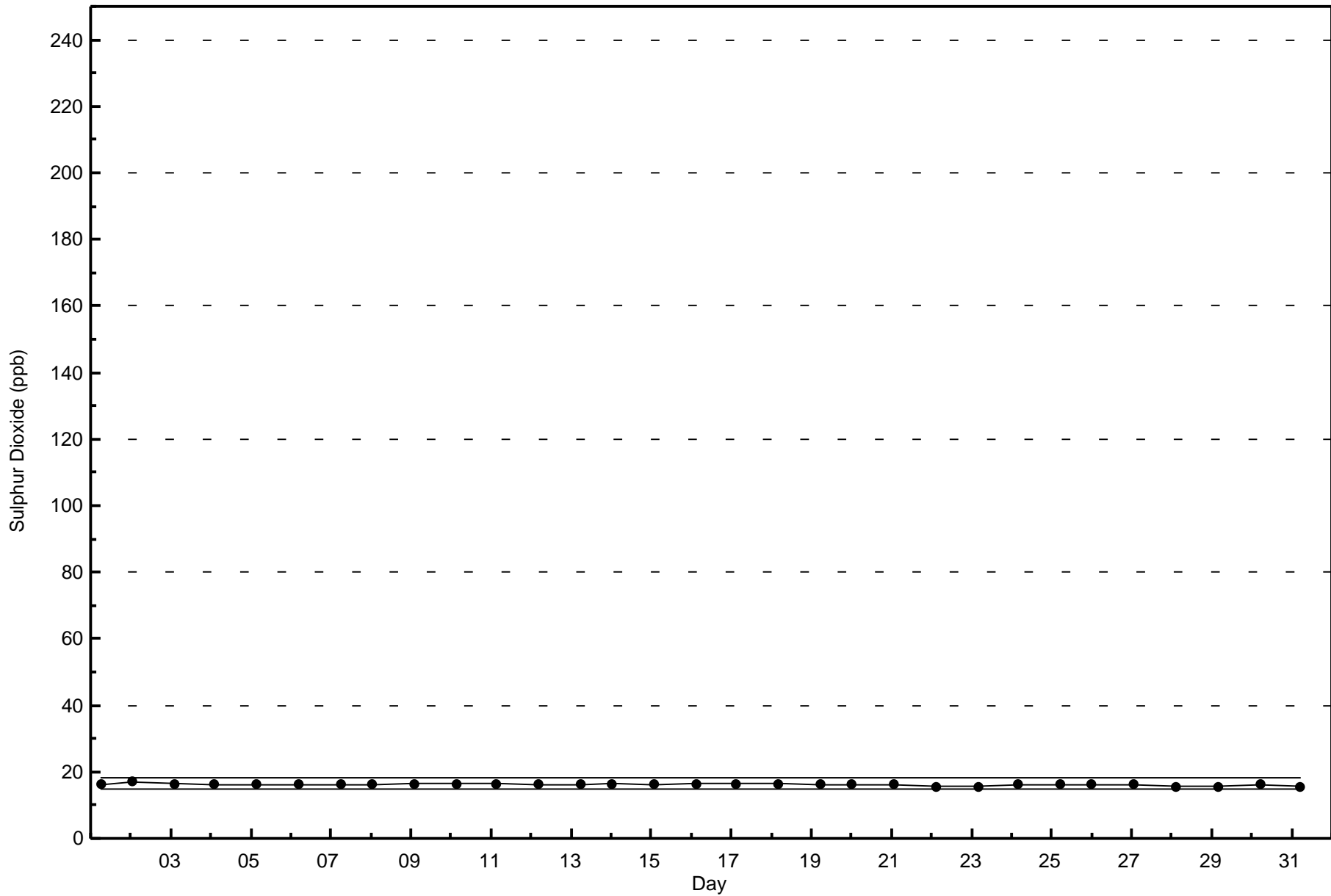
Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - December 2016



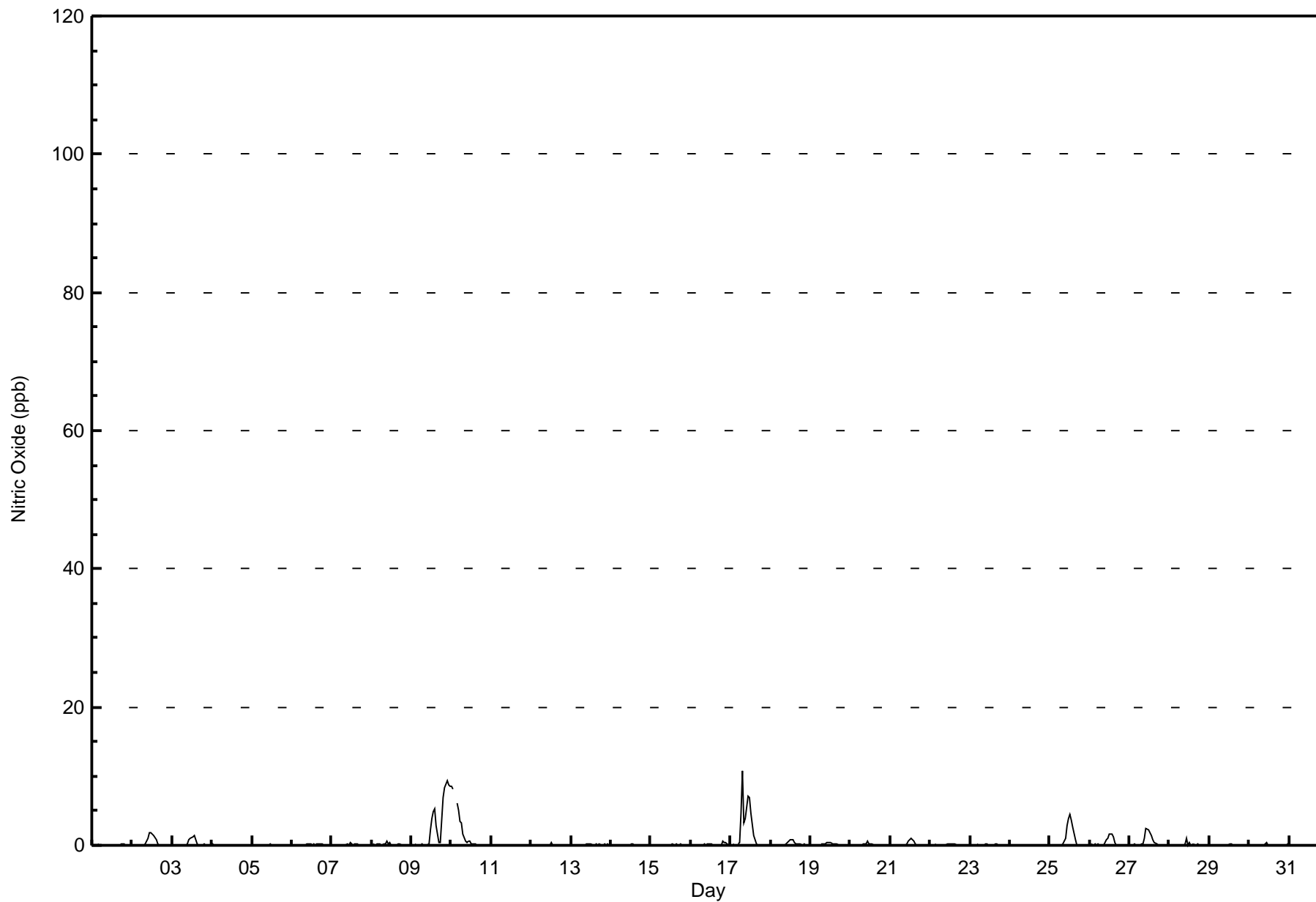


Maximum Value: 11 ppb on Dec 17 08:00		Maximum Daily Average: 2.9 ppb on Dec 9		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 2 22:00		Minimum Daily Average: 0.0 ppb on Dec 24		Hours of Data: 708																							
Maximum Diurnal Average: 0.8 ppb at hour 13		Minimum Diurnal Average: 0.0 ppb at hour 3		Hours of Missing Data: 36																							
Monthly Average: 0.3 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 8		Hours of Calibration: 36																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.1	0	
2-Dec	Z	0	0	0	0	0	0	0	0	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.4	2
3-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Dec	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
9-Dec	0	Z	0	0	0	0	0	0	0	0	2	4	5	5	3	0	0	0	4	7	8	9	9	8	2.9	9	
10-Dec	9	8	Z	6	5	3	3	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	9
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	1
17-Dec	0	0	0	Z	0	0	5	11	3	4	7	7	5	3	1	0	0	0	0	0	0	0	0	0	0	2.0	11
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	0	0	0	0	0	Z	0	0	0	1	3	4	4	4	3	1	0	0	0	0	0	0	0	0	0	0.9	4
26-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0.3	2
27-Dec	0	Z	0	0	0	0	0	0	0	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.5	2
28-Dec	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
		0.4	0.3	0.0	0.3	0.3	0.2	0.3	0.4	0.2	0.3	0.7	0.8	0.8	0.7	0.5	0.2	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	Diurnal Average	
		9	8	0	6	5	3	5	11	3	4	7	7	5	5	5	3	0	0	4	7	8	9	9	8	Diurnal Maximum	
Z - zerospan		C - Calibration																									



WBEA Data PC
Hourly Averages

Nitric Oxide (NO) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitric Oxide (NO) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	9	9	13	44	84	52	18	34	50	15	11	19	73	134	116	24	705
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	9	9	13	44	84	52	18	34	50	15	11	19	73	134	116	24	705

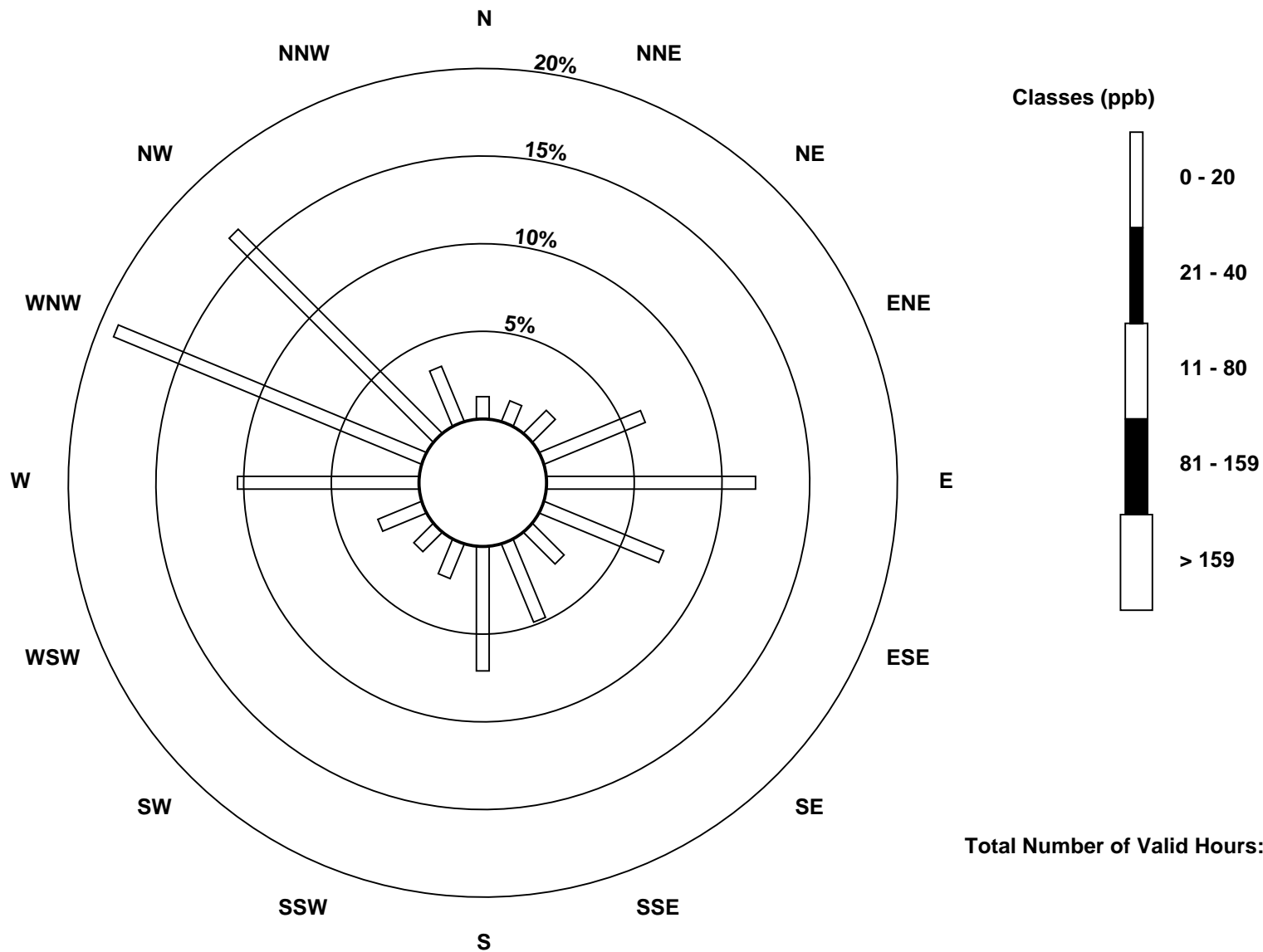
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitric Oxide (NO) - ppb
Fort Chipewyan (AMS 8)

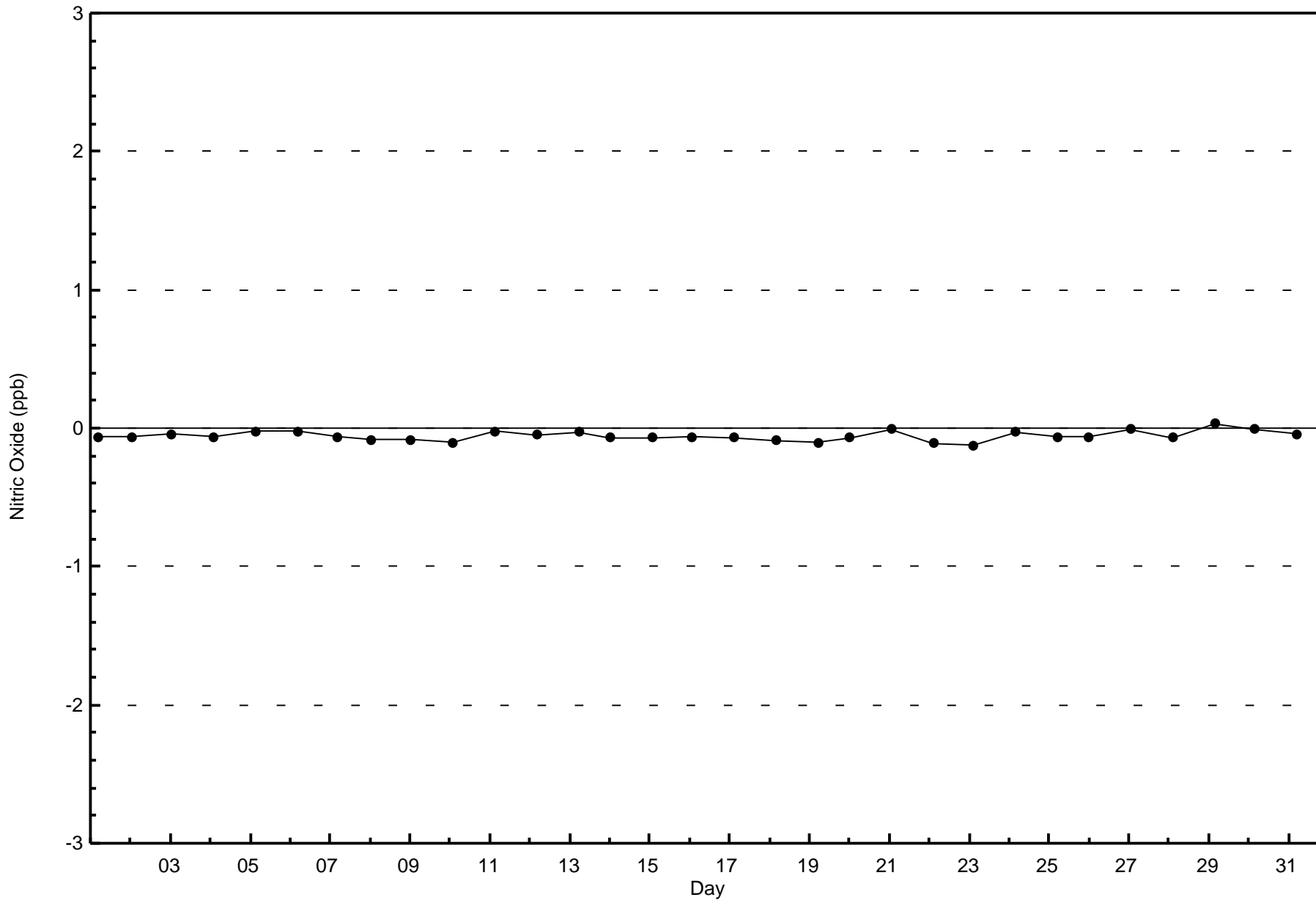


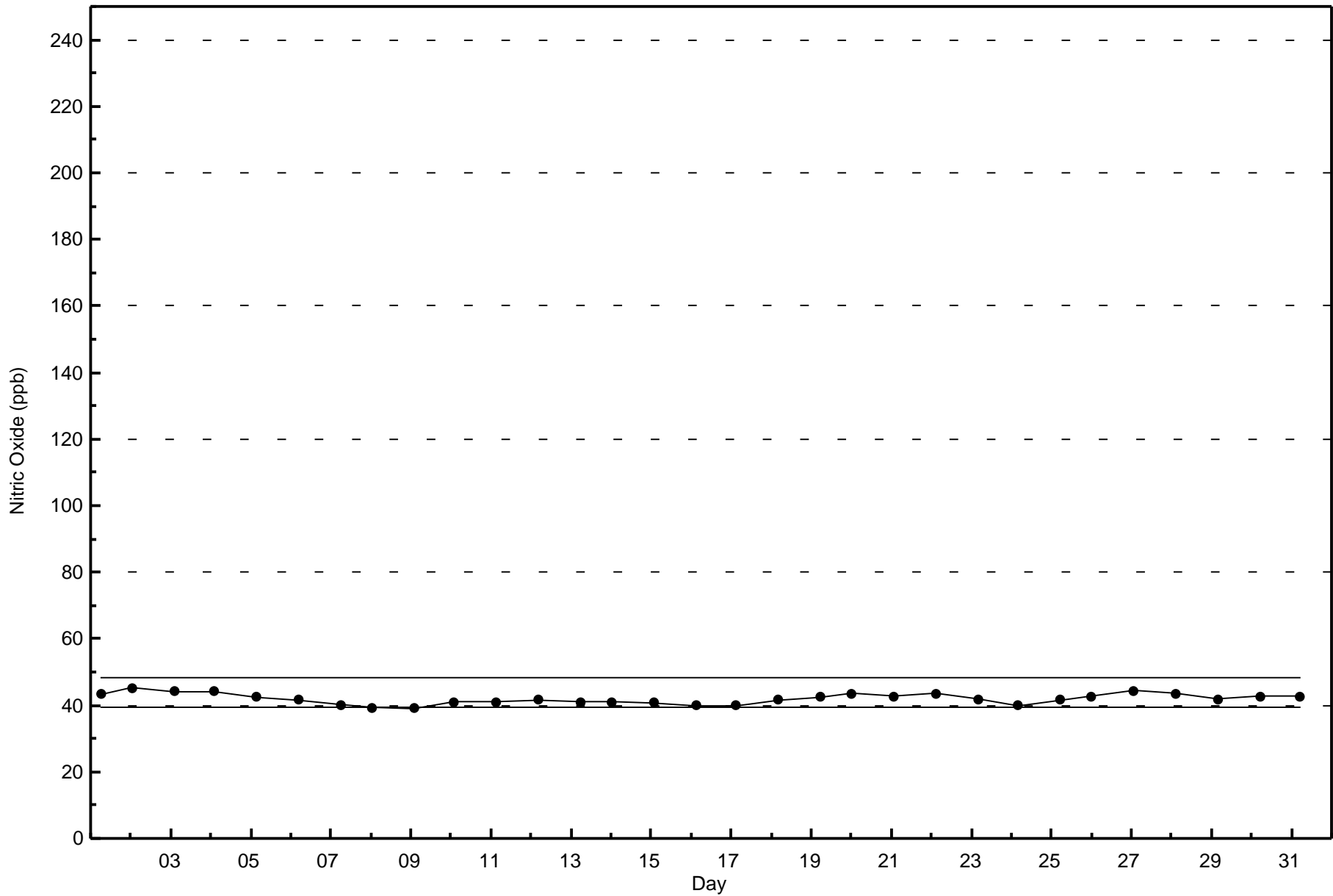
Total Number of Valid Hours: 705



WBEA Data PC
Zero Responses

Nitric Oxide (NO) - ppb
Fort Chipewyan - December 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort Chipewyan - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 30 ppb on Dec 9 20:00	Maximum Daily Average: 13.5 ppb on Dec 9		Hours of Data:	708
Minimum Value: 0 ppb on Dec 4 06:00	Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Missing Data:	36
Maximum Diurnal Average: 3.7 ppb at hour 7	Minimum Diurnal Average: 1.8 ppb at hour 3		Hours of Calibration:	36
Monthly Average: 2.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 7 P ₉₉ = 28		Percent Operational Time:	100.0

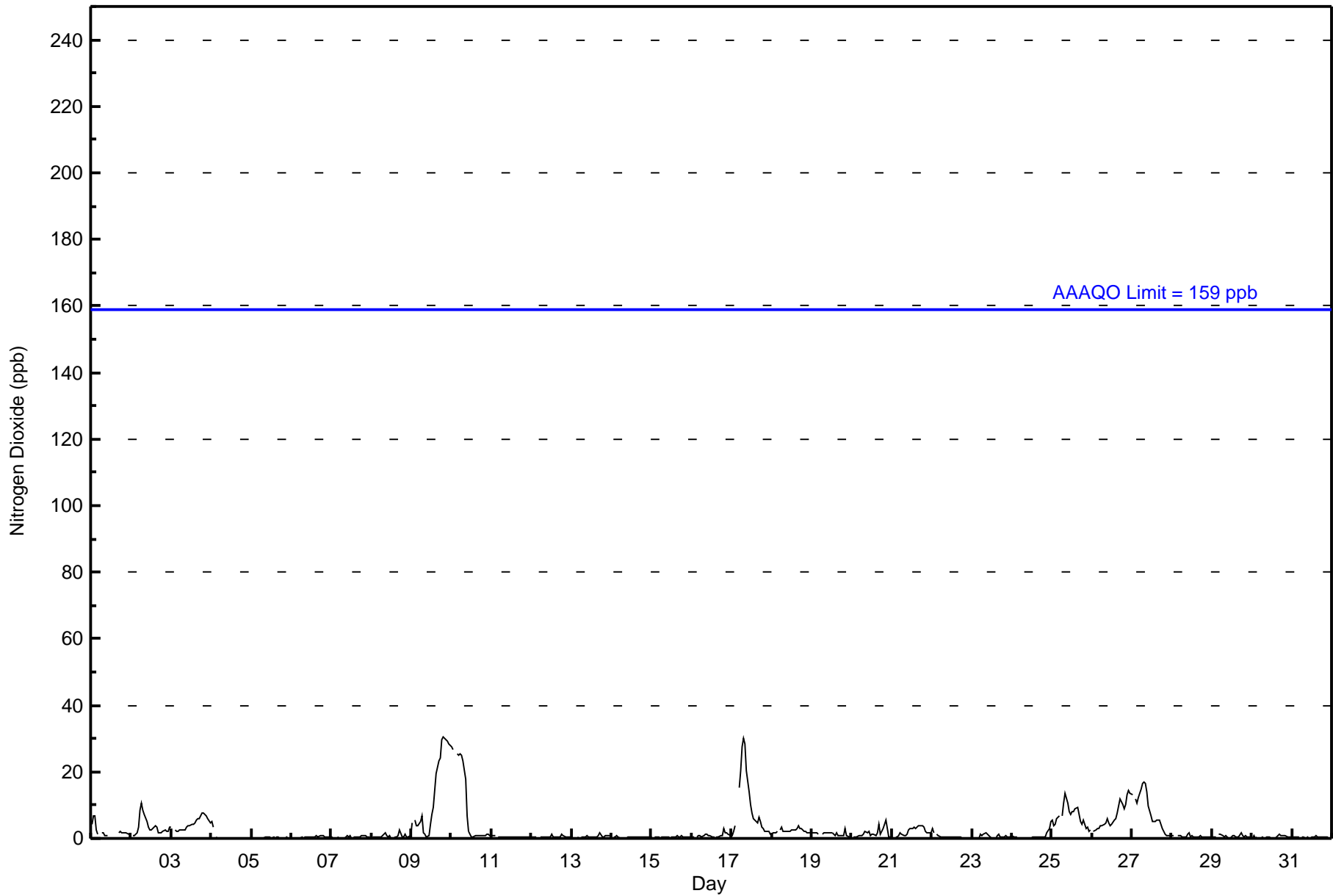
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	4	7	7	3	1	Z	2	2	1	1	1	C	C	C	C	C	2	2	2	2	2	2	1	1	2.2	7
2-Dec	Z	1	1	2	3	8	10	9	7	5	4	3	3	3	4	3	2	2	2	2	3	2	2	3	3.6	10
3-Dec	3	Z	3	2	2	3	3	2	3	4	4	4	4	5	5	6	6	8	8	7	7	6	5	4.4	8	
4-Dec	5	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	5
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
6-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	0	0	0	0	0.4	1
7-Dec	0	0	0	0	0	Z	0	0	0	1	0	1	0	0	0	1	1	0	1	1	1	0	0	0	0.4	1
8-Dec	Z	0	0	0	1	1	1	1	2	1	1	1	0	0	0	0	1	3	1	1	1	1	1	1	0.7	3
9-Dec	5	Z	6	4	4	5	7	2	1	0	1	4	7	10	14	19	23	24	30	30	30	29	29	28	13.5	30
10-Dec	28	27	Z	25	25	25	25	23	18	7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	9.4	28
11-Dec	1	1	1	Z	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0.5	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	1	0	0	0	0.5	1
13-Dec	0	0	0	0	0	Z	0	1	0	1	1	1	1	0	0	1	1	2	1	1	1	1	1	1	0.6	2
14-Dec	Z	0	0	1	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0.4	1
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0.4	1
16-Dec	0	0	Z	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	3	2	2	1	1	0.9	3
17-Dec	1	2	4	Z	15	20	28	30	28	20	14	10	8	6	5	5	6	5	3	3	2	2	2	1	9.6	30
18-Dec	1	2	2	2	Z	3	3	2	2	2	2	2	2	3	3	3	4	3	3	2	2	2	2	2	2.3	4
19-Dec	2	2	2	2	1	Z	1	2	2	2	2	2	2	1	1	2	1	1	1	1	3	1	1	1	1.3	3
20-Dec	Z	1	1	1	1	1	1	1	2	2	2	1	1	1	1	2	4	1	2	3	5	3	1	1	1.6	5
21-Dec	0	Z	0	0	1	2	1	1	1	1	3	3	3	3	3	4	4	4	4	3	2	2	2	2	2.1	4
22-Dec	3	2	Z	1	1	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0.6	3
23-Dec	0	0	0	Z	0	1	1	1	2	1	1	0	0	0	0	1	1	1	1	1	1	0	1	0.6	2	
24-Dec	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	0.7	5	
25-Dec	6	4	4	6	7	Z	7	11	13	11	8	7	8	8	9	10	7	5	4	5	3	3	2	3	6.5	13
26-Dec	Z	2	3	3	3	4	4	4	5	6	5	4	4	6	6	8	10	12	10	9	10	13	15	14	6.8	15
27-Dec	13	Z	12	11	12	15	17	17	16	14	10	7	5	5	5	6	6	4	3	2	1	1	1	1	7.9	17
28-Dec	1	1	Z	1	1	1	1	1	1	1	2	1	1	0	1	0	0	1	0	0	1	0	0	1	0.6	2
29-Dec	0	0	0	Z	1	1	1	1	1	1	0	0	1	1	1	0	1	2	1	0	1	0	1	1	0.6	2
30-Dec	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0.5	1
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
	2.9	2.2	1.8	2.5	3.2	3.7	3.7	3.7	3.5	2.7	2.1	1.8	1.8	1.9	2.1	2.5	2.7	2.6	2.6	2.7	2.6	2.5	2.4	2.4	Diurnal Average	
	28	27	12	25	25	25	28	30	28	20	14	10	8	10	14	19	23	24	30	30	30	29	29	28	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	690	97.46	97.46
21 - 40	18	2.54	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	9	9	13	44	84	49	18	34	50	12	8	12	71	134	116	24	687
21 - 40	0	0	0	0	0	3	0	0	0	3	3	7	2	0	0	0	18
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	9	9	13	44	84	52	18	34	50	15	11	19	73	134	116	24	705

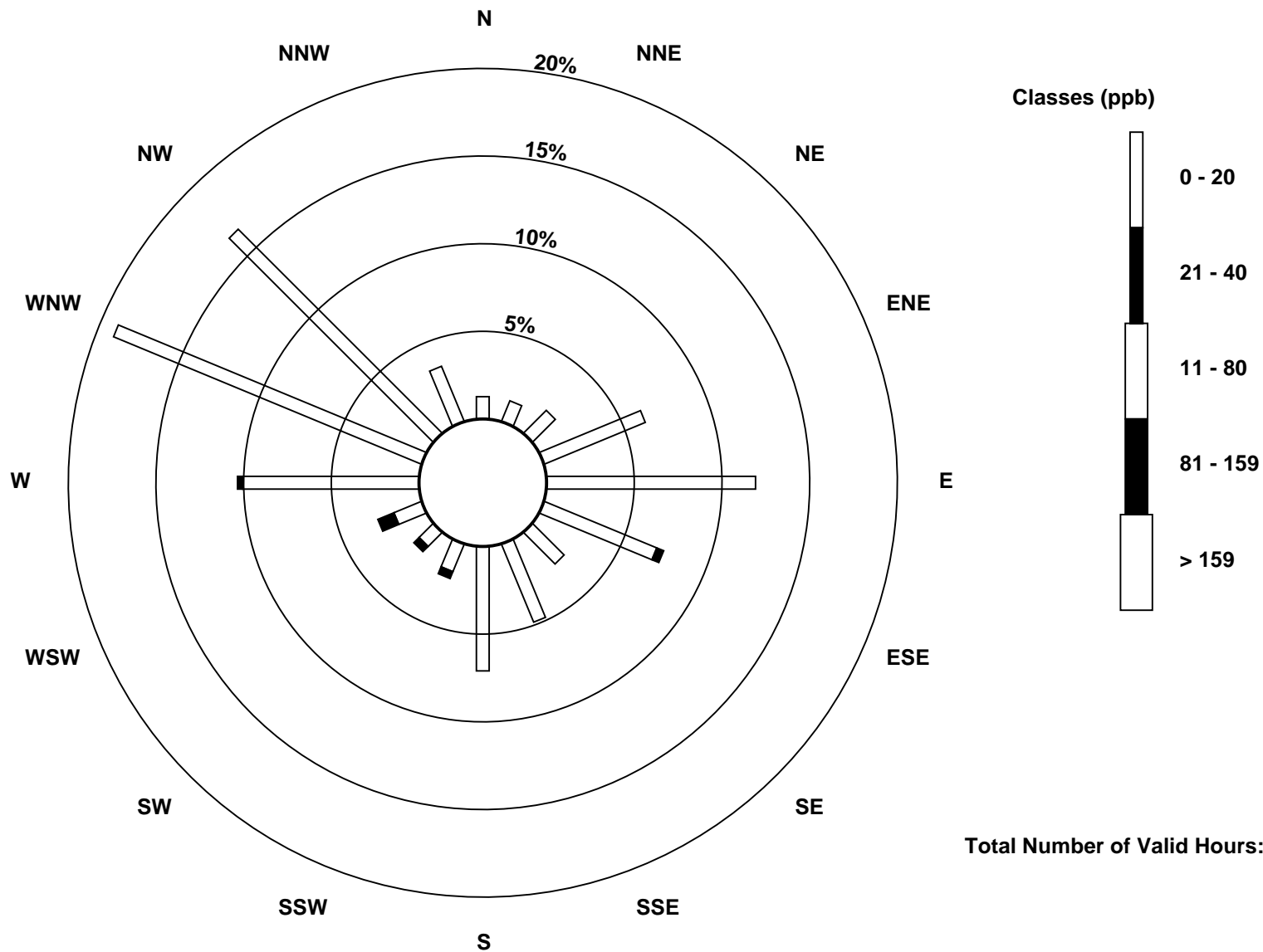
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

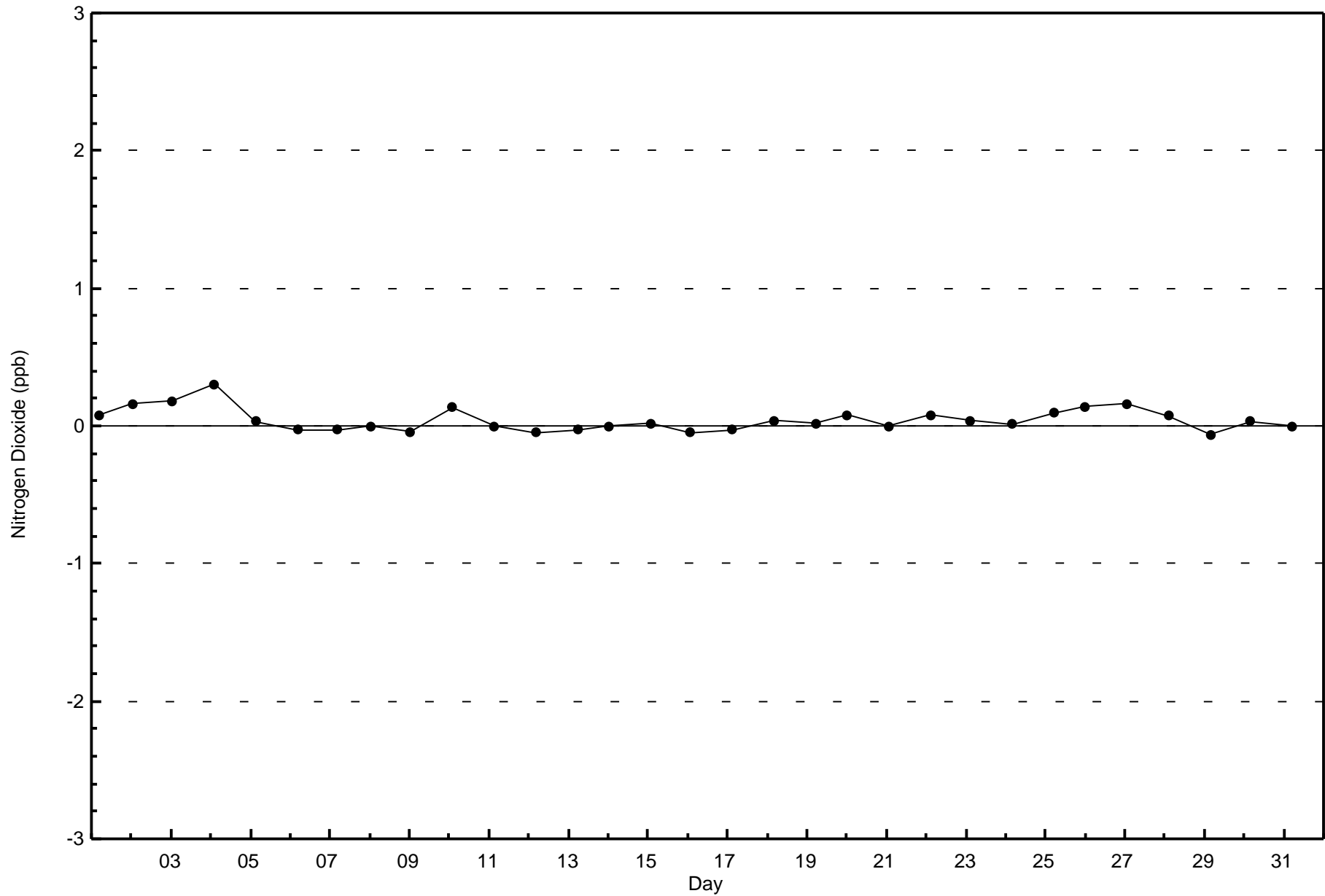
Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan (AMS 8)





WBEA Data PC
Zero Responses

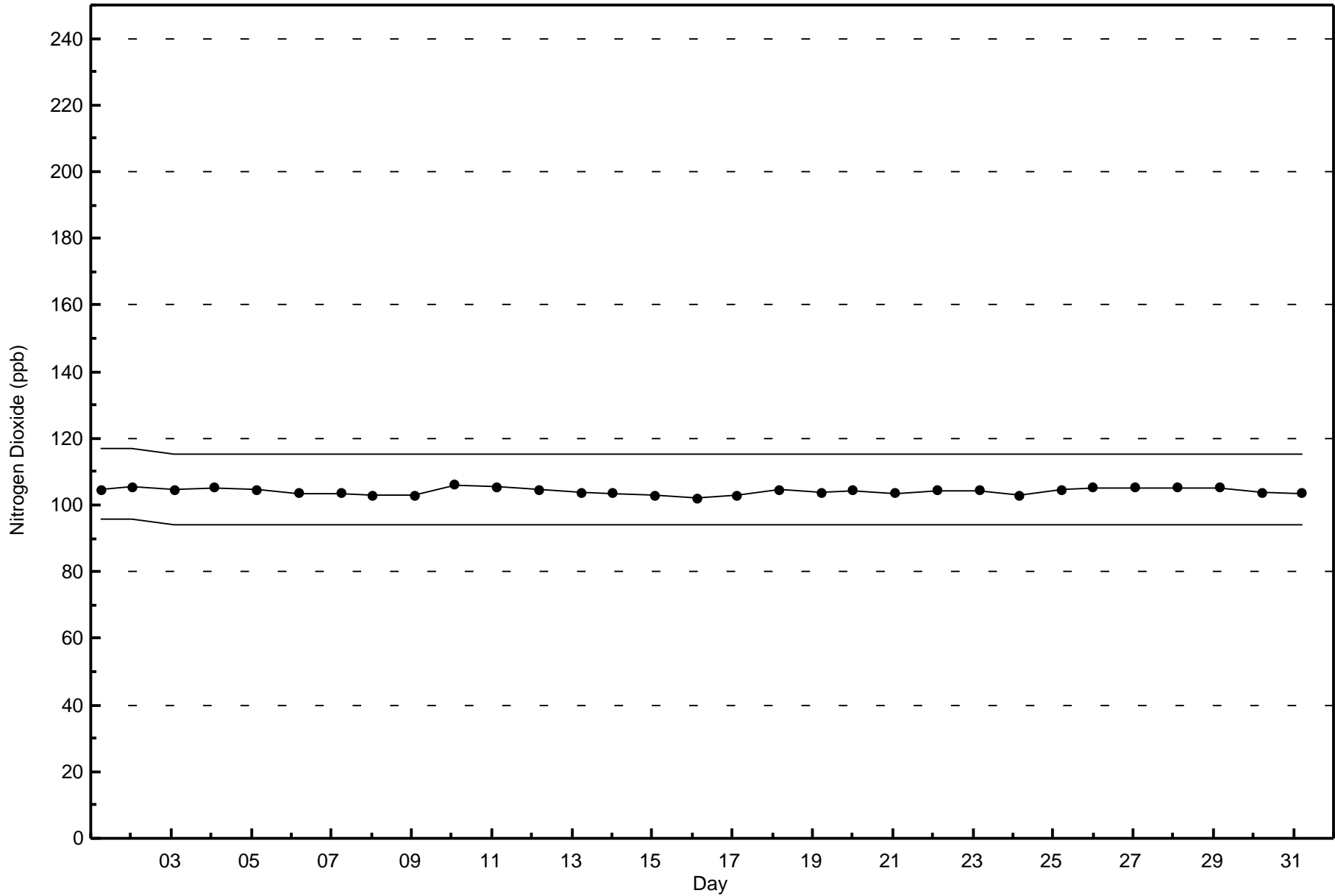
Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

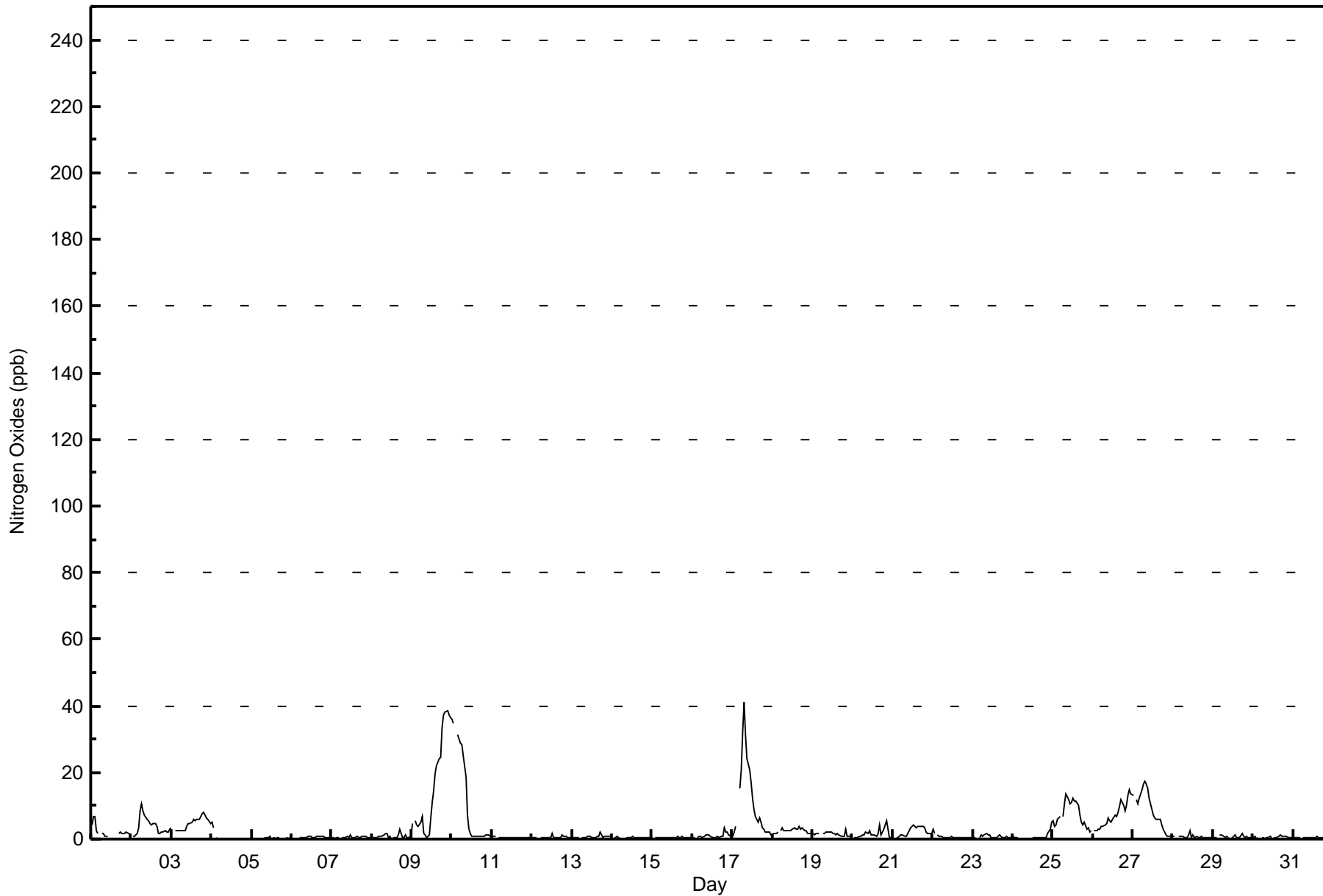
Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - December 2016

Maximum Value: 41 ppb on Dec 17 08:00		Maximum Daily Average: 16.4 ppb on Dec 9		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 4 06:00		Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Data: 708																																													
Maximum Diurnal Average: 4.1 ppb at hour 8		Minimum Diurnal Average: 1.8 ppb at hour 3		Hours of Missing Data: 36																																													
Monthly Average: 3.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 3 P ₉₀ = 7 P ₉₉ = 36		Hours of Calibration: 36																																													
				Percent Operational Time: 100.0																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	4	7	7	3	2	Z	2	2	1	1	1	C	C	C	C	C	2	2	2	2	2	2	2	1	2.3	7																							
2-Dec	Z	1	1	2	3	8	10	9	7	6	5	5	4	4	4	4	2	2	2	2	3	2	2	3	4.0	10																							
3-Dec	3	Z	3	2	2	2	3	2	3	4	4	5	5	6	6	6	6	6	8	8	7	7	6	5	4.7	8																							
4-Dec	5	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	5																							
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
6-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	0	1	0	1	1	1	1	1	0	0	0	0	0.5	1																							
7-Dec	0	0	0	0	0	Z	0	0	0	1	0	1	0	0	1	1	1	0	1	1	1	0	1	0	0.5	1																							
8-Dec	Z	0	0	1	1	1	1	1	2	2	1	1	0	0	0	1	1	3	1	1	1	1	1	1	0.9	3																							
9-Dec	5	Z	6	4	4	5	7	2	1	1	1	6	11	14	20	22	24	24	33	37	38	39	37	36	16.4	39																							
10-Dec	36	35	Z	32	30	29	28	25	19	7	3	2	1	1	1	1	1	1	1	1	1	1	1	1	11.1	36																							
11-Dec	1	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0.5	1																							
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	2	1	0	0	0	0	1	1	1	0	0	0	0.5	2																							
13-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	0	0	1	1	2	1	1	1	1	1	1	0.7	2																							
14-Dec	Z	0	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0.4	1																							
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0.4	1																							
16-Dec	0	0	Z	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	3	2	2	1	1.0	3																							
17-Dec	1	2	4	Z	15	21	32	41	32	24	21	17	12	9	7	5	6	5	3	3	2	2	2	1	11.7	41																							
18-Dec	1	2	2	2	Z	3	3	2	2	2	3	3	3	3	3	3	4	3	3	2	2	2	2	2	2.5	4																							
19-Dec	2	1	2	2	2	Z	2	2	2	2	2	2	2	2	1	2	1	1	1	1	3	1	1	1	1.5	3																							
20-Dec	Z	1	1	1	1	1	1	1	2	2	3	1	1	1	1	2	4	1	2	3	6	3	0	1	1.7	6																							
21-Dec	0	Z	0	0	1	1	1	1	1	2	3	4	4	4	3	4	4	4	4	4	3	2	2	2	2.2	4																							
22-Dec	3	2	Z	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.7	3																							
23-Dec	0	0	0	Z	0	1	1	1	2	1	1	0	0	0	0	1	1	1	1	1	1	0	1	0	0.7	2																							
24-Dec	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	0	0.7	5																							
25-Dec	6	4	4	6	7	Z	7	11	13	12	11	11	12	12	11	10	7	5	4	5	3	3	2	3	7.4	13																							
26-Dec	Z	2	3	3	3	4	4	4	5	6	5	5	6	7	7	8	10	12	10	9	10	13	15	14	7.1	15																							
27-Dec	13	Z	12	11	12	15	17	17	17	15	12	9	7	6	6	6	6	4	3	2	1	1	1	1	8.4	17																							
28-Dec	1	1	Z	1	1	1	1	1	1	1	3	1	1	0	1	0	0	1	0	0	1	0	0	1	0.8	3																							
29-Dec	0	0	0	Z	1	1	1	1	1	0	0	0	1	1	1	0	1	2	1	0	1	0	1	0	0.7	2																							
30-Dec	0	1	0	0	Z	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0	0	0.5	1																							
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1																							
																								3.3	2.5	1.8	2.8	3.4	3.9	4.0	4.1	3.7	3.1	2.7	2.6	2.6	2.6	2.6	2.7	2.8	2.7	2.8	2.9	3.0	2.8	2.7	2.7	Diurnal Average	
																								36	35	12	32	30	29	32	41	32	24	21	17	12	14	20	22	24	24	33	37	38	39	37	36	Diurnal Maximum	
Z - zerospan		C - Calibration																																															



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	686	96.89	96.89
21 - 40	21	2.97	99.86
41 - 80	1	0.14	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	9	9	13	44	84	47	17	34	50	11	8	12	71	134	116	24	683
21 - 40	0	0	0	0	0	4	1	0	0	4	3	7	2	0	0	0	21
11 - 80	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	9	9	13	44	84	52	18	34	50	15	11	19	73	134	116	24	705

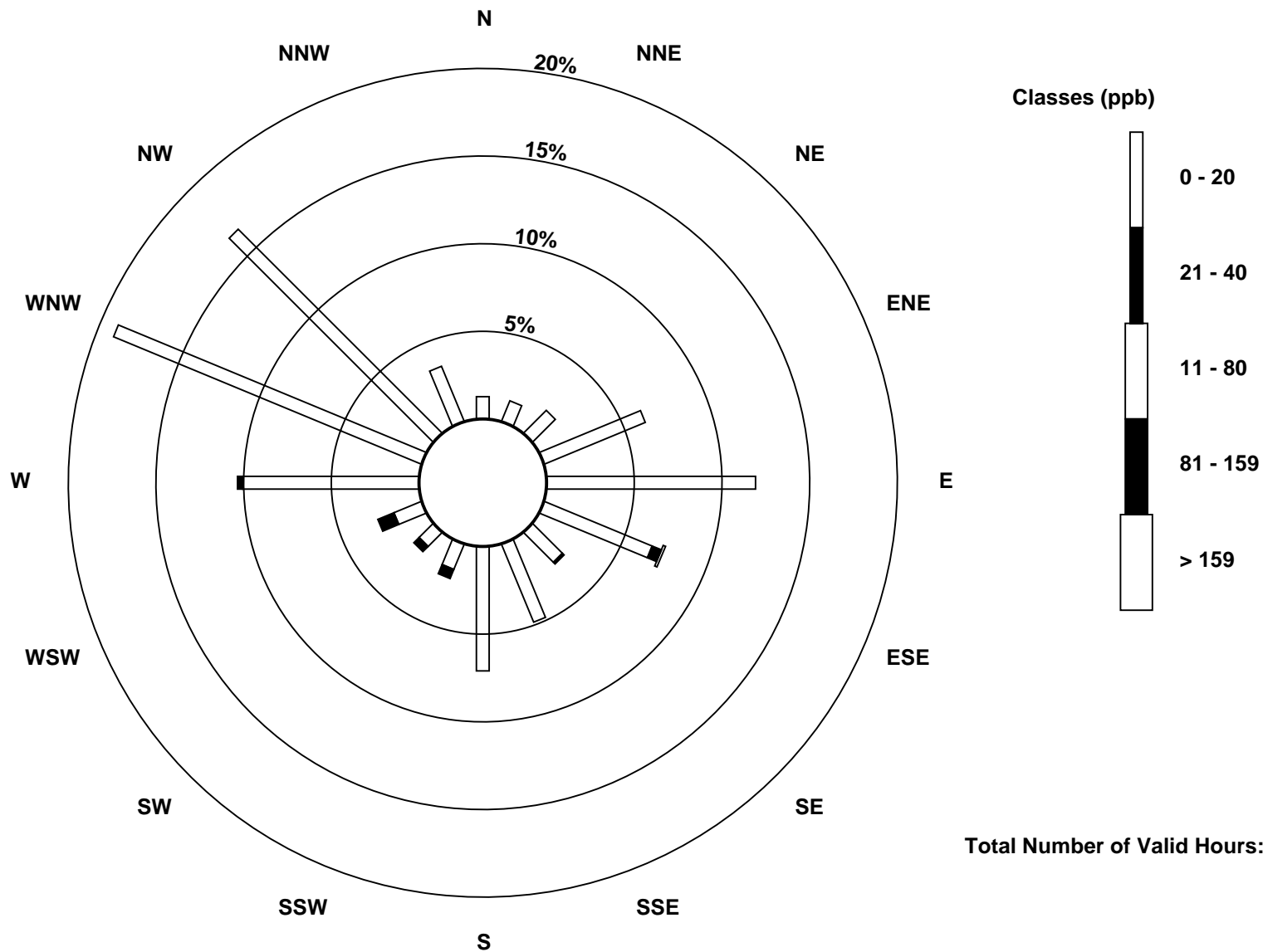
Total Number of Valid Hours: 705

Total Number of Hours: 744

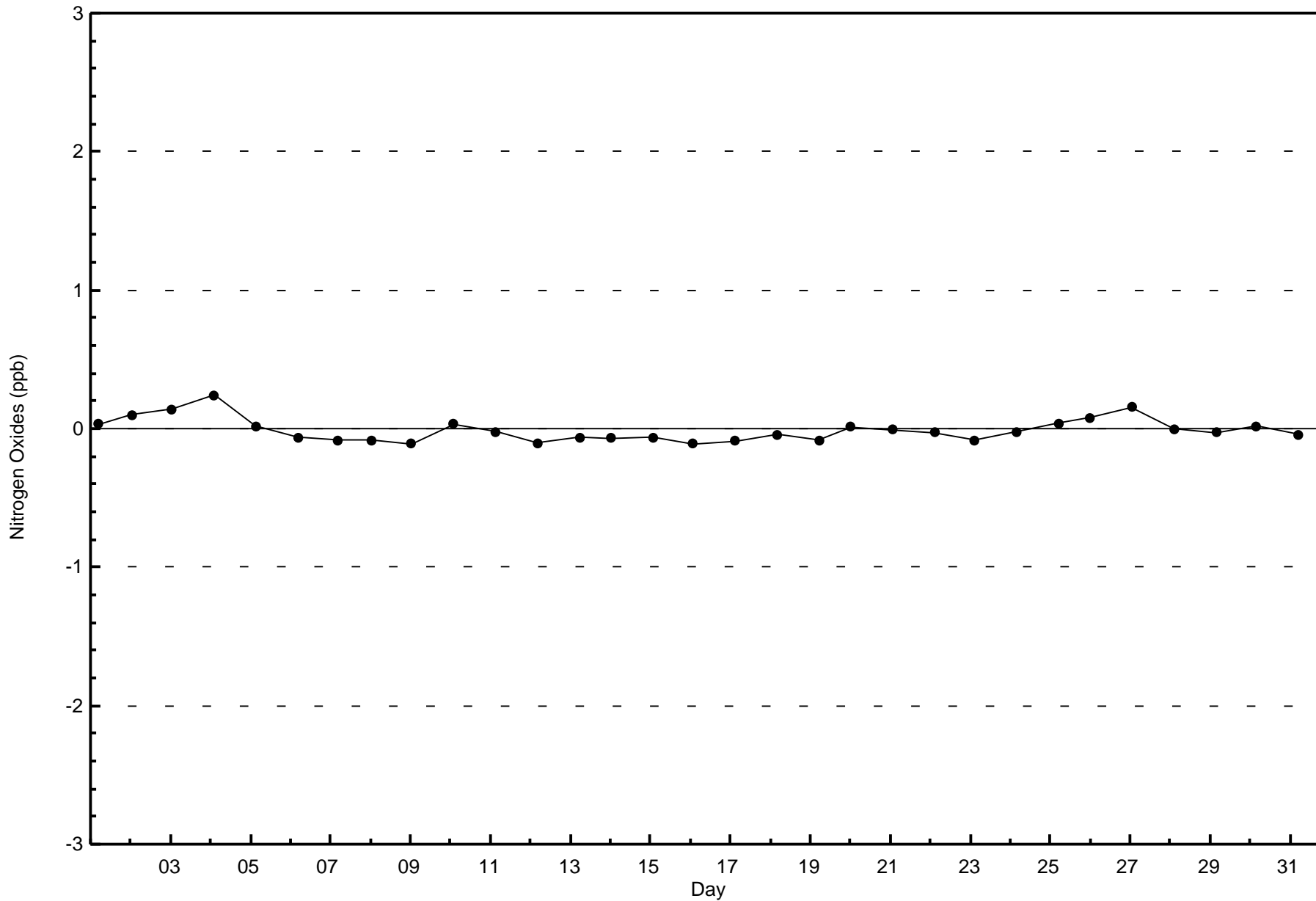


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan (AMS 8)



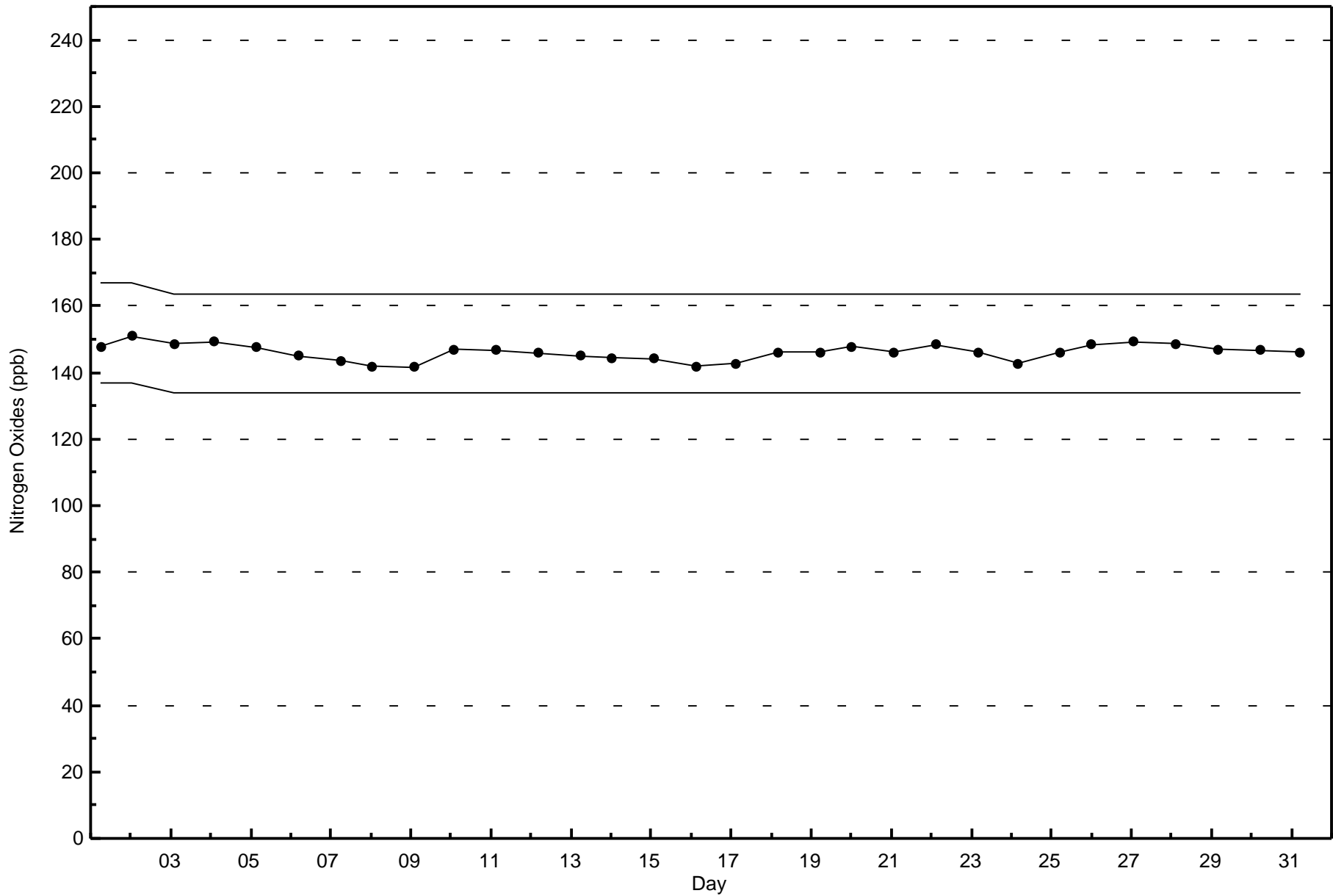
Total Number of Valid Hours: 705





WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

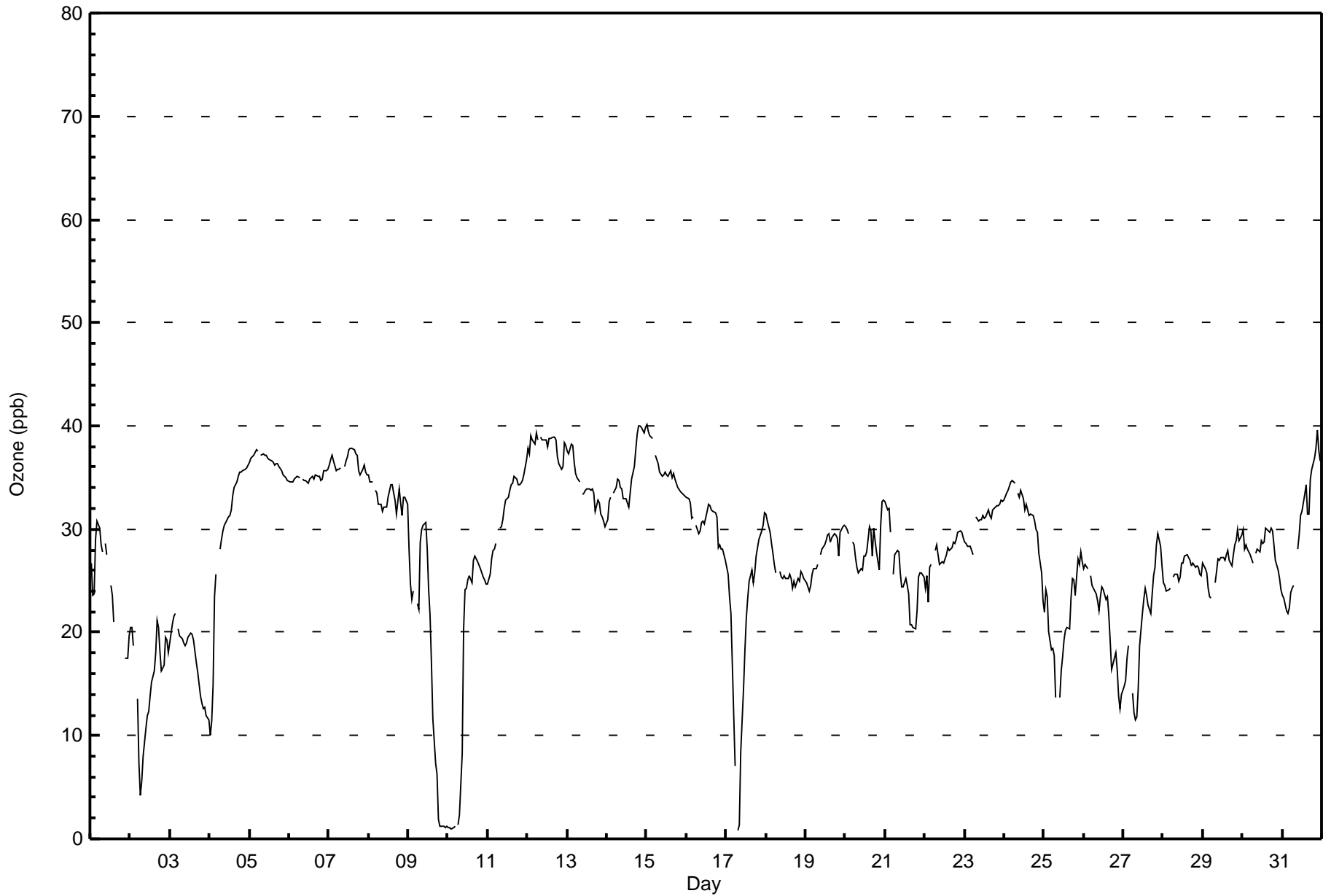
Fort Chipewyan - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 40 ppb on Dec 15 01:00 Maximum Daily Average: 38.2 ppb on Dec 12		Hours in Service: 744 Hours of Data: 706 Hours of Missing Data: 38 Hours of Calibration: 37 Percent Operational Time: 99.9																								
Minimum Value: 1 ppb on Dec 17 08:00 Maximum Diurnal Average: 28.9 ppb at hour 15 Monthly Average: 27.8 ppb		Minimum Daily Average: 15.1 ppb on Dec 2 Minimum Diurnal Average: 25.0 ppb at hour 8 Percentiles: P ₁ = 1 P ₁₀ = 18 Q ₁ = 24 Median = 29 Q ₃ = 34 P ₉₀ = 36 P ₉₉ = 39																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	27	24	24	29	31	30	28	28	Z	29	28	M	24	24	21	C	C	C	C	C	C	17	17	20	--	31
2-Dec	20	20	19	Z	14	7	4	6	8	11	12	12	14	15	16	18	21	21	18	16	17	19	19	18	15.1	21
3-Dec	19	21	22	22	Z	20	20	19	19	19	19	20	20	20	19	18	17	16	14	13	13	13	12	11	17.6	22
4-Dec	10	11	15	23	26	Z	28	29	30	30	31	31	31	32	33	34	35	35	35	36	36	36	36	36	29.5	36
5-Dec	36	37	37	37	38	38	Z	37	37	37	37	37	37	37	37	36	36	36	36	36	35	35	35	35	36.5	38
6-Dec	35	35	35	35	35	35	35	Z	35	35	35	34	35	35	35	35	35	35	35	35	35	36	36	36	35.0	36
7-Dec	36	37	37	37	36	36	36	36	Z	36	37	37	38	38	38	38	37	37	36	35	36	36	36	35	36.5	38
8-Dec	35	35	35	Z	34	33	32	32	32	32	32	32	33	34	34	33	33	31	34	33	31	33	33	32	33.1	35
9-Dec	28	25	23	24	Z	23	22	29	30	30	31	28	24	22	17	12	7	6	2	1	1	1	1	1	16.9	31
10-Dec	1	1	1	1	1	Z	1	2	8	20	24	24	25	25	25	27	27	27	27	26	26	25	25	25	17.3	27
11-Dec	25	26	27	28	28	29	Z	30	30	31	32	33	33	34	34	35	35	35	34	34	34	35	35	37	31.9	37
12-Dec	38	37	39	39	38	39	39	Z	39	39	39	39	38	39	39	39	39	39	37	36	36	36	38	38	38.2	39
13-Dec	38	37	38	38	36	35	35	35	Z	33	34	34	34	34	34	34	34	32	33	33	31	31	30	30	34.0	38
14-Dec	31	33	33	Z	34	34	35	35	34	34	33	33	33	32	34	35	36	38	39	40	40	39	40	40	35.3	40
15-Dec	40	39	39	39	Z	37	37	36	36	35	35	36	35	35	36	35	35	35	34	34	34	33	33	33	35.8	40
16-Dec	33	33	32	31	31	Z	30	30	30	31	31	31	32	32	32	32	32	32	31	28	28	28	28	27	30.7	33
17-Dec	26	26	23	22	12	7	Z	1	1	8	14	18	21	23	25	26	25	26	27	28	29	30	30	32	21.0	32
18-Dec	31	31	30	29	28	27	26	Z	26	25	25	25	25	25	26	25	24	25	24	25	25	26	25	25	26.3	31
19-Dec	25	24	24	25	26	26	26	27	Z	28	28	29	29	29	30	29	29	30	29	29	27	30	30	30	27.7	30
20-Dec	30	30	30	Z	29	29	27	26	26	26	26	27	27	28	30	30	27	30	29	28	26	30	33	33	28.6	33
21-Dec	33	32	32	30	Z	26	28	28	28	26	24	24	25	25	24	21	21	21	20	22	25	26	26	25	25.7	33
22-Dec	24	25	23	26	27	Z	28	28	28	27	27	27	27	27	28	28	28	29	29	29	30	30	30	29	27.5	30
23-Dec	29	29	28	28	28	27	Z	31	31	31	31	31	31	31	32	31	31	32	32	32	32	33	33	33	30.8	33
24-Dec	33	33	34	34	35	35	34	Z	33	33	34	33	32	32	32	31	32	31	31	30	30	28	26	23	31.7	35
25-Dec	22	24	23	20	18	18	18	14	Z	14	16	18	19	20	21	20	23	25	25	24	27	27	28	27	21.4	28
26-Dec	26	27	26	Z	25	25	24	24	23	22	23	24	24	23	23	22	19	16	17	18	16	14	13	14	21.3	27
27-Dec	15	15	17	19	Z	14	12	11	12	15	19	22	23	24	24	23	22	24	26	26	28	30	28	26	20.6	30
28-Dec	25	25	24	24	24	Z	25	26	26	25	25	27	27	27	27	27	27	26	27	26	26	26	26	26	25.9	27
29-Dec	27	26	26	24	24	23	Z	25	26	27	27	27	27	27	28	28	27	26	27	29	29	30	29	29	26.9	30
30-Dec	30	28	28	28	27	27	27	Z	28	28	28	29	29	29	30	30	30	30	30	28	27	26	25	24	28.1	30
31-Dec	24	23	22	22	22	24	24	24	Z	28	29	31	32	33	34	31	32	35	36	37	38	40	38	37	30.3	40
27.5 27.4 27.3 27.4 27.1 27.1 26.2 25.0 26.2 27.2 27.9 28.4 28.6 28.8 28.9 28.8 28.5 28.7 28.5 28.3 28.3 28.3 28.2 28.0																								Diurnal Average		
40 39 39 39 38 39 39 37 39 39 39 39 38 39 39 39 39 39 39 39 40 40 40 39 40																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



WBEA Data PC
Hourly Averages

Ozone (O₃) - ppb
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	103	14.59	14.59
21 - 50	603	85.41	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Ozone (O₃) - ppb
Fort Chipewyan - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	0	0	0	0	5	18	7	19	24	7	4	7	6	0	4	2	103
21 - 50	11	9	13	43	81	32	10	15	26	7	9	10	65	134	113	22	600
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	11	9	13	43	86	50	17	34	50	14	13	17	71	134	117	24	703

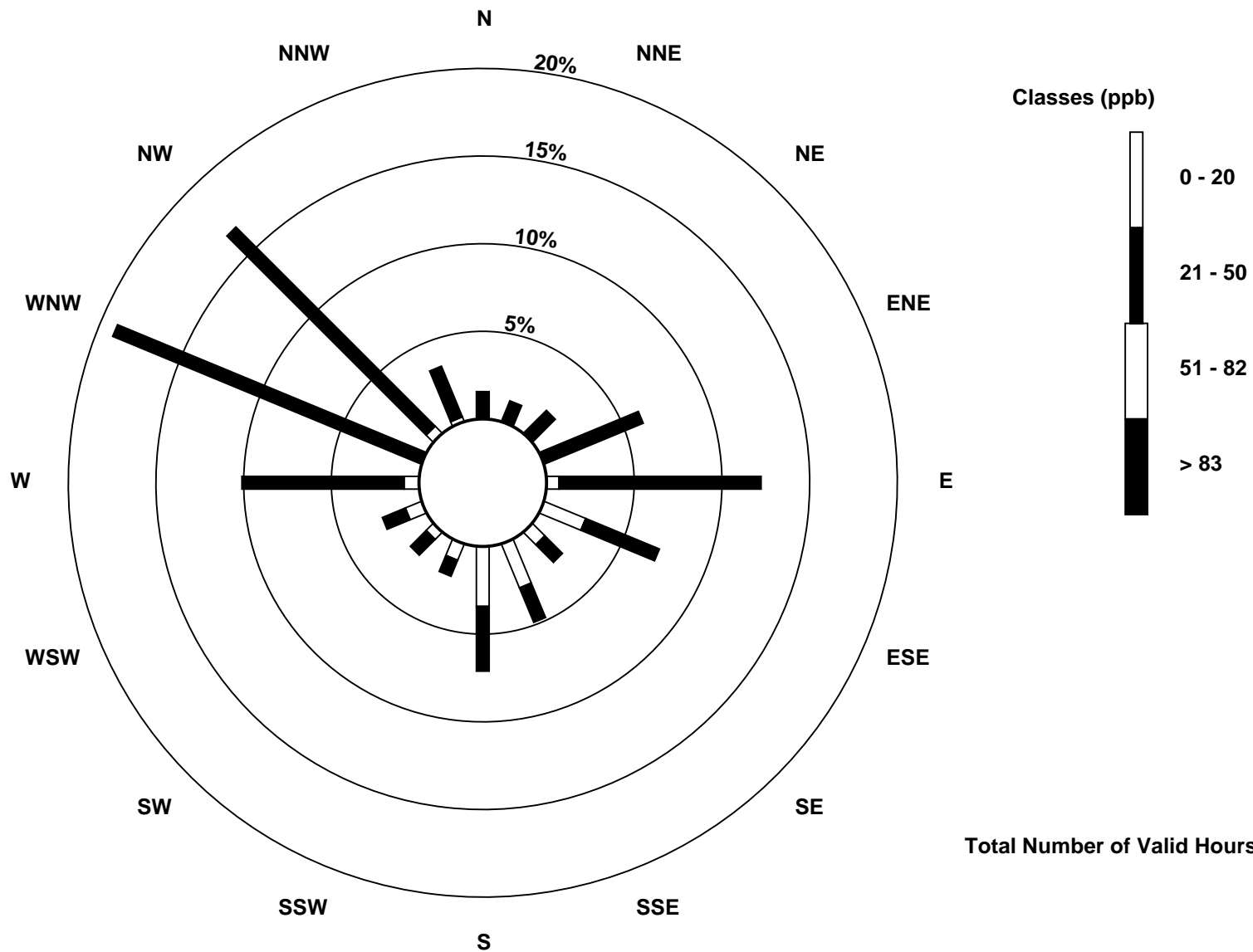
Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ozone (O₃) - ppb
Fort Chipewyan (AMS 8)

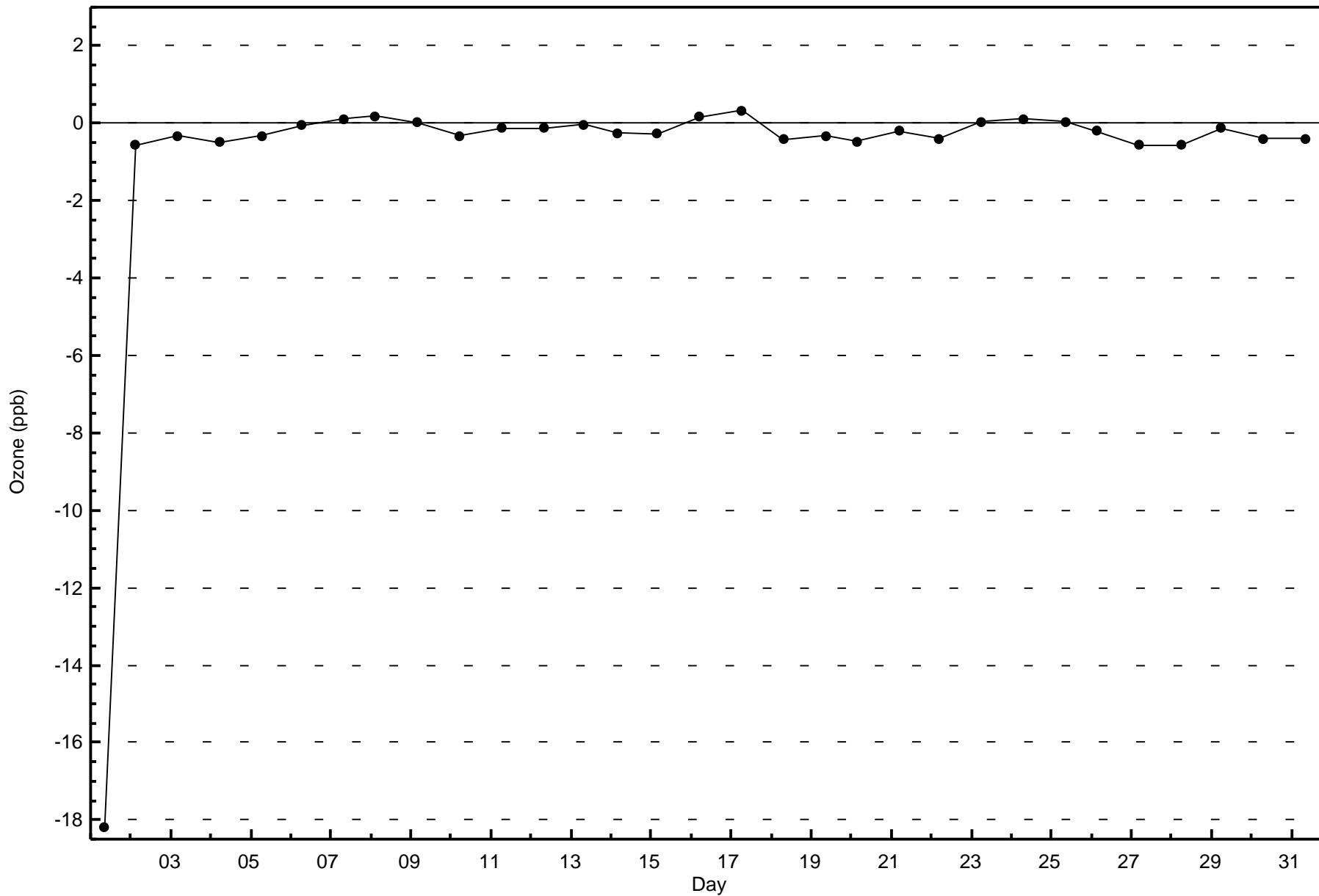


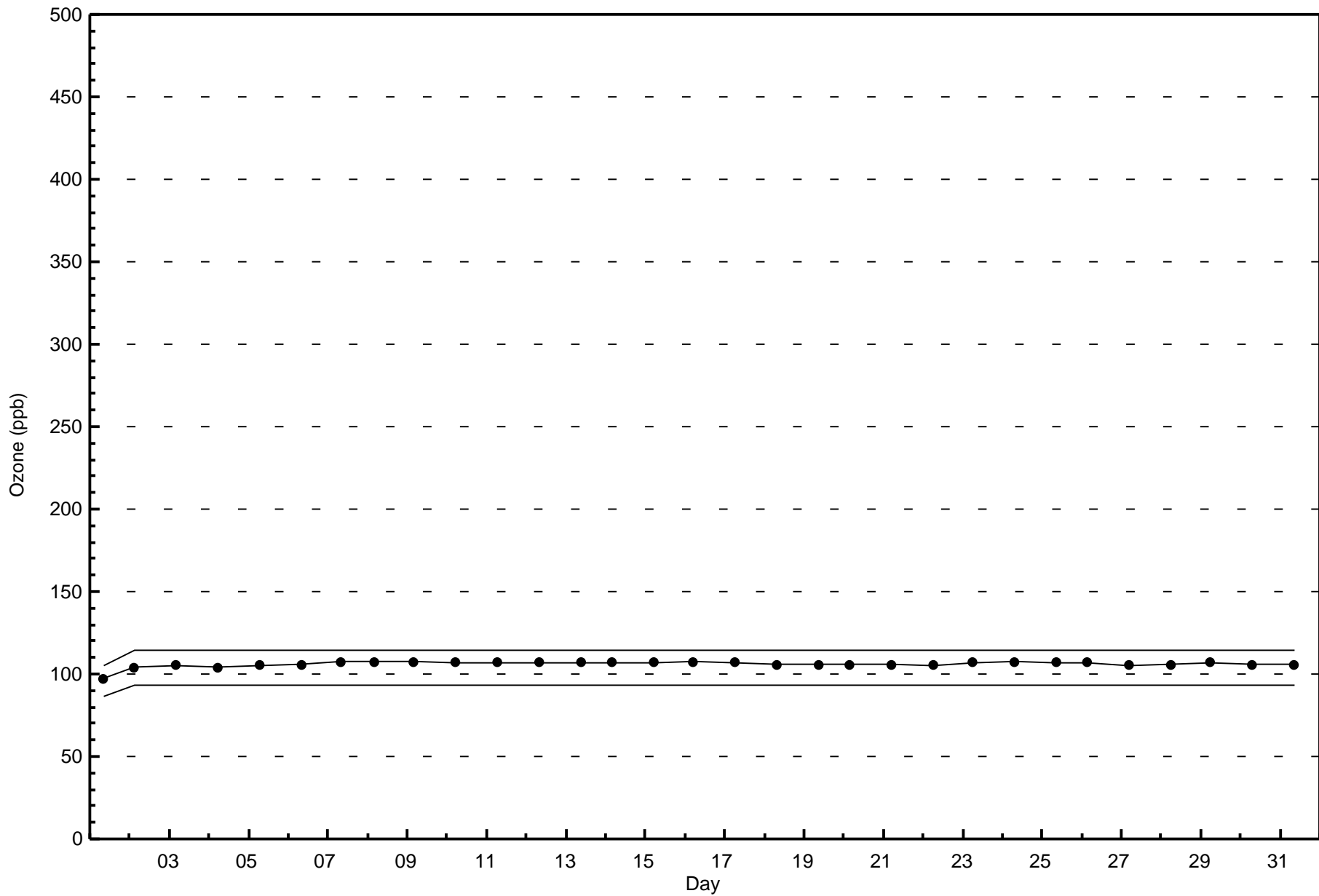
Total Number of Valid Hours: 703



WBEA Data PC
Zero Responses

Ozone (O₃) - ppb
Fort Chipewyan - December 2016





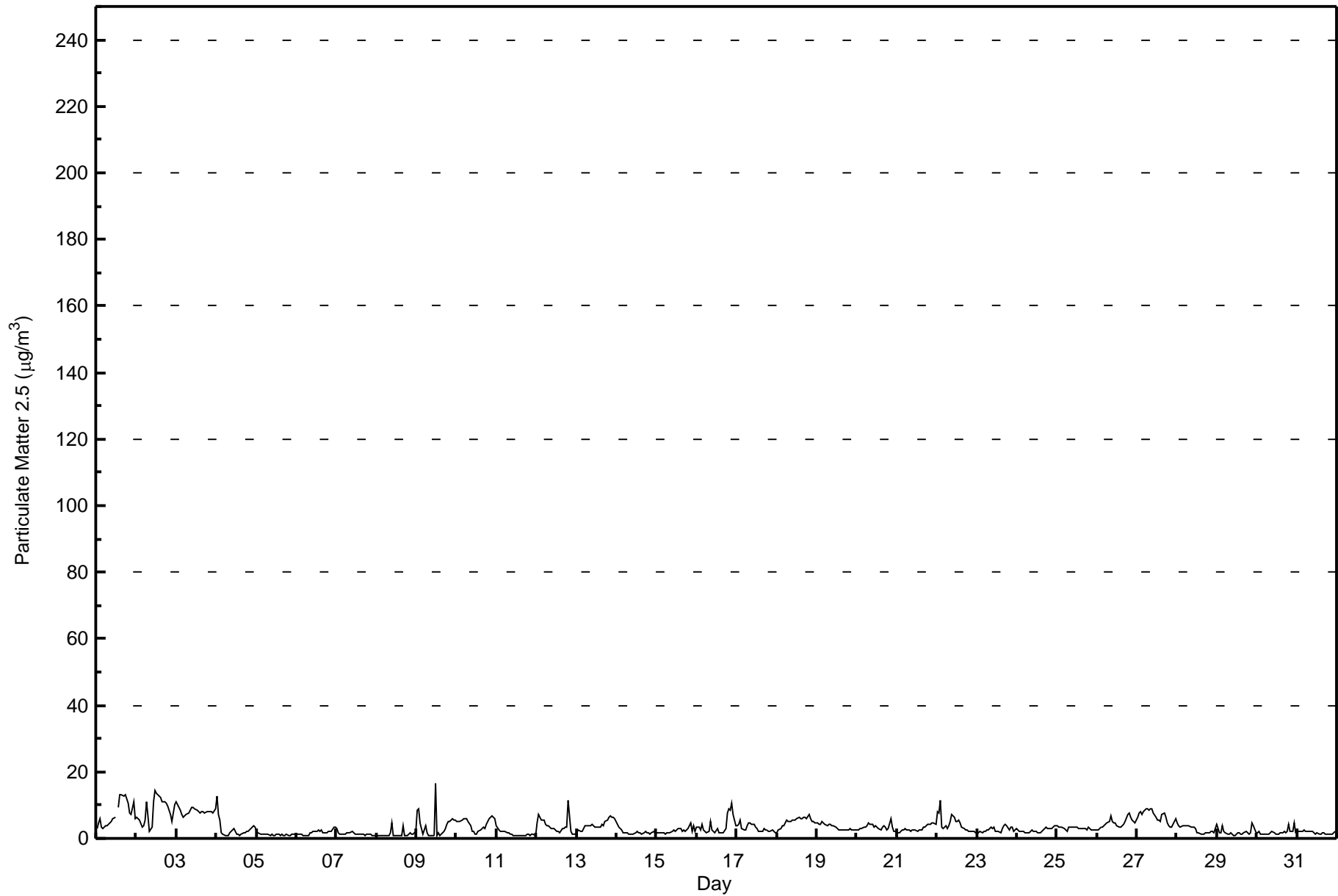


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 16.4 µg/m ³ on Dec 9 12:00 Minimum Value: 0.7 µg/m ³ on Dec 11 14:00 Maximum Diurnal Average: 4.2 µg/m ³ at hour 20 Monthly Average: 3.47 µg/m ³																	Maximum Daily Average: 8.4 µg/m ³ on Dec 2 Minimum Daily Average: 1.2 µg/m ³ on Dec 5 Minimum Diurnal Average: 2.9 µg/m ³ at hour 5 Percentiles: P ₁ = 0.8 P ₁₀ = 1.2 Q ₁ = 1.7 Median = 2.7 Q ₃ = 4.4 P ₉₀ = 7.0 P ₉₉ = 12.8																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 1 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	3.1	4.7	5.8	3.4	3.1	3.7	3.9	4.2	4.5	5.1	5.9	6.4	C	9.2	13.1	13.2	12.7	13.0	11.9	10.4	7.6	7.4	11.2	6.1	7.4	13.2									
2-Dec	6.3	5.9	5.7	3.4	3.7	5.4	11.0	6.8	2.2	3.5	11.1	14.6	13.6	13.3	12.2	11.2	11.1	11.2	10.5	9.8	7.0	5.2	7.5	10.0	8.4	14.6									
3-Dec	10.8	9.5	8.4	7.0	6.2	6.9	7.3	7.5	8.3	9.4	9.4	9.0	8.4	7.9	7.6	8.0	8.1	7.8	8.0	7.9	7.9	7.9	7.8	8.9	8.2	10.8									
4-Dec	12.6	7.2	5.4	1.8	1.2	1.0	1.0	1.0	1.5	2.0	2.8	2.3	1.4	1.3	1.0	1.4	1.6	1.8	1.9	2.2	2.5	3.3	3.7	3.5	2.7	12.6									
5-Dec	2.0	1.6	1.4	1.3	1.1	1.2	1.2	1.1	1.0	1.1	1.0	1.0	1.2	1.1	1.0	1.2	0.9	1.0	1.1	1.0	1.0	1.2	1.3	1.4	1.2	2.0									
6-Dec	1.1	1.1	1.1	1.1	1.0	1.0	0.9	0.9	1.9	1.7	2.1	2.0	2.0	2.3	2.0	2.6	1.8	1.9	1.8	2.2	2.0	2.1	3.6	3.4	1.8	3.6									
7-Dec	3.1	1.6	1.3	1.2	1.3	1.3	1.8	1.6	1.8	2.0	1.6	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.4	1.1	1.1	1.0	1.0	1.0	1.4	3.1									
8-Dec	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.7	4.9	1.0	1.0	0.8	0.8	0.8	0.9	4.0	1.0	1.0	1.4	1.6	1.3	1.2	2.0	1.3	4.9									
9-Dec	8.4	8.8	4.5	2.8	1.3	3.8	1.8	1.0	1.0	0.8	0.8	16.4	0.9	1.7	1.1	1.3	1.9	2.8	4.3	5.0	5.1	5.9	5.6	5.4	3.9	16.4									
10-Dec	5.2	5.2	5.1	5.4	5.8	6.1	5.8	5.0	3.8	2.2	2.1	1.5	1.4	2.0	2.5	3.1	3.3	3.1	4.1	5.9	6.5	6.9	6.6	5.7	4.4	6.9									
11-Dec	3.7	2.7	2.2	2.2	2.1	2.0	1.9	1.5	1.2	1.1	0.9	0.7	0.8	0.7	0.7	0.7	0.7	0.8	1.1	1.2	0.8	1.4	1.1	0.9	1.4	3.7									
12-Dec	4.7	7.2	6.4	5.5	5.4	4.4	3.9	3.7	3.3	3.0	2.9	2.4	2.2	2.0	1.9	2.8	3.2	3.6	3.4	11.5	2.1	1.2	1.4	1.4	3.7	11.5									
13-Dec	1.9	2.4	2.3	2.1	2.8	3.6	3.7	3.9	3.9	4.2	3.8	3.4	3.2	3.2	3.4	4.4	3.8	4.9	5.6	6.4	6.6	6.5	6.2	6.0	4.1	6.6									
14-Dec	4.3	3.3	3.1	2.5	1.9	1.5	1.6	1.5	1.3	1.3	1.3	1.7	1.9	1.7	1.6	1.5	1.8	2.2	1.7	1.5	1.4	1.7	2.2	1.4	1.9	4.3									
15-Dec	1.7	1.7	1.6	1.7	1.5	1.4	1.6	1.7	1.8	2.2	2.6	2.3	2.4	3.1	2.8	2.3	2.7	2.3	2.6	2.8	4.5	2.3	3.8	2.3	2.3	4.5									
16-Dec	3.6	3.5	2.6	4.1	2.7	2.2	1.9	2.2	5.1	2.5	2.0	1.9	3.0	1.6	1.6	1.9	1.7	2.8	7.7	9.0	8.4	10.8	7.2	4.0	3.9	10.8									
17-Dec	3.6	4.2	5.3	3.1	2.4	2.6	3.8	4.7	4.5	4.3	4.2	3.5	2.8	2.2	2.0	2.3	2.9	2.5	2.5	2.3	2.2	2.7	2.3	1.7	3.1	5.3									
18-Dec	1.9	2.4	2.9	3.6	3.6	4.6	5.3	5.3	5.2	5.5	5.4	5.4	6.0	6.2	5.8	5.7	6.5	6.2	5.7	7.3	6.1	5.0	4.9	4.7	5.0	7.3									
19-Dec	4.5	4.2	4.4	5.1	4.7	4.2	4.0	4.1	4.3	4.0	3.6	3.5	3.0	2.6	2.4	2.5	2.5	2.4	2.4	2.5	3.1	2.7	2.5	2.6	3.4	5.1									
20-Dec	2.7	2.7	3.0	3.1	3.6	3.6	3.9	4.5	4.0	4.1	3.5	3.7	3.4	2.9	2.6	3.3	3.9	3.4	2.4	3.0	5.9	3.5	2.0	2.2	3.4	5.9									
21-Dec	1.9	1.8	2.2	2.5	2.5	2.8	2.4	2.4	2.2	2.5	2.7	2.4	2.3	2.4	2.4	2.4	3.5	3.6	4.2	4.1	4.4	4.6	4.7	4.2	3.0	4.7									
22-Dec	7.9	7.4	11.5	3.3	2.9	3.7	2.9	3.7	5.2	7.2	6.4	5.3	4.9	5.4	4.7	3.4	2.8	2.6	2.3	2.3	2.2	2.0	2.0	1.8	4.3	11.5									
23-Dec	1.6	1.7	1.9	1.9	1.9	2.0	2.5	2.6	3.2	2.9	3.3	2.2	2.0	2.0	1.9	2.8	3.7	4.3	3.9	2.5	3.2	3.4	2.3	2.5	2.6	4.3									
24-Dec	2.8	2.3	2.3	2.0	2.0	1.8	1.7	1.6	2.2	2.6	2.3	2.0	1.7	1.7	1.9	2.3	2.6	3.2	3.1	3.2	2.9	3.1	3.7	4.0	2.5	4.0									
25-Dec	3.8	3.3	3.3	3.4	3.1	2.6	2.3	3.2	3.3	3.3	3.4	3.4	3.4	3.0	2.8	2.8	2.9	2.8	2.7	3.3	2.6	2.5	2.6	2.4	3.0	3.8									
26-Dec	2.7	2.7	3.5	3.3	3.6	4.4	4.7	5.0	6.8	5.2	4.9	4.8	3.8	3.6	3.3	3.6	4.2	5.2	7.1	7.7	6.6	5.5	5.3	4.8	4.7	7.7									
27-Dec	6.3	7.7	8.2	7.2	7.9	8.9	8.8	8.7	8.8	8.9	7.6	6.6	5.6	5.6	5.2	7.0	7.5	6.2	4.6	3.8	3.3	3.5	5.1	5.8	6.6	8.9									
28-Dec	4.7	3.7	3.5	3.7	3.9	3.7	3.6	3.7	3.4	3.2	3.6	2.9	1.7	1.5	1.1	1.2	1.2	1.7	1.6	1.8	1.9	2.0	1.5	2.8	2.7	4.7									
29-Dec	4.2	1.7	1.8	3.7	2.2	1.6	1.3	1.2	1.8	1.1	1.0	1.0	1.7	1.7	1.3	1.2	1.5	2.1	1.6	1.4	1.6	4.9	4.0	1.5	2.0	4.9									
30-Dec	1.6	2.3	1.2	1.3	1.2	1.2	1.4	1.3	1.8	2.1	1.7	1.4	1.3	1.5	1.5	1.7	2.1	1.6	1.9	4.0	1.9	2.3	4.6	1.7	1.9	4.6									
31-Dec	1.8	2.1	2.1	2.3	2.7	2.0	2.2	2.3	2.2	2.1	1.6	1.3	1.5	1.1	1.1	1.5	1.6	1.4	1.4	1.2	1.2	1.3	1.6	2.1	1.7	2.7									
																								Diurnal Average											
																								Diurnal Maximum											
4.0 3.8 3.7 3.1 2.9 3.1 3.3 3.2 3.3 3.4 3.4 3.8 3.0 3.1 3.0 3.3 3.5 3.6 3.7 4.2 3.7 3.7 3.9 3.5 12.6 9.5 11.5 7.2 7.9 8.9 11.0 8.7 8.8 9.4 11.1 16.4 13.6 13.3 13.1 13.2 12.7 13.0 11.9 11.5 8.4 10.8 11.2 10.0																																			
C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																			



WBEA Data PC
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	582	78.33	78.33
6 - 15	122	16.42	94.75
16 - 25	1	0.13	94.89
26 - 80	0	0.00	94.89
> 81.0	0	0.00	94.89

Total Number of Valid Hours: 743

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Fort Chipewyan - December 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	10	9	13	38	81	48	14	16	26	10	11	13	49	117	104	22	581
6 - 15	1	0	0	7	7	4	3	19	26	6	1	8	16	12	7	3	120
16 - 25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	11	9	13	45	88	52	18	35	52	16	12	21	65	129	111	25	702

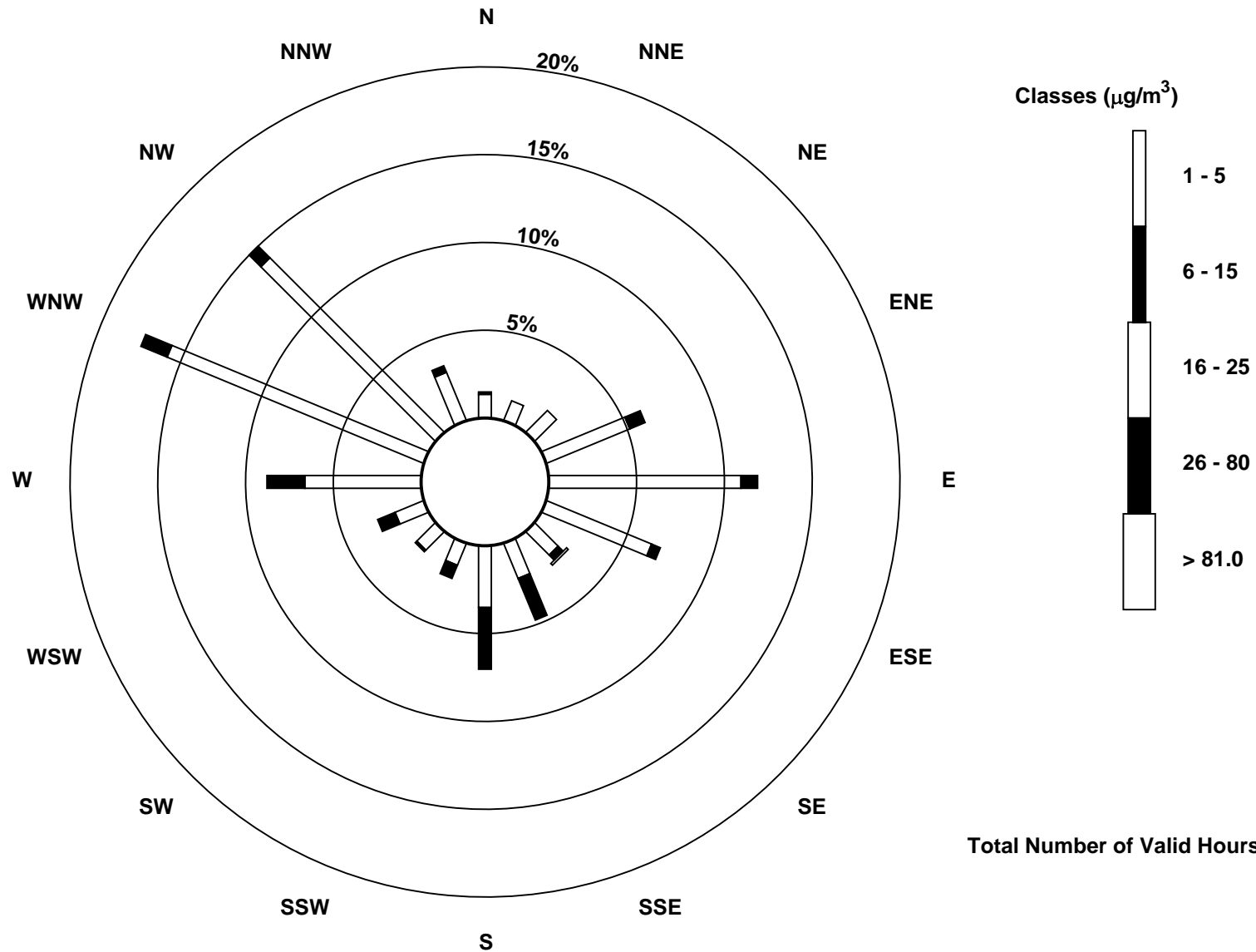
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 740

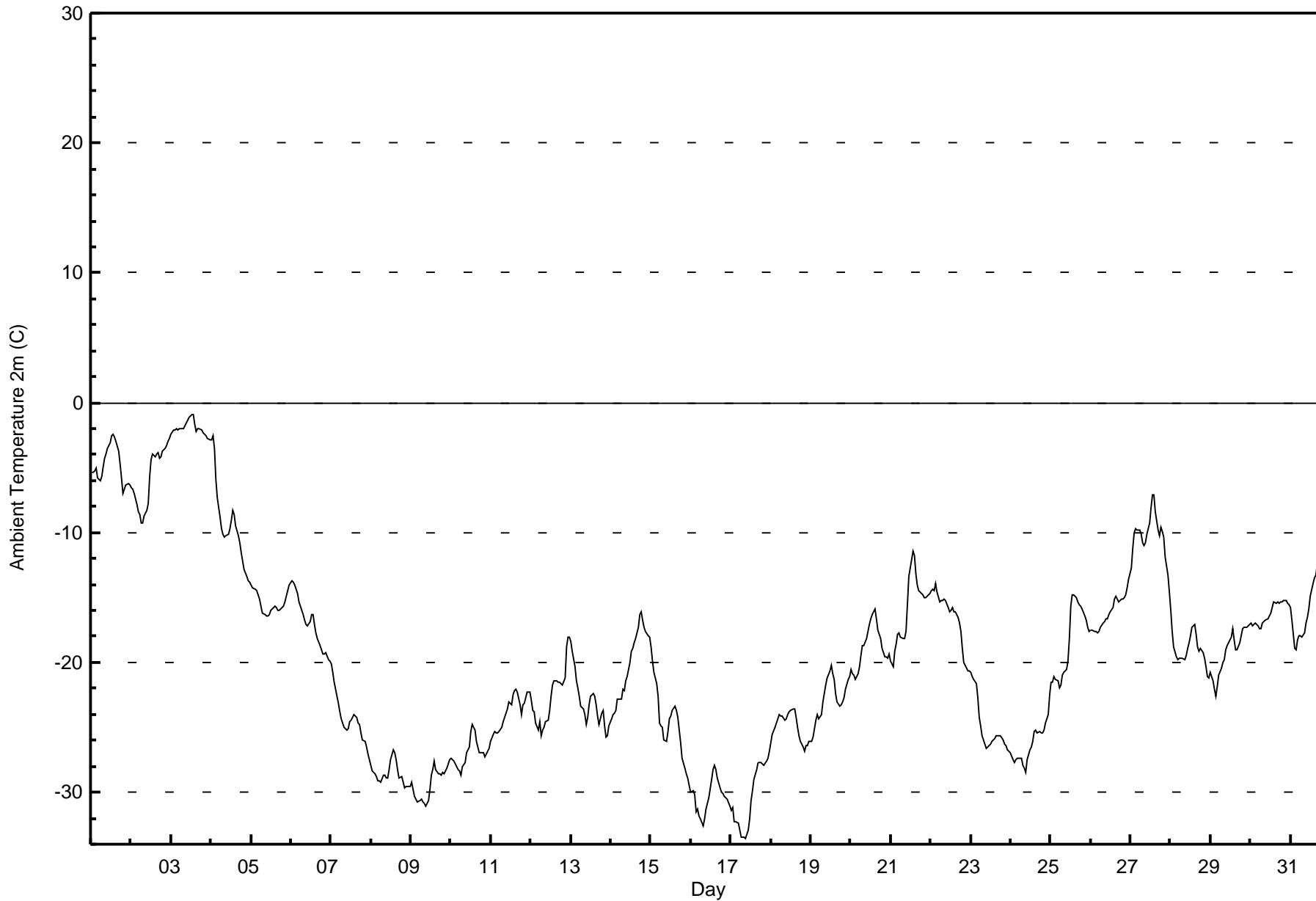


Maximum Value: -0.9 C on Dec 3 13:00 Maximum Daily Average: -2.0 C on Dec 3																							Hours in Service:	744		
Minimum Value: -33.6 C on Dec 17 10:00 Minimum Daily Average: -30.4 C on Dec 17																							Hours of Data:	744		
Maximum Diurnal Average: -18.1 C at hour 15 Minimum Diurnal Average: -20.5 C at hour 7																							Hours of Missing Data:	0		
Monthly Average: -19.45 C Percentiles: P ₁ = -32.4 P ₁₀ = -28.5 Q ₁ = -25.4 Median = -20.0 Q ₃ = -15.3 P ₉₀ = -8.3 P ₉₉ = -1.9																							Hours of Calibration:	0		
																							Percent Operational Time:	100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.3	-5.3	-5.3	-5.0	-5.8	-6.0	-5.7	-4.9	-4.3	-3.9	-3.6	-3.1	-2.6	-2.4	-2.7	-3.0	-3.7	-4.8	-5.8	-6.9	-6.6	-6.4	-6.3	-6.4	-4.8	-2.4
2-Dec	-6.5	-6.6	-7.0	-7.9	-8.4	-8.6	-9.2	-9.2	-8.7	-8.3	-7.7	-5.7	-4.4	-4.0	-4.2	-4.0	-3.9	-4.2	-4.1	-3.7	-3.5	-3.3	-3.0	-2.8	-5.8	-2.8
3-Dec	-2.5	-2.2	-2.1	-2.0	-2.1	-2.0	-2.0	-2.0	-1.8	-1.6	-1.3	-1.1	-0.9	-0.9	-1.7	-2.2	-2.0	-2.0	-2.1	-2.3	-2.5	-2.5	-2.7	-2.9	-2.0	-0.9
4-Dec	-2.9	-2.6	-3.5	-5.9	-7.4	-8.8	-9.7	-10.1	-10.3	-10.3	-10.1	-9.7	-9.0	-8.3	-8.6	-9.5	-10.2	-10.7	-11.5	-12.2	-12.8	-13.4	-13.7	-13.8	-9.4	-2.6
5-Dec	-14.0	-14.2	-14.4	-14.5	-14.8	-15.1	-15.7	-16.2	-16.3	-16.4	-16.4	-16.3	-16.0	-15.8	-15.6	-15.8	-16.0	-16.0	-15.8	-15.6	-15.3	-14.9	-14.5	-14.0	-15.4	-14.0
6-Dec	-13.8	-13.8	-14.1	-14.3	-14.7	-15.3	-16.0	-16.3	-16.7	-17.0	-17.1	-16.9	-16.3	-16.4	-17.1	-17.7	-18.2	-18.7	-19.0	-19.4	-19.4	-19.3	-19.8	-19.9	-17.0	-13.8
7-Dec	-20.1	-20.8	-21.5	-22.1	-23.1	-23.8	-24.3	-24.7	-25.0	-25.2	-25.1	-24.6	-24.4	-24.2	-24.0	-24.3	-24.7	-24.8	-25.5	-26.0	-26.1	-26.5	-27.1	-27.5	-24.4	-20.1
8-Dec	-27.9	-28.3	-28.6	-28.8	-29.1	-29.1	-29.2	-28.7	-28.7	-28.9	-28.9	-28.2	-27.4	-26.8	-26.9	-27.5	-28.3	-28.9	-28.8	-29.2	-29.7	-29.5	-29.6	-29.5	-28.6	-26.8
9-Dec	-29.2	-29.7	-30.3	-30.5	-30.7	-30.7	-30.5	-30.7	-30.8	-31.1	-30.7	-29.8	-28.7	-28.3	-27.6	-28.2	-28.6	-28.6	-28.7	-28.5	-28.6	-28.1	-27.8	-27.4	-29.3	-27.4
10-Dec	-27.4	-27.5	-27.7	-28.0	-28.2	-28.4	-28.6	-28.0	-27.7	-27.0	-26.7	-26.5	-25.3	-24.8	-25.2	-26.0	-26.6	-26.9	-26.9	-26.9	-27.2	-27.1	-26.9	-26.6	-27.0	-24.8
11-Dec	-26.1	-25.6	-25.4	-25.4	-25.5	-25.3	-25.0	-24.5	-24.2	-23.9	-23.6	-23.0	-23.3	-22.5	-22.1	-22.1	-22.3	-23.3	-24.0	-23.3	-23.1	-22.7	-22.3	-22.2	-23.8	-22.1
12-Dec	-23.0	-23.7	-23.8	-24.7	-25.3	-24.6	-25.6	-25.2	-25.0	-24.6	-24.5	-23.7	-22.6	-21.7	-21.4	-21.4	-21.5	-21.5	-21.6	-21.8	-21.2	-18.8	-18.0	-18.1	-22.6	-18.0
13-Dec	-18.3	-19.2	-20.3	-21.4	-22.0	-22.6	-23.3	-23.6	-24.0	-24.8	-24.2	-23.3	-22.6	-22.4	-22.6	-23.3	-24.1	-24.7	-23.9	-23.7	-24.9	-25.7	-25.7	-24.9	-23.2	-18.3
14-Dec	-24.4	-24.0	-23.9	-23.6	-22.8	-22.8	-22.8	-22.0	-22.2	-21.5	-21.1	-20.1	-19.1	-18.9	-18.5	-18.1	-17.3	-16.4	-16.2	-16.8	-17.3	-17.6	-18.0	-18.0	-20.1	-16.2
15-Dec	-18.8	-19.9	-20.7	-21.6	-22.7	-24.7	-24.8	-25.0	-26.0	-26.1	-25.3	-24.3	-24.1	-23.7	-23.3	-23.7	-24.2	-25.2	-26.1	-27.3	-28.2	-28.6	-28.9	-29.4	-24.7	-18.8
16-Dec	-30.0	-29.9	-30.2	-31.5	-31.3	-31.9	-32.0	-32.6	-32.1	-31.3	-30.9	-30.4	-29.0	-28.2	-28.0	-28.2	-28.9	-29.7	-30.0	-30.1	-30.3	-30.5	-30.5	-31.1	-30.3	-28.0
17-Dec	-31.4	-31.2	-32.2	-32.3	-32.4	-32.9	-33.4	-33.4	-33.5	-33.6	-33.0	-32.0	-30.7	-29.8	-29.0	-28.3	-27.7	-27.7	-27.8	-27.8	-27.9	-27.6	-27.4	-26.8	-30.4	-26.8
18-Dec	-26.2	-25.5	-25.0	-24.6	-24.4	-24.0	-24.2	-24.1	-24.4	-24.3	-24.0	-23.8	-23.7	-23.6	-23.6	-24.3	-24.9	-25.6	-26.0	-26.5	-26.8	-26.4	-26.4	-26.1	-24.9	-23.6
19-Dec	-26.0	-25.8	-25.1	-24.4	-24.1	-24.3	-24.1	-23.1	-22.3	-21.7	-21.3	-20.6	-20.2	-20.9	-21.3	-22.4	-23.0	-23.4	-23.2	-23.1	-22.7	-22.0	-21.3	-21.0	-22.8	-20.2
20-Dec	-20.6	-20.8	-21.0	-21.3	-20.9	-20.3	-19.5	-18.8	-18.7	-18.2	-17.6	-17.1	-16.7	-16.3	-15.9	-16.7	-17.5	-17.9	-18.2	-18.9	-19.6	-19.6	-19.6	-19.4	-18.8	-15.9
21-Dec	-19.9	-20.3	-19.1	-18.6	-17.8	-17.8	-18.1	-18.1	-18.2	-17.6	-15.5	-13.4	-12.1	-11.4	-11.7	-13.2	-14.0	-14.5	-14.7	-14.8	-15.0	-15.0	-14.9	-14.7	-15.8	-11.4
22-Dec	-14.4	-14.4	-14.5	-14.0	-14.6	-15.3	-15.2	-15.2	-15.1	-15.2	-15.8	-16.1	-16.0	-15.8	-16.1	-16.1	-16.5	-17.0	-17.6	-18.9	-20.0	-20.4	-20.7	-20.7	-16.5	-14.0
23-Dec	-20.8	-21.1	-21.3	-21.6	-22.8	-24.2	-24.9	-25.6	-26.3	-26.7	-26.6	-26.4	-26.3	-26.1	-25.8	-25.7	-25.6	-25.6	-25.7	-25.9	-26.2	-26.4	-26.7	-26.9	-25.1	-20.8
24-Dec	-27.0	-27.5	-27.7	-27.5	-27.4	-27.4	-27.4	-27.9	-28.1	-28.5	-27.5	-26.8	-26.5	-26.1	-25.4	-25.2	-25.4	-25.4	-25.4	-25.2	-25.2	-24.7	-24.0	-22.5	-26.3	-22.5
25-Dec	-21.6	-21.6	-21.1	-21.3	-21.4	-21.9	-21.7	-21.0	-20.7	-20.5	-19.9	-18.2	-15.7	-14.8	-14.7	-15.0	-15.3	-15.5	-15.6	-15.9	-16.5	-16.8	-17.2	-17.6	-18.4	-14.7
26-Dec	-17.5	-17.5	-17.6	-17.6	-17.7	-17.6	-17.3	-17.0	-16.8	-16.7	-16.7	-16.4	-16.1	-15.8	-15.2	-14.9	-15.1	-15.3	-15.2	-15.1	-15.0	-14.8	-14.3	-13.7	-16.1	-13.7
27-Dec	-12.8	-11.3	-10.1	-9.7	-9.8	-9.9	-10.2	-10.7	-11.0	-10.8	-10.2	-9.2	-8.1	-7.0	-7.1	-8.4	-9.8	-10.2	-9.6	-9.9	-10.3	-11.9	-13.3	-14.5	-10.2	-7.0
28-Dec	-16.0	-17.6	-18.8	-19.6	-19.8	-19.6	-19.6	-19.7	-19.8	-19.5	-18.9	-18.5	-18.0	-17.2	-17.1	-17.8	-18.8	-19.2	-18.9	-19.3	-19.6	-20.3	-21.1	-21.2	-19.0	-16.0
29-Dec	-20.8	-21.4	-22.0	-22.6	-21.9	-20.9	-20.5	-20.0	-19.8	-19.0	-18.7	-18.5	-18.0	-17.4	-18.3	-19.1	-19.1	-18.5	-17.9	-17.4	-17.3	-17.3	-17.3	-17.1	-19.2	-17.1
30-Dec	-17.0	-17.1	-17.1	-17.0	-17.2	-17.4	-17.4	-17.0	-16.9	-16.7	-16.7	-16.5	-16.2	-15.8	-15.4	-15.4	-15.4	-15.4	-15.4	-15.3	-15.2	-15.2	-15.4	-15.5	-16.2	-15.2
31-Dec	-15.8	-16.8	-18.9	-19.0	-18.3	-18.0	-17.9	-18.0	-17.7	-17.0	-16.6	-15.9	-15.0	-14.0	-13.5	-13.3	-12.4	-10.6	-9.7	-9.1	-9.1	-10.2	-12.7	-14.5	-14.8	-9.1
																							Diurnal Average			
																							Diurnal Maximum			



WBEA Data PC
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	372	50.00	50.00
-20 - 0	372	50.00	100.00
0 - 10	0	0.00	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

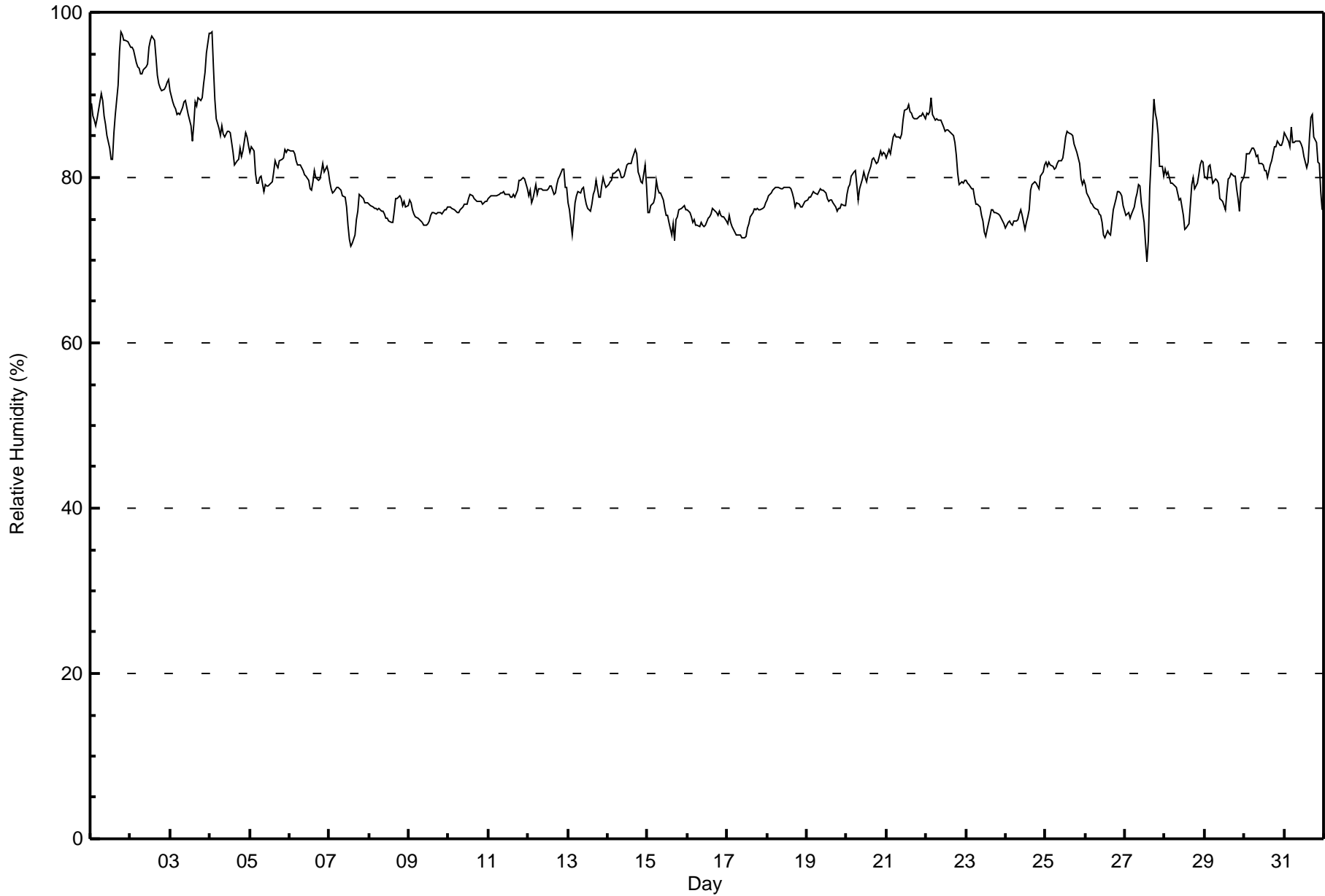
Fort Chipewyan - December 2016

Maximum Value: 98 % on Dec 1 19:00 Maximum Daily Average: 93.5 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 70 % on Dec 27 14:00 Minimum Daily Average: 74.7 % on Dec 17 Maximum Diurnal Average: 81.1 % at hour 18 Minimum Diurnal Average: 78.9 % at hour 13 Monthly Average: 80.3 % Percentiles: P ₁ = 73 P ₁₀ = 75 Q ₁ = 76 Median = 79 Q ₃ = 83 P ₉₀ = 88 P ₉₉ = 96																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	89	88	87	86	87	89	90	89	87	86	85	84	82	82	85	88	91	95	98	97	97	97	97	96	89.7	98	
2-Dec	96	96	95	94	93	93	93	93	93	93	94	96	97	97	97	95	92	91	91	90	91	91	91	92	93.5	97	
3-Dec	90	89	89	88	88	88	88	88	89	89	88	88	86	84	86	89	89	90	89	90	91	93	95	98	89.3	98	
4-Dec	97	98	93	90	87	86	85	86	85	85	86	86	85	84	83	81	82	82	84	83	83	85	85	84	86.1	98	
5-Dec	83	84	83	81	79	79	80	80	78	79	79	79	79	80	81	82	82	81	82	82	82	83	83	83	81.1	84	
6-Dec	83	83	83	83	82	82	82	81	81	80	80	80	79	78	79	81	80	80	80	81	82	81	81	81	80.9	83	
7-Dec	79	79	78	78	79	79	79	78	78	78	76	74	73	72	72	73	75	76	78	78	78	77	77	77	76.7	79	
8-Dec	77	77	76	76	76	76	76	76	76	76	75	75	75	75	75	76	77	77	78	77	77	77	76	77	76.2	78	
9-Dec	77	77	76	76	75	75	75	75	75	74	74	74	75	75	76	76	76	76	76	76	76	76	76	76	75.5	77	
10-Dec	76	76	76	76	76	76	76	76	76	77	77	77	78	78	78	77	77	77	77	77	77	77	77	77	76.8	78	
11-Dec	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	80	80	80	80	80	79	79	78.3	80	
12-Dec	78	78	77	78	79	78	79	79	79	79	79	79	79	79	79	78	78	79	80	80	81	81	79	79	78.8	81	
13-Dec	77	76	73	75	77	78	78	78	79	79	78	77	76	76	77	78	79	80	78	78	79	80	79	79	77.6	80	
14-Dec	79	80	80	80	81	81	81	81	80	80	80	81	82	82	82	82	83	83	81	80	79	79	82	79	80.7	83	
15-Dec	76	76	77	77	78	80	79	78	78	77	76	75	75	75	73	74	72	75	75	76	76	77	77	76	76.2	80	
16-Dec	76	76	75	75	75	74	74	74	74	74	74	74	75	75	76	76	76	76	75	76	75	75	75	75	75.1	76	
17-Dec	74	75	75	74	73	73	73	73	73	73	73	73	74	74	75	76	76	76	76	76	76	76	76	77	74.7	77	
18-Dec	77	78	78	78	79	79	79	79	79	79	79	79	79	79	79	78	77	76	77	77	76	76	77	77	77.9	79	
19-Dec	77	78	78	78	78	78	78	78	79	79	78	78	77	77	77	77	77	76	76	76	76	77	77	77	77.4	79	
20-Dec	78	79	79	80	81	81	79	77	79	80	81	80	79	80	81	82	82	82	82	82	83	83	83	83	80.7	83	
21-Dec	82	83	83	84	85	85	85	85	85	85	87	88	88	89	88	88	87	87	87	87	87	87	88	87	86.2	89	
22-Dec	88	88	88	90	88	87	87	87	87	87	86	86	86	86	86	85	85	84	83	81	79	79	79	80	85.0	90	
23-Dec	80	79	79	79	79	78	77	77	76	76	75	73	73	74	75	76	76	76	76	76	75	75	74	74	76.1	80	
24-Dec	74	75	75	74	74	75	75	75	76	76	75	74	75	75	76	78	79	80	79	79	79	80	81	82	76.6	82	
25-Dec	82	81	82	81	81	81	81	82	82	82	82	84	85	86	85	85	85	84	84	83	82	80	79	80	82.5	86	
26-Dec	79	78	77	77	77	76	76	76	76	75	74	73	73	74	73	73	75	76	77	78	78	78	77	77	76.1	79	
27-Dec	75	76	76	75	76	76	78	78	79	79	77	75	72	70	72	79	86	89	88	87	85	81	81	80	78.8	89	
28-Dec	81	80	81	79	79	79	79	79	79	77	77	76	75	74	74	74	77	79	80	79	79	80	82	82	82	78.6	82
29-Dec	80	80	81	82	80	79	80	80	79	78	77	77	76	78	80	80	81	80	80	79	77	76	79	80	79.2	82	
30-Dec	81	83	83	83	84	84	83	83	83	82	82	82	81	81	80	82	82	83	84	84	84	84	84	84	82.6	84	
31-Dec	85	85	84	84	86	84	84	84	84	84	84	84	83	81	82	85	87	88	85	84	82	82	78	76	83.6	88	
80.9 80.9 80.5 80.3 80.3 80.2 80.2 80.1 80.0 79.9 79.6 79.2 78.9 78.9 79.4 80.2 80.7 81.1 81.0 80.9 80.8 80.8 80.9 80.7																		Diurnal Average									
97 98 95 94 93 93 93 93 93 93 93 94 96 97 97 97 95 92 95 98 97 97 97 98																		Diurnal Maximum									



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Fort Chipewyan - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	441	59.27	59.27
80 - 100	303	40.73	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

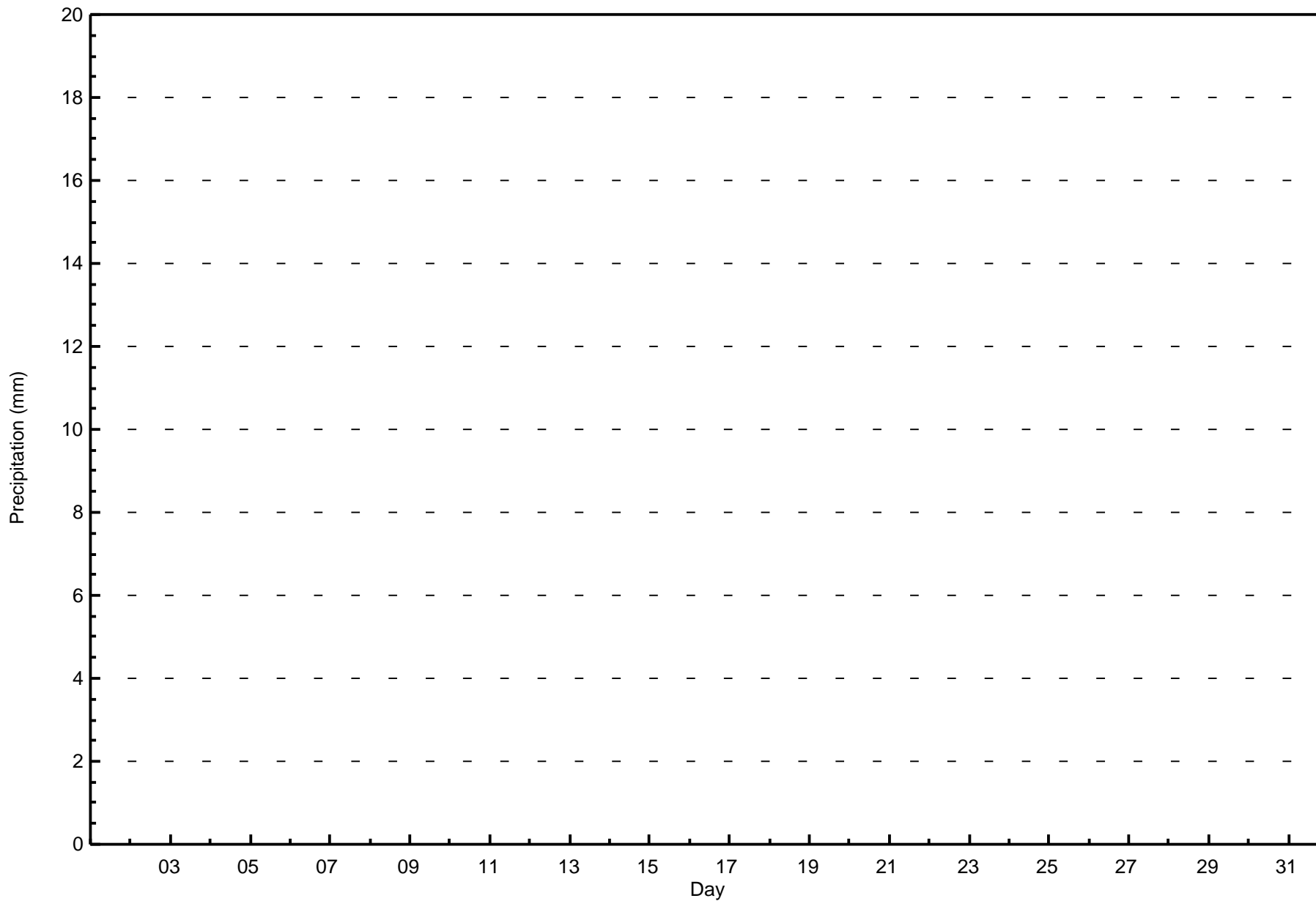


Maximum Value: -- mm on Dec 1 00:00														Maximum Daily Total: -- mm on Nov 30														Hours in Service: 744	
Minimum Value: -- mm on Dec 1 00:00														Minimum Daily Total: -- mm on Nov 30														Hours of Data: 0	
Maximum Diurnal Total: -- mm at hour 0														Minimum Diurnal Total: -- mm at hour 0														Hours of Missing Data: 744	
Monthly Total: -- mm														Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.0														Hours of Calibration: 0	
																												Percent Operational Time: 0.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
13-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
15-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
18-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
19-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
22-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
23-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
24-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
25-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
28-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
29-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
30-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
31-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
																								Diurnal Average					
																								Diurnal Maximum					
AF - Analyzer Failure																													



WBEA Data PC
Hourly Averages

Precipitation (PC) - mm
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Precipitation (PC) - mm
Fort Chipewyan - December 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	0	0.00	0.00
0.4 - 0.5	0	0.00	0.00
0.6 - 0.7	0	0.00	0.00
0.8 - 1.4	0	0.00	0.00
1.5 - 10	0	0.00	0.00
> 10	0	0.00	0.00

Total Number of Valid Hours: 0
Total Number of Hours: 744

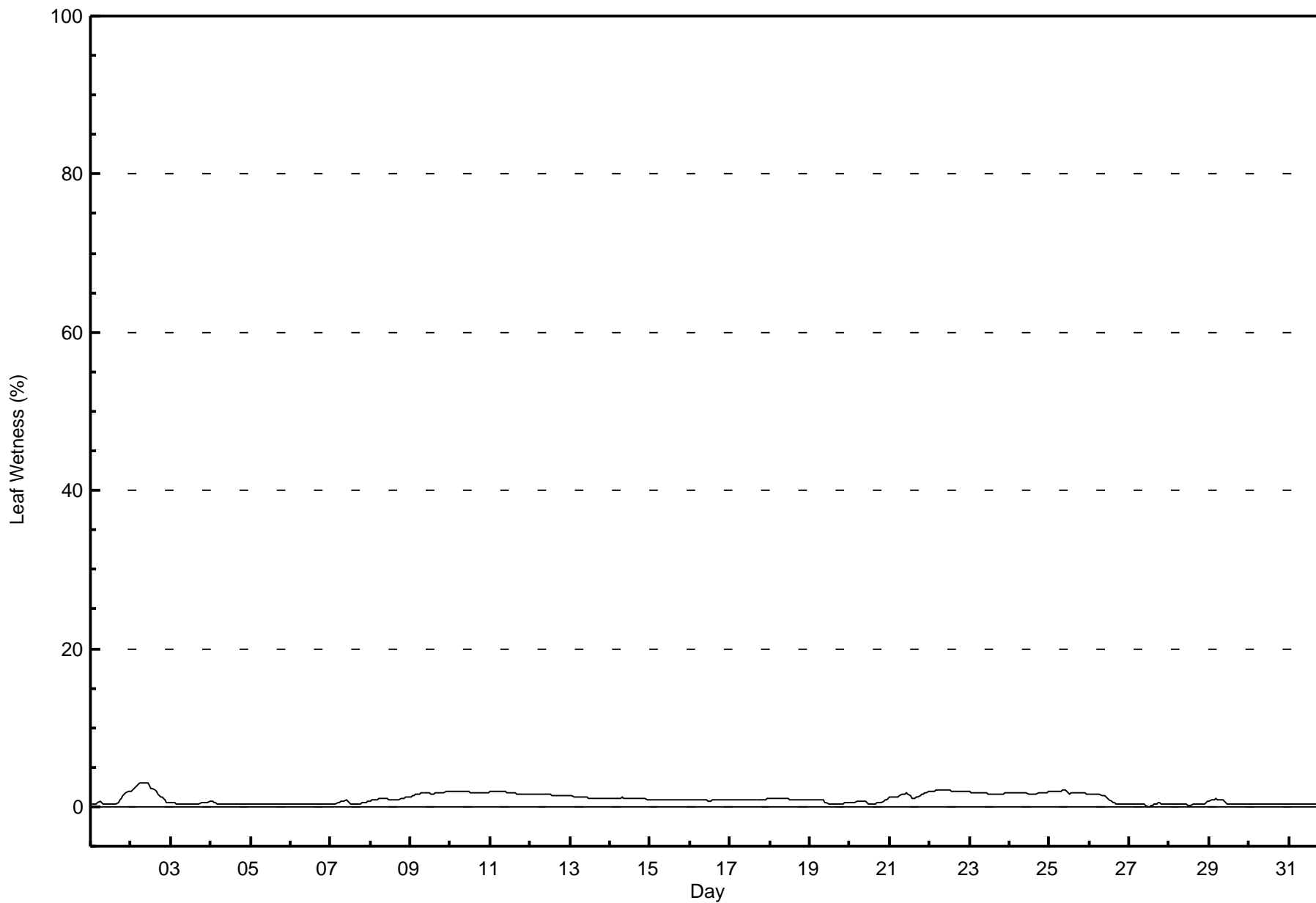


Maximum Value: 3 % on Dec 2 10:00 Maximum Daily Average: 2.1 % on Dec 2																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 0 % on Dec 27 13:00 Minimum Daily Average: 0.3 % on Dec 27 Maximum Diurnal Average: 1.1 % at hour 9 Minimum Diurnal Average: 0.9 % at hour 15 Monthly Average: 1.0 % Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 2 P ₉₉ = 3																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2	0.7	2
2-Dec	2	2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	1	1	1	1	1	0	0	2.1	3
3-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1
4-Dec	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
5-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
9-Dec	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.7	2
10-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.9	2
11-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2
12-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.5	2
13-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1
15-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
16-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
18-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
19-Dec	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1
20-Dec	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.6	1
21-Dec	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	1.4	2
22-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	2
23-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.7	2
24-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.7	2
25-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2
26-Dec	2	2	2	2	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1.0	2
27-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.3	1
28-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
29-Dec	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1
30-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
1.0 1.0 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.0 1.0 0.9 0.9 0.9 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0																								Diurnal Average		
2 2 2 3 3 3 3 3 3 3 3 3 3 2 2 2 2 2 2 2 2 2 2 2 2																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Leaf Wetness (SW) - %
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Fort Chipewyan - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	151	20.35	20.35
0.4 - 0.5	115	15.50	35.85
0.6 - 0.7	28	3.77	39.62
0.8 - 1.4	228	30.73	70.35
1.5 - 10	216	29.11	99.46
> 10	0	0.00	99.46

Total Number of Valid Hours: 742

Total Number of Hours: 744

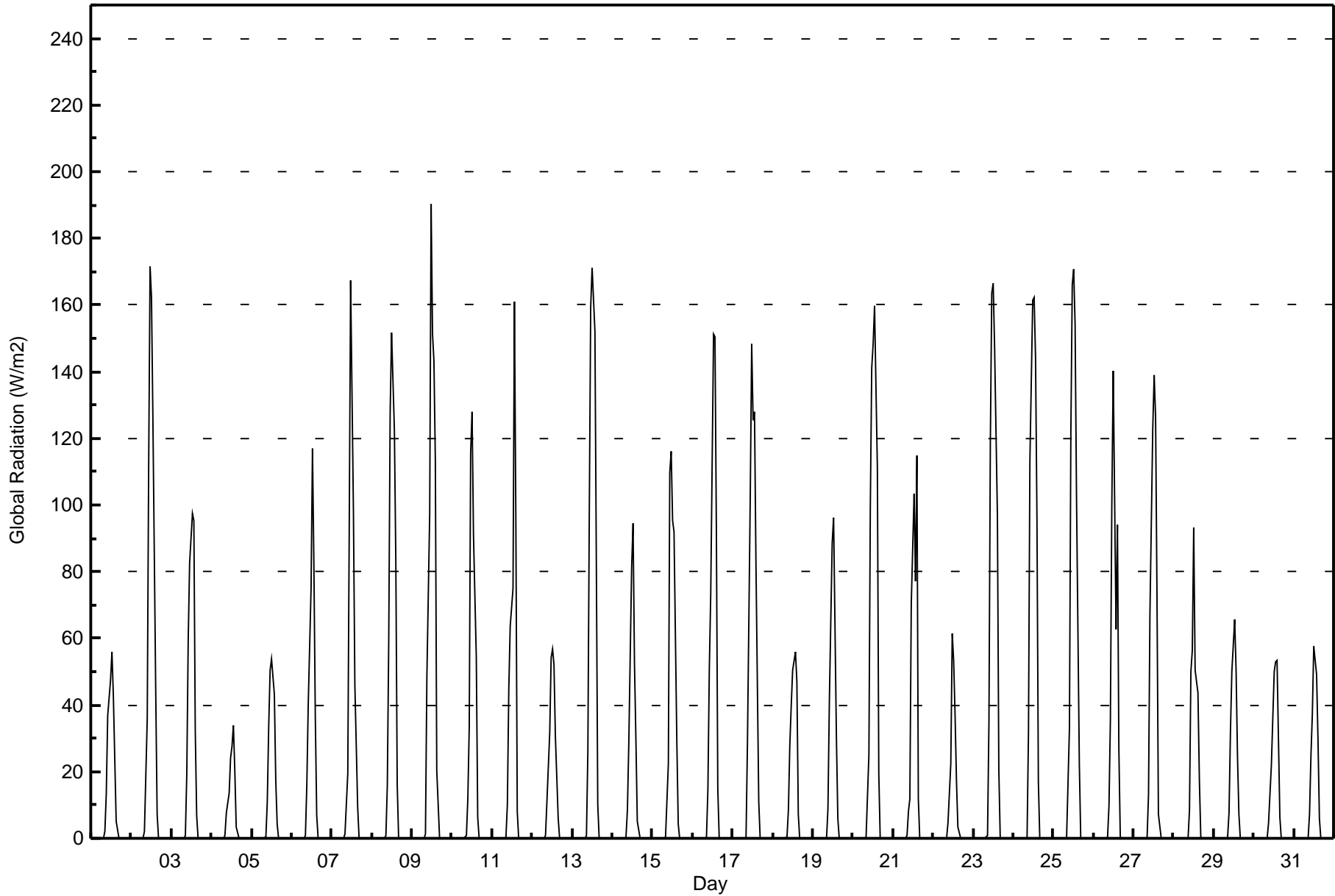


Maximum Value: 190 W/m2 on Dec 9 12:00																			Maximum Daily Average: 32.2 W/m2 on Dec 25						Hours in Service: 744	
Minimum Value: 0 W/m2 on Dec 1 01:00																			Minimum Daily Average: 5.5 W/m2 on Dec 4						Hours of Data: 744	
Maximum Diurnal Average: 107.9 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 19						Hours of Missing Data: 0	
Monthly Average: 18.6 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 10 P ₉₀ = 82 P ₉₉ = 166						Hours of Calibration: 0	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	0	2	14	37	48	56	43	24	5	0	0	0	0	0	0	0	0	9.5	56
2-Dec	0	0	0	0	0	0	0	0	2	36	112	172	162	126	44	7	0	0	0	0	0	0	0	0	27.6	172
3-Dec	0	0	0	0	0	0	0	0	1	19	59	82	97	95	32	7	0	0	0	0	0	0	0	0	16.4	97
4-Dec	0	0	0	0	0	0	0	0	1	8	14	24	28	34	20	4	0	0	0	0	0	0	0	0	5.5	34
5-Dec	0	0	0	0	0	0	0	0	1	11	33	50	54	43	17	4	0	0	0	0	0	0	0	0	8.9	54
6-Dec	0	0	0	0	0	0	0	0	1	16	40	75	117	82	36	7	0	0	0	0	0	0	0	0	15.6	117
7-Dec	0	0	0	0	0	0	0	0	1	20	91	167	133	98	46	9	0	0	0	0	0	0	0	0	23.6	167
8-Dec	0	0	0	0	0	0	0	0	1	16	59	127	152	123	84	16	0	0	0	0	0	0	0	0	24.1	152
9-Dec	0	0	0	0	0	0	0	0	1	48	98	190	151	143	113	20	0	0	0	0	0	0	0	0	31.9	190
10-Dec	0	0	0	0	0	0	0	0	1	12	33	116	128	91	54	7	0	0	0	0	0	0	0	0	18.4	128
11-Dec	0	0	0	0	0	0	0	0	0	10	45	63	75	161	96	8	0	0	0	0	0	0	0	0	19.1	161
12-Dec	0	0	0	0	0	0	0	0	1	11	32	54	57	52	30	6	0	0	0	0	0	0	0	0	10.1	57
13-Dec	0	0	0	0	0	0	0	0	1	26	97	159	171	152	83	10	0	0	0	0	0	0	0	0	29.2	171
14-Dec	0	0	0	0	0	0	0	0	0	8	29	81	94	53	30	5	0	0	0	0	0	0	0	0	12.5	94
15-Dec	0	0	0	0	0	0	0	0	1	22	110	116	95	92	29	4	0	0	110	0	0	0	0	0	19.6	116
16-Dec	0	0	0	0	0	0	0	0	0	15	51	73	151	151	92	15	0	0	0	0	0	0	0	0	22.8	151
17-Dec	0	0	0	0	0	0	0	0	1	29	103	148	126	128	83	11	0	0	0	0	0	0	0	0	26.2	148
18-Dec	0	0	0	0	0	0	0	0	0	9	28	40	51	56	47	7	0	0	0	0	0	0	0	0	9.9	56
19-Dec	0	0	0	0	0	0	0	0	0	9	41	88	96	63	30	6	0	0	0	0	0	0	0	0	13.9	96
20-Dec	0	0	0	0	0	0	0	0	1	25	99	141	149	160	111	20	0	0	0	0	0	0	0	0	29.4	160
21-Dec	0	0	0	0	0	0	0	0	1	8	12	70	103	77	115	12	0	0	0	0	0	0	0	0	16.6	115
22-Dec	0	0	0	0	0	0	0	0	0	5	22	62	54	37	17	3	0	0	0	0	0	0	0	0	8.4	62
23-Dec	0	0	0	0	0	0	0	0	1	35	119	164	166	148	97	20	0	0	0	0	0	0	0	0	31.3	166
24-Dec	0	0	0	0	0	0	0	0	1	32	113	161	162	144	96	17	0	0	0	0	0	0	0	0	30.3	162
25-Dec	0	0	0	0	0	0	0	0	0	33	121	166	171	154	103	22	0	0	0	0	0	0	0	0	32.2	171
26-Dec	0	0	0	0	0	0	0	0	0	10	35	100	140	63	94	27	0	0	0	0	0	0	0	0	19.6	140
27-Dec	0	0	0	0	0	0	0	0	0	13	67	123	139	126	72	7	0	0	0	0	0	0	0	0	22.9	139
28-Dec	0	0	0	0	0	0	0	0	0	8	50	56	93	50	44	18	0	0	0	0	0	0	0	0	13.4	93
29-Dec	0	0	0	0	0	0	0	0	0	8	32	50	66	50	24	7	0	0	0	0	0	0	0	0	9.9	66
30-Dec	0	0	0	0	0	0	0	0	0	5	22	36	50	53	53	7	0	0	0	0	0	0	0	0	9.4	53
31-Dec	0	0	0	0	0	0	0	0	0	7	25	37	58	49	30	6	0	0	0	0	0	0	0	0	8.8	58
																			0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.6 17.0 59.0 98.1 107.9 93.4 59.6 10.4 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0						Diurnal Average	
																			0 0 0 0 0 0 0 0 2 48 121 190 171 161 115 27 0 0 0 0 0 0 0 0						Diurnal Maximum	



WBEA Data PC
Hourly Averages

Global Radiation (GR) - W/m²
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Fort Chipewyan - December 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	583	78.36	78.36
21 - 100	110	14.78	93.15
101 - 300	51	6.85	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 31 km/h on Dec 3 01:00	Maximum Daily Speed Average: 22.2 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 9 00:00	Minimum Daily Speed Average: 1.3 km/h on Dec 30	Hours of Data: 741
Maximum Diurnal Speed Average: 2.8 km/h at hour 21	Minimum Diurnal Speed Average: 0.9 km/h at hour 10	Hours of Missing Data: 3
Monthly Average Velocity: 1.7 km/h 293.3 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 7 Median = 12 Q ₃ = 16 P ₉₀ = 21 P ₉₉ = 29	Percent Operational Time: 99.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S20	S19	SSW20	SSW16	S11	SSE9	SSE8	S8	SSW13	SSW14	SSW15	SSW14	SW14	WSW12	W11	WSW7	WSW8	W6	W5	W5	NW3	NW2	NW3	W5	SSW8.3	S20	
2-Dec	W3	S4	SE6	SE6	ESE6	E9	ESE8	E7	E8	ESE8	ESE7	SE10	SSE12	SSE23	SSE24	SSE28	SSE24	SSE25	SSE23	SSE23	SSE24	SSE26	SSE27	S30	SSE14.0	S30	
3-Dec	S31	S30	S24	SSE21	S21	S21	SSE18	S17	SSE15	S19	S23	S24	S21	S17	SSE10	E8	ESE9	ESE7	SE5	SSE5	S2	S2	WSW4	NW7	SSE13.8	S31	
4-Dec	NW6	NNW7	NNW13	NNW18	NNW19	NW20	NW20	NW21	NW20	NW20	NW21	NW18	NW20	NW20	NW25	NW26	NW24	NW25	NW24	NW25	NW28	NW26	NW28	NW28	NW20.8	NW28	
5-Dec	NW29	NW28	NW29	NW27	NW26	WNW25	WNW22	WNW21	WNW23	WNW21	WNW23	WNW21	WNW21	WNW23	WNW23	WNW23	WNW22	WNW23	WNW21	WNW18	WNW19	WNW18	WNW16	WNW17	WNW22.2	NW29	
6-Dec	NW19	WNW19	WNW18	NW18	NW17	NW17	NW17	WNW16	NW15	NW15	NW14	NW13	NW14	NW12	WNW12	WNW11	WNW14	WNW15	WNW14	NW11	NW11	NW10	NW12	NW13	NW14.4	WNW19	
7-Dec	NW13	NW13	NW13	NW10	WNW10	WNW10	WNW10	NW16	NW16	NW14	NW13	NW14	NW16	NW15	NW13	NW11	NW9	NW8	NW6	NW6	NW9	NW12	NW12	NW12	NW11.6	NW16	
8-Dec	NW11	NW10	NW10	NW10	NW10	NW8	NW8	WNW7	WNW7	WNW7	WNW7	NW6	WNW6	W6	W7	W7	W6	WNW7	WNW3	W2	WSW3	SW3	SW3	SW3	SW3	WNW5.6	NW11
9-Dec	E3	E5	E5	E5	E5	E5	E5	E6	ESE6	ESE7	ESE6	SE5	S5	SSE3	SSW4	SSW4	SSW4	SSW4	SSW6	SW5	SW5	WSW3	WSW3	WSW3	SE2.5	ESE7	
10-Dec	WSW4	WSW3	SW5	SW5	WSW5	WSW4	W5	W5	W5	W6	WNW9	WNW8	W8	W7	WSW7	W7	WSW7	WSW8	W8	W8	W7	W9	W10	W13	W6.5	W13	
11-Dec	W14	W14	W16	W16	W15	W15	W16	W17	W15	W11	W15	WNW18	WNW15	W15	W16	W14	W14	W12	W12	WNW12	WNW12	WNW13	WNW15	WNW13	W14.1	WNW18	
12-Dec	WNW12	WNW13	WNW13	WNW14	WNW15	WNW13	WNW13	WNW13	WNW14	W12	WNW11	WNW12	WNW10	W10	WNW10	WNW10	NW9	NW7	NW5	WNW4	W7	NW14	NW14	NW13	WNW10.8	WNW15	
13-Dec	NW16	NNW13	NNW15	NNW11	NW11	NW13	NW12	NW12	NW11	NW8	NNW9	NW9	NW7	WNW11	WNW8	NW11	WNW8	WNW8	NW10	WNW8	WNW8	WNW9	WNW8	WNW6	NW9.7	NW16	
14-Dec	WNW7	W8	W7	W3	WSW6	SW8	SW9	SSW7	SW8	SSW7	WSW7	W10	WNW12	WNW12	WNW14	WNW11	W11	WNW14	WNW15	WNW15	WNW16	WNW15	WNW13	WNW16	W9.3	WNW16	
15-Dec	NW16	NW16	NW14	WNW14	WNW14	W13	WNW15	WNW13	W13	W15	W16	W18	WNW17	WNW12	WNW14	WNW13	NW17	WNW14	WNW12	WNW13	WNW12	W10	WNW10	WNW10	WNW13.6	WNW18	
16-Dec	WNW11	WNW10	WNW7	WNW8	WNW6	WSW5	W6	WSW5	WNW10	W5	W6	W6	W8	W6	W6	W7	WSW5	W7	W6	WNW7	W7	WNW6	W5	AF	W6.6	WNW11	
17-Dec	SW3	SE2	ENE5	E3	SE3	SE5	ESE7	ESE7	ESE9	ESE7	ESE9	ESE7	ESE7	ESE12	ESE10	E12	ESE13	E15	E15	E14	ESE14	E15	ESE15	E16	E17	ESE9.5	E17
18-Dec	E15	E17	E14	E13	E15	ESE11	E10	ESE16	ESE11	ESE12	ESE11	E12	ENE11	ENE12	ENE14	ENE13	ENE10	ENE12	ENE12	E11	E11	E16	ENE13	E17	E12.4	E17	
19-Dec	E20	E24	E26	E23	E25	ENE25	ENE28	ENE28	ENE29	ENE28	ENE29	ENE29	NE23	NE20	NE12	NNE9	N7	N6	NNW4	NNE3	NE5	ESE5	SE5	SE7	ENE16.3	ENE29	
20-Dec	ESE10	ESE11	ESE13	E14	E17	E21	ENE22	ENE19	ENE15	ENE18	ENE15	ENE16	ENE12	E12	E15	ENE12	ENE9	NE6	NNE4	NE6	E6	E10	E13	E17	E12.5	ENE22	
21-Dec	E15	E13	E16	E17	E18	E17	E17	E17	E17	E13	E13	E11	E9	E8	E8	E12	E13	E12	E10	E12	E11	E8	E8	E7	E12.6	E18	
22-Dec	AF	AF	N1	NNW13	NNW8	NNW6	NNW8	NNW9	NW6	NNW7	NNW8	NW7	NW10	NW11	NW12	NNW9	N6	NNE7	NNE10	NNE8	NNW9	NNW10	NNW7	N6	NNW7.6	NNW13	
23-Dec	N6	N7	NNE6	N6	N7	NNE7	ENE10	ENE11	ENE10	ENE9	ENE11	E17	E19	E22	E20	ENE18	ENE20	ENE19	E20	ENE16	ENE19	E19	E17	E17	ENE12.8	E22	
24-Dec	E15	E16	E16	E16	E17	E18	ESE15	ESE10	ESE10	ESE10	E10	ESE11	ESE9	E10	E13	E13	ESE12	ESE12	ESE13	ESE13	ESE11	ESE11	E10	ESE8	E12.4	E18	
25-Dec	E9	ESE8	ESE7	ESE8	ESE7	ESE7	ESE6	ESE6	ESE6	ESE6	ESE6	SE6	S8	SSE9	SSE12	SSE11	SSE11	S19	S16	S20	S25	S30	S27	S23	SSE10.6	S30	
26-Dec	S18	SSE17	SSE14	SSE16	S16	SSE15	SSE18	SSE19	S23	S24	S29	S27	S27	S30	S28	S26	S29	S25	S26	S20	S19	S20	S19	SE12	S21.2	S30	
27-Dec	SSE14	S20	SSE18	SSE19	S21	S20	SSW20	S14	S12	S9	S12	SSW10	S9	SW8	WSW8	W8	WNW9	WNW10	NW11	WNW10	NW13	NW15	NW16	NW15	SSW6.7	S21	
28-Dec	NW16	NW15	NW14	NW16	NW14	NW16	NW14	WNW14	WNW14	WNW13	WNW13	WNW12	WNW13	WNW13	WNW13	WNW10	WNW10	WNW11	WNW12	WNW10	WNW10	WNW9	WNW9	WNW9	WNW12.3	NW16	
29-Dec	NW9	W5	W7	WNW6	WNW3	W3	NW2	NE1	NE2	SSE3	SE2	ESE4	ENE4	ENE8	E15	E13	NE11	ENE11	ENE16	ENE15	NE9	NE10	NE11	ENE11	ENE4.6	ENE16	
30-Dec	NNE6	NNW5	NNW4	N3	NW5	NW5	NW2	S3	SSE5	SE8	SE9	SE10	SE11	SE10	ESE8	E9	ENE7	NE5	N3	NW5	NW8	WNW8	NW7	W7	ENE1.3	SE11	
31-Dec	W11	WNW13	WNW13	WNW13	WNW15	NW12	WNW11	WNW12	WNW11	NW14	NW14	NW13	WNW12	WNW12	WNW9	W9	W11	W15	W19	W19	WNW22	NNW23	NNW18	NNW16	WNW13.0	NNW23	

WNW2.2	WNW1.7	NW1.5	NW1.9	NW1.5	NW1.3	NW1.0	WNW1.0	WNW1.3	WSW0.9	W1.5	W1.5	W2.2	W1.9	WNW1.6	WNW1.6	WNW1.9	WNW2.0	WNW2.3	W2.3	WNW2.8	NW2.5	NW2.4	NW2.6	Diurnal Average
S31	S30	NW29	NW27	NW26	ENE25	ENE28	ENE28	ENE29	ENE28	S29	ENE29	S27	S30	S28	SSE28	S29	SSE25	S26	NW25	NW28	S30	NW28	S30	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort Chipewyan - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 31 22:00	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6
Minimum Value: 0 km/h on Dec 9 06:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 7	

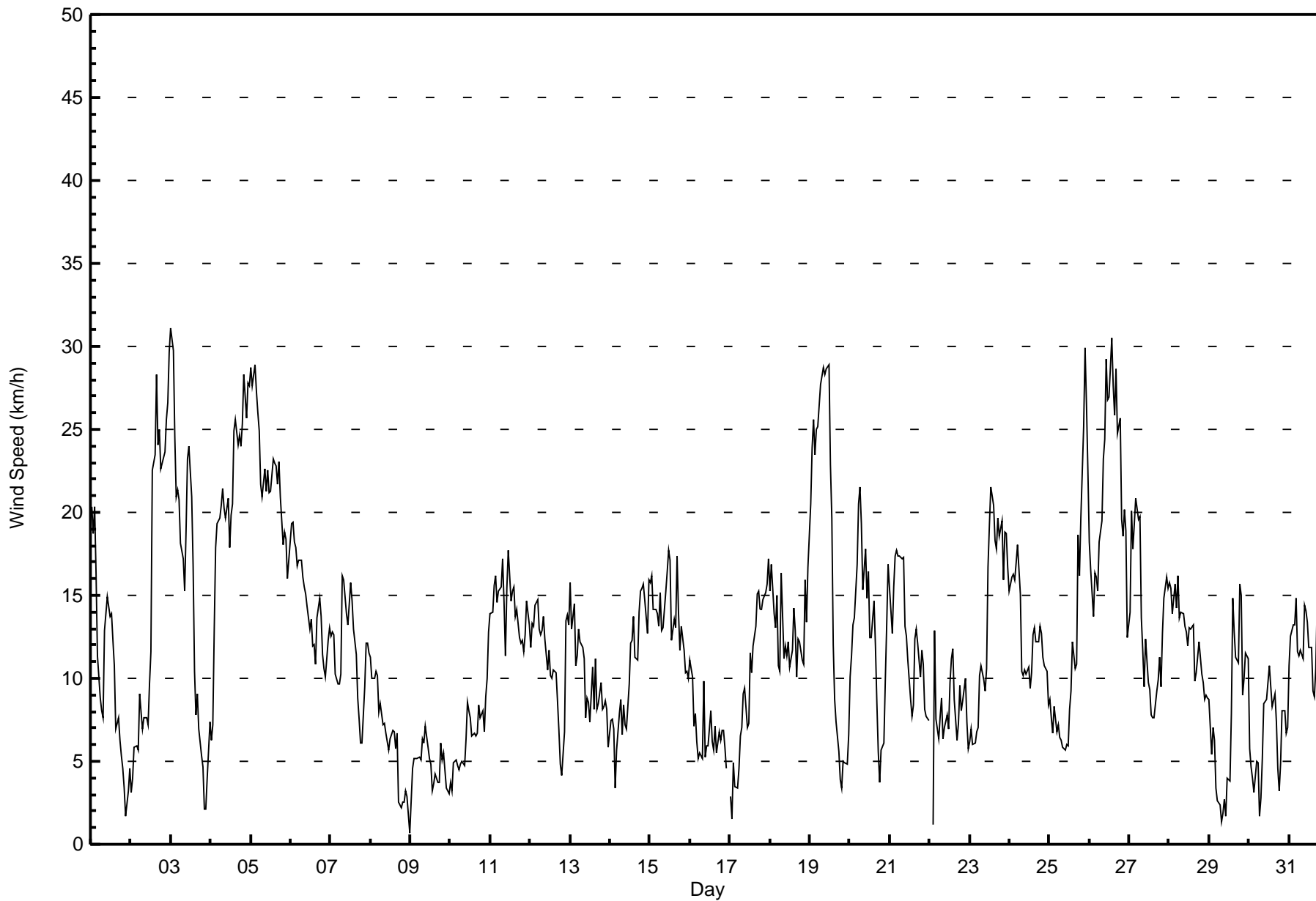
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	4	4	3	3	2	2	2	2	2	2	2	2	3	3	3	1	1	1	1	1	1	1	1	1	4
2-Dec	1	2	1	1	1	2	1	1	1	1	1	2	4	4	4	4	3	3	5	5	4	4	4	5	5
3-Dec	5	4	4	4	3	3	3	3	3	4	3	3	3	3	1	1	1	1	1	1	1	2	1	5	
4-Dec	1	2	5	5	6	6	6	5	5	5	5	4	5	6	7	7	7	7	7	7	7	7	6	7	
5-Dec	7	7	7	7	7	7	6	5	6	5	5	5	5	5	5	5	5	5	4	4	4	4	4	7	
6-Dec	4	5	5	5	4	5	4	4	4	4	4	3	4	3	3	3	3	4	4	3	3	3	3	5	
7-Dec	3	4	4	4	2	3	3	4	4	3	4	4	4	4	4	3	2	2	1	2	3	3	3	4	
8-Dec	3	3	3	2	2	2	2	2	2	2	2	2	1	2	2	1	1	3	1	1	1	1	1	3	
9-Dec	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	
10-Dec	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	2	1	2	2	2	3	
11-Dec	3	3	3	4	3	4	4	4	4	3	4	4	3	3	3	3	3	3	2	2	2	3	3	4	
12-Dec	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3	2	2	1	1	3	3	4	4	
13-Dec	5	4	5	3	3	4	3	3	3	2	3	3	3	3	2	2	2	2	2	2	1	2	1	5	
14-Dec	1	1	1	3	1	1	1	1	1	2	1	3	3	3	3	2	3	3	3	3	3	4	2	4	
15-Dec	4	4	4	3	3	2	3	2	3	3	3	4	4	3	4	4	5	3	2	2	2	2	2	5	
16-Dec	2	2	1	1	1	1	1	2	3	1	1	2	2	1	1	1	2	1	1	1	1	1	1	3	
17-Dec	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	
18-Dec	2	1	2	1	2	3	3	1	1	1	1	1	1	2	2	3	2	2	2	2	2	2	2	3	
19-Dec	3	2	3	3	3	3	4	3	4	4	4	4	5	4	3	3	3	2	1	1	1	1	1	5	
20-Dec	2	1	1	2	3	2	2	3	2	2	3	2	3	2	3	3	2	3	1	2	2	2	1	3	
21-Dec	2	1	2	1	1	1	2	2	3	1	1	1	1	1	2	1	2	1	1	1	2	2	1	3	
22-Dec	AF	AF	2	4	2	2	3	3	2	2	3	2	3	3	3	2	3	3	3	3	3	3	2	4	
23-Dec	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	3	
24-Dec	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	4	3	5	4	5	
26-Dec	3	3	3	3	2	3	4	4	3	4	4	5	4	5	6	5	4	3	4	3	2	3	3	6	
27-Dec	4	3	4	4	3	3	4	3	2	2	2	2	2	2	3	2	1	1	2	2	4	4	4	4	
28-Dec	4	4	4	4	4	4	3	4	4	3	3	3	3	3	4	3	2	2	3	2	2	1	1	4	
29-Dec	2	1	1	1	1	1	1	1	1	1	1	2	2	2	1	3	2	2	3	3	2	2	3	3	
30-Dec	2	1	1	1	2	2	1	1	1	3	2	1	1	2	1	2	1	1	1	2	2	2	2	3	
31-Dec	3	2	3	4	3	4	3	3	3	4	4	4	3	3	2	2	2	3	4	5	5	8	6	8	
	7	7	7	7	7	7	6	5	6	5	5	5	5	6	7	7	7	7	7	7	7	8	7	6	
	Diurnal Maximum																								

AF - Analyzer Failure



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Fort Chipewyan - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Fort Chipewyan - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	90	12.15	12.15
6 - 11	275	37.11	49.26
12 - 19	273	36.84	86.10
20 - 28	91	12.28	98.38
29 - 38	12	1.62	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
Fort Chipewyan - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	3	2	4	2	8	2	7	4	6	4	8	12	13	3	9	3	90
6 - 11	8	7	6	13	23	40	10	6	5	4	4	8	39	52	37	13	275
12 - 19	0	0	1	20	50	12	1	14	11	6	1	1	24	69	55	8	273
20 - 28	0	0	2	7	8	0	0	11	24	2	0	0	0	15	21	1	91
29 - 38	0	0	0	3	0	0	0	0	7	0	0	0	0	0	2	0	12
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	11	9	13	45	89	54	18	35	53	16	13	21	76	139	124	25	741

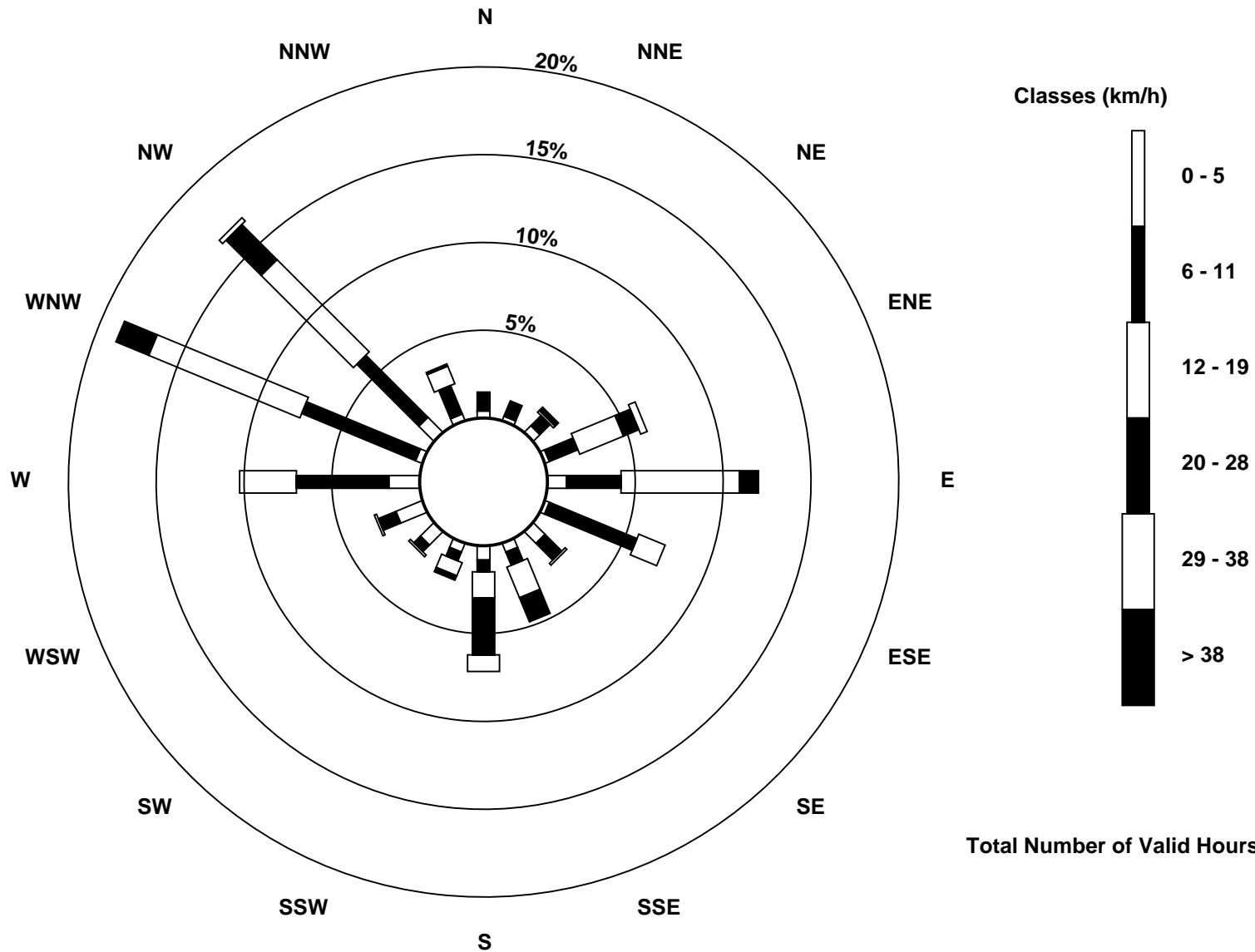
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 741



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort Chipewyan - December 2016

Direction of Maximum Speed: 169 deg on Dec 3 01:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 297.2 deg on Dec 5	Hours of Data: 741
Direction of Minimum Speed: 171 deg on Dec 9 00:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 1.3 deg on Dec 30	Percent Operational Time: 99.6
Monthly Average Direction: 290.5 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	188	189	192	198	175	154	157	187	195	198	201	212	232	250	268	258	258	265	266	264	310	317	304	275	211.0
2-Dec	273	191	134	126	108	98	105	94	93	105	102	128	149	157	156	158	157	149	162	167	156	149	160	170	149.6
3-Dec	169	176	171	166	170	172	167	169	164	172	177	180	179	171	152	101	107	113	130	155	178	173	246	304	168.5
4-Dec	317	335	330	331	330	326	321	318	312	310	312	311	314	320	322	321	321	316	315	316	316	315	313	313	318.1
5-Dec	313	311	311	308	308	301	296	295	294	289	285	284	287	291	294	297	292	289	289	287	292	301	300	303	297.2
6-Dec	304	301	299	304	305	309	307	303	305	310	307	304	305	304	301	293	300	302	303	304	316	321	311	315	305.3
7-Dec	312	321	319	311	303	302	303	310	311	308	310	314	313	315	320	317	312	316	309	305	308	311	313	308	311.7
8-Dec	319	316	317	313	311	308	305	298	292	289	310	303	269	266	267	268	286	301	268	240	233	217	225	171	294.3
9-Dec	93	85	85	84	97	94	99	98	102	104	114	138	178	155	197	201	208	203	212	226	220	250	256	255	142.6
10-Dec	253	237	231	236	242	253	272	270	275	274	283	286	275	265	254	261	251	244	259	265	263	270	265	272	262.9
11-Dec	268	267	265	267	266	265	265	266	267	271	281	288	283	280	278	277	272	273	278	282	283	292	293	303	275.9
12-Dec	301	294	300	283	288	292	285	285	282	281	285	288	288	280	287	302	319	318	309	284	280	306	318	320	294.4
13-Dec	323	338	341	332	310	316	320	316	318	318	327	326	321	309	300	304	294	302	310	298	293	290	292	296	314.4
14-Dec	288	281	277	271	239	230	215	203	218	204	239	271	287	288	288	282	276	286	287	288	287	289	282	303	274.0
15-Dec	304	310	304	298	289	281	287	284	279	278	281	281	283	289	300	294	308	298	290	287	285	281	287	283	290.5
16-Dec	289	294	297	284	291	258	260	255	292	271	279	281	281	269	268	268	254	268	272	284	280	283	280	AF	278.4
17-Dec	217	145	67	89	146	128	109	103	104	109	102	108	112	104	101	105	100	100	100	102	100	102	97	100	103.6
18-Dec	97	95	95	100	99	107	100	107	123	123	120	95	74	71	77	68	67	72	70	79	79	83	78	79	89.9
19-Dec	81	88	83	79	79	72	73	72	64	63	61	61	55	52	37	15	11	1	345	32	53	108	129	126	67.1
20-Dec	120	119	102	89	81	80	74	78	72	77	67	76	72	85	85	77	62	48	16	39	85	81	81	79	79.6
21-Dec	92	92	93	91	95	93	88	87	89	89	95	92	89	85	88	90	93	91	90	92	94	87	83	82	90.4
22-Dec	AF	AF	349	346	344	343	333	329	321	329	339	318	321	320	322	329	2	12	21	17	348	337	346	352	340.5
23-Dec	349	2	14	5	10	20	59	62	66	63	71	83	82	84	79	74	76	77	78	79	76	75	79	79	69.4
24-Dec	81	88	89	92	94	99	109	114	107	110	100	113	107	90	92	92	102	103	107	111	111	107	99	105	99.9
25-Dec	100	105	104	103	113	110	113	112	108	110	106	141	177	163	163	155	149	179	170	180	176	174	175	177	156.0
26-Dec	171	168	160	163	172	166	159	168	172	171	176	178	174	176	179	185	189	186	185	188	181	180	176	137	175.2
27-Dec	150	171	165	162	173	186	194	185	182	183	191	198	191	223	248	259	297	303	312	301	311	324	316	317	212.1
28-Dec	312	321	313	311	308	316	306	303	297	289	301	301	295	296	300	300	289	289	296	286	289	287	282	299	300.8
29-Dec	308	281	277	291	296	279	308	37	54	162	127	107	70	68	100	84	53	72	78	77	54	38	54	59	59.8
30-Dec	30	338	344	355	325	325	325	180	150	128	143	137	131	124	103	79	71	46	357	318	318	297	311	271	65.5
31-Dec	274	287	286	289	297	310	301	285	286	316	311	306	290	286	286	260	261	266	273	279	290	330	343	336	295.7

292.7 285.1 309.6 314.4 306.7 316.9 314.4 302.5 284.9 257.4 271.4 266.5 269.2 271.9 288.6 299.6 298.5 288.0 285.9 277.7 287.3 308.3 308.3 321.5
 Diurnal Average

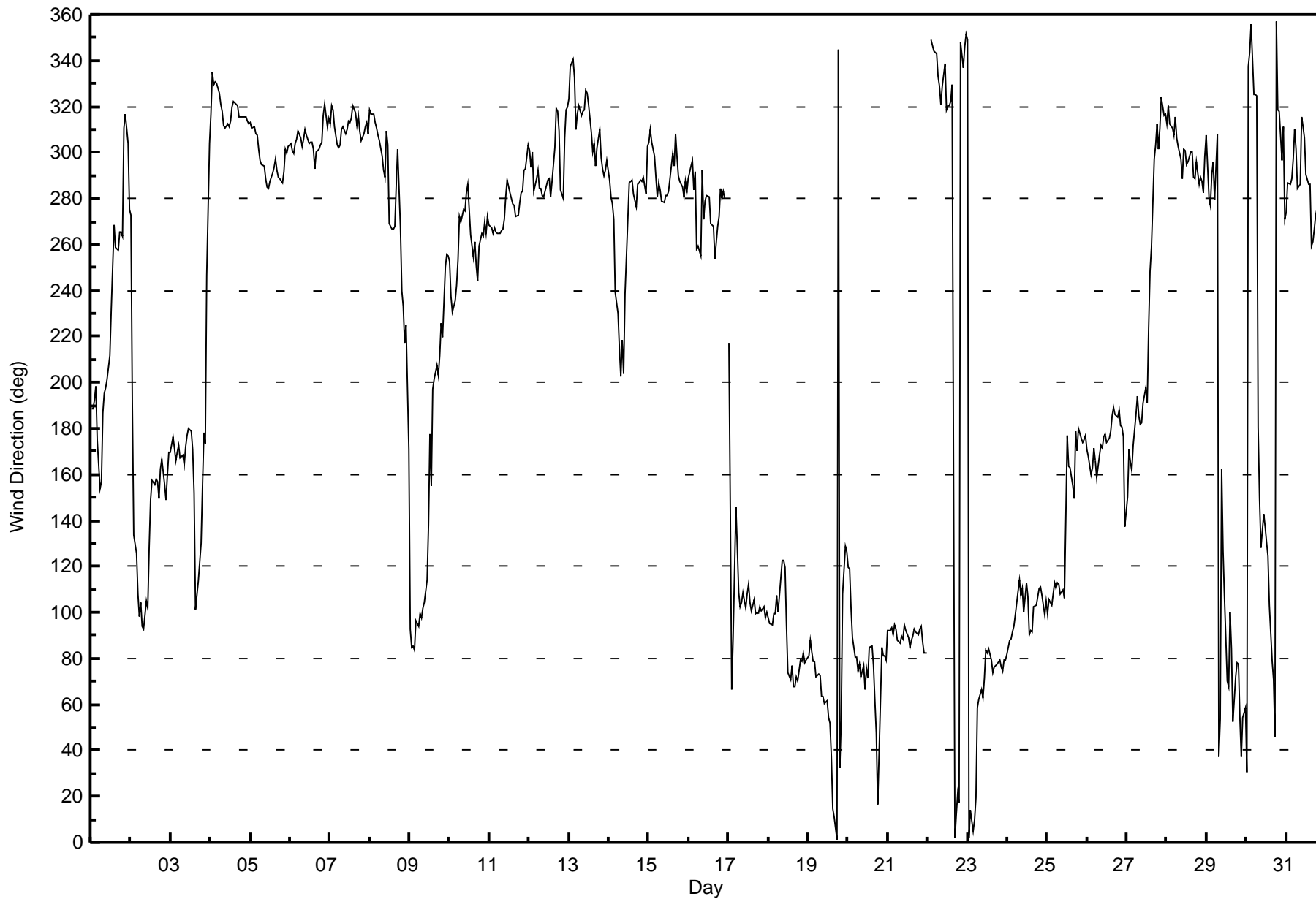
AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Fort Chipewyan - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 92 deg on Dec 22 03:00 Minimum Value: 4 deg on Dec 16 20:00 Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 9 Median = 14 Q ₃ = 16 P ₉₀ = 22 P ₉₉ = 65																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6																								
Day	Hourly Period Ending At (MST)																								Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																	
1-Dec	10	10	10	10	11	15	25	12	8	7	7	7	14	15	16	18	19	13	9	17	34	71	30	18	71																
2-Dec	23	29	20	12	17	7	10	10	12	11	9	13	11	9	9	9	9	9	14	12	10	7	13	10	29																
3-Dec	9	8	9	10	9	8	10	8	10	9	7	7	9	10	29	12	12	10	11	22	19	40	23	16	40																
4-Dec	15	23	23	20	19	18	17	15	15	15	14	15	14	18	17	18	18	17	17	16	16	16	15	15	23																
5-Dec	15	14	15	15	15	15	15	15	14	15	14	13	14	14	14	14	15	13	13	14	14	15	15	15	15																
6-Dec	15	14	14	15	16	16	16	16	16	15	15	16	15	16	15	14	15	15	16	14	17	18	14	15	18																
7-Dec	16	21	21	20	16	17	15	12	14	14	15	16	17	18	20	18	16	17	12	16	13	12	13	14	21																
8-Dec	18	16	18	12	12	15	15	18	14	16	20	23	15	15	13	10	9	27	20	32	16	13	41	67	67																
9-Dec	21	11	8	8	8	7	9	7	7	6	8	21	22	29	12	8	16	22	8	11	8	25	19	15	29																
10-Dec	11	15	11	10	9	11	12	11	15	16	17	15	17	16	15	14	13	11	13	11	13	14	14	14	17																
11-Dec	13	14	14	14	14	15	14	14	15	15	14	14	14	13	13	13	14	12	11	13	13	14	14	15	15																
12-Dec	14	13	15	13	14	15	12	12	12	13	14	14	14	13	13	15	17	20	17	16	17	17	19	20	20																
13-Dec	20	22	22	22	15	17	16	15	15	14	20	23	25	15	16	12	11	16	15	18	10	8	10	15	25																
14-Dec	10	10	15	66	12	7	11	15	10	19	18	17	14	14	14	12	14	13	13	13	13	13	12	17	66																
15-Dec	16	16	16	14	14	12	12	12	13	12	13	13	14	18	16	15	14	15	15	12	12	12	12	13	18																
16-Dec	12	13	13	9	15	8	10	18	9	14	15	12	17	13	13	10	16	7	7	4	6	10	21	AF	21																
17-Dec	19	60	11	10	32	30	7	5	4	7	11	8	5	6	5	6	7	5	5	6	6	6	8	5	60																
18-Dec	6	6	9	6	8	16	14	4	7	5	9	7	9	8	7	8	9	8	7	7	8	5	6	6	16																
19-Dec	6	6	5	6	7	7	7	7	8	9	8	9	10	10	16	19	23	22	27	19	18	18	25	17	27																
20-Dec	20	13	5	8	6	6	7	6	11	7	9	7	14	11	10	13	16	41	38	24	11	13	4	5	41																
21-Dec	12	11	7	5	5	4	5	5	4	6	6	7	6	9	8	5	4	4	6	6	5	14	9	8	14																
22-Dec	AF	AF	92	20	20	25	27	21	23	25	22	17	18	18	27	27	26	19	22	25	21	28	35	92	92																
23-Dec	26	23	23	21	19	18	8	8	8	10	10	5	5	5	6	5	5	5	5	6	6	6	4	6	26																
24-Dec	7	7	6	7	7	7	7	6	5	6	9	8	8	5	5	6	7	4	7	7	7	7	6	9	9																
25-Dec	8	5	7	8	14	9	10	9	15	17	21	17	11	16	10	16	18	8	10	7	7	7	7	9	21																
26-Dec	10	10	13	13	9	12	12	10	9	8	9	8	9	9	8	8	7	7	7	7	8	8	10	25	25																
27-Dec	23	10	14	13	10	9	8	11	10	19	9	9	11	17	20	20	10	9	14	17	18	22	17	15	23																
28-Dec	15	17	14	15	16	17	16	16	16	15	16	18	16	16	15	16	13	12	13	12	12	12	13	10	18																
29-Dec	13	17	11	14	24	40	55	72	68	45	55	38	20	22	12	20	7	9	11	16	16	12	17	12	72																
30-Dec	29	28	34	39	25	23	75	27	16	11	20	10	12	10	16	8	12	14	33	22	19	17	20	20	75																
31-Dec	16	14	13	15	15	19	17	16	19	18	18	19	17	17	15	16	13	14	14	15	14	24	23	23	24																
																	29	60	92	66	32	40	75	72	68	45	55	38	25	29	29	27	27	41	38	32	34	71	41	67	
Diurnal Maximum																																									
AF - Analyzer Failure																																									





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	11:12	End Time (MST)	15:20
Gas Cert Reference	LL79696	Station temp.	22 Deg C
Cal Gas Concentration	2.35 ppm	Cal Gas Exp Date	2/13/18
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG Make/Model	Teledyne API T701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-827	-827
Analyzer IP address	192.168.1.43		Lamp voltage	1001	1006
Calculated slope	1.009479	1.005756	Chamber temp	45.0	45.0
Calculated intercept	-0.145717	-0.122848	Pressure	712.2	716.0
Analyzer Background	1.22	1.21	Flow	0.438	0.433
Analyzer Coefficient	1.093	1.093	Intensity	91	91

Analyzer make Thermo 43i-TLE Analyzer serial # 1136451241

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.2	----
as found span	6000	44.8	17.5	17.6	0.998
calibrator zero	6000	0.0	0.0	0.2	----
high point	6000	44.8	17.5	17.6	0.998
second point	6000	29.9	11.7	11.8	0.996
third point	6000	15.0	5.9	5.9	0.994
as left zero	6000	0.0	0.0	0.2	----
as left span	6000	44.8	17.5	17.3	1.016
Average Correction Factor					0.996

Corrected As found 17.4 Previous response 17.5 % change 0.6%

Notes:

As found span completed without purging the calibration line showed low response. Purged the line and completed as founds span again. Response was on target. No adjustments made.

Calibration Performed By: Devin Russell



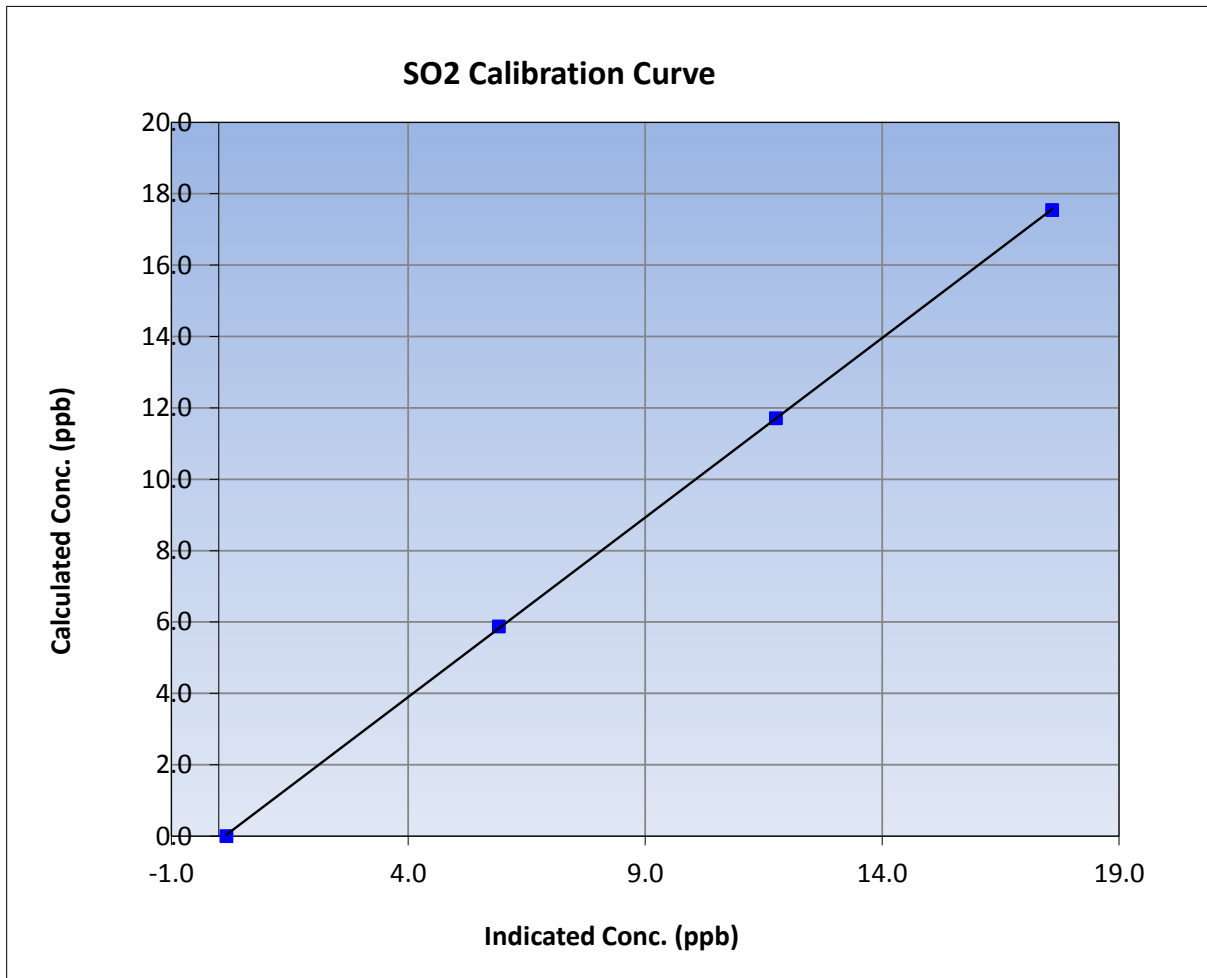
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	11:12	End Time (MST)	15:20
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1136451241

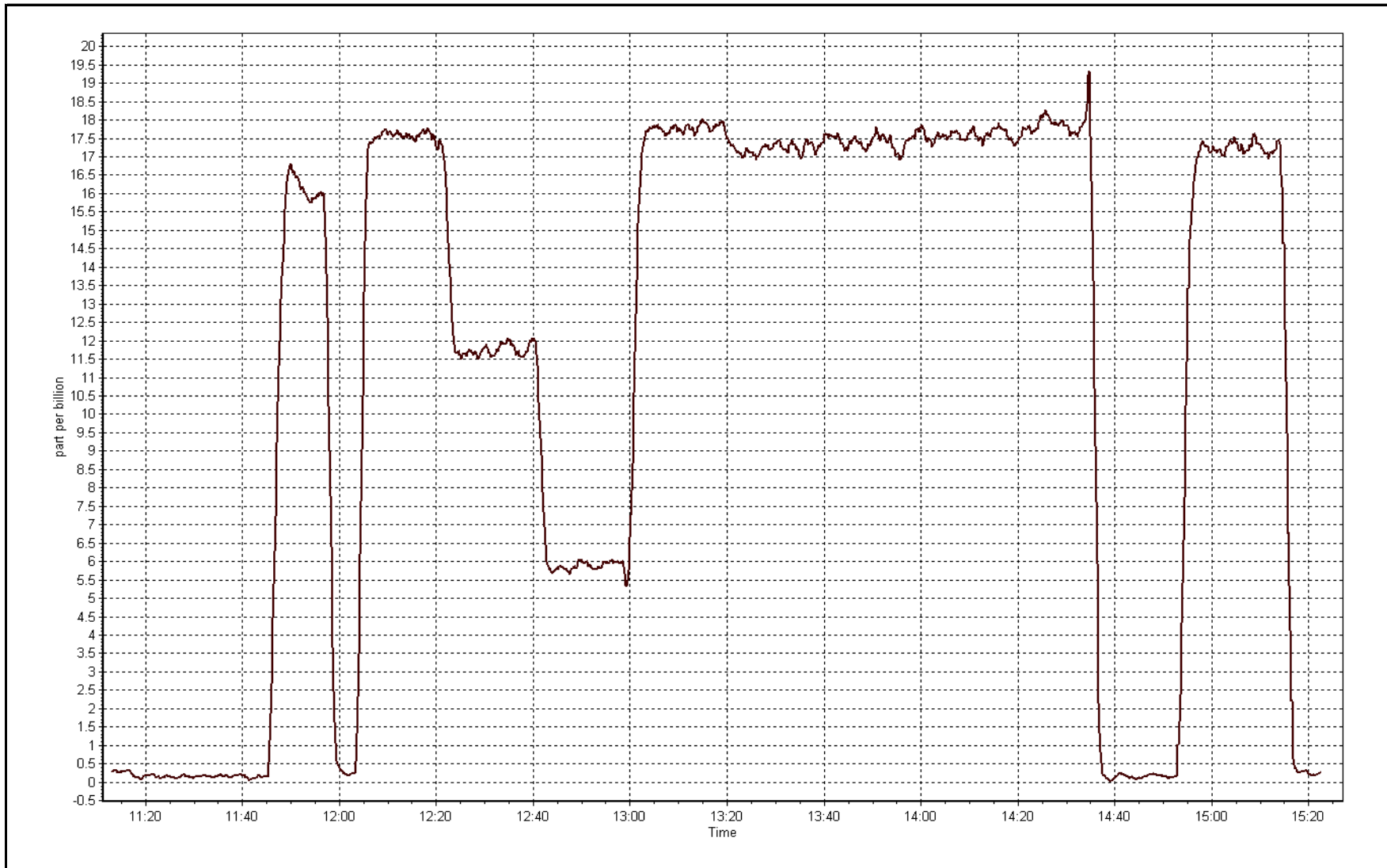
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999972
17.5	17.6	0.9975		
11.7	11.8	0.9958	Slope	1.005756
5.9	5.9	0.9941		
			Intercept	-0.122848



SO2 Calibration Plot

Date: December 1, 2016





Wood Buffalo Environmental Association O₃ Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 3, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Removal		
Start Time (MST)	15:20	End Time (MST)	17:30
NO2 GPT Ref date	December-01-16	Transfer Standard	NA
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.7	NA
Analyzer IP address	192.168.1.49		Lamp temp.	53.5	NA
Calculated slope	0.995249	0.998170	Pressure	651.7	NA
Calculated intercept	-0.218724	-0.699561	Flow cell A	0.708	NA
Analyzer Background	-2.2	NA	Flow cell B	0.711	NA
Analyzer Coefficient	1.037	NA	O3 Measure	102145	NA
			O3 Reference	99350	NA

Analyzer make	Thermo 49i	Analyzer serial #	1300156233
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero	6000	0.00	0.0	0.4	----
As found span	6000	830.30	102.9	103.3	0.996
calibrator zero	6000	0.00	0.0	0.4	----
high point	6000	830.30	102.9	103.3	0.996
second point	6000	799.20	82.9	84.0	0.987
third point	6000	733.10	52.4	53.7	0.976
as left zero					
as left span					
Average Correction Factor					0.986

Corrected As found	102.9	Previous response	103.6	% change	0.7%
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Notes:

Removal calibration. Installing original O3 T400 analyzer.

Calibration Performed By: Devin Russell



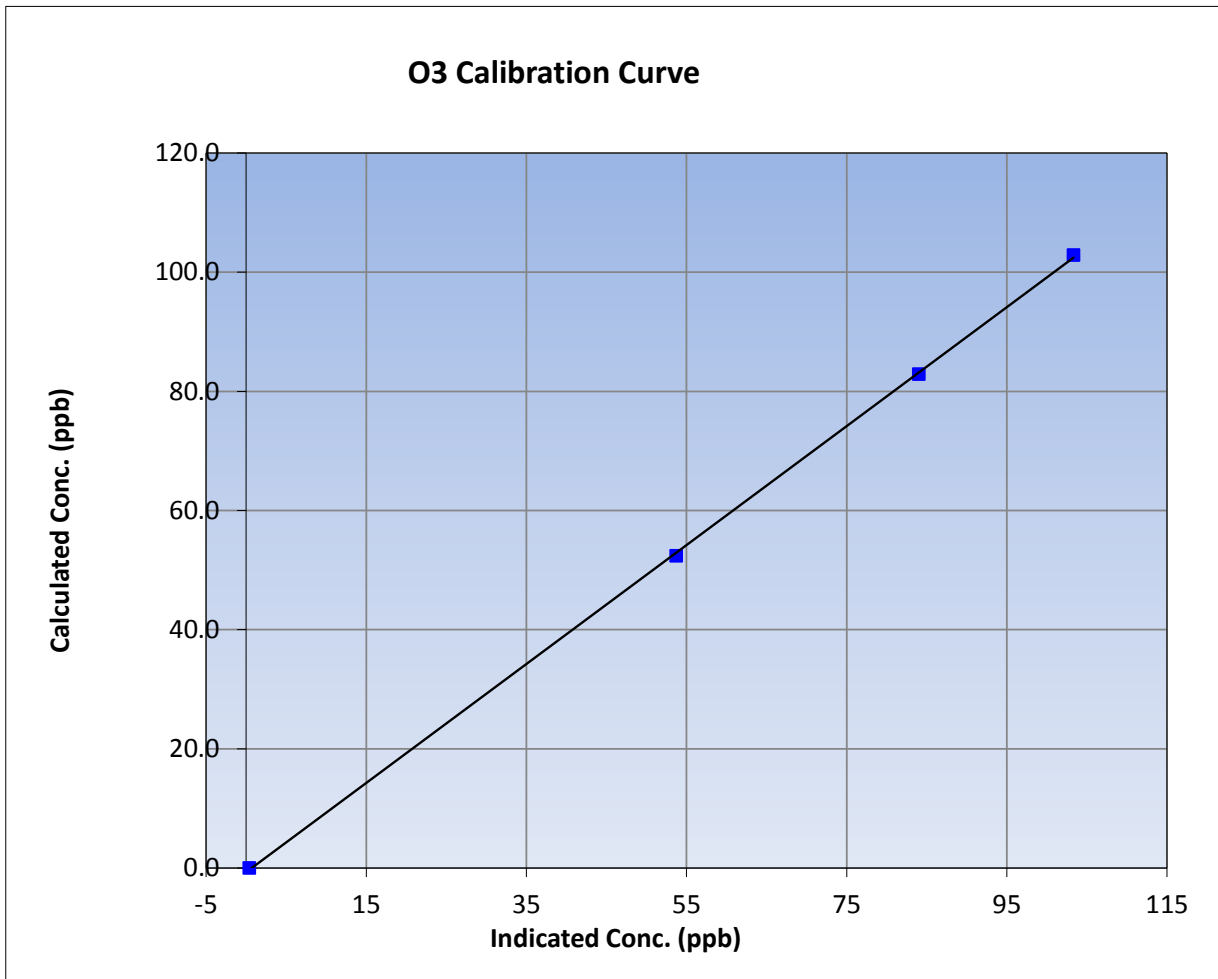
Wood Buffalo Environmental Association O3 Calibration Report

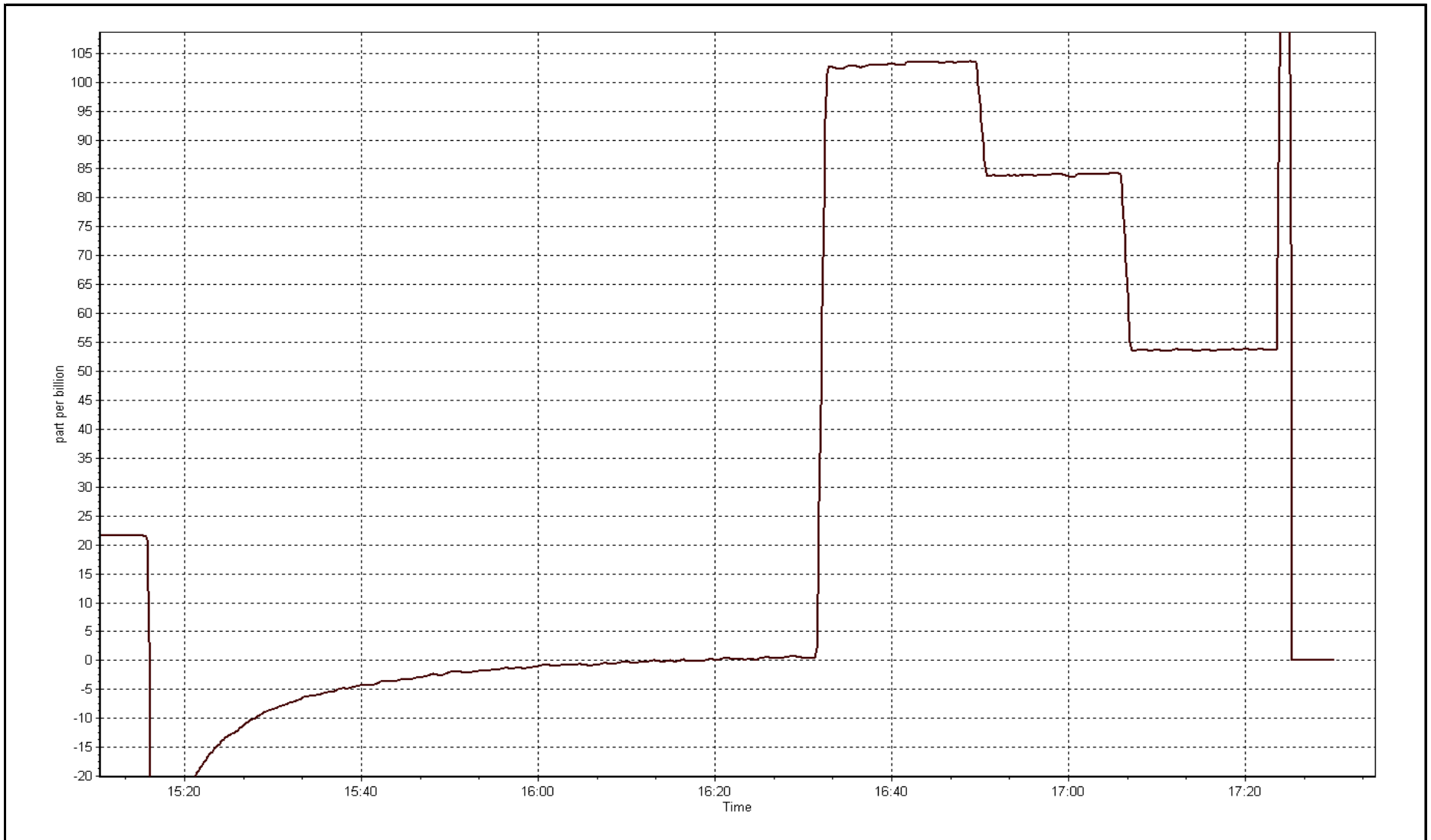
Station Information

Calibration Date	December-01-16	Previous Calibration	November-03-16
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	15:20	End Time (MST)	17:30
Analyzer make	Thermo 49i	Analyzer serial #	1300156233

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999897
102.9	103.3	0.9959		
82.9	84.0	0.9868	Slope	0.998170
52.4	53.7	0.9758		
			Intercept	-0.699561







Wood Buffalo Environmental Association O₃ Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	NA
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Install		
Start Time (MST)	17:45	End Time (MST)	20:20
NO2 GPT Ref date	December-01-16	Transfer Standard	NA
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	NA	36.6
Analyzer IP address	192.168.1.79		Lamp temp.	NA	58.0
Calculated slope	NA	0.997382	Pressure	NA	27.4
Calculated intercept	NA	-0.228114	Flow cell A	NA	770.000
Analyzer Background	NA	-0.4	Flow cell B	NA	766.000
Analyzer Coefficient	NA	1.049	O3 Measure	NA	4246.9
			O3 Reference	NA	4246.8
Analyzer make	API T400		Analyzer serial #	1020	

Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero					
As found span					
calibrator zero	6000	0.00	0.0	0.2	----
high point	6000	830.30	102.9	103.3	0.996
second point	6000	799.20	82.9	83.6	0.992
third point	6000	733.10	52.4	52.7	0.995
as left zero	6000	0.00	0.0	0.1	----
as left span	6000	830.30	102.9	103.9	0.991
Average Correction Factor					0.994

Corrected As found NA Previous response NA % change NA

Notes:

Installation calibraton.

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association O3 Calibration Report

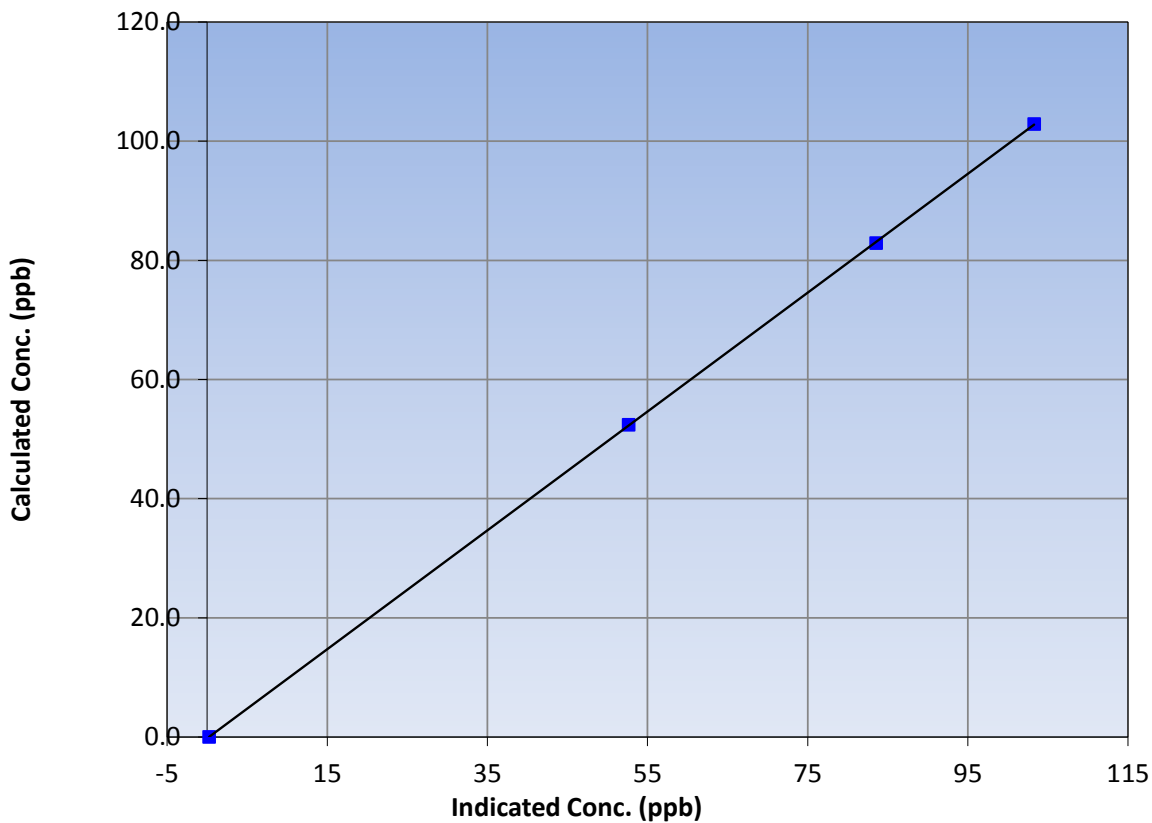
Station Information

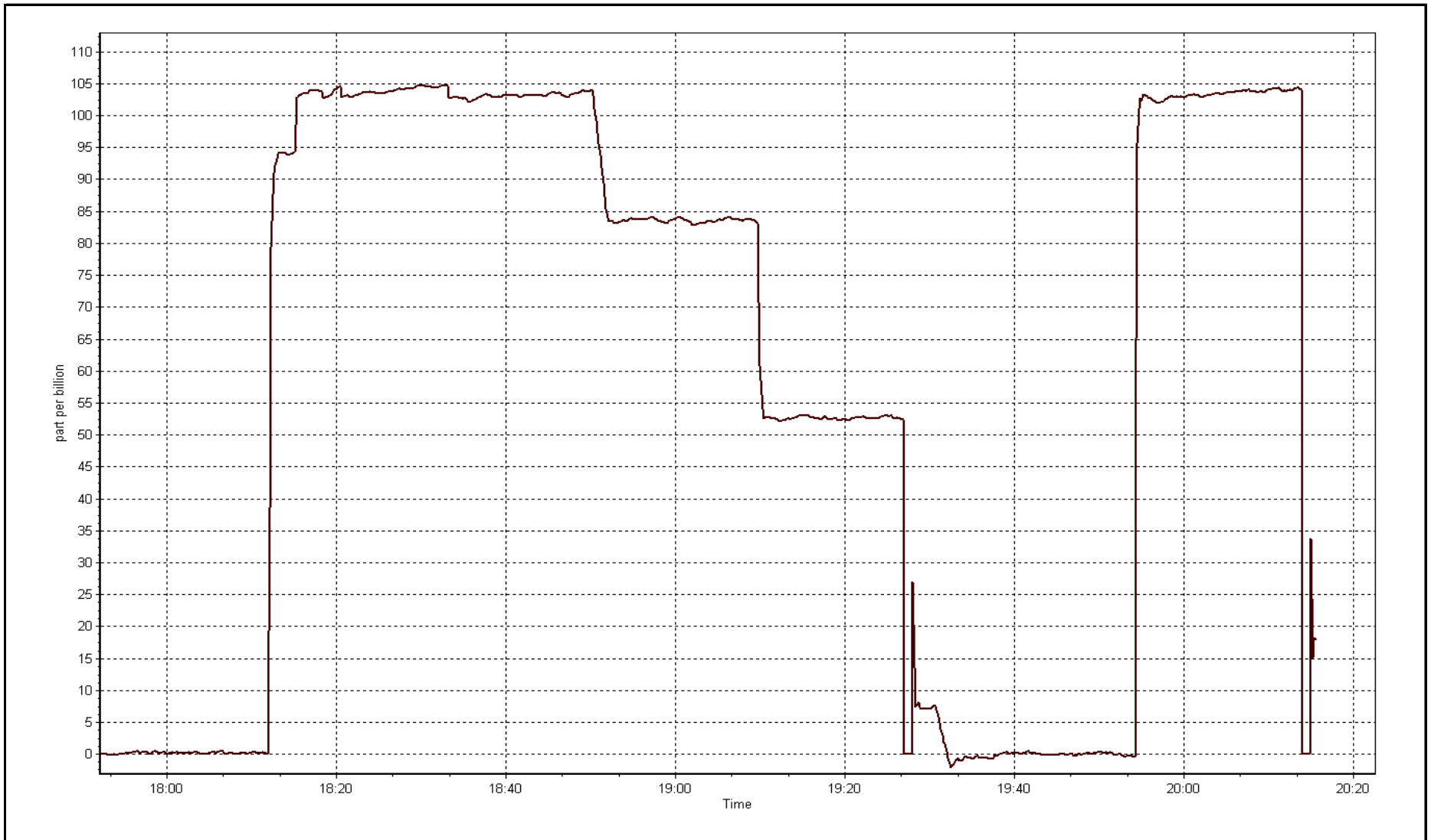
Calibration Date	December-01-16	Previous Calibration	NA
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	17:45	End Time (MST)	20:20
Analyzer make	API T400	Analyzer serial #	1020

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999988
102.9	103.3	0.9963		
82.9	83.6	0.9921	Slope	0.997382
52.4	52.7	0.9951		
			Intercept	-0.228114

O3 Calibration Curve







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	11:12	End Time (MST)	15:20
NO Cal Gas Conc	20.1 ppm	Gas Cert Reference	LL79696
NOx Cal Gas Conc	20.1 ppm	Cal Gas Expiry Date	2/13/18
Calibrator	Teledyne API T700	Serial Number	747
Zero air Generator	Teledyne API 701	Serial Number	4698

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11039
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Calibration Statistics

Parameter	NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997620	0.997797
	Data Offset	0.504265	0.570834
Current Calibration	Data Slope	0.996215	0.993494
	Data Offset	0.452457	0.629076

Analyzer Information

Analyzer make/model	Teledyne API T200u	Analyzer serial #	172
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Test Point	before		after	
		ppb		ppb
Concentration range	0-200		0-200	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.272		1.272	
NOx coefficient	1.285		1.285	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.1		0.1	
NOx bkgrnd	0.2		0.2	
Chamber Temp	40	Deg C	40	Deg C
Moly Temp	314.1	Deg C	31702	Deg C
PMT voltage	502	V	502	V
PMT Temp	5.1	Deg C	5.1	Deg C
O3 flow	88	ccm	88	ccm
R Cell press NO	3.8	"Hg	3.9	"Hg
R Cell Press Nox	3.8	"Hg	3.9	"Hg
NO sample flow	1107	cc/min	1114	cc/min
Nox sample Flow	1083	cc/min	1091	cc/min

Notes:

No adjustments made. No maintenance completed. As finds span point completed twice. Once without purging the calibration lines and once after the calibration lines were purged.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 1, 2016 Station Number: AMS 8

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as found span	6000	44.8	150.1	150.1	0.0	150.5	151.0	-0.5	0.9973	0.9942
calibrator zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	6000	44.8	150.1	150.1	0.0	150.5	151.0	-0.5	0.9973	0.9942
second point	6000	29.9	100.2	100.2	0.0	99.9	99.7	0.2	1.0026	1.0047
third point	6000	15.0	50.3	50.3	0.0	49.5	49.3	0.2	1.0154	1.0184
as left zero	6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as left span	6000	44.8	150.1	47.0	103.1	150.2	47.3	103.0	0.9989	0.9953
Average Correction Factor									1.0051	1.0058

Corrected As found NO_x= 150.5 NO= 151.0 Percent Change NO_x= -0.4% NO= -0.8%
 Previous Response NO_x= 149.9 NO= 149.8

GPT Calibration Data

Dilution Flow (total) 6000 ccm Source Gas Flow 44.80 ccm NOx ref calc conc = 150.1 ppb NO ref calc conc = 150.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	149.8	149.9	0.0	1.0016	1.0010	----	----
1st NO2 (100)	47.0	102.9	150.0	47.0	103.0	1.0005	----	0.9993	100.1%
2nd NO2 (80)	67.0	82.9	149.9	67.0	82.9	1.0012	----	1.0004	100.0%
3rd NO2 (50)	97.5	52.4	149.9	97.5	52.4	1.0011	----	1.0002	100.0%
2nd NO ref point	----	0.0	149.6	149.7	-0.2	1.0035	1.0025	----	----
Average Correction Factor						1.0016		1.0000	100.0%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

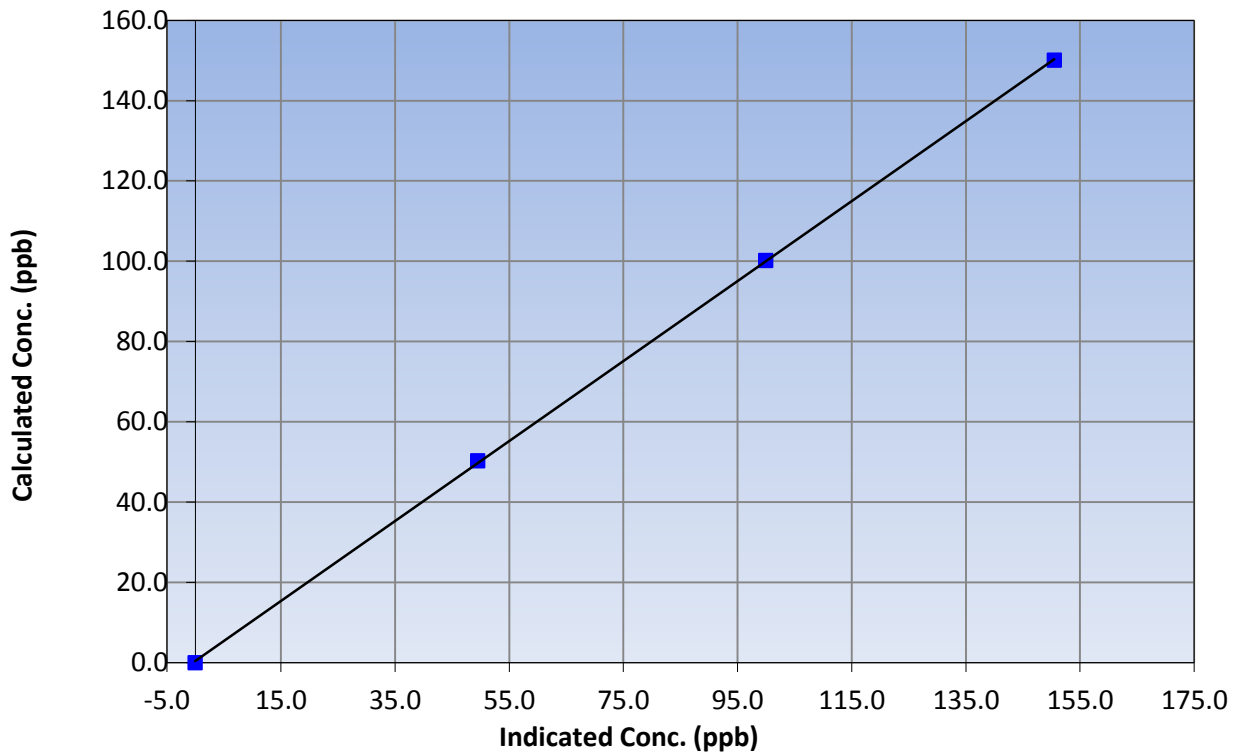
Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	11:12	End Time (MST)	15:20
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999959
150.1	150.5	0.9973		
100.2	99.9	1.0026	Slope	0.996215
50.3	49.5	1.0154		
			Intercept	0.452457

NO_x Calibration Curve





Wood Buffalo Environmental Association

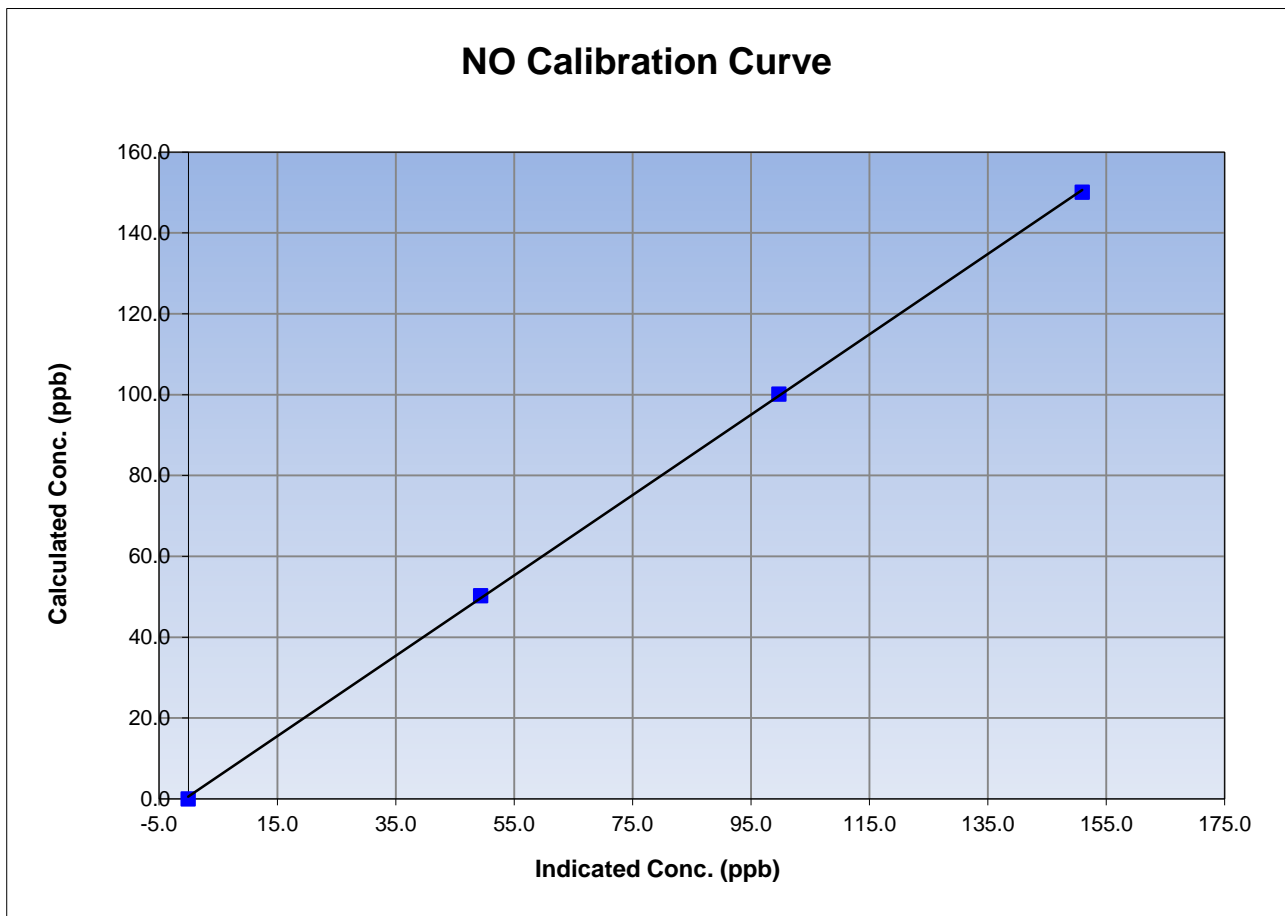
NO Calibration Summary

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	11:12	End Time (MST)	15:20
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999905
150.1	151.0	0.9942		
100.2	99.7	1.0047	Slope	0.993494
50.3	49.3	1.0184		
			Intercept	0.629076





Wood Buffalo Environmental Association

NO₂ Calibration Summary

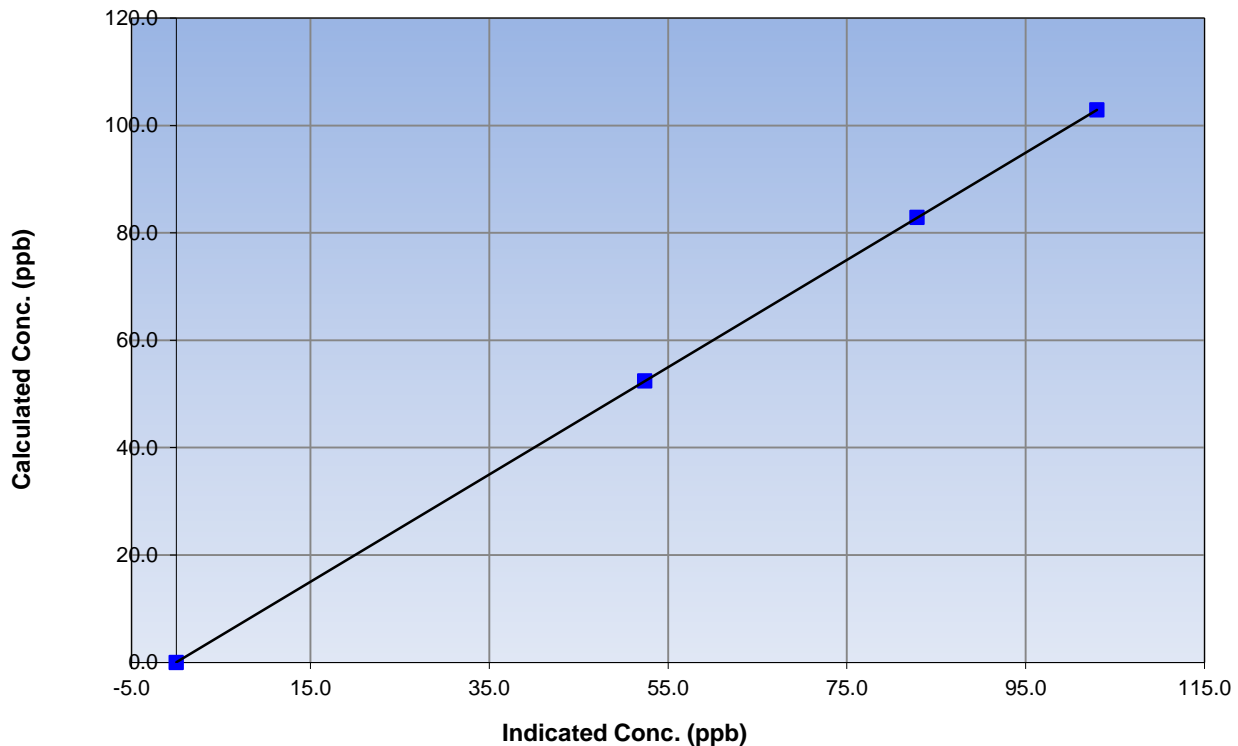
Station Information

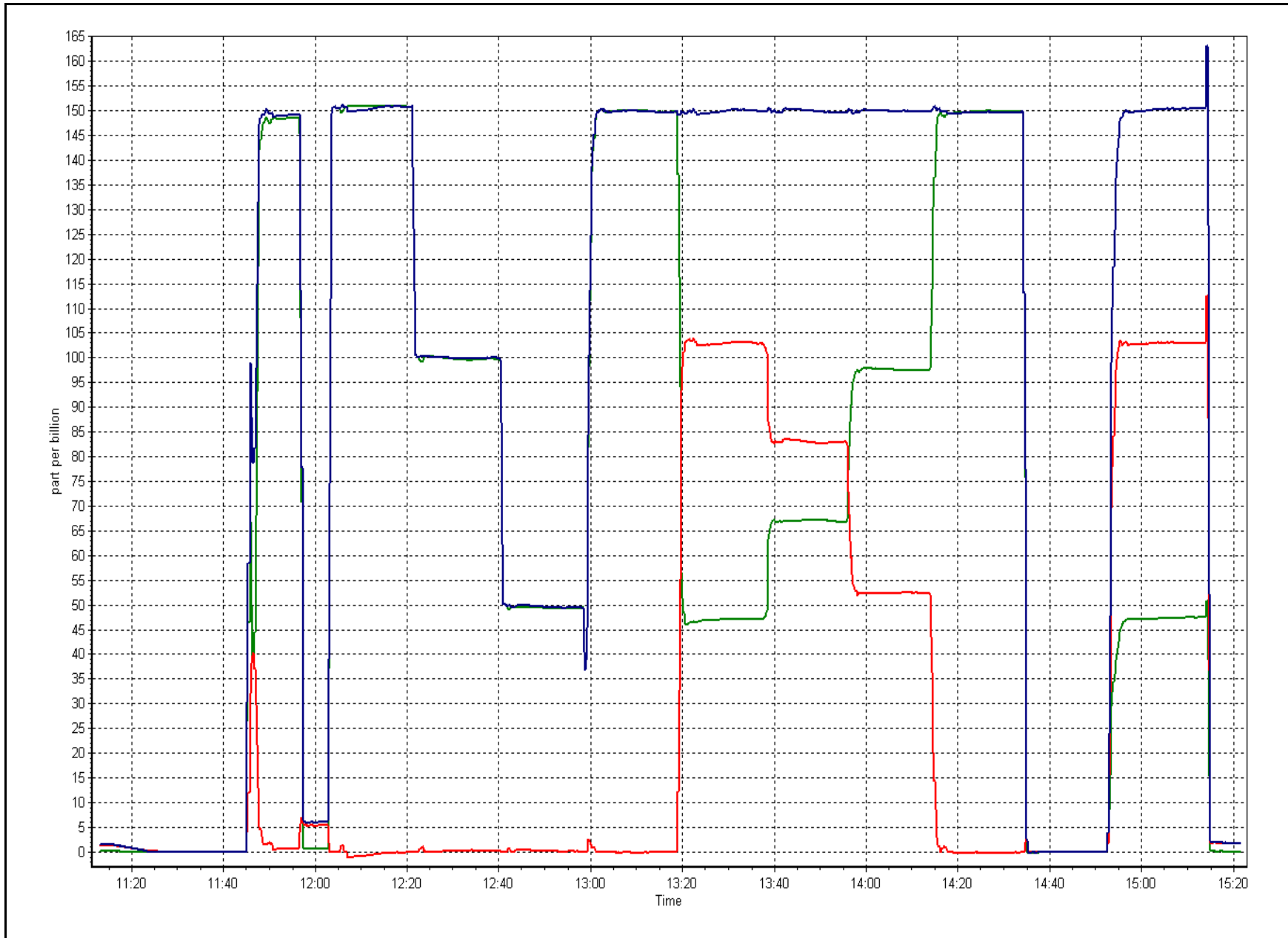
Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Number	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	11:12	End Time (MST)	15:20
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999999
102.9	103.0	0.9993		
82.9	82.9	1.0004	Slope	0.999600
52.4	52.4	1.0002		
			Intercept	0.016328

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Fort Chipewyan	Station number:	AMS 8
Calibration Date:	December 1, 2016	Last Cal Date:	November 2, 2016
Start time (MST):	11:50	End time (MST):	13:10
Sharp Model:	Thermo 5030	S/N:	E-2025
Particulate Fraction:	PM2.5	C14 Source S/N:	7414
Flow Standard Model:	Delta Cal	S/N:	1451
Temp/RH standard:	Delta Cal	S/N:	1451

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-4	-2.8	-4	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	981	983.6	981	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1008.6	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.2	----	0.2	<input type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning:	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date: <u>September 1, 2016</u>	<u>Tolerance</u>
	Flow w/o adaptor: _____	Flow w/ adaptor: _____	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: _____	S/N: _____
	Date of check: _____	Last Cal Date: _____
	New Correction Factor: _____	Previous Correction Factor: _____

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)				<input type="checkbox"/>	+/- 2 °C
T3 (°C)				<input type="checkbox"/>	+/- 2 °C
T4 (°C)				<input type="checkbox"/>	+/- 2 °C
RH (%)				<input type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned. No adjustments needed to flow, temperature, pressure or nephelometer.

Calibration by: Devin Russell



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 9 BARGE LANDING DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
TRS(ppb) Average	710	34	34	100.00	2	0	1	0
THC(ppm) Average	710	34	34	100.00	4.7	-	3.1	-
Temperature (C) Average	744	0	0	100.00	0.1	-	-1.5	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	91	-
Wind Speed 10 m (km/h) Average	738	0	6	99.19	18	-	8	-
Wind Direction 10 m (deg) Average	738	0	6	99.19	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
TRS(ppb) Average	710	0.5	0	-	0	0	0	0	1	1	2
THC(ppm) Average	710	2.52	0.3	-	2.1	2.2	2.3	2.5	2.7	2.9	4.7
Temperature (C) Average	744	-17.93	9	-	-36.6	-29.6	-24.5	-18.5	-12.7	-4	0.1
Relative Humidity (%) Average	744	80.4	6	-	66	73	76	80	84	88	96
Wind Speed 10 m (km/h) Average	738	4.4	3	-	0	1	2	4	6	8	18
Wind Direction 10 m (deg) Average	738	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	08 Dec 2016 16:00	08 Dec 2016 18:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	24 Dec 2016 04:00	24 Dec 2016 05:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	24 Dec 2016 09:00	24 Dec 2016 09:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

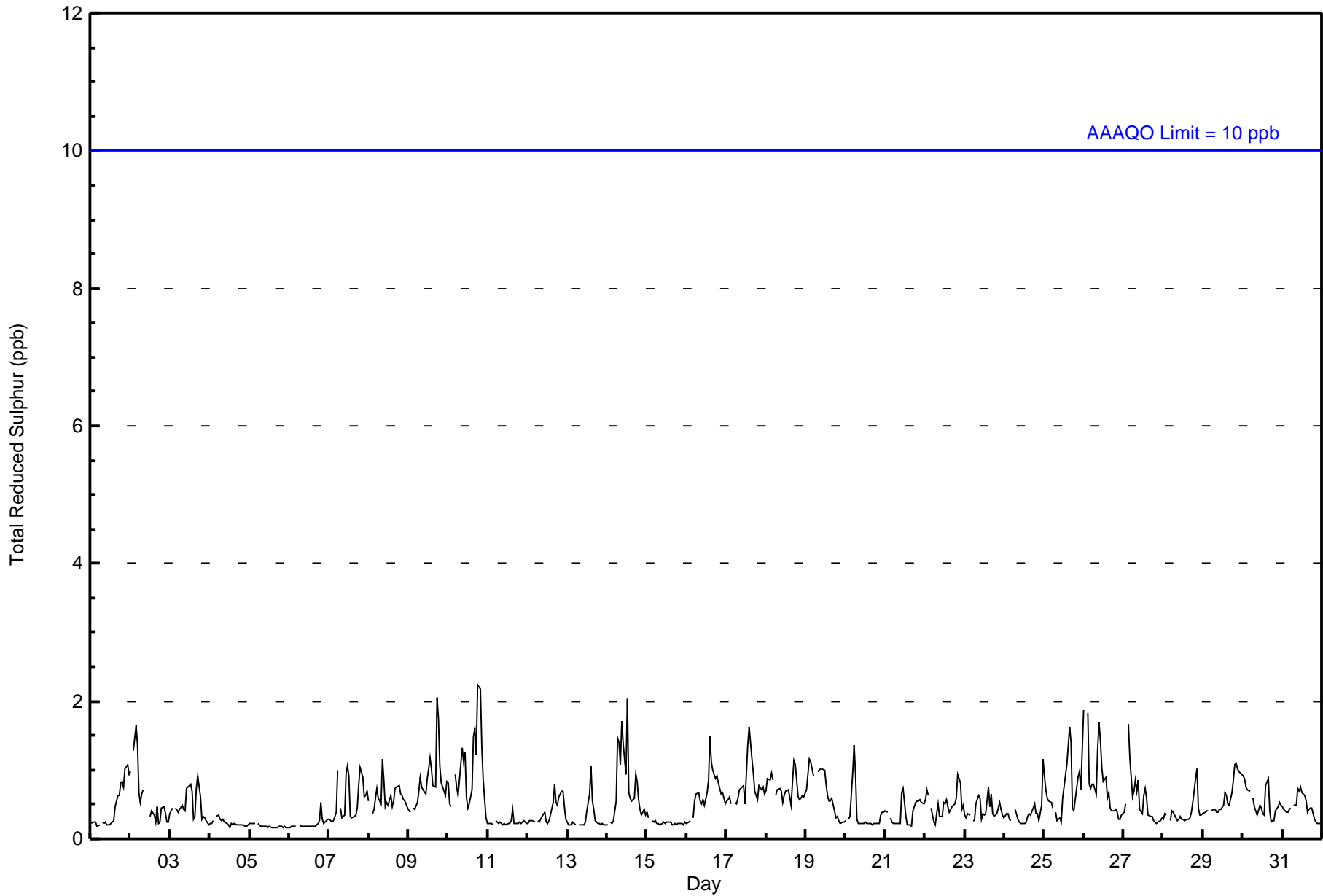
Barge Landing - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 2 ppb on Dec 10 19:00										Maximum Daily Average: 1.0 ppb on Dec 10										Hours of Data: 710																													
Minimum Value: 0 ppb on Dec 6 00:00										Minimum Daily Average: 0.2 ppb on Dec 5										Hours of Missing Data: 34																													
Maximum Diurnal Average: 0.6 ppb at hour 19										Minimum Diurnal Average: 0.4 ppb at hour 2										Hours of Calibration: 34																													
Monthly Average: 0.5 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 2										Percent Operational Time: 100.0																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.4	1																							
2-Dec	1	Z	1	2	1	1	1	1	1	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2																							
3-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0.5	1																							
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1																							
7-Dec	0	0	0	0	0	1	Z	0	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0.6	1																							
8-Dec	1	Z	0	0	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0.6	1																							
9-Dec	0	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	0.8	2																							
10-Dec	1	1	0	Z	1	1	1	1	1	1	1	1	0	1	1	1	2	1	2	2	1	1	1	0	1.0	2																							
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0.4	1																							
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.3	1																							
14-Dec	0	Z	0	0	0	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	0	0	0	0.8	2																							
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
16-Dec	0	0	0	Z	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																							
17-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	0.8	2																							
18-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.7	1																							
19-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.7	1																							
20-Dec	0	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																							
21-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0.4	1																							
22-Dec	1	1	1	Z	0	0	0	0	1	0	0	1	1	1	0	0	0	0	1	1	1	1	0	0	0.5	1																							
23-Dec	0	0	0	0	Z	0	0	1	1	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0.4	1																							
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.4	1																							
25-Dec	1	1	1	1	1	0	Z	0	0	0	0	1	1	1	1	2	1	0	0	1	1	1	1	1	0.7	2																							
26-Dec	2	Z	2	1	1	1	1	1	1	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.8	2																							
27-Dec	0	0	Z	2	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.6	2																							
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.4	1																							
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0.6	1																							
30-Dec	1	1	1	1	1	Z	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0.5	1																							
31-Dec	0	0	0	0	0	0	Z	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1																							
0.5																								0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.6	0.6	0.5	0.5	0.5	0.5	Diurnal Average		
2																								1	2	2	1	1	1	1	1	1	2	1	1	2	1	2	2	2	2	2	2	1	1	1	1	Diurnal Maximum	
Z - zerospan C - Calibration																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																																																	



WBEA Data PC
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Barge Landing - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Barge Landing - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Barge Landing - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	51	44	26	9	11	16	15	68	122	57	42	51	34	41	50	67	704
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	51	44	26	9	11	16	15	68	122	57	42	51	34	41	50	67	704

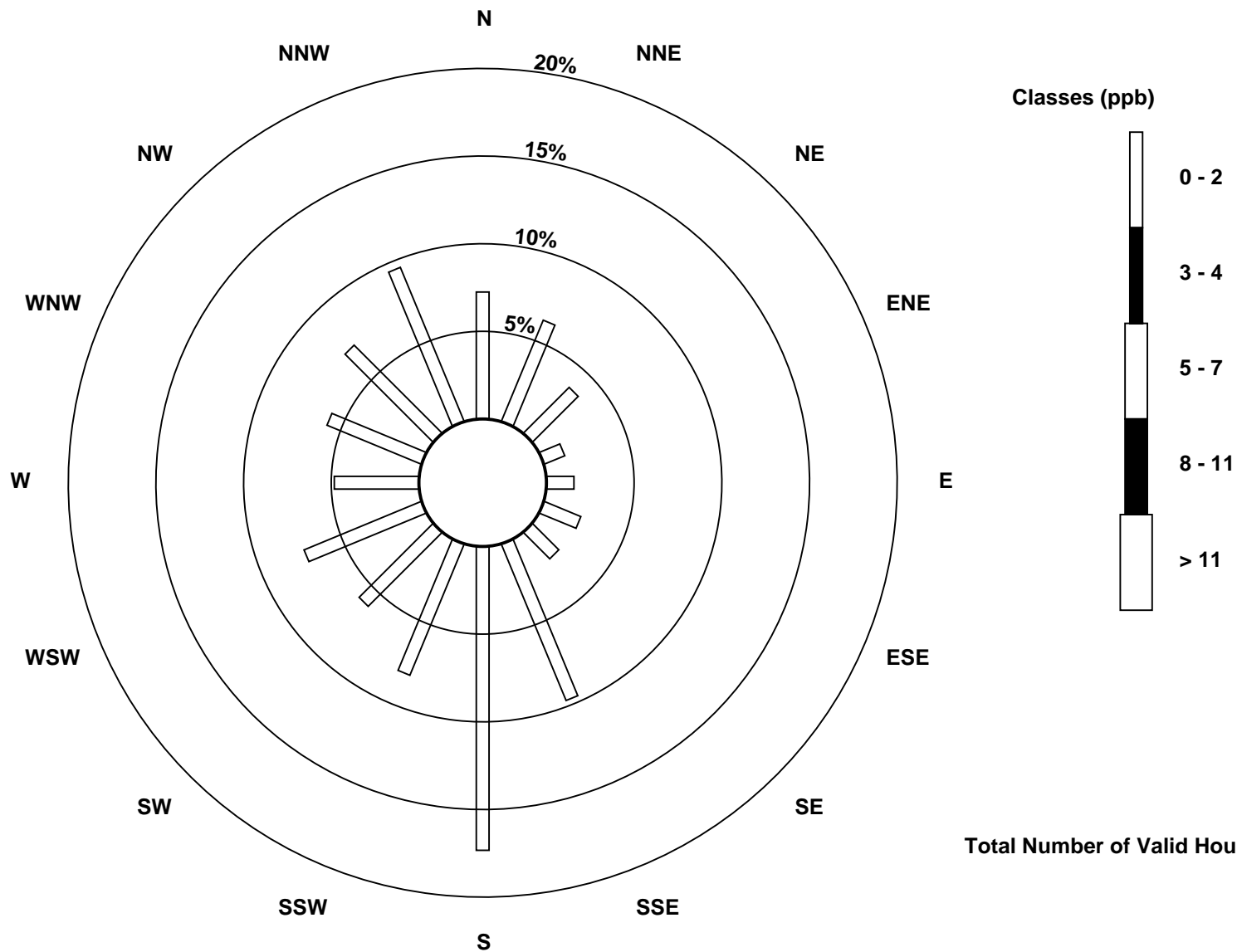
Total Number of Valid Hours: 704

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Reduced Sulphur (TRS) - ppb
Barge Landing (AMS 9)

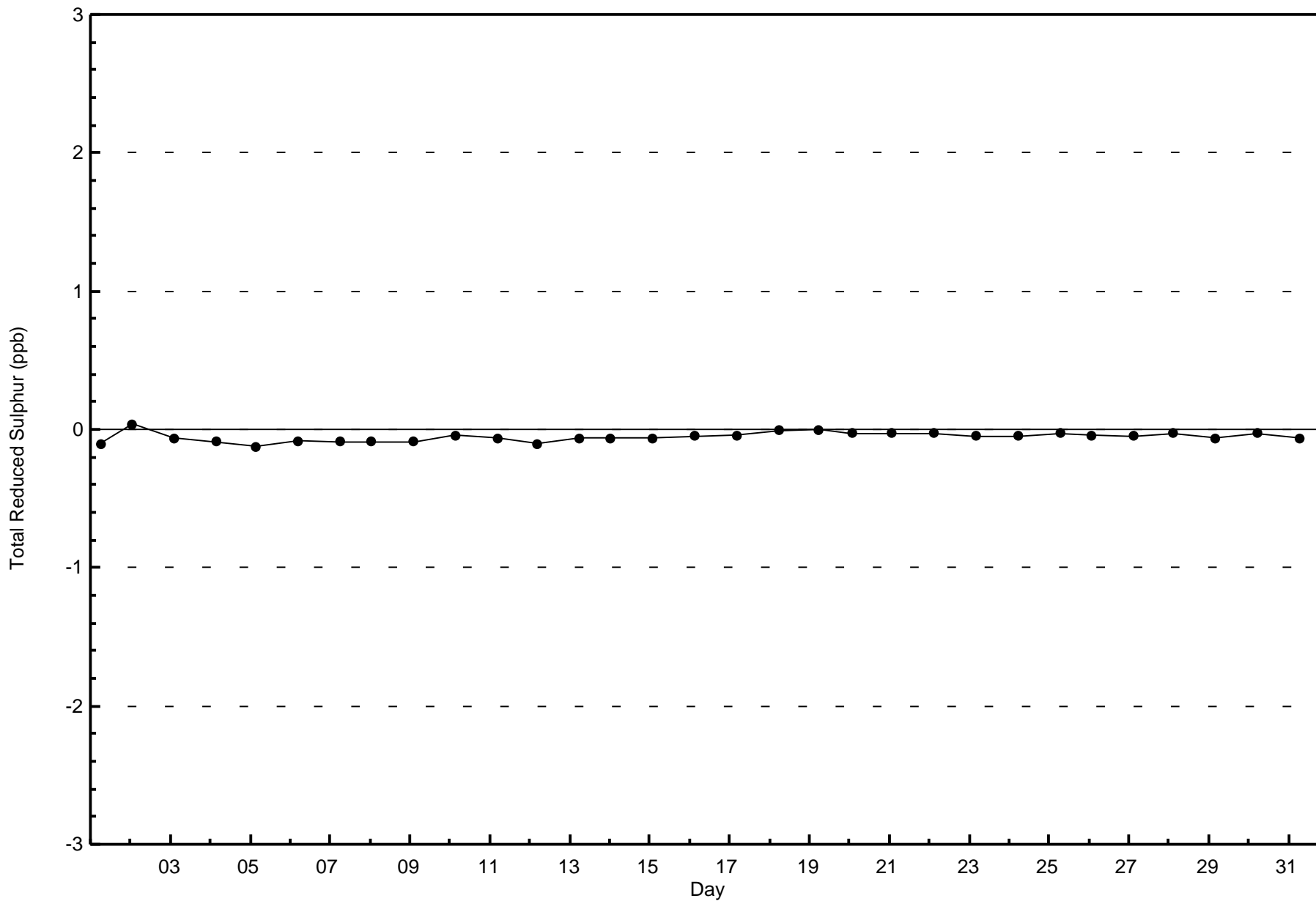


Total Number of Valid Hours: 704



WBEA Data PC
Zero Responses

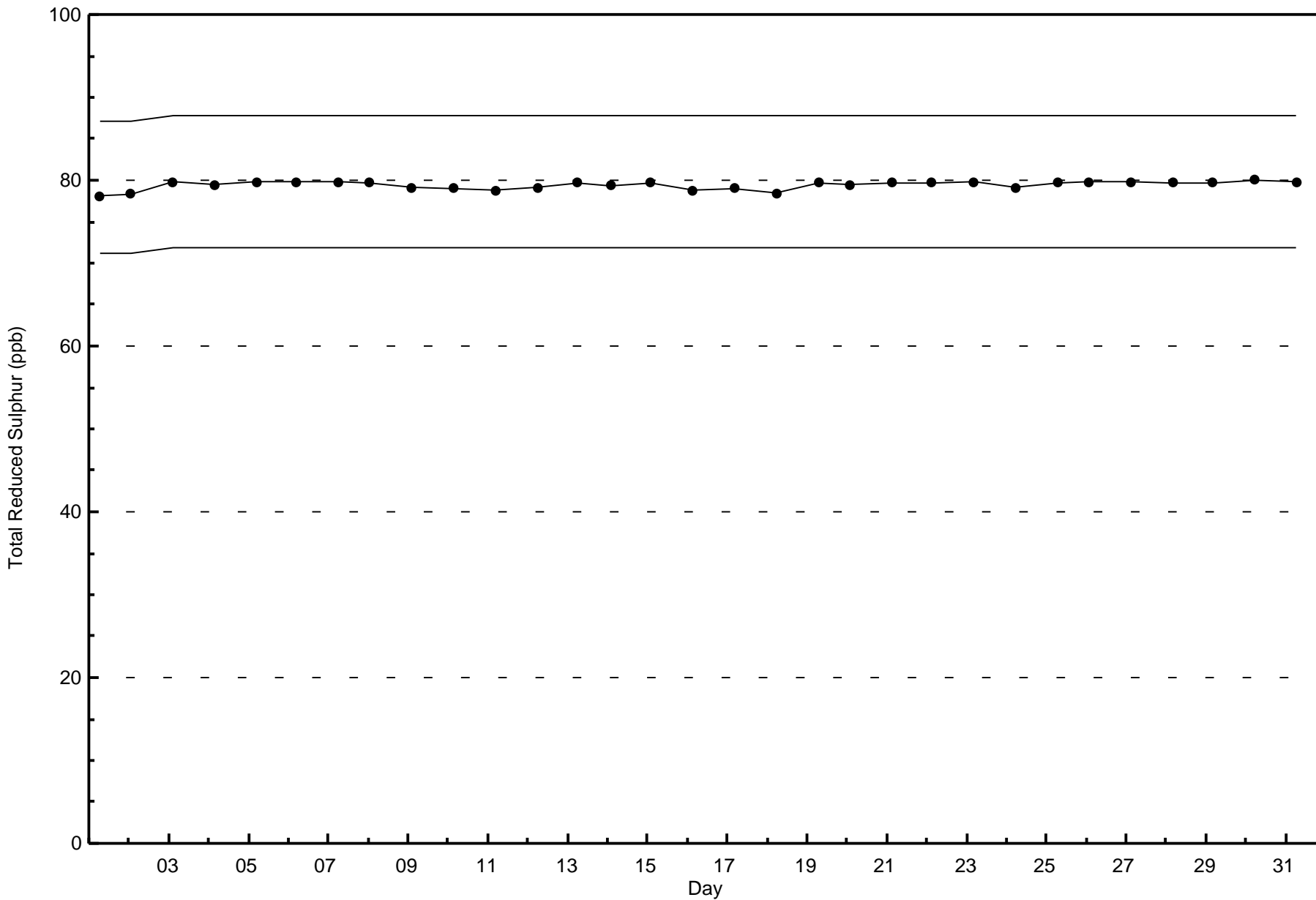
Total Reduced Sulphur (TRS) - ppb
Barge Landing - December 2016





WBEA Data PC
Span Responses

Total Reduced Sulphur (TRS) - ppb
Barge Landing - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

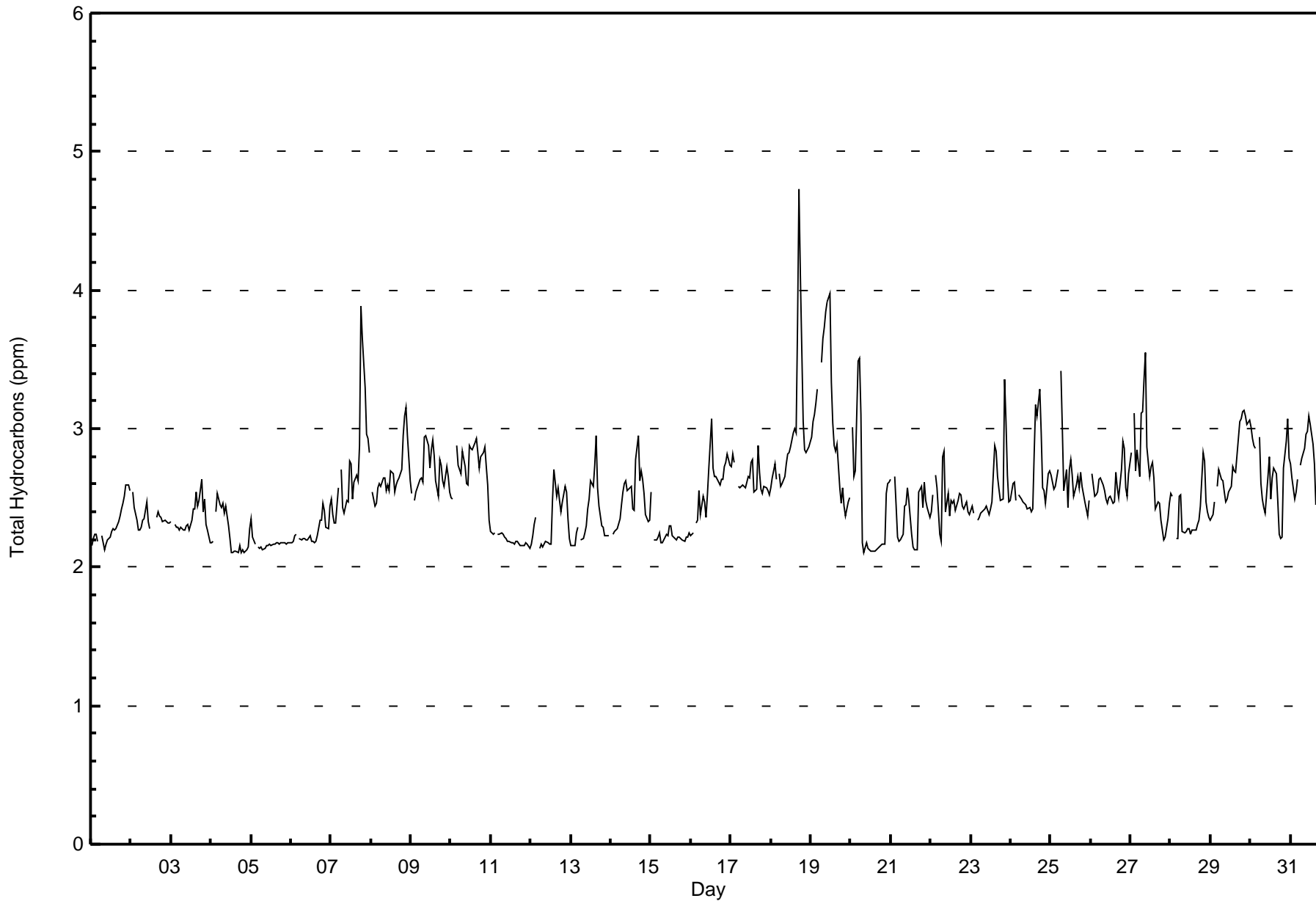
Total Hydrocarbons (THC) - ppm
Barge Landing - December 2016

Maximum Value: 4.7 ppm on Dec 18 18:00																				Maximum Daily Average: 3.1 ppm on Dec 19					Hours in Service: 744	
Minimum Value: 2.1 ppm on Dec 4 14:00																				Minimum Daily Average: 2.2 ppm on Dec 5					Hours of Data: 710	
Maximum Diurnal Average: 2.6 ppm at hour 19																				Minimum Diurnal Average: 2.5 ppm at hour 24					Hours of Missing Data: 34	
Monthly Average: 2.52 ppm																				Percentiles: P ₁ = 2.1 P ₁₀ = 2.2 Q ₁ = 2.3 Median = 2.5 Q ₃ = 2.7 P ₉₀ = 2.9 P ₉₉ = 3.7					Hours of Calibration: 34	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.6	2.3	2.6
2-Dec	Z	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.3	2.3	C	C	C	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.4	2.5
3-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.4	2.5	2.6	2.4	2.5	2.3	2.3	2.2	2.4	2.6
4-Dec	2.2	2.2	Z	2.4	2.5	2.5	2.4	2.5	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.5
5-Dec	2.3	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
6-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.5	2.4	2.3	2.3	2.4	2.3	2.5
7-Dec	2.5	2.4	2.3	2.3	2.6	Z	2.7	2.4	2.4	2.5	2.5	2.8	2.7	2.5	2.6	2.7	2.6	2.9	3.9	3.7	3.3	3.0	2.9	2.8	2.7	3.9
8-Dec	Z	2.5	2.4	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.5	2.6	2.6	2.6	2.7	3.0	3.1	3.2	3.0	2.6	2.7	3.2
9-Dec	2.5	Z	2.5	2.5	2.6	2.6	2.6	2.6	2.9	2.9	2.9	2.7	2.9	2.9	2.8	2.6	2.5	2.8	2.7	2.6	2.6	2.7	2.6	2.5	2.7	2.9
10-Dec	2.5	2.5	Z	2.9	2.7	2.7	2.7	2.8	2.7	2.6	2.6	2.9	2.9	2.8	2.9	2.9	2.8	2.7	2.8	2.8	2.9	2.7	2.6	2.3	2.7	2.9
11-Dec	2.3	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.3
12-Dec	2.2	2.2	2.3	2.4	Z	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.5	2.7	2.5	2.6	2.5	2.4	2.5	2.6	2.5	2.4	2.2	2.3	2.7
13-Dec	2.2	2.2	2.2	2.2	2.3	Z	2.2	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.9	2.6	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.4	2.9
14-Dec	Z	2.2	2.3	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.4	2.4	2.8	3.0	2.6	2.7	2.6	2.5	2.4	2.3	2.3	2.5	3.0
15-Dec	2.5	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5
16-Dec	2.2	2.2	Z	2.3	2.3	2.5	2.4	2.5	2.5	2.4	2.5	2.7	3.1	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.7	2.8	2.8	2.7	2.6	3.1
17-Dec	2.7	2.8	2.8	Z	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.6	2.8	2.8	2.5	2.6	2.9	2.7	2.6	2.5	2.6	2.6	2.6	2.5	2.6	2.9
18-Dec	2.6	2.6	2.7	2.6	Z	2.7	2.6	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.0	3.0	3.8	4.7	4.1	3.1	2.8	2.8	2.8	2.9	3.0	4.7
19-Dec	2.9	3.0	3.1	3.2	3.3	Z	3.5	3.7	3.7	3.8	3.9	4.0	3.3	3.0	2.9	2.8	2.9	2.6	2.5	2.6	2.4	2.4	2.5	2.5	3.1	4.0
20-Dec	Z	3.0	2.7	2.7	3.5	3.5	3.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.5	2.6	2.6	2.4	3.5	
21-Dec	2.6	Z	2.7	2.4	2.2	2.2	2.2	2.2	2.4	2.4	2.6	2.5	2.2	2.1	2.1	2.1	2.1	2.5	2.6	2.4	2.6	2.5	2.4	2.4	2.4	2.7
22-Dec	2.4	2.5	Z	2.7	2.6	2.2	2.2	2.8	2.8	2.4	2.5	2.4	2.5	2.5	2.5	2.4	2.5	2.5	2.5	2.4	2.4	2.5	2.4	2.4	2.5	2.8
23-Dec	2.4	2.4	2.4	Z	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.9	2.8	2.7	2.6	2.5	2.5	3.4	3.0	2.7	2.5	2.6	3.4
24-Dec	2.5	2.6	2.6	2.5	Z	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.8	3.2	3.1	3.3	3.0	2.6	2.6	2.5	2.7	2.7	2.6	3.3
25-Dec	2.7	2.6	2.6	2.6	2.7	Z	3.4	3.0	2.6	2.7	2.4	2.7	2.8	2.7	2.5	2.6	2.7	2.6	2.7	2.6	2.5	2.4	2.4	2.5	2.6	3.4
26-Dec	Z	2.7	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.6	2.5	2.7	2.9	2.9	2.6	2.5	2.7	2.6	2.9
27-Dec	2.8	Z	3.1	2.7	2.8	2.7	3.1	3.1	3.4	3.6	2.9	2.7	2.7	2.8	2.6	2.4	2.5	2.5	2.3	2.3	2.2	2.2	2.3	2.5	2.7	3.6
28-Dec	2.5	2.5	Z	2.2	2.2	2.5	2.5	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.8	2.8	2.5	2.4	2.4	2.8
29-Dec	2.3	2.4	2.5	Z	2.6	2.7	2.6	2.6	2.5	2.5	2.5	2.5	2.6	2.7	2.7	2.7	2.8	3.1	3.1	3.1	3.1	3.1	3.1	3.0	3.1	3.1
30-Dec	3.0	2.9	2.9	2.9	Z	2.9	2.6	2.5	2.4	2.4	2.7	2.8	2.5	2.6	2.7	2.7	2.5	2.2	2.2	2.2	2.7	2.9	3.1	2.8	2.7	3.1
31-Dec	2.7	2.6	2.5	2.5	2.6	Z	2.7	2.8	2.9	3.0	3.0	3.1	3.0	2.9	2.7	2.5	2.6	2.6	2.7	2.3	2.2	2.2	2.2	2.2	2.6	3.1
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Barge Landing - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Barge Landing - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	669	94.23	94.23
3.1 - 10.0	41	5.77	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Barge Landing - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	46	39	25	11	10	17	15	64	121	54	39	51	30	40	48	54	664
3.1 - 10.0	3	4	1	0	0	1	0	4	2	4	2	1	2	2	2	13	41
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	49	43	26	11	10	18	15	68	123	58	41	52	32	42	50	67	705

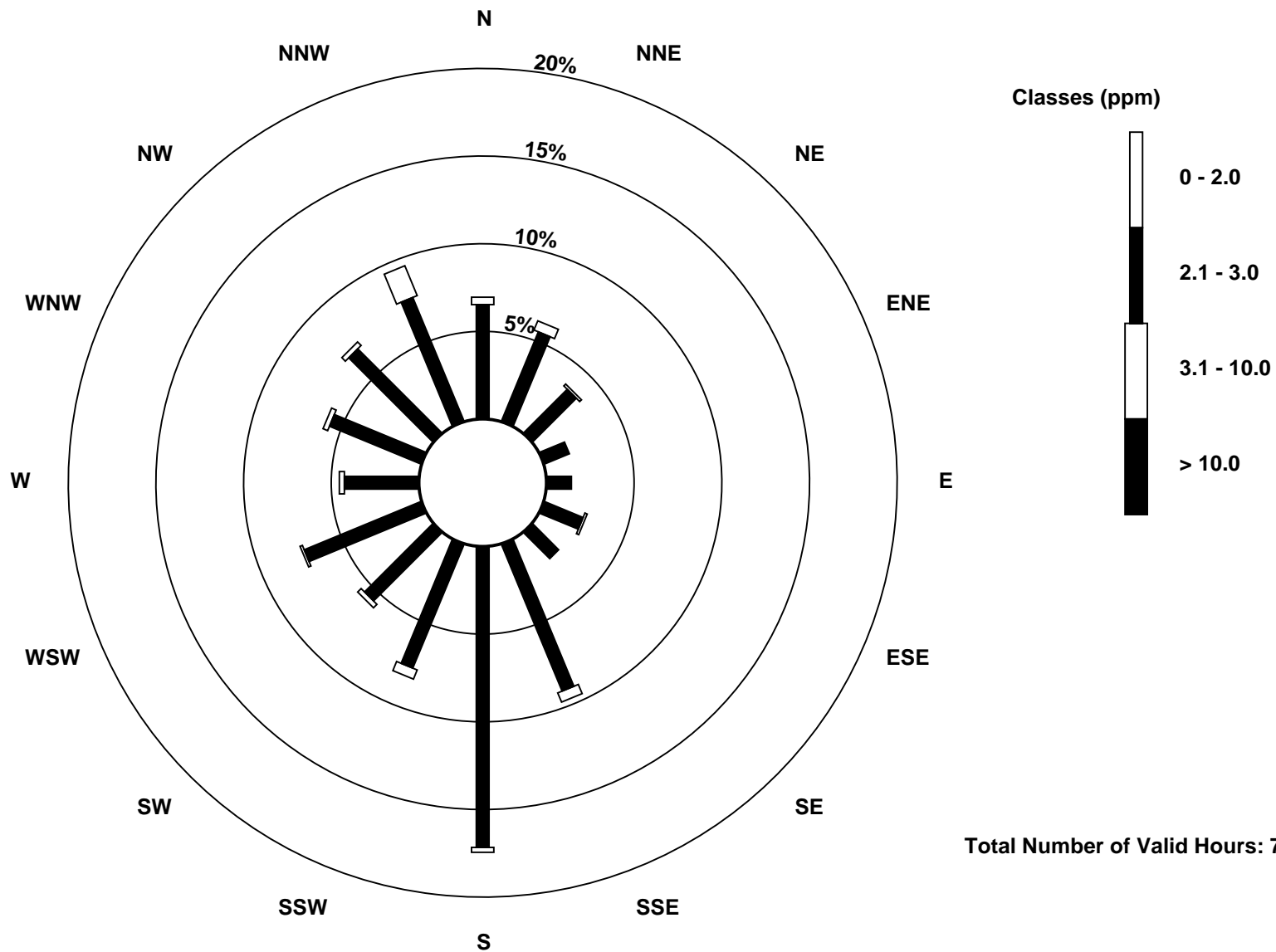
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

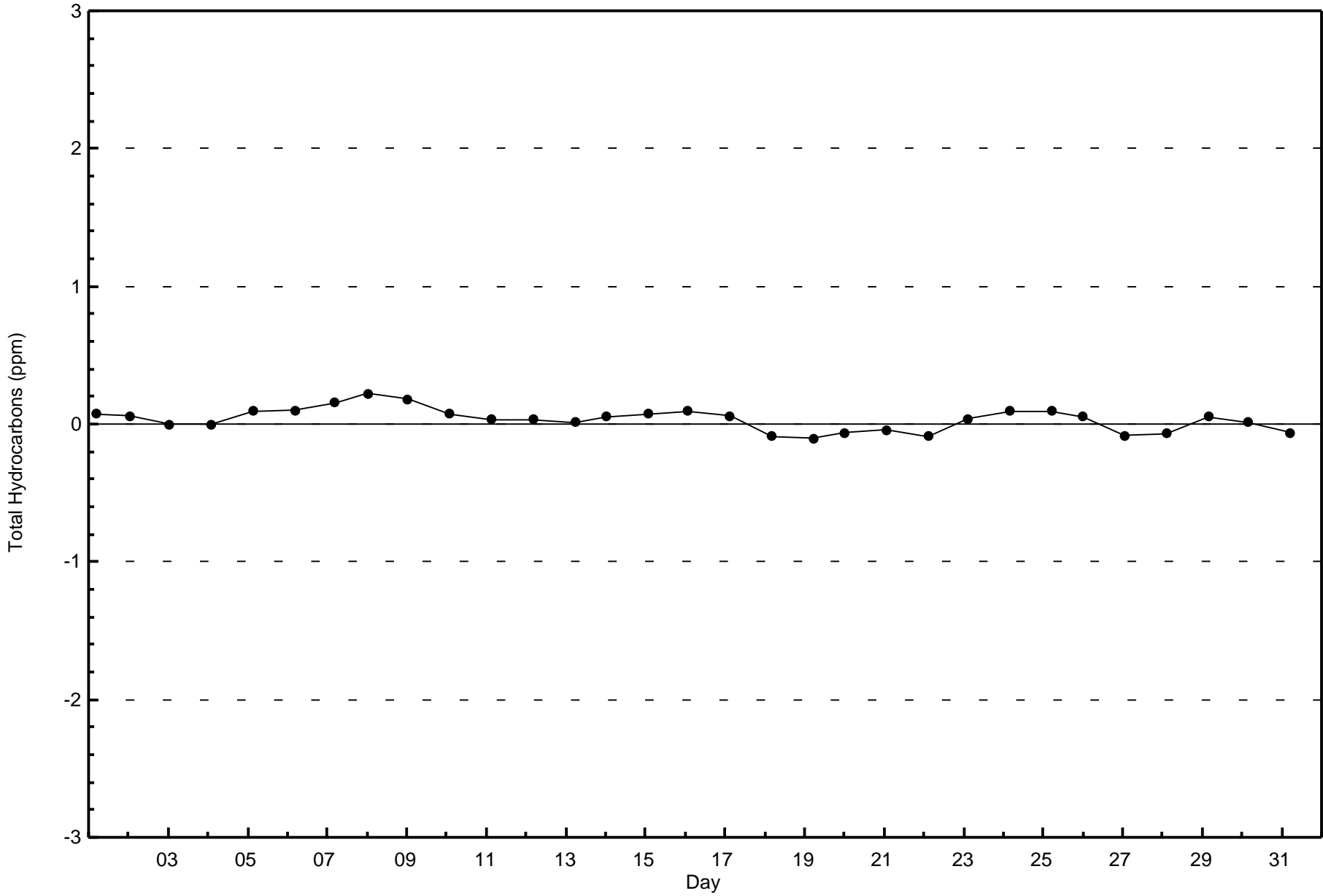
Total Hydrocarbons (THC) - ppm
Barge Landing (AMS 9)





WBEA Data PC
Zero Responses

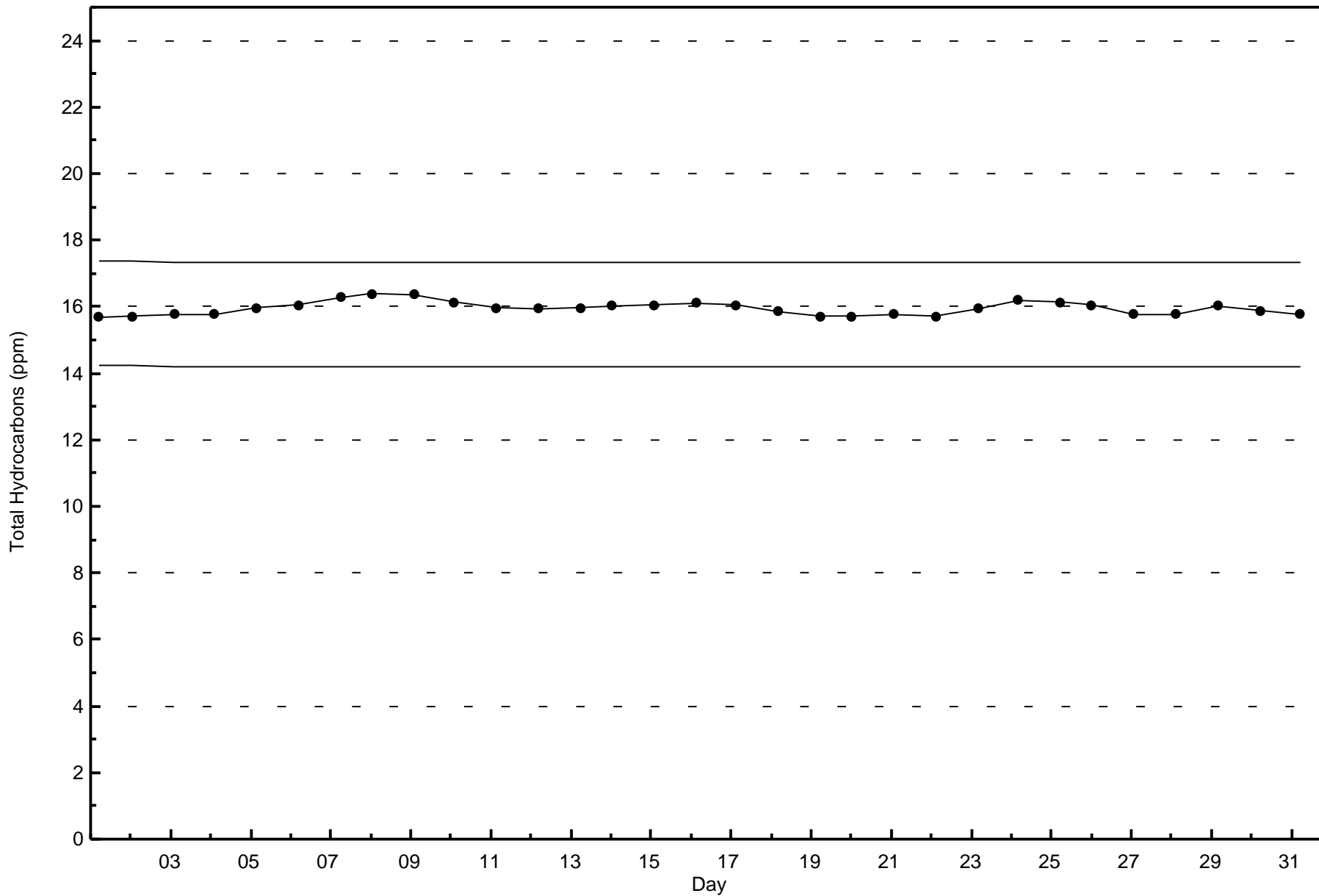
Total Hydrocarbons (THC) - ppm
Barge Landing - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Barge Landing - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

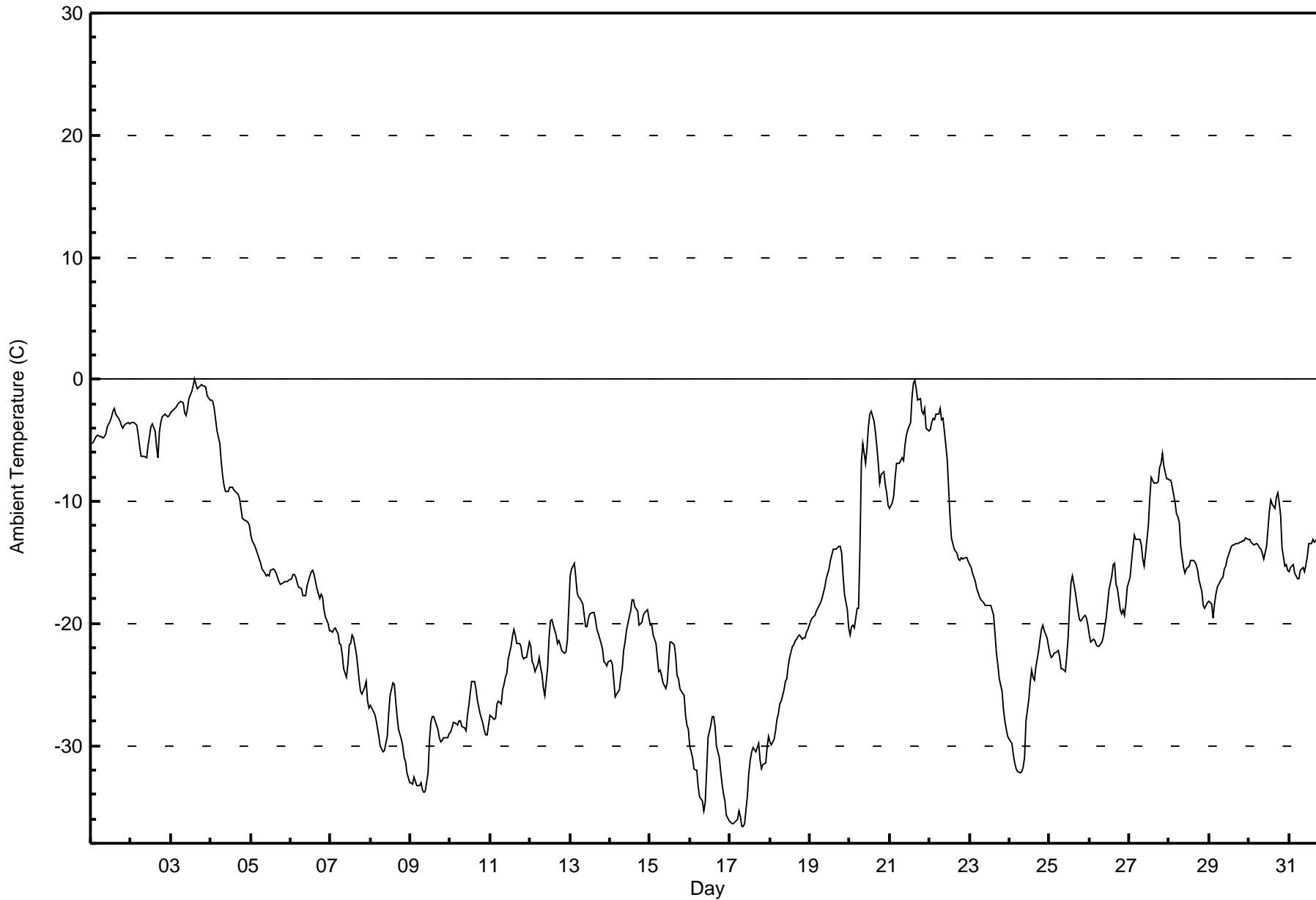
Barge Landing - December 2016

Maximum Value: 0.1 C on Dec 3 15:00		Maximum Daily Average: -1.5 C on Dec 3		Hours in Service: 744																							
Minimum Value: -36.6 C on Dec 17 09:00		Minimum Daily Average: -33.2 C on Dec 17		Hours of Data: 744																							
Maximum Diurnal Average: -15.8 C at hour 15		Minimum Diurnal Average: -19.1 C at hour 10		Hours of Missing Data: 0																							
Monthly Average: -17.93 C		Percentiles: P ₁ = -36.2 P ₁₀ = -29.6 Q ₁ = -24.5 Median = -18.5 Q ₃ = -12.7 P ₉₀ = -4.0 P ₉₉ = -0.5		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-5.3	-5.2	-5.0	-4.7	-4.6	-4.7	-4.7	-4.8	-4.7	-4.4	-3.9	-3.4	-3.1	-2.6	-2.4	-2.9	-3.2	-3.4	-3.8	-4.0	-3.8	-3.7	-3.6	-3.6	-4.0	-2.4	
2-Dec	-3.6	-3.5	-3.5	-3.8	-4.6	-5.5	-6.2	-6.3	-6.3	-6.4	-5.4	-4.7	-3.9	-3.6	-4.2	-5.5	-6.4	-4.3	-3.6	-3.1	-2.9	-3.0	-3.1	-2.9	-4.4	-2.9	
3-Dec	-2.7	-2.6	-2.3	-2.2	-2.1	-1.9	-1.8	-2.0	-2.7	-3.0	-2.3	-1.6	-1.0	-0.5	0.1	-0.4	-0.8	-0.7	-0.4	-0.5	-0.6	-0.6	-1.4	-1.7	-1.5	0.1	
4-Dec	-1.7	-1.8	-2.4	-3.3	-4.2	-5.3	-6.8	-8.0	-8.8	-9.2	-9.2	-8.9	-8.8	-8.8	-9.1	-9.2	-9.4	-9.8	-10.5	-11.4	-11.5	-11.6	-11.7	-12.0	-8.0	-1.7	
5-Dec	-12.7	-13.3	-13.7	-14.0	-14.4	-14.8	-15.1	-15.5	-15.9	-16.1	-16.0	-16.1	-15.6	-15.5	-15.6	-15.9	-16.2	-16.6	-16.8	-16.7	-16.6	-16.6	-16.6	-16.4	-15.5	-12.7	
6-Dec	-16.3	-16.0	-16.0	-16.3	-16.7	-17.1	-17.1	-17.7	-17.7	-17.7	-16.9	-16.1	-15.7	-15.7	-16.0	-16.5	-17.1	-17.9	-17.6	-17.8	-18.8	-19.4	-20.0	-20.6	-17.3	-15.7	
7-Dec	-20.6	-20.7	-20.4	-20.4	-20.8	-21.6	-21.7	-22.6	-23.8	-24.4	-23.3	-21.8	-21.6	-20.9	-21.2	-22.4	-23.4	-24.6	-25.6	-25.8	-25.2	-24.8	-26.3	-26.9	-23.0	-20.4	
8-Dec	-26.7	-26.9	-27.4	-27.8	-28.5	-29.2	-30.0	-30.5	-30.4	-29.8	-29.3	-27.4	-25.9	-24.9	-25.0	-26.4	-27.6	-28.7	-29.5	-30.1	-31.0	-31.4	-32.3	-33.1	-28.7	-24.9	
9-Dec	-33.0	-33.1	-32.6	-32.9	-33.3	-33.3	-33.1	-33.6	-33.9	-33.8	-32.2	-29.6	-28.1	-27.6	-27.6	-28.0	-28.7	-29.3	-29.8	-29.6	-29.3	-29.3	-29.3	-29.0	-30.8	-27.6	
10-Dec	-28.9	-28.6	-28.1	-28.2	-28.3	-28.0	-28.0	-28.4	-28.6	-28.7	-27.5	-26.7	-25.7	-24.7	-24.7	-25.3	-26.2	-26.9	-27.4	-28.2	-28.8	-29.2	-29.1	-28.3	-27.6	-24.7	
11-Dec	-27.5	-27.7	-27.8	-27.7	-26.6	-26.4	-26.6	-25.4	-25.0	-24.4	-24.1	-22.9	-21.9	-21.1	-20.4	-20.9	-21.6	-21.6	-21.9	-22.7	-22.9	-22.8	-22.8	-21.6	-23.9	-20.4	
12-Dec	-21.8	-23.1	-23.4	-23.9	-23.3	-22.8	-23.6	-24.2	-25.3	-25.9	-23.6	-21.1	-19.7	-19.7	-20.1	-21.0	-21.6	-21.4	-21.7	-22.2	-22.4	-22.3	-21.4	-18.7	-22.3	-18.7	
13-Dec	-16.1	-15.5	-15.1	-16.3	-17.5	-17.8	-18.0	-18.4	-19.4	-20.2	-20.3	-19.6	-19.3	-19.2	-19.1	-19.7	-20.4	-20.8	-21.6	-22.1	-23.2	-23.2	-23.4	-23.1	-19.6	-15.1	
14-Dec	-23.0	-23.4	-24.6	-26.0	-25.8	-25.4	-24.4	-23.7	-22.3	-21.5	-20.6	-19.4	-19.0	-18.1	-18.1	-18.6	-19.0	-20.1	-20.1	-20.0	-19.3	-19.1	-18.9	-19.5	-21.2	-18.1	
15-Dec	-20.1	-20.1	-21.0	-21.7	-22.8	-24.0	-23.8	-24.3	-24.9	-25.3	-24.9	-23.2	-21.5	-21.6	-21.8	-22.7	-24.2	-24.5	-25.3	-25.5	-25.9	-27.5	-28.3	-28.7	-23.9	-20.1	
16-Dec	-30.1	-31.0	-31.8	-32.0	-32.1	-33.4	-34.3	-34.5	-35.4	-34.7	-32.1	-29.3	-28.3	-27.7	-27.7	-28.4	-30.0	-31.0	-32.1	-33.1	-33.9	-34.6	-35.7	-36.2	-32.1	-27.7	
17-Dec	-36.3	-36.3	-36.4	-36.2	-36.0	-35.4	-35.8	-36.6	-36.6	-36.4	-34.1	-32.2	-31.2	-30.5	-30.2	-30.5	-30.1	-29.8	-31.2	-31.9	-31.5	-31.5	-30.1	-29.2	-33.2	-29.2	
18-Dec	-29.7	-29.9	-29.4	-28.7	-27.8	-27.4	-26.6	-26.4	-25.4	-24.7	-24.5	-23.5	-22.8	-21.8	-21.7	-21.5	-21.3	-21.0	-20.9	-21.2	-21.2	-21.2	-20.7	-20.5	-24.2	-20.5	
19-Dec	-19.8	-19.5	-19.4	-19.3	-18.9	-18.7	-18.3	-18.0	-17.5	-17.0	-16.3	-15.5	-14.9	-14.4	-13.9	-14.0	-13.9	-13.7	-13.7	-14.3	-16.1	-17.6	-18.9	-20.4	-16.8	-13.7	
20-Dec	-20.9	-20.3	-20.1	-20.4	-18.8	-18.7	-13.8	-6.8	-5.3	-6.9	-5.6	-3.8	-2.8	-2.6	-3.4	-4.4	-5.4	-6.8	-8.5	-7.8	-7.6	-8.7	-9.3	-10.3	-10.0	-2.6	
21-Dec	-10.5	-10.1	-9.5	-8.0	-6.9	-6.9	-6.9	-6.4	-6.7	-5.4	-4.6	-4.1	-3.5	-1.4	-0.3	-0.1	-0.8	-1.7	-1.6	-2.6	-2.8	-2.4	-4.0	-4.2	-4.6	-0.1	
22-Dec	-4.1	-3.5	-3.2	-3.4	-2.8	-2.8	-2.4	-3.3	-3.2	-4.2	-6.5	-8.9	-11.3	-13.0	-13.5	-13.9	-14.2	-14.7	-14.9	-14.6	-14.7	-14.6	-14.6	-15.0	-9.0	-2.4	
23-Dec	-15.2	-15.4	-15.9	-16.6	-17.2	-17.5	-17.8	-18.1	-18.2	-18.5	-18.5	-18.5	-18.5	-18.6	-19.3	-20.8	-22.4	-23.4	-24.5	-25.5	-27.1	-28.0	-28.6	-29.3	-20.6	-15.2	
24-Dec	-29.5	-29.9	-30.8	-31.4	-31.9	-32.1	-32.3	-32.1	-31.8	-31.0	-27.9	-26.3	-24.8	-23.8	-24.4	-24.7	-23.6	-22.3	-21.3	-20.4	-20.1	-20.6	-21.2	-21.8	-26.5	-20.1	
25-Dec	-22.5	-22.8	-22.6	-22.4	-22.3	-22.2	-22.7	-23.7	-23.7	-23.9	-22.6	-21.0	-18.5	-16.7	-16.1	-17.3	-18.2	-19.0	-19.6	-19.8	-19.5	-19.4	-19.5	-20.1	-20.7	-16.1	
26-Dec	-20.9	-21.5	-21.2	-21.3	-21.8	-21.9	-21.8	-21.6	-21.1	-20.3	-19.5	-18.4	-17.3	-16.0	-15.1	-15.0	-16.8	-17.2	-18.8	-19.2	-18.9	-19.3	-18.4	-17.0	-19.2	-15.0	
27-Dec	-16.2	-14.9	-13.8	-12.7	-13.0	-13.1	-13.1	-13.6	-14.7	-15.3	-14.3	-11.9	-9.7	-8.1	-8.3	-8.5	-8.5	-8.3	-7.2	-6.8	-6.0	-7.1	-8.1	-8.1	-10.9	-6.0	
28-Dec	-8.2	-8.3	-8.8	-10.1	-11.1	-11.2	-11.7	-13.7	-15.5	-15.9	-15.5	-15.4	-15.3	-14.9	-14.8	-15.0	-15.1	-15.6	-16.5	-17.4	-18.5	-18.8	-18.6	-18.2	-14.3	-8.2	
29-Dec	-18.2	-18.4	-19.6	-18.4	-17.6	-17.0	-16.6	-16.3	-16.2	-15.5	-15.3	-14.7	-14.0	-13.7	-13.6	-13.6	-13.4	-13.4	-13.4	-13.3	-13.2	-13.2	-13.0	-13.1	-15.2	-13.0	
30-Dec	-13.1	-13.3	-13.5	-13.5	-13.5	-13.6	-13.8	-13.9	-14.3	-14.7	-13.7	-12.3	-10.8	-9.9	-10.3	-10.5	-9.6	-9.3	-10.1	-11.2	-13.8	-15.3	-15.2	-15.6	-12.7	-9.3	
31-Dec	-15.7	-15.4	-15.1	-15.8	-16.1	-16.3	-16.3	-15.6	-15.4	-15.8	-15.2	-14.5	-13.4	-13.5	-13.1	-13.3	-13.2	-12.8	-12.3	-10.5	-10.7	-11.5	-12.8	-12.6	-14.0	-10.5	
		-18.4	-18.5	-18.5	-18.7	-18.7	-18.9	-18.9	-18.9	-19.1	-19.1	-18.3	-17.2	-16.4	-15.8	-15.8	-16.3	-16.9	-17.1	-17.5	-17.7	-18.0	-18.3	-18.6	-18.6	Diurnal Average	
		-1.7	-1.8	-2.3	-2.2	-2.1	-1.9	-1.8	-2.0	-2.7	-3.0	-2.3	-1.6	-1.0	-0.5	0.1	-0.1	-0.8	-0.7	-0.4	-0.5	-0.6	-0.6	-1.4	-1.7	Diurnal Maximum	



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Barge Landing - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Barge Landing - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	323	43.41	43.41
-20 - 0	420	56.45	99.87
0 - 10	1	0.13	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

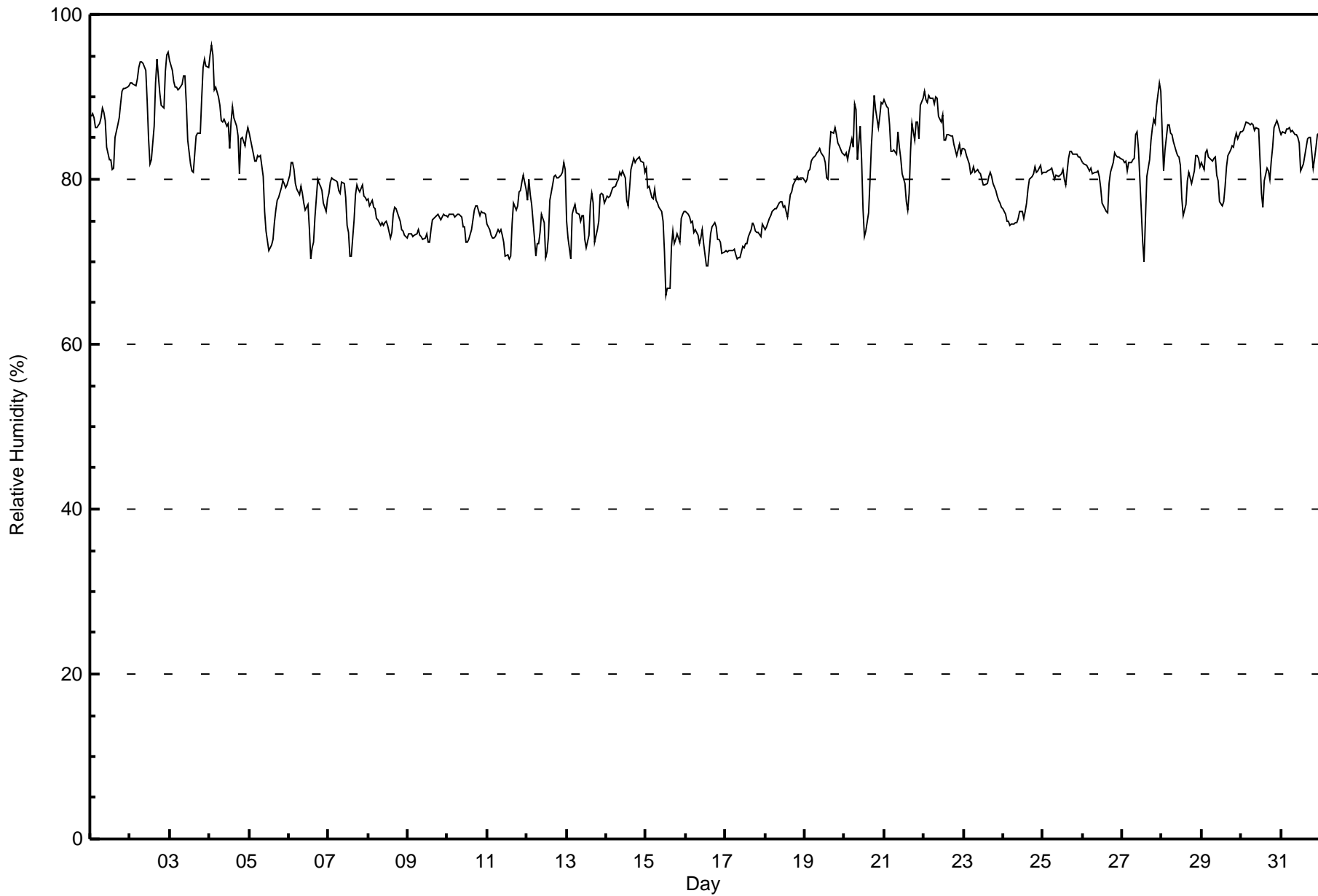
Barge Landing - December 2016

Maximum Value: 96 % on Dec 4 02:00																		Maximum Daily Average: 91.0 % on Dec 2																		Hours in Service: 744	
Minimum Value: 66 % on Dec 15 13:00																		Minimum Daily Average: 72.4 % on Dec 17																		Hours of Data: 744	
Maximum Diurnal Average: 82.2 % at hour 23																		Minimum Diurnal Average: 75.8 % at hour 14																		Hours of Missing Data: 0	
Monthly Average: 80.4 %																		Percentiles: P ₁ = 70 P ₁₀ = 73 Q ₁ = 76 Median = 80 Q ₃ = 84 P ₉₀ = 88 P ₉₉ = 94																		Hours of Calibration: 0	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	88	88	87	86	86	87	87	89	88	87	84	82	82	81	81	85	87	87	89	91	91	91	91	91	87.0	91											
2-Dec	92	92	91	91	92	94	94	94	94	93	89	85	82	82	86	92	95	93	91	89	89	93	95	95	91.0	95											
3-Dec	94	93	92	91	91	91	91	92	93	92	89	85	82	81	81	83	85	86	86	90	94	95	94	94	89.3	95											
4-Dec	95	96	95	91	91	90	89	87	87	87	86	87	84	87	89	87	86	85	81	85	85	84	86	86	87.8	96											
5-Dec	86	85	83	82	82	83	83	83	80	76	74	73	71	72	73	75	76	78	78	79	80	80	79	79	78.7	86											
6-Dec	81	82	82	81	79	79	78	79	78	77	76	77	74	70	72	72	75	80	79	79	79	77	76	78	77.6	82											
7-Dec	78	80	80	80	80	80	79	78	80	80	78	74	74	71	71	75	78	79	79	78	79	78	78	77	77.6	80											
8-Dec	78	77	77	77	76	75	75	74	75	74	75	75	74	73	74	76	77	76	75	75	74	74	73	73	75.1	78											
9-Dec	73	73	73	73	73	73	74	73	73	73	73	73	72	72	74	75	75	76	76	75	75	76	76	76	74.1	76											
10-Dec	75	76	76	76	75	76	76	76	75	74	74	72	72	73	74	75	76	77	77	76	76	76	76	76	75.2	77											
11-Dec	74	74	73	73	73	73	74	74	74	73	72	71	71	70	71	75	77	76	77	78	79	80	80	79	74.6	80											
12-Dec	77	80	78	77	73	71	72	72	74	76	75	70	71	73	77	79	80	80	80	80	80	81	82	81	76.7	82											
13-Dec	75	73	70	76	76	77	76	76	75	76	76	73	72	73	77	78	77	72	74	75	78	78	77	77	75.3	78											
14-Dec	78	78	78	79	79	79	80	80	81	81	81	80	77	77	79	81	82	82	82	83	83	82	82	81	80.2	83											
15-Dec	81	79	79	78	78	79	77	77	77	76	75	71	66	67	67	72	74	72	73	73	72	75	76	76	74.6	81											
16-Dec	76	76	76	75	75	74	74	73	72	73	74	72	69	69	71	73	74	75	74	73	73	72	71	71	73.1	76											
17-Dec	71	71	71	71	71	72	71	70	71	71	72	72	72	72	73	74	75	74	74	74	74	73	75	74	72.4	75											
18-Dec	74	74	75	76	76	76	76	76	77	77	77	77	77	75	77	78	78	79	80	80	80	80	80	80	77.4	80											
19-Dec	80	80	81	81	82	83	83	83	83	84	83	83	82	80	80	84	86	86	86	85	84	84	83	83	82.9	86											
20-Dec	83	83	82	83	85	84	89	89	82	86	82	76	73	74	76	80	84	87	90	88	86	88	89	89	83.8	90											
21-Dec	90	89	89	87	83	83	84	83	86	84	82	81	80	77	76	78	83	87	85	87	87	85	89	90	84.3	90											
22-Dec	91	90	89	90	90	90	89	90	90	88	87	88	85	85	85	85	85	85	84	84	83	84	83	84	86.8	91											
23-Dec	84	83	83	82	81	81	82	81	81	81	81	80	79	79	80	80	81	80	80	79	78	78	77	77	80.2	84											
24-Dec	76	76	75	75	74	75	75	75	75	76	76	75	76	75	76	77	79	80	80	81	81	81	82	81	77.4	82											
25-Dec	81	81	81	81	81	81	81	80	80	80	80	81	81	80	79	82	83	83	83	83	83	83	82	82	81.5	83											
26-Dec	82	82	82	81	81	81	81	81	81	81	80	79	77	76	76	76	80	81	82	83	83	83	83	83	80.6	83											
27-Dec	82	82	82	81	82	82	82	83	85	86	84	76	73	70	75	80	82	85	86	87	87	89	92	91	82.7	92											
28-Dec	86	81	84	87	87	86	85	85	83	83	83	82	78	76	77	80	81	80	80	81	83	83	83	82	82.1	87											
29-Dec	82	81	83	84	83	83	82	83	83	81	80	77	77	77	79	81	83	84	84	84	85	86	85	86	82.1	86											
30-Dec	86	86	87	87	87	87	87	87	86	86	86	82	78	77	80	81	81	80	82	84	86	87	87	86	84.2	87											
31-Dec	85	86	86	86	86	86	86	86	85	85	85	84	81	82	83	84	85	85	85	81	82	84	85	86	84.6	86											
	81.7	81.5	81.3	81.2	81.0	80.9	81.0	80.9	80.8	80.5	79.7	77.9	76.2	75.8	77.1	79.3	80.7	81.0	81.0	81.3	81.6	81.9	82.2	82.0	Diurnal Average												
	95	96	95	91	92	94	94	94	94	93	89	88	85	87	89	92	95	93	91	91	94	95	95	95	Diurnal Maximum												



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Barge Landing - December 2016





Maximum Speed: 18 km/h on Dec 21 15:00	Maximum Daily Speed Average: 7.3 km/h on Dec 3	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 13 16:00	Minimum Daily Speed Average: 0.3 km/h on Dec 18	Hours of Data: 738
Maximum Diurnal Speed Average: 2.0 km/h at hour 14	Minimum Diurnal Speed Average: 0.5 km/h at hour 23	Hours of Missing Data: 6
Monthly Average Velocity: 1.2 km/h 220.8 deg	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 4 Q ₃ = 6 P ₉₀ = 8 P ₉₉ = 11	Percent Operational Time: 99.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S8	S7	S8	SSW6	SSW6	SSW7	SSW8	S6	S6	SSW6	SSW7	SSW7	SSW7	SSW6	SSW6	S5	SSE5	SSE5	SSE5	SSE4	SSE5	S5	SSE5	SSE5	S5.7	S8
2-Dec	SSE6	SSE6	SSE7	SSE7	S6	SSE7	S5	SSE7	SSW6	S6	S9	S11	S8	S7	S5	SE3	SE2	SSE8	S8	S8	SSE10	SSE11	SSE10	S10	S7.1	S11
3-Dec	SSE11	SSE10	S10	SSE10	SSE10	S10	S10	S10	S8	S8	S11	S10	S8	S6	S7	S8	S6	S6	SSW4	S6	S5	SSW5	NW3	NW1	S7.3	S11
4-Dec	WSW1	NNW4	NNE6	NNE8	NE8	NNE8	NNE9	NNE8	NE7	NNE6	NNE5	N7	NNW7	NNW8	NNW8	NNW8	NNW7	NNW6	NNW7	N11	NNW7	NNW4	NW5	NW6	N5.9	N11
5-Dec	NW7	NW6	NW5	NW5	NW5	WNW6	WNW6	WNW7	WNW7	WNW7	WNW7	WNW8	WNW8	WNW8	WNW8	WNW7	WNW8	WNW7	WNW6	W6	W6	W5	WNW5	WNW5	WNW6.4	WNW8
6-Dec	WNW6	WNW5	NW5	NW5	NW4	NW5	NW5	NW5	NW4	NW4	NNW6	NNW9	NNW8	NNW8	N8	N5	N4	N3	N3	N4	N5	N5	N4	NNW4.9	NNW9	
7-Dec	NNW3	NW3	N3	N3	N3	N3	NNE4	N3	NNW2	N1	W2	N2	NNE4	NNE3	NNE2	NE1	WNW1	E2	NE2	W0	SSE1	SW1	WSW0	NW1	N1.6	NNE4
8-Dec	NNE0	S0	ESE3	NNE2	N1	WNW1	NW1	WNW1	NNW1	NW1	NW2	WNW2	WNW1	W2	WSW2	AF	AF	AF	NW1	NNW1	NW1	NNW2	WSW1	SW1	NW0.7	ESE3
9-Dec	WSW1	SW1	S2	SSE2	SSW2	S2	S3	SSW2	S3	SW2	SSW2	S5	S5	S5	S5	SSE5	S4	S4	S5	SSW3	S3	SSE4	SSE4	SSE5	S3.1	S5
10-Dec	SSE4	SSE5	S6	S5	S4	S5	SSE3	SSE4	SSW4	SSW2	SSW3	SSW5	S5	S4	S3	SSW2	SSE1	SE3	S2	SW2	SSW3	SSW3	S4	SSW4	S3.3	S6
11-Dec	SW5	WSW6	WSW7	WSW8	WSW8	SW6	SW6	WSW11	WSW12	WSW10	WSW8	WSW8	WSW8	W6	W7	WSW7	WSW4	WSW6	WSW4	SSE1	SW3	S2	W2	NW4	WSW6.0	WSW12
12-Dec	NNW4	N4	NNW4	NNW4	NW6	WNW7	W6	W5	WSW3	SSW3	SW2	WSW5	S4	SSE5	SE5	ESE3	ESE4	ESE3	SSE3	S3	SSE2	SE4	WNW2	WNW4	WSW1.1	WNW7
13-Dec	WNW7	NW8	NW12	N10	N9	N9	N9	N8	NNE6	N4	N3	NE2	ENE3	ESE4	E1	W0	WNW3	NNW5	N2	WNW2	NW2	W2	NNW3	NNW2	NNW3.8	NW12
14-Dec	W3	WSW4	WSW2	S4	SE5	SSE4	SSE5	SE4	SSE5	SSE5	ESE2	SW0	N1	ENE1	ESE2	E1	W2	SW2	WSW2	NNE1	NNW1	NW2	NW3	SSE1.3	SSE5	
15-Dec	NW3	W4	NW3	NNW4	NNW5	NNW3	NW4	WNW3	NW4	W5	W4	NW4	W5	WSW5	W8	W5	NNW4	NNW4	WNW3	NW3	NW2	NNE1	NNW1	WNW1	WNW3.2	W8
16-Dec	NNW1	N1	W3	W3	W3	NW1	S1	WNW1	SSE3	SSW4	S3	S4	S5	S5	S4	SSE3	S1	SSE2	SE3	NNW1	ESE1	SE2	ENE0	SSE2	S1.5	S5
17-Dec	S3	SSW2	S4	S3	S4	S4	SSE3	SSW2	S2	S3	S4	S7	S7	S6	S5	SSE6	S7	SSW5	S3	S3	SSW2	S2	SSE3	SW3	S3.8	S7
18-Dec	S2	S4	S5	SSE6	S6	S4	SW3	WSW2	E1	W1	N2	NW1	NNW3	N3	N3	NNW3	NNW3	NNW2	NNW2	NNW4	NNW3	NNW2	W1	N1	W0.3	S6
19-Dec	SSW2	WNW1	NNW2	N2	N2	N4	NNW3	NNW2	NNW3	NNW3	N2	NNW3	NNW3	NNW2	NW3	N3	NNW4	NNW4	NW2	ENE3	E4	E4	NE2	NE1	N1.9	E4
20-Dec	N2	ESE2	S3	SSW4	SSW3	ESE1	SSE6	WSW13	WSW12	S5	SSW4	SW5	WSW8	WSW8	SW7	SW5	SSW5	SW5	WSW7	WSW10	WSW10	S5	S6	SSE6	SW4.9	WSW13
21-Dec	SSE6	SSE7	SSE6	SSW6	SW9	WSW8	SW8	SSW7	SSW7	SSW8	S8	SSW8	WSW10	W17	W18	W10	SSW6	S8	S7	SE8	SSE8	SSE8	ESE3	SE2	SSW6.0	W18
22-Dec	S2	SSE3	S2	SSW2	SW1	WSW4	WNW2	NNE4	NNE4	NE7	NE9	NNE9	NE9	NE7	NNE7	NNE8	NNE7	NE6	NE7	NNE7	NNE6	NNE5	NNE7	NE7	NE4.4	NE9
23-Dec	NE7	NNE6	NE7	NNE7	NNE7	NE7	NE6	NNE7	NNE6	NNE6	NNE6	NNE6	NNE6	NNE5	NNE4	N3	N4	N3	N2	NNE1	ENE1	E1	ESE2	NNE4.5	NNE7	
24-Dec	SSE3	N1	N1	AF	AF	SSE1	SW2	WSW2	AF	S2	SW1	WSW2	SW3	SW1	SE2	SSE4	SSE3	S3	WSW1	SW2	S3	S4	S5	S1.7	S5	
25-Dec	S4	SSE5	SSE5	SSE5	S5	SSW4	SSW4	SSW3	SSW3	SSW3	SW4	WSW3	WSW3	SW4	SSW5	S5	S5	SSE5	S5	S6	S7	S6	S6	S6	S4.2	S7
26-Dec	S4	S6	S6	S7	S5	S5	SSW5	SSW6	S7	S9	S9	S9	S10	S9	S9	SSW8	SW5	SW4	W4	W5	W5	W5	WSW5	SW4	SSW5.5	S10
27-Dec	SW4	SSW5	SSW5	SSW7	SSW6	SSW5	SSW5	SW4	SW5	W4	W4	WNW4	WSW3	W3	WSW1	SSW5	SSE5	SE5	SW4	WSW5	SW5	NNW5	NNW3	N4	SW3.1	SSW7
28-Dec	N5	N5	NNE6	ENE7	ENE6	NE4	NE5	NE6	NE5	ENE5	NE5	ENE4	ESE4	E1	ESE2	E3	NE4	NE6	NE4	N3	N3	NNW2	N3	NNW3	NE3.6	ENE7
29-Dec	NNW2	NW1	NE1	SSW1	ESE1	SSE1	ESE0	NW1	NNE2	NW1	NNW2	N2	NW2	NNE1	ESE2	NNE2	NNW2	NNW2	NW1	WNW2	WSW1	NNE2	S1	WNW1	NNW0.8	ESE2
30-Dec	W2	WNW1	NW1	ENE1	NW0	NW2	NNW3	NNW2	NW3	SW2	S5	SSW7	S7	S8	S9	S8	S7	SW5	WSW7	NW5	NNW6	N4	NNE3	NNW2	SW1.7	S9
31-Dec	WNW2	NNW2	WSW1	SE4	SSE4	E4	ENE1	SW2	NNW2	NW1	E1	NNE1	SW1	WSW3	ESE1	SE3	SW4	S3	SSW3	WSW6	S5	SW6	SW4	SW3	SSW1.5	WSW6

SW1.1 SW1.1 SSW1.0 S1.0 SSW1.0 SW0.9 SW0.9 WSW1.4 SW1.3 SW1.4 SSW1.4 SW1.7 SW1.8 SW2.0 SW1.7 SW1.2 SSW1.0 SSW1.0 SW1.1 WSW1.1 SW1.2 SSW0.9 SW0.5 SW0.7	Diurnal Average
SSE11 SSE10 NW12 N10 SSE10 S10 S10 WSW13 WSW12 WSW10 S11 S11 S10 W17 W18 W10 WNW8 SSE8 N11 WSW10 SSE10 SSE11 SSE10 S10	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

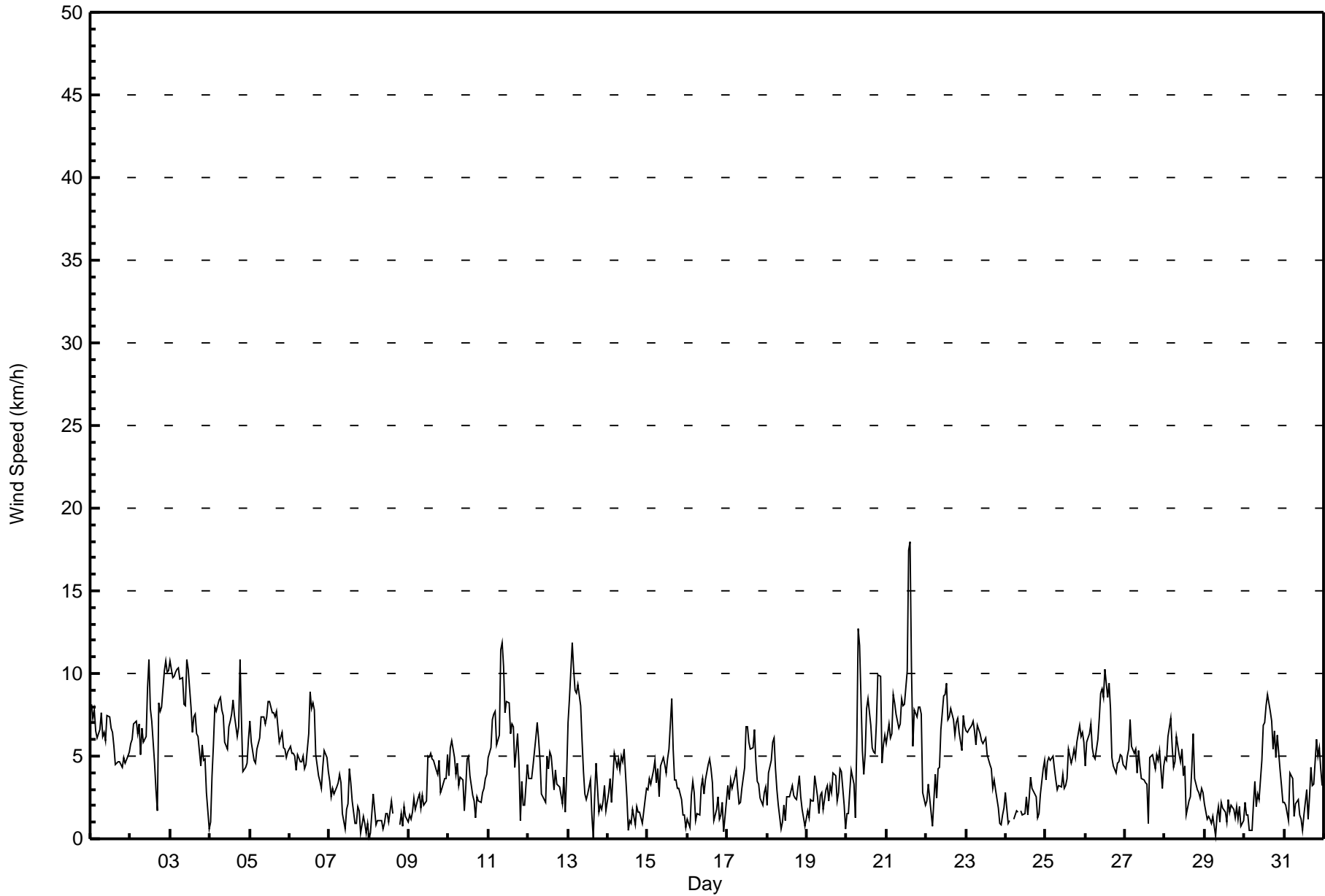
Wind Speed (WS) - km/h
Barge Landing - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Dec 21 15:00														Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Hours of Calibration: 0 Percent Operational Time: 99.2											
Minimum Value: 1 km/h on Dec 23 18:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 4																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	3	2	3	2	2	2	2	2	2	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	3
2-Dec	1	2	2	2	2	2	1	2	1	2	3	4	3	3	1	1	2	3	3	3	4	4	3	4	4
3-Dec	4	3	3	3	3	3	3	3	3	3	4	3	3	2	2	2	2	2	2	1	1	1	1	1	4
4-Dec	1	1	2	3	2	2	3	2	2	2	3	2	3	2	2	2	2	3	3	2	1	2	2	2	3
5-Dec	2	2	2	2	2	2	2	3	3	3	3	3	4	3	2	3	3	3	2	2	2	2	2	2	4
6-Dec	2	2	2	2	2	2	2	1	2	1	1	3	2	2	3	2	2	1	1	1	1	1	1	1	3
7-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	AF	AF	AF	1	1	1	1	1	1	1
9-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	2	2
10-Dec	1	2	2	2	2	2	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	2
11-Dec	1	2	2	2	3	2	3	4	3	3	3	2	2	3	2	2	1	2	2	1	1	1	1	1	4
12-Dec	1	1	1	1	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	2	2
13-Dec	2	3	4	4	3	3	3	2	2	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	4
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	2
15-Dec	1	1	1	1	2	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2
16-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	2	1	1	1	2
17-Dec	1	1	1	1	1	1	1	1	1	1	2	2	3	2	2	1	2	2	1	1	1	1	1	1	3
18-Dec	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
19-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2
20-Dec	1	1	1	1	2	2	1	5	3	2	1	3	3	2	2	2	1	1	2	2	2	2	1	1	5
21-Dec	2	1	2	2	3	2	3	2	2	2	2	3	3	5	5	4	1	2	2	2	2	2	1	1	5
22-Dec	1	2	2	1	2	1	2	1	1	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3
23-Dec	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	1	1	2
24-Dec	2	1	1	AF	AF	1	1	1	AF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	2	1	2
26-Dec	1	2	2	2	2	2	1	2	2	3	3	3	3	3	3	3	1	1	1	2	1	1	1	1	3
27-Dec	1	2	1	3	1	1	1	1	3	1	2	1	1	1	1	1	1	1	1	2	2	2	1	1	3
28-Dec	1	1	2	2	2	1	1	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1	1	1	2
29-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
30-Dec	1	1	1	1	1	1	1	1	2	1	2	2	2	3	3	2	2	2	3	2	2	1	1	1	3
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	2	1	2	2	2	2
														4 3 4 4 3 3 3 5 3 3 4 4 4 5 5 4 3 3 3 3 4 4 3 4											
Diurnal Maximum																									
AF - Analyzer Failure																									



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Barge Landing - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Barge Landing - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	511	69.24	69.24
6 - 11	221	29.95	99.19
12 - 19	6	0.81	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 738

Total Number of Hours: 744



**WBEA Data PC
Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	44	22	12	9	11	18	14	47	74	39	38	28	26	25	48	56	511
6 - 11	8	25	14	2	0	0	1	24	57	23	4	22	7	17	5	12	221
12 - 19	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	0	6
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	52	47	26	11	11	18	15	71	131	62	42	53	35	42	54	68	738

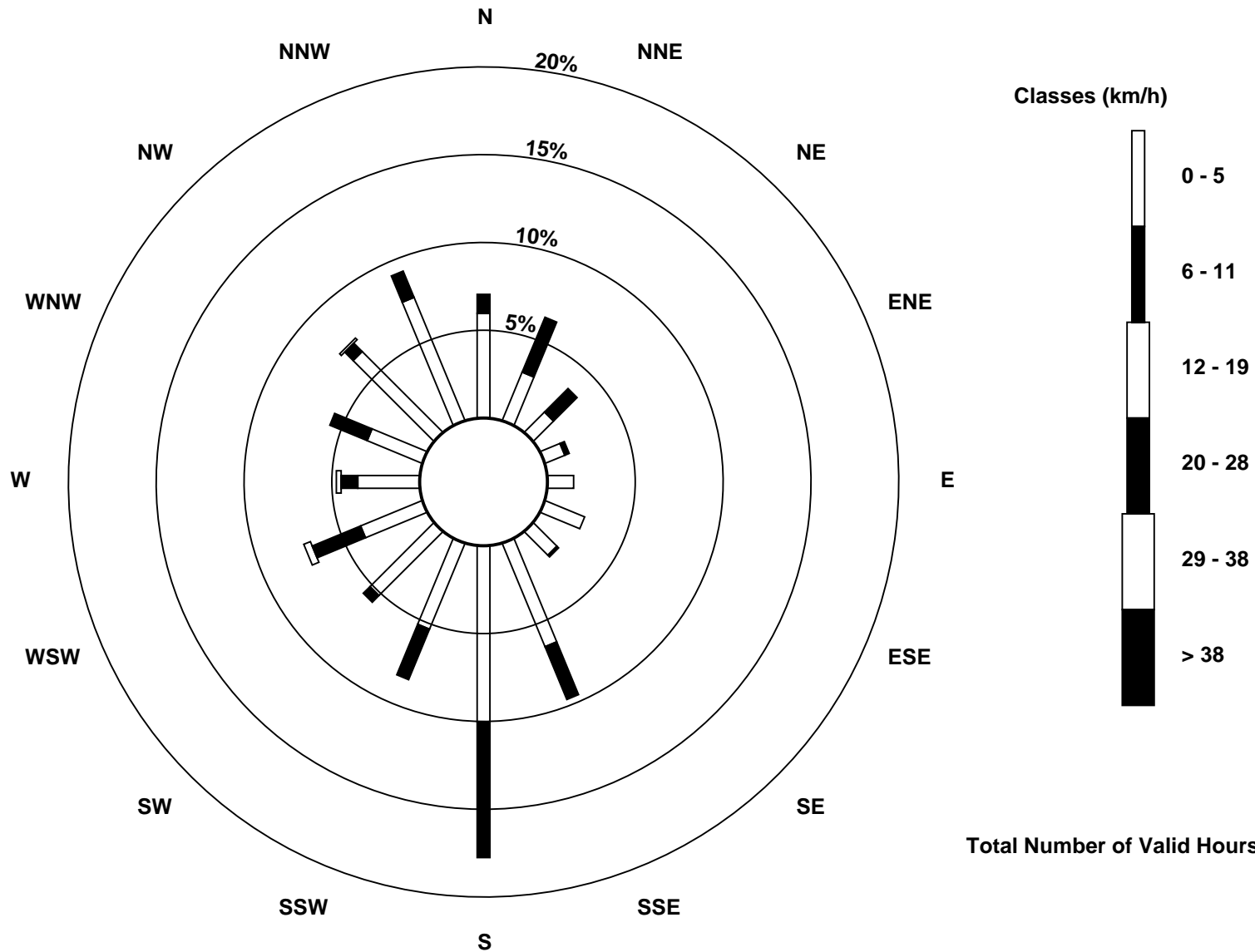
Total Number of Valid Hours: 738

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Barge Landing (AMS 9)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Barge Landing - December 2016

Direction of Maximum Speed: 263 deg on Dec 21 15:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 174.7 deg on Dec 3	Hours of Data: 738
Direction of Minimum Speed: 265 deg on Dec 13 16:00	Hours of Missing Data: 6
Direction of Minimum Daily Speed Average: 0.3 deg on Dec 18	Percent Operational Time: 99.2
Monthly Average Direction: 259.8 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	180	179	181	211	207	199	199	184	183	193	204	208	199	197	194	170	164	160	149	148	150	169	168	165	184.5
2-Dec	163	164	166	163	182	161	169	165	195	191	176	179	183	187	170	144	144	164	173	173	166	160	163	171	170.8
3-Dec	167	168	170	167	166	170	173	176	169	172	173	176	172	169	185	180	170	179	203	185	183	198	322	317	174.7
4-Dec	257	334	19	25	39	26	24	24	34	31	17	351	344	340	338	335	340	342	349	346	331	340	325	321	358.7
5-Dec	322	320	312	308	308	303	300	299	302	295	293	298	295	287	295	294	297	294	285	271	279	278	282	289	296.0
6-Dec	293	297	310	313	317	320	308	322	322	325	323	329	339	341	350	8	4	5	11	8	2	1	3	335.3	
7-Dec	347	321	349	352	10	11	18	3	344	358	270	6	21	14	20	39	303	87	45	263	168	227	246	326	2.4
8-Dec	19	174	111	27	359	300	317	285	330	313	318	301	301	273	254	AF	AF	AF	324	336	325	334	242	219	308.7
9-Dec	242	219	190	168	200	185	179	200	183	223	203	178	179	170	174	166	181	180	169	206	183	168	152	163	179.6
10-Dec	162	158	176	176	188	176	156	155	194	193	195	206	188	175	182	203	153	143	173	218	197	203	187	210	181.6
11-Dec	229	242	248	247	244	230	236	255	251	246	242	245	249	267	278	256	240	245	247	165	222	183	261	321	248.2
12-Dec	334	349	348	327	308	283	273	272	243	211	233	239	177	157	145	122	109	109	148	174	166	139	301	289	240.4
13-Dec	298	308	315	4	3	1	3	2	18	7	5	53	73	103	82	265	291	329	350	292	306	280	332	344	347.3
14-Dec	260	247	239	170	145	159	148	145	156	147	147	120	227	7	66	105	95	266	235	254	14	328	318	322	168.2
15-Dec	314	274	326	339	334	338	322	295	312	263	281	320	269	251	266	281	334	328	298	318	313	30	331	296	300.9
16-Dec	342	352	276	262	268	317	184	282	160	202	181	187	173	171	169	160	189	161	133	339	105	146	67	155	185.2
17-Dec	170	204	177	191	186	174	168	207	179	169	173	182	175	178	173	166	182	193	173	177	200	188	166	218	180.4
18-Dec	180	183	170	152	170	174	219	245	86	275	358	316	345	2	2	343	345	334	337	339	345	328	277	2	270.1
19-Dec	209	301	327	355	351	349	336	340	331	341	8	335	332	342	322	350	345	337	325	62	90	83	40	41	353.4
20-Dec	354	119	174	213	203	108	147	241	239	182	202	233	254	237	236	233	212	231	243	242	246	184	176	156	221.6
21-Dec	167	152	162	192	236	238	232	194	193	195	180	206	244	259	263	262	206	173	169	136	164	166	116	135	206.7
22-Dec	176	155	186	203	236	239	298	23	21	38	46	31	44	41	33	30	30	36	34	29	23	25	32	36	34.1
23-Dec	35	33	39	32	24	36	40	26	23	31	27	17	20	27	24	17	352	353	351	350	27	76	89	121	26.8
24-Dec	147	358	9	AF	AF	154	236	246	AF	172	216	256	224	215	137	149	153	182	191	238	221	179	175	178	183.8
25-Dec	178	166	158	162	174	193	204	229	205	200	236	245	245	232	195	181	173	164	182	171	181	187	171	169	186.3
26-Dec	187	183	184	183	171	180	199	202	186	177	170	180	177	186	186	199	224	234	269	261	262	269	248	225	197.8
27-Dec	234	198	194	199	206	208	197	217	225	263	264	286	258	259	256	204	161	142	220	248	224	339	334	349	225.2
28-Dec	3	359	30	58	57	45	35	56	53	60	54	60	102	80	110	91	54	54	37	358	354	330	357	330	42.7
29-Dec	345	307	55	213	111	165	103	307	12	322	338	349	322	13	112	24	348	331	306	300	250	19	178	301	343.1
30-Dec	265	290	312	68	320	322	337	331	325	217	189	197	187	188	180	175	190	222	246	321	342	359	25	343	226.6
31-Dec	302	344	238	134	151	101	59	236	345	312	84	29	225	241	111	134	217	180	198	238	191	223	229	236	206.8

227.4 219.1 207.5 190.4 211.6 215.6 230.2 246.8 235.5 213.8 203.5 226.3 226.5 230.3 228.2 215.3 206.9 201.7 227.3 243.7 213.9 199.2 217.8 227.5
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

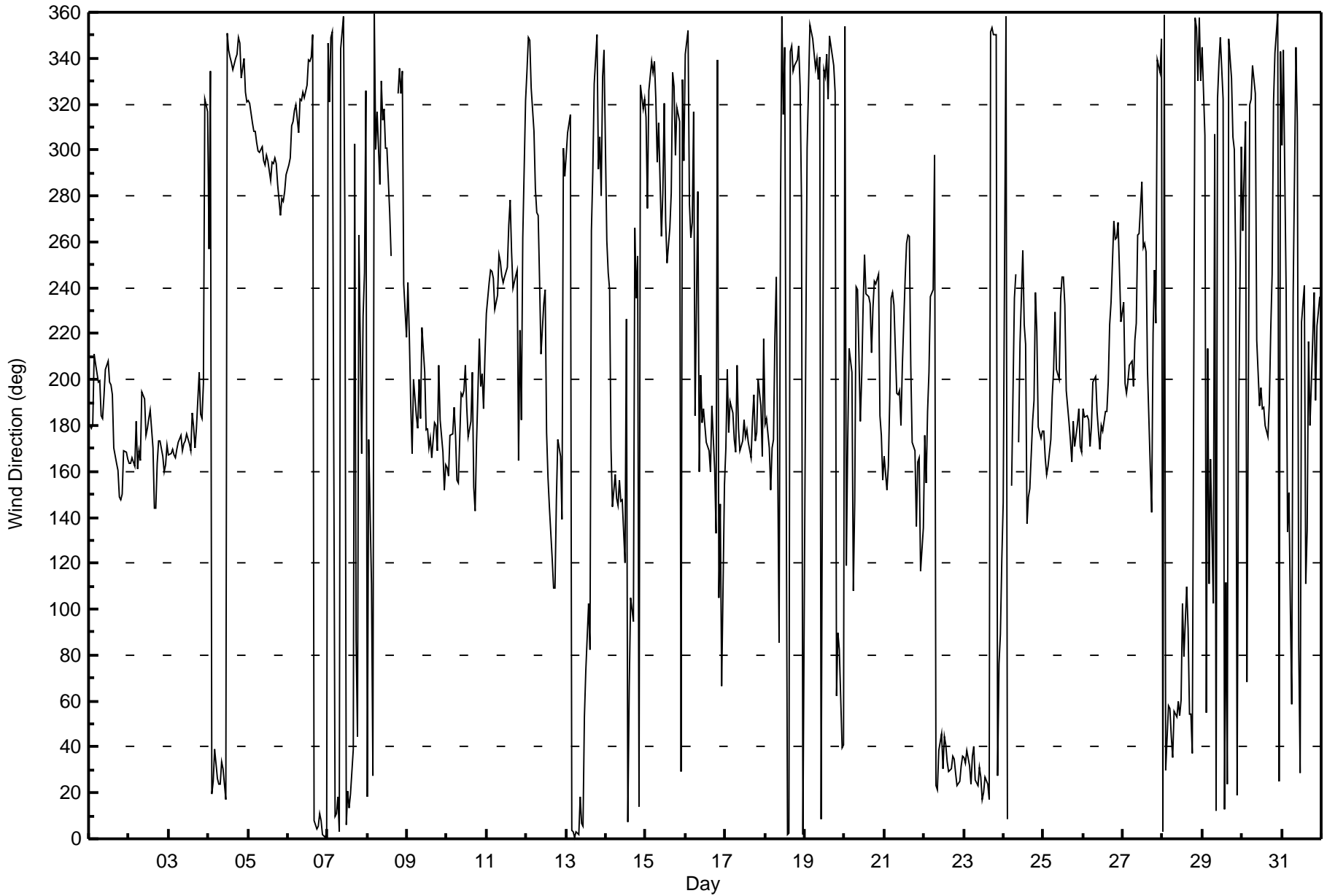
Wind Direction (WD) - deg
Barge Landing - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Dec 22 05:00 Minimum Value: 11 deg on Dec 9 01:00 Percentiles: P ₁ = 12 P ₁₀ = 17 Q ₁ = 19 Median = 24 O ₃ = 33 P ₉₀ = 55 P ₉₉ = 92		Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Hours of Calibration: 0 Percent Operational Time: 99.2																							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	24	25	26	24	24	22	24	24	24	23	25	25	25	24	26	21	18	15	13	15	15	17	17	18	26
2-Dec	17	23	21	20	21	17	22	21	25	28	24	24	25	24	20	25	81	23	23	26	24	21	22	24	81
3-Dec	23	23	24	22	22	23	25	23	23	23	22	25	25	25	21	22	20	23	35	22	28	24	40	92	92
4-Dec	70	19	21	20	21	19	22	21	21	21	21	23	21	19	19	18	21	24	20	20	19	19	19	22	70
5-Dec	22	22	28	30	29	32	33	29	27	29	29	30	31	30	32	32	30	29	29	23	29	27	29	32	33
6-Dec	28	29	24	23	26	21	24	17	18	19	21	24	19	20	19	19	17	18	19	20	17	18	20	20	29
7-Dec	27	25	18	17	20	18	20	19	16	54	56	59	21	23	16	24	53	48	22	80	33	42	74	53	80
8-Dec	96	90	27	30	19	24	25	15	29	22	15	32	38	33	18	AF	AF	AF	33	14	23	21	42	52	96
9-Dec	11	44	34	28	50	23	20	40	28	36	27	26	30	26	22	17	14	25	15	24	22	17	18	19	50
10-Dec	20	21	29	27	28	26	26	15	33	46	39	26	29	31	30	31	60	12	46	51	34	19	21	19	60
11-Dec	21	19	17	16	22	32	32	19	14	16	16	17	18	32	27	19	24	21	27	92	33	55	63	23	92
12-Dec	18	13	17	18	28	28	21	22	33	32	49	14	29	23	15	43	14	31	18	41	50	27	54	38	54
13-Dec	28	30	23	34	21	19	19	19	23	21	23	39	32	17	51	96	37	18	48	42	52	28	26	18	96
14-Dec	18	19	48	26	16	19	16	21	22	19	15	25	77	68	44	44	76	60	72	81	26	61	28	16	81
15-Dec	18	30	24	21	14	17	18	41	23	13	26	34	33	17	21	31	20	18	33	25	35	52	52	81	81
16-Dec	24	15	14	17	13	34	77	32	36	22	34	34	28	24	24	24	58	55	16	64	50	51	48	44	77
17-Dec	21	31	19	18	21	22	21	25	42	28	28	25	27	28	24	20	21	20	30	31	36	52	31	25	52
18-Dec	38	32	24	17	28	35	29	37	79	77	26	79	35	37	27	24	27	28	21	26	41	43	69	88	88
19-Dec	54	59	36	40	36	22	19	25	17	22	25	19	21	36	25	23	19	22	19	40	17	26	21	45	59
20-Dec	61	62	26	23	59	99	28	22	21	34	32	39	25	18	19	21	25	17	15	11	12	40	23	17	99
21-Dec	19	14	27	33	21	21	22	28	22	23	19	28	19	16	19	20	26	21	27	12	20	17	62	55	62
22-Dec	62	26	60	69	104	46	70	28	26	27	20	19	19	19	17	16	17	17	18	17	17	19	17	17	104
23-Dec	18	18	19	17	17	18	20	18	16	16	17	19	18	19	13	14	17	14	16	30	32	51	48	29	51
24-Dec	25	55	45	AF	AF	29	37	19	AF	14	24	50	27	52	16	17	21	32	29	52	49	29	15	18	55
25-Dec	17	13	11	12	13	18	25	18	22	23	14	23	23	33	28	18	26	13	17	16	22	22	20	17	33
26-Dec	19	24	21	23	21	26	21	21	23	23	25	28	24	27	28	30	21	29	13	12	23	14	14	23	30
27-Dec	25	23	25	29	18	17	18	47	35	22	42	27	44	36	93	33	21	22	25	19	42	20	27	15	93
28-Dec	17	17	23	19	19	19	19	19	21	20	20	25	26	53	28	34	22	20	50	22	20	21	18	26	53
29-Dec	36	57	52	87	70	56	91	57	69	83	52	47	88	85	71	84	45	76	55	40	81	66	94	64	94
30-Dec	56	57	75	76	79	43	24	56	22	62	27	32	28	26	24	21	23	31	19	41	17	17	27	29	79
31-Dec	21	27	81	21	23	23	68	60	31	55	46	82	61	33	70	55	53	36	50	35	29	28	38	50	82
Diurnal Maximum																									
96 90 81 87 104 99 91 60 79 83 56 82 88 85 93 96 81 76 72 92 81 66 94 92																									
AF - Analyzer Failure																									



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Barge Landing - December 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	10:58
Gas Cert Reference	LL107929	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	08-Spet-2018
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-593	-593
Analyzer IP address	192.168.1.43		Lamp voltage	841	841
Calculated slope	0.997298	1.000155	Chamber temp	45.0	45.0
Calculated intercept	0.724135	0.723869	Pressure	702.1	702.1
Analyzer Background	11.6	11.6	Flow	0.503	0.503
Analyzer Coefficient	0.819	0.819	Intensity	85	85

Analyzer make TEI 43i Analyzer serial # JC1327300932

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	60.4	600.4	598.7	1.003
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	60.4	600.4	599.5	1.001
second point	5000	30.2	300.2	300.2	1.000
third point	5000	15.1	150.1	148.0	1.014
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	60.4	600.4	600.0	1.001
Average Correction Factor					1.005

Corrected As found 598.9 Previous response 601.3 % change 0.4%

Notes:

No maintenance or adjustments done, filter changed out

Calibration Performed By: Melissa Lemay



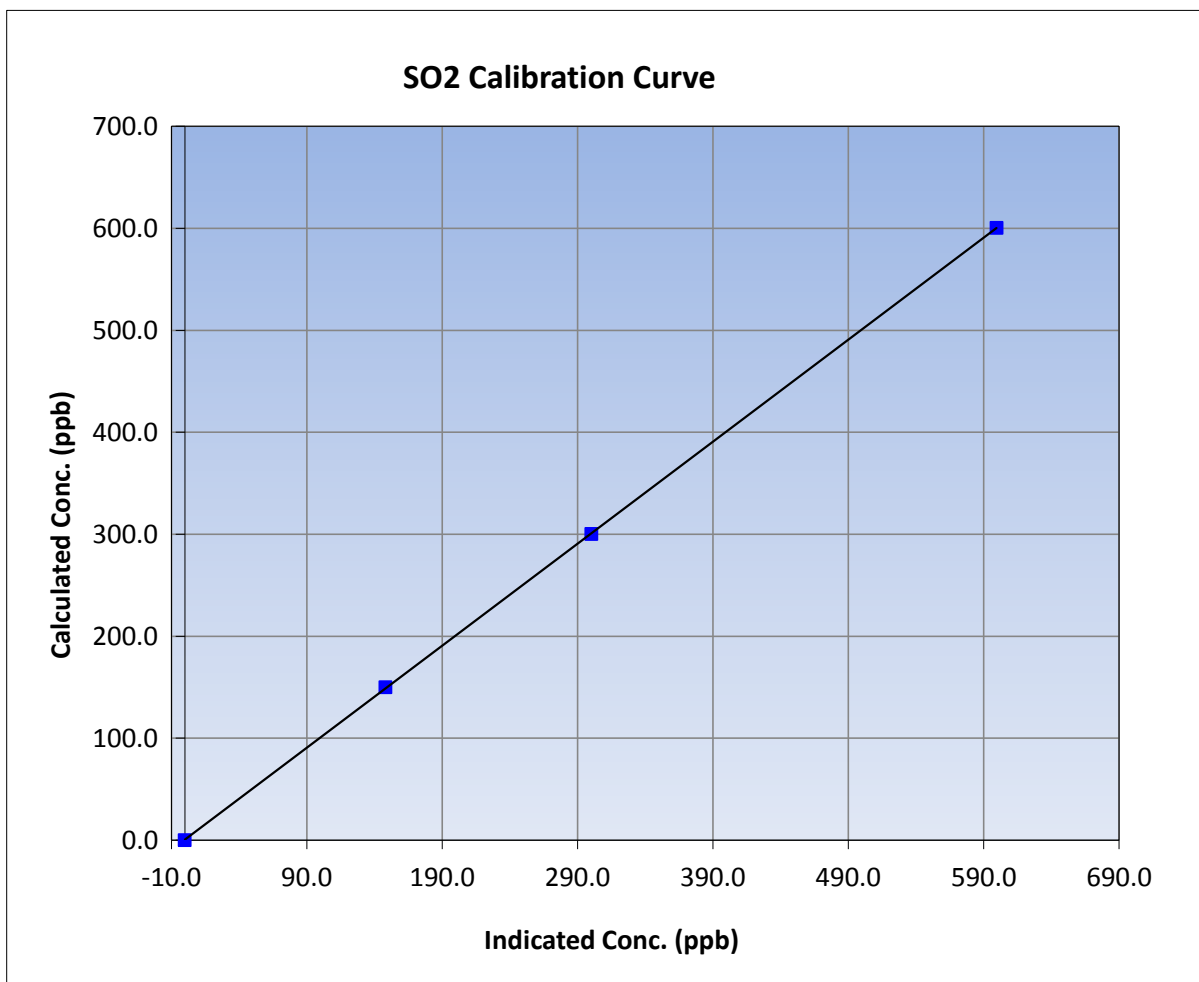
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:30	End Time (MST)	10:58
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

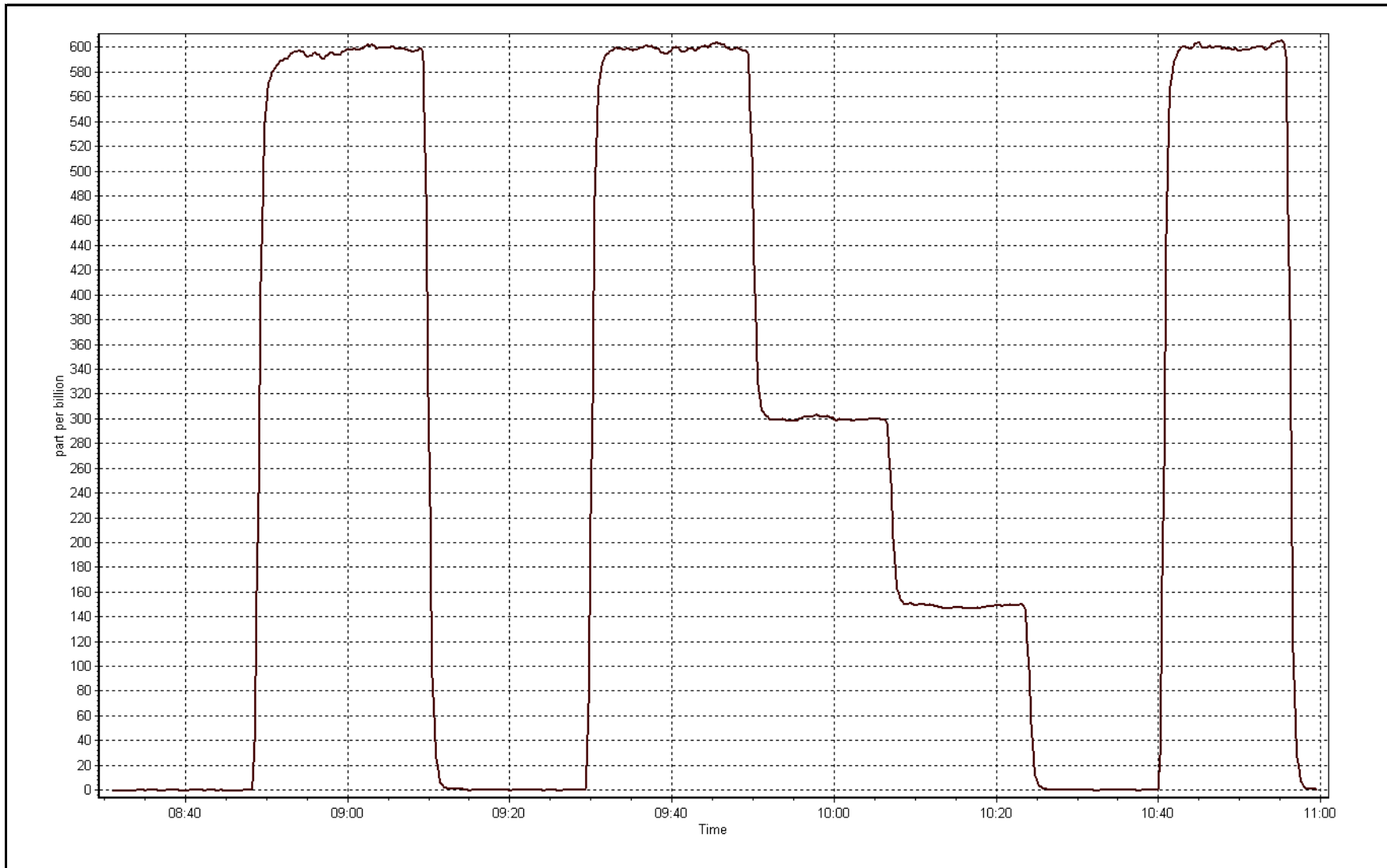
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999986
600.4	599.5	1.0015		
300.2	300.2	1.0000	Slope	1.000155
150.1	148.0	1.0141		
			Intercept	0.723869



SO2 Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	10:55	End Time (MST)	13:44
Gas Cert Reference	LL101590	Station temp.	22 Deg C
Cal Gas Concentration	9.75 ppm	Cal Gas Exp Date	2/22/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG air Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	08/09/2018 Praxair

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-618	-618
Analyzer IP address	192.168.1.42		Lamp voltage	879	879
Calculated slope	0.993960	0.989218	Chamber temp	45	45
Calculated intercept	-0.267235	0.125818	Pressure	555.3	555.3
Analyzer Background	14.1	14.7	Flow	1.054	1.054
Analyzer Coefficient	0.849	0.871	Intensity	94	94
			Converter temp.	330	330
Analyzer make/model	TEI 450i		Analyzer serial #	1336160094	
Converter make/model	na		Converter serial #	na	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.6	----
as found span	6000	46.1	74.9	73.9	1.014
SO2 scrubber check	5000	15.1	150.1	1.9	----
calibrator zero	6000	0.0	0.0	-0.1	----
high point	6000	46.1	74.9	75.6	0.991
second point	6000	25.8	41.9	42.3	0.991
third point	6000	15.4	25.0	25.1	0.997
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	46.2	75.1	75.7	0.992
Average Correction Factor					0.993

Corrected As found 73.3 Previous response 75.6 % change 3.2%

Notes:

Scrubber checked after as founds, zero and span adjusted, no maintenance done, filter changed out

Calibration Performed By:

_____ Melissa Lemay



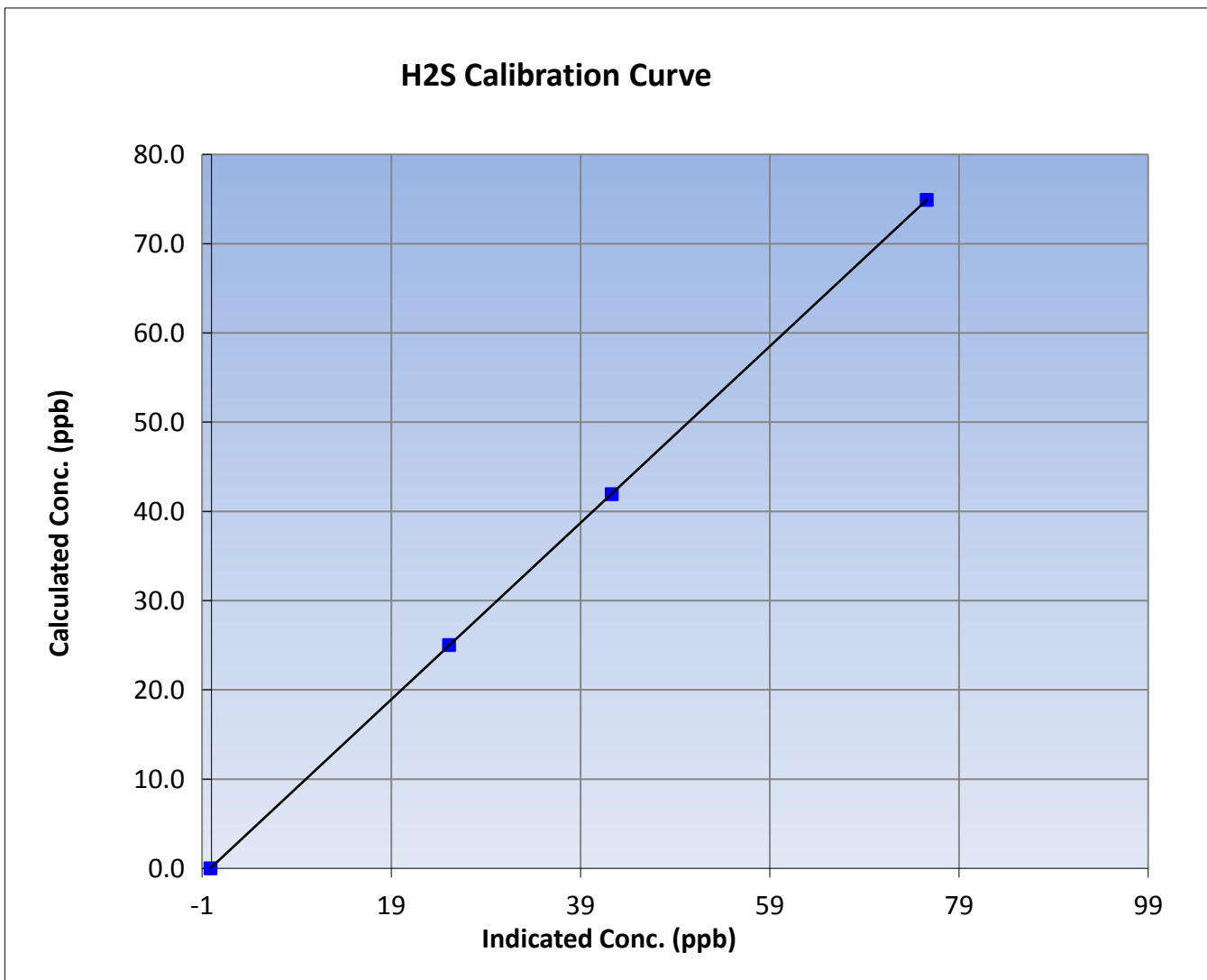
Wood Buffalo Environmental Association H2S Calibration Report

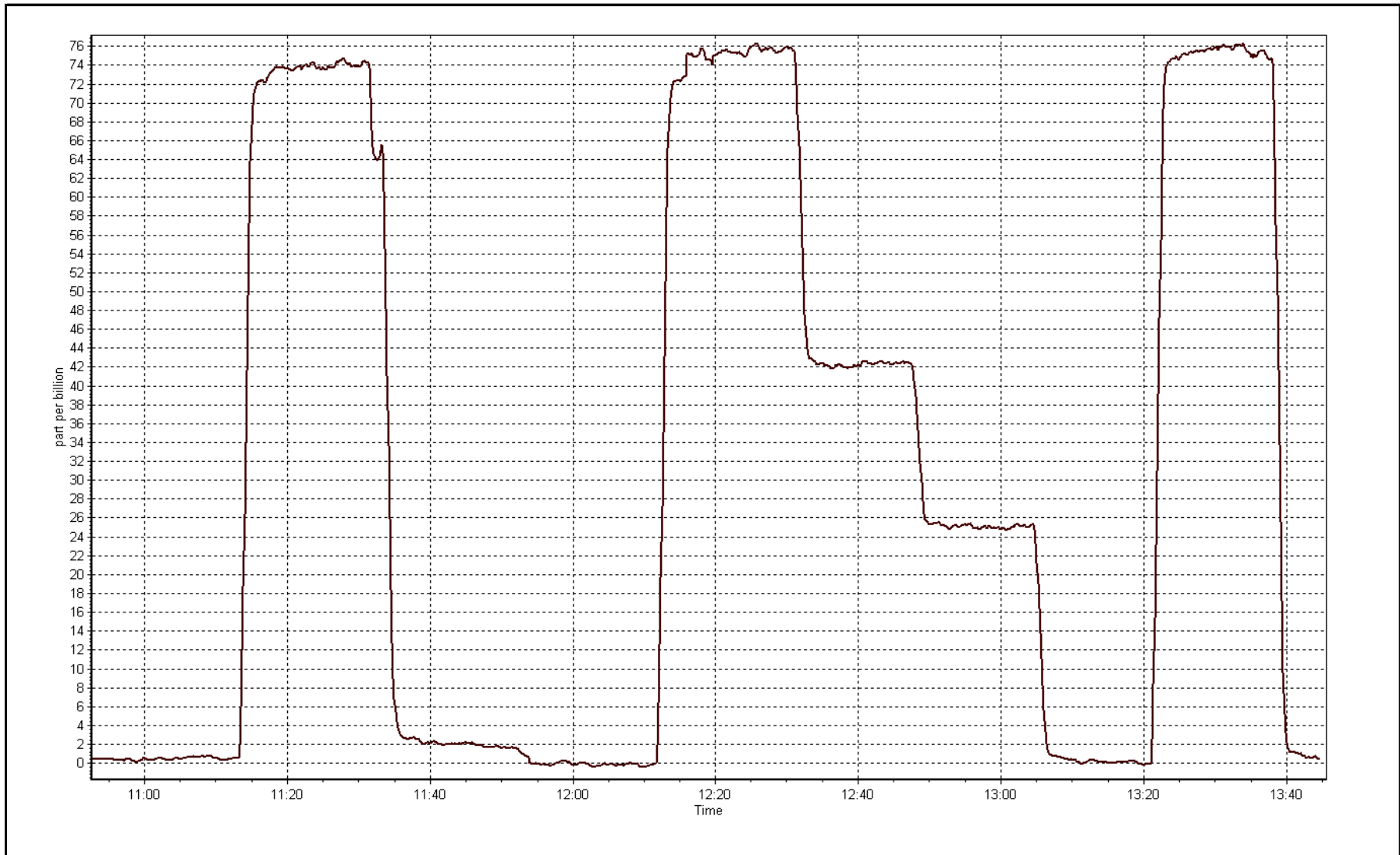
Station Information

Calibration Date	December 15, 2016	Previous Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	10:55	End Time (MST)	13:44
Analyzer make	Routine	Analyzer serial #	1336160094

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999997
74.9	75.6	0.9909		
41.9	42.3	0.9911	Slope	0.989218
25.0	25.1	0.9970		
			Intercept	0.125818







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	10:58
Gas Cert Reference	LL107929	Cal Gas Expiry Date	September 8, 2018
CH4 Cal Gas Conc.	514 ppm	CH4 Equiv Conc.	1061.3 ppm
C3H8 Cal Gas Conc.	199 ppm	Station temp.	21 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG make/model	Teledyne API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	30.4	30.4
Calculated slope	0.998141	0.992977	Fuel Pressure	19.9	19.9
Calculated intercept	0.004146	-0.021475	Analyzer Coeff	4.275	4.275
			Analyzer BKG	0.840	0.840

Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.02	----
as found span	5000	60.4	12.82	12.95	0.990
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	60.4	12.82	12.91	0.993
second point	5000	30.2	6.41	6.54	0.980
third point	5000	15.1	3.20	3.21	0.998
as left zero	5000	0.0	0.00	-0.01	----
as left span	5000	60.4	12.82	12.96	0.989
Average Correction Factor					0.991

Corrected As found	12.93	Previous response	12.84	% change	-0.7%
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Notes:

No adjustments done, filter changed out, hydrogen changed out

Calibration Performed By:

Melissa Lemay



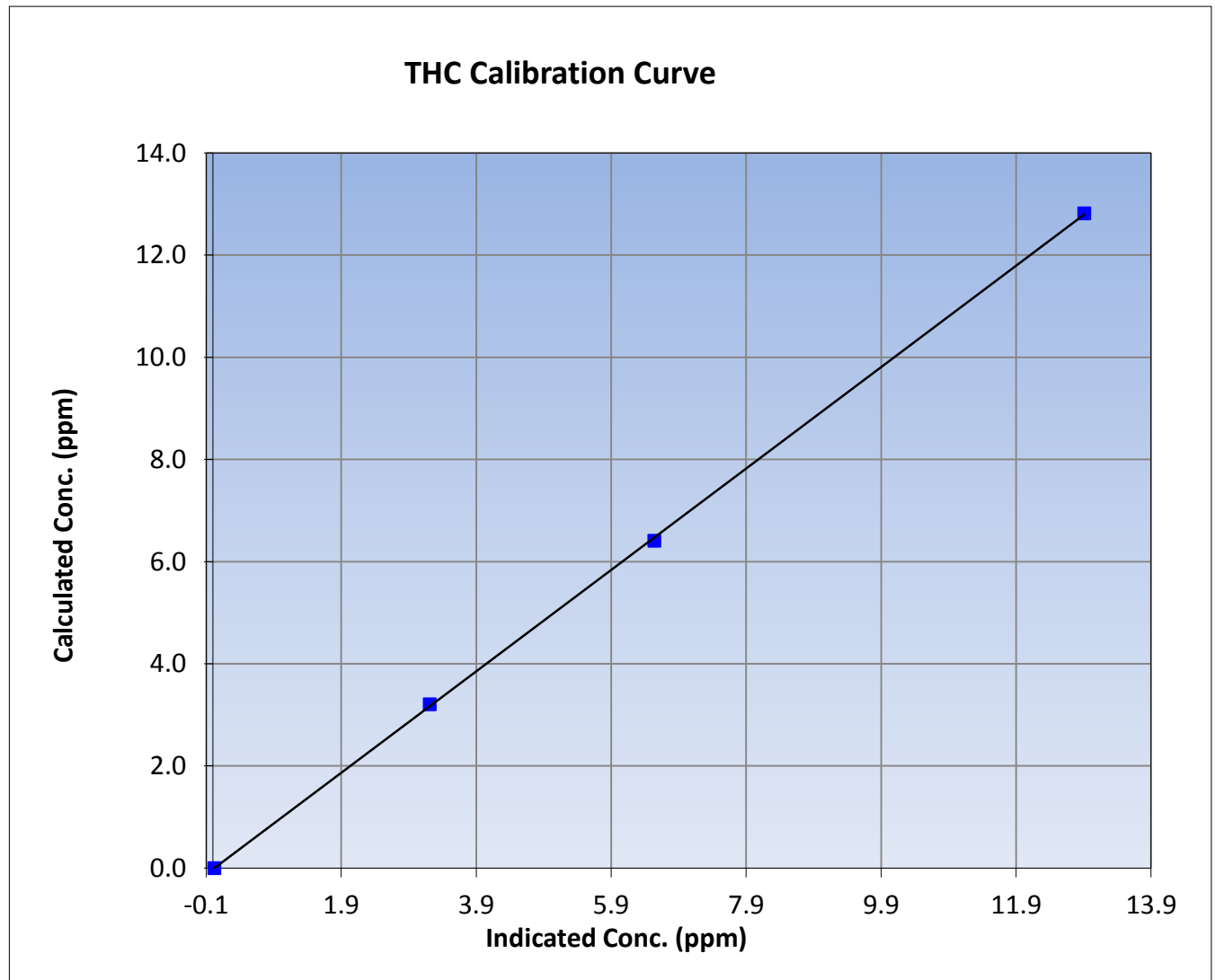
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 1, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:30	End Time (MST)	10:58
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

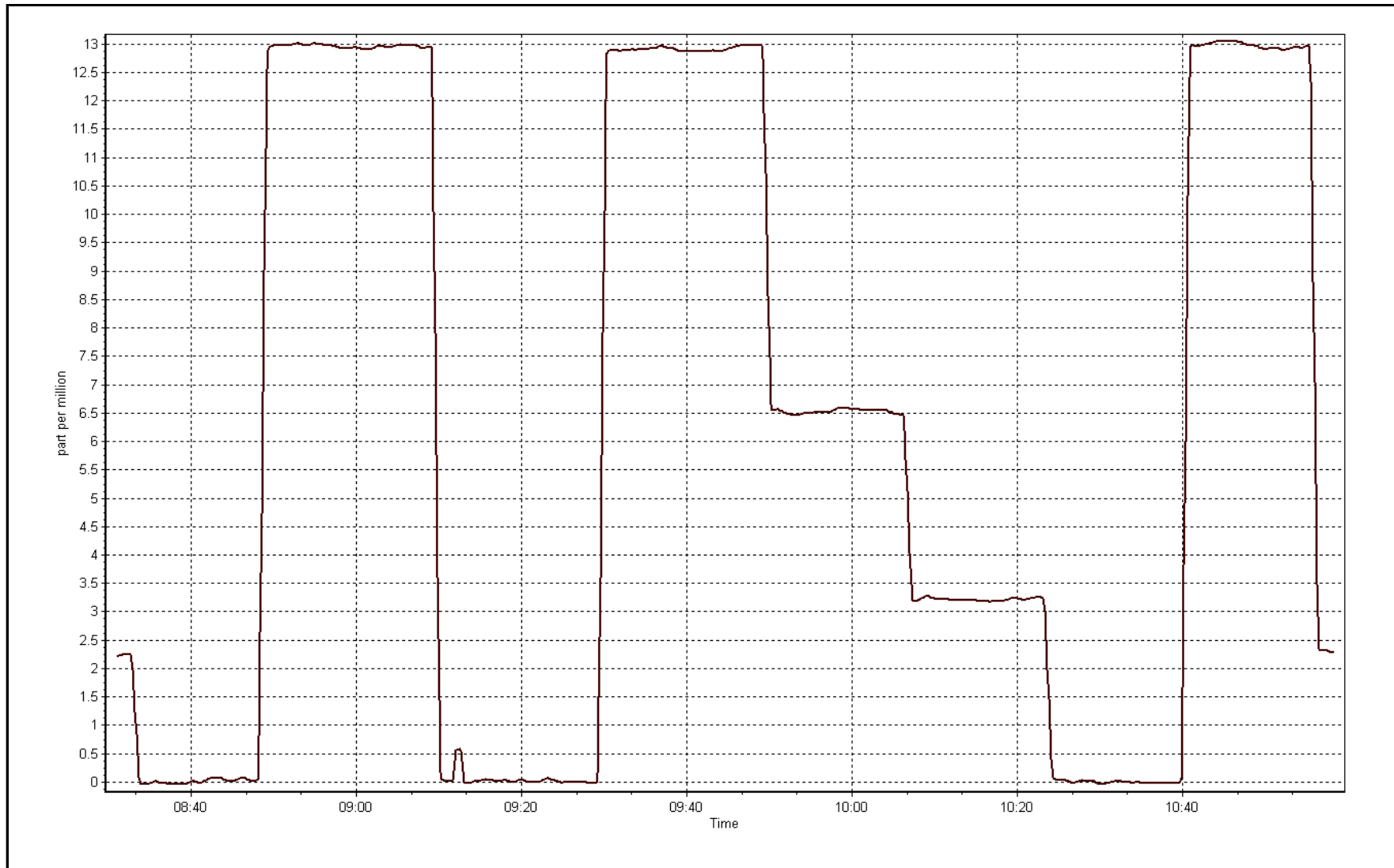
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999934
12.82	12.91	0.9930		
6.41	6.54	0.9801		
3.20	3.21	0.9984		
			Slope	0.992977
			Intercept	-0.021475



THC Calibration Plot

Date: December 15, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 11
LOWER CAMP
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	64	0	10	0
H2S (ppb) Average	709	35	35	100.00	9	0	2	0
THC (ppm) Average	709	35	35	100.00	5	-	3.3	-
Temperature (C) Average	744	0	0	100.00	1.1	-	-1.1	-
Relative Humidity (%) Average	744	0	0	100.00	94	-	87	-
Wind Speed 10 m (km/h) Average	741	0	3	99.60	25	-	20	-
Wind Direction 10 m (deg) Average	741	0	3	99.60	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1.8	5	-	0	0	0	0	1	4	64
H2S (ppb) Average	709	0.6	1	-	0	0	0	0	1	1	9
THC (ppm) Average	709	2.48	0.4	-	2	2.2	2.3	2.4	2.6	2.8	5
Temperature 2 m (C) Average	744	-17.99	9.1	-	-36.9	-30.1	-24.9	-17.8	-12.9	-4	1.1
Relative Humidity (%) Average	744	77.8	6	-	59	70	73	78	82	86	94
Wind Speed 10 m (km/h) Average	741	7.4	5	-	0	1	3	6	10	16	25
Wind Direction 10 m (deg) Average	741	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	08 Dec 2016 23:00	08 Dec 2016 23:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	24 Dec 2016 19:00	24 Dec 2016 19:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	25 Dec 2016 05:00	25 Dec 2016 05:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

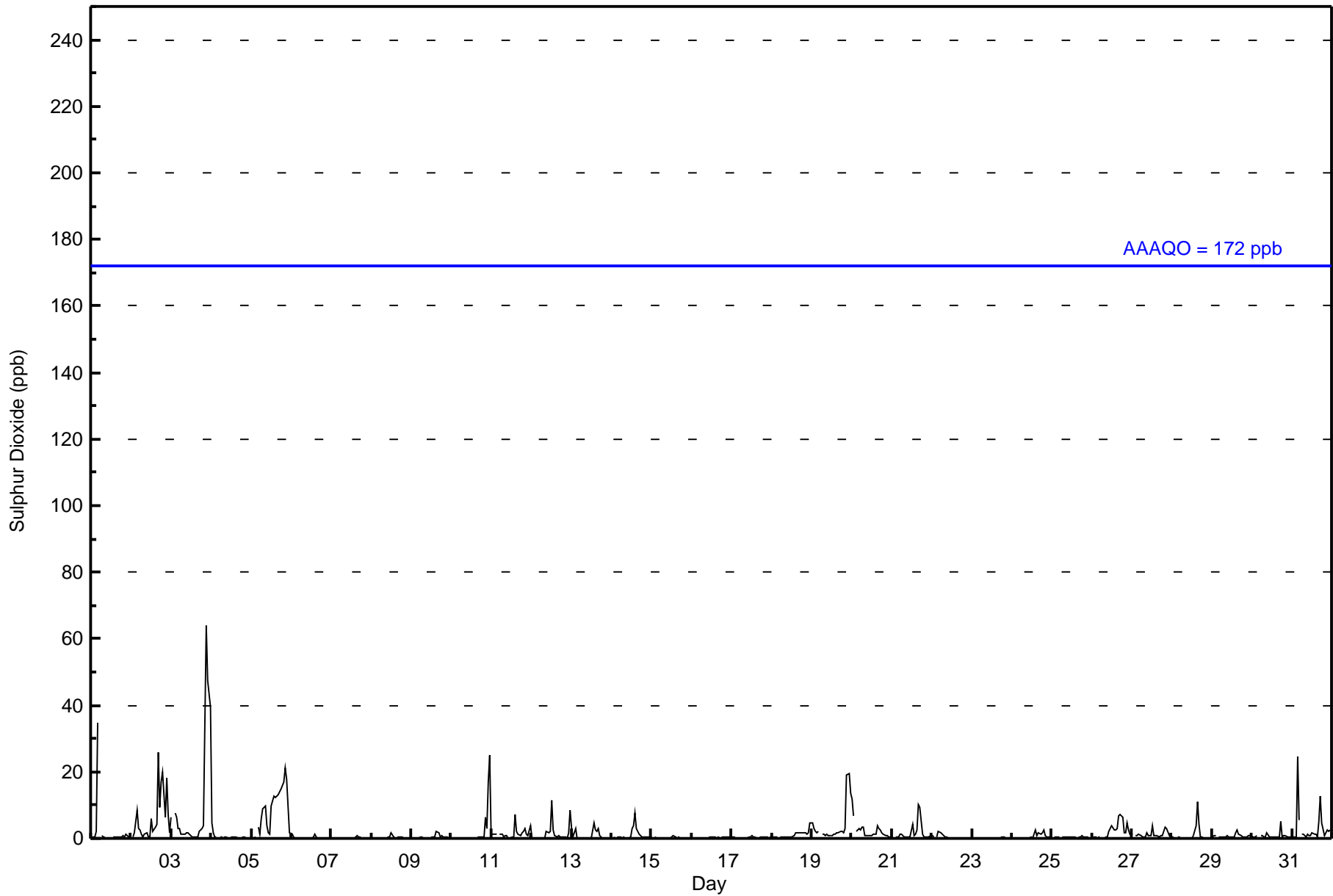
Sulphur Dioxide (SO₂) - ppb
Lower Camp - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																	Hours in Service: 744																								
Maximum Value: 64 ppb on Dec 3 22:00																	Maximum Daily Average: 10.0 ppb on Dec 3		Hours of Data: 709																						
Minimum Value: 0 ppb on Dec 7 22:00																	Minimum Daily Average: 0.2 ppb on Dec 7		Hours of Missing Data: 35																						
Maximum Diurnal Average: 4.6 ppb at hour 22																	Minimum Diurnal Average: 0.5 ppb at hour 11		Hours of Calibration: 35																						
Monthly Average: 1.8 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 4 P ₉₉ = 25		Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																	
1-Dec	0	0	0	2	35	Z	1	0	0	C	C	C	C	0	0	0	0	0	1	1	0	1	0	0																	
2-Dec	Z	0	2	9	3	3	1	0	1	2	0	0	6	2	3	4	26	9	17	20	6	18	7	2																	
3-Dec	7	Z	8	6	3	3	1	1	1	2	1	1	1	0	0	0	2	3	4	34	64	48	39																		
4-Dec	5	2	1	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0																		
5-Dec	0	0	0	Z	3	1	6	9	10	4	2	1	10	13	12	13	13	14	15	17	21	18	10	2																	
6-Dec	1	1	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0																	
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0																	
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0																	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	0	0	0	0																	
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	17	25																	
11-Dec	1	1	1	1	Z	1	1	0	1	1	0	0	0	7	2	1	1	2	2	3	1	1	1	4																	
12-Dec	0	0	0	0	Z	0	0	0	0	2	2	2	11	3	1	1	1	0	0	0	0	2	8	11																	
13-Dec	4	0	3	0	0	Z	0	0	0	0	0	0	0	5	3	2	3	1	0	0	0	0	0	0																	
14-Dec	Z	0	0	0	1	0	0	0	0	0	0	0	3	4	8	3	1	1	1	0	0	1	0	0																	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0																	
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0																	
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	2	2	2	2	2	2	2	1	2	5																	
19-Dec	4	3	2	2	2	Z	1	1	1	1	1	1	1	1	2	2	2	2	2	1	3	19	20	14																	
20-Dec	12	7	Z	2	3	3	3	3	1	1	1	1	1	1	1	4	3	2	2	1	1	1	1	1																	
21-Dec	0	Z	0	0	0	1	1	0	0	0	0	4	1	1	2	10	9	1	1	0	0	1	1	10																	
22-Dec	1	0	Z	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																	
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	2	1	1	2	1	0	0	0	0																	
25-Dec	0	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0																	
26-Dec	Z	0	0	0	0	0	0	0	1	1	2	3	4	3	2	3	7	7	6	2	2	5	2	1																	
27-Dec	1	Z	1	1	1	1	1	0	0	2	1	1	4	1	1	1	1	1	1	2	3	3	1	1																	
28-Dec	1	1	Z	0	0	0	0	0	0	0	0	0	0	1	4	11	4	0	0	0	0	0	0	0																	
29-Dec	0	1	1	Z	0	1	0	0	0	1	0	0	0	0	2	2	1	1	1	0	1	0	1	1																	
30-Dec	1	0	0	1	Z	1	1	1	0	2	1	0	0	0	1	0	5	1	1	1	0	1	0	0																	
31-Dec	0	0	0	24	5	Z	1	1	1	1	1	1	2	1	1	0	5	13	5	1	2	3	2	3																	
																	1.5	0.8	0.9	1.9	2.6	0.7	0.8	0.7	0.7	0.7	0.5	0.5	1.8	1.3	1.8	1.9	2.8	2.4	2.0	2.0	2.9	4.6	3.7	3.5	Diurnal Average
																	12	7	8	24	35	3	6	9	10	4	2	3	11	13	12	13	26	14	17	20	34	64	48	39	Diurnal Maximum
Z - zerospan C - Calibration																																									
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																																									



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Lower Camp - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Lower Camp - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	96.05	96.05
11 - 20	19	2.68	98.73
21 - 60	8	1.13	99.86
61 - 110	1	0.14	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Lower Camp - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	50	10	6	8	9	14	220	28	4	1	2	20	34	102	113	57	678
11 - 20	0	0	0	1	0	0	3	1	0	1	0	0	3	8	2	0	19
21 - 60	0	0	0	0	0	0	1	2	1	1	1	1	1	0	0	0	8
61 - 110	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	50	10	6	9	9	14	224	31	5	3	4	21	38	110	115	57	706

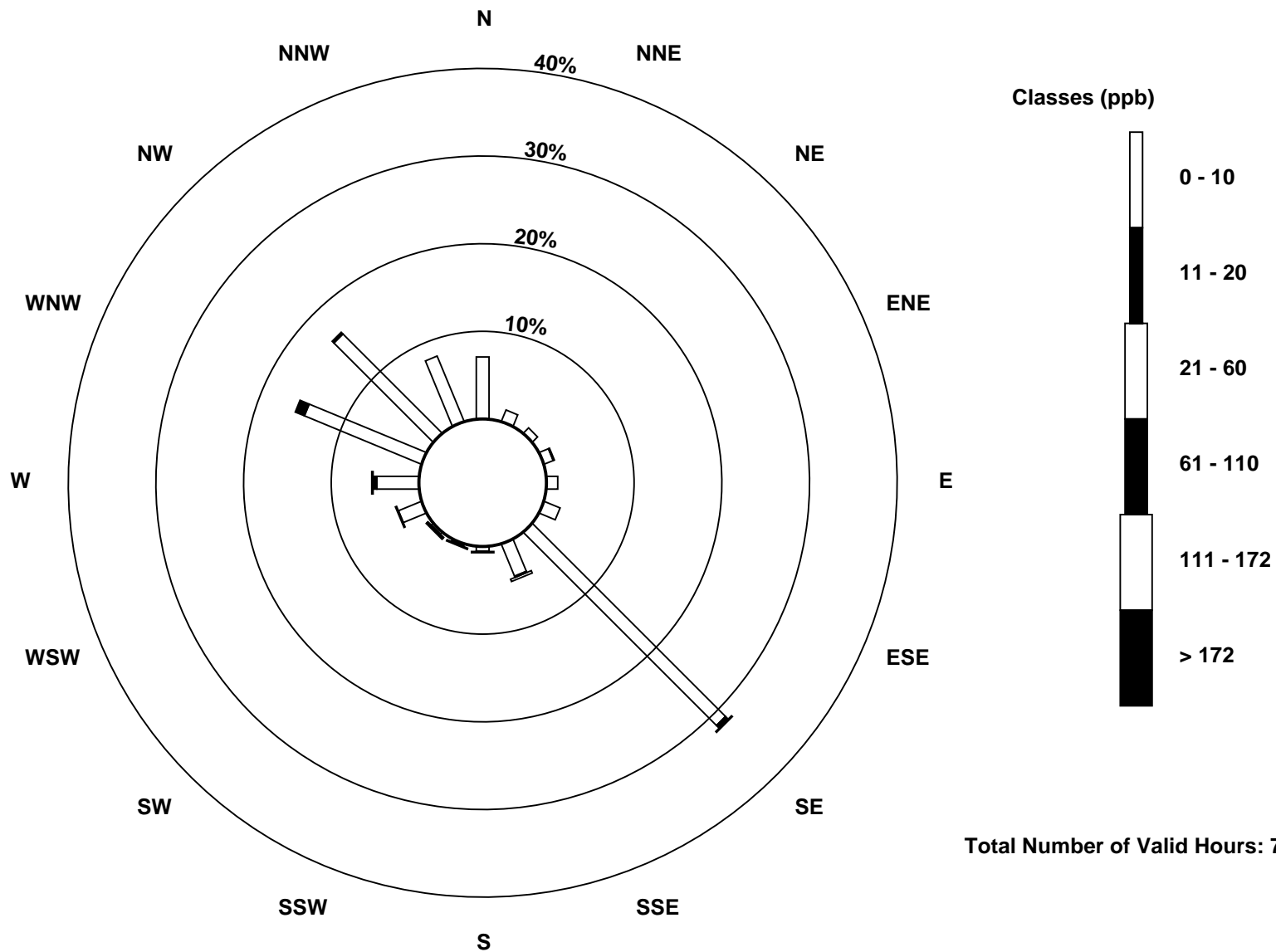
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Lower Camp (AMS 11)

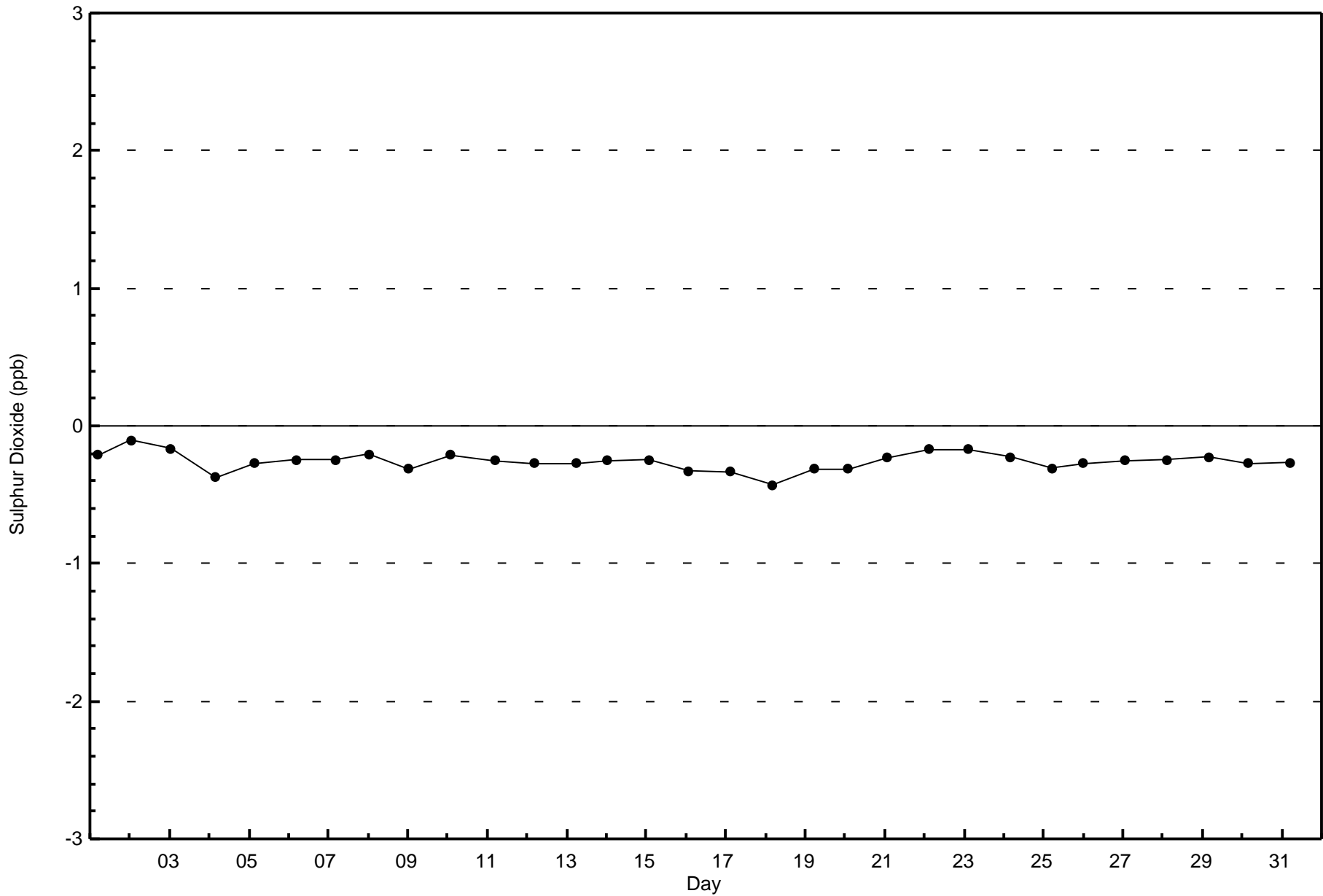


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

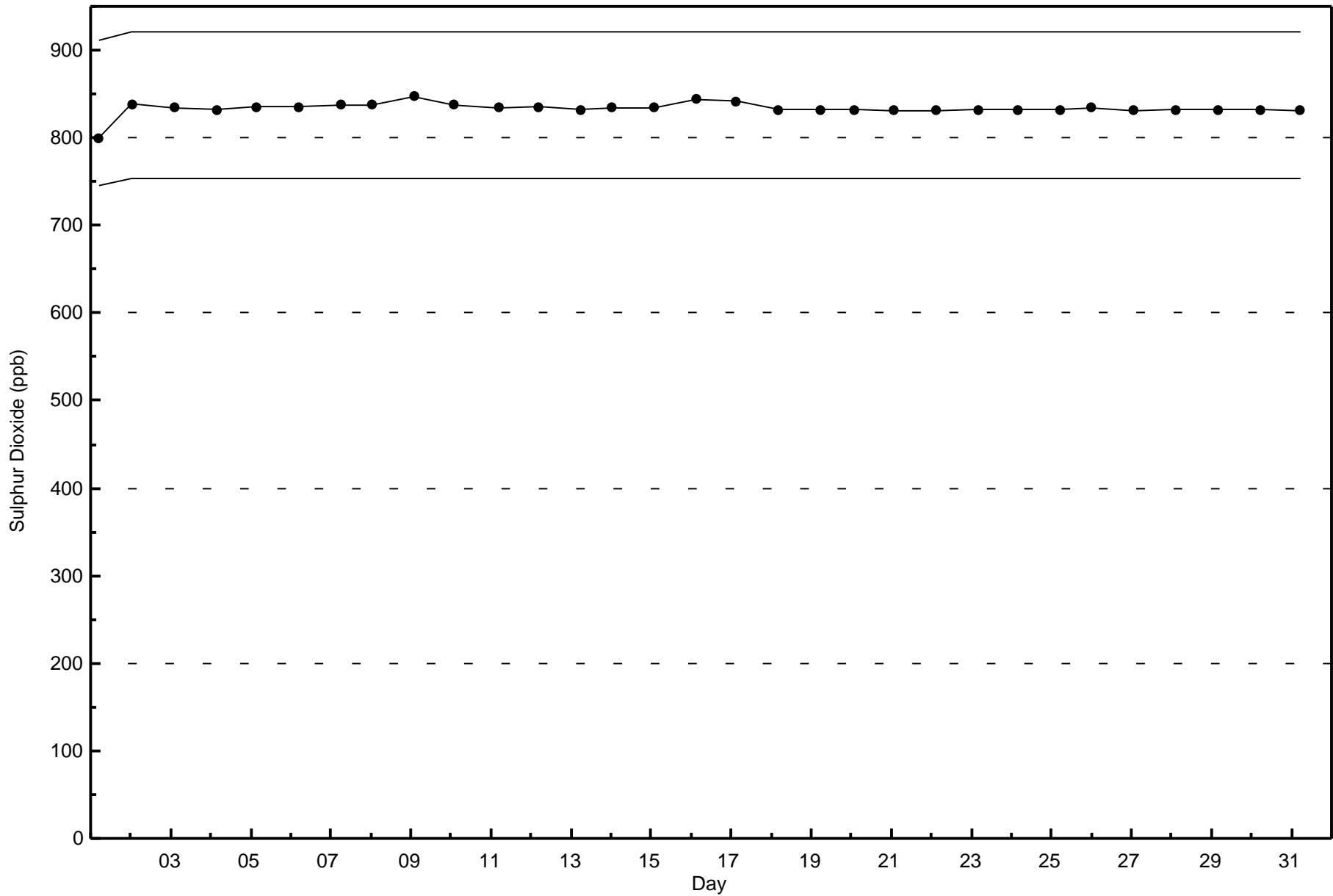
Sulphur Dioxide (SO₂) - ppb
Lower Camp - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Lower Camp - December 2016



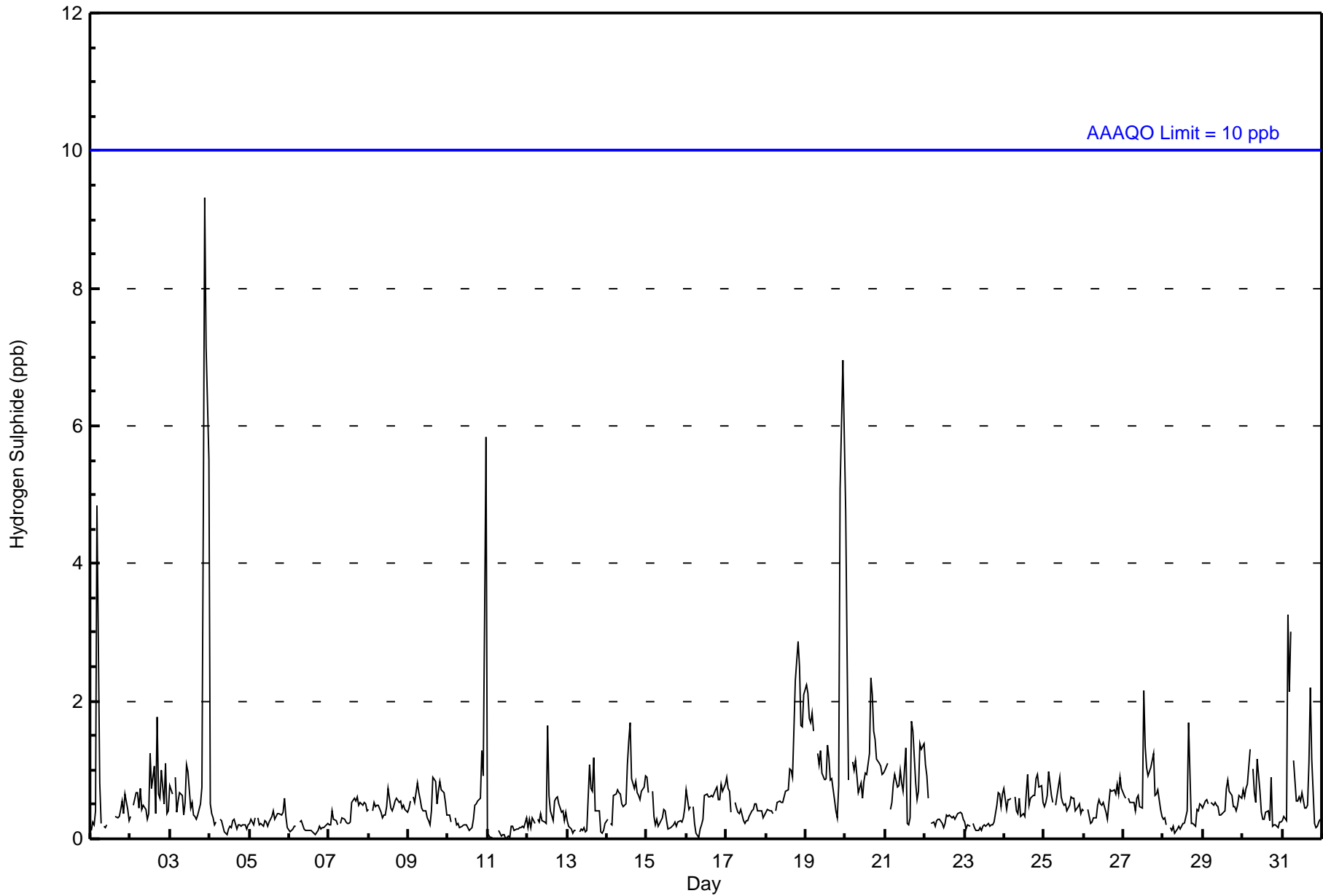


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 9 ppb on Dec 3 22:00										Maximum Daily Average: 1.8 ppb on Dec 19										Hours of Data: 709							
Minimum Value: 0 ppb on Dec 11 04:00										Minimum Daily Average: 0.1 ppb on Dec 11										Hours of Missing Data: 35							
Maximum Diurnal Average: 1.0 ppb at hour 24										Minimum Diurnal Average: 0.4 ppb at hour 9										Hours of Calibration: 35							
Monthly Average: 0.6 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 1 P ₉₉ = 5										Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	5	1	0	Z	0	0	0	C	C	C	C	0	0	0	0	1	0	1	0	0	0.6	5	
2-Dec	0	Z	0	1	1	0	1	0	0	0	0	0	1	1	1	0	2	1	1	1	1	1	0	0	0.7	2	
3-Dec	1	1	Z	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	1	1	5	9	7	6	1.6	9	
4-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1	
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	1	1	0.4	1	
8-Dec	0	Z	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	0	0	0	0.5	1	
9-Dec	0	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0.5	1	
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	3	6	0.7	6	
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	2	1	0	0	1	1	1	1	0	0	0	0	0.4	2	
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.3	1	
14-Dec	0	Z	0	0	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	0.7	2	
15-Dec	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
16-Dec	1	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	
17-Dec	1	1	1	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.4	1	
18-Dec	0	0	0	0	0	Z	0	1	1	1	1	1	1	1	1	1	1	2	2	3	3	2	2	2	1.0	3	
19-Dec	2	2	2	2	2	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	5	7	6	1.8	7
20-Dec	5	3	1	Z	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1.4	5	
21-Dec	1	1	Z	0	1	1	1	1	1	1	1	1	0	0	0	0	2	2	1	1	1	1	1	1	0.9	2	
22-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0.3	1	
24-Dec	1	0	1	1	1	Z	1	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.6	1	
25-Dec	0	1	1	1	1	1	Z	0	1	1	1	1	0	1	0	0	1	1	1	0	0	1	0	0	0.6	1	
26-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	0.5	1	
27-Dec	1	1	Z	1	1	1	1	0	1	1	0	0	2	1	1	1	1	1	1	1	1	1	0	0	0.8	2	
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0.3	2	
29-Dec	0	1	1	1	Z	1	0	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	0.5	1	
30-Dec	1	1	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0.5	1	
31-Dec	0	0	0	3	2	3	Z	1	1	1	1	1	1	0	0	0	1	2	1	0	0	0	0	0	0.9	3	
0.7 0.6 0.4 0.6 0.7 0.6 0.4 0.4 0.4 0.4 0.4 0.4 0.6 0.5 0.6 0.6 0.7 0.7 0.6 0.6 0.7 1.0 1.0 1.0																								Diurnal Average			
5 3 2 3 5 3 1 1 1 1 1 1 1 2 1 2 2 2 2 2 3 5 9 7 6																								Diurnal Maximum			
Z - zerospan C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																											



WBEA Data PC
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Lower Camp - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Lower Camp - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	693	97.74	97.74
3 - 4	6	0.85	98.59
5 - 7	9	1.27	99.86
8 - 11	1	0.14	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**WBEA Data PC
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	48	10	6	9	9	15	222	28	4	1	2	20	38	104	117	57	690
3 - 4	1	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	6
5 - 7	0	0	0	0	0	0	0	1	1	1	1	1	0	3	1	0	9
8 - 11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	49	10	6	9	10	15	222	30	5	3	4	21	39	107	119	57	706

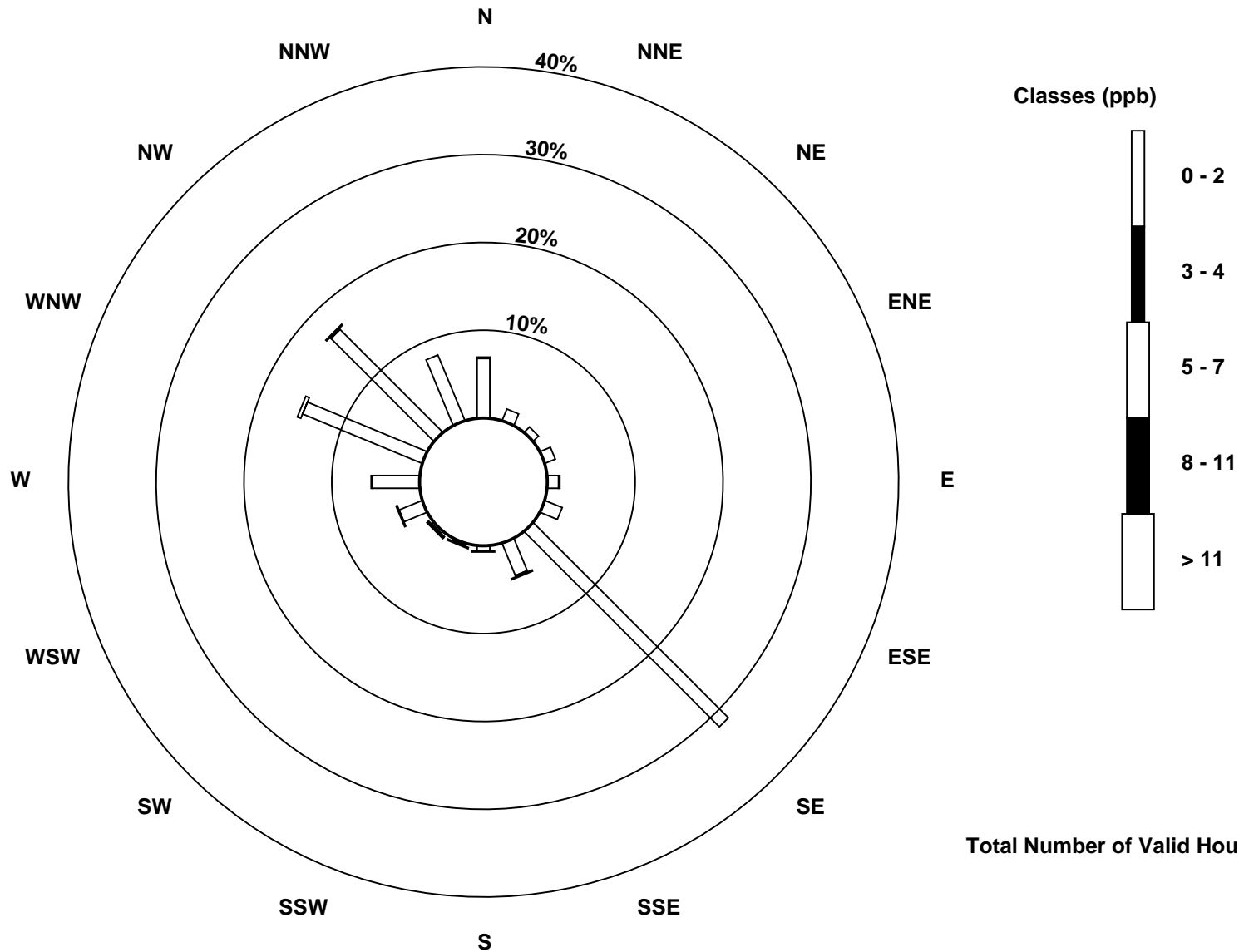
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Lower Camp (AMS 11)

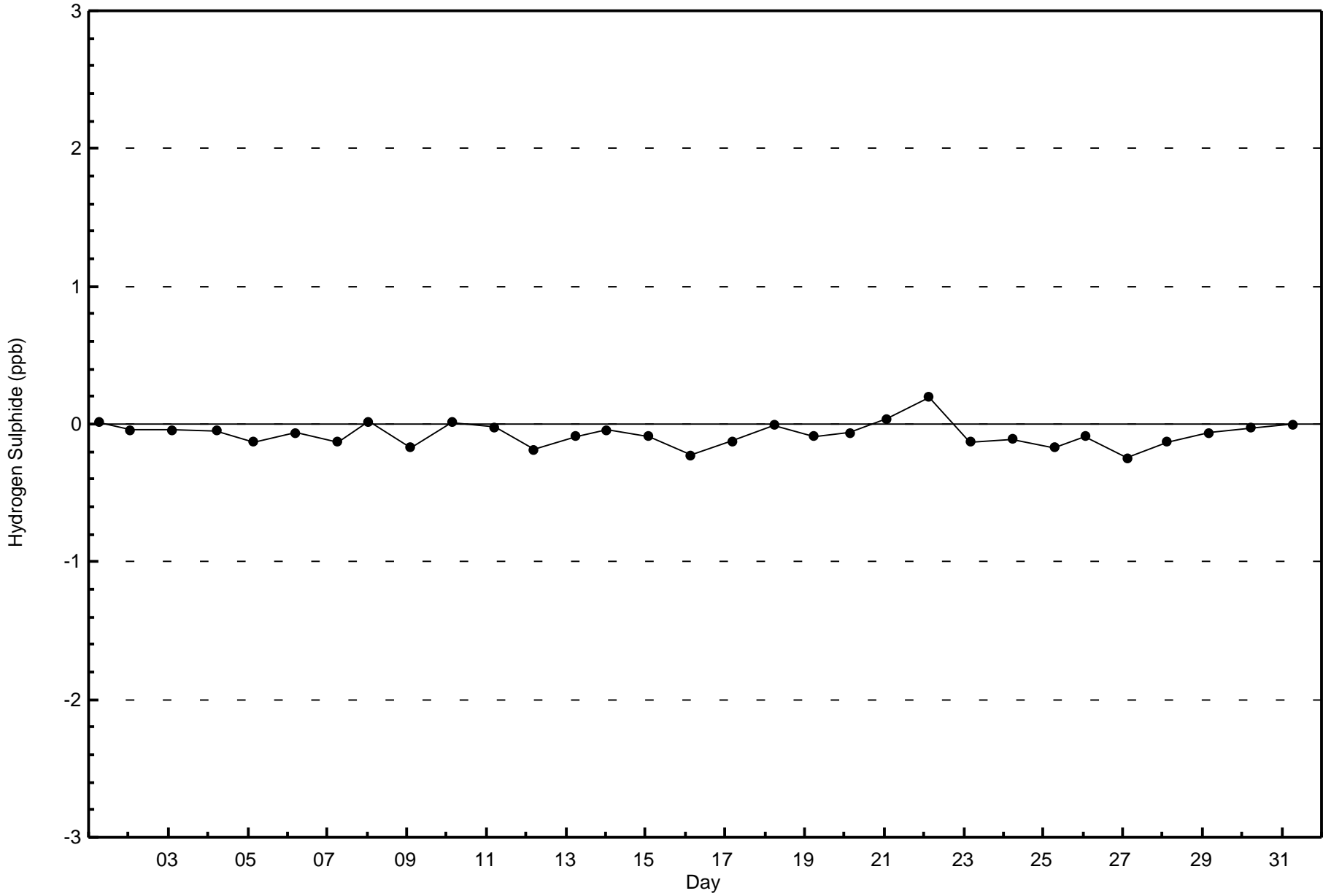


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

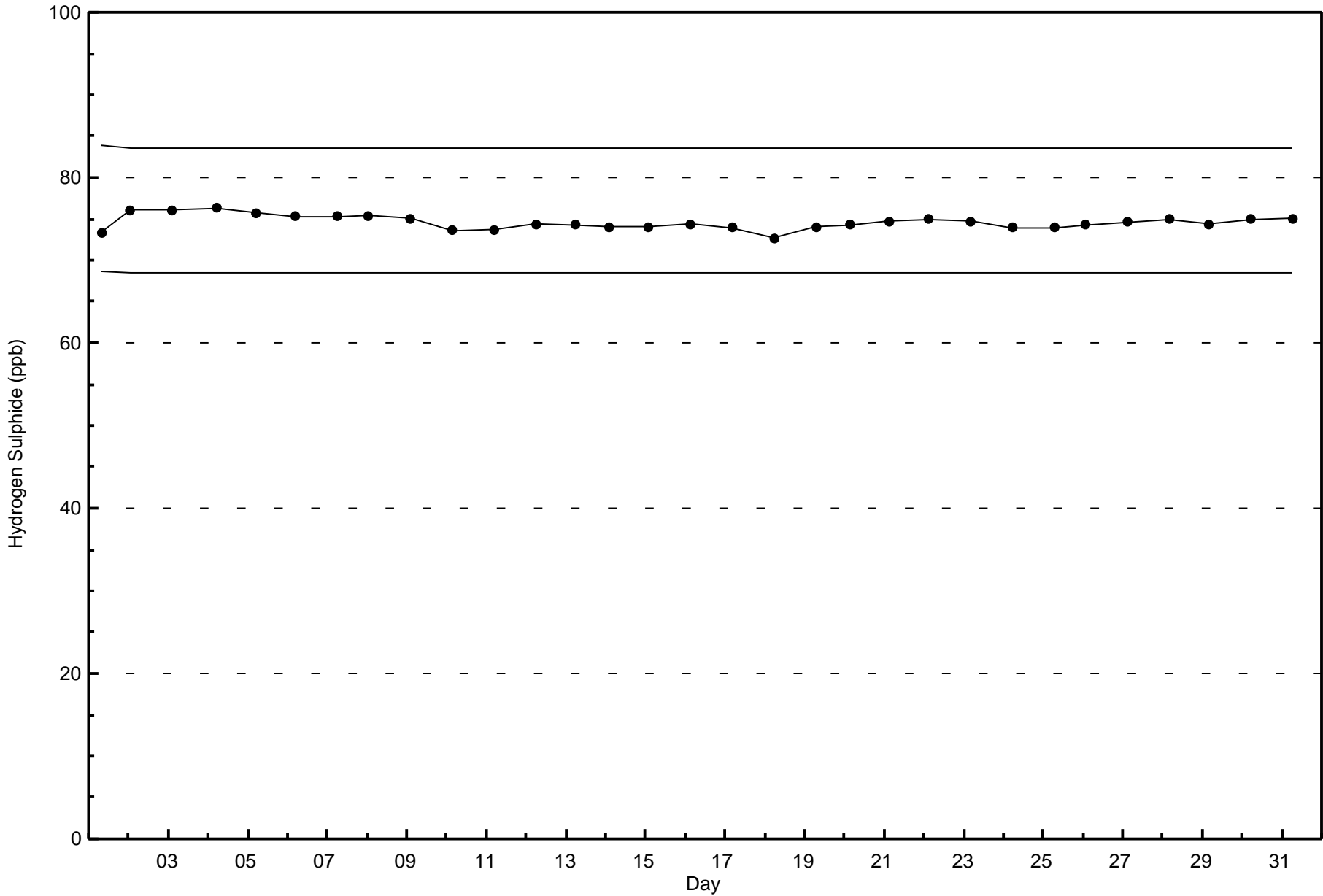
Hydrogen Sulphide (H₂S) - ppb
Lower Camp - December 2016





WBEA Data PC
Span Responses

Hydrogen Sulphide (H₂S) - ppb
Lower Camp - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

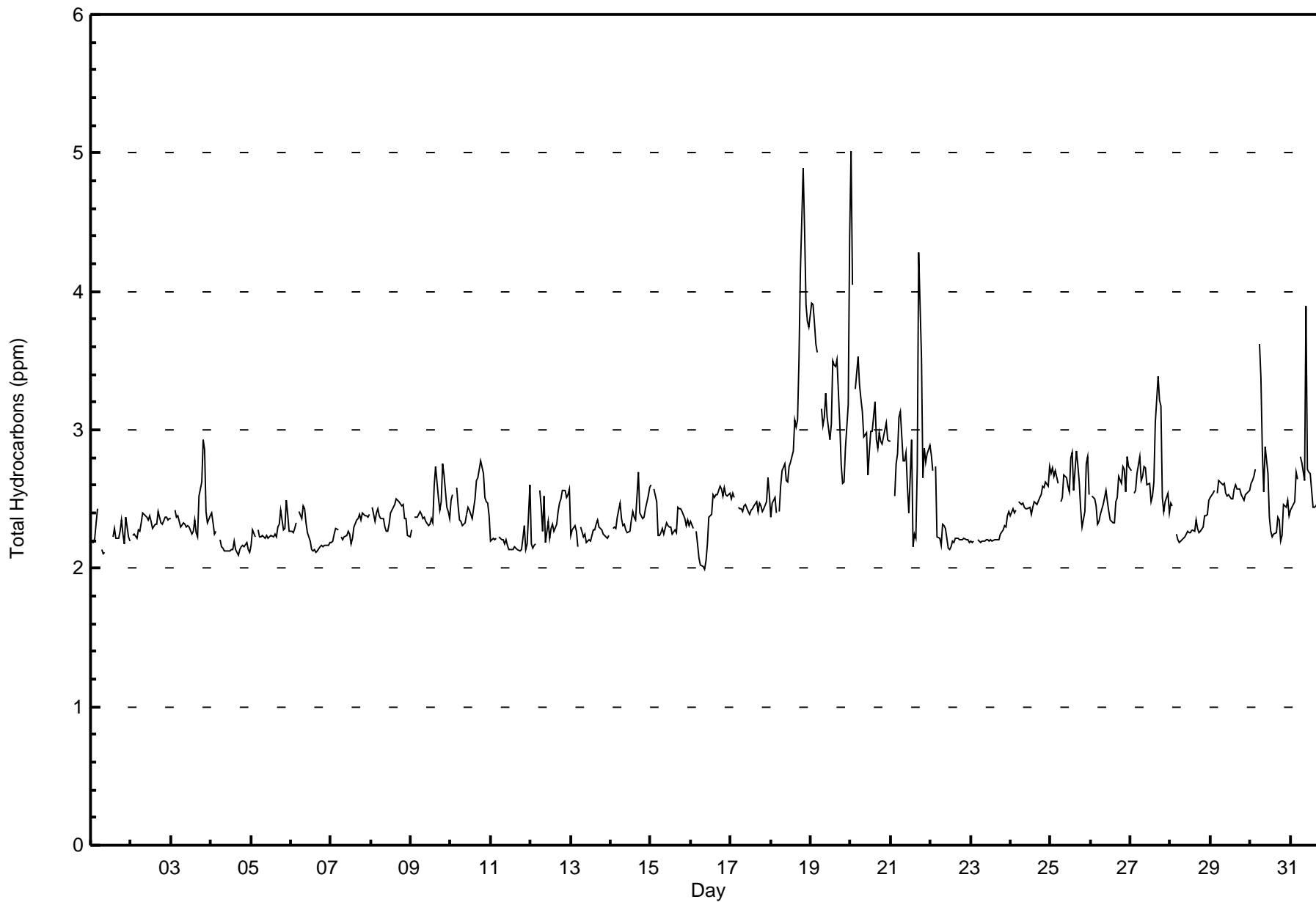
Lower Camp - December 2016

Maximum Value: 5.0 ppm on Dec 20 01:00																				Maximum Daily Average: 3.3 ppm on Dec 19					Hours in Service: 744			
Minimum Value: 2.0 ppm on Dec 16 09:00																				Minimum Daily Average: 2.2 ppm on Dec 4					Hours of Data: 709			
Maximum Diurnal Average: 2.6 ppm at hour 18																				Minimum Diurnal Average: 2.4 ppm at hour 12					Hours of Missing Data: 35			
Monthly Average: 2.48 ppm																				Percentiles: P ₁ = 2.1 P ₁₀ = 2.2 Q ₁ = 2.3 Median = 2.4 Q ₃ = 2.6 P ₉₀ = 2.8 P ₉₉ = 4.0					Hours of Calibration: 35			
																									Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	2.2	2.2	2.2	2.3	2.4	Z	2.1	2.1	2.1	C	C	C	C	2.2	2.3	2.2	2.2	2.3	2.3	2.2	2.2	2.4	2.2	2.2	2.2	2.2	2.4	
2-Dec	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.4	2.4	2.3	2.4	2.3	2.4	2.3	2.4
3-Dec	2.4	Z	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.5	2.6	2.9	2.9	2.4	2.3	2.4	2.4	2.9	2.4	
4-Dec	2.4	2.3	2.2	2.3	Z	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.4	2.1	
5-Dec	2.2	2.3	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.5	2.4	2.3	2.3	2.5	
6-Dec	2.3	2.3	2.3	2.3	Z	2.4	2.4	2.5	2.4	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5	
7-Dec	2.2	2.2	2.2	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4	
8-Dec	Z	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.2	2.2	2.4	2.5	
9-Dec	2.3	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.3	2.6	2.7	2.5	2.4	2.5	2.8	2.7	2.4	2.4	2.4	2.4	2.4	2.8	
10-Dec	2.5	2.5	Z	2.6	2.5	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.5	2.6	2.7	2.7	2.8	2.7	2.5	2.5	2.5	2.4	2.5	2.5	2.8	
11-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.3	2.1	2.2	2.6	2.2	2.2	2.6	
12-Dec	2.2	2.1	2.2	2.2	Z	2.6	2.4	2.3	2.5	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.5	2.5	2.6	2.4	2.6	2.6	
13-Dec	2.2	2.3	2.3	2.3	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	
14-Dec	Z	2.3	2.3	2.3	2.4	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.7	2.4	2.4	2.4	2.4	2.4	2.5	2.6	2.4	2.4	2.7	
15-Dec	2.6	Z	2.6	2.5	2.2	2.2	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.3	2.3	2.6	
16-Dec	2.3	2.3	Z	2.3	2.2	2.1	2.0	2.0	2.0	2.1	2.2	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.5	2.6	2.5	2.5	2.5	2.4	2.4	2.6	
17-Dec	2.5	2.5	2.5	Z	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.5	2.4	2.4	2.4	2.5	2.7	2.5	2.5	2.5	2.7	
18-Dec	2.4	2.5	2.5	2.4	Z	2.4	2.6	2.7	2.8	2.6	2.6	2.7	2.8	2.9	3.1	3.0	3.1	3.5	4.1	4.9	4.4	3.9	3.8	3.7	3.1	4.9		
19-Dec	3.9	3.9	3.8	3.6	3.6	Z	3.1	3.0	3.1	3.3	3.1	2.9	3.0	3.5	3.5	3.5	3.5	3.0	2.7	2.6	2.6	2.9	3.2	4.4	3.3	4.4		
20-Dec	5.0	4.1	Z	3.3	3.5	3.3	3.2	3.1	3.0	3.0	2.7	2.8	3.0	3.0	3.2	2.9	2.9	3.0	2.9	2.9	3.0	3.0	2.9	2.9	3.2	5.0	2.9	
21-Dec	2.9	Z	2.5	2.8	2.8	3.1	3.1	2.8	2.8	2.8	2.6	2.4	2.9	2.2	2.3	2.2	2.7	4.3	3.5	2.7	2.9	2.8	2.8	2.9	2.8	4.3		
22-Dec	2.8	2.7	Z	2.7	2.2	2.2	2.2	2.3	2.3	2.3	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.8		
23-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.2	2.4		
24-Dec	2.4	2.4	2.4	2.4	Z	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.7	2.5	2.7		
25-Dec	2.7	2.7	2.7	2.7	2.6	Z	2.5	2.5	2.7	2.7	2.6	2.6	2.8	2.8	2.6	2.8	2.7	2.6	2.4	2.3	2.4	2.8	2.8	2.5	2.6	2.8		
26-Dec	Z	2.5	2.5	2.4	2.3	2.3	2.4	2.5	2.5	2.6	2.5	2.4	2.4	2.3	2.3	2.5	2.5	2.7	2.6	2.7	2.7	2.6	2.8	2.7	2.5	2.8		
27-Dec	2.7	Z	2.5	2.6	2.7	2.8	2.6	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.6	3.1	3.4	3.2	3.2	2.5	2.4	2.5	2.5	2.4	2.7	3.4		
28-Dec	2.5	2.4	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.3	2.5		
29-Dec	2.5	2.5	2.6	Z	2.5	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	
30-Dec	2.6	2.6	2.7	2.7	Z	3.6	3.4	2.8	2.6	2.9	2.7	2.4	2.3	2.2	2.2	2.3	2.4	2.3	2.2	2.2	2.5	2.4	2.5	2.4	2.6	3.6		
31-Dec	2.4	2.4	2.5	2.7	2.6	Z	2.8	2.8	2.6	3.9	2.7	2.7	2.7	2.4	2.4	2.5	2.5	2.8	2.7	2.1	2.1	2.1	2.1	2.1	2.6	3.9		
																								Diurnal Average				
																								Diurnal Maximum				
Z - zerospan C - Calibration																												



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Lower Camp - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Lower Camp - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	3	0.42	0.42
2.1 - 3.0	663	93.51	93.94
3.1 - 10.0	43	6.06	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Lower Camp - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3
2.1 - 3.0	48	10	4	7	9	13	211	30	4	3	4	21	37	104	103	52	660
3.1 - 10.0	2	0	1	0	0	1	13	1	1	0	0	0	1	6	12	5	43
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	50	10	6	9	9	14	224	31	5	3	4	21	38	110	115	57	706

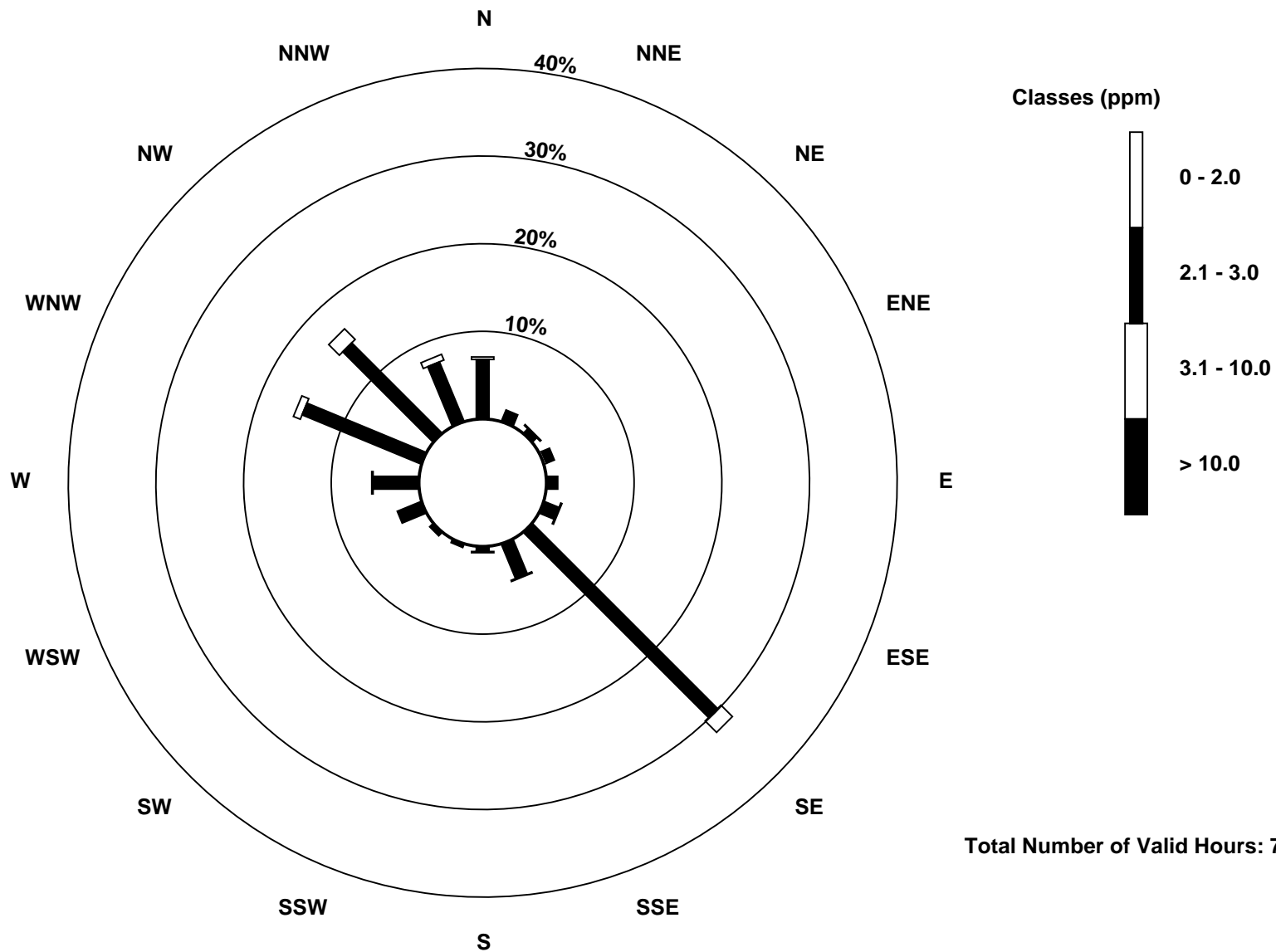
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

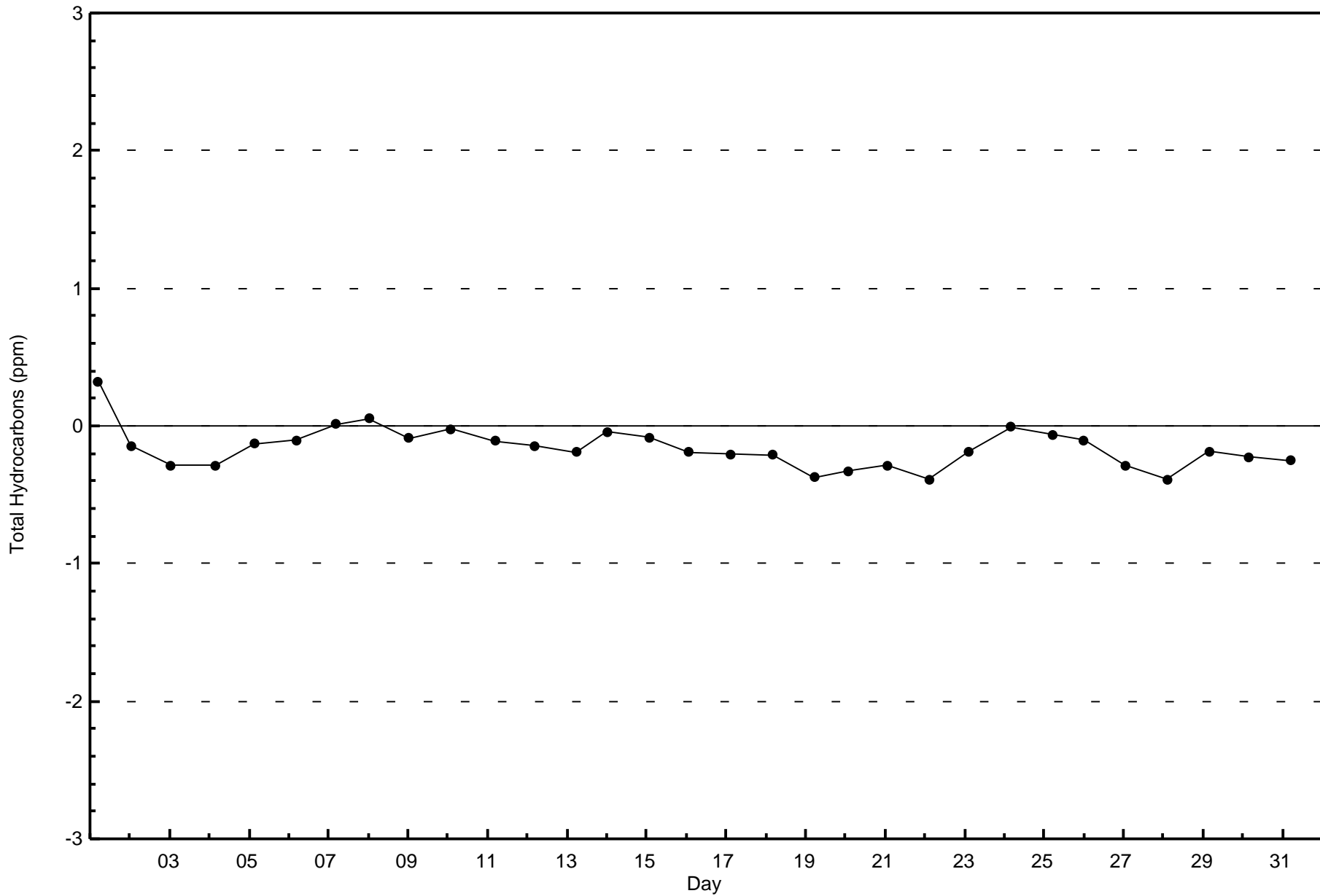
Total Hydrocarbons (THC) - ppm
Lower Camp (AMS 11)





WBEA Data PC
Zero Responses

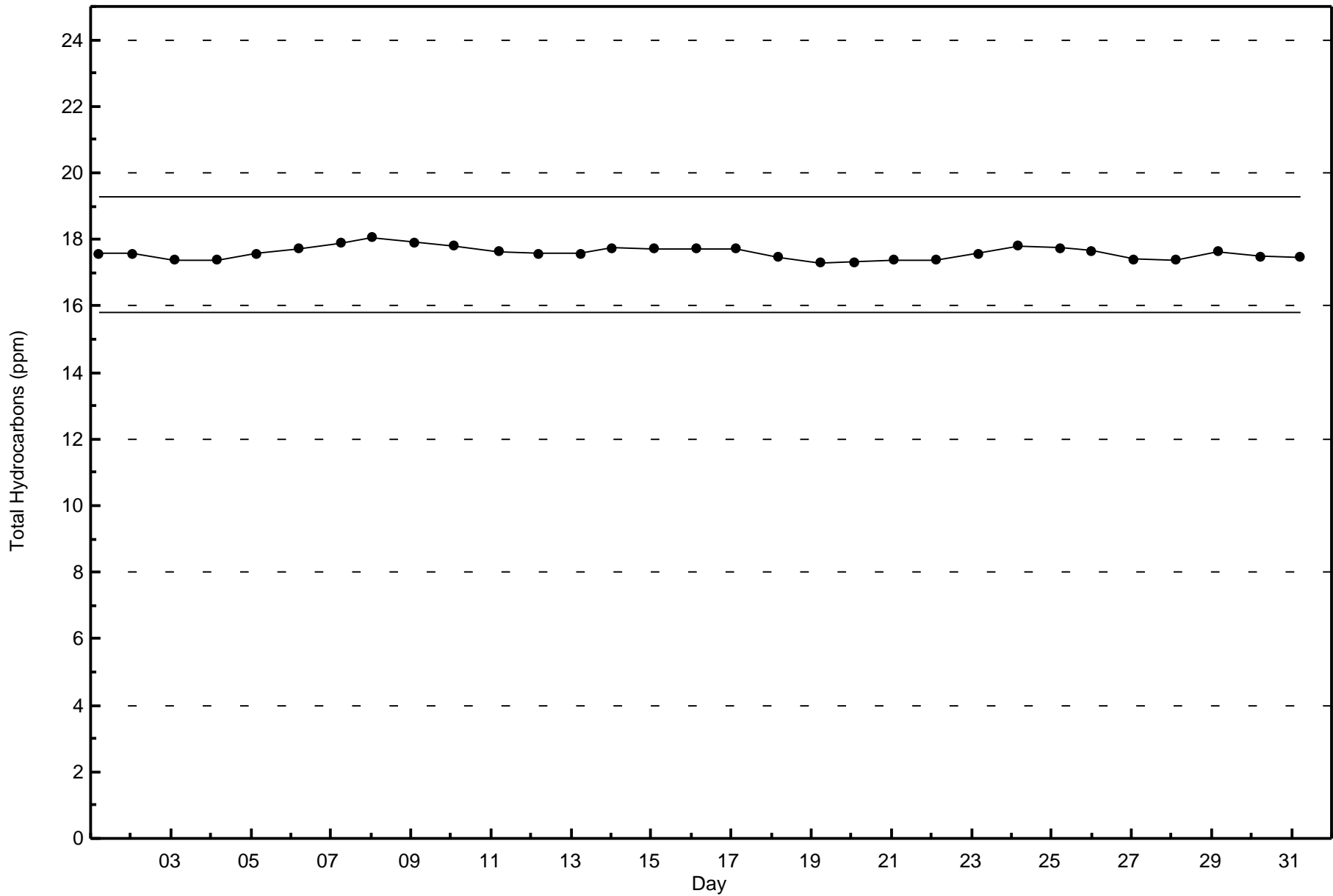
Total Hydrocarbons (THC) - ppm
Lower Camp - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Lower Camp - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

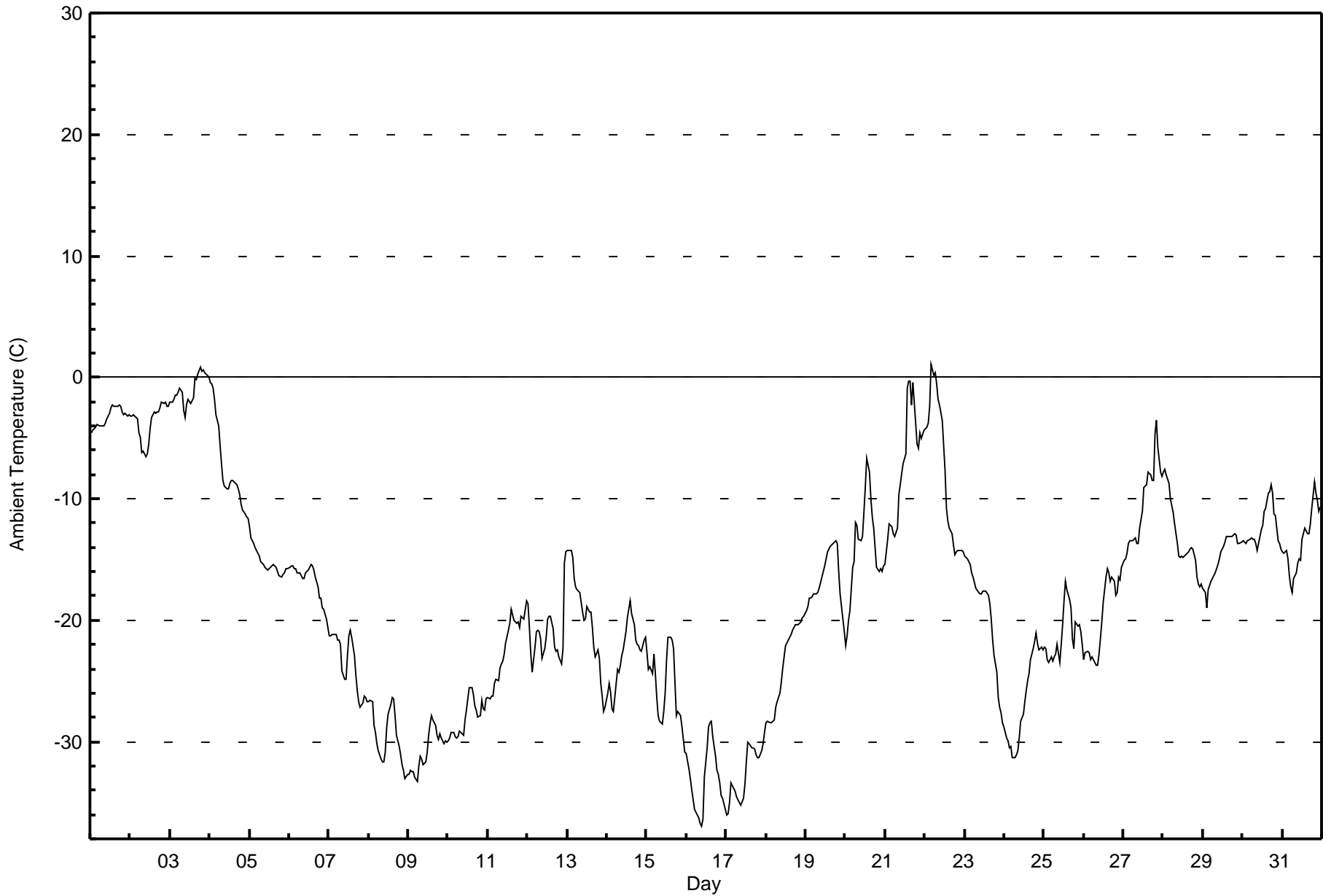
Ambient Temperature (AT) - C
Lower Camp - December 2016

Maximum Value: 1.1 C on Dec 22 05:00 Maximum Daily Average: -1.1 C on Dec 3		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -36.9 C on Dec 16 10:00 Minimum Daily Average: -33.2 C on Dec 16 Maximum Diurnal Average: -16.0 C at hour 15 Minimum Diurnal Average: -19.2 C at hour 10 Monthly Average: -17.99 C Percentiles: P ₁ = -35.6 P ₁₀ = -30.1 Q ₁ = -24.9 Median = -17.8 Q ₃ = -12.9 P ₉₀ = -4.0 P ₉₉ = 0.1																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.6	-4.4	-4.2	-4.1	-3.9	-4.0	-4.0	-4.0	-4.0	-3.8	-3.4	-3.0	-2.5	-2.3	-2.4	-2.4	-2.4	-2.3	-2.4	-2.8	-3.0	-3.0	-3.2	-3.1	-3.3	-2.3
2-Dec	-3.2	-3.1	-3.1	-3.3	-3.4	-4.6	-4.9	-6.2	-6.0	-6.6	-6.3	-5.6	-4.3	-3.3	-2.9	-2.9	-2.9	-2.9	-2.5	-2.0	-2.1	-2.0	-2.4	-2.3	-3.7	-2.0
3-Dec	-2.1	-2.0	-1.8	-1.5	-1.5	-1.2	-0.9	-1.3	-2.7	-3.3	-2.2	-1.8	-2.1	-2.0	-1.6	-0.1	-0.2	0.2	0.8	0.5	0.6	0.4	0.2	0.0	-1.1	0.8
4-Dec	-0.4	-0.5	-0.9	-1.8	-3.1	-4.0	-5.6	-7.1	-8.5	-9.0	-9.2	-9.2	-8.7	-8.5	-8.5	-8.6	-8.9	-9.1	-9.6	-10.5	-10.9	-11.3	-11.5	-11.6	-7.4	-0.4
5-Dec	-12.2	-13.2	-13.7	-14.0	-14.3	-14.5	-14.7	-15.1	-15.4	-15.7	-15.8	-15.8	-15.8	-15.5	-15.4	-15.5	-15.7	-15.9	-16.4	-16.4	-16.3	-16.1	-15.8	-15.7	-15.2	-12.2
6-Dec	-15.7	-15.6	-15.6	-15.7	-15.7	-16.0	-16.1	-16.4	-16.6	-16.6	-16.1	-15.9	-15.6	-15.4	-15.6	-15.8	-16.5	-17.3	-18.2	-18.2	-18.9	-19.1	-19.9	-20.6	-16.8	-15.4
7-Dec	-21.3	-21.2	-21.2	-21.2	-21.1	-21.7	-21.6	-21.9	-24.2	-24.9	-24.9	-22.9	-21.3	-20.8	-21.4	-22.9	-24.5	-25.7	-26.7	-27.2	-26.8	-26.3	-26.4	-26.7	-23.5	-20.8
8-Dec	-26.7	-26.5	-26.7	-28.6	-29.2	-30.1	-30.8	-31.4	-31.7	-31.7	-30.8	-28.9	-27.8	-26.9	-26.4	-26.5	-27.8	-29.4	-30.4	-31.1	-31.9	-32.3	-33.0	-32.7	-29.6	-26.4
9-Dec	-32.7	-32.4	-32.5	-32.5	-33.0	-33.3	-32.0	-31.2	-31.4	-31.9	-31.7	-30.8	-29.5	-28.5	-27.9	-28.2	-28.7	-29.5	-29.8	-29.4	-29.7	-30.2	-30.0	-30.0	-30.7	-27.9
10-Dec	-30.0	-29.8	-29.3	-29.3	-29.6	-29.7	-29.6	-29.1	-29.4	-29.4	-28.3	-27.5	-26.5	-25.5	-25.5	-26.1	-27.1	-27.4	-28.0	-27.9	-26.6	-27.3	-27.4	-26.5	-28.0	-25.5
11-Dec	-26.3	-26.5	-26.2	-26.2	-25.2	-24.8	-24.9	-23.9	-23.6	-23.4	-22.8	-21.9	-20.9	-20.2	-19.1	-19.6	-20.1	-20.2	-20.1	-20.6	-19.7	-19.7	-19.9	-18.4	-22.3	-18.4
12-Dec	-18.6	-20.7	-22.8	-24.3	-22.2	-20.9	-20.8	-21.0	-21.5	-23.1	-22.3	-21.4	-19.9	-19.6	-19.7	-20.7	-22.2	-22.6	-22.5	-23.1	-23.6	-22.4	-15.3	-14.4	-21.1	-14.4
13-Dec	-14.2	-14.2	-14.2	-14.9	-16.6	-17.3	-17.5	-17.7	-18.5	-19.3	-20.0	-19.9	-18.9	-19.4	-19.4	-20.6	-22.2	-23.1	-22.4	-23.1	-25.2	-26.2	-27.5	-27.1	-20.0	-14.2
14-Dec	-26.0	-25.2	-25.9	-27.3	-27.5	-25.2	-24.1	-24.3	-23.7	-22.9	-22.4	-21.0	-19.7	-19.1	-18.5	-19.4	-20.3	-21.6	-22.0	-22.2	-22.4	-22.5	-21.6	-21.4	-22.8	-18.5
15-Dec	-22.7	-24.0	-23.9	-24.3	-22.8	-24.4	-26.3	-27.8	-28.3	-28.6	-27.5	-26.0	-23.3	-21.4	-21.4	-21.7	-22.3	-25.1	-27.8	-27.5	-27.8	-28.8	-29.8	-30.8	-25.6	-21.4
16-Dec	-31.0	-32.2	-33.1	-34.0	-34.8	-35.6	-35.8	-36.3	-36.7	-36.9	-36.4	-33.0	-30.5	-28.8	-28.4	-28.4	-29.5	-31.2	-32.3	-32.7	-33.4	-34.5	-34.6	-35.6	-33.2	-28.4
17-Dec	-36.1	-35.9	-35.0	-33.4	-33.8	-34.1	-34.5	-34.8	-35.0	-35.2	-34.7	-33.5	-31.7	-30.1	-30.2	-30.5	-30.5	-30.6	-31.1	-31.3	-31.4	-30.8	-30.2	-29.2	-32.6	-29.2
18-Dec	-28.5	-28.3	-28.4	-28.5	-28.3	-28.2	-27.2	-26.7	-26.0	-25.1	-23.9	-23.1	-22.0	-21.7	-21.4	-21.2	-20.8	-20.7	-20.3	-20.3	-20.2	-20.2	-19.8	-19.6	-23.8	-19.6
19-Dec	-19.3	-18.9	-18.2	-18.1	-18.0	-17.8	-17.8	-17.7	-17.4	-16.9	-16.4	-15.5	-15.0	-14.4	-14.1	-13.9	-13.8	-13.6	-13.4	-13.7	-16.0	-17.8	-19.9	-21.0	-16.6	-13.4
20-Dec	-22.0	-21.2	-20.0	-19.3	-15.6	-15.1	-11.9	-12.2	-13.4	-13.5	-13.1	-11.1	-9.1	-6.7	-7.8	-9.9	-11.5	-12.5	-14.0	-15.6	-16.0	-15.8	-16.0	-15.5	-14.1	-6.7
21-Dec	-15.4	-13.4	-12.1	-12.2	-12.3	-12.9	-13.1	-12.4	-9.7	-8.9	-7.9	-7.1	-6.4	-0.9	-0.3	-0.3	-2.2	-0.4	-3.8	-5.5	-5.9	-4.6	-5.0	-4.3	-7.4	-0.3
22-Dec	-4.3	-4.2	-3.8	-2.4	1.1	0.1	0.4	-0.6	-1.8	-2.2	-3.5	-5.6	-7.7	-10.8	-11.9	-12.4	-12.9	-13.8	-14.6	-14.3	-14.2	-14.3	-14.2	-14.4	-7.6	1.1
23-Dec	-14.7	-14.9	-15.0	-15.4	-16.1	-16.5	-16.9	-17.3	-17.7	-17.8	-17.8	-17.6	-17.6	-17.6	-17.9	-18.6	-19.9	-21.6	-22.9	-24.3	-26.4	-27.2	-27.6	-28.4	-19.5	-14.7
24-Dec	-28.8	-29.7	-29.9	-30.5	-30.4	-31.3	-31.3	-31.1	-30.8	-29.7	-28.4	-27.7	-26.7	-25.8	-25.0	-24.4	-23.3	-22.4	-21.7	-21.1	-21.9	-22.5	-22.3	-22.4	-26.6	-21.1
25-Dec	-22.2	-22.3	-23.3	-23.4	-23.1	-23.3	-23.0	-22.7	-22.0	-23.5	-21.9	-20.3	-18.4	-16.8	-17.5	-18.2	-19.0	-21.6	-22.3	-20.1	-20.5	-20.4	-21.0	-22.0	-21.2	-16.8
26-Dec	-23.2	-22.7	-22.6	-22.7	-23.3	-23.0	-23.2	-23.7	-23.7	-22.8	-21.5	-20.2	-18.5	-16.5	-15.8	-16.1	-16.8	-16.5	-16.8	-18.0	-17.7	-16.5	-16.6	-15.6	-19.7	-15.6
27-Dec	-15.0	-14.9	-14.5	-13.7	-13.4	-13.5	-13.3	-13.2	-13.6	-13.7	-12.4	-11.0	-9.1	-8.9	-8.8	-7.9	-8.0	-8.5	-8.5	-4.7	-3.5	-5.8	-7.8	-8.1	-10.5	-3.5
28-Dec	-7.8	-7.5	-8.0	-8.8	-10.0	-10.6	-11.1	-12.1	-13.7	-14.7	-14.9	-14.7	-14.8	-14.7	-14.5	-14.4	-14.2	-14.0	-14.2	-15.1	-16.4	-17.1	-17.2	-17.0	-13.2	-7.5
29-Dec	-17.4	-17.8	-18.9	-17.5	-17.2	-16.8	-16.3	-16.1	-15.8	-15.4	-15.0	-14.4	-13.9	-13.5	-13.1	-13.1	-13.1	-13.1	-13.0	-12.9	-13.0	-13.7	-13.7	-13.6	-14.9	-12.9
30-Dec	-13.4	-13.5	-13.7	-13.5	-13.3	-13.3	-13.3	-13.4	-13.7	-14.2	-13.1	-12.5	-12.1	-11.1	-10.8	-9.5	-9.4	-8.9	-9.5	-11.2	-11.3	-13.4	-13.6	-14.1	-12.3	-8.9
31-Dec	-14.3	-14.4	-14.2	-15.0	-16.3	-17.2	-17.8	-16.6	-16.1	-15.3	-15.0	-15.1	-13.3	-12.4	-12.7	-12.9	-12.9	-12.1	-10.8	-8.6	-9.5	-10.1	-11.0	-10.7	-13.5	-8.6
																								Diurnal Average		
																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Lower Camp - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Lower Camp - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	321	43.15	43.15
-20 - 0	413	55.51	98.66
0 - 10	10	1.34	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

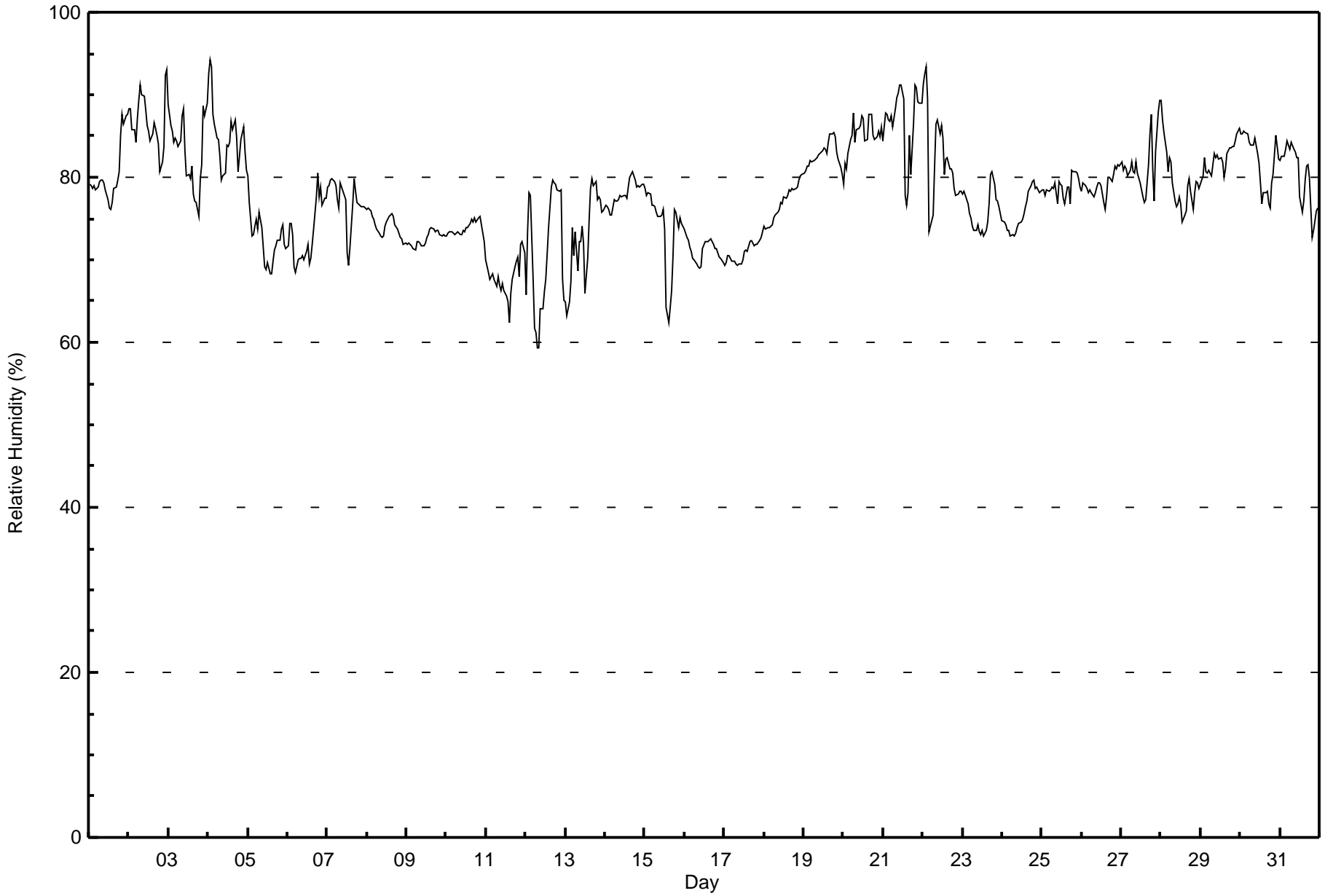
**Relative Humidity (RH) - %
Lower Camp - December 2016**

Maximum Value: 94 % on Dec 4 02:00 Maximum Daily Average: 86.8 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 59 % on Dec 12 08:00 Minimum Daily Average: 67.9 % on Dec 11 Maximum Diurnal Average: 79.2 % at hour 22 Minimum Diurnal Average: 75.4 % at hour 14 Monthly Average: 77.8 % Percentiles: P ₁ = 64 P ₁₀ = 70 Q ₁ = 73 Median = 78 Q ₃ = 82 P ₉₀ = 86 P ₉₉ = 92																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	79	79	79	79	78	79	79	80	80	79	78	77	76	76	77	79	79	80	81	85	88	86	87	88	80.3	88
2-Dec	88	88	86	86	84	87	89	91	90	90	88	86	86	84	85	87	86	85	84	81	82	84	92	93	86.8	93
3-Dec	89	86	86	84	85	84	84	84	88	88	83	80	80	80	81	78	77	77	75	80	82	89	88	89	83.2	89
4-Dec	93	94	93	88	86	85	85	82	80	80	81	84	84	84	87	86	87	85	81	82	85	86	83	81	85.0	94
5-Dec	80	77	73	73	74	75	74	76	74	71	69	69	70	68	68	70	71	72	72	72	74	74	72	71	72.5	80
6-Dec	72	74	74	73	69	68	70	70	70	71	70	71	72	69	70	72	74	78	80	78	79	77	77	77	73.2	80
7-Dec	79	79	80	80	79	79	77	76	79	78	78	77	71	69	72	77	80	78	77	77	76	77	76	76	77.0	80
8-Dec	76	76	76	75	75	74	74	73	73	73	73	74	75	75	75	76	75	74	74	73	73	73	72	72	74.1	76
9-Dec	72	72	72	72	71	71	72	72	72	72	72	72	73	73	74	74	74	73	74	74	73	73	73	73	72.6	74
10-Dec	73	73	73	73	73	73	73	73	73	73	74	73	74	74	74	75	75	75	75	75	75	74	73	72	73.8	75
11-Dec	70	68	68	68	68	68	67	68	67	66	67	66	66	65	62	66	68	69	70	70	68	72	72	71	67.9	72
12-Dec	66	73	78	78	67	62	61	59	59	64	64	66	68	71	74	79	80	79	79	78	78	78	68	65	70.6	80
13-Dec	65	63	65	68	74	71	73	69	72	72	74	72	66	70	75	79	80	79	79	77	78	77	76	76	72.9	80
14-Dec	77	76	76	75	75	77	77	77	77	78	78	78	77	79	80	81	80	80	79	79	79	79	79	79	78.0	81
15-Dec	79	78	78	78	77	77	76	76	75	75	75	76	74	64	62	64	66	70	76	76	74	75	74	74	73.8	79
16-Dec	74	73	72	72	71	70	70	69	69	69	69	71	72	72	72	72	72	72	71	71	71	70	70	70	71.1	74
17-Dec	69	70	70	71	70	70	70	70	69	69	70	70	71	71	71	72	72	72	72	72	72	72	73	73	70.9	73
18-Dec	74	74	74	74	74	74	75	75	76	76	77	77	78	77	78	78	78	79	78	79	79	80	80	80	76.8	80
19-Dec	80	81	81	81	82	82	82	82	82	83	83	83	84	83	83	84	85	85	85	85	83	82	81	80	82.7	85
20-Dec	79	82	81	83	85	85	88	84	86	86	86	87	87	84	85	88	88	88	85	85	85	86	85	86	85.1	88
21-Dec	84	88	88	87	87	87	86	88	90	90	91	91	89	78	77	78	85	80	87	91	91	89	89	89	86.7	91
22-Dec	91	92	93	90	73	75	75	81	86	87	85	86	85	80	82	82	81	81	81	79	78	78	78	78	82.5	93
23-Dec	78	78	78	77	76	75	74	74	73	74	73	73	74	73	74	75	77	80	81	79	77	77	76	76	75.9	81
24-Dec	75	75	74	73	73	73	73	73	74	74	75	75	76	76	77	78	79	79	80	79	79	79	78	78	75.8	80
25-Dec	78	79	78	78	78	78	79	79	79	77	80	79	79	77	77	79	79	77	81	81	81	81	80	79	78.8	81
26-Dec	78	79	79	79	78	78	78	78	78	79	79	79	79	77	76	78	80	80	79	80	81	81	81	81	79.1	81
27-Dec	82	81	81	81	80	81	82	81	81	82	81	79	78	78	77	77	82	85	88	81	77	83	88	89	81.4	89
28-Dec	89	87	85	83	81	82	82	79	77	76	77	78	77	75	75	76	79	80	78	76	78	79	79	79	79.5	89
29-Dec	79	80	82	81	81	81	80	82	83	82	83	82	82	82	80	81	83	84	84	84	84	84	85	86	82.3	86
30-Dec	85	85	86	85	85	84	84	84	84	85	83	82	79	77	78	78	78	77	76	79	80	85	84	82	81.9	86
31-Dec	82	82	83	83	84	84	83	84	83	83	82	82	78	76	77	80	81	81	80	73	74	75	76	76	80.2	84
																		78.6						Diurnal Average		
																		93						Diurnal Maximum		



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Lower Camp - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Lower Camp - December 2016

Maximum Speed: 25 km/h on Dec 13 03:00	Maximum Daily Speed Average: 20.1 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 24 13:00	Minimum Daily Speed Average: 0.5 km/h on Dec 18	Hours of Data: 741
Maximum Diurnal Speed Average: 2.2 km/h at hour 24	Minimum Diurnal Speed Average: 0.5 km/h at hour 14	Hours of Missing Data: 3
Monthly Average Velocity: 0.9 km/h 246.6 deg	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 3 Median = 6 Q ₃ = 10 P ₉₀ = 16 P ₉₉ = 22	Percent Operational Time: 99.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE8	SSE9	SSE9	SSE6	SSW6	S5	SSE6	SSE9	SE9	SSE6	SE7	SSE6	SE8	SE10	SE8	SE6	SSE7	SSE5	SSE6	SE7	SE8	SE5	SE4	SE8	SSE6.9	SE10
2-Dec	SE8	SE10	SE12	SE13	SE11	SE8	SE11	SE11	SE10	SE12	SE17	SE17	SE19	SE21	SE11	SE17	SE17	SE21	SE12	SSE13	SE16	SE17	SE19	SE20	SE14.3	SE21
3-Dec	SE15	SE13	SE11	SE11	SE12	SE12	SSE12	SSE12	SE14	SE13	SE15	SE18	SE15	SE12	SE9	SSE10	SSE10	SSE9	SSE9	SSE7	S6	SW12	SW7	SSE3	SSE10.5	SE18
4-Dec	SSE4	W1	NNW8	N14	N15	N14	N14	N12	N11	NNW9	N10	N10	NNW8	NNW10	NW11	NW11	NW11	NW13	NW14	NW13	NW9	NW6	NNW11	NNW16	NNW9.5	NNW16
5-Dec	WNW19	WNW20	WNW21	WNW20	WNW19	WNW22	WNW20	WNW21	WNW22	WNW21	WNW22	WNW20	WNW21	WNW20	WNW21	WNW22	WNW21	WNW22	WNW21	W18	W18	W19	W19	WNW18	WNW20.1	WNW22
6-Dec	WNW18	WNW18	WNW18	WNW16	WNW18	WNW16	WNW16	WNW14	WNW14	NW9	NW15	WNW14	NW14	NW17	NW16	NW12	NW9	NW6	NW5	WNW6	NW7	WNW6	NW6	WNW12.1	WNW18	
7-Dec	WNW4	NW4	NW4	WNW4	WNW4	NW5	WNW5	WNW6	NW3	WNW4	WNW4	NNW5	NNW8	NW9	WNW7	W3	NNW1	NW2	NW2	NW3	NW3	NW1	NNW3	NW3	WNW3.8	NW9
8-Dec	NW3	WNW3	WNW3	NW3	NW3	WNW4	NW3	NW3	NW3	WNW2	NW2	NW2	NW3	NNW3	NNW4	NW4	NW2	NNW2	NW2	NW3	NW2	WNW3	AF	NNW2	NW2.6	NNW4
9-Dec	NNW2	NW2	NW1	NW2	NW1	ENE0	SE8	SE10	SE9	SE10	SE11	SE10	SE8	SE11	SE7	SE7	SE5	SSE3	ESE1	SSE4	SSE5	SE5	SE7	SE8	SE4.9	SE11
10-Dec	SE8	SE5	SE9	SE11	SE11	SE12	SE12	SE11	SE7	SE7	SE8	SE8	SE9	SE7	SE4	SE4	E1	ESE3	ESE2	SE5	SSE6	SE6	SSW5	WSW10	SE6.4	SE12
11-Dec	WSW17	WSW17	WSW16	WSW13	WSW17	WSW19	WSW18	W20	WSW18	WSW15	W15	W16	W17	W17	W17	WSW17	WSW17	W16	WSW15	WNW7	W13	WSW13	W9	WNW15	W15.4	W20
12-Dec	NW14	NNW7	WNW6	WNW6	WNW14	WNW19	WNW20	WNW20	WNW13	WSW18	W10	W9	SE1	SE8	SE6	NW1	NNW2	WNW3	WNW3	N2	ENE1	NW6	WNW16	WNW20	WNW7.6	WNW20
13-Dec	WNW24	WNW25	WNW25	NW18	NNW13	NNW11	NNW12	NNW12	NNW8	NW7	NNW3	E3	E0	W2	WNW3	W1	NW0	NW3	NW5	NW2	N1	NE1	N1	WNW1	NW6.7	WNW25
14-Dec	NNW1	ESE2	NNW0	ENE1	ESE4	SE8	SE14	SE13	SE13	SE12	SE14	SE10	SE4	WNW2	WNW4	WNW2	NW3	WNW3	NW1	ESE2	ENE1	SE1	E1	NNW1	SE3.5	SE14
15-Dec	N0	ESE2	S1	NW4	NNW7	WNW4	W1	NNE1	N3	WNW3	WNW2	W2	NW2	W10	W10	W12	WNW9	NNW4	E1	N3	N3	N2	NNW2	NNW2	WNW2.8	W12
16-Dec	NW2	NNW2	NW3	WNW2	NW2	NNE1	ENE1	ENE1	ENE1	ENE1	ESE4	ESE6	SE11	SE10	SE8	SE10	SE4	NW2	ENE0	E1	N1	N2	N2	NW2	ESE1.5	SE11
17-Dec	NNW1	NNW1	ESE2	SE6	SE7	SE7	SE8	SE7	SE10	SE9	SE10	SE9	SE9	SE9	SE6	SE7	SE9	SE8	SE8	SE7	SE7	SE7	SE6	SSE3	SE6.6	SE10
18-Dec	SE3	SE4	SE5	SE7	SE5	SE5	SE5	SE5	SE4	SSE1	ESE1	NNE1	WNW1	NNW4	WNW4	NW4	NW4	WNW4	NW3	NW3	N3	WNW2	NE2	N1	SE0.5	SE7
19-Dec	NNW2	NW1	NW3	NNW4	NW4	NNW4	NW3	NW3	NW3	NW4	NW3	NW3	NNW3	NW4	NW5	NNW4	NNW4	NW6	NW4	W1	SE1	NW1	WNW0	NNW1	NW2.8	NW6
20-Dec	WNW1	W2	NW1	SE3	SE8	SE8	SSE7	SE13	SE15	SE14	SE10	SE8	SE8	SE7	SE6	SE4	SE4	SE5	SE5	SE6	SE9	SE9	SE9	SE8	SE6.8	SE15
21-Dec	SE7	SE9	SE10	SE10	SE9	SE9	SE8	SE8	SE10	SE10	SE11	SE10	SE4	W12	W7	W7	S4	S6	SE7	SE10	SE10	SE10	E3	NNE2	SE6.1	W12
22-Dec	NE2	ENE1	ESE5	SSE1	W12	W13	W14	NW10	NW5	NW7	N13	N16	N18	N16	N12	NNW10	N13	N12	NNW11	N9	N10	N8	N8	NNE11	NNW7.6	N18
23-Dec	N10	N7	N9	NNE12	NNE11	NNE10	NNE11	N10	N11	N9	N10	N9	NNW9	NNW9	NNW8	N9	NNW7	NW5	WNW4	NW3	NNW2	NW2	WNW4	NW3	N7.1	NNE12
24-Dec	WNW3	NW3	WNW3	NW3	NNW2	NW3	NW3	NW3	NW3	NW2	WNW3	NW2	E0	WNW1	NW1	NW2	NW1	NW2	AF	NW1	N0	SE2	SE6	SE5	NW1.2	SE6
25-Dec	SE3	SE1	NW1	NW0	AF	SE1	SE3	SE3	S2	ESE0	SE5	SE5	SE5	SE6	SE5	SE6	SE6	SE4	SE5	SE6	SE9	SE7	SE5	SE6	SE4.0	SE9
26-Dec	SE5	SE9	SE8	SE9	SE10	SE10	SE7	SE6	SE5	SE7	SE8	SE6	SE7	SE5	SE5	SE4	SE1	SE4	SE5	ESE7	ESE7	SE7	SE8	SE9	SE6.6	SE10
27-Dec	SE9	SE11	SE9	SE9	SE8	SE9	SE10	SE11	SE12	SE13	SE16	SE17	SE17	SE10	SE12	SE10	SE6	ESE2	SE1	WSW7	SW6	WNW5	NW4	WNW5	SE7.2	SE17
28-Dec	WNW5	WNW5	NW7	N9	NNE10	NNW8	N8	N10	N8	N7	N7	N8	N5	WNW4	WSW3	NW1	N2	NNW5	NNW7	NNW8	NW6	WNW4	NNW5	NW4	NNW5.3	N10
29-Dec	NNW4	WNW3	NW1	W2	NNW3	WNW3	NNW4	WNW3	NW3	WNW3	NNW4	NW3	NNW3	N5	WNW4	NW3	NW4	NW4	WNW4	WNW4	NNW5	WNW3	W3	NNW2	NW3.0	N5
30-Dec	WNW3	NNE0	NE0	SE1	SE4	SE5	SE4	SE4	SE4	SSE2	SE8	SE10	SE10	SE12	SE10	SE12	SE10	SSW3	W7	WNW5	WNW7	NW6	WNW5	WNW7	SSE2.7	SE12
31-Dec	WNW7	NW4	W5	SSE1	E1	E1	NNW1	WNW4	NW3	NNW4	NW3	W4	WNW4	W4	WNW2	WNW2	SW1	ENE2	WSW4	W20	WSW21	WSW22	WSW21	WSW18	W5.9	WSW22

W2.1	W1.6	W1.8	NNW0.8	NNW1.1	W1.3	SW0.9	SW0.7	SSE0.6	S1.0	SE1.3	SE1.3	SE1.3	SW0.5	W1.3	WSW1.2	WSW1.0	W1.2	W1.6	W1.2	SW1.2	SW1.8	WSW1.9	W2.2	Diurnal Average		
WNW24	WNW25	WNW25	WNW20	WNW19	WNW22	WNW20	WNW21	WNW22	WNW21	WNW22	WNW22	WNW20	WNW21	WNW20	WNW21	WNW22	WNW21	W18	W18	W20	WSW21	WSW22	WSW21	SE20	Diurnal Maximum	

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

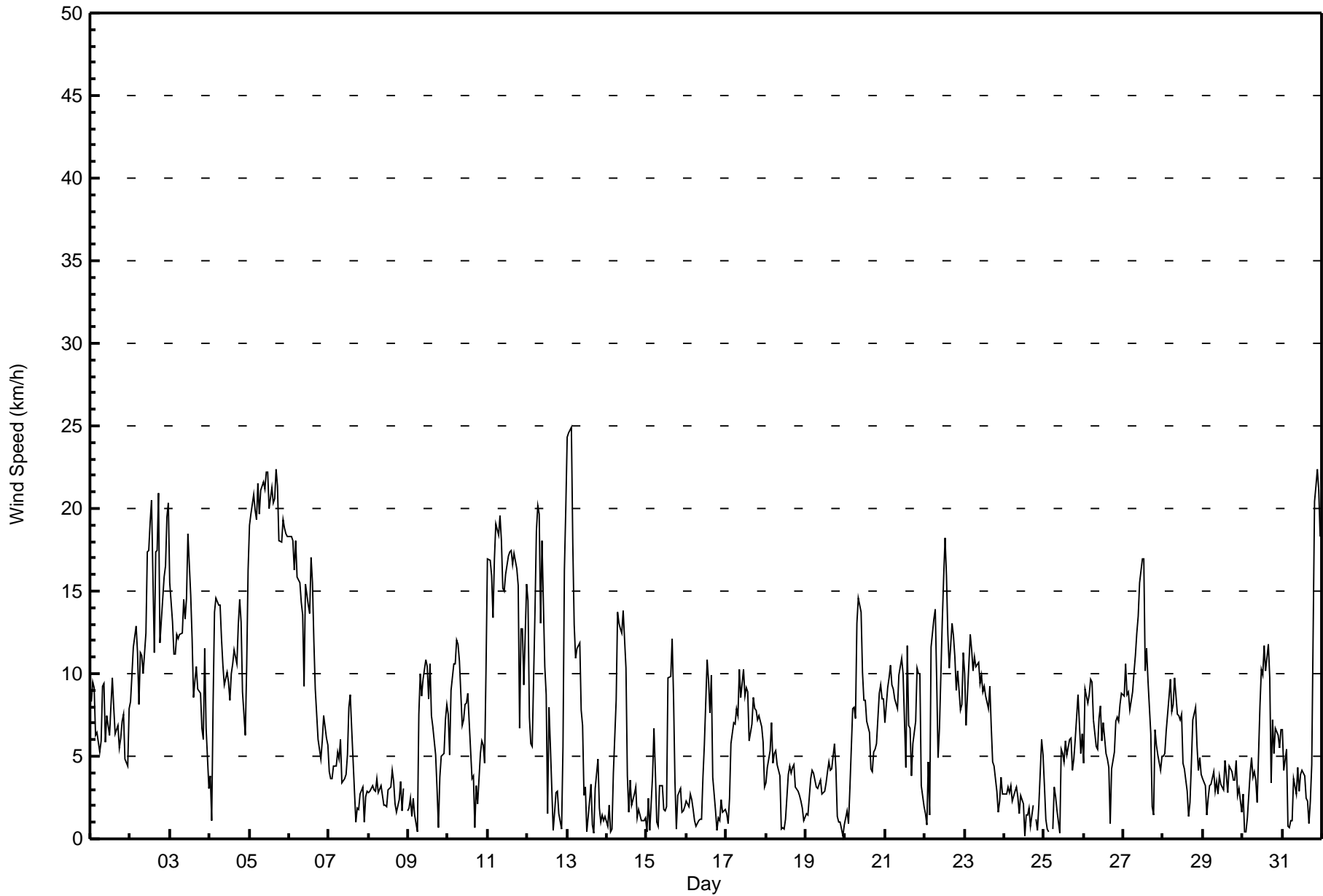
Wind Speed (WS) - km/h
Lower Camp - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 31 19:00																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6								
Minimum Value: 0 km/h on Dec 13 15:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 3 P ₉₉ = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	3
2-Dec	3	2	2	2	3	3	3	3	3	3	3	3	4	4	3	4	4	5	4	4	3	4	4	4	5
3-Dec	5	5	3	4	3	4	4	4	4	3	2	3	4	3	4	2	2	2	3	2	2	3	3	2	5
4-Dec	2	2	2	3	4	4	4	4	4	3	2	2	2	2	3	2	2	3	3	3	2	1	4	3	4
5-Dec	3	3	4	4	4	4	4	4	4	4	4	5	4	4	4	4	5	4	3	3	3	3	4	3	5
6-Dec	3	4	3	3	3	3	3	3	2	3	3	2	2	3	3	2	2	1	1	1	1	1	1	2	4
7-Dec	1	1	1	1	1	1	2	1	1	1	1	2	2	2	1	2	1	1	1	1	1	1	1	1	2
8-Dec	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	AF	1	2
9-Dec	1	1	1	1	1	1	2	2	1	2	2	2	1	1	2	3	2	1	1	1	1	1	1	1	3
10-Dec	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2	4	4
11-Dec	3	3	3	3	5	4	3	4	3	3	3	3	3	3	3	3	3	3	3	3	4	3	3	4	5
12-Dec	4	2	1	1	5	4	4	3	4	5	3	3	2	1	2	1	1	1	1	1	1	4	4	5	5
13-Dec	5	4	5	5	4	3	3	3	2	2	2	1	1	0	1	1	2	2	2	2	1	1	1	1	5
14-Dec	1	1	1	1	1	3	2	3	2	2	2	2	2	1	1	2	1	1	1	1	1	1	1	1	3
15-Dec	1	1	1	2	2	2	1	1	2	2	2	2	2	2	3	2	3	2	1	2	1	2	2	2	3
16-Dec	1	2	1	1	1	1	1	1	1	1	3	1	3	3	2	1	3	1	1	1	1	2	1	1	3
17-Dec	1	1	2	1	1	1	2	2	2	2	2	2	2	2	2	3	1	1	2	1	2	1	2	1	3
18-Dec	1	2	2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
19-Dec	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
20-Dec	1	1	1	3	2	2	3	3	2	2	3	3	2	2	2	3	2	2	1	2	2	1	1	1	3
21-Dec	2	2	2	2	2	2	2	2	2	3	2	2	3	3	3	3	2	2	3	2	2	2	2	2	3
22-Dec	1	1	2	3	3	2	3	2	1	2	4	4	3	4	3	3	4	3	3	3	3	2	2	3	4
23-Dec	2	2	2	3	3	2	2	3	2	2	2	2	2	2	1	2	2	1	1	2	1	1	1	1	3
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	AF	1	1	2	1	1	2
25-Dec	1	1	1	1	AF	1	2	2	1	1	1	1	1	1	1	2	2	1	2	2	2	2	1	1	2
26-Dec	1	2	2	2	2	2	3	2	2	2	2	2	2	1	1	2	1	1	2	1	2	1	2	2	3
27-Dec	2	2	2	2	2	1	1	1	1	1	2	2	2	3	3	2	2	2	1	3	3	4	3	1	4
28-Dec	2	2	2	3	4	2	2	3	2	2	2	1	1	1	1	1	1	1	1	1	1	2	1	2	4
29-Dec	1	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	2	2	2	2
30-Dec	1	1	1	1	2	1	1	1	1	2	2	2	2	2	2	3	3	3	3	2	3	2	1	1	3
31-Dec	1	1	1	2	1	1	1	1	2	2	1	1	1	1	2	1	2	2	7	4	4	3	4	4	7
																	Diurnal Maximum								
AF - Analyzer Failure																									



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Lower Camp - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Lower Camp - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	339	45.75	45.75
6 - 11	251	33.87	79.62
12 - 19	121	16.33	95.95
20 - 28	30	4.05	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
Lower Camp - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	17	5	6	9	10	13	54	13	4	2	1	2	13	59	93	38	339
6 - 11	22	5	0	0	0	3	139	17	2	1	2	2	8	12	18	20	251
12 - 19	12	1	0	0	0	0	40	3	0	0	1	15	16	20	10	3	121
20 - 28	0	0	0	0	0	0	3	0	0	0	0	3	2	22	0	0	30
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	51	11	6	9	10	16	236	33	6	3	4	22	39	113	121	61	741

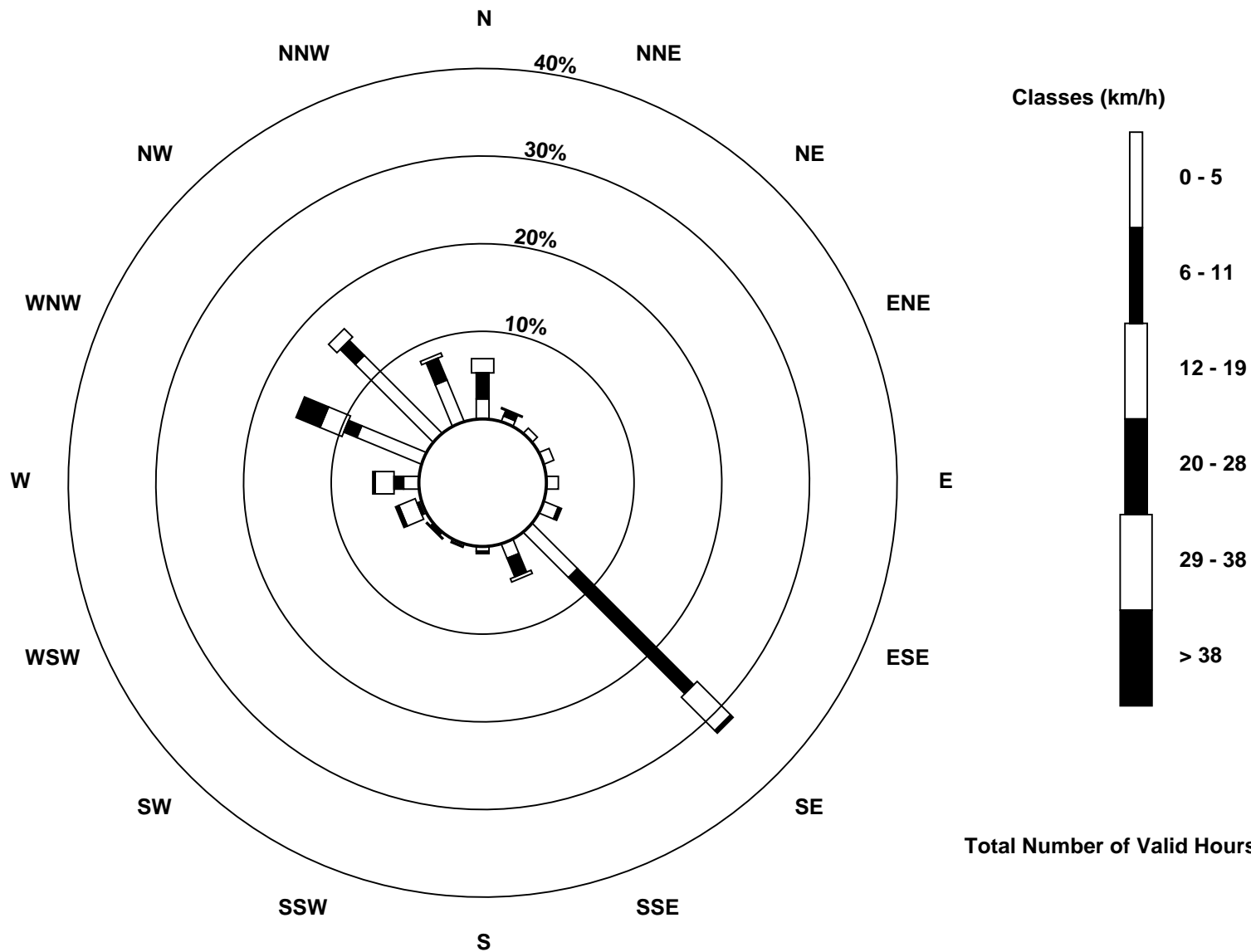
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Lower Camp (AMS 11)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Lower Camp - December 2016

Direction of Maximum Speed: 289 deg on Dec 13 03:00															Hours in Service: 744	
Direction of Maximum Daily Speed Average: 288.6 deg on Dec 5															Hours of Data: 741	
Direction of Minimum Speed: 99 deg on Dec 24 13:00										Direction of Minimum Daily Speed Average: 0.5 deg on Dec 18					Hours of Missing Data: 3	
Monthly Average Direction: 304.7 deg															Percent Operational Time: 99.6	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	156	152	150	165	207	169	155	148	146	148	144	151	142	141	143	144	147	151	148	137	133	134	129	137	148.4
2-Dec	128	132	139	136	146	143	139	134	142	141	137	124	124	126	133	132	136	128	142	147	140	141	134	131	134.7
3-Dec	140	145	143	146	141	144	154	147	137	136	142	141	139	141	137	148	150	156	164	159	186	221	226	166	149.6
4-Dec	148	281	330	357	7	5	11	353	349	343	352	353	341	331	317	323	309	313	318	319	314	315	299	301	334.3
5-Dec	301	293	291	292	291	293	290	288	288	291	296	296	293	292	290	289	285	285	278	276	277	279	283	286	288.6
6-Dec	286	290	291	288	292	295	301	298	303	324	308	302	307	318	320	314	311	305	308	308	303	304	301	315	302.1
7-Dec	299	316	311	291	298	304	293	290	316	298	296	330	346	312	294	276	338	315	326	313	307	325	327	306	308.1
8-Dec	314	303	286	318	305	298	313	304	310	294	318	311	322	330	345	315	320	334	319	307	324	298	AF	332	313.3
9-Dec	330	310	323	305	304	63	129	127	130	131	134	129	134	135	143	145	140	147	121	152	153	144	135	137	135.9
10-Dec	134	139	133	132	135	133	133	129	135	136	135	131	133	135	146	139	98	122	106	136	148	145	202	237	139.4
11-Dec	248	252	256	258	255	252	258	261	255	258	268	271	262	262	275	257	257	262	255	290	277	249	269	293	261.3
12-Dec	305	334	303	298	298	287	286	285	293	254	269	273	126	129	126	312	340	303	299	6	58	326	286	283	287.5
13-Dec	290	293	289	315	348	336	328	331	341	317	337	86	83	269	285	269	321	317	314	316	359	38	4	303	312.5
14-Dec	346	122	346	73	116	132	140	140	138	141	137	138	146	283	283	293	306	302	311	116	73	145	88	335	138.3
15-Dec	354	119	178	320	331	284	268	22	351	296	302	273	307	276	273	264	298	332	100	351	356	360	301	328	298.9
16-Dec	304	342	305	301	321	16	74	41	65	36	120	123	137	137	137	138	130	311	64	95	355	350	351	318	118.8
17-Dec	334	342	114	134	137	137	132	134	132	129	131	135	134	133	135	134	136	137	139	138	141	137	139	150	134.6
18-Dec	139	138	139	138	135	137	135	134	135	159	116	13	283	344	302	315	312	300	317	321	351	303	46	358	124.7
19-Dec	337	321	324	345	322	331	313	315	326	312	315	311	338	316	319	330	327	312	306	267	140	310	296	291	319.9
20-Dec	291	281	307	126	135	138	156	138	139	140	136	137	138	139	142	138	142	135	137	133	135	134	135	138	138.7
21-Dec	132	138	138	138	135	137	136	137	140	137	135	134	140	274	269	264	183	172	135	131	129	139	82	31	143.7
22-Dec	39	69	123	147	263	261	263	318	325	311	355	6	357	10	351	339	350	359	340	349	359	351	355	17	342.1
23-Dec	5	6	7	21	13	14	13	355	355	7	6	0	344	346	342	349	338	309	298	325	336	306	296	304	355.6
24-Dec	302	315	301	317	309	332	311	309	309	326	299	310	99	292	310	315	308	313	AF	311	10	124	142	146	306.3
25-Dec	144	132	315	305	AF	145	132	140	169	118	139	142	144	141	140	140	142	137	137	138	141	143	141	132	140.1
26-Dec	130	140	143	141	138	140	134	135	126	136	136	135	139	132	137	138	137	146	132	105	121	133	135	136	134.6
27-Dec	130	129	138	139	137	143	138	131	128	132	136	135	137	128	138	145	135	107	130	251	236	293	313	297	139.7
28-Dec	293	295	326	358	13	347	5	9	10	356	358	357	7	285	258	323	1	339	340	332	325	300	344	307	343.4
29-Dec	328	303	315	271	346	283	338	291	310	297	335	321	339	357	303	325	326	310	298	291	332	297	267	328	315.1
30-Dec	299	21	37	124	140	134	131	137	126	152	134	136	133	138	140	143	144	206	260	300	295	325	293	290	154.3
31-Dec	297	325	268	158	96	80	328	283	306	332	309	281	282	273	282	294	234	59	247	261	255	255	254	256	266.8

276.1 264.8 264.6 288.6 290.8 259.2 232.4 235.6 167.3 189.2 140.5 129.8 129.3 213.9 261.7 237.8 253.1 274.4 267.1 260.0 235.1 236.0 251.8 268.4
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

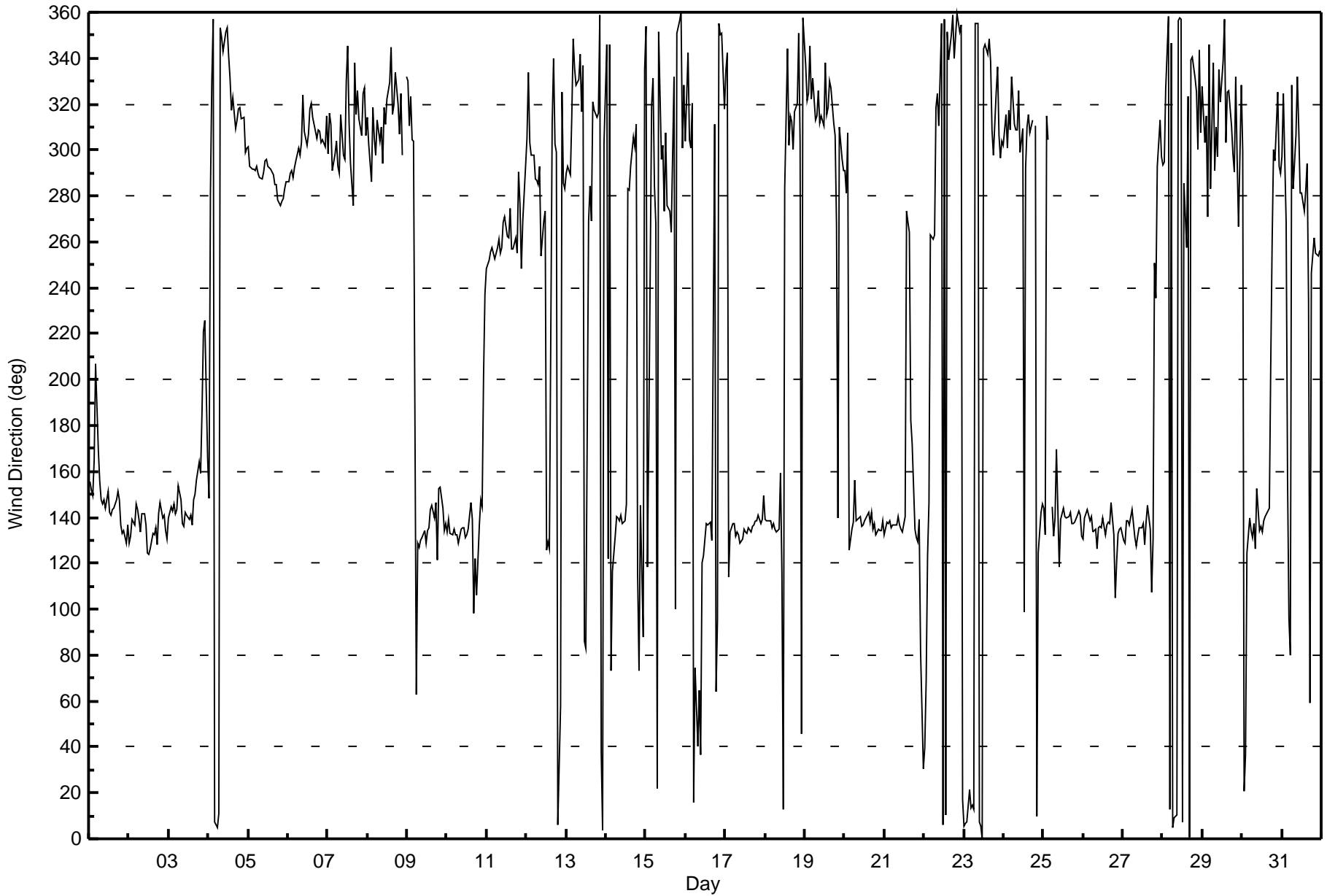
Wind Direction (WD) - deg
Lower Camp - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Dec 30 03:00 Minimum Value: 4 deg on Dec 20 22:00 Percentiles: P ₁ = 7 P ₁₀ = 10 Q ₁ = 12 Median = 18 Q ₃ = 32 P ₉₀ = 59 P ₉₉ = 89																			Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	22	20	18	26	25	25	21	17	16	19	18	25	14	12	15	15	14	17	13	8	7	28	18	12	28
2-Dec	12	10	11	9	17	47	12	10	14	12	11	9	9	11	15	13	13	11	21	20	14	15	11	10	47
3-Dec	15	23	19	21	17	19	22	21	11	10	14	12	10	10	10	17	13	17	21	25	35	18	31	53	53
4-Dec	19	89	15	18	18	18	24	22	24	20	17	16	19	17	11	12	10	11	12	11	10	14	9	9	89
5-Dec	10	10	11	10	11	10	11	11	11	11	10	10	11	11	12	12	11	11	10	10	10	10	11	11	12
6-Dec	11	11	10	10	11	10	11	11	14	20	13	10	12	11	11	10	9	8	14	18	13	11	20	24	24
7-Dec	16	23	17	13	15	17	17	10	28	25	23	22	17	19	11	41	52	39	47	28	21	32	33	25	52
8-Dec	27	46	27	45	36	47	42	15	29	20	25	31	21	20	15	30	32	32	37	16	39	16	AF	36	47
9-Dec	30	23	36	31	54	79	17	9	9	11	11	9	8	6	13	20	15	20	68	25	17	14	7	5	79
10-Dec	8	12	10	8	9	9	10	10	9	8	8	7	6	8	17	16	67	13	40	16	19	20	37	19	67
11-Dec	11	11	12	12	13	11	11	11	11	12	12	12	11	11	13	13	11	13	10	36	28	11	37	18	37
12-Dec	13	20	22	12	17	10	10	10	22	16	23	30	71	7	21	89	65	36	37	75	88	34	14	11	89
13-Dec	11	10	10	39	18	17	16	17	20	17	55	24	74	57	15	64	72	58	25	66	64	63	51	58	74
14-Dec	92	24	73	88	17	21	7	9	8	9	7	9	43	64	32	50	30	15	61	37	71	77	77	59	92
15-Dec	86	21	100	30	26	23	93	74	46	45	53	63	67	11	13	11	31	62	83	57	51	87	88	51	100
16-Dec	42	41	38	30	34	60	45	37	35	54	42	9	7	6	7	7	77	29	66	34	61	44	23	35	77
17-Dec	41	39	72	11	10	10	11	11	10	10	10	10	11	9	9	11	9	9	10	11	13	9	15	21	72
18-Dec	26	24	26	12	16	10	12	19	14	68	58	57	79	22	19	18	15	15	31	30	39	24	51	63	79
19-Dec	42	55	59	32	31	22	20	20	18	22	26	29	20	19	14	23	11	16	18	16	59	68	59	52	68
20-Dec	58	30	55	37	21	19	47	12	10	11	12	17	13	15	19	30	52	17	12	12	7	4	6	10	58
21-Dec	18	13	15	15	14	13	9	13	14	10	9	10	40	12	16	32	48	33	16	9	12	12	79	79	79
22-Dec	88	81	17	82	16	11	12	19	36	17	22	18	17	18	19	18	19	18	19	19	18	16	16	15	88
23-Dec	16	17	18	15	15	20	15	18	14	14	14	17	17	16	16	22	20	16	22	47	48	24	35	48	48
24-Dec	32	30	25	28	18	22	17	20	20	40	26	23	78	36	39	33	68	28	AF	33	82	42	13	14	82
25-Dec	16	40	40	40	AF	71	41	53	49	72	13	15	20	16	12	15	17	21	23	15	15	12	14	11	72
26-Dec	14	12	16	14	13	13	12	13	24	15	18	22	19	21	19	30	75	24	17	9	15	14	13	13	75
27-Dec	15	11	12	17	14	11	8	8	9	7	7	7	7	13	13	11	15	74	83	61	54	78	77	22	83
28-Dec	21	19	20	21	25	17	13	17	22	17	18	16	20	22	22	75	44	18	17	13	22	31	26	34	75
29-Dec	35	45	78	47	32	24	25	36	24	46	36	32	34	30	41	60	32	20	21	41	28	72	35	51	78
30-Dec	50	89	104	68	20	19	31	13	13	69	11	9	9	7	13	10	15	60	52	40	35	21	20	16	104
31-Dec	18	24	16	72	83	64	55	28	55	29	34	33	23	31	27	39	92	82	78	12	11	10	12	12	92
92 89 104 88 83 79 93 74 55 72 58 63 79 64 41 89 92 82 83 75 88 87 88 79																									
Diurnal Maximum																									
AF - Analyzer Failure																									



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Lower Camp - December 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	9:36	End Time (MST)	12:23
Gas Cert Reference	LL101792	Station temp.	20 Deg C
Cal Gas Concentration	49.5 ppm	Cal Gas Exp Date	2/16/2019
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG Make/Model	API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2403

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-675	-675
Analyzer IP address	192.168.1.43		Lamp voltage	800	804
Calculated slope	1.001818	0.999985	Chamber temp	44.8	45.1
Calculated intercept	-0.022004	0.640351	Pressure	710.8	710.8
Analyzer Background	11.5	11.9	Flow	0.620	0.620
Analyzer Coefficient	1.015	1.044	Intensity	91	91

Analyzer make TEI 43i Analyzer serial # 100841398

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	83.8	829.6	799.6	1.038
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	83.8	829.6	829.2	1.000
second point	5000	42.4	419.8	418.9	1.002
third point	5000	21.2	209.9	208.7	1.006
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	83.8	829.6	831.4	0.998
Average Correction Factor					1.003

Corrected As found 799.8 Previous response 828.1 % change 3.5%

Notes:

Changed inlet filter after as founds. Adjusted span.

Calibration Performed By:

Jayne Marcoux



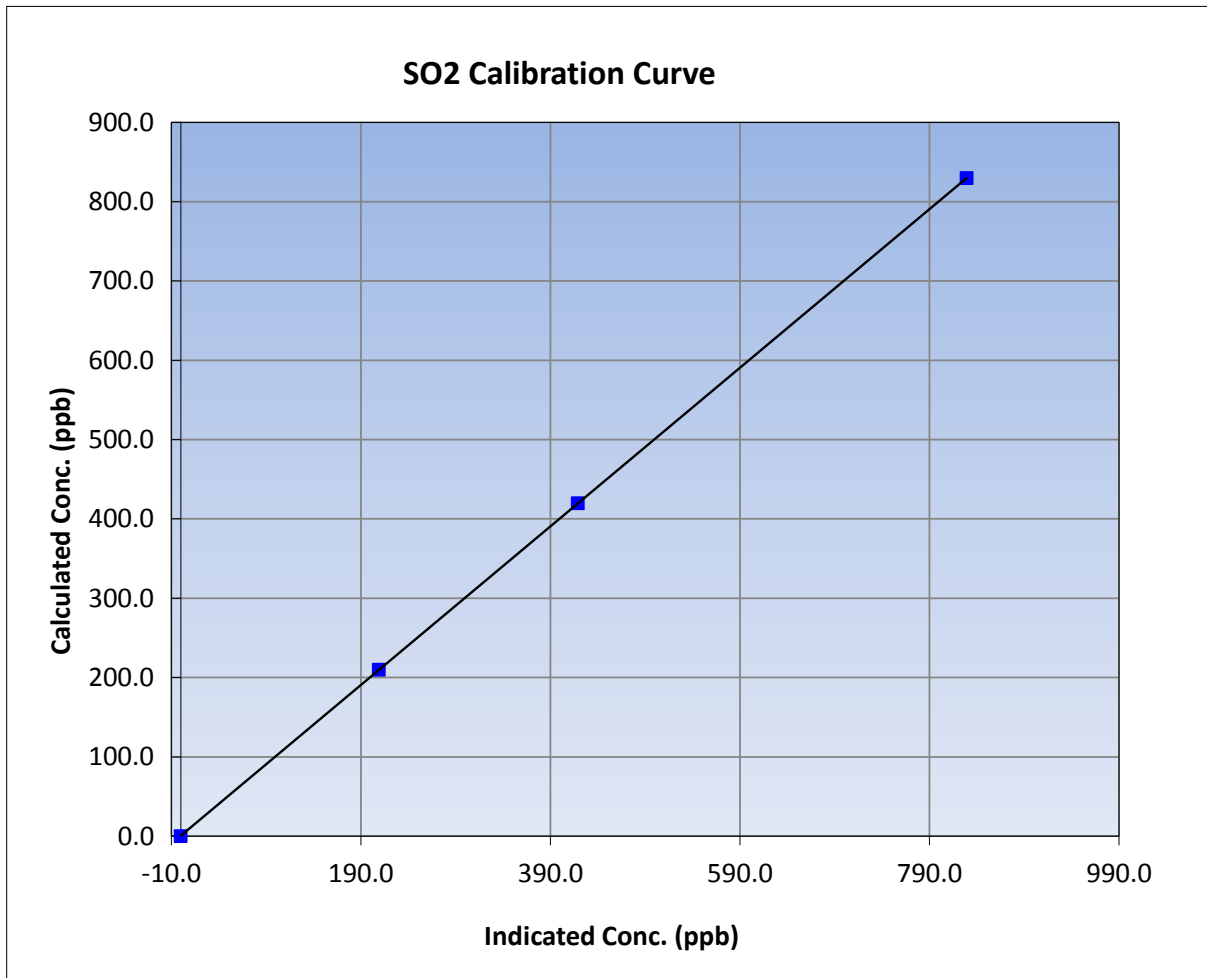
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	9:36	End Time (MST)	12:23
Analyzer make	TEI 43i	Analyzer serial #	100841398

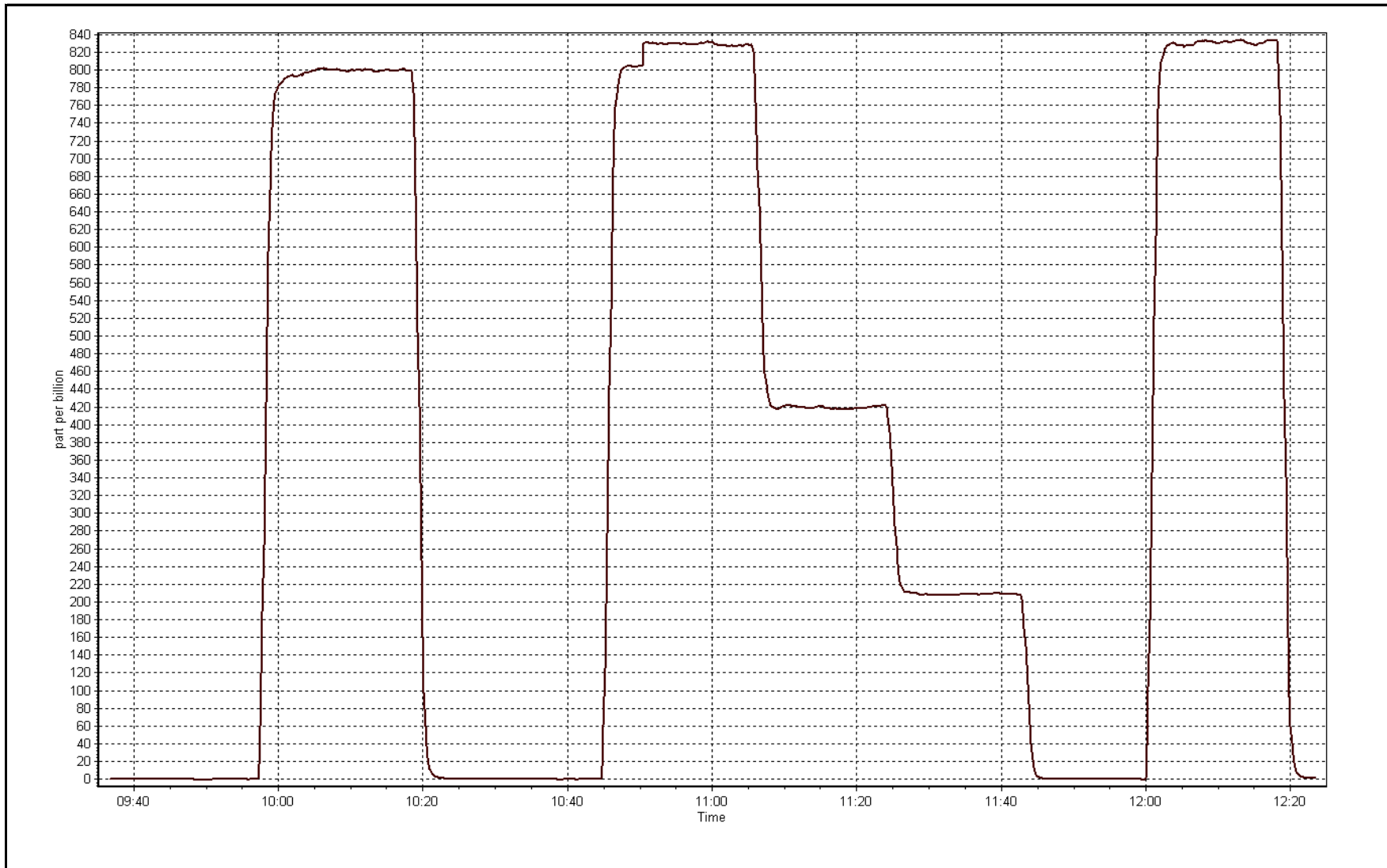
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999998
829.6	829.2	1.0005		
419.8	418.9	1.0020	Slope	0.999985
209.9	208.7	1.0055		
			Intercept	0.640351



SO2 Calibration Plot

Date: December 1, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	12:18	End Time (MST)	15:06
Gas Cert Reference	ALM061435	Station temp.	22 Deg C
Cal Gas Concentration	5.15 ppm	Cal Gas Exp Date	9/9/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG air Make/Model	API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	Serial Number	2403
SO2 gas concentration	49.5 ppm	SO2 gas cert/exp	LL101792 2/16/2019

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-671	-671
Analyzer IP address	192.168.1.42		Lamp voltage	796	796
Calculated slope	0.998212	0.996984	Chamber temp	45	45
Calculated intercept	-0.154290	-0.082705	Pressure	477.3	506.6
Analyzer Background	12.4	12.4	Flow	0.881	0.930
Analyzer Coefficient	1.218	1.251	Intensity	91	90
			Converter temp.	325	325

Analyzer make/model	Thermo 450i	Analyzer serial #	1410661328
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	72.8	75.0	72.9	1.029
SO2 scrubber check	5000	20.5	203.0	1.6	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	72.8	75.0	75.3	0.996
second point	5000	38.8	40.0	40.2	0.995
third point	5000	19.4	20.0	20.2	0.990
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	72.8	75.0	75.5	0.993
Average Correction Factor					0.994

Corrected As found	72.8	Previous response	75.3	% change	3.4%
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Notes:

Inlet filter changed and scrubber check done after as founds. Adjusted span.

Calibration Performed By: Jayme Marcoux



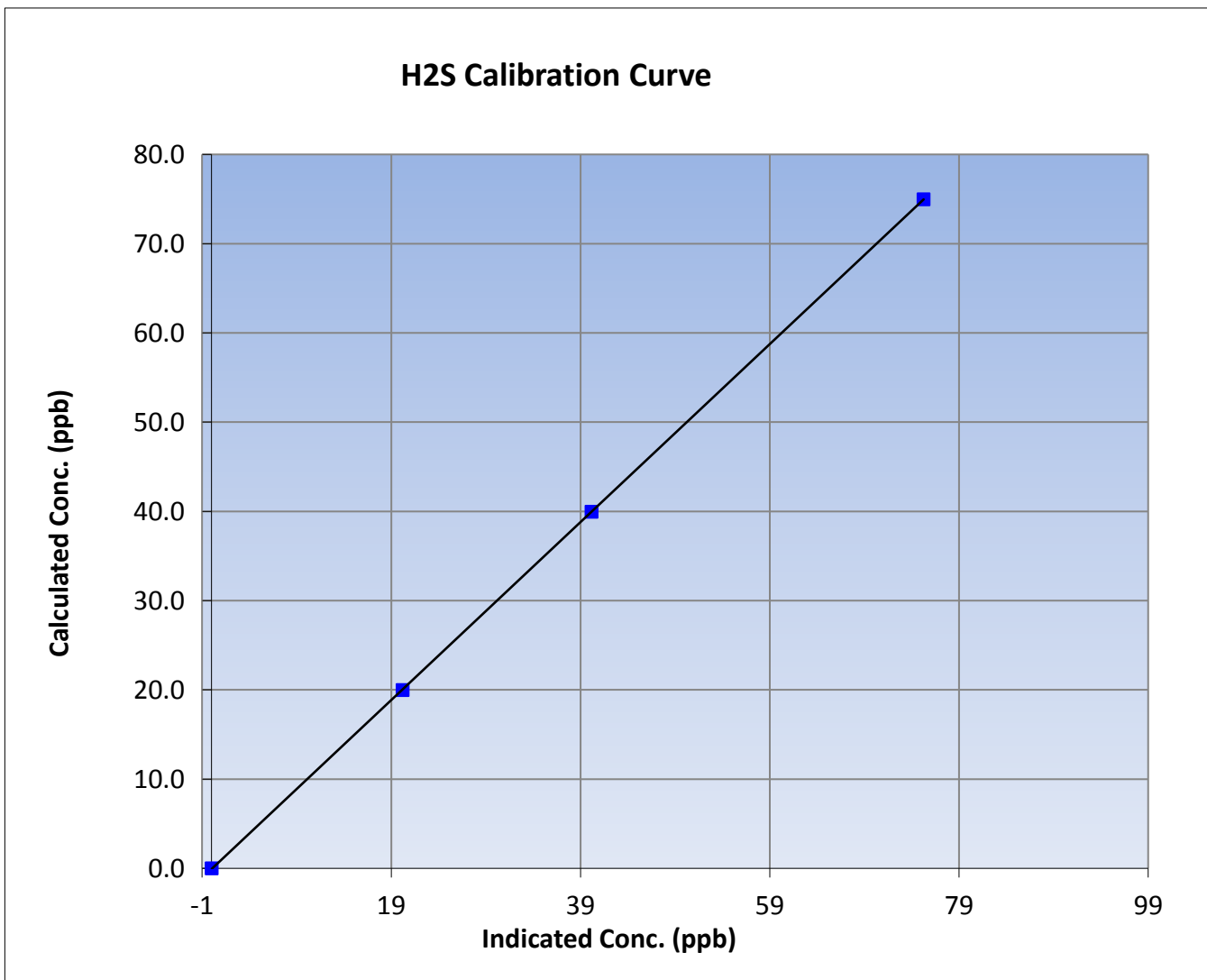
Wood Buffalo Environmental Association H2S Calibration Report

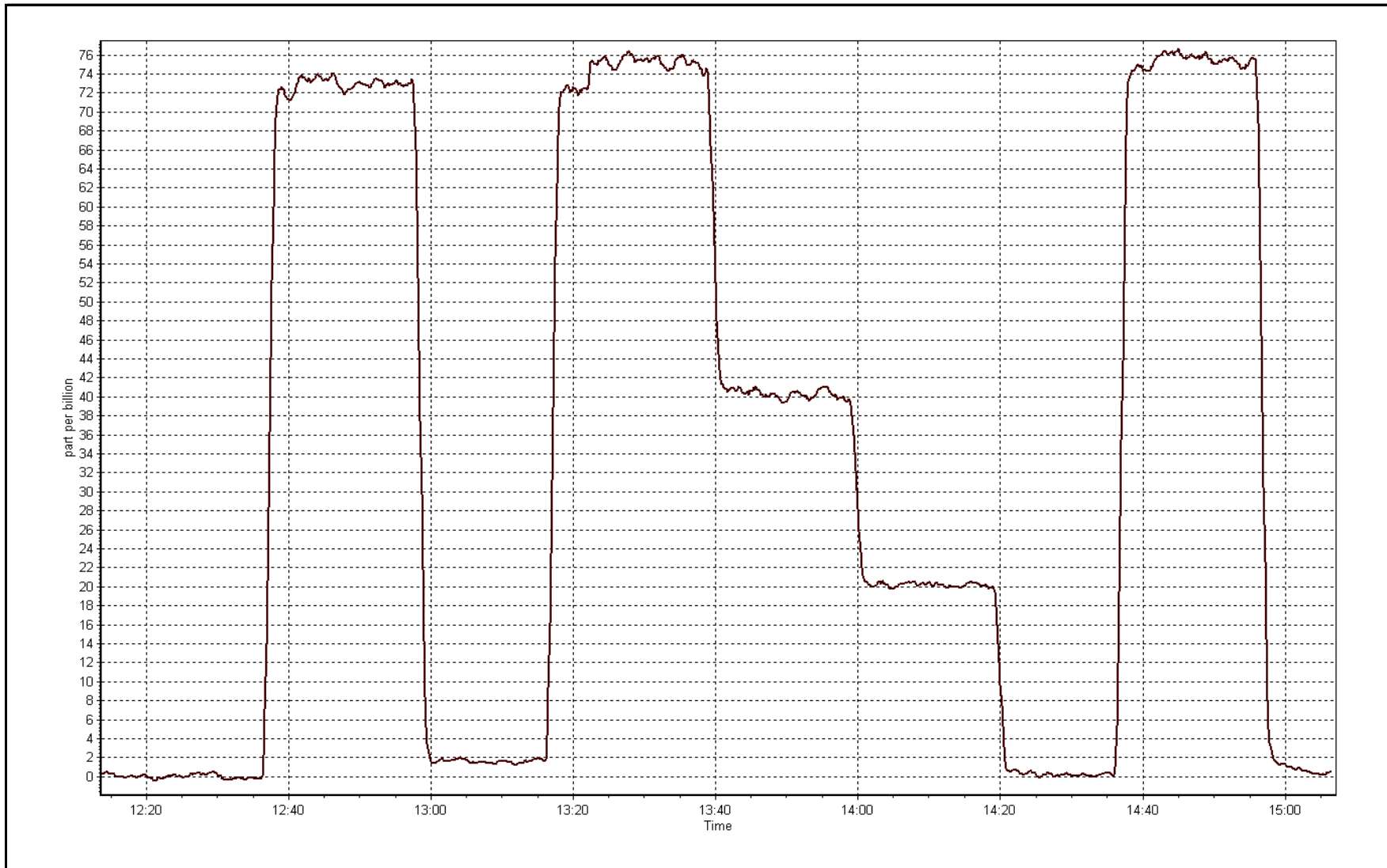
Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	12:18	End Time (MST)	15:06
Analyzer make	Thermo 450i	Analyzer serial #	1410661328

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999998
75.0	75.3	0.9962		
40.0	40.2	0.9946	Slope	0.996984
20.0	20.2	0.9897		
			Intercept	-0.082705







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 2, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	9:36	End Time (MST)	12:21
Gas Cert Reference	LL101792	Cal Gas Expiry Date	2/16/2019
CH4 Cal Gas Conc.	493 ppm	CH4 Equiv Conc.	1043.0 ppm
C3H8 Cal Gas Conc.	200 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG make/model	Teledyne API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	Serial Number	2403

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	7.8	7.8
Analyzer IP address	192.168.1.51		Air or Bypass Press	40.2	40.2
Calculated slope	0.999717	0.994994	Fuel Pressure	25.1	25.1
Calculated intercept	-0.015906	0.017994	Analyzer Coeff	4.457	4.511
			Analyzer BKG	3.16	3.36

Analyzer make: 51i-LT Analyzer serial #: 1218153353

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.19	----
as found span	5000	83.8	17.48	17.34	1.008
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	83.8	17.48	17.54	0.997
second point	5000	42.4	8.84	8.90	0.994
third point	5000	21.2	4.42	4.41	1.003
as left zero	5000	0.0	0.00	-0.02	----
as left span	5000	83.8	17.48	17.51	0.998
Average Correction Factor					0.998

Corrected As found: 17.15 Previous response: 17.50 % change: 2.0%

Notes:

Changed inlet filter after as founds. Adjusted zero and span.

Calibration Performed By:

Jayme Marcoux



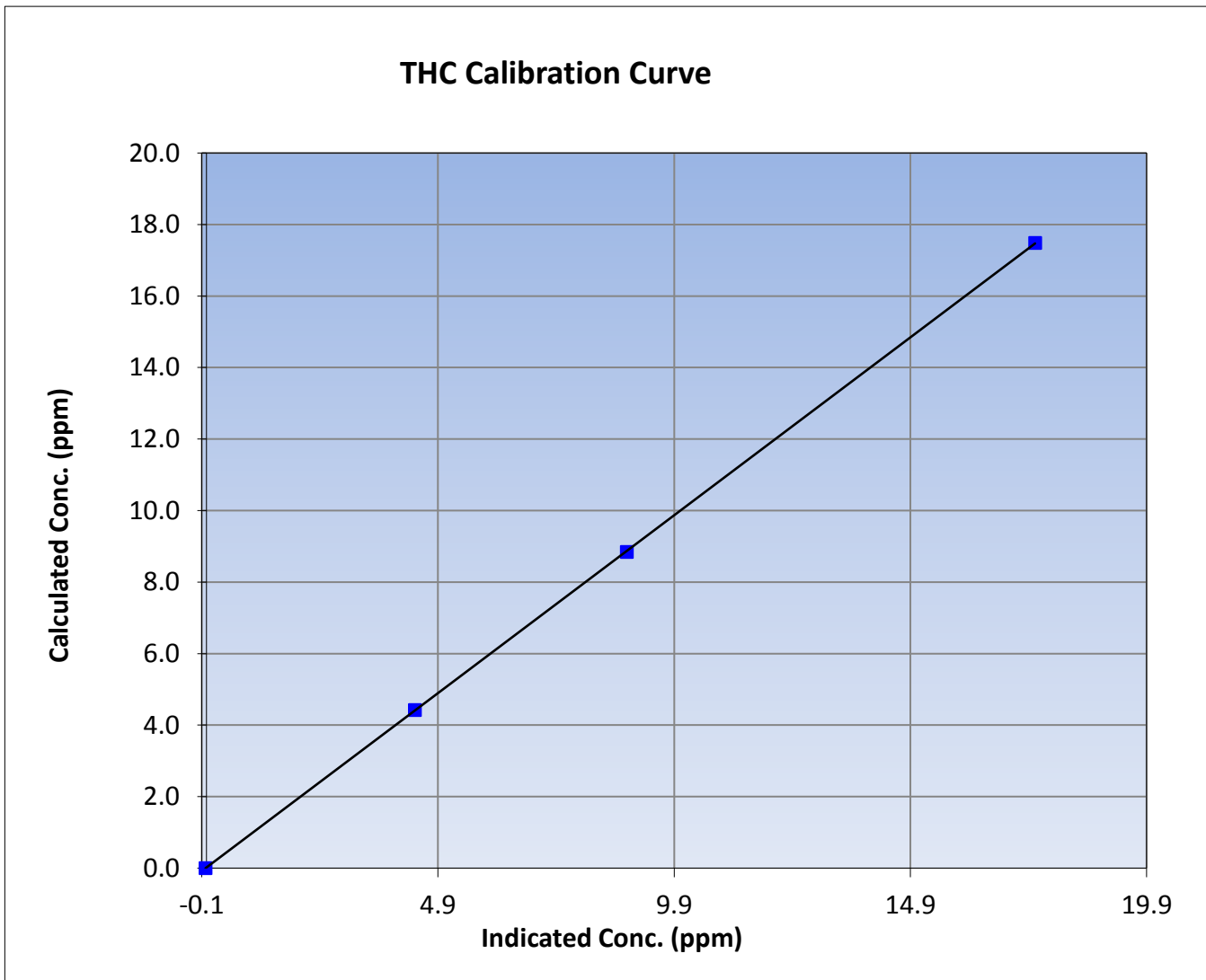
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 2, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	9:36	End Time (MST)	12:21
Analyzer make	51i-LT	Analyzer serial #	1218153353

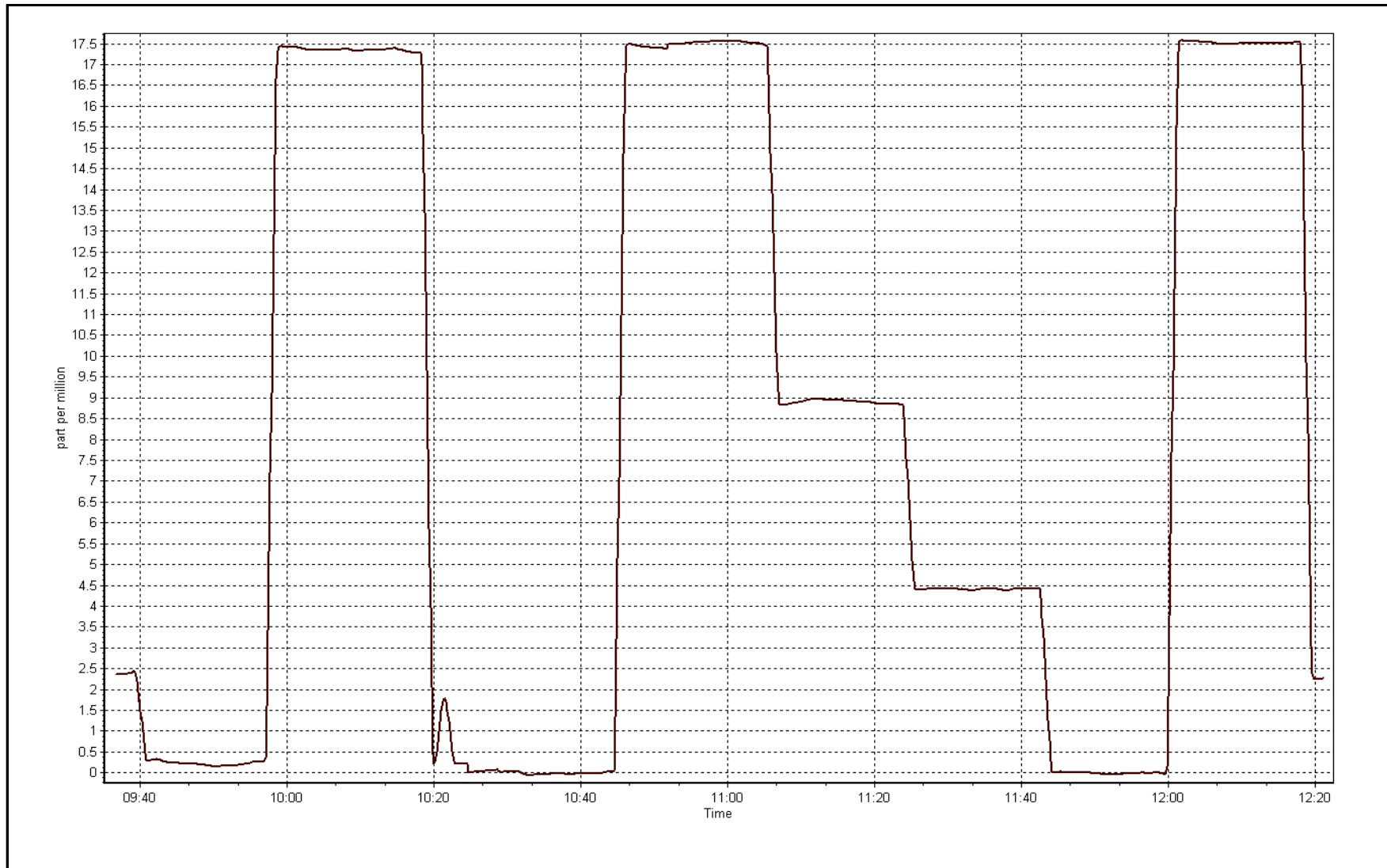
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999993
17.48	17.54	0.9966		
8.84	8.90	0.9938	Slope	0.994994
4.42	4.41	1.0028		
			Intercept	0.017994



THC Calibration Plot

Date: December 1, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 13
FORT MCKAY SOUTH
DECEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	710	34	34	100.00	11	0	2	0
TRS(ppb) Average	710	34	34	100.00	2	0	1	0
THC(ppm) Average	710	34	34	100.00	4	-	3	-
O3(ppb) Average	710	34	34	100.00	38	0	34	-
NO2(ppb) Average	684	34	60	96.51	35	0	22	-
NO(ppb) Average	684	34	60	96.51	100	-	27	-
NOX(ppb) Average	684	34	60	96.51	135	-	45	-
PM2.5(ug/m3) Average	742	2	2	100.00	17.9	-	13.8	0
ET(C) Average	744	0	0	100.00	0.7	-	-1.5	-
RH(%) Average	744	0	0	100.00	96	-	90	-
WS(km/h) Average	743	0	1	99.87	17	-	10	-
WD(deg) Average	743	0	1	99.87	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	710	0.5	1	-	0	0	0	0	1	1	11
TRS(ppb) Average	710	0.3	0	-	0	0	0	0	0	1	2
THC(ppm) Average	710	2.45	0.3	-	2.1	2.1	2.2	2.4	2.6	2.9	4
O3(ppb) Average	710	13.4	11	-	0	1	3	11	21	32	38
NO2(ppb) Average	684	11	8	-	0	0	5	10	17	22	35
NO(ppb) Average	684	7.1	13	-	0	0	0	1	9	23	100
NOX(ppb) Average	684	18.1	20	-	0	0	5	12	27	43	135
PM2.5(ug/m3) Average	742	4.36	3.4	-	0.3	1.3	2	3.3	5.3	9.6	17.9
Temperature 2 m (C) Average	744	-18.6	9.4	-	-39.8	-31.3	-25	-18.6	-13.2	-4.5	0.7
Relative Humidity (%) Average	744	79.4	6	-	65	71	74	79	84	89	96
Wind Speed 10 m (km/h) Average	743	5.4	4	-	0	1	2	4	8	11	17
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -FORT McKAY SOUTH (AMS 13)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NO2, NO, NOX	07 Dec 2016 09:00	07 Dec 2016 10:00	2	Maintenance - Station operator on site
NO2, NO, NOX	13 Dec 2016 14:00	14 Dec 2016 13:00	24	Maintenance - replaced zero/span valve
Wind Speed, Wind Direction	09 Dec 2016 00:00	09 Dec 2016 00:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Fort McKay South - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 11 ppb on Dec 26 14:00	Maximum Daily Average: 2.3 ppb on Dec 19
Minimum Value: 0 ppb on Dec 6 23:00	Hours of Data: 710
Maximum Diurnal Average: 1.2 ppb at hour 14	Hours of Missing Data: 34
Monthly Average: 0.5 ppb	Hours of Calibration: 34
Minimum Daily Average: 0.0 ppb on Dec 15	Percent Operational Time: 100.0
Minimum Diurnal Average: 0.3 ppb at hour 3	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 4	

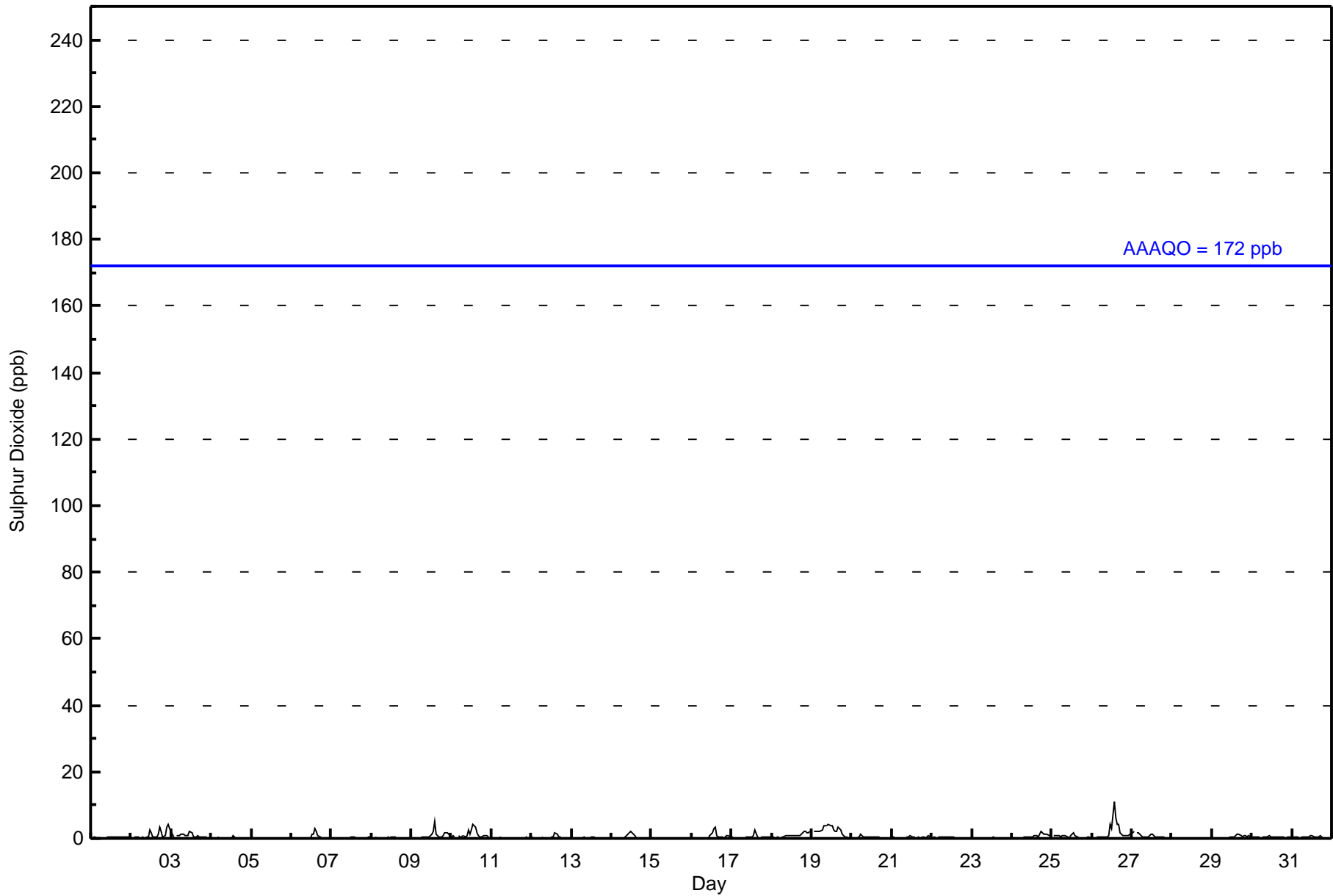
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	2	2	1	0	0	1	4	2	1	1	3	4	3	1.2	4
3-Dec	2	0	Z	1	1	1	1	1	1	1	1	2	2	1	1	0	1	1	0	0	0	0	0	0.8	2	
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1	
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	3	2	1	0	0	0	0	0	0	0.4	3	
7-Dec	Z	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
9-Dec	0	0	Z	0	0	0	0	0	1	1	1	1	1	2	5	1	1	0	0	1	2	2	1	1	0.9	5
10-Dec	1	1	1	Z	1	0	0	1	0	1	2	1	2	4	3	2	1	1	1	1	1	1	1	1.1	4	
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0.3	2	
13-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
14-Dec	0	Z	0	0	0	0	0	0	0	1	1	2	2	1	1	0	0	0	0	0	0	0	0	0.4	2	
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	2	3	3	1	0	0	0	0	0	1	1	1	0.6	3
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	1	1	0.4	2
18-Dec	0	0	0	0	0	Z	1	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1.0	2
19-Dec	Z	2	2	2	2	2	3	4	4	4	4	4	4	3	2	2	3	3	1	1	0	0	0	2.3	4	
20-Dec	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
21-Dec	0	1	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	0.6	2	
25-Dec	Z	1	1	1	1	0	1	1	1	1	0	1	1	2	1	0	0	0	0	0	0	0	0	0.6	2	
26-Dec	0	Z	0	0	0	0	0	0	0	1	1	4	3	11	6	4	4	2	1	1	1	1	1	1.9	11	
27-Dec	2	2	Z	2	2	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.7	2	
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.4	1	
30-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1	
31-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	1	0	0	0	0	0.4	1	
	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.6	0.9	0.9	1.2	1.2	0.7	0.6	0.6	0.4	0.4	0.4	0.5	0.5	0.4	Diurnal Average	
	2	2	2	2	2	2	3	4	4	4	4	4	4	11	6	4	4	4	4	2	2	2	3	4	3	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	709	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	61	52	16	4	4	3	7	47	137	58	58	67	47	64	37	46	708
11 - 20	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	61	52	16	4	4	3	7	48	137	58	58	67	47	64	37	46	709

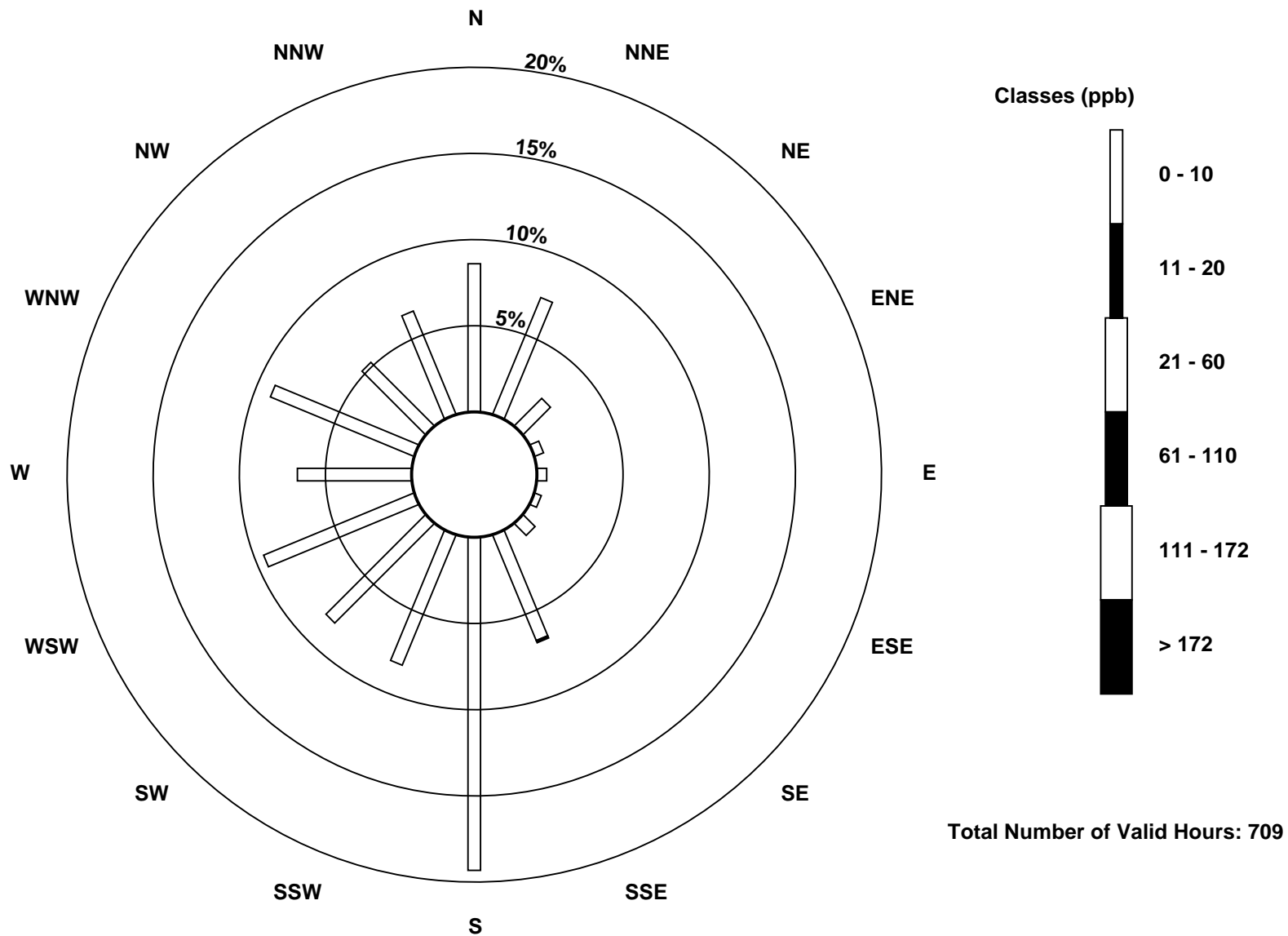
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

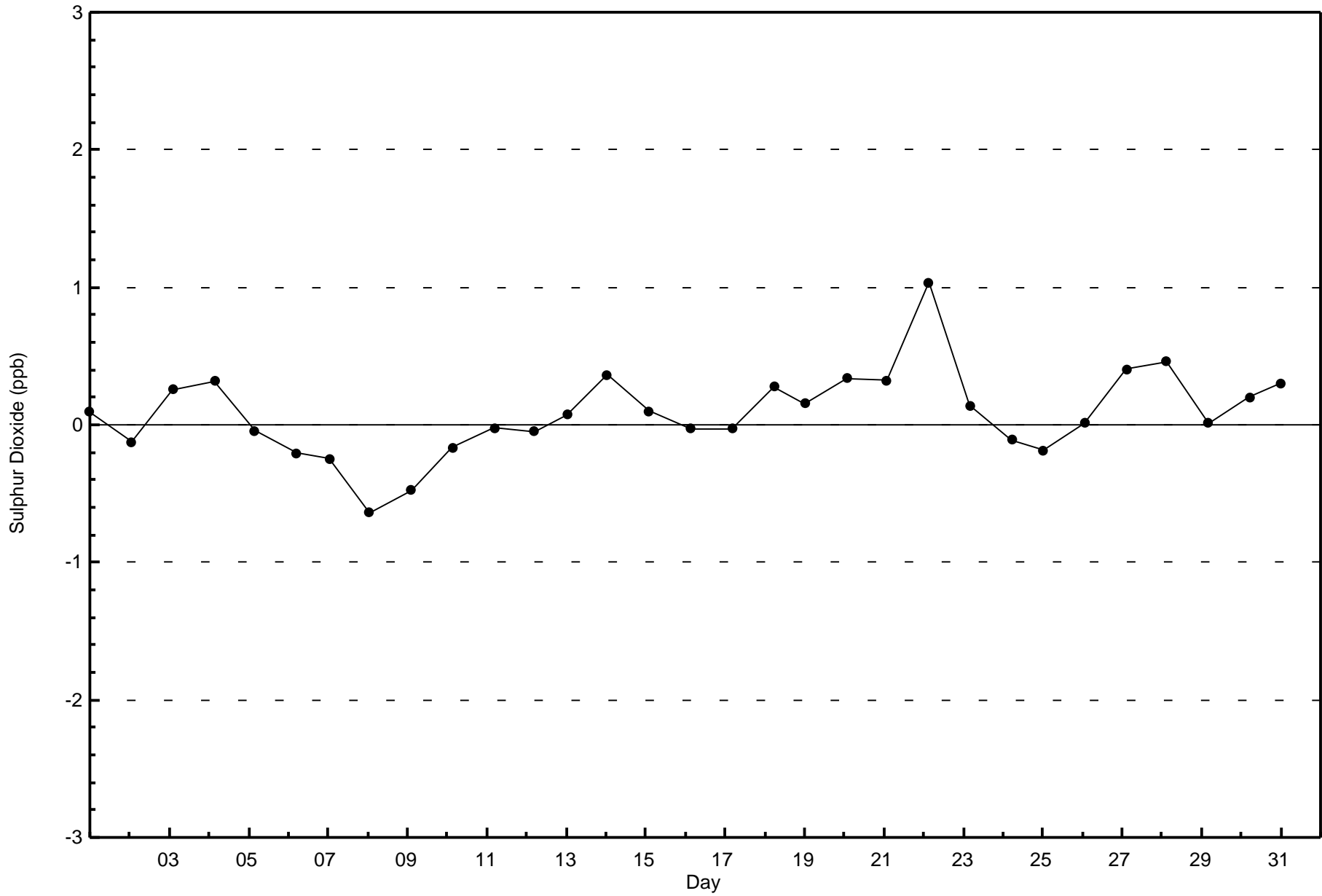
Sulphur Dioxide (SO₂) - ppb
Fort McKay South (AMS 13)





WBEA Data PC
Zero Responses

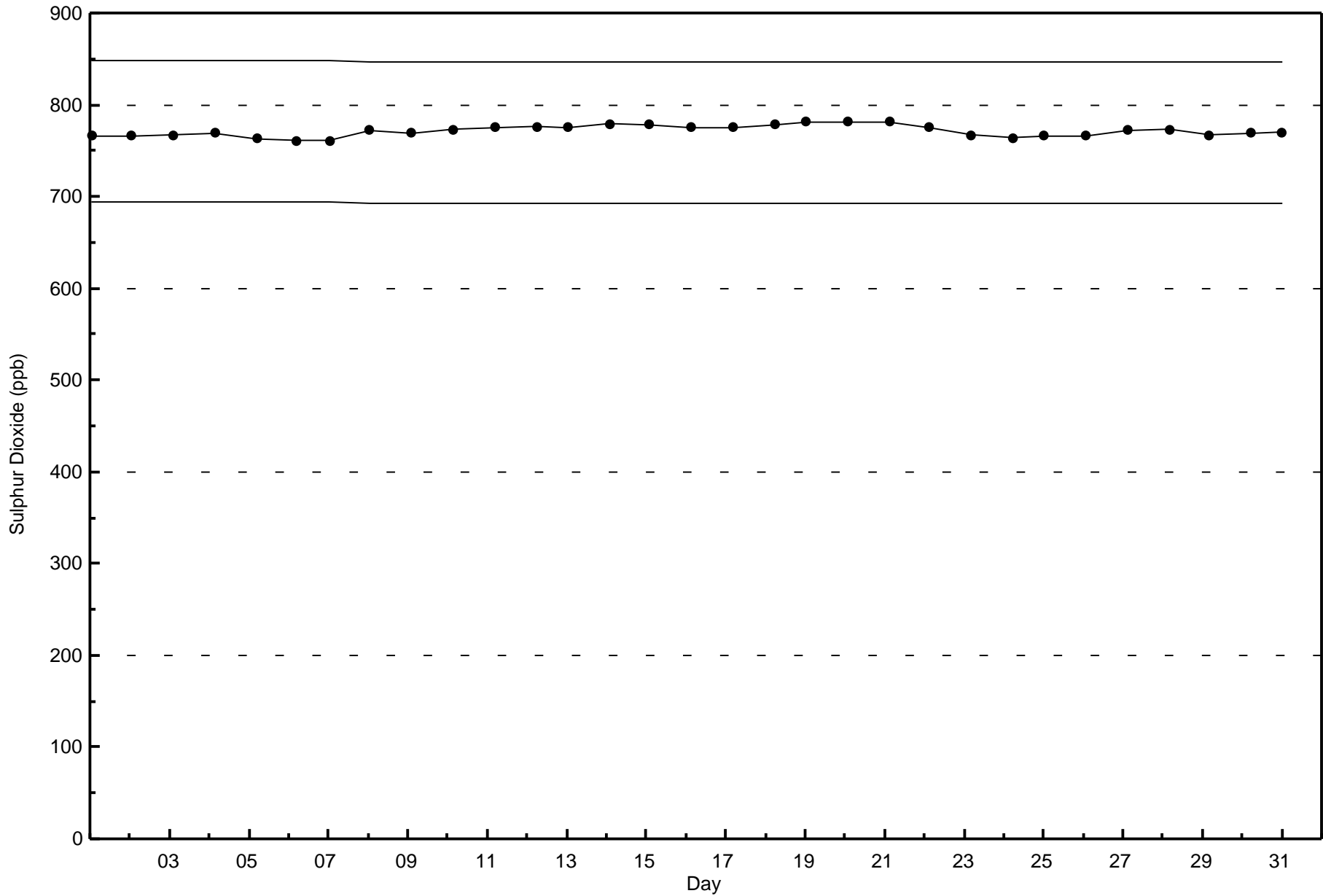
Sulphur Dioxide (SO₂) - ppb
Fort McKay South - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

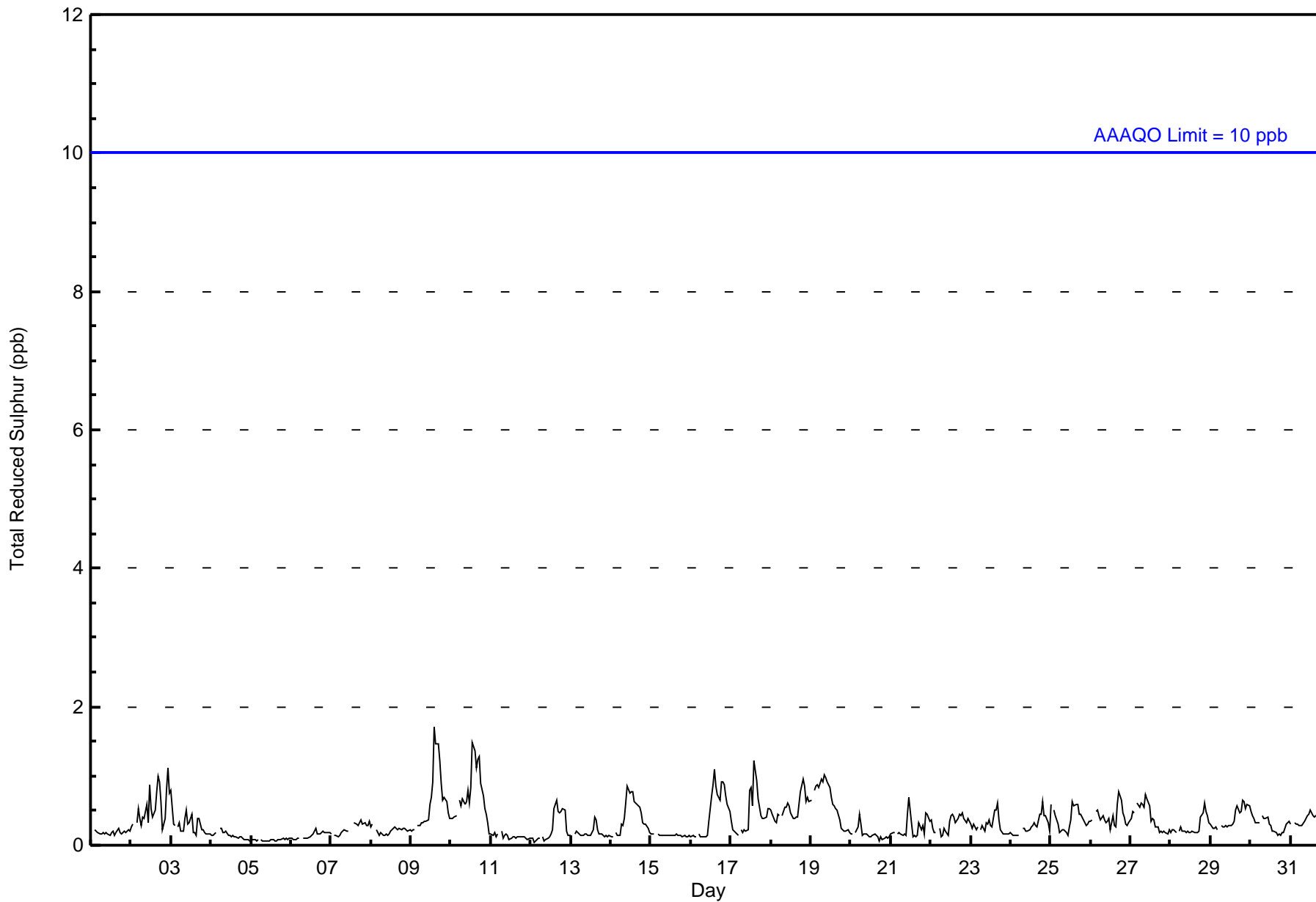
Fort McKay South - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2 ppb on Dec 9 15:00 Maximum Daily Average: 0.7 ppb on Dec 10																	Hours in Service: 744 Hours of Data: 710 Hours of Missing Data: 34 Hours of Calibration: 34 Percent Operational Time: 100.0									
Minimum Value: 0 ppb on Dec 12 03:00 Minimum Daily Average: 0.1 ppb on Dec 5 Maximum Diurnal Average: 0.4 ppb at hour 15 Minimum Diurnal Average: 0.2 ppb at hour 2 Monthly Average: 0.3 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 1																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	0	Z	0	1	0	0	0	0	1	0	1	1	0	1	1	1	1	1	0	0	1	1	1	0.6	1
3-Dec	1	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Dec	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	2	1	1	1	1	1	1	1	1	0	0.6	2
10-Dec	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.7	1
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0.2	1
13-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.4	1
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0.5	1
17-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	1	0.5	1
18-Dec	0	0	0	0	0	0	Z	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0.5	1
19-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.6	1
20-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.3	1
24-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.3	1
25-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0.4	1
26-Dec	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.4	1
27-Dec	0	0	0	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
28-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
29-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0.4	1
30-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
																								0.3	0.3	
																								1	1	
Z - zerospan C - Calibration																								Diurnal Average		
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	60	51	16	6	3	3	6	46	137	57	59	69	48	65	38	45	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	51	16	6	3	3	6	46	137	57	59	69	48	65	38	45	709

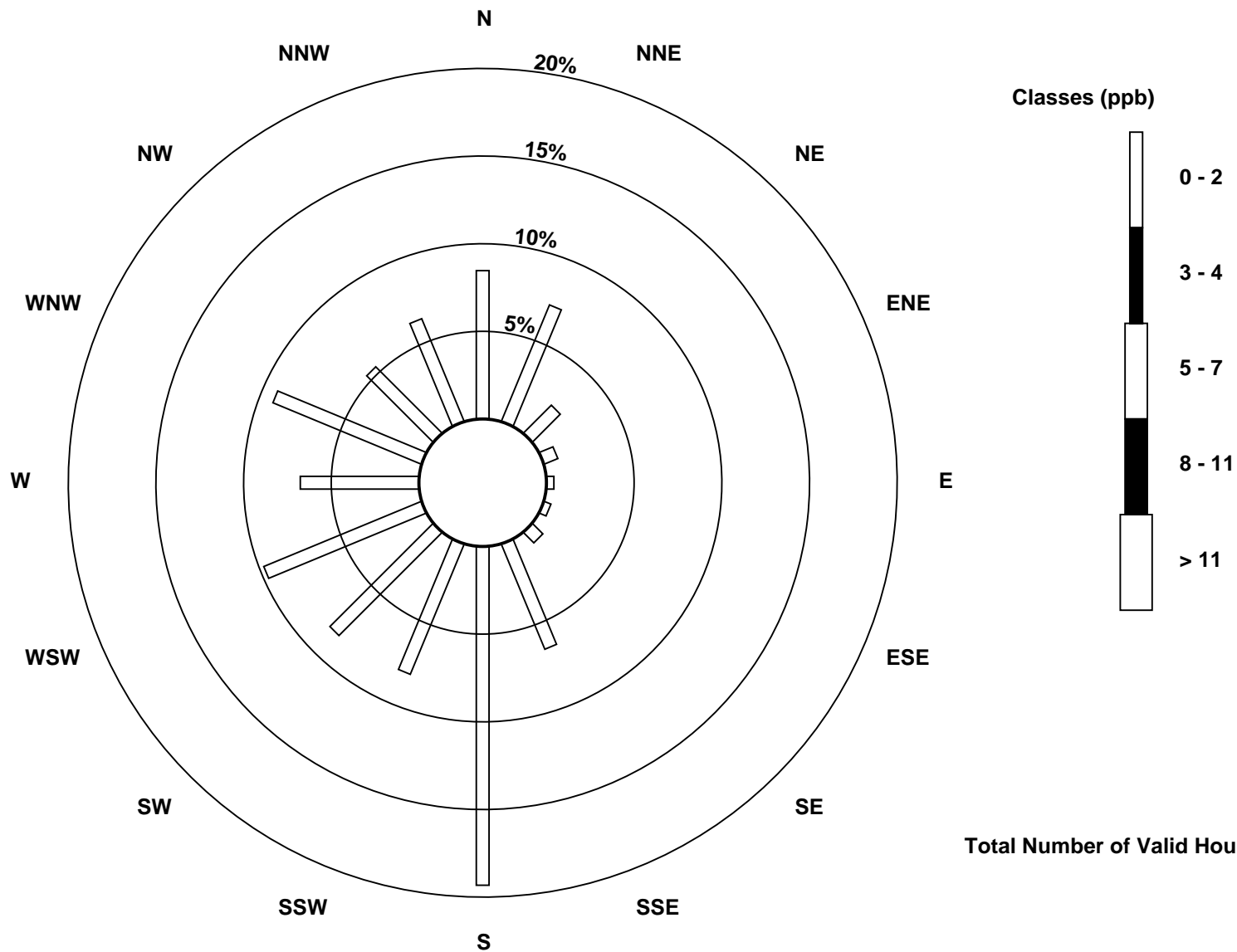
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Reduced Sulphur (TRS) - ppb
Fort McKay South (AMS 13)

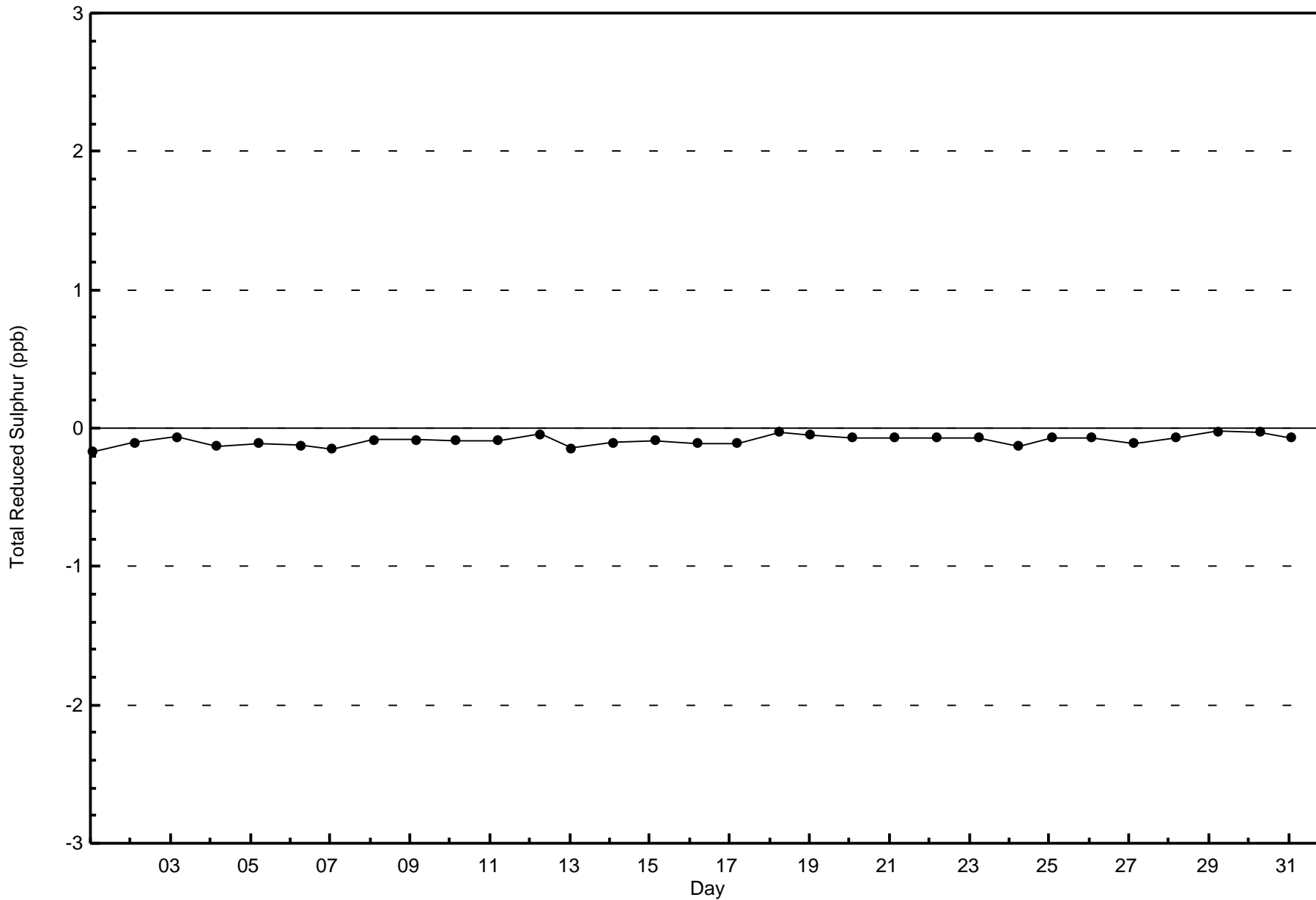


Total Number of Valid Hours: 709



WBEA Data PC
Zero Responses

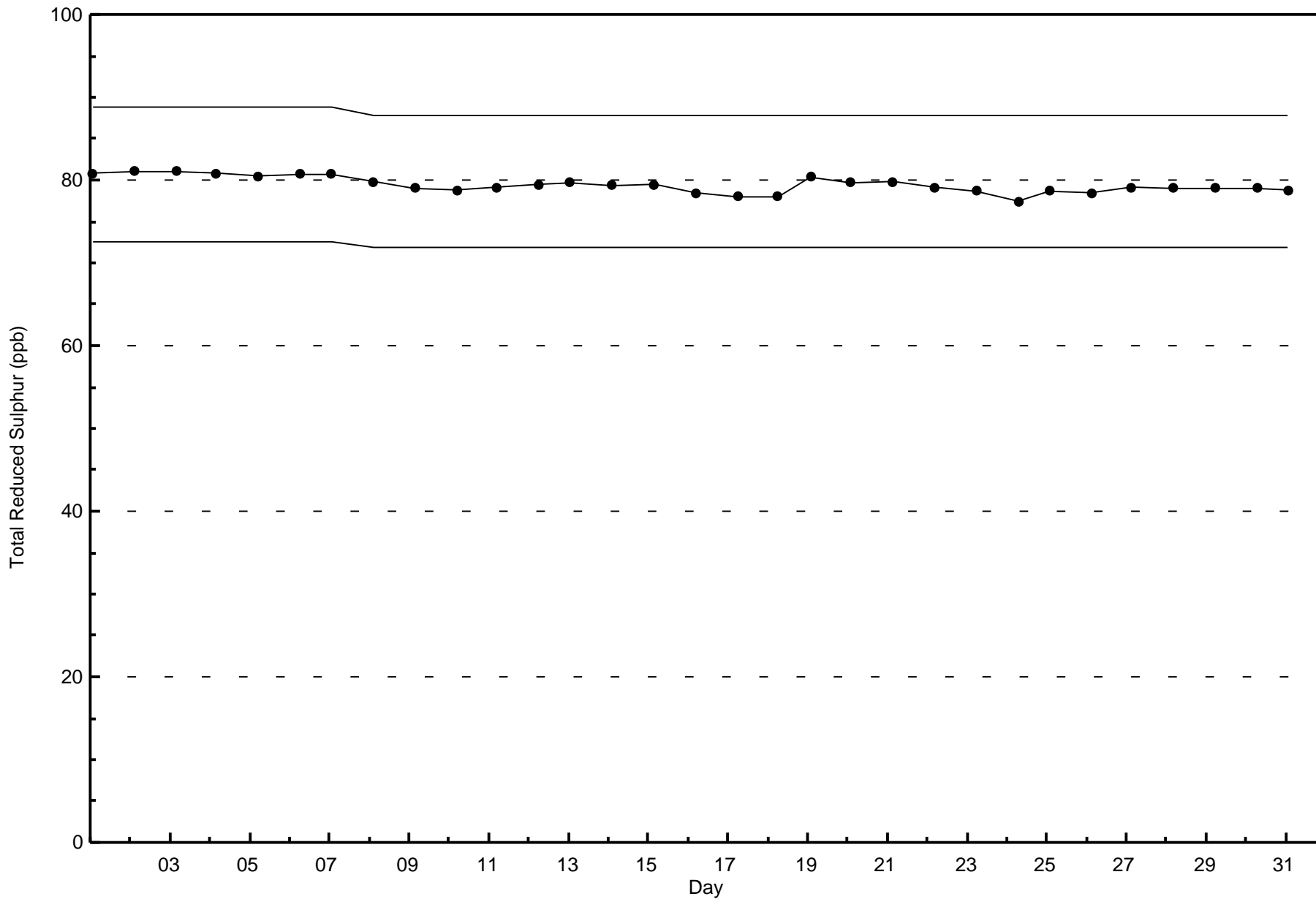
Total Reduced Sulphur (TRS) - ppb
Fort McKay South - December 2016





WBEA Data PC
Span Responses

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - December 2016



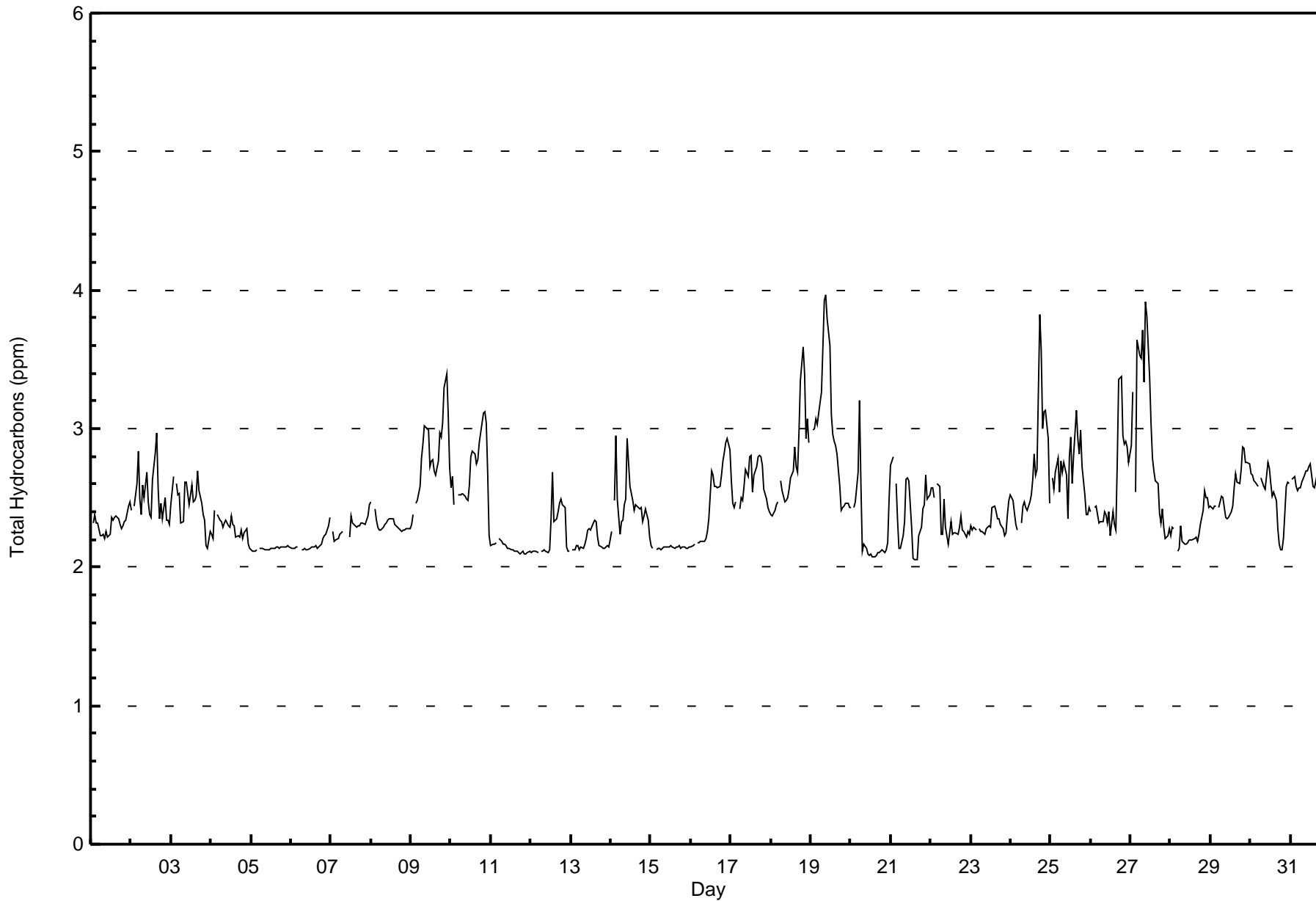


Maximum Value: 4.0 ppm on Dec 19 10:00																				Maximum Daily Average: 3.0 ppm on Dec 19					Hours in Service: 744		
Minimum Value: 2.1 ppm on Dec 21 17:00																				Minimum Daily Average: 2.1 ppm on Dec 5					Hours of Data: 710		
Maximum Diurnal Average: 2.5 ppm at hour 19																				Minimum Diurnal Average: 2.4 ppm at hour 3					Hours of Missing Data: 34		
Monthly Average: 2.45 ppm																				Percentiles: P ₁ = 2.1 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.4 Q ₃ = 2.6 P ₉₀ = 2.9 P ₉₉ = 3.7					Hours of Calibration: 34		
																									Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.3	2.5	
2-Dec	2.4	Z	2.4	2.6	2.8	2.5	2.4	2.6	2.5	2.7	2.5	2.4	2.4	2.6	2.8	3.0	2.6	2.4	2.5	2.4	2.5	2.3	2.3	2.3	2.5	3.0	
3-Dec	2.5	2.7	Z	2.6	2.5	2.5	2.3	2.3	2.6	2.6	2.5	2.4	2.6	2.5	2.5	2.5	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.3	2.5	2.7	
4-Dec	2.2	2.2	2.4	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.1	2.3	2.3	2.4	
5-Dec	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	
6-Dec	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.4	
7-Dec	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.3	C	C	C	2.2	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.3	2.5	
8-Dec	2.5	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	
9-Dec	2.3	2.4	Z	2.5	2.5	2.6	2.8	2.9	3.0	3.0	3.0	2.7	2.8	2.8	2.7	2.7	2.8	3.0	2.9	3.0	3.3	3.4	3.1	2.7	2.8	3.4	
10-Dec	2.6	2.7	2.4	Z	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.8	2.8	2.8	2.8	2.8	2.9	3.0	3.1	3.1	3.0	2.7	2.2	2.7	3.1	
11-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	
12-Dec	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.4	2.7	2.3	2.4	2.4	2.5	2.5	2.5	2.4	2.1	2.1	2.1	2.2	2.7	
13-Dec	Z	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.3	
14-Dec	2.3	Z	2.5	2.9	2.5	2.2	2.3	2.3	2.5	2.5	2.9	2.6	2.5	2.5	2.4	2.5	2.4	2.4	2.4	2.3	2.4	2.4	2.3	2.2	2.5	2.9	
15-Dec	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	
16-Dec	2.1	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.7	2.7	2.6	2.6	2.6	2.6	2.7	2.8	2.8	2.9	2.9	2.8	2.5	2.9	
17-Dec	2.6	2.5	2.4	2.5	Z	2.4	2.5	2.5	2.6	2.7	2.6	2.8	2.8	2.5	2.7	2.7	2.8	2.8	2.8	2.7	2.6	2.5	2.4	2.4	2.6	2.8	
18-Dec	2.4	2.4	2.4	2.5	2.5	Z	2.6	2.6	2.5	2.5	2.5	2.6	2.6	2.7	2.9	2.7	2.7	3.0	3.3	3.6	3.4	2.9	3.1	2.9	2.7	3.6	
19-Dec	Z	3.0	3.0	3.1	3.0	3.1	3.3	3.6	3.9	4.0	3.8	3.6	3.1	3.0	2.9	2.9	2.8	2.6	2.4	2.4	2.4	2.5	2.5	2.4	3.0	4.0	
20-Dec	2.4	Z	2.4	2.5	2.7	3.2	2.6	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.5	2.3	3.2	
21-Dec	2.7	2.8	Z	2.6	2.3	2.1	2.1	2.2	2.3	2.6	2.6	2.6	2.3	2.1	2.1	2.1	2.1	2.2	2.3	2.4	2.5	2.7	2.5	2.5	2.4	2.8	
22-Dec	2.6	2.6	2.5	Z	2.6	2.6	2.2	2.2	2.5	2.3	2.2	2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.4	2.3	2.3	2.2	2.3	2.2	2.3	2.6	
23-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.2	2.3	2.4	2.5	2.3	2.5	
24-Dec	2.5	2.5	2.4	2.3	2.3	Z	2.3	2.4	2.5	2.4	2.4	2.5	2.5	2.6	2.8	2.7	2.7	3.8	3.6	3.0	3.1	3.1	2.9	2.5	2.7	3.8	
25-Dec	Z	2.6	2.6	2.7	2.8	2.5	2.8	2.7	2.8	2.7	2.4	2.8	2.9	2.6	2.8	3.1	2.9	2.8	3.0	2.7	2.5	2.4	2.4	2.4	2.7	3.1	
26-Dec	2.4	Z	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.4	2.3	2.4	2.2	2.4	2.3	2.3	2.8	3.4	3.4	3.0	2.9	2.9	2.9	2.8	2.6	3.4	
27-Dec	2.9	3.3	Z	2.5	3.6	3.5	3.5	3.7	3.3	3.9	3.8	3.4	3.0	2.8	2.7	2.6	2.6	2.4	2.3	2.4	2.3	2.2	2.2	2.3	2.9	3.9	
28-Dec	2.2	2.3	2.3	Z	2.1	2.1	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.5	2.4	2.3	2.5	
29-Dec	2.4	2.4	2.4	2.4	Z	2.4	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.6	2.7	2.6	2.6	2.7	2.9	2.9	2.8	2.8	2.7	2.6	2.9
30-Dec	2.7	2.7	2.6	2.6	2.6	Z	2.6	2.6	2.6	2.6	2.8	2.7	2.6	2.5	2.5	2.5	2.3	2.2	2.1	2.1	2.2	2.6	2.6	2.6	2.5	2.8	
31-Dec	Z	2.6	2.7	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.6	3.1	2.7	2.2	2.1	2.1	2.1	2.1	2.5	3.1	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration																											



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay South - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	674	94.93	94.93
3.1 - 10.0	36	5.07	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay South - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	53	50	16	3	4	3	7	48	131	48	54	67	46	64	37	42	673
3.1 - 10.0	8	2	0	1	0	0	0	0	6	10	4	0	1	0	0	4	36
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	61	52	16	4	4	3	7	48	137	58	58	67	47	64	37	46	709

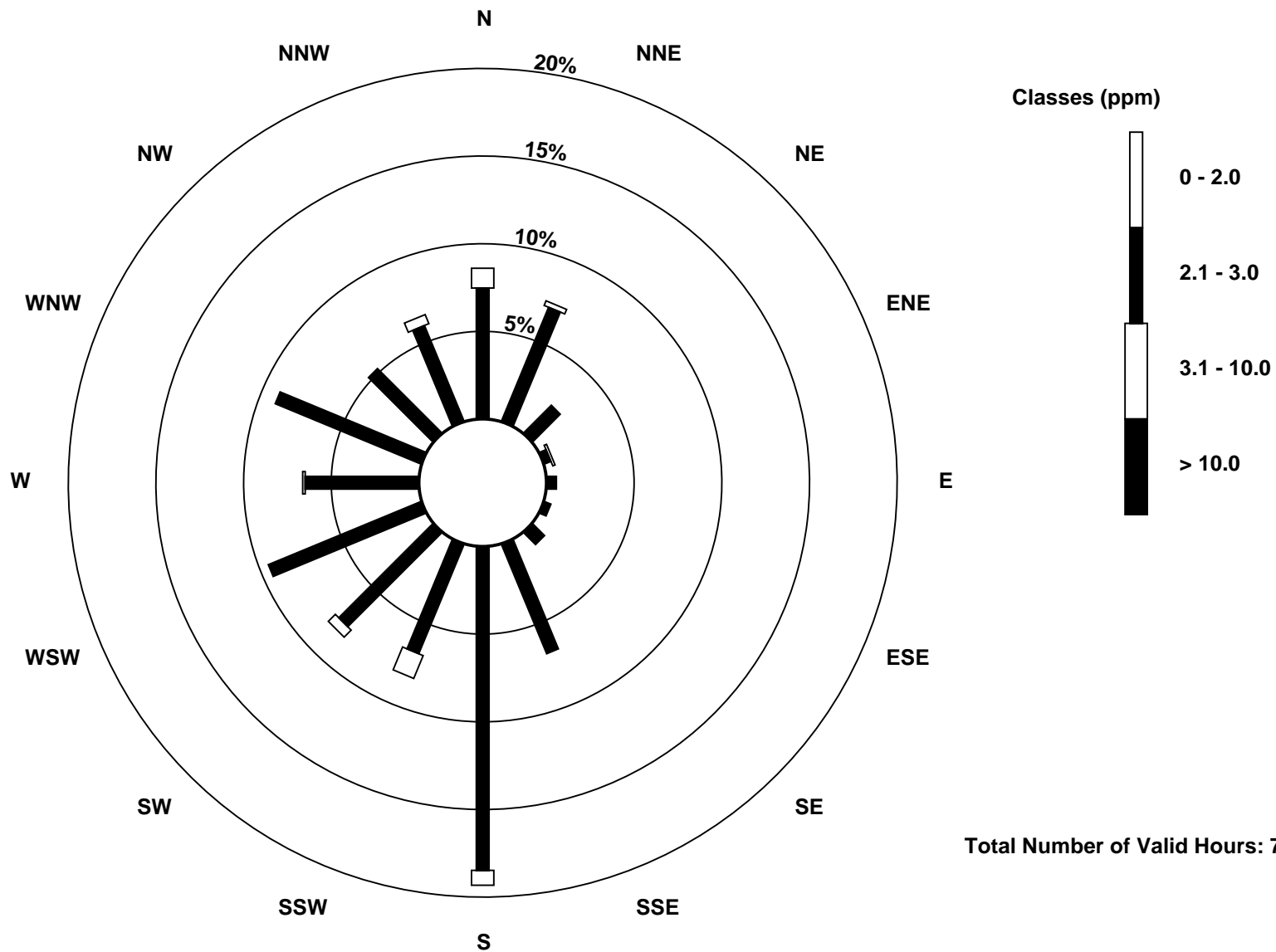
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

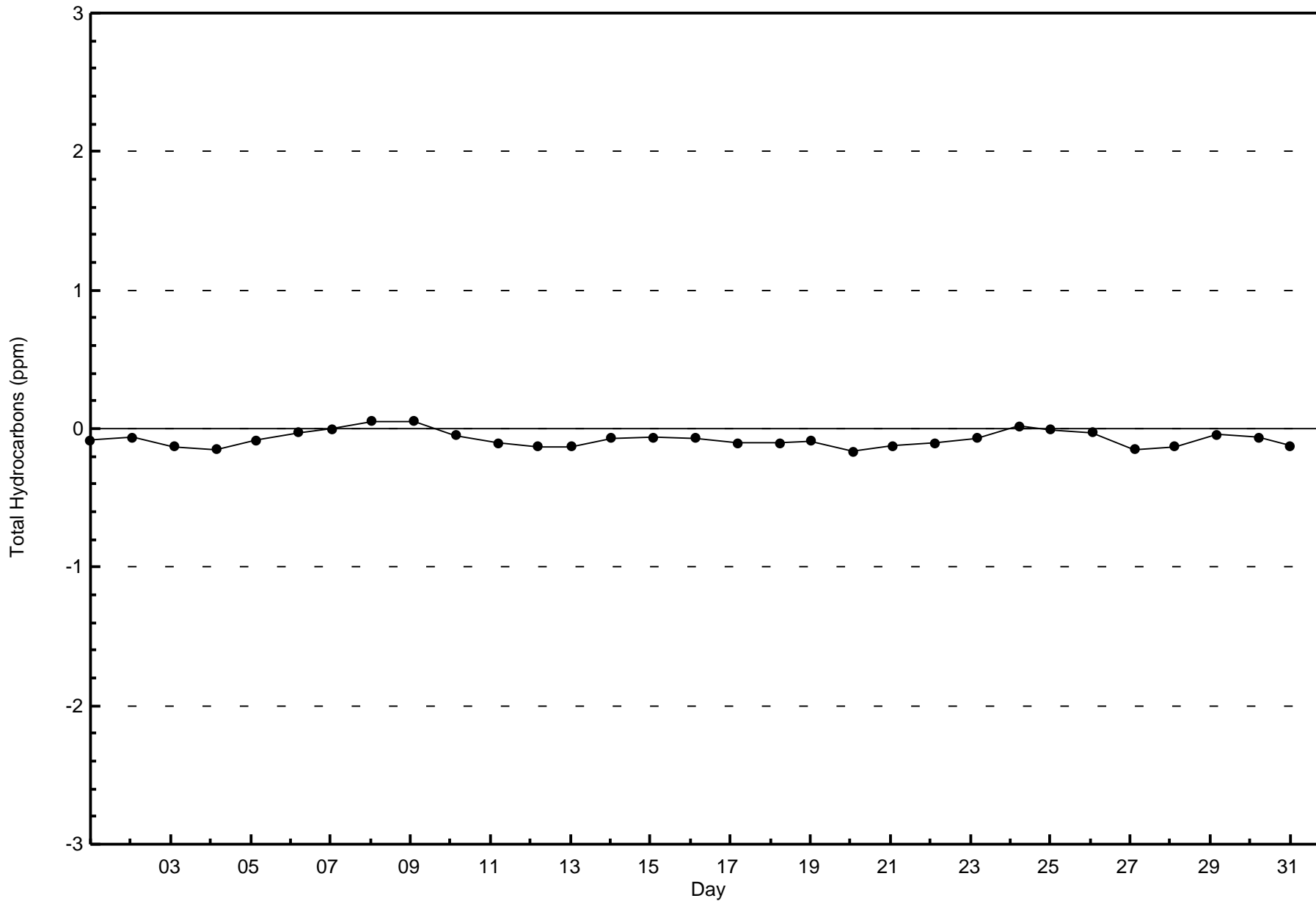
Total Hydrocarbons (THC) - ppm
Fort McKay South (AMS 13)





WBEA Data PC
Zero Responses

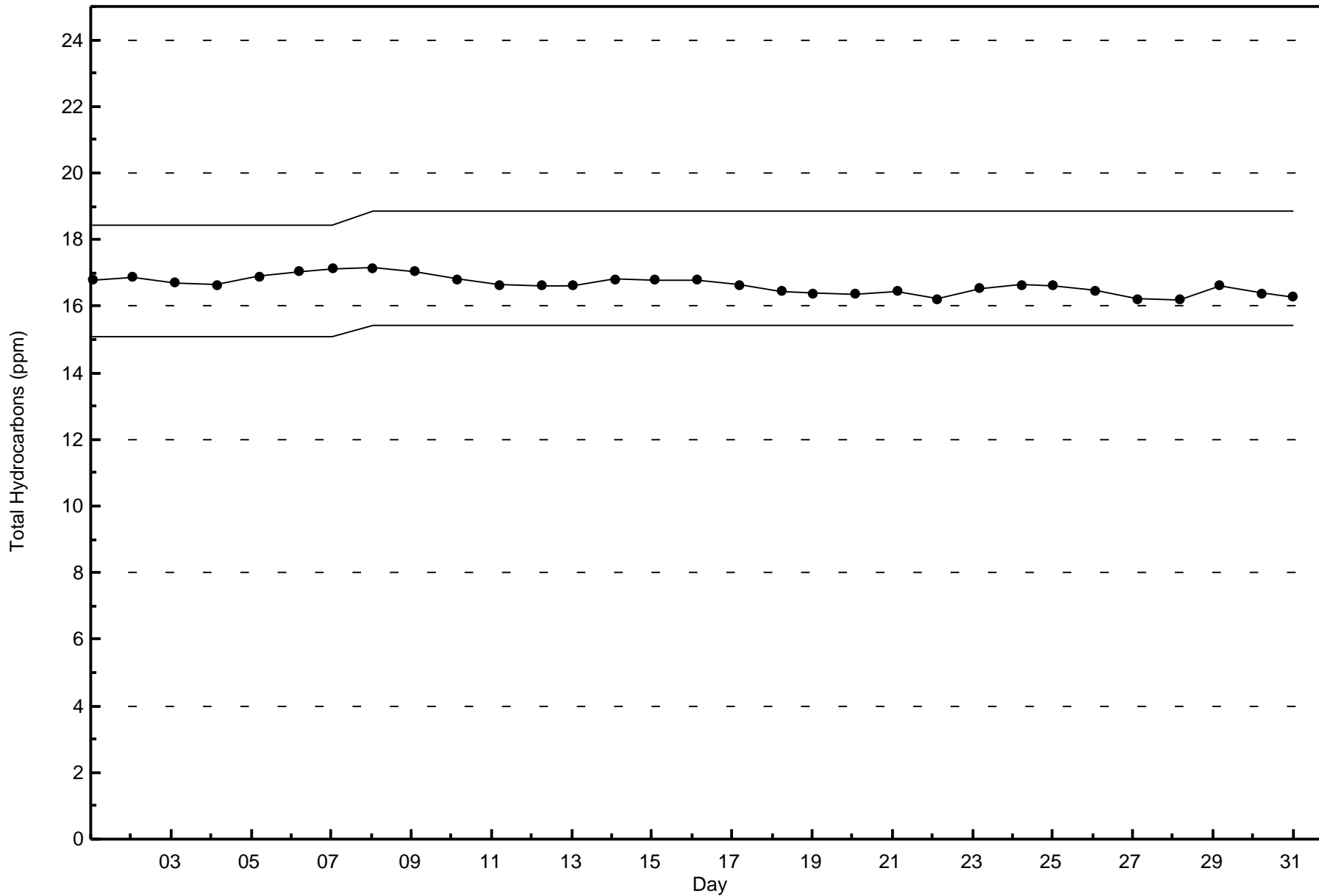
Total Hydrocarbons (THC) - ppm
Fort McKay South - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Fort McKay South - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

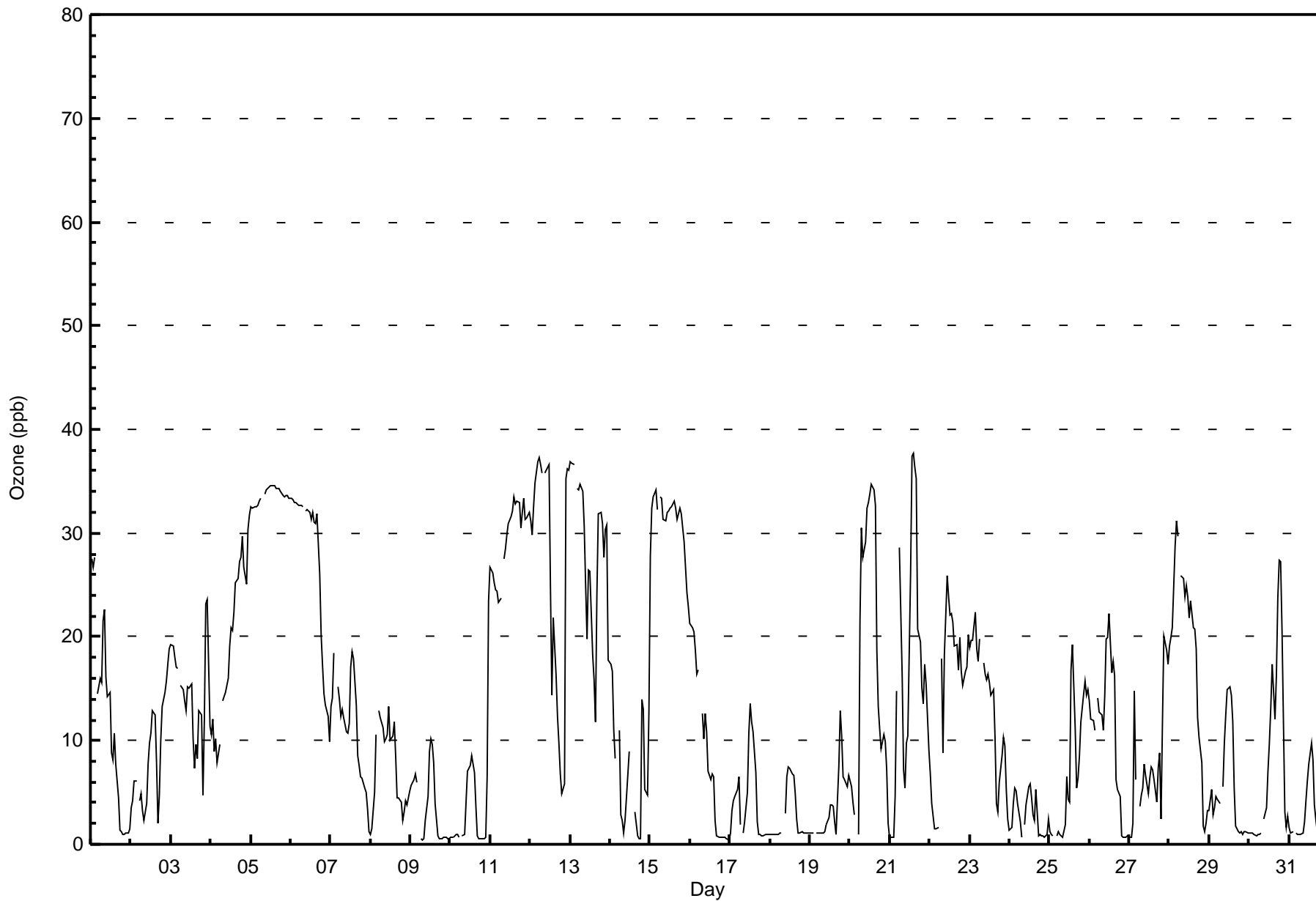
Fort McKay South - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 38 ppb on Dec 21 15:00										Maximum Daily Average: 33.7 ppb on Dec 5										Hours of Data: 710						
Minimum Value: 0 ppb on Dec 9 08:00										Minimum Daily Average: 2.6 ppb on Dec 18										Hours of Missing Data: 34						
Maximum Diurnal Average: 16.9 ppb at hour 15										Minimum Diurnal Average: 11.3 ppb at hour 18										Hours of Calibration: 34						
Monthly Average: 13.4 ppb										Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 3 Median = 11 Q ₃ = 21 P ₉₀ = 32 P ₉₉ = 37										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	27	27	28	Z	14	16	16	22	23	16	14	15	9	8	11	8	4	1	1	1	1	1	1	2	11.5	28
2-Dec	3	4	6	6	Z	4	5	3	2	4	8	10	11	13	12	8	2	5	10	13	15	16	17	19	8.5	19
3-Dec	19	19	18	17	17	Z	15	15	14	13	15	15	10	7	10	8	13	13	5	12	23	24	11	14.3	24	
4-Dec	11	12	9	10	8	10	Z	14	14	15	16	19	21	21	22	25	26	27	28	30	27	25	30	32	19.6	32
5-Dec	33	32	32	33	33	33	33	Z	34	34	34	34	35	35	35	34	34	34	34	34	34	34	33	33	33.7	35
6-Dec	33	33	33	33	33	33	33	33	Z	32	32	32	31	32	31	31	32	26	20	17	14	13	12	10	27.4	33
7-Dec	13	14	18	Z	15	14	12	13	12	11	11	12	17	19	18	13	9	8	6	6	5	5	3	1	11.2	19
8-Dec	1	2	5	11	Z	13	12	11	10	10	11	13	10	10	12	8	4	4	4	2	3	4	4	5	7.4	13
9-Dec	6	6	6	7	6	Z	0	0	1	2	5	9	10	10	8	4	1	1	1	1	1	1	0	1	3.7	10
10-Dec	1	1	1	1	1	1	Z	1	1	4	7	7	8	9	7	4	1	1	1	1	1	1	6	23	3.7	23
11-Dec	27	26	25	24	24	23	24	Z	28	28	30	31	32	32	33	33	33	33	31	32	33	31	31	32	29.5	33
12-Dec	31	30	33	35	37	37	37	36	Z	36	36	37	25	14	22	16	12	10	7	5	6	35	36	36	26.5	37
13-Dec	37	37	37	Z	34	34	35	34	31	25	20	26	26	18	16	12	24	32	32	31	28	30	31	18	28.1	37
14-Dec	17	17	11	8	Z	11	3	2	1	2	5	9	C	C	C	3	1	1	1	14	13	5	5	13	7.1	17
15-Dec	28	32	33	34	32	Z	33	33	31	31	32	32	32	33	33	32	31	32	32	32	29	27	24	23	31.1	34
16-Dec	21	21	20	19	16	17	Z	13	10	13	11	7	6	7	6	2	1	1	1	1	1	1	0	0	8.5	21
17-Dec	1	3	4	5	5	7	2	Z	1	2	5	11	14	12	11	7	2	1	1	1	1	1	1	1	4.2	14
18-Dec	1	1	1	1	1	1	1	1	Z	3	7	7	7	7	7	5	2	1	1	1	1	1	1	1	2.6	7
19-Dec	1	1	1	Z	1	1	1	1	1	1	2	3	4	4	4	2	1	8	13	10	7	6	5	7	3.7	13
20-Dec	6	6	4	3	Z	1	21	31	28	29	32	33	34	35	34	33	19	13	11	9	11	10	7	2	17.9	35
21-Dec	1	1	1	5	15	Z	29	16	7	5	10	10	26	37	38	36	35	21	20	15	14	17	16	9	16.7	38
22-Dec	7	4	3	2	1	2	Z	18	9	18	26	24	22	22	21	19	19	17	20	17	15	17	17	20	14.8	26
23-Dec	19	20	20	22	19	18	20	Z	17	16	16	16	16	14	15	10	4	3	6	9	10	9	5	2	13.4	22
24-Dec	1	2	4	5	5	4	2	1	Z	2	4	6	6	4	3	2	5	1	1	1	1	1	1	2	2.8	6
25-Dec	1	1	1	Z	1	1	1	1	1	2	7	4	4	17	19	11	5	6	9	12	15	16	14	15	7.1	19
26-Dec	14	12	12	11	Z	14	13	12	11	14	20	20	22	17	18	16	6	5	5	1	1	1	1	1	10.7	22
27-Dec	1	1	2	15	6	Z	4	5	5	8	7	5	6	7	7	6	4	7	9	2	12	20	19	17	7.6	20
28-Dec	19	20	21	29	31	30	Z	26	26	24	25	24	22	23	21	21	19	12	10	8	2	1	2	3	18.2	31
29-Dec	3	5	3	4	5	4	4	Z	6	10	12	15	15	14	12	5	2	1	1	1	1	1	1	1	5.5	15
30-Dec	1	1	1	1	1	1	1	1	Z	2	4	7	10	13	17	12	16	24	27	27	21	3	2	3	8.5	27
31-Dec	2	1	1	Z	1	1	1	1	1	2	4	6	8	10	8	4	2	1	8	26	31	28	34	34	9.4	34
12.5 12.6 12.7 13.5 14.0 12.7 13.8 13.2 12.4 13.4 15.0 16.1 16.8 16.9 16.9 14.0 11.8 11.3 11.7 11.7 11.7 12.4 12.5 12.2																								Diurnal Average		
37 37 37 35 37 37 37 36 34 36 36 36 37 35 37 38 36 35 34 34 34 34 34 35 36 36																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



WBEA Data PC
Hourly Averages

Ozone (O₃) - ppb
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	522	73.52	73.52
21 - 50	188	26.48	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Ozone (O₃) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	53	34	13	6	3	3	8	41	133	49	44	40	17	18	27	32	521
21 - 50	6	14	3	0	1	0	0	5	7	6	16	26	32	48	10	14	188
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	48	16	6	4	3	8	46	140	55	60	66	49	66	37	46	709

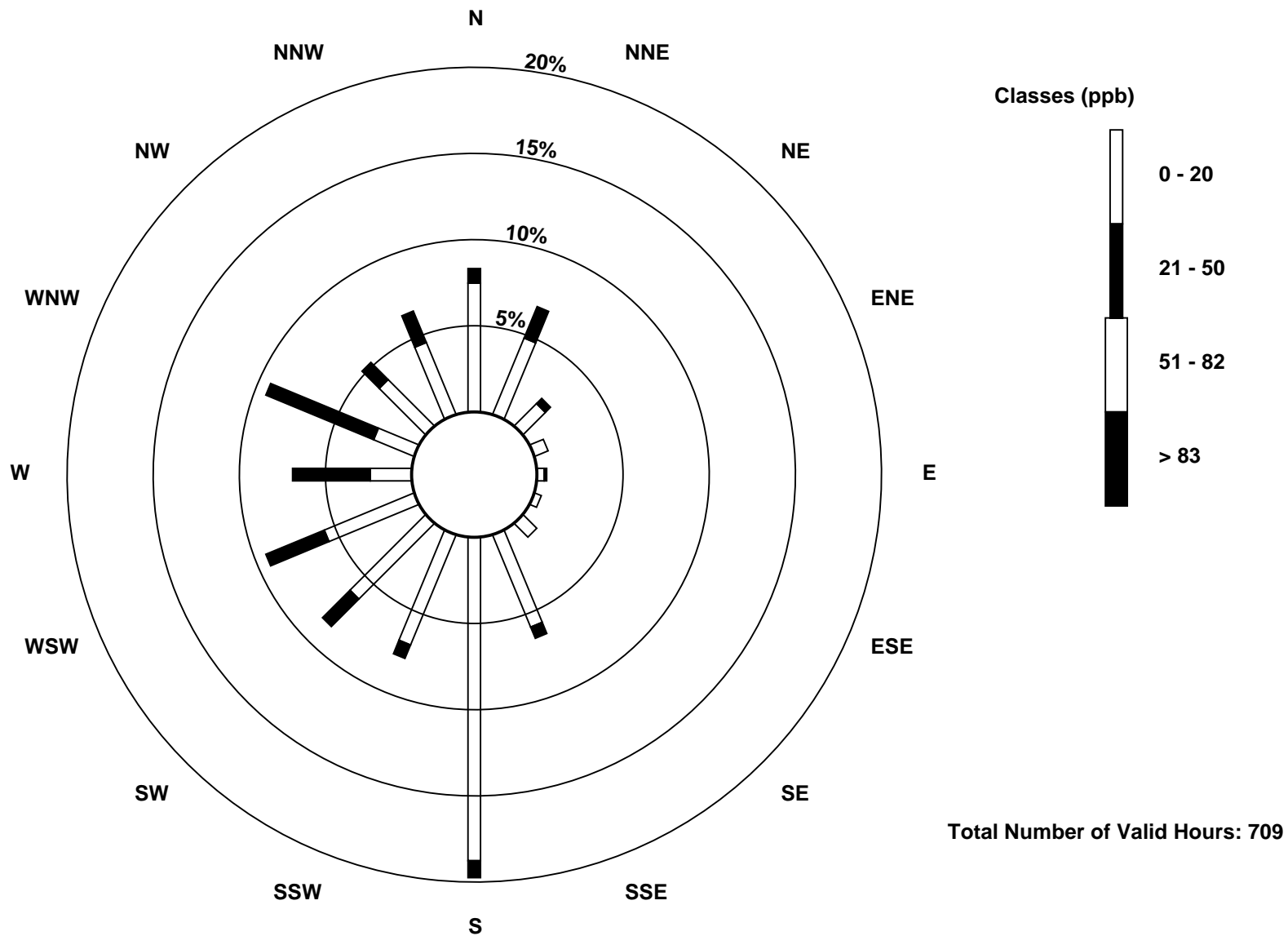
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

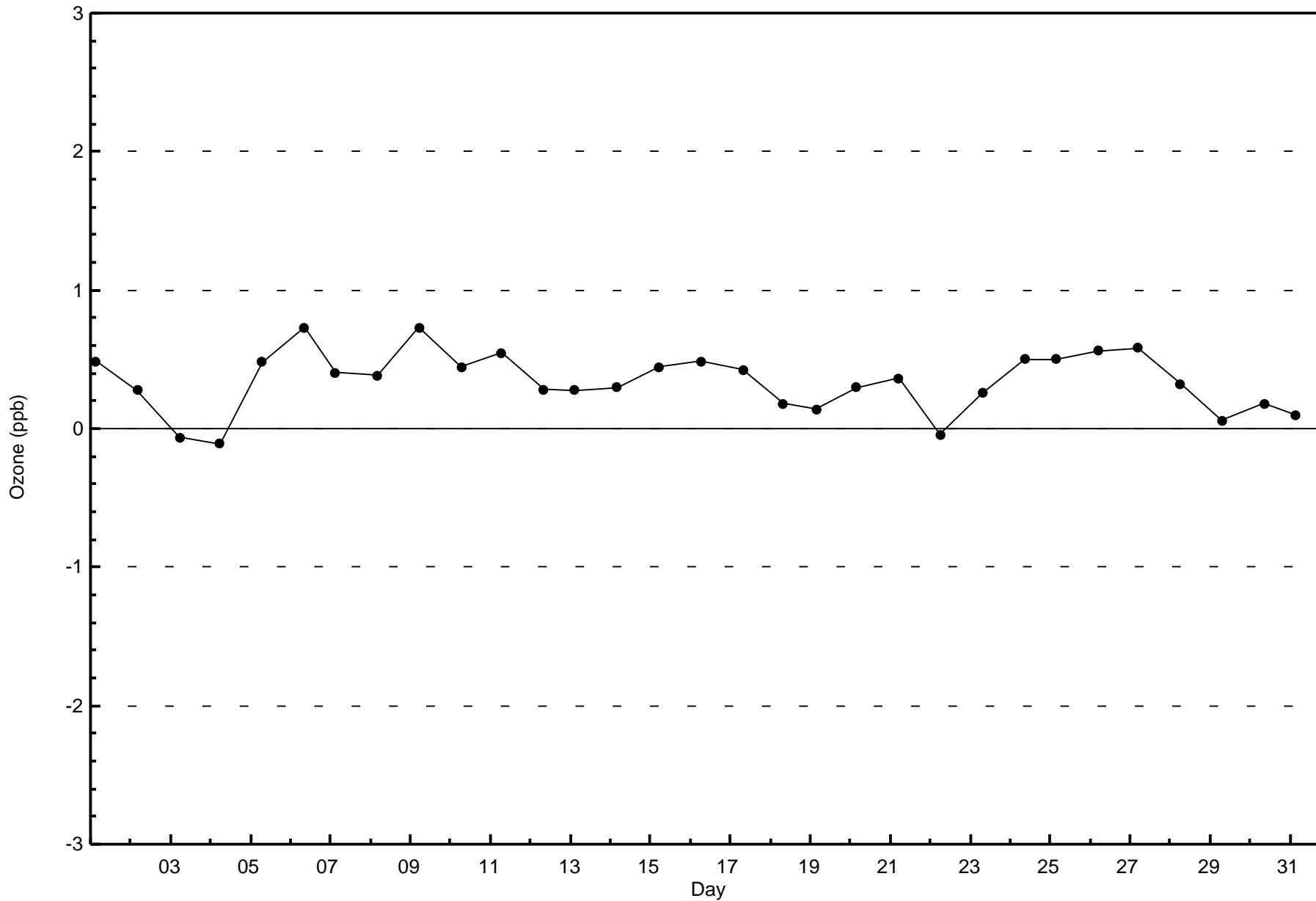
Ozone (O₃) - ppb
Fort McKay South (AMS 13)





WBEA Data PC
Zero Responses

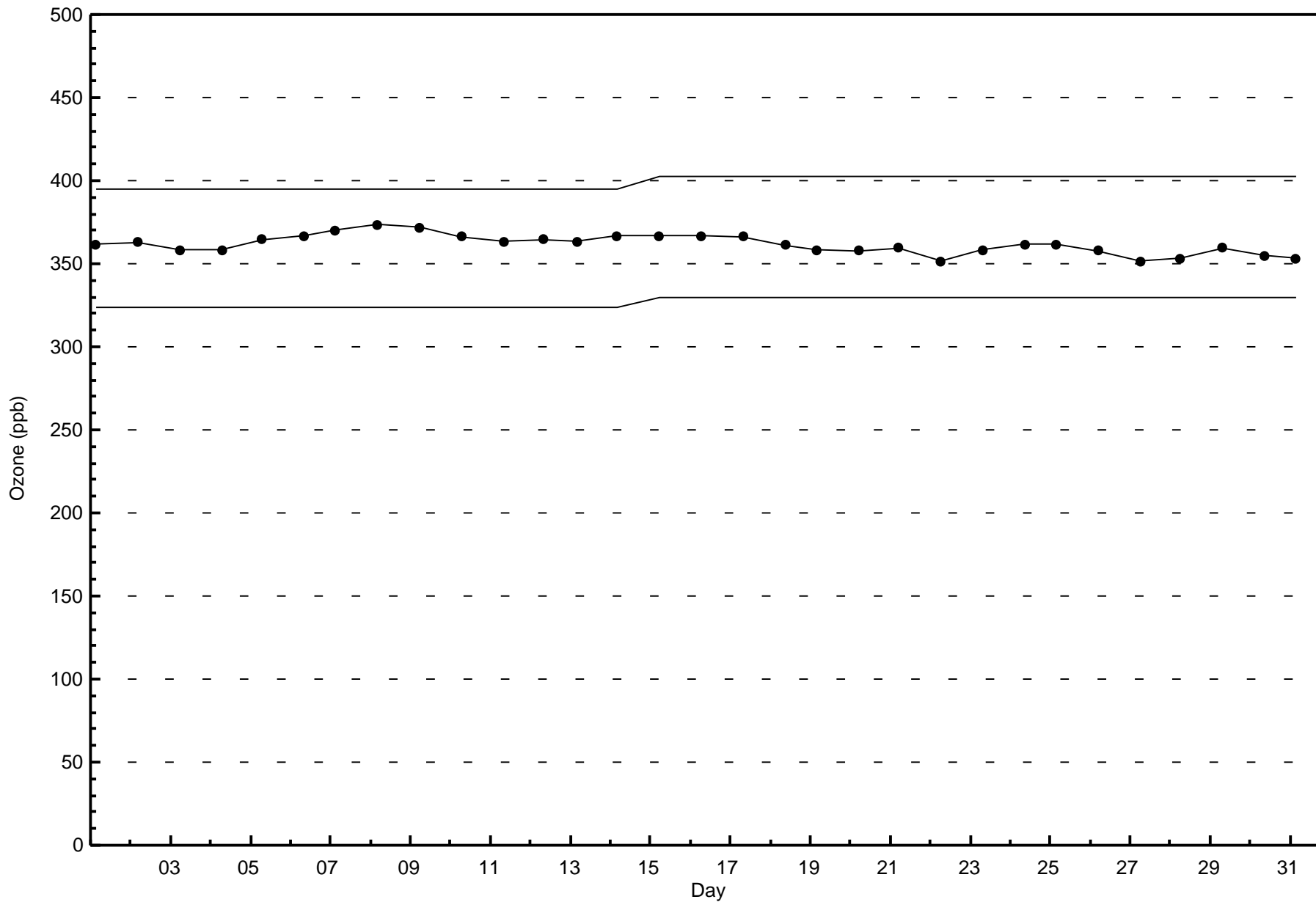
Ozone (O₃) - ppb
Fort McKay South - December 2016





WBEA Data PC
Span Responses

Ozone (O₃) - ppb
Fort McKay South - December 2016



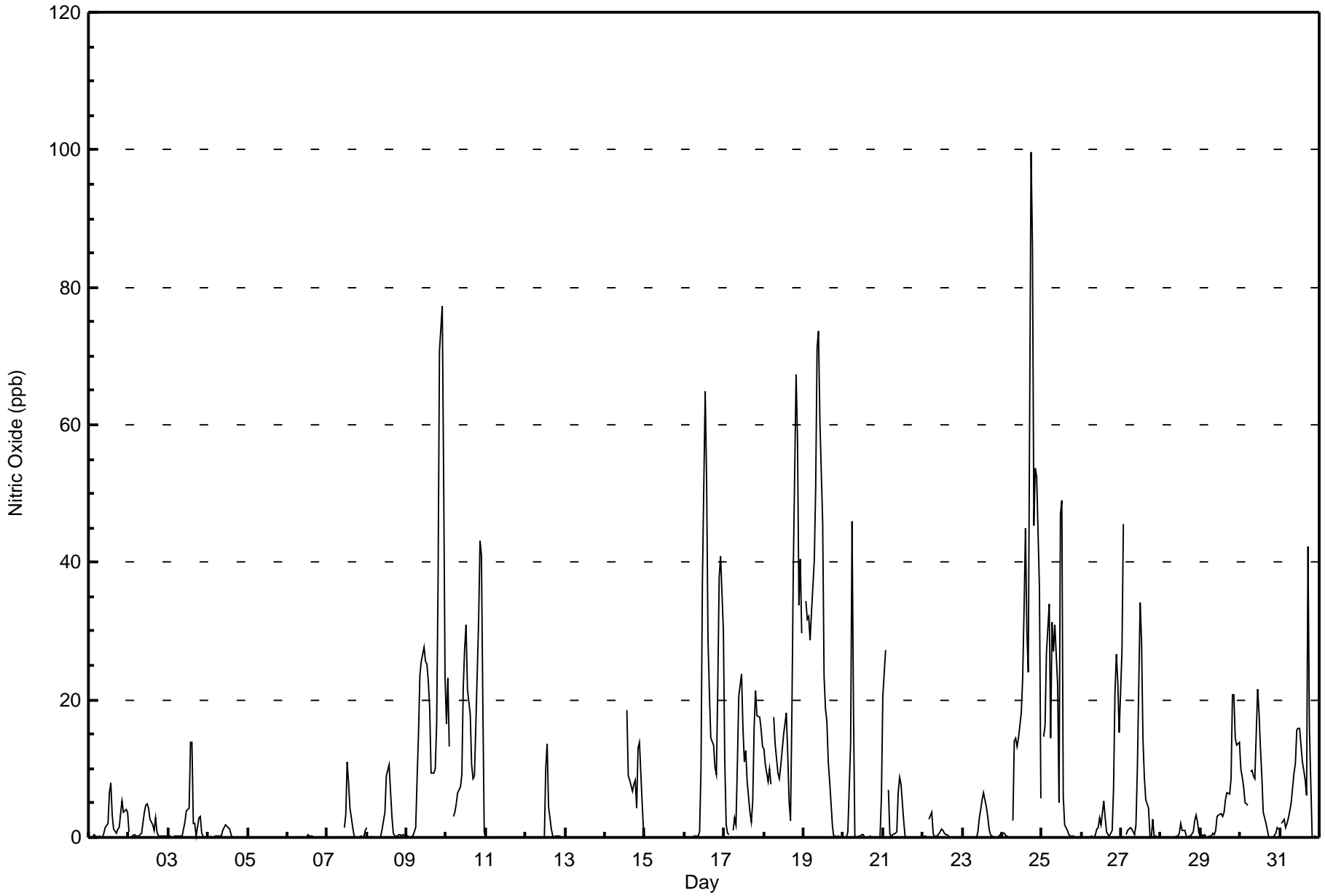


Maximum Value: 100 ppb on Dec 24 18:00		Maximum Daily Average: 26.6 ppb on Dec 24		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 5 10:00		Minimum Daily Average: 0.0 ppb on Dec 5		Hours of Data: 684																																													
Maximum Diurnal Average: 12.5 ppb at hour 13		Minimum Diurnal Average: 3.3 ppb at hour 3		Hours of Missing Data: 60																																													
Monthly Average: 7.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 9 P ₉₀ = 23 P ₉₉ = 66		Hours of Calibration: 34																																													
				Percent Operational Time: 96.5																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	0	0	0	0	0	0	0	0	1	1	2	6	8	3	1	1	1	1	3	5	4	4	4	2.1	8																							
2-Dec	1	Z	0	0	0	0	0	0	1	4	5	5	4	3	2	1	3	1	0	0	0	0	0	0	1.3	5																							
3-Dec	0	0	Z	0	0	0	0	0	0	1	2	4	4	14	14	2	2	0	3	3	1	0	0	0	2.2	14																							
4-Dec	0	0	0	Z	0	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.4	2																							
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
7-Dec	Z	0	0	0	0	0	0	0	M	M	1	3	11	8	4	1	0	0	0	0	0	0	0	0	1.5	11																							
8-Dec	1	Z	0	0	0	0	0	0	0	1	2	4	9	11	7	3	1	0	0	0	0	0	0	0	1.8	11																							
9-Dec	0	0	Z	0	0	1	9	15	24	26	28	26	25	23	19	9	9	10	17	37	71	77	52	23	21.8	77																							
10-Dec	17	23	13	Z	3	4	5	7	7	9	22	27	31	21	18	11	9	9	16	31	43	41	20	1	16.8	43																							
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	10	14	4	1	0	0	0	0	0	0	0	0	1.3	14																							
13-Dec	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	M	M	M	M	M	M	M	M	M	M	--	0																							
14-Dec	M	M	M	M	M	M	M	M	M	M	M	M	M	M	19	9	8	7	8	8	4	13	14	5	1	--	19																						
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
16-Dec	0	0	0	Z	0	0	0	0	0	1	10	37	65	52	29	21	14	13	10	9	22	38	41	30	17.1	65																							
17-Dec	11	2	1	0	Z	1	3	2	11	21	24	16	11	13	8	4	2	5	16	21	18	17	16	13	10.2	24																							
18-Dec	13	11	8	10	8	Z	17	14	9	9	10	13	15	18	12	5	2	18	39	67	58	34	41	30	20.1	67																							
19-Dec	Z	34	32	32	29	33	40	51	71	74	61	46	23	19	17	11	8	2	0	0	0	0	0	0	25.3	74																							
20-Dec	0	Z	0	1	14	46	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.8	46																							
21-Dec	20	27	Z	7	1	0	0	1	1	7	9	8	2	0	0	0	0	0	0	0	0	0	0	0	3.6	27																							
22-Dec	0	0	0	Z	3	4	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	4																							
23-Dec	0	0	0	0	Z	0	0	0	0	1	3	4	5	6	4	3	1	1	0	0	0	0	0	0	1.3	6																							
24-Dec	1	1	0	0	0	Z	2	14	14	13	14	18	23	33	45	30	24	100	86	45	54	53	36	6	26.6	100																							
25-Dec	Z	15	16	27	34	14	31	27	31	22	5	47	49	6	2	1	0	0	0	0	0	0	0	0	14.3	49																							
26-Dec	0	Z	0	0	0	0	0	0	1	1	1	3	2	5	3	1	0	0	1	7	21	27	23	15	4.9	27																							
27-Dec	27	46	Z	0	1	1	1	1	0	2	10	34	29	15	9	6	4	0	0	3	0	0	0	0	8.2	46																							
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	1	2	3	2	1	0.7	3																							
29-Dec	1	0	0	0	Z	0	0	1	0	1	3	3	3	3	4	5	6	6	9	21	21	14	14	14	5.7	21																							
30-Dec	10	9	7	5	5	Z	10	10	9	9	22	18	13	9	4	2	1	0	0	0	0	1	1	1	6.3	22																							
31-Dec	Z	2	3	1	2	3	4	5	9	11	16	16	16	11	10	8	6	42	16	0	0	0	0	0	7.9	42																							
																								4.2	6.5	3.3	3.4	4.0	4.3	4.8	4.9	6.5	7.6	8.7	11.6	12.5	10.4	7.6	4.5	3.4	7.3	7.5	8.5	11.0	10.8	8.5	4.9	Diurnal Average	
																								27	46	32	32	34	46	40	51	71	74	61	47	65	52	45	30	24	100	86	67	71	77	52	30	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance																					



WBEA Data PC
Hourly Averages

Nitric Oxide (NO) - ppb
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	603	88.16	88.16
21 - 40	54	7.89	96.05
41 - 80	25	3.65	99.71
81 - 159	2	0.29	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	48	47	14	2	3	2	4	33	114	48	49	63	41	59	36	39	602
21 - 40	6	3	1	0	0	1	2	10	12	3	7	4	1	0	0	4	54
11 - 80	5	2	0	2	0	0	0	4	3	3	2	0	2	0	0	2	25
81 - 159	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	52	15	4	3	3	6	47	131	54	58	67	44	59	36	45	683

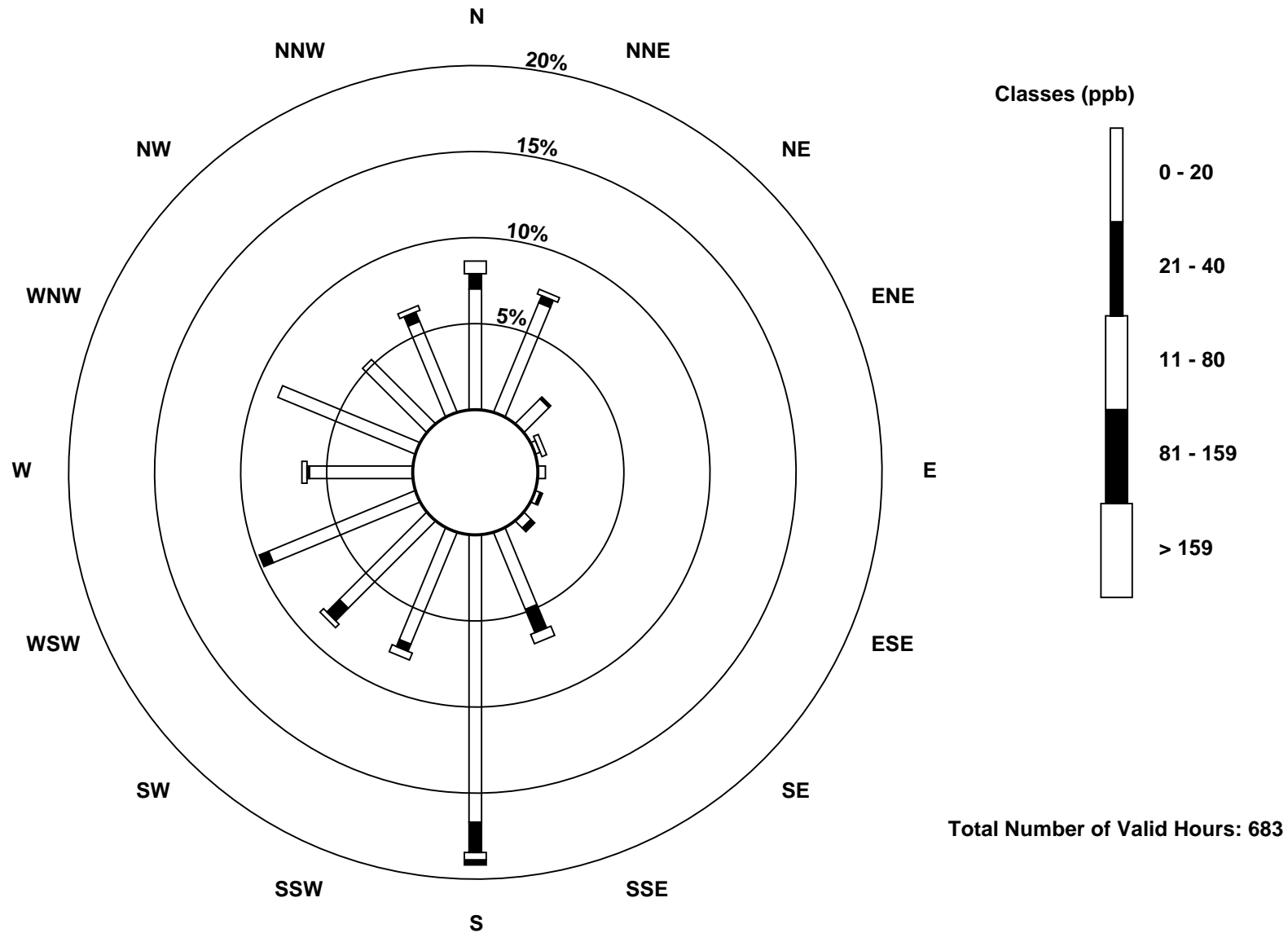
Total Number of Valid Hours: 683

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

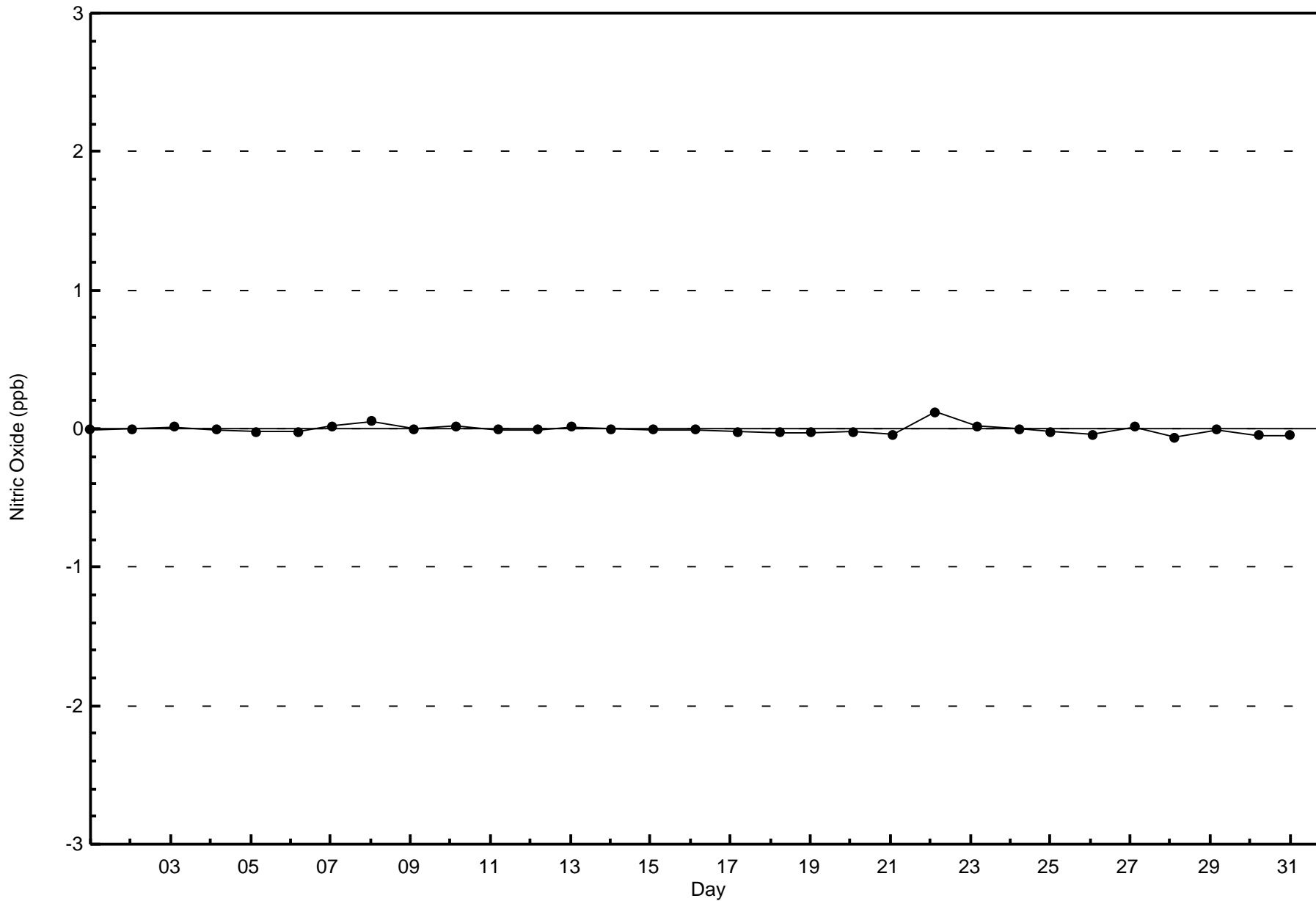
Nitric Oxide (NO) - ppb
Fort McKay South (AMS 13)

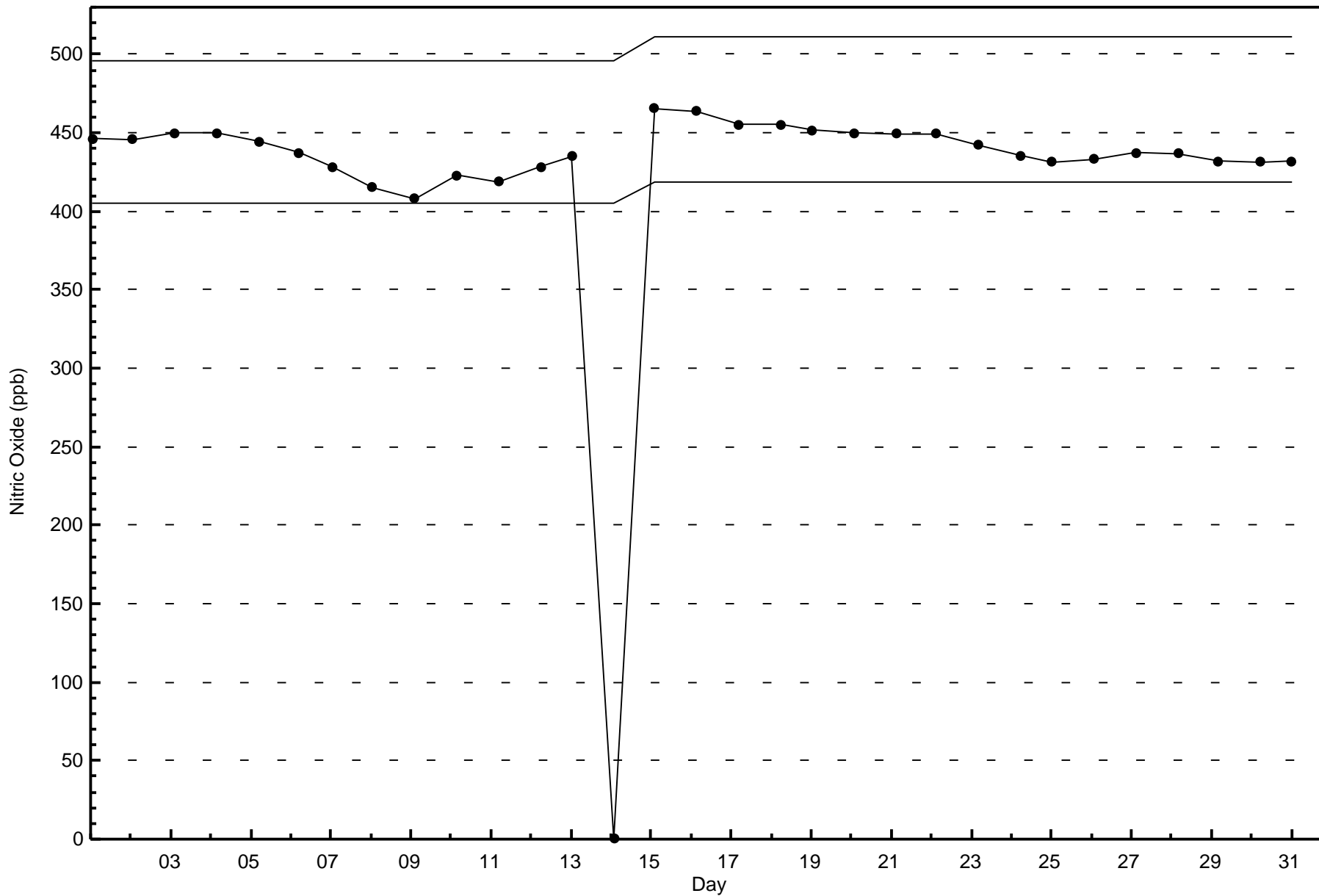




WBEA Data PC
Zero Responses

Nitric Oxide (NO) - ppb
Fort McKay South - December 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

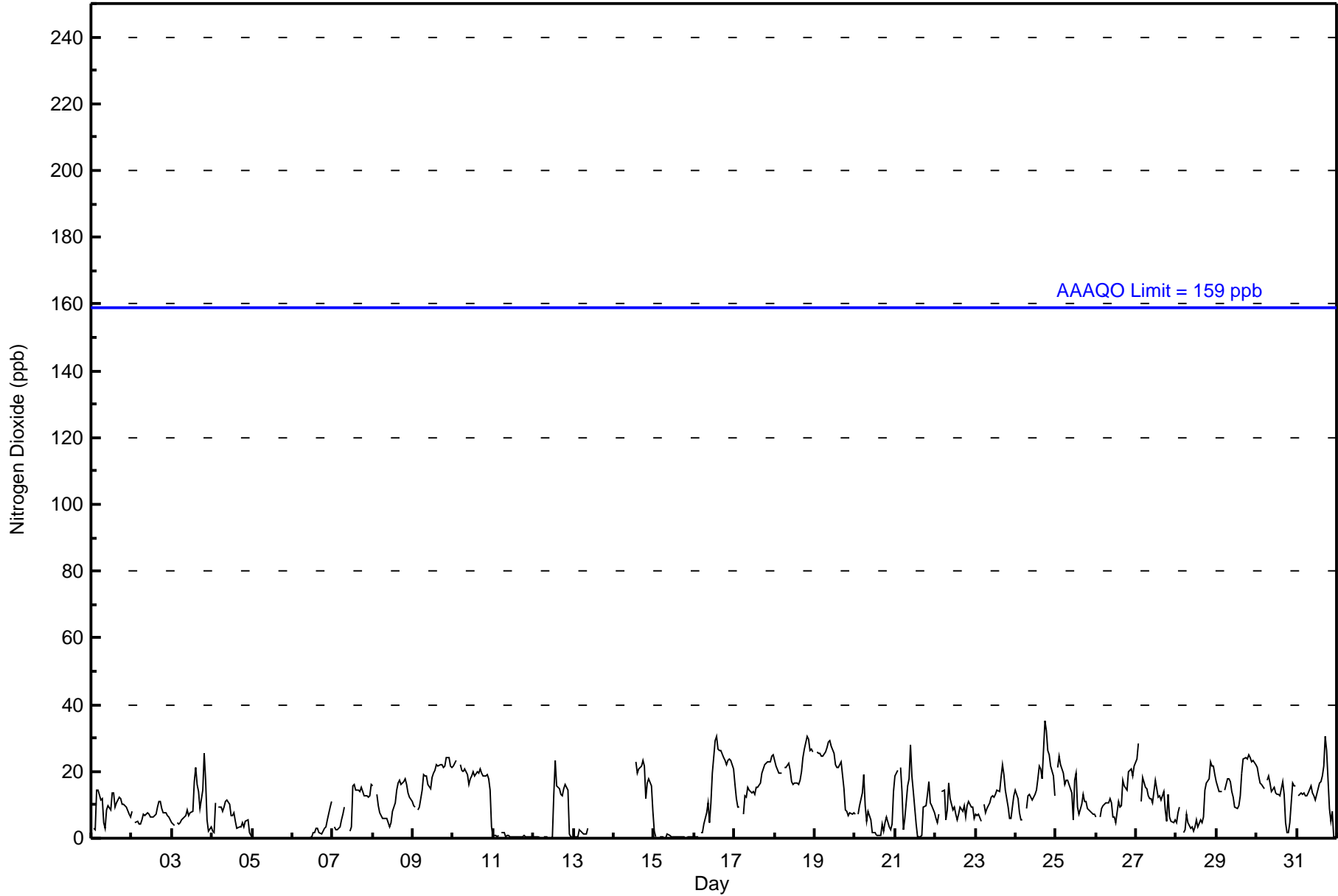
Fort McKay South - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 35 ppb on Dec 24 18:00										Maximum Daily Average: 21.7 ppb on Dec 18										Hours of Data: 684																													
Minimum Value: 0 ppb on Dec 5 03:00										Minimum Daily Average: 0.1 ppb on Dec 5										Hours of Missing Data: 60																													
Maximum Diurnal Average: 13.8 ppb at hour 18										Minimum Diurnal Average: 9.0 ppb at hour 11										Hours of Calibration: 34																													
Monthly Average: 11.0 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 5 Median = 10 Q ₃ = 17 P ₉₀ = 22 P ₉₉ = 29										Percent Operational Time: 96.5																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	3	3	14	15	11	12	5	3	9	10	8	14	13	10	11	12	12	10	10	10	9	7	6	9.4	15																							
2-Dec	8	Z	5	5	4	4	6	7	7	8	7	6	6	6	7	10	11	11	9	8	8	7	6	6	7.0	11																							
3-Dec	5	4	Z	5	4	5	6	6	7	9	7	8	8	17	21	16	14	9	14	26	17	5	2	3	9.4	26																							
4-Dec	2	2	11	Z	9	9	8	9	11	11	10	7	7	8	5	3	4	3	5	3	5	6	2	1	6.1	11																							
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	2	2	3	3	2	1	2	3	3	6	9	11	2.1	11																							
7-Dec	Z	4	3	3	4	5	7	9	M	M	2	4	16	16	15	14	14	15	14	13	13	12	13	16	10.0	16																							
8-Dec	16	Z	13	10	8	7	6	6	6	5	4	5	8	11	14	17	17	16	17	18	16	14	12	11	11.1	18																							
9-Dec	10	9	Z	9	9	14	19	19	19	16	15	18	20	21	22	22	22	22	21	21	24	24	22	21	18.2	24																							
10-Dec	22	23	24	Z	22	20	20	21	19	16	18	19	20	19	20	20	21	20	19	19	19	18	15	3	18.9	24																							
11-Dec	1	1	1	1	Z	2	2	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0.7	2																							
12-Dec	0	0	1	0	0	Z	0	0	0	0	0	0	13	23	16	15	13	13	15	16	14	1	1	1	6.2	23																							
13-Dec	Z	1	0	3	2	2	1	1	3	C	C	C	C	M	M	M	M	M	M	M	M	M	M	M	--	3																							
14-Dec	M	M	M	M	M	M	M	M	M	M	M	M	M	M	23	20	21	22	23	22	12	16	18	16	8	--	23																						
15-Dec	2	1	Z	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0.5	2																							
16-Dec	1	0	0	Z	2	2	4	8	11	5	10	20	29	30	27	26	26	24	23	22	23	24	23	21	15.7	30																							
17-Dec	16	12	10	9	Z	7	13	12	15	15	14	14	13	15	15	17	20	21	22	22	23	23	24	25	16.4	25																							
18-Dec	23	21	20	20	20	Z	21	21	23	20	17	16	17	17	16	17	20	24	27	31	30	26	27	26	21.7	31																							
19-Dec	Z	26	25	25	25	25	26	27	29	29	27	26	22	21	21	22	23	15	8	8	7	8	7	8	20.0	29																							
20-Dec	7	Z	7	10	14	19	10	5	8	5	2	2	2	1	1	1	4	2	5	6	3	3	4	14	5.8	19																							
21-Dec	19	20	Z	21	14	2	6	16	18	28	19	14	4	1	1	1	1	10	10	13	17	10	10	8	11.4	28																							
22-Dec	6	5	7	Z	14	14	6	9	17	12	9	9	7	6	7	10	8	10	6	10	11	9	9	6	8.9	17																							
23-Dec	7	7	7	5	Z	10	8	9	11	12	13	12	13	15	14	18	22	19	14	10	6	6	9	13	11.3	22																							
24-Dec	14	12	8	5	6	Z	9	13	13	12	11	13	14	18	22	21	18	35	32	26	25	22	19	13	16.5	35																							
25-Dec	Z	21	24	22	20	16	18	17	16	14	6	17	20	9	7	10	13	11	11	9	8	8	7	7	13.5	24																							
26-Dec	7	Z	6	9	10	10	11	11	12	10	6	7	5	11	9	10	17	16	14	20	21	21	19	22	12.2	22																							
27-Dec	24	29	Z	11	18	15	15	13	12	12	11	17	15	12	13	11	14	8	5	13	6	5	5	6	12.6	29																							
28-Dec	5	8	9	Z	2	2	7	5	3	4	2	3	5	3	6	5	6	14	17	18	23	21	22	19	9.1	23																							
29-Dec	17	14	14	14	Z	15	18	18	17	14	12	10	9	10	13	20	24	24	24	25	24	23	23	22	17.5	25																							
30-Dec	21	19	17	16	15	Z	18	19	17	14	15	14	13	13	13	17	13	5	2	2	5	16	16	16	13.5	21																							
31-Dec	Z	13	13	13	13	13	13	14	16	14	13	11	13	17	17	19	22	30	26	9	5	8	1	1	13.6	30																							
																								9.6	9.7	9.1	9.2	9.9	9.2	9.6	10.0	10.8	10.5	9.0	9.7	10.9	11.9	11.8	12.5	13.4	13.8	13.1	13.1	12.7	11.8	11.0	10.4	Diurnal Average	
																								24	29	25	25	25	25	26	27	29	29	27	26	29	30	27	26	26	35	32	31	30	26	27	26	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																																																	



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	579	84.65	84.65
21 - 40	105	15.35	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	41	43	14	3	2	3	5	38	112	43	46	60	41	56	34	37	578
21 - 40	18	9	1	1	1	0	1	9	19	11	12	7	3	3	2	8	105
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	52	15	4	3	3	6	47	131	54	58	67	44	59	36	45	683

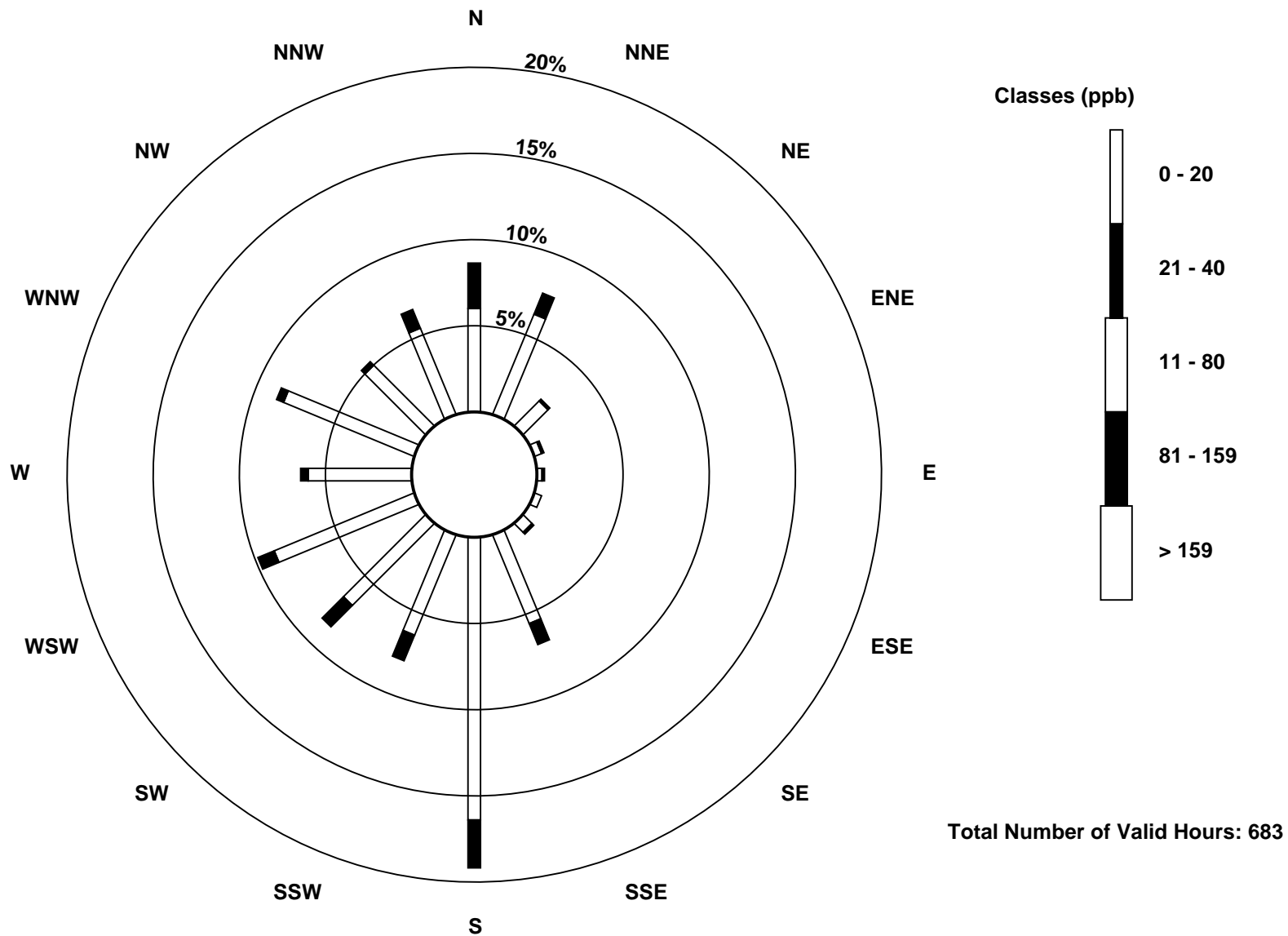
Total Number of Valid Hours: 683

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

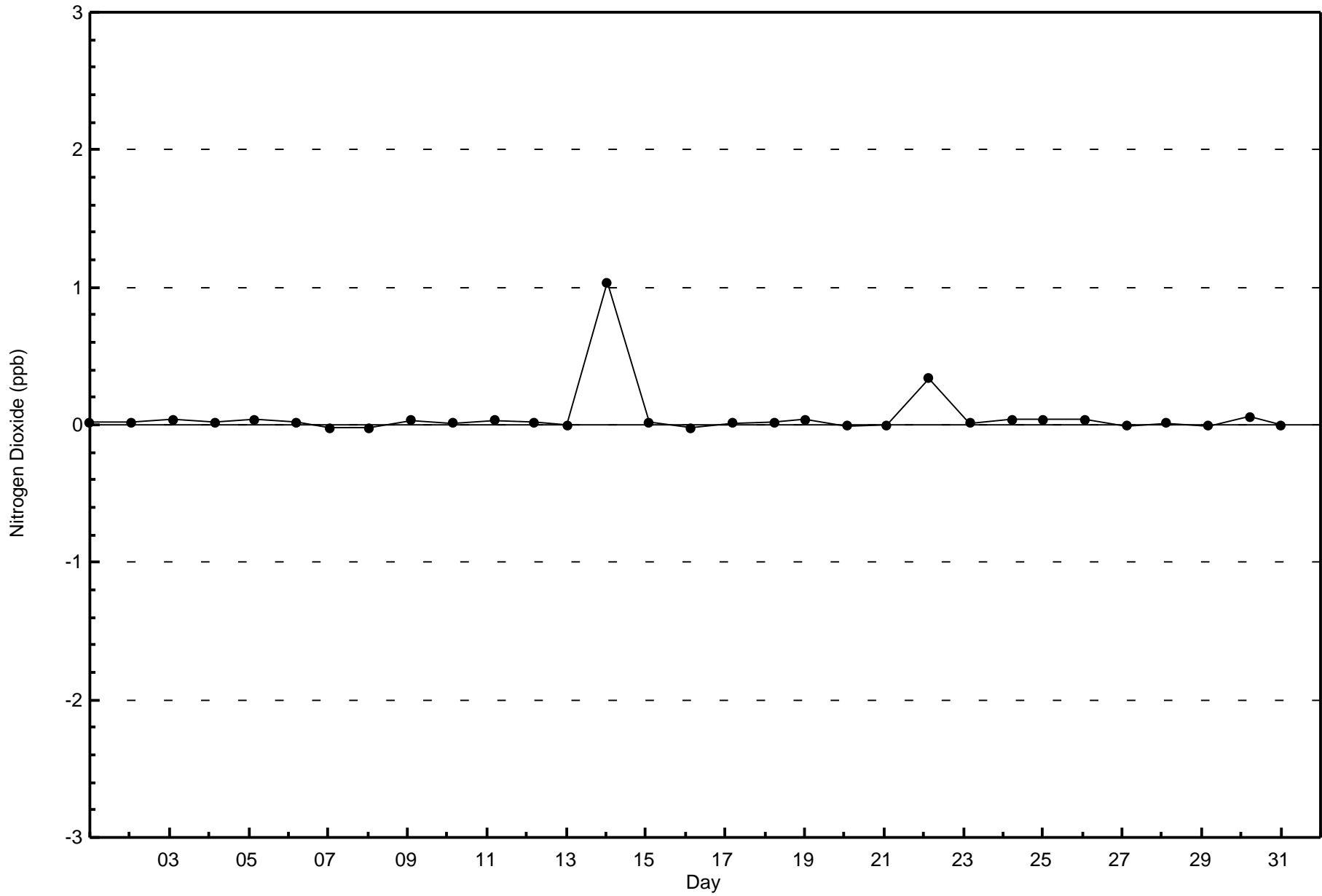
Nitrogen Dioxide (NO₂) - ppb
Fort McKay South (AMS 13)





WBEA Data PC
Zero Responses

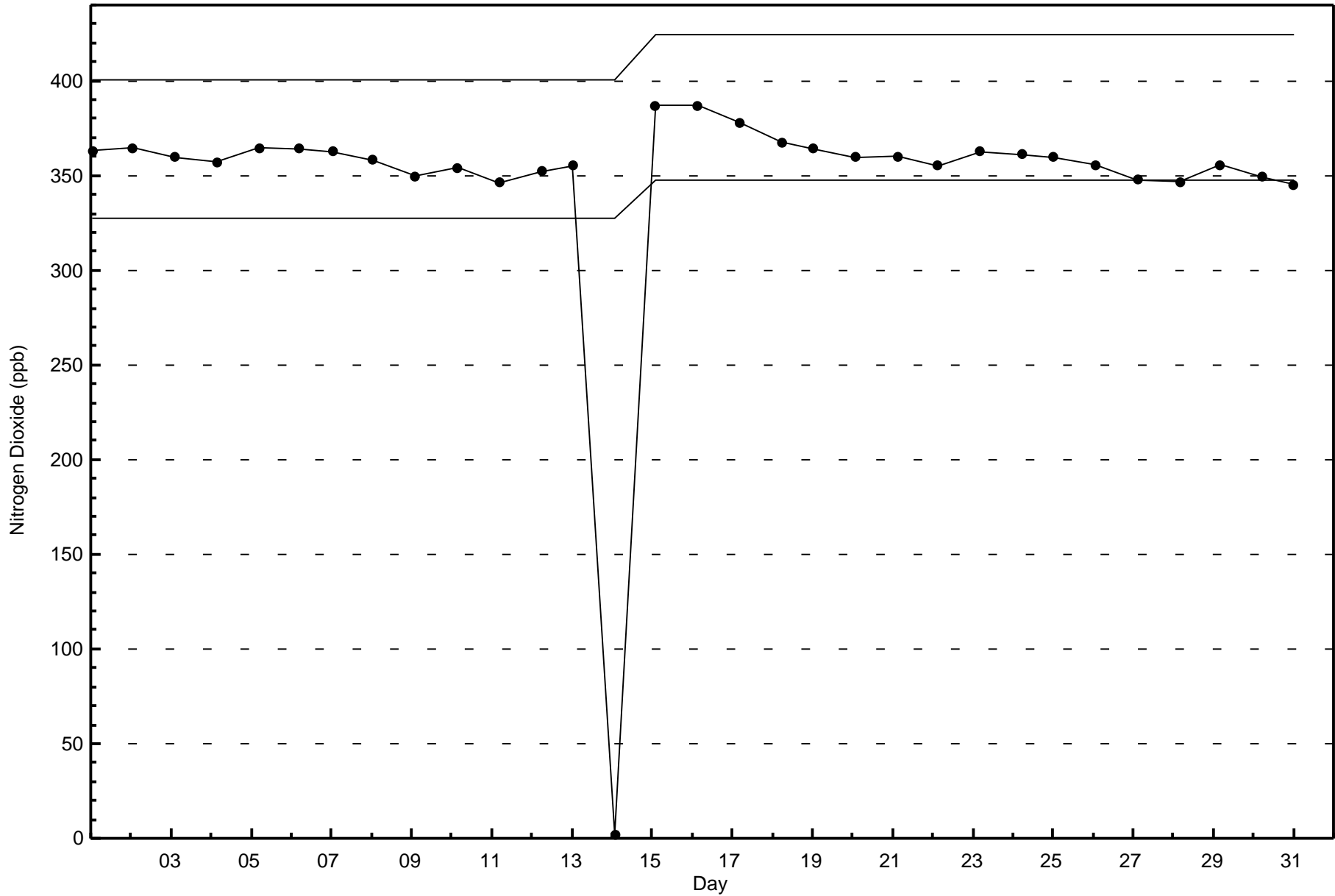
Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

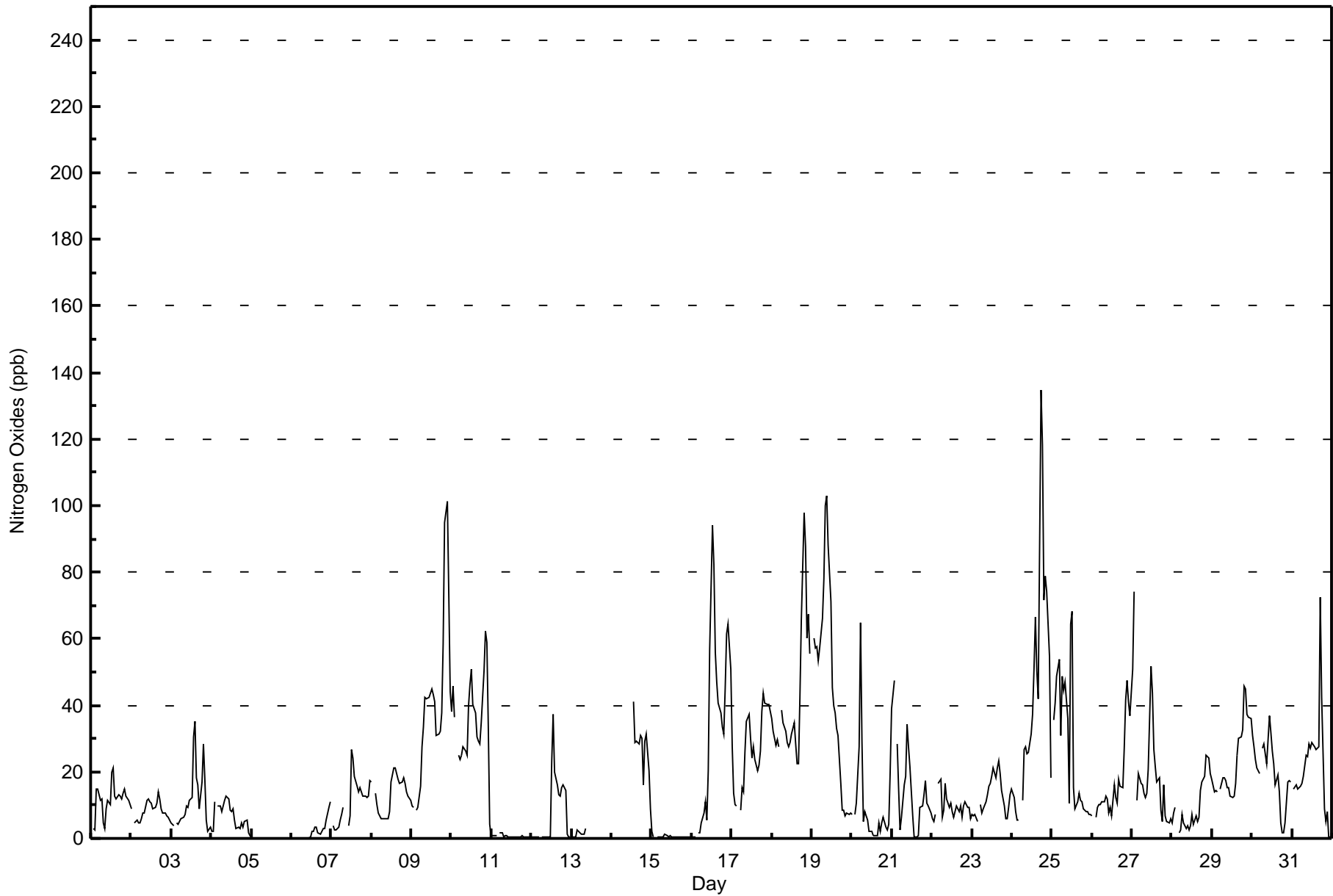
Fort McKay South - December 2016

Maximum Value: 135 ppb on Dec 24 18:00		Maximum Daily Average: 45.3 ppb on Dec 19		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 5 09:00		Minimum Daily Average: 0.1 ppb on Dec 5		Hours of Data: 684																																													
Maximum Diurnal Average: 23.7 ppb at hour 21		Minimum Diurnal Average: 12.3 ppb at hour 3		Hours of Missing Data: 60																																													
Monthly Average: 18.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 5 Median = 12 Q ₃ = 27 P ₉₀ = 43 P ₉₉ = 94		Hours of Calibration: 34																																													
				Percent Operational Time: 96.5																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	3	2	15	15	12	12	5	3	9	11	10	20	21	13	12	13	13	12	13	15	13	11	10	11.4	21																							
2-Dec	9	Z	5	6	5	5	6	8	8	11	12	11	10	9	9	11	14	12	9	8	8	7	6	6	8.4	14																							
3-Dec	5	4	Z	5	4	5	6	6	7	10	9	12	12	31	35	18	16	9	17	29	18	5	2	3	11.7	35																							
4-Dec	2	2	11	Z	10	10	8	10	11	13	12	8	8	9	6	3	4	3	5	3	5	6	2	1	6.5	13																							
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	2	2	3	3	1	1	2	3	3	5	9	11	2.2	11																							
7-Dec	Z	4	2	3	4	5	7	9	M	M	4	7	27	24	19	16	14	15	14	13	13	12	13	17	11.5	27																							
8-Dec	17	Z	13	10	8	7	6	6	6	6	6	8	17	21	21	20	18	16	17	18	17	14	13	11	12.8	21																							
9-Dec	10	9	Z	9	10	16	28	34	42	42	42	44	45	43	41	31	31	32	38	59	95	101	73	44	39.9	101																							
10-Dec	38	46	37	Z	25	24	25	28	26	25	40	46	51	40	38	30	29	29	35	50	62	59	34	4	35.7	62																							
11-Dec	1	1	1	1	Z	2	2	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.7	2																							
12-Dec	0	0	1	0	0	Z	0	0	0	0	0	0	23	37	20	16	13	13	15	16	15	1	1	0	7.6	37																							
13-Dec	Z	0	0	3	2	2	1	1	3	C	C	C	C	M	M	M	M	M	M	M	M	M	M	M	--	3																							
14-Dec	M	M	M	M	M	M	M	M	M	M	M	M	M	41	29	29	28	31	30	16	29	31	20	9	--	41																							
15-Dec	2	0	Z	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2																							
16-Dec	0	0	0	Z	2	2	5	8	11	6	20	57	94	82	56	47	41	38	33	31	45	62	64	51	32.8	94																							
17-Dec	27	14	10	10	Z	9	15	14	26	35	37	30	24	28	24	20	22	26	38	44	41	40	40	38	26.6	44																							
18-Dec	36	32	28	30	27	Z	39	35	32	29	28	29	32	35	28	23	22	42	66	98	88	60	67	55	41.7	98																							
19-Dec	Z	60	57	57	53	57	66	78	100	103	88	71	45	40	38	33	31	17	8	8	7	8	7	8	45.3	103																							
20-Dec	7	Z	7	10	27	65	29	5	8	6	2	2	2	1	1	1	5	2	5	6	3	3	4	20	9.6	65																							
21-Dec	39	48	Z	28	15	2	6	16	19	34	27	22	7	1	1	1	1	10	10	13	17	10	10	8	14.9	48																							
22-Dec	6	5	7	Z	17	18	6	9	17	12	9	10	8	6	8	10	8	10	6	10	11	9	9	6	9.5	18																							
23-Dec	7	7	7	5	Z	10	8	9	11	13	16	16	19	21	18	21	23	20	14	10	6	6	9	13	12.6	23																							
24-Dec	15	12	8	6	6	Z	11	27	27	25	26	31	37	51	66	50	42	135	118	72	79	74	55	18	43.1	135																							
25-Dec	Z	36	41	49	54	31	49	44	47	36	11	64	68	15	9	11	14	11	11	9	8	8	7	7	27.8	68																							
26-Dec	7	Z	7	9	10	10	11	11	13	12	8	9	7	16	12	11	18	16	15	27	42	47	41	37	17.1	47																							
27-Dec	51	74	Z	11	19	17	16	14	12	14	21	51	44	27	22	17	18	8	5	16	7	5	5	6	20.8	74																							
28-Dec	5	8	9	Z	2	2	7	4	3	4	2	4	7	4	7	5	6	14	17	19	25	25	24	20	9.7	25																							
29-Dec	18	14	14	14	Z	15	18	18	17	15	15	13	12	13	17	25	30	30	32	46	45	37	37	36	23.1	46																							
30-Dec	31	27	24	21	19	Z	27	28	25	23	37	32	26	22	16	19	14	4	2	2	4	17	17	17	19.8	37																							
31-Dec	Z	15	16	15	15	15	17	19	25	25	28	27	29	28	27	27	28	73	42	9	5	8	1	1	21.4	73																							
																								13.9	16.2	12.3	12.6	13.9	13.6	14.4	14.9	17.3	18.1	17.7	21.3	23.4	22.3	19.4	17.0	16.8	21.1	20.6	21.6	23.7	22.5	19.4	15.3	Diurnal Average	
																								51	74	57	57	54	65	66	78	100	103	88	71	94	82	66	50	42	135	118	98	95	101	73	55	Diurnal Maximum	
Z - zerospan		C - Calibration				M - Maintenance																																											



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	472	69.01	69.01
21 - 40	131	19.15	88.16
41 - 80	70	10.23	98.39
81 - 159	11	1.61	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	37	6	2	2	2	2	25	84	34	40	52	39	55	31	32	471
21 - 40	19	9	9	0	1	0	1	8	34	13	10	10	1	4	5	7	131
11 - 80	10	5	0	2	0	1	3	12	11	5	8	5	4	0	0	4	70
81 - 159	2	1	0	0	0	0	0	2	2	2	0	0	0	0	0	2	11
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	52	15	4	3	3	6	47	131	54	58	67	44	59	36	45	683

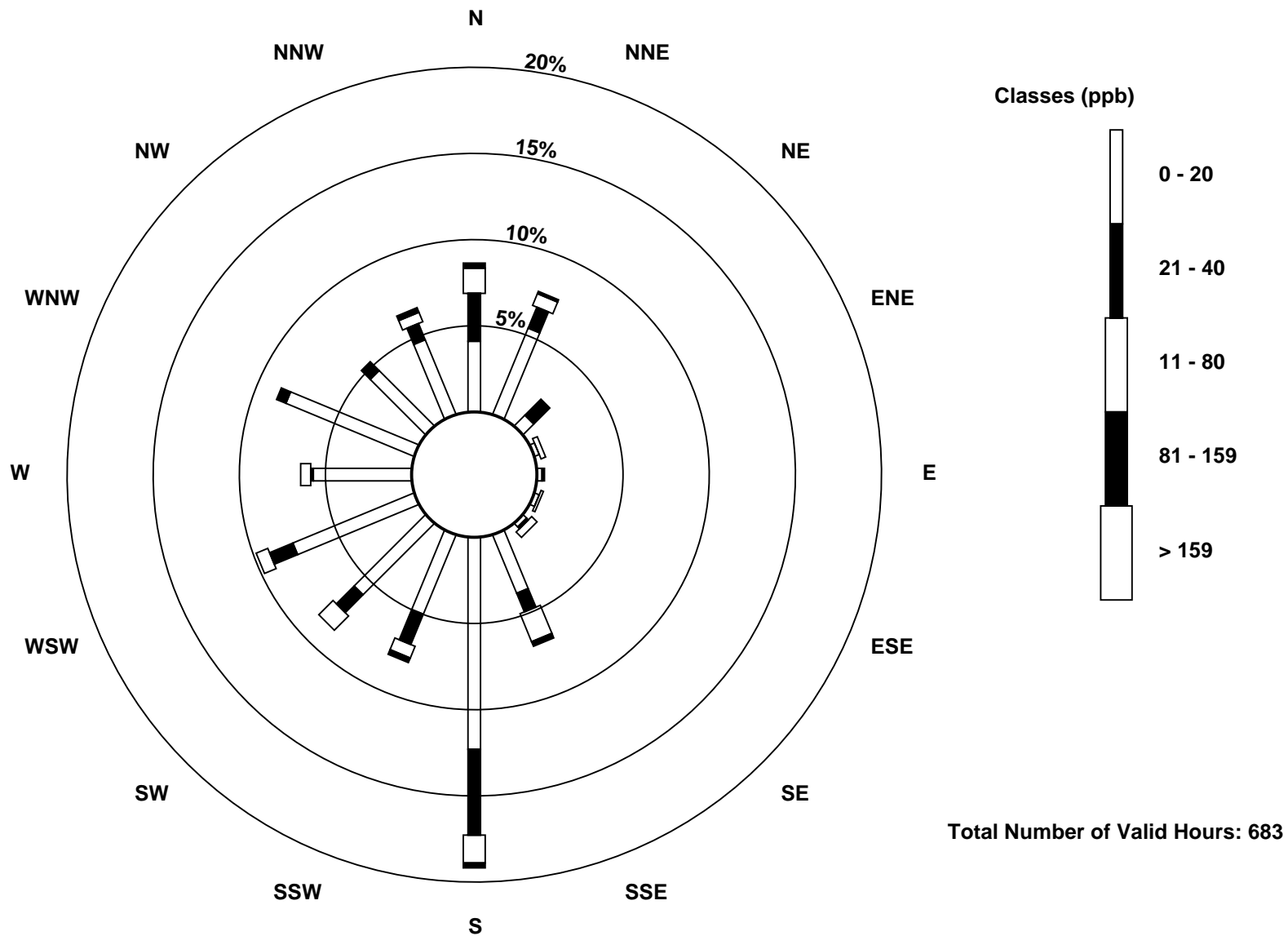
Total Number of Valid Hours: 683

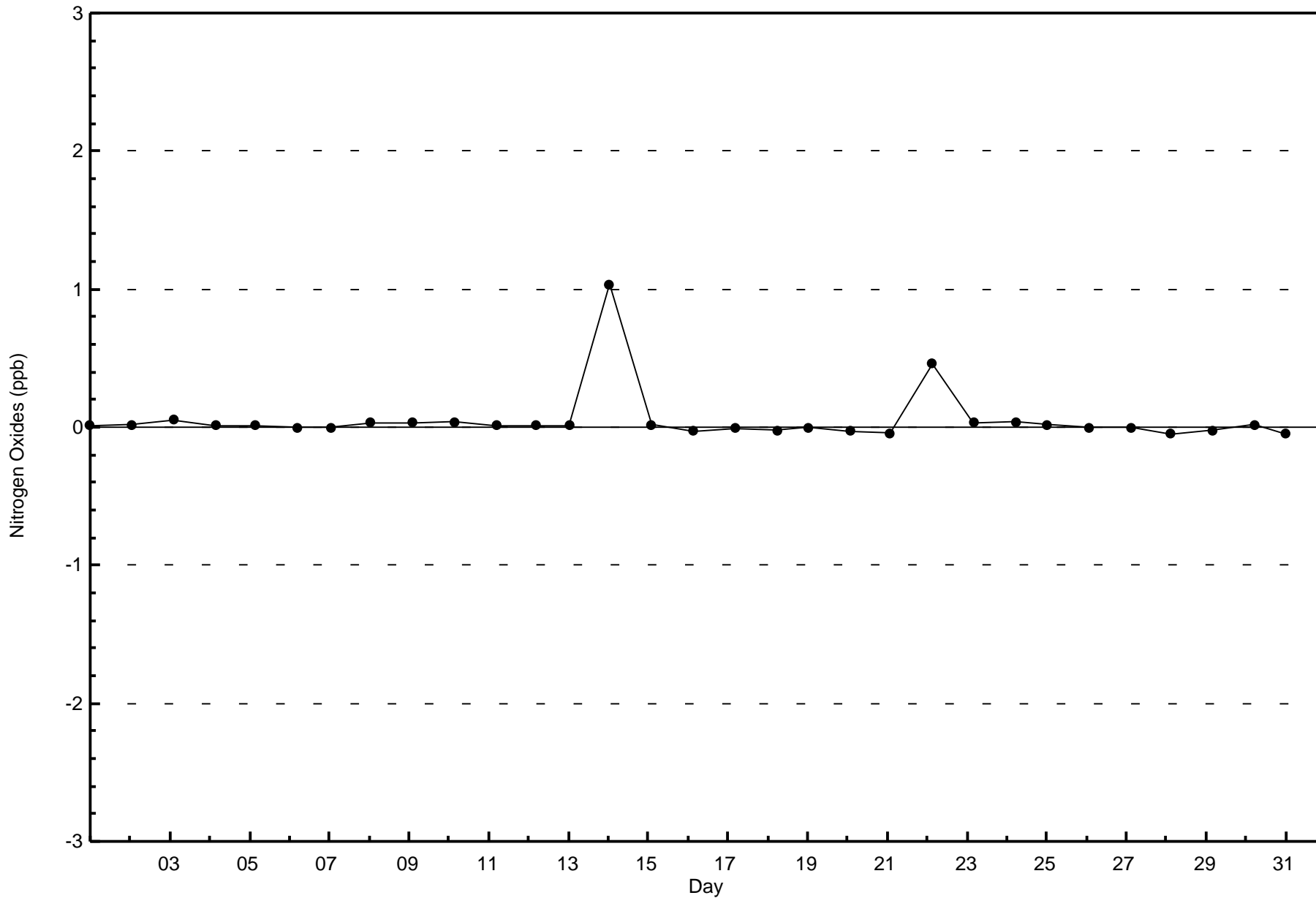
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Fort McKay South (AMS 13)

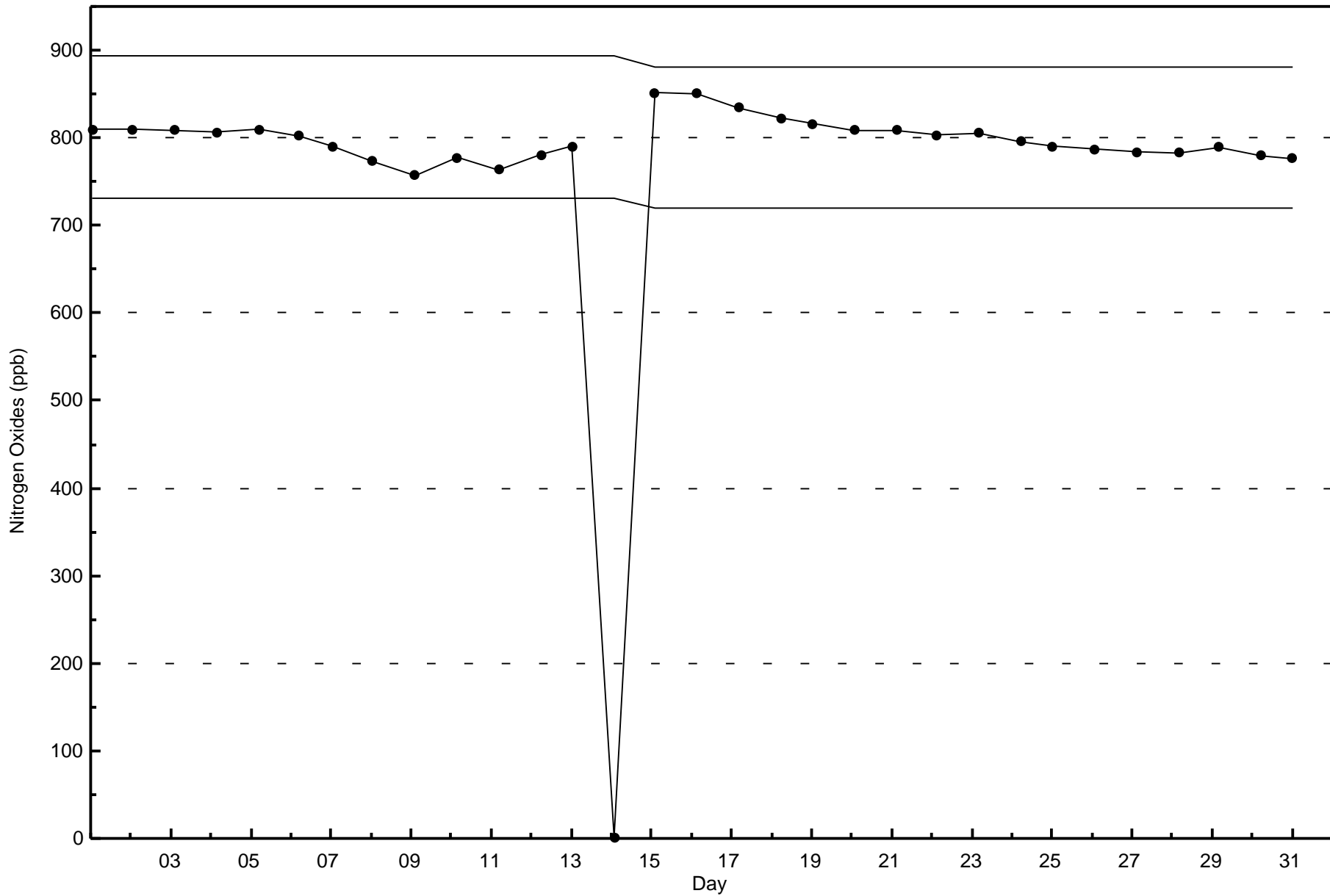






WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

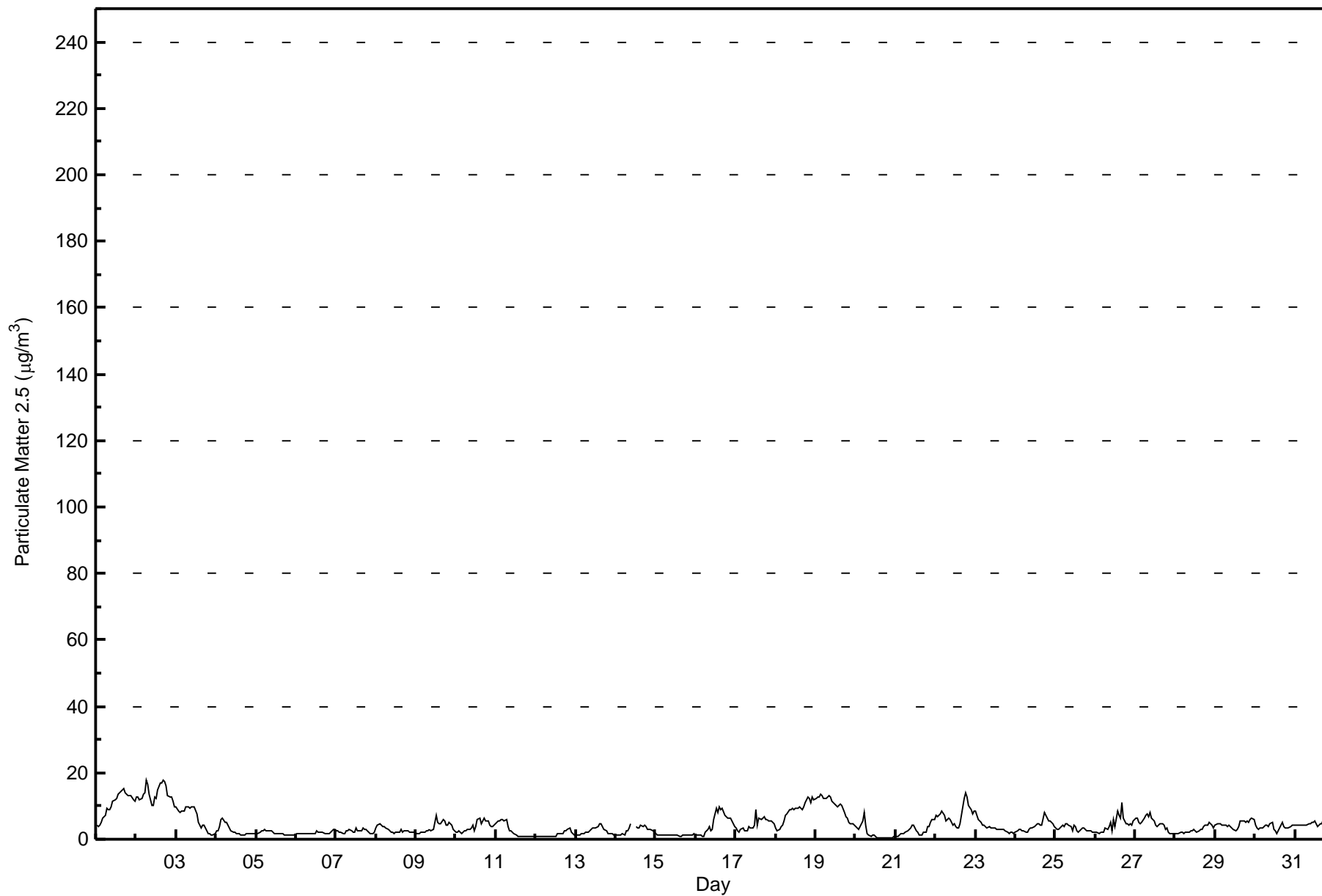
Fort McKay South - December 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 17.9 µg/m ³ on Dec 2 07:00 Minimum Value: 0.3 µg/m ³ on Dec 20 15:00 Maximum Diurnal Average: 5.2 µg/m ³ at hour 17 Monthly Average: 4.36 µg/m ³		Maximum Daily Average: 13.8 µg/m ³ on Dec 2 Minimum Daily Average: 1.3 µg/m ³ on Dec 15 Minimum Diurnal Average: 3.8 µg/m ³ at hour 24 Percentiles: P ₁ = 0.5 P ₁₀ = 1.3 Q ₁ = 2.0 Median = 3.3 Q ₃ = 5.3 P ₉₀ = 9.6 P ₉₉ = 15.7		Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 2 Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	4.0	3.9	4.4	5.2	6.5	7.0	9.2	8.9	8.8	9.6	11.4	11.9	12.4	13.5	14.2	14.2	15.4	13.8	13.5	13.3	13.0	13.0	12.1	11.4	10.4	15.4
2-Dec	12.8	12.6	11.9	12.3	13.4	14.1	17.9	16.7	13.4	10.1	10.4	12.8	12.2	15.0	16.8	17.0	17.9	17.3	16.1	13.0	12.8	12.8	11.3	9.7	13.8	17.9
3-Dec	9.8	8.7	8.2	8.5	8.4	8.7	9.7	9.6	9.5	9.8	9.9	9.6	7.8	5.0	4.1	3.4	4.4	4.2	2.4	1.8	1.6	1.4	1.4	1.9	6.2	9.9
4-Dec	2.3	2.7	3.8	5.7	6.2	4.9	5.1	4.3	3.2	2.6	2.3	2.1	1.8	1.6	1.5	1.4	1.5	1.4	1.8	1.9	1.9	1.8	1.7	1.8	2.7	6.2
5-Dec	1.8	1.9	2.1	2.7	2.7	2.9	2.6	2.7	2.5	2.3	1.9	1.8	1.6	1.6	1.5	1.7	1.6	1.5	1.3	1.4	1.4	1.4	1.4	1.4	1.9	2.9
6-Dec	1.6	1.7	1.6	1.6	1.6	1.9	1.8	1.6	1.6	1.6	1.7	1.8	2.4	2.1	2.1	2.1	2.0	1.8	1.6	1.7	1.8	2.1	3.2	2.9	1.9	3.2
7-Dec	2.7	2.4	2.1	1.9	1.8	1.9	2.4	2.7	2.9	2.7	2.2	2.2	3.2	2.7	2.5	2.5	3.4	3.1	2.8	2.5	1.9	1.9	1.8	2.3	2.4	3.4
8-Dec	3.6	4.4	4.7	4.2	3.9	3.7	3.4	2.9	2.3	2.3	2.0	1.8	2.0	2.0	2.2	2.8	2.2	2.6	2.5	2.7	2.2	2.0	1.9	2.1	2.8	4.7
9-Dec	1.7	1.8	1.9	2.0	2.0	2.2	2.5	2.5	2.9	2.4	2.8	5.2	7.1	5.2	4.7	4.7	6.0	5.4	4.4	4.2	5.0	4.3	3.0	2.5	3.6	7.1
10-Dec	2.2	2.3	2.6	1.9	2.2	2.7	2.7	3.2	2.9	3.2	4.1	2.5	3.7	6.0	6.5	4.8	5.3	6.2	5.4	5.3	4.4	3.6	3.7	4.2	3.8	6.5
11-Dec	4.6	5.5	5.4	6.1	5.8	5.6	5.8	4.0	2.4	2.4	2.2	1.6	1.1	0.9	0.9	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	2.6	6.1
12-Dec	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	1.0	1.5	1.7	1.6	1.8	2.5	2.5	2.9	3.3	1.9	1.5	1.4	1.4	3.3
13-Dec	1.4	1.3	1.2	1.7	1.7	1.7	2.1	2.2	2.5	3.0	3.2	3.6	3.5	3.8	4.8	4.6	3.7	3.2	2.3	1.7	1.6	1.7	1.5	1.5	2.5	4.8
14-Dec	1.4	1.3	1.3	1.3	1.5	1.5	2.4	2.4	3.6	4.8	C	C	3.7	3.2	3.6	4.1	4.0	4.3	3.9	3.0	3.0	2.8	2.4	2.3	2.8	4.8
15-Dec	1.9	1.3	1.3	1.3	1.1	1.2	1.2	1.3	1.3	1.3	1.5	1.2	1.2	1.1	1.1	1.0	1.1	1.2	1.2	1.3	1.4	1.3	1.1	1.5	1.3	1.9
16-Dec	1.4	1.4	1.2	1.1	1.0	1.0	2.3	2.9	3.6	2.4	3.1	5.9	9.3	8.2	9.6	9.0	9.2	7.0	7.0	6.3	6.5	6.2	5.5	4.0	4.8	9.6
17-Dec	3.3	2.5	2.3	2.8	3.3	2.6	2.4	2.5	3.8	3.4	3.4	4.4	8.7	4.4	6.2	5.8	6.5	6.7	5.9	6.0	5.5	5.3	5.2	4.5	4.5	8.7
18-Dec	3.5	2.7	3.1	3.6	4.2	5.6	7.3	7.7	9.1	8.7	9.1	9.0	9.2	9.3	9.9	9.3	8.8	9.8	10.9	12.5	12.3	11.0	12.8	11.7	8.4	12.8
19-Dec	12.1	12.7	12.8	13.6	12.9	12.1	12.4	12.7	13.2	12.7	11.3	10.6	10.2	9.8	10.3	10.5	10.3	8.2	6.8	6.5	5.1	4.8	4.5	4.3	10.0	13.6
20-Dec	3.9	3.4	3.1	4.0	5.3	7.9	4.2	1.5	1.1	1.0	1.1	1.2	0.9	0.4	0.3	0.4	0.4	0.4	0.5	0.6	0.6	0.5	0.5	0.8	1.8	7.9
21-Dec	0.9	1.0	1.1	1.8	1.6	1.8	2.0	2.7	3.0	3.5	4.4	4.2	2.6	2.0	1.3	1.3	1.4	2.0	2.2	3.8	3.7	5.3	5.8	5.8	2.7	5.8
22-Dec	7.3	6.9	7.4	7.5	8.5	7.3	5.6	5.8	6.2	5.8	4.4	4.6	3.7	3.4	3.5	4.5	9.7	12.2	14.0	12.9	10.2	8.9	7.7	8.3	7.3	14.0
23-Dec	8.5	7.1	6.1	5.0	4.4	4.1	3.7	3.6	3.7	3.5	3.3	3.3	3.1	2.8	3.0	3.2	3.2	2.5	2.2	1.9	2.1	2.2	1.9	3.7	8.5	
24-Dec	2.0	2.6	3.1	3.0	2.7	2.6	2.2	2.0	3.0	3.4	3.5	3.9	4.2	4.5	4.7	4.4	4.3	8.1	7.2	6.2	5.7	5.5	4.8	3.8	4.1	8.1
25-Dec	3.3	2.8	2.9	3.4	4.2	3.8	4.6	4.7	4.3	3.8	2.7	4.4	4.0	2.6	2.0	3.2	3.5	3.3	3.2	2.6	2.3	2.7	2.3	2.3	3.3	4.7
26-Dec	2.2	2.2	1.7	2.1	2.2	2.1	3.2	3.0	3.7	4.9	2.7	5.8	3.8	8.3	7.1	6.3	11.2	6.5	4.7	4.6	4.3	4.5	4.4	5.7	4.5	11.2
27-Dec	6.3	6.3	5.0	4.7	5.2	6.2	7.1	7.7	6.8	8.2	6.6	5.3	4.3	3.6	4.1	4.8	4.8	4.2	3.0	3.2	2.1	1.9	1.8	1.6	4.8	8.2
28-Dec	1.8	1.8	1.8	2.0	1.9	1.9	2.2	2.2	2.3	2.7	2.6	2.8	2.5	2.1	2.4	2.9	3.0	3.8	4.2	4.4	5.1	4.6	4.1	3.4	2.9	5.1
29-Dec	4.2	4.6	4.5	4.7	4.3	4.1	4.2	3.8	4.1	4.0	3.5	3.0	2.6	2.8	3.9	5.3	5.3	5.4	4.9	5.4	5.2	5.8	6.2	5.8	4.5	6.2
30-Dec	4.3	3.2	3.1	3.2	3.3	3.7	4.2	4.2	3.8	4.7	4.9	3.1	2.7	1.8	2.6	4.2	5.2	3.7	3.2	3.3	3.2	3.7	4.3	4.2	3.7	5.2
31-Dec	4.3	4.1	4.4	4.4	4.4	4.4	4.4	4.2	4.6	4.6	5.1	5.3	5.5	3.9	4.3	4.6	4.8	5.7	4.1	2.2	1.4	1.6	1.2	1.2	3.9	5.7
3.9 3.8 3.8 4.0 4.2 4.3 4.6 4.4 4.4 4.4 4.3 4.5 4.6 4.4 4.6 4.7 5.2 5.1 4.7 4.5 4.2 4.1 3.9 3.8																								Diurnal Average		
12.8 12.7 12.8 13.6 13.4 14.1 17.9 16.7 13.4 12.7 11.4 12.8 12.4 15.0 16.8 17.0 17.9 17.3 16.1 13.3 13.0 13.0 12.8 11.7																								Diurnal Maximum		
C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



WBEA Data PC
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	530	71.43	71.43
6 - 15	167	22.51	93.94
16 - 25	7	0.94	94.88
26 - 80	0	0.00	94.88
> 81.0	0	0.00	94.88

Total Number of Valid Hours: 742

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Fort McKay South - December 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	36	36	14	4	3	2	7	32	80	43	42	53	39	62	35	41	529
6 - 15	27	17	2	2	1	1	1	17	51	14	11	8	3	3	3	6	167
16 - 25	0	0	0	0	0	0	0	0	5	2	0	0	0	0	0	0	7
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	63	53	16	6	4	3	8	49	136	59	53	61	42	65	38	47	703

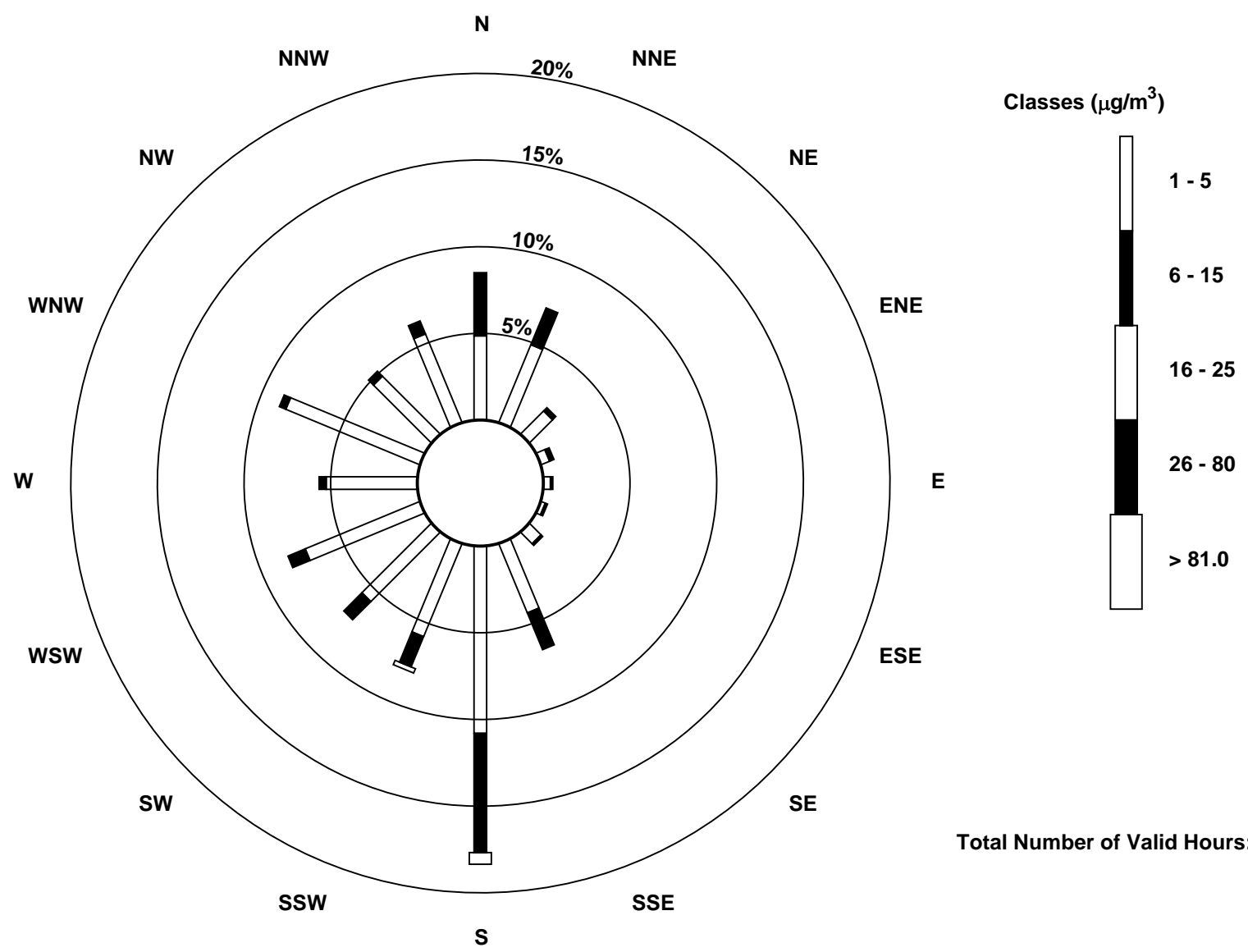
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Fort McKay South (AMS 13)



Total Number of Valid Hours: 741



Wood Buffalo Environmental Association
Summary of Hour Averages

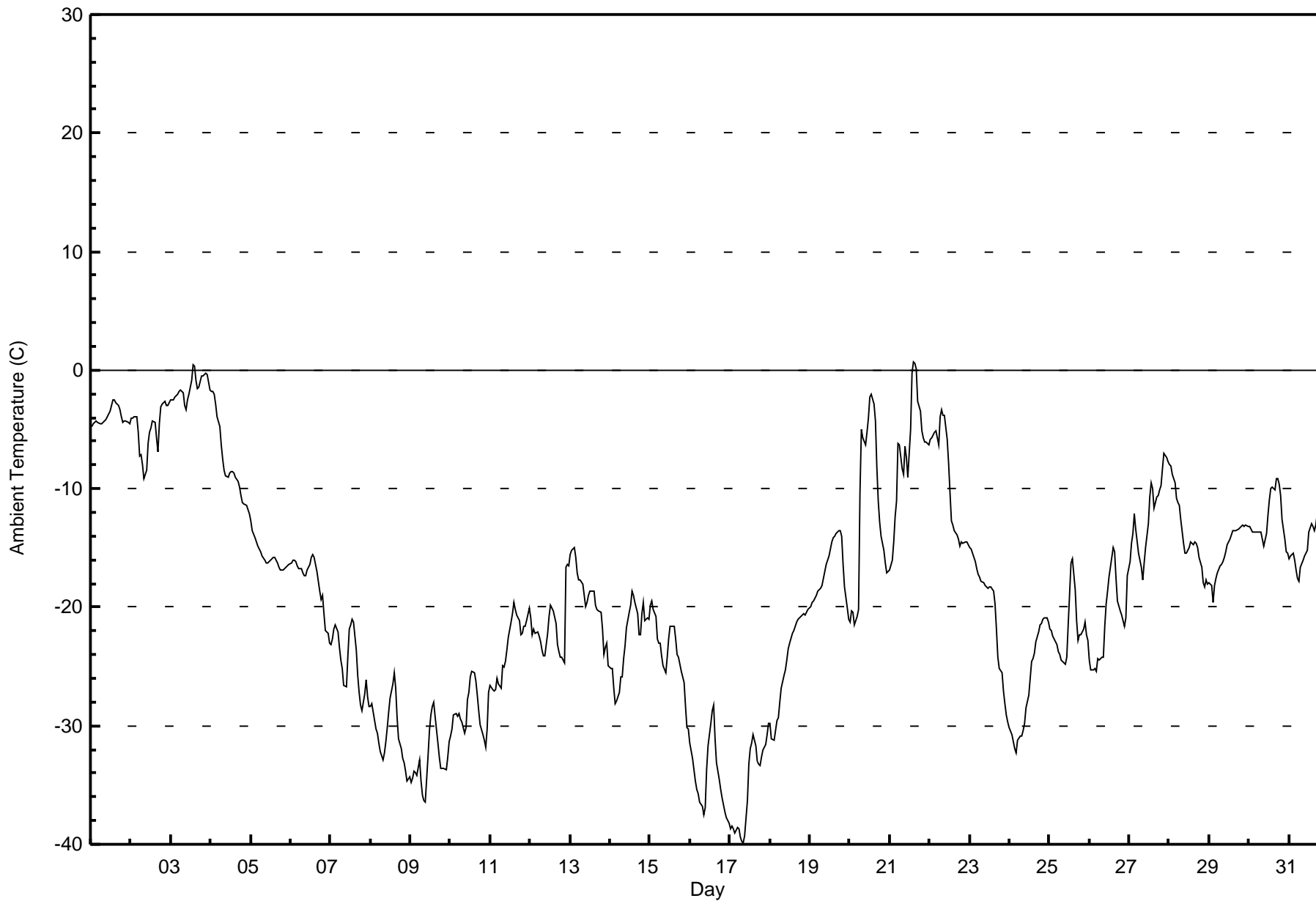
Ambient Temperature (AT) - C
Fort McKay South - December 2016

Maximum Value: 0.7 C on Dec 21 15:00 Maximum Daily Average: -1.5 C on Dec 3																								Hours in Service: 744		
Minimum Value: -39.8 C on Dec 17 09:00 Minimum Daily Average: -35.1 C on Dec 17																								Hours of Data: 744		
Maximum Diurnal Average: -15.9 C at hour 15 Minimum Diurnal Average: -19.9 C at hour 9																								Hours of Missing Data: 0		
Monthly Average: -18.60 C Percentiles: P₁ = -38.6 P₁₀ = -31.3 Q₁ = -25.0 Median = -18.6 Q₃ = -13.2 P₉₀ = -4.5 P₉₉ = -0.3																								Hours of Calibration: 0		
Percent Operational Time: 100.0																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.8	-4.6	-4.4	-4.3	-4.4	-4.5	-4.6	-4.5	-4.3	-4.1	-3.9	-3.4	-3.0	-2.5	-2.5	-2.7	-3.0	-3.4	-4.0	-4.4	-4.3	-4.3	-4.5	-4.5	-4.0	-2.5
2-Dec	-4.1	-4.1	-4.0	-4.0	-5.2	-7.2	-7.2	-8.0	-9.1	-8.4	-6.2	-5.3	-4.8	-4.3	-4.4	-5.7	-6.9	-4.5	-3.2	-2.8	-2.7	-3.0	-3.0	-2.7	-5.0	-2.7
3-Dec	-2.6	-2.5	-2.3	-2.2	-2.0	-1.8	-1.7	-1.9	-3.0	-3.3	-2.5	-2.0	-0.8	0.5	0.3	-0.8	-1.5	-1.4	-0.5	-0.5	-0.4	-0.3	-0.3	-1.6	-1.5	0.5
4-Dec	-1.8	-1.7	-2.0	-2.9	-3.9	-4.8	-6.3	-7.5	-8.4	-8.9	-9.0	-8.7	-8.6	-8.6	-8.7	-9.0	-9.4	-9.9	-10.6	-11.2	-11.3	-11.4	-11.8	-12.2	-7.9	-1.7
5-Dec	-12.7	-13.6	-14.2	-14.5	-14.8	-15.1	-15.3	-15.7	-16.0	-16.3	-16.3	-16.2	-16.0	-15.8	-15.8	-16.1	-16.3	-16.6	-16.9	-16.9	-16.7	-16.6	-16.5	-16.4	-15.7	-12.7
6-Dec	-16.3	-16.1	-16.0	-16.2	-16.5	-16.8	-16.7	-17.1	-17.4	-17.3	-16.9	-16.3	-15.8	-15.6	-15.8	-16.4	-16.9	-18.7	-19.4	-19.0	-20.5	-21.9	-22.2	-23.0	-17.7	-15.6
7-Dec	-23.1	-22.7	-21.9	-21.5	-22.1	-23.4	-24.4	-25.1	-26.6	-26.7	-24.1	-21.8	-21.5	-21.0	-21.3	-23.7	-25.8	-27.1	-28.3	-28.7	-27.3	-26.1	-27.5	-28.4	-24.6	-21.0
8-Dec	-28.4	-28.1	-29.6	-30.2	-30.7	-31.4	-32.1	-32.9	-32.3	-31.3	-30.1	-28.8	-27.7	-26.4	-25.5	-26.9	-29.3	-31.0	-31.9	-32.7	-33.1	-33.8	-34.7	-34.4	-30.6	-25.5
9-Dec	-34.7	-34.4	-33.8	-34.0	-34.1	-32.9	-34.6	-35.9	-36.4	-36.5	-32.6	-30.3	-29.1	-28.3	-28.0	-29.2	-31.5	-32.6	-33.6	-33.6	-33.6	-33.7	-32.6	-31.4	-32.8	-28.0
10-Dec	-30.9	-30.3	-29.1	-29.0	-29.2	-29.0	-29.5	-29.7	-30.6	-30.1	-27.8	-27.2	-25.9	-25.4	-25.5	-26.2	-27.4	-28.8	-29.9	-30.8	-31.2	-31.8	-30.3	-27.2	-28.9	-25.4
11-Dec	-26.6	-26.9	-27.1	-27.0	-26.0	-26.4	-26.8	-24.9	-25.1	-24.6	-23.6	-22.5	-21.3	-20.5	-19.7	-20.2	-20.6	-21.1	-22.3	-22.2	-21.6	-21.6	-21.1	-20.1	-23.3	-19.7
12-Dec	-20.9	-22.3	-21.9	-22.2	-22.1	-22.4	-22.9	-23.6	-24.1	-24.1	-22.2	-20.8	-19.8	-20.0	-20.3	-21.4	-23.2	-23.8	-24.2	-24.2	-24.6	-16.6	-16.4	-16.5	-21.7	-16.4
13-Dec	-15.6	-15.2	-15.0	-15.8	-17.1	-17.7	-17.7	-18.1	-19.0	-20.0	-19.6	-19.0	-18.6	-18.7	-18.7	-19.8	-20.2	-20.3	-20.4	-21.8	-24.0	-23.3	-23.1	-25.0	-19.3	-15.0
14-Dec	-25.2	-25.2	-26.8	-28.1	-27.9	-27.2	-25.8	-25.9	-24.3	-23.3	-21.8	-20.4	-19.9	-18.6	-19.0	-19.6	-20.6	-22.3	-22.3	-20.6	-19.6	-21.1	-20.8	-21.1	-22.8	-18.6
15-Dec	-19.8	-19.4	-20.2	-20.8	-22.7	-23.0	-23.0	-24.1	-24.9	-25.5	-24.2	-22.7	-21.6	-21.7	-21.6	-22.6	-24.0	-24.2	-24.8	-25.4	-26.4	-28.4	-30.2	-30.2	-23.8	-19.4
16-Dec	-31.4	-32.7	-33.7	-34.7	-35.4	-35.7	-36.5	-36.7	-37.5	-36.9	-33.7	-29.8	-28.8	-28.3	-31.1	-33.1	-34.5	-35.3	-36.1	-36.7	-37.2	-37.7	-38.2	-34.3	-28.3	
17-Dec	-38.6	-38.5	-38.7	-39.0	-38.6	-38.7	-39.4	-39.8	-39.8	-39.3	-36.3	-33.2	-31.9	-31.5	-30.8	-31.6	-33.1	-33.3	-33.4	-32.6	-32.0	-31.6	-30.7	-29.8	-35.1	-29.8
18-Dec	-29.8	-31.1	-31.2	-30.4	-29.6	-29.3	-28.0	-26.9	-25.8	-25.3	-24.5	-23.5	-23.0	-22.3	-22.0	-21.6	-21.2	-21.1	-20.9	-20.7	-20.6	-20.7	-20.4	-20.2	-24.6	-20.2
19-Dec	-19.9	-19.6	-19.5	-19.2	-19.0	-18.7	-18.4	-18.1	-17.6	-17.0	-16.4	-15.7	-15.1	-14.5	-14.1	-14.1	-13.8	-13.6	-13.6	-14.1	-16.3	-18.3	-20.1	-21.0	-17.0	-13.6
20-Dec	-21.2	-20.3	-20.4	-21.5	-20.8	-20.2	-10.3	-5.1	-5.7	-6.3	-5.2	-4.0	-2.3	-2.1	-2.8	-4.3	-8.2	-11.1	-12.8	-14.1	-15.3	-16.3	-17.1	-17.0	-11.8	-2.1
21-Dec	-16.9	-16.0	-14.5	-12.3	-11.1	-6.2	-6.3	-8.3	-8.8	-6.4	-7.4	-9.0	-5.0	-0.2	0.7	0.6	0.1	-2.6	-3.5	-5.1	-5.7	-6.1	-6.0	-6.3	-6.8	0.7
22-Dec	-5.8	-5.7	-5.4	-5.3	-5.1	-6.4	-4.0	-3.4	-3.8	-3.8	-5.8	-7.9	-10.4	-12.7	-13.1	-13.5	-13.9	-14.3	-14.9	-14.5	-14.6	-14.5	-14.5	-14.7	-9.5	-3.4
23-Dec	-14.9	-15.1	-15.5	-16.2	-16.8	-17.2	-17.5	-17.8	-18.0	-18.2	-18.3	-18.4	-18.3	-18.3	-18.7	-19.7	-21.9	-24.2	-25.1	-25.5	-27.0	-28.2	-29.1	-29.7	-20.4	-14.9
24-Dec	-30.2	-30.8	-31.4	-32.0	-32.3	-31.2	-30.9	-30.8	-30.4	-29.7	-28.5	-27.5	-26.0	-24.6	-24.4	-23.9	-22.9	-22.1	-21.5	-21.4	-21.0	-20.9	-20.9	-21.2	-26.5	-20.9
25-Dec	-21.9	-21.9	-22.4	-22.7	-23.1	-23.8	-24.0	-24.5	-24.6	-24.9	-24.2	-21.5	-18.8	-16.3	-15.9	-18.5	-21.1	-22.8	-22.3	-22.3	-21.9	-21.2	-22.3	-22.8	-21.9	-15.9
26-Dec	-24.4	-25.3	-25.3	-25.2	-25.4	-24.3	-24.5	-24.3	-24.3	-21.6	-19.7	-18.6	-17.5	-15.8	-15.0	-15.3	-17.6	-19.5	-20.4	-20.7	-21.1	-21.6	-20.9	-17.4	-21.1	-15.0
27-Dec	-16.1	-14.6	-13.8	-12.1	-13.5	-15.5	-16.0	-16.7	-17.7	-16.3	-15.0	-12.9	-10.7	-9.5	-10.0	-11.6	-10.7	-10.6	-10.1	-9.8	-8.3	-7.0	-7.3	-7.7	-12.2	-7.0
28-Dec	-7.9	-8.1	-8.8	-9.5	-10.8	-11.1	-11.4	-12.6	-14.6	-15.5	-15.4	-15.3	-15.0	-14.5	-14.7	-14.5	-14.6	-15.0	-15.8	-16.7	-17.9	-18.3	-17.8	-18.0	-13.9	-7.9
29-Dec	-18.0	-18.2	-19.6	-18.1	-17.6	-17.1	-16.5	-16.4	-16.2	-15.8	-15.3	-14.7	-14.3	-13.9	-13.6	-13.5	-13.5	-13.4	-13.3	-13.2	-13.1	-13.2	-13.1	-13.2	-15.2	-13.1
30-Dec	-13.2	-13.4	-13.6	-13.6	-13.6	-13.7	-13.6	-13.7	-14.2	-14.8	-13.7	-12.2	-10.9	-10.0	-9.9	-10.1	-9.1	-9.2	-9.6	-10.6	-12.6	-14.2	-15.3	-15.5	-12.5	-9.1
31-Dec	-15.9	-15.6	-15.4	-16.1	-16.8	-17.6	-17.8	-16.6	-16.0	-15.7	-15.4	-15.2	-13.7	-12.9	-13.2	-13.5	-13.1	-12.1	-10.8	-10.1	-10.7	-11.7	-11.7	-11.3	-14.1	-10.1
Diurnal Average																								-19.2		
Diurnal Maximum																								-1.8		



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Fort McKay South - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	340	45.70	45.70
-20 - 0	399	53.63	99.33
0 - 10	5	0.67	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

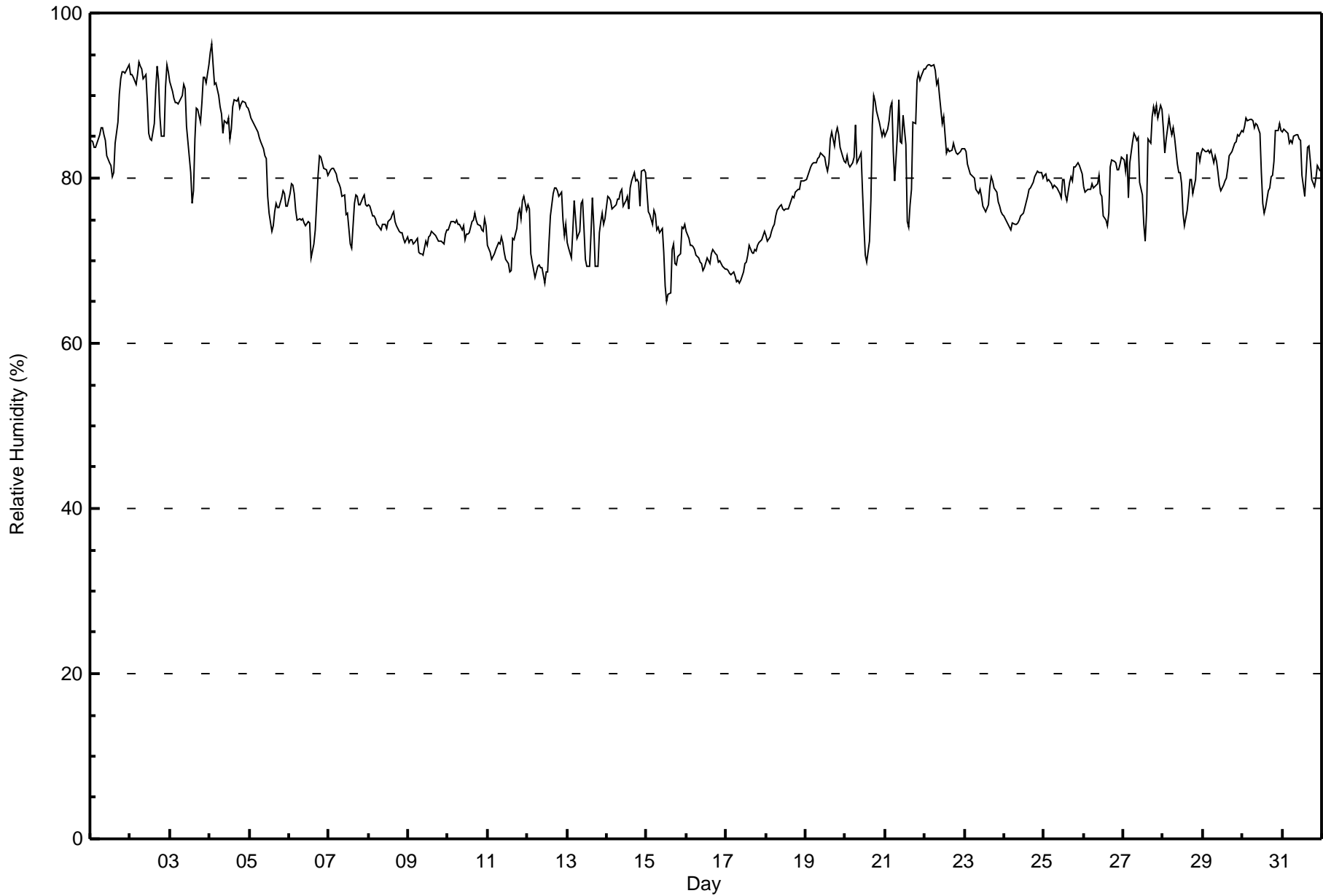
Fort McKay South - December 2016

Maximum Value: 96 % on Dec 4 02:00 Maximum Daily Average: 90.4 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 65 % on Dec 15 13:00 Minimum Daily Average: 70.0 % on Dec 17 Maximum Diurnal Average: 81.1 % at hour 24 Minimum Diurnal Average: 75.1 % at hour 14 Monthly Average: 79.4 % Percentiles: P ₁ = 68 P ₁₀ = 71 Q ₁ = 74 Median = 79 Q ₃ = 84 P ₉₀ = 89 P ₉₉ = 94																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	85	84	84	84	84	85	86	86	85	85	83	82	82	80	81	84	87	90	92	93	93	93	93	94	86.4	94
2-Dec	93	93	92	91	93	94	94	93	92	93	89	85	85	85	87	91	94	92	87	85	85	91	94	93	90.4	94
3-Dec	92	91	90	89	89	89	89	90	91	91	86	84	81	77	78	85	89	88	87	89	92	92	91	94	88.1	94
4-Dec	95	96	94	91	92	90	89	88	85	87	87	87	85	86	89	89	89	90	88	89	89	89	89	88	89.2	96
5-Dec	88	87	87	86	86	86	85	84	84	83	82	78	76	74	74	76	77	77	76	78	78	78	77	77	80.5	88
6-Dec	78	79	79	78	76	75	75	75	75	74	74	75	75	70	71	72	74	80	83	83	82	81	81	80	76.9	83
7-Dec	81	81	81	81	81	80	79	79	78	78	76	76	74	72	72	77	78	78	77	77	78	78	77	77	77.6	81
8-Dec	77	77	75	75	75	74	74	74	74	74	74	74	75	75	76	76	75	74	74	73	73	73	72	73	74.5	77
9-Dec	72	72	73	72	72	73	71	71	71	71	72	72	73	73	74	73	73	73	72	72	72	72	73	74	72.4	74
10-Dec	74	74	75	75	75	75	74	74	74	74	73	73	73	73	75	75	76	75	74	74	74	74	75	74	74.2	76
11-Dec	72	71	70	71	71	71	72	72	73	72	71	70	70	69	69	73	73	74	76	76	75	77	78	76	72.5	78
12-Dec	77	76	71	70	68	69	69	70	69	69	67	69	69	72	75	78	79	79	79	78	78	75	73	74	73.0	79
13-Dec	72	72	70	74	77	75	73	74	77	77	74	70	69	69	73	78	74	69	69	73	75	76	74	75	73.3	78
14-Dec	78	78	77	76	76	77	77	77	78	79	77	77	78	76	79	80	81	80	80	79	77	81	81	81	78.3	81
15-Dec	78	76	76	74	76	76	74	74	73	74	71	67	65	66	66	71	72	70	69	71	71	74	74	74	72.2	78
16-Dec	74	73	72	72	72	71	71	70	70	70	69	69	70	70	70	71	71	71	71	70	70	70	69	69	70.6	74
17-Dec	69	69	69	68	69	68	67	68	67	68	69	70	70	71	72	71	71	71	71	72	72	73	73	74	70.0	74
18-Dec	73	72	73	74	74	74	75	76	77	77	76	76	76	76	77	77	78	78	78	79	79	80	80	80	76.4	80
19-Dec	80	80	81	81	82	82	82	82	82	83	83	83	82	81	82	85	86	84	85	86	85	84	82	82	82.7	86
20-Dec	82	83	82	81	82	83	86	82	82	83	78	74	71	70	72	77	86	90	89	88	87	86	85	86	81.9	90
21-Dec	85	86	87	89	89	83	80	85	89	84	84	88	84	75	74	77	79	87	87	92	93	92	92	93	85.6	93
22-Dec	93	94	94	94	94	94	93	91	92	90	87	87	85	83	84	83	83	84	84	83	83	83	84	84	87.7	94
23-Dec	84	83	82	80	80	80	80	79	78	79	78	77	76	76	77	79	80	80	79	78	77	77	76	76	78.7	84
24-Dec	75	75	74	74	74	75	74	74	75	75	75	76	76	77	78	79	79	79	80	81	81	81	81	80	77.0	81
25-Dec	80	80	80	80	79	79	79	79	79	79	78	80	80	78	77	80	80	80	81	81	82	81	81	81	79.7	82
26-Dec	79	78	79	79	79	79	79	79	79	80	78	78	75	75	74	76	81	82	82	82	81	81	82	82	79.2	82
27-Dec	82	81	83	78	82	84	85	85	85	85	79	78	74	72	76	85	84	87	89	88	89	87	89	88	83.2	89
28-Dec	86	83	85	87	86	85	86	85	82	81	81	79	76	74	76	78	80	80	78	80	83	83	82	83	81.6	87
29-Dec	84	83	83	83	83	83	82	83	82	81	79	78	79	80	80	81	83	83	84	84	84	85	85	86	82.5	86
30-Dec	86	86	87	87	87	87	87	86	87	86	86	81	77	76	77	79	79	80	80	82	86	86	87	86	83.6	87
31-Dec	86	86	86	85	84	85	84	85	85	85	85	85	80	78	81	84	84	82	80	79	80	82	81	81	83.0	86
80.9 80.6 80.3 80.0 80.2 80.0 79.8 79.7 79.7 79.5 78.1 77.3 76.1 75.1 76.2 78.7 79.8 80.2 80.1 80.5 80.8 81.1 81.0 81.1																		Diurnal Average								
95 96 94 94 94 94 94 93 92 93 89 88 85 86 89 91 94 92 92 93 93 93 93 94 94																		Diurnal Maximum								



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Fort McKay South - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Fort McKay South - December 2016

Maximum Speed: 17 km/h on Dec 2 21:00	Maximum Daily Speed Average: 10.3 km/h on Dec 2	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 16 05:00	Minimum Daily Speed Average: 0.4 km/h on Dec 24	Hours of Data: 743
Maximum Diurnal Speed Average: 2.4 km/h at hour 23	Minimum Diurnal Speed Average: 1.1 km/h at hour 4	Hours of Missing Data: 1
Monthly Average Velocity: 1.7 km/h 247.0 deg	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 4 Q ₃ = 8 P ₉₀ = 11 P ₉₉ = 15	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S13	S14	S12	SSW9	S8	S9	S10	S9	S9	S9	S10	S9	S9	S8	S9	S5	S4	S2	S3	S4	S4	S3	S3	S5	S7.5	S14	
2-Dec	S6	S6	S7	S7	S6	S6	SSW8	S6	SSW6	S8	S12	S15	S16	S13	S10	S4	S5	S12	S15	S16	SSE17	SSE16	SSE15	S17	S10.3	SSE17	
3-Dec	SSE15	SSE15	SSE13	SSE13	S14	S13	S14	S13	S12	S11	S13	S14	S10	S9	S7	S7	S8	S8	S8	S7	SSW7	W3	ENE2	S9.8	SSE15		
4-Dec	N1	NNW5	N12	NNE13	NNE13	N15	NNE14	N13	NNE13	NNE8	N9	N7	NNW8	NNW8	NNW8	NNW8	NNW9	NNW9	NNW10	NNW9	NNW5	NNW5	NNW8	NNW9	N8.4	N15	
5-Dec	NNW10	WNW9	WNW8	WNW9	WNW9	WNW9	WNW10	WNW10	WNW12	WNW11	WNW11	WNW11	WNW11	WNW10	WNW10	WNW10	WNW11	WNW11	W9	W9	W9	W9	W10	WNW10	WNW9.8	WNW12	
6-Dec	WNW10	WNW10	WNW8	WNW9	WNW9	WNW9	WNW9	WNW9	WNW8	WNW8	WNW8	WNW8	NNW11	NNW14	NNW12	NNW10	NNW8	NW3	WNW2	SW2	WNW1	NNW3	NW4	NW3	NW6.7	NNW14	
7-Dec	WNW3	WNW3	WNW3	NW4	NW2	NW3	NNW3	NNW4	W3	WSW2	SW1	SE1	N5	N4	NNW2	WSW2	WSW3	WSW2	W2	WSW2	SW2	SSW1	SW1	W2	WNW1.7	N5	
8-Dec	WSW3	WSW1	WSW2	NW2	WSW3	W2	WSW2	WSW2	WSW2	WSW1	SW1	ESE1	NE1	NE1	NE2	NNW1	W2	WSW2	W2	WSW2	W2	SW2	SW2	AF	WSW1.3	WSW3	
9-Dec	WSW1	SSW1	SW1	SW2	WSW1	SSW2	SW2	SW2	SSW3	WSW3	S2	SSE7	SSE8	SSE8	SSE7	SSW3	SSW3	S3	SSW3	SW2	SSW3	SSW3	S4	S5	S2.9	SSE8	
10-Dec	S3	S4	S7	S8	S4	S1	S1	S3	SSW4	SSW2	S4	SSE5	SSE5	SSE7	SSE5	S4	N1	WSW2	WSW3	SSW3	S3	SSE4	SW5	SW6	S3.4	S8	
11-Dec	WSW9	WSW10	WSW11	WSW10	WSW10	SSW9	SW8	WSW11	SW7	SSW5	WSW9	WSW11	WSW9	W8	W9	WSW7	WSW8	WSW7	SW4	W6	WSW9	WSW4	W9	W8	WSW8.0	WSW11	
12-Dec	W7	WNW7	WNW9	WNW7	WNW9	WNW9	W9	WSW10	WSW10	WSW9	W8	WSW7	S7	S7	SSE6	SSW2	WNW1	NW2	WSW3	SW2	WSW2	WNW8	W7	W8	W5.3	WSW10	
13-Dec	WNW9	WNW11	NW12	N14	N14	N12	N13	NNW9	NNE6	N4	NNW2	NE2	E2	SSE4	SE3	NW3	WNW5	WNW6	WNW7	WNW6	W6	W9	W8	WNW2	NW5.0	N14	
14-Dec	SW1	SSW2	S2	S3	S5	S4	SSW3	SW1	SSW2	SSW3	S2	S4	N0	NNE2	NNW3	WSW1	WSW2	WSW3	SW3	W6	WNW3	SW2	WNW2	WNW4	SW1.6	W6	
15-Dec	WNW6	W8	W9	W9	WNW4	WNW7	WNW8	W10	WNW6	W8	W9	WNW7	WSW7	W7	WSW7	W6	WNW6	WNW7	W6	W7	WSW4	W5	W1	NW2	W6.3	W10	
16-Dec	WNW2	NW1	WSW1	NW1	E0	NNE1	SSW1	SSW2	SSW2	S3	SE2	SSE6	SSE7	SSE5	S1	W1	WSW3	SW1	NW1	SW2	WSW2	W1	SW1	SSW1.2	SSE7		
17-Dec	WSW2	SW1	SW2	SW2	SW2	SSW3	WSW3	WSW3	WSW3	SW2	S4	SSE8	SSE9	SSE7	SSE6	SSW4	S3	S2	SSW1	SSW1	SSW1	SSW0	S1	NE1	S2.6	SSE9	
18-Dec	SSW2	S3	S4	S4	S4	S3	SW1	N1	NNE2	NW2	NE3	NE1	NNE3	NNE5	N5	N5	N5	N4	NNW2	NNW3	NNE4	NNE3	ENE1	NE2	NNE1.1	N5	
19-Dec	ENE1	N1	N3	NNE4	N4	N6	N6	N5	NNW5	N5	N3	N5	N6	N3	NNE4	NNE4	N6	NNW6	NW2	ESE1	N3	NNW3	NW3	NW3	N3.6	NNW6	
20-Dec	W1	SSW2	S3	S3	SSW3	W2	WSW9	SW12	SW13	SW12	SW10	SSW6	SW6	SW7	SW7	SW5	S4	S4	S4	S4	SW3	SW2	SW3	S4	SW5.0	SW13	
21-Dec	SSW2	SW1	S5	SSE5	S3	SW9	SSW7	S7	S6	S7	S5	S5	SW7	WSW13	WSW14	WSW8	SSW7	S9	SSE6	SE4	S8	S6	S4	SW2	SSW5.2	WSW14	
22-Dec	WSW2	SW1	WSW2	NNW2	WNW2	SSW4	WNW2	N7	NNW4	N9	NNE14	NNE14	NNE15	NNE13	NNE13	NNE14	NNE14	NNE10	N9	N11	N9	N8	N9	NNE10	N7.4	NNE15	
23-Dec	NNE9	NNE9	NNE9	NNE12	N11	NNE10	NNE9	NNE11	N11	N10	N11	N12	NNE10	N9	NNE9	NNE8	NNW3	NW3	NW1	NNW0	WSW1	NW1	WSW1	WNW1	N6.8	N12	
24-Dec	N1	NW1	W1	W0	NW1	S0	S0	N1	N1	NE1	NE1	NE1	NNE1	NE1	ESE1	NNE1	SSE2	S3	S2	S1	N1	SW1	S2	S3	SSE2	SSE0.4	S3
25-Dec	N1	SSE4	SE3	SSE3	S4	S4	S5	S2	SE1	S2	SW2	SSE1	ENE1	SSE7	S7	S4	S2	SSW3	S6	S5	S9	S6	SSW5	SSE2	S3.5	S9	
26-Dec	NW1	SE1	SE1	NE2	SSE5	S5	S4	S3	SSE7	SSE10	SSE11	SSE11	SSE14	S14	S15	S10	SSW4	SSW4	SW4	SW5	SW4	WSW3	WSW4	SW5	S5.4	S15	
27-Dec	SW4	SSW5	S6	S9	SSW6	SSW5	SSW4	SSW4	SW5	SSW5	N3	NNW3	NNW3	N3	N2	SW5	SSE3	SSW3	WSW4	S5	WSW4	NW6	NW5	NW6	SW2.4	S9	
28-Dec	NNW7	N6	N9	NNE8	NNE7	NNE4	NNE6	NNE8	NNE8	NNE6	NNE7	NE7	NE3	SSE1	SSE4	SSE3	NNE4	NNE8	NNE7	N5	NNW4	WNW3	N3	NW1	NNE4.5	N9	
29-Dec	NNE2	NW1	W1	SSW2	ENE2	SSW1	ENE1	N3	NNE4	NW2	N4	NNE2	NE3	NE4	E2	NNE2	N4	NNW3	NW1	W1	NNW1	N2	E1	WNW1	N1.4	N4	
30-Dec	W1	S2	NW2	SSW1	WNW1	WNW1	NNW3	NNW2	W2	SSW3	S6	S8	S8	S9	S12	SSE9	S8	SW3	W5	WNW6	N8	N6	NNW3	NNW3	SSW1.9	S12	
31-Dec	W1	NNW2	SW1	SSE2	SSW3	NNW2	WNW2	SW2	N3	NW0	NNE1	N2	S2	SE2	NE2	WSW1	SW8	SW4	W9	WSW10	SW8	SW9	WSW11	WSW9	WSW3.0	WSW11	

WSW2.1	WSW2.0	WSW1.9	W1.1	W1.3	W1.6	W1.9	W2.1	W1.8	WSW1.9	SW1.2	SSW1.2	S1.2	SSW1.5	SSW1.5	WSW1.5	W1.7	WSW2.0	WSW2.2	WSW2.3	SW2.2	WSW2.1	WSW2.4	W2.1	Diurnal Average
SSE15	SSE15	SSE13	N14	N14	N15	NNE14	N13	NNE13	SW12	NNE14	S15	S16	NNW14	S15	NNE14	NNE14	S12	S15	S16	SSE17	SSE16	SSE15	S17	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort McKay South - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Dec 21 15:00	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 0 km/h on Dec 9 04:00	
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 4	

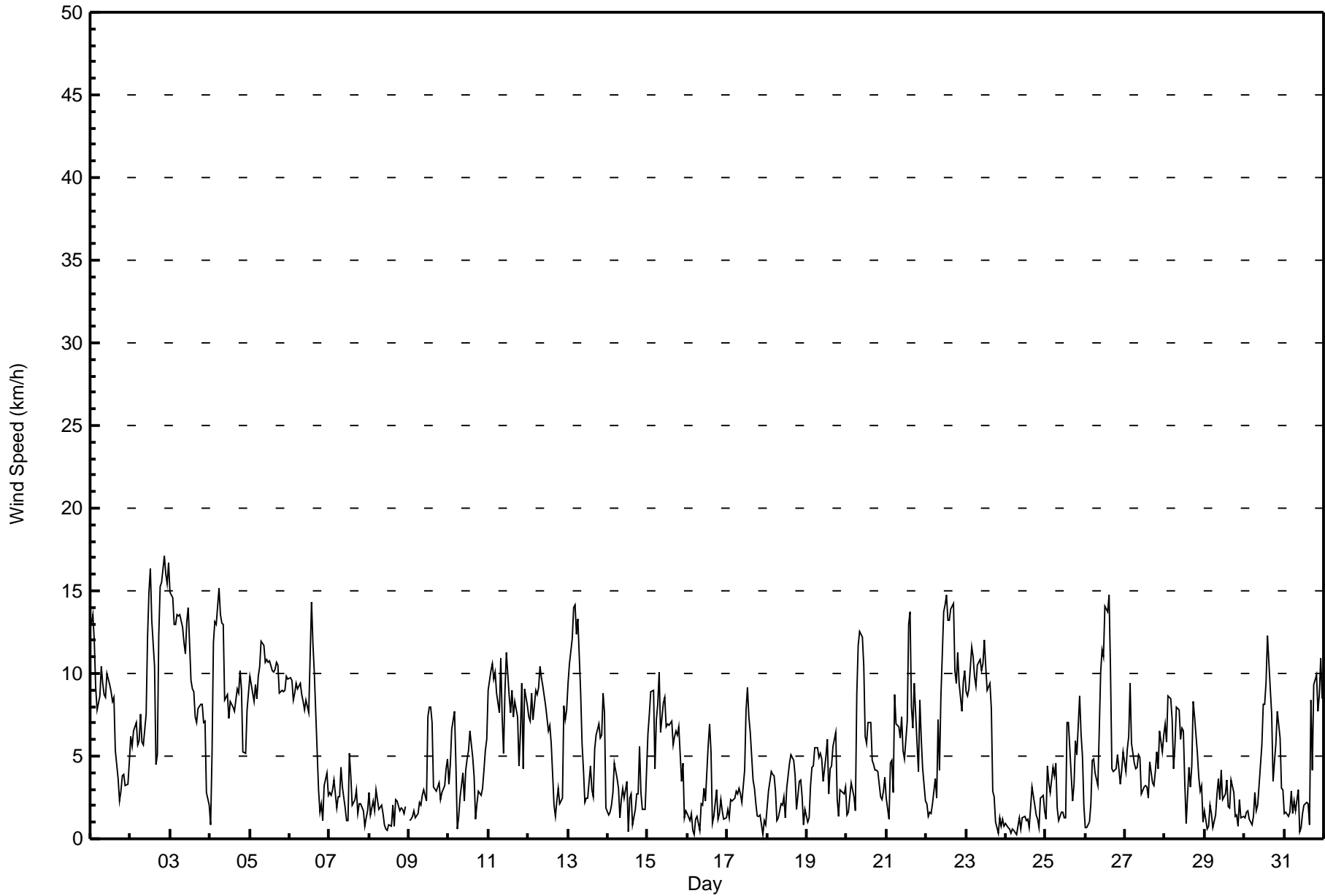
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	3	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	3
2-Dec	1	1	1	1	1	1	1	1	1	2	3	3	3	3	1	2	2	2	3	3	3	3	3	3	3
3-Dec	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	1	1	1	2	2	1	3	
4-Dec	1	2	3	3	3	3	3	3	3	2	2	2	2	2	3	2	2	3	2	1	1	2	3	3	
5-Dec	4	3	3	3	3	3	3	4	3	4	4	3	4	3	3	3	4	3	3	3	3	3	3	4	
6-Dec	3	3	3	2	3	3	3	3	2	2	2	2	3	4	3	3	3	1	1	1	1	1	1	4	
7-Dec	0	1	1	1	1	1	1	1	1	1	1	0	2	1	1	1	1	2	1	1	1	1	1	2	
8-Dec	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	AF	
9-Dec	1	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
10-Dec	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
11-Dec	3	3	3	3	3	2	3	4	2	2	3	4	3	3	3	2	2	2	2	2	2	3	3	2	
12-Dec	1	2	2	2	3	2	3	2	2	2	2	2	1	2	1	1	1	1	1	1	2	2	2	3	
13-Dec	3	3	4	5	3	4	4	2	2	1	1	1	1	1	2	2	1	2	1	1	2	2	2	5	
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	2	
15-Dec	2	2	2	3	3	2	2	3	4	3	3	2	2	2	2	1	1	2	1	1	2	1	1	4	
16-Dec	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
17-Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	0	1	1	2	
18-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	
19-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	
20-Dec	1	1	1	1	1	1	5	3	3	3	3	3	3	3	2	2	1	1	1	1	1	1	1	5	
21-Dec	1	1	3	1	2	4	3	2	2	2	1	2	4	4	5	3	2	1	3	1	2	1	2	5	
22-Dec	2	1	1	1	2	2	4	1	2	4	3	3	3	3	3	3	3	2	2	3	2	2	2	4	
23-Dec	2	2	3	3	2	2	2	3	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	3	
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	
25-Dec	1	2	1	1	2	2	1	1	1	1	1	1	1	2	3	1	1	1	1	2	2	1	2	3	
26-Dec	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3	4	2	2	1	1	1	2	3	4	
27-Dec	2	2	2	3	1	1	1	1	2	1	2	1	1	1	2	2	1	2	2	1	3	3	2	3	
28-Dec	2	1	1	2	2	1	2	2	2	1	2	1	2	1	1	1	2	1	2	1	1	1	1	2	
29-Dec	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1	1	2	1	2	
30-Dec	1	1	1	1	1	2	2	1	1	1	2	3	2	2	2	1	2	2	2	2	1	2	1	3	
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	2	2	2	2	3	3	
	4	3	4	5	3	4	5	4	4	4	4	4	4	4	5	4	4	4	3	3	3	3	3	3	
	Diurnal Maximum																								

AF - Analyzer Failure



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Fort McKay South - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Fort McKay South - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	427	57.47	57.47
6 - 11	257	34.59	92.06
12 - 19	59	7.94	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
Fort McKay South - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	33	20	15	6	4	3	8	21	72	51	46	43	21	22	29	33	427
6 - 11	22	22	1	0	0	0	0	19	52	9	12	25	29	46	8	12	257
12 - 19	8	12	0	0	0	0	0	9	20	0	3	2	0	2	1	2	59
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	63	54	16	6	4	3	8	49	144	60	61	70	50	70	38	47	743

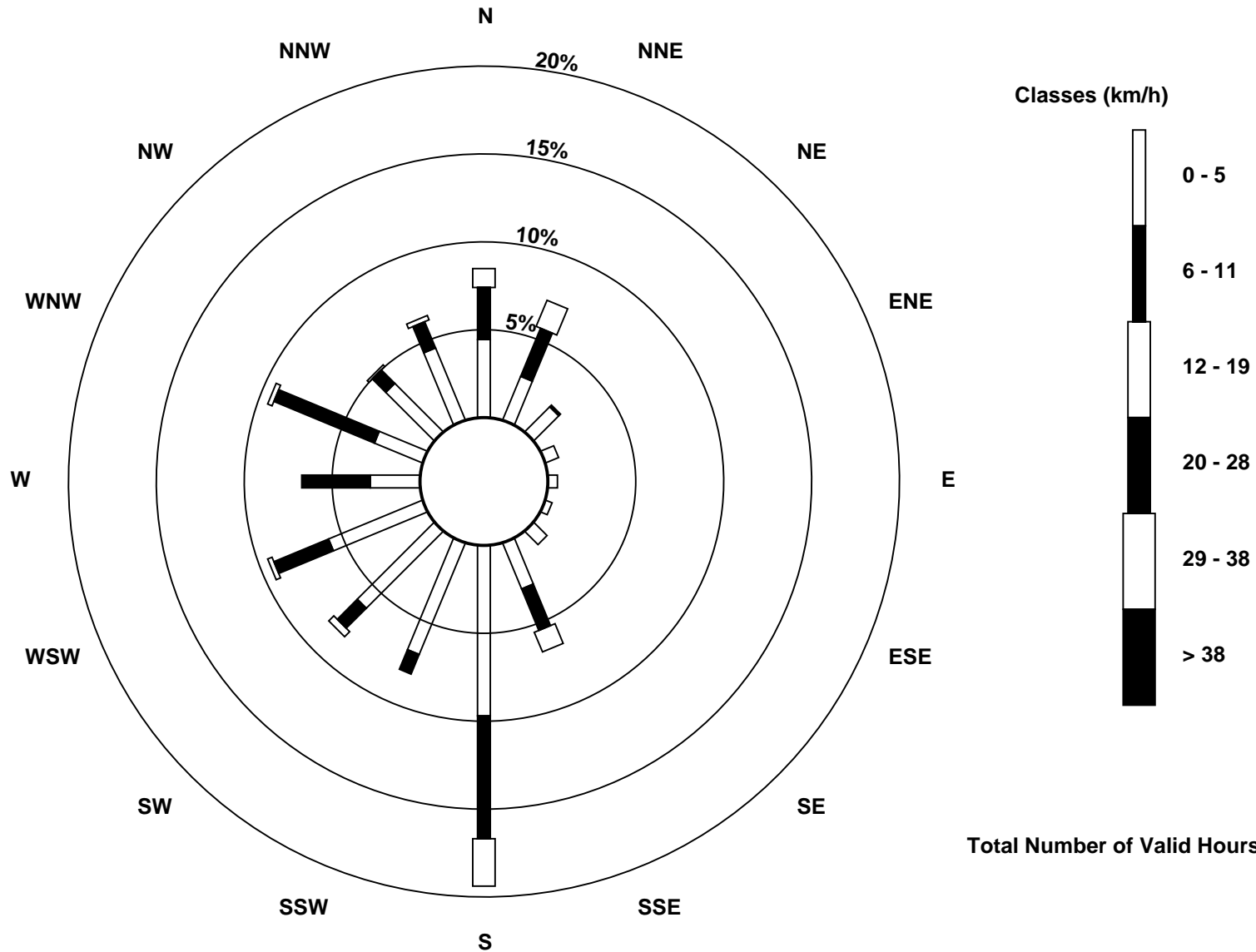
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Fort McKay South (AMS 13)



Total Number of Valid Hours: 743



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort McKay South - December 2016

Direction of Maximum Speed: 167 deg on Dec 2 21:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 174.6 deg on Dec 2	Hours of Data: 743
Direction of Minimum Speed: 88 deg on Dec 16 05:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 0.4 deg on Dec 24	Percent Operational Time: 99.9
Monthly Average Direction: 254.4 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	180	181	183	197	191	185	187	186	183	186	187	188	181	180	183	182	172	187	189	182	190	188	188	188	184.9
2-Dec	184	178	178	170	186	187	192	187	196	187	176	169	171	179	169	191	174	176	174	169	167	167	166	169	174.6
3-Dec	167	167	168	167	169	170	171	174	176	175	171	173	170	186	177	183	182	185	190	188	182	203	266	61	175.4
4-Dec	349	344	0	16	16	11	13	8	17	18	9	354	330	341	335	321	329	326	327	330	337	337	313	310	351.2
5-Dec	312	298	292	288	288	288	290	295	290	293	288	290	285	283	284	283	284	282	280	273	270	271	279	283	286.4
6-Dec	284	288	290	294	289	284	285	288	284	284	293	308	336	343	343	340	332	319	289	232	291	328	326	320	306.2
7-Dec	284	292	296	312	314	322	336	327	278	242	229	126	6	357	346	244	258	245	262	251	217	208	231	261	295.5
8-Dec	248	258	242	306	256	264	238	249	250	250	234	123	39	50	51	340	261	250	262	249	260	224	229	AF	255.7
9-Dec	248	194	226	220	242	210	220	223	207	243	190	163	149	147	158	198	203	189	200	217	203	200	191	174	185.5
10-Dec	172	187	185	179	183	188	170	180	199	207	169	147	152	151	168	190	349	253	256	212	188	166	214	235	185.1
11-Dec	246	251	255	254	238	213	227	250	226	213	253	253	252	277	281	251	250	242	234	267	256	245	261	281	250.2
12-Dec	273	291	303	288	293	287	273	258	250	253	276	254	171	171	167	209	292	312	251	234	248	282	268	268	263.9
13-Dec	288	292	306	351	0	353	353	347	18	9	335	40	100	149	135	324	300	282	301	284	266	261	271	301	321.7
14-Dec	214	210	176	178	188	183	194	234	202	193	184	170	8	20	337	255	256	248	225	268	293	219	302	293	225.1
15-Dec	282	272	276	280	294	284	284	266	285	268	276	288	258	264	258	264	287	290	269	274	245	273	262	317	275.0
16-Dec	297	311	248	318	88	23	197	213	194	212	171	136	151	148	156	191	266	251	231	306	235	237	265	227	192.8
17-Dec	241	232	220	232	215	205	241	248	254	222	183	164	164	155	165	196	185	178	201	194	205	202	177	36	190.0
18-Dec	206	179	174	185	176	169	222	352	26	305	40	49	33	25	1	355	354	352	347	342	19	16	60	34	11.8
19-Dec	60	11	8	19	7	5	0	356	345	2	6	351	2	357	21	27	353	335	317	106	349	339	315	326	357.7
20-Dec	265	201	188	172	209	280	242	229	229	223	225	211	234	223	224	218	175	186	182	191	224	227	218	184	217.8
21-Dec	207	221	180	163	170	231	192	170	184	182	177	187	236	248	255	244	200	177	148	146	184	191	170	227	201.3
22-Dec	238	219	248	336	296	201	302	355	347	4	23	16	24	26	18	14	13	15	9	10	9	10	10	15	10.8
23-Dec	16	16	22	23	6	19	20	12	6	9	7	6	15	10	13	12	344	313	316	329	252	309	243	293	10.2
24-Dec	355	314	271	270	306	172	191	8	1	40	56	31	46	102	28	160	171	174	169	357	232	170	184	163	150.7
25-Dec	4	164	145	160	173	170	169	174	138	182	229	156	69	166	179	170	174	197	184	186	182	181	194	166	174.9
26-Dec	316	139	141	39	161	186	188	179	168	159	155	162	164	169	172	178	206	203	215	224	219	248	238	231	179.0
27-Dec	229	209	188	185	200	197	196	209	217	198	356	341	332	7	8	214	147	192	247	185	247	323	317	317	226.5
28-Dec	341	359	10	29	23	31	14	32	22	31	26	35	56	158	147	153	21	13	25	6	341	290	6	314	19.6
29-Dec	15	308	260	202	62	207	58	355	22	325	1	20	40	42	89	25	354	344	317	267	333	4	98	285	8.0
30-Dec	281	169	317	199	295	301	342	329	270	194	171	183	179	170	173	167	183	222	259	287	353	351	337	340	205.8
31-Dec	275	347	226	155	193	332	296	225	352	320	21	351	182	142	52	258	236	235	259	253	226	232	251	257	247.0

256.0 248.1 254.2 259.4 260.2 259.7 262.6 271.9 260.6 238.8 234.4 206.5 187.3 191.4 204.8 243.9 266.9 253.9 246.5 246.8 235.4 247.1 254.4 265.3
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

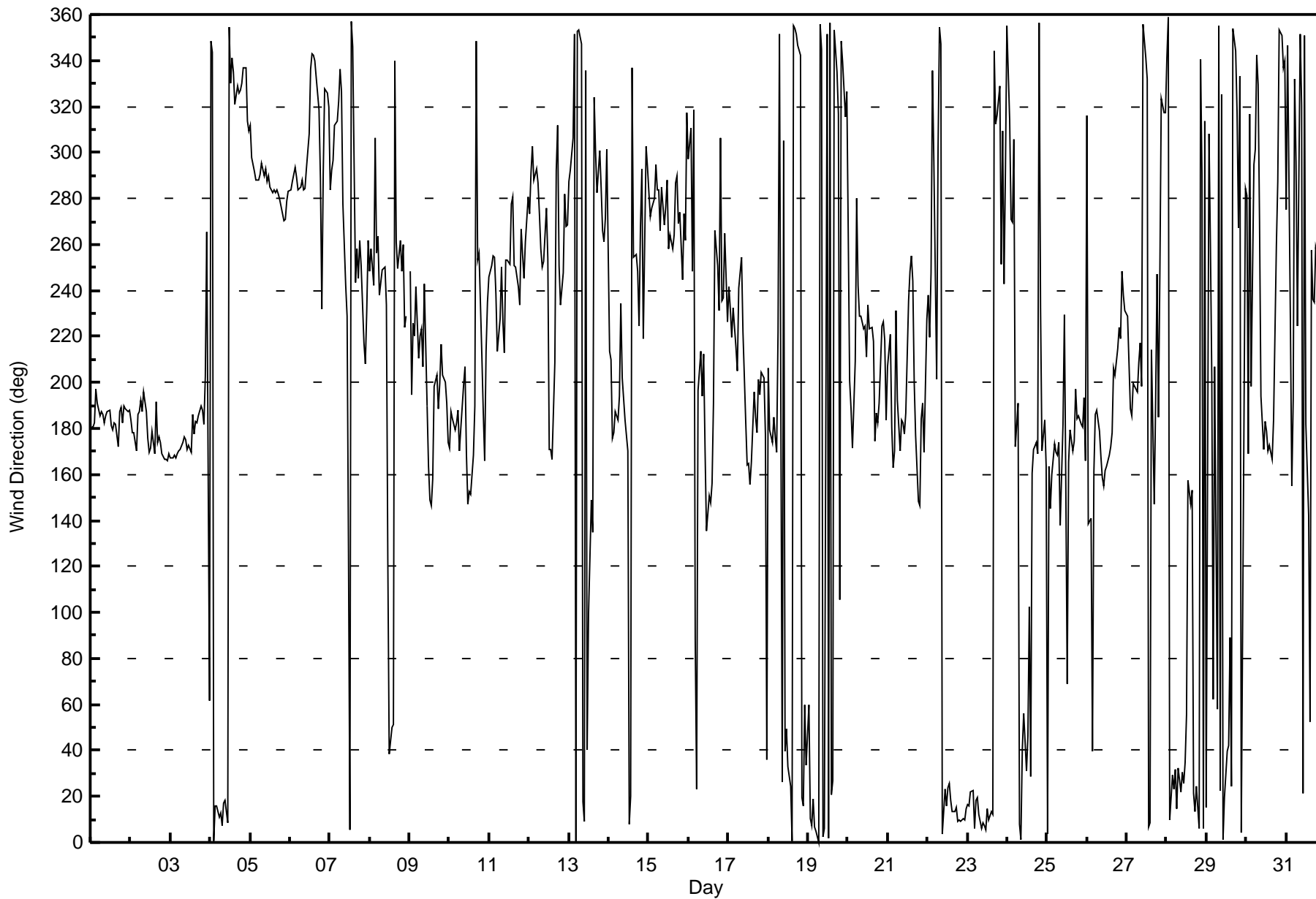
Wind Direction (WD) - deg
Fort McKay South - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Dec 16 05:00 Minimum Value: 5 deg on Dec 10 04:00 Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 14 Median = 22 Q ₃ = 40 P ₉₀ = 65 P ₉₉ = 92																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	12	11	12	15	13	10	11	10	11	10	13	12	13	12	9	12	10	12	14	8	12	11	14	10	15	
2-Dec	10	17	12	13	14	21	12	18	19	11	11	12	10	11	10	25	21	10	10	10	11	11	10	25		
3-Dec	11	10	9	9	9	10	9	8	8	9	9	9	11	13	9	11	16	8	10	10	12	21	69	71		
4-Dec	80	21	18	14	14	13	15	13	16	15	13	22	19	18	16	18	17	17	17	16	15	16	20	20	80	
5-Dec	23	21	25	23	24	23	26	22	23	25	25	26	27	26	27	25	26	26	27	24	24	24	24	25	27	
6-Dec	25	24	24	22	22	22	22	21	22	22	22	21	21	17	14	14	14	15	64	40	60	19	16	31	64	
7-Dec	15	15	16	20	14	14	27	13	19	15	46	46	14	24	42	13	10	74	46	40	30	75	42	14	75	
8-Dec	13	35	37	48	9	13	25	17	12	36	54	31	46	32	15	55	12	11	17	34	25	38	22	AF	55	
9-Dec	55	68	46	24	28	27	17	35	24	10	21	10	7	6	15	15	22	16	15	20	14	12	8	9	68	
10-Dec	15	9	7	5	48	87	60	28	34	29	10	15	17	7	17	34	84	50	25	33	15	19	31	28	87	
11-Dec	23	22	22	21	21	18	24	20	20	29	30	23	26	33	26	21	16	17	21	26	14	51	21	21	51	
12-Dec	15	19	14	18	19	20	20	15	11	13	22	21	22	16	39	32	66	35	29	30	43	22	23	22	66	
13-Dec	22	23	22	32	15	16	15	15	15	21	27	28	41	16	34	67	20	18	15	14	14	13	16	56	67	
14-Dec	45	54	33	25	15	18	31	54	29	18	29	15	86	39	13	57	33	38	34	16	58	47	57	21	86	
15-Dec	17	15	17	18	54	21	17	18	52	19	20	23	22	25	22	17	15	16	14	14	42	58	70	49	70	
16-Dec	70	81	40	82	98	48	70	96	54	29	15	40	10	5	10	73	30	22	52	46	25	72	41	58	98	
17-Dec	21	51	37	23	25	22	15	13	14	22	10	12	10	9	11	14	17	34	35	42	35	98	81	70	98	
18-Dec	37	34	18	18	33	25	63	60	37	40	25	73	52	17	23	16	20	29	64	35	33	42	82	57	82	
19-Dec	80	85	32	24	20	13	13	16	12	14	18	14	16	45	13	13	19	16	33	72	18	36	27	15	85	
20-Dec	69	55	23	24	35	41	48	19	19	19	24	43	63	34	26	33	26	25	18	21	34	29	29	19	69	
21-Dec	23	49	44	26	79	36	41	17	14	15	15	19	37	24	27	26	27	6	40	40	11	12	41	54	79	
22-Dec	54	57	64	66	65	67	74	14	30	28	14	15	15	14	14	13	12	14	13	14	12	14	12	14	74	
23-Dec	13	14	16	16	13	16	16	15	12	12	13	13	13	12	11	10	35	22	43	33	51	87	46	59	87	
24-Dec	56	60	66	76	65	75	86	87	51	79	51	33	53	38	68	44	21	69	50	39	77	10	18	23	87	
25-Dec	39	13	10	19	16	17	10	28	66	32	48	76	60	16	13	13	13	13	13	13	9	13	23	29	76	
26-Dec	93	74	83	44	22	12	16	20	11	11	10	10	9	10	9	16	26	32	16	14	16	55	34	22	93	
27-Dec	28	16	18	23	12	8	11	28	25	16	63	52	26	33	80	35	49	63	36	24	80	46	15	19	80	
28-Dec	14	15	12	16	17	19	21	18	14	16	16	19	73	59	15	42	19	11	17	10	32	23	38	53	73	
29-Dec	55	98	89	37	58	86	94	51	24	48	23	53	46	38	64	95	48	42	71	65	93	80	63	72	98	
30-Dec	80	65	65	89	82	65	37	59	43	43	15	18	15	11	14	8	19	68	45	45	14	13	37	43	89	
31-Dec	63	47	76	56	24	71	34	65	44	93	85	52	31	28	44	85	14	62	19	14	23	19	16	20	93	
																	93 98 89 89 98 87 94 96 66 93 85 76 86 59 80 95 84 74 71 72 93 98 82 72									
																	Diurnal Maximum									
AF - Analyzer Failure																										



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Fort McKay South - December 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:12	End Time (MST)	10:58
Gas Cert Reference	LL110515	Station temp.	22 Deg C
Cal Gas Concentration	49.8 ppm	Cal Gas Exp Date	9/08/18
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG Make/Model	API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11038

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		HVPS voltage	524	524
Analyzer IP address	192.168.1.73		Lamp voltage	3111	3250
Calculated slope	0.999774	0.999259	Box temp	32.5	32.5
Calculated intercept	3.421881	2.622764	Pressure	26.9	26.4
Analyzer Background	32.2	32.2	Flow	714	693
Analyzer Coefficient	1.026	1.026	Lamp Ratio	105	110
Analyzer make	API T100		Analyzer serial #	599	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	78.9	785.8	773.8	1.016
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	78.9	785.8	785.7	1.000
second point	5000	39.4	392.4	386.6	1.015
third point	5000	19.7	196.2	193.0	1.017
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	78.9	785.8	778.1	1.010
Average Correction Factor					1.011

Corrected As found 774.1 Previous response 782.6 % change 1.1%

Notes:

filter changed out, no maintenance done, span adjusted

Calibration Performed By:

Melissa Lemay



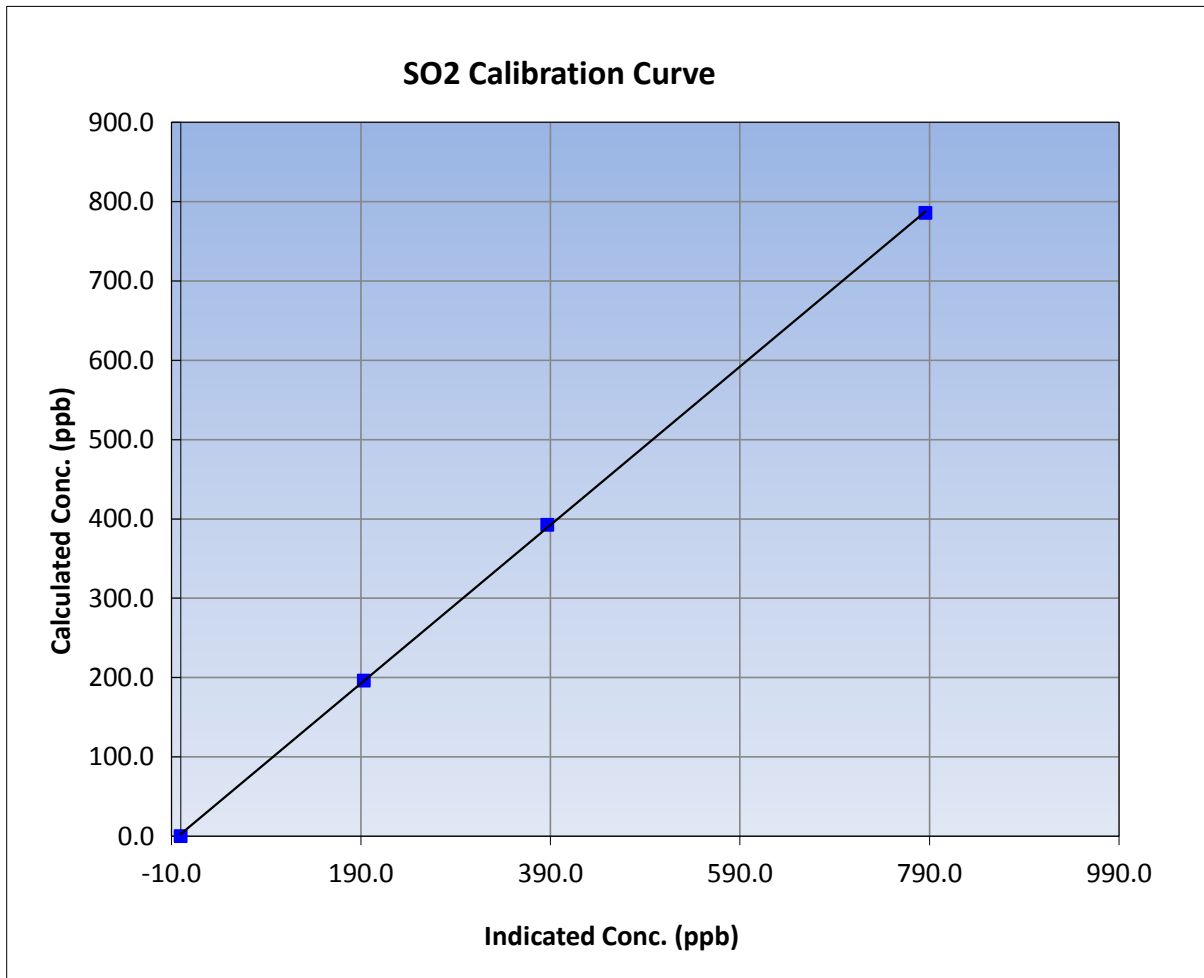
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:12	End Time (MST)	10:58
Analyzer make	API T100	Analyzer serial #	599

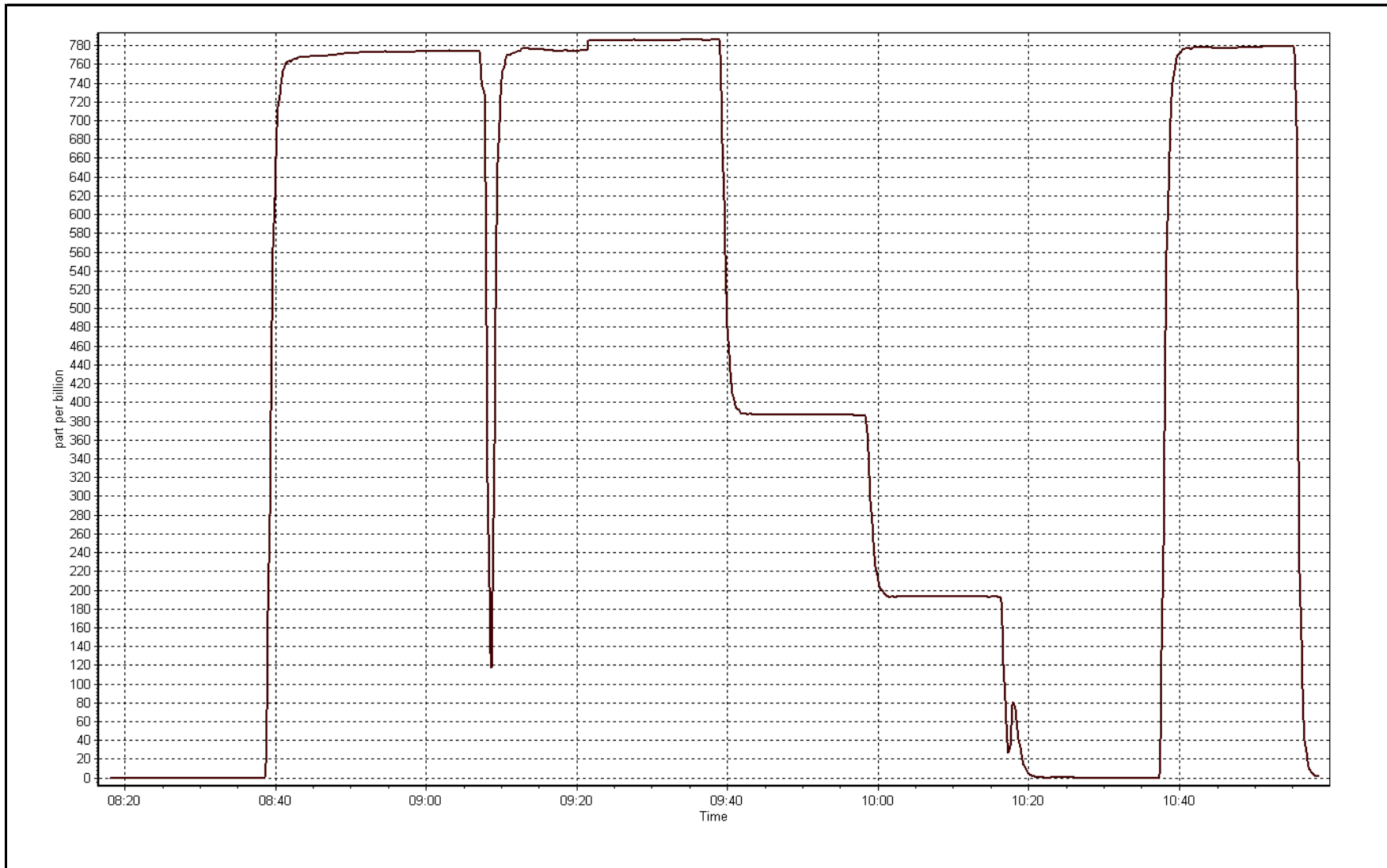
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999936
785.8	785.7	1.0002		
392.4	386.6	1.0151	Slope	0.999259
196.2	193.0	1.0166		
			Intercept	2.622764



SO2 Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 14, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	10:55	End Time (MST)	13:53
Gas Cert Reference	CC178364	Station temp.	22 Deg C
Cal Gas Concentration	5.07 ppm	Cal Gas Exp Date	September 9, 2017
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
Dil air Make/Model	API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11038
SO2 gas concentration	49.8 ppm	SO2 gas cert/exp	LL110515 8/Sep/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-727	-727
Analyzer IP address	192.168.1.44		Lamp voltage	1010	1007
Calculated slope	0.986381	0.994173	Chamber temp	45	45
Calculated intercept	0.336372	0.460342	Pressure	709.4	675.7
Analyzer Background	2.08	2	Flow	0.461	0.441
Analyzer Coefficient	1.016	1.001	Intensity		89
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153359	
Converter make/model	CDN-101		Converter serial #	456	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	78.9	80.0	81.5	0.982
SO2 scrubber check	5000	17.6	175.3	0.3	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	78.9	80.0	80.2	0.998
second point	5000	39.4	40.0	39.5	1.011
third point	5000	19.7	20.0	19.3	1.035
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	78.9	80.0	80.5	0.994
Average Correction Factor					1.015

Corrected As found	81.6	Previous response	80.8	% change	-1.0%
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Notes:

Scrubber check done after as founds. Inlet filter changed. No maintenance done, Span adjusted

Calibration Performed By:

Melissa Lemay



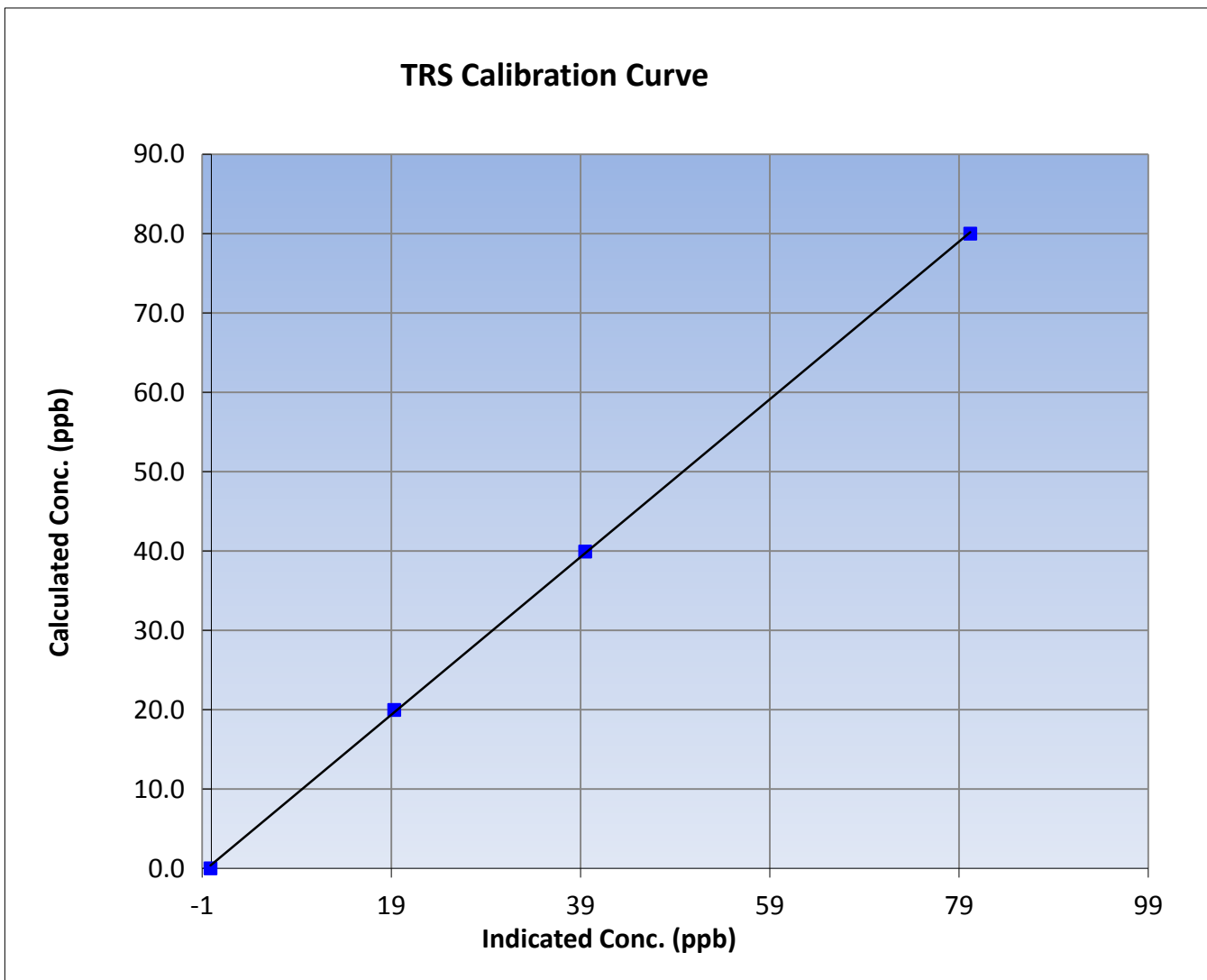
Wood Buffalo Environmental Association TRS Calibration Report

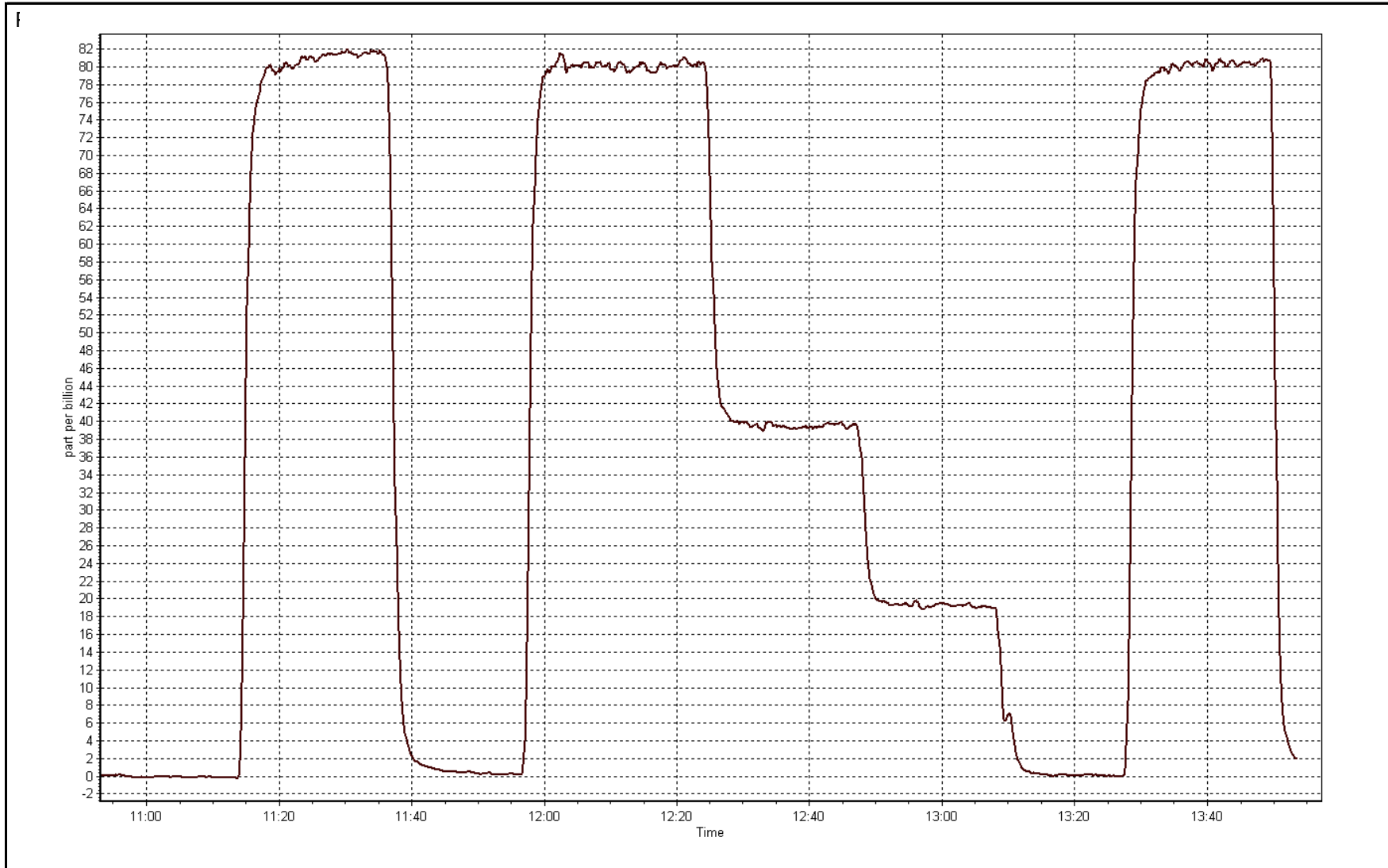
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 14, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	10:55	End Time (MST)	13:53
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153359

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999908
80.0	80.2	0.9976		
40.0	39.5	1.0114	Slope	0.994173
20.0	19.3	1.0350		
			Intercept	0.460342







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:12	End Time (MST)	10:57
Gas Cert Reference	LL110515	Cal Gas Expiry Date	September 8, 2018
CH4 Cal Gas Conc.	517 ppm	CH4 Equiv Conc.	1067.0 ppm
C3H8 Cal Gas Conc.	200 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG make/model	Teledyne API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	Serial Number	11038

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	9.2	9.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.3	34.3
Calculated slope	0.997295	1.000841	Fuel Pressure	23.1	23.1
Calculated intercept	0.081697	0.025807	Analyzer Coeff	3.011	3.011
			Analyzer BKG	1.360	1.360

Analyzer make	51i-LT	Analyzer serial #	1505164380
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.02	----
as found span	5000	78.9	16.84	17.01	0.990
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	78.9	16.84	16.84	1.000
second point	5000	39.4	8.41	8.29	1.014
third point	5000	19.6	4.18	4.15	1.008
as left zero	5000	0.0	0.00	0.03	----
as left span	5000	78.9	16.84	16.98	0.992
Average Correction Factor					1.007

Corrected As found	16.99	Previous response	16.80	% change	-1.1%
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Notes:

no maintenance done, filter changed out, span adjusted

Calibration Performed By:

Melissa Lemay



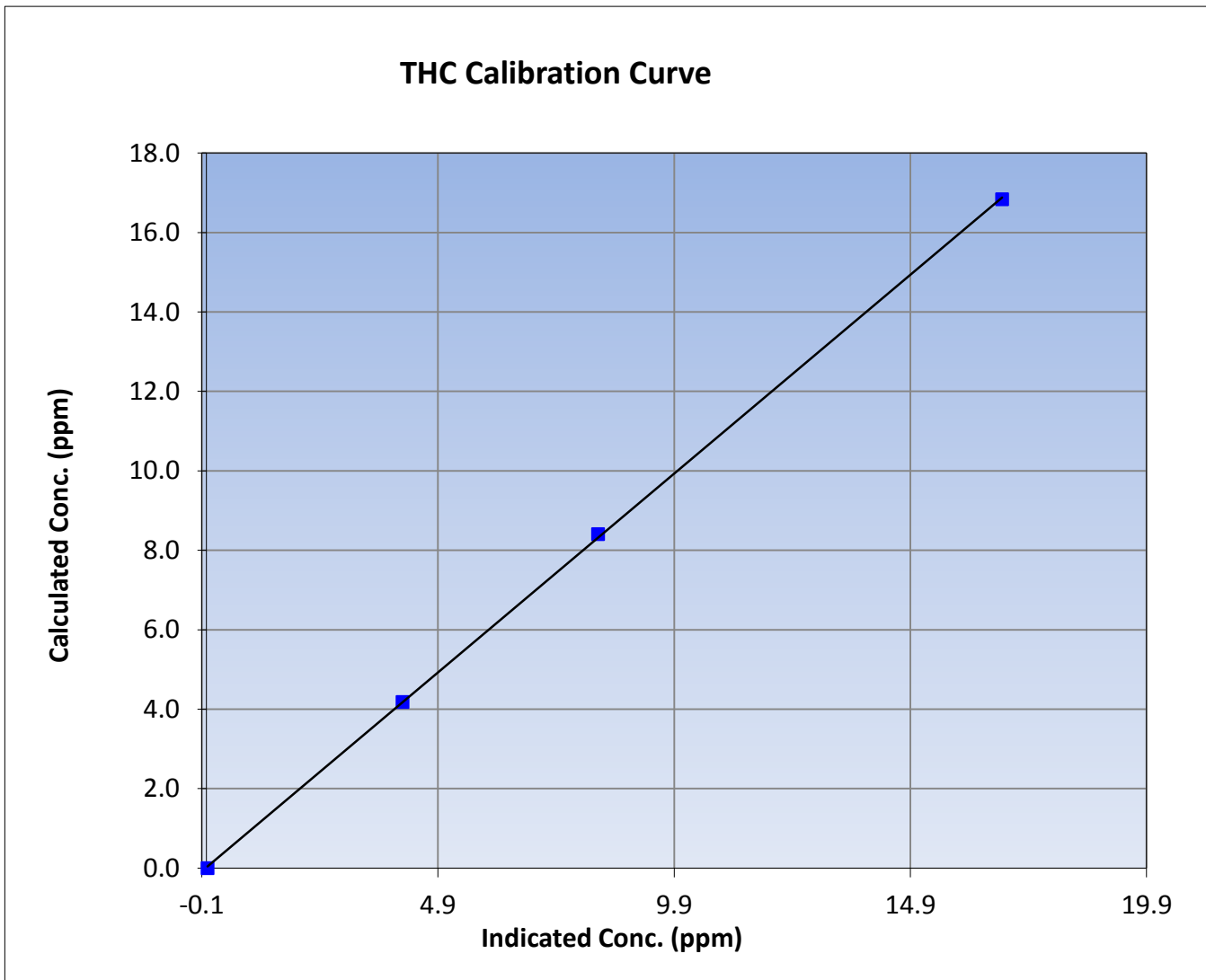
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:12	End Time (MST)	10:57
Analyzer make	51i-LT	Analyzer serial #	1505164380

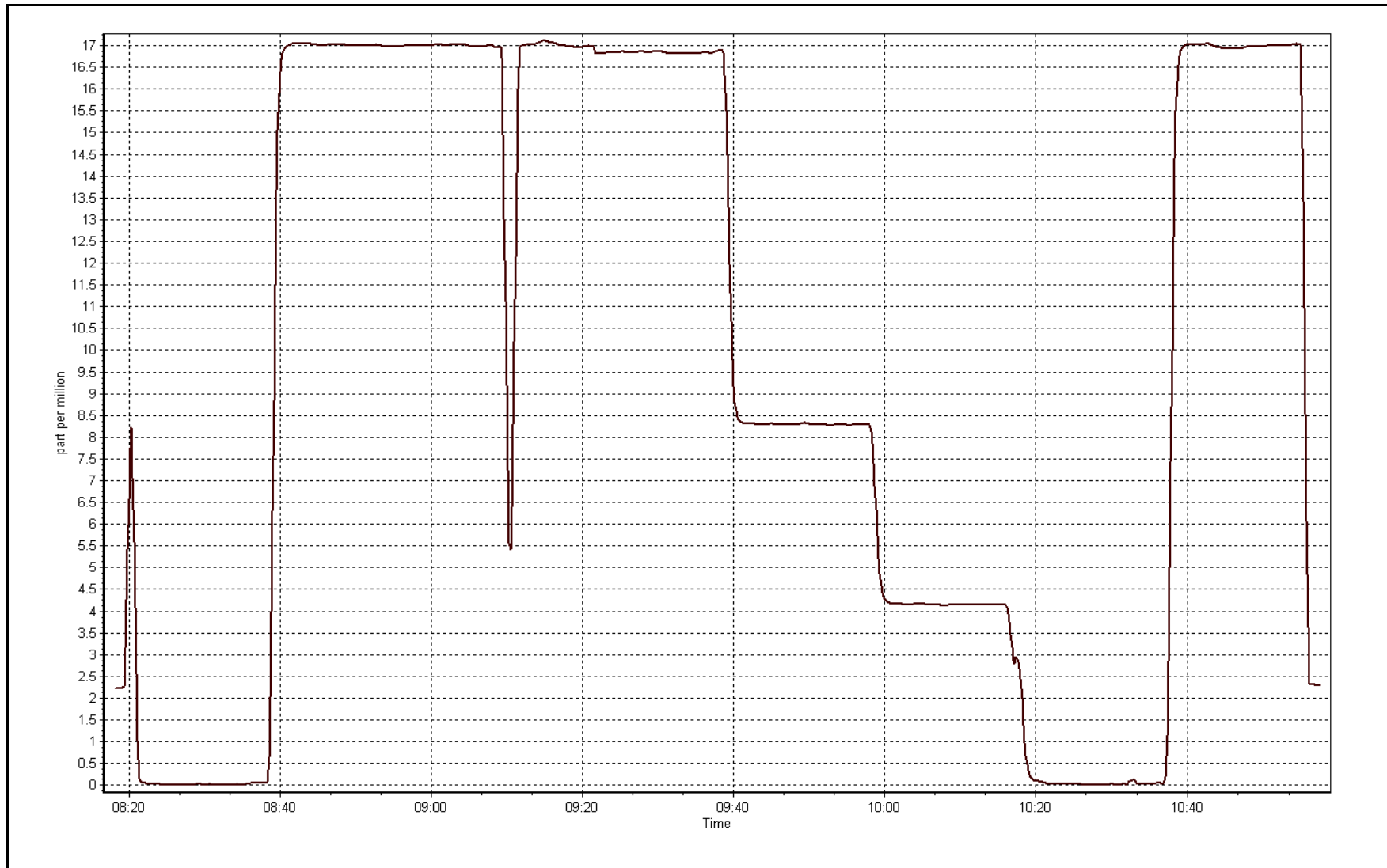
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999928
16.84	16.84	0.9998		
8.41	8.29	1.0142	Slope	1.000841
4.18	4.15	1.0079		
			Intercept	0.025807



THC Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 14, 2016	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	12:23	End Time (MST)	14:25
NO2 GPT Ref date	December 14, 2016	Transfer Standard	Nox
		Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG make/model	Teledyne API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	Serial Number	11038

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Box temp.	24.1	24.1
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	1.007941	1.008612	Pressure	26.7	26.7
Calculated intercept	-0.227369	-1.587993	Flow	767.0	767.0
Analyzer Background	1.2	1.2	Intensity	4360.7	4360.7
Analyzer Coefficient	1.002	1.002			

Analyzer make	API T400	Analyzer serial #	825
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.4	----
as found span	5000	0.89	357.5	355.1	1.007
calibrator zero	5000	0.00	0.0	0.4	----
high point	5000	0.89	357.5	355.1	1.007
second point	5000	0.47	211.4	212.1	0.997
third point	5000	0.36	110.1	111.9	0.984
as left zero	5000	0.00	0.0	0.6	----
as left span	5000	0.89	357.5	364.3	0.981
Average Correction Factor					0.996

Corrected As found	354.7	Previous response	354.9	% change	0.1%
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Notes:

filter changed out, no adjustments or maintenance done

Calibration Performed By:

Melissa Lemay



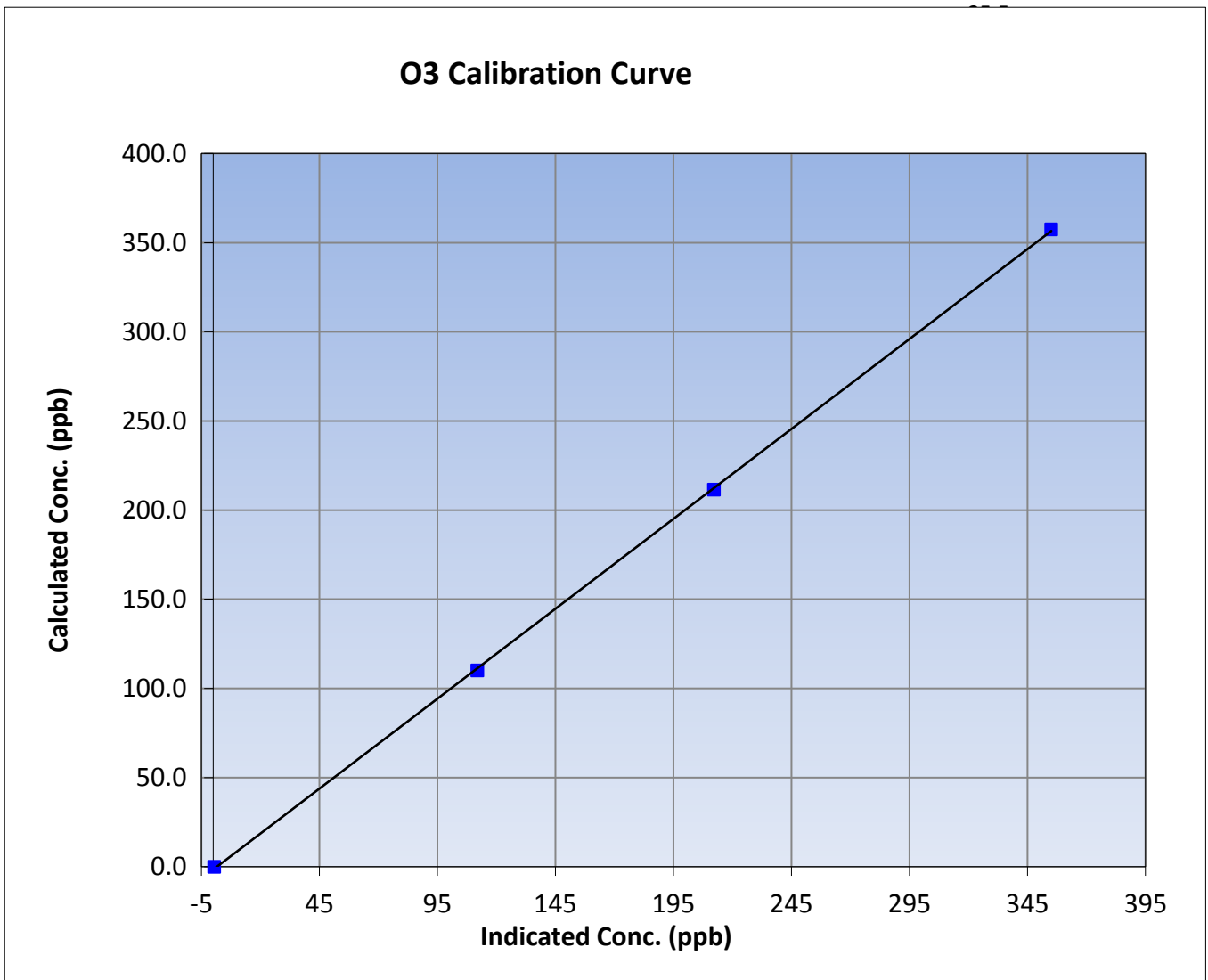
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	December-14-16	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	12:23	End Time (MST)	14:25
Analyzer make	API T400	Analyzer serial #	825

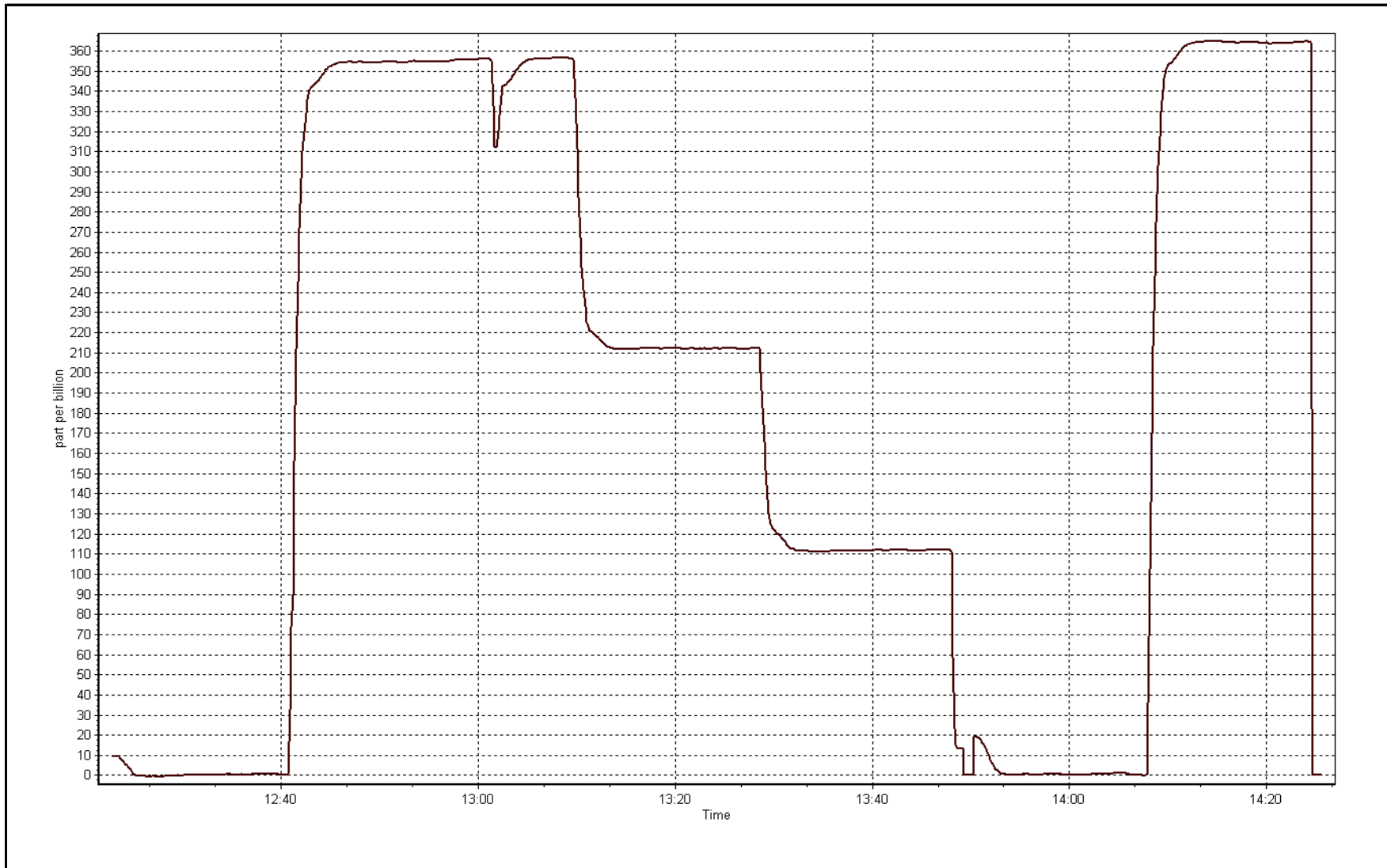
Calibration Data

Calculated concentration (ppb) (Cc)	11/10/16	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999935
357.5	355.1	1.0068		
211.4	212.1	0.9967	Slope	1.008612
110.1	111.9	0.9839		
			Intercept	-1.587993



O3 Calibration Plot

Date: December 14, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:12	End Time (MST)	12:54
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL110515
NOx Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	September 8, 2018
Calibrator	Sabio 4010	Serial Number	11041107
Zero air Generator	Teledyne API T701	Serial Number	5613

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11038
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.995461	0.994868	1.008983
	Data Offset	2.325690	2.123525	0.650515
Current Calibration	Data Slope	1.003580	1.002798	0.989098
	Data Offset	1.386939	1.407968	-0.205336

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661329
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.108		1.108	
NOx coefficient	1.001		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	8.3		8.3	
NOx bkgrnd	8.3		8.3	
Chamber Temp	50.2	Deg C	50.2	Deg C
Moly Temp	323.7	Deg C	323.7	Deg C
PMT voltage	-827.7	V	-827.7	V
PMT Temp	-3	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	210.9	mmHg	220	mmHg
R Cell Press Nox	211.2	mmHg	223.4	mmHg
NO sample flow	0.759	lpm	0.76	lpm
Nox sample Flow	0.758	lpm	0.770	lpm

Notes:

Decrease in response from last nightly span, bypassed the solenoid and Pressure increased, Will put in new solenoid tomorrow, Adjusted span, filter changed out, second GPT used



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 13, 2016 Station Number: AMS 13

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.1	0.0	0.0	----	----
as found span	5000	78.9	803.2	800.0	3.2	758.2	755.7	2.5	1.0594	1.0587
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	0.2	0.1	----	----
high point	5000	78.9	803.2	800.0	3.2	800.8	798.3	2.6	1.0030	1.0022
second point	5000	39.4	401.1	399.5	1.6	394.2	392.8	1.4	1.0175	1.0171
third point	5000	19.7	200.5	199.8	0.8	199.1	198.5	0.6	1.0073	1.0063
as left zero										
as left span										
Average Correction Factor									1.0092	1.0085

Corrected As found NO_x= 758.1 NO= 755.7 Percent Change NO_x= 6.1% NO= 6.1%
 Previous Response NO_x= 804.5 NO= 802.0

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 78.90 ccm NOx ref calc conc = 803.2 ppb NO ref calc conc = 800.0 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		3.2	795.7	792.5	0.1	1.0094	1.0095	----	----
1st NO2 (300)	438.7	357.0	799.6	438.7	360.8	1.0045	----	0.9893	101.1%
2nd NO2 (200)	585.2	210.5	798.8	585.2	213.6	1.0055	----	0.9853	101.5%
3rd NO2 (100)	682.5	113.2	796.9	682.5	114.4	1.0079	----	0.9891	101.1%
2nd NO ref point		3.2	804.3	801.7	2.5	0.9986	0.9979	----	----
Average Correction Factor						1.0041		0.9879	101.2%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

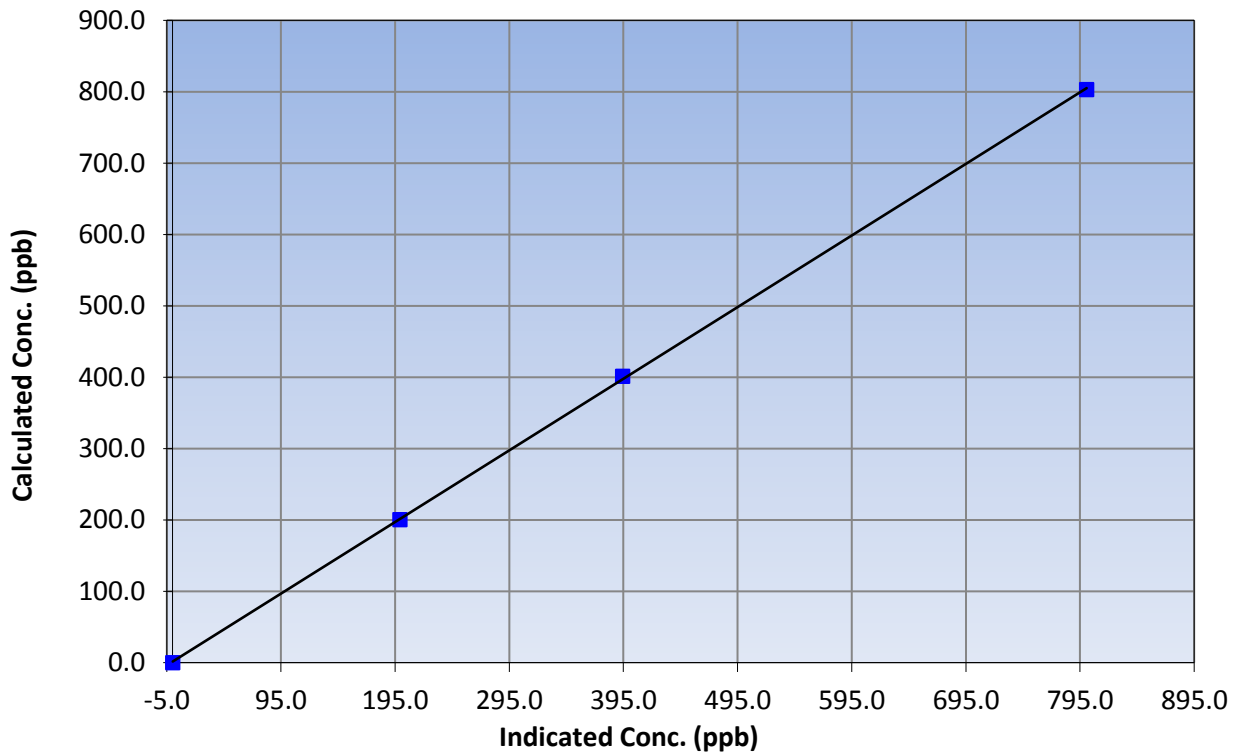
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:12	End Time (MST)	12:54
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999934
803.2	800.8	1.0030		
401.1	394.2	1.0175	Slope	1.003580
200.5	199.1	1.0073		
			Intercept	1.386939

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

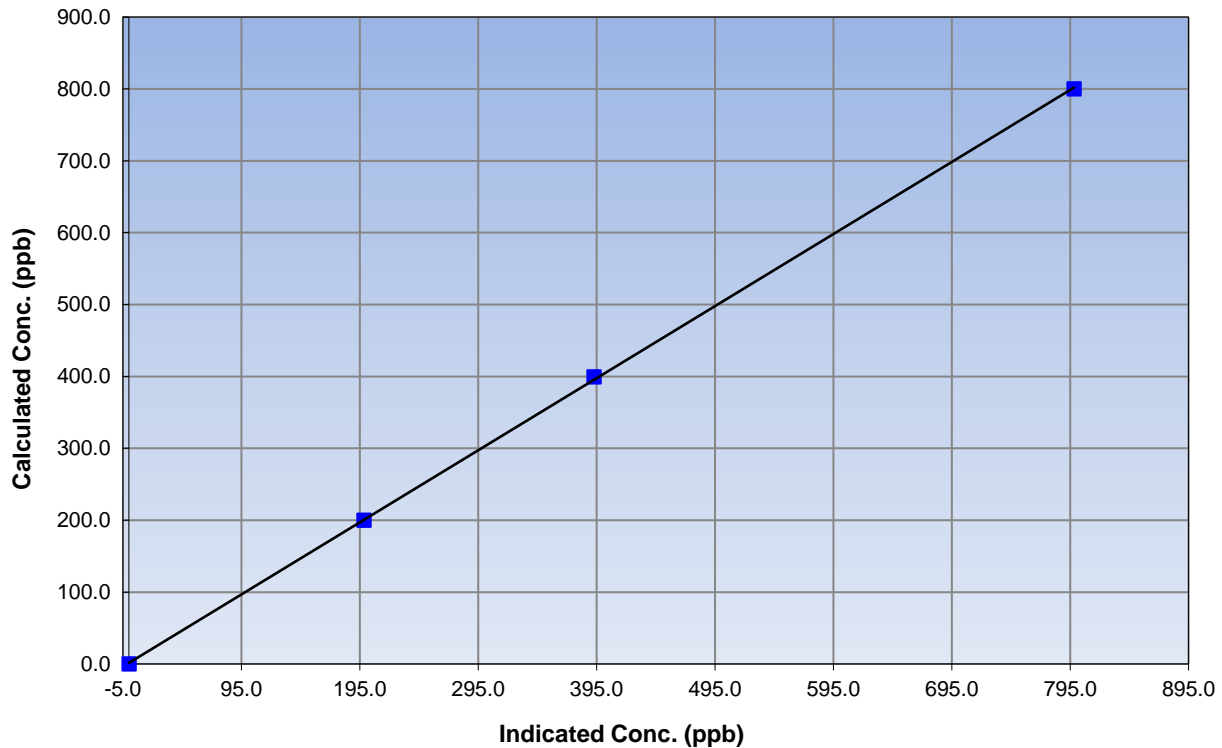
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 10, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:12	End Time (MST)	12:54
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	0.999930
800.0	798.3	1.0022		
399.5	392.8	1.0171	Slope	1.002798
199.8	198.5	1.0063		
			Intercept	1.407968

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

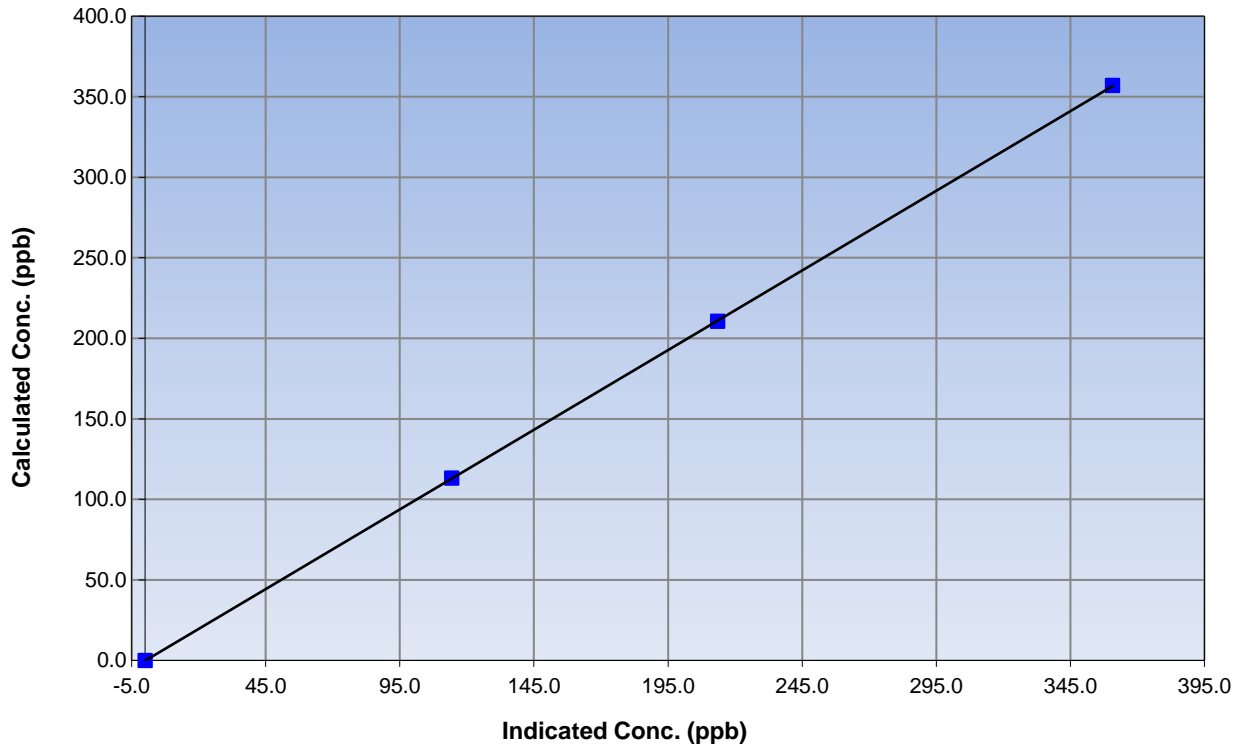
Station Information

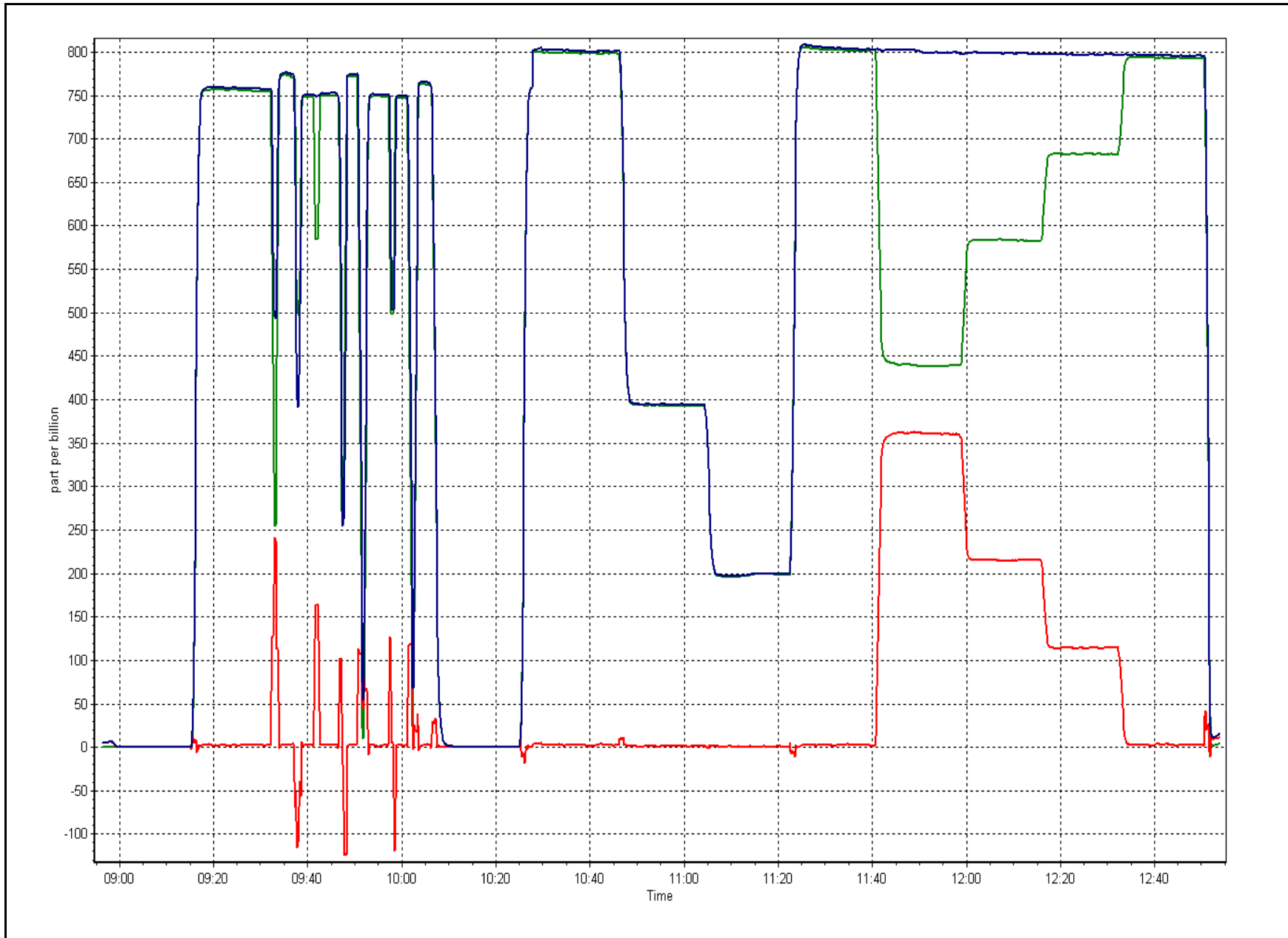
Calibration Date	December 13, 2016	Previous Calibration	November 10, 2016
Station Number	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:12	End Time (MST)	12:54
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999993
357.0	360.8	0.9893		
210.5	213.6	0.9853	Slope	0.989098
113.2	114.4	0.9891		
			Intercept	-0.205336

NO₂ Calibration Curve







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 13, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Other: Repair of valve		
Start Time (MST)	9:35	End Time (MST)	12:26
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL110515
NOx Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	September 8, 2018
Calibrator	Sabio 4010	Serial Number	11041107
Zero air Generator	Teledyne API T701	Serial Number	5613

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11038
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.003580	1.002798	0.989098
	Data Offset	1.386939	1.407968	-0.205336
Current Calibration	Data Slope	0.999105	0.998232	1.005421
	Data Offset	2.697226	2.969484	-0.765164

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661329
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.108		1.254	
NOx coefficient	1.001		1.000	
NO2 coefficient	1.000		1.000	
NO bkgnd	8.3		9.4	
NOx bkgnd	8.3		9.5	
Chamber Temp	50.2	Deg C	50.2	Deg C
Moly Temp	323.7	Deg C	323.7	Deg C
PMT voltage	-827.7	V	-827.7	V
PMT Temp	-3	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	219	mmHg	218.4	mmHg
R Cell Press Nox	219	mmHg	218.4	mmHg
NO sample flow	0.76	lpm	0.684	lpm
Nox sample Flow	0.770	lpm	0.684	lpm

Notes:

Placed new zero/span valve on, replaced line from sample into analyzer to NO on valve, Replaced Sample filter, as founds from yesterdays calibration, span adjusted, As lefts will be done by nightly zero and span



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 14, 2016 Station Number: AMS 13

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero										
as found span										
calibrator zero	5000	0.0	0.0	0.0	0.0	0.7	0.1	0.6	----	----
high point	5000	78.9	803.2	800.0	3.2	803.8	800.9	2.9	0.9993	0.9989
second point	5000	39.4	401.1	399.5	1.6	394.2	392.9	1.3	1.0175	1.0168
third point	5000	19.7	200.5	199.8	0.8	196.6	196.0	0.6	1.0201	1.0192
as left zero										
as left span										
Average Correction Factor									1.0123	1.0116

Corrected As found NO_x= NA NO= NA Percent Change NO_x= N/A NO= N/A
 Previous Response NO_x= NA NO= NA

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 78.90 ccm NOx ref calc conc = 803.2 ppb NO ref calc conc = 800.0 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		3.2	797.4	795.9	0.6	1.0073	1.0052	----	----
1st NO2 (300)	438.4	360.7	797.6	438.4	359.3	1.0070	----	1.0038	99.6%
2nd NO2 (200)	584.5	214.6	798.9	584.5	214.4	1.0054	----	1.0007	99.9%
3rd NO2 (100)	685.8	113.3	799.4	685.8	113.5	1.0048	----	0.9979	100.2%
2nd NO ref point		3.2	797.9	796.4	1.5	1.0066	1.0046	----	----
Average Correction Factor						1.0060		1.0008	99.9%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

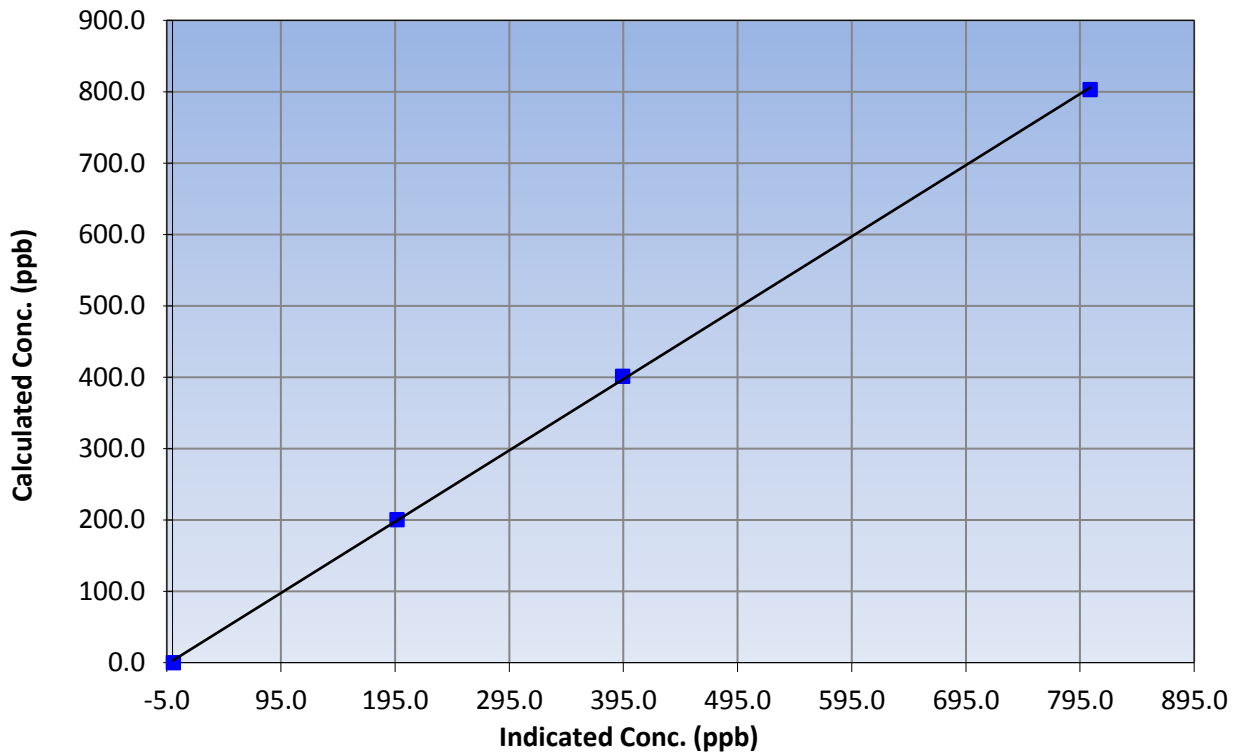
Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 13, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:35	End Time (MST)	12:26
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.7	----	Correlation Coefficient	0.999884
803.2	803.8	0.9993		
401.1	394.2	1.0175	Slope	0.999105
200.5	196.6	1.0201		
			Intercept	2.697226

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

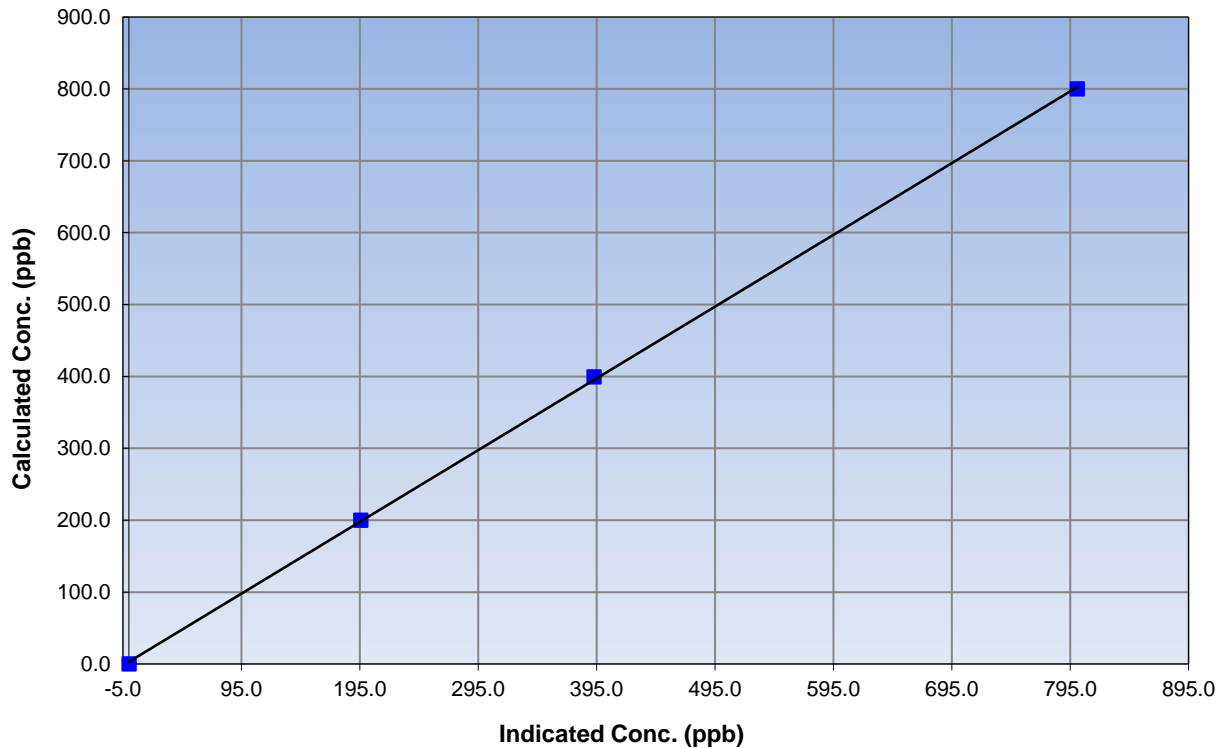
Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 13, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:35	End Time (MST)	12:26
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999899
800.0	800.9	0.9989		
399.5	392.9	1.0168	Slope	0.998232
199.8	196.0	1.0192		
			Intercept	2.969484

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

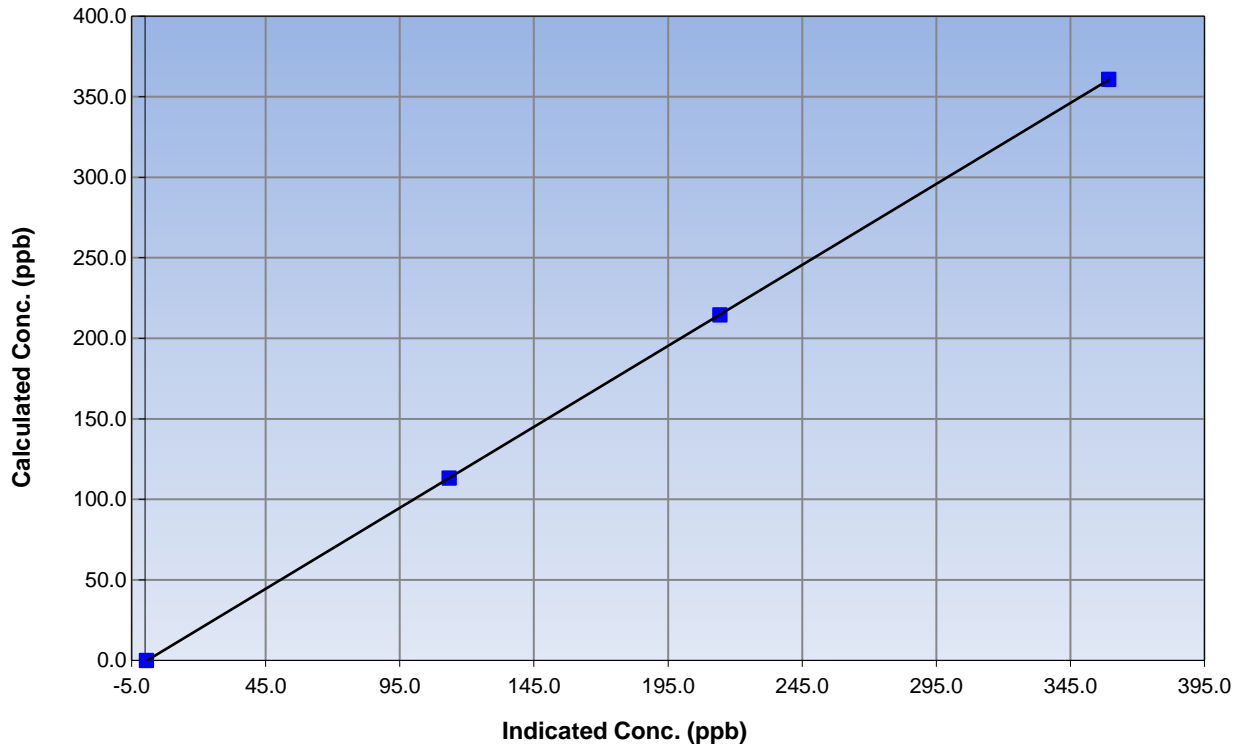
Station Information

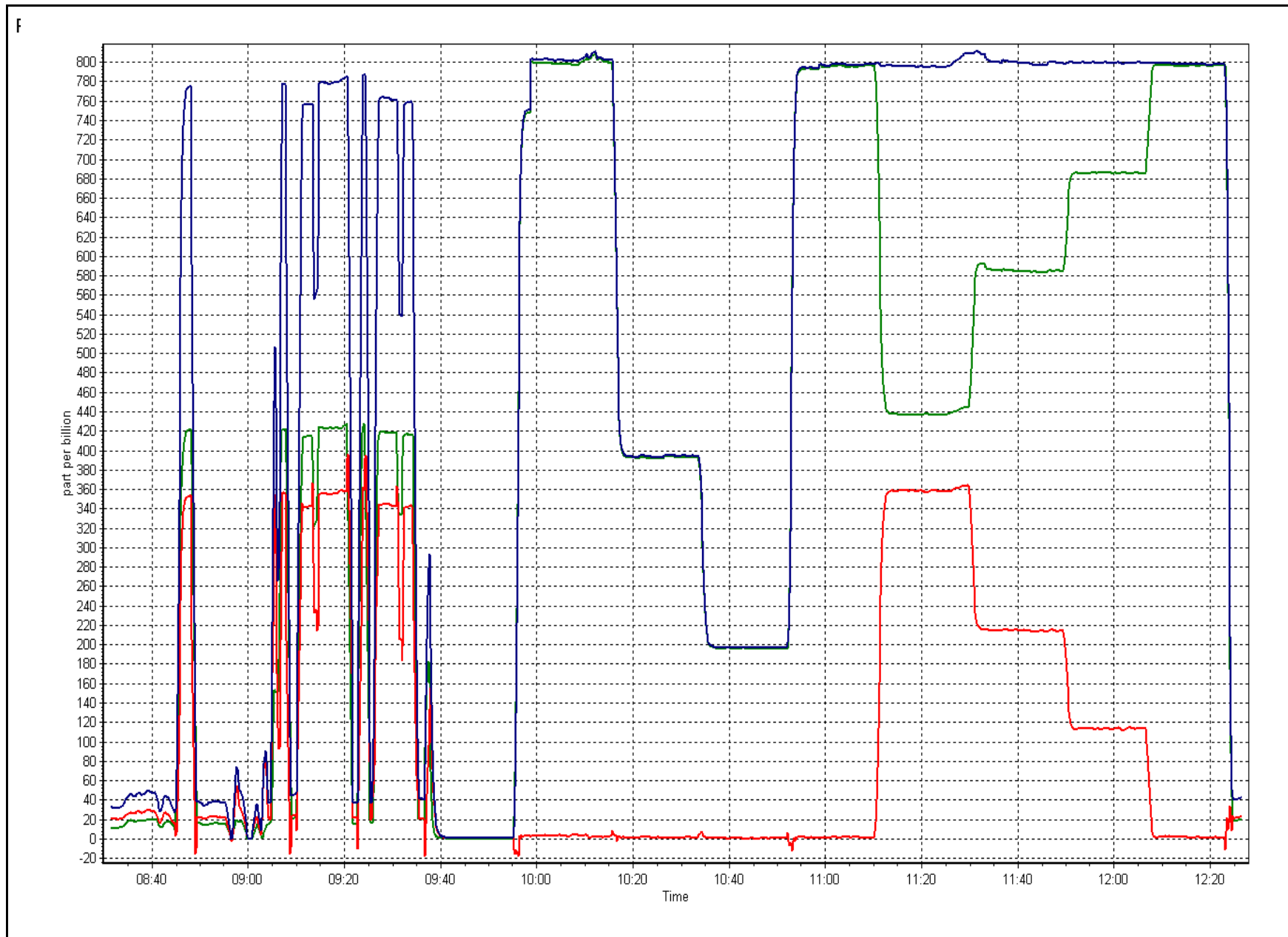
Calibration Date	December 14, 2016	Previous Calibration	December 13, 2016
Station Number	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:35	End Time (MST)	12:26
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	N/A	Correlation Coefficient	0.999998
360.7	359.3	1.0038		
214.6	214.4	1.0007	Slope	1.005421
113.3	113.5	0.9979		
			Intercept	-0.765164

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Fort McKay South	Station number:	AMS 13
Calibration Date:	December 14, 2016	Last Cal Date:	November 18, 2016
Start time (MST):	10:15	End time (MST):	11:12
Sharp Model:	5030	S/N:	E-803
Particulate Fraction:	PM2.5	C14 Source S/N:	4066
Flow Standard Model:	Delta Cal	S/N:	1450
Temp/RH standard:	Delta Cal	S/N:	1450

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-21	-22	-21	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	985	986	985	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1020	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	1.5	-----	0.2	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input checked="" type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check:	<u>November 18, 2016</u>	Last Cal Date:	<u>October 27, 2016</u>	Tolerance
	Flow w/o adaptor:	<u>16.7</u>	Flow w/ adaptor:	<u>16.66</u>	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: <u>1337</u>	S/N: <u>NA</u>
	Date of check: <u>June 9, 2016</u>	Last Cal Date: <u>July 14, 2016</u>
	New Correction Factor: <u>7150</u>	Previous Correction Factor: <u>7079</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)				<input type="checkbox"/>	+/- 2 °C
T3 (°C)				<input type="checkbox"/>	+/- 2 °C
T4 (°C)				<input type="checkbox"/>	+/- 2 °C
RH (%)				<input type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned, Nephelometer and flow adjusted

Calibration by: Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 14
ANZAC
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	646	32	98	91.13	9	0	2	0
TRS(ppb) Average	709	35	35	100.00	1	0	1	0
THC(ppm) Average	664	32	80	93.55	3.2	-	2.4	-
NMHC(ppm) Average	664	32	80	93.55	0.274	-	0.068	-
CH4(ppm) Average	664	32	80	93.55	2.9	-	2.4	-
NO2(ppb) Average	704	37	40	99.60	25	0	11	-
NO(ppb) Average	704	37	40	99.60	28	-	4	-
NOX(ppb) Average	704	37	40	99.60	42	-	15	-
O3(ppb) Average	650	32	94	91.67	42	0	40	-
PM2.5(ug/m3) Average	743	1	1	100.00	49.9	-	24	0
AT 2m(C) Average	744	0	0	100.00	3.2	-	0	-
RH(%) Average	744	0	0	100.00	95	-	89	-
Leaf Wetness (% of range) Average	744	0	0	100.00	36	-	5	-
WS(km/h) Average	733	0	11	98.52	23	-	18	-
WD(deg) Average	733	0	11	98.52	-	-	-	-
PC(mm) Total	744	0	0	100.00	0.5	-	2.8	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	646	0.6	1	-	0	0	0	0	0	2	9
TRS(ppb) Average	709	0.3	0	-	0	0	0	0	0	0	1
THC(ppm) Average	664	2.03	0.1	-	1.9	2	2	2	2.1	2.2	3.2
NMHC (ppm) Average	664	0.006	0.028	-	0	0	0	0	0	0	0.274
CH4(ppm) Average	664	2.03	0.1	-	1.9	2	2	2	2.1	2.1	2.9
NO2(ppb) Average	704	4.3	5	-	0	1	1	3	6	10	25
NO(ppb) Average	704	0.8	2	-	0	0	0	0	1	2	28
NOX(ppb) Average	704	5.1	6	-	0	1	1	3	7	11	42
O3(ppb) Average	650	27.2	8	-	3	16	22	28	34	37	42
PM2.5(ug/m3) Average	743	5.11	6.5	-	0.6	1.5	2	3	4.8	10.7	49.9
Temperature 2 m (C) Average	744	-16.01	9.1	-	-36.8	-27.5	-22.2	-16.8	-9.3	-3.1	3.2
Relative Humidity (%) Average	744	78.6	7	-	54	71	75	79	83	87	95
Leaf Wetness (% of range) Average	744	1.8	2	-	0	0	1	2	2	3	36
Wind Speed 20 m (km/h) Average	733	9.2	5	-	0	3	6	9	13	16	23
Wind Direction 20 m (deg) Average	733	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	744	-	-	6.1	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	17 Dec 2016 01:00	19 Dec 2016 17:00	65	Unstable Operation - unstable shelter temperature
SO2	31 Dec 2016 09:00	31 Dec 2016 09:00	1	Maintenance - reinitiated daily QA check
CH4, NMHC, THC	01 Dec 2016 12:00	03 Dec 2016 10:00	47	Maintenance - in shop repairs
CH4, NMHC, THC	31 Dec 2016 09:00	31 Dec 2016 09:00	1	Maintenance - reinitiated daily QA check
NO2, NO, NOX	14 Dec 2016 13:00	14 Dec 2016 14:00	2	Maintenance - confirmed calibration points for Ozone
NO2, NO, NOX	31 Dec 2016 09:00	31 Dec 2016 09:00	1	Maintenance - reinitiated daily QA check
O3	17 Dec 2016 02:00	19 Dec 2016 14:00	61	Unstable Operation - unstable shelter temperature
O3	31 Dec 2016 10:00	31 Dec 2016 10:00	1	Maintenance - reinitiated daily QA check
Wind Speed, Wind Direction	08 Dec 2016 19:00	08 Dec 2016 19:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	08 Dec 2016 21:00	08 Dec 2016 21:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	08 Dec 2016 23:00	08 Dec 2016 23:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	09 Dec 2016 08:00	09 Dec 2016 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	10 Dec 2016 08:00	10 Dec 2016 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	10 Dec 2016 10:00	10 Dec 2016 13:00	4	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	17 Dec 2016 00:00	17 Dec 2016 00:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	18 Dec 2016 12:00	18 Dec 2016 12:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

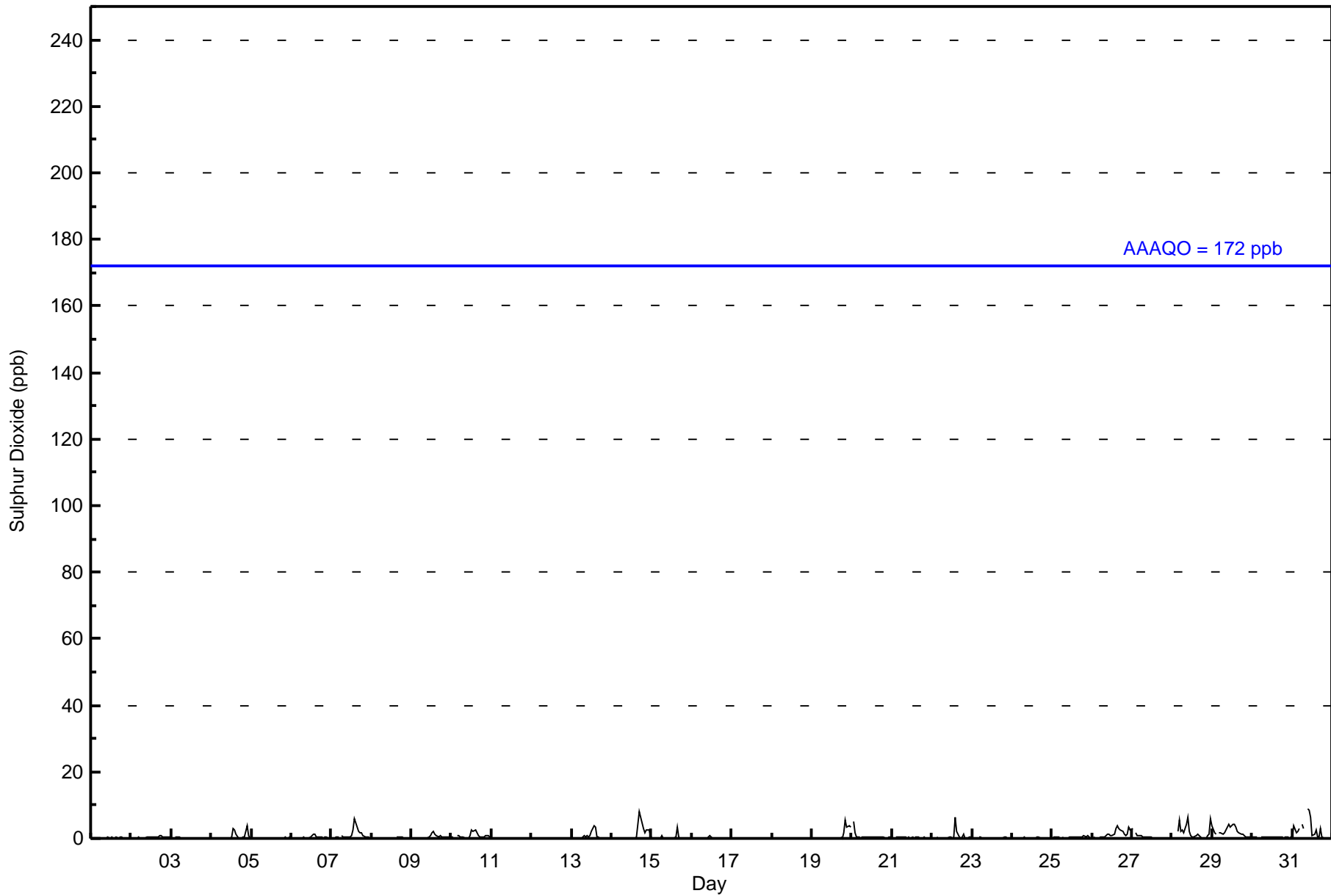
Anzac - December 2016

Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service: 744																																													
Maximum Value: 9 ppb on Dec 31 10:00		Maximum Daily Average: 2.3 ppb on Dec 31		Hours of Data: 646																																													
Minimum Value: 0 ppb on Dec 3 18:00		Minimum Daily Average: 0.0 ppb on Dec 12		Hours of Missing Data: 98																																													
Maximum Diurnal Average: 1.3 ppb at hour 15		Minimum Diurnal Average: 0.3 ppb at hour 6		Hours of Calibration: 32																																													
Monthly Average: 0.6 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 6		Percent Operational Time: 91.1																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0.3	1																							
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	4	1	0	0.6	4																							
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1																							
7-Dec	0	0	0	0	0	Z	1	0	0	0	0	1	3	6	3	2	2	2	2	1	0	0	0	0	1.0	6																							
8-Dec	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	1	0	0	0	0	0	0	0	0	0	0.2	1																							
9-Dec	0	Z	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	1	1	1	0	0	0	0	0.5	2																							
10-Dec	0	0	Z	1	1	1	0	0	0	0	1	2	2	2	2	1	0	1	0	1	1	1	0	0	0.8	2																							
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
13-Dec	0	0	0	0	0	Z	0	1	0	1	0	1	2	4	3	0	0	0	0	0	0	0	0	0	0.6	4																							
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	6	5	3	2	2	2	1	1.4	8																							
15-Dec	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0.3	4																							
16-Dec	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
17-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--																							
18-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--																							
19-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	6																							
20-Dec	Z	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5																							
21-Dec	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	7	2	0	0	0	1	1	0	0	0	0	0.6	7																							
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0.4	1																							
26-Dec	Z	0	0	0	0	0	0	0	1	1	1	1	1	3	4	3	2	2	1	1	1	1	4	3	1.4	4																							
27-Dec	3	Z	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3																							
28-Dec	0	0	Z	2	6	2	2	2	4	6	2	1	0	0	1	1	1	0	0	0	0	1	1	6	1.7	6																							
29-Dec	4	2	1	Z	2	2	1	2	3	4	4	3	4	4	3	2	2	1	1	1	1	0	0	0	2.1	4																							
30-Dec	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
31-Dec	1	4	2	2	3	Z	4	3	M	9	8	6	1	1	3	0	0	3	0	0	0	0	0	0	2.3	9																							
																								0.5	0.6	0.4	0.4	0.6	0.3	0.5	0.4	0.4	0.9	0.7	0.7	0.6	0.9	1.3	0.9	0.8	0.7	0.5	0.5	0.5	0.5	0.6	0.6	0.6	Diurnal Average
																								4	5	2	2	6	2	4	3	4	9	8	6	4	4	7	4	8	6	5	3	6	4	4	6	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																																																	



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	646	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 646

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	20	0	2	3	4	12	36	76	48	25	15	13	47	87	163	85	636
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	20	0	2	3	4	12	36	76	48	25	15	13	47	87	163	85	636

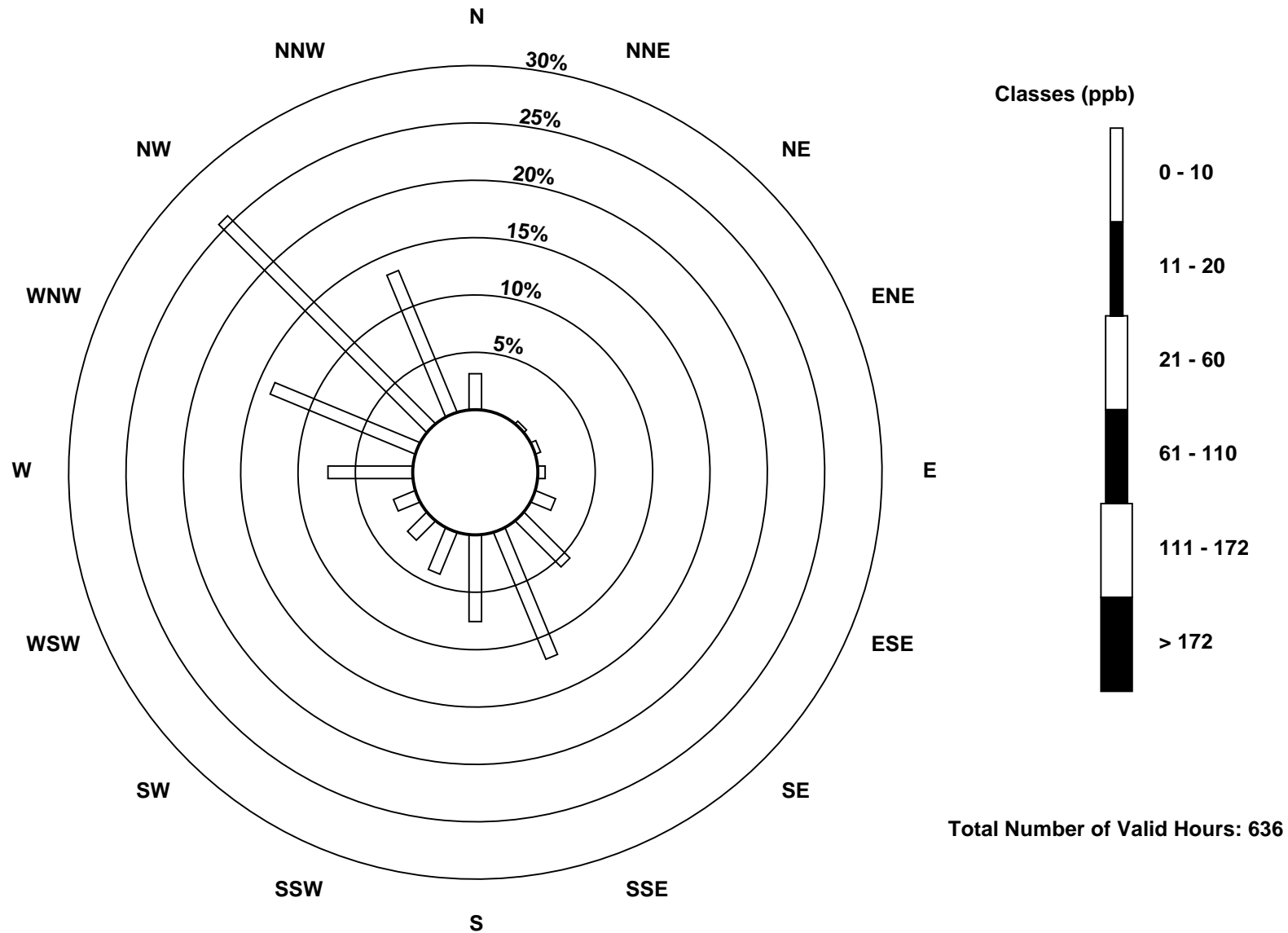
Total Number of Valid Hours: 636

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

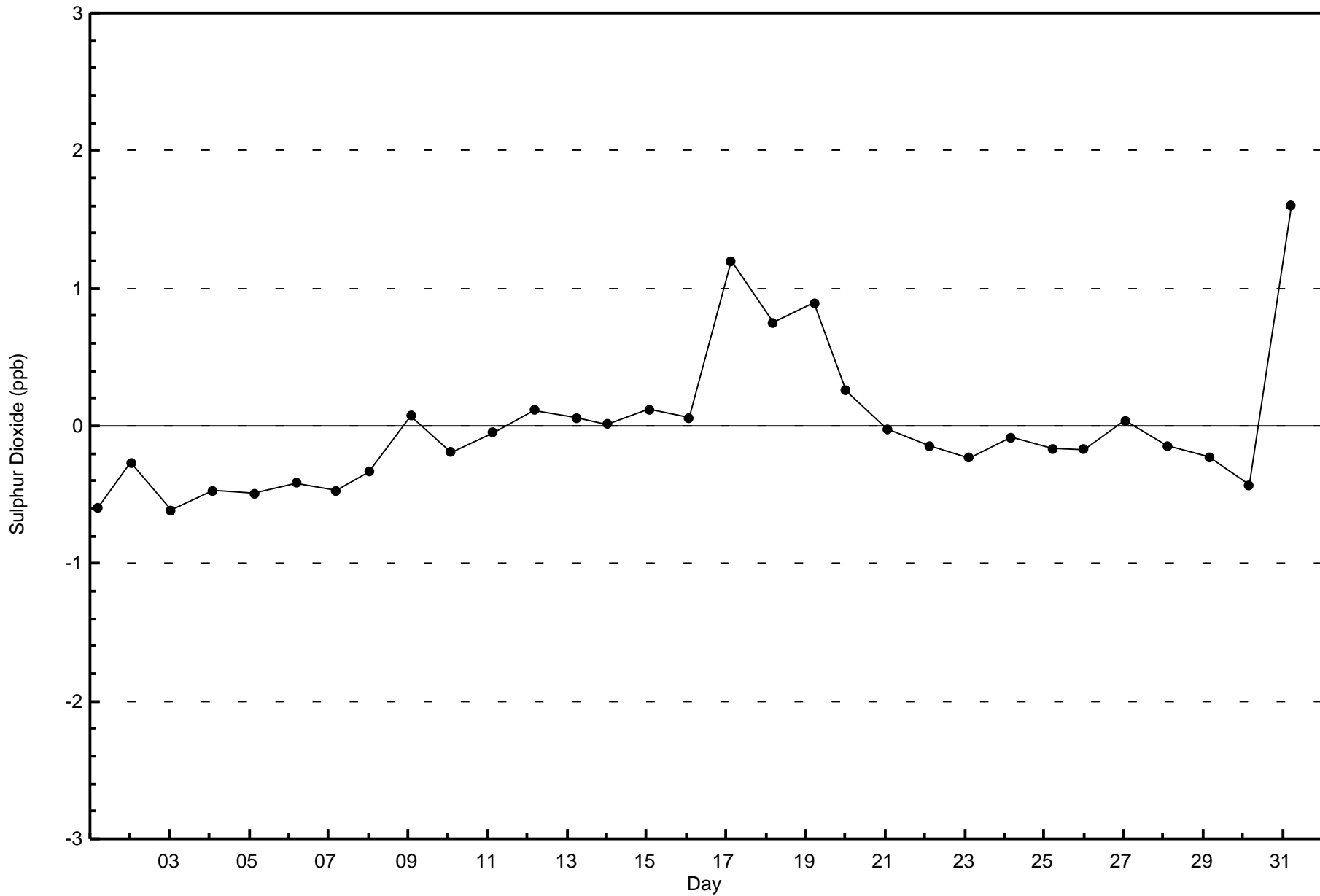
Sulphur Dioxide (SO₂) - ppb
Anzac (AMS 14)





WBEA Data PC
Zero Responses

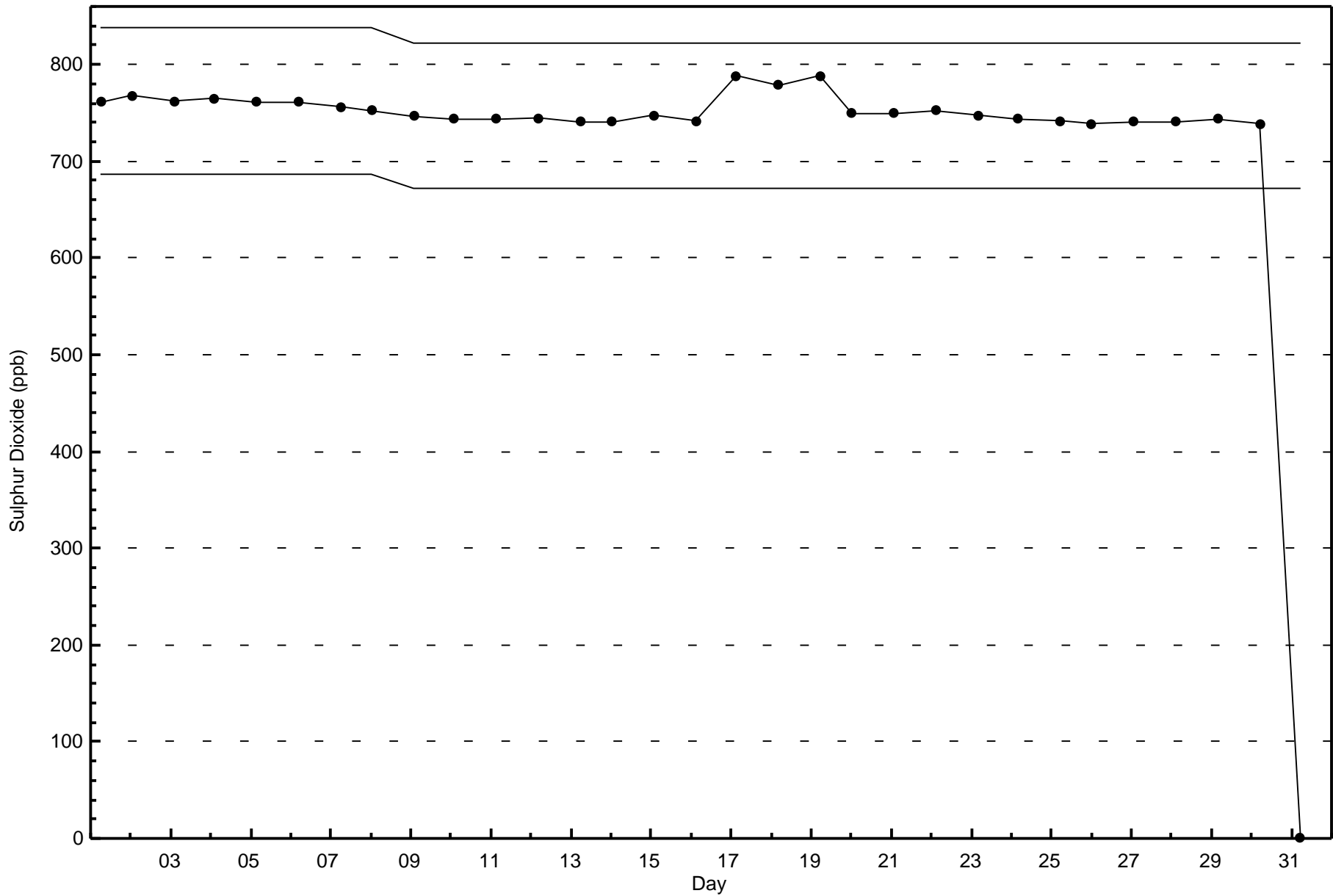
Sulphur Dioxide (SO₂) - ppb
Anzac - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Anzac - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

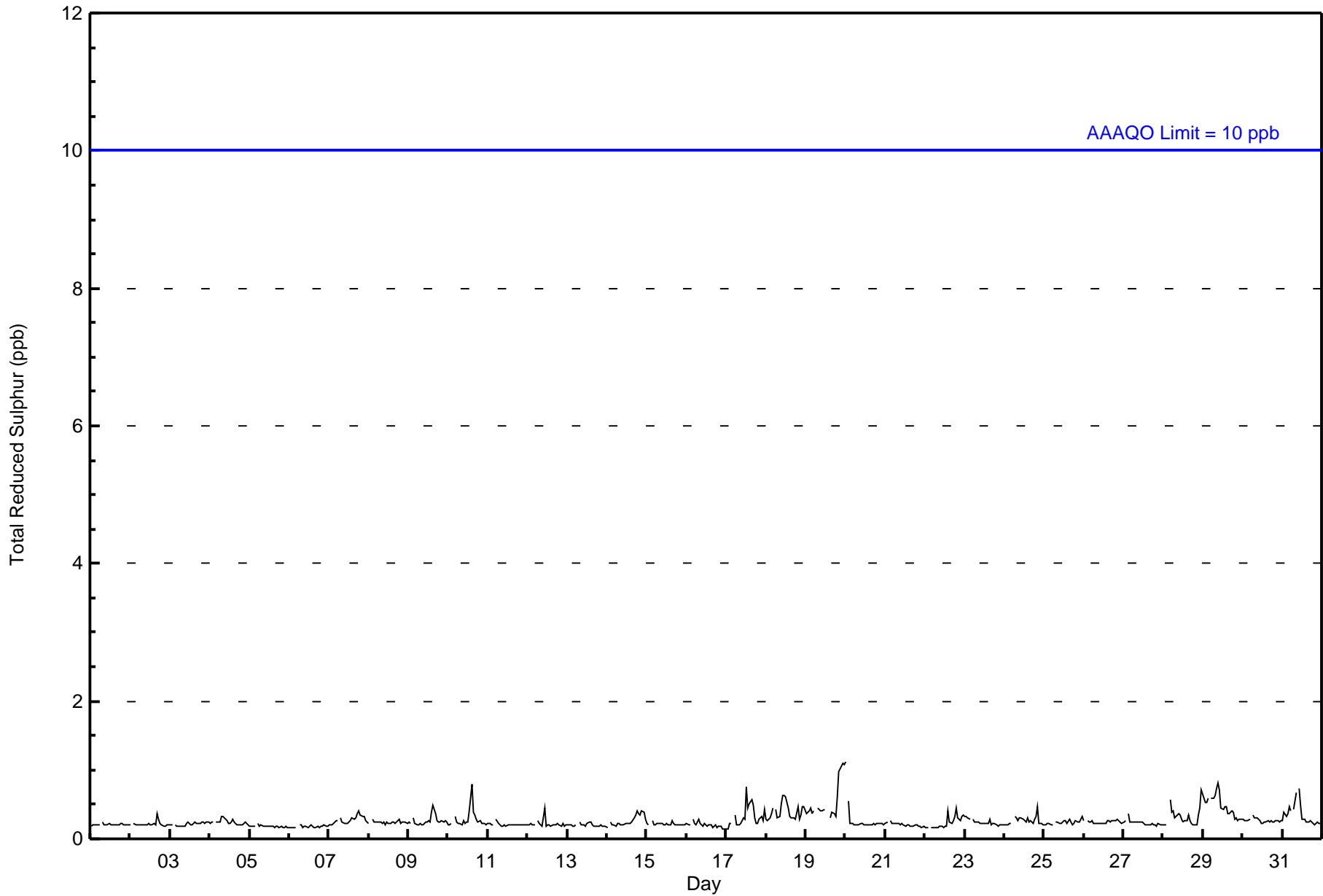
Anzac - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744										Daily Average		Daily Maximum					
Maximum Value: 1 ppb on Dec 20 01:00										Maximum Daily Average: 0.5 ppb on Dec 19										Hours of Data: 709							
Minimum Value: 0 ppb on Dec 16 23:00										Minimum Daily Average: 0.2 ppb on Dec 6										Hours of Missing Data: 35							
Maximum Diurnal Average: 0.3 ppb at hour 11										Minimum Diurnal Average: 0.2 ppb at hour 2										Hours of Calibration: 34							
Monthly Average: 0.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 99.9							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	C	C	C	0	0	0	0	1	1	1	1	1	1	0.5	1
20-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
29-Dec	1	1	1	1	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	Z	0	1	M	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
0.3 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.2 0.2 0.3 0.3 0.3 0.3 0.3																								Diurnal Average			
1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 0 0 0 1 1 1 1 1 1																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																											



WBEA Data PC
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	22	1	4	6	5	16	55	90	52	25	20	14	48	87	165	88	698
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	1	4	6	5	16	55	90	52	25	20	14	48	87	165	88	698

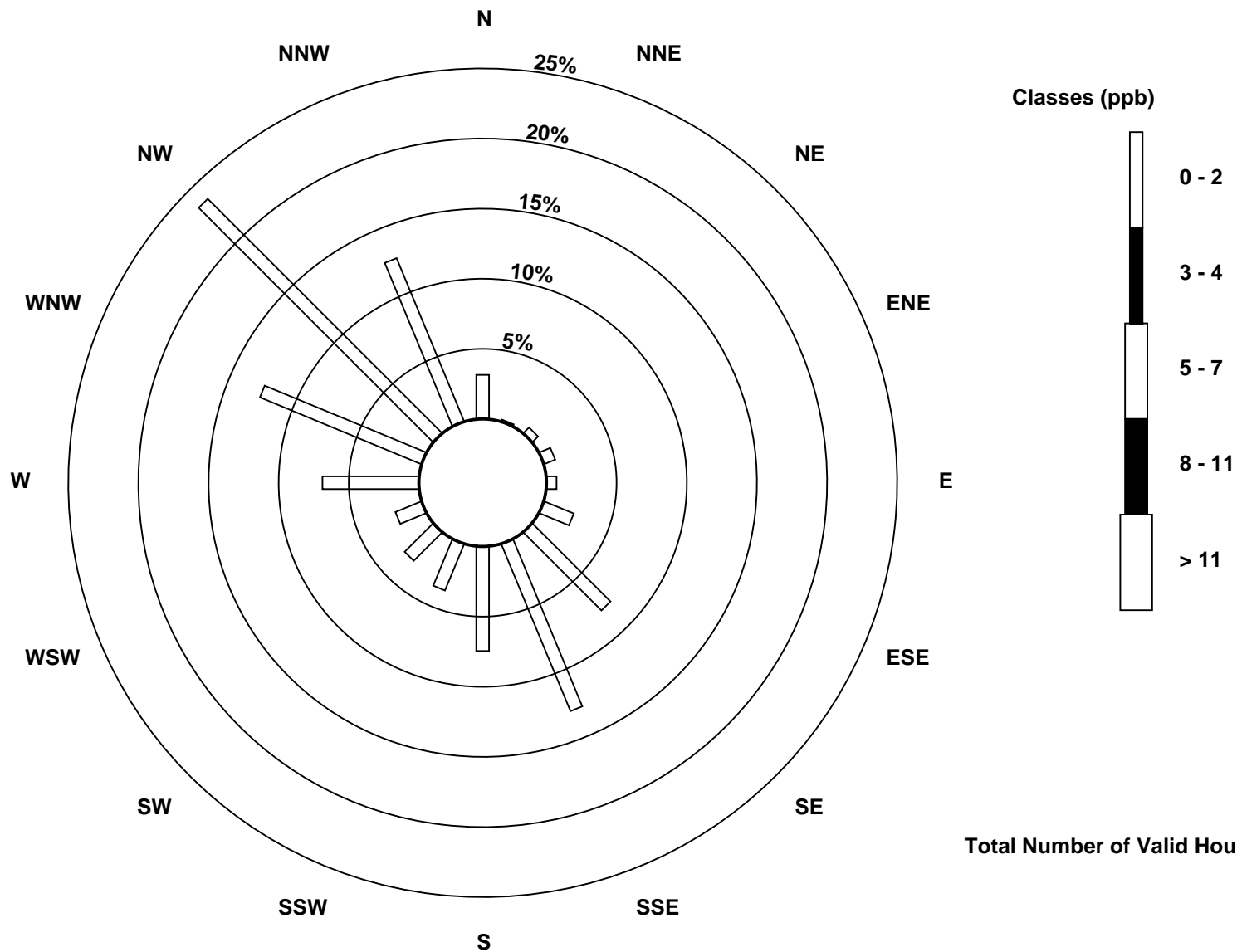
Total Number of Valid Hours: 698

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

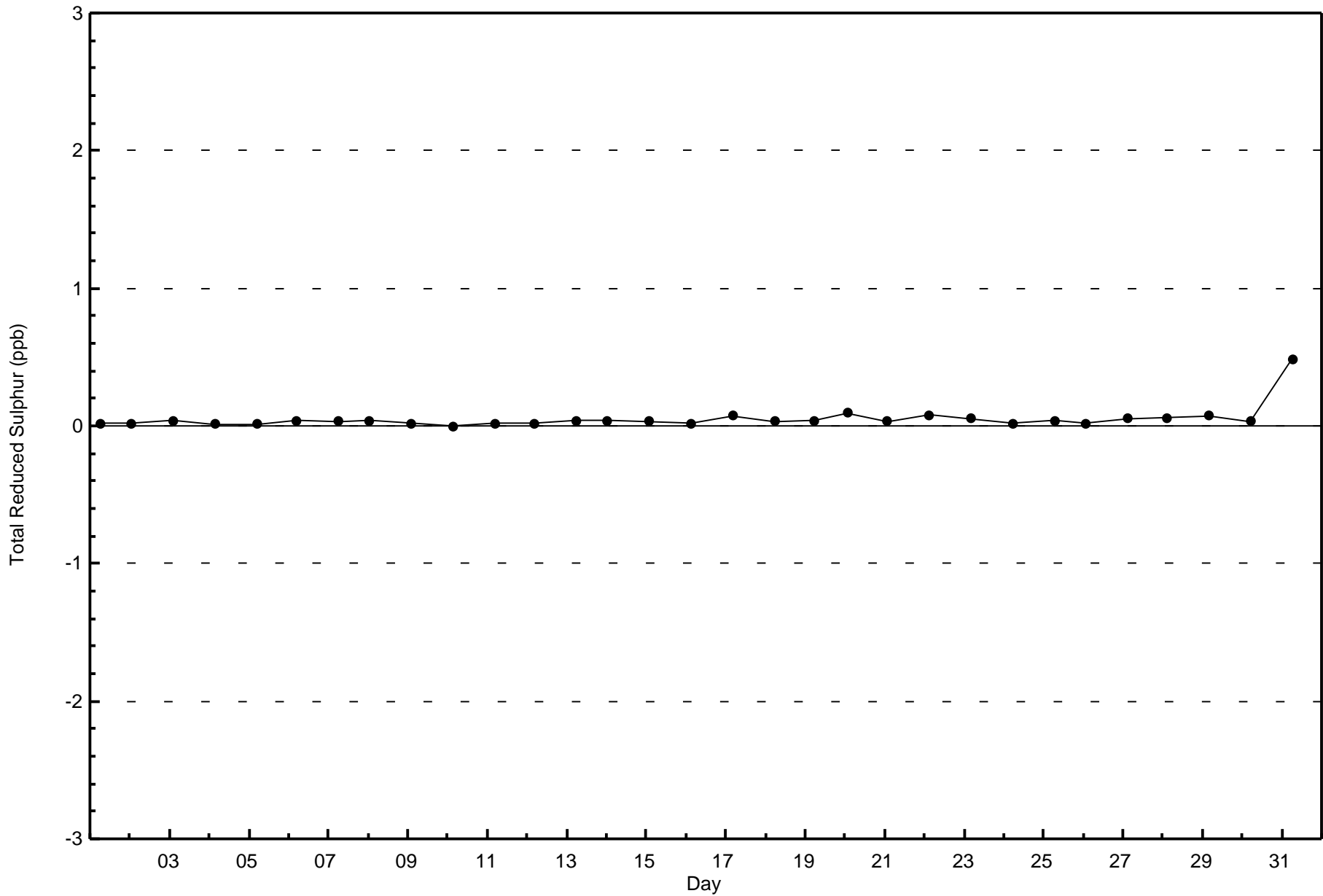
Total Reduced Sulphur (TRS) - ppb
Anzac (AMS 14)

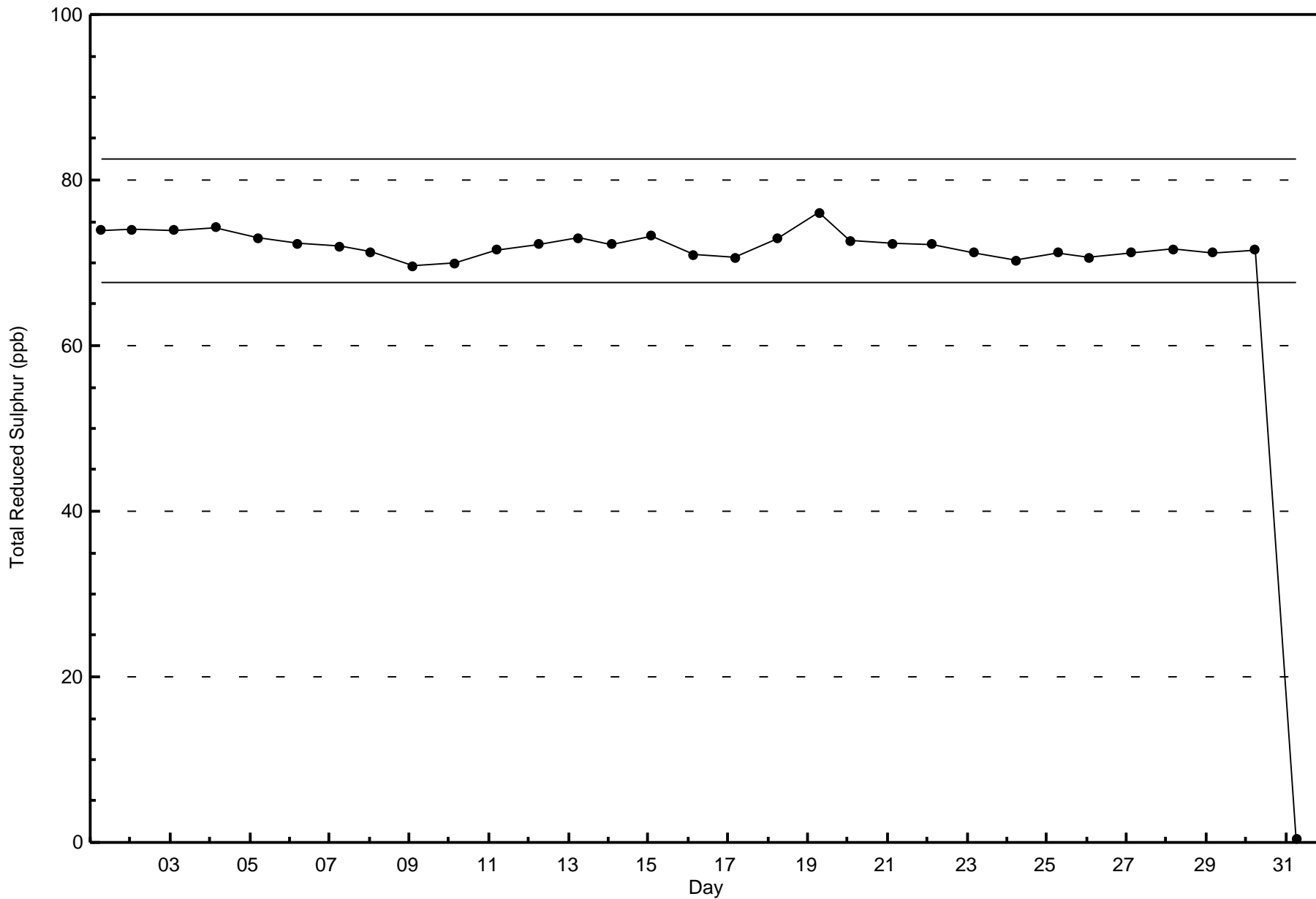




WBEA Data PC
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Anzac - December 2016





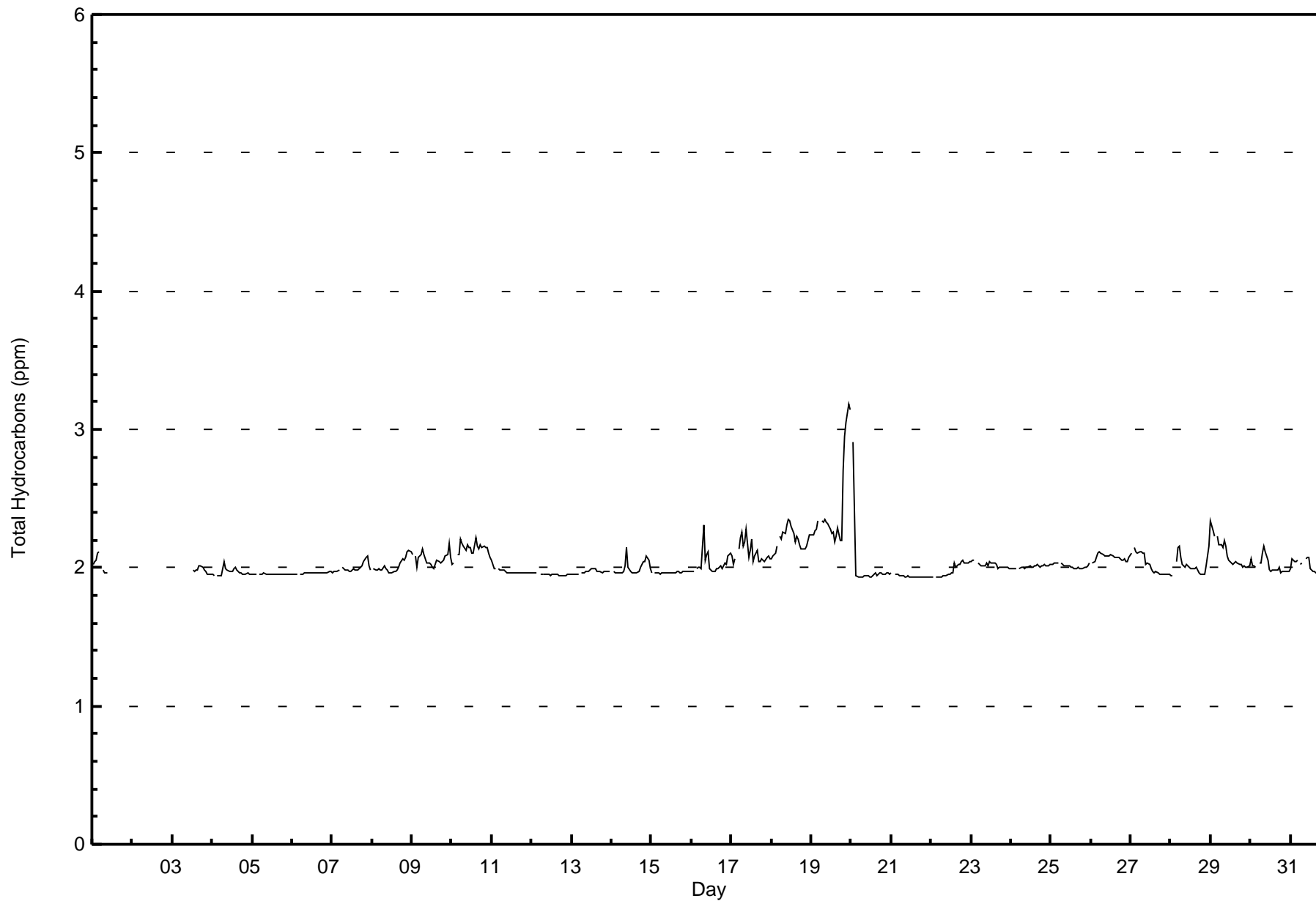


Maximum Value: 3.2 ppm on Dec 19 23:00		Maximum Daily Average: 2.4 ppm on Dec 19		Hours in Service: 744																							
Minimum Value: 1.9 ppm on Dec 21 14:00		Minimum Daily Average: 1.9 ppm on Dec 21		Hours of Data: 664																							
Maximum Diurnal Average: 2.1 ppm at hour 23		Minimum Diurnal Average: 2.0 ppm at hour 14		Hours of Missing Data: 80																							
Monthly Average: 2.03 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.1 P ₉₀ = 2.2 P ₉₉ = 2.4		Hours of Calibration: 32																							
				Percent Operational Time: 93.6																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2.0	2.0	2.1	2.1	2.1	Z	2.0	2.0	2.0	2.0	C	M	M	M	M	M	M	M	M	M	M	M	M	M	--	2.1	
2-Dec	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	--	
3-Dec	M	M	M	M	M	M	M	M	M	M	C	C	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	--	2.0	
4-Dec	1.9	1.9	Z	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
5-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
6-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
7-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.1
8-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
9-Dec	2.1	Z	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2
10-Dec	2.0	2.0	Z	2.1	2.1	2.2	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2
11-Dec	2.1	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
12-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0
13-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
14-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.2
15-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
16-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.3	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.3
17-Dec	2.1	2.0	2.1	Z	2.1	2.2	2.3	2.2	2.2	2.3	2.1	2.1	2.2	2.0	2.1	2.1	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.3
18-Dec	2.1	2.1	2.1	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3
19-Dec	2.2	2.2	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.2	2.2	2.7	3.0	3.0	3.2	3.1	2.4	3.2	
20-Dec	Z	2.9	2.4	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.9	
21-Dec	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
22-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	
23-Dec	2.0	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
26-Dec	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.1	
27-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
28-Dec	1.9	1.9	Z	2.0	2.1	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.0	2.2	
29-Dec	2.3	2.3	2.2	Z	2.2	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3
30-Dec	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2
31-Dec	2.0	2.1	2.0	2.0	2.1	Z	2.0	2.0	M	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.1	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	489	73.64	73.64
2.1 - 3.0	173	26.05	99.70
3.1 - 10.0	2	0.30	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	19	0	1	2	2	10	29	40	14	5	9	11	41	77	156	73	489
2.1 - 3.0	3	2	3	4	4	6	25	30	17	16	9	4	5	10	10	14	162
3.1 - 10.0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	2	4	6	6	17	55	70	31	21	18	15	46	87	166	87	653

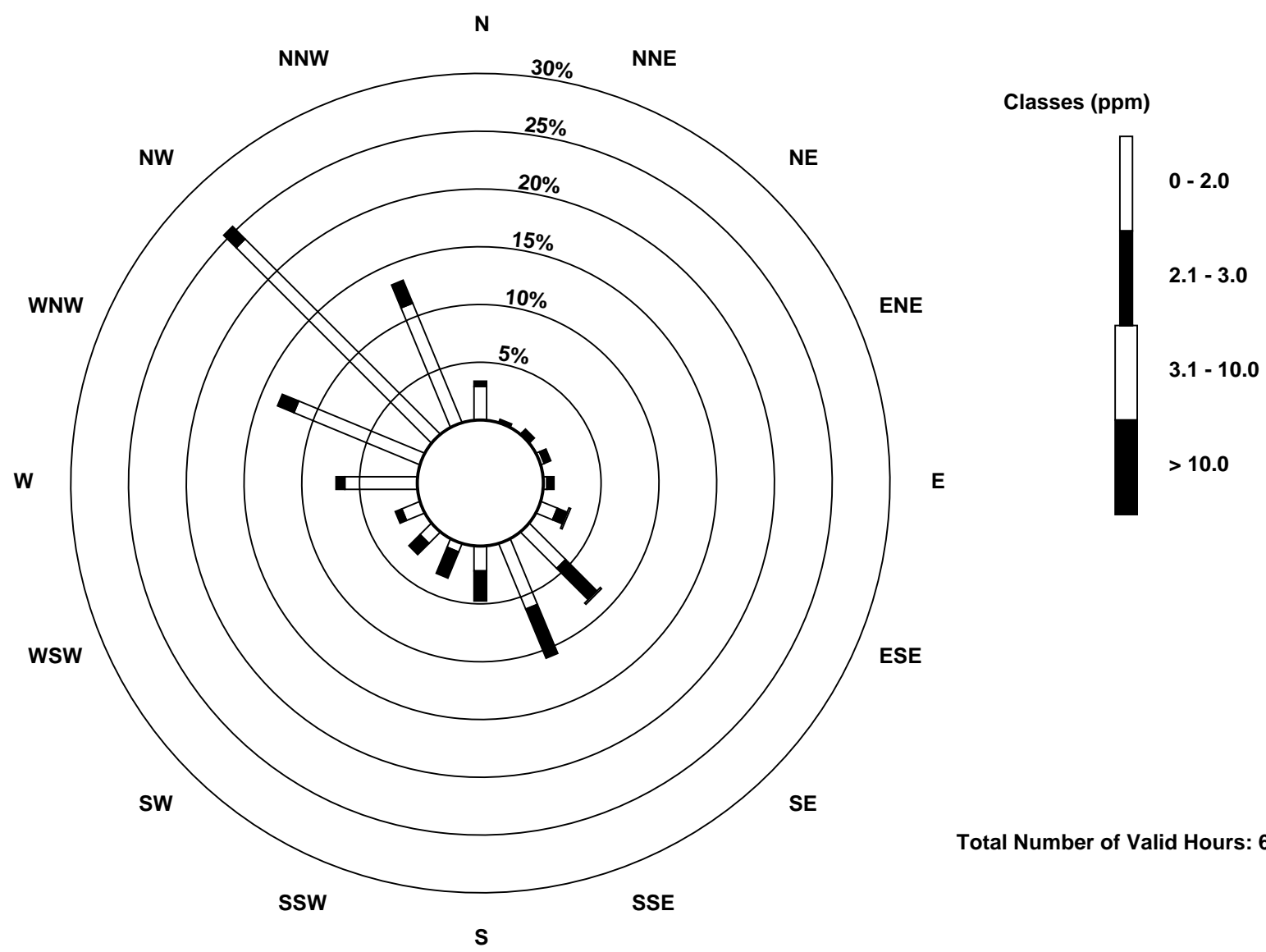
Total Number of Valid Hours: 653

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

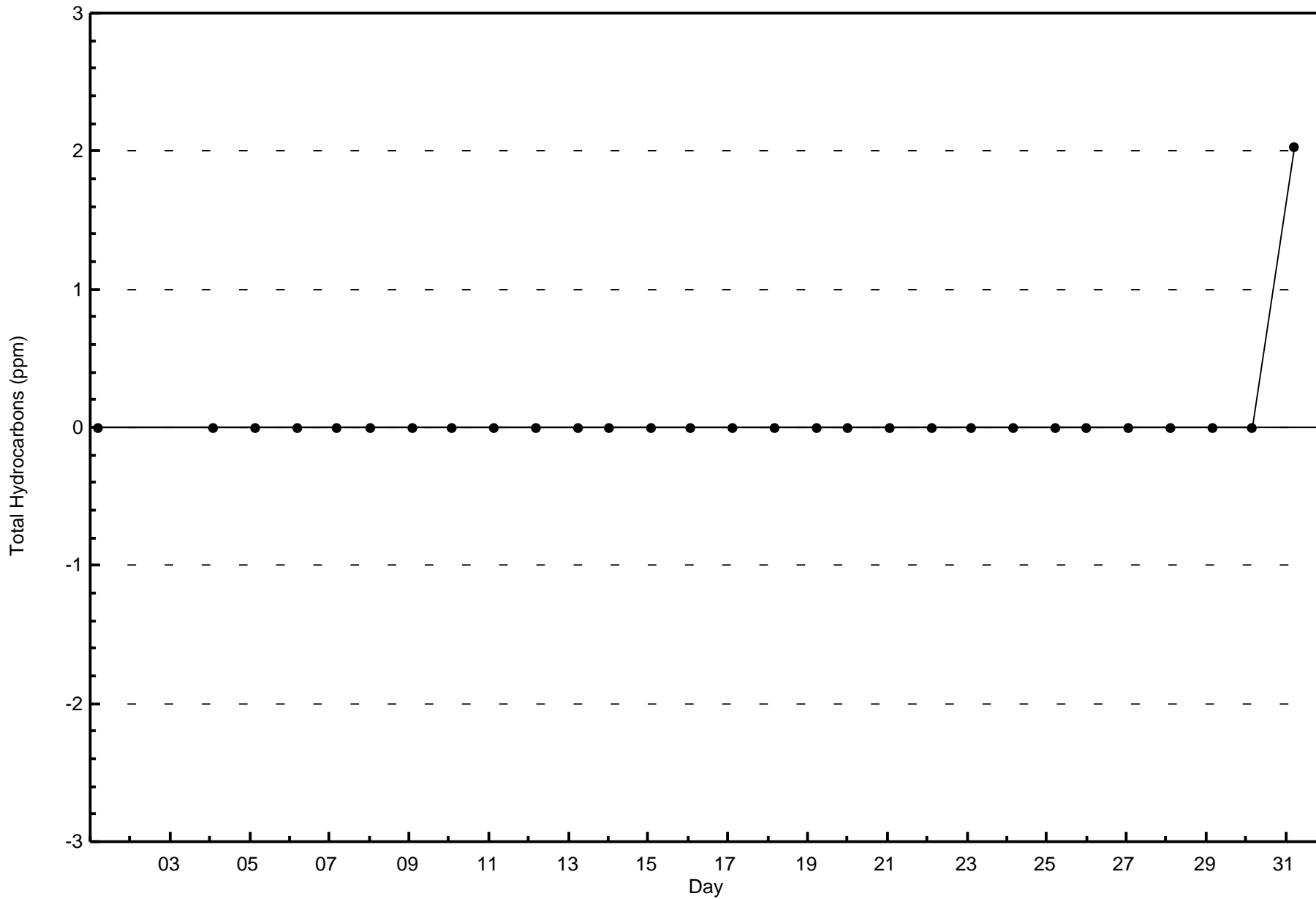
Total Hydrocarbons (THC) - ppm
Anzac (AMS 14)





WBEA Data PC
Zero Responses

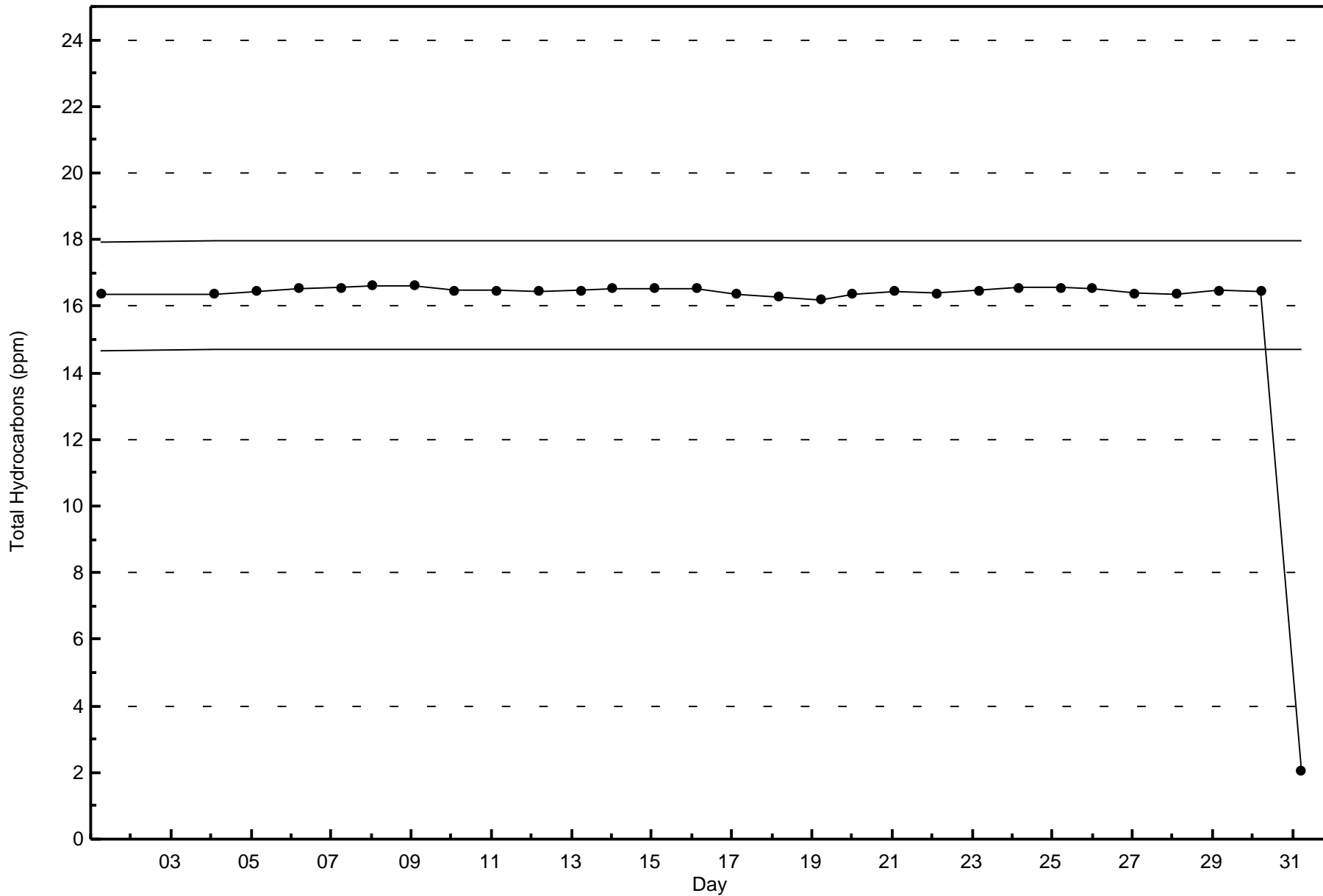
Total Hydrocarbons (THC) - ppm
Anzac - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Anzac - December 2016





Summary of Hour Averages

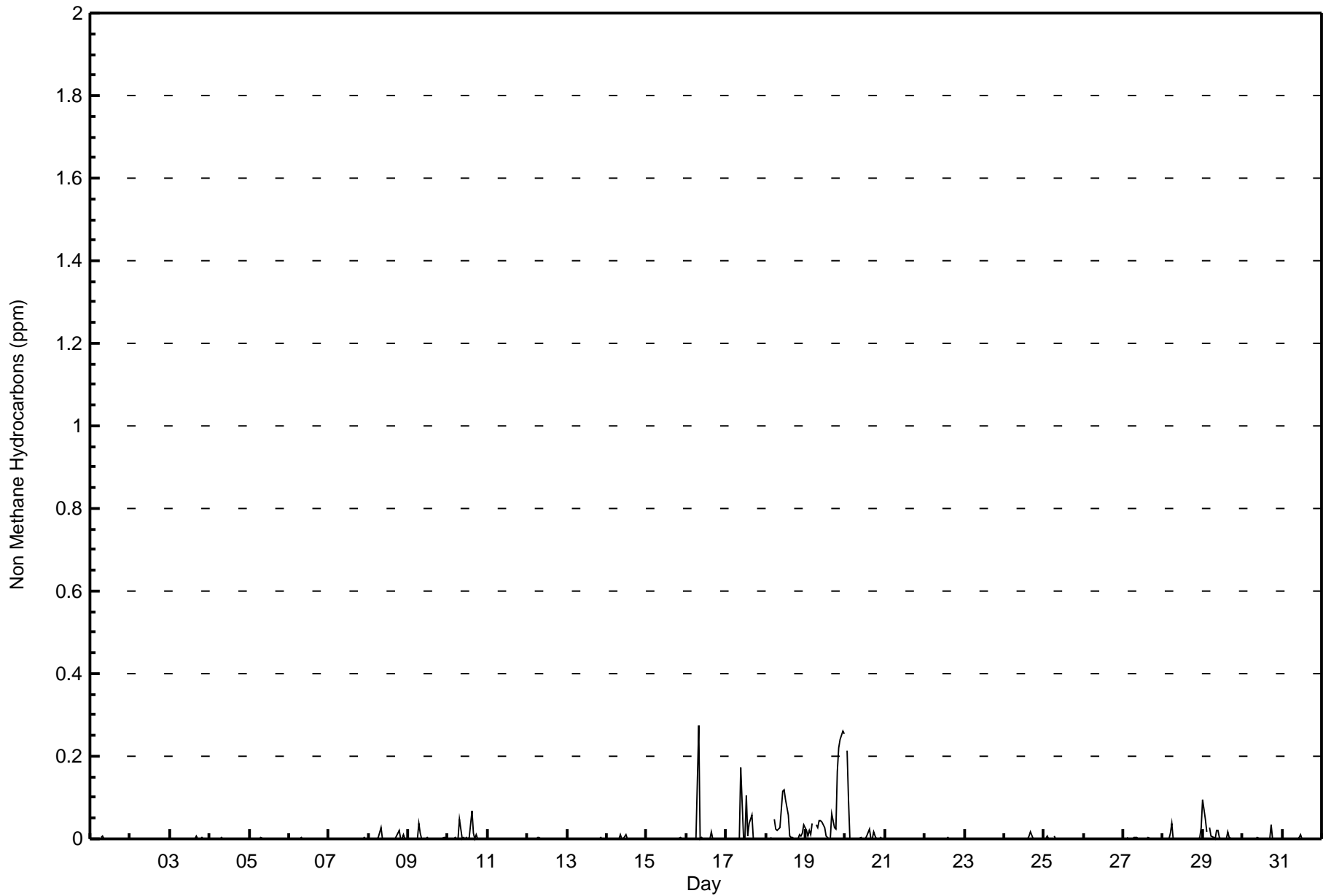
Anzac - December 2016

Maximum Value: 0.274 ppm on Dec 16 08:00		Maximum Daily Average: 0.068 ppm on Dec 19		Hours in Service:	744																					
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 21		Hours of Data:	664																					
Maximum Diurnal Average: 0.015 ppm at hour 8		Minimum Diurnal Average: 0.001 ppm at hour 4		Hours of Missing Data:	80																					
Monthly Average: 0.006 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.2		Hours of Calibration:	32																					
				Percent Operational Time:	93.6																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.002	0.006	0.000	0.000	C	M	M	M	M	M	M	M	M	M	M	M	M	M	--	0.006
2-Dec	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	--
3-Dec	M	M	M	M	M	M	M	M	M	M	C	C	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.002	0.000	0.000	0.000	0.000	--	0.005
4-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.005
8-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.004	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.019	0.000	0.000	0.010	0.000	0.000	0.003	0.029
9-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.037	0.013	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.005	0.002	0.000	0.003	0.037
10-Dec	0.000	0.001	Z	0.000	0.003	0.000	0.000	0.046	0.000	0.003	0.000	0.002	0.000	0.003	0.069	0.015	0.002	0.010	0.000	0.001	0.000	0.000	0.000	0.000	0.007	0.069
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.002	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.004
14-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010
15-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.274	0.000	0.003	0.000	0.000	0.000	0.000	0.017	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.013	0.274
17-Dec	0.000	0.001	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.171	0.003	0.003	0.104	0.006	0.036	0.057	0.001	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.017	0.171
18-Dec	0.001	0.000	0.000	0.002	Z	0.049	0.025	0.021	0.028	0.072	0.114	0.119	0.096	0.058	0.007	0.003	0.005	0.000	0.000	0.000	0.011	0.006	0.015	0.034	0.029	0.119
19-Dec	0.019	0.006	0.019	0.010	0.037	Z	0.035	0.026	0.043	0.045	0.041	0.027	0.008	0.004	0.000	0.001	0.060	0.029	0.023	0.164	0.222	0.241	0.262	0.256	0.068	0.262
20-Dec	Z	0.214	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.005	0.024	0.000	0.000	0.017	0.007	0.000	0.000	0.002	0.000	0.000	0.016	0.214
21-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
23-Dec	0.000	0.000	0.000	Z	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.015	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.015
25-Dec	0.000	0.000	0.006	0.000	0.000	Z	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.007
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27-Dec	0.000	Z	0.002	0.000	0.001	0.000	0.002	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.005
28-Dec	0.000	0.000	Z	0.000	0.014	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.028	0.004	0.038
29-Dec	0.095	0.049	0.016	Z	0.028	0.007	0.004	0.001	0.022	0.022	0.003	0.000	0.000	0.000	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.095
30-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.033
31-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	M	0.000	0.005	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



WBEA Data PC
Hourly Averages

Non Methane Hydrocarbons (NMHC) - ppm
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Non Methane Hydrocarbons (NMHC) - ppm
Anzac - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	588	88.55	88.55
0.006 - 0.05	57	8.58	97.14
0.06 - 0.1	11	1.66	98.80
> 0.1	8	1.20	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Non Methane Hydrocarbons (NMHC) - ppm
Anzac - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	20	2	2	4	4	10	33	64	27	20	16	14	43	80	163	79	581
0.006 - 0.05	0	0	0	1	2	4	20	6	1	1	1	1	2	6	2	7	54
0.06 - 0.1	0	0	1	1	0	2	1	0	2	0	0	0	1	0	1	1	10
> 0.1	2	0	1	0	0	1	1	0	1	0	1	0	0	1	0	0	8
Totals	22	2	4	6	6	17	55	70	31	21	18	15	46	87	166	87	653

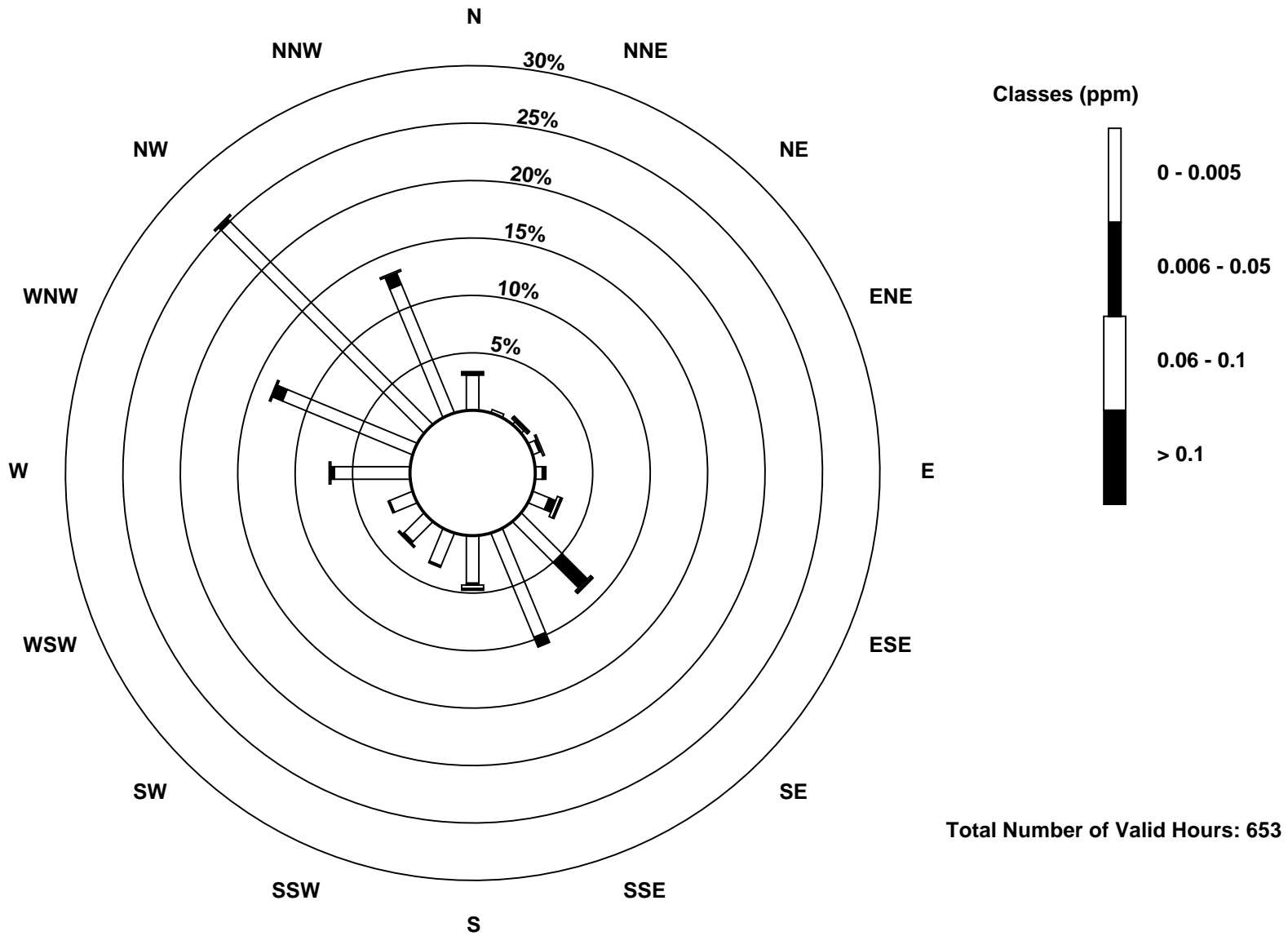
Total Number of Valid Hours: 653

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

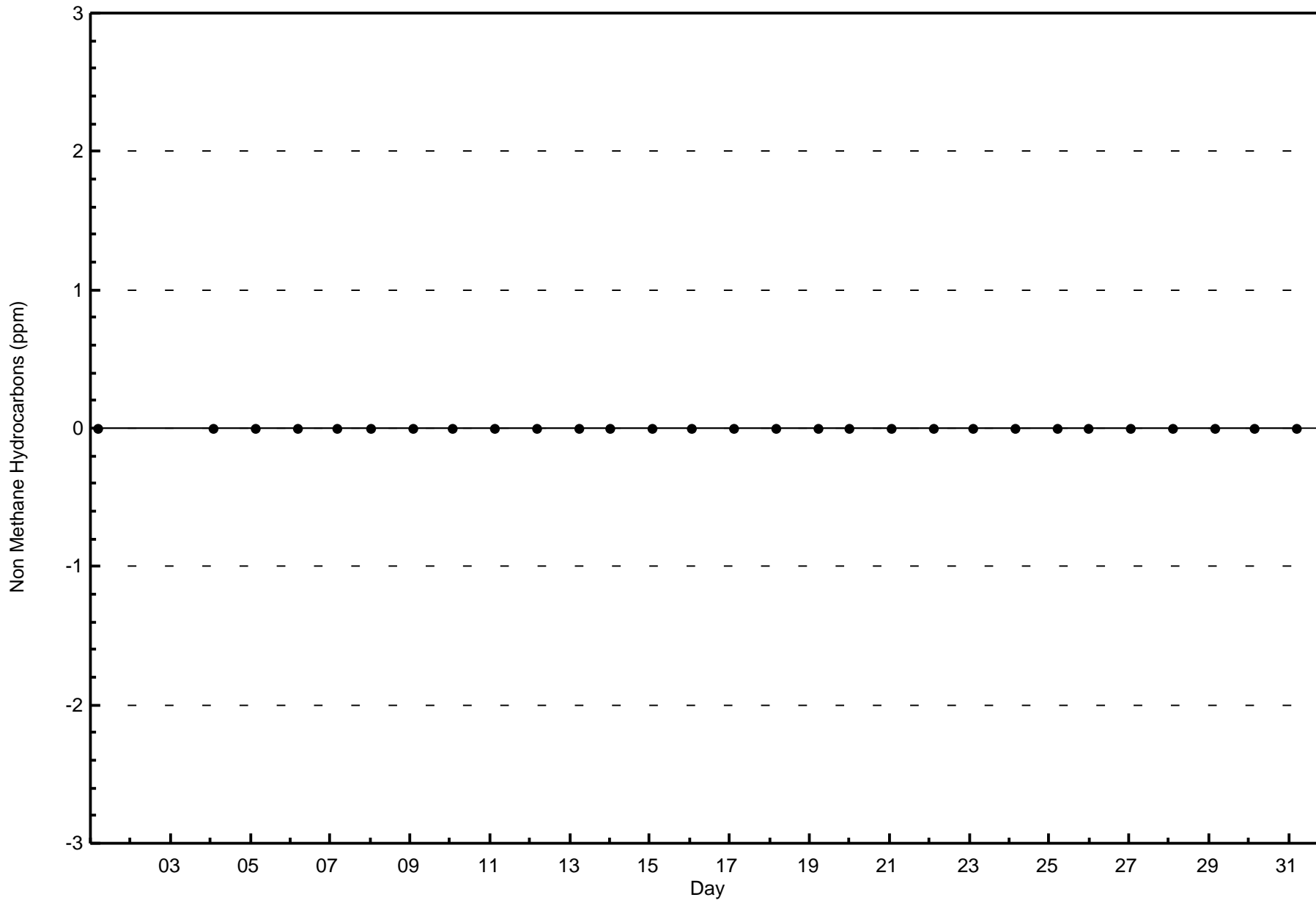
Non Methane Hydrocarbons (NMHC) - ppm
Anzac (AMS 14)

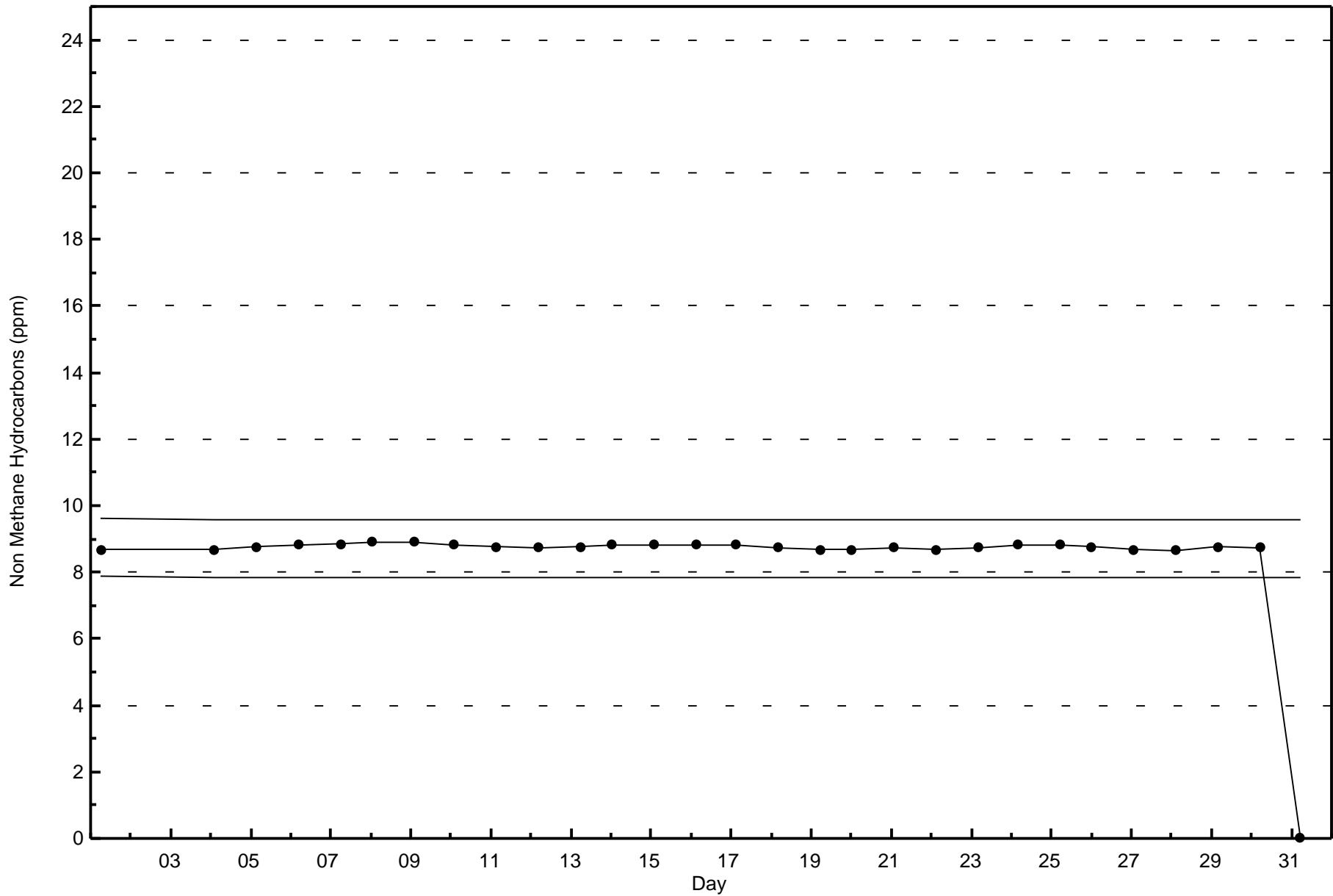




WBEA Data PC
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm
Anzac - December 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

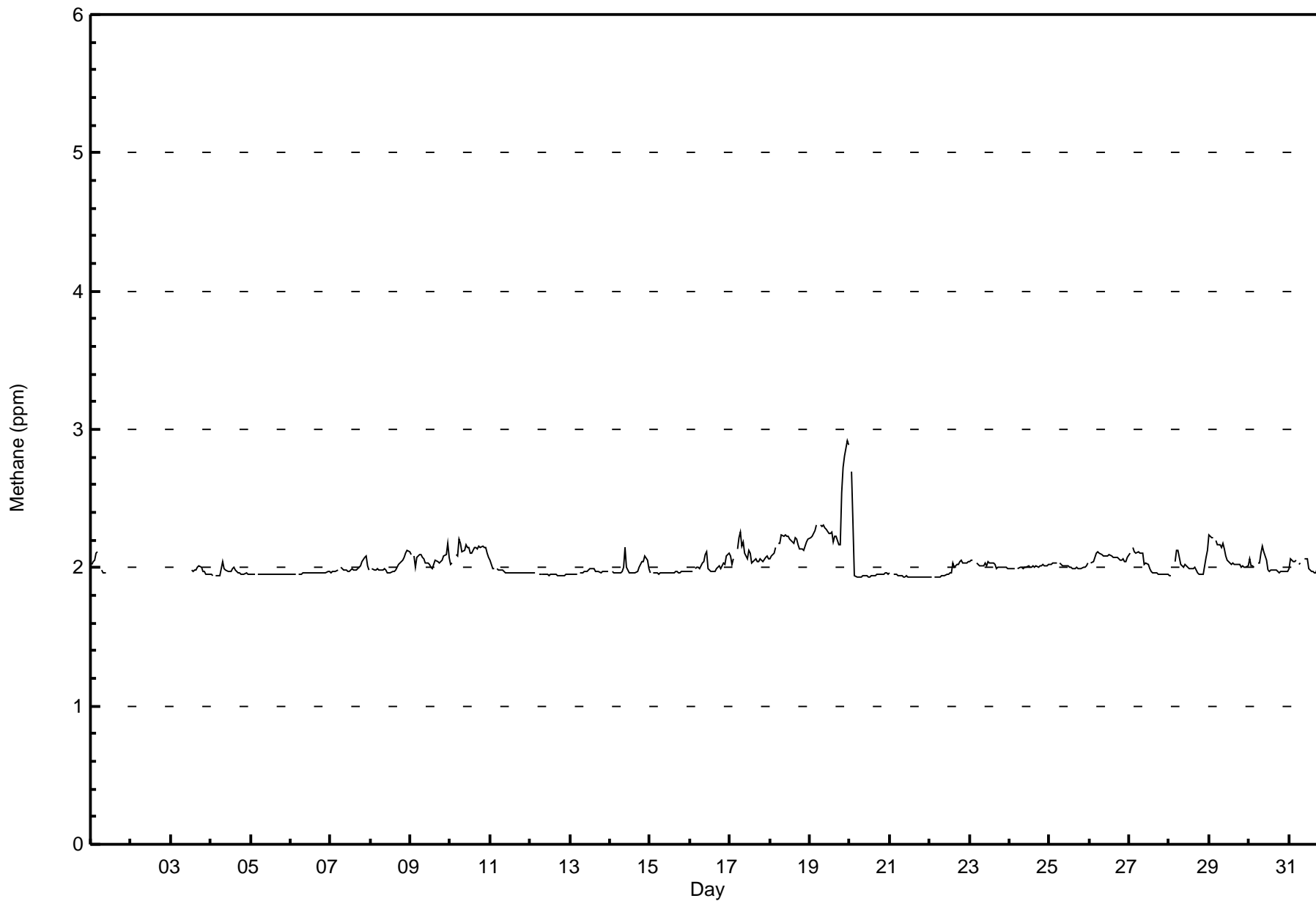
Anzac - December 2016

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																	Daily Average		Daily Maximum				
Maximum Value: 2.9 ppm on Dec 19 23:00		Maximum Daily Average: 2.4 ppm on Dec 19																	Hours of Data: 664		Hours of Missing Data: 80						
Minimum Value: 1.9 ppm on Dec 21 14:00		Minimum Daily Average: 1.9 ppm on Dec 21																	Hours of Calibration: 32		Percent Operational Time: 93.6						
Maximum Diurnal Average: 2.0 ppm at hour 23		Minimum Diurnal Average: 2.0 ppm at hour 14																									
Monthly Average: 2.03 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.1 P ₉₀ = 2.1 P ₉₉ = 2.3																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2.0	2.0	2.1	2.1	2.1	Z	2.0	2.0	2.0	2.0	C	M	M	M	M	M	M	M	M	M	M	M	M	M	--	2.1	
2-Dec	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	--	
3-Dec	M	M	M	M	M	M	M	M	M	M	C	C	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	--	2.0		
4-Dec	1.9	1.9	Z	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
5-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
6-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
7-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.1	
8-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.1	
9-Dec	2.1	Z	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.1	2.1	2.2		
10-Dec	2.0	2.0	Z	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.2		
11-Dec	2.1	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1		
12-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	
13-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
14-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.1	
15-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
16-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1		
17-Dec	2.1	2.0	2.1	Z	2.1	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.1	2.3		
18-Dec	2.1	2.1	2.1	2.1	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	
19-Dec	2.2	2.2	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.5	2.7	2.8	2.9	2.9	2.4	2.9	
20-Dec	Z	2.7	2.3	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.7		
21-Dec	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0		
22-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	
23-Dec	2.0	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1		
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
26-Dec	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.1	
27-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1		
28-Dec	1.9	1.9	Z	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1		
29-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2		
30-Dec	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2		
31-Dec	2.0	2.1	2.0	2.0	2.1	Z	2.0	2.0	M	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.1		
																								Diurnal Average		Diurnal Maximum	
																								2.0		2.9	
																								2.2		2.9	
Z - zerspan																								C - Calibration		M - Maintenance	



WBEA Data PC
Hourly Averages

Methane (CH₄) - ppm
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Anzac - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	492	74.10	74.10
2.1 - 3.0	172	25.90	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Methane (CH₄) - ppm
Anzac - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	19	0	1	2	2	10	30	40	14	5	9	11	41	78	156	73	491
2.1 - 3.0	3	2	3	4	4	7	25	30	17	16	9	4	5	9	10	14	162
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	2	4	6	6	17	55	70	31	21	18	15	46	87	166	87	653

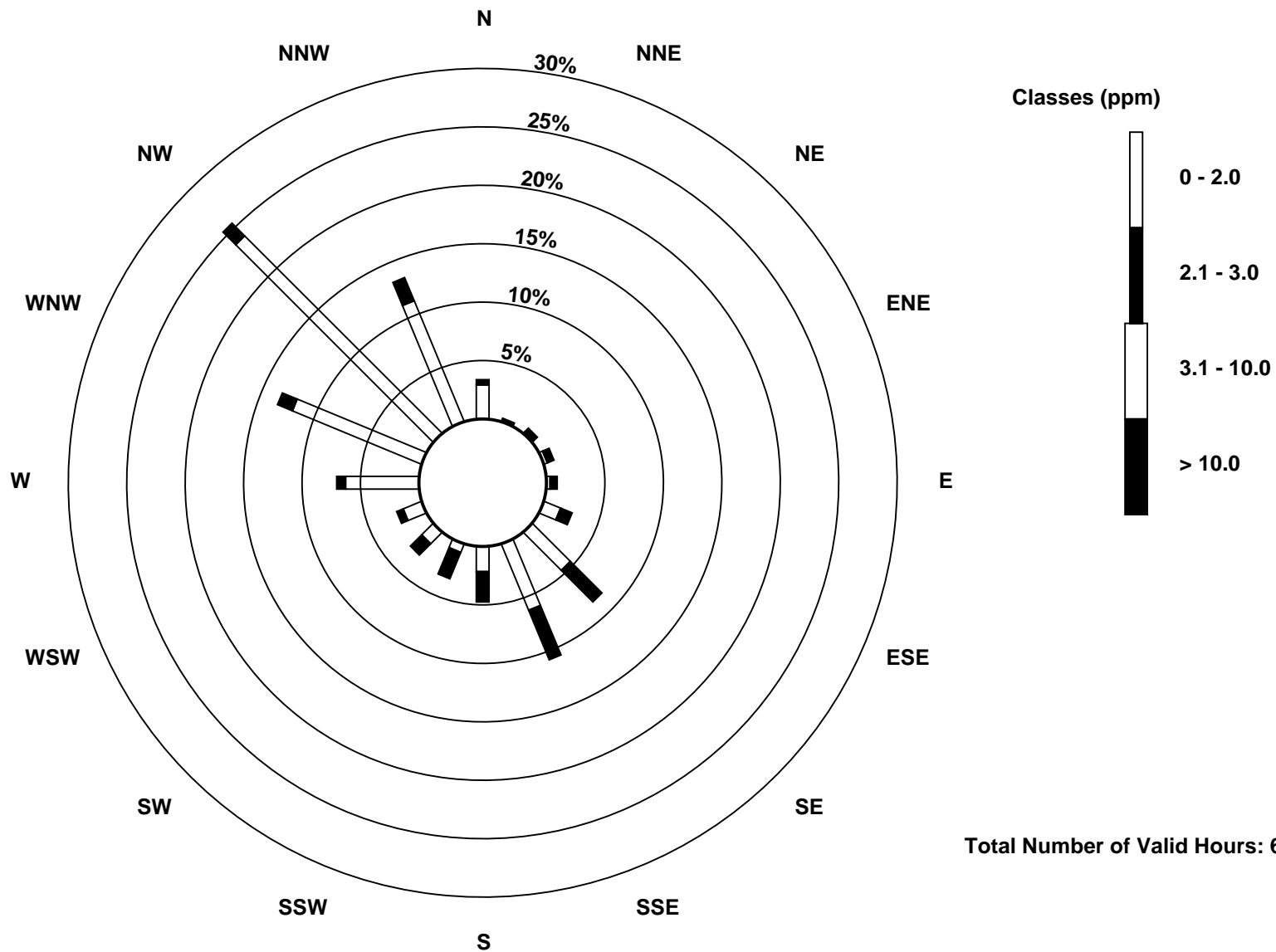
Total Number of Valid Hours: 653

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

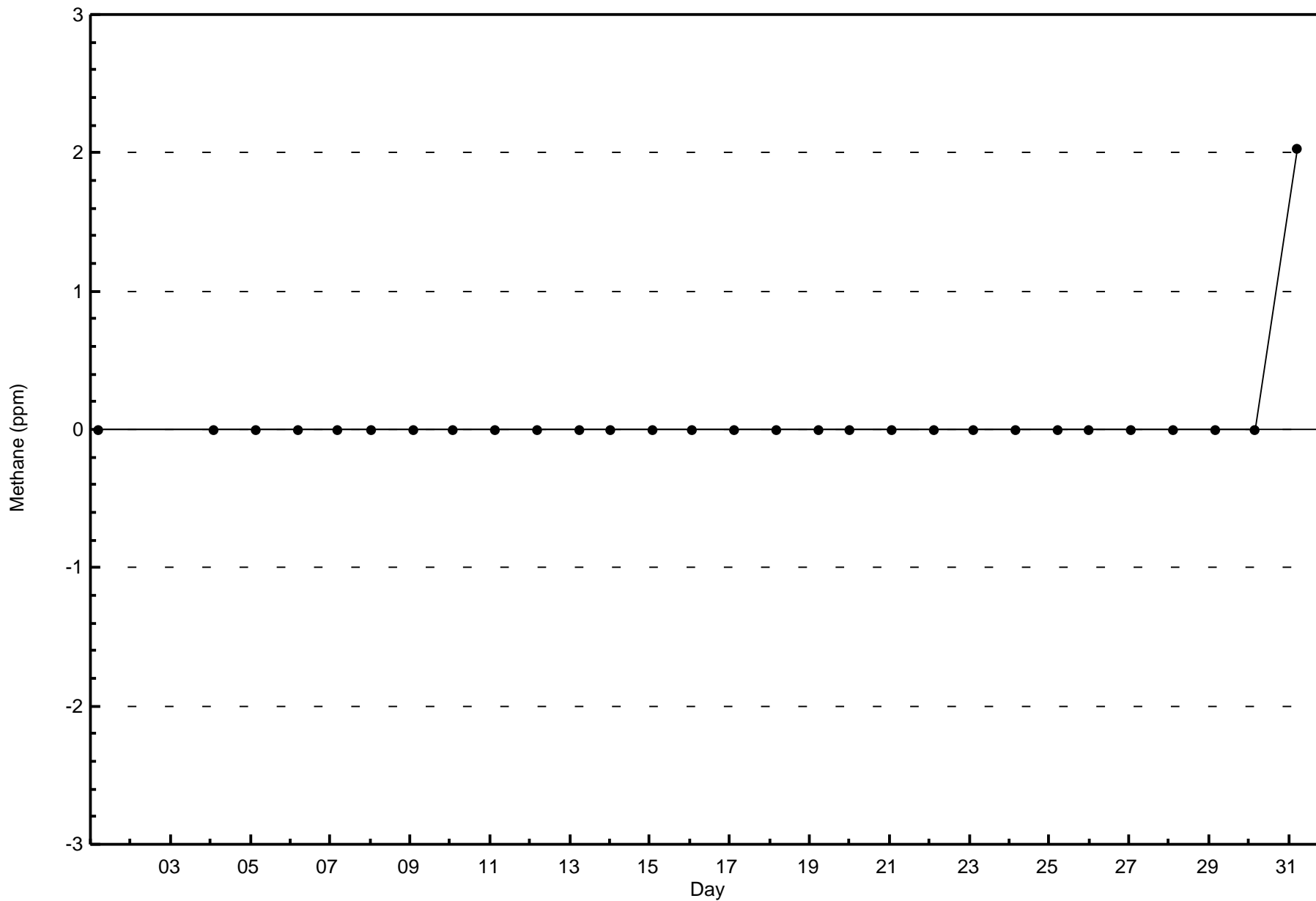
Methane (CH₄) - ppm
Anzac (AMS 14)





WBEA Data PC
Zero Responses

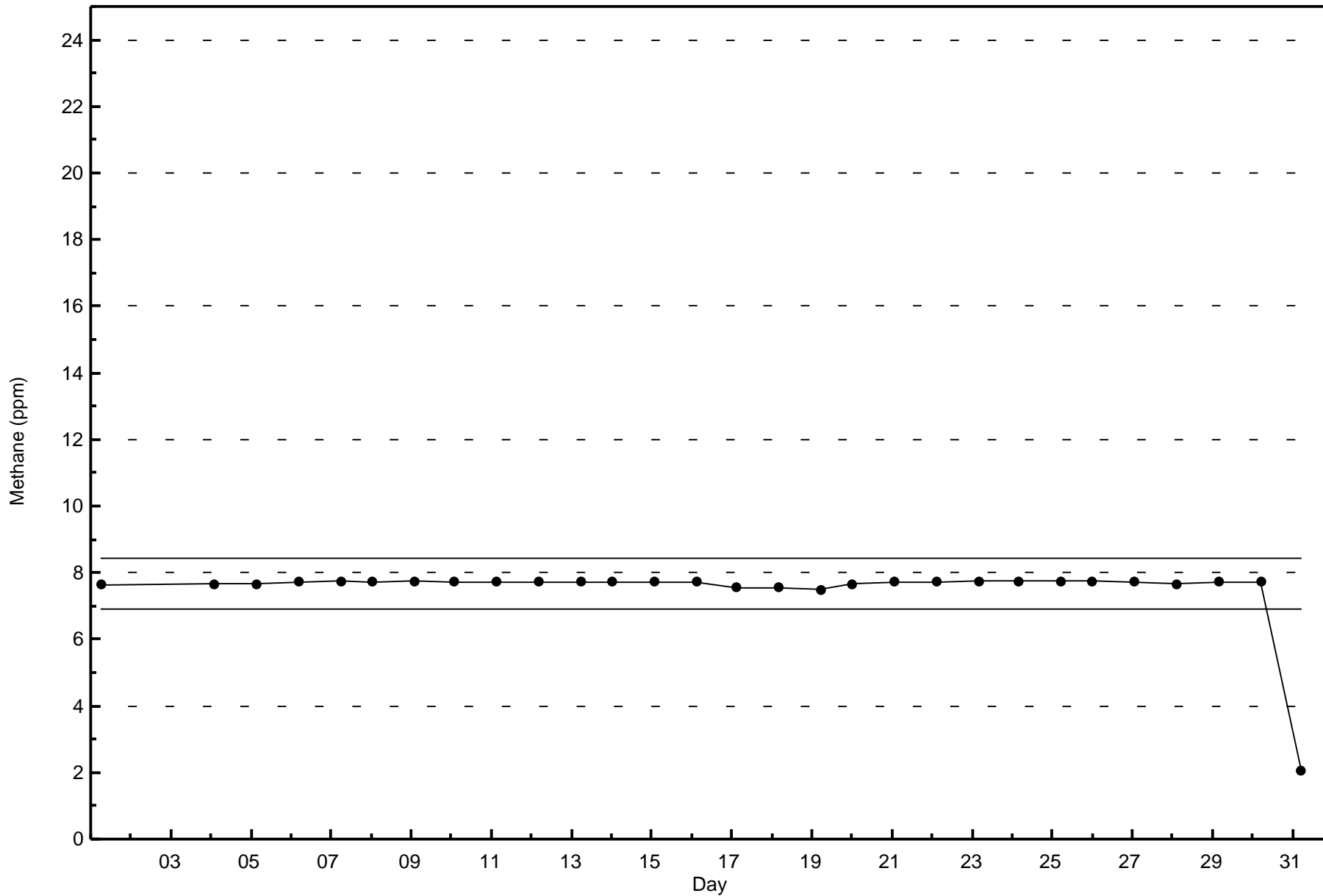
Methane (CH₄) - ppm
Anzac - December 2016





WBEA Data PC
Span Responses

Methane (CH₄) - ppm
Anzac - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

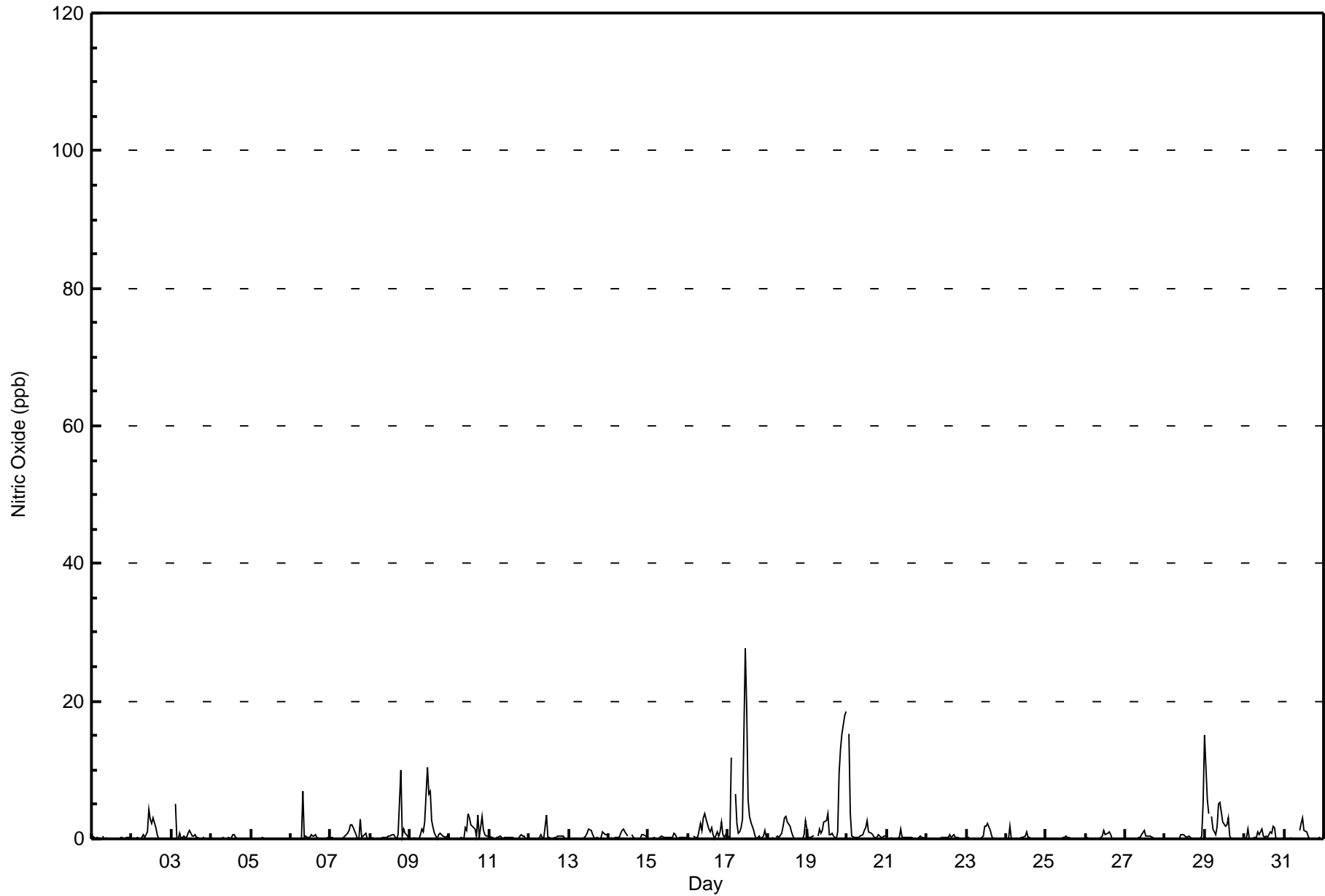
Nitric Oxide (NO) - ppb
Anzac - December 2016

Maximum Value: 28 ppb on Dec 17 11:00		Maximum Daily Average: 4.0 ppb on Dec 19		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 2 23:00		Minimum Daily Average: 0.1 ppb on Dec 5		Hours of Data: 704																																													
Maximum Diurnal Average: 2.4 ppb at hour 11		Minimum Diurnal Average: 0.1 ppb at hour 4		Hours of Missing Data: 40																																													
Monthly Average: 0.8 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 15		Hours of Calibration: 37																																													
				Percent Operational Time: 99.6																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0																							
2-Dec	Z	0	0	0	0	0	0	1	0	1	4	3	2	3	2	1	0	0	0	0	0	0	0	0	0	0.8	4																						
3-Dec	0	Z	5	0	0	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.5	5																						
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.1	1																						
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
6-Dec	0	0	0	0	Z	0	0	7	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0.5	7																						
7-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	2	2	2	1	0	0	3	0	1	1	0	0	0	0.6	3																						
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	10	0	1	1	1	0	0	0	0.7	10																						
9-Dec	0	Z	0	0	0	0	1	2	1	2	10	7	7	3	2	1	0	1	1	1	0	0	0	0	1.6	10																							
10-Dec	0	0	Z	0	0	0	0	0	0	2	1	4	3	2	2	1	0	3	0	3	1	1	0	0	1.1	4																							
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1																							
12-Dec	0	0	0	0	Z	0	0	1	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	4																							
13-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0.4	1																							
14-Dec	Z	0	0	0	0	0	0	1	1	1	1	0	M	M	1	0	0	0	0	1	1	0	0	0	0.4	1																							
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.2	1																							
16-Dec	0	0	Z	0	0	0	0	2	1	3	4	3	1	1	2	1	0	1	0	1	2	1	0	1	1.1	4																							
17-Dec	0	0	12	Z	7	2	1	1	2	3	28	19	6	3	2	1	0	0	0	0	0	0	1	0	3.9	28																							
18-Dec	0	0	0	0	Z	0	0	0	1	2	3	3	3	2	1	1	0	0	0	0	0	0	1	3	0.8	3																							
19-Dec	0	0	0	0	0	Z	0	1	1	1	2	3	4	1	1	1	0	0	1	10	13	15	18	19	4.0	19																							
20-Dec	Z	15	4	1	0	0	0	0	0	1	1	2	3	1	1	1	0	0	0	1	0	0	0	0	1.4	15																							
21-Dec	1	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0.2	1																							
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	2	2	2	1	0	0	0	0	0	0	0	0	0	0.4	2																							
24-Dec	0	0	2	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	2																							
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.2	1																							
27-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
28-Dec	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	5	0.4	5																							
29-Dec	15	6	4	Z	3	1	1	2	5	5	4	2	2	2	3	0	0	0	0	0	0	0	0	0	2.4	15																							
30-Dec	0	0	1	0	Z	0	0	0	1	1	1	0	0	0	0	1	1	2	2	0	0	0	0	0	0.5	2																							
31-Dec	0	0	0	0	0	Z	0	0	M	1	2	3	1	1	0	0	0	0	0	0	0	0	0	0	0.4	3																							
																								0.7	0.9	1.1	0.1	0.5	0.3	0.2	0.6	0.5	0.9	2.4	2.0	1.5	1.0	0.8	0.5	0.2	0.3	0.6	0.6	0.7	0.7	0.8	1.0	Diurnal Average	
																								15	15	12	1	7	2	1	7	5	5	28	19	7	3	3	1	1	3	10	10	13	15	18	19	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance																					



WBEA Data PC
Hourly Averages

Nitric Oxide (NO) - ppb
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	99.86	99.86
21 - 40	1	0.14	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitric Oxide (NO) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	22	2	4	6	6	17	56	86	49	25	18	15	47	86	166	87	692
21 - 40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	2	4	6	6	17	56	86	49	26	18	15	47	86	166	87	693

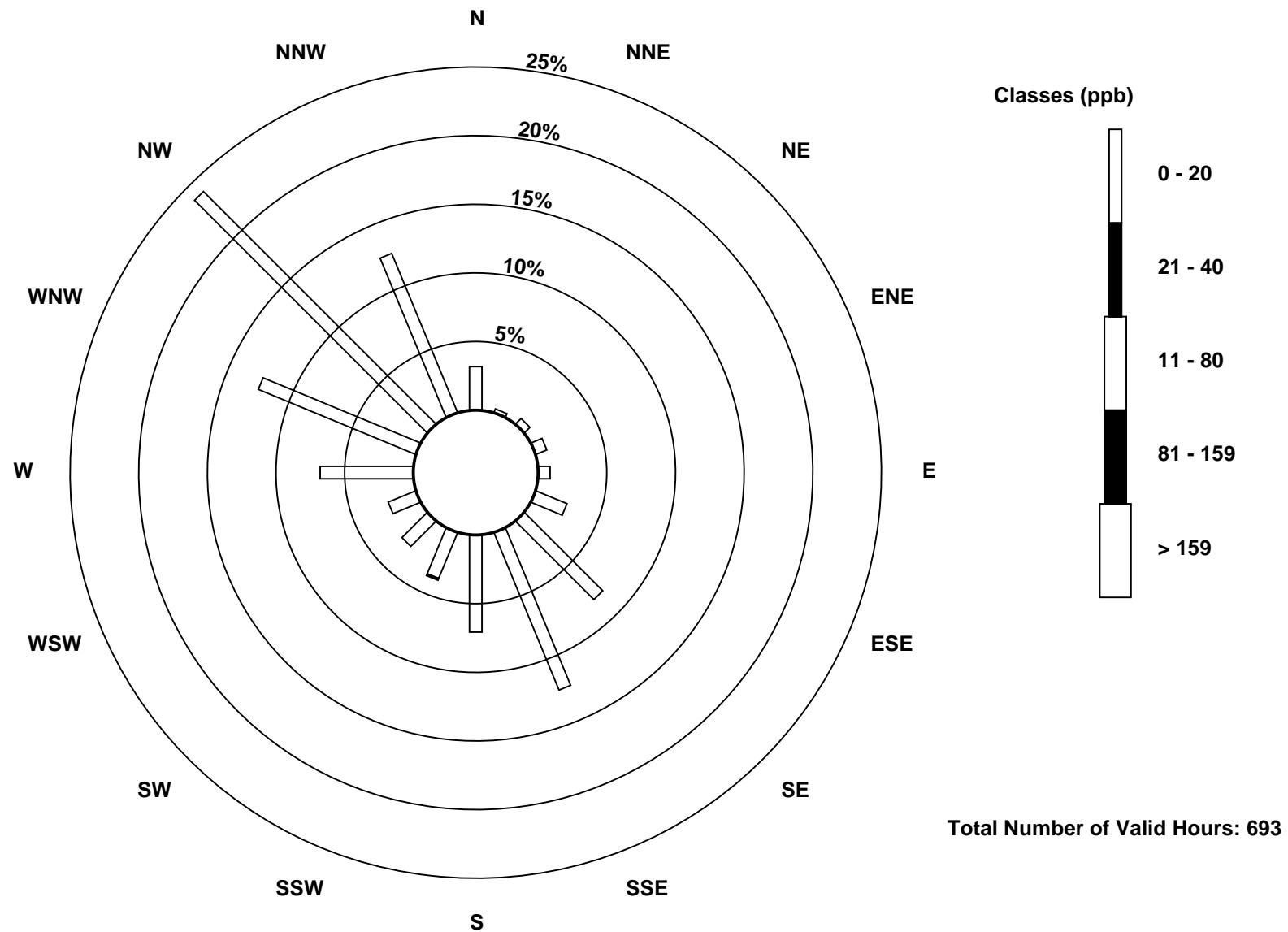
Total Number of Valid Hours: 693

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

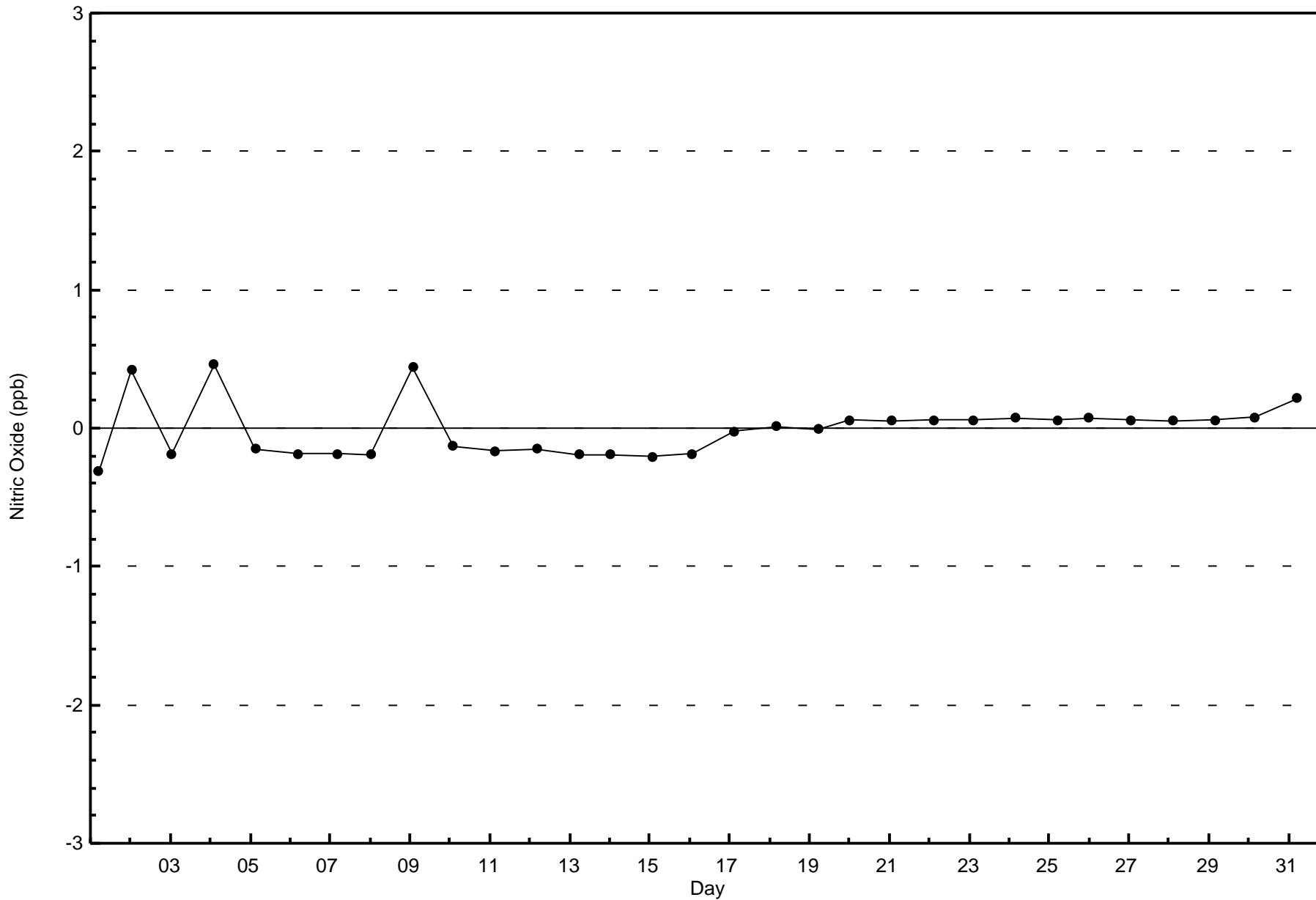
Nitric Oxide (NO) - ppb
Anzac (AMS 14)





WBEA Data PC
Zero Responses

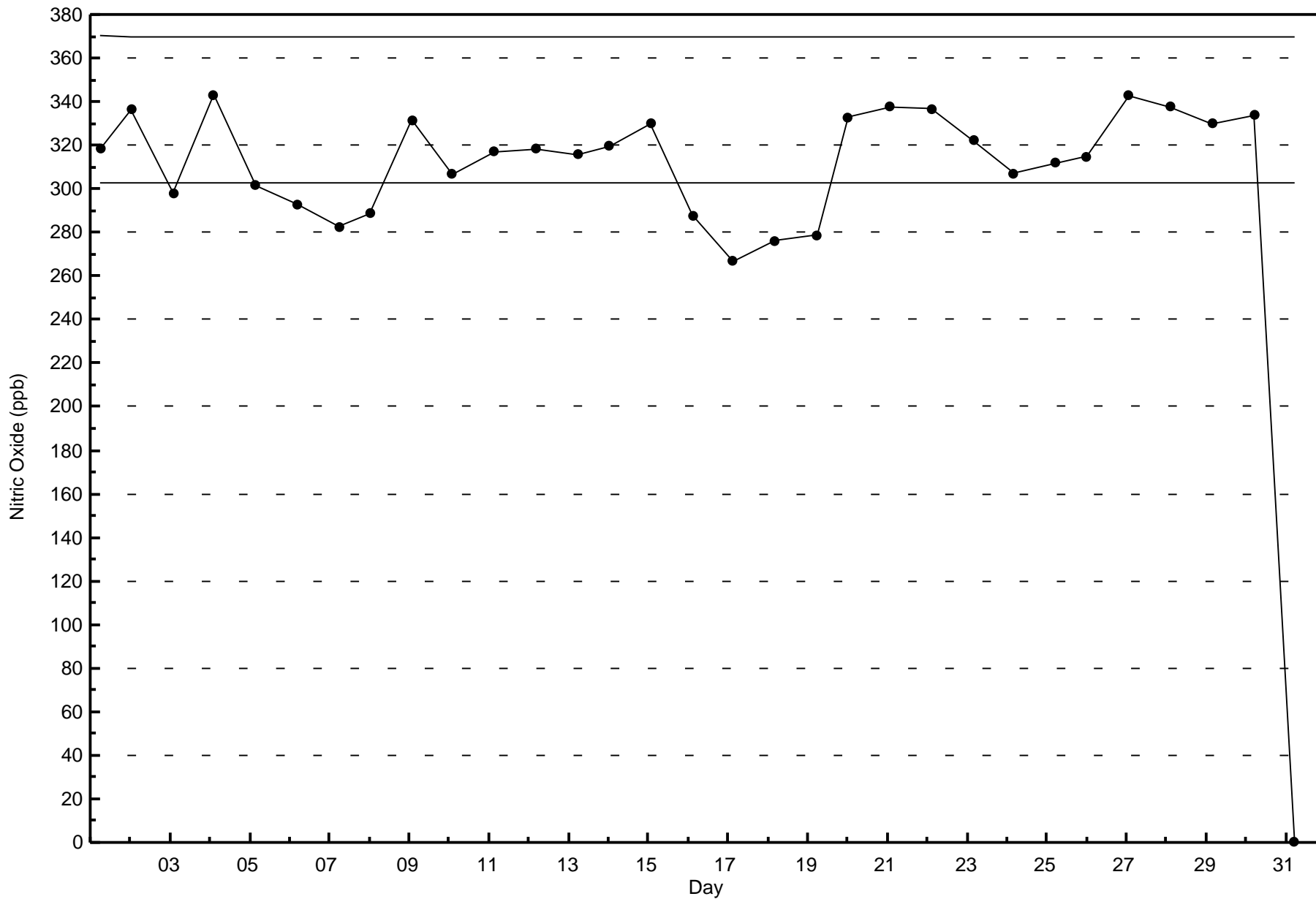
Nitric Oxide (NO) - ppb
Anzac - December 2016





WBEA Data PC
Span Responses

Nitric Oxide (NO) - ppb
Anzac - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

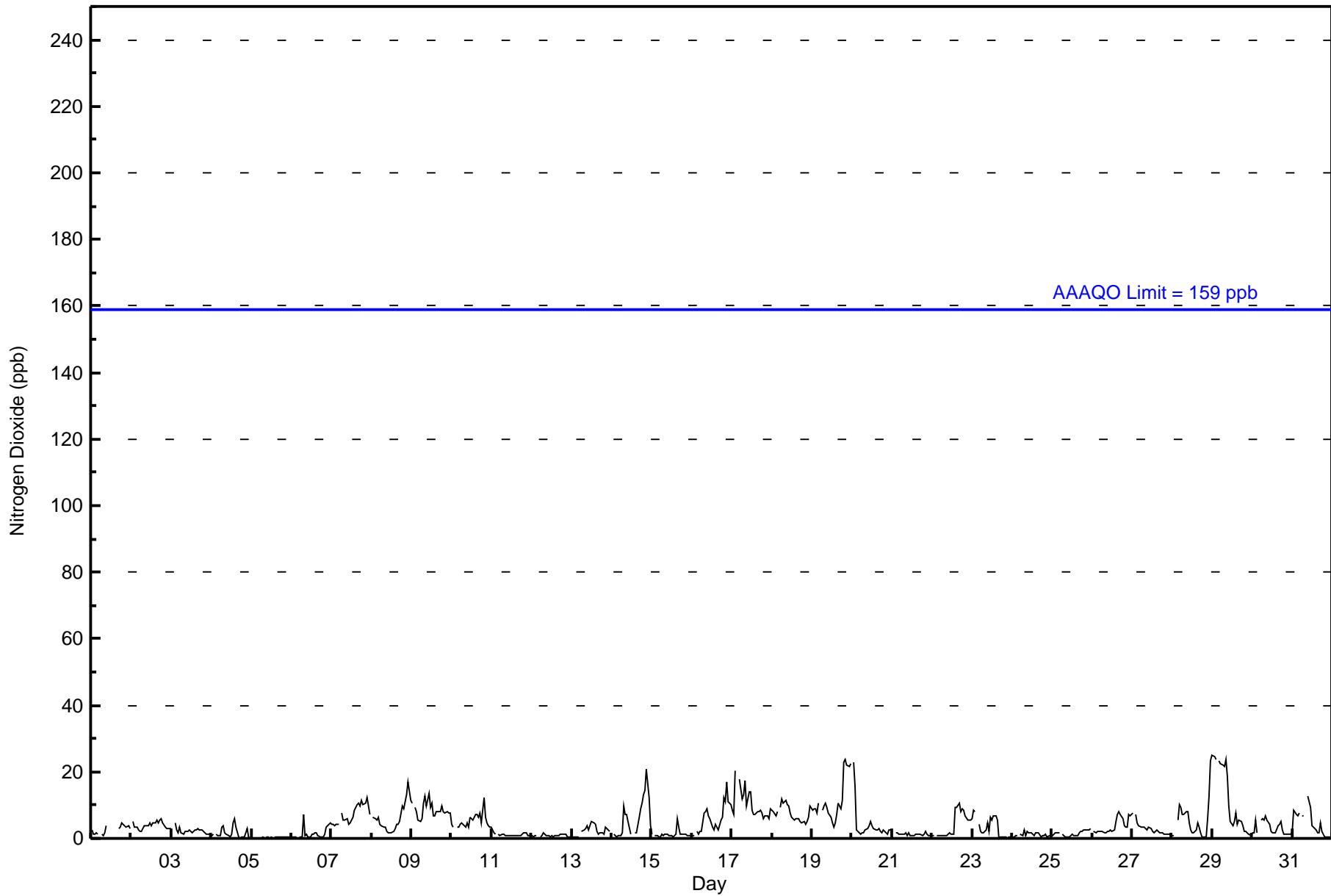
Anzac - December 2016

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																				Daily Average	Daily Maximum		
Maximum Value: 25 ppb on Dec 29 01:00		Maximum Daily Average: 11.5 ppb on Dec 29		Hours of Data: 704																							
Minimum Value: 0 ppb on Dec 5 01:00		Minimum Daily Average: 0.3 ppb on Dec 5		Hours of Missing Data: 40																							
Maximum Diurnal Average: 5.5 ppb at hour 3		Minimum Diurnal Average: 3.0 ppb at hour 14		Hours of Calibration: 37																							
Monthly Average: 4.3 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 3 Q ₃ = 6 P ₉₀ = 10 P ₉₉ = 23		Percent Operational Time: 99.6																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	3	1	1	2	1	Z	1	1	2	4	C	C	C	C	C	C	3	4	5	4	4	4	4	3	--	5	
2-Dec	Z	5	4	3	3	2	2	3	4	4	4	5	4	5	5	6	5	6	6	5	3	3	3	3	3.9	6	
3-Dec	3	Z	5	3	2	3	2	1	2	2	2	3	2	2	3	3	3	3	2	2	2	1	1	1	2.3	5	
4-Dec	1	1	Z	1	1	1	3	4	2	1	1	1	1	5	6	3	0	0	0	0	0	3	1	0	1.6	6	
5-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.3	1	
6-Dec	1	0	0	0	Z	0	0	7	1	1	1	1	1	2	2	1	0	1	1	1	4	4	5	1.5	7		
7-Dec	4	4	4	4	4	Z	8	6	5	6	4	5	5	6	8	10	11	10	12	10	11	12	10	7	7.2	12	
8-Dec	Z	6	6	6	6	4	4	3	3	2	2	2	2	3	4	4	4	5	10	9	11	13	17	11	5.9	17	
9-Dec	10	Z	9	8	6	5	6	11	13	10	14	10	11	7	7	8	8	8	10	8	8	8	8	8	8.6	14	
10-Dec	4	3	Z	4	4	4	5	4	3	5	3	6	6	5	7	7	6	8	5	12	6	5	4	4	5.2	12	
11-Dec	3	2	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1.2	3	
12-Dec	1	1	1	1	Z	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0.8	2	
13-Dec	0	0	0	0	0	Z	2	3	3	4	3	4	5	4	2	1	2	2	1	3	3	3	2	2	2.3	5	
14-Dec	Z	1	1	1	1	1	2	10	7	7	5	1	M	M	2	2	7	9	11	13	14	21	12	4	6.2	21	
15-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	6	3	1	1	1	1	1	1	1	1.3	6	
16-Dec	1	1	Z	2	1	2	2	8	8	9	7	6	3	2	4	4	3	5	6	12	11	17	11	10	5.9	17	
17-Dec	9	7	20	Z	18	15	12	13	17	10	14	14	9	7	7	8	8	9	8	6	7	7	6	9	10.4	20	
18-Dec	8	8	7	8	Z	9	12	11	11	10	10	8	6	6	6	6	6	5	5	5	4	5	6	10	7.5	12	
19-Dec	8	9	9	8	11	Z	9	10	11	9	8	6	5	4	5	7	11	9	11	23	24	22	22	22	11.3	24	
20-Dec	Z	23	16	3	2	1	2	2	3	3	4	5	4	3	2	3	3	2	2	2	2	1	3	3	4.0	23	
21-Dec	3	Z	2	2	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1.3	3	
22-Dec	1	1	Z	1	1	1	1	1	1	1	2	1	1	1	9	10	11	8	9	9	7	5	6	6	4.0	11	
23-Dec	6	8	8	Z	4	2	2	2	3	5	2	6	5	7	7	5	0	0	1	1	0	0	1	1	3.3	8	
24-Dec	0	1	1	1	Z	1	1	2	1	2	2	2	1	1	2	2	2	1	1	1	1	1	1	1	1.2	2	
25-Dec	1	1	2	2	2	Z	1	1	0	1	1	1	1	1	1	1	2	2	2	3	3	3	3	3	1.5	3	
26-Dec	Z	2	2	2	2	2	2	2	2	2	2	3	2	3	5	7	8	7	6	4	4	4	7	7	3.7	8	
27-Dec	8	Z	7	5	4	4	4	4	3	3	3	3	2	2	2	2	2	2	2	1	1	1	1	1	2.8	8	
28-Dec	1	1	Z	6	10	9	7	7	8	8	5	3	2	2	3	5	4	2	1	0	1	6	13	23	5.4	23	
29-Dec	25	25	24	Z	24	23	22	21	24	19	10	5	4	5	8	4	6	5	4	2	2	2	1	1	11.5	25	
30-Dec	2	2	6	2	Z	5	6	6	7	5	4	2	2	2	2	4	4	5	2	1	1	1	1	1	3.2	7	
31-Dec	2	8	7	7	8	Z	7	7	M	13	11	10	4	3	3	2	2	5	2	1	1	1	0	0	4.6	13	
		4.1	4.7	5.5	3.0	4.5	4.0	4.1	4.9	5.0	4.8	4.2	3.7	3.1	3.0	3.8	4.1	4.0	4.1	4.1	4.6	4.5	5.0	4.9	4.8	Diurnal Average	
		25	25	24	8	24	23	22	21	24	19	14	14	11	7	9	10	11	10	12	23	24	22	22	23	Diurnal Maximum	
Z - zerspan		C - Calibration				M - Maintenance																					
Alberta Ambient Air Quality Objectives (AAAQO):		1-hr		159 ppb																							



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	688	97.73	97.73
21 - 40	16	2.27	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	20	2	3	6	5	14	53	86	48	26	18	15	47	84	166	84	677
21 - 40	2	0	1	0	1	3	3	0	1	0	0	0	0	2	0	3	16
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	2	4	6	6	17	56	86	49	26	18	15	47	86	166	87	693

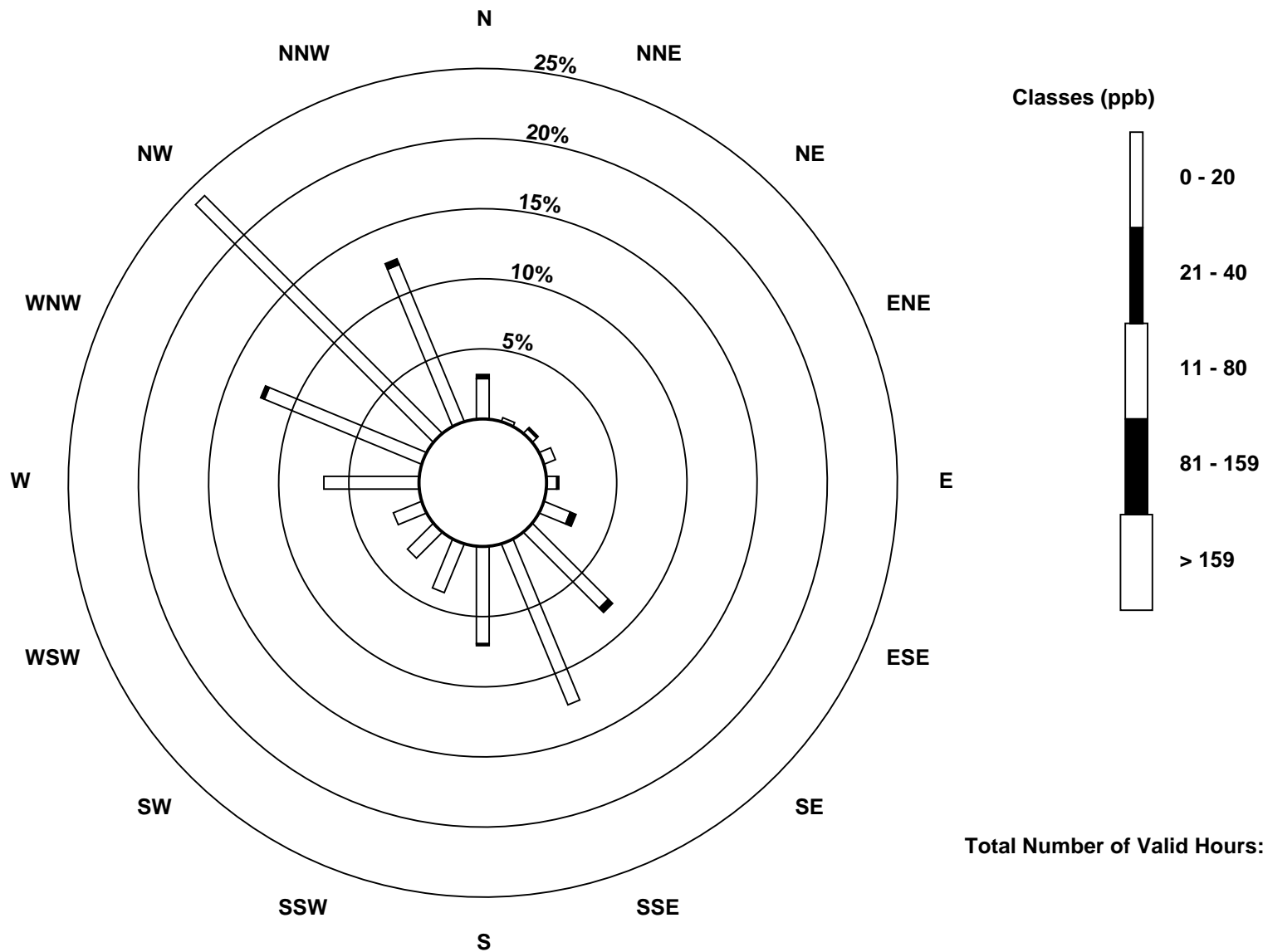
Total Number of Valid Hours: 693

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

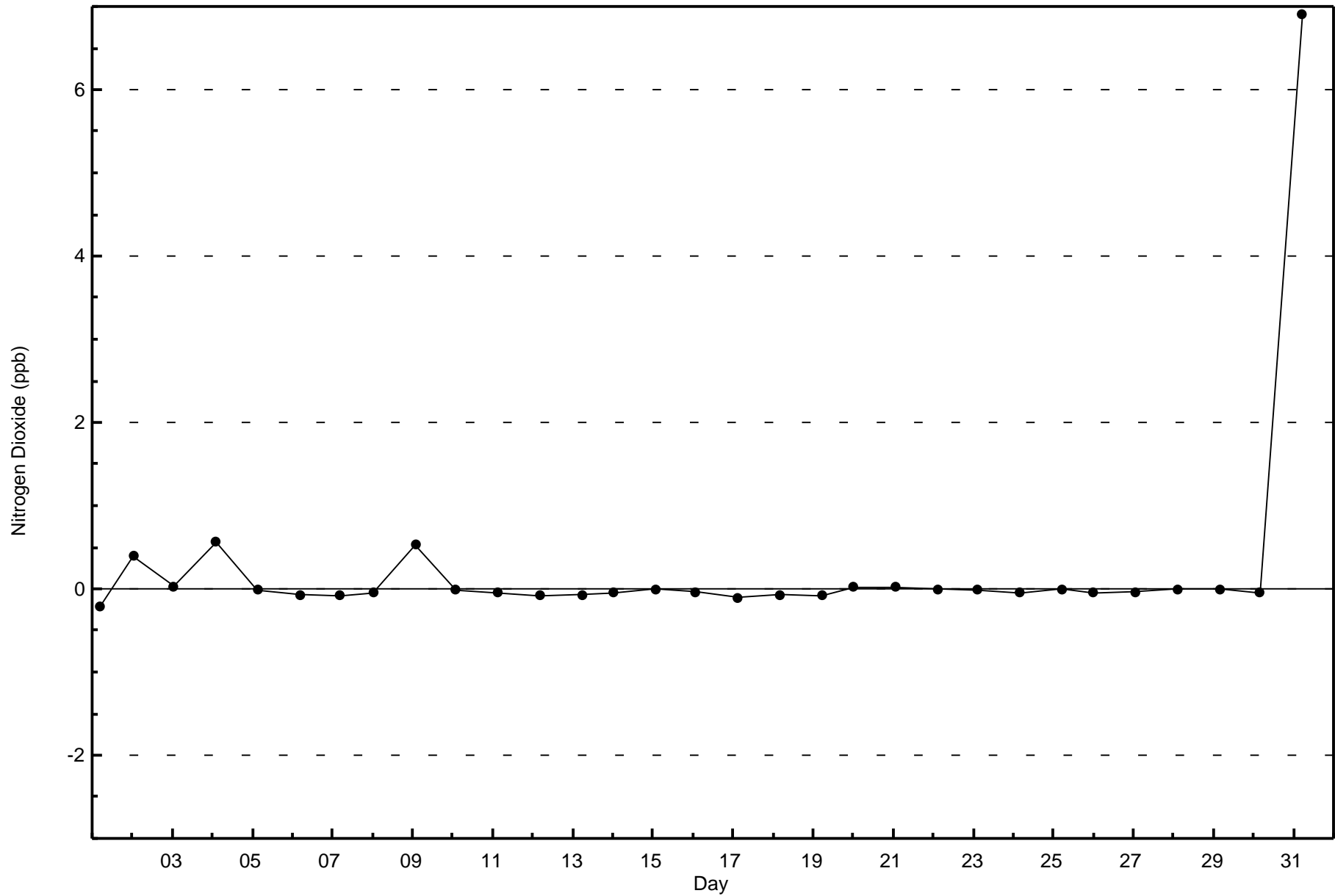
Nitrogen Dioxide (NO₂) - ppb
Anzac (AMS 14)





WBEA Data PC
Zero Responses

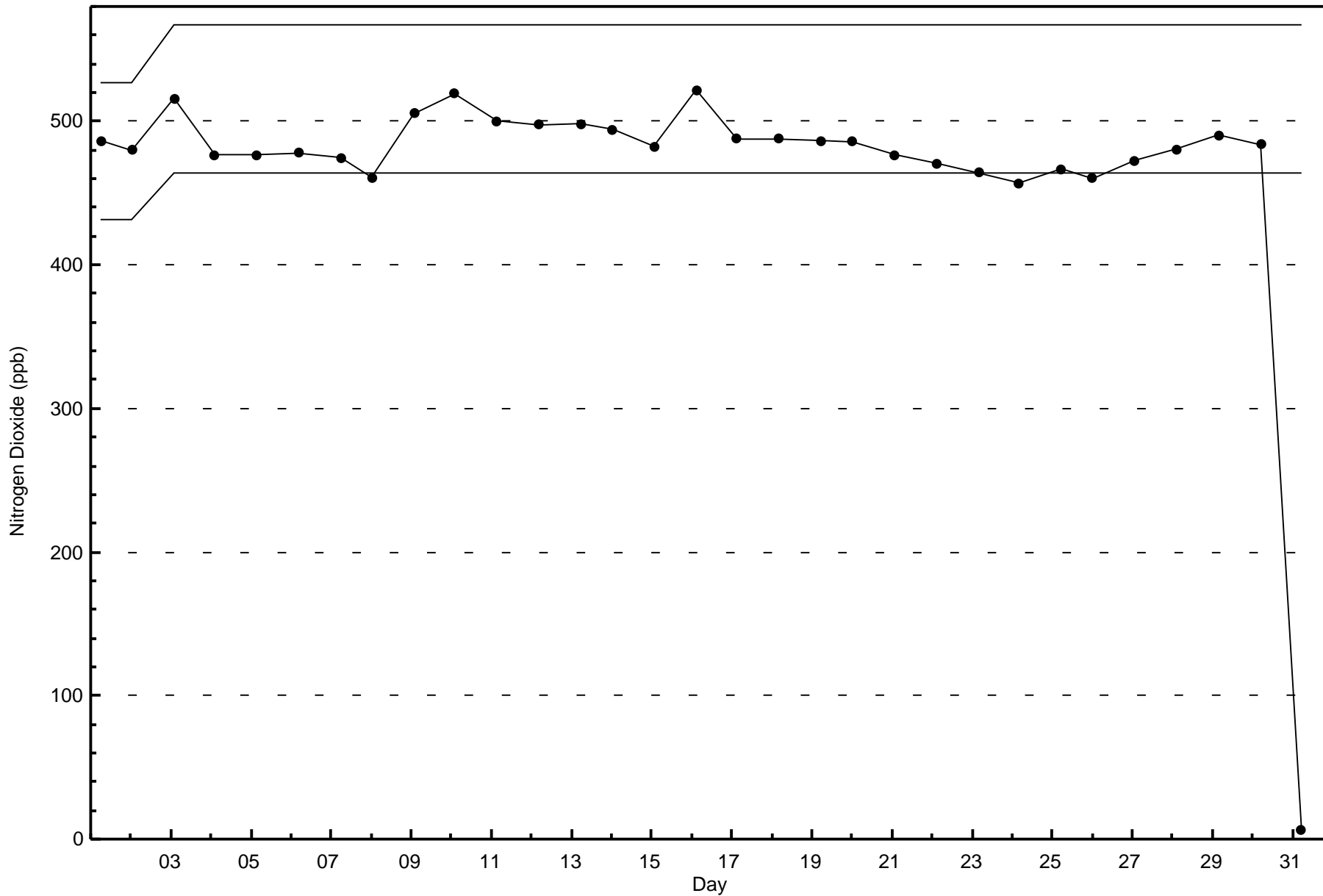
Nitrogen Dioxide (NO₂) - ppb
Anzac - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Anzac - December 2016



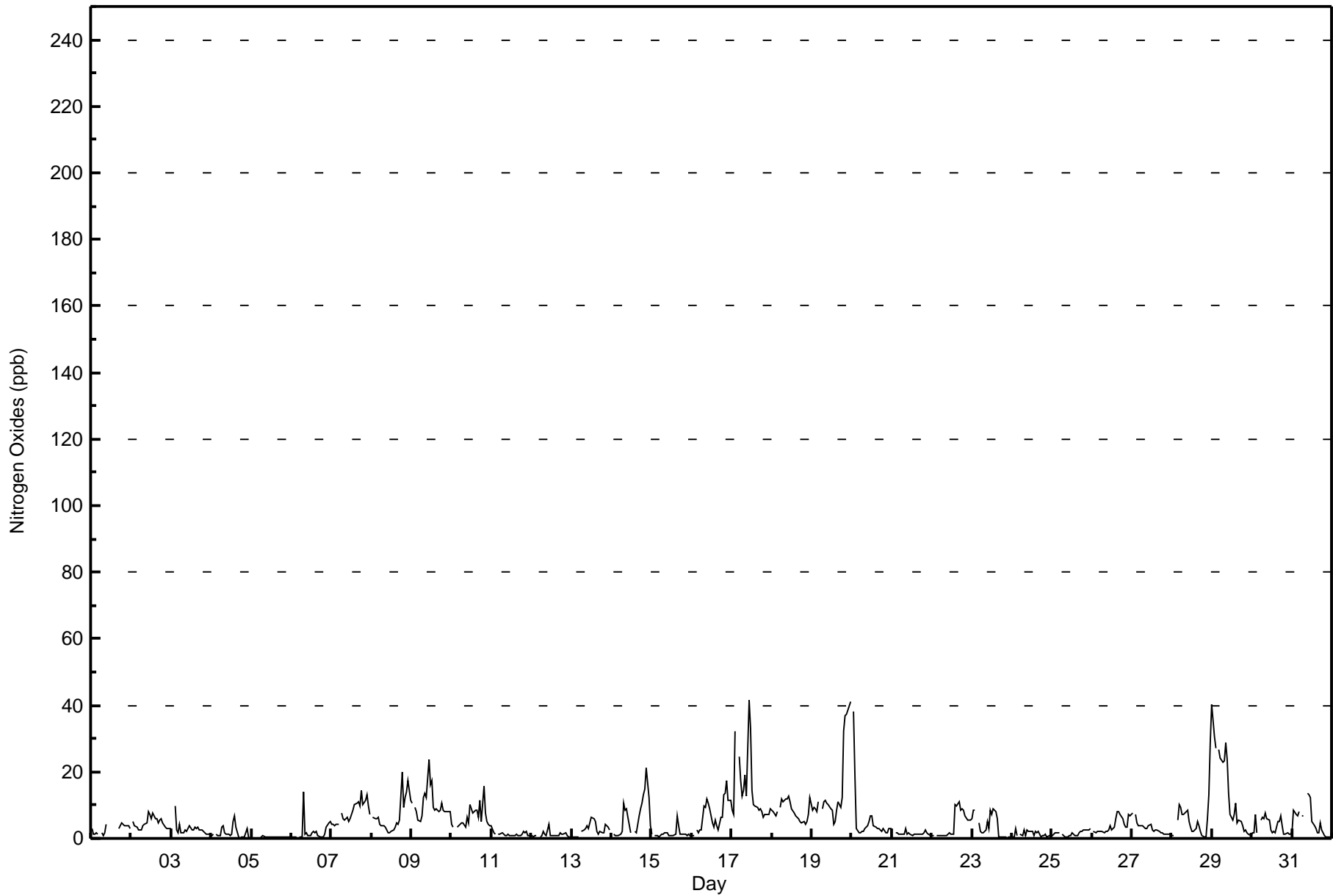


Maximum Value: 42 ppb on Dec 17 11:00		Maximum Daily Average: 15.3 ppb on Dec 19		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 5 03:00		Minimum Daily Average: 0.4 ppb on Dec 5		Hours of Data: 704																																													
Maximum Diurnal Average: 6.6 ppb at hour 11		Minimum Diurnal Average: 3.1 ppb at hour 4		Hours of Missing Data: 40																																													
Monthly Average: 5.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 3 Q ₃ = 7 P ₉₀ = 11 P ₉₉ = 36		Hours of Calibration: 37																																													
				Percent Operational Time: 99.6																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	3	1	1	2	1	Z	2	1	2	4	C	C	C	C	C	C	3	4	5	4	4	4	4	3	--	5																							
2-Dec	Z	5	4	3	3	2	3	4	4	5	8	7	6	8	6	6	5	6	6	4	3	3	3	3	4.6	8																							
3-Dec	3	Z	10	2	2	4	2	2	2	3	4	2	3	3	3	3	3	3	2	2	2	1	1	1	2.7	10																							
4-Dec	1	1	Z	1	1	1	3	4	2	1	1	1	1	5	7	3	0	0	0	0	0	3	0	0	1.7	7																							
5-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	0.4	1																							
6-Dec	1	1	0	0	Z	0	1	14	1	2	1	1	2	2	2	2	1	0	1	0	1	4	5	5	2.0	14																							
7-Dec	4	4	4	4	4	Z	8	6	6	6	5	6	7	8	10	11	11	10	14	10	11	13	10	7	7.8	14																							
8-Dec	Z	6	6	6	6	4	4	4	4	2	2	2	3	4	4	4	4	6	20	9	12	14	17	12	6.6	20																							
9-Dec	10	Z	9	8	6	5	7	12	14	12	24	16	18	9	8	9	8	8	10	9	8	8	8	8	10.2	24																							
10-Dec	4	3	Z	4	4	4	5	4	3	6	5	10	9	7	9	8	6	11	5	16	8	5	4	4	6.3	16																							
11-Dec	4	2	1	Z	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1.4	4																							
12-Dec	1	1	1	1	Z	1	1	2	1	1	4	1	1	1	1	1	1	2	1	1	2	1	1	1	1.1	4																							
13-Dec	0	0	0	0	0	Z	2	3	3	4	3	5	6	6	5	2	1	2	2	2	4	4	3	3	2.7	6																							
14-Dec	Z	1	1	1	1	1	2	11	8	9	6	2	M	M	2	2	7	9	11	13	15	21	12	4	6.6	21																							
15-Dec	1	Z	1	1	1	1	1	1	2	2	1	1	1	1	1	7	4	1	1	1	1	1	1	1	1.5	7																							
16-Dec	1	1	Z	3	2	2	2	10	9	12	11	9	5	3	6	4	2	6	6	13	14	18	12	11	7.0	18																							
17-Dec	9	7	32	Z	24	17	13	14	19	13	42	33	14	10	10	9	9	9	8	6	7	7	7	9	14.3	42																							
18-Dec	8	8	7	8	Z	9	12	11	12	12	13	11	9	7	7	7	6	5	5	5	4	5	7	12	8.3	13																							
19-Dec	8	9	9	8	11	Z	9	11	11	11	10	9	8	4	5	8	11	9	12	32	37	37	40	41	15.3	41																							
20-Dec	Z	38	19	3	2	2	2	2	3	4	5	7	7	4	3	3	3	2	2	3	2	2	3	3	5.3	38																							
21-Dec	3	Z	2	2	1	1	1	1	3	1	2	1	1	1	1	1	1	1	1	2	2	2	1	1	1.5	3																							
22-Dec	1	1	Z	1	1	1	1	1	1	1	2	1	1	1	10	10	11	8	9	9	7	6	5	6	4.1	11																							
23-Dec	6	8	8	Z	4	2	2	2	3	5	3	8	7	9	8	6	0	0	0	0	0	0	0	0	3.7	9																							
24-Dec	0	1	3	1	Z	1	1	2	1	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1.3	3																							
25-Dec	1	1	2	2	2	Z	1	1	0	1	1	1	2	1	1	1	2	2	2	3	3	2	3	3	1.6	3																							
26-Dec	Z	2	2	2	2	2	2	2	2	2	3	4	3	3	6	8	8	7	6	4	3	4	7	7	3.9	8																							
27-Dec	7	Z	7	5	4	4	4	3	3	3	4	4	2	2	2	3	2	2	2	1	1	1	1	1	3.0	7																							
28-Dec	1	1	Z	6	10	9	7	7	8	8	5	3	2	2	3	5	4	2	1	0	1	6	13	29	5.8	29																							
29-Dec	40	30	27	Z	27	24	23	23	29	24	14	7	6	7	11	5	5	5	4	2	2	2	1	1	13.9	40																							
30-Dec	2	2	7	2	Z	6	6	6	7	6	6	2	2	2	2	5	5	7	4	1	1	2	1	1	3.7	7																							
31-Dec	2	8	7	7	8	Z	7	7	M	14	13	12	5	4	3	2	2	5	2	1	1	1	0	0	5.0	14																							
																								4.7	5.6	6.6	3.1	4.9	4.3	4.3	5.5	5.5	5.7	6.6	5.7	4.6	4.0	4.6	4.6	4.2	4.4	4.7	5.1	5.2	5.8	5.7	5.8	Diurnal Average	
																								40	38	32	8	27	24	23	23	29	24	42	33	18	10	11	11	11	11	20	32	37	37	40	41	Diurnal Maximum	
Z - zerospan		C - Calibration				M - Maintenance																																											



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	682	96.88	96.88
21 - 40	20	2.84	99.72
41 - 80	2	0.28	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	20	2	3	6	5	14	52	86	45	25	18	14	47	84	166	84	671
21 - 40	2	0	1	0	1	3	3	0	4	0	0	1	0	2	0	3	20
11 - 80	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	2	4	6	6	17	56	86	49	26	18	15	47	86	166	87	693

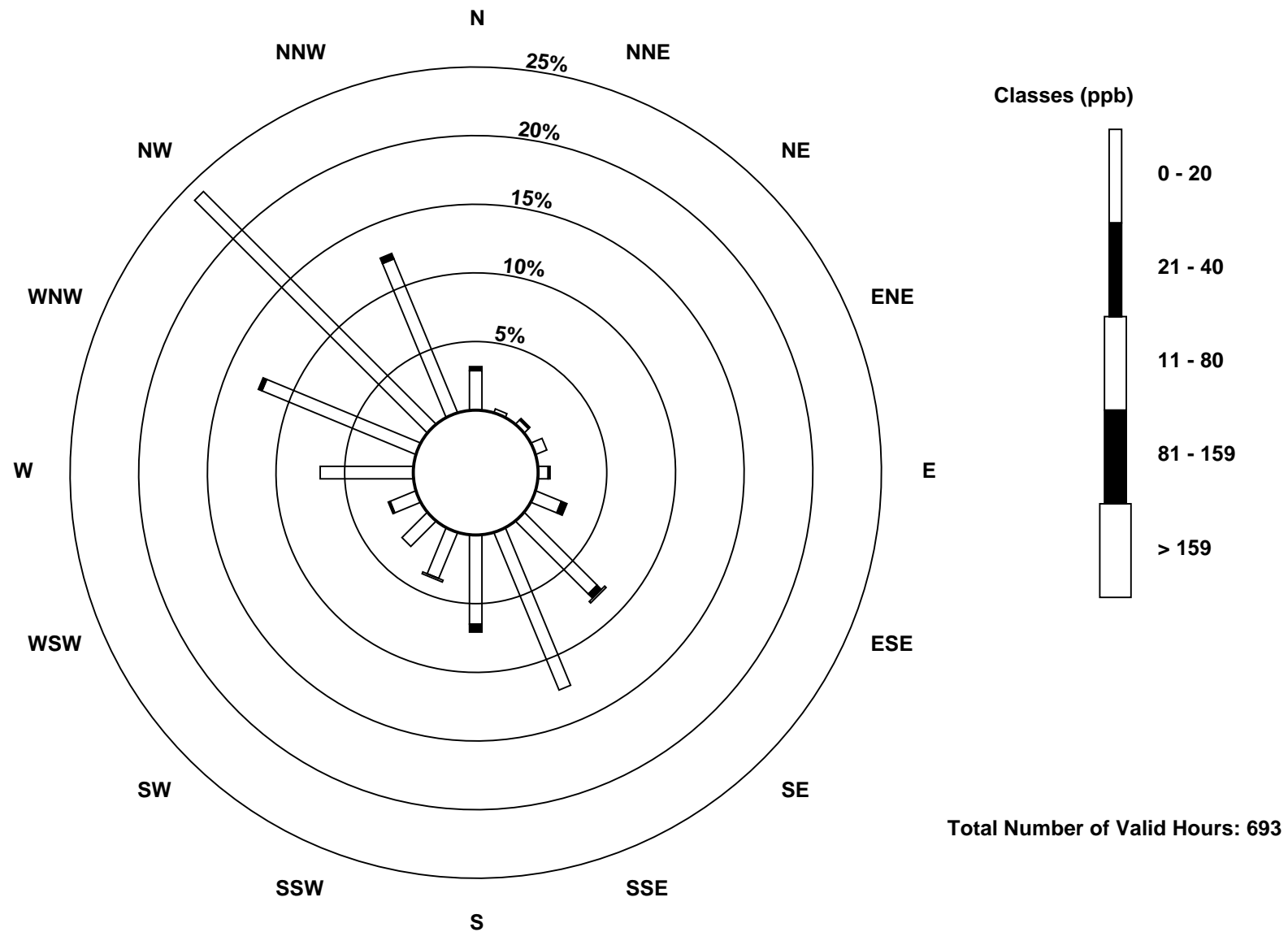
Total Number of Valid Hours: 693

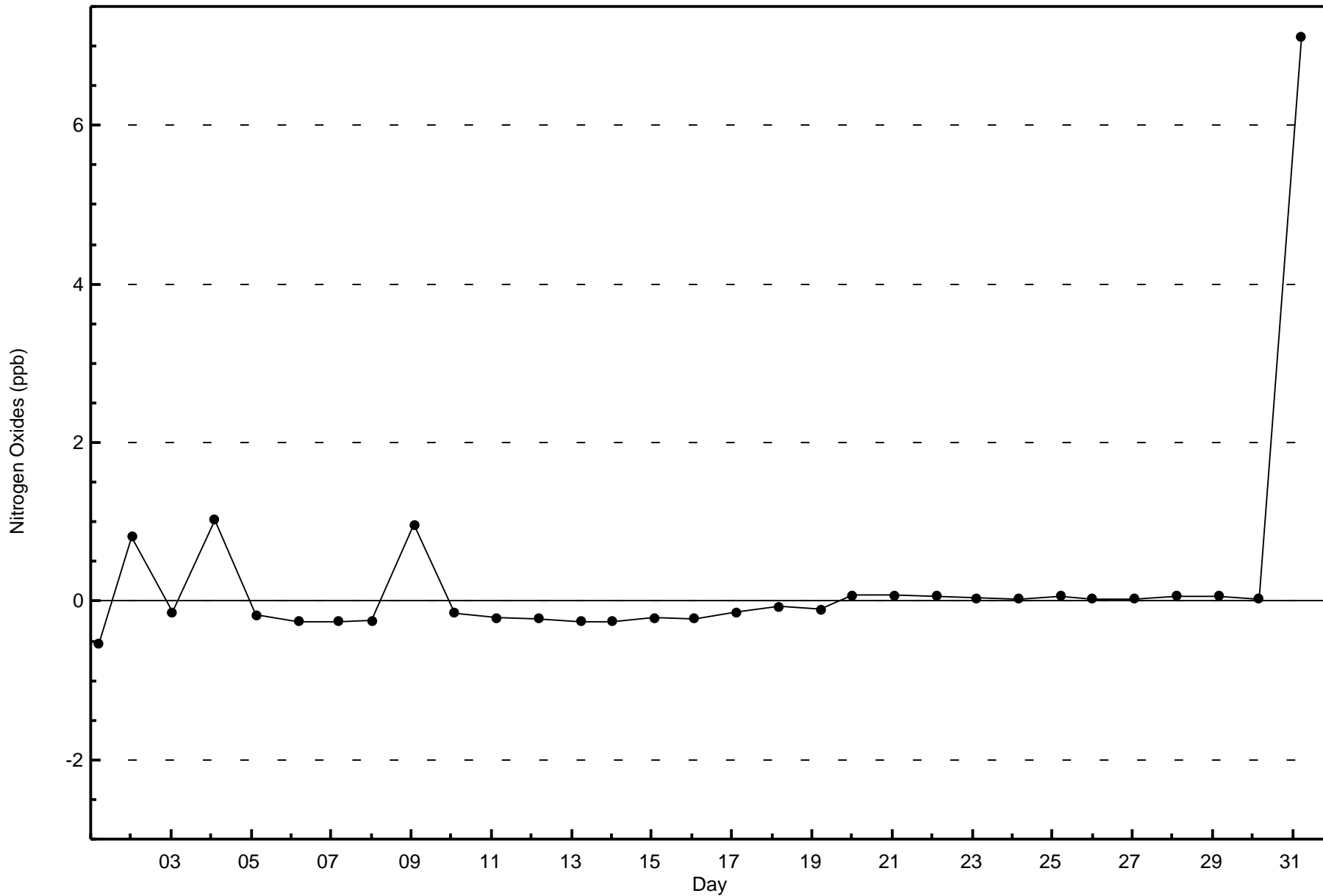
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Anzac (AMS 14)

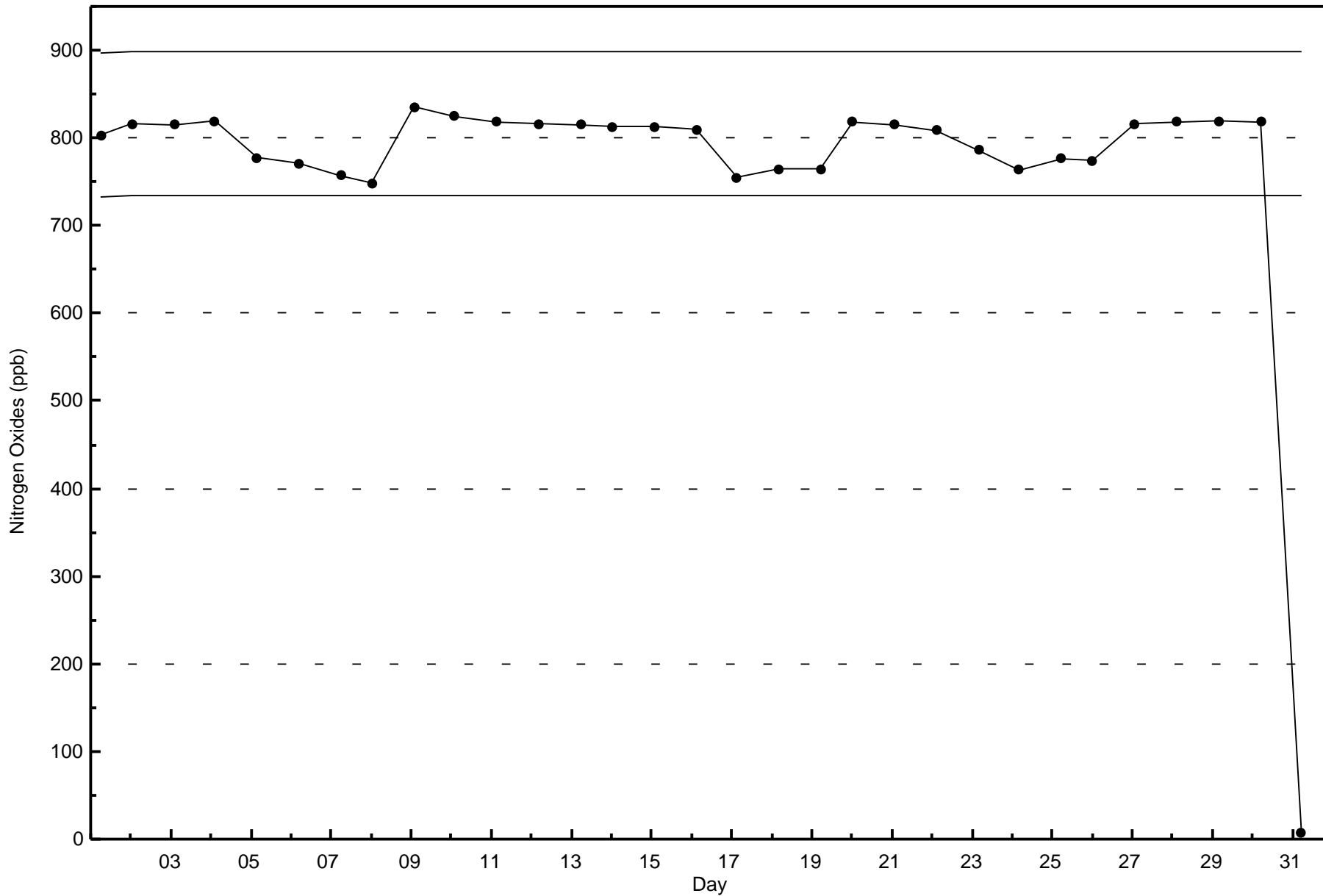






WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
Anzac - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

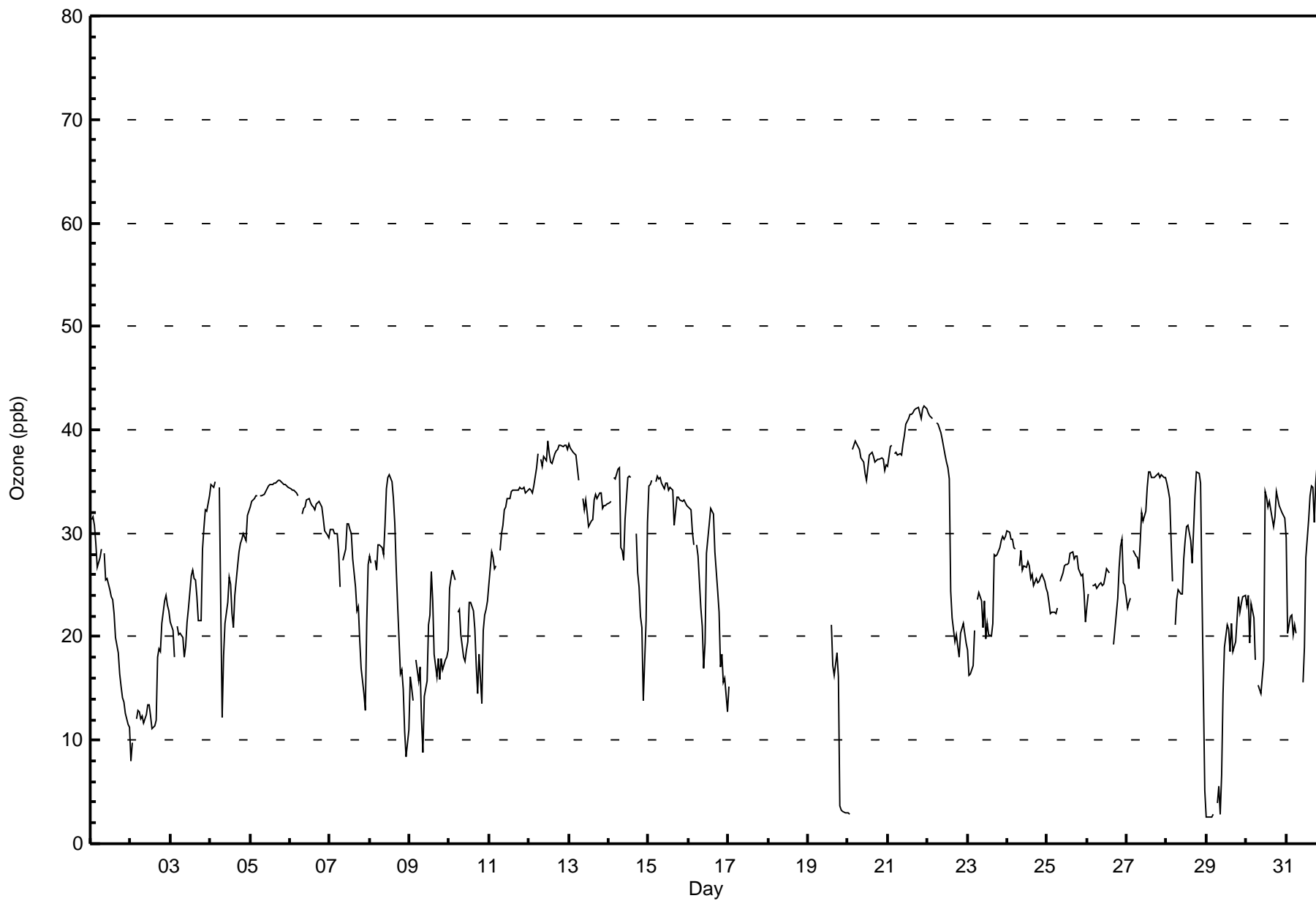
Anzac - December 2016

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service:		744																																												
Maximum Value: 42 ppb on Dec 21 23:00		Maximum Daily Average: 40.0 ppb on Dec 21		Hours of Data:		650																																												
Minimum Value: 3 ppb on Dec 29 03:00		Minimum Daily Average: 14.1 ppb on Dec 29		Hours of Missing Data:		94																																												
Maximum Diurnal Average: 29.8 ppb at hour 14		Minimum Diurnal Average: 25.4 ppb at hour 9		Hours of Calibration:		32																																												
Monthly Average: 27.2 ppb		Percentiles: P ₁ = 3 P ₁₀ = 16 Q ₁ = 22 Median = 28 Q ₃ = 34 P ₉₀ = 37 P ₉₉ = 42		Percent Operational Time:		91.7																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	31	32	31	29	27	28	28	Z	28	25	26	24	24	24	22	20	18	16	15	14	14	13	11	11	22.3	32																								
2-Dec	8	10	Z	12	13	13	12	12	12	12	13	13	12	11	11	12	18	19	19	21	23	24	23	23	15.1	24																								
3-Dec	21	21	18	Z	21	20	20	20	18	19	21	23	26	26	26	25	24	22	22	28	31	32	32	34	23.9	34																								
4-Dec	35	35	34	35	Z	34	23	12	18	21	23	26	25	22	21	24	27	28	29	29	30	29	32	32	27.2	35																								
5-Dec	33	33	33	34	34	Z	34	34	34	34	34	35	35	35	35	35	35	35	35	35	35	35	35	35	34.3	35																								
6-Dec	34	34	34	34	34	34	Z	32	32	33	33	33	33	33	33	32	33	33	33	33	31	30	30	30	32.6	34																								
7-Dec	30	30	30	30	30	28	25	Z	27	29	31	31	30	30	28	25	22	23	20	17	15	13	21	27	25.8	31																								
8-Dec	28	27	Z	27	26	29	29	29	28	31	34	35	36	35	33	31	27	23	16	17	15	11	8	11	25.5	36																								
9-Dec	16	15	14	Z	18	16	17	12	9	14	16	21	22	26	23	18	16	18	16	18	17	18	18	19	17.2	26																								
10-Dec	25	26	26	25	Z	22	23	20	18	18	19	20	23	23	22	21	17	14	18	14	21	22	23	23	21.0	26																								
11-Dec	25	28	28	27	27	Z	28	30	31	32	32	33	33	34	34	34	34	34	34	34	34	34	34	34	31.8	34																								
12-Dec	34	34	34	35	36	38	Z	37	36	37	37	39	38	37	37	38	38	38	38	38	38	39	39	38	37.1	39																								
13-Dec	39	38	38	38	38	36	35	Z	33	32	33	32	31	31	31	33	34	33	34	34	32	33	33	33	34.1	39																								
14-Dec	33	33	Z	35	35	36	36	29	28	27	31	35	36	35	C	C	30	26	25	22	21	14	22	31	29.6	36																								
15-Dec	35	35	35	Z	35	36	35	35	35	34	35	35	34	34	34	31	32	33	33	33	33	33	33	33	34.0	36																								
16-Dec	33	32	30	29	Z	29	28	23	21	17	19	28	31	32	32	32	28	24	22	17	18	16	16	13	24.8	33																								
17-Dec	15	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	15																								
18-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--																								
19-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	21	17	16	18	16	4	3	3	3	--	21																								
20-Dec	3	3	Z	38	39	39	38	38	37	37	36	35	36	38	38	37	37	37	37	37	37	37	36	37	34.2	39																								
21-Dec	36	38	39	Z	38	38	38	38	38	39	39	41	41	42	41	42	42	42	42	42	41	42	42	42	40.0	42																								
22-Dec	42	41	41	41	Z	41	41	40	40	39	38	37	36	35	24	22	19	20	19	18	20	21	20	19	31.1	42																								
23-Dec	19	16	16	17	21	Z	24	24	23	21	24	20	21	20	21	28	28	28	29	29	30	29	30	30	23.4	30																								
24-Dec	30	30	29	29	29	28	Z	27	28	26	27	27	27	27	26	26	25	26	25	25	26	26	25	25	27.0	30																								
25-Dec	24	23	22	22	22	22	23	Z	25	26	27	27	27	27	28	28	27	28	28	27	26	26	24	21	25.3	28																								
26-Dec	23	24	Z	25	25	25	25	25	25	25	25	26	27	26	C	C	19	21	24	27	29	29	25	25	25.0	29																								
27-Dec	23	23	24	Z	28	28	28	27	29	32	31	32	35	36	36	35	35	35	36	36	35	36	35	35	31.8	36																								
28-Dec	35	34	33	25	Z	21	24	25	24	24	28	29	31	31	29	27	30	34	36	36	35	24	15	5	27.6	36																								
29-Dec	3	3	3	3	3	Z	4	6	3	7	14	19	21	21	19	21	19	19	22	24	22	23	24	24	14.1	24																								
30-Dec	23	24	19	23	22	18	Z	15	15	14	18	34	34	32	33	31	31	32	34	33	33	32	32	31	26.7	34																								
31-Dec	30	20	22	22	20	21	20	Z	15	M	16	19	28	31	34	35	34	31	35	38	38	37	37	37	28.2	38																								
																								26.4	26.6	27.6	27.7	26.9	28.3	26.5	25.6	25.4	26.2	27.2	28.9	29.7	29.8	28.6	28.0	27.5	27.3	27.3	26.9	27.0	26.3	26.1	26.2	Diurnal Average		
																								42	41	41	41	39	41	41	40	40	39	39	41	41	42	41	42	42	42	42	42	41	42	42	42	42	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance				UO - Unstable Operation																		
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																		



WBEA Data PC
Hourly Averages

Ozone (O₃) - ppb
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	136	20.92	20.92
21 - 50	514	79.08	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 650

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Ozone (O₃) - ppb
Anzac - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	7	0	1	1	0	3	10	21	27	9	3	2	5	6	12	20	127
21 - 50	15	0	1	2	3	9	26	56	20	15	13	10	42	82	154	65	513
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	0	2	3	3	12	36	77	47	24	16	12	47	88	166	85	640

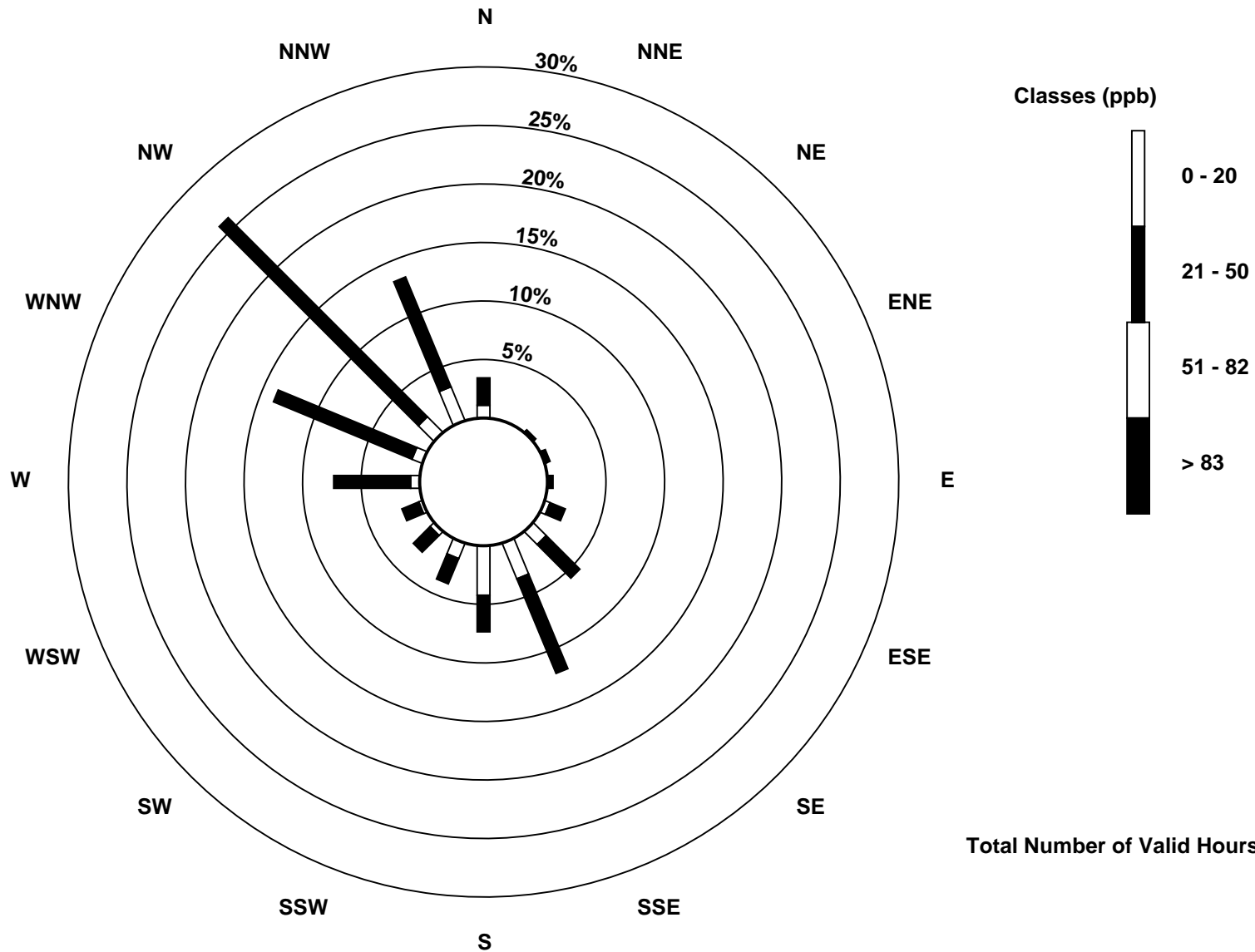
Total Number of Valid Hours: 640

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

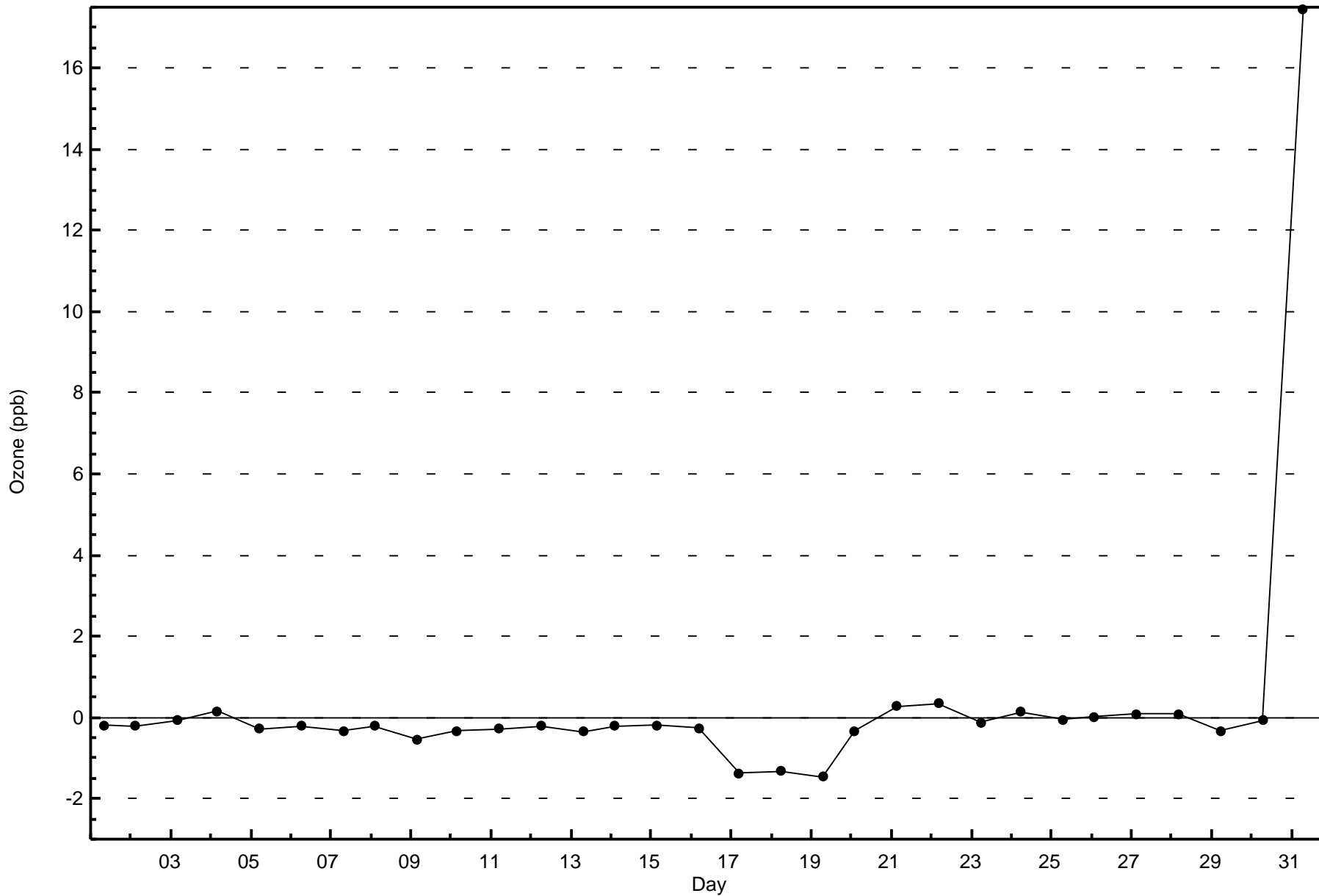
Ozone (O₃) - ppb
Anzac (AMS 14)





WBEA Data PC
Zero Responses

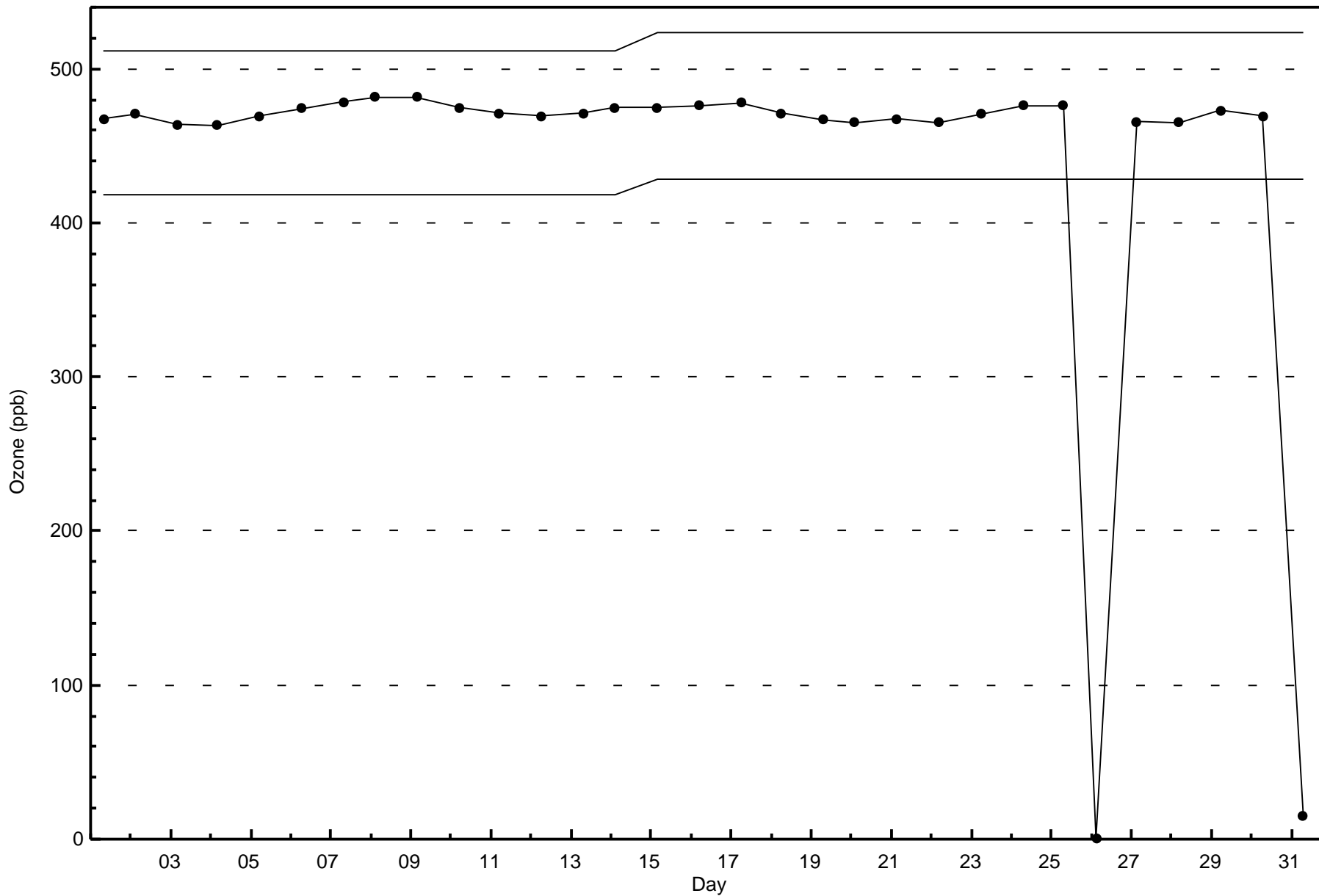
Ozone (O₃) - ppb
Anzac - December 2016





WBEA Data PC
Span Responses

Ozone (O₃) - ppb
Anzac - December 2016



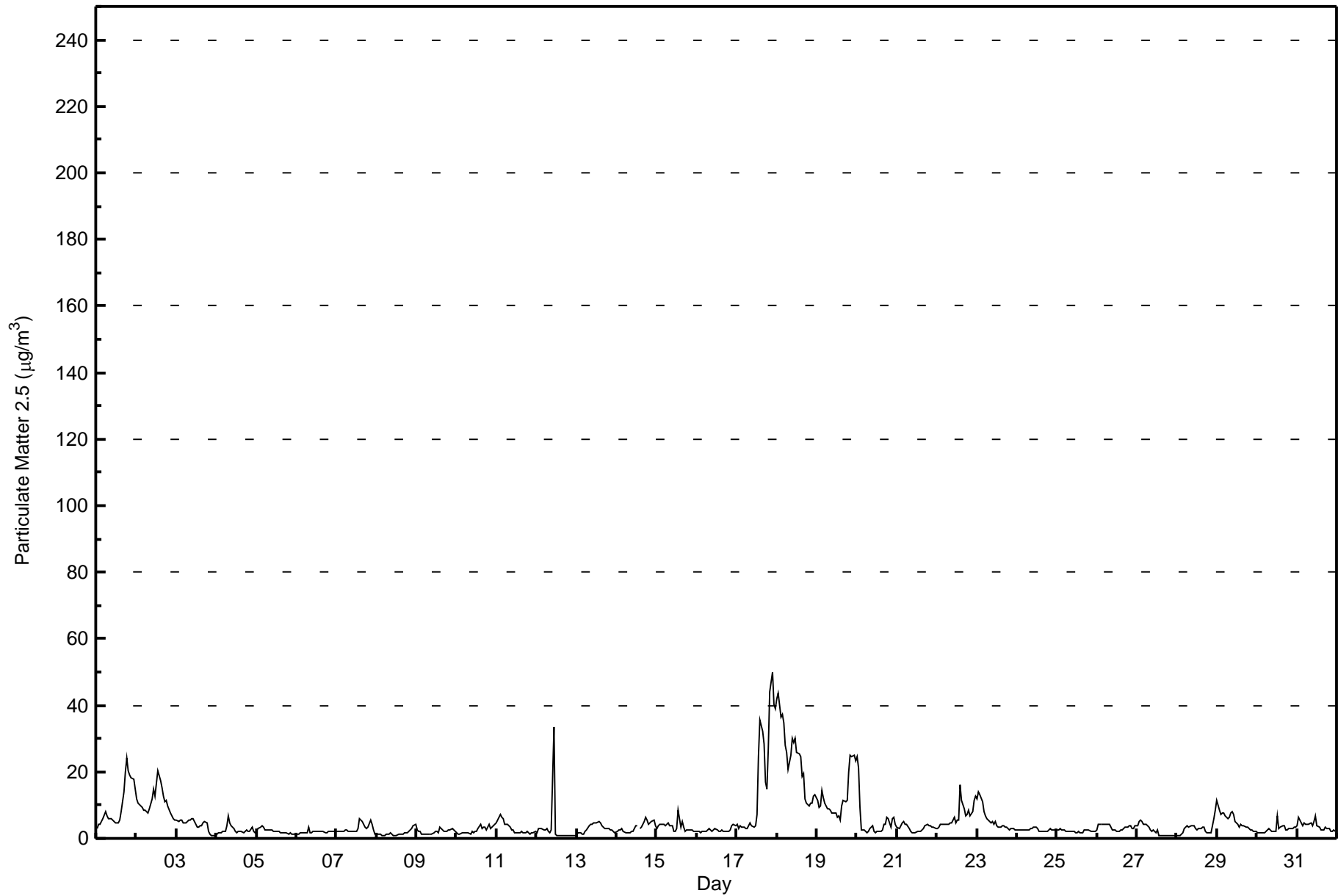


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 49.9 µg/m ³ on Dec 17 22:00 Minimum Value: 0.6 µg/m ³ on Dec 27 18:00 Maximum Diurnal Average: 6.1 µg/m ³ at hour 22 Monthly Average: 5.11 µg/m ³		Maximum Daily Average: 24.0 µg/m ³ on Dec 18 Minimum Daily Average: 1.6 µg/m ³ on Dec 8 Minimum Diurnal Average: 4.3 µg/m ³ at hour 12 Percentiles: P ₁ = 0.7 P ₁₀ = 1.5 Q ₁ = 2.0 Median = 3.0 Q ₃ = 4.8 P ₉₀ = 10.7 P ₉₉ = 36.1		Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 1 Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	2.9	4.1	4.3	5.3	5.8	7.9	6.8	5.8	5.7	5.9	5.5	4.5	4.8	4.7	5.6	8.1	13.8	20.0	24.0	20.5	19.0	18.4	17.9	14.7	9.8	24.0																						
2-Dec	12.0	10.5	10.3	9.5	8.6	8.6	8.3	7.8	8.8	11.9	14.9	12.9	16.4	20.1	17.4	15.4	12.6	10.9	11.5	9.7	7.6	7.0	6.0	5.7	11.0	20.1																						
3-Dec	5.4	5.1	5.4	5.4	4.5	4.5	4.7	5.3	5.6	6.1	5.8	5.0	3.5	3.4	3.7	3.7	4.5	5.1	4.7	2.1	1.2	0.9	0.9	1.1	4.1	6.1																						
4-Dec	1.2	1.5	1.6	1.8	2.2	2.2	3.9	6.7	4.5	3.8	2.8	2.0	1.8	2.0	2.3	1.9	1.5	2.0	2.4	2.1	2.1	3.5	2.0	1.8	2.5	6.7																						
5-Dec	2.0	3.2	3.4	3.7	3.2	2.6	2.6	2.6	2.5	2.4	2.2	2.2	2.0	2.0	1.8	1.7	1.8	1.5	1.8	1.4	1.5	1.5	1.4	1.4	2.2	3.7																						
6-Dec	1.3	1.4	1.5	1.6	1.7	1.8	1.7	3.5	1.8	1.8	2.0	2.0	2.0	2.1	1.9	2.0	2.0	1.9	1.9	2.3	1.9	2.3	2.1	2.2	1.9	3.5																						
7-Dec	2.1	2.0	2.0	2.1	2.1	2.5	2.5	2.1	1.9	2.1	1.9	1.9	2.2	2.8	6.0	5.2	4.3	3.2	2.9	3.5	5.5	4.4	2.5	1.1	2.9	6.0																						
8-Dec	1.2	1.5	1.2	1.0	1.0	1.0	1.1	1.1	1.7	1.2	0.9	0.8	0.8	1.1	1.2	1.2	1.2	1.6	1.9	2.2	2.5	2.8	3.8	4.4	1.6	4.4																						
9-Dec	2.6	2.1	1.9	1.4	1.2	1.2	1.2	1.2	1.2	1.5	1.9	1.9	2.3	1.8	3.3	3.0	2.1	2.0	2.3	2.4	2.6	3.0	2.4	1.9	2.0	3.3																						
10-Dec	1.6	1.4	1.4	1.6	1.6	1.6	1.5	1.5	1.5	2.1	1.6	2.0	2.1	2.9	4.2	3.0	3.3	3.4	2.4	4.4	3.0	3.5	3.9	4.1	2.5	4.4																						
11-Dec	4.8	6.2	7.2	6.6	5.9	4.3	4.4	3.7	3.3	2.5	2.4	1.9	1.7	1.6	1.7	2.1	1.8	1.7	1.9	1.8	1.4	1.5	1.6	2.0	3.1	7.2																						
12-Dec	1.8	2.8	3.0	3.0	2.5	2.7	2.8	2.3	1.9	2.4	33.3	1.3	0.7	0.7	0.9	0.8	0.8	0.7	0.7	0.7	0.8	0.8	0.9	0.9	2.9	33.3																						
13-Dec	1.0	1.8	1.6	1.5	1.4	2.1	2.7	3.7	4.2	4.3	4.6	4.6	4.5	5.1	4.7	3.7	3.4	3.1	3.0	2.8	2.6	2.4	1.9	1.6	3.0	5.1																						
14-Dec	2.2	2.4	2.6	2.8	2.0	1.5	1.5	1.7	1.7	1.9	2.3	3.9	3.7	C	2.8	3.4	5.2	6.3	5.6	4.1	4.6	5.3	5.3	4.0	3.3	6.3																						
15-Dec	3.2	4.0	4.1	4.2	4.1	3.7	4.1	4.8	3.7	3.8	2.1	2.3	3.1	8.6	3.4	5.1	3.3	2.3	2.6	2.5	2.4	2.7	2.1	2.1	3.5	8.6																						
16-Dec	2.0	2.2	1.9	2.1	1.9	2.1	2.2	2.8	2.4	2.3	2.6	3.0	2.5	1.9	2.0	2.6	2.3	1.9	1.9	2.0	2.4	3.9	4.0	3.9	2.5	4.0																						
17-Dec	4.2	2.8	3.6	3.3	3.3	3.0	2.8	3.8	4.6	3.9	3.3	3.8	7.3	24.6	35.7	32.3	28.5	16.8	14.7	27.3	44.0	49.9	40.1	39.0	16.8	49.9																						
18-Dec	41.8	43.8	36.6	37.5	34.6	28.2	25.9	20.6	25.1	30.2	28.9	30.0	26.0	25.2	24.5	18.8	19.7	12.0	10.7	9.8	10.5	10.8	12.7	13.0	24.0	43.8																						
19-Dec	11.3	9.3	9.7	14.3	12.5	10.6	9.0	9.0	8.4	7.8	7.6	7.6	6.5	6.9	5.7	9.7	11.5	11.1	11.6	19.7	25.1	24.8	25.2	23.4	12.4	25.2																						
20-Dec	24.6	21.3	9.5	2.7	2.5	2.3	1.5	1.9	3.0	3.9	2.0	1.6	2.3	1.9	1.9	2.6	4.3	4.4	6.5	6.1	3.4	5.7	6.2	4.0	5.3	24.6																						
21-Dec	3.6	2.8	3.8	4.8	4.9	4.4	4.3	3.1	2.0	1.8	1.6	1.9	1.9	2.2	2.2	2.4	2.8	3.7	4.1	3.8	4.0	3.5	3.5	3.2	3.2	4.9																						
22-Dec	3.2	3.5	4.0	4.4	4.4	4.4	4.2	4.4	4.5	4.7	6.3	4.5	5.6	5.6	16.0	11.5	9.0	6.9	7.2	8.4	6.8	7.9	11.4	12.8	6.7	16.0																						
23-Dec	11.9	14.2	13.3	11.1	8.2	6.7	6.0	5.4	4.8	5.1	4.3	4.9	3.9	3.4	3.5	3.8	3.8	3.6	3.2	2.7	2.8	2.9	3.0	2.7	5.6	14.2																						
24-Dec	2.6	2.6	2.6	2.7	2.5	2.6	2.6	2.5	2.9	3.1	3.5	3.2	2.8	2.2	2.2	2.1	2.1	2.1	2.3	2.6	3.1	2.5	2.7	2.4	2.6	3.5																						
25-Dec	2.4	2.7	2.8	2.6	2.4	2.3	2.2	2.1	2.3	2.1	2.2	1.9	1.9	1.9	1.9	1.9	2.4	2.3	2.5	2.4	2.2	2.1	2.2	2.2	2.2	2.8																						
26-Dec	2.7	4.3	4.3	4.3	4.4	4.4	4.4	4.4	3.4	2.7	2.6	2.6	2.3	2.3	2.5	2.7	2.8	3.2	3.6	3.6	3.7	3.0	3.1	3.7	3.4	4.4																						
27-Dec	3.9	5.0	5.7	4.9	4.2	4.4	3.7	3.4	2.7	2.0	2.4	1.8	2.4	0.8	0.6	0.7	0.7	0.6	0.7	0.6	0.7	0.7	0.8	0.8	2.2	5.7																						
28-Dec	0.9	0.8	0.9	1.9	2.8	3.6	3.7	3.5	3.9	4.0	4.0	2.9	2.7	3.1	3.1	3.3	3.3	2.1	1.5	1.6	1.6	4.0	6.1	8.4	3.1	8.4																						
29-Dec	11.5	8.7	7.2	7.7	7.4	6.8	6.1	6.3	7.4	8.2	7.2	5.2	4.2	3.5	4.1	4.0	3.9	3.6	3.3	2.8	2.7	2.3	2.3	1.9	5.3	11.5																						
30-Dec	1.8	1.5	1.6	1.6	1.7	2.0	2.6	2.8	2.5	2.3	2.0	2.0	7.0	2.9	3.3	3.6	4.0	2.7	2.4	3.0	3.1	3.2	3.4	3.5	2.8	7.0																						
31-Dec	3.8	6.5	4.8	3.9	4.6	4.2	4.4	4.3	4.6	4.0	5.1	6.6	3.9	3.4	2.4	2.4	2.6	3.4	3.1	3.0	2.2	2.2	2.6	2.2	3.8	6.6																						
																								5.7	5.9	5.3	5.2	4.9	4.5	4.4	4.3	4.3	4.6	5.5	4.3	4.3	5.0	5.6	5.3	5.3	4.7	4.8	5.2	5.7	6.1	5.9	5.7	Diurnal Average
																								41.8	43.8	36.6	37.5	34.6	28.2	25.9	20.6	25.1	30.2	33.3	30.0	26.0	25.2	35.7	32.3	28.5	20.0	24.0	27.3	44.0	49.9	40.1	39.0	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																



WBEA Data PC
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	554	74.56	74.56
6 - 15	113	15.21	89.77
16 - 25	25	3.36	93.14
26 - 80	20	2.69	95.83
> 81.0	0	0.00	95.83

Total Number of Valid Hours: 743

Total Number of Hours: 744



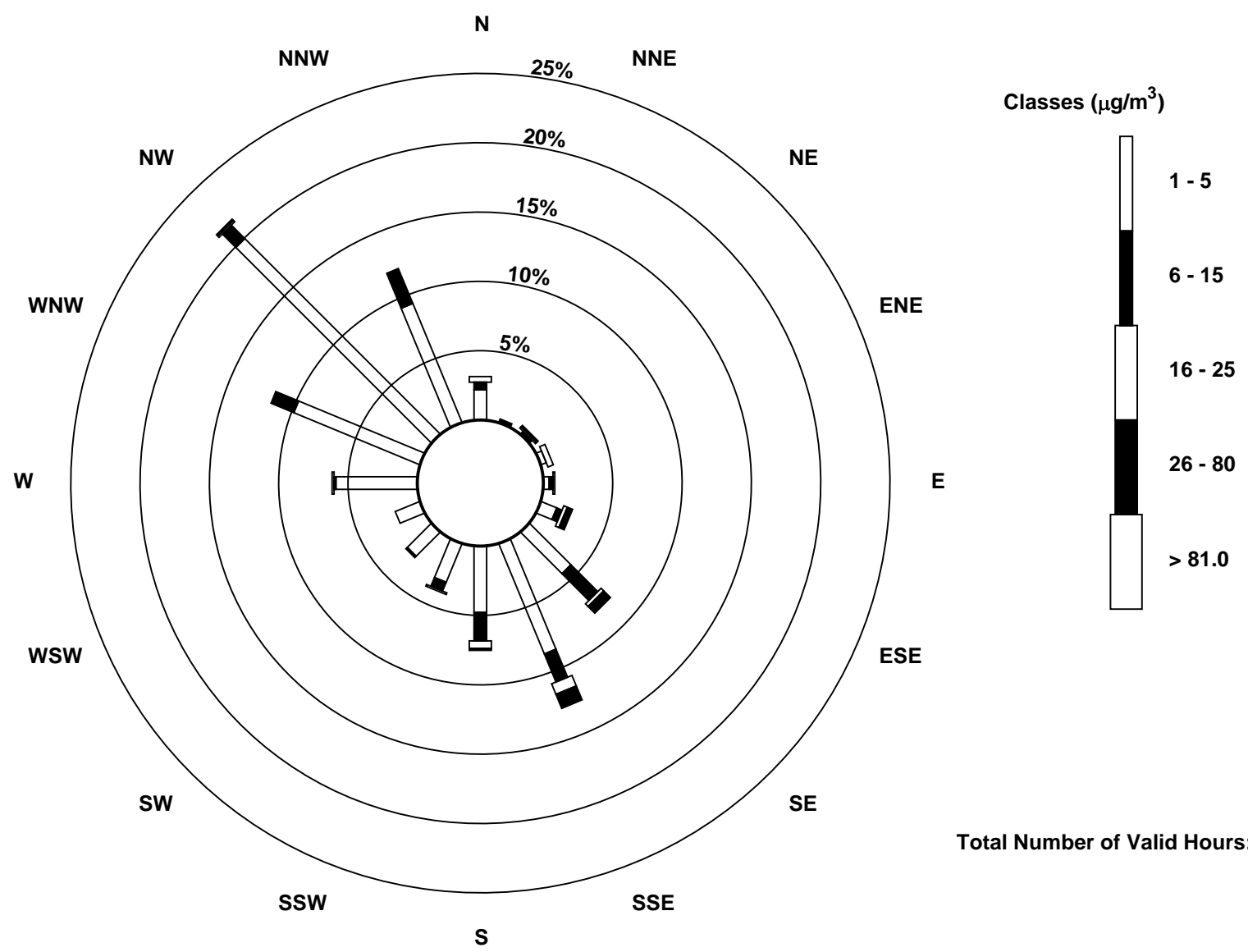
WBEA Data PC
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	16	0	1	3	3	9	31	63	35	22	18	14	43	72	146	68	544
6 - 15	4	2	1	0	2	3	20	16	15	5	1	0	1	13	10	20	113
16 - 25	3	0	1	3	1	2	2	6	4	1	0	0	1	0	1	0	25
26 - 80	0	0	1	0	0	3	5	8	1	0	0	0	0	0	1	0	19
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	23	2	4	6	6	17	58	93	55	28	19	14	45	85	158	88	701

Total Number of Valid Hours: 732

Total Number of Hours: 744



Total Number of Valid Hours: 732

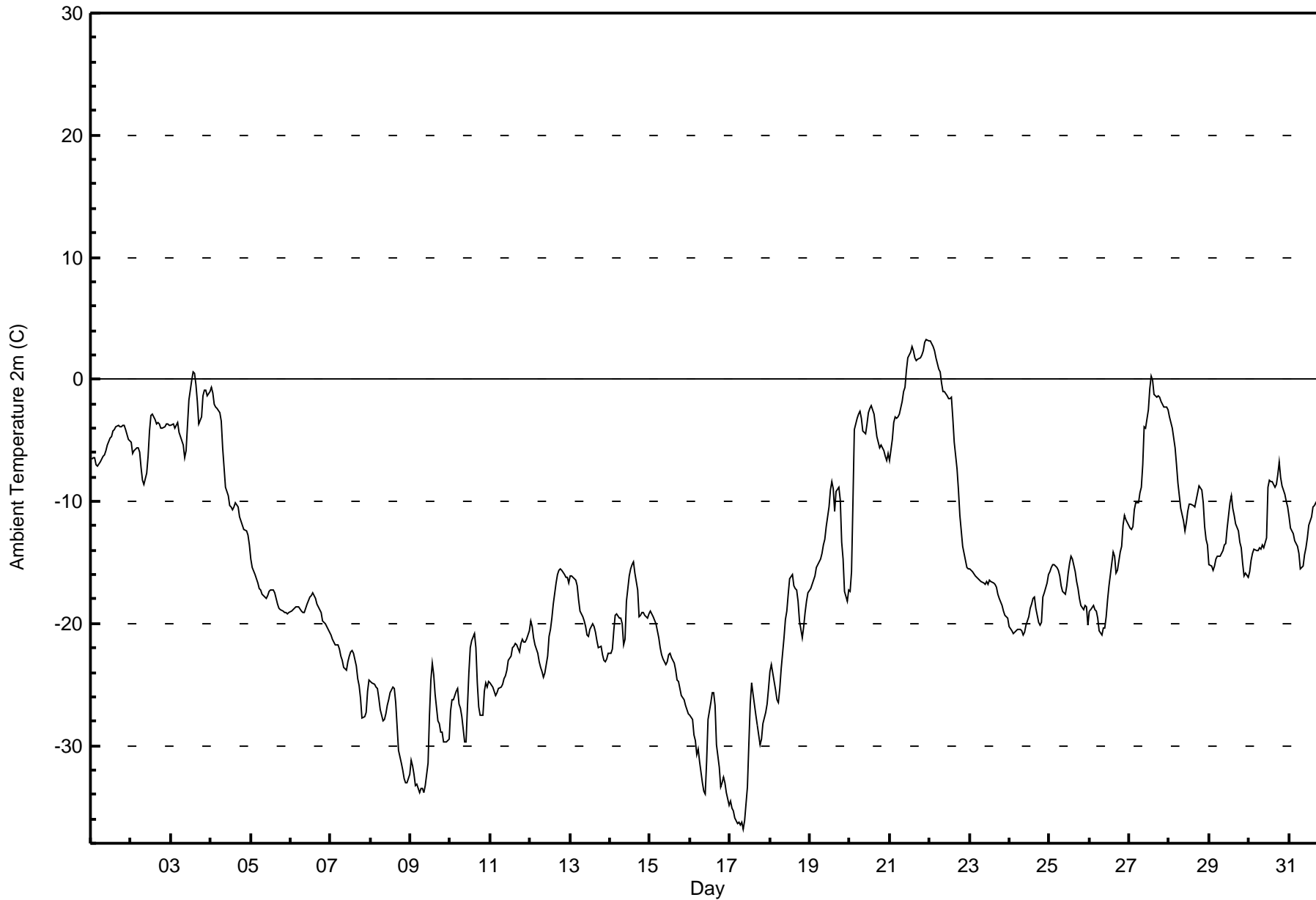


Maximum Value: 3.2 C on Dec 21 23:00 Maximum Daily Average: 0.0 C on Dec 21																						Hours in Service:	744			
Minimum Value: -36.8 C on Dec 17 09:00 Minimum Daily Average: -31.3 C on Dec 17																						Hours of Data:	744			
Maximum Diurnal Average: -13.6 C at hour 14 Minimum Diurnal Average: -17.5 C at hour 9																						Hours of Missing Data:	0			
Monthly Average: -16.01 C Percentiles: P ₁ = -35.4 P ₁₀ = -27.5 Q ₁ = -22.2 Median = -16.8 Q ₃ = -9.3 P ₉₀ = -3.1 P ₉₉ = 2.6																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.5	-6.5	-6.5	-6.9	-7.1	-6.7	-6.5	-6.3	-6.2	-5.9	-5.4	-4.9	-4.7	-4.3	-4.1	-3.9	-3.8	-3.9	-3.9	-3.7	-3.8	-4.1	-4.9	-5.0	-5.2	-3.7
2-Dec	-5.2	-6.1	-5.9	-5.6	-5.6	-6.0	-7.2	-8.3	-8.7	-7.7	-6.3	-4.2	-2.9	-2.9	-3.3	-3.6	-3.6	-3.6	-4.0	-4.0	-3.8	-3.7	-3.7	-3.8	-5.0	-2.9
3-Dec	-3.8	-3.7	-3.9	-3.8	-3.5	-4.4	-4.7	-5.3	-6.4	-5.9	-3.7	-1.7	-0.1	0.6	0.5	-0.5	-1.8	-3.7	-3.1	-1.3	-0.9	-0.9	-1.3	-0.9	-2.7	0.6
4-Dec	-0.7	-1.1	-2.0	-2.3	-2.4	-2.8	-3.4	-5.6	-7.2	-8.8	-9.5	-10.4	-10.5	-10.7	-10.5	-10.1	-10.5	-11.2	-11.6	-12.0	-12.3	-12.4	-12.7	-13.6	-8.1	-0.7
5-Dec	-14.8	-15.4	-16.0	-16.4	-16.7	-17.1	-17.3	-17.6	-17.8	-17.9	-17.7	-17.4	-17.3	-17.2	-17.5	-17.9	-18.4	-18.7	-18.9	-19.0	-19.1	-19.1	-19.2	-19.1	-17.6	-14.8
6-Dec	-19.0	-18.9	-18.8	-18.7	-18.6	-18.7	-18.9	-19.1	-19.1	-18.7	-18.4	-17.8	-17.7	-17.5	-17.8	-17.9	-18.4	-18.9	-19.1	-19.7	-20.0	-20.0	-20.5	-20.7	-18.9	-17.5
7-Dec	-21.0	-21.3	-21.5	-21.7	-21.7	-22.1	-22.7	-23.0	-23.6	-23.8	-23.1	-22.7	-22.3	-22.2	-22.5	-23.5	-24.6	-25.1	-26.1	-27.7	-27.6	-27.3	-25.5	-24.6	-23.6	-21.0
8-Dec	-24.7	-24.9	-25.0	-25.2	-25.3	-26.1	-27.1	-28.0	-27.9	-27.4	-26.7	-26.3	-25.6	-25.2	-25.4	-26.4	-28.4	-30.4	-31.4	-32.0	-32.7	-33.0	-33.0	-32.3	-27.9	-24.7
9-Dec	-31.2	-31.7	-32.4	-33.2	-33.2	-33.8	-33.5	-33.5	-33.8	-33.3	-31.4	-27.5	-24.6	-23.3	-24.2	-25.7	-27.9	-28.2	-28.9	-28.9	-29.7	-29.7	-29.6	-29.4	-29.9	-23.3
10-Dec	-27.2	-26.2	-26.3	-25.6	-25.4	-26.5	-26.9	-27.6	-29.7	-29.7	-26.8	-24.0	-22.0	-21.4	-20.8	-22.0	-24.9	-26.8	-27.5	-27.5	-25.6	-24.9	-25.2	-24.7	-25.6	-20.8
11-Dec	-24.9	-25.2	-25.6	-25.9	-25.6	-25.3	-25.2	-25.0	-24.5	-24.2	-23.8	-23.1	-22.6	-22.0	-21.8	-21.7	-21.8	-22.3	-21.7	-21.2	-21.5	-21.5	-21.3	-20.6	-23.3	-20.6
12-Dec	-19.8	-20.3	-21.1	-21.8	-22.5	-23.1	-23.6	-23.9	-24.4	-24.1	-22.7	-21.0	-20.5	-19.6	-18.3	-16.7	-16.0	-15.7	-15.6	-15.6	-16.0	-16.2	-16.2	-16.7	-19.6	-15.6
13-Dec	-16.2	-16.1	-16.4	-16.5	-16.9	-18.0	-19.0	-19.4	-19.8	-20.3	-21.0	-21.1	-20.5	-20.0	-20.2	-20.7	-21.4	-22.0	-21.9	-22.5	-23.0	-23.1	-22.9	-22.4	-20.1	-16.1
14-Dec	-22.4	-22.2	-20.6	-19.3	-19.3	-19.6	-19.6	-20.0	-21.8	-21.3	-18.2	-16.1	-15.5	-15.2	-15.0	-15.9	-17.2	-19.4	-19.3	-19.1	-19.1	-19.3	-19.5	-19.2	-18.9	-15.0
15-Dec	-18.9	-19.2	-19.4	-20.0	-20.6	-21.2	-21.9	-22.6	-22.9	-23.4	-23.1	-22.5	-22.4	-22.8	-23.2	-23.8	-24.6	-24.7	-25.3	-25.9	-26.2	-26.7	-27.0	-27.4	-23.2	-18.9
16-Dec	-27.5	-27.9	-29.2	-29.6	-30.7	-30.3	-31.3	-33.1	-33.8	-34.0	-31.3	-27.8	-26.5	-25.7	-25.7	-26.7	-29.9	-31.8	-33.4	-33.1	-32.6	-33.0	-33.9	-34.9	-30.6	-25.7
17-Dec	-34.6	-35.2	-35.4	-35.9	-36.4	-36.2	-36.5	-36.2	-36.8	-36.1	-33.4	-29.9	-26.6	-24.8	-25.8	-27.5	-28.4	-29.1	-29.9	-29.4	-28.2	-27.2	-26.6	-25.3	-31.3	-24.8
18-Dec	-23.9	-23.3	-24.7	-25.4	-26.2	-26.5	-25.3	-23.8	-21.2	-19.7	-19.0	-17.7	-16.3	-16.0	-16.9	-17.1	-17.2	-18.1	-19.8	-21.2	-20.2	-19.1	-18.2	-17.4	-20.6	-16.0
19-Dec	-17.1	-16.8	-16.4	-16.1	-15.5	-15.2	-14.8	-14.3	-13.6	-13.1	-12.1	-10.5	-9.1	-8.4	-9.0	-10.8	-9.1	-8.9	-9.9	-13.3	-14.8	-17.4	-18.2	-17.3	-13.4	-8.4
20-Dec	-17.4	-15.7	-10.1	-4.1	-3.2	-2.9	-2.7	-3.1	-4.2	-4.4	-3.7	-2.8	-2.3	-2.1	-2.8	-3.8	-4.7	-5.1	-5.6	-5.4	-5.8	-6.3	-6.6	-6.1	-5.5	-2.1
21-Dec	-6.6	-4.9	-3.6	-3.1	-3.2	-3.1	-2.9	-1.8	-1.0	-0.6	0.8	1.7	2.3	2.6	2.3	1.7	1.6	1.6	1.8	2.0	2.4	3.0	3.2	3.2	0.0	3.2
22-Dec	3.1	2.9	2.6	2.4	1.7	0.9	0.6	-0.4	-1.0	-1.0	-1.3	-1.6	-1.5	-1.4	-3.2	-5.1	-7.4	-9.1	-11.2	-12.5	-13.7	-14.9	-15.4	-15.5	-4.2	3.1
23-Dec	-15.5	-15.6	-15.8	-16.1	-16.2	-16.4	-16.4	-16.5	-16.7	-16.8	-16.6	-16.8	-16.4	-16.5	-16.7	-16.8	-17.0	-17.6	-17.9	-18.6	-19.0	-19.4	-19.4	-19.6	-17.1	-15.5
24-Dec	-20.2	-20.6	-20.8	-20.7	-20.6	-20.5	-20.5	-20.6	-20.9	-20.7	-20.1	-19.5	-18.7	-18.4	-18.0	-17.8	-18.8	-19.9	-20.1	-19.9	-17.9	-17.5	-16.7	-16.0	-19.4	-16.0
25-Dec	-15.8	-15.4	-15.2	-15.2	-15.4	-15.6	-16.1	-16.9	-17.4	-17.6	-16.9	-15.9	-15.1	-14.5	-14.7	-15.7	-16.6	-17.2	-18.0	-18.5	-18.8	-18.5	-18.7	-20.2	-16.7	-14.5
26-Dec	-19.0	-18.9	-18.5	-18.9	-18.9	-19.5	-20.6	-20.9	-20.4	-20.3	-19.5	-18.1	-16.9	-15.0	-14.1	-14.5	-15.8	-15.7	-14.1	-13.7	-11.9	-11.1	-11.4	-11.8	-16.7	-11.1
27-Dec	-12.2	-12.3	-12.1	-10.7	-10.1	-10.1	-9.3	-8.9	-7.0	-3.8	-4.0	-2.4	-0.7	0.3	-0.1	-1.2	-1.4	-1.4	-1.5	-1.8	-2.0	-2.3	-2.3	-2.4	-5.0	0.3
28-Dec	-3.0	-3.6	-4.0	-5.6	-7.1	-8.5	-9.5	-10.5	-11.6	-12.4	-11.7	-10.9	-10.3	-10.2	-10.3	-10.4	-9.8	-9.3	-8.7	-9.0	-10.1	-12.1	-13.1	-13.6	-9.4	-3.0
29-Dec	-15.2	-15.2	-15.7	-15.3	-14.8	-14.5	-14.5	-14.2	-14.0	-13.6	-13.4	-12.2	-10.1	-9.5	-10.6	-11.1	-11.8	-12.4	-13.4	-13.7	-15.0	-16.0	-15.9	-16.3	-13.7	-9.5
30-Dec	-15.8	-14.8	-14.2	-13.9	-14.1	-14.0	-13.8	-13.9	-13.6	-13.8	-12.9	-8.8	-8.3	-8.3	-8.4	-8.9	-8.6	-7.8	-6.8	-8.0	-8.8	-9.4	-10.0	-10.5	-11.1	-6.8
31-Dec	-11.2	-12.2	-12.6	-13.2	-13.4	-13.7	-14.2	-15.5	-15.4	-14.4	-13.8	-13.0	-11.9	-11.3	-10.5	-10.3	-10.1	-10.4	-11.0	-10.3	-10.2	-10.2	-10.3	-10.8	-12.1	-10.1
																						Diurnal Average				
																						Diurnal Maximum				



WBEA Data PC
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature 2m (AT 2m) - C
Anzac - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	251	33.74	33.74
-20 - 0	469	63.04	96.77
0 - 10	24	3.23	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

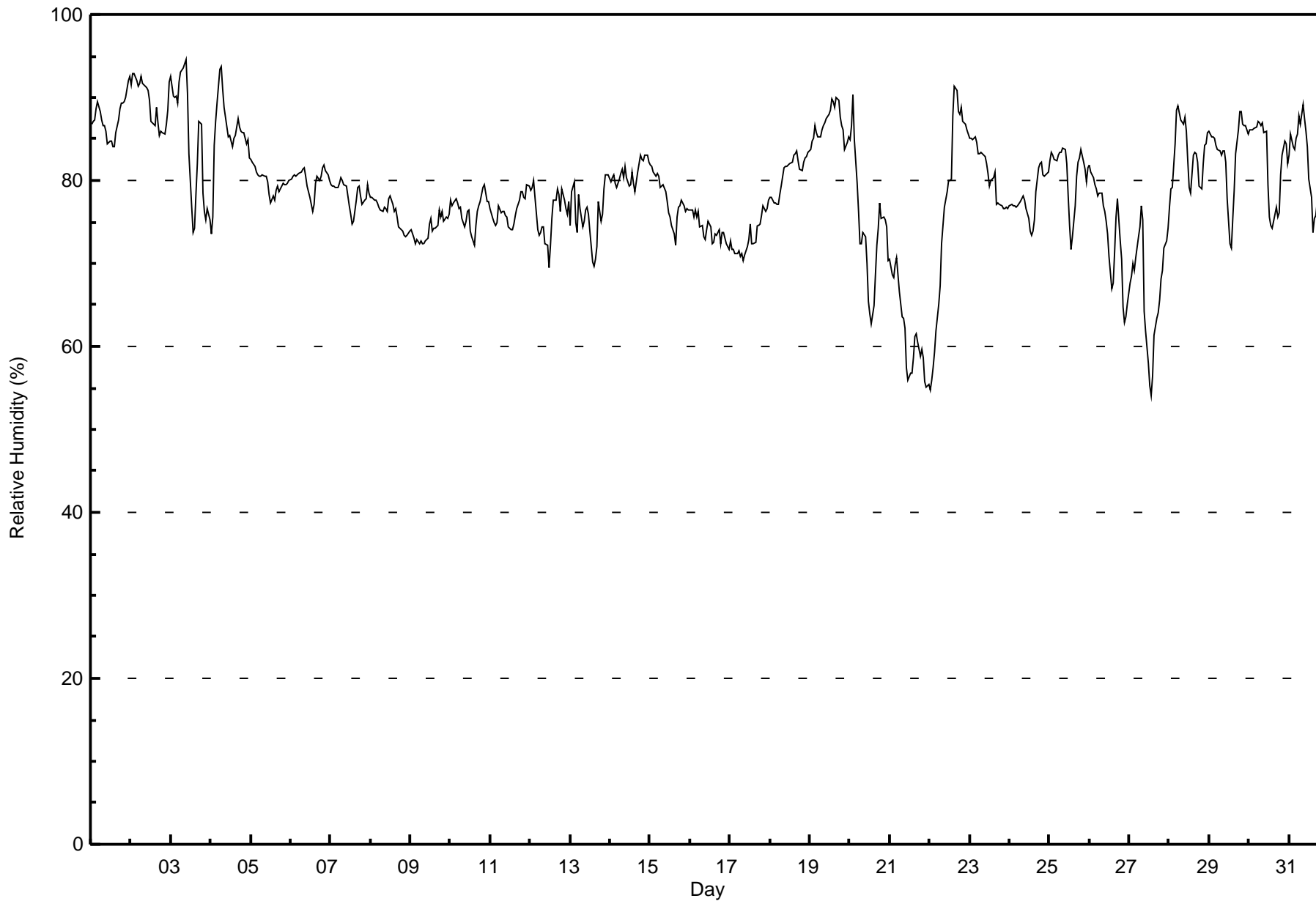
Anzac - December 2016

Maximum Value: 95 % on Dec 3 10:00 Maximum Daily Average: 89.4 % on Dec 2																		Hours in Service: 744 Hours of Data: 744																																																	
Minimum Value: 54 % on Dec 27 14:00 Minimum Daily Average: 61.9 % on Dec 21 Maximum Diurnal Average: 80.0 % at hour 6 Minimum Diurnal Average: 74.9 % at hour 14 Monthly Average: 78.6 % Percentiles: P ₁ = 56 P ₁₀ = 71 Q ₁ = 75 Median = 79 Q ₃ = 83 P ₉₀ = 87 P ₉₉ = 93																		Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																											
1-Dec	87	87	87	89	90	88	87	87	87	86	84	85	85	84	84	86	87	89	89	89	89	90	92	93	87.5	93																																									
2-Dec	91	93	93	92	91	92	92	92	92	91	91	90	87	87	87	89	87	85	86	86	86	87	88	92	89.4	93																																									
3-Dec	93	90	90	90	89	92	93	94	94	95	91	83	77	74	74	78	82	87	87	78	76	75	77	75	84.7	95																																									
4-Dec	74	76	84	87	89	93	94	91	89	88	85	85	84	85	85	87	87	86	86	86	84	85	83	85.7	94																																										
5-Dec	83	82	82	81	81	81	81	81	80	80	80	78	77	78	78	79	79	79	79	80	80	80	80	80	79.8	83																																									
6-Dec	80	81	81	81	81	81	81	81	81	80	79	78	77	76	77	80	81	80	80	82	82	81	81	80	80.1	82																																									
7-Dec	79	79	79	79	79	80	80	80	80	79	78	77	76	75	75	78	79	79	78	77	78	78	80	79	78.4	80																																									
8-Dec	78	78	78	78	77	77	76	76	77	77	76	78	78	77	76	77	76	74	74	74	73	73	73	74	76.0	78																																									
9-Dec	74	74	73	72	73	72	73	72	72	73	73	75	75	74	74	74	75	76	76	76	75	76	75	76	74.1	76																																									
10-Dec	78	77	77	78	77	77	77	75	74	75	76	76	74	73	72	75	76	77	77	79	79	79	77	77	76.4	79																																									
11-Dec	77	75	75	75	75	77	76	76	76	76	76	74	74	74	75	76	77	78	79	79	78	78	79	79	76.3	79																																									
12-Dec	79	79	80	78	74	73	74	74	74	72	72	70	72	76	78	78	79	78	76	79	78	77	76	77	76.0	80																																									
13-Dec	75	79	80	75	74	78	77	74	75	76	77	76	74	70	70	70	72	78	75	76	79	81	81	81	75.9	81																																									
14-Dec	80	80	81	80	79	80	81	81	80	82	80	79	80	81	80	79	81	82	83	83	82	83	83	82	80.9	83																																									
15-Dec	82	82	81	81	81	81	79	79	79	79	78	76	76	75	74	72	76	77	77	78	77	76	77	76	77.7	82																																									
16-Dec	76	76	76	76	76	76	74	75	73	73	74	75	74	72	73	74	73	74	72	74	74	73	72	72	74.1	76																																									
17-Dec	73	72	72	71	71	71	71	71	70	71	72	73	75	72	72	72	74	75	75	76	77	76	77	78	73.2	78																																									
18-Dec	78	78	77	77	77	77	78	79	81	82	82	82	82	82	83	83	84	82	81	81	82	83	83	83	80.8	84																																									
19-Dec	84	85	85	87	86	85	85	86	87	87	87	88	88	90	89	89	90	90	88	87	86	84	85	85	86.7	90																																									
20-Dec	85	87	90	85	80	76	72	72	74	73	70	65	64	63	65	69	72	74	77	75	76	75	74	70	74.4	90																																									
21-Dec	70	69	68	70	71	69	67	64	63	62	58	56	57	57	59	61	62	60	59	60	59	56	55	55	61.9	71																																									
22-Dec	55	56	58	59	62	65	67	72	75	77	79	80	80	80	88	91	91	88	88	89	87	87	86	86	76.9	91																																									
23-Dec	85	85	85	85	84	83	83	83	83	82	81	79	80	80	81	77	77	77	77	77	77	77	77	77	80.8	85																																									
24-Dec	77	77	77	77	77	77	77	78	78	78	77	75	74	73	74	75	79	82	82	82	81	81	81	81	77.9	82																																									
25-Dec	82	83	83	82	82	83	83	83	84	84	82	78	75	72	73	77	80	82	83	84	82	81	80	82	80.9	84																																									
26-Dec	82	81	80	80	79	78	78	78	77	76	75	73	71	67	68	71	76	78	73	71	65	63	64	65	73.7	82																																									
27-Dec	68	68	70	69	71	73	74	77	75	64	62	58	55	54	56	61	63	64	66	68	69	72	73	74	66.9	77																																									
28-Dec	77	79	79	84	88	89	88	87	87	88	86	82	79	78	83	83	83	82	79	79	82	84	84	86	83.3	89																																									
29-Dec	86	85	85	85	84	84	83	83	84	84	82	78	72	72	75	79	83	86	88	88	87	87	87	86	83.0	88																																									
30-Dec	86	86	86	86	87	87	87	87	87	86	86	79	76	75	74	76	77	76	76	81	83	85	84	82	82.2	87																																									
31-Dec	83	86	84	84	85	86	88	87	89	87	86	84	80	78	74	75	76	77	79	77	82	81	82	82	82.2	89																																									
																		79.2		79.5		79.9		79.8		79.7		80.0		80.0		79.9		80.0		79.5		78.6		77.1		75.7		74.9		75.6		77.2		78.5		79.1		78.9		79.0		78.9		78.7		78.9		78.9		Diurnal Average	
																		93		93		93		92		91		93		94		94		94		95		91		90		88		90		89		91		91		90		89		89		89		90		92		93		Diurnal Maximum	



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Anzac - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	19	2.55	2.55
60 - 80	414	55.65	58.20
80 - 100	311	41.80	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (SW) - %

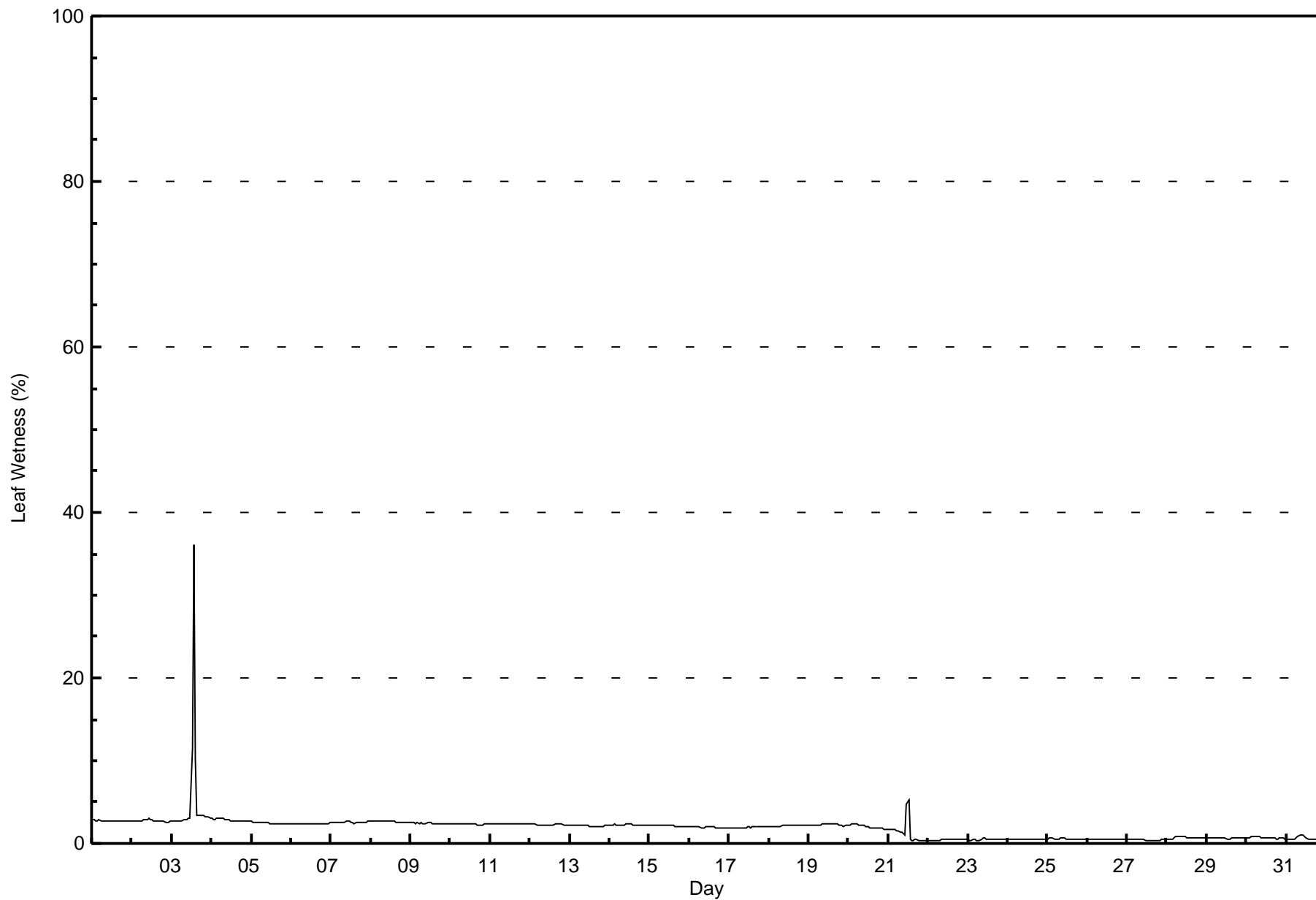
Anzac - December 2016

Maximum Value: 36 % on Dec 3 14:00 Maximum Daily Average: 5.0 % on Dec 3																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 0 % on Dec 27 14:00 Minimum Daily Average: 0.4 % on Dec 22 Maximum Diurnal Average: 2.8 % at hour 14 Minimum Diurnal Average: 1.7 % at hour 19 Monthly Average: 1.8 % Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 3																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.8	3
2-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.7	3
3-Dec	3	3	3	3	3	3	3	3	3	3	3	3	11	36	10	3	3	3	3	3	3	3	3	3	5.0	36
4-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.8	3
5-Dec	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3
6-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.4	2
7-Dec	2	2	2	2	2	2	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3	3	2.5	3
8-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	3	2.6	3
9-Dec	3	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2.4	3
10-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.4	2
11-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2
12-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2
13-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2
14-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2
15-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2
16-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	2
17-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.9	2
18-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2
19-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2
20-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	2
21-Dec	2	2	2	2	2	2	1	1	1	1	1	5	5	1	0	0	0	0	0	0	0	0	0	0	1.3	5
22-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0.4	1
23-Dec	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.5	1
24-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0.6	1
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0.5	1
27-Dec	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
28-Dec	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
29-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
30-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
31-Dec	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	1	0	0	1	0.6	1
1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.9 2.2 2.8 1.9 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7																								Diurnal Average		
3 3 3 3 3 3 3 3 3 3 3 5 11 36 10 3 3 3 3 3 3 3 3 3 3 3 3																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Leaf Wetness (SW) - %
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Anzac - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	10	1.34	1.34
0.4 - 0.5	132	17.74	19.09
0.6 - 0.7	87	11.69	30.78
0.8 - 1.4	26	3.49	34.27
1.5 - 10	485	65.19	99.46
> 10	3	0.40	99.87

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Anzac - December 2016

Maximum Speed: 23 km/h on Dec 21 12:00	Maximum Daily Speed Average: 17.5 km/h on Dec 21	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 29 04:00	Minimum Daily Speed Average: 2.1 km/h on Dec 19	Hours of Data: 733
Maximum Diurnal Speed Average: 5.3 km/h at hour 13	Minimum Diurnal Speed Average: 3.8 km/h at hour 9	Hours of Missing Data: 11
Monthly Average Velocity: 4.3 km/h 290.3 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 6 Median = 9 Q ₃ = 13 P ₉₀ = 16 P ₉₉ = 20	Percent Operational Time: 98.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S7	S5	S6	SSW5	SSW3	SW5	SSW4	SSE4	SSE5	SSE6	SSE4	S2	SSW2	S4	S3	S3	S3	NW3	W3	S3	S3	S4	SSW4	SSW4	S3.6	S7
2-Dec	S5	SSW6	S6	S7	S6	S6	SSE5	SSE6	SSE9	SSE10	SE9	SSE9	SSE11	SSE14	SSE13	SSE14	S15	S16	S17	S16	S15	S14	SSE13	SSE13	SSE10.5	S17
3-Dec	SSE12	SSE11	SSE10	S9	S9	SSE8	S10	S8	S6	S6	S8	SSW7	WSW14	WSW16	SW14	SW11	SW9	SSW6	SSW5	SW11	SW9	WSW10	SW8	WSW9	SSW8.1	WSW16
4-Dec	W11	W9	W9	WNW9	WNW9	WNW9	NW10	NNW14	NNW15	NNW15	NNW15	NNW15	NNW14	NNW15	NNW12	NNW13	NW14	NW15	NW15	NW15	NW14	NNW16	NNW15	NW14	NW12.2	NNW16
5-Dec	NW16	NW18	NW17	NW16	NW17	NW17	NW16	NW17	NW18	NW18	NW17	NW16	NW16	NW15	NW16	NW16	NW16	NW16	NW16	NW16	NW16	NW16	NW16	NW16	NW16.6	NW18
6-Dec	NW17	NW16	NW15	NW15	NW14	NW13	NW14	NW13	NW11	NW12	NW13	NW13	NW14	NW14	NW14	NW12	NW12	NW13	NW11	NW9	NW10	NNW11	NNW12	NNW12	NW12.7	NW17
7-Dec	NNW13	NNW11	NNW12	NW12	NW11	NW9	NW10	NW11	NW10	NW10	NNW10	NNW12	NNW11	NNW13	NNW11	NNW8	NNW6	N6	NNW5	NNW5	NNW5	NW5	NNW7	NNW6	NNW9.0	NNW13
8-Dec	NNW5	NW4	NNW5	NNW4	NNW4	NNW5	NNW4	NNW4	NW3	NNW4	N5	N5	NNW4	NW5	NW5	NNW3	NW2	NNW3	AF	W1	AF	WSW1	AF	SW1	NNW3.5	NNW5
9-Dec	SSE2	SSE2	S2	S3	SSW2	SW2	SSW2	AF	SW1	S2	S3	SSW1	S0	ENE1	E4	SE5	SE5	SSE5	SSE5	S6	S5	S6	SSW5	SSW5	S2.9	S6
10-Dec	SW7	SSW6	SSW6	SSW6	SSW6	SSW5	SW6	AF	ENE1	AF	AF	AF	AF	E2	S4	S3	S1	W2	NNW3	WNV6	WNV9	WNV10	NW14	WNV14	WSW3.6	NW14
11-Dec	WNV16	WNV16	WNV15	WNV16	WNV18	WNV15	WNV14	WNV14	WNV16	WNV16	WNV15	WNV17	WNV16	WNV15	WNV14	NW13	NW13	NW10	NW12	WNV13	NW12	NW10	WNV9	NW15	WNV14.2	WNV18
12-Dec	NW15	NW12	NW10	NW11	NNW12	NW12	NW12	NW15	NW15	NW14	NW15	NW16	NW11	NW8	NW9	NW14	NW14	NW15	NW15	NW12	NW13	NW14	NW14	NW15	NW13.0	NW16
13-Dec	NW17	NW18	NW18	NW18	NW16	N16	N16	NNW16	NNW16	NNW12	N12	NNW11	NNW10	NNW13	NNW11	NW10	NNW9	NW8	NW9	NW8	NW8	NW8	NW8	NW8	NNW12.0	NW18
14-Dec	NW7	NW7	NW8	NW10	WNV9	WNV8	WNV8	W6	SW4	SW7	WSW5	WNV11	WNV11	NW11	NW10	NNW10	NNW8	NNW7	N6	N5	NW6	WNV6	WNV7	NW7	NW6.7	WNV11
15-Dec	NW8	NW9	NW9	NW8	NW10	NW11	NW9	NW7	WNV8	WNV9	NW10	NW8	NW9	NW9	NNW9	NW7	NW8	NW11	NW10	NW8	NW9	NW9	NW9	NW10	NW8.8	NW11
16-Dec	NW9	NW9	NW5	NW6	NW6	NW6	NW5	WNV4	WNV4	W4	W4	WNV5	WNV6	WNV5	WNV4	WNV2	SE1	SSE2	SSE2	SSE2	S3	S5	S4	AF	WNV3.1	NW9
17-Dec	S2	S1	S2	SW2	WSW3	SW3	SW3	SSW2	WSW2	SW3	SSW3	S3	S1	ESE3	SE5	SE6	SSE7	SSE6	SSE7	SSE7	SSE8	SSE8	SSE6	SSE7	SSE3.6	SSE8
18-Dec	SSE6	SE4	ESE4	SE4	S5	SSE3	SE2	SSE2	SE2	ESE0	NE2	AF	ESE1	ENE3	ENE4	E4	ENE3	NE2	NNE2	N1	SE1	ESE4	SE5	SE7	ESE2.4	SE7
19-Dec	SE8	SE8	SE9	SE11	SE11	SE14	SE13	SE12	SE11	SE9	SE7	SE6	E4	NNE4	NNW10	NW13	NW17	NW19	NNW14	N9	N5	NE2	ESE3	SE3	ESE2.1	NW19
20-Dec	SSE5	S5	W9	W12	W16	WNV19	WNV14	WNV15	W12	W10	W12	W12	W13	W11	WNV10	WNV11	W10	WNV8	WNV9	WNV10	WNV10	WNV11	WNV10	WNV10	W10.4	WNV19
21-Dec	W10	W14	W15	W17	WNV20	WNV22	W21	W22	W20	W16	W19	W23	W22	WNV20	WNV18	W18	W16	W16	W18	W14	W12	W15	W17	W16	W17.5	W23
22-Dec	W16	W17	W15	W17	W17	W16	WNV16	WNV14	WNV14	NW14	WNV11	WNV9	WNV7	NW7	N9	N9	NNW8	NW8	NW8	NW9	NNW9	NW8	NNW8	NNW8	WNV10.3	W17
23-Dec	NNW7	NNW7	NNW7	NNW6	N5	NNW4	NNW5	N6	N5	NNW3	N3	N5	N4	N5	N4	NE4	E8	ESE6	SE8	ESE8	SE9	ESE9	SE9	ESE8	NE2.6	ESE9
24-Dec	ESE10	ESE10	ESE9	SE9	SE8	SE8	SE10	SE8	SSE9	SE7	SE7	SE8	SE9	SE7	SE7	SE8	ESE7	SE7	SE7	SE8	SSE8	SSE8	SSE7	SSE6	SE7.8	ESE10
25-Dec	SSE7	SSE7	SSE8	SSE9	SSE9	SSE8	SSE8	SSE9	SSE9	SSE10	SSE11	SE8	SSE6	SE7	SE10	SE8	SSE9	SSE10	SSE7	SSE8	SSE8	SSE8	SSE6	SSE4	SSE8.0	SSE11
26-Dec	SSE6	S6	SSE8	SSE7	SSE5	SSE11	SSE10	SSE11	SSE9	SSE11	SSE11	SSE11	SSE11	SSE10	SSE9	SSE11	SSE8	SSE11	SSE13	S10	SSW11	S12	S12	SSE10	SSE9.6	SSE13
27-Dec	SSE8	SSE10	SE7	S10	SSE8	S10	S10	SSW9	SW11	SW17	WSW20	WSW19	WSW15	W15	W14	W13	W14	W14	WNV13	WNV13	WNV13	WNV12	WNV11	NW13	WSW8.6	WSW20
28-Dec	NW13	NW11	NW10	NNW7	NNW9	NNW10	NNW9	NNW8	NNW9	NNW11	NNW10	NW11	NW10	NW9	NNW8	NW7	NW8	NW10	NW10	NNW10	NNW8	N6	NNW4	NNW3	NW8.6	NW13
29-Dec	NNW3	NNW2	WNV1	WNV0	ESE2	E4	ESE5	SE5	SE8	SE8	SSE8	SSE8	SSE7	ENE3	SE4	SSE7	SE6	SE8	SSE8	SSE8	SE5	ESE4	SE4	SE3	SE4.3	SE8
30-Dec	SSW4	S7	N1	NNW3	NW3	WNV4	WSW1	SSW1	WSW5	SSW3	NW4	WNV11	WNV12	WNV13	WNV13	WSW9	WSW9	W10	WNV16	WNV13	NW14	NW13	NW10	NW9	WNV6.6	WNV16
31-Dec	NW10	NNW9	NNW9	NNW9	WNV7	WNV7	NW6	N5	N6	NW6	NW7	NW9	NW11	NW12	NW14	NNW11	NNW10	NW11	WNV11	WNV12	WNV15	WNV17	WNV19	WNV16	NW9.9	WNV19

WNV4.0	WNV3.9	WNV4.1	WNV4.4	WNV4.7	WNV4.4	WNV3.9	WNV4.1	WNV3.8	WNV3.8	WNV3.9	WNV5.2	WNV5.3	WNV5.2	NW4.8	WNV4.1	WNV3.9	WNV4.3	WNV4.3	WNV4.2	WNV4.3	WNV4.2	WNV4.4	WNV4.7	Diurnal Average
NW17	NW18	NW18	NW18	WNV20	WNV22	W21	W22	WNV20	NW18	WSW20	W23	W22	WNV20	WNV18	W18	NW17	NW19	W18	S16	NW16	WNV17	WNV19	WNV16	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

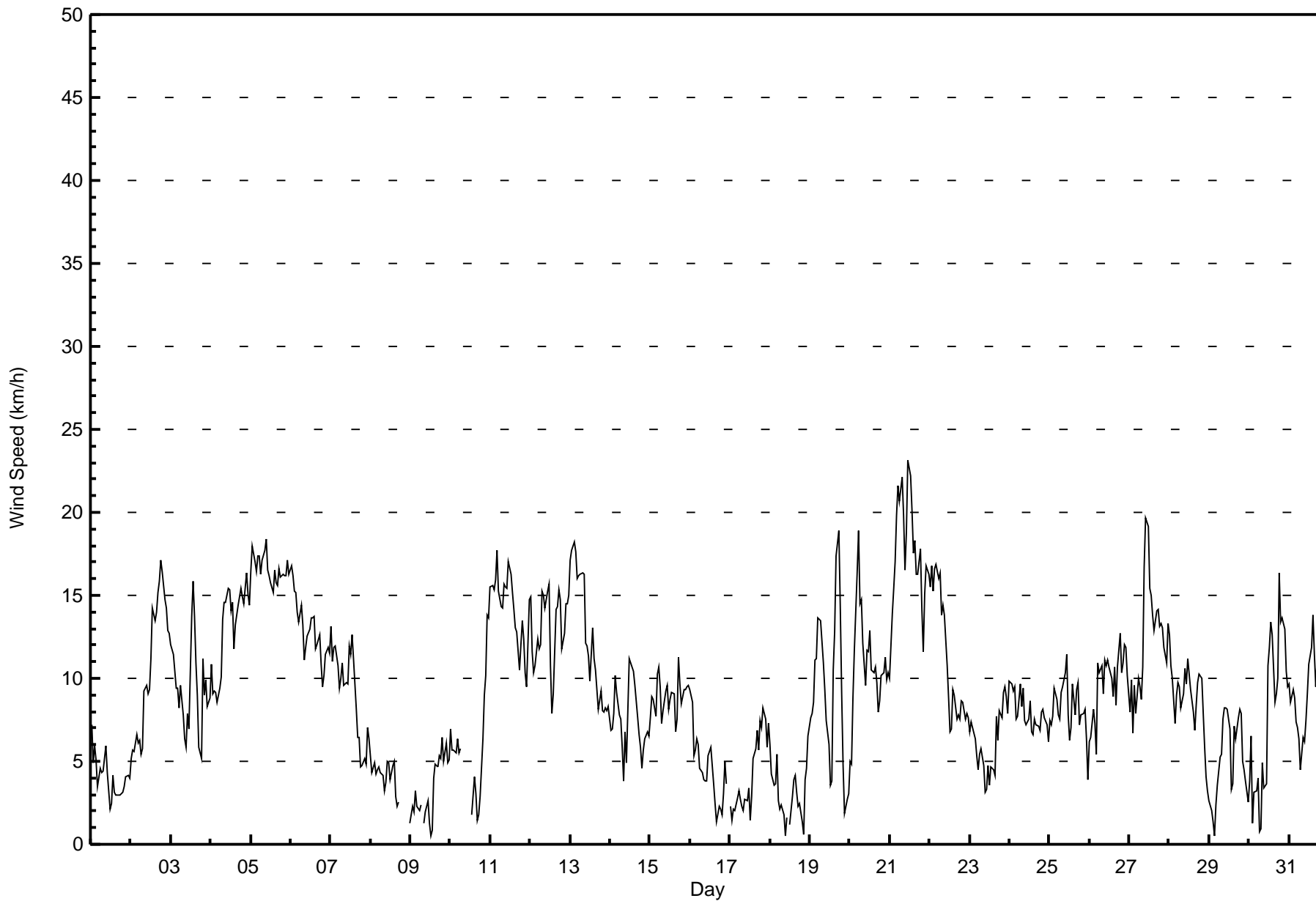
Wind Speed (WS) - km/h
Anzac - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 21 12:00 Minimum Value: 0 km/h on Dec 9 03:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 7																	Hours in Service: 744 Hours of Data: 733 Hours of Missing Data: 11 Hours of Calibration: 0 Percent Operational Time: 98.5									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	1	2	2	1	1	1	1	1	1	2	1	2	1	1	1	1	2	1	1	1	1	1	1	2	2
2-Dec	1	1	1	1	2	1	2	2	3	3	2	3	3	4	3	3	5	5	5	6	4	4	3	3	6	
3-Dec	3	3	2	3	2	2	2	2	2	2	3	4	4	4	3	2	3	3	2	3	2	2	2	3	4	
4-Dec	4	3	3	3	3	3	3	4	5	4	4	5	4	4	4	4	5	5	5	5	5	6	5	4	6	
5-Dec	6	5	6	5	5	6	5	6	6	5	5	5	5	5	6	5	5	5	5	5	5	5	5	5	6	
6-Dec	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	5	
7-Dec	3	3	3	4	3	3	3	3	3	3	3	3	3	4	3	2	1	1	1	1	1	1	2	2	4	
8-Dec	2	1	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	0	AF	1	AF	1	AF	1	2	
9-Dec	1	1	0	1	1	1	1	AF	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	
10-Dec	2	1	1	1	1	1	1	AF	AF	1	AF	AF	AF	AF	1	2	1	1	2	1	2	3	4	4	5	
11-Dec	5	5	5	6	6	5	5	5	6	6	6	6	6	5	5	4	4	3	4	4	4	3	4	5	6	
12-Dec	5	4	3	3	4	4	4	5	5	4	5	5	4	3	4	4	5	4	5	3	4	5	5	5	5	
13-Dec	6	6	6	6	5	5	5	5	5	4	3	3	3	4	3	3	3	2	3	2	2	2	2	2	6	
14-Dec	2	2	4	3	3	3	2	2	1	1	3	4	3	3	4	4	3	2	1	2	2	2	2	2	4	
15-Dec	2	3	2	2	3	3	3	2	2	3	3	2	3	3	3	2	3	3	3	2	3	2	3	3	3	
16-Dec	3	3	1	1	2	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	2	AF	3	
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	1	2	2	1	2	
18-Dec	2	2	2	2	1	1	1	1	1	1	1	AF	1	1	1	1	2	1	1	1	1	2	2	2	2	
19-Dec	2	2	2	3	3	4	4	4	3	2	2	2	1	2	4	5	6	6	5	2	2	1	1	1	6	
20-Dec	2	2	3	4	7	7	5	4	4	3	4	4	4	3	3	4	3	3	3	3	3	3	3	3	7	
21-Dec	3	4	5	6	7	7	7	8	6	6	6	8	8	7	6	6	5	6	6	5	4	5	6	6	8	
22-Dec	6	6	5	6	6	6	6	5	5	4	3	3	2	3	2	3	3	2	2	2	2	2	2	2	6	
23-Dec	2	2	2	2	2	1	2	2	2	1	1	1	1	1	3	2	2	2	3	2	3	2	3	2	3	
24-Dec	3	3	3	2	2	2	3	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	3	
25-Dec	2	2	2	3	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	1	3	
26-Dec	2	2	2	3	2	2	3	2	2	3	3	3	3	3	2	3	2	3	3	3	3	3	3	4	4	
27-Dec	3	4	3	3	2	2	2	2	3	4	5	4	4	5	5	4	5	5	4	4	5	4	4	4	5	
28-Dec	4	4	3	2	3	3	3	3	2	3	3	4	3	3	2	3	3	3	3	3	2	2	1	1	4	
29-Dec	1	1	1	1	2	1	2	2	2	2	2	2	3	1	1	2	2	2	3	2	1	1	1	2	3	
30-Dec	2	2	2	1	1	2	1	1	1	1	3	4	4	4	5	2	2	3	6	4	5	4	3	3	6	
31-Dec	3	2	3	3	2	2	2	2	1	2	2	3	3	4	5	3	3	3	4	4	5	6	6	5	6	
Diurnal Maximum																								6		
AF - Analyzer Failure																										



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Anzac - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Anzac - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	182	24.83	24.83
6 - 11	336	45.84	70.67
12 - 19	206	28.10	98.77
20 - 28	9	1.23	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 733

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
Anzac - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	13	2	4	6	5	9	16	16	29	18	9	6	5	9	11	24	182
6 - 11	8	0	0	0	1	8	39	69	19	10	9	4	10	35	81	43	336
12 - 19	3	0	0	0	0	0	3	8	7	0	2	4	31	42	83	23	206
20 - 28	0	0	0	0	0	0	0	0	0	0	0	1	4	4	0	0	9
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	24	2	4	6	6	17	58	93	55	28	20	15	50	90	175	90	733

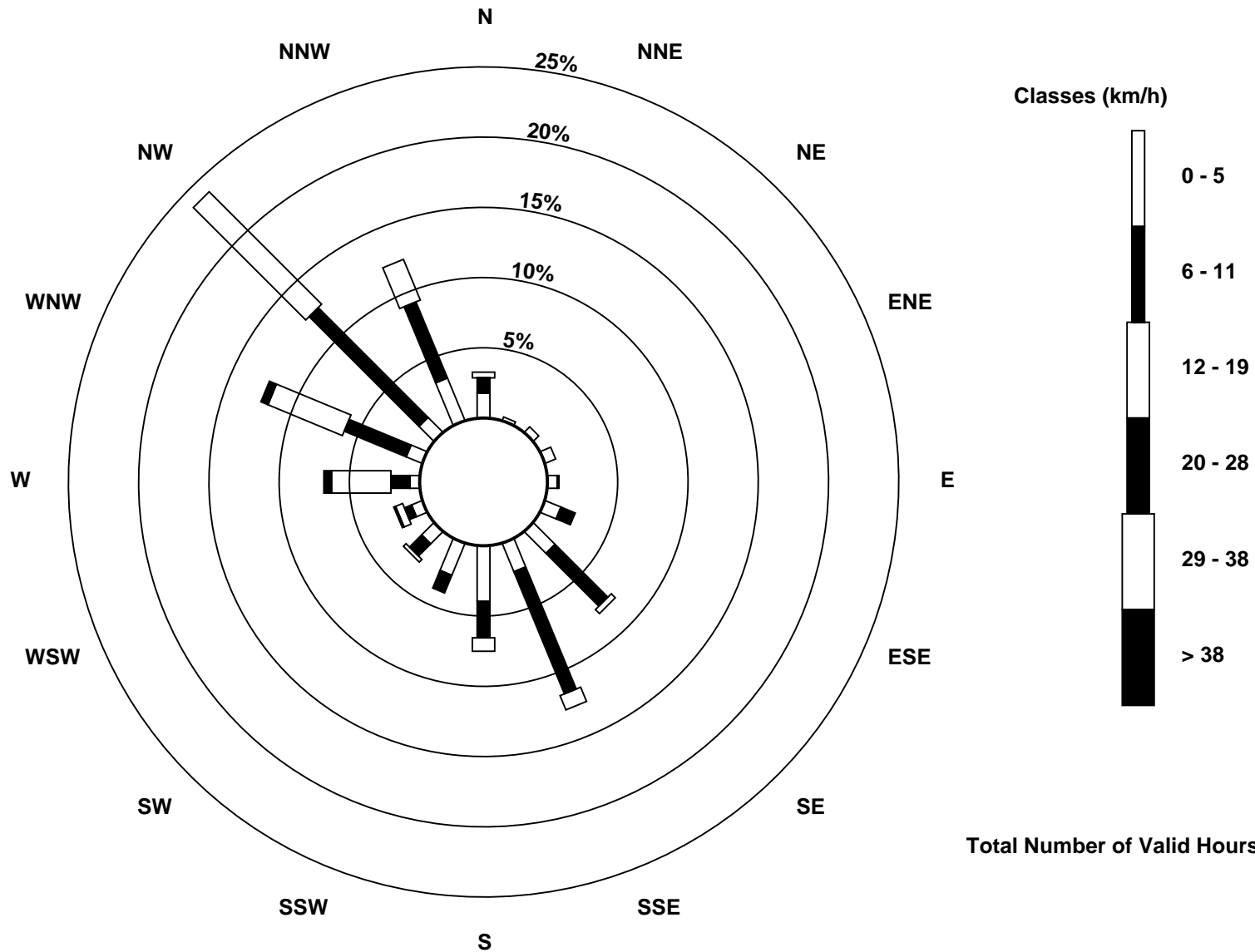
Total Number of Valid Hours: 733

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Anzac (AMS 14)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Anzac - December 2016

Direction of Maximum Speed: 270 deg on Dec 21 12:00																						Hours in Service: 744			
Direction of Maximum Daily Speed Average: 277.1 deg on Dec 21																						Hours of Data: 733			
Direction of Minimum Speed: 294 deg on Dec 29 04:00											Direction of Minimum Daily Speed Average: 2.1 deg on Dec 19											Hours of Missing Data: 11			
Monthly Average Direction: 296.9 deg																						Percent Operational Time: 98.5			
Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	184	190	185	200	210	222	203	161	161	149	151	176	205	178	190	191	187	313	264	178	181	185	209	210	189.1
2-Dec	185	200	191	175	172	169	165	160	153	161	146	154	161	165	159	164	177	170	173	175	170	169	158	159	166.9
3-Dec	158	160	163	178	174	167	176	179	173	177	176	205	237	238	234	226	219	201	193	233	220	239	232	251	203.5
4-Dec	262	274	269	284	292	295	324	333	336	335	341	345	340	338	331	332	322	320	315	318	323	336	327	317	321.3
5-Dec	312	311	314	311	315	318	314	312	309	312	313	311	314	311	310	307	309	307	307	304	305	304	303	305	310.1
6-Dec	306	306	306	306	307	310	307	306	306	312	316	320	321	324	322	318	322	322	323	321	326	330	329	333	315.8
7-Dec	333	328	327	326	325	320	321	322	319	323	328	334	330	331	333	338	344	351	347	343	338	324	328	336	329.8
8-Dec	332	315	336	328	333	339	341	329	325	331	349	358	348	312	306	330	319	337	AF	268	AF	255	AF	232	329.0
9-Dec	167	165	173	169	195	222	210	AF	231	180	183	207	188	62	91	133	143	152	163	175	179	180	196	203	171.8
10-Dec	216	192	204	213	204	207	220	AF	60	AF	AF	AF	AF	88	186	176	178	261	342	286	295	294	304	297	254.9
11-Dec	289	292	300	291	291	296	289	291	294	298	296	298	297	300	301	306	304	305	305	303	304	306	302	307	297.9
12-Dec	310	318	319	320	327	319	315	307	309	311	309	323	310	320	316	314	317	316	323	325	315	314	310	310	315.3
13-Dec	316	315	318	320	324	353	349	346	345	346	353	348	339	336	331	326	329	316	318	317	306	308	314	306	329.9
14-Dec	310	308	308	309	303	295	287	273	234	227	251	297	298	304	316	330	332	341	1	352	326	290	298	305	304.6
15-Dec	316	319	324	310	314	323	326	308	297	301	323	323	314	324	330	310	307	312	314	307	305	309	304	307	313.9
16-Dec	307	312	318	308	311	306	307	289	285	267	270	293	300	297	291	293	132	164	153	163	170	176	180	AF	288.8
17-Dec	183	177	175	230	242	228	228	198	240	223	208	183	170	114	133	139	149	158	161	157	148	163	161	153	167.2
18-Dec	152	144	114	131	170	162	135	153	134	109	46	AF	108	66	71	81	77	54	30	1	133	120	130	134	118.1
19-Dec	128	129	138	141	133	139	139	140	132	135	132	128	95	13	328	310	316	321	337	352	4	37	123	138	104.3
20-Dec	168	182	275	269	277	284	282	282	275	272	267	274	279	279	285	282	281	289	285	286	289	293	284	284	278.3
21-Dec	279	278	280	281	282	282	279	279	281	275	269	270	276	285	283	275	274	272	277	279	272	272	274	277	277.1
22-Dec	273	278	276	279	280	280	284	297	295	306	300	301	297	324	354	352	334	324	309	317	327	325	330	331	300.4
23-Dec	327	329	337	338	349	346	346	357	357	346	5	355	2	1	10	49	98	111	124	121	125	123	128	120	43.7
24-Dec	117	120	123	125	130	132	140	141	147	128	133	144	144	137	127	135	123	140	135	136	149	156	161	152	135.9
25-Dec	164	164	155	161	158	162	158	153	150	152	157	143	147	131	144	139	155	163	151	152	161	161	150	147	153.6
26-Dec	154	170	162	163	157	158	156	162	156	156	153	161	158	155	154	162	164	162	167	179	193	183	170	159	163.6
27-Dec	155	147	140	178	163	172	176	198	228	236	239	238	245	265	267	265	268	276	289	296	295	299	300	304	248.2
28-Dec	306	305	306	329	336	336	335	335	336	334	329	317	321	324	333	326	313	312	315	328	327	354	339	342	324.7
29-Dec	343	343	282	294	103	95	113	145	142	141	147	149	158	70	141	159	133	143	154	150	124	114	127	133	137.7
30-Dec	192	189	5	347	311	294	257	206	255	200	323	282	295	300	292	249	254	261	289	302	304	309	314	319	288.1
31-Dec	323	338	339	337	284	302	311	1	349	313	313	315	315	312	323	329	338	322	302	301	297	293	298	301	314.0
283.0	283.5	290.7	284.9	286.9	288.3	287.2	290.2	288.6	283.2	288.1	292.9	292.1	303.2	304.0	294.8	293.2	293.3	292.8	288.6	287.0	284.7	287.1	291.7		
Diurnal Average																									
AF - Analyzer Failure																									
All monthly, daily, and diurnal averages have been calculated using vector methods																									



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Anzac - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 94 deg on Dec 29 04:00	Hours of Data: 733
Minimum Value: 8 deg on Dec 9 22:00	Hours of Missing Data: 11
Percentiles: P ₁ = 10 P ₁₀ = 14 Q ₁ = 16 Median = 18 Q ₃ = 22 P ₉₀ = 26 P ₉₉ = 65	Hours of Calibration: 0
	Percent Operational Time: 98.5

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	25	22	19	21	27	17	31	19	18	16	20	35	43	23	26	21	30	34	40	14	17	16	21	24	43
2-Dec	16	15	13	17	18	18	24	20	17	17	17	20	21	16	17	19	17	19	19	20	20	21	17	17	24
3-Dec	18	18	17	18	17	16	14	16	19	22	21	27	16	16	15	14	18	30	26	16	18	15	15	25	30
4-Dec	23	26	20	24	23	20	22	14	16	14	15	16	15	14	15	16	17	18	17	17	16	16	15	19	26
5-Dec	18	17	18	18	17	16	17	17	18	17	18	18	18	19	18	19	19	18	17	19	17	18	18	18	19
6-Dec	18	18	18	17	18	18	18	18	19	18	18	18	17	16	18	16	16	16	16	14	13	14	13	14	19
7-Dec	14	15	15	15	16	15	15	15	15	16	16	14	16	15	15	13	11	13	13	8	10	13	13	16	16
8-Dec	16	14	18	18	14	14	15	14	13	13	17	17	21	26	25	22	14	10	AF	12	AF	22	AF	12	26
9-Dec	19	20	12	10	15	9	10	AF	27	25	19	51	75	64	29	12	13	13	14	10	12	8	12	14	75
10-Dec	13	14	15	11	10	12	11	AF	31	AF	AF	AF	AF	38	19	25	52	62	27	16	17	21	19	22	62
11-Dec	22	21	22	22	22	22	24	23	24	24	24	22	21	21	20	19	20	19	20	19	20	19	22	19	24
12-Dec	19	17	16	16	15	17	18	17	17	18	20	17	21	20	20	19	18	16	18	16	17	18	20	19	21
13-Dec	19	18	18	18	17	19	16	16	17	16	15	16	16	16	16	15	14	15	15	16	13	14	14	15	19
14-Dec	16	16	20	18	19	19	19	15	17	12	37	21	21	21	21	16	14	14	12	16	21	19	19	17	37
15-Dec	17	15	15	17	18	18	18	19	19	19	18	22	21	19	14	22	20	17	16	17	18	17	17	17	22
16-Dec	16	15	13	16	15	15	14	18	16	14	28	18	20	26	30	42	38	50	26	25	20	9	14	AF	50
17-Dec	14	54	20	52	14	10	10	11	21	24	21	16	52	20	18	15	15	12	9	13	13	14	17	16	54
18-Dec	21	20	23	16	17	24	42	29	34	83	17	AF	48	35	18	22	21	19	17	37	76	26	29	21	83
19-Dec	21	19	20	19	19	18	19	20	16	18	16	16	23	31	19	21	18	18	19	15	34	48	31	28	48
20-Dec	23	34	25	25	26	24	26	21	22	21	19	22	19	22	20	22	20	25	24	20	19	20	18	17	34
21-Dec	18	21	21	23	24	23	25	24	24	23	22	24	26	25	24	24	23	23	23	24	25	23	26	25	26
22-Dec	25	25	26	26	24	25	25	20	22	20	20	19	21	22	15	16	22	22	20	20	16	21	16	14	26
23-Dec	15	15	15	26	36	17	15	15	17	18	21	15	25	16	16	35	21	20	17	19	18	15	17	19	36
24-Dec	17	17	15	16	17	18	17	18	18	17	17	22	18	21	17	15	12	15	21	14	16	17	15	17	22
25-Dec	17	17	18	17	15	18	16	15	15	14	14	19	25	20	17	16	16	16	18	17	14	14	15	15	25
26-Dec	14	18	12	19	22	14	16	15	17	17	19	16	17	17	21	17	17	14	13	17	21	19	14	21	22
27-Dec	22	41	32	19	24	15	15	17	14	15	15	15	19	25	23	25	22	24	25	22	23	22	22	19	41
28-Dec	19	20	21	16	15	16	14	15	13	13	17	19	20	20	16	27	20	20	18	16	13	19	26	26	27
29-Dec	17	36	53	94	68	26	20	22	20	19	19	18	26	52	43	18	20	18	25	19	16	19	18	45	94
30-Dec	26	19	71	24	34	33	66	84	18	36	48	25	24	21	24	19	15	23	22	19	19	19	17	16	84
31-Dec	16	15	14	22	20	19	20	19	18	17	21	18	18	18	17	16	15	19	20	20	23	22	21	22	23
	26	54	71	94	68	33	66	84	34	83	48	51	75	64	43	42	52	62	40	37	76	48	31	45	

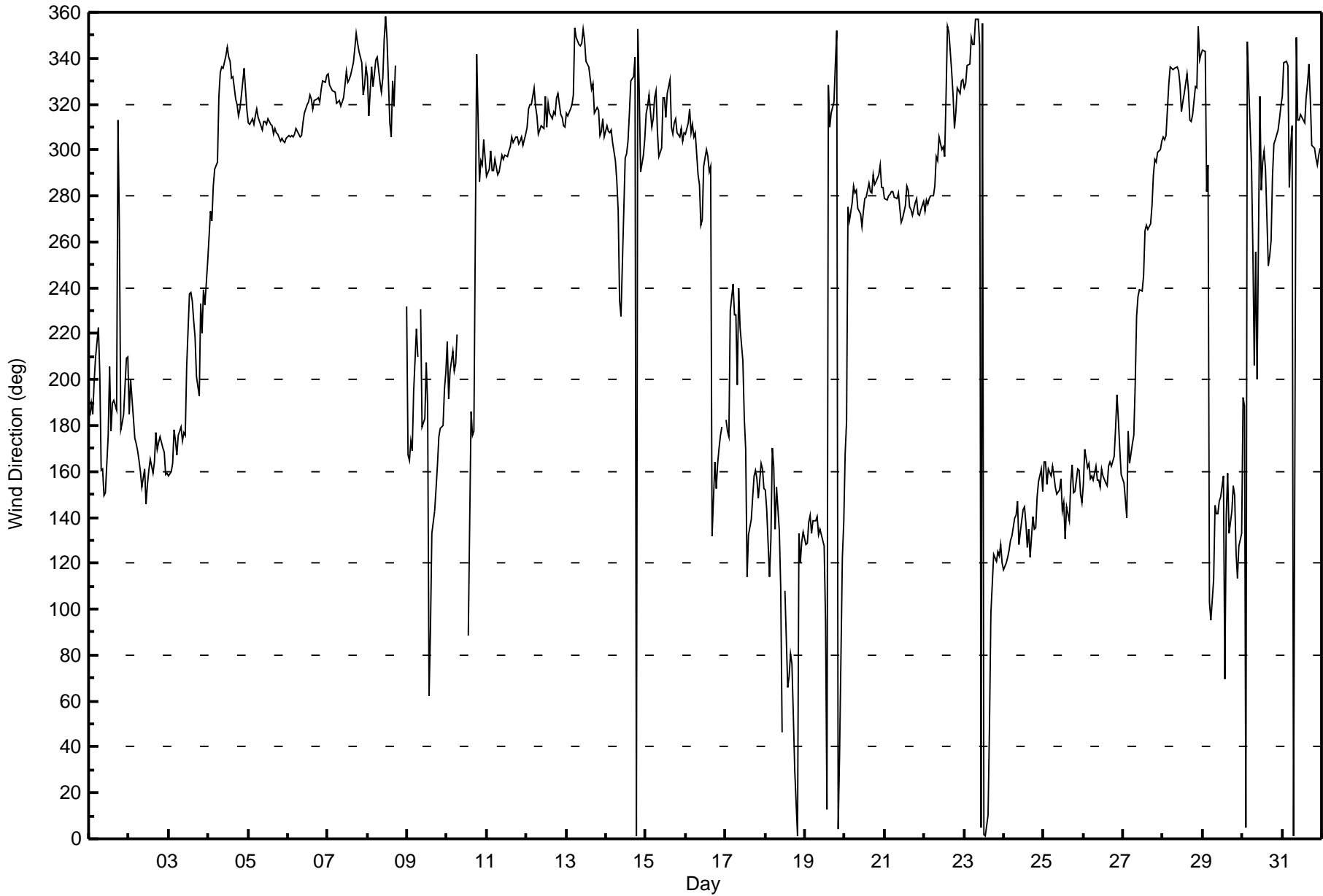
Diurnal Maximum

AF - Analyzer Failure



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Anzac - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

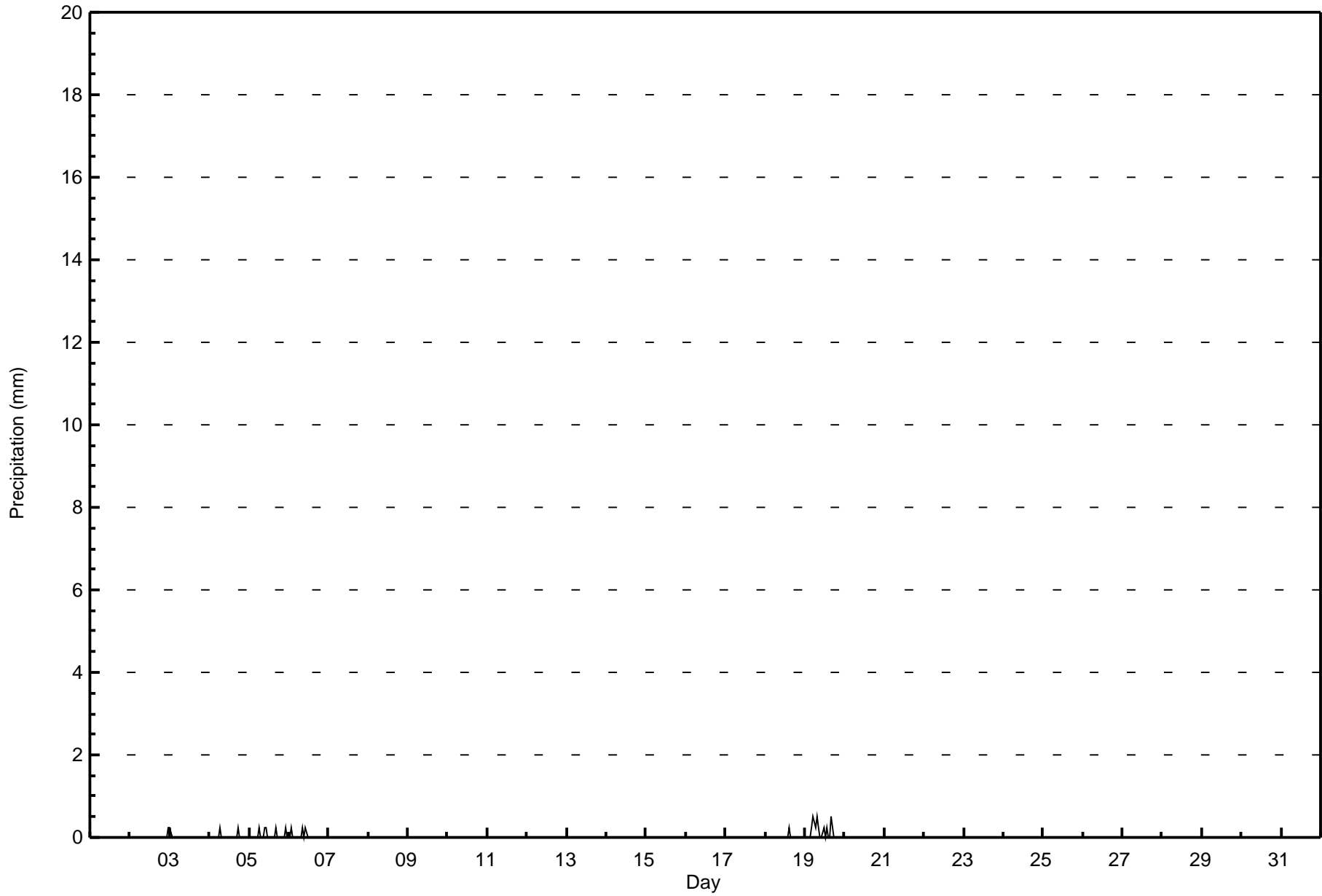
Anzac - December 2016

Maximum Value: 0.5 mm on Dec 19 06:00 Maximum Daily Total: 2.8 mm on Dec 19		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																												
Minimum Value: 0.0 mm on Dec 1 01:00 Maximum Diurnal Total: 0.8 mm at hour 7 Monthly Total: 6.10 mm		Minimum Daily Total: 0.0 mm on Dec 1 Minimum Diurnal Total: 0.0 mm at hour 3 Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.3																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24						
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.3		
3-Dec	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	1.3	0.3	
6-Dec	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.3	
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3
19-Dec	0.0	0.0	0.0	0.0	0.3	0.5	0.3	0.5	0.3	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.5	0.5
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
																								0.3	0.3	Diurnal Average				
																								0.3	0.3	Diurnal Maximum				



WBEA Data PC
Hourly Averages

Precipitation (PC) - mm
Anzac - December 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 8, 2016	Last Calibration	November 1, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	11:50	End Time (MST)	14:00
Gas Cert Reference	LL104186	Station temp.	22 Deg C
Cal Gas Concentration	50.1 ppm	Cal Gas Exp Date	February 6, 2019
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
ZAG Make/Model	API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2582

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-638	-638
Analyzer IP address	192.168.1.43		Lamp voltage	794	792
Calculated slope	0.992637	1.001805	Chamber temp	45.0	45.2
Calculated intercept	-1.139494	0.070479	Pressure	733.1	717.6
Analyzer Background	14.5	13.9	Flow	0.140	0.443
Analyzer Coefficient	0.977	0.977	Intensity	85	85
Analyzer make	Thermo 43i		Analyzer serial #	1152430005	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	79.8	799.6	798.2	1.002
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	79.8	799.6	798.2	1.002
second point	5000	39.9	399.8	399.1	1.002
third point	5000	19.9	199.4	198.6	1.004
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	74.9	750.5	749.2	1.002
Average Correction Factor					1.003

Corrected As found 798.4 Previous response 806.7 % change 1.0%

Notes:

Exhaust line had a small rupture which caused flow to drop quite bit prior to calibration. Repaired the exhaust line after as founds and flow came back to where it should be. Sample inlet filter replaced after as founds. Slightly adjusted zero.

Calibration Performed By:

Asad Hidayat



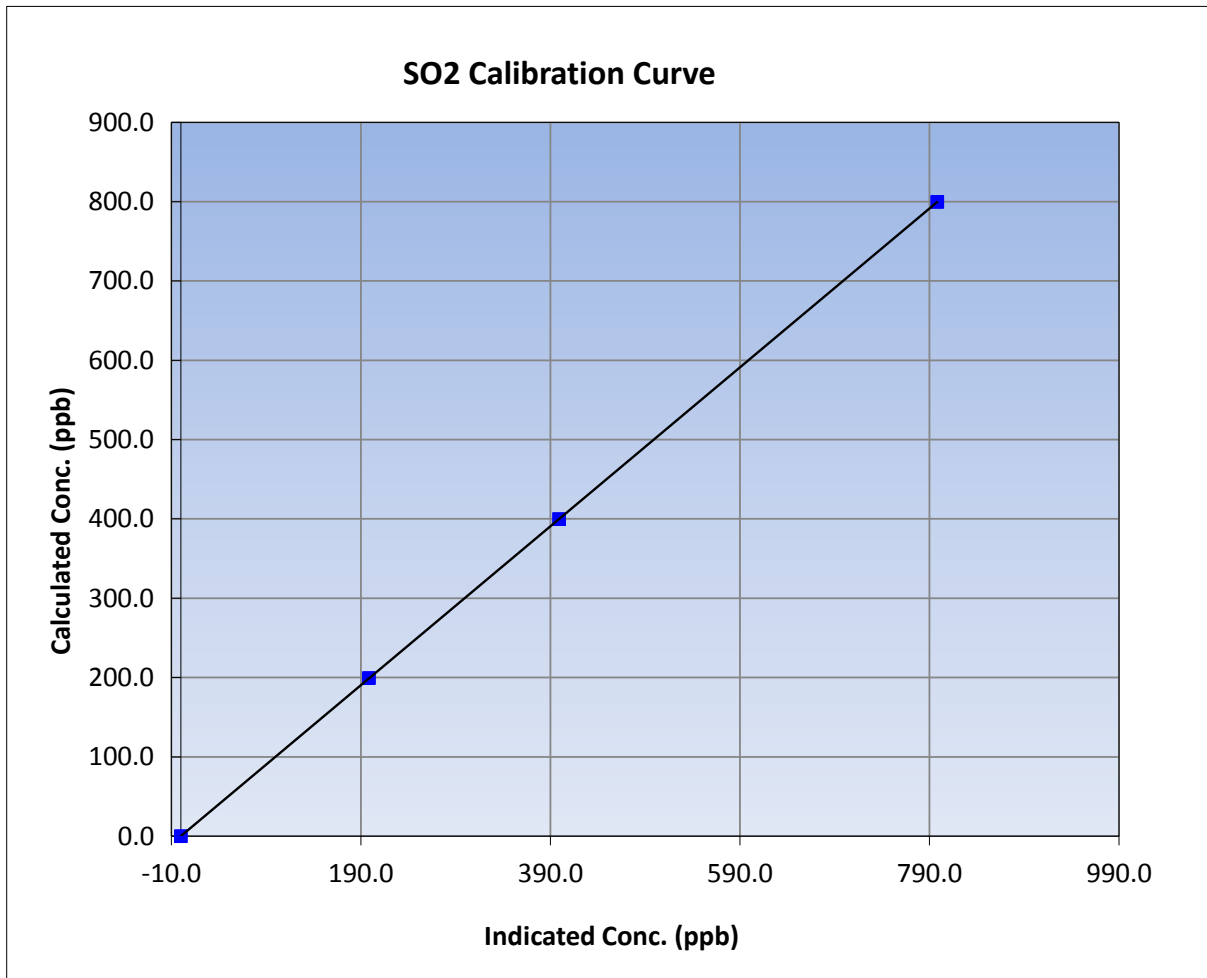
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 8, 2016	Previous Calibration	November 1, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:50	End Time (MST)	14:00
Analyzer make	Thermo 43i	Analyzer serial #	1152430005

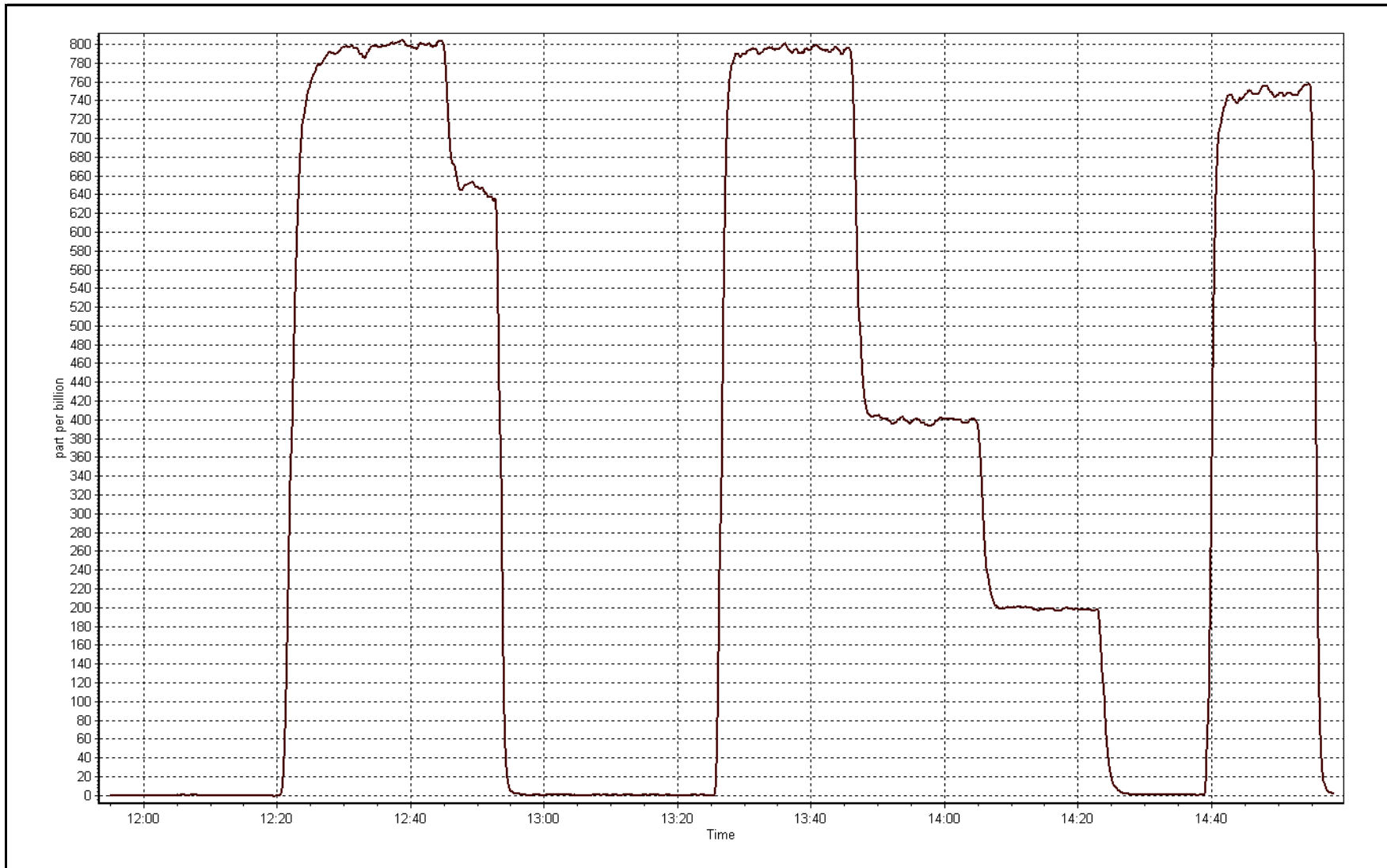
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999999
799.6	798.2	1.0018		
399.8	399.1	1.0018	Slope	1.001805
199.4	198.6	1.0040		
			Intercept	0.070479



SO2 Calibration Plot

Date: December 8, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 19, 2016	Last Calibration	November 1, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	11:48	End Time (MST)	14:20
Gas Cert Reference	ALM033528	Station temp.	22 Deg C
Cal Gas Concentration	5.05 ppm	Cal Gas Exp Date	September 9, 2017
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
Dil air Make/Model	API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2582
SO2 gas concentration	50.1 ppm	SO2 gas cert/exp	LL104186 February 6, 2019

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-731	-731
Analyzer IP address	192.168.1.42		Lamp voltage	992	1010
Calculated slope	1.010248	0.990823	Chamber temp	45	44
Calculated intercept	-0.260850	0.053943	Pressure	672.5	638.4
Analyzer Background	1.71	1.76	Flow	0.414	0.399
Analyzer Coefficient	1.197	1.171	Intensity	96	97
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1300156232	
Converter make/model	CDN-101		Converter serial #	510	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	74.3	75.0	76.6	0.979
SO2 scrubber check	5000	18.7	187.4	0.3	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	74.3	75.0	75.7	0.992
second point	5000	39.6	40.0	40.4	0.990
third point	5000	19.8	20.0	20.0	1.000
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	74.3	75.0	74.4	1.008
Average Correction Factor					0.994

Corrected As found	76.6	Previous response	74.5	% change	-2.7%
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Notes:

Sample inlet filter replaced after as founds. Adjusted span. Used SO2 gas cylinder to do scrubber test after 3rd point.

Calibration Performed By:

Asad Hidayat



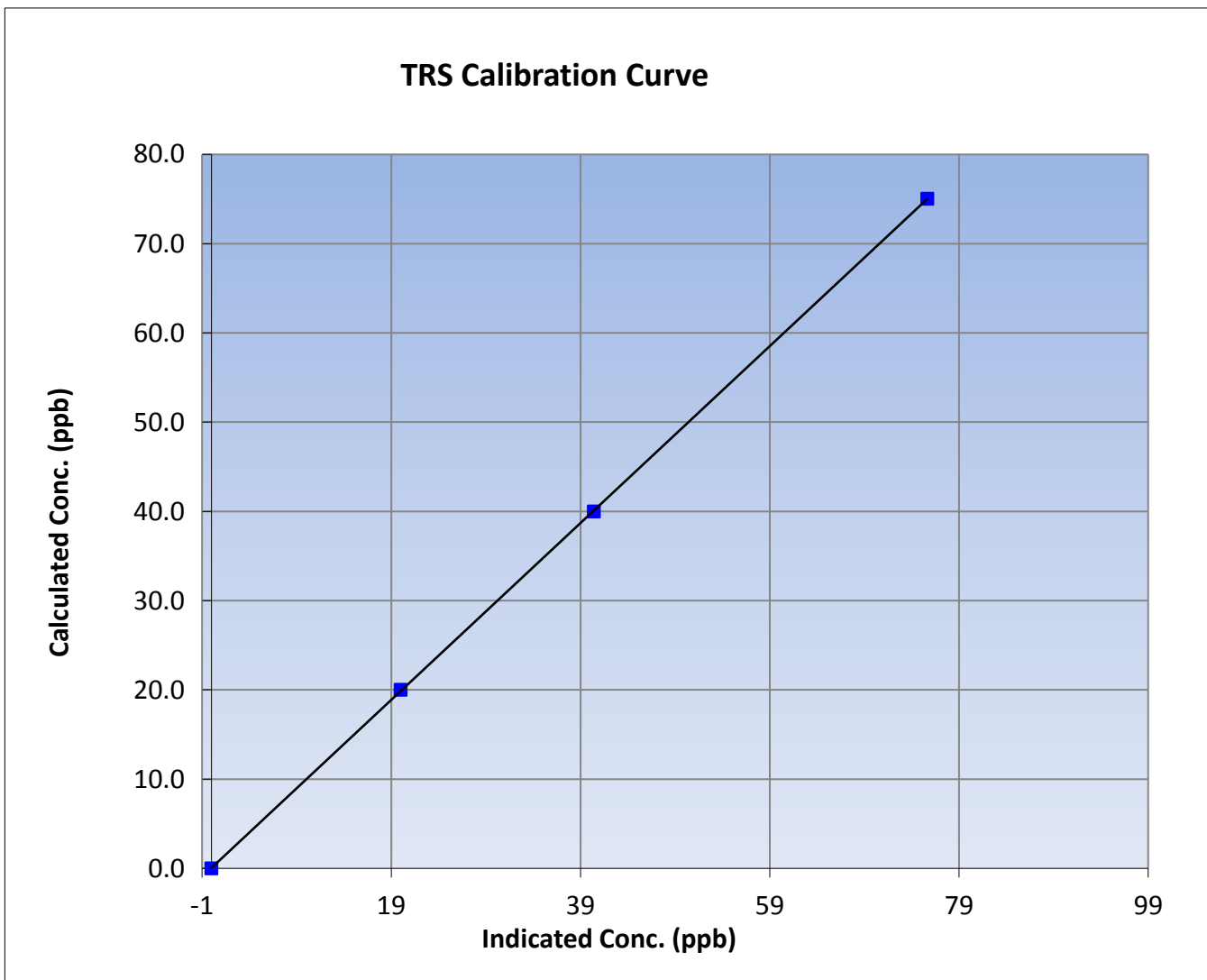
Wood Buffalo Environmental Association TRS Calibration Report

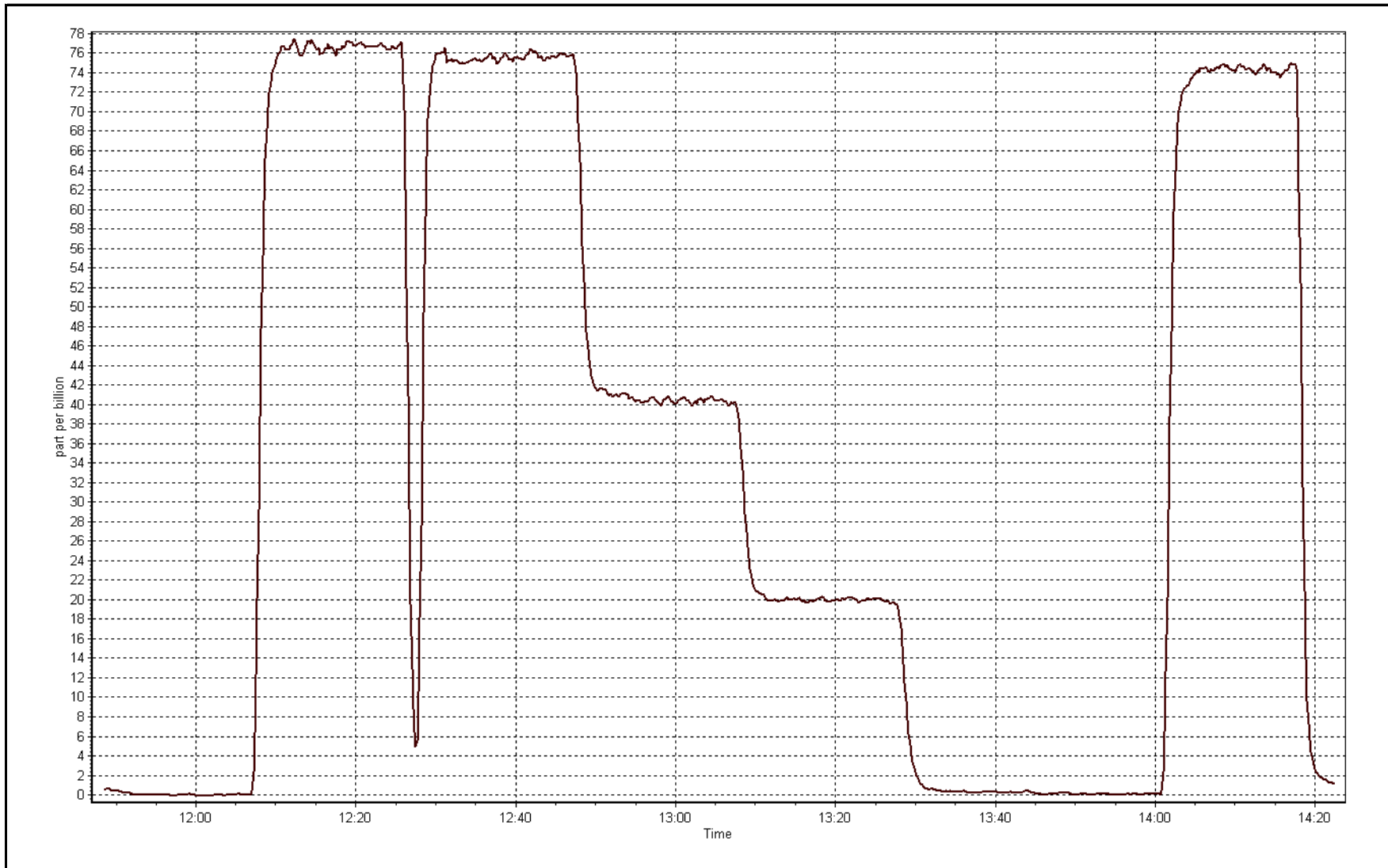
Station Information

Calibration Date	December 19, 2016	Previous Calibration	November 1, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:48	End Time (MST)	14:20
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1300156232

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999990
75.0	75.7	0.9918		
40.0	40.4	0.9895	Slope	0.990823
20.0	20.0	0.9999		
			Intercept	0.053943







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 1, 2016	Last Calibration	November 21, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	10:04	End Time (MST)	03/12/2016 11:57
Gas Cert Reference	SA130026A	Cal Gas Expiry Date	December 12, 2016
CH4 Cal Gas Conc.	512.0 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	8400311
ZAG make/model	Teledyne API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	Serial Number	2582

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.1	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.003158	0.999451	Carrier Pressure	36.3	33.3
THC Calc intercept	0.021783	0.015661	Fuel Pressure	47.8	47.9
NMHC Calc slope	1.001165	1.000119	Air Pressure	36.6	36.6
NMHC Calc intercept	-0.006292	-0.002317			

Analyzer make Thermo 55i Analyzer serial # 1218153355

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	74.9	16.36	16.38	0.999
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	16.36	16.36	1.000
second point	5000	37.4	8.17	8.16	1.001
third point	5000	18.7	4.09	4.05	1.009
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	16.36	16.35	1.001
Average Correction Factor					1.003

Corrected As found 16.38 Previous response 16.29 % change -0.6%

Notes:

Sample inlet filter was replaced after as founds. Replaced actuator to address baseline dips issue but didn't seem to fix the issue. Tried re-adjusting the "socket adjustment screw", slightly turning clockwise couple times; it didn't help either. Chromatograms showed leak in the system. Instrument was taken back to FOC for repairs. 8-port valve was replaced and optimized gas flows and changed carrier pressure to get better linearity and bring RT timing to as close as 12 secs. Adjusted span. Lost "as founds" RTMC graph, used MDS to grab "as founds" graph.

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	74.9	8.69	8.70	0.999
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	8.69	8.69	1.000
second point	5000	37.4	4.34	4.35	0.998
third point	5000	18.7	2.17	2.17	1.000
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	8.69	8.68	1.001
Average Correction Factor					0.999

Corrected As found 8.70 Previous response 8.69 % change -0.1%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	74.9	7.67	7.68	0.999
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	7.67	7.67	1.000
second point	5000	37.4	3.83	3.81	1.005
third point	5000	18.7	1.91	1.88	1.019
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	7.67	7.67	1.000
Average Correction Factor					1.008

Corrected As found 7.68 Previous response 7.60 % change -1.0%



Wood Buffalo Environmental Association

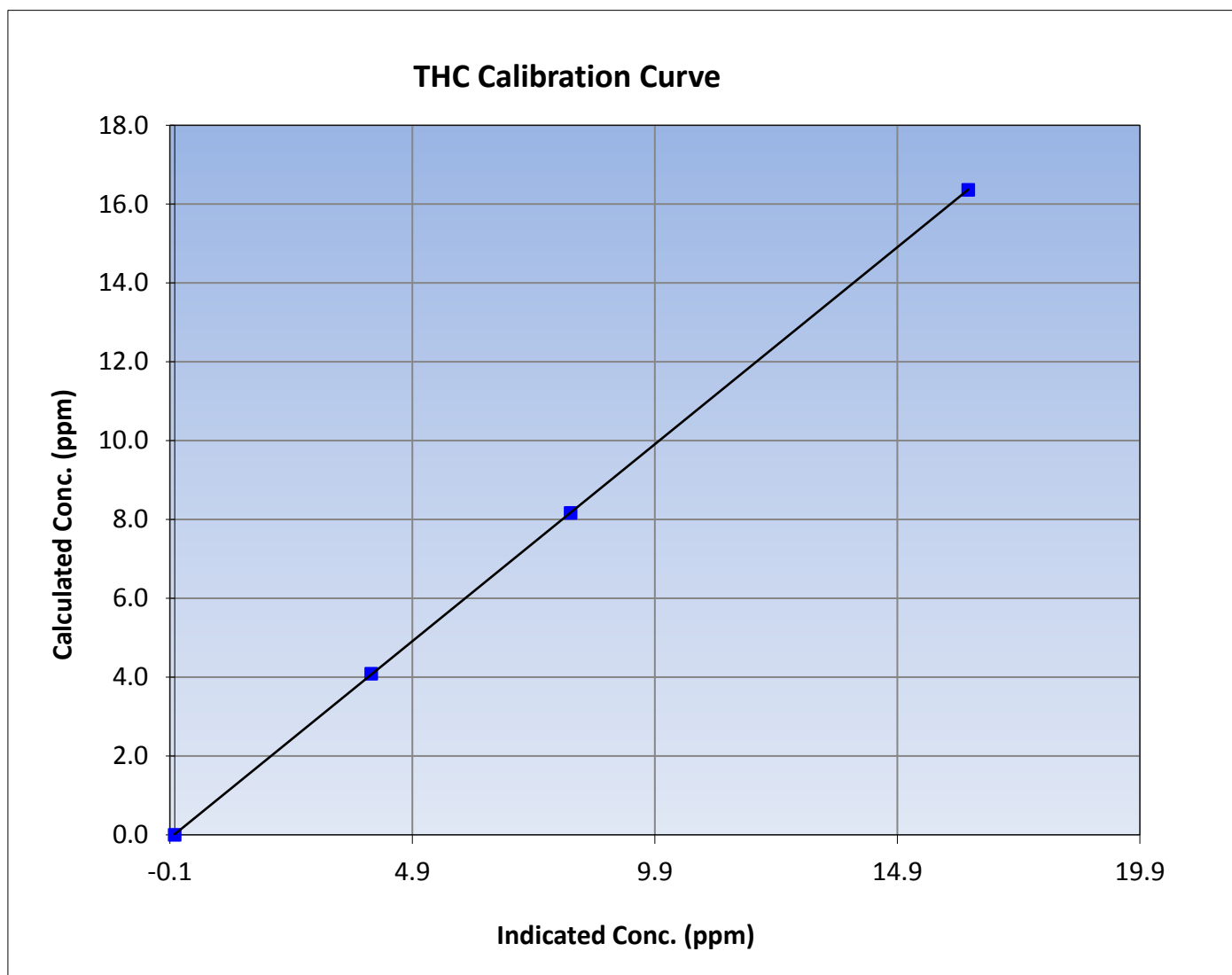
THC Calibration Summary

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 21, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:04	End Time (MST)	11:55
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999995
16.36	16.36	1.0001		
8.17	8.16	1.0012	Slope	0.999451
4.09	4.05	1.0086		
			Intercept	0.015661





Wood Buffalo Environmental Association

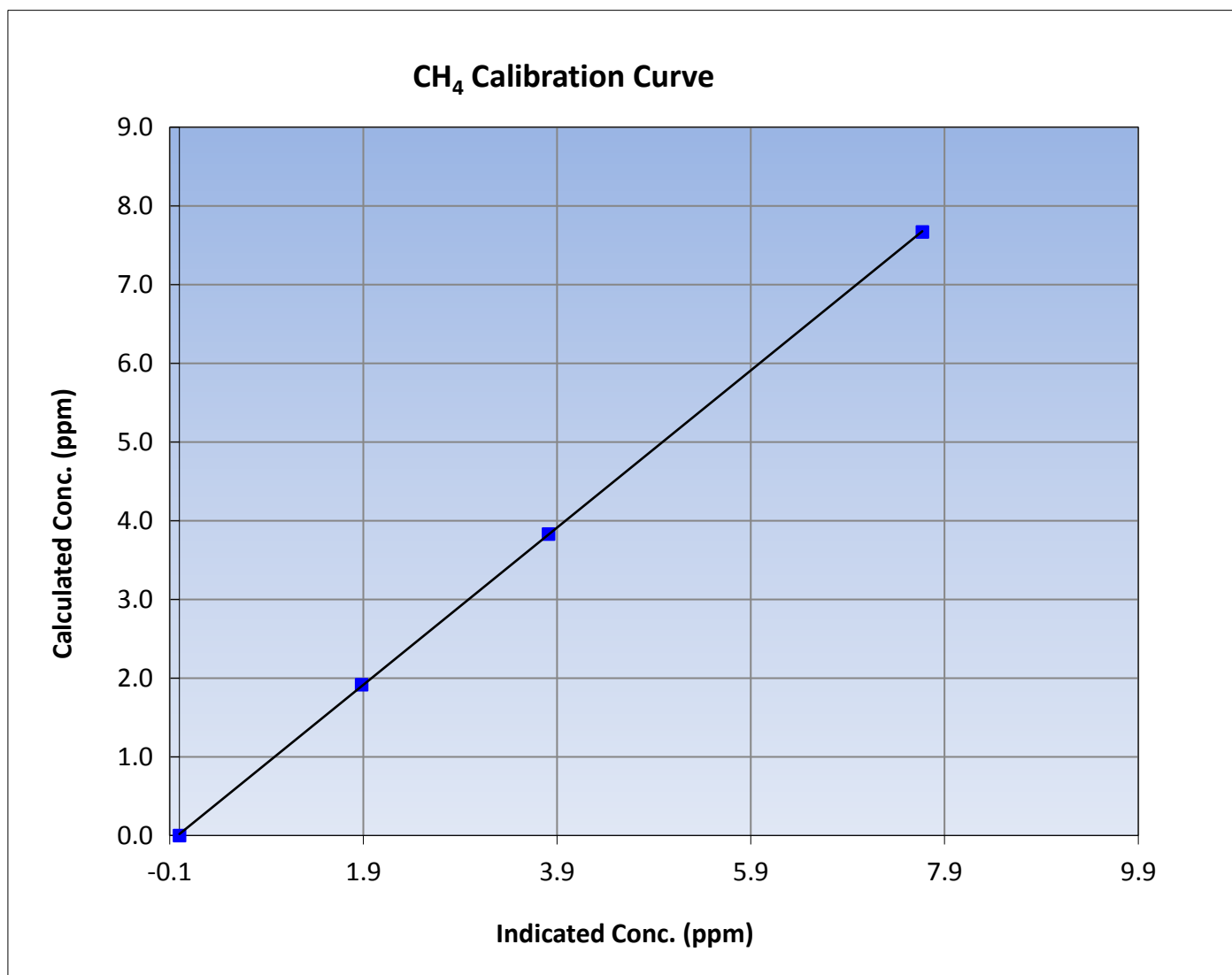
CH₄ Calibration Summary

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 21, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:04	End Time (MST)	11:55
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999975
7.67	7.67	1.0000		
3.83	3.81	1.0052	Slope	0.998677
1.91	1.88	1.0186		
			Intercept	0.018019





Wood Buffalo Environmental Association

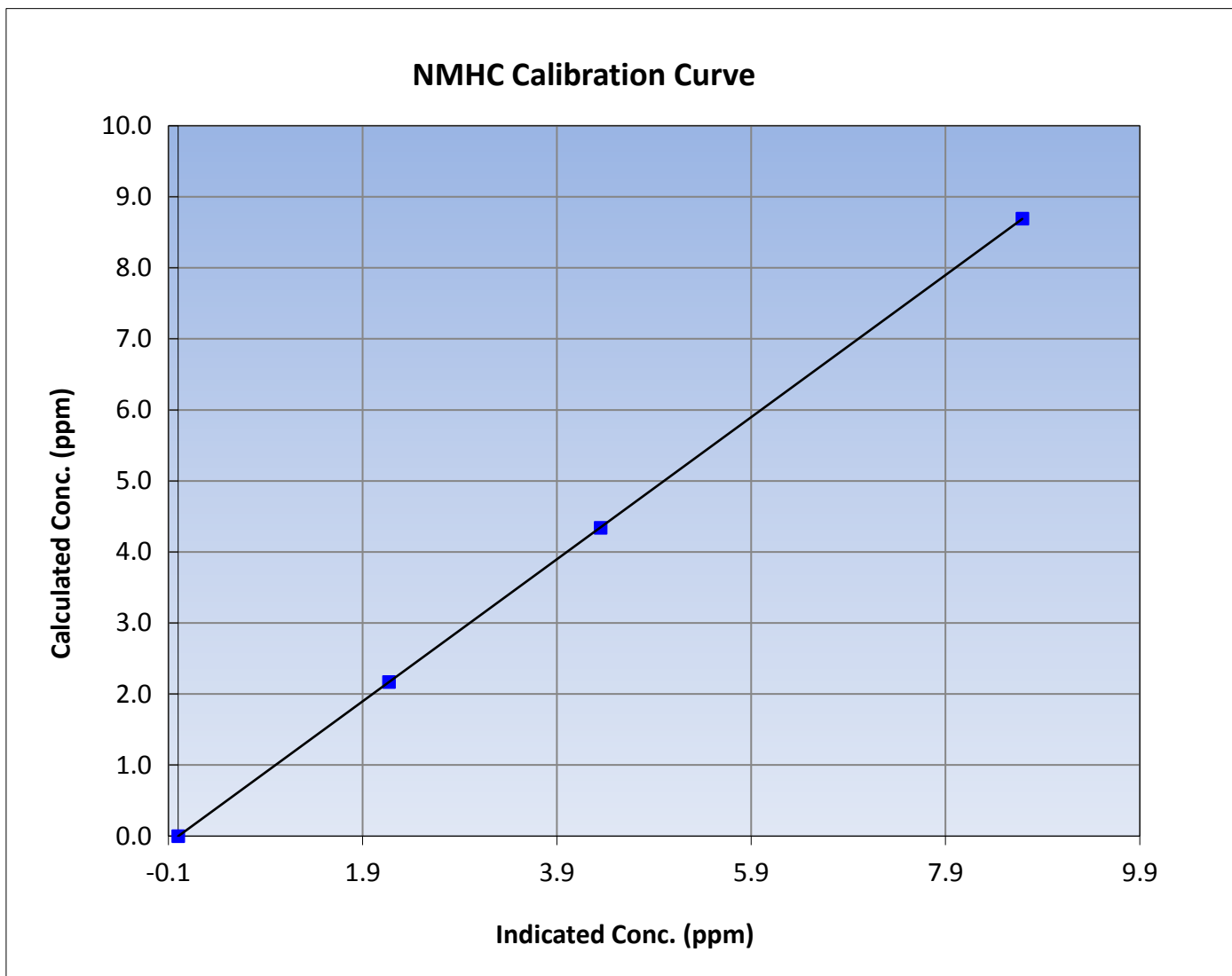
NMHC Calibration Summary

Station Information

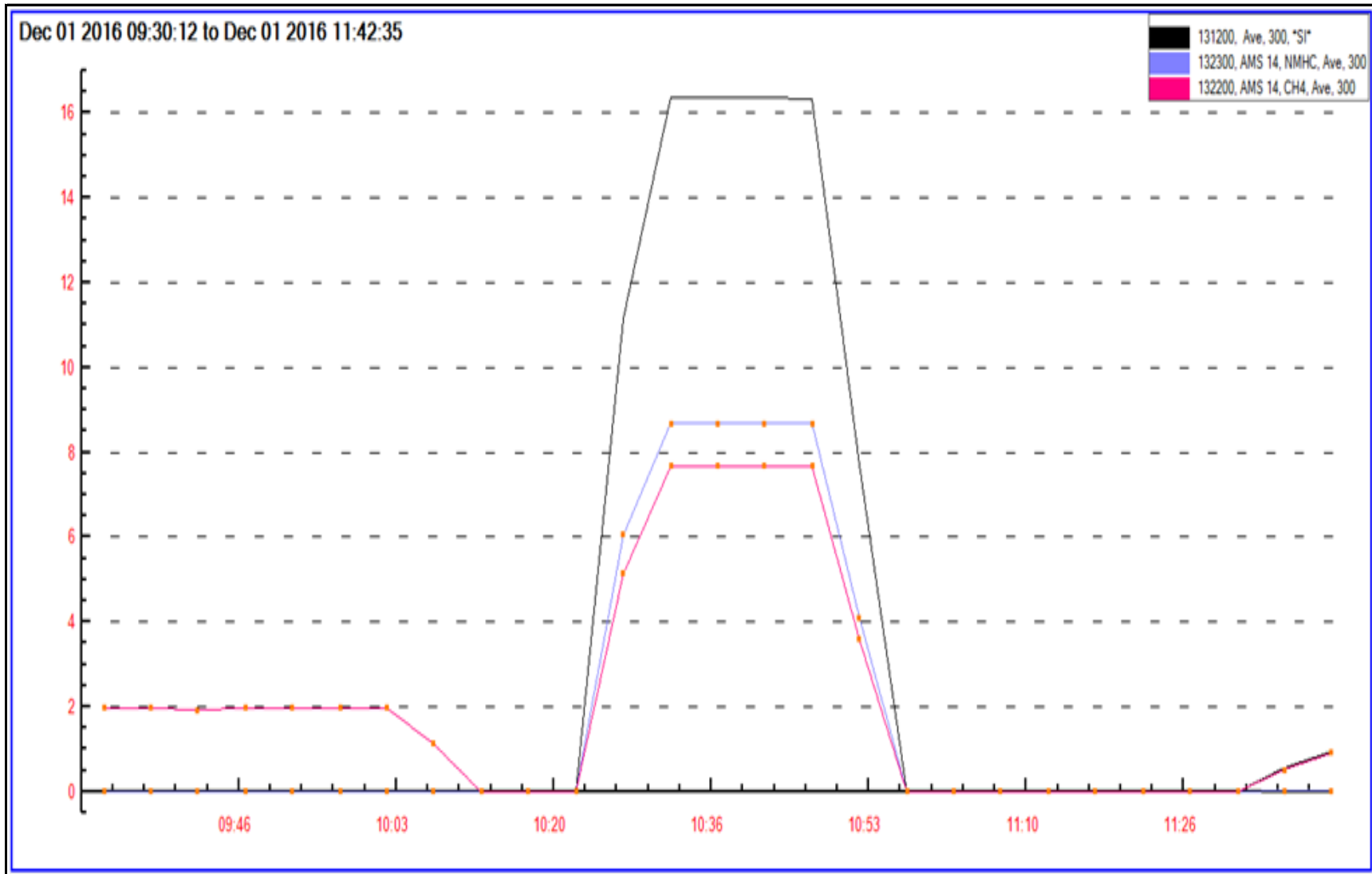
Calibration Date	December 1, 2016	Previous Calibration	November 21, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:04	End Time (MST)	11:55
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

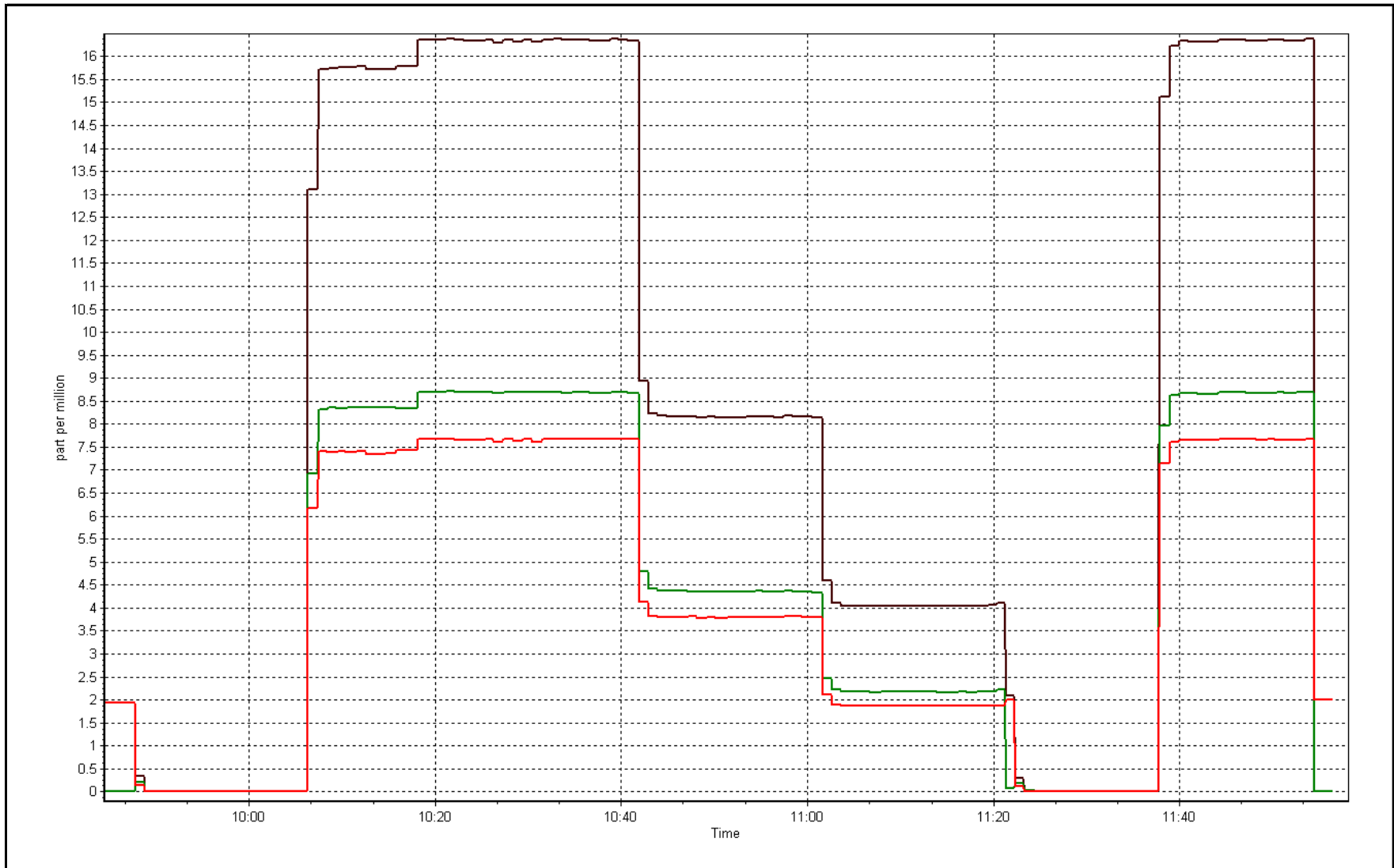
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999998
8.69	8.69	1.0002		
4.34	4.35	0.9978	Slope	1.000119
2.17	2.17	1.0001		
			Intercept	-0.002317



THC "As founds" Calibration Plot Date: December 1, 2016







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 14, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	13:45	End Time (MST)	16:10
NO2 GPT Ref date	December 14, 2016	Transfer Standard	NO2
		Station temp.	23 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
ZAG make/model	Teledyne API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	Serial Number	2582

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.2	25.7
Analyzer IP address	192.168.1.48		Lamp temp.	53.8	53.8
Calculated slope	1.001346	0.998983	Pressure	661.3	667.1
Calculated intercept	-0.700397	-1.400966	Flow cell A	0.711	0.712
Analyzer Background	-1.7	-1.7	Flow cell B	0.720	0.720
Analyzer Coefficient	0.987	0.990	Cell A Intensity	96533	95160
			Cell B Intensity	108696	108176

Analyzer make Thermo 49i Analyzer serial # 1426262595

Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.2	----
as found span	5000	1.19	470.8	471.0	1.000
calibrator zero	5000	0.00	0.0	0.2	----
high point	5000	1.19	470.8	471.9	0.998
second point	5000	0.85	319.9	322.0	0.993
third point	5000	0.51	162.8	166.0	0.981
as left zero	5000	0.00	0.0	1.7	----
as left span	5000	1.19	470.8	475.4	0.990
Average Correction Factor					0.991

Corrected As found 470.8 Previous response 470.9 % change 0.0%

Notes:

Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By: Asad Hidayat



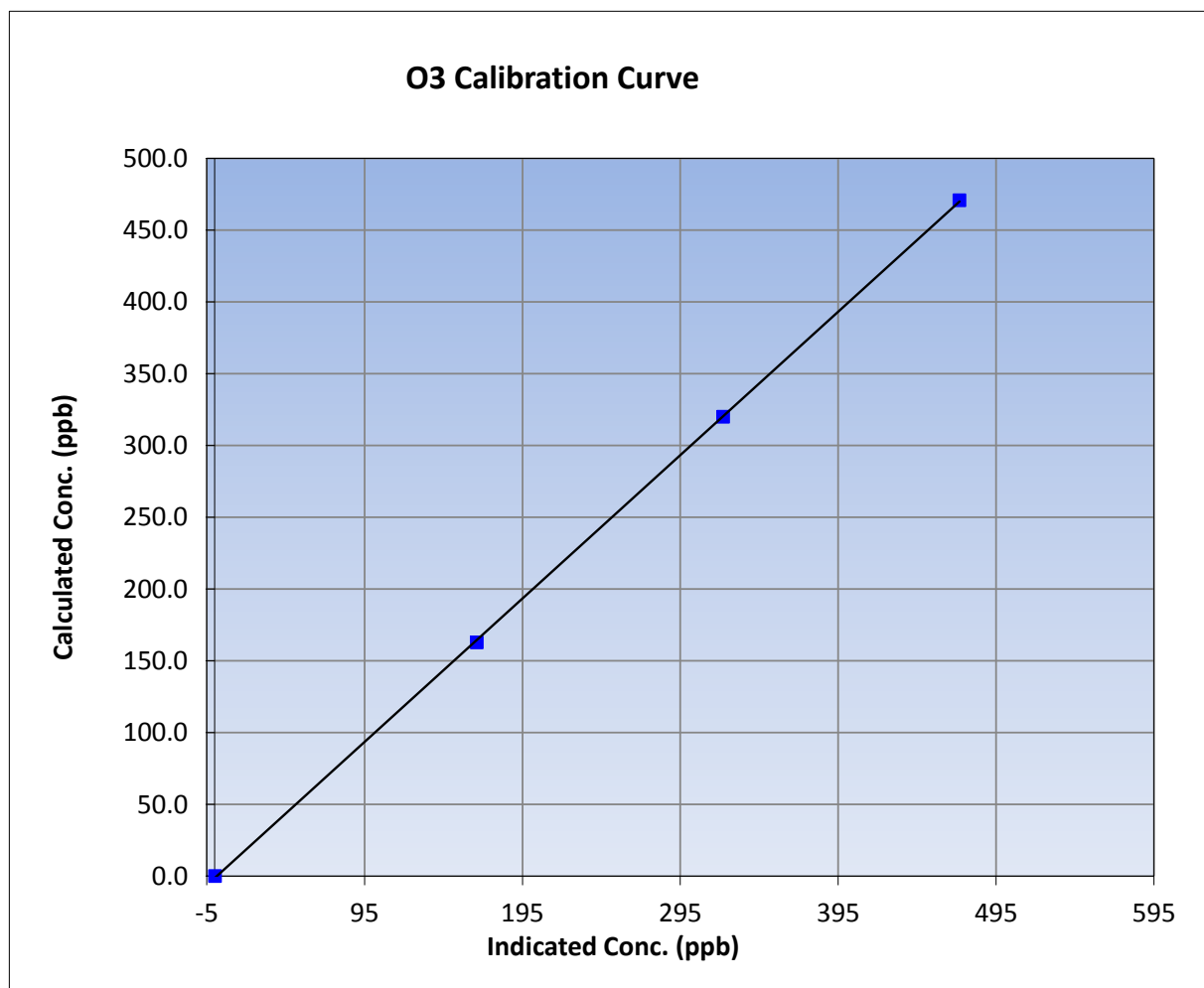
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	December 14, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	13:45	End Time (MST)	16:10
Analyzer make	Thermo 49i	Analyzer serial #	1426262595

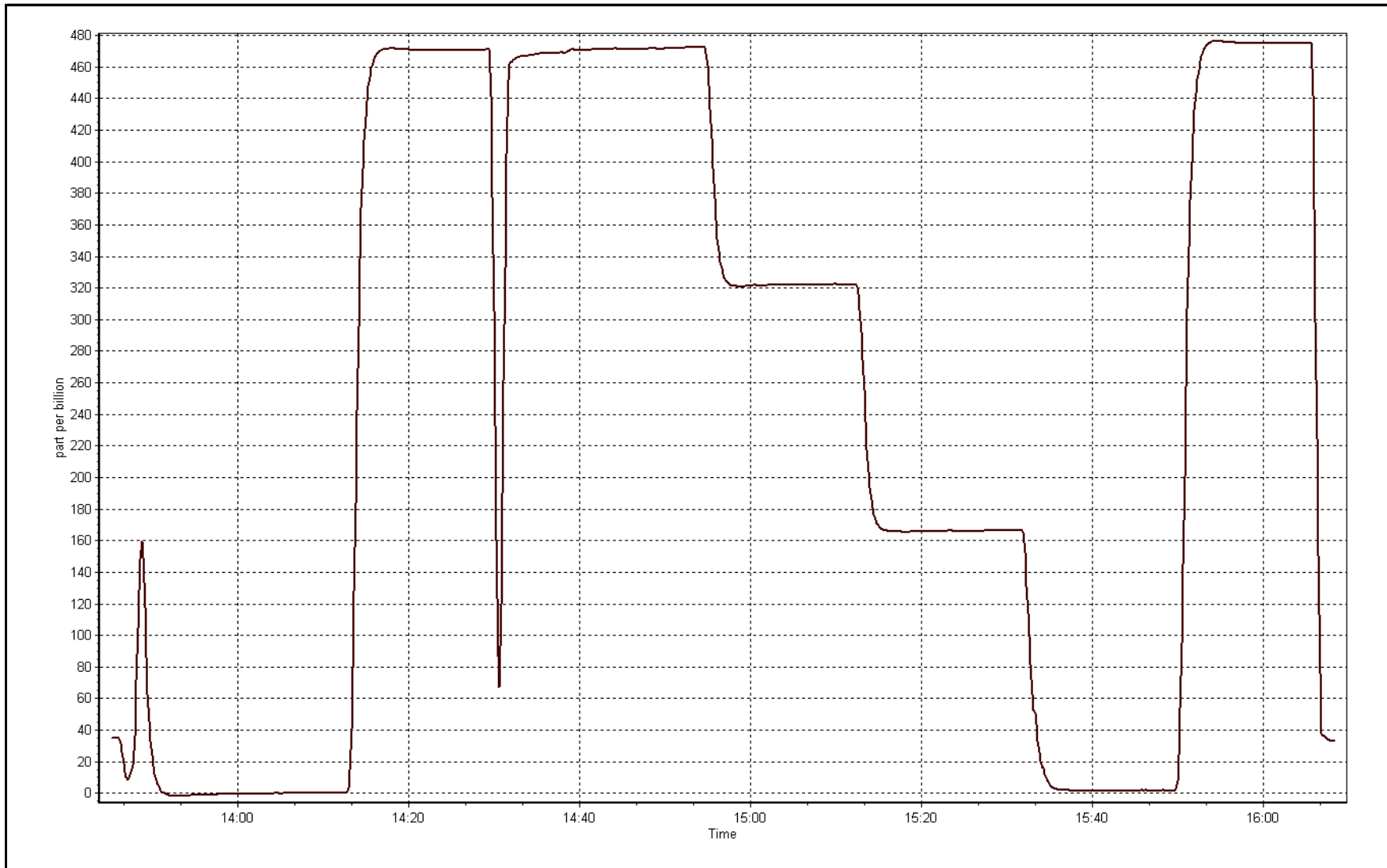
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999960
470.8	471.9	0.9979		
319.9	322.0	0.9932	Slope	0.998983
162.8	166.0	0.9809		
			Intercept	-1.400966



O3 Calibration Plot

Date: December 14, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	10:04	End Time (MST)	15:10
NO Cal Gas Conc	53.4 ppm	Gas Cert Reference	SA130026A
NOX Cal Gas Conc	53.4 ppm	Cal Gas Expiry Date	December 12, 2016
Calibrator	Sabio 4010	Serial Number	8400311
Zero air Generator	Teledyne API T701	Serial Number	4764

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2582
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.995715	0.998270	0.996126
	Data Offset	1.335596	1.164231	-0.409015
Current Calibration	Data Slope	0.996542	0.996205	1.002433
	Data Offset	0.756785	0.760487	-0.182479

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.068		1.084	
NOX coefficient	1.002		0.999	
NO2 coefficient	1.000		1.000	
NO bkgnd	4.1		4.0	
NOX bkgnd	4.4		4.2	
Chamber Temp	49.9	Deg C	50.3	Deg C
Moly Temp	325.5	Deg C	325.5	Deg C
PMT voltage	-808.1	V	-808.1	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	173.1	mmHg	170.6	mmHg
R Cell Press Nox	172.5	mmHg	170.6	mmHg
NO sample flow	0.781	lpm	0.736	lpm
Nox sample Flow	0.781	lpm	0.738	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted both zero and span. NMHC's was being fixed during this cal as well.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 1, 2016 Station Number: AMS 14

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.3	-0.2	----	----
as found span	5000	74.9	799.9	799.9	0.0	791.9	789.6	2.2	1.0102	1.0131
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
high point	5000	74.9	799.9	799.9	0.0	801.6	801.9	-0.3	0.9980	0.9976
second point	5000	37.5	400.5	400.5	0.0	402.9	402.9	-0.1	0.9941	0.9940
third point	5000	18.8	200.8	200.8	0.0	198.8	198.8	0.0	1.0102	1.0100
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as left span	5000	74.9	799.9	334.7	465.2	819.2	337.1	482.1	0.9765	0.9931
									1.0008	1.0005

Corrected As found NO_x= 792.4 NO= 789.9 Percent Change NO_x= 1.2% NO= 1.3%
 Previous Response NO_x= 802.0 NO= 800.2

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 74.90 ccm NOx ref calc conc = 799.9 ppb NO ref calc conc = 799.9 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	802.5	803.0	-0.1	0.9968	0.9962	----	----
1st NO2 (300)	334.7	468.2	801.9	334.7	467.2	0.9975	----	1.0022	99.8%
2nd NO2 (200)	484.1	318.9	802.3	484.1	318.2	0.9971	----	1.0022	99.8%
3rd NO2 (100)	639.1	163.9	803.1	639.1	164.1	0.9960	----	0.9988	100.1%
2nd NO ref point		0.0	803.2	802.8	0.5	0.9959	0.9965	----	----
Average Correction Factor						0.9966		1.0011	99.9%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

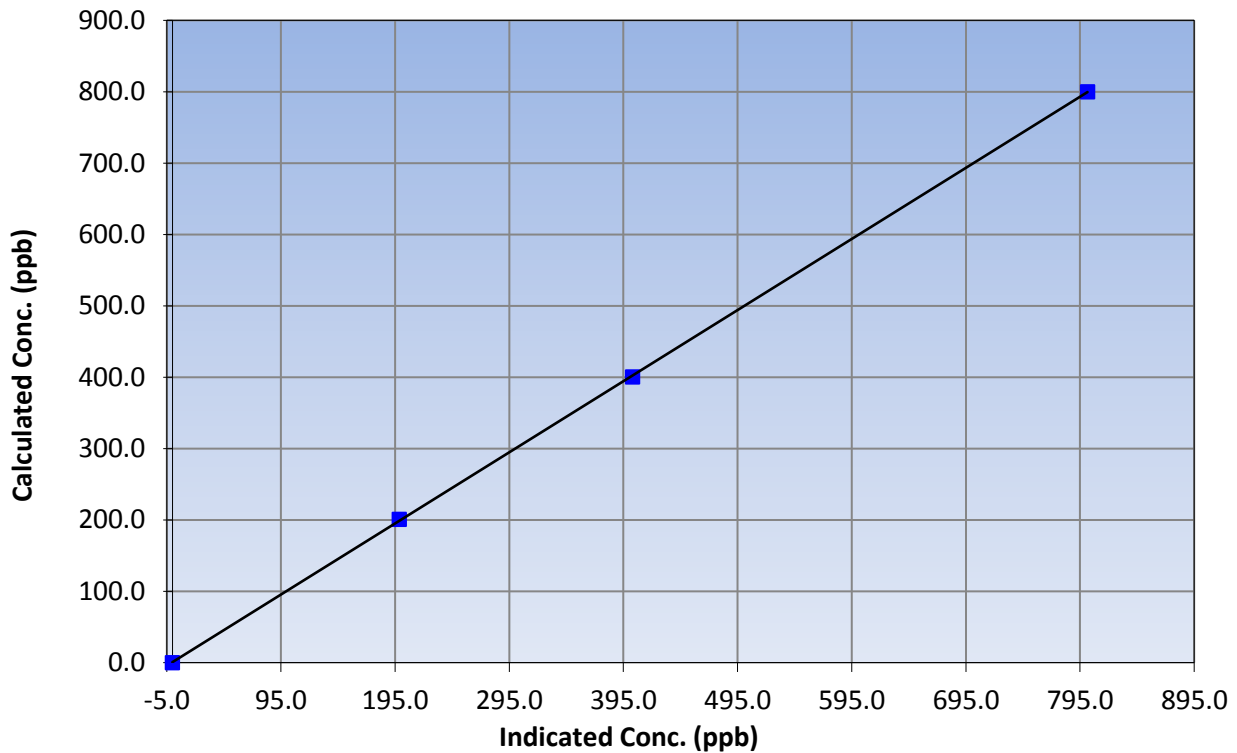
Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:04	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999979
799.9	801.6	0.9980		
400.5	402.9	0.9941	Slope	0.996542
200.8	198.8	1.0102		
			Intercept	0.756785

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

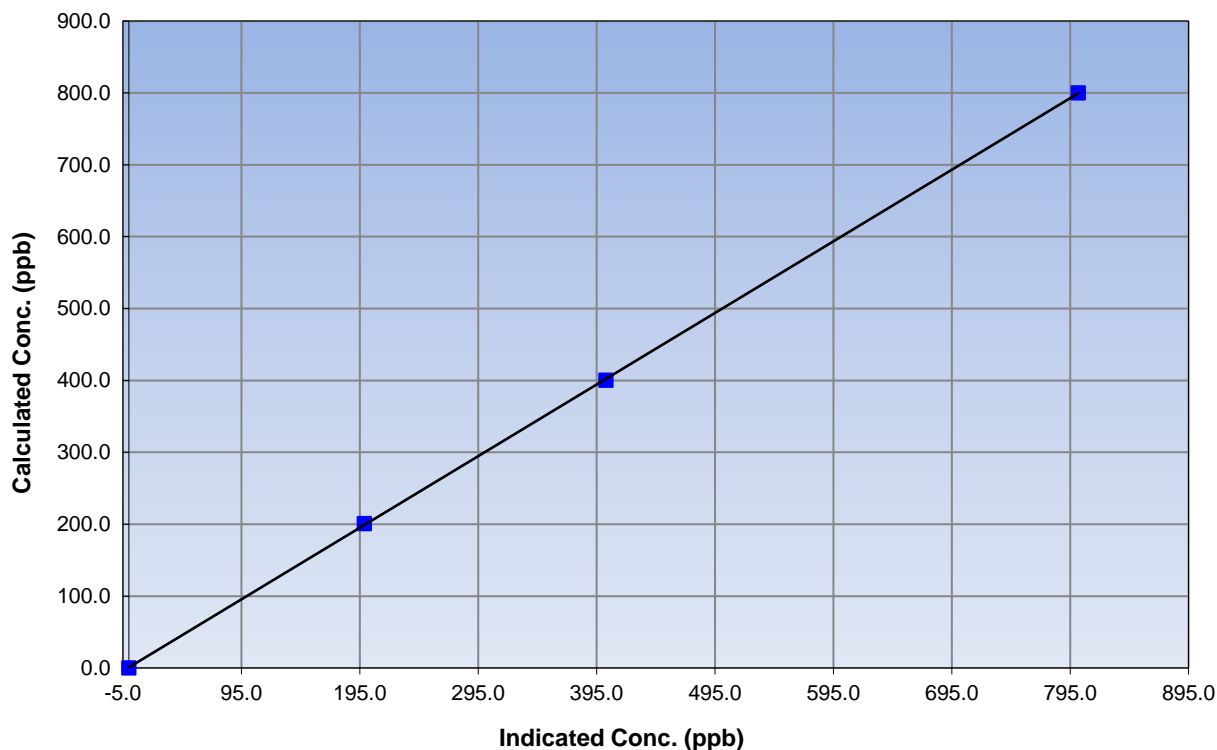
Station Information

Calibration Date	December 1, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:04	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999979
799.9	801.9	0.9976		
400.5	402.9	0.9940	Slope	0.996205
200.8	198.8	1.0100		
			Intercept	0.760487

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

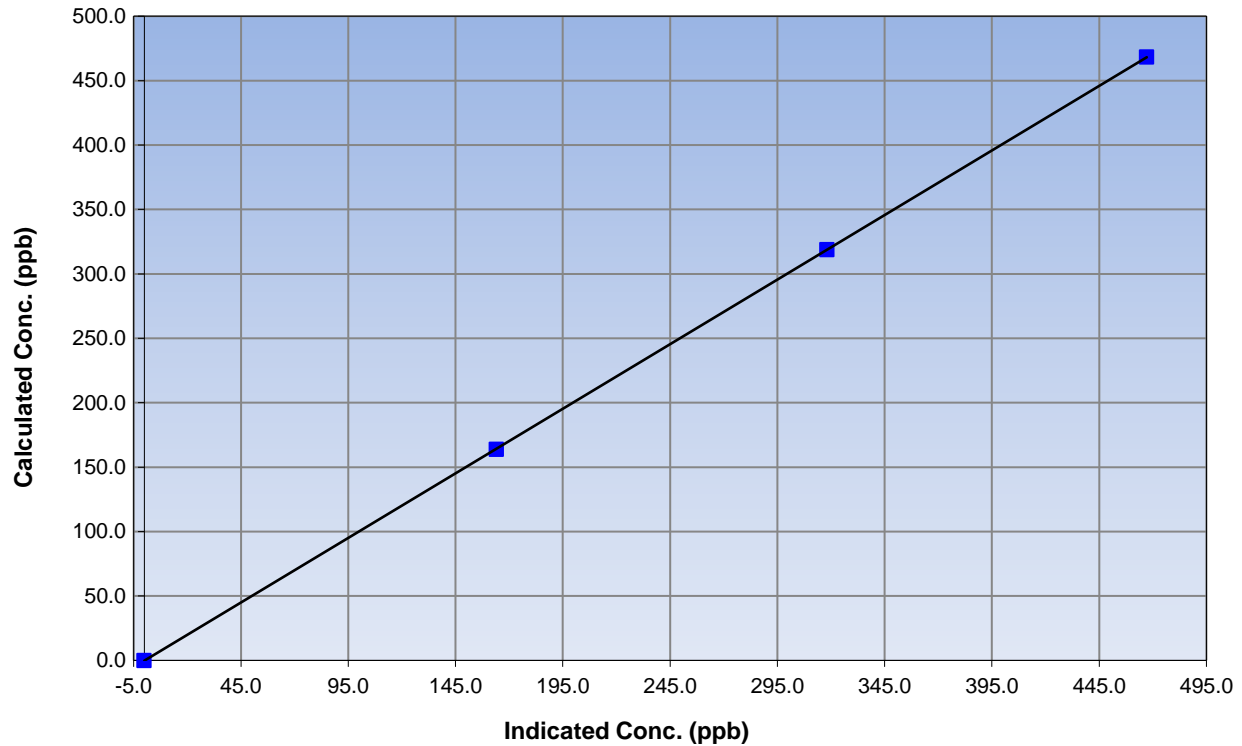
Station Information

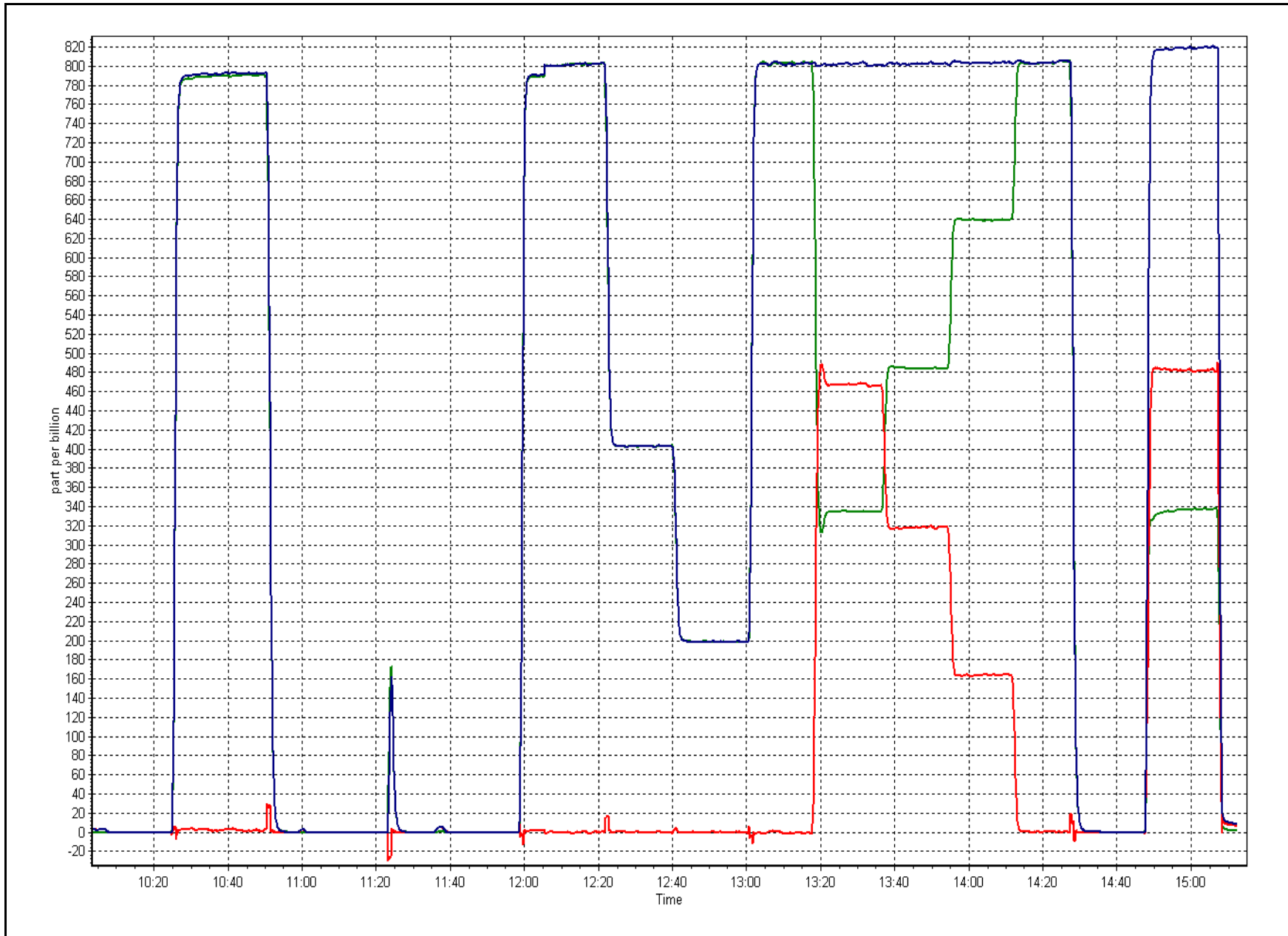
Calibration Date	December 1, 2016	Previous Calibration	November 3, 2016
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	10:04	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999998
468.2	467.2	1.0022		
318.9	318.2	1.0022	Slope	1.002433
163.9	164.1	0.9988		
			Intercept	-0.182479

NO₂ Calibration Curve







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 1, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Other: O3 GPT Reference		
Start Time (MST)	12:00	End Time (MST)	13:50
NO Cal Gas Conc	53.4 ppm	Gas Cert Reference	SA130026A
NOX Cal Gas Conc	53.4 ppm	Cal Gas Expiry Date	December 12, 2016
Calibrator	Sabio 4010	Serial Number	8400311
Zero air Generator	Teledyne API T701	Serial Number	4764

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2582
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.996542	0.996205	1.002433
	Data Offset	0.756785	0.760487	-0.182479
Current Calibration	Data Slope	1.001555	1.000803	1.001767
	Data Offset	0.290451	0.190153	-0.774305

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.084		1.084	
NOX coefficient	0.999		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.0		4.0	
NOX bkgrnd	4.2		4.2	
Chamber Temp	50.3	Deg C	50.2	Deg C
Moly Temp	325.5	Deg C	322.6	Deg C
PMT voltage	-808.1	V	-807.1	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	170.6	mmHg	172.2	mmHg
R Cell Press Nox	170.6	mmHg	172.2	mmHg
NO sample flow	0.736	lpm	0.734	lpm
Nox sample Flow	0.738	lpm	0.735	lpm

Notes:

No adjustments made. GPT reference for O3 calibration.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

December 14, 2016

Station Number:

AMS 14

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
as found span	5000	74.9	799.9	799.9	0.0	798.4	799.1	-0.3	1.0019	1.0010
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
high point	5000	74.9	799.9	799.9	0.0	798.4	799.1	-0.3	1.0019	1.0010
second point										
third point										
as left zero										
as left span										
									1.0019	1.0010

Corrected As found
Previous Response

NO_x= 798.7
NO_x= 802.0

NO= 799.3
NO= 802.2

Percent Change

NO_x= 0.4%

NO= 0.4%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 74.90 ccm NOx ref calc conc = 799.9 ppb NO ref calc conc = 799.9 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	798.4	799.1	-0.1	1.0019	1.0010	----	----
1st NO2 (300)	328.3	470.8	798.1	328.3	470.0	1.0022	----	1.0018	99.8%
2nd NO2 (200)	479.3	319.9	800.0	479.3	320.7	1.0000	----	0.9973	100.3%
3rd NO2 (100)	636.3	162.8	800.5	636.3	164.3	0.9992	----	0.9909	100.9%
2nd NO ref point		0.0	802.0	800.0	1.4	0.9974	0.9999	----	----
Average Correction Factor						0.9997		0.9967	100.3%

Calibration Performed By:

Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

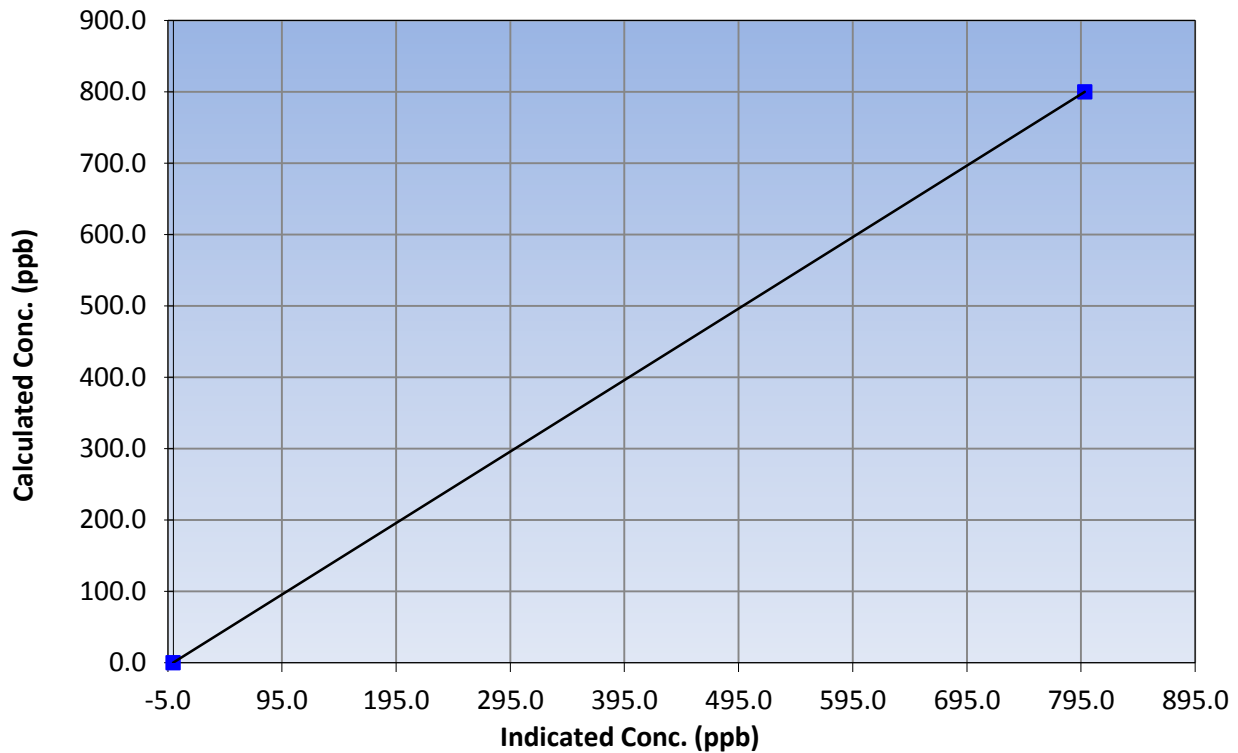
Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 1, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	12:00	End Time (MST)	13:50
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	1.000000
799.9	798.4	1.0019		
			Slope	1.001555
			Intercept	0.290451

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

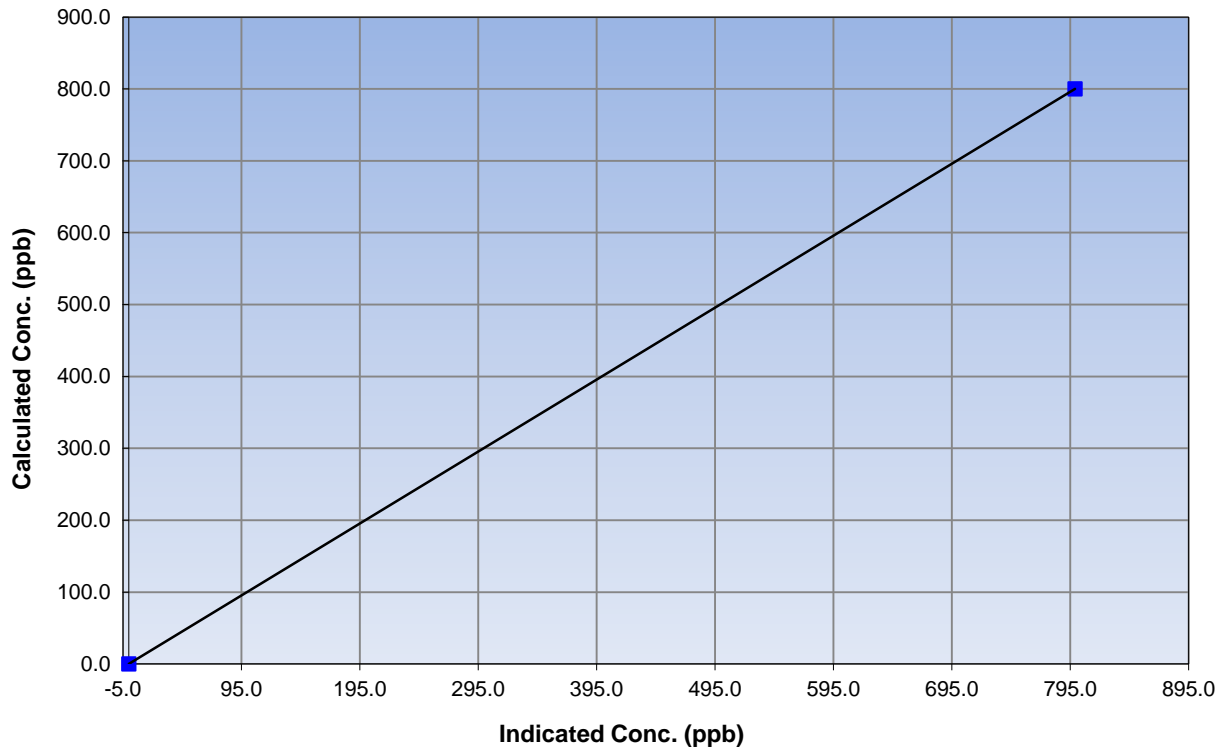
Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 1, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	12:00	End Time (MST)	13:50
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	1.000000
799.9	799.1	1.0010		
			Slope	1.000803
			Intercept	0.190153

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

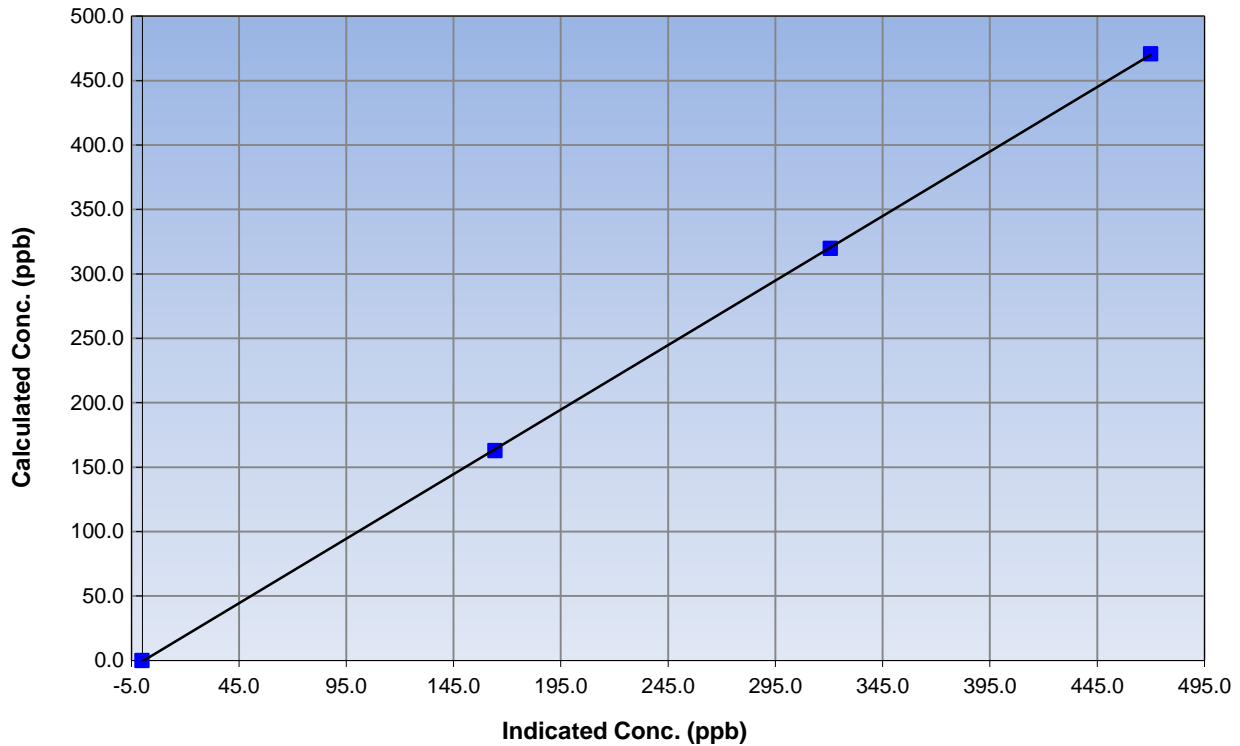
Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 1, 2016
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	12:00	End Time (MST)	13:50
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

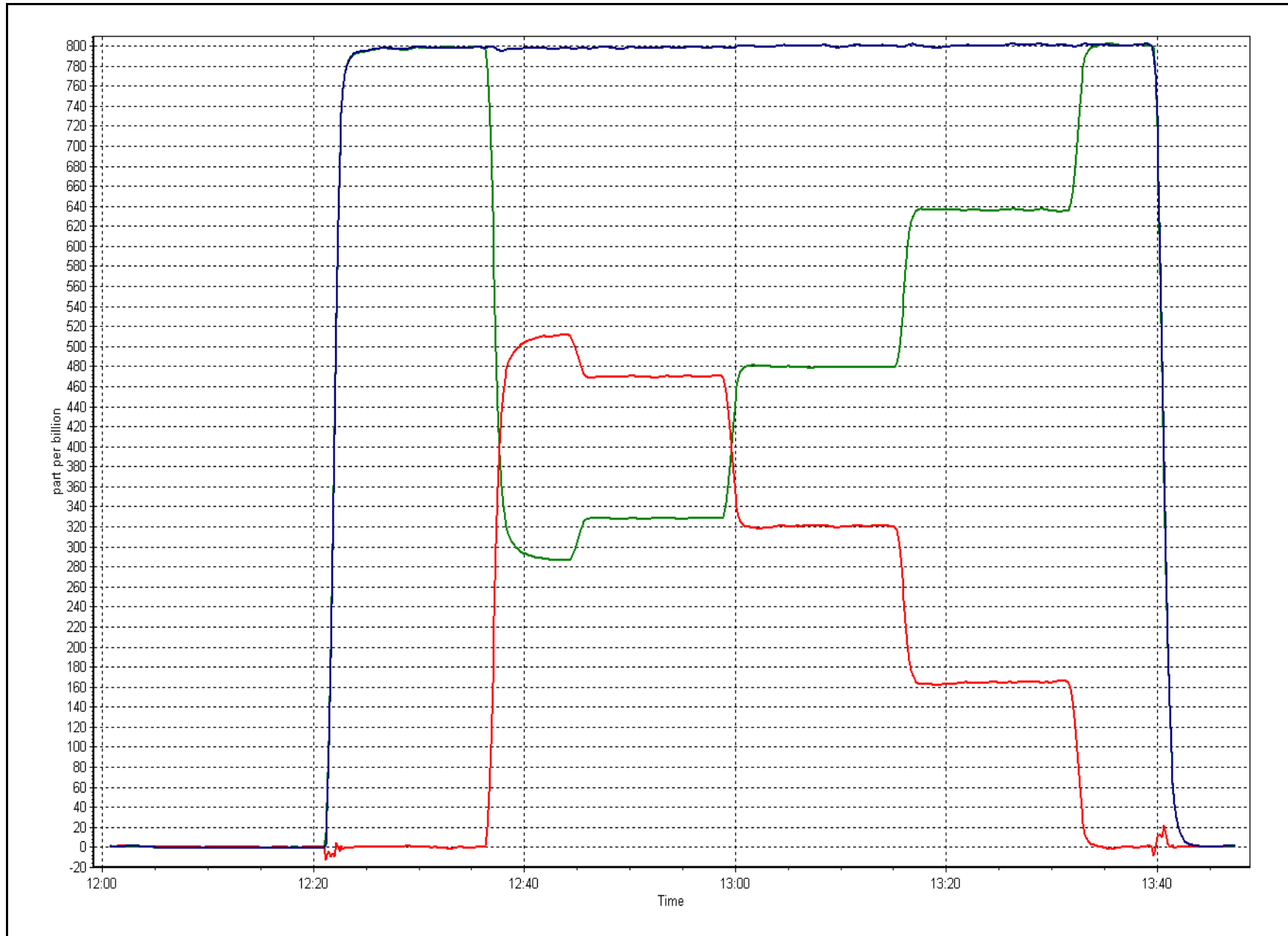
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999977
470.8	470.0	1.0018		
319.9	320.7	0.9973	Slope	1.001767
162.8	164.3	0.9909		
			Intercept	-0.774305

NO₂ Calibration Curve



NOX Calibration Plot

Date: December 14, 2016





Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Anzac	Station number:	AMS 14
Calibration Date:	December 14, 2016	Last Cal Date:	November 3, 2016
Start time (MST):	13:15	End time (MST):	14:05
Sharp Model:	5030	S/N:	E1093
Particulate Fraction:	PM2.5	C14 Source S/N:	4933
Flow Standard Model:	Delta Cal	S/N:	1019
Temp/RH standard:	Delta Cal	S/N:	1019

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-14	-14.1	-14	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	958	954.25	958	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	998	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.2	-----	0.2	<input type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

				Tolerance
Leak Test:	Date of check:	<u>September 22, 2016</u>	Last Cal Date:	<u>June 15, 2016</u>
	Flow w/o adaptor:	<u>16.67</u>	Flow w/ adaptor:	<u>16.38</u> 0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	<u>1337</u>	S/N:	<u>5872</u>
	Date of check:	<u>June 15, 2016</u>	Last Cal Date:	<u>March 16, 2016</u>
	New Correction Factor:	<u>7212</u>	Previous Correction Factor:	<u>7124</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	16		16	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	19		19	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	17		17	<input type="checkbox"/>	+/- 2 °C
RH (%)	9		9	<input type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned. No adjustment made.

Calibration by: Asad Hidayat



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 15
CNRL HORIZON
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	687	36	57	97.18	15	0	5	0
TRS (ppb) Average	674	32	70	94.89	1	0	1	0
THC (ppm) Average	703	36	41	99.33	4.6	-	3	-
NO2 (ppb) Average	703	36	41	99.33	42	0	20	-
NO (ppb) Average	703	36	41	99.33	114	-	22	-
NOX (ppb) Average	703	36	41	99.33	133	-	42	-
PM2.5 (ug/m3) Average	709	2	35	95.56	22.9	-	15.4	0
Temperature 2 m (C) Average	744	0	0	100.00	-0.9	-	-2.5	-
Wind Speed 10 m (km/h) Average	736	0	8	98.92	25	-	16	-
Wind Direction 10 m (deg) Average	736	0	8	98.92	-	-	-	-
Precipitation (mm) Total	421	0	323	56.59	0.8	-	2.3	-
Relative Humidity (%) Average	744	0	0	100.00	95	-	92	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	200	-	31	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	687	0.6	2	-	0	0	0	0	0	0	1	15
TRS (ppb) Average	674	0.3	0	-	0	0	0	0	0	0	1	1
THC (ppm) Average	703	2.37	0.3	-	2.1	2.1	2.2	2.3	2.5	2.8	4.6	4.6
NO2 (ppb) Average	703	8.7	9	-	0	1	2	5	14	23	42	42
NO (ppb) Average	703	3.7	10	-	0	0	0	0	2	12	114	114
NOX (ppb) Average	703	12.4	16	-	0	1	2	5	17	35	133	133
PM2.5 (ug/m3) Average	709	5.5	4.1	-	0.9	1.9	2.7	4.2	7	11.5	22.9	22.9
Temperature 2 m (C) Average	744	-18.46	9.1	-	-38.7	-30.2	-24.9	-18.5	-13.1	-4.7	-0.9	-0.9
Wind Speed 10 m (km/h) Average	736	7.9	4	-	0	3	5	7	10	14	25	25
Wind Direction 10 m (deg) Average	736	-	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	421	-	-	2.54	-	-	-	-	-	-	-	-
Relative Humidity (%) Average	744	78	8	-	57	69	72	78	83	88	95	95
Global Solar Radiation (W/m2) Average	744	11.3	26	-	0	0	0	0	8	47	200	200

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	13 Dec 2016 02:00	13 Dec 2016 10:00	9	Unstable operation - excessive baseline drift
SO2	13 Dec 2016 16:00	14 Dec 2016 01:00	10	Unstable operation - excessive baseline drift
SO2	18 Dec 2016 09:00	18 Dec 2016 10:00	2	Unstable operation - excessive baseline drift
TRS	09 Dec 2016 05:00	10 Dec 2016 13:00	33	Analyzer Failure - pump failure
TRS	14 Dec 2016 11:00	14 Dec 2016 15:00	5	Maintenance - baseline adjustment
THC	06 Dec 2016 13:00	06 Dec 2016 17:00	5	Analyzer Failure - unstable station temp
NO2	06 Dec 2016 15:00	06 Dec 2016 19:00	5	Unstable Operation - unstable station temp
PM2.5	23 Dec 2016 06:00	24 Dec 2016 14:00	33	Unstable Operation
WS	19 Dec 2016 09:00	19 Dec 2016 12:00	4	Flat line in sensor output signal -sensor frozen
WS	23 Dec 2016 22:00	23 Dec 2016 22:00	1	Flat line in sensor output signal -sensor frozen
WS	29 Dec 2016 00:00	29 Dec 2016 00:00	1	Flat line in sensor output signal -sensor frozen
WS	30 Dec 2016 02:00	30 Dec 2016 02:00	1	Flat line in sensor output signal -sensor frozen
WS	31 Dec 2016 02:00	31 Dec 2016 02:00	1	Flat line in sensor output signal -sensor frozen
PC	01 Dec 2016 01:00	14 Dec 2016 11:00	323	Analyzer Failure - ice/snow build up



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 15 ppb on Dec 2 14:00	Maximum Daily Average: 4.7 ppb on Dec 19		Hours of Data:	687
Minimum Value: 0 ppb on Dec 4 22:00	Minimum Daily Average: 0.0 ppb on Dec 5		Hours of Missing Data:	57
Maximum Diurnal Average: 1.2 ppb at hour 14	Minimum Diurnal Average: 0.3 ppb at hour 3		Hours of Calibration:	36
Monthly Average: 0.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 8		Percent Operational Time:	97.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	7	15	8	3	2	1	1	7	15	4	3	4	3.0	15
3-Dec	5	7	Z	6	5	6	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	7	
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.2	1	
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
6-Dec	0	0	0	0	0	Z	0	0	0	0	1	4	7	3	1	3	1	0	0	0	0	0	0	0.9	7	
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
9-Dec	0	0	Z	0	0	0	0	0	0	1	1	2	2	3	2	2	1	0	0	0	1	1	1	1	0.8	3
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1	
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1	
13-Dec	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	C	C	C	C	C	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
14-Dec	UO	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	1	
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.2	1	
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	0	0	0	0	0	Z	0	0	UO	UO	1	3	2	0	0	1	1	1	1	2	3	2	3	3	1.2	3
19-Dec	Z	2	3	5	8	5	6	7	6	8	7	7	8	10	9	8	4	1	1	1	0	0	1	1	4.7	10
20-Dec	1	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
22-Dec	0	0	0	Z	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
25-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0.5	1	
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.2	1	
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	2	2	2	1	1	1	0	1	0.7	2
30-Dec	1	1	1	1	1	Z	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1
31-Dec	Z	0	1	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2	

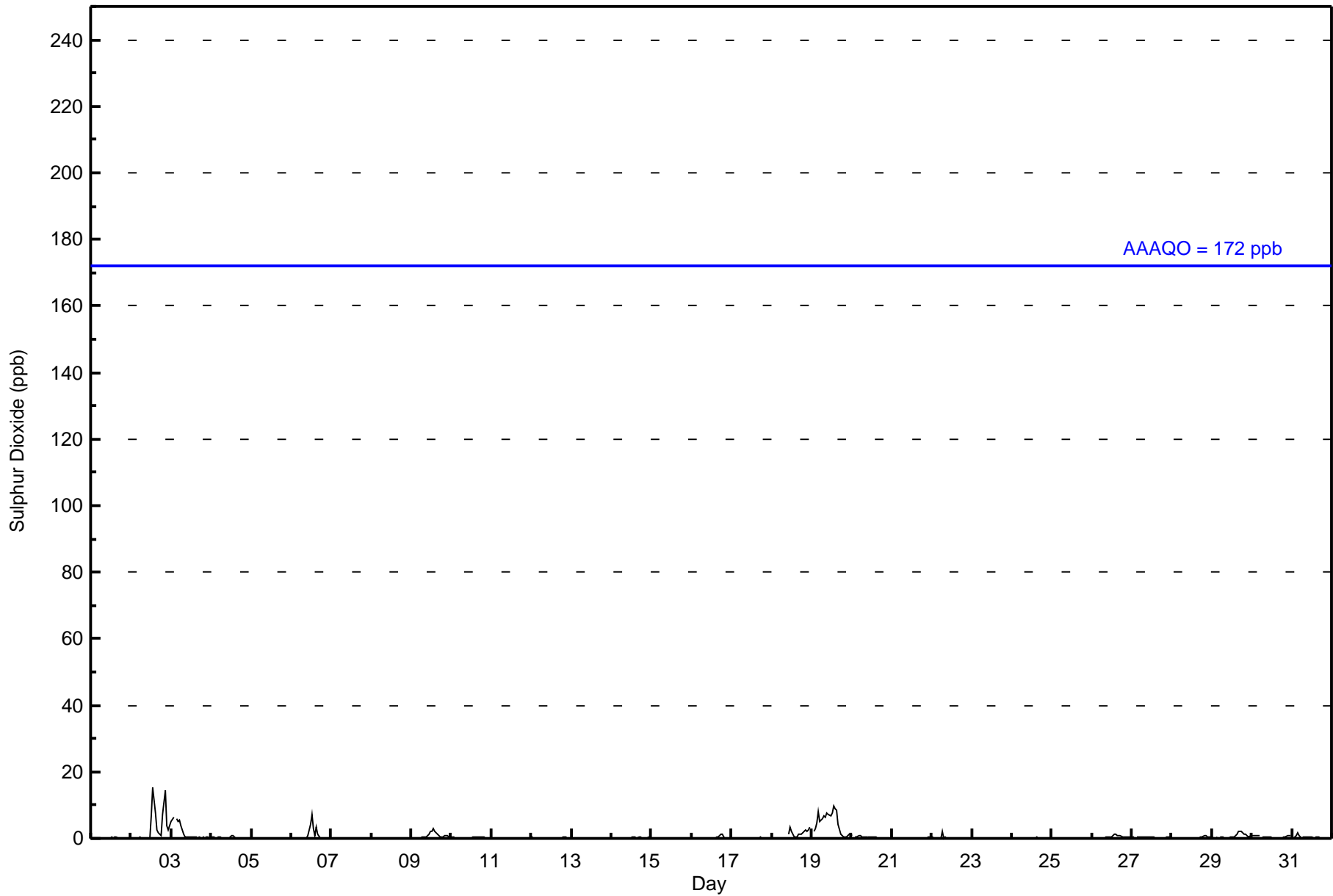
0.4	0.5	0.3	0.6	0.7	0.6	0.5	0.4	0.4	0.4	0.4	0.5	0.7	1.0	1.2	0.8	0.8	0.5	0.4	0.3	0.5	0.8	0.4	0.4	0.4	Diurnal Average
5	7	3	6	8	6	6	6	7	6	8	7	7	8	15	9	8	4	2	2	7	15	4	3	4	Diurnal Maximum

Z - zerospan C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	685	99.71	99.71
11 - 20	2	0.29	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	16	35	49	15	7	5	12	20	87	202	80	40	28	41	26	14	677
11 - 20	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	16	35	49	15	7	5	12	21	88	202	80	40	28	41	26	14	679

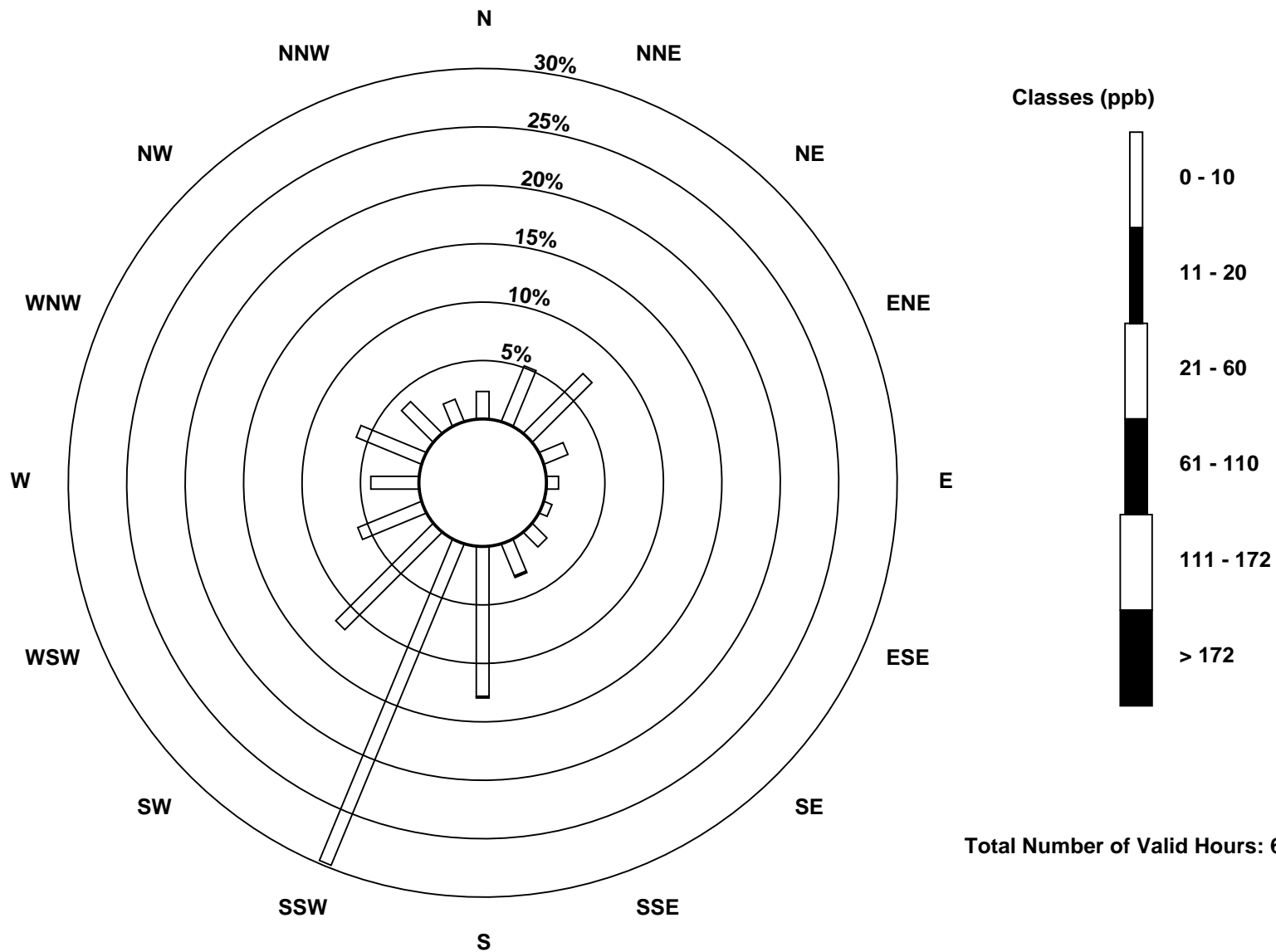
Total Number of Valid Hours: 679

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

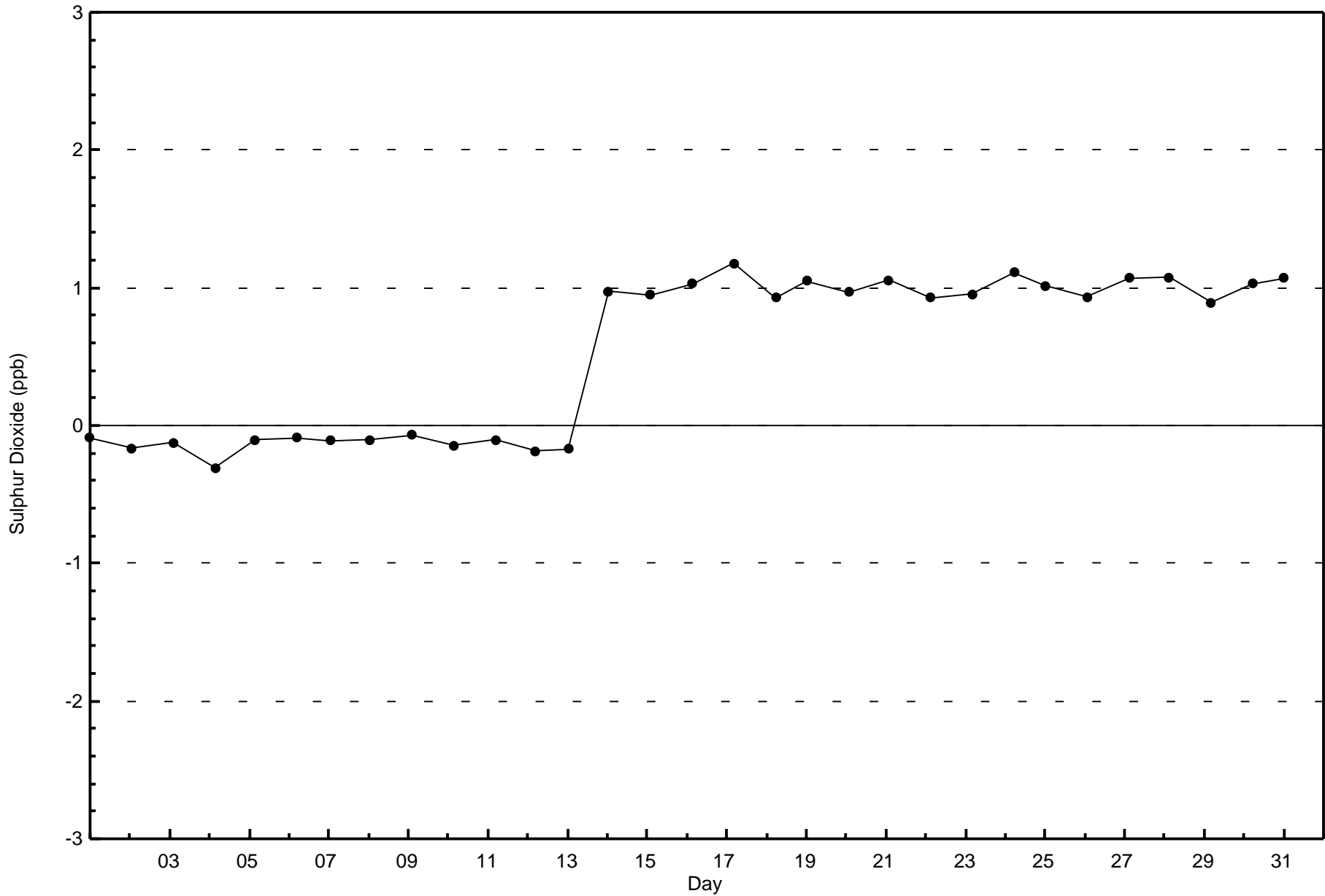
Sulphur Dioxide (SO₂) - ppb
CNRL Horizon (AMS 15)





WBEA Data PC
Zero Responses

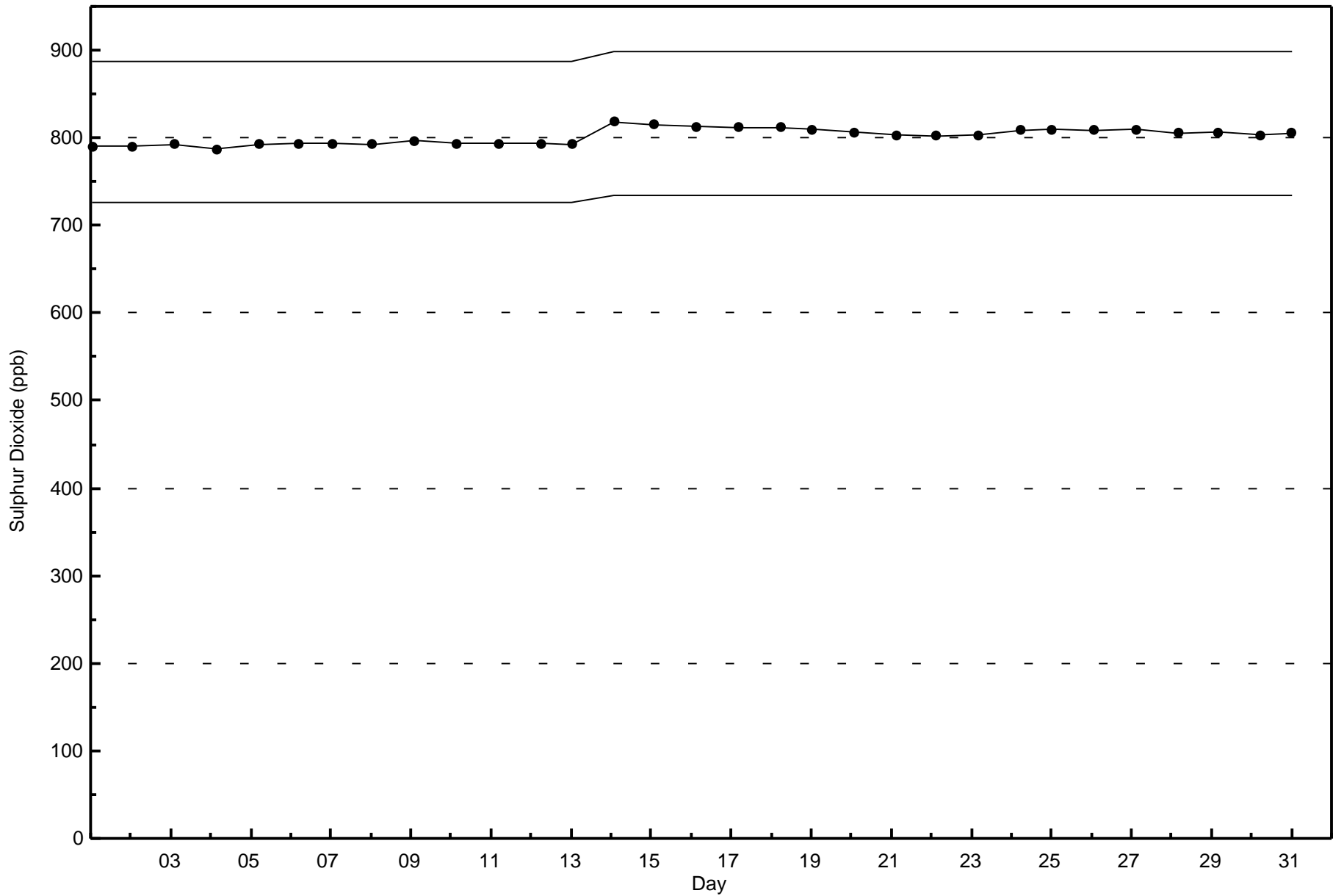
Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

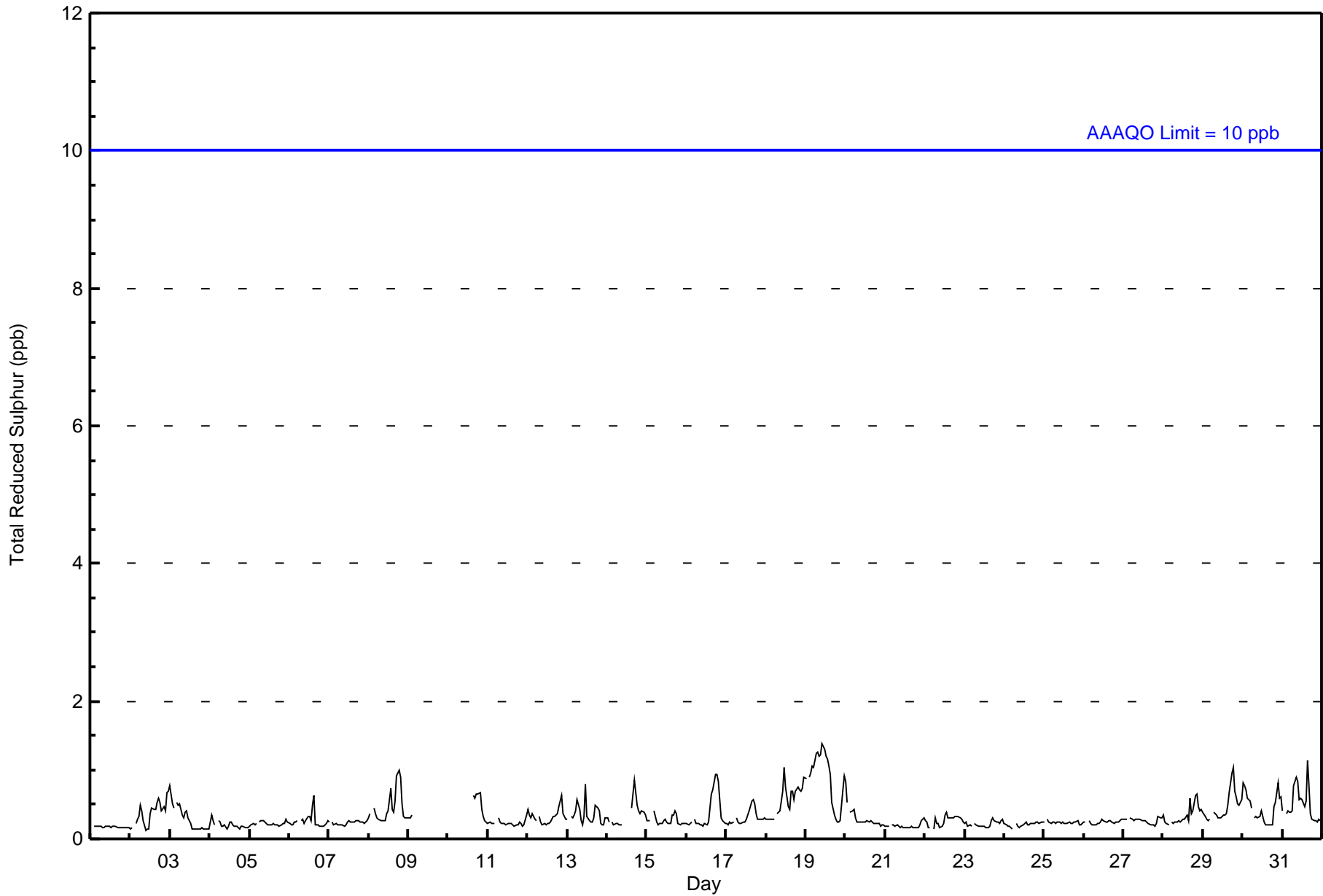
CNRL Horizon - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 1 ppb on Dec 19 11:00 Maximum Daily Average: 0.9 ppb on Dec 19																	Hours in Service: 744 Hours of Data: 674									
Minimum Value: 0 ppb on Dec 2 10:00 Minimum Daily Average: 0.2 ppb on Dec 1 Maximum Diurnal Average: 0.4 ppb at hour 18 Minimum Diurnal Average: 0.3 ppb at hour 10 Monthly Average: 0.3 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 1																	Hours of Missing Data: 70 Hours of Calibration: 32 Percent Operational Time: 94.9									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	1	0.4	1
3-Dec	1	1	0	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1
7-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0.4	1
9-Dec	0	0	0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0	
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	1	1	1	1	1	0	0	0	--	1	
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1
13-Dec	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
14-Dec	0	0	Z	0	0	0	0	0	0	0	M	M	M	M	M	0	1	1	0	0	0	0	0	0	0.4	1
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0.4	1
17-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0.3	1
18-Dec	0	0	0	0	0	0	Z	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0.6	1
19-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0.9	1
20-Dec	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
21-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
28-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0.3	1
29-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0.5	1
30-Dec	1	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
31-Dec	0	Z	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0.5	1
0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.4 0.4 0.4 0.4 0.4 0.3 0.3 0.3 0.3																								Diurnal Average		
1 1																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



WBEA Data PC
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	674	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	20	38	50	16	7	5	10	17	74	187	80	39	36	44	28	16	667
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	20	38	50	16	7	5	10	17	74	187	80	39	36	44	28	16	667

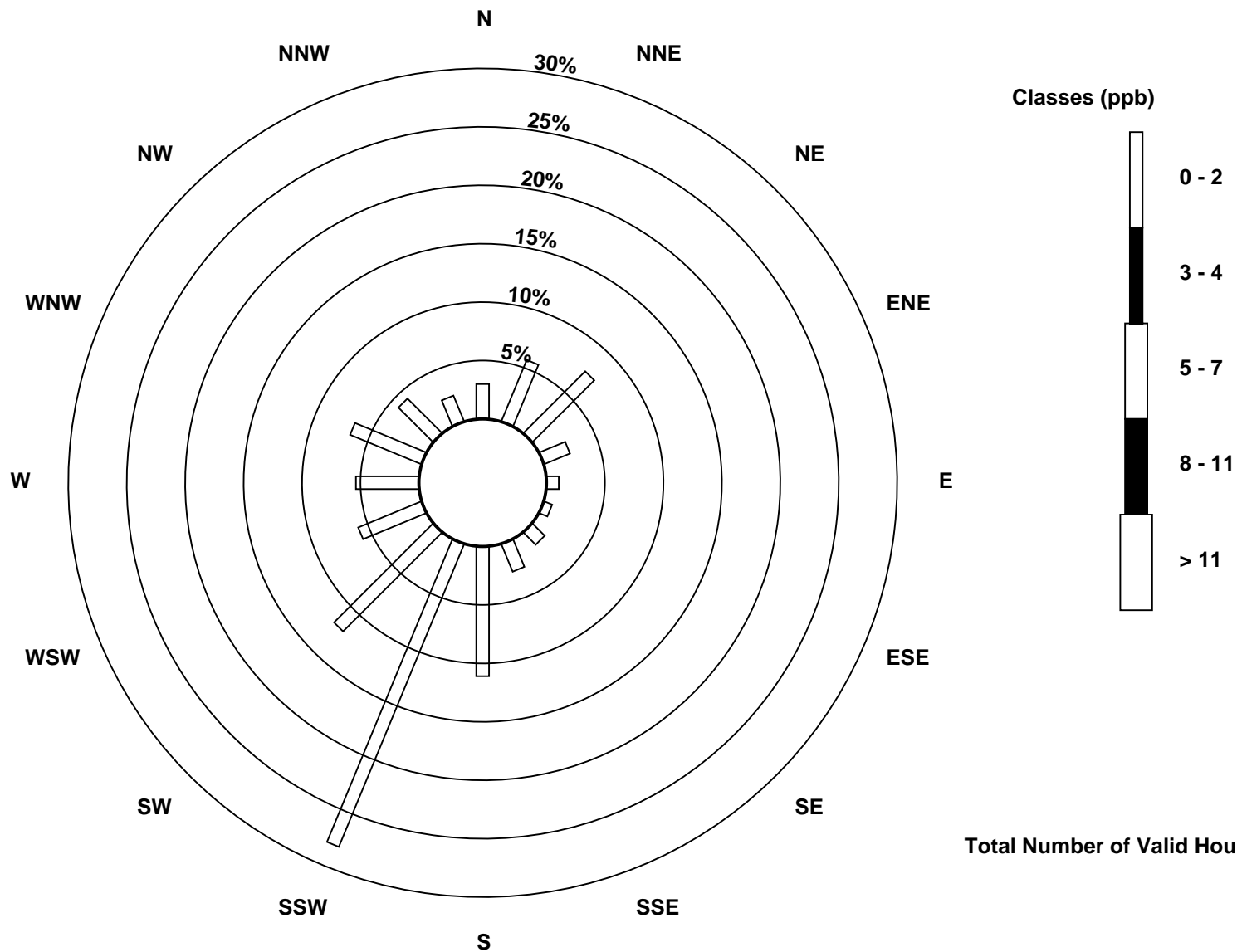
Total Number of Valid Hours: 667

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

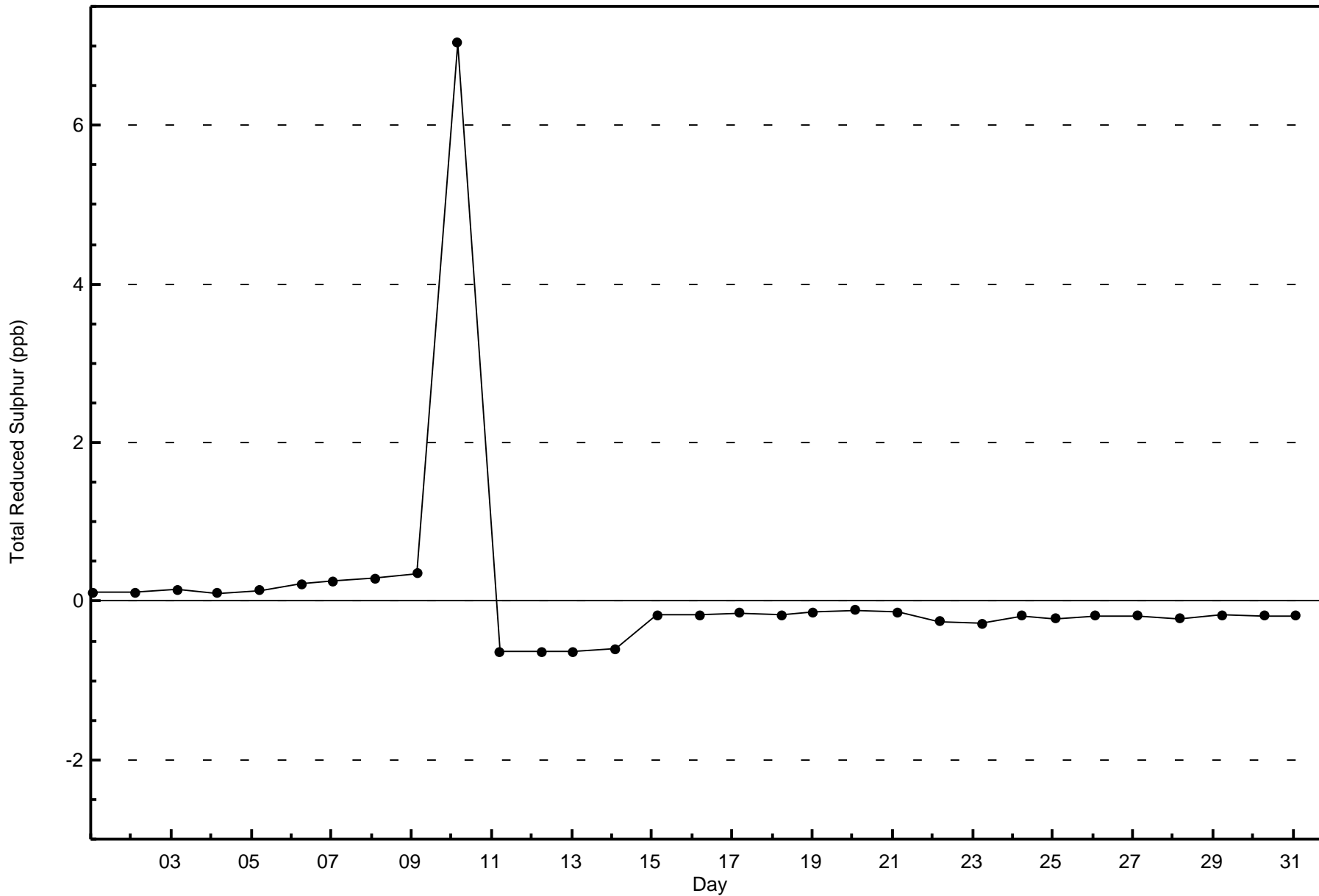
Total Reduced Sulphur (TRS) - ppb
CNRL Horizon (AMS 15)

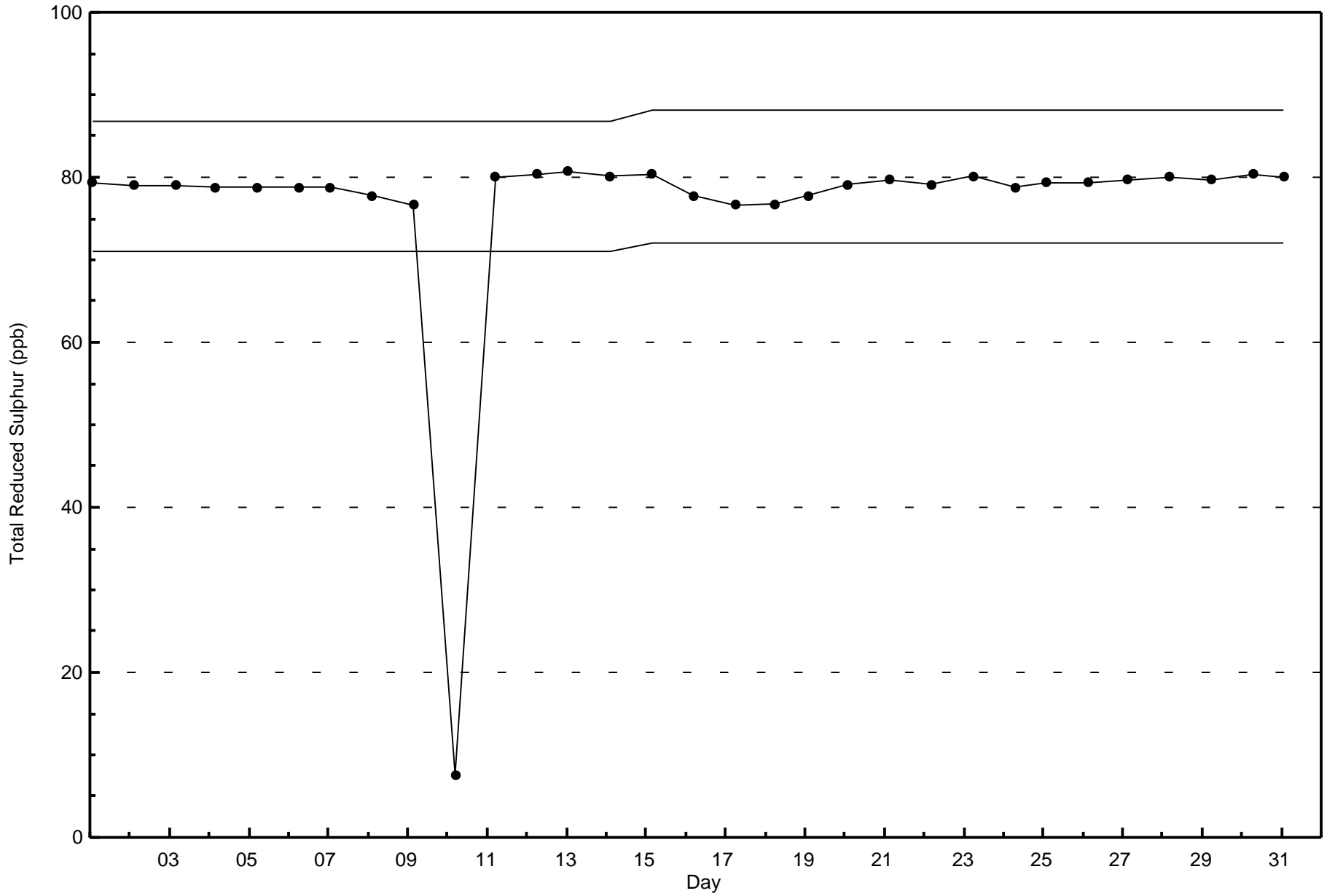




WBEA Data PC
Zero Responses

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - December 2016

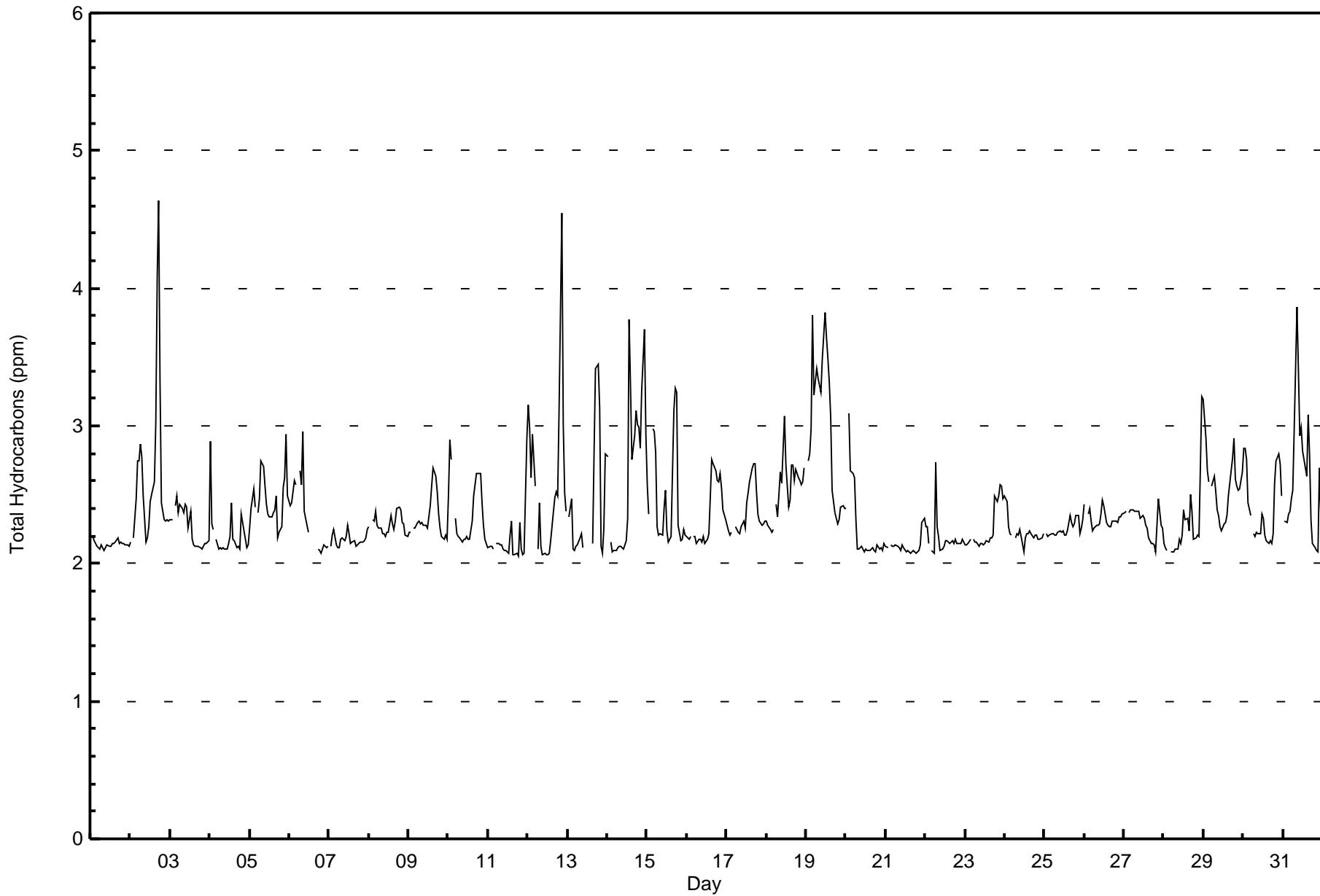






WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
CNRL Horizon - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	667	94.88	94.88
3.1 - 10.0	36	5.12	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
CNRL Horizon - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	15	37	49	13	6	5	11	21	85	200	77	40	28	38	27	12	664	
3.1 - 10.0	1	1	1	3	1	0	1	0	3	2	3	0	6	7	1	1	31	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	16	38	50	16	7	5	12	21	88	202	80	40	34	45	28	13	695	

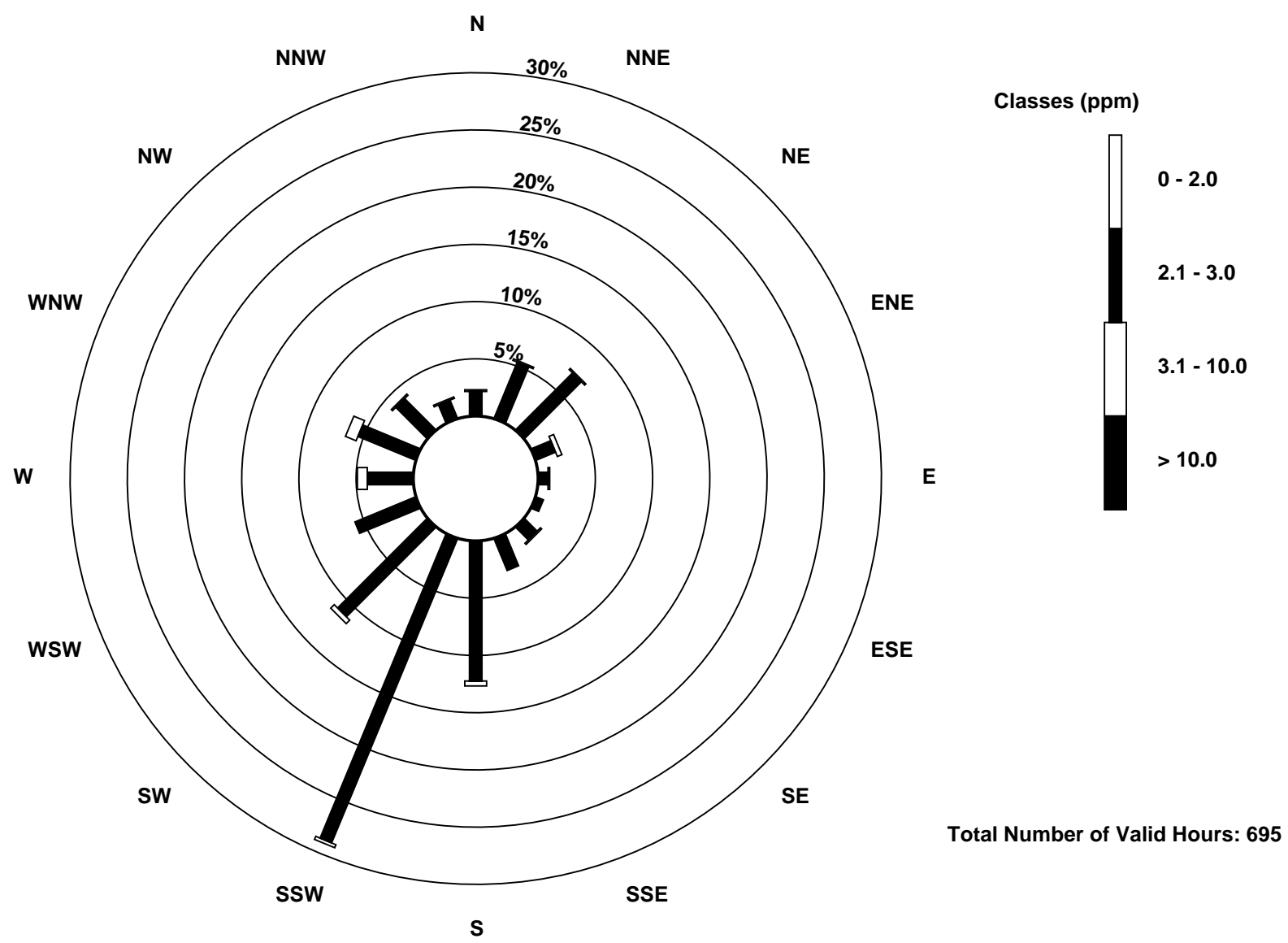
Total Number of Valid Hours: 695

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

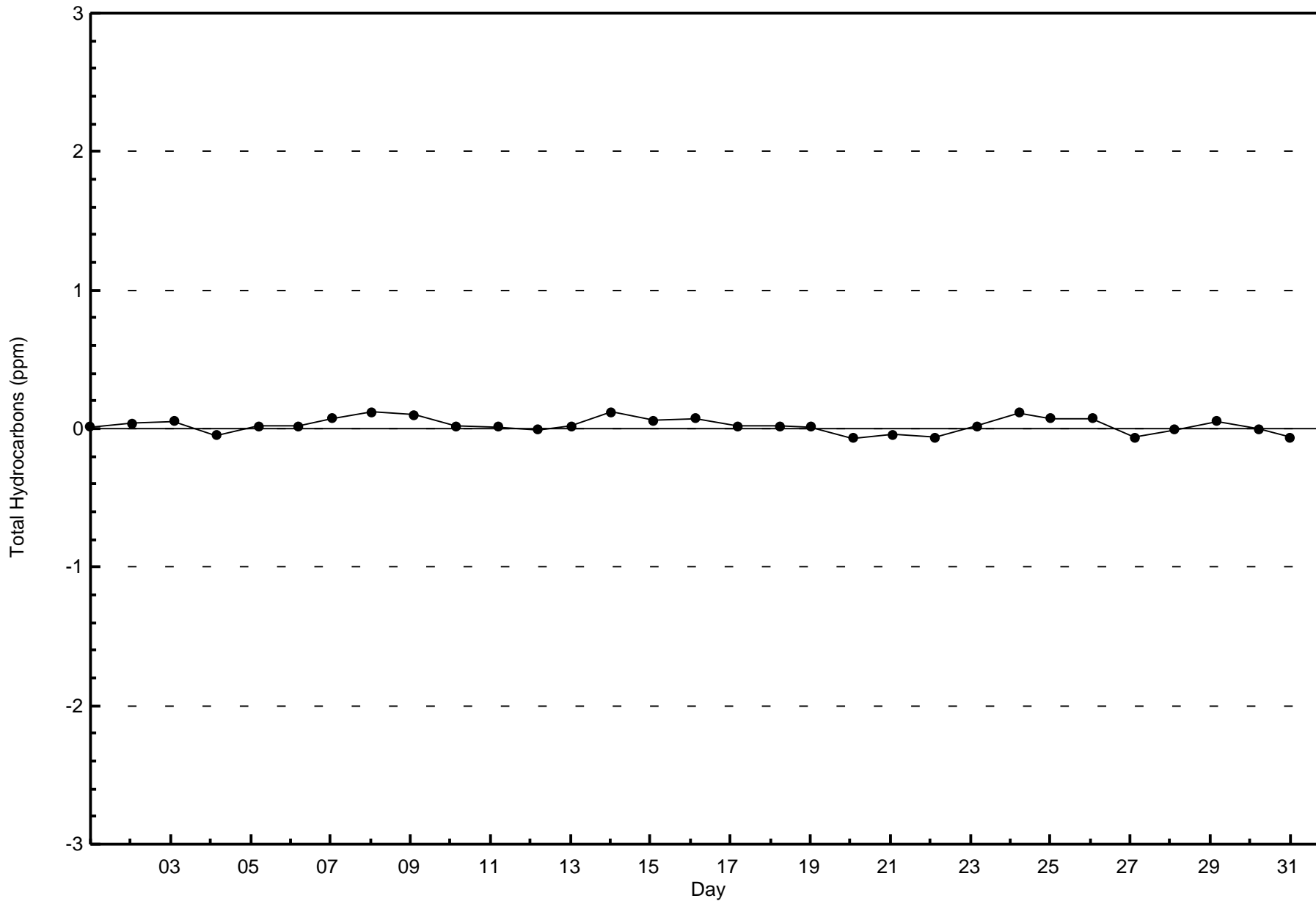
Total Hydrocarbons (THC) - ppm
CNRL Horizon (AMS 15)





WBEA Data PC
Zero Responses

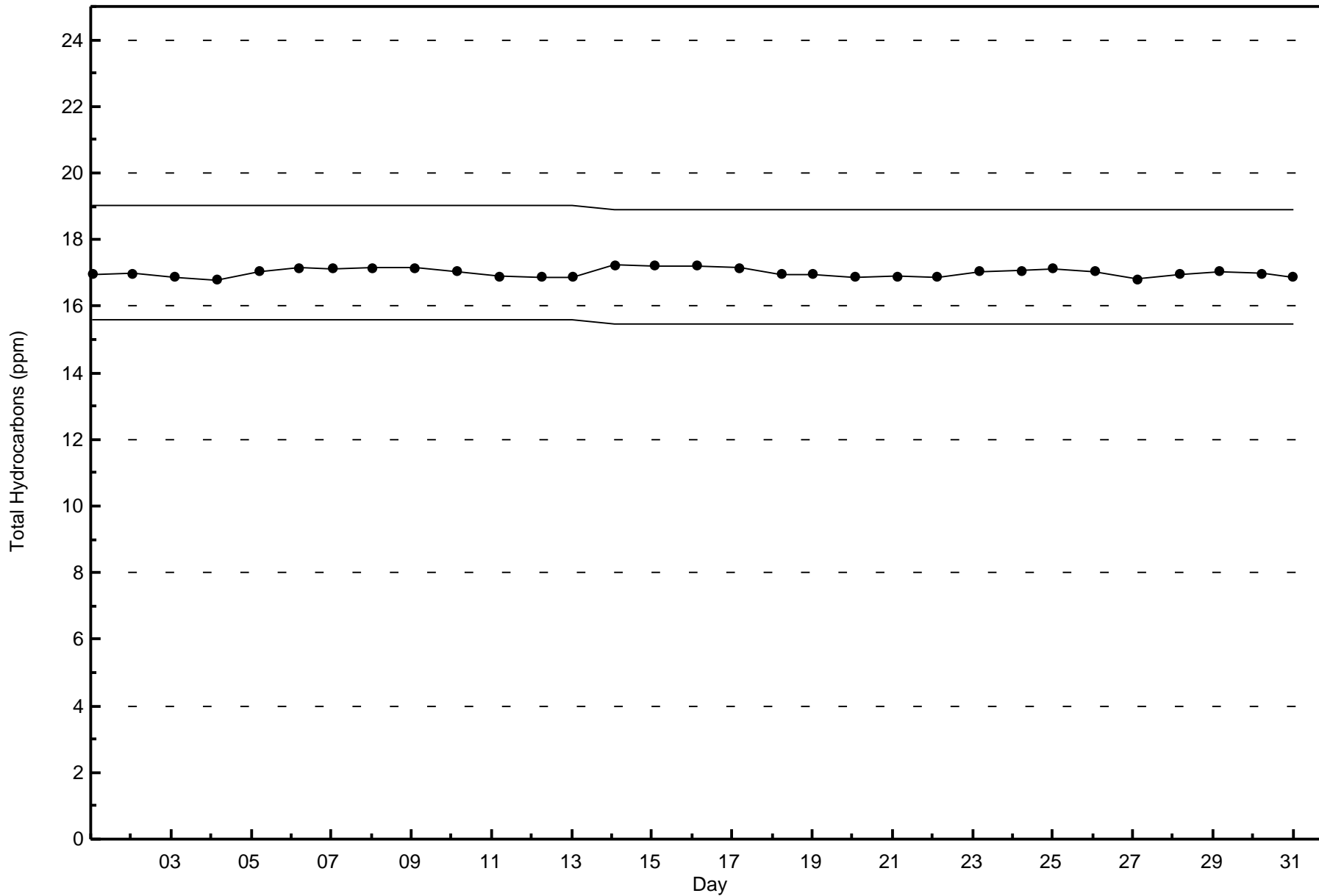
Total Hydrocarbons (THC) - ppm
CNRL Horizon - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
CNRL Horizon - December 2016



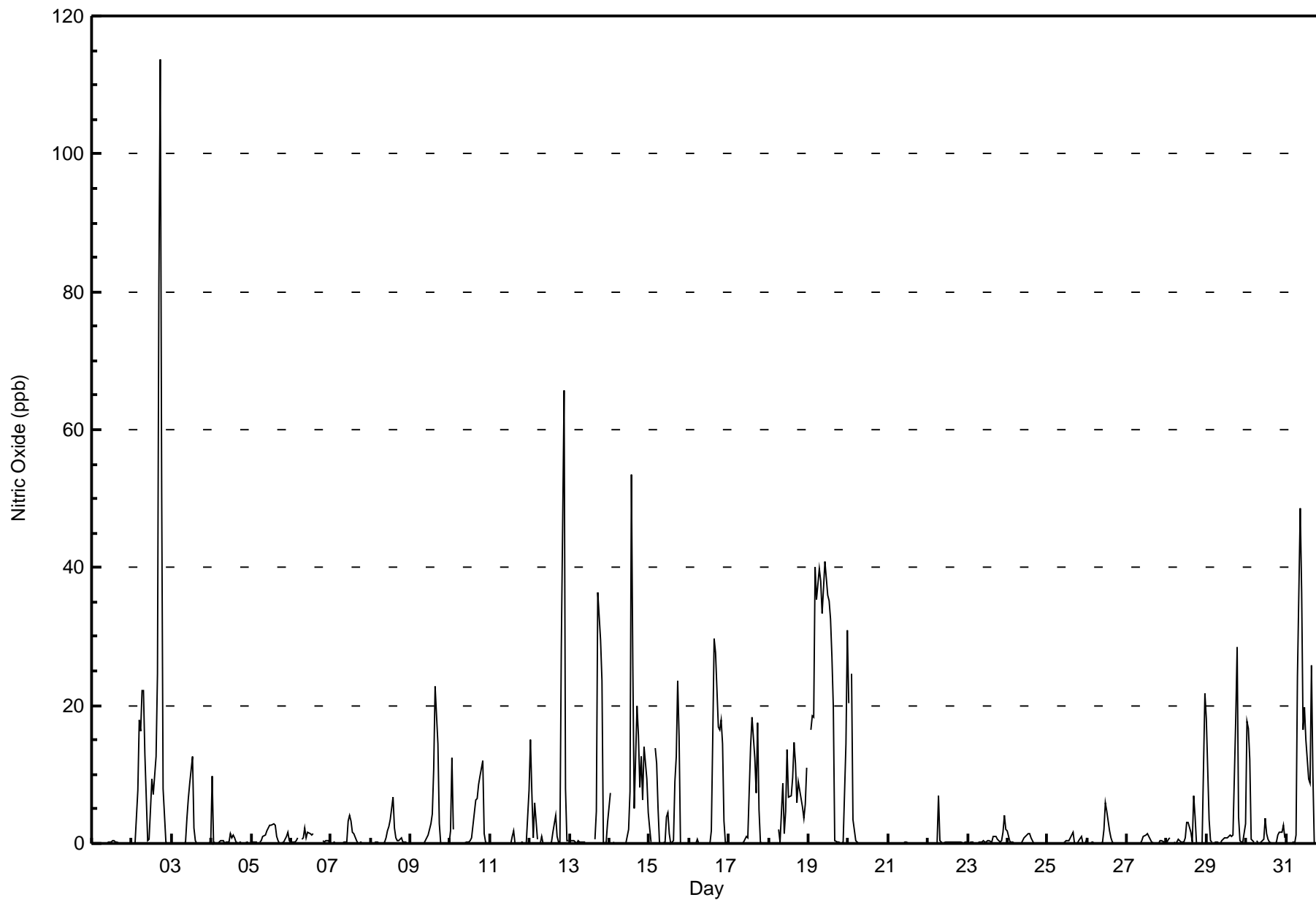


Maximum Value: 114 ppb on Dec 2 18:00		Maximum Daily Average: 22.4 ppb on Dec 19		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 3 18:00		Minimum Daily Average: 0.0 ppb on Dec 21		Hours of Data: 703																							
Maximum Diurnal Average: 8.8 ppb at hour 18		Minimum Diurnal Average: 1.1 ppb at hour 22		Hours of Missing Data: 41																							
Monthly Average: 3.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 2 P ₉₀ = 12 P ₉₉ = 37		Hours of Calibration: 36																							
				Percent Operational Time: 99.3																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
2-Dec	0	Z	0	8	18	16	22	22	13	0	1	5	9	7	13	25	81	114	51	8	0	0	0	0	18.0	114	
3-Dec	0	0	Z	0	0	0	0	0	0	4	7	9	13	2	0	0	0	0	0	0	0	0	0	0	1.5	13	
4-Dec	10	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.7	10	
5-Dec	0	0	0	0	Z	0	0	1	1	2	2	3	3	3	3	1	0	0	0	0	0	1	1	2	1.0	3	
6-Dec	0	0	0	0	1	Z	1	1	2	1	2	1	1	1	UO	UO	UO	UO	UO	0	0	0	0	0	0.7	2	
7-Dec	Z	0	0	0	0	0	0	0	0	0	3	4	3	2	1	0	0	0	0	0	0	0	0	0	0.7	4	
8-Dec	0	Z	0	0	0	0	0	0	0	1	2	2	3	7	2	1	0	0	1	0	0	0	0	0	0.9	7	
9-Dec	0	0	Z	0	0	0	0	0	0	0	1	2	3	4	11	23	14	3	0	0	0	0	0	0	2.7	23	
10-Dec	2	12	2	Z	0	0	0	0	0	0	0	0	0	1	4	6	7	9	10	12	2	0	0	0	2.9	12	
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	8	0.5	8	
12-Dec	15	7	1	6	1	Z	0	1	0	0	0	0	0	0	2	4	1	0	0	28	66	8	0	0	6.1	66	
13-Dec	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	1	5	36	30	24	0	0	0	3	5.6	36	
14-Dec	7	Z	0	0	0	0	0	0	0	0	0	2	8	54	26	5	20	16	8	13	6	14	9	5	8.4	54	
15-Dec	2	0	Z	14	12	5	0	0	0	0	4	5	1	0	0	9	13	24	16	0	0	0	0	0	4.5	24	
16-Dec	0	0	0	Z	0	1	0	0	0	0	0	0	0	2	15	30	28	17	16	18	14	3	0	0	6.3	30	
17-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	8	14	18	12	7	18	5	0	0	0	0	0	3.7	18	
18-Dec	0	0	0	0	0	Z	2	0	9	1	5	14	7	7	10	15	12	6	9	7	5	4	6	11	5.5	15	
19-Dec	Z	17	19	18	40	35	40	38	33	37	41	36	35	33	27	20	0	0	0	0	0	0	15	31	22.4	41	
20-Dec	20	Z	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.1	25	
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
22-Dec	0	0	0	Z	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	7	
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	2	4	2	0.6	4
24-Dec	2	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2	
25-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	0	0	0	0.3	2	
26-Dec	1	Z	0	0	0	0	0	0	0	0	2	6	5	2	1	0	0	0	0	0	0	0	0	0	0.7	6	
27-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1	
28-Dec	0	1	1	Z	0	0	0	1	0	0	0	1	3	3	2	0	7	4	0	0	0	0	11	22	2.4	22	
29-Dec	18	4	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	18	28	4	0	0	0	3	3.6	28	
30-Dec	18	17	12	1	0	Z	0	0	0	0	1	4	2	1	0	0	0	0	0	0	1	2	2	3	1	2.7	18
31-Dec	Z	0	0	0	0	0	1	24	49	36	17	20	15	9	9	26	10	0	0	0	0	0	1	0	9.4	49	
		3.8	2.3	2.4	2.0	2.8	2.3	2.4	2.9	3.5	2.8	3.0	4.0	4.1	5.3	5.2	6.1	6.9	8.8	5.8	3.8	3.2	1.1	1.6	2.8	Diurnal Average	
		20	17	25	18	40	35	40	38	49	37	41	36	35	54	27	30	81	114	51	28	66	14	15	31	Diurnal Maximum	
Z - zerospan		C - Calibration				UO - Unstable Operation																					



WBEA Data PC
Hourly Averages

Nitric Oxide (NO) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	667	94.88	94.88
21 - 40	29	4.13	99.00
41 - 80	5	0.71	99.72
81 - 159	1	0.14	99.86
> 159	0	0.00	99.86

Total Number of Valid Hours: 703

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitric Oxide (NO) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	15	37	49	13	6	5	10	20	83	199	77	39	31	40	27	13	664
21 - 40	1	0	1	2	1	0	2	1	5	3	2	1	2	3	1	0	25
11 - 80	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	4
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	16	37	50	16	7	5	12	21	88	202	80	40	34	44	28	14	694

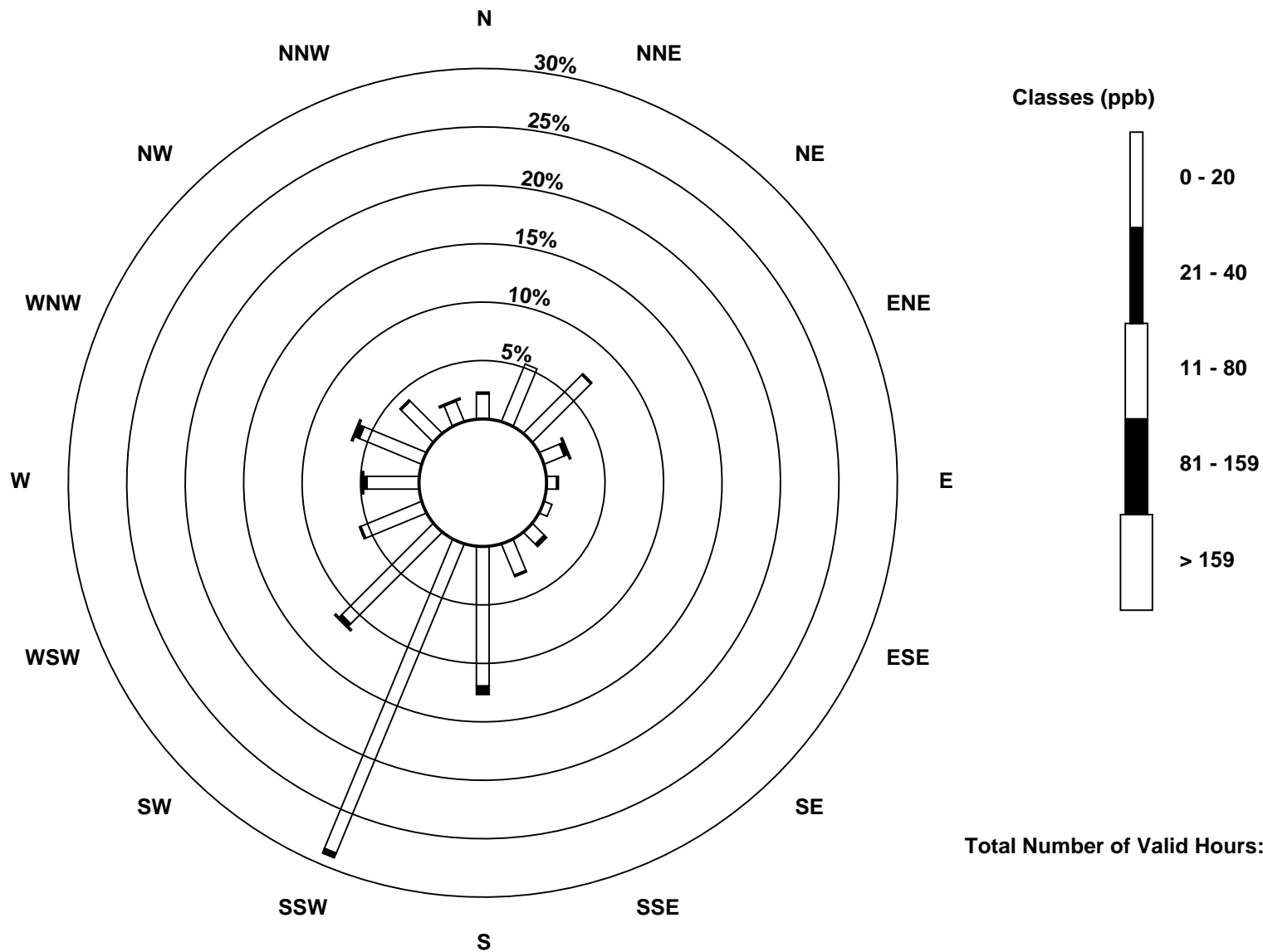
Total Number of Valid Hours: 695

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

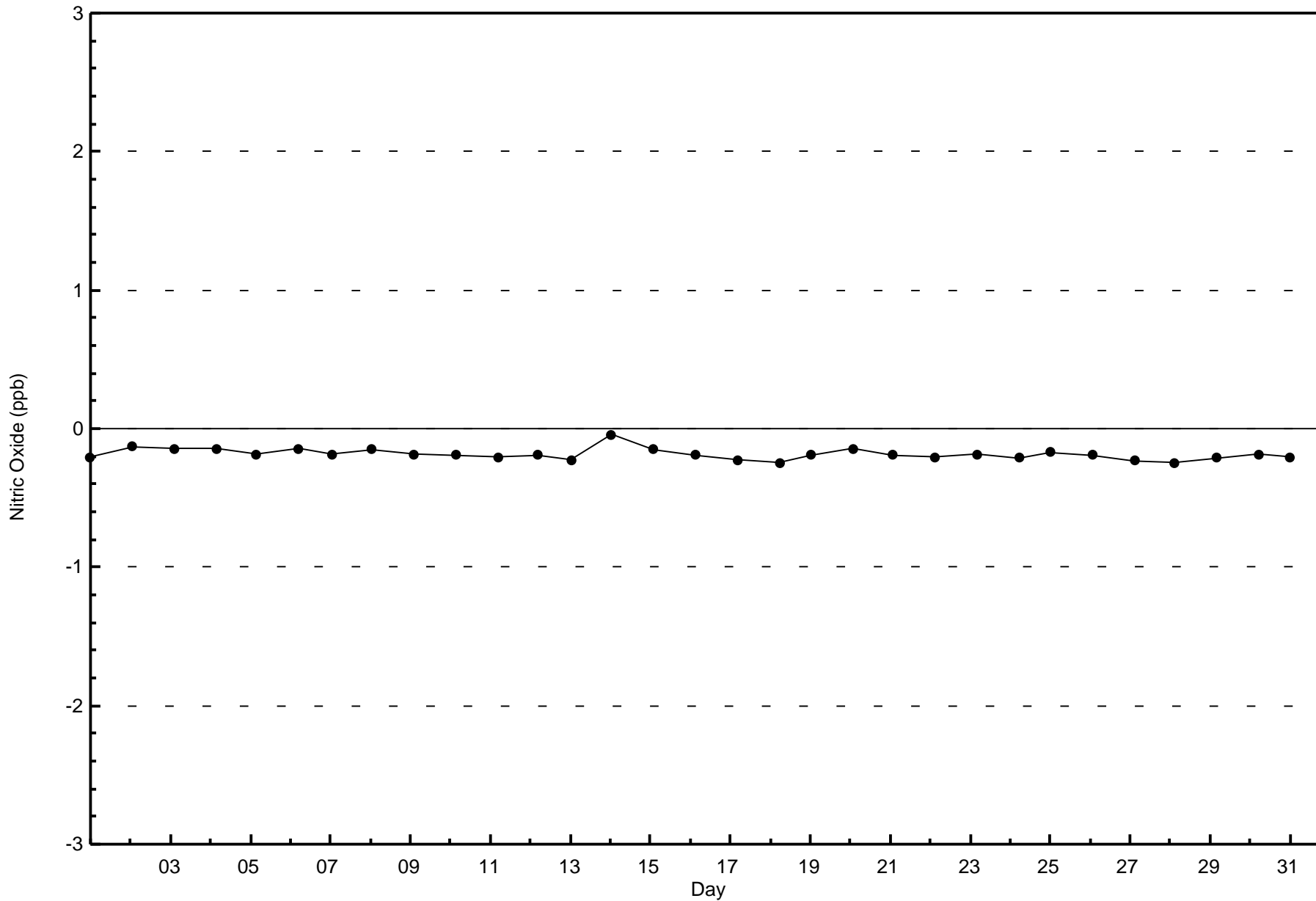
Nitric Oxide (NO) - ppb
CNRL Horizon (AMS 15)





WBEA Data PC
Zero Responses

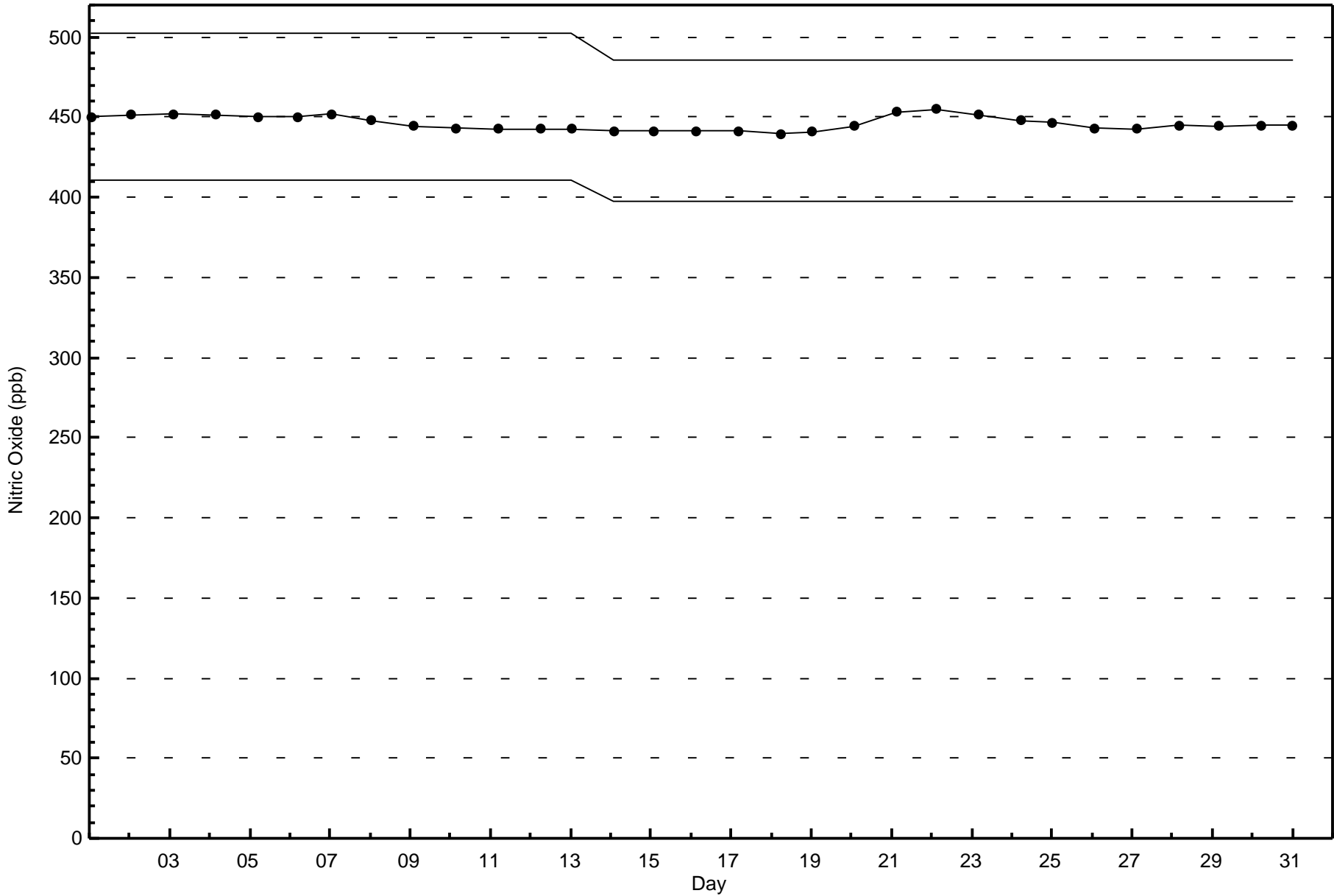
Nitric Oxide (NO) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Span Responses

Nitric Oxide (NO) - ppb
CNRL Horizon - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

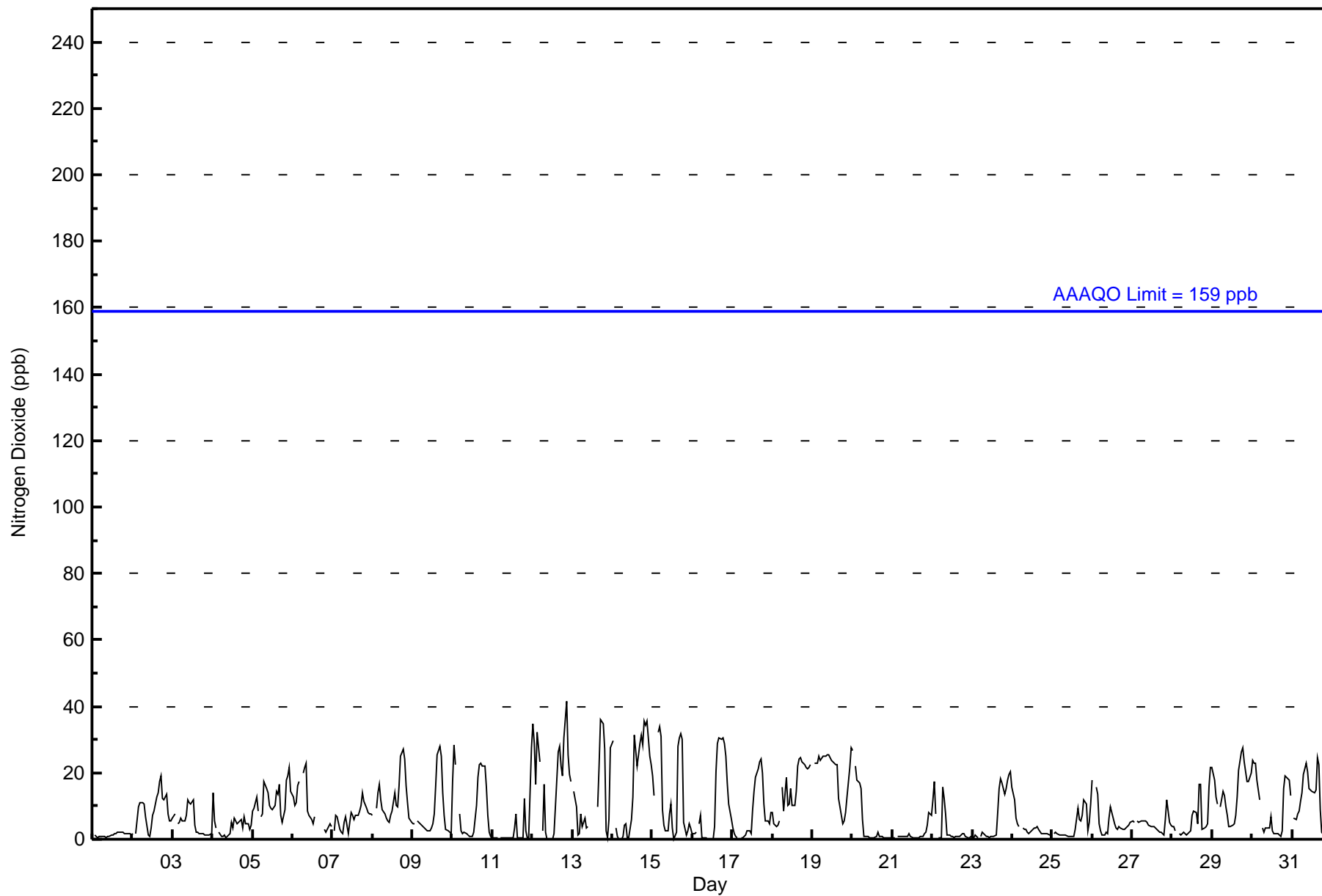
CNRL Horizon - December 2016

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																				Daily Average		Daily Maximum	
Maximum Value: 42 ppb on Dec 12 21:00		Maximum Daily Average: 19.9 ppb on Dec 19		Hours of Data: 703																							
Minimum Value: 0 ppb on Dec 14 06:00		Minimum Daily Average: 1.3 ppb on Dec 1		Hours of Missing Data: 41																							
Maximum Diurnal Average: 13.8 ppb at hour 18		Minimum Diurnal Average: 4.5 ppb at hour 11		Hours of Calibration: 36																							
Monthly Average: 8.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 5 Q ₃ = 14 P ₉₀ = 23 P ₉₉ = 34		Percent Operational Time: 99.3																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1.3	2	
2-Dec	2	Z	2	10	11	11	11	10	7	1	1	3	7	8	13	14	17	19	12	12	13	8	6	5	8.9	19	
3-Dec	6	8	Z	5	5	6	6	6	7	12	11	12	4	2	2	2	2	2	1	1	1	1	2	5.0	12		
4-Dec	14	6	4	Z	2	1	1	1	0	1	2	5	3	6	5	5	6	4	7	5	5	3	4	4.1	14		
5-Dec	9	9	13	8	Z	7	8	18	15	14	10	9	9	10	14	14	17	7	5	9	18	19	22	15	12.1	22	
6-Dec	13	10	11	16	17	Z	20	22	23	8	7	6	5	7	UO	UO	UO	UO	UO	3	2	3	5	4	10.1	23	
7-Dec	Z	3	7	7	3	2	2	5	7	2	5	8	7	6	7	7	8	10	14	12	10	8	8	8	6.7	14	
8-Dec	7	Z	10	14	17	12	9	8	6	6	5	7	9	14	10	10	16	25	27	24	16	11	6	5	11.8	27	
9-Dec	5	5	Z	5	5	4	4	3	3	3	3	3	5	8	16	25	28	25	14	7	3	3	2	2	7.8	28	
10-Dec	17	28	23	Z	8	2	2	2	2	1	1	1	1	2	10	19	22	23	22	22	16	7	2	1	10.1	28	
11-Dec	1	1	1	1	Z	1	1	1	1	1	0	0	0	4	8	1	0	0	0	12	3	0	0	28	2.7	28	
12-Dec	35	29	17	32	23	Z	2	17	2	0	0	0	0	2	10	26	28	22	19	31	42	25	20	17	17.3	42	
13-Dec	Z	14	10	1	2	8	4	6	3	4	C	C	C	C	C	10	22	36	35	27	2	0	6	28	12.1	36	
14-Dec	30	Z	4	1	0	0	1	4	5	0	1	6	13	32	27	22	29	31	28	36	35	35	25	23	16.7	36	
15-Dec	19	13	Z	32	34	31	9	4	2	3	8	10	4	0	2	28	31	32	30	5	1	2	5	3	13.4	34	
16-Dec	2	2	2	Z	5	7	0	0	0	0	0	0	4	20	29	30	30	31	29	25	17	10	6	10.9	31		
17-Dec	4	2	1	1	Z	0	1	1	1	3	3	2	9	14	19	21	23	24	20	10	6	6	5	8	7.9	24	
18-Dec	8	5	4	4	5	Z	16	9	19	10	11	15	10	10	14	22	24	25	24	22	22	21	22	23	14.9	25	
19-Dec	Z	23	23	23	25	24	25	25	25	25	26	24	23	23	22	23	12	7	5	5	8	13	21	28	19.9	28	
20-Dec	27	Z	22	18	17	15	6	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	0	5.1	27	
21-Dec	0	1	Z	1	1	1	1	1	1	1	2	1	0	1	1	1	1	1	1	2	2	4	8	7	1.6	8	
22-Dec	12	17	8	Z	1	0	16	12	8	1	1	1	1	0	1	1	1	1	2	2	1	1	1	1	3.8	17	
23-Dec	1	1	1	1	Z	1	2	2	1	1	1	1	1	1	8	15	18	17	13	15	18	20	21	6.9	21		
24-Dec	16	12	6	5	4	Z	3	3	3	2	2	3	3	3	4	3	2	2	2	2	2	1	1	1	3.7	16	
25-Dec	Z	2	2	2	1	1	1	1	1	1	1	1	1	1	3	10	6	6	7	12	11	3	5	11	3.8	12	
26-Dec	18	Z	16	14	5	2	1	1	2	2	7	10	8	5	4	3	4	4	3	3	3	4	4	5	5.5	18	
27-Dec	5	5	Z	5	5	5	5	6	6	5	4	4	4	4	3	3	2	2	2	1	6	12	5	4	4.6	12	
28-Dec	4	4	3	Z	2	1	2	2	1	2	2	3	7	8	8	5	17	16	3	3	4	5	16	22	6.0	22	
29-Dec	21	18	13	11	Z	10	15	13	10	7	4	4	4	5	7	13	21	26	27	23	20	17	17	20	14.2	27	
30-Dec	24	23	23	18	12	Z	3	2	4	4	4	4	7	3	2	2	2	1	1	2	15	19	18	18	13	9.5	24
31-Dec	Z	6	6	8	9	11	14	19	23	21	15	15	15	14	15	25	23	9	2	1	1	2	15	10	12.0	25	
		11.9	9.4	8.8	9.3	8.4	6.4	6.1	6.6	6.1	4.5	4.5	5.4	5.5	6.6	8.7	11.8	13.7	13.8	12.1	11.4	10.1	8.7	9.0	10.4	Diurnal Average	
		35	29	23	32	34	31	25	25	25	25	26	24	23	32	27	29	31	36	35	36	42	35	25	28	Diurnal Maximum	
Z - zerospan		C - Calibration										UO - Unstable Operation															
Alberta Ambient Air Quality Objectives (AAAQO):		1-hr		159 ppb																							



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	602	85.63	85.63
21 - 40	100	14.22	99.86
41 - 80	1	0.14	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	15	34	44	10	3	5	10	14	79	191	72	36	22	28	25	12	600
21 - 40	1	3	6	6	4	0	2	7	9	11	8	4	12	16	3	2	94
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	16	37	50	16	7	5	12	21	88	202	80	40	34	45	28	14	695

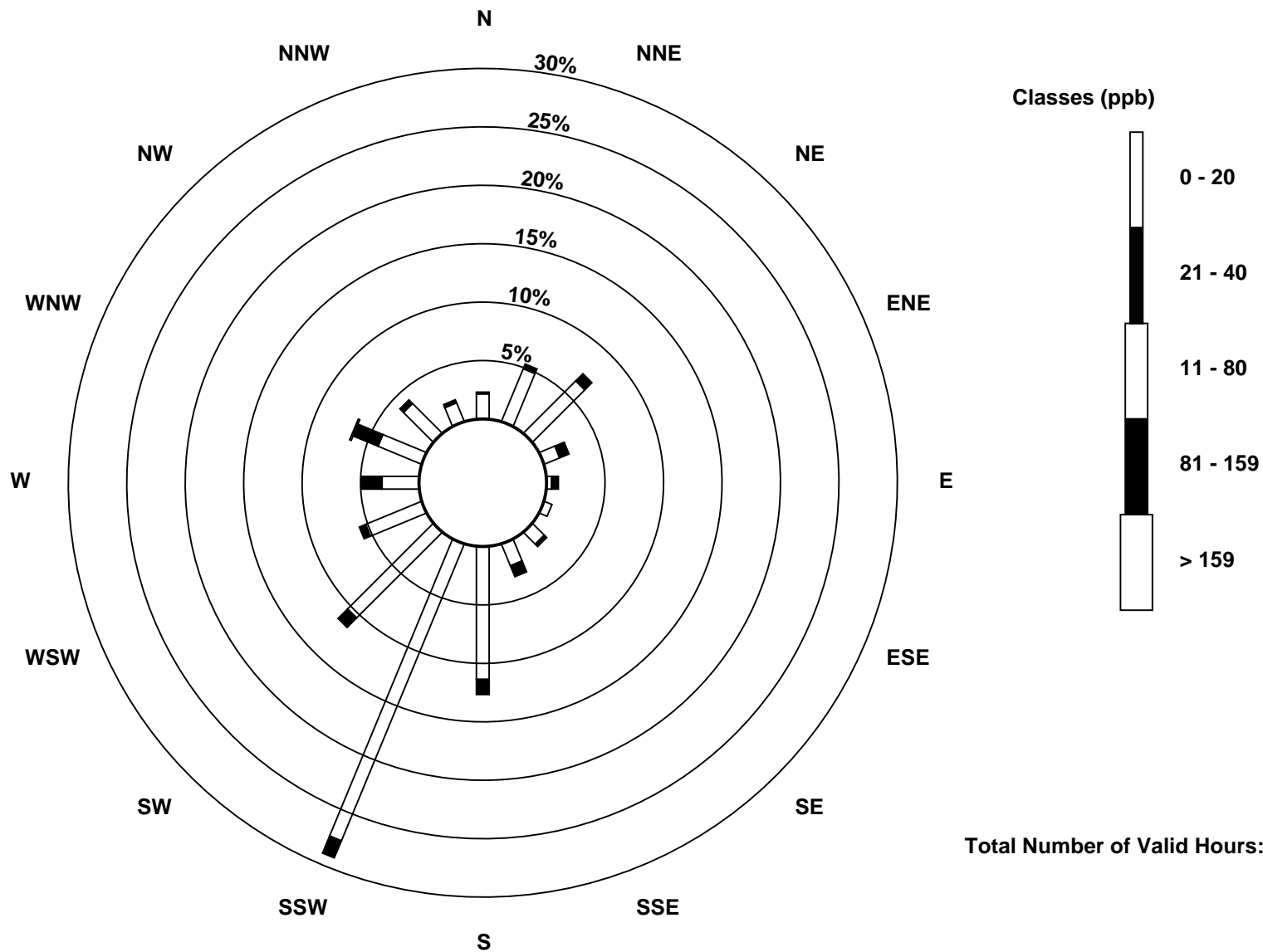
Total Number of Valid Hours: 695

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

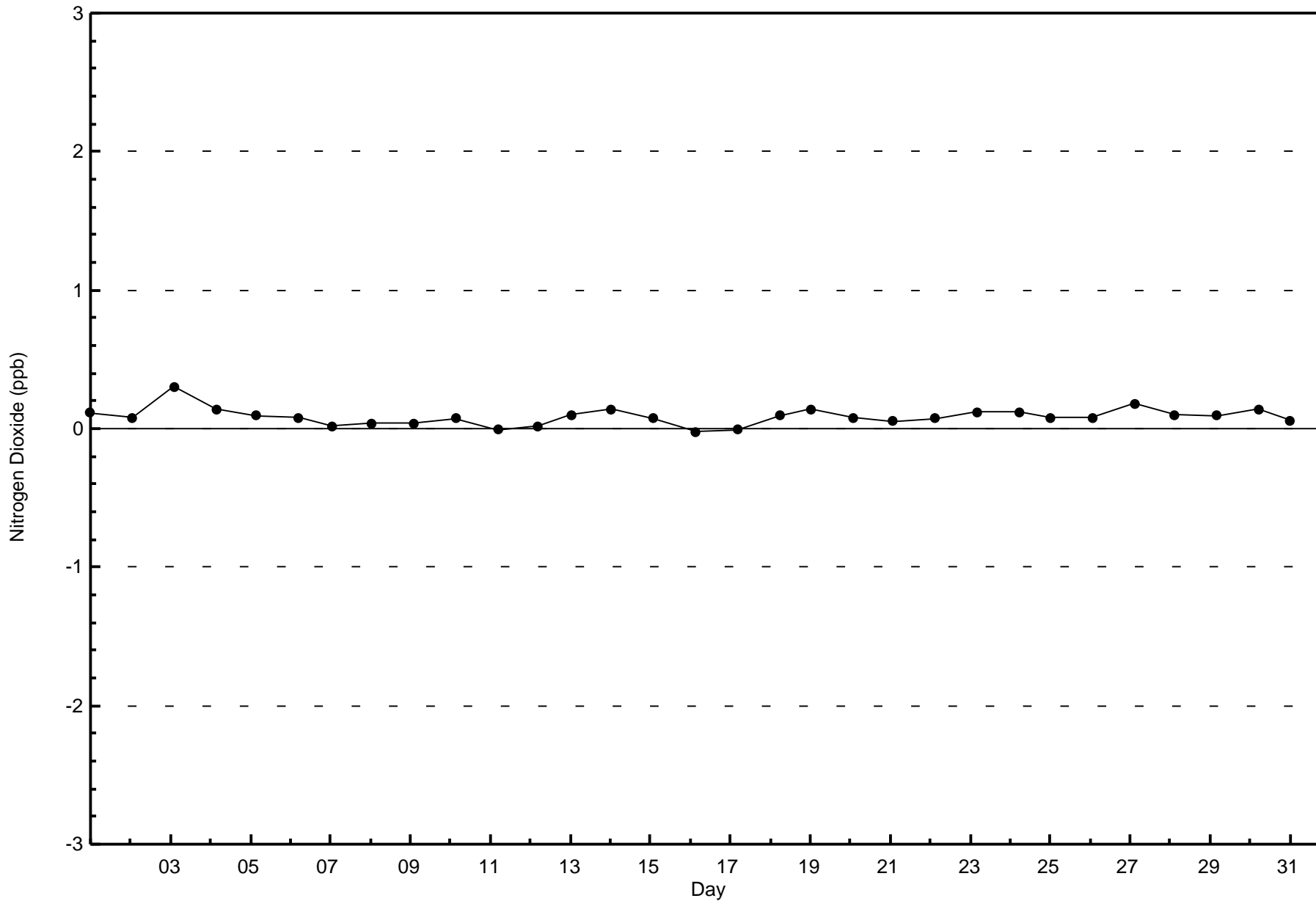
Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon (AMS 15)





WBEA Data PC
Zero Responses

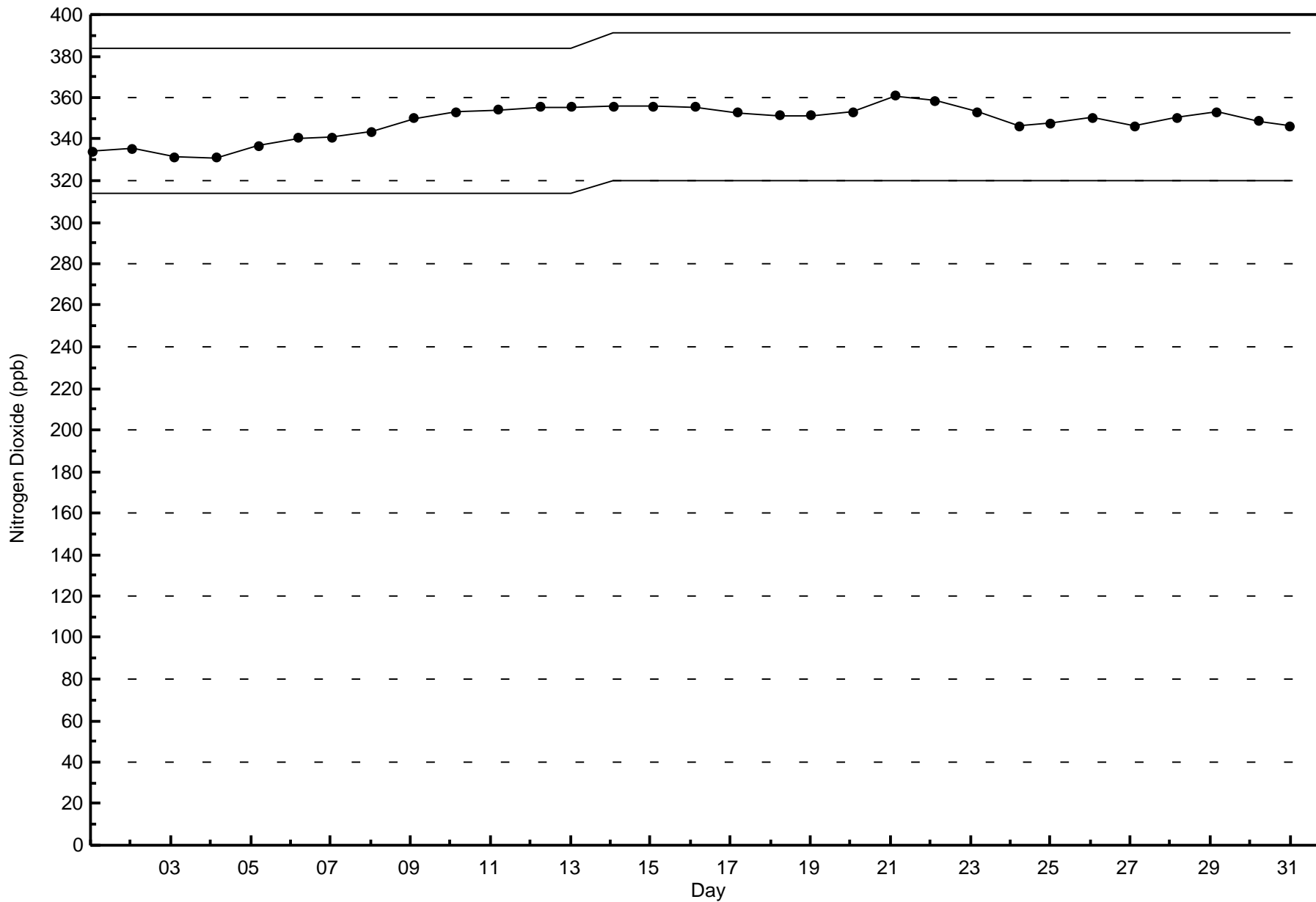
Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

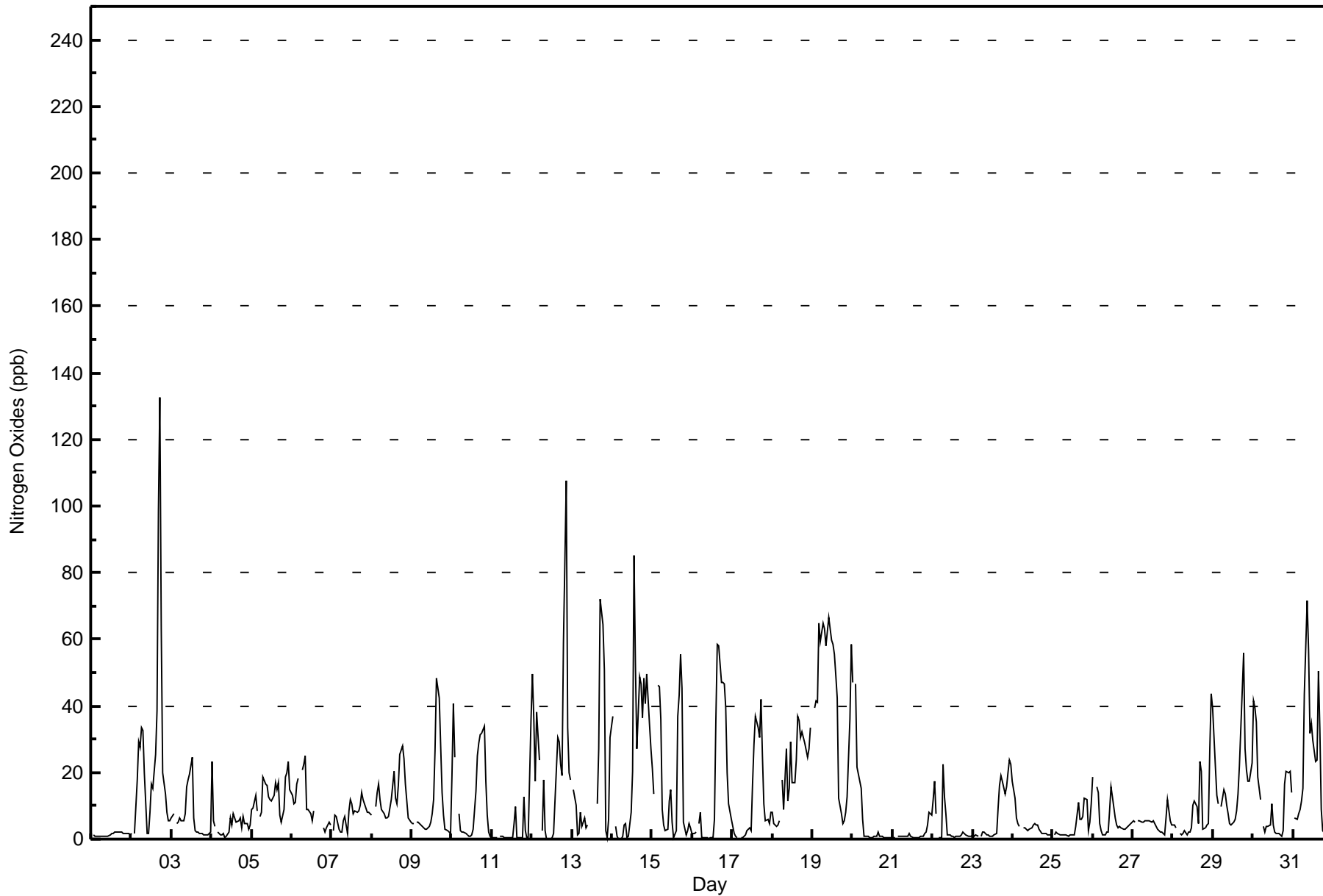
Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - December 2016

Maximum Value: 133 ppb on Dec 2 18:00		Maximum Daily Average: 42.2 ppb on Dec 19		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 14 06:00		Minimum Daily Average: 1.4 ppb on Dec 1		Hours of Data: 703																																													
Maximum Diurnal Average: 22.6 ppb at hour 18		Minimum Diurnal Average: 7.3 ppb at hour 10		Hours of Missing Data: 41																																													
Monthly Average: 12.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 5 Q ₃ = 17 P ₉₀ = 35 P ₉₉ = 64		Hours of Calibration: 36																																													
				Percent Operational Time: 99.3																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1.4	2																							
2-Dec	1	Z	2	18	29	27	33	33	20	2	1	8	17	15	25	38	99	133	63	20	14	8	6	5	26.8	133																							
3-Dec	6	8	Z	5	5	6	6	5	7	16	18	20	24	6	2	2	2	2	1	1	1	1	2	6.5	24																								
4-Dec	23	5	4	Z	2	1	1	2	0	1	2	6	4	7	5	5	6	4	7	5	5	3	4	4.8	23																								
5-Dec	9	9	13	9	Z	7	8	19	17	16	13	12	11	13	17	15	17	7	5	9	18	20	23	15	13.1	23																							
6-Dec	13	10	11	17	18	Z	21	22	25	9	9	8	6	8	UO	UO	UO	UO	UO	3	2	4	5	4	10.8	25																							
7-Dec	Z	3	7	7	3	2	2	5	7	2	8	12	11	8	9	8	8	10	14	12	10	8	8	8	7.4	14																							
8-Dec	7	Z	10	14	17	12	9	8	6	6	7	9	12	20	12	11	16	25	28	24	16	11	6	5	12.7	28																							
9-Dec	5	5	Z	5	5	4	4	3	3	3	4	5	7	12	27	48	42	28	14	7	3	3	2	2	10.5	48																							
10-Dec	19	41	25	Z	8	2	2	2	2	1	1	1	1	3	15	25	29	31	32	34	17	7	2	1	13.1	41																							
11-Dec	1	1	1	1	Z	1	1	1	1	0	0	0	0	5	10	1	0	0	0	13	3	0	0	36	3.2	36																							
12-Dec	50	36	17	38	24	Z	2	18	2	0	0	0	0	2	11	30	29	22	19	59	108	33	20	18	23.5	108																							
13-Dec	Z	15	10	1	2	8	4	6	3	4	C	C	C	C	C	10	27	72	64	51	3	0	6	31	17.7	72																							
14-Dec	37	Z	4	1	0	0	1	4	5	0	1	8	20	85	53	27	49	47	36	48	41	49	34	27	25.1	85																							
15-Dec	21	13	Z	46	46	36	9	4	2	3	12	15	5	0	3	37	43	56	46	5	1	2	5	3	17.9	56																							
16-Dec	1	2	2	Z	5	8	0	0	0	0	0	0	6	36	58	58	47	47	47	47	40	20	11	6	17.2	58																							
17-Dec	4	2	1	0	Z	0	1	1	1	3	4	3	16	28	37	34	30	42	25	11	6	6	5	8	11.6	42																							
18-Dec	8	5	4	4	6	Z	18	9	27	12	15	29	17	17	24	37	35	30	32	29	27	25	27	33	20.4	37																							
19-Dec	Z	39	42	41	65	59	65	63	58	62	66	60	59	55	49	42	12	8	5	5	8	13	36	59	42.2	66																							
20-Dec	47	Z	47	21	18	15	6	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	0	7.2	47																							
21-Dec	0	1	Z	1	1	1	1	1	1	1	2	1	1	0	1	0	1	1	1	2	2	4	8	7	1.6	8																							
22-Dec	12	17	8	Z	1	0	22	13	8	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	4.2	22																							
23-Dec	1	1	1	1	Z	1	2	2	1	1	1	1	1	1	9	16	19	17	14	16	20	24	22	7.6	24																								
24-Dec	17	12	6	5	4	Z	3	3	3	3	4	4	5	4	4	3	2	2	2	2	1	1	1	1	4.1	17																							
25-Dec	Z	1	2	2	1	1	1	1	1	1	1	1	1	1	4	11	6	6	7	12	12	3	5	11	4.1	12																							
26-Dec	19	Z	16	14	5	2	1	1	2	2	9	16	13	6	4	3	4	4	3	3	3	4	4	5	6.2	19																							
27-Dec	5	5	Z	5	5	5	5	5	6	5	5	5	5	5	4	3	2	2	2	1	6	12	5	4	4.9	12																							
28-Dec	4	4	4	Z	2	1	2	2	1	2	2	3	10	11	10	5	23	20	3	3	4	5	27	44	8.4	44																							
29-Dec	39	21	13	11	Z	10	15	13	10	8	5	4	5	6	9	14	22	44	56	27	21	17	17	23	17.8	56																							
30-Dec	42	39	35	19	12	Z	4	2	4	4	4	4	11	4	2	2	2	1	1	3	17	20	20	14	12.2	42																							
31-Dec	Z	6	6	8	9	11	15	43	71	57	32	35	30	23	24	50	33	9	2	1	1	2	15	10	21.5	71																							
																								15.7	11.7	11.1	11.3	11.2	8.7	8.5	9.5	9.6	7.3	7.6	9.3	9.6	11.9	13.9	17.9	20.6	22.6	17.9	15.2	13.3	9.9	10.7	13.2	Diurnal Average	
																								50	41	47	46	65	59	65	63	71	62	66	60	59	85	53	58	99	133	64	59	108	49	36	59	Diurnal Maximum	
Z - zerspan																								C - Calibration						UO - Unstable Operation																			



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	566	80.51	80.51
21 - 40	82	11.66	92.18
41 - 80	51	7.25	99.43
81 - 159	4	0.57	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	14	32	43	8	3	4	8	13	74	182	70	34	18	26	25	10	564
21 - 40	1	4	5	5	2	1	2	5	8	15	6	5	8	9	2	3	81
11 - 80	1	1	2	3	2	0	2	3	6	5	4	1	7	8	1	0	46
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	4
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	16	37	50	16	7	5	12	21	88	202	80	40	34	45	28	14	695

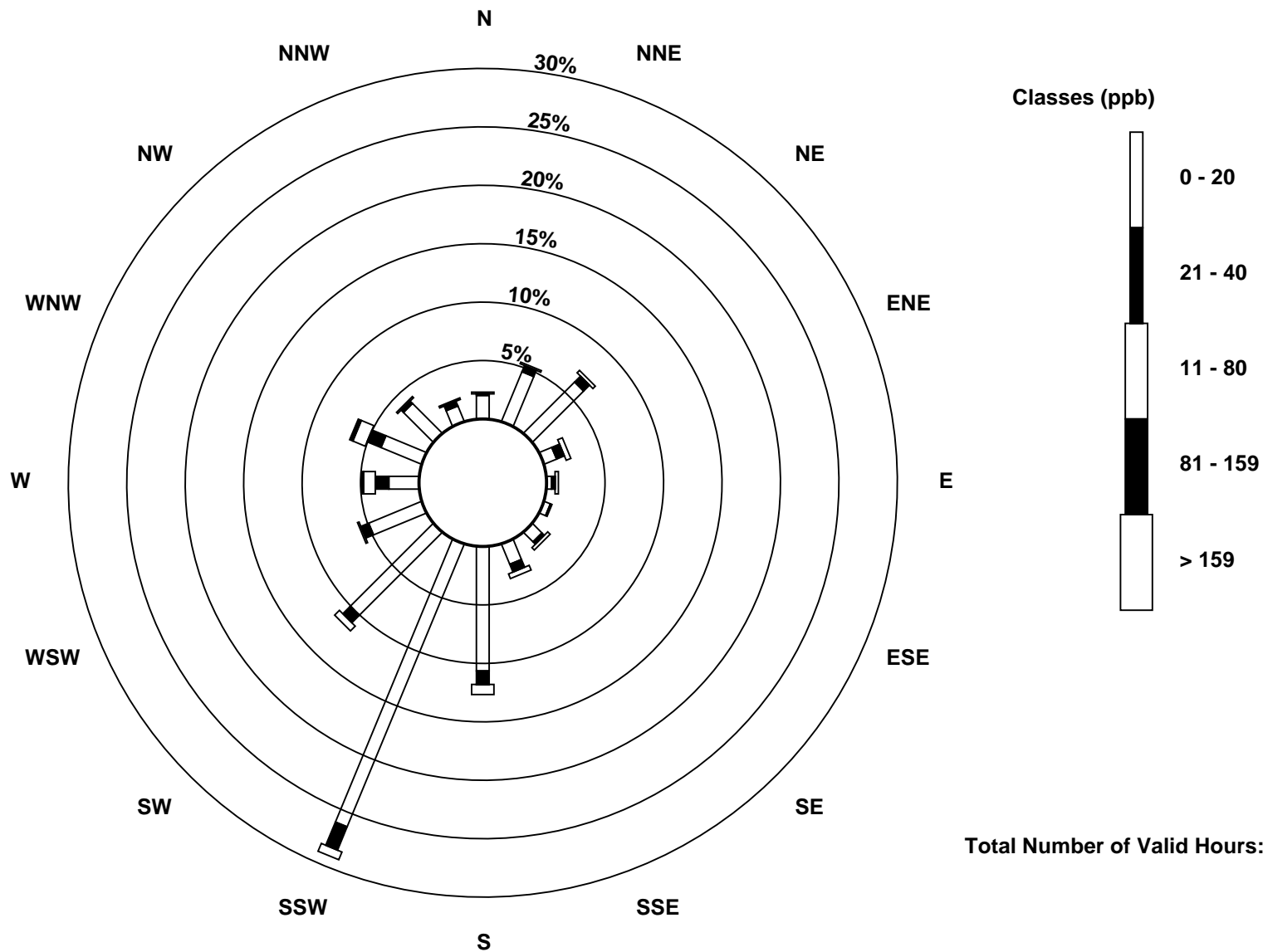
Total Number of Valid Hours: 695

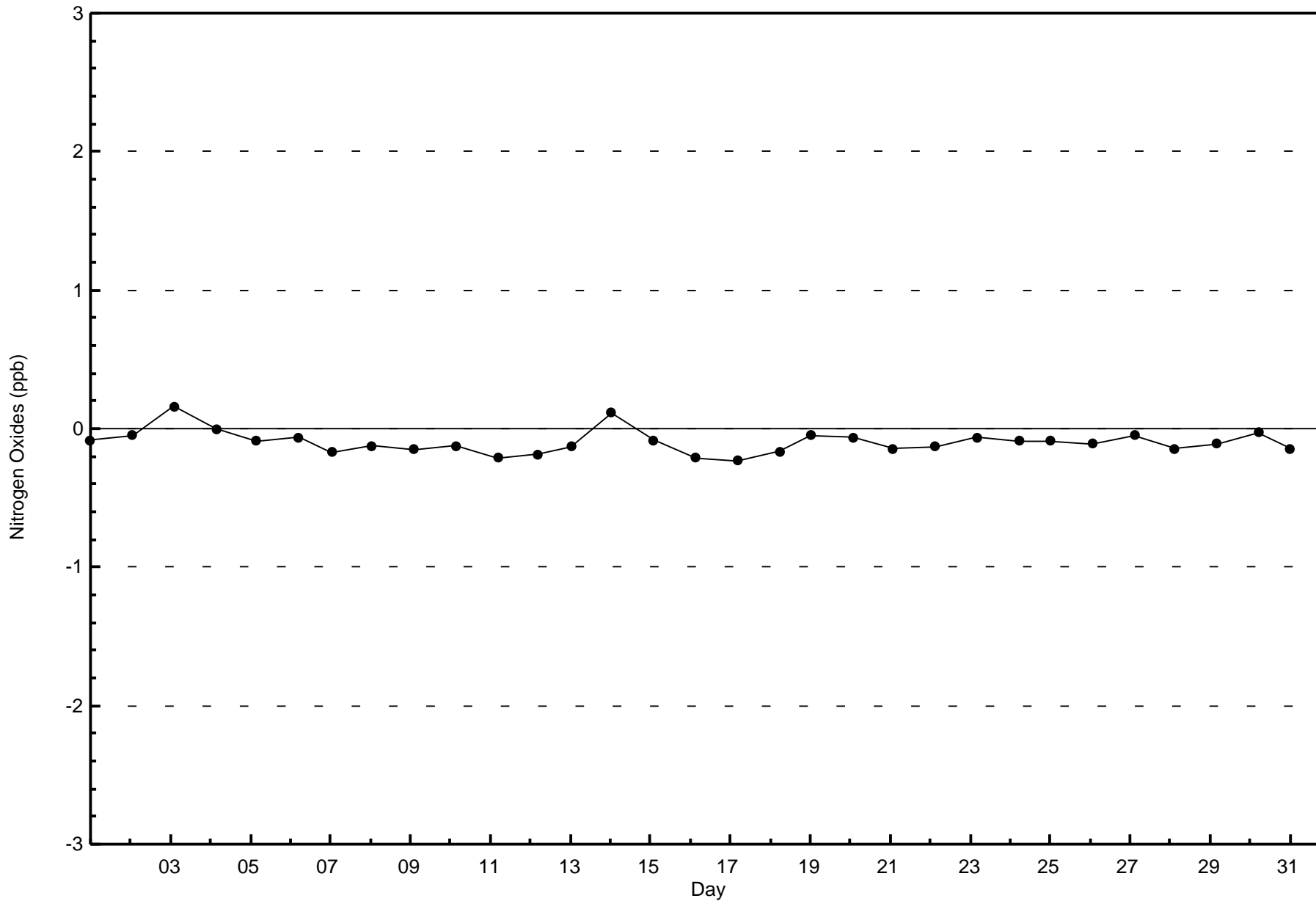
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon (AMS 15)

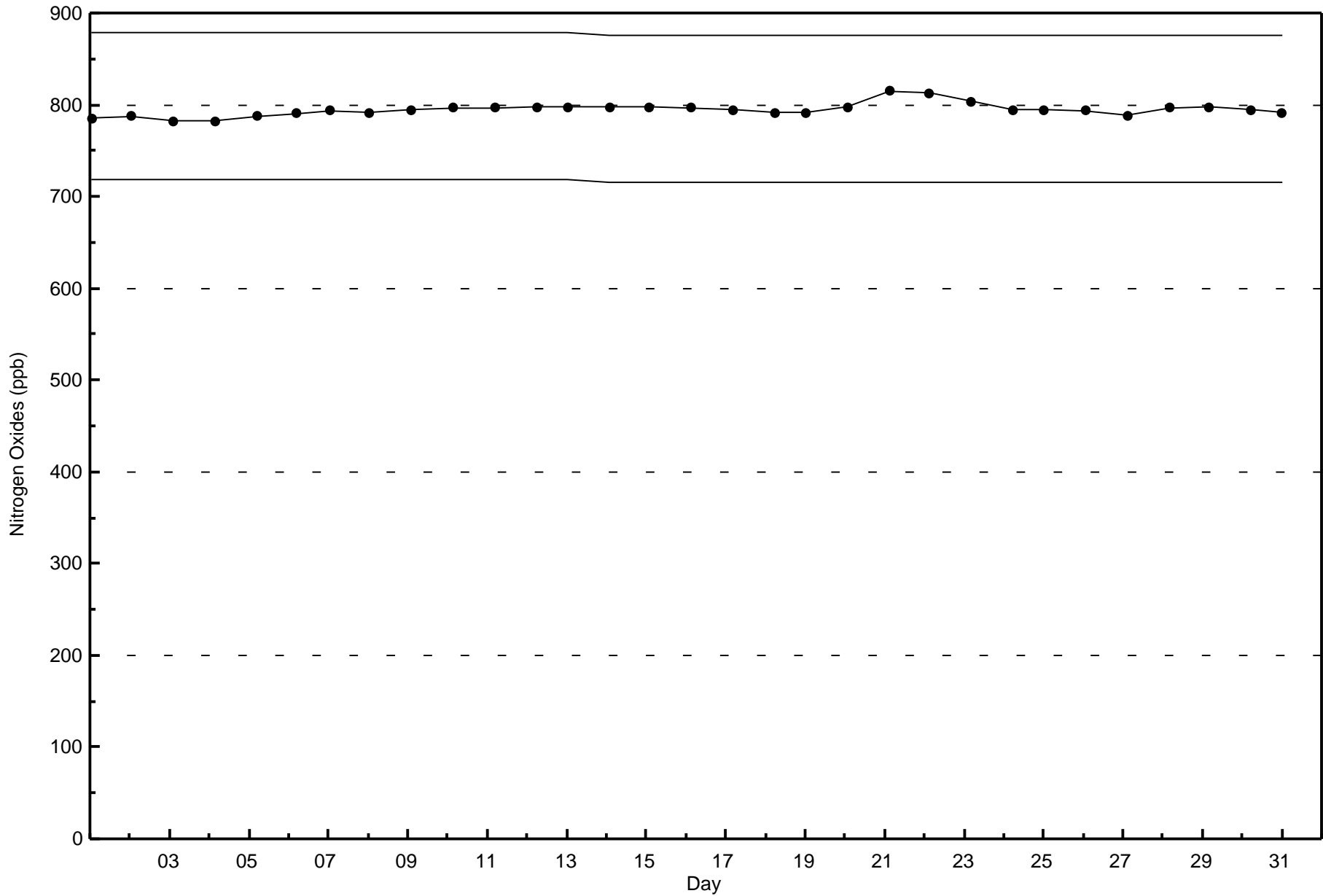






WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - December 2016



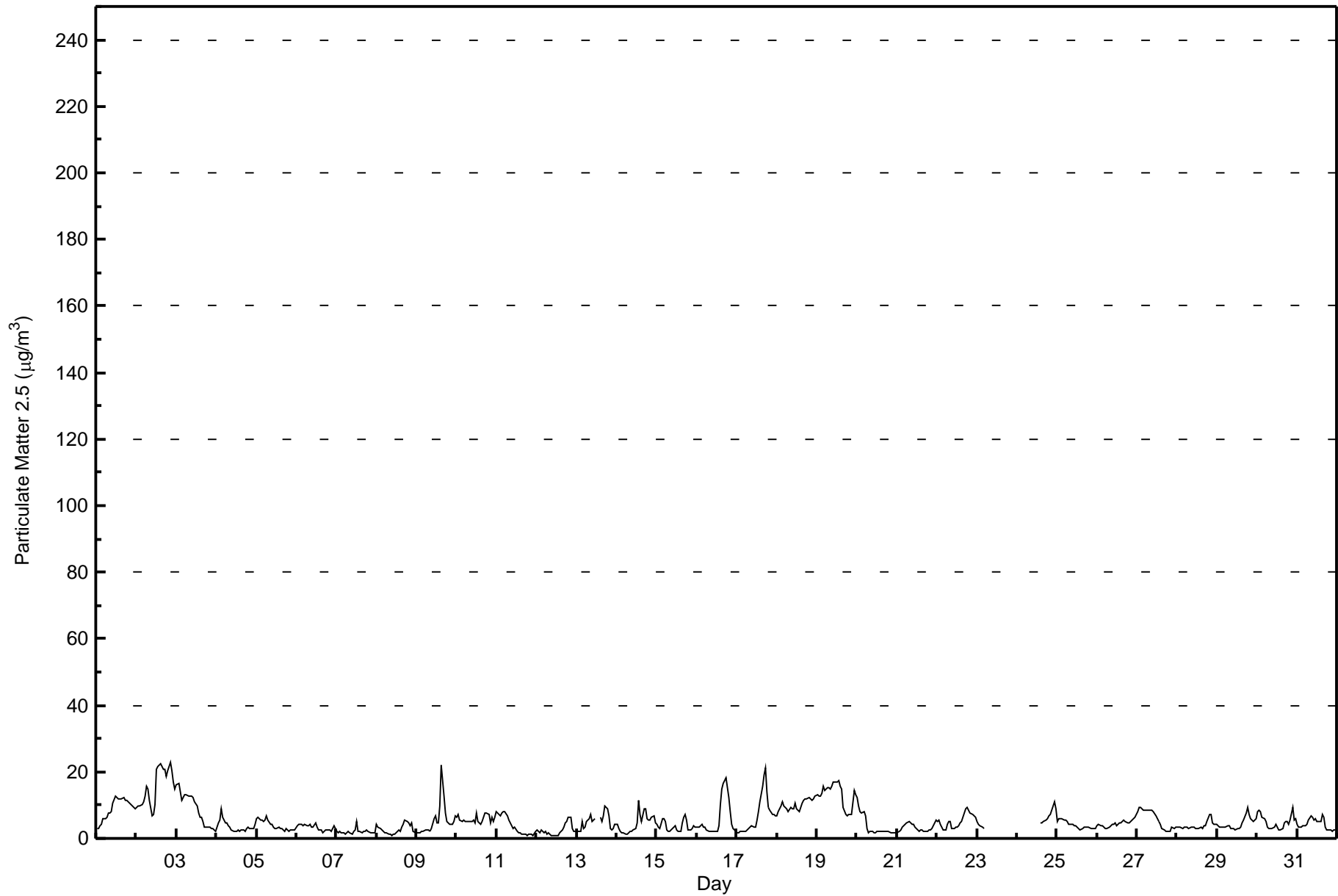


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 22.9 µg/m ³ on Dec 2 21:00 Minimum Value: 0.9 µg/m ³ on Dec 12 13:00 Maximum Diurnal Average: 6.8 µg/m ³ at hour 18 Monthly Average: 5.50 µg/m ³		Maximum Daily Average: 15.4 µg/m ³ on Dec 2 Minimum Daily Average: 2.0 µg/m ³ on Dec 7 Minimum Diurnal Average: 4.6 µg/m ³ at hour 10 Percentiles: P ₁ = 1.1 P ₁₀ = 1.9 Q ₁ = 2.7 Median = 4.2 Q ₃ = 7.0 P ₉₀ = 11.5 P ₉₉ = 20.8		Hours in Service: 744 Hours of Data: 709 Hours of Missing Data: 35 Hours of Calibration: 2 Percent Operational Time: 95.6																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	3.0	3.1	3.6	4.1	5.8	6.1	6.4	7.5	7.5	8.0	10.4	12.8	12.2	12.0	11.9	12.0	12.1	11.6	11.5	10.9	10.7	10.0	9.3	8.9	8.8	12.8																						
2-Dec	9.4	9.6	9.9	10.1	11.1	12.8	15.7	14.7	11.3	6.6	7.2	10.2	20.6	21.5	22.3	21.6	20.9	20.8	18.5	20.2	22.9	20.4	16.8	14.9	15.4	22.9																						
3-Dec	16.2	16.4	14.0	11.2	12.3	13.3	13.0	12.7	12.5	12.5	12.4	11.0	9.7	7.8	6.6	6.4	5.1	3.4	3.4	3.3	3.2	3.2	2.9	2.3	8.9	16.4																						
4-Dec	3.4	4.6	5.6	8.7	6.4	4.7	4.5	3.8	3.4	2.6	2.1	2.3	2.2	2.7	2.3	2.5	2.6	2.3	3.0	3.3	2.8	2.8	3.1	4.0	3.6	8.7																						
5-Dec	6.0	6.2	5.4	5.4	5.1	5.6	6.6	5.6	4.3	4.2	3.6	3.2	3.1	3.5	3.2	3.0	2.7	2.3	2.8	1.9	2.5	2.5	2.7	2.5	3.9	6.6																						
6-Dec	3.9	4.3	4.3	4.2	3.9	4.3	3.7	3.7	4.1	3.2	3.3	4.7	3.4	2.6	2.7	2.4	1.9	2.7	2.5	2.7	2.6	2.3	3.6	3.0	3.3	4.7																						
7-Dec	2.1	1.7	2.0	1.6	1.5	1.4	1.6	2.1	1.9	1.1	2.3	2.3	5.2	2.1	2.1	1.9	1.9	2.0	2.5	1.9	1.9	1.6	1.6	1.6	2.0	5.2																						
8-Dec	4.3	3.3	2.9	2.4	2.1	1.8	1.7	1.4	1.2	1.0	1.1	1.5	1.7	2.4	2.2	3.4	4.3	5.6	5.2	4.6	3.9	4.5	2.2	1.6	2.8	5.6																						
9-Dec	1.7	1.7	1.9	2.0	2.0	2.6	2.7	2.5	2.1	3.0	6.1	6.7	4.8	4.9	9.8	21.8	12.9	7.6	5.2	4.7	4.4	4.4	5.1	6.8	5.3	21.8																						
10-Dec	6.2	7.0	5.5	5.1	5.6	4.9	5.3	5.0	5.1	5.0	5.3	4.7	7.5	4.9	4.4	5.2	6.5	7.5	7.8	7.2	4.9	6.2	5.3	6.2	5.8	7.8																						
11-Dec	8.1	7.1	6.8	7.6	8.2	7.9	6.8	5.5	4.8	3.7	2.9	3.3	1.9	1.6	1.6	1.2	1.1	1.1	1.0	1.4	1.1	1.1	1.1	2.3	3.7	8.2																						
12-Dec	2.6	2.3	1.9	2.4	1.9	1.9	1.2	1.7	1.2	1.0	0.9	0.9	0.9	1.0	1.5	2.4	3.6	4.5	5.1	6.2	6.5	2.8	2.0	2.1	2.4	6.5																						
13-Dec	2.1	1.9	1.9	5.1	3.0	3.4	5.0	5.7	7.3	5.3	5.7	5.9	C	C	6.2	5.3	6.8	9.8	8.7	7.0	3.1	2.7	2.9	4.3	5.0	9.8																						
14-Dec	4.1	3.1	2.2	1.8	1.6	1.5	1.4	1.6	1.9	2.1	2.4	3.1	4.5	11.5	7.3	5.3	8.8	8.9	5.9	5.3	5.3	6.3	6.9	4.8	4.5	11.5																						
15-Dec	4.2	3.3	3.0	5.8	5.8	4.9	2.6	2.1	1.9	2.8	3.2	3.7	2.6	2.1	2.2	4.8	6.3	7.1	5.6	2.4	2.5	2.8	3.9	3.5	3.7	7.1																						
16-Dec	3.2	3.5	3.9	4.1	3.3	3.6	2.5	2.1	2.2	2.0	2.0	2.1	2.3	3.7	10.0	15.0	16.5	18.0	15.3	12.5	8.2	4.2	3.0	2.3	6.1	18.0																						
17-Dec	1.9	1.6	1.9	2.0	2.2	2.0	2.5	3.0	3.3	4.0	3.6	3.4	5.4	8.0	11.1	15.8	19.2	21.0	13.8	9.5	8.3	7.4	7.4	6.8	6.9	21.0																						
18-Dec	6.6	8.0	9.8	10.9	9.8	9.2	9.1	8.1	9.5	8.7	9.0	10.6	9.0	8.2	9.4	10.8	11.5	11.7	12.0	12.5	12.0	11.6	11.9	12.7	10.1	12.7																						
19-Dec	13.0	12.7	12.6	13.7	15.6	14.3	15.4	15.2	14.6	15.7	16.9	17.0	16.8	17.2	15.8	14.9	9.3	7.3	7.0	7.0	7.0	7.0	14.5	13.1	13.1	17.2																						
20-Dec	12.3	9.9	8.0	7.5	7.9	6.8	3.0	1.6	2.1	2.0	1.8	1.9	2.0	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.8	3.7	12.3																						
21-Dec	1.8	2.1	2.6	3.3	3.8	4.2	4.5	4.9	4.6	4.2	4.2	3.5	2.7	2.3	2.4	2.3	2.2	2.2	2.3	2.5	2.7	2.9	3.9	5.3	3.2	5.3																						
22-Dec	5.3	5.3	4.2	3.6	2.6	2.7	4.2	5.0	5.0	2.8	3.0	3.3	3.4	4.0	4.7	5.2	7.7	8.9	9.1	8.4	7.6	7.1	6.7	6.3	5.3	9.1																						
23-Dec	5.0	4.2	3.7	3.3	3.1	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	5.0																						
24-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	11.2																						
25-Dec	5.1	6.1	5.8	5.8	5.5	5.4	4.9	4.4	4.2	4.1	4.0	3.6	3.3	3.1	2.6	2.9	3.3	3.4	3.4	3.5	3.0	2.9	3.0	3.1	4.0	6.1																						
26-Dec	3.7	4.2	4.0	3.8	3.2	3.2	3.1	3.3	4.0	4.2	4.3	4.6	3.7	4.6	4.8	5.0	5.5	5.3	4.6	4.8	5.3	5.7	5.9	6.4	4.5	6.4																						
27-Dec	8.1	9.2	9.4	8.8	8.5	8.5	8.6	8.6	8.5	8.4	8.0	6.8	5.7	4.9	4.1	3.1	2.4	2.3	2.2	2.0	2.1	3.2	3.0	3.4	5.8	9.4																						
28-Dec	3.2	3.5	3.2	3.1	3.4	3.4	3.4	3.1	3.4	3.3	3.2	3.1	3.2	3.0	3.2	3.0	3.7	3.9	5.2	7.2	7.2	4.7	4.3	4.2	3.8	7.2																						
29-Dec	4.1	3.3	3.4	3.4	3.5	3.6	3.8	3.7	3.1	2.8	2.8	2.7	2.9	2.8	3.5	4.9	5.6	7.6	9.2	7.0	6.0	5.4	5.1	6.1	4.4	9.2																						
30-Dec	8.2	8.4	8.2	6.2	5.7	4.9	3.6	3.1	3.0	3.0	3.2	4.1	3.4	2.6	2.5	3.0	4.6	5.3	5.0	4.2	5.6	9.5	5.7	5.9	5.0	9.5																						
31-Dec	4.1	3.5	3.4	3.8	3.8	3.9	4.3	5.4	7.0	6.2	5.6	6.0	5.3	5.2	5.2	7.2	6.3	3.3	2.6	2.4	2.4	2.0	2.7	2.4	4.3	7.2																						
																								5.4	5.4	5.2	5.4	5.3	5.3	5.2	5.1	5.0	4.6	4.8	5.1	5.3	5.4	5.7	6.6	6.7	6.8	6.3	5.8	5.5	5.3	5.3	5.2	Diurnal Average
																								16.2	16.4	14.0	13.7	15.6	14.3	15.7	15.2	14.6	15.7	16.9	17.0	20.6	21.5	22.3	21.8	20.9	21.0	18.5	20.2	22.9	20.4	16.8	14.9	Diurnal Maximum
C - Calibration																																																
UO - Unstable Operation																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																



WBEA Data PC
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	459	64.74	64.74
6 - 15	219	30.89	95.63
16 - 25	27	3.81	99.44
26 - 80	0	0.00	99.44
> 81.0	0	0.00	99.44

Total Number of Valid Hours: 709

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	12	21	28	6	5	5	9	11	50	121	59	38	26	39	20	7	457
6 - 15	5	16	17	9	2	0	2	7	31	76	18	4	9	8	8	5	217
16 - 25	1	0	1	0	0	0	1	2	12	3	1	0	2	1	0	0	24
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	18	37	46	15	7	5	12	20	93	200	78	42	37	48	28	12	698

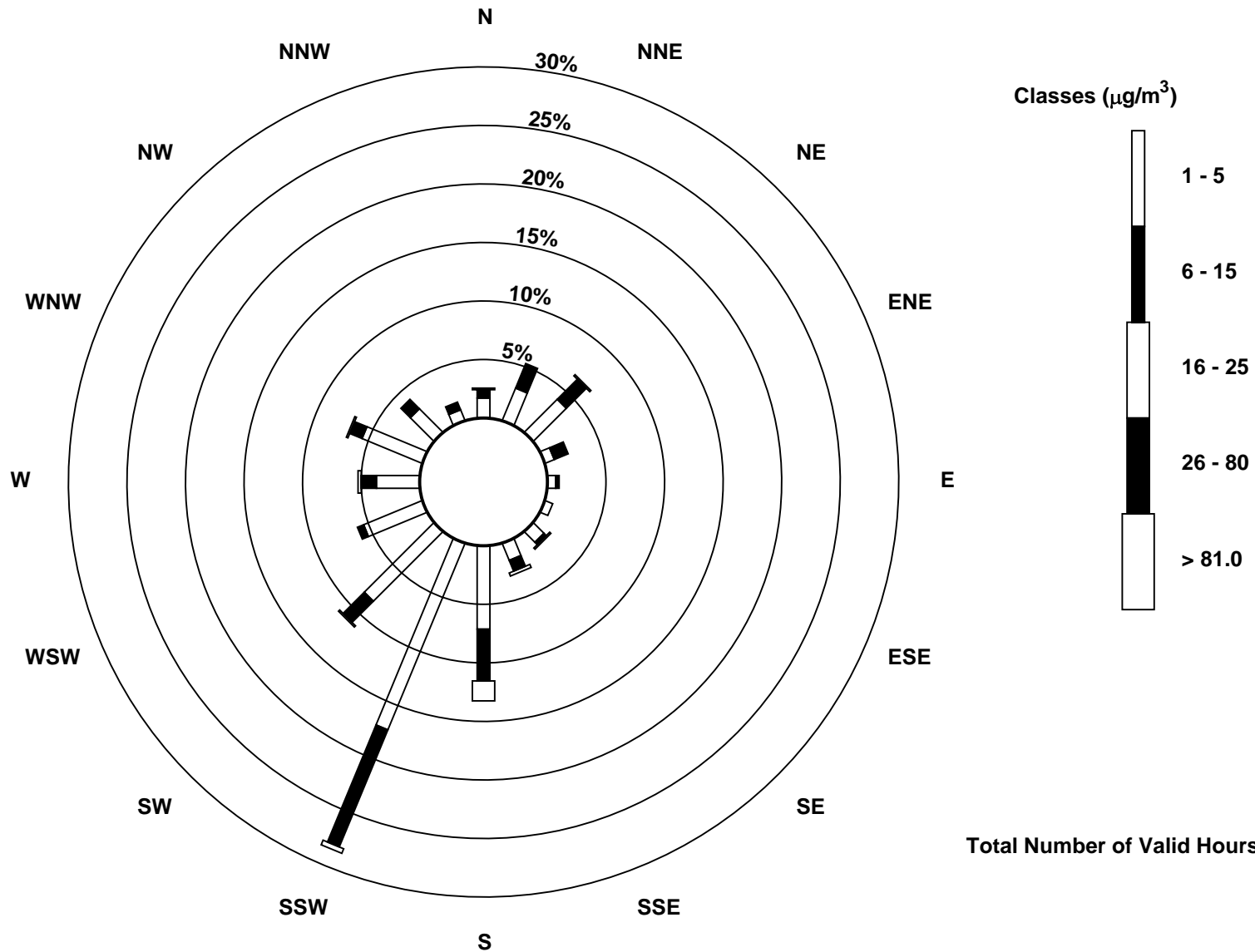
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon (AMS 15)



Total Number of Valid Hours: 702



Wood Buffalo Environmental Association
Summary of Hour Averages

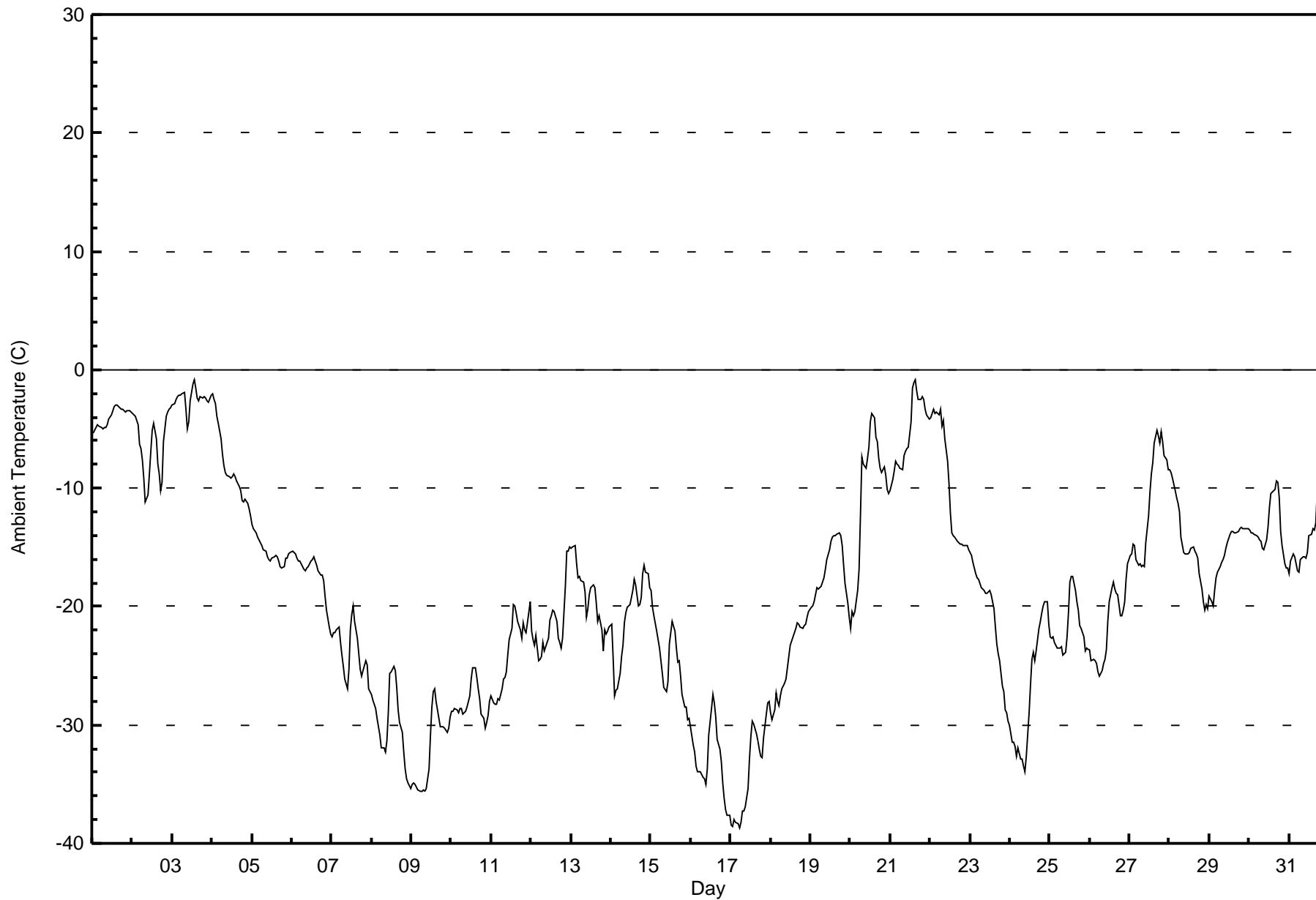
Ambient Temperature (AT) - C
CNRL Horizon - December 2016

Maximum Value: -0.9 C on Dec 3 14:00 Maximum Daily Average: -2.5 C on Dec 3																						Hours in Service: 744				
Minimum Value: -38.7 C on Dec 17 06:00 Minimum Daily Average: -34.0 C on Dec 17																						Hours of Data: 744				
Maximum Diurnal Average: -16.1 C at hour 14 Minimum Diurnal Average: -19.9 C at hour 10																						Hours of Missing Data: 0				
Monthly Average: -18.46 C Percentiles: P₁ = -37.6 P₁₀ = -30.2 Q₁ = -24.9 Median = -18.5 Q₃ = -13.1 P₉₀ = -4.7 P₉₉ = -2.1																						Hours of Calibration: 0				
																						Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.4	-5.1	-4.8	-4.7	-4.8	-4.8	-5.1	-4.9	-4.9	-4.7	-4.2	-3.8	-3.4	-3.1	-2.9	-3.0	-3.2	-3.3	-3.4	-3.4	-3.5	-3.5	-3.5	-3.6	-4.0	-2.9
2-Dec	-3.7	-3.8	-3.9	-4.6	-6.3	-6.7	-7.6	-9.1	-11.1	-10.5	-8.8	-6.9	-5.2	-4.5	-5.9	-8.0	-8.8	-10.2	-9.5	-6.1	-3.9	-3.5	-3.4	-3.2	-6.5	-3.2
3-Dec	-3.0	-2.8	-2.5	-2.3	-2.2	-2.2	-2.0	-1.9	-3.3	-5.0	-4.4	-2.6	-1.2	-0.9	-1.5	-2.4	-2.6	-2.2	-2.4	-2.3	-2.4	-2.6	-2.7	-2.1	-2.5	-0.9
4-Dec	-2.0	-2.5	-2.9	-3.9	-4.5	-5.9	-7.1	-8.1	-8.7	-8.9	-9.0	-9.1	-9.0	-8.8	-9.1	-9.4	-9.9	-10.2	-11.1	-11.1	-10.9	-11.2	-11.7	-12.4	-8.2	-2.0
5-Dec	-13.0	-13.4	-13.7	-14.2	-14.4	-14.6	-14.8	-15.2	-15.4	-15.8	-16.0	-16.1	-15.9	-15.8	-15.7	-15.8	-16.2	-16.7	-16.8	-16.6	-15.9	-15.9	-15.6	-15.5	-15.4	-13.0
6-Dec	-15.4	-15.5	-15.6	-15.9	-16.1	-16.2	-16.6	-16.9	-17.0	-16.7	-16.6	-16.1	-16.0	-15.8	-16.1	-16.5	-16.9	-17.4	-17.3	-17.9	-19.1	-20.3	-21.8	-22.3	-17.2	-15.4
7-Dec	-22.6	-22.2	-22.2	-22.0	-21.7	-23.0	-24.1	-25.1	-26.1	-26.9	-25.3	-22.0	-20.7	-20.0	-21.2	-22.7	-24.0	-25.3	-25.8	-25.4	-24.6	-24.9	-26.9	-27.2	-23.8	-20.0
8-Dec	-27.4	-27.9	-28.6	-29.4	-30.1	-30.8	-31.9	-32.0	-32.3	-31.4	-29.0	-25.6	-25.6	-25.0	-25.3	-26.9	-28.7	-29.8	-30.6	-32.3	-33.7	-34.6	-34.9	-35.3	-30.0	-25.0
9-Dec	-35.1	-34.9	-35.0	-35.3	-35.5	-35.6	-35.6	-35.5	-35.6	-35.3	-33.7	-30.9	-28.5	-27.2	-27.0	-28.0	-29.4	-30.2	-30.1	-30.2	-30.2	-30.6	-30.2	-29.3	-32.0	-27.0
10-Dec	-28.9	-28.9	-28.6	-28.7	-29.0	-28.6	-28.6	-29.1	-28.9	-28.5	-28.1	-27.6	-26.1	-25.1	-25.2	-26.0	-26.9	-27.7	-29.1	-29.4	-30.3	-29.8	-29.2	-28.0	-28.2	-25.1
11-Dec	-27.6	-28.1	-28.2	-28.3	-27.8	-27.9	-27.0	-26.2	-26.0	-25.5	-24.1	-22.7	-21.8	-19.9	-20.0	-20.5	-21.2	-21.9	-22.7	-21.4	-22.0	-22.2	-21.4	-19.6	-23.9	-19.6
12-Dec	-22.1	-22.8	-23.3	-22.4	-24.5	-24.5	-24.2	-23.1	-23.7	-23.4	-22.7	-21.1	-20.8	-20.3	-20.4	-21.3	-22.7	-23.0	-23.6	-22.6	-18.3	-15.3	-15.3	-15.0	-21.5	-15.0
13-Dec	-15.1	-14.9	-14.9	-16.4	-17.6	-17.4	-17.9	-18.0	-18.8	-20.9	-20.2	-19.0	-18.4	-18.2	-18.4	-19.7	-21.3	-20.8	-21.9	-23.7	-21.9	-22.4	-22.1	-21.7	-19.2	-14.9
14-Dec	-21.5	-24.3	-27.5	-27.0	-27.0	-25.7	-24.3	-23.3	-21.4	-20.5	-20.0	-19.8	-19.2	-18.7	-17.7	-18.2	-19.9	-19.9	-19.3	-17.3	-16.5	-17.1	-17.2	-18.4	-20.9	-16.5
15-Dec	-18.7	-20.1	-20.7	-22.1	-22.7	-23.5	-24.6	-25.6	-26.8	-27.2	-26.4	-23.1	-22.2	-21.3	-22.1	-23.5	-24.7	-24.6	-25.8	-27.4	-28.5	-28.5	-29.5	-29.5	-24.5	-18.7
16-Dec	-30.1	-31.7	-32.3	-33.5	-33.9	-33.9	-34.0	-34.4	-34.6	-35.1	-33.7	-30.8	-28.6	-27.4	-28.1	-29.4	-31.2	-32.1	-33.1	-34.9	-36.2	-37.1	-37.6	-37.6	-33.0	-27.4
17-Dec	-38.5	-38.6	-38.0	-38.3	-38.3	-38.7	-38.2	-37.2	-37.2	-36.9	-35.4	-32.9	-31.0	-29.7	-29.9	-30.8	-31.3	-32.1	-32.6	-32.8	-31.1	-29.1	-28.2	-28.0	-34.0	-28.0
18-Dec	-29.0	-29.6	-28.7	-27.3	-28.0	-28.4	-27.6	-27.0	-26.5	-26.1	-25.2	-24.2	-23.3	-22.6	-22.3	-21.8	-21.4	-21.5	-21.8	-21.9	-21.6	-21.5	-20.9	-20.5	-24.5	-20.5
19-Dec	-20.1	-19.9	-19.6	-19.0	-18.4	-18.5	-18.3	-18.0	-17.6	-16.9	-16.1	-15.2	-14.5	-14.1	-14.0	-14.0	-14.0	-13.8	-14.0	-14.9	-16.5	-18.0	-19.7	-20.9	-16.9	-13.8
20-Dec	-21.9	-20.4	-20.7	-20.4	-18.6	-16.8	-12.2	-7.4	-8.0	-8.3	-7.5	-6.5	-4.4	-3.7	-4.1	-5.7	-6.1	-7.4	-8.4	-8.7	-8.2	-8.9	-10.1	-10.5	-10.6	-3.7
21-Dec	-10.2	-9.3	-8.6	-7.7	-7.9	-8.1	-8.3	-8.4	-7.3	-6.9	-6.6	-6.5	-4.4	-1.6	-1.1	-0.9	-1.8	-2.6	-2.6	-2.3	-2.5	-3.3	-3.8	-4.2	-5.3	-0.9
22-Dec	-4.0	-3.7	-3.3	-3.7	-3.6	-3.8	-3.3	-4.8	-4.3	-5.8	-7.7	-9.6	-12.1	-13.7	-14.0	-14.1	-14.5	-14.6	-14.8	-14.8	-14.8	-14.8	-14.9	-15.2	-9.6	-3.3
23-Dec	-15.4	-15.6	-16.3	-17.2	-17.5	-17.7	-18.0	-18.4	-18.6	-18.9	-18.9	-18.8	-18.7	-19.1	-20.2	-21.8	-23.2	-24.0	-24.6	-26.7	-27.2	-28.7	-28.9	-29.6	-21.0	-15.4
24-Dec	-30.0	-31.5	-31.5	-31.8	-32.6	-32.0	-32.8	-32.9	-33.5	-33.9	-32.6	-29.0	-26.6	-24.4	-23.8	-24.6	-23.8	-21.9	-21.2	-20.5	-19.9	-19.6	-19.6	-21.5	-27.1	-19.6
25-Dec	-22.5	-22.7	-22.6	-23.1	-23.5	-23.5	-23.5	-23.4	-24.1	-23.9	-22.5	-20.6	-17.9	-17.4	-17.5	-18.6	-19.6	-20.3	-21.6	-21.8	-22.6	-23.7	-23.5	-23.7	-21.8	-17.4
26-Dec	-23.6	-24.6	-24.4	-24.5	-24.9	-25.6	-25.9	-25.4	-24.8	-24.4	-23.7	-21.3	-19.6	-18.4	-18.0	-18.5	-18.8	-19.0	-20.8	-20.8	-20.3	-19.5	-17.6	-16.4	-21.7	-16.4
27-Dec	-15.7	-15.6	-14.7	-14.9	-16.0	-16.5	-16.4	-16.6	-16.5	-16.6	-14.6	-12.3	-10.3	-8.8	-7.9	-6.2	-5.1	-5.6	-6.2	-5.3	-6.1	-7.3	-7.6	-8.4	-11.3	-5.1
28-Dec	-8.4	-8.7	-9.1	-10.2	-10.8	-11.3	-12.0	-14.1	-15.4	-15.6	-15.6	-15.6	-15.4	-15.0	-15.0	-15.3	-15.5	-15.9	-17.2	-18.5	-19.6	-20.3	-19.9	-20.2	-14.8	-8.4
29-Dec	-19.2	-19.6	-19.9	-18.6	-17.6	-17.1	-16.6	-16.2	-16.1	-15.7	-15.0	-14.7	-13.9	-13.7	-13.6	-13.7	-13.8	-13.7	-13.4	-13.4	-13.4	-13.5	-13.4	-13.4	-15.4	-13.4
30-Dec	-13.5	-13.8	-13.8	-13.9	-14.0	-14.1	-14.3	-14.5	-15.1	-15.2	-14.4	-13.3	-11.6	-10.4	-10.3	-10.1	-9.4	-9.5	-10.8	-13.7	-14.9	-16.4	-16.8	-16.7	-13.4	-9.4
31-Dec	-17.2	-16.1	-15.6	-15.8	-16.3	-17.0	-17.1	-16.1	-15.8	-15.8	-15.9	-15.4	-14.0	-13.9	-13.5	-13.6	-12.9	-10.3	-9.2	-10.4	-12.2	-12.2	-8.8	-7.5	-13.9	-7.5
																								Diurnal Average		
																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
CNRL Horizon - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	328	44.09	44.09
-20 - 0	416	55.91	100.00
0 - 10	0	0.00	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

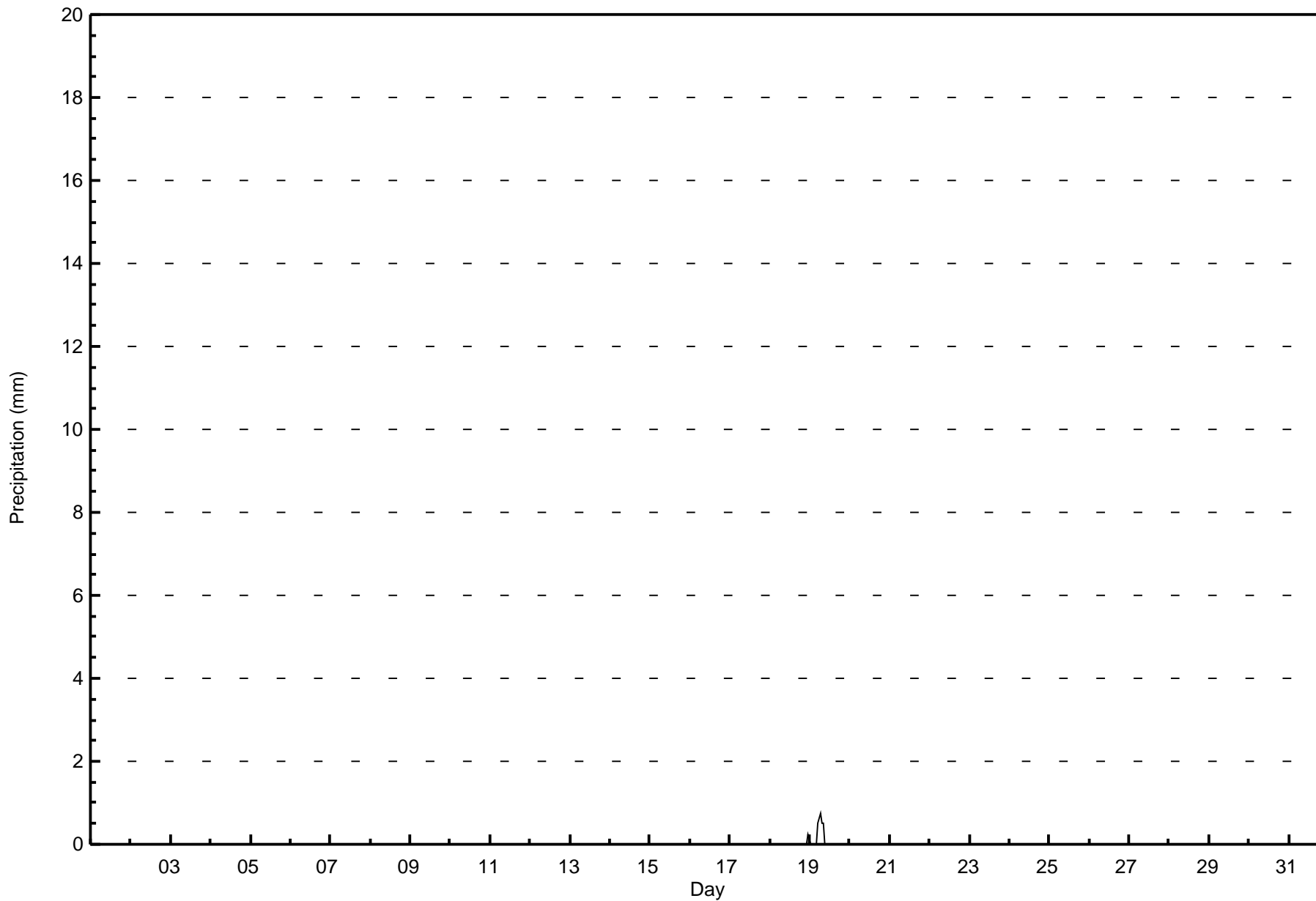
CNRL Horizon - December 2016

Maximum Value: 0.8 mm on Dec 19 07:00																				Maximum Daily Total: 2.3 mm on Dec 19					Hours in Service: 744																							
Minimum Value: 0.0 mm on Dec 14 12:00																				Minimum Daily Total: 0.0 mm on Dec 15					Hours of Data: 421																							
Maximum Diurnal Total: 0.8 mm at hour 7																				Minimum Diurnal Total: 0.0 mm at hour 1					Hours of Missing Data: 323																							
Monthly Total: 2.54 mm																				Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.5					Hours of Calibration: 0																							
																									Percent Operational Time: 56.6																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
13-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																					
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.0																					
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3																					
19-Dec	0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.8																						
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
																								0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	Diurnal Average	
																								0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	Diurnal Maximum	
AF - Analyzer Failure																																																



WBEA Data PC
Hourly Averages

Precipitation (PC) - mm
CNRL Horizon - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

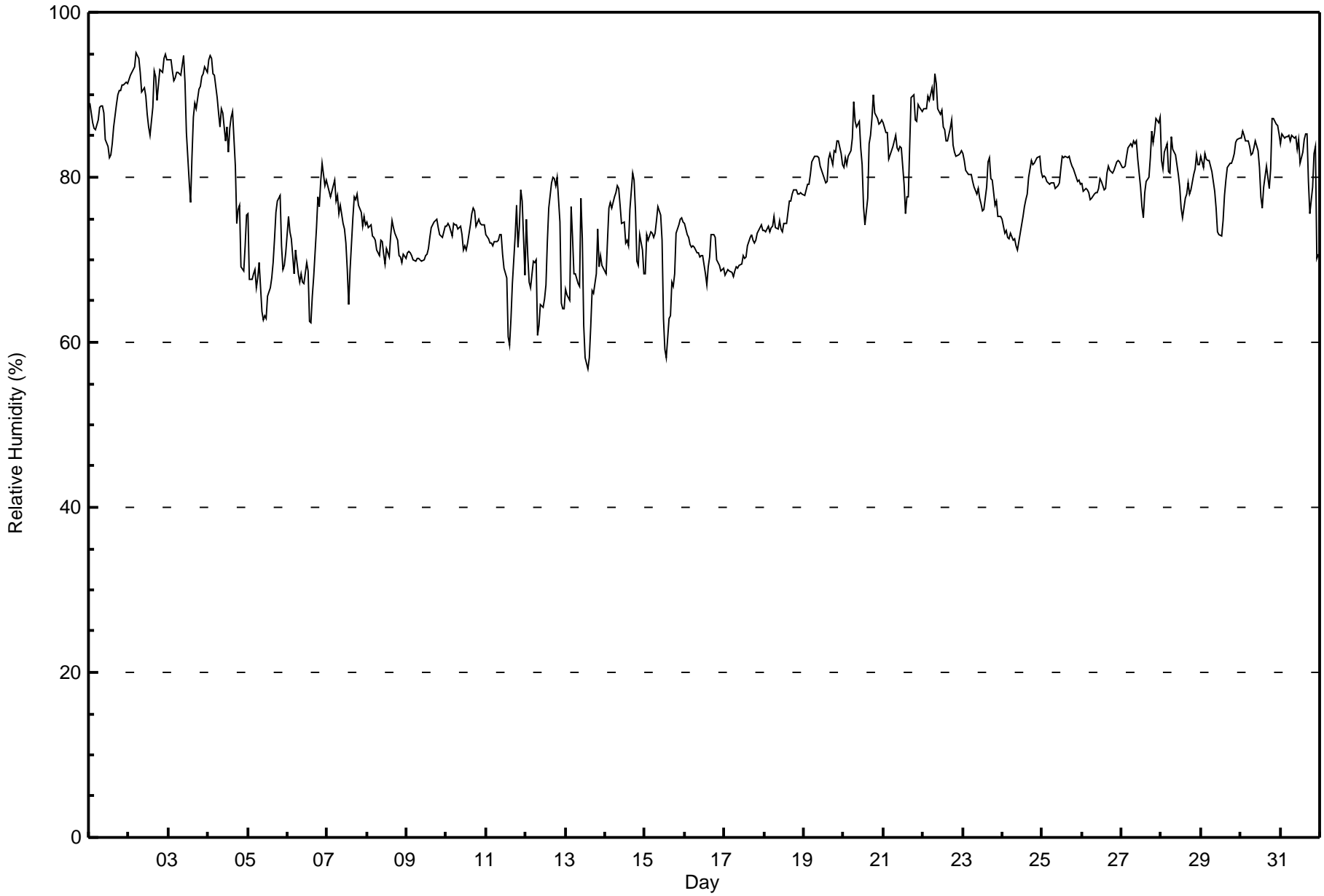
**Relative Humidity (RH) - %
CNRL Horizon - December 2016**

Maximum Value: 95 % on Dec 2 05:00																			Maximum Daily Average: 91.7 % on Dec 2						Hours in Service: 744																			
Minimum Value: 57 % on Dec 13 14:00																			Minimum Daily Average: 67.3 % on Dec 13						Hours of Data: 744																			
Maximum Diurnal Average: 79.6 % at hour 19																			Minimum Diurnal Average: 73.6 % at hour 14						Hours of Missing Data: 0																			
Monthly Average: 78.0 %																			Percentiles: P ₁ = 61 P ₁₀ = 69 Q ₁ = 72 Median = 78 Q ₃ = 83 P ₉₀ = 88 P ₉₉ = 94						Hours of Calibration: 0																			
																			Percent Operational Time: 100.0																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Dec	89	88	87	86	86	87	89	89	89	88	85	84	82	83	84	86	89	90	90	90	91	91	92	91	87.7	92																		
2-Dec	92	92	93	93	95	95	94	93	90	91	90	88	86	85	88	93	92	89	91	93	93	94	95	94	91.7	95																		
3-Dec	94	94	93	92	92	93	93	92	94	95	92	85	79	77	83	87	89	88	91	91	92	93	93	93	90.2	95																		
4-Dec	94	95	94	93	92	90	88	86	88	88	84	86	83	86	87	88	81	74	76	77	69	69	72	75	84.0	95																		
5-Dec	76	68	68	68	69	67	68	70	64	63	63	63	66	67	68	70	73	76	77	78	72	69	71	69.1	78																			
6-Dec	75	73	72	71	68	71	68	67	68	67	67	70	69	62	62	66	68	74	78	77	79	82	79	80	71.4	82																		
7-Dec	79	78	78	78	80	77	78	76	77	74	74	72	69	65	69	75	78	77	78	77	76	74	75	74	75.3	80																		
8-Dec	75	74	74	73	73	72	71	71	72	72	71	69	71	70	73	75	74	73	72	71	70	70	71	70	72.0	75																		
9-Dec	71	71	71	70	70	70	70	70	70	70	70	70	71	71	73	74	75	75	75	74	73	73	73	74	71.8	75																		
10-Dec	74	74	74	73	74	74	74	74	74	73	71	72	71	72	74	76	76	76	74	75	74	74	74	74	73.9	76																		
11-Dec	73	73	72	72	72	72	72	72	73	73	71	69	68	61	60	63	67	73	77	72	74	79	77	68	70.9	79																		
12-Dec	75	71	67	67	70	70	70	61	62	65	64	65	67	72	76	79	80	80	79	80	75	65	64	64	70.3	80																		
13-Dec	67	66	65	76	73	68	68	67	67	77	72	62	58	57	58	62	66	66	68	74	69	70	69	69	67.3	77																		
14-Dec	68	72	76	77	76	78	78	79	79	77	74	75	72	72	72	76	81	80	76	70	69	73	71	68	74.5	81																		
15-Dec	68	73	72	73	73	73	73	75	76	75	72	63	59	58	63	63	67	67	68	73	74	75	75	75	70.2	76																		
16-Dec	74	73	73	72	72	72	72	71	71	70	70	71	68	67	69	70	73	73	73	70	70	69	69	69	70.8	74																		
17-Dec	68	68	69	69	69	68	69	69	69	69	69	70	70	70	72	73	73	72	72	72	73	74	74	74	70.7	74																		
18-Dec	74	73	74	73	74	74	75	74	74	75	74	73	74	74	76	77	77	78	78	79	78	78	78	78	75.5	79																		
19-Dec	78	78	79	79	80	82	82	83	83	82	81	80	80	79	79	82	83	82	83	83	84	84	83	82	81.4	84																		
20-Dec	81	82	82	82	83	85	89	87	86	87	84	82	76	74	78	84	85	87	90	88	87	86	87	87	84.1	90																		
21-Dec	87	85	85	82	83	83	84	85	83	83	84	84	79	76	78	78	84	90	90	87	87	89	88	88	84.2	90																		
22-Dec	88	88	88	90	89	91	89	92	91	88	88	88	86	86	84	84	86	87	84	83	83	83	83	83	86.8	92																		
23-Dec	83	82	81	80	80	80	80	79	78	79	77	77	76	76	79	82	82	80	80	77	77	75	75	75	78.8	83																		
24-Dec	75	73	74	73	73	73	72	73	72	71	72	74	75	76	77	78	80	82	82	82	82	82	83	81	76.4	83																		
25-Dec	80	80	80	79	79	79	79	79	79	79	79	81	83	82	83	82	83	82	81	81	80	79	80	79	80.4	83																		
26-Dec	79	78	79	78	78	77	77	78	78	78	79	80	80	78	79	80	81	81	81	81	81	82	82	82	79.5	82																		
27-Dec	81	81	81	82	84	84	84	84	84	84	82	79	76	75	78	80	80	82	86	84	85	87	87	87	82.5	87																		
28-Dec	82	81	83	84	81	81	85	83	83	82	80	79	76	75	77	78	79	78	78	80	81	83	82	82	80.5	85																		
29-Dec	82	81	83	82	82	82	81	80	78	76	73	73	73	75	78	80	81	82	82	82	83	84	85	85	80.1	85																		
30-Dec	85	86	85	84	84	84	83	83	84	84	83	81	78	76	79	81	80	79	81	87	87	87	86	85	83.0	87																		
31-Dec	84	85	85	85	85	85	84	85	85	85	83	85	82	83	85	85	85	80	76	79	83	84	70	71	82.4	85																		
																			79.1	78.7	78.6	78.7	78.6	78.6	78.7	78.2	78.1	78.1	76.8	75.8	74.3	73.6	75.5	77.6	79.0	79.1	79.6	79.5	79.1	79.2	78.7	78.3	Diurnal Average	
																			94	95	94	93	95	95	94	93	94	95	92	88	86	86	88	93	92	90	91	93	93	94	95	94	Diurnal Maximum	



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
CNRL Horizon - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	6	0.81	0.81
60 - 80	441	59.27	60.08
80 - 100	297	39.92	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

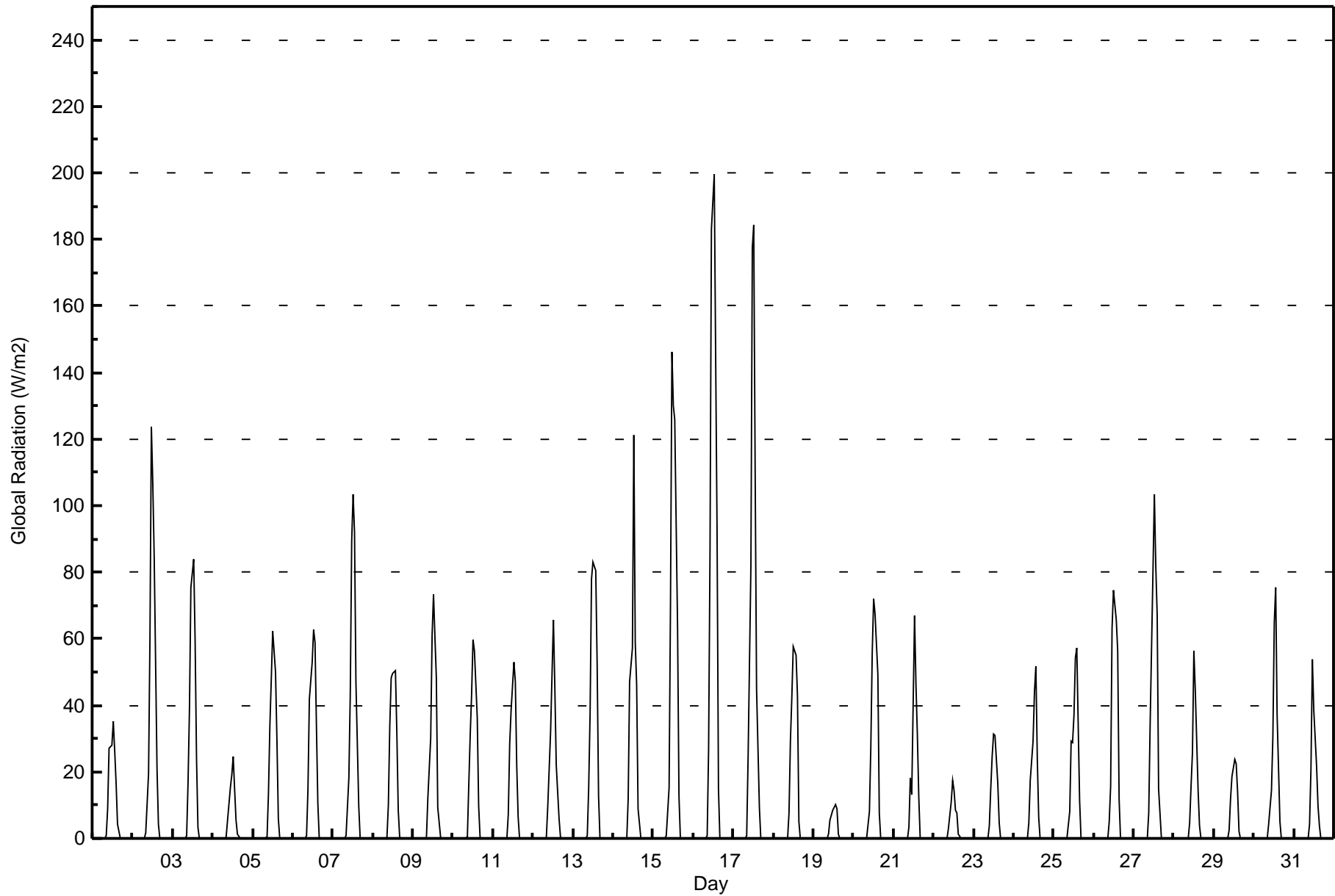


Maximum Value: 200 W/m2 on Dec 16 13:00																			Maximum Daily Average: 31.2 W/m2 on Dec 16						Hours in Service: 744	
Minimum Value: 0 W/m2 on Dec 1 01:00																			Minimum Daily Average: 1.9 W/m2 on Dec 19						Hours of Data: 744	
Maximum Diurnal Average: 70.7 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 7						Hours of Missing Data: 0	
Monthly Average: 11.3 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 8 P ₉₀ = 47 P ₉₉ = 116						Hours of Calibration: 0	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	0	1	9	27	28	35	26	16	4	0	0	0	0	0	0	0	0	6.1	35
2-Dec	0	0	0	0	0	0	0	0	2	19	61	124	107	84	21	4	0	0	0	0	0	0	0	0	17.6	124
3-Dec	0	0	0	0	0	0	0	0	1	17	39	75	84	59	24	4	0	0	0	0	0	0	0	0	12.6	84
4-Dec	0	0	0	0	0	0	0	0	0	5	15	19	25	15	6	1	0	0	0	0	0	0	0	0	3.6	25
5-Dec	0	0	0	0	0	0	0	0	1	13	34	48	62	50	30	6	0	0	0	0	0	0	0	0	10.1	62
6-Dec	0	0	0	0	0	0	0	0	1	15	42	53	63	59	34	11	0	0	0	0	0	0	0	0	11.5	63
7-Dec	0	0	0	0	0	0	0	0	1	18	44	89	103	92	47	10	0	0	0	0	0	0	0	0	16.9	103
8-Dec	0	0	0	0	0	0	0	0	1	10	34	48	50	51	32	8	0	0	0	0	0	0	0	0	9.8	51
9-Dec	0	0	0	0	0	0	0	0	1	12	30	61	73	61	48	9	0	0	0	0	0	0	0	0	12.3	73
10-Dec	0	0	0	0	0	0	0	0	0	16	31	43	60	56	37	10	0	0	0	0	0	0	0	0	10.6	60
11-Dec	0	0	0	0	0	0	0	0	0	7	28	38	53	47	22	6	0	0	0	0	0	0	0	0	8.4	53
12-Dec	0	0	0	0	0	0	0	0	1	10	32	49	66	45	22	6	0	0	0	0	0	0	0	0	9.6	66
13-Dec	0	0	0	0	0	0	0	0	1	15	38	78	83	81	52	13	0	0	0	0	0	0	0	0	15.0	83
14-Dec	0	0	0	0	0	0	0	0	0	12	47	57	121	59	46	9	0	0	0	0	0	0	0	0	14.7	121
15-Dec	0	0	0	0	0	0	0	0	1	15	71	146	130	126	63	13	0	0	0	0	0	0	0	0	23.6	146
16-Dec	0	0	0	0	0	0	0	0	1	27	86	183	200	145	92	15	0	0	0	0	0	0	0	0	31.2	200
17-Dec	0	0	0	0	0	0	0	0	1	24	82	178	184	110	45	9	0	0	0	0	0	0	0	0	26.4	184
18-Dec	0	0	0	0	0	0	0	0	0	8	29	42	58	55	43	5	0	0	0	0	0	0	0	0	10.0	58
19-Dec	0	0	0	0	0	0	0	0	0	1	6	8	9	10	9	1	0	0	0	0	0	0	0	0	1.9	10
20-Dec	0	0	0	0	0	0	0	0	0	8	28	56	72	67	49	8	0	0	0	0	0	0	0	0	12.0	72
21-Dec	0	0	0	0	0	0	0	0	0	4	18	13	67	46	31	12	0	0	0	0	0	0	0	0	8.0	67
22-Dec	0	0	0	0	0	0	0	0	0	3	11	17	14	9	8	1	0	0	0	0	0	0	0	0	2.6	17
23-Dec	0	0	0	0	0	0	0	0	0	4	15	25	31	31	17	5	0	0	0	0	0	0	0	0	5.3	31
24-Dec	0	0	0	0	0	0	0	0	0	5	17	29	44	52	24	6	0	0	0	0	0	0	0	0	7.4	52
25-Dec	0	0	0	0	0	0	0	0	0	8	29	29	37	54	57	12	0	0	0	0	0	0	0	0	9.4	57
26-Dec	0	0	0	0	0	0	0	0	0	5	16	63	75	66	56	12	0	0	0	0	0	0	0	0	12.2	75
27-Dec	0	0	0	0	0	0	0	0	0	8	34	80	103	82	67	15	0	0	0	0	0	0	0	0	16.2	103
28-Dec	0	0	0	0	0	0	0	0	0	5	16	26	56	44	15	4	0	0	0	0	0	0	0	0	6.9	56
29-Dec	0	0	0	0	0	0	0	0	0	3	12	19	24	22	14	2	0	0	0	0	0	0	0	0	4.0	24
30-Dec	0	0	0	0	0	0	0	0	0	4	15	31	65	75	37	5	0	0	0	0	0	0	0	0	9.7	75
31-Dec	0	0	0	0	0	0	0	0	0	4	21	54	39	22	10	4	0	0	0	0	0	0	0	0	6.4	54
0.0																			0.0						Diurnal Average	
0																			2						Diurnal Maximum	



WBEA Data PC
Hourly Averages

Global Radiation (GR) - W/m²
CNRL Horizon - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

CNRL Horizon - December 2016

Maximum Speed: 25 km/h on Dec 13 03:00	Maximum Daily Speed Average: 15.5 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 29 10:00	Minimum Daily Speed Average: 1.1 km/h on Dec 18	Hours of Data: 736
Maximum Diurnal Speed Average: 4.8 km/h at hour 24	Minimum Diurnal Speed Average: 2.2 km/h at hour 16	Hours of Missing Data: 8
Monthly Average Velocity: 3.5 km/h 232.3 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 7 Q ₃ = 10 P ₉₀ = 14 P ₉₉ = 19	Percent Operational Time: 98.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S10	S12	SSW11	SSW11	SSW11	S10	S9	S9	SSW10	SSW10	SSW10	SSW11	SSW11	SSW10	SSW8	SSW7	SSW6	SSW6	SSW6	SSW5	SSW5	SSW5	S6	SSW7	SSW8.5	S12	
2-Dec	S5	S6	S7	S6	SSW9	S8	S7	SSW6	SW7	SW7	SSW6	SSW4	S6	S9	SSW7	W3	WNW2	W3	SW5	S9	SSE8	S11	S11	S11	SSW6.2	S11	
3-Dec	S10	S9	S11	S12	S10	S8	S10	S10	S9	SSW10	SSW8	SSW7	SW7	SW5	SW4	SSW6	SW8	SW7	SSW8	SSW8	SSW7	SSW6	SSW4	W8	SSW7.3	S12	
4-Dec	NNW5	NNE10	NNE11	NNE10	NNE11	NE12	NE12	NE12	NE10	NNE8	NNE8	N6	N4	NNW4	NNW6	NW15	NW17	NW16	NW10	NW12	NW18	NW17	NW18	NW18	N8.6	NW18	
5-Dec	NW17	NW17	NW16	NW18	WNW18	NW22	NW21	WNW17	NW19	WNW20	WNW17	WNW15	WNW16	WNW15	WNW14	WNW16	W13	W10	W10	W9	WNW14	WNW15	WNW14	WNW15	WNW15.5	NW22	
6-Dec	WNW15	NW15	NW15	WNW16	NW15	WNW15	WNW13	WNW13	NW14	NW16	NW9	NNW8	N12	N21	NNW19	N12	N9	N2	NNE2	NNE7	NE6	NE6	NNE3	NE2	NNW9.6	NNW21	
7-Dec	SW1	NNE1	S3	E2	NE3	ENE1	WNW0	WSW3	SW5	SW4	WNW2	SSE3	ESE1	SSW4	SW5	SSW4	SSW5	E1	ENE3	ESE2	S3	SW3	WSW4	SW3	SSW1.6	SW5	
8-Dec	SSW5	SSW4	SSE4	S3	SSW4	SSW4	SSW4	SSW5	SW6	SW6	SW5	SSW3	SSW4	SSW4	S4	SE3	SSE3	SSE2	SW2	WSW1	WSW3	WSW2	SW4	SW4	SSW3.4	SW6	
9-Dec	SSW5	SW6	SSW7	SSW8	SSW8	SSW8	SSW8	SSW9	SSW8	SSW9	SSW9	SSW9	S8	S7	SSE7	S8	S8	S10	SSW9	SSW8	SSW9	SSW7	SSW9	SSW10	SSW8.1	SSW10	
10-Dec	SSW10	SSW9	SW3	SSW3	S6	S6	S5	S5	S5	SSW5	S5	SSW6	S6	SSE4	SE4	ESE3	ENE4	SSE4	WSW4	SSW4	SSW7	SW9	SW8	SW10	SSW4.7	SSW10	
11-Dec	SW10	SW11	SW11	SW11	SW13	SW13	WSW14	SW13	SW13	SSW9	WSW16	WSW12	SW11	WNW14	W11	W9	WSW11	SW9	SW10	W12	WSW9	SW8	W11	WNW15	WSW10.7	WSW16	
12-Dec	WNW8	WNW11	WNW13	W11	WSW9	W9	W12	WNW14	W10	WSW12	SW8	SSW7	SSW9	SSE7	SSE8	SSE3	E2	E2	SSW4	SW8	WNW15	WNW17	WNW17	WNW19	W7.1	WNW19	
13-Dec	WNW19	WNW22	NW25	NNE14	NNE13	N16	N12	NNW17	N10	NNE2	NNE2	N6	NNW17	NNW17	NW17	NW9	WNW10	WNW10	WNW9	W9	W11	W12	W11	W9	NW10.2	NW25	
14-Dec	W7	WSW7	WSW6	SW7	SSW7	SSW9	S5	S9	SSW9	SSW7	S4	SE2	WNW2	NNW2	S3	SSW2	E1	W3	W6	WNW10	WNW8	WNW5	NW7	WNW10	WSW3.8	WNW10	
15-Dec	W8	W10	W11	WNW10	W7	W10	WSW10	WSW9	WSW5	SW7	WSW5	NW4	WSW8	WSW10	W10	WNW11	W8	WNW10	W9	WSW6	WSW6	WSW2	SSW3	WSW5	W7.1	W11	
16-Dec	SW5	WSW1	W3	WSW5	WSW6	SW6	SSW7	SW6	SSW7	SSW7	SSW7	S7	S7	SSE5	SE5	SE4	SSE3	SSW4	S3	SSE3	SSW4	SSW5	SSW4	SSW7	SSW4.4	SSW7	
17-Dec	SSW5	SSW7	SSW8	SSW7	SSW9	S8	S10	SSW10	SSW9	S10	SSW9	S10	S10	S10	S10	S10	S10	SSW9	SSW6	SSW6	SSW8	SSW10	SSW10	SSW11	SSW8.7	SSW11	
18-Dec	SSW10	SSW11	SSW13	SSW8	SSW3	S2	SSE3	WSW3	NE2	ENE0	NW1	W1	NNE2	N3	NNE5	NE4	NE3	NE5	NNE4	NNE5	ENE3	SSE2	SSW4	SSW3	S1.1	SSW13	
19-Dec	S4	SSW3	W2	W2	N2	ENE4	ENE3	E1	AF	AF	AF	AF	S2	SE3	NE3	NNE6	NNE6	NNE6	NE5	ENE6	NE5	NE4	NNW4	NW3	NE1.9	NNE6	
20-Dec	SW2	SSW5	SSW9	SSW12	SSW14	SSW11	SW12	SW17	SSW18	SSW15	SSW13	SW12	SW12	SW9	SSW8	SSE6	SSW7	S8	SW11	SSW14	S12	S11	SSW12	SSW13	SSW10.6	SSW18	
21-Dec	SSW14	SSW9	SSW10	SW13	SW17	SW17	SW16	SSW15	SSW16	SSW12	S11	S11	SW9	SW18	WSW18	WSW12	SSW7	S10	S12	S12	S11	SE9	S12	S10	SSW11.4	SW18	
22-Dec	SSW9	SSW8	SW8	SW9	WSW11	SW13	N7	NNE5	NNE9	NNE11	NE12	NNE12	NE14	NE14	NE13	NE12	NE11	NE10	NE9	NE8	NE7	NE8	NE10	NE10	NE5.1	NE14	
23-Dec	NE9	NE10	NE11	NE11	NE7	NE8	ENE8	NE8	NNE10	NE10	NNE10	NNE8	NNE7	NE7	NE7	NE5	N6	NNW5	NW5	NNW2	N3	AF	NNW2	SW3	NNE6.3	NE11	
24-Dec	SSW5	S2	SSW6	SW4	SW5	SW5	SW6	SSW7	SSW6	SSW6	SSW7	SSW7	SSW8	SSW9	S8	SSW10	SSW10	SSW9	SSW8	SSW6	SSW5	SSW6	SSW6	SSW7	SSW6.4	SSW10	
25-Dec	SSW6	S7	SSW7	SSW7	SSW7	SSW8	SSW7	SSW8	SSW9	SSW9	SSW7	SSW7	SSW6	SSW7	S7	SSW6	SSW6	SSW5	SSW5	SSW6	SSW5	SW6	SSW7	SSW7	SSW6.8	SSW9	
26-Dec	SSW7	SSW6	SSW7	SSW8	SSW7	SW6	SW6	SSW7	SSW8	SSW7	SW7	SSW7	SW6	SW7	SW6	SW6	SW8	SW7	SSW7	SSW8	SSW8	SSW8	SSW8	SSW8	SSW8	SSW7.0	SSW8
27-Dec	SSW8	SSW9	SSW9	SSW9	SSW9	SSW10	SSW10	SSW10	SSW9	SSW9	S9	S7	S8	S9	SSW15	SW13	SW13	S5	SSW5	SW12	W5	NNE7	NNE6	N7	SSW7.0	SSW15	
28-Dec	NNE5	NE7	NE8	NE9	NE7	ENE7	NE7	NE9	NE7	NE6	ENE5	E5	SE5	SSE4	SSE5	ESE4	ENE6	NE8	NNE5	NNE5	N3	W3	WSW3	AF	NE4.4	NE9	
29-Dec	SW3	S2	S1	S3	S2	S3	S4	SSW4	SE2	W0	WSW2	WSW2	SSW1	SE4	SE4	ESE3	ENE3	SSE1	SW3	WSW2	SSW5	S4	S6	NNE3	S1.9	S6	
30-Dec	NE1	AF	NE4	NE5	NNE6	NNE6	NNE7	NE4	N3	SSW5	S7	S9	SSW14	SSW16	SSW15	S11	SW14	WSW13	WSW8	NNE8	NNE7	N4	NNW4	NNW4	SSW2.0	SSW16	
31-Dec	W3	AF	SW9	S4	SSE5	ENE5	NNW2	WSW4	NE0	SSW3	SSW3	ENE2	SSW3	SSW5	SE4	S4	SW12	WSW11	WSW10	SW11	SSW11	WSW7	WNW19	WNW23	WSW4.5	WNW23	

SW4.3 SW3.9WSW3.9 SW3.6 SW3.9 SW3.6 SW3.3 SW4.0 SW3.9 SW4.3 SW3.8SSW3.2 SW3.4 SW3.3 SW2.9 SW2.2WSW2.9WSW3.0WSW3.5 SW3.4WSW3.4WSW3.2WSW4.1 W4.8	Diurnal Average
WNW19WNW22 NW25 NW18WNW18 NW22 NW21WNW17 NW19WNW20WNW17WNW15NNW17 NNW21 NNW19WNW16 NW15 NW17 NW16 SSW14WNW15 NW18WNW19WNW23	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
CNRL Horizon - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 8 km/h on Jan 1 00:00	Hours of Data: 736
Minimum Value: 0 km/h on Dec 8 07:00	Hours of Missing Data: 8
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 5	Hours of Calibration: 0
	Percent Operational Time: 98.9

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	3
2-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	2	2	3	2	3	3
3-Dec	2	2	3	3	3	2	2	2	1	2	2	2	1	2	1	2	2	1	1	1	1	1	2	1	3
4-Dec	2	2	3	4	3	3	3	3	2	3	3	2	1	1	2	4	2	3	3	2	3	3	2	3	4
5-Dec	3	2	2	2	3	3	4	3	3	3	4	3	3	1	3	3	2	2	2	2	4	2	2	2	4
6-Dec	2	2	2	2	2	2	2	2	2	2	4	3	3	5	3	3	3	2	1	3	1	1	2	1	5
7-Dec	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	0	0	1	1	2	0	1	1	1	2
8-Dec	1	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1
9-Dec	1	0	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	2	2	2	1	1	2	1	2
10-Dec	2	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	2
11-Dec	2	2	3	3	2	2	3	2	3	2	4	3	3	4	3	2	2	2	2	2	2	1	3	3	4
12-Dec	1	1	1	2	2	2	2	3	2	2	2	2	1	1	1	2	1	2	2	1	5	3	3	3	5
13-Dec	3	4	5	6	4	5	3	5	7	1	2	3	4	4	3	2	2	2	2	2	2	2	2	2	7
14-Dec	2	1	1	2	1	1	3	2	2	2	1	1	1	1	1	2	3	1	2	3	4	1	3	2	4
15-Dec	1	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	1	3
16-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	1	2
17-Dec	1	1	1	1	1	1	1	2	1	1	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2
18-Dec	2	2	3	5	1	1	1	1	2	1	1	1	2	1	1	2	2	1	1	2	2	1	2	2	5
19-Dec	1	1	2	2	1	1	2	1	AF	AF	AF	AF	1	2	2	2	2	2	1	2	1	1	1	1	2
20-Dec	1	2	1	2	3	2	3	4	3	3	2	2	3	2	2	2	2	2	2	2	3	2	2	3	4
21-Dec	3	2	2	5	6	4	5	3	3	3	2	3	5	4	4	3	2	1	2	2	2	2	2	2	6
22-Dec	1	1	2	2	2	2	3	2	3	2	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3
23-Dec	3	3	3	3	2	2	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	AF	2	2	3
24-Dec	1	2	1	1	1	0	0	0	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	2
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2
27-Dec	2	2	2	2	1	2	1	2	2	2	2	1	2	2	2	3	2	2	2	2	3	1	2	1	3
28-Dec	1	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	2	1	1	2	0	2	AF	2
29-Dec	2	1	2	1	1	1	1	1	1	1	2	1	1	2	2	2	1	2	1	2	2	1	1	2	2
30-Dec	1	AF	1	2	2	2	2	1	3	1	2	2	2	3	3	3	5	3	2	1	1	1	1	2	5
31-Dec	1	AF	2	2	1	2	2	2	2	2	1	2	1	1	1	2	2	2	2	2	3	2	6	8	8
	3	4	5	6	6	5	5	5	7	3	4	3	5	5	4	4	5	3	3	3	5	3	6	8	

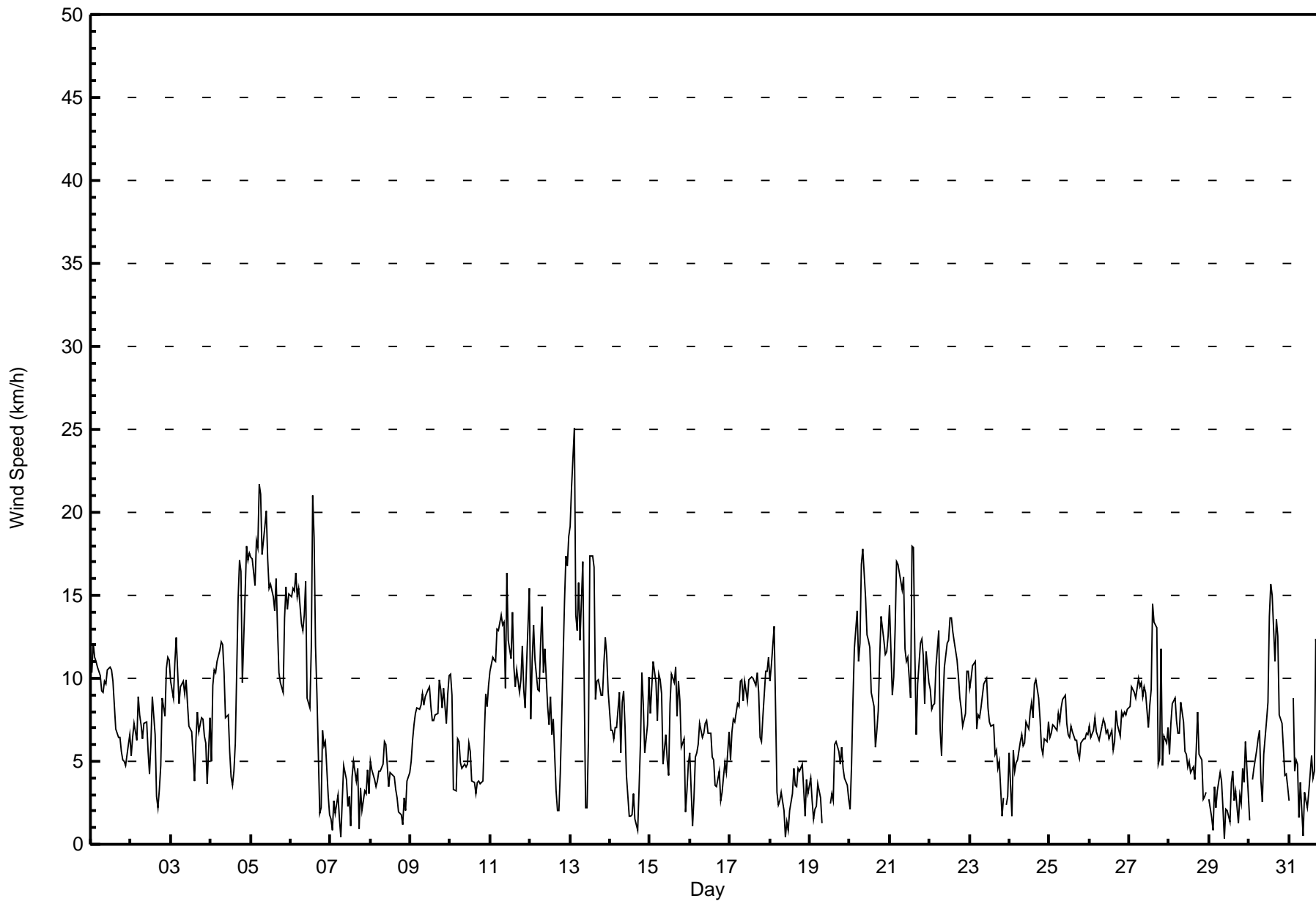
Diurnal Maximum

AF - Analyzer Failure



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
CNRL Horizon - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
CNRL Horizon - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	233	31.66	31.66
6 - 11	379	51.49	83.15
12 - 19	117	15.90	99.05
20 - 28	7	0.95	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 736

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
CNRL Horizon - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	9	14	15	12	7	5	11	16	27	47	22	18	10	6	4	10	233
6 - 11	7	24	29	4	0	0	1	5	61	147	43	17	24	11	4	2	379
12 - 19	4	3	8	0	0	0	0	0	6	17	19	7	3	28	18	4	117
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	7
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	20	41	52	16	7	5	12	21	94	211	84	42	37	48	29	17	736

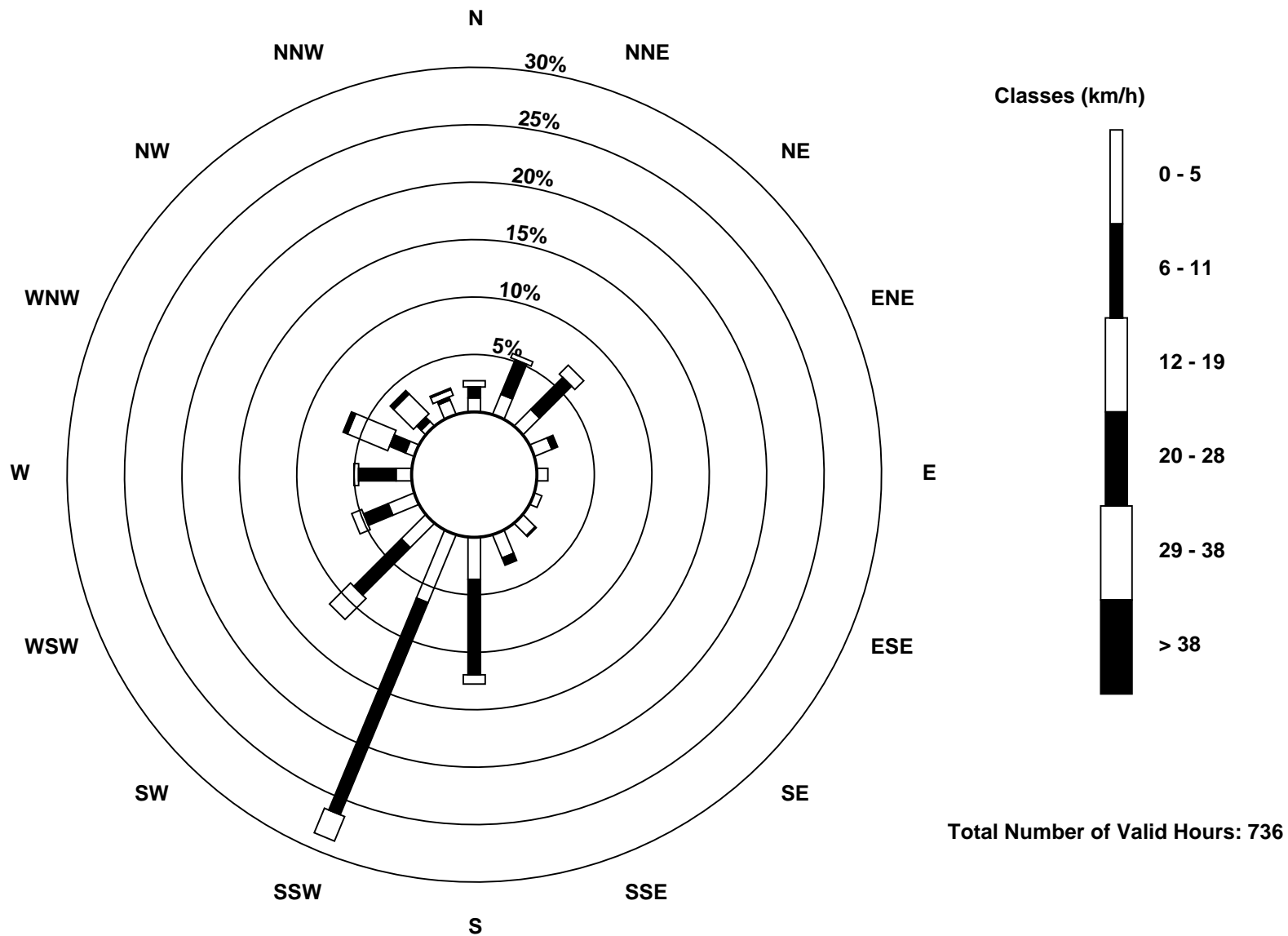
Total Number of Valid Hours: 736

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
CNRL Horizon (AMS 15)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
CNRL Horizon - December 2016

Direction of Maximum Speed: 309 deg on Dec 13 03:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 296.0 deg on Dec 5	Hours of Data: 736
Direction of Minimum Speed: 261 deg on Dec 29 10:00	Hours of Missing Data: 8
Direction of Minimum Daily Speed Average: 1.1 deg on Dec 18	Percent Operational Time: 98.9
Monthly Average Direction: 229.9 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	188	181	194	210	201	191	191	189	194	192	206	211	213	207	205	203	195	198	198	206	193	199	181	196	197.8
2-Dec	176	179	179	180	193	181	186	211	224	215	212	202	191	191	195	278	289	270	232	183	168	170	173	176	191.9
3-Dec	172	170	171	176	171	170	176	183	191	207	203	207	222	231	217	203	214	227	203	193	212	211	206	259	195.4
4-Dec	347	18	31	24	23	40	38	38	49	33	12	354	5	353	348	332	314	316	313	321	320	322	319	313	349.7
5-Dec	307	306	304	305	303	308	306	303	306	302	294	283	284	284	283	288	281	273	270	269	294	303	296	301	296.0
6-Dec	302	305	307	302	304	300	300	302	307	312	320	346	354	349	341	352	9	0	32	29	36	43	29	48	326.6
7-Dec	216	15	189	88	46	63	302	241	218	215	302	151	120	210	216	204	201	95	78	117	170	214	239	226	199.1
8-Dec	194	192	153	186	210	202	205	209	231	231	230	207	198	200	180	145	147	154	216	245	239	238	224	230	204.6
9-Dec	205	217	203	198	200	198	200	199	196	194	192	193	181	173	164	174	184	190	193	207	213	199	194	199	194.4
10-Dec	196	194	222	192	184	187	175	177	190	192	189	192	180	151	129	121	64	160	245	206	210	236	228	225	194.8
11-Dec	233	233	232	229	222	217	239	232	220	203	253	244	233	282	280	259	249	227	227	267	252	229	261	303	243.6
12-Dec	287	298	302	275	255	273	260	289	265	240	236	200	194	159	152	150	97	79	209	222	294	299	294	297	267.8
13-Dec	295	297	309	14	14	354	1	344	350	30	27	6	338	334	324	311	296	283	293	266	262	263	269	269	317.7
14-Dec	261	240	247	221	203	204	169	189	193	208	179	127	286	329	187	210	84	273	278	285	301	303	321	302	242.8
15-Dec	277	263	265	286	271	262	249	240	251	225	252	316	255	249	259	297	277	284	274	238	244	239	196	255	262.4
16-Dec	217	247	273	250	239	230	213	230	213	209	199	188	185	156	131	131	161	205	176	163	207	207	211	211	203.6
17-Dec	196	197	202	192	197	190	188	196	193	191	195	191	178	173	173	178	187	199	211	193	200	209	202	207	192.8
18-Dec	199	202	194	195	193	177	159	258	55	78	304	266	22	3	26	40	42	40	21	22	62	157	198	194	179.1
19-Dec	187	192	280	279	354	57	73	88	AF	AF	AF	AF	180	130	43	18	19	15	45	77	54	53	334	321	40.4
20-Dec	224	199	193	194	201	196	223	221	213	209	204	218	232	224	207	161	205	191	216	209	188	190	206	195	206.1
21-Dec	204	195	199	224	233	227	222	207	210	200	187	185	227	232	238	243	208	171	173	182	174	142	182	190	206.2
22-Dec	203	203	214	227	238	223	6	20	30	31	48	33	39	42	38	40	41	42	40	34	42	42	36	40	36.1
23-Dec	39	36	38	39	37	48	60	45	32	40	28	30	30	41	53	41	357	344	314	334	2	AF	343	215	32.2
24-Dec	203	176	204	229	228	226	217	213	210	210	208	211	195	195	189	192	196	207	206	203	204	194	196	196	203.9
25-Dec	193	188	198	199	209	207	202	209	207	207	203	200	190	192	190	203	203	208	210	199	210	217	204	214	203.1
26-Dec	210	204	207	211	209	220	216	209	206	208	215	213	217	215	217	221	217	216	209	211	208	200	201	208	210.8
27-Dec	207	200	205	211	201	208	205	204	211	199	183	181	178	190	197	214	230	176	205	231	265	17	12	358	206.9
28-Dec	31	34	42	47	48	58	44	40	51	55	63	99	129	149	147	102	62	50	28	16	353	281	255	AF	53.2
29-Dec	235	189	178	188	183	174	173	200	145	261	250	245	195	143	133	107	62	151	219	238	207	171	187	15	180.9
30-Dec	56	AF	56	48	30	29	33	37	356	196	190	188	196	195	194	189	224	241	252	20	29	356	341	347	208.0
31-Dec	266	AF	221	183	168	70	345	240	56	197	205	67	195	196	126	171	224	250	244	219	211	255	297	295	240.0

233.9 235.9 237.4 232.9 229.1 229.0 230.7 234.7 227.7 220.4 220.7 213.4 219.7 223.7 216.8 225.1 236.9 237.0 238.6 229.2 237.0 243.3 249.8 258.8
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

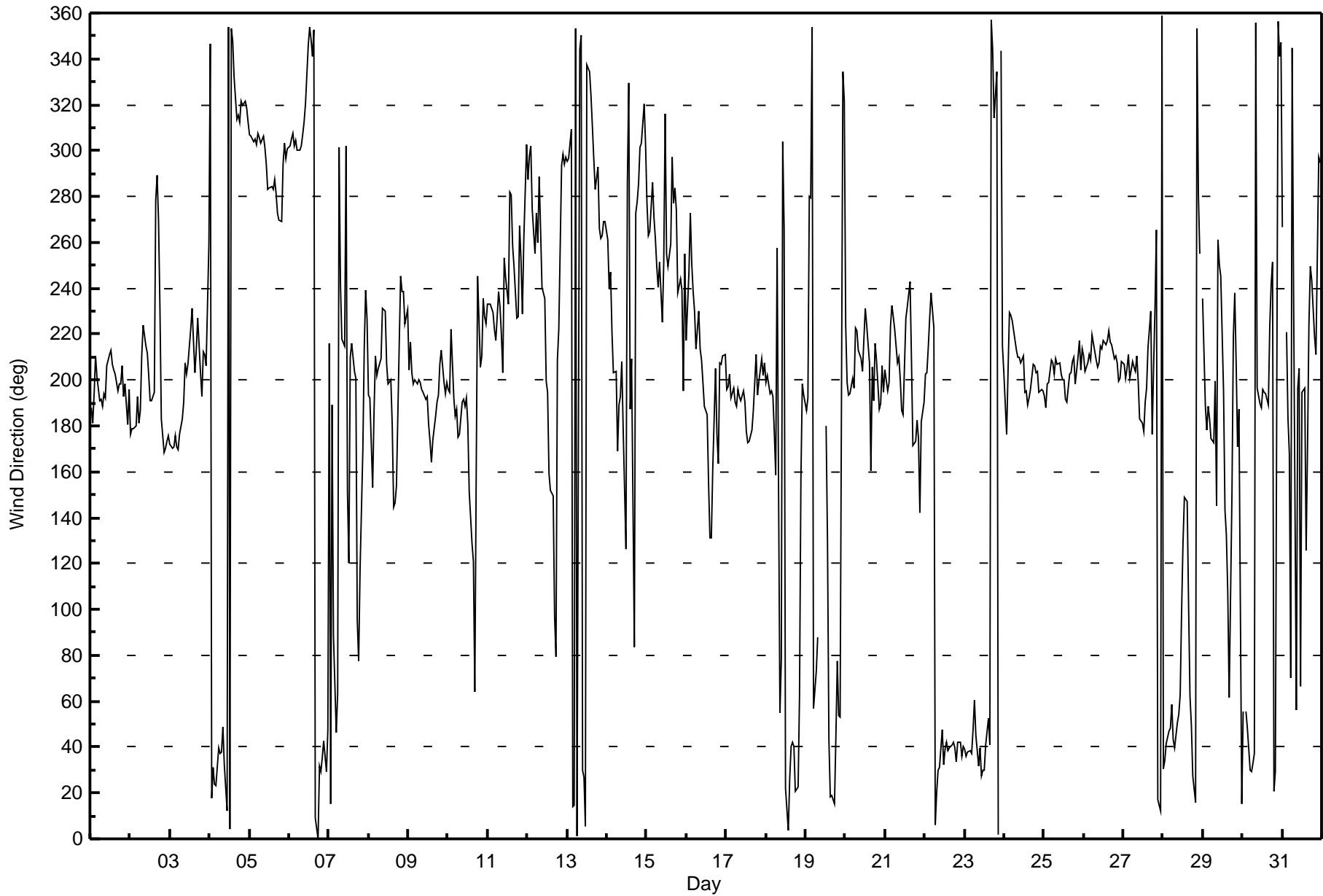
Wind Direction (WD) - deg
CNRL Horizon - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 97 deg on Dec 29 03:00 Minimum Value: 6 deg on Dec 6 10:00 Percentiles: P ₁ = 7 P ₁₀ = 9 Q ₁ = 12 Median = 15 Q ₃ = 21 P ₉₀ = 43 P ₉₉ = 86																	Hours in Service: 744 Hours of Data: 736 Hours of Missing Data: 8 Hours of Calibration: 0 Percent Operational Time: 98.9																														
Day	Hourly Period Ending At (MST)																								Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	15	14	17	16	15	14	13	15	14	15	16	15	14	14	15	13	13	13	13	12	15	27	14	13	27																						
2-Dec	16	17	13	14	14	10	11	17	14	11	15	17	19	16	13	45	41	22	17	14	16	18	16	16	45																						
3-Dec	16	17	16	15	16	15	15	14	13	11	14	15	17	16	18	12	14	14	14	13	14	11	33	15	33																						
4-Dec	36	18	19	20	18	17	17	16	12	22	21	25	26	25	30	26	7	7	6	11	12	8	8	9	36																						
5-Dec	9	7	7	7	7	7	7	9	7	8	11	12	12	12	12	10	13	13	15	13	15	7	9	8	15																						
6-Dec	8	8	8	7	8	7	6	7	6	6	23	20	20	16	11	18	19	62	43	22	17	10	66	83	83																						
7-Dec	39	90	23	63	39	23	67	23	8	18	50	48	82	18	9	11	8	85	16	40	18	32	7	23	90																						
8-Dec	7	11	15	22	12	7	7	8	6	6	10	16	16	18	15	19	10	16	52	50	16	41	18	16	52																						
9-Dec	12	7	7	8	10	10	11	11	10	10	12	13	14	14	15	10	6	9	11	11	8	10	12	12	15																						
10-Dec	13	14	15	7	9	12	10	9	10	13	14	13	23	24	25	37	16	27	28	24	12	8	11	10	37																						
11-Dec	11	11	13	13	11	11	19	13	13	16	14	14	21	28	17	14	12	14	18	12	15	12	16	10	28																						
12-Dec	10	8	8	11	14	27	13	14	17	9	12	15	13	18	19	50	62	66	23	18	14	10	10	9	66																						
13-Dec	8	9	9	32	19	20	20	14	54	38	75	29	13	10	10	9	9	12	13	15	11	11	12	13	75																						
14-Dec	22	16	20	20	13	11	25	19	15	18	30	47	62	55	20	79	87	43	19	14	9	19	38	12	87																						
15-Dec	22	13	13	15	18	11	11	13	48	17	40	58	20	16	21	9	12	11	18	24	20	66	72	10	72																						
16-Dec	23	84	58	26	15	14	10	10	12	11	12	15	16	29	17	21	34	7	30	39	14	19	38	7	84																						
17-Dec	15	14	7	10	9	9	9	13	10	10	13	14	15	14	12	10	9	12	19	16	14	13	14	12	19																						
18-Dec	14	12	13	24	46	34	24	25	76	93	72	60	88	36	20	52	41	21	18	24	50	60	23	41	93																						
19-Dec	28	35	72	47	28	19	24	28	AF	AF	AF	AF	23	35	72	20	19	22	21	22	13	35	21	30	72																						
20-Dec	56	18	11	13	13	12	14	13	10	12	14	15	16	16	17	32	43	28	9	11	15	11	14	12	56																						
21-Dec	12	13	18	18	18	15	16	12	12	14	11	13	30	15	14	15	30	9	10	13	13	20	14	12	30																						
22-Dec	12	12	11	14	11	11	57	38	20	18	16	18	17	15	17	17	16	16	16	17	16	15	18	16	57																						
23-Dec	17	19	18	17	18	15	14	17	17	16	18	18	19	17	10	21	11	25	12	70	11	AF	58	50	70																						
24-Dec	15	81	13	16	13	13	10	8	9	13	11	12	13	12	11	9	12	13	12	13	14	14	13	11	81																						
25-Dec	11	11	13	12	11	11	12	11	11	11	13	14	15	12	13	14	12	12	16	8	13	14	8	9	16																						
26-Dec	9	10	10	9	12	10	11	11	12	11	17	18	16	15	15	13	11	13	9	10	12	12	14	13	18																						
27-Dec	14	14	14	14	13	11	12	12	13	13	15	16	15	14	11	14	13	45	46	11	72	20	23	11	72																						
28-Dec	18	14	16	15	14	16	13	17	13	22	19	24	29	24	36	36	18	13	22	16	45	40	42	AF	45																						
29-Dec	46	68	97	27	37	31	32	24	42	95	48	73	89	46	35	71	43	70	43	50	29	21	18	74	97																						
30-Dec	70	AF	24	17	20	20	20	23	84	23	18	17	13	13	13	13	21	14	46	15	14	23	22	50	84																						
31-Dec	38	AF	12	22	20	45	81	41	77	21	40	75	44	24	37	35	10	17	18	11	11	21	18	18	81																						
Diurnal Maximum																								70	90	97	63	46	45	81	41	84	95	75	75	89	55	72	79	87	85	52	70	72	66	72	83
AF - Analyzer Failure																																															



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
CNRL Horizon - December 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Last Calibration	November 8, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:51
Gas Cert Reference	S0002488	Station temp.	21 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	September 26, 2017
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG Make/Model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11040

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-622	-622
Analyzer IP address	192.168.1.43		Lamp voltage	864	864
Calculated slope	0.997668	0.992125	Chamber temp	45.0	44.9
Calculated intercept	0.895714	1.493461	Pressure	714.2	719.4
Analyzer Background	18.8	18.4	Flow	0.331	0.314
Analyzer Coefficient	0.990	1.008	Intensity	91	90

Analyzer make Thermo 43i Analyzer serial # 710321322

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-1.0	----
as found span	5000	81.5	815.0	800.4	1.018
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	81.5	815.0	820.8	0.993
second point	5000	40.7	407.0	407.9	0.998
third point	5000	20.3	203.0	201.5	1.008
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	81.5	815.0	820.8	0.993
Average Correction Factor					1.000

Corrected As found 801.4 Previous response 816.0 % change 1.8%

Notes:

Changed inlet filter after as founds. Installed new pump, flow is still low. Adjusted zero and span.

Calibration Performed By: Jayne Marcoux



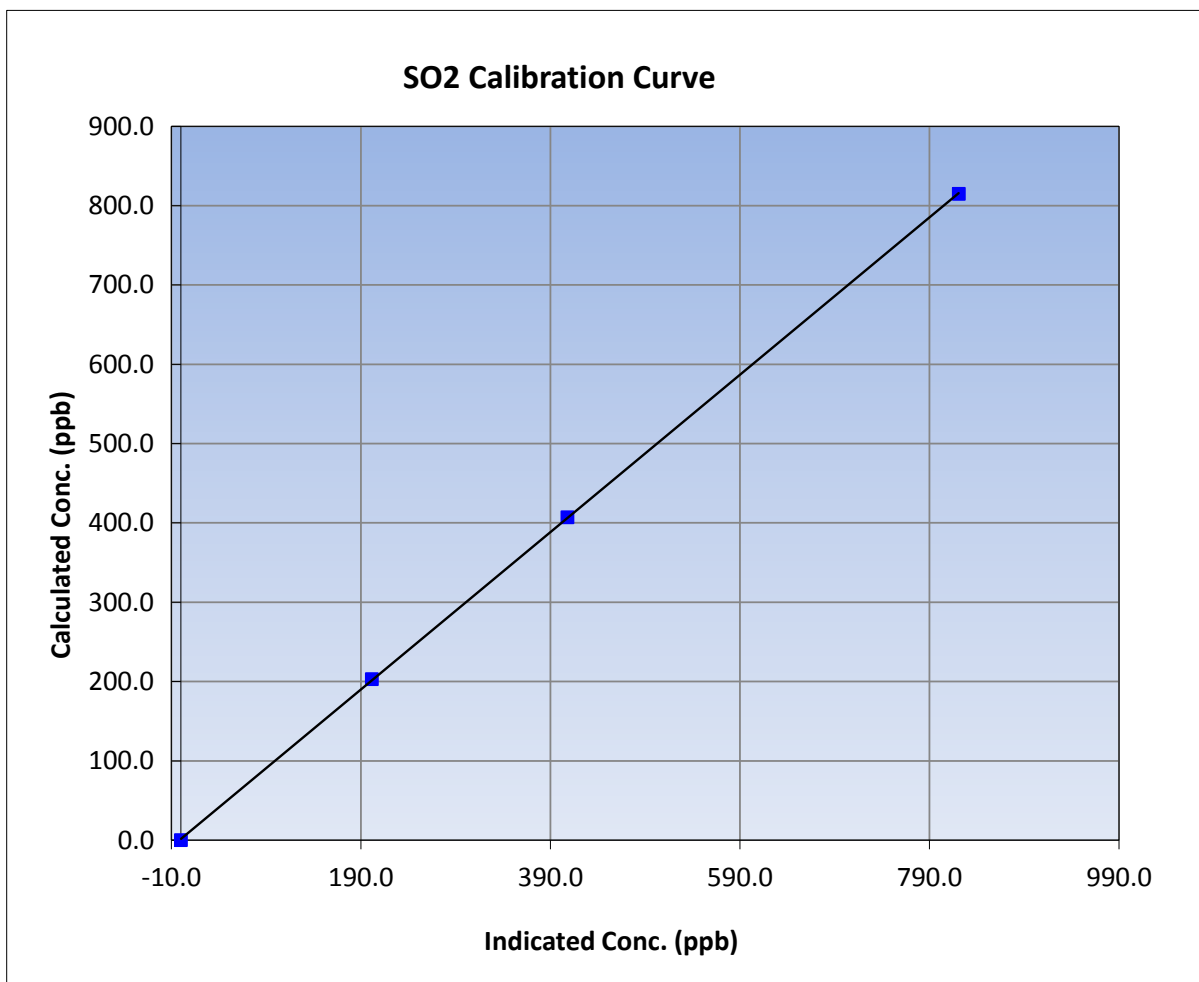
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 8, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:00	End Time (MST)	14:51
Analyzer make	Thermo 43i	Analyzer serial #	710321322

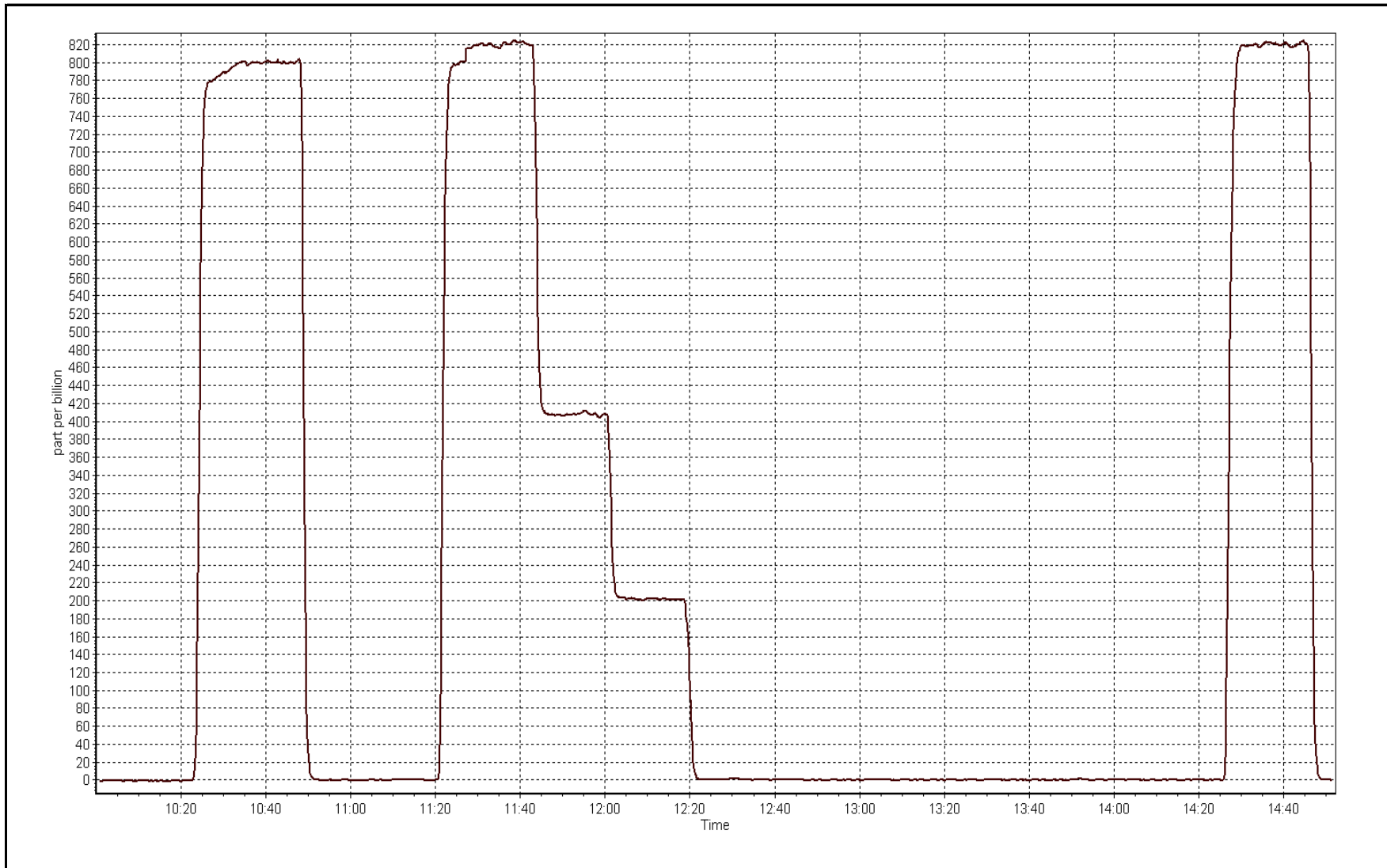
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999981
815.0	820.8	0.9929		
407.0	407.9	0.9979	Slope	0.992125
203.0	201.5	1.0077		
			Intercept	1.493461



SO2 Calibration Plot

Date: December 13, 2016





Wood Buffalo Environmental Association TRS Calibration Report

W B E A

Station Information

Calibration Date	December 10, 2016	Last Calibration	November 7, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Other: Pump failed		
Start Time (MST)	12:25	End Time (MST)	14:15
Gas Cert Reference	LL119538	Station temp.	22 Deg C
Cal Gas Concentration	4.95 ppm	Cal Gas Exp Date	February 12, 2019
Calibrator Make/Model	API T700	Serial Number	1223
Dil air Make/Model	API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11040
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S0002486 September 26, 2017

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-684	-684
Analyzer IP address	192.168.1.44		Lamp voltage	982	992
Calculated slope	0.992109	0.986720	Chamber temp	45	45
Calculated intercept	-0.007285	-0.012821	Pressure	641.4	643.9
Analyzer Background	2.11	3.23	Flow	0.404	0.409
Analyzer Coefficient	1.153	1.223	Intensity	90	89
			Converter temp.	800	800
Analyzer make/model	Thermo 43i TLE		Analyzer serial #	1151680032	
Converter make/model	CDN-101		Converter serial #	531	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
SO2 scrubber check					
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	79.8	80.8	0.988
second point	5000	40.2	39.8	40.7	0.979
third point	5000	20.0	19.8	19.9	0.994
as left zero					
as left span					
Average Correction Factor					0.987

Corrected As found NA Previous response NA % change NA

Notes:

Pump failed over night. As founds could not be completed. New pump installed. Zero and span adjusted. As lefts not completed.

Calibration Performed By: Devin Russell



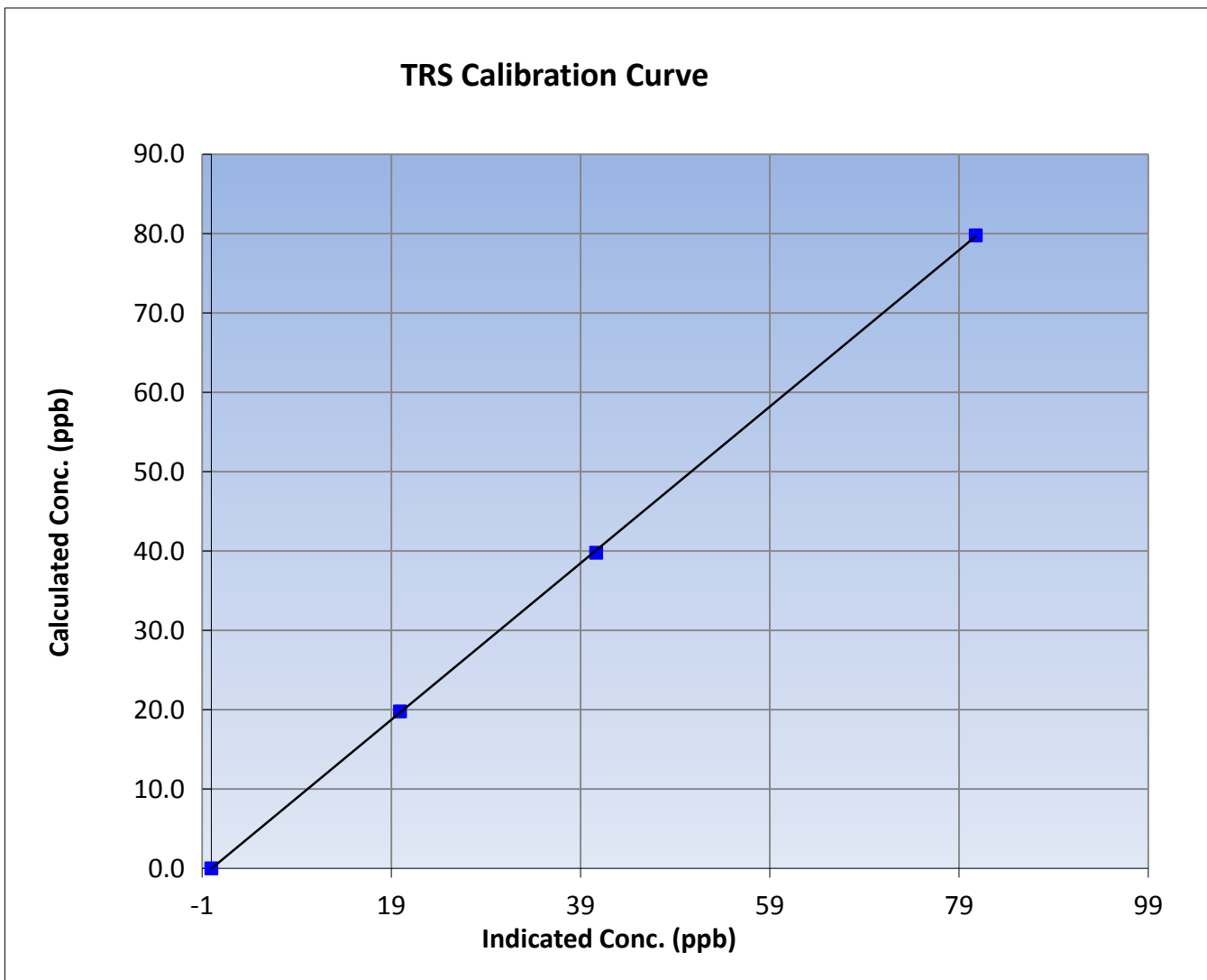
Wood Buffalo Environmental Association TRS Calibration Report

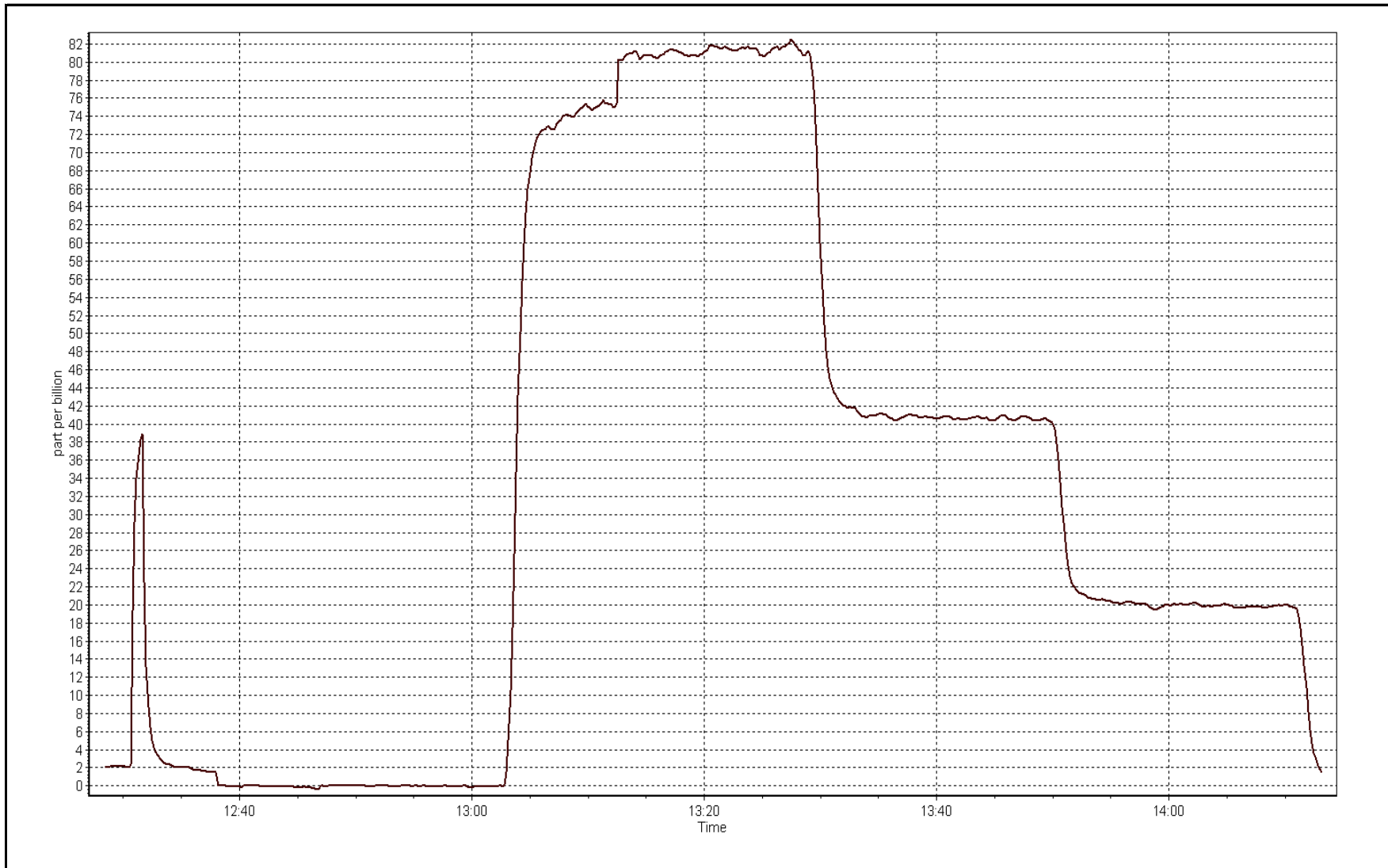
Station Information

Calibration Date	December 10, 2016	Previous Calibration	November 7, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	12:25	End Time (MST)	14:15
Analyzer make	Thermo 43i TLE	Analyzer serial #	1151680032

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999963
79.8	80.8	0.9879		
39.8	40.7	0.9790	Slope	0.986720
19.8	19.9	0.9945		
			Intercept	-0.012821







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 14, 2016	Last Calibration	December 10, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:09	End Time (MST)	13:54
Gas Cert Reference	LL119538	Station temp.	22 Deg C
Cal Gas Concentration	4.95 ppm	Cal Gas Exp Date	February 12, 2019
Calibrator Make/Model	API T700	Serial Number	1223
Dil air Make/Model	API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11040
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S0002486 September 26, 2017

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-684	-684
Analyzer IP address	192.168.1.44		Lamp voltage	992	995
Calculated slope	0.986720	0.990353	Chamber temp	45	45
Calculated intercept	-0.012821	0.071762	Pressure	642.7	641.1
Analyzer Background	3.23	2.76	Flow	0.408	0.407
Analyzer Coefficient	1.223	1.191	Intensity	90	89
			Converter temp.	800	800
Analyzer make/model	Thermo 43i TLE		Analyzer serial #	1151680032	
Converter make/model	CDN-101		Converter serial #	531	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.6	----
as found span	5000	80.6	79.8	81.3	0.981
SO2 scrubber check	5000	20.4	204.0	0.6	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	79.8	80.5	0.991
second point	5000	40.2	39.8	40.2	0.990
third point	5000	20.0	19.8	19.8	1.001
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	80.6	79.8	80.9	0.987
Average Correction Factor					0.994

Corrected As found	81.9	Previous response	80.9	% change	-1.3%
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Notes:

Adjusted the zero and span.

Calibration Performed By:

Jayme Marcoux



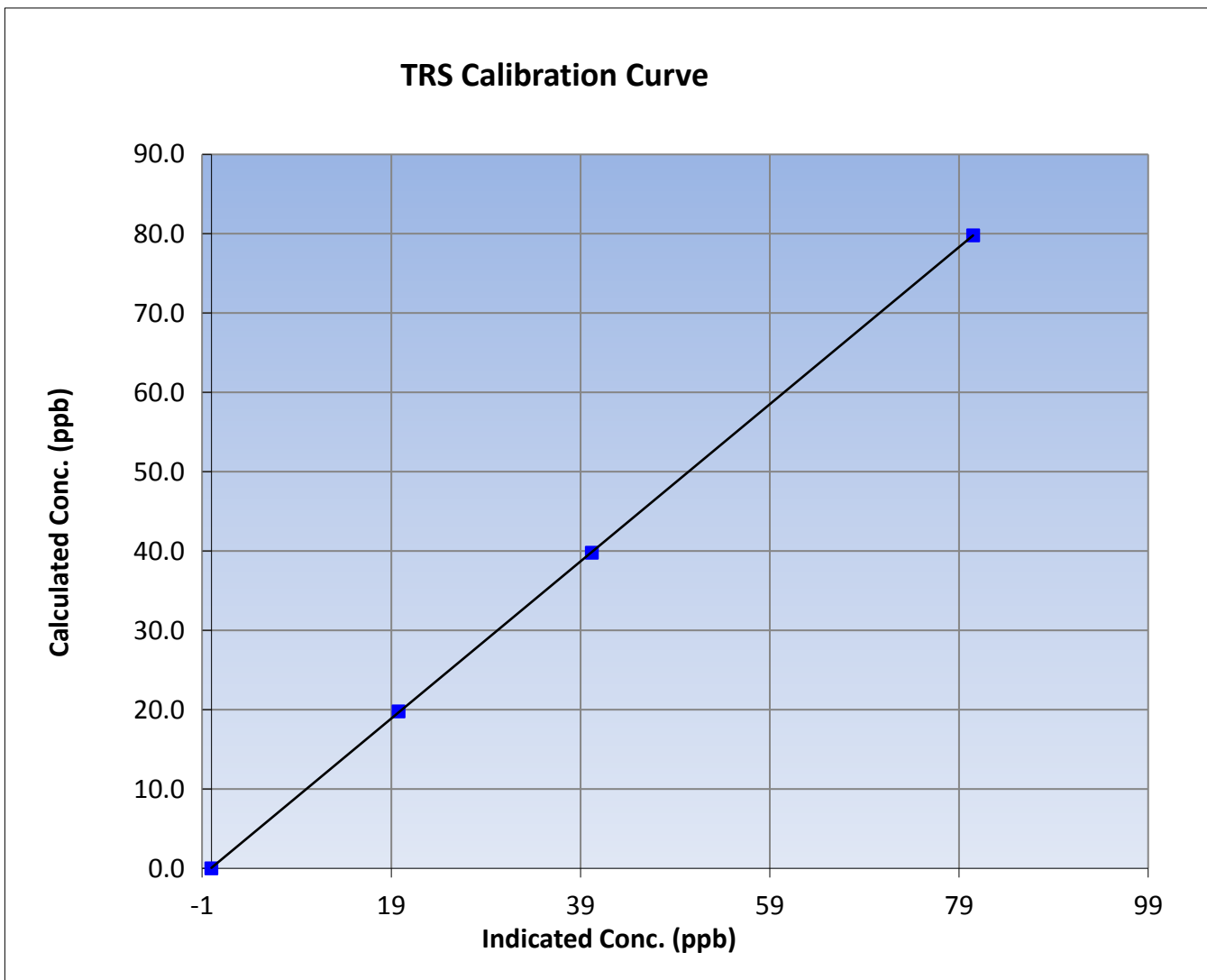
Wood Buffalo Environmental Association TRS Calibration Report

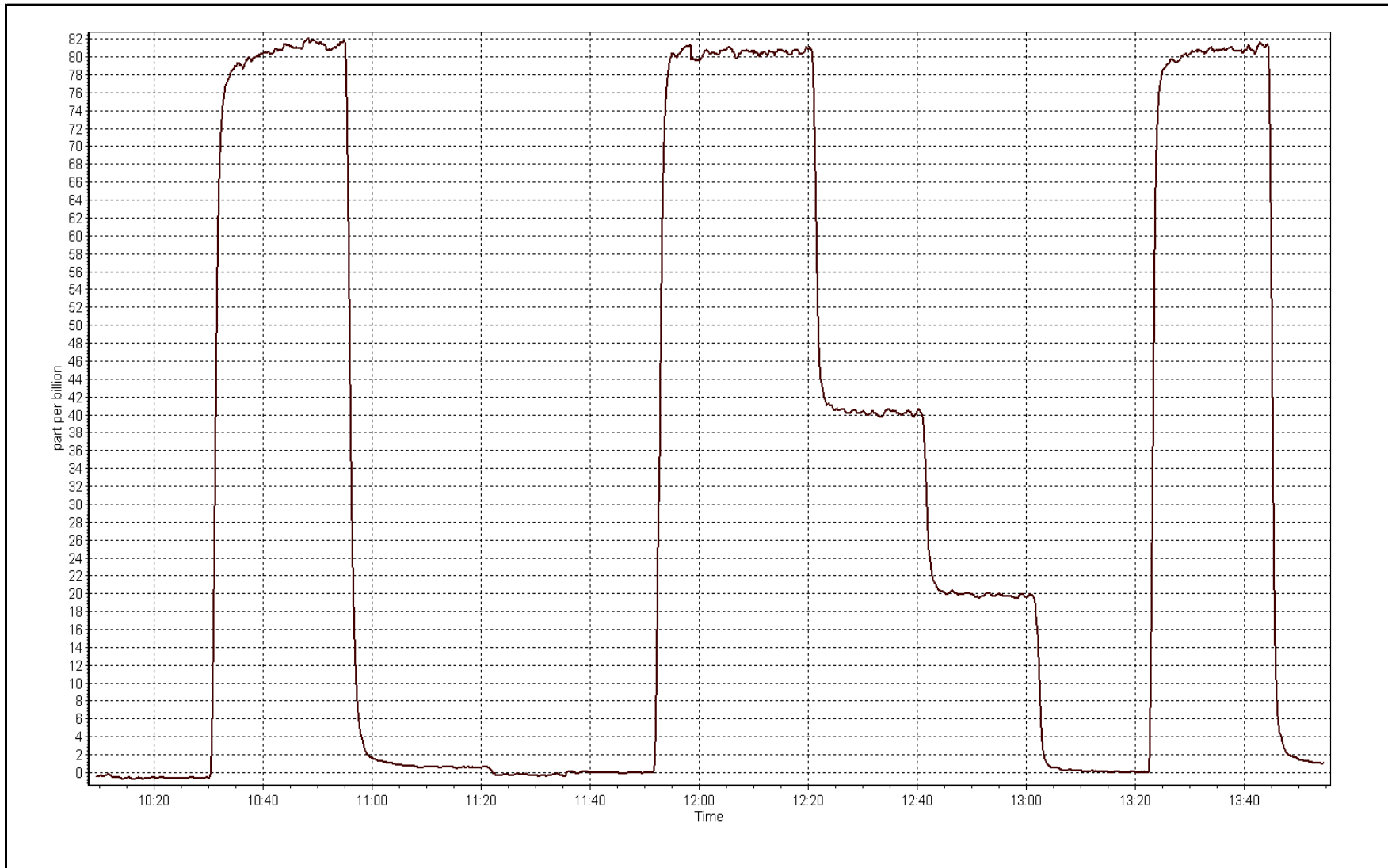
Station Information

Calibration Date	December 14, 2016	Previous Calibration	December 10, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:09	End Time (MST)	13:54
Analyzer make	Thermo 43i TLE	Analyzer serial #	1151680032

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999991
79.8	80.5	0.9914		
39.8	40.2	0.9900	Slope	0.990353
19.8	19.8	1.0010		
			Intercept	0.071762







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December-13-16	Last Calibration	November-08-16
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:47
Gas Cert Reference	S0002488	Cal Gas Expiry Date	September 26, 2017
CH4 Cal Gas Conc.	505 ppm	CH4 Equiv Conc.	1046.8 ppm
C3H8 Cal Gas Conc.	197 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG make/model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	Serial Number	11040

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.7	8.7
Analyzer IP address	192.168.1.51		Air or Bypass Press	38.0	38.0
Calculated slope	1.000531	0.996260	Fuel Pressure	26.3	26.3
Calculated intercept	0.021647	0.013543	Analyzer Coeff	3.118	3.154
			Analyzer BKG	2.15	2.13

Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.04	----
as found span	5000	81.5	17.06	16.89	1.010
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	81.5	17.06	17.11	0.997
second point	5000	40.7	8.52	8.54	0.998
third point	5000	20.3	4.25	4.26	0.998
as left zero	5000	0.0	0.00	0.05	----
as left span	5000	81.5	17.06	17.16	0.994
Average Correction Factor					0.998

Corrected As found	16.93	Previous response	17.03	% change	0.6%
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Notes:

Changed inlet filter after as founds. Installed new Hydrogen cylinder. Adjusted zero and span. Had to shut of the valve during as lefts zero.

Calibration Performed By:

Jayme Marcoux



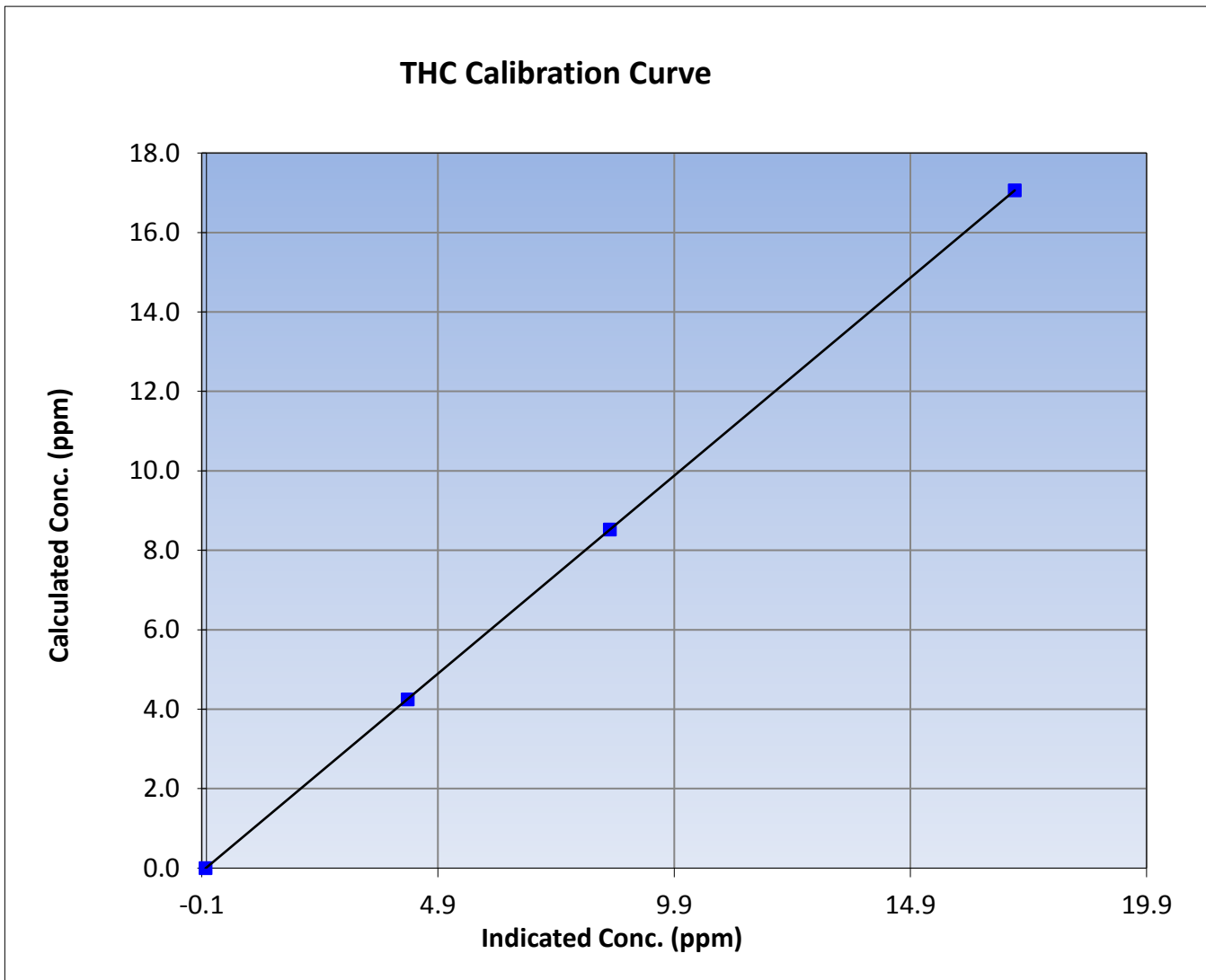
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 8, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:00	End Time (MST)	14:47
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295

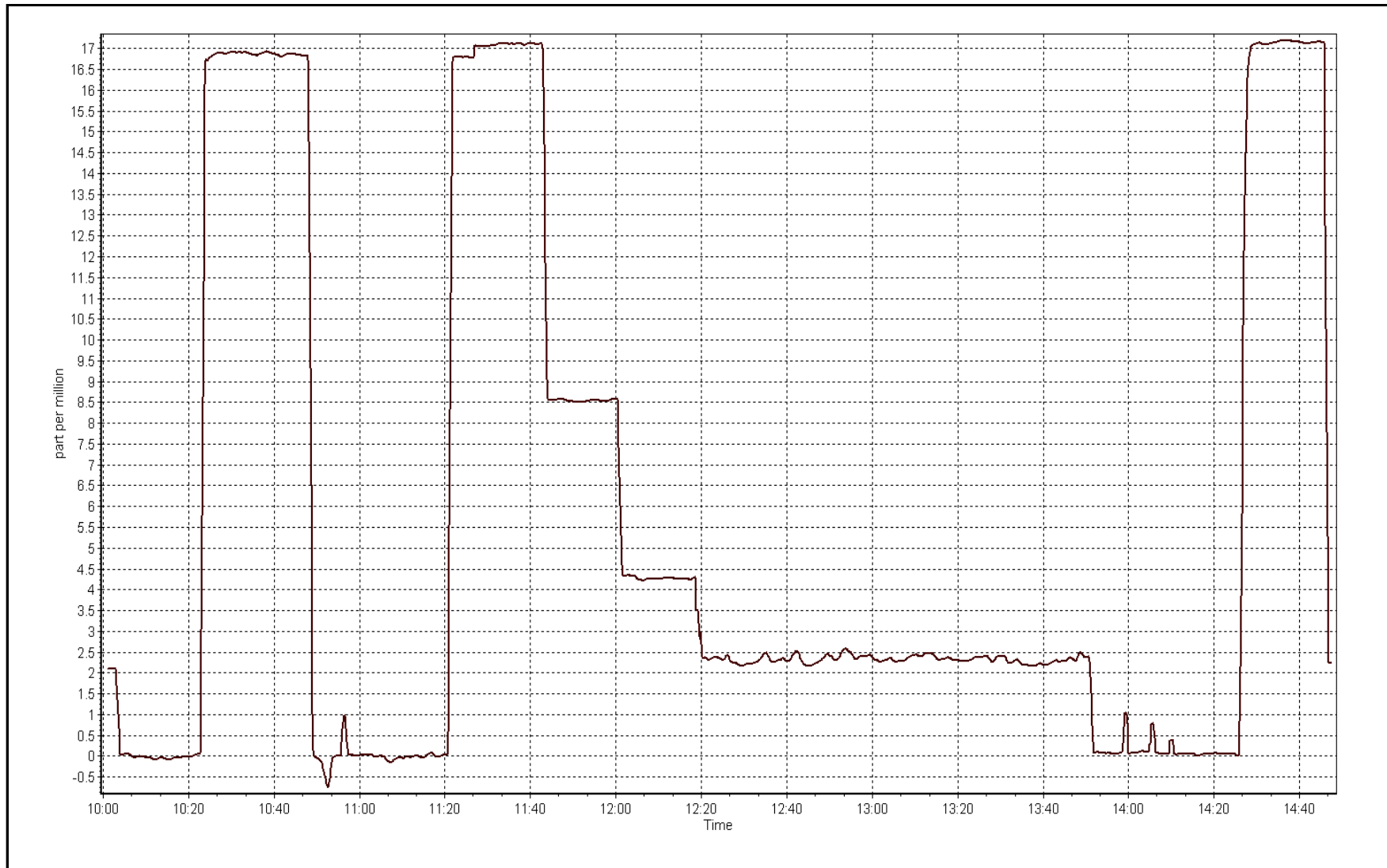
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999999
17.06	17.11	0.9972		
8.52	8.54	0.9977	Slope	0.996260
4.25	4.26	0.9976		
			Intercept	0.013543



THC Calibration Plot

Date: December 13, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 8, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:48
NO Cal Gas Conc	48.9 ppm	Gas Cert Reference	S0002488
NOx Cal Gas Conc	48.9 ppm	Cal Gas Expiry Date	September 26, 2017
Calibrator	Teledyne API T700	Serial Number	1223
Zero air Generator	Teledyne API T701	Serial Number	1004

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11040
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998691	0.998929	0.996508
	Data Offset	0.176520	0.240751	-0.030734
Current Calibration	Data Slope	0.992995	0.993268	0.997191
	Data Offset	1.594148	1.570703	-0.174852

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	710321429
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.709		0.709	
NOx coefficient	1.000		1.000	
NO2 coefficient	1.000		1.000	
NO bkgnd	8.9		8.9	
NOx bkgnd	9.0		9.0	
Chamber Temp	49.9	Deg C	50.1	Deg C
Moly Temp	323.9	Deg C	323.9	Deg C
PMT voltage	-778.9	V	-778.9	V
PMT Temp	-2.8	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	149.1	mmHg	148.2	mmHg
R Cell Press Nox	148.8	mmHg	148.2	mmHg
NO sample flow	0.788	lpm	0.782	lpm
Nox sample Flow	0.789	lpm	0.780	lpm

Notes:

Changed inlet filter after as founds. No adjustments made. During as lefts zero the Nox concentrations were high. It appears that the valve wasn't registered as opened. Nox zeroed properly after the valve was closed then reopened.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 13, 2016 Station Number: AMS 15

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	----	----
as found span	5000	81.5	797.1	797.1	0.0	802.3	801.9	0.4	0.9935	0.9940
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	5000	81.5	797.1	797.1	0.0	801.8	801.6	0.2	0.9941	0.9943
second point	5000	40.7	398.0	398.0	0.0	398.6	398.4	0.2	0.9985	0.9990
third point	5000	20.3	198.5	198.5	0.0	196.7	196.8	-0.1	1.0093	1.0090
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.1	0.1	----	----
as left span	5000	81.5	797.1	442.7	354.4	795.6	441.3	354.3	1.0019	1.0031
Average Correction Factor									1.0006	1.0008

Corrcted As found NO_x= 802.5 NO= 802.1 Percent Change NO_x= -0.6% NO= -0.6%
 Previous Response NO_x= 797.9 NO= 797.7

GPT Calibration Data

Dilution Flow (total) 5000 ccm 0.999911 81.50 ccm NOx ref calc conc = 797.1 ppb NO ref calc conc = 797.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	796.6	794.9	0.0	1.0006	1.0028	----	----
1st NO2 (300)	442.7	352.2	795.8	442.7	353.2	1.0015	----	0.9972	100.3%
2nd NO2 (200)	556.9	237.9	795.9	556.9	239.0	1.0015	----	0.9957	100.4%
3rd NO2 (100)	671.8	123.1	795.6	671.8	123.8	1.0019	----	0.9943	100.6%
2nd NO ref point		0.0	796.6	793.8	2.8	1.0006	1.0041	----	----
Average Correction Factor						1.0014		0.9958	100.4%

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

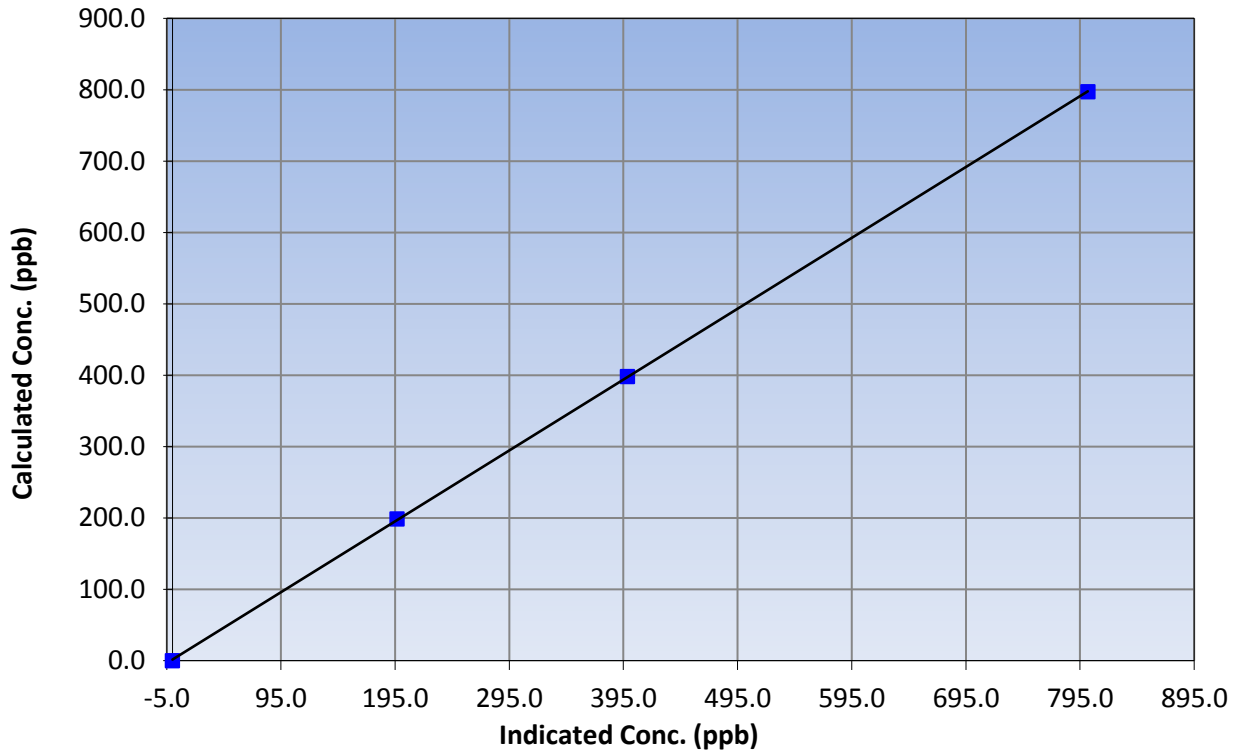
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 8, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:00	End Time (MST)	14:48
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999983
797.1	801.8	0.9941		
398.0	398.6	0.9985	Slope	0.992995
198.5	196.7	1.0093		
			Intercept	1.594148

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

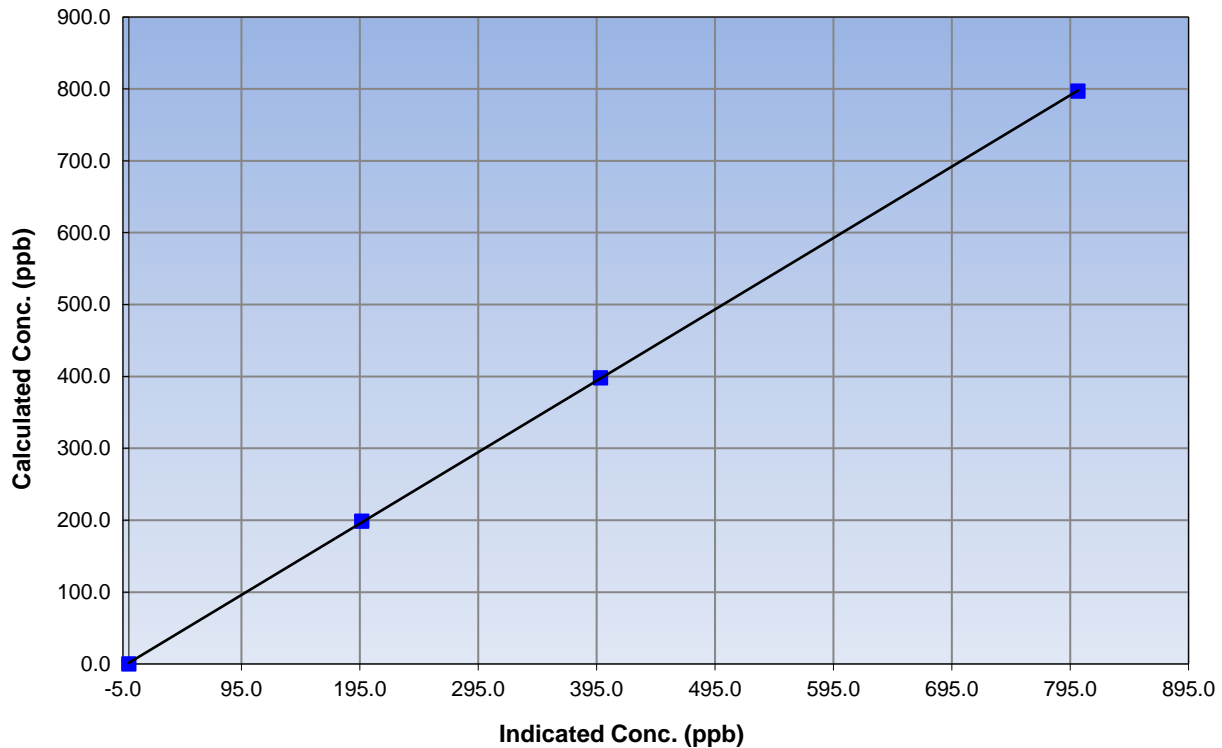
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 8, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:00	End Time (MST)	14:48
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999984
797.1	801.6	0.9943		
398.0	398.4	0.9990	Slope	0.993268
198.5	196.8	1.0090		
			Intercept	1.570703

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

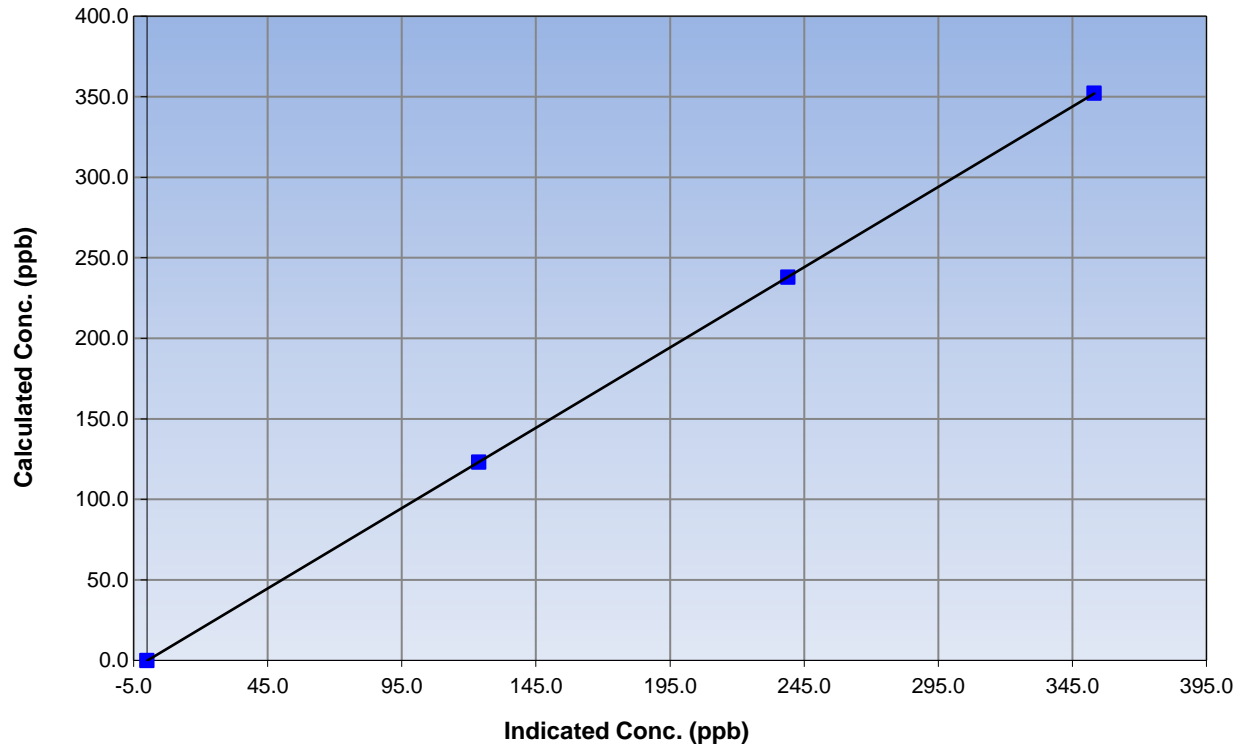
Station Information

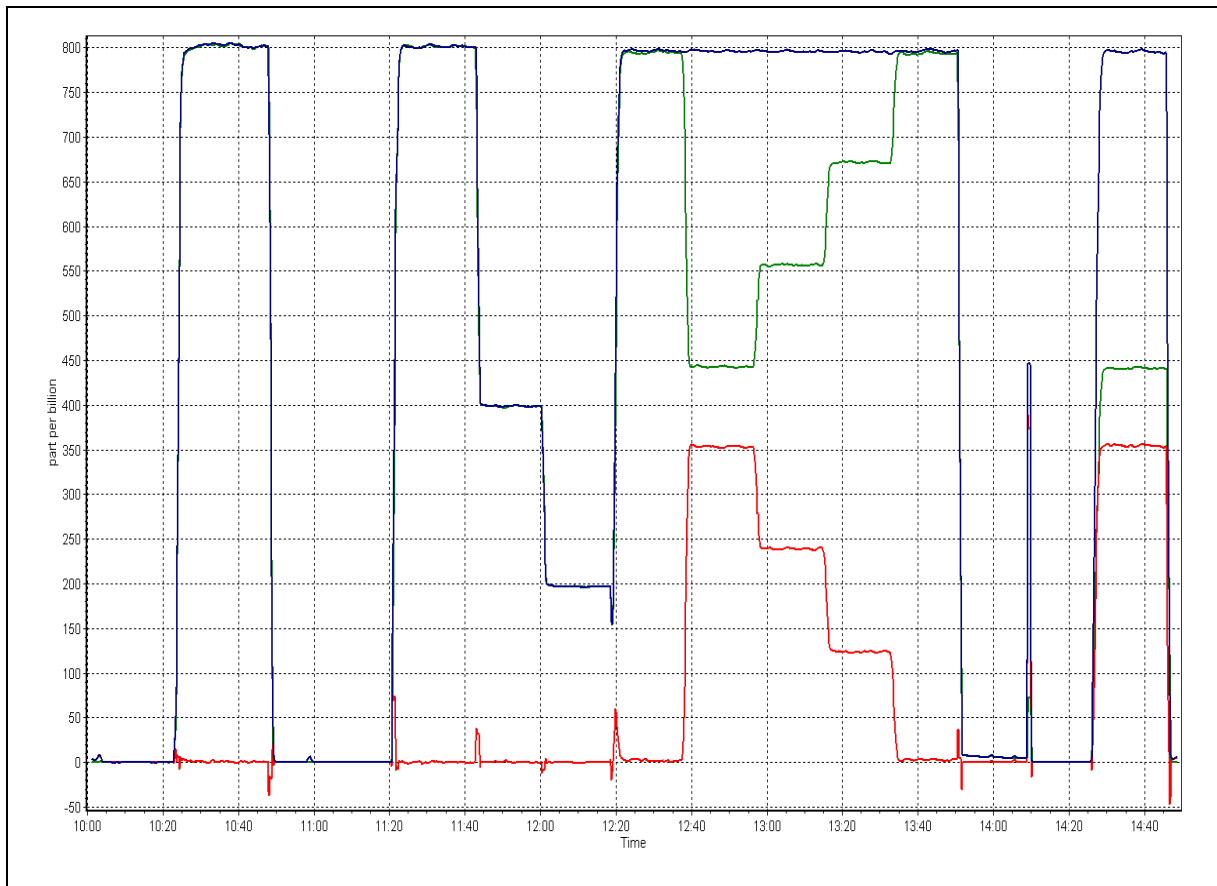
Calibration Date	December 13, 2016	Previous Calibration	November 8, 2016
Station Number	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:00	End Time (MST)	14:48
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999998
352.2	353.2	0.9972		
237.9	239.0	0.9957	Slope	0.997191
123.1	123.8	0.9943		
			Intercept	-0.174852

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	CNRL Horizon	Station number:	AMS 15
Calibration Date:	December 13, 2016	Last Cal Date:	November 7, 2016
Start time (MST):	12:00	End time (MST):	13:18
Sharp Model:	5030	S/N:	E-2020
Particulate Fraction:	PM2.5	C14 Source S/N:	7409
Flow Standard Model:	DeltaCal	S/N:	628
Temp/RH standard:	NA	S/N:	NA

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-17	-17.2	-17	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	970	969	970	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1022	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.4	-----	0	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date: <u>November 7, 2016</u>	<u>Tolerance</u>
	Flow w/o adaptor: _____	Flow w/ adaptor: _____	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: _____	S/N: _____
	Date of check: _____	Last Cal Date: <u>November 7, 2016</u>
	New Correction Factor: _____	Previous Correction Factor: _____

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
RH (%)	NA	NA	NA	<input type="checkbox"/>	+/- 10%

Notes: Adjusted instrument flow. Cyclone head cleaned. Nephelometer zeroed.

Calibration by: Jayme Marcoux



Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	CNRL Horizon	Station number:	AMS 15
Calibration Date:	December 24, 2016	Last Cal Date:	December 13, 2016
Start time (MST):	10:35	End time (MST):	13:48
Sharp Model:	5030	S/N:	E-2020
Particulate Fraction:	PM2.5	C14 Source S/N:	7409
Flow Standard Model:	DeltaCal	S/N:	1019
Temp/RH standard:	NA	S/N:	NA

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-29	-30.3	-29	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	978	983	978	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1066	1008	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	23	-----	0.2	<input type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

				Tolerance
Leak Test:	Date of check:	<u>December 24, 2016</u>	Last Cal Date:	<u>November 7, 2016</u>
	Flow w/o adaptor:	<u>17.83</u>	Flow w/ adaptor:	<u>17.78</u> 0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	_____	S/N:	_____
	Date of check:	_____	Last Cal Date:	<u>November 7, 2016</u>
	New Correction Factor:	_____	Previous Correction Factor:	_____

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	15	NA	15	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	19	NA	19	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	7	NA	7	<input type="checkbox"/>	+/- 2 °C
RH (%)	7	NA	7	<input type="checkbox"/>	+/- 10%

Notes: Re-calibrating this instrument due to elevated baseline since 05:00 MST Dec 23. Optic concentration jumped from about 4.0 ug/m3 to 420 ug/m3 and stayed around there. As found neph zero was around 23. Predicted that something might have went inside nephelometer chamber; however, it looked fairly clean. Neph zero had come back down to around 0.2 after putting this it back together. Not sure what was main cause of elevated baseline and high neph zero. Neph zero did not require any adjustments. Adjusted sample flow. Cyclone head cleaned.

Calibration by: Jayme Marcoux



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 16
SHELL MUSKEG RIVER
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	704	38	40	99.73	29	0	6	0
THC (ppm) Average	704	38	40	99.73	12.3	-	3.4	-
NO2 (ppb) Average	704	38	40	99.73	47	0	32	-
NO (ppb) Average	704	38	40	99.73	134	-	30	-
NOX (ppb) Average	704	38	40	99.73	174	-	55	-
PM2.5 (ug/m3) Average	741	1	3	99.73	31	-	12.7	0
Temperature 2 m (C) Average	742	0	2	99.73	-0.6	-	-1.9	-
Relative Humidity (%) Average	742	0	2	99.73	96	-	92	-
Barometric Pressure (inHg) Average	741	0	3	99.60	29.8	-	29.8	-
Wind Speed 10 m (km/h) Average	740	0	4	99.46	29	-	16	-
Wind Direction 10 m (deg) Average	740	0	4	99.46	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	704	1.3	3	-	0	0	0	0	1	4	29
THC (ppm) Average	704	2.59	0.6	-	2.1	2.2	2.3	2.5	2.7	3	12.3
NO2 (ppb) Average	704	16.1	9	-	0	4	8	16	23	27	47
NO (ppb) Average	704	9.5	15	-	0	0	0	4	13	26	134
NOX (ppb) Average	704	25.6	22	-	0	4	10	21	35	55	174
PM2.5 (ug/m3) Average	741	6.16	3.6	-	0.7	2.2	3.4	5.4	8.2	10.9	31
Temperature 2 m (C) Average	742	-18.37	9	-	-39.2	-30.4	-24.6	-18.5	-13.1	-4.7	-0.6
Relative Humidity (%) Average	742	80.1	6	-	62	73	76	80	84	88	96
Barometric Pressure (inHg) Average	741	28.92	0.4	-	28.1	28.4	28.6	28.9	29.2	29.4	29.8
Wind Speed 10 m (km/h) Average	740	8.3	5	-	0	2	5	8	11	15	29
Wind Direction 10 m (deg) Average	740	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	22 Dec 2016 12:00	22 Dec 2016 13:00	2	Maintenance to station wiring and datalogger
Barometric Pressure	22 Dec 2016 12:00	22 Dec 2016 14:00	3	Maintenance to station wiring and datalogger
Wind Speed, Wind Direction	22 Dec 2016 12:00	22 Dec 2016 14:00	3	Maintenance to station wiring and datalogger
Wind Speed, Wind Direction	24 Dec 2016 02:00	24 Dec 2016 02:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Other: <input type="checkbox"/> Cylinder Removal		
Start Time (MST)	10:10	End Time (MST)	10:55
Gas Cert Reference	LL104193	Station temp.	22 Deg C
Cal Gas Concentration	48.3 ppm	Cal Gas Exp Date	12-Feb-18
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2632

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-710	-710
Analyzer IP address	192.168.1.43		Lamp voltage	828	828
Calculated slope	0.997772		Chamber temp	44.9	44.9
Calculated intercept	3.321681		Pressure	712.0	712.0
Analyzer Background	9.0	9.0	Flow	0.453	0.453
Analyzer Coefficient	1.019	1.019	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 1118148498

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.5	----
as found span	5000	83.6	807.6	787.8	1.025
calibrator zero					
high point					
second point					
third point					
as left zero					
as left span					
Average Correction Factor					

Corrected As found 788.2 Previous response 806.1 % change 2.3%

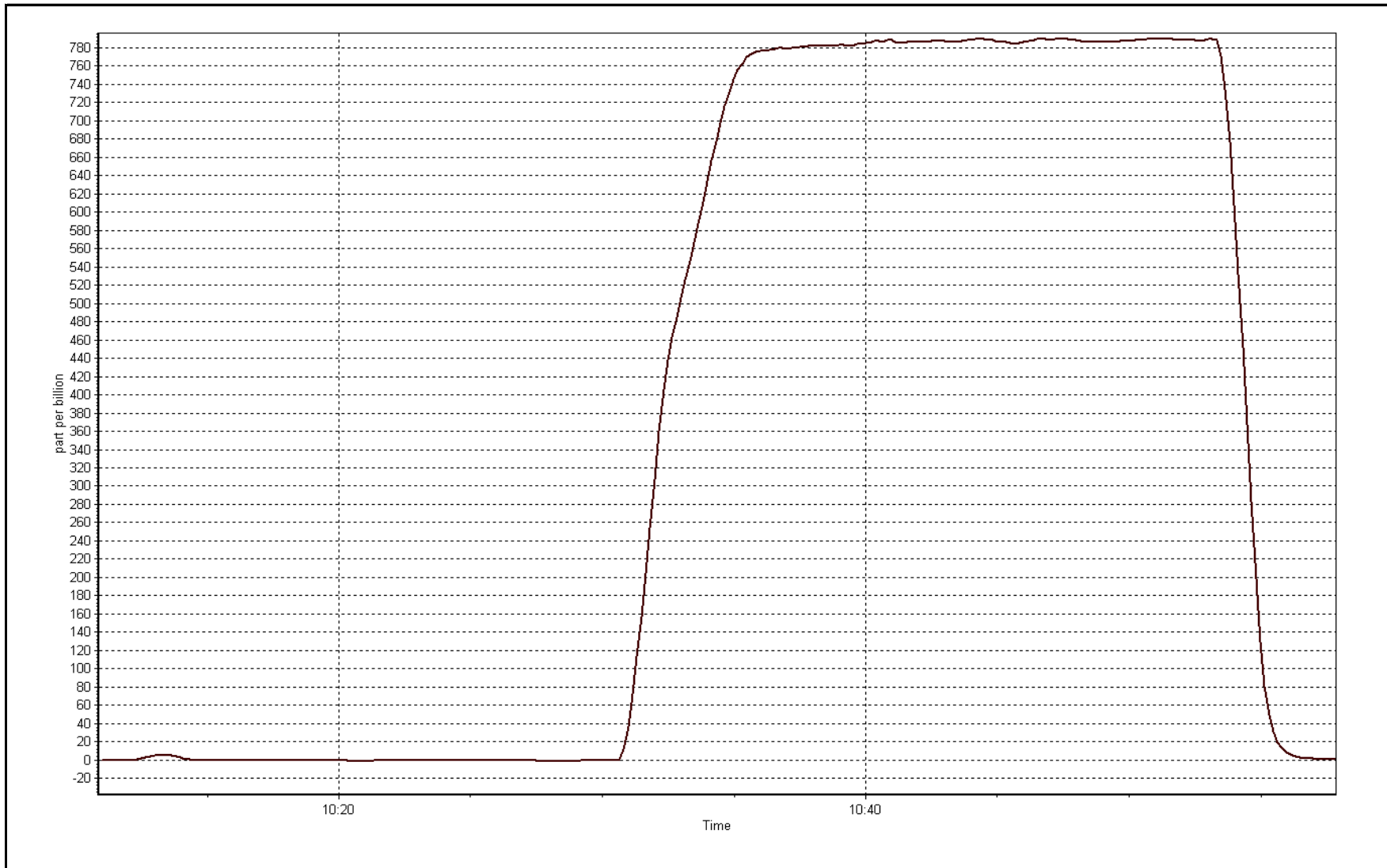
Notes:

As founds for cylinder removal.

Calibration Performed By: Jayne Marcoux

SO2 Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Last Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	16:21
Gas Cert Reference	EY0000638	Station temp.	22 Deg C
Cal Gas Concentration	48.2 ppm	Cal Gas Exp Date	04-Nov-18
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2632

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-710	-710
Analyzer IP address	192.168.1.43		Lamp voltage	828	828
Calculated slope	0.997772	0.990192	Chamber temp	44.9	45.2
Calculated intercept	3.321681	1.060315	Pressure	712.0	704.5
Analyzer Background	9.0	8.4	Flow	0.453	0.449
Analyzer Coefficient	1.019	1.033	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 1118148498

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.4	----
as found span	5000	76.6	738.4	733.5	1.007
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	76.6	738.4	745.3	0.991
second point	5000	38.5	371.1	373.2	0.995
third point	5000	19.4	187.0	186.4	1.003
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	76.6	738.4	744.1	0.992
Average Correction Factor					0.996

Corrected As found 733.9 Previous response 736.8 % change 0.4%

Notes:

Changed inlet filter after as founds. Adjusted the zero and span.

Calibration Performed By: Jayne Marcoux



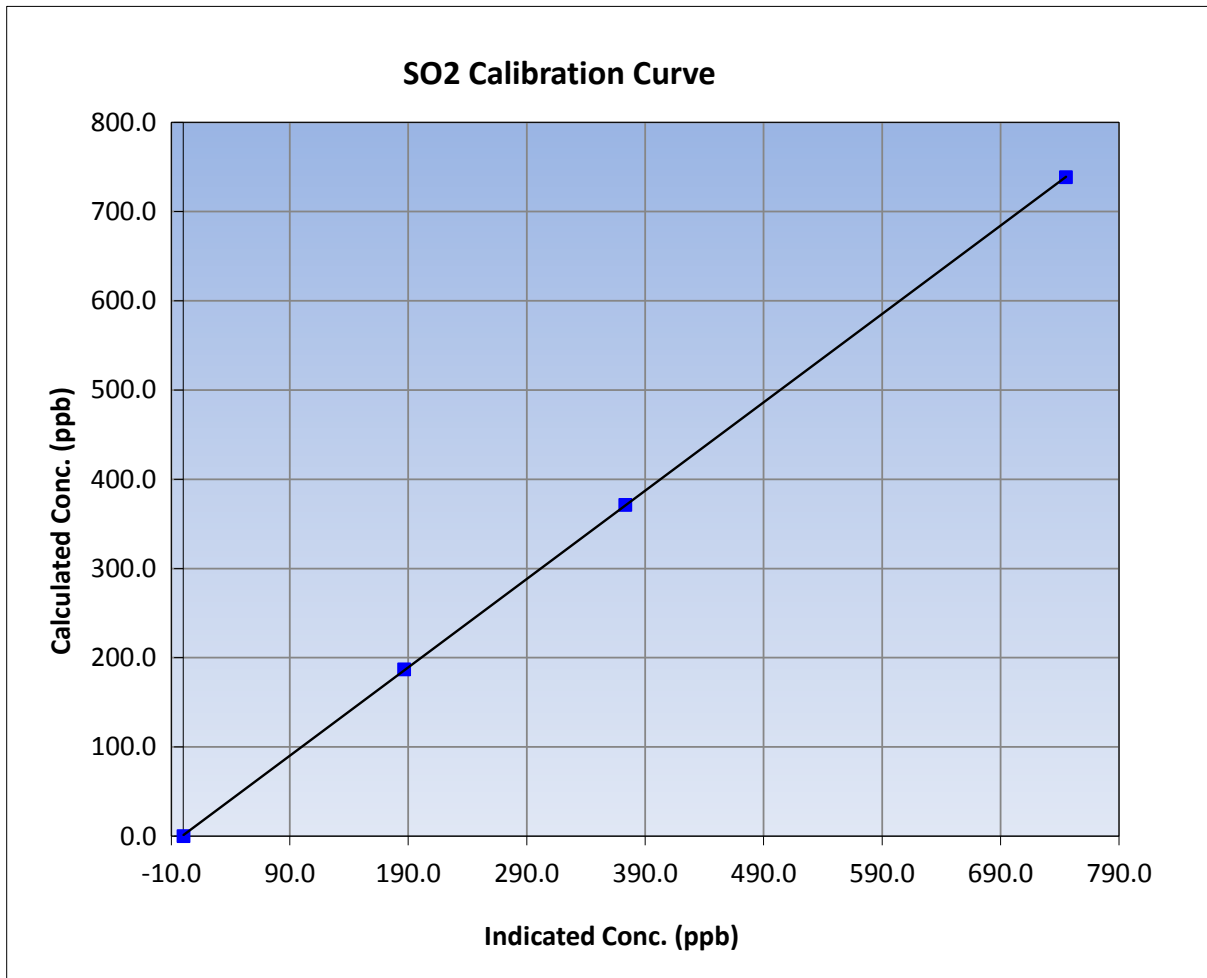
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	11:20	End Time (MST)	16:21
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

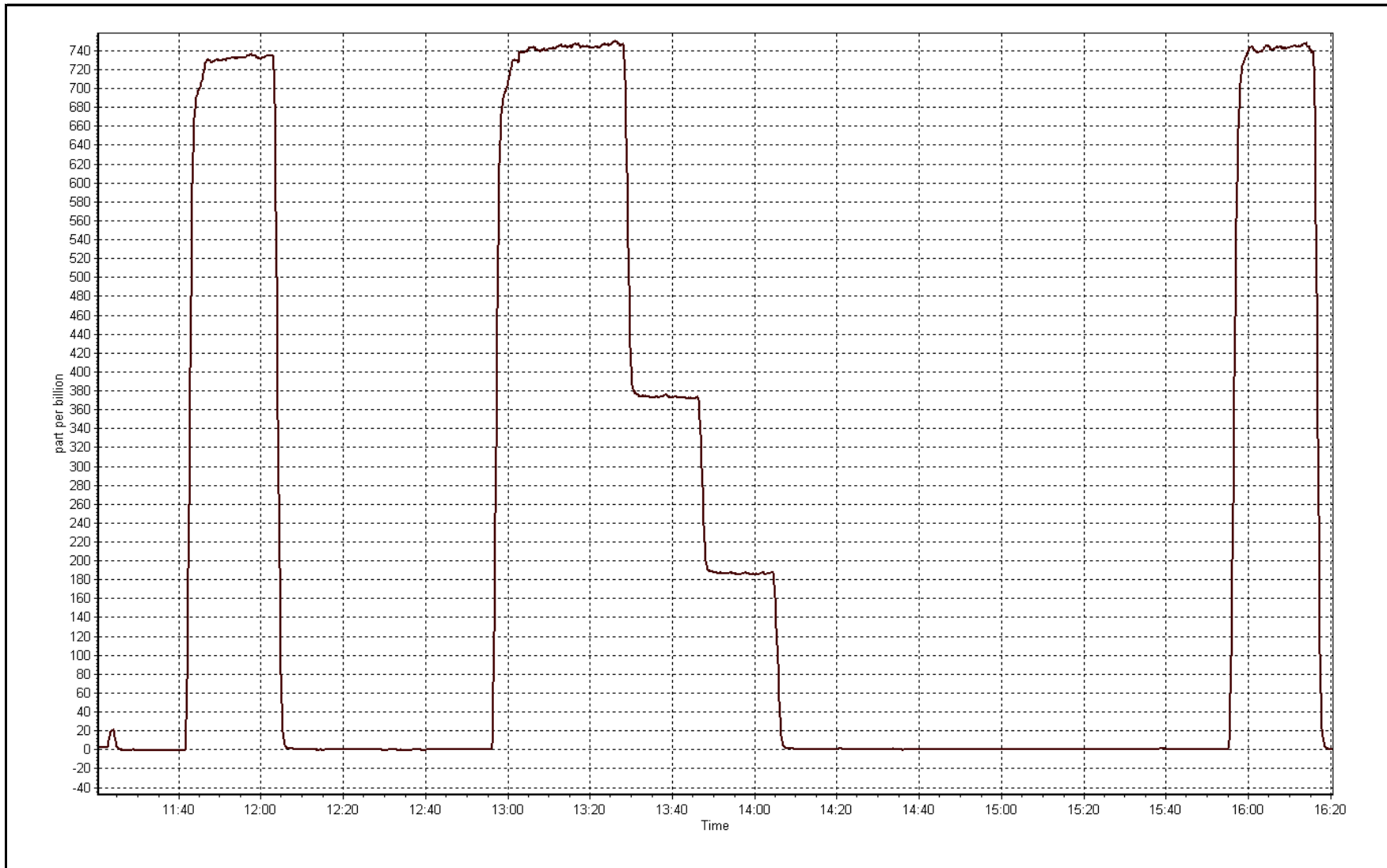
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999986
738.4	745.3	0.9908		
371.1	373.2	0.9946	Slope	0.990192
187.0	186.4	1.0031		
			Intercept	1.060315



SO2 Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December-12-16	Last Calibration	November-01-16
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Other: <input type="checkbox"/> Cylinder Removal		
Start Time (MST)	10:10	End Time (MST)	10:55
Gas Cert Reference	LL104193	Cal Gas Expiry Date	12-Feb-18
CH4 Cal Gas Conc.	487 ppm	CH4 Equiv Conc.	1017.8 ppm
C3H8 Cal Gas Conc.	193 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG make/model	Teledyne API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	Serial Number	2632

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.2	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	34.9
Calculated slope	0.996278		Fuel Pressure	24.2	24.2
Calculated intercept	0.112665		Analyzer Coeff	4.435	4.435
			Analyzer BKG	2.18	2.18

Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.30	----
as found span	5000	83.6	17.02	16.43	1.036
calibrator zero					
high point					
second point					
third point					
as left zero					
as left span					
Average Correction Factor					

Corrected As found	16.73	Previous response	16.97	% change	1.4%
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Notes:

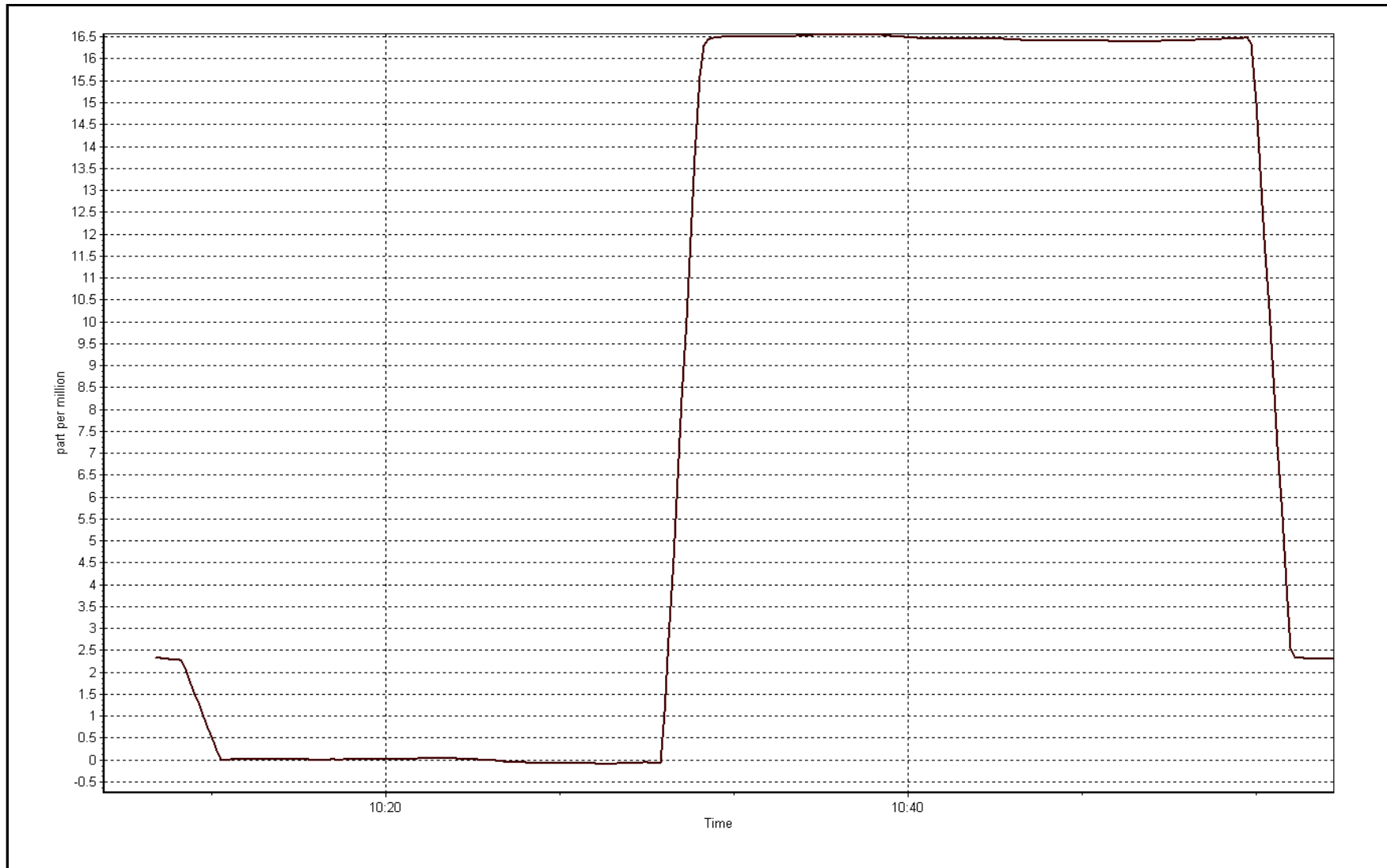
As founds for Cylinder Removal.

Calibration Performed By:

Jayme Marcoux

THC Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December-12-16	Last Calibration	November-01-16
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	16:18
Gas Cert Reference	EY0000638	Cal Gas Expiry Date	04-Nov-18
CH4 Cal Gas Conc.	502 ppm	CH4 Equiv Conc.	1035.5 ppm
C3H8 Cal Gas Conc.	194 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG make/model	Teledyne API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	Serial Number	2632

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.2	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	34.9
Calculated slope	0.996278	1.007785	Fuel Pressure	24.2	24.2
Calculated intercept	0.112665	-0.025252	Analyzer Coeff	4.435	4.575
			Analyzer BKG	2.18	2.20

Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.12	----
as found span	5000	76.6	15.86	15.34	1.034
calibrator zero	5000	0.0	0.00	0.07	----
high point	5000	76.6	15.86	15.80	1.004
second point	5000	38.5	7.97	7.88	1.012
third point	5000	19.4	4.02	3.99	1.007
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	76.6	15.86	15.91	0.997
Average Correction Factor					1.008

Corrected As found	15.46	Previous response	15.81	% change	2.3%
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Notes:

Changed inlet filter after as founds. Adjusted the zero and span. Had to removed the Calibration line from the calibrator during the calibration zero.

Calibration Performed By:

Jayme Marcoux



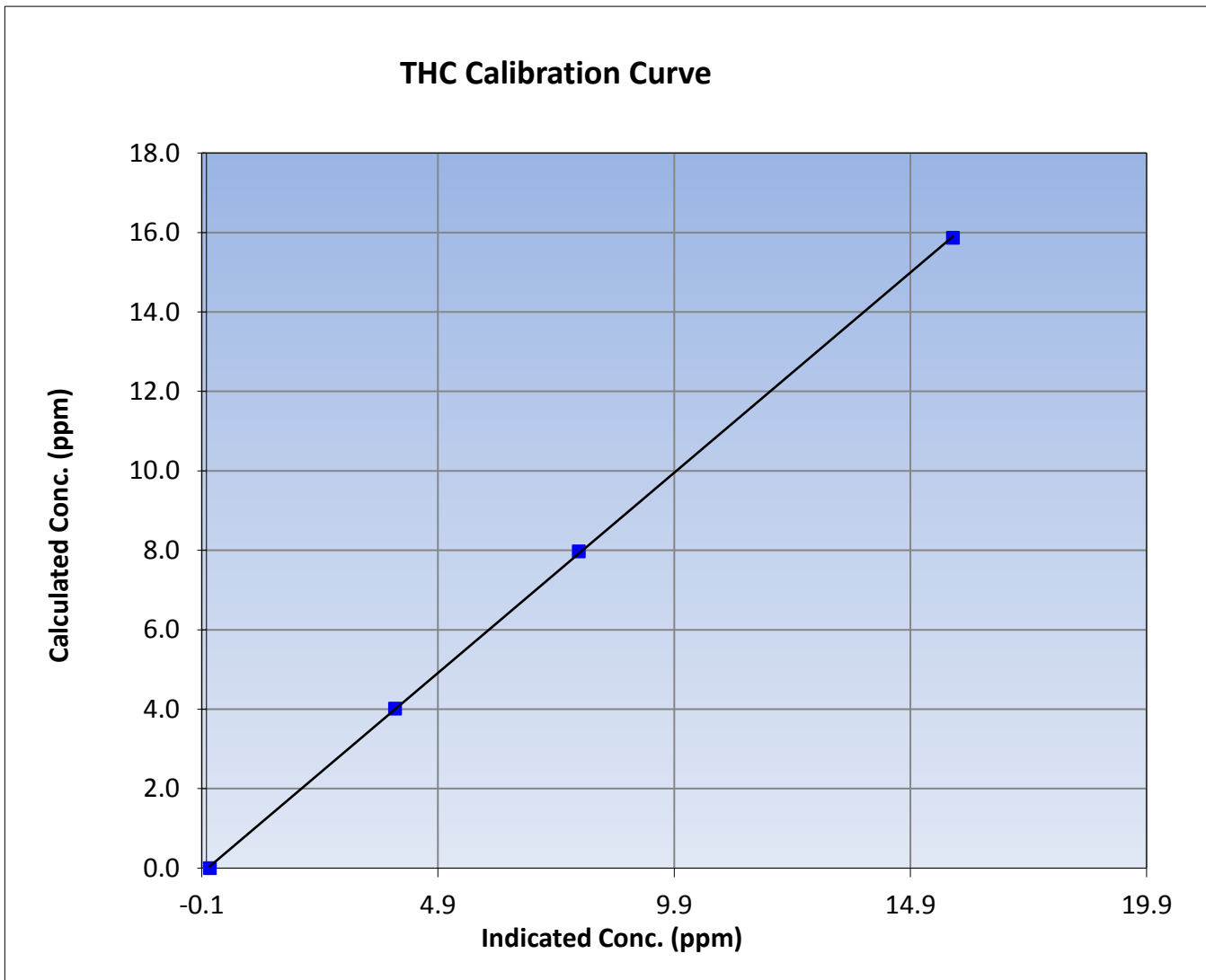
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	11:20	End Time (MST)	16:18
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

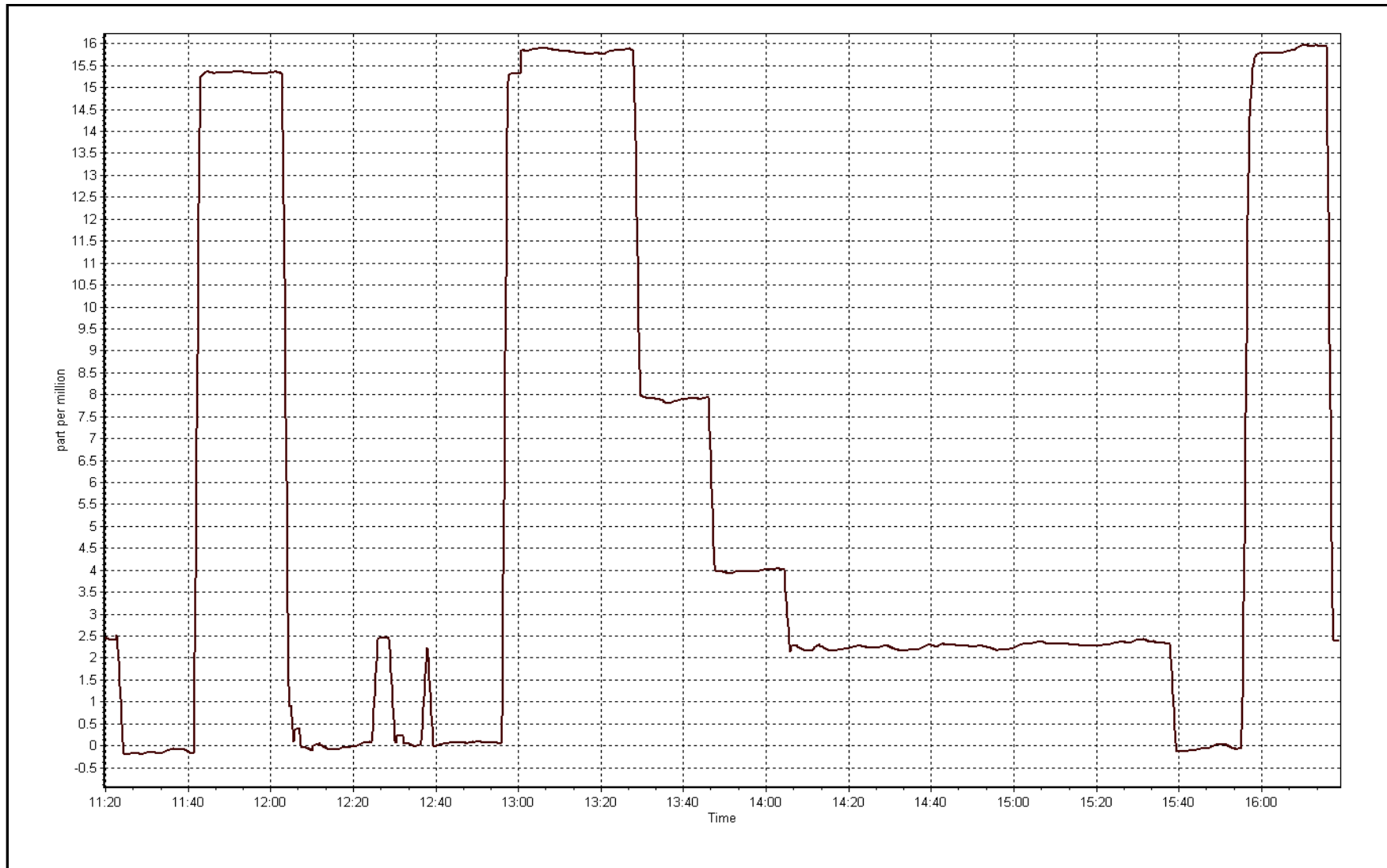
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.07	----	Correlation Coefficient	0.999949
15.86	15.80	1.0040		
7.97	7.88	1.0118	Slope	1.007785
4.02	3.99	1.0070		
			Intercept	-0.025252



THC Calibration Plot

Date: December 12, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Other: <input type="checkbox"/> Cylinder Removal		
Start Time (MST)	10:10	End Time (MST)	10:55
NO Cal Gas Conc	48 ppm	Gas Cert Reference	LL104193
NOX Cal Gas Conc	48 ppm	Cal Gas Expiry Date	February 12, 2018
Calibrator	API T700	Serial Number	493
Zero air Generator	Teledyne API T701	Serial Number	2155

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2632
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999474	0.999342	0.994758
	Data Offset	2.146791	2.560071	0.494924
Current Calibration	Data Slope			
	Data Offset			

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262593
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.012		1.012	
NOX coefficient	1.000		1.000	
NO2 coefficient	0.998		0.998	
NO bkgrnd	8.3		8.3	
NOX bkgrnd	8.5		8.5	
Chamber Temp	50.1	Deg C	50.1	Deg C
Moly Temp	325	Deg C	325	Deg C
PMT voltage	-744.4	V	-744.4	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	168.6	mmHg	168.6	mmHg
R Cell Press Nox	168.6	mmHg	168.6	mmHg
NO sample flow	0.911	lpm	0.911	lpm
Nox sample Flow	0.914	lpm	0.914	lpm

Notes:

As founds before removal of mix gas cylinder.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 12, 2016 Station Number: AMS 16

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.6	-0.1	0.7	----	----
as found span	0:00	83.6	802.6	802.6	0.0	768.6	768.2	0.4	1.0442	1.0447
calibrator zero										
high point										
second point										
third point										
as left zero										
as left span										
Average Correction Factor										

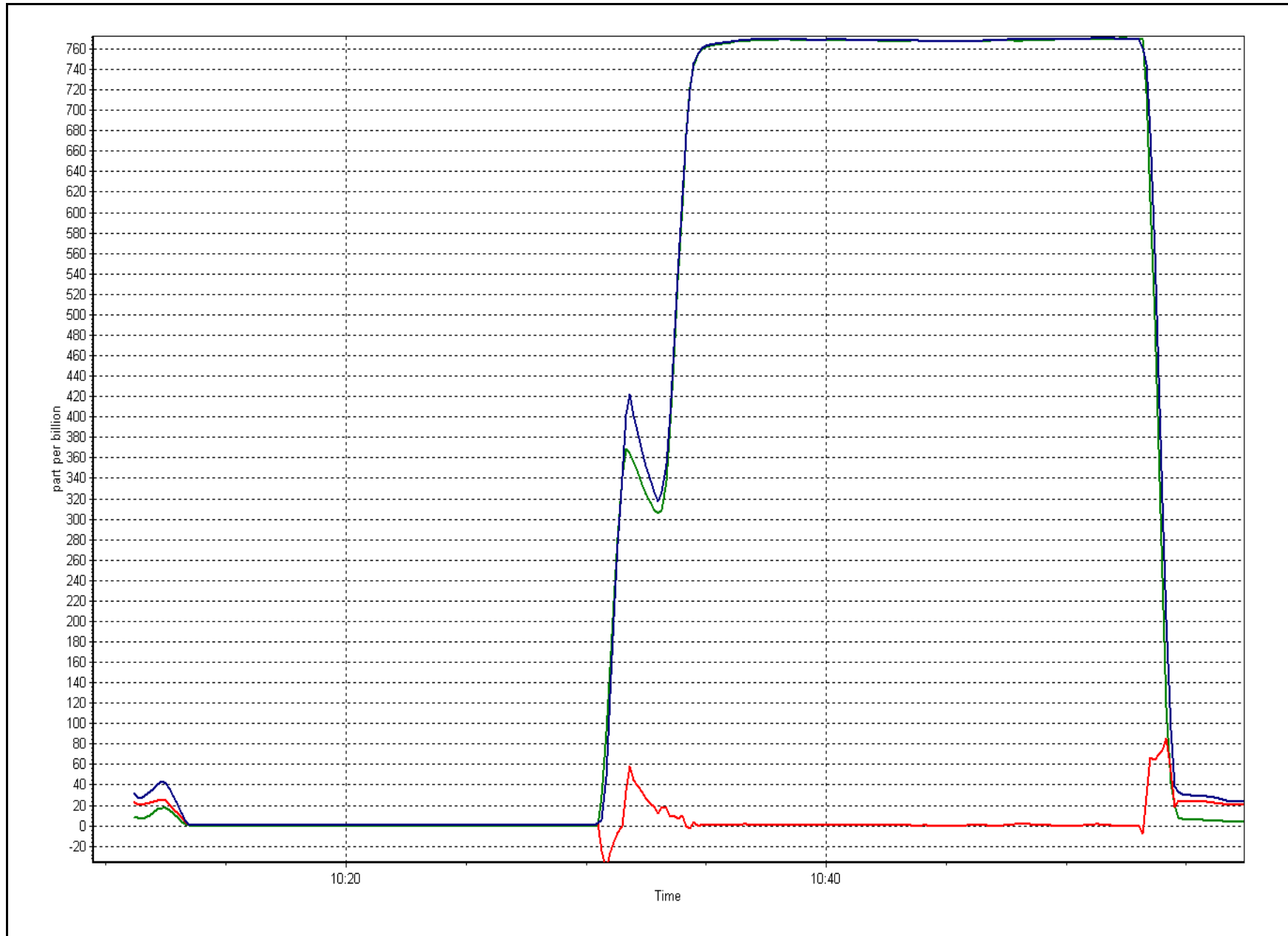
Corrcted As found NO_x= 768.0 NO= 768.3 Percent Change NO_x= 4.3% NO= 4.2%
 Previous Response NO_x= 800.8 NO= 800.5

GPT Calibration Data

Dilution Flow _____ ccm Source Gas Flow _____ ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero										
1st NO2 (300)										
2nd NO2 (200)										
3rd NO2 (100)										
4th NO2 (0)										
Average Correction Factor										

Calibration Performed By: Jayme Marcoux





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	16:19
NO Cal Gas Conc	52.4 ppm	Gas Cert Reference	EY0000638
NOx Cal Gas Conc	52.4 ppm	Cal Gas Expiry Date	November 4, 2019
Calibrator	API T700	Serial Number	493
Zero air Generator	Teledyne API T701	Serial Number	2155

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2632
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999474	0.999342	0.994758
	Data Offset	2.146791	2.560071	0.494924
Current Calibration	Data Slope	0.997667	0.994294	0.998109
	Data Offset	1.078949	1.339645	0.238626

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262593
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.012		1.100	
NOx coefficient	1.000		0.996	
NO2 coefficient	0.998		1.000	
NO bkgrnd	8.3		9.0	
NOx bkgrnd	8.5		9.4	
Chamber Temp	50.1	Deg C	50.4	Deg C
Moly Temp	325	Deg C	325	Deg C
PMT voltage	-744.4	V	-744.8	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	168.6	mmHg	168	mmHg
R Cell Press Nox	168.6	mmHg	167.4	mmHg
NO sample flow	0.911	lpm	0.909	lpm
Nox sample Flow	0.914	lpm	0.906	lpm

Notes:

Installed new mix gas cylinder. Changed inlet filter after as founds. Adjusted the zero and span. During calibrator zero something in the calibration line caused the concentraion to increase greatly. Allowed for the line to clear and continued.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

December 12, 2016

Station Number:

AMS 16

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.3	-0.1	0.4	----	----
as found span	5000	76.6	802.8	802.8	0.0	739.8	739.8	0.0	1.0851	1.0851
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	----	----
high point	5000	76.6	802.8	802.8	0.0	804.1	806.8	-2.7	0.9983	0.9950
second point	5000	38.5	403.5	403.5	0.0	402.7	403.6	-0.9	1.0019	0.9997
third point	5000	19.4	203.3	203.3	0.0	201.8	201.8	-0.1	1.0076	1.0073
as left zero	5000	0.0	0.0	0.0	0.0	0.7	0.1	0.6	----	----
as left span	5000	76.6	802.8	486.9	315.8	802.6	485.3	317.3	1.0002	1.0033
Average Correction Factor									1.0026	1.0007

Corrected As found
Previous Response

NO_x= 739.5
NO_x= 801.0

NO= 739.9
NO= 800.7

Percent Change

NO_x= 8.3%

NO= 8.2%

GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

76.60

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			-0.1			N/A	
1st NO2 (300)	----	486.9	313.8	801.4	486.9	314.5	0.9866	1.0000	0.9978	100.2%
2nd NO2 (200)	----	587.1	213.6	800.8	587.1	213.2	0.9873	1.0000	1.0018	99.8%
3rd NO2 (100)	----	691.2	109.5	800.7	691.2	109.6	0.9874	1.0000	0.9995	100.1%
4th NO2 (0)	800.7	----	-3.7	797.0	797.2	-0.2	0.9920	1.0044	N/A	----
Average Correction Factor							0.9883	1.0011	0.9997	100.0%

Calibration Performed By:

Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

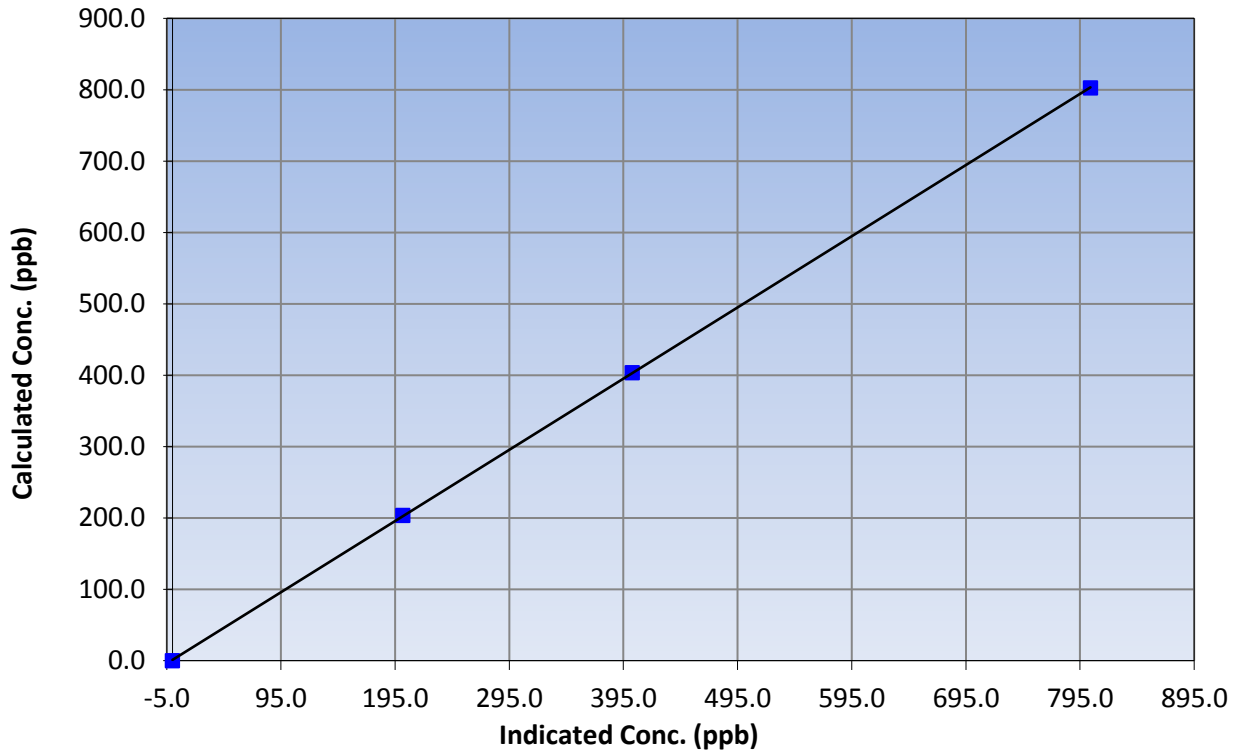
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	11:20	End Time (MST)	16:19
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999993
802.8	804.1	0.9983		
403.5	402.7	1.0019	Slope	0.997667
203.3	201.8	1.0076		
			Intercept	1.078949

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

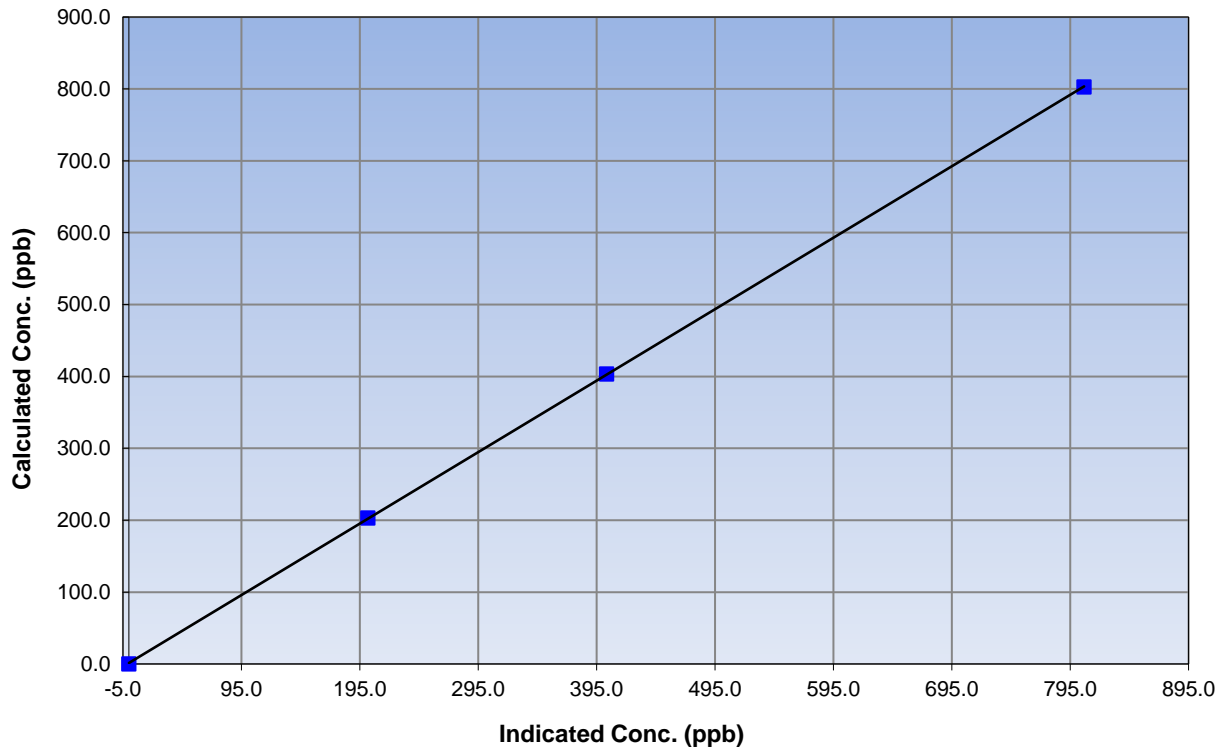
Station Information

Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	11:20	End Time (MST)	16:19
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999986
802.8	806.8	0.9950		
403.5	403.6	0.9997	Slope	0.994294
203.3	201.8	1.0073		
			Intercept	1.339645

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

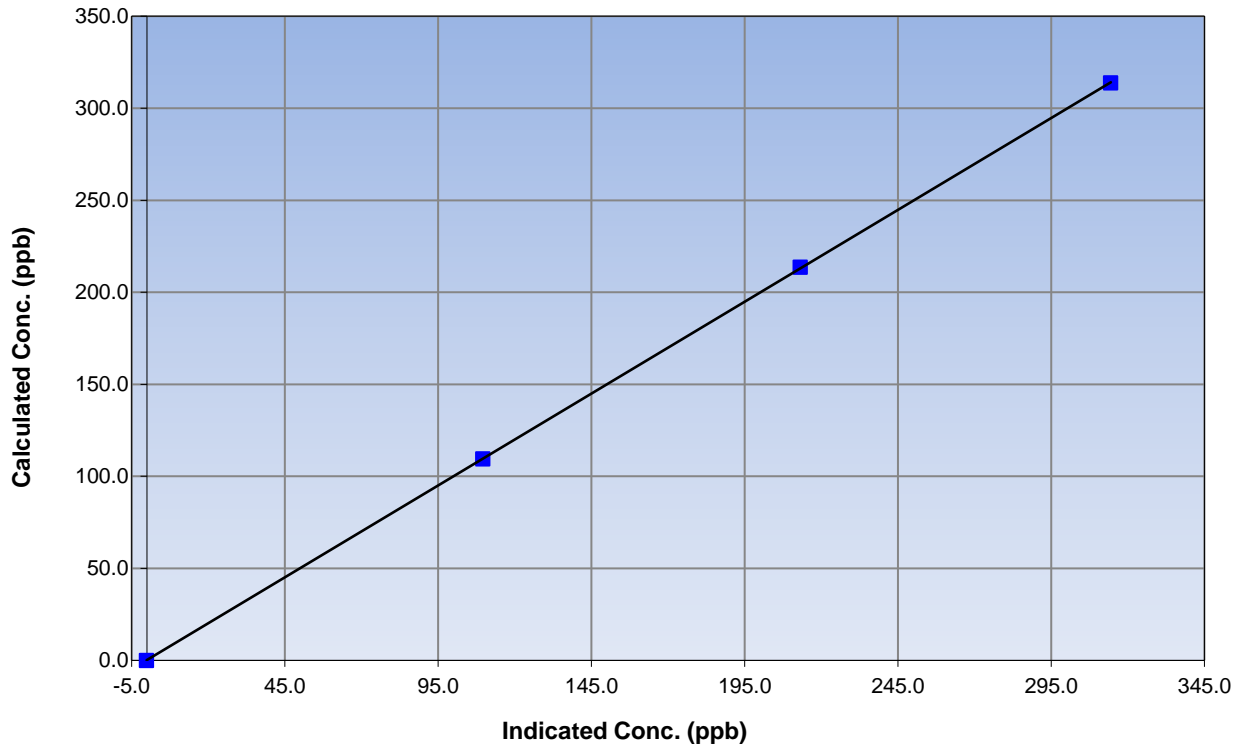
Station Information

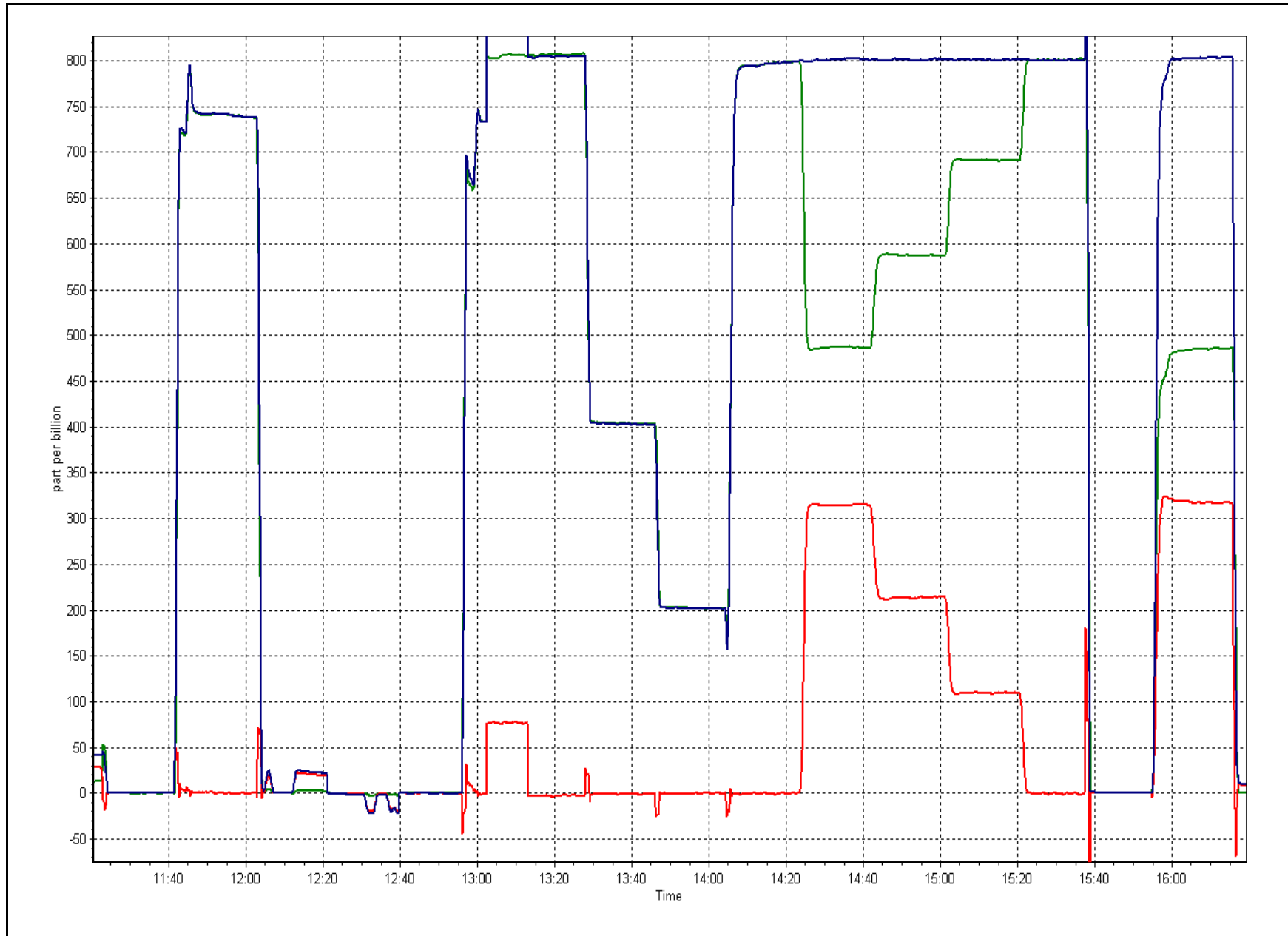
Calibration Date	December 12, 2016	Previous Calibration	November 1, 2016
Station Number	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	11:20	End Time (MST)	16:19
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999992
313.8	314.5	0.9978		
213.6	213.2	1.0018	Slope	0.998109
109.5	109.6	0.9995		
			Intercept	0.238626

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Shell Muskeg River	Station number:	AMS 16
Calibration Date:	December 12, 2016	Last Cal Date:	November 1, 2016
Start time (MST):	13:02	End time (MST):	14:12
Sharp Model:	Thermo / SHARP 5030	S/N:	E-798
Particulate Fraction:	PM2.5	C14 Source S/N:	4142
Flow Standard Model:	DeltaCal	S/N:	628
Temp/RH standard:	NA	S/N:	NA

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-17	-18.8	-18.8	<input checked="" type="checkbox"/>	+/- 2 °C
P3 (hPa)	978	964	964	<input checked="" type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	952.2	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.4	-----	0.1	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check:	December 12, 2016	Last Cal Date:	June 24, 2016	Tolerance
	Flow w/o adaptor:	<u>15.87</u>	Flow w/ adaptor:	<u>15.56</u>	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: <u>NA</u>	S/N: <u>NA</u>
	Date of check: <u>NA</u>	Last Cal Date: <u>June 24, 2016</u>
	New Correction Factor: <u>NA</u>	Previous Correction Factor: <u>NA</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)				<input type="checkbox"/>	+/- 2 °C
T3 (°C)				<input type="checkbox"/>	+/- 2 °C
T4 (°C)				<input type="checkbox"/>	+/- 2 °C
RH (%)				<input type="checkbox"/>	+/- 10%

Notes: Cleaned cyclone head. Adjusted nephelometer, Temperature, Pressure and the Flow.

Calibration by: Jayme Marcoux

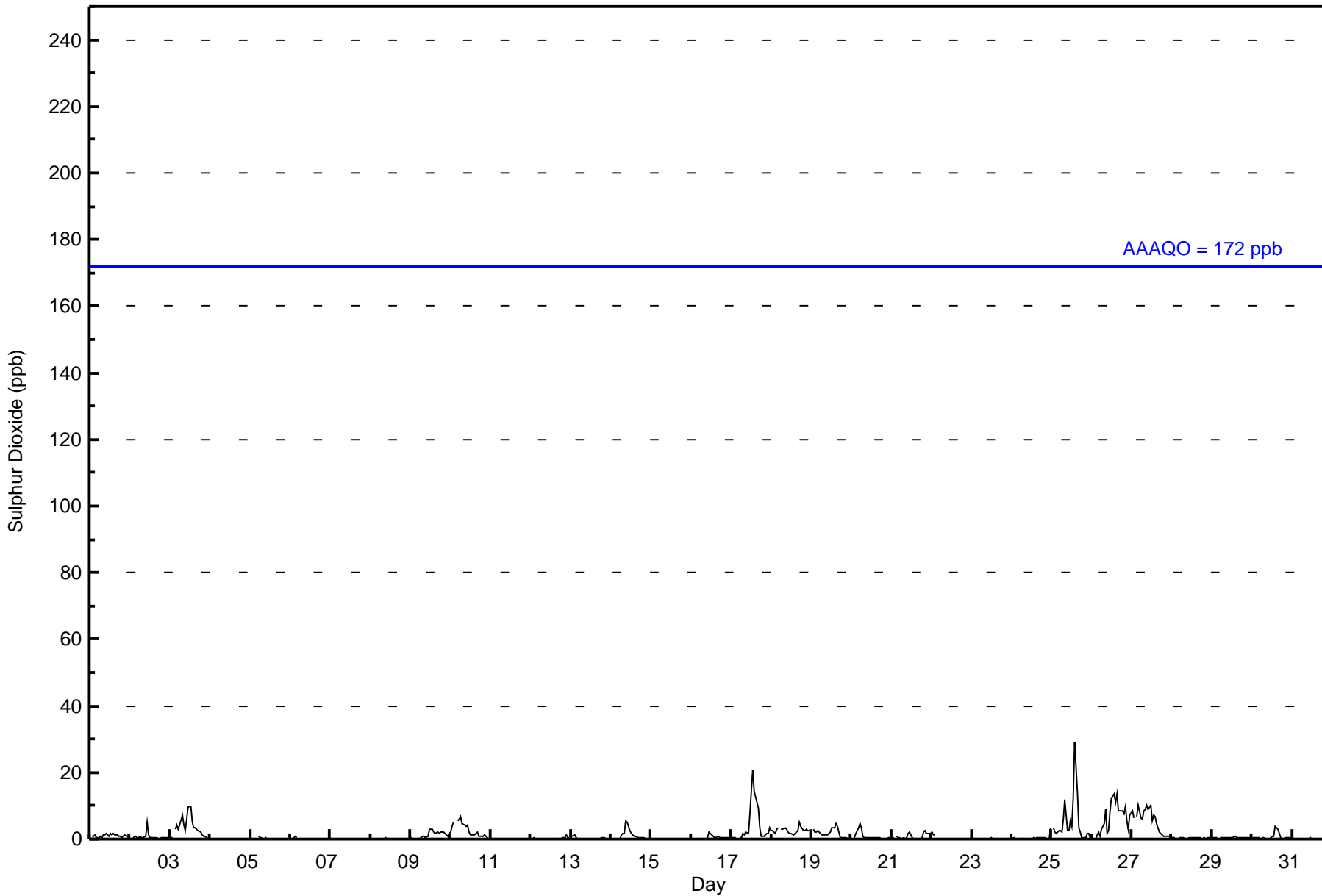


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 29 ppb on Dec 25 15:00										Maximum Daily Average: 6.2 ppb on Dec 26										Hours of Data: 704							
Minimum Value: 0 ppb on Dec 4 11:00										Minimum Daily Average: 0.0 ppb on Dec 15										Hours of Missing Data: 40							
Maximum Diurnal Average: 2.8 ppb at hour 15										Minimum Diurnal Average: 0.5 ppb at hour 23										Hours of Calibration: 38							
Monthly Average: 1.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 4 P ₉₉ = 13										Percent Operational Time: 99.7							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	1	1	1	1	0	1	1	1	1	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1.0	2
2-Dec	0	Z	1	1	0	0	1	0	0	1	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5
3-Dec	0	0	Z	3	4	3	4	7	4	3	6	10	10	5	4	3	3	2	2	1	1	1	0	0	3.3	10	
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
5-Dec	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
6-Dec	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
9-Dec	0	0	Z	0	0	0	0	1	1	0	1	3	3	3	2	2	2	2	2	2	2	2	1	1	1.3	3	
10-Dec	2	4	5	Z	5	6	7	5	4	4	4	2	1	1	1	1	2	1	1	1	1	1	0	0	2.7	7	
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	C	C	0	0	0	0	1	0	--	1	
13-Dec	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
14-Dec	0	Z	0	0	0	0	1	2	2	6	5	2	2	1	1	1	0	0	0	0	0	0	0	0	1.1	6	
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0	0	0.4	2	
17-Dec	0	0	0	0	Z	0	1	2	1	2	2	8	15	21	15	11	9	3	1	1	1	2	2	4	4.3	21	
18-Dec	3	2	2	3	3	Z	3	3	3	3	2	2	2	1	2	2	3	5	4	3	3	3	3	2	2.6	5	
19-Dec	Z	3	2	2	3	2	1	1	1	1	1	2	3	4	4	5	4	1	1	1	0	0	0	0	1.8	5	
20-Dec	0	Z	0	2	3	5	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	5	
21-Dec	1	0	Z	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	1	2	3	2	2	2	0.8	3	
22-Dec	2	1	1	Z	0	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0.3	2	
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.3	3	
25-Dec	Z	3	2	2	2	3	2	6	12	3	2	6	4	12	29	14	3	2	0	0	0	2	1	0	4.8	29	
26-Dec	0	Z	0	1	2	1	3	5	9	2	2	8	12	13	11	14	9	9	8	8	10	5	3	7	6.2	14	
27-Dec	9	6	Z	7	10	6	6	8	9	10	9	10	5	7	7	5	2	2	1	1	1	1	1	1	5.4	10	
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
29-Dec	0	0	0	0	Z	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	0.4	1	
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	4	3	2	0	0	0	0	0	0	0	0.7	4	
31-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	692	98.30	98.30
11 - 20	10	1.42	99.72
21 - 60	2	0.28	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	19	29	41	35	21	7	11	32	148	137	44	34	47	32	28	25	690
11 - 20	0	0	0	0	0	0	0	0	6	2	2	0	0	0	0	0	10
21 - 60	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	19	29	41	35	21	7	11	32	155	139	47	34	47	32	28	25	702

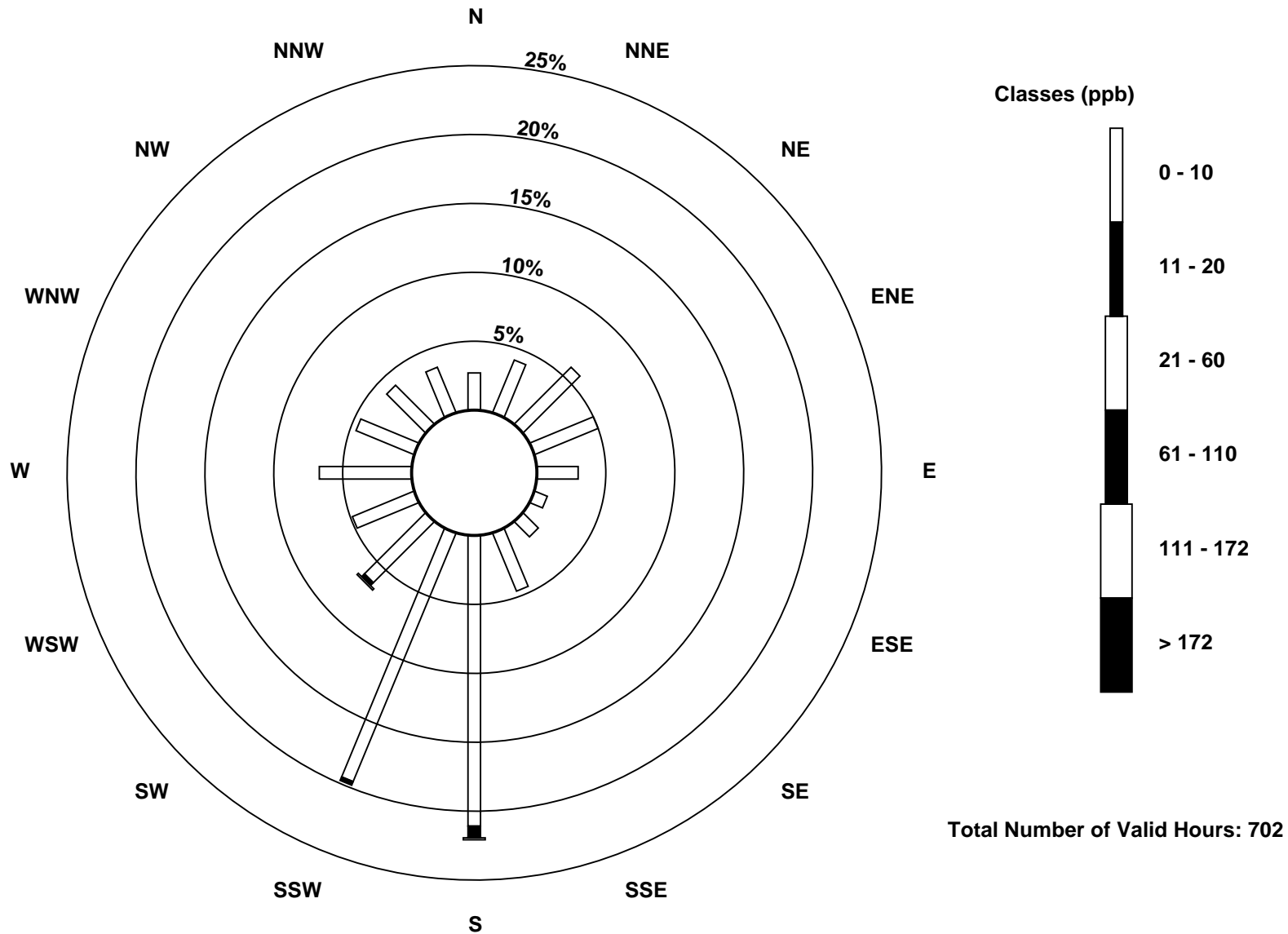
Total Number of Valid Hours: 702

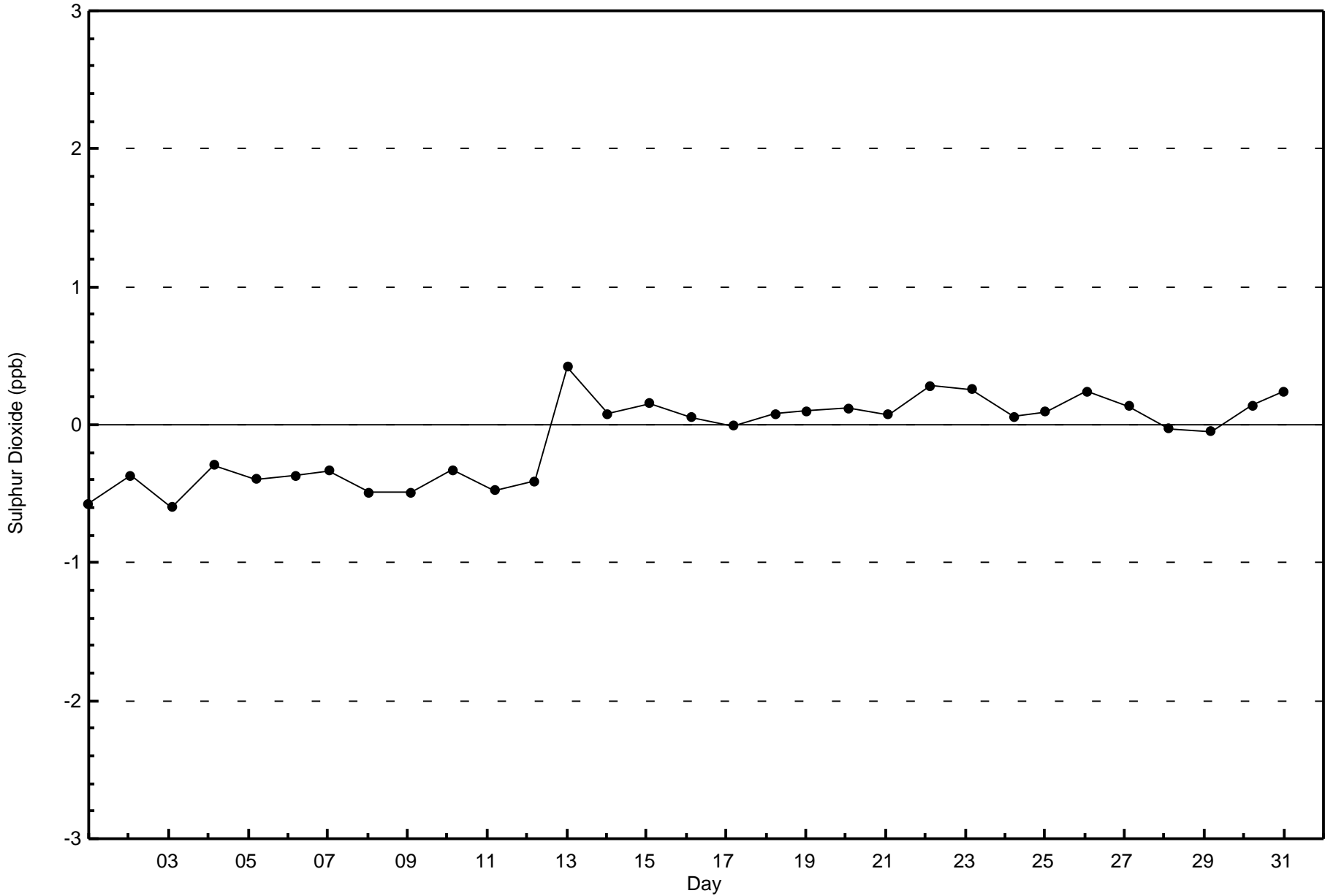
Total Number of Hours: 744

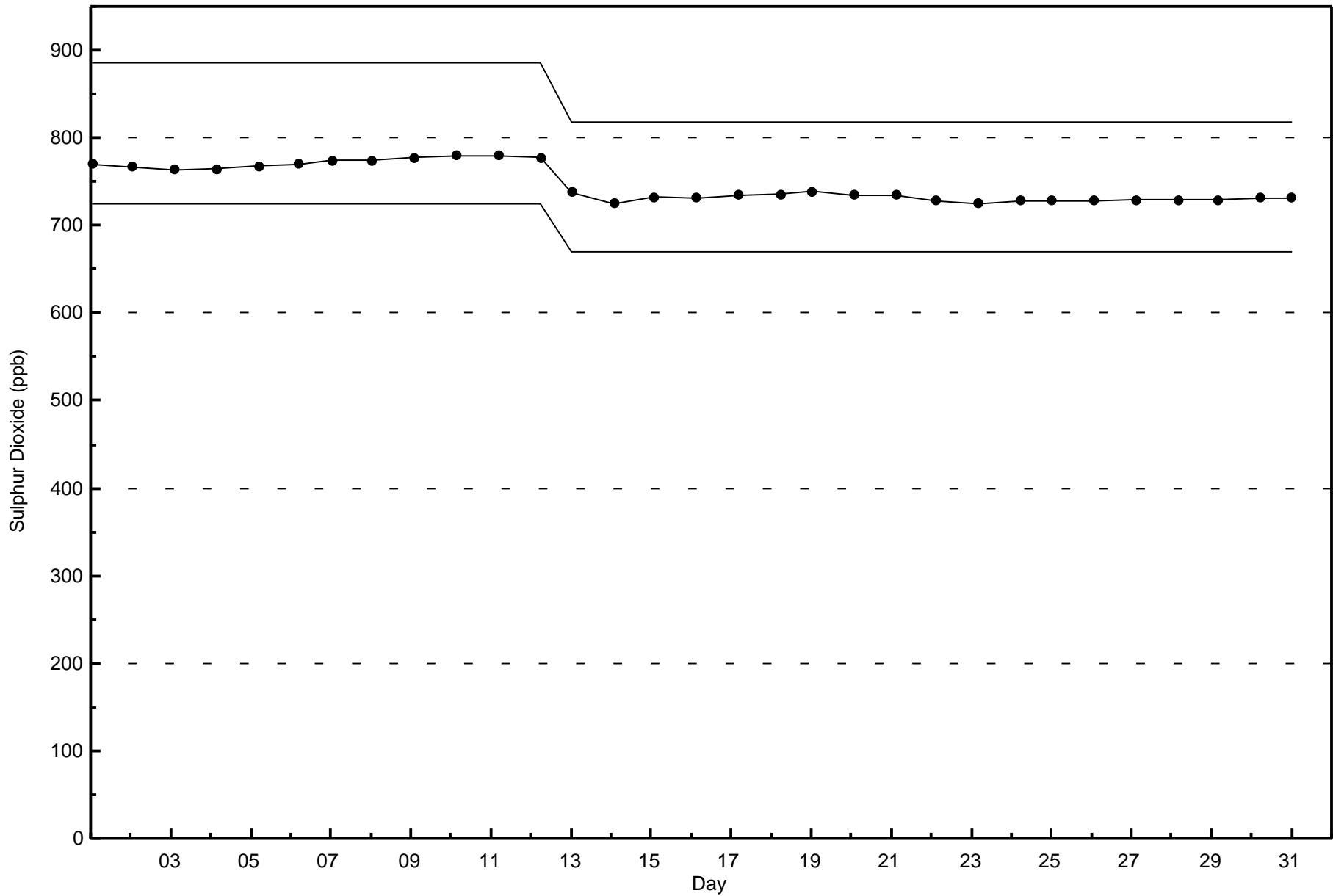


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

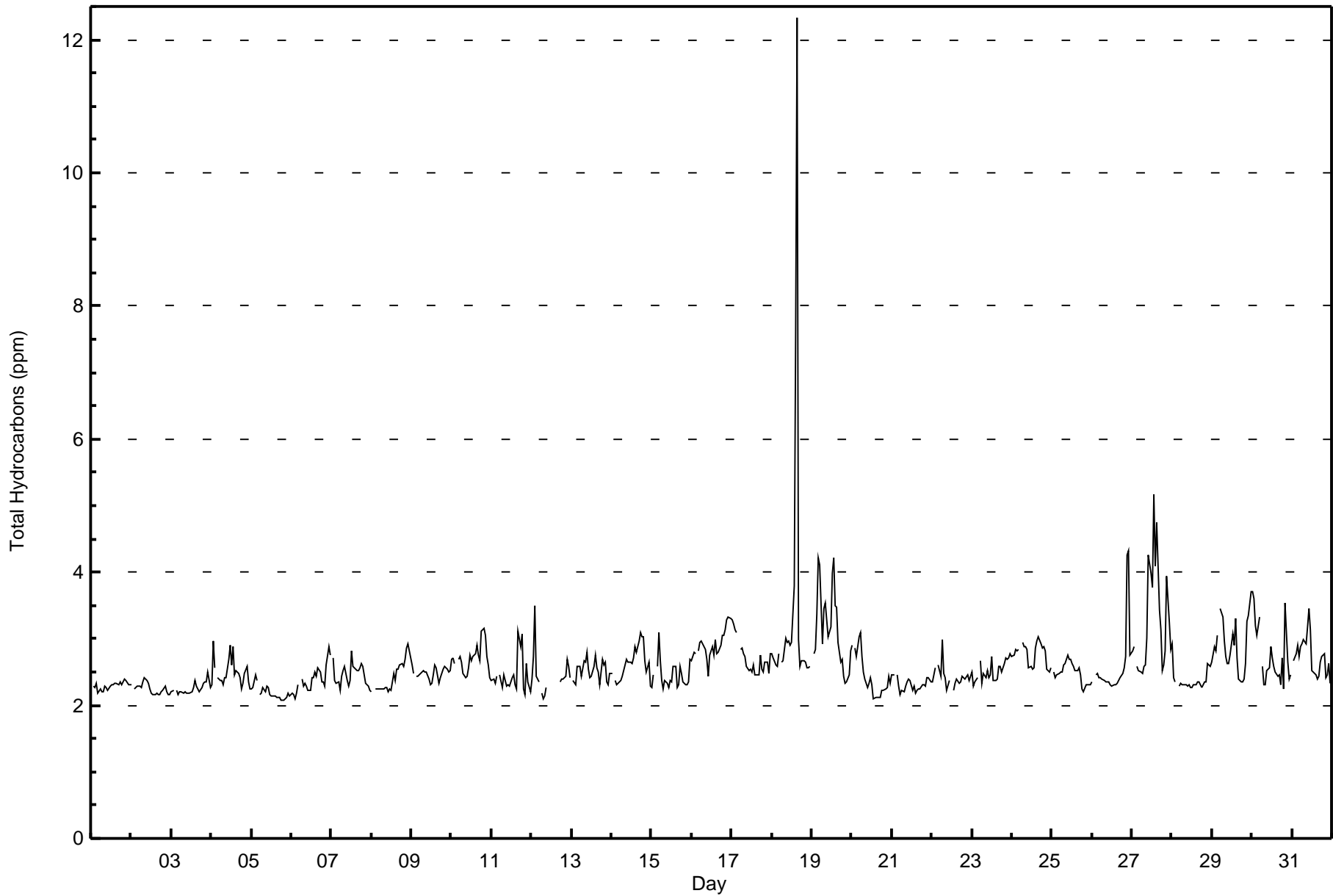
Total Hydrocarbons (THC) - ppm
Shell Muskeg River - December 2016

Maximum Value: 12.3 ppm on Dec 18 16:00																								Hours in Service: 744																									
Maximum Daily Average: 3.4 ppm on Dec 18																								Hours of Data: 704																									
Minimum Value: 2.1 ppm on Dec 5 20:00																								Hours of Missing Data: 40																									
Minimum Daily Average: 2.2 ppm on Dec 5																								Hours of Calibration: 38																									
Maximum Diurnal Average: 2.9 ppm at hour 16																								Percent Operational Time: 99.7																									
Minimum Diurnal Average: 2.5 ppm at hour 20																																																	
Monthly Average: 2.59 ppm																																																	
Percentiles: P ₁ = 2.1 P ₁₀ = 2.2 O ₁ = 2.3 Median = 2.5 Q ₃ = 2.7 P ₉₀ = 3.0 P ₉₉ = 4.2																																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.3	2.4																							
2-Dec	2.3	Z	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2																						
3-Dec	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.3	2.3	2.2	2.3	2.3	2.4	2.3	2.5	2.3	2.3	2.3	2.5																						
4-Dec	2.3	3.0	2.6	Z	2.4	2.4	2.4	2.3	2.4	2.4	2.7	2.9	2.6	2.9	2.4	2.5	2.5	2.4	2.2	2.3	2.5	2.6	2.3	2.3	2.3	2.3	2.5																						
5-Dec	2.2	2.3	2.5	2.4	Z	2.2	2.2	2.3	2.2	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.2																						
6-Dec	2.2	2.2	2.1	2.2	2.3	Z	2.4	2.3	2.3	2.3	2.2	2.2	2.4	2.4	2.5	2.4	2.6	2.5	2.3	2.3	2.3	2.6	2.9	2.8	2.4	2.9	2.4																						
7-Dec	Z	2.7	2.4	2.3	2.4	2.2	2.4	2.5	2.6	2.4	2.3	2.4	2.8	2.6	2.6	2.5	2.5	2.6	2.6	2.6	2.6	2.3	2.3	2.3	2.2	2.5	2.8																						
8-Dec	2.2	Z	2.2	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.5	2.4	2.5	2.6	2.6	2.6	2.6	2.7	2.9	2.9	2.7	2.4	2.9	2.4																						
9-Dec	2.6	2.5	Z	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.4	2.3	2.3	2.5	2.6	2.6	2.3	2.4	2.5	2.5	2.6	2.5	2.5	2.5	2.5	2.5	2.6																						
10-Dec	2.7	2.7	2.6	Z	2.7	2.7	2.6	2.5	2.4	2.4	2.6	2.8	2.7	2.7	2.8	2.9	2.8	2.7	3.1	3.1	3.0	2.7	2.6	2.4	2.7	3.1	2.7																						
11-Dec	2.4	2.4	2.3	2.4	Z	2.5	2.3	2.5	2.4	2.3	2.3	2.3	2.4	2.5	2.3	2.3	3.1	2.9	3.1	2.2	2.2	2.6	2.4	2.2	2.4	3.1	2.4																						
12-Dec	2.4	2.7	3.5	2.4	2.4	Z	2.2	2.1	2.1	2.3	C	C	C	C	C	C	C	2.3	2.4	2.4	2.4	2.7	2.6	2.4	--	3.5																							
13-Dec	Z	2.4	2.3	2.6	2.6	2.6	2.4	2.7	2.6	2.8	2.5	2.4	2.4	2.6	2.7	2.6	2.5	2.3	2.7	2.6	2.7	2.4	2.3	2.5	2.5	2.8	2.5																						
14-Dec	2.5	Z	2.4	2.3	2.3	2.4	2.4	2.5	2.6	2.7	2.6	2.7	2.6	2.7	2.9	2.8	3.0	3.1	3.0	3.0	2.7	2.5	2.7	2.3	2.6	3.1	2.6																						
15-Dec	2.3	2.5	Z	2.6	3.1	2.7	2.4	2.2	2.4	2.3	2.3	2.4	2.3	2.6	2.6	2.3	2.3	2.6	2.5	2.4	2.3	2.3	2.3	2.7	2.4	3.1	2.4																						
16-Dec	2.7	2.8	2.8	Z	2.8	3.0	3.0	2.9	2.8	2.7	2.4	2.7	2.9	2.8	3.0	2.8	2.8	2.9	3.0	3.1	3.1	3.3	3.3	3.3	2.9	3.3	2.9																						
17-Dec	3.3	3.2	3.1	3.1	Z	2.8	2.9	2.8	2.7	2.6	2.5	2.5	2.5	2.6	2.5	2.5	2.5	2.8	2.5	2.5	2.6	2.7	2.5	2.8	2.7	3.3	2.7																						
18-Dec	2.8	2.7	2.6	2.6	2.8	Z	2.6	2.7	3.0	2.9	3.0	2.9	3.0	3.8	7.6	12.3	3.0	2.6	2.7	2.7	2.6	2.6	2.6	2.6	3.4	12.3	3.4																						
19-Dec	Z	2.8	2.8	3.4	4.2	4.1	2.9	3.5	3.5	3.3	3.0	3.2	4.0	4.2	3.5	3.5	2.9	2.7	2.7	2.4	2.3	2.3	2.5	2.8	3.2	4.2	3.2																						
20-Dec	2.9	Z	2.9	2.7	3.0	3.1	2.7	2.5	2.4	2.3	2.3	2.4	2.3	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.3	2.4	3.1	2.4																						
21-Dec	2.5	2.5	Z	2.4	2.3	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.2	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.3																						
22-Dec	2.3	2.5	2.6	Z	2.6	2.4	3.0	2.5	2.4	2.2	2.4	M	M	2.2	2.3	2.4	2.3	2.3	2.4	2.4	2.4	2.5	2.4	2.4	2.4	3.0	2.4																						
23-Dec	2.5	2.3	2.3	2.4	Z	2.7	2.3	2.5	2.4	2.5	2.4	2.5	2.7	2.4	2.4	2.4	2.6	2.6	2.5	2.6	2.7	2.7	2.7	2.8	2.5	2.8	2.5																						
24-Dec	2.7	2.7	2.8	2.8	2.8	Z	3.0	2.9	2.9	2.8	2.6	2.6	2.5	2.6	2.9	3.0	3.0	2.9	2.9	2.9	2.8	2.5	2.5	2.6	2.8	3.0	2.8																						
25-Dec	Z	2.5	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.8	2.7	2.7	2.6	2.6	2.5	2.5	2.6	2.5	2.2	2.2	2.3	2.3	2.3	2.3	2.5	2.8	2.5																						
26-Dec	2.4	Z	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.6	2.7	4.3	4.3	2.8	2.6	4.3	2.6																						
27-Dec	2.8	2.9	Z	2.6	2.5	2.5	2.5	2.6	2.6	3.0	4.3	4.0	3.8	5.2	4.1	4.8	3.4	3.1	2.5	2.6	2.8	3.9	3.2	2.8	3.2	5.2	3.2																						
28-Dec	2.9	2.4	2.4	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6	2.6	2.6	2.4	2.9	2.4																						
29-Dec	2.7	2.9	2.8	3.0	Z	3.4	3.3	3.0	2.7	2.6	2.6	2.8	3.1	2.9	3.3	2.7	2.4	2.3	2.4	2.4	2.6	3.3	3.3	3.7	2.9	3.7	2.9																						
30-Dec	3.7	3.6	3.2	3.1	3.3	Z	2.6	2.3	2.3	2.5	2.6	2.9	2.7	2.6	2.5	2.4	2.5	2.3	2.7	2.3	3.5	2.7	2.4	2.5	2.7	3.7	2.7																						
31-Dec	Z	2.7	2.8	2.9	2.7	2.9	2.9	3.0	2.9	3.2	3.5	3.1	2.5	2.5	2.5	2.4	2.4	2.6	2.7	2.8	2.4	2.5	2.6	2.3	2.7	3.5	2.7																						
																								2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.8	2.9	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.5	Diurnal Average
																								3.7	3.6	3.5	3.4	4.2	4.1	3.3	3.5	3.5	3.3	4.3	4.0	4.0	5.2	7.6	12.3	3.4	3.1	3.1	3.1	3.1	3.5	4.3	4.3	3.7	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																	



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Shell Muskeg River - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	645	91.62	91.62
3.1 - 10.0	58	8.24	99.86
> 10.0	1	0.14	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Shell Muskeg River - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	17	27	39	30	19	6	8	29	145	132	41	29	42	31	27	21	643
3.1 - 10.0	2	1	2	5	2	1	3	3	10	7	6	5	5	1	1	4	58
> 10.0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Totals	19	29	41	35	21	7	11	32	155	139	47	34	47	32	28	25	702

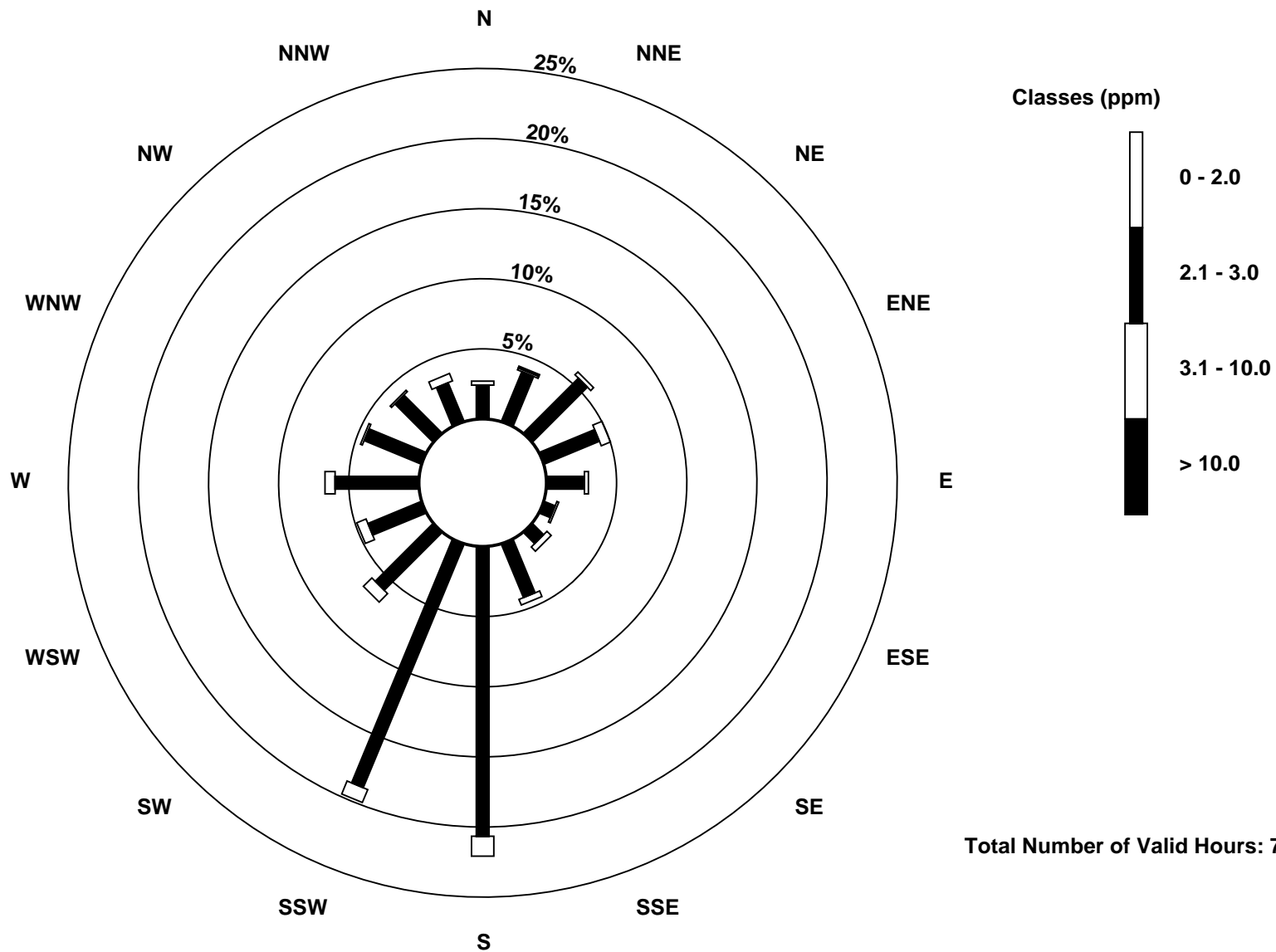
Total Number of Valid Hours: 702

Total Number of Hours: 744

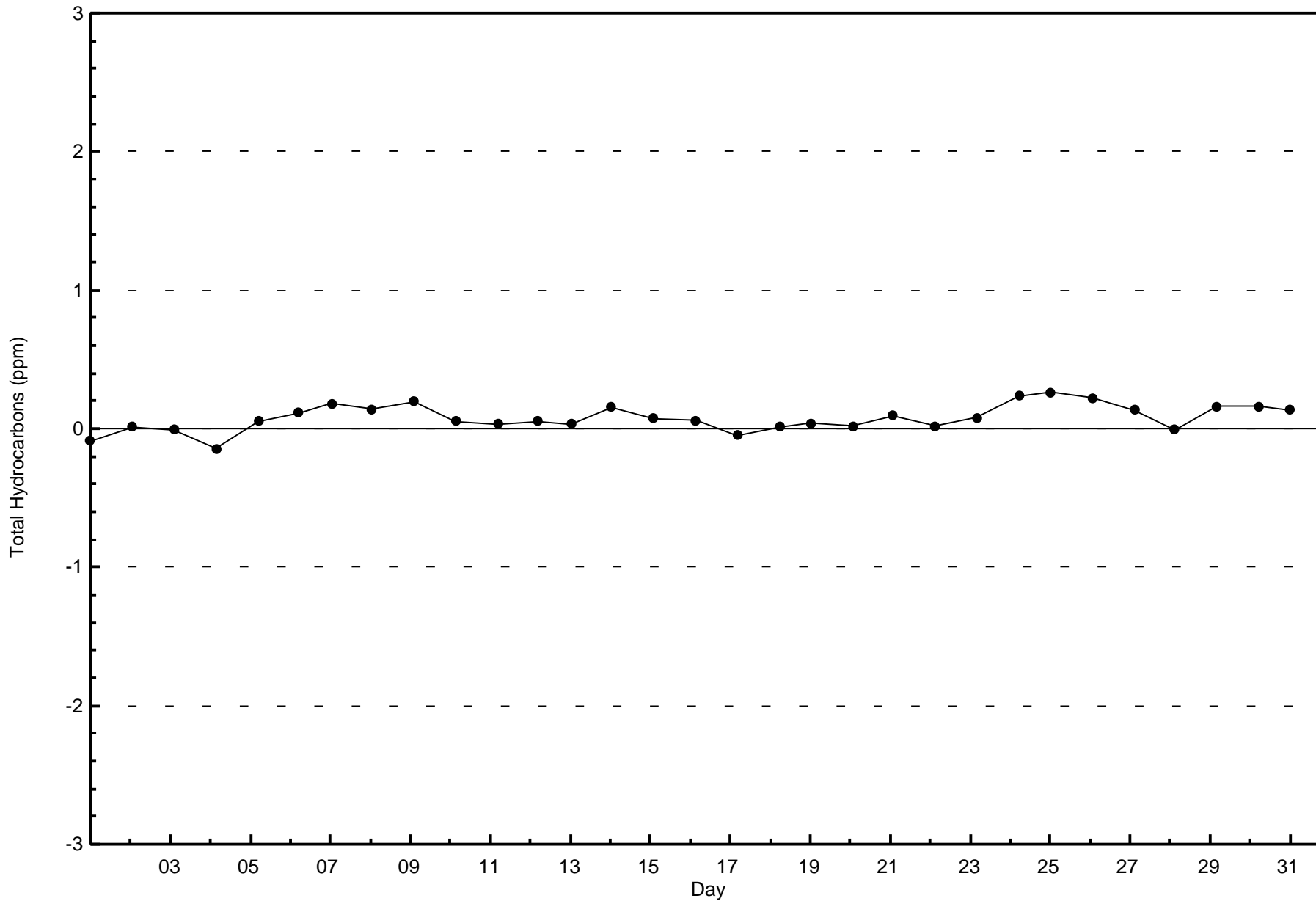


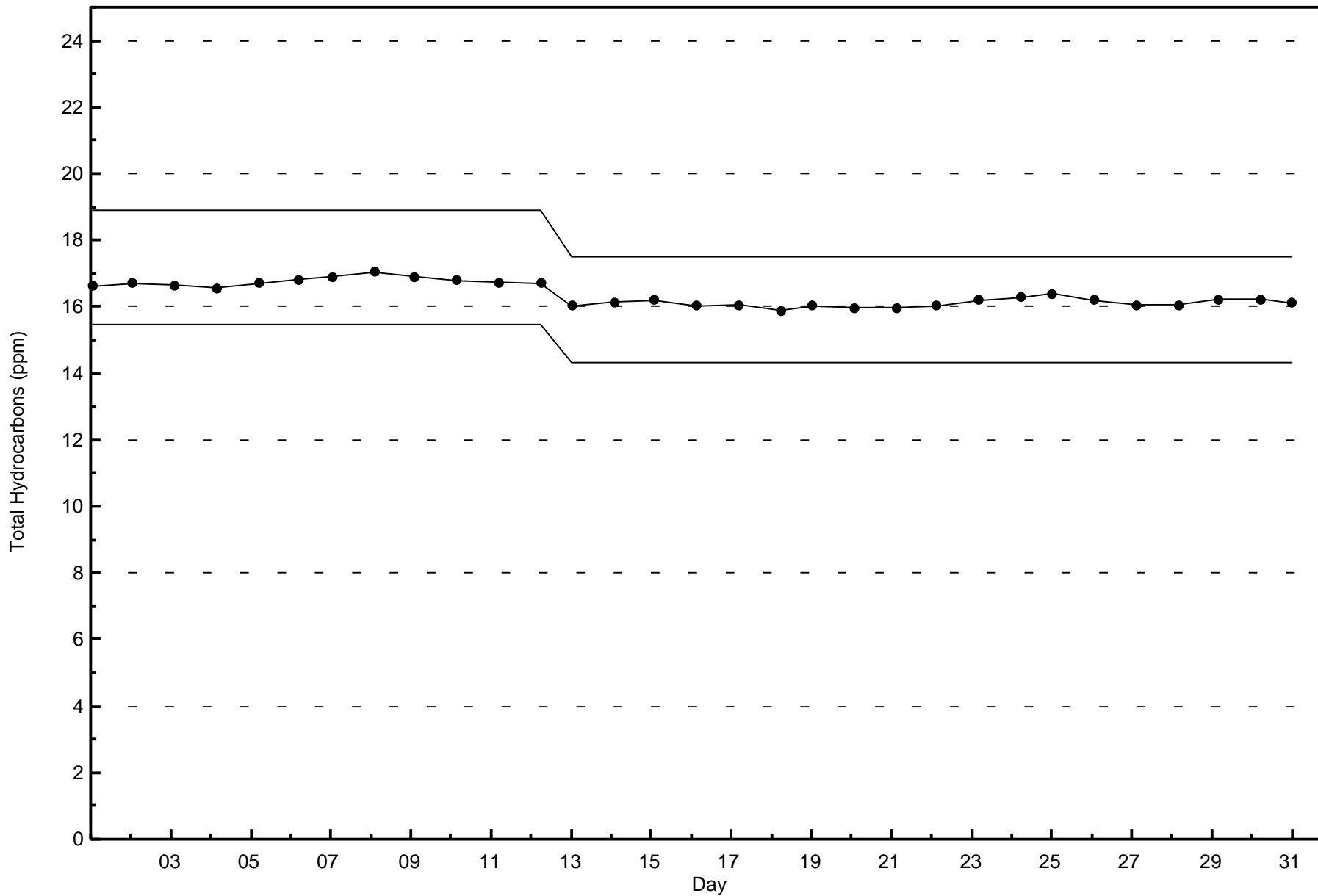
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Shell Muskeg River (AMS 16)



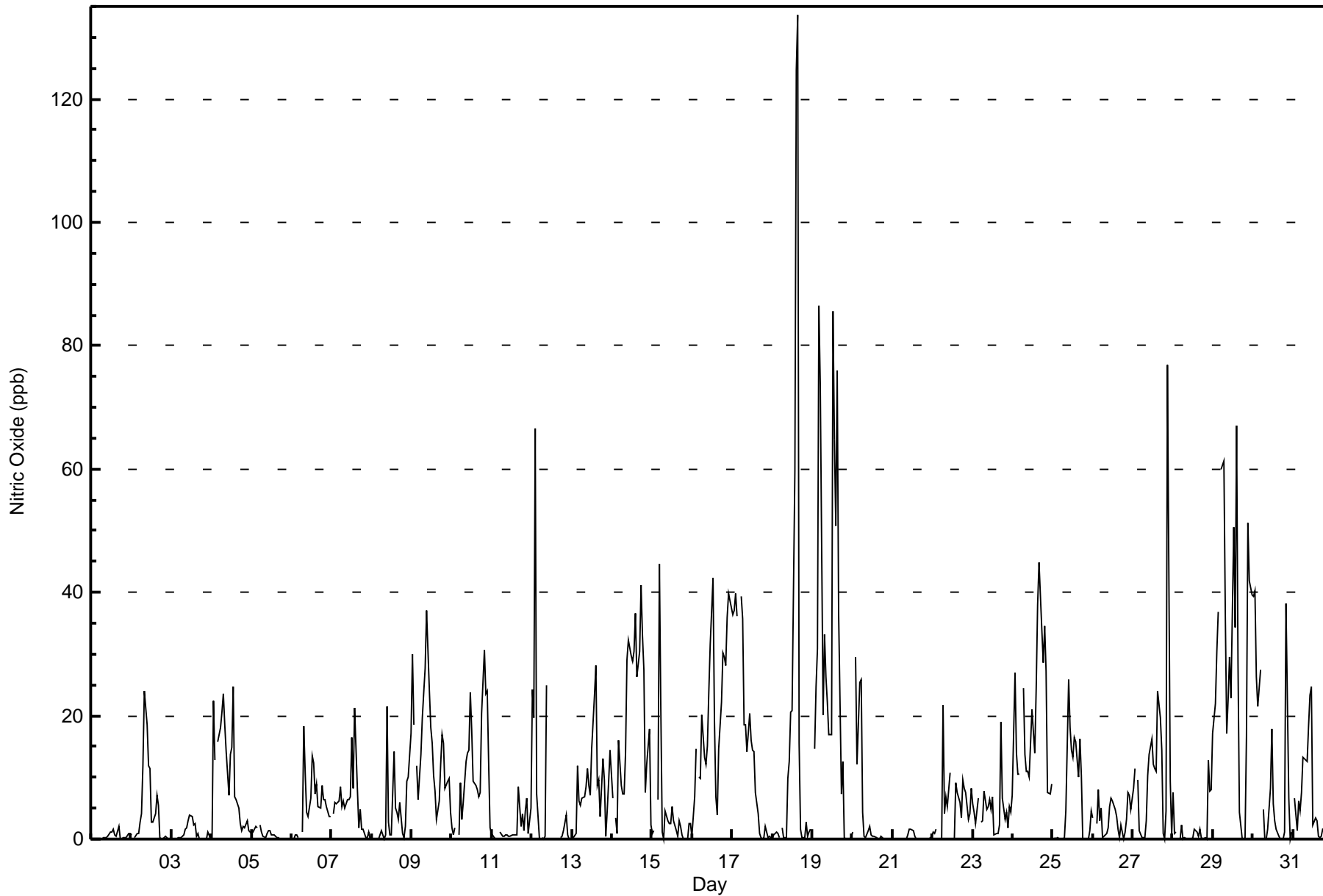
Total Number of Valid Hours: 702







Maximum Value: 134 ppb on Dec 18 16:00																			Maximum Daily Average: 30.5 ppb on Dec 19						Hours in Service: 744	
Minimum Value: 0 ppb on Dec 1 04:00																			Minimum Daily Average: 0.3 ppb on Dec 21						Hours of Data: 704	
Maximum Diurnal Average: 15.3 ppb at hour 15																			Minimum Diurnal Average: 5.6 ppb at hour 24						Hours of Missing Data: 40	
Monthly Average: 9.5 ppb																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 4 Q ₃ = 13 P ₉₀ = 26 P ₉₉ = 72						Hours of Calibration: 38	
																									Percent Operational Time: 99.7	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	2	0	0	0	0	1	1		0.5	2
2-Dec	1	Z	0	1	1	3	4	12	24	19	12	12	3	3	4	7	5	0	0	0	0	0	0	0	4.8	24
3-Dec	0	0	Z	0	0	0	0	1	2	2	3	4	4	2	3	1	1	0	0	0	0	1	0	1.0	4	
4-Dec	0	22	13	Z	16	18	21	24	18	14	7	14	15	25	7	6	5	2	1	2	2	3	1	1	10.3	25
5-Dec	1	1	2	2	Z	2	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.7	2
6-Dec	0	0	1	1	0	Z	1	18	11	4	4	7	14	12	7	9	5	5	9	6	6	5	4	4	5.8	18
7-Dec	Z	4	6	6	6	9	5	6	5	6	6	7	17	8	21	8	2	5	2	2	0	0	1	0	5.7	21
8-Dec	0	Z	0	0	0	1	1	0	1	21	3	1	1	14	5	4	3	6	1	0	2	9	10	17	4.4	21
9-Dec	30	19	Z	12	6	14	20	24	28	37	24	18	15	10	8	3	6	12	17	16	8	9	10	4	15.2	37
10-Dec	2	1	2	Z	1	9	3	6	13	14	14	24	18	9	9	8	7	8	20	31	24	24	12	2	11.3	31
11-Dec	1	0	0	0	Z	1	0	0	1	1	0	1	1	1	1	1	8	2	4	1	4	7	1	5	1.8	8
12-Dec	24	20	67	7	0	Z	0	0	0	25	C	C	C	C	C	C	C	0	1	1	4	1	0	0	--	67
13-Dec	Z	0	1	12	6	5	7	7	9	11	9	7	15	23	28	9	10	4	13	10	0	5	9	14	9.3	28
14-Dec	7	Z	3	1	16	9	7	7	14	29	32	30	29	30	37	26	31	41	33	27	8	12	18	2	19.5	41
15-Dec	1	1	Z	6	45	21	1	0	5	3	2	2	5	3	1	0	3	2	1	0	0	0	3	3	4.7	45
16-Dec	0	7	15	Z	10	10	20	13	12	15	24	31	42	19	7	4	15	22	30	30	28	36	40	38	20.4	42
17-Dec	36	37	40	36	Z	39	36	19	19	14	20	16	14	14	7	4	1	0	0	0	2	0	0	0	15.5	40
18-Dec	0	1	1	1	0	Z	2	0	0	10	13	21	21	60	125	134	15	1	0	0	3	1	1	2	17.9	134
19-Dec	Z	15	25	31	86	73	20	33	26	22	17	17	86	65	51	76	37	7	12	0	0	0	0	0	30.5	86
20-Dec	1	Z	30	12	25	26	4	0	0	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	4.6	30
21-Dec	0	0	Z	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0.3	2
22-Dec	1	1	2	Z	0	0	22	4	7	5	11	M	M	0	9	8	6	3	10	8	8	3	4	8	5.7	22
23-Dec	6	4	2	7	Z	3	3	8	5	5	6	5	7	1	1	1	2	19	7	3	4	2	5	4	4.8	19
24-Dec	7	27	14	10	10	Z	24	14	11	11	10	21	17	14	24	38	45	34	29	35	27	7	7	9	19.4	45
25-Dec	Z	0	0	0	0	0	0	0	5	26	18	14	13	16	16	10	16	10	0	0	0	1	4		6.6	26
26-Dec	3	Z	2	8	3	5	0	1	1	2	5	7	6	5	4	2	0	2	0	1	3	8	7	5	3.5	8
27-Dec	8	11	Z	10	1	0	0	0	3	10	14	16	12	11	11	24	20	14	1	0	5	77	9	1	11.3	77
28-Dec	8	1	1	Z	0	2	0	0	0	0	0	0	0	2	1	1	2	0	0	0	0	13	8	8	2.0	13
29-Dec	17	22	30	37	Z	60	61	37	17	23	29	23	51	34	67	29	4	0	0	0	17	51	42	40	30.0	67
30-Dec	39	40	26	21	28	Z	5	0	0	2	8	18	6	3	2	1	0	0	0	1	38	7	0	1	10.7	40
31-Dec	Z	7	1	6	5	7	13	13	13	18	23	25	2	3	3	1	0	1	1	1	0	0	0	0	6.3	25
																			Diurnal Average							
																			Diurnal Maximum							
Z - zerospan																			C - Calibration						M - Maintenance	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Shell Muskeg River - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	596	84.66	84.66
21 - 40	87	12.36	97.02
41 - 80	17	2.41	99.43
81 - 159	4	0.57	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Shell Muskeg River - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	16	25	41	28	19	5	7	26	137	108	43	28	41	29	26	16	595
21 - 40	2	2	0	4	2	1	4	5	17	28	4	5	4	2	1	5	86
41 - 80	1	0	0	2	0	1	0	1	1	3	0	1	2	1	1	3	17
81 - 159	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	4
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	19	29	41	35	21	7	11	32	155	139	47	34	47	32	28	25	702

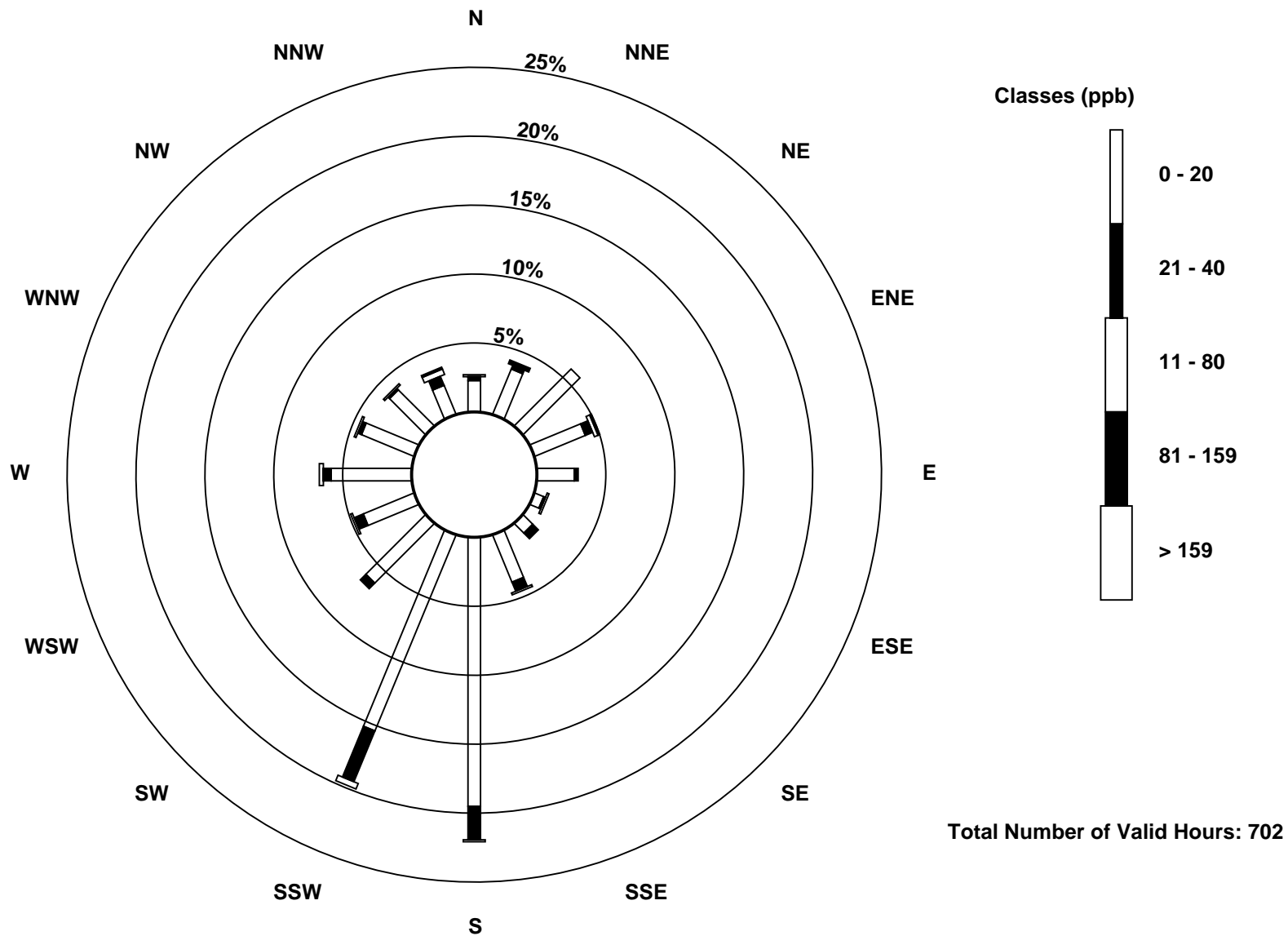
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

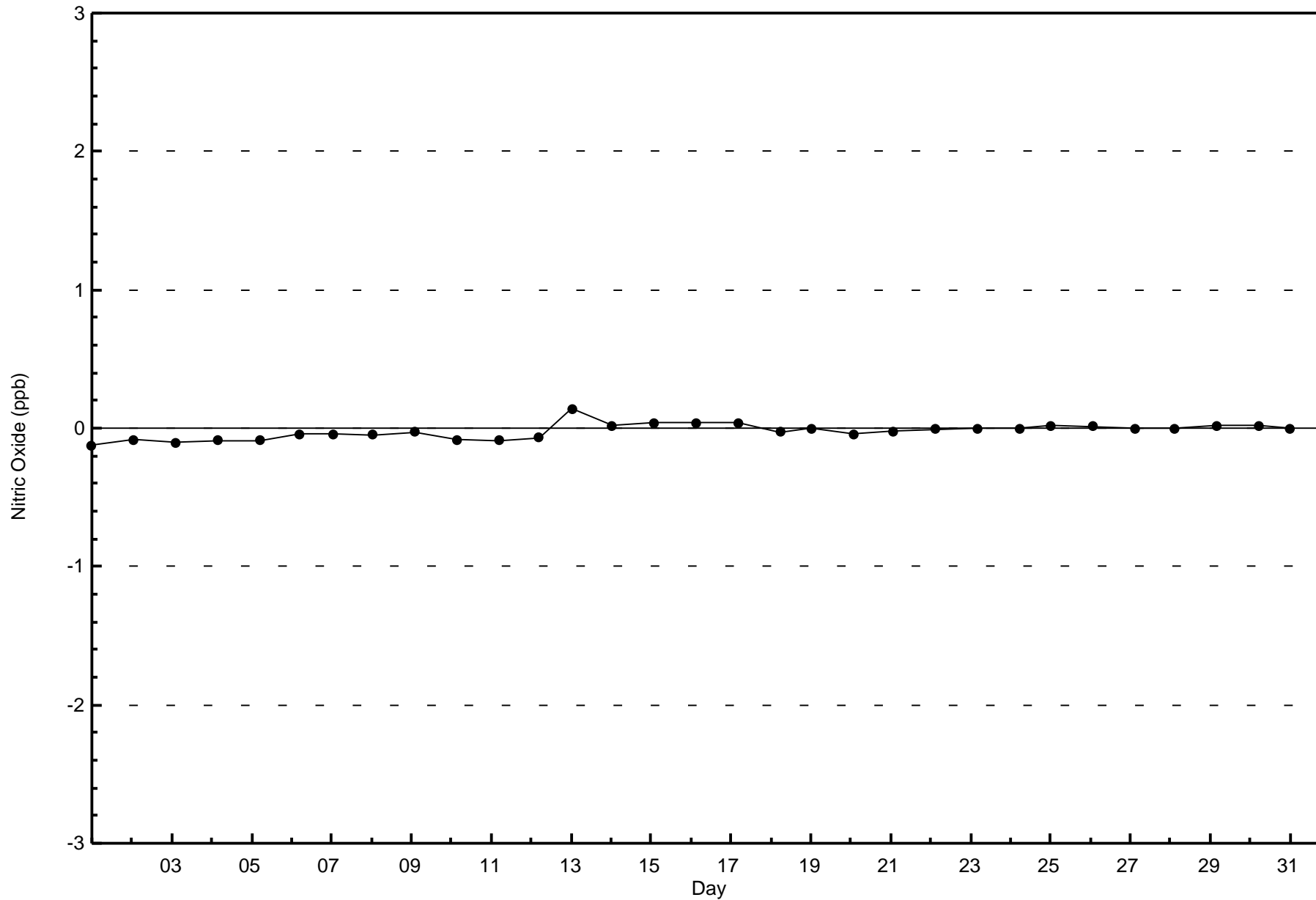
Nitric Oxide (NO) - ppb
Shell Muskeg River (AMS 16)

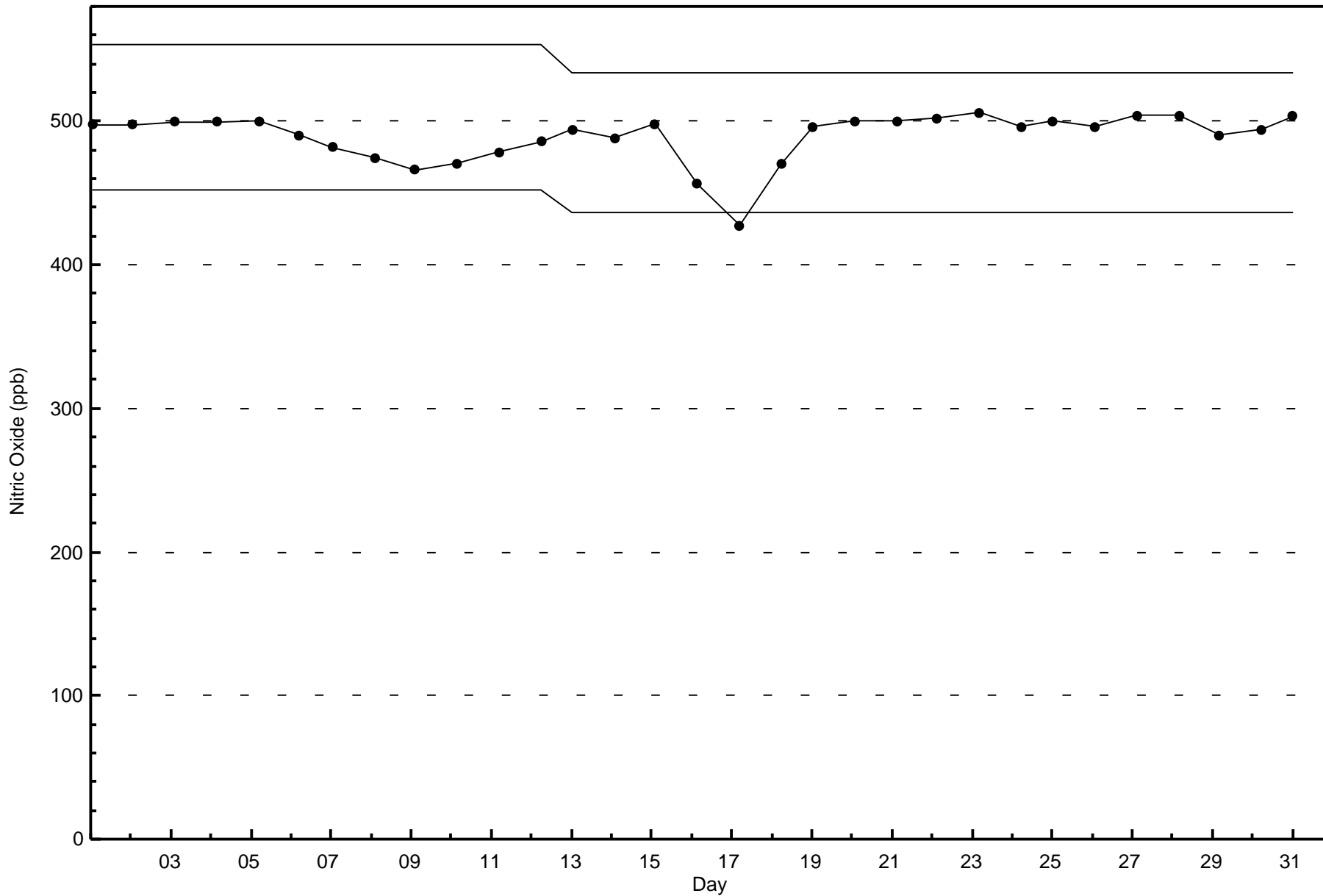




Wood Buffalo Environmental Association
Zero Responses

Nitric Oxide (NO) - ppb
Shell Muskeg River - December 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Shell Muskeg River - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 47 ppb on Dec 15 05:00	Maximum Daily Average: 32.1 ppb on Dec 14		Hours of Data:	704
Minimum Value: 0 ppb on Dec 28 09:00	Minimum Daily Average: 5.0 ppb on Dec 1		Hours of Missing Data:	40
Maximum Diurnal Average: 18.6 ppb at hour 17	Minimum Diurnal Average: 13.3 ppb at hour 12		Hours of Calibration:	38
Monthly Average: 16.1 ppb	Percentiles: P ₁ = 0 P ₁₀ = 4 Q ₁ = 8 Median = 16 Q ₃ = 23 P ₉₀ = 27 P ₉₉ = 38		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	2	3	3	3	2	1	2	3	3	4	4	4	5	4	5	8	7	6	8	10	8	11	11	5.0	11
2-Dec	11	Z	9	11	10	10	11	11	13	11	9	8	3	2	4	8	7	4	4	9	14	8	6	6	8.3	14
3-Dec	5	9	Z	13	11	13	9	9	9	7	8	7	7	6	8	7	9	8	9	5	7	7	10	4	8.1	13
4-Dec	2	18	9	Z	9	8	12	11	11	10	7	18	21	26	19	20	20	15	11	15	18	22	13	12	14.1	26
5-Dec	10	11	18	14	Z	12	7	6	4	6	6	4	2	3	3	2	3	2	1	0	0	1	3	2	5.3	18
6-Dec	4	3	4	6	8	Z	13	30	24	15	10	14	21	20	15	21	16	12	12	10	13	13	11	12	13.3	30
7-Dec	Z	16	12	12	12	10	8	10	15	10	10	10	22	14	29	29	24	31	12	13	12	5	4	2	13.9	31
8-Dec	1	Z	3	1	5	18	15	4	14	28	8	3	2	19	17	25	26	25	20	17	18	21	21	22	14.5	28
9-Dec	26	26	Z	24	23	25	26	27	27	25	21	18	16	15	17	18	25	27	27	27	25	26	27	24	23.6	27
10-Dec	23	21	22	Z	20	25	24	25	26	21	18	19	16	13	15	20	24	23	25	26	22	24	23	19	21.5	26
11-Dec	19	10	4	2	Z	5	4	5	5	4	2	2	2	3	4	5	17	13	16	9	16	25	11	16	8.8	25
12-Dec	37	37	45	21	13	Z	10	6	6	30	C	C	C	C	C	C	C	22	18	21	30	26	17	10	--	45
13-Dec	Z	9	7	17	23	22	26	23	16	27	16	16	24	32	37	32	34	19	34	27	23	13	21	37	23.2	37
14-Dec	29	Z	18	16	39	34	34	34	38	40	36	31	30	32	36	37	37	36	32	30	31	37	38	15	32.1	40
15-Dec	10	18	Z	23	47	32	9	4	18	15	9	8	12	10	7	6	17	23	15	6	5	5	14	26	14.6	47
16-Dec	24	27	28	Z	23	20	18	20	19	18	22	24	27	22	18	21	32	31	31	29	25	25	27	24	23.9	32
17-Dec	24	22	25	23	Z	26	24	24	23	22	21	18	16	17	16	19	20	15	15	18	22	19	19	18	20.2	26
18-Dec	18	20	20	19	15	Z	16	17	16	22	19	21	20	29	38	40	25	21	20	18	20	17	19	21	21.2	40
19-Dec	Z	24	25	26	32	30	23	26	26	25	22	21	33	31	30	33	26	18	21	4	3	5	4	13	21.8	33
20-Dec	20	Z	28	25	25	26	29	18	6	13	11	3	3	4	3	5	12	17	20	12	8	7	12	10	13.7	29
21-Dec	11	14	Z	14	9	6	3	4	11	13	10	9	7	3	2	3	8	8	6	6	9	9	13	22	8.8	22
22-Dec	29	24	29	Z	7	3	23	9	10	6	13	M	M	2	9	8	7	5	9	8	8	5	5	7	10.7	29
23-Dec	7	5	4	7	Z	5	4	8	7	7	7	5	8	2	4	5	11	25	21	18	19	19	20	19	10.2	25
24-Dec	19	23	18	16	17	Z	17	19	17	14	13	16	16	16	23	28	30	30	31	31	29	25	22	24	21.4	31
25-Dec	Z	16	13	17	17	15	15	16	23	22	19	16	16	18	21	23	28	22	5	6	14	17	25	29	17.9	29
26-Dec	28	Z	25	28	27	27	21	21	22	16	15	13	12	11	12	14	16	21	20	24	27	27	26	27	20.8	28
27-Dec	29	28	Z	29	27	24	22	23	27	25	21	19	16	17	20	28	27	26	14	9	8	37	22	14	22.2	37
28-Dec	21	4	3	Z	0	4	1	1	0	0	0	0	1	5	7	9	16	7	8	14	11	17	17	17	7.0	21
29-Dec	21	24	25	27	Z	30	32	29	27	27	26	24	30	27	33	27	15	9	14	17	22	30	28	27	24.8	33
30-Dec	26	26	25	23	23	Z	13	6	6	9	14	15	10	8	8	9	10	6	3	7	27	16	9	8	13.3	27
31-Dec	Z	24	20	24	22	22	22	21	23	21	20	20	5	10	12	7	13	22	23	21	3	2	3	2	15.7	24

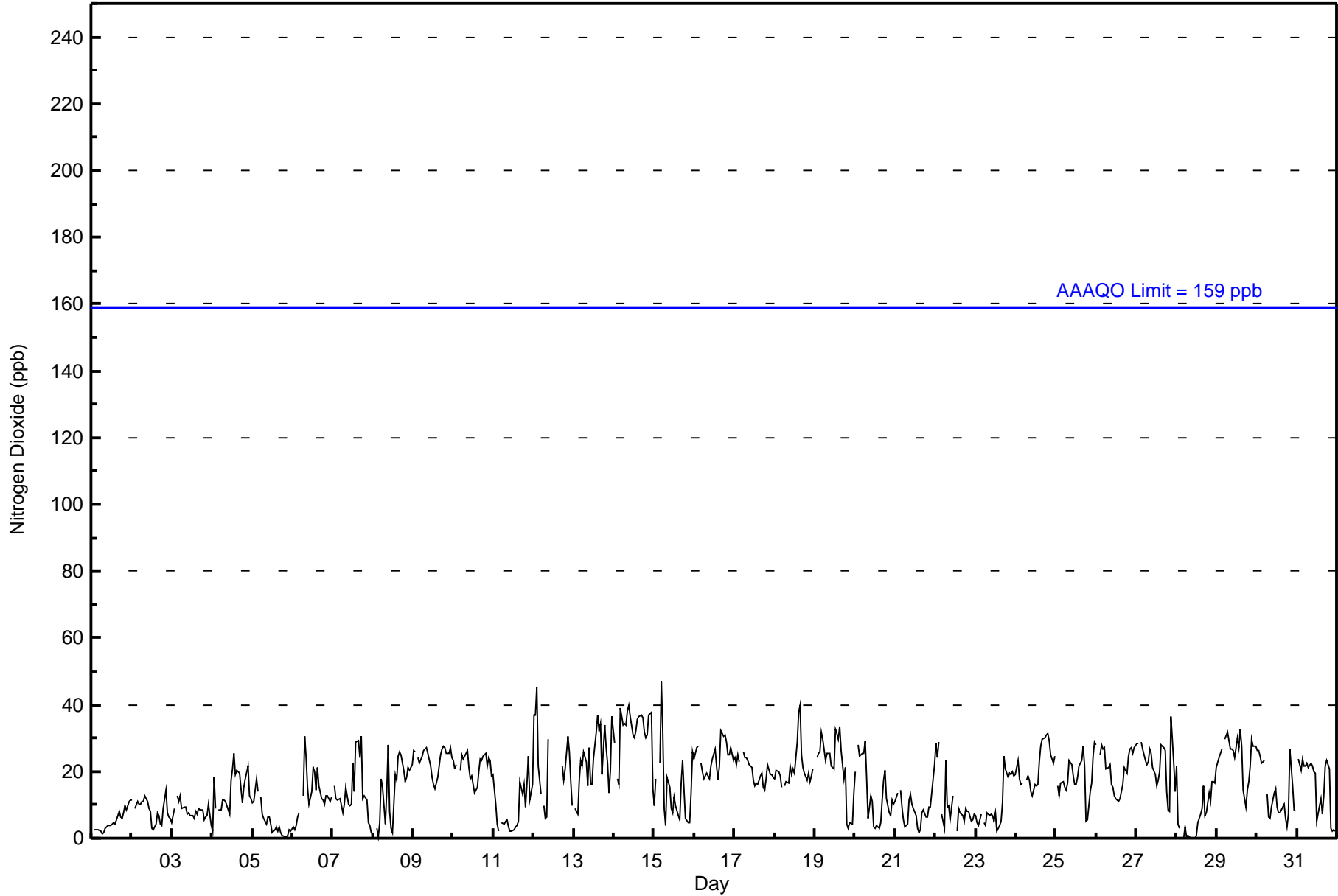
18.1	17.7	17.0	16.9	17.9	17.3	15.8	15.1	15.9	16.6	13.9	13.3	13.8	14.0	15.6	17.1	18.6	17.7	16.1	15.0	16.0	16.6	16.1	16.1	Diurnal Average
37	37	45	29	47	34	34	34	38	40	36	31	33	32	38	40	37	36	34	31	31	37	38	37	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	452	64.20	64.20
21 - 40	250	35.51	99.72
41 - 80	2	0.28	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	12	26	39	26	14	4	7	24	89	76	26	23	35	22	18	10	451
21 - 40	7	3	2	9	7	3	4	8	66	63	21	11	12	10	9	14	249
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	19	29	41	35	21	7	11	32	155	139	47	34	47	32	28	25	702

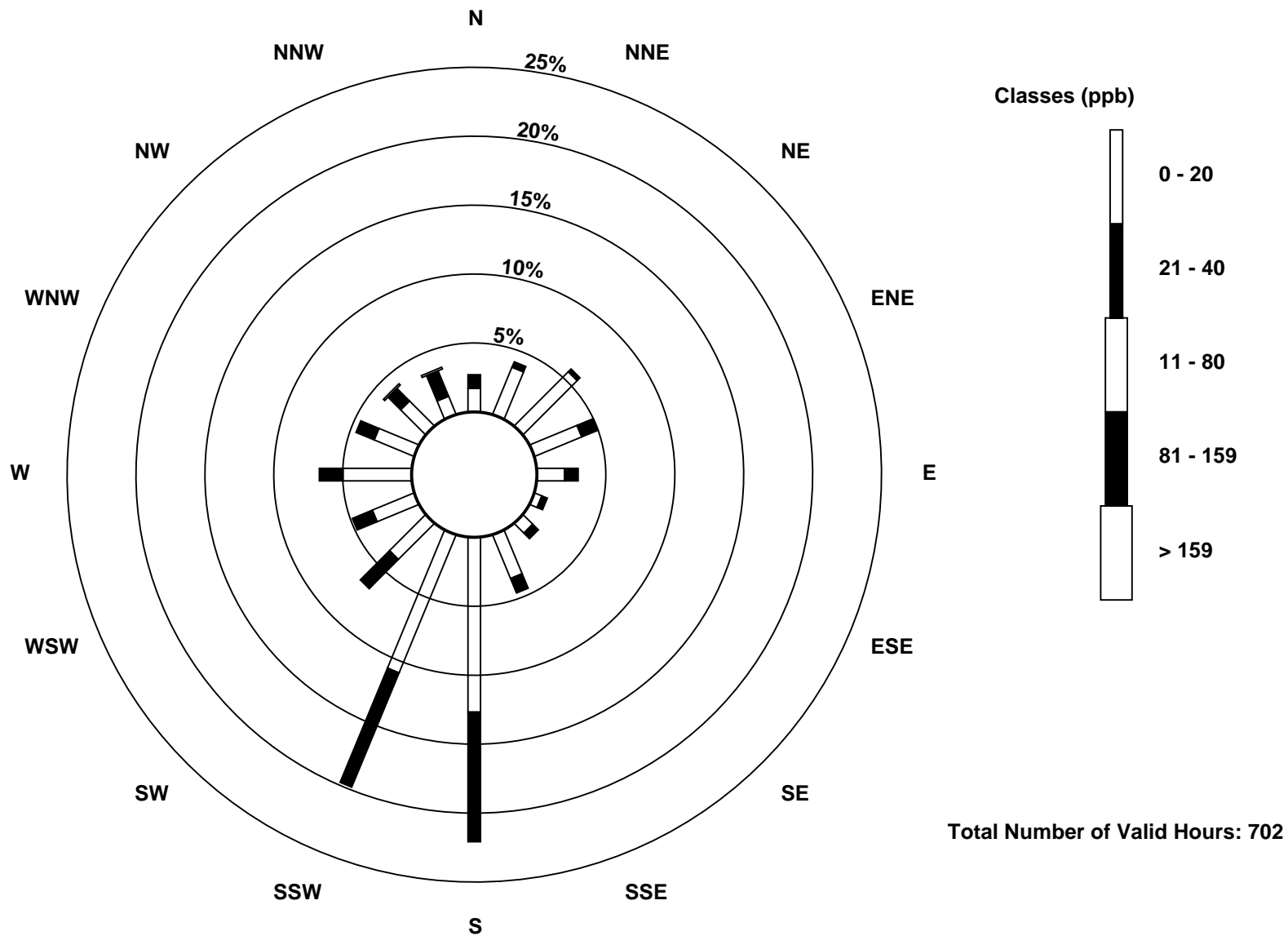
Total Number of Valid Hours: 702

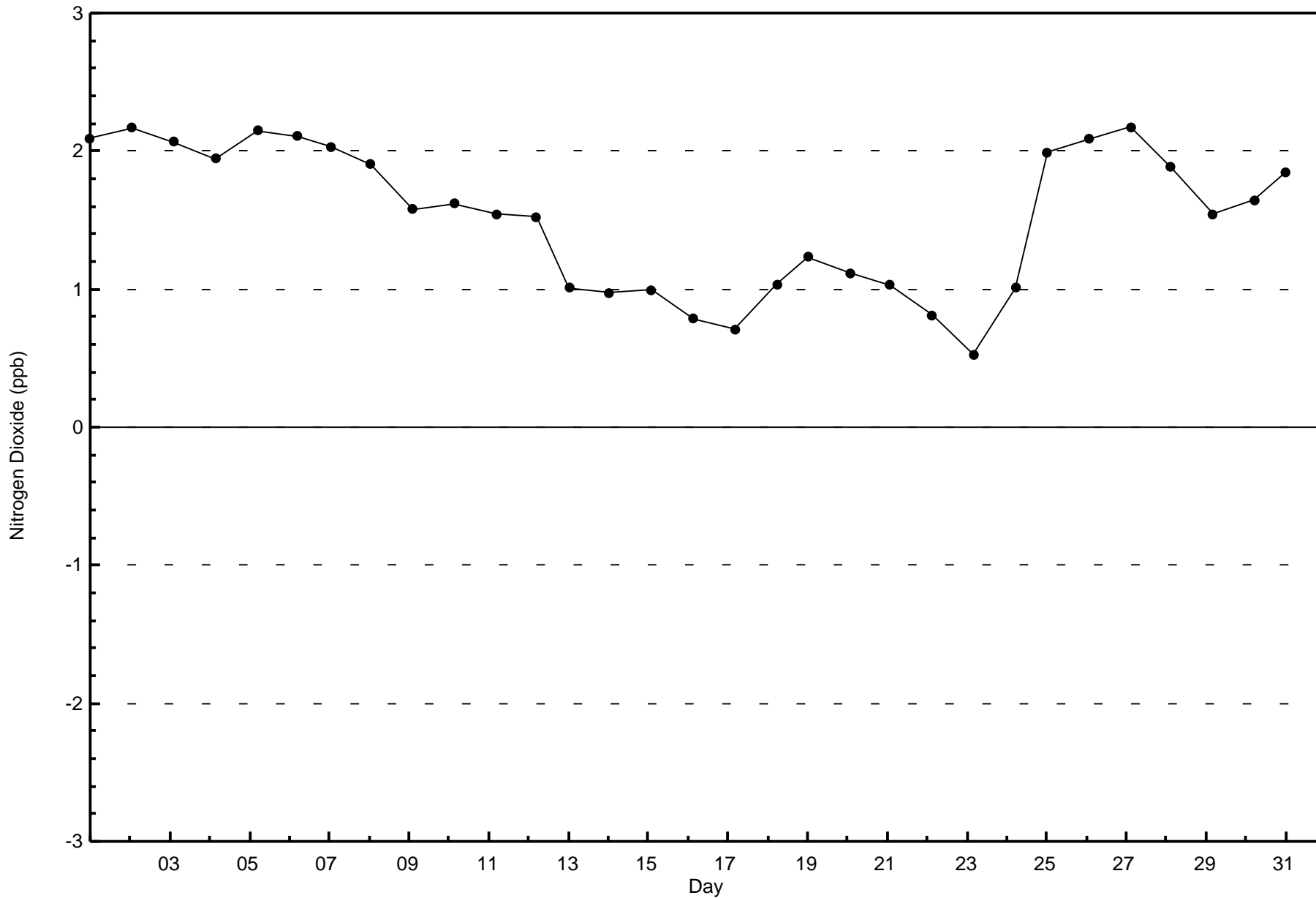
Total Number of Hours: 744

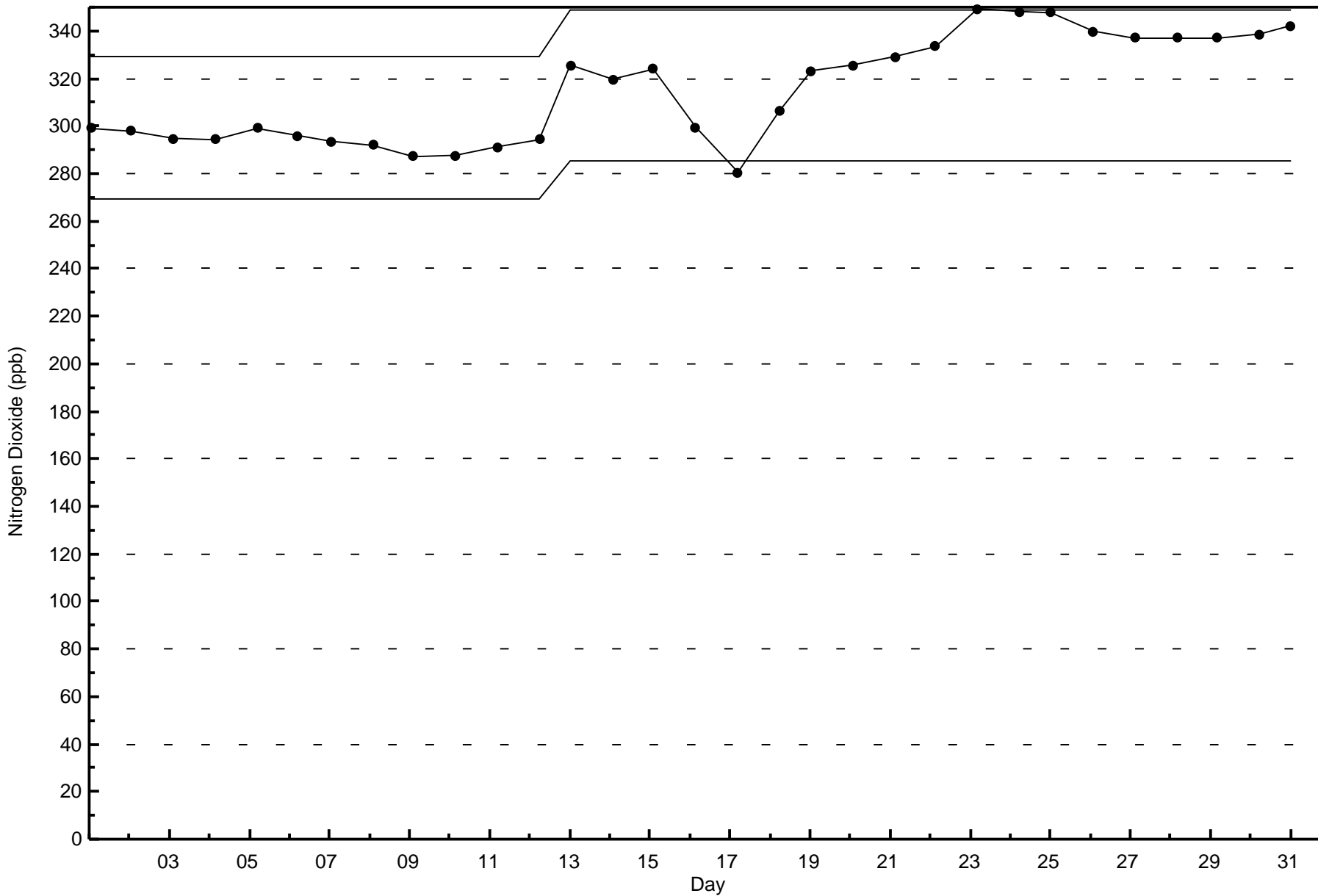


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

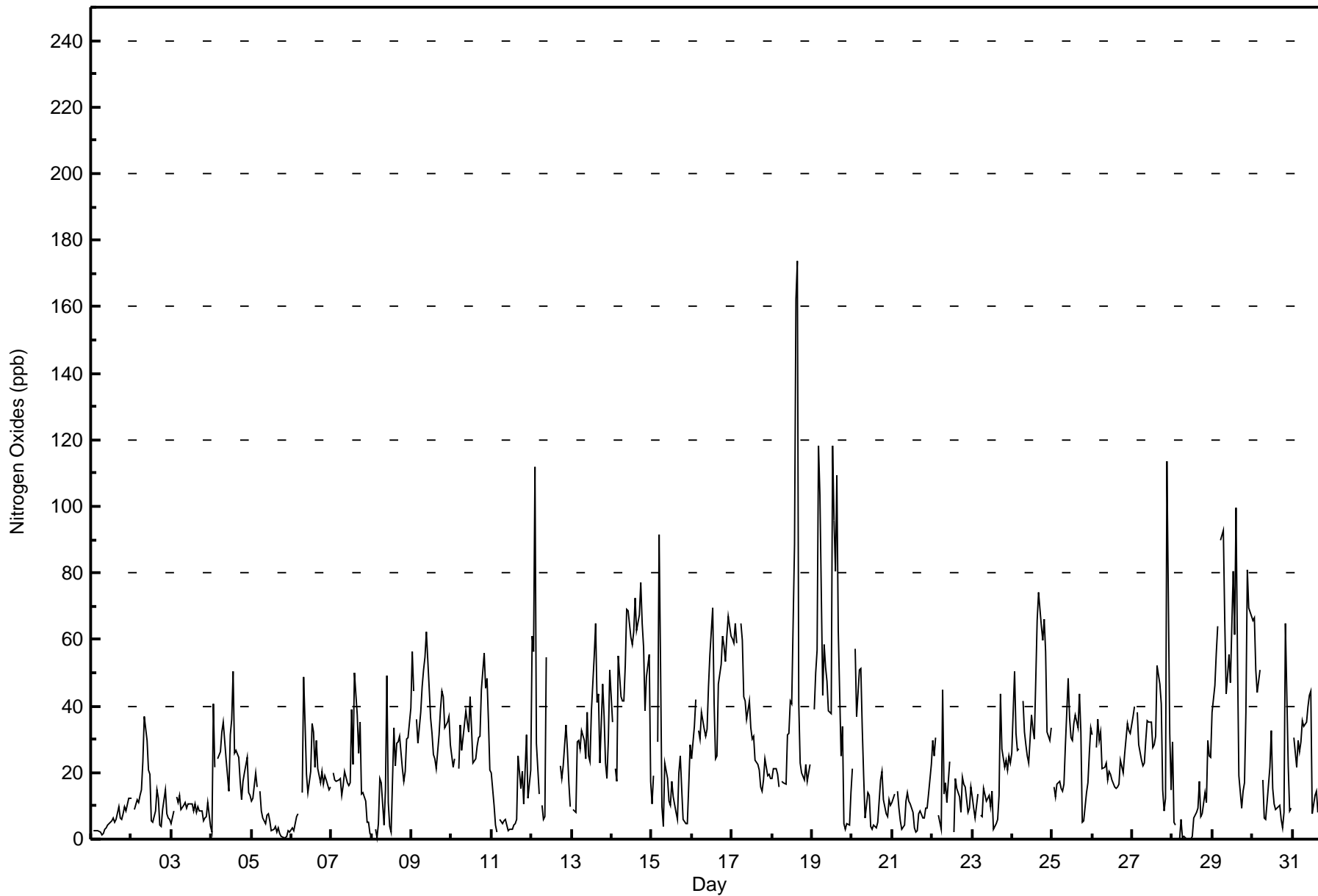
Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - December 2016

Maximum Value: 174 ppb on Dec 18 16:00		Maximum Daily Average: 54.8 ppb on Dec 29		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 28 09:00		Minimum Daily Average: 5.5 ppb on Dec 1		Hours of Data: 704																																													
Maximum Diurnal Average: 30.9 ppb at hour 15		Minimum Diurnal Average: 20.7 ppb at hour 20		Hours of Missing Data: 40																																													
Monthly Average: 25.6 ppb		Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 10 Median = 21 O ₃ = 35 P ₉₀ = 55 P ₉₉ = 108		Hours of Calibration: 38																																													
				Percent Operational Time: 99.7																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	2	3	2	3	2	1	2	3	3	4	5	5	6	5	6	10	7	6	8	10	9	12	12	5.5	12																							
2-Dec	12	Z	9	12	11	13	15	23	37	30	21	20	6	5	8	15	12	4	4	9	15	8	7	6	13.0	37																							
3-Dec	5	9	Z	13	11	13	9	10	11	9	10	11	10	8	11	8	10	8	8	5	7	7	11	4	9.1	13																							
4-Dec	2	41	22	Z	24	26	32	35	30	24	14	31	36	50	26	27	24	17	12	17	20	25	14	13	24.4	50																							
5-Dec	11	12	20	16	Z	15	8	6	5	7	8	6	2	3	4	2	3	2	1	0	0	1	3	2	6.0	20																							
6-Dec	4	3	5	7	8	Z	14	49	35	20	14	20	35	32	22	30	21	17	20	17	19	18	15	16	19.1	49																							
7-Dec	Z	20	18	17	18	18	13	16	20	17	16	17	39	22	50	37	26	35	13	14	12	5	5	2	19.6	50																							
8-Dec	1	Z	3	1	5	18	17	4	15	49	11	4	2	33	22	29	29	31	21	17	20	30	31	39	18.8	49																							
9-Dec	56	44	Z	36	29	38	46	51	55	62	45	36	32	25	24	21	31	39	44	43	34	35	37	28	38.8	62																							
10-Dec	25	22	24	Z	21	34	27	30	39	35	32	43	34	23	24	28	30	31	45	56	45	48	36	21	32.7	56																							
11-Dec	20	10	4	2	Z	6	5	6	6	4	2	3	3	4	5	6	25	15	20	11	21	31	12	21	10.5	31																							
12-Dec	61	57	112	29	13	Z	10	6	7	55	C	C	C	C	C	C	C	22	18	22	34	27	17	10	--	112																							
13-Dec	Z	9	8	29	29	27	32	30	24	38	25	23	38	55	65	41	44	23	47	37	23	18	29	51	32.5	65																							
14-Dec	35	Z	21	17	55	43	41	42	52	69	69	61	59	62	72	63	67	77	65	57	38	49	56	17	51.6	77																							
15-Dec	11	19	Z	29	92	53	10	4	23	18	11	10	18	13	8	6	20	25	15	6	5	5	16	28	19.3	92																							
16-Dec	24	34	42	Z	32	30	38	33	31	33	46	55	69	41	24	25	47	53	61	58	53	61	67	61	44.3	69																							
17-Dec	60	59	65	59	Z	65	60	43	42	36	42	34	30	31	24	23	21	16	15	18	24	19	20	18	35.7	65																							
18-Dec	18	21	21	20	16	Z	18	17	17	31	32	41	40	88	162	174	41	23	20	18	22	17	20	22	39.1	174																							
19-Dec	Z	39	50	57	118	103	43	59	52	47	39	38	118	96	81	109	63	25	34	5	3	5	4	14	52.2	118																							
20-Dec	21	Z	57	37	51	51	34	19	6	14	13	4	3	4	3	5	12	18	21	12	7	7	12	10	18.3	57																							
21-Dec	11	13	Z	14	9	6	3	4	11	14	12	11	8	3	2	3	8	8	6	6	9	9	13	23	9.0	23																							
22-Dec	30	25	30	Z	7	3	45	13	17	11	23	M	M	2	18	15	13	8	19	16	16	8	10	16	16.4	45																							
23-Dec	13	9	6	14	Z	7	7	15	11	12	13	10	15	3	5	6	13	44	27	22	24	21	25	23	15.0	44																							
24-Dec	26	50	32	27	27	Z	42	32	28	25	23	37	33	30	47	65	74	64	60	66	56	32	30	33	40.9	74																							
25-Dec	Z	16	13	17	17	15	15	17	28	48	37	31	29	35	37	34	44	32	5	6	14	17	26	33	24.5	48																							
26-Dec	31	Z	28	36	30	32	21	22	23	18	20	20	18	16	15	16	16	24	20	26	30	35	33	32	24.3	36																							
27-Dec	37	40	Z	38	28	24	22	23	30	36	35	35	28	28	31	52	47	40	15	9	12	114	32	15	33.5	114																							
28-Dec	29	5	4	Z	0	6	1	1	0	0	0	0	1	6	8	9	17	7	8	14	11	30	25	25	9.0	30																							
29-Dec	38	46	56	64	Z	90	93	66	44	49	55	47	81	62	100	56	19	9	14	17	38	81	70	67	54.8	100																							
30-Dec	66	67	51	44	51	Z	18	6	6	11	22	33	15	11	9	10	10	6	3	8	65	22	9	9	24.0	67																							
31-Dec	Z	30	22	30	26	29	36	34	35	40	43	44	8	13	15	8	13	22	25	22	3	2	3	2	21.9	44																							
																								25.9	27.0	27.9	25.6	28.1	29.5	25.0	23.2	23.9	28.0	24.6	25.1	28.1	27.1	30.9	30.9	27.0	24.3	22.3	20.7	22.3	25.6	22.5	21.7	Diurnal Average	
																								66	67	112	64	118	103	93	66	55	69	69	61	118	96	162	174	74	77	65	66	65	114	70	67	Diurnal Maximum	
Z - zerospan		C - Calibration				M - Maintenance																																											



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	351	49.86	49.86
21 - 40	220	31.25	81.11
41 - 80	116	16.48	97.59
81 - 159	12	1.70	99.29
> 159	2	0.28	99.57

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	17	37	25	11	2	5	20	68	53	18	19	29	21	12	7	350
21 - 40	10	10	4	1	6	3	2	5	57	52	25	9	11	7	9	9	220
11 - 80	2	0	0	6	4	1	4	6	30	33	4	6	5	3	6	5	115
81 - 159	1	0	0	3	0	1	0	1	0	1	0	0	0	1	1	3	12
> 159	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Totals	19	29	41	35	21	7	11	32	155	139	47	34	45	32	28	24	699

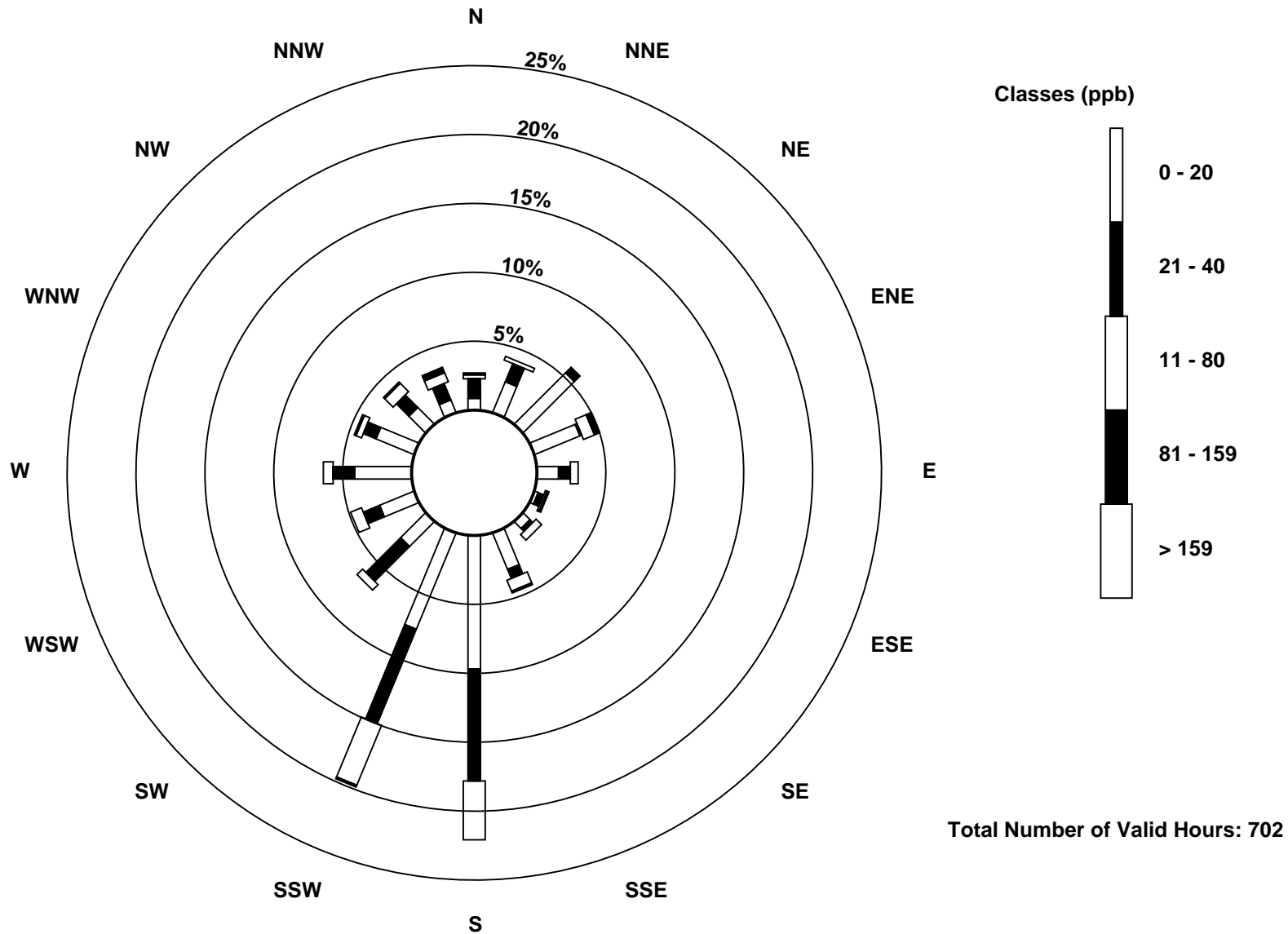
Total Number of Valid Hours: 702

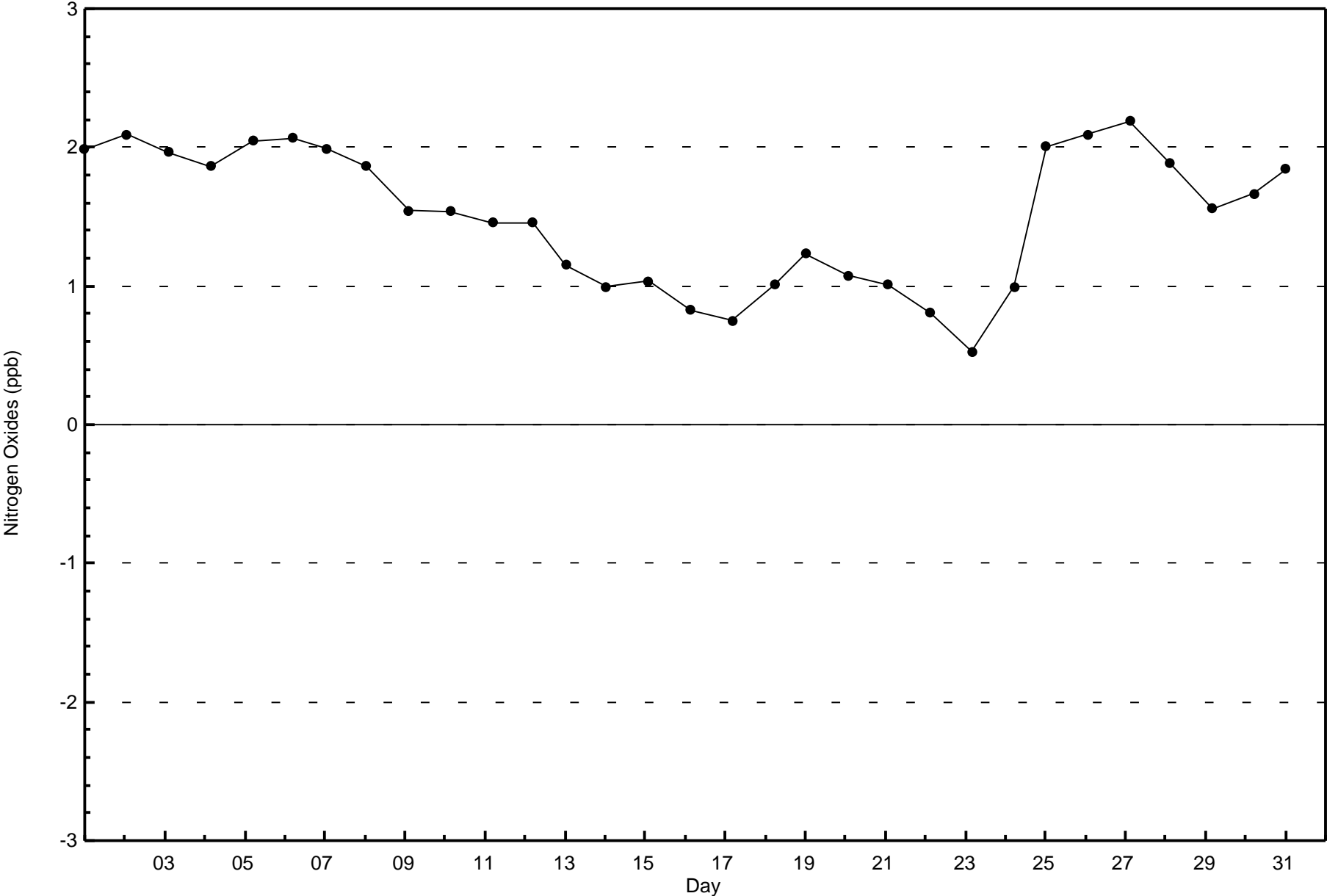
Total Number of Hours: 744

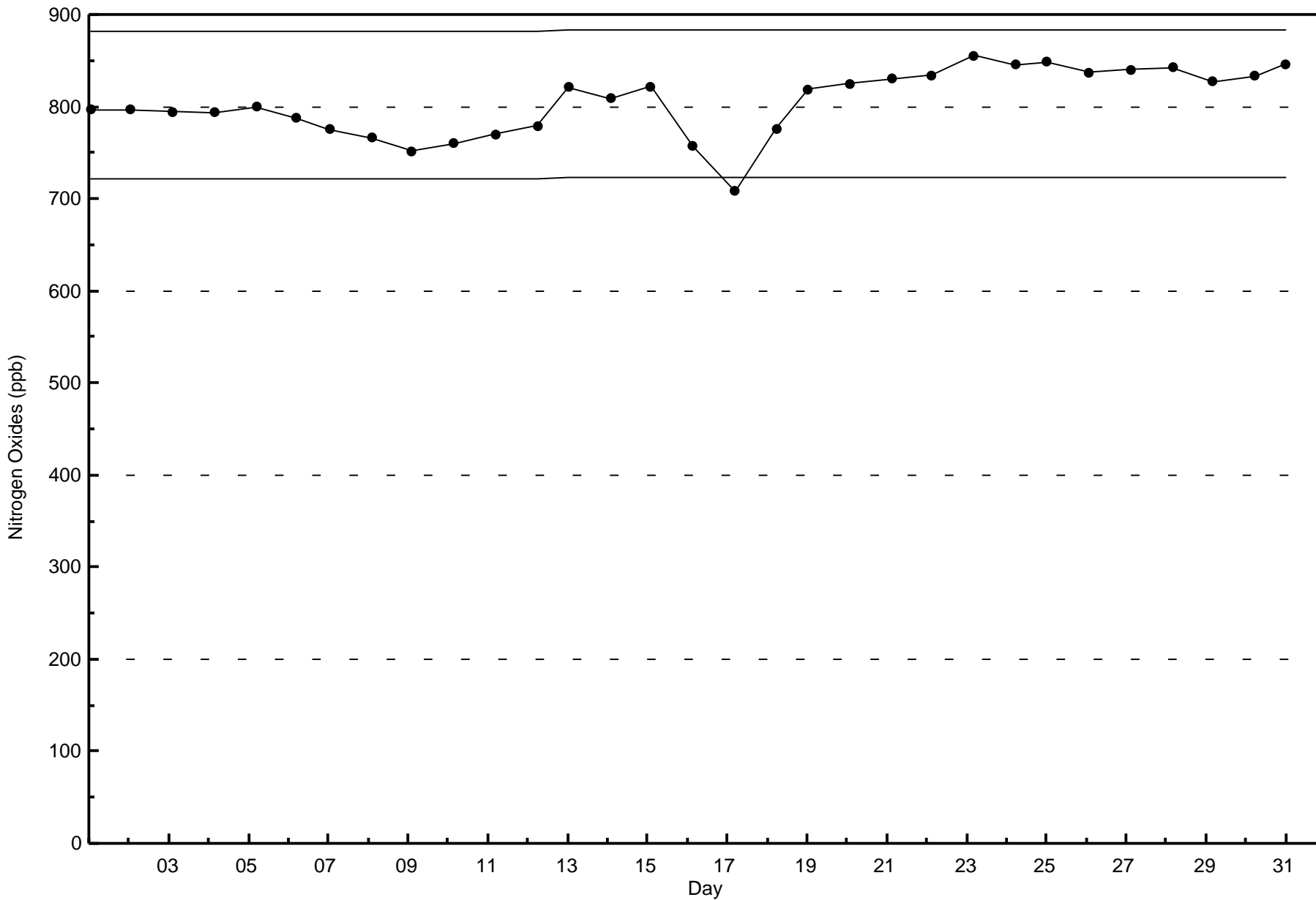


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

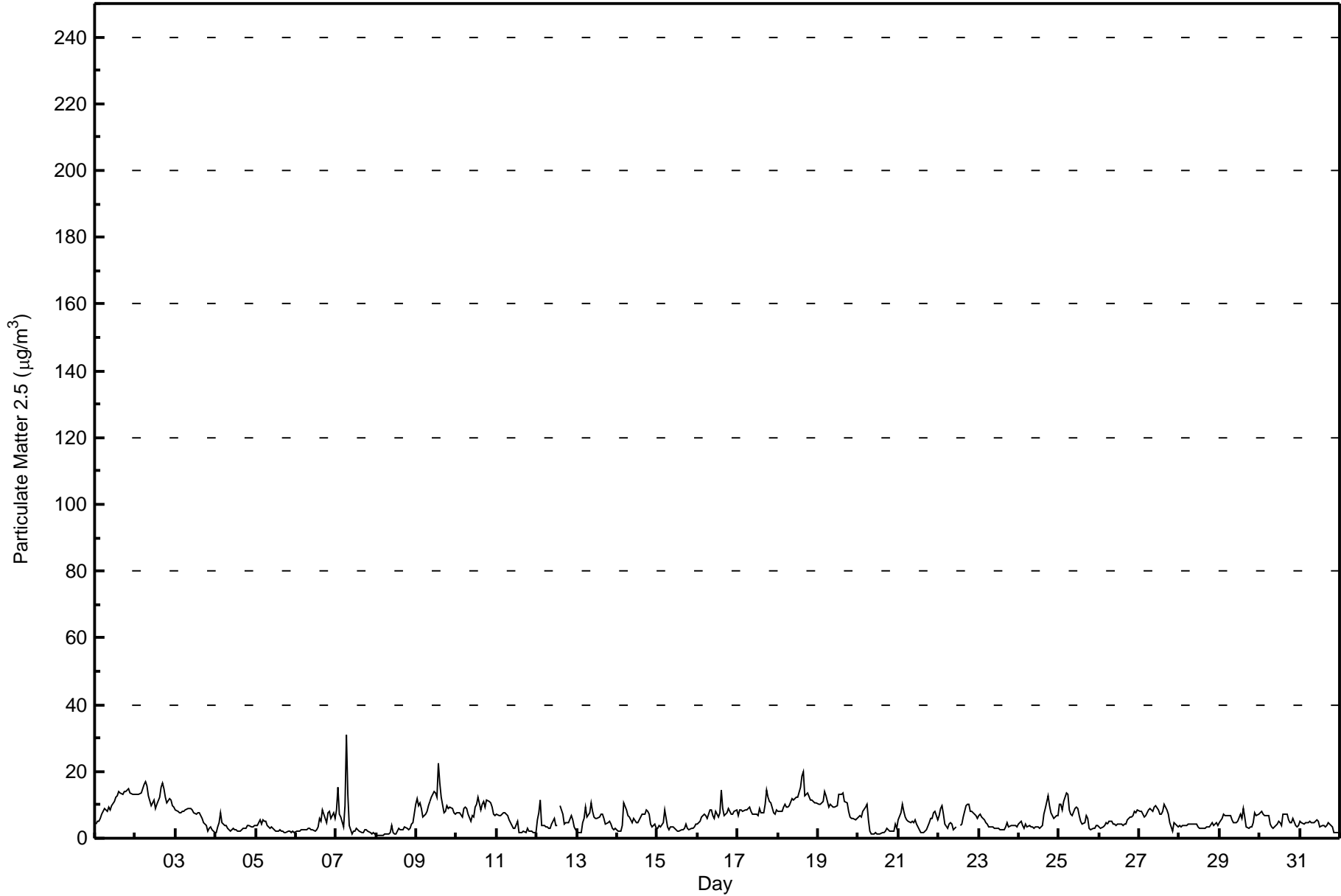
Shell Muskeg River - December 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 31.0 µg/m ³ on Dec 7 07:00 Minimum Value: 0.7 µg/m ³ on Dec 8 02:00 Maximum Diurnal Average: 7.1 µg/m ³ at hour 7 Monthly Average: 6.16 µg/m ³		Maximum Daily Average: 12.7 µg/m ³ on Dec 2 Minimum Daily Average: 2.5 µg/m ³ on Dec 8 Minimum Diurnal Average: 5.3 µg/m ³ at hour 24 Percentiles: P ₁ = 1.2 P ₁₀ = 2.2 Q ₁ = 3.4 Median = 5.4 Q ₃ = 8.2 P ₉₀ = 10.9 P ₉₉ = 16.5		Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 1 Percent Operational Time: 99.7																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	4.2	5.1	4.9	6.1	7.2	8.7	8.5	8.3	9.3	8.6	9.6	10.9	12.2	12.8	14.0	13.5	13.1	13.9	14.0	14.5	14.8	13.4	13.2	13.1	10.6	14.8																							
2-Dec	13.0	13.1	13.1	13.7	14.7	16.3	17.0	15.6	12.9	9.7	10.5	11.2	8.9	10.1	12.5	15.4	16.6	14.9	12.1	10.7	11.7	11.4	9.6	9.2	12.7	17.0																							
3-Dec	8.5	8.1	7.5	7.6	8.1	8.1	8.6	8.7	8.8	8.7	8.5	7.7	7.3	7.5	7.5	6.6	6.1	4.5	3.8	2.3	3.1	3.6	2.5	1.6	6.5	8.8																							
4-Dec	1.6	3.4	4.9	7.4	4.5	3.9	3.8	3.0	2.6	2.1	3.2	2.6	2.5	2.2	2.1	2.1	2.8	2.9	3.1	3.8	3.8	3.5	3.5	3.8	3.3	7.4																							
5-Dec	3.8	3.8	5.4	4.3	5.7	5.0	5.1	3.9	3.1	3.4	2.8	2.5	2.3	2.2	2.4	2.1	2.3	1.9	1.9	2.0	2.1	1.9	1.9	1.7	3.1	5.7																							
6-Dec	1.9	2.3	2.1	2.5	2.5	2.4	2.7	2.8	2.8	2.6	2.6	2.2	2.7	3.5	6.0	5.3	8.7	6.1	4.8	7.6	7.9	5.7	7.8	6.0	4.2	8.7																							
7-Dec	8.6	15.3	7.1	6.5	3.5	9.8	31.0	13.2	3.8	1.4	2.1	2.0	3.0	2.4	2.0	1.8	1.8	2.5	2.6	2.3	1.5	1.3	1.6	1.2	5.4	31.0																							
8-Dec	1.0	0.7	0.8	0.8	0.9	1.2	1.4	1.2	1.5	3.7	1.9	1.4	1.2	3.2	2.7	2.6	2.7	3.6	2.9	2.4	2.8	4.2	4.5	10.2	2.5	10.2																							
9-Dec	12.1	9.9	10.8	8.7	6.2	7.1	8.2	9.8	10.9	12.3	14.1	13.6	12.5	22.5	16.5	12.5	7.7	8.1	9.8	9.1	9.1	8.9	7.6	7.3	10.6	22.5																							
10-Dec	7.6	7.6	7.8	6.3	8.7	9.3	8.8	7.2	5.0	6.6	6.3	9.1	10.2	12.3	8.5	10.1	11.2	9.5	11.2	11.0	10.5	9.5	7.4	6.6	8.7	12.3																							
11-Dec	7.3	6.9	6.8	7.3	7.7	7.6	6.7	5.6	4.6	3.7	3.1	2.9	4.9	1.7	1.6	1.5	1.9	1.7	3.1	2.2	1.9	2.3	1.9	1.8	4.0	7.7																							
12-Dec	5.4	7.4	11.6	4.0	3.7	3.3	3.3	3.0	3.0	4.1	6.0	3.7	3.9	C	9.9	7.2	4.2	4.8	4.5	4.7	6.8	5.3	3.5	2.7	5.0	11.6																							
13-Dec	2.0	1.9	1.9	4.6	5.9	9.5	6.5	7.4	10.6	8.1	6.4	5.9	6.1	6.2	7.1	7.0	5.9	4.1	4.6	5.2	4.1	3.0	2.6	2.9	5.4	10.6																							
14-Dec	2.2	2.0	2.0	3.9	10.7	8.4	6.6	6.4	5.6	4.7	6.0	4.8	4.8	5.5	6.5	7.4	7.3	8.7	7.9	7.1	4.2	3.5	4.1	2.8	5.5	10.7																							
15-Dec	3.0	3.9	3.5	4.6	8.6	6.0	3.3	2.7	3.2	3.4	2.8	2.6	2.1	2.3	2.4	2.4	3.1	4.2	3.0	2.7	2.8	3.2	3.5	4.2	3.5	8.6																							
16-Dec	4.2	5.0	6.2	6.8	7.0	6.7	5.9	8.5	8.4	6.7	6.1	8.0	6.3	7.8	14.5	9.0	7.0	7.7	8.8	8.0	7.0	7.0	7.9	8.6	7.5	14.5																							
17-Dec	6.7	8.3	8.7	8.2	8.7	8.5	8.8	9.3	8.1	7.3	7.2	7.3	6.8	9.0	7.5	7.4	10.1	14.6	12.2	10.9	10.8	7.7	7.1	8.4	8.7	14.6																							
18-Dec	8.1	8.1	7.9	9.4	10.1	9.5	9.3	9.8	11.9	11.5	12.0	12.2	12.2	15.0	18.7	19.8	12.9	13.0	13.4	11.5	11.3	10.8	10.6	10.5	11.6	19.8																							
19-Dec	10.0	10.1	10.6	11.2	14.2	12.7	9.5	10.2	9.7	9.3	9.1	9.6	13.2	13.2	13.0	13.5	11.1	10.7	7.9	6.4	5.8	5.8	5.6	5.9	9.9	14.2																							
20-Dec	6.5	6.8	6.5	8.0	9.5	10.1	5.6	2.3	1.2	1.5	1.8	1.2	1.1	1.4	1.6	1.9	2.2	2.8	2.7	2.3	2.2	2.2	4.4	2.9	3.7	10.1																							
21-Dec	5.6	7.7	10.4	7.9	6.5	5.5	5.0	4.9	5.1	4.6	5.6	4.4	2.6	1.7	1.6	1.5	2.0	2.5	4.6	6.1	5.8	7.7	8.2	5.6	5.1	10.4																							
22-Dec	6.7	8.8	9.8	7.2	4.1	2.9	4.3	4.5	4.2	2.7	3.2	M	M	4.0	4.2	6.2	9.6	10.2	10.1	8.1	7.9	7.2	6.9	5.9	6.3	10.2																							
23-Dec	6.8	7.3	6.4	5.3	4.8	4.2	3.6	3.5	3.4	3.1	3.1	2.9	2.8	2.4	2.4	2.7	3.3	4.5	3.5	3.7	3.9	3.7	3.9	3.6	3.9	7.3																							
24-Dec	4.1	4.9	3.6	3.2	4.1	3.3	3.8	3.5	3.6	3.0	3.3	3.5	3.2	3.2	3.6	7.0	9.1	12.8	9.8	7.7	6.7	6.0	6.9	6.9	5.3	12.8																							
25-Dec	10.1	10.2	8.5	10.8	13.7	13.1	8.4	7.2	6.9	8.7	9.4	8.9	6.8	5.2	4.4	4.5	6.9	6.0	3.0	2.7	3.0	3.1	3.6	3.9	7.0	13.7																							
26-Dec	3.2	3.1	3.2	4.0	4.7	4.1	5.1	5.0	4.1	4.0	3.9	4.2	4.2	4.1	4.0	4.2	4.4	5.3	6.4	6.3	6.8	8.0	7.7	8.4	4.9	8.4																							
27-Dec	8.0	7.9	7.0	6.5	6.7	8.5	8.7	8.4	8.2	9.3	9.8	8.3	7.2	7.0	8.0	10.1	8.5	7.2	4.7	3.2	2.2	4.7	3.7	3.2	7.0	10.1																							
28-Dec	3.8	3.3	3.9	3.7	3.8	4.1	4.3	4.2	4.1	4.3	4.3	3.5	3.0	2.8	2.9	3.1	3.5	3.4	3.5	4.5	4.0	4.4	4.6	3.6	3.8	4.6																							
29-Dec	4.7	6.1	7.0	6.7	6.7	6.7	6.8	5.4	4.5	4.5	4.8	5.1	7.3	5.7	9.0	6.5	3.5	3.2	3.4	3.4	4.7	7.6	7.0	7.2	5.7	9.0																							
30-Dec	7.5	7.9	7.2	6.6	7.0	7.0	4.3	3.6	3.1	3.4	4.2	4.9	4.8	3.7	7.3	7.1	7.3	5.3	4.5	4.5	6.0	3.9	3.6	4.0	5.4	7.9																							
31-Dec	4.9	4.5	4.2	4.6	4.7	4.6	5.1	4.6	4.9	4.9	5.4	5.3	3.2	3.9	3.8	3.3	4.0	4.5	4.3	3.4	1.7	1.7	1.8	1.7	4.0	5.4																							
																								5.9	6.5	6.5	6.4	6.9	7.0	7.1	6.2	5.8	5.5	5.8	5.6	6.2	6.7	6.6	6.5	6.6	6.2	5.8	5.7	5.6	5.4	5.3	Diurnal Average		
																								13.0	15.3	13.1	13.7	14.7	16.3	31.0	15.6	12.9	12.3	14.1	13.6	13.2	22.5	18.7	19.8	16.6	14.9	14.0	14.5	14.8	13.4	13.2	13.1	Diurnal Maximum	
C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																	



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	369	49.80	49.80
6 - 15	358	48.31	98.11
16 - 25	8	1.08	99.19
26 - 80	1	0.13	99.33
> 81.0	0	0.00	99.33

Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	4	18	30	23	14	4	9	10	40	49	25	28	39	30	26	18	367
6 - 15	16	9	12	12	5	2	6	26	114	99	25	7	11	4	3	7	358
16 - 25	0	2	0	0	0	0	0	0	6	0	0	0	0	0	0	0	8
26 - 80	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	20	30	42	35	19	6	15	36	160	148	50	35	50	34	29	25	734

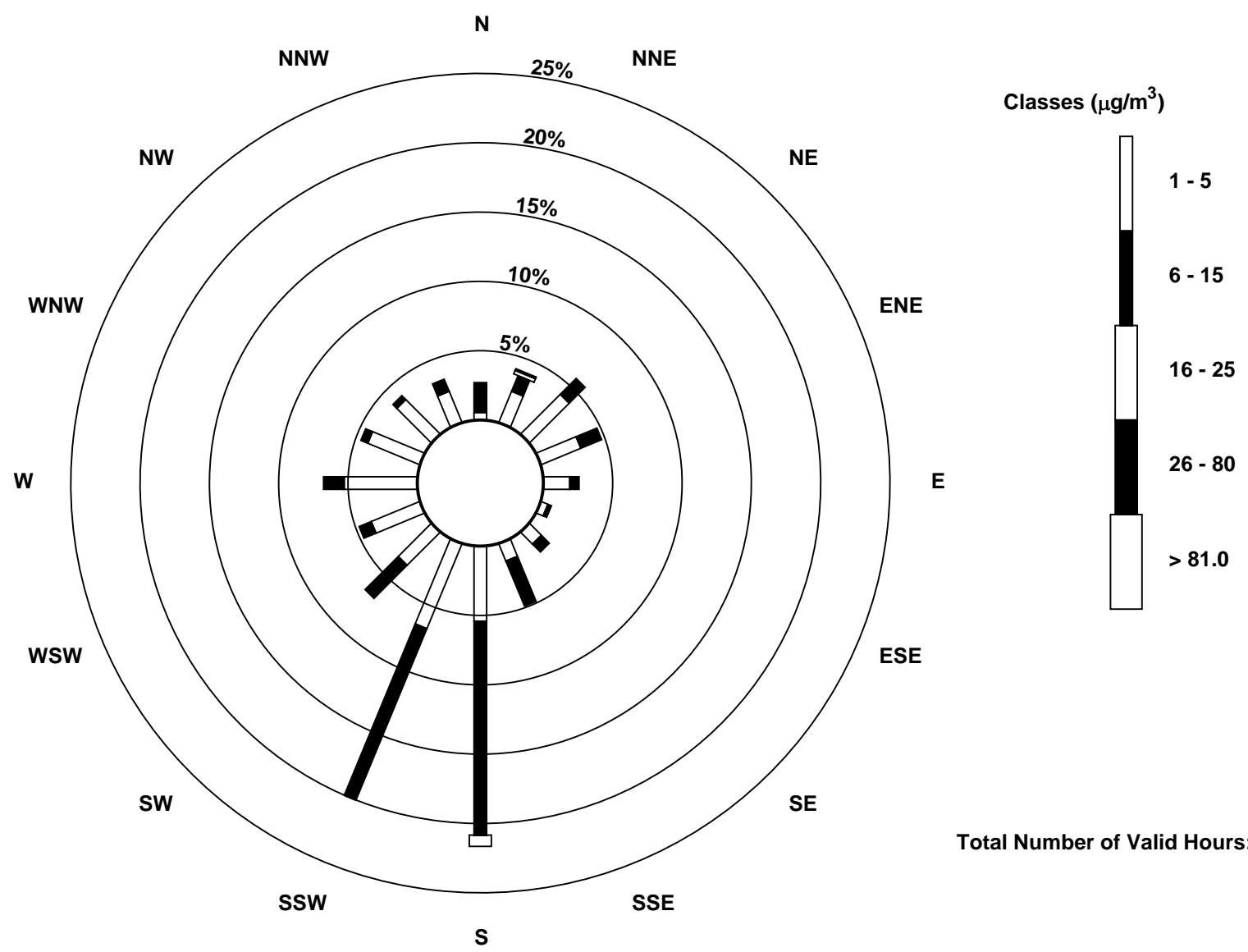
Total Number of Valid Hours: 739

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River (AMS 16)





Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

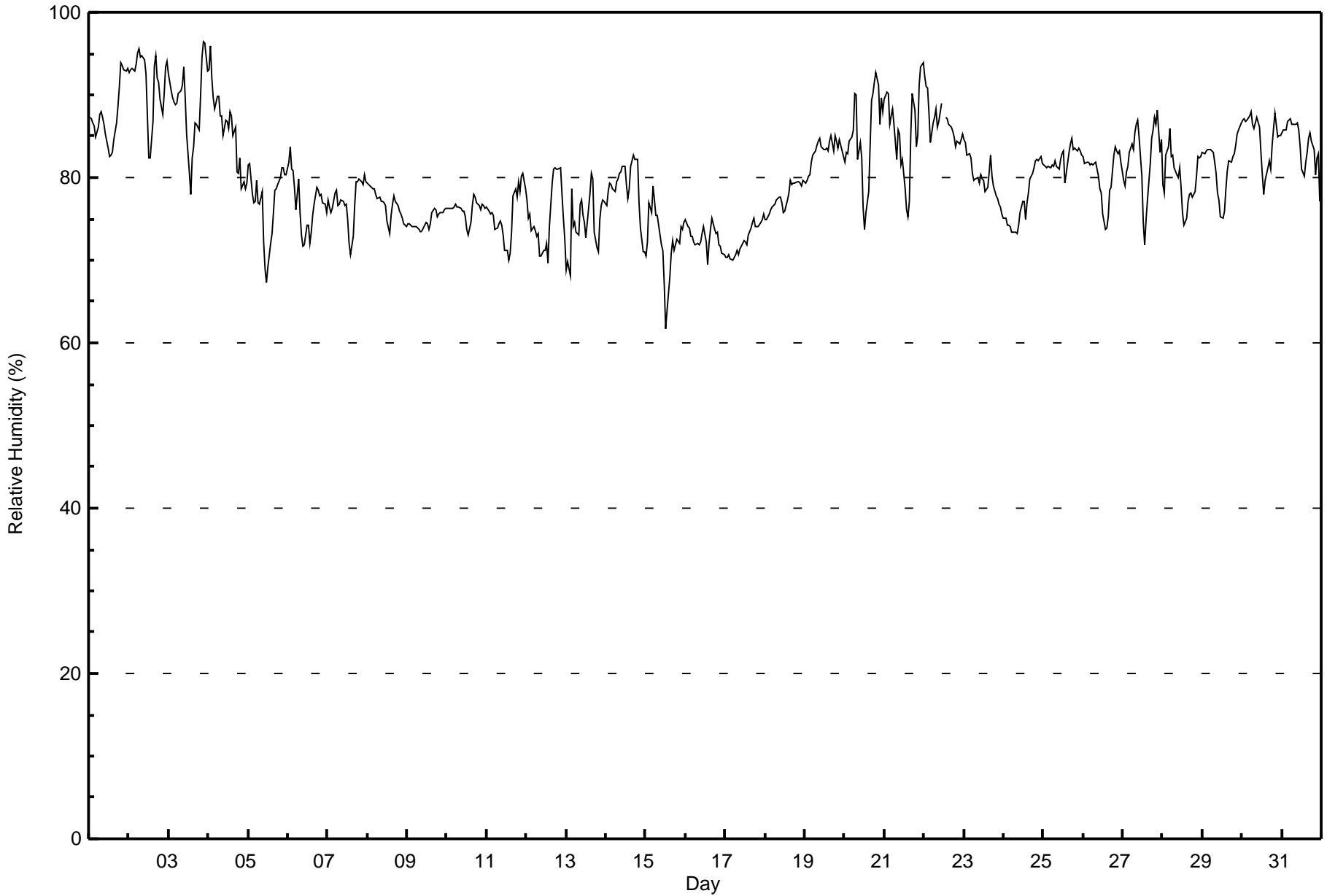
Shell Muskeg River - December 2016

Maximum Value: 96 % on Dec 3 22:00																		Maximum Daily Average: 91.6 % on Dec 2																		Hours in Service: 744																																	
Minimum Value: 62 % on Dec 15 13:00																		Minimum Daily Average: 72.2 % on Dec 15																		Hours of Data: 742																																	
Maximum Diurnal Average: 81.5 % at hour 22																		Minimum Diurnal Average: 75.9 % at hour 14																		Hours of Missing Data: 2																																	
Monthly Average: 80.1 %																		Percentiles: P ₁ = 69 P ₁₀ = 73 Q ₁ = 76 Median = 80 Q ₃ = 84 P ₉₀ = 88 P ₉₉ = 95																		Hours of Calibration: 0																																	
																																				Percent Operational Time: 99.7																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																													
1-Dec	87	87	87	86	85	86	88	88	87	86	85	84	83	83	83	85	87	89	91	94	93	93	93	93	87.6	94																																											
2-Dec	93	93	93	93	94	95	96	95	95	94	93	87	82	82	87	93	95	92	92	90	88	90	93	94	91.6	96																																											
3-Dec	92	91	90	89	89	89	90	91	91	93	90	85	80	78	82	84	87	86	86	90	95	96	96	93	88.9	96																																											
4-Dec	93	96	92	90	88	90	90	87	87	85	87	87	86	88	87	85	86	81	81	82	79	80	79	79	86.0	96																																											
5-Dec	82	82	78	77	77	80	77	77	78	72	69	67	69	72	73	76	78	79	79	80	81	81	80	80	76.9	82																																											
6-Dec	82	84	81	81	79	76	80	76	73	72	72	74	74	72	73	75	77	79	78	78	78	77	77	76	76.8	84																																											
7-Dec	77	76	76	76	78	78	77	77	77	77	77	77	75	72	71	73	77	79	80	80	80	79	80	79	77.0	80																																											
8-Dec	79	79	79	79	79	78	78	78	77	77	77	77	75	73	75	77	78	77	77	76	76	75	74	74	76.7	79																																											
9-Dec	74	74	74	74	74	74	74	74	73	74	74	75	74	74	74	76	76	76	75	76	76	76	76	76	74.7	76																																											
10-Dec	76	76	76	76	76	77	76	76	76	76	76	75	74	73	75	77	78	78	77	77	76	77	77	76	76.1	78																																											
11-Dec	76	76	76	76	75	74	74	74	75	74	73	71	71	70	71	73	78	79	78	80	78	80	80	79	75.5	80																																											
12-Dec	77	75	76	74	74	74	73	73	71	70	71	71	72	70	74	79	81	81	81	81	81	78	75	72	75.2	81																																											
13-Dec	69	70	68	79	74	75	73	73	77	77	75	75	73	76	78	81	80	73	72	71	75	77	77	77	74.8	81																																											
14-Dec	77	78	79	79	79	78	79	80	81	81	81	81	79	78	79	81	83	82	82	82	77	74	71	71	78.8	83																																											
15-Dec	70	72	77	76	79	77	75	75	74	72	71	67	62	64	68	71	72	71	72	73	72	74	74	75	72.2	79																																											
16-Dec	75	74	74	73	73	72	72	72	72	72	73	74	72	70	72	74	75	74	73	73	72	72	71	71	72.7	75																																											
17-Dec	70	70	71	70	70	70	71	71	71	71	72	72	72	72	73	74	75	75	74	74	74	75	75	76	72.4	76																																											
18-Dec	75	75	76	76	76	77	77	77	78	78	77	76	76	77	78	80	79	79	79	79	80	79	79	80	77.6	80																																											
19-Dec	79	80	80	80	82	83	83	84	84	85	84	83	83	84	83	84	85	83	85	84	84	85	83	83	83.1	85																																											
20-Dec	82	83	83	84	85	86	90	90	82	84	82	76	74	76	78	84	89	90	92	93	91	86	90	88	85.0	93																																											
21-Dec	89	90	90	86	87	88	86	82	86	85	82	82	79	76	75	77	85	90	88	84	85	91	93	94	85.6	94																																											
22-Dec	92	91	91	88	84	87	87	88	86	87	89	M	M	87	87	86	86	86	85	84	84	84	85	85	86.8	92																																											
23-Dec	85	84	83	83	82	80	80	80	80	79	80	80	80	78	79	81	83	80	79	78	77	77	76	76	80.0	85																																											
24-Dec	75	75	74	74	74	73	73	73	73	74	76	77	77	75	77	78	80	81	81	82	82	82	83	82	77.2	83																																											
25-Dec	81	81	81	81	81	82	81	82	81	81	82	83	83	79	81	83	84	85	83	84	83	84	83	83	82.2	85																																											
26-Dec	83	82	82	82	82	82	82	82	81	80	79	78	76	74	74	75	78	79	83	84	83	83	83	82	80.3	84																																											
27-Dec	80	79	81	81	83	84	83	86	87	87	85	80	75	72	75	77	82	85	86	87	86	88	83	85	82.3	88																																											
28-Dec	79	78	83	84	86	83	83	81	80	80	81	79	76	74	75	77	78	78	78	78	80	82	82	83	79.9	86																																											
29-Dec	83	83	83	83	83	83	83	82	80	78	77	75	75	76	79	81	82	82	82	83	84	85	86	87	81.5	87																																											
30-Dec	87	87	87	87	87	88	87	86	87	87	86	83	80	78	80	81	82	81	84	86	88	85	85	85	84.7	88																																											
31-Dec	85	86	86	87	87	87	87	86	87	87	86	84	81	80	82	83	85	85	84	83	80	82	83	77	84.2	87																																											
																		80.8		80.9		80.8		80.8		80.8		80.8		80.8		80.5		80.3		79.9		79.4		77.9		76.3		75.9		77.4		79.4		81.3		81.1		81.2		81.4		81.2		81.5		81.4		80.9		Diurnal Average			
																		93		96		93		93		94		95		96		95		95		94		93		93		87		86		88		87		93		95		92		92		94		95		96		96		94		Diurnal Maximum	
M - Maintenance																																																																					



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Shell Muskeg River - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Shell Muskeg River - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	389	52.43	52.43
80 - 100	353	47.57	100.00

Total Number of Valid Hours: 742

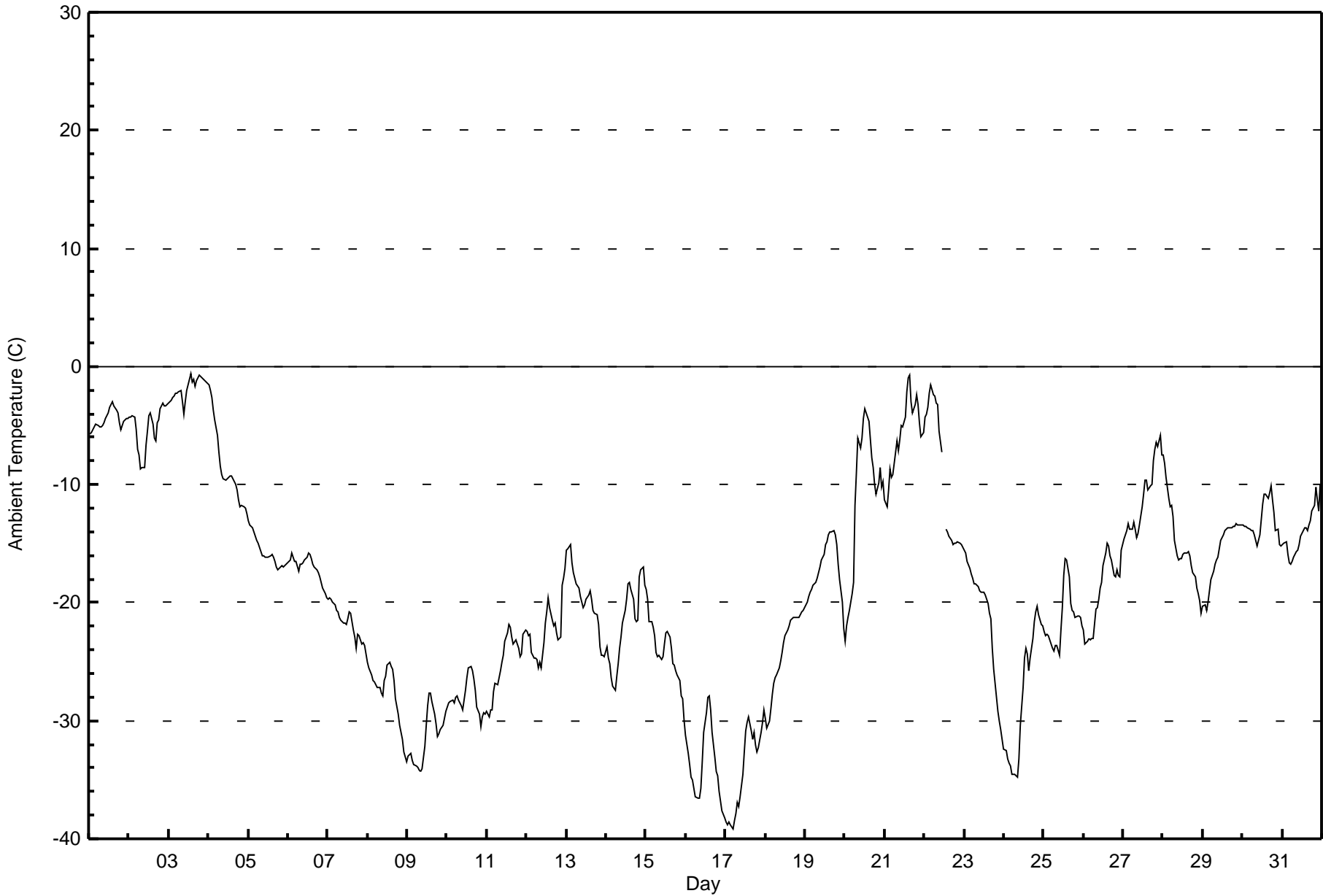
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Shell Muskeg River - December 2016

Maximum Value: -0.6 C on Dec 3 14:00 Maximum Daily Average: -1.9 C on Dec 3 Minimum Value: -39.2 C on Dec 17 05:00 Minimum Daily Average: -34.1 C on Dec 17 Maximum Diurnal Average: -16.2 C at hour 14 Minimum Diurnal Average: -19.5 C at hour 6 Monthly Average: -18.37 C Percentiles: P ₁ = -37.9 P ₁₀ = -30.4 Q ₁ = -24.6 Median = -18.5 Q ₃ = -13.1 P ₉₀ = -4.7 P ₉₉ = -1.2																								Hours in Service:	744	
																								Hours of Data:	742	
																								Hours of Missing Data:	2	
																								Hours of Calibration:	0	
																								Percent Operational Time:	99.7	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.7	-5.5	-5.3	-5.1	-4.9	-5.0	-5.1	-5.1	-5.0	-4.7	-4.4	-3.9	-3.5	-3.2	-3.0	-3.3	-3.6	-3.9	-4.8	-5.4	-5.0	-4.6	-4.4	-4.4	-4.5	-3.0
2-Dec	-4.3	-4.3	-4.2	-4.3	-5.3	-7.0	-7.6	-8.7	-8.6	-8.6	-6.7	-5.4	-4.2	-3.9	-4.9	-6.1	-6.3	-4.8	-4.5	-3.6	-3.1	-3.3	-3.4	-3.2	-5.3	-3.1
3-Dec	-3.1	-2.9	-2.6	-2.5	-2.3	-2.2	-2.1	-2.0	-3.0	-4.1	-3.0	-2.0	-1.1	-0.6	-1.3	-1.1	-1.6	-1.2	-0.8	-0.9	-0.9	-1.1	-1.2	-1.5	-1.9	-0.6
4-Dec	-1.6	-2.0	-2.6	-3.7	-4.6	-5.9	-7.2	-8.4	-9.1	-9.6	-9.6	-9.5	-9.4	-9.2	-9.3	-9.5	-10.0	-10.4	-11.3	-11.9	-11.7	-11.8	-12.0	-12.5	-8.4	-1.6
5-Dec	-13.1	-13.4	-13.7	-14.0	-14.4	-14.7	-15.0	-15.4	-16.0	-16.1	-16.2	-16.2	-16.1	-16.0	-15.9	-16.2	-16.5	-17.0	-17.2	-17.0	-16.9	-16.9	-16.8	-16.8	-15.7	-13.1
6-Dec	-16.6	-16.3	-15.8	-16.1	-16.5	-16.5	-17.4	-16.8	-16.8	-16.6	-16.4	-16.1	-15.8	-15.9	-16.3	-16.7	-17.0	-17.2	-17.4	-17.8	-18.3	-18.8	-19.3	-19.6	-17.0	-15.8
7-Dec	-19.7	-19.5	-19.7	-20.0	-20.2	-20.6	-20.8	-21.3	-21.5	-21.7	-21.7	-21.9	-21.4	-20.8	-20.9	-22.3	-22.9	-23.9	-22.7	-22.8	-23.5	-23.4	-23.6	-24.4	-21.7	-19.5
8-Dec	-25.1	-25.6	-26.1	-26.5	-26.7	-26.9	-27.2	-27.2	-27.7	-27.8	-26.6	-26.2	-25.3	-25.1	-25.4	-25.7	-26.5	-28.1	-29.4	-30.4	-31.0	-31.6	-32.6	-33.5	-27.7	-25.1
9-Dec	-33.0	-32.9	-32.7	-33.4	-33.7	-33.8	-34.0	-34.2	-34.4	-34.1	-32.2	-30.3	-28.7	-27.6	-27.7	-28.4	-29.4	-30.2	-31.4	-31.1	-30.7	-30.4	-29.8	-29.2	-31.4	-27.6
10-Dec	-28.9	-28.5	-28.3	-28.2	-28.5	-28.1	-27.9	-28.2	-28.7	-29.1	-28.3	-27.4	-26.3	-25.5	-25.5	-25.8	-26.4	-27.4	-28.9	-29.5	-30.5	-29.6	-29.3	-29.4	-28.1	-25.5
11-Dec	-29.2	-29.7	-29.1	-29.1	-27.5	-26.9	-27.0	-26.4	-25.7	-25.0	-24.5	-23.3	-22.5	-21.9	-22.0	-22.9	-23.5	-23.2	-23.5	-23.8	-24.6	-24.4	-22.7	-22.3	-25.0	-21.9
12-Dec	-22.4	-22.8	-22.6	-24.2	-24.7	-24.8	-24.8	-25.5	-25.1	-25.5	-23.4	-21.7	-20.7	-19.6	-20.4	-21.5	-22.0	-21.8	-22.6	-23.2	-22.9	-18.6	-18.0	-17.1	-22.3	-17.1
13-Dec	-15.5	-15.4	-15.1	-16.7	-17.5	-17.9	-18.4	-18.8	-19.5	-19.9	-20.4	-20.2	-19.7	-19.4	-19.0	-19.7	-20.7	-20.9	-21.1	-21.9	-23.7	-24.5	-24.5	-24.6	-19.8	-15.1
14-Dec	-23.8	-24.7	-25.2	-26.4	-27.0	-27.4	-26.2	-25.2	-23.8	-22.9	-21.8	-20.7	-19.8	-18.4	-18.3	-18.8	-19.7	-21.3	-21.6	-21.4	-17.8	-17.3	-17.0	-18.5	-21.9	-17.0
15-Dec	-18.9	-19.7	-21.6	-21.6	-22.0	-22.8	-24.2	-24.6	-24.4	-24.8	-24.6	-23.5	-22.6	-22.5	-22.9	-23.9	-25.1	-25.2	-25.8	-26.1	-26.6	-27.9	-28.1	-30.0	-24.1	-18.9
16-Dec	-31.3	-32.8	-33.7	-34.8	-35.0	-35.7	-36.4	-36.5	-36.5	-35.8	-33.5	-31.0	-29.3	-28.0	-27.9	-29.0	-31.0	-33.1	-34.3	-34.6	-35.9	-36.8	-37.6	-38.2	-33.7	-27.9
17-Dec	-38.6	-38.8	-38.6	-38.8	-39.2	-38.5	-37.8	-36.9	-37.3	-36.4	-34.5	-32.6	-30.8	-30.1	-29.7	-30.9	-31.5	-31.0	-32.1	-32.6	-32.3	-31.0	-30.1	-29.0	-34.1	-29.0
18-Dec	-29.8	-30.6	-30.1	-28.9	-27.8	-26.9	-26.3	-26.1	-25.5	-25.0	-24.3	-23.4	-22.8	-22.3	-22.0	-21.5	-21.4	-21.3	-21.3	-21.2	-21.2	-21.1	-20.8	-20.7	-24.3	-20.7
19-Dec	-20.2	-19.9	-19.5	-19.1	-18.9	-18.5	-18.3	-17.9	-17.4	-17.0	-16.4	-15.9	-15.1	-14.8	-14.3	-14.0	-14.0	-13.9	-14.2	-15.1	-16.7	-18.0	-19.9	-22.2	-17.1	-13.9
20-Dec	-23.2	-22.0	-21.3	-20.7	-19.2	-18.2	-11.8	-9.0	-6.1	-6.9	-6.0	-4.4	-3.6	-3.9	-4.6	-6.1	-7.7	-8.5	-10.0	-10.8	-9.9	-8.6	-10.2	-9.8	-10.9	-3.6
21-Dec	-11.2	-11.9	-10.5	-8.7	-9.3	-9.2	-8.2	-6.3	-7.1	-6.2	-5.0	-5.1	-4.3	-2.2	-1.0	-0.8	-3.0	-3.9	-3.2	-2.4	-3.2	-4.8	-6.0	-5.6	-5.8	-0.8
22-Dec	-4.3	-4.0	-3.4	-2.2	-1.5	-2.4	-2.5	-3.1	-3.2	-5.5	-7.3	M	M	-13.8	-14.0	-14.4	-14.7	-15.0	-14.9	-15.0	-14.9	-14.9	-15.0	-15.3	-9.2	-1.5
23-Dec	-15.5	-15.8	-16.5	-17.1	-17.6	-17.9	-18.3	-18.4	-18.7	-19.0	-19.2	-19.2	-19.1	-19.4	-20.0	-20.9	-21.4	-23.9	-25.7	-28.0	-29.2	-30.1	-30.8	-31.6	-21.4	-15.5
24-Dec	-32.4	-32.6	-33.2	-33.7	-33.8	-34.5	-34.5	-34.6	-34.8	-33.3	-30.4	-27.2	-24.7	-23.8	-24.3	-25.7	-24.7	-23.0	-21.7	-20.8	-20.3	-21.0	-21.8	-21.9	-27.9	-20.3
25-Dec	-22.5	-22.8	-22.7	-22.9	-23.5	-23.9	-24.1	-23.6	-23.6	-24.5	-22.4	-20.4	-17.7	-16.2	-16.4	-17.8	-20.1	-20.7	-20.8	-21.2	-21.1	-21.1	-21.3	-21.9	-21.4	-16.2
26-Dec	-22.3	-23.5	-23.2	-23.0	-23.1	-23.1	-23.0	-20.5	-20.4	-19.7	-18.7	-18.3	-16.8	-15.8	-14.9	-15.2	-16.0	-16.4	-17.6	-17.8	-17.2	-17.7	-17.8	-15.5	-19.1	-14.9
27-Dec	-14.6	-14.2	-13.9	-13.3	-13.8	-13.8	-13.2	-13.8	-14.5	-14.1	-13.4	-11.8	-10.8	-9.6	-9.6	-10.5	-10.1	-10.0	-7.9	-7.0	-6.4	-6.8	-5.8	-7.5	-11.1	-5.8
28-Dec	-7.5	-8.1	-9.4	-11.2	-11.8	-11.8	-12.8	-14.8	-16.1	-16.4	-16.3	-16.3	-15.9	-15.8	-15.8	-15.7	-16.1	-16.9	-17.4	-17.8	-18.8	-19.3	-19.9	-20.8	-15.1	-7.5
29-Dec	-20.4	-20.2	-20.7	-19.9	-19.0	-18.1	-17.3	-16.8	-16.3	-16.1	-15.4	-14.8	-14.2	-13.9	-13.8	-13.7	-13.7	-13.7	-13.6	-13.5	-13.3	-13.4	-13.4	-13.5	-15.8	-13.3
30-Dec	-13.5	-13.5	-13.6	-13.7	-13.8	-13.9	-13.9	-14.2	-14.7	-15.2	-14.3	-13.0	-11.7	-10.8	-10.8	-11.2	-10.7	-10.0	-11.3	-12.3	-13.9	-13.8	-15.1	-15.2	-13.1	-10.0
31-Dec	-15.1	-15.0	-14.9	-15.9	-16.6	-16.8	-16.6	-16.2	-15.7	-15.6	-15.1	-14.3	-14.1	-13.7	-13.7	-13.8	-13.4	-13.0	-12.3	-11.7	-10.2	-11.3	-12.3	-10.0	-14.0	-10.0
																								Diurnal Average		
																								Diurnal Maximum		
M - Maintenance																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Shell Muskeg River - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	328	44.20	44.20
-20 - 0	414	55.80	100.00
0 - 10	0	0.00	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744

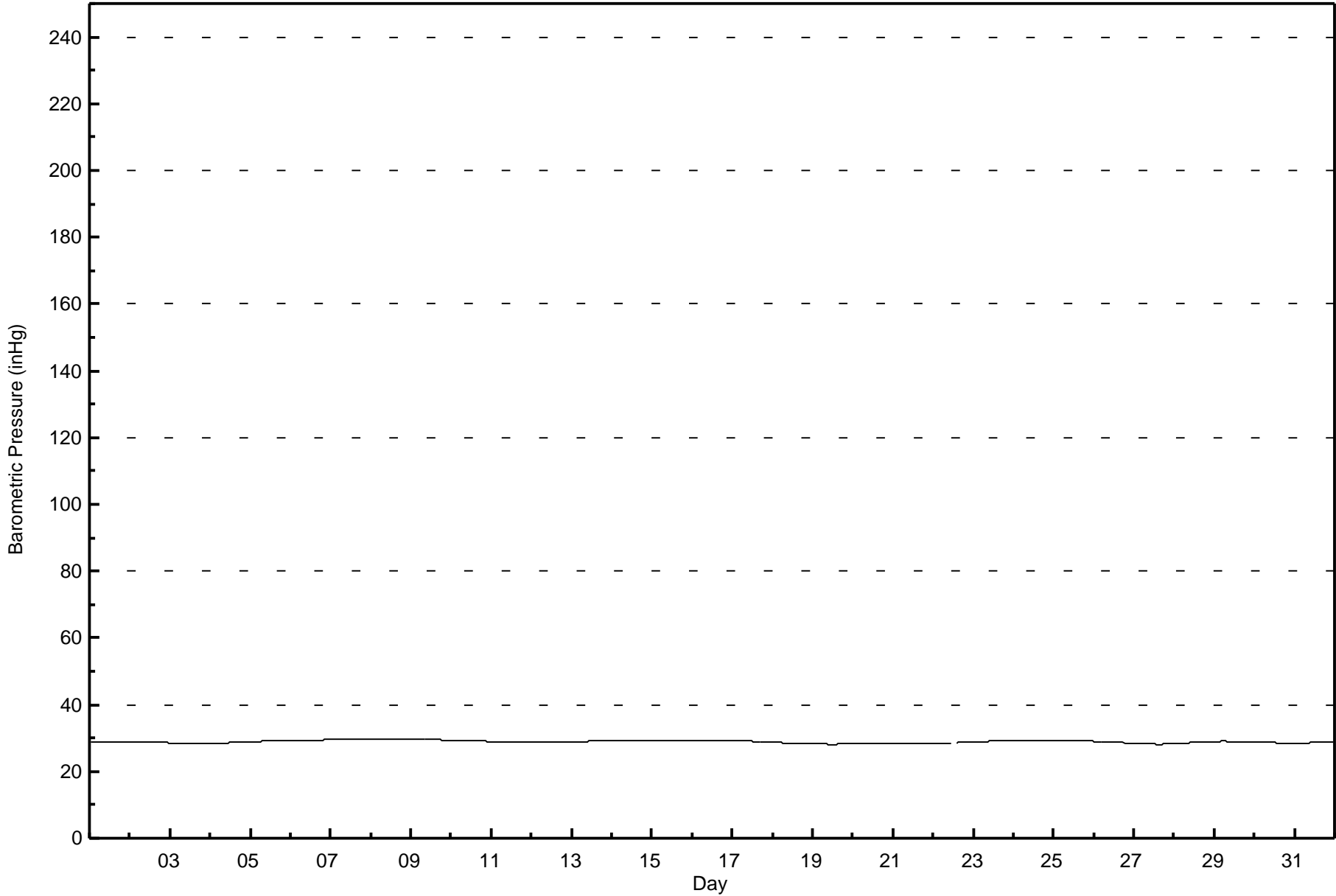


Maximum Value: 29.8 inHg on Dec 8 05:00																						Maximum Daily Average: 29.8 inHg on Dec 8																						Hours in Service: 744	
Minimum Value: 28.1 inHg on Dec 19 13:00																						Minimum Daily Average: 28.3 inHg on Dec 27																						Hours of Data: 741	
Maximum Diurnal Average: 28.9 inHg at hour 12																						Minimum Diurnal Average: 28.9 inHg at hour 15																						Hours of Missing Data: 3	
Monthly Average: 28.92 inHg																						Percentiles: P ₁ = 28.2 P ₁₀ = 28.4 Q ₁ = 28.6 Median = 28.9 Q ₃ = 29.2 P ₉₀ = 29.4 P ₉₉ = 29.8																						Hours of Calibration: 0	
																																												Percent Operational Time: 99.6	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																					
1-Dec	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	29.0																		
2-Dec	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.8	29.0																		
3-Dec	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.5	28.6																		
4-Dec	28.4	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.9	28.6	28.9																		
5-Dec	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.2																			
6-Dec	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.4	29.4	29.4	29.4	29.4	29.4	29.5	29.5	29.5	29.5	29.3	29.5																			
7-Dec	29.5	29.5	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.7	29.7	29.7	29.7	29.7	29.7	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.7	29.8																			
8-Dec	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.7	29.7	29.7	29.7	29.8	29.8																			
9-Dec	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.5	29.5	29.5	29.5	29.4	29.4	29.4	29.4	29.4	29.3	29.6	29.7																			
10-Dec	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.1	29.3																			
11-Dec	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	29.0																			
12-Dec	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9																		
13-Dec	28.8	28.8	28.8	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.0	29.2																			
14-Dec	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.1	29.2	29.2	29.1	29.2																			
15-Dec	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2																		
16-Dec	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2																			
17-Dec	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	29.0	29.1																			
18-Dec	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.6	28.7																			
19-Dec	28.5	28.5	28.4	28.4	28.4	28.3	28.3	28.2	28.2	28.2	28.2	28.1	28.1	28.1	28.2	28.2	28.3	28.3	28.4	28.4	28.4	28.4	28.4	28.3	28.5	28.5																			
20-Dec	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.5	28.4	28.5																			
21-Dec	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5																			
22-Dec	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	M	M	M	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.5	28.8																			
23-Dec	28.8	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.2																			
24-Dec	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3																			
25-Dec	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.2	29.3																			
26-Dec	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.8	29.0																			
27-Dec	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.3	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.3	28.3	28.4																			
28-Dec	28.3	28.3	28.4	28.4	28.4	28.5	28.5	28.5	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.7	28.9																			
29-Dec	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.9	29.0																			
30-Dec	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.8																			
31-Dec	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.7																			
28.9																								Diurnal Average																					
29.8																								Diurnal Maximum																					
M - Maintenance																																													



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - inHg
Shell Muskeg River - December 2016





Maximum Speed: 29 km/h on Dec 21 15:00	Maximum Daily Speed Average: 13.4 km/h on Dec 4	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 8 19:00	Minimum Daily Speed Average: 0.9 km/h on Dec 29	Hours of Data: 740
Maximum Diurnal Speed Average: 4.0 km/h at hour 14	Minimum Diurnal Speed Average: 0.9 km/h at hour 7	Hours of Missing Data: 4
Monthly Average Velocity: 1.9 km/h 225.9 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 5 Median = 8 Q ₃ = 11 P ₉₀ = 15 P ₉₉ = 22	Percent Operational Time: 99.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S12	S13	S11	SSW9	SSW11	S8	S9	S10	S10	S9	SSW9	SSW9	SSW9	S8	S8	S8	S7	S6	S6	S5	S6	S6	S6	S7	S8.3	S13
2-Dec	S7	SSE7	S8	S9	S8	S8	S7	S8	S9	S8	S10	S13	S12	S13	SSE9	SSE9	S12	SSE15	S11	S15	S19	SSE19	SSE17	SSE16	S11.2	SSE19
3-Dec	S13	S13	S14	S14	S17	SSE16	SSE14	S14	SSE13	S11	S15	S15	S13	S10	SSE8	S9	S8	S8	S9	SSW8	S8	S7	W5	WSW4	S10.6	SSE17
4-Dec	W6	N10	NNE18	NNE20	NNE25	NNE24	NNE24	NNE23	NNE22	NNE21	NNE14	NNW11	NNW10	NNW7	NNW10	NW12	NNW13	NNW15	NNW15	NNW14	NNW12	NNW11	NNW15	NNW15	N13.4	NNE25
5-Dec	NW16	NW12	NNW10	NW12	NW11	NW12	WNW13	WNW14	W12	W14	W14	W14	W14	W14	W13	W12	W13	W11	W11	W11	W10	W10	W10	WNW11.5	NW16	
6-Dec	W10	NNW10	NW13	WNW12	WNW12	WNW11	WNW9	NW11	NW12	NW14	NW14	NW12	NNW11	N13	N17	NNW15	N12	NNE12	NNE14	NNE15	NNE13	N15	N16	N17	NNW11.0	N17
7-Dec	N16	N13	NNE14	N14	NNE15	NNE17	NNE16	NNE14	NNE10	NE15	NNE14	NNE11	NNW9	N10	NNW4	W2	SE2	SSW2	N6	NNE7	SE2	ENE1	ENE9	ENE9	NNE8.5	NNE17
8-Dec	ENE8	E4	E6	ESE3	E5	E5	ENE7	E5	SSE1	ESE2	ENE6	E5	E4	WSW2	W3	WSW2	SW2	S1	NW0	E2	ENE2	E2	SSE1	SSW3	E2.3	ENE8
9-Dec	S3	S3	SSW3	S5	S6	SSW6	S5	SSW5	S5	SSW5	S5	S7	S7	S7	S7	S6	SSW6	SSW6	S6	SSW5	SSW5	S6	S6	S7	S5.6	S7
10-Dec	S6	S9	S10	SSW7	SSW5	SSW7	SSW8	S5	S4	SSW4	SSW5	SSW5	SSW7	SSW5	SW4	SW3	SW4	S3	S3	SSW3	SSW6	SSW7	S6	S5	SSW5.3	S10
11-Dec	SSW6	SW8	SSW7	SSW7	SW10	WSW18	SW16	SW12	SW11	WSW15	SW13	WSW13	SW12	WSW10	WSW8	WSW11	WSW10	WSW10	SW8	W7	WSW5	WSW8	WSW7	NW7	WSW9.5	WSW18
12-Dec	NW9	NW9	NNW8	NNW11	W13	W14	W13	W13	WNW11	W8	W9	SW5	SSW4	S7	SSE6	SE4	SE3	S1	SSW4	SSW5	W4	WNW11	W12	W12	W6.0	W14
13-Dec	WNW17	WNW17	NW21	NNE22	N22	N21	N19	N17	N16	N13	NNE3	SW2	SW4	WNW5	NNW5	SSE3	WNW5	NW9	NW6	WNW8	W9	W10	NW7	W3	NNW8.8	N22
14-Dec	WNW3	SSW4	SSW4	SSW6	S6	S7	SSW7	S7	S8	S7	S5	SSE3	SSE2	SW2	S2	SSW2	SW4	WSW3	WSW5	W7	NW10	NW9	NW10	NW11	SW3.0	NW11
15-Dec	NW11	NW6	W10	NW11	NW10	WNW10	WNW12	W10	NW12	WNW9	W10	WNW10	WNW7	WSW9	W10	W11	WNW9	WNW11	WNW11	WNW9	WNW9	WNW8	NW9	S2	WNW9.0	NW12
16-Dec	SW2	SW2	W3	SSW2	S3	S4	S3	SSW3	S4	SSW4	SSW4	SSW5	SSW7	SSW4	S4	S4	S4	SSW4	SSW5	SE2	SE3	S4	SSW3	S4	SSW3.4	SSW7
17-Dec	S5	SSW6	S4	SSW6	SSW5	SSW5	S5	SSW5	S7	S7	S6	SSW8	S9	S9	S7	S6	SSW7	SSW7	SSW5	SSW6	SSW5	SSW7	SSW6	SSW6	SSW6.1	S9
18-Dec	S5	S6	SSW8	S8	SSW10	SSE7	SSE5	SSW3	S1	S1	S1	S2	W2	WNW3	NNE3	NNE3	E3	ENE6	ENE3	E3	SSE2	SE1	S2	S1	SSE2.2	SSW10
19-Dec	SSE2	SW2	WSW1	WSW1	ENE5	ENE5	ENE4	ENE3	E1	E2	ESE3	NE2	NNW1	ENE4	NNW3	NNW7	NNW10	N9	NNW7	ENE8	ENE4	ENE6	ENE6	E3	NE2.6	NNW10
20-Dec	S2	SE3	SSW6	SSW8	SSW8	SSW8	SSE6	SW10	WSW24	SSW10	SSW10	SW10	S6	S10	SSW11	SSW9	SSW10	S10	SSW10	SSW9	SSW13	SSW12	SSW14	SSW10	SSW9.0	WSW24
21-Dec	SSW9	S9	S9	S12	SSE11	SSE12	SSW13	SW16	S8	SW15	SSW11	SSW11	SW17	WSW26	WSW29	WSW21	SW12	SSW12	SSW12	SSW12	SSW9	SSE4	SSE6	S8	SSW11.1	WSW29
22-Dec	S8	S8	S6	SW11	WSW15	WSW13	NNW9	NE12	NNE17	NE21	NE21	M	M	M	NNE20	NNE23	NE19	NE20	NE19	NE21	NE16	NE15	NE15	NE18	NE9.9	NNE23
23-Dec	NE17	NE17	NE17	NE17	NE19	NE15	NE16	NE17	NE17	NE16	NE15	NE14	NE13	ENE13	ENE13	NE12	NE8	ENE2	SSW1	SE3	E4	E3	E1	SW0	NE10.8	NE19
24-Dec	SW3	AF	SSW2	ESE1	ESE2	SE3	SE2	S1	SSE2	SSE3	S2	SSW2	SSW3	SSW6	SSW5	S4	SSW6	SSW5	SSW5	SSW5	SSW4	SSW5	S6	S8	SSW3.3	S8
25-Dec	SSW7	SSW8	SSW7	SSW6	SSW7	SSW7	SSW7	SSW7	SSW7	SSW7	SSW7	SSW7	SSW7	SSW6	SSW5	SSW5	SSW6	SSW6	SSW6	S8	S9	S9	S9	S8	SSW6.9	S9
26-Dec	S6	S7	SSW8	SSW9	SSW8	S9	SSW7	S12	S10	S13	S14	SSW12	S15	S16	S16	SSW11	SSW11	SSW11	SW9	SW12	SW11	WSW10	SW7	SW11	SSW10.3	S16
27-Dec	SW11	SSW9	SSW9	SSW7	SW10	SSW9	SSW9	SW8	SSW7	SW8	SW7	W4	W4	W4	SW4	S5	S8	S6	S8	SSW9	WSW7	N8	NE14	NE7	SW4.8	NE14
28-Dec	N8	NE13	NE18	ENE13	ENE11	NE13	NE15	NE16	ENE12	ENE12	ENE11	ENE8	ENE7	SE5	SE4	ESE3	ENE9	NE12	NE10	NE8	ENE7	WSW1	W2	WNW2	ENE8.2	NE18
29-Dec	W2	SSW1	SSW2	S3	S2	SSE2	SSW2	SSE1	E2	ENE2	S1	WSW1	W3	W2	ESE2	ENE3	ENE3	E4	SSE2	WSW2	SW3	W2	S3	SW2	S0.9	E4
30-Dec	SSE2	SW3	WSW3	S1	SE2	SSW1	ENE5	E4	NE1	SSW5	SSW7	SSW8	S10	SSW11	S12	S12	S7	SSW8	SW9	WNW8	N10	NE14	ENE10	NE9	S2.4	NE14
31-Dec	WSW2	WNW6	SSW3	S5	S5	E4	E1	S2	WSW4	SSW3	SSE3	ENE8	ENE5	S3	SE2	SSW5	SW9	SSW7	SSW7	WSW8	SW18	SW16	WSW16	W13	SW4.1	SW18

WSW2.1	SW1.9	SW1.3	SW1.3	SW1.2	SW1.1	WSW0.9	WSW0.9	WSW1.1	SW1.0	SSW1.7	SSW2.9	SW3.4	SW4.0	SW2.7	SW2.3	SW2.2	SW2.2	SW2.4	SW2.0	SW2.6	WSW2.1	WSW1.6	WSW1.6	WSW1.6	Diurnal Average
NE17	NE17	NW21	NNE22	NNE25	NNE24	NNE24	NNE23	WSW24	NNE21	NE21	S15	SW17	WSW26	WSW29	NNE23	NE19	NE20	NE19	NE21	SSE19	SSE19	SSE17	NE18	Diurnal Maximum	

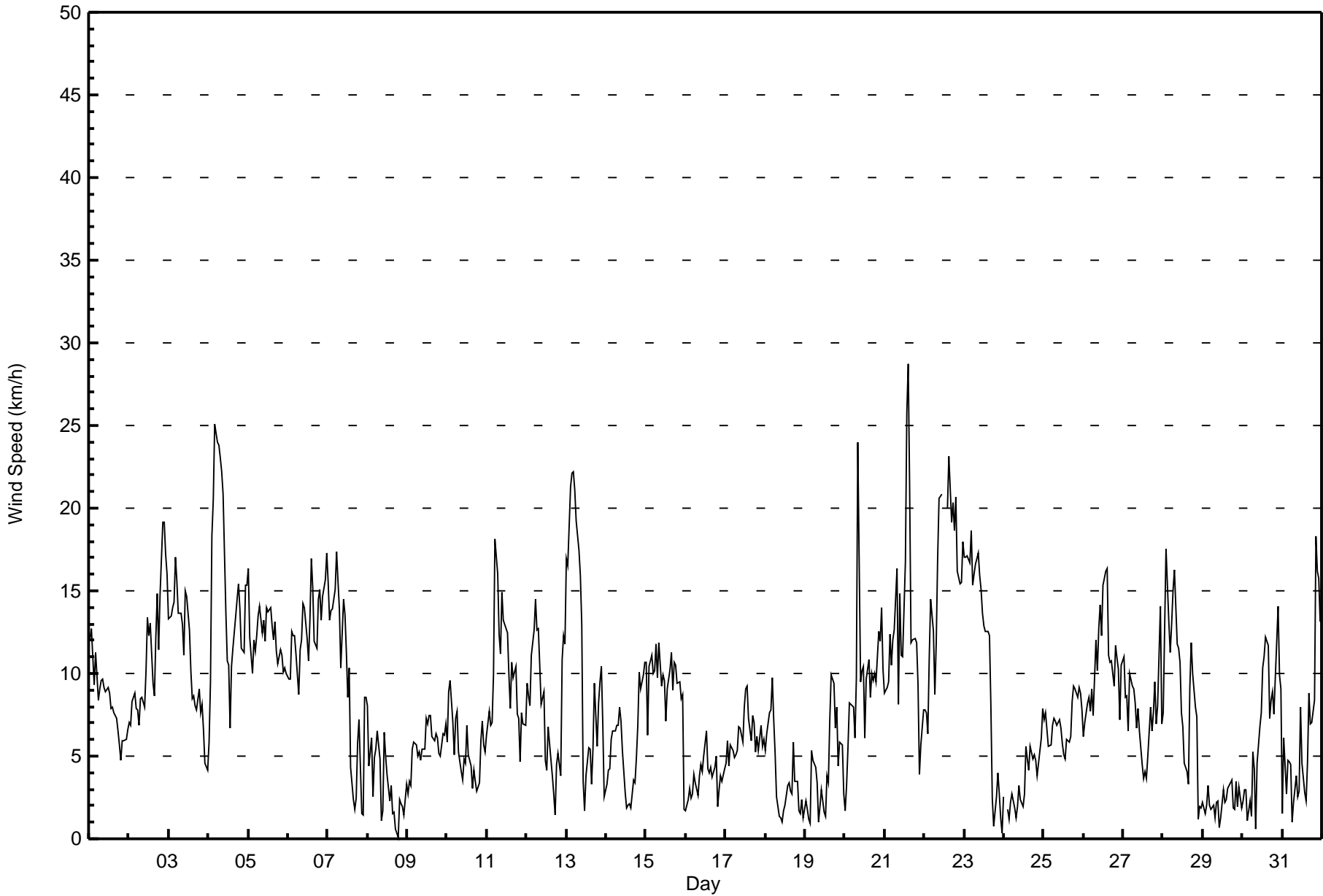
M - Maintenance AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Shell Muskeg River - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 13 06:00																	Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 0 Percent Operational Time: 99.5								
Minimum Value: 0 km/h on Dec 16 21:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	3	3	3	2	3	2	2	3	3	3	3	2	3	2	2	2	2	1	1	1	1	1	1	1	3
2-Dec	1	2	2	2	1	1	1	2	2	1	3	4	3	3	2	2	3	3	2	3	4	4	4	3	4
3-Dec	3	3	3	4	3	4	3	3	3	2	3	3	3	3	2	1	2	2	2	2	2	3	3	4	
4-Dec	2	5	4	4	5	4	5	5	5	4	4	4	3	2	3	4	4	5	5	4	4	5	5	5	
5-Dec	5	4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	5	
6-Dec	2	2	3	3	2	3	2	3	3	4	4	3	4	5	4	4	3	4	4	3	4	4	4	3	5
7-Dec	3	3	4	4	3	3	4	4	3	3	3	3	3	3	2	2	1	1	5	3	1	3	6	3	6
8-Dec	3	3	2	2	2	1	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3
9-Dec	1	1	1	1	1	1	1	1	2	2	2	2	3	2	2	1	1	2	1	1	1	1	1	2	3
10-Dec	2	2	2	2	1	2	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2
11-Dec	2	2	2	2	4	3	3	2	3	3	2	3	3	3	2	2	1	2	3	2	2	2	2	2	4
12-Dec	2	2	2	2	2	2	2	2	2	1	2	2	2	2	1	1	1	1	1	1	2	2	2	2	2
13-Dec	4	4	6	6	6	7	6	5	4	5	2	1	1	1	3	1	2	2	2	2	1	2	2	2	7
14-Dec	2	2	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	2	1	2	2	2	3	2	3
15-Dec	2	2	4	3	1	2	2	2	2	1	2	3	3	2	3	2	1	1	1	2	3	2	3	1	4
16-Dec	1	1	2	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	0	1	1	2	2
17-Dec	1	1	2	1	1	1	1	2	1	2	2	3	3	2	2	1	2	2	1	1	1	2	2	2	3
18-Dec	1	1	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	2
19-Dec	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	2	4	4	3	2	2	1	1	1	4
20-Dec	1	2	2	2	2	2	3	7	3	6	5	5	2	2	3	2	2	2	2	2	6	3	3	2	7
21-Dec	2	1	2	3	2	2	6	6	2	4	3	6	4	5	4	3	3	2	3	4	3	1	2	2	6
22-Dec	2	1	1	4	3	4	5	4	3	4	3	M	M	M	3	3	4	4	3	3	3	2	3	4	5
23-Dec	3	2	3	3	3	3	3	2	2	2	2	2	2	2	2	2	4	1	1	1	1	1	1	4	
24-Dec	1	AF	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	2
25-Dec	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	1	2	2	1	2
26-Dec	1	1	2	2	2	2	2	3	2	3	3	4	4	5	5	3	3	3	2	1	2	1	2	3	5
27-Dec	3	3	2	2	1	2	1	2	3	2	2	2	1	1	1	2	2	2	3	2	3	3	3	4	4
28-Dec	3	4	3	2	2	3	3	3	2	2	2	2	2	2	1	1	1	2	2	2	3	1	1	1	4
29-Dec	2	2	2	1	1	1	1	1	2	2	1	1	2	2	2	1	2	1	1	1	1	2	1	1	2
30-Dec	1	1	1	1	1	1	2	2	2	1	2	2	3	3	3	3	3	2	4	2	5	3	3	4	5
31-Dec	2	2	1	1	1	2	1	1	1	2	1	5	3	2	1	3	2	2	2	3	3	3	2	3	5
																	Diurnal Maximum								
																	M - Maintenance AF - Analyzer Failure								





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Shell Muskeg River - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	240	32.43	32.43
6 - 11	317	42.84	75.27
12 - 19	162	21.89	97.16
20 - 28	20	2.70	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 740

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Shell Muskeg River - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	0	3	2	15	21	7	15	16	49	54	19	14	15	5	1	4	240
6 - 11	6	4	6	16	1	0	0	9	89	86	20	11	20	21	16	12	317
12 - 19	12	13	30	5	0	0	0	11	23	8	11	6	15	8	11	9	162
20 - 28	2	10	4	0	0	0	0	0	0	0	0	3	0	0	1	0	20
29 - 38	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	20	30	42	36	22	7	15	36	161	148	50	35	50	34	29	25	740

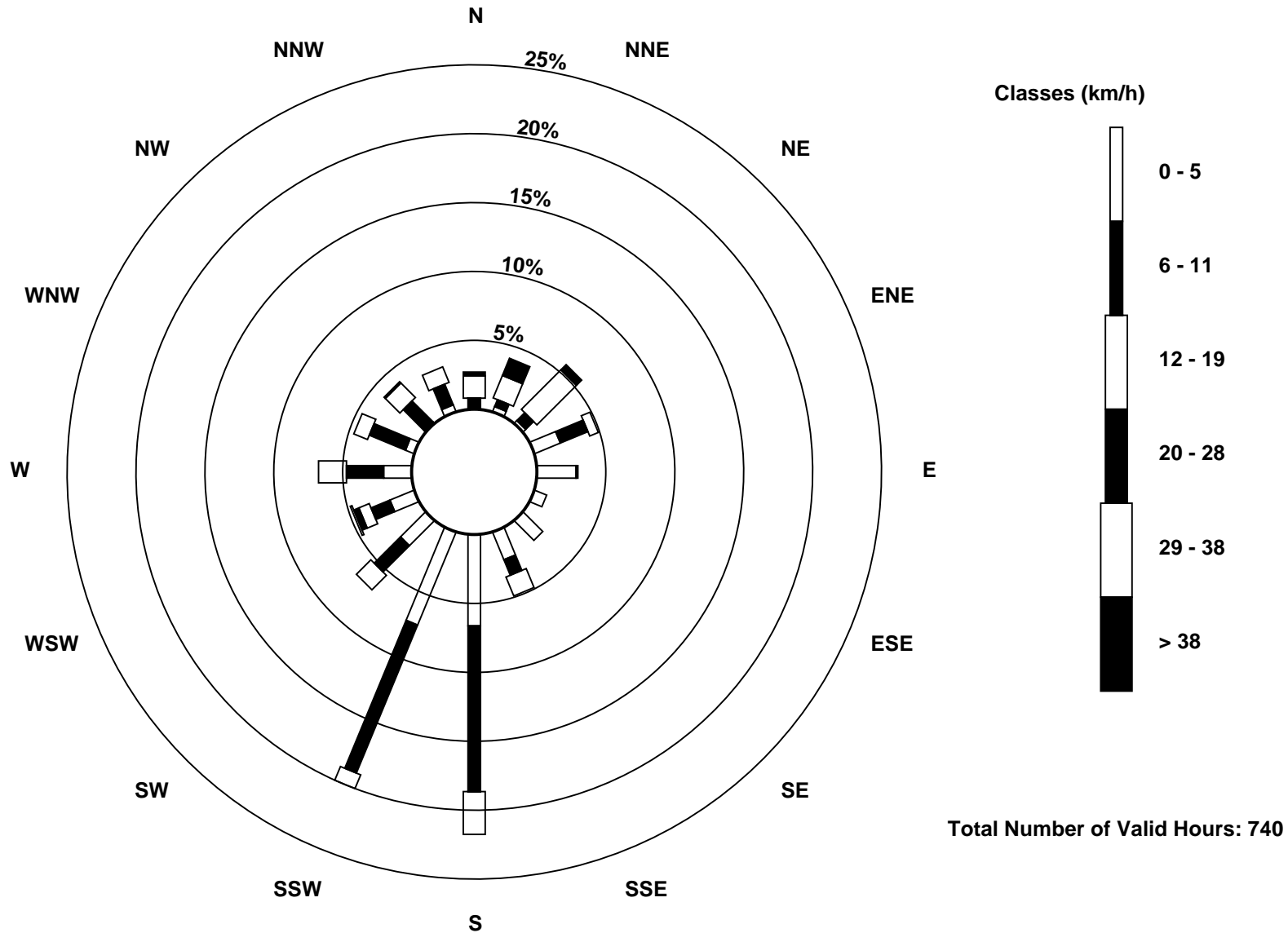
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Shell Muskeg River (AMS 16)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Shell Muskeg River - December 2016

Direction of Maximum Speed: 251 deg on Dec 21 15:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 359.3 deg on Dec 4	Hours of Data: 740
Direction of Minimum Speed: 321 deg on Dec 8 19:00	Hours of Missing Data: 4
Direction of Minimum Daily Speed Average: 0.9 deg on Dec 29	Percent Operational Time: 99.5
Monthly Average Direction: 225.2 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	182	180	181	202	207	191	184	190	187	190	196	192	192	188	184	184	183	182	179	172	183	188	183	184	187.4
2-Dec	170	167	174	175	191	176	190	176	191	180	175	178	171	169	168	166	169	168	171	173	169	167	168	168	172.6
3-Dec	177	172	175	176	169	168	168	169	168	177	179	181	181	185	167	174	171	184	190	192	188	191	264	257	178.2
4-Dec	265	6	22	15	23	31	23	25	28	28	29	340	336	328	323	326	329	330	327	331	335	331	329	329	359.3
5-Dec	324	321	327	324	306	310	300	295	277	283	276	275	273	274	275	275	275	271	267	265	265	268	271	278	286.6
6-Dec	277	282	304	298	295	303	291	320	321	322	319	315	331	349	359	344	360	20	25	27	13	6	358	359	337.2
7-Dec	358	2	15	7	32	24	14	15	17	40	25	19	340	1	330	266	146	200	1	26	124	71	53	77	18.2
8-Dec	77	88	87	115	87	82	76	81	166	123	73	80	83	257	273	245	232	190	321	81	69	90	167	193	90.2
9-Dec	173	185	194	182	189	199	191	195	181	194	190	184	188	187	181	174	200	206	188	193	193	178	177	177	187.4
10-Dec	177	183	186	193	203	199	193	186	189	197	205	200	192	210	218	228	220	191	187	206	199	192	178	188	194.8
11-Dec	213	218	206	211	228	243	232	231	233	243	233	237	235	241	250	255	243	244	232	261	255	247	254	308	238.8
12-Dec	318	320	327	295	276	277	266	269	283	265	266	223	197	174	163	130	139	170	204	201	259	286	280	278	269.8
13-Dec	296	295	307	12	356	354	350	357	11	350	19	222	233	299	339	163	295	305	318	303	276	269	280	271	328.2
14-Dec	298	192	197	196	177	176	192	182	187	180	171	147	165	232	187	195	227	237	253	265	305	316	317	309	228.5
15-Dec	306	304	281	316	322	303	284	281	305	292	280	287	283	254	260	273	299	288	282	285	286	290	312	177	289.7
16-Dec	220	222	272	198	191	188	179	195	188	197	201	197	209	194	180	174	183	194	198	143	125	173	197	178	191.6
17-Dec	184	204	177	204	192	197	187	198	175	181	188	192	186	183	185	189	204	204	203	196	201	207	201	213	193.5
18-Dec	184	191	192	176	193	165	163	210	188	171	175	174	266	288	26	13	81	72	72	81	161	139	189	188	168.7
19-Dec	163	232	240	253	65	57	67	68	89	81	110	45	332	66	339	329	343	350	346	63	75	61	66	92	35.3
20-Dec	181	145	192	197	202	193	164	215	241	193	201	215	184	184	211	206	195	191	198	195	213	195	207	197	202.4
21-Dec	201	172	184	187	161	157	205	217	176	215	200	210	229	243	251	250	219	207	206	196	198	152	153	186	209.6
22-Dec	186	191	183	236	251	240	342	52	32	42	37	M	M	M	33	25	40	44	38	36	39	47	44	38	35.1
23-Dec	40	46	49	44	35	47	49	38	40	40	49	53	45	63	61	55	45	73	210	133	86	91	92	227	48.2
24-Dec	219	AF	202	118	107	133	146	175	158	162	187	205	213	209	204	191	199	200	204	208	206	202	186	190	191.6
25-Dec	203	203	194	197	193	207	202	213	210	197	209	218	199	234	221	216	196	188	187	184	194	189	184	180	199.1
26-Dec	188	188	195	194	195	191	195	190	186	179	176	192	185	189	190	198	197	207	216	219	226	237	226	214	197.5
27-Dec	215	205	208	212	218	212	213	220	213	230	231	263	259	264	221	191	183	189	187	204	248	356	36	47	216.4
28-Dec	11	53	49	61	65	53	54	54	64	60	60	70	77	144	135	103	63	52	56	54	64	246	273	303	58.8
29-Dec	281	200	192	171	179	155	194	154	84	76	182	239	278	264	113	58	75	84	167	240	231	261	182	228	178.6
30-Dec	164	224	255	182	140	208	69	86	40	198	194	192	181	192	187	187	179	207	229	291	1	48	61	52	175.3
31-Dec	242	282	204	173	182	80	98	179	250	202	166	61	67	191	136	197	215	203	204	237	236	236	255	275	225.2

243.5 222.6 226.3 228.8 227.4 221.3 240.2 237.3 248.0 216.7 198.1 212.9 214.1 219.3 225.3 230.9 216.9 215.5 223.3 227.3 233.2 237.2 253.9 244.4
 Diurnal Average

M - Maintenance AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

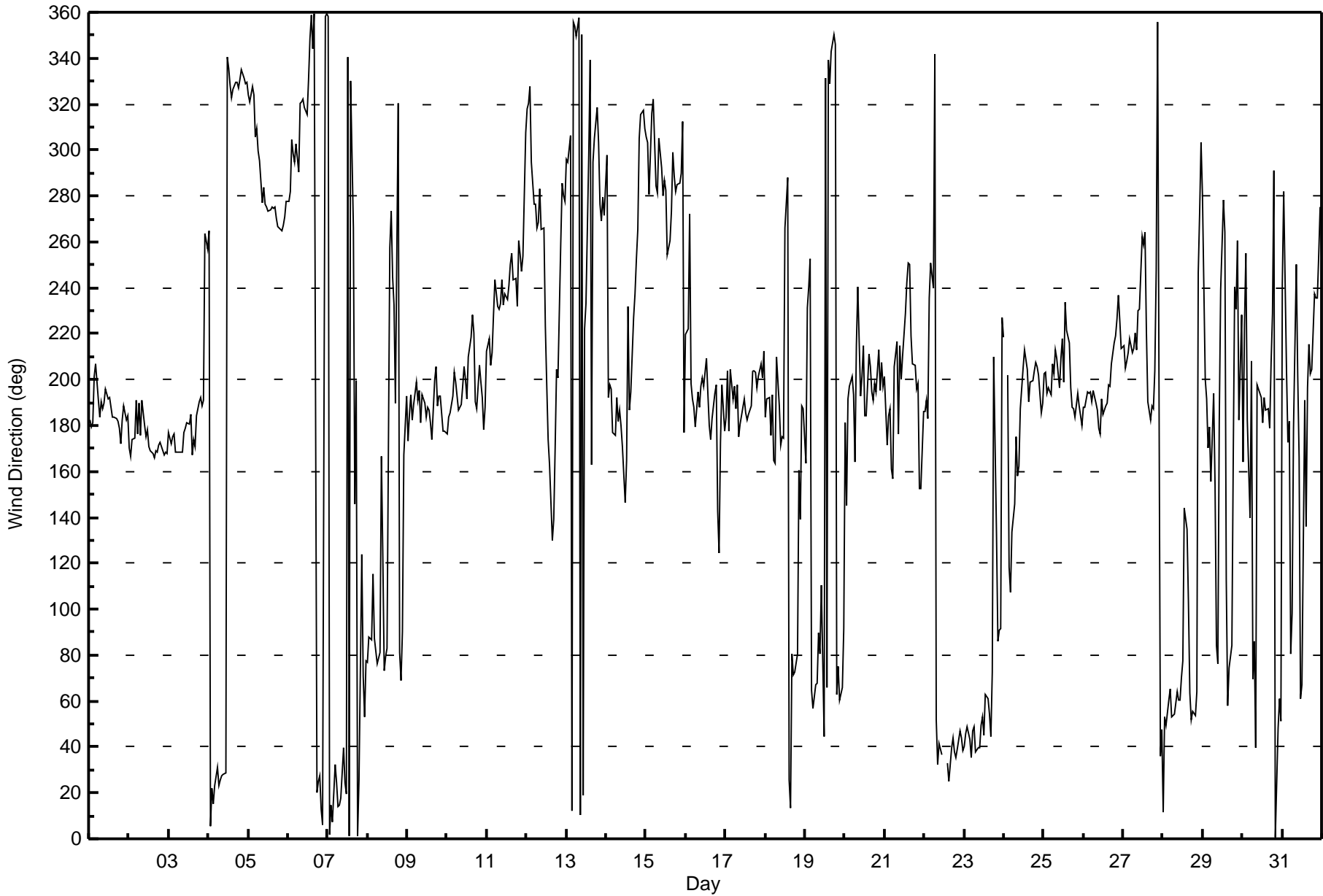
Wind Direction (WD) - deg
Shell Muskeg River - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 93 deg on Dec 19 03:00	Hours of Data: 740
Minimum Value: 5 deg on Dec 17 05:00	Hours of Missing Data: 4
Percentiles: P ₁ = 7 P ₁₀ = 10 Q ₁ = 12 Median = 16 Q ₃ = 23 P ₉₀ = 45 P ₉₉ = 77	Hours of Calibration: 0
	Percent Operational Time: 99.5

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	16	15	17	18	18	17	15	18	18	18	20	20	19	18	18	15	13	14	12	8	10	14	11	13	20
2-Dec	14	15	13	14	16	15	17	21	18	15	17	16	14	12	10	18	10	11	11	12	11	12	12	12	21
3-Dec	14	13	14	16	11	13	12	12	11	12	14	15	14	17	11	13	15	17	18	18	17	18	38	54	54
4-Dec	35	35	12	15	11	11	11	11	11	10	19	19	17	22	20	21	21	22	23	24	20	22	21	21	35
5-Dec	19	20	25	22	17	14	15	12	11	12	12	12	12	12	12	13	12	12	11	11	10	11	10	25	
6-Dec	10	12	13	14	13	18	18	18	18	18	18	17	21	19	14	16	17	23	17	19	19	18	16	15	23
7-Dec	14	16	19	18	13	13	18	17	22	12	18	21	24	25	47	57	60	41	81	43	68	77	57	18	81
8-Dec	20	55	23	47	20	15	12	18	32	36	10	15	26	65	16	11	42	62	90	11	12	16	40	21	90
9-Dec	8	12	12	8	14	10	9	17	17	14	15	14	18	17	12	9	14	14	11	11	13	8	9	11	18
10-Dec	12	13	12	16	15	16	16	17	16	14	15	24	21	23	15	19	13	14	12	17	15	14	13	17	24
11-Dec	14	13	15	13	17	8	8	10	12	10	10	15	14	12	14	8	8	7	15	22	22	16	26	16	26
12-Dec	12	15	17	18	8	10	10	7	7	10	10	29	25	14	13	21	28	63	15	13	45	12	9	9	63
13-Dec	15	13	14	22	18	18	16	17	17	18	65	85	40	28	58	26	42	10	23	16	8	8	11	50	85
14-Dec	39	32	14	11	10	11	14	14	14	15	13	21	49	66	38	26	25	24	25	17	17	14	18	11	66
15-Dec	10	15	13	16	10	14	7	9	13	15	22	18	25	10	15	11	12	6	7	8	7	11	18	63	63
16-Dec	32	41	38	24	22	10	16	23	28	14	19	20	18	22	13	10	11	9	12	30	21	19	16	17	41
17-Dec	16	22	18	13	5	12	10	12	9	12	16	18	16	14	15	12	13	14	13	14	14	17	18	15	22
18-Dec	16	15	13	16	17	15	17	26	51	52	48	49	56	28	56	57	46	15	23	26	48	47	37	80	80
19-Dec	39	58	93	72	17	30	25	25	60	30	16	45	67	15	44	18	19	22	38	16	15	22	13	19	93
20-Dec	45	30	20	17	15	19	40	45	8	52	34	32	32	23	15	14	13	14	10	11	23	26	12	16	52
21-Dec	14	10	18	19	15	12	36	21	17	16	21	26	11	10	9	8	13	13	15	19	19	38	24	15	38
22-Dec	14	12	16	19	10	19	52	18	14	12	12	M	M	M	12	8	12	11	12	13	13	11	15	13	52
23-Dec	13	10	10	13	12	15	11	13	12	13	8	10	14	9	9	8	21	31	86	42	18	25	36	80	86
24-Dec	28	AF	26	58	13	16	24	67	10	8	13	20	21	13	15	12	13	15	18	17	15	15	11	14	67
25-Dec	13	13	14	14	11	13	13	10	12	12	13	12	21	21	13	9	12	12	14	11	14	14	13	10	21
26-Dec	13	13	15	16	14	15	15	16	16	14	14	22	18	18	19	18	17	20	10	9	10	8	11	17	22
27-Dec	15	18	15	28	10	13	12	13	43	18	25	26	22	17	37	18	18	14	22	25	55	27	15	53	55
28-Dec	31	14	11	10	9	17	9	9	9	10	10	14	28	31	36	30	8	8	11	11	13	69	47	55	69
29-Dec	62	73	80	30	52	36	47	69	63	78	78	88	54	53	51	52	60	23	27	52	38	62	24	52	88
30-Dec	34	36	29	49	29	57	24	26	77	29	22	22	16	19	20	16	21	18	33	20	28	16	12	17	77
31-Dec	84	16	51	13	14	41	62	56	30	40	26	38	26	39	38	40	13	21	22	27	10	8	14	13	84
	84	73	93	72	52	57	62	69	77	78	78	88	67	66	58	57	60	63	90	52	68	77	57	80	

Diurnal Maximum

M - Maintenance AF - Analyzer Failure





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 17
WAPASU
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100.00	26	0	8	0
H2S (ppb) Average	709	35	35	100.00	1	0	0	0
THC (ppm) Average	708	36	36	100.00	3.5	-	2.5	-
O3 (ppb) Average	694	32	50	97.58	37	0	34	-
NO2 (ppb) Average	708	36	36	100.00	35	0	13	-
NO (ppb) Average	708	36	36	100.00	18	-	5	-
NOX (ppb) Average	708	36	36	100.00	53	-	16	-
PM2.5 (ug/m3) Average	733	3	11	98.92	19.6	-	11.1	0
Temperature 2 m (C) Average	744	0	0	100.00	-0.7	-	-2.9	-
Relative Humidity (%) Average	744	0	0	100.00	98	-	95	-
Precipitation (mm) Total	565	0	179	75.94	0.8	-	6.3	-
Wind Speed 10 m (km/h) Average	741	0	3	99.60	21	-	14	-
Wind Direction 10 m (deg) Average	741	0	3	99.60	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	1.7	3	-	0	0	0	0	1	5	26
H2S (ppb) Average	709	0.2	0	-	0	0	0	0	0	0	1
THC (ppm) Average	708	2.29	0.1	-	2.1	2.2	2.2	2.3	2.3	2.4	3.5
O3 (ppb) Average	694	24.8	7	-	1	15	21	26	30	33	37
NO2 (ppb) Average	708	4.3	5	-	0	0	1	3	7	11	35
NO (ppb) Average	708	0.7	2	-	0	0	0	0	1	1	18
NOX (ppb) Average	708	5	6	-	0	0	1	3	7	12	53
PM2.5 (ug/m3) Average	733	4.25	3.3	-	0	1.3	2	3.3	5.3	8.7	19.6
Temperature 2 m (C) Average	744	-17.67	8.3	-	-36.8	-27.5	-24.1	-18.2	-12	-5	-0.7
Relative Humidity (%) Average	744	82.9	6	-	71	76	79	82	87	92	98
Precipitation (mm) Total	565	-	-	11.64	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	741	7.4	4	-	0	3	5	7	9	13	21
Wind Direction 10 m (deg) Average	741	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
O3	15 Dec 2016 13:00	15 Dec 2016 13:00	1	Unstable Operation - lamp voltage fluctuation
O3	18 Dec 2016 21:00	19 Dec 2016 13:00	17	Unstable Operation - lamp voltage fluctuation
PM2.5	08 Dec 2016 06:00	08 Dec 2016 07:00	2	Unstable operation - excessive baseline drift
PM2.5	08 Dec 2016 10:00	08 Dec 2016 10:00	1	Unstable operation - excessive baseline drift
PM2.5	08 Dec 2016 19:00	08 Dec 2016 23:00	5	Unstable operation - excessive baseline drift
Precipitation Collector	01 Dec 2016 01:00	08 Dec 2016 10:00	178	DAS collection error - data not recorded
Precipitation Collector	20 Dec 2016 10:00	20 Dec 2016 10:00	1	Maintenance - cleared snow from collection bucket
Wind Speed, Wind Direction	10 Dec 2016 17:00	10 Dec 2016 18:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	18 Dec 2016 20:00	18 Dec 2016 20:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Wapasu - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 26 ppb on Dec 30 12:00	Maximum Daily Average: 7.7 ppb on Dec 10		Hours of Data:	708
Minimum Value: 0 ppb on Dec 22 14:00	Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Missing Data:	36
Maximum Diurnal Average: 3.0 ppb at hour 12	Minimum Diurnal Average: 1.0 ppb at hour 23		Hours of Calibration:	36
Monthly Average: 1.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 5 P ₉₉ = 18		Percent Operational Time:	100.0

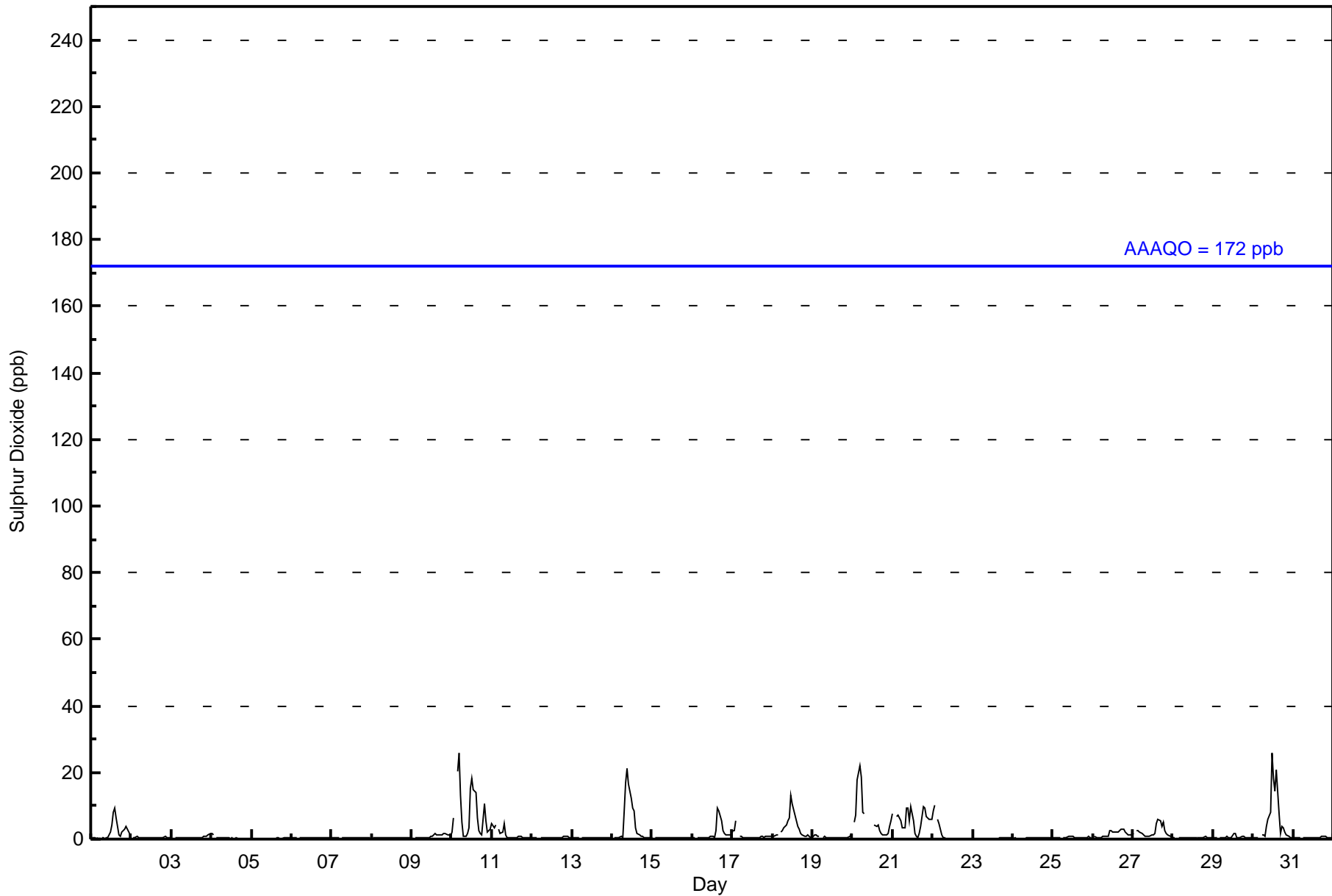
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	1	2	4	8	9	6	1	1	2	2	3	4	2	1	2.2	9
2-Dec	Z	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	1	0	1	1	1	1	1	1	0.5	1
3-Dec	1	Z	1	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1	1	1	1	2	0.6	2
4-Dec	2	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	2	1	1	1	1	1	2	2	1	1	0.9	2
10-Dec	2	6	Z	20	26	13	5	1	1	2	3	15	18	15	14	6	2	1	1	10	5	2	3	3	7.7	26
11-Dec	5	4	4	Z	3	2	2	5	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1.4	5
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0.5	1
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	Z	0	0	0	0	1	0	8	17	21	17	12	9	9	3	2	1	1	1	1	1	1	0	0	4.6	21
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	3	9	9	6	2	2	1	1	1	1	1.8	9
17-Dec	3	3	6	Z	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1.1	6
18-Dec	1	1	1	1	Z	2	3	3	4	5	6	13	11	7	5	4	3	2	1	1	1	1	1	1	3.4	13
19-Dec	1	1	1	1	1	Z	1	1	1	0	0	0	1	1	1	0	0	0	0	0	1	1	1	2	0.7	2
20-Dec	Z	5	7	18	22	19	8	8	C	C	C	C	C	4	4	4	3	2	1	1	1	2	4	6	6.6	22
21-Dec	8	Z	7	7	6	5	3	3	9	9	5	10	6	2	1	0	2	4	10	9	7	7	6	6	5.7	10
22-Dec	8	10	Z	6	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	10
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
25-Dec	0	0	0	1	1	Z	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	0.5	1
26-Dec	Z	1	0	1	1	1	1	1	1	1	2	3	2	2	2	2	2	3	3	2	2	1	1	1	1.5	3
27-Dec	2	Z	2	3	2	1	1	1	1	1	1	1	1	2	5	6	5	4	5	3	2	1	1	1	2.2	6
28-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.4	1
29-Dec	0	0	0	Z	0	0	0	0	1	1	0	1	2	2	1	0	0	1	1	1	0	1	0	0	0.6	2
30-Dec	0	0	0	1	Z	1	1	1	4	6	8	26	18	14	21	8	2	4	4	2	1	1	1	0	5.4	26
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0.4	1
	1.4	1.4	1.3	2.5	2.8	2.1	1.1	1.2	1.5	1.8	1.7	3.0	2.6	2.3	2.4	1.8	1.2	1.2	1.3	1.4	1.1	1.0	1.0	1.0	Diurnal Average	
	8	10	7	20	26	19	8	8	17	21	17	26	18	15	21	9	9	6	10	10	7	7	6	6	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	688	97.18	97.18
11 - 20	15	2.12	99.29
21 - 60	5	0.71	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	83	35	19	8	5	8	21	117	122	58	43	19	11	30	37	69	685
11 - 20	0	0	0	0	0	0	0	1	8	4	1	1	0	0	0	0	15
21 - 60	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	5
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	83	35	19	8	5	8	21	118	133	64	44	20	11	30	37	69	705

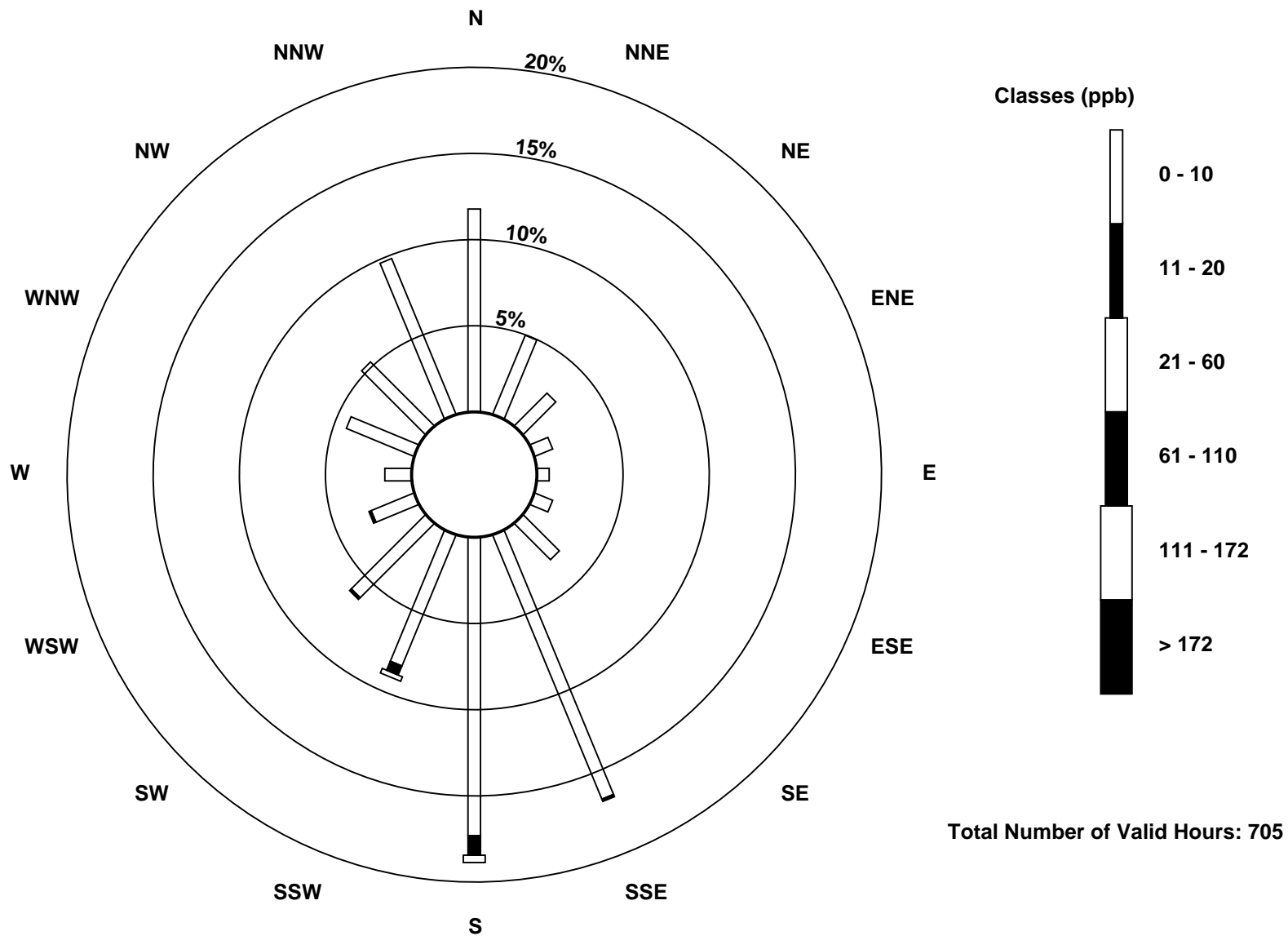
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

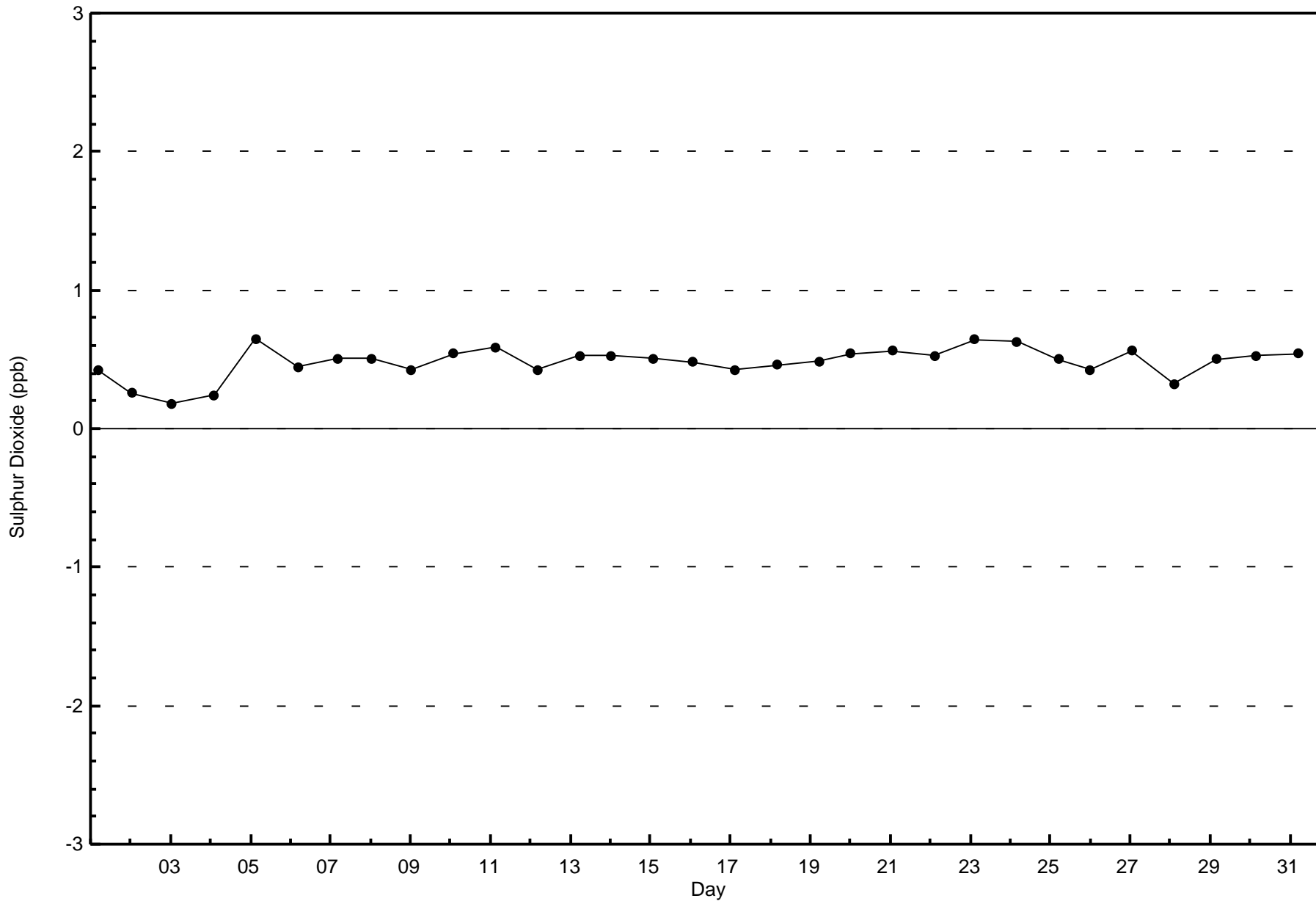
Sulphur Dioxide (SO₂) - ppb
Wapasu (AMS 17)





WBEA Data PC
Zero Responses

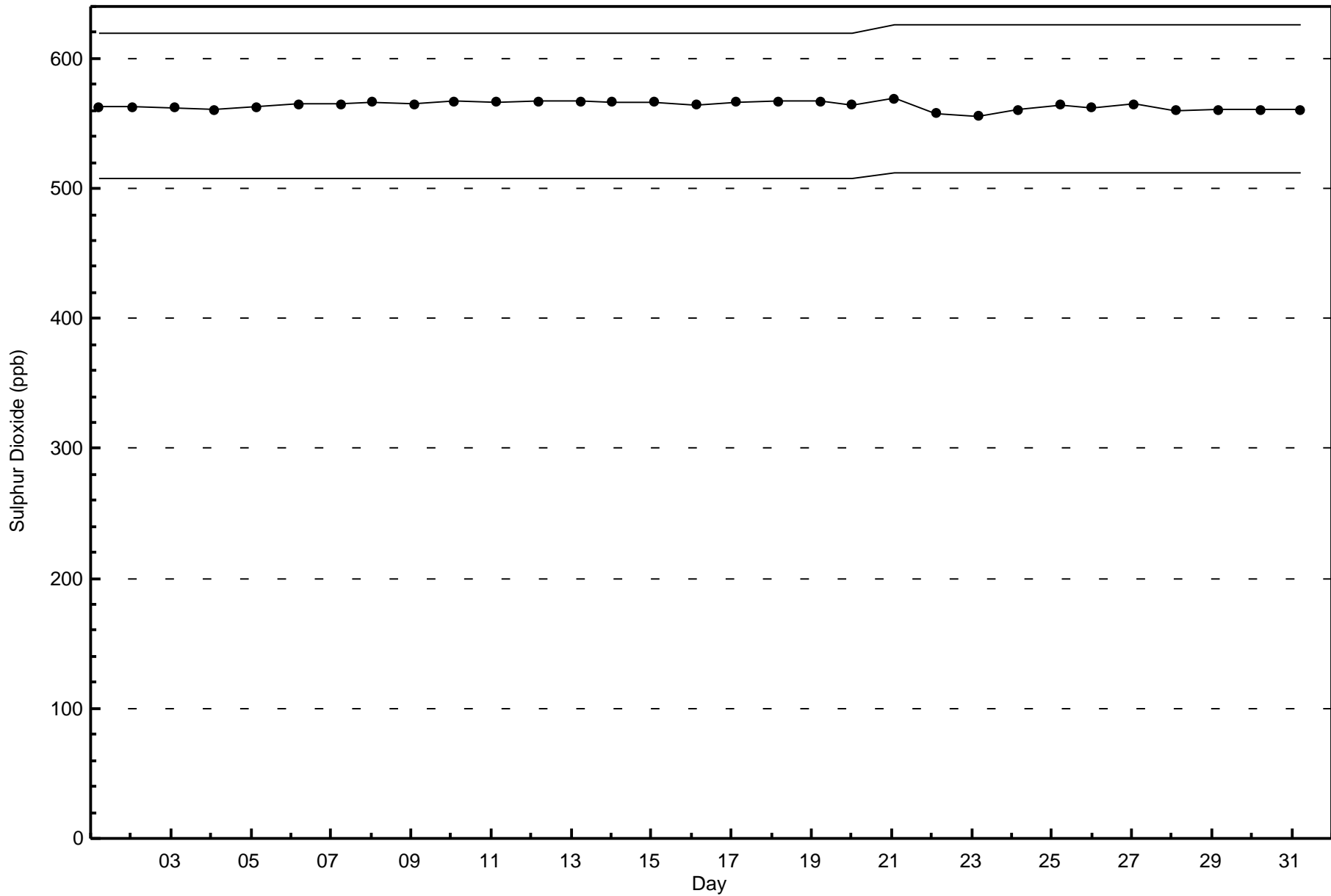
Sulphur Dioxide (SO₂) - ppb
Wapasu - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Wapasu - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

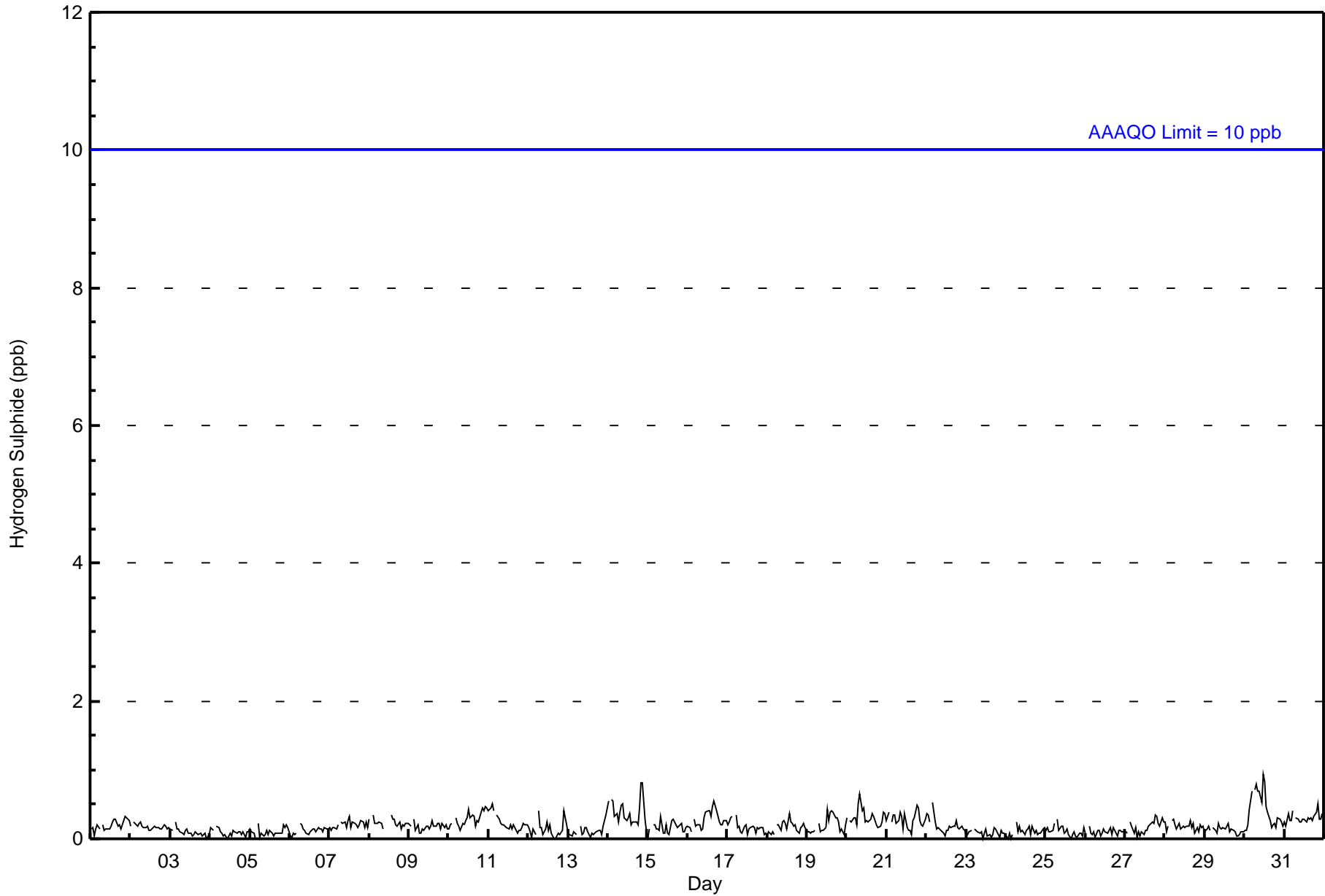
Wapasu - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																						
Maximum Value: 1 ppb on Dec 30 12:00										Maximum Daily Average: 0.4 ppb on Dec 30										Hours of Data: 709																												
Minimum Value: 0 ppb on Dec 4 11:00										Minimum Daily Average: 0.1 ppb on Dec 23										Hours of Missing Data: 35																												
Maximum Diurnal Average: 0.2 ppb at hour 6										Minimum Diurnal Average: 0.2 ppb at hour 2										Hours of Calibration: 35																												
Monthly Average: 0.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 100.0																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
8-Dec	0	Z	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
11-Dec	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																						
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
14-Dec	1	Z	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.4	1																						
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1																						
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
20-Dec	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
22-Dec	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																						
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
30-Dec	0	0	0	0	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1																						
																								0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
																								1	0	1	1	1	0	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	1	0	0	Diurnal Maximum
Z - zerospan C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																																																



WBEA Data PC
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	82	33	18	8	5	9	22	115	134	63	49	21	11	30	37	69	706
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	82	33	18	8	5	9	22	115	134	63	49	21	11	30	37	69	706

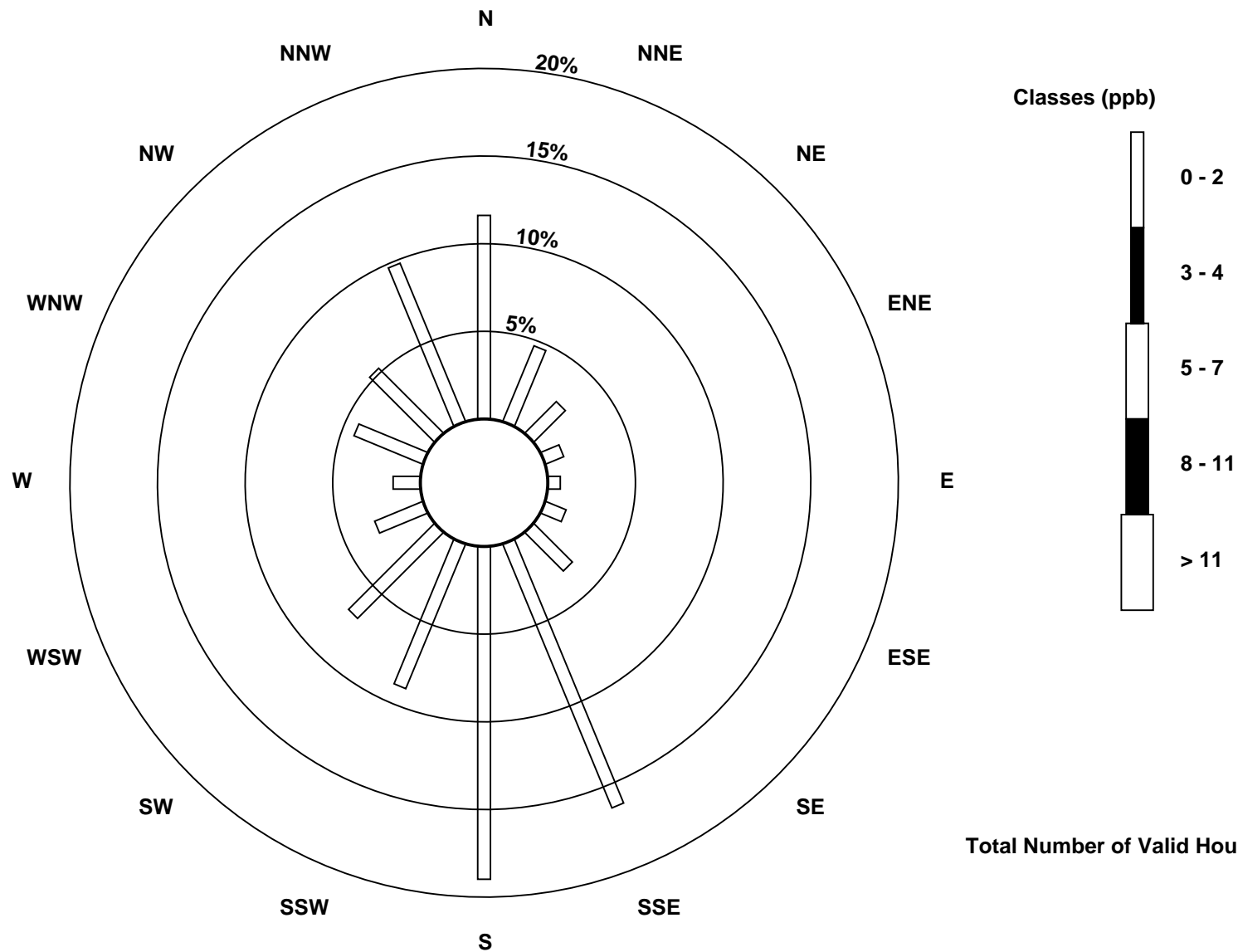
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Wapasu (AMS 17)

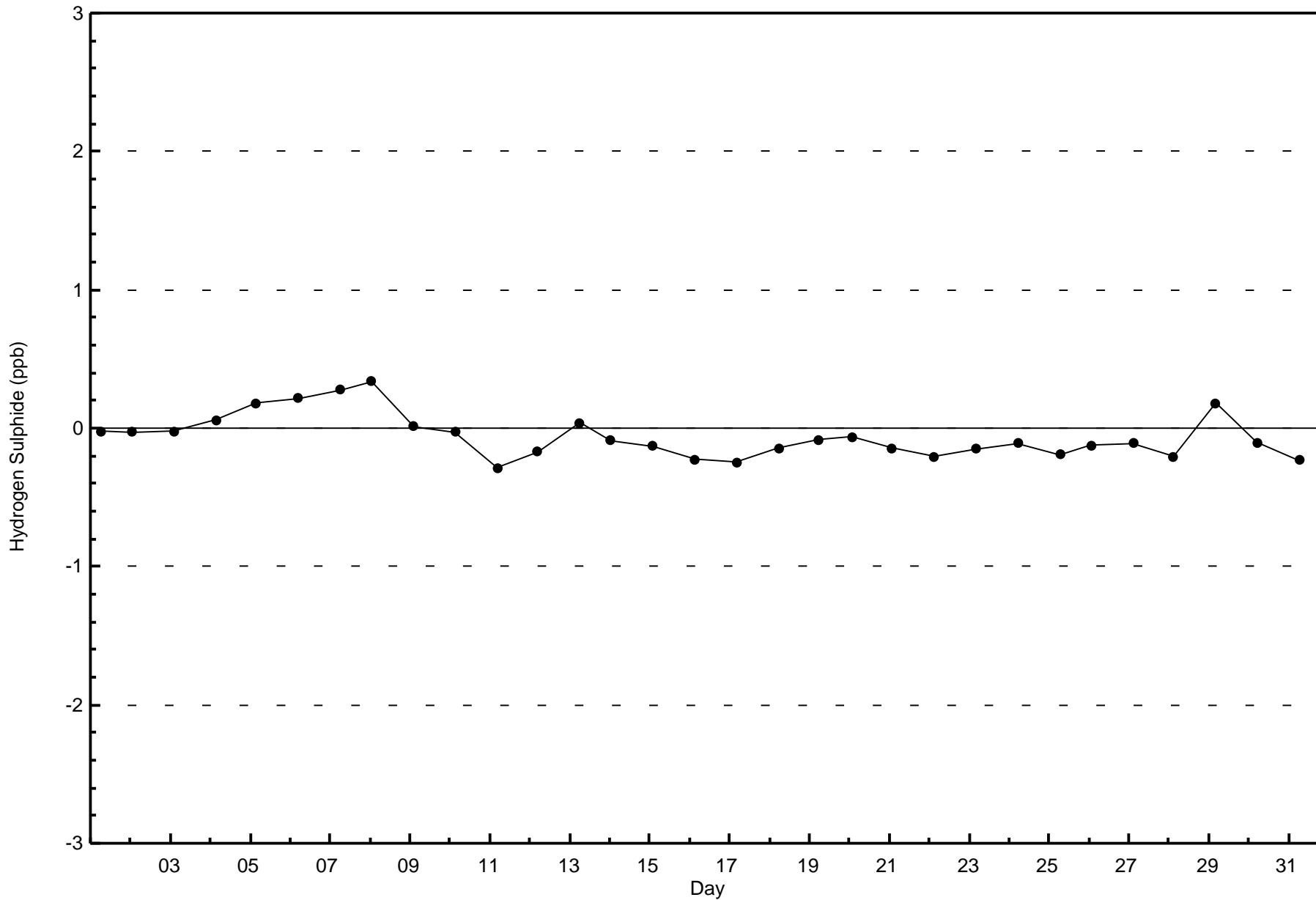


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

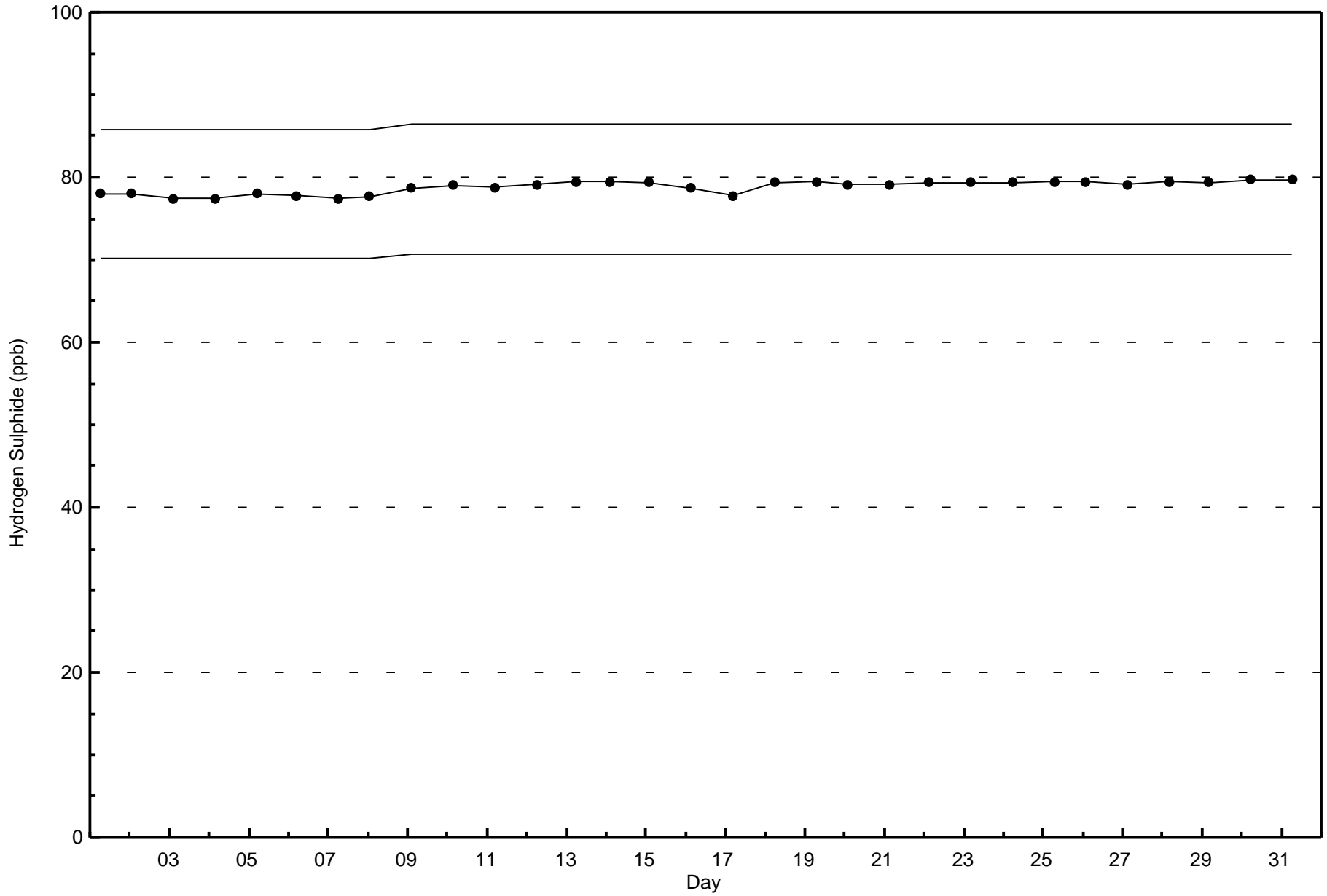
Hydrogen Sulphide (H₂S) - ppb
Wapasu - December 2016





WBEA Data PC
Span Responses

Hydrogen Sulphide (H₂S) - ppb
Wapasu - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

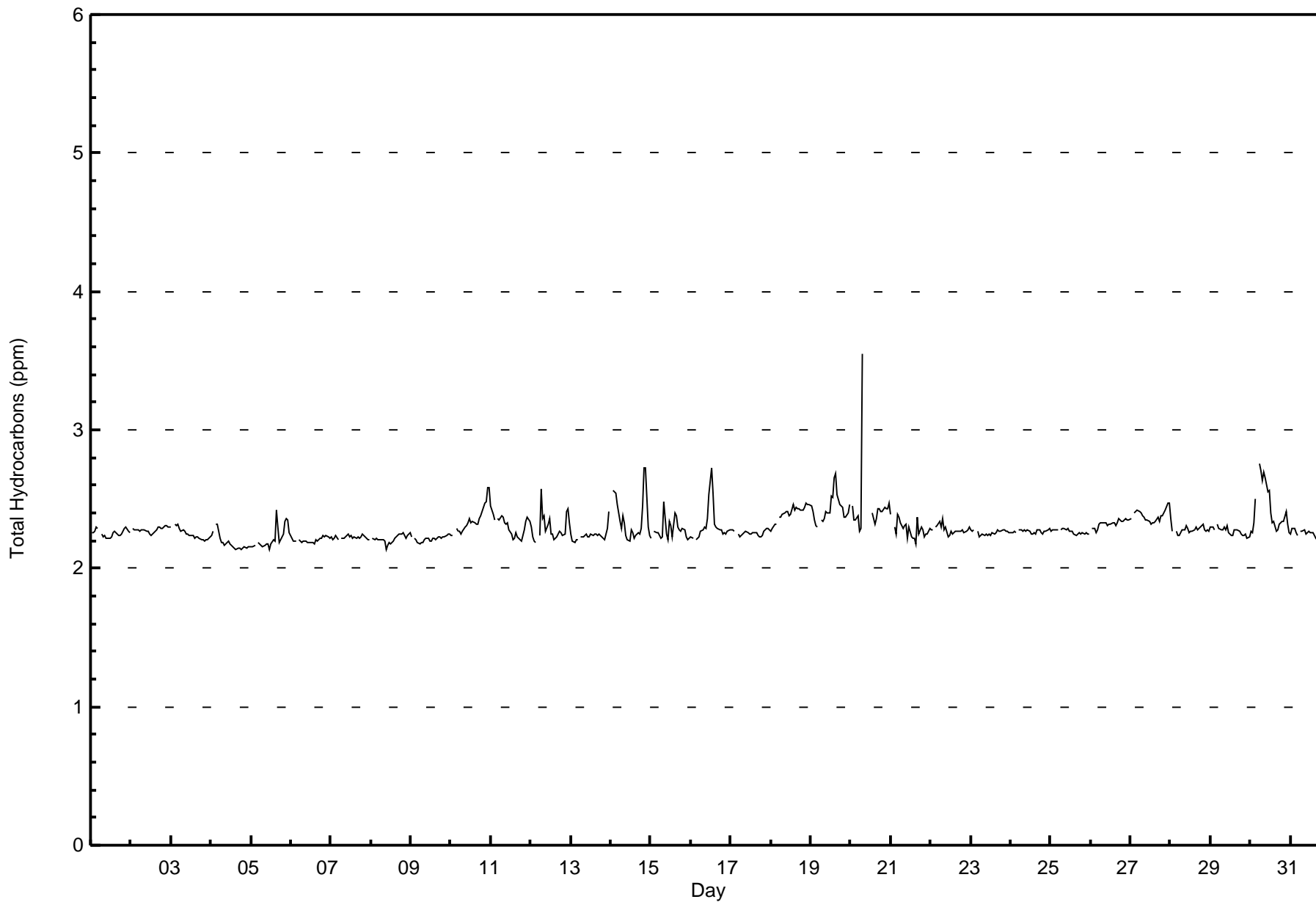
Wapasu - December 2016

Maximum Value: 3.5 ppm on Dec 20 08:00		Maximum Daily Average: 2.5 ppm on Dec 20		Hours in Service:	744																					
Minimum Value: 2.1 ppm on Dec 8 10:00		Minimum Daily Average: 2.2 ppm on Dec 4		Hours of Data:	708																					
Maximum Diurnal Average: 2.3 ppm at hour 8		Minimum Diurnal Average: 2.3 ppm at hour 15		Hours of Missing Data:	36																					
Monthly Average: 2.29 ppm		Percentiles: P ₁ = 2.1 P ₁₀ = 2.2 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.3 P ₉₀ = 2.4 P ₉₉ = 2.7		Hours of Calibration:	36																					
				Percent Operational Time:	100.0																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.3	2.3	2.3	2.3	2.3	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3
2-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
3-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
4-Dec	2.2	2.3	Z	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3
5-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.4	2.3	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.2	2.4
6-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
7-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.3
8-Dec	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.2	2.3	2.2	2.3
9-Dec	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
10-Dec	2.2	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.6	2.6	2.3	2.6
11-Dec	2.5	2.4	2.4	Z	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.5
12-Dec	2.3	2.2	2.2	2.2	Z	2.2	2.6	2.4	2.4	2.3	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.4	2.4	2.3	2.3	2.6
13-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.4
14-Dec	Z	2.6	2.6	2.5	2.5	2.3	2.3	2.4	2.3	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.3	2.2	2.3	2.4	2.7	2.7	2.3	2.2	2.4	2.7
15-Dec	2.2	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.5	2.2	2.2	2.3	2.3	2.2	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.5
16-Dec	2.2	2.2	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.5	2.7	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.7
17-Dec	2.3	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3
18-Dec	2.3	2.3	2.3	2.3	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.4	2.5
19-Dec	2.5	2.4	2.4	2.3	2.3	Z	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.5	2.7	2.7	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.5	2.4	2.7
20-Dec	Z	2.4	2.3	2.3	2.4	2.3	2.3	3.5	C	C	C	C	C	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	3.5
21-Dec	2.4	Z	2.3	2.2	2.4	2.4	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.4	
22-Dec	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4
23-Dec	2.3	2.3	2.3	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
24-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
25-Dec	2.3	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.3
26-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.4
27-Dec	2.4	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.5
28-Dec	2.4	2.3	Z	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4
29-Dec	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3
30-Dec	2.3	2.3	2.3	2.5	Z	2.8	2.7	2.6	2.7	2.7	2.6	2.6	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.8
31-Dec	2.2	2.3	2.3	2.3	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.5	2.3	2.2	2.3	2.3	2.5
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	707	99.86	99.86
3.1 - 10.0	1	0.14	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	83	35	19	8	5	8	21	118	133	63	44	20	11	30	37	69	704	
3.1 - 10.0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	83	35	19	8	5	8	21	118	133	64	44	20	11	30	37	69	705	

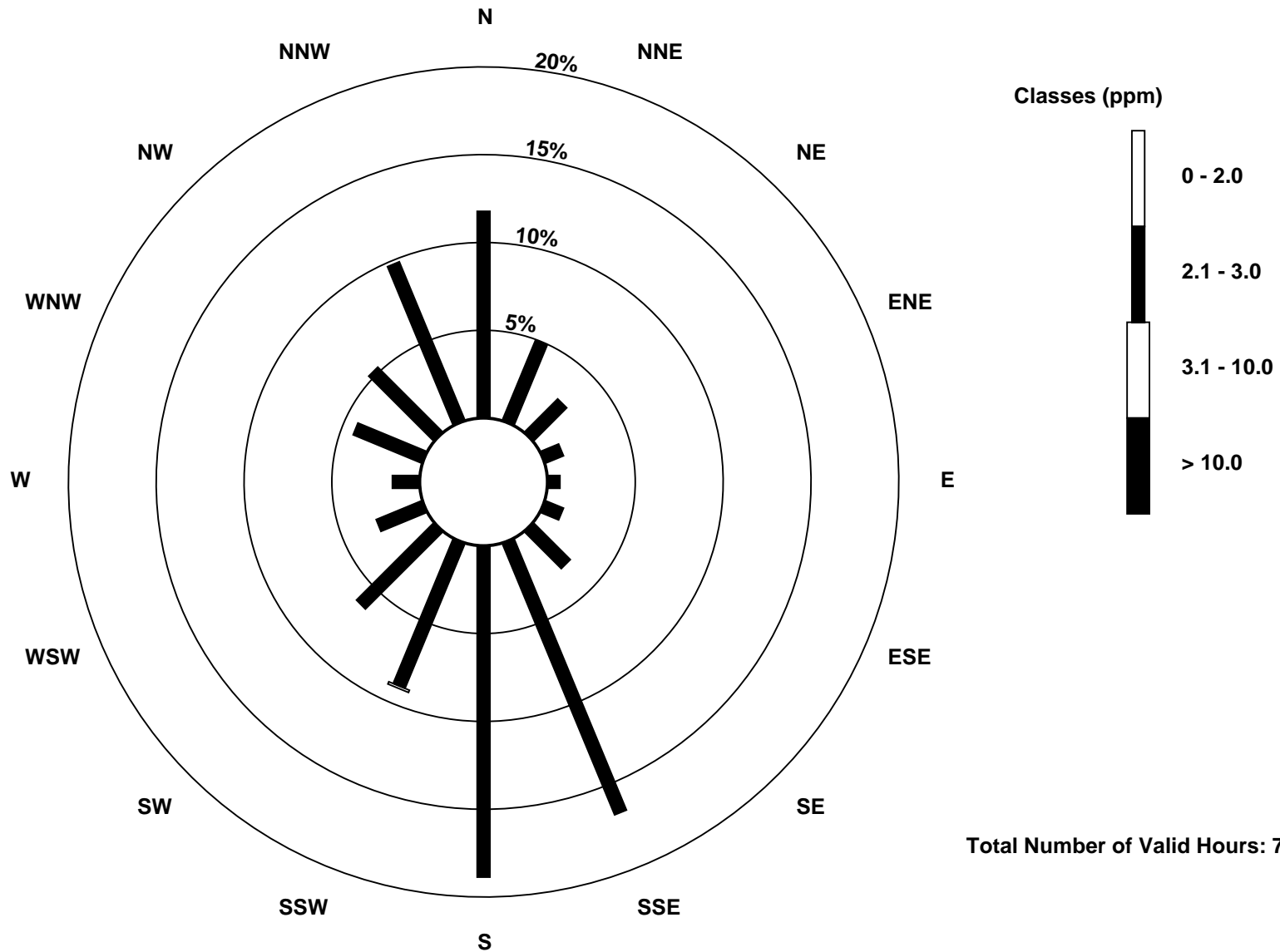
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

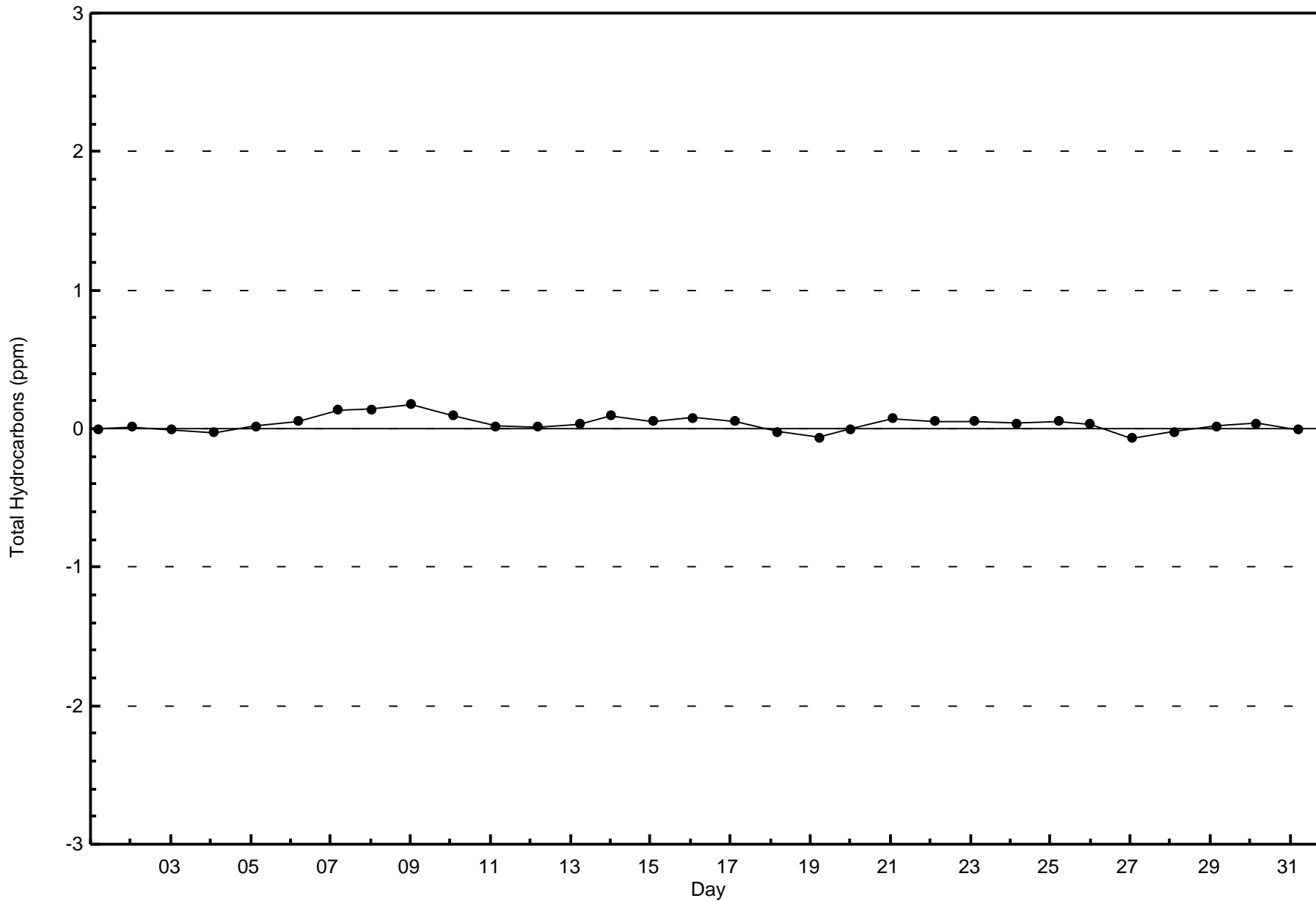
Total Hydrocarbons (THC) - ppm
Wapasu (AMS 17)





WBEA Data PC
Zero Responses

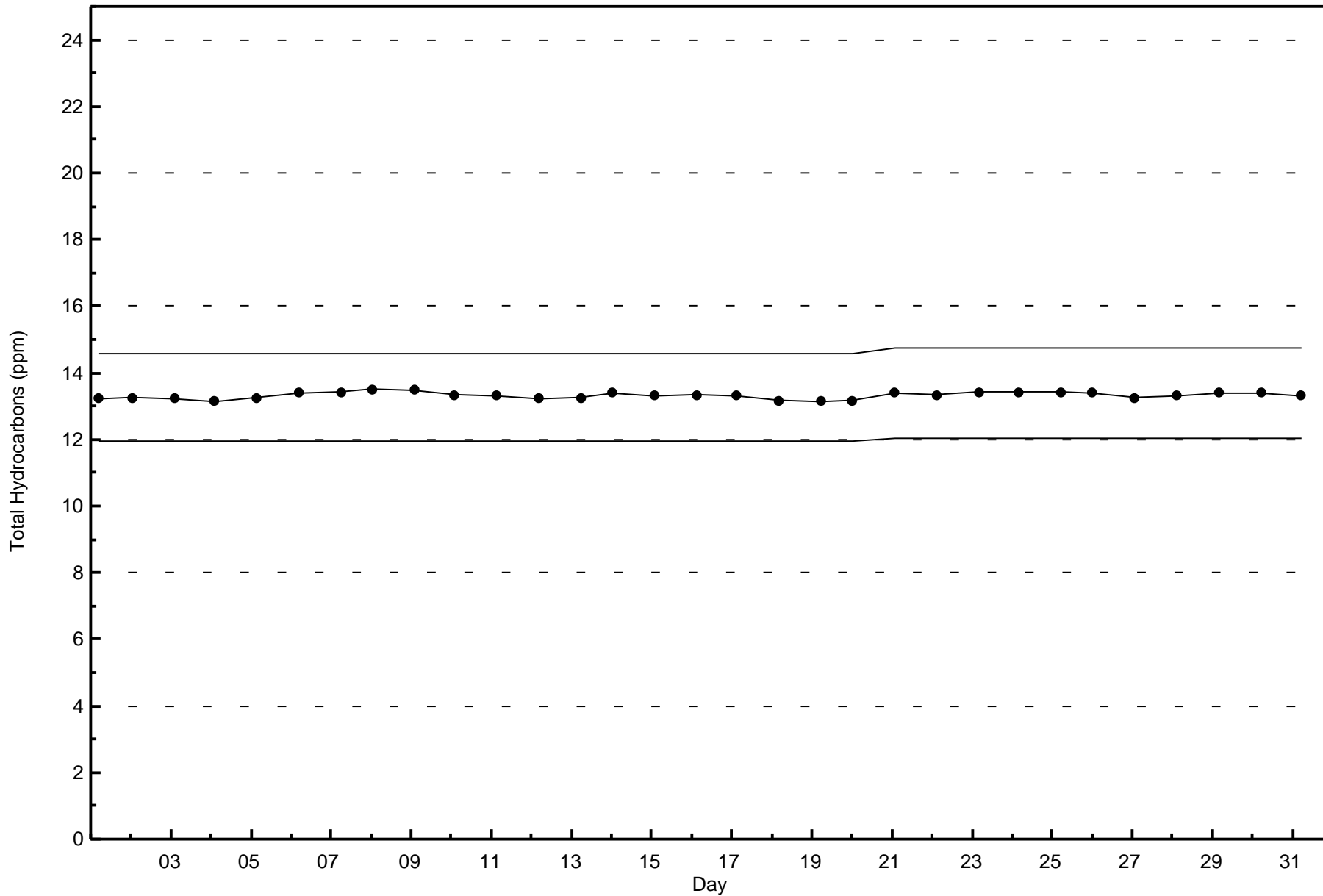
Total Hydrocarbons (THC) - ppm
Wapasu - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Wapasu - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

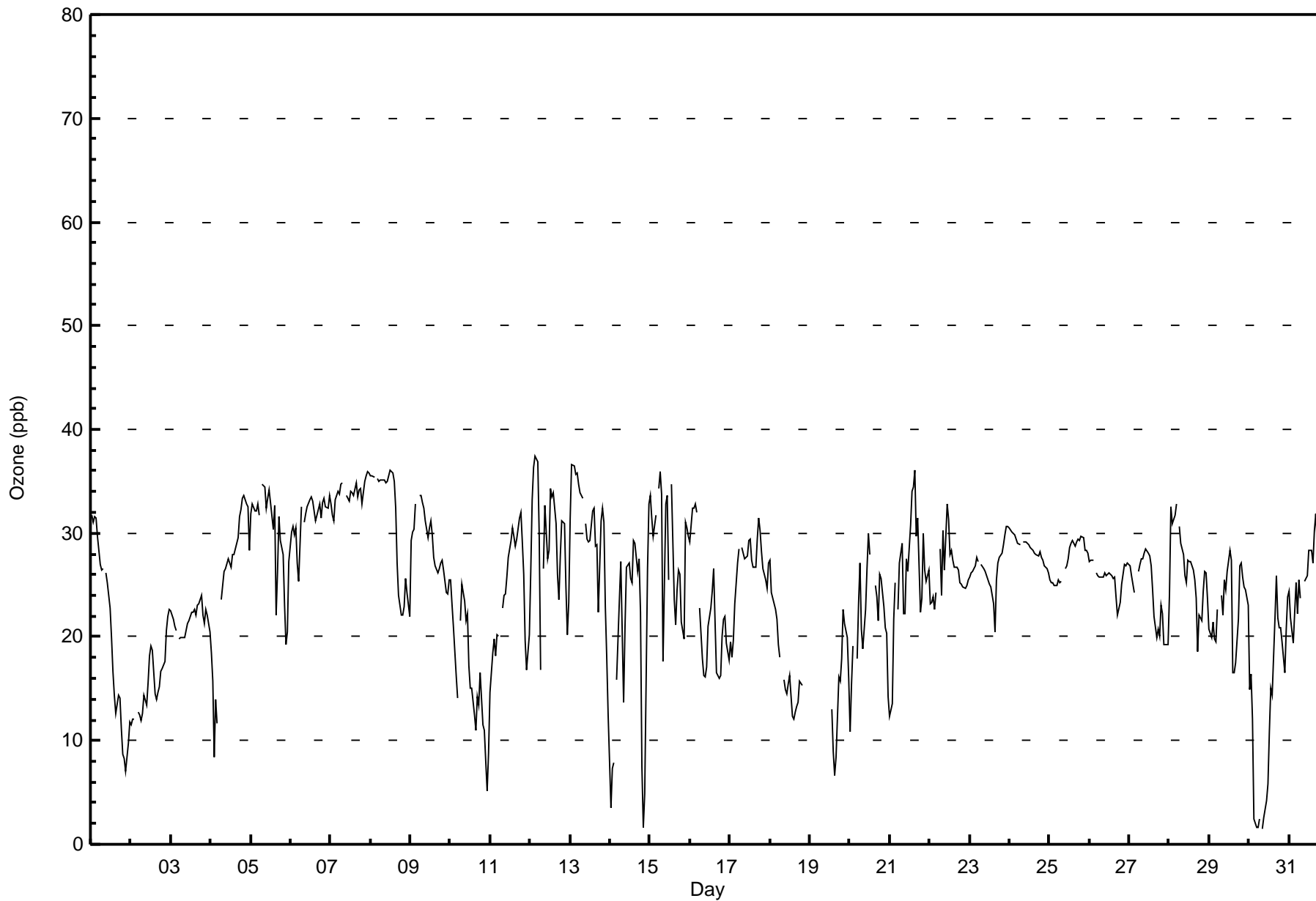
Wapasu - December 2016

Number of Exceedences (AAAQO):		1-hr: 0		24-hr: 0		Hours in Service:		744																																									
Maximum Value: 37 ppb on Dec 12 04:00		Maximum Daily Average: 33.9 ppb on Dec 7		Minimum Value: 1 ppb on Dec 30 09:00		Minimum Daily Average: 13.0 ppb on Dec 30		Hours of Data: 694																																									
Maximum Diurnal Average: 26.8 ppb at hour 13		Minimum Diurnal Average: 23.3 ppb at hour 22		Hours of Missing Data: 50		Hours of Calibration: 32		Percent Operational Time: 97.6																																									
Monthly Average: 24.8 ppb		Percentiles: P ₁ = 3 P ₁₀ = 15 Q ₁ = 21 Median = 26 Q ₃ = 30 P ₉₀ = 33 P ₉₉ = 36		Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																				
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	32	31	32	31	30	27	26	27	Z	26	25	23	20	17	14	13	14	14	11	9	8	7	10	12	19.9	32																							
2-Dec	11	12	12	Z	13	12	12	13	14	13	16	18	19	19	15	14	15	15	17	17	18	21	22	23	15.6	23																							
3-Dec	23	22	21	21	Z	20	20	20	20	21	21	22	22	22	23	22	23	23	24	22	21	23	22	20	21.6	24																							
4-Dec	18	16	8	14	12	Z	24	25	26	27	28	27	27	28	28	28	30	32	32	33	34	33	33	28	25.6	34																							
5-Dec	32	33	32	32	33	32	Z	35	35	32	33	34	33	30	33	22	26	32	29	28	23	19	20	27	29.8	35																							
6-Dec	30	31	30	31	27	25	33	Z	31	32	33	33	33	33	32	31	32	33	31	33	33	33	32	34	31.5	34																							
7-Dec	33	32	31	33	34	34	35	35	Z	34	33	33	34	34	34	35	33	34	34	33	35	35	36	36	33.9	36																							
8-Dec	36	35	35	Z	35	35	35	35	35	35	36	36	36	35	32	27	24	22	22	23	26	24	22	31.2	36																								
9-Dec	29	30	30	33	Z	34	34	33	32	31	30	30	31	30	28	27	26	27	27	27	26	24	24	26	29.1	34																							
10-Dec	26	23	21	16	14	Z	21	25	23	22	22	17	15	15	12	11	14	13	17	12	11	8	5	9	16.2	26																							
11-Dec	15	18	20	18	20	20	Z	23	24	24	26	28	29	31	30	29	29	32	32	29	26	20	17	20	24.3	32																							
12-Dec	26	33	36	37	37	30	17	Z	27	33	28	28	34	34	34	31	26	24	28	31	31	25	20	23	29.2	37																							
13-Dec	31	37	36	36	36	35	34	33	Z	31	29	29	29	32	32	29	29	22	31	32	31	23	18	12	30.0	37																							
14-Dec	4	7	8	Z	16	24	27	20	14	21	27	27	26	25	29	29	26	27	22	7	2	5	27	33	19.7	33																							
15-Dec	34	31	30	32	Z	34	36	34	18	33	34	26	UO	35	24	21	25	26	26	21	20	31	31	30	28.6	36																							
16-Dec	29	32	32	33	32	Z	23	18	16	16	17	21	23	24	27	21	17	16	16	20	22	22	19	18	22.4	33																							
17-Dec	20	18	20	23	27	28	Z	29	28	27	28	29	29	27	27	27	29	31	30	28	27	26	25	27	26.5	31																							
18-Dec	27	24	23	23	22	19	18	Z	16	15	14	15	16	12	12	13	13	14	16	15	UO	UO	UO	UO	17.3	27																							
19-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	13	9	7	8	16	16	18	23	21	20	16	--	23																							
20-Dec	11	15	19	Z	18	23	27	21	19	23	27	30	28	C	C	25	24	22	26	26	23	21	20	14	22.0	30																							
21-Dec	12	14	22	25	Z	23	27	29	22	22	28	26	31	34	34	36	30	31	22	24	30	26	25	26	26.1	36																							
22-Dec	23	23	24	23	24	Z	28	24	30	27	33	31	28	28	27	27	27	26	25	25	25	25	25	25	26.3	33																							
23-Dec	26	26	26	27	28	27	Z	27	27	26	26	26	25	25	23	20	26	27	28	28	29	30	31	31	26.6	31																							
24-Dec	31	30	30	30	29	29	Z	29	29	29	29	29	29	28	28	28	28	28	28	28	27	27	27	26	28.5	31																							
25-Dec	26	25	25	25	25	25	25	25	Z	27	27	28	29	29	29	29	29	29	29	30	30	28	28	28	27.4	30																							
26-Dec	27	27	27	Z	26	26	26	26	26	26	26	26	26	26	26	26	24	22	23	25	26	27	27	27	25.8	27																							
27-Dec	27	26	25	24	Z	26	27	27	28	28	28	28	28	27	24	22	20	21	20	23	22	19	19	19	24.3	28																							
28-Dec	24	33	31	32	33	Z	31	29	28	26	25	27	27	27	26	25	24	19	22	22	24	26	26	24	26.6	33																							
29-Dec	21	20	21	20	19	23	Z	24	22	25	25	26	28	27	16	17	18	22	27	27	26	25	24	23	22.9	28																							
30-Dec	15	16	12	2	2	2	Z	1	3	4	6	11	15	14	22	26	22	21	21	20	17	21	24	13.0	26																								
31-Dec	24	22	19	22	25	22	25	24	Z	25	26	26	28	28	27	30	32	29	25	23	20	27	32	29	25.8	32																							
																								24.1	24.8	24.7	25.7	24.7	25.4	25.7	26.4	23.6	25.3	26.0	26.2	26.8	26.4	25.1	24.1	24.2	24.3	24.5	23.9	23.8	23.3	23.7	23.7	Diurnal Average	
																								36	37	36	37	37	35	36	35	35	35	35	36	36	36	35	36	33	34	34	33	35	35	36	36	Diurnal Maximum	
Z - zerospan																								C - Calibration				UO - Unstable Operation																					
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	



WBEA Data PC
Hourly Averages

Ozone (O₃) - ppb
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	159	22.91	22.91
21 - 50	535	77.09	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 694

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Ozone (O₃) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	4	2	4	1	3	4	37	29	22	12	4	5	7	5	11	156
21 - 50	76	31	17	4	4	5	14	68	104	43	35	16	6	23	32	57	535
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	82	35	19	8	5	8	18	105	133	65	47	20	11	30	37	68	691

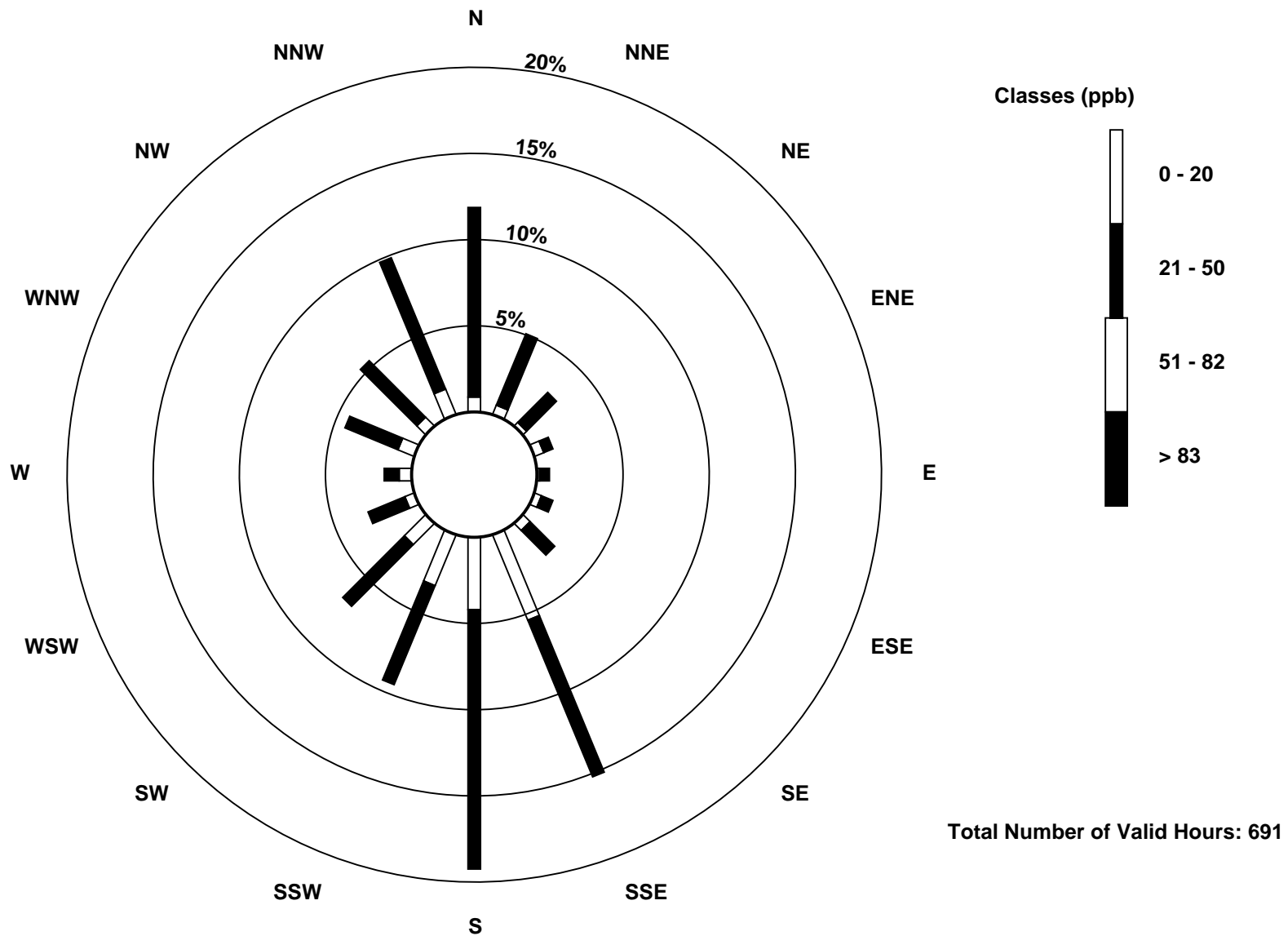
Total Number of Valid Hours: 691

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

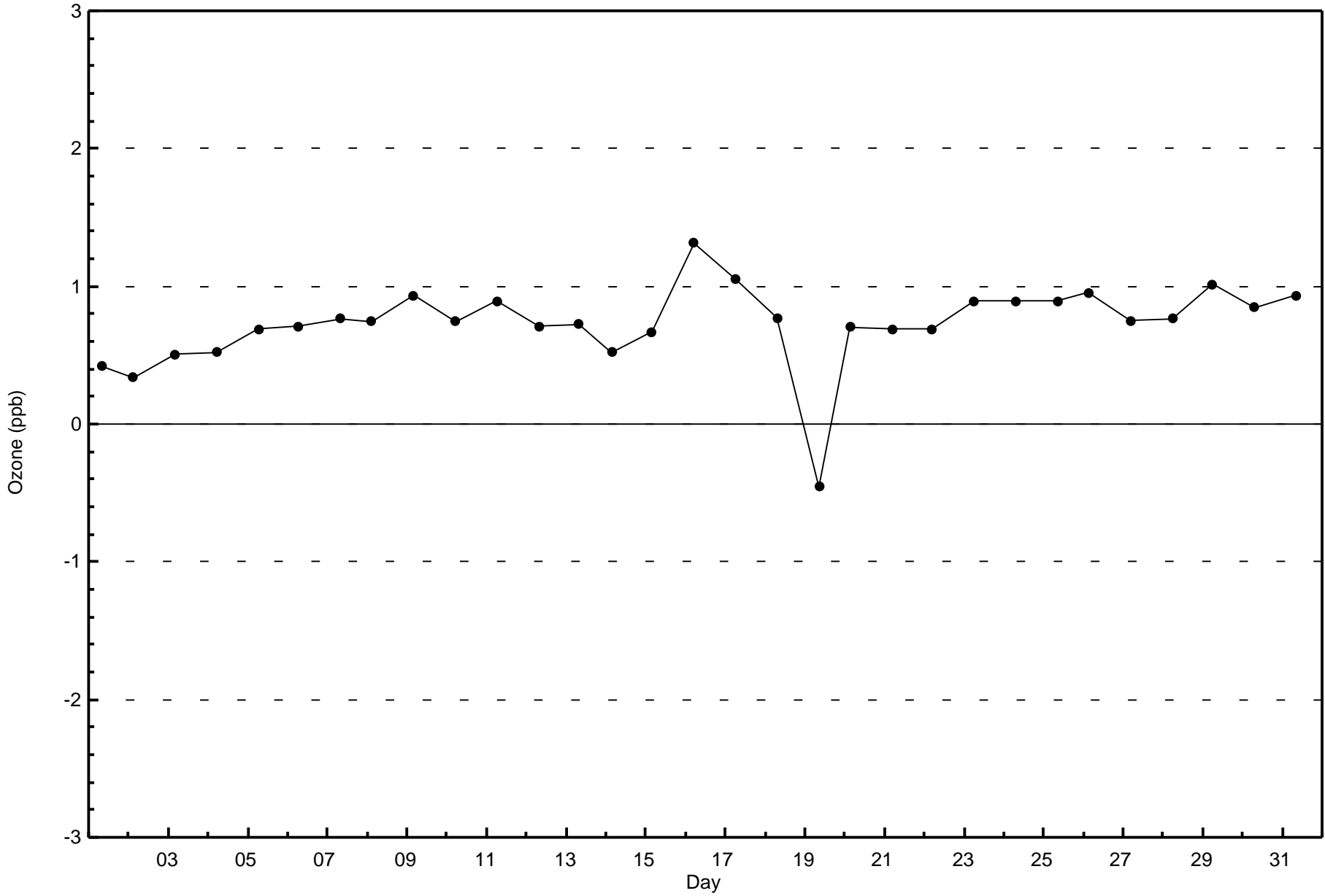
Ozone (O₃) - ppb
Wapasu (AMS 17)





WBEA Data PC
Zero Responses

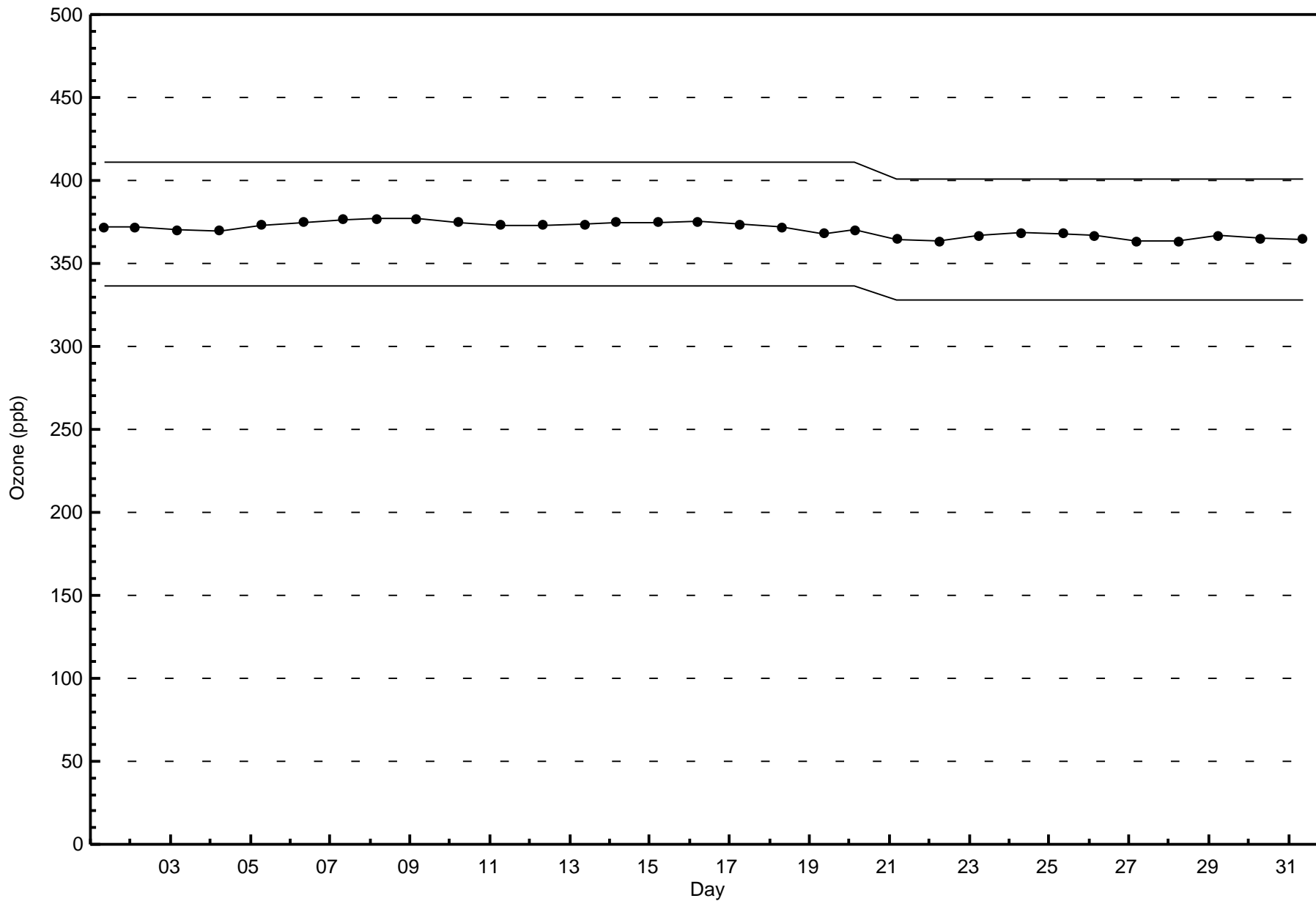
Ozone (O₃) - ppb
Wapasu - December 2016





WBEA Data PC
Span Responses

Ozone (O₃) - ppb
Wapasu - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

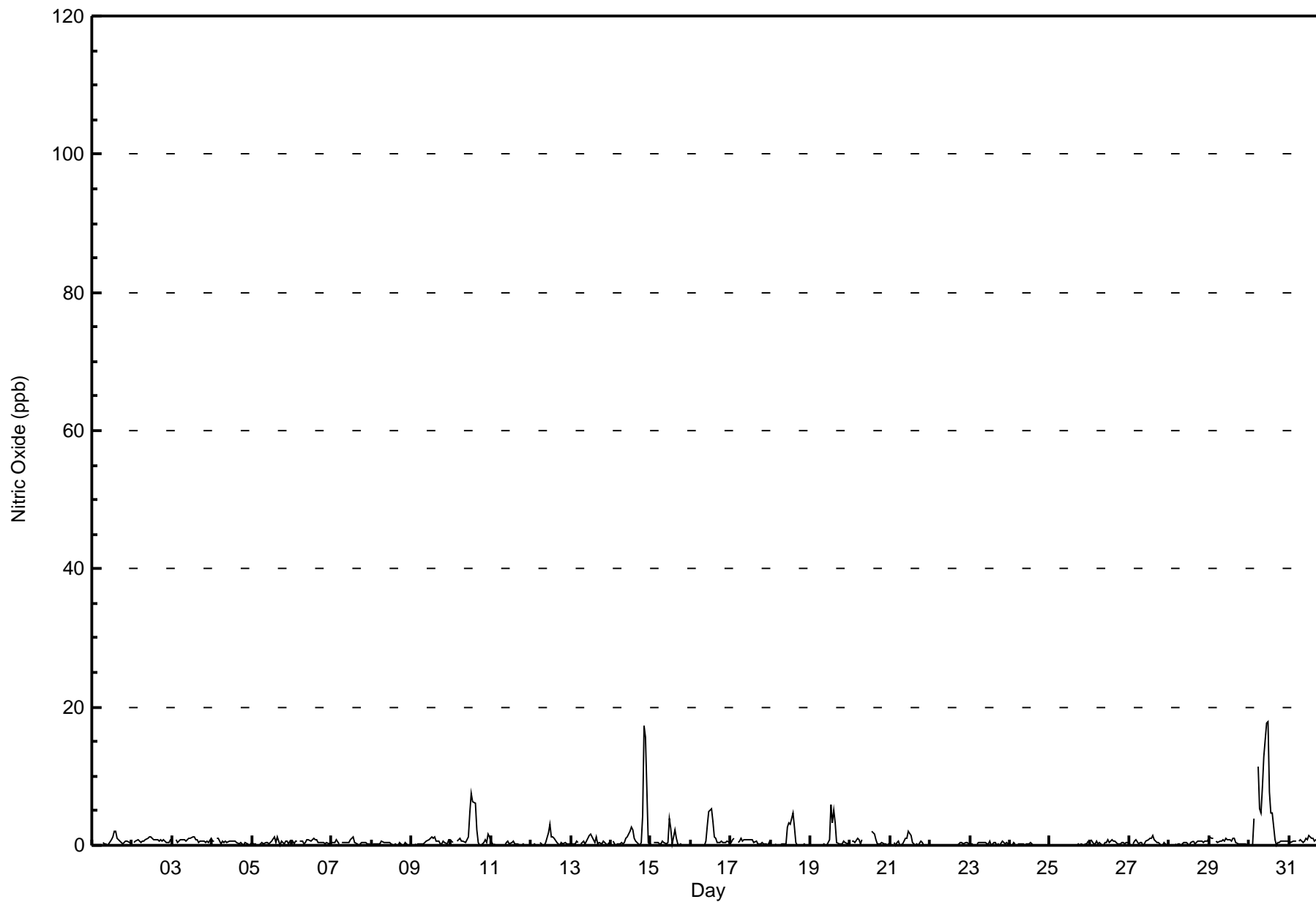
Nitric Oxide (NO) - ppb
Wapasu - December 2016

Maximum Value: 18 ppb on Dec 30 12:00		Maximum Daily Average: 4.5 ppb on Dec 30		Hours in Service: 744																						
Minimum Value: 0 ppb on Dec 1 04:00		Minimum Daily Average: 0.1 ppb on Dec 25		Hours of Data: 708																						
Maximum Diurnal Average: 1.9 ppb at hour 12		Minimum Diurnal Average: 0.3 ppb at hour 18		Hours of Missing Data: 36																						
Monthly Average: 0.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 7		Hours of Calibration: 36																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	2	2	1	1	0	0	0	1	1	0	0	0.5	2
2-Dec	Z	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0.7	1
3-Dec	1	Z	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	0	1	0.8	1
4-Dec	1	1	Z	1	1	0	1	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	1	0	1	0.5	1
6-Dec	1	0	1	1	Z	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	1
7-Dec	0	0	0	1	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1
8-Dec	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
9-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	1	0	0	1	1	0.5	1
10-Dec	1	0	Z	1	1	1	1	1	0	1	1	5	8	6	6	2	0	0	0	0	1	0	2	1	1.7	8
11-Dec	1	0	0	Z	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	2	3	1	1	1	0	0	0	0	0	0	0	0	0	0.5	3
13-Dec	0	0	0	1	0	Z	0	1	0	1	1	1	2	1	0	1	0	0	0	1	0	0	0	0	0.5	2
14-Dec	Z	1	0	0	0	0	0	0	0	1	1	2	3	2	1	1	0	0	0	4	17	16	0	0	2.2	17
15-Dec	0	Z	0	0	0	0	0	1	0	0	0	4	2	0	2	1	0	0	0	0	0	0	0	0	0.6	4
16-Dec	0	0	Z	0	0	0	0	0	0	1	3	5	5	4	1	1	0	0	1	0	0	0	1	0	1.0	5
17-Dec	0	1	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1
18-Dec	0	0	0	0	Z	0	0	0	0	0	3	3	3	5	3	0	0	0	0	0	0	0	0	0	0.8	5
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	6	3	5	3	0	0	0	0	1	0	0	0	0.9	6
20-Dec	Z	1	1	0	1	1	0	1	C	C	C	C	C	2	2	1	0	0	0	0	0	0	0	0	0.6	2
21-Dec	0	Z	0	0	0	1	0	0	1	1	1	2	2	0	0	0	0	0	1	0	0	0	0	0	0.4	2
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0.3	1
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1
26-Dec	Z	1	0	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0.4	1
27-Dec	0	Z	0	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	1	1	1	0.3	1
29-Dec	1	1	1	Z	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.6	1
30-Dec	0	0	0	4	Z	11	5	5	8	13	18	18	8	5	5	1	0	0	0	1	1	1	1	1	4.5	18
31-Dec	1	0	1	1	1	Z	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0.7	1
		0.3	0.3	0.3	0.5	0.4	0.8	0.5	0.5	0.6	0.9	1.4	1.9	1.8	1.4	1.3	0.7	0.3	0.3	0.3	0.5	0.9	0.8	0.3	0.4	Diurnal Average
		1	1	1	4	1	11	5	5	8	13	18	18	8	6	6	3	1	1	1	4	17	16	2	1	Diurnal Maximum
Z - zerospan		C - Calibration																								



WBEA Data PC
Hourly Averages

Nitric Oxide (NO) - ppb
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitric Oxide (NO) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	83	35	19	8	5	8	21	118	133	64	44	20	11	30	37	69	705
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	83	35	19	8	5	8	21	118	133	64	44	20	11	30	37	69	705

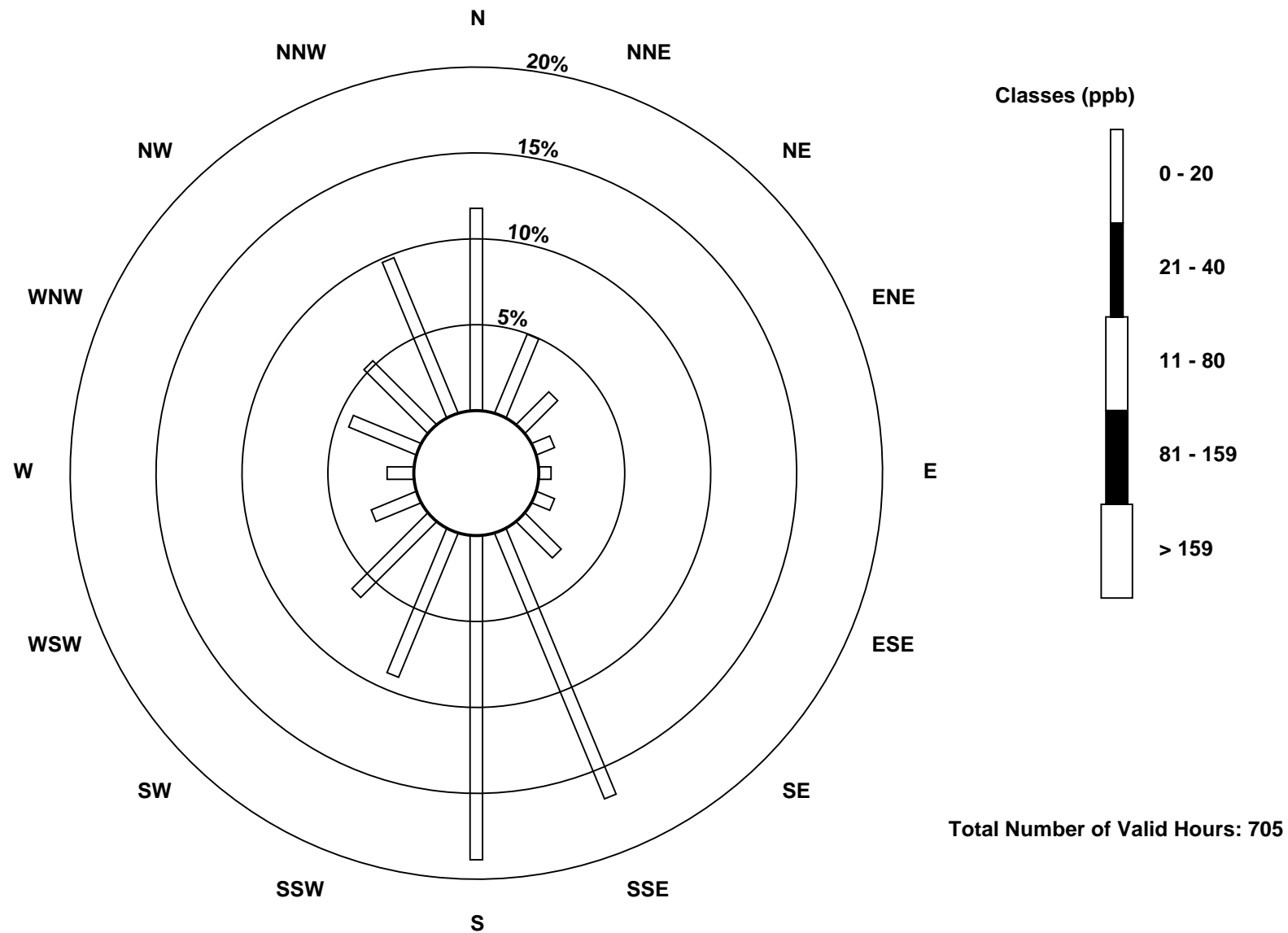
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

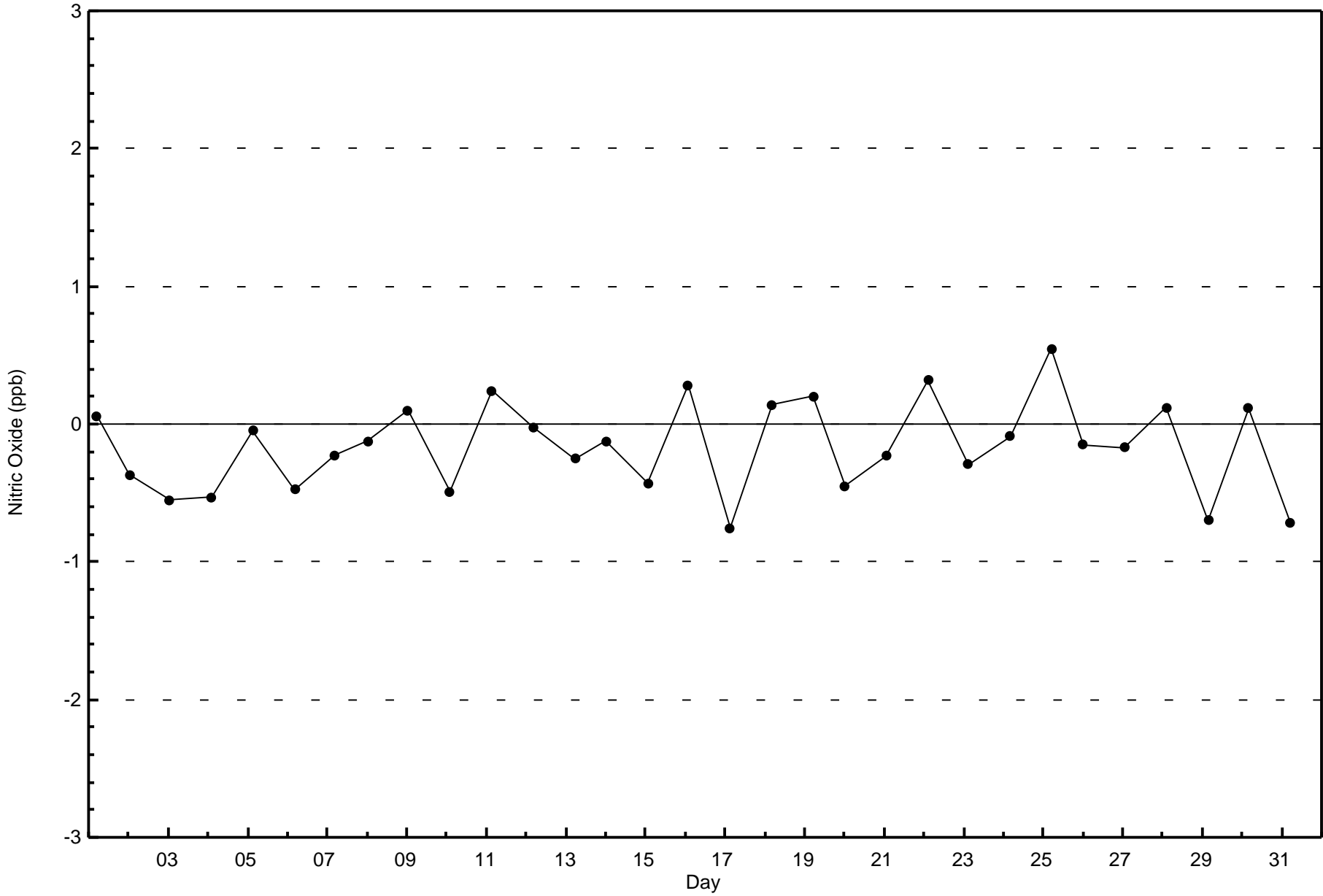
Nitric Oxide (NO) - ppb
Wapasu (AMS 17)





WBEA Data PC
Zero Responses

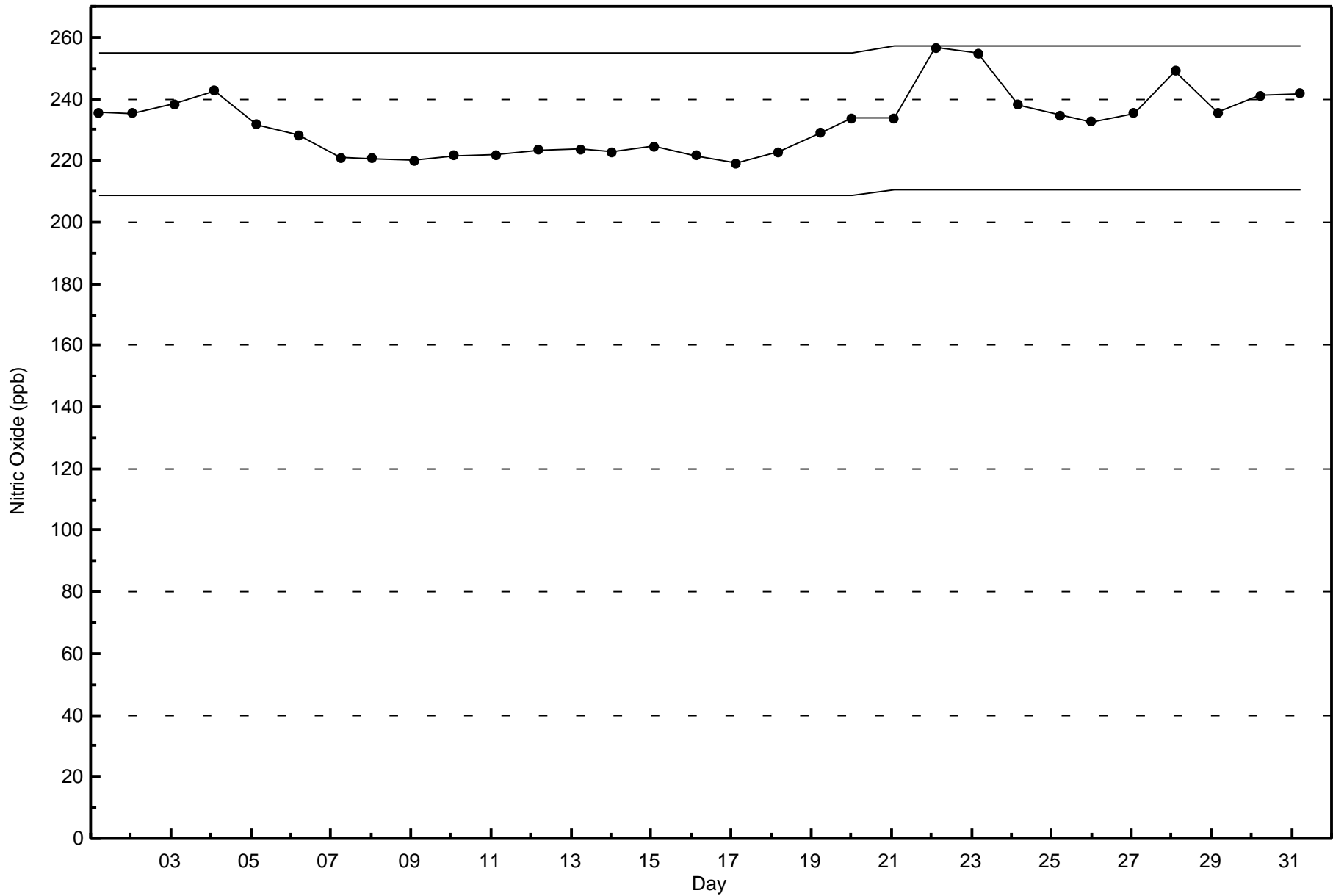
Nitric Oxide (NO) - ppb
Wapasu - December 2016





WBEA Data PC
Span Responses

Nitric Oxide (NO) - ppb
Wapasu - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Wapasu - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 35 ppb on Dec 14 21:00	Maximum Daily Average: 13.2 ppb on Dec 14		Hours of Data:	708
Minimum Value: 0 ppb on Dec 4 07:00	Minimum Daily Average: 0.0 ppb on Dec 23		Hours of Missing Data:	36
Maximum Diurnal Average: 5.8 ppb at hour 22	Minimum Diurnal Average: 3.4 ppb at hour 11		Hours of Calibration:	36
Monthly Average: 4.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 3 Q ₃ = 7 P ₉₀ = 11 P ₉₉ = 22		Percent Operational Time:	100.0

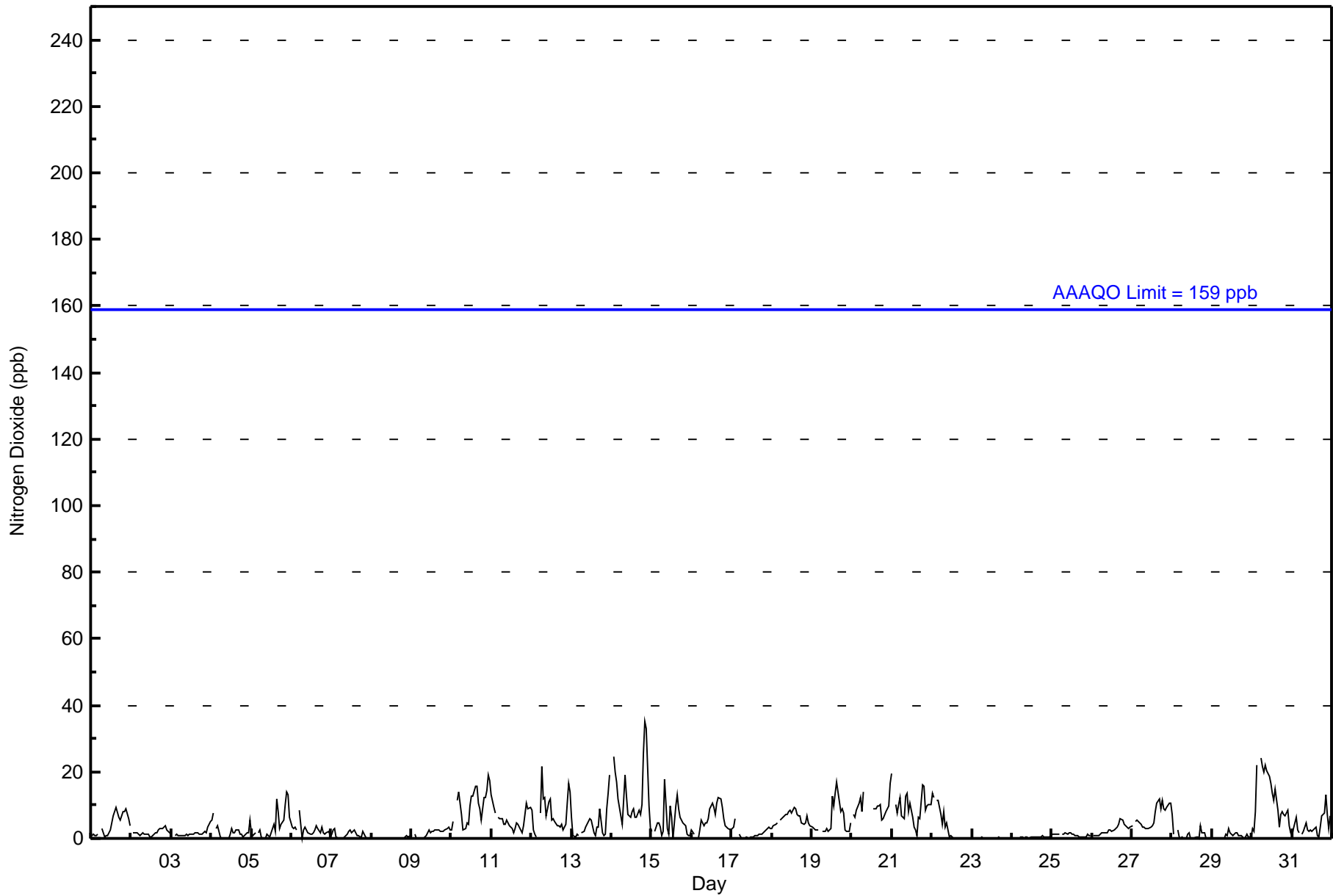
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	Z	3	2	0	1	1	3	5	7	8	9	6	6	7	8	8	9	6	4	4.2	9
2-Dec	Z	2	2	2	1	1	1	2	1	1	1	1	0	1	2	2	3	3	3	3	4	3	2	2	1.8	4
3-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	2	2	2	4	5	1.5	5
4-Dec	6	8	Z	3	4	0	0	0	0	0	1	3	2	2	3	3	1	1	0	1	2	2	5	5	2.0	8
5-Dec	2	1	2	Z	2	3	0	0	0	1	1	0	2	4	2	12	8	3	4	5	10	14	13	6	4.2	14
6-Dec	4	3	3	3	Z	8	0	2	4	3	2	1	1	2	3	4	3	2	4	2	1	2	2	0	2.5	8
7-Dec	1	3	3	1	0	Z	0	0	0	1	2	2	2	2	3	1	1	0	0	2	0	0	0	0	1.1	3
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0.1	1
9-Dec	1	Z	1	0	0	0	0	0	1	1	3	2	2	2	3	3	2	2	2	2	2	3	4	3	1.6	4
10-Dec	3	5	Z	12	14	11	7	2	3	5	4	10	13	13	16	16	11	9	5	12	12	14	19	17	10.1	19
11-Dec	13	9	8	Z	6	6	6	4	4	5	5	4	3	2	3	5	4	3	2	4	7	11	9	9	5.7	13
12-Dec	9	3	1	0	Z	8	21	12	12	7	11	12	6	6	5	4	4	4	4	3	4	11	17	14	7.7	21
13-Dec	6	1	1	1	1	Z	2	2	3	4	5	6	5	2	1	3	3	9	2	1	1	9	14	19	4.4	19
14-Dec	Z	25	20	17	12	7	4	11	19	13	7	7	8	9	7	6	9	7	10	25	35	33	10	3	13.2	35
15-Dec	2	Z	2	5	5	4	1	2	18	3	1	10	7	0	10	13	9	6	5	5	4	1	1	1	4.9	18
16-Dec	3	1	Z	0	0	3	6	4	5	5	6	9	11	9	7	11	12	12	9	6	4	4	3	3	5.6	12
17-Dec	3	3	6	Z	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	3	4	3	1.5	6
18-Dec	3	4	4	5	Z	6	6	6	7	7	8	9	8	9	9	7	7	7	5	4	5	7	5	4	6.1	9
19-Dec	4	3	3	3	3	Z	2	2	2	3	2	3	13	10	14	17	14	8	9	8	3	2	2	5	5.7	17
20-Dec	Z	7	7	8	11	12	8	14	C	C	C	C	C	9	9	10	10	10	6	6	8	9	10	16	9.5	16
21-Dec	20	Z	10	8	10	12	7	6	13	14	8	11	6	4	3	1	7	6	16	16	9	10	10	10	9.3	20
22-Dec	14	12	Z	11	11	7	4	8	3	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3.4	14
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0.4	1
25-Dec	1	1	1	1	1	Z	1	1	2	1	2	2	1	1	1	1	1	1	1	1	0	1	1	1	1.1	2
26-Dec	Z	1	1	1	1	1	2	2	2	2	3	3	2	3	3	3	4	6	6	4	4	3	3	3	2.7	6
27-Dec	4	Z	5	6	5	4	3	3	3	3	3	4	4	5	8	10	12	9	12	9	9	9	11	11	6.5	12
28-Dec	7	1	Z	2	1	0	0	0	0	1	2	0	0	0	0	1	0	4	2	2	0	0	0	0	1.0	7
29-Dec	0	0	0	Z	0	0	0	0	1	1	3	2	1	1	2	2	1	1	1	0	0	1	1	0	0.7	3
30-Dec	3	2	8	22	Z	24	21	20	22	21	19	17	14	11	15	8	3	7	8	7	7	8	4	2	11.9	24
31-Dec	1	3	6	3	2	Z	1	2	5	3	2	2	2	3	4	1	0	3	7	8	13	7	3	7	3.8	13
4.2 3.9 3.7 4.4 3.6 4.7 3.5 3.6 4.4 3.7 3.4 4.0 4.0 3.8 4.5 5.0 4.5 4.2 4.2 4.7 5.0 5.8 5.1 5.0																								Diurnal Average		
20 25 20 22 14 24 21 20 22 21 19 17 14 13 16 17 14 12 16 25 35 33 19 19																								Diurnal Maximum		

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	698	98.59	98.59
21 - 40	10	1.41	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	83	35	19	8	5	8	21	118	133	61	43	20	10	28	35	68	695
21 - 40	0	0	0	0	0	0	0	0	0	3	1	0	1	2	2	1	10
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	83	35	19	8	5	8	21	118	133	64	44	20	11	30	37	69	705

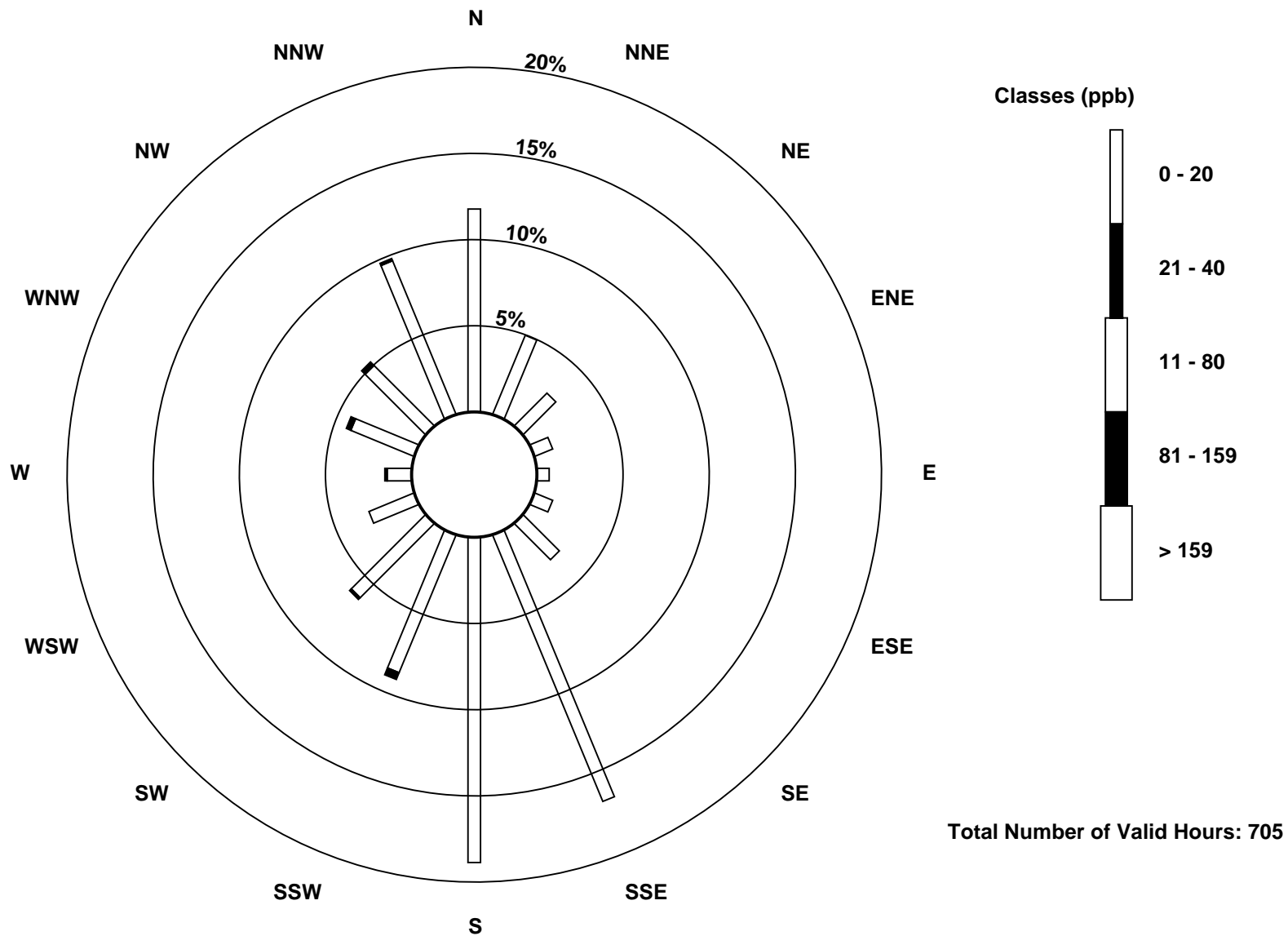
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

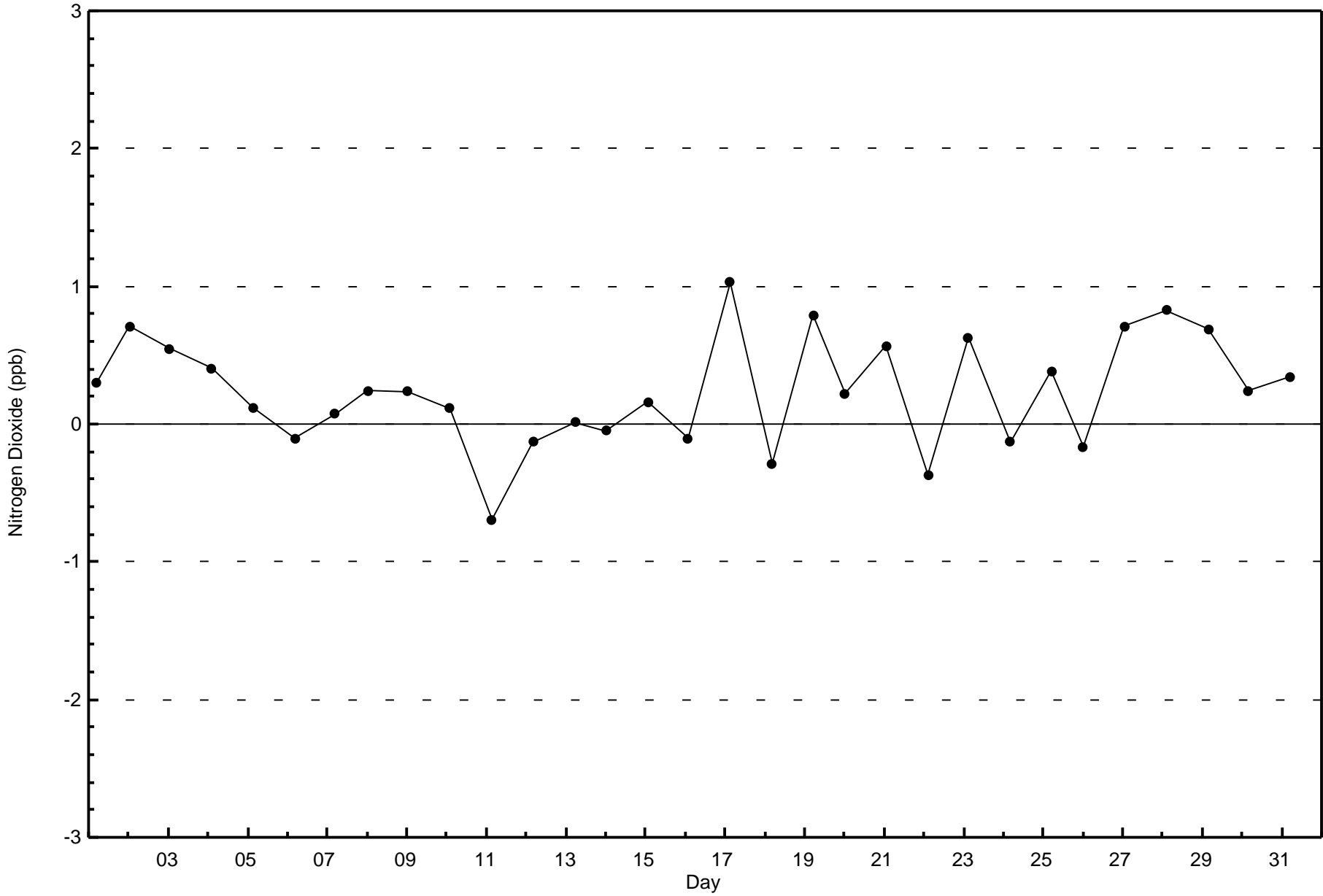
Nitrogen Dioxide (NO₂) - ppb
Wapasu (AMS 17)





WBEA Data PC
Zero Responses

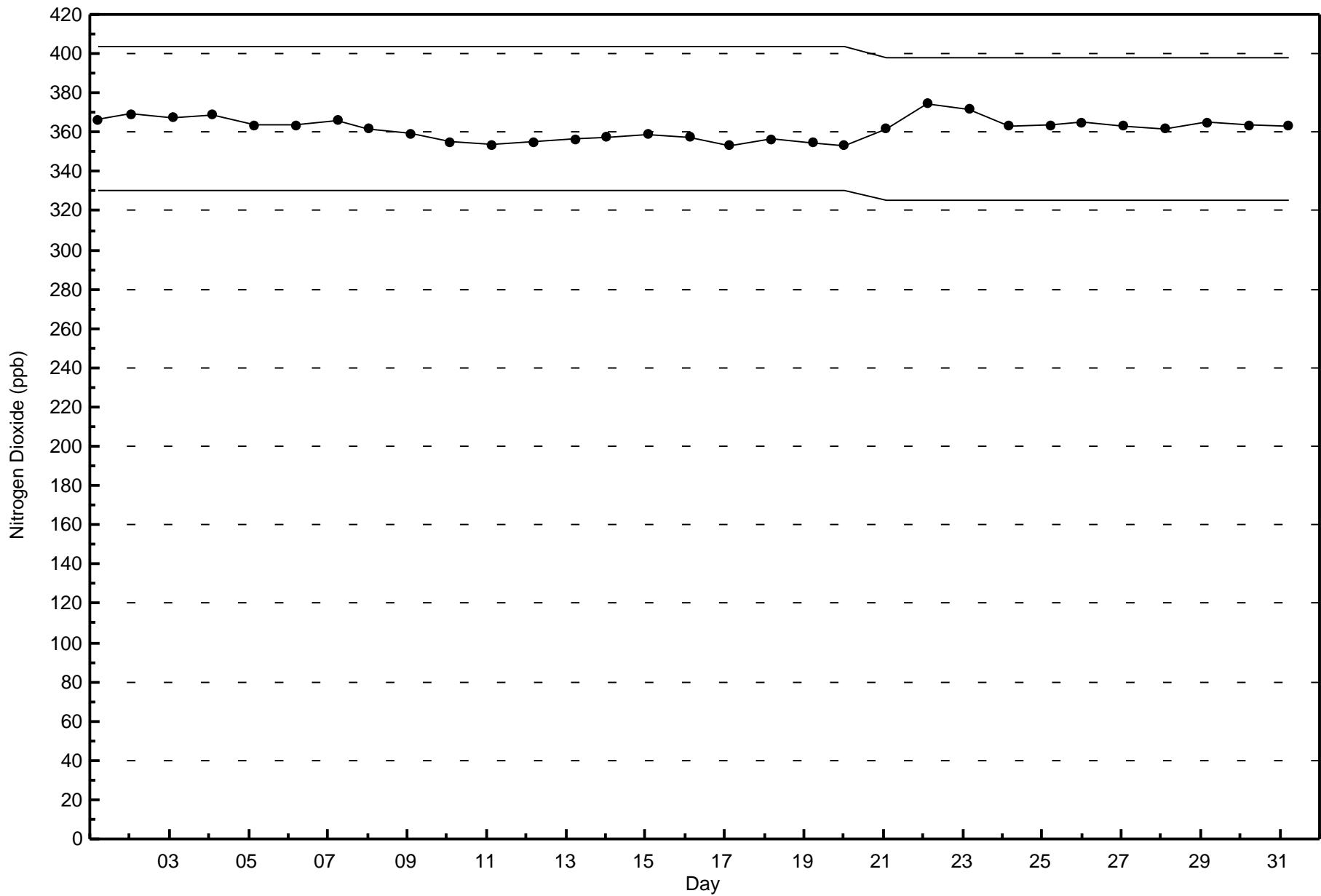
Nitrogen Dioxide (NO₂) - ppb
Wapasu - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Wapasu - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

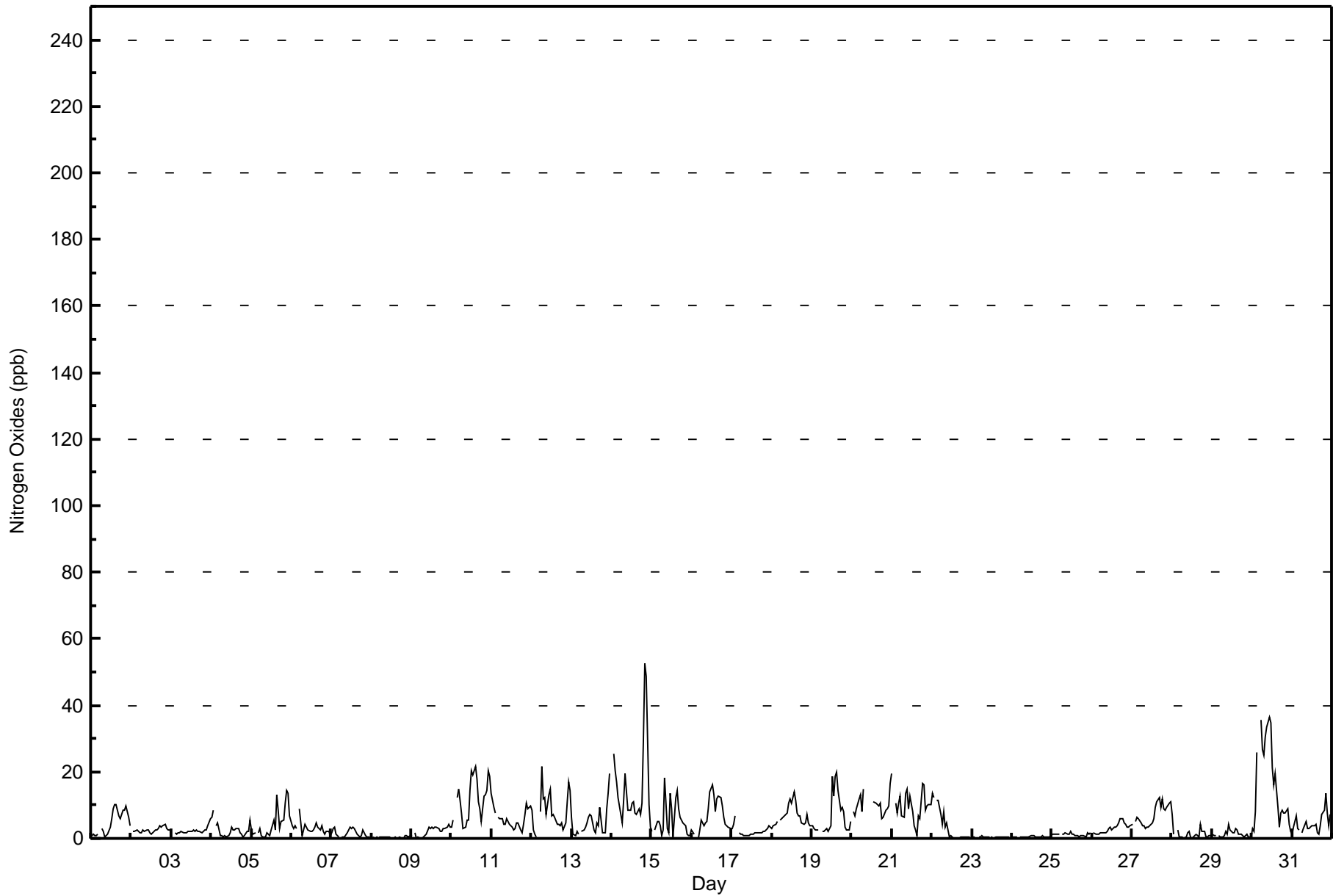
Wapasu - December 2016

Maximum Value: 53 ppb on Dec 14 21:00																		Maximum Daily Average: 16.4 ppb on Dec 30																		Hours in Service: 744	
Minimum Value: 0 ppb on Dec 8 14:00																		Minimum Daily Average: 0.3 ppb on Dec 8																		Hours of Data: 708	
Maximum Diurnal Average: 6.6 ppb at hour 22																		Minimum Diurnal Average: 3.9 ppb at hour 5																		Hours of Missing Data: 36	
Monthly Average: 5.0 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 3 Q ₃ = 7 P ₉₀ = 12 P ₉₉ = 29																		Hours of Calibration: 36	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	1	1	Z	3	2	1	1	1	3	6	9	10	10	7	6	7	9	8	10	6	4	4.7	10											
2-Dec	Z	2	2	3	2	2	2	3	2	3	3	2	1	2	2	3	3	4	4	4	4	3	3	3	2.5	4											
3-Dec	2	Z	2	1	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	4	6	2.3	6											
4-Dec	6	8	Z	4	5	1	1	0	1	0	1	2	3	2	3	3	3	2	1	0	1	2	2	5	2.5	8											
5-Dec	2	1	2	Z	2	3	1	0	1	2	1	1	2	5	3	13	9	3	5	6	10	15	13	7	4.6	15											
6-Dec	4	3	4	3	Z	9	1	3	4	3	3	2	2	3	3	5	3	2	4	2	1	2	2	1	3.0	9											
7-Dec	2	3	3	1	0	Z	0	0	1	2	2	3	3	3	3	1	1	1	1	3	1	0	0	0	1.5	3											
8-Dec	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0.3	1											
9-Dec	1	Z	2	0	0	0	0	0	1	1	3	3	3	3	4	3	3	2	2	3	3	3	4	3	2.1	4											
10-Dec	3	5	Z	12	15	12	8	3	4	5	6	14	20	19	22	18	11	9	5	13	13	15	21	19	11.7	22											
11-Dec	14	9	8	Z	6	6	6	4	4	6	5	4	3	2	3	5	5	3	2	4	7	10	9	10	5.9	14											
12-Dec	8	3	1	0	Z	8	22	12	12	7	13	15	7	7	6	4	4	4	5	3	5	11	17	14	8.2	22											
13-Dec	6	1	1	2	1	Z	2	3	3	5	6	7	7	3	2	5	4	9	2	2	9	14	19	4.9	19												
14-Dec	Z	25	20	17	12	7	5	11	20	14	9	8	11	11	7	7	9	7	10	30	53	49	10	3	15.4	53											
15-Dec	2	Z	3	5	5	4	1	3	18	3	2	14	9	0	12	14	9	6	5	5	4	1	1	1	5.5	18											
16-Dec	3	1	Z	0	0	3	6	4	5	5	9	14	16	13	8	12	13	12	10	6	4	4	4	3	6.7	16											
17-Dec	3	4	7	Z	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	4	3	2.1	7											
18-Dec	3	4	4	5	Z	6	6	6	7	8	11	12	11	14	11	8	7	7	5	4	5	7	5	4	6.9	14											
19-Dec	4	3	3	3	2	Z	2	2	2	3	2	4	19	13	19	20	14	8	9	8	3	3	2	5	6.7	20											
20-Dec	Z	8	7	9	12	13	8	15	C	C	C	C	C	11	11	10	10	11	6	7	8	9	10	17	10.0	17											
21-Dec	20	Z	11	8	10	13	7	6	14	15	9	13	8	4	3	1	7	6	17	16	9	10	10	10	9.7	20											
22-Dec	14	12	Z	11	12	7	4	8	3	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3.5	14											
23-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0.3	1											
24-Dec	0	0	1	0	Z	0	0	0	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	1	0.5	1											
25-Dec	1	1	1	1	1	Z	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1.2	2											
26-Dec	Z	2	1	1	1	2	2	2	2	2	3	4	3	3	4	4	5	6	6	5	4	4	4	4	3.1	6											
27-Dec	4	Z	5	6	6	4	4	4	3	3	3	4	5	6	9	11	12	9	12	9	9	9	11	11	7.0	12											
28-Dec	7	1	Z	2	0	0	1	0	0	2	2	0	0	0	1	1	0	4	2	2	0	1	1	1	1.4	7											
29-Dec	1	1	1	Z	1	0	1	1	2	1	4	2	2	2	3	3	1	1	1	0	1	1	1	0	1.3	4											
30-Dec	3	2	8	26	Z	36	27	25	30	33	36	35	21	16	20	9	3	8	8	8	7	9	4	2	16.4	36											
31-Dec	1	3	7	3	3	Z	2	3	5	3	3	3	4	4	4	2	1	4	7	8	14	8	4	7	4.5	14											
4.5																		4.1																		Diurnal Average	
20																		25																		Diurnal Maximum	
4.0																		4.8																			
3.9																		5.5																			
4.0																		4.0																			
5.0																		4.6																			
4.8																		5.9																			
5.8																		5.2																			
5.8																		5.7																			
4.8																		4.5																			
4.5																		4.5																			
5.2																		5.9																			
6.6																		5.4																			
5.4																		5.4																			
Z - zerospan																								C - Calibration													



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	692	97.74	97.74
21 - 40	14	1.98	99.72
41 - 80	2	0.28	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Wapasu - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	83	35	19	8	5	8	21	118	132	58	42	19	10	28	35	68	689
21 - 40	0	0	0	0	0	0	0	0	1	6	2	1	1	2	1	0	14
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	83	35	19	8	5	8	21	118	133	64	44	20	11	30	37	69	705

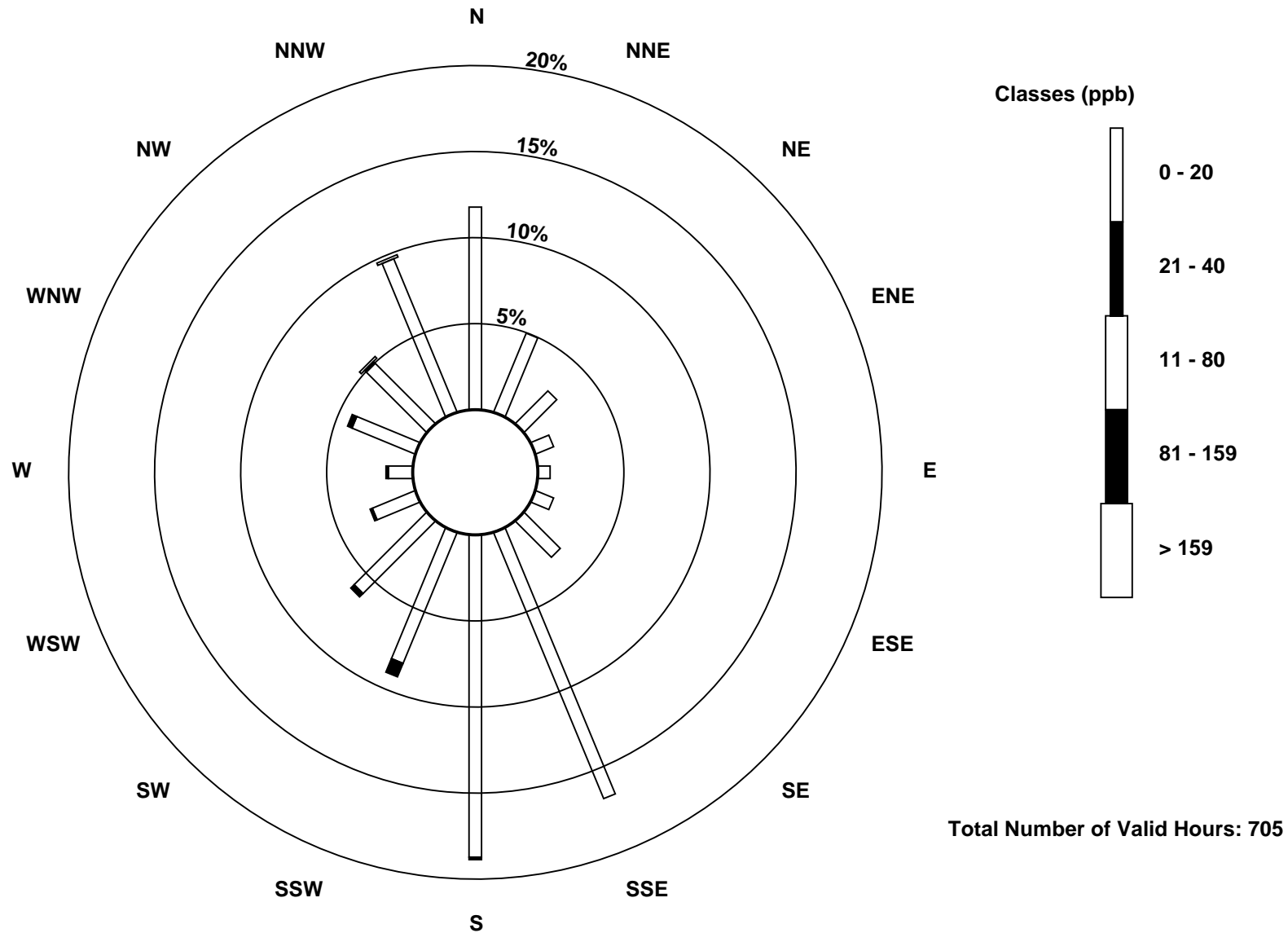
Total Number of Valid Hours: 705

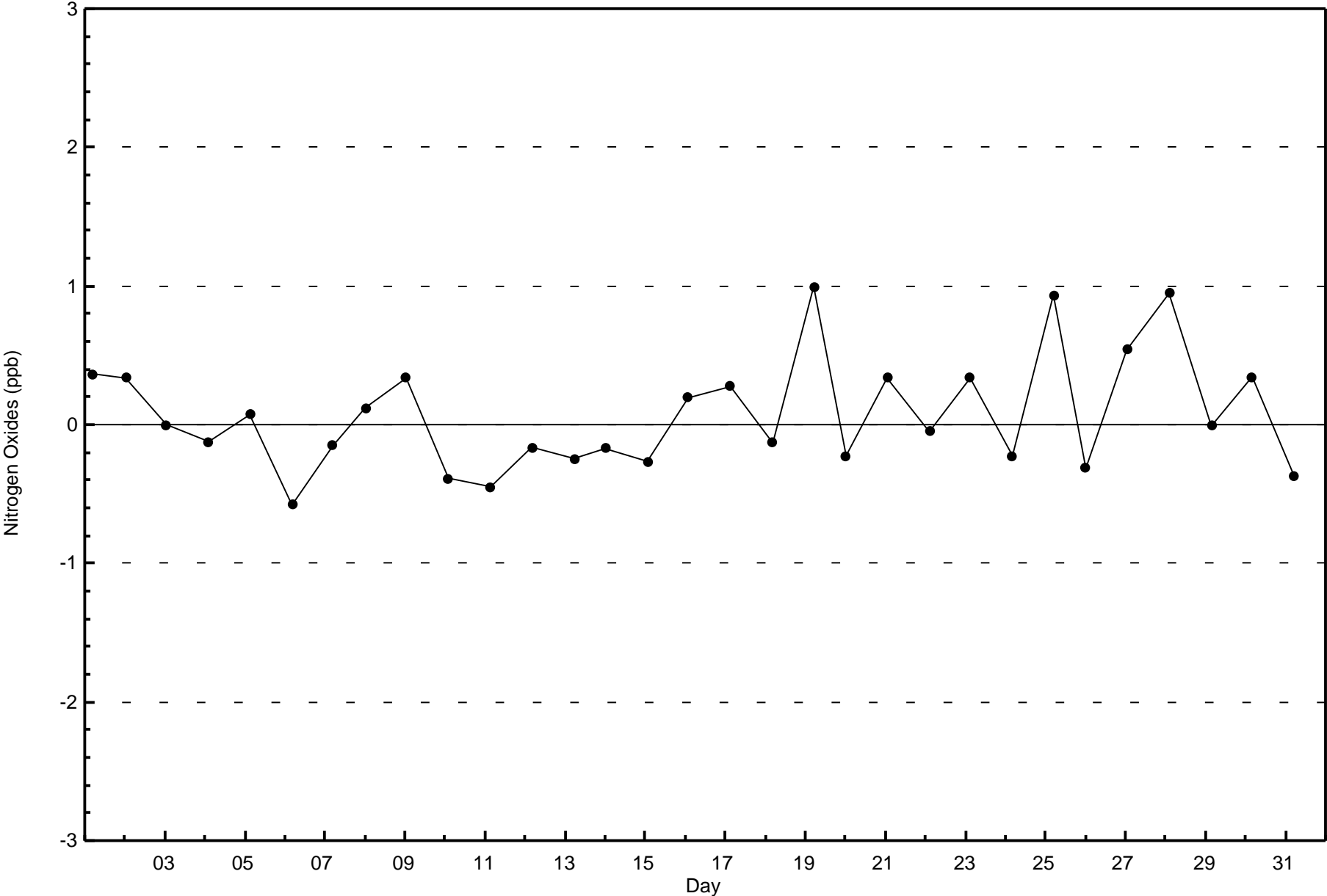
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Wapasu (AMS 17)

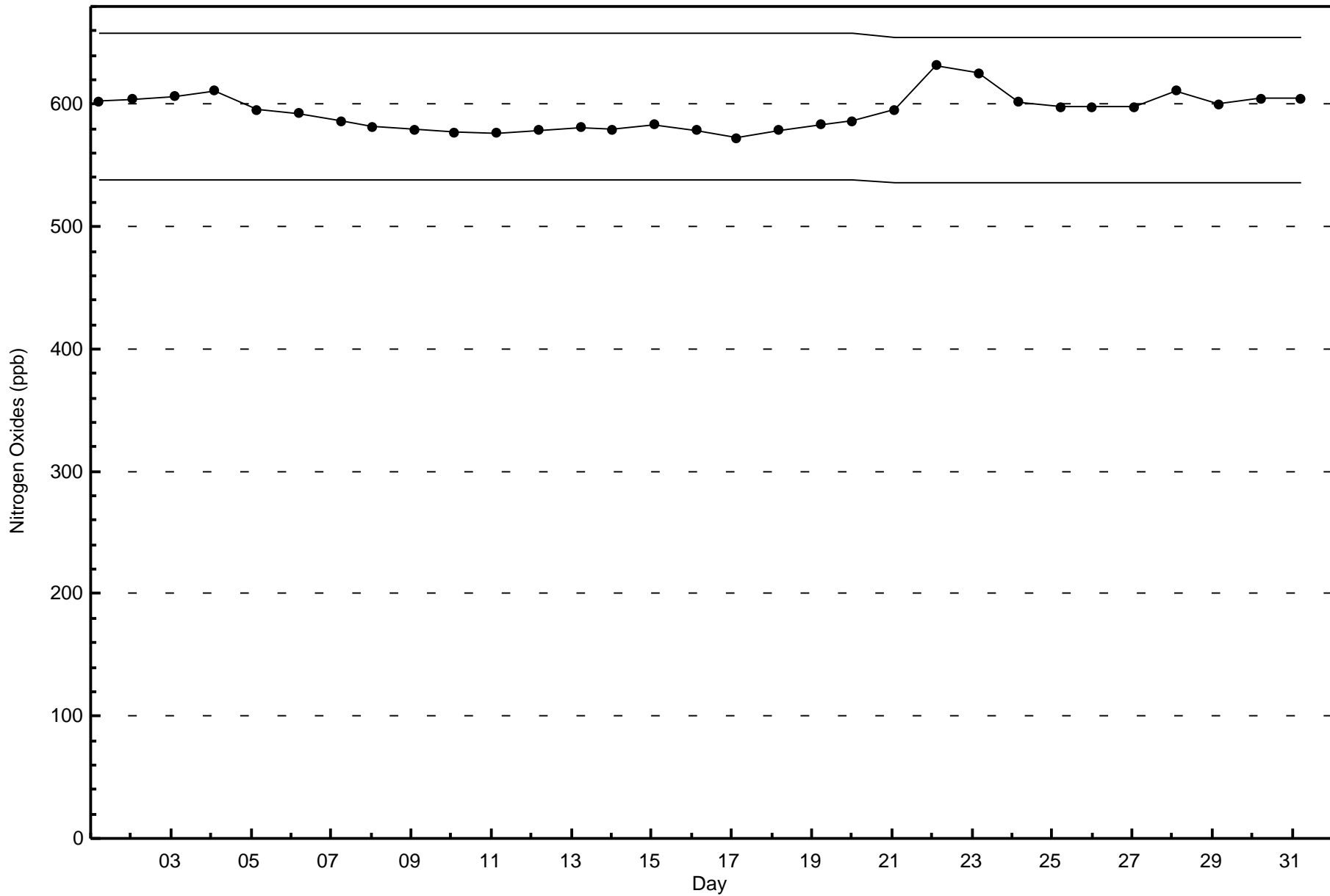






WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
Wapasu - December 2016



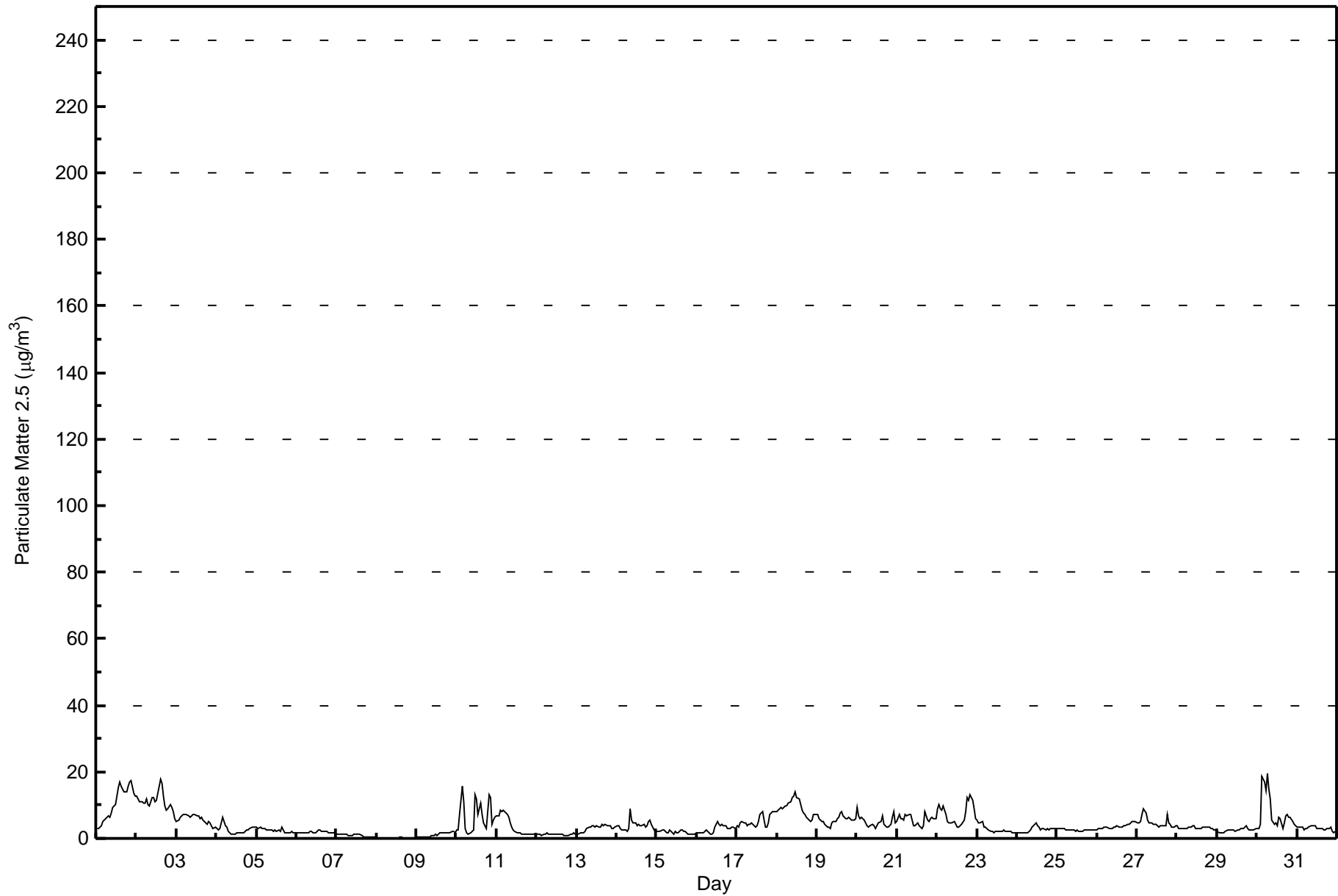


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 19.6 µg/m ³ on Dec 30 07:00 Maximum Daily Average: 11.1 µg/m ³ on Dec 2		Hours in Service: 744 Hours of Data: 733 Hours of Missing Data: 11 Hours of Calibration: 3 Percent Operational Time: 98.9																																														
Minimum Value: 0.0 µg/m ³ on Dec 8 05:00 Maximum Diurnal Average: 4.9 µg/m ³ at hour 4 Monthly Average: 4.25 µg/m ³		Minimum Daily Average: 0.9 µg/m ³ on Dec 7 Minimum Diurnal Average: 3.7 µg/m ³ at hour 24 Percentiles: P ₁ = 0.2 P ₁₀ = 1.3 Q ₁ = 2.0 Median = 3.3 Q ₃ = 5.3 P ₉₀ = 8.7 P ₉₉ = 17.0																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	3.0	3.1	3.5	3.9	5.0	6.1	6.5	6.7	6.2	7.6	9.3	10.3	12.9	15.2	17.0	15.5	14.0	14.0	14.0	15.7	17.1	17.3	13.5	12.5	10.4	17.3																						
2-Dec	12.7	11.9	11.2	11.2	10.5	10.5	11.7	10.0	9.6	12.2	12.4	10.8	11.3	13.6	17.6	16.5	12.8	9.7	8.3	9.0	10.3	9.3	7.9	5.9	11.1	17.6																						
3-Dec	5.1	5.6	6.3	7.0	7.2	7.3	7.2	6.7	6.5	7.0	7.3	7.1	6.9	6.6	6.1	6.3	5.5	5.0	4.3	5.0	4.8	3.7	2.8	3.2	5.9	7.3																						
4-Dec	3.1	2.4	2.8	4.6	6.3	4.0	3.5	2.1	1.5	1.4	1.4	1.5	1.7	1.6	1.6	1.8	1.9	2.1	2.4	2.6	3.1	3.5	3.4	3.5	2.7	6.3																						
5-Dec	3.3	3.1	3.3	3.2	3.0	3.0	2.6	2.6	2.4	2.4	2.2	2.4	2.3	2.6	1.9	3.2	2.6	1.7	1.7	1.6	1.9	1.9	1.9	1.6	2.4	3.3																						
6-Dec	1.7	1.7	1.8	1.7	1.8	1.7	1.6	1.9	2.0	1.9	1.9	1.8	1.9	2.7	2.4	2.3	2.2	2.0	1.9	1.8	1.8	1.6	1.6	1.4	1.9	2.7																						
7-Dec	1.5	1.5	1.4	1.3	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.3	1.2	1.3	1.2	0.8	0.6	0.5	0.4	0.6	0.5	0.3	0.2	0.2	0.9	1.5																						
8-Dec	0.2	0.2	0.2	0.1	0.0	UO	UO	0.1	0.1	UO	C	C	C	0.5	0.4	0.3	0.2	0.0	UO	UO	UO	UO	UO	0.1	--	0.5																						
9-Dec	0.3	0.3	0.5	0.4	0.4	0.5	0.4	0.5	0.5	0.8	1.0	1.1	1.0	1.4	1.7	1.6	1.5	1.5	1.5	1.5	1.8	2.1	2.2	1.9	1.1	2.2																						
10-Dec	2.7	2.4	7.3	15.7	10.9	3.1	1.7	1.4	1.5	2.0	2.5	13.3	11.8	7.0	10.5	7.3	4.7	3.7	2.8	13.1	12.4	4.1	5.5	6.3	6.4	15.7																						
11-Dec	6.7	6.8	8.4	8.1	8.4	7.9	7.0	6.5	4.7	3.4	2.5	1.9	1.8	1.6	1.5	1.5	1.3	1.2	1.1	1.1	1.2	1.3	1.1	1.1	3.7	8.4																						
12-Dec	1.3	1.1	1.1	1.1	1.1	1.2	1.5	1.5	1.4	1.1	1.3	1.4	1.2	1.2	1.2	1.1	0.9	0.9	1.0	1.1	1.2	1.5	1.5	1.3	1.2	1.5																						
13-Dec	1.1	1.4	1.7	1.7	1.8	2.3	3.0	3.4	3.6	3.6	3.7	3.6	3.7	3.5	3.6	4.1	3.9	4.1	4.0	3.9	3.6	3.1	3.1	3.3	3.1	4.1																						
14-Dec	3.8	3.9	2.9	2.6	2.3	2.4	1.9	3.0	8.9	5.5	4.5	4.8	3.9	4.2	3.7	3.9	4.4	3.3	3.7	4.9	5.6	4.4	2.4	2.0	3.9	8.9																						
15-Dec	2.1	2.1	2.2	2.5	2.4	2.1	1.8	1.8	2.6	1.6	1.4	2.1	1.9	1.7	2.4	2.5	2.2	2.0	1.9	1.4	1.2	1.4	1.4	1.5	1.9	2.6																						
16-Dec	1.7	1.8	1.9	1.7	1.7	2.1	2.4	1.5	1.3	1.3	1.9	3.6	5.2	4.0	3.7	4.1	4.0	4.0	3.0	2.8	2.8	3.2	3.4	3.1	2.8	5.2																						
17-Dec	3.8	3.4	4.5	5.1	4.6	4.8	4.0	4.1	4.2	4.5	4.0	3.6	3.7	5.2	7.1	8.0	5.5	3.6	3.3	4.6	7.3	8.0	7.9	7.9	5.1	8.0																						
18-Dec	8.0	8.4	9.2	9.0	9.2	9.6	9.7	10.5	11.1	12.2	12.6	14.0	12.4	11.8	10.1	8.6	7.5	7.0	6.3	5.5	4.9	5.5	7.2	7.2	9.1	14.0																						
19-Dec	7.1	6.1	5.4	5.2	5.1	4.2	3.6	3.3	3.1	4.5	5.1	5.1	5.9	6.3	7.4	7.9	6.9	5.8	6.0	6.5	5.9	5.7	5.4	5.8	5.5	7.9																						
20-Dec	9.4	6.9	5.7	6.3	5.5	4.7	3.6	3.4	3.6	4.3	3.7	3.0	4.0	4.8	5.2	6.6	4.4	3.8	3.2	3.5	4.3	6.5	8.2	4.6	5.0	9.4																						
21-Dec	5.3	7.0	5.9	5.9	5.6	7.1	6.8	7.3	7.4	5.5	3.7	3.8	4.7	3.9	3.4	2.8	3.8	8.3	5.5	5.1	6.1	6.6	6.0	5.9	5.5	8.3																						
22-Dec	8.7	10.3	8.7	8.4	9.7	7.4	5.2	4.6	4.5	4.9	4.9	4.1	3.5	3.2	3.8	4.4	5.3	8.2	12.4	11.4	13.0	11.5	9.0	5.8	7.2	13.0																						
23-Dec	5.3	4.7	4.8	5.0	3.6	3.3	2.9	2.6	2.3	2.2	1.8	2.0	2.2	2.1	2.2	2.0	2.4	2.2	1.9	1.9	1.9	1.9	1.9	1.8	2.7	5.3																						
24-Dec	1.8	1.8	1.7	1.8	1.9	1.8	1.8	1.9	2.7	3.3	3.7	4.7	4.0	3.2	2.6	2.8	2.8	2.6	2.8	2.7	2.9	2.8	3.0	3.0	2.7	4.7																						
25-Dec	3.0	2.9	2.8	2.9	2.8	2.7	2.7	2.6	2.7	2.4	2.4	2.3	2.4	2.3	2.2	2.2	2.5	2.6	2.5	2.5	2.4	2.5	2.5	2.5	2.6	3.0																						
26-Dec	2.6	3.0	3.0	2.9	3.2	3.6	3.4	3.2	3.1	2.8	3.5	3.4	3.7	3.5	3.4	3.3	3.8	3.9	4.2	4.1	4.8	5.1	4.9	4.9	3.6	5.1																						
27-Dec	4.9	4.9	5.0	7.2	8.8	7.5	5.6	4.7	4.5	4.6	4.3	4.1	3.9	3.5	3.7	3.9	3.9	3.9	7.0	4.6	4.4	3.5	3.3	3.8	4.8	8.8																						
28-Dec	3.8	2.8	2.9	3.2	3.0	3.1	3.1	3.2	3.4	3.8	3.7	3.0	3.1	3.1	3.1	3.3	3.2	3.5	3.4	3.3	3.1	3.0	2.5	2.3	3.2	3.8																						
29-Dec	2.1	1.6	1.7	1.7	1.7	2.3	2.4	2.4	2.6	2.5	2.3	2.2	2.4	2.5	2.8	2.8	3.1	3.7	3.0	2.7	2.7	2.7	2.7	2.8	2.5	3.7																						
30-Dec	2.8	3.2	4.3	18.8	17.1	14.6	19.6	14.9	11.9	5.3	4.2	4.5	4.0	6.2	6.1	3.0	4.7	6.6	7.0	6.2	6.2	5.2	4.3	3.8	7.7	19.6																						
31-Dec	3.4	3.6	3.6	3.2	2.7	2.8	2.8	3.6	3.6	3.7	3.8	3.6	3.1	3.0	3.1	2.8	2.5	2.6	2.8	3.0	3.3	2.2	1.8	2.0	3.0	3.8																						
																								3.9	3.9	4.1	4.9	4.8	4.5	4.4	4.0	4.0	4.0	3.9	4.3	4.4	4.3	4.6	4.4	4.0	4.0	4.1	4.5	4.8	4.4	4.1	3.7	Diurnal Average
																								12.7	11.9	11.2	18.8	17.1	14.6	19.6	14.9	11.9	12.2	12.6	14.0	12.9	15.2	17.6	16.5	14.0	14.0	14.0	15.7	17.1	17.3	13.5	12.5	Diurnal Maximum
C - Calibration																								UO - Unstable Operation																								
Alberta Ambient Air Quality Objectives (AAAQO):																								24-hr 30 µg/m ³																								



WBEA Data PC
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	523	71.35	71.35
6 - 15	164	22.37	93.72
16 - 25	10	1.36	95.09
26 - 80	0	0.00	95.09
> 81.0	0	0.00	95.09

Total Number of Valid Hours: 733

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Wapasu - December 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	75	17	12	5	3	4	20	70	91	36	28	18	10	29	38	65	521
6 - 15	4	8	2	2	0	1	2	39	43	28	22	3	0	0	2	7	163
16 - 25	0	0	0	0	0	0	0	3	3	1	1	0	1	1	0	0	10
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	79	25	14	7	3	5	22	112	137	65	51	21	11	30	40	72	694

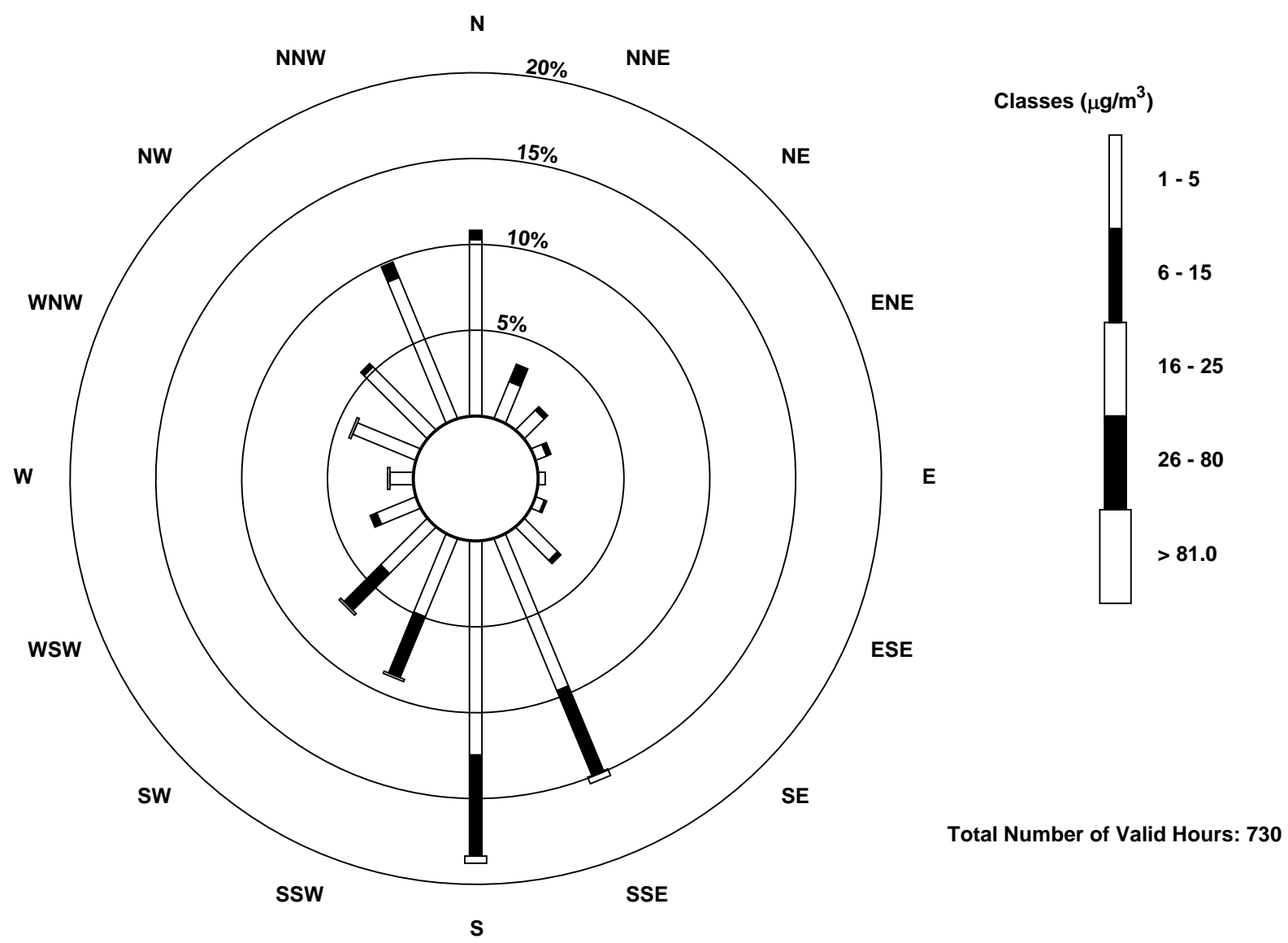
Total Number of Valid Hours: 730

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu (AMS 17)





Wood Buffalo Environmental Association
Summary of Hour Averages

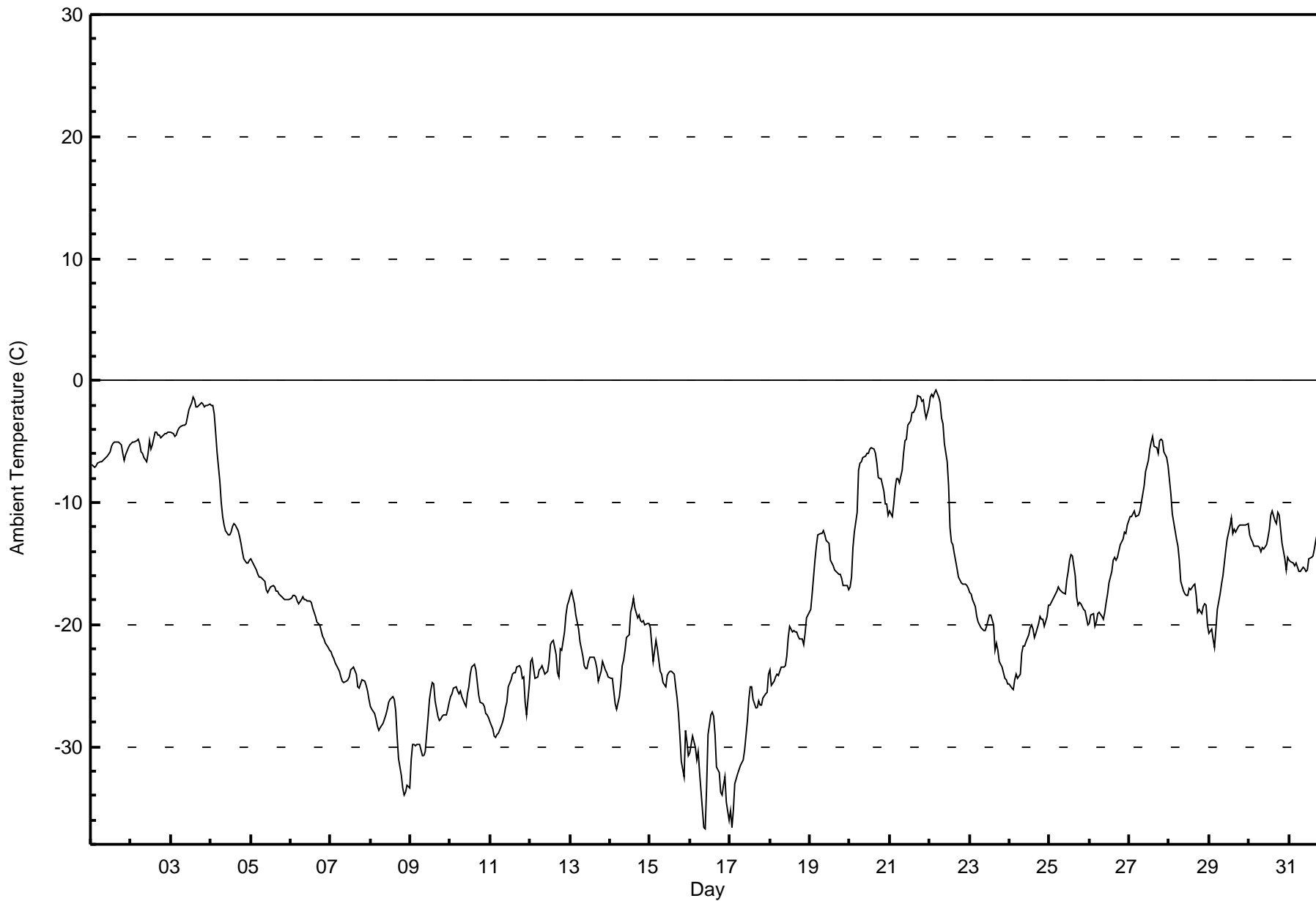
Ambient Temperature (AT) - C
Wapasu - December 2016

Maximum Value: -0.7 C on Dec 22 05:00 Maximum Daily Average: -2.9 C on Dec 3																								Hours in Service: 744		
Minimum Value: -36.8 C on Dec 16 10:00 Minimum Daily Average: -31.8 C on Dec 16																								Hours of Data: 744		
Maximum Diurnal Average: -16.3 C at hour 14 Minimum Diurnal Average: -18.2 C at hour 9																								Hours of Missing Data: 0		
Monthly Average: -17.67 C Percentiles: P₁ = -34.6 P₁₀ = -27.5 Q₁ = -24.1 Median = -18.2 Q₃ = -12.0 P₉₀ = -5.0 P₉₉ = -1.3																								Hours of Calibration: 0		
																								Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.9	-6.9	-7.2	-7.0	-6.8	-6.6	-6.6	-6.6	-6.5	-6.3	-6.1	-5.9	-5.4	-5.1	-5.0	-5.0	-5.1	-5.1	-5.3	-6.0	-6.5	-6.1	-5.5	-5.3	-6.0	-5.0
2-Dec	-5.2	-5.0	-5.0	-4.9	-4.8	-5.2	-5.8	-6.0	-6.3	-6.7	-6.0	-4.9	-5.6	-5.3	-4.3	-4.2	-4.5	-4.4	-4.6	-4.6	-4.3	-4.3	-4.3	-4.2	-5.0	-4.2
3-Dec	-4.2	-4.4	-4.6	-4.5	-4.1	-3.8	-3.7	-3.6	-3.7	-3.5	-3.0	-2.4	-1.8	-1.4	-1.6	-2.2	-2.2	-2.0	-1.8	-1.9	-2.2	-2.0	-2.0	-2.0	-2.9	-1.4
4-Dec	-2.0	-2.1	-2.7	-4.3	-5.9	-8.3	-10.0	-11.1	-11.9	-12.3	-12.6	-12.7	-12.4	-12.0	-11.7	-11.8	-12.3	-12.8	-13.4	-14.0	-14.6	-15.0	-15.0	-14.7	-10.6	-2.0
5-Dec	-14.7	-14.9	-15.3	-15.5	-15.8	-16.1	-16.1	-16.2	-16.4	-17.2	-17.3	-17.2	-16.9	-16.8	-16.9	-17.2	-17.3	-17.4	-17.6	-17.8	-17.9	-17.9	-17.9	-17.9	-16.8	-14.7
6-Dec	-17.8	-17.6	-17.7	-17.7	-18.1	-18.3	-18.0	-17.7	-17.9	-18.0	-18.0	-18.1	-18.2	-18.6	-19.0	-19.4	-19.8	-20.0	-20.4	-21.0	-21.2	-21.5	-21.9	-22.1	-19.1	-17.6
7-Dec	-22.2	-22.6	-22.8	-23.1	-23.6	-23.9	-24.3	-24.7	-24.7	-24.7	-24.5	-24.3	-23.7	-23.6	-23.5	-24.0	-25.1	-25.3	-24.8	-24.5	-24.7	-25.0	-25.5	-26.1	-24.2	-22.2
8-Dec	-26.7	-26.9	-27.2	-27.8	-28.3	-28.7	-28.4	-28.1	-27.7	-27.4	-26.9	-26.4	-26.2	-25.9	-26.1	-27.1	-29.2	-31.0	-32.4	-33.4	-34.0	-33.7	-33.2	-33.3	-29.0	-25.9
9-Dec	-31.1	-29.8	-29.8	-29.9	-29.8	-29.8	-30.3	-30.7	-30.7	-30.4	-27.7	-26.2	-25.3	-24.7	-24.9	-26.2	-27.5	-27.9	-27.8	-27.5	-27.4	-27.4	-27.0	-26.4	-28.2	-24.7
10-Dec	-25.9	-25.7	-25.2	-25.1	-25.4	-25.7	-25.5	-25.9	-26.5	-26.7	-25.7	-25.1	-24.1	-23.5	-23.2	-23.7	-24.7	-25.8	-26.3	-26.4	-26.7	-27.3	-27.4	-27.6	-25.6	-23.2
11-Dec	-27.9	-28.6	-29.1	-29.2	-29.0	-28.9	-28.3	-27.9	-27.5	-26.8	-26.3	-25.1	-24.5	-24.1	-24.0	-23.9	-23.5	-23.4	-23.6	-24.4	-24.3	-26.4	-27.4	-24.8	-26.2	-23.4
12-Dec	-23.0	-22.7	-23.6	-24.4	-24.3	-23.7	-23.6	-23.4	-23.7	-24.0	-23.8	-23.0	-21.7	-21.4	-21.3	-22.4	-23.9	-24.3	-21.9	-22.1	-20.6	-19.2	-18.4	-18.0	-22.4	-18.0
13-Dec	-17.6	-17.2	-18.3	-19.2	-19.8	-20.4	-21.4	-22.6	-23.4	-23.5	-23.6	-23.0	-22.7	-22.7	-22.7	-23.0	-23.6	-24.6	-23.8	-23.1	-23.4	-23.7	-24.0	-24.3	-22.1	-17.2
14-Dec	-24.3	-24.4	-25.4	-26.4	-27.0	-25.9	-24.8	-23.4	-22.9	-22.1	-21.0	-20.8	-19.0	-18.5	-17.8	-18.6	-19.4	-19.3	-19.7	-19.8	-19.7	-20.0	-19.9	-19.9	-21.7	-17.8
15-Dec	-20.2	-21.7	-23.0	-21.2	-22.0	-22.9	-23.8	-24.1	-24.7	-25.1	-24.2	-23.9	-23.8	-24.1	-25.1	-26.0	-27.3	-29.1	-31.2	-32.5	-28.7	-29.6	-30.8	-25.4	-20.2	
16-Dec	-30.5	-29.1	-29.5	-30.1	-31.0	-30.5	-32.1	-35.2	-36.6	-36.8	-33.3	-29.0	-27.4	-27.1	-27.5	-29.0	-31.7	-32.1	-33.8	-34.0	-33.2	-32.5	-34.6	-36.1	-31.8	-27.1
17-Dec	-35.2	-36.6	-35.2	-33.1	-32.3	-31.9	-31.5	-31.3	-31.1	-30.3	-27.9	-26.1	-25.0	-25.1	-26.1	-26.9	-26.8	-26.2	-26.5	-26.6	-26.1	-25.7	-25.5	-24.0	-28.9	-24.0
18-Dec	-23.7	-25.0	-24.6	-24.3	-24.1	-24.2	-23.8	-23.5	-23.5	-23.4	-22.5	-21.0	-20.1	-20.6	-20.5	-20.5	-20.6	-20.9	-21.1	-21.2	-21.7	-20.7	-19.4	-19.3	-22.1	-19.3
19-Dec	-18.8	-17.5	-16.1	-14.7	-13.6	-12.7	-12.5	-12.5	-12.3	-12.6	-13.1	-13.4	-14.7	-14.9	-15.2	-15.5	-15.7	-15.9	-15.9	-16.2	-16.8	-16.7	-16.8	-17.2	-15.0	-12.3
20-Dec	-17.0	-16.1	-13.7	-12.4	-10.8	-7.3	-6.7	-6.6	-6.4	-6.1	-5.9	-5.9	-5.6	-5.5	-5.6	-6.0	-6.7	-7.9	-8.0	-8.1	-9.1	-10.1	-10.1	-11.1	-8.7	-5.5
21-Dec	-10.7	-11.1	-10.2	-8.9	-8.1	-8.0	-8.4	-7.3	-6.0	-5.0	-4.8	-3.7	-3.4	-2.6	-2.6	-2.3	-2.1	-1.3	-1.3	-1.7	-1.6	-2.5	-3.1	-2.2	-4.9	-1.3
22-Dec	-1.3	-1.2	-1.3	-1.0	-0.7	-1.4	-1.8	-3.1	-3.5	-5.2	-6.6	-8.6	-12.1	-13.3	-13.4	-14.2	-15.5	-16.1	-16.3	-16.6	-16.7	-16.7	-16.8	-17.0	-9.2	-0.7
23-Dec	-17.3	-17.5	-17.9	-18.5	-19.3	-19.7	-20.0	-20.3	-20.5	-20.1	-19.7	-19.2	-19.2	-20.0	-22.1	-21.5	-22.2	-23.0	-23.5	-24.0	-24.4	-24.5	-24.8	-20.8	-17.3	
24-Dec	-24.9	-25.2	-25.3	-24.5	-24.1	-24.4	-24.0	-22.3	-21.7	-21.8	-21.4	-20.9	-20.3	-20.0	-20.4	-21.1	-20.7	-20.0	-19.4	-19.6	-19.5	-20.1	-19.3	-18.4	-21.6	-18.4
25-Dec	-18.4	-18.2	-17.9	-17.7	-17.2	-16.9	-17.2	-17.3	-17.4	-17.5	-16.4	-15.6	-14.7	-14.3	-14.4	-16.0	-17.7	-18.3	-18.1	-18.3	-18.7	-18.9	-19.5	-20.1	-17.4	-14.3
26-Dec	-19.9	-19.2	-19.1	-20.1	-19.8	-19.1	-19.0	-19.3	-19.5	-19.0	-18.1	-17.5	-16.6	-15.7	-14.7	-14.5	-14.7	-14.5	-13.4	-13.2	-13.0	-12.4	-12.5	-11.8	-16.5	-11.8
27-Dec	-11.1	-11.1	-10.9	-10.7	-11.1	-11.0	-10.7	-10.0	-9.3	-8.6	-7.5	-6.6	-5.6	-5.0	-4.6	-5.4	-5.5	-6.0	-5.0	-4.8	-4.9	-5.8	-6.3	-7.0	-7.7	-4.6
28-Dec	-8.1	-9.3	-10.9	-12.4	-13.0	-13.6	-14.7	-16.4	-17.3	-17.5	-17.6	-17.6	-17.0	-17.1	-16.8	-16.7	-17.6	-19.0	-18.8	-19.1	-18.5	-18.3	-18.4	-20.1	-16.1	-8.1
29-Dec	-20.8	-20.4	-21.2	-21.8	-20.4	-18.8	-17.5	-16.7	-16.0	-14.9	-13.9	-13.0	-12.0	-11.3	-12.5	-12.2	-12.4	-12.0	-11.9	-11.9	-11.8	-11.8	-11.8	-11.7	-14.9	-11.3
30-Dec	-12.7	-13.0	-13.2	-13.6	-13.6	-13.5	-13.7	-14.0	-13.7	-13.7	-13.4	-12.9	-12.2	-11.0	-10.7	-11.5	-11.7	-10.8	-11.1	-12.1	-13.3	-14.5	-15.5	-14.5	-12.9	-10.7
31-Dec	-14.7	-14.9	-14.9	-15.2	-15.0	-15.3	-15.7	-15.6	-15.3	-15.4	-15.6	-15.5	-14.6	-14.5	-14.4	-13.8	-13.1	-12.5	-12.1	-11.8	-11.7	-11.5	-11.4	-11.3	-14.0	-11.3
																								Diurnal Average		
																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Wapasu - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	311	41.80	41.80
-20 - 0	433	58.20	100.00
0 - 10	0	0.00	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

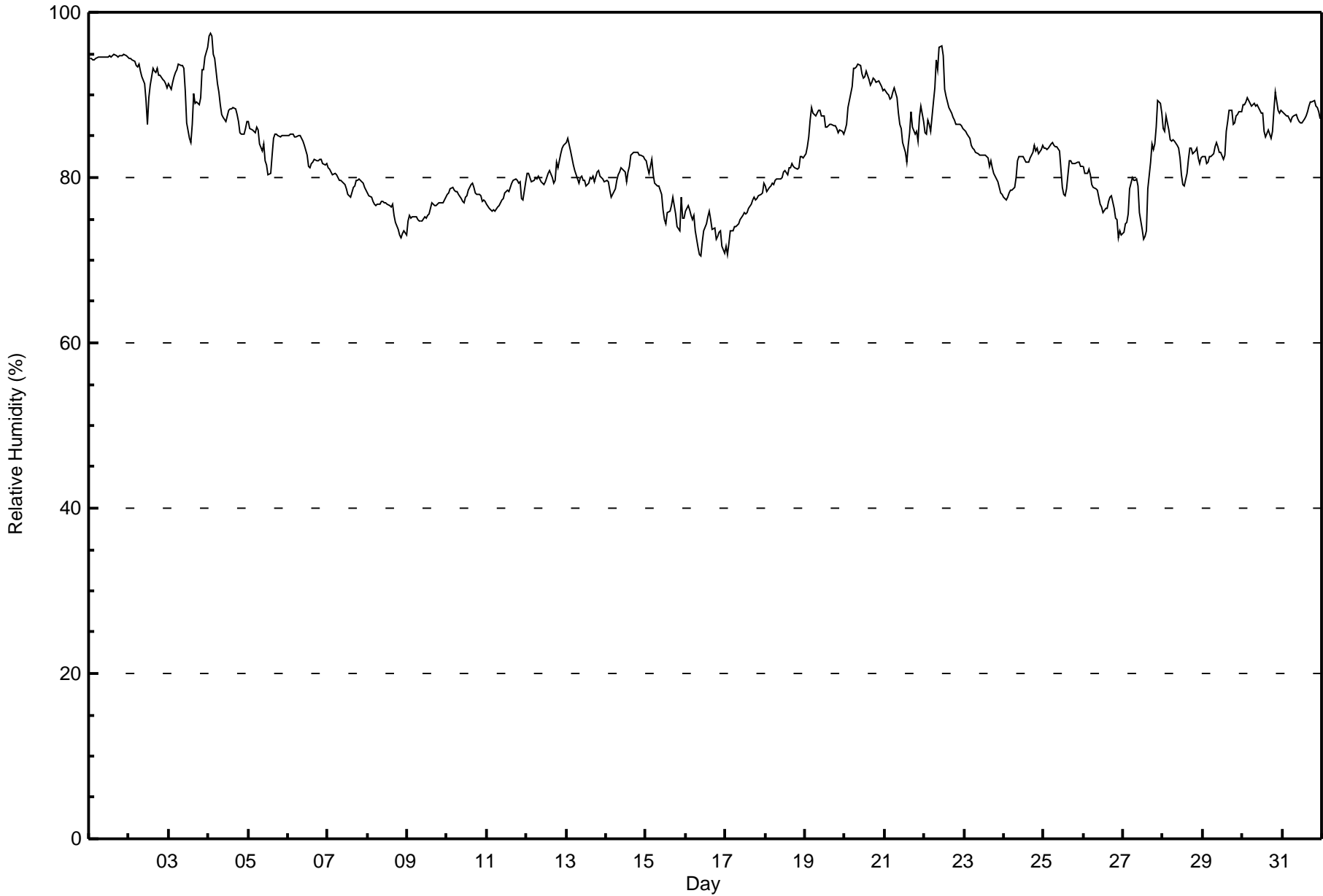
Wapasu - December 2016

Maximum Value: 98 % on Dec 4 02:00 Maximum Daily Average: 94.6 % on Dec 1																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																					
Minimum Value: 71 % on Dec 16 10:00 Minimum Daily Average: 73.7 % on Dec 16 Maximum Diurnal Average: 83.4 % at hour 7 Minimum Diurnal Average: 81.6 % at hour 13 Monthly Average: 82.9 % Percentiles: P ₁ = 72 P ₁₀ = 76 Q ₁ = 79 Median = 82 Q ₃ = 87 P ₉₀ = 92 P ₉₉ = 94																																																																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																															
1-Dec	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	94.6	95																																													
2-Dec	94	94	94	94	94	93	94	93	92	91	89	86	90	91	93	93	93	93	92	92	92	92	91	91	92.2	94																																													
3-Dec	91	91	92	92	93	93	94	94	94	93	91	87	85	84	86	90	89	89	89	89	90	93	93	95	96	90.9	96																																												
4-Dec	97	98	97	95	94	91	90	89	88	87	87	88	88	88	88	89	88	88	87	85	85	85	86	87	89.4	98																																													
5-Dec	87	86	86	86	85	86	86	84	83	84	82	82	80	81	83	85	85	85	85	85	85	85	85	85	84.4	87																																													
6-Dec	85	85	85	85	85	85	85	85	85	84	84	83	81	81	82	82	82	82	82	82	82	82	81	82	83.3	85																																													
7-Dec	81	81	81	80	80	80	80	80	80	79	79	79	78	78	78	79	79	80	80	80	79	79	79	78	79.4	81																																													
8-Dec	78	78	78	77	77	77	77	77	77	77	77	77	77	77	76	77	75	74	74	73	73	73	73	73	75.9	78																																													
9-Dec	75	75	75	75	75	75	75	75	75	75	75	75	75	76	76	77	77	77	77	77	77	77	77	78	75.9	78																																													
10-Dec	78	78	79	79	78	78	78	78	78	77	77	78	78	78	79	79	79	78	78	78	78	77	77	77	78.0	79																																													
11-Dec	77	76	76	76	76	76	76	77	77	77	77	78	79	78	79	79	80	80	80	79	79	77	77	80	77.8	80																																													
12-Dec	81	81	80	80	80	80	80	80	80	79	79	79	80	81	81	80	79	80	82	81	83	84	84	84	80.7	84																																													
13-Dec	84	85	83	82	82	81	80	79	80	80	80	80	79	79	80	80	79	80	81	81	80	80	80	80	80.6	85																																													
14-Dec	80	79	78	78	78	79	80	80	81	81	81	81	80	81	81	83	83	83	83	83	83	83	82	82	80.9	83																																													
15-Dec	82	81	80	82	80	79	79	79	79	78	76	75	74	76	76	77	78	77	76	74	74	78	75	75	77.5	82																																													
16-Dec	76	77	76	75	75	75	74	71	71	71	72	74	74	75	76	75	74	74	73	73	73	74	72	71	73.7	77																																													
17-Dec	72	71	72	74	74	74	74	74	74	75	75	76	76	76	76	77	77	78	77	77	78	78	78	79	75.5	79																																													
18-Dec	79	78	79	79	79	79	80	80	80	80	80	81	81	80	81	81	82	81	81	81	81	82	83	82	80.5	83																																													
19-Dec	83	84	85	87	89	88	88	88	88	88	87	87	86	86	86	86	86	86	86	86	85	86	86	85	86.4	89																																													
20-Dec	86	86	89	89	91	93	93	93	94	94	93	92	92	93	92	91	92	92	92	92	92	91	91	91	91.4	94																																													
21-Dec	91	90	90	89	90	90	91	90	88	86	86	84	83	82	84	85	88	86	85	86	84	87	89	87	87.2	91																																													
22-Dec	85	85	87	87	86	89	91	94	93	96	96	95	91	90	89	89	88	87	87	86	86	86	86	86	89.0	96																																													
23-Dec	86	86	85	85	84	84	83	83	83	83	83	83	83	82	81	82	81	80	80	79	79	78	78	82.2	86																																														
24-Dec	78	77	78	78	78	78	79	80	82	83	82	82	82	82	82	82	83	84	83	83	83	83	84	84	81.2	84																																													
25-Dec	84	84	83	84	84	84	84	84	84	83	81	79	78	78	79	82	82	82	82	82	82	82	81	81	82.0	84																																													
26-Dec	81	81	81	81	80	79	79	79	79	78	77	76	76	76	77	78	78	76	75	75	73	74	73	77.3	81																																														
27-Dec	73	74	75	76	79	80	80	80	80	79	76	74	73	73	74	79	82	84	83	84	86	89	89	88	79.5	89																																													
28-Dec	86	86	87	86	85	84	85	84	84	84	82	80	79	79	81	82	83	84	83	83	84	82	82	82	83.2	87																																													
29-Dec	83	83	82	82	82	83	83	84	84	84	83	83	82	83	86	87	88	88	86	87	87	88	88	88	84.7	88																																													
30-Dec	89	89	89	90	89	89	89	89	89	89	88	88	88	86	85	86	85	85	86	88	90	88	88	88	87.8	90																																													
31-Dec	88	88	87	88	87	87	87	87	88	87	87	87	87	87	87	88	89	89	89	89	89	88	88	87	87.7	89																																													
83.3																		83.2						83.3		83.3		83.3		83.4		83.4		83.4		83.2		83.1		82.5		82.0		81.6		81.7		82.2		83.0		83.2		83.2		82.9		82.8		83.0		83.1		83.0		83.0		83.0		Diurnal Average	
97																		98						97		95		94		95		95		95		95		96		96		95		95		95		95		95		95		95		95		95		95		95		95		96		Diurnal Maximum			



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Wapasu - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	278	37.37	37.37
80 - 100	466	62.63	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

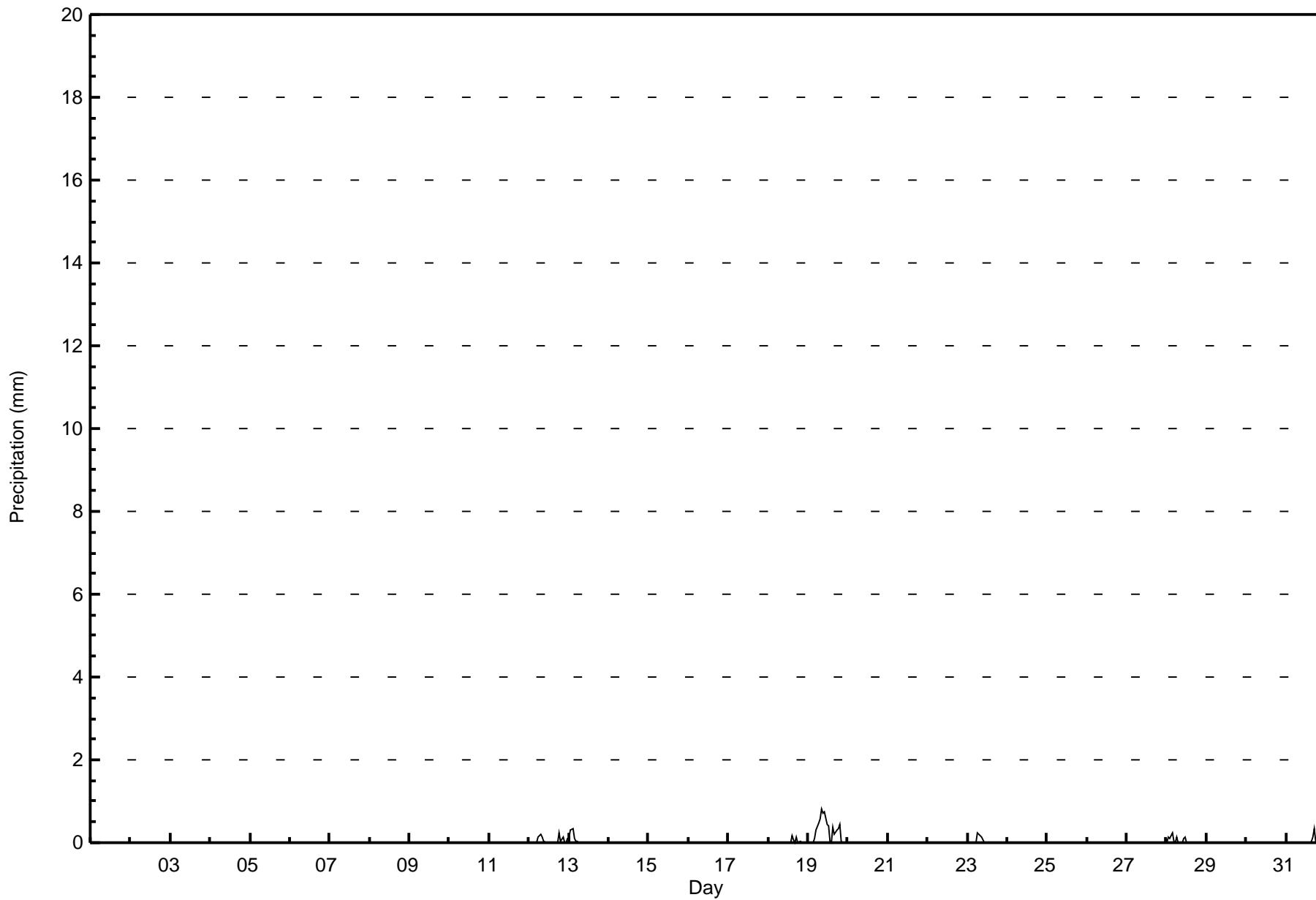
Wapasu - December 2016

Maximum Value: 0.8 mm on Dec 19 09:00																				Maximum Daily Total: 6.3 mm on Dec 19					Hours in Service: 744			
Minimum Value: 0.0 mm on Dec 8 11:00																				Minimum Daily Total: 0.0 mm on Dec 9					Hours of Data: 565			
Maximum Diurnal Total: 1.1 mm at hour 9																				Minimum Diurnal Total: 0.0 mm at hour 22					Hours of Missing Data: 179			
Monthly Total: 11.64 mm																				Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.5					Hours of Calibration: 0			
																									Percent Operational Time: 75.9			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--		
2-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--	
3-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--	
4-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--	
5-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--	
6-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--	
7-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	--	
8-Dec	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	0.0	
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
12-Dec	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.1	1.2	0.2		
13-Dec	0.1	0.3	0.4	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4		
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.2		
19-Dec	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.6	0.8	0.7	0.7	0.5	0.4	0.1	0.0	0.4	0.2	0.3	0.3	0.4	0.0	0.0	0.0	0.0	6.3	0.8		
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3		
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
28-Dec	0.0	0.1	0.1	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.3		
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.5	1.3	0.5			
																								Diurnal Average				
																								Diurnal Maximum				
M - Maintenance DF - DAS Failure																												



WBEA Data PC
Hourly Averages

Precipitation (PC) - mm
Wapasu - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Wapasu - December 2016

Maximum Speed: 21 km/h on Dec 4 20:00	Maximum Daily Speed Average: 13.6 km/h on Dec 4	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 30 02:00	Minimum Daily Speed Average: 0.5 km/h on Dec 14	Hours of Data: 741
Maximum Diurnal Speed Average: 2.0 km/h at hour 19	Minimum Diurnal Speed Average: 0.8 km/h at hour 8	Hours of Missing Data: 3
Monthly Average Velocity: 1.3 km/h 214.5 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 7 Q ₃ = 9 P ₉₀ = 13 P ₉₉ = 17	Percent Operational Time: 99.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSW7	SSW7	SSW6	SSW6	SSW6	SSW6	SSW6	SSW6	SSW6	SSW6	SSW6	SSW5	SSW6	SSW6	SSW5	SSW5	SSW5	S4	S4	S4	S4	SSE4	S4	S5	SSW5.3	SSW7
2-Dec	S6	S6	SSE6	SSE6	SSE7	SSE6	SSE9	SSE8	SSE8	S8	SSE9	SSE10	SSE13	SSE16	SSE15	SSE15	SSE17	SSE19	SSE18	SSE17	SSE17	SSE17	SSE17	SSE17	SSE11.9	SSE19
3-Dec	SSE15	SSE15	S14	S14	S13	S13	S13	S13	S12	S13	S13	S13	S13	S11	S10	S10	S12	S10	S10	S9	S8	SSW9	SSW6	SSW5	S11.3	SSE15
4-Dec	SSW4	WSW3	N9	N12	N13	N16	N14	N14	N14	N14	N15	N15	N14	N17	NNW16	NNW15	NNW17	NNW16	NNW18	N21	N20	N17	N14	NNW11	N13.6	N21
5-Dec	NNW14	NNW16	NNW14	NNW16	NNW14	NNW12	NNW14	NNW15	NNW13	NW8	WNW9	WNW11	WNW11	WNW10	WNW10	WNW8	NW9	NW9	NW8	WNW7	WNW7	WNW7	WNW7	WNW7	NNW10.0	NNW16
6-Dec	NW7	NW6	NW6	NW6	NW5	NW6	NNW8	NNW11	NNW13	NNW16	NNW15	NNW16	NNW17	N14	NNW14	NNW15	NNW13	N14	N12	N12	N11	N9	N9	N9	NNW10.7	NNW17
7-Dec	N10	N10	N8	N9	N9	N10	N9	N7	N7	N8	N12	N12	N11	NNW12	N11	N7	N6	N8	N9	N10	N9	N9	NNE10	NNE8	N9.1	NNW12
8-Dec	NNE7	NNE6	NNE6	NNE6	NE5	NE5	NE5	NE5	NNE5	NE5	NNE6	NNE6	N6	NNE5	NNE4	NNE3	ENE2	ESE3	SE3	ESE4	E4	E4	ESE2	SSE4	NE3.6	NNE7
9-Dec	SSE4	S4	SSE5	SSE5	SSE4	SSE5	SSE6	SSE6	SSE5	SSE6	S5	S6	SSW6	S7	SSW5	S4	SSE5	SSE5	S7	S7	S7	S6	S6	S6	S5.2	S7
10-Dec	S5	S5	S5	S6	S5	S5	S4	S4	S5	SSE6	S5	SSW6	S5	SSW4	WSW5	SSW3	AF	AF	S4	S4	SSW5	S5	SW6	SW6	S4.7	SW6
11-Dec	SW8	SW8	SW9	SW8	SW9	SW9	SW9	SW9	SW8	SW8	SW8	WSW9	SW8	SW7	WSW7	WSW6	WSW6	WSW6	SW6	SW4	WSW4	S2	SSW2	W4	SW6.7	SW9
12-Dec	NNW7	NNW9	NNW8	NNW7	NW6	NW7	WNW7	NW7	WNW7	WNW6	WNW5	WNW6	NW7	W4	WSW3	SSE2	SSE3	S2	WNW3	WNW2	WNW3	WNW6	WNW7	WNW7	WNW4.7	NNW9
13-Dec	WNW7	NW8	N8	N12	NNW17	NNW17	NNW15	NNW13	NNW12	NNW12	NNW7	NNW8	NNW8	NNW8	NNW5	NW3	NW4	NW3	NNW6	NNW5	NW3	WNW3	WNW3	W2	NNW7.5	NNW17
14-Dec	WSW2	SSW2	SE2	SSE2	SSE4	SSE5	SSE5	S5	S5	S6	S5	S5	SSW3	WNW2	N6	N6	N6	NNW6	NW3	NW3	NW4	NNW5	NW5	NW5	WSW0.5	N6
15-Dec	NW4	NW3	NW3	NNW8	NNW9	NNW7	NNW5	NW4	NW5	NNW5	NW4	WNW5	NW6	NW6	W4	W4	NW5	NW4	NNW3	W1	NNW3	NNW6	NNW4	NNW5	NNW4.4	NNW9
16-Dec	NNW6	NNW6	NNW6	NNW5	NNW5	N4	N3	ESE1	SE3	SE3	SSE4	S4	SSW3	SSW2	SSW3	S3	SSE3	SSE3	SSE4	SSE5	SSE5	SSE5	SSE4	SSE4	SSE0.9	NNW6
17-Dec	SE4	SSE4	SSE5	SSE5	SSE4	SSE4	SSE5	SSE5	SSE4	SSE5	SSE5	S5	S5	S5	SSE5	SSE5	SSE6	SSE7	SSE7	SSE7	SSE8	SSE5	SSE7	SSE7	SSE5.4	SSE8
18-Dec	S5	SSE6	S6	SSE5	S5	S4	SSE4	SSE3	S2	ESE3	S2	SSE3	S2	NNW3	NE3	NNE3	NNE3	NE2	ENE2	AF	SE2	SSE3	SSE3	S3	SSE2.1	SSE6
19-Dec	SSE5	SE6	SE8	SSE8	SSE7	SE7	SSE6	SSE6	SSE5	SSE5	SSE5	SSE3	NW5	NNW4	N5	NNW5	NNW6	NNW7	NNW6	N5	ENE3	SE3	SSE4	SSE5	SE1.8	SE8
20-Dec	SSE6	SSE6	S6	S6	SSW6	SW13	SW10	SSW8	SW9	SW11	SW13	SW12	SW8	SW7	SW12	SW10	SW7	SSW5	SW7	SW6	S5	S5	S6	S7	SSW7.4	SW13
21-Dec	S7	S7	S8	SSW8	SW10	SSW8	SSW8	SW12	SW14	SW15	SSW10	SW12	SW13	SW12	SW6	SW8	SSW7	SW13	SW12	SW12	SW12	SSW6	SSW7	SSW7	SW9.4	SW15
22-Dec	SSW8	SSW7	S6	SW8	SW11	WSW10	W8	N8	N8	N8	NNE9	N10	N11	NNE8	NNE8	NNE7	NNE8	NNE8	NNE7	NNE7	NNE7	NNE6	N7	NNE7	N3.7	SW11
23-Dec	NNE6	NNE7	NNE6	NNE6	NNE7	N6	N5	NNE5	NE5	NE5	NE5	NE4	NNE4	NNE3	NE3	E3	SE6	SE8	SE8	SE8	SE8	SE10	SE10	SE9	ENE3.5	SE10
24-Dec	SE11	SSE9	SE8	SSE7	SSE7	SSE8	SSE8	S6	SSE8	SSE8	S7	S7	S7	S7	S5	SSE5	S6	S5	S6	S6	S6	S6	S7	SSE8	SSE6.8	SE11
25-Dec	SSE7	SSE7	SSE7	SSE8	SSE7	S8	SSE9	SSE9	SSE8	S8	S8	S7	SSW5	S6	S5	SSE7	SSE8	SSE10	SSE12	SSE13	SSE12	S11	S9	S8	SSE8.3	SSE13
26-Dec	S8	S10	S10	S10	S11	S10	S10	S10	S12	S13	S15	S15	S15	S15	S16	S16	S15	S14	S14	S14	S14	S13	S14	S14	S12.8	S16
27-Dec	S13	S13	S14	S15	S14	S12	S13	S13	S13	S11	S12	SSW12	SSW10	SSW9	SSW9	SSW7	SSW7	S6	SW9	WSW9	WSW6	NW5	NNE5	N7	S8.4	S15
28-Dec	N9	N9	N11	N10	N10	NNE10	N10	N8	N8	N8	N9	N8	N5	ENE3	WNW2	E2	NE4	ENE6	ENE5	NE3	NE5	NE6	NE3	E3	NNE5.8	N11
29-Dec	SE1	ENE4	NE2	ESE3	SSE3	ESE4	ESE4	S1	SE4	SE5	SW3	SSW4	SSE4	SSW3	NW1	WNW1	ENE0	SSW4	S6	SSE6	NW1	SSW4	SSE4	WSW2	SSE2.0	SSE6
30-Dec	NNW3	W0	W4	W4	SW4	SSW4	WNW4	S2	SW6	SSW8	SSW9	SSW8	SSW9	SSW8	S9	SSW9	S9	SW11	SW8	WSW6	NNW4	NNE7	NE5	NNE6	SW3.8	SW11
31-Dec	N8	N7	NNW8	NNW5	N11	N10	N7	N7	N12	N14	NNW12	N11	N10	N9	NNW7	NW3	W3	WSW5	WSW6	WSW5	WSW10	WSW10	WSW9	NW9	NNW6.2	N14

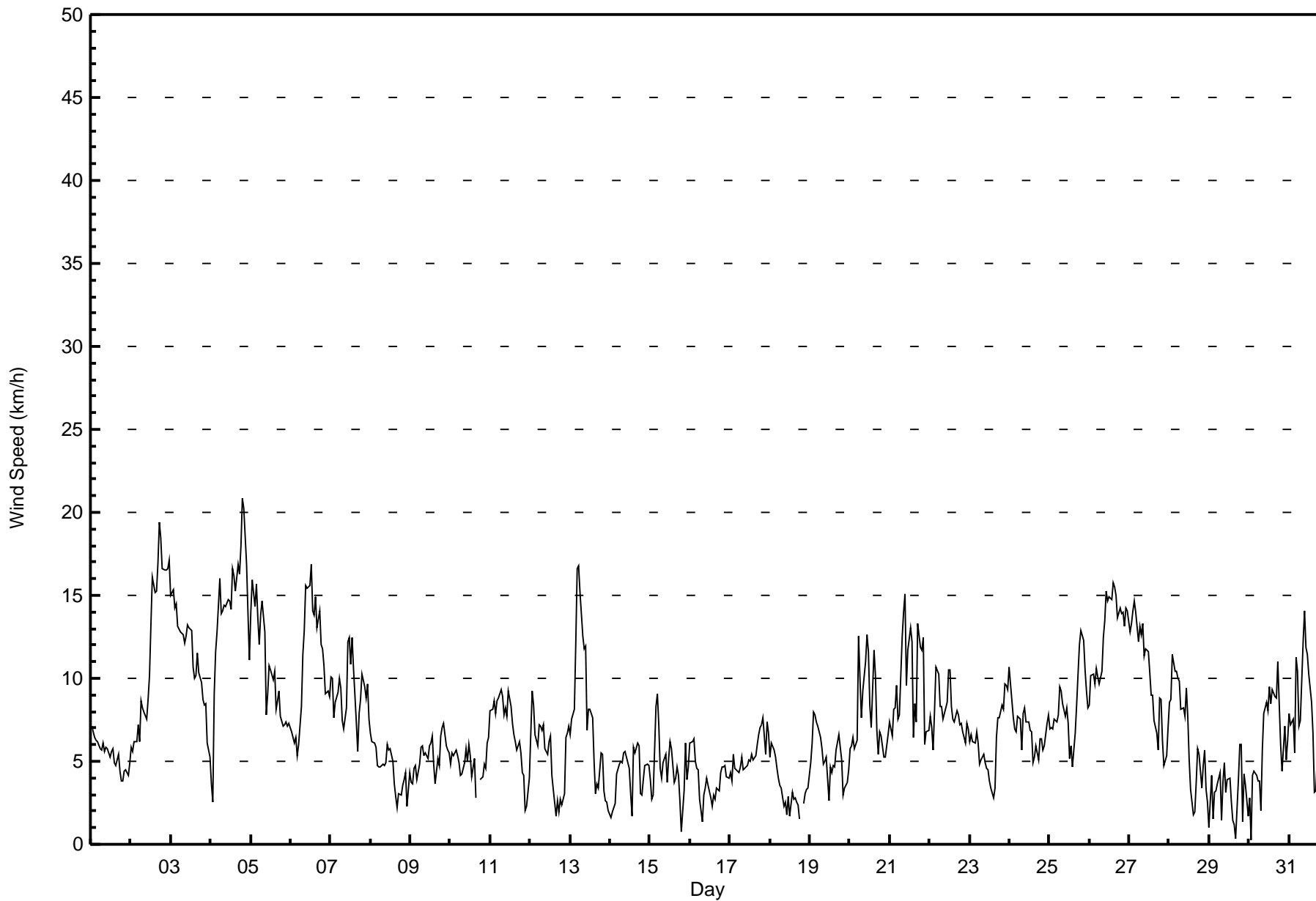
SSW1.3SSW1.2SSW0.9SSW0.8 SW1.0SSW1.1 SW0.9 SW0.8 SW1.1 SW1.3 SW1.5WSW2.0SSW1.9SSW1.6SSW1.7 SW1.5SSW1.3SSW1.6SSW2.0SSW2.0SSW1.6SSW1.3 S1.5SSW1.4	Diurnal Average
SSE15 NNW16 NNW14 NNW16 NNW17 NNW17 NNW15 NNW15 N14 NNW16 NNW15 NNW16 NNW17 N17 NNW16 S16 SSE17 SSE19 SSE18 N21 N20 N17 SSE17 SSE17	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Wapasu - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Wapasu - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	261	35.22	35.22
6 - 11	356	48.04	83.27
12 - 19	122	16.46	99.73
20 - 28	2	0.27	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
Wapasu - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	6	10	18	7	5	9	9	57	44	24	3	8	10	11	23	17	261
6 - 11	57	27	1	1	0	0	13	49	58	41	34	13	1	19	17	25	356
12 - 19	22	0	0	0	0	0	0	17	38	1	14	0	0	0	0	30	122
20 - 28	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	37	19	8	5	9	22	123	140	66	51	21	11	30	40	72	741

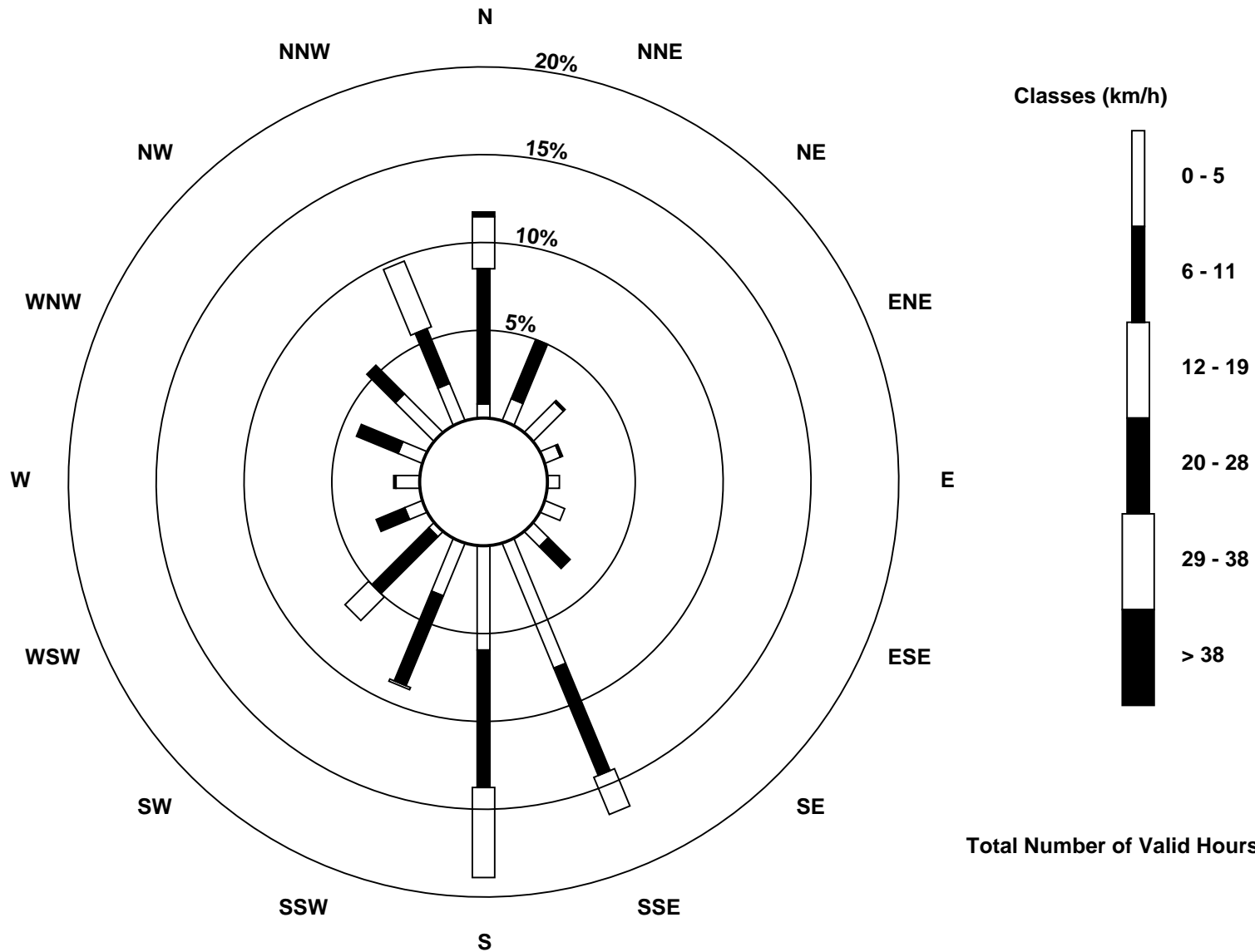
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Wapasu (AMS 17)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Wapasu - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 2 22:00 Minimum Value: 0 km/h on Dec 16 09:00 Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	1	1	1	1	1	1	1	2	
2-Dec	2	2	2	2	2	2	2	2	2	2	3	3	3	4	4	4	4	5	5	4	5	6	5	6	6	
3-Dec	5	5	4	5	5	4	4	4	4	4	5	4	5	4	3	3	4	3	3	3	3	3	2	1	5	
4-Dec	1	1	3	4	4	4	4	4	5	5	4	5	4	5	4	4	4	4	5	5	5	5	4	2	5	
5-Dec	4	4	3	4	3	3	4	4	4	2	3	3	3	3	4	2	3	3	2	2	2	2	2	2	4	
6-Dec	2	2	2	2	1	2	2	3	3	4	5	4	4	4	3	4	3	4	3	3	3	3	3	2	5	
7-Dec	3	2	2	2	3	3	3	2	2	2	3	3	4	3	3	2	2	2	3	3	3	3	3	2	4	
8-Dec	2	2	2	2	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	0	1	1	2	
9-Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	
10-Dec	2	2	2	2	2	2	2	1	2	1	2	2	2	1	1	1	AF	AF	1	1	1	1	2	2	2	
11-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	1	0	1	1	2	
12-Dec	2	2	3	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	3	2	2	3	
13-Dec	2	2	3	4	5	5	4	4	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	5	
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	2	1	1	2	
15-Dec	1	1	1	2	2	2	1	1	2	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	
16-Dec	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	0	0	0	0	1	0	1	1	
17-Dec	1	1	0	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	2	
18-Dec	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	AF	1	1	1	1	2	
19-Dec	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	2	1	2	1	1	1	1	2	
20-Dec	1	1	2	2	2	3	3	2	3	4	4	3	3	2	3	3	2	1	1	2	1	1	1	2	4	
21-Dec	2	2	2	2	3	2	2	4	4	5	3	3	3	3	2	2	3	3	4	3	3	2	2	2	5	
22-Dec	2	2	1	3	2	2	2	3	2	2	3	3	3	3	2	2	3	2	2	2	2	2	2	2	3	
23-Dec	2	2	2	2	2	2	1	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	
24-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
25-Dec	2	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	2	3	3	4	3	3	3	3	4	
26-Dec	2	3	3	3	3	3	3	3	4	4	5	5	5	5	5	5	5	4	4	4	4	4	5	5	5	
27-Dec	5	4	4	5	4	4	4	4	4	4	4	3	3	3	3	2	2	2	3	2	2	2	2	3	5	
28-Dec	2	3	3	3	3	3	3	3	3	2	3	3	2	1	1	1	1	2	1	1	1	2	1	1	3	
29-Dec	1	1	1	2	1	1	2	2	1	1	1	2	2	1	2	2	1	2	2	3	1	2	1	1	3	
30-Dec	2	1	2	2	1	1	1	2	2	2	2	2	3	3	3	3	3	3	2	2	2	3	1	2	3	
31-Dec	2	2	2	1	3	3	2	2	4	4	3	3	3	2	2	2	1	1	2	2	2	3	2	3	4	
	5	5	4	5	5	5	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	6	5	6		
Diurnal Maximum																										
AF - Analyzer Failure																										



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Wapasu - December 2016

Direction of Maximum Speed: 350 deg on Dec 4 20:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 353.0 deg on Dec 4	Hours of Data: 741
Direction of Minimum Speed: 265 deg on Dec 30 02:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 0.5 deg on Dec 14	Percent Operational Time: 99.6
Monthly Average Direction: 249.1 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	195	201	201	202	206	201	198	201	197	200	198	204	205	209	207	198	200	191	186	185	169	168	169	170	195.6
2-Dec	169	169	163	161	160	168	158	167	168	175	163	159	154	154	155	152	151	153	153	157	166	166	164	162	159.6
3-Dec	167	164	169	170	173	170	174	178	175	178	183	183	182	188	187	180	180	176	184	181	182	196	197	200	178.1
4-Dec	193	240	354	2	357	359	2	1	4	0	359	356	356	351	347	348	345	348	347	350	351	352	351	347	353.0
5-Dec	341	341	342	342	341	340	336	337	332	308	301	300	296	299	303	289	306	311	310	296	295	296	297	303	319.9
6-Dec	307	310	314	315	320	319	329	341	343	344	346	343	342	350	344	348	348	351	354	352	351	358	359	357	343.0
7-Dec	352	352	353	357	2	0	2	6	359	359	353	352	352	347	352	360	3	3	1	359	5	10	14	23	359.0
8-Dec	24	22	16	33	37	39	41	44	29	35	26	16	6	16	18	25	61	119	124	117	99	85	119	155	42.4
9-Dec	160	181	156	159	157	165	162	153	158	159	170	188	196	187	194	190	167	167	171	172	173	177	178	180	171.8
10-Dec	177	177	188	190	186	185	183	187	173	164	174	194	188	199	237	206	AF	AF	174	186	194	185	220	216	190.4
11-Dec	225	226	226	221	226	228	232	234	226	230	228	243	230	235	237	242	248	246	233	226	251	179	196	279	232.1
12-Dec	331	333	332	328	318	304	303	306	298	295	288	297	317	266	241	155	147	183	283	289	284	287	300	297	303.2
13-Dec	299	315	8	349	341	340	342	348	345	348	342	342	344	337	327	322	323	323	327	328	322	296	299	271	337.2
14-Dec	239	208	125	154	156	156	159	171	174	170	172	170	196	287	4	3	350	338	323	310	312	330	323	326	241.8
15-Dec	322	309	318	347	344	340	332	325	317	331	323	301	315	325	277	275	310	321	332	279	331	346	337	334	325.2
16-Dec	339	341	343	335	345	358	9	108	144	143	150	187	197	199	203	175	154	158	147	151	151	151	155	154	149.9
17-Dec	141	152	147	155	154	157	150	152	157	159	163	171	182	179	168	161	162	166	161	160	158	168	159	159	160.4
18-Dec	173	163	174	167	175	174	161	167	170	117	183	156	175	331	35	16	17	46	64	AF	140	154	167	169	156.3
19-Dec	151	144	144	148	149	145	148	161	160	150	155	152	324	342	351	338	337	344	338	350	69	135	154	164	136.6
20-Dec	160	163	184	177	193	228	227	210	218	221	226	225	220	214	227	225	221	206	227	218	186	188	179	177	210.4
21-Dec	173	177	183	198	214	204	196	223	224	223	205	223	230	234	222	226	210	228	223	221	229	208	203	208	215.3
22-Dec	212	205	191	216	228	242	269	358	10	359	16	1	2	30	32	23	30	32	22	17	16	17	10	22	358.1
23-Dec	27	15	15	30	14	2	4	29	38	42	46	39	27	30	41	101	129	134	134	137	131	136	138	142	76.3
24-Dec	144	148	144	151	157	153	148	173	162	161	169	171	172	171	170	166	174	177	177	173	172	171	170	166	162.9
25-Dec	165	165	165	167	166	169	164	161	165	170	171	175	193	179	173	161	160	159	163	164	168	181	174	170	168.0
26-Dec	180	176	174	171	176	177	180	178	175	177	173	181	183	177	178	174	172	171	179	180	180	186	179	183	177.6
27-Dec	183	182	183	180	177	182	178	175	176	186	190	198	194	195	203	203	194	178	222	239	239	325	21	355	191.0
28-Dec	0	359	351	0	11	14	10	11	7	359	4	8	11	77	285	97	45	59	78	42	53	46	45	88	16.9
29-Dec	126	77	36	117	148	113	113	179	135	133	215	206	156	205	319	303	69	201	182	163	312	199	152	248	159.2
30-Dec	336	265	271	268	227	210	296	185	221	204	193	207	202	198	185	193	190	219	229	238	330	25	42	15	217.0
31-Dec	4	349	344	338	351	350	10	352	353	353	347	356	2	352	340	304	275	256	256	244	245	247	254	309	330.3

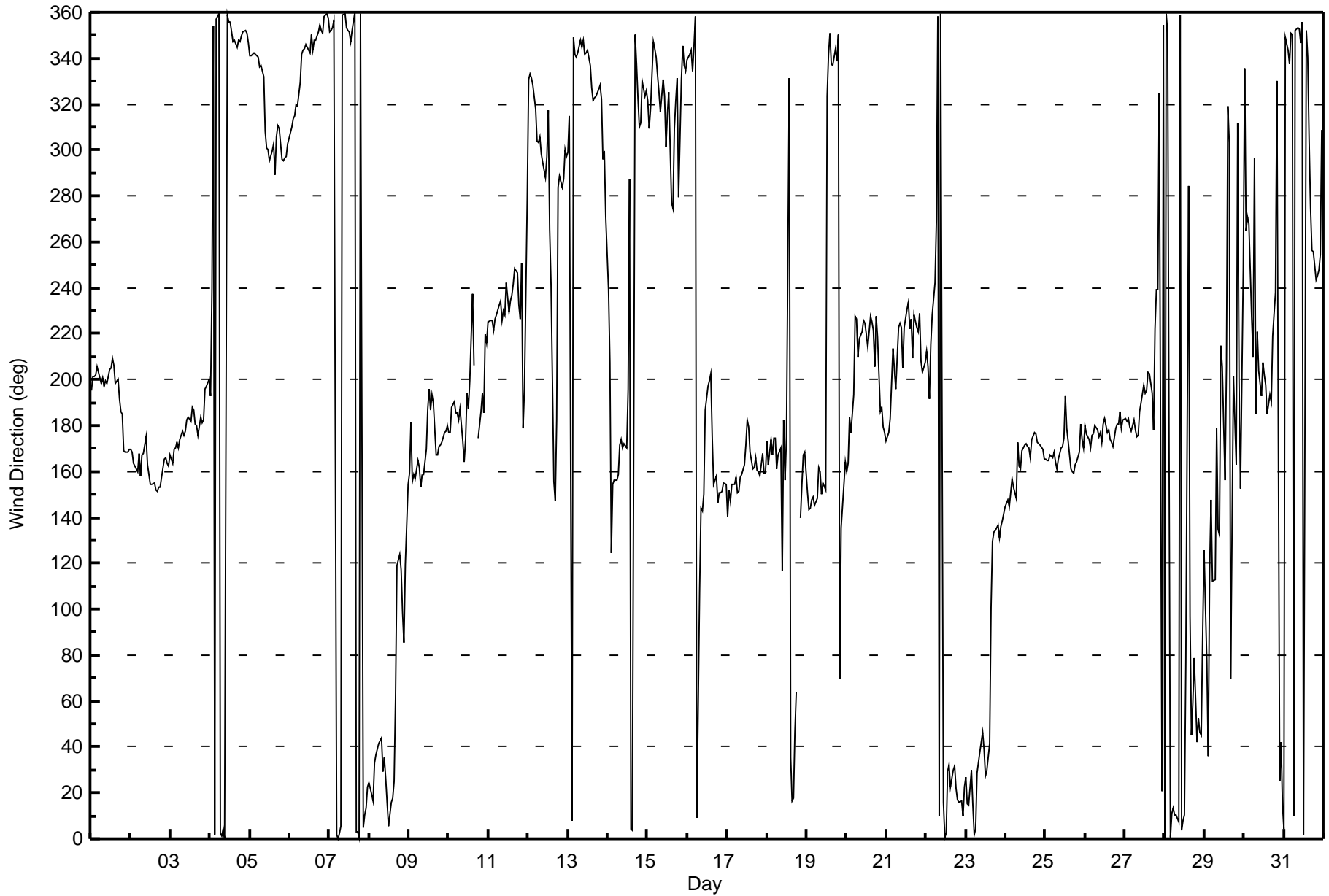
195.7 197.9 199.4 204.7 228.7 240.4 225.2 222.7 219.4 218.1 217.6 240.8 248.4 245.0 245.4 216.8 195.3 198.0 200.9 202.1 201.7 192.3 183.3 195.8
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Wapasu - December 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Wapasu - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 103 deg on Dec 30 02:00																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6																								
Minimum Value: 4 deg on Dec 17 03:00																																									
Percentiles: P ₁ = 8 P ₁₀ = 16 Q ₁ = 19 Median = 25 Q ₃ = 29 P ₉₀ = 33 P ₉₉ = 86																																									
Day	Hourly Period Ending At (MST)																							Daily Maximum																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24																
1-Dec	32	30	30	30	29	30	28	31	29	30	31	28	26	28	26	28	26	28	26	22	18	24	23	22	32																
2-Dec	23	23	21	23	21	24	19	25	27	27	25	22	18	19	19	19	19	19	19	21	24	25	23	24	27																
3-Dec	25	23	25	26	28	29	30	29	28	27	30	30	30	29	29	29	27	29	29	29	29	30	28	30																	
4-Dec	26	46	22	26	23	24	25	25	28	25	24	24	22	20	18	18	16	17	18	20	20	22	19	16	46																
5-Dec	16	16	16	16	15	13	16	16	19	24	26	25	25	26	25	26	25	24	25	28	26	26	27	25	28																
6-Dec	25	25	24	24	22	22	16	16	17	17	17	18	17	20	17	17	16	18	21	19	17	23	21	21	25																
7-Dec	18	17	18	21	24	24	24	28	23	23	19	17	23	16	20	24	28	29	25	24	28	30	29	29	30																
8-Dec	27	28	29	27	23	20	23	22	27	26	28	29	24	28	24	15	32	23	21	12	15	8	35	9	35																
9-Dec	11	21	10	11	16	14	13	8	10	12	22	28	29	28	26	23	18	19	20	23	25	25	28	26	29																
10-Dec	26	22	30	30	27	27	30	26	24	17	26	30	29	32	16	33	AF	AF	14	22	22	25	25	23	33																
11-Dec	19	15	15	21	16	16	16	15	17	15	16	16	14	14	15	16	20	18	19	22	33	27	30	38	38																
12-Dec	20	16	16	17	25	28	28	27	28	30	34	30	25	30	34	36	27	48	40	53	37	33	28	27	53																
13-Dec	29	26	27	21	18	16	17	18	16	17	17	17	18	17	26	33	31	20	18	19	34	36	49	48	49																
14-Dec	80	39	40	24	8	10	14	21	20	20	23	22	39	70	28	25	20	17	33	42	32	20	23	21	80																
15-Dec	23	37	36	17	16	14	14	23	27	19	23	28	28	21	36	34	30	15	54	99	30	14	15	11	99																
16-Dec	12	14	12	12	16	23	31	48	15	10	7	30	33	29	16	18	14	14	7	6	7	7	7	9	48																
17-Dec	11	11	4	9	11	11	9	11	12	16	20	25	28	29	24	22	21	23	20	23	20	27	20	21	29																
18-Dec	26	19	27	26	30	23	21	24	29	19	49	25	38	34	34	38	45	35	55	AF	23	23	28	32	55																
19-Dec	21	18	18	21	24	27	29	28	28	25	23	60	20	19	25	21	16	16	18	24	34	17	18	15	60																
20-Dec	17	18	27	29	32	18	18	30	22	22	19	18	21	22	15	17	19	23	16	23	20	20	20	21	32																
21-Dec	21	21	28	28	28	26	29	23	18	20	28	21	17	18	24	17	30	15	19	21	15	24	23	21	30																
22-Dec	23	25	25	28	15	18	34	32	30	29	30	26	25	30	28	31	28	27	29	29	27	30	29	29	34																
23-Dec	29	31	29	27	31	25	27	28	27	27	26	28	30	31	22	30	16	17	18	18	17	18	16	16	31																
24-Dec	16	15	17	21	19	17	20	27	21	23	26	26	26	25	23	21	27	27	27	25	25	23	24	22	27																
25-Dec	21	21	21	22	22	25	24	22	25	26	25	28	32	28	23	20	19	19	22	23	23	29	25	25	32																
26-Dec	26	27	26	24	28	29	26	27	26	29	27	30	30	28	27	27	28	24	28	28	28	29	28	30	30																
27-Dec	29	29	29	28	26	30	30	27	25	32	30	31	29	30	28	27	28	25	21	17	23	48	30	26	48																
28-Dec	24	25	18	25	30	29	27	30	28	23	25	27	30	49	64	48	27	15	17	42	24	24	29	19	64																
29-Dec	55	18	60	46	41	26	31	84	38	22	40	33	53	66	87	103	99	52	32	57	95	43	25	76	103																
30-Dec	71	103	46	44	41	34	41	88	37	30	29	24	25	29	29	30	30	23	18	21	43	27	21	28	103																
31-Dec	25	19	18	19	18	20	29	21	21	21	18	22	25	23	20	56	39	26	24	16	17	20	22	37	56																
																	80	103	60	46	41	34	41	88	38	32	49	60	53	70	87	103	99	52	55	99	95	48	49	76	
Diurnal Maximum																																									
AF - Analyzer Failure																																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 20, 2017	Last Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	12:49
Gas Cert Reference	SA130010A	Station temp.	22 Deg C
Cal Gas Concentration	47.8 ppm	Cal Gas Exp Date	December 12, 2016
Calibrator Make/Model	API T700	Serial Number	997
ZAG Make/Model	API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2633

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-653	-653
Analyzer IP address	192.168.1.43		Lamp voltage	994	994
Calculated slope	0.994649	0.994993	Chamber temp	44.8	44.8
Calculated intercept	1.255921	1.417486	Pressure	677.8	677.8
Analyzer Background	8.8	8.8	Flow	0.445	0.445
Analyzer Coefficient	1.047	1.047	Intensity	92	92

Analyzer make Thermo 43i Analyzer serial # 1218153459

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.5	----
as found span	5000	60.5	578.4	577.0	1.002
calibrator zero	5000	0.0	0.0	0.6	----
high point	5000	60.5	578.4	580.7	0.996
second point	5000	30.2	288.7	288.2	1.002
third point	5000	15.2	145.3	142.3	1.021
as left zero	5000	0.0	0.0	0.8	----
as left span	5000	60.5	578.4	582.2	0.993
Average Correction Factor					1.006

Corrected As found 576.5 Previous response 580.2 % change 0.6%

Notes:

Inlet filter changed after as founds. No maintenance or adjustments done

Calibration Performed By: Melissa Lemay



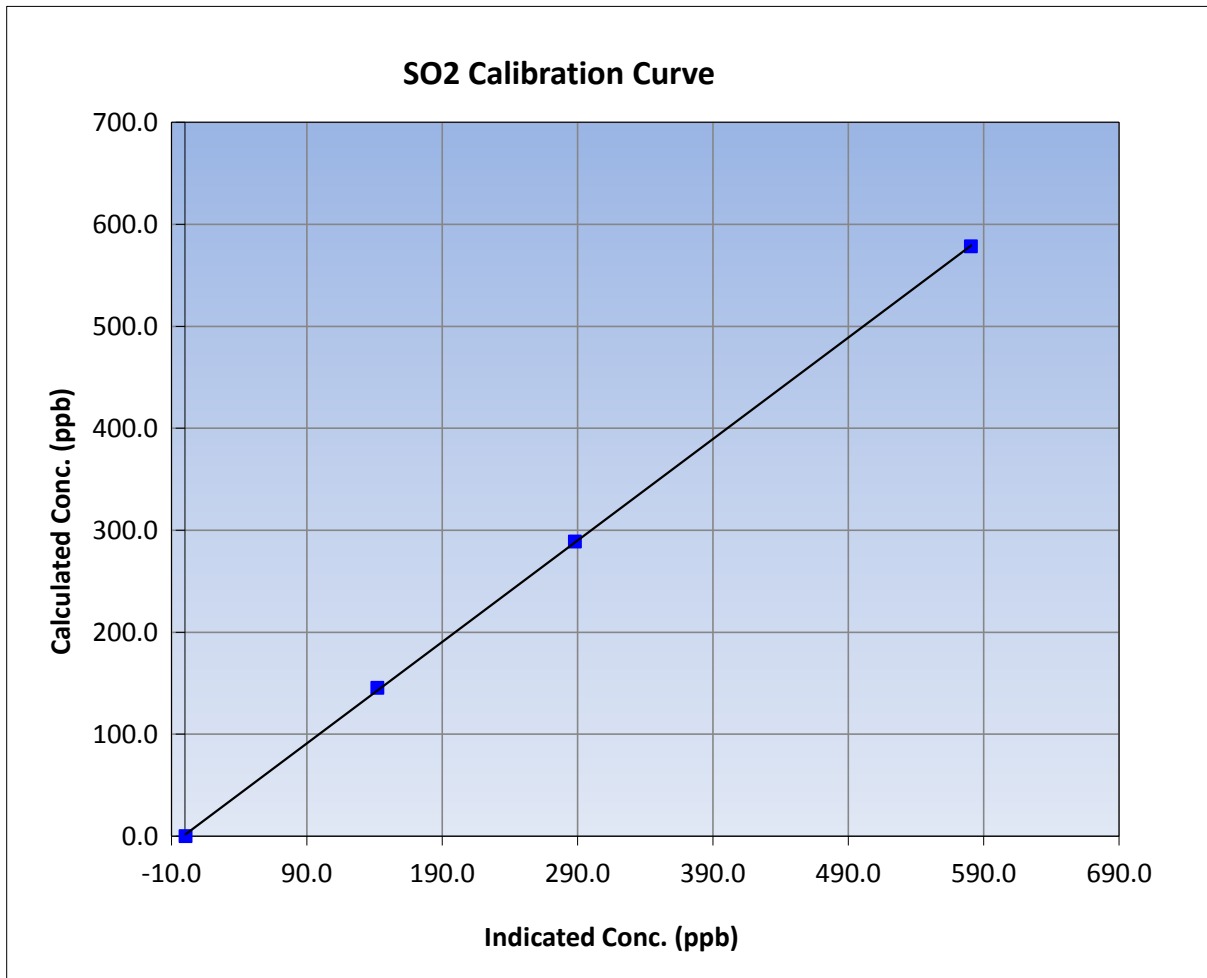
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	12:49
Analyzer make	Thermo 43i	Analyzer serial #	1218153459

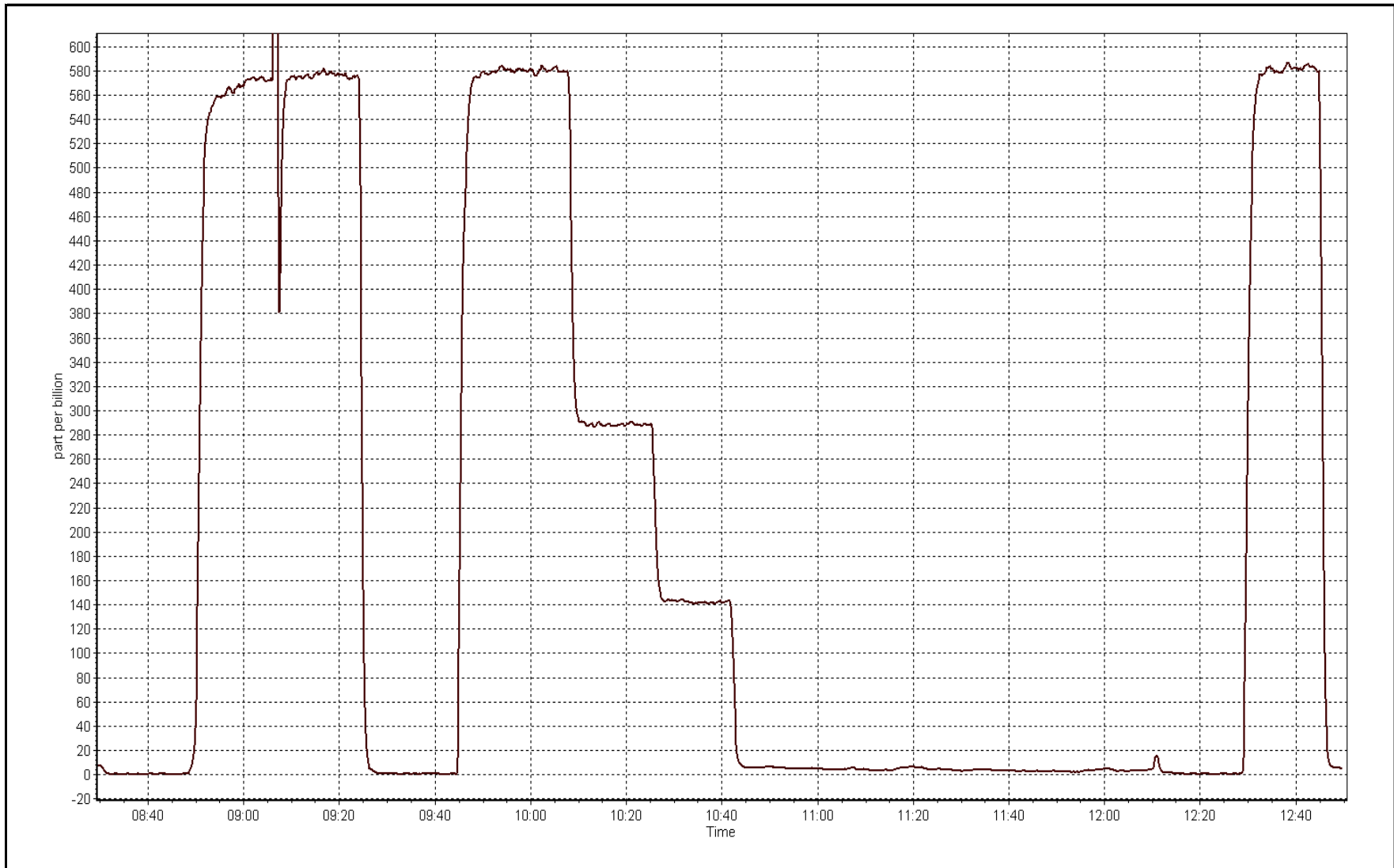
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999943
578.4	580.7	0.9960		
288.7	288.2	1.0018	Slope	0.994993
145.3	142.3	1.0212		
			Intercept	1.417486



SO2 Calibration Plot

Date: December 20, 2017





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 8, 2016	Last Calibration	November 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:34	End Time (MST)	12:42
Gas Cert Reference	CC107167	Station temp.	21 Deg C
Cal Gas Concentration	5.1 ppm	Cal Gas Exp Date	September-09-17
Calibrator Make/Model	API T700	Serial Number	997
ZAG air Make/Model	API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	2633
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	SA130010A December-12-16

Analyzer Information

	Before	After		Before	Before
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-675	-675
Analyzer IP address	192.168.1.45		Lamp voltage	759	759
Calculated slope	0.994828	0.989458	Chamber temp	45	45
Calculated intercept	-0.454104	-0.114267	Pressure	649.4	570.5
Analyzer Background	13.9	14.6	Flow	0.537	1.021
Analyzer Coefficient	1.028	1.055	Intensity	100	100
			Converter temp.	339	339

Analyzer make/model	Thermo 450i	Analyzer serial #	1218153583
Converter make/model	na	Converter serial #	na

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.7	----
as found span	5000	78.3	79.9	77.8	1.027
SO2 scrubber check	5000	19.9	190.2	1.9	----
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	78.3	79.9	81.0	0.986
second point	5000	39.3	40.1	40.2	0.997
third point	5000	19.7	20.1	20.6	0.975
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	78.3	79.9	80.6	0.991
Average Correction Factor					0.986

Corrected As found	77.1	Previous response	80.7	% change	4.7%
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Notes:

Pump was slowly dropping flow passed 3 days, changed out pump, scrubber checked after as founds and pump change out, span adjusted filter changed out

Calibration Performed By: Melissa Lemay



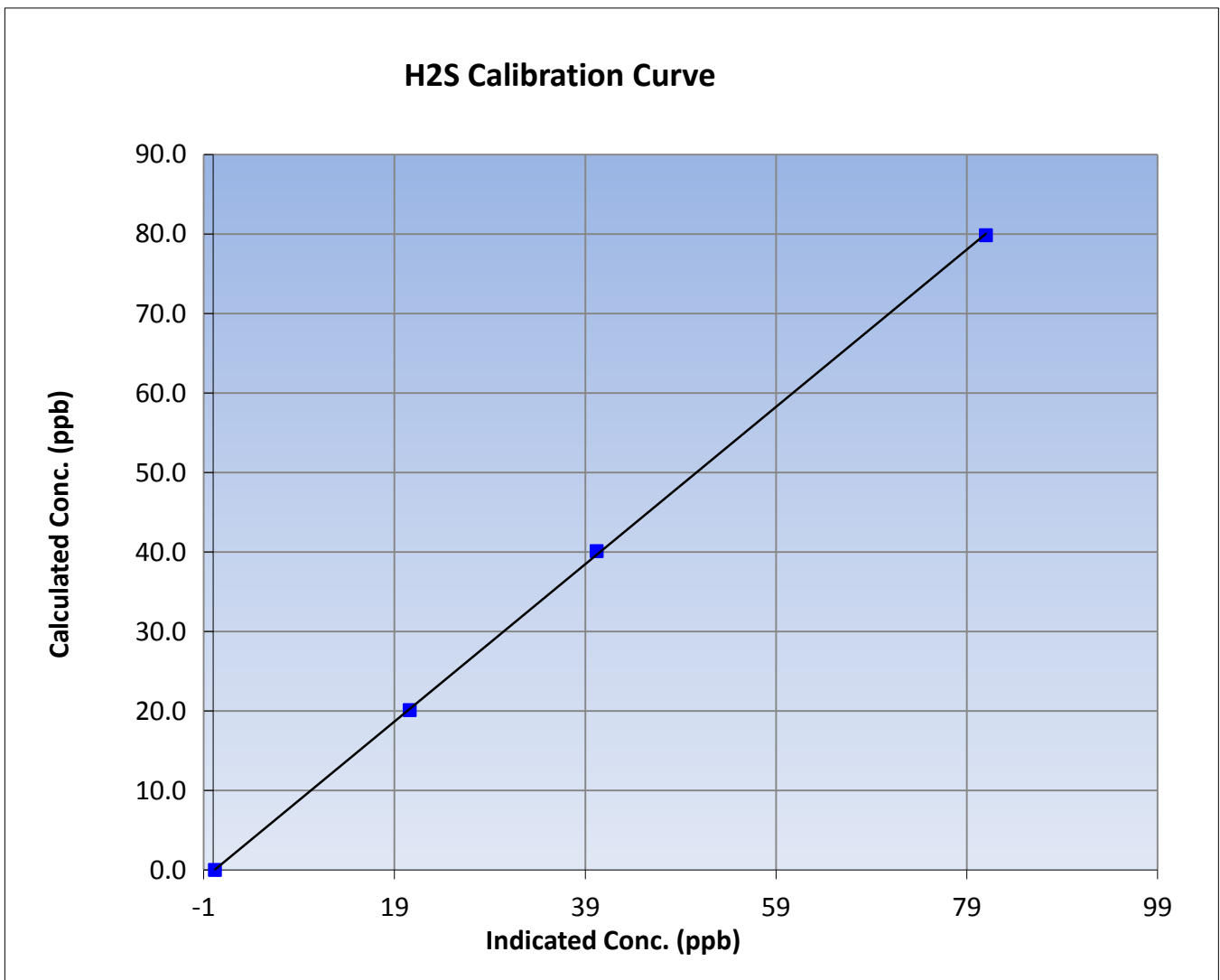
Wood Buffalo Environmental Association H2S Calibration Report

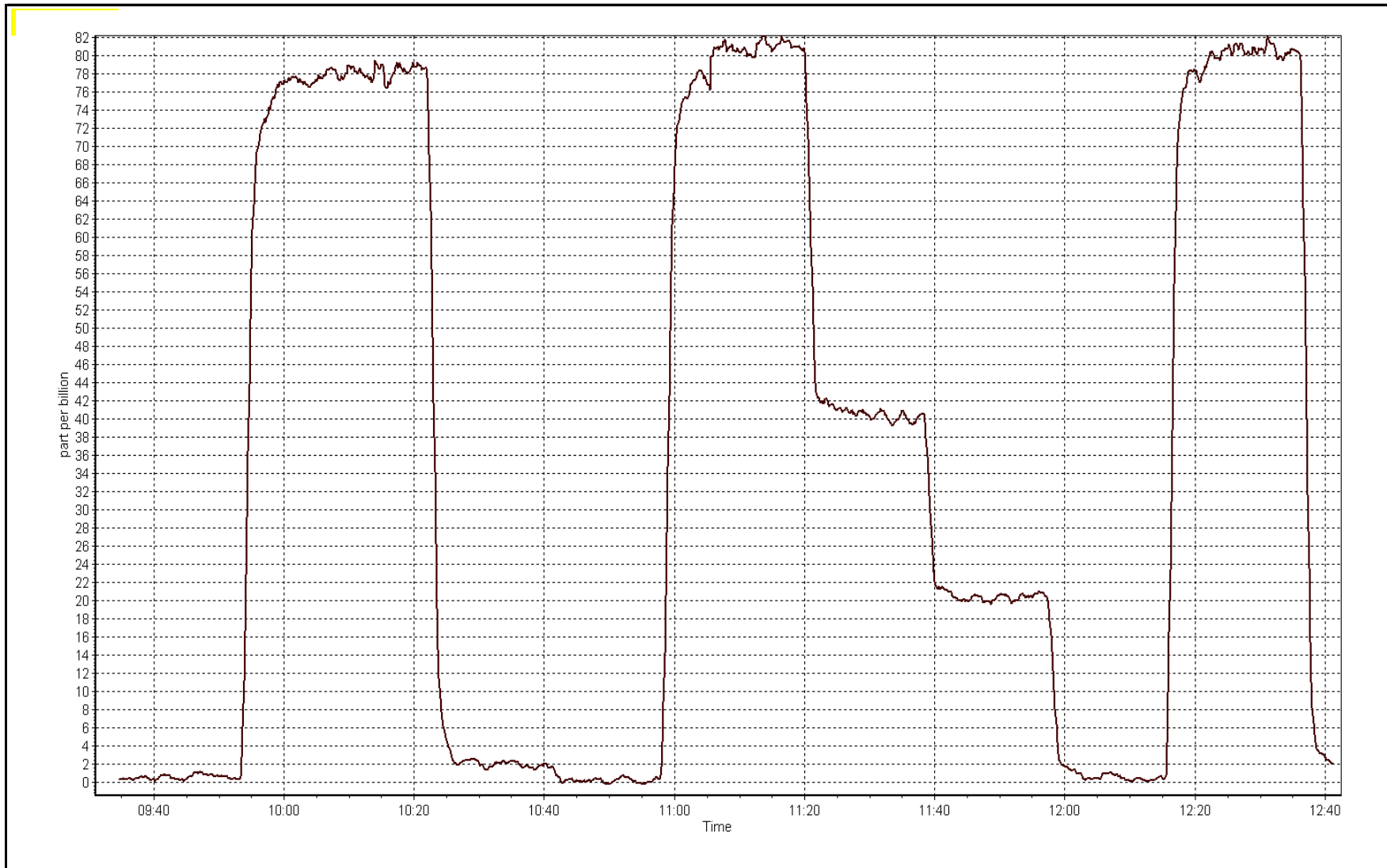
Station Information

Calibration Date	December 8, 2016	Previous Calibration	November 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:34	End Time (MST)	12:42
Analyzer make	Thermo 450i	Analyzer serial #	1218153583

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999930
79.9	81.0	0.9860		
40.1	40.2	0.9972	Slope	0.989458
20.1	20.6	0.9754		
			Intercept	-0.114267







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 20, 2016	Last Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	12:49
Gas Cert Reference	SA130010A	Cal Gas Expiry Date	December 12, 2016
CH4 Cal Gas Conc.	512 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	997
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	40.9	40.9
Calculated slope	1.003832	0.997598	Fuel Pressure	24.8	24.8
Calculated intercept	-0.023705	0.002385	Analyzer Coeff	4.462	4.513
			Analyzer BKG	2.910	2.950

Analyzer make Thermo 51i-LT Analyzer serial # 1218153352

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.10	----
as found span	5000	60.5	13.22	13.11	1.008
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.5	13.22	13.24	0.998
second point	5000	30.2	6.60	6.63	0.995
third point	5000	15.2	3.32	3.31	1.003
as left zero	5000	0.0	0.00	0.06	----
as left span	5000	60.5	13.22	13.44	0.983
Average Correction Factor					0.999

Corrected As found 13.21 Previous response 13.19 % change -0.2%

Notes:

Inlet filter changed after as founds. Adjusted span. No maintenance done

Calibration Performed By:

Melissa Lemay



Wood Buffalo Environmental Association THC Calibration Report

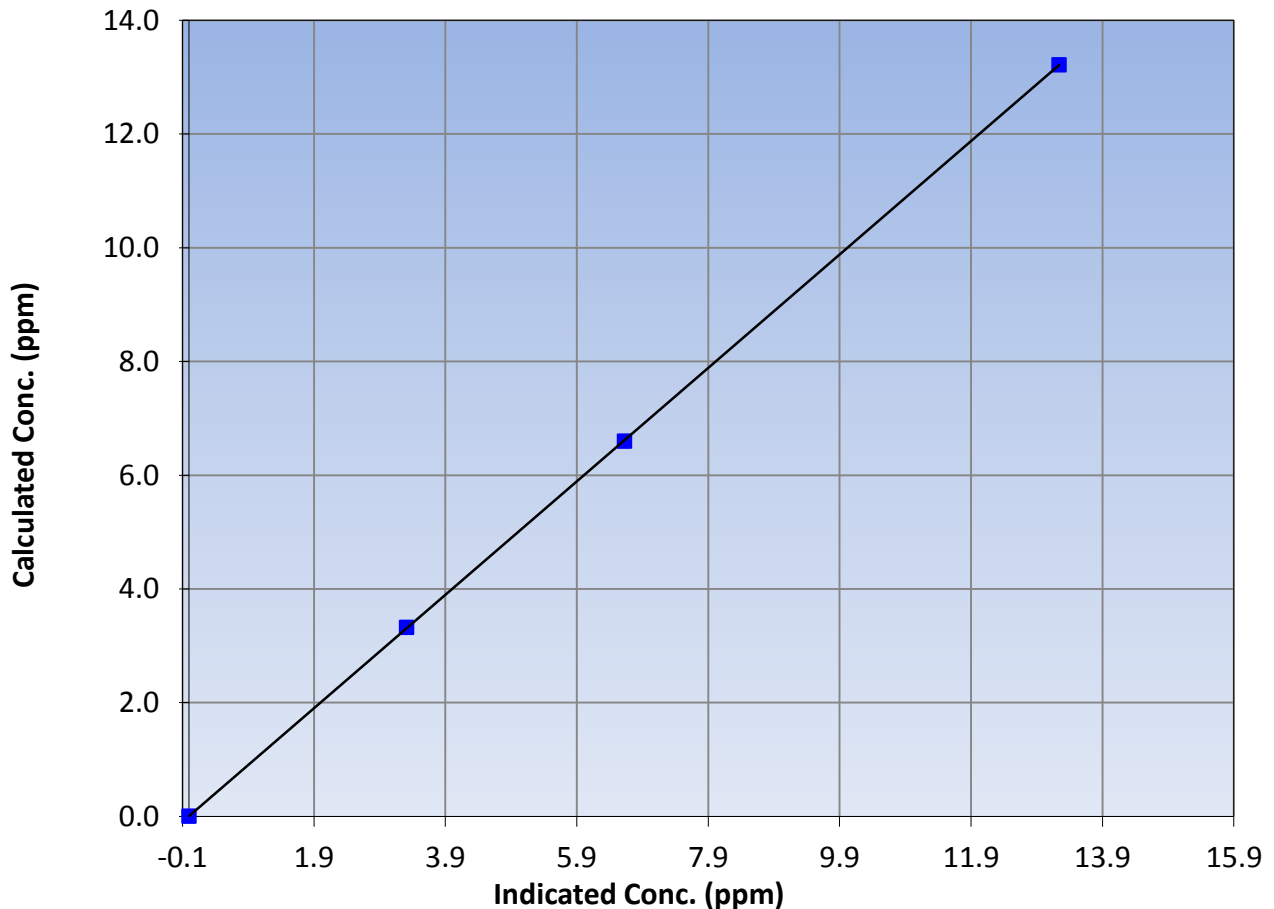
Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	12:49
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352

Calibration Data

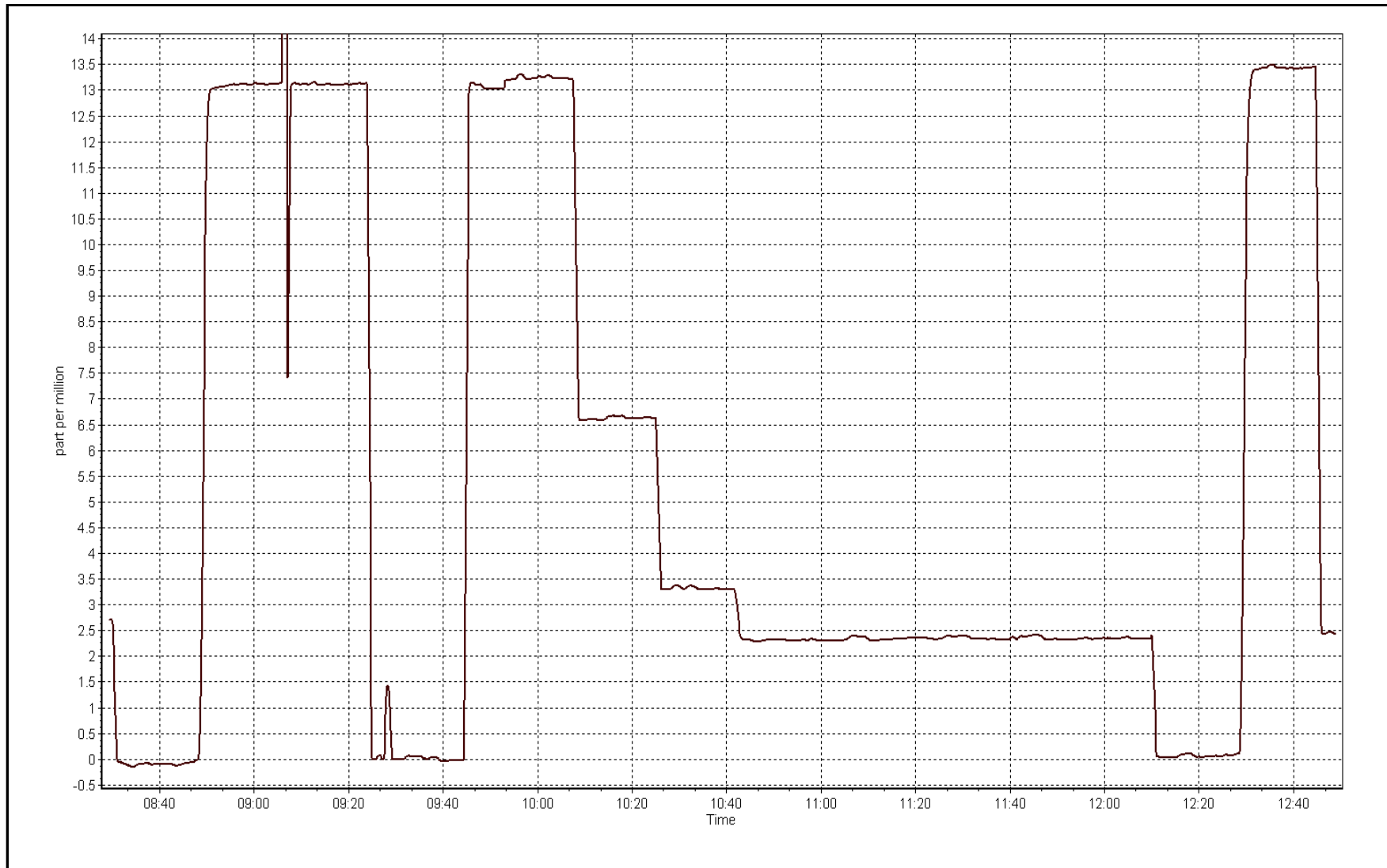
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999993
13.22	13.24	0.9982		
6.60	6.63	0.9951	Slope	0.997598
3.32	3.31	1.0032		
			Intercept	0.002385

THC Calibration Curve



THC Calibration Plot

Date: December 20, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	12:45	End Time (MST)	14:52
NO2 GPT Ref date	December 20, 2016	Transfer Standard	GPT
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	997
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.9	27.9
Analyzer IP address	192.168.1.72		Lamp temp.	58.0	58.0
Calculated slope	1.001062	1.003685	Pressure	25.6	25.6
Calculated intercept	0.202125	-1.725603	Flow cell A	681	681
Analyzer Background	5.369	5.282	Flow cell B	681	681
Analyzer Coefficient	1.006	0.989	O3 measure	4618.5	4618.5
			O3 reference	4618.8	4618.8

Analyzer make	Teledyne T400	Analyzer serial #	824
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	197.7/800	0.0	0.7	----
as found span	5000	713.2/1079.8	359.8	366.8	0.981
calibrator zero	5000	197.7/800	0.0	0.7	----
high point	5000	713.2/1079.8	359.8	360.2	0.999
second point	5000	494.7/971.3	244.6	244.3	1.001
third point	5000	260.9/844.3	124.7	128.1	0.973
as left zero	5000	197.7/800	0.0	1.4	----
as left span	5000	713.2/1079.8	359.8	363.6	0.990
Average Correction Factor					0.991

Corrected As found	366.1	Previous response	359.2	% change	-1.9%
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Notes:

Inlet filter changed after as founds. Adjusted span. No maintenance done

Calibration Performed By: Melissa Lemay



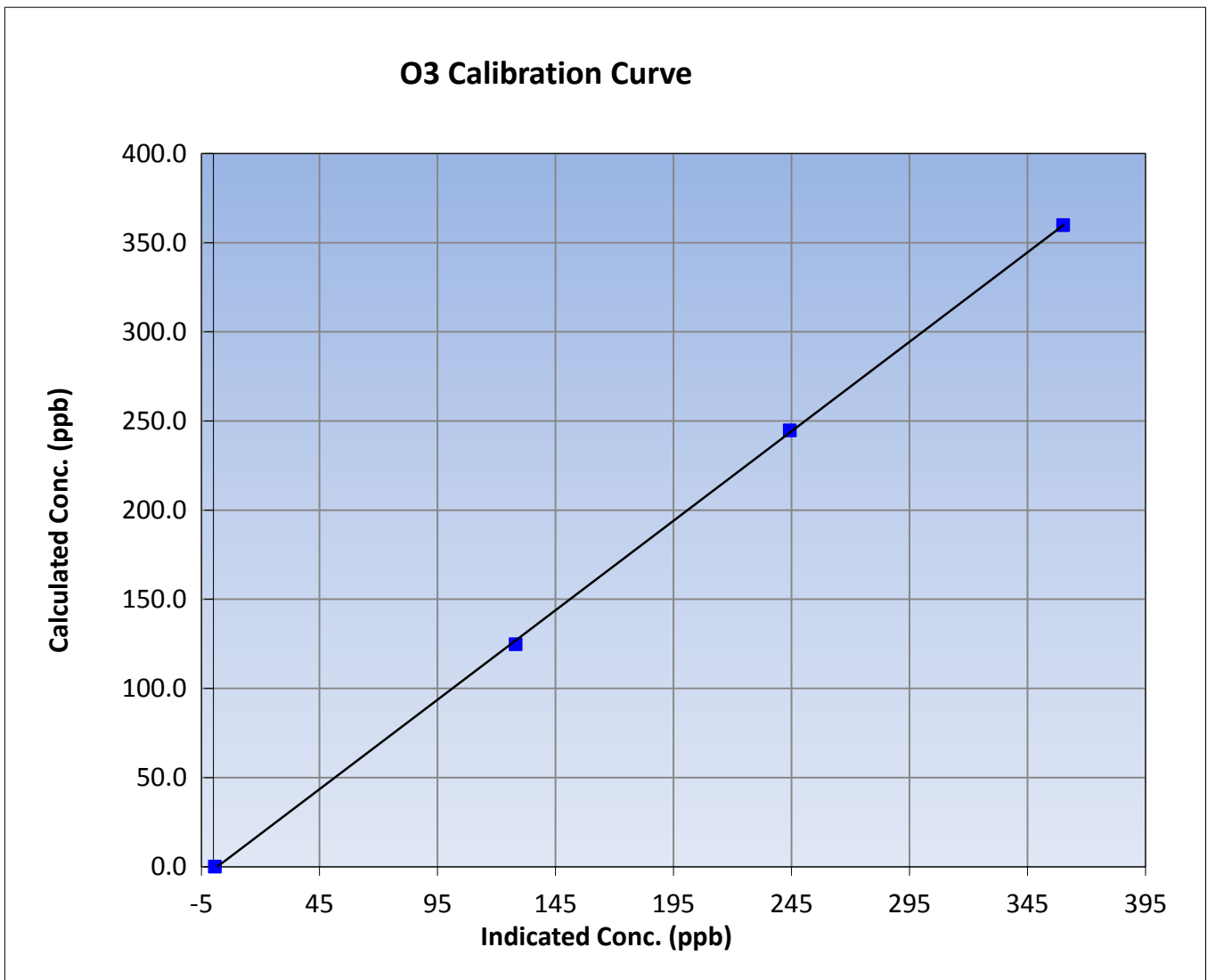
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	12:45	End Time (MST)	14:52
Analyzer make	Teledyne T400	Analyzer serial #	824

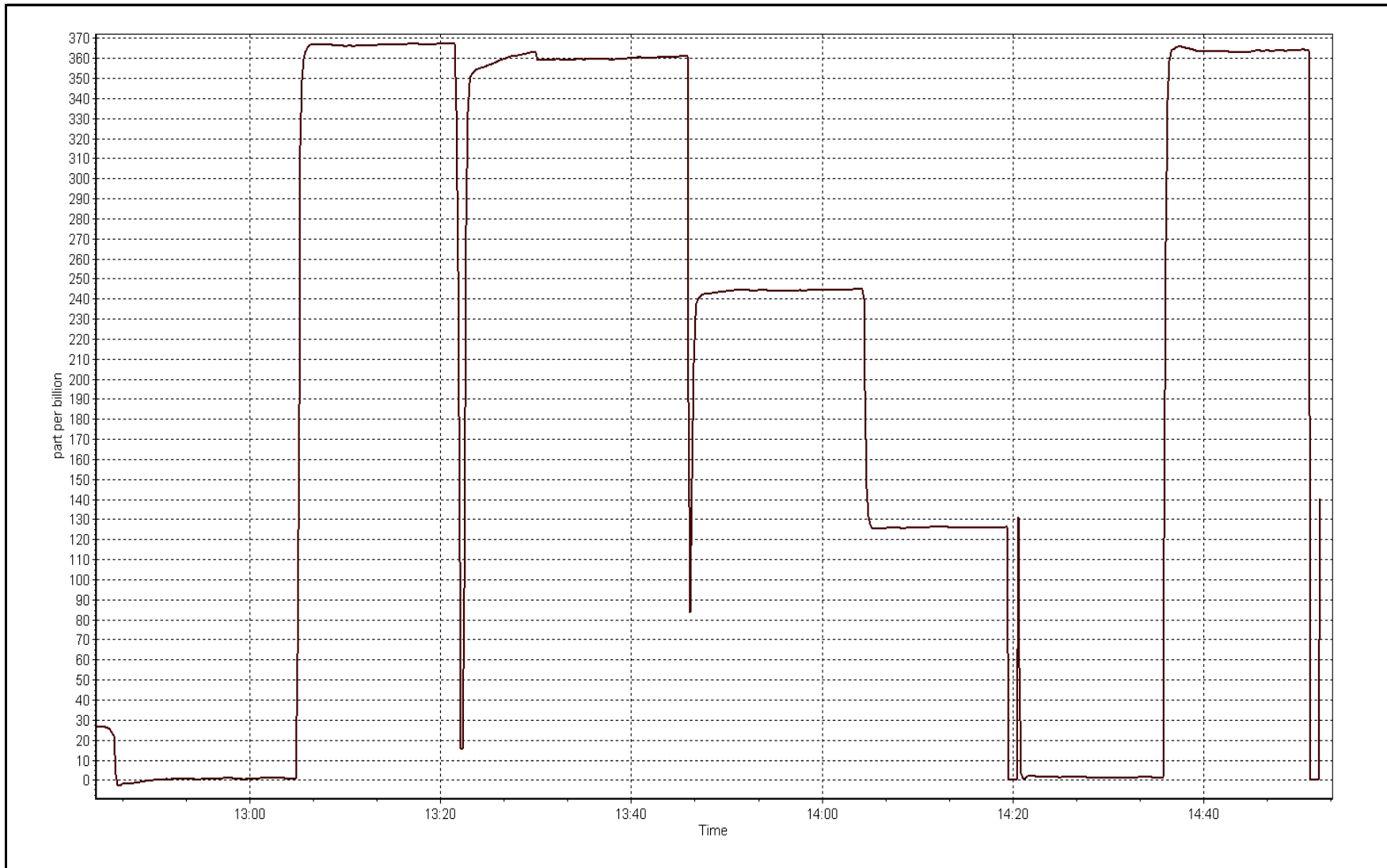
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.7	----	Correlation Coefficient	0.999904
359.8	360.2	0.9989		
244.6	244.3	1.0012	Slope	1.003685
124.7	128.1	0.9735		
			Intercept	-1.725603



O3 Calibration Plot

Date: December 20, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	12:48
NO Cal Gas Conc	49.7 ppm	Gas Cert Reference	SA130010A
NOx Cal Gas Conc	49.7 ppm	Cal Gas Expiry Date	December 12, 2016
Calibrator	API T700	Serial Number	997
Zero air Generator	Teledyne API T701	Serial Number	4427

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2633
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999230	0.996015	1.016157
	Data Offset	0.566429	1.160724	0.082303
Current Calibration	Data Slope	1.001638	0.995283	1.016061
	Data Offset	0.741828	1.478200	0.755758

Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	722
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.096		1.121	
NOx coefficient	1.097		1.117	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.0		0.0	
NOx bkgrnd	0.1		0.1	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	316.4	Deg C	316.4	Deg C
PMT voltage	781	V	781	V
PMT Temp	7	Deg C	7	Deg C
O3 flow	71	ccm	71	ccm
R Cell press NO	8.8	mmHg	8.8	mmHg
R Cell Press Nox	8.8	mmHg	8.8	mmHg
NO sample flow	436	lpm	436	lpm
Nox sample Flow	436	lpm	436	lpm

Notes:

Inlet filter changed after as founds. Adjusted span. No maintenance done, Wrong button pushed on calibrator, As found span done after a GPT point second GPT point used for the GPT



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 20, 2016 Station Number: AMS 17

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.5	0.5	-0.1	----	----
as found span	5000.00	60.2	598.4	598.4	0.0	588.6	587.2	1.3	1.0166	1.019
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.2	-0.2	----	----
high point	5000	60.2	598.4	598.4	0.0	596.8	600.6	-3.8	1.0027	0.996
second point	5000	30.2	300.2	300.2	0.0	298.9	298.8	0.0	1.0043	1.005
third point	5000	15.0	149.1	149.1	0.0	147.7	147.5	0.1	1.0095	1.011
as left zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	----	----
as left span	5000	60.5	601.4	236.0	365.4	589.8	234.6	355.3	1.0196	1.006
Average Correction Factor									1.0055	1.0039

Corrected As found NO_x= 588.1 NO= 586.7 Percent Change NO_x= 1.7% NO= 2.2%
 Previous Response NO_x= 598.3 NO= 599.6

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.20 ccm NOx ref calc conc = 598.4 ppb NO ref calc conc = 598.4 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	592.4	595.8	-0.2	1.0101	1.0043	----	----
1st NO2 (300)	236.0	359.8	590.5	236.0	354.5	1.0134	----	1.0150	98.5%
2nd NO2 (200)	351.2	244.6	590.0	351.2	238.3	1.0142	----	1.0264	97.4%
3rd NO2 (100)	471.1	124.7	592.3	471.1	122.0	1.0103	----	1.0221	97.8%
2nd NO ref point	----	0.0	595.2	599.8	-4.6	1.0054	0.9976	----	----
Average Correction Factor						1.0108		1.0212	97.9%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

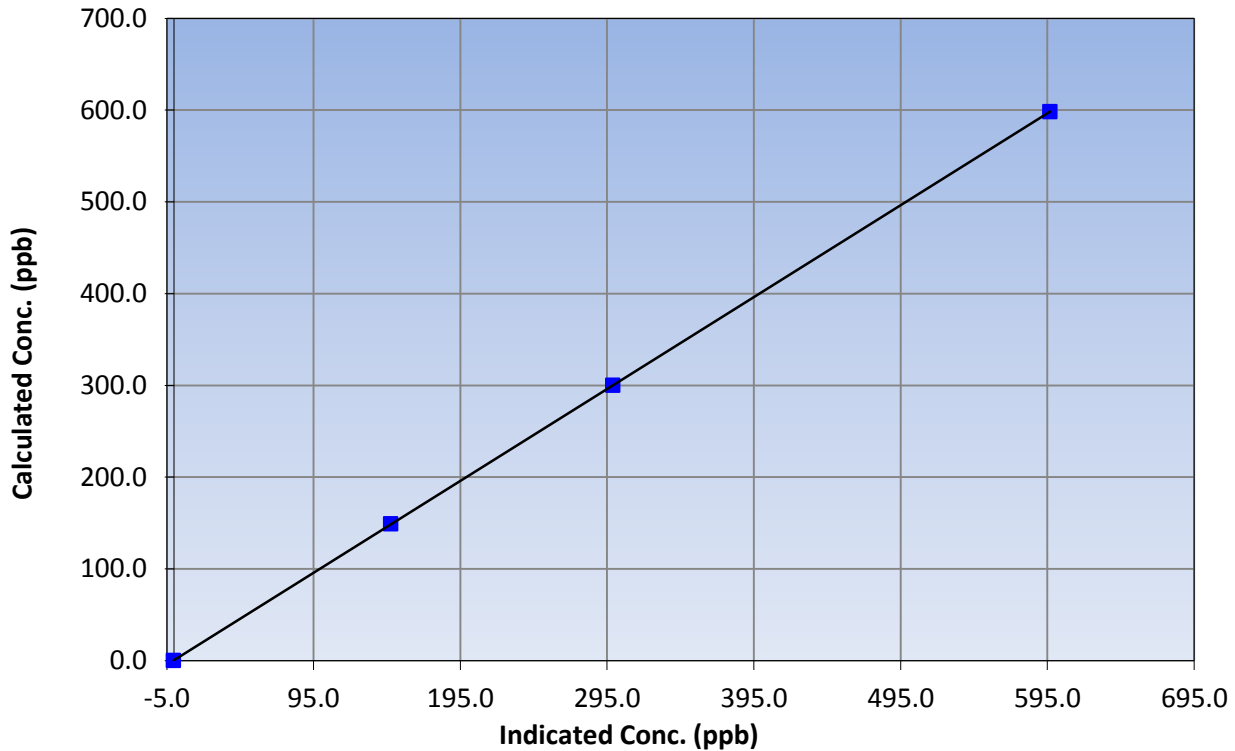
Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999998
598.4	596.8	1.0027		
300.2	298.9	1.0043	Slope	1.001638
149.1	147.7	1.0095		
			Intercept	0.741828

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

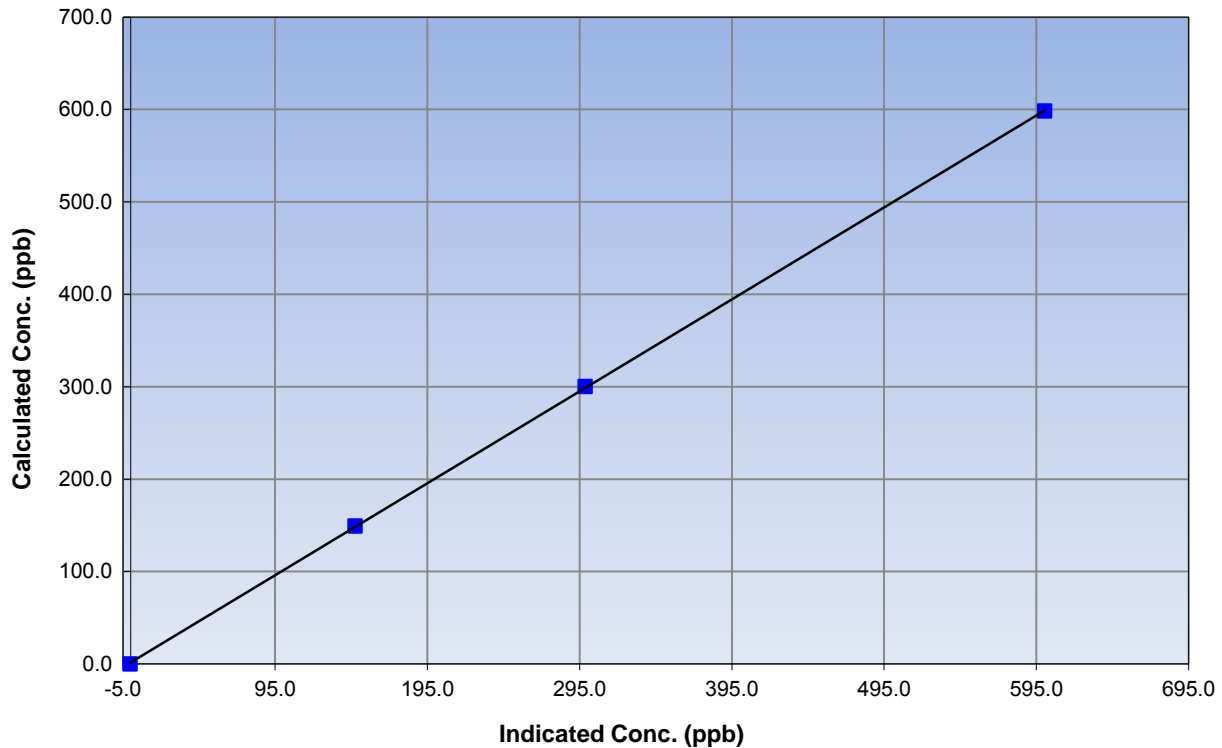
Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 15, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999976
598.4	600.6	0.9963		
300.2	298.8	1.0046	Slope	0.995283
149.1	147.5	1.0108		
			Intercept	1.478200

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

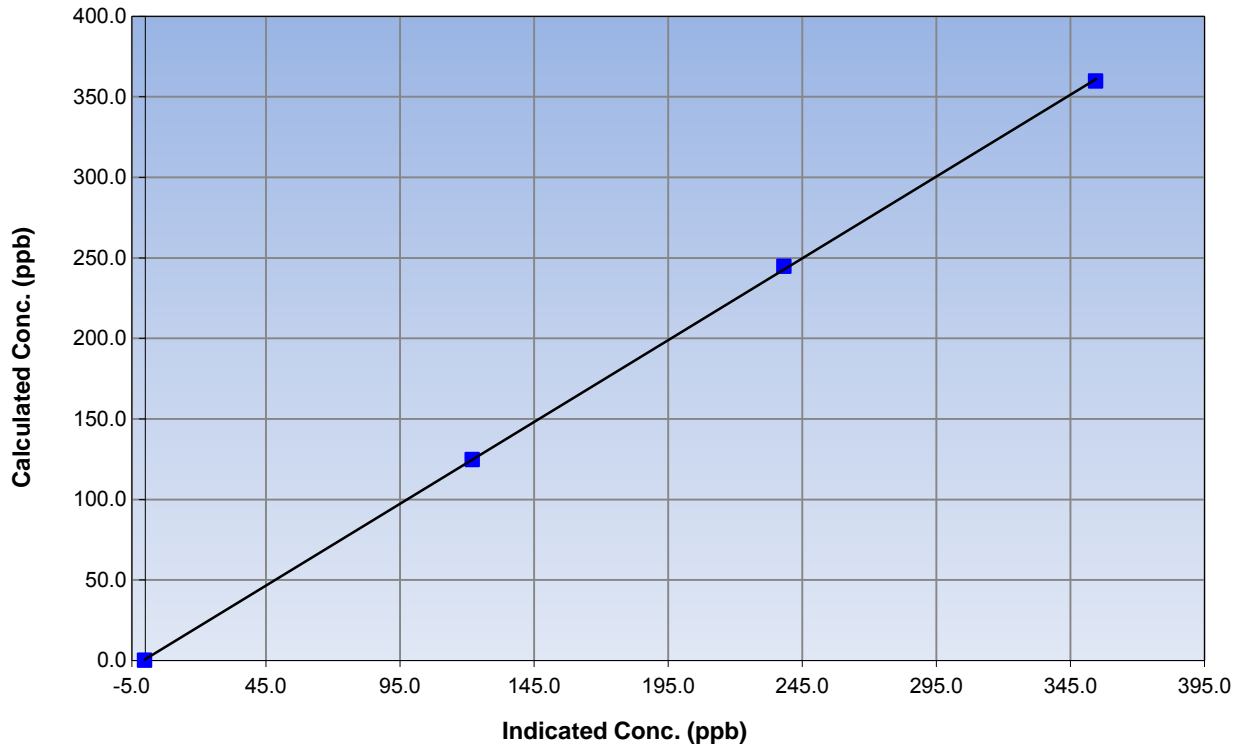
Station Information

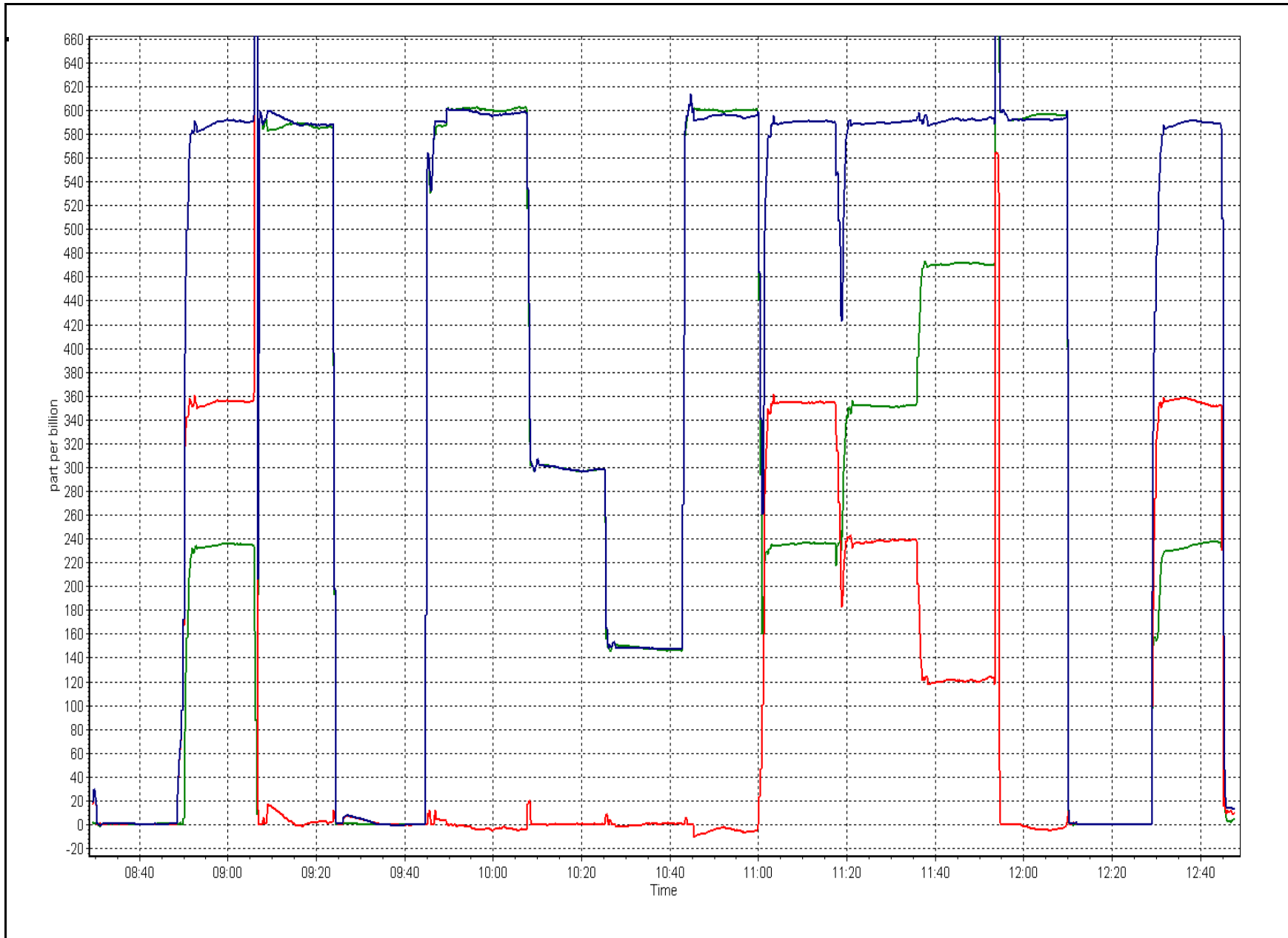
Calibration Date	December 20, 2016	Previous Calibration	November 15, 2016
Station Number	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999936
359.8	354.5	1.0150		
244.6	238.3	1.0264	Slope	1.016061
124.7	122.0	1.0221		
			Intercept	0.755758

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Wapasu	Station number:	AMS 17
Calibration Date:	December 8, 2016	Last Cal Date:	November 17, 2016
Start time (MST):	9:22	End time (MST):	12:52
Sharp Model:	5030	S/N:	CM-2390
Particulate Fraction:	PM2.5	C14 Source S/N:	10391
Flow Standard Model:	DeltaCal	S/N:	1450
Temp/RH standard:	NA	S/N:	NA

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-27	-27	-27	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	977	978	977	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1010	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-1.1	-----	-0.7	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified	<input type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check:	<u>December 8, 2016</u>	Last Cal Date:	<u>October 28, 2016</u>	Tolerance
	Flow w/o adaptor:	<u>16.9</u>	Flow w/ adaptor:	<u>16.51</u>	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: <u>1326</u>	S/N: <u>2519</u>
	Date of check: <u>December 8, 2016</u>	Last Cal Date: <u>October 28, 2016</u>
	New Correction Factor: <u>7072</u>	Previous Correction Factor: <u>7090</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
RH (%)	NA	NA	NA	<input type="checkbox"/>	+/- 10%

Notes: Spiking noticed in the data, nephelometer and filter tape check, both had nothing in them, leak check done before and after nephelometer and chamber opened, Nephelometer keeps going negative, tried adjusting nephelometer numerous times and stays around -0.7ug/m3

Calibration by: Melissa Lemay
and Aswin Sasikumar



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 18
STONY MOUNTAIN
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	707	37	37	100.00	5	0	1	0
TRS(ppb) Average	708	36	36	100.00	1	0	0	0
THC(ppm) Average	705	37	39	99.73	2.4	-	2.1	-
NMHC(ppm) Average	705	37	39	99.73	0.096	-	0.046	-
CH4(ppm) Average	705	37	39	99.73	2.3	-	2.1	-
O3 (ppb) Average	709	35	35	100.00	45	0	42	-
NO2 (ppb) Average	707	37	37	100.00	18	0	8	-
NO (ppb) Average	707	37	37	100.00	2	-	0	-
NOX (ppb) Average	707	37	37	100.00	18	-	8	-
PM2.5 (ug/m3) Average	732	2	12	98.66	29.6	-	16.5	0
Wind Speed 10 m (km/h) Average	744	0	0	100.00	25	-	17	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	0.9	-	-2.2	-
Relative Humidity (%) Average	744	0	0	100.00	97	-	95.0	-
Precipitation (mm) Total	744	0	0	100.00	0.8	-	4.5	-
Leaf Wetness (% of range) Average	744	0	0	100.00	5	-	4.0	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	245	-	37.0	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	707	0.3	0	-	0	0	0	0	0	0	1	5
TRS (ppb) Average	708	0.3	0	-	0	0	0	0	0	0	0	1
THC (ppm) Average	705	1.96	0.1	-	1.9	1.9	1.9	1.9	2	2.1	2.4	
NMHC(ppm) Average	705	0.004	0.013	-	0	0	0	0	0	0	0	0.096
CH4(ppm) Average	705	1.96	0.1	-	1.9	1.9	1.9	1.9	2	2.1	2.3	
O3 (ppb) Average	709	33	7	-	13	24	29	34	38	42	45	
NO2 (ppb) Average	707	2	2	-	0	0	1	1	3	5	18	
NO (ppb) Average	707	0.1	0	-	0	0	0	0	0	0	0	2
NOX (ppb) Average	707	2.1	2	-	0	0	1	1	3	5	18	
PM2.5 (ug/m3) Average	732	4.51	4.6	-	0.2	1.6	2.2	2.8	4.5	9.6	29.6	
Wind Speed 10 m (km/h) Average	744	9.3	4	-	0	4	6	9	12	15	25	
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-14.97	8.4	-	-30.6	-25.9	-21.8	-16.2	-6.8	-4.4	0.9	
Relative Humidity (%) Average	744	80.7	8	-	53	72	77	80	85	92	97	
Precipitation (mm) Total	744	-	-	18.53	-	-	-	-	-	-	-	-
Surface Wetness (% of range) Average	744	2.8	1	-	2	2	2	3	3	4	5	
Global Solar Radiation (W/m2) Average	744	18	37	-	0	0	0	0	15	70	245	

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	08 Dec 2016 12:00	08 Dec 2016 13:00	2	Maintenance - replaced carrier gas
PM2.5	07 Dec 2016 20:00	07 Dec 2016 22:00	3	Unstable operation - excessive baseline drift
PM2.5	08 Dec 2016 01:00	08 Dec 2016 07:00	7	Unstable operation - excessive baseline drift



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

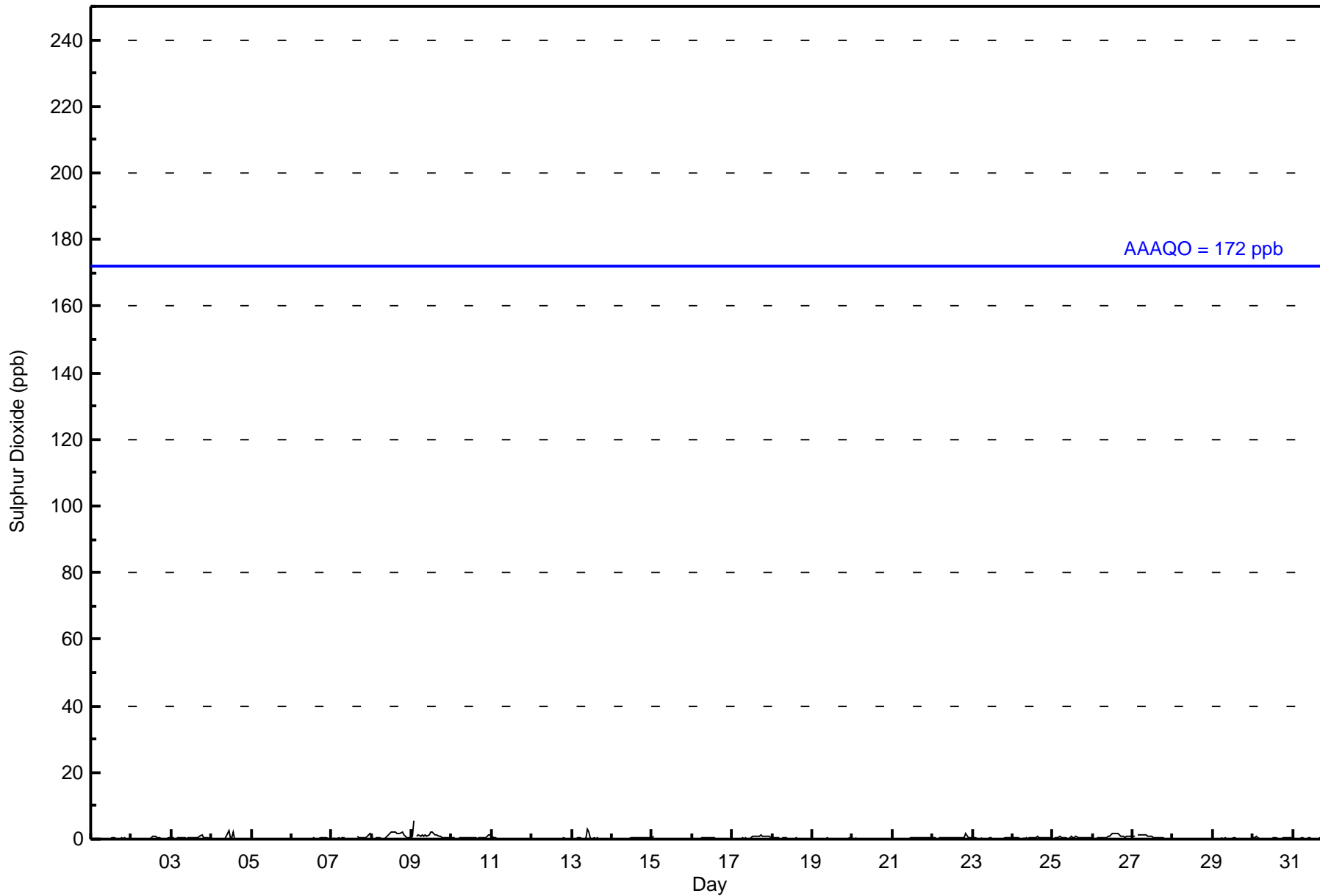
Stony Mountain - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 ppb on Dec 9 02:00 Maximum Daily Average: 1.2 ppb on Dec 9																	Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 37 Percent Operational Time: 100.0									
Minimum Value: 0 ppb on Dec 15 05:00 Minimum Daily Average: 0.1 ppb on Dec 5 Maximum Diurnal Average: 0.5 ppb at hour 2 Minimum Diurnal Average: 0.2 ppb at hour 3 Monthly Average: 0.3 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 2																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
3-Dec	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0.4	1
4-Dec	0	0	0	Z	0	0	0	0	0	1	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0.3	3
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	Z	0	0	0	0	0	1	1	0	C	C	C	C	C	C	1	1	0	1	1	0	1	1	2	--	2
8-Dec	1	Z	0	0	1	0	0	0	0	1	1	2	2	2	2	2	2	2	2	2	1	1	0	0	1.0	2
9-Dec	1	5	Z	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	0	0	0	0	0	1.2	5
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
11-Dec	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	Z	0	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
18-Dec	1	0	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
19-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.3	1
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0.4	2
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	1	0	0.4	1
25-Dec	Z	0	0	0	1	0	0	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0.4	1
26-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0.8	2
27-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.7	1
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
31-Dec	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	707	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707

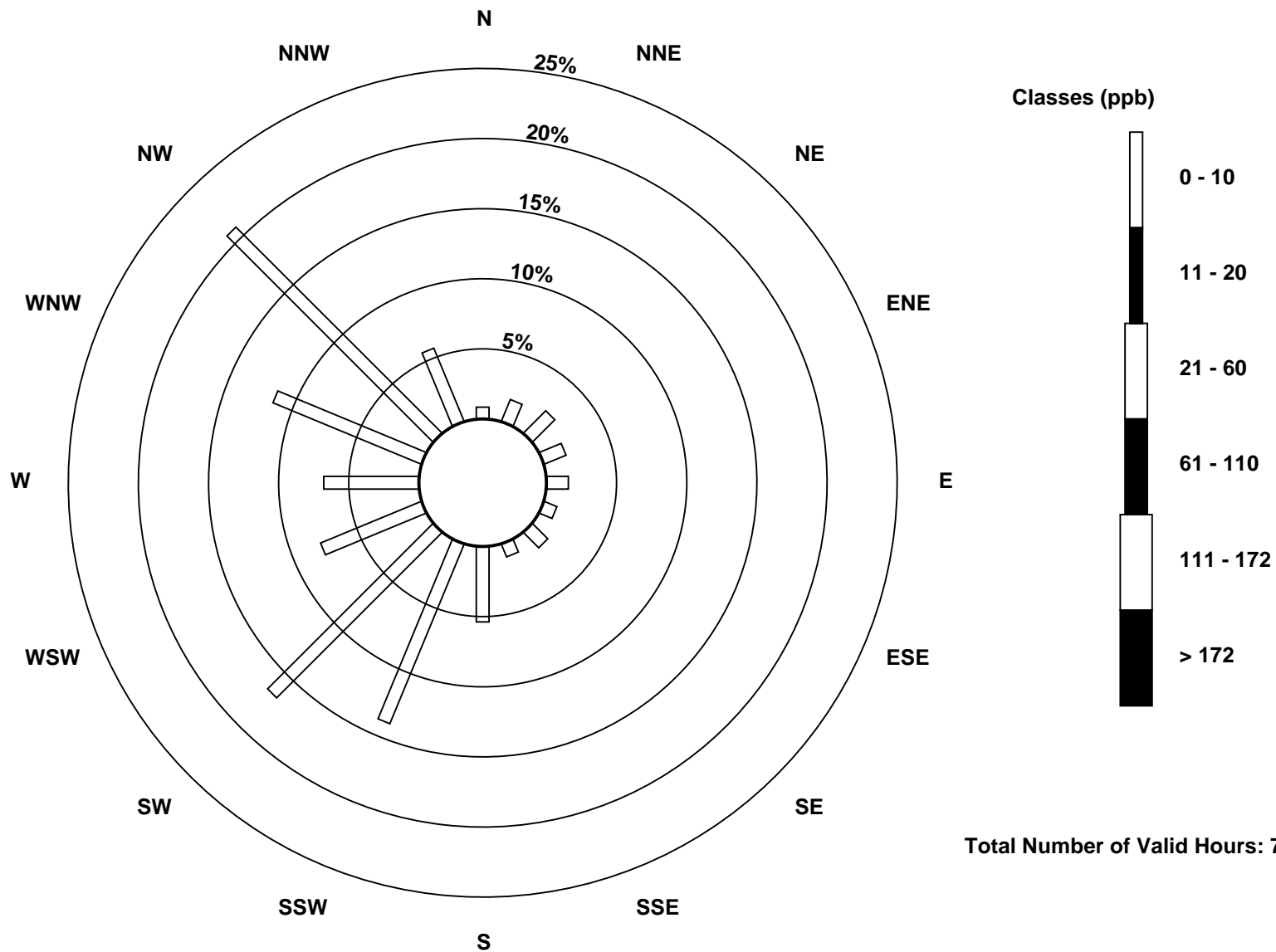
Total Number of Valid Hours: 707

Total Number of Hours: 744

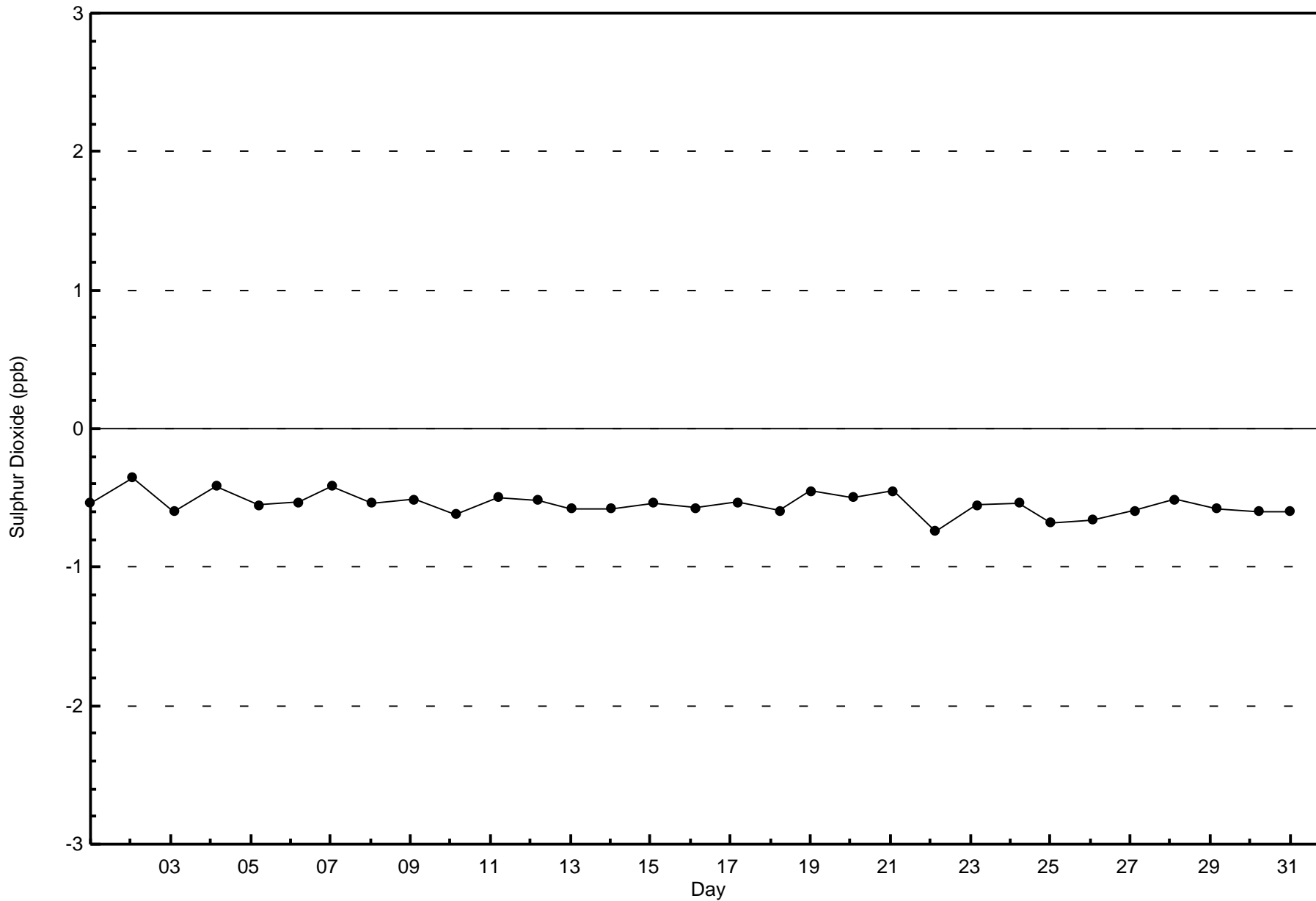


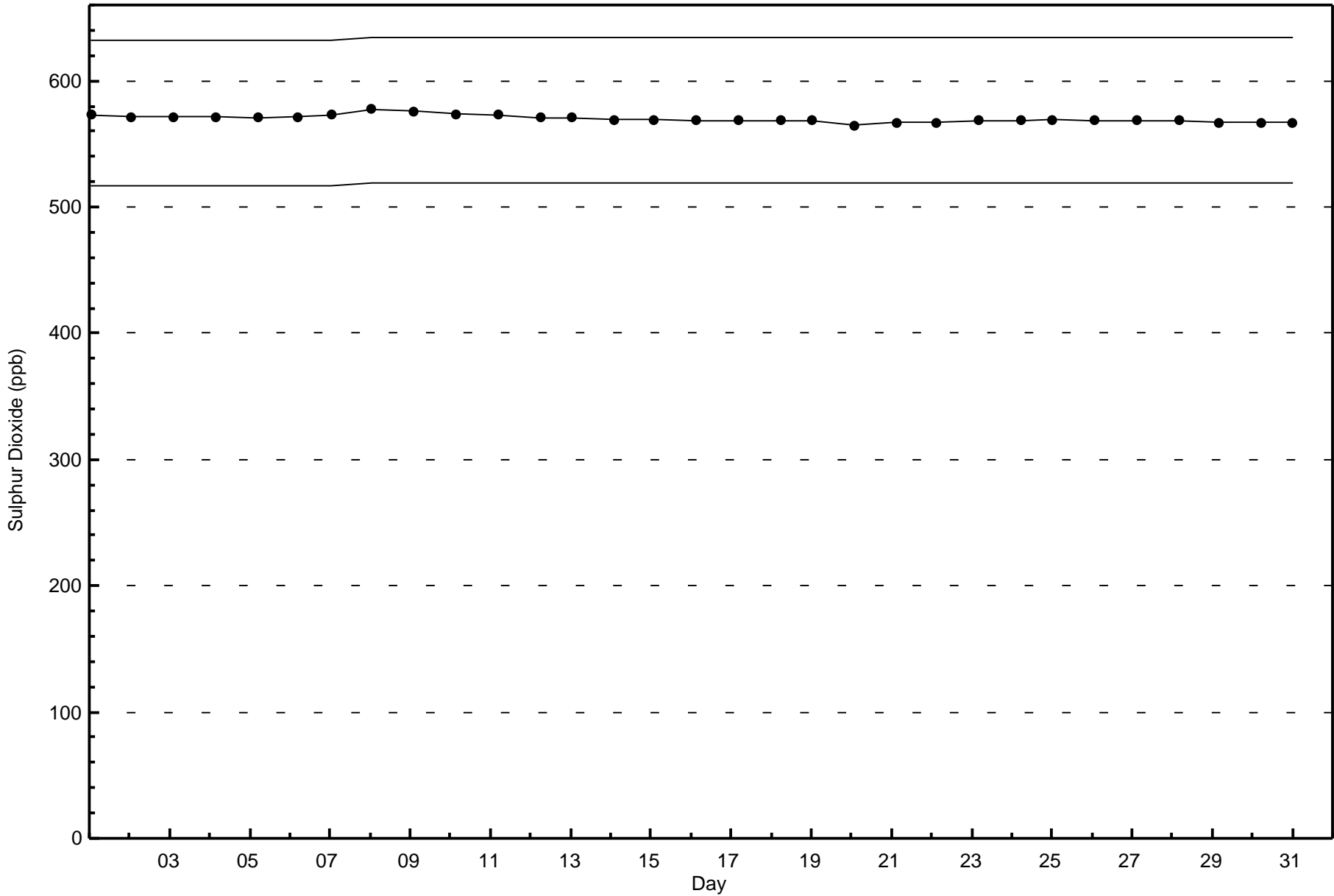
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 707







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

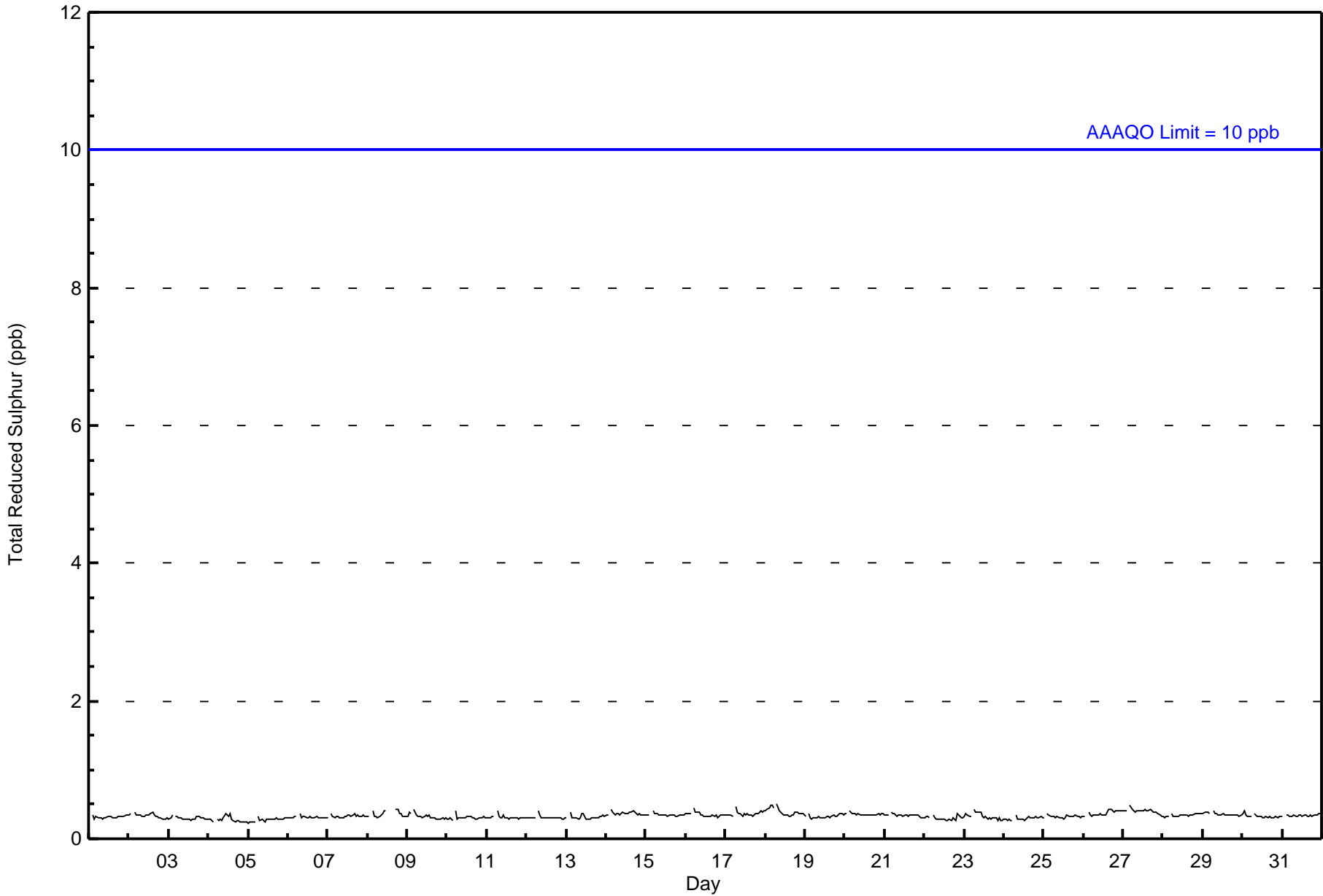
Stony Mountain - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 1 ppb on Dec 18 08:00										Maximum Daily Average: 0.4 ppb on Dec 27										Hours of Data: 708						
Minimum Value: 0 ppb on Dec 5 01:00										Minimum Daily Average: 0.3 ppb on Dec 5										Hours of Missing Data: 36						
Maximum Diurnal Average: 0.3 ppb at hour 5										Minimum Diurnal Average: 0.3 ppb at hour 13										Hours of Calibration: 36						
Monthly Average: 0.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 0										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.4	0
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
18-Dec	0	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
19-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
21-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
25-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
26-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
27-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
28-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
29-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
30-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
0.3																								Diurnal Average		
0																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	6	10	16	12	11	6	11	7	37	99	118	55	47	83	151	39	708
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	10	16	12	11	6	11	7	37	99	118	55	47	83	151	39	708

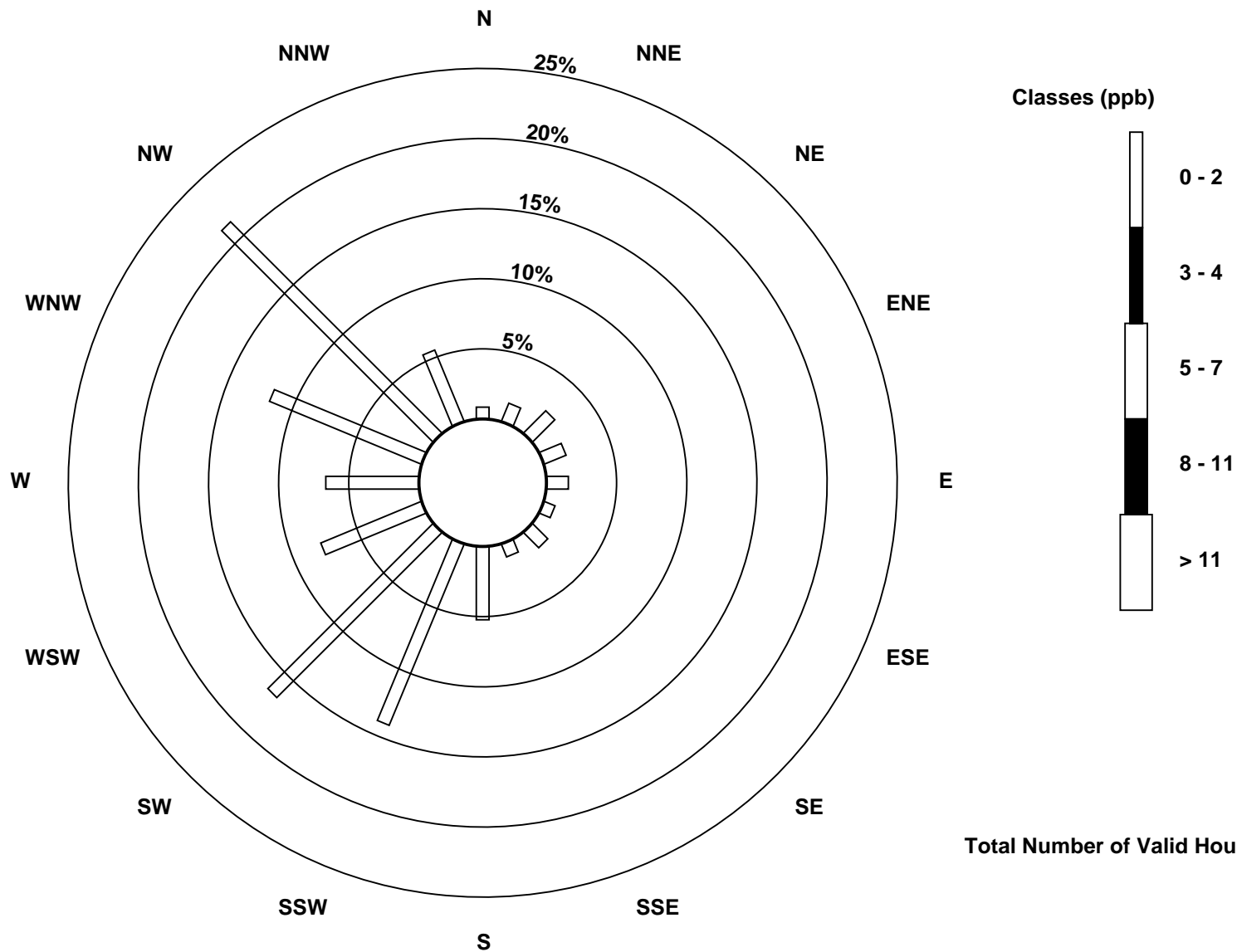
Total Number of Valid Hours: 708

Total Number of Hours: 744

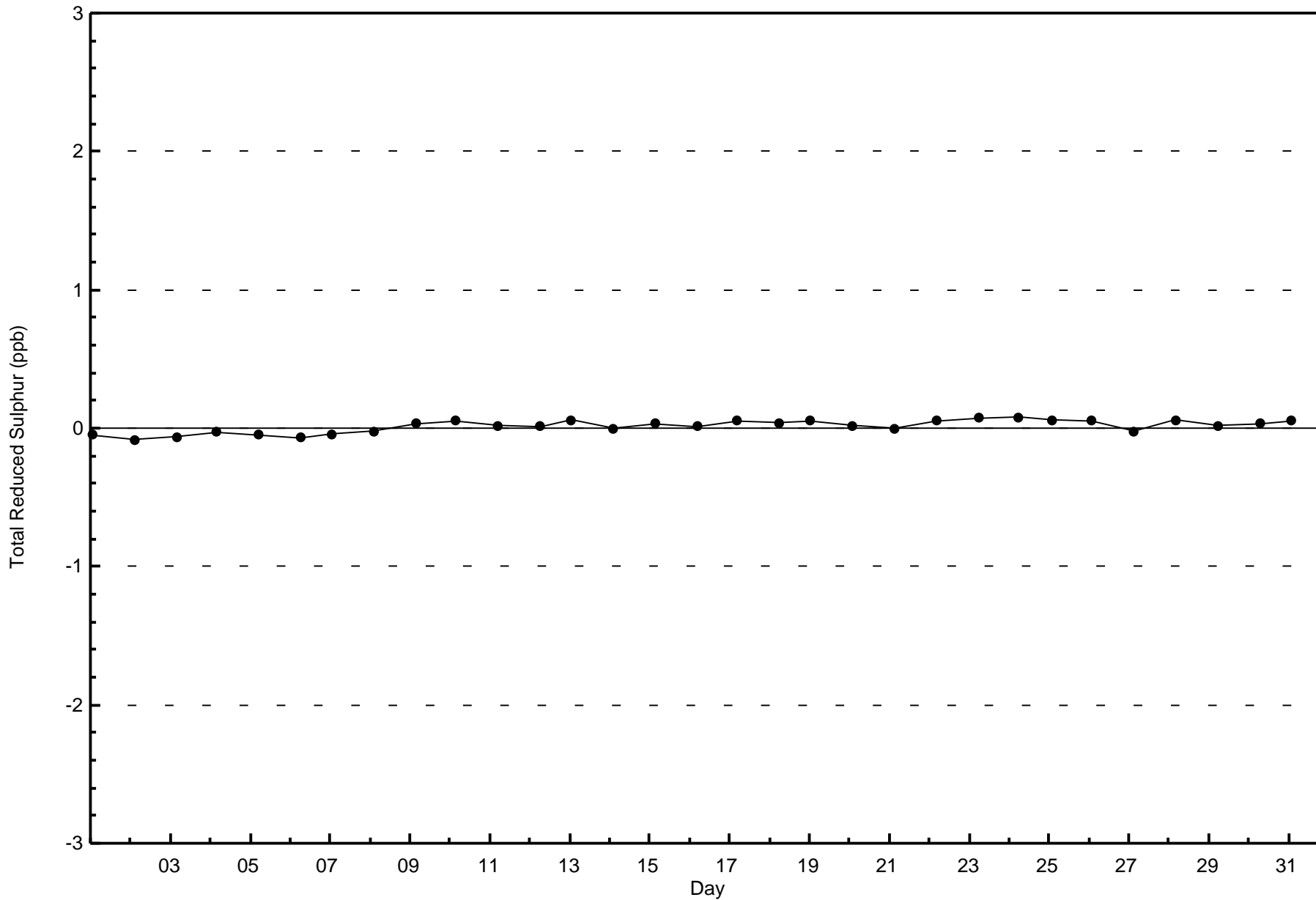


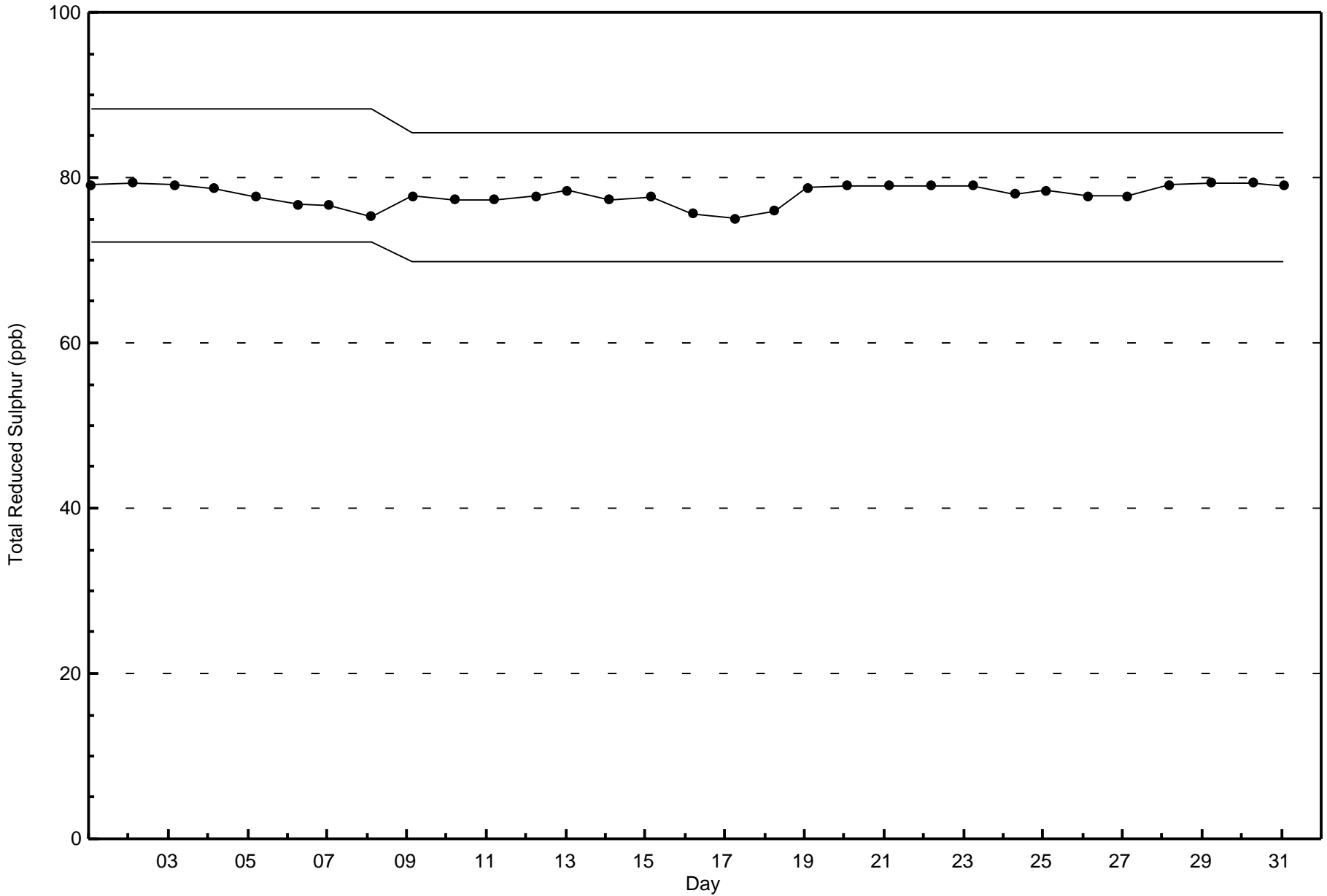
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Reduced Sulphur (TRS) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 708







Wood Buffalo Environmental Association
Summary of Hour Averages

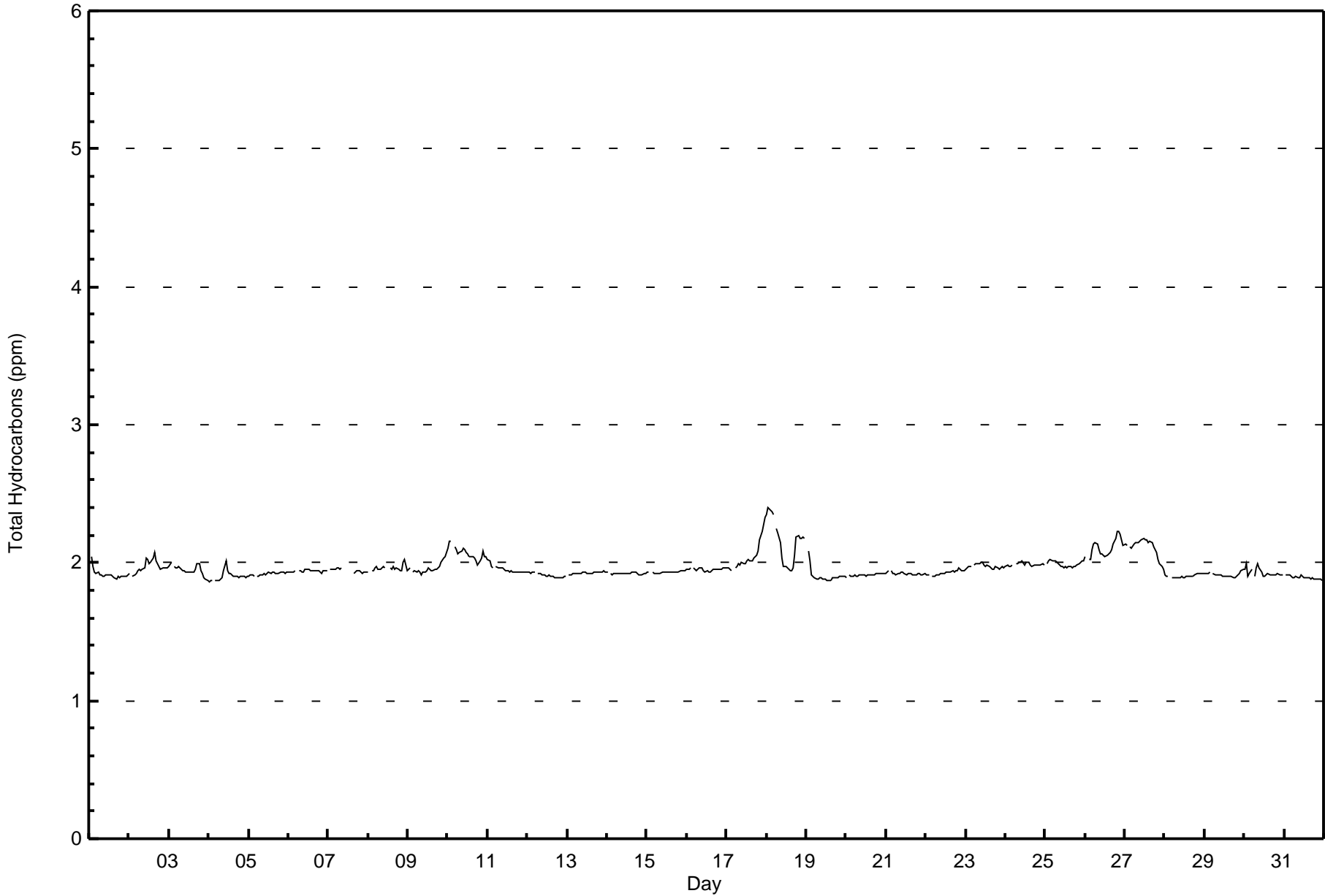
Total Hydrocarbons (THC) - ppm
Stony Mountain - December 2016

Maximum Value: 2.4 ppm on Dec 18 02:00		Maximum Daily Average: 2.1 ppm on Dec 18		Hours in Service: 744																																														
Minimum Value: 1.9 ppm on Dec 4 01:00		Minimum Daily Average: 1.9 ppm on Dec 31		Hours of Data: 705																																														
Maximum Diurnal Average: 2.0 ppm at hour 2		Minimum Diurnal Average: 1.9 ppm at hour 17		Hours of Missing Data: 39																																														
Monthly Average: 1.96 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.3		Hours of Calibration: 37																																														
				Percent Operational Time: 99.7																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
2-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1																						
3-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
4-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
5-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
6-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
7-Dec	Z	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	C	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	--																							
8-Dec	1.9	Z	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	M	M	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0																							
9-Dec	1.9	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1																							
10-Dec	2.1	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.2																							
11-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
12-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
13-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
14-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
15-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
16-Dec	2.0	2.0	2.0	Z	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0																							
17-Dec	2.0	2.0	2.0	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.0	2.3																								
18-Dec	2.4	2.4	2.4	2.4	2.4	Z	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.4																								
19-Dec	Z	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1																							
20-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
21-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
22-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0																							
23-Dec	1.9	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																							
24-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																							
25-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																							
26-Dec	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2																							
27-Dec	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	2.1	2.2	2.2																							
28-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
29-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0																							
30-Dec	2.0	2.0	1.9	1.9	2.0	Z	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
31-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																							
																								2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Diurnal Average	
																								2.4	2.4	2.4	2.4	2.4	2.1	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.0	2.3	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																		



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Stony Mountain - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Stony Mountain - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	631	89.50	89.50
2.1 - 3.0	74	10.50	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Stony Mountain - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	5	11	15	12	11	7	11	5	34	61	91	55	47	81	146	39	631
2.1 - 3.0	1	0	0	0	0	0	0	2	4	37	27	0	1	0	1	1	74
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	11	15	12	11	7	11	7	38	98	118	55	48	81	147	40	705

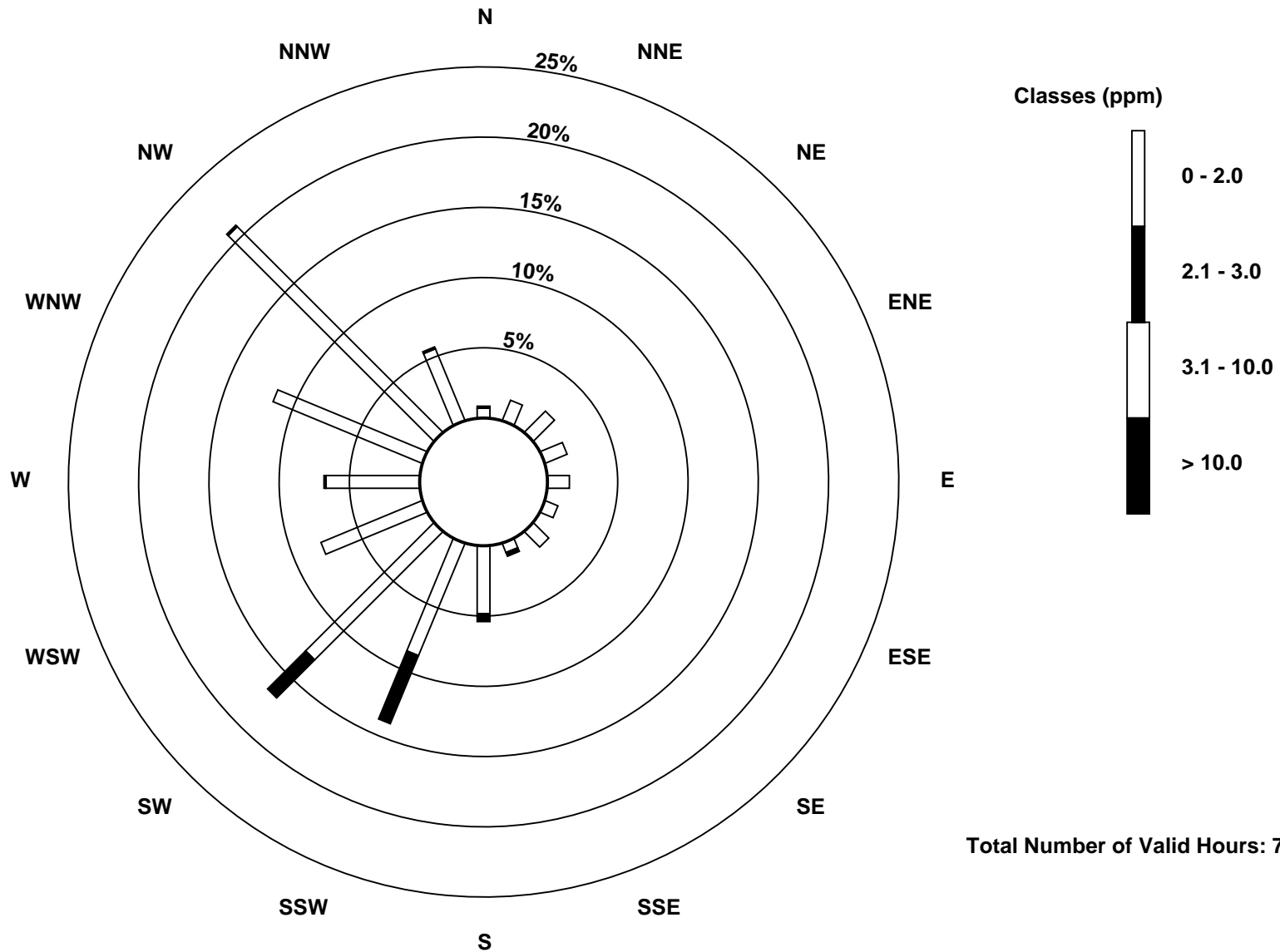
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Stony Mountain (AMS 18)



Total Number of Valid Hours: 705

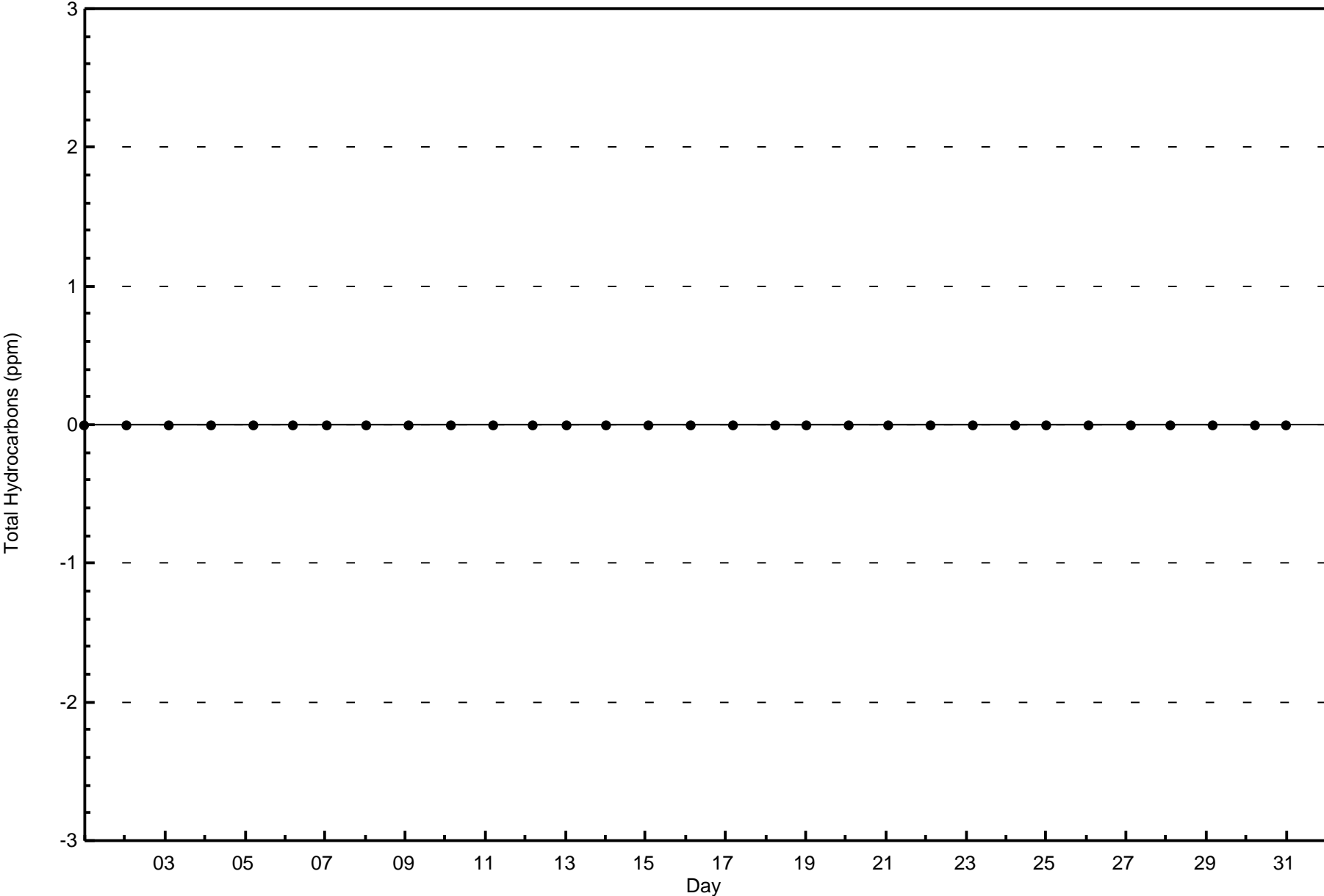


Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

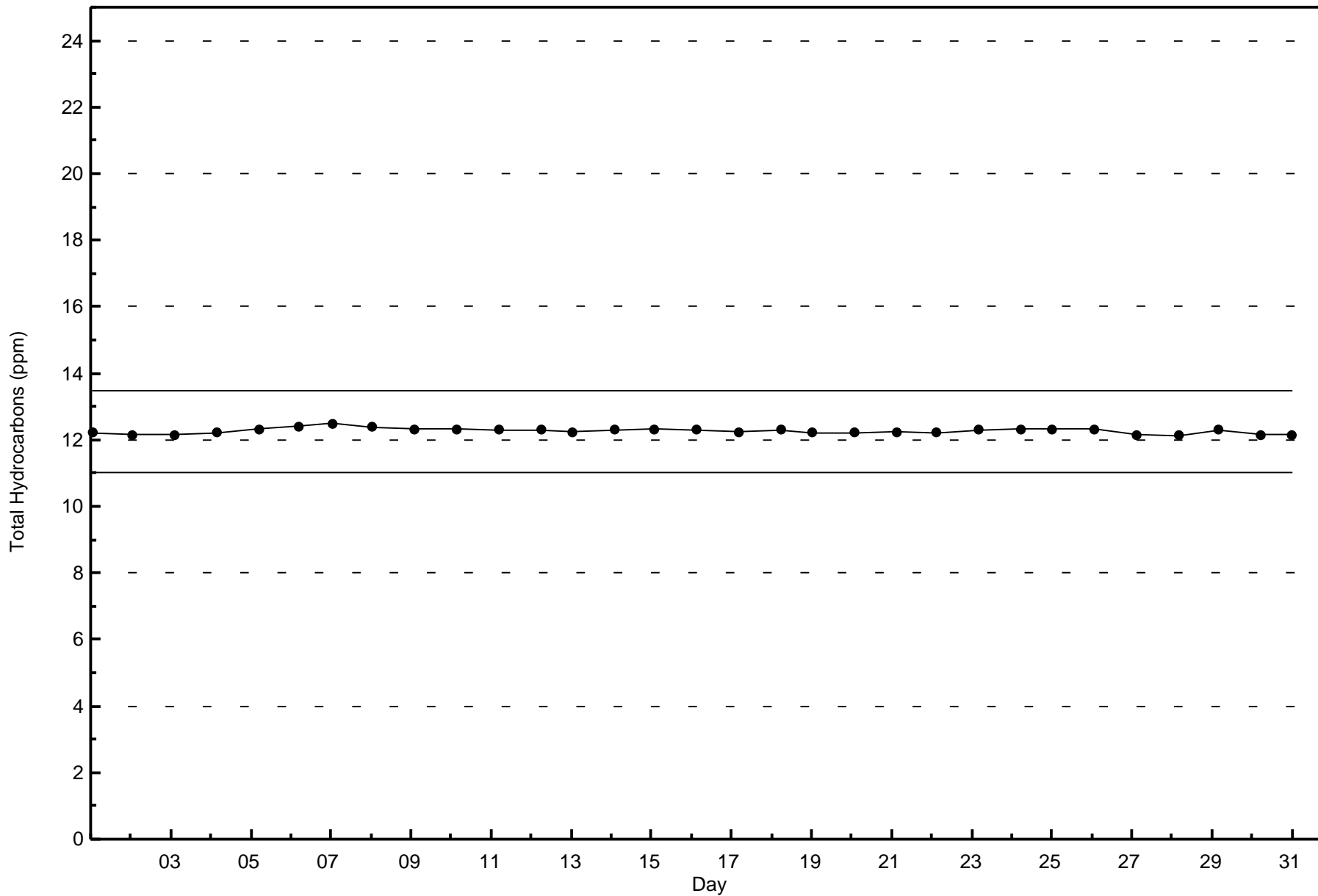
Stony Mountain - December 2016





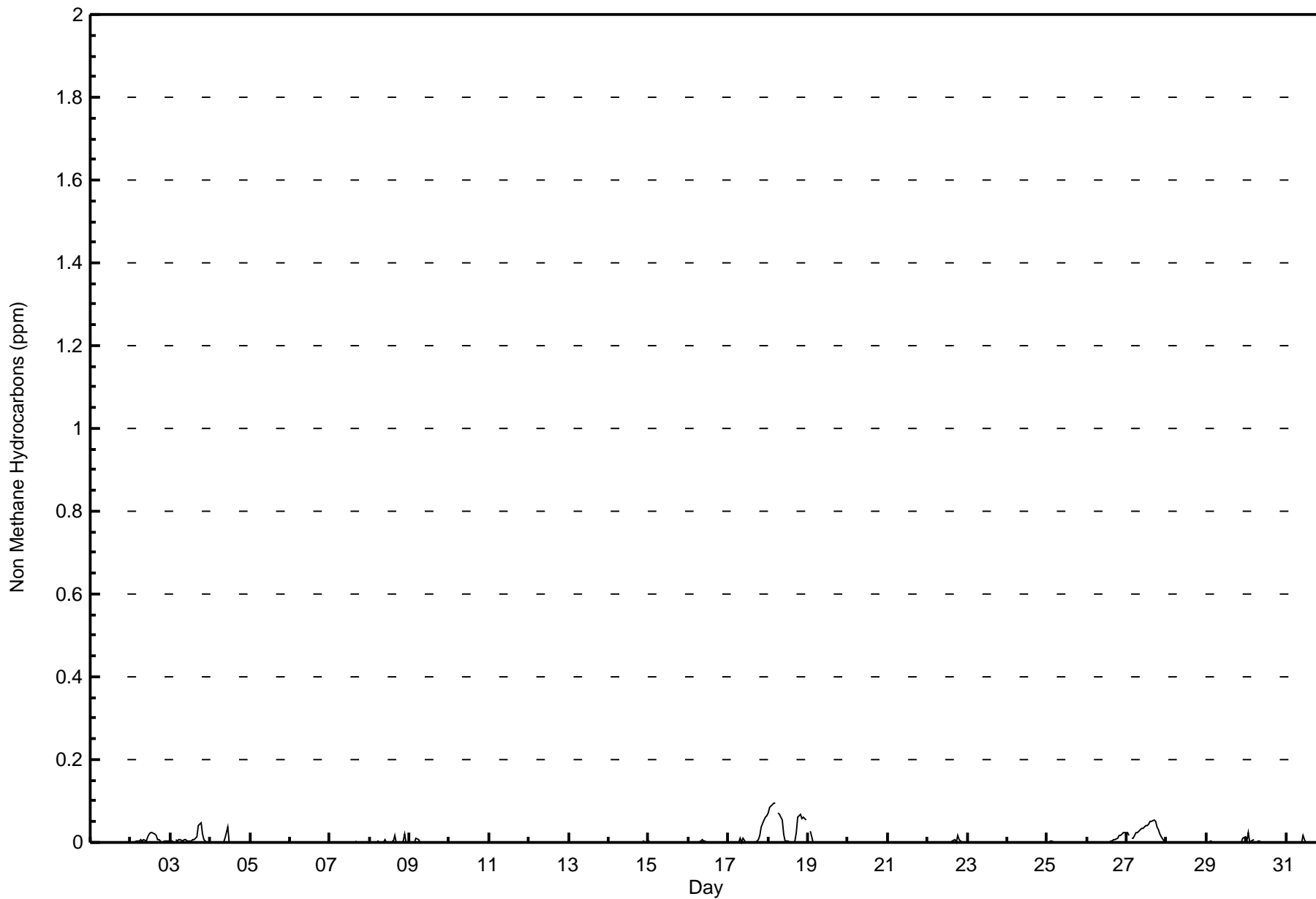
Wood Buffalo Environmental Association
Span Responses

Total Hydrocarbons (THC) - ppm
Stony Mountain - December 2016





Maximum Value: 0.096 ppm on Dec 18 04:00																				Maximum Daily Average: 0.046 ppm on Dec 18					Hours in Service:	744
Minimum Value: 0.000 ppm on Dec 1 02:00																				Minimum Daily Average: 0.000 ppm on Dec 5					Hours of Data:	705
Maximum Diurnal Average: 0.006 ppm at hour 2																				Minimum Diurnal Average: 0.002 ppm at hour 6					Hours of Missing Data:	39
Monthly Average: 0.004 ppm																				Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.1					Hours of Calibration:	37
																									Percent Operational Time:	99.7
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001
2-Dec	0.000	Z	0.002	0.004	0.005	0.002	0.005	0.005	0.006	0.005	0.014	0.022	0.024	0.024	0.019	0.017	0.007	0.007	0.002	0.001	0.002	0.002	0.002	0.003	0.008	0.024
3-Dec	0.002	0.005	Z	0.006	0.005	0.007	0.007	0.005	0.006	0.006	0.004	0.005	0.004	0.005	0.006	0.010	0.015	0.041	0.047	0.020	0.008	0.004	0.000	0.000	0.010	0.047
4-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.012	0.039	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.039	
5-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	
7-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	C	C	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.001	--	0.002	
8-Dec	0.002	Z	0.001	0.001	0.001	0.003	0.000	0.000	0.002	0.006	0.000	M	M	0.002	0.002	0.016	0.000	0.001	0.000	0.000	0.003	0.020	0.000	0.003	0.020	
9-Dec	0.000	0.000	Z	0.000	0.009	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.009	
10-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	
11-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
13-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
14-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.003	0.001	0.000	0.003	
15-Dec	0.005	0.001	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.005	
16-Dec	0.000	0.000	0.000	Z	0.001	0.001	0.002	0.003	0.008	0.003	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.008	
17-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.012	0.000	0.009	0.000	0.000	0.001	0.001	0.000	0.000	0.002	0.003	0.007	0.017	0.038	0.055	0.060	0.012	0.063	
18-Dec	0.071	0.084	0.092	0.096	0.095	Z	0.072	0.068	0.053	0.020	0.003	0.003	0.003	0.000	0.000	0.000	0.003	0.024	0.063	0.066	0.059	0.061	0.058	0.046	0.096	
19-Dec	Z	0.027	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.027	
20-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
21-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
22-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.000	0.019	0.006	0.004	0.000	0.000	0.002	0.019	
23-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
25-Dec	Z	0.000	0.002	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
26-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.006	0.007	0.009	0.016	0.018	0.020	0.024	0.006	0.024	
27-Dec	0.023	0.017	Z	0.011	0.011	0.025	0.023	0.028	0.032	0.034	0.033	0.042	0.042	0.045	0.052	0.051	0.054	0.050	0.036	0.030	0.020	0.013	0.002	0.029	0.054	
28-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
29-Dec	0.001	0.000	0.002	0.002	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.011	0.001	0.014	
30-Dec	0.004	0.023	0.000	0.003	0.008	Z	0.000	0.003	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.023	
31-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.017	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.017	
																				0.004 0.006 0.004 0.005 0.005 0.002 0.004 0.004 0.004 0.003 0.004 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.004 0.006 0.005 0.005 0.006 0.005 0.005					Diurnal Average	
																				0.071 0.084 0.092 0.096 0.095 0.025 0.072 0.068 0.053 0.034 0.039 0.042 0.042 0.045 0.052 0.051 0.054 0.050 0.063 0.066 0.059 0.061 0.060 0.063					Diurnal Maximum	
Z - zerospan		C - Calibration				M - Maintenance																				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	613	86.95	86.95
0.006 - 0.05	78	11.06	98.01
0.06 - 0.1	14	1.99	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	4	9	14	12	11	7	11	4	28	66	91	53	47	80	141	35	613
0.006 - 0.05	2	2	1	0	0	0	0	1	9	29	21	2	1	1	5	4	78
0.06 - 0.1	0	0	0	0	0	0	0	2	1	3	6	0	0	0	1	1	14
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	11	15	12	11	7	11	7	38	98	118	55	48	81	147	40	705

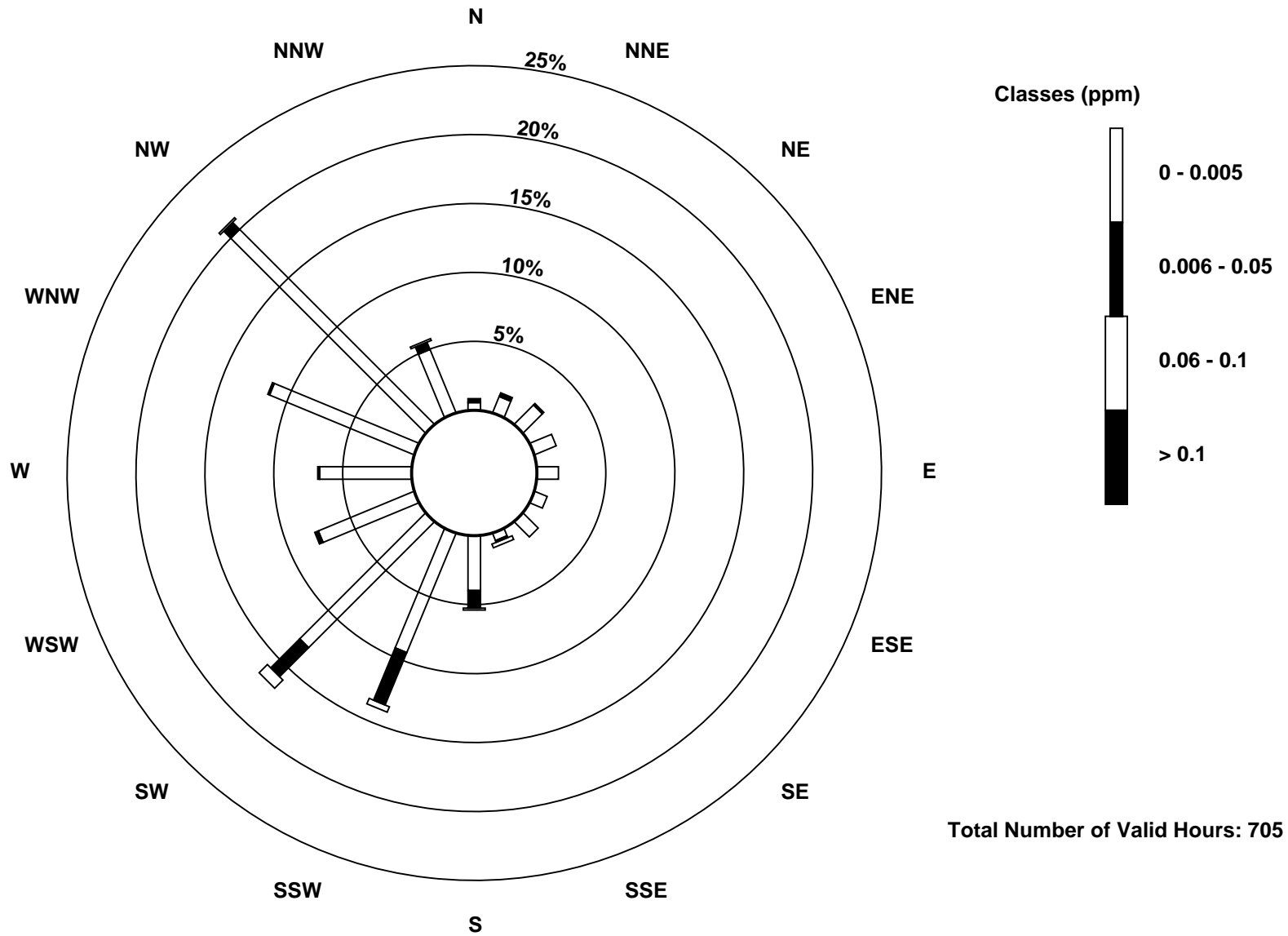
Total Number of Valid Hours: 705

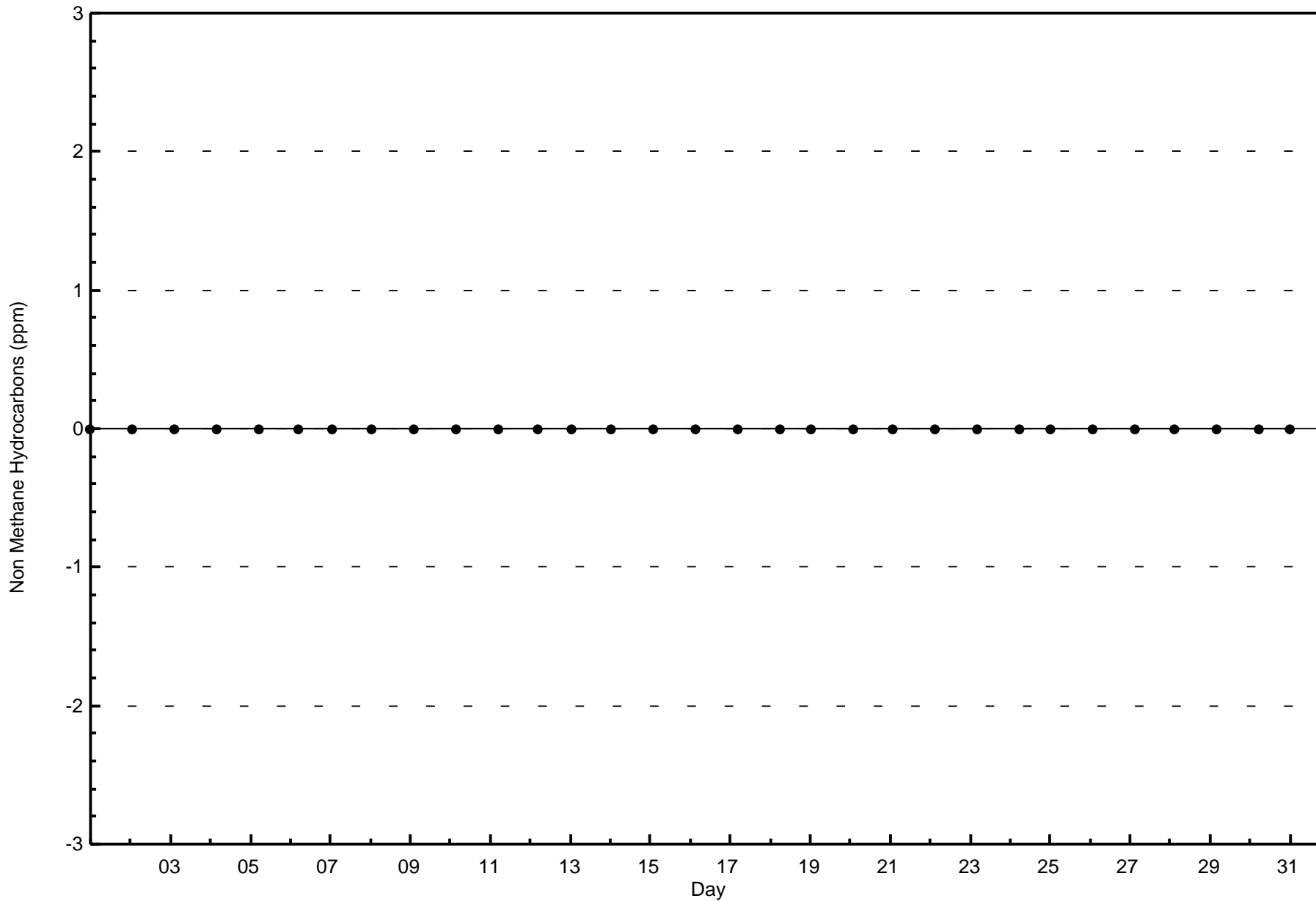
Total Number of Hours: 744

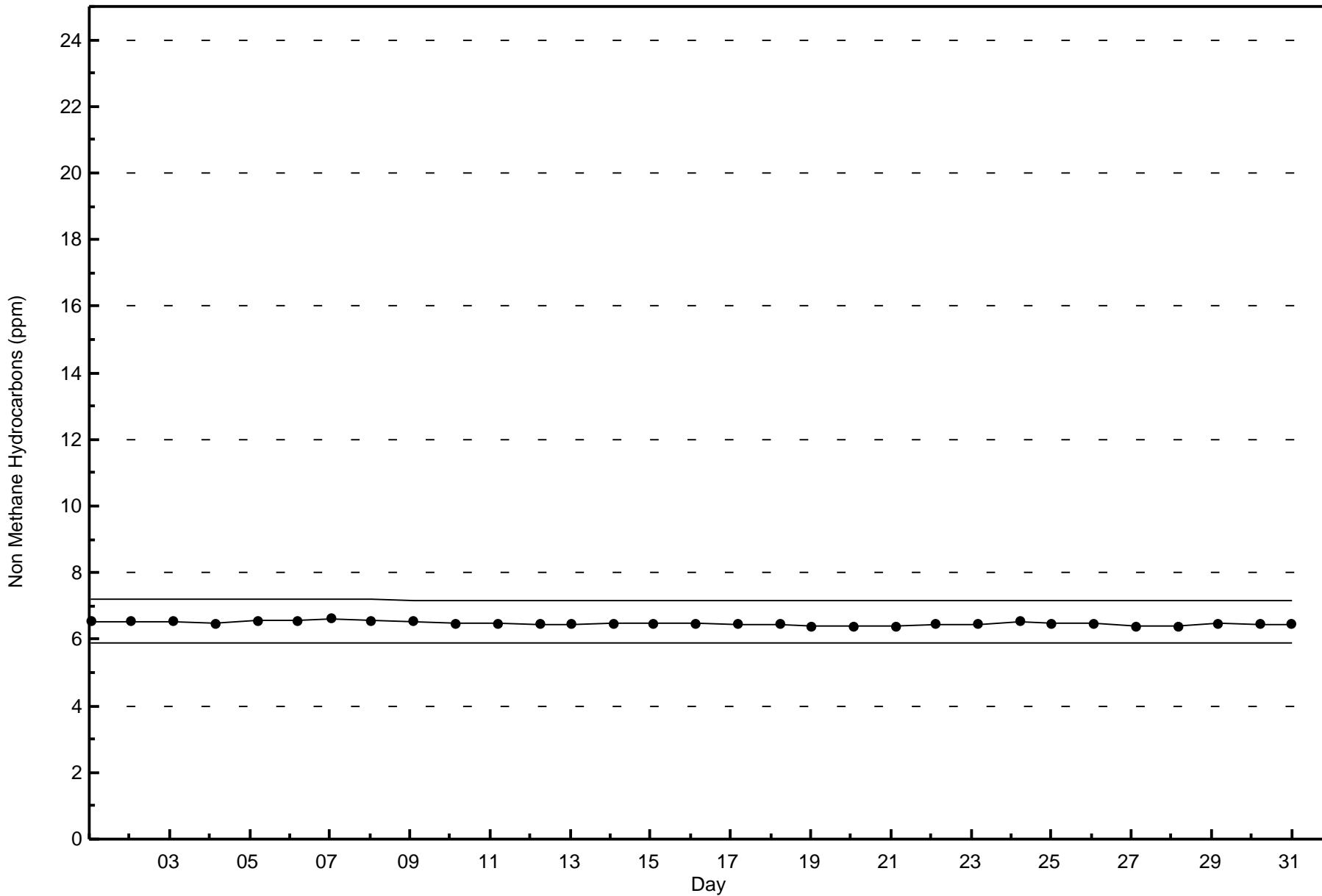


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain (AMS 18)



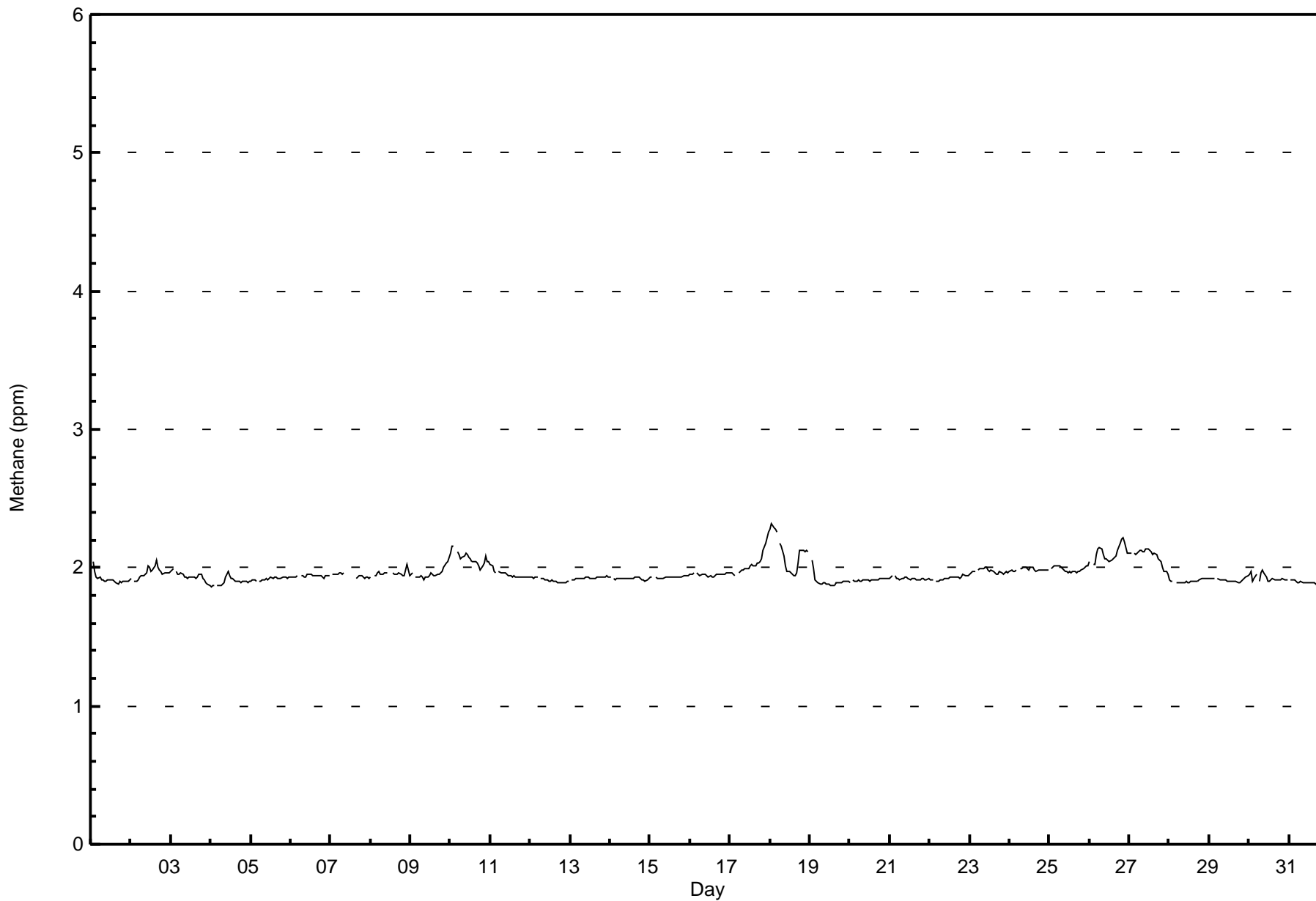






Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Stony Mountain - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Stony Mountain - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	634	89.93	89.93
2.1 - 3.0	71	10.07	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Stony Mountain - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	6	11	15	12	11	7	11	5	34	62	92	55	47	81	146	39	634
2.1 - 3.0	0	0	0	0	0	0	0	2	4	36	26	0	1	0	1	1	71
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	11	15	12	11	7	11	7	38	98	118	55	48	81	147	40	705

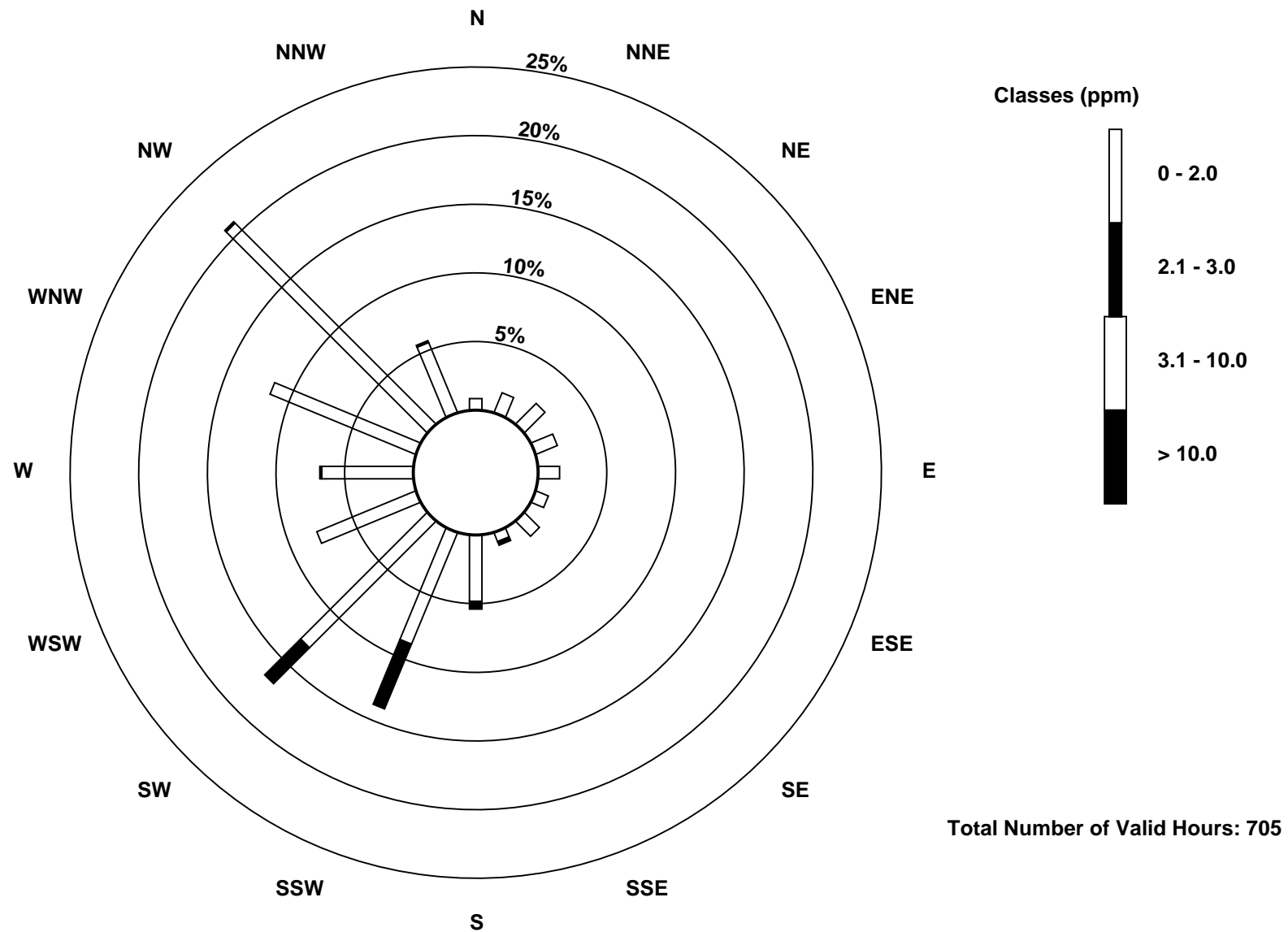
Total Number of Valid Hours: 705

Total Number of Hours: 744

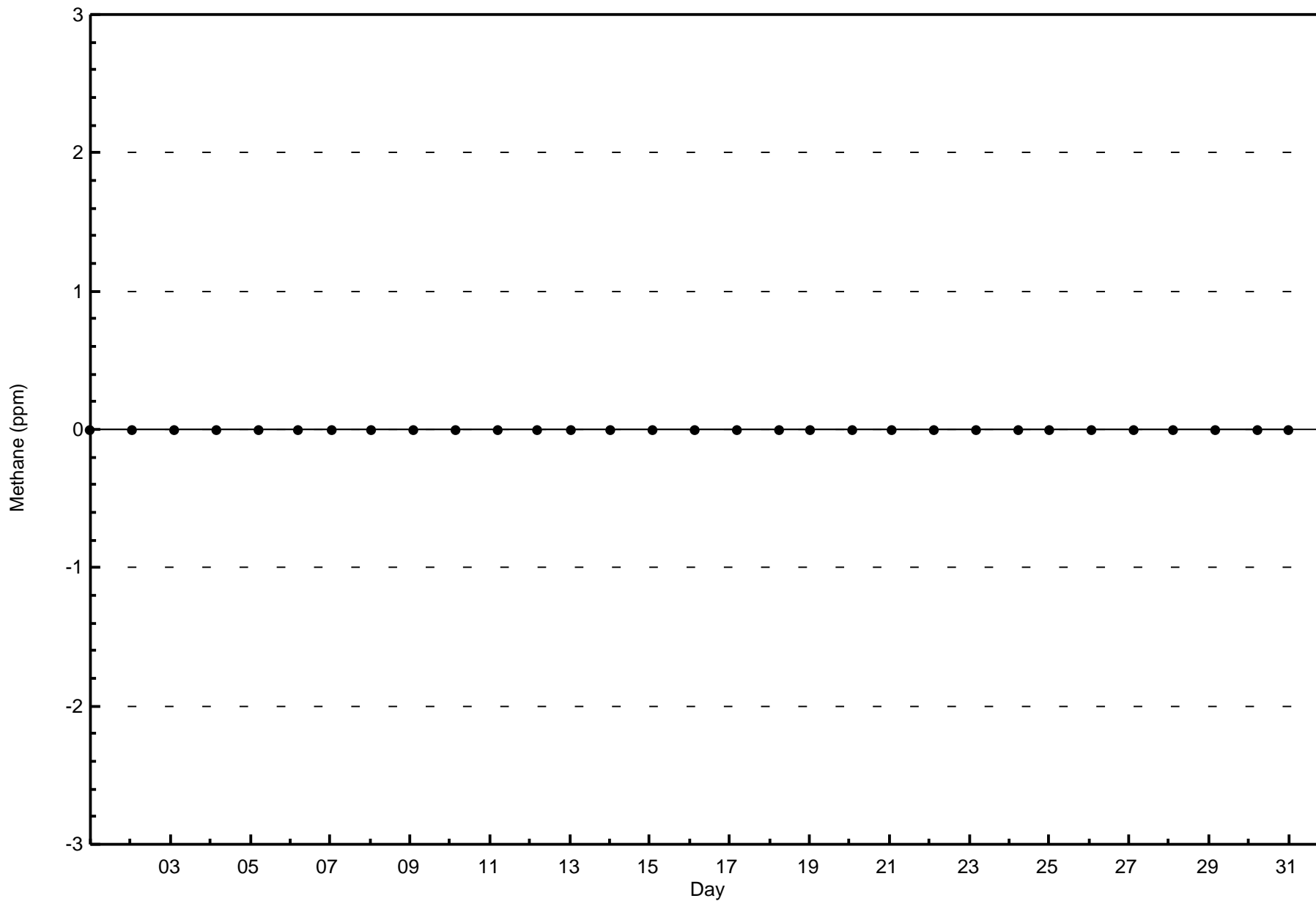


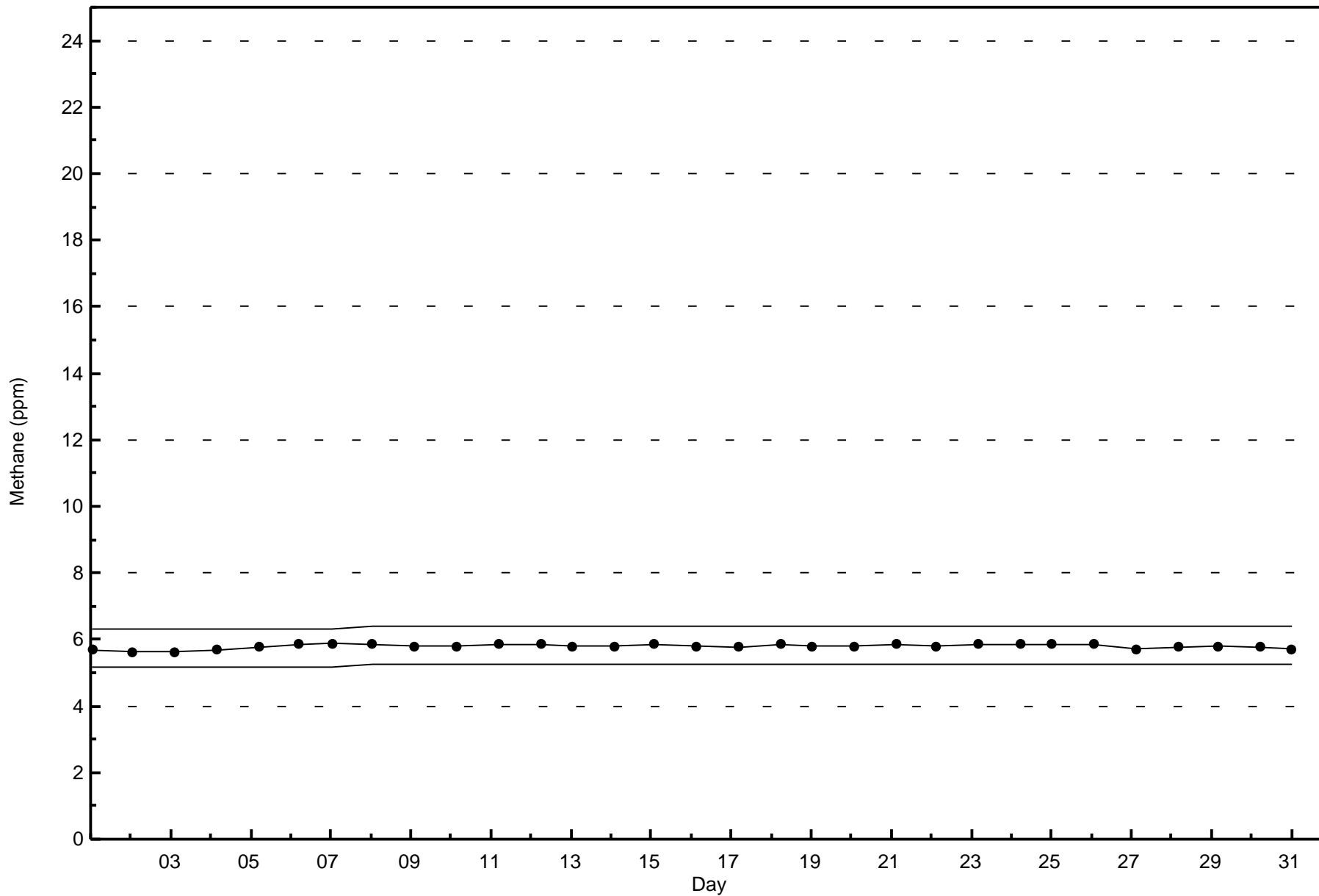
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Methane (CH₄) - ppm
Stony Mountain (AMS 18)



Total Number of Valid Hours: 705





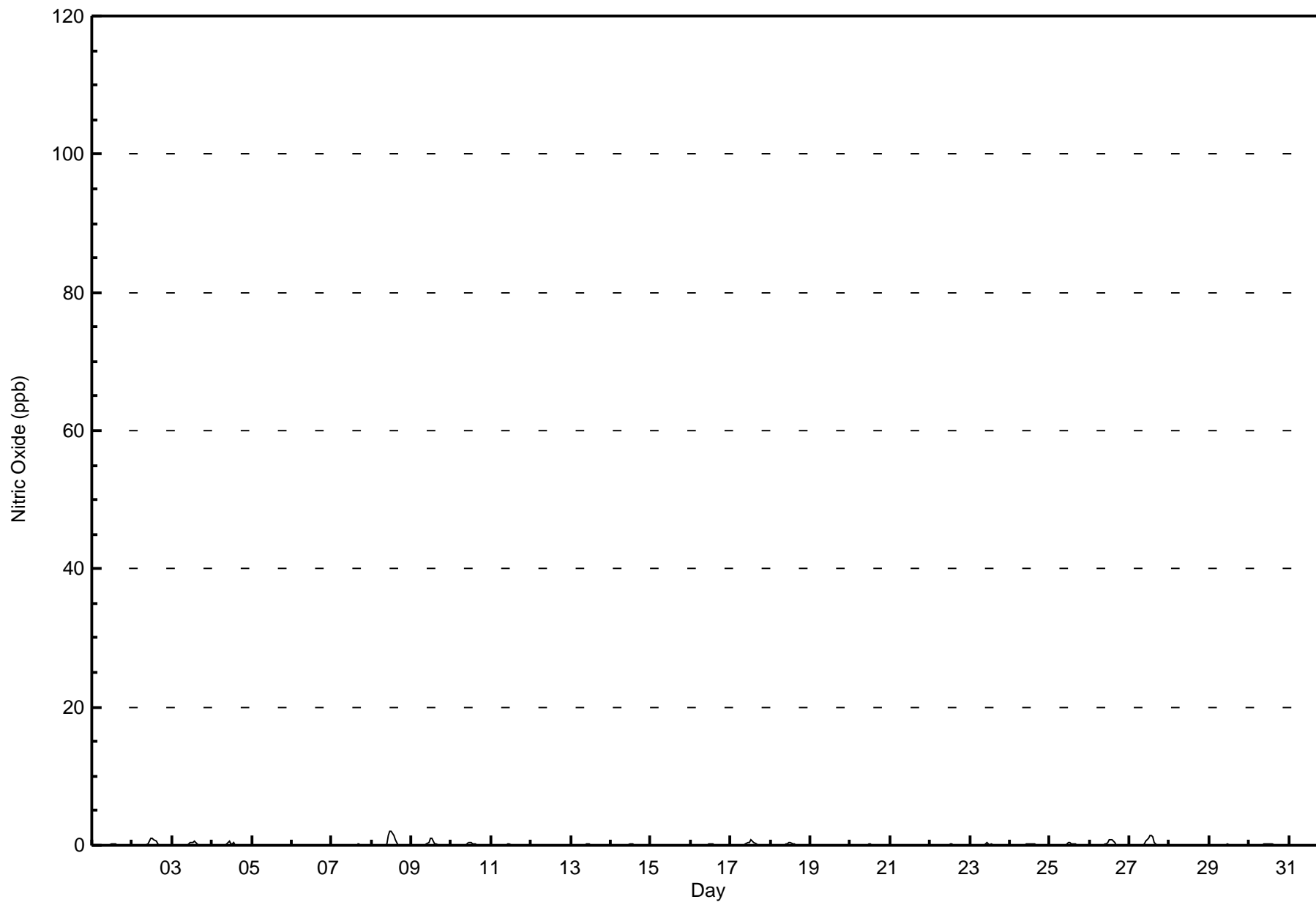


Maximum Value: 2 ppb on Dec 8 12:00 Maximum Daily Average: 0.4 ppb on Dec 8																	Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 37 Percent Operational Time: 100.0										
Minimum Value: 0 ppb on Dec 1 06:00 Minimum Daily Average: 0.0 ppb on Dec 5 Maximum Diurnal Average: 0.3 ppb at hour 13 Minimum Diurnal Average: 0.0 ppb at hour 1 Monthly Average: 0.1 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 1																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
4-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	1	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0.4	2
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
27-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration																											



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Stony Mountain - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Stony Mountain - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707

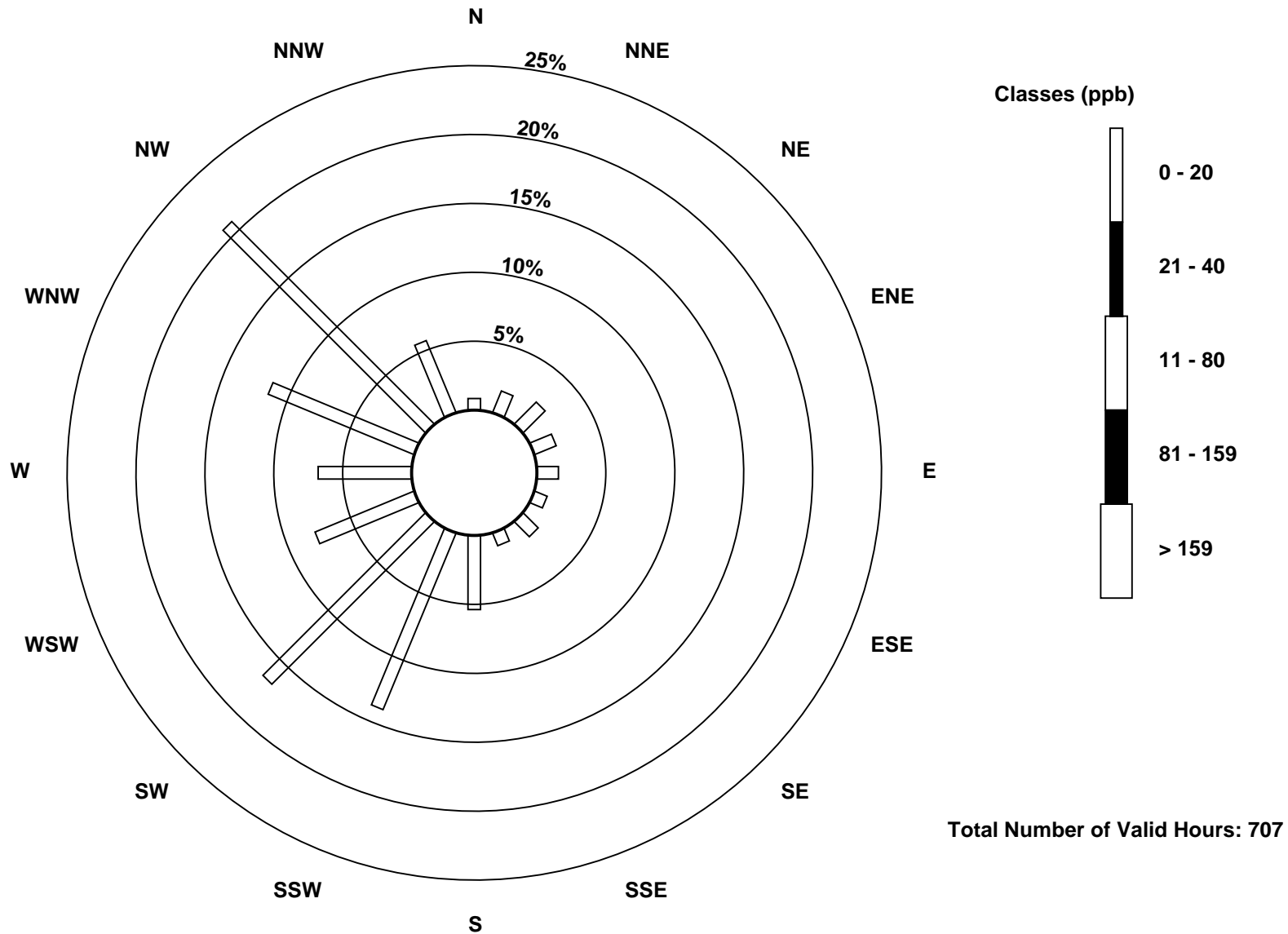
Total Number of Valid Hours: 707

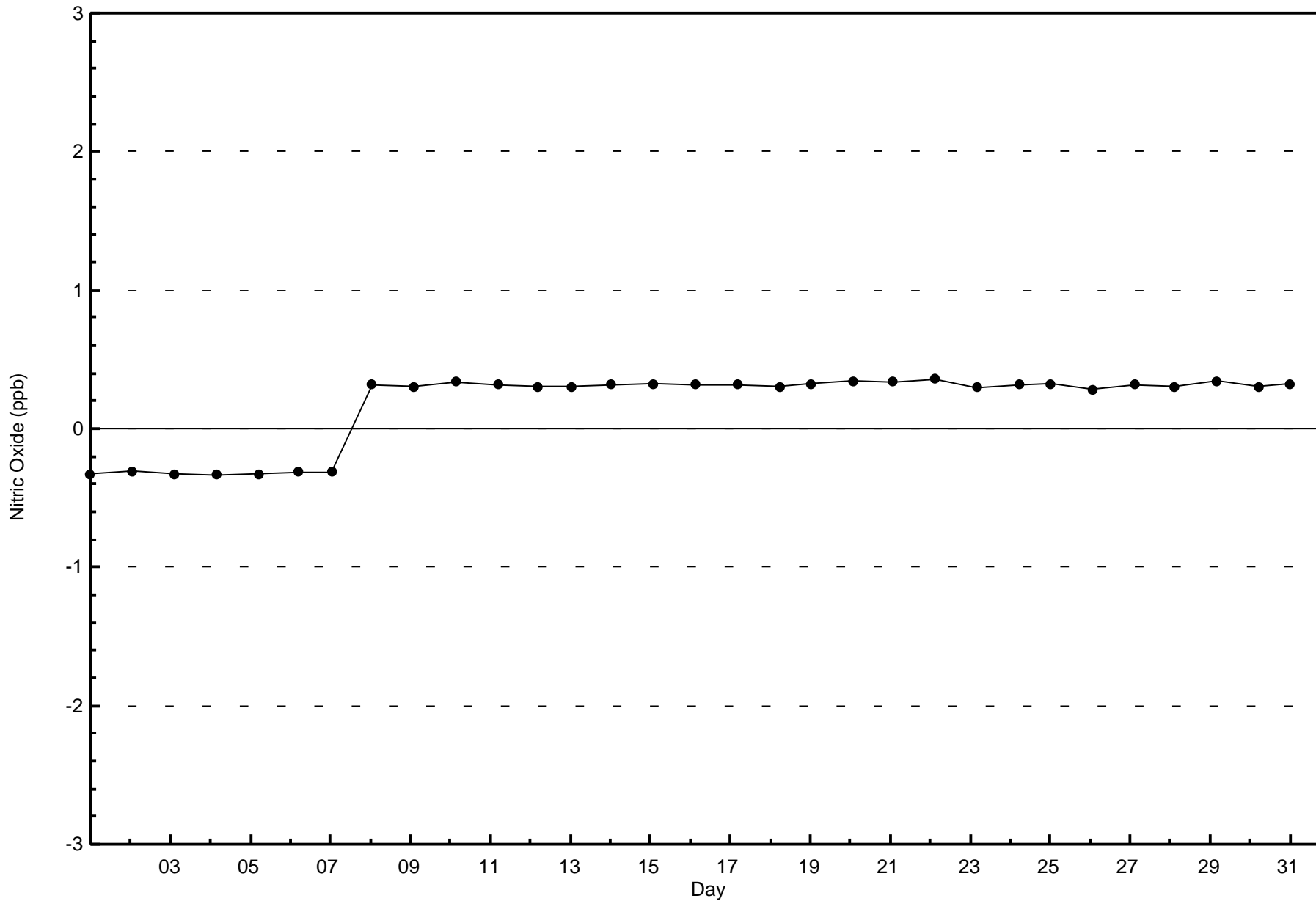
Total Number of Hours: 744

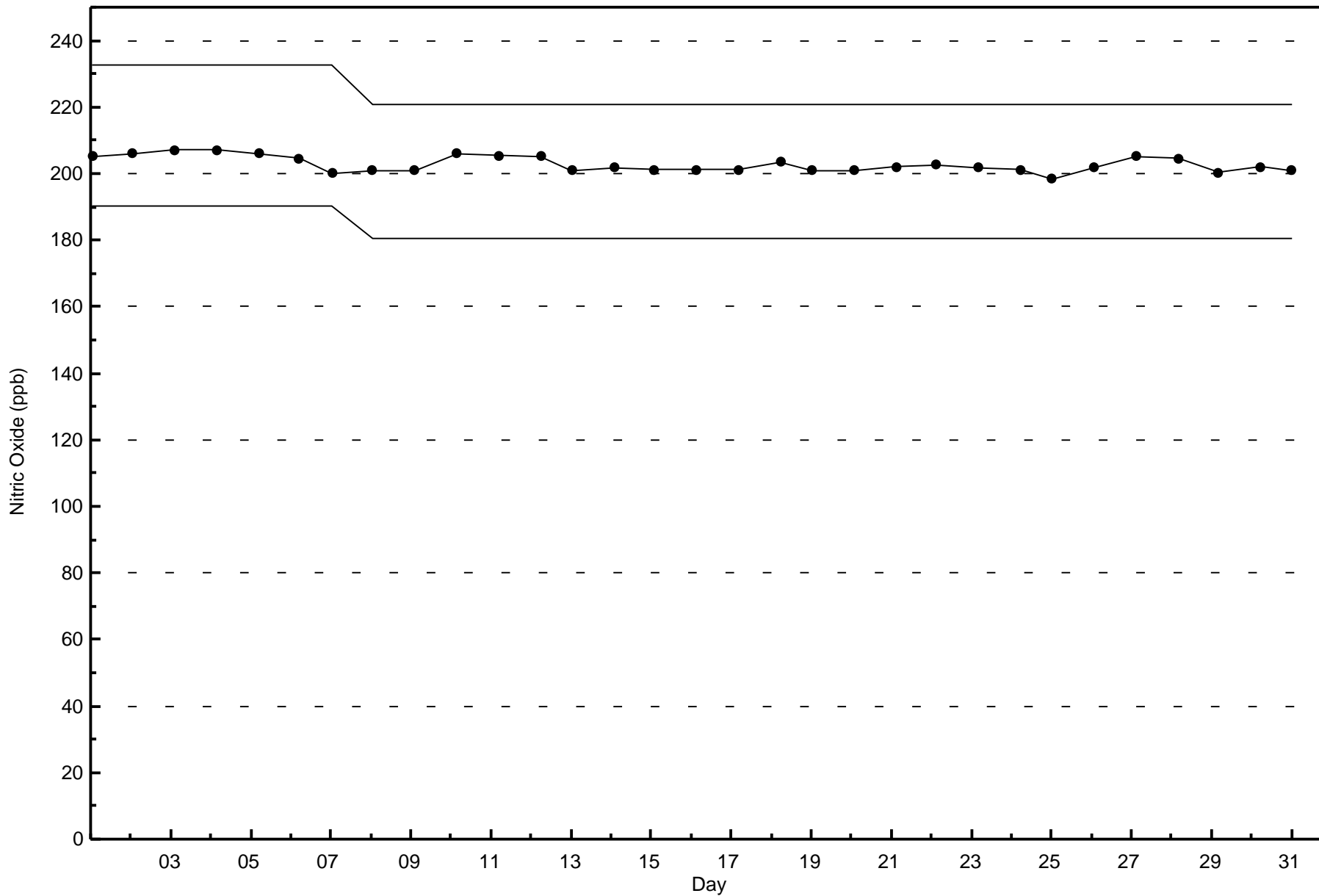


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitric Oxide (NO) - ppb
Stony Mountain (AMS 18)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 18 ppb on Dec 18 04:00	Maximum Daily Average: 8.3 ppb on Dec 18		Hours of Data:	707
Minimum Value: 0 ppb on Dec 4 20:00	Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Missing Data:	37
Maximum Diurnal Average: 2.8 ppb at hour 2	Minimum Diurnal Average: 1.6 ppb at hour 13		Hours of Calibration:	37
Monthly Average: 2.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 12		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	4	2.0	4
2-Dec	4	Z	5	5	4	5	5	5	4	4	6	6	5	6	7	6	5	5	4	3	3	3	4	3	4.6	7
3-Dec	3	3	Z	3	3	3	2	2	2	2	2	2	3	3	3	4	5	6	6	4	3	2	2	1	2.9	6
4-Dec	1	1	1	Z	1	1	1	1	1	2	3	1	1	2	1	1	0	0	0	0	0	0	0	0	0.8	3
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	0.4	1
7-Dec	Z	1	1	1	1	1	1	1	1	C	C	C	C	C	C	2	2	2	2	2	1	2	1	2	--	2
8-Dec	1	Z	1	2	1	3	1	2	3	3	5	5	5	4	5	5	6	7	6	6	5	5	4	3	3.8	7
9-Dec	5	12	Z	3	4	3	4	2	3	2	2	3	3	3	2	3	2	2	2	3	3	4	5	5	3.4	12
10-Dec	5	6	6	Z	4	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1	2	3	5	5	2.8	6
11-Dec	4	3	2	1	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	4
12-Dec	1	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.4	1
13-Dec	Z	0	0	1	1	0	0	0	1	3	2	1	0	0	0	0	0	0	0	0	0	1	1	1	0.6	3
14-Dec	1	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
15-Dec	1	1	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1
16-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0.9	2
17-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	3	3	4	5	6	6	7	7	8	10	11	11	4.5	11
18-Dec	12	15	17	18	17	Z	12	11	8	5	4	4	4	3	3	3	4	7	8	7	7	8	7	7	8.3	18
19-Dec	Z	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	4
20-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
21-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1.2	2
22-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	3	3	2	1.3	4
23-Dec	3	4	3	2	Z	2	3	3	3	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1.7	4
24-Dec	1	1	1	1	1	Z	1	1	1	1	2	2	1	1	2	2	4	3	2	2	2	2	2	3	1.6	4
25-Dec	Z	2	2	2	3	3	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	1	2	2	1.6	3
26-Dec	2	Z	2	2	2	3	2	2	2	2	2	2	3	3	3	5	5	5	6	7	7	6	6	5	3.6	7
27-Dec	5	4	Z	4	4	5	5	5	5	5	5	5	6	8	7	7	7	6	5	5	4	4	3	2	4.9	8
28-Dec	2	2	2	Z	1	1	1	1	1	0	0	0	0	1	0	0	1	0	1	1	1	1	1	1	0.7	2
29-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	2	4	1.4	4
30-Dec	4	5	3	4	5	Z	1	3	3	2	2	2	1	2	2	1	1	2	2	2	2	2	1	1	2.2	5
31-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0.6	1

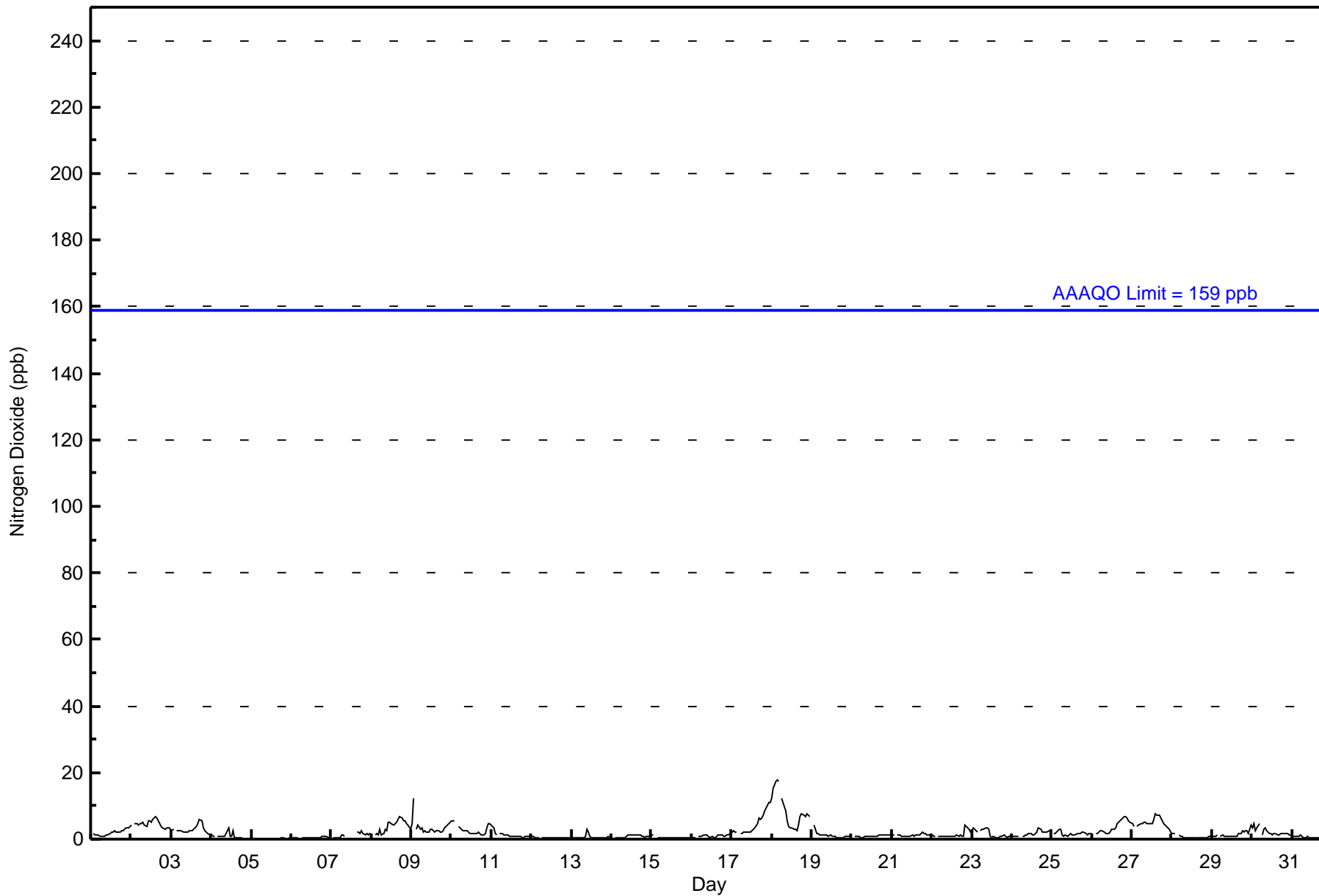
2.4	2.8	2.1	2.2	2.3	1.7	1.8	1.8	1.7	1.7	1.8	1.6	1.6	1.7	1.8	1.9	2.1	2.2	2.2	2.2	2.1	2.2	2.3	2.3	2.3	Diurnal Average
12	15	17	18	17	5	12	11	8	5	6	6	5	6	8	7	7	7	8	7	8	10	11	11	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707

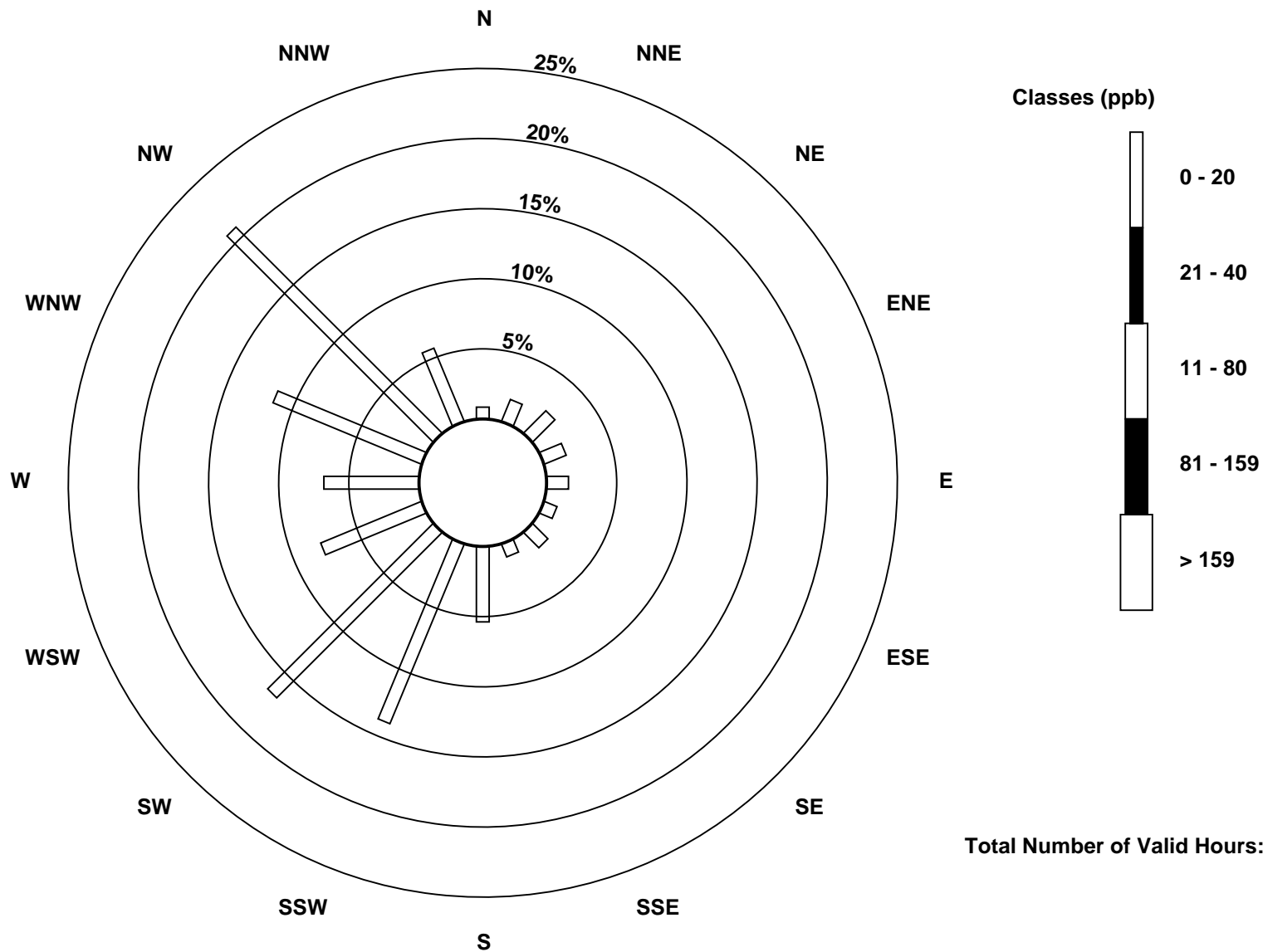
Total Number of Valid Hours: 707

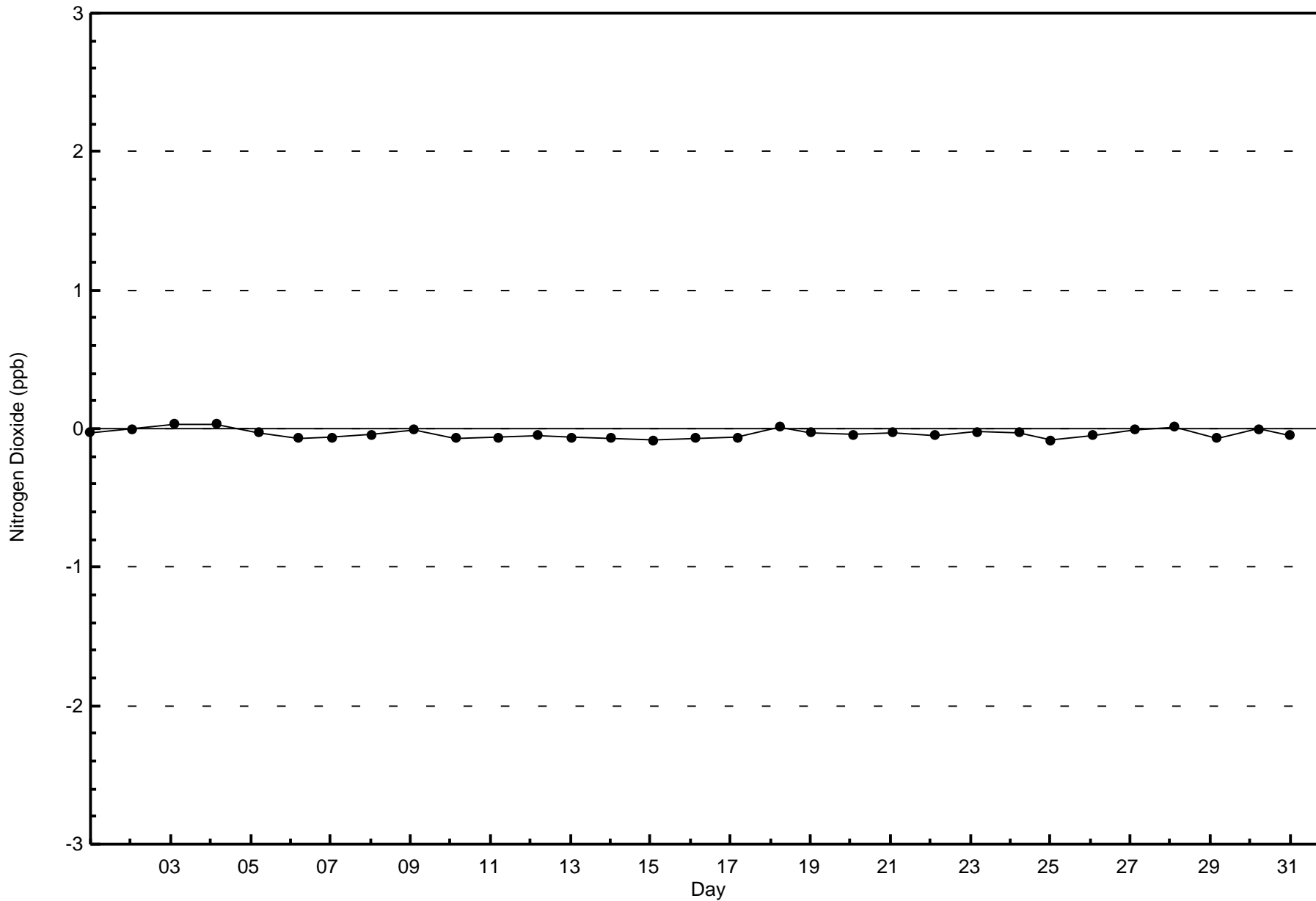
Total Number of Hours: 744

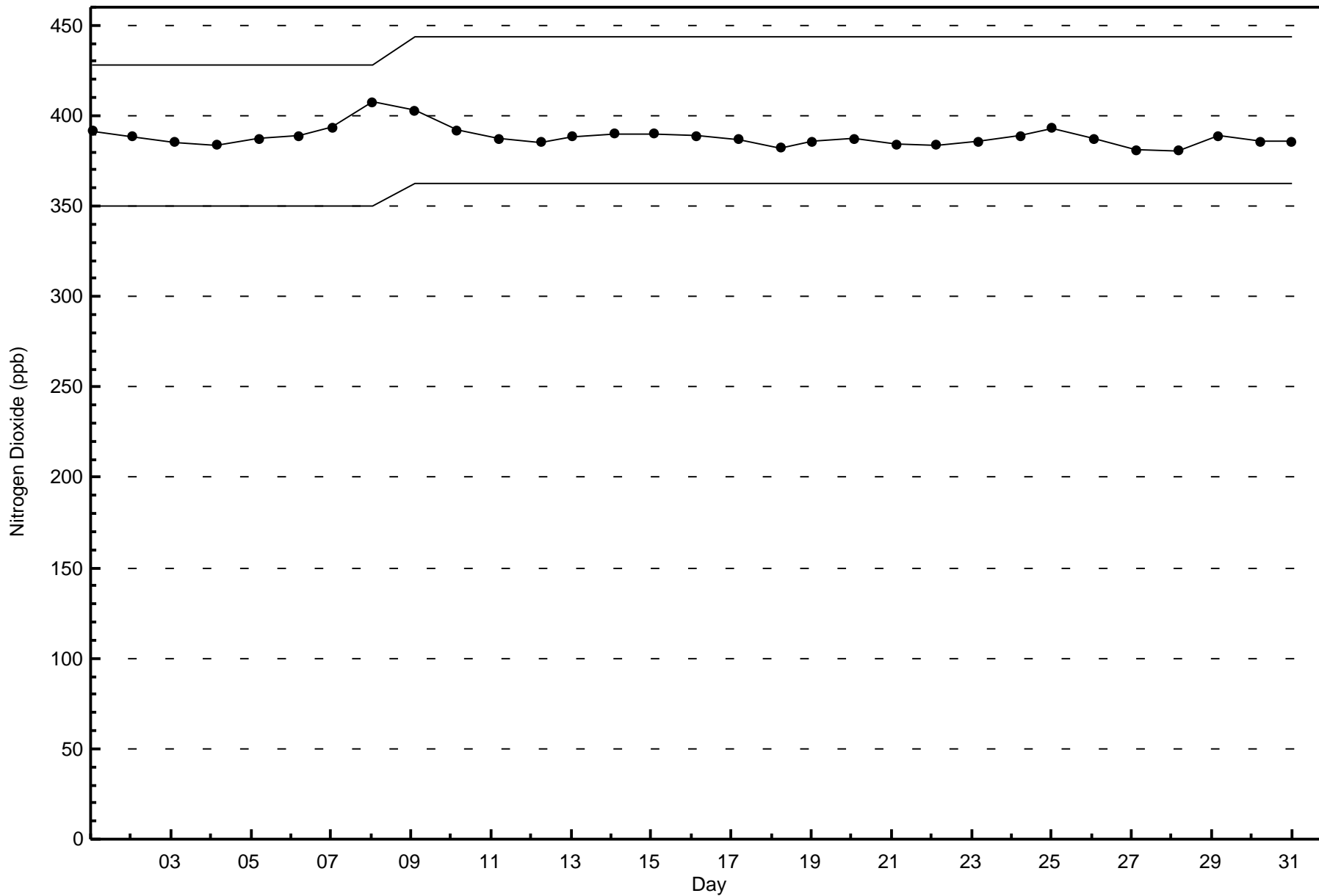


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain (AMS 18)









Wood Buffalo Environmental Association
Summary of Hour Averages

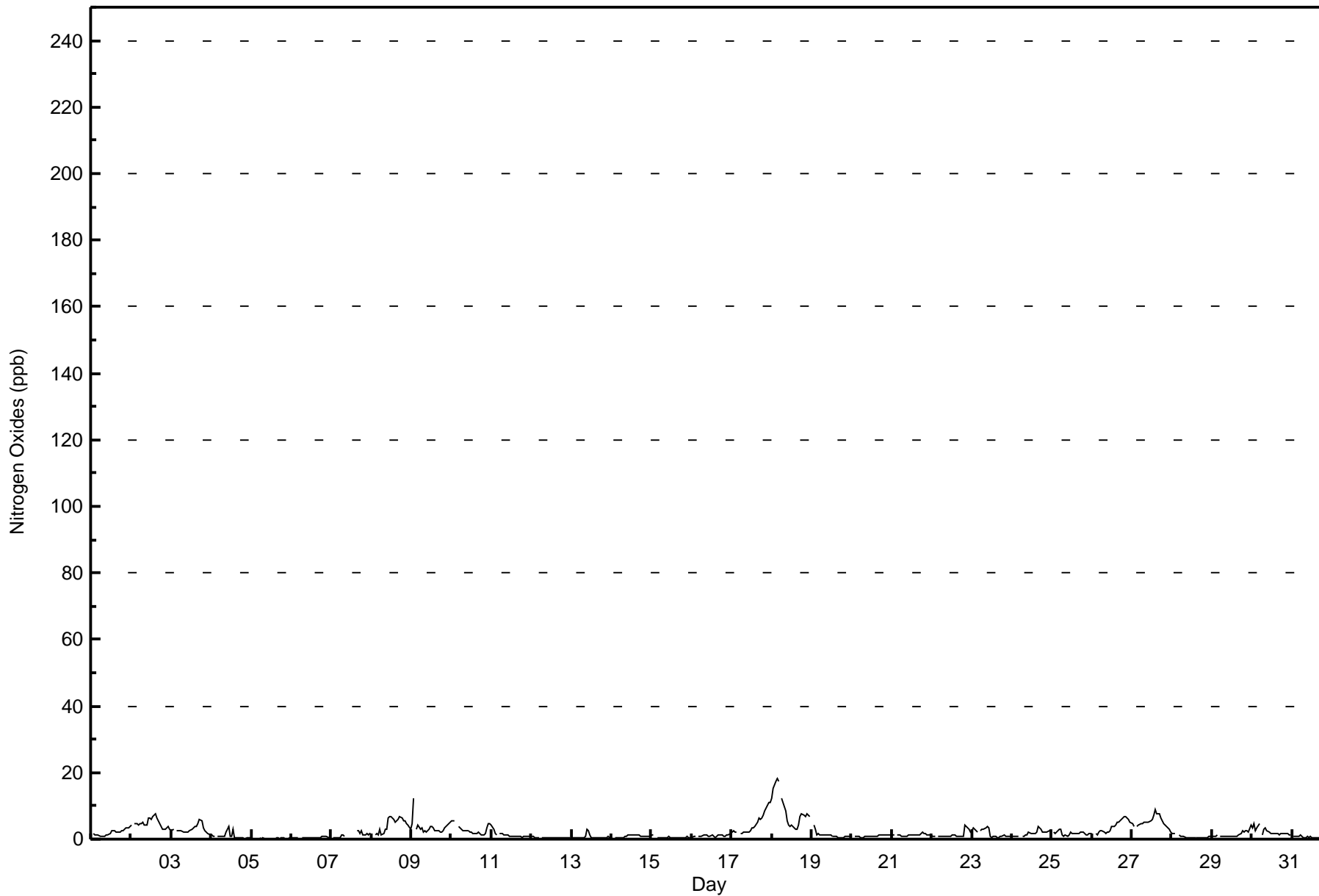
Nitrogen Oxides (NO_x) - ppb
Stony Mountain - December 2016

Maximum Value: 18 ppb on Dec 18 04:00		Maximum Daily Average: 8.4 ppb on Dec 18		Hours in Service: 744																																												
Minimum Value: 0 ppb on Dec 5 12:00		Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Data: 707																																												
Maximum Diurnal Average: 2.8 ppb at hour 2		Minimum Diurnal Average: 1.7 ppb at hour 6		Hours of Missing Data: 37																																												
Monthly Average: 2.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 12		Hours of Calibration: 37																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	Z	2	1	1	1	1	1	1	1	1	1	2	2	3	2	2	2	2	2	3	3	3	3	4	2.0	4																						
2-Dec	4	Z	5	5	4	5	5	5	4	4	6	6	6	7	8	7	5	4	4	3	3	3	4	3	4.8	8																						
3-Dec	3	3	Z	3	3	2	2	2	2	2	2	3	3	4	4	4	5	6	6	4	3	2	2	1	3.0	6																						
4-Dec	1	1	1	Z	1	1	1	1	1	2	4	1	1	3	1	0	0	0	0	0	0	0	0	0	0.9	4																						
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0.4	1																						
7-Dec	Z	1	1	0	1	1	1	1	1	C	C	C	C	C	C	2	3	2	2	1	1	2	1	2	--	3																						
8-Dec	1	Z	1	2	1	3	1	2	3	3	6	7	7	6	5	5	6	7	6	5	5	5	4	3	4.1	7																						
9-Dec	5	12	Z	3	4	3	3	2	3	2	3	4	4	3	3	3	2	2	2	3	3	4	5	5	3.6	12																						
10-Dec	5	6	6	Z	4	3	3	3	3	3	3	2	2	2	2	2	2	2	1	1	2	3	5	5	2.9	6																						
11-Dec	4	3	2	1	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	4																						
12-Dec	1	1	1	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.4	1																						
13-Dec	Z	0	0	0	1	0	0	0	1	3	3	1	0	0	0	0	0	0	0	0	0	1	1	1	0.7	3																						
14-Dec	1	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																						
15-Dec	1	1	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1																						
16-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.0	2																						
17-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	4	4	4	5	6	6	6	7	8	10	11	11	4.6	11																						
18-Dec	12	15	18	18	17	Z	12	11	8	6	4	4	4	3	3	3	4	7	7	7	7	7	7	7	8.4	18																						
19-Dec	Z	4	3	1	2	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1.2	4																						
20-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																						
21-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1.2	2																						
22-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	3	3	2	1.3	4																						
23-Dec	3	4	3	2	Z	2	3	3	3	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1.8	4																						
24-Dec	1	1	1	1	1	Z	1	1	1	1	2	2	1	2	2	2	4	3	2	2	2	2	2	3	1.7	4																						
25-Dec	Z	2	2	2	3	3	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	2	2	1.7	3																						
26-Dec	2	Z	2	1	2	2	2	2	2	2	2	3	4	4	4	5	5	5	6	7	7	6	6	5	3.7	7																						
27-Dec	5	4	Z	4	4	5	5	5	5	5	5	6	6	7	9	8	7	6	5	5	4	4	3	2	5.2	9																						
28-Dec	2	2	2	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.7	2																						
29-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	2	4	1.5	4																						
30-Dec	4	5	3	4	4	Z	1	3	3	3	2	2	2	2	2	2	1	2	1	1	2	2	1	1	2.2	5																						
31-Dec	Z	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1																						
																								2.4	2.8	2.1	2.2	2.3	1.7	1.8	1.8	1.7	1.8	2.0	1.9	2.0	2.0	2.0	2.0	2.2	2.2	2.2	2.1	2.2	2.3	2.3	2.3	Diurnal Average
																								12	15	18	18	17	5	12	11	8	6	6	7	7	7	9	8	7	7	7	7	8	10	11	11	Diurnal Maximum
Z - zerospan		C - Calibration																																														



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Stony Mountain - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	12	16	12	11	7	11	7	38	98	118	55	48	81	147	40	707

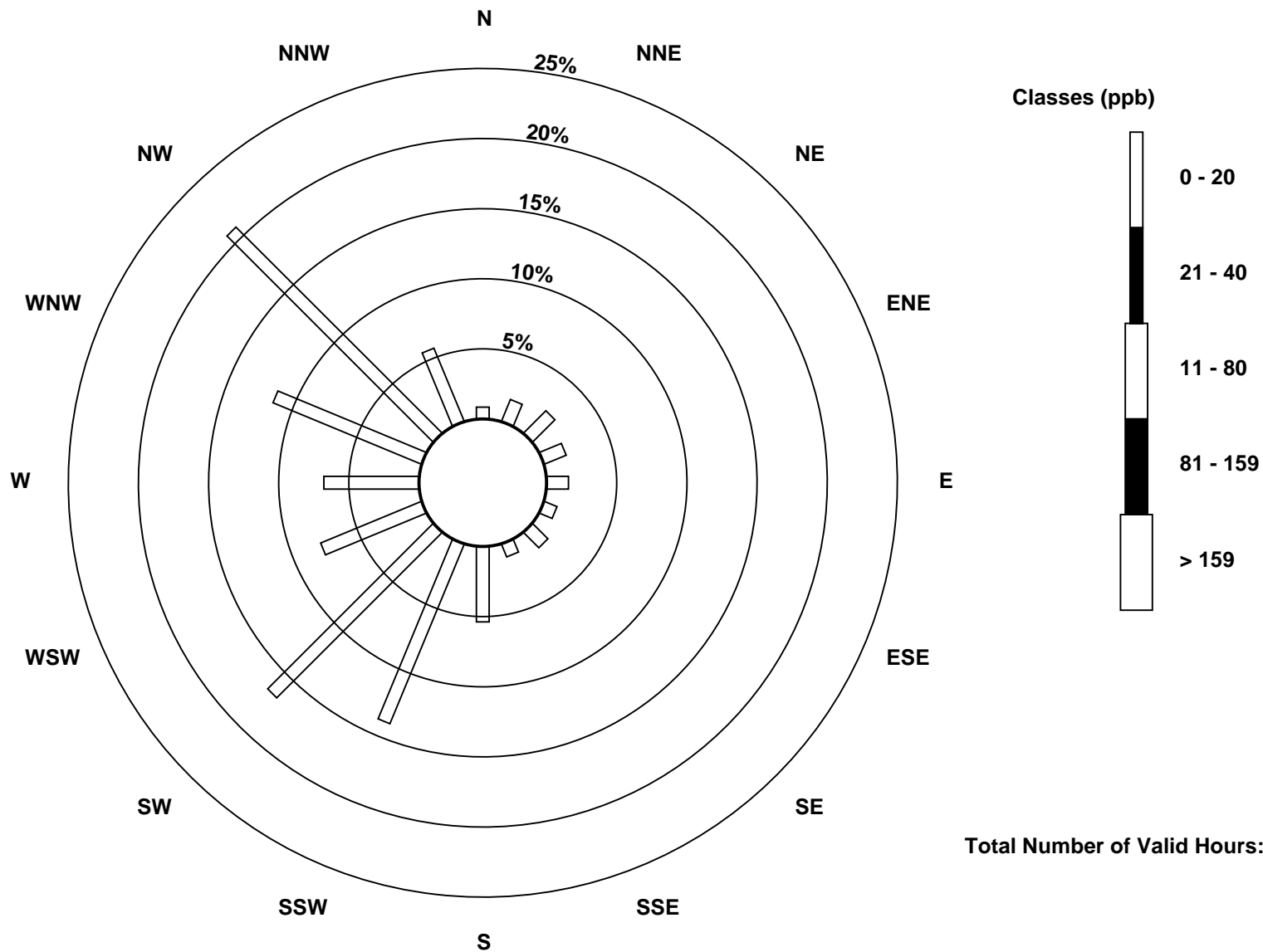
Total Number of Valid Hours: 707

Total Number of Hours: 744

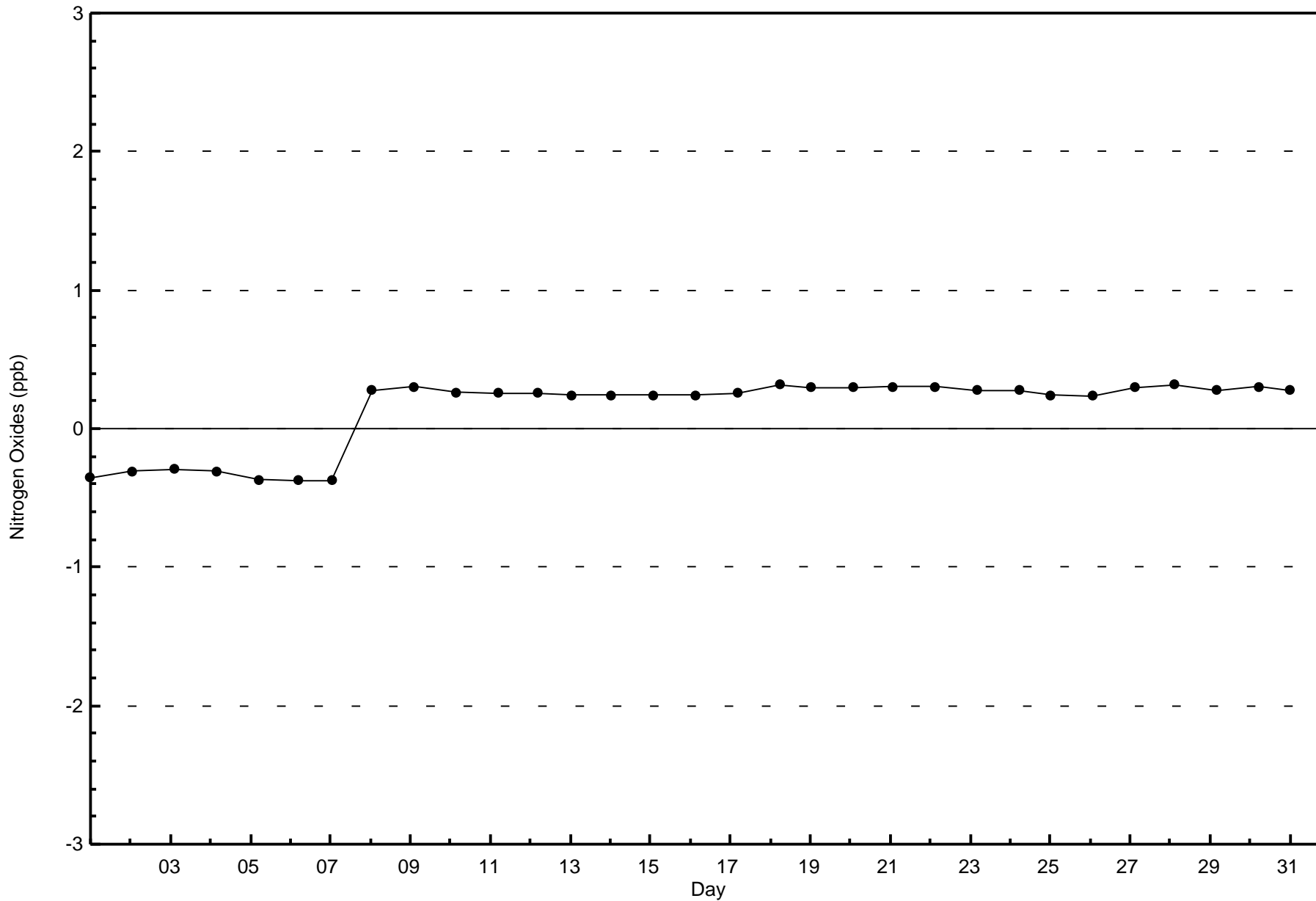


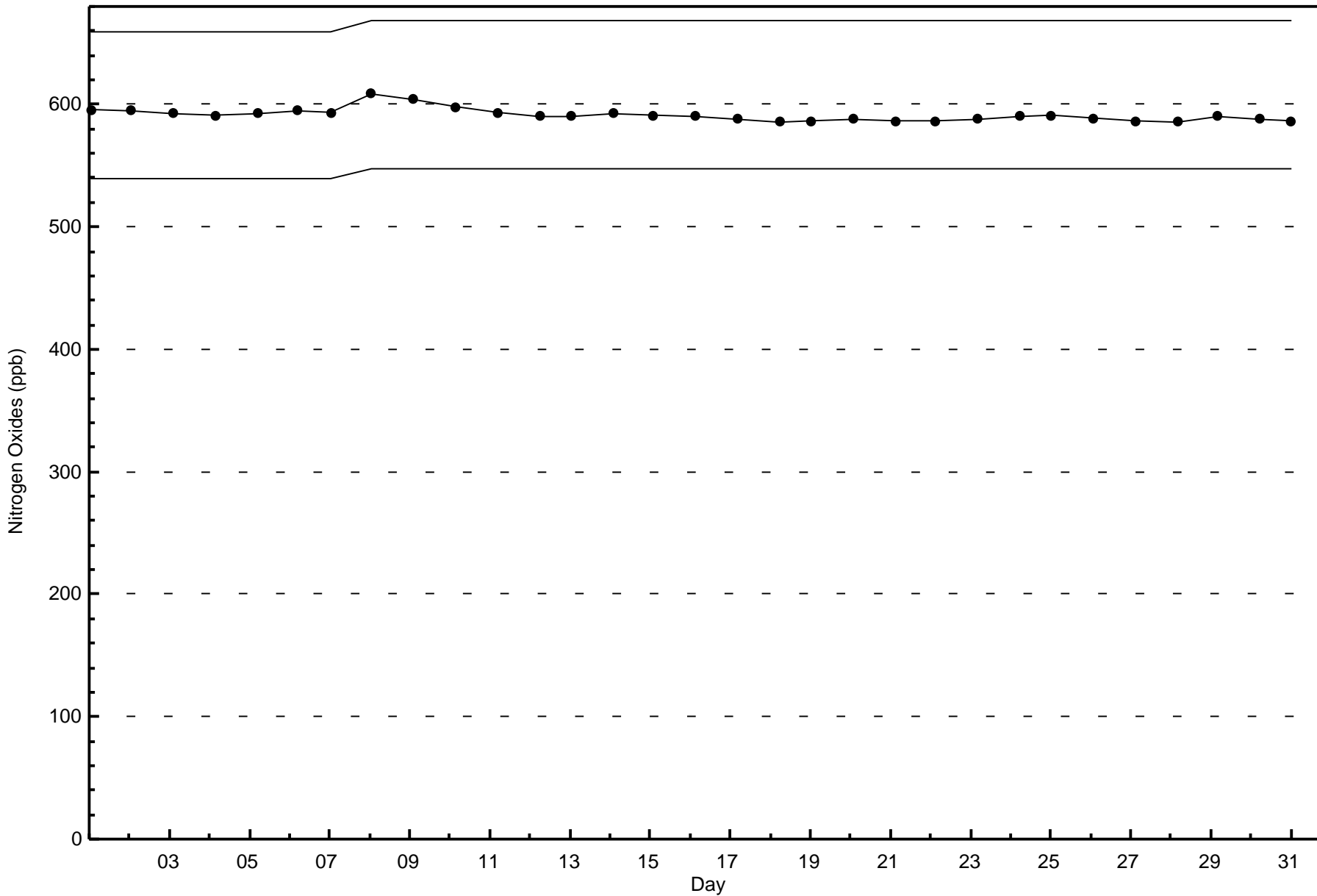
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 707







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Stony Mountain - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 45 ppb on Dec 19 17:00	Maximum Daily Average: 42.3 ppb on Dec 20		Hours of Data:	709
Minimum Value: 13 ppb on Dec 18 04:00	Minimum Daily Average: 19.0 ppb on Dec 2		Hours of Missing Data:	35
Maximum Diurnal Average: 34.3 ppb at hour 15	Minimum Diurnal Average: 31.7 ppb at hour 2		Hours of Calibration:	35
Monthly Average: 33.0 ppb	Percentiles: P ₁ = 14 P ₁₀ = 24 Q ₁ = 29 Median = 34 Q ₃ = 38 P ₉₀ = 42 P ₉₉ = 45		Percent Operational Time:	100.0

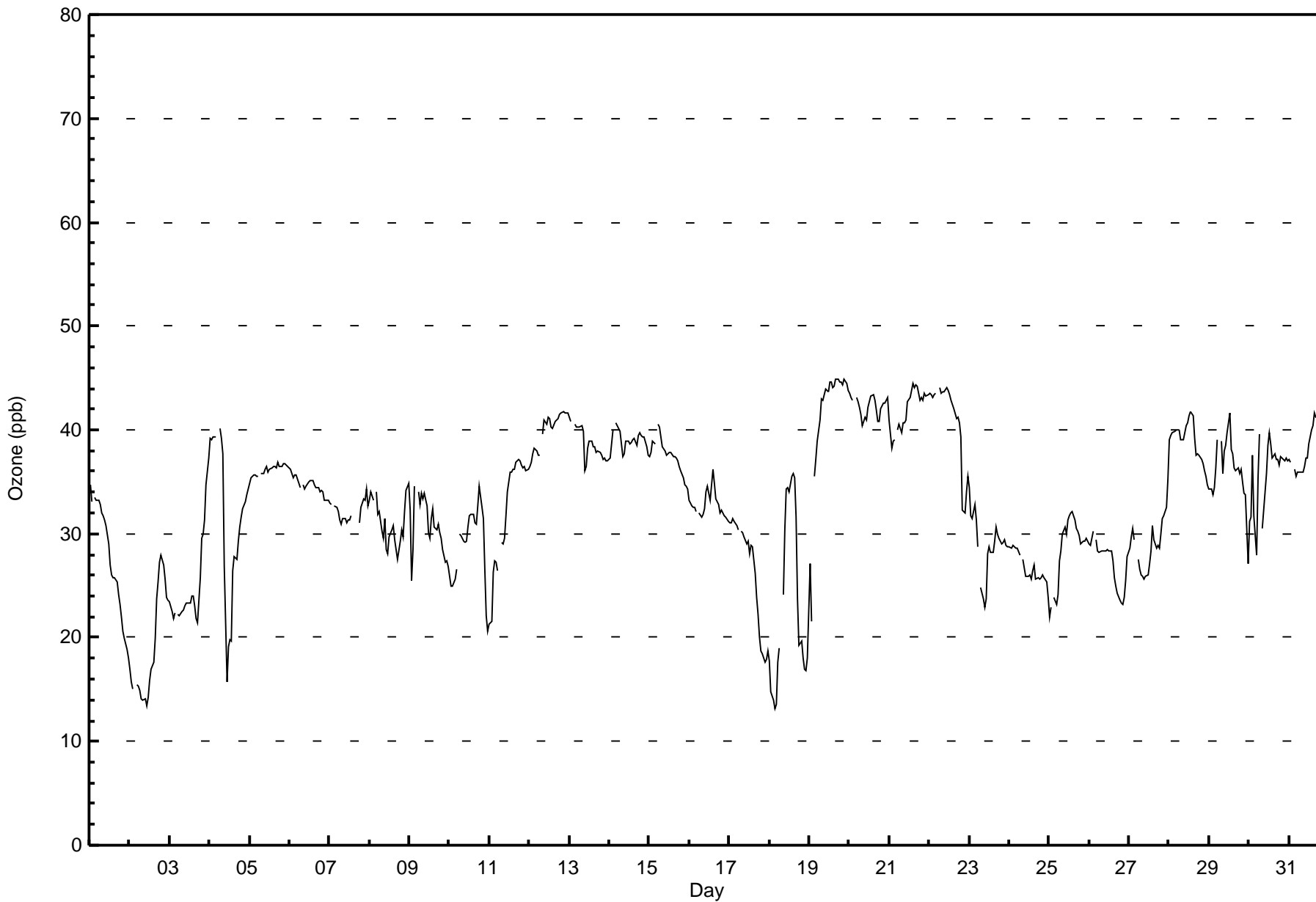
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	35	33	Z	33	33	33	33	32	32	31	31	29	27	26	26	26	25	24	23	22	21	20	19	18	27.5	35
2-Dec	17	16	15	Z	15	15	15	14	14	14	13	14	16	17	18	20	24	25	27	28	27	26	24	24	19.0	28
3-Dec	23	23	22	22	Z	22	22	23	23	23	23	23	23	24	24	23	22	21	26	30	30	31	35	37	25.0	37
4-Dec	39	39	39	39	39	Z	40	39	38	27	16	19	20	20	26	28	28	29	31	32	32	33	34	34	31.4	40
5-Dec	35	35	36	36	36	36	Z	36	36	36	36	36	36	36	36	36	36	37	36	36	37	37	36	36	36.1	37
6-Dec	36	36	35	36	36	35	34	Z	35	34	35	35	35	35	35	35	34	34	34	34	34	33	33	33	34.7	36
7-Dec	33	33	Z	33	33	32	31	31	32	31	31	31	31	32	C	C	C	C	31	32	33	33	34	33	32.2	34
8-Dec	33	34	33	Z	34	32	32	30	30	31	28	28	30	30	31	29	28	27	29	30	30	32	34	35	31.0	35
9-Dec	32	25	28	35	Z	34	33	34	33	34	33	30	30	31	32	31	30	31	30	30	28	27	27	27	30.7	35
10-Dec	26	25	25	26	27	Z	30	30	29	29	29	31	32	32	32	31	31	33	35	33	31	27	22	21	28.9	35
11-Dec	21	22	26	27	27	26	Z	29	29	30	32	34	36	36	36	36	37	37	37	37	36	36	36	36	32.2	37
12-Dec	36	37	38	38	38	38	38	Z	40	41	41	41	41	40	40	41	41	41	41	42	42	42	42	42	40.0	42
13-Dec	41	41	Z	41	40	40	40	40	40	36	37	38	39	39	38	38	38	38	38	38	37	37	37	37	38.6	41
14-Dec	37	39	40	Z	41	40	40	39	37	38	39	39	39	39	39	39	38	39	40	39	39	39	38	38	38.9	41
15-Dec	37	38	39	39	Z	41	40	39	38	38	38	38	38	38	37	37	37	37	37	36	35	35	35	34	37.4	41
16-Dec	33	33	33	33	32	Z	32	32	32	32	34	35	33	35	36	35	33	33	32	32	32	32	32	31	32.9	36
17-Dec	31	31	31	31	31	30	Z	30	30	30	29	29	28	29	29	26	24	22	20	19	18	18	18	19	26.3	31
18-Dec	18	15	14	13	14	18	19	Z	24	30	34	35	34	35	36	35	32	24	19	20	18	17	17	18	23.4	36
19-Dec	27	21	Z	36	37	39	41	43	43	43	44	44	45	45	44	44	45	45	45	45	44	45	44	44	41.4	45
20-Dec	44	43	43	Z	43	43	42	42	40	41	41	42	43	43	43	43	42	41	41	42	43	43	43	43	42.3	44
21-Dec	41	38	39	39	Z	40	41	40	41	41	41	43	43	44	44	44	44	44	43	43	43	44	43	43	42.0	44
22-Dec	44	43	43	43	44	Z	44	44	44	44	44	44	43	43	42	42	41	41	41	39	32	32	34	36	41.2	44
23-Dec	34	32	31	33	31	29	Z	25	24	23	24	28	29	28	28	29	31	30	30	29	29	29	29	29	28.9	34
24-Dec	29	29	29	29	29	29	28	Z	28	27	26	26	26	26	26	26	27	26	26	26	26	26	25	24	26.8	29
25-Dec	22	23	Z	24	23	24	27	28	30	31	30	31	32	32	32	31	31	30	30	29	29	29	30	29	28.6	32
26-Dec	29	29	30	Z	29	28	28	28	28	28	28	29	28	28	27	26	25	24	24	23	23	24	25	28	27.1	30
27-Dec	29	30	31	29	Z	28	27	26	26	26	26	26	27	28	31	29	29	29	29	30	31	32	32	35	28.9	35
28-Dec	39	39	40	40	40	Z	40	39	39	40	40	41	41	42	41	39	38	38	37	37	37	36	35	35	38.8	42
29-Dec	34	34	34	34	36	39	Z	39	36	38	38	40	42	38	38	36	36	36	36	36	35	34	34	27	36.1	42
30-Dec	31	32	37	32	28	35	40	Z	31	32	36	38	40	39	37	38	37	37	37	37	37	37	37	37	35.8	40
31-Dec	37	37	Z	36	36	36	36	36	36	36	37	37	39	40	40	42	41	41	42	43	42	42	41	42	38.9	43
32.4 31.7 32.5 32.9 32.8 32.4 33.6 33.4 32.7 32.8 32.7 33.3 33.7 33.9 34.3 33.9 33.5 33.2 33.0 33.2 32.7 32.5 32.5 32.4																								Diurnal Average		
44 43 43 43 44 43 44 44 44 44 44 44 44 45 45 44 44 45 45 45 45 44 45 44 44																								Diurnal Maximum		

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Stony Mountain - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Stony Mountain - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	41	5.78	5.78
21 - 50	668	94.22	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Stony Mountain - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	0	0	0	0	0	0	0	2	8	14	10	1	0	0	4	2	41
21 - 50	6	11	17	13	10	7	11	5	30	86	110	50	48	81	147	36	668
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	11	17	13	10	7	11	7	38	100	120	51	48	81	151	38	709

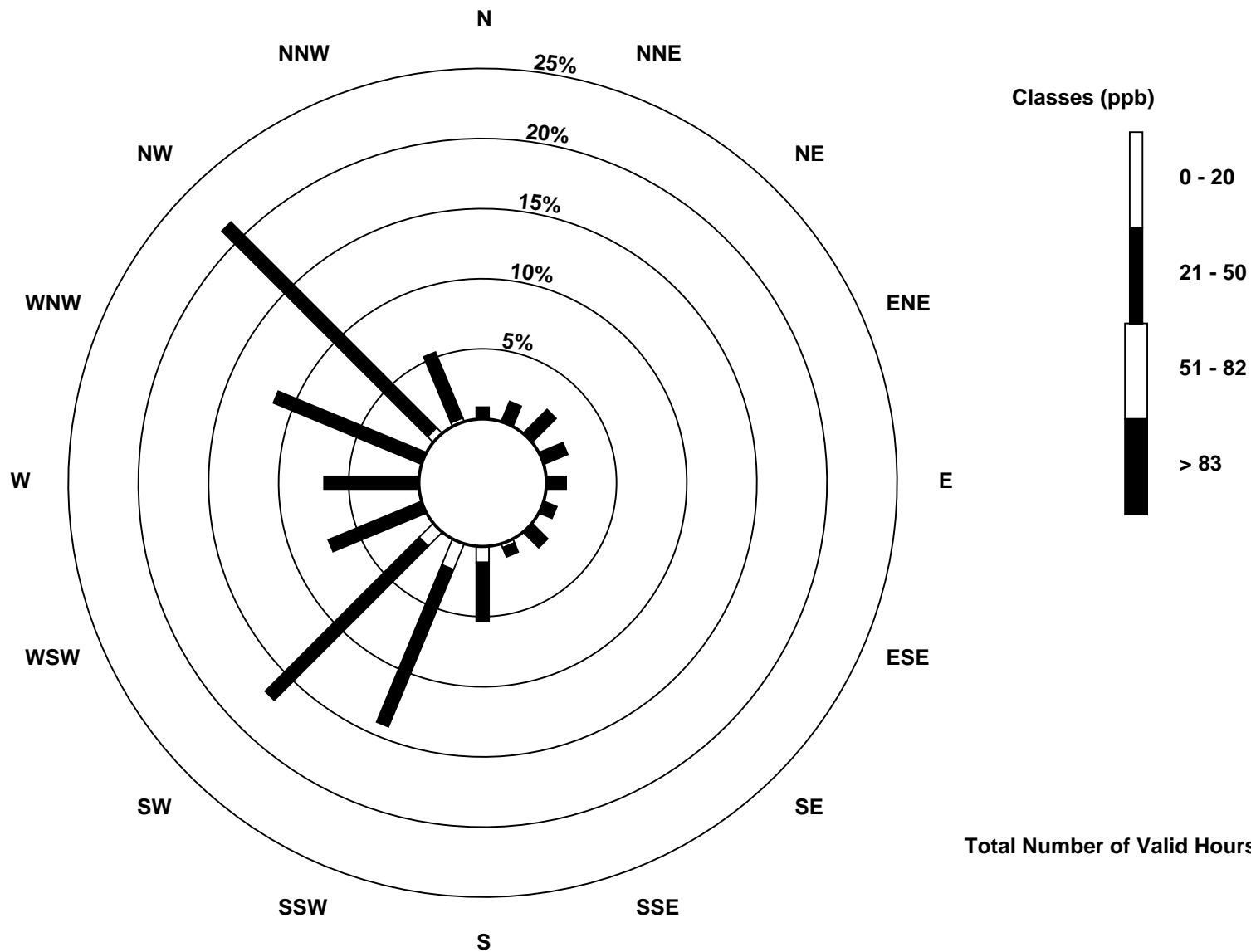
Total Number of Valid Hours: 709

Total Number of Hours: 744

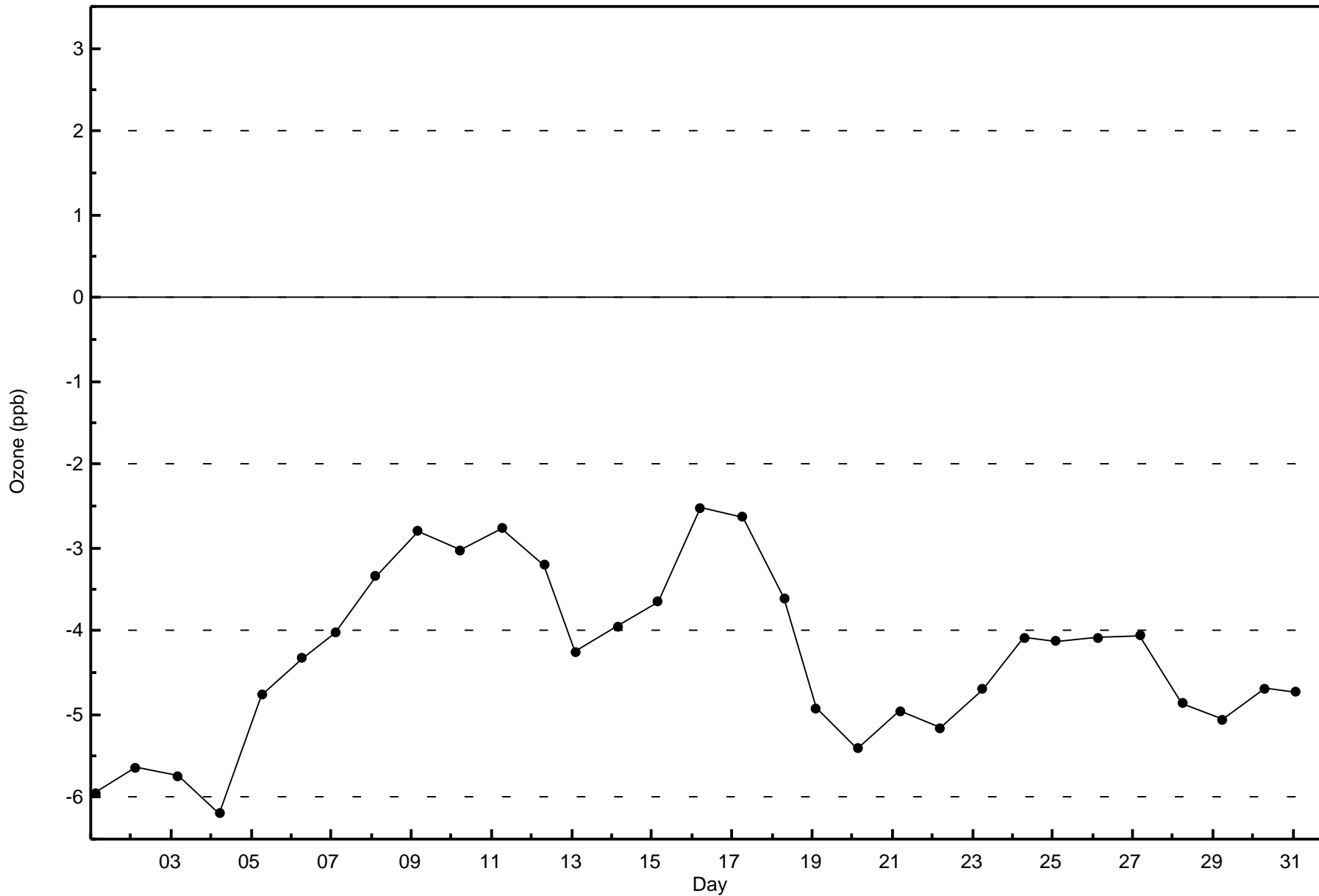


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ozone (O₃) - ppb
Stony Mountain (AMS 18)



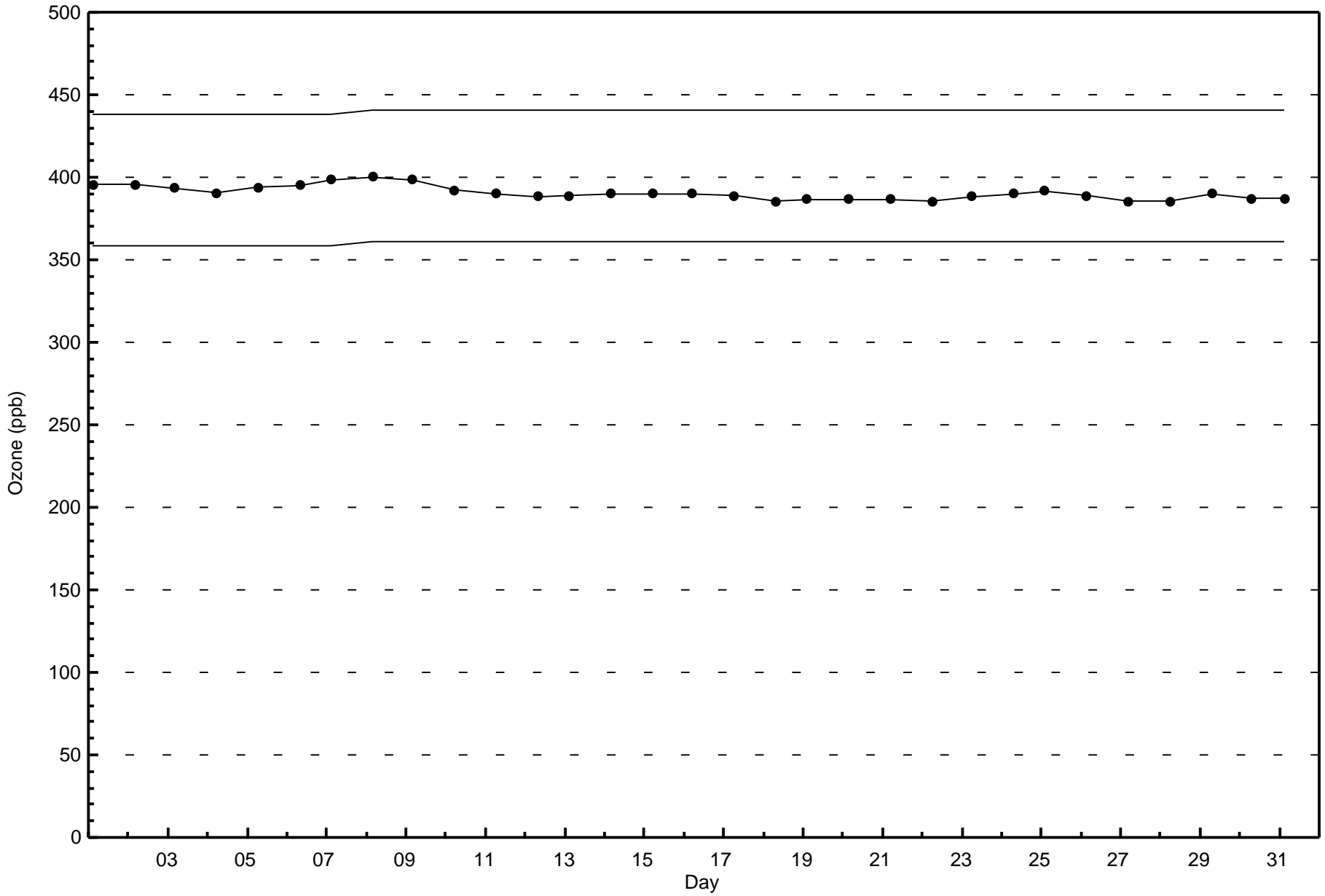
Total Number of Valid Hours: 709





Wood Buffalo Environmental Association
Span Responses

Ozone (O₃) - ppb
Stony Mountain - December 2016



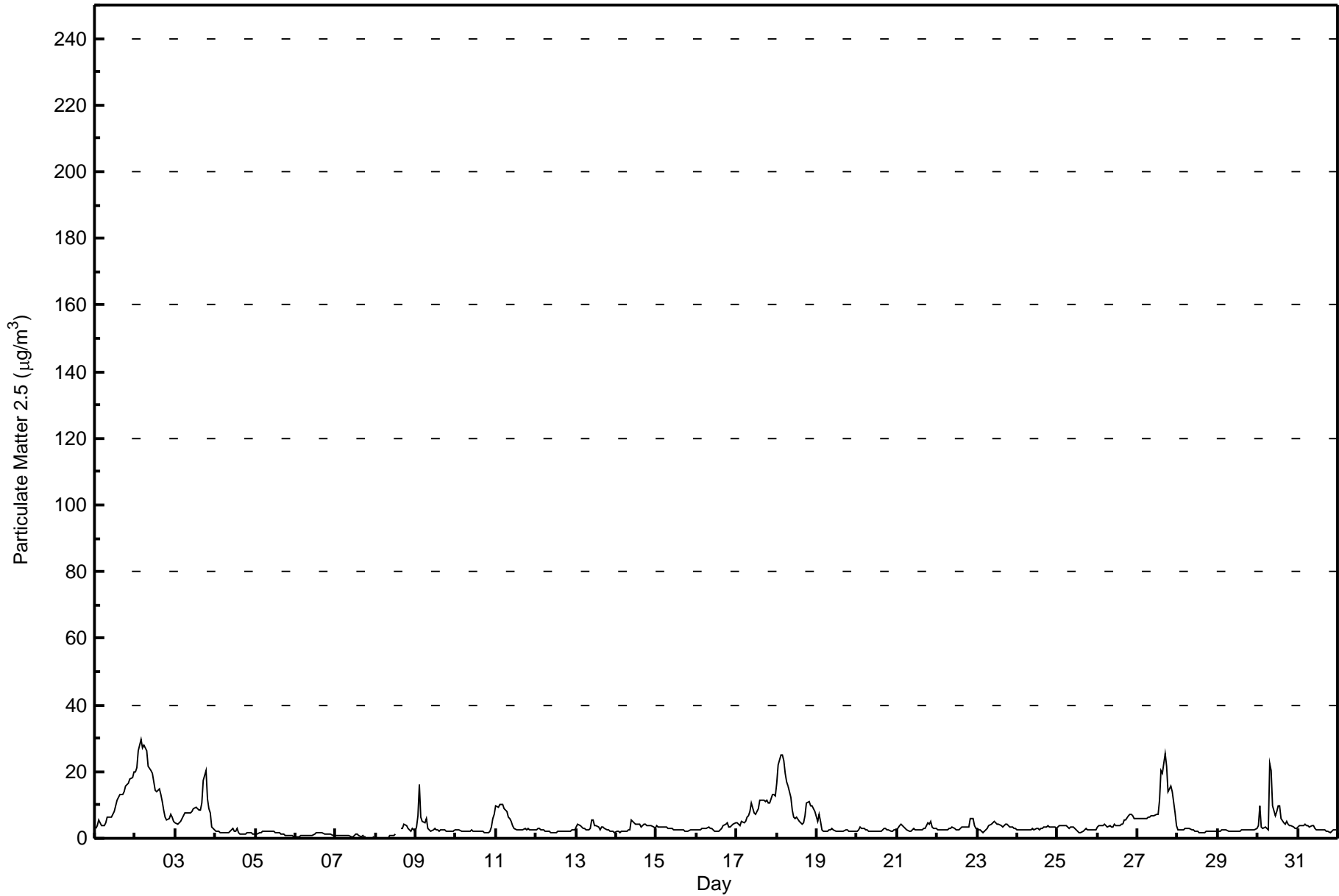


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 29.6 µg/m ³ on Dec 2 04:00 Maximum Daily Average: 16.5 µg/m ³ on Dec 2		Hours in Service: 744 Hours of Data: 732 Hours of Missing Data: 12 Hours of Calibration: 2 Percent Operational Time: 98.7																								
Minimum Value: 0.2 µg/m ³ on Dec 8 08:00 Maximum Diurnal Average: 5.3 µg/m ³ at hour 3 Monthly Average: 4.51 µg/m ³		Minimum Daily Average: 0.7 µg/m ³ on Dec 7 Minimum Diurnal Average: 3.9 µg/m ³ at hour 24 Percentiles: P ₁ = 0.6 P ₁₀ = 1.6 Q ₁ = 2.2 Median = 2.8 Q ₃ = 4.5 P ₉₀ = 9.6 P ₉₉ = 25.1																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.9	3.8	5.4	4.5	4.0	3.9	4.5	6.4	6.5	6.2	6.4	8.1	9.7	11.3	12.4	13.3	13.3	13.8	15.8	16.0	16.5	18.0	18.4	19.8	10.0	19.8
2-Dec	19.8	21.3	26.3	29.6	27.0	28.0	27.0	26.1	21.5	20.3	19.5	17.1	14.4	13.8	14.8	13.1	10.8	8.3	6.2	5.4	5.9	7.0	6.4	5.3	16.5	29.6
3-Dec	4.6	4.3	4.5	5.0	6.0	6.8	7.5	7.4	7.6	7.5	8.0	8.8	9.4	9.0	8.4	8.6	10.5	17.2	20.5	11.7	8.8	7.6	3.4	2.4	8.2	20.5
4-Dec	2.1	2.1	2.0	1.9	1.7	1.6	1.6	1.5	1.6	2.2	3.1	2.2	2.0	3.1	1.7	1.3	1.5	1.4	1.5	1.6	1.6	1.5	1.4	1.3	1.8	3.1
5-Dec	1.3	1.4	1.7	1.8	2.0	2.1	2.1	2.2	2.2	2.2	2.1	1.9	1.8	1.7	1.5	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.6	1.5	2.2
6-Dec	0.6	0.6	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.3	1.6	1.6	1.6	1.6	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	1.1	1.6
7-Dec	0.9	0.7	0.7	0.6	0.7	0.7	0.9	0.8	0.7	0.5	0.4	0.8	1.4	1.5	0.8	0.6	0.7	0.4	0.3	UO	UO	UO	0.4	0.6	0.7	1.5
8-Dec	UO	UO	UO	UO	UO	UO	UO	0.2	0.6	0.7	0.9	1.0	1.3	C	C	2.9	2.8	4.2	3.8	2.9	2.7	2.3	2.9	2.2	--	4.2
9-Dec	3.6	7.0	16.0	6.4	4.9	4.7	5.8	3.1	2.7	2.1	2.4	2.8	2.6	2.5	2.3	2.4	2.6	2.5	2.1	2.0	1.9	2.0	2.1	2.4	3.7	16.0
10-Dec	2.4	2.6	2.4	2.3	2.3	2.1	2.2	2.2	2.3	2.4	2.3	2.1	2.1	2.2	2.1	2.1	2.0	1.9	1.8	1.8	2.2	3.4	6.0	7.1	2.6	7.1
11-Dec	9.8	9.2	10.1	10.0	10.0	8.9	8.2	6.5	5.9	5.0	4.0	3.0	2.5	2.4	2.4	2.5	2.7	2.8	2.6	2.9	2.6	2.3	2.7	2.7	5.1	10.1
12-Dec	2.7	2.9	2.8	2.6	2.4	2.3	2.2	2.1	1.9	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.1	2.2	2.2	2.5	2.5	2.5	2.3	2.9
13-Dec	3.3	4.3	3.8	3.4	2.9	2.9	2.7	2.6	2.8	5.5	5.3	3.7	3.7	3.6	2.6	3.5	3.5	3.0	2.6	2.3	2.2	2.0	1.9	1.9	3.2	5.5
14-Dec	1.9	2.0	1.9	1.9	2.0	2.1	2.2	2.6	2.5	5.6	5.3	4.4	4.2	4.3	4.1	3.3	4.1	4.3	3.7	3.8	3.8	3.6	3.4	3.1	3.3	5.6
15-Dec	3.7	3.5	3.4	3.5	3.3	3.4	3.2	3.2	3.0	2.9	2.6	2.4	2.4	2.7	2.4	2.4	2.3	2.3	2.2	2.2	2.4	2.6	2.5	2.5	2.8	3.7
16-Dec	2.7	2.7	2.7	2.8	2.9	2.9	3.0	3.2	3.0	3.1	2.6	2.2	2.2	2.3	2.6	3.2	3.6	4.4	4.5	3.4	3.2	3.7	4.1	4.9	3.2	4.9
17-Dec	4.5	4.1	4.0	5.0	4.5	5.0	6.2	6.6	8.2	10.6	7.6	7.0	8.2	8.8	11.3	11.2	11.4	11.2	11.4	10.8	10.5	13.1	13.2	12.9	8.6	13.2
18-Dec	16.4	21.9	25.0	24.8	23.4	19.6	17.0	15.7	12.3	8.3	6.4	6.0	6.2	5.1	4.5	4.3	4.7	6.6	10.8	11.1	9.8	9.6	9.1	8.1	11.9	25.0
19-Dec	5.0	7.2	5.0	2.5	2.3	2.2	2.3	2.5	2.7	2.8	2.6	2.3	2.2	2.0	2.1	2.0	2.2	2.5	2.4	2.3	2.1	2.0	2.0	2.0	2.7	7.2
20-Dec	2.0	2.7	3.2	3.2	2.9	2.7	2.4	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.2	2.4	2.9	2.8	2.5	2.4	2.3	2.3	2.3	2.4	2.4	3.2
21-Dec	2.6	3.7	4.1	3.8	3.4	2.9	2.4	2.3	2.2	2.6	3.1	2.5	2.5	2.4	2.5	2.6	2.9	3.1	4.8	4.3	5.1	3.5	3.0	2.9	3.1	5.1
22-Dec	2.6	2.4	2.6	2.6	2.6	2.6	2.7	3.1	3.2	3.2	3.1	2.5	2.7	2.7	2.8	3.2	3.4	3.5	3.4	3.5	6.0	5.8	3.9	2.8	3.2	6.0
23-Dec	2.8	2.6	2.4	1.8	2.2	2.5	3.1	3.9	4.2	4.7	5.0	4.5	4.4	4.4	3.9	3.4	3.6	4.2	4.1	3.6	3.4	3.5	3.1	2.8	3.5	5.0
24-Dec	2.5	2.4	2.5	2.6	2.6	2.5	2.4	2.7	2.9	2.7	2.9	2.8	2.6	2.8	3.2	3.2	3.4	3.8	3.4	3.3	3.3	3.3	3.2	3.2	2.9	3.8
25-Dec	3.6	3.8	4.0	3.9	3.7	3.7	3.3	3.1	3.2	3.3	2.8	2.4	2.0	1.8	1.9	2.1	2.7	3.0	2.6	2.5	2.4	2.4	2.5	2.5	2.9	4.0
26-Dec	3.4	3.9	3.7	3.8	4.0	3.7	3.6	3.6	3.5	3.5	4.0	4.0	3.8	3.6	4.2	4.2	5.5	5.6	7.0	7.1	7.1	6.7	5.9	5.7	4.6	7.1
27-Dec	6.1	6.1	5.8	6.0	5.9	6.0	6.2	6.5	6.7	6.7	6.8	7.1	7.2	11.6	20.3	19.7	25.5	21.8	13.9	14.8	15.5	14.0	7.7	3.8	10.5	25.5
28-Dec	2.5	2.6	2.6	2.7	2.8	2.9	2.9	2.8	2.6	2.4	2.3	2.0	1.9	1.9	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.3	2.9
29-Dec	2.3	2.3	2.3	2.5	2.5	2.4	2.3	2.2	2.1	2.2	2.2	2.1	2.0	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.4	2.8	2.4	2.8
30-Dec	3.7	9.5	3.4	3.1	3.2	3.0	2.4	22.3	20.3	9.7	7.0	8.2	9.7	9.9	5.8	4.5	4.1	5.3	4.1	4.0	3.9	3.5	3.0	3.0	6.5	22.3
31-Dec	3.2	3.8	3.8	3.9	4.1	3.9	3.7	3.5	3.9	3.8	3.1	2.7	2.6	2.5	2.3	2.3	2.5	2.2	2.0	1.9	2.0	2.4	2.6	2.5	3.0	4.1
																								Diurnal Average		
																								Diurnal Maximum		
4.2 4.9 5.3 5.0 4.8 4.6 4.6 5.0 4.7 4.4 4.1 3.9 4.0 4.2 4.4 4.3 4.7 4.9 4.8 4.6 4.5 4.6 4.1 3.9 19.8 21.9 26.3 29.6 27.0 28.0 27.0 26.1 21.5 20.3 19.5 17.1 14.4 13.8 20.3 19.7 25.5 21.8 20.5 16.0 16.5 18.0 18.4 19.8																										
C - Calibration UO - Unstable Operation Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - December 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	541	73.91	73.91
6 - 15	118	16.12	90.03
16 - 25	29	3.96	93.99
26 - 80	7	0.96	94.95
> 81.0	0	0.00	94.95

Total Number of Valid Hours: 732

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - December 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	1	9	16	13	11	7	12	4	22	46	79	51	40	74	124	32	541
6 - 15	2	2	0	0	0	0	0	3	13	46	27	4	9	10	1	1	118
16 - 25	0	0	0	0	0	0	0	0	3	6	17	1	1	1	0	0	29
26 - 80	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	7
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	3	11	16	13	11	7	12	7	38	104	124	56	50	85	125	33	695

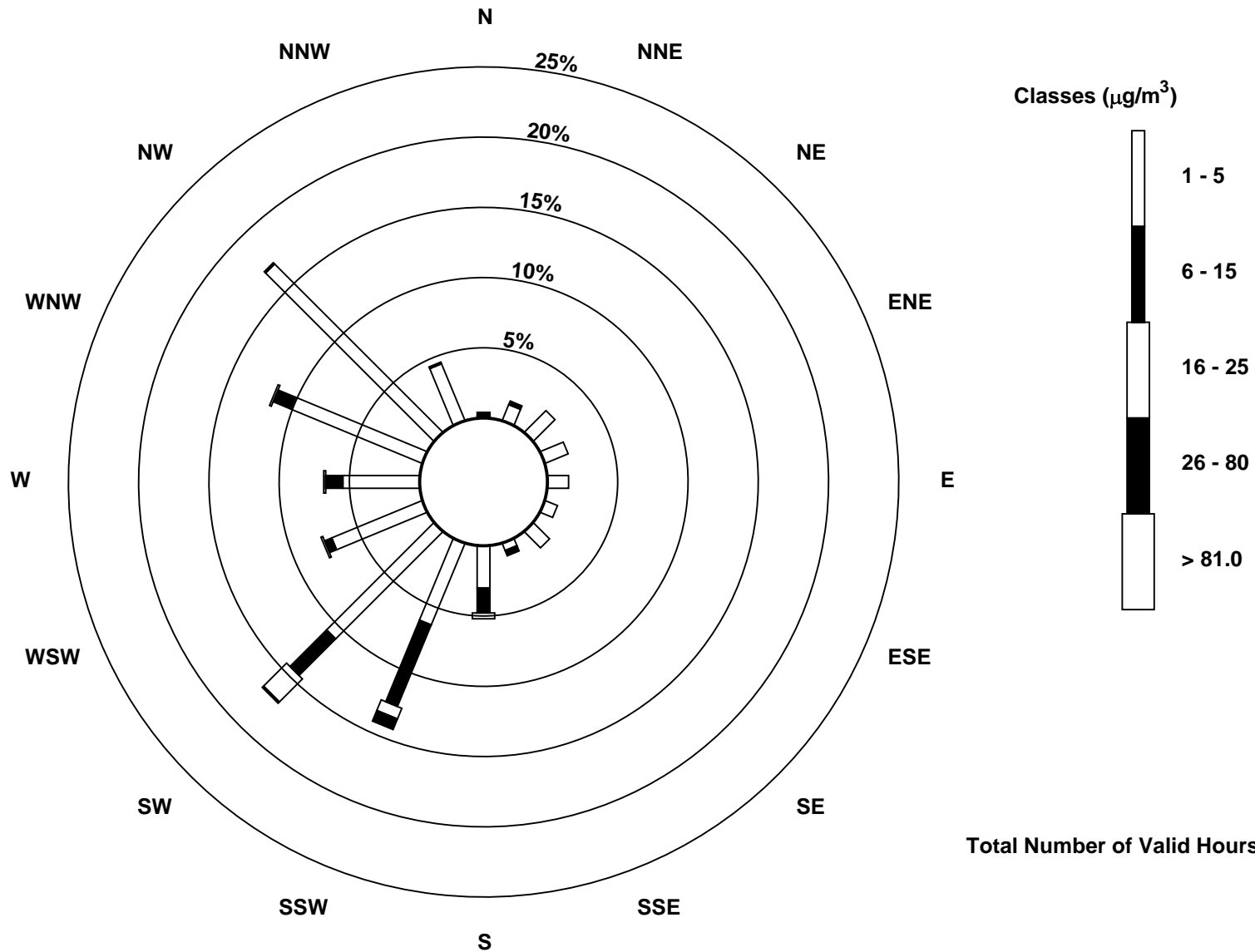
Total Number of Valid Hours: 732

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain (AMS 18)



Total Number of Valid Hours: 732

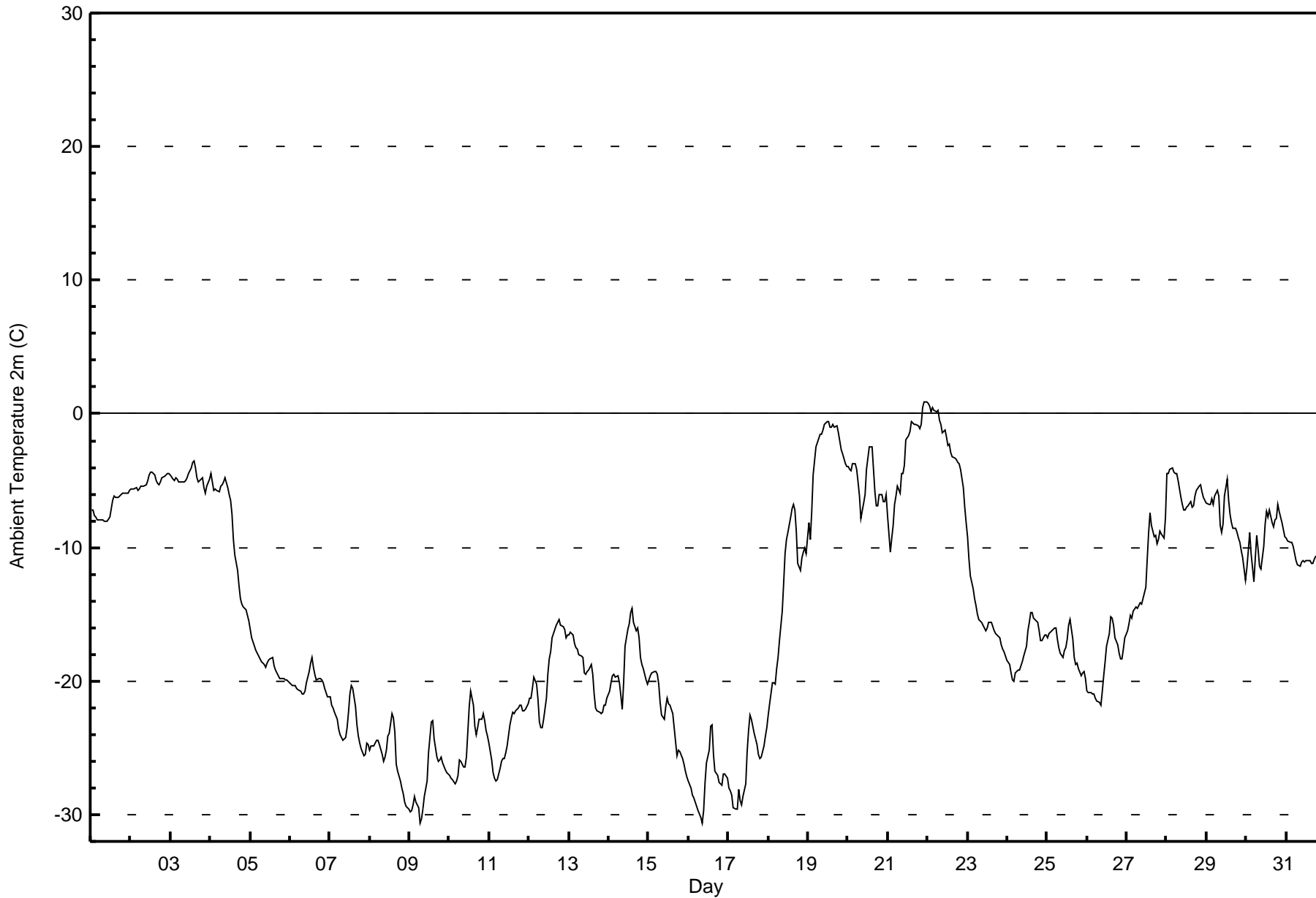


Maximum Value: 0.9 C on Dec 21 23:00 Maximum Daily Average: -2.2 C on Dec 22																						Hours in Service:	744			
Minimum Value: -30.6 C on Dec 9 07:00 Minimum Daily Average: -27.5 C on Dec 16																						Hours of Data:	744			
Maximum Diurnal Average: -13.1 C at hour 14 Minimum Diurnal Average: -16.0 C at hour 9																						Hours of Missing Data:	0			
Monthly Average: -14.97 C Percentiles: P ₁ = -29.7 P ₁₀ = -25.9 Q ₁ = -21.8 Median = -16.2 Q ₃ = -6.8 P ₉₀ = -4.4 P ₉₉ = 0.0																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-7.2	-7.2	-7.6	-7.7	-7.9	-7.9	-8.0	-7.9	-8.0	-8.0	-8.0	-7.8	-7.0	-6.5	-6.2	-6.3	-6.2	-6.2	-6.1	-6.0	-6.0	-6.0	-5.9	-5.8	-7.0	-5.8
2-Dec	-5.7	-5.6	-5.6	-5.5	-5.7	-5.6	-5.5	-5.4	-5.4	-5.3	-5.0	-4.5	-4.3	-4.3	-4.6	-5.0	-5.2	-5.3	-5.1	-4.8	-4.7	-4.6	-4.5	-4.5	-5.1	-4.3
3-Dec	-4.6	-4.8	-5.0	-4.8	-4.9	-5.1	-5.1	-5.1	-5.1	-5.0	-4.8	-4.4	-4.0	-3.6	-3.5	-4.1	-4.8	-5.1	-4.9	-4.8	-5.5	-5.9	-5.4	-4.8	-4.8	-3.5
4-Dec	-4.5	-5.1	-5.7	-5.6	-5.8	-5.9	-5.4	-5.3	-5.1	-4.8	-5.6	-6.1	-6.4	-7.5	-9.4	-10.6	-11.7	-12.9	-13.8	-14.2	-14.5	-14.7	-15.1	-15.5	-8.8	-4.5
5-Dec	-16.1	-16.8	-17.4	-17.7	-17.9	-18.1	-18.4	-18.6	-18.7	-19.0	-18.7	-18.5	-18.3	-18.2	-18.9	-19.2	-19.4	-19.6	-19.8	-19.8	-19.9	-19.9	-19.9	-20.0	-18.7	-16.1
6-Dec	-20.2	-20.4	-20.3	-20.4	-20.5	-20.6	-20.8	-21.0	-21.0	-20.7	-20.1	-19.3	-18.7	-18.2	-18.9	-19.5	-19.9	-19.8	-19.8	-19.9	-20.1	-20.5	-21.2	-21.2	-20.1	-18.2
7-Dec	-21.2	-21.8	-22.1	-22.3	-22.9	-23.6	-24.0	-24.3	-24.5	-24.2	-23.5	-22.3	-21.0	-20.3	-20.6	-21.9	-23.2	-24.1	-24.7	-25.1	-25.6	-25.5	-24.6	-24.7	-23.2	-20.3
8-Dec	-25.2	-24.9	-24.8	-24.7	-24.4	-24.5	-24.7	-25.5	-26.1	-25.7	-25.2	-24.1	-23.9	-22.5	-22.8	-23.8	-26.2	-26.8	-27.5	-28.0	-28.5	-29.1	-29.3	-29.6	-25.7	-22.5
9-Dec	-29.8	-29.7	-29.2	-28.6	-29.0	-29.5	-30.6	-30.3	-29.6	-28.7	-27.4	-25.4	-24.2	-23.1	-23.0	-24.4	-25.7	-26.0	-25.9	-25.7	-26.1	-26.6	-26.8	-26.9	-27.2	-23.0
10-Dec	-27.1	-27.2	-27.3	-27.7	-27.5	-27.0	-25.9	-26.0	-26.4	-26.4	-25.7	-23.8	-21.9	-20.8	-21.8	-23.4	-24.0	-23.5	-22.9	-22.9	-22.4	-23.0	-23.7	-24.1	-24.7	-20.8
11-Dec	-24.7	-25.9	-26.9	-27.2	-27.5	-27.3	-26.6	-26.0	-25.8	-25.8	-25.4	-24.8	-23.3	-22.7	-22.3	-22.4	-22.2	-22.0	-21.8	-21.8	-22.2	-22.2	-22.1	-21.7	-24.2	-21.7
12-Dec	-21.3	-21.3	-20.5	-19.7	-20.2	-21.4	-23.0	-23.5	-23.5	-22.9	-21.3	-19.5	-18.4	-17.8	-16.8	-16.2	-15.8	-15.7	-15.4	-15.8	-15.9	-16.1	-16.7	-16.6	-19.0	-15.4
13-Dec	-16.5	-16.3	-16.6	-17.1	-17.5	-17.6	-18.0	-18.1	-18.2	-19.4	-19.5	-19.3	-19.2	-18.8	-19.5	-21.0	-22.0	-22.3	-22.3	-22.4	-22.3	-21.9	-21.8	-21.3	-19.5	-16.3
14-Dec	-20.8	-20.1	-19.6	-19.5	-19.7	-19.6	-20.1	-21.1	-22.2	-20.1	-17.4	-16.1	-15.7	-14.9	-14.6	-15.6	-16.2	-16.1	-16.7	-18.2	-18.7	-19.0	-20.0	-20.3	-18.4	-14.6
15-Dec	-19.9	-19.6	-19.4	-19.3	-19.3	-19.5	-20.2	-21.6	-22.6	-22.8	-21.9	-21.2	-21.7	-21.8	-22.5	-23.5	-24.5	-25.6	-25.2	-25.3	-25.8	-26.2	-26.7	-27.1	-22.6	-19.3
16-Dec	-27.5	-28.0	-28.6	-28.8	-29.1	-29.4	-29.7	-30.2	-30.6	-29.7	-27.6	-26.1	-25.2	-23.4	-23.3	-25.5	-26.8	-27.0	-27.6	-27.7	-27.8	-26.9	-27.0	-27.2	-27.5	-23.3
17-Dec	-28.0	-28.2	-28.6	-29.5	-29.6	-29.5	-28.1	-28.9	-29.2	-28.6	-27.7	-25.3	-23.6	-22.5	-22.9	-24.0	-24.3	-24.7	-25.5	-25.8	-25.7	-24.8	-24.1	-23.5	-26.4	-22.5
18-Dec	-22.5	-21.7	-20.1	-20.1	-20.2	-19.1	-18.2	-17.0	-14.7	-12.7	-10.5	-9.4	-8.9	-7.7	-7.1	-6.8	-7.2	-8.8	-11.2	-11.7	-10.8	-10.4	-10.0	-10.4	-13.2	-6.8
19-Dec	-8.2	-9.5	-7.3	-4.6	-3.5	-2.5	-1.8	-1.5	-1.5	-1.3	-0.8	-0.5	-0.6	-1.0	-1.0	-0.8	-1.0	-0.9	-1.4	-2.0	-2.7	-3.0	-3.8	-3.9	-2.7	-0.5
20-Dec	-4.0	-4.1	-4.3	-3.7	-3.7	-4.1	-5.1	-6.1	-7.8	-6.7	-6.0	-4.2	-3.3	-2.5	-2.5	-4.2	-5.8	-6.9	-6.8	-6.0	-6.0	-6.6	-6.6	-6.0	-5.1	-2.5
21-Dec	-7.7	-10.3	-9.3	-8.3	-6.7	-6.2	-5.4	-5.9	-4.5	-4.4	-3.8	-2.0	-1.6	-1.4	-0.6	-0.7	-0.8	-0.8	-0.9	-1.1	-0.8	0.5	0.9	0.9	-3.4	0.9
22-Dec	0.8	0.6	0.1	0.4	0.2	0.2	0.2	-0.5	-0.8	-1.5	-1.2	-1.7	-2.4	-2.3	-2.9	-3.2	-3.3	-3.4	-3.6	-3.8	-4.2	-5.6	-6.9	-8.1	-2.2	0.8
23-Dec	-9.2	-10.8	-12.2	-13.1	-13.8	-14.4	-14.9	-15.4	-15.6	-15.8	-16.0	-16.2	-16.1	-15.7	-15.6	-15.9	-16.2	-16.4	-16.6	-16.8	-17.3	-17.6	-17.8	-18.1	-15.3	-9.2
24-Dec	-18.4	-18.8	-19.4	-19.9	-20.0	-19.4	-19.2	-19.1	-18.8	-18.6	-18.1	-17.4	-16.2	-15.6	-14.9	-14.9	-15.2	-15.5	-15.6	-16.2	-17.0	-17.0	-16.5	-16.6	-17.4	-14.9
25-Dec	-16.7	-16.5	-16.3	-16.2	-16.0	-16.1	-16.8	-17.5	-17.9	-18.2	-17.7	-17.5	-16.9	-15.8	-15.4	-16.8	-18.3	-18.7	-18.6	-19.1	-19.6	-19.4	-19.3	-19.9	-17.6	-15.4
26-Dec	-20.7	-20.9	-20.9	-21.0	-21.0	-21.3	-21.5	-21.6	-21.8	-20.8	-19.6	-18.6	-17.4	-16.5	-15.2	-15.3	-15.8	-16.7	-17.3	-17.9	-18.3	-18.4	-17.6	-16.7	-18.9	-15.2
27-Dec	-16.2	-15.8	-15.0	-15.3	-14.7	-14.5	-14.6	-14.4	-14.1	-14.3	-13.8	-13.0	-10.9	-8.9	-7.5	-8.4	-9.2	-9.1	-9.7	-9.4	-8.8	-9.0	-9.3	-7.8	-11.8	-7.5
28-Dec	-4.4	-4.4	-4.2	-4.0	-4.4	-4.5	-4.5	-5.0	-6.2	-6.8	-7.2	-7.2	-7.0	-6.9	-6.6	-7.0	-6.9	-6.2	-5.7	-5.4	-5.3	-5.8	-6.2	-6.4	-5.8	-4.0
29-Dec	-6.6	-6.8	-6.7	-6.4	-6.7	-6.2	-5.8	-6.2	-8.4	-8.9	-8.2	-6.2	-4.9	-6.5	-7.5	-8.2	-8.5	-8.6	-8.9	-9.3	-9.7	-10.2	-10.8	-12.5	-7.9	-4.9
30-Dec	-11.5	-10.2	-8.9	-10.4	-12.6	-10.7	-9.1	-10.1	-11.4	-11.6	-9.9	-8.3	-7.3	-7.7	-7.2	-8.1	-8.5	-7.9	-7.9	-6.8	-7.3	-8.1	-8.6	-9.1	-9.1	-6.8
31-Dec	-9.3	-9.5	-9.6	-9.6	-9.9	-10.4	-11.0	-11.2	-11.4	-11.1	-11.0	-11.1	-11.0	-11.0	-11.0	-11.2	-11.1	-10.9	-10.7	-10.7	-11.5	-11.8	-12.2	-10.9	-10.8	-9.3
																						Diurnal Average				
																						Diurnal Maximum				



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Stony Mountain - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Stony Mountain - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	244	32.80	32.80
-20 - 0	490	65.86	98.66
0 - 10	10	1.34	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



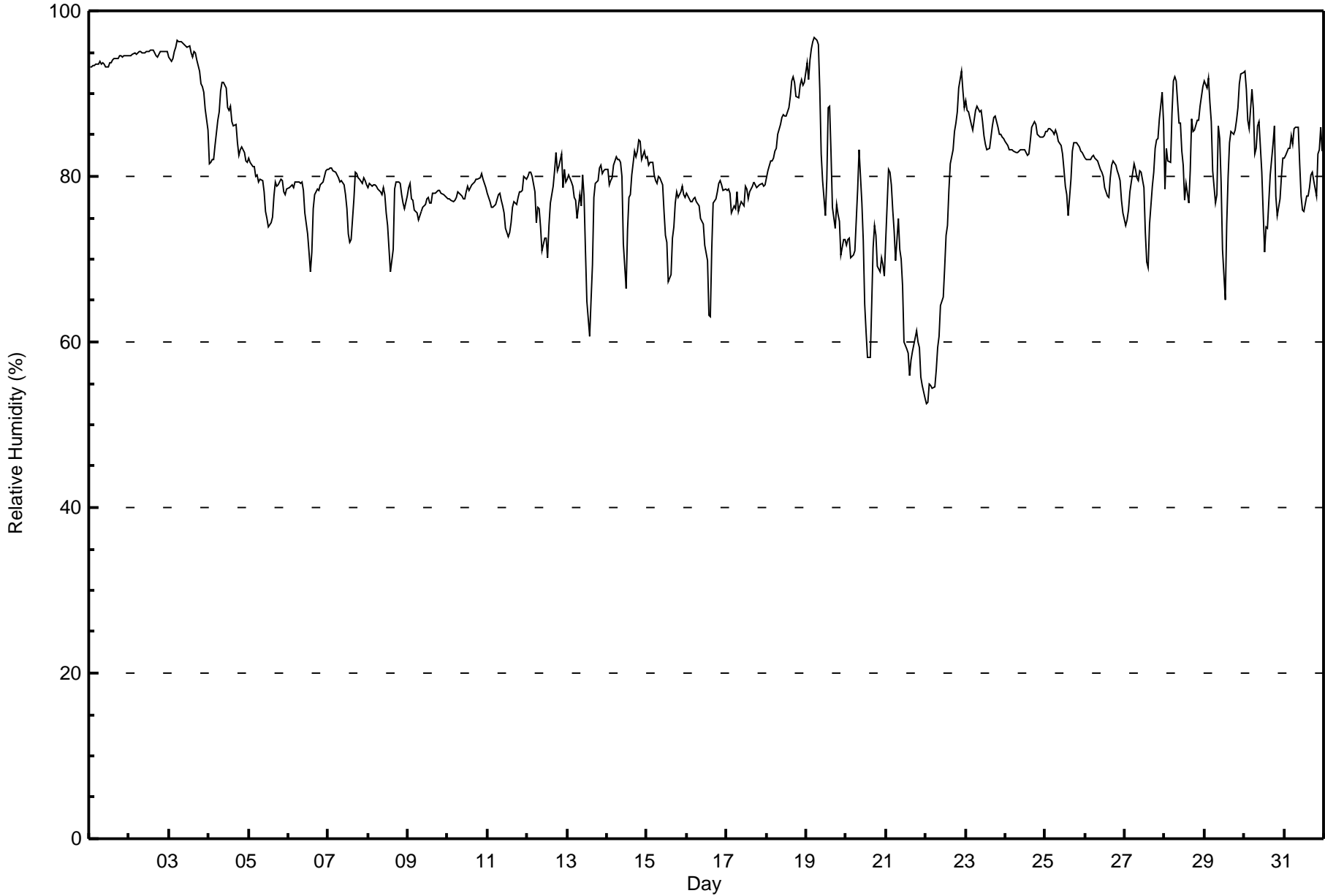
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Stony Mountain - December 2016

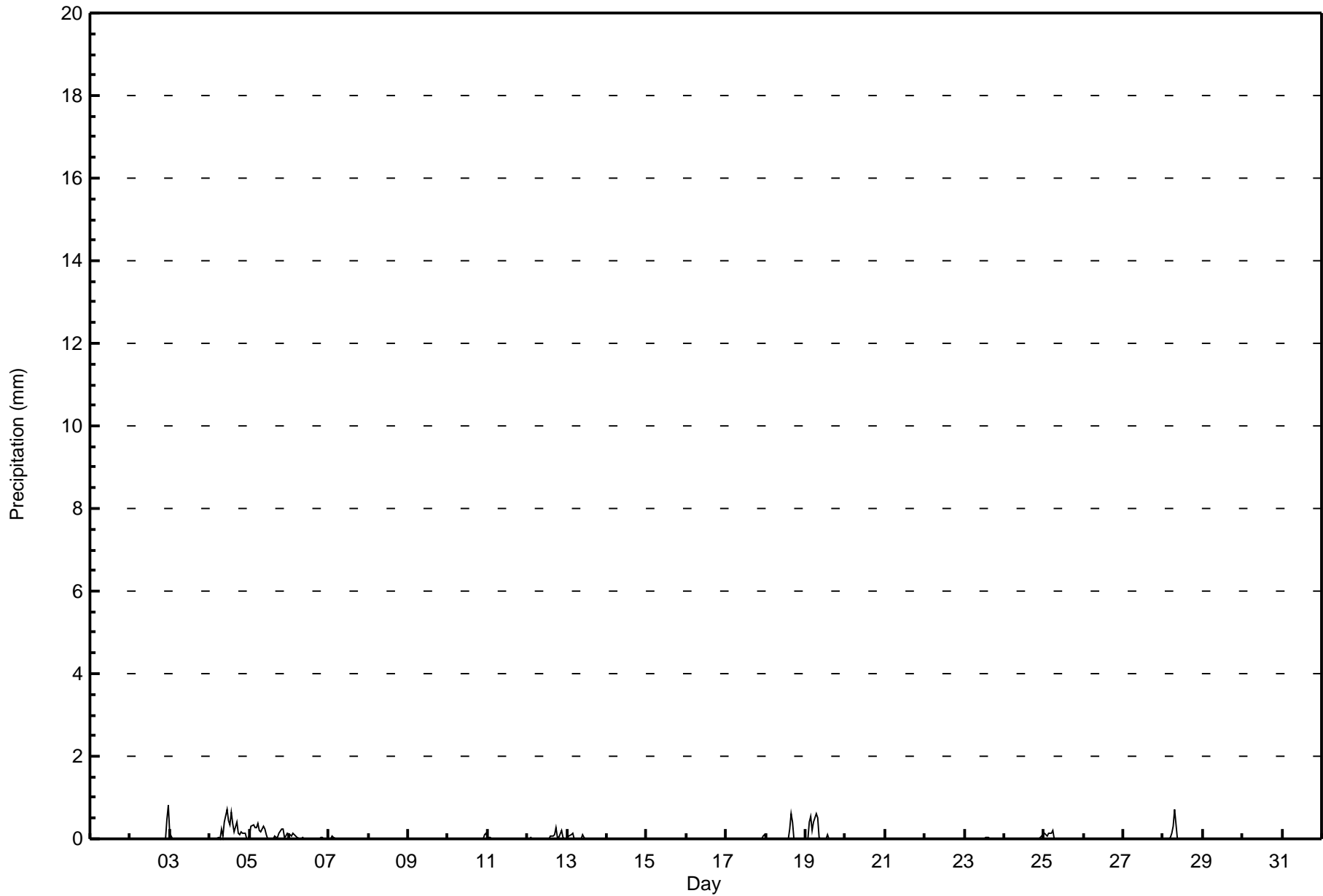
Maximum Value: 97 % on Dec 19 06:00														Maximum Daily Average: 94.9 % on Dec 2														Hours in Service: 744	
Minimum Value: 53 % on Dec 22 01:00														Minimum Daily Average: 65.4 % on Dec 21														Hours of Data: 744	
Maximum Diurnal Average: 82.0 % at hour 8														Minimum Diurnal Average: 76.4 % at hour 14														Hours of Missing Data: 0	
Monthly Average: 80.7 %														Percentiles: P ₁ = 55 P ₁₀ = 72 Q ₁ = 77 Median = 80 O ₃ = 85 P ₉₀ = 92 P ₉₉ = 96														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	93	93	93	93	94	94	94	94	94	94	93	93	94	94	94	94	94	94	95	95	94	95	95	95	93.9	95			
2-Dec	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	94	95	95	95	95	95	95	94.9	95			
3-Dec	94	94	94	95	96	96	96	96	96	96	96	96	95	94	95	95	94	93	91	91	90	88	86	93.9	96				
4-Dec	81	82	82	82	84	87	88	90	91	91	88	88	88	87	86	86	84	82	83	84	83	82	82	85.5	91				
5-Dec	82	82	81	81	80	80	79	80	80	78	76	75	74	74	75	78	79	79	79	80	79	78	78	78	78.5	82			
6-Dec	79	79	79	79	79	79	79	79	79	78	76	73	71	68	71	76	78	79	78	79	79	79	81	81	77.4	81			
7-Dec	81	81	81	81	80	80	80	79	79	79	78	76	73	72	72	77	81	80	80	80	79	80	80	79	78.7	81			
8-Dec	79	79	79	79	79	79	78	78	78	79	78	76	74	69	70	71	78	79	79	79	78	77	76	78	77.0	79			
9-Dec	79	79	77	77	76	76	75	75	76	76	77	77	77	77	77	78	78	78	78	78	78	78	78	77	77.2	79			
10-Dec	77	77	77	77	77	77	78	78	78	77	77	78	79	78	79	79	79	80	80	80	80	80	79	79	78.4	80			
11-Dec	78	77	76	76	76	77	78	78	77	76	76	74	73	73	74	76	77	77	77	78	78	78	80	80	76.7	80			
12-Dec	80	80	80	80	78	74	76	76	74	71	73	72	70	74	77	79	81	83	81	81	83	79	81	79	77.6	83			
13-Dec	80	80	79	79	77	77	75	78	76	80	78	71	65	61	65	69	77	79	79	81	81	80	81	81	76.3	81			
14-Dec	81	79	79	80	81	82	82	82	80	72	67	74	78	78	80	83	82	83	84	84	82	83	82	82	80.0	84			
15-Dec	82	81	82	82	80	80	79	80	80	79	76	73	72	67	68	73	74	77	78	77	78	79	78	77	77.2	82			
16-Dec	78	77	77	77	77	77	77	76	75	75	74	72	70	63	63	71	77	77	78	79	80	79	78	79	75.3	80			
17-Dec	78	78	78	76	76	76	78	76	77	77	77	79	79	77	78	79	79	79	79	79	79	79	79	79	77.9	79			
18-Dec	80	81	82	82	82	83	83	85	86	87	87	87	87	88	90	92	92	91	90	90	91	92	91	91	87.1	92			
19-Dec	94	92	94	95	96	97	96	96	90	83	80	75	80	88	88	83	76	74	77	75	75	71	72	72	84.1	97			
20-Dec	72	72	73	70	71	71	75	79	83	77	72	65	61	58	58	65	71	74	73	69	68	70	69	68	70.2	83			
21-Dec	72	81	81	79	76	73	70	75	71	70	67	60	59	59	56	58	59	60	61	60	59	56	55	53	65.4	81			
22-Dec	53	53	55	55	54	55	57	59	61	64	65	69	73	74	78	82	83	85	87	88	91	93	90	88	71.3	93			
23-Dec	89	88	88	86	86	87	88	88	88	88	87	85	84	83	83	85	86	87	87	86	85	85	85	85	86.2	89			
24-Dec	84	84	83	83	83	83	83	83	83	83	83	83	83	83	84	86	87	86	85	85	85	85	85	85	84.0	87			
25-Dec	85	85	86	86	85	85	86	85	84	84	83	81	79	78	75	80	83	84	84	84	84	83	83	82	83.1	86			
26-Dec	82	82	82	82	82	82	82	82	81	81	80	80	79	78	77	80	81	82	81	81	80	80	77	76	80.5	82			
27-Dec	74	75	76	78	79	82	81	80	79	81	81	79	73	70	69	74	79	81	83	84	85	87	90	86	79.4	90			
28-Dec	79	83	82	82	88	92	92	91	87	86	83	81	77	79	77	81	87	85	86	87	87	88	90	91	85.0	92			
29-Dec	91	91	92	89	87	81	77	78	86	85	79	71	65	74	80	84	85	85	86	87	88	91	92	92	84.0	92			
30-Dec	93	91	87	86	91	88	83	83	86	87	81	76	71	74	74	80	82	84	86	78	75	77	80	82	82.2	93			
31-Dec	82	83	83	83	85	84	86	86	86	82	78	76	76	78	78	79	80	80	80	78	83	83	86	83	81.5	86			
	81.5	81.7	81.7	81.4	81.7	81.6	81.5	82.0	81.9	81.2	79.5	77.5	76.4	76.4	76.9	79.4	81.4	81.8	82.0	81.6	81.8	81.6	81.8	81.4	Diurnal Average				
	95	95	95	95	96	97	96	96	96	96	96	96	96	96	95	95	95	95	94	95	95	95	95	95	Diurnal Maximum				





Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Stony Mountain - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Precipitation (PC) - mm
Stony Mountain - December 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	727	97.72	97.72
0.4 - 0.5	11	1.48	99.19
0.6 - 0.7	5	0.67	99.87
0.8 - 1.4	1	0.13	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



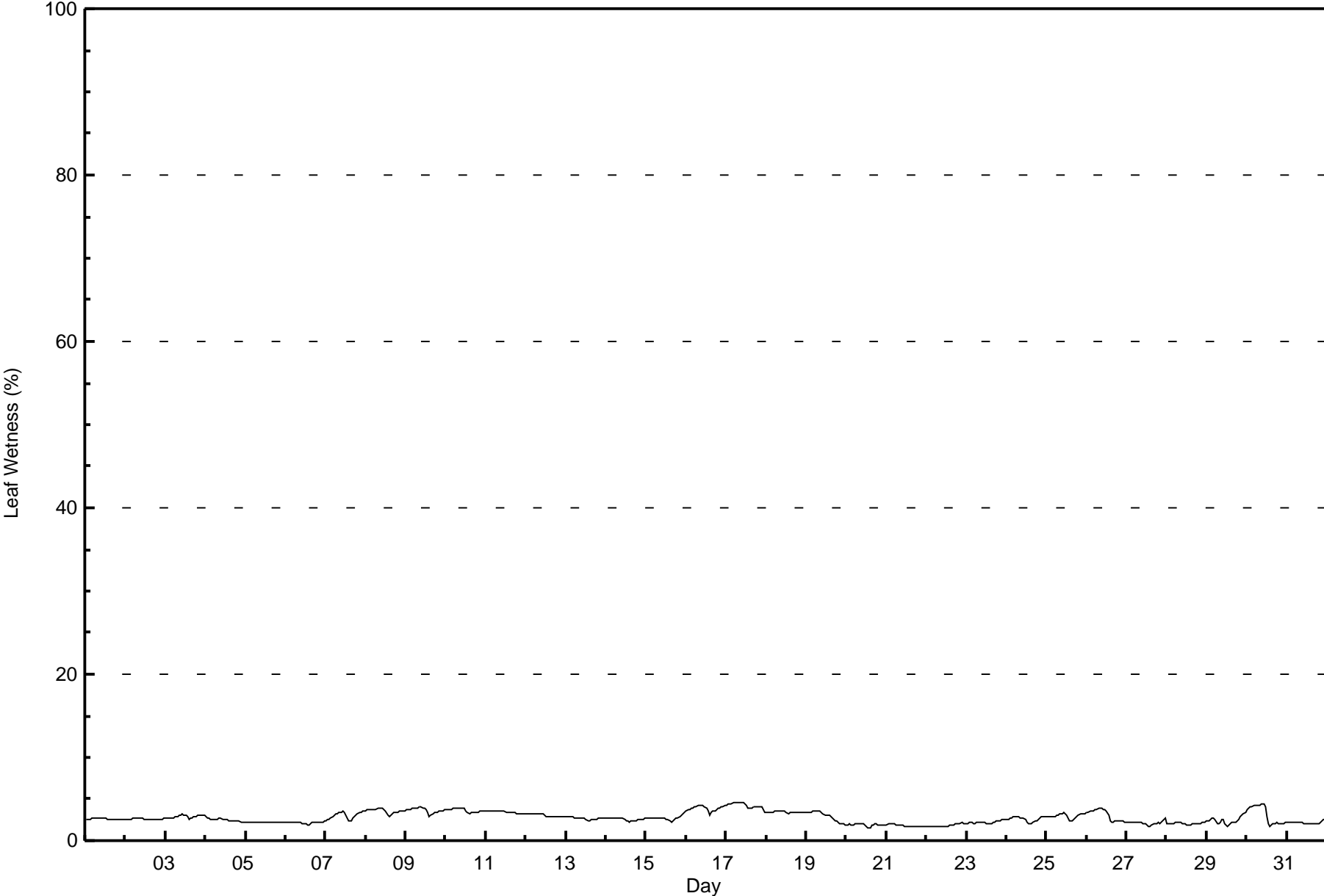
Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (LW) - %

Stony Mountain - December 2016

Maximum Value: 5 % on Dec 17 10:00																	Maximum Daily Average: 4.2 % on Dec 17																	Hours in Service: 744			
Minimum Value: 2 % on Dec 20 15:00																	Minimum Daily Average: 1.8 % on Dec 21																	Hours of Data: 744			
Maximum Diurnal Average: 3.0 % at hour 10																	Minimum Diurnal Average: 2.4 % at hour 15																	Hours of Missing Data: 0			
Monthly Average: 2.8 %																	Percentiles: P ₁ = 2 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 4																	Hours of Calibration: 0			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.6	3											
2-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.6	3											
3-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.9	3											
4-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3											
5-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2											
6-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2											
7-Dec	2	2	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3	3.0	4											
8-Dec	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	4	4	4	4	3.6	4											
9-Dec	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	4	4	4	4	3.6	4											
10-Dec	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	4	4	4	4	3.6	4											
11-Dec	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3.5	4											
12-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3.1	3											
13-Dec	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3	3	3	3	2.7	3											
14-Dec	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3	3	3	3	2.6	3											
15-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3	3	2.7	3											
16-Dec	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	4	4	4	4	4	4	4	3.9	4											
17-Dec	4	4	4	4	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	3	4.2	5											
18-Dec	3	3	3	3	3	4	4	4	4	4	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3.4	4											
19-Dec	3	3	3	3	3	4	4	3	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2.9	4											
20-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.9	2											
21-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2											
22-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2											
23-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2.2	3											
24-Dec	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	3	3	3	3	3	2.6	3											
25-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3	3.0	3											
26-Dec	3	3	4	4	4	4	4	4	4	4	4	4	3	2	2	2	2	2	2	2	2	2	2	2	3.1	4											
27-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2.1	3											
28-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2											
29-Dec	2	2	3	3	3	2	2	2	2	3	3	2	2	2	2	2	2	2	2	3	3	3	3	3	2.4	3											
30-Dec	4	4	4	4	4	4	4	4	4	4	4	3	2	2	2	2	2	2	2	2	2	2	2	2	3.1	4											
31-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2.2	3											
2.8																	2.8																	Diurnal Average			
4																	4																	Diurnal Maximum			





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (LW) - %
Stony Mountain - December 2016

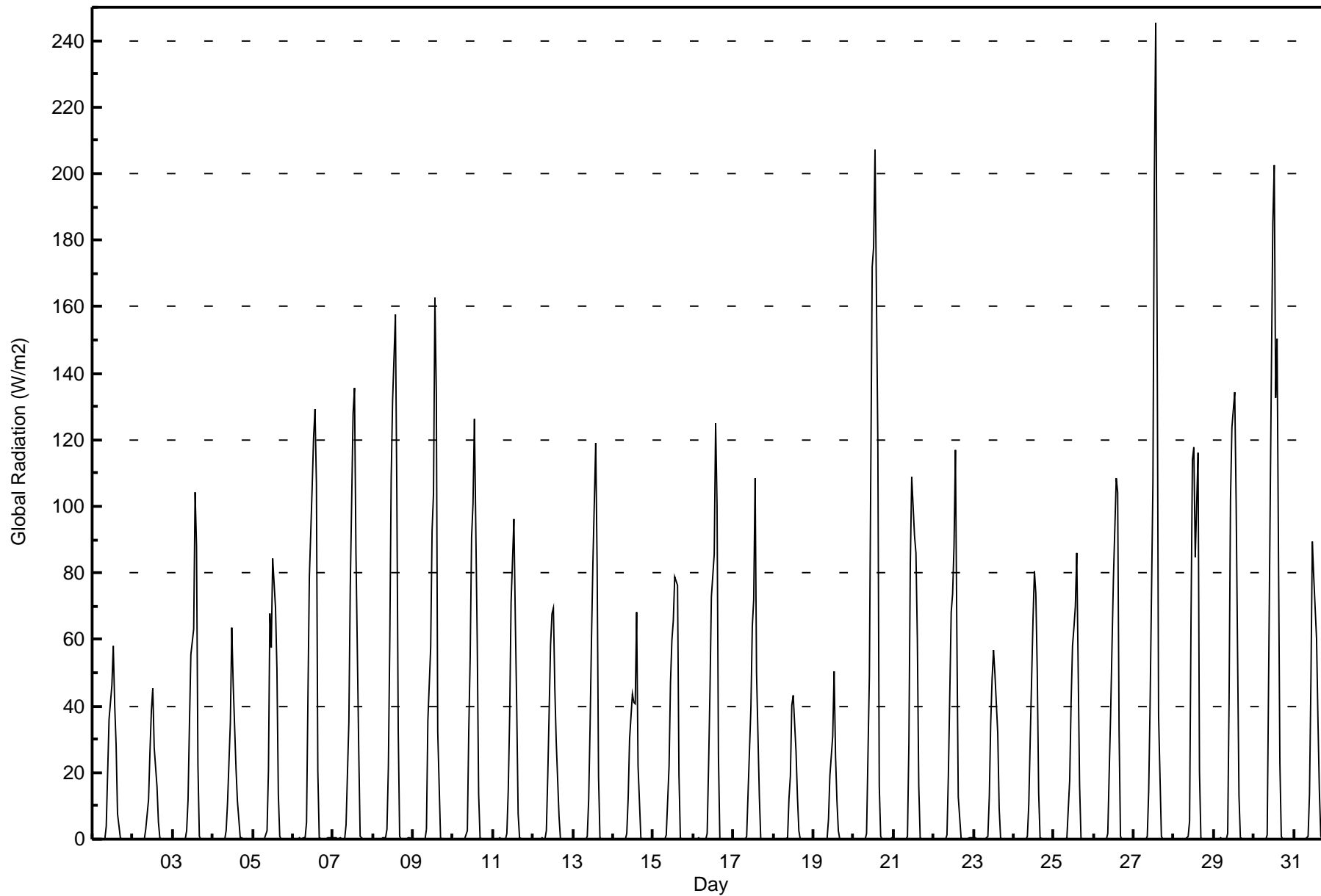
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	0	0.00	0.00
0.4 - 0.5	0	0.00	0.00
0.6 - 0.7	0	0.00	0.00
0.8 - 1.4	0	0.00	0.00
1.5 - 10	744	100.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 245 W/m2 on Dec 27 14:00																			Maximum Daily Average: 36.9 W/m2 on Dec 30						Hours in Service: 744	
Minimum Value: 0 W/m2 on Dec 1 01:00																			Minimum Daily Average: 6.1 W/m2 on Dec 19						Hours of Data: 744	
Maximum Diurnal Average: 95.4 W/m2 at hour 14																			Minimum Diurnal Average: 0.0 W/m2 at hour 20						Hours of Missing Data: 0	
Monthly Average: 18.0 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 15 P ₉₀ = 70 P ₉₉ = 167						Hours of Calibration: 0	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	0	4	20	36	46	58	40	28	8	0	0	0	0	0	0	0	0	10.0	58
2-Dec	0	0	0	0	0	0	0	0	3	12	26	39	45	27	16	5	0	0	0	0	0	0	0	0	7.2	45
3-Dec	0	0	0	0	0	0	0	0	3	12	35	55	63	104	88	22	1	0	0	0	0	0	0	0	16.0	104
4-Dec	0	0	0	0	0	0	0	0	3	11	35	63	47	34	21	12	0	0	0	0	0	0	0	0	9.4	63
5-Dec	0	0	0	0	0	0	0	0	2	21	68	57	84	70	51	13	1	0	0	0	0	0	0	0	15.3	84
6-Dec	0	0	0	0	0	0	0	0	5	43	79	106	121	129	107	20	0	0	0	0	0	0	0	0	25.5	129
7-Dec	0	0	0	0	0	0	0	0	4	35	76	102	128	135	87	27	1	0	0	0	0	0	0	0	24.9	135
8-Dec	0	0	0	0	0	0	0	0	3	22	59	108	132	157	104	32	1	0	0	0	0	1	1	0	25.9	157
9-Dec	0	0	0	0	0	0	0	0	3	36	57	93	104	163	134	32	1	0	0	0	0	0	0	0	25.9	163
10-Dec	0	0	0	0	0	0	0	0	3	33	55	91	101	126	59	13	0	0	0	0	0	0	0	0	20.1	126
11-Dec	0	0	0	0	0	0	0	0	2	15	37	71	96	66	39	8	0	0	0	0	0	0	0	0	14.0	96
12-Dec	0	0	0	0	0	0	0	0	2	19	58	68	69	45	29	7	0	0	0	0	0	0	0	0	12.5	69
13-Dec	0	0	0	0	0	0	0	0	1	12	34	60	83	119	82	19	1	0	0	0	0	0	0	0	17.1	119
14-Dec	0	0	0	0	0	0	0	0	2	12	30	44	41	41	68	22	0	0	0	0	0	0	0	0	10.8	68
15-Dec	0	0	0	0	0	0	0	0	1	22	47	60	65	79	76	19	0	0	0	0	0	0	0	0	15.5	79
16-Dec	0	0	0	0	0	0	0	0	1	22	45	73	86	125	101	25	0	0	0	0	0	0	0	0	19.9	125
17-Dec	0	0	0	0	0	0	0	0	1	14	39	64	72	109	50	13	0	0	0	0	0	0	0	0	15.1	109
18-Dec	0	0	0	0	0	0	0	0	0	12	19	40	43	26	13	3	0	0	0	0	0	0	0	0	6.6	43
19-Dec	0	0	0	0	0	0	0	0	0	6	19	31	50	25	11	2	0	0	0	0	0	0	0	0	6.1	50
20-Dec	0	0	0	0	0	0	0	0	2	49	111	172	178	207	119	16	1	0	0	0	0	0	0	0	35.7	207
21-Dec	0	0	0	0	0	0	0	0	1	29	82	109	91	86	60	16	0	0	0	0	0	0	0	0	19.8	109
22-Dec	0	0	0	0	0	0	0	0	1	19	68	74	88	117	62	13	0	0	0	0	0	0	0	0	18.5	117
23-Dec	0	0	0	0	0	0	0	0	1	13	35	48	57	50	32	9	0	0	0	0	0	0	0	0	10.3	57
24-Dec	0	0	0	0	0	0	0	0	1	11	30	66	80	74	51	14	0	0	0	0	0	0	0	0	13.6	80
25-Dec	0	0	0	0	0	0	0	0	1	18	41	58	64	70	86	17	0	0	0	0	0	0	0	0	14.8	86
26-Dec	0	0	0	0	0	0	0	0	2	20	37	58	78	109	104	33	1	0	0	0	0	0	0	0	18.4	109
27-Dec	0	0	0	0	0	0	0	0	1	15	41	107	198	245	152	37	1	0	0	0	0	0	0	0	33.2	245
28-Dec	0	0	0	0	0	0	0	0	1	6	66	114	118	85	116	20	0	0	0	0	0	0	0	0	21.9	118
29-Dec	0	0	0	0	0	0	0	0	2	42	102	124	134	101	56	13	0	0	0	0	0	0	0	0	24.0	134
30-Dec	0	0	0	0	0	0	0	0	1	48	141	185	202	132	150	23	1	0	0	0	0	0	0	0	36.9	202
31-Dec	0	0	0	0	0	0	0	0	1	14	47	89	79	60	36	15	1	0	0	0	0	0	0	0	14.2	89
																			0.1 0.0 0.0 0.0 0.1 0.0 0.1 0.0 1.8 21.3 53.4 79.9 92.2 95.4 70.6 17.1 0.5 0.0 0.0 0.0 0.0 0.1 0.0 0.0						Diurnal Average	
																			0 0 0 0 0 0 0 0 5 49 141 185 202 245 152 37 1 0 0 0 0 1 1 0						Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Stony Mountain - December 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	573	77.02	77.02
21 - 100	125	16.80	93.82
101 - 300	46	6.18	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

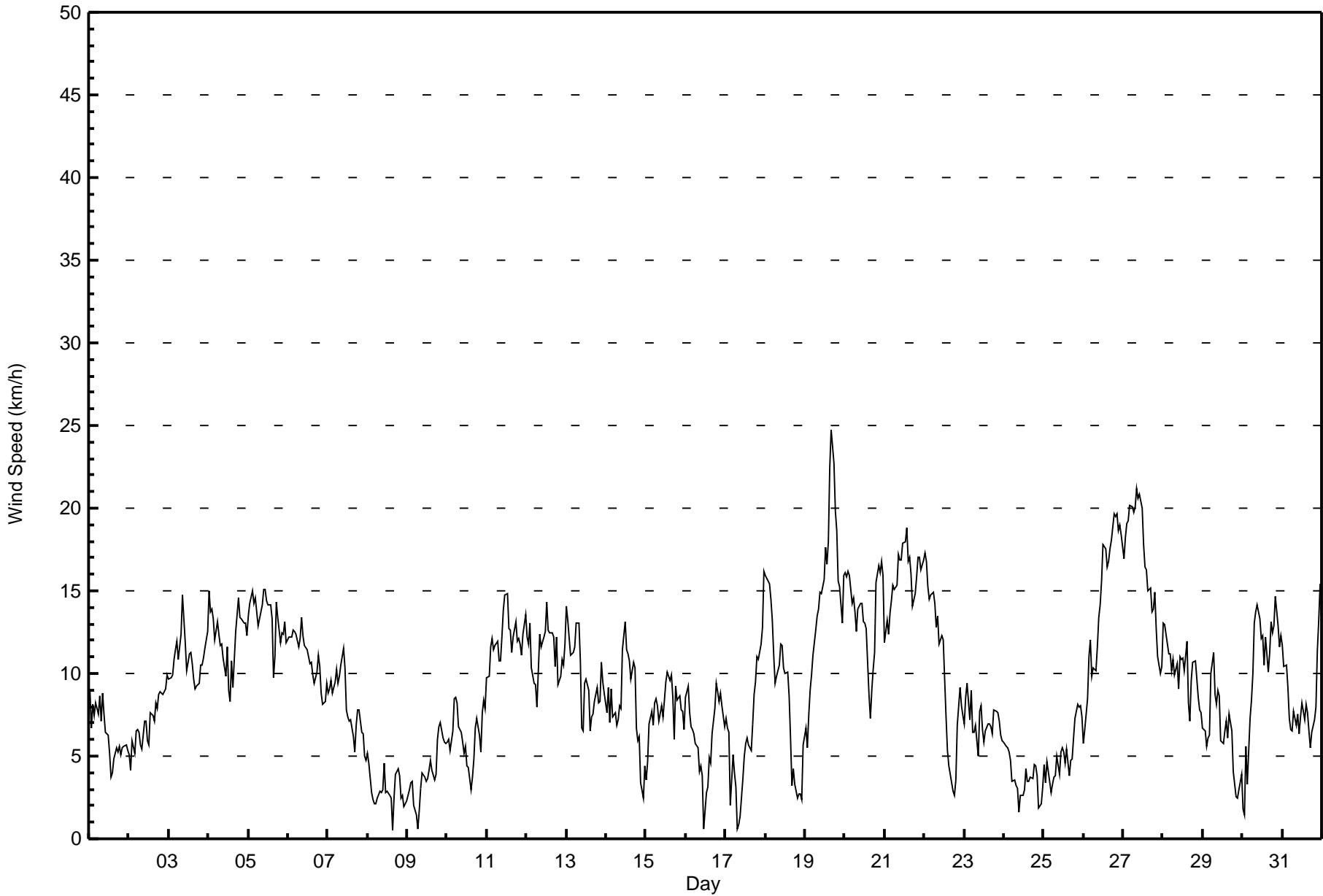


Maximum Speed: 25 km/h on Dec 19 17:00	Maximum Daily Speed Average: 16.6 km/h on Dec 27	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 8 16:00	Minimum Daily Speed Average: 1.8 km/h on Dec 8	Hours of Data: 744
Maximum Diurnal Speed Average: 6.2 km/h at hour 24	Minimum Diurnal Speed Average: 5.0 km/h at hour 17	Hours of Missing Data: 0
Monthly Average Velocity: 5.8 km/h 263.3 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 12 P ₉₀ = 15 P ₉₉ = 20	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSW9	SW7	SW8	SW7	SSW8	SW8	SW9	SSW7	SSW9	SW8	SW6	SW6	SW5	SW4	SW4	SSW5	SW5	SW5	SSW6	SW5	SSW6	SSW6	SW6	SW5	SW6.3	SSW9
2-Dec	WSW5	SW4	SSW6	SSW5	SSW7	SSW7	SSW6	SSW6	S5	SSW7	S7	S6	S6	S8	S7	S7	SSE8	S8	S9	S9	S9	S9	S9	S10	S6.8	S10
3-Dec	S10	S10	SSW10	SSW11	SSW11	SSW12	SSW11	SSW12	SSW15	SSW13	SSW12	SSW10	SW11	SW11	SSW11	SSW10	SW9	SW9	SW9	SW10	SW10	SW11	SSW12	SSW13	SSW10.7	SSW15
4-Dec	WSW15	WSW14	WSW14	WSW13	WSW12	WSW13	WSW12	WSW12	W12	NW11	NW10	NW12	NW9	NNW8	NW11	NW9	NW13	NW14	NW15	NW13	NW13	NW13	NW13	NW12	WNW9.9	WSW15
5-Dec	NW13	NW14	NW15	NW14	NW15	NW14	NW13	NW13	NW14	NW15	NW15	NW14	NW14	NW14	NW13	NW10	NW11	NW14	NW13	NW12	NW12	NW12	NW13	NW12	NW13.4	NW15
6-Dec	NW12	NW12	NW12	NW13	NW13	NW12	NW12	NW12	NW13	NW12	NW12	NW11	NW11	NW11	NW11	NW10	NW9	NW10	NW11	NW10	NNW9	NNW8	NW8	NW9	NW11.0	NW13
7-Dec	NW9	NW9	NW10	NW9	NW10	NW10	NW9	NW10	NW11	NW12	NW10	NW8	NW7	NW7	NW7	NW6	NNW5	NW7	NW8	NW8	NNW6	NW6	NNW5	NW5	NW8.0	NW12
8-Dec	NW5	NW5	NNW3	NNW2	NNW2	NNW2	N2	N3	N3	NNE3	NE5	NE3	NNE3	NNW3	NW2	NNE0	SE2	E4	E4	ESE4	E2	NE3	ENE2	ESE2	NNE1.8	NW5
9-Dec	SSE3	S3	SSW3	SSW4	WSW2	WSW1	SSW1	SW2	SW3	SW4	SSW4	SW3	SSW4	SSW4	SSW5	SSW4	S4	S4	SSW6	SW7	SW7	SSW6	SSW6	SSW6	SSW3.8	SW7
10-Dec	SSW6	SW6	SSW5	SSW7	SW9	SW9	SW8	SW7	SW6	SW6	SSW5	SW6	SW4	SW4	SSW3	SSW4	SSW5	SW7	SW7	SW6	W5	W8	WNW8	WNW8	SW5.6	SW9
11-Dec	WNW10	WNW10	WNW12	WNW12	WNW11	W12	WNW12	WNW11	W11	W12	WNW14	WNW15	WNW15	WNW13	WNW13	WNW11	WNW12	WNW13	WNW12	WNW12	WNW12	W11	W12	W14	WNW12.1	WNW15
12-Dec	WNW12	WNW12	WNW13	NW10	NNW9	NNW9	NW8	NW10	NW12	NW12	NW12	NW13	NW14	WNW13	WNW12	WNW12	NW12	NW10	NW12	NW9	NW10	NW11	NW11	NW12	NW11.1	NW14
13-Dec	NW14	NW13	NNW11	NNW11	NW11	NW12	NW13	NW13	NNW11	N7	NNW7	NNW9	NNW10	NNW9	NNW6	NNW7	NW8	NW8	NW9	NW8	WNW8	WNW11	WNW9	WNW9	WNW9.5	NW14
14-Dec	WNW8	NW9	NW7	NW9	NW7	WNW8	W7	WSW7	SW8	WSW8	W11	W13	W11	W11	WNW11	WNW10	WNW11	NW10	NNW7	NW6	NW6	NNW3	NNW2	NNW4	WNW7.2	W13
15-Dec	NW4	NW5	WNW7	NW8	NW7	NW8	NW9	NW8	NW7	NW8	NW7	NW8	NW9	NW10	NW10	NW9	WNW6	WNW9	WNW8	WNW9	WNW8	NW8	WNW7	NW7.7	NW10	
16-Dec	WNW9	NW9	NW8	NW7	NW7	NW6	NW6	NW5	NW4	WNW4	WNW4	WSW1	SW3	WSW3	W5	WSW5	SW6	SW8	SW9	SW9	SW8	WSW9	WSW8	SW7	W4.9	SW9
17-Dec	SW7	SW7	SW6	SW2	SW5	SW4	WSW3	WNW1	W1	W1	SSW4	SSW5	SSW6	SSW6	SSW6	S5	SSW7	SSW9	SSW10	SSW11	SSW11	SSW12	SSW13	SSW16	SSW6.4	SSW16
18-Dec	SSW16	SW16	SW15	SW15	SW13	SW11	SW9	SW10	SW10	SW12	WSW12	SW10	SW10	SW10	SW9	WSW6	NNE3	N4	NNW3	NW2	S3	SSE3	SSE2	SW6	SW7.7	SSW16
19-Dec	SW7	S6	SW7	SW9	SW10	SW11	SW13	SW13	SW14	WSW15	WSW15	WSW16	WSW18	W17	W18	WNW22	WNW25	WNW23	WNW20	WNW19	WNW16	WNW15	W13	W16	W12.9	WNW25
20-Dec	W16	W16	W16	W16	W14	WSW15	WSW14	SW13	SW14	SW14	SW14	SW13	WSW13	WSW13	WSW9	WSW7	SW9	SW10	WSW11	W15	W17	W16	W17	W16	WSW13.0	W17
21-Dec	WSW12	SW13	SW12	SW14	WSW14	WSW15	WSW15	SW15	SW17	SW17	SW17	SW18	WSW18	WSW19	WSW17	WSW17	WSW16	SW14	SW15	SW16	SW17	SW17	SW16	SW17	SW15.6	WSW19
22-Dec	SW17	SW17	SW15	SW14	SW15	WSW15	WSW14	WSW13	WSW13	W12	W12	WNW12	WNW10	NW7	NW5	WNW4	NNW3	NNE3	NW3	NNW4	NNE7	NNE9	NNE8	NNE7	W6.8	SW17
23-Dec	NNE7	NNE9	NE9	ENE7	NE9	NE6	NNE6	NE7	E5	NE8	NE8	NE7	NE6	ENE6	NE7	NE7	NE7	NE6	NE8	ENE8	ENE8	ENE7	E6	ENE6	NE6.8	NE9
24-Dec	ENE6	ENE6	E6	ENE5	ENE5	ENE3	ENE4	E3	E3	E2	ESE3	SE3	ESE3	SE4	SE4	SE3	SE4	SE4	SSE5	S4	S4	S2	S2	SE3	ESE2.9	ENE6
25-Dec	SE4	ESE3	SE5	SE4	E3	E3	ESE4	SE4	SSE5	SSE4	S5	S6	SSW5	S5	S5	S4	S5	S5	S6	SSW7	SSW8	SSW8	SSW8	SSW7	S4.5	SSW8
26-Dec	S6	SSW7	SSW8	SSW11	SSW12	SSW10	SSW10	SSW10	S12	SSW13	SSW14	SSW16	SSW18	SSW18	SSW16	SSW17	SSW18	SSW18	SSW20	SSW19	SSW20	SSW19	SSW19	SSW18	SSW14.4	SSW20
27-Dec	SSW17	SSW18	SSW19	SSW19	SSW20	SSW20	SSW20	SSW20	SSW21	SSW21	SSW21	SSW20	SSW18	SSW16	SSW16	SSW15	SSW15	SSW14	SSW14	SSW15	SSW13	SSW11	SSW10	WSW10	SSW16.6	SSW21
28-Dec	W13	W13	W12	W11	WNW11	WNW10	WNW11	NW10	NW11	NW9	NW11	NW11	WNW11	WNW10	WNW12	WNW8	WNW7	WNW10	WNW11	WNW11	WNW10	WNW9	WNW8	W8	WNW10.0	W13
29-Dec	WNW7	W7	WNW6	W6	WNW6	W10	W11	WSW9	SW8	SW9	SW9	WSW6	WNW6	SW7	SSW7	SSW6	SSW8	SSW7	SSW4	S3	ESE3	NE2	N3	NNW4	WSW4.6	W11
30-Dec	S2	SW1	WSW6	NNW3	NW7	NW8	WNW10	WNW13	W14	W14	W13	WSW12	W12	W11	W12	W10	WSW11	WSW13	WSW12	W13	W15	WNW13	WNW12	WNW12	W9.7	W15
31-Dec	WNW12	NW10	WNW11	NW9	NNW7	NNW7	NW7	NW8	NW7	NW8	NNW6	NNW7	NNW8	NNW7	NNW8	NNW8	NW7	NNW6	NW6	NNW7	WNW8	W11	WNW13	WNW15	NW8.0	WNW15

W6.0 W5.7 W5.9 W5.7 W5.8 W6.1 W6.2 W6.0 WSW6.2 W6.2 W6.0 W6.2 W6.2 W5.8 W5.8 W5.1 W5.0 W5.2 W5.5 W5.7 W5.6 W5.4 W5.7 W6.2	Diurnal Average
SW17 SSW18 SSW19 SSW19 SSW20 SSW20 SSW20 SSW20 SSW21 SSW21 SW21 SW20 WSW18 WSW19 W18 WNW22 WNW25 WNW23 WNW20 SSW19 SSW20 SSW19 SSW19 SSW18	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Stony Mountain - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	150	20.16	20.16
6 - 11	356	47.85	68.01
12 - 19	224	30.11	98.12
20 - 28	14	1.88	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Stony Mountain - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	5	4	5	9	7	12	6	18	19	19	7	4	4	11	15	150
6 - 11	1	7	13	8	2	0	0	1	19	50	60	14	15	46	94	26	356
12 - 19	0	0	0	0	0	0	0	0	1	27	43	35	31	31	56	0	224
20 - 28	0	0	0	0	0	0	0	0	0	8	2	0	0	4	0	0	14
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	12	17	13	11	7	12	7	38	104	124	56	50	85	161	41	744

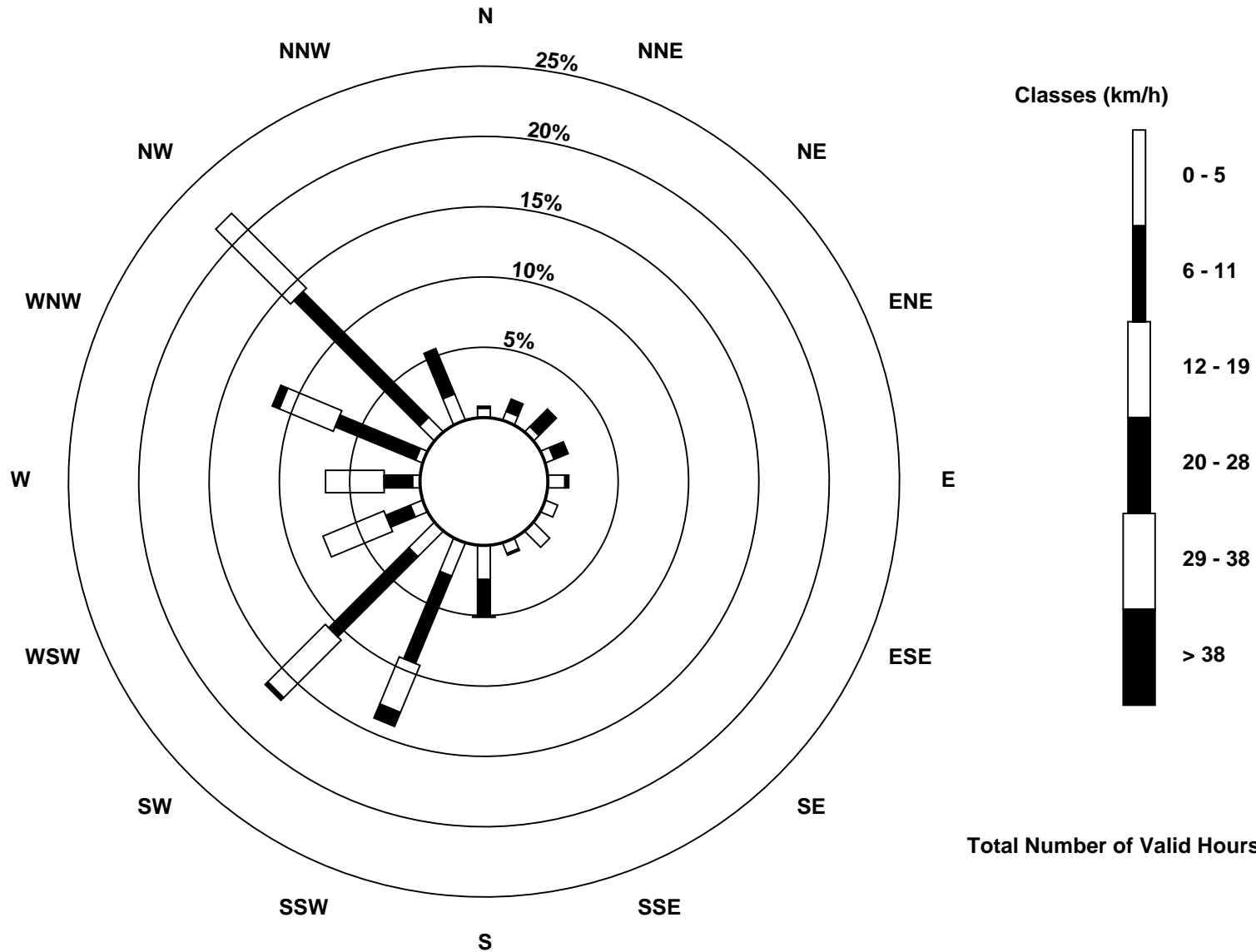
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Stony Mountain (AMS 18)



Total Number of Valid Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Stony Mountain - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 19 17:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 0 km/h on Dec 8 23:00																										
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 6																										
Day	Hourly Period Ending At (MST)																							Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24	
1-Dec	3	2	2	2	3	3	3	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	1	3	
2-Dec	2	1	1	2	2	2	2	2	2	2	2	2	3	2	2	3	2	3	3	3	3	3	3	3	3	3
3-Dec	3	3	3	4	4	4	4	3	4	4	3	3	3	3	2	2	2	2	2	2	2	3	3	3	4	
4-Dec	4	4	4	4	3	4	4	3	4	4	4	3	3	4	4	4	4	4	5	5	5	4	4	4	5	
5-Dec	4	4	5	4	5	5	4	4	4	5	5	4	5	4	4	3	4	4	5	4	4	4	4	4	5	
6-Dec	4	3	3	3	4	3	3	4	4	4	3	4	3	4	4	3	3	3	3	3	3	3	2	3	4	
7-Dec	3	2	3	2	2	3	2	2	3	3	3	3	3	2	2	2	1	2	2	2	1	2	2	1	3	
8-Dec	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	2	
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	
10-Dec	1	1	1	2	2	2	2	2	1	1	2	2	1	2	1	1	1	2	2	2	2	2	3	3	3	
11-Dec	3	3	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	3	4	4	5	
12-Dec	4	4	4	4	4	4	3	3	4	4	4	5	5	4	4	4	4	4	5	3	4	4	4	4	5	
13-Dec	5	5	5	5	4	4	5	5	4	3	3	4	4	4	3	3	2	2	2	2	3	3	3	3	5	
14-Dec	2	3	2	3	2	2	2	2	2	3	4	4	4	4	3	3	3	3	2	2	2	2	1	1	4	
15-Dec	1	1	2	2	2	3	3	3	2	2	2	4	4	4	3	3	3	2	3	3	2	2	3	2	4	
16-Dec	3	3	2	2	2	2	2	1	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	3	
17-Dec	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1	1	2	2	2	3	3	3	4	4	4	
18-Dec	4	4	4	4	3	3	2	3	3	3	3	3	3	3	2	3	1	1	1	1	1	1	2	2	4	
19-Dec	2	1	3	2	2	3	3	4	4	5	5	5	6	5	6	8	9	8	7	6	5	5	4	5	9	
20-Dec	5	5	5	5	4	4	4	3	3	4	3	4	4	4	3	2	2	2	3	5	5	5	5	5	5	
21-Dec	3	3	3	4	4	5	5	4	4	5	4	5	5	5	5	5	4	4	4	4	4	5	5	5	5	
22-Dec	5	5	4	4	4	5	4	4	4	4	4	4	3	2	2	1	1	1	1	1	3	3	3	2	5	
23-Dec	2	3	2	2	3	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	
24-Dec	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
25-Dec	1	1	1	1	1	1	1	2	1	1	2	2	1	2	2	1	1	1	2	2	2	2	2	2	2	
26-Dec	2	2	2	3	3	3	3	3	3	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
27-Dec	4	4	5	5	5	5	5	5	5	5	5	4	4	4	4	3	3	4	3	3	3	2	2	3	5	
28-Dec	4	4	3	3	3	3	3	4	4	4	4	3	4	4	4	3	2	3	3	3	4	3	2	2	4	
29-Dec	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	1	2	2	1	0	1	1	1	1	3	
30-Dec	1	1	3	1	2	2	2	3	4	4	4	4	4	3	4	4	3	4	3	4	4	4	4	4	4	
31-Dec	4	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3	2	2	3	3	3	4	4	5	5	
Diurnal Maximum																										
5 5 5 5 5 5 5 5 5 5 5 5 6 5 6 8 9 8 7 6 5 5 5 5 5																										



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Stony Mountain - December 2016

Direction of Maximum Speed: 298 deg on Dec 19 17:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 214.8 deg on Dec 27		Hours of Data:	744
Direction of Minimum Speed: 14 deg on Dec 8 16:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 1.8 deg on Dec 8		Percent Operational Time:	100.0
Monthly Average Direction: 273.2 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	200	214	216	214	208	221	219	210	207	215	234	231	225	225	220	207	218	220	213	225	212	211	219	231	216.5
2-Dec	247	216	202	206	206	198	195	192	184	193	188	177	170	187	185	174	165	173	174	177	182	176	178	185	186.3
3-Dec	184	190	193	208	211	204	209	209	208	210	208	213	216	217	211	212	214	219	222	229	224	222	233	239	212.9
4-Dec	247	243	240	240	239	246	257	257	269	308	324	316	325	339	326	325	315	317	317	316	320	321	323	323	292.8
5-Dec	321	320	319	318	320	318	319	317	315	316	316	314	314	306	306	307	309	311	310	314	315	315	311	309	314.3
6-Dec	307	310	310	311	312	311	313	311	309	309	309	315	320	322	321	317	321	323	326	326	328	328	318	320	315.8
7-Dec	322	320	318	320	317	316	316	311	307	313	318	323	323	325	319	324	336	323	323	323	328	325	331	321	319.8
8-Dec	321	323	339	336	332	342	356	8	9	30	43	40	30	339	324	14	126	91	89	106	93	52	59	117	25.6
9-Dec	161	183	200	213	241	256	193	232	221	217	209	219	207	203	193	198	188	189	206	216	214	207	209	210	206.9
10-Dec	212	215	210	207	215	218	224	224	221	214	212	216	228	236	213	192	198	219	224	225	270	281	282	282	227.9
11-Dec	288	290	285	283	285	278	283	284	279	281	295	285	289	291	290	288	284	287	287	286	286	281	278	279	285.2
12-Dec	283	287	297	312	328	336	326	317	314	311	308	312	316	299	298	297	304	315	319	324	314	317	306	304	309.2
13-Dec	304	317	330	329	324	325	321	317	329	353	348	343	339	338	339	328	312	308	313	307	299	300	303	303	321.0
14-Dec	299	306	311	305	304	299	267	240	216	243	261	272	271	280	289	296	300	314	327	321	320	332	340	328	289.6
15-Dec	311	305	295	314	322	317	311	312	317	316	318	316	318	320	314	307	313	301	293	300	299	299	307	297	309.4
16-Dec	298	305	307	309	310	315	317	318	310	296	295	255	232	254	276	237	227	225	224	227	230	238	239	236	267.9
17-Dec	219	224	221	224	220	228	241	302	259	281	211	213	207	201	195	187	200	206	206	208	205	205	205	208	209.8
18-Dec	212	216	220	218	221	232	229	231	231	229	237	228	226	236	230	249	29	8	335	323	182	161	159	225	226.8
19-Dec	225	190	224	218	214	215	221	223	225	241	244	252	256	259	276	292	298	298	293	290	282	283	271	268	262.1
20-Dec	264	263	268	269	262	251	240	233	227	233	228	235	237	240	244	237	231	236	254	274	277	277	272	264	252.8
21-Dec	239	227	227	229	241	254	253	234	235	225	222	233	238	239	240	237	237	230	225	229	227	234	231	231	234.1
22-Dec	234	235	229	232	235	246	253	253	254	260	278	286	296	304	305	290	334	15	322	330	28	32	26	21	266.6
23-Dec	29	29	53	57	42	49	29	46	95	48	51	42	52	72	56	46	50	45	50	66	68	70	85	78	53.3
24-Dec	69	76	84	76	71	73	59	89	82	88	116	133	123	131	140	135	131	144	153	179	179	184	172	135	112.0
25-Dec	143	118	126	127	87	90	119	146	158	168	179	186	197	169	183	170	170	175	187	195	196	194	198	194	171.3
26-Dec	181	193	200	206	207	198	194	196	189	196	197	196	203	197	200	194	201	198	201	200	200	198	202	202	198.5
27-Dec	198	196	201	208	212	211	211	211	214	213	216	217	215	216	222	218	220	222	220	224	228	225	230	248	214.8
28-Dec	272	277	279	281	282	288	298	317	320	320	316	308	301	295	303	300	295	293	290	292	298	296	286	280	294.8
29-Dec	285	277	286	278	289	271	277	253	224	231	223	245	287	215	205	195	205	209	213	174	105	39	4	341	248.0
30-Dec	173	220	247	344	317	306	291	282	279	271	266	252	269	260	271	268	251	248	237	261	277	285	292	291	271.6
31-Dec	300	304	300	314	329	328	324	312	312	323	343	345	336	336	337	330	320	334	322	332	286	277	282	298	314.0

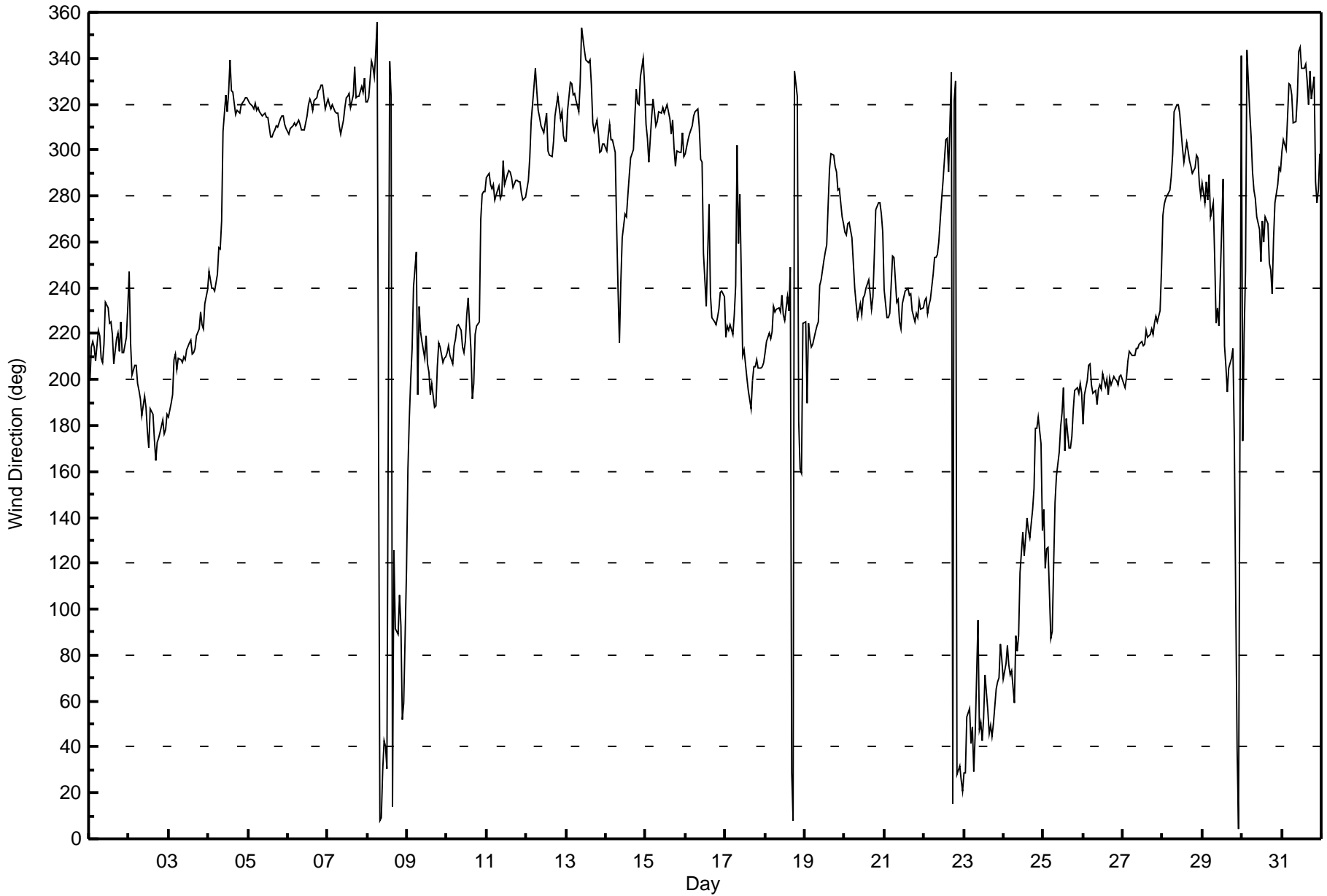
259.6 261.4 259.3 262.2 264.2 265.4 265.6 261.5 255.1 259.6 261.3 264.0 267.3 262.7 266.9 265.0 264.0 265.8 263.3 263.9 263.9 267.3 265.3 265.3
 Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Stony Mountain - December 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Stony Mountain - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 93 deg on Dec 16 12:00 Minimum Value: 10 deg on Dec 17 05:00 Percentiles: P ₁ = 13 P ₁₀ = 16 Q ₁ = 18 Median = 21 Q ₃ = 23 P ₉₀ = 27 P ₉₉ = 61		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	26	24	25	24	26	26	24	23	21	25	26	25	27	27	25	23	21	20	19	22	20	19	22	22	27	
2-Dec	25	20	18	22	22	23	24	26	28	23	25	27	32	29	28	27	28	28	28	30	30	27	25	24	32	
3-Dec	25	26	24	24	23	23	23	23	20	20	20	21	20	19	21	19	20	18	18	17	17	17	18	20	26	
4-Dec	22	22	21	21	22	21	24	24	23	27	25	22	25	31	27	26	21	21	21	21	21	21	21	23	31	
5-Dec	21	20	22	21	21	22	22	21	20	21	22	20	22	22	20	23	21	19	20	22	21	20	19	20	23	
6-Dec	19	19	19	19	19	19	19	19	20	20	19	20	22	23	21	22	21	21	20	19	20	20	18	18	23	
7-Dec	18	17	16	14	14	15	15	16	16	15	16	20	24	22	20	17	17	16	14	14	15	16	22	16	24	
8-Dec	14	21	24	22	23	23	22	17	16	22	19	45	59	67	49	38	39	13	13	16	33	21	16	21	67	
9-Dec	22	13	14	12	23	53	77	22	15	12	16	21	25	26	25	15	12	13	15	16	18	16	15	15	77	
10-Dec	16	18	16	17	19	19	20	21	17	17	20	24	28	28	24	14	15	16	17	19	29	22	22	22	29	
11-Dec	22	22	21	23	21	23	23	22	24	24	26	23	22	23	23	21	21	22	21	20	20	21	21	20	26	
12-Dec	20	20	21	24	30	29	23	19	20	19	23	22	23	23	22	23	21	23	26	26	23	23	21	24	30	
13-Dec	23	25	28	29	26	25	24	23	31	30	33	31	34	32	32	23	16	18	17	19	21	20	20	21	34	
14-Dec	21	21	22	21	22	22	25	25	17	30	25	22	23	22	22	18	19	19	22	17	16	26	20	17	30	
15-Dec	23	18	18	20	24	20	19	19	17	15	19	21	24	25	20	20	18	18	20	19	19	19	20	20	25	
16-Dec	20	19	19	17	18	15	15	14	15	15	19	93	46	54	22	20	15	15	15	16	16	19	18	16	93	
17-Dec	13	12	13	63	10	18	22	51	41	42	19	18	21	21	18	19	17	17	17	18	18	19	20	18	63	
18-Dec	18	18	17	17	19	19	17	18	20	20	20	22	21	21	19	36	33	23	36	50	36	46	62	41	62	
19-Dec	26	13	37	17	18	18	21	20	24	23	24	24	25	24	24	22	23	23	22	22	22	20	23	24	37	
20-Dec	23	23	24	23	23	25	20	19	17	19	19	20	24	22	25	18	15	19	22	20	20	21	22	22	25	
21-Dec	22	16	17	18	21	25	26	18	19	18	20	22	22	22	21	20	21	19	19	19	19	21	22	22	26	
22-Dec	22	22	20	22	21	23	24	23	23	23	23	22	20	20	20	25	27	33	27	26	27	21	23	20	33	
23-Dec	19	20	17	21	19	19	18	22	22	22	19	22	23	22	20	19	17	17	16	18	15	15	17	21	23	
24-Dec	17	18	17	14	16	24	20	26	27	52	32	32	24	19	22	18	20	14	19	18	15	16	31	17	52	
25-Dec	17	22	16	16	22	27	19	13	15	21	21	28	24	26	26	21	15	13	19	18	19	19	20	19	28	
26-Dec	21	19	18	18	19	21	21	20	20	20	20	20	20	20	20	19	19	18	17	17	17	17	17	17	21	
27-Dec	16	16	17	18	17	17	17	17	16	16	16	16	16	16	17	17	17	18	15	16	17	17	16	23	23	
28-Dec	24	20	22	22	20	21	22	25	22	25	23	21	22	23	23	21	23	21	20	23	22	20	21	20	25	
29-Dec	20	21	23	25	24	23	21	25	19	17	21	33	24	27	16	15	16	13	16	22	28	40	46	23	46	
30-Dec	64	85	34	36	12	15	16	18	19	21	23	25	26	25	23	24	22	22	20	26	22	22	19	20	85	
31-Dec	21	21	20	19	26	24	22	19	18	21	32	29	27	29	30	26	20	31	27	32	18	23	20	23	32	
		64	85	37	63	30	53	77	51	41	52	33	93	59	67	49	38	39	33	36	50	36	46	62	41	
		Diurnal Maximum																								



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	14:30
Gas Cert Reference	LL110090	Station temp.	22 Deg C
Cal Gas Concentration	49.4 ppm	Cal Gas Exp Date	February 16, 2019
Calibrator Make/Model	API T700	Serial Number	1222
ZAG Make/Model	API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11041

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-601	-601
Analyzer IP address	192.168.1.43		Lamp voltage	898	898
Calculated slope	0.998873	1.000396	Chamber temp	45.0	45.0
Calculated intercept	1.098186	1.194096	Pressure	672.0	672.0
Analyzer Background	21.3	20.9	Flow	0.384	0.384
Analyzer Coefficient	0.890	0.889	Intensity	86	86

Analyzer make Thermo 43i Analyzer serial # JC1501301453

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.5	----
as found span	5000	58.9	581.9	580.6	1.002
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	58.9	581.9	581.1	1.001
second point	5000	29.5	291.5	289.4	1.007
third point	5000	14.7	145.2	143.1	1.015
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	58.9	581.9	582.1	1.000
Average Correction Factor					1.008

Corrected As found 580.1 Previous response 581.5 % change 0.2%

Notes:

Disregard first span point as the as found span point, operator error in input of span concentration in the calibrator. Second span point is the as found span. Span adjusted slighter after as founds. No issues with calibration, cal passes. Noted that lamp voltage is getting a little high and intensity is starting to drop slightly, some maintenance may be required in the near future.

Calibration Performed By: Zack Eastman



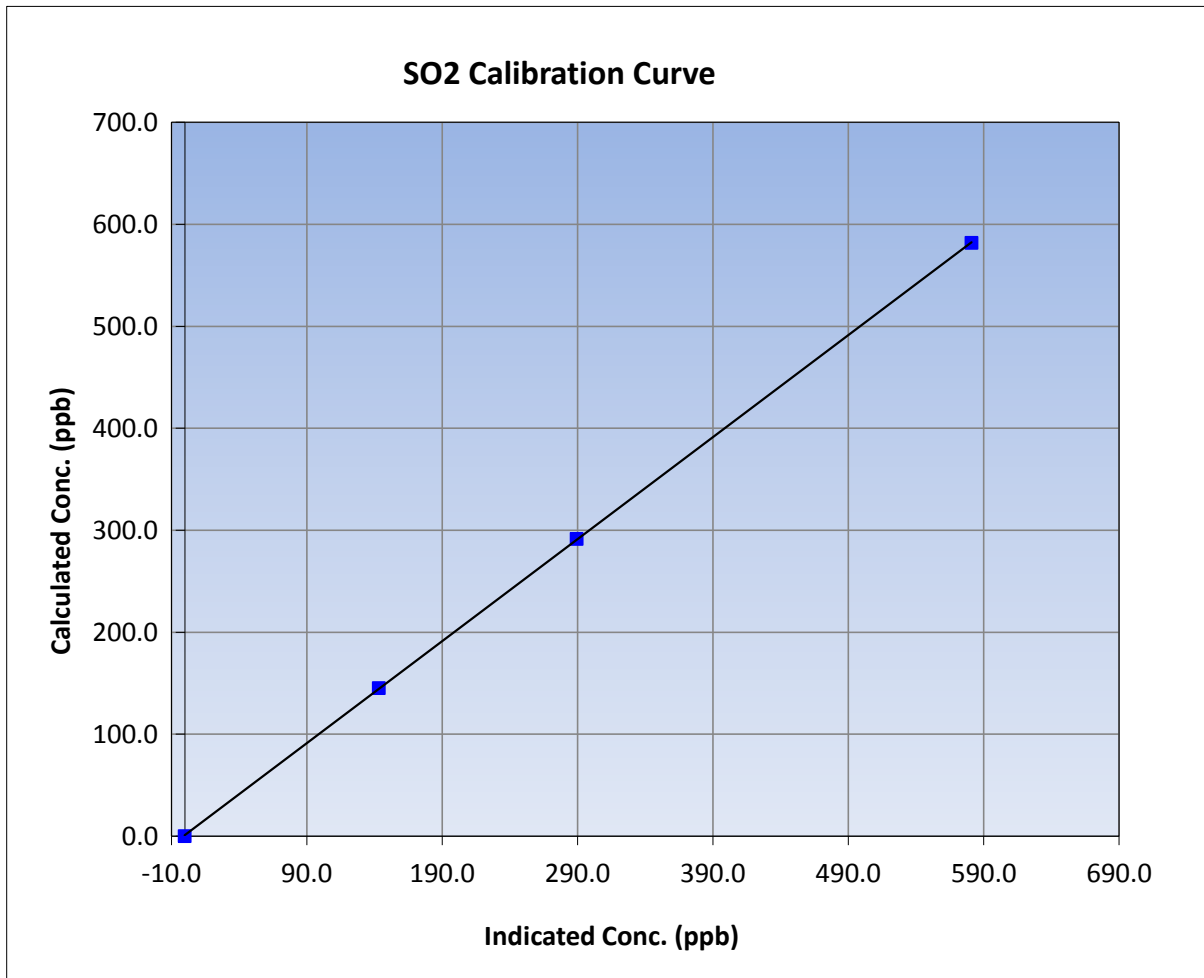
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301453

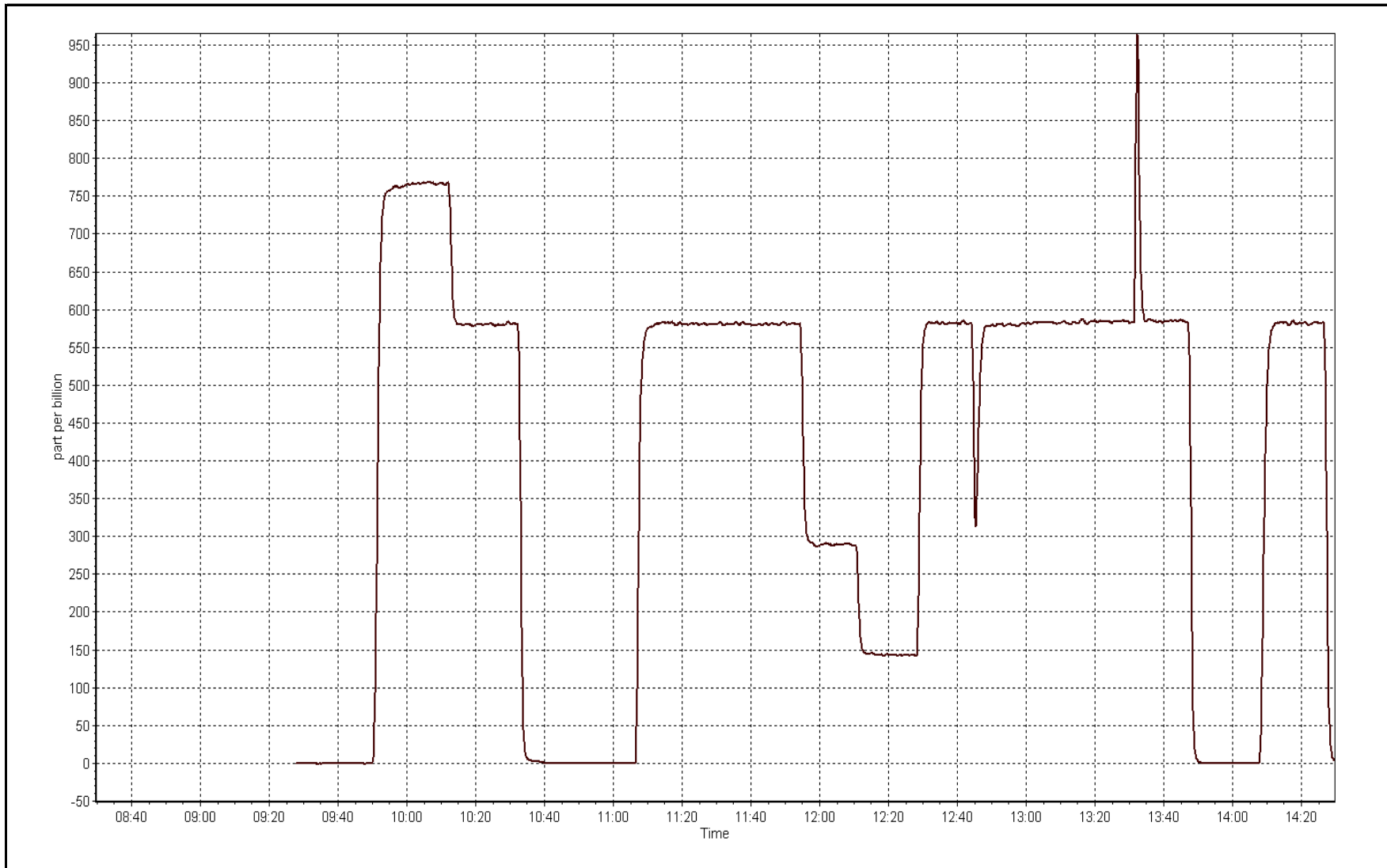
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999985
581.9	581.1	1.0014		
291.5	289.4	1.0071	Slope	1.000396
145.2	143.1	1.0149		
			Intercept	1.194096



SO2 Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 8, 2016	Last Calibration	November 25, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	12:40	End Time (MST)	16:00
Gas Cert Reference	CC233389	Station temp.	22 Deg C
Cal Gas Concentration	4.88 ppm	Cal Gas Exp Date	10/6/2014
Calibrator Make/Model	API 700	Serial Number	1222
Dil air Make/Model	API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11041
SO2 gas concentration	49.4 ppm	SO2 gas cert/exp	LL11090 16/Feb/19

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-698	-698
Analyzer IP address	192.168.1.44		Lamp voltage	1018	1018
Calculated slope	1.010886	0.998922	Chamber temp	45	45
Calculated intercept	-0.191852	-0.328995	Pressure	651.6	651.6
Analyzer Background	2.78	2.79	Flow	0.421	0.421
Analyzer Coefficient	1.065	1.078	Intensity	91	91
			Converter temp.	800	800

Analyzer make/model	Thermo 43i-TLE	Analyzer serial #	1336160090
Converter make/model	CDN-101	Converter serial #	522

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	82.0	80.0	77.7	1.030
SO2 scrubber check	5000	10.0	98.8	0.4	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	82.0	80.0	80.2	0.998
second point	5000	41.1	40.1	40.9	0.981
third point	5000	20.6	20.1	20.6	0.976
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	82.0	80.0	80.5	0.994
Average Correction Factor					0.985

Corrected As found	77.7	Previous response	79.4	% change	2.2%
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Notes:

Span adjusted only after as founds. Slight drift in span required a second span adjustment. Cal passes but with slightly high response for each point.

Calibration Performed By:

Zach Eastman



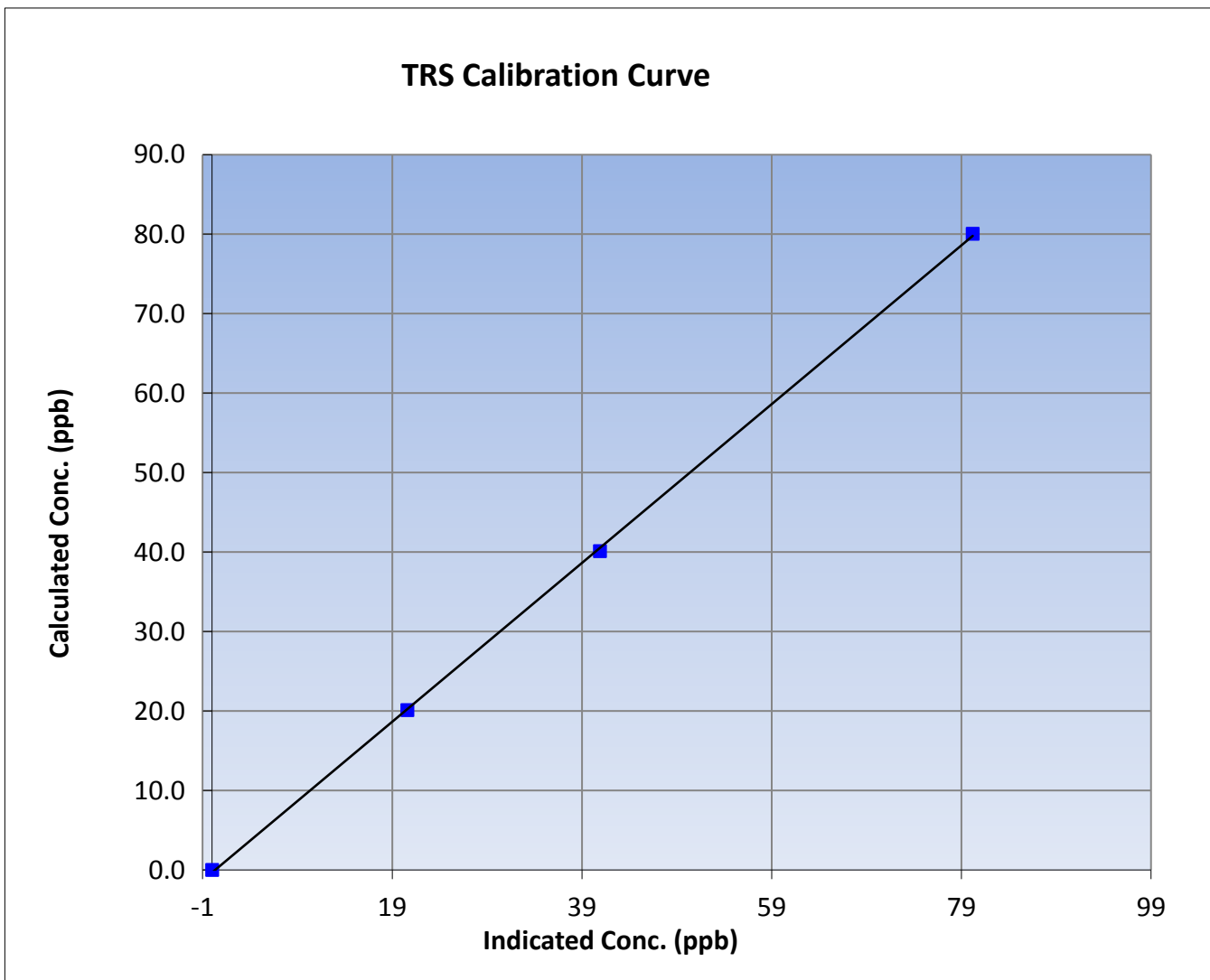
Wood Buffalo Environmental Association TRS Calibration Report

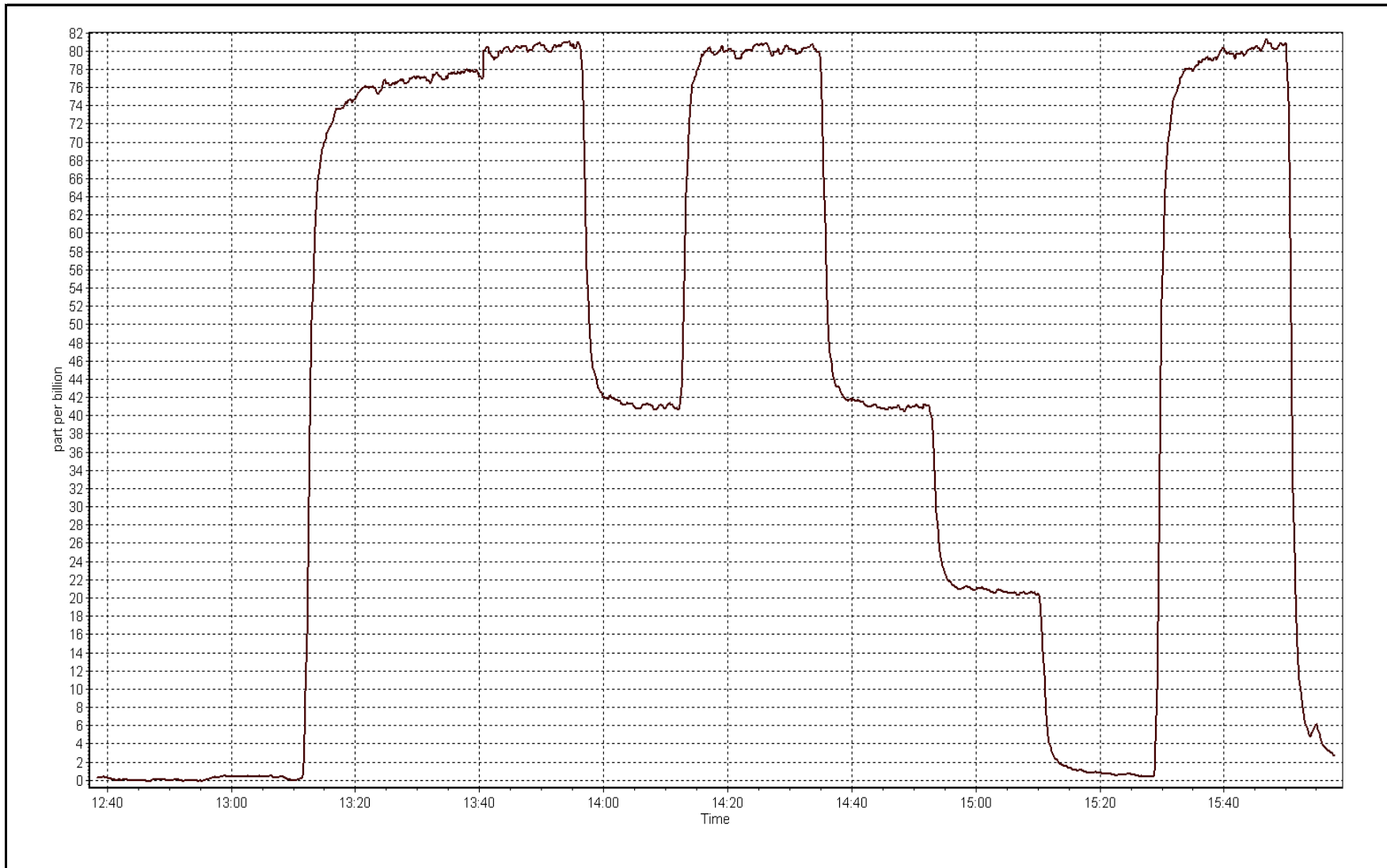
Station Information

Calibration Date	December 8, 2016	Previous Calibration	November 25, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	12:40	End Time (MST)	16:00
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1336160090

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999901
80.0	80.2	0.9979		
40.1	40.9	0.9808	Slope	0.998922
20.1	20.6	0.9760		
			Intercept	-0.328995







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	14:30
Gas Cert Reference	LL110090	Cal Gas Expiry Date	February 16, 2019
CH4 Cal Gas Conc.	491.0 ppm	CH4 Equiv Conc.	1041.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	22 Deg C
Calibrator Model	API T700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	Serial Number	11041

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.999861	0.997981	Carrier Pressure	30.9	30.9
THC Calc intercept	0.022097	0.032147	Fuel Pressure	44.3	44.3
NMHC Calc slope	0.997609	0.997774	Air Pressure	34.4	34.4
NMHC Calc intercept	0.012016	0.014043			

Analyzer make Thermo 55i Analyzer serial # 1505164831

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	58.9	12.26	12.46	0.984
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.9	12.26	12.28	0.999
second point	5000	29.5	6.14	6.08	1.010
third point	5000	14.7	3.06	3.02	1.013
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.9	12.26	12.32	0.995
Average Correction Factor					1.007

Corrected As found 12.46 Previous response 12.24 % change -1.7%

Notes:

H2 changed after as founds. Disregard the first span point as the as found span point. Operator error in input of span concentration in the calibrator. Second span point is the as found span. Span adjusted after as founds and by change. No other issues with calibration, cal passes.

Calibration Performed By: Zach Eastman



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	58.9	6.48	6.56	0.988
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.9	6.48	6.49	0.998
second point	5000	29.5	3.25	3.22	1.008
third point	5000	14.7	1.62	1.60	1.011
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.9	6.48	6.53	0.992
Average Correction Factor					1.006

Corrected As found 6.56 Previous response 6.48 % change -1.2%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	58.9	5.78	5.90	0.980
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.9	5.78	5.79	0.999
second point	5000	29.5	2.90	2.86	1.013
third point	5000	14.7	1.44	1.42	1.017
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.9	5.78	5.79	0.999
Average Correction Factor					1.009

Corrected As found 5.90 Previous response 5.76 % change -2.4%



Wood Buffalo Environmental Association

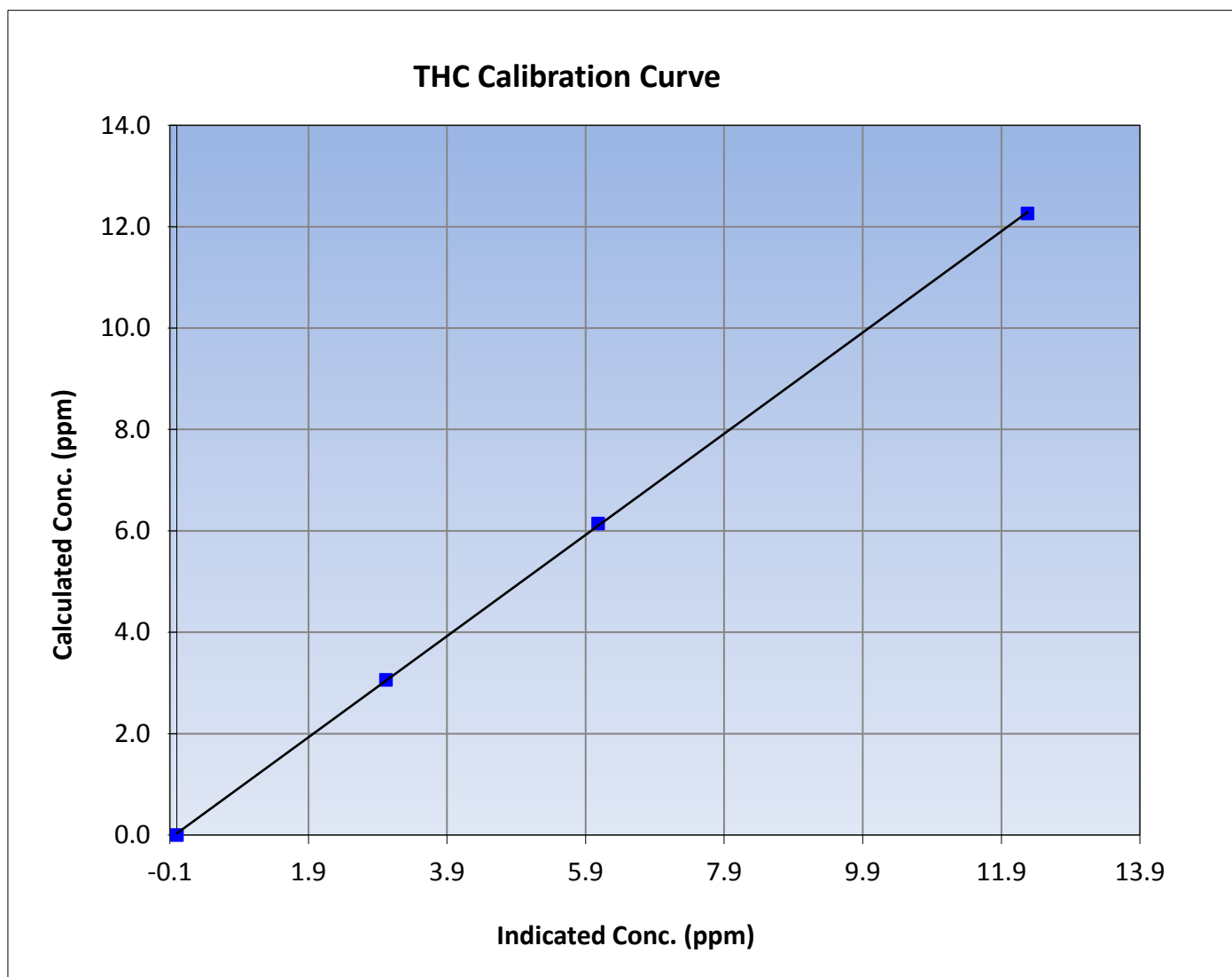
THC Calibration Summary

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1505164831

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999956
12.26	12.28	0.9986		
6.14	6.08	1.0102	Slope	0.997981
3.06	3.02	1.0134		
			Intercept	0.032147





Wood Buffalo Environmental Association

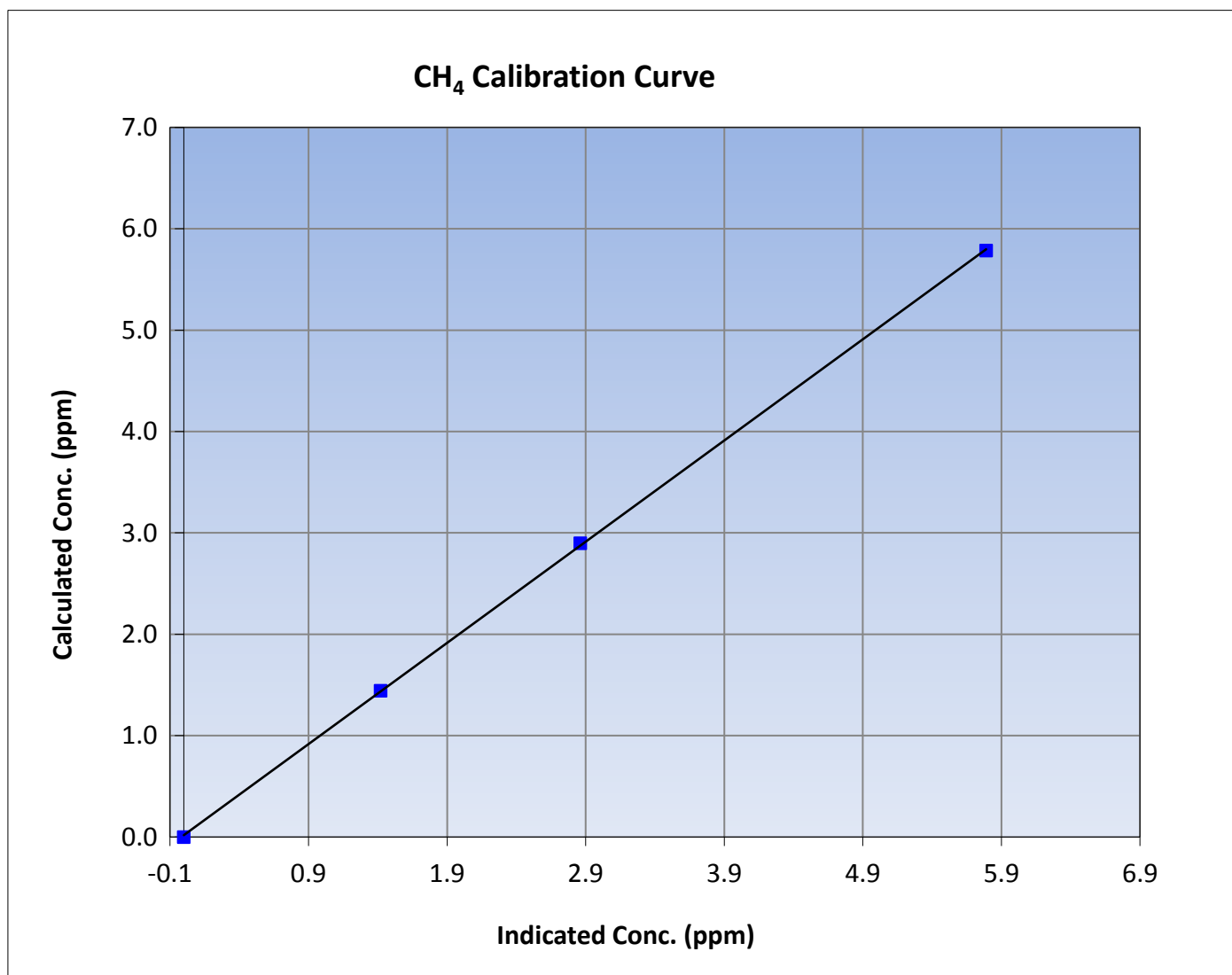
CH₄ Calibration Summary

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1505164831

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999937
5.78	5.79	0.9990		
2.90	2.86	1.0129	Slope	0.998209
1.44	1.42	1.0166		
			Intercept	0.018114





Wood Buffalo Environmental Association

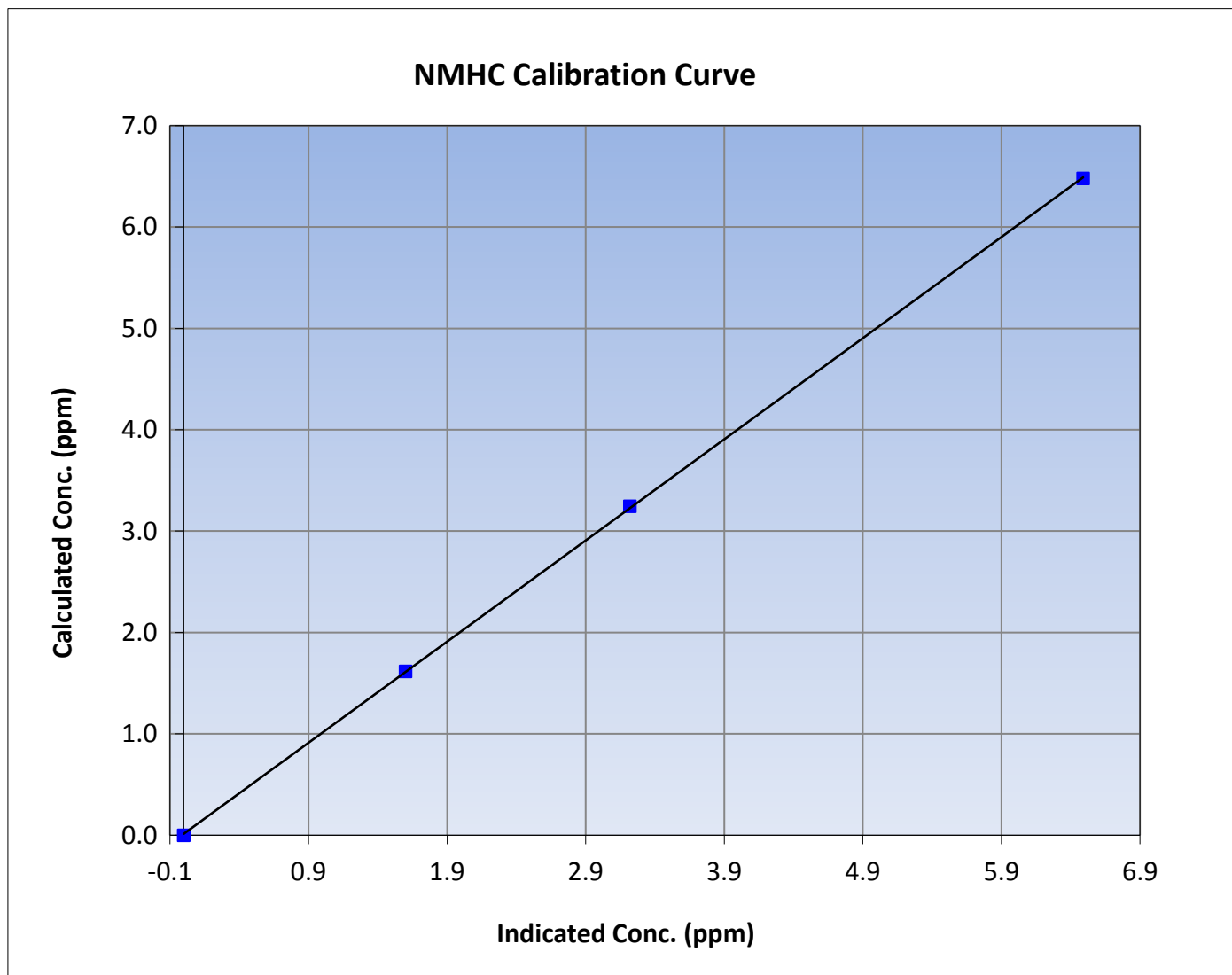
NMHC Calibration Summary

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1505164831

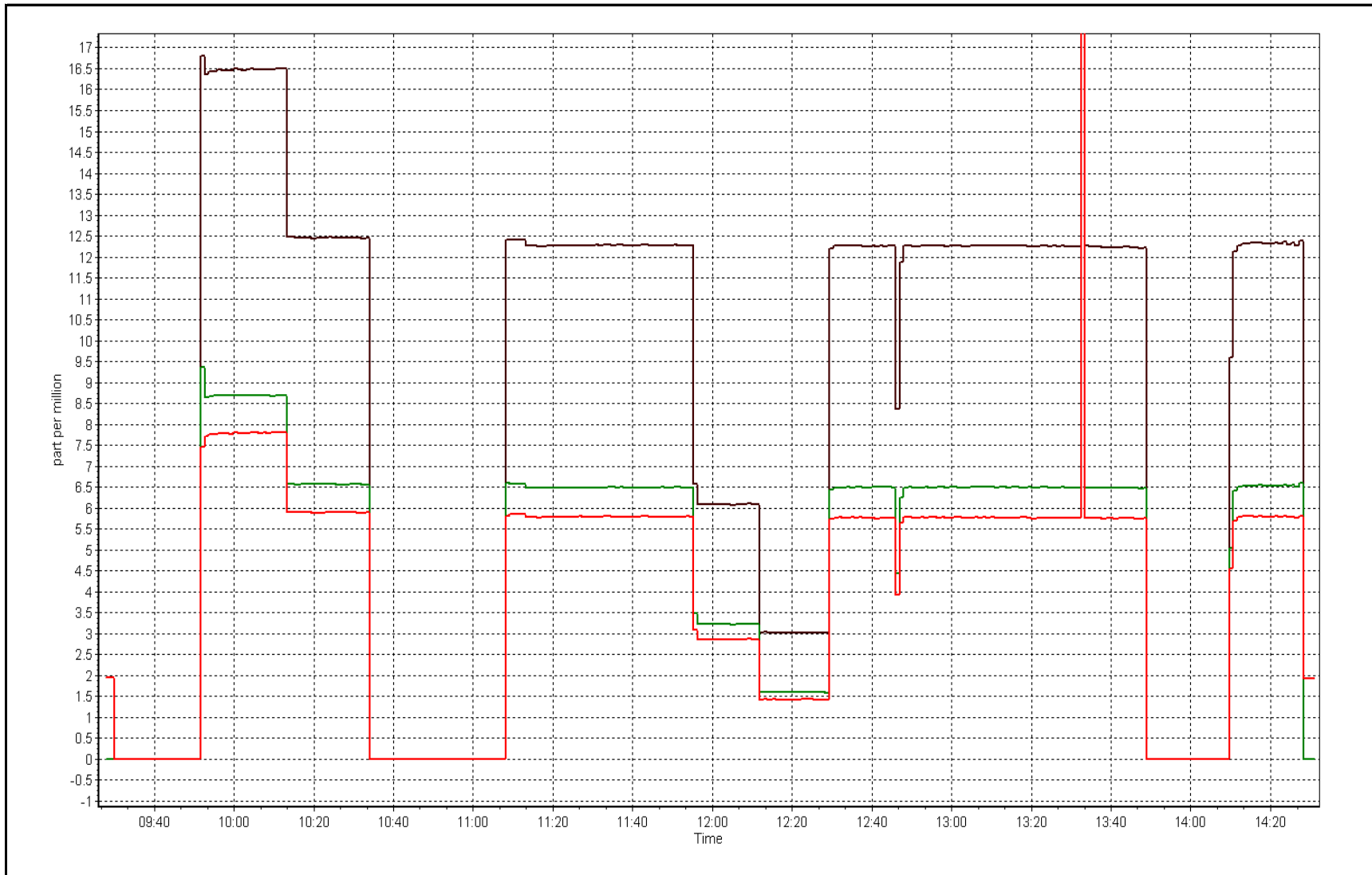
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999970
6.48	6.49	0.9983		
3.25	3.22	1.0078	Slope	0.997774
1.62	1.60	1.0106		
			Intercept	0.014043



THC Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 28, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	14:29	End Time (MST)	17:30
NO2 GPT Ref date	December 07 2016	Transfer Standard	GPT
		Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	Serial Number	11041

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.0	26.0
Analyzer IP address	192.168.1.48		Lamp temp.	53.0	53.0
Calculated slope	0.993185	1.001355	Pressure	628.0	628.0
Calculated intercept	-0.783730	0.110853	Flow cell A	0.699	0.699
Analyzer Background	-2.3	-2.1	Flow cell B	0.697	0.697
Analyzer Coefficient	1.403	1.377	Cell A Intensity	65xxx	65xxx
			Cell B Intensity	66xxx	66xxx

Analyzer make	Thermo 49i	Analyzer serial #	1501663733
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp O3 Gen Drive	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	-0.5	----
as found span	5000	1082	399.3	404.9	0.986
calibrator zero	5000	0.00	0.0	0.0	----
high point	5000	1083	399.3	398.9	1.001
second point	5000	975	271.5	270.6	1.003
third point	5000		139.8	139.6	1.001
as left zero	5000	0.00	0.0	-1.0	----
as left span	5000		399.3	402.0	0.993
Average Correction Factor					1.002

Corrected As found	405.4	Previous response	402.8	% change	-0.6%
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Notes:

Zero and span adjusted after as founds. Calibration passed.

Calibration Performed By: Zach Eastman



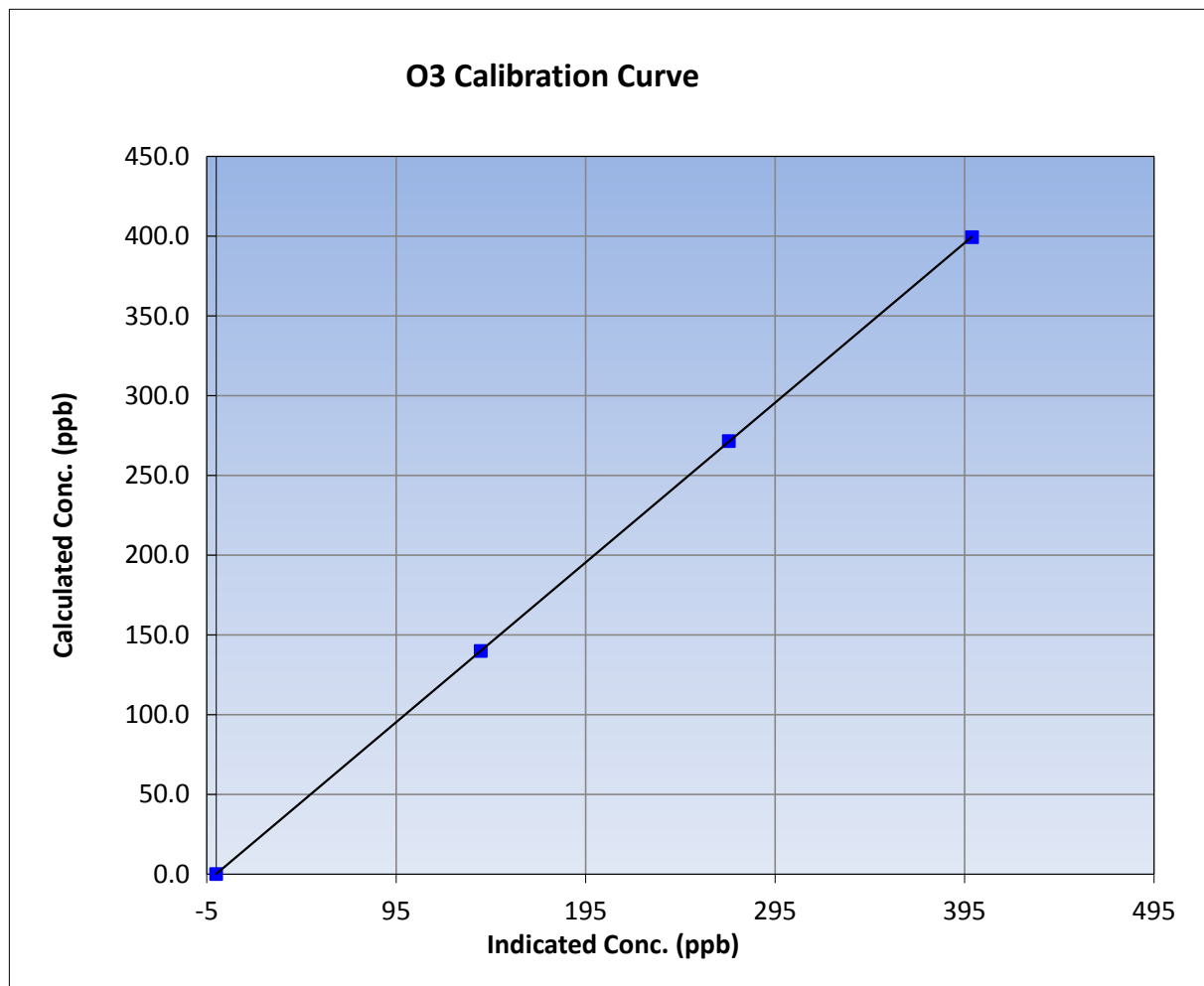
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	Wednesday, December 07, 2016	Previous Calibration	November 28, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	14:29	End Time (MST)	17:30
Analyzer make	Thermo 49i	Analyzer serial #	1501663733

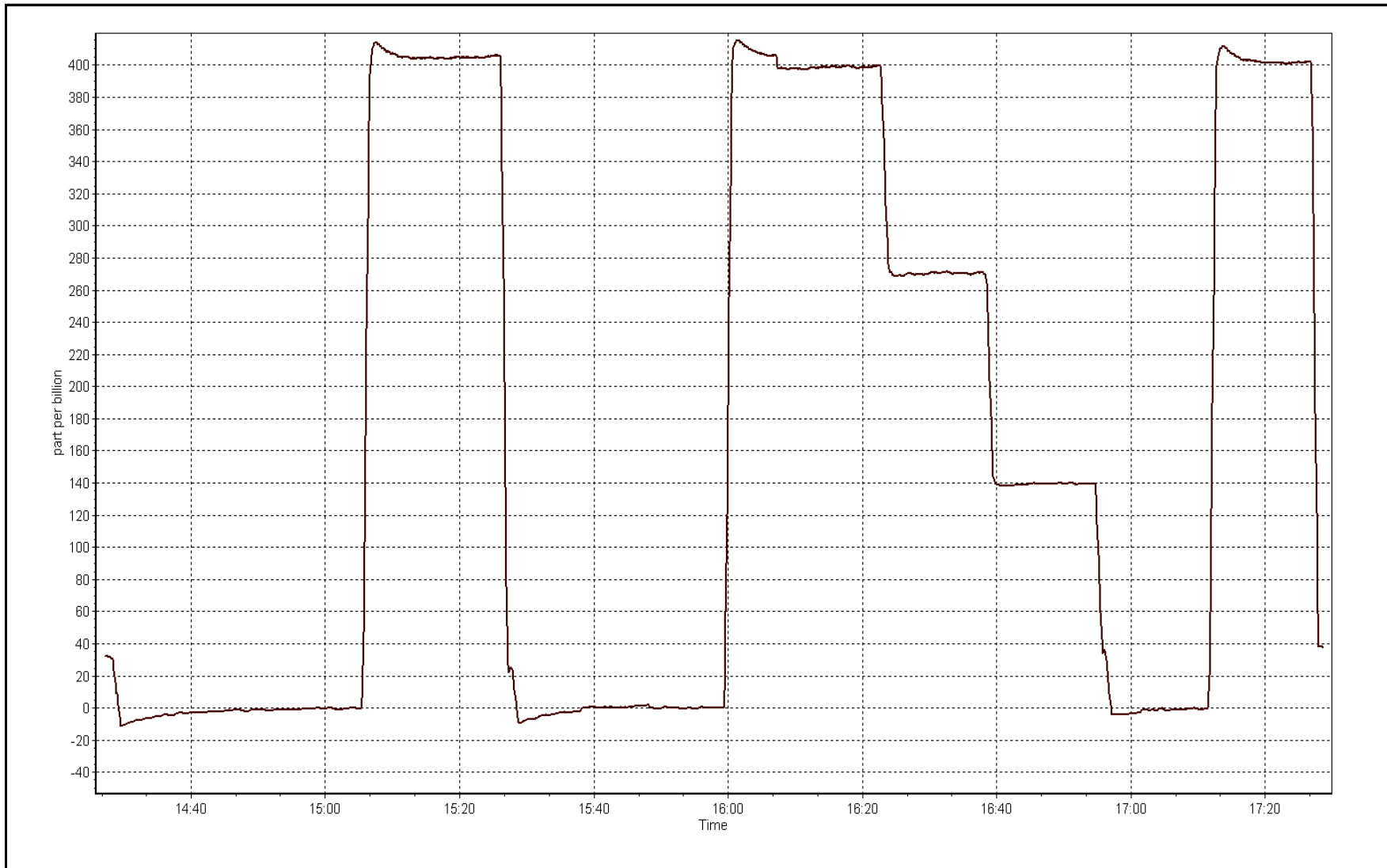
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
399.3	398.9	1.0010		
271.5	270.6	1.0033	Slope	1.001355
139.8	139.6	1.0014		
			Intercept	0.110853



O3 Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	14:30
NO Cal Gas Conc	50.9 ppm	Gas Cert Reference	LL110090
NOx Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	February 16, 2019
Calibrator	API T700	Serial Number	1222
Zero air Generator	Teledyne API T701	Serial Number	5610

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11041
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999993	1.000654	0.997310
	Data Offset	0.853757	1.176194	-0.977375
Current Calibration	Data Slope	0.996628	0.998457	1.001591
	Data Offset	0.670099	0.803728	-0.783057

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1336160088
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Test Point	before		after	
Concentration range	0-1000	ppb	0-1000	ppb
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.022		0.965	
NOx coefficient	0.998		0.999	
NO2 coefficient	0.999		1.000	
NO bkgnd	1.8		1.7	
NOx bkgnd	1.9		1.8	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	323	Deg C	323	Deg C
PMT voltage	-813.6	V	-813.6	V
PMT Temp	-2.9	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	150.9	mmHg	204	mmHg
R Cell Press Nox	150.9	mmHg	204	mmHg
NO sample flow	0.951	lpm	0.732	lpm
Nox sample Flow	0.953	lpm	0.732	lpm

Notes:

Sample pump changed after as founds. Disregard first as found span point, operator error in input concentration in the calibrator. Second span point is the as found span. Span adjusted after as founds and pump change. NO coefficient is on the high side after span adjustment, PMT adjusted to correct. Due to slight drift during GPT, second GPT ref points used. Cal passes with first set but results are better with the second set. No other issues noted with calibration.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

December 7, 2016

Station Number:

AMS 18

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.3	-0.1	----	----
as found span	5000	58.9	599.6	599.6	0.0	598.9	598.5	0.4	1.001	1.002
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
high point	5000	58.9	599.6	599.6	0.0	601.2	600.1	1.1	0.997	0.999
second point	5000	29.5	300.3	300.3	0.0	300.3	299.4	0.9	1.000	1.003
third point	5000	14.7	149.6	149.6	0.0	149.2	148.7	0.5	1.003	1.006
as left zero	5000	0.0	0.0	0.0	0.0	0.4	0.4	0.0	----	----
as left span	5000	58.9	599.6	210.3	389.3	609.5	205.3	404.2	0.984	1.024
Average Correction Factor									1.000	1.003

Corrected As found
Previous Response

NO_x= 599.3
NO_x= 598.8

NO= 598.8
NO= 598.0

Percent Change

NO_x= -0.1%

NO= -0.1%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 58.90 ccm NOx ref calc conc = 599.6 ppb NO ref calc conc = 599.6 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	610.4	609.6	-0.1	0.9823	0.9836	----	----
1st NO2 (300)	210.3	399.3	608.8	210.3	398.5	0.9849	----	1.0020	99.8%
2nd NO2 (200)	338.1	271.5	610.8	338.1	272.8	0.9817	----	0.9952	100.5%
3rd NO2 (100)	469.8	139.8	611.0	469.8	141.2	0.9813	----	0.9901	101.0%
2nd NO ref point		0.0	610.4	609.6	0.7	0.9823	0.9836	----	----
Average Correction Factor						0.9826		0.9958	100.4%

Calibration Performed By: Zach Eastman



Wood Buffalo Environmental Association

NO_x Calibration Summary

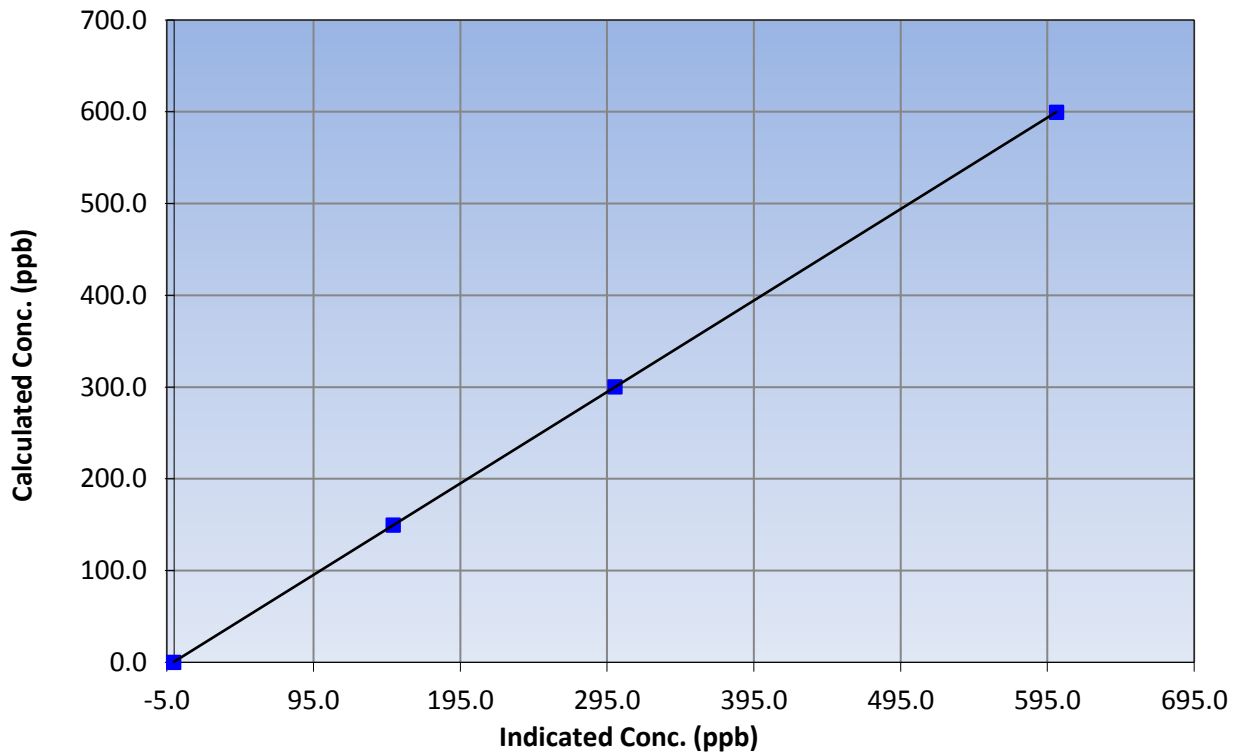
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999998
599.6	601.2	0.9973		
300.3	300.3	1.0000	Slope	0.996628
149.6	149.2	1.0029		
			Intercept	0.670099

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

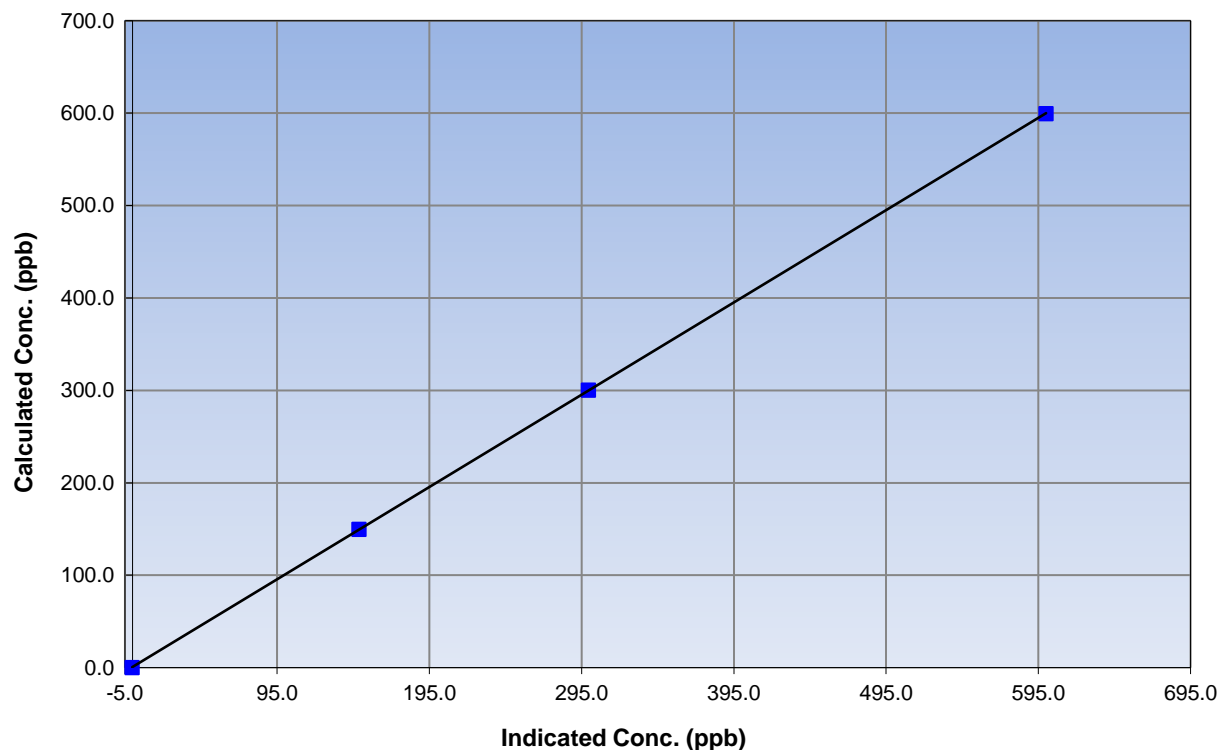
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999995
599.6	600.1	0.9992		
300.3	299.4	1.0030	Slope	0.998457
149.6	148.7	1.0064		
			Intercept	0.803728

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

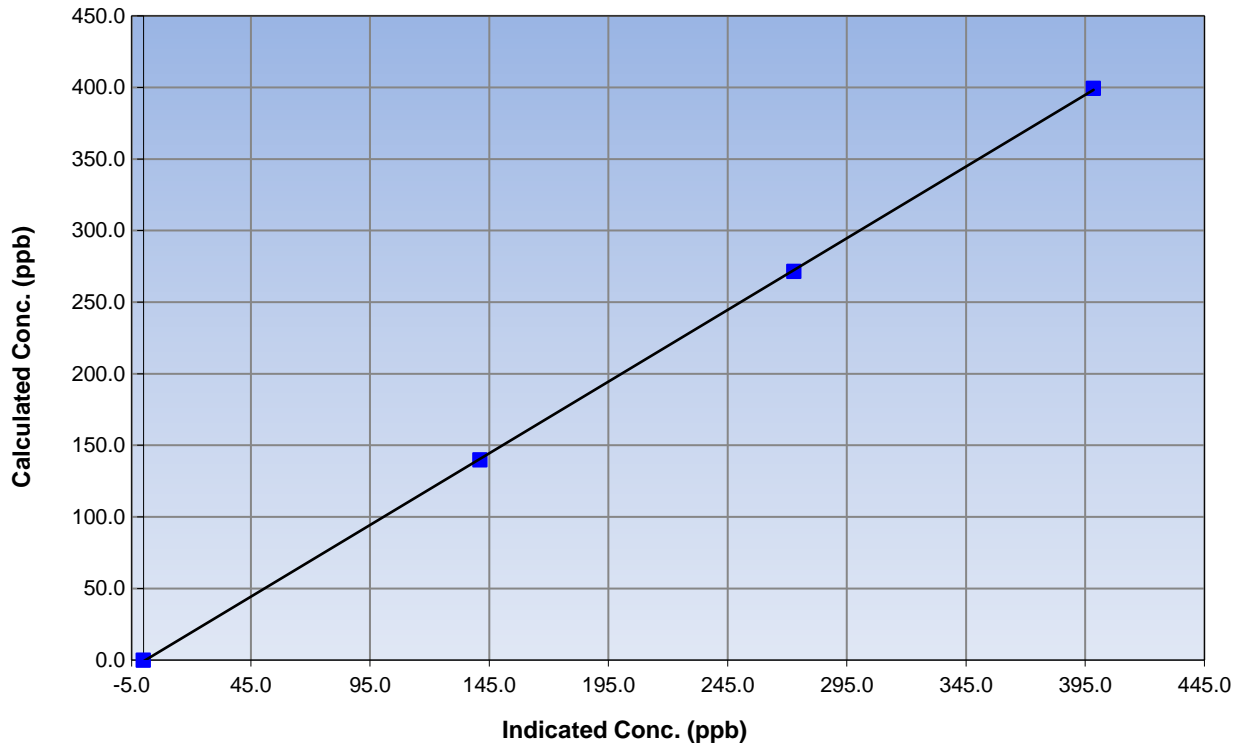
Station Information

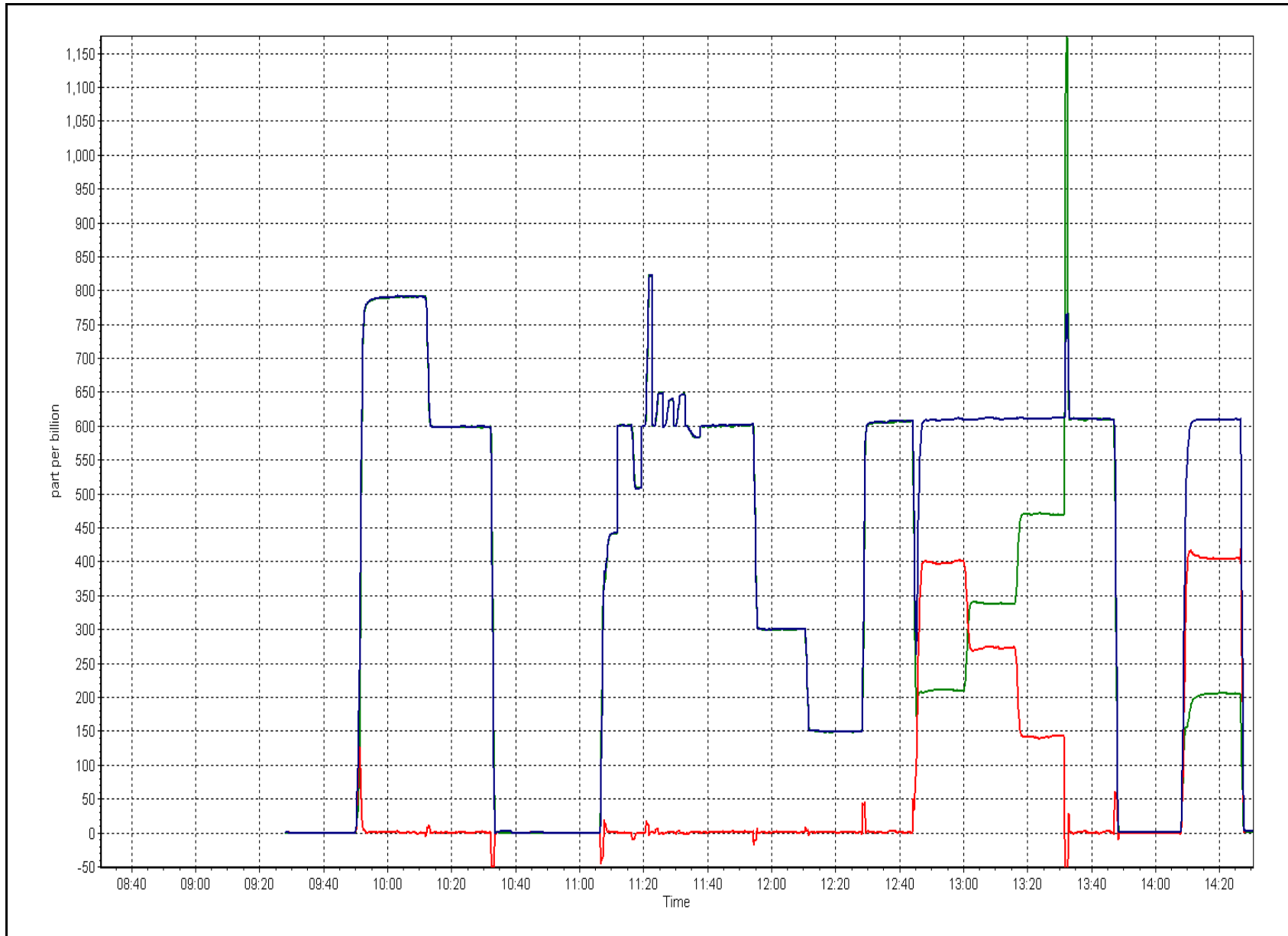
Calibration Date	December 7, 2016	Previous Calibration	November 4, 2016
Station Number	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:30	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999964
399.3	398.5	1.0020		
271.5	272.8	0.9952	Slope	1.001591
139.8	141.2	0.9901		
			Intercept	-0.783057

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Stony Mountain	Station number:	AMS 18
Calibration Date:	December 8, 2016	Last Cal Date:	November 28, 2016
Start time (MST):	12:45	End time (MST):	14:30
Sharp Model:	Thermo 5030 SHARP	S/N:	E-781
Particulate Fraction:	PM2.5	C14 Source S/N:	4048
Flow Standard Model:	Delta-Cal	S/N:	954
Temp/RH standard:	Delta-Cal	S/N:	954

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-18	-22	-22	<input checked="" type="checkbox"/>	+/- 2 °C
P3 (hPa)	953	949	953	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	982	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.6	-----	0	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning:	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check:	<u>Oct 18 2016</u>	Last Cal Date:	<u>June 22 2016</u>	<u>Tolerance</u>
	Flow w/o adaptor:	<u>16.74</u>	Flow w/ adaptor:	<u>16.43</u>	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	<u>1337</u>	S/N:	<u>5872</u>
	Date of check:	<u>June 22 2016</u>	Last Cal Date:	<u>March 23 2016</u>
	New Correction Factor:	<u>7027</u>	Previous Correction Factor:	<u>6985</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	17	NA	20	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	20	NA	23	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	14	NA	18	<input type="checkbox"/>	+/- 2 °C
RH (%)	5	NA	19	<input type="checkbox"/>	+/- 10%

Notes: T1 and flow adjusted slightly, nephelometer zero adjusted.

Calibration by: Zach Eastman



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 19
FIREBAG
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100.00	32	0	9	0
H2S (ppb) Average	709	35	35	100.00	1	0	0	0
THC (ppm) Average	708	36	36	100.00	2.7	-	2.4	-
NO2 (ppb) Average	708	36	36	100.00	29	0	9	-
NO (ppb) Average	708	36	36	100.00	18	-	3	-
NOX (ppb) Average	708	36	36	100.00	38	-	11	-
Temperature 2 m (C) Average	744	0	0	100.00	-1.8	-	-3.7	-
Relative Humidity (%) Average	744	0	0	100.00	97	-	95	-
Wind Speed 10 m (km/h) Average	742	0	2	99.73	29	-	21	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	1.8	4	-	0	0	0	0	1	6	32
H2S (ppb) Average	709	0.2	0	-	0	0	0	0	0	0	1
THC (ppm) Average	708	2.28	0.1	-	2.1	2.2	2.2	2.3	2.3	2.4	2.7
NO2 (ppb) Average	708	4.4	4	-	0	0	1	3	6	10	29
NO (ppb) Average	708	0.7	1	-	0	0	0	0	1	2	18
NOX (ppb) Average	708	5	5	-	0	0	1	4	7	11	38
Temperature 2 m (C) Average	744	-18.12	8	-	-35.7	-27.9	-24.9	-18.9	-12.3	-5.8	-1.8
Relative Humidity (%) Average	744	83.4	7	-	70	76	78	83	88	94	97
Wind Speed 10 m (km/h) Average	742	10.5	6	-	1	4	6	8	14	20	29
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	18 Dec 2016 14:00	18 Dec 2016 14:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	18 Dec 2016 20:00	18 Dec 2016 20:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Firebag - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 32 ppb on Dec 14 10:00	Maximum Daily Average: 8.6 ppb on Dec 20		Hours of Data:	708
Minimum Value: 0 ppb on Dec 5 08:00	Minimum Daily Average: 0.0 ppb on Dec 6		Hours of Missing Data:	36
Maximum Diurnal Average: 2.9 ppb at hour 1	Minimum Diurnal Average: 1.0 ppb at hour 23		Hours of Calibration:	36
Monthly Average: 1.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 6 P ₉₉ = 23		Percent Operational Time:	100.0

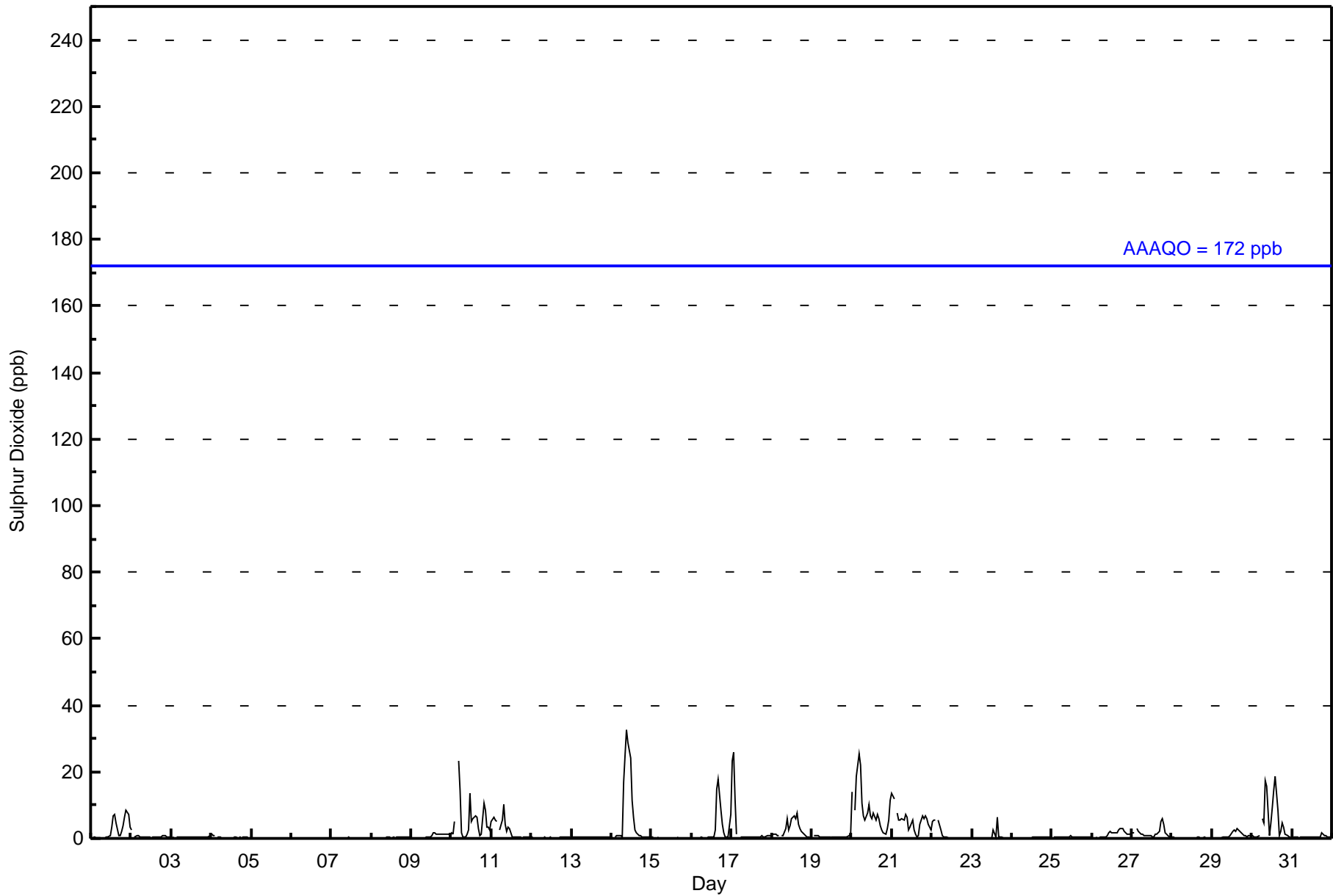
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	4	7	7	5	1	1	2	4	6	8	7	3	2.5	8
2-Dec	2	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0.5	2
3-Dec	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1
4-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	1	1	1	1	1	1	0.8	2
10-Dec	2	1	5	Z	23	14	2	1	1	1	3	13	5	6	7	6	3	1	1	10	8	3	3	3	5.3	23
11-Dec	5	6	6	5	Z	3	6	10	4	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	2.4	10
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0.3	1
13-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	Z	0	1	1	1	1	17	25	32	29	24	12	7	3	2	1	1	1	0	0	0	0	0	6.9	32
15-Dec	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	3	15	18	8	4	2	1	0	1	7	2.7	18	
17-Dec	23	26	12	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	3.1	26
18-Dec	1	1	1	1	1	Z	1	1	3	6	3	4	6	7	6	7	4	3	2	1	1	1	0	0	2.6	7
19-Dec	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0.5	2
20-Dec	14	Z	8	19	25	22	11	7	5	8	10	7	6	8	5	7	6	4	2	2	1	3	6	12	8.6	25
21-Dec	14	12	Z	8	5	6	6	6	7	6	3	3	6	3	1	0	1	4	7	6	7	6	4	3	5.3	14
22-Dec	5	6	5	Z	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	6
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	3	1	6	0	0	0	0	0	0	0	0	0.5	6
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0.4	1
26-Dec	0	Z	0	0	0	0	0	0	1	1	2	2	2	2	2	2	3	3	3	2	2	1	1	1	1.3	3
27-Dec	2	2	Z	3	2	1	1	1	1	1	1	1	1	1	1	1	2	5	6	4	2	1	1	0	1.8	6
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	1	2	2	2	3	2	2	2	1	1	1	1	1	1	0.9	3
30-Dec	1	1	0	0	1	Z	6	5	17	16	1	4	9	15	19	8	1	2	5	3	1	1	0	0	5.1	19
31-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0.4	2
																								Diurnal Average		
																								Diurnal Maximum		

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	682	96.33	96.33
11 - 20	17	2.40	98.73
21 - 60	9	1.27	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	73	28	8	7	4	5	26	41	114	69	72	45	21	31	45	91	680
11 - 20	0	0	0	0	0	0	0	1	0	1	13	2	0	0	0	0	17
21 - 60	0	0	0	0	0	0	0	2	0	1	5	1	0	0	0	0	9
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706

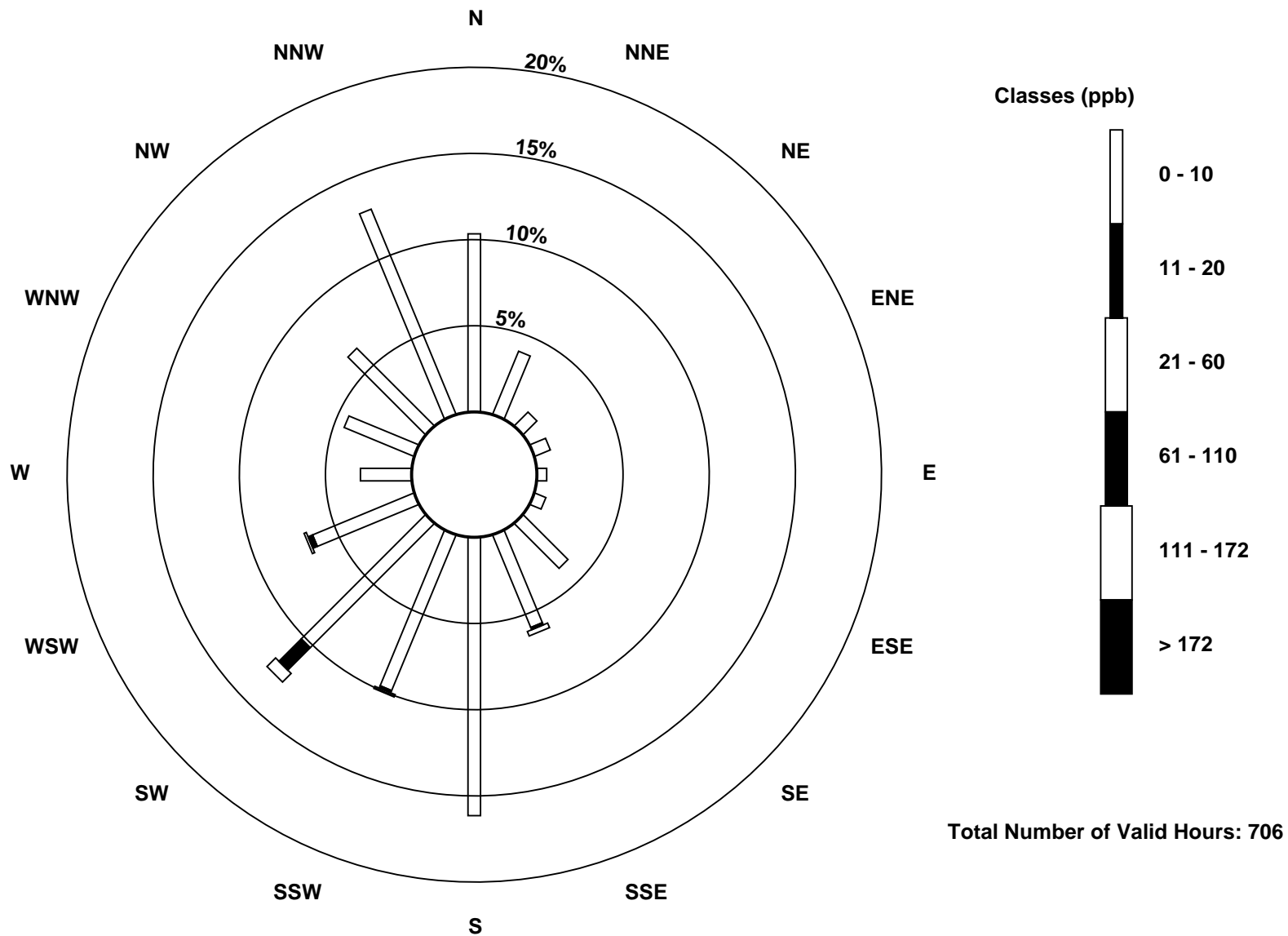
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Firebag (AMS 19)

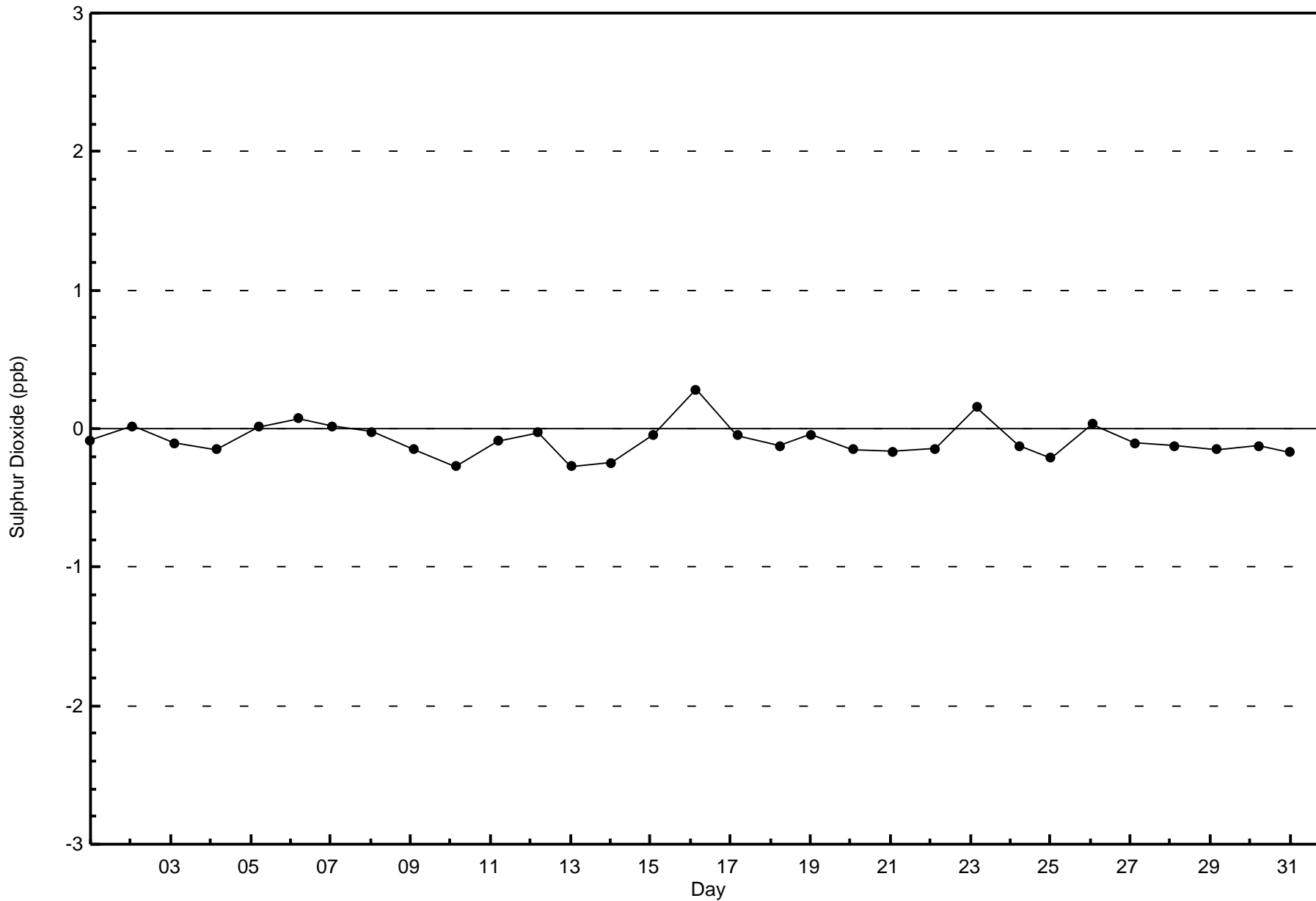


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

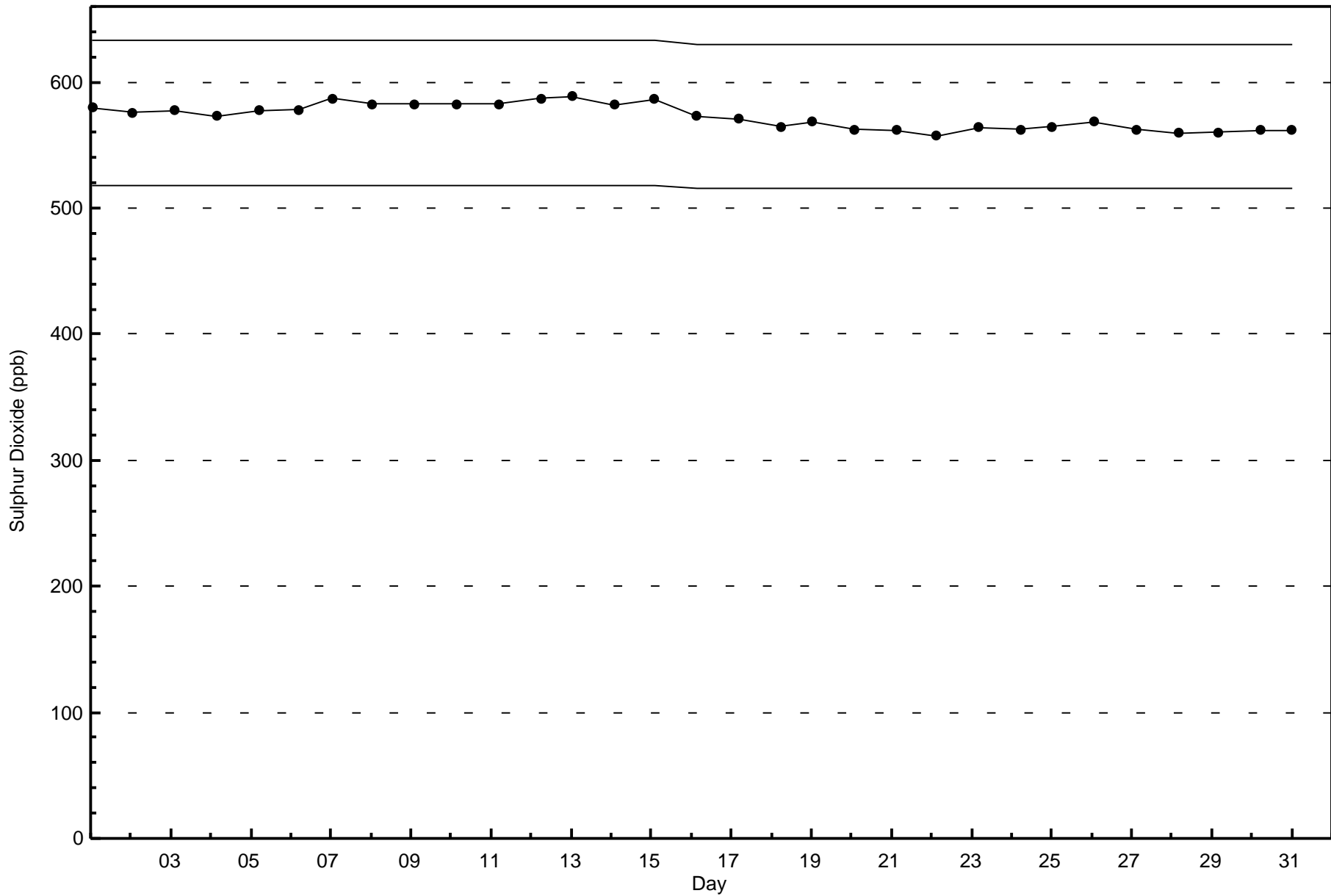
Sulphur Dioxide (SO₂) - ppb
Firebag - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Firebag - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

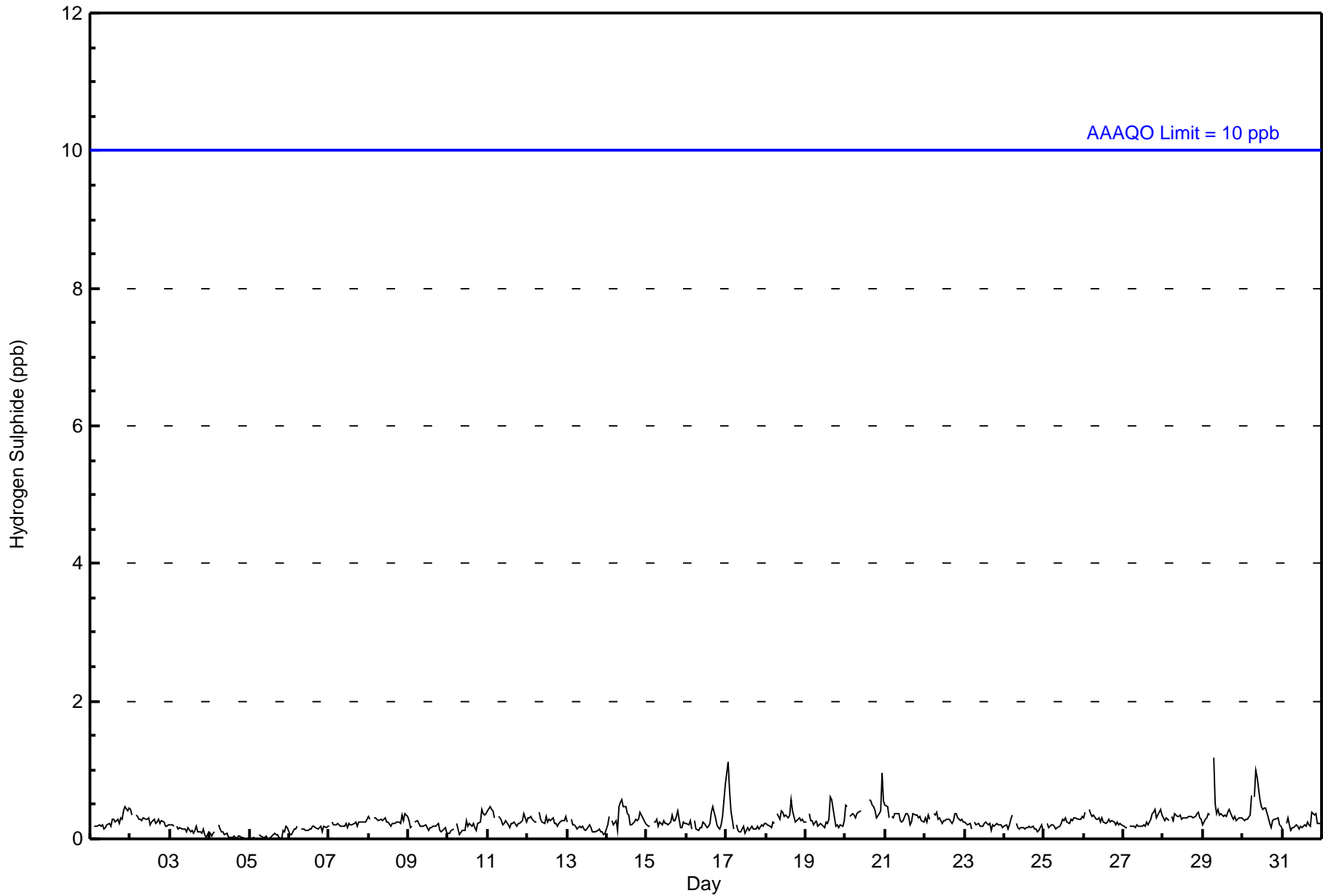
Firebag - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 1 ppb on Dec 29 07:00										Maximum Daily Average: 0.4 ppb on Dec 20										Hours of Data: 709						
Minimum Value: 0 ppb on Dec 4 17:00										Minimum Daily Average: 0.0 ppb on Dec 5										Hours of Missing Data: 35						
Maximum Diurnal Average: 0.3 ppb at hour 2										Minimum Diurnal Average: 0.2 ppb at hour 13										Hours of Calibration: 35						
Monthly Average: 0.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
17-Dec	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.3	1
20-Dec	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	1	1	0	0	0	0	0	1	1	0.4	1	
21-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
27-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
29-Dec	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Dec	0	0	0	0	0	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
31-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
0.3 0.3 0.2 0.2 0.2 0.3 0.3 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.3 0.3																								Diurnal Average		
1 1 1 0 0 1 1 1 1 1 1 0 0 0 0 1 1 1 0 0 0 0 0 0 0 1 1																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



WBEA Data PC
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	73	29	8	7	3	5	26	44	114	72	88	47	20	34	50	87	707
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	29	8	7	3	5	26	44	114	72	88	47	20	34	50	87	707

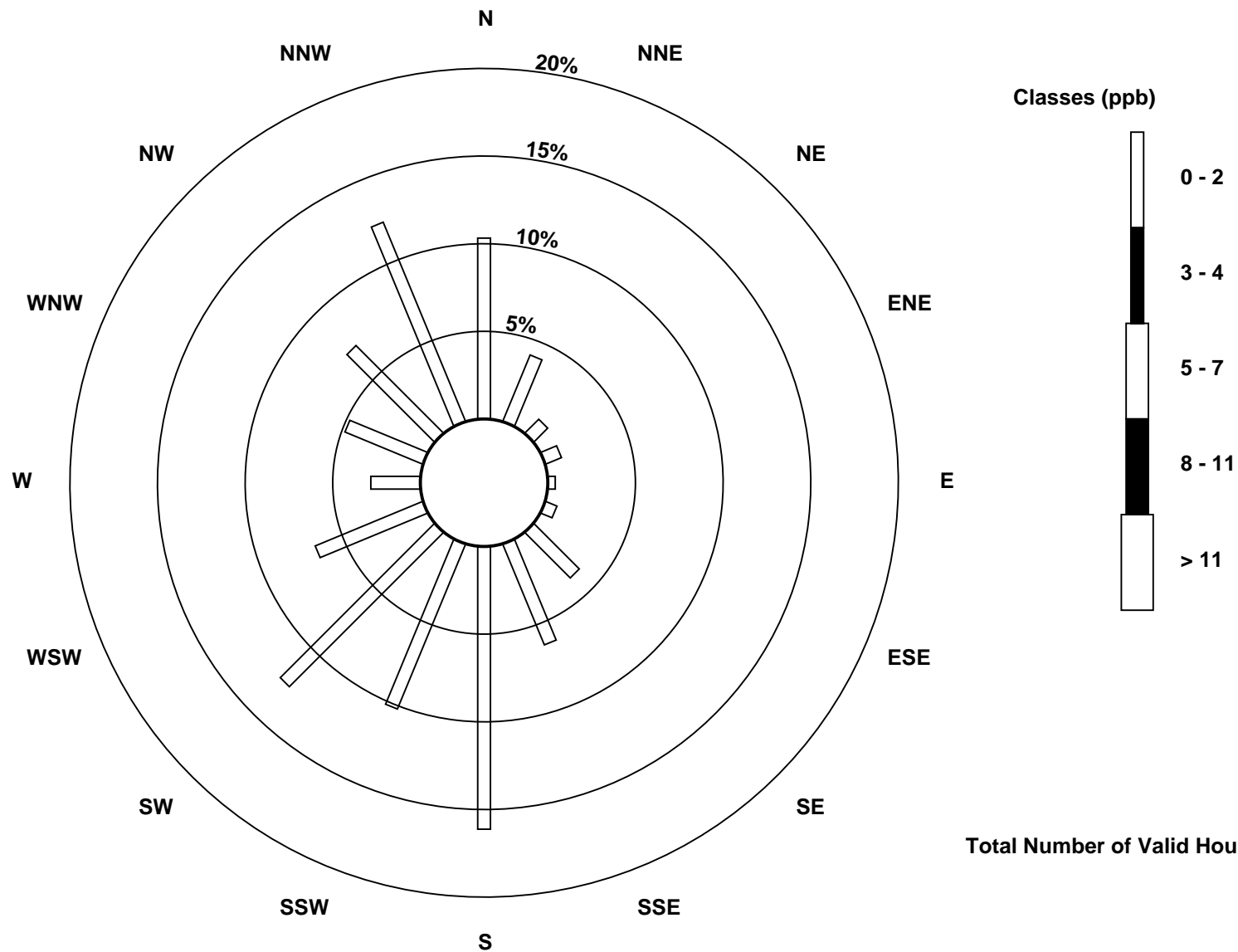
Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Firebag (AMS 19)

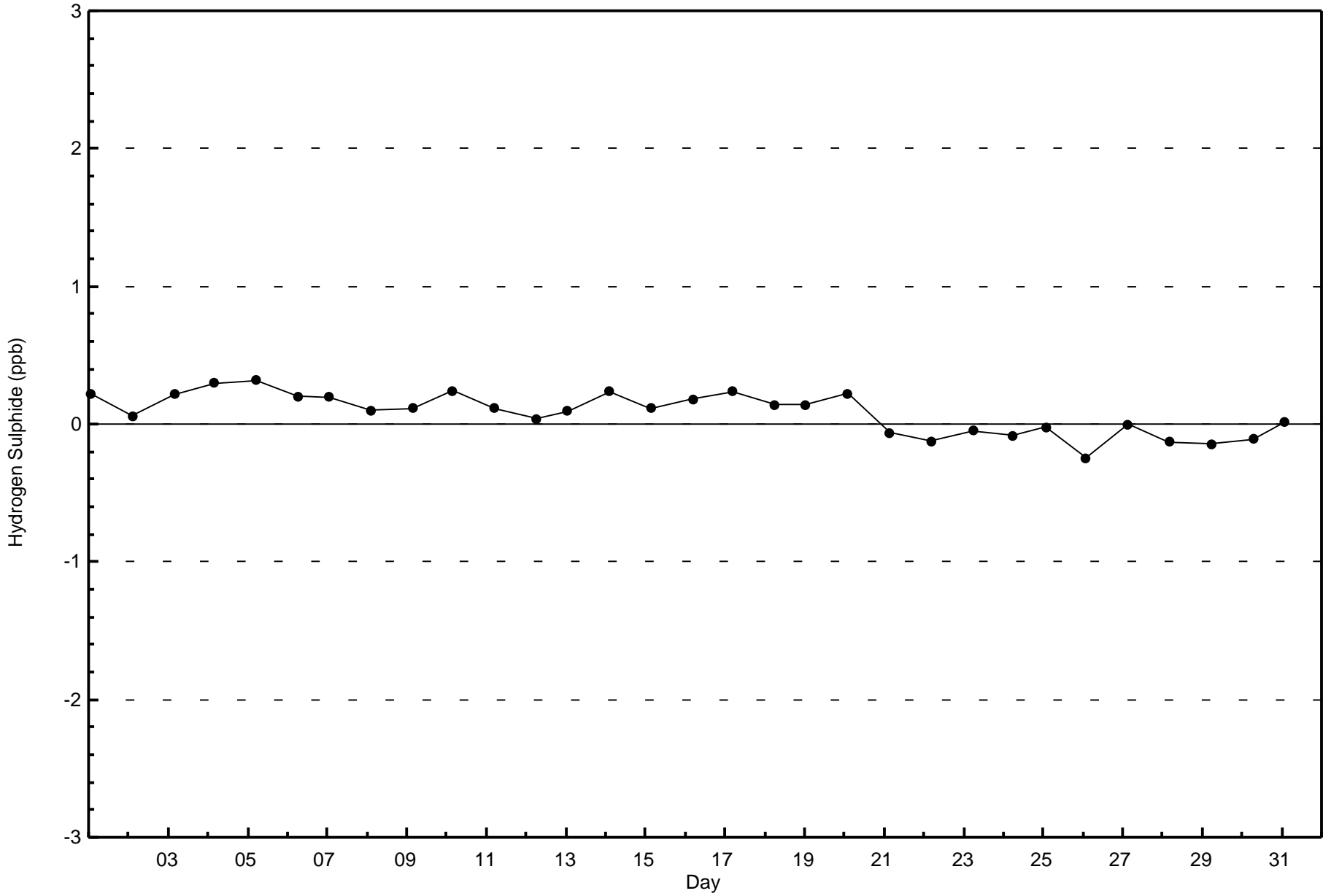


Total Number of Valid Hours: 707



WBEA Data PC
Zero Responses

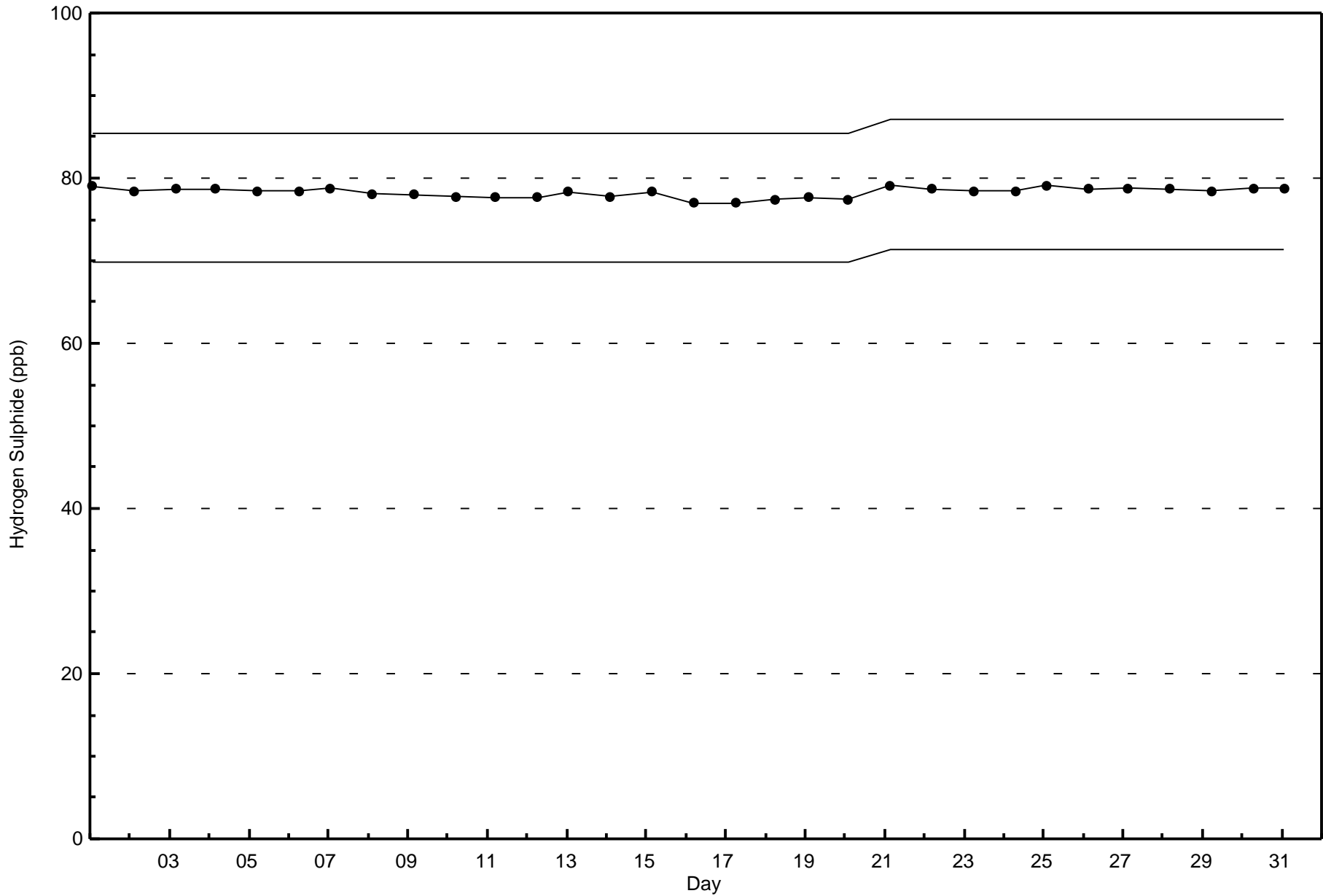
Hydrogen Sulphide (H₂S) - ppb
Firebag - December 2016





WBEA Data PC
Span Responses

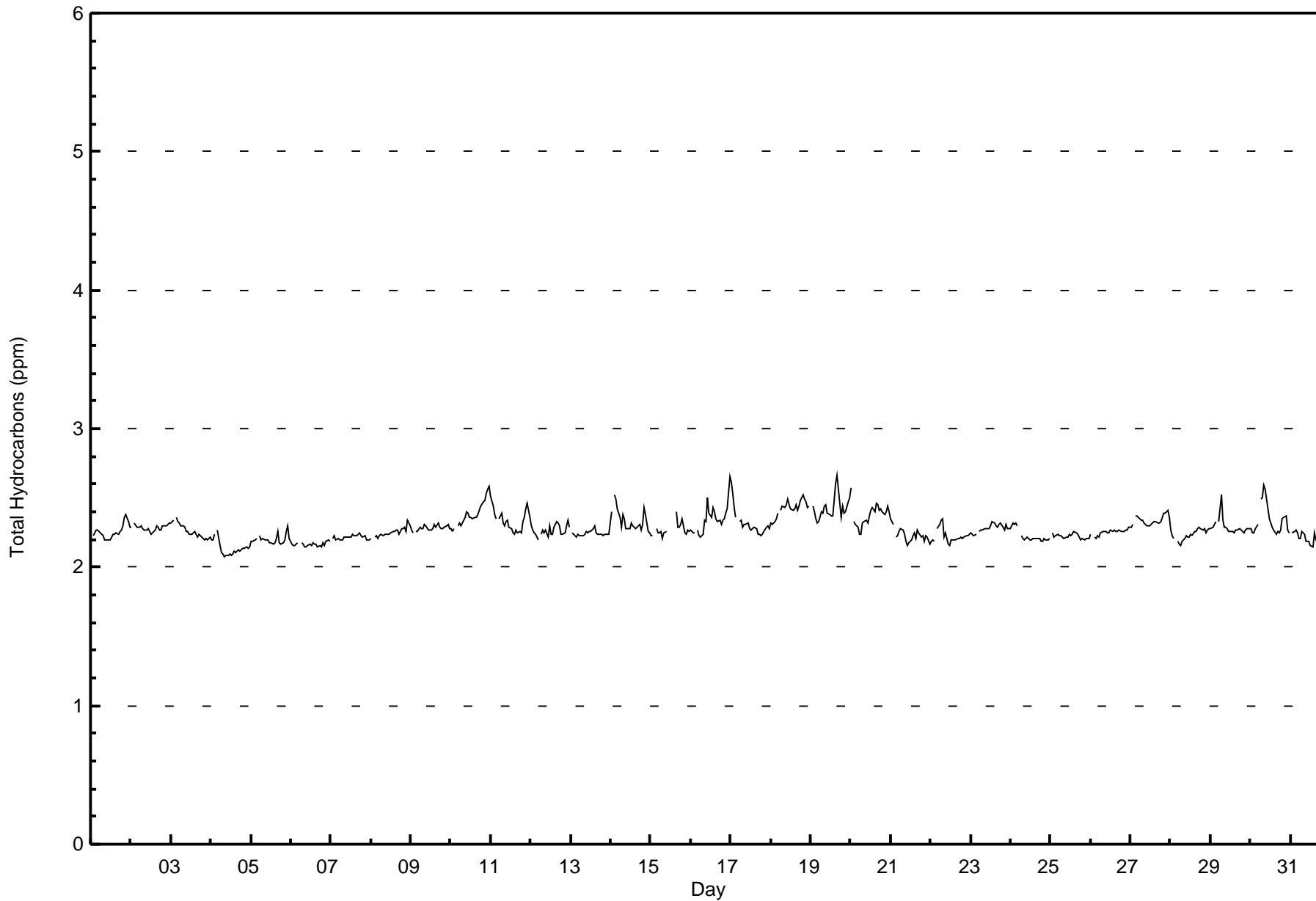
Hydrogen Sulphide (H₂S) - ppb
Firebag - December 2016





WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	708	100.00	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706

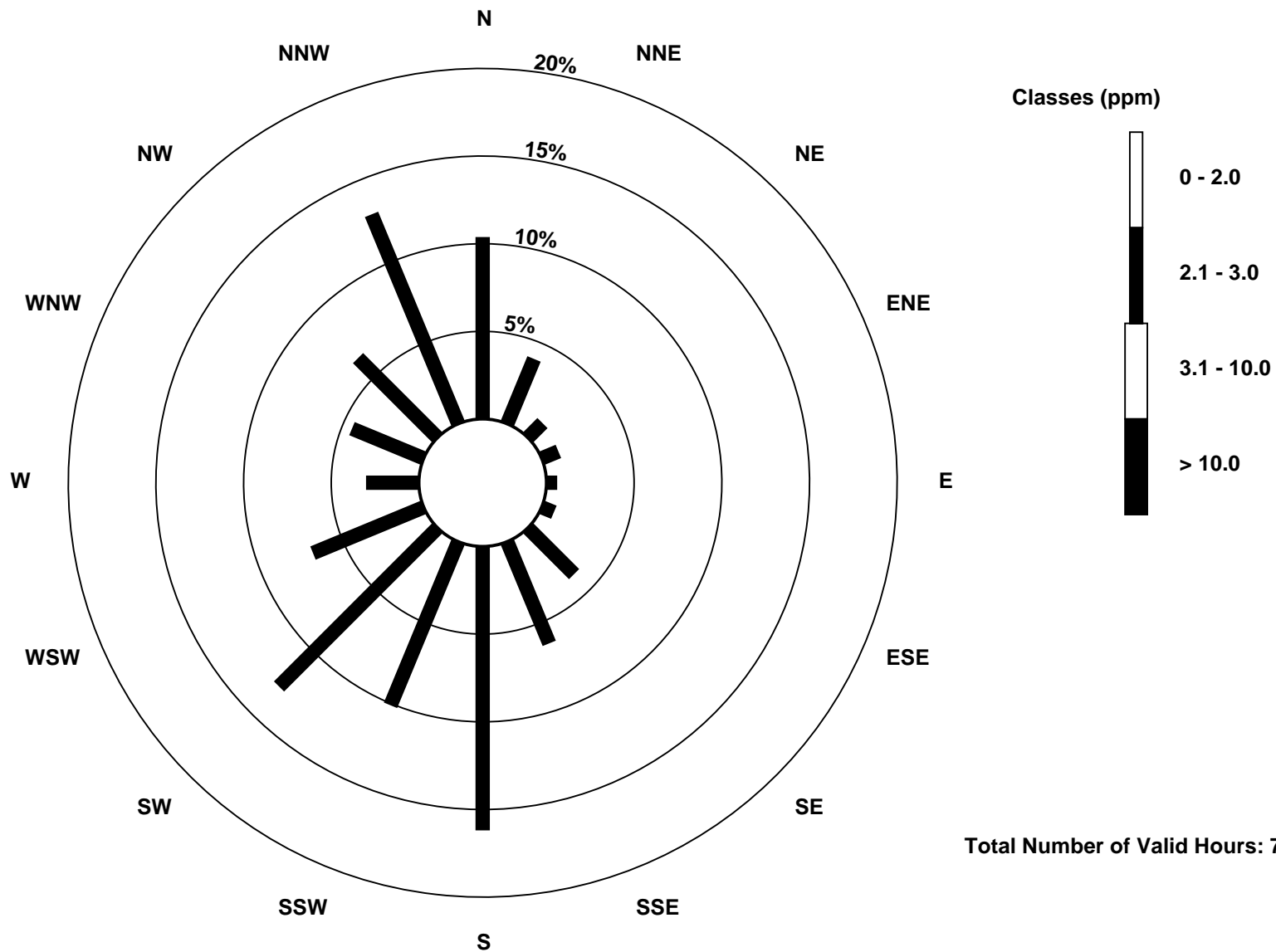
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Firebag (AMS 19)

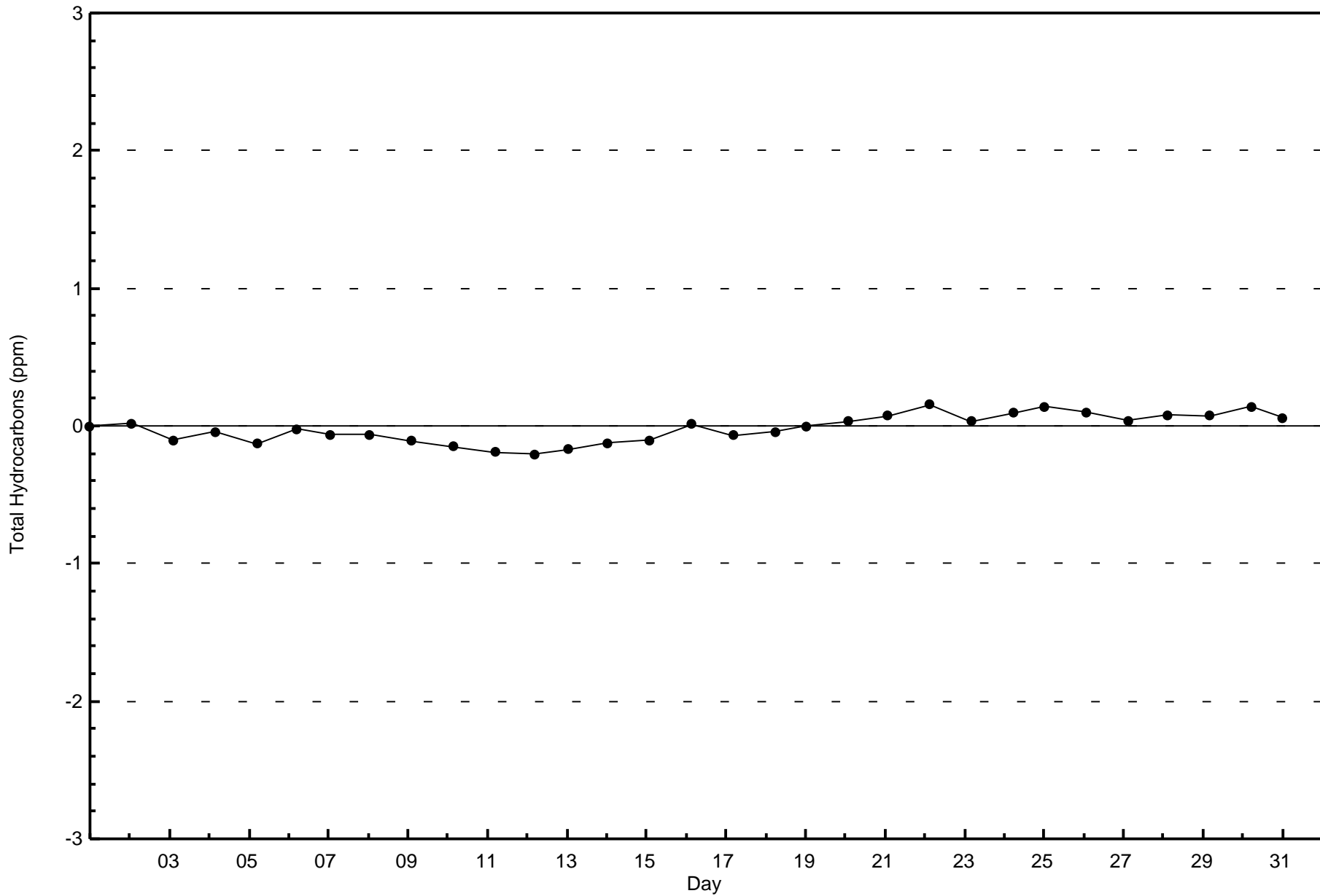


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

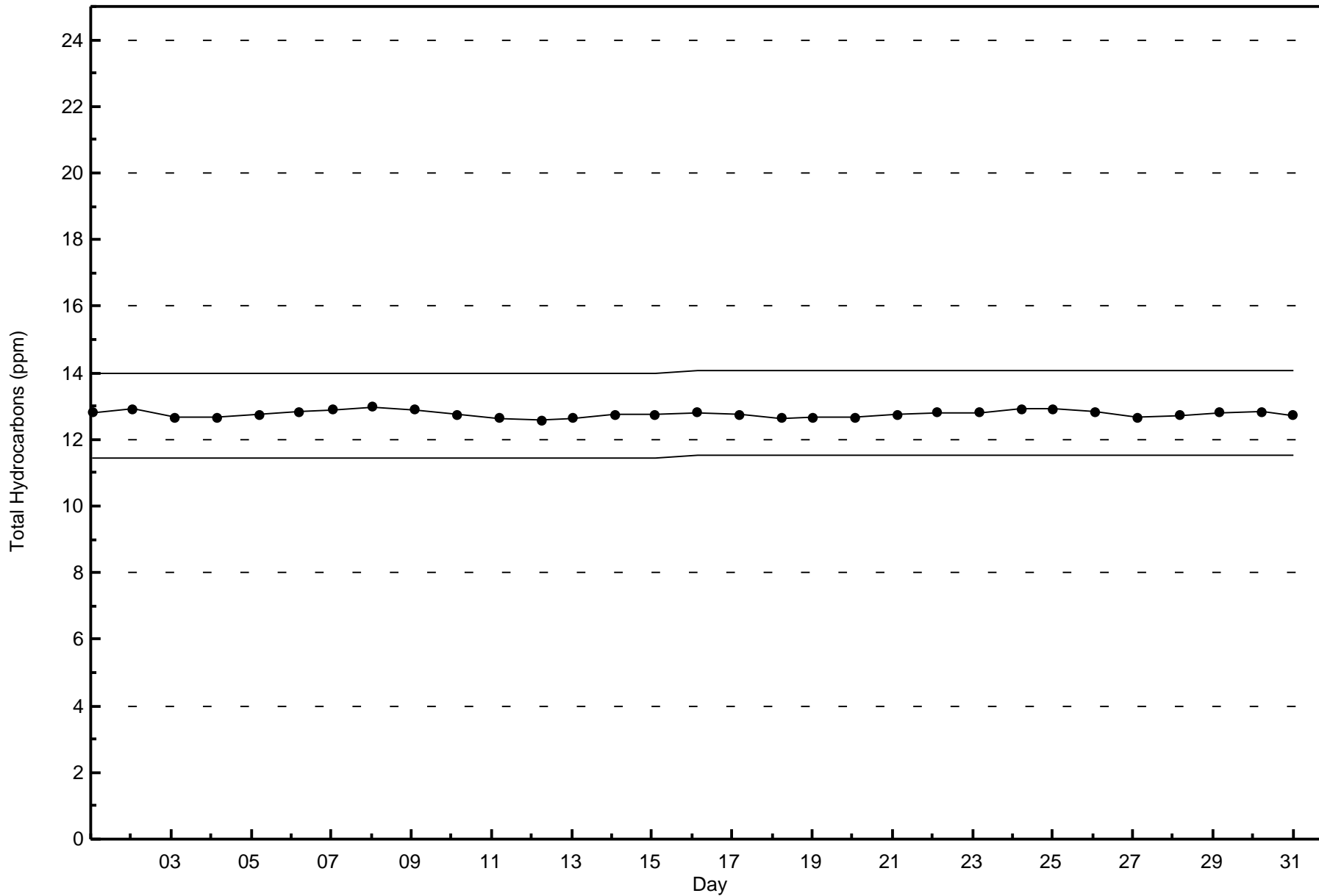
Total Hydrocarbons (THC) - ppm
Firebag - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Firebag - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

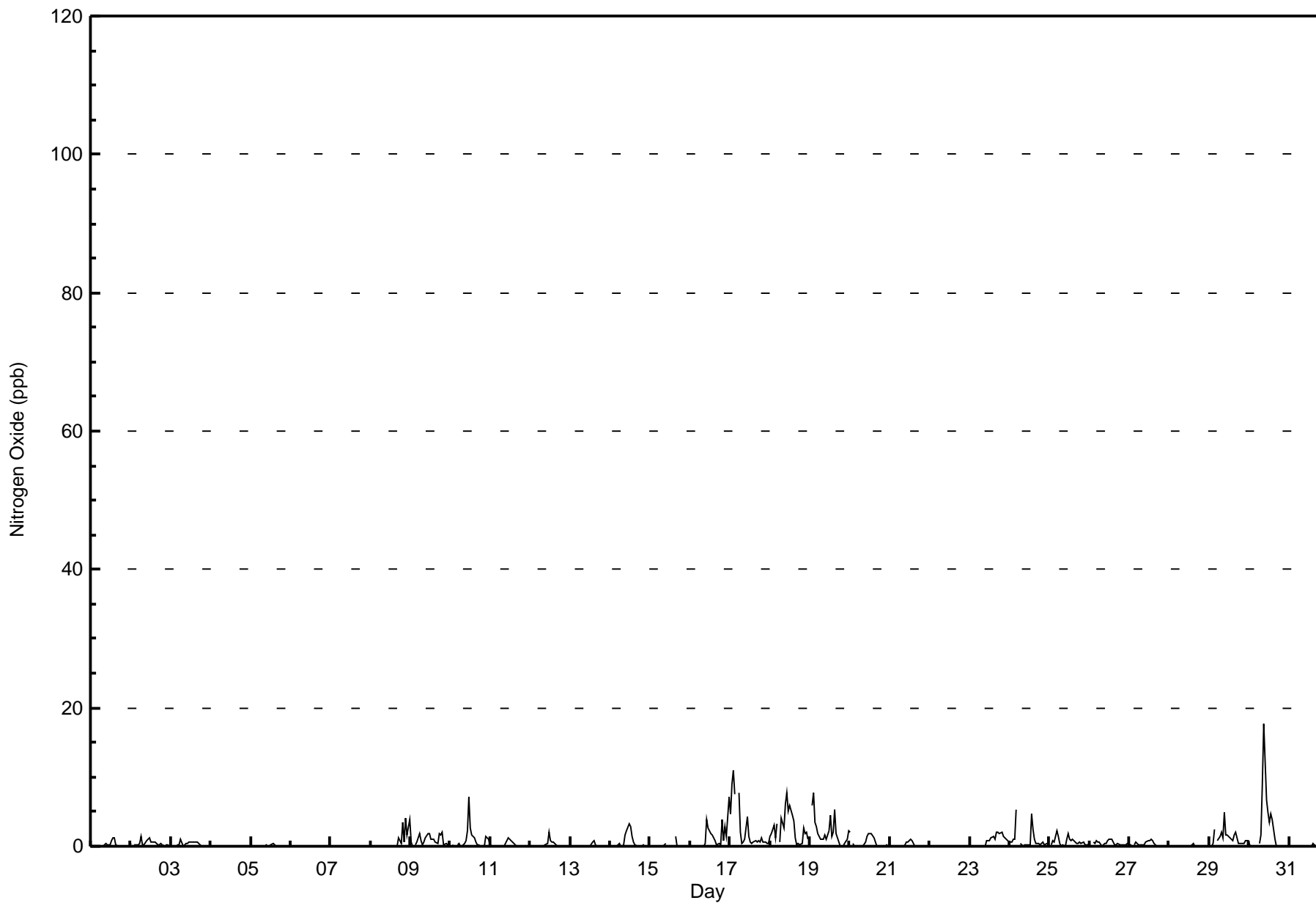
Firebag - December 2016

Maximum Value: 18 ppb on Dec 30 10:00																		Maximum Daily Average: 2.7 ppb on Dec 18																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 4 08:00																		Minimum Daily Average: 0.0 ppb on Dec 4																		Hours of Data: 708			
Maximum Diurnal Average: 1.4 ppb at hour 12																		Minimum Diurnal Average: 0.2 ppb at hour 19																		Hours of Missing Data: 36			
Monthly Average: 0.7 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 8																		Hours of Calibration: 36			
																																				Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1												
2-Dec	0	Z	0	0	0	0	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1												
3-Dec	0	0	Z	0	0	0	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0.3	1													
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	1	4	2	4	0.7	4													
9-Dec	1	0	Z	0	1	2	1	0	1	1	2	2	1	1	1	1	0	2	2	2	0	0	0	0	0.9	2													
10-Dec	0	0	0	Z	0	0	0	0	0	1	2	7	3	2	1	1	0	0	0	0	0	1	1	1	0.9	7													
11-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1													
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	2	1	1	1	0	0	0	0	0	0	0	0	0	0.2	2													
13-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.1	1													
14-Dec	0	Z	0	0	0	0	0	0	0	2	2	3	3	1	1	0	0	0	0	0	0	0	0	0	0.6	3													
15-Dec	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	1	0	0	0	0	0	0	0	0	0.1	1													
16-Dec	0	0	0	Z	0	0	0	0	0	0	4	3	2	2	1	1	0	0	0	4	1	3	1	7	1.3	7													
17-Dec	5	9	11	7	Z	8	2	0	1	1	4	2	1	0	1	1	1	1	1	1	1	1	0	0	2.5	11													
18-Dec	1	2	3	1	3	Z	1	4	3	6	8	5	6	5	4	1	0	0	0	0	3	2	2	1	2.7	8													
19-Dec	Z	6	8	3	3	2	1	1	1	2	1	2	4	1	2	5	2	1	0	0	0	0	1	2	2.1	8													
20-Dec	2	Z	0	0	0	0	0	0	0	1	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0.5	2													
21-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1													
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
23-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	2	2	2	2	1	1	1	1	0.8	2													
24-Dec	1	1	1	1	5	Z	0	0	0	0	0	0	5	2	1	0	0	0	0	1	0	0	0	0	0.9	5													
25-Dec	Z	0	1	1	2	1	0	0	0	1	2	1	1	1	1	0	0	1	0	1	0	0	0	0	0.7	2													
26-Dec	0	Z	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1													
27-Dec	0	0	Z	0	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1													
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
29-Dec	0	0	0	2	Z	1	1	2	1	5	2	2	1	1	1	2	2	0	0	0	0	0	1	1	1.2	5													
30-Dec	0	0	0	0	0	Z	0	2	9	18	7	5	3	5	4	1	0	0	0	0	0	0	0	0	2.3	18													
31-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
																								Diurnal Average															
																								Diurnal Maximum															
Z - zerospan C - Calibration																																							



WBEA Data PC
Hourly Averages

Nitrogen Oxide (NO) - ppb
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxide (NO) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxide (NO) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706

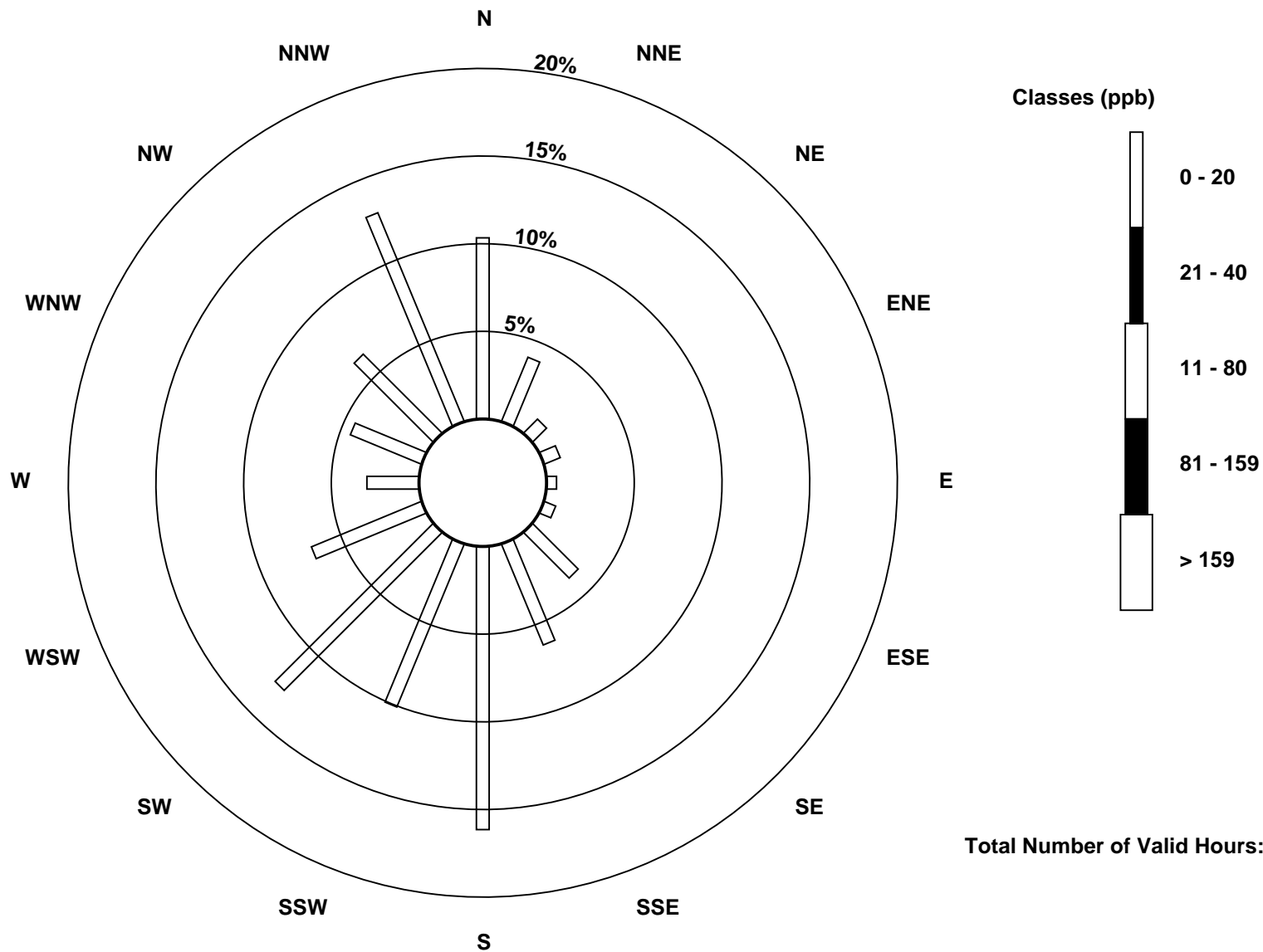
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

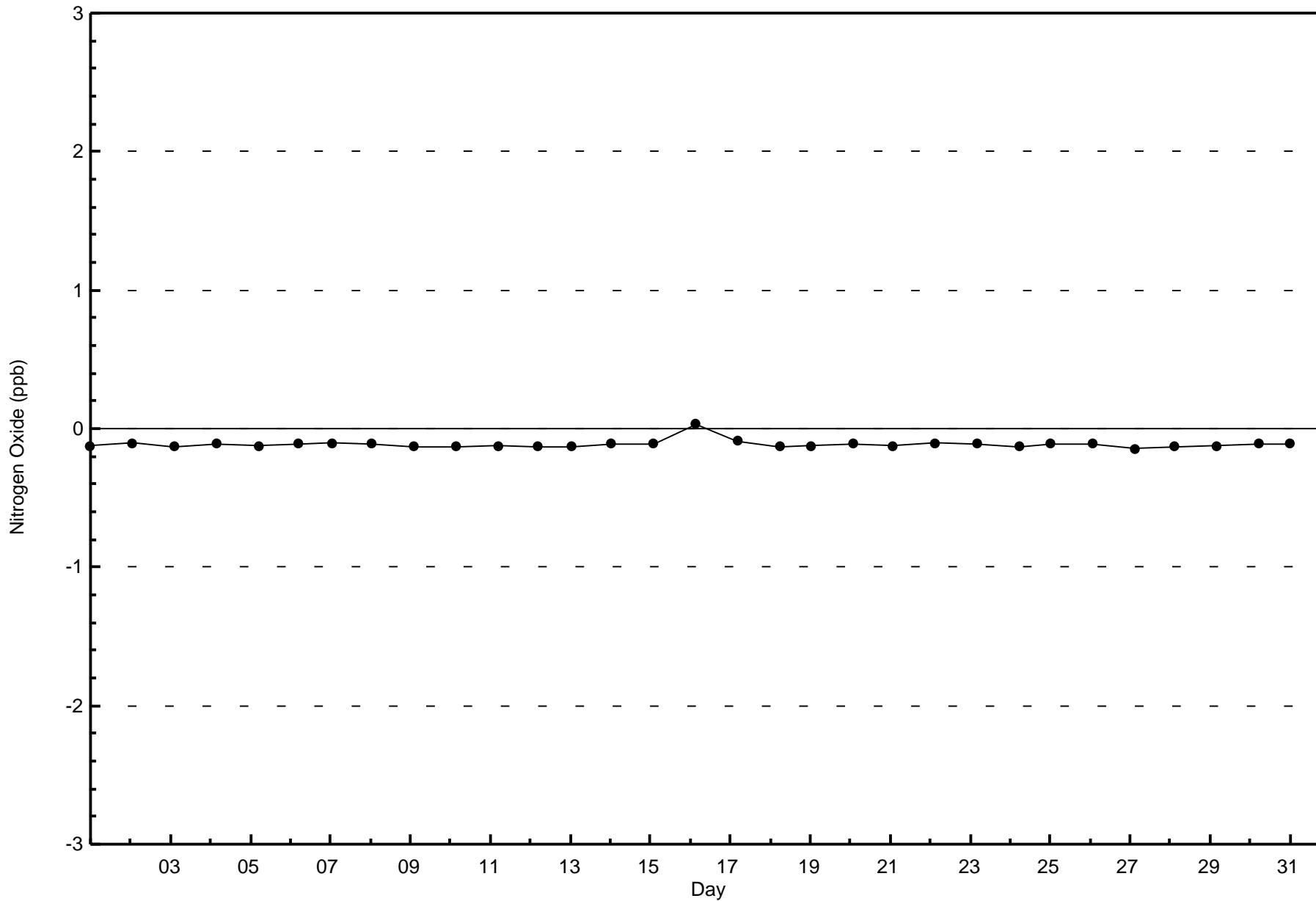
Nitrogen Oxide (NO) - ppb
Firebag (AMS 19)





WBEA Data PC
Zero Responses

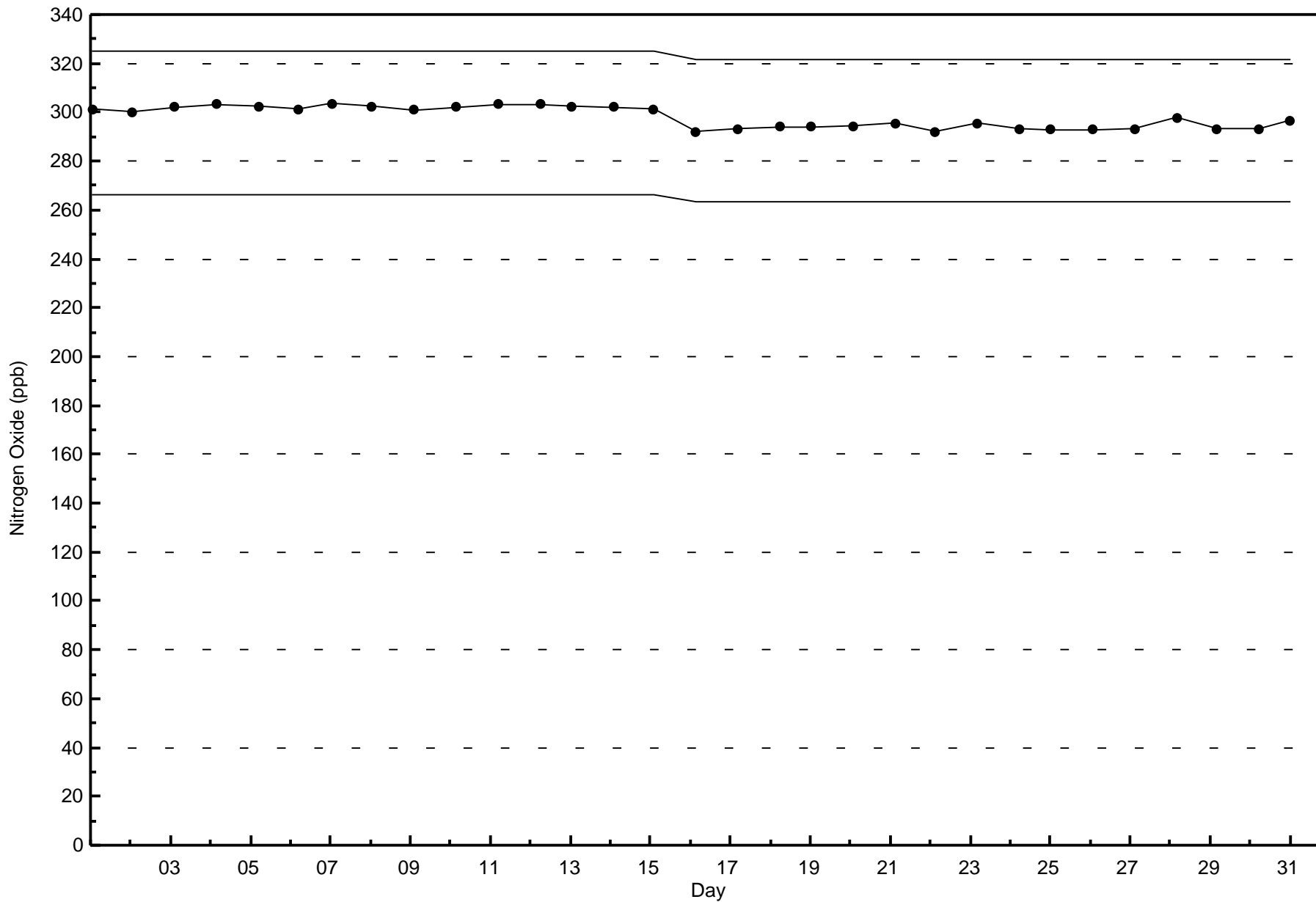
Nitrogen Oxide (NO) - ppb
Firebag - December 2016





WBEA Data PC
Span Responses

Nitrogen Oxide (NO) - ppb
Firebag - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Firebag - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 29 ppb on Dec 17 02:00	Maximum Daily Average: 9.4 ppb on Dec 20		Hours of Data:	708
Minimum Value: 0 ppb on Dec 4 09:00	Minimum Daily Average: 0.1 ppb on Dec 7		Hours of Missing Data:	36
Maximum Diurnal Average: 6.0 ppb at hour 1	Minimum Diurnal Average: 2.8 ppb at hour 13		Hours of Calibration:	36
Monthly Average: 4.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 3 Q ₃ = 6 P ₉₀ = 10 P ₉₉ = 21		Percent Operational Time:	100.0

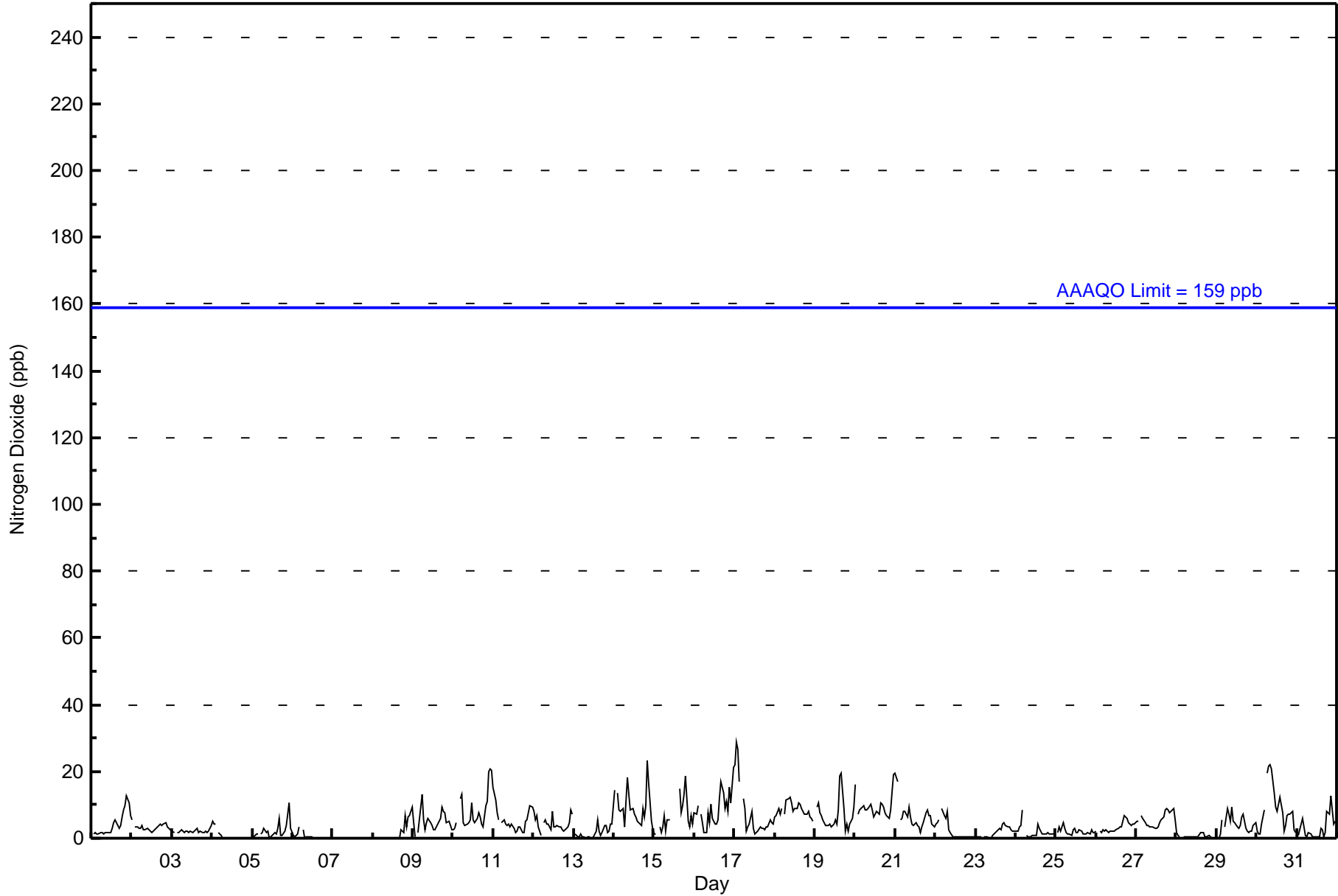
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	Z	1	2	1	1	2	2	1	2	2	2	2	3	5	6	5	3	4	6	8	10	13	10	7	4.1	13																							
2-Dec	6	Z	3	3	3	3	4	3	3	3	3	2	2	2	3	4	4	4	4	4	5	4	3	3	3.3	6																							
3-Dec	2	2	Z	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	4	2.1	4																							
4-Dec	5	4	4	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	5																							
5-Dec	0	0	1	1	Z	1	2	3	2	2	0	0	1	2	1	3	6	1	1	2	4	7	11	3	2.3	11																							
6-Dec	1	1	1	1	3	Z	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3																							
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	7	4	7	7	9	1.7	9																							
9-Dec	5	0	Z	2	6	13	6	3	5	6	5	4	2	3	4	4	6	9	8	8	5	5	4	3	4.9	13																							
10-Dec	3	3	5	Z	12	13	5	4	4	5	6	11	6	5	6	8	6	4	3	10	11	20	21	20	8.2	21																							
11-Dec	15	11	8	6	Z	5	5	4	4	4	4	4	3	2	2	3	3	2	2	5	6	8	10	9	5.4	15																							
12-Dec	8	5	7	3	1	Z	5	5	4	4	2	8	4	3	4	3	3	2	2	3	3	5	8	7	4.4	8																							
13-Dec	Z	1	0	0	1	1	0	0	0	0	0	0	0	2	5	2	1	2	4	4	2	2	4	4	1.7	5																							
14-Dec	14	Z	13	9	8	9	3	11	18	13	9	9	7	6	5	5	4	9	6	10	23	17	5	2	9.4	23																							
15-Dec	1	1	Z	4	2	3	7	2	6	6	C	C	C	C	C	15	8	10	13	19	5	3	7	4	6.3	19																							
16-Dec	8	7	10	Z	7	5	2	2	8	5	10	6	4	4	5	12	17	14	9	11	8	15	11	21	8.7	21																							
17-Dec	22	29	27	17	Z	12	9	2	4	4	8	3	1	2	2	3	3	3	3	3	3	5	5	4	7.5	29																							
18-Dec	6	7	9	7	9	Z	7	12	12	12	11	8	9	9	11	10	9	8	7	7	8	6	6	5	8.4	12																							
19-Dec	Z	10	11	8	7	5	4	4	4	4	3	4	6	4	8	19	19	9	2	4	2	4	6	9	6.8	19																							
20-Dec	16	Z	7	8	10	10	8	9	9	10	9	6	7	8	7	11	10	9	8	7	6	9	14	19	9.4	19																							
21-Dec	19	17	Z	5	6	8	8	6	10	7	4	4	5	4	4	2	3	5	8	8	7	7	4	3	6.6	19																							
22-Dec	4	5	6	Z	9	7	6	8	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4	9																							
23-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	2	2	3	3	4	5	4	4	3	2	2	2	1.7	5																							
24-Dec	2	2	3	4	9	Z	1	0	0	1	1	1	4	3	2	1	1	1	2	1	1	1	1	2	2.0	9																							
25-Dec	Z	2	4	2	5	3	2	1	1	1	3	3	2	2	3	2	2	1	1	1	2	1	3	2	2	2.0	5																						
26-Dec	2	Z	2	2	3	2	3	2	2	2	2	2	2	3	3	4	5	7	6	5	4	4	4	4	3.3	7																							
27-Dec	5	5	Z	7	6	5	4	4	4	3	3	3	3	4	5	6	7	8	9	8	8	8	9	5	5.5	9																							
28-Dec	2	1	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	2	1	0	1	0	0	0	0	0.6	2																							
29-Dec	0	0	1	6	Z	3	9	7	5	9	5	5	3	3	4	6	7	3	2	2	2	2	4	5	4.1	9																							
30-Dec	2	1	1	4	8	Z	19	22	22	21	13	9	8	10	12	8	2	4	7	7	7	8	3	2	8.7	22																							
31-Dec	Z	1	4	6	4	1	1	2	1	0	0	0	0	0	3	3	0	2	8	7	13	8	4	5	3.2	13																							
																								6.0	4.5	5.0	4.2	4.7	4.4	4.1	3.8	4.3	4.2	3.5	3.3	2.8	3.1	3.8	4.7	4.4	4.2	4.1	5.1	5.0	5.7	5.4	5.3	Diurnal Average	
																								22	29	27	17	12	13	19	22	22	21	13	11	9	10	12	19	19	14	13	19	23	20	21	21	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	699	98.73	98.73
21 - 40	9	1.27	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	73	28	8	7	4	5	26	40	114	71	87	47	21	31	44	91	697
21 - 40	0	0	0	0	0	0	0	4	0	0	3	1	0	0	1	0	9
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706

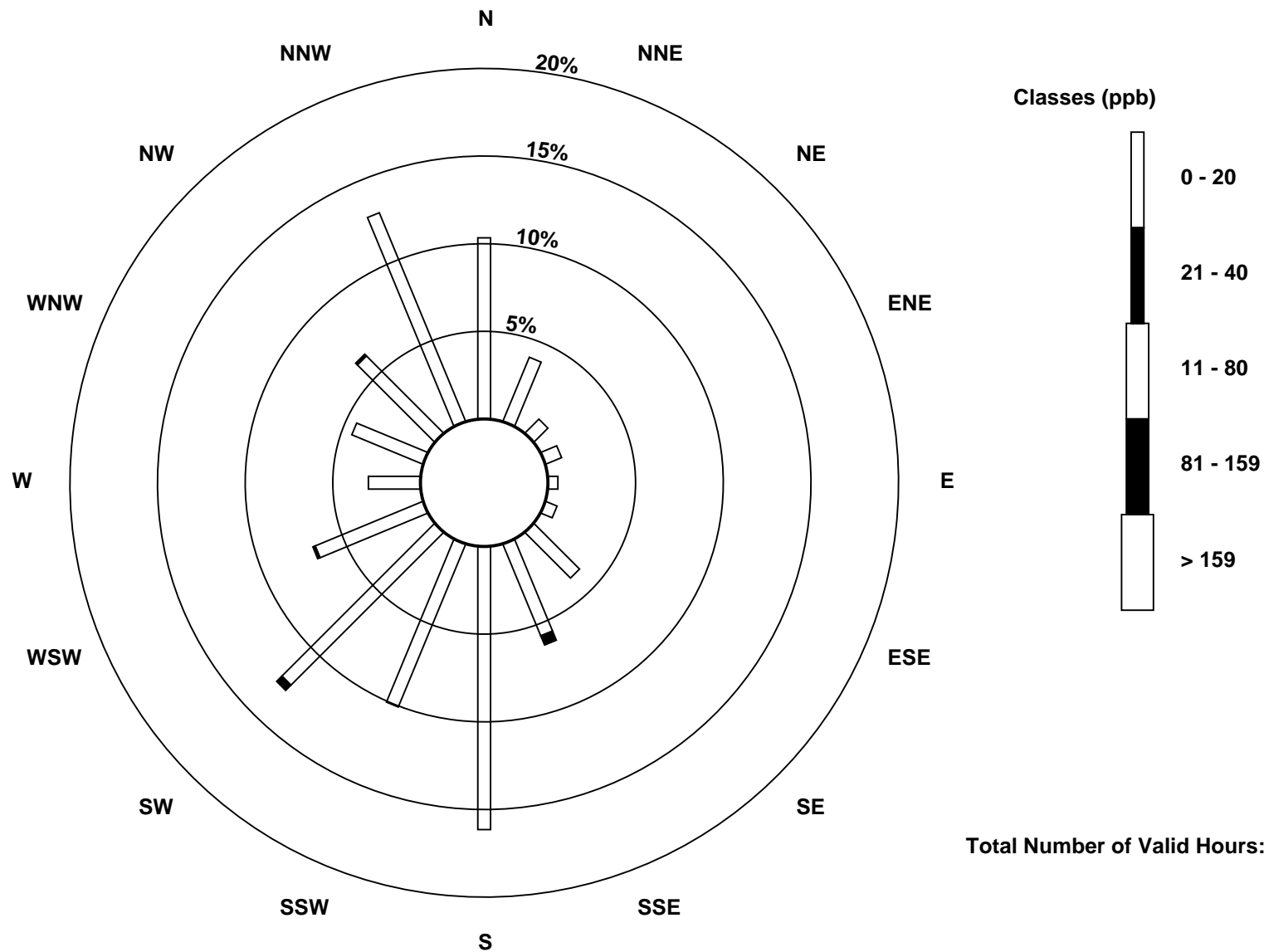
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Firebag (AMS 19)

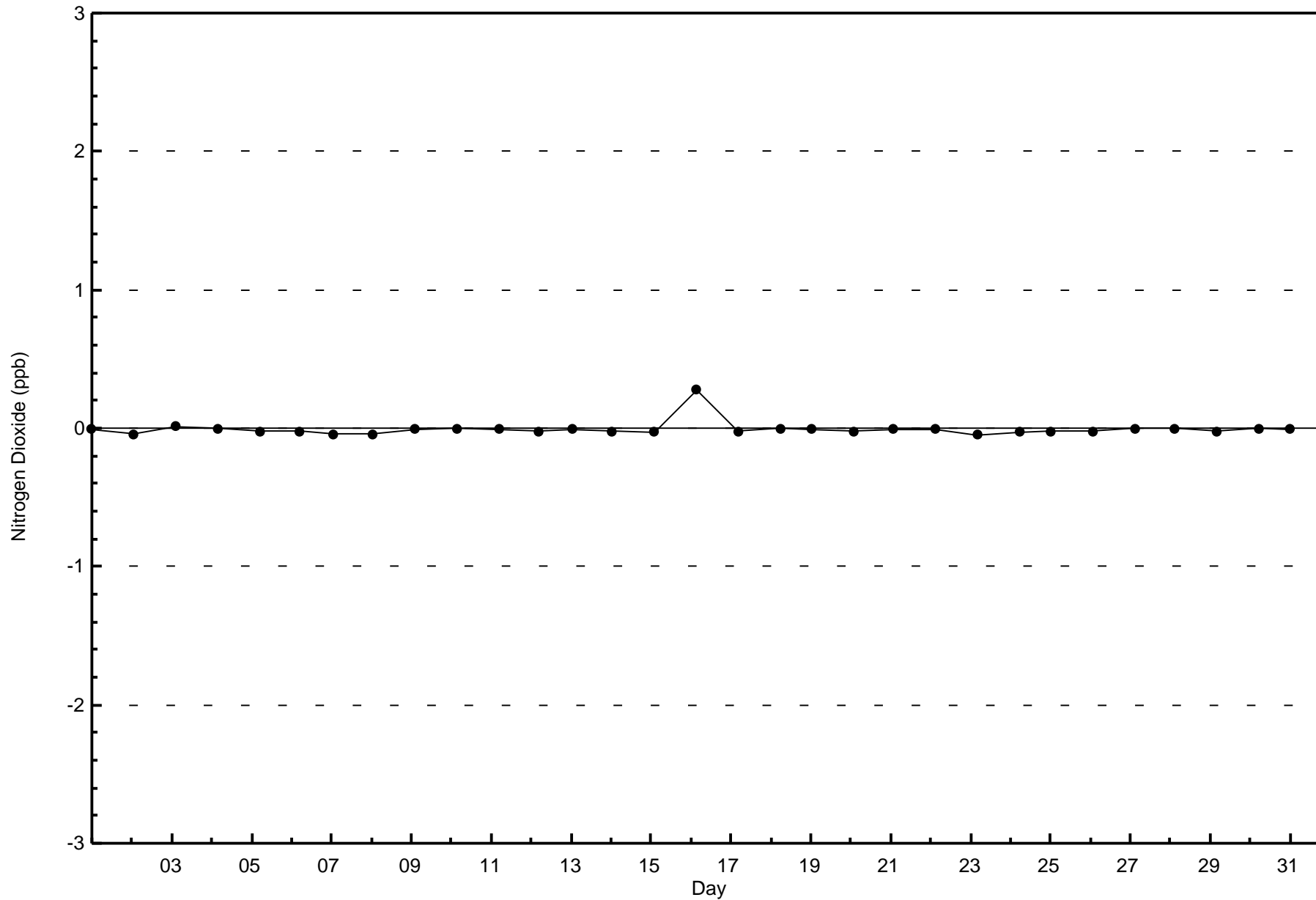


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

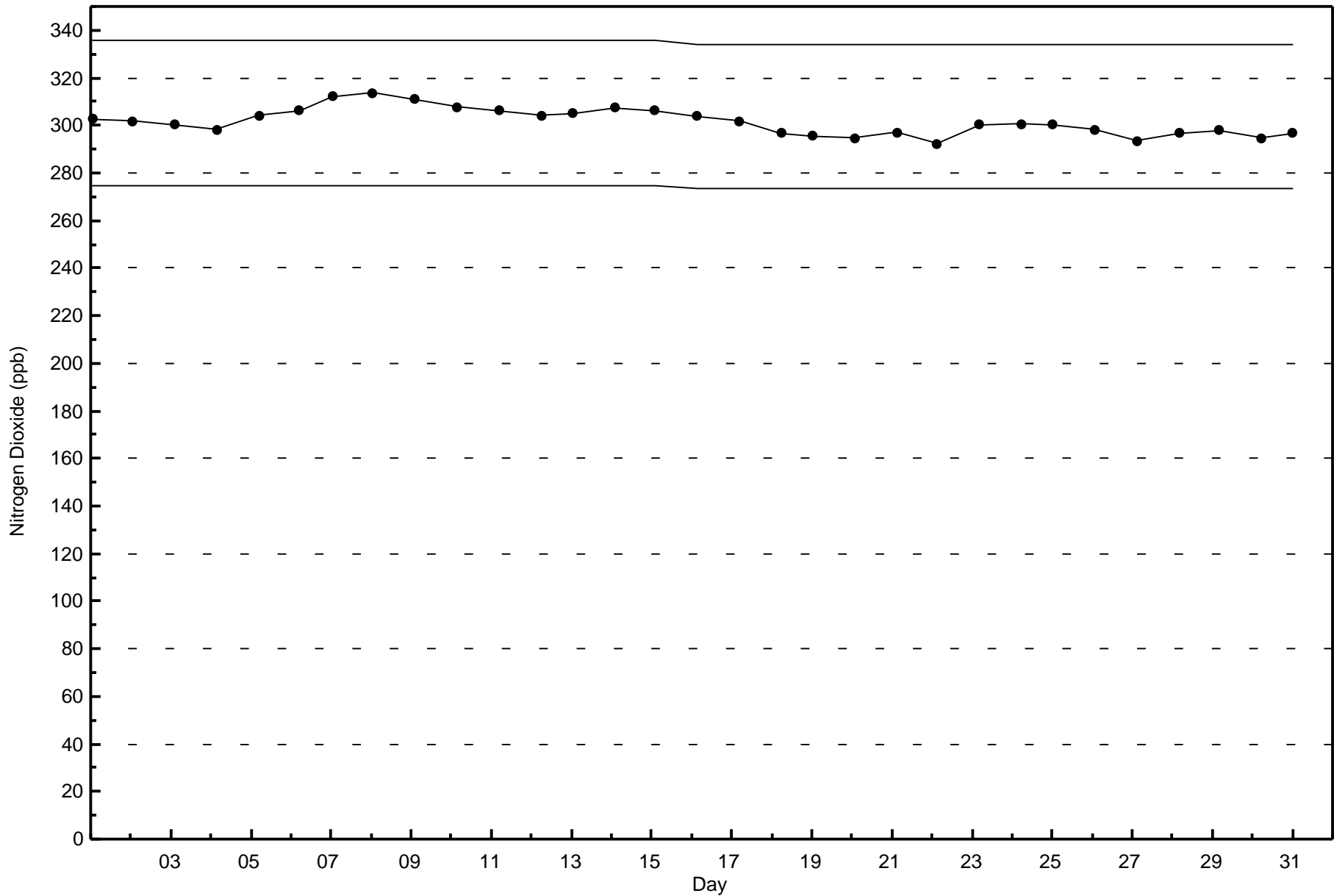
Nitrogen Dioxide (NO₂) - ppb
Firebag - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Firebag - December 2016



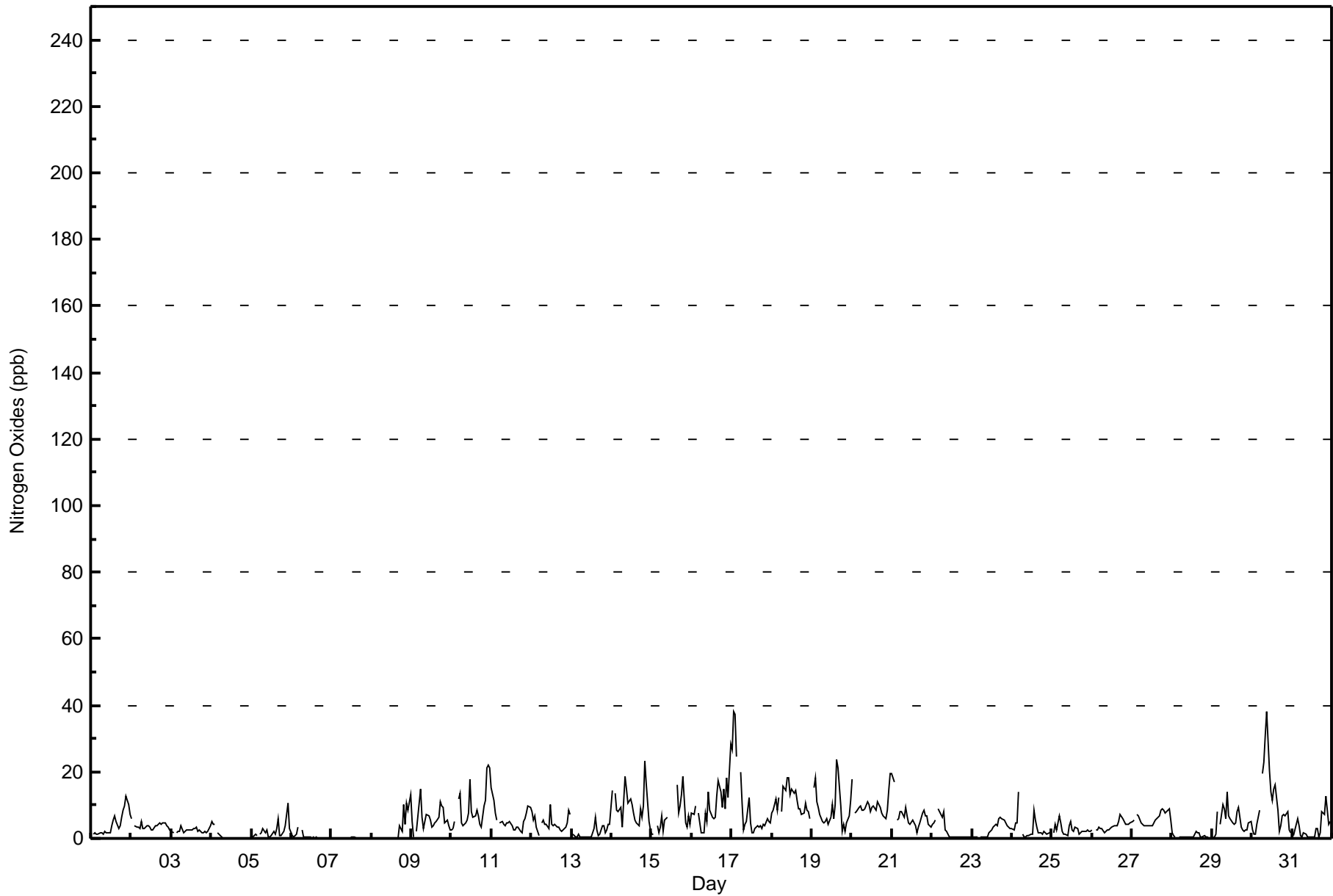


Maximum Value: 38 ppb on Dec 30 10:00		Maximum Daily Average: 11.1 ppb on Dec 18		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 7 00:00		Minimum Daily Average: 0.2 ppb on Dec 7		Hours of Data: 708																							
Maximum Diurnal Average: 6.4 ppb at hour 1		Minimum Diurnal Average: 3.9 ppb at hour 13		Hours of Missing Data: 36																							
Monthly Average: 5.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 4 Q ₃ = 7 P ₉₀ = 11 P ₉₉ = 23		Hours of Calibration: 36																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	Z	1	2	1	1	2	2	1	2	2	2	4	6	7	5	3	4	6	8	10	13	10	7	4.3	13		
2-Dec	6	Z	4	3	3	3	5	3	3	4	4	3	2	3	4	4	4	5	4	4	5	4	3	3	3.7	6	
3-Dec	2	2	Z	2	2	2	4	2	2	3	2	3	3	3	3	3	2	2	2	2	2	2	4	2.4	4		
4-Dec	5	4	4	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	5	
5-Dec	0	0	1	1	Z	1	2	3	2	2	0	0	1	2	1	3	6	1	1	2	4	7	11	3	2.4	11	
6-Dec	1	1	1	1	3	Z	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3	
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	10	4	11	8	13	2.4	13	
9-Dec	5	0	Z	2	6	15	7	3	5	7	7	6	3	4	5	5	6	11	10	9	5	5	4	3	5.8	15	
10-Dec	3	3	5	Z	12	13	5	4	5	6	8	18	8	6	7	8	7	4	3	10	11	21	22	21	9.1	22	
11-Dec	15	11	8	6	Z	5	5	4	4	5	5	5	4	3	2	4	3	2	2	5	6	8	10	9	5.6	15	
12-Dec	8	5	7	3	1	Z	5	5	4	4	3	10	4	4	4	3	3	2	2	3	3	5	8	7	4.6	10	
13-Dec	Z	1	0	0	1	0	0	0	0	0	0	0	3	6	2	1	1	4	4	2	2	4	4	1.7	6		
14-Dec	14	Z	13	9	8	9	3	11	19	15	11	12	10	8	6	5	4	9	6	10	23	17	5	2	9.9	23	
15-Dec	1	1	Z	4	2	3	7	2	6	6	C	C	C	C	C	16	7	10	13	19	5	3	7	4	6.4	19	
16-Dec	8	7	10	Z	7	5	2	2	8	5	14	8	6	6	7	13	17	14	9	15	9	18	12	28	9.9	28	
17-Dec	27	38	37	24	Z	20	11	3	4	5	12	5	2	2	3	4	3	4	3	4	4	6	5	5	10.0	38	
18-Dec	8	9	12	8	12	Z	8	16	14	18	18	13	15	14	14	11	9	9	7	8	11	8	8	6	11.1	18	
19-Dec	Z	15	18	11	10	7	5	5	5	6	4	6	10	6	10	24	21	10	2	4	2	5	7	11	8.9	24	
20-Dec	18	Z	8	8	9	10	8	9	9	11	10	8	9	10	8	11	10	9	8	7	6	8	14	19	9.9	19	
21-Dec	19	17	Z	5	6	8	8	6	9	7	5	4	5	5	4	2	3	5	8	8	7	7	4	3	6.8	19	
22-Dec	4	5	6	Z	9	7	6	8	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4	9	
23-Dec	0	0	0	0	Z	0	0	0	0	0	2	2	2	3	4	4	6	7	6	5	5	4	3	3	2.5	7	
24-Dec	3	3	5	5	14	Z	1	1	0	1	1	1	1	9	5	3	2	1	1	2	2	1	2	2	2.9	14	
25-Dec	Z	2	4	3	7	5	2	1	1	1	1	4	5	3	2	4	3	1	2	2	2	3	2	2	2.7	7	
26-Dec	3	Z	3	2	3	3	3	2	2	3	3	3	3	4	4	4	5	7	6	5	4	4	4	5	3.7	7	
27-Dec	5	5	Z	7	7	5	4	4	4	4	4	4	4	5	5	6	7	8	9	8	8	8	9	5	5.8	9	
28-Dec	2	1	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	1	0	0	0	0	0.6	2	
29-Dec	0	0	1	8	Z	4	10	9	6	14	7	6	5	4	5	8	9	4	3	2	3	2	5	5	5.2	14	
30-Dec	3	1	1	4	8	Z	20	23	31	38	20	14	11	15	16	8	2	4	7	7	7	8	3	2	11.1	38	
31-Dec	Z	1	4	6	4	1	0	2	1	0	0	0	0	0	3	3	0	2	8	7	13	9	4	5	3.2	13	
		6.4	5.2	5.9	4.8	5.3	5.0	4.4	4.1	4.9	5.5	4.9	4.7	3.9	4.2	4.7	5.3	4.7	4.5	4.3	5.6	5.2	6.1	5.7	5.9	Diurnal Average	
		27	38	37	24	14	20	20	23	31	38	20	18	15	15	16	24	21	14	13	19	23	21	22	28	Diurnal Maximum	
Z - zerospan		C - Calibration																									



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	694	98.02	98.02
21 - 40	14	1.98	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Firebag - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	73	28	8	7	4	5	26	40	113	71	86	46	21	31	44	89	692
21 - 40	0	0	0	0	0	0	0	4	1	0	4	2	0	0	1	2	14
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	73	28	8	7	4	5	26	44	114	71	90	48	21	31	45	91	706

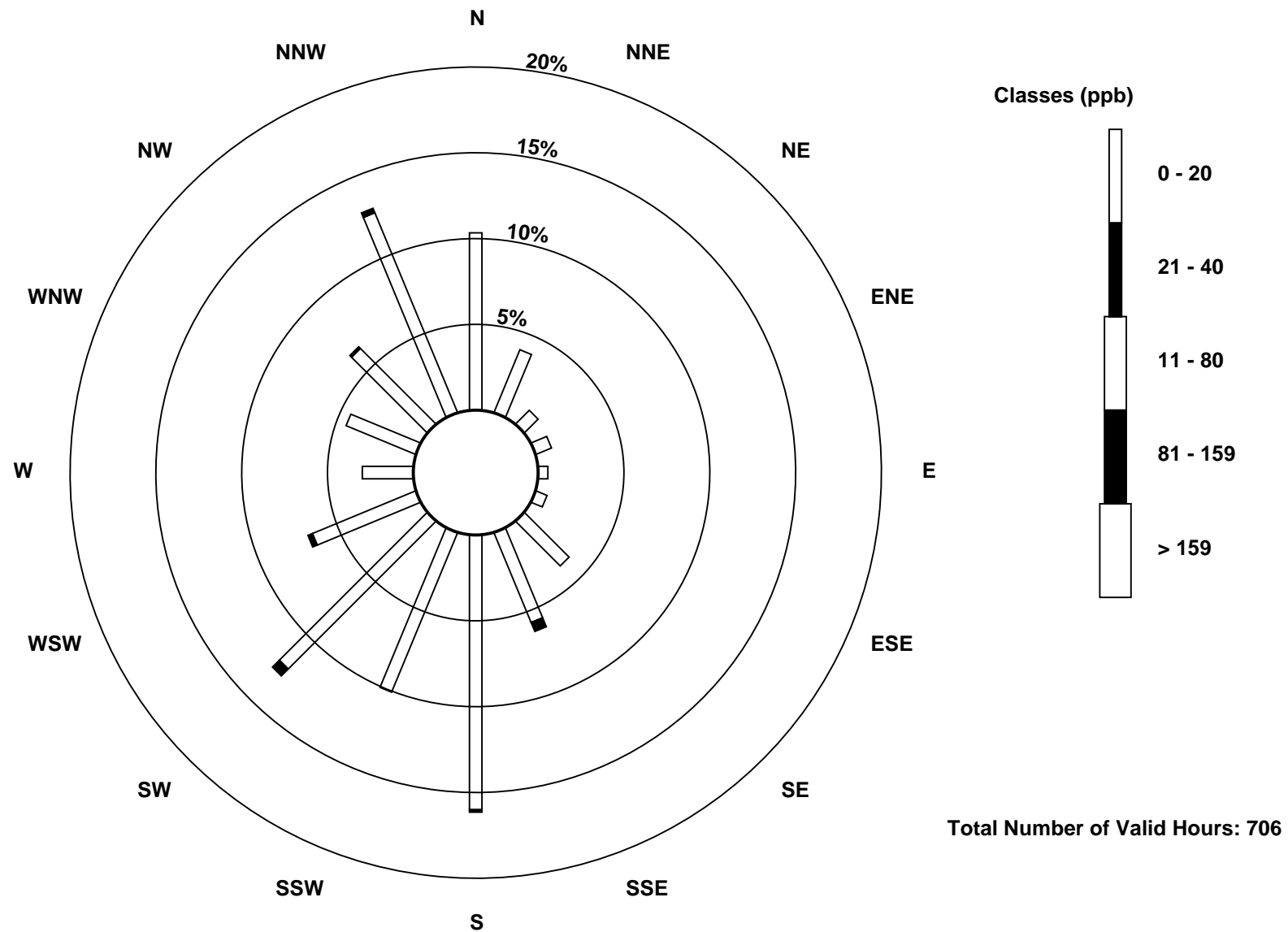
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

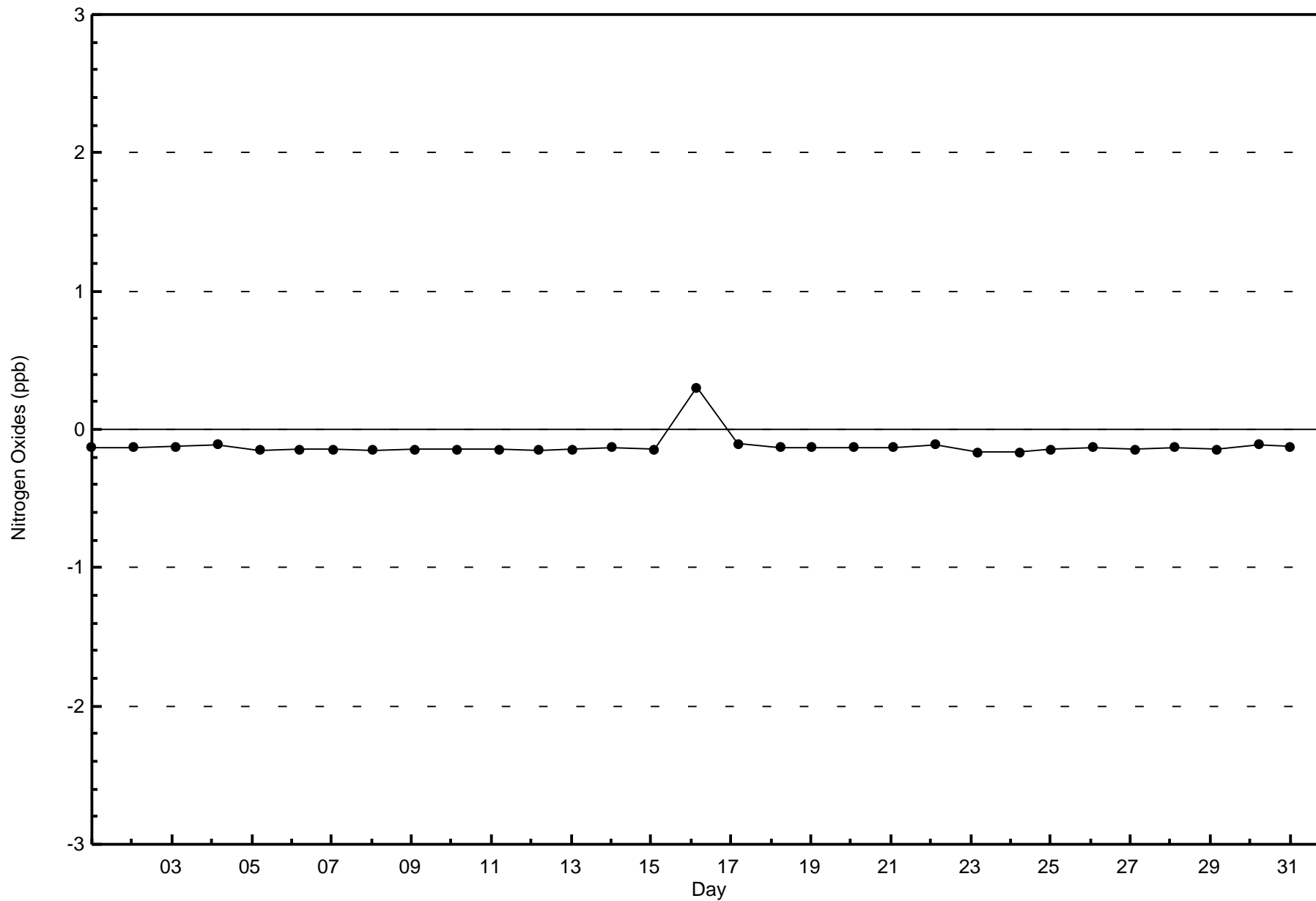
Nitrogen Oxides (NO_x) - ppb
Firebag (AMS 19)





Wood Buffalo Environmental Association
Zero Responses

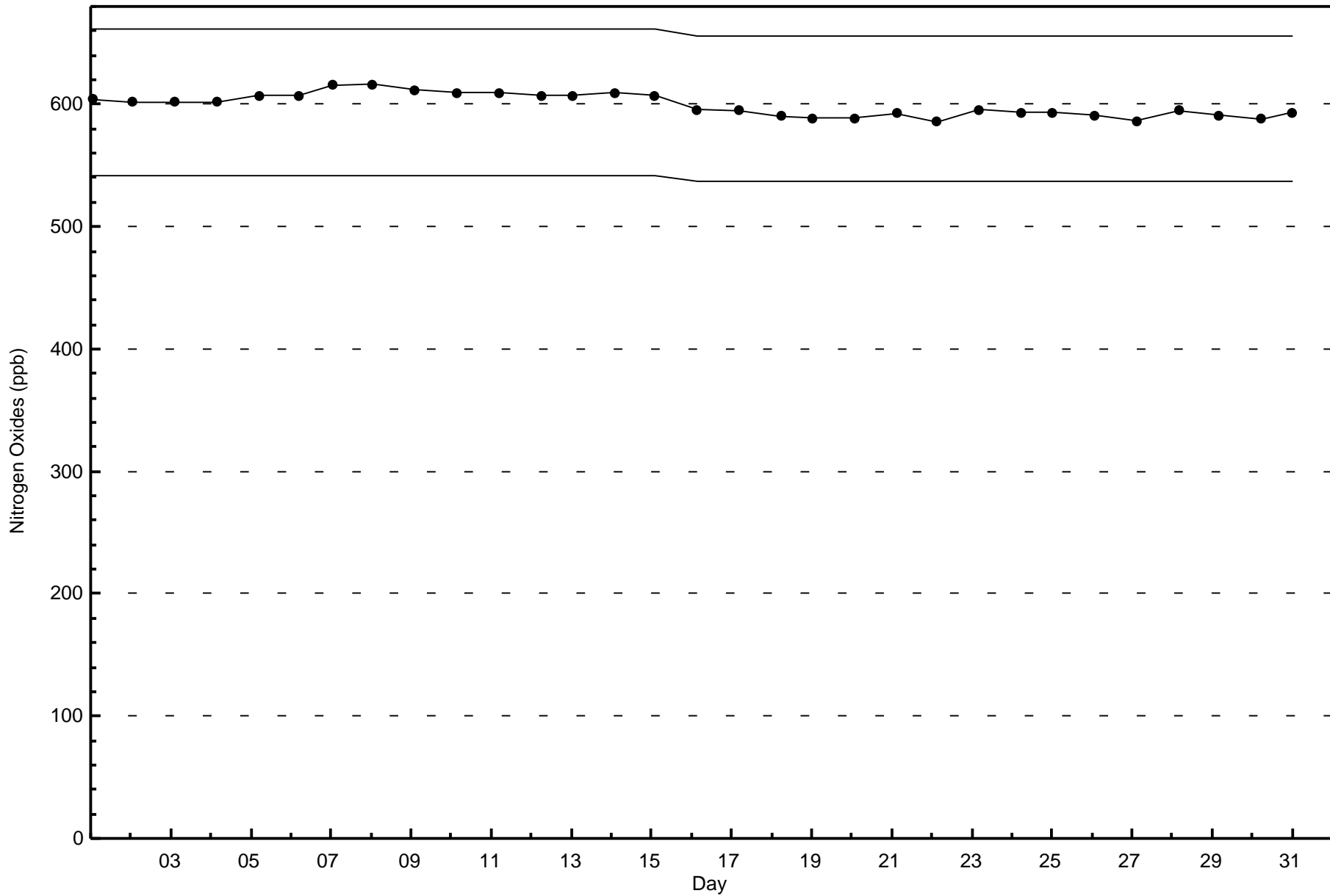
Nitrogen Oxides (NO_x) - ppb
Firebag - December 2016





WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
Firebag - December 2016



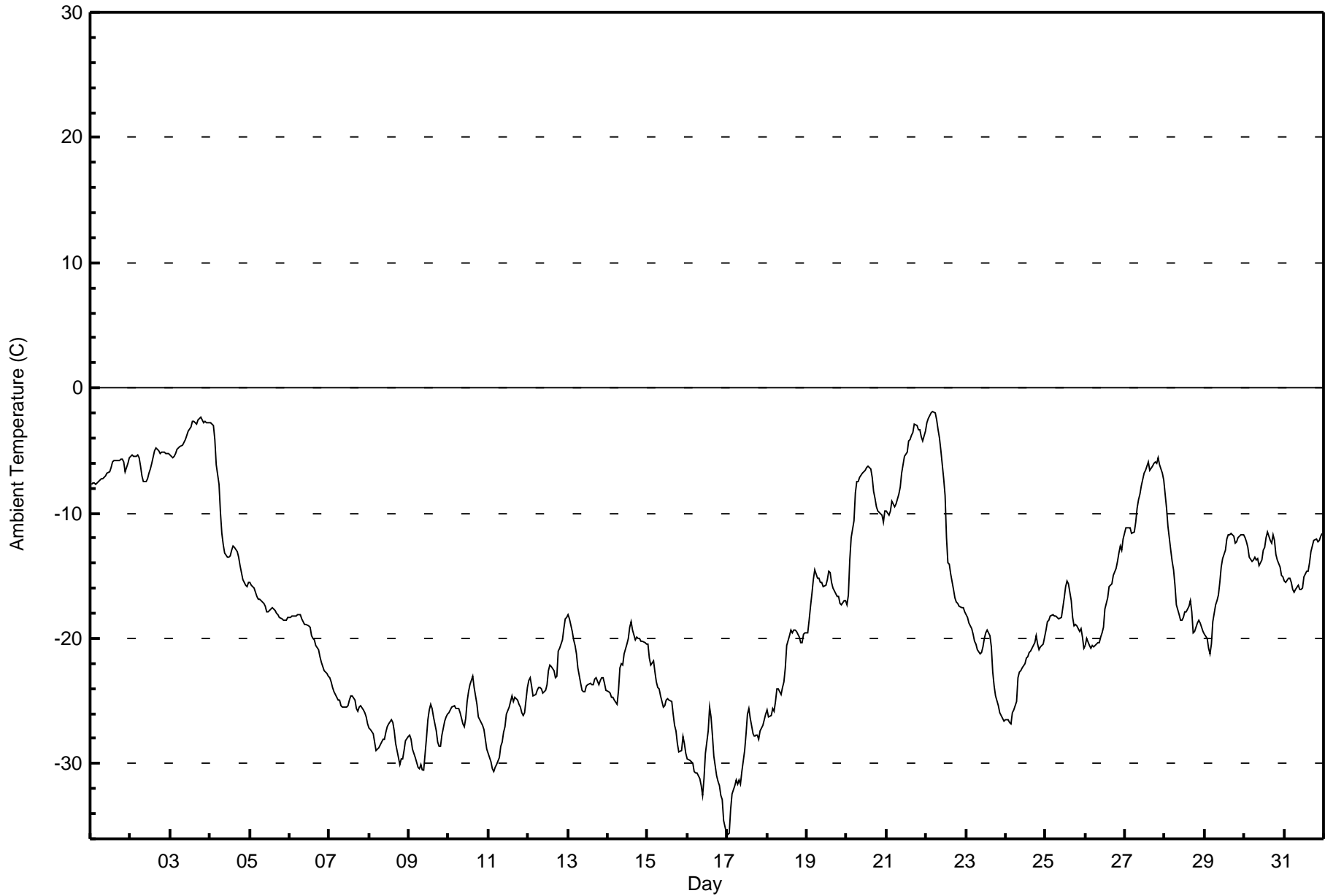


Maximum Value: -1.8 C on Dec 22 05:00 Maximum Daily Average: -3.7 C on Dec 3																						Hours in Service: 744 Hours of Data: 744					
Minimum Value: -35.7 C on Dec 17 01:00 Minimum Daily Average: -30.6 C on Dec 16 Maximum Diurnal Average: -16.9 C at hour 15 Minimum Diurnal Average: -18.7 C at hour 9 Monthly Average: -18.12 C Percentiles: P ₁ = -32.5 P ₁₀ = -27.9 Q ₁ = -24.9 Median = -18.9 Q ₃ = -12.3 P ₉₀ = -5.8 P ₉₉ = -2.6																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-7.6	-7.6	-7.6	-7.7	-7.6	-7.4	-7.3	-7.2	-7.1	-7.0	-6.8	-6.7	-6.3	-5.9	-5.8	-5.7	-5.8	-5.8	-5.7	-5.7	-5.9	-6.7	-6.0	-5.6	-6.6	-5.6	
2-Dec	-5.5	-5.4	-5.4	-5.4	-5.3	-5.6	-6.2	-7.0	-7.5	-7.4	-7.3	-6.8	-6.4	-6.0	-5.0	-4.8	-4.9	-5.0	-5.2	-5.2	-5.1	-5.2	-5.3	-5.3	-5.8	-4.8	
3-Dec	-5.4	-5.5	-5.5	-5.2	-5.0	-4.8	-4.7	-4.6	-4.3	-4.1	-3.8	-3.5	-3.2	-2.7	-2.6	-2.8	-2.9	-2.5	-2.3	-2.5	-2.8	-2.7	-2.8	-2.8	-3.7	-2.3	
4-Dec	-2.8	-2.9	-3.0	-4.1	-6.1	-7.7	-9.9	-11.6	-12.5	-13.1	-13.5	-13.6	-13.4	-13.0	-12.6	-12.7	-13.1	-13.6	-14.2	-14.7	-15.3	-15.8	-15.9	-15.6	-11.3	-2.8	
5-Dec	-15.6	-15.7	-16.0	-16.3	-16.6	-16.8	-16.9	-17.0	-17.2	-17.5	-17.9	-17.7	-17.6	-17.6	-17.8	-18.0	-18.1	-18.3	-18.5	-18.5	-18.5	-18.6	-18.5	-18.3	-17.5	-15.6	
6-Dec	-18.3	-18.2	-18.3	-18.3	-18.2	-18.2	-18.1	-18.4	-18.7	-18.8	-18.9	-19.0	-19.1	-19.8	-20.0	-20.2	-20.5	-20.9	-21.4	-21.9	-22.2	-22.6	-22.8	-23.0	-19.8	-18.1	
7-Dec	-23.2	-23.5	-23.9	-24.2	-24.7	-24.9	-25.0	-25.3	-25.4	-25.5	-25.5	-25.4	-25.0	-24.6	-24.6	-24.9	-25.6	-25.8	-25.5	-25.4	-25.7	-25.9	-26.2	-26.8	-25.1	-23.2	
8-Dec	-27.1	-27.3	-27.6	-28.3	-28.9	-28.8	-28.7	-28.3	-28.1	-28.0	-27.5	-27.1	-26.8	-26.5	-26.7	-27.4	-28.3	-29.0	-30.0	-29.6	-29.6	-29.0	-28.2	-27.9	-28.1	-26.5	
9-Dec	-27.7	-28.1	-28.9	-29.2	-29.6	-30.3	-30.4	-30.0	-30.5	-30.5	-27.9	-26.5	-25.7	-25.2	-25.6	-26.3	-27.4	-28.3	-28.7	-28.6	-27.7	-26.6	-26.3	-26.0	-28.0	-25.2	
10-Dec	-25.9	-25.7	-25.5	-25.4	-25.6	-25.6	-25.5	-26.0	-26.8	-27.1	-26.4	-25.1	-24.3	-23.7	-23.0	-24.0	-24.6	-25.3	-26.3	-26.7	-26.9	-27.3	-28.1	-28.8	-25.8	-23.0	
11-Dec	-29.2	-29.8	-30.5	-30.6	-30.3	-30.1	-29.5	-28.6	-28.2	-27.5	-27.0	-26.0	-25.5	-25.1	-24.6	-25.1	-24.7	-25.0	-25.3	-25.5	-26.0	-26.2	-25.9	-23.9	-27.1	-23.9	
12-Dec	-23.4	-23.2	-23.9	-24.6	-24.4	-24.1	-23.9	-23.9	-24.0	-24.3	-24.1	-23.7	-22.6	-22.2	-22.3	-22.6	-23.2	-23.0	-21.0	-20.8	-20.1	-19.2	-18.5	-18.4	-22.5	-18.4	
13-Dec	-18.1	-18.4	-19.5	-20.1	-20.5	-21.3	-22.3	-23.6	-24.1	-24.3	-24.2	-23.8	-23.7	-23.6	-23.7	-23.2	-23.2	-23.2	-23.2	-23.7	-23.4	-23.1	-23.1	-23.6	-24.1	-22.6	-18.1
14-Dec	-24.3	-24.3	-24.7	-24.8	-25.0	-25.3	-24.2	-22.3	-22.0	-22.2	-21.3	-20.5	-20.0	-19.1	-18.6	-19.4	-20.1	-19.9	-20.0	-20.0	-20.2	-20.3	-20.3	-20.4	-21.6	-18.6	
15-Dec	-20.5	-21.5	-22.1	-21.8	-22.7	-23.4	-24.0	-24.0	-24.6	-25.5	-25.4	-24.9	-24.8	-24.9	-25.1	-26.1	-26.9	-27.4	-28.3	-29.1	-29.0	-29.0	-27.8	-28.4	-29.1	-25.3	-20.5
16-Dec	-29.6	-29.7	-29.8	-30.0	-30.6	-30.7	-30.8	-31.2	-31.8	-32.6	-31.2	-29.2	-27.4	-25.5	-26.3	-27.7	-29.4	-31.0	-31.4	-31.7	-32.5	-32.9	-34.5	-35.6	-30.6	-25.5	
17-Dec	-35.7	-35.5	-33.6	-32.4	-31.7	-31.3	-31.6	-31.3	-31.6	-30.7	-29.0	-27.7	-26.0	-25.6	-26.4	-27.6	-27.8	-27.7	-27.8	-28.0	-27.4	-26.9	-26.5	-26.1	-29.4	-25.6	
18-Dec	-25.7	-26.3	-26.1	-25.6	-25.8	-25.1	-24.0	-24.0	-24.4	-24.0	-23.5	-22.3	-20.6	-19.7	-19.4	-19.6	-19.4	-19.3	-19.5	-19.9	-20.3	-20.3	-19.7	-19.5	-22.3	-19.3	
19-Dec	-19.6	-18.5	-17.5	-16.4	-15.3	-14.5	-15.2	-15.2	-15.5	-15.5	-15.9	-15.8	-15.4	-14.6	-14.8	-15.5	-15.9	-16.4	-16.7	-16.7	-17.2	-17.3	-16.9	-17.0	-16.2	-14.5	
20-Dec	-17.3	-16.5	-13.7	-11.9	-10.6	-8.4	-7.5	-7.5	-7.1	-6.8	-6.7	-6.5	-6.4	-6.3	-6.4	-7.1	-8.2	-8.8	-9.5	-9.8	-10.1	-10.1	-10.7	-9.9	-9.3	-6.3	
21-Dec	-9.8	-10.2	-9.8	-9.0	-9.2	-9.5	-9.3	-8.5	-8.0	-6.8	-6.2	-5.4	-5.2	-4.2	-4.1	-3.8	-3.6	-2.9	-3.0	-3.4	-3.3	-3.9	-4.2	-3.4	-6.1	-2.9	
22-Dec	-2.8	-2.5	-2.2	-2.0	-1.8	-2.0	-2.5	-3.3	-4.1	-5.0	-7.3	-8.6	-11.9	-14.0	-14.0	-14.9	-16.1	-16.8	-17.0	-17.3	-17.4	-17.5	-17.5	-17.9	-9.9	-1.8	
23-Dec	-18.1	-18.4	-18.7	-19.2	-19.7	-20.3	-20.4	-20.9	-21.2	-21.1	-20.7	-20.0	-19.5	-19.3	-19.8	-20.7	-22.7	-23.8	-24.6	-25.4	-25.9	-26.2	-26.4	-26.6	-21.7	-18.1	
24-Dec	-26.5	-26.5	-26.7	-26.8	-25.9	-25.7	-25.0	-23.1	-22.7	-22.6	-22.4	-22.0	-21.5	-21.4	-21.2	-21.0	-20.8	-20.4	-19.8	-20.5	-20.9	-20.7	-20.4	-19.8	-22.7	-19.8	
25-Dec	-19.4	-18.7	-18.6	-18.2	-18.1	-18.2	-18.2	-18.3	-18.4	-18.3	-17.5	-16.8	-15.9	-15.4	-15.7	-17.0	-18.3	-19.0	-18.9	-19.0	-19.4	-19.2	-19.9	-20.8	-18.2	-15.4	
26-Dec	-20.6	-20.0	-20.5	-20.8	-20.6	-20.7	-20.5	-20.4	-20.3	-19.9	-19.6	-19.1	-17.7	-16.8	-15.8	-15.7	-15.6	-15.0	-14.4	-13.8	-13.2	-12.7	-13.0	-12.1	-17.4	-12.1	
27-Dec	-11.2	-11.2	-11.1	-11.1	-11.7	-11.5	-10.7	-9.6	-8.9	-8.5	-7.8	-6.8	-6.6	-6.2	-5.9	-6.6	-6.2	-6.0	-5.9	-6.1	-5.6	-6.2	-6.8	-7.4	-8.1	-5.6	
28-Dec	-8.5	-9.6	-11.0	-13.0	-13.9	-14.6	-15.7	-17.3	-18.1	-18.5	-18.6	-18.3	-17.9	-17.9	-17.4	-16.9	-17.8	-19.6	-19.5	-18.8	-18.6	-18.7	-19.1	-19.4	-16.6	-8.5	
29-Dec	-19.7	-20.0	-20.8	-21.2	-20.4	-18.6	-17.3	-16.9	-16.6	-15.6	-14.3	-13.6	-12.9	-12.1	-11.7	-11.8	-11.6	-11.8	-12.4	-12.3	-11.9	-11.8	-11.8	-11.7	-14.9	-11.6	
30-Dec	-11.9	-12.3	-12.8	-13.5	-13.9	-13.7	-13.6	-13.7	-13.6	-14.2	-13.8	-13.0	-12.8	-11.9	-11.6	-12.1	-12.4	-11.8	-12.2	-13.3	-13.8	-14.3	-15.0	-15.1	-13.2	-11.6	
31-Dec	-15.4	-15.6	-15.2	-15.2	-15.6	-16.0	-16.3	-16.1	-15.8	-16.1	-16.1	-16.0	-15.1	-14.7	-14.7	-13.9	-13.0	-12.6	-12.2	-12.1	-12.3	-12.1	-11.8	-11.7	-14.4	-11.7	
																								Diurnal Average			
																								Diurnal Maximum			



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Firebag - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	328	44.09	44.09
-20 - 0	416	55.91	100.00
0 - 10	0	0.00	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

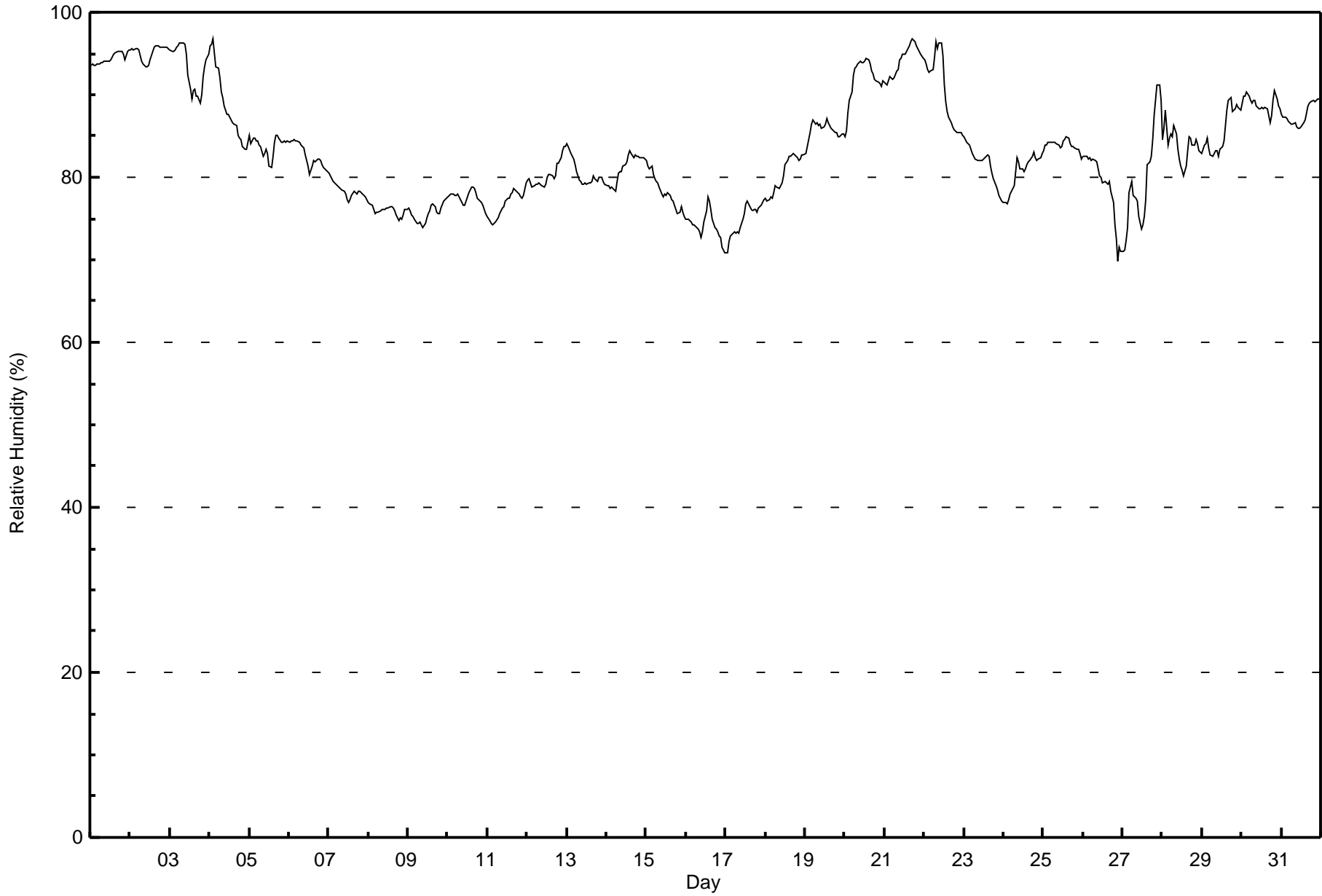
Firebag - December 2016

Maximum Value: 97 % on Dec 4 03:00 Maximum Daily Average: 95.1 % on Dec 2																	Hours in Service: 744										
Minimum Value: 70 % on Dec 26 22:00 Minimum Daily Average: 74.2 % on Dec 16																	Hours of Data: 744										
Maximum Diurnal Average: 83.8 % at hour 16 Minimum Diurnal Average: 83.0 % at hour 13																	Hours of Missing Data: 0										
Monthly Average: 83.4 % Percentiles: P ₁ = 71 P ₁₀ = 76 Q ₁ = 78 Median = 83 Q ₃ = 88 P ₉₀ = 94 P ₉₉ = 96																	Hours of Calibration: 0										
																	Percent Operational Time: 100.0										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	94	94	94	94	94	94	94	94	94	94	94	94	94	95	95	95	95	95	95	95	95	94	95	95	94.4	95	
2-Dec	95	96	96	96	96	95	95	94	94	93	93	94	94	95	96	96	96	96	96	96	96	96	96	96	96	95.1	96
3-Dec	95	95	95	95	96	96	96	96	96	96	95	92	91	89	91	91	90	90	89	90	92	93	94	95	93.3	96	
4-Dec	96	96	97	95	93	93	92	90	89	88	88	87	87	87	86	86	85	85	85	84	83	83	84	84	88.7	97	
5-Dec	85	84	85	85	84	84	84	84	82	83	83	83	81	81	83	84	85	85	85	84	84	84	84	84	83.8	85	
6-Dec	84	84	84	85	84	84	84	84	84	84	83	81	80	81	81	82	82	82	82	82	81	81	81	81	82.6	85	
7-Dec	80	80	80	80	79	79	79	79	78	78	78	77	77	77	78	78	78	78	78	78	78	78	78	77	78.4	80	
8-Dec	77	77	77	76	76	76	76	76	76	76	76	76	76	76	76	76	76	75	75	75	75	75	76	76	76.0	77	
9-Dec	76	76	75	75	75	74	74	75	74	74	74	75	76	76	77	77	76	76	76	76	76	77	77	78	75.6	78	
10-Dec	78	78	78	78	78	78	78	78	77	77	77	77	78	78	79	79	79	78	77	77	77	77	76	76	77.5	79	
11-Dec	75	75	74	74	74	75	75	76	76	76	76	77	78	77	78	78	79	78	78	78	78	78	79	79	76.7	79	
12-Dec	80	80	79	79	79	79	79	79	79	79	79	79	80	80	80	80	80	80	82	82	82	83	84	84	80.3	84	
13-Dec	84	84	83	83	82	82	81	80	79	79	79	79	79	79	80	80	80	80	80	80	80	79	79	79	80.4	84	
14-Dec	79	79	79	79	79	78	79	81	81	81	81	82	82	83	83	83	82	83	83	82	82	82	82	82	81.1	83	
15-Dec	82	81	81	81	80	80	79	79	79	78	78	78	78	78	78	77	77	77	76	76	76	76	75	75	78.2	82	
16-Dec	75	75	75	75	74	74	74	74	73	73	73	75	76	78	77	76	75	74	74	73	73	73	71	71	74.2	78	
17-Dec	71	71	72	73	73	73	73	73	73	74	75	76	77	77	77	76	76	76	76	76	76	77	77	77	74.8	77	
18-Dec	78	77	77	78	78	78	79	79	79	79	79	80	82	82	82	83	83	83	83	82	82	82	83	83	80.4	83	
19-Dec	83	84	85	85	86	87	86	87	86	86	86	86	86	87	87	86	86	86	86	85	85	85	85	85	85.7	87	
20-Dec	85	86	88	89	90	92	93	93	94	94	94	94	94	94	94	94	93	92	92	92	91	91	91	92	91.8	94	
21-Dec	92	91	92	92	92	92	92	93	93	94	94	95	95	95	96	96	96	97	96	96	96	95	95	94	94.1	97	
22-Dec	94	94	93	93	93	93	95	96	96	96	96	95	91	89	88	87	87	86	86	86	85	85	85	85	90.6	96	
23-Dec	85	85	84	84	83	83	83	82	82	82	82	82	82	82	83	82	81	81	80	79	78	78	77	77	81.6	85	
24-Dec	77	77	77	77	78	78	79	81	82	82	81	81	81	81	82	82	82	83	83	82	82	82	83	83	80.6	83	
25-Dec	83	84	84	84	84	84	84	84	84	84	84	84	84	85	85	85	84	84	84	84	83	83	83	82	83.9	85	
26-Dec	83	83	82	82	82	82	82	82	82	81	80	80	79	79	79	79	79	78	77	74	73	70	72	71	78.9	83	
27-Dec	71	71	72	74	78	80	78	78	77	77	75	74	74	75	77	81	82	83	85	87	89	91	91	89	79.6	91	
28-Dec	85	86	88	84	85	85	85	86	85	83	82	81	81	80	81	83	85	85	84	84	85	84	83	83	83.9	88	
29-Dec	83	84	84	85	84	83	83	83	83	83	82	83	84	84	86	88	89	90	88	88	88	89	89	88	85.5	90	
30-Dec	89	90	90	90	90	89	89	89	89	89	88	88	89	88	89	88	87	87	87	89	91	90	89	88	88.9	91	
31-Dec	88	87	87	87	87	87	86	87	87	86	86	86	86	87	87	88	89	89	89	89	89	89	89	89	87.6	89	
																	Diurnal Average										
																	Diurnal Maximum										



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Firebag - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	273	36.69	36.69
80 - 100	471	63.31	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Firebag - December 2016

Maximum Speed: 29 km/h on Dec 4 21:00	Maximum Daily Speed Average: 19.9 km/h on Dec 4	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 29 05:00	Minimum Daily Speed Average: 2.0 km/h on Dec 16	Hours of Data: 742
Maximum Diurnal Speed Average: 3.9 km/h at hour 14	Minimum Diurnal Speed Average: 2.3 km/h at hour 23	Hours of Missing Data: 2
Monthly Average Velocity: 3.1 km/h 258.9 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 8 Q ₃ = 14 P ₉₀ = 20 P ₉₉ = 26	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S19	SSW18	SSW18	SSW16	SW14	SW13	SSW14	SSW14	SSW14	SW15	SSW14	SW12	SW11	SW11	SSW9	SW9	SW10	SW10	SW8	SW8	SW8	SSW6	SSW6	SSW7	SSW11.7	S19
2-Dec	SSW8	SSW8	S9	S9	S10	S11	S11	S12	S14	S13	S11	SSE13	SSE15	S17	S16	SSE16	SSE20	SSE21	SSE20	SSE20	S21	S23	S22	S22	S14.9	S23
3-Dec	S23	S23	S22	S23	S23	S20	S20	S22	S21	S21	SSW24	SSW23	SSW23	SSW20	SSW19	SSW19	SSW20	SSW19	SSW19	SSW18	SSW18	SSW16	SSW12	SSW10	S19.5	SSW24
4-Dec	SSW9	SSW7	W3	N15	N18	N21	N20	N20	N22	N21	N23	N23	NNW25	N24	NNW23	NNW25	NNW26	NNW27	NNW28	NNW26	NNW29	NNW27	NNW27	NNW24	N19.9	NNW29
5-Dec	NNW20	NNW24	NNW19	NNW21	NNW23	NNW22	NNW25	NNW24	NNW24	NNW19	NW17	NNW17	NNW18	NNW18	NNW16	NNW15	NNW15	NW15	NNW15	NNW16	NNW13	NNW14	NNW12	NW14	NW17.4	NNW25
6-Dec	NW13	NW14	NW13	NW14	NNW15	NW13	NNW20	NNW22	NNW21	NNW22	NNW22	NNW23	NNW22	NNW21	NNW21	NNW21	N21	N20	N18	N19	N20	N17	N17	N17	NNW18.4	NNW23
7-Dec	N18	N17	N16	NNW14	N15	N19	N17	N16	N16	N18	N21	N17	NNW18	NNW21	NNW20	N17	NNW12	N13	N17	N18	N17	N16	N17	N15	N16.8	NNW21
8-Dec	N13	N12	N12	N10	N9	N11	N10	N11	N10	N7	NNE9	N9	N7	N6	N5	NNE4	NNE5	ENE4	ENE4	E5	E5	ENE6	ESE4	SSE6	NNE6.5	N13
9-Dec	S5	SW5	SW5	SSW5	S5	S3	SSW6	S6	S5	S5	SSW6	SSW9	SSW8	SSW8	SSW8	S7	S6	S6	S6	S8	S8	SSW9	SSW9	SSW10	SSW6.4	SSW10
10-Dec	SW8	SW9	SW9	SW9	SW9	SW9	SW8	SW7	SSW5	SSW6	SSW4	SW6	SW6	SW6	SW5	SW4	SSW6	SW5	SW5	WSW5	SW6	SW6	SW8	WSW7	SW6.5	SW9
11-Dec	WSW7	WSW6	SW6	WSW7	WSW8	WSW8	WSW8	WSW8	WSW8	WSW8	WSW9	WSW9	WSW9	WSW8	W7	W6	WSW6	WSW5	WSW5	WSW6	W6	W5	W5	WNW6	WSW6.8	WSW9
12-Dec	NW7	NNW9	NNW9	NW7	NW8	WNW8	NW9	NW8	NW7	NW7	WNW8	NW8	NW8	NW6	WNW4	W3	W3	W4	WNW6	WNW6	WNW6	WNW8	NNW10	WNW9	NW6.9	NW10
13-Dec	WNW9	NNW7	N9	NNW11	NNW14	NNW16	NNW13	NNW12	NNW10	NNW10	NNW10	NNW10	NNW10	NNW8	NW7	NW6	NW8	NW6	NW7	NW7	NW6	NW6	WNW5	WNW5	NNW8.6	NNW16
14-Dec	W5	W4	W4	W4	WSW5	SW5	SW6	SW6	SW6	SW6	SW6	SW6	SW5	WSW5	NW4	N7	NNW6	NNW6	NW5	NW5	NW5	NW6	NW6	NW5	WNW3.5	N7
15-Dec	NW5	NW4	NW4	NNW7	NNW7	NNW7	NNW5	NW5	NW5	NNW6	NW6	NW6	NW6	WNW5	WNW5	WNW5	NNW5	NW4	NW3	NW3	NNW6	NNW5	NNW5	NNW5	NW4.9	NNW7
16-Dec	NNW6	NNW6	NNW7	NNW5	NNW4	NNW5	NNW4	NNW3	WNW3	WNW2	WSW3	W4	WSW4	WSW3	WSW4	SW4	SW3	SW3	SSW3	SSW3	SSW3	SSE2	SE2	SSE2	WNW2.0	NNW7
17-Dec	SSE2	SSE3	SSE3	S3	S4	S4	S4	S4	S5	S4	S5	S5	SSW5	SSW6	S5	SSE5	S6	S6	S7	S7	SSE7	SSE7	SSE7	SSE7	S4.9	SSE7
18-Dec	SSE5	S5	S5	SSE5	S4	SSW4	SSW4	SSE3	SSW2	SE2	SE2	SSE3	SSE2	AF	ENE2	NE2	NE2	SE1	SSW2	AF	SSE4	SSE4	S5	SSE2.8	S5	
19-Dec	SSE5	SSE5	SSE7	SE6	SE7	SE8	SE9	SE10	SE9	SE8	SE7	SE6	SSE5	SSE2	NNW4	NNW5	NNW5	NNW6	NNW6	NNW5	NNE3	S2	SSE3	S5	SE3.0	SE10
20-Dec	SSW7	SSW6	SW9	SW10	SW11	WSW13	WSW12	SW10	WSW9	SW11	SW12	WSW10	SW11	SW10	SW8	SW8	SW8	SW7	SW8	SW7	SW7	SW9	SW9	SW12	SW9.2	WSW13
21-Dec	SW10	SW11	SW11	SW14	SW14	WSW12	SW14	SW14	SW14	SW20	SW19	SW17	SW12	WSW14	WSW14	WSW13	SW11	WSW16	WSW19	SW18	WSW17	WSW12	SW15	SW13	SW14.2	SW20
22-Dec	SW12	SW14	SW12	SW13	WSW14	WSW15	W12	NNW12	N11	N12	NNE14	NNE12	N13	NNE10	NNE7	NNE7	NNE7	NNE7	NNE9	NNE7	NNE8	NNE7	NNE7	NNE8	NNW4.7	WSW15
23-Dec	NNE8	NNE8	NNE7	NNE7	NNE6	N6	N5	NNE6	NE5	NE6	NE5	ENE4	ENE4	E5	ESE5	ESE6	ESE7	SE5	SE7	SE7	SE6	SE7	SE6	SE6	ENE3.7	NNE8
24-Dec	SE5	SE5	SE4	SE5	SE6	SSE7	SSE9	S9	S9	S8	S8	S8	S7	S7	S6	S6	S7	SSW7	S7	S6	S6	S6	S6	S6	S6.4	SSE9
25-Dec	S6	S7	S5	S6	S6	S6	S7	S6	S6	S7	S6	S7	S7	S6	S5	SSE6	SSE7	S7	S9	S9	S10	S10	S8	S6	S6.8	S10
26-Dec	S6	S8	S8	S8	S9	S9	S8	S10	S11	S13	S12	S12	SSW16	S18	S24	S26	S25	S20	SSW26	SSW26	SSW28	SSW28	SSW24	SSW24	S16.6	SSW28
27-Dec	SSW24	SSW24	SSW25	SSW27	S23	SSW23	SSW26	SSW25	SSW23	SSW25	SSW25	SW25	SW22	SW20	SW17	SW14	SW15	SW15	WSW15	WSW12	W11	WNW9	N10	N12	SW16.6	SSW27
28-Dec	N13	N13	N16	N19	N19	N19	N18	N17	N12	N15	N17	N13	N9	N4	W2	WNW5	N5	NE7	NE6	NE5	NNE8	NNE8	NNE5	N5	N10.4	N19
29-Dec	NNW5	NNE4	NNE3	ENE4	SSW1	E5	ESE5	SE5	SSE5	SE8	SSE9	S9	SSE8	SSE9	S7	SSE10	SSE11	S11	S11	SSE11	S4	SSW7	S5	S5	SSE5.3	S11
30-Dec	W5	WSW6	WSW8	W8	WSW7	WSW7	W8	WSW7	SW9	SW11	SW14	SW13	SW16	SW14	SW17	SSW18	SW20	SW19	WSW14	WSW10	NW9	N14	NNE12	N11	WSW8.3	SW20
31-Dec	N13	NNW11	NNW9	NNW13	NNW14	N16	NNW9	NNW9	NNW16	NNW16	NNW14	NNW14	NNW16	NNW13	NNW10	NW10	NW9	WNW8	WNW9	WNW8	W9	W11	W11	NW14	NNW10.3	NNW16

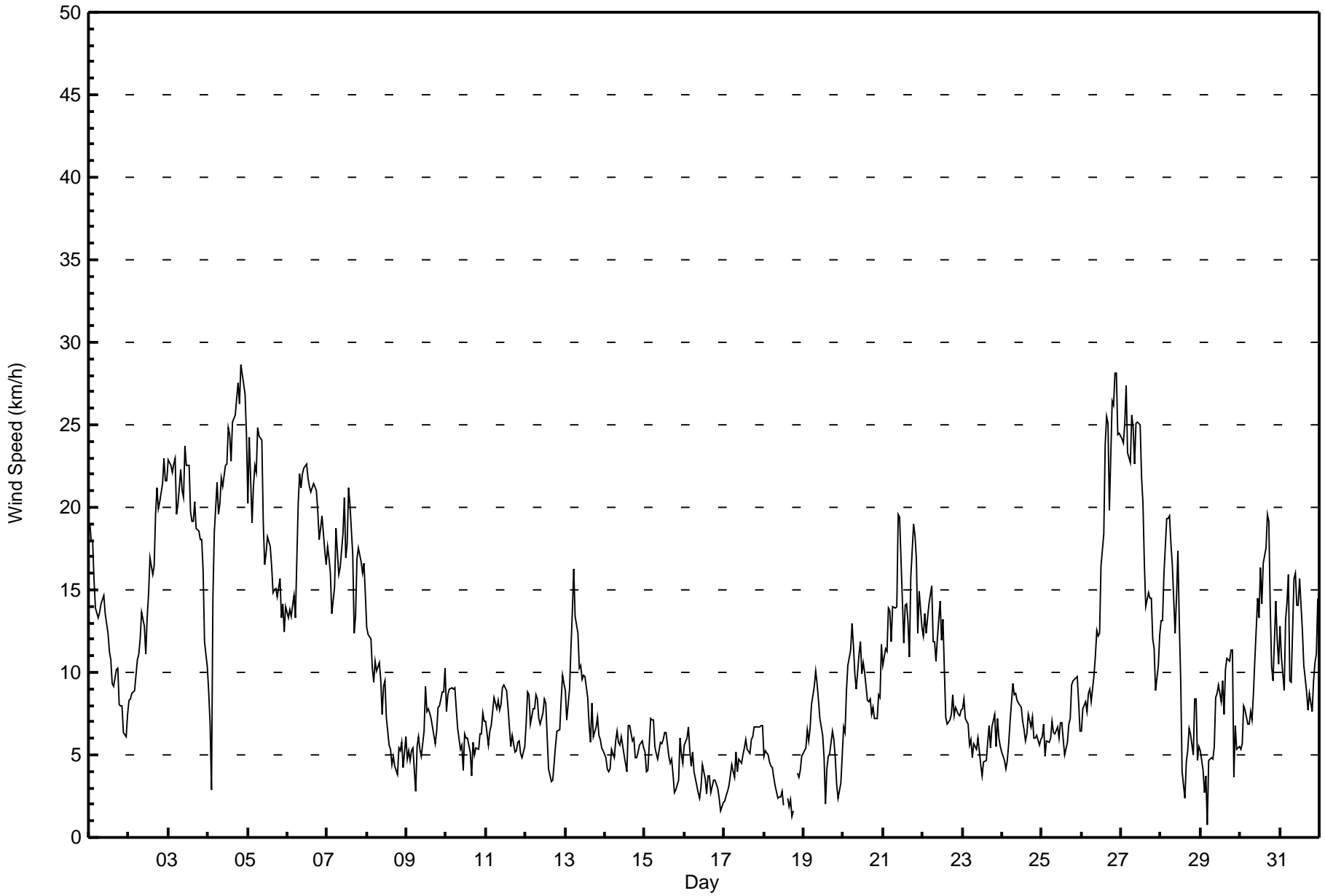
WSW2.9	WSW2.9	WSW2.9	W2.9	W3.0	NNW3.0	W3.0	W2.8	W2.7	W2.9	W3.3	W3.7	W3.8	W3.9	WSW3.6	WSW3.2	WSW3.4	WSW3.4	WSW3.6	WSW3.5	WSW3.3	W2.9	W2.3	W2.6	Diurnal Average
SSW24	NNW24	SSW25	SSW27	S23	SSW23	SSW26	SSW25	NNW24	SSW25	SSW25	SW25	NNW25	N24	S24	S26	NNW26	NNW27	NNW28	NNW26	NNW29	SSW28	NNW27	SSW24	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Firebag - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Firebag - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	166	22.37	22.37
6 - 11	319	42.99	65.36
12 - 19	164	22.10	87.47
20 - 28	92	12.40	99.87
29 - 38	1	0.13	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**WBEA Data PC
Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	4	6	5	6	4	3	9	21	26	12	11	9	12	10	14	14	166
6 - 11	18	20	3	1	0	2	17	18	64	26	49	24	9	14	27	27	319
12 - 19	45	3	0	0	0	0	0	3	10	17	29	17	1	10	10	19	164
20 - 28	11	0	0	0	0	0	0	4	19	21	5	0	0	0	0	32	92
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	78	29	8	7	4	5	26	46	119	76	94	50	22	34	51	93	742

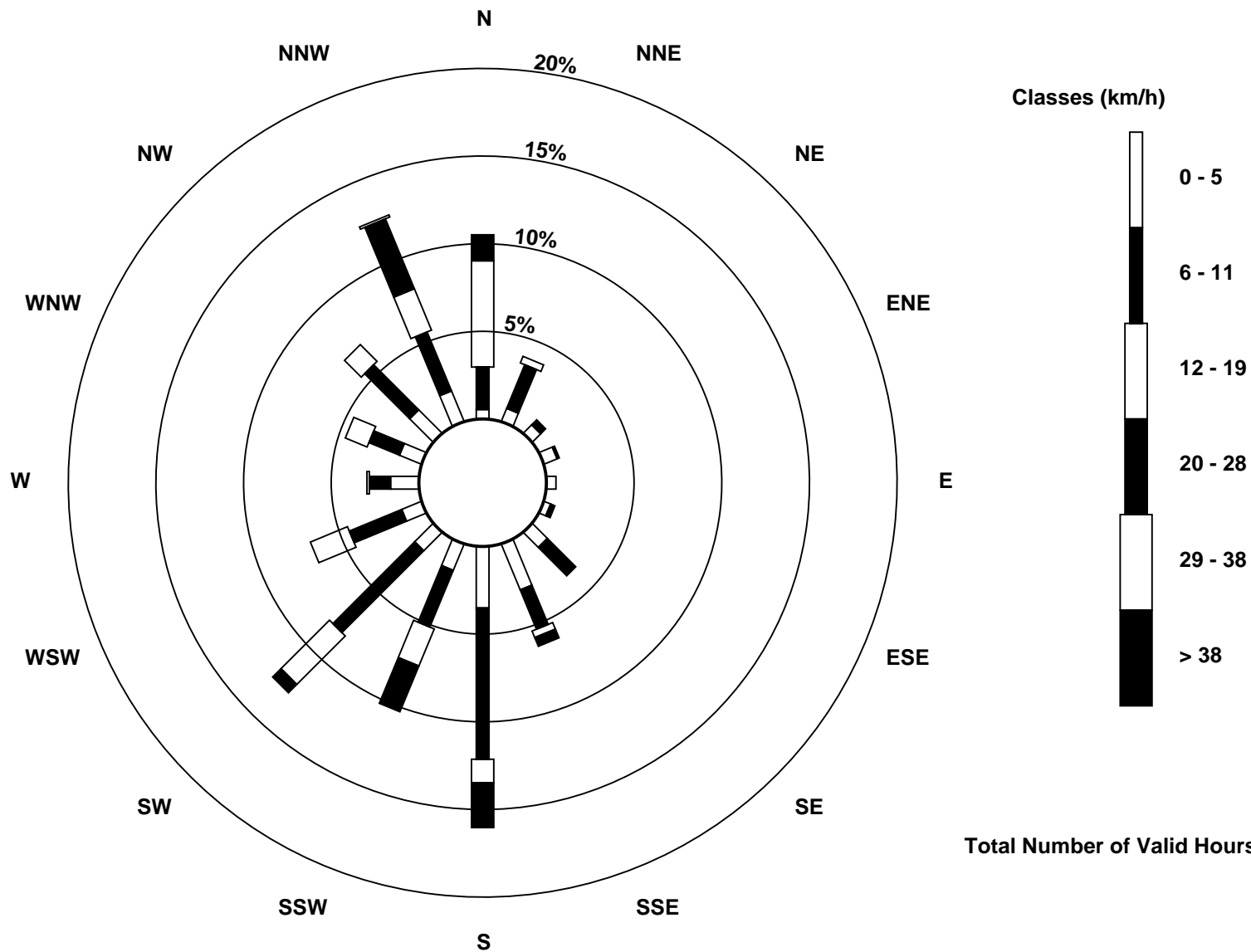
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Firebag (AMS 19)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Firebag - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 6 07:00 Minimum Value: 0 km/h on Dec 16 20:00 Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 5																	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	4	3	3	3	2	2	3	2	2	2	2	2	2	1	2	1	1	1	2	1	1	1	4		
2-Dec	1	1	1	1	2	2	1	2	2	2	1	3	3	2	2	2	3	3	4	3	3	4	4	4		
3-Dec	4	4	3	3	3	3	3	3	3	2	3	3	3	2	3	2	2	3	2	2	3	2	1	4		
4-Dec	1	1	1	3	3	4	5	4	4	4	4	5	4	4	4	5	5	6	5	5	6	6	5	6		
5-Dec	5	5	4	5	4	5	5	4	5	5	3	3	4	3	4	3	3	3	3	3	2	2	2	5		
6-Dec	2	3	2	2	2	2	7	4	4	5	5	5	4	4	4	5	4	4	4	3	3	3	3	7		
7-Dec	3	3	3	2	3	3	3	3	3	3	4	4	3	4	4	3	2	3	3	3	3	3	3	4		
8-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2		
9-Dec	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
10-Dec	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	2		
11-Dec	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	0	1	0	0	2		
12-Dec	1	2	2	1	1	2	2	2	1	1	1	1	2	1	1	1	0	1	1	1	1	2	2	2		
13-Dec	1	1	2	2	3	3	3	3	2	2	2	2	2	2	1	1	2	1	1	1	1	1	1	3		
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
15-Dec	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	2		
16-Dec	1	1	1	1	1	1	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1		
17-Dec	0	0	0	1	0	1	1	0	0	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1		
18-Dec	1	1	1	1	1	1	0	0	0	1	0	1	1	AF	1	1	1	1	1	AF	1	1	1	1		
19-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
20-Dec	1	1	2	1	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	2		
21-Dec	1	2	2	2	2	2	2	2	2	4	2	3	2	3	2	2	2	2	2	2	2	1	2	4		
22-Dec	1	2	2	2	2	2	4	3	2	2	3	3	2	2	2	1	1	1	1	2	2	2	2	4		
23-Dec	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2		
24-Dec	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2		
25-Dec	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
26-Dec	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	4	3	3	4	5	4	5		
27-Dec	3	3	3	4	4	3	3	4	3	3	4	4	3	3	3	2	2	2	2	2	2	2	2	4		
28-Dec	2	3	3	4	3	4	4	3	2	3	3	4	2	3	2	1	1	1	2	1	1	2	1	4		
29-Dec	1	1	1	2	1	2	2	2	2	1	1	2	2	1	1	2	2	2	2	2	3	2	1	3		
30-Dec	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	2	2	1	3	2	3		
31-Dec	2	2	2	3	3	4	2	3	3	3	3	3	3	3	2	2	2	1	1	1	2	2	2	4		
																	Diurnal Maximum									
AF - Analyzer Failure																										



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Firebag - December 2016

Direction of Maximum Speed: 344 deg on Dec 4 21:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 349.8 deg on Dec 4	Hours of Data: 742
Direction of Minimum Speed: 192 deg on Dec 29 05:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 2.0 deg on Dec 16	Percent Operational Time: 99.7
Monthly Average Direction: 266.6 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	189	197	202	213	217	216	205	210	211	215	212	220	215	224	212	219	223	226	228	226	217	204	204	197	211.3
2-Dec	196	197	190	184	181	183	182	179	170	184	169	162	167	169	171	164	164	165	163	165	173	171	173	171	172.3
3-Dec	172	174	175	178	180	175	178	182	188	190	194	194	193	195	197	198	199	196	204	201	202	208	206	205	189.8
4-Dec	210	209	277	5	4	6	4	5	2	358	355	349	348	349	346	347	345	346	348	345	344	344	346	343	349.8
5-Dec	340	344	337	334	338	333	330	331	330	327	305	301	298	302	301	299	300	305	306	301	298	300	299	306	318.2
6-Dec	310	312	314	317	328	324	340	343	342	340	343	344	343	342	342	346	348	352	349	351	351	352	353	354	341.0
7-Dec	350	351	349	347	351	354	356	357	356	353	352	349	348	343	346	351	348	357	355	351	355	355	3	6	352.5
8-Dec	4	2	6	7	10	8	11	10	10	10	13	7	10	11	8	12	33	59	77	84	79	70	116	161	19.7
9-Dec	190	220	219	200	186	177	193	190	182	187	198	201	210	206	197	190	182	184	180	181	191	205	211	213	196.7
10-Dec	218	219	223	224	222	224	219	214	208	203	199	223	226	225	234	231	213	216	226	243	224	220	232	238	222.0
11-Dec	239	241	236	241	247	247	248	255	249	247	247	252	249	249	262	263	257	256	252	249	261	261	264	289	251.7
12-Dec	315	328	328	319	314	302	307	313	305	305	297	304	321	310	282	281	260	280	300	302	302	298	308	303	306.4
13-Dec	302	342	3	347	338	344	344	344	339	344	346	342	335	334	321	311	318	316	320	320	322	313	301	297	333.0
14-Dec	279	276	272	269	238	216	225	226	218	214	224	229	249	317	357	351	341	331	320	306	307	321	318	314	281.4
15-Dec	317	308	320	346	341	336	327	319	304	328	321	310	319	324	299	284	291	317	316	306	320	334	336	341	321.3
16-Dec	335	334	336	334	335	345	339	335	303	293	254	259	252	247	237	231	231	222	210	206	202	157	141	151	285.9
17-Dec	163	150	166	170	169	170	170	171	177	186	178	175	196	196	186	166	173	171	169	169	164	162	162	163	172.1
18-Dec	168	170	174	168	169	212	194	166	196	124	146	160	152	AF	65	38	55	140	200	AF	161	165	165	169	164.5
19-Dec	156	148	148	145	141	127	124	125	132	133	131	132	151	148	337	335	333	336	337	340	29	174	161	189	130.5
20-Dec	204	204	214	225	228	242	242	233	241	233	234	238	234	232	227	226	227	224	233	230	230	225	214	221	228.8
21-Dec	215	220	215	223	234	239	227	236	233	235	229	232	233	249	250	246	228	242	239	236	243	240	228	224	233.8
22-Dec	221	223	223	225	237	255	273	332	4	9	18	13	10	12	14	20	18	18	17	15	15	16	12	19	337.3
23-Dec	19	12	12	14	16	2	10	19	40	49	54	64	75	96	111	111	120	133	129	129	128	129	132	136	71.5
24-Dec	135	137	139	136	145	154	166	177	176	174	183	187	186	180	180	173	185	193	190	180	176	184	181	183	173.1
25-Dec	181	187	182	178	179	183	187	179	179	178	179	177	184	177	172	167	168	174	180	182	181	188	191	184	180.3
26-Dec	188	184	178	179	180	176	180	178	183	186	180	185	192	187	185	184	189	181	193	192	197	199	193	196	188.4
27-Dec	200	201	198	196	187	195	201	209	208	203	211	217	217	222	226	219	220	231	239	255	265	297	356	358	214.1
28-Dec	0	356	359	357	354	5	4	357	357	352	350	356	351	349	274	294	6	40	39	46	21	19	19	9	0.5
29-Dec	348	21	19	63	192	79	120	136	165	143	164	170	166	167	169	158	155	179	176	168	183	204	181	187	161.2
30-Dec	269	258	253	280	249	239	261	247	229	225	217	226	227	229	216	212	217	236	237	258	305	2	20	5	243.2
31-Dec	355	339	334	343	346	350	342	330	343	346	343	345	348	340	332	324	307	295	283	283	262	261	269	304	327.4

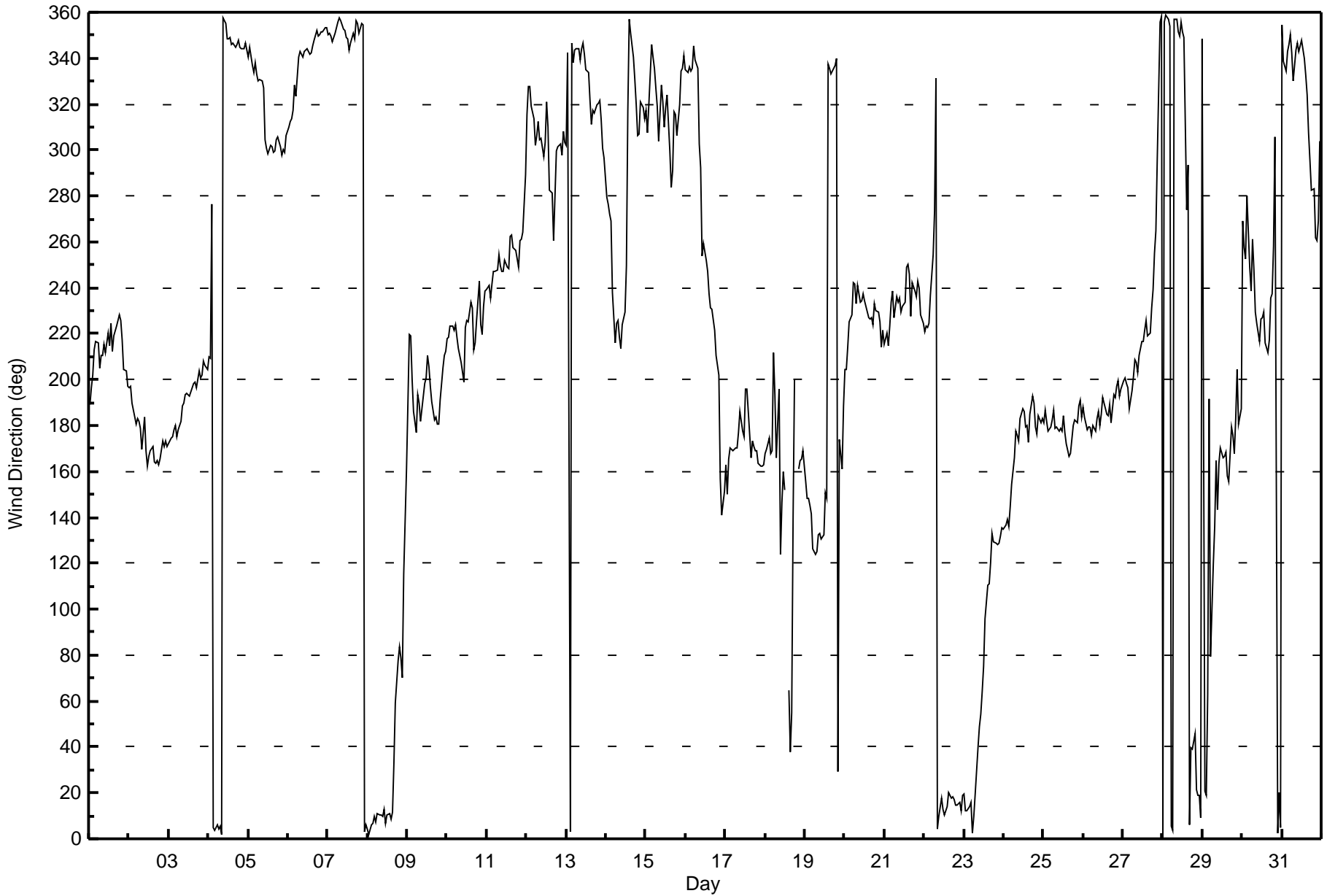
249.8 253.5 251.6 266.9 269.1 283.1 273.0 275.5 271.6 264.8 260.9 259.9 262.2 261.6 256.1 248.6 240.3 246.7 246.4 247.2 254.7 260.0 259.0 260.3
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Firebag - December 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Firebag - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 95 deg on Dec 29 05:00	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7
Minimum Value: 4 deg on Dec 17 09:00	
Percentiles: P ₁ = 6 P ₁₀ = 7 Q ₁ = 8 Median = 10 Q ₃ = 12 P ₉₀ = 15 P ₉₉ = 47	

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	8	8	10	10	10	10	9	9	9	8	9	10	10	10	12	10	9	9	9	10	10	8	9	5	12
2-Dec	7	7	9	11	11	9	9	9	7	10	12	9	9	9	9	9	9	9	10	9	9	9	9	9	12
3-Dec	10	8	8	9	8	9	9	9	10	8	7	8	7	7	7	6	6	7	7	7	7	9	12	10	12
4-Dec	9	9	44	14	11	13	13	13	15	14	13	12	10	12	12	10	10	11	12	11	10	11	11	11	44
5-Dec	11	10	10	10	11	11	10	10	10	12	10	11	11	11	11	11	11	11	11	10	10	11	10	10	12
6-Dec	10	10	10	10	9	10	12	10	11	10	10	11	11	11	10	11	11	12	10	10	11	10	11	12	12
7-Dec	10	10	10	11	11	11	13	13	12	11	12	12	12	11	11	11	9	13	13	12	14	12	13	13	14
8-Dec	13	13	12	12	11	11	11	11	11	12	11	12	12	11	10	12	15	10	14	9	15	7	29	13	29
9-Dec	14	11	9	9	13	19	7	5	7	8	8	8	10	10	8	7	7	6	6	9	5	7	8	7	19
10-Dec	9	8	8	9	7	7	8	8	8	6	9	10	9	8	10	14	8	10	11	10	7	10	13	8	14
11-Dec	10	10	8	9	9	8	8	10	10	9	8	10	8	9	11	9	9	10	9	7	6	6	10	10	11
12-Dec	15	11	11	12	12	12	13	13	13	13	13	12	16	15	12	10	13	10	11	10	11	12	12	12	16
13-Dec	12	19	14	14	13	12	13	12	11	12	12	12	12	13	12	12	12	12	11	12	12	12	11	10	19
14-Dec	10	9	12	8	11	9	7	9	10	8	10	9	10	27	12	11	13	10	12	12	12	12	12	12	27
15-Dec	11	10	15	11	12	11	11	12	15	13	11	14	16	13	12	9	14	10	11	13	12	11	10	9	16
16-Dec	8	9	10	10	10	10	12	9	14	14	13	10	13	9	8	7	7	10	7	7	12	14	39	9	39
17-Dec	8	9	12	5	5	6	6	6	4	6	5	8	8	8	14	7	6	8	8	8	7	7	7	7	14
18-Dec	10	8	10	13	20	10	8	25	16	36	22	15	24	AF	16	14	16	64	67	AF	14	15	16	15	67
19-Dec	12	15	15	17	17	15	11	12	13	14	14	17	21	60	13	11	12	12	11	16	29	36	17	17	60
20-Dec	12	8	11	8	10	8	9	11	11	8	8	9	7	8	10	7	9	7	8	9	8	8	12	8	12
21-Dec	7	8	9	8	12	9	7	8	8	7	7	8	10	9	7	8	8	7	7	7	8	8	7	7	12
22-Dec	6	7	7	10	9	10	16	31	15	13	14	14	12	12	11	14	11	13	11	11	12	12	12	12	31
23-Dec	12	11	13	12	16	12	12	13	14	9	12	16	21	22	11	9	10	12	11	10	12	12	14	14	22
24-Dec	12	12	12	14	13	11	8	8	8	8	9	6	6	9	10	7	8	7	8	8	7	8	9	8	14
25-Dec	7	6	7	6	7	7	8	7	7	7	7	7	8	8	9	9	8	8	8	7	8	8	6	6	9
26-Dec	12	8	8	8	8	8	7	8	8	7	8	9	7	7	6	7	7	10	8	8	8	9	9	8	12
27-Dec	8	8	10	8	8	8	6	7	7	8	9	8	8	8	9	9	8	8	7	9	10	31	20	11	31
28-Dec	12	12	13	14	12	11	13	13	12	11	10	12	13	52	57	21	23	7	11	17	14	13	18	13	57
29-Dec	27	30	35	11	95	17	28	32	39	12	15	17	13	11	18	12	16	13	13	10	68	31	17	14	95
30-Dec	35	37	30	26	26	19	17	37	25	18	10	12	8	9	13	9	9	10	7	14	22	13	11	12	37
31-Dec	13	12	14	14	12	14	13	13	12	11	13	12	12	11	10	12	13	13	10	12	10	12	11	25	25
	35	37	44	26	95	19	28	37	39	36	22	17	24	60	57	21	23	64	67	17	68	36	39	25	
	Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:28
Gas Cert Reference	SA130123A	Station temp.	22 Deg C
Cal Gas Concentration	49.3 ppm	Cal Gas Exp Date	December 12, 2016
Calibrator Make/Model	API T700	Serial Number	996
ZAG Make/Model	API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	DACS serial No.	6466

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-606	-606
Analyzer IP address	192.168.1.43		Lamp voltage	806	806
Calculated slope	0.995654	0.999412	Chamber temp	45.0	45.0
Calculated intercept	1.219879	1.366964	Pressure	690.4	686.5
Analyzer Background	8.2	8.0	Flow	0.451	0.449
Analyzer Coefficient	0.995	0.965	Intensity	90	90

Analyzer make Thermo 43i Analyzer serial # 1410661308

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	58.3	574.8	592.4	0.970
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	58.3	574.8	574.9	1.000
second point	5000	29.3	288.9	285.9	1.010
third point	5000	14.7	144.9	143.0	1.014
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	58.3	574.8	576.0	0.998
Average Correction Factor					1.008

Corrected As found 592.3 Previous response 576.1 % change -2.7%

Notes:

Inlet filter changed after as founds. Adjusted the span.

Calibration Performed By: Jayne Marcoux



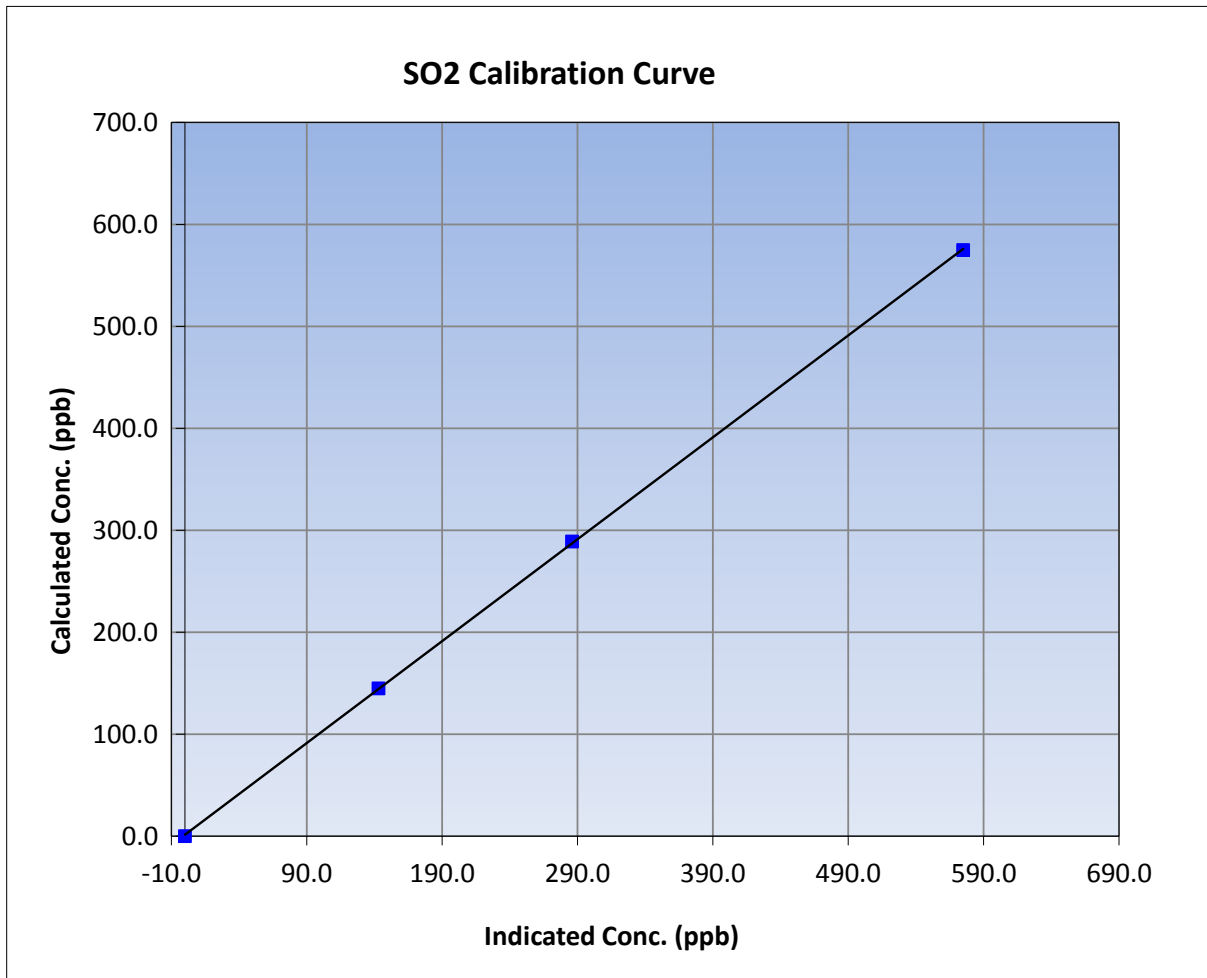
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:00	End Time (MST)	14:28
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

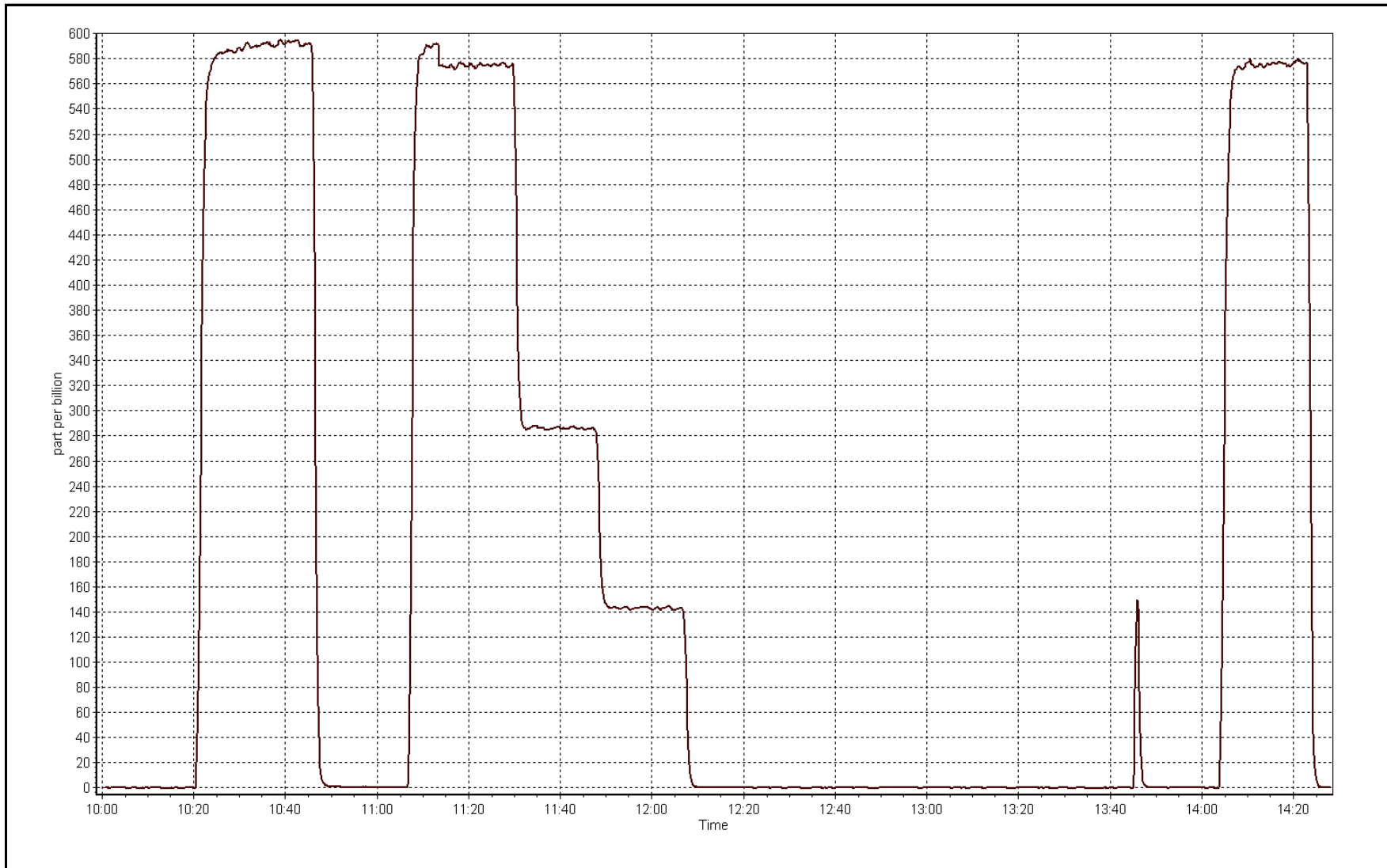
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999963
574.8	574.9	1.0000		
288.9	285.9	1.0103	Slope	0.999412
144.9	143.0	1.0139		
			Intercept	1.366964



SO2 Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 20, 2016	Last Calibration	November 10, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:08	End Time (MST)	13:49
Gas Cert Reference	LL77486	Station temp.	22 Deg C
Cal Gas Concentration	5.3 ppm	Cal Gas Exp Date	February 13, 2018
Calibrator Make/Model	API T700	Serial Number	996
ZAG air Make/Model	API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	Serial Number	6466
SO2 gas concentration	49.3 ppm	SO2 gas cert/exp	SA130123A December-12-16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-573	-574
Analyzer IP address	192.168.1.45		Lamp voltage	934	931
Calculated slope	0.996727	1.005280	Chamber temp	45	45
Calculated intercept	-0.078521	-0.040989	Pressure	526.8	531.6
Analyzer Background	13.3	13.9	Flow	0.935	0.944
Analyzer Coefficient	1.162	1.174	Intensity	85	86
			Converter temp.	335	335

Analyzer make/model	Thermo 450i	Analyzer serial #	815129098
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	75.6	80.1	79.1	1.013
SO2 scrubber check	5000	15.2	149.9	1.5	----
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	75.6	80.1	79.8	1.005
second point	5000	37.8	40.1	40.0	1.001
third point	5000	19.0	20.1	19.8	1.019
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	75.6	80.1	79.7	1.005
Average Correction Factor					1.008

Corrected As found	78.9	Previous response	80.5	% change	2.1%
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Notes:

Changed inlet filter after as founds. Adjusted zero and span.

Calibration Performed By: Jayme Marcoux



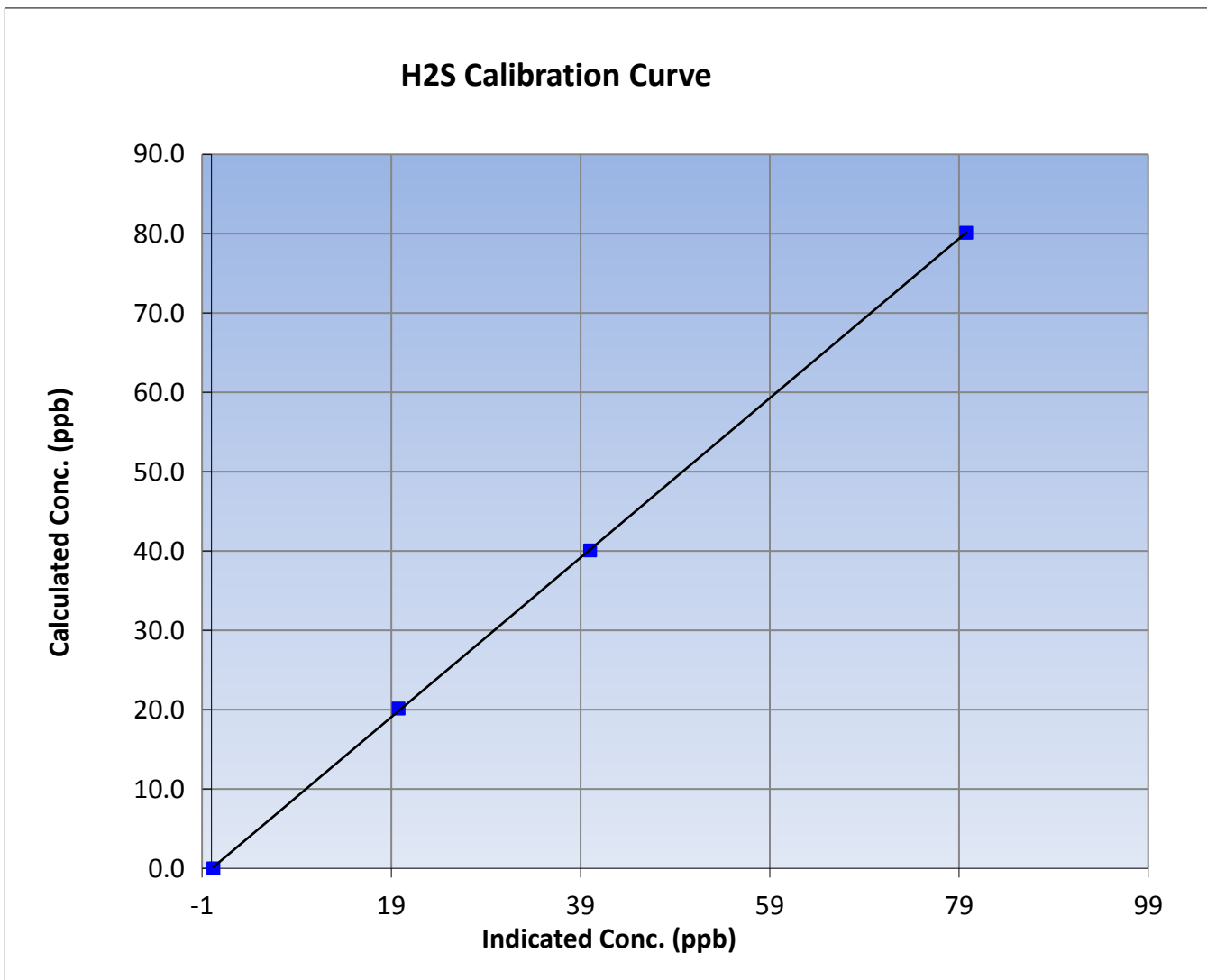
Wood Buffalo Environmental Association H2S Calibration Report

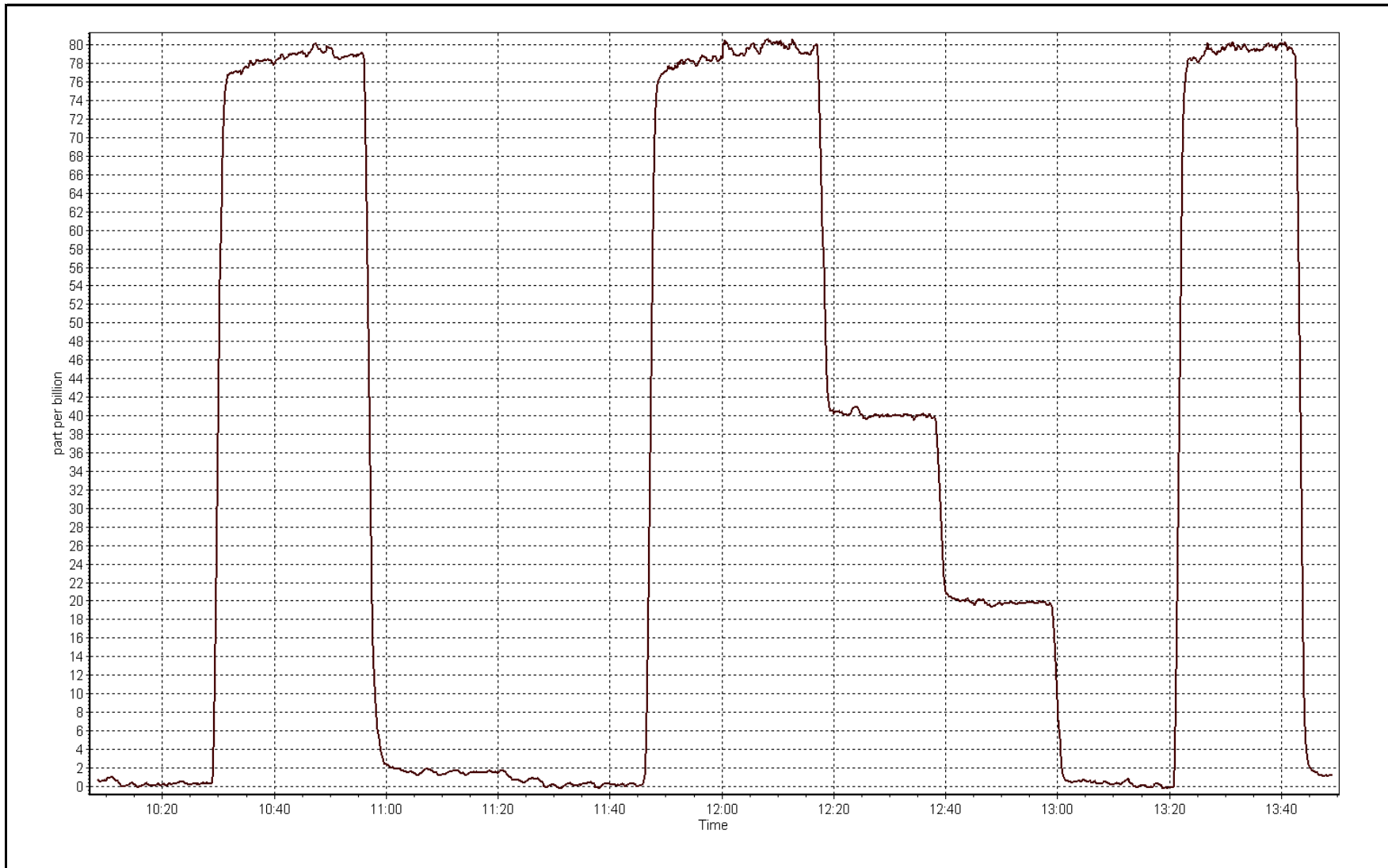
Station Information

Calibration Date	December 20, 2016	Previous Calibration	November 10, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:08	End Time (MST)	13:49
Analyzer make	Thermo 450i	Analyzer serial #	815129098

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999961
80.1	79.8	1.0046		
40.1	40.0	1.0012	Slope	1.005280
20.1	19.8	1.0187		
			Intercept	-0.040989







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:25
Gas Cert Reference	SA130123A	Cal Gas Expiry Date	December 12, 2016
CH4 Cal Gas Conc.	512 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	996
ZAG make/model	Teledyne API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	Serial Number	6466

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	29.5
Calculated slope	0.997218	1.003113	Fuel Pressure	23.0	23.0
Calculated intercept	0.019887	0.019583	Analyzer Coeff	3.604	3.586
			Analyzer BKG	4.90	4.76

Analyzer make Thermo 51i-LT Analyzer serial # 1336160089

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.12	----
as found span	5000	58.3	12.74	12.70	1.003
calibrator zero	5000	0.0	0.00	0.01	----
high point	5000	58.3	12.74	12.70	1.003
second point	5000	29.3	6.40	6.32	1.013
third point	5000	14.7	3.21	3.17	1.013
as left zero	5000	0.0	0.00	0.02	----
as left span	5000	58.3	12.74	12.76	0.998
Average Correction Factor					1.010

Corrected As found 12.82 Previous response 12.75 % change -0.5%

Notes:

Inlet filter changed after as founds. Adjusted the zero.

Calibration Performed By:

Jayne Marcoux



Wood Buffalo Environmental Association THC Calibration Report

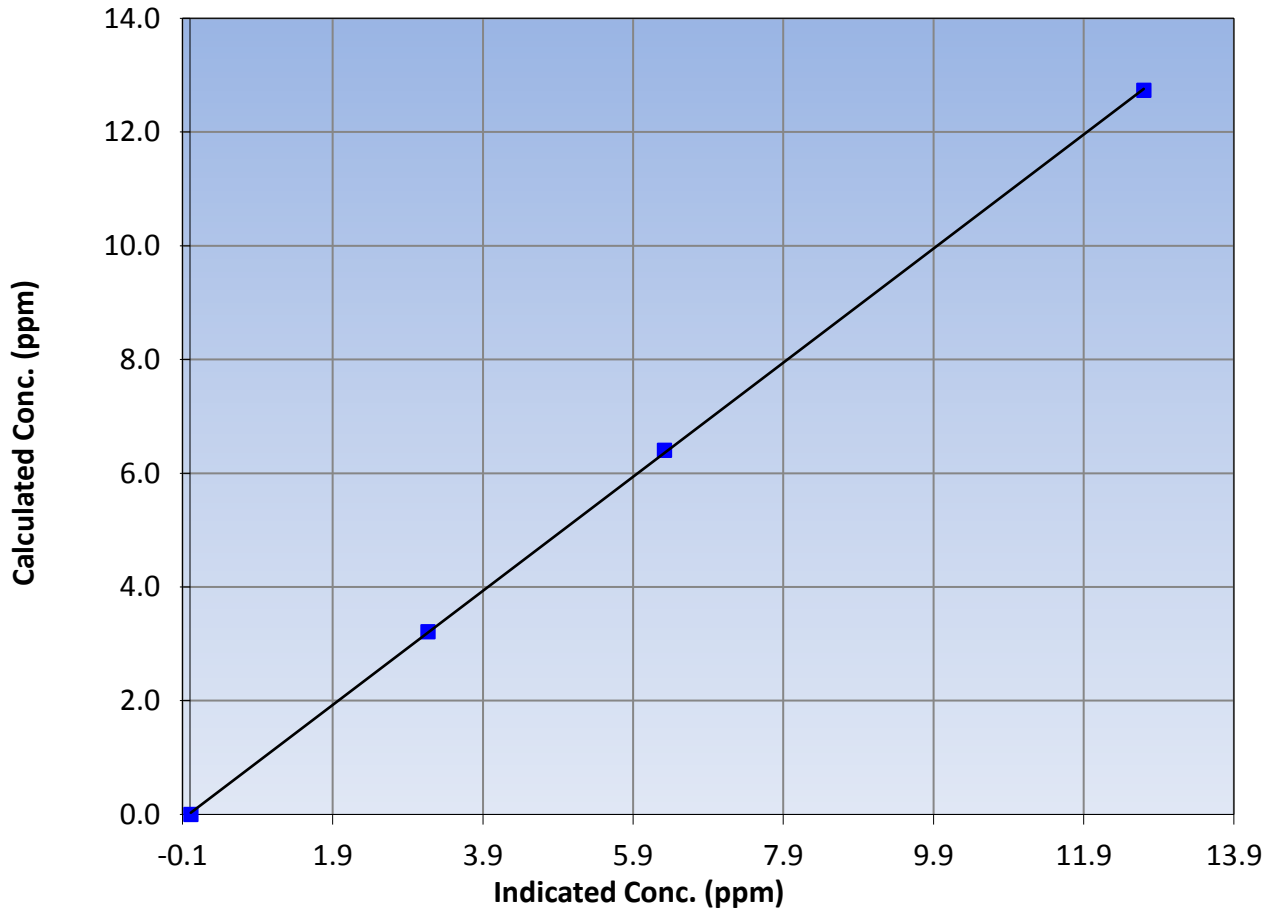
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:00	End Time (MST)	14:25
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

Calibration Data

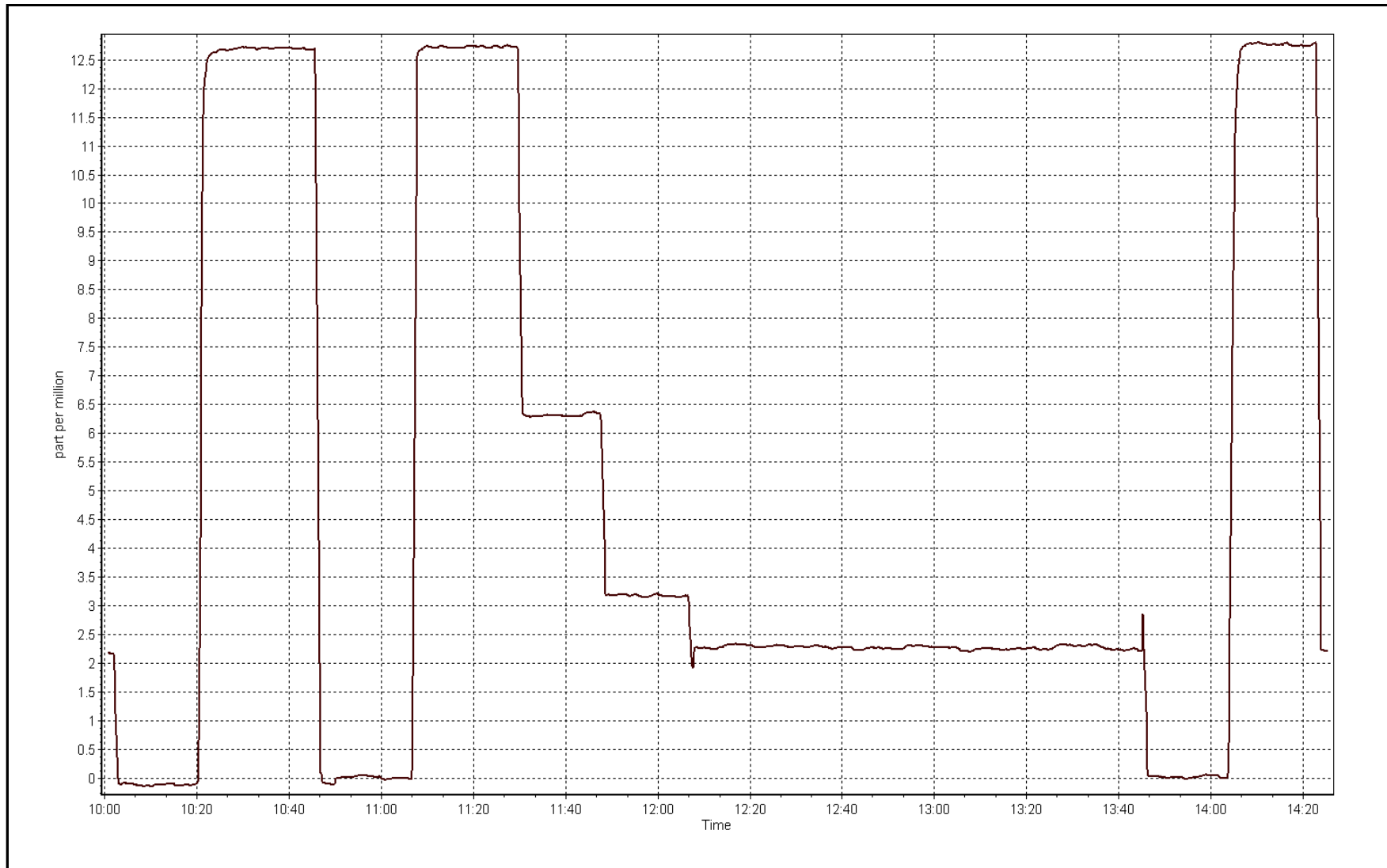
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.01	----	Correlation Coefficient	0.999963
12.74	12.70	1.0028		
6.40	6.32	1.0128	Slope	1.003113
3.21	3.17	1.0130		
			Intercept	0.019583

THC Calibration Curve



THC Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:27
NO Cal Gas Conc	51.5 ppm	Gas Cert Reference	SA130123A
NOX Cal Gas Conc	51.5 ppm	Cal Gas Expiry Date	December 12, 2016
Calibrator	API T700	Serial Number	996
Zero air Generator	Teledyne API T701	Serial Number	4891

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	6466
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998626	0.998350	0.997926
	Data Offset	1.565260	1.717473	-0.644007
Current Calibration	Data Slope	1.000452	0.999924	0.996613
	Data Offset	1.564121	1.704906	-0.084796

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661309
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.883		0.862	
NOX coefficient	1.000		1.000	
NO2 coefficient	1.000		1.000	
NO bkgrnd	3.8		3.8	
NOX bkgrnd	3.9		3.8	
Chamber Temp	50.7	Deg C	50.5	Deg C
Moly Temp	325	Deg C	325	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-2.7	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	158.9	mmHg	158	mmHg
R Cell Press Nox	158.6	mmHg	157.7	mmHg
NO sample flow	0.66	lpm	0.65	lpm
Nox sample Flow	0.658	lpm	0.651	lpm

Notes:

Inlet filter changed after as founds. Adjusted the span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

December 15, 2016

Station Number:

AMS 19

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as found span	5000	58.3	600.5	600.5	0.0	614.6	614.4	0.2	0.9771	0.9774
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	5000	58.3	600.5	600.5	0.0	599.7	599.9	-0.3	1.0014	1.0009
second point	5000	29.3	301.8	301.8	0.0	298.5	298.4	0.1	1.0112	1.0115
third point	5000	14.7	151.4	151.4	0.0	149.0	148.8	0.2	1.0164	1.0177
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as left span	5000	58.3	600.5	299.5	301.0	597.4	294.5	302.9	1.0052	1.0169
Average Correction Factor									1.0097	1.0100

Corrced As found NO_x= 614.7 NO= 614.5 Percent Change NO_x= -2.4% NO= -2.4%
 Previous Response NO_x= 599.8 NO= 599.8

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 58.30 ccm NOx ref calc conc = 600.5 ppb NO ref calc conc = 600.5 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	599.1	597.9	0.0	1.0024	1.0043	----	----
1st NO2 (300)	299.5	298.4	598.7	299.5	299.2	1.0031	----	0.9975	100.3%
2nd NO2 (200)	396.9	201.0	598.6	396.9	202.4	1.0031	----	0.9933	100.7%
3rd NO2 (100)	494.2	103.7	598.2	494.2	104.0	1.0038	----	0.9970	100.3%
2nd NO ref point	----	0.0	598.5	597.4	1.1	1.0034	1.0051	----	----
Average Correction Factor						1.0033		0.9959	100.4%

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

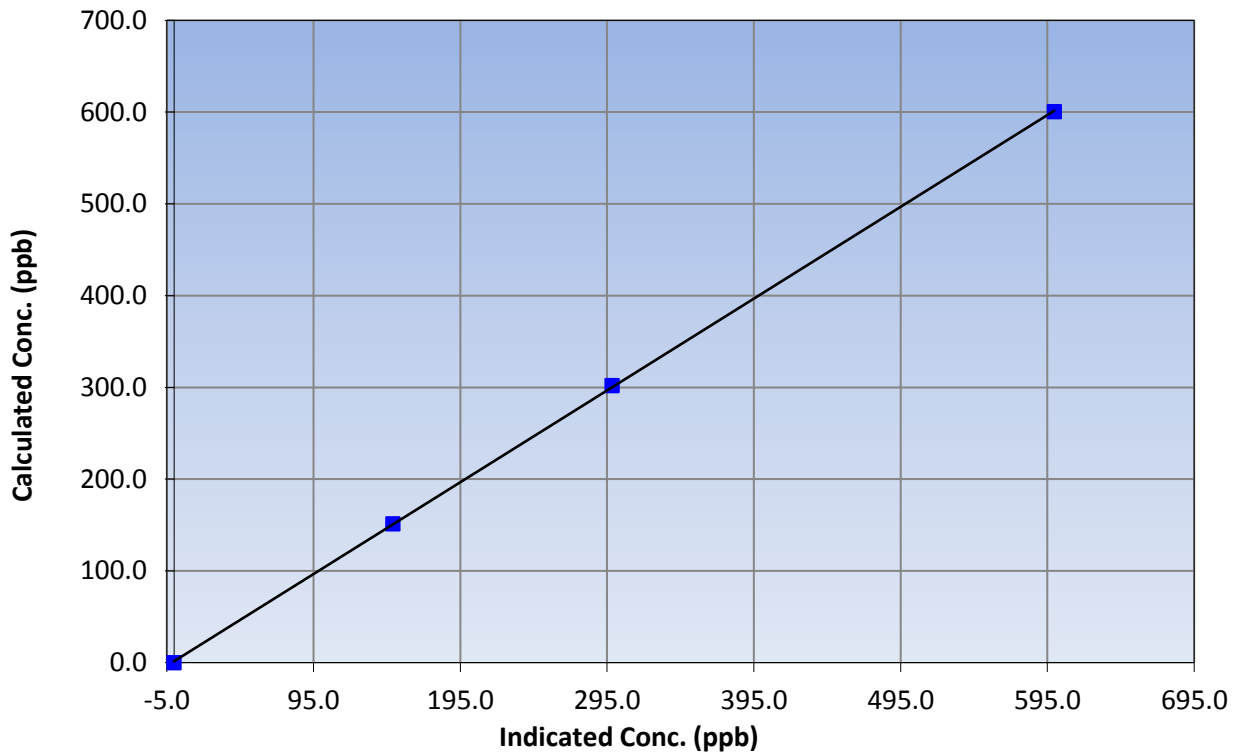
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:00	End Time (MST)	14:27
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999967
600.5	599.7	1.0014		
301.8	298.5	1.0112	Slope	1.000452
151.4	149.0	1.0164		
			Intercept	1.564121

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

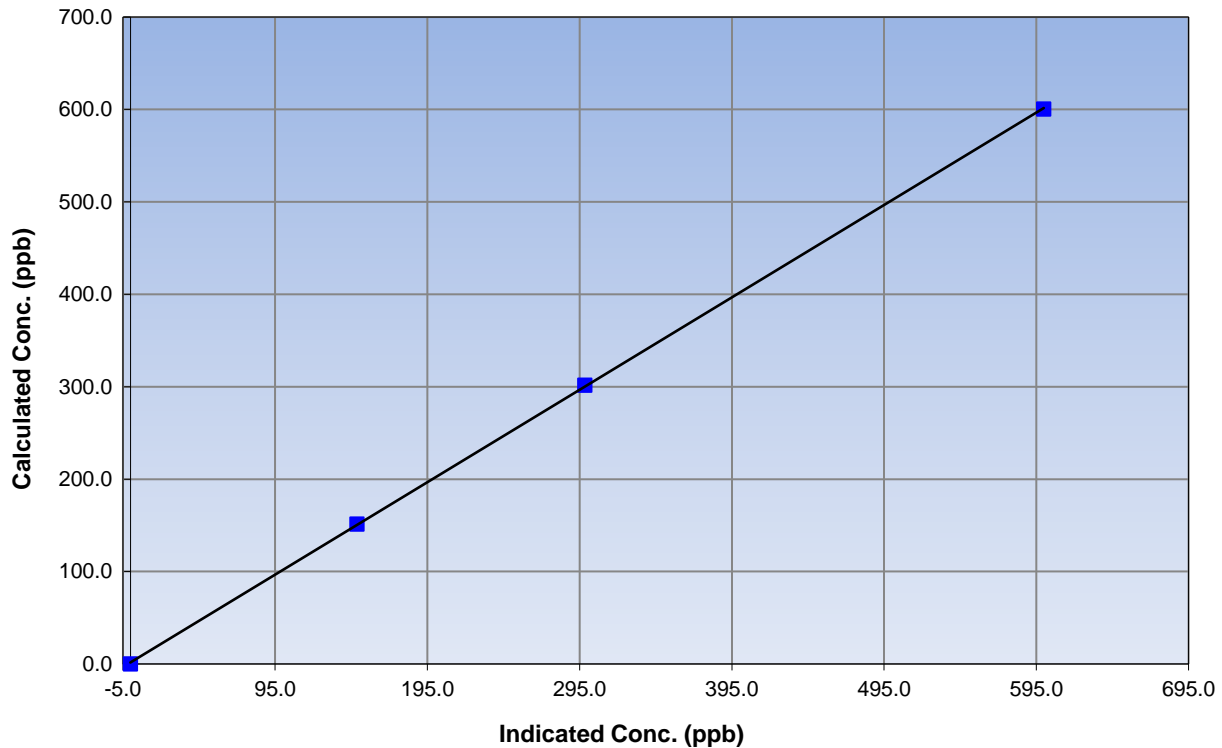
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 9, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:00	End Time (MST)	14:27
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999961
600.5	599.9	1.0009		
301.8	298.4	1.0115	Slope	0.999924
151.4	148.8	1.0177		
			Intercept	1.704906

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

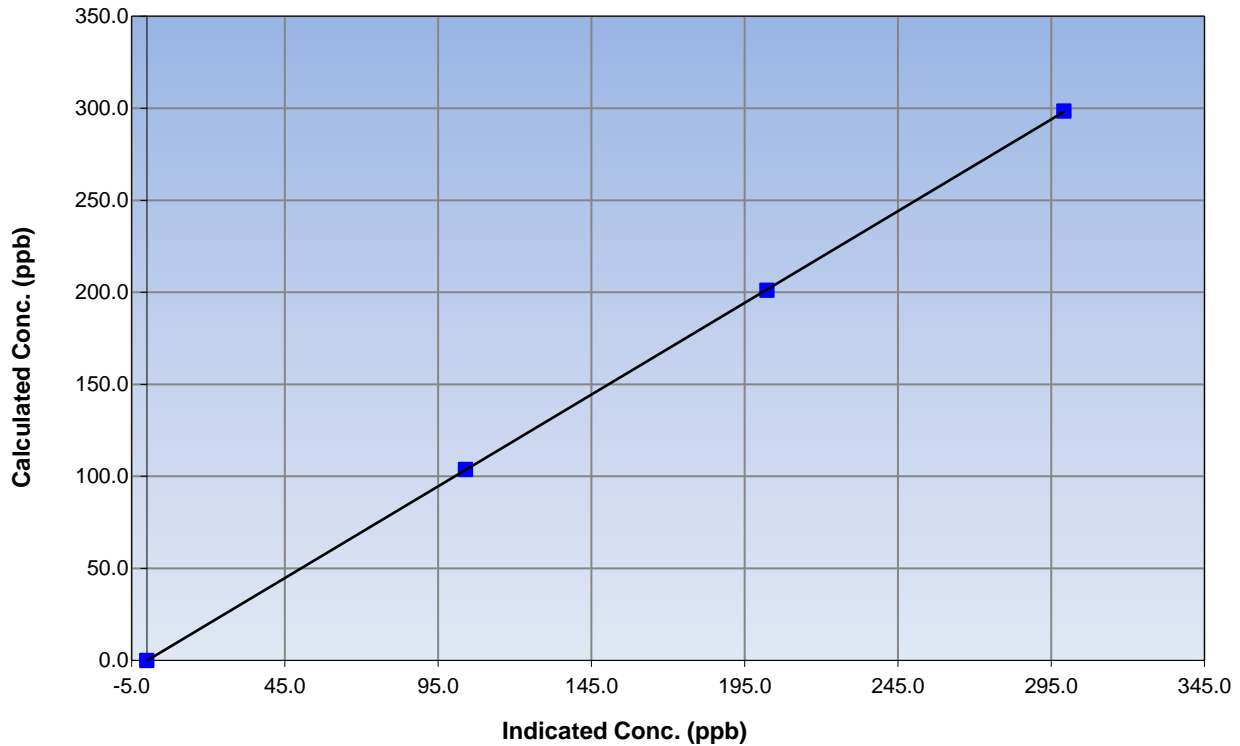
Station Information

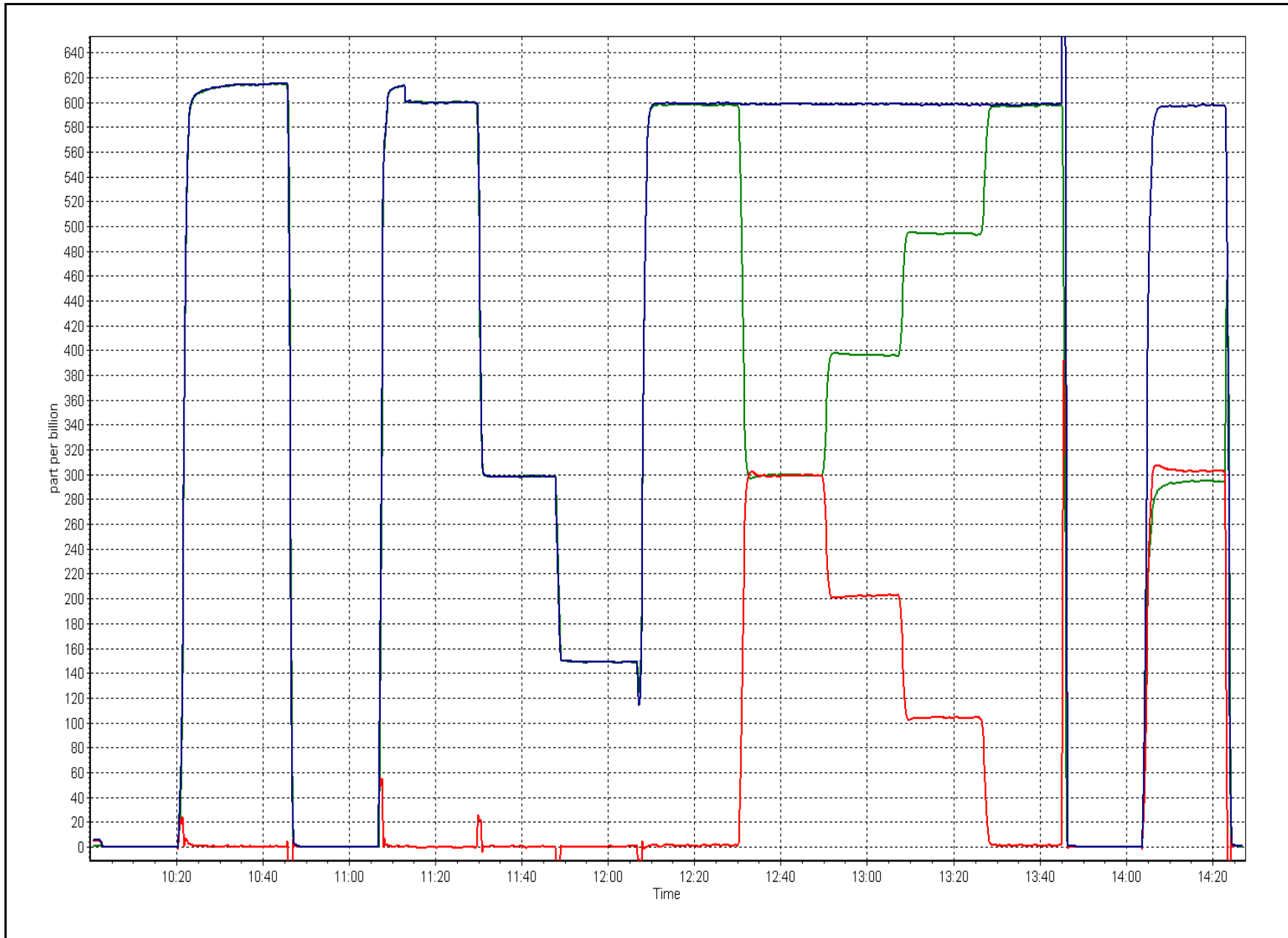
Calibration Date	December 15, 2016	Previous Calibration	November 9, 2016
Station Number	Firebag	Station Number	AMS 19
Start Time (MST)	10:00	End Time (MST)	14:27
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999990
298.4	299.2	0.9975		
201.0	202.4	0.9933	Slope	0.996613
103.7	104.0	0.9970		
			Intercept	-0.084796

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 20
BRION MACKAY RIVER
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100.00	46	0	10	0
H2S (ppb) Average	706	35	38	99.60	3	0	1	0
THC (ppm) Average	708	36	36	100.00	4	-	2.6	-
NO2 (ppb) Average	708	36	36	100.00	30	0	15	-
NO (ppb) Average	708	36	36	100.00	36	-	7	-
NOX (ppb) Average	708	36	36	100.00	65	-	19	-
Temperature 2 m (C) Average	744	0	0	100.00	1.7	-	-2.2	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	92	-
Wind Speed 10 m (km/h) Average	742	0	2	99.73	15	-	12	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.7	3	-	0	0	0	0	0	1	46
H2S (ppb) Average	706	0.3	0	-	0	0	0	0	0	0	3
THC (ppm) Average	708	2.29	0.2	-	2	2.1	2.2	2.3	2.3	2.4	4
NO2 (ppb) Average	708	3.8	5	-	0	1	1	2	4	10	30
NO (ppb) Average	708	0.6	3	-	0	0	0	0	0	1	36
NOX (ppb) Average	708	4.4	7	-	0	1	1	2	5	10	65
Temperature 2 m (C) Average	744	-17.27	9.4	-	-39.3	-30.6	-23.6	-18.2	-10.1	-4	1.7
Relative Humidity (%) Average	744	80.5	6	-	65	73	76	80	85	90	96
Wind Speed 10 m (km/h) Average	742	6.1	4	-	0	2	3	6	8	11	15
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	01 Dec 2016 08:00	01 Dec 2016 08:00	1	Intermittent unstable operation - excessive baseline drift
H2S	06 Dec 2016 14:00	06 Dec 2016 14:00	1	Intermittent unstable operation - excessive baseline drift
H2S	15 Dec 2016 12:00	15 Dec 2016 12:00	1	Intermittent unstable operation - excessive baseline drift
Wind Speed, Wind Direction	08 Dec 2016 05:00	08 Dec 2016 05:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	09 Dec 2016 01:00	09 Dec 2016 01:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Brion MacKay River - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 46 ppb on Dec 18 20:00	Maximum Daily Average: 10.2 ppb on Dec 18		Hours of Data:	708
Minimum Value: 0 ppb on Dec 1 01:00	Minimum Daily Average: 0.0 ppb on Dec 13		Hours of Missing Data:	36
Maximum Diurnal Average: 1.6 ppb at hour 20	Minimum Diurnal Average: 0.2 ppb at hour 2		Hours of Calibration:	36
Monthly Average: 0.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 6		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	1
3-Dec	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Dec	Z	0	0	0	0	0	0	0	0	0	4	5	3	3	2	1	1	1	0	0	0	0	1	1	1.0	5
9-Dec	1	Z	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	3	7	28	40	46	33	32	35	6	10.2	46	
19-Dec	3	2	1	1	1	Z	1	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.6	3
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	5	7	7	2	0	0	0	0	0	0	0	0	1.0	7
23-Dec	0	0	0	Z	2	1	1	0	3	1	0	10	9	6	6	5	4	2	1	0	2	3	1	1	2.5	10
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	Z	0	0	0	1	1	1	2	2	2	2	2	2	3	3	2	1	1	1	1	1	1	1	1	1.4	3
27-Dec	1	Z	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	1	Z	14	14	6	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	2.0	14
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

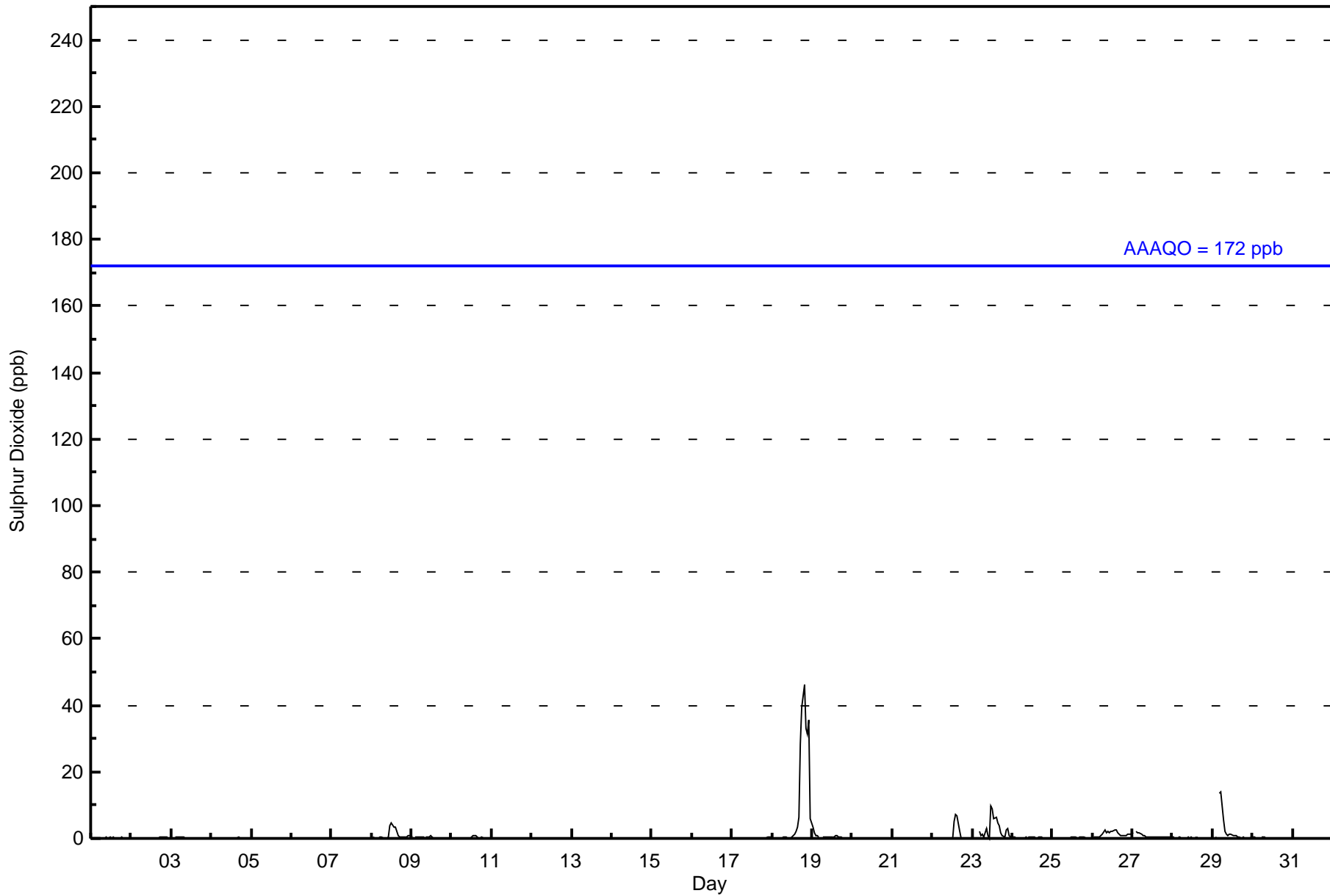
0.3	0.2	0.2	0.2	0.8	0.8	0.4	0.3	0.3	0.2	0.2	0.7	0.7	0.8	0.9	0.7	0.6	1.1	1.4	1.6	1.3	1.2	1.3	0.4	Diurnal Average	
3	2	2	2	14	14	6	2	3	2	2	10	9	6	7	7	7	28	40	46	33	32	35	6	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	700	98.87	98.87
11 - 20	2	0.28	99.15
21 - 60	6	0.85	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	14	18	24	1	7	13	48	69	77	71	44	60	50	119	62	21	698
11 - 20	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
21 - 60	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	1	6
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	20	24	2	7	15	49	69	77	71	44	60	50	119	62	22	706

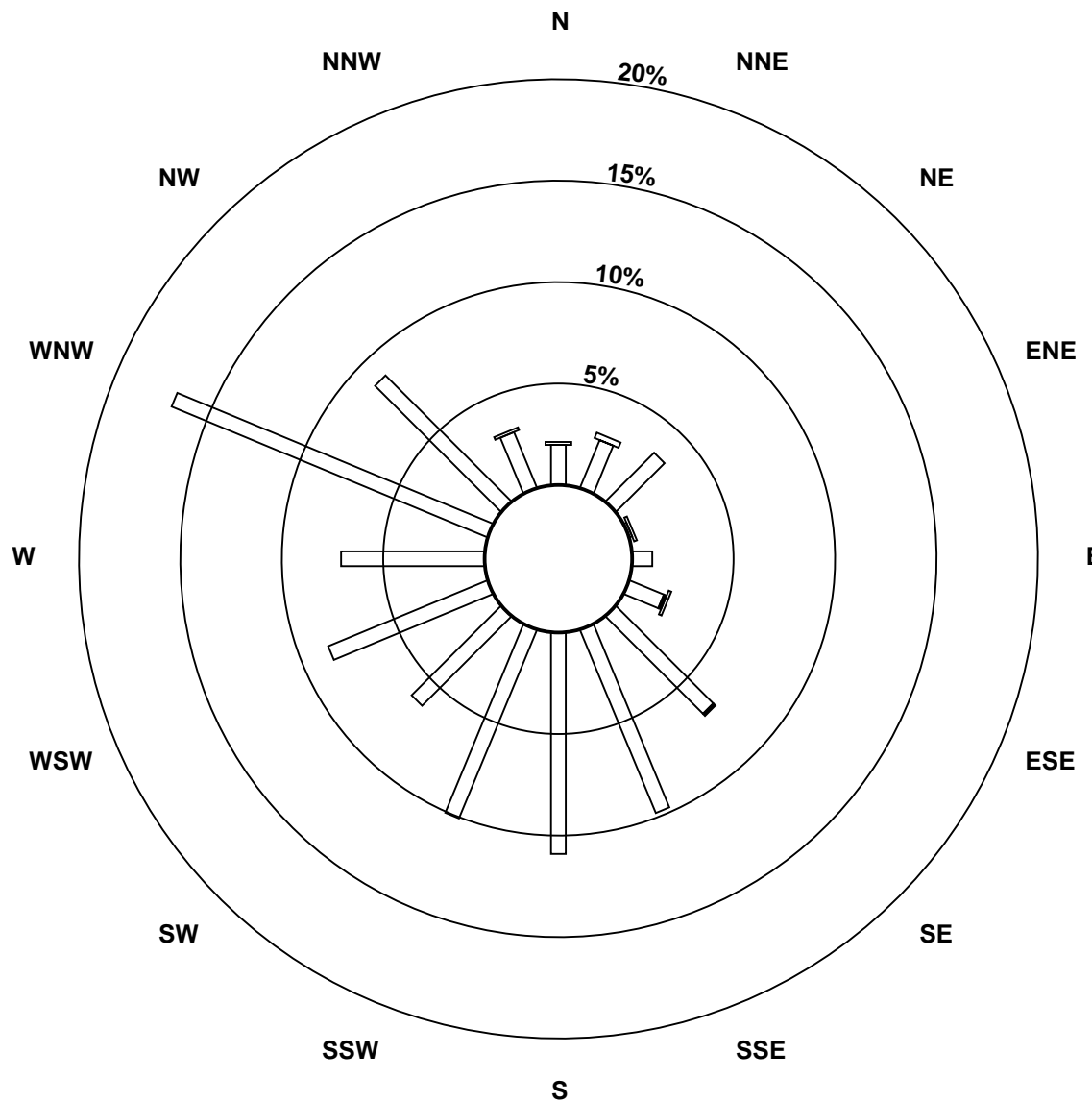
Total Number of Valid Hours: 706

Total Number of Hours: 744

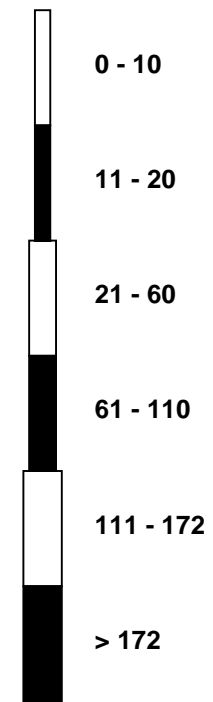


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River (AMS 20)



Classes (ppb)

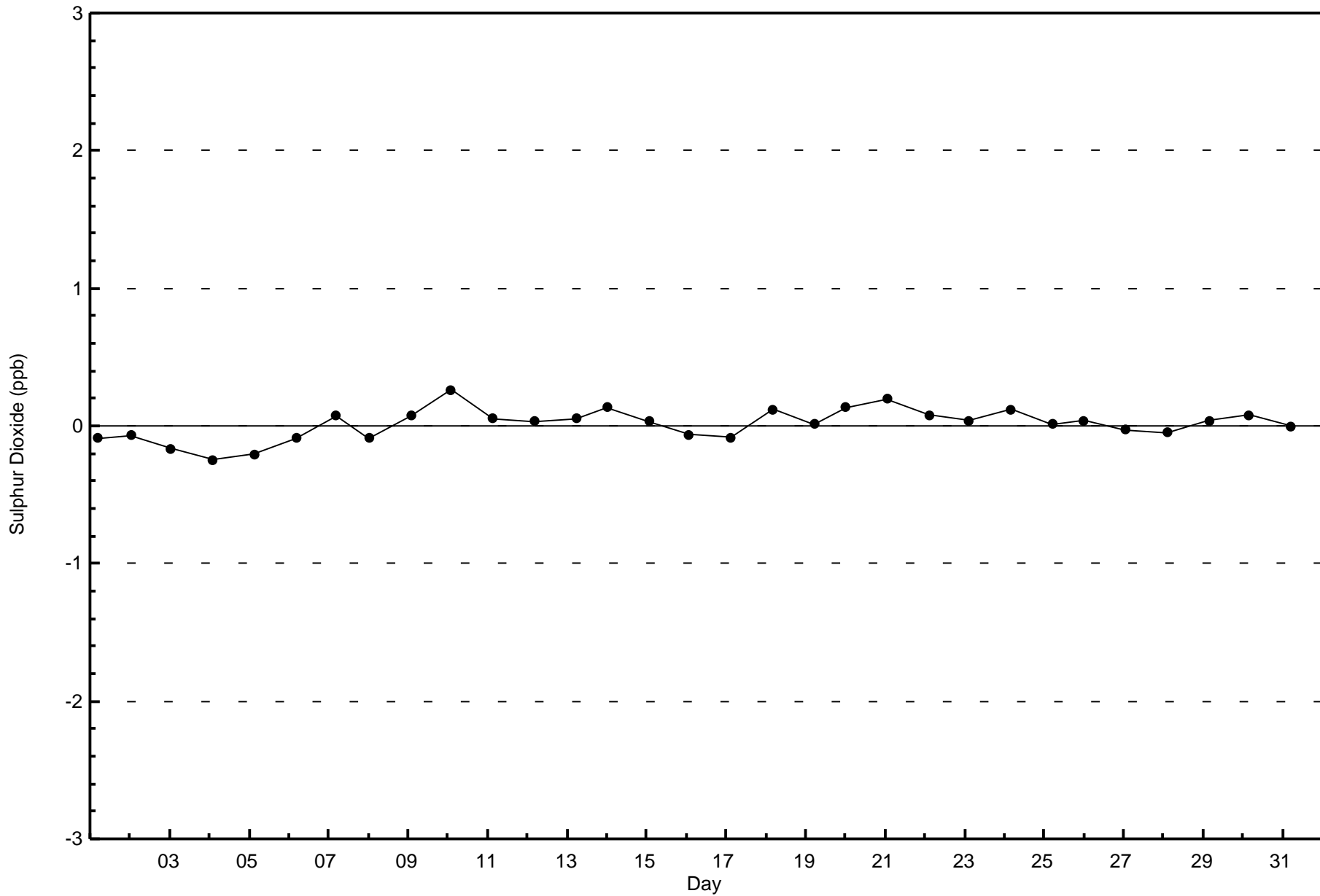


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

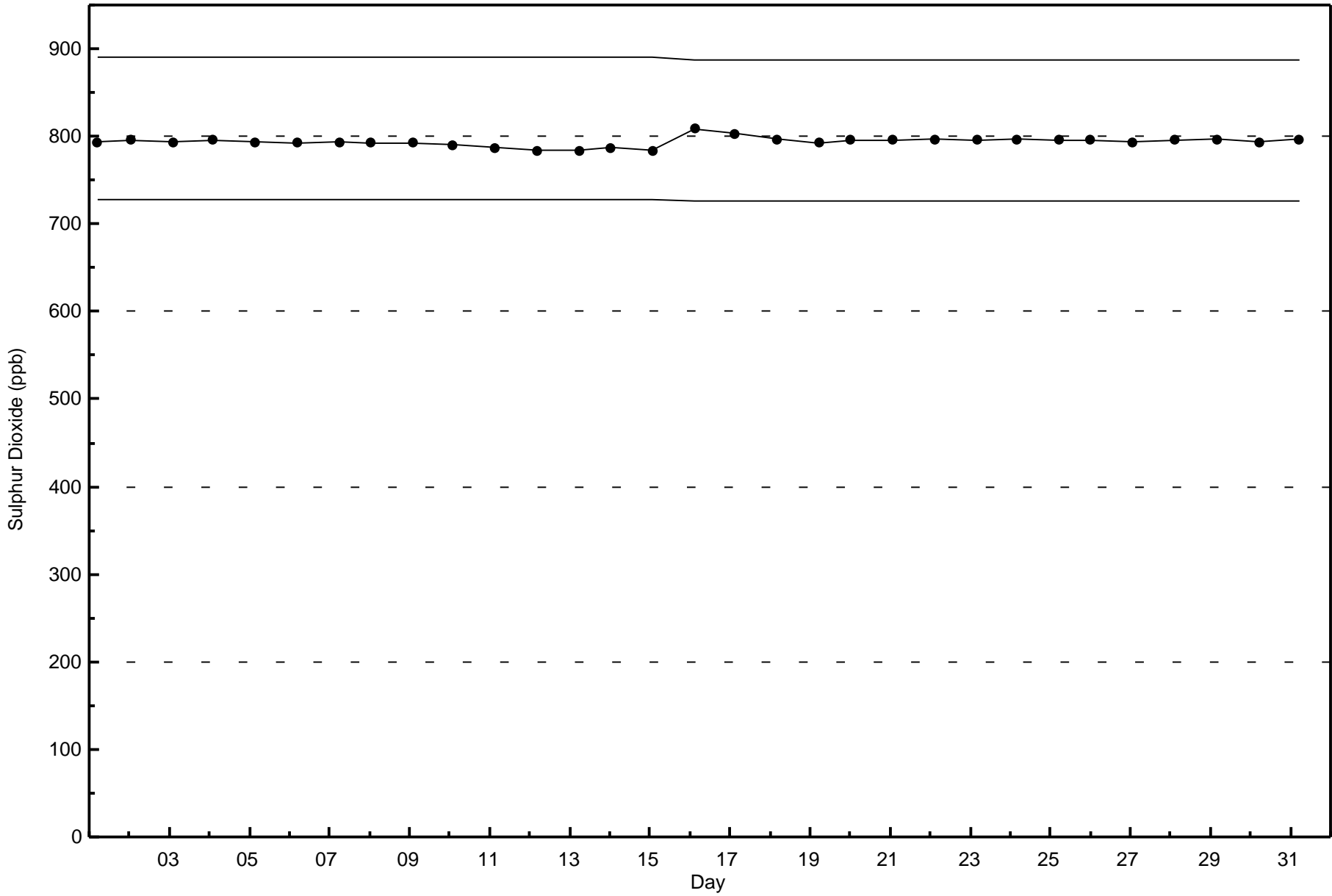
Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

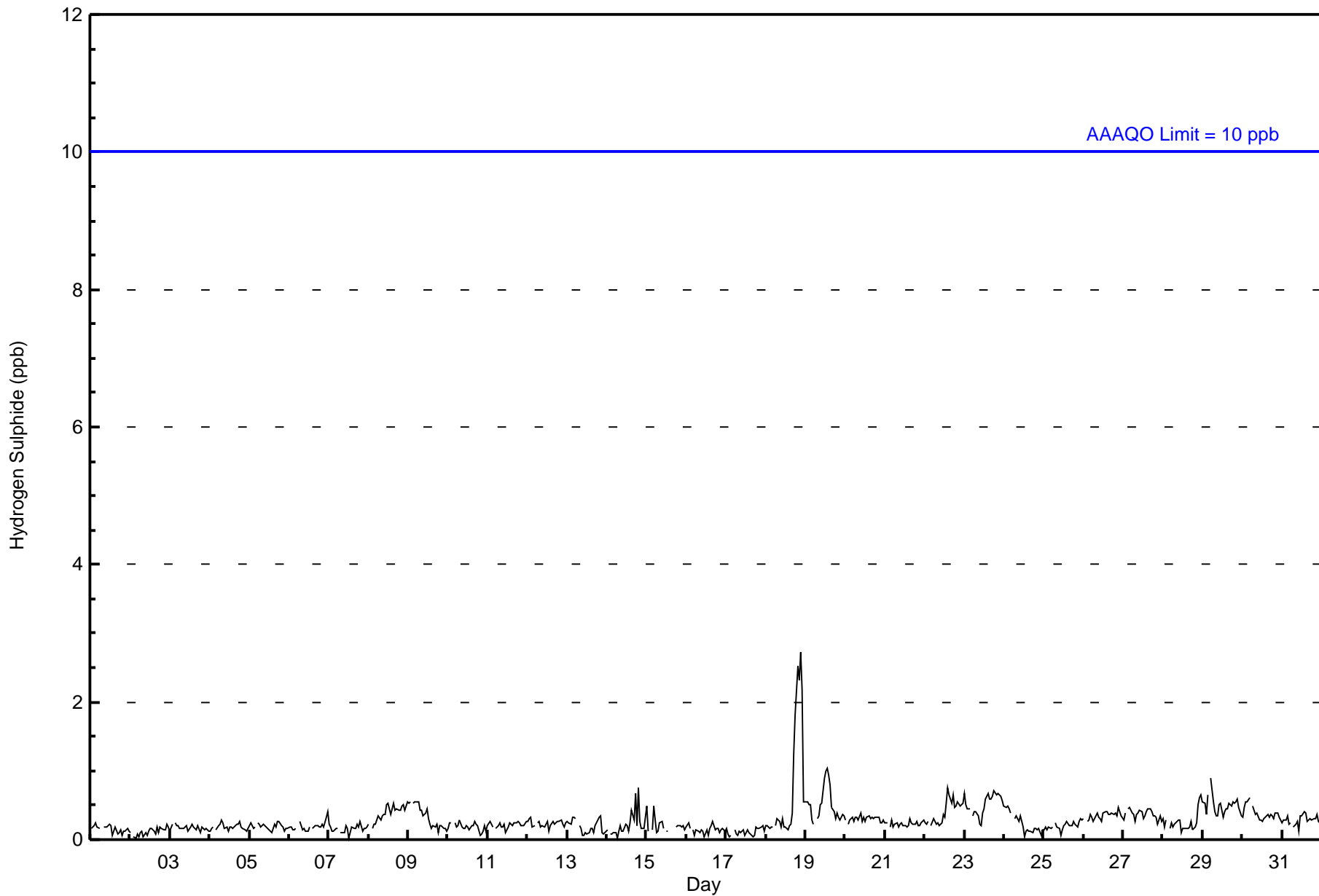
Brion MacKay River - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 3 ppb on Dec 18 22:00										Maximum Daily Average: 0.7 ppb on Dec 18										Hours of Data: 706							
Minimum Value: 0 ppb on Dec 14 07:00										Minimum Daily Average: 0.1 ppb on Dec 17										Hours of Missing Data: 38							
Maximum Diurnal Average: 0.4 ppb at hour 20										Minimum Diurnal Average: 0.2 ppb at hour 11										Hours of Calibration: 35							
Monthly Average: 0.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 99.6							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0.4	1
9-Dec	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0.2	1
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	UO	0	0	C	C	C	C	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	3	2	1	0.7	3
19-Dec	1	1	1	1	0	0	Z	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	1	1	1	0.4	1
23-Dec	1	1	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
29-Dec	1	1	0	1	Z	1	1	0	0	0	1	1	0	0	0	0	1	0	1	1	1	1	1	0	0	0.5	1
30-Dec	0	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	Diurnal Average	
	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	2	3	2	3	2	1	Diurnal Maximum	
Z - zerospan	C - Calibration	UO - Unstable Operation																									
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb	24-hr 3 ppb																										



WBEA Data PC
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	704	99.72	99.72
3 - 4	2	0.28	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**WBEA Data PC
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	14	18	23	3	6	16	46	70	75	75	46	59	50	116	63	22	702
3 - 4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	14	20	23	3	6	16	46	70	75	75	46	59	50	116	63	22	704

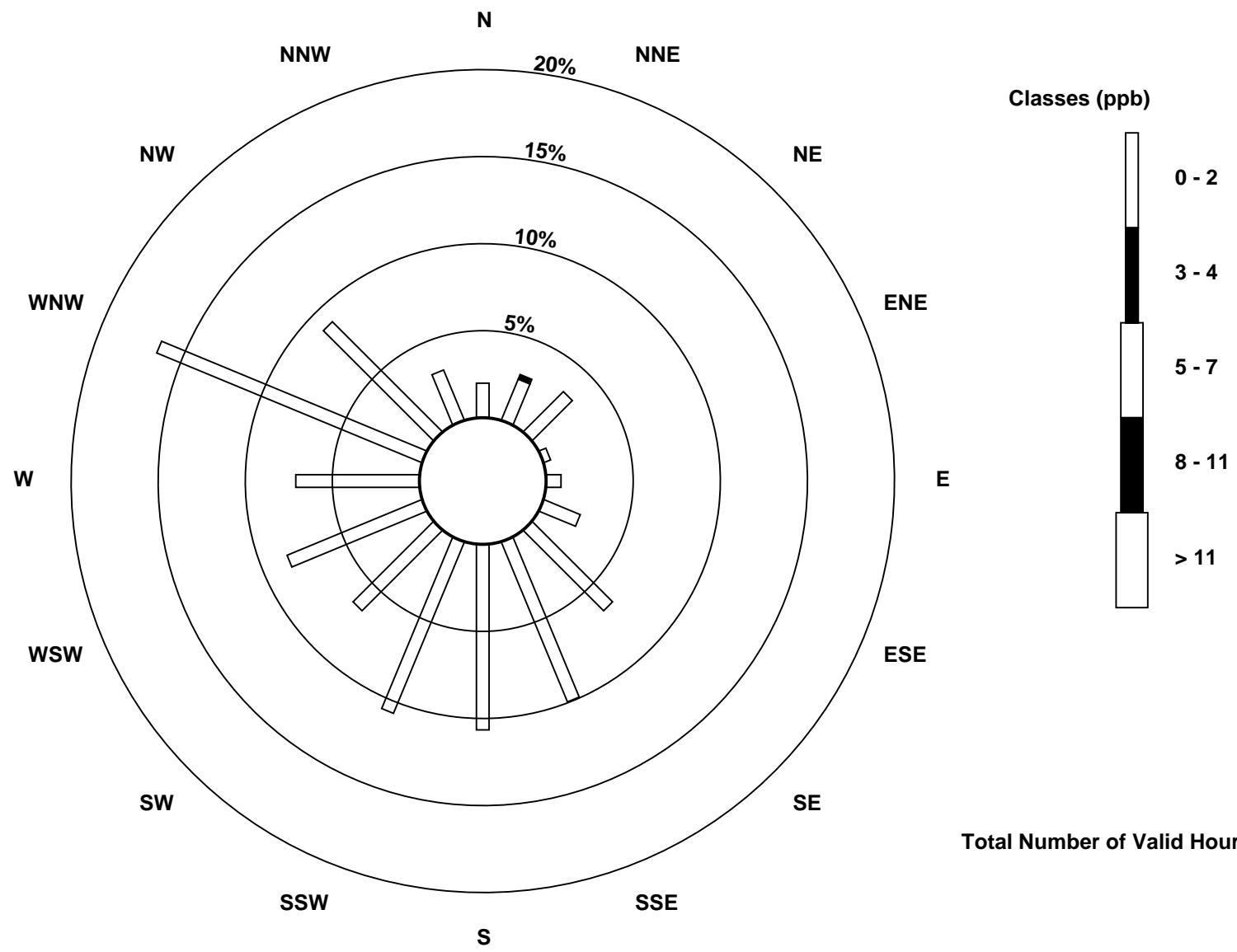
Total Number of Valid Hours: 704

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River (AMS 20)

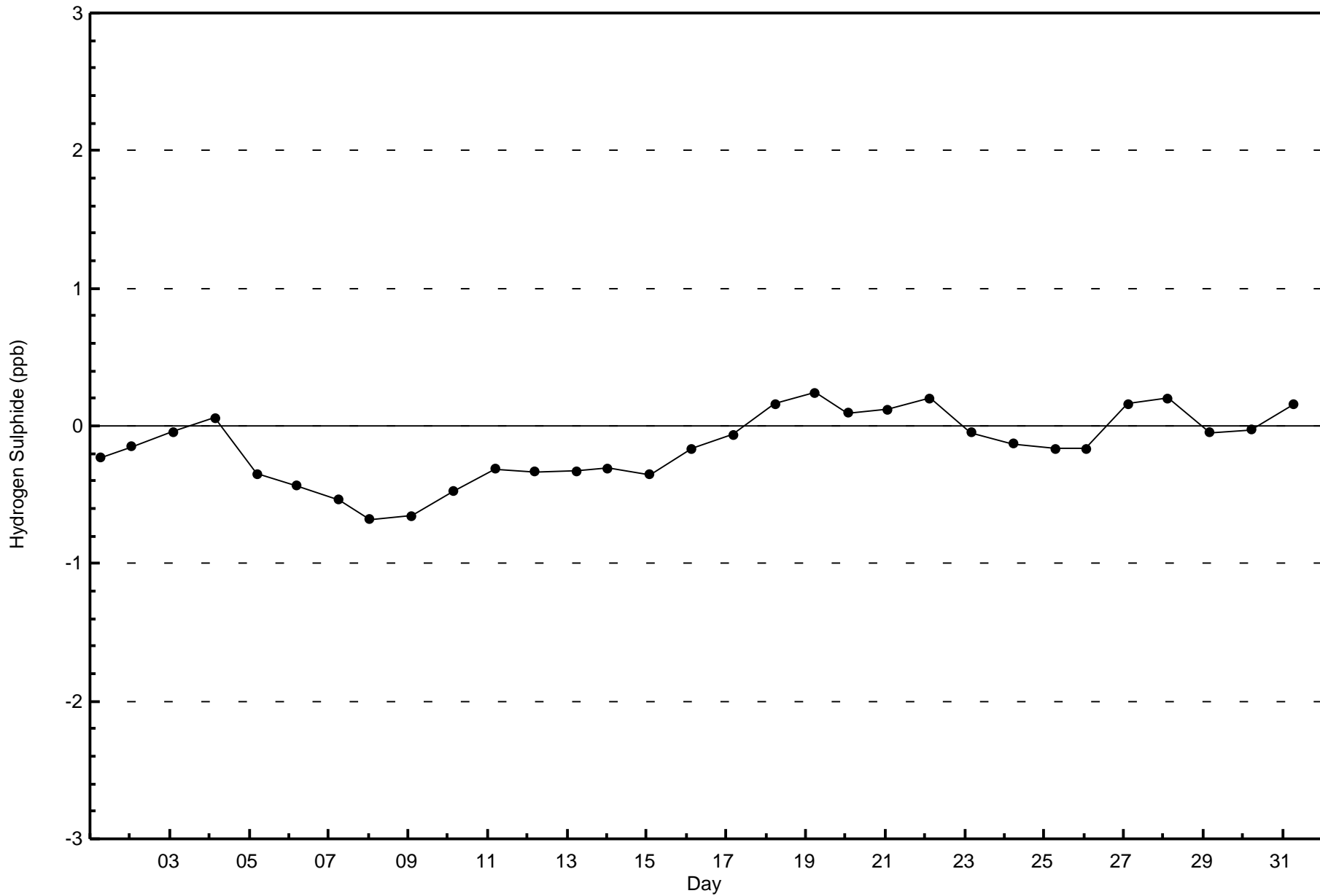


Total Number of Valid Hours: 704



WBEA Data PC
Zero Responses

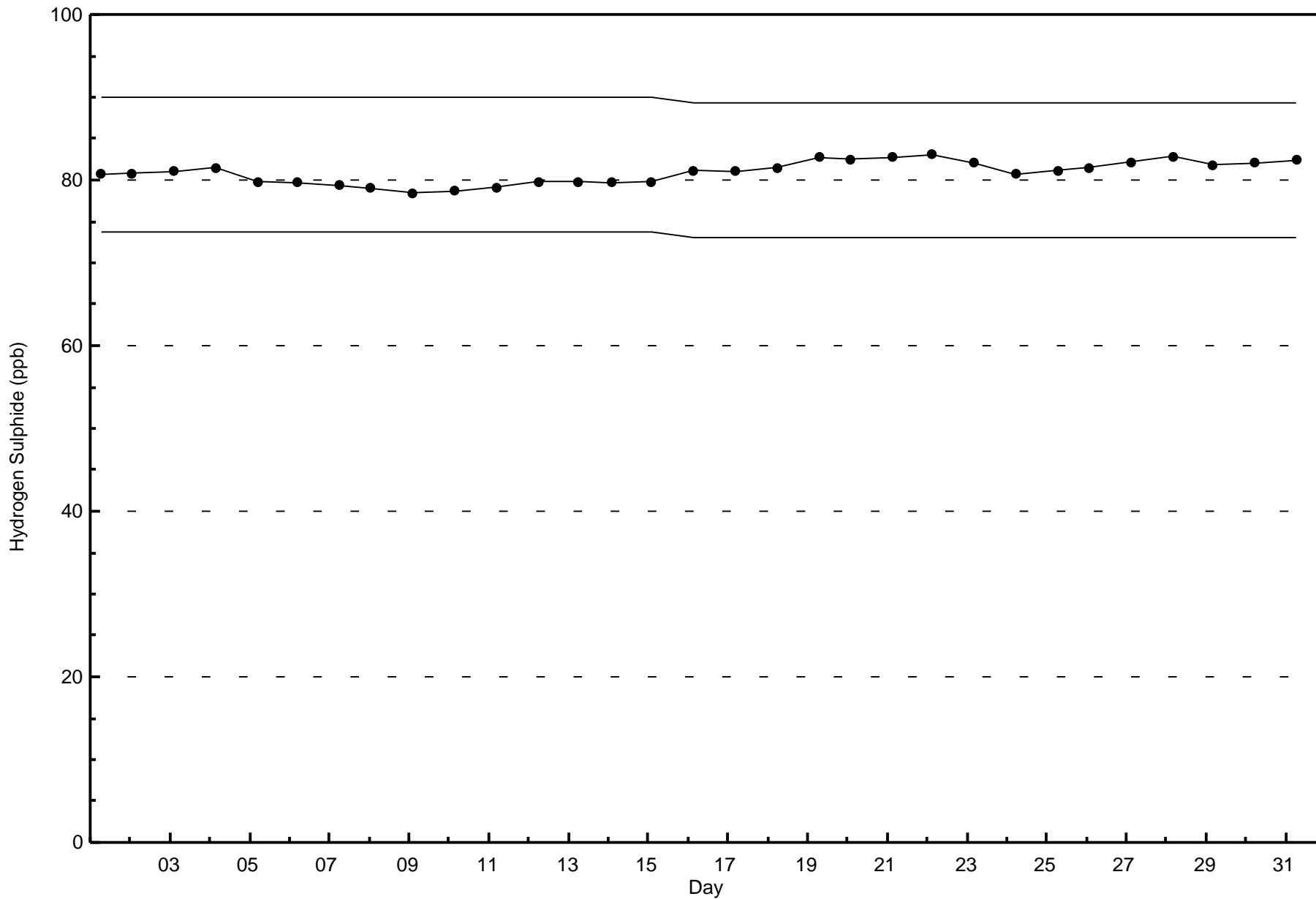
Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Span Responses

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - December 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

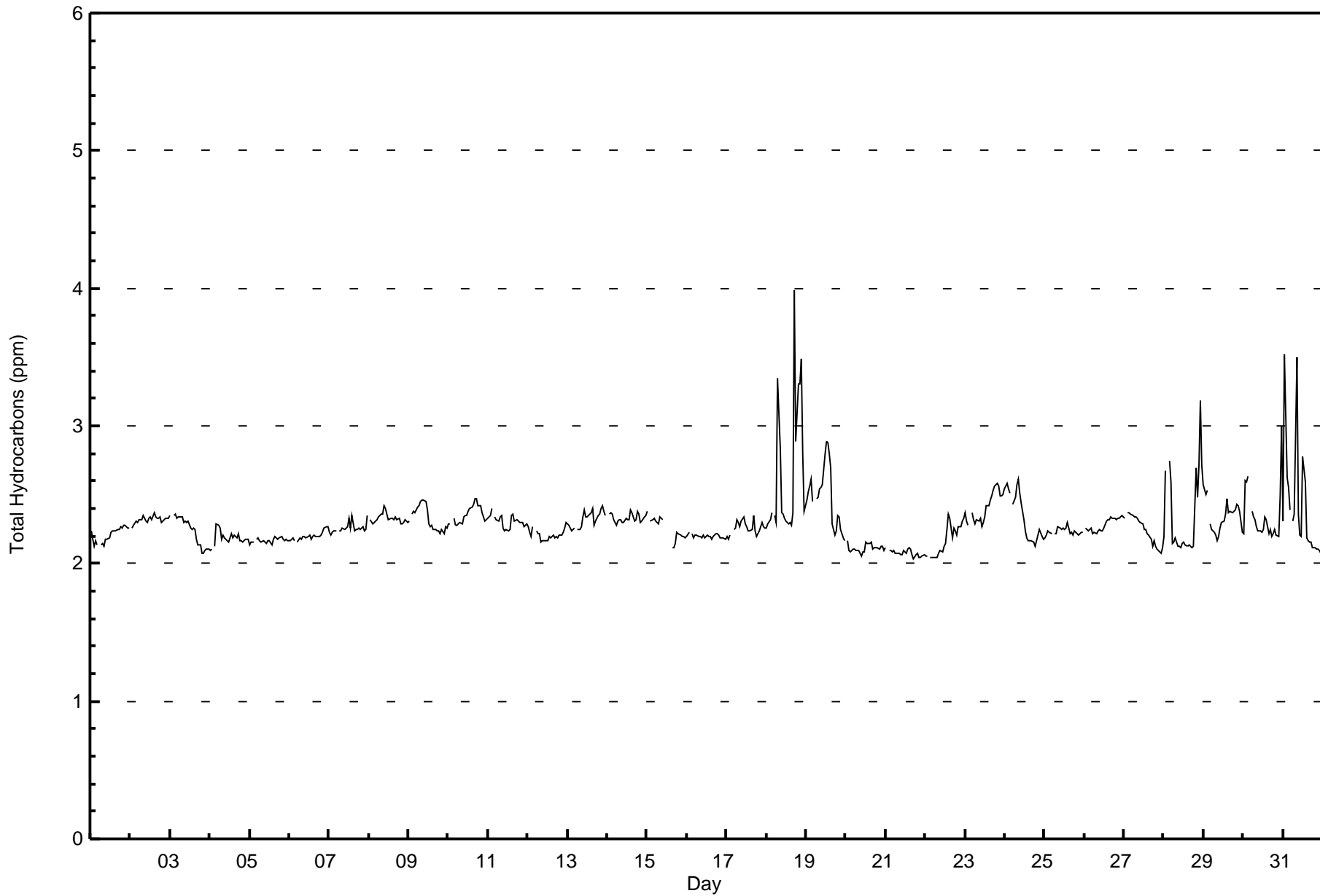
Total Hydrocarbons (THC) - ppm
Brion MacKay River - December 2016

Maximum Value: 4.0 ppm on Dec 18 18:00		Maximum Daily Average: 2.6 ppm on Dec 18		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Dec 21 18:00		Minimum Daily Average: 2.1 ppm on Dec 21		Hours of Data: 708																						
Maximum Diurnal Average: 2.3 ppm at hour 2		Minimum Diurnal Average: 2.2 ppm at hour 17		Hours of Missing Data: 36																						
Monthly Average: 2.29 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.3 P ₉₀ = 2.4 P ₉₉ = 3.3		Hours of Calibration: 36																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.2	2.2	2.1	2.2	2.1	Z	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3
2-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
3-Dec	2.3	Z	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4
4-Dec	2.1	2.1	Z	2.1	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
5-Dec	2.1	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
6-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.3
7-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.2	2.3	2.3	2.3
8-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4
9-Dec	2.3	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.4	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.5
10-Dec	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.5
11-Dec	2.3	2.4	2.4	Z	2.3	2.3	2.3	2.3	2.4	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4
12-Dec	2.3	2.2	2.2	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3
13-Dec	2.3	2.3	2.2	2.2	2.3	Z	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.4
14-Dec	Z	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.4
15-Dec	2.4	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	C	C	C	C	C	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4
16-Dec	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
17-Dec	2.2	2.2	2.2	Z	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3
18-Dec	2.3	2.3	2.3	2.4	Z	2.3	2.3	3.3	2.8	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.4	4.0	2.9	3.3	3.3	3.5	2.8	2.4	2.6	4.0
19-Dec	2.5	2.5	2.6	2.6	2.5	Z	2.5	2.5	2.5	2.6	2.6	2.8	2.9	2.9	2.8	2.7	2.3	2.2	2.2	2.4	2.3	2.3	2.2	2.2	2.5	2.9
20-Dec	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
21-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1
22-Dec	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.3	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.4
23-Dec	2.4	2.3	2.3	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.6	2.5	2.5	2.5	2.4	2.6
24-Dec	2.5	2.6	2.5	2.5	Z	2.4	2.5	2.6	2.6	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.6
25-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
26-Dec	Z	2.3	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4
27-Dec	2.3	Z	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.4
28-Dec	2.2	2.7	Z	2.7	2.6	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.7	2.5	2.7	3.2	2.7	2.3	3.2
29-Dec	2.6	2.5	2.5	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.2	2.6
30-Dec	2.2	2.6	2.6	2.6	Z	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5	3.0	2.3	3.0
31-Dec	2.3	3.5	2.6	2.6	2.4	Z	2.3	2.4	3.5	2.4	2.2	2.2	2.8	2.6	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.4	3.5
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										



WBEA Data PC
Hourly Averages

Total Hydrocarbons (THC) - ppm
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Brion MacKay River - December 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	8	1.13	1.13
2.1 - 3.0	692	97.74	98.87
3.1 - 10.0	8	1.13	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Brion MacKay River - December 2016

Concentration Ranges (ppm)	Wind Direction																Totals	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0 - 2.0	0	0	0	0	0	0	0	0	0	0	2	1	5	0	0	0	0	8
2.1 - 3.0	14	17	24	1	7	15	49	69	77	69	43	55	50	119	60	21	690	
3.1 - 10.0	1	3	0	1	0	0	0	0	0	0	0	0	0	0	2	1	8	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	15	20	24	2	7	15	49	69	77	71	44	60	50	119	62	22	706	

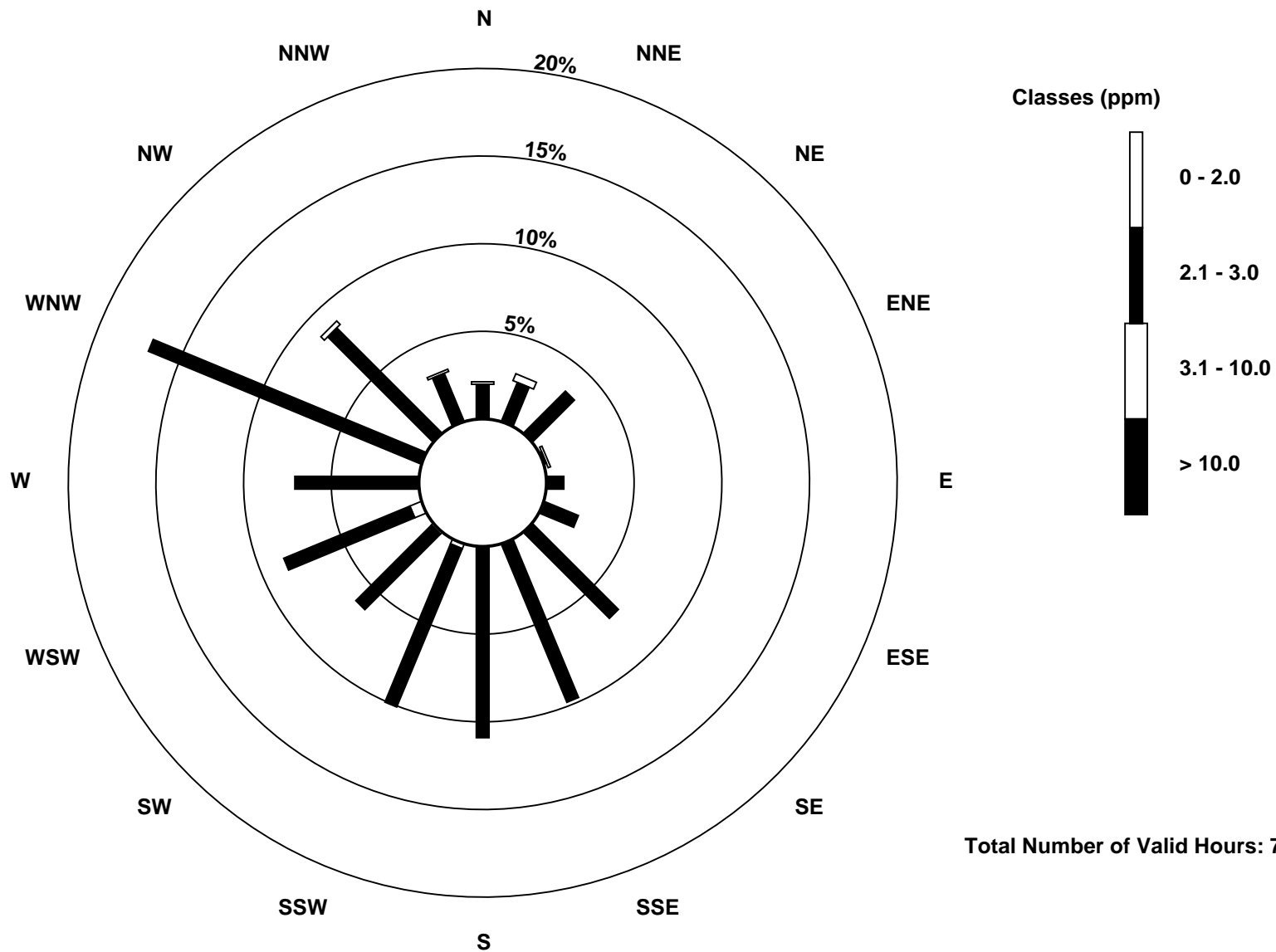
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Brion MacKay River (AMS 20)

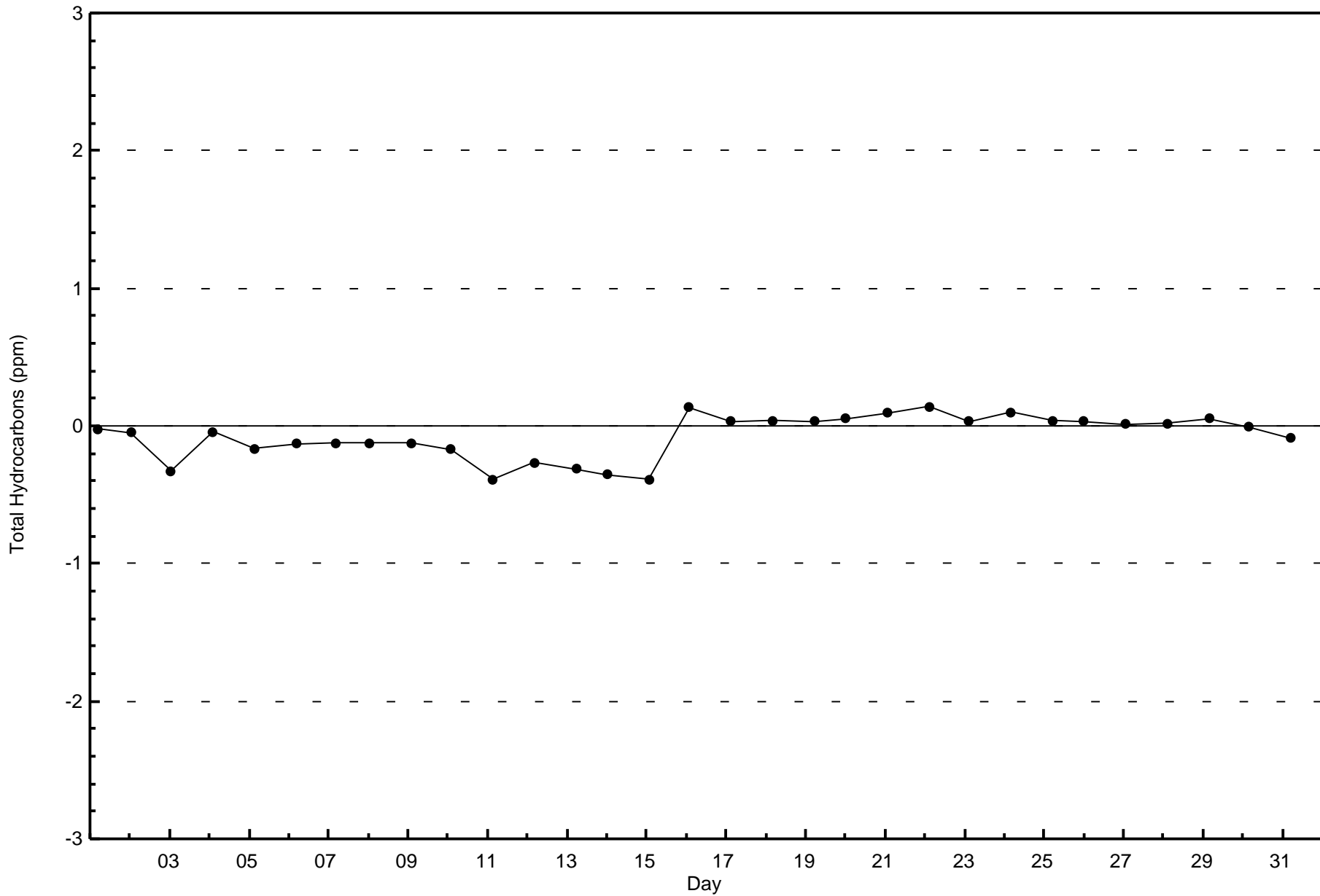


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

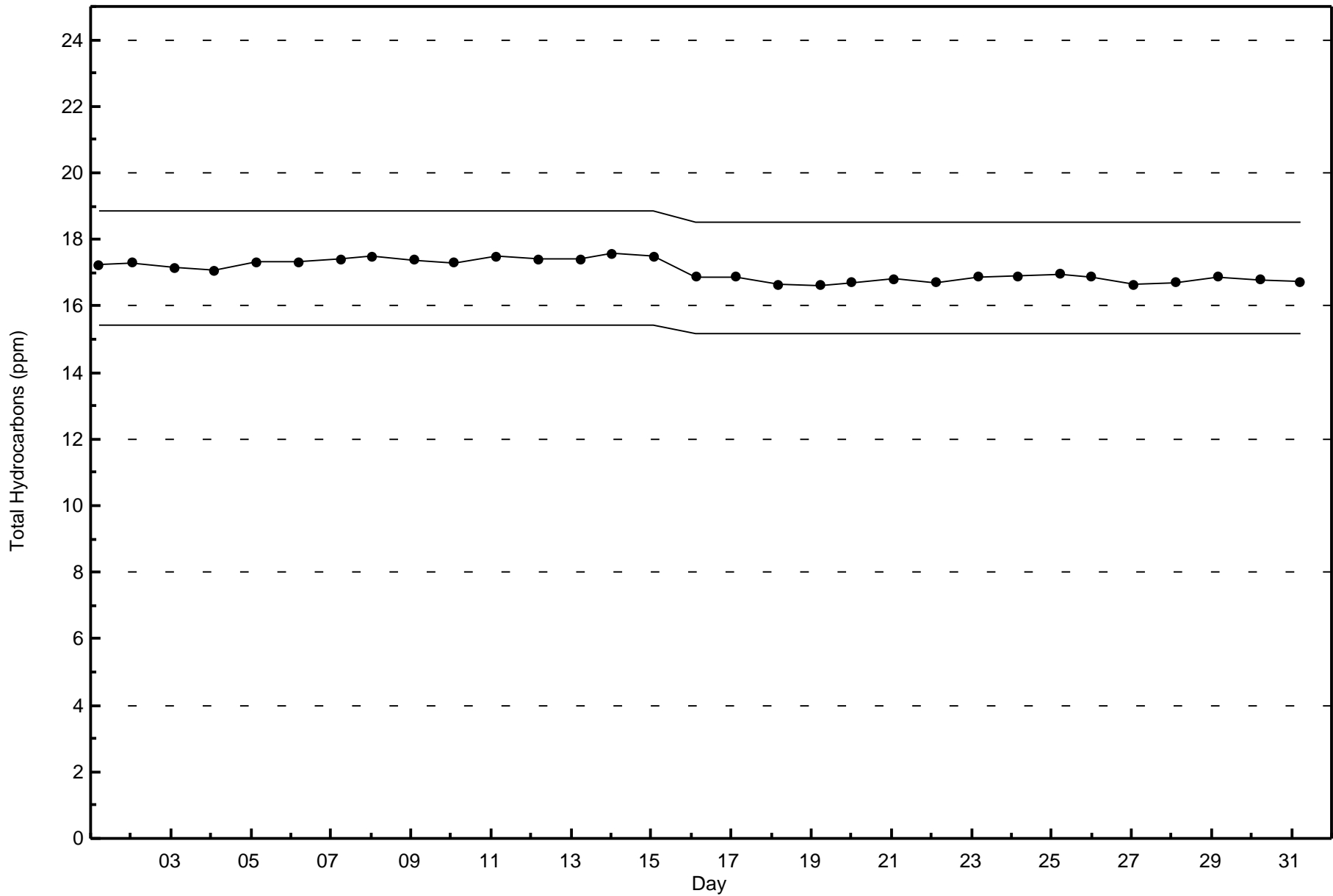
Total Hydrocarbons (THC) - ppm
Brion MacKay River - December 2016





WBEA Data PC
Span Responses

Total Hydrocarbons (THC) - ppm
Brion MacKay River - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

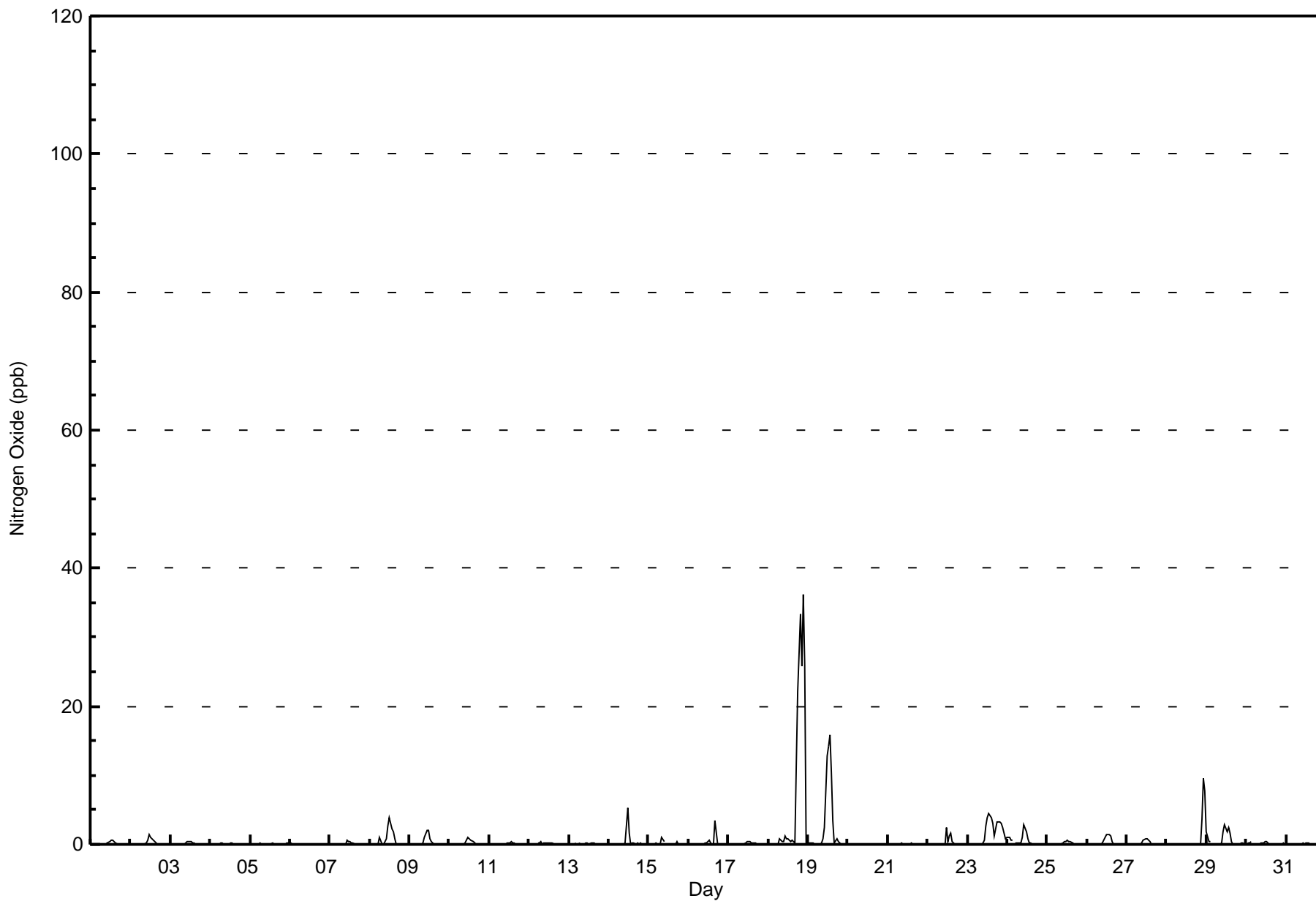
Brion MacKay River - December 2016

Maximum Value: 36 ppb on Dec 18 22:00																		Maximum Daily Average: 7.0 ppb on Dec 18																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 1 01:00																		Minimum Daily Average: 0.0 ppb on Dec 20																		Hours of Data: 708			
Maximum Diurnal Average: 1.4 ppb at hour 22																		Minimum Diurnal Average: 0.0 ppb at hour 5																		Hours of Missing Data: 36			
Monthly Average: 0.6 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 13																		Hours of Calibration: 36			
																																				Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1												
2-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1												
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1												
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0												
7-Dec	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1												
8-Dec	Z	0	0	0	0	0	1	0	0	0	1	3	4	2	2	1	0	0	0	0	0	0	0	0	0	0.6	4												
9-Dec	0	Z	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2												
10-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1												
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0.3	5												
15-Dec	0	Z	0	0	0	0	0	0	1	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	1												
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0.2	3												
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
18-Dec	0	0	0	0	Z	0	0	1	0	0	1	1	1	0	1	0	0	12	22	33	26	36	26	0	0	7.0	36												
19-Dec	0	0	0	0	0	Z	0	0	0	1	2	13	14	16	10	4	0	1	0	0	0	0	0	0	0	2.7	16												
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0												
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0												
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0.3	3												
23-Dec	0	0	0	Z	0	0	0	0	0	0	1	3	4	5	4	3	1	2	3	3	3	3	2	1	0	1.6	5												
24-Dec	1	1	1	1	Z	0	0	0	0	1	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3												
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1												
26-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0.3	2												
27-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1												
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	10	8	0	0.9	10												
29-Dec	2	1	0	Z	0	0	0	0	0	0	2	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0.6	3												
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0												
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0												
0.1 0.1 0.1 0.1 0.0 0.0 0.1 0.1 0.1 0.2 0.6 1.4 1.2 1.1 0.9 0.4 0.2 0.5 0.9 1.2 1.0 1.4 1.2 0.3																		Diurnal Average																					
2 1 1 1 0 0 1 1 1 1 3 13 14 16 10 4 3 12 22 33 26 36 26 8																		Diurnal Maximum																					
Z - zerospan		C - Calibration																																					



WBEA Data PC
Hourly Averages

Nitrogen Oxide (NO) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxide (NO) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	99.29	99.29
21 - 40	5	0.71	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxide (NO) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	14	18	24	1	7	14	49	69	77	71	44	60	50	119	62	22	701
21 - 40	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	5
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	20	24	2	7	15	49	69	77	71	44	60	50	119	62	22	706

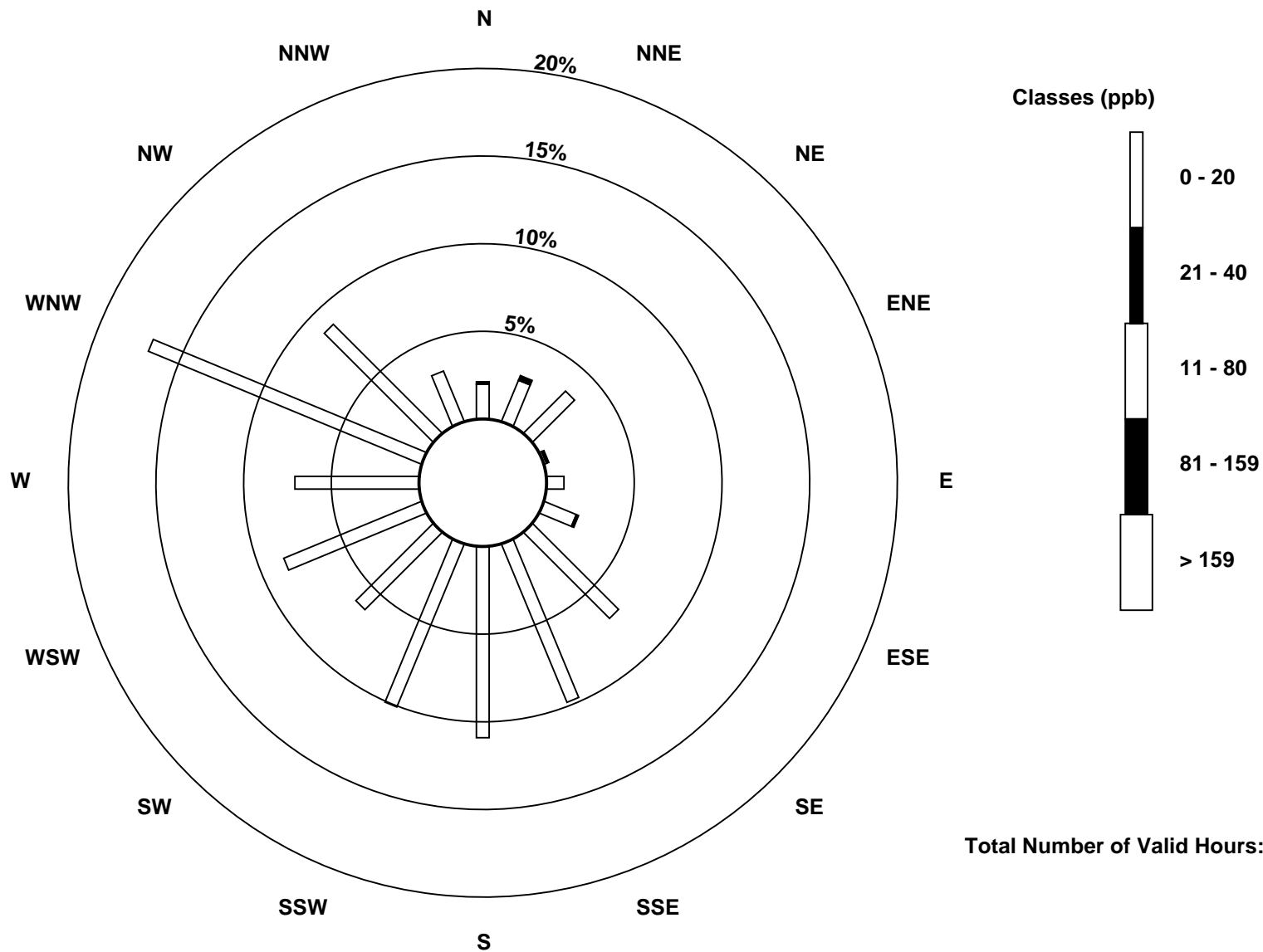
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

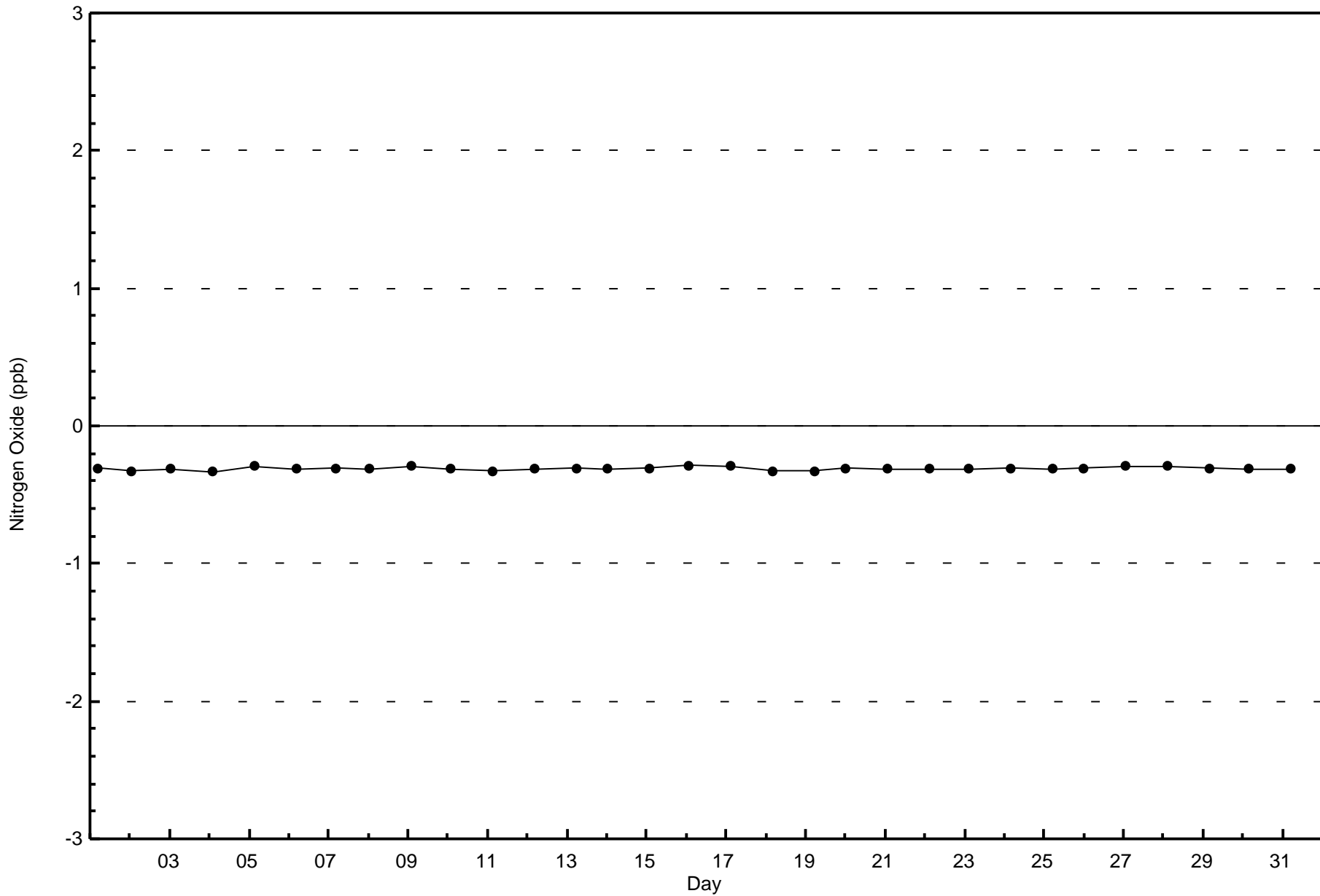
Nitrogen Oxide (NO) - ppb
Brion MacKay River (AMS 20)





WBEA Data PC
Zero Responses

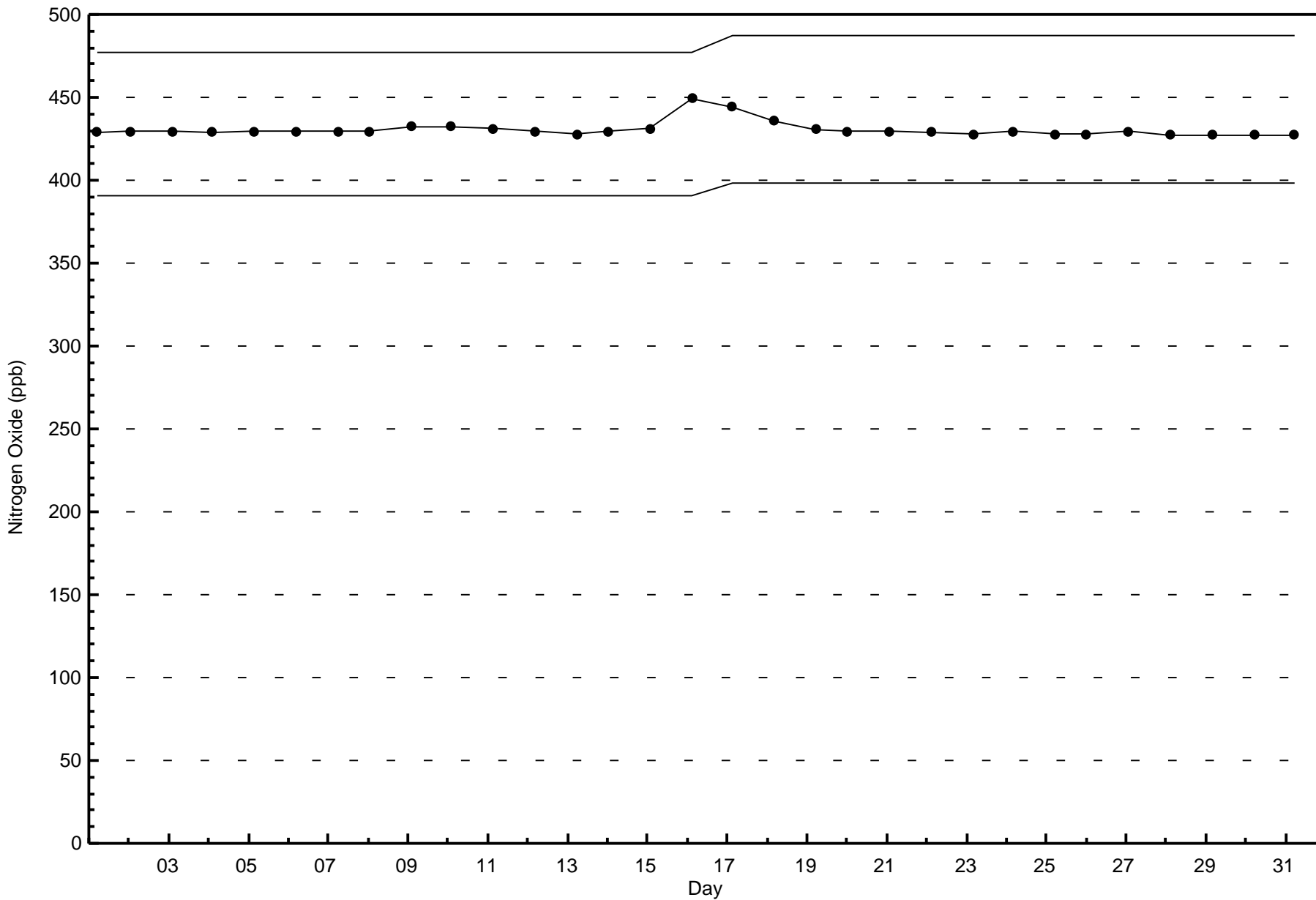
Nitrogen Oxide (NO) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Span Responses

Nitrogen Oxide (NO) - ppb
Brion MacKay River - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

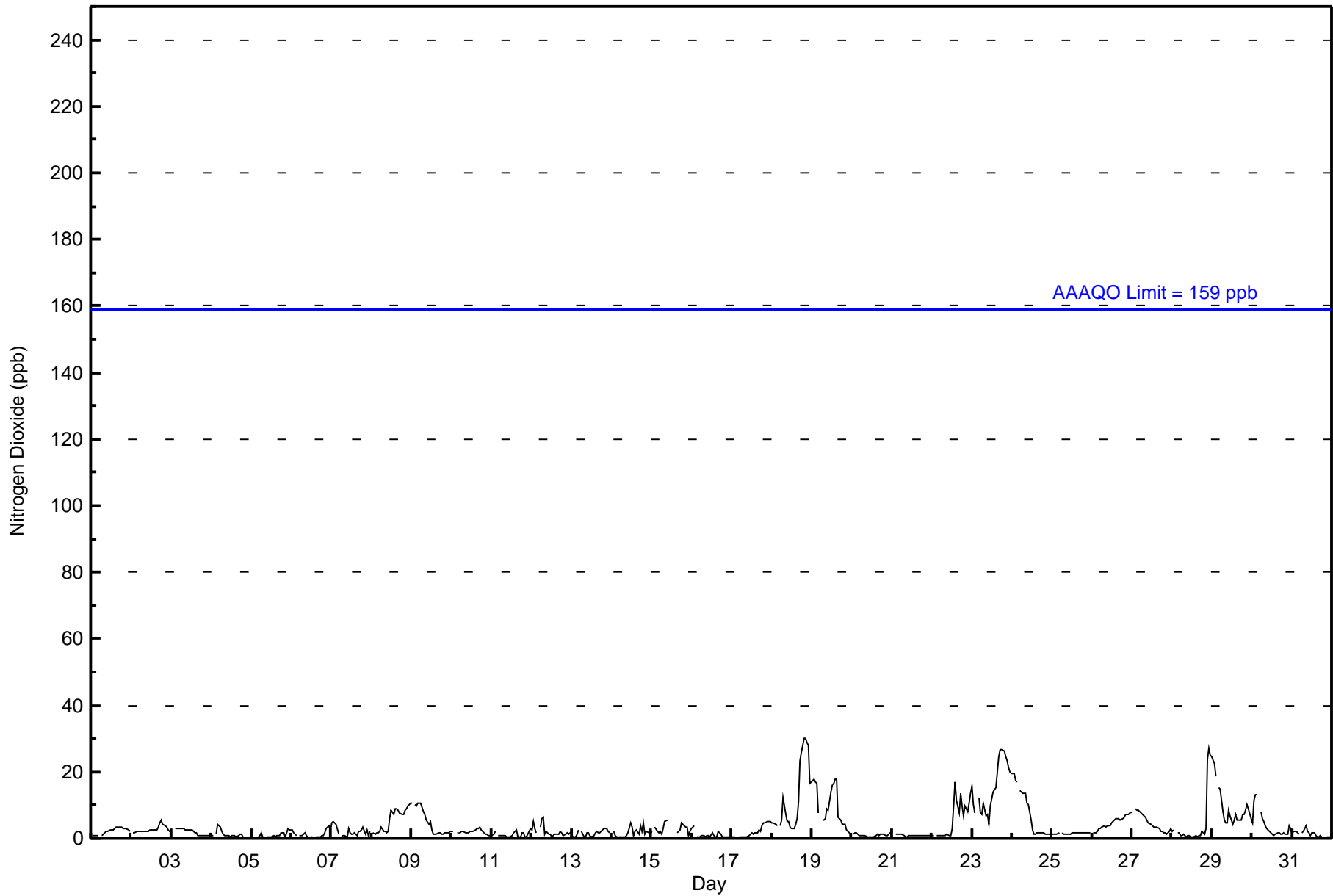
Brion MacKay River - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 30 ppb on Dec 18 20:00										Maximum Daily Average: 15.3 ppb on Dec 23										Hours of Data: 708						
Minimum Value: 0 ppb on Dec 4 21:00										Minimum Daily Average: 0.9 ppb on Dec 21										Hours of Missing Data: 36						
Maximum Diurnal Average: 5.2 ppb at hour 1										Minimum Diurnal Average: 2.7 ppb at hour 11										Hours of Calibration: 36						
Monthly Average: 3.8 ppb										Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 10 P ₉₉ = 27										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	Z	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	2	2	2.2	3
2-Dec	Z	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	5	5	4	4	4	3	2	2.8	5
3-Dec	2	Z	3	3	3	3	3	3	3	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1.9	3
4-Dec	1	1	Z	1	4	3	2	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	1.0	4
5-Dec	0	0	0	Z	0	1	2	0	0	1	0	0	1	1	1	1	1	1	2	2	1	2	3	3	0.9	3
6-Dec	3	2	1	1	Z	1	1	1	2	1	0	0	0	0	0	1	0	0	1	1	2	3	4	2	1.1	4
7-Dec	5	5	5	4	1	Z	0	1	1	0	3	2	1	1	2	1	2	2	3	3	1	2	1	2	2.1	5
8-Dec	Z	2	1	2	2	2	3	2	2	2	2	6	9	7	9	9	9	8	7	7	8	9	10	11	5.6	11
9-Dec	11	Z	10	10	11	10	9	8	7	5	4	5	3	1	1	1	2	2	1	1	2	2	2	2	4.8	11
10-Dec	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	3	3	3	4	3	2	1	1	1	1	2.0	4
11-Dec	1	1	2	Z	1	1	1	1	1	1	0	1	1	2	2	3	0	0	2	2	1	1	1	3	1.2	3
12-Dec	3	5	3	2	Z	3	6	7	1	2	1	1	1	1	1	1	1	2	2	1	1	2	1	2	2.2	7
13-Dec	1	0	0	1	2	Z	2	1	0	2	2	1	0	1	2	2	2	2	2	3	3	3	2	2	1.6	3
14-Dec	Z	2	1	1	1	0	1	1	1	1	2	5	3	1	2	3	1	4	2	5	1	2	2	1	1.8	5
15-Dec	2	Z	3	2	2	2	1	3	5	5	C	C	C	C	C	2	2	3	5	4	3	3	1	2	2.9	5
16-Dec	3	4	Z	1	0	1	1	1	1	1	1	1	2	1	1	0	2	1	0	0	0	0	0	0	0.9	4
17-Dec	0	1	1	Z	1	1	1	1	1	1	1	1	2	1	2	2	3	2	4	5	5	5	5	5	2.0	5
18-Dec	5	5	4	4	Z	4	6	12	7	5	5	3	3	3	4	6	11	23	26	30	30	29	28	17	11.7	30
19-Dec	17	18	17	17	8	Z	6	5	6	9	9	14	16	16	18	18	6	6	4	4	4	2	2	1	9.6	18
20-Dec	Z	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.0	2
21-Dec	2	Z	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	2
22-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	3	10	17	12	8	13	10	7	10	8	11	14	5.6	17
23-Dec	16	10	8	Z	12	8	7	10	7	7	4	10	12	14	15	20	25	27	27	26	25	23	21	20	15.3	27
24-Dec	20	20	18	17	Z	14	14	14	14	11	10	6	3	1	1	2	2	2	2	2	2	1	1	1	7.6	20
25-Dec	1	1	1	1	2	Z	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1.5	2
26-Dec	Z	2	2	2	3	3	4	4	3	4	4	4	5	6	6	6	6	6	6	6	7	7	7	8	4.7	8
27-Dec	8	Z	9	9	8	8	7	7	6	6	5	4	4	4	4	3	3	2	2	2	2	1	2	3	4.6	9
28-Dec	2	2	Z	2	2	1	1	1	0	1	1	0	0	1	1	1	1	1	2	1	3	24	27	25	4.3	27
29-Dec	24	22	19	Z	15	15	8	5	5	5	9	7	4	6	7	6	6	6	7	7	8	10	9	6	9.3	24
30-Dec	5	11	13	13	Z	8	6	5	4	3	2	2	1	1	1	2	2	1	1	2	1	1	4	3	4.0	13
31-Dec	1	2	2	2	1	Z	2	2	4	2	2	1	2	2	1	0	0	1	0	0	0	0	0	1	1.3	4
																								Diurnal Average		
																								Diurnal Maximum		
5.2 4.7 4.9 3.9 3.3 3.8 3.2 3.4 2.9 2.7 2.7 2.9 2.9 3.1 3.7 3.7 3.5 4.2 4.3 4.3 4.3 4.9 5.0 4.6																										
24 22 19 17 15 15 14 14 14 11 10 14 16 16 18 20 25 27 27 30 30 29 28 25																										
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	690	97.46	97.46
21 - 40	18	2.54	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	11	15	20	1	6	14	49	69	77	71	44	60	50	119	61	21	688
21 - 40	4	5	4	1	1	1	0	0	0	0	0	0	0	0	1	1	18
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	20	24	2	7	15	49	69	77	71	44	60	50	119	62	22	706

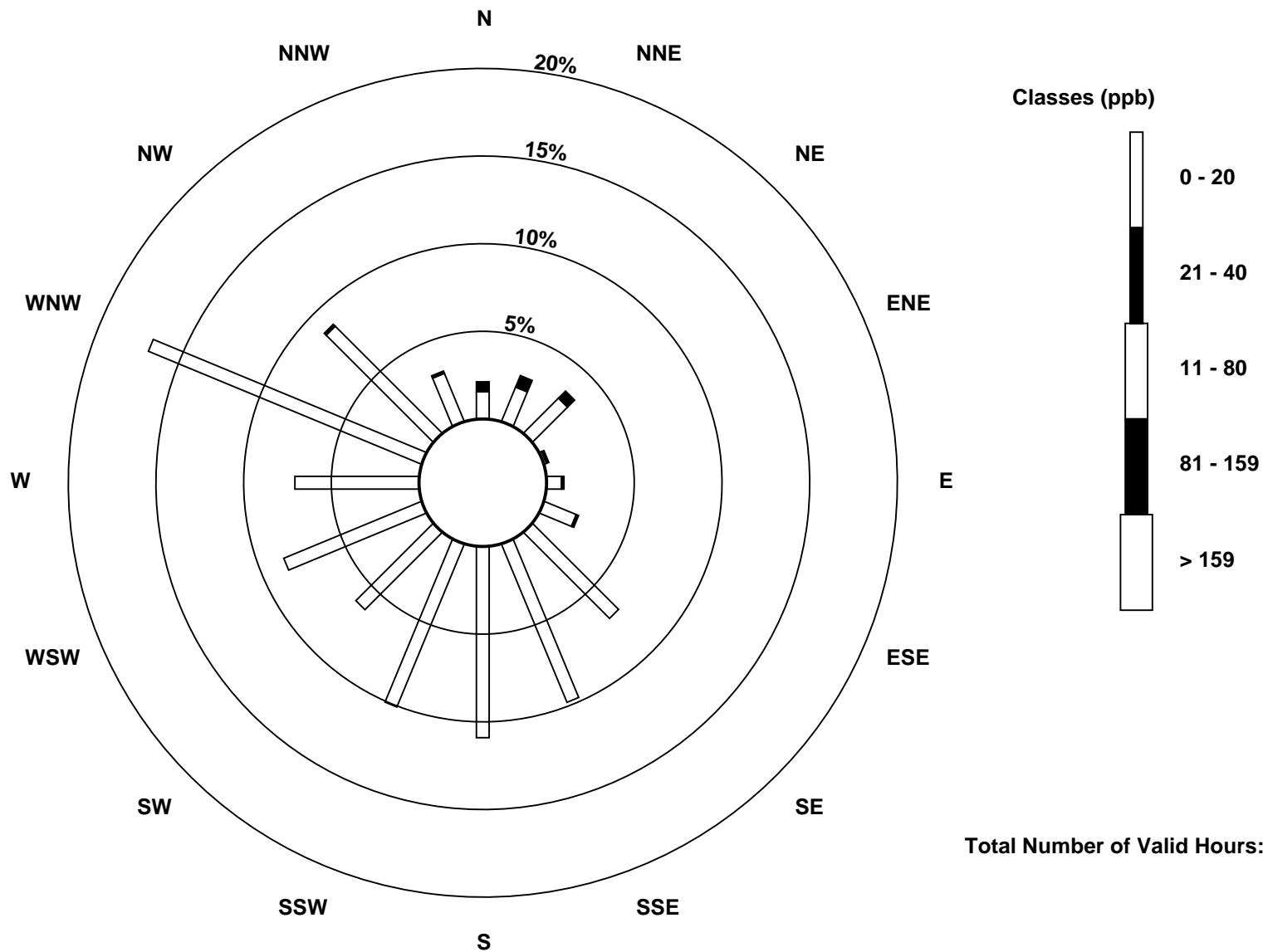
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River (AMS 20)

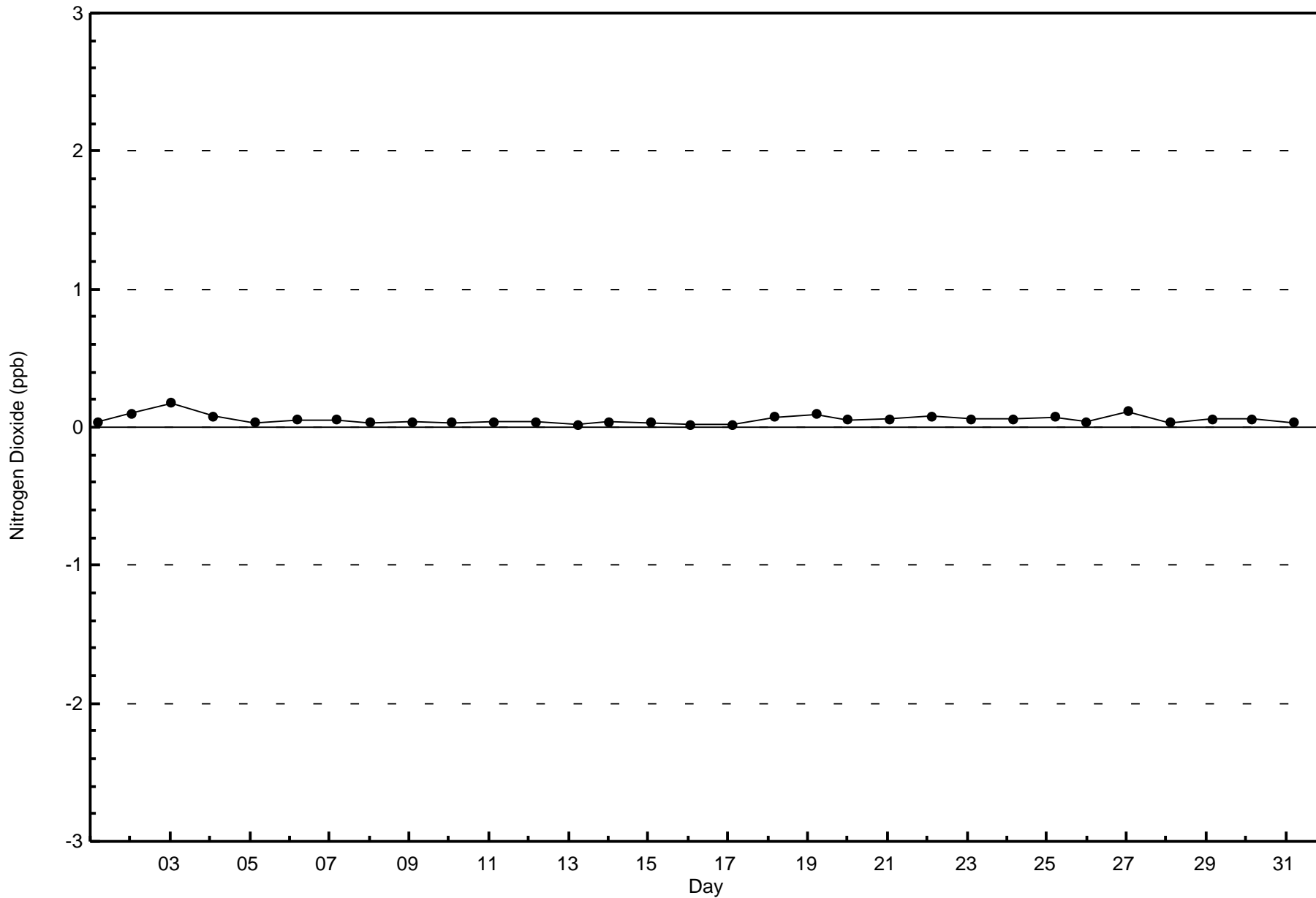


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

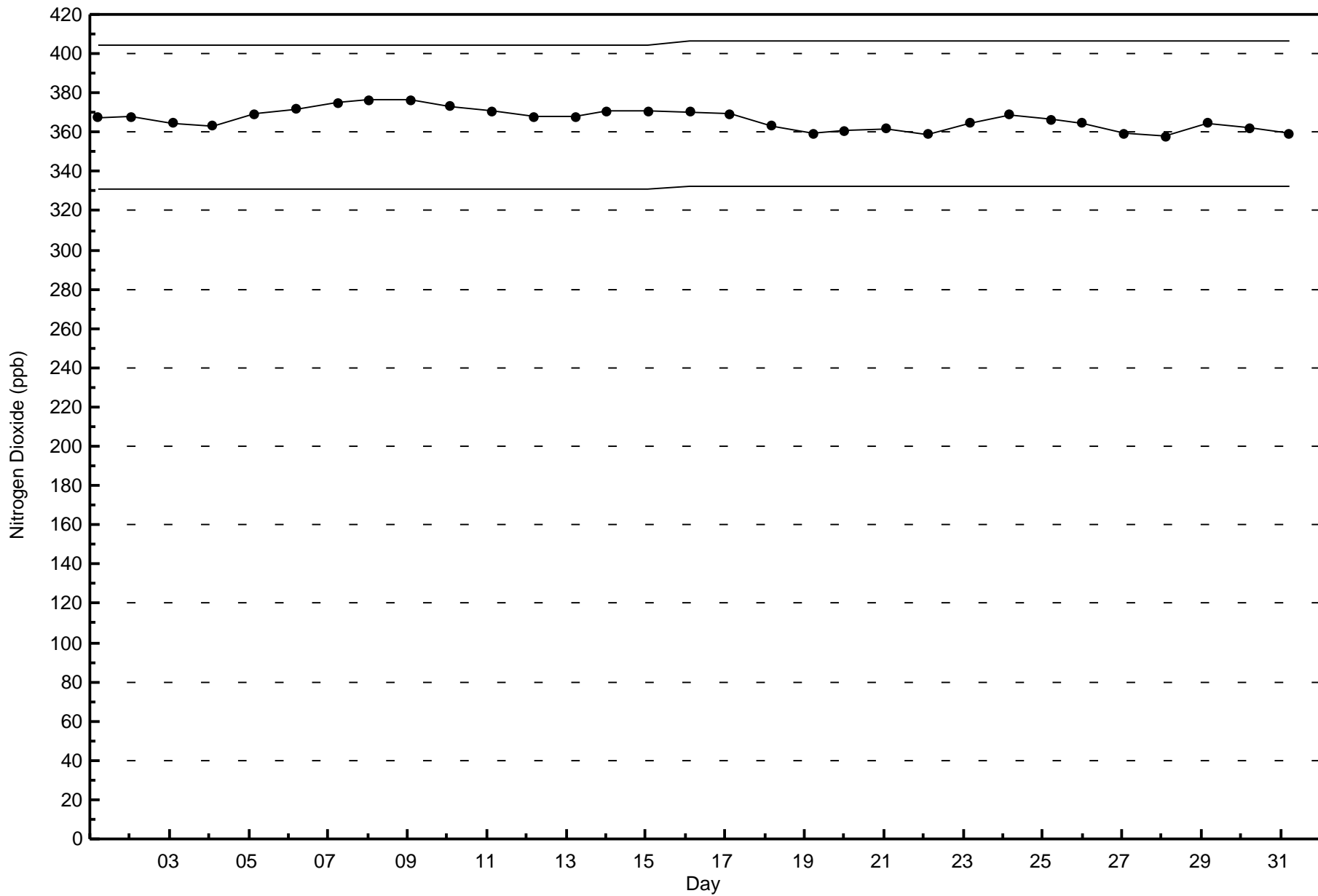
Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

Brion MacKay River - December 2016

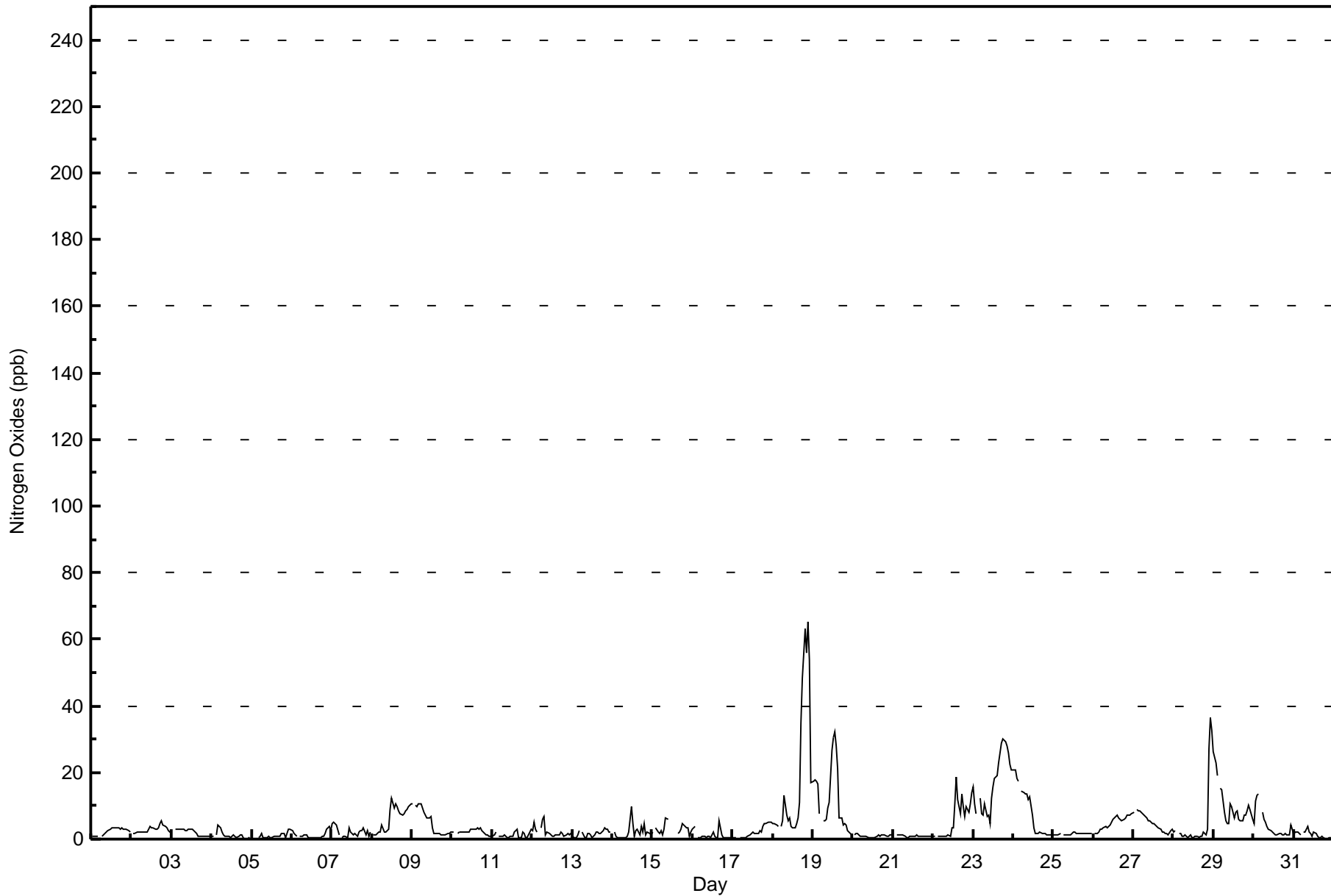
Maximum Value: 65 ppb on Dec 18 22:00																		Maximum Daily Average: 18.7 ppb on Dec 18																		Hours in Service: 744	
Minimum Value: 0 ppb on Dec 5 00:00																		Minimum Daily Average: 0.9 ppb on Dec 21																		Hours of Data: 708	
Maximum Diurnal Average: 6.3 ppb at hour 22																		Minimum Diurnal Average: 2.9 ppb at hour 10																		Hours of Missing Data: 36	
Monthly Average: 4.4 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 5 P ₉₀ = 10 P ₉₉ = 34																		Hours of Calibration: 36	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	1	1	Z	1	1	2	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2.3	3											
2-Dec	Z	2	2	2	2	2	2	2	2	2	3	4	4	3	3	3	3	5	5	4	4	3	3	2	3.0	5											
3-Dec	2	Z	3	3	3	3	3	3	3	3	3	3	3	2	2	1	1	1	1	1	1	1	1	1	2.0	3											
4-Dec	1	1	Z	1	4	3	2	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	1.1	4											
5-Dec	0	0	0	Z	0	1	2	0	0	0	1	0	0	1	1	1	1	1	2	2	1	2	3	3	0.9	3											
6-Dec	3	2	1	1	Z	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	2	3	4	2	1.2	4											
7-Dec	5	5	5	4	1	Z	0	1	1	0	4	2	1	1	2	1	2	2	3	3	1	2	1	2	2.2	5											
8-Dec	Z	1	1	2	2	2	4	2	2	2	3	9	12	9	11	10	9	8	7	7	8	9	10	11	6.2	12											
9-Dec	11	Z	10	10	11	10	9	8	7	6	6	7	3	2	2	2	2	1	1	1	1	2	2	2	5.1	11											
10-Dec	2	2	Z	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	3	2	1	1	1	1	2.2	4											
11-Dec	1	1	2	Z	1	1	1	1	1	0	1	1	1	2	2	3	0	0	2	2	1	1	1	3	1.2	3											
12-Dec	3	5	3	2	Z	4	6	7	1	2	2	1	1	1	1	1	1	2	2	1	1	2	1	2	2.3	7											
13-Dec	1	0	0	1	3	Z	2	1	0	2	2	1	1	1	2	2	2	2	2	3	3	3	2	2	1.7	3											
14-Dec	Z	2	1	0	0	0	0	1	1	1	2	10	5	1	2	3	1	4	2	5	1	2	2	1	2.1	10											
15-Dec	2	Z	3	2	2	2	1	3	6	6	C	C	C	C	C	2	2	3	5	4	3	3	1	2	3.0	6											
16-Dec	3	4	Z	1	0	1	1	1	1	1	1	1	2	1	1	0	6	1	0	0	0	0	0	0	1.1	6											
17-Dec	0	0	1	Z	1	0	0	1	1	1	1	2	2	2	2	2	3	2	4	4	5	5	5	5	2.1	5											
18-Dec	5	5	4	4	Z	4	6	13	7	5	6	4	4	3	5	7	11	35	48	63	56	65	54	17	18.7	65											
19-Dec	17	18	17	17	8	Z	5	5	6	10	11	27	30	32	28	21	6	6	4	5	4	2	2	1	12.3	32											
20-Dec	Z	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2											
21-Dec	1	Z	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1											
22-Dec	1	1	Z	1	1	1	1	1	1	1	1	3	3	11	19	12	8	13	10	7	10	8	11	14	5.9	19											
23-Dec	16	10	8	Z	12	7	7	10	7	7	5	12	16	18	19	23	26	29	30	29	28	26	23	21	16.9	30											
24-Dec	21	21	18	17	Z	14	14	14	14	12	13	7	3	2	2	2	2	2	2	1	1	1	1	1	8.0	21											
25-Dec	1	1	1	1	1	Z	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1.6	2											
26-Dec	Z	2	2	2	3	3	4	4	3	4	4	5	6	7	7	6	6	6	6	6	7	7	7	7	5.0	7											
27-Dec	8	Z	9	9	8	8	7	7	6	6	5	5	4	4	4	3	3	2	2	2	1	1	2	3	4.8	9											
28-Dec	2	2	Z	2	2	1	1	1	0	1	1	0	0	1	1	1	1	1	2	1	3	27	37	33	5.2	37											
29-Dec	26	23	19	Z	15	15	8	5	4	5	10	10	6	8	9	6	6	6	7	7	8	10	9	6	9.9	26											
30-Dec	5	12	13	14	Z	8	6	5	4	3	3	2	2	1	1	2	1	1	1	2	1	1	4	3	4.1	14											
31-Dec	1	2	2	2	1	Z	2	2	4	2	2	1	2	2	1	0	0	1	0	0	0	0	0	0	1.3	4											
5.3																		4.8																		Diurnal Average	
26																		23																		Diurnal Maximum	
5.0																		3.9																			
15																		15																			
3.3																		3.3																			
14																		14																			
2.9																		2.9																			
12																		12																			
3.3																		3.3																			
4.2																		4.2																			
30																		30																			
4.1																		4.1																			
4.2																		4.2																			
4.5																		4.5																			
23																		23																			
3.6																		3.6																			
4.7																		4.7																			
5.2																		5.2																			
6.3																		6.3																			
5.5																		5.5																			
5.2																		5.2																			
6.2																		6.2																			
4.9																		4.9																			

Z - zerospan C - Calibration



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	96.19	96.19
21 - 40	22	3.11	99.29
41 - 80	5	0.71	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	11	15	19	1	6	13	49	67	77	71	44	60	50	116	60	20	679
21 - 40	3	3	5	0	1	1	0	2	0	0	0	0	0	3	2	2	22
11 - 80	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	5
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	20	24	2	7	15	49	69	77	71	44	60	50	119	62	22	706

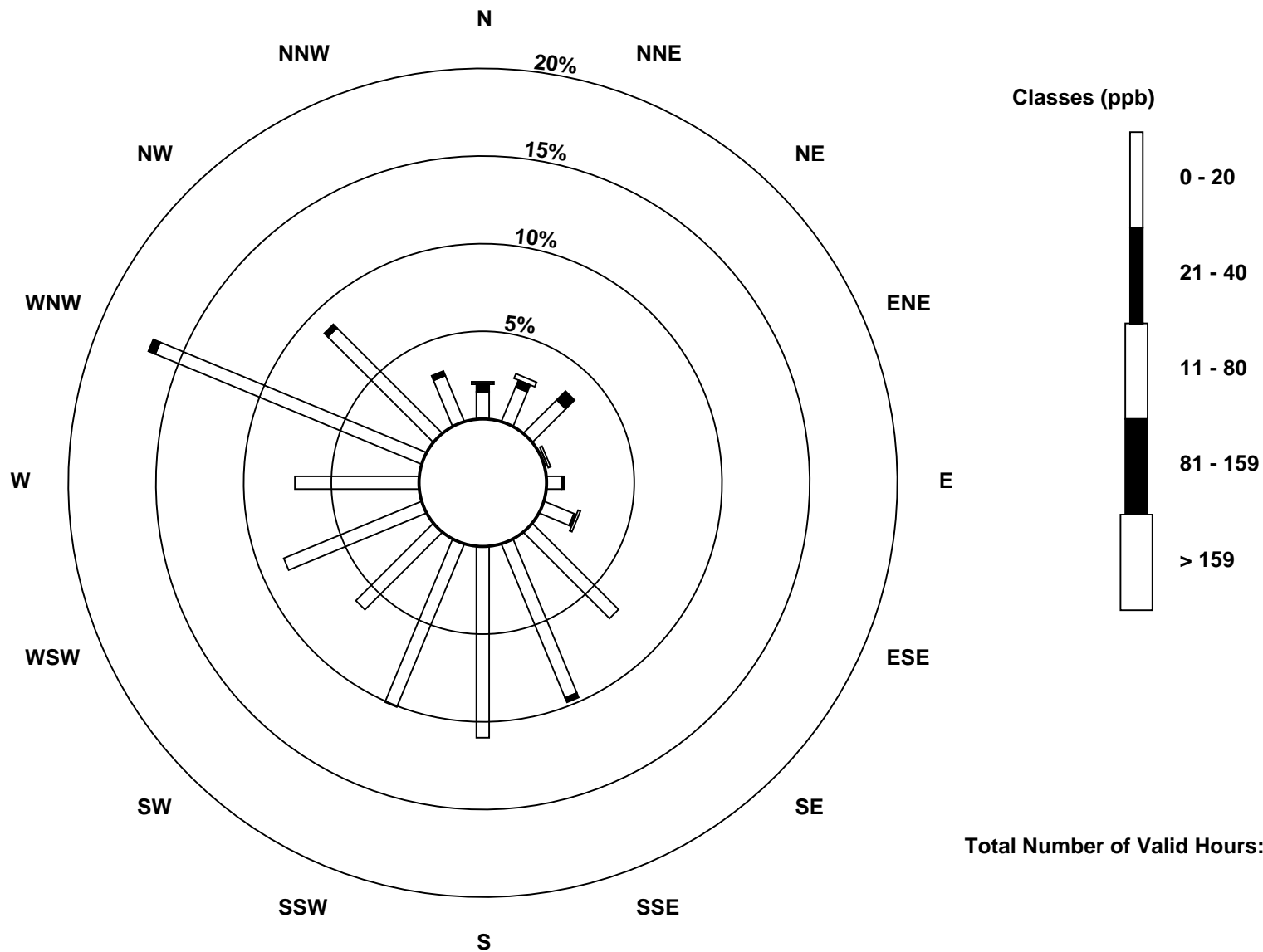
Total Number of Valid Hours: 706

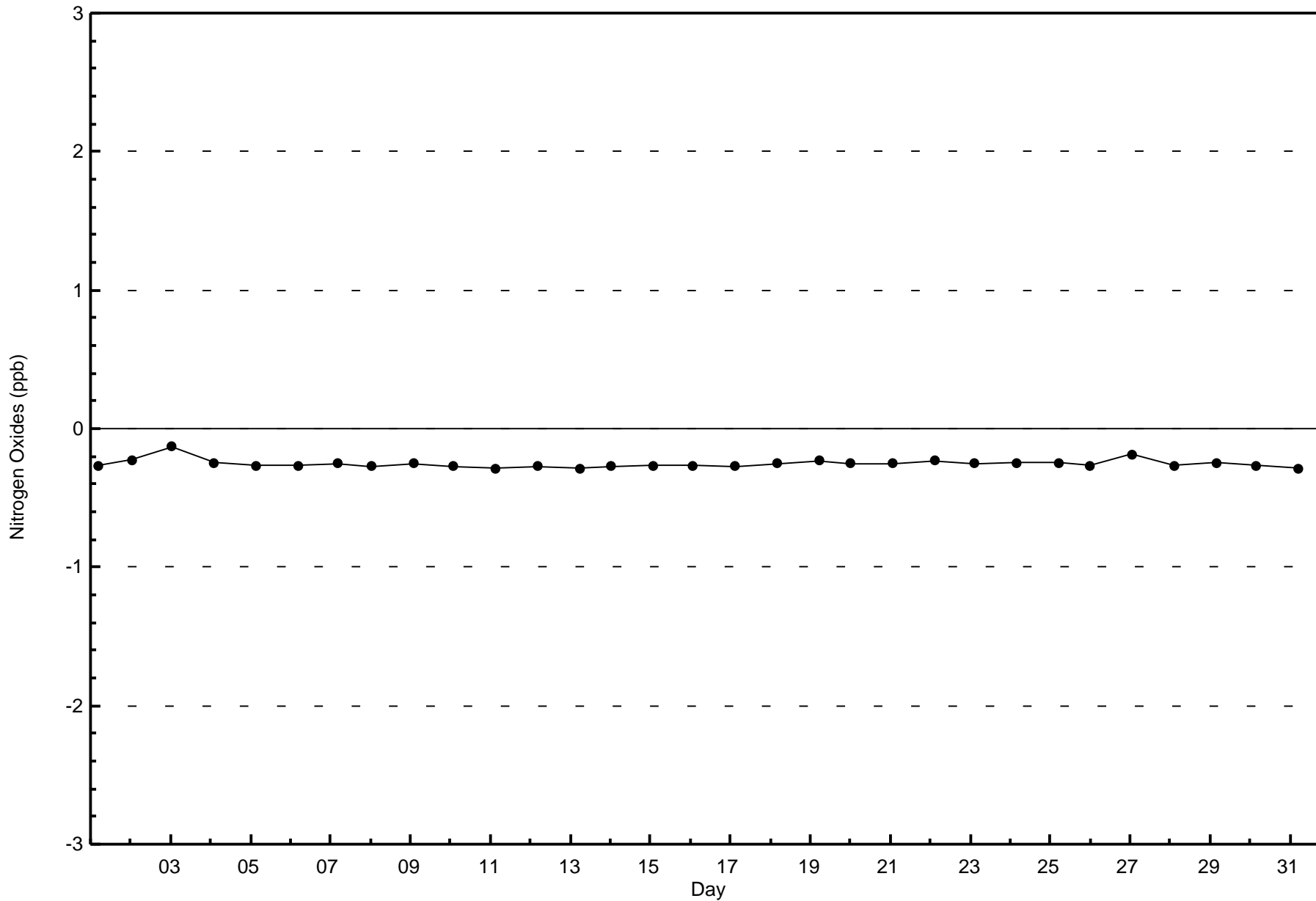
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River (AMS 20)

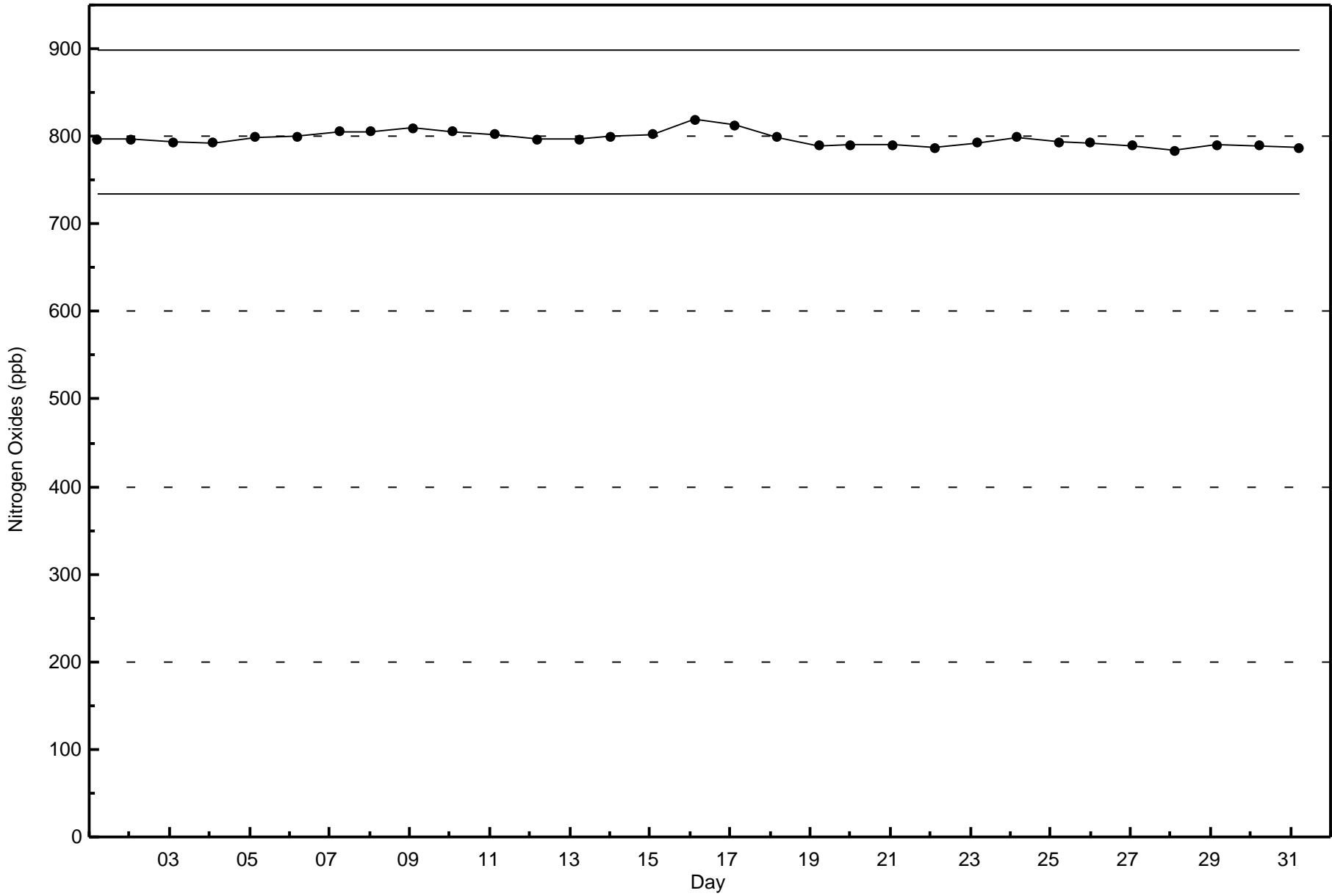






WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - December 2016



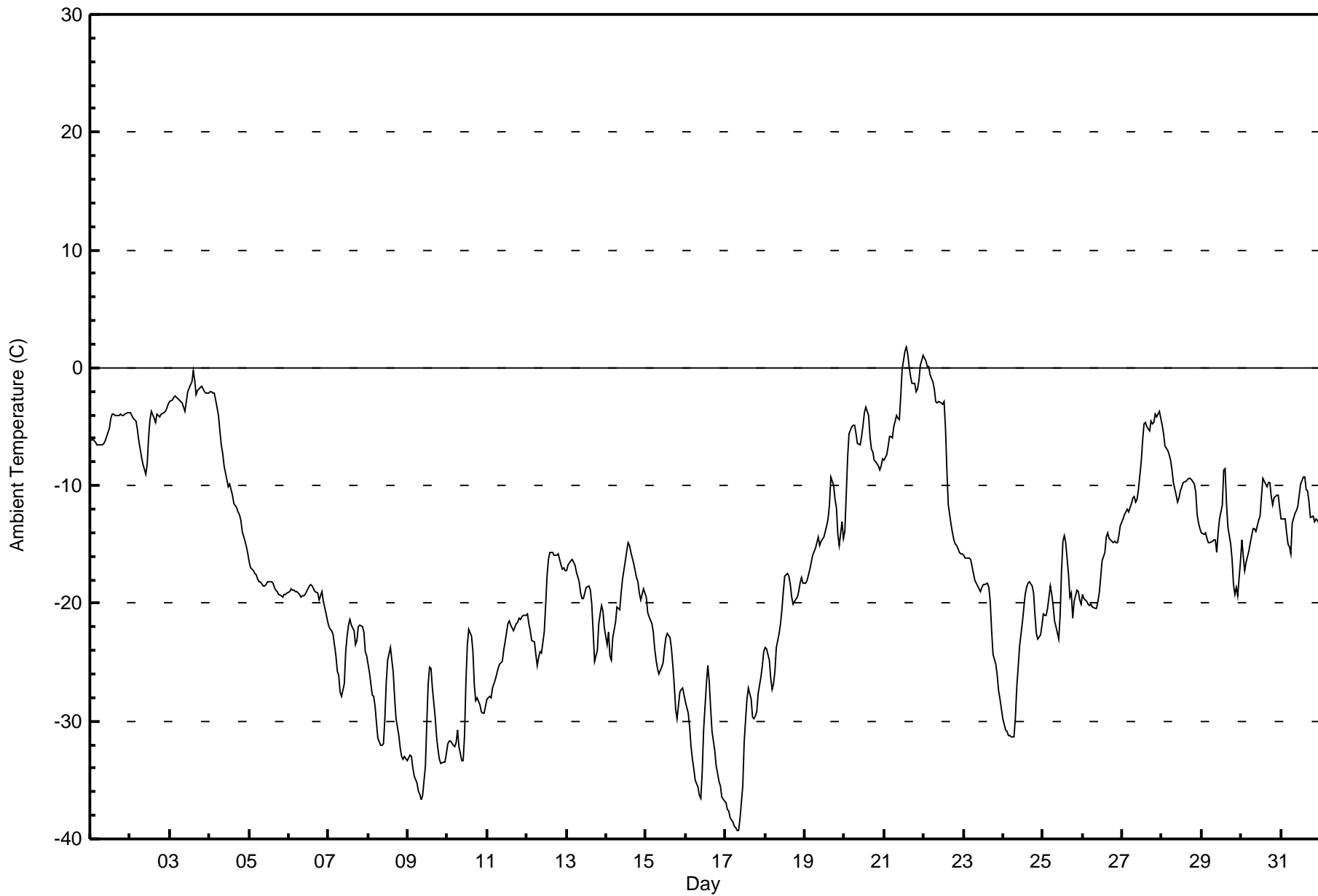


Maximum Value: 1.7 C on Dec 21 14:00 Maximum Daily Average: -2.2 C on Dec 3																						Hours in Service:	744			
Minimum Value: -39.3 C on Dec 17 08:00 Minimum Daily Average: -32.7 C on Dec 17																						Hours of Data:	744			
Maximum Diurnal Average: -14.3 C at hour 14 Minimum Diurnal Average: -18.9 C at hour 9																						Hours of Missing Data:	0			
Monthly Average: -17.27 C Percentiles: P ₁ = -37.7 P ₁₀ = -30.6 Q ₁ = -23.6 Median = -18.2 Q ₃ = -10.1 P ₉₀ = -4.0 P ₉₉ = -0.1																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.2	-6.1	-6.2	-6.3	-6.5	-6.6	-6.5	-6.5	-6.4	-6.2	-5.8	-5.2	-4.3	-4.0	-3.9	-4.1	-4.1	-4.0	-3.9	-4.0	-4.0	-3.9	-3.8	-3.8	-5.1	-3.8
2-Dec	-3.9	-4.0	-4.3	-4.5	-5.2	-6.1	-6.9	-7.6	-8.2	-9.0	-8.2	-6.0	-4.4	-3.7	-4.3	-4.7	-4.0	-4.0	-4.2	-4.0	-3.8	-3.6	-3.5	-3.1	-5.1	-3.1
3-Dec	-2.9	-2.7	-2.5	-2.4	-2.5	-2.6	-2.7	-3.0	-3.4	-3.7	-2.9	-2.1	-1.4	-1.2	-0.3	-1.1	-2.3	-1.9	-1.6	-1.6	-1.8	-2.0	-2.2	-2.2	-2.2	-0.3
4-Dec	-2.0	-2.0	-2.1	-2.1	-2.7	-4.0	-5.4	-6.5	-7.3	-8.4	-9.5	-10.1	-9.9	-10.3	-10.8	-11.5	-11.9	-12.2	-12.5	-13.0	-13.9	-14.7	-15.3	-15.9	-8.9	-2.0
5-Dec	-16.5	-16.9	-17.2	-17.5	-17.6	-18.0	-18.1	-18.2	-18.5	-18.6	-18.4	-18.2	-18.1	-18.3	-18.7	-18.9	-19.0	-19.3	-19.4	-19.4	-19.4	-19.3	-19.3	-19.1	-18.4	-16.5
6-Dec	-18.9	-18.8	-18.8	-18.9	-19.0	-19.0	-19.2	-19.4	-19.4	-19.4	-19.2	-18.8	-18.5	-18.5	-18.8	-19.0	-19.2	-19.8	-19.4	-19.0	-19.8	-20.9	-21.5	-19.2	-18.5	
7-Dec	-22.0	-22.2	-22.3	-22.7	-24.5	-25.8	-26.2	-27.6	-27.9	-26.9	-24.1	-22.8	-21.8	-21.4	-21.8	-22.3	-23.5	-23.2	-22.0	-21.8	-22.0	-22.5	-24.1	-24.4	-23.6	-21.4
8-Dec	-25.1	-25.9	-27.8	-27.9	-28.7	-30.2	-31.4	-32.1	-32.1	-31.9	-29.8	-26.7	-24.8	-23.8	-24.8	-25.9	-28.1	-29.8	-31.3	-32.3	-33.0	-33.3	-32.9	-33.4	-29.3	-23.8
9-Dec	-33.1	-32.9	-33.0	-33.9	-34.6	-35.3	-36.0	-36.2	-36.7	-36.4	-33.8	-30.1	-26.8	-25.4	-25.5	-27.2	-29.6	-31.3	-32.4	-33.2	-33.6	-33.5	-33.5	-32.8	-32.4	-25.4
10-Dec	-31.9	-31.7	-31.6	-32.1	-32.2	-31.8	-30.7	-32.2	-33.4	-33.3	-31.2	-26.7	-23.5	-22.2	-22.8	-24.1	-26.9	-28.3	-28.0	-28.6	-29.2	-29.4	-29.3	-28.7	-29.2	-22.2
11-Dec	-28.2	-27.8	-28.1	-27.1	-26.8	-26.5	-25.6	-25.2	-25.1	-24.9	-24.0	-23.3	-21.8	-21.5	-21.8	-22.1	-22.3	-21.7	-21.6	-21.3	-21.4	-21.1	-21.0	-21.1	-23.8	-21.0
12-Dec	-20.9	-21.8	-22.3	-23.2	-23.2	-24.3	-25.3	-24.6	-24.2	-24.2	-22.5	-20.2	-17.7	-16.3	-15.6	-15.7	-15.9	-15.9	-15.9	-15.8	-16.7	-17.1	-16.9	-17.2	-19.7	-15.6
13-Dec	-17.2	-16.7	-16.4	-16.2	-16.5	-16.8	-17.3	-18.2	-19.1	-19.6	-19.6	-19.1	-18.6	-18.5	-18.8	-20.0	-22.4	-24.9	-24.0	-21.8	-20.9	-20.2	-20.7	-22.1	-19.4	-16.2
14-Dec	-23.5	-22.5	-24.5	-24.8	-22.9	-21.6	-20.4	-20.4	-20.5	-19.1	-17.9	-16.4	-15.6	-14.8	-15.1	-15.7	-16.6	-17.3	-17.9	-18.2	-19.1	-19.7	-18.8	-19.1	-19.3	-14.8
15-Dec	-19.5	-20.8	-21.1	-21.7	-22.5	-23.9	-24.8	-25.5	-26.0	-25.4	-25.1	-23.8	-22.9	-22.6	-22.9	-23.9	-25.3	-26.9	-29.0	-29.8	-27.6	-27.4	-27.2	-27.7	-24.7	-19.5
16-Dec	-28.3	-29.3	-30.6	-32.1	-33.3	-34.1	-35.0	-35.6	-36.3	-36.6	-34.4	-30.7	-26.9	-25.3	-26.6	-28.9	-30.8	-32.6	-33.8	-34.4	-35.1	-35.4	-36.4	-36.8	-32.5	-25.3
17-Dec	-36.9	-37.5	-37.7	-38.3	-38.5	-39.0	-39.0	-39.3	-39.3	-38.3	-35.5	-31.8	-29.9	-28.2	-27.2	-28.1	-29.6	-29.8	-29.6	-29.2	-27.7	-26.2	-25.3	-24.1	-32.7	-24.1
18-Dec	-23.7	-23.9	-24.8	-26.4	-27.3	-26.8	-25.7	-23.7	-22.6	-21.7	-20.5	-19.0	-17.8	-17.5	-17.7	-18.5	-19.5	-20.1	-19.9	-19.4	-19.0	-18.2	-17.8	-18.2	-21.2	-17.5
19-Dec	-18.3	-18.0	-17.6	-17.1	-16.5	-15.9	-15.3	-14.8	-14.3	-15.1	-14.7	-14.3	-13.9	-13.4	-12.9	-11.6	-9.3	-10.0	-11.1	-11.9	-14.2	-15.1	-13.0	-14.4	-14.3	-9.3
20-Dec	-13.9	-10.8	-7.6	-5.5	-5.0	-4.9	-4.9	-5.6	-6.4	-6.5	-5.8	-4.9	-3.8	-3.4	-4.1	-5.8	-6.9	-7.2	-7.8	-8.0	-8.4	-8.7	-8.3	-7.8	-6.8	-3.4
21-Dec	-7.9	-7.4	-6.7	-5.9	-5.8	-5.9	-5.0	-4.0	-4.3	-4.4	-2.4	-0.2	1.4	1.7	1.2	0.0	-0.7	-1.3	-1.4	-2.0	-1.8	-1.1	0.2	1.1	-2.6	1.7
22-Dec	0.8	0.6	0.2	0.1	-0.7	-1.2	-1.8	-2.9	-3.0	-2.9	-2.9	-3.0	-2.8	-5.2	-8.6	-11.6	-13.3	-14.0	-14.6	-15.0	-15.1	-15.6	-15.8	-15.8	-6.8	0.8
23-Dec	-15.9	-16.2	-16.2	-16.1	-16.3	-16.9	-17.4	-18.0	-18.6	-18.8	-19.0	-18.7	-18.5	-18.4	-18.3	-18.6	-19.8	-22.3	-24.4	-25.2	-26.1	-27.4	-28.2	-28.9	-20.2	-15.9
24-Dec	-29.8	-30.7	-30.8	-31.2	-31.2	-31.4	-31.3	-29.7	-27.1	-25.4	-23.6	-21.7	-20.5	-19.3	-18.6	-18.3	-18.2	-18.5	-19.1	-21.0	-22.5	-23.0	-22.7	-21.9	-24.5	-18.2
25-Dec	-20.9	-21.0	-21.0	-20.5	-18.5	-19.2	-20.2	-21.5	-22.0	-23.0	-21.0	-17.2	-14.7	-14.2	-14.9	-17.5	-19.5	-19.1	-21.3	-19.8	-18.9	-19.0	-19.7	-20.0	-19.4	-14.2
26-Dec	-19.2	-19.7	-19.9	-20.0	-20.2	-20.1	-20.4	-20.4	-19.8	-19.1	-17.8	-16.4	-15.6	-14.4	-14.0	-14.4	-14.4	-14.6	-14.8	-14.7	-14.8	-14.9	-14.2	-13.4	-17.2	-13.4
27-Dec	-12.8	-12.4	-12.2	-12.0	-12.2	-11.6	-11.1	-11.0	-11.4	-11.1	-10.3	-8.0	-6.2	-4.8	-4.6	-5.1	-5.4	-4.5	-4.8	-4.6	-4.0	-4.1	-3.8	-4.3	-8.0	-3.8
28-Dec	-4.8	-5.6	-6.7	-7.0	-7.4	-7.9	-8.7	-9.7	-10.8	-11.4	-11.0	-10.4	-10.1	-9.8	-9.7	-9.5	-9.4	-9.3	-9.5	-9.9	-10.6	-12.4	-13.2	-13.6	-9.5	-4.8
29-Dec	-14.0	-14.1	-14.1	-14.5	-14.9	-14.8	-14.7	-14.6	-14.6	-15.7	-14.0	-12.9	-11.6	-8.7	-8.6	-11.5	-13.5	-15.0	-16.2	-18.4	-19.2	-18.7	-19.3	-16.4	-14.6	-8.6
30-Dec	-14.6	-16.0	-17.2	-16.5	-15.6	-14.8	-14.3	-13.7	-13.7	-13.9	-13.0	-12.6	-10.9	-9.4	-9.6	-10.1	-9.7	-9.8	-10.9	-11.7	-11.1	-10.8	-10.9	-11.9	-12.6	-9.4
31-Dec	-12.8	-12.8	-12.9	-14.0	-15.0	-15.2	-15.9	-13.2	-12.3	-12.1	-11.7	-10.8	-9.8	-9.2	-9.3	-10.4	-10.4	-11.4	-12.7	-12.6	-13.0	-12.8	-13.0	-13.2	-12.4	-9.2
																								Diurnal Average		
																								Diurnal Maximum		



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Brion MacKay River - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	277	37.23	37.23
-20 - 0	457	61.42	98.66
0 - 10	10	1.34	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

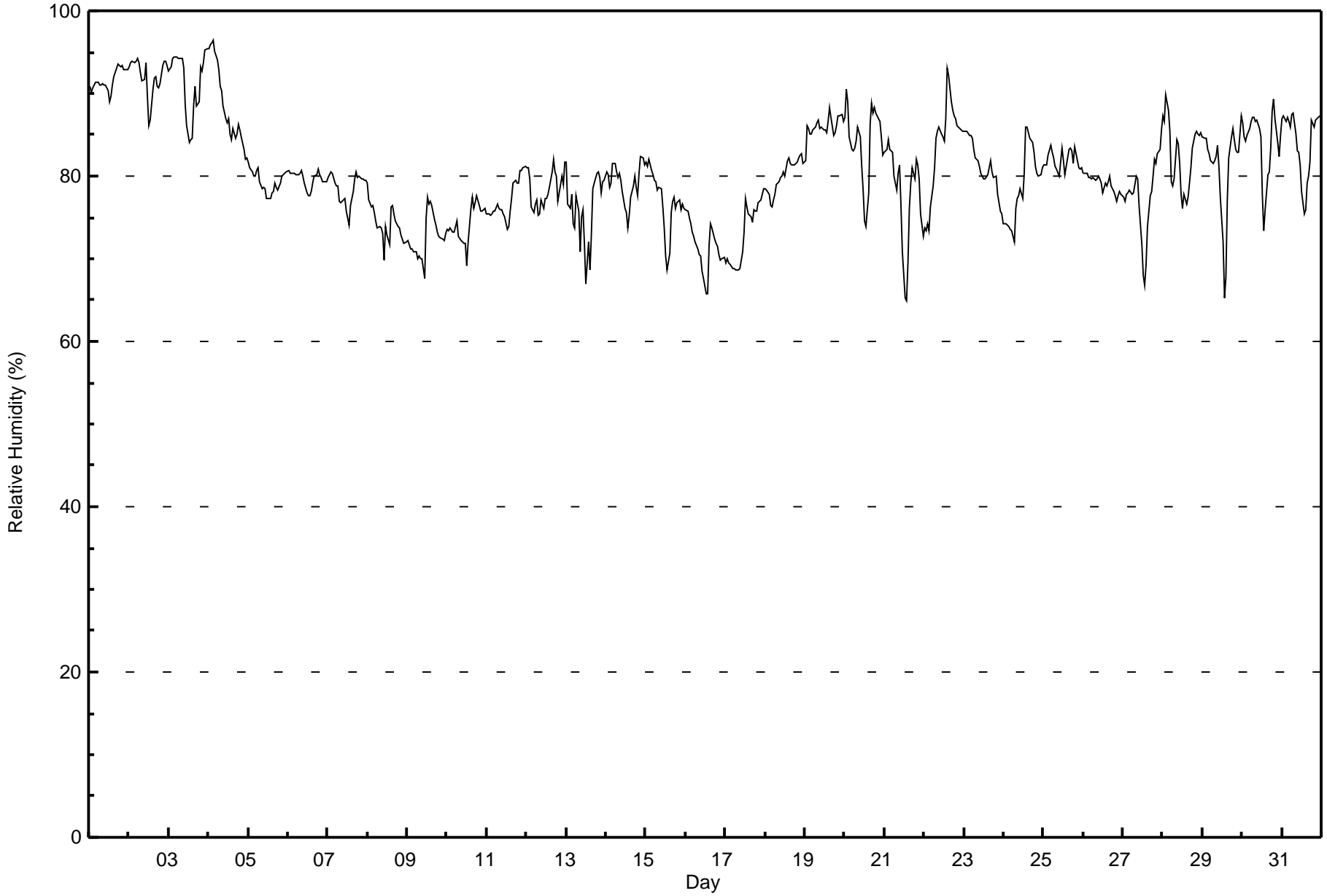
Brion MacKay River - December 2016

Maximum Value: 96 % on Dec 4 04:00 Maximum Daily Average: 92.1 % on Dec 2																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																			
Minimum Value: 65 % on Dec 21 14:00 Minimum Daily Average: 71.4 % on Dec 16 Maximum Diurnal Average: 81.8 % at hour 20 Minimum Diurnal Average: 76.8 % at hour 14 Monthly Average: 80.5 % Percentiles: P ₁ = 68 P ₁₀ = 73 Q ₁ = 76 Median = 80 Q ₃ = 85 P ₉₀ = 90 P ₉₉ = 95																																																																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																													
1-Dec	91	90	91	91	91	91	91	91	91	91	91	90	89	90	91	92	93	93	93	93	93	93	93	93	93	91.6	93																																										
2-Dec	93	94	94	94	94	94	94	93	92	92	94	90	86	87	90	92	92	91	91	91	93	94	94	93	92.1	94																																											
3-Dec	93	93	94	94	94	94	94	94	94	93	89	86	84	84	85	88	91	88	89	93	93	94	95	95	91.4	95																																											
4-Dec	95	96	96	96	95	94	93	91	90	88	87	86	87	85	84	86	85	85	86	86	85	83	82	82	88.5	96																																											
5-Dec	82	81	81	80	80	81	81	79	79	79	79	77	77	77	78	78	79	79	78	79	80	80	80	81	79.4	82																																											
6-Dec	81	80	80	80	80	80	80	80	81	80	79	78	78	78	79	80	80	81	80	80	79	79	79	79	79.7	81																																											
7-Dec	80	80	80	80	79	79	79	77	77	77	77	76	75	74	76	78	80	80	80	80	80	80	79	79	78.5	80																																											
8-Dec	79	77	76	76	76	75	74	74	74	73	70	74	73	72	76	76	75	75	74	74	73	72	72	72	74.2	79																																											
9-Dec	72	72	71	71	71	71	70	70	70	70	68	75	77	77	77	76	75	74	73	73	73	72	72	73	72.6	77																																											
10-Dec	74	73	74	73	73	74	75	73	72	72	72	72	69	72	76	77	76	77	78	76	76	76	76	76	74.2	78																																											
11-Dec	76	75	75	75	76	76	77	76	76	76	75	75	74	74	76	77	79	80	79	79	81	81	81	81	77.0	81																																											
12-Dec	81	81	80	76	76	77	77	75	75	77	76	77	77	78	79	81	82	81	80	77	79	80	79	82	78.4	82																																											
13-Dec	82	77	76	78	74	74	78	76	71	75	76	72	67	72	69	73	78	79	80	80	80	78	79	79	76.0	82																																											
14-Dec	80	80	79	79	82	82	81	80	80	79	78	76	74	75	77	79	80	79	78	80	82	82	81	81	79.2	82																																											
15-Dec	82	81	82	81	80	79	79	78	79	78	76	74	70	69	71	76	77	78	76	77	77	76	77	76	77.0	82																																											
16-Dec	76	76	75	74	73	73	72	71	70	70	69	68	66	66	71	74	74	72	72	71	70	70	70	70	71.4	76																																											
17-Dec	70	70	69	69	69	69	69	69	69	69	71	73	77	76	75	75	74	76	76	76	77	77	78	79	72.9	79																																											
18-Dec	79	78	78	77	76	77	78	79	79	80	80	81	80	82	82	82	81	81	81	82	82	83	83	82	80.1	83																																											
19-Dec	82	86	86	85	85	86	86	86	87	86	86	86	86	85	87	88	87	85	85	86	87	87	87	87	86.0	88																																											
20-Dec	87	91	89	85	83	83	83	84	86	85	81	78	75	74	78	86	89	88	88	88	87	87	85	83	84.2	91																																											
21-Dec	83	83	84	83	83	83	80	78	80	81	77	71	65	65	70	76	79	81	80	82	81	80	75	73	78.0	84																																											
22-Dec	74	73	74	73	76	79	81	85	85	86	85	85	84	87	93	92	89	88	87	87	86	86	86	86	83.7	93																																											
23-Dec	85	85	85	85	85	85	83	82	82	81	80	80	80	80	80	81	82	80	80	80	78	77	76	75	81.2	85																																											
24-Dec	74	74	74	74	73	73	72	76	77	78	78	77	80	86	86	85	85	84	83	81	80	80	81	81	78.9	86																																											
25-Dec	81	81	81	82	84	83	82	81	81	80	82	83	82	80	81	83	83	83	81	84	82	81	81	81	81.9	84																																											
26-Dec	80	80	80	80	80	80	80	79	80	80	80	79	78	79	79	79	80	79	78	78	77	78	78	78	79.1	80																																											
27-Dec	77	77	78	78	78	78	78	79	80	80	76	72	68	67	69	74	78	78	80	82	82	83	83	86	77.5	86																																											
28-Dec	87	87	90	88	85	79	79	80	84	84	81	78	76	78	77	77	79	81	83	85	86	85	85	85	82.5	90																																											
29-Dec	85	85	85	83	83	82	81	82	82	84	81	77	72	65	68	77	82	85	86	84	83	83	83	87	81.0	87																																											
30-Dec	86	85	84	85	86	87	87	87	87	87	86	85	78	73	76	80	81	83	88	89	87	84	82	85	84.1	89																																											
31-Dec	87	87	87	87	87	86	87	88	85	83	83	81	78	75	76	79	80	82	87	86	87	87	87	87	84.1	88																																											
81.7																		81.6						81.6		81.1		80.9		80.7		80.7		80.5		80.5		80.5		79.4		78.4		76.9		76.8		78.4		80.6		81.4		81.5		81.7		81.8		81.7		81.5		81.3		81.5		Diurnal Average	
95																		96						96		96		95		94		94		94		94		93		94		90		89		90		93		92		93		93		93		93		93		94		95		95		Diurnal Maximum	



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Brion MacKay River - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	365	49.06	49.06
80 - 100	379	50.94	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 15 km/h on Dec 13 04:00	Maximum Daily Speed Average: 11.6 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 23 22:00	Minimum Daily Speed Average: 0.8 km/h on Dec 18	Hours of Data: 742
Maximum Diurnal Speed Average: 3.8 km/h at hour 13	Minimum Diurnal Speed Average: 2.5 km/h at hour 9	Hours of Missing Data: 2
Monthly Average Velocity: 2.9 km/h 254.9 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 3 Median = 6 Q ₃ = 8 P ₉₀ = 11 P ₉₉ = 14	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S7	SSW9	SSW7	SSW8	SSW6	S7	SSW7	S7	SSW7	SSW7	SSW6	SSW5	SW5	SSW5	SSW5	SSW5	SW4	SW4	WSW4	WSW3	WSW3	WSW3	WSW4	WSW3	SSW5.2	SSW9
2-Dec	SW3	S3	SSE5	S6	S6	SSE5	SSE6	S5	S8	SSE8	S9	SSE10	SSE8	SSE7	SE7	SE8	SSE11	SSE11	S10	S11	SSE10	SSE10	SSE10	SSE10	SSW7.6	SSE11
3-Dec	S9	S10	S11	S13	S12	SSW11	S12	SSW11	S10	S9	S10	SSW11	SSW11	SSW9	SSW8	SSW7	SSW7	SSW8	SSW7	SSW8	SSW8	SSW8	SSW6	SW7	SSW9.1	S13
4-Dec	WSW6	WSW5	W4	WNW5	N7	N8	NW10	NNW11	NNW11	NNW11	NNW13	NNW13	NW12	NW15	NW14	NW11	NW14	NW14	NW12	NW11	WNW12	WNW13	WNW13	WNW14	NW9.9	NW15
5-Dec	WNW13	WNW15	NW14	WNW14	WNW14	WNW12	WNW12	WNW14	WNW13	WNW12	WNW10	WNW13	WNW12	WNW11	WNW10	WNW11	WNW10	WNW11	WNW9	WNW8	WNW9	WNW9	WNW10	WNW9	WNW11.6	WNW15
6-Dec	WNW10	WNW10	WNW11	WNW11	WNW10	WNW11	WNW10	WNW9	WNW8	WNW9	WNW9	WNW10	WNW11	WNW11	WNW10	WNW9	WNW8	WNW7	WNW7	WNW9	WNW9	WNW9	WNW6	WNW6	WNW9.2	WNW11
7-Dec	WNW4	WNW5	WNW4	WNW4	W2	W3	W3	W2	WSW2	W2	WNW3	NW4	NW6	NNW6	NW6	WNW5	WNW4	WNW5	NW6	NW4	NW7	NW5	WNW3	NW5	WNW3.9	NW7
8-Dec	NNW3	ESE0	SSE1	SE1	AF	SE2	SE2	SE2	SE2	E0	ESE2	SE3	SSE4	NW1	N3	NE1	ESE1	ESE1	SE2	SE2	SE1	SE2	SE2	SE1	SE1.0	SSE4
9-Dec	AF	SE1	SE1	SE1	SSE2	SE1	SE2	SSE2	SSE3	SSE1	SSW3	SW3	SSW2	SSW5	S4	S2	SSE2	SSE3	SE1	SSE2	S0	SE1	SE1	SSE2	SSW5.1	SSW5
10-Dec	SSE2	S3	SSE1	SSE1	SSE3	SSW4	S3	SSE2	SSE1	SSE3	S2	SSW2	SSW3	SSW4	SSW5	SSW4	SW2	WSW3	WSW5	W4	WSW4	WSW5	WSW6	WSW7	SW2.6	WSW7
11-Dec	WSW7	W8	WSW7	WSW8	W7	W9	W10	W10	W10	W8	WSW9	W8	W9	W8	W7	W6	W6	W7	W8	WNW7	W6	W7	W6	W5	W7.6	W10
12-Dec	WNW6	NW6	NNW7	NW9	NW8	WNW6	WNW6	WNW8	W8	W6	WNW6	WNW7	WNW9	WNW9	WNW9	WNW8	WNW10	WNW11	WNW9	W8	WNW9	WNW7	WNW7	WNW7.8	WNW11	
13-Dec	WNW8	WNW12	NW13	NW15	NW14	NW14	NNW10	NNW10	NNW11	NNW8	NW9	NW9	NNW12	NW11	NW11	NW6	WNW3	WNW2	NW3	WNW4	NW4	NNW6	NNW2	SSW2	NW7.9	NW15
14-Dec	WSW3	WSW2	SSW3	SSW4	SW5	SW6	SW6	SSW5	SSW5	WSW5	WSW4	W5	W6	WNW8	NW10	NW6	WNW8	NW8	NW8	NW5	W3	WSW2	W4	WNW6	W4.0	NW10
15-Dec	WNW6	WNW6	WNW6	WNW7	NW7	WNW5	WNW6	WNW4	W3	W4	WNW6	WNW7	WNW7	W6	WNW5	WNW5	WNW4	W3	W4	WNW6	WNW4	W4	WNW4	WNW5.3	WNW8	
16-Dec	WNW5	W3	WSW2	WSW2	SW2	S2	SE2	SSW1	SSE2	SE2	SSE2	WSW1	WSW3	SW4	SSW3	S4	SE2	SE2	SE2	SSE2	SSE2	SSE2	SE2	SE2	SSW1.5	WNW5
17-Dec	SSE2	SSE3	SSE3	SSE3	SE1	SE2	SSE2	SSE2	SSE2	SE2	S2	SSW3	S4	S4	SSE3	SSE3	SSE3	SSE5	SSE6	SSE6	SSE7	SSE6	SSE5	SSE3	SSE3.3	SSE7
18-Dec	SSE3	SSW4	SSW2	S1	SSW2	N1	S1	NNE1	ESE2	SSW1	SE2	NNE1	NNE2	NNE4	N4	N5	N4	N3	N3	NNE3	ENE2	NNE1	ESE3	SE4	NE0.8	N5
19-Dec	ESE4	ESE5	ESE5	E4	ESE4	ESE4	E3	E3	NE2	NNW3	NNW3	NNW5	NW4	WNW6	WNW7	WNW7	NW14	NW13	NW8	NW3	SSE2	S5	S4	SSE4	NW1.4	NW14
20-Dec	SSW2	WSW5	SW7	SW11	WSW10	WSW9	WSW8	WSW7	SW8	SW8	SSW7	SW7	SW7	SW6	WSW6	SW4	SW6	SW6	WSW6	WSW6	WSW7	WSW6	WSW8	WSW8	SW6.6	SW11
21-Dec	SW6	SW6	SW7	WSW10	WSW10	WSW10	SW11	SW11	SSW11	SSW11	WSW12	WSW14	WSW14	WSW13	WSW9	WSW7	SW8	SW8	SW8	SSW8	SSW7	SSW7	SW8	WSW9	SW9.0	WSW14
22-Dec	SW8	SW8	SW8	WSW9	WSW8	WSW9	WSW8	WSW6	W6	W5	W4	WNW5	NNW7	NNE9	NE9	NE10	NE9	NE8	NNE10	NNE8	NE6	NNE7	NNE6	NNE6	NNW2.5	NE10
23-Dec	NNE6	NNE7	NE4	ENE4	NE5	NE6	NE6	NE7	NE5	NE7	NE7	NE6	NNE7	NNE6	NE5	NE5	NE4	NE3	NE3	NE3	NNE1	N0	E1	SSE1	NE4.4	NE7
24-Dec	ESE1	SSE0	SE1	S1	SSW1	SE1	SE1	E0	SW0	S1	N0	SSW0	S1	SSE3	SE3	SE3	SE4	SE3	SE2	SSE0	S0	SE1	SSE4	SE1.4	SSE4	SE4
25-Dec	SSE3	SSE2	SSE3	S4	S5	S5	S4	SSE3	S3	SSE3	S3	SSW4	S4	S5	S4	SSE2	SE4	SSE4	SSE2	S5	S6	S8	S5	S5	S4.0	S8
26-Dec	S8	S7	SSE7	S8	S8	S9	S7	S8	S9	S10	S9	S11	S12	S12	S11	S12	S11	S14	S15	S15	SSW15	S14	SSW13	SSW11	S10.6	SSW15
27-Dec	SSW9	SSW10	S11	S13	S12	S12	S12	S13	S13	SSW13	SSW11	SSW13	SSW11	SSW10	SSW10	SSW9	SSW8	SSW8	SW6	SW6	WSW6	W6	WNW9	WNW7	SSW8.8	SSW13
28-Dec	NW5	NW6	WNW5	NW7	NW9	NW14	NW11	NW11	WNW9	WNW7	WNW9	NW7	WNW9	WNW7	WNW5	W4	W5	W4	WNW5	NW4	N3	NW3	N3	N3	NW6.1	NW14
29-Dec	NNE3	NE2	E3	SE6	SE5	ESE4	SE4	SE4	SE4	ESE3	SSE4	N4	N2	W0	NW3	NE4	ESE1	NE3	ENE0	NNE0	S0	SE4	SE3	SSE7	ESE1.8	SSE7
30-Dec	S2	NNW3	SW1	WSW2	SW4	SW5	SW6	WSW6	SSW5	SW6	SSW6	SW6	WSW7	SW7	SSW8	SW7	SW8	WSW8	W7	W7	WNW8	WNW7	NW6	NW3	WSW4.6	SW8
31-Dec	W2	NW4	WNW4	SW1	SW2	SSW3	WNW3	NW6	NW7	NW8	WNW5	WNW7	NW8	NW9	WNW9	WNW8	WNW8	WNW5	WSW5	WSW7	WSW8	W9	W8	W8	WNW5.3	NW9

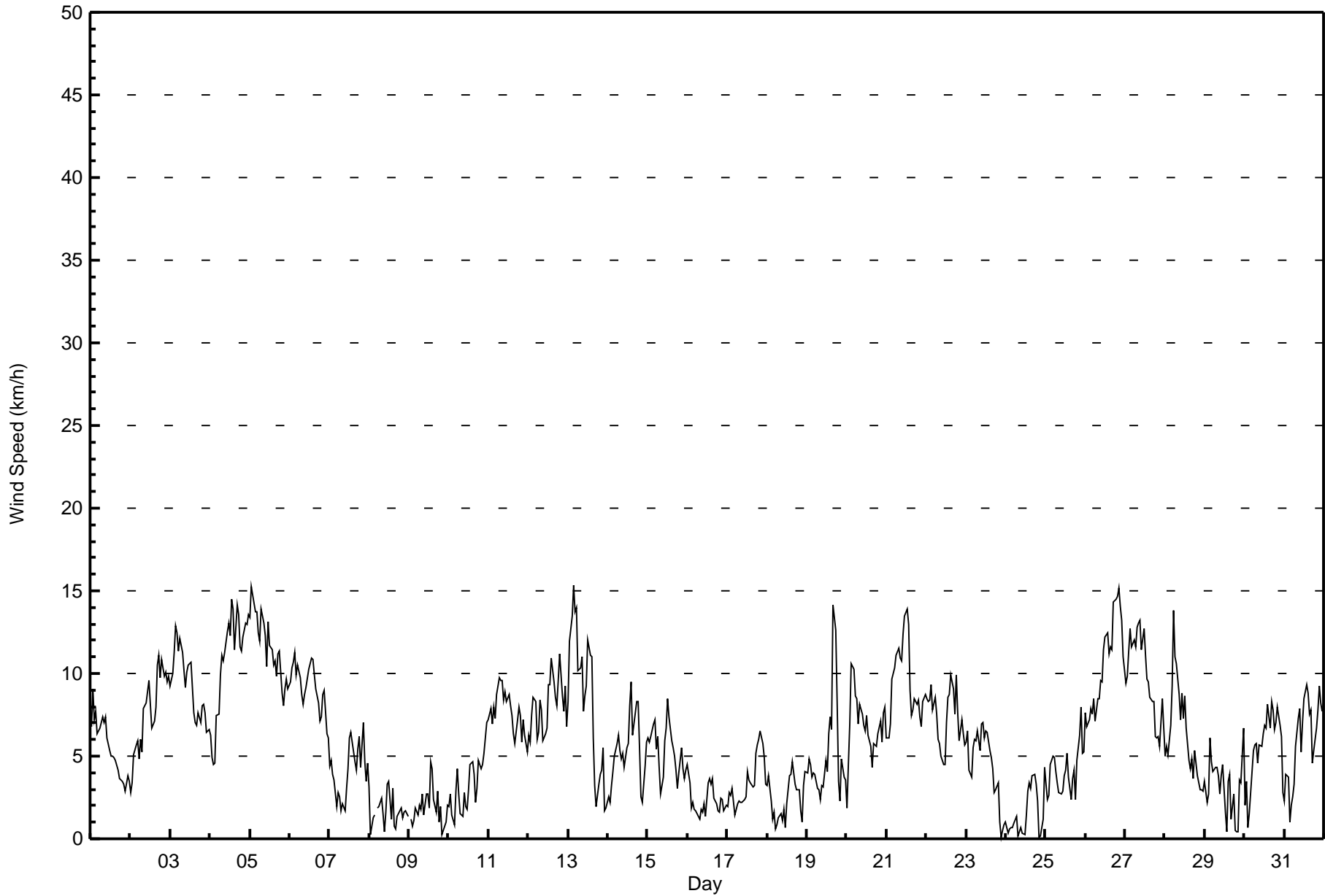
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WNW13	WNW15	WNW14	NW15	WNW14	NW14	SSW12	WNW14	S13	SSW13	NNW13	WSW14	WSW14	NW15	NW14	S12	NW14	S14	S15	S15	SSW15	S14	SSW13	WNW14	WNW14	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
Brion MacKay River - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Brion MacKay River - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	346	46.63	46.63
6 - 11	339	45.69	92.32
12 - 19	57	7.68	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
Brion MacKay River - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	13	10	13	3	7	16	48	54	35	31	16	24	23	30	15	8	346
6 - 11	2	10	11	0	0	1	2	17	31	40	32	35	30	80	36	12	339
12 - 19	0	0	0	0	0	0	0	0	15	5	0	4	0	17	13	3	57
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	20	24	3	7	17	50	71	81	76	48	63	53	127	64	23	742

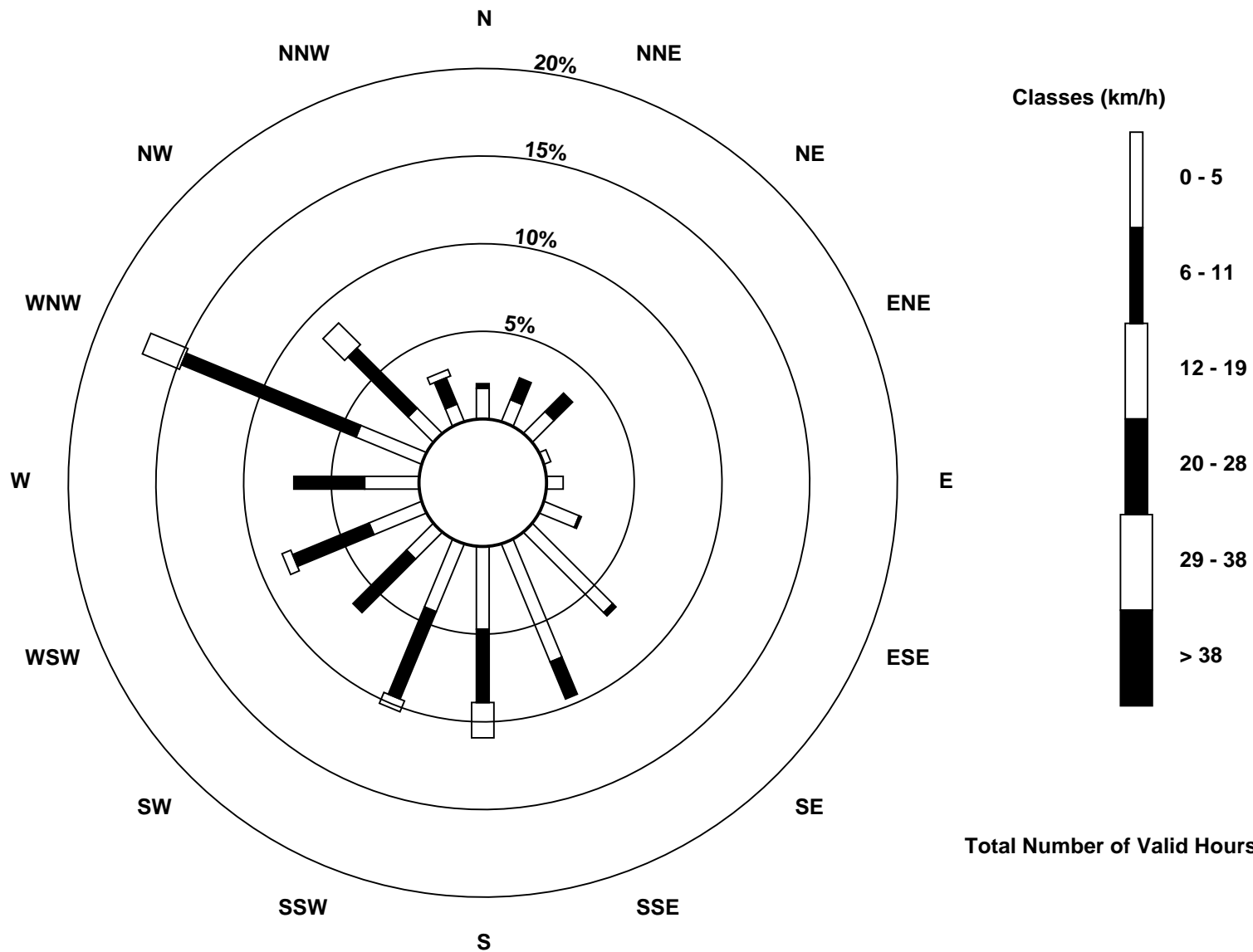
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Brion MacKay River (AMS 20)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Brion MacKay River - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 21 13:00																	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7								
Minimum Value: 0 km/h on Dec 17 01:00																									
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	2	4	3	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	1	4
2-Dec	1	1	1	1	1	1	2	2	2	2	3	3	3	2	2	2	3	4	3	3	3	3	3	3	4
3-Dec	3	3	3	3	3	3	3	4	3	2	3	3	3	3	2	2	1	2	2	2	2	2	2	2	4
4-Dec	2	2	1	1	3	2	3	3	3	4	4	3	4	4	4	4	5	4	4	3	4	4	4	4	5
5-Dec	4	5	5	5	5	4	4	5	4	4	4	4	4	4	4	4	3	4	4	3	3	3	3	3	5
6-Dec	3	4	3	4	3	3	3	3	2	3	3	3	3	3	4	3	3	2	2	2	3	2	2	2	4
7-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	2	2	1	2	1	1	1	2
8-Dec	1	1	1	1	AF	1	1	0	1	1	2	1	1	1	1	1	1	1	1	0	1	1	1	1	2
9-Dec	AF	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	0	1	1	1	1	1	1	2
10-Dec	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3
11-Dec	3	4	3	3	3	4	4	4	4	4	4	3	4	3	3	3	2	3	3	3	2	3	2	2	4
12-Dec	2	2	2	2	3	2	2	3	3	2	2	3	4	4	4	3	3	2	3	3	3	3	3	2	4
13-Dec	3	4	4	4	4	4	5	3	3	3	2	3	3	3	2	1	1	1	1	1	2	2	1	1	5
14-Dec	1	1	1	1	1	1	2	1	1	2	2	2	2	3	3	2	3	2	2	2	1	1	2	1	3
15-Dec	2	2	2	3	2	1	2	2	1	1	2	2	3	2	2	2	2	1	1	1	2	1	1	1	3
16-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	1	0	1	1
17-Dec	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	2
18-Dec	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
19-Dec	1	1	2	1	2	1	1	1	1	1	1	1	1	2	3	2	6	4	3	2	1	1	2	1	6
20-Dec	1	2	3	4	4	3	4	3	2	2	2	2	3	2	2	2	1	2	2	2	3	2	3	3	4
21-Dec	2	2	2	4	4	4	4	4	3	3	5	6	6	5	4	3	2	2	2	2	2	2	3	3	6
22-Dec	3	3	3	4	3	4	3	3	2	2	2	2	2	3	3	3	3	3	4	3	2	3	2	2	4
23-Dec	2	2	2	1	2	2	2	2	2	3	2	2	2	2	2	1	1	1	1	1	1	1	1	1	3
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	2
25-Dec	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	2	2	2
26-Dec	2	2	2	2	2	2	2	2	2	3	3	3	4	4	3	3	3	4	4	4	4	4	4	3	4
27-Dec	3	3	3	4	4	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	3	2	4
28-Dec	1	2	2	2	3	4	4	3	3	2	3	2	3	3	2	2	2	1	1	2	2	2	1	1	4
29-Dec	1	2	1	1	2	1	2	1	1	1	1	3	2	1	2	2	2	2	1	1	1	2	2	1	3
30-Dec	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	2	2	1	3
31-Dec	1	1	1	1	1	1	2	2	2	3	2	2	2	3	3	2	2	3	2	3	3	4	3	3	4
																	Diurnal Maximum								
AF - Analyzer Failure																									



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Brion MacKay River - December 2016

Direction of Maximum Speed: 311 deg on Dec 13 04:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 296.7 deg on Dec 5	Hours of Data: 742
Direction of Minimum Speed: 1 deg on Dec 23 22:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 0.8 deg on Dec 18	Percent Operational Time: 99.7
Monthly Average Direction: 257.6 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	183	194	203	205	193	187	192	190	196	201	198	212	223	201	197	211	223	230	247	248	244	248	250	241	206.9
2-Dec	215	177	168	174	180	168	168	170	181	164	172	157	151	159	139	145	155	162	169	173	164	156	155	165	163.9
3-Dec	170	188	188	188	190	192	191	192	189	189	189	196	203	210	213	205	192	192	205	205	206	207	208	225	195.7
4-Dec	239	249	277	284	7	10	326	330	338	341	336	332	322	320	321	313	321	317	312	304	301	299	302	303	317.2
5-Dec	302	302	304	301	299	298	297	301	300	298	296	297	298	292	295	291	293	294	295	289	286	291	291	294	296.7
6-Dec	294	295	295	297	298	297	298	295	294	295	299	300	300	303	301	302	304	301	294	303	317	320	313	307	300.7
7-Dec	290	294	294	287	278	259	269	272	251	268	287	309	326	332	319	300	294	301	315	310	322	305	299	320	303.1
8-Dec	336	116	153	135	AF	138	141	139	124	97	122	140	161	316	354	39	113	123	129	126	145	134	137	135	128.3
9-Dec	AF	136	131	126	153	132	144	149	149	156	193	230	203	202	174	177	152	153	139	162	187	135	137	159	167.2
10-Dec	153	178	149	154	167	198	187	151	150	151	176	213	204	205	196	195	236	241	254	267	257	246	253	250	216.1
11-Dec	257	269	252	258	259	259	266	275	272	261	256	263	274	280	281	281	264	262	276	282	261	269	271	275	267.6
12-Dec	285	305	329	323	315	294	288	288	281	280	282	282	283	285	292	291	291	292	299	303	293	278	291	285	293.4
13-Dec	293	303	305	311	312	316	344	346	348	331	320	326	327	325	320	308	293	302	306	301	313	327	335	208	318.8
14-Dec	248	250	210	207	224	226	220	195	201	238	247	266	279	295	318	314	303	310	323	310	270	257	281	302	272.2
15-Dec	301	295	292	294	305	290	295	284	270	280	293	292	298	288	278	282	288	286	270	274	289	290	264	284	288.8
16-Dec	290	275	248	250	227	181	146	192	166	146	164	237	239	225	200	178	143	141	131	147	151	154	137	139	193.0
17-Dec	157	152	156	156	142	132	159	156	148	128	186	192	179	186	158	158	158	150	151	151	154	148	158	159	157.4
18-Dec	158	193	192	189	196	350	178	12	106	199	137	27	12	14	10	4	355	349	11	12	62	26	109	124	45.2
19-Dec	116	113	116	97	104	112	96	100	56	338	330	330	305	296	293	293	304	314	325	318	163	183	180	162	317.8
20-Dec	202	237	230	235	242	246	247	237	217	217	212	217	222	225	239	224	217	232	243	250	245	237	246	238	233.1
21-Dec	229	222	214	244	240	239	236	228	207	209	239	257	255	253	254	237	222	215	219	205	206	202	227	237	231.4
22-Dec	235	234	231	246	243	251	248	254	277	277	265	293	348	25	41	37	42	34	25	32	41	27	30	27	329.8
23-Dec	32	33	55	63	35	46	43	45	40	40	37	39	25	23	40	35	34	39	37	40	32	1	88	152	38.7
24-Dec	114	166	141	184	199	140	142	90	231	185	10	194	180	157	144	129	137	134	127	133	153	175	146	159	144.9
25-Dec	161	153	167	180	180	175	172	164	171	165	178	192	174	184	173	163	140	150	158	181	175	178	171	179	172.0
26-Dec	187	175	166	180	178	176	181	186	183	181	176	186	182	184	182	187	186	189	191	191	192	186	192	194	185.0
27-Dec	198	198	186	190	187	188	190	190	190	194	195	203	202	201	199	203	205	213	217	221	253	268	289	299	203.7
28-Dec	312	319	298	315	311	310	306	309	302	298	299	304	303	298	284	271	277	268	293	326	358	319	360	5	306.0
29-Dec	22	40	83	124	128	111	124	125	133	110	148	356	351	275	326	35	117	51	70	23	176	145	139	160	106.3
30-Dec	186	348	219	238	223	229	234	240	210	223	211	221	238	228	209	216	227	244	265	276	283	296	315	305	243.5
31-Dec	268	313	303	220	224	204	287	308	324	326	289	301	323	319	302	295	298	282	245	254	258	264	272	271	289.5

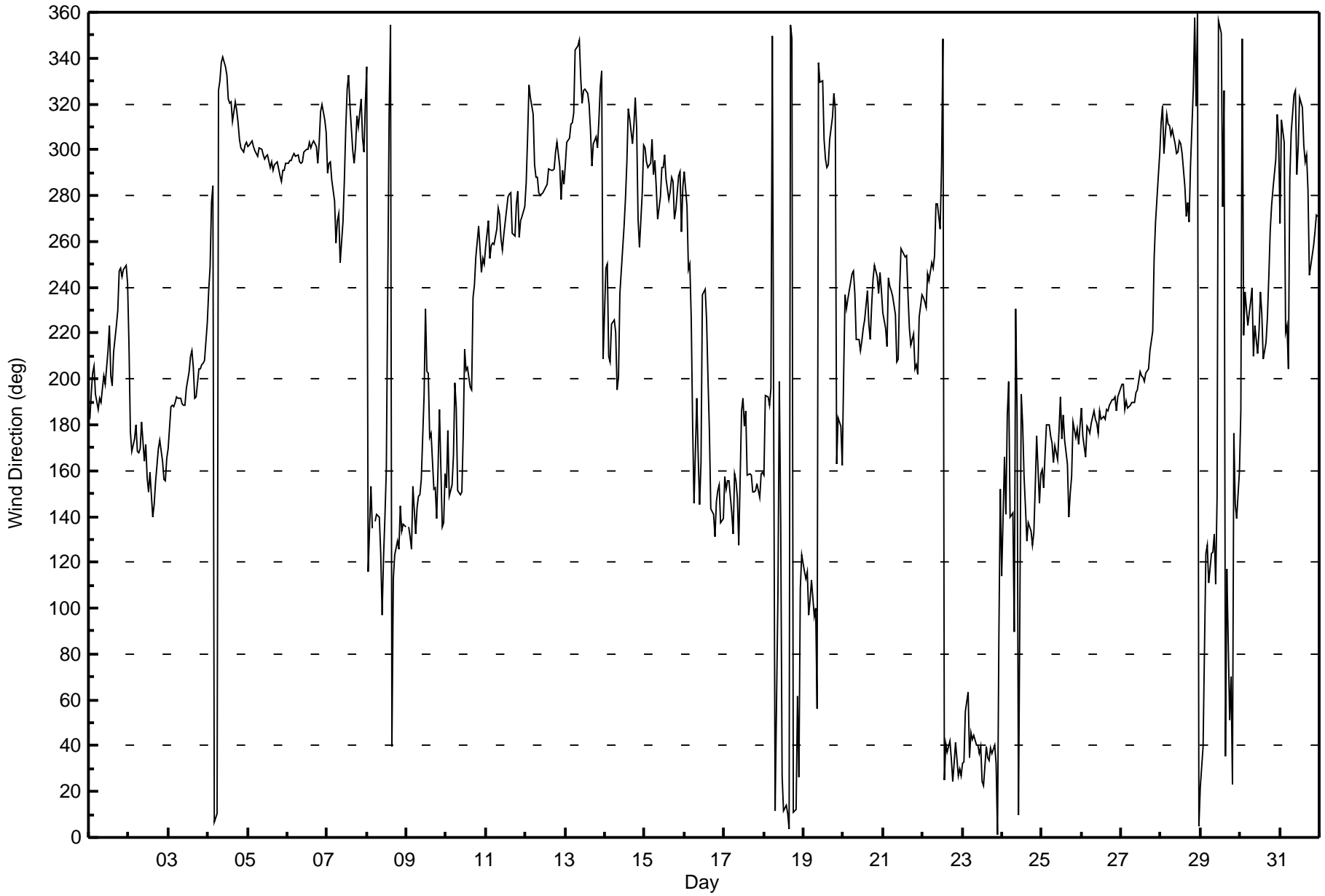
248.6 254.2 243.3 244.6 247.2 245.3 246.0 250.1 242.6 244.8 246.8 263.0 269.2 270.9 273.0 265.3 262.7 257.6 266.9 258.0 252.4 249.7 254.3 247.9
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
Brion MacKay River - December 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Brion MacKay River - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 106 deg on Dec 29 14:00	Hours of Data: 742
Minimum Value: 6 deg on Dec 8 18:00	Hours of Missing Data: 2
Percentiles: P ₁ = 11 P ₁₀ = 18 Q ₁ = 21 Median = 25 O ₃ = 36 P ₉₀ = 49 P ₉₉ = 87	Hours of Calibration: 0
	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	24	25	24	24	22	24	21	20	20	21	21	24	31	24	22	23	22	29	49	49	40	46	56	36	56
2-Dec	28	28	19	21	21	24	25	28	24	23	25	26	26	24	21	23	24	27	25	25	27	24	24	26	28
3-Dec	26	23	22	21	21	23	21	24	20	22	19	20	23	24	23	20	14	15	23	19	21	20	23	28	28
4-Dec	33	48	41	34	35	24	20	19	21	22	22	20	20	20	21	23	21	19	21	22	24	22	25	48	48
5-Dec	24	24	23	23	24	26	26	24	25	26	29	28	28	28	27	32	30	28	26	31	35	28	28	25	35
6-Dec	24	27	25	23	24	25	25	26	26	28	22	24	24	24	22	22	22	21	25	22	21	18	20	23	28
7-Dec	28	21	28	26	25	22	27	33	22	17	34	40	23	18	18	21	18	20	19	23	17	20	16	16	40
8-Dec	16	79	51	26	AF	9	23	11	12	23	47	25	26	74	20	29	43	6	14	11	31	15	17	30	79
9-Dec	AF	52	58	58	22	12	14	19	11	33	36	29	38	31	23	19	57	10	52	19	86	59	38	47	86
10-Dec	23	20	46	79	24	19	37	44	13	20	25	58	29	27	22	17	30	23	45	52	51	46	50	44	79
11-Dec	53	48	51	48	56	48	48	46	46	46	53	47	45	43	38	49	51	52	46	40	50	49	44	46	56
12-Dec	28	23	16	17	20	23	21	25	30	33	38	36	37	36	29	28	29	26	24	22	29	36	31	30	38
13-Dec	27	22	21	20	21	21	31	22	23	22	19	19	19	19	19	20	19	25	21	22	25	20	47	20	47
14-Dec	45	40	20	17	20	24	24	18	24	38	43	50	42	30	19	21	21	22	17	21	30	44	43	19	50
15-Dec	21	21	22	23	21	20	20	22	24	35	28	28	26	31	37	28	21	19	16	18	26	26	46	32	46
16-Dec	20	26	47	29	48	41	30	53	35	36	29	43	36	27	21	13	12	14	13	22	16	12	17	16	53
17-Dec	22	14	13	10	31	31	12	12	21	21	31	31	24	21	27	22	20	23	16	17	18	17	23	33	33
18-Dec	28	22	47	48	36	61	54	49	56	62	42	70	53	22	23	21	24	27	29	33	65	81	45	34	81
19-Dec	31	22	25	28	25	21	27	31	48	22	23	19	30	32	31	31	24	20	19	30	34	19	35	22	48
20-Dec	45	31	30	33	41	46	47	42	23	25	23	26	31	31	36	31	20	30	41	45	42	36	38	32	47
21-Dec	28	29	27	44	41	34	33	30	22	22	41	52	46	47	50	38	27	22	23	18	19	18	29	34	52
22-Dec	32	34	33	43	44	42	43	52	43	42	56	39	27	23	23	25	25	27	25	25	25	24	24	25	56
23-Dec	28	29	33	35	27	27	24	26	26	23	28	25	28	23	26	23	16	15	16	17	65	79	66	72	79
24-Dec	57	92	41	41	53	41	17	57	62	66	81	93	80	39	29	27	22	22	18	21	97	88	21	12	97
25-Dec	10	15	14	13	15	15	14	14	14	14	21	23	24	20	24	17	15	28	27	22	27	25	29	26	29
26-Dec	24	27	28	25	25	24	24	21	24	24	26	22	23	21	20	19	20	19	20	20	19	21	20	22	28
27-Dec	22	22	25	22	21	20	19	18	20	18	20	19	19	18	18	19	19	21	22	27	39	42	28	22	42
28-Dec	19	19	21	21	22	22	23	21	22	24	25	25	24	28	48	47	39	52	25	37	59	60	47	23	60
29-Dec	39	63	50	20	28	33	26	32	35	40	54	48	89	106	63	52	68	55	101	80	93	30	44	14	106
30-Dec	77	32	84	47	32	33	33	34	37	30	28	29	34	34	22	26	32	41	49	40	31	28	19	38	84
31-Dec	38	22	22	54	29	33	26	21	17	25	28	23	19	20	23	22	25	33	38	45	44	46	47	44	54
	77	92	84	79	56	61	54	57	62	66	81	93	89	106	63	52	68	55	101	80	97	88	66	72	

Diurnal Maximum

AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	14:25
Gas Cert Reference	EY0000372	Station temp.	22 Deg C
Cal Gas Concentration	50.7 ppm	Cal Gas Exp Date	June 10, 2016
Calibrator Make/Model	API T700	Serial Number	1220
ZAG Make/Model	API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9627

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-633	-634
Analyzer IP address	192.168.1.43		Lamp voltage	835	842
Calculated slope	0.993277	0.997186	Chamber temp	45	45.0
Calculated intercept	1.474897	2.054889	Pressure	661.8	673.5
Analyzer Background	12.8	12.8	Flow	0.479	0.490
Analyzer Coefficient	0.930	0.942	Intensity	88	88
Analyzer make	Thermo 43i		Analyzer serial #	1501301450	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	79.9	810.2	801.1	1.011
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	79.9	810.2	812.0	0.998
second point	5000	40.1	406.6	403.0	1.009
third point	5000	20.1	203.8	201.5	1.012
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	79.9	810.2	815.1	0.994
Average Correction Factor					1.006

Corrected As found 801.2 Previous response 814.2 % change 1.6%

Notes:

Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By:

Asad Hidayat



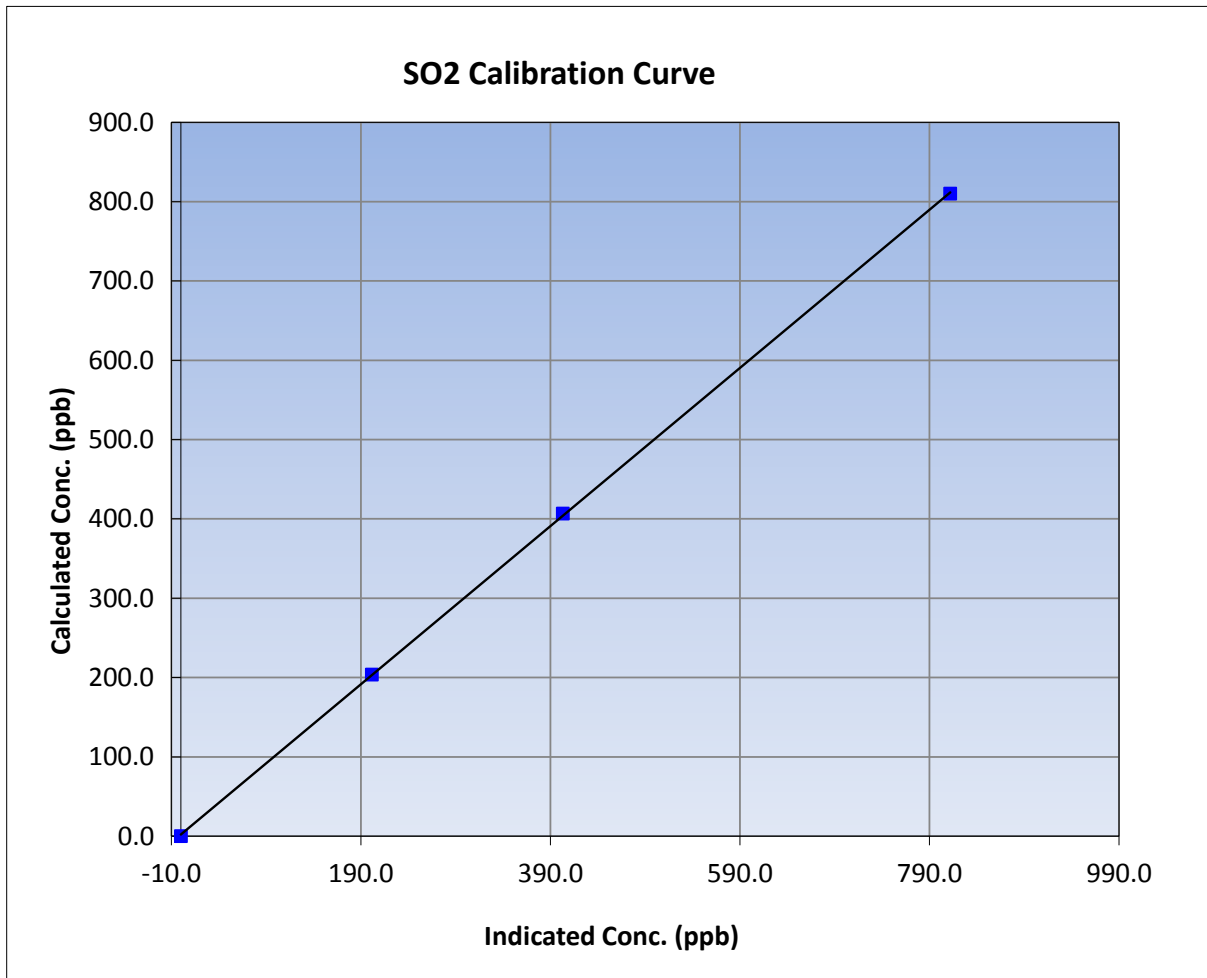
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:15	End Time (MST)	14:25
Analyzer make	Thermo 43i	Analyzer serial #	1501301450

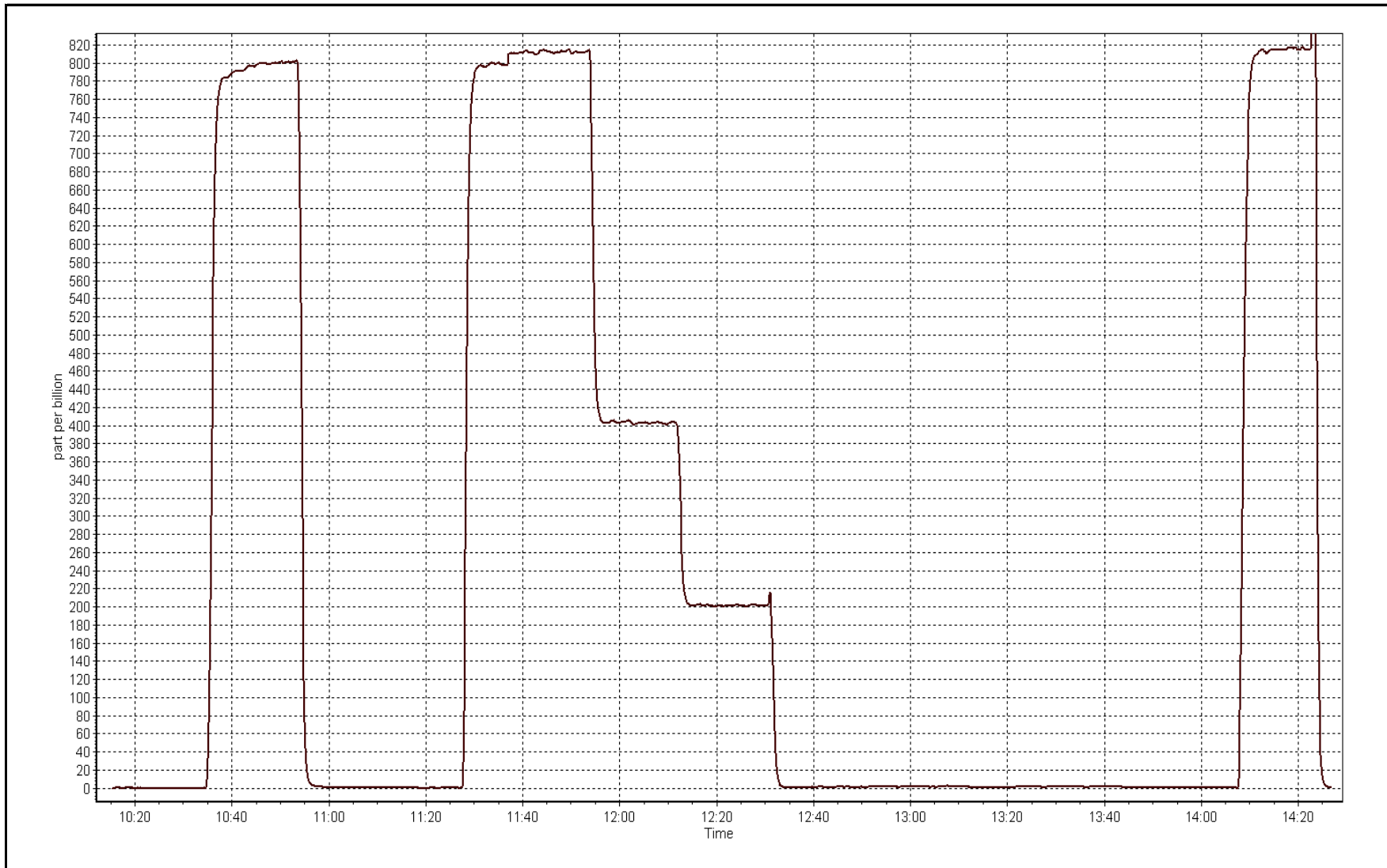
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999960
810.2	812.0	0.9978		
406.6	403.0	1.0090	Slope	0.997186
203.8	201.5	1.0117		
			Intercept	2.054889



SO2 Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 14, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	14:24	End Time (MST)	17:20
Gas Cert Reference	LL119508	Station temp.	22 Deg C
Cal Gas Concentration	5.35 ppm	Cal Gas Exp Date	February 13, 2018
Calibrator Make/Model	API 700	Serial Number	1220
ZAG air Make/Model	API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	Serial Number	9627
SO2 gas concentration	50.7 ppm	SO2 gas cert/exp	EY0000372 June 10, 2016

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	505	505
Analyzer IP address	192.168.1.75		Lamp voltage	2608	2567
Calculated slope	0.996849	0.990099	Chamber temp	50	50
Calculated intercept	0.022050	0.093235	Pressure	22.8	23.4
Analyzer Background	25.2	24.8	Flow	0.607	0.626
Analyzer Coefficient	0.999	1.014	Intensity	64	63
			Converter temp.	317	315

Analyzer make/model	API T101	Analyzer serial #	196
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.4	----
as found span	5000	75.6	80.9	79.8	1.013
SO2 scrubber check	5000	19.8	200.8	3.7	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	75.6	80.9	81.7	0.991
second point	5000	37.8	40.4	40.7	0.995
third point	5000	18.9	20.2	20.3	0.995
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	75.6	80.9	81.4	0.994
Average Correction Factor					0.993

Corrected As found	80.2	Previous response	81.1	% change	1.2%
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Notes:

Sample inlet filter replaced after as founds. Sox scrubber test completed after 3rd point. Adjusted both zero and span.

Calibration Performed By: Asad Hidayat



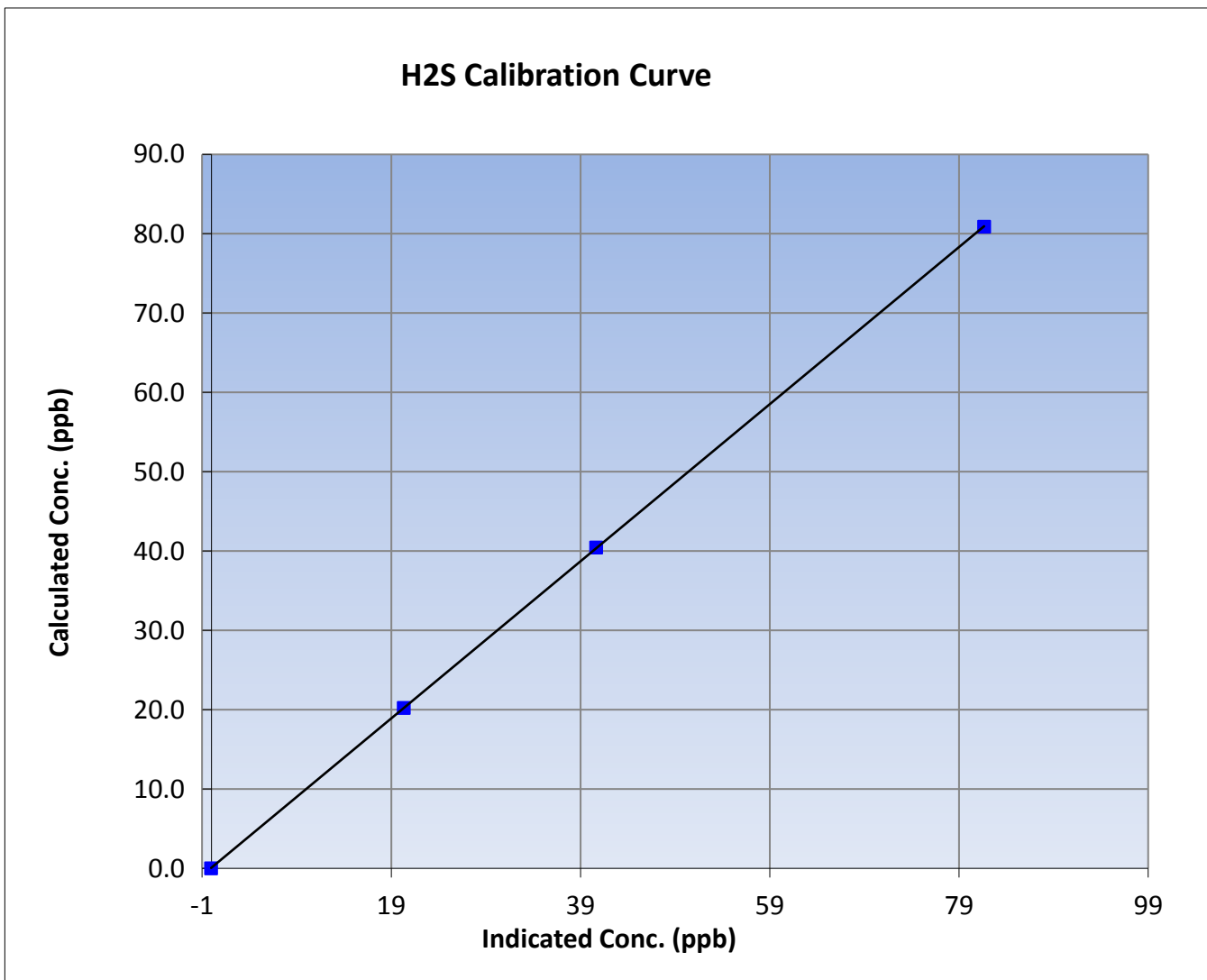
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 14, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	14:24	End Time (MST)	17:20
Analyzer make	API T101	Analyzer serial #	196

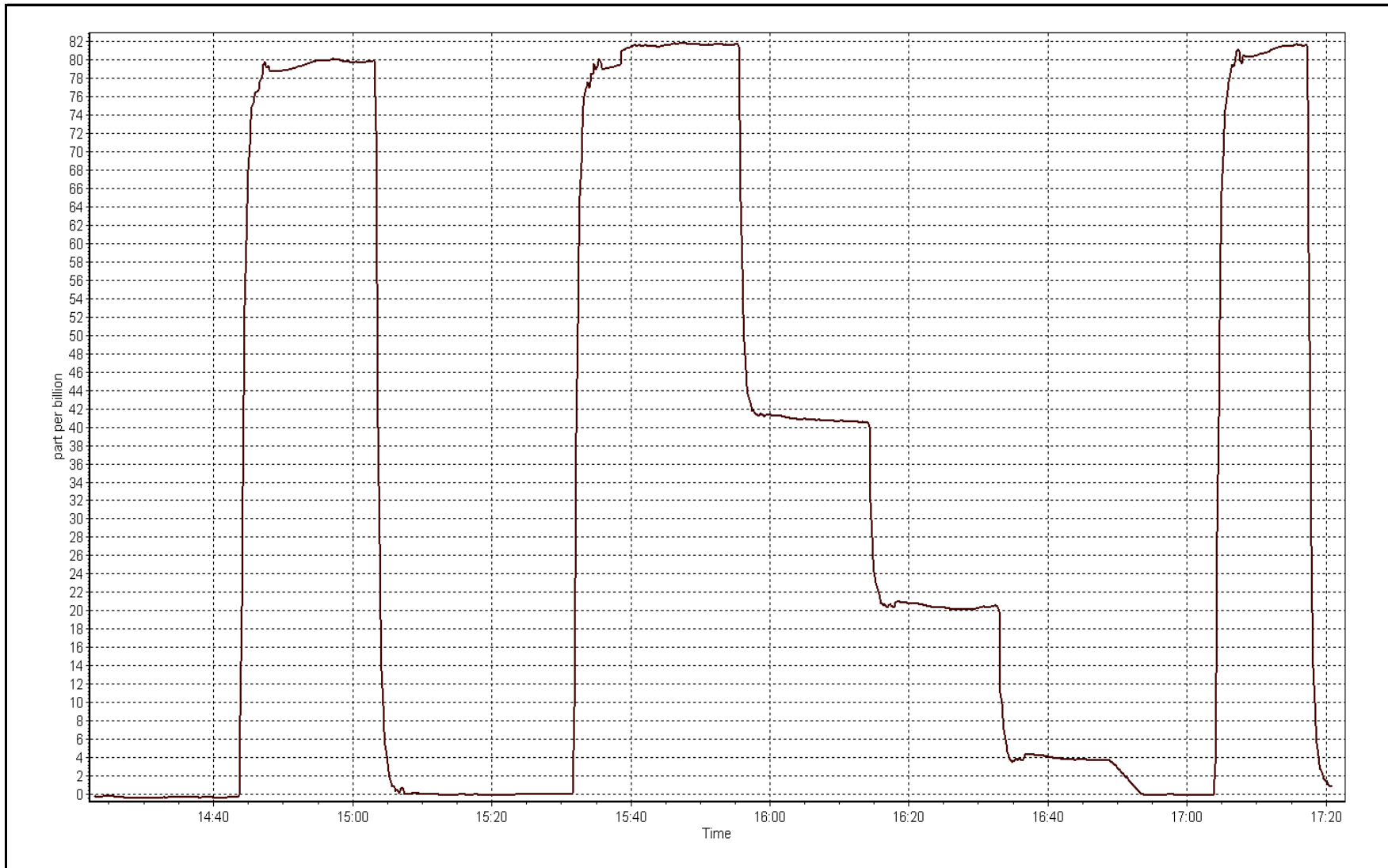
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999995
80.9	81.7	0.9906		
40.4	40.7	0.9950	Slope	0.990099
20.2	20.3	0.9947		
			Intercept	0.093235



H2S Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	December 15, 2016	Last Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	14:25
Gas Cert Reference	EY0000372	Cal Gas Expiry Date	June 10, 2016
CH4 Cal Gas Conc.	517 ppm	CH4 Equiv Conc.	1072.5 ppm
C3H8 Cal Gas Conc.	202 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1220
ZAG make/model	Teledyne API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	Serial Number	9627

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.3	34.3
Calculated slope	0.996951	0.997517	Fuel Pressure	23.9	23.9
Calculated intercept	0.073118	0.091337	Analyzer Coeff	4.5	4.3
			Analyzer BKG	2.230	1.920

Analyzer make	51i-LT	Analyzer serial #	1501663727
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.33	----
as found span	5000	79.9	17.14	17.48	0.980
calibrator zero	5000	0.0	0.00	-0.03	----
high point	5000	79.9	17.14	17.13	1.000
second point	5000	40.1	8.60	8.47	1.016
third point	5000	20.1	4.31	4.19	1.029
as left zero	5000	0.0	0.00	-0.02	----
as left span	5000	79.9	17.14	17.12	1.001
Average Correction Factor					1.015

Corrected As found	17.81	Previous response	17.12	% change	-3.9%
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Notes:

Sample inlet filter replaced after as founds. Adjusted both zero and span.

Calibration Performed By:

_____ Asad Hidayat



Wood Buffalo Environmental Association THC Calibration Report

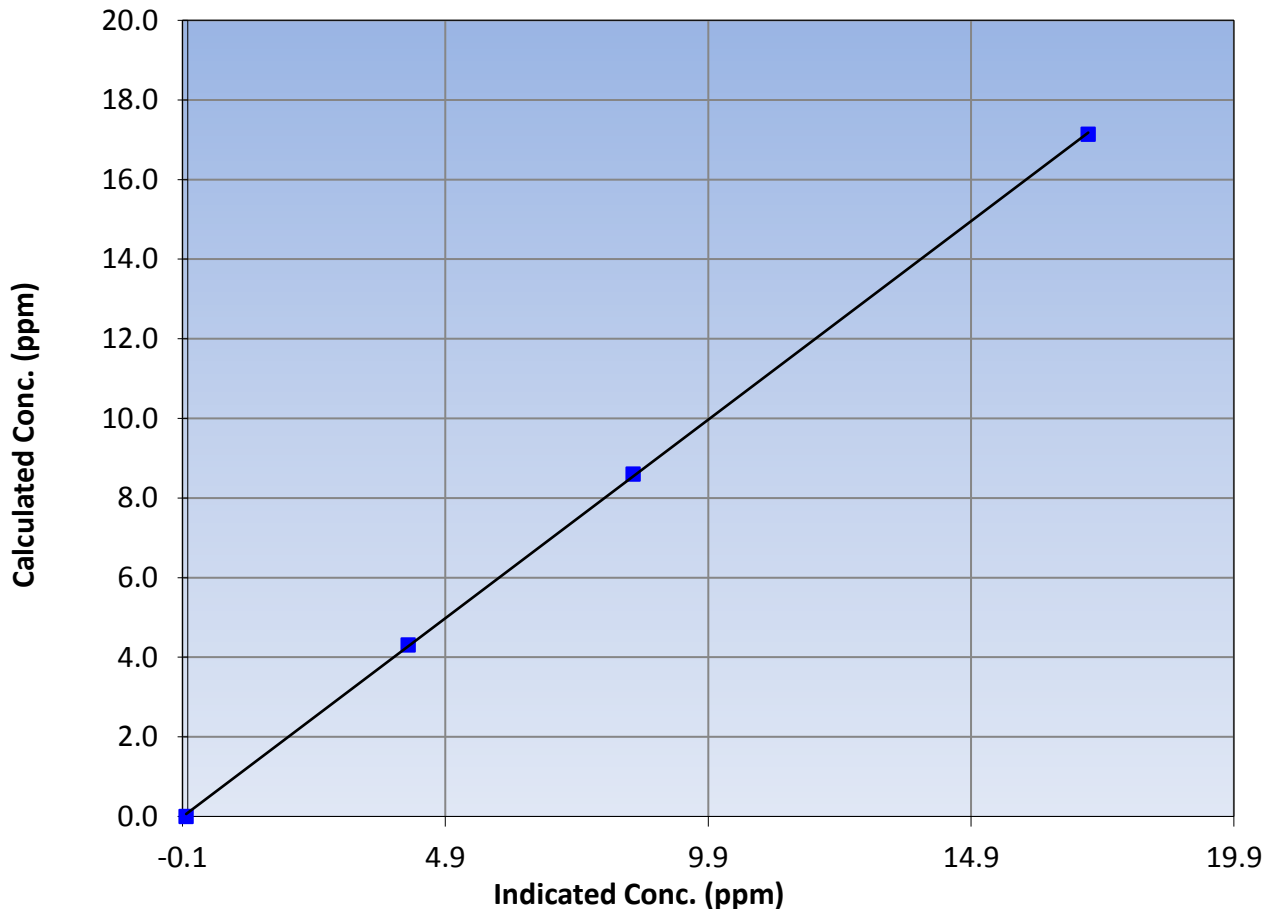
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:15	End Time (MST)	14:25
Analyzer make	51i-LT	Analyzer serial #	1501663727

Calibration Data

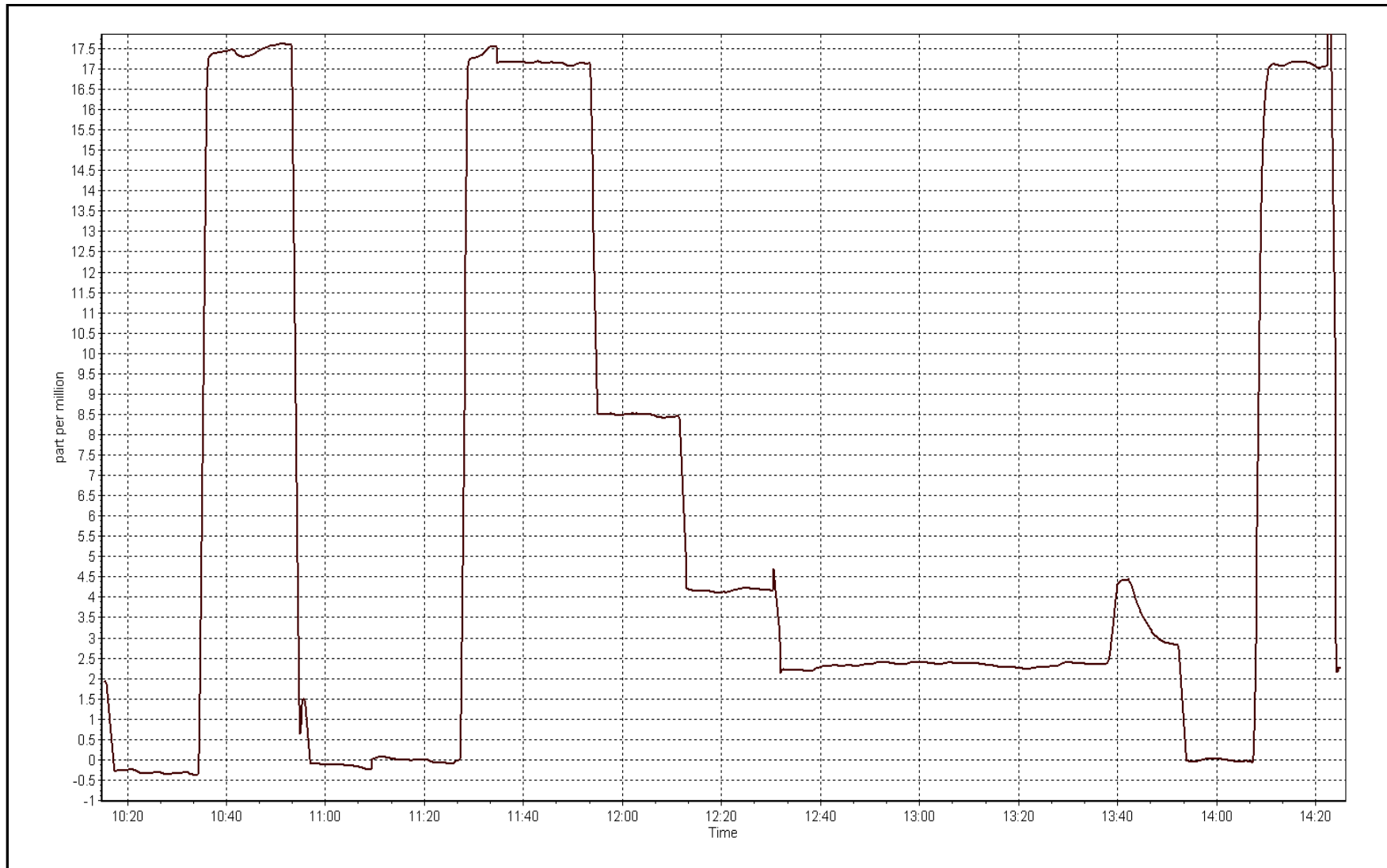
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.03	----	Correlation Coefficient	0.999933
17.14	17.13	1.0005		
8.60	8.47	1.0155	Slope	0.997517
4.31	4.19	1.0290		
			Intercept	0.091337

THC Calibration Curve



THC Calibration Plot

Date: December 15, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	14:25
NO Cal Gas Conc	50.1 ppm	Gas Cert Reference	EY0000372
NOX Cal Gas Conc	50.4 ppm	Cal Gas Expiry Date	June 10, 2016
Calibrator	API T700	Serial Number	1220
Zero air Generator	Teledyne API T701	Serial Number	4766

DACS Information

DACS make & model	Cambell Scientific CR3000	DACS serial No.	9627
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.995863	0.994252	0.992823
	Data Offset	0.352225	0.697999	-0.157233
Current Calibration	Data Slope	0.997952	0.995987	0.994293
	Data Offset	0.500620	0.950697	0.162890

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1505164379
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.099		1.090	
NOX coefficient	1.003		1.003	
NO2 coefficient	0.995		0.995	
NO bkgrnd	3.3		3.2	
NOX bkgrnd	3.3		3.2	
Chamber Temp	50.2	Deg C	50.6	Deg C
Moly Temp	326.6	Deg C	324.2	Deg C
PMT voltage	-767	V	-767	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	169.9	mmHg	172.6	mmHg
R Cell Press Nox	169.9	mmHg	172.1	mmHg
NO sample flow	0.796	lpm	0.816	lpm
Nox sample Flow	0.796	lpm	0.814	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 15, 2016 Station Number: AMS 20

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.3	0.1	----	----
as found span	5000	79.9	805.4	800.6	4.8	810.0	805.5	4.5	0.9944	0.9939
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.3	0.1	----	----
high point	5000	79.9	805.4	800.6	4.8	806.7	803.2	3.5	0.9984	0.9967
second point	5000	40.1	404.2	401.8	2.4	404.3	402.1	2.2	0.9998	0.9994
third point	5000	20.1	202.6	201.4	1.2	202.3	200.7	1.7	1.0014	1.0036
as left zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
as left span	5000	79.9	805.4	451.5	353.9	819.4	452.1	367.3	0.9829	0.9988
Average Correction Factor									0.9998	0.9999

Corrced As found NO_x= 810.2 NO= 805.8 Percent Change NO_x= -0.2% NO= -0.2%
 Previous Response NO_x= 808.4 NO= 804.5

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 79.90 ccm NOx ref calc conc = 805.4 ppb NO ref calc conc = 800.6 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		4.8	816.7	810.2	0.1	0.9861	0.9881	----	----
1st NO2 (300)	451.5	363.5	817.0	451.5	365.5	0.9857	----	0.9945	100.6%
2nd NO2 (200)	566.0	249.0	816.3	566.0	250.4	0.9866	----	0.9946	100.5%
3rd NO2 (100)	684.8	130.2	815.2	684.8	130.4	0.9880	----	0.9987	100.1%
2nd NO ref point		4.8	813.5	808.0	5.5	0.9901	0.9909	----	----
Average Correction Factor						0.9876		0.9959	100.4%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

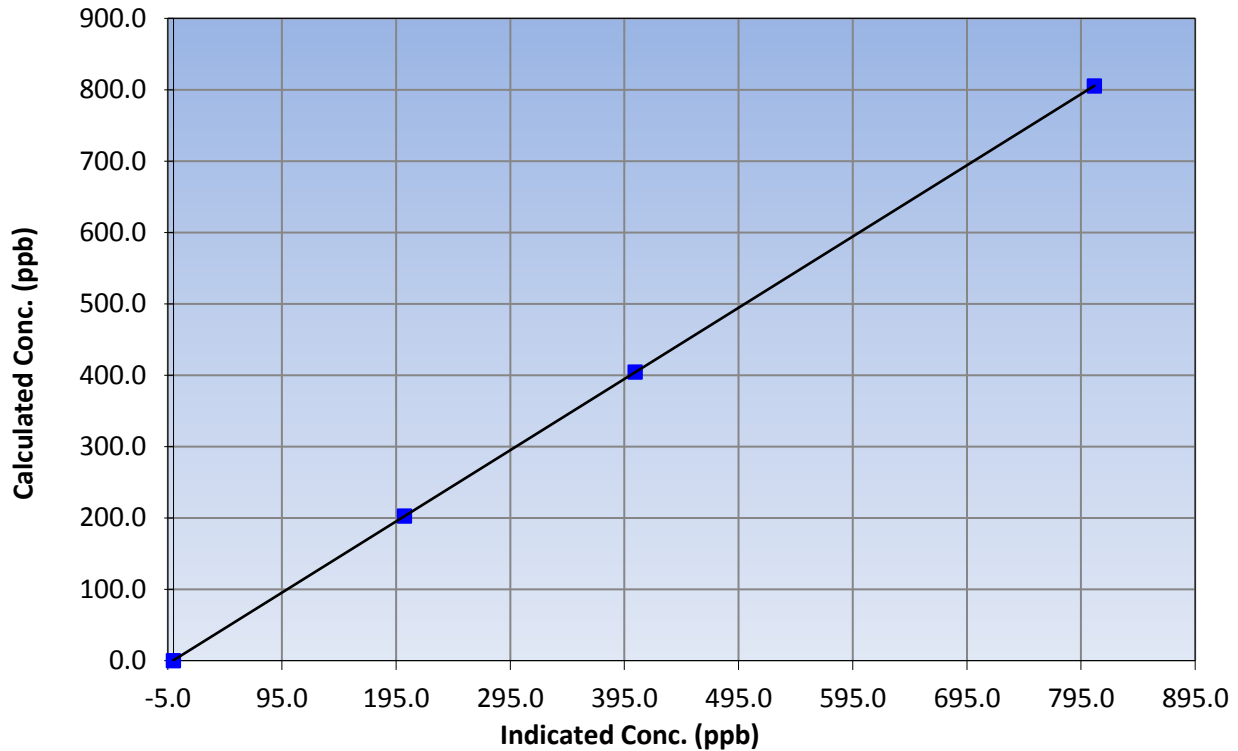
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:15	End Time (MST)	14:25
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999999
805.4	806.7	0.9984		
404.2	404.3	0.9998	Slope	0.997952
202.6	202.3	1.0014		
			Intercept	0.500620

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

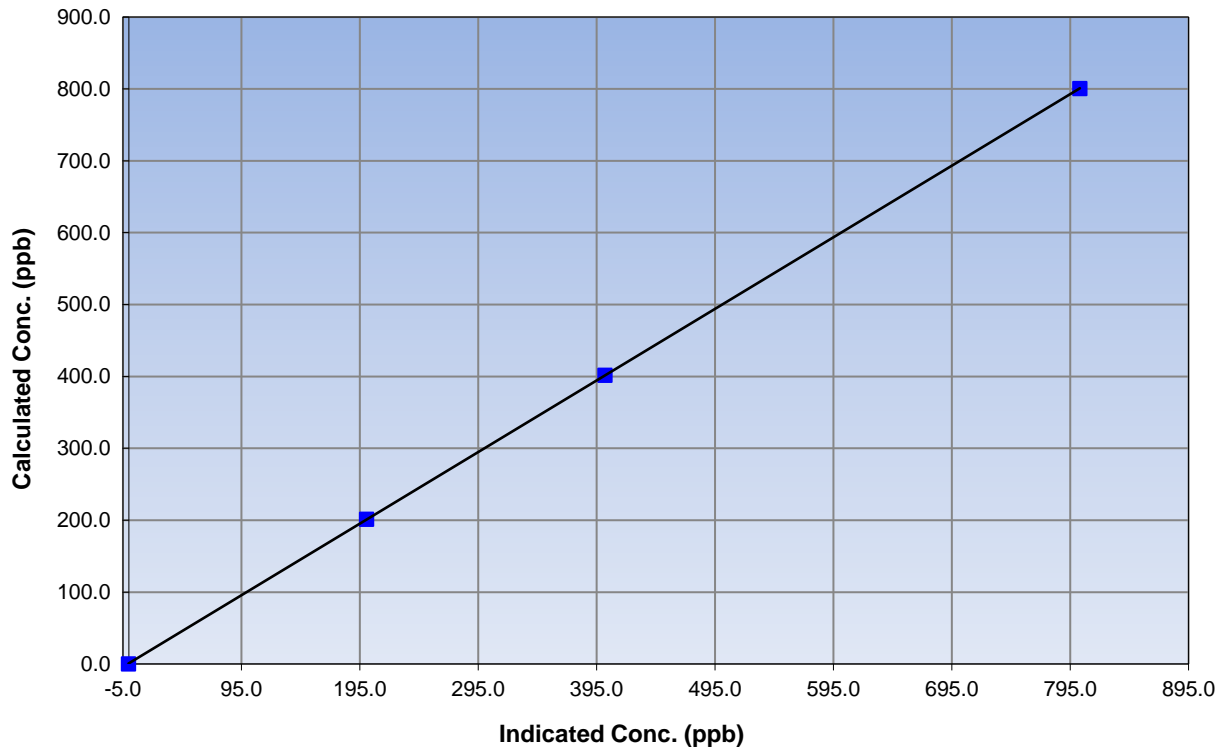
Station Information

Calibration Date	December 15, 2016	Previous Calibration	November 15, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:15	End Time (MST)	14:25
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	N/A	Correlation Coefficient	0.999997
800.6	803.2	0.9967		
401.8	402.1	0.9994	Slope	0.995987
201.4	200.7	1.0036		
			Intercept	0.950697

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

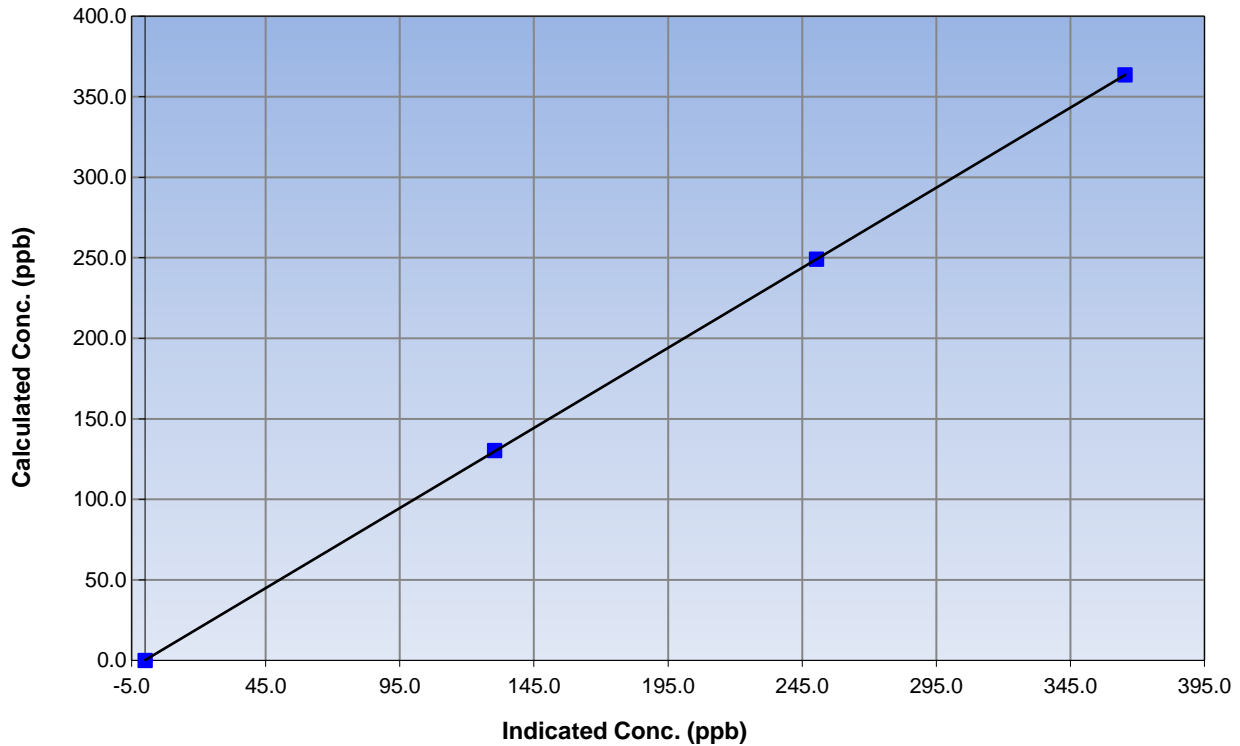
Station Information

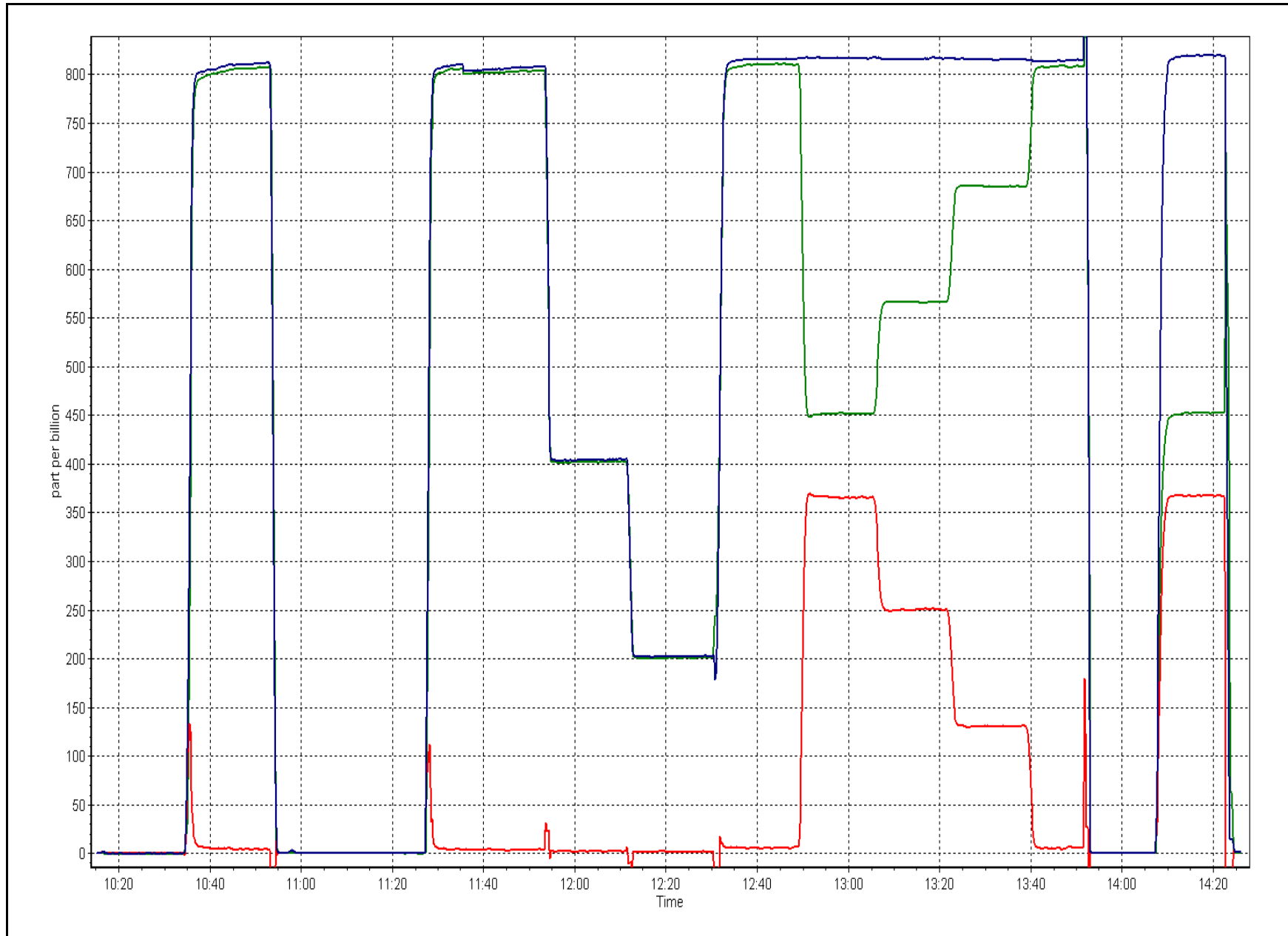
Calibration Date	December 15, 2016	Previous Calibration	November 15, 2016
Station Number	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:15	End Time (MST)	14:25
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999997
363.5	365.5	0.9945		
249.0	250.4	0.9946	Slope	0.994293
130.2	130.4	0.9987		
			Intercept	0.162890

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 21
CONKLIN COMMUNITY
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	709	35	35	100.00	6	0	1	0
TRS(ppb) Average	710	34	34	100.00	1	0	0	0
THC(ppm) Average	709	35	35	100.00	2.3	-	2.1	-
NMHC(ppm) Average	709	35	35	100.00	0.163	-	0.007	-
CH4(ppm) Average	709	35	35	100.00	2.3	-	2.1	-
O3 (ppb) Average	710	34	34	100.00	44	0	40	-
NO2 (ppb) Average	709	35	35	100.00	19	0	10	-
NO (ppb) Average	709	35	35	100.00	13	-	2	-
NOX (ppb) Average	709	35	35	100.00	26	-	11	-
PM2.5 (ug/m3) Average	715	4	29	96.64	59.8	-	16.3	0
Wind Speed 10 m (km/h) Average	736	0	8	98.92	19	-	14	-
Wind Direction 10 m (deg) Average	736	0	8	98.92	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	1.2	-	-2.1	-
Relative Humidity (%) Average	744	0	0	100.00	94	-	90.0	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	709	0.3	0	-	0	0	0	0	0	0	1	6
TRS (ppb) Average	710	0.4	0	-	0	0	0	0	0	0	0	1
THC (ppm) Average	709	1.97	0.1	-	1.9	1.9	1.9	1.9	2	2.1	2.1	2.3
NMHC(ppm) Average	709	0	0.006	-	0	0	0	0	0	0	0	0.163
CH4(ppm) Average	709	1.97	0.1	-	1.9	1.9	1.9	1.9	2	2.1	2.1	2.3
O3 (ppb) Average	710	29	9	-	4	15	22	30	37	40	40	44
NO2 (ppb) Average	709	3.2	3	-	0	1	1	2	4	7	7	19
NO (ppb) Average	709	0.5	1	-	0	0	0	0	0	1	1	13
NOX (ppb) Average	709	3.7	4	-	0	1	2	3	5	7	7	26
PM2.5 (ug/m3) Average	715	4.58	5.8	-	0.2	1	1.5	2.5	4.7	10.5	10.5	59.8
Wind Speed 10 m (km/h) Average	736	7.1	4	-	0	1	3	7	10	13	13	19
Wind Direction 10 m (deg) Average	736	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-15.65	9.6	-	-39	-28.4	-22.1	-15.7	-7	-3.7	-3.7	1.2
Relative Humidity (%) Average	744	77.4	8	-	54	69	73	77	82	88	88	94

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
DECEMBER 2016

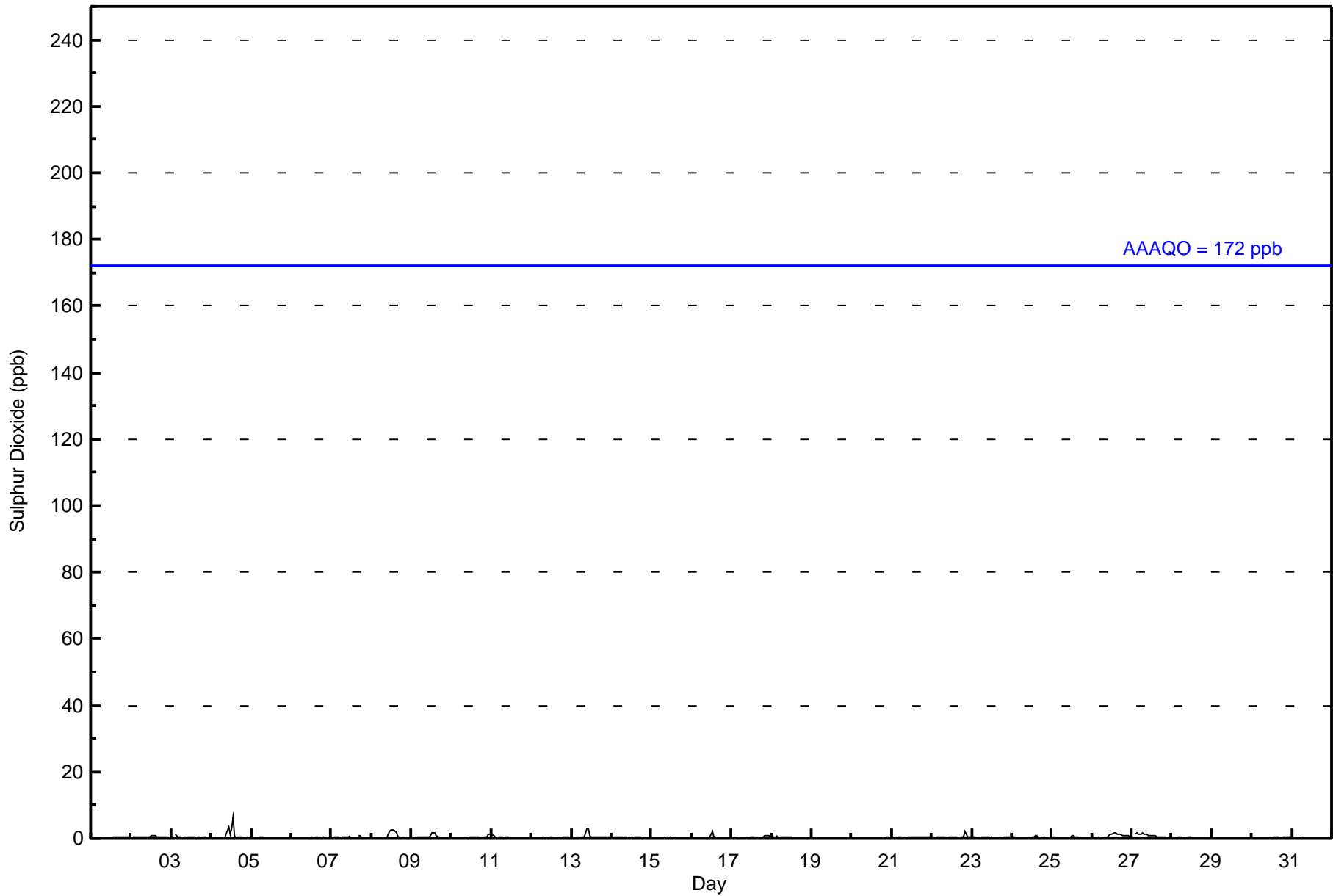
OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
PM2.5	07 Dec 2016 20:00	07 Dec 2016 23:00	4	Unstable operation - excessive baseline drift
PM2.5	08 Dec 2016 01:00	08 Dec 2016 03:00	3	Unstable operation - excessive baseline drift
PM2.5	08 Dec 2016 07:00	08 Dec 2016 09:00	3	Unstable operation - excessive baseline drift
PM2.5	09 Dec 2016 00:00	09 Dec 2016 01:00	2	Unstable operation - excessive baseline drift
PM2.5	09 Dec 2016 19:00	10 Dec 2016 05:00	11	Unstable operation - excessive baseline drift
PM2.5	10 Dec 2016 07:00	10 Dec 2016 08:00	2	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	08 Dec 2016 04:00	08 Dec 2016 04:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	08 Dec 2016 07:00	08 Dec 2016 07:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	08 Dec 2016 10:00	08 Dec 2016 10:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	17 Dec 2016 10:00	17 Dec 2016 10:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	24 Dec 2016 23:00	24 Dec 2016 23:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	25 Dec 2016 23:00	25 Dec 2016 23:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	26 Dec 2016 01:00	26 Dec 2016 01:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	29 Dec 2016 21:00	29 Dec 2016 21:00	1	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	709	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Conklin Community - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

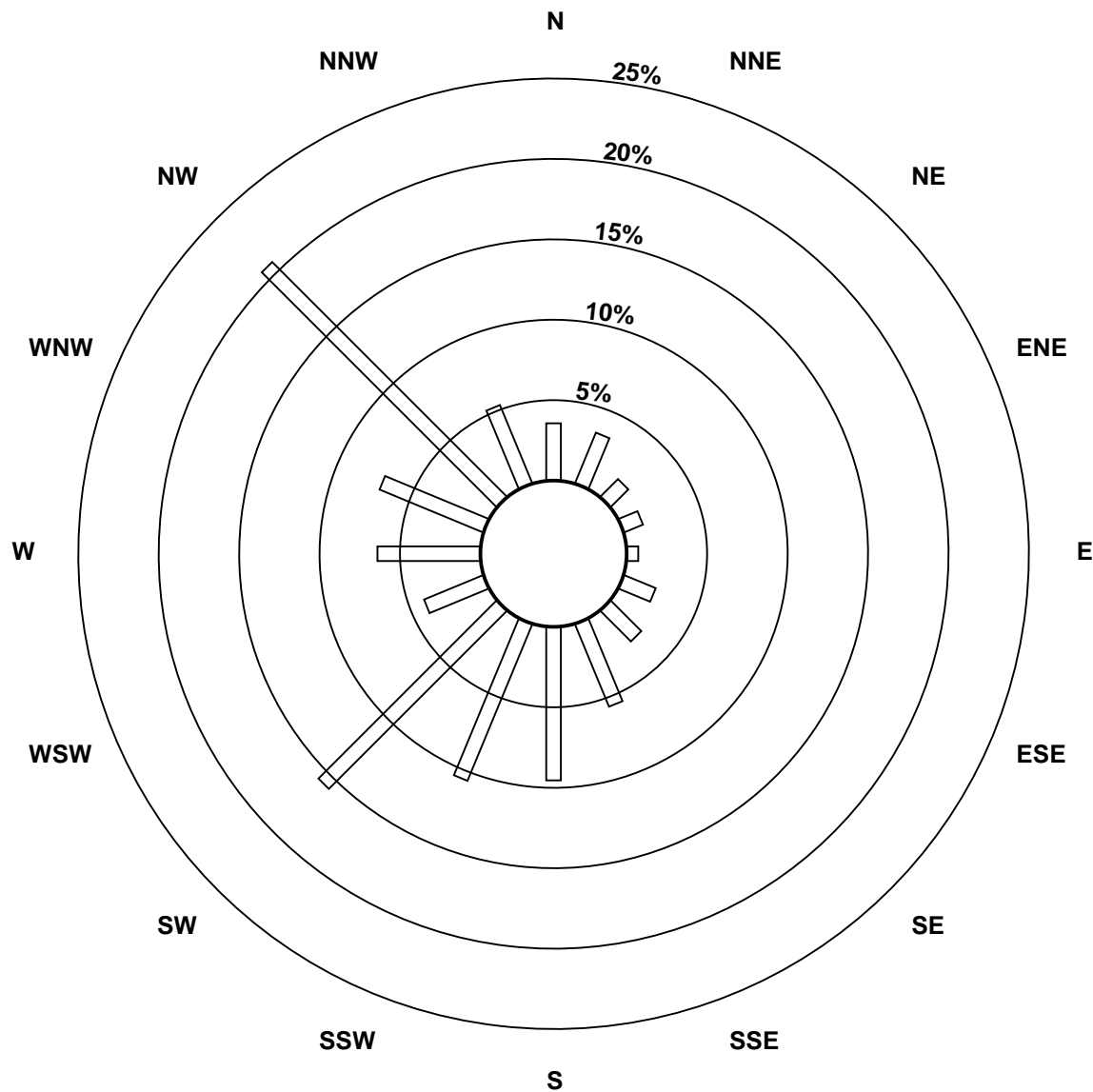
Total Number of Valid Hours: 702

Total Number of Hours: 744

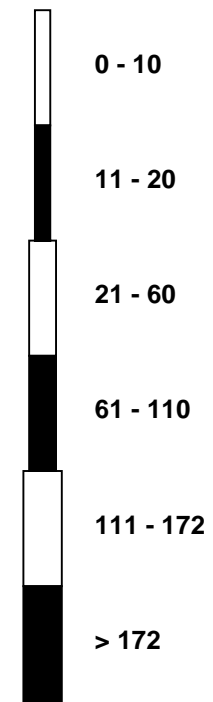


Wood Buffalo Environmental Association
Wind Rose Dec 2016

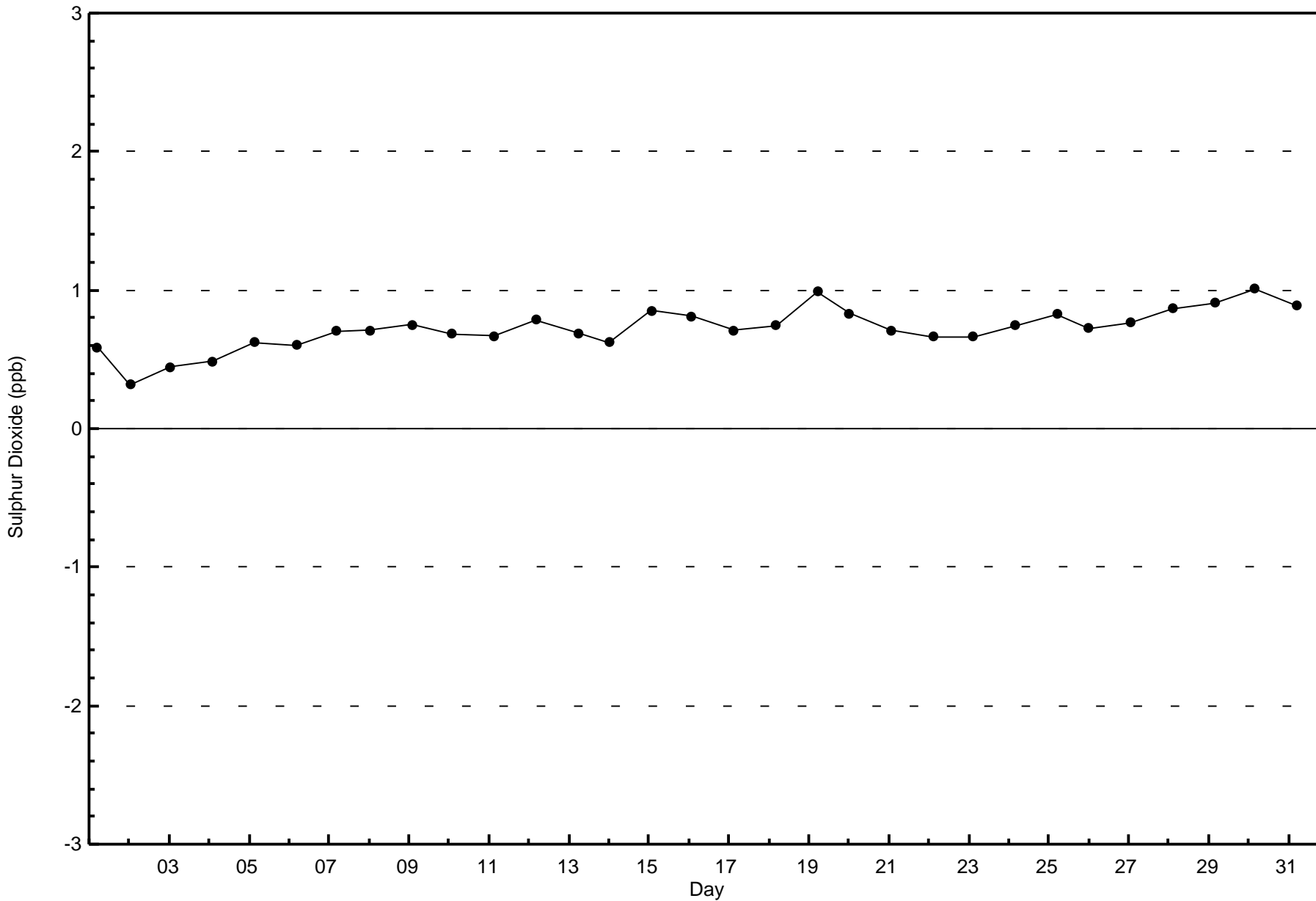
Sulphur Dioxide (SO₂) - ppb
Conklin Community (AMS 21)

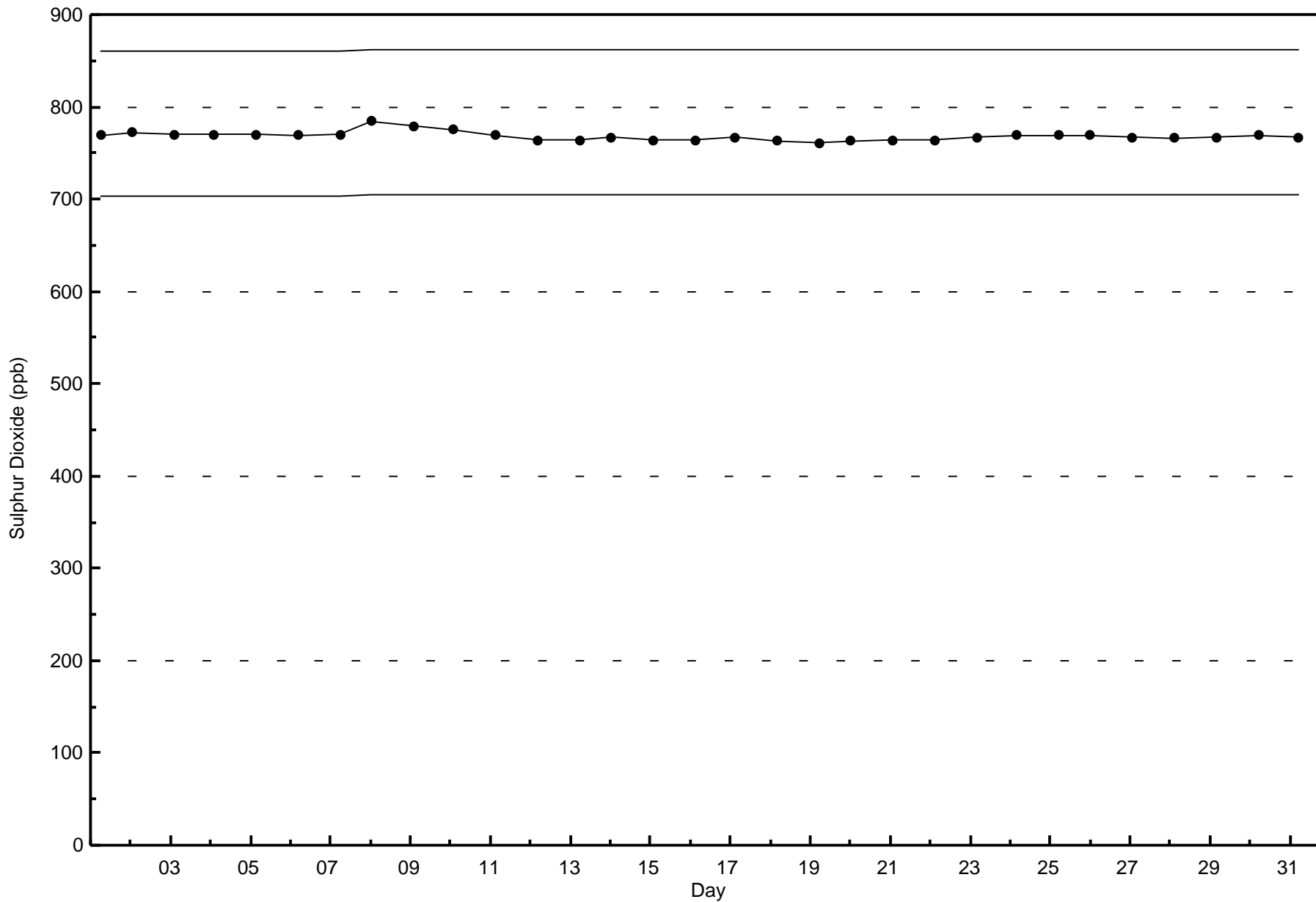


Classes (ppb)



Total Number of Valid Hours: 702







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

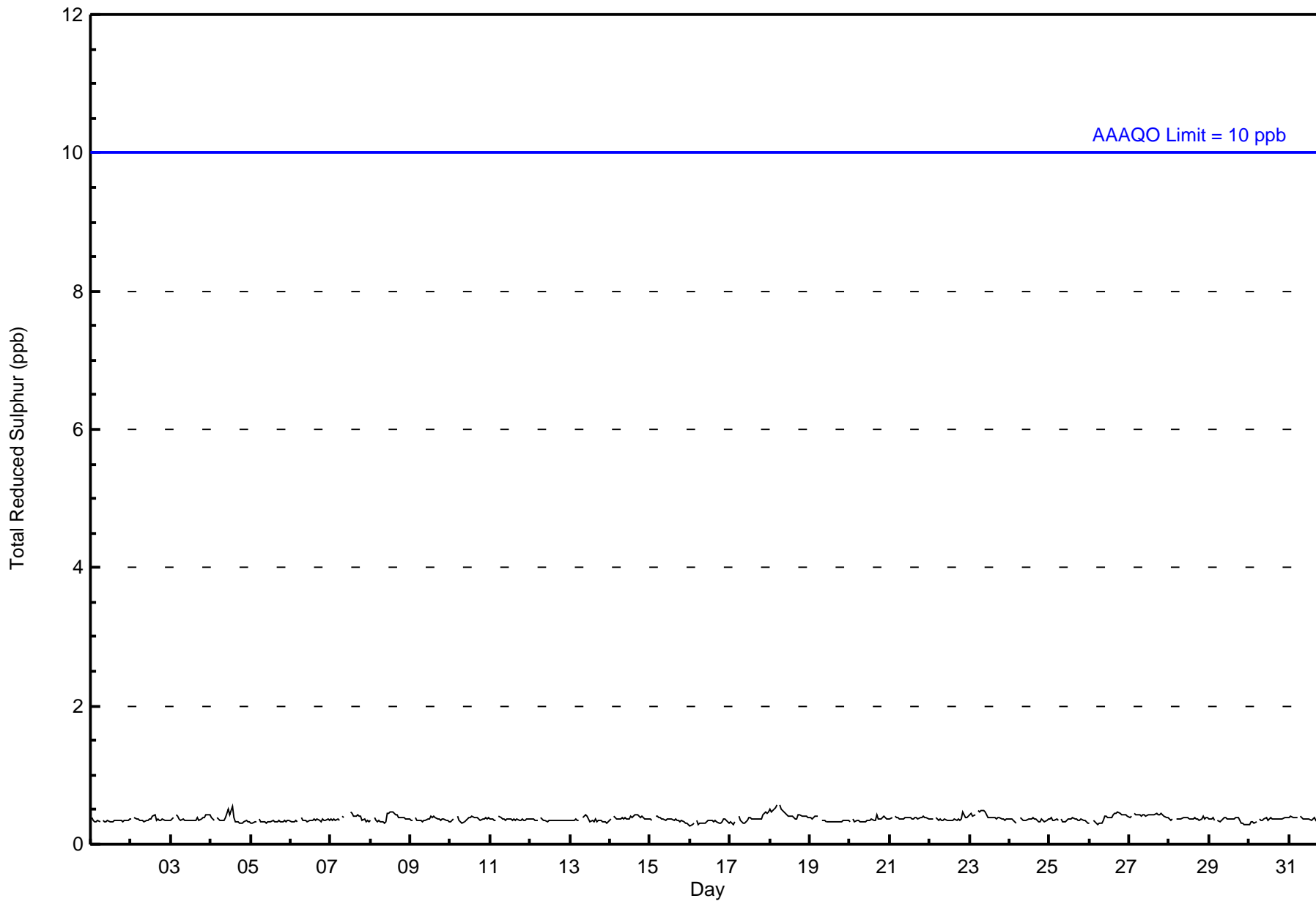
Conklin Community - December 2016

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service:		744																																														
Maximum Value: 1 ppb on Dec 18 05:00		Maximum Daily Average: 0.4 ppb on Dec 18		Hours of Data:		710																																														
Minimum Value: 0 ppb on Dec 16 01:00		Minimum Daily Average: 0.3 ppb on Dec 16		Hours of Missing Data:		34																																														
Maximum Diurnal Average: 0.4 ppb at hour 14		Minimum Diurnal Average: 0.4 ppb at hour 9		Hours of Calibration:		34																																														
Monthly Average: 0.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		Percent Operational Time:		100.0																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																												
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
4-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1																									
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
7-Dec	0	0	0	0	0	0	Z	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
18-Dec	1	0	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																									
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																									
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																									
																								0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	Diurnal Average	
																								1	0	1	1	1	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum
Z - zerospan C - Calibration																																																				
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																																																				



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	25	24	11	10	5	14	19	38	68	74	108	29	45	48	147	37	702
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	10	5	14	19	38	68	74	108	29	45	48	147	37	702

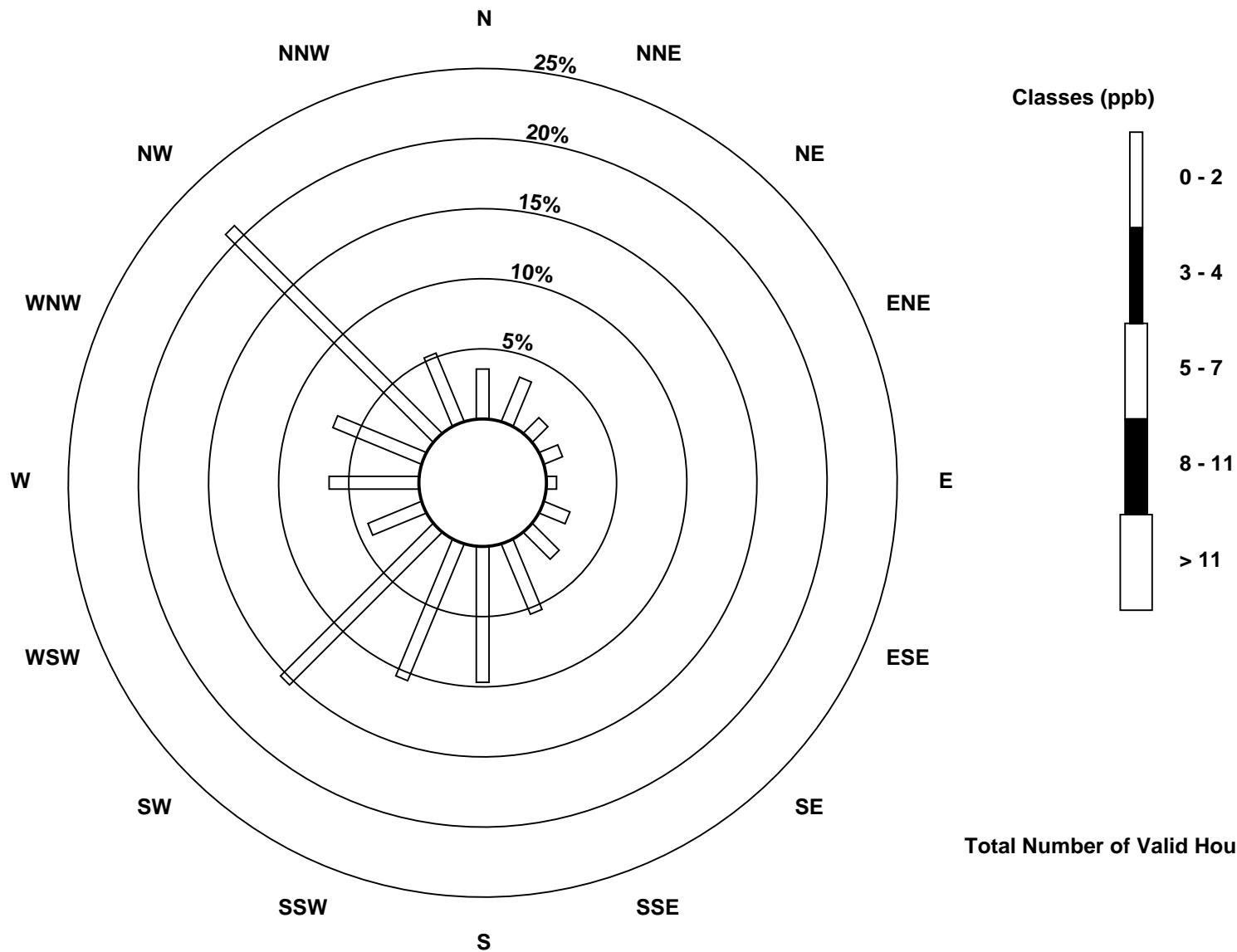
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Reduced Sulphur (TRS) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 702

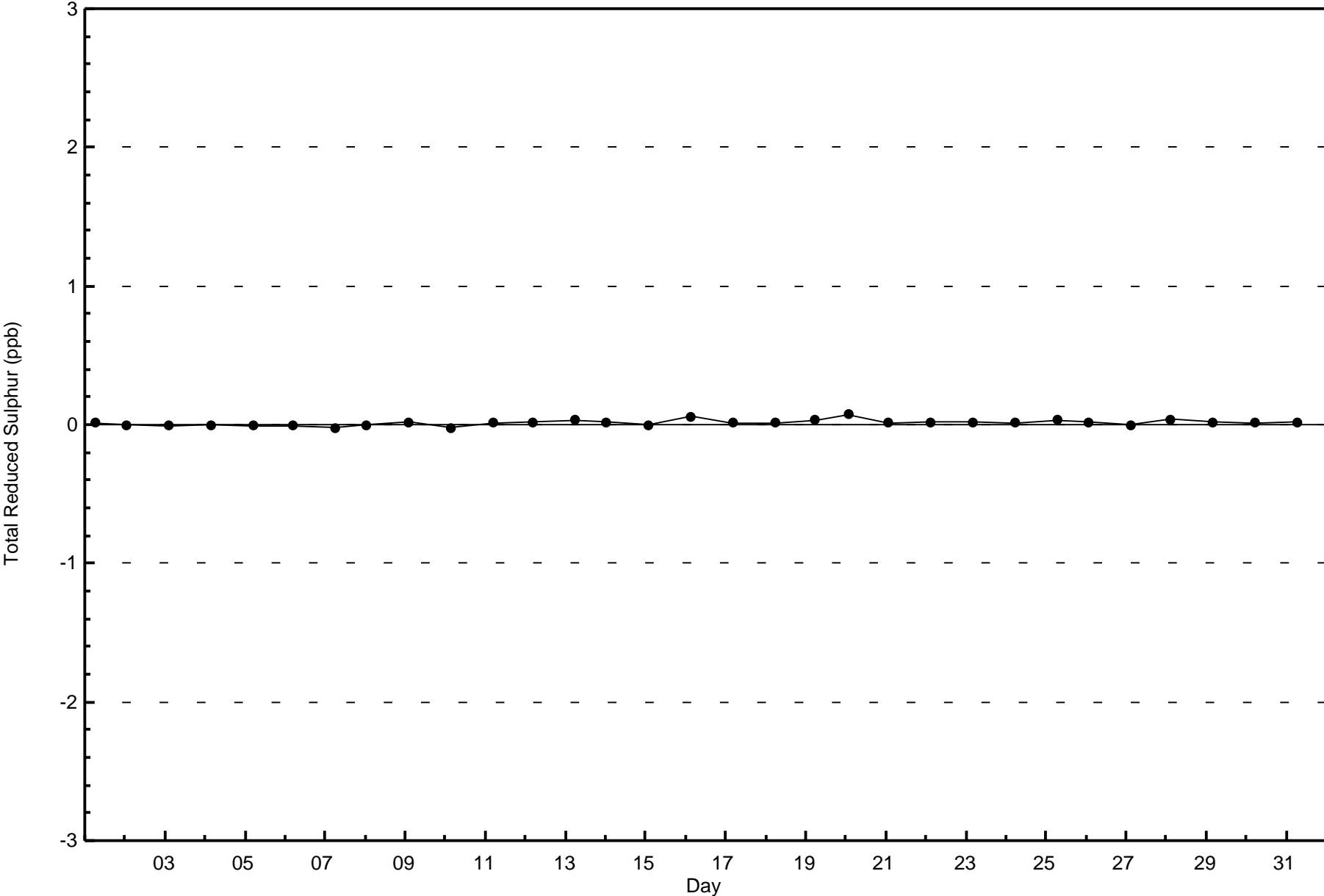


Wood Buffalo Environmental Association

Zero Responses

Total Reduced Sulphur (TRS) - ppb

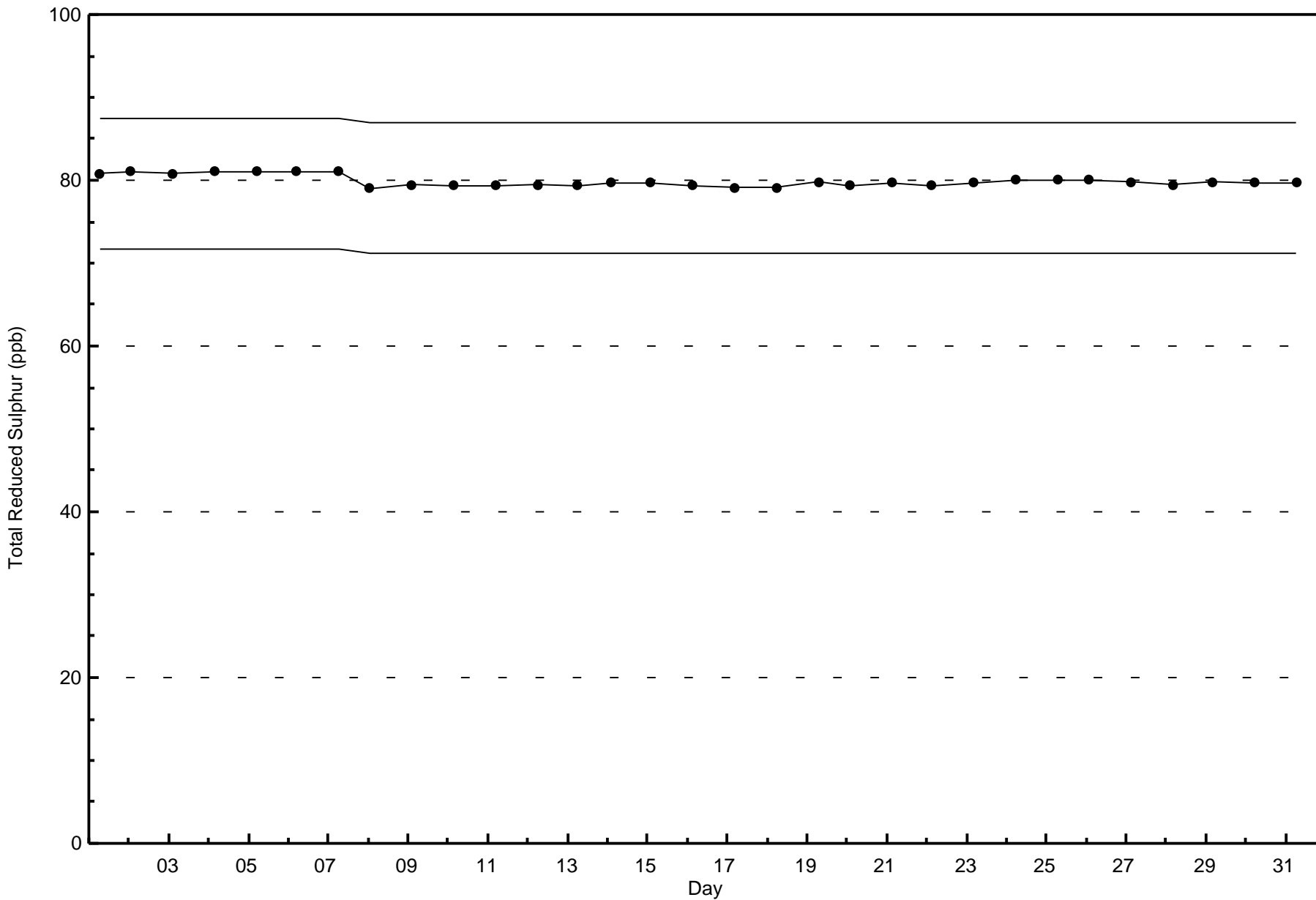
Conklin Community - December 2016





Wood Buffalo Environmental Association
Span Responses

Total Reduced Sulphur (TRS) - ppb
Conklin Community - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

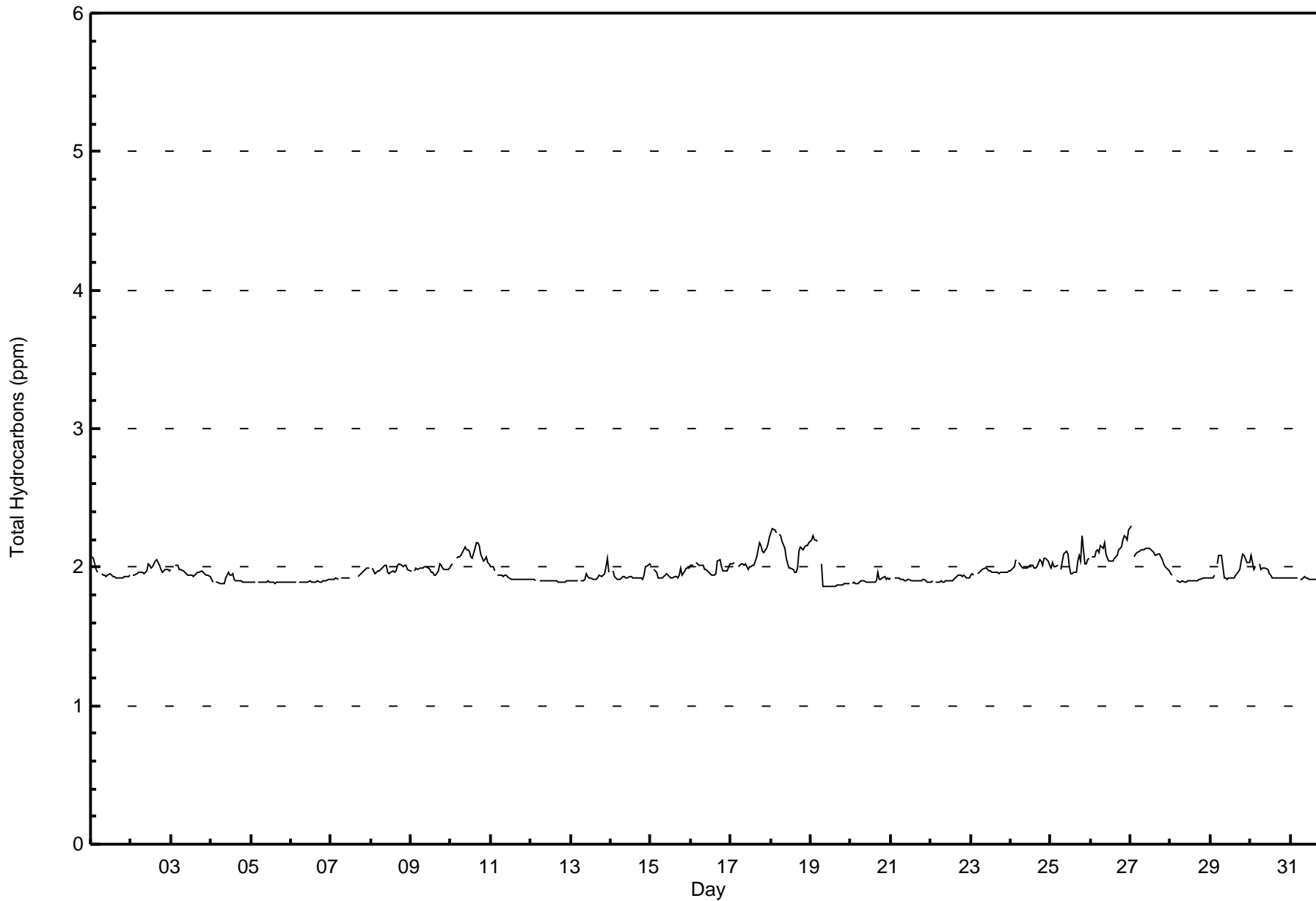
Total Hydrocarbons (THC) - ppm
Conklin Community - December 2016

Maximum Value: 2.3 ppm on Dec 27 01:00																				Maximum Daily Average: 2.1 ppm on Dec 26					Hours in Service: 744			
Minimum Value: 1.9 ppm on Dec 19 14:00																				Minimum Daily Average: 1.9 ppm on Dec 5					Hours of Data: 709			
Maximum Diurnal Average: 2.0 ppm at hour 1																				Minimum Diurnal Average: 1.9 ppm at hour 14					Hours of Missing Data: 35			
Monthly Average: 1.97 ppm																				Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2					Hours of Calibration: 35			
																									Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	2.1	2.1	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1		
2-Dec	Z	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
3-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	
4-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
5-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
6-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
7-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0
8-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
9-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10-Dec	2.0	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.0	2.1	2.1	2.0	2.0	2.1	2.2	2.2	2.1
11-Dec	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
13-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.0	1.9	2.1	2.1	1.9
14-Dec	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9
15-Dec	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0
16-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
17-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.1
18-Dec	2.2	2.3	2.3	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1
19-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
20-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
21-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
22-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
23-Dec	1.9	2.0	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.2	2.0	2.0	2.1	2.1	2.0	2.2	2.0
26-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.1	2.3	2.1
27-Dec	2.3	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.3	2.1	2.3
28-Dec	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
29-Dec	1.9	1.9	1.9	Z	2.0	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0
30-Dec	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
31-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
																								Diurnal Average				
																								Diurnal Maximum				
Z - zerospan C - Calibration																												



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	601	84.77	84.77
2.1 - 3.0	108	15.23	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	19	21	9	7	4	12	11	31	39	56	95	26	44	47	143	32	596
2.1 - 3.0	6	3	2	2	1	3	8	8	28	18	15	2	1	2	2	5	106
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

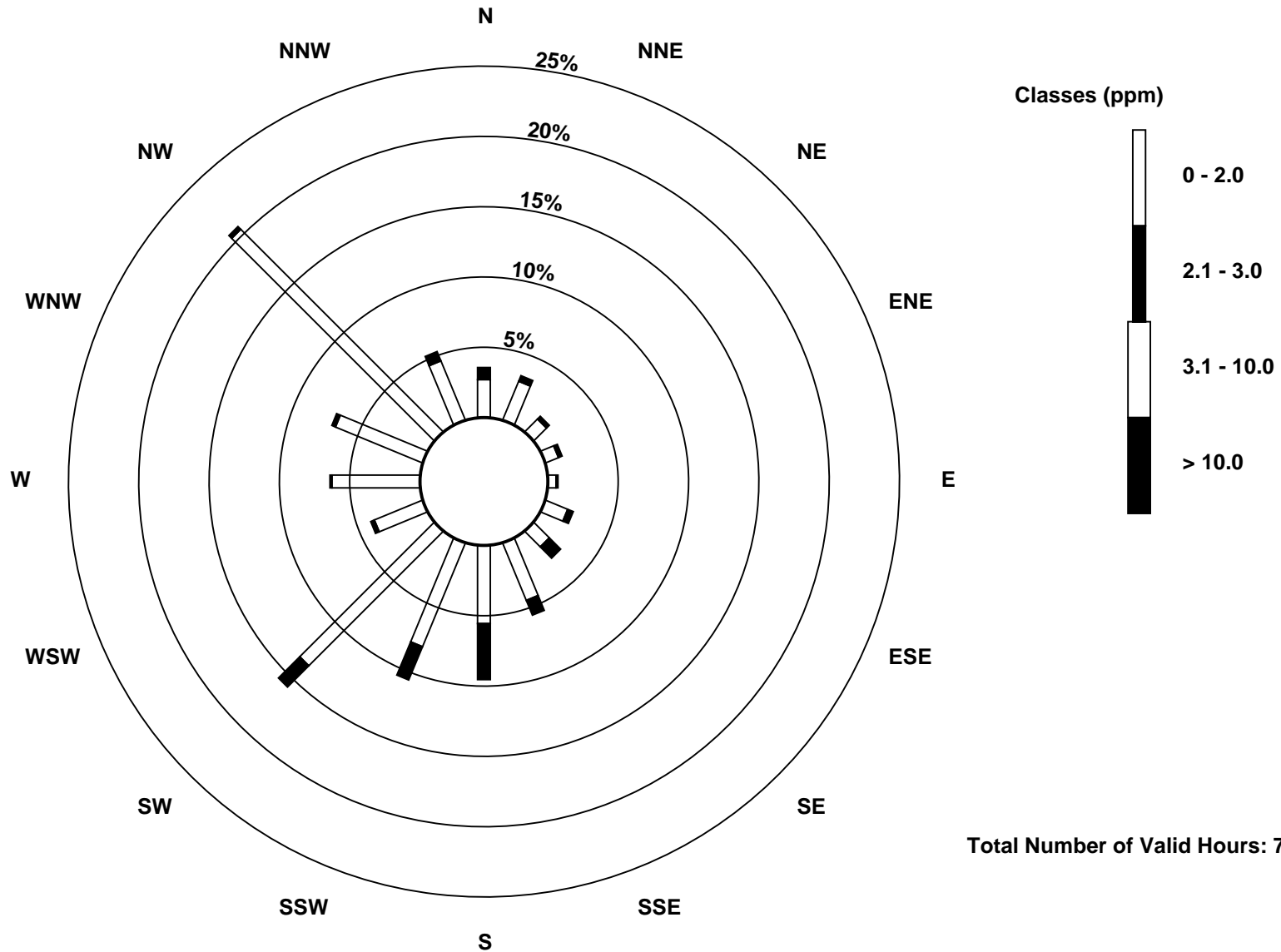
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Total Hydrocarbons (THC) - ppm
Conklin Community (AMS 21)

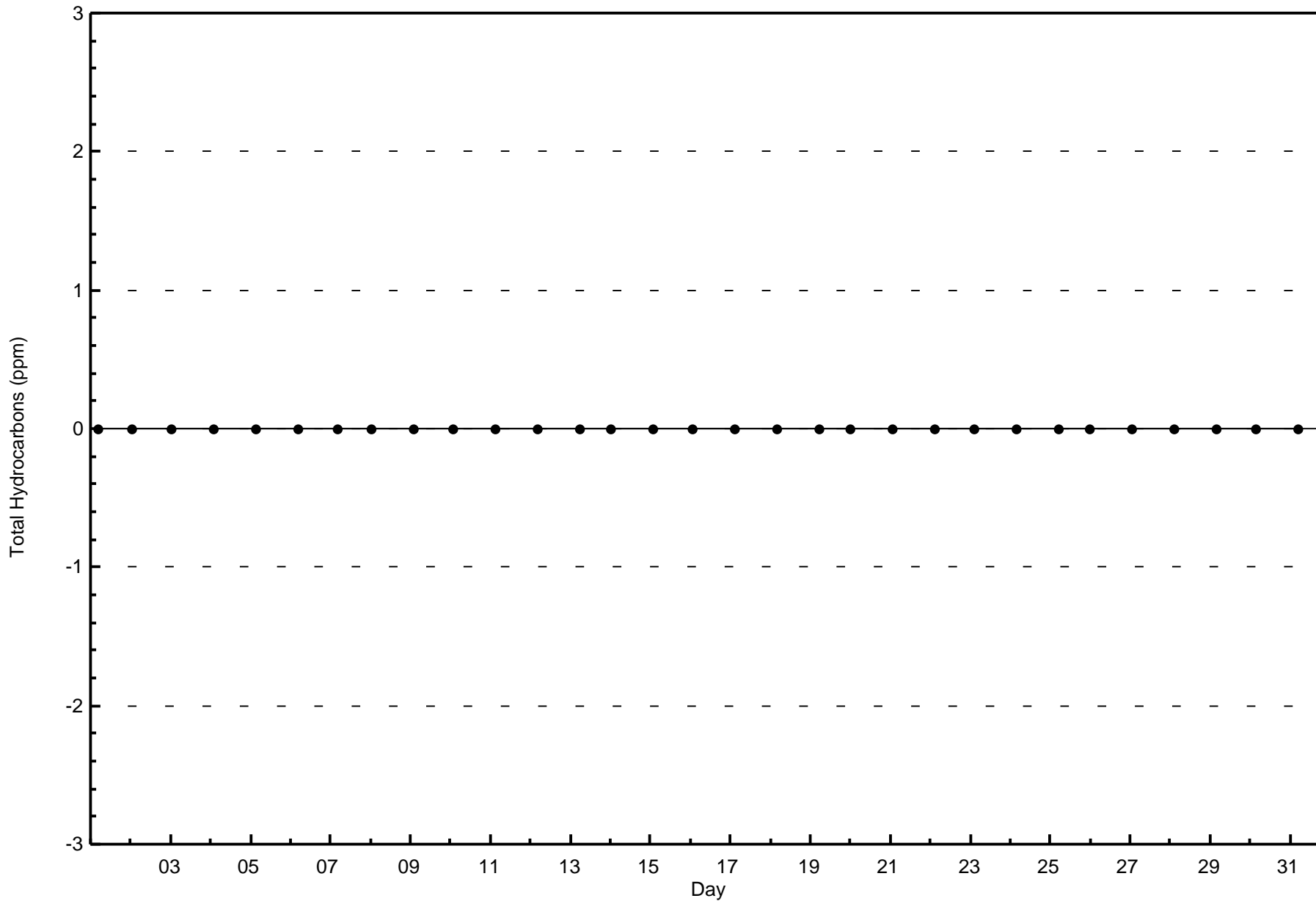


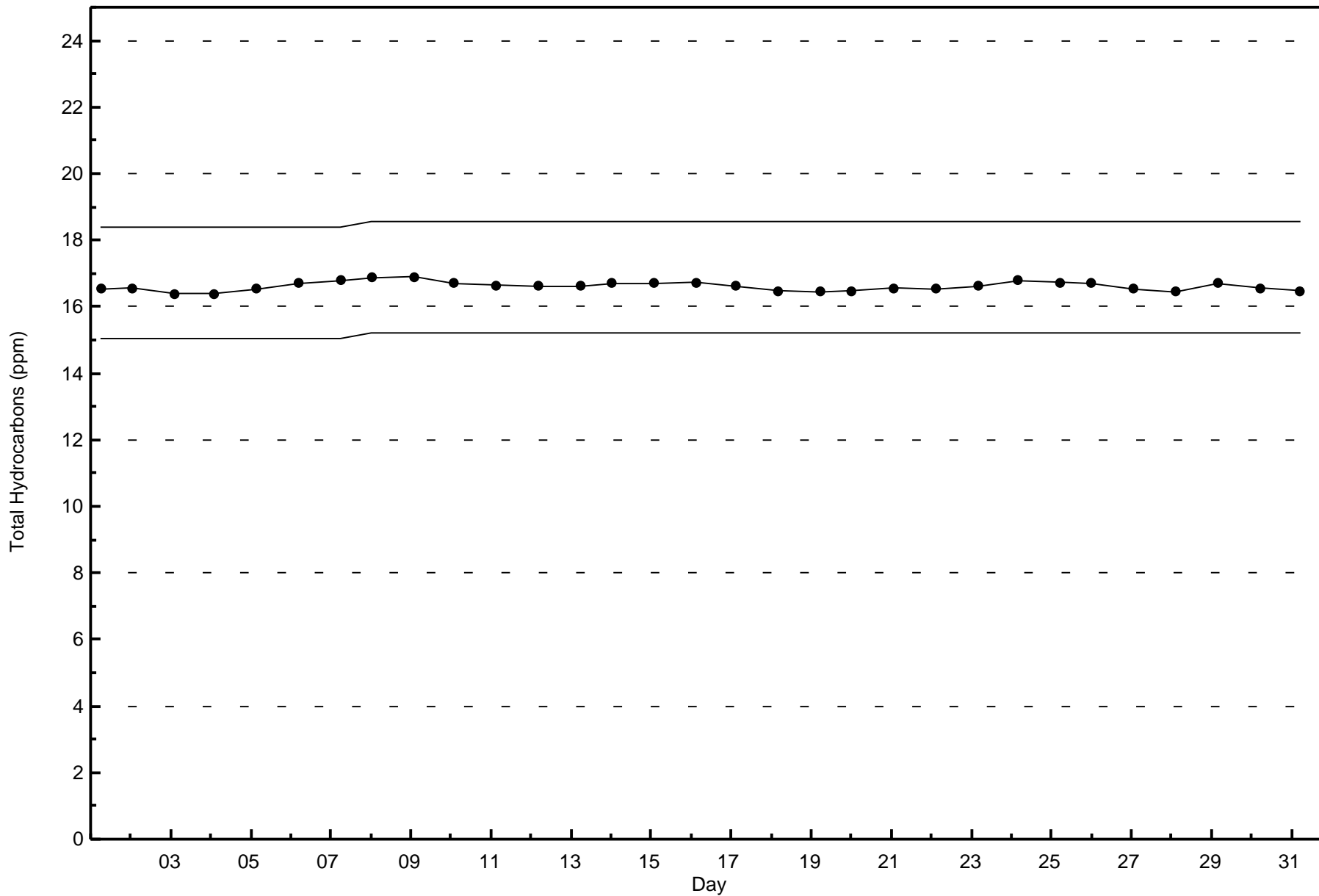
Total Number of Valid Hours: 702



Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Conklin Community - December 2016







Maximum Value: 0.163 ppm on Dec 25 20:00	Maximum Daily Average: 0.007 ppm on Dec 25	Hours in Service: 744
Minimum Value: 0.000 ppm on Dec 1 01:00	Minimum Daily Average: 0.000 ppm on Dec 2	Hours of Data: 709
Maximum Diurnal Average: 0.005 ppm at hour 20	Minimum Diurnal Average: 0.000 ppm at hour 2	Hours of Missing Data: 35
Monthly Average: 0.000 ppm	Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.0	Hours of Calibration: 35
		Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24									
1-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
2-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
3-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
4-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
8-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
9-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
10-Dec	0.000	0.000	Z	0.006	0.000	0.000	0.000	0.000	0.032	0.012	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.009	
14-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
15-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
17-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
18-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
19-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
20-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
21-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
22-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
23-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
25-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.163	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.163	
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	
27-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
28-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
29-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

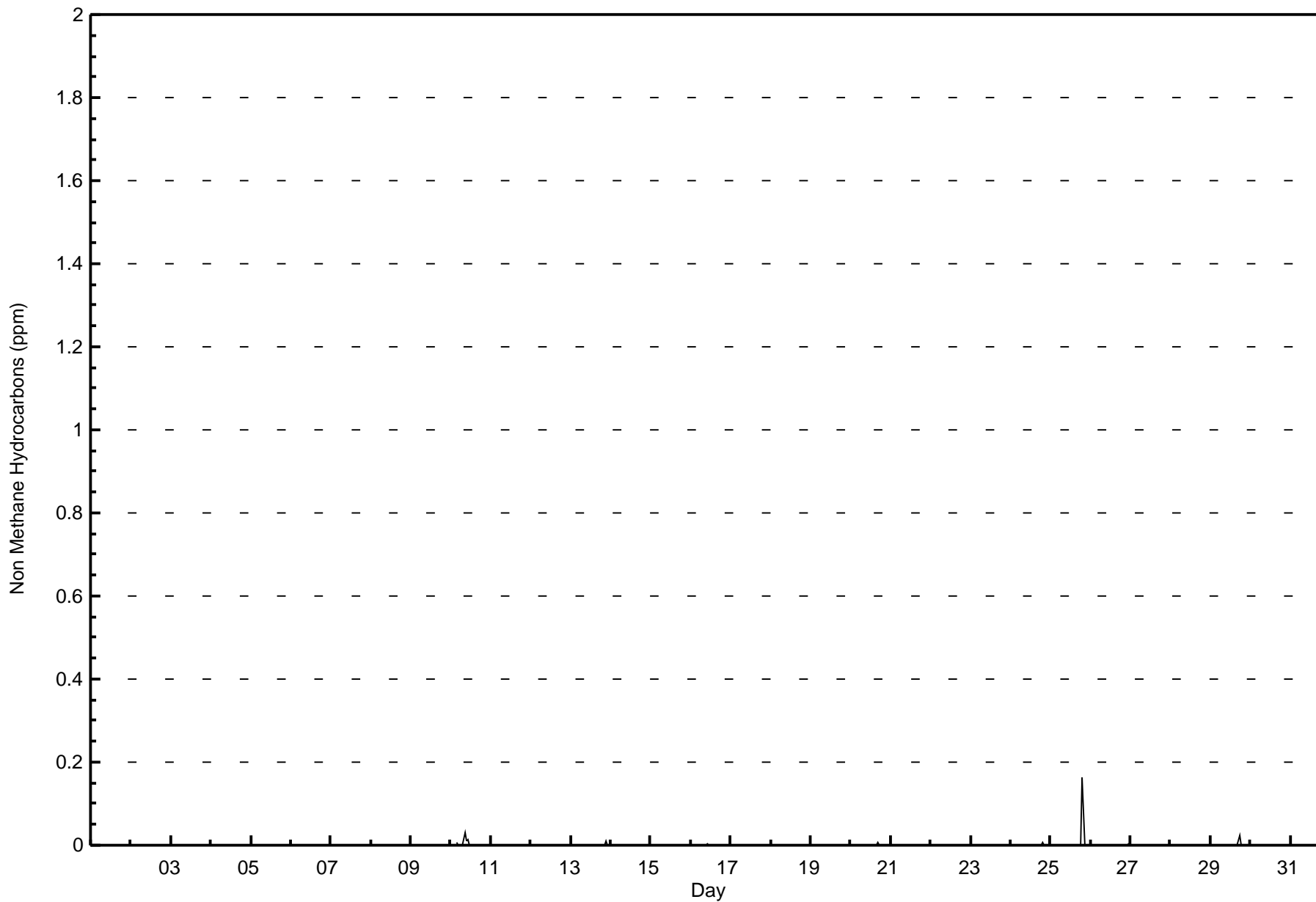
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0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.002	0.001	0.032	0.012	0.013	0.000	0.002	0.000	0.000	0.000	0.006	0.025	0.000	0.163	0.001	0.009	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	Diurnal Maximum	

Z - zerospan C - Calibration



Wood Buffalo Environmental Association
Hourly Averages

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	701	98.87	98.87
0.006 - 0.05	7	0.99	99.86
0.06 - 0.1	0	0.00	99.86
> 0.1	1	0.14	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	25	24	11	9	4	15	18	39	63	72	110	28	45	49	145	37	694
0.006 - 0.05	0	0	0	0	1	0	1	0	3	2	0	0	0	0	0	0	7
0.06 - 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 0.1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

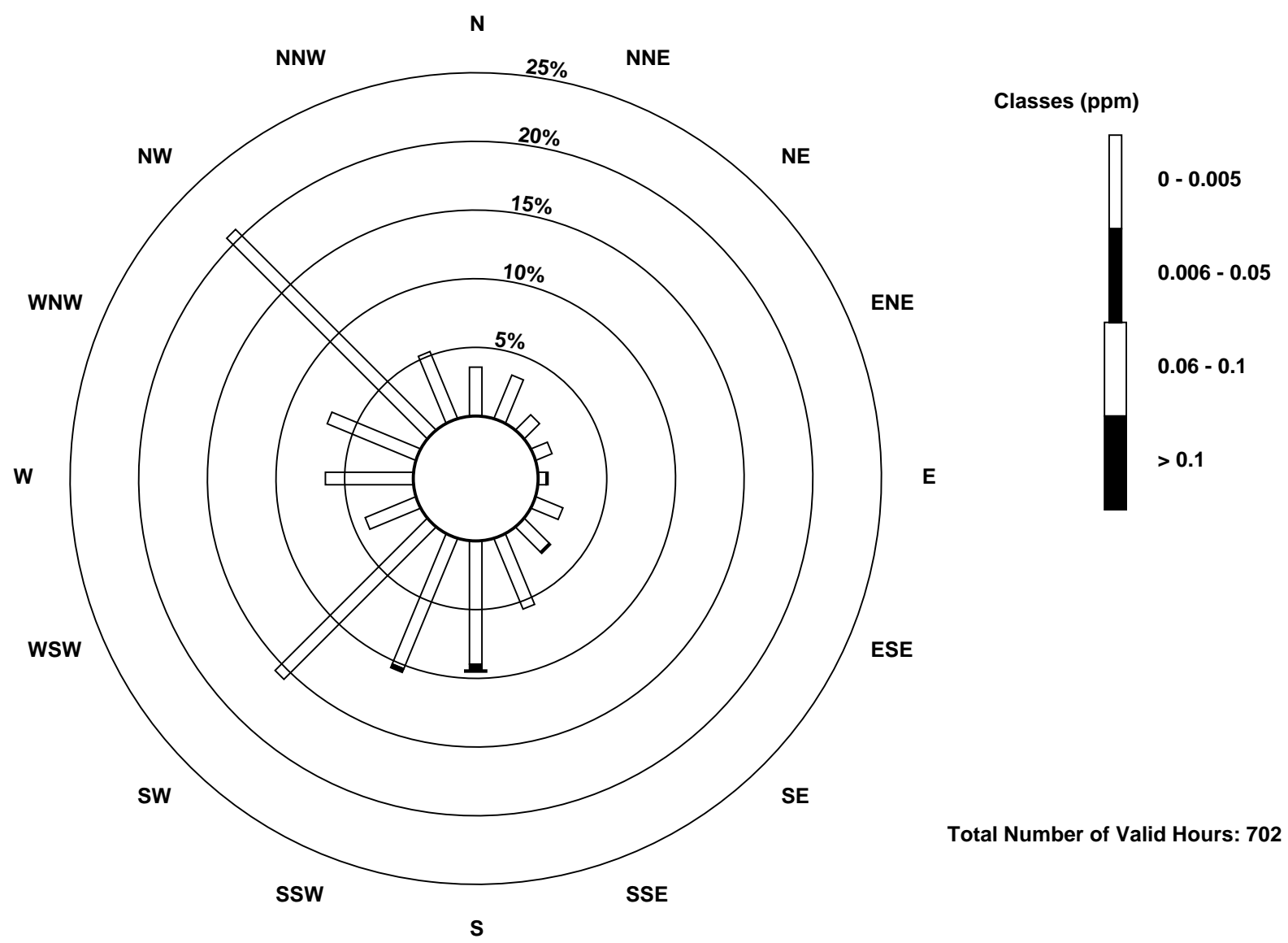
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community (AMS 21)

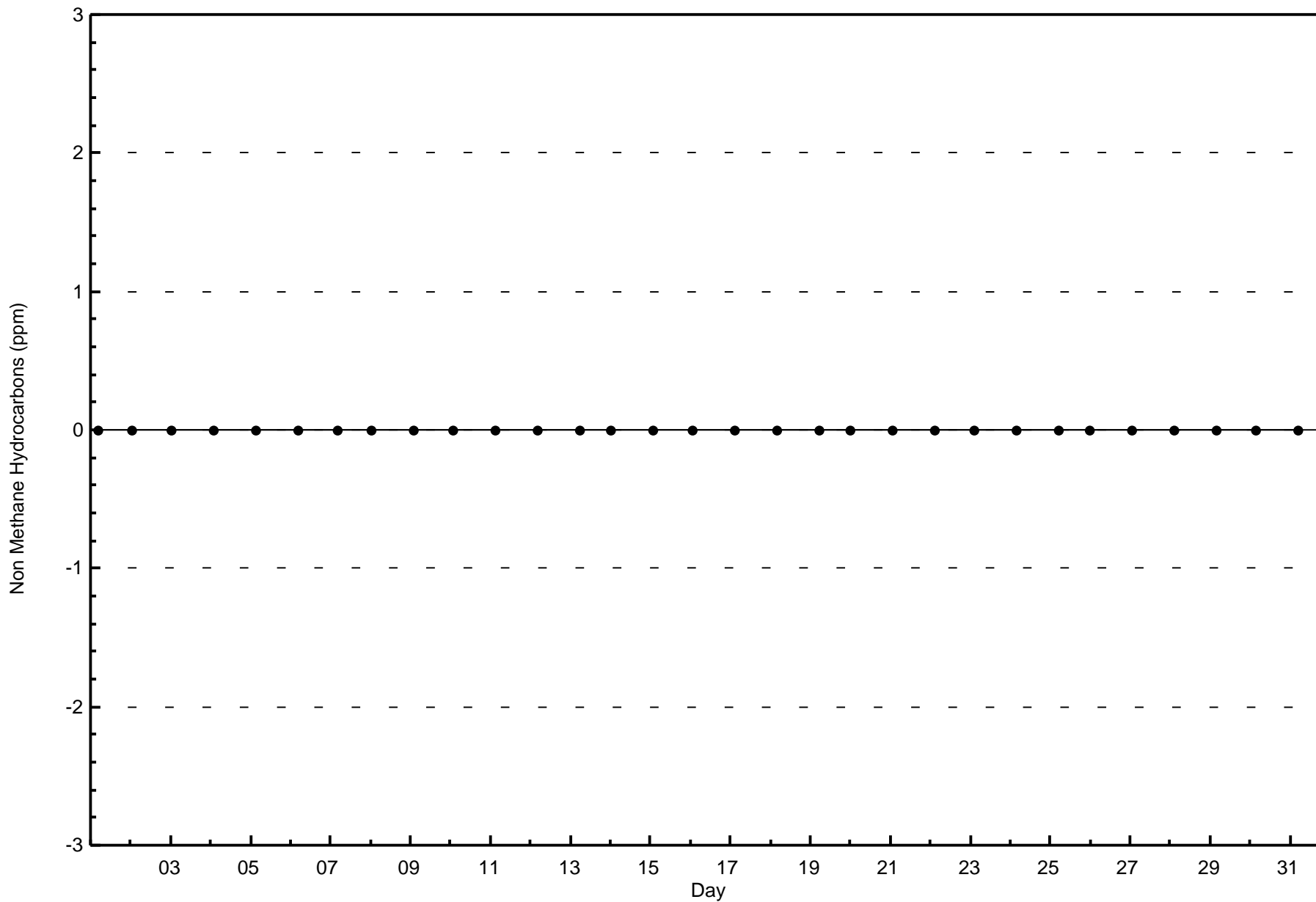


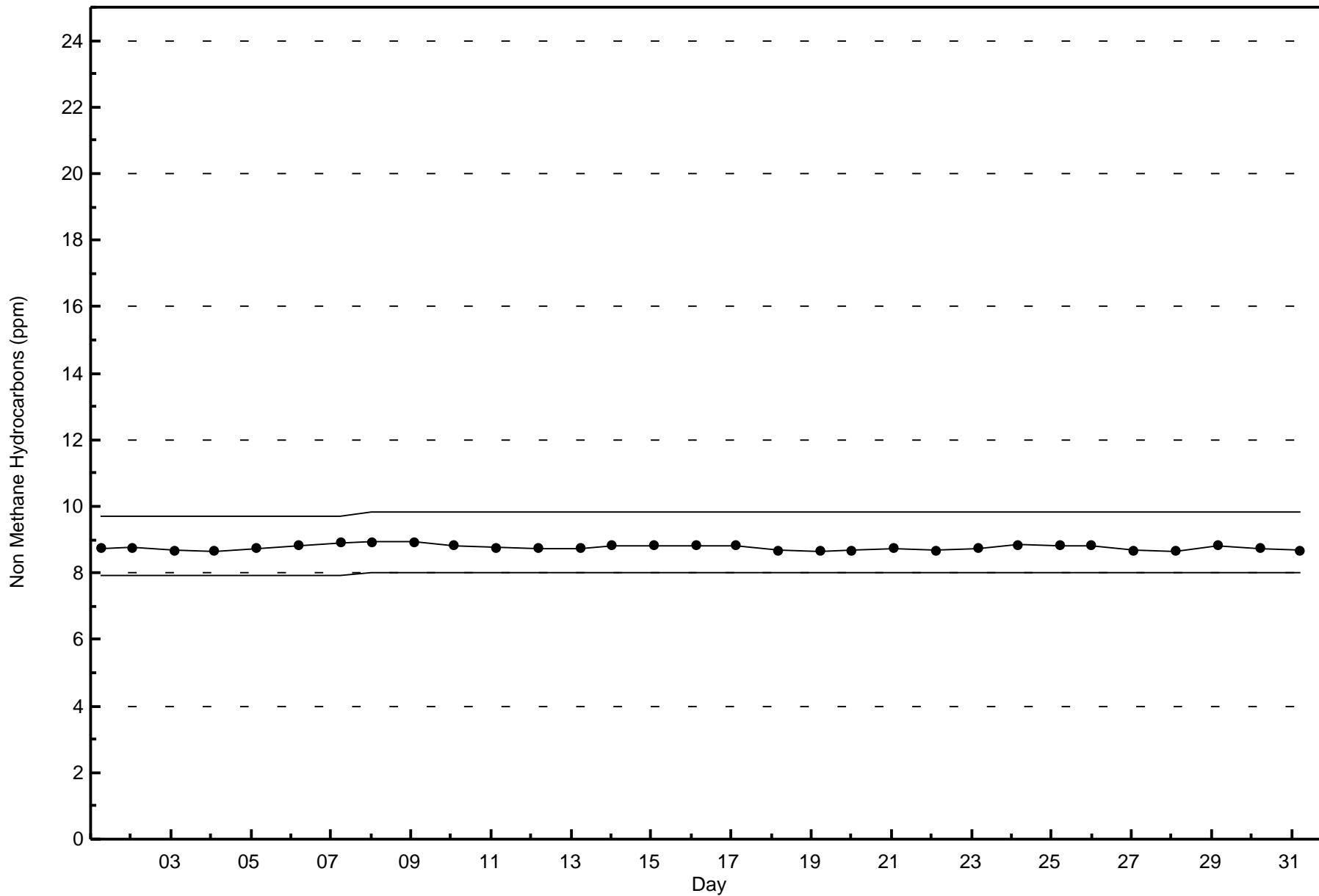
Total Number of Valid Hours: 702



Wood Buffalo Environmental Association
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - December 2016







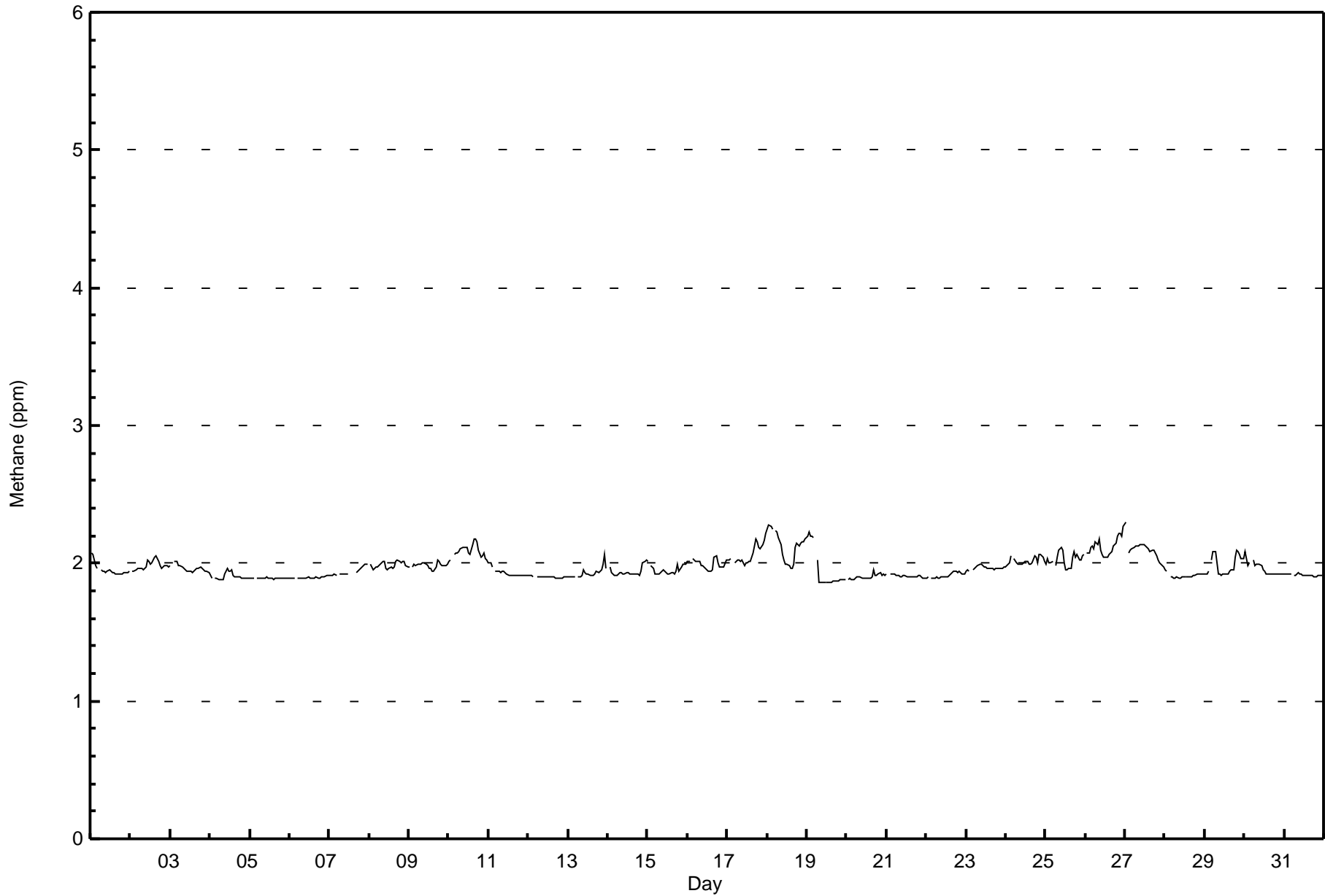
Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

Conklin Community - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744																																					
Maximum Value: 2.3 ppm on Dec 27 01:00														Maximum Daily Average: 2.1 ppm on Dec 26																																					
Minimum Value: 1.9 ppm on Dec 19 14:00														Minimum Daily Average: 1.9 ppm on Dec 5																																					
Maximum Diurnal Average: 2.0 ppm at hour 1														Minimum Diurnal Average: 1.9 ppm at hour 14																																					
Monthly Average: 1.97 ppm														Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2																																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																											
1-Dec	2.1	2.1	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1																									
2-Dec	Z	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
3-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0																								
4-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
5-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
6-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
7-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
8-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
9-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
10-Dec	2.0	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.0	2.1	2.1	2.0	2.0	2.1	2.2	2.2																								
11-Dec	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
13-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.0	1.9	2.1	2.1																								
14-Dec	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0																								
15-Dec	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
16-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1																								
17-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.2																								
18-Dec	2.2	2.3	2.3	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.3	2.3																								
19-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.2																								
20-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
21-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
22-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
23-Dec	1.9	2.0	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.0	2.1	2.1																								
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.1																								
26-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.1	2.3																								
27-Dec	2.3	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.3	2.3																								
28-Dec	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
29-Dec	1.9	1.9	1.9	Z	2.0	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.1	2.1																								
30-Dec	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1																								
31-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
																								2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Diurnal Average	
																								2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	Diurnal Maximum
Z - zerospan C - Calibration																																																			





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - December 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	601	84.77	84.77
2.1 - 3.0	108	15.23	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - December 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	19	21	9	7	4	12	11	31	39	56	95	26	44	47	143	32	596
2.1 - 3.0	6	3	2	2	1	3	8	8	28	18	15	2	1	2	2	5	106
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

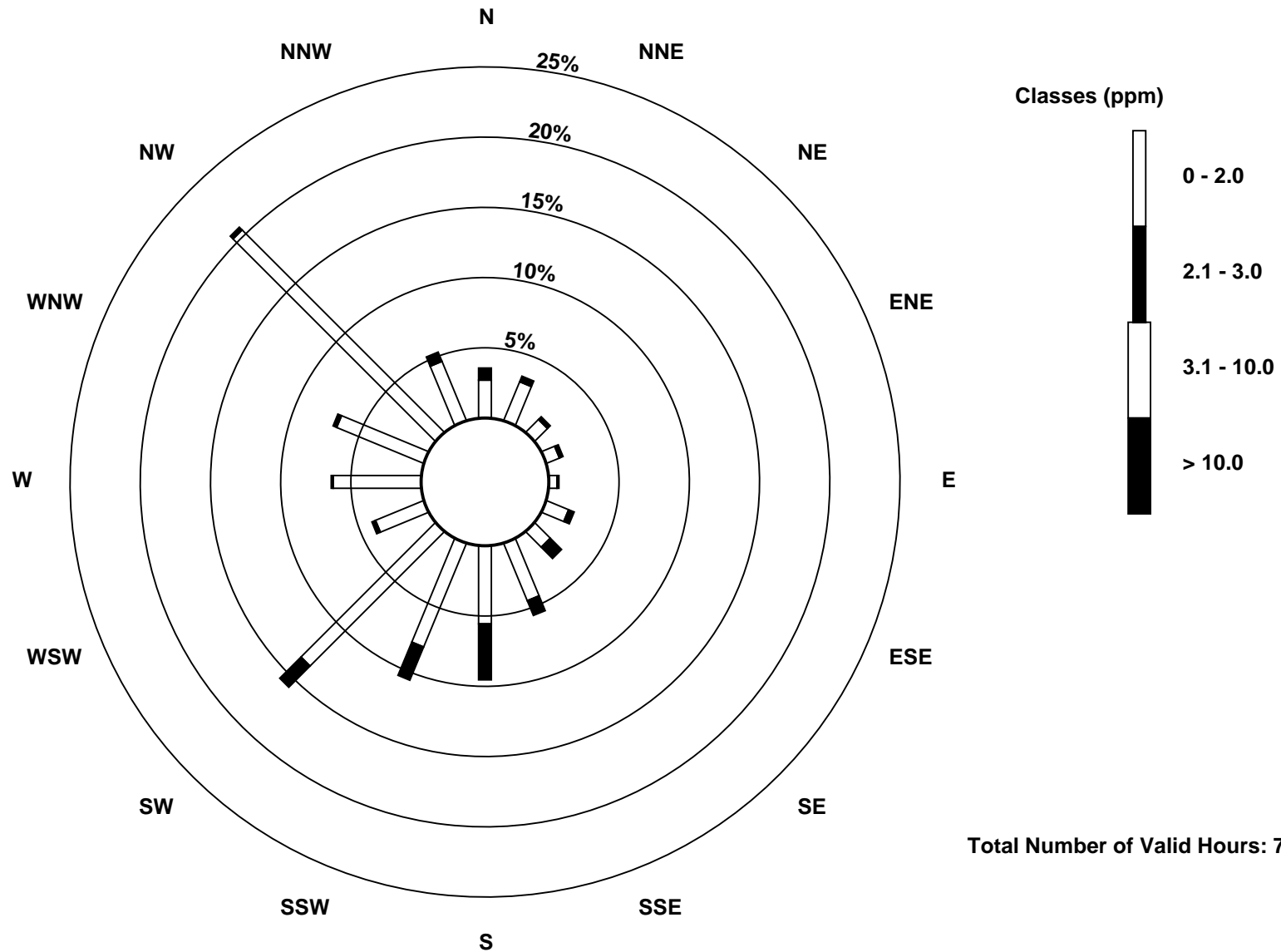
Total Number of Valid Hours: 702

Total Number of Hours: 744

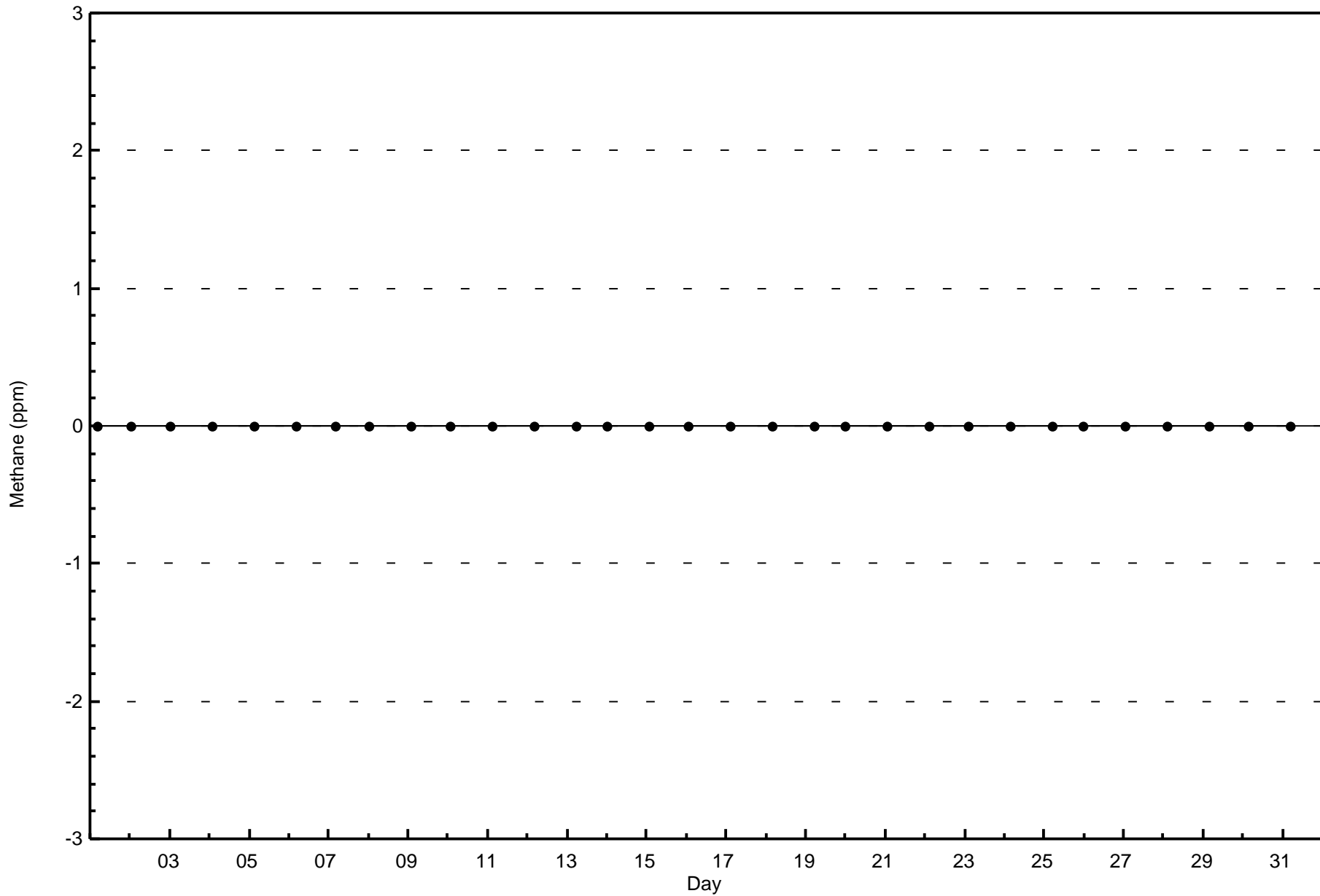


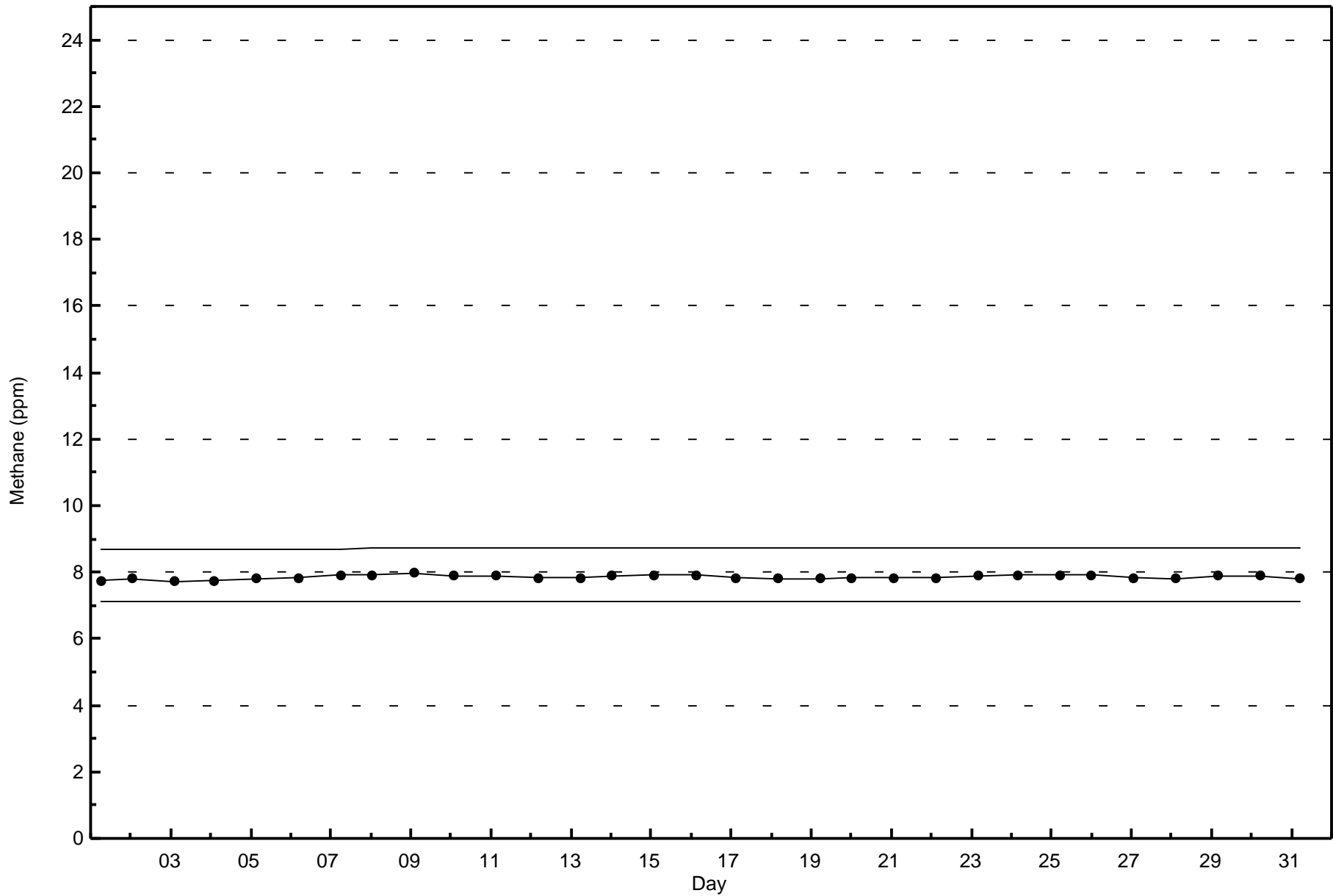
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Methane (CH₄) - ppm
Conklin Community (AMS 21)



Total Number of Valid Hours: 702







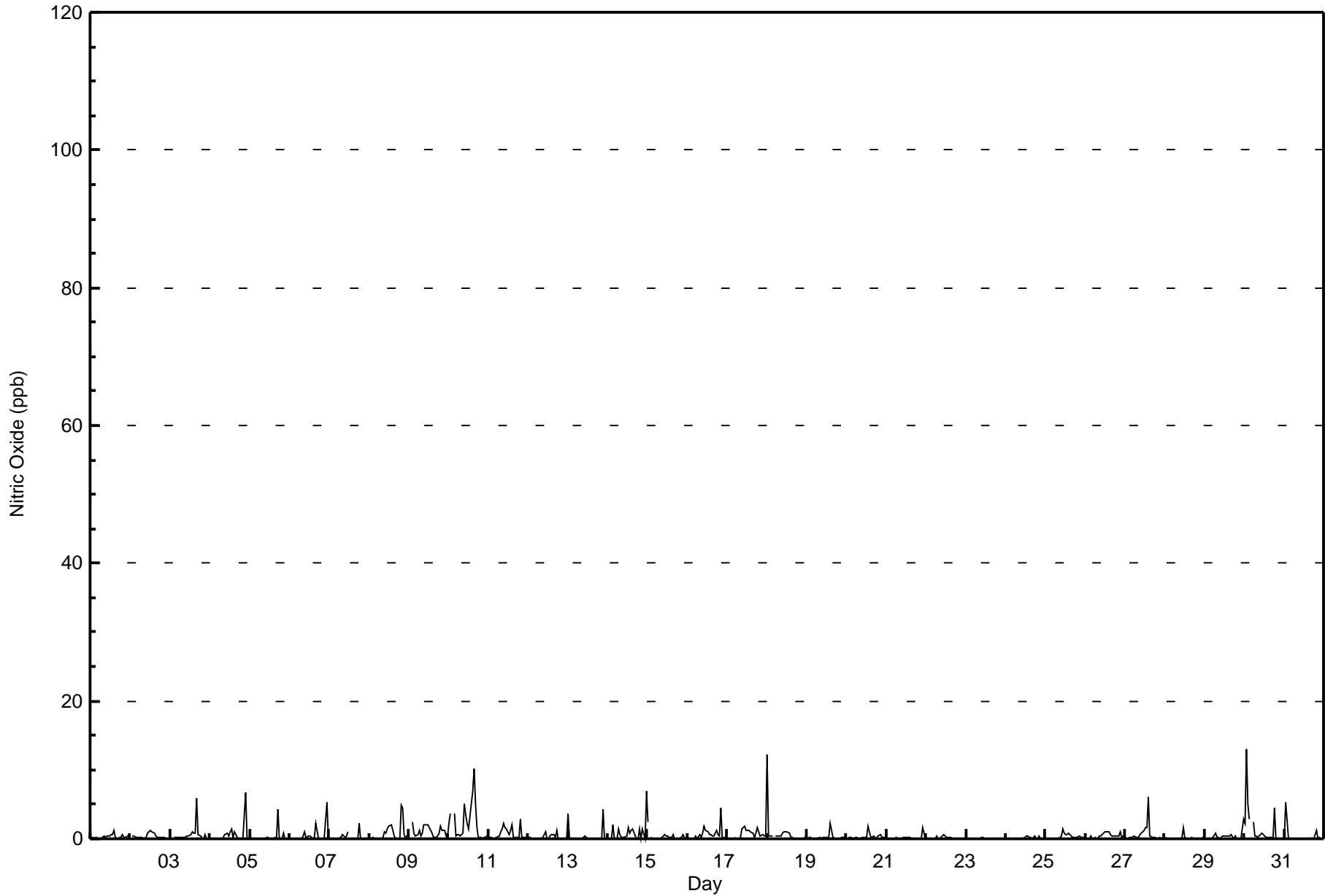
Maximum Value: 13 ppb on Dec 30 02:00																		Maximum Daily Average: 2.3 ppb on Dec 10																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 4 18:00																		Minimum Daily Average: 0.0 ppb on Dec 23																		Hours of Data: 709			
Maximum Diurnal Average: 1.0 ppb at hour 15																		Minimum Diurnal Average: 0.1 ppb at hour 5																		Hours of Missing Data: 35			
Monthly Average: 0.5 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 6																		Hours of Calibration: 35			
																																				Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0.3	1													
2-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1													
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	6	1	0	0	0	1	0	0	0.6	6														
4-Dec	0	0	Z	0	0	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0	7	0	0	0.6	7														
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0.3	4														
6-Dec	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	5	0	0.5	5														
7-Dec	0	0	0	0	0	Z	0	0	1	0	0	1	C	C	C	C	0	0	2	0	0	0	0	0.3	2														
8-Dec	Z	0	0	0	0	0	0	0	0	1	1	2	2	2	1	1	0	0	0	5	4	1	0	0.9	5														
9-Dec	0	Z	3	1	0	1	1	0	1	2	2	2	2	1	1	0	0	0	1	2	1	1	0	1.0	3														
10-Dec	2	4	Z	4	0	1	1	0	1	5	4	2	1	3	7	10	5	2	0	0	0	0	0	2.3	10														
11-Dec	0	0	0	Z	0	0	0	1	1	2	2	1	1	1	2	0	0	0	0	3	0	0	0	0.8	3														
12-Dec	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0.2	1														
13-Dec	4	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0.4	4														
14-Dec	Z	0	0	2	0	0	1	1	0	0	0	2	1	1	1	0	0	0	0	1	0	1	0	0.9	7														
15-Dec	2	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0.3	2														
16-Dec	0	0	Z	0	0	0	0	1	0	1	2	1	1	1	1	0	0	1	1	0	5	0	0	0.7	5														
17-Dec	0	0	0	Z	0	0	0	0	0	1	2	1	1	1	1	1	0	1	2	1	1	1	0	0.6	2														
18-Dec	12	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.9	12														
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0.3	2														
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0.3	2														
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.2	2														
22-Dec	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1														
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0														
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0														
25-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.3	1														
26-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	1	0	0.4	1														
27-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	2	2	6	0	0	0	0	0	0	0	0	0.7	6														
28-Dec	0	0	Z	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2														
29-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0.3	3														
30-Dec	2	13	5	3	Z	2	0	0	0	0	1	1	0	0	0	0	0	0	4	0	0	0	0	1.5	13														
31-Dec	0	5	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	5														
0.9																		0.9																		Diurnal Average			
12																		13																		Diurnal Maximum			
0.4																		0.4																					
0.1																		0.2																					
0.2																		0.2																					
0.2																		0.2																					
0.6																		0.6																					
0.8																		0.7																					
0.7																		0.7																					
0.8																		1.0																					
0.7																		0.7																					
0.8																		1.0																					
0.7																		0.7																					
0.6																		0.6																					
0.4																		0.4																					
0.4																		0.4																					
0.5																		0.5																					
0.5																		0.5																					
0.6																		0.3																					
0.3																		0.4																					

Z - zerospan C - Calibration



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

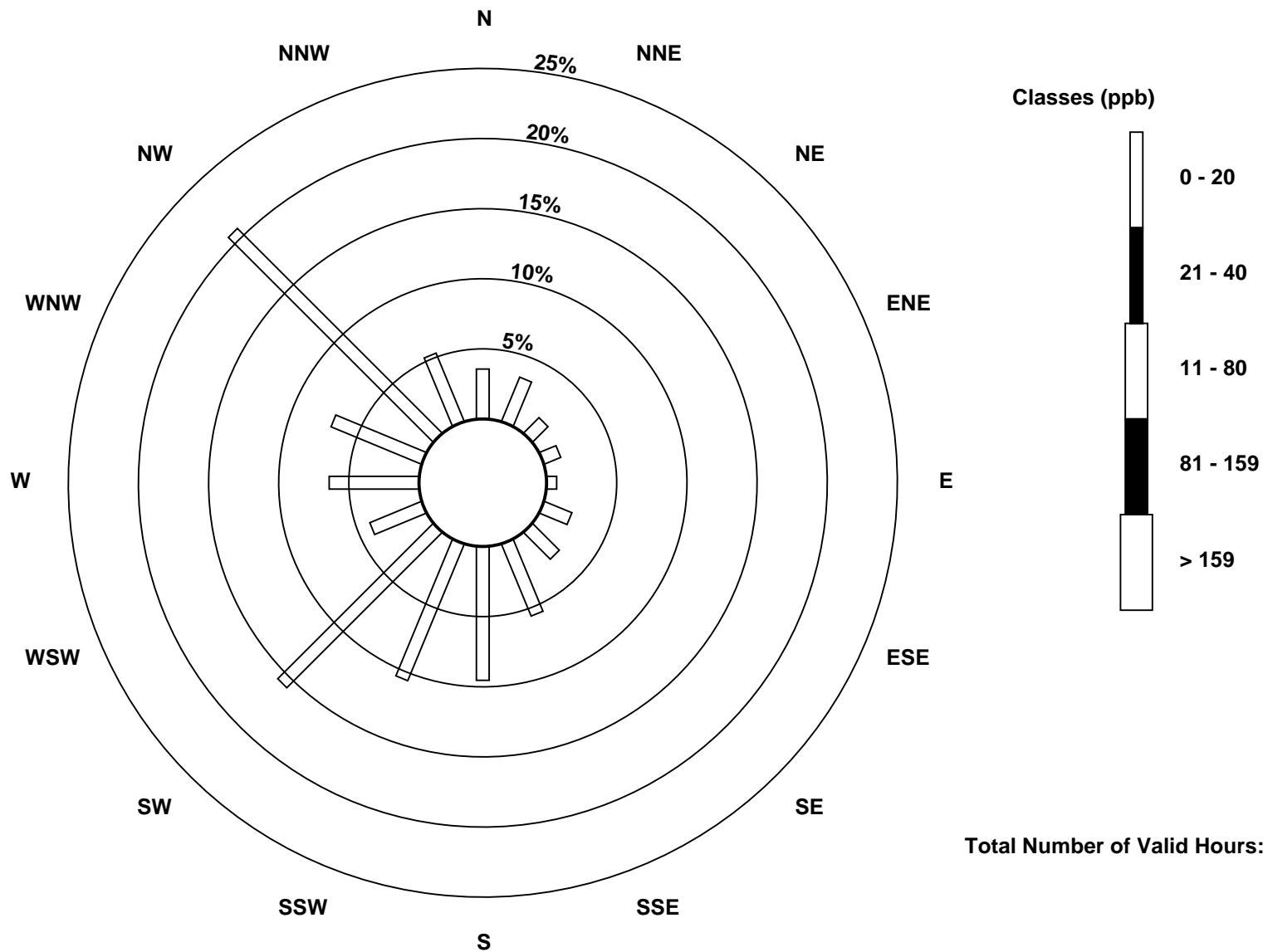
Total Number of Valid Hours: 702

Total Number of Hours: 744

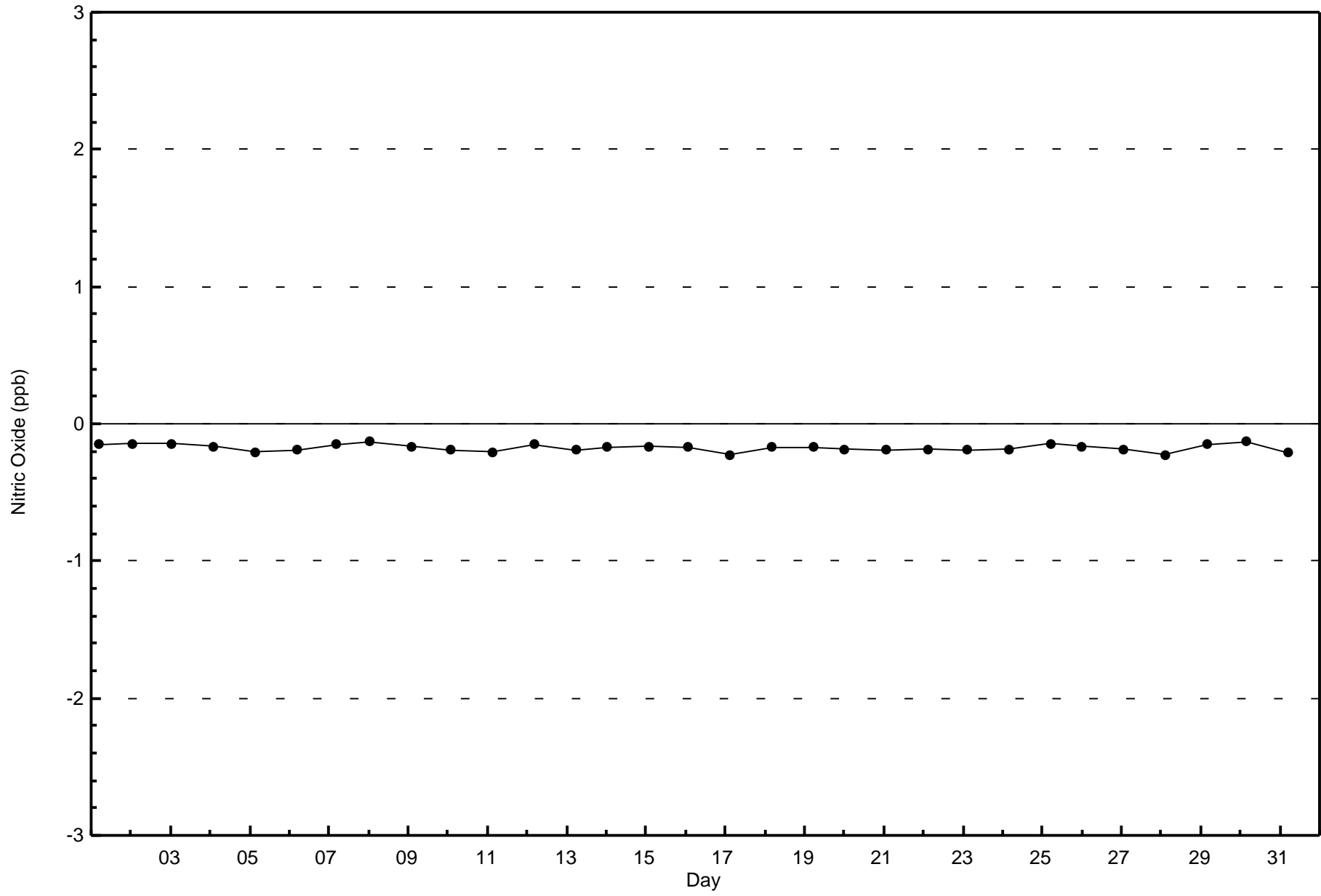


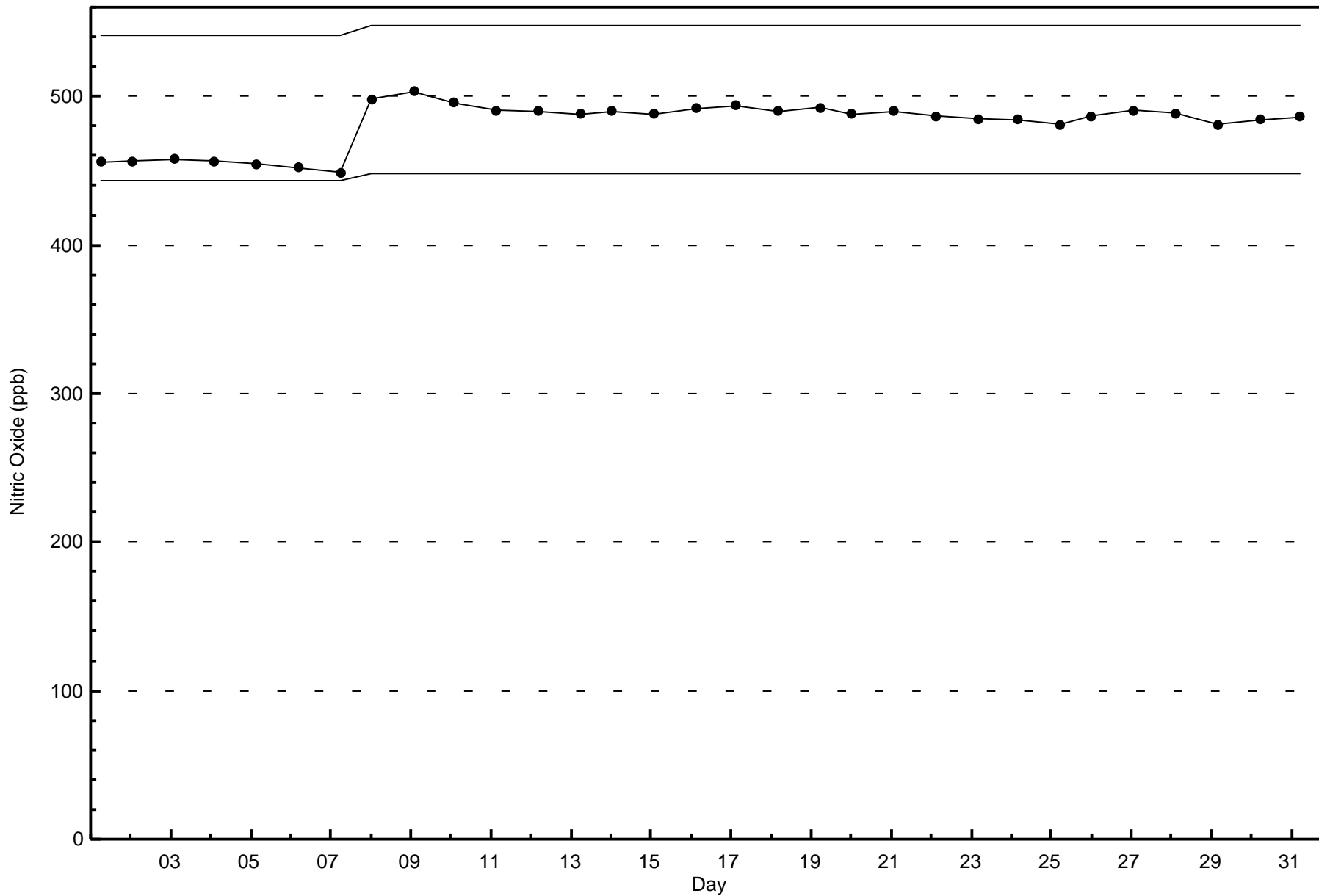
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitric Oxide (NO) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 702







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 19 ppb on Dec 18 04:00	Maximum Daily Average: 9.6 ppb on Dec 18
Minimum Value: 0 ppb on Dec 6 21:00	Hours of Data: 709
Maximum Diurnal Average: 4.3 ppb at hour 4	Hours of Missing Data: 35
Monthly Average: 3.2 ppb	Hours of Calibration: 35
Minimum Daily Average: 0.7 ppb on Dec 5	Percent Operational Time: 100.0
Minimum Diurnal Average: 2.0 ppb at hour 12	
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 7 P ₉₉ = 15	

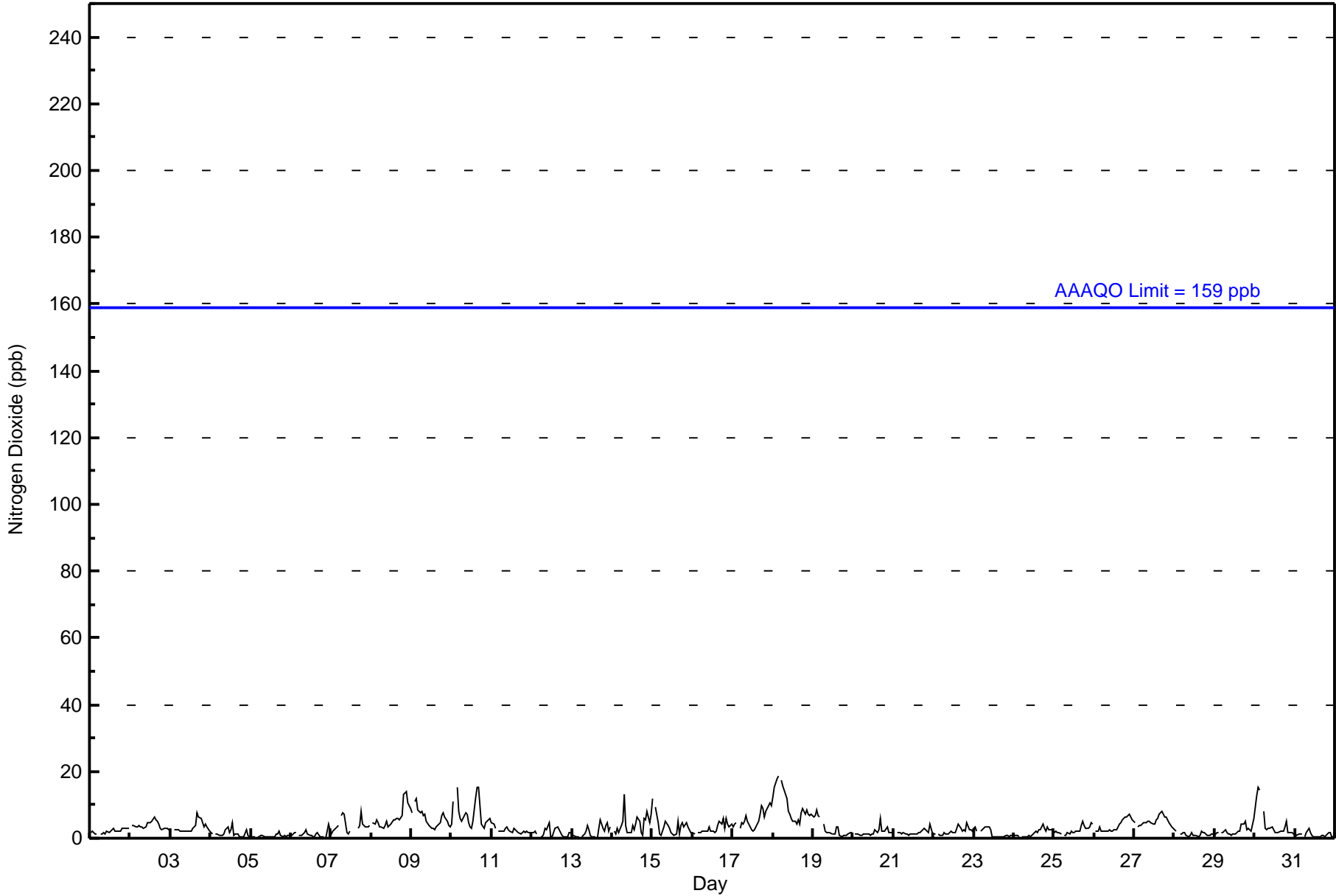
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	2	1	1	Z	1	1	2	1	2	2	2	3	3	2	2	2	2	3	3	3	3	3	2.1	3
2-Dec	Z	4	4	4	4	4	4	4	3	3	5	5	5	5	6	6	5	4	3	3	3	3	3	3	3.9	6
3-Dec	3	Z	3	3	2	2	2	2	2	2	2	2	2	3	3	4	8	6	6	5	4	4	3	2	3.3	8
4-Dec	2	1	Z	1	1	1	1	1	1	1	3	4	2	3	5	1	1	1	1	0	1	3	1	1	1.5	5
5-Dec	1	1	1	Z	1	1	1	1	0	0	0	0	0	0	1	1	1	2	1	0	1	0	1	1	0.7	2
6-Dec	1	1	2	2	Z	1	1	1	2	3	1	1	1	1	1	1	2	1	0	0	0	0	4	2	1.2	4
7-Dec	1	2	3	3	4	Z	7	8	7	2	1	2	C	C	C	C	3	4	8	4	4	4	3	4	3.8	8
8-Dec	Z	5	4	6	5	4	3	3	4	5	4	4	4	5	6	6	6	5	7	13	13	14	11	9	6.3	14
9-Dec	8	Z	11	12	9	8	8	7	7	5	4	3	3	3	3	4	4	5	7	8	7	5	4	3	5.9	12
10-Dec	4	11	Z	15	8	6	5	6	8	7	5	3	3	5	12	15	15	10	4	3	5	5	5	6	7.3	15
11-Dec	5	4	3	Z	2	2	2	2	3	3	3	2	2	3	3	2	2	1	2	2	2	2	2	2	2.4	5
12-Dec	2	2	2	1	Z	0	0	1	3	3	5	1	1	2	3	4	3	2	1	0	1	1	2	2	1.7	5
13-Dec	1	1	0	0	0	Z	0	1	2	4	3	1	1	0	0	0	3	6	3	2	4	5	2	3	1.8	6
14-Dec	Z	2	1	3	2	4	5	13	4	2	2	4	3	4	6	5	2	1	6	5	8	5	7	4	4.1	13
15-Dec	12	Z	9	5	1	1	2	3	5	4	3	2	2	1	1	5	1	4	5	3	5	4	3	2	3.5	12
16-Dec	2	1	Z	2	2	2	2	2	2	2	3	2	2	2	2	4	5	4	6	3	6	4	3	4	3.0	6
17-Dec	3	4	5	Z	3	5	4	5	7	5	3	2	2	3	3	5	7	10	9	6	8	10	11	10	5.6	11
18-Dec	12	15	18	19	Z	17	16	14	12	8	7	6	5	5	4	6	4	8	9	7	9	7	7	7	9.6	19
19-Dec	6	7	9	7	6	Z	4	2	2	2	2	1	1	1	3	3	1	1	1	1	1	1	2	2	2.8	9
20-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	3	2	3	6	2	2	2	3	2	2	2	1.8	6
21-Dec	2	Z	2	2	2	1	2	1	1	1	1	1	1	1	1	2	2	2	3	3	2	2	4	1	1.7	4
22-Dec	1	1	Z	1	1	1	2	1	1	1	2	2	2	2	3	4	3	2	2	2	5	3	3	2	2.1	5
23-Dec	3	4	2	Z	2	3	3	3	4	4	3	1	1	0	0	0	1	0	0	1	1	1	1	1	1.6	4
24-Dec	1	1	1	1	Z	1	1	0	1	1	1	1	2	2	2	2	3	4	3	2	3	3	2	3	1.7	4
25-Dec	2	2	2	2	1	Z	1	1	2	1	2	2	2	2	2	2	4	5	4	3	3	4	5	4	2.4	5
26-Dec	Z	2	2	4	2	2	2	2	2	2	2	2	3	3	3	4	5	5	6	7	7	7	6	5	3.8	7
27-Dec	5	Z	4	4	4	5	5	5	5	5	5	4	4	5	6	7	8	7	6	7	6	5	3	3	5.0	8
28-Dec	2	2	Z	1	1	2	2	1	1	1	2	1	1	1	1	1	2	2	2	1	1	1	1	1	1.3	2
29-Dec	1	2	2	Z	2	2	3	2	1	1	1	1	1	2	2	2	4	4	5	3	3	3	2	6	2.3	6
30-Dec	9	13	15	15	Z	8	3	3	3	3	3	2	2	2	2	2	2	2	4	5	2	2	2	1	4.5	15
31-Dec	1	1	1	1	1	Z	1	2	3	2	1	1	0	0	1	0	1	1	0	1	2	2	1	0	1.0	3
	3.5	3.5	4.1	4.3	2.6	3.2	3.0	3.2	3.2	2.8	2.5	2.0	2.0	2.4	2.8	3.5	3.8	3.7	3.6	3.4	3.7	3.7	3.4	3.3	Diurnal Average	
	12	15	18	19	9	17	16	14	12	8	7	6	5	5	12	15	15	10	9	13	13	14	11	10	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

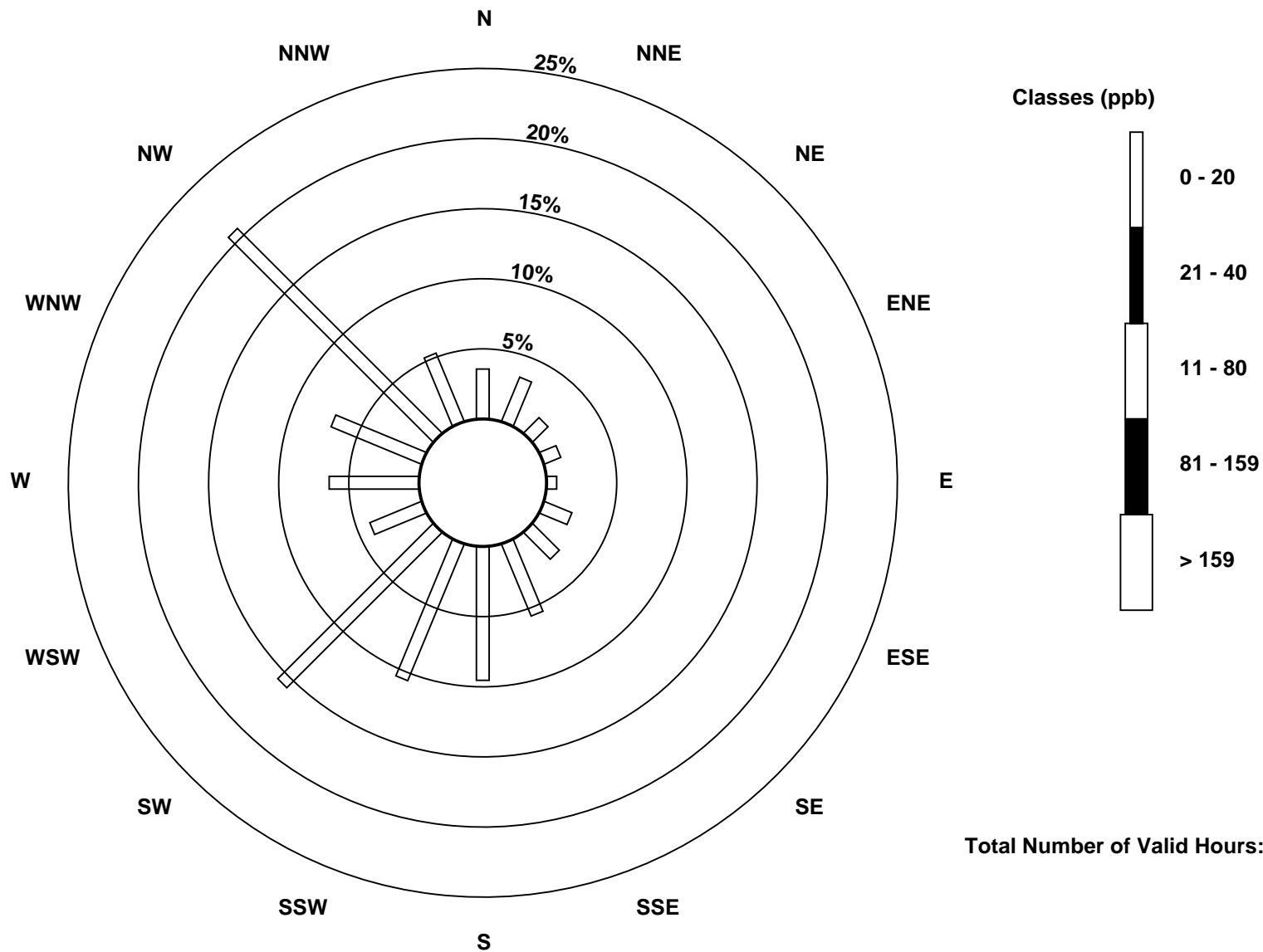
Total Number of Valid Hours: 702

Total Number of Hours: 744

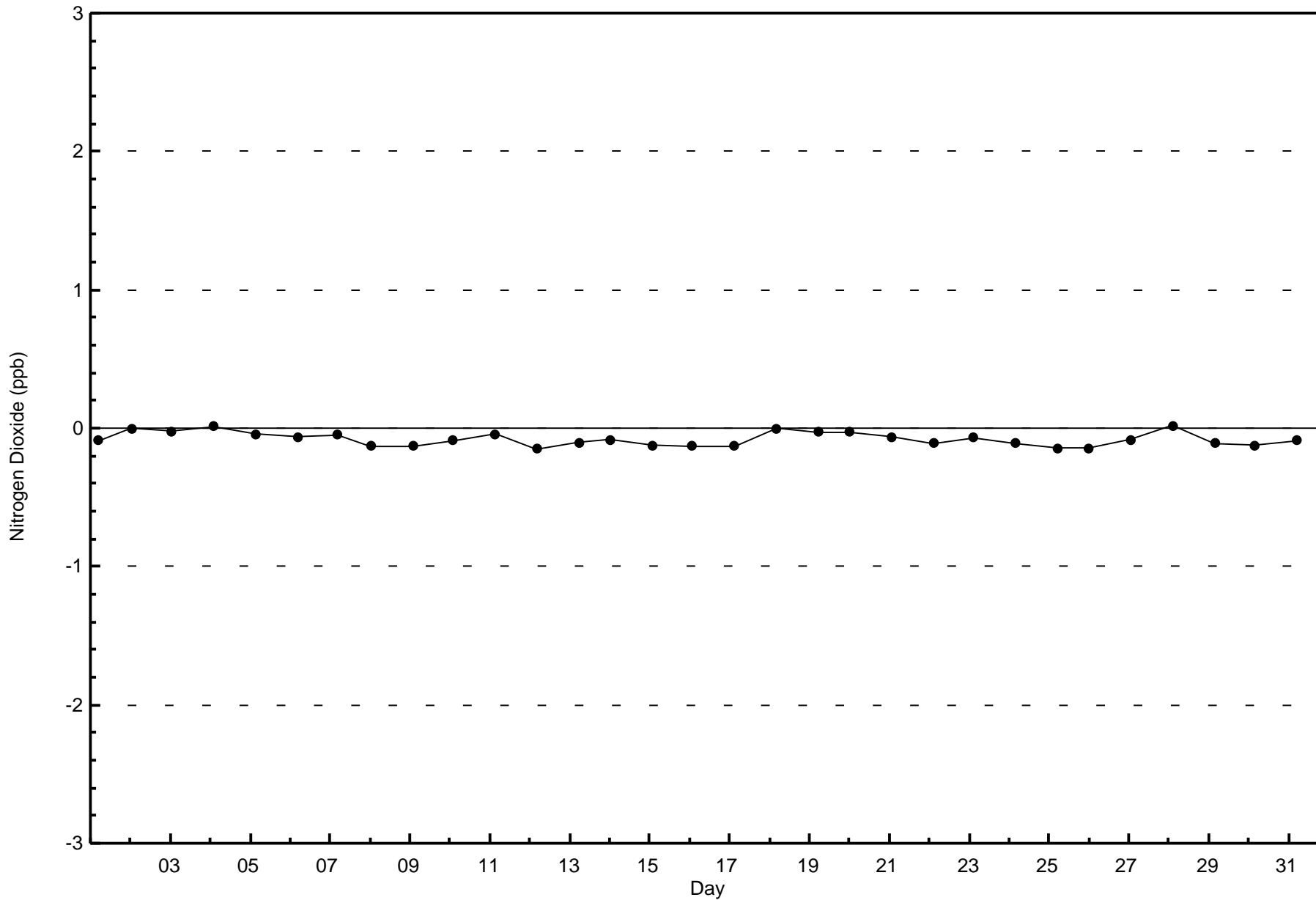


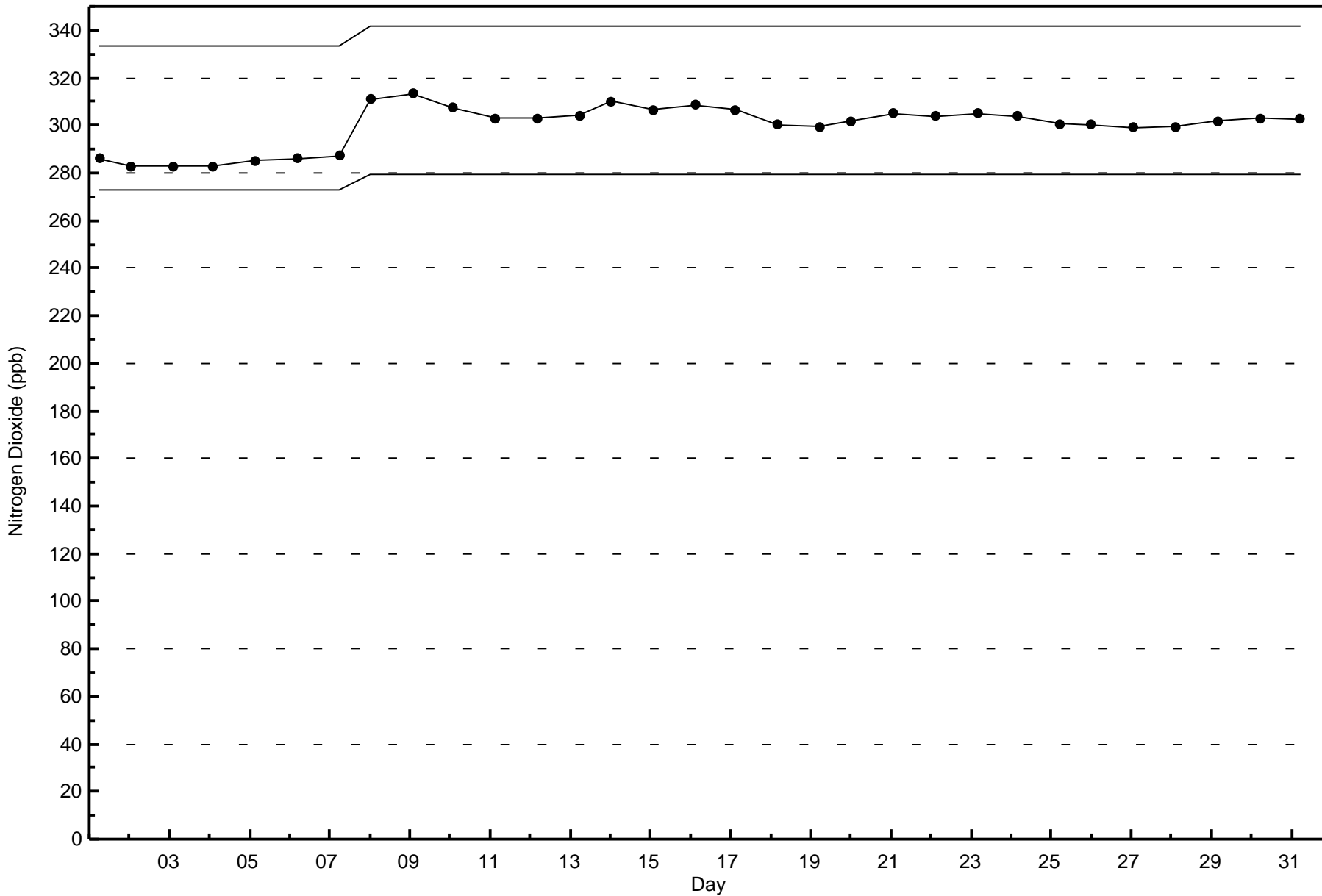
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 702







Wood Buffalo Environmental Association
Summary of Hour Averages

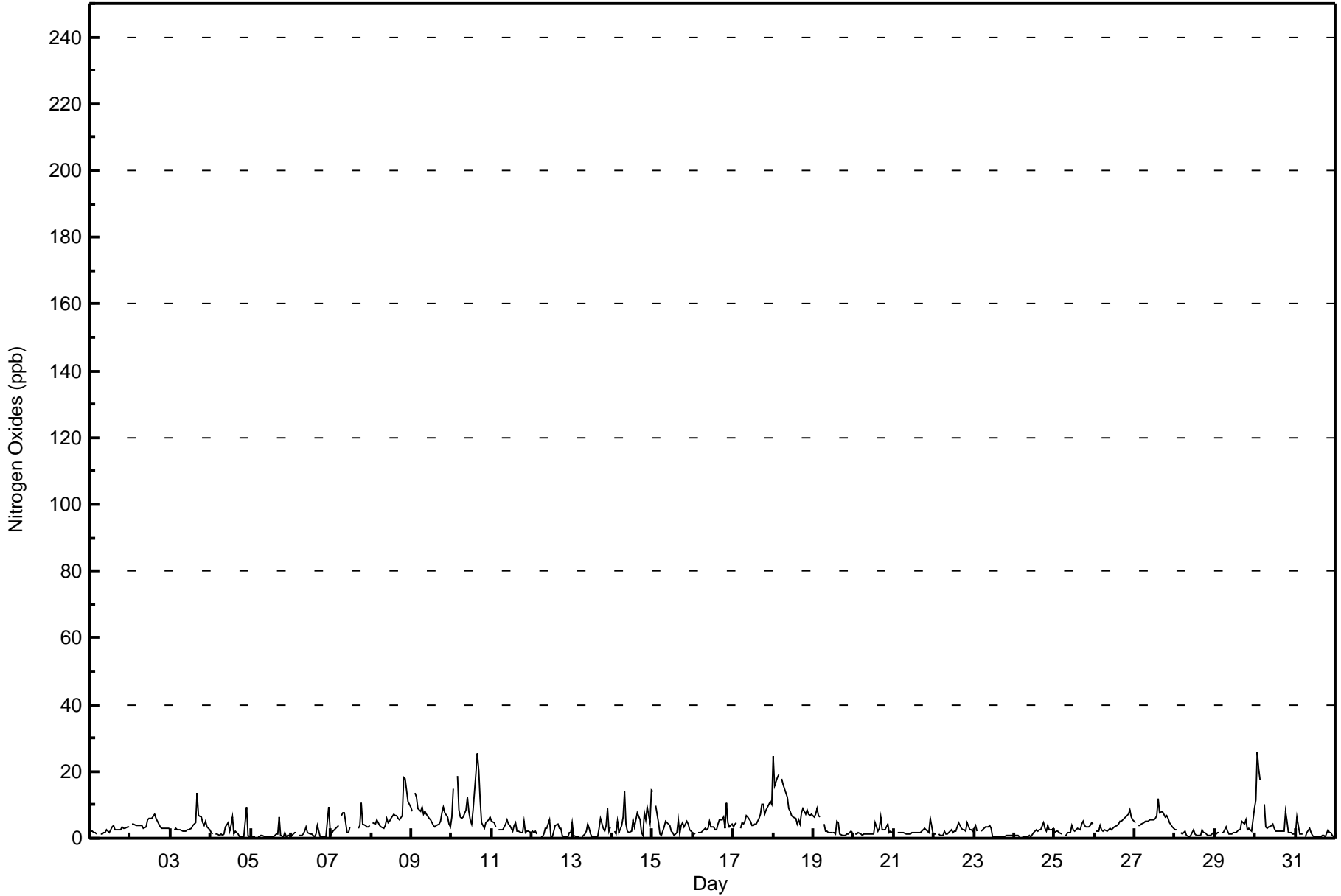
Nitrogen Oxides (NO_x) - ppb
Conklin Community - December 2016

Maximum Value: 26 ppb on Dec 30 02:00		Maximum Daily Average: 10.5 ppb on Dec 18		Hours in Service: 744																																												
Minimum Value: 0 ppb on Dec 6 21:00		Minimum Daily Average: 0.9 ppb on Dec 5		Hours of Data: 709																																												
Maximum Diurnal Average: 4.8 ppb at hour 4		Minimum Diurnal Average: 2.7 ppb at hour 5		Hours of Missing Data: 35																																												
Monthly Average: 3.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 7 P ₉₉ = 19		Hours of Calibration: 35																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	2	2	2	2	1	Z	1	1	2	2	2	2	3	3	4	2	2	3	2	3	3	3	3	3	2.4	4																						
2-Dec	Z	4	4	4	4	4	4	4	3	4	5	6	6	6	7	6	5	4	3	3	3	3	3	3	4.3	7																						
3-Dec	3	Z	3	3	3	3	2	2	2	2	2	3	4	4	5	14	7	6	5	4	5	3	2	3.9	14																							
4-Dec	2	1	Z	1	1	1	1	1	1	2	3	4	2	4	6	1	2	1	1	0	0	9	1	1	2.0	9																						
5-Dec	1	1	1	Z	1	1	1	1	0	0	1	1	0	0	1	1	1	6	1	0	2	0	1	1	0.9	6																						
6-Dec	1	1	2	2	Z	1	1	1	2	3	2	1	1	1	1	1	4	1	0	0	0	0	9	2	1.7	9																						
7-Dec	1	2	3	3	4	Z	7	8	8	2	2	3	C	C	C	C	3	4	11	4	4	4	3	4	4.1	11																						
8-Dec	Z	5	4	6	5	4	3	3	4	6	5	5	6	7	7	7	6	5	7	18	18	15	11	9	7.2	18																						
9-Dec	8	Z	14	12	9	8	9	7	8	7	6	5	5	4	4	4	4	5	7	9	8	6	4	3	6.9	14																						
10-Dec	7	15	Z	19	9	6	6	6	9	12	8	6	4	8	19	26	21	11	5	3	5	5	6	6	9.6	26																						
11-Dec	5	5	3	Z	2	3	3	3	4	6	4	4	2	4	5	2	2	2	2	5	2	2	2	2	3.2	6																						
12-Dec	2	2	2	1	Z	0	0	1	3	3	5	0	0	2	4	4	3	3	1	0	1	1	2	2	1.9	5																						
13-Dec	5	1	0	0	0	Z	0	1	2	4	3	1	1	0	0	0	3	6	3	2	4	9	2	3	2.2	9																						
14-Dec	Z	2	1	5	2	4	7	14	4	2	2	2	5	3	5	8	5	2	1	7	5	9	5	14	5.0	14																						
15-Dec	14	Z	10	5	1	1	2	3	5	4	4	2	2	2	1	2	6	1	4	5	3	5	4	3	2	3.8	14																					
16-Dec	2	1	Z	2	2	2	2	3	3	3	5	4	3	2	3	4	5	6	6	3	10	5	3	4	3.6	10																						
17-Dec	3	4	5	Z	3	4	4	5	7	6	5	4	4	4	4	6	7	10	10	7	9	10	11	10	6.3	11																						
18-Dec	24	16	18	19	Z	18	16	15	12	9	8	7	6	6	4	6	4	7	9	7	8	7	7	7	10.5	24																						
19-Dec	6	7	9	7	6	Z	4	2	2	2	2	2	2	1	5	4	1	1	1	1	1	1	2	2	3.1	9																						
20-Dec	Z	1	1	2	1	1	1	1	1	1	1	1	1	5	2	3	6	2	2	2	4	2	2	2	2.1	6																						
21-Dec	2	Z	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	3	3	2	2	6	1	1.9	6																						
22-Dec	1	1	Z	1	1	1	2	1	1	1	3	2	2	2	3	5	3	2	2	2	5	3	2	2	2.2	5																						
23-Dec	3	4	2	Z	2	3	3	3	4	4	3	1	1	0	0	0	1	0	0	1	1	1	1	1	1.7	4																						
24-Dec	1	1	1	1	Z	1	0	0	1	1	1	2	2	2	2	3	3	5	3	2	4	3	2	3	1.8	5																						
25-Dec	2	2	2	2	1	Z	1	1	2	2	4	3	2	3	3	2	4	5	4	3	4	4	5	4	2.7	5																						
26-Dec	Z	2	2	4	2	2	2	2	2	3	3	3	3	4	4	5	5	6	6	7	7	8	7	6	4.2	8																						
27-Dec	5	Z	4	4	4	5	5	5	5	6	5	6	6	7	12	8	8	7	7	7	6	5	4	3	5.7	12																						
28-Dec	3	3	Z	2	1	2	2	1	1	1	2	3	1	1	1	1	2	2	2	1	1	1	1	1	1.4	3																						
29-Dec	1	2	2	Z	2	2	3	2	1	1	1	2	2	2	2	3	5	4	6	3	3	3	2	9	2.7	9																						
30-Dec	11	26	21	18	Z	10	4	3	3	3	4	3	2	2	2	2	2	2	8	5	2	2	1	1	6.0	26																						
31-Dec	1	6	1	1	1	Z	1	2	3	2	1	1	0	0	1	0	1	1	0	3	2	2	1	0	1.3	6																						
																								4.4	4.5	4.5	4.8	2.7	3.5	3.2	3.4	3.4	3.4	3.3	2.7	2.7	3.2	3.8	4.3	4.4	4.0	4.0	3.9	4.2	4.3	3.7	3.7	Diurnal Average
																								24	26	21	19	9	18	16	15	12	12	8	7	6	8	19	26	21	11	11	18	18	15	11	14	Diurnal Maximum
Z - zerospan C - Calibration																																																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	99.29	99.29
21 - 40	5	0.71	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	25	24	11	9	5	15	19	39	66	70	110	28	45	49	145	37	697
21 - 40	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	5
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	24	11	9	5	15	19	39	67	74	110	28	45	49	145	37	702

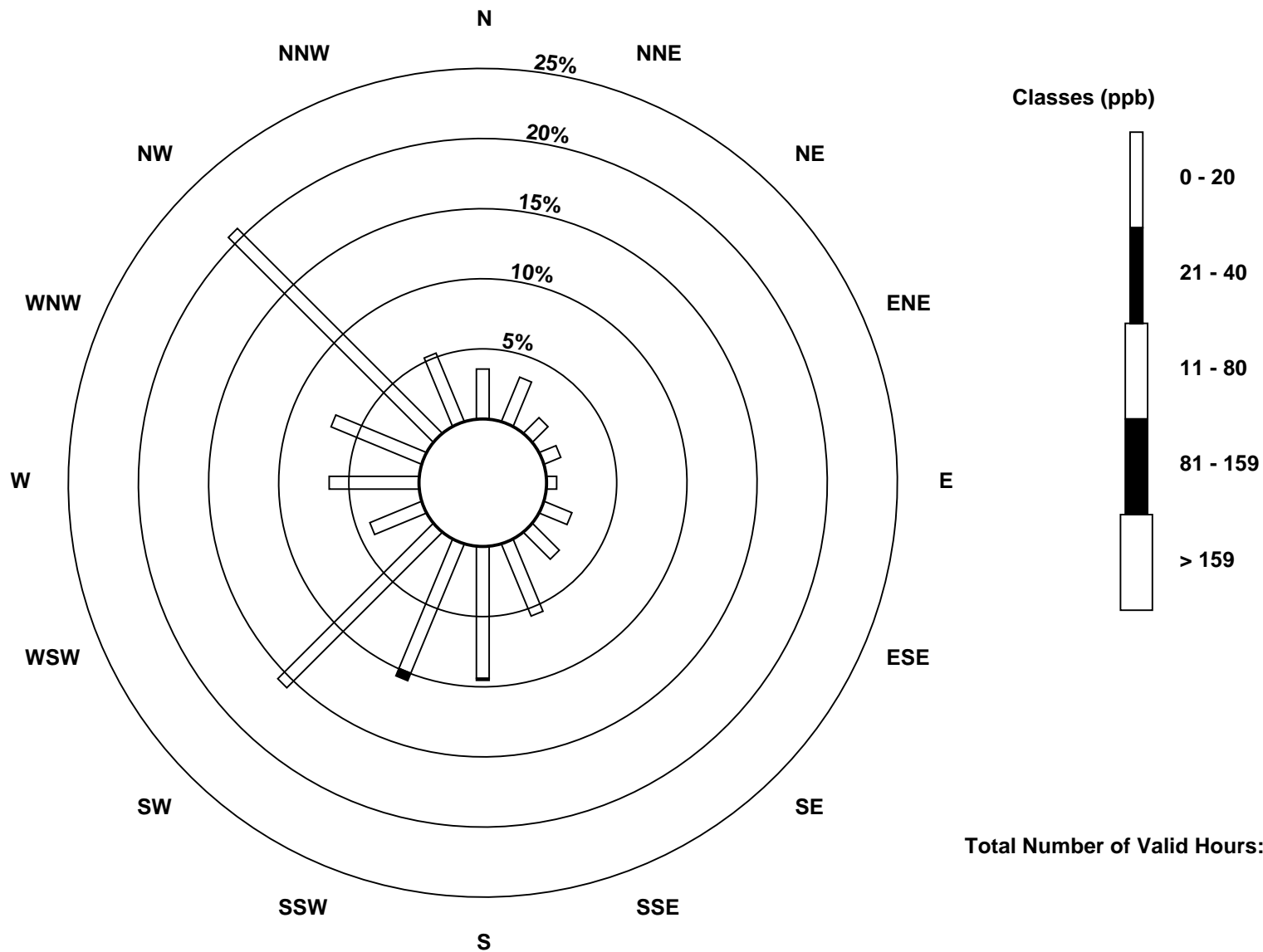
Total Number of Valid Hours: 702

Total Number of Hours: 744

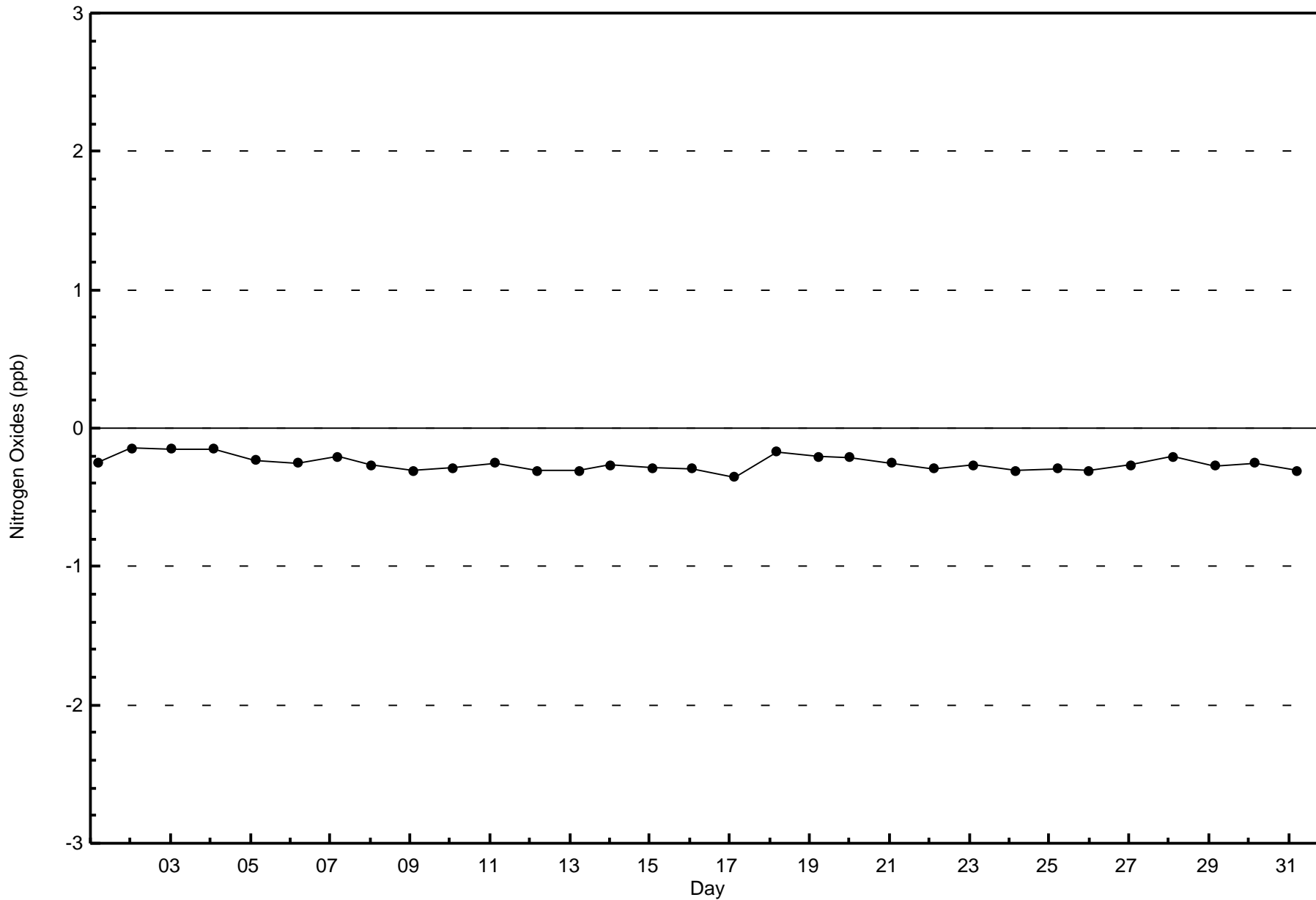


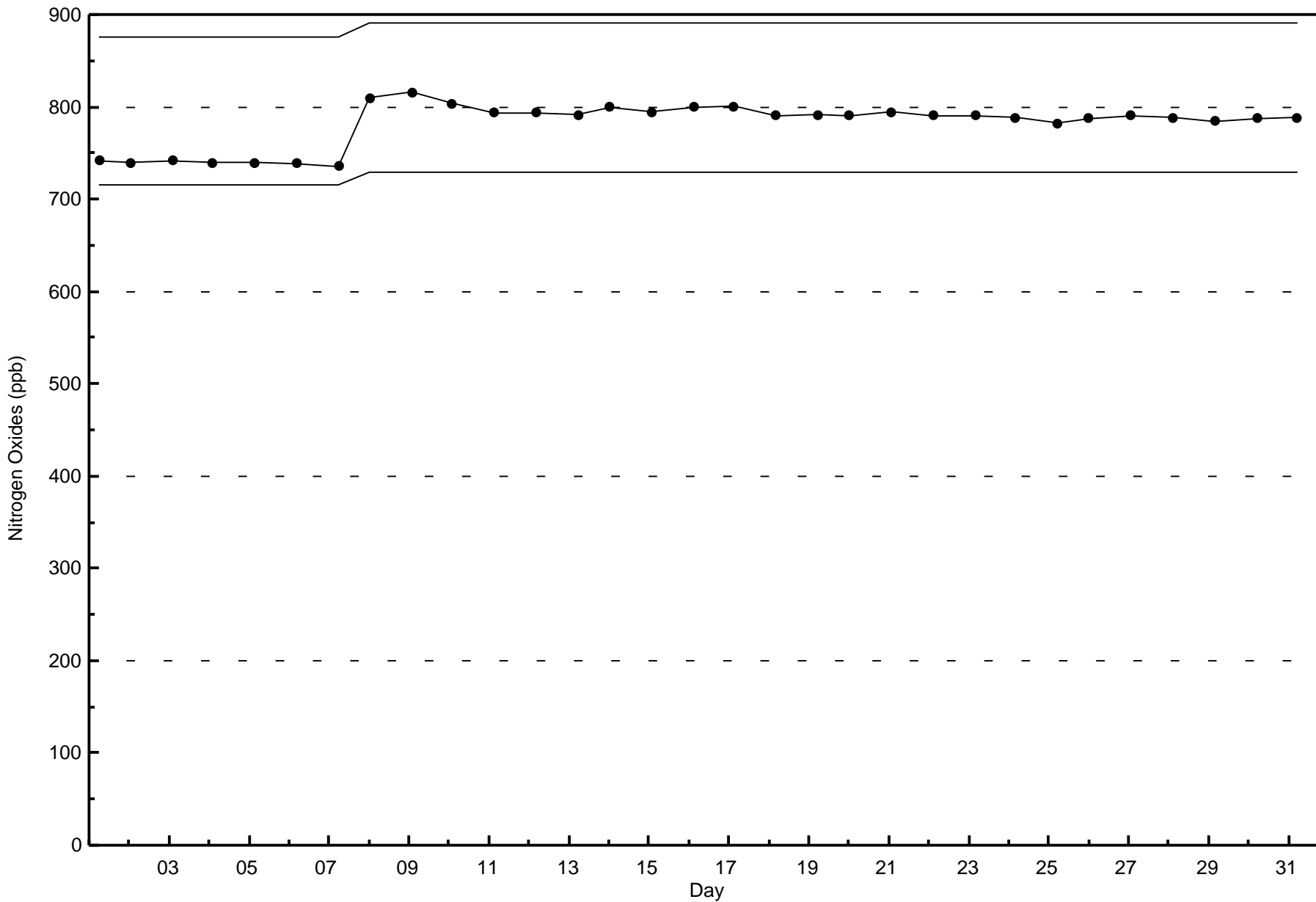
Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 702







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Conklin Community - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 44 ppb on Dec 19 18:00	Maximum Daily Average: 40.4 ppb on Dec 21		Hours of Data:	710
Minimum Value: 4 ppb on Dec 10 03:00	Minimum Daily Average: 16.0 ppb on Dec 17		Hours of Missing Data:	34
Maximum Diurnal Average: 33.1 ppb at hour 14	Minimum Diurnal Average: 26.6 ppb at hour 2		Hours of Calibration:	34
Monthly Average: 29.0 ppb	Percentiles: P ₁ = 8 P ₁₀ = 15 Q ₁ = 22 Median = 30 Q ₃ = 37 P ₉₀ = 40 P ₉₉ = 43		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	36	34	34	34	34	33	33	Z	32	32	31	30	28	27	26	26	26	25	24	23	22	21	20	19	28.3	36
2-Dec	18	17	Z	16	15	16	15	15	15	15	15	16	17	19	19	21	24	26	28	29	28	27	26	25	20.0	29
3-Dec	24	24	23	Z	22	23	23	23	23	23	24	24	24	25	24	23	20	19	20	25	28	29	30	32	24.2	32
4-Dec	35	37	37	38	Z	38	38	38	37	28	15	18	18	19	26	29	27	29	31	32	32	31	34	35	30.4	38
5-Dec	35	36	36	36	36	Z	36	36	37	37	37	37	37	37	37	36	37	37	38	38	38	38	37	37	36.9	38
6-Dec	37	37	36	36	37	37	Z	35	34	34	35	36	36	36	36	35	34	36	36	36	36	36	31	33	35.4	37
7-Dec	34	32	32	31	30	30	28	Z	27	31	32	32	31	32	34	C	C	C	23	25	24	22	21	20	28.5	34
8-Dec	19	19	Z	19	18	21	20	19	17	17	28	30	30	30	29	27	23	19	16	10	8	8	12	14	19.7	30
9-Dec	15	18	12	Z	13	14	13	14	15	18	23	28	29	30	32	30	23	19	16	16	17	17	18	18	19.4	32
10-Dec	14	8	4	6	Z	13	12	11	10	12	18	25	29	28	18	11	10	13	20	28	27	26	23	20	16.7	29
11-Dec	21	21	25	28	28	Z	28	29	29	29	31	34	36	35	35	36	37	38	37	37	37	37	37	37	32.2	38
12-Dec	37	37	37	38	38	39	Z	38	37	39	38	41	42	40	38	38	39	40	41	42	42	41	40	40	39.3	42
13-Dec	40	40	41	40	40	40	40	Z	38	36	36	38	39	39	38	38	34	30	32	32	31	24	22	29	35.5	41
14-Dec	32	29	Z	37	39	37	36	25	35	36	36	36	35	35	36	35	35	38	40	34	32	24	25	20	33.4	40
15-Dec	14	14	17	Z	39	40	39	37	34	33	34	37	38	38	37	34	37	32	27	33	29	24	23	23	31.0	40
16-Dec	21	25	25	22	Z	20	20	20	21	20	22	28	32	33	33	28	20	19	19	26	24	25	24	16	23.7	33
17-Dec	18	15	13	13	17	Z	13	11	10	11	18	24	25	23	22	17	12	9	9	12	19	18	20	21	16.0	25
18-Dec	18	16	13	12	12	12	Z	15	19	25	28	31	32	32	34	31	29	20	18	19	18	18	17	15	21.0	34
19-Dec	13	11	12	13	13	12	28	Z	42	42	43	43	43	44	42	42	44	44	44	44	43	43	43	43	34.3	44
20-Dec	43	42	Z	42	42	40	39	39	39	39	40	40	41	41	41	40	36	39	38	38	38	41	40	39	39.8	43
21-Dec	37	37	38	Z	38	38	37	38	39	40	40	41	42	43	44	43	43	43	42	42	42	42	40	43	40.4	44
22-Dec	42	42	42	42	Z	42	42	42	42	41	42	43	42	42	40	36	34	38	36	37	29	33	34	35	39.0	43
23-Dec	31	29	31	31	29	Z	25	24	23	22	24	29	28	29	30	30	31	31	30	29	29	29	29	29	28.4	31
24-Dec	29	27	26	23	20	20	Z	28	28	28	27	27	26	26	27	27	25	19	19	25	19	17	18	20	24.0	29
25-Dec	23	24	25	26	27	28	27	Z	20	18	17	26	32	31	32	31	23	20	20	19	19	18	16	15	23.4	32
26-Dec	15	15	Z	14	14	14	14	16	18	28	28	29	29	29	28	26	25	25	24	24	24	23	23	20	22.0	29
27-Dec	17	30	32	Z	29	28	27	27	26	26	27	26	27	29	29	30	29	27	28	28	30	31	32	32	28.1	32
28-Dec	33	34	37	39	Z	39	38	38	39	40	40	40	40	41	41	39	36	35	35	36	36	36	35	34	37.5	41
29-Dec	33	33	29	24	20	Z	15	24	34	36	37	37	37	37	35	34	31	27	20	18	16	15	13	9	26.8	37
30-Dec	6	4	5	4	5	12	Z	23	26	28	29	32	34	38	37	37	36	35	34	32	37	37	37	37	26.3	38
31-Dec	37	36	36	36	36	37	36	Z	31	33	37	38	39	40	40	41	41	41	42	41	41	41	41	42	38.3	42

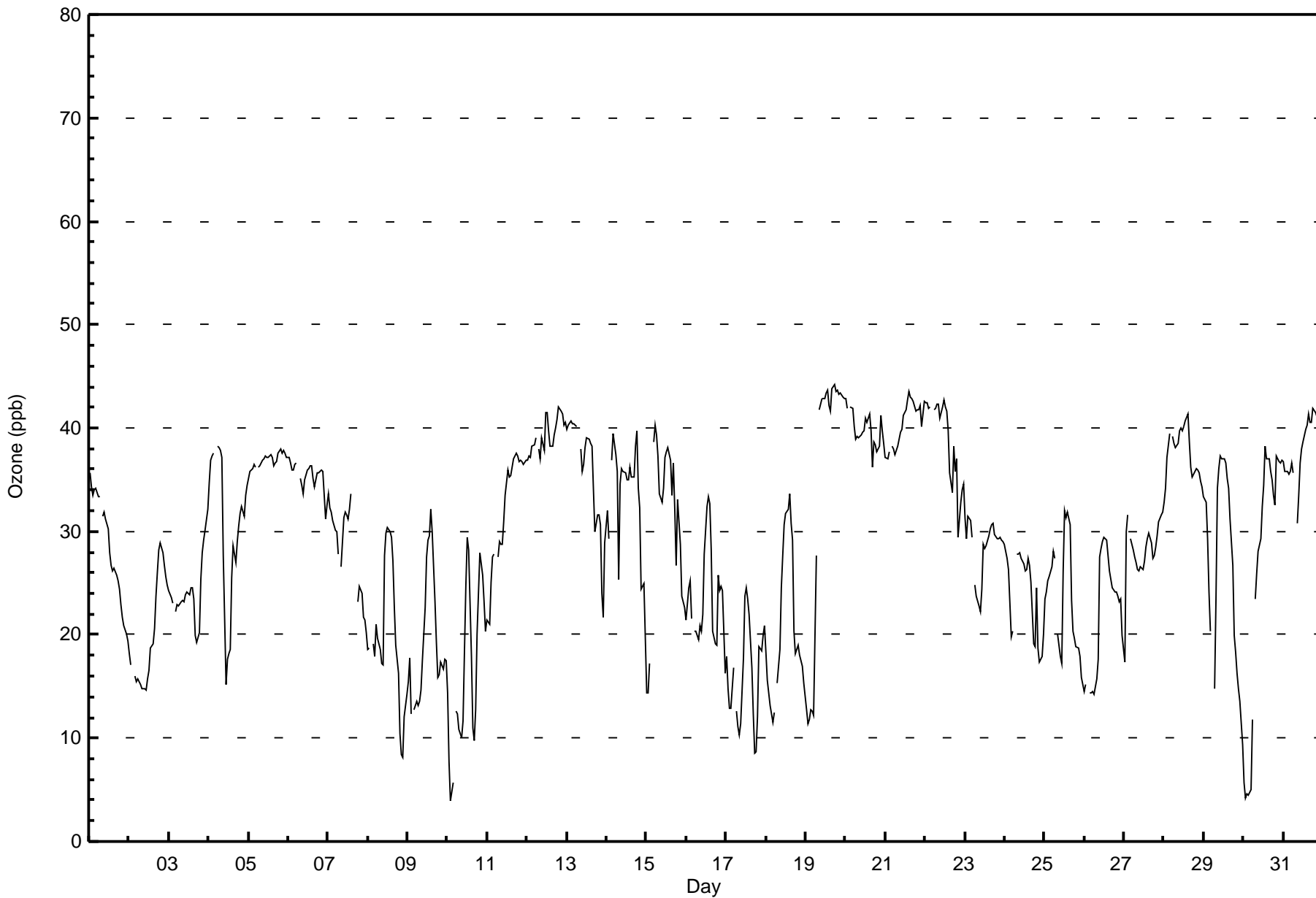
26.7	26.6	26.8	26.9	26.6	27.9	27.8	26.6	28.2	28.9	30.1	32.0	32.9	33.1	32.9	31.7	30.0	29.1	28.5	29.4	28.8	28.1	27.8	27.4	Diurnal Average	
43	42	42	42	42	42	42	42	42	42	42	43	43	43	44	44	43	44	44	44	44	43	43	43	43	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Conklin Community - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	164	23.10	23.10
21 - 50	546	76.90	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Conklin Community - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	9	2	3	4	1	8	12	18	32	29	13	1	3	3	6	12	156
21 - 50	15	22	8	7	4	7	7	20	37	44	97	28	41	46	138	25	546
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	24	24	11	11	5	15	19	38	69	73	110	29	44	49	144	37	702

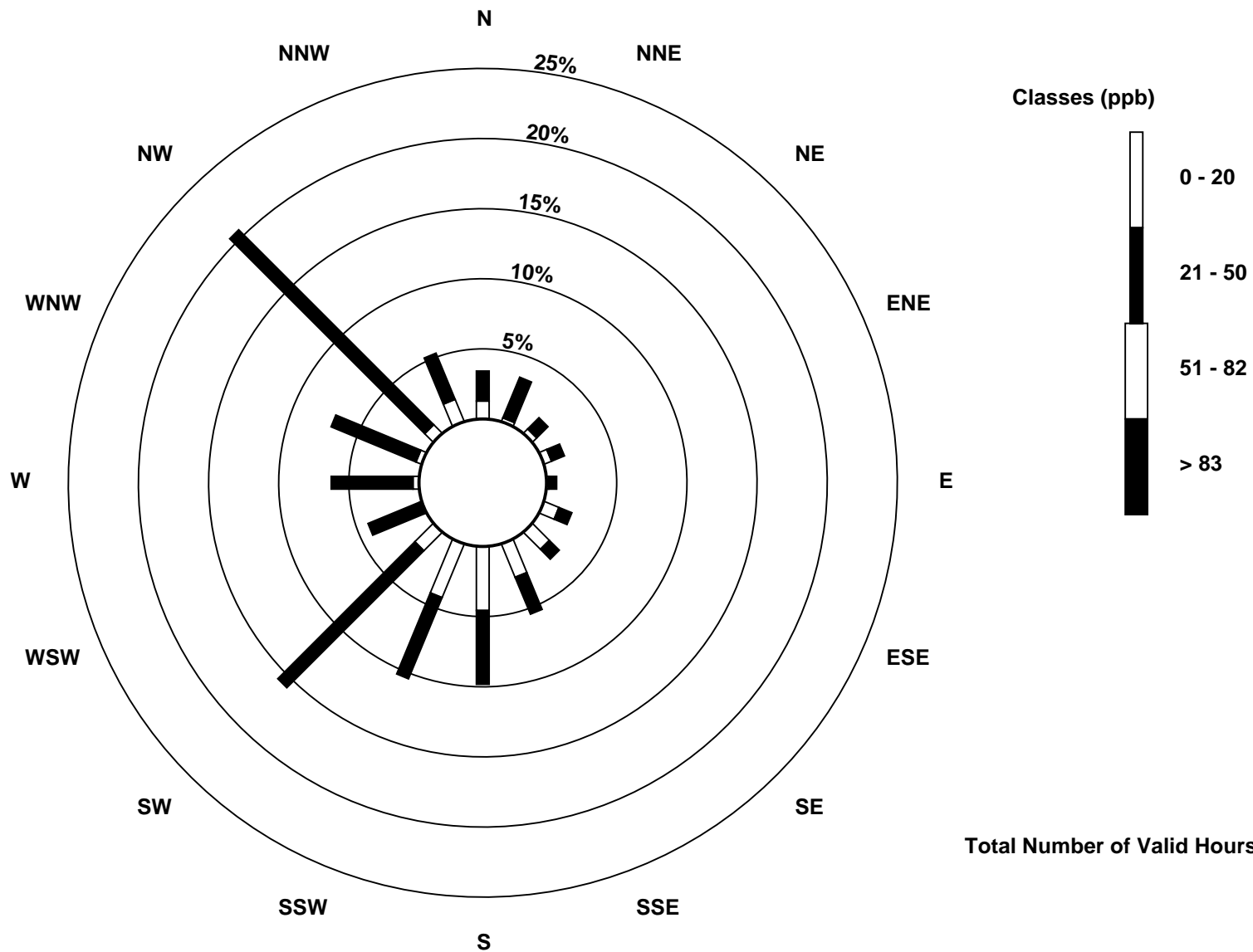
Total Number of Valid Hours: 702

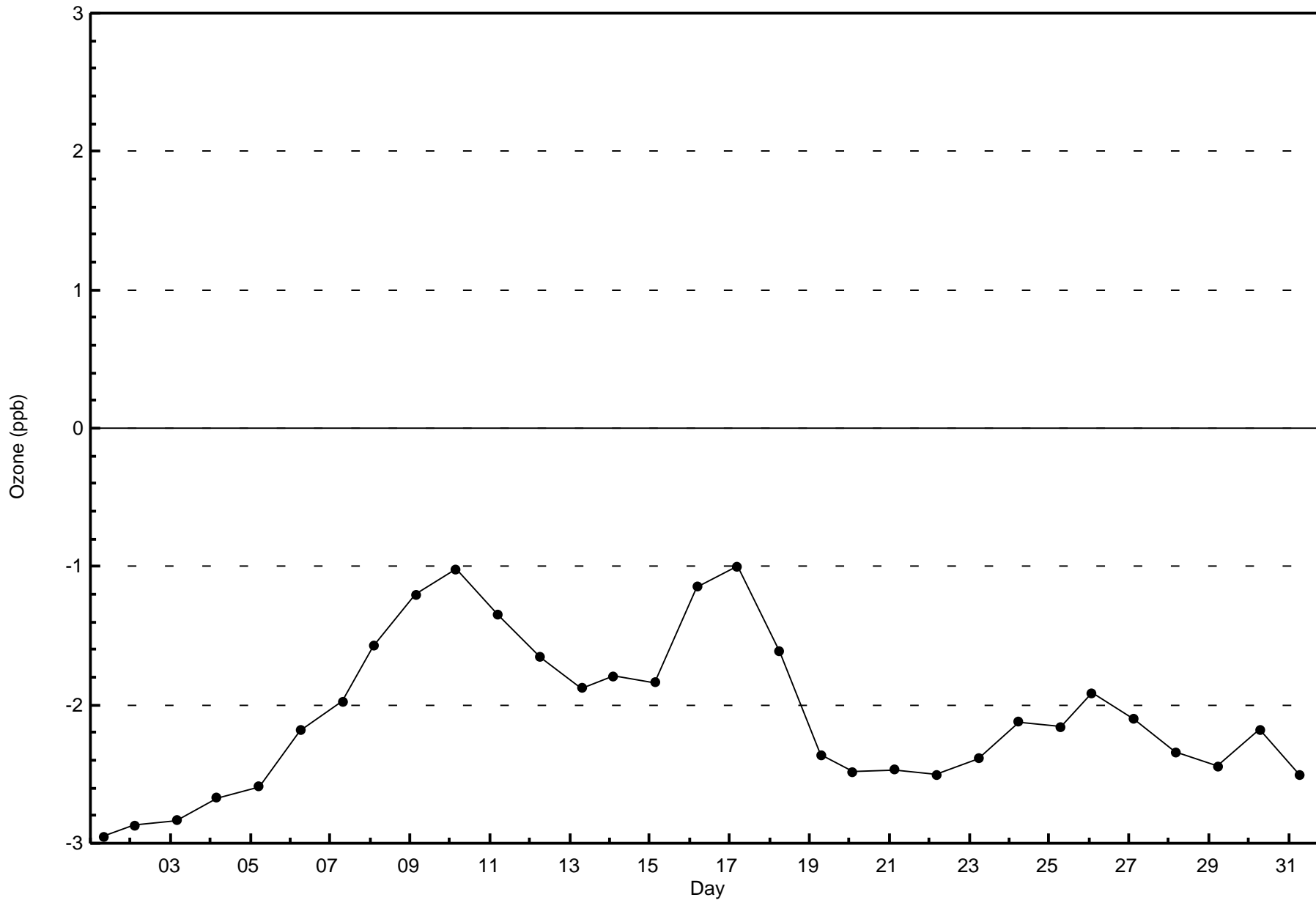
Total Number of Hours: 744

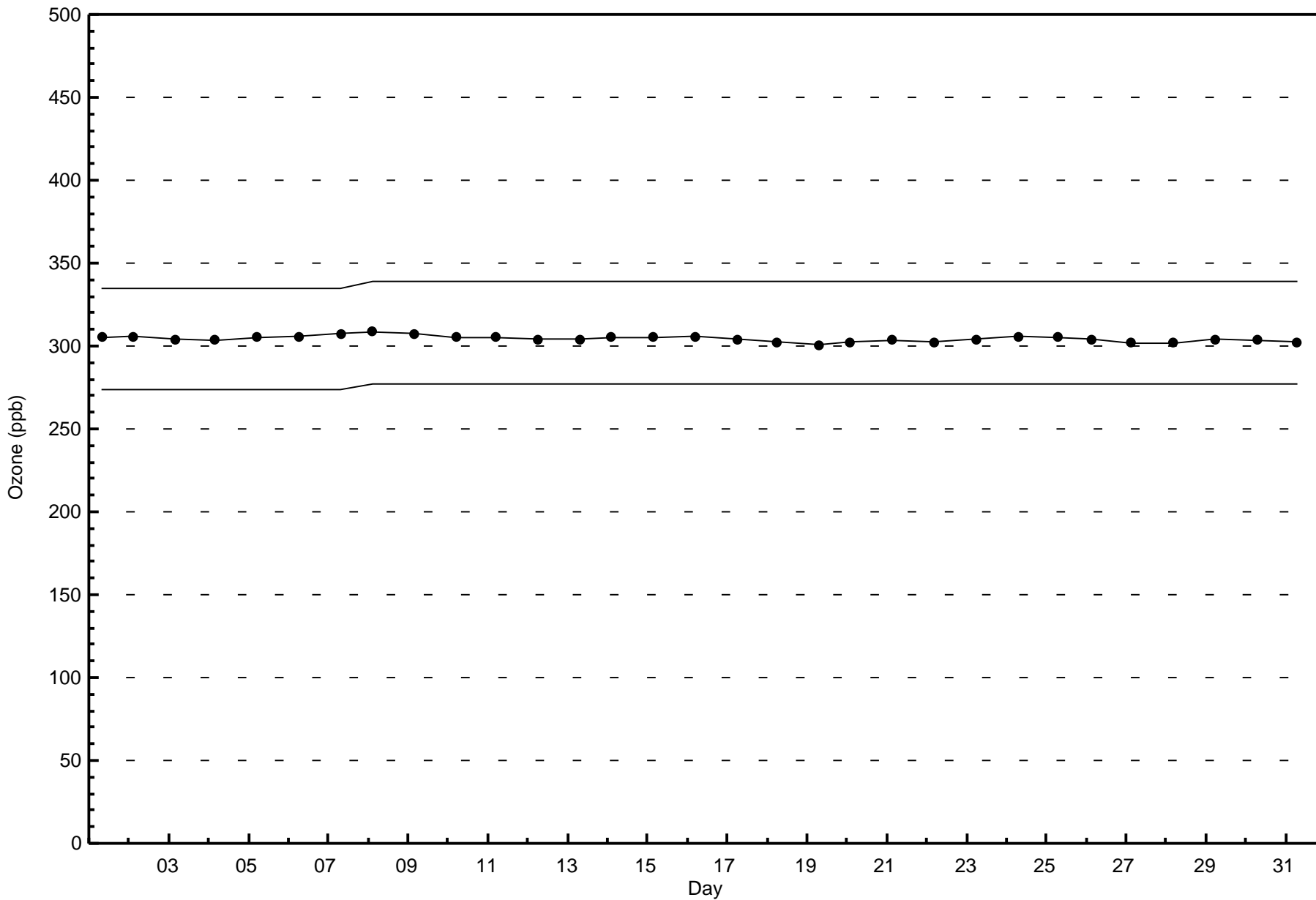


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Ozone (O₃) - ppb
Conklin Community (AMS 21)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

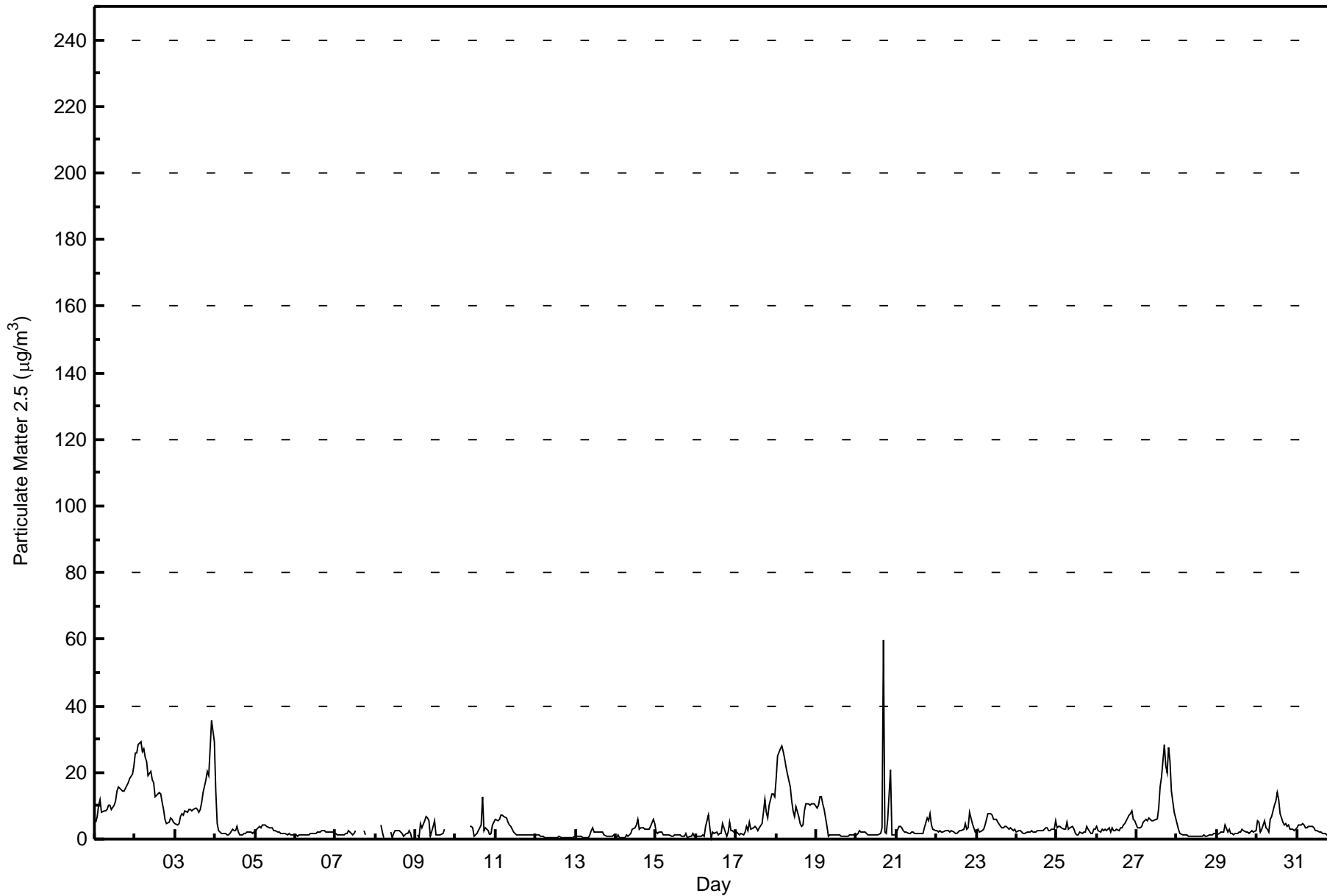
Conklin Community - December 2016

Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																															
Maximum Value: 59.8 µg/m ³ on Dec 20 17:00		Maximum Daily Average: 16.3 µg/m ³ on Dec 2																																															
Minimum Value: 0.2 µg/m ³ on Dec 8 23:00		Hours of Data: 715																																															
Maximum Diurnal Average: 6.6 µg/m ³ at hour 17		Hours of Missing Data: 29																																															
Monthly Average: 4.58 µg/m ³		Hours of Calibration: 4																																															
Minimum Daily Average: 0.6 µg/m ³ on Dec 12		Percent Operational Time: 96.6																																															
Minimum Diurnal Average: 3.7 µg/m ³ at hour 12		Percentiles: P ₁ = 0.4 P ₁₀ = 1.0 Q ₁ = 1.5 Median = 2.5 Q ₃ = 4.7 P ₉₀ = 10.5 P ₉₉ = 27.4																																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	5.0	6.6	10.3	11.7	7.9	8.3	8.3	8.7	10.0	10.1	8.7	10.1	11.6	14.2	15.6	15.3	14.4	14.3	15.3	16.2	17.0	18.4	19.6	22.0	12.5	22.0																							
2-Dec	25.9	26.0	28.4	29.2	26.1	27.1	24.5	23.3	19.3	20.3	17.9	17.0	12.9	13.0	14.0	13.5	11.1	8.8	5.8	4.7	5.3	6.2	6.1	5.2	16.3	29.2																							
3-Dec	4.7	4.3	4.5	6.6	7.5	7.4	8.3	8.3	8.9	9.0	8.6	8.8	9.3	8.7	8.2	8.8	10.9	13.8	17.6	20.4	18.9	27.0	35.5	29.1	12.3	35.5																							
4-Dec	14.2	4.8	2.7	2.2	1.8	1.6	1.6	1.5	1.5	1.9	3.1	2.4	2.5	3.9	2.1	1.4	1.5	1.6	1.6	2.0	2.1	2.3	1.8	2.1	2.7	14.2																							
5-Dec	2.2	3.0	3.6	3.6	4.1	4.3	4.0	3.8	3.4	3.5	3.2	2.7	2.4	2.0	2.0	1.9	1.7	1.6	1.5	1.4	1.5	1.3	1.3	1.2	2.6	4.3																							
6-Dec	1.1	1.0	1.1	1.2	1.2	1.3	1.4	1.4	1.4	1.7	1.5	1.6	1.8	1.9	2.1	2.3	2.6	2.6	2.2	2.2	2.0	1.9	2.1	1.9	1.7	2.6																							
7-Dec	1.7	1.5	1.4	1.3	1.2	1.2	1.5	1.6	2.6	1.6	1.2	1.7	2.6	C	C	C	C	2.5	1.4	UO	UO	UO	UO	3.3	--	3.3																							
8-Dec	UO	UO	UO	4.2	2.1	0.6	UO	UO	UO	1.9	0.6	1.6	2.6	2.6	2.4	2.1	1.8	1.0	1.8	1.7	2.4	1.9	0.2	UO	--	4.2																							
9-Dec	UO	1.1	0.5	4.7	3.4	5.7	6.9	6.4	5.4	1.0	3.7	5.4	1.3	1.3	1.3	1.3	1.6	3.0	UO	UO	UO	UO	UO	UO	--	6.9																							
10-Dec	UO	UO	UO	UO	UO	2.1	UO	UO	3.9	3.7	3.4	0.9	1.2	1.8	3.6	4.0	12.8	2.5	3.5	2.7	1.5	1.7	4.4	4.9	--	12.8																							
11-Dec	5.7	5.7	6.0	7.3	7.1	6.8	6.3	4.9	4.3	3.6	2.8	2.1	1.4	1.2	1.1	1.3	1.2	1.4	1.3	1.3	1.4	1.2	1.3	1.5	3.3	7.3																							
12-Dec	1.3	1.3	1.2	0.9	0.8	0.6	0.5	0.5	0.4	0.5	0.4	0.4	0.3	0.4	1.0	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.6	0.7	0.6	1.3																							
13-Dec	0.8	0.9	0.8	0.7	0.5	0.5	0.5	0.4	1.3	2.4	3.2	2.1	2.2	2.2	2.3	2.2	1.9	1.4	1.0	0.8	0.8	1.0	0.7	1.3	1.3	3.2																							
14-Dec	0.3	1.5	0.3	0.4	0.4	0.5	1.4	0.9	1.2	1.9	3.1	3.3	4.1	5.9	3.1	3.3	3.4	3.1	2.9	3.0	3.0	3.7	6.1	4.7	2.6	6.1																							
15-Dec	2.2	1.8	2.0	2.1	1.1	1.1	1.2	1.2	1.1	0.9	1.0	1.1	1.2	1.1	1.1	1.0	0.8	0.7	1.8	0.6	0.8	0.8	1.9	0.6	1.2	2.2																							
16-Dec	0.8	0.8	0.7	0.7	1.1	0.9	3.7	7.1	3.3	0.2	2.1	1.7	2.1	1.3	1.7	1.8	4.5	2.2	0.9	2.2	5.1	2.6	2.4	1.5	2.1	7.1																							
17-Dec	2.3	1.6	1.1	1.6	1.2	2.0	3.9	2.5	5.1	3.0	3.6	3.6	3.4	2.6	3.3	4.6	7.9	12.0	8.2	6.5	10.2	13.5	13.5	12.5	5.4	13.5																							
18-Dec	18.3	24.8	27.2	27.8	26.2	24.2	21.8	19.4	15.7	11.5	8.6	6.8	9.6	6.6	4.6	3.8	4.3	8.5	10.5	10.4	10.1	10.7	10.4	10.4	13.8	27.8																							
19-Dec	9.5	10.3	12.5	12.5	10.5	9.1	3.7	0.7	1.3	1.3	1.3	1.3	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.3	1.6	3.6	12.5																							
20-Dec	1.3	1.8	2.4	2.2	2.2	2.0	1.9	1.4	1.4	1.3	1.3	1.3	1.3	1.4	1.6	3.2	59.8	2.0	1.9	5.8	20.9	1.1	1.4	1.2	5.1	59.8																							
21-Dec	1.5	3.7	3.9	3.4	2.6	2.2	2.1	1.8	1.5	1.9	2.1	1.8	1.7	1.6	1.5	1.6	1.9	3.2	6.4	5.7	7.7	4.3	2.8	2.5	2.9	7.7																							
22-Dec	2.6	2.3	2.3	2.2	2.3	2.3	2.5	2.5	2.2	2.6	2.2	1.8	1.7	1.9	2.5	2.7	2.8	4.7	2.9	3.2	7.8	4.7	3.3	2.1	2.8	7.8																							
23-Dec	2.3	3.1	2.1	2.4	2.9	4.2	5.9	7.7	7.8	7.3	6.1	5.9	5.8	5.2	3.6	3.2	3.3	3.6	3.9	3.2	3.5	3.1	2.7	2.8	4.2	7.8																							
24-Dec	2.3	2.4	2.4	2.3	1.8	1.9	2.1	2.1	2.2	2.5	2.2	2.3	2.4	2.5	2.4	2.6	2.7	3.3	3.4	2.7	2.6	2.9	3.1	5.7	2.6	5.7																							
25-Dec	3.3	3.7	3.9	3.3	3.0	2.9	5.0	3.0	3.4	3.9	2.8	1.8	1.4	1.4	2.2	1.9	2.3	2.2	3.6	2.9	1.7	1.6	2.8	3.0	2.8	5.0																							
26-Dec	3.7	2.4	2.0	3.1	2.7	3.2	2.4	3.4	2.1	3.3	2.7	2.4	2.8	2.7	3.3	3.4	4.4	4.8	6.5	7.0	7.8	8.3	6.0	5.5	4.0	8.3																							
27-Dec	3.3	3.5	3.3	3.8	4.9	5.9	5.7	6.5	6.1	5.5	5.5	5.7	6.1	9.4	15.9	18.8	28.5	22.2	19.8	27.7	23.2	14.3	8.2	6.2	10.8	28.5																							
28-Dec	4.7	2.9	1.6	1.1	1.2	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	1.0	1.1	1.1	1.0	1.2	1.4	1.4	1.5	1.5	1.4	4.7																							
29-Dec	1.5	1.6	2.1	2.1	2.2	4.3	2.1	2.8	1.7	1.7	1.4	1.8	1.6	2.3	2.2	2.9	2.6	2.1	1.9	1.6	2.2	2.4	2.0	2.4	2.1	4.3																							
30-Dec	5.6	5.0	2.0	3.1	5.4	3.3	3.0	2.3	5.7	6.7	10.3	11.4	13.8	11.7	7.8	5.1	4.1	4.6	3.9	4.1	3.1	2.9	2.5	2.9	5.4	13.8																							
31-Dec	3.6	4.4	4.4	4.5	4.4	3.5	3.5	3.7	3.6	3.9	3.3	2.4	2.4	2.2	2.0	1.8	1.8	1.7	1.5	1.5	3.6	4.5	2.8	2.0	3.0	4.5																							
																								4.7	4.6	4.7	5.1	4.7	4.6	4.7	4.5	4.3	3.9	3.8	3.7	3.7	3.8	3.9	3.9	6.6	4.5	4.5	5.0	5.8	5.1	5.1	4.9	Diurnal Average	
																								25.9	26.0	28.4	29.2	26.2	27.1	24.5	23.3	19.3	20.3	17.9	17.0	13.8	14.2	15.9	18.8	59.8	22.2	19.8	27.7	23.2	27.0	35.5	29.1	Diurnal Maximum	
C - Calibration																								UO - Unstable Operation																									
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																	



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - December 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	484	67.69	67.69
6 - 15	120	16.78	84.48
16 - 25	27	3.78	88.25
26 - 80	15	2.10	90.35
> 81.0	0	0.00	90.35

Total Number of Valid Hours: 715

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - December 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	17	15	8	8	4	14	13	18	38	30	69	23	39	32	116	33	477
6 - 15	5	7	2	3	1	0	3	10	19	29	24	5	6	2	2	2	120
16 - 25	0	0	0	0	0	0	0	5	2	8	12	0	0	0	0	0	27
26 - 80	0	0	0	0	0	0	0	2	2	3	6	2	0	0	0	0	15
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	22	10	11	5	14	16	35	61	70	111	30	45	34	118	35	639

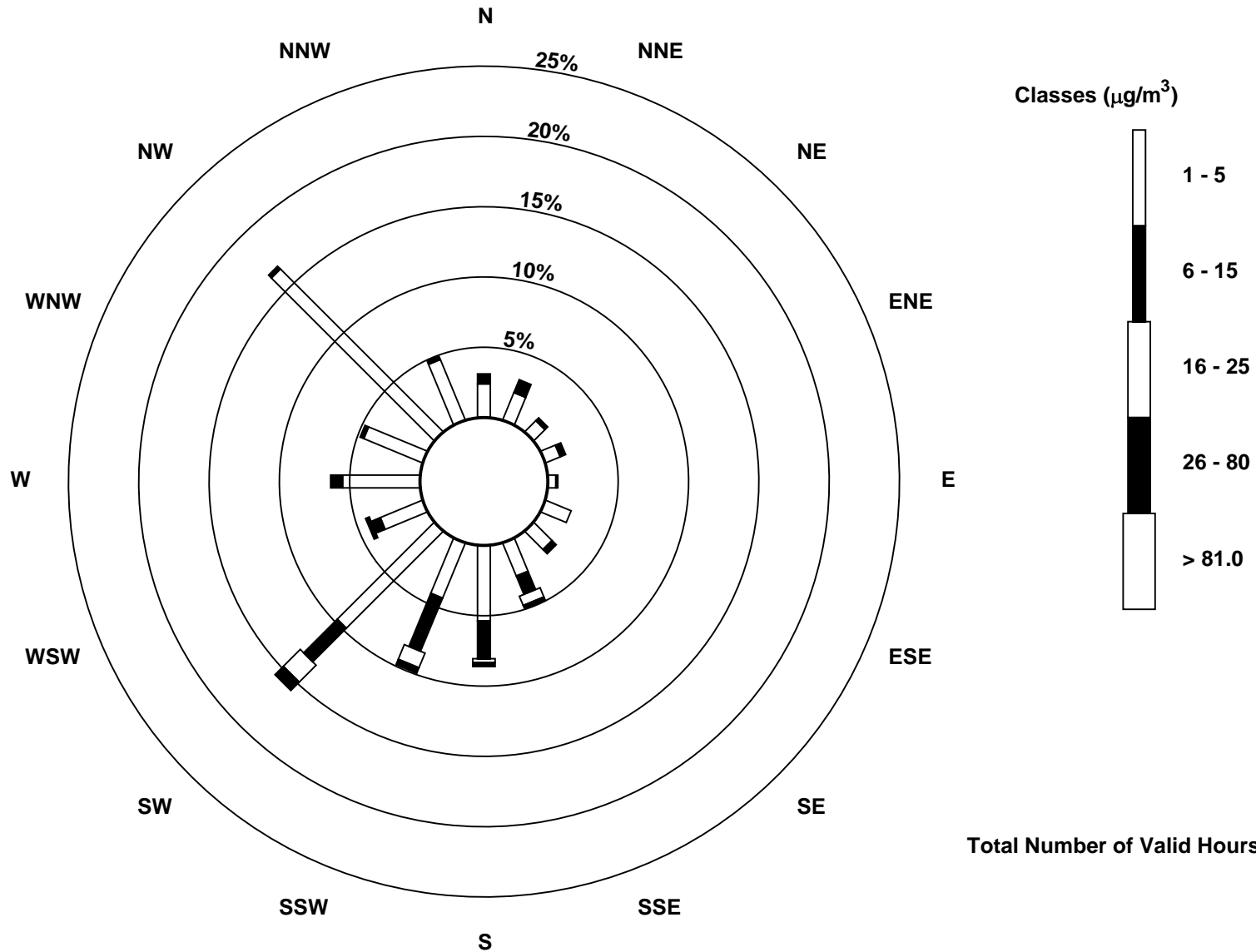
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community (AMS 21)



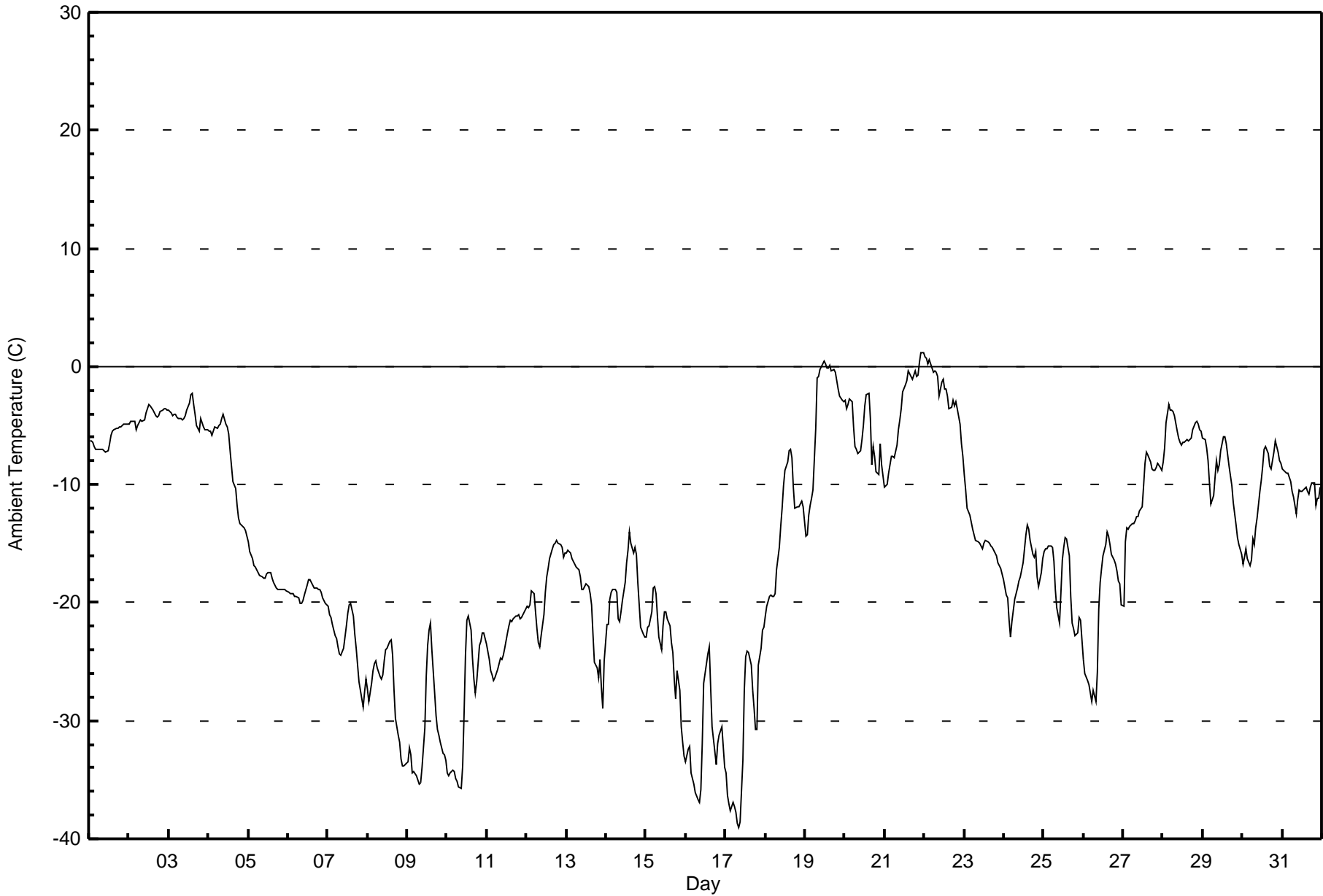
Total Number of Valid Hours: 708



Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Conklin Community - December 2016

Maximum Value: 1.2 C on Dec 22 00:00 Maximum Daily Average: -2.1 C on Dec 22																						Hours in Service:	744			
Minimum Value: -39.0 C on Dec 17 09:00 Minimum Daily Average: -31.8 C on Dec 16																						Hours of Data:	744			
Maximum Diurnal Average: -12.6 C at hour 15 Minimum Diurnal Average: -17.1 C at hour 8																						Hours of Missing Data:	0			
Monthly Average: -15.65 C Percentiles: P ₁ = -36.9 P ₁₀ = -28.4 Q ₁ = -22.1 Median = -15.7 Q ₃ = -7.0 P ₉₀ = -3.7 P ₉₉ = 0.3																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.3	-6.3	-6.4	-6.8	-7.0	-7.1	-7.0	-7.0	-7.0	-7.2	-7.2	-7.1	-6.5	-5.9	-5.4	-5.3	-5.3	-5.2	-5.2	-5.1	-5.0	-4.9	-4.9	-4.9	-6.1	-4.9
2-Dec	-4.8	-4.7	-4.6	-4.7	-5.4	-5.0	-4.7	-4.5	-4.7	-4.5	-4.0	-3.5	-3.2	-3.4	-3.7	-3.9	-4.2	-4.3	-4.2	-3.9	-3.7	-3.6	-3.6	-3.7	-4.2	-3.2
3-Dec	-3.7	-3.9	-4.1	-4.1	-4.1	-4.2	-4.4	-4.4	-4.5	-4.4	-4.1	-3.6	-3.1	-2.4	-2.3	-3.3	-4.0	-5.0	-5.5	-4.5	-4.8	-5.1	-5.4	-5.3	-4.2	-2.3
4-Dec	-5.5	-5.4	-5.8	-5.5	-5.1	-5.3	-5.0	-4.9	-4.4	-4.0	-4.9	-5.1	-5.7	-7.1	-8.5	-9.7	-10.4	-11.8	-12.8	-13.3	-13.5	-13.6	-13.9	-14.3	-8.2	-4.0
5-Dec	-14.9	-15.6	-16.3	-16.8	-17.0	-17.3	-17.5	-17.7	-17.8	-18.0	-17.9	-17.6	-17.5	-17.5	-17.9	-18.3	-18.6	-18.8	-18.9	-18.8	-18.9	-18.9	-18.9	-19.0	-17.8	-14.9
6-Dec	-19.1	-19.3	-19.2	-19.3	-19.4	-19.5	-19.6	-20.0	-20.1	-19.9	-19.3	-18.5	-18.1	-18.0	-18.3	-18.5	-18.8	-18.8	-18.8	-18.9	-19.1	-19.6	-20.1	-20.2	-19.2	-18.0
7-Dec	-20.3	-21.1	-21.3	-21.8	-22.8	-23.0	-23.8	-24.3	-24.5	-23.9	-23.0	-22.0	-20.8	-20.2	-20.1	-21.1	-22.7	-23.9	-25.2	-26.7	-28.1	-28.8	-27.6	-26.5	-23.5	-20.1
8-Dec	-27.3	-28.4	-26.8	-25.8	-25.2	-24.9	-25.5	-26.2	-26.5	-26.1	-24.9	-23.9	-23.8	-23.2	-23.2	-24.5	-27.4	-29.8	-31.2	-31.8	-33.2	-33.9	-33.8	-33.6	-27.5	-23.2
9-Dec	-33.5	-32.2	-32.9	-34.4	-34.2	-34.7	-35.1	-35.4	-35.3	-33.9	-30.6	-26.2	-23.6	-22.4	-21.8	-23.9	-27.7	-29.5	-30.7	-31.2	-31.8	-32.7	-32.9	-33.4	-30.8	-21.8
10-Dec	-34.4	-34.7	-34.4	-34.2	-34.3	-34.9	-35.2	-35.6	-35.8	-33.8	-29.4	-24.5	-21.5	-21.1	-22.3	-24.6	-26.5	-27.7	-26.7	-23.7	-23.2	-22.6	-22.5	-23.0	-28.6	-21.1
11-Dec	-23.5	-24.8	-25.8	-26.1	-26.6	-26.4	-25.7	-25.1	-24.8	-24.8	-24.5	-23.9	-22.6	-22.0	-21.5	-21.6	-21.3	-21.1	-21.1	-21.0	-21.3	-21.3	-21.0	-20.5	-23.3	-20.5
12-Dec	-20.3	-20.4	-20.1	-19.0	-19.2	-20.8	-22.2	-23.4	-23.7	-22.7	-21.1	-19.1	-17.8	-17.2	-16.3	-15.5	-15.1	-15.0	-14.7	-14.9	-15.1	-15.3	-16.2	-15.7	-18.4	-14.7
13-Dec	-15.8	-15.6	-15.8	-16.3	-16.5	-16.7	-17.0	-17.2	-17.8	-18.9	-18.9	-18.7	-18.4	-18.6	-19.2	-20.2	-22.7	-25.0	-25.6	-26.3	-24.8	-27.2	-29.0	-24.9	-20.3	-15.6
14-Dec	-21.9	-21.8	-19.7	-19.1	-18.8	-18.9	-19.2	-21.4	-21.6	-20.7	-19.8	-18.3	-16.6	-15.6	-14.0	-15.0	-15.8	-15.3	-15.9	-18.3	-20.2	-22.1	-22.7	-22.9	-19.0	-14.0
15-Dec	-23.0	-22.1	-22.0	-20.7	-18.8	-18.7	-19.3	-21.1	-22.9	-23.9	-22.0	-20.7	-20.7	-21.3	-21.9	-23.3	-24.2	-26.5	-28.1	-25.7	-27.4	-30.5	-31.8	-33.0	-23.7	-18.7
16-Dec	-33.5	-32.4	-32.1	-34.4	-34.9	-35.4	-36.1	-36.6	-36.9	-35.8	-31.9	-26.8	-25.2	-24.3	-23.8	-27.2	-30.5	-32.6	-33.7	-32.0	-31.2	-30.9	-30.5	-33.9	-31.8	-23.8
17-Dec	-34.5	-36.3	-37.1	-37.6	-36.9	-37.3	-37.8	-38.7	-39.0	-38.5	-33.4	-27.4	-24.6	-24.1	-24.3	-25.2	-27.4	-28.9	-30.7	-30.8	-25.3	-23.8	-22.4	-22.1	-31.0	-22.1
18-Dec	-21.1	-20.4	-19.4	-19.3	-19.5	-19.5	-19.2	-17.2	-15.3	-13.5	-12.0	-10.0	-8.8	-8.0	-7.1	-7.0	-7.7	-10.2	-12.0	-11.9	-11.9	-11.7	-11.5	-11.9	-13.6	-7.0
19-Dec	-14.4	-14.2	-12.6	-11.8	-11.1	-10.5	-5.2	-1.0	-0.8	-0.3	0.0	0.4	0.3	-0.1	-0.2	0.1	-0.3	-0.2	-0.5	-1.2	-1.9	-2.5	-2.8	-3.0	-3.9	0.4
20-Dec	-2.9	-3.5	-3.3	-2.8	-3.0	-5.1	-6.8	-7.0	-7.4	-7.2	-6.2	-5.0	-3.3	-2.4	-2.2	-4.4	-8.3	-6.8	-7.6	-8.9	-9.2	-6.5	-8.3	-9.3	-5.7	-2.2
21-Dec	-10.2	-10.0	-9.1	-8.3	-7.6	-7.6	-7.7	-6.6	-5.4	-4.5	-3.6	-2.2	-1.6	-1.2	-0.4	-0.7	-0.9	-1.0	-0.4	-0.8	-0.7	0.3	1.1	1.2	-3.7	1.2
22-Dec	0.8	0.7	0.3	0.6	0.2	-0.5	-0.4	-0.5	-0.9	-2.5	-1.3	-1.1	-1.9	-1.9	-2.6	-3.6	-3.4	-2.9	-3.3	-3.0	-3.5	-4.9	-6.5	-7.6	-2.1	0.8
23-Dec	-9.2	-10.5	-12.0	-12.5	-13.2	-13.8	-14.3	-14.7	-14.9	-15.0	-15.2	-15.4	-15.0	-14.7	-14.8	-14.9	-15.2	-15.4	-15.6	-16.0	-16.6	-16.9	-17.1	-17.6	-14.6	-9.2
24-Dec	-18.0	-19.3	-19.6	-21.4	-22.9	-21.6	-19.8	-19.2	-18.7	-18.2	-17.8	-16.6	-15.4	-14.3	-13.5	-13.8	-14.7	-15.9	-16.1	-15.7	-17.8	-18.7	-17.4	-16.3	-17.6	-13.5
25-Dec	-15.7	-15.5	-15.4	-15.2	-15.3	-15.3	-16.5	-18.8	-20.4	-21.7	-19.1	-16.3	-15.4	-14.5	-14.6	-16.0	-19.4	-21.7	-22.3	-22.8	-22.6	-21.2	-21.5	-23.1	-18.3	-14.5
26-Dec	-24.8	-26.0	-26.5	-26.9	-27.7	-28.4	-27.4	-28.4	-25.9	-20.5	-18.3	-17.0	-16.0	-15.0	-14.0	-14.3	-15.1	-15.9	-16.4	-16.7	-17.3	-18.2	-18.4	-20.1	-20.6	-14.0
27-Dec	-20.2	-14.9	-13.6	-13.8	-13.5	-13.3	-13.3	-13.0	-12.7	-12.8	-12.3	-11.9	-10.1	-8.2	-7.3	-7.4	-8.1	-8.6	-8.8	-8.7	-8.5	-8.2	-8.5	-8.7	-11.1	-7.3
28-Dec	-8.1	-6.8	-4.8	-3.2	-3.6	-3.7	-3.8	-4.2	-5.5	-6.0	-6.4	-6.6	-6.4	-6.4	-6.2	-6.3	-6.2	-6.1	-5.4	-4.8	-4.6	-4.9	-5.3	-5.5	-5.4	-3.2
29-Dec	-6.0	-6.2	-7.0	-7.9	-9.9	-11.6	-11.0	-9.4	-7.9	-8.8	-8.4	-7.1	-6.0	-6.0	-6.6	-7.5	-8.4	-10.1	-11.5	-12.4	-13.4	-14.4	-15.1	-15.9	-9.5	-6.0
30-Dec	-16.7	-16.1	-15.4	-16.2	-16.9	-16.4	-14.7	-15.1	-13.6	-12.8	-10.6	-9.7	-8.4	-7.0	-6.7	-7.4	-8.4	-8.7	-8.0	-7.3	-6.2	-7.2	-8.0	-8.2	-11.1	-6.2
31-Dec	-8.7	-8.7	-9.0	-9.0	-9.3	-9.8	-10.6	-11.0	-12.4	-11.3	-10.4	-10.6	-10.5	-10.4	-10.3	-10.6	-10.8	-10.2	-9.9	-9.8	-11.8	-11.2	-11.2	-10.2	-10.3	-8.7
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Conklin Community - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	246	33.06	33.06
-20 - 0	487	65.46	98.52
0 - 10	11	1.48	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

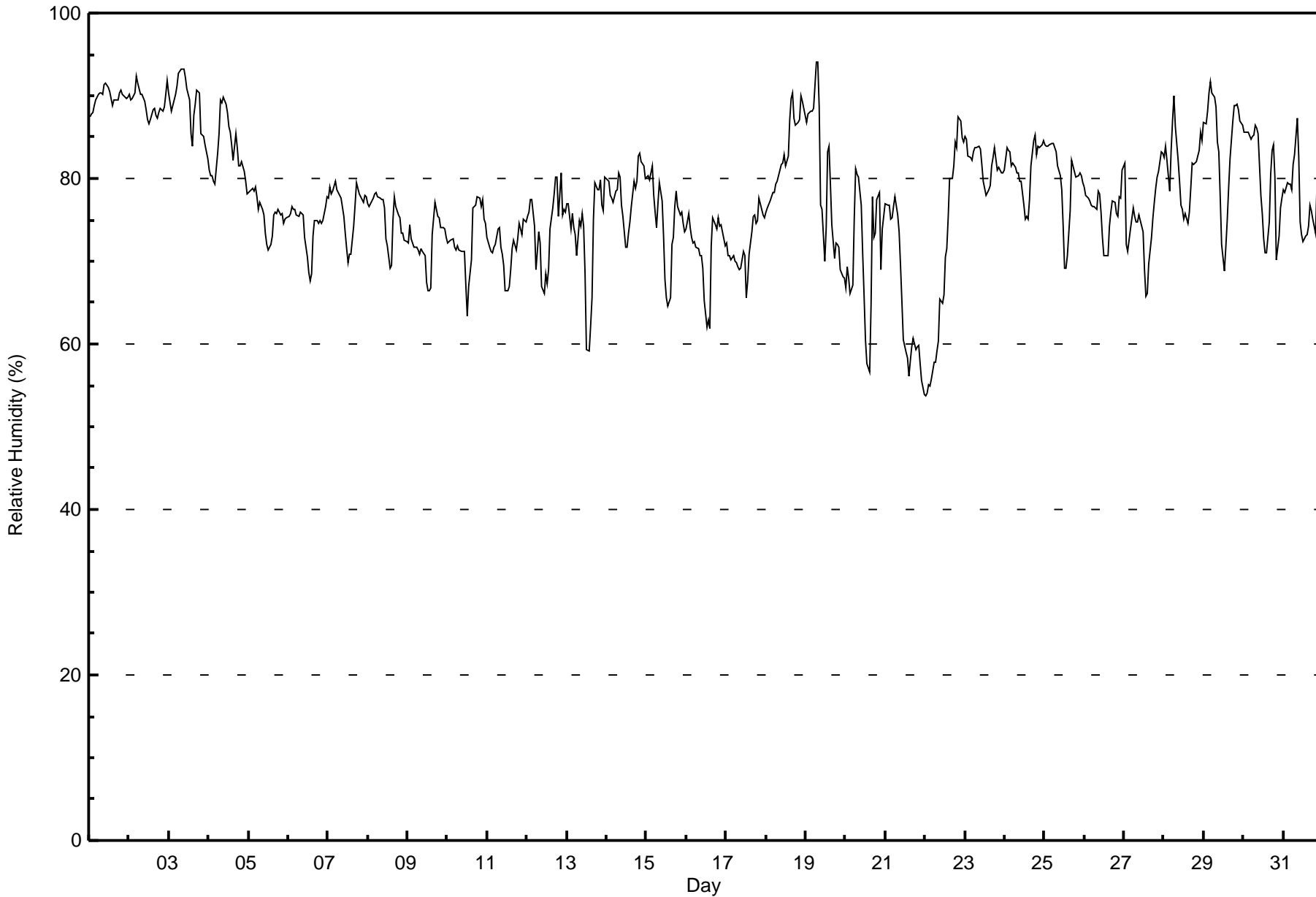
Conklin Community - December 2016

Maximum Value: 94 % on Dec 19 07:00 Maximum Daily Average: 89.8 % on Dec 1																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 54 % on Dec 22 01:00 Minimum Daily Average: 65.7 % on Dec 21 Maximum Diurnal Average: 79.6 % at hour 8 Minimum Diurnal Average: 71.6 % at hour 13 Monthly Average: 77.4 % Percentiles: P ₁ = 56 P ₁₀ = 69 Q ₁ = 73 Median = 77 O ₃ = 82 P ₉₀ = 88 P ₉₉ = 92																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	87	88	88	89	89	90	90	90	90	91	92	91	91	90	89	90	90	89	90	91	90	90	90	90	89.8	92
2-Dec	90	89	90	90	92	91	91	90	90	89	88	87	87	87	88	88	88	87	88	88	88	89	90	92	89.2	92
3-Dec	90	88	89	90	90	91	93	93	93	93	92	91	90	85	84	88	89	91	90	85	85	85	84	82	88.8	93
4-Dec	81	80	80	80	79	83	85	89	89	90	89	88	86	86	84	82	85	84	81	82	82	81	80	78	83.6	90
5-Dec	78	78	79	79	79	78	76	77	76	76	73	72	71	72	73	76	76	76	76	76	75	75	75	75	75.7	79
6-Dec	75	76	77	76	76	76	75	76	76	76	73	70	69	68	69	73	75	75	75	75	75	75	77	78	74.3	78
7-Dec	78	79	78	79	80	79	78	78	78	75	73	72	70	71	74	77	79	79	78	78	77	78	78	78	76.5	80
8-Dec	77	77	77	78	78	78	78	78	77	77	76	73	72	69	70	75	78	77	76	75	73	73	73	72	75.3	78
9-Dec	72	74	73	72	72	72	71	71	72	71	71	68	66	67	67	73	77	76	75	75	74	74	74	73	72.1	77
10-Dec	72	72	73	73	72	71	72	71	71	71	71	67	63	67	70	76	77	77	78	78	77	77	75	75	72.8	78
11-Dec	73	72	71	71	72	72	74	74	72	71	70	66	66	67	69	72	73	71	73	75	74	73	75	75	71.6	75
12-Dec	75	76	77	77	74	69	71	74	72	67	66	68	67	69	74	76	78	80	80	75	81	76	76	76	74.0	81
13-Dec	77	77	74	76	74	73	71	75	74	76	74	69	59	59	62	66	75	79	79	79	80	77	76	80	73.3	80
14-Dec	80	80	78	78	77	79	79	81	80	77	75	72	72	73	75	77	80	79	80	83	83	82	81	80	78.2	83
15-Dec	80	80	80	82	78	76	74	77	79	77	73	68	66	65	66	72	73	77	78	77	76	76	75	74	74.8	82
16-Dec	74	76	74	73	72	72	72	71	71	71	69	65	62	63	62	72	75	74	74	75	74	74	74	72	71.3	76
17-Dec	72	71	71	70	71	70	70	69	69	69	71	71	66	68	71	74	75	76	75	75	78	76	76	75	71.9	78
18-Dec	76	76	77	78	78	78	79	80	81	82	82	83	82	83	87	90	90	87	86	87	87	90	89	88	83.2	90
19-Dec	87	88	88	88	88	88	94	94	89	77	76	70	74	83	84	79	74	70	72	72	72	69	68	68	79.7	94
20-Dec	67	69	68	66	67	75	81	80	80	77	71	66	61	58	57	65	78	73	73	77	78	69	74	75	71.1	81
21-Dec	77	77	77	75	75	77	78	76	74	69	65	60	59	58	56	58	60	61	59	60	60	58	56	54	65.7	78
22-Dec	54	54	55	55	56	58	58	59	60	65	65	66	70	72	75	80	80	82	84	84	87	87	85	84	69.8	87
23-Dec	85	85	83	82	82	83	84	84	84	84	82	80	79	78	79	79	82	83	84	81	81	81	81	81	81.8	85
24-Dec	81	84	83	83	82	82	81	81	81	80	80	77	75	75	75	77	81	85	85	83	84	84	84	85	81.1	85
25-Dec	84	84	84	84	84	84	84	83	82	80	79	74	69	69	71	76	82	82	81	80	80	81	80	79	79.9	84
26-Dec	79	78	78	77	77	77	77	76	78	78	76	73	71	71	71	74	76	77	77	76	75	78	78	81	76.1	81
27-Dec	82	72	71	73	74	76	75	75	75	76	75	74	69	66	66	70	73	75	77	79	80	81	83	83	75.0	83
28-Dec	82	84	82	78	83	87	90	86	82	80	77	76	75	76	75	76	79	82	82	82	83	83	86	85	81.3	90
29-Dec	87	87	88	90	92	90	90	89	84	83	78	72	69	72	75	79	82	87	89	89	89	88	87	87	84.2	92
30-Dec	86	86	86	86	85	85	85	87	86	85	78	76	73	71	71	75	80	83	84	80	70	73	76	78	80.2	87
31-Dec	79	78	80	79	79	79	82	83	87	83	75	73	72	73	73	74	77	76	75	73	79	79	80	79	77.9	87
78.6 78.5 78.3 78.3 78.3 78.7 79.3 79.6 79.1 77.9 76.0 73.5 71.6 71.9 72.8 76.0 78.5 79.0 79.2 78.8 79.0 78.4 78.5 78.4																		Diurnal Average								
90 89 90 90 92 91 94 94 93 93 92 91 91 90 89 90 90 90 91 90 91 90 90 92																		Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Conklin Community - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

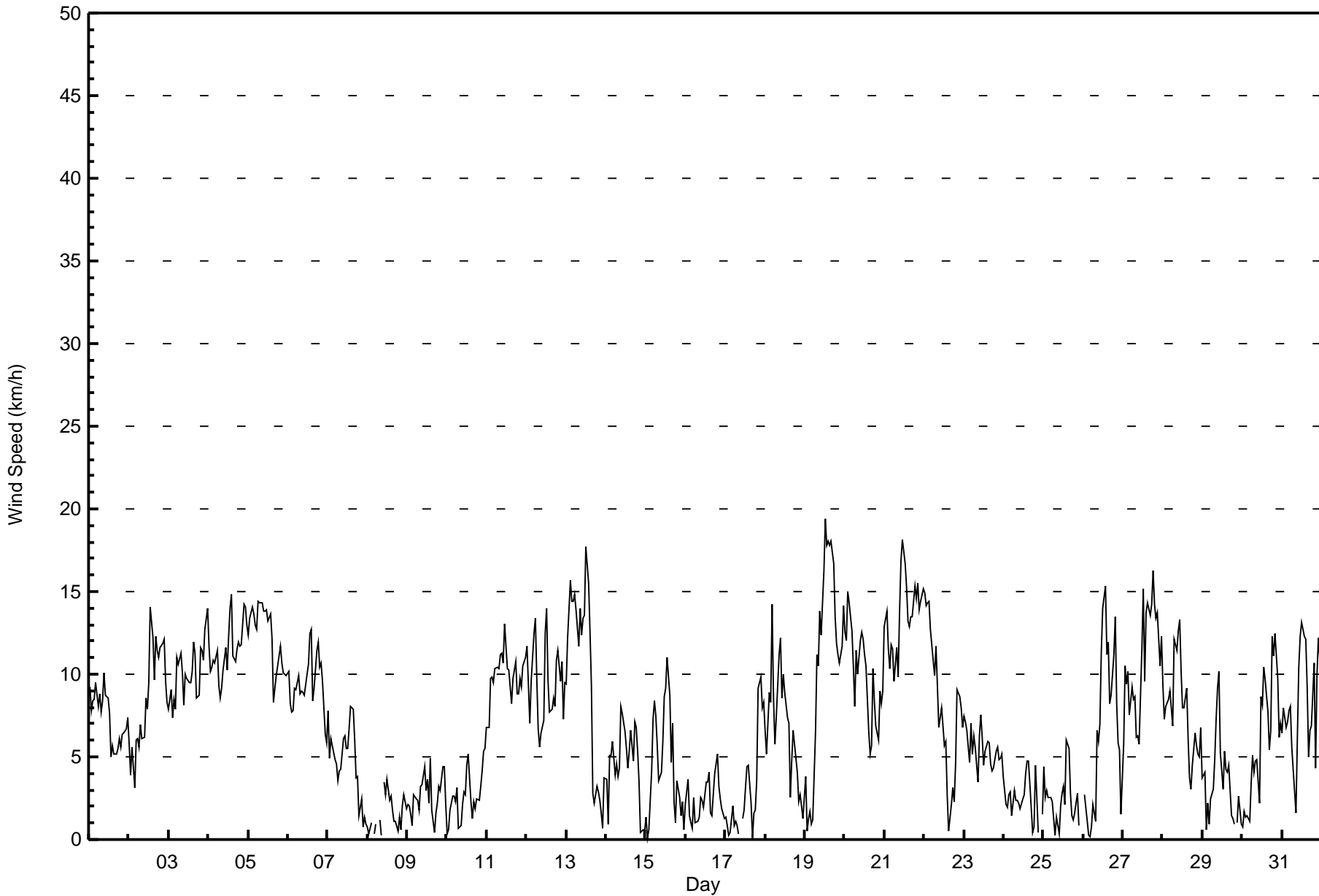
Conklin Community - December 2016

Maximum Speed: 19 km/h on Dec 19 13:00	Maximum Daily Speed Average: 13.5 km/h on Dec 21	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 15 02:00	Minimum Daily Speed Average: 0.6 km/h on Dec 8	Hours of Data: 736
Maximum Diurnal Speed Average: 4.9 km/h at hour 12	Minimum Diurnal Speed Average: 3.2 km/h at hour 17	Hours of Missing Data: 8
Monthly Average Velocity: 3.8 km/h 261.9 deg	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 3 Median = 7 Q ₃ = 10 P ₉₀ = 13 P ₉₉ = 18	Percent Operational Time: 98.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S9	SSW8	SW8	S9	SSW9	SSW8	SW9	SSW8	SSW8	SSW10	SW9	SW9	SW8	SW5	SW6	SSW5	SW5	SW6	SW6	SW6	SSW6	SSW6	SSW7	SW7	SSW7.2	SSW10	
2-Dec	SW6	SSW4	S6	SSE3	SSE6	S6	SSE6	SSE7	SSE6	SSE6	SSE9	S8	SSE9	S14	S12	S10	SSE12	SSE11	SSE11	SSE12	SSE12	SSE12	SSE10	SSE8	S8.3	S14	
3-Dec	SSE8	S9	S7	S9	S8	SSW11	SSW11	SSW11	SSW10	SSW8	SSW10	SSW10	SSW9	SW9	SSW10	SSW12	SSW11	SSW9	SSW9	SW12	SW11	SW11	WSW13	SW14	SSW9.5	SW14	
4-Dec	SW12	SW10	SW10	SW11	SW11	WSW11	SW9	SW9	WSW9	NW10	NNW12	NW10	NNW12	NNW14	NW15	NW11	NW11	NW11	NW12	NW12	NW12	NW14	NW14	NW13	WNW8.5	NW15	
5-Dec	NW12	NW13	NW14	NW14	NW13	NW13	NW14	NW14	NW14	NW14	NW14	NW14	NW13	NW14	NW12	WNW8	NW9	NW10	NW10	NW12	NW11	NW10	NW10	NW10	NW12.2	NW14	
6-Dec	NW10	NW8	NW8	NW8	NW9	NW9	NW10	NW9	NW9	NW9	NW9	NW10	NW11	NW12	NW13	NW8	NW9	NW11	NW12	NW10	NW11	NW10	NW6	NW6	NW9.4	NW13	
7-Dec	NW8	NW5	NW6	NW6	NW5	NW5	NW4	NW4	NW4	NW6	NW6	WNW6	NW6	NW7	NW8	NNW8	NNW6	NW4	NNW4	N1	N2	NE1	NNE1	ENE1	NW4.5	NW8	
8-Dec	S1	S0	SW1	AF	N0	NNW1	AF	N1	NW0	AF	NNE3	N3	N4	WNW2	N3	N2	N1	NW1	WNW0	SSW1	NNW1	SSW2	SSW3	SSW2	NNW0.6	N4	
9-Dec	SSW2	S2	SW2	WSW1	SSW3	S2	S2	SSW2	S3	S3	S4	S3	S4	SSW2	SSW5	WSW2	WNW0	S2	SSE2	SSE3	SSE3	S4	SSW4	SW2	S2.5	SSW5	
10-Dec	W0	S1	S2	S3	SSW3	SSW2	S3	S1	SSW1	S2	S3	S3	WSW4	WSW5	WNW2	SSW1	S2	SE2	SE2	WSW2	W3	WNW4	WNW5	W6	SW1.7	W6	
11-Dec	WNW7	WNW7	W10	W10	W10	W10	W10	W10	W11	W11	WNW11	W13	WNW10	WNW10	WNW9	WNW8	W10	W11	W9	W9	W10	W9	W10	W11	W9.8	W13	
12-Dec	W12	W9	WNW7	NW10	NNW12	NNW13	NW10	NW7	NW6	NW6	WNW7	NW12	NW14	WNW10	WNW8	WNW8	WNW9	NW8	NW11	NW11	NW10	NW11	NW7	NW9	NW9.1	NW14	
13-Dec	WNW9	NW12	NW16	NW14	NW14	NW15	NW14	NW12	NNW14	NNW12	NNW13	NNW14	NNW18	NNW15	NNW13	NW9	NW3	NW2	NW3	NW3	WNW2	SE2	NNE1	NW4	NNW9.4	NNW18	
14-Dec	NW4	NNW1	NW5	WNW5	WNW6	WNW4	SW5	SSW4	SW4	SW8	SW8	SW7	SW6	SSW4	W5	W7	WNW5	NW7	NW7	NW5	NW3	NW0	WSW1	W1	W3.3	SW8	
15-Dec	ESE1	S0	SW1	NW4	NW7	NW8	NW7	NW6	NW4	NW4	NW6	NW9	NW9	NW11	NW9	NW5	NW7	WNW2	W1	WNW4	W3	S1	SSE2	SSE1	NW4.1	NW11	
16-Dec	SE2	NNW4	NNW1	ESE1	SSE1	SE3	SSE1	S1	SSW1	S3	SSW2	S2	SSW3	SW3	SW4	NW2	S1	S4	SSW5	S5	S3	SSE2	SSE2	ESE1	S1.7	S5	
17-Dec	ESE1	SE1	NE0	SW0	S2	NNW1	NNW1	N1	SE0	AF	SSW1	SSE2	SE3	SE4	SE5	ESE2	NW0	SSE2	SSE2	SE4	S9	SSW10	SSW8	S8	S2.3	SSW10	
18-Dec	SSW7	SW5	SW9	SW8	SW14	SSW9	S6	SW7	SW11	SW12	WSW9	SW10	SW9	WSW7	WSW7	NW3	NNE5	N7	NNW6	N4	N2	ENE3	E2	NE1	SW4.4	SSW14	
19-Dec	NNW4	NW0	N1	NNE2	NNE1	NE1	SW7	SW11	SW10	WSW14	WSW12	WSW16	WSW19	WSW18	W18	WNW18	WNW18	NW17	WNW14	WNW12	W11	W11	W12	W14	W9.4	WSW19	
20-Dec	W13	WSW12	W15	W14	WSW13	SW11	SSW8	SW11	SW10	SW12	SW13	SW12	SW11	SW11	SW7	SW5	SSW6	SW10	SW8	SSW7	SSW6	WSW9	SW8	SSW9	SW9.5	W15	
21-Dec	SW13	SW14	SW12	SW10	SW12	SW12	SW10	SW12	SW10	SW14	SW17	SW18	SW17	SW15	SW13	SW13	SW13	SW14	SW15	SW15	SW16	SW14	SW14	SW15	SW13.5	SW18	
22-Dec	SW15	SW14	SW14	SW14	SW13	SW11	SW10	WSW12	SW9	SW7	W8	WNW7	NW6	NW6	NW3	NNW0	N2	NNW3	NNW2	N5	NNE9	NNE9	N8	NNE7	WSW4.6	SW15	
23-Dec	NNE7	N7	NE7	NNE5	NNE7	NNE5	N6	NNE6	ENE3	NNE6	NNE8	N6	NE4	E5	NE6	NNE6	NNE5	N4	NNE4	ENE5	NE6	NE5	ENE5	NE5	NNE5.3	NNE8	
24-Dec	NNE4	N2	N2	NW3	NNW3	NNW1	N3	N2	N2	NE2	NNE2	ENE2	ESE3	ESE4	ESE5	ESE5	ESE3	ENE0	ESE1	SE5	SE3	N0	AF	SE2	ENE1.3	ESE5	
25-Dec	SE4	ENE3	E3	E3	NNE3	ENE2	ENE1	NNW0	SE1	S0	SE2	SSE3	SW3	ESE2	S6	SSE6	S3	S1	SSW1	S2	S3	ESE1	AF	AF	SE1.6	S6	
26-Dec	AF	NNW3	NNW1	SSE0	N0	ESE1	ESE2	NE1	SSE7	SSE6	S7	S11	S14	S15	SSW11	S12	S8	SSE9	S11	S14	S8	S6	SSE5	SE2	S6.1	S15	
27-Dec	SSE6	S10	S9	SSW10	SSW8	S9	SSW8	S9	SSW6	SSW6	SW6	SSW12	SSW15	SW10	SW14	SW14	SW14	SW14	SW14	SW16	SW14	SW13	SW14	SW11	SW12	SSW10.2	SW16
28-Dec	SW9	SSW7	WSW8	W8	W9	W8	WNW7	NW12	NW11	NW13	NW13	NW10	NW8	WNW8	NW9	NW6	NW4	WNW3	WNW4	WNW6	NW6	WNW5	W5	W7	WNW6.8	NW13	
29-Dec	WNW4	W4	WSW1	SSW2	SSE1	S2	SE3	SSW5	SSW7	SW9	SW10	SW5	SSW3	S5	S4	S4	SSW5	E1	SSW1	SW1	AF	NNW1	NNW3	NW1	SSW2.8	SW10	
30-Dec	SW1	SSW2	SSW1	WNW1	SW1	SSW3	S5	S4	S5	SSE5	S2	SW9	WSW8	WSW10	W10	WSW8	SW5	SW7	SW12	WSW11	W12	WNW10	WNW6	WNW7	WSW5.1	W12	
31-Dec	WNW6	NW8	NW7	NW7	NNW8	NW8	NNW6	NW4	WNW2	NW6	NNW10	NNW12	NNW13	NNW12	NNW12	NW9	NW5	NW7	NW7	NW11	W4	W10	W12	WNW11	NW7.7	NNW13	

WSW3.4	WSW3.3	W3.6	W3.7	W3.7	W3.5	WSW3.3	WSW3.8	WSW3.5	WSW4.2	W4.2	W4.9	W4.9	W4.6	W4.6	W3.6	W3.2	W3.4	W3.7	W3.5	W3.5	W3.5	WSW3.7	W3.7	Diurnal Average
SW15	SW14	NW16	NW14	NW14	NW15	NW14	NW14	NW14	NW14	SW17	SW18	WSW19	WSW18	W18	WNW18	WNW18	NW17	SW16	SW15	SW16	NW14	SW14	SW15	Diurnal Maximum

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - December 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	294	39.95	39.95
6 - 11	307	41.71	81.66
12 - 19	135	18.34	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 736

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	22	14	8	11	5	15	19	18	43	34	18	8	9	18	33	19	294
6 - 11	3	11	3	0	0	0	0	17	24	38	55	13	28	27	81	7	307
12 - 19	0	0	0	0	0	0	0	4	6	5	42	9	10	4	39	16	135
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	25	25	11	11	5	15	19	39	73	77	115	30	47	49	153	42	736

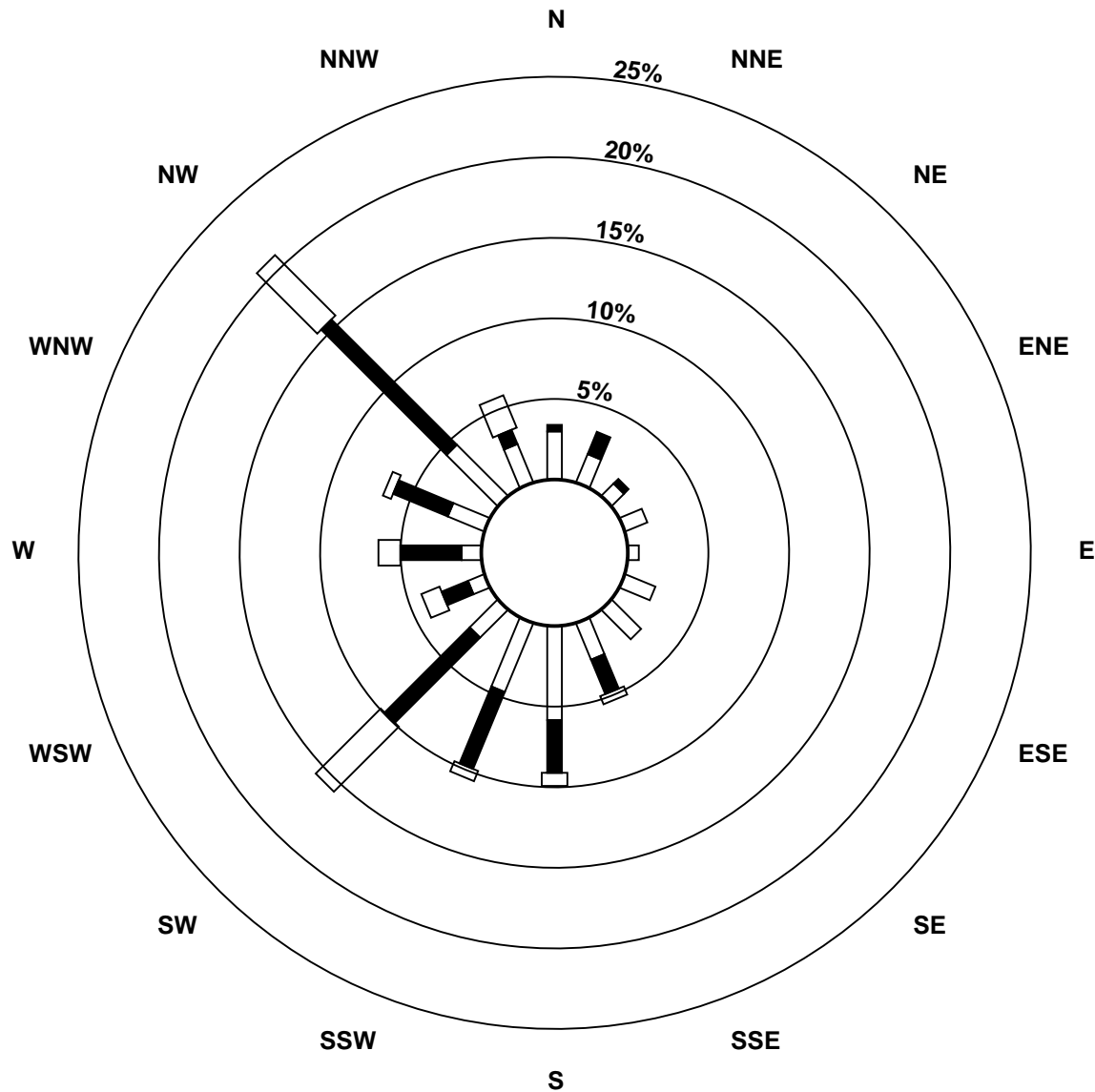
Total Number of Valid Hours: 736

Total Number of Hours: 744

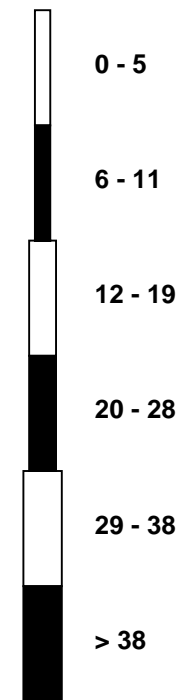


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Conklin Community (AMS 21)



Classes (km/h)



Total Number of Valid Hours: 736



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Conklin Community - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 19 16:00	Hours in Service: 744 Hours of Data: 736 Hours of Missing Data: 8 Hours of Calibration: 0 Percent Operational Time: 98.9
Minimum Value: 0 km/h on Dec 24 04:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5	

Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	3	3	3	3	3	2	2	3	3	3	2	1	1	1	1	2	2	1	2	1	2	2	3	
2-Dec	2	1	1	2	1	2	2	2	1	1	2	2	3	4	3	3	3	3	3	3	3	3	3	3	2	4
3-Dec	2	2	2	3	2	3	4	4	4	4	4	3	3	3	3	3	2	2	2	3	3	3	3	3	4	
4-Dec	3	3	3	3	3	3	3	2	3	3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	4	
5-Dec	4	4	4	4	3	4	4	4	4	5	5	4	5	5	4	3	3	3	3	4	3	3	3	3	5	
6-Dec	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	2	3	3	3	3	3	3	2	2	2	4
7-Dec	2	1	2	1	1	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	1	1	1	1	3	
8-Dec	1	1	1	AF	1	1	AF	1	1	AF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	
10-Dec	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	2	2	1	2	2	2	2	2	2	3	
11-Dec	3	3	4	3	3	4	4	4	4	4	4	4	4	4	4	3	4	4	4	3	3	3	4	4	4	
12-Dec	4	4	3	4	4	5	3	2	3	3	4	4	4	4	3	3	3	3	4	4	3	3	3	4	5	
13-Dec	4	4	5	4	4	4	4	3	5	3	3	4	6	4	4	4	2	1	1	1	1	1	1	1	6	
14-Dec	1	1	2	3	2	2	1	1	1	2	2	2	1	1	2	2	2	2	2	2	1	1	1	1	3	
15-Dec	1	1	1	2	2	3	3	2	1	1	2	3	3	4	3	2	2	1	2	1	1	1	1	1	4	
16-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	
17-Dec	1	1	1	1	1	1	1	1	1	AF	1	1	1	1	1	1	1	1	2	2	3	3	4	3	4	
18-Dec	3	2	3	3	4	4	2	4	3	3	3	2	3	2	2	1	1	2	3	1	1	1	1	1	4	
19-Dec	1	1	1	1	1	1	4	3	4	4	4	5	7	5	6	7	7	7	5	5	4	4	3	4	7	
20-Dec	4	4	4	4	4	3	2	3	3	3	4	3	3	3	2	2	2	3	3	2	2	4	2	2	4	
21-Dec	4	4	3	2	3	3	3	3	3	4	5	5	4	4	4	3	4	4	4	4	4	4	4	4	5	
22-Dec	4	4	4	4	3	3	2	3	3	1	3	3	2	2	1	1	1	1	2	2	3	3	2	2	4	
23-Dec	3	2	3	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	3	
24-Dec	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	2	2	
25-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	AF	AF	1	
26-Dec	AF	1	1	1	1	2	2	1	3	2	4	3	4	4	4	3	2	3	3	3	4	1	1	2	4	
27-Dec	2	2	4	4	3	3	3	3	2	2	3	4	4	3	4	4	4	3	4	4	3	3	3	3	4	
28-Dec	2	2	3	3	3	4	4	4	4	3	4	3	3	3	3	3	1	1	2	3	2	2	2	2	4	
29-Dec	1	1	2	2	1	1	1	2	2	2	3	2	2	2	1	1	1	1	1	1	AF	1	1	1	3	
30-Dec	1	1	2	1	1	2	2	1	1	1	1	2	2	3	4	3	3	3	4	3	5	4	2	3	5	
31-Dec	2	3	2	2	2	3	1	2	1	3	3	4	3	4	3	3	2	2	3	3	2	3	4	5	5	
	4	4	5	4	4	5	4	4	5	5	5	5	7	5	6	7	7	7	7	5	5	5	4	4	5	

Diurnal Maximum

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Conklin Community - December 2016

Direction of Maximum Speed: 254 deg on Dec 19 13:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 225.3 deg on Dec 21	Hours of Data: 736
Direction of Minimum Speed: 186 deg on Dec 15 02:00	Hours of Missing Data: 8
Direction of Minimum Daily Speed Average: 0.6 deg on Dec 8	Percent Operational Time: 98.9
Monthly Average Direction: 271.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	185	198	216	191	194	210	216	208	192	209	236	222	225	227	216	210	216	221	214	232	210	211	207	222	211.0
2-Dec	236	199	188	161	156	173	156	166	150	153	168	173	164	181	175	174	161	168	165	165	168	166	160	166	169.3
3-Dec	167	170	170	183	184	194	201	201	195	198	204	211	205	217	206	208	204	201	208	231	233	228	237	236	206.3
4-Dec	235	226	225	226	235	239	235	236	250	304	336	320	338	345	325	325	315	312	314	314	315	321	320	319	295.5
5-Dec	316	317	318	316	318	314	318	318	318	314	313	315	313	314	310	303	309	312	311	314	316	312	312	309	314.2
6-Dec	313	310	305	307	311	312	313	311	309	309	305	309	314	319	316	311	316	320	323	323	325	325	320	312	314.5
7-Dec	324	315	313	316	316	314	307	313	310	313	309	303	309	322	322	331	330	326	334	355	355	51	28	78	320.5
8-Dec	181	169	218	AF	358	345	AF	351	304	AF	28	8	8	297	1	350	350	319	284	195	331	206	199	200	332.3
9-Dec	207	183	236	245	206	183	191	200	172	169	174	176	183	196	197	250	286	185	154	159	165	181	198	226	188.2
10-Dec	275	178	180	183	201	194	173	185	208	182	186	176	237	239	300	202	182	140	142	258	275	287	295	277	226.2
11-Dec	290	293	271	269	270	271	275	277	273	274	291	272	285	293	290	283	274	277	277	279	276	271	274	277	277.8
12-Dec	272	276	288	314	331	331	325	317	309	307	303	315	316	301	295	298	302	318	321	321	317	317	308	306	309.9
13-Dec	301	314	324	323	322	321	319	314	339	346	341	337	342	335	329	323	306	310	322	326	291	132	26	323	327.2
14-Dec	324	336	322	298	302	297	236	204	225	224	218	221	216	208	281	274	302	321	325	314	323	322	256	273	272.0
15-Dec	121	186	227	325	322	317	311	311	313	317	319	312	306	314	314	308	318	295	269	295	266	178	164	149	310.2
16-Dec	135	329	328	117	160	140	149	178	197	185	195	177	197	217	230	305	174	189	193	175	171	165	152	117	186.2
17-Dec	119	141	41	218	183	332	343	355	126	AF	201	147	126	132	137	123	320	154	156	134	191	193	196	188	170.5
18-Dec	192	228	229	220	214	213	173	217	229	220	241	233	235	241	250	325	12	352	341	349	1	78	79	44	232.8
19-Dec	334	306	351	30	17	56	214	220	217	238	240	247	254	253	268	285	300	306	295	292	279	274	265	261	266.7
20-Dec	264	249	260	265	249	222	213	223	226	229	228	234	235	231	222	224	205	233	233	201	194	257	219	213	234.1
21-Dec	227	228	223	218	231	231	215	230	227	218	215	220	229	231	228	227	231	229	231	229	224	226	219	221	225.3
22-Dec	225	223	223	226	229	227	228	237	232	215	267	293	306	311	312	340	353	331	332	350	21	20	4	17	255.6
23-Dec	22	11	37	27	13	25	8	31	58	25	16	11	55	83	44	22	21	11	20	57	49	47	65	54	31.8
24-Dec	29	1	359	326	332	342	11	11	7	36	13	68	103	109	122	119	116	72	110	136	136	352	AF	131	67.8
25-Dec	133	77	89	81	32	57	74	335	137	180	143	165	219	102	172	156	174	171	195	189	173	109	AF	173	141.2
26-Dec	AF	340	328	163	11	122	116	36	159	166	180	186	191	186	194	176	177	168	175	178	178	189	168	126	178.4
27-Dec	151	173	183	196	192	183	205	185	194	199	220	211	209	218	214	216	218	227	231	230	230	234	227	232	211.7
28-Dec	222	210	245	278	275	278	291	315	322	315	321	315	307	303	308	308	304	303	291	290	308	291	281	271	293.4
29-Dec	292	271	248	211	163	172	136	212	211	219	214	214	208	191	190	182	202	96	196	235	AF	328	338	305	211.8
30-Dec	232	195	200	284	223	194	191	190	186	166	186	234	240	253	260	254	230	222	236	244	275	282	300	294	243.5
31-Dec	303	309	314	321	330	326	328	318	287	320	335	339	330	332	329	324	322	323	318	322	277	268	272	300	316.6

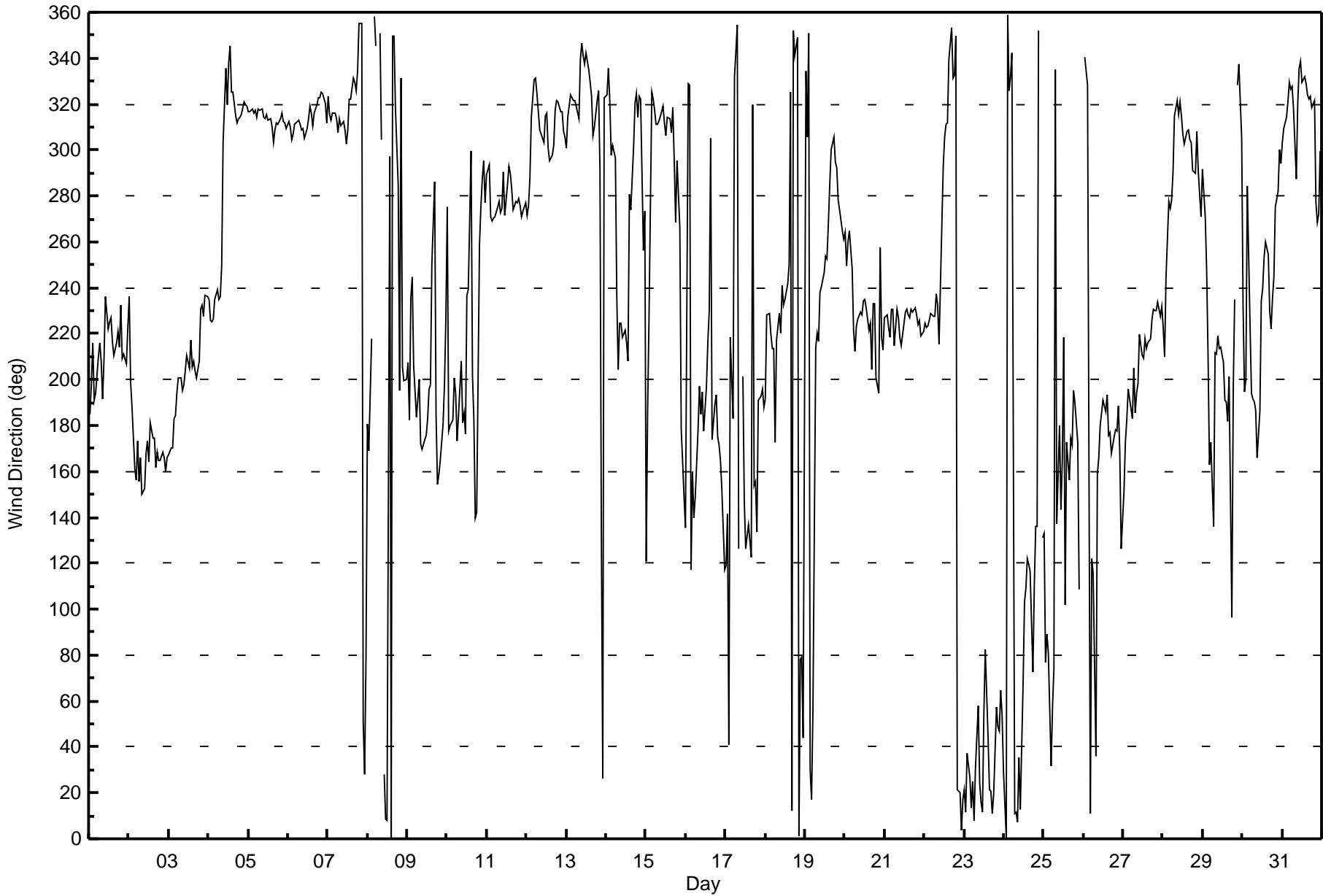
256.8 256.3 260.3 264.2 266.4 262.3 256.6 255.3 247.3 253.5 265.5 263.1 265.5 266.8 268.2 265.7 265.8 270.4 265.3 263.2 260.9 260.7 257.7 262.5
 Diurnal Average

AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Conklin Community - December 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Conklin Community - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 101 deg on Dec 14 02:00	Hours of Data: 736
Minimum Value: 7 deg on Dec 8 05:00	Hours of Missing Data: 8
Percentiles: P ₁ = 11 P ₁₀ = 17 Q ₁ = 19 Median = 23 Q ₃ = 32 P ₉₀ = 63 P ₉₉ = 94	Hours of Calibration: 0
	Percent Operational Time: 98.9

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	21	24	24	19	25	23	29	20	21	25	24	23	24	26	22	24	24	26	25	28	18	18	21	21	29
2-Dec	24	31	20	65	19	26	28	20	15	18	16	20	19	18	18	19	17	17	16	18	17	17	17	17	65
3-Dec	18	18	21	24	22	21	23	23	28	34	25	26	23	25	24	18	15	17	22	20	18	19	17	17	34
4-Dec	18	20	20	20	21	18	19	19	19	33	17	21	22	16	18	17	21	21	20	20	18	17	16	17	33
5-Dec	20	18	19	18	18	20	16	17	19	22	21	19	21	20	22	26	23	24	21	22	21	23	23	21	26
6-Dec	20	25	27	24	22	24	21	21	22	22	25	23	22	19	20	22	17	16	16	18	16	15	15	20	27
7-Dec	15	17	18	16	14	18	22	16	23	24	27	28	27	24	18	16	12	19	15	15	13	34	48	51	51
8-Dec	75	88	67	AF	7	17	AF	8	75	AF	35	61	40	47	37	15	9	26	51	84	66	30	13	46	88
9-Dec	38	31	48	68	17	25	33	30	19	17	15	30	37	71	28	53	69	68	36	13	32	16	19	67	71
10-Dec	78	93	27	25	25	20	12	84	76	24	24	37	31	39	39	78	57	59	65	81	46	40	31	28	93
11-Dec	31	32	22	22	20	23	23	24	22	25	30	23	29	30	29	28	24	27	25	27	23	20	24	25	32
12-Dec	20	23	31	22	19	18	16	18	24	25	28	20	20	30	29	32	27	19	19	18	21	18	24	26	32
13-Dec	30	22	18	17	16	17	18	20	25	17	17	19	19	19	18	17	20	19	17	16	70	77	57	20	77
14-Dec	21	101	16	32	25	32	20	21	33	19	21	19	22	24	33	23	28	18	17	12	15	55	71	61	101
15-Dec	78	86	71	25	19	20	21	18	16	11	16	22	26	22	19	21	15	22	82	27	48	74	38	95	95
16-Dec	60	17	50	78	80	22	71	83	55	35	37	47	43	37	25	24	70	17	11	14	36	45	60	64	83
17-Dec	48	91	65	81	30	52	8	20	99	AF	81	59	32	17	10	44	71	50	89	46	22	20	43	27	99
18-Dec	40	50	34	36	20	31	30	50	22	20	24	20	23	19	19	41	26	28	27	20	35	48	61	78	78
19-Dec	13	90	43	36	47	51	50	21	25	19	19	17	18	17	21	29	29	29	29	31	28	23	16	16	90
20-Dec	20	19	17	18	17	24	20	20	22	20	20	18	19	21	24	22	17	19	19	28	35	39	25	19	39
21-Dec	20	20	20	20	21	20	21	21	25	21	19	19	20	21	20	20	18	20	18	20	20	21	20	19	25
22-Dec	19	20	20	20	19	19	19	15	20	15	38	32	27	20	17	20	25	45	14	27	23	24	23	21	45
23-Dec	22	25	34	35	22	24	23	35	40	26	23	26	40	32	34	26	21	21	29	31	30	33	39	28	40
24-Dec	21	17	20	11	14	12	29	28	25	39	60	51	54	33	23	18	27	76	68	14	63	20	39	85	85
25-Dec	15	41	32	38	24	41	52	88	86	86	44	60	44	76	20	12	22	73	70	52	31	62	AF	97	97
26-Dec	AF	11	61	94	86	79	71	70	23	21	34	19	19	19	27	18	25	21	16	15	20	17	34	78	94
27-Dec	18	15	22	31	41	24	31	23	31	32	55	27	16	23	18	19	20	19	19	19	18	19	20	19	55
28-Dec	17	17	32	26	23	26	31	19	17	18	17	22	27	29	27	24	29	23	28	29	25	32	28	21	32
29-Dec	28	21	93	73	96	55	39	27	23	20	17	35	40	20	23	27	25	69	85	69	AF	66	20	67	96
30-Dec	81	68	94	51	69	31	20	16	18	23	74	22	23	18	25	28	32	23	19	21	24	28	29	30	94
31-Dec	26	24	20	20	16	15	13	17	31	18	18	20	18	19	18	17	18	21	20	18	25	20	21	30	31
	81	101	94	94	96	79	71	88	99	86	81	61	54	76	39	78	71	76	89	84	70	77	71	97	

Diurnal Maximum

AF - Analyzer Failure



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	11:45	End Time (MST)	15:25
Gas Cert Reference	EY0000359	Station temp.	22 Deg C
Cal Gas Concentration	51.4 ppm	Cal Gas Exp Date	February 9, 2018
Calibrator Make/Model	API T700	Serial Number	1221
ZAG Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-655	-655
Analyzer IP address	192.168.1.43		Lamp voltage	846	849
Calculated slope	1.006434	1.001201	Chamber temp	45.0	45.0
Calculated intercept	-0.739315	-0.582164	Pressure	659.3	672.5
Analyzer Background	21.2	20.9	Flow	0.486	0.494
Analyzer Coefficient	0.904	0.904	Intensity	92	92

Analyzer make Thermo 43i Analyzer serial # JC1428701363

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.5	----
as found span	5000	76.5	786.4	785.6	1.001
calibrator zero	5000	0.0	0.0	0.5	----
high point	5000	76.5	786.4	785.6	1.001
second point	5000	38.2	392.7	394.0	0.997
third point	5000	19.1	196.3	195.9	1.002
as left zero	5000	0.0	0.0	0.8	----
as left span	5000	76.5	786.4	789.4	0.996
Average Correction Factor					1.000

Corrected As found 785.1 Previous response 782.1 % change -0.4%

Notes:

Sample inlet filter replaced after as founds. No adjustments. As lefts began at 14:50 MST.

Calibration Performed By: Asad Hidayat



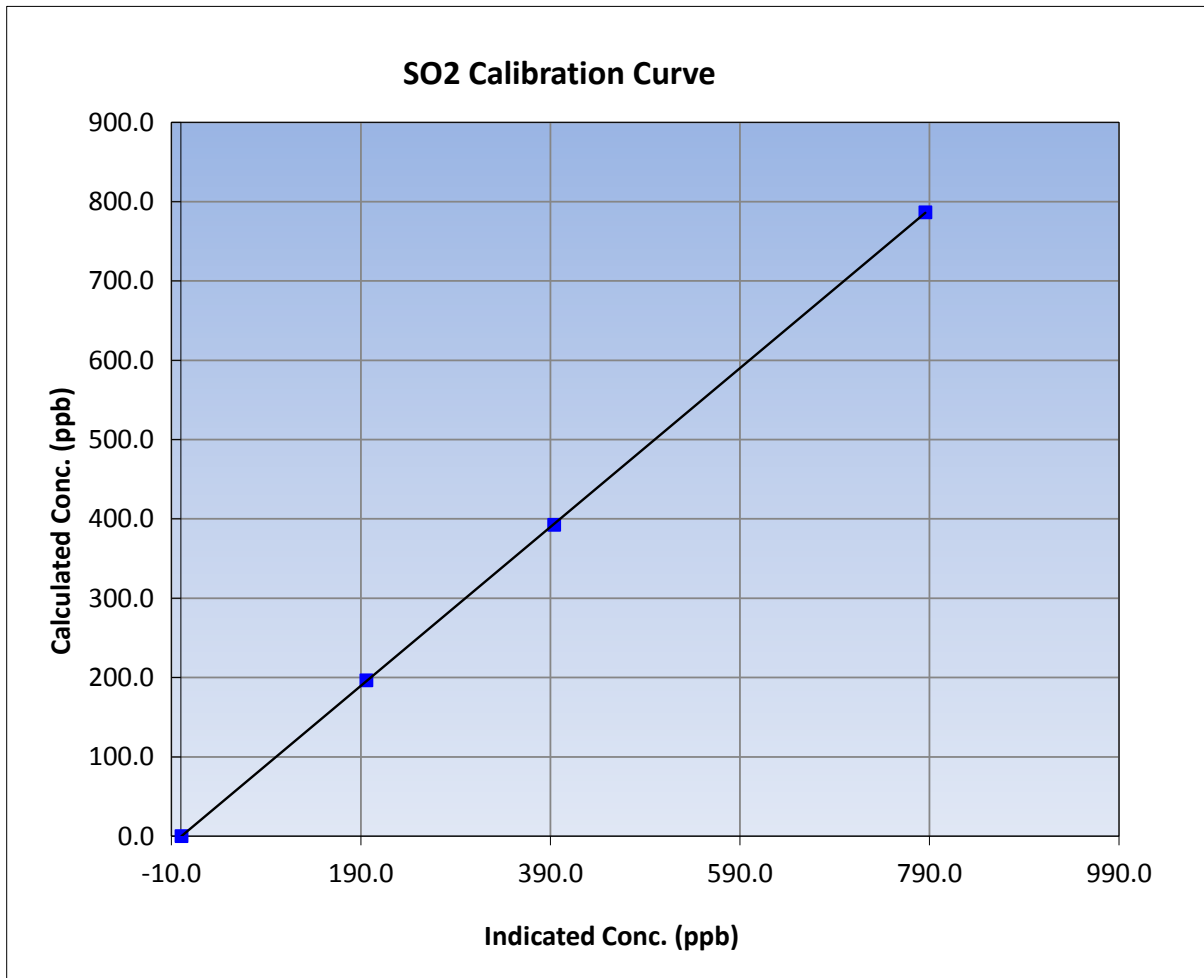
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 43i	Analyzer serial #	JC1428701363

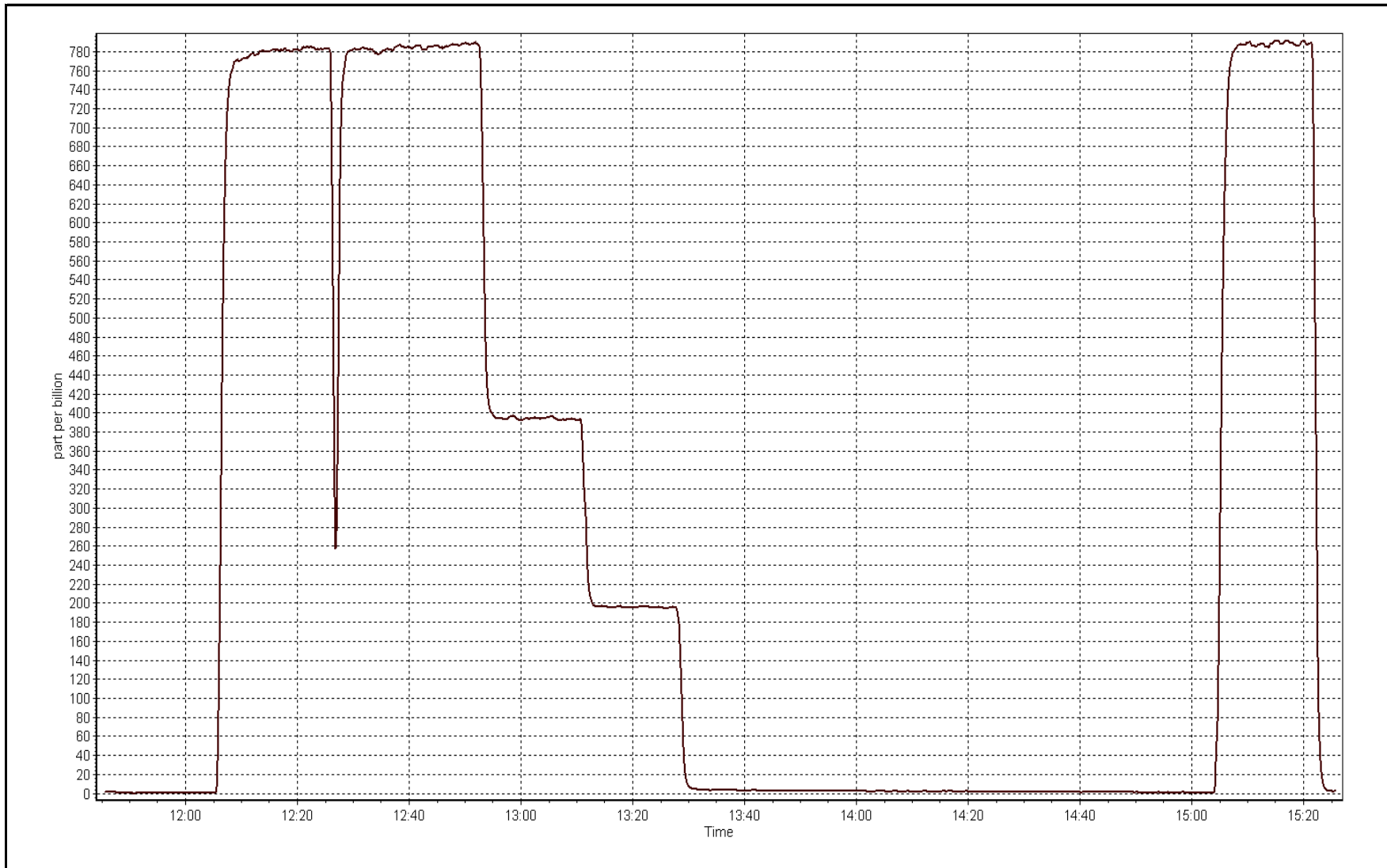
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999993
786.4	785.6	1.0010		
392.7	394.0	0.9966	Slope	1.001201
196.3	195.9	1.0021		
			Intercept	-0.582164



SO2 Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	11:45
Gas Cert Reference	LL119411	Station temp.	22 Deg C
Cal Gas Concentration	4.97 ppm	Cal Gas Exp Date	February 12, 2019
Calibrator Make/Model	API T700	Serial Number	1221
Dil air Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	EY0000359 February 9, 2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-732	-732
Analyzer IP address	192.168.1.44		Lamp voltage	1023	1033
Calculated slope	1.000321	0.990332	Chamber temp	45	45
Calculated intercept	0.101957	0.057688	Pressure	662.4	680.4
Analyzer Background	1.49	1.44	Flow	0.427	0.437
Analyzer Coefficient	1.007	0.992	Intensity	92	92
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1236656116	
Converter make/model	CDN-101		Converter serial #	NA	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	80.6	80.1	81.7	0.980
SO2 scrubber check	5000	19.5	200.5	0.9	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	80.1	80.9	0.991
second point	5000	40.4	40.2	40.5	0.992
third point	5000	20.2	20.1	20.1	0.998
as left zero	6000	0.0	0.0	0.2	----
as left span	5000	80.6	80.1	80.2	0.999
Average Correction Factor					0.993

Corrected As found	81.7	Previous response	80.0	% change	-2.1%
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Notes:

Sample inlet filter replaced after as founds. SO2 scrubber check completed after as founds. Slightly adjusted span.

Calibration Performed By:

Asad Hidayat



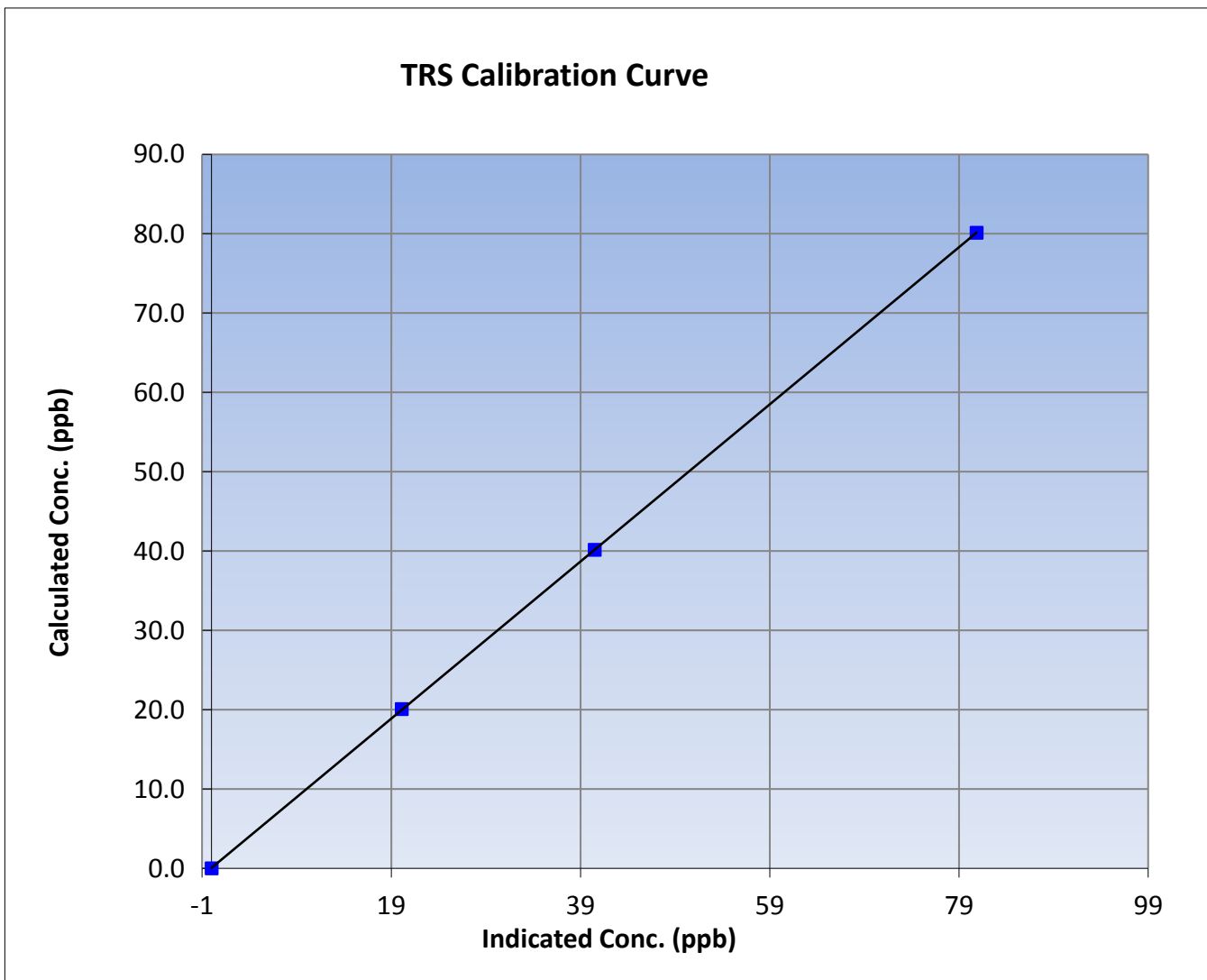
Wood Buffalo Environmental Association TRS Calibration Report

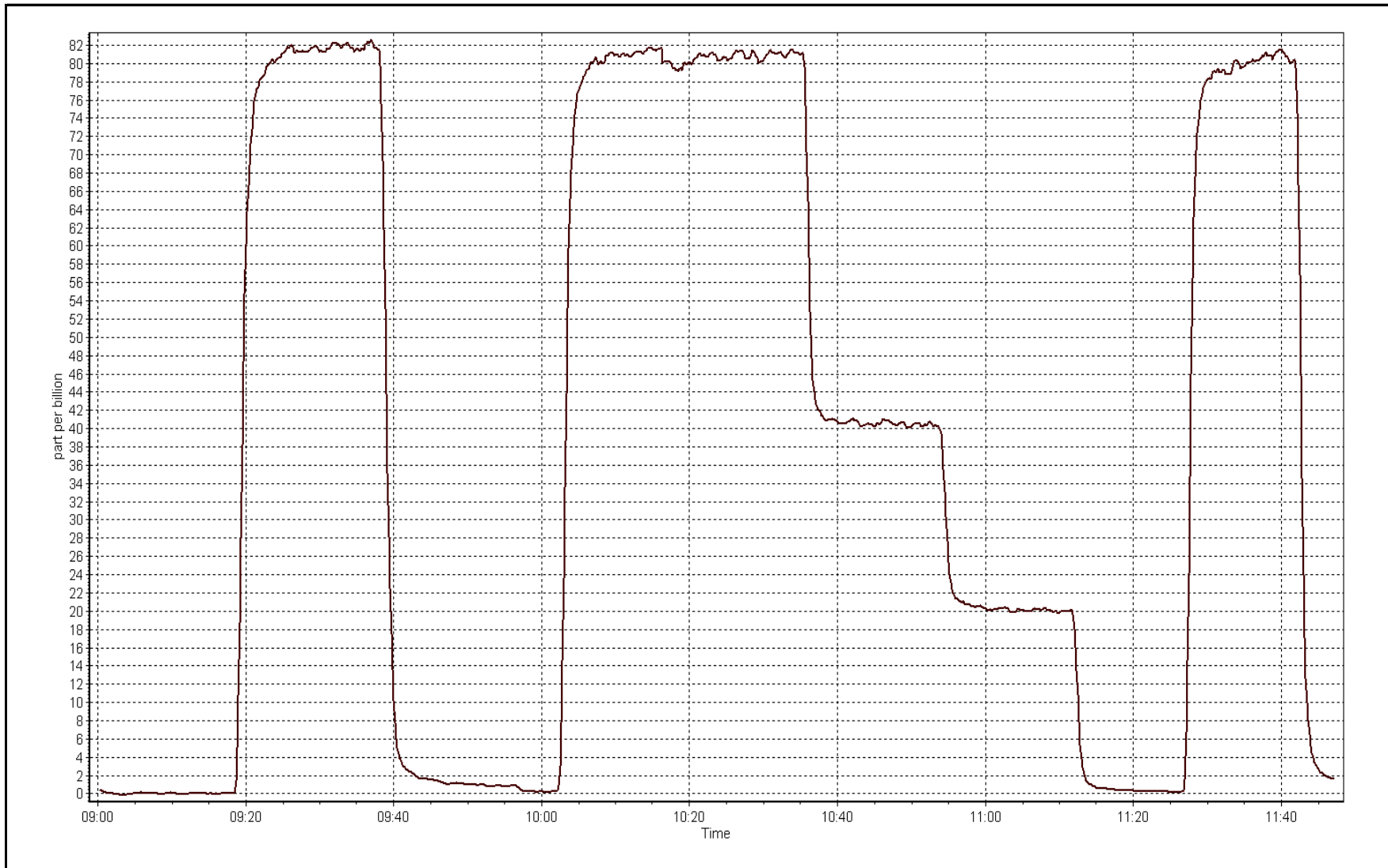
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:00	End Time (MST)	11:45
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1236656116

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999996
80.1	80.9	0.9908		
40.2	40.5	0.9915	Slope	0.990332
20.1	20.1	0.9980		
			Intercept	0.057688







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	December 7, 2016	Last Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	11:45	End Time (MST)	15:25
Gas Cert Reference	EY0000359	Cal Gas Expiry Date	February 9, 2018
CH4 Cal Gas Conc.	512.0 ppm	CH4 Equiv Conc.	1084.0 ppm
C3H8 Cal Gas Conc.	208.0 ppm	Station temp.	21 Deg C
Calibrator Model	API T700	Serial Number	1221
ZAG make/model	Teledyne API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	Serial Number	9628

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.995984	0.986778	Carrier Pressure	37.0	37.0
THC Calc intercept	0.065937	0.063281	Fuel Pressure	49.6	49.6
NMHC Calc slope	0.994449	0.984102	Air Pressure	34.2	34.3
NMHC Calc intercept	0.037831	0.035427			

Analyzer make Thermo 55i Analyzer serial # 1152430011

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	76.5	16.59	16.77	0.989
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	16.59	16.77	0.989
second point	5000	38.2	8.28	8.31	0.997
third point	5000	19.1	4.14	4.06	1.020
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	16.59	16.84	0.985
Average Correction Factor					1.002

Corrected As found 16.77 Previous response 16.59 % change -1.1%

Notes:

Sample inlet filter and hydrogen cylinder replaced after as founds No adjustments.

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	76.5	8.75	8.87	0.987
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	8.75	8.87	0.987
second point	5000	38.2	4.37	4.40	0.993
third point	5000	19.1	2.19	2.14	1.021
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	8.75	8.91	0.982
Average Correction Factor					1.000

Corrected As found 8.87 Previous response 8.76 % change -1.2%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	76.5	7.83	7.89	0.993
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	7.83	7.89	0.993
second point	5000	38.2	3.91	3.91	1.000
third point	5000	19.1	1.96	1.92	1.019
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	7.83	7.93	0.988
Average Correction Factor					1.004

Corrected As found 7.89 Previous response 7.82 % change -0.8%



Wood Buffalo Environmental Association

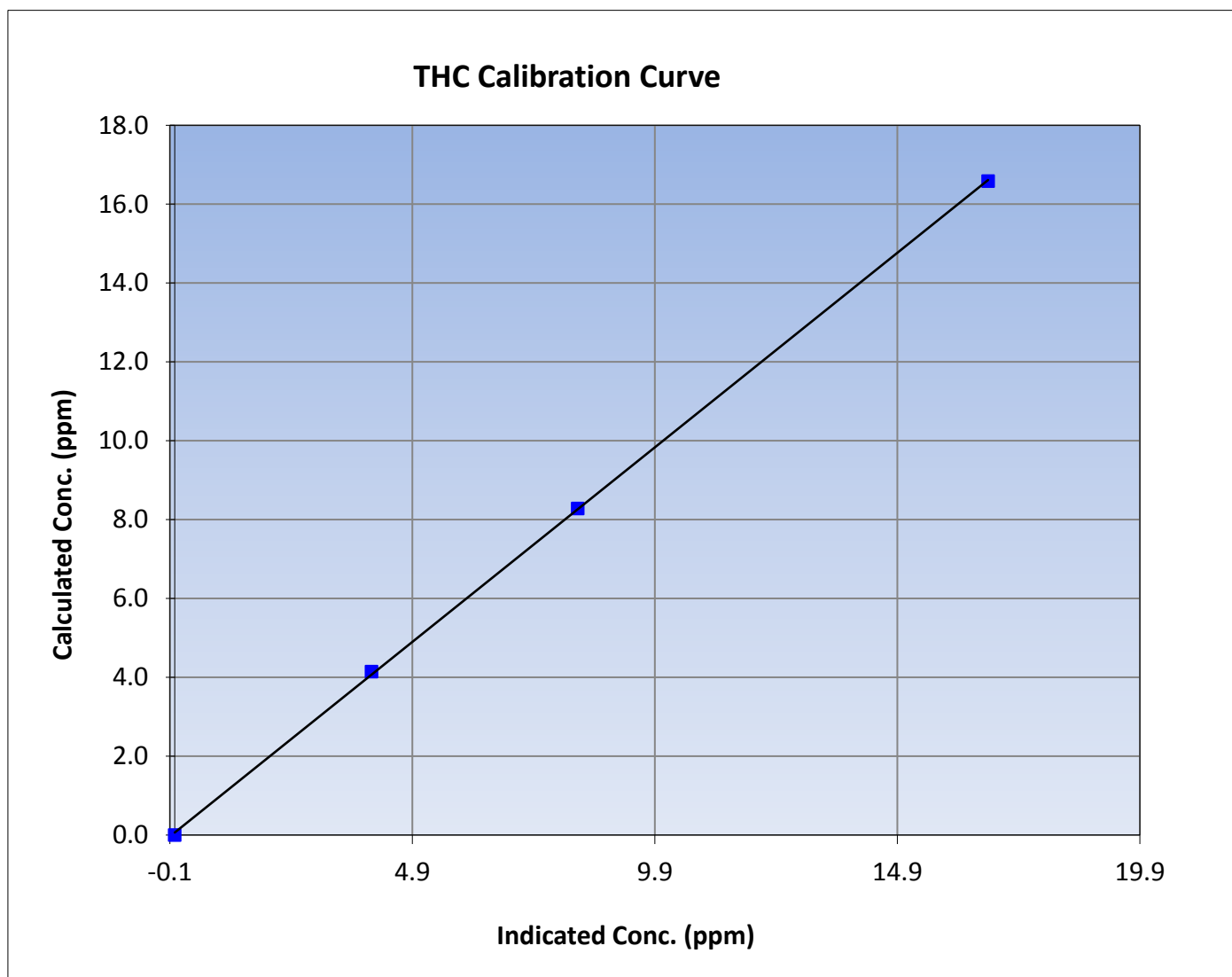
THC Calibration Summary

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999933
16.59	16.77	0.9890		
8.28	8.31	0.9966	Slope	0.986778
4.14	4.06	1.0199		
			Intercept	0.063281





Wood Buffalo Environmental Association

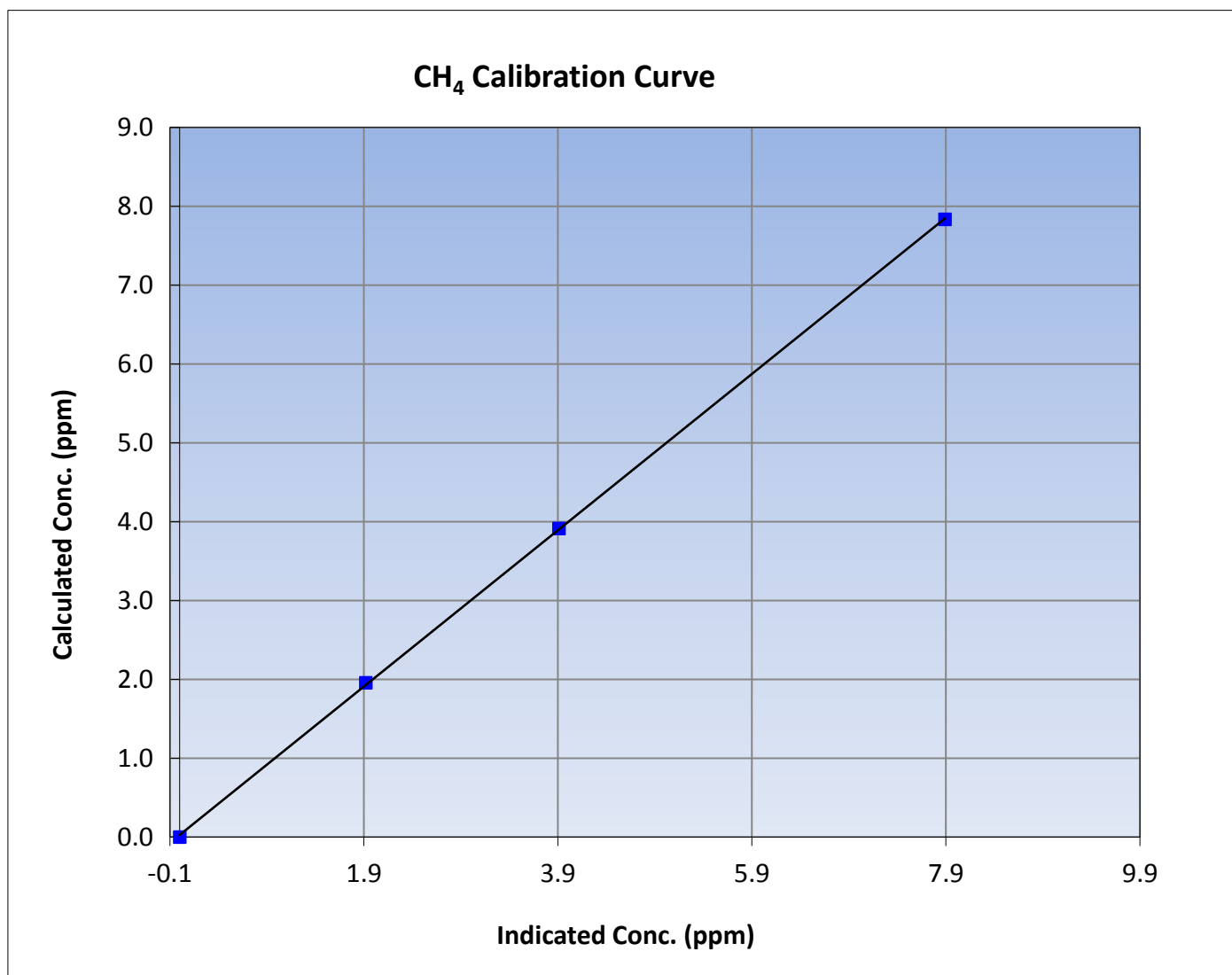
CH₄ Calibration Summary

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999951
7.83	7.89	0.9929		
3.91	3.91	1.0004	Slope	0.991077
1.96	1.92	1.0187		
			Intercept	0.025884





Wood Buffalo Environmental Association

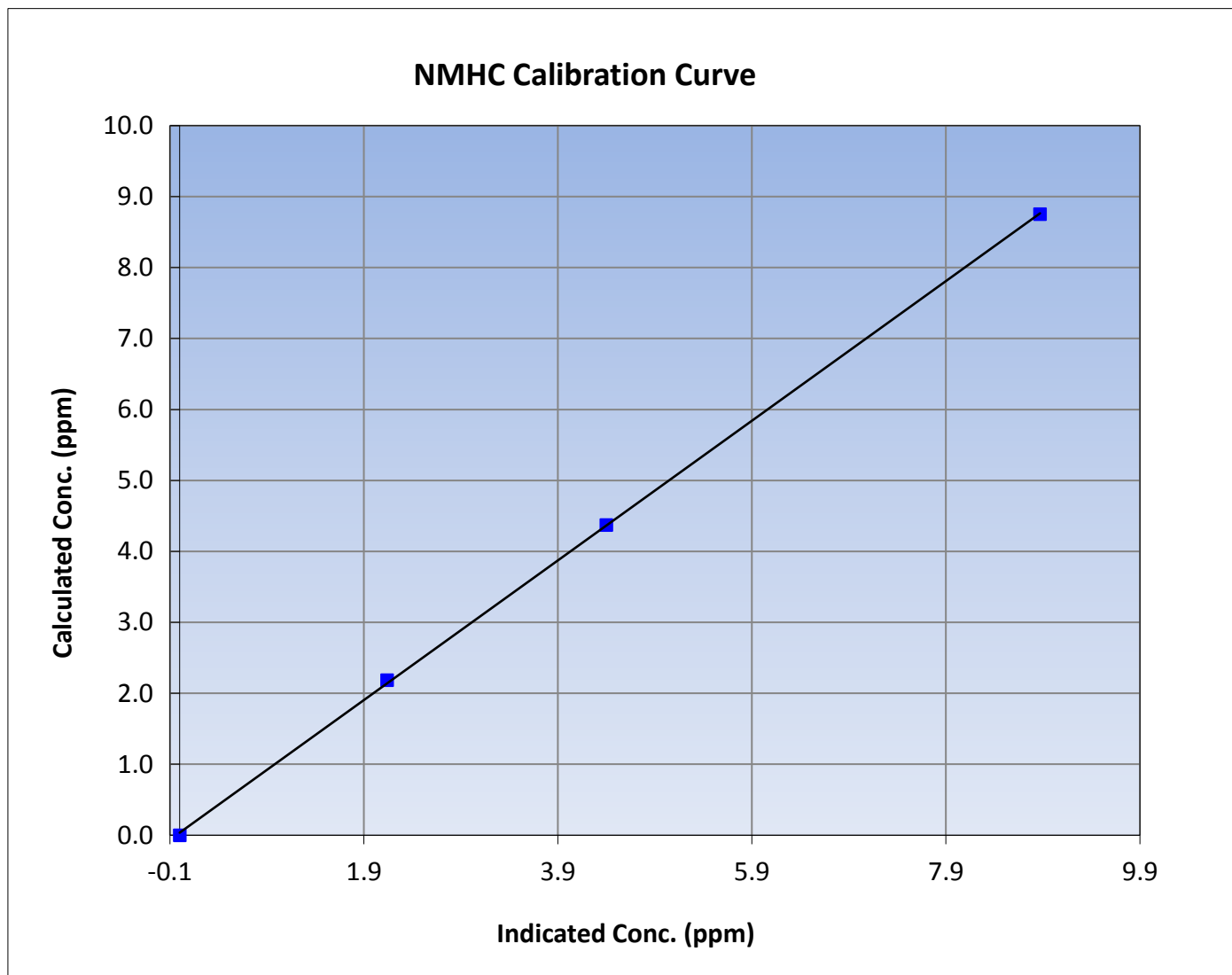
NMHC Calibration Summary

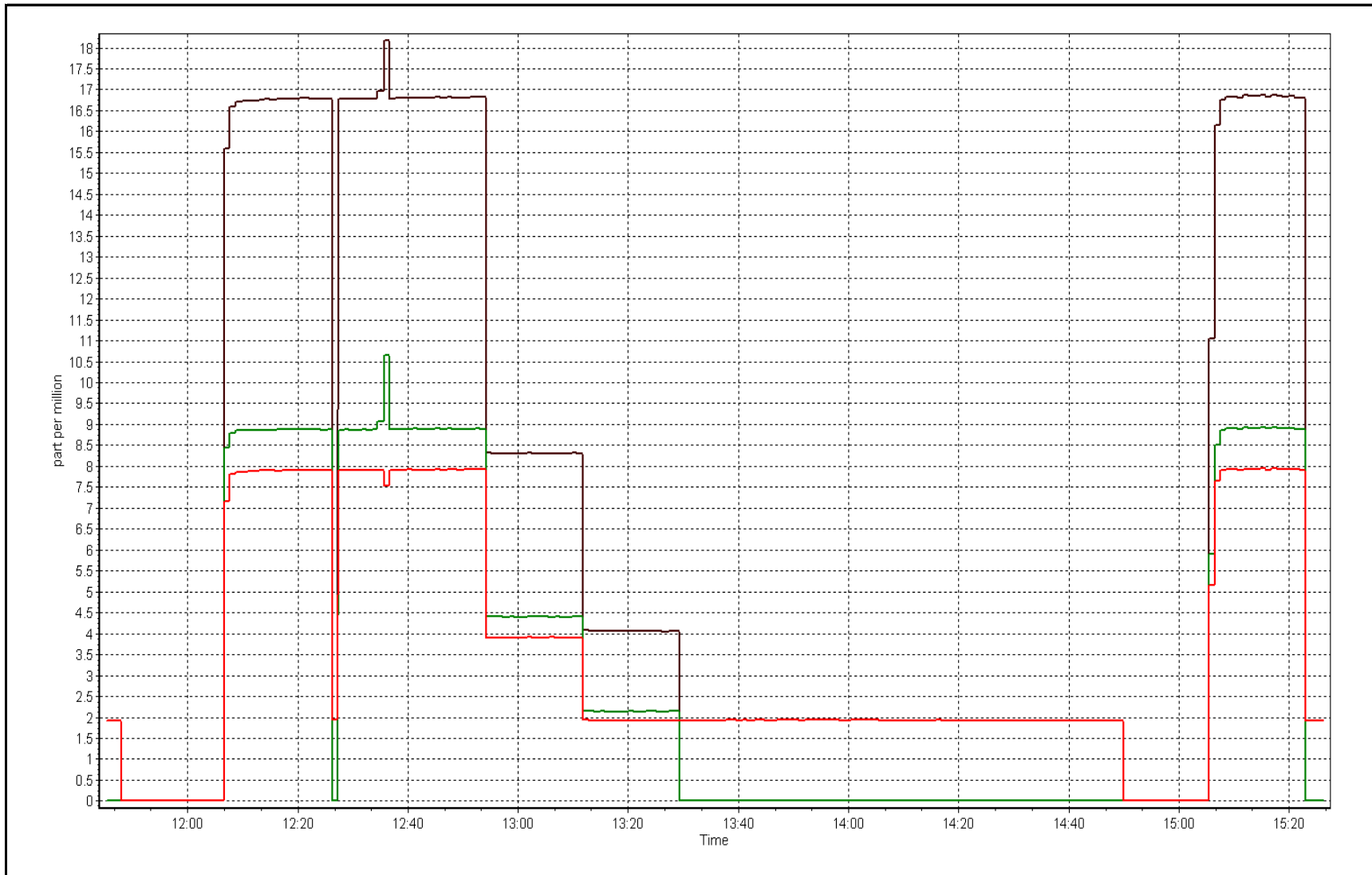
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999920
8.75	8.87	0.9867		
4.37	4.40	0.9932	Slope	0.984102
2.19	2.14	1.0210		
			Intercept	0.035427







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	15:26	End Time (MST)	17:40
NO2 GPT Ref date	Wednesday, December 07, 2016	Transfer Standard	23
Calibrator Make/Model	Teledyne API 700	Station temp.	21 Deg C
ZAG make/model	Teledyne API 701	Serial Number	1221
DACS make/model	Campbell Scientific CR3000	Serial Number	5611
		Serial Number	9628

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.8	26.8
Analyzer IP address	192.168.1.49		Lamp temp.	53.4	53.4
Calculated slope	0.994138	0.995135	Pressure	640.7	667.3
Calculated intercept	-0.204911	-0.037539	Flow cell A	0.730	0.751
Analyzer Background	-1.4	-1.3	Flow cell B	0.721	0.741
Analyzer Coefficient	1.036	1.033	Cell A Intensity	71398	71185
			Cell B Intensity	69780	69005

Analyzer make	Thermo 49i	Analyzer serial #	1501663734
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	186.2/800	0.0	-0.1	----
as found span	5000	568.9/1001.8	306.0	308.1	0.993
calibrator zero	5000	185.2/800	0.0	-0.1	----
high point	5000	568.9/1001.8	306.0	307.3	0.996
second point	5000	383.6/913.1	202.9	204.2	0.993
third point	5000	192.5/802.7	102.6	103.2	0.994
as left zero	6000	188.2/800	0.0	0.0	----
as left span	5000	568.9/1001.8	306.0	309.1	0.990
Average Correction Factor					0.994

Corrected As found	308.3	Previous response	308.0	% change	-0.1%
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Notes:

Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By: Asad Hidayat



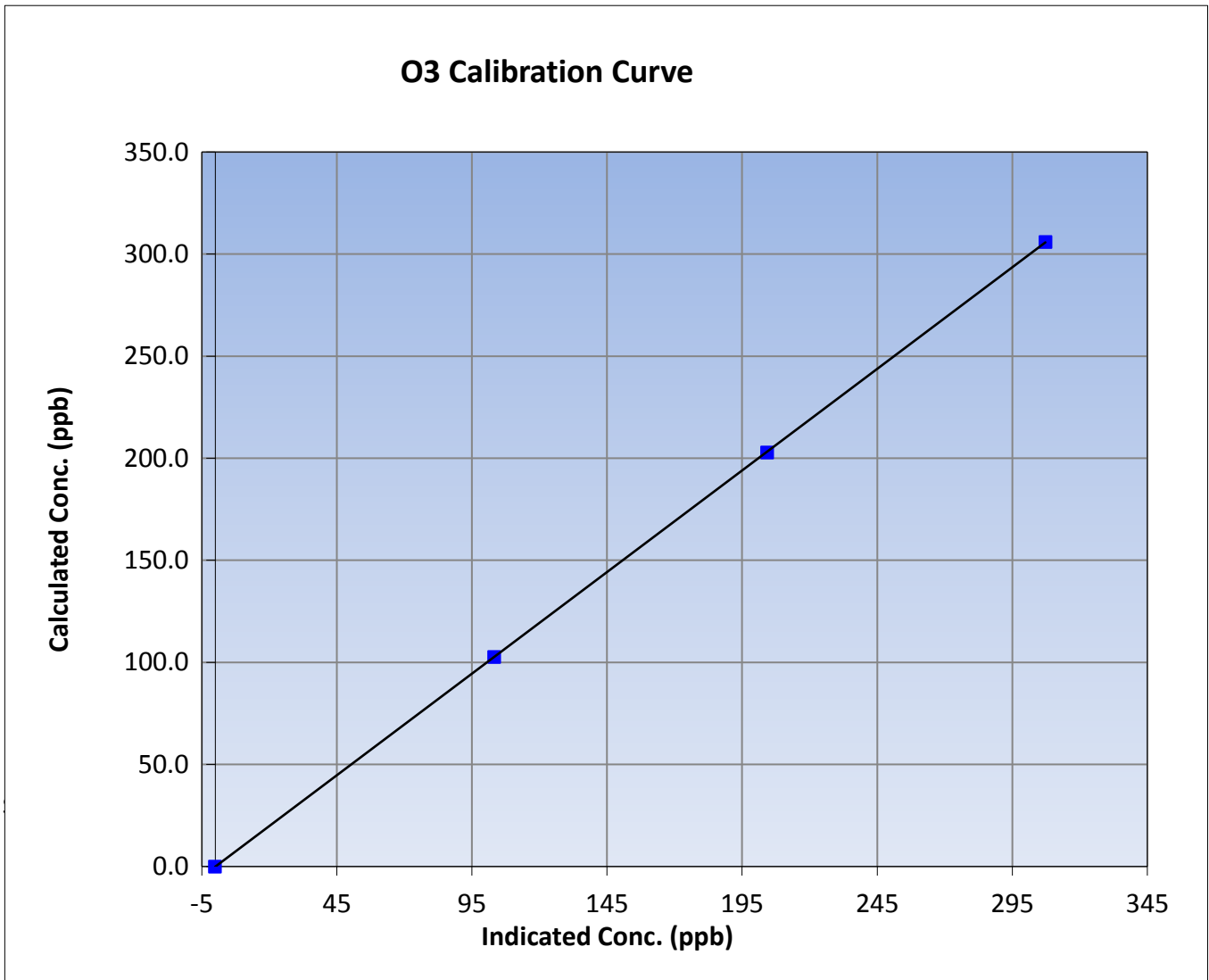
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	Wednesday, December 07, 2016	Previous Calibration	Tuesday, November 08, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	15:26	End Time (MST)	17:40
Analyzer make	Thermo 49i	Analyzer serial #	1501663734

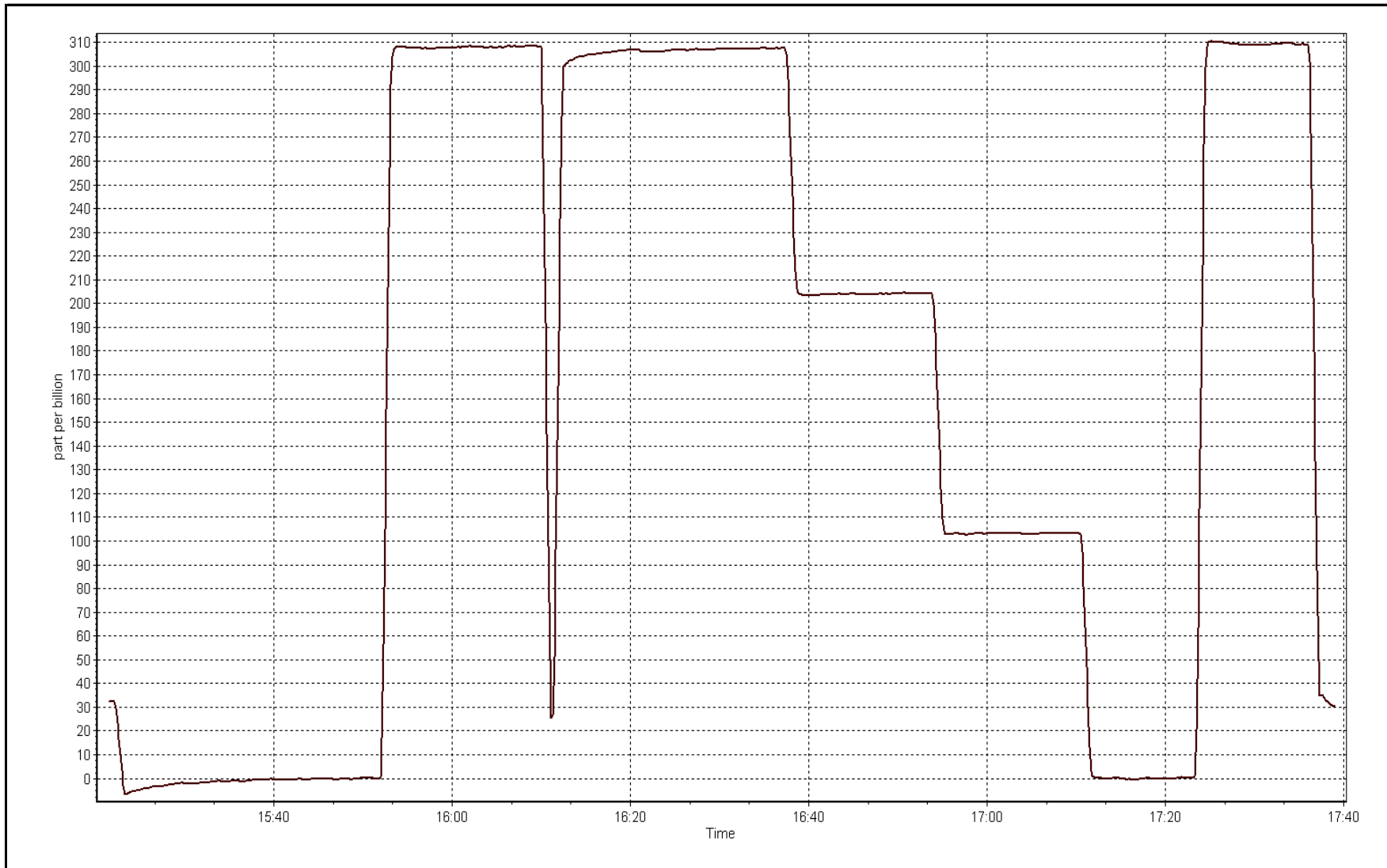
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999997
306.0	307.3	0.9958		
202.9	204.2	0.9934	Slope	0.995135
102.6	103.2	0.9942		
			Intercept	-0.037539



O3 Calibration Plot

Date: December 7, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	11:45	End Time (MST)	15:25
NO Cal Gas Conc	52.4 ppm	Gas Cert Reference	EY0000359
NOx Cal Gas Conc	52.4 ppm	Cal Gas Expiry Date	February 9, 2018
Calibrator	API T700	Serial Number	1221
Zero air Generator	API 701	Serial Number	5611

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9628
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.996143	0.995256	0.995795
	Data Offset	-0.118163	0.206558	-0.483831
Current Calibration	Data Slope	0.994433	0.993281	0.999262
	Data Offset	-0.660479	-0.285577	0.020423

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1501663731
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000 ppb		0-1000 ppb	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.251		1.357	
NOx coefficient	0.998		0.998	
NO2 coefficient	1.000		1.000	
NO bkgrnd	8.1		8.8	
NOx bkgrnd	8.2		8.9	
Chamber Temp	50.2	Deg C	49.8	Deg C
Moly Temp	326.6	Deg C	325	Deg C
PMT voltage	-840.6	V	-840.6	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	162.6	mmHg	165.8	mmHg
R Cell Press Nox	162.9	mmHg	165.8	mmHg
NO sample flow	0.711	lpm	0.719	lpm
Nox sample Flow	0.710	lpm	0.719	lpm

Notes:

Inlet filter replaced after as founds. As founds span response was low, was advised to calibrate the high point and will monitor the data to see what further steps should be taken. Adjusted span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 7, 2016 Station Number: AMS 21

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
as found span	5000	76.5	801.7	801.7	0.0	738.5	738.1	0.4	1.0856	1.0862
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
high point	5000	76.5	801.7	801.7	0.0	805.9	806.7	-0.8	0.9948	0.9938
second point	5000	38.2	400.3	400.3	0.0	405.2	405.1	0.1	0.9879	0.9882
third point	5000	19.1	200.2	200.2	0.0	201.8	201.2	0.6	0.9918	0.9950
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	----	----
as left span	5000	76.5	801.7	498.8	303.0	805.6	498.4	307.2	0.9952	1.0008
Average Correction Factor									0.9915	0.9923

Corrected As found NO_x= 738.7 NO= 738.2 Percent Change NO_x= 9.0% NO= 9.1%
 Previous Response NO_x= 804.9 NO= 805.3

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 76.50 ccm NOx ref calc conc = 801.7 ppb NO ref calc conc = 801.7 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	806.2	804.7	-0.1	0.9944	0.9963	----	----
1st NO2 (300)	498.8	306.0	804.9	498.8	306.1	0.9961	----	0.9994	100.1%
2nd NO2 (200)	601.9	202.9	804.8	601.9	203.0	0.9961	----	0.9995	100.1%
3rd NO2 (100)	702.1	102.6	804.9	702.1	102.8	0.9961	----	0.9983	100.2%
2nd NO ref point		0.0	804.1	802.6	1.5	0.9971	0.9989	----	----
Average Correction Factor						0.9963		0.9991	100.1%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

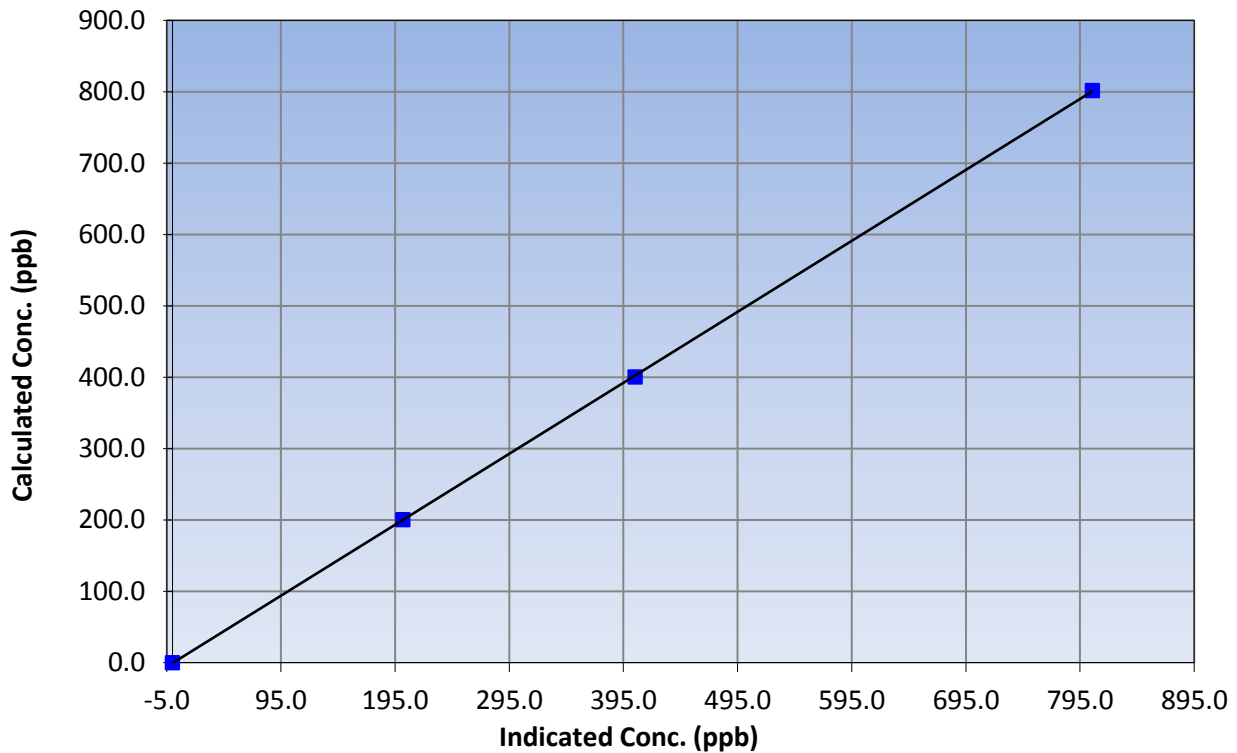
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999984
801.7	805.9	0.9948		
400.3	405.2	0.9879	Slope	0.994433
200.2	201.8	0.9918		
			Intercept	-0.660479

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

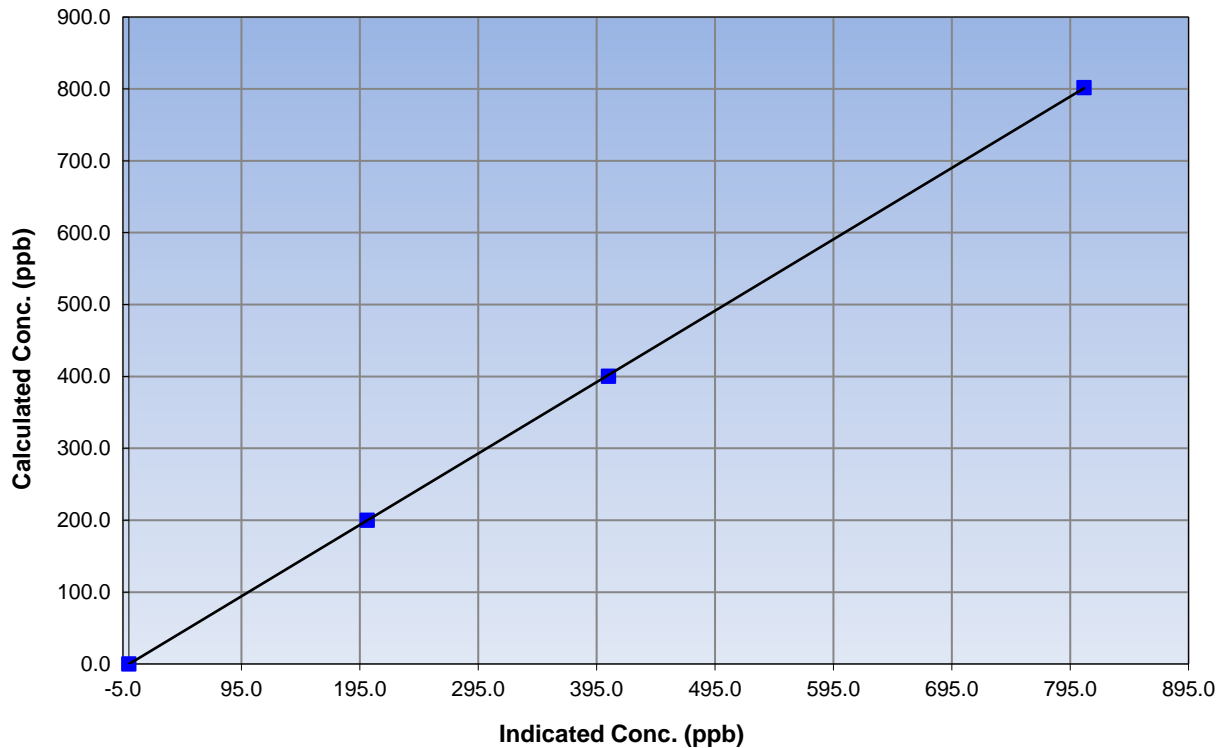
Station Information

Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999988
801.7	806.7	0.9938		
400.3	405.1	0.9882	Slope	0.993281
200.2	201.2	0.9950		
			Intercept	-0.285577

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

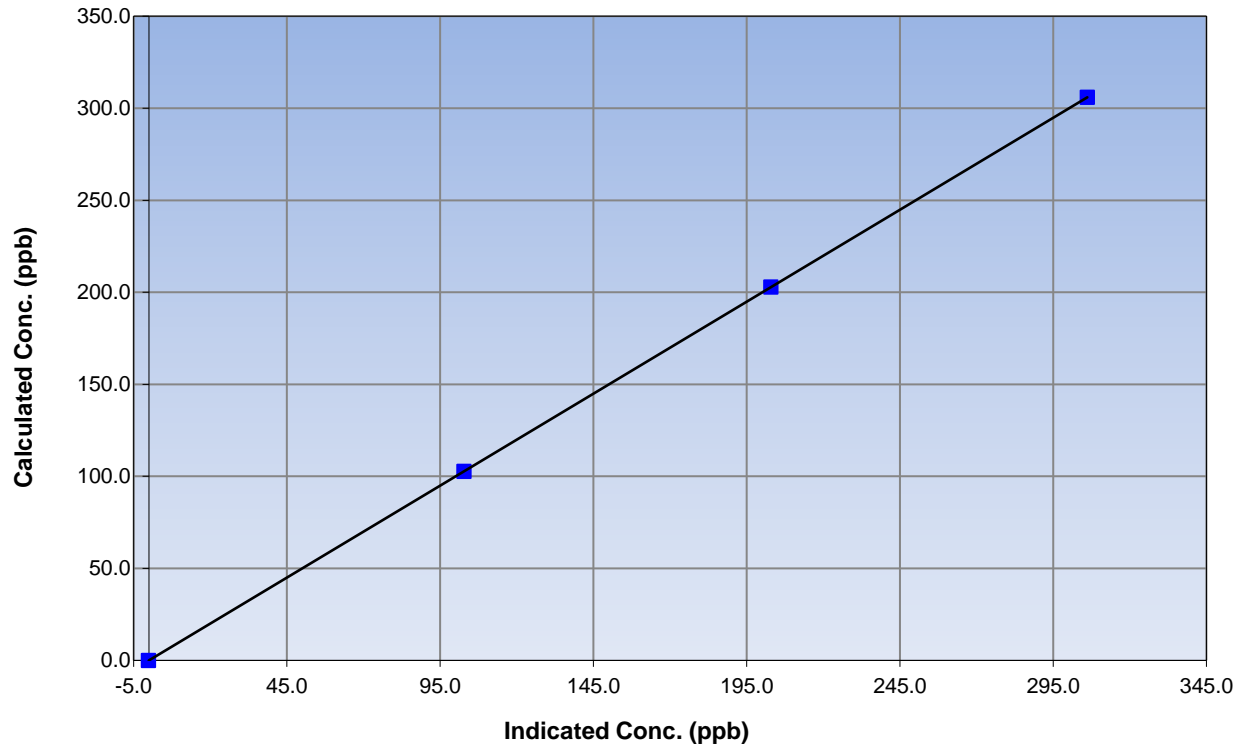
Station Information

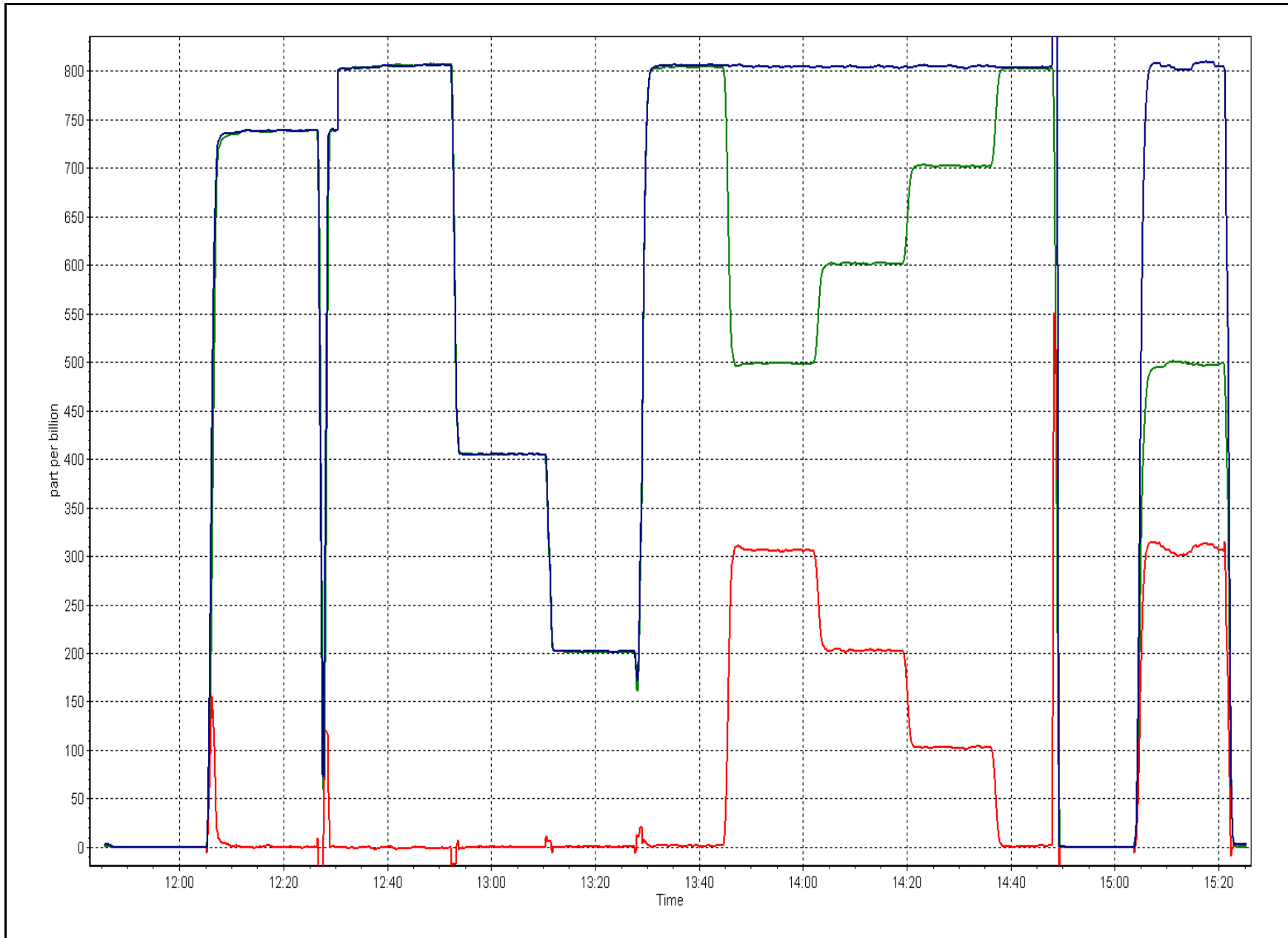
Calibration Date	December 7, 2016	Previous Calibration	November 2, 2016
Station Number	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:45	End Time (MST)	15:25
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	1.000000
306.0	306.1	0.9994		
202.9	203.0	0.9995	Slope	0.999262
102.6	102.8	0.9983		
			Intercept	0.020423

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Conklin Community	Station number:	AMS 21
Calibration Date:	December 7, 2016	Last Cal Date:	November 8, 2016
Start time (MST):	13:05	End time (MST):	16:55
Sharp Model:	5030	S/N:	7494
Particulate Fraction:	PM2.5	C14 Source S/N:	CM-0404
Flow Standard Model:	Delta Cal	S/N:	1019
Temp/RH standard:	Delta Cal	S/N:	1019

Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T1 (°C)	-18	-18.5	-18	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	968	963	968	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1001	1000	1001	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.6	-----	0.1	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

			<u>Tolerance</u>
Leak Test:	Date of check: <u>October 12, 2016</u>	Last Cal Date: <u>September 22, 2016</u>	
	Flow w/o adaptor: <u>16.95</u>	Flow w/ adaptor: <u>16.91</u>	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: <u>1265</u>	S/N: <u>2598</u>
	Date of check: <u>October 12, 2016</u>	Last Cal Date: <u>June 14, 2016</u>
	New Correction Factor: <u>7119</u>	Previous Correction Factor: <u>5603</u>

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T2 (°C)	20	22.5	21	<input checked="" type="checkbox"/>	+/- 2 °C
T3 (°C)	22	22.5	22	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	23	22.5	23	<input type="checkbox"/>	+/- 2 °C
RH (%)	37	8.3	9	<input checked="" type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned. Verified T2, T3, T4, and RH readings with vaisala primary standard (SN:L.3930028) ; RH readings on SHARP were much higher than what it was showing on T/RH standard. Adjusted RH and T2 only. Neph zero reponse changed without adjusting after doing T2-RH audit test. Adjusted neph zero.

Calibration by: Asad Hidayat



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 500
CENOVUS
CHRISTINA LAKE
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
DECEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100	17	0	10	0
H2S (ppb) Average	707	34	37	99.6	1	0	0	0
NO2 (ppb) Average	708	36	36	100	32	0	14	-
NO (ppb) Average	708	36	36	100	22	-	7	-
NOX (ppb) Average	708	36	36	100	54	-	19	-
Temperature 2 m (C) Average	744	0	0	100	2.1	-	-1.3	-
Relative Humidity (%) Average	744	0	0	100	95	-	90	-
Wind Speed 10 m (km/h) Average	744	0	0	100	33	-	22	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	1.6	3	-	0	0	0	0	2	5	17
H2S (ppb) Average	707	0.2	0	-	0	0	0	0	0	0	1
NO2 (ppb) Average	708	6	5	-	0	1	3	5	8	12	32
NO (ppb) Average	708	2.1	3	-	0	0	0	1	2	6	22
NOX (ppb) Average	708	8	8	-	0	2	3	6	10	18	54
Temperature 2 m (C) Average	744	-14.45	8.8	-	-35.5	-25.9	-20.9	-15.2	-6.1	-3.8	2.1
Relative Humidity (%) Average	744	76.8	8	-	50	69	73	76	81	89	95
Wind Speed 10 m (km/h) Average	744	11.3	6	-	1	4	7	11	15	19	33
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	06 Dec 2016 15:00	06 Dec 2016 15:00	1	Maintenance - sample manifold cleaned
H2S	20 Dec 2016 13:00	20 Dec 2016 14:00	2	Maintenance - reinitiated daily QA check



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Cenovus - Christina Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 17 ppb on Dec 13 19:00	Maximum Daily Average: 10.4 ppb on Dec 5
Minimum Value: 0 ppb on Dec 4 02:00	Hours of Data: 708
Maximum Diurnal Average: 2.3 ppb at hour 19	Hours of Missing Data: 36
Monthly Average: 1.6 ppb	Hours of Calibration: 36
Minimum Daily Average: 0.0 ppb on Dec 20	Percent Operational Time: 100.0
Minimum Diurnal Average: 1.0 ppb at hour 24	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 2 P ₉₀ = 5 P ₉₉ = 14	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
2-Dec	0	0	Z	0	1	1	0	0	1	1	2	2	0	1	2	1	1	0	1	1	2	3	4	2	1.2	4	
3-Dec	3	2	1	Z	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.5	3	
4-Dec	0	0	0	0	Z	0	0	0	0	0	4	3	4	2	3	2	1	1	14	16	12	10	7	3	3.5	16	
5-Dec	6	8	10	12	11	Z	9	8	8	10	14	10	9	10	11	13	14	13	14	11	8	9	9	12	10.4	14	
6-Dec	Z	11	9	9	6	11	12	9	7	12	9	6	5	C	C	C	C	C	0	1	0	0	0	1	6.0	12	
7-Dec	1	Z	0	1	1	1	3	5	3	1	5	2	3	5	4	1	1	1	1	0	1	0	0	0	1.8	5	
8-Dec	1	2	Z	1	1	1	1	2	2	3	3	4	3	3	3	3	2	1	1	1	0	0	0	0	1.7	4	
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	2	2	2	2	2	1	1	0	0	0	0	0	0	0.8	2	
10-Dec	0	1	1	0	Z	2	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0.5	2	
11-Dec	1	1	1	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1	
12-Dec	Z	0	0	3	0	0	0	5	8	8	2	8	13	5	1	1	2	3	4	2	5	5	7	3	3.8	13	
13-Dec	4	Z	2	1	1	2	6	11	1	2	2	3	2	1	0	0	8	1	17	11	0	0	0	0	3.3	17	
14-Dec	0	2	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	5	2	0	2	11	4	0	1.3	11	
15-Dec	16	12	2	Z	3	4	3	4	5	8	5	2	4	2	1	2	2	1	0	0	0	1	0	0	3.5	16	
16-Dec	0	0	2	1	Z	4	2	6	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1.0	6	
17-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	1	1	2	2	2	2	1	0.5	2	
18-Dec	Z	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
19-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	7	5	1	1	0	0	0	1.0	7	
20-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
21-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0.3	1	
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	4	3	3	1	1	0	0	0	1	0	0	0	0.7	4	
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0.3	1	
25-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	5	1	1	0	0	0	0	1	1	1	1	1	0.6	5	
26-Dec	3	1	Z	1	1	1	1	1	2	2	2	1	1	2	2	1	1	1	1	1	1	1	6	4	2	1.6	6
27-Dec	2	2	2	Z	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1.3	2	
28-Dec	0	0	0	0	Z	0	0	6	1	11	3	5	5	3	2	3	1	1	0	1	1	2	0	0	2.1	11	
29-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
30-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
31-Dec	2	Z	8	6	1	0	0	0	0	2	0	1	2	1	0	1	2	1	4	2	1	0	0	0	1.5	8	

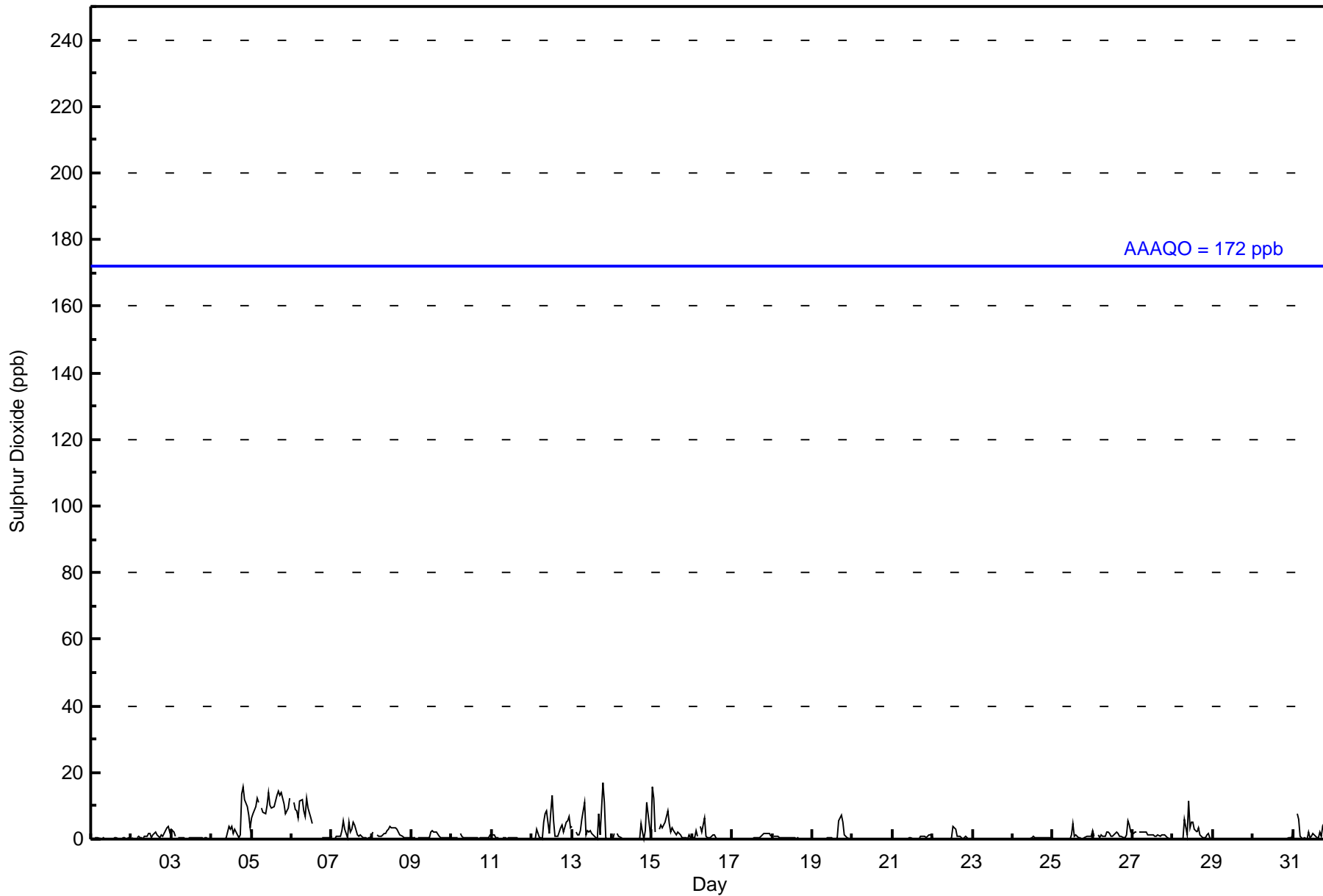
1.6	1.8	1.5	1.5	1.2	1.2	1.4	2.0	1.4	1.4	2.1	1.8	1.8	2.1	1.6	1.4	1.2	1.5	1.4	2.3	1.7	1.4	1.7	1.4	1.0	Diurnal Average	
16	12	10	12	11	11	12	11	8	12	14	10	13	10	11	13	14	13	14	17	16	12	11	9	12	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	683	96.47	96.47
11 - 20	25	3.53	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	8	25	14	13	15	12	23	56	102	50	88	101	31	45	85	15	683
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	18	7	0	25
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	25	14	13	15	12	23	56	102	50	88	101	31	63	92	15	708

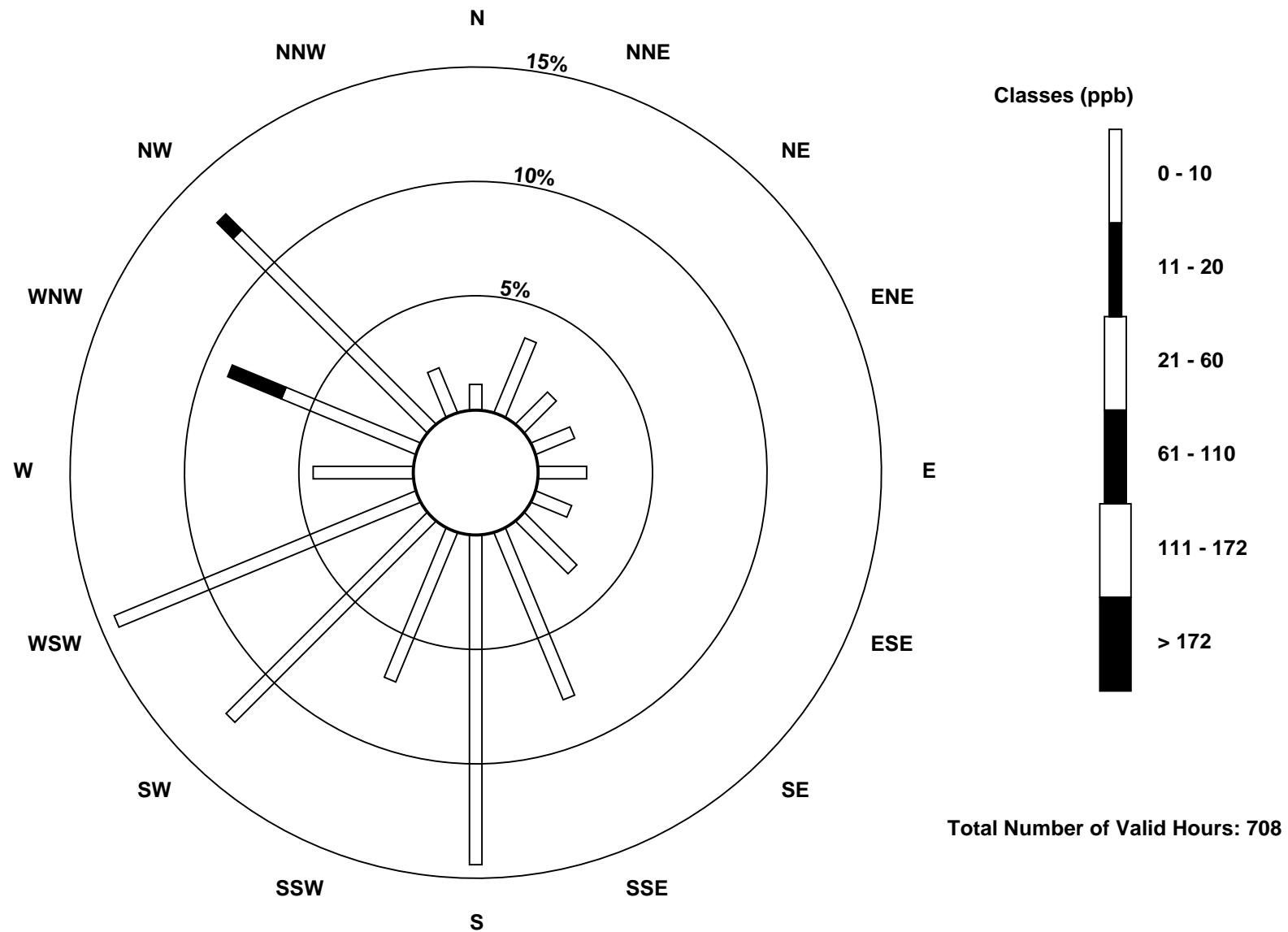
Total Number of Valid Hours: 708

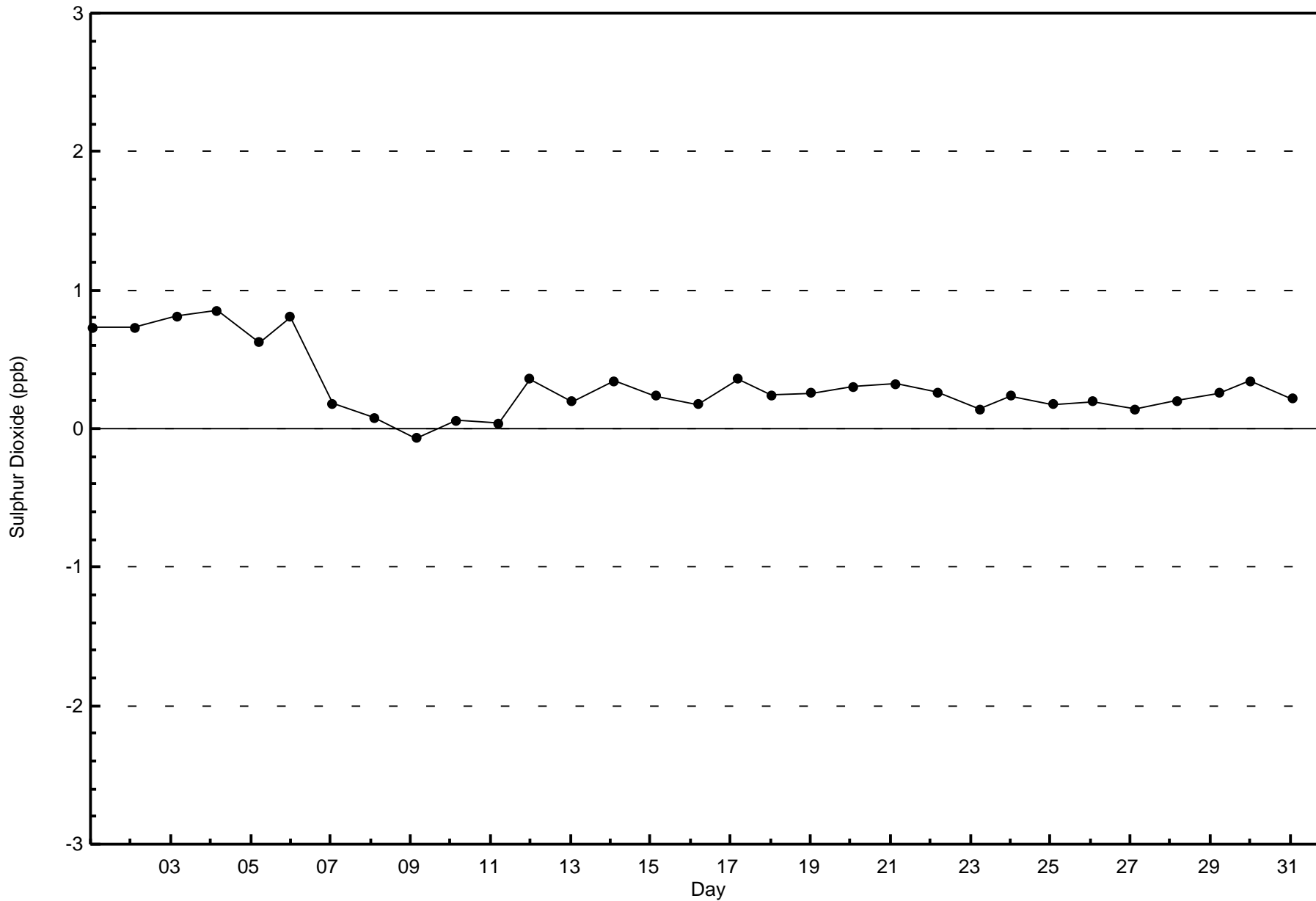
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake (AMS500)

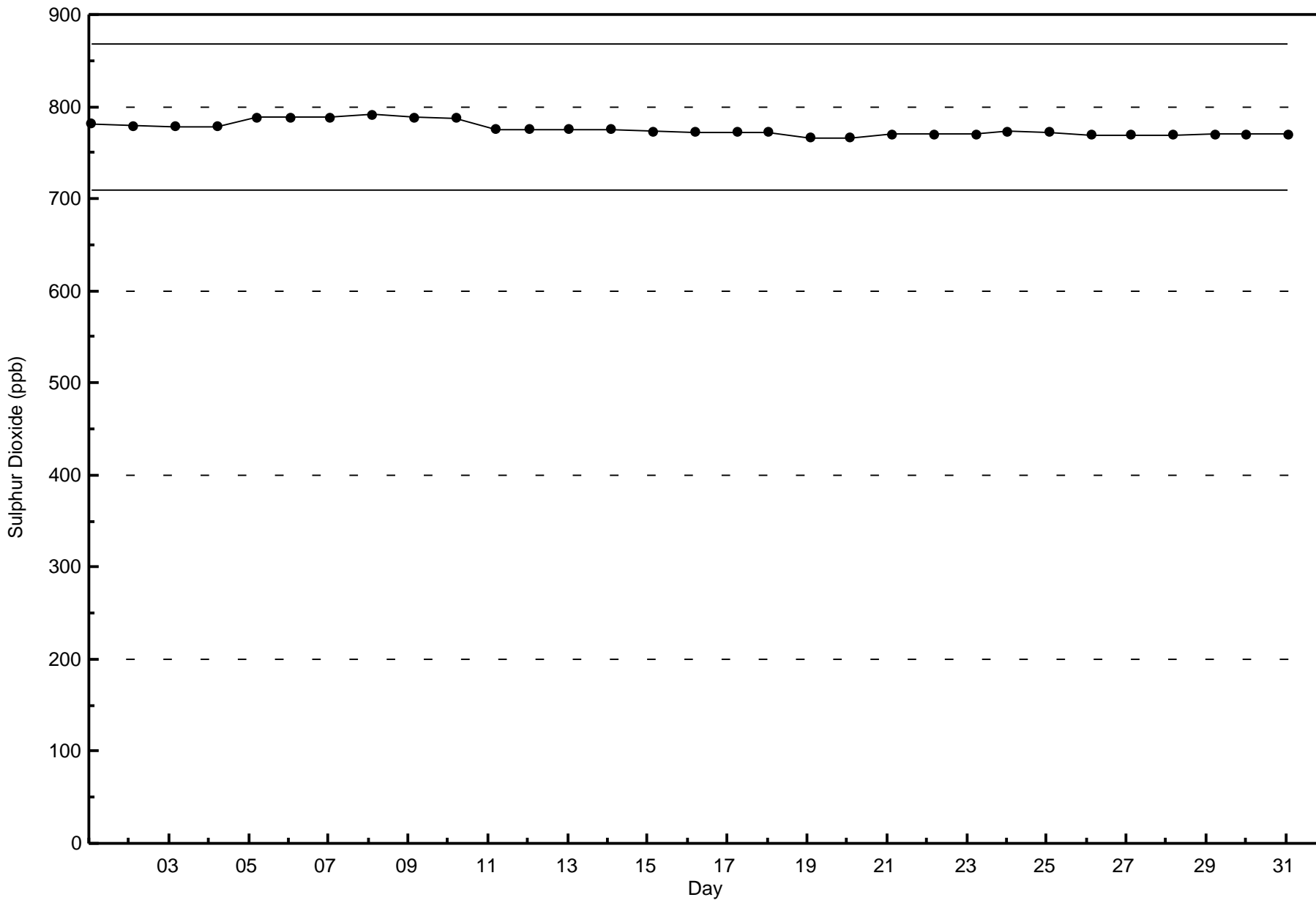






Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - December 2016



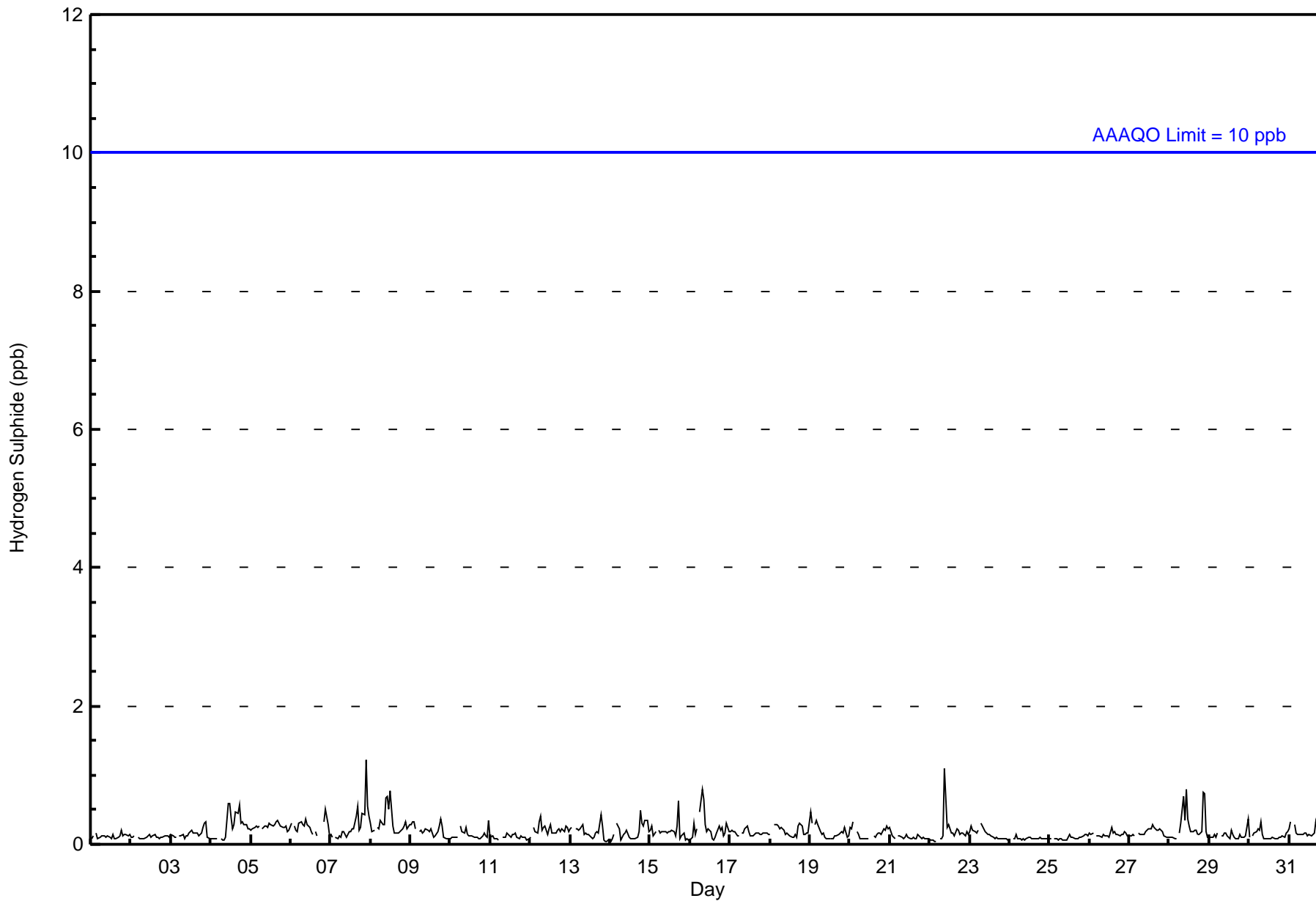


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 1 ppb on Dec 7 22:00 Maximum Daily Average: 0.3 ppb on Dec 8																	Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 34 Percent Operational Time: 99.6										
Minimum Value: 0 ppb on Dec 13 22:00 Minimum Daily Average: 0.1 ppb on Dec 24 Maximum Diurnal Average: 0.2 ppb at hour 22 Minimum Diurnal Average: 0.1 ppb at hour 15 Monthly Average: 0.2 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 1																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
2-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
3-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
4-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0.3	1	
5-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
6-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	M	0	0	C	C	C	0	1	0	0	0.3	1	
7-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	C	C	0	0	1	1	0	0.3	1
8-Dec	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
9-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
10-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
11-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
13-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
14-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
15-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1	
16-Dec	0	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
17-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
18-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
19-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
20-Dec	0	0	0	Z	0	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
21-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
22-Dec	0	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
23-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
25-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
26-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
27-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
28-Dec	0	0	0	0	0	Z	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0.3	1	
29-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
30-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
31-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1	
0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.1 0.1 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2																								Diurnal Average			
0 0 0 0 0 0 0 0 1 1 1 1 1 1 0 0 0 1 1 1 0 1 1 1 0																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	707	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	8	25	14	13	15	12	23	54	105	50	85	101	32	66	89	15	707
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	25	14	13	15	12	23	54	105	50	85	101	32	66	89	15	707

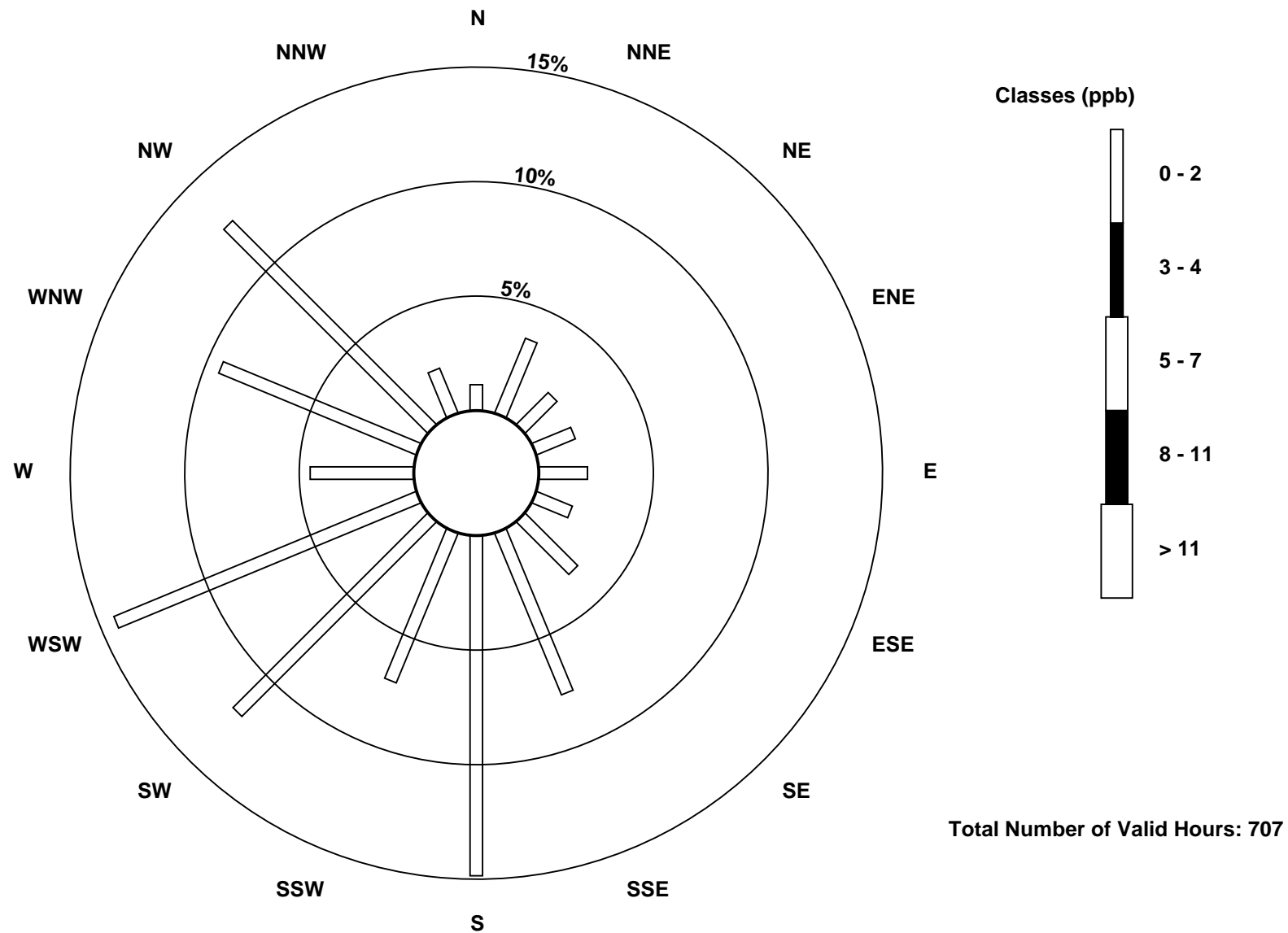
Total Number of Valid Hours: 707

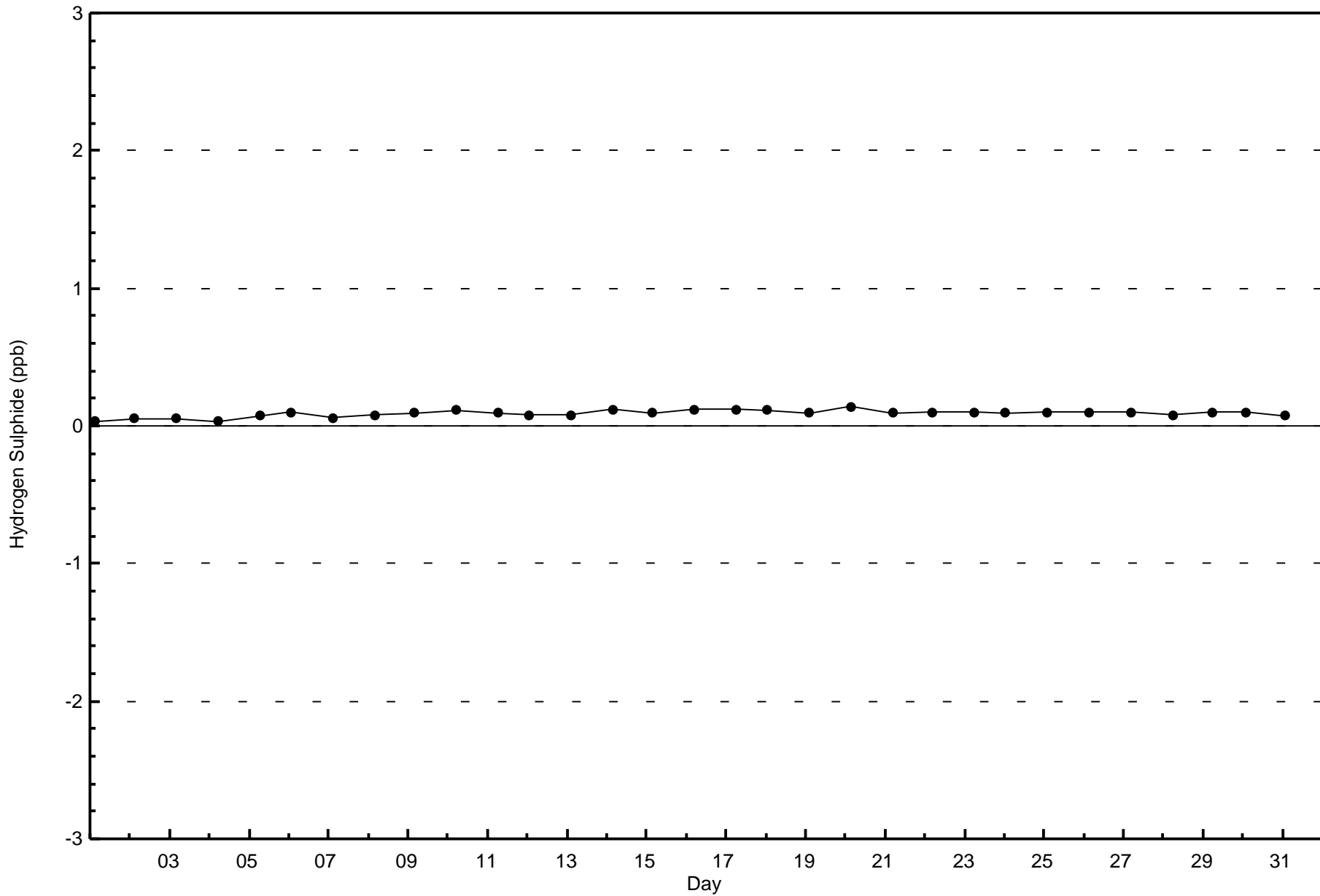
Total Number of Hours: 744

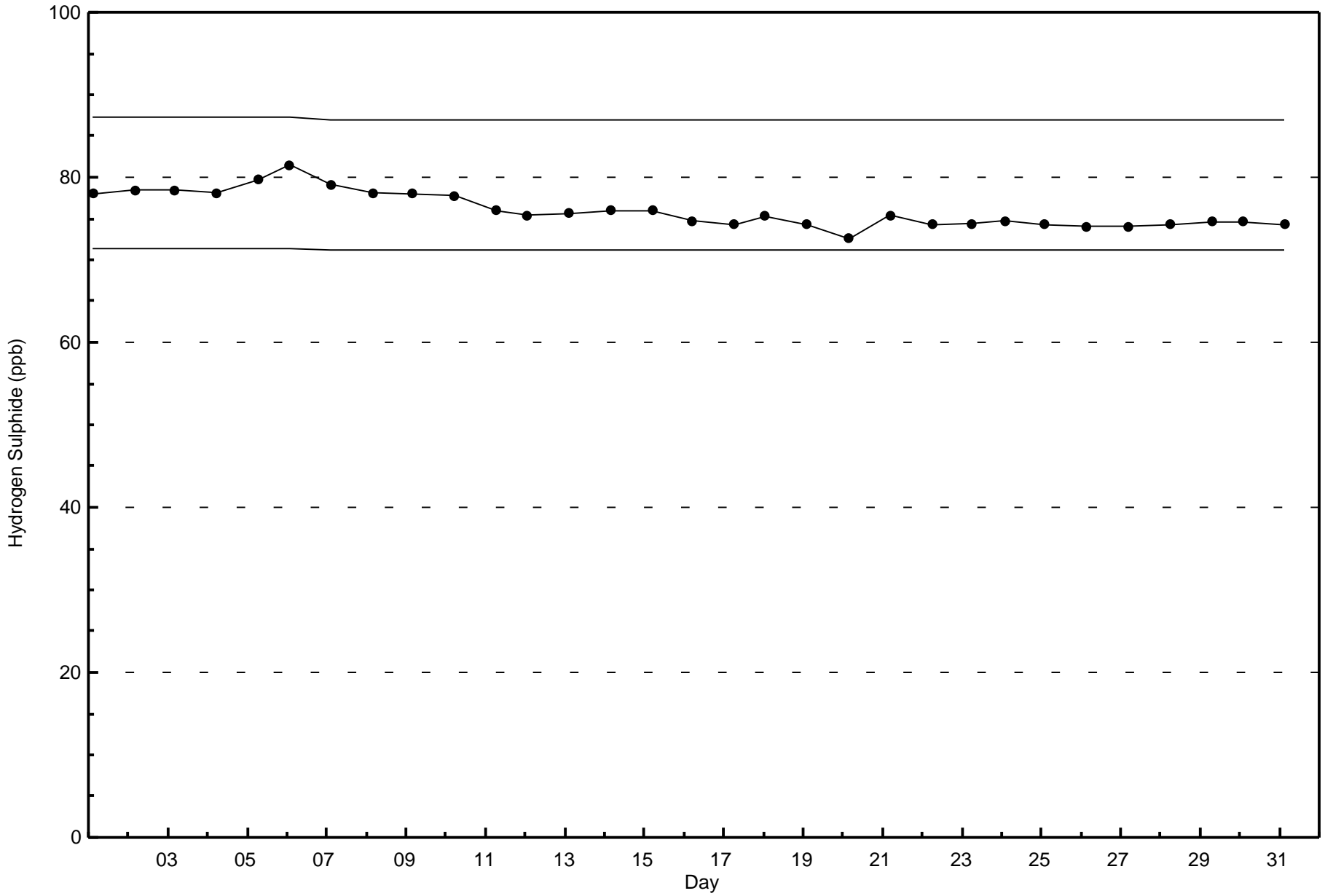


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake (AMS500)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

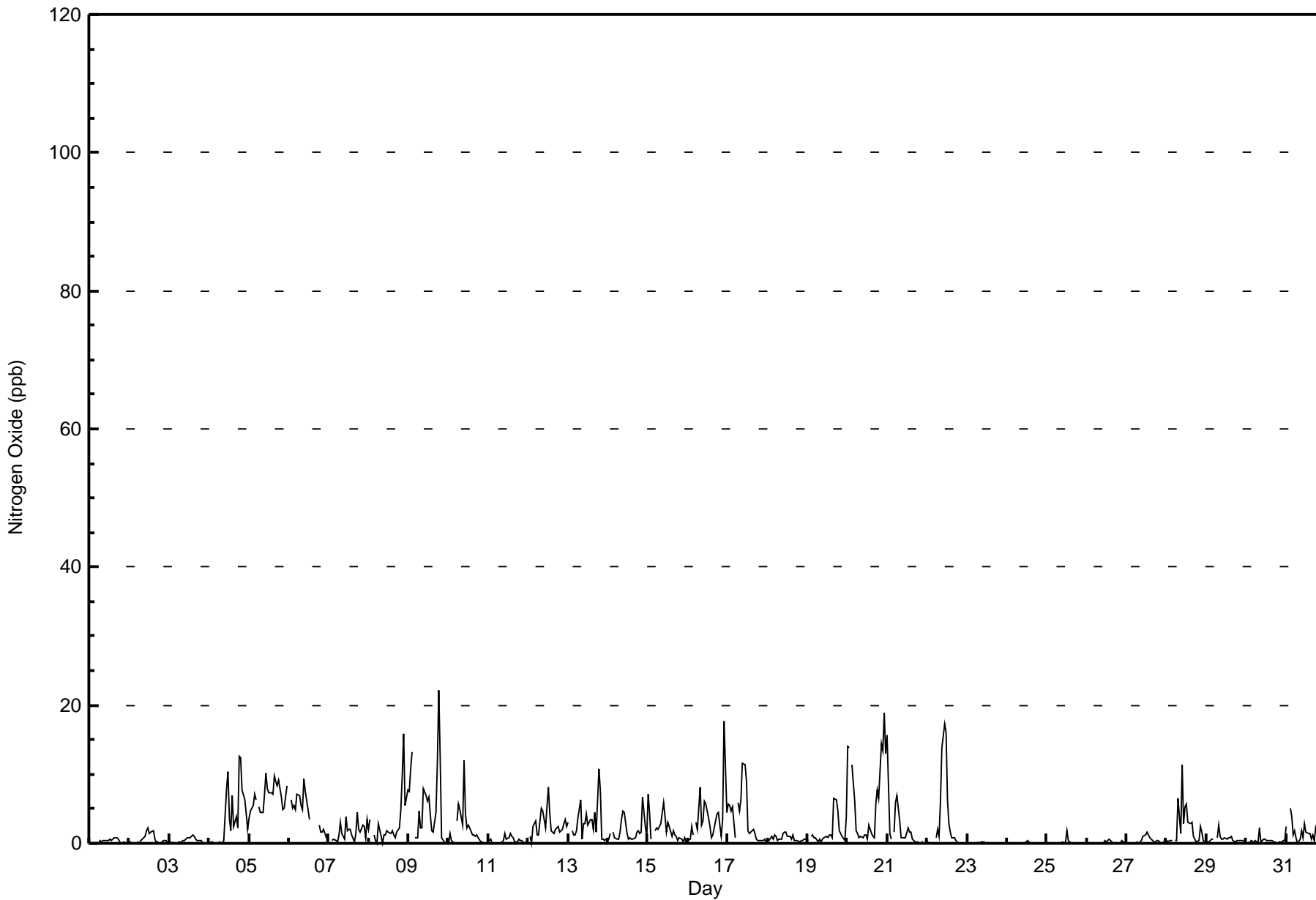
Cenovus - Christina Lake - December 2016

Maximum Value: 22 ppb on Dec 9 19:00																		Maximum Daily Average: 6.8 ppb on Dec 5						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 1 04:00																		Minimum Daily Average: 0.0 ppb on Dec 23						Hours of Data: 708		
Maximum Diurnal Average: 3.4 ppb at hour 10																		Minimum Diurnal Average: 1.3 ppb at hour 5						Hours of Missing Data: 36		
Monthly Average: 2.1 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 6 P ₉₉ = 15						Hours of Calibration: 36		
																		Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0.3	1
2-Dec	0	0	Z	0	0	0	0	0	1	1	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0.6	2
3-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0.4	1	
4-Dec	0	0	0	0	Z	0	0	0	0	0	8	10	4	2	7	2	4	2	13	12	8	6	4	2	3.7	13
5-Dec	4	5	6	7	6	Z	5	4	4	7	10	8	7	7	7	10	9	8	9	7	5	5	7	8	6.8	10
6-Dec	Z	6	5	5	5	7	7	5	5	9	8	5	3	C	C	C	C	C	3	2	2	2	1	1	4.5	9
7-Dec	1	Z	0	1	0	0	1	3	2	1	4	2	2	2	1	0	1	4	2	2	3	2	1	3	1.7	4
8-Dec	2	3	Z	1	1	0	3	1	0	1	1	2	2	1	2	1	1	2	2	5	10	16	5	8	3.0	16
9-Dec	8	11	13	Z	1	1	5	2	2	8	7	6	7	4	2	2	4	12	22	13	1	0	0	0	5.6	22
10-Dec	0	1	0	0	Z	3	6	5	3	12	4	2	3	2	1	1	1	1	1	0	0	0	0	0	2.1	12
11-Dec	0	1	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0.4	1
12-Dec	Z	1	0	2	3	1	1	3	5	5	2	5	8	4	2	2	2	2	3	2	2	3	3	2	2.8	8
13-Dec	3	Z	2	1	1	2	4	6	1	3	3	4	3	4	3	2	4	2	11	7	1	1	0	1	3.0	11
14-Dec	1	1	Z	2	1	1	1	2	4	5	4	1	1	1	1	1	1	2	2	1	2	7	2	1	1.8	7
15-Dec	7	4	1	Z	2	2	2	2	3	6	4	2	3	2	1	2	1	1	0	1	1	0	1	0	2.1	7
16-Dec	0	1	2	1	Z	3	2	8	3	3	6	6	4	2	1	1	2	4	4	3	1	3	18	5	3.7	18
17-Dec	6	6	5	5	1	Z	6	5	6	12	11	9	2	1	2	2	1	1	0	1	0	1	1	0	3.6	12
18-Dec	Z	0	1	1	1	1	0	1	1	1	2	2	1	1	1	1	1	0	0	0	0	0	1	1	0.8	2
19-Dec	0	Z	1	1	1	1	0	1	0	1	1	1	1	1	1	1	6	6	5	2	1	1	0	4	1.6	6
20-Dec	14	14	Z	11	6	2	1	1	1	1	1	1	3	1	1	1	1	6	8	7	14	13	19	13	6.1	19
21-Dec	16	1	1	Z	2	6	7	3	1	1	1	1	2	2	2	1	0	0	0	0	0	0	0	0	2.0	16
22-Dec	0	0	0	0	Z	1	2	1	6	14	17	16	6	3	2	1	1	0	0	0	0	0	0	0	3.1	17
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0.1	2
26-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1
27-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	2	1	1	1	0	0	0	0	0	0	0	1	0.4	2
28-Dec	0	0	0	0	Z	0	0	7	1	11	3	5	6	3	3	3	1	1	0	0	2	2	0	0	2.2	11
29-Dec	0	0	0	1	1	Z	1	3	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.6	3
30-Dec	Z	0	0	0	0	0	0	0	2	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2
31-Dec	3	Z	5	4	1	2	1	0	1	2	1	3	2	1	1	1	1	0	2	1	1	0	0	1	1.5	5
2.5 2.3 1.7 1.7 1.3 1.3 1.8 2.1 1.7 3.4 3.4 3.2 2.4 1.9 1.6 1.3 1.6 1.9 2.9 2.1 1.8 2.1 2.1 1.7																								Diurnal Average		
16 14 13 11 6 7 7 8 6 14 17 16 8 7 7 10 9 12 22 13 14 16 19 13																								Diurnal Maximum		
Z - zerospan		C - Calibration																								



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	99.86	99.86
21 - 40	1	0.14	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	8	25	14	13	15	12	22	56	102	50	88	101	31	63	92	15	707
21 - 40	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	25	14	13	15	12	23	56	102	50	88	101	31	63	92	15	708

Total Number of Valid Hours: 708

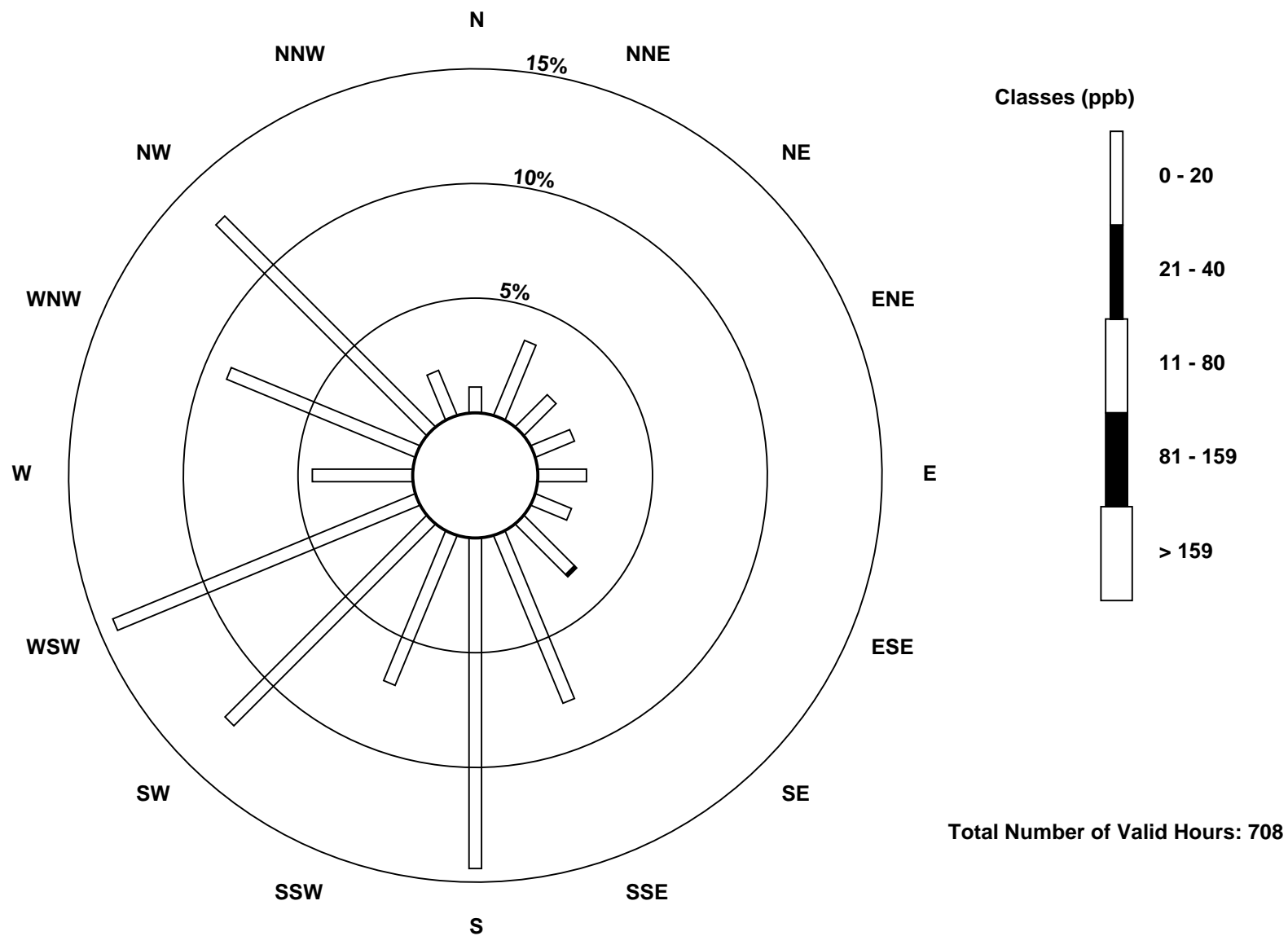
Total Number of Hours: 744

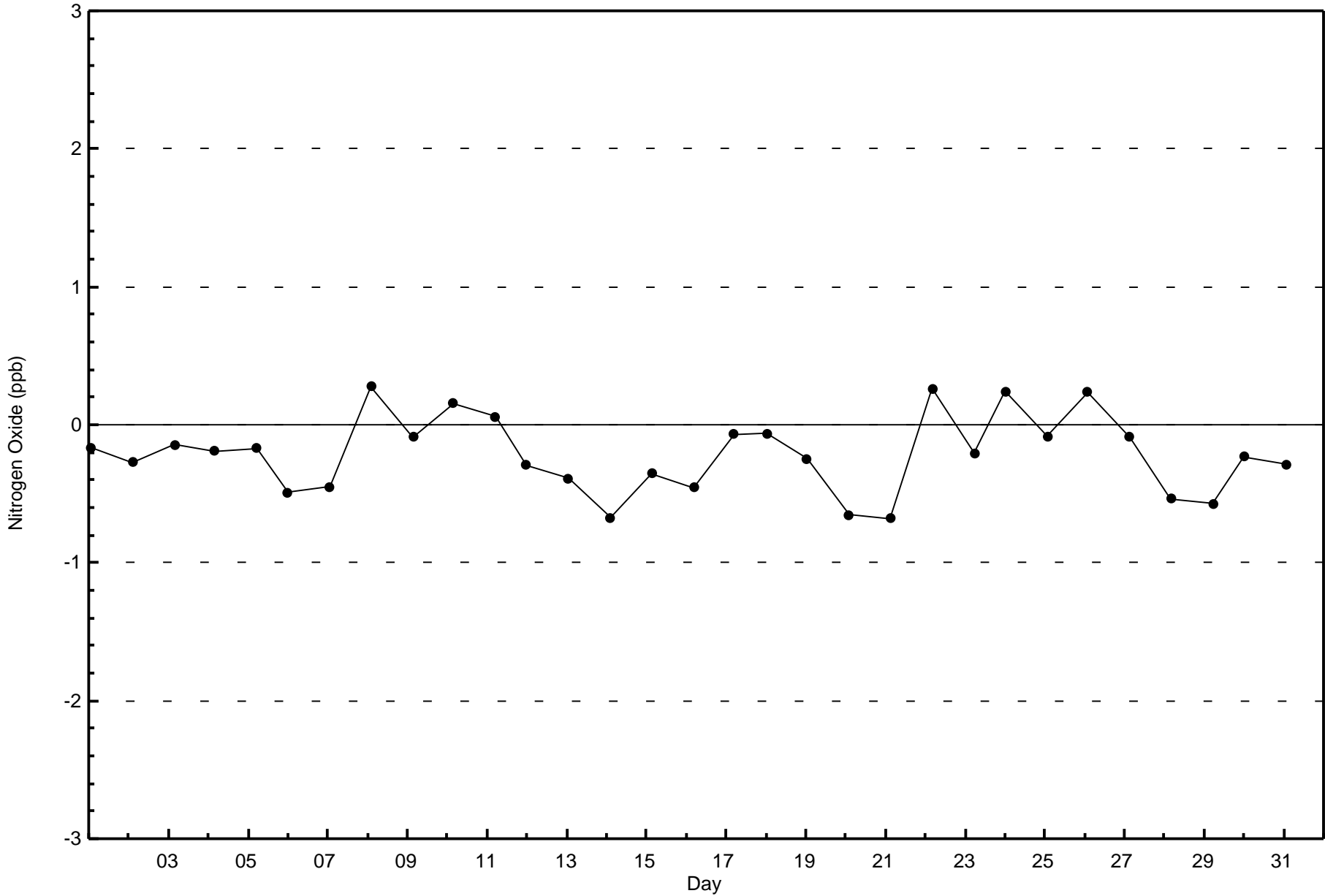


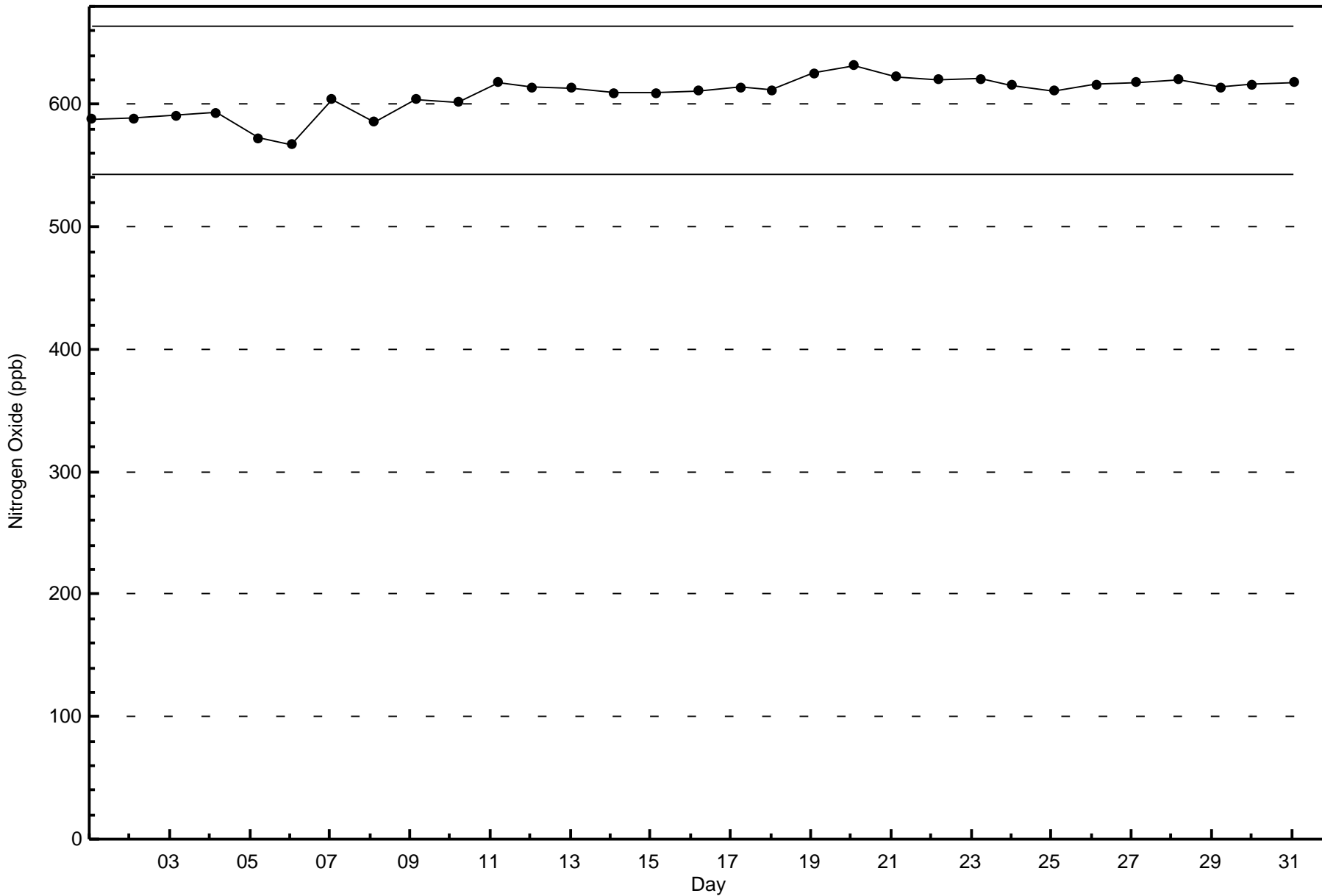
Wood Buffalo Environmental Association

Wind Rose Dec 2016

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake (AMS500)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

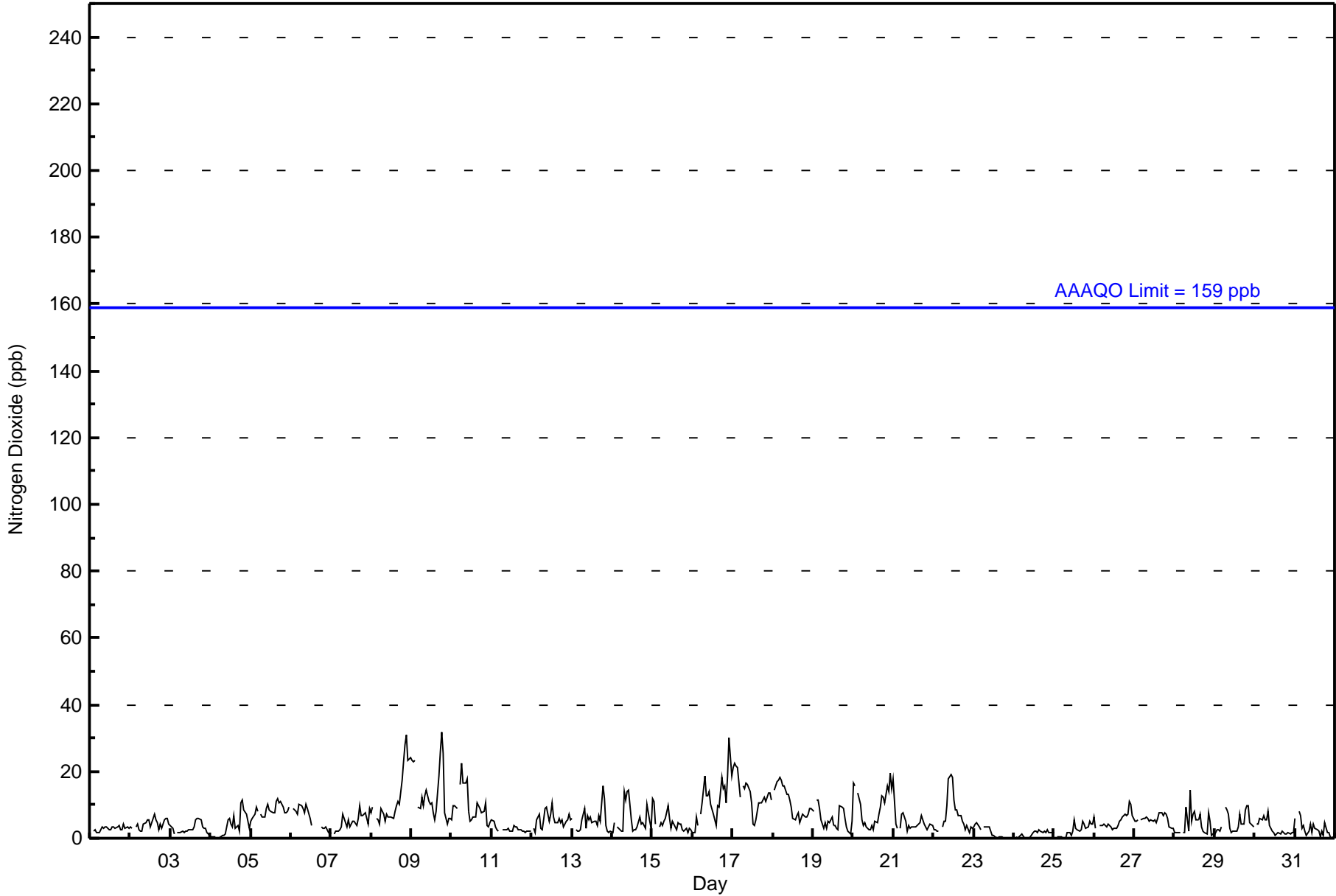
Cenovus - Christina Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 32 ppb on Dec 9 19:00										Maximum Daily Average: 13.7 ppb on Dec 9										Hours of Data: 708							
Minimum Value: 0 ppb on Dec 23 21:00										Minimum Daily Average: 1.3 ppb on Dec 24										Hours of Missing Data: 36							
Maximum Diurnal Average: 7.5 ppb at hour 19										Minimum Diurnal Average: 4.3 ppb at hour 14										Hours of Calibration: 36							
Monthly Average: 6.0 ppb										Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 3 Median = 5 O ₃ = 8 P ₉₀ = 12 P ₉₉ = 23										Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	3	Z	2	3	2	2	3	4	3	3	4	3	2	3	3	3	4	4	3	3	4	3	4	3	3.0	4	
2-Dec	3	3	Z	3	4	3	2	2	4	5	6	6	3	5	7	5	5	3	4	3	5	6	6	4	4.2	7	
3-Dec	4	3	1	Z	2	2	2	2	2	2	3	2	2	3	6	6	6	6	6	4	3	3	2	1	2.9	6	
4-Dec	1	0	0	0	Z	0	1	1	1	1	6	6	4	3	7	3	4	2	11	12	9	7	5	3	3.7	12	
5-Dec	5	6	7	9	8	Z	7	6	6	9	10	8	8	8	7	8	11	12	11	11	9	8	8	10	8.4	12	
6-Dec	Z	9	8	8	7	10	10	9	8	10	9	6	4	C	C	C	C	C	4	3	3	4	2	1	6.3	10	
7-Dec	2	Z	1	2	2	2	3	7	6	3	6	4	4	5	5	4	6	10	7	7	8	6	4	9	4.9	10	
8-Dec	8	10	Z	6	5	4	9	7	5	7	6	6	6	8	10	11	10	17	23	28	31	23	24	11.8	31		
9-Dec	24	23	23	Z	9	9	12	10	13	14	11	10	11	8	6	8	19	26	32	25	8	4	6	6	13.7	32	
10-Dec	6	10	10	9	Z	16	22	16	16	18	8	5	6	6	6	11	10	9	8	8	11	4	3	5	9.6	22	
11-Dec	5	5	3	2	2	Z	3	3	2	3	3	2	2	4	4	3	3	3	2	2	2	2	2	2	2.8	5	
12-Dec	Z	3	2	6	7	3	3	5	9	10	5	7	11	7	5	5	6	5	6	3	5	5	7	6	5.6	11	
13-Dec	6	Z	3	2	2	3	6	9	3	7	6	7	5	5	4	7	5	16	12	4	2	2	2	2	5.2	16	
14-Dec	2	5	Z	4	3	2	2	14	12	14	14	6	2	3	3	3	6	4	5	4	3	10	5	3	5.5	14	
15-Dec	12	11	4	Z	4	5	4	5	6	10	6	3	5	4	2	5	4	4	2	2	3	2	3	2	4.7	12	
16-Dec	2	2	7	4	Z	7	11	19	13	13	14	10	7	6	4	10	9	18	15	16	11	19	30	19	11.4	30	
17-Dec	21	22	22	21	12	Z	16	15	17	16	14	11	4	4	6	11	11	10	12	12	11	14	14	11	13.3	22	
18-Dec	Z	14	17	17	18	17	16	16	13	13	12	9	6	6	7	8	5	6	7	6	6	7	9	9	10.6	18	
19-Dec	8	Z	12	11	9	6	3	5	3	5	5	6	4	4	3	3	10	9	9	6	4	2	1	5	5.7	12	
20-Dec	17	16	Z	13	10	6	4	5	3	3	3	4	3	5	5	7	10	13	12	11	16	14	19	15	9.1	19	
21-Dec	18	4	3	Z	3	7	8	5	2	4	3	3	3	4	4	4	5	7	4	3	3	3	4	4	4.7	18	
22-Dec	3	3	2	2	Z	3	5	5	10	18	19	18	12	9	8	7	7	5	4	3	4	2	3	3	6.7	19	
23-Dec	3	4	5	3	2	Z	3	3	4	3	2	1	1	1	0	0	0	1	0	0	0	0	0	0	1.7	5	
24-Dec	Z	1	0	1	1	1	0	0	0	0	1	2	2	2	3	2	3	2	2	2	3	2	2	2	1.3	3	
25-Dec	2	Z	0	0	0	0	0	0	0	2	2	1	2	5	3	3	2	3	5	4	3	3	5	4	4	2.3	5
26-Dec	6	3	Z	4	4	4	4	3	4	4	3	3	3	3	4	5	6	6	7	7	7	11	10	7	5.1	11	
27-Dec	5	5	6	Z	6	6	6	6	6	5	5	5	5	5	6	8	8	7	8	7	6	3	3	3	5.6	8	
28-Dec	2	2	2	2	Z	2	2	9	2	15	5	7	8	6	6	7	4	2	2	1	8	5	1	1	4.3	15	
29-Dec	1	3	2	2	3	Z	10	8	7	3	2	2	2	2	3	7	4	4	9	10	10	5	4	4	4.6	10	
30-Dec	Z	4	4	6	5	7	6	6	8	4	2	2	1	1	2	1	2	2	1	1	2	1	2	2	3.0	8	
31-Dec	6	Z	8	7	3	4	2	1	2	4	2	4	3	2	2	1	2	1	5	2	2	0	0	1	2.7	8	
																								Diurnal Average			
																								Diurnal Maximum			
6.6 6.8 5.9 5.7 5.2 5.0 5.9 6.7 6.2 7.3 6.2 5.5 4.7 4.3 4.5 5.4 6.2 6.6 7.5 6.7 6.3 6.1 6.1 5.5																											
24 23 23 21 18 17 22 19 17 18 19 18 12 9 8 11 19 26 32 25 28 31 30 24																											
Z - zerospan C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	691	97.60	97.60
21 - 40	17	2.40	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	8	25	14	13	15	10	18	50	98	50	88	101	31	63	92	15	691
21 - 40	0	0	0	0	0	2	5	6	4	0	0	0	0	0	0	0	17
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	25	14	13	15	12	23	56	102	50	88	101	31	63	92	15	708

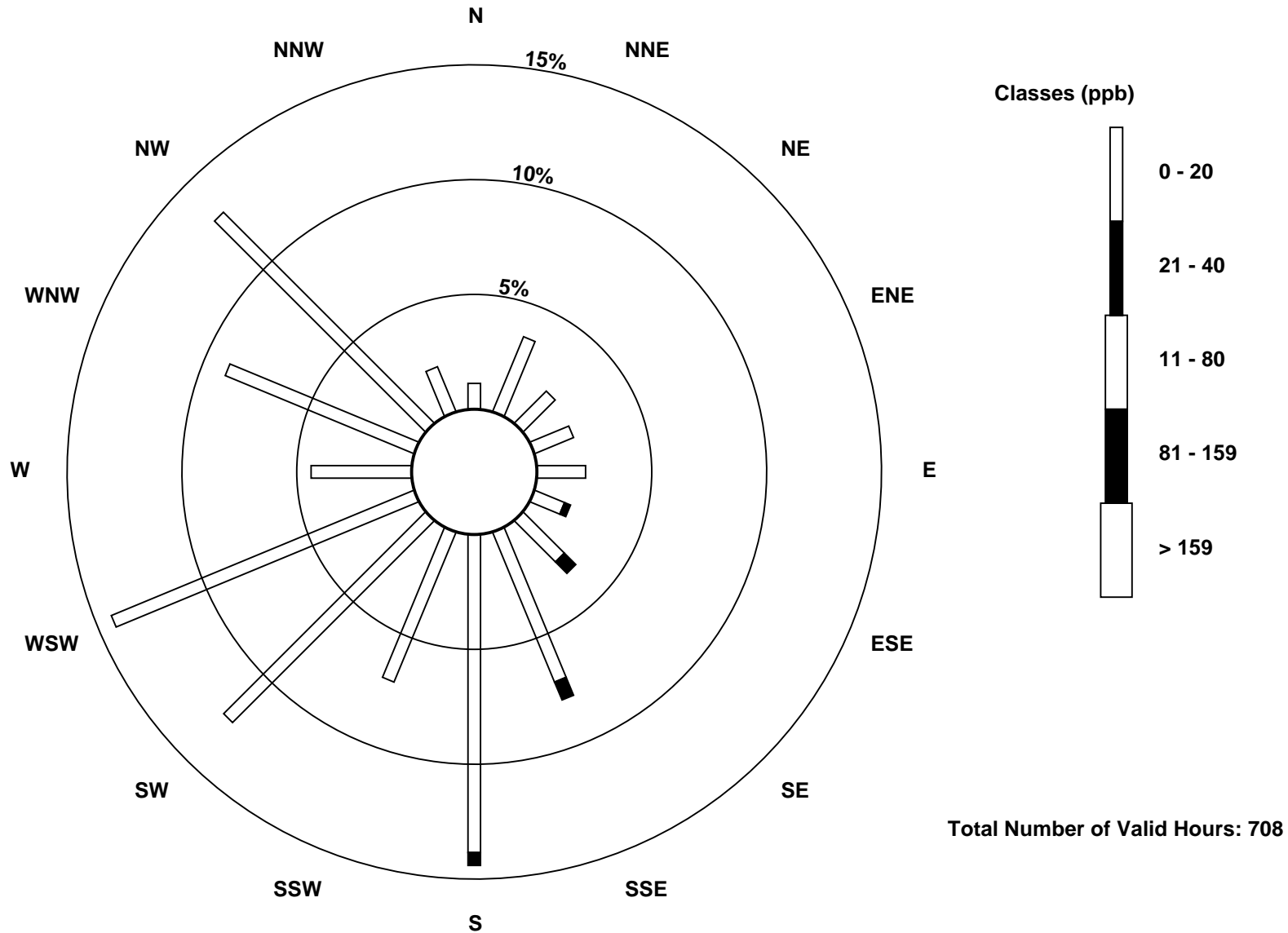
Total Number of Valid Hours: 708

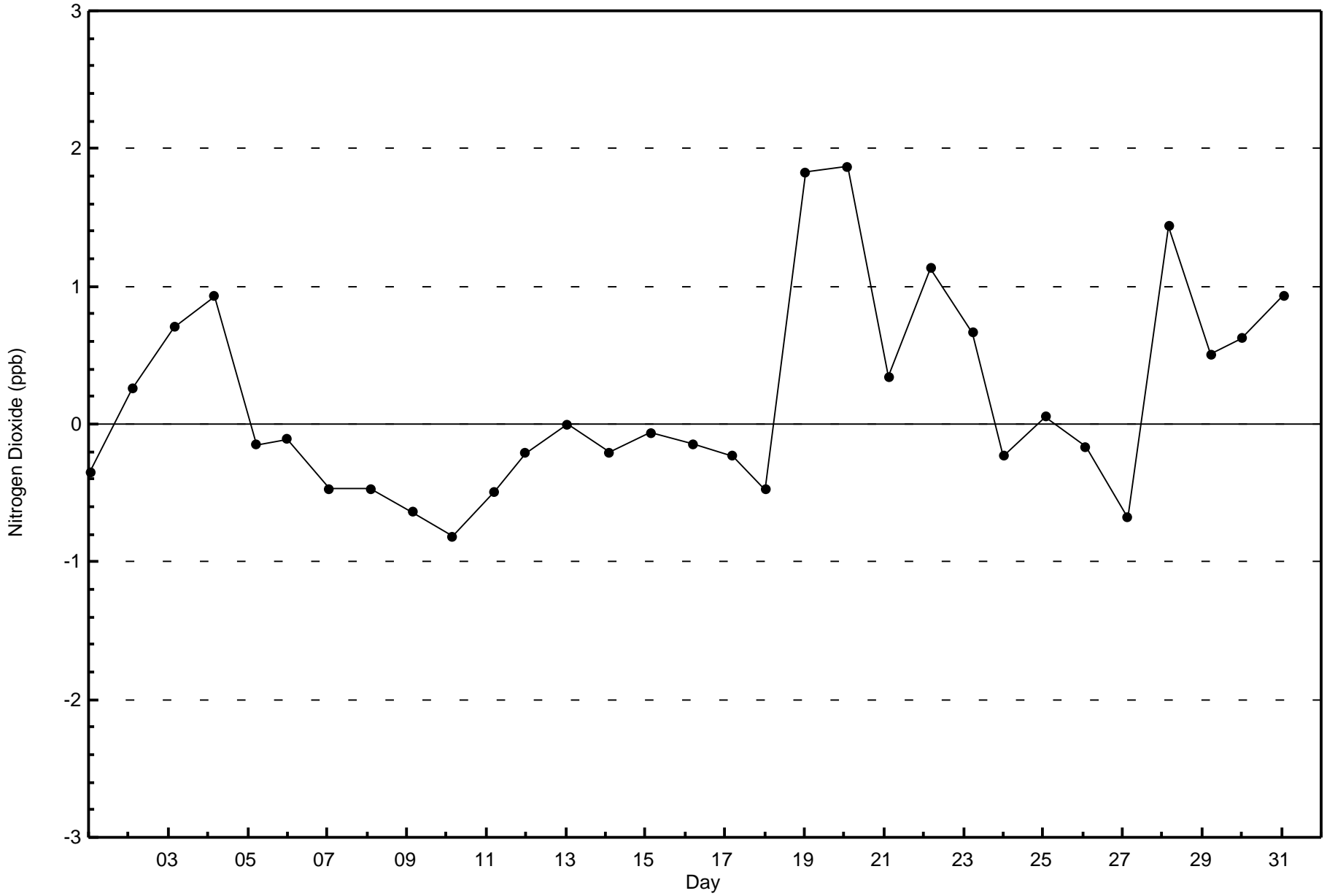
Total Number of Hours: 744

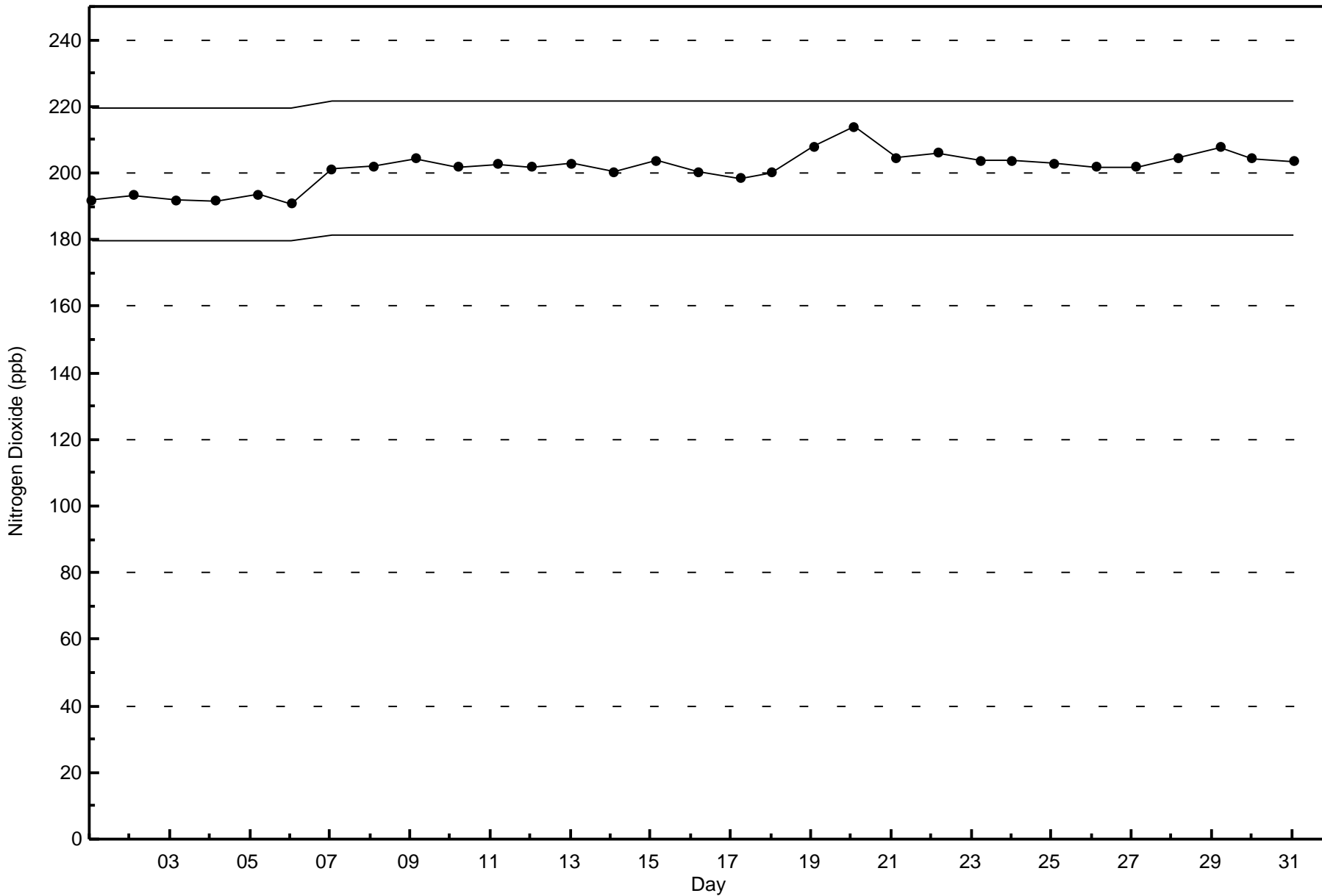


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake (AMS500)







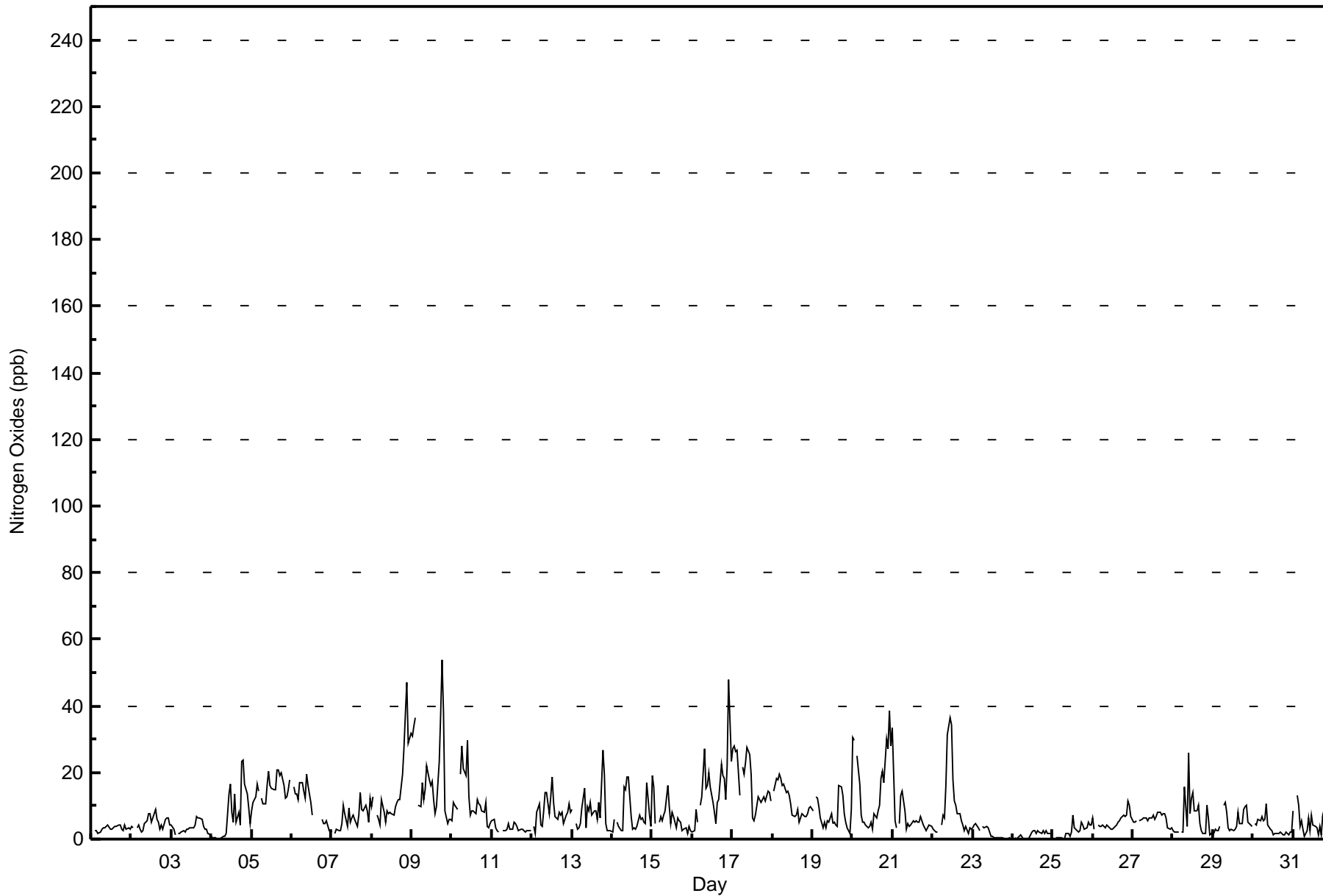


Maximum Value: 54 ppb on Dec 9 19:00																		Maximum Daily Average: 19.4 ppb on Dec 9						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 23 22:00																		Minimum Daily Average: 1.4 ppb on Dec 24						Hours of Data: 708		
Maximum Diurnal Average: 10.7 ppb at hour 10																		Minimum Diurnal Average: 6.1 ppb at hour 15						Hours of Missing Data: 36		
Monthly Average: 8.0 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 3 Median = 6 O ₃ = 10 P ₉₀ = 18 P ₉₉ = 37						Hours of Calibration: 36		
																								Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	Z	2	2	2	2	3	4	3	4	4	3	3	4	4	4	4	4	3	3	4	3	4	3	3.2	4
2-Dec	4	3	Z	3	4	3	2	3	5	6	7	8	5	6	9	6	5	3	4	3	6	6	6	4	4.8	9
3-Dec	4	3	1	Z	2	2	2	3	2	3	3	3	3	4	7	7	6	6	4	3	3	2	1	3.3	7	
4-Dec	1	1	0	0	Z	0	1	1	1	2	14	16	8	5	14	5	8	4	23	24	16	13	9	5	7.4	24
5-Dec	9	11	13	16	14	Z	12	11	11	16	20	16	15	15	15	21	21	19	20	16	12	13	15	18	15.1	21
6-Dec	Z	16	13	13	12	17	17	14	12	19	16	11	7	C	C	C	C	C	6	5	5	6	3	2	10.8	19
7-Dec	3	Z	2	3	2	3	5	10	8	4	9	5	6	7	6	4	7	14	9	8	10	9	5	12	6.6	14
8-Dec	10	13	Z	7	6	4	12	8	5	8	8	8	8	7	10	11	12	12	20	28	38	47	29	32	14.8	47
9-Dec	31	34	36	Z	10	10	17	12	15	22	18	16	18	12	8	10	23	38	54	38	8	5	6	6	19.4	54
10-Dec	6	11	10	9	Z	19	28	21	19	30	13	7	8	9	7	12	11	10	9	8	11	4	3	5	11.7	30
11-Dec	5	6	3	2	2	Z	3	3	2	3	5	3	3	5	5	4	3	3	3	3	2	3	2	3	3.3	6
12-Dec	Z	4	2	8	10	4	4	9	14	14	7	13	19	11	7	6	8	7	8	5	7	8	11	8	8.4	19
13-Dec	9	Z	4	3	4	5	9	15	4	10	8	11	7	9	9	6	11	7	27	19	5	3	2	3	8.2	27
14-Dec	2	6	Z	5	4	3	3	16	15	19	19	7	3	3	4	7	6	6	5	5	17	7	4	4	7.3	19
15-Dec	19	16	5	Z	5	7	6	7	9	16	10	5	8	7	4	6	6	5	3	3	3	2	4	3	6.8	19
16-Dec	2	2	9	5	Z	10	13	27	15	16	20	16	11	8	5	11	12	22	19	18	12	22	48	23	15.1	48
17-Dec	27	28	26	27	13	Z	22	20	23	28	25	20	6	5	7	13	12	11	12	13	12	14	14	11	16.9	28
18-Dec	Z	15	18	18	20	18	16	16	14	14	13	11	7	7	7	9	5	6	8	7	7	8	9	10	11.4	20
19-Dec	9	Z	13	12	10	6	3	5	3	6	5	7	5	5	4	4	16	16	13	8	5	3	2	9	7.3	16
20-Dec	31	29	Z	25	16	7	5	5	4	4	4	5	3	8	6	8	10	18	20	17	30	27	38	28	15.2	38
21-Dec	34	6	3	Z	5	13	14	8	3	5	4	4	6	5	6	5	5	7	4	3	3	4	4	4	6.7	34
22-Dec	3	2	2	2	Z	4	7	6	16	31	36	35	18	11	10	8	8	5	4	3	4	2	3	3	9.8	36
23-Dec	3	4	4	4	3	Z	4	3	4	3	2	1	1	1	0	0	0	1	0	0	0	0	0	0	1.7	4
24-Dec	Z	1	0	1	1	1	0	0	0	0	1	2	3	3	2	3	2	2	2	2	3	2	2	2	1.4	3
25-Dec	2	Z	0	0	0	0	0	0	2	2	1	2	7	3	3	2	3	5	4	3	3	5	4	4	2.5	7
26-Dec	6	3	Z	4	4	4	4	3	4	4	3	3	3	4	4	5	5	6	7	7	7	11	10	7	5.3	11
27-Dec	5	5	6	Z	6	6	6	6	6	5	6	6	7	6	7	8	8	7	8	7	6	3	3	4	6.0	8
28-Dec	2	2	2	2	Z	2	2	16	4	26	8	12	14	9	9	10	5	3	2	2	10	6	1	2	6.5	26
29-Dec	1	3	3	3	4	Z	10	11	8	3	3	3	3	3	4	8	5	5	9	10	10	5	5	4	5.2	11
30-Dec	Z	5	4	6	5	7	6	6	11	4	3	2	1	2	2	2	2	2	1	1	2	1	2	2	3.4	11
31-Dec	8	Z	13	10	4	6	3	1	3	6	3	7	4	4	4	1	4	1	7	2	2	1	0	1	4.2	13
9.1 9.1 7.6 7.4 6.4 6.3 7.7 8.7 7.9 10.7 9.6 8.7 7.1 6.1 6.1 6.7 7.8 8.5 10.4 8.8 8.1 8.2 8.2 7.1																								Diurnal Average		
34 34 36 27 20 19 28 27 23 31 36 35 19 15 15 21 23 38 54 38 38 47 48 32																								Diurnal Maximum		
Z - zerospan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	662	93.50	93.50
21 - 40	43	6.07	99.58
41 - 80	3	0.42	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - December 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	8	25	14	13	15	10	17	44	95	49	88	90	30	58	91	15	662
21 - 40	0	0	0	0	0	1	4	12	7	1	0	11	1	5	1	0	43
11 - 80	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	3
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	25	14	13	15	12	23	56	102	50	88	101	31	63	92	15	708

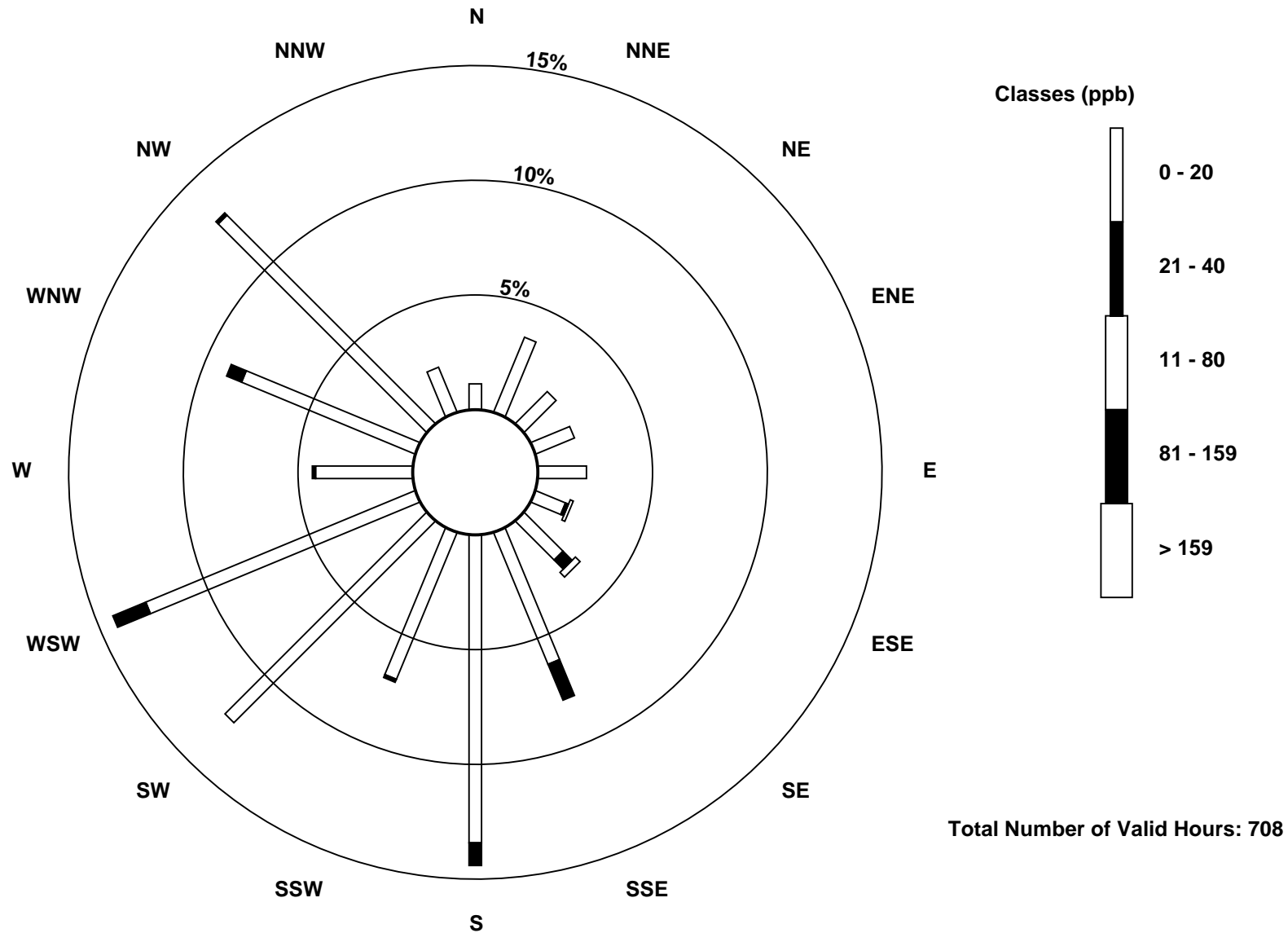
Total Number of Valid Hours: 708

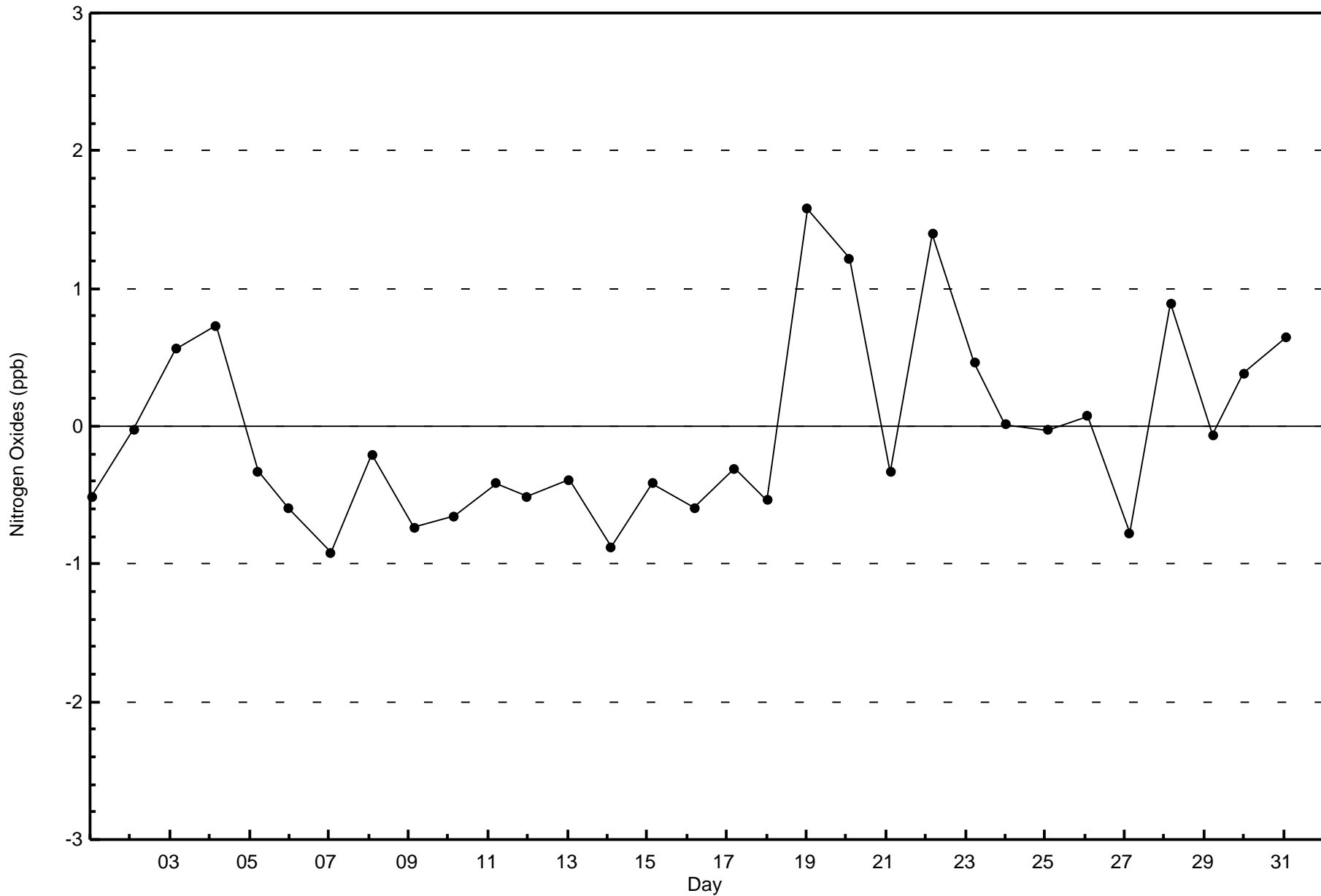
Total Number of Hours: 744

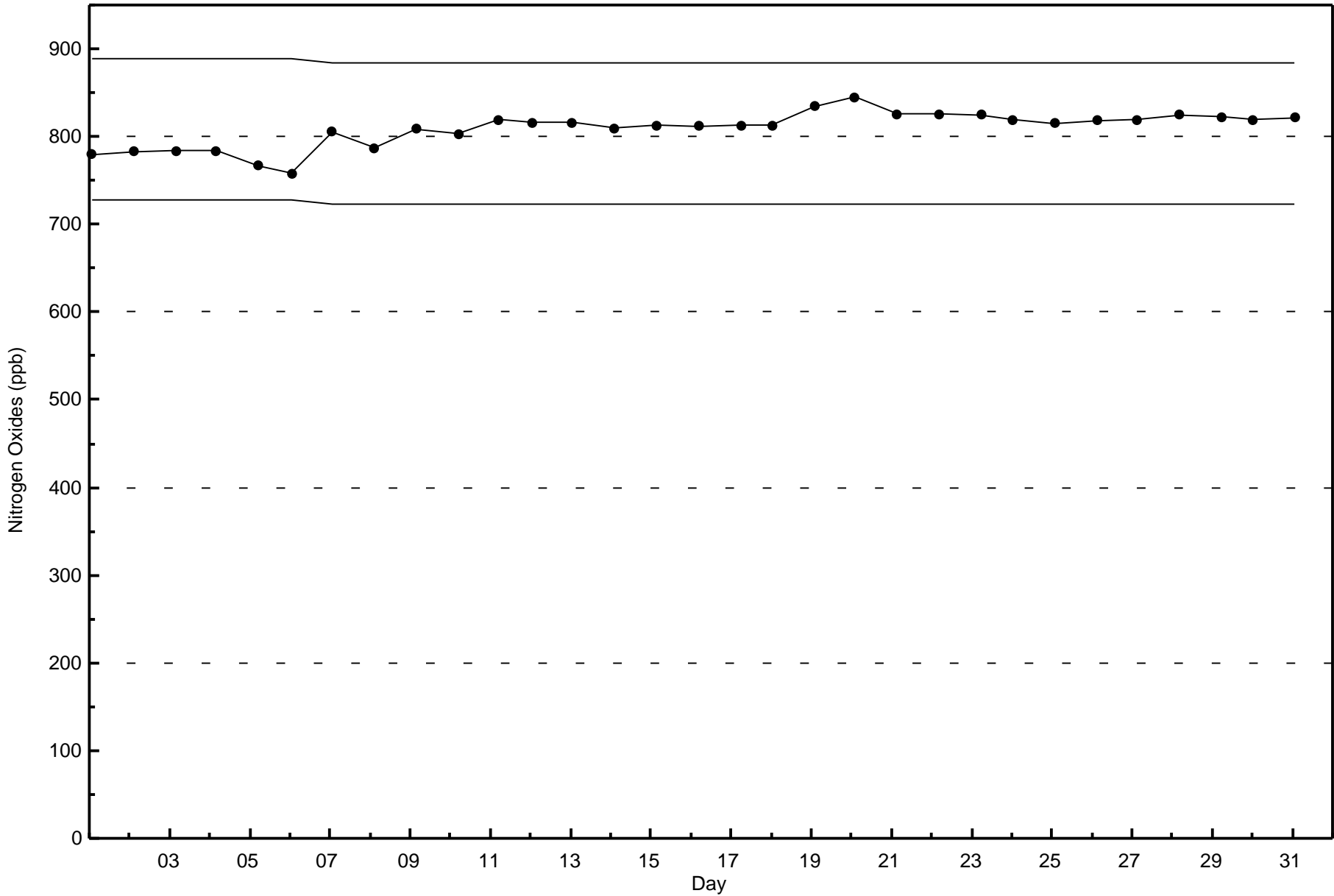


Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake (AMS500)







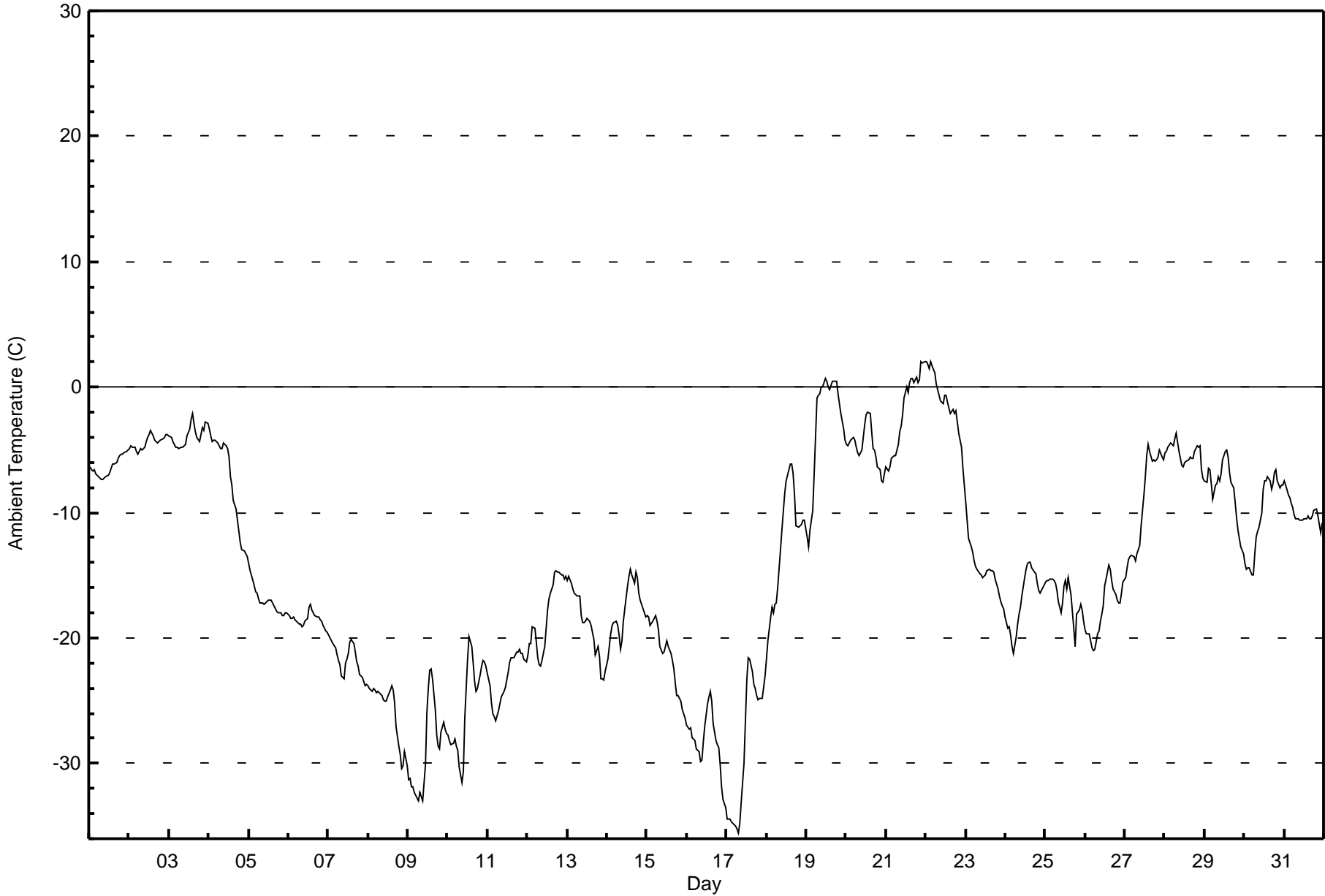


Maximum Value: 2.1 C on Dec 22 04:00 Maximum Daily Average: -1.3 C on Dec 22																						Hours in Service:	744			
Minimum Value: -35.5 C on Dec 17 08:00 Minimum Daily Average: -28.8 C on Dec 9																						Hours of Data:	744			
Maximum Diurnal Average: -12.3 C at hour 15 Minimum Diurnal Average: -15.6 C at hour 6																						Hours of Missing Data:	0			
Monthly Average: -14.45 C Percentiles: P ₁ = -34.4 P ₁₀ = -25.9 Q ₁ = -20.9 Median = -15.2 Q ₃ = -6.1 P ₉₀ = -3.8 P ₉₉ = 1.5																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.4	-6.6	-6.6	-6.6	-6.9	-7.1	-7.3	-7.4	-7.3	-7.3	-7.2	-7.0	-6.8	-6.5	-6.2	-6.1	-6.0	-5.7	-5.4	-5.3	-5.3	-5.2	-5.2	-5.0	-6.3	-5.0
2-Dec	-4.8	-4.7	-4.7	-4.8	-5.1	-5.3	-5.1	-4.9	-5.0	-4.8	-4.3	-4.0	-3.7	-3.4	-3.9	-4.2	-4.3	-4.5	-4.4	-4.2	-4.2	-4.0	-3.8	-3.8	-4.4	-3.4
3-Dec	-3.8	-4.0	-4.3	-4.6	-4.8	-4.8	-4.9	-4.8	-4.8	-4.7	-4.5	-3.9	-3.3	-2.5	-2.2	-2.9	-3.6	-4.0	-4.4	-3.8	-3.2	-3.5	-2.8	-2.8	-3.9	-2.2
4-Dec	-3.3	-3.9	-4.3	-4.2	-4.2	-4.5	-4.7	-4.9	-4.9	-4.5	-4.7	-5.0	-5.5	-7.1	-7.8	-9.1	-9.7	-10.6	-11.5	-12.4	-12.9	-13.0	-13.3	-13.5	-7.5	-3.3
5-Dec	-14.1	-14.7	-15.4	-15.9	-16.3	-16.4	-16.9	-17.2	-17.3	-17.3	-17.2	-17.1	-17.0	-17.0	-17.2	-17.4	-17.7	-17.9	-17.9	-18.0	-18.2	-18.2	-18.0	-18.0	-17.0	-14.1
6-Dec	-18.2	-18.4	-18.5	-18.4	-18.5	-18.6	-18.9	-18.9	-19.1	-19.0	-18.6	-18.4	-17.5	-17.4	-17.8	-18.0	-18.2	-18.3	-18.3	-18.5	-18.7	-19.0	-19.5	-19.6	-18.5	-17.4
7-Dec	-19.8	-20.0	-20.2	-20.5	-20.8	-21.3	-21.8	-22.1	-23.0	-23.3	-22.0	-21.6	-21.2	-20.3	-20.1	-20.4	-21.1	-21.9	-22.3	-22.9	-23.2	-23.5	-23.8	-23.7	-21.7	-19.8
8-Dec	-23.8	-24.0	-24.3	-24.1	-24.1	-24.4	-24.3	-24.4	-24.6	-24.9	-25.0	-25.0	-24.7	-24.1	-23.8	-24.2	-25.1	-27.1	-28.7	-29.3	-30.4	-30.2	-29.1	-30.2	-25.8	-23.8
9-Dec	-31.3	-31.2	-31.8	-31.8	-32.4	-32.8	-32.9	-32.3	-32.7	-33.0	-30.1	-26.0	-24.0	-22.6	-22.5	-23.3	-25.7	-27.8	-28.7	-28.8	-27.6	-26.8	-27.3	-27.6	-28.8	-22.5
10-Dec	-27.7	-28.1	-28.5	-28.3	-28.1	-28.6	-29.0	-30.3	-31.5	-30.7	-26.4	-24.0	-21.7	-19.9	-20.7	-22.0	-23.4	-24.2	-24.0	-22.9	-22.3	-21.8	-21.9	-22.2	-25.3	-19.9
11-Dec	-22.8	-23.8	-25.2	-26.1	-26.2	-26.6	-25.8	-25.2	-24.7	-24.5	-24.3	-23.9	-22.7	-21.9	-21.6	-21.5	-21.5	-21.2	-21.2	-21.0	-21.2	-21.2	-21.7	-21.9	-23.2	-21.0
12-Dec	-21.3	-20.5	-20.5	-19.1	-19.2	-20.3	-21.5	-22.1	-22.2	-21.8	-20.7	-19.2	-17.8	-16.9	-16.4	-15.7	-14.7	-14.7	-14.7	-14.8	-14.9	-15.0	-15.3	-15.1	-18.1	-14.7
13-Dec	-15.4	-15.1	-15.6	-16.1	-16.4	-16.6	-16.6	-16.7	-18.2	-18.8	-18.8	-18.6	-18.4	-18.6	-19.0	-19.5	-20.2	-21.3	-20.7	-21.5	-23.2	-23.3	-23.3	-22.7	-18.9	-15.1
14-Dec	-21.7	-20.7	-19.7	-19.0	-18.8	-18.7	-19.0	-19.8	-20.9	-20.3	-18.7	-16.8	-15.8	-15.1	-14.6	-15.0	-15.6	-14.8	-15.2	-16.4	-17.0	-17.3	-18.0	-18.3	-17.8	-14.6
15-Dec	-18.2	-18.3	-19.0	-18.7	-18.4	-18.2	-18.6	-19.3	-20.7	-21.2	-20.7	-20.2	-20.7	-21.3	-21.8	-22.5	-23.6	-24.6	-24.6	-25.1	-25.7	-26.1	-26.4	-21.5	-18.2	
16-Dec	-26.9	-27.3	-27.2	-28.0	-28.1	-28.2	-28.9	-29.1	-29.9	-29.7	-28.3	-27.1	-25.2	-24.7	-24.2	-25.1	-26.9	-28.1	-28.6	-28.7	-30.0	-31.9	-32.8	-33.5	-28.3	-24.2
17-Dec	-34.4	-34.4	-34.4	-34.6	-34.9	-35.0	-35.2	-35.5	-34.8	-33.1	-29.9	-26.6	-23.4	-21.6	-21.7	-22.7	-23.7	-24.0	-24.5	-25.0	-24.8	-24.8	-23.9	-23.0	-28.6	-21.6
18-Dec	-21.6	-20.2	-18.3	-17.6	-18.0	-17.4	-17.2	-15.9	-13.0	-11.4	-9.9	-8.5	-7.5	-6.6	-6.1	-6.1	-6.9	-8.6	-11.0	-11.2	-11.1	-11.0	-10.6	-10.6	-12.3	-6.1
19-Dec	-12.0	-12.8	-11.4	-10.6	-9.9	-6.9	-0.9	-0.7	-0.5	0.0	0.1	0.7	0.5	0.0	-0.2	0.1	0.5	0.5	0.4	-0.5	-1.3	-2.1	-3.3	-4.2	-3.1	0.7
20-Dec	-4.5	-4.6	-4.5	-4.2	-4.0	-4.2	-4.8	-5.3	-5.4	-5.0	-4.0	-3.0	-2.3	-2.0	-2.1	-3.6	-5.0	-5.1	-5.6	-6.3	-6.6	-7.4	-7.6	-6.9	-4.8	-2.0
21-Dec	-6.4	-6.6	-6.3	-5.7	-5.5	-5.5	-5.5	-4.6	-3.6	-3.2	-2.3	-0.8	0.1	-0.4	0.4	0.7	0.7	0.4	0.8	0.3	0.5	2.1	1.9	2.0	-1.9	2.1
22-Dec	2.1	1.9	1.4	2.1	1.7	1.1	0.3	-0.2	-0.6	-1.1	-1.3	-0.6	-0.7	-1.2	-1.7	-2.1	-1.8	-2.1	-1.9	-2.8	-3.7	-4.7	-6.5	-7.8	-1.3	2.1
23-Dec	-9.2	-10.7	-12.1	-12.7	-13.2	-13.8	-14.3	-14.6	-14.9	-14.9	-15.2	-15.1	-15.0	-14.7	-14.5	-14.7	-14.7	-14.7	-15.4	-16.1	-16.7	-17.1	-17.4	-17.6	-14.5	-9.2
24-Dec	-18.3	-19.2	-19.1	-19.7	-20.7	-21.3	-19.9	-18.8	-18.2	-17.6	-16.6	-15.2	-14.5	-14.1	-13.9	-14.0	-14.4	-14.7	-14.8	-15.7	-16.3	-16.4	-15.9	-15.7	-16.9	-13.9
25-Dec	-15.5	-15.5	-15.4	-15.3	-15.3	-15.4	-15.6	-16.2	-17.1	-18.0	-17.2	-15.9	-15.4	-16.1	-15.2	-16.5	-17.9	-19.2	-20.6	-18.1	-17.7	-17.3	-17.7	-18.6	-16.8	-15.2
26-Dec	-19.3	-19.7	-19.7	-20.3	-20.7	-21.0	-20.9	-19.7	-19.5	-18.6	-18.1	-17.4	-15.9	-14.8	-14.2	-14.6	-15.4	-16.1	-16.5	-17.0	-17.2	-17.2	-16.5	-15.6	-17.7	-14.2
27-Dec	-15.2	-14.4	-13.8	-13.5	-13.4	-13.5	-13.9	-13.3	-13.0	-12.6	-11.0	-8.6	-7.1	-5.5	-4.5	-5.1	-5.9	-5.8	-5.9	-5.8	-5.6	-5.0	-5.6	-5.8	-9.3	-4.5
28-Dec	-5.3	-5.1	-4.8	-4.5	-4.6	-4.7	-4.2	-3.7	-5.1	-5.7	-6.3	-6.3	-6.1	-6.0	-5.8	-5.6	-5.7	-5.7	-5.2	-4.7	-4.8	-4.7	-6.6	-7.2	-5.3	-3.7
29-Dec	-7.5	-7.6	-6.5	-6.6	-7.7	-8.9	-7.8	-7.7	-7.2	-7.5	-6.9	-5.8	-5.1	-5.0	-5.6	-6.8	-7.6	-8.0	-9.1	-10.4	-11.3	-12.1	-12.8	-13.2	-8.1	-5.0
30-Dec	-14.1	-14.5	-14.4	-14.5	-15.0	-14.9	-13.3	-11.9	-11.5	-11.1	-10.1	-8.1	-7.5	-7.5	-7.1	-7.4	-8.2	-7.7	-6.8	-6.6	-7.4	-8.1	-7.8	-7.9	-10.2	-6.6
31-Dec	-7.4	-7.9	-8.6	-8.8	-9.3	-9.7	-10.2	-10.5	-10.5	-10.6	-10.6	-10.6	-10.5	-10.4	-10.3	-10.5	-10.5	-10.2	-9.8	-9.8	-10.3	-10.9	-11.6	-10.9	-10.0	-7.4
																						Diurnal Average				
																						Diurnal Maximum				



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Cenovus - Christina Lake - December 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Cenovus - Christina Lake - December 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	212	28.49	28.49
-20 - 0	505	67.88	96.37
0 - 10	27	3.63	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

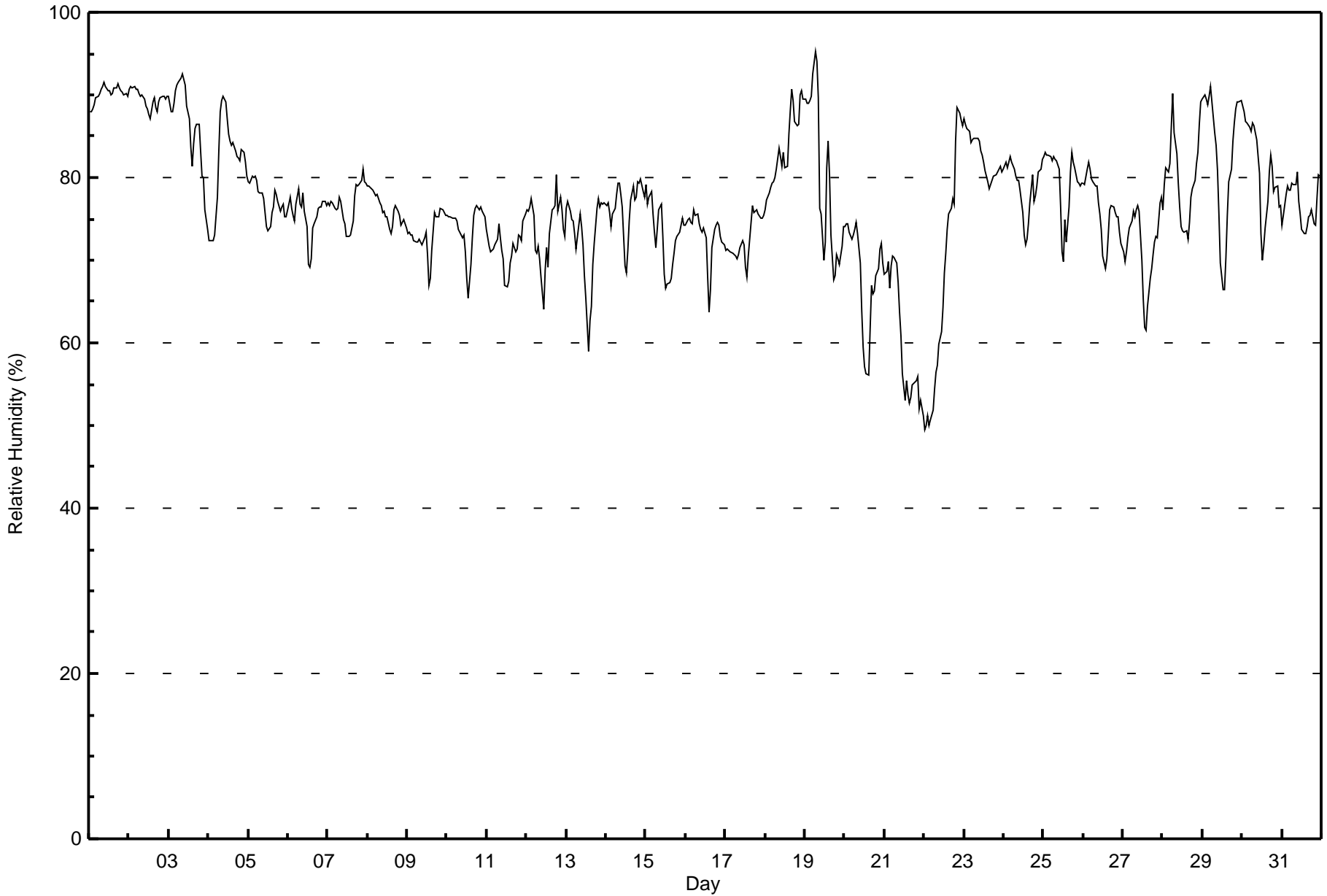
Cenovus - Christina Lake - December 2016

Maximum Value: 95 % on Dec 19 07:00 Maximum Daily Average: 90.1 % on Dec 1																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 50 % on Dec 22 01:00 Minimum Daily Average: 60.3 % on Dec 21 Maximum Diurnal Average: 79.0 % at hour 8 Minimum Diurnal Average: 71.8 % at hour 14 Monthly Average: 76.8 % Percentiles: P ₁ = 52 P ₁₀ = 69 Q ₁ = 73 Median = 76 O ₃ = 81 P ₉₀ = 89 P ₉₉ = 91																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	88	88	88	89	90	90	90	91	91	92	91	91	91	90	90	91	91	91	91	91	90	90	90	90	90	90.1	92
2-Dec	91	91	91	91	91	91	90	90	90	90	89	88	88	87	89	90	89	88	89	90	90	90	89	90	89.6	91	
3-Dec	90	88	88	89	90	91	92	92	92	91	89	87	84	81	84	86	86	86	83	80	80	76	74	86.3	92		
4-Dec	72	72	72	72	73	78	83	88	89	90	89	87	85	84	84	83	82	82	82	83	83	82	80	81.8	90		
5-Dec	79	79	80	80	80	80	78	78	78	77	76	74	74	76	76	78	78	77	76	76	77	75	75	77.2	80		
6-Dec	77	78	76	75	75	77	79	77	76	78	76	74	69	69	70	74	74	75	76	76	76	77	77	75.4	79		
7-Dec	77	77	77	77	76	76	76	78	77	75	74	73	73	73	75	78	79	79	79	80	81	80	79	76.7	81		
8-Dec	79	79	79	78	78	78	78	77	77	76	76	75	75	74	73	74	76	77	76	75	74	75	74	76.1	79		
9-Dec	73	73	73	73	72	72	72	73	72	72	73	73	71	67	68	71	76	75	75	75	76	76	76	75	73.1	76	
10-Dec	75	75	75	75	75	75	75	74	73	73	73	71	68	65	70	73	76	76	77	76	76	76	75	73.9	77		
11-Dec	74	72	71	71	71	72	73	74	73	71	70	67	67	67	70	70	72	71	71	73	73	72	75	76	71.5	76	
12-Dec	76	76	76	77	76	71	71	72	70	68	64	69	72	69	73	76	76	77	80	76	78	76	74	73	73.5	80	
13-Dec	76	77	76	75	75	73	71	74	76	74	72	68	65	59	63	64	69	72	76	77	76	77	77	77	72.6	77	
14-Dec	77	77	76	74	76	76	78	79	79	78	76	69	69	71	75	77	79	77	78	79	79	80	78	78	76.5	80	
15-Dec	79	77	78	78	76	73	72	74	76	77	73	68	67	67	68	70	71	72	73	73	74	75	74	73.0	79		
16-Dec	74	75	75	75	74	76	75	76	74	74	73	74	73	68	64	66	71	74	74	75	74	73	72	72	73.0	76	
17-Dec	71	71	71	71	71	71	70	70	71	72	72	72	69	68	70	75	77	76	76	76	76	75	75	75	72.5	77	
18-Dec	76	77	78	79	79	79	80	81	83	83	81	83	81	81	85	88	91	89	87	86	87	90	90	90	83.6	91	
19-Dec	89	89	89	89	90	93	95	94	90	76	76	70	72	81	84	80	73	68	68	71	70	69	72	74	80.1	95	
20-Dec	74	74	74	73	73	73	74	75	73	70	64	59	57	56	56	62	67	66	66	68	69	71	72	70	68.2	75	
21-Dec	68	69	70	67	69	70	70	70	67	64	61	56	53	56	54	53	53	55	55	55	56	52	53	51	60.3	70	
22-Dec	50	50	51	50	51	52	54	57	57	60	61	64	69	71	74	76	76	77	77	84	89	88	87	86	67.1	89	
23-Dec	87	86	86	86	84	85	85	85	84	83	83	83	82	81	79	79	79	80	80	80	81	81	81	81	82.6	87	
24-Dec	81	82	81	82	83	82	81	80	80	80	78	76	73	72	73	74	77	80	77	78	79	81	81	82	78.8	83	
25-Dec	83	83	83	83	83	82	82	82	82	81	76	71	70	75	72	77	81	83	82	81	79	79	79	79	79.5	83	
26-Dec	79	79	81	82	81	80	79	79	79	77	76	74	70	69	70	73	76	77	76	76	75	75	73	72	76.2	82	
27-Dec	71	70	71	73	74	75	76	75	76	77	76	70	65	62	62	64	68	69	71	72	73	73	77	78	71.5	78	
28-Dec	76	79	81	81	82	86	90	85	83	79	76	74	74	73	74	72	75	78	79	80	82	83	86	89	79.9	90	
29-Dec	90	90	89	89	90	91	87	85	84	81	76	70	66	66	70	75	79	81	84	87	88	89	89	89	82.8	91	
30-Dec	89	88	87	87	86	86	87	86	85	85	80	73	70	72	74	77	81	83	81	78	79	79	76	77	81.0	89	
31-Dec	74	75	78	79	78	79	79	79	79	81	77	76	74	73	73	74	75	75	76	74	74	77	80	80	76.7	81	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Cenovus - Christina Lake - December 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Cenovus - Christina Lake - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	28	3.76	3.76
60 - 80	496	66.67	70.43
80 - 100	220	29.57	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

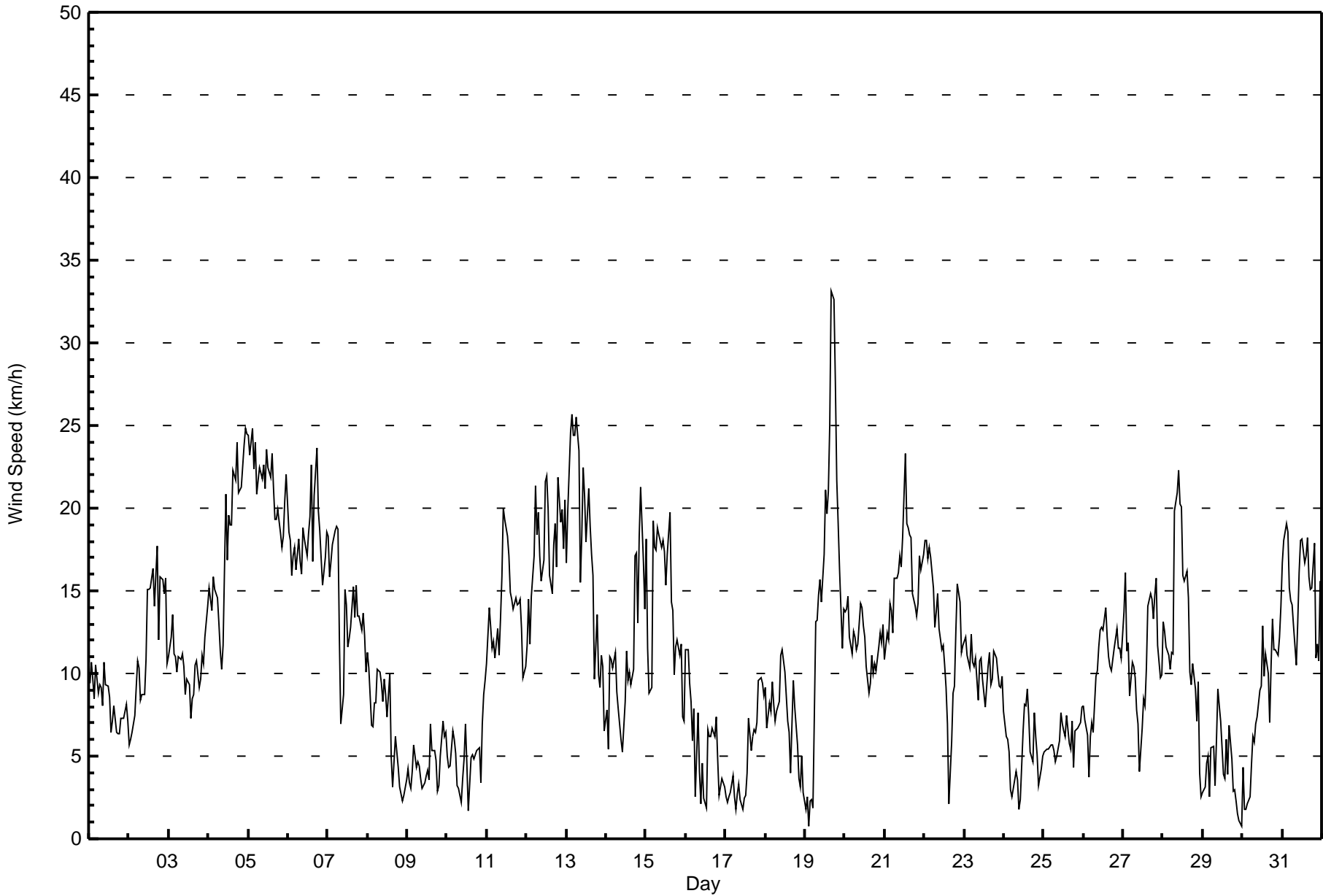


Maximum Speed: 33 km/h on Dec 19 17:00	Maximum Daily Speed Average: 21.4 km/h on Dec 5	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 30 00:00	Minimum Daily Speed Average: 3.6 km/h on Dec 29	Hours of Data: 744
Maximum Diurnal Speed Average: 7.0 km/h at hour 13	Minimum Diurnal Speed Average: 5.4 km/h at hour 9	Hours of Missing Data: 0
Monthly Average Velocity: 6.2 km/h 261.2 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 7 Median = 11 Q ₃ = 15 P ₉₀ = 19 P ₉₉ = 25	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S9	S11	SSW10	SSW9	S11	SSW9	SW9	SW9	SSW8	SSW11	SW9	SW9	SW9	SSW6	S7	S8	S6	SSW6	SSW6	SSW7	SSW7	SSW7	SSW8	SW7	SSW8.0	SSW11	
2-Dec	SW6	SSW6	S6	SSE7	SSE9	S11	S10	S8	SSE9	S9	SSE11	S15	SSE15	S15	S16	S14	SSE16	SSE18	S12	SSE16	S16	S15	S16	SSE11	S11.8	SSE18	
3-Dec	S11	SSE12	S14	S11	S11	S10	SSW11	SSW11	SSW11	SSW10	SSW9	SSW10	SSW9	SSW7	SSW9	S9	SSW11	SSW11	SSW9	SSW10	SSW11	SSW11	SW12	SW14	SSW10.2	SW14	
4-Dec	SW15	SW15	SW14	SW16	SW15	SW15	WSW13	WSW11	WSW10	WSW12	NW21	NW17	NNW20	NNW19	NNW19	NW22	NW22	NW24	NNW21	NNW21	NNW21	NW21	NW24	NW25	NNW25	NNW14.7	NW25
5-Dec	NW24	NW23	NW25	NW22	NW24	NNW21	NW22	NW22	NNW22	NNW23	NNW21	NW24	NNW22	NNW22	NNW23	NNW21	NNW19	NNW19	NNW20	NNW19	NNW18	NNW18	NNW20	NNW22	NNW21.4	NW25	
6-Dec	NNW19	NNW18	NNW16	NNW17	NNW18	NNW16	NW18	NNW17	NNW16	NNW19	NNW18	NNW17	NNW18	NW20	NW23	NW17	NW21	NW24	NW20	NW19	NW17	NW15	NW17	NW19	NNW18.0	NW24	
7-Dec	NW18	NW16	NW17	NW18	NW19	NW19	NW19	NNW12	W7	WSW9	NW15	NW14	NW12	NW12	NW13	NW15	NW13	NNW15	NW13	NW13	NW14	NW12	NW10	NNW13.7	NW19		
8-Dec	NW11	NNW10	N7	N7	NNE8	NNE8	NNW10	N10	N9	N8	NNE10	N9	NNE7	NNE10	NE5	E3	E5	E6	E4	SE3	ESE3	SE2	SSE3	SSE4	NNE4.8	NW11	
9-Dec	S4	SSE3	SE3	S4	S6	S4	SSE5	S4	S4	SSE3	S3	SSE4	SSE4	SSE4	SSE7	SSE5	SSE5	SE5	SE3	S3	S5	S7	S6	S6	S4.4	S7	
10-Dec	S5	S4	S4	S7	S6	SSE5	SSE3	SSE3	SE2	S4	S5	S7	SSE4	SSE2	SSW5	SSW5	S5	S5	S5	S6	SSW3	SW7	WSW9	WSW10	SSW4.5	WSW10	
11-Dec	WSW11	WSW14	WSW13	WSW12	WSW12	WSW11	WSW13	WSW11	WSW13	W16	W20	W19	W18	W17	W15	WSW14	WSW14	WSW15	WSW14	WSW14	WSW14	WSW13	WSW10	WSW10	WSW13.8	W20	
12-Dec	WSW12	WSW14	WSW12	NNW15	NW17	NW21	NW18	NW20	NNW17	NNW16	W17	NW22	NNW22	NNW20	W16	W15	W18	NNW19	NW16	NNW22	NW19	NW20	NNW18	W20	NNW16.8	NNW22	
13-Dec	W17	NNW20	NW25	NW26	NW24	NW24	NW26	NW23	N16	NNW18	NNW22	NNW21	NNW18	NNW21	NNW19	NW17	NW16	WSW10	NNW14	NNW10	SW9	WSW11	WSW10	WSW6	NW15.7	NW26	
14-Dec	WSW8	W5	NNW11	NNW11	WSW10	WSW11	SW9	SW8	S7	SSE6	S5	WSW8	WSW11	WSW10	WSW10	WSW9	WSW10	NW17	NW17	NW13	NNW18	NNW21	NNW17	NW14	W8.8	NNW21	
15-Dec	NW18	NNW11	WSW9	W9	NW19	NNW18	NW17	NW19	NW18	NW18	NW18	NW17	NNW15	NW17	NW20	NNW14	W14	W10	WSW12	WSW12	WSW11	WSW12	WSW7	WSW7	NNW13.0	NW20	
16-Dec	WSW11	WSW11	NNW9	W8	W6	W8	NNW3	W8	W4	SSW2	SW5	E2	E2	SSW7	SW6	SSW6	S7	SSW6	SSW7	SSW5	ESE3	SE3	ESE4	SSE3	SW3.9	WSW11	
17-Dec	SSE3	SSE2	S3	S3	S4	SSE3	S2	SSW3	S3	SSE2	SSE2	SSE2	SSE3	SSE4	SSE7	SE5	SSE6	S7	SSE6	S7	S10	S10	S9	S9	S4.6	S10	
18-Dec	S9	S7	SSW8	SSW8	SW9	SSW8	S7	SSW8	SW8	SW11	SW11	SW11	SW10	WSW7	WSW6	W4	NNE7	NNE10	N8	NNE6	ENE4	E3	ENE5	E3	SW3.6	SW11	
19-Dec	NNE2	SE3	SE1	NE2	NE2	S2	SW13	SW13	SSW15	SW16	SW14	WSW17	WSW21	WSW20	WSW21	W25	NNW33	NNW33	W28	W22	W19	W16	WSW11	WSW14	WSW13.3	NNW33	
20-Dec	WSW14	WSW14	WSW15	WSW12	SW11	SW13	SW12	SW11	SW12	SW14	SW14	SW13	SW12	SW10	SW9	SW9	SW11	WSW10	WSW11	WSW10	WSW12	WSW12	WSW12	WSW13	SW11.7	WSW15	
21-Dec	WSW11	SW12	SW12	SW14	SW14	WSW12	WSW16	WSW16	SW16	SW17	SW16	SW18	SW23	SW19	SW19	SW18	SW18	SW15	SW14	SW13	SW14	SW17	SW16	SW17	SW15.7	SW23	
22-Dec	SW18	SW18	SW17	SW18	SW17	SW15	WSW13	WSW14	WSW15	WSW13	WSW11	WSW12	NNW11	NNW9	NNW7	S2	NW6	NNW9	NNW9	NNE13	NNE15	NNE14	N11	NNE12	W7.0	SW18	
23-Dec	NNE12	NNE12	NNE11	NNE10	NNE12	NNE11	NNE10	NNE11	NNE8	NNE11	NNE11	NNE10	NNE9	NE8	NE10	NE11	NE9	NE10	NE11	NE11	NE10	NE9	ENE9	ENE10	NNE9.9	NNE12	
24-Dec	NE8	NE6	ENE6	ENE5	E3	SE3	ENE4	ENE4	ENE4	ENE2	ENE2	SE6	SE8	SE8	SE9	SE7	ESE5	ESE5	SE8	SE6	SE5	E3	ENE4	E5	ESE4.3	SE9	
25-Dec	ESE5	E5	E5	E5	E6	ESE6	ESE5	ESE5	SE5	SE6	SSE8	SSE7	SSE7	SE6	SSE7	SSE6	SSE5	ESE7	SE4	S7	S7	S7	S7	S8	SE5.3	S8	
26-Dec	S8	S7	S6	SSE4	S6	SSE7	S6	S10	S10	S12	S13	S13	S13	S14	S12	S11	S10	S10	S12	S12	S13	SSE11	S12	S11	S10.0	S14	
27-Dec	S14	S16	S11	S12	S9	S11	S10	S10	S8	S7	SE4	SSW7	SSW8	SW8	SW10	SW14	SW15	SW15	SW13	SSW15	SW16	SW12	SW10	SW10	SSW10.1	S16	
28-Dec	WSW13	WSW13	WSW12	WSW11	SW10	WSW11	WSW11	NNW20	NW21	NW22	NW20	NNW20	NNW16	W16	W16	NNW15	W10	WSW9	WSW11	WSW9	NW7	NNW10	ENE4	ESE3	W11.0	NW22	
29-Dec	SE3	SSE3	SW5	SW5	S3	S6	SW6	SSW3	SW6	SW9	SW8	SW7	SSW4	SSW4	S6	SSE4	S7	S5	ESE3	SSE3	E2	SSE2	NE1	SW1	SSW3.6	SW9	
30-Dec	S4	S2	S2	SSE2	S3	S5	S6	SSW6	SW7	SW7	WSW9	WSW9	WSW13	SW10	WSW11	WSW10	WSW7	WSW11	SW13	WSW11	WSW11	WSW11	WSW12	WSW14	SW7.7	WSW14	
31-Dec	W17	NNW18	NW19	NW19	NW15	NW14	NW14	NW13	NW11	NNW13	NW16	NNW18	NW18	NW17	NW17	NW18	NW16	NW15	NW15	NW18	W11	WSW12	WSW11	WSW16	NNW14.4	NW19	

WSW6.3	WSW6.1	WSW6.0	W6.0	W5.7	W5.9	W6.3	W6.4	WSW5.4	WSW6.3	W6.7	W7.0	W7.0	W6.5	W6.6	WSW6.6	W6.3	W6.1	W6.2	W5.9	WSW5.6	WSW6.1	WSW5.6	WSW6.2	Diurnal Average
NW24	NW23	NW25	NW26	NW24	NW24	NW26	NW23	NNW22	NNW23	NNW22	NW24	SW23	NNW22	NNW23	W25	NNW33	NNW33	W28	NNW22	NW21	NW24	NW25	NNW25	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Cenovus - Christina Lake - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	134	18.01	18.01
6 - 11	288	38.71	56.72
12 - 19	252	33.87	90.59
20 - 28	68	9.14	99.73
29 - 38	2	0.27	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Cenovus - Christina Lake - December 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	0	1	4	10	14	10	16	31	31	9	4	0	3	1	0	0	134
6 - 11	8	18	11	3	2	2	8	20	59	40	36	54	9	9	5	4	288
12 - 19	1	7	0	0	0	0	0	6	21	2	50	48	16	35	59	7	252
20 - 28	0	0	0	0	0	0	0	0	0	0	1	3	5	21	34	4	68
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	9	26	15	13	16	12	24	57	111	51	91	105	33	68	98	15	744

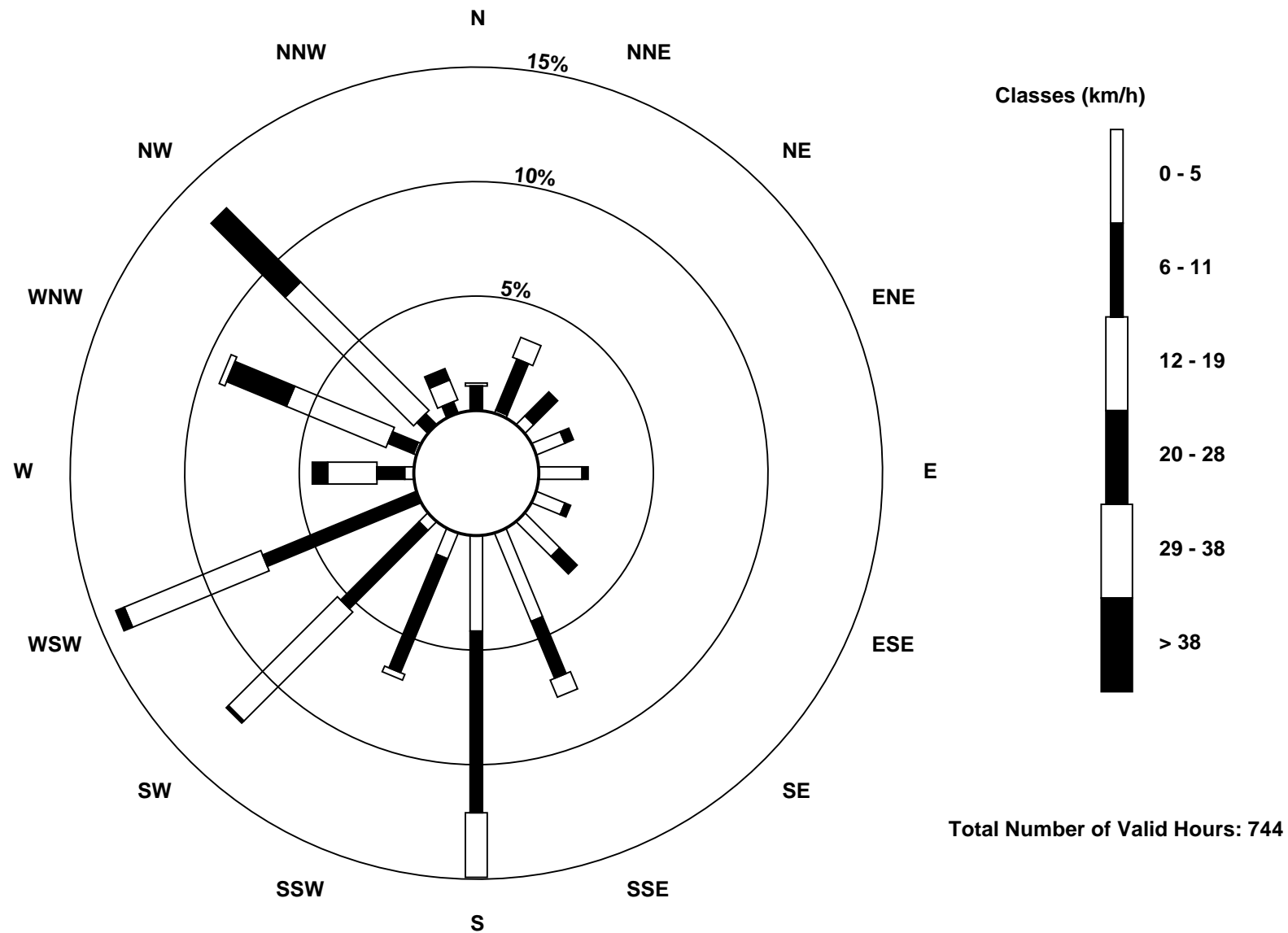
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
Cenovus - Christina Lake (AMS500)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Cenovus - Christina Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 19 17:00																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Dec 8 23:00																										
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 6																										
Day	Hourly Period Ending At (MST)																							Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24	
1-Dec	3	3	2	2	3	3	3	3	2	3	2	3	2	2	1	2	2	2	2	2	2	2	2	2	2	3
2-Dec	1	1	1	2	3	2	2	2	2	2	3	4	3	4	4	4	4	4	3	4	4	4	4	4	4	4
3-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	4	4	4
4-Dec	4	4	4	4	4	4	4	4	3	4	6	4	4	4	5	5	5	5	5	5	4	4	4	4	4	6
5-Dec	5	5	5	5	5	5	5	6	5	6	5	6	6	5	6	5	4	5	5	5	4	4	5	5	6	6
6-Dec	4	4	3	4	4	4	4	4	5	4	4	4	4	4	4	3	4	4	4	4	4	4	3	3	3	5
7-Dec	3	3	3	3	2	3	3	4	3	2	3	3	3	2	3	3	3	2	3	3	2	2	2	2	2	4
8-Dec	2	2	1	2	1	1	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	0	1	2
9-Dec	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	0	1	1	1	1	1	1	2
10-Dec	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	2	1	2	2	2	2	2	2	2
11-Dec	3	4	4	3	3	3	4	3	3	4	6	6	5	5	4	4	4	4	4	3	4	4	2	3	6	6
12-Dec	3	3	3	4	4	4	3	4	5	3	4	5	5	5	4	4	5	5	4	4	3	5	5	5	5	5
13-Dec	6	5	5	5	4	5	4	4	4	3	4	4	4	4	4	4	5	3	4	7	3	3	3	3	7	7
14-Dec	3	3	5	4	3	3	3	1	1	1	1	3	3	2	2	2	3	3	4	3	3	3	5	3	5	5
15-Dec	3	4	3	5	3	5	4	4	4	4	4	3	5	4	4	3	4	3	2	3	3	2	4	3	5	5
16-Dec	3	3	3	2	2	3	4	4	3	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	4
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	2	2	2	2	2
18-Dec	2	3	3	2	3	3	1	2	3	3	3	3	3	2	2	2	2	2	3	2	1	2	1	1	3	3
19-Dec	2	1	1	1	1	4	4	4	5	4	4	5	7	6	6	7	9	8	8	5	5	4	3	4	9	9
20-Dec	3	4	4	3	3	3	3	3	3	4	3	3	3	3	3	2	2	3	3	3	3	3	3	3	4	4
21-Dec	3	3	3	4	4	4	4	4	5	5	4	6	6	6	5	5	5	4	4	3	4	5	4	5	6	6
22-Dec	5	5	4	5	4	4	3	3	4	3	3	3	3	4	3	2	2	2	2	3	3	2	2	2	5	5
23-Dec	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
24-Dec	1	1	1	1	1	1	1	1	1	1	1	3	1	2	2	2	1	1	2	1	1	1	1	1	3	3
25-Dec	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	0	1	2	2	1	1	2	1	2	2	2
26-Dec	2	2	1	1	1	1	2	2	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3	3	3	3
27-Dec	4	5	5	3	3	3	3	2	2	2	2	2	3	3	3	4	4	4	3	3	4	4	3	3	5	5
28-Dec	3	3	3	2	2	3	2	6	4	5	4	5	5	5	5	4	3	2	2	3	2	2	2	1	6	6
29-Dec	1	2	2	3	2	2	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	3	3
30-Dec	2	1	3	2	1	2	2	1	2	2	2	3	4	3	3	3	2	4	4	4	3	3	3	3	4	4
31-Dec	4	5	4	3	3	3	3	2	3	5	3	4	4	4	4	3	3	3	4	3	3	3	3	4	5	5
Diurnal Maximum																										
6 5 5 5 5 5 5 6 5 6 6 6 7 6 6 7 9 8 8 7 5 5 5 5 5																										



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Cenovus - Christina Lake - December 2016

Direction of Maximum Speed: 283 deg on Dec 19 17:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 298.9 deg on Dec 5		Hours of Data:	744
Direction of Minimum Speed: 229 deg on Dec 30 00:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 3.6 deg on Dec 29		Percent Operational Time:	100.0
Monthly Average Direction: 249.7 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	188	191	204	205	187	210	220	216	193	201	224	227	234	207	171	179	187	192	206	196	200	197	205	219	202.8
2-Dec	216	200	184	159	163	170	172	173	153	170	163	170	156	175	177	174	163	160	170	164	172	170	169	166	169.1
3-Dec	172	168	175	182	188	185	193	198	193	198	199	204	209	199	197	190	194	194	197	205	207	209	220	228	196.0
4-Dec	235	232	229	231	232	234	240	242	243	255	311	313	332	340	329	306	318	305	292	299	306	308	307	303	289.7
5-Dec	305	306	306	304	305	301	305	306	303	301	295	305	301	302	301	295	298	296	288	289	288	295	282	286	298.9
6-Dec	293	298	292	287	283	293	304	292	282	297	294	300	299	308	308	304	308	305	308	307	308	312	304	304	299.9
7-Dec	305	305	305	308	309	309	307	303	263	249	309	304	318	321	310	304	318	330	320	320	321	312	315	319	309.5
8-Dec	322	327	7	349	13	25	344	0	4	4	13	7	18	28	42	84	99	92	93	142	110	129	154	163	15.8
9-Dec	173	165	146	172	186	170	166	185	179	161	174	162	154	150	164	165	156	141	131	172	186	182	179	186	168.8
10-Dec	189	189	187	187	174	161	149	163	145	169	185	187	149	164	200	200	174	187	183	188	192	234	238	246	191.7
11-Dec	248	258	255	250	249	247	252	251	254	260	265	260	263	264	261	257	255	257	255	254	254	251	244	246	255.6
12-Dec	249	254	248	293	319	307	306	307	291	292	273	305	301	282	265	260	274	300	308	303	306	305	291	277	290.9
13-Dec	272	297	306	307	307	306	306	307	353	327	331	328	336	328	329	318	307	256	294	294	235	238	239	245	306.9
14-Dec	245	263	292	289	253	255	233	215	183	157	177	239	246	244	245	237	245	304	310	314	303	301	303	309	272.7
15-Dec	306	298	243	281	305	302	308	307	309	308	311	308	290	306	309	283	279	265	238	249	249	237	252	247	290.2
16-Dec	239	253	282	260	272	268	293	279	266	202	221	92	79	212	215	206	191	200	199	200	111	126	110	161	230.9
17-Dec	158	153	180	188	175	161	169	206	170	148	155	153	163	155	165	145	166	176	165	178	178	175	180	175	170.3
18-Dec	175	190	213	208	217	211	182	197	225	223	227	228	235	240	238	270	33	14	359	18	58	89	78	89	217.7
19-Dec	31	133	136	48	48	191	215	220	213	229	227	239	243	245	252	266	283	283	280	270	265	260	246	248	255.1
20-Dec	249	247	244	246	233	231	226	220	216	221	223	224	226	232	221	220	222	238	247	246	246	246	253	250	234.7
21-Dec	250	223	218	223	232	243	243	238	229	221	216	226	236	234	235	233	227	222	219	220	217	226	223	225	228.4
22-Dec	230	228	226	229	230	235	237	237	245	247	250	252	288	300	291	186	324	328	345	17	15	14	3	17	267.3
23-Dec	17	14	19	19	21	18	13	12	29	25	20	20	22	45	49	41	48	49	49	47	53	49	63	62	32.7
24-Dec	38	54	67	69	84	131	78	69	75	78	58	146	143	140	143	134	115	106	146	133	126	99	73	85	106.5
25-Dec	109	84	93	100	82	105	119	119	127	138	152	150	165	134	156	154	150	121	130	185	181	178	172	173	140.1
26-Dec	169	186	172	149	178	155	173	180	173	170	173	175	183	185	188	176	183	169	174	175	172	167	169	169	174.5
27-Dec	171	176	180	178	173	179	179	175	172	174	145	203	199	214	215	216	217	215	217	212	219	234	235	234	199.8
28-Dec	246	245	244	239	236	243	245	297	309	304	310	303	292	278	274	283	270	248	244	256	307	300	59	118	277.3
29-Dec	125	153	229	219	177	191	222	199	215	215	217	219	197	192	177	150	180	176	106	154	89	161	51	229	192.6
30-Dec	189	180	177	165	169	173	188	212	234	231	240	247	245	230	241	239	237	241	236	240	247	245	248	253	234.4
31-Dec	275	294	309	310	314	318	308	312	307	302	312	328	311	308	311	310	305	304	308	308	267	248	245	253	301.2

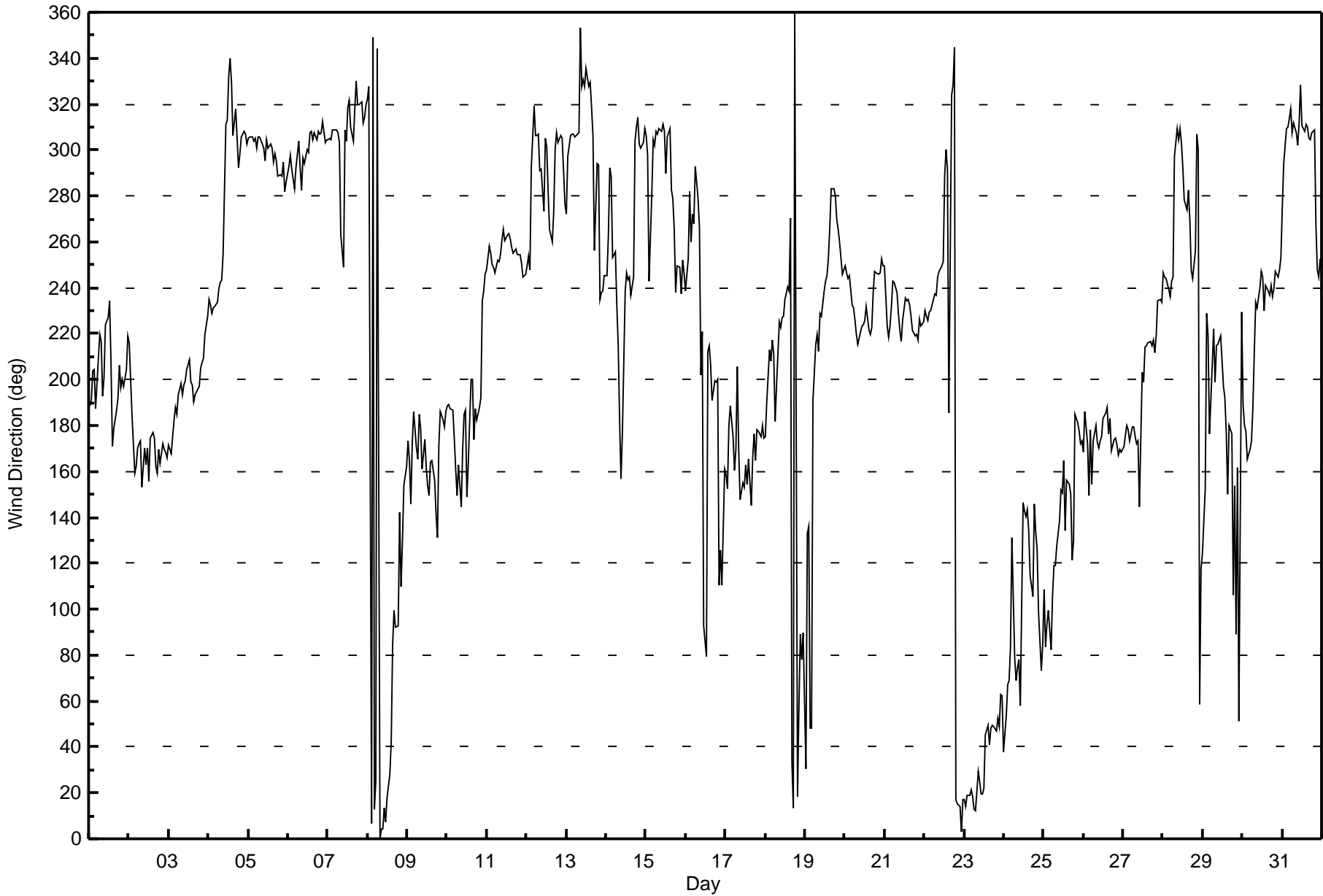
254.2 255.4 257.6 260.9 263.3 261.0 262.0 264.6 256.1 256.6 268.0 268.5 268.0 269.0 261.2 257.2 261.3 266.8 265.8 262.6 258.2 258.4 253.8 254.3
 Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Cenovus - Christina Lake - December 2016





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Cenovus - Christina Lake - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Dec 16 07:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: 5 deg on Dec 8 18:00																										
Percentiles: P ₁ = 8 P ₁₀ = 10 Q ₁ = 13 Median = 16 Q ₃ = 19 P ₉₀ = 29 P ₉₉ = 68																										
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	15	17	19	19	15	24	20	22	19	16	19	21	23	22	15	12	16	16	16	19	16	18	15	19	24	
2-Dec	19	21	19	15	13	12	12	13	15	16	13	13	12	14	15	13	15	13	16	14	14	13	14	15	21	
3-Dec	13	16	13	15	15	15	16	16	16	17	19	18	17	19	18	16	13	13	13	14	13	14	15	17	19	
4-Dec	18	18	17	18	19	19	19	20	19	23	14	15	19	16	14	10	16	12	15	15	10	9	9	10	23	
5-Dec	10	11	11	12	11	15	12	13	15	14	16	13	15	14	14	15	14	16	16	16	17	16	15	14	17	
6-Dec	15	15	17	16	16	15	14	16	18	14	15	16	16	12	10	14	10	10	13	12	14	15	10	9	18	
7-Dec	9	10	9	9	8	8	8	17	33	22	13	12	20	20	14	9	15	8	13	14	12	8	10	11	33	
8-Dec	10	13	19	29	25	15	22	23	13	14	14	17	13	8	57	39	22	5	22	33	30	25	16	14	57	
9-Dec	14	35	22	21	9	10	11	14	13	15	18	19	21	31	9	14	8	8	12	19	10	11	11	11	35	
10-Dec	12	13	14	10	14	6	16	30	26	15	13	14	17	63	18	20	12	12	11	18	39	20	15	16	63	
11-Dec	16	18	15	17	17	17	17	18	17	16	16	17	16	17	17	16	16	16	15	15	15	16	15	16	18	
12-Dec	16	16	15	24	15	12	11	10	23	16	16	14	13	19	18	17	17	16	14	10	9	13	21	14	24	
13-Dec	19	17	10	10	10	10	10	10	19	11	13	12	18	13	12	16	15	24	19	30	31	15	17	33	33	
14-Dec	30	47	34	31	26	19	17	12	13	10	28	25	16	16	15	14	18	11	15	15	8	8	12	15	47	
15-Dec	8	17	26	34	8	14	11	14	11	11	10	11	22	14	10	17	18	27	13	17	17	14	44	40	44	
16-Dec	15	17	20	24	30	26	104	51	51	66	27	56	67	29	26	15	7	11	9	14	53	29	29	30	104	
17-Dec	28	31	35	37	16	26	40	20	19	21	52	34	23	18	8	9	17	13	15	18	14	12	22	14	52	
18-Dec	13	26	20	18	18	21	15	14	20	17	19	19	19	22	23	54	17	15	16	25	24	43	31	50	54	
19-Dec	88	42	83	43	24	84	18	18	20	18	17	18	18	19	17	16	15	14	15	15	15	15	17	16	88	
20-Dec	16	17	17	17	18	18	18	17	17	16	17	17	17	20	19	13	13	15	16	15	18	15	16	17	20	
21-Dec	18	18	18	18	19	21	18	19	18	17	17	19	19	17	17	17	17	17	17	17	17	18	17	17	21	
22-Dec	17	17	17	17	17	17	17	17	16	16	15	17	31	25	28	63	39	25	18	12	13	14	17	12	63	
23-Dec	11	14	14	12	11	14	13	14	14	10	13	14	16	17	11	10	11	9	11	8	10	10	9	9	17	
24-Dec	12	15	8	14	17	27	21	22	21	55	23	31	15	15	13	13	14	24	12	12	11	14	13	14	55	
25-Dec	12	10	16	11	13	14	10	10	9	13	11	15	18	16	9	9	15	9	27	15	14	17	12	9	27	
26-Dec	14	13	14	28	11	9	11	15	13	14	12	13	16	15	16	13	15	12	15	16	15	15	16	18	28	
27-Dec	15	14	19	14	15	14	18	15	13	15	35	23	22	23	19	17	16	16	17	15	17	20	22	23	35	
28-Dec	16	16	15	13	15	14	17	25	11	13	12	14	20	18	17	18	22	25	18	25	29	25	50	66	66	
29-Dec	30	42	65	70	71	28	15	36	16	14	17	16	67	54	21	43	10	33	36	36	41	55	70	91	91	
30-Dec	20	64	74	51	41	29	14	15	18	16	19	20	18	19	18	16	17	18	19	19	16	15	17	16	74	
31-Dec	17	18	11	11	14	14	12	12	22	31	15	12	14	13	14	9	10	10	12	9	25	15	16	16	31	
		88	64	83	70	71	84	104	51	51	66	52	56	67	63	57	63	39	33	36	36	53	55	70	91	
		Diurnal Maximum																								



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 6, 2016	Last Calibration	November 9, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	13:15	End Time (MST)	17:28
Gas Cert Reference	LL107928	Station temp.	22 Deg C
Cal Gas Concentration	50.0 ppm	Cal Gas Exp Date	September 8, 2018
Calibrator Make/Model	API T700	Serial Number	451
ZAG Make/Model	API 701	Serial Number	4604
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2575

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-698	-698
Analyzer IP address	192.168.1.43		Lamp voltage	840	843
Calculated slope	0.998721	1.002794	Chamber temp	45.0	45.0
Calculated intercept	0.516256	0.722668	Pressure	677.3	683.5
Analyzer Background	12.5	13.3	Flow	0.591	0.594
Analyzer Coefficient	1.028	1.036	Intensity	92	92

Analyzer make Thermo 43i Analyzer serial # 1118148497

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.7	----
as found span	5000	79.3	793.0	789.2	1.005
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	79.3	793.0	791.0	1.002
second point	5000	39.7	397.0	393.3	1.009
third point	5000	19.8	198.0	196.6	1.007
as left zero	5000	0.0	0.0	-0.5	----
as left span	5000	79.3	793.0	795.0	0.997
Average Correction Factor					1.006

Corrected As found 788.4 Previous response 793.5 % change 0.6%

Notes:

Changed inlet filter after as founds. Adjusted both zero and span. Did not take full 15 mins "as lefts" average due to being short on time.

Calibration Performed By: Asad Hidayat



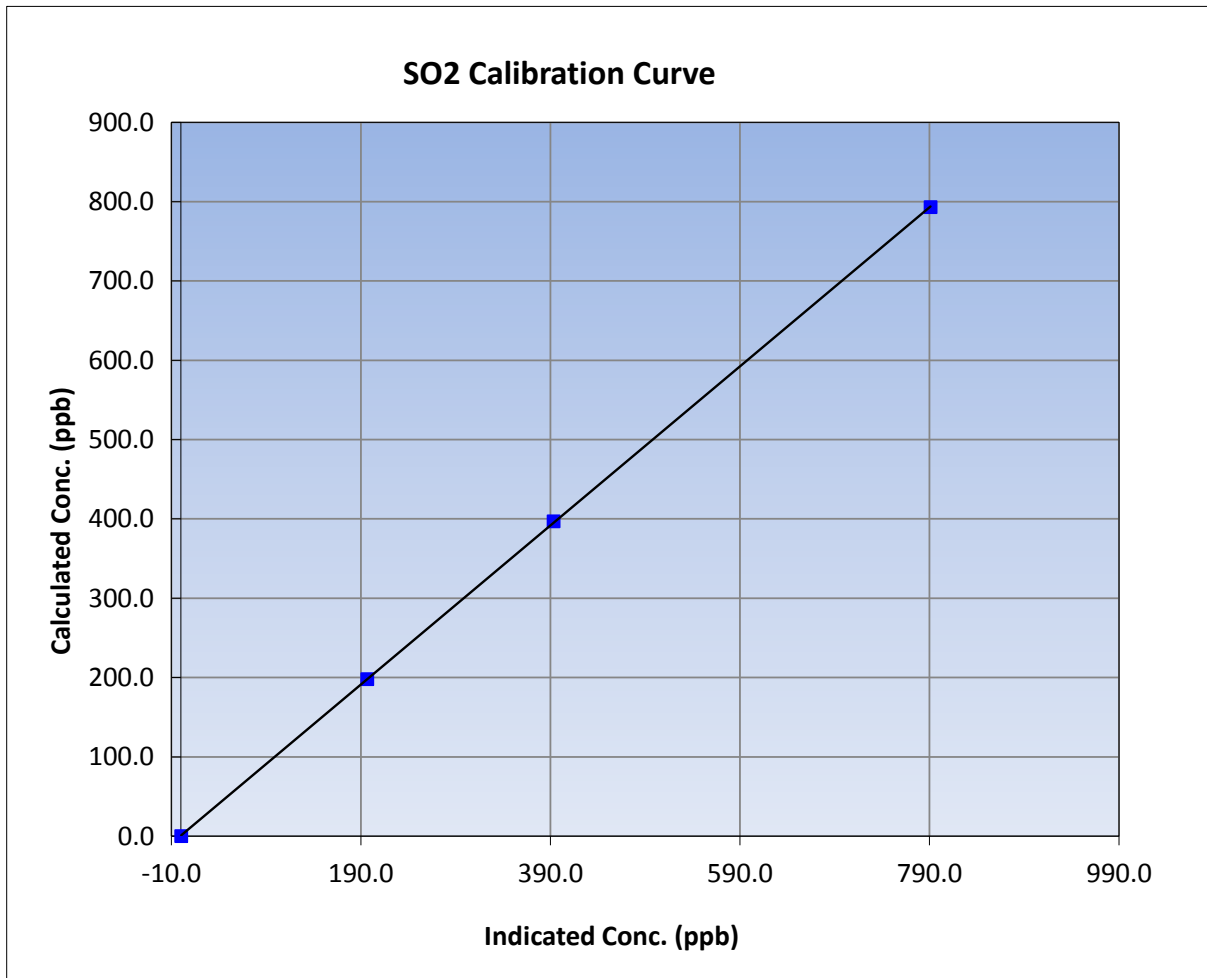
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Start Time (MST)	13:15	End Time (MST)	17:28
Analyzer make	Thermo 43i	Analyzer serial #	1118148497

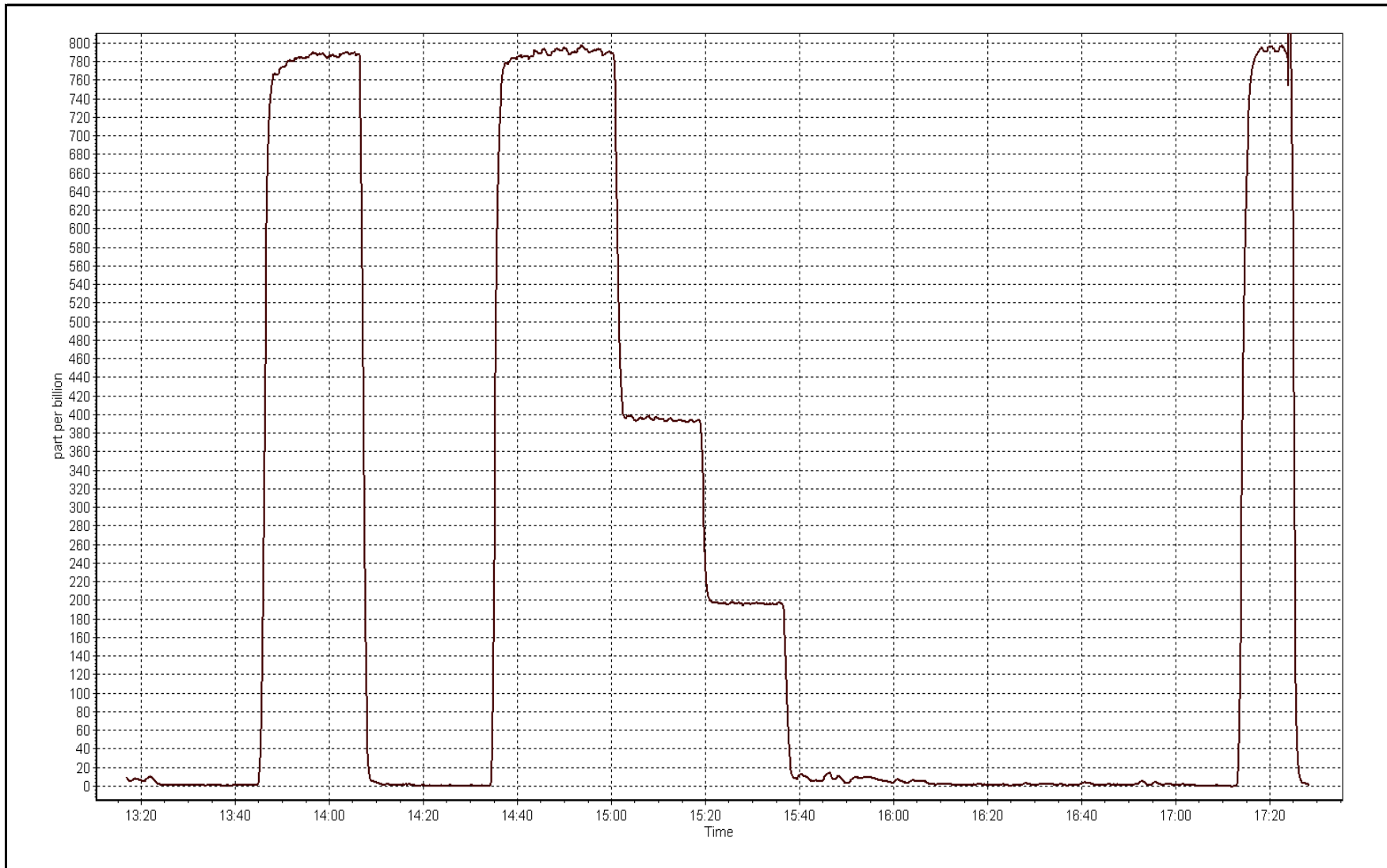
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999984
793.0	791.0	1.0025		
397.0	393.3	1.0093	Slope	1.002794
198.0	196.6	1.0074		
			Intercept	0.722668



SO2 Calibration Plot

Date: December 6, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 6, 2016	Last Calibration	November 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	17:27	End Time (MST)	19:10
Gas Cert Reference	LL30650	Station temp.	22 Deg C
Cal Gas Concentration	5.1 ppm	Cal Gas Exp Date	February 12, 2019
Calibrator Make/Model	API 700	Serial Number	2445
ZAG air Make/Model	API 701	Serial Number	4604
DACS make/model	Campbell Scientific CR3000	Serial Number	2575
SO2 gas concentration	50 ppm	SO2 gas cert/exp	LL107928 September 8, 2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-681	-680
Analyzer IP address	192.168.1.35		Lamp voltage	971	978
Calculated slope	0.992900	1.013807	Chamber temp	45	45
Calculated intercept	0.049692	-0.137034	Pressure	659.0	664.1
Analyzer Background	1.51	1.49	Flow	0.439	0.444
Analyzer Coefficient	0.849	0.849	Intensity	91	92
			Converter temp.	310	310

Analyzer make/model	Thermo 43i-TLE	Analyzer serial #	1008841400
Converter make/model	Thermo 340	Converter serial #	328702539

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	78.5	80.1	79.0	1.013
SO2 scrubber check	5000	19.8	198.0	1.6	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	78.5	80.1	79.0	1.013
second point	5000	39.3	40.1	39.9	1.005
third point	5000	19.6	20.0	19.8	1.009
as left zero					
as left span					
Average Correction Factor					1.009

Corrected As found	79.0	Previous response	80.6	% change	2.1%
--------------------	------	-------------------	------	----------	------

Notes:

Inlet filter changed after as founds. No adjustments. Sox scrubber test completed after 3rd point. As lefts were not completed because work permit was expiring very soon.

Calibration Performed By: Asad Hidayat



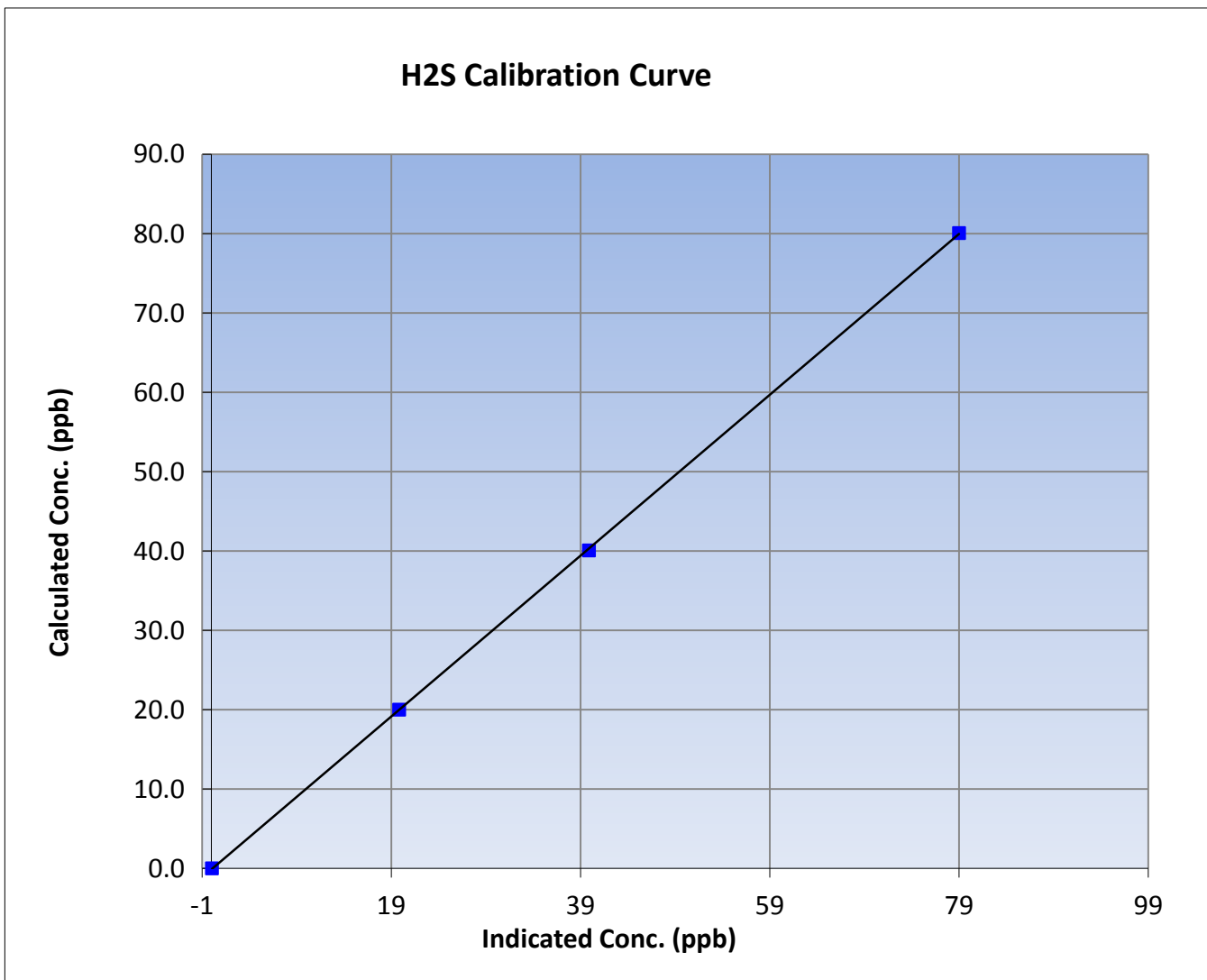
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	17:27	End Time (MST)	19:10
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1008841400

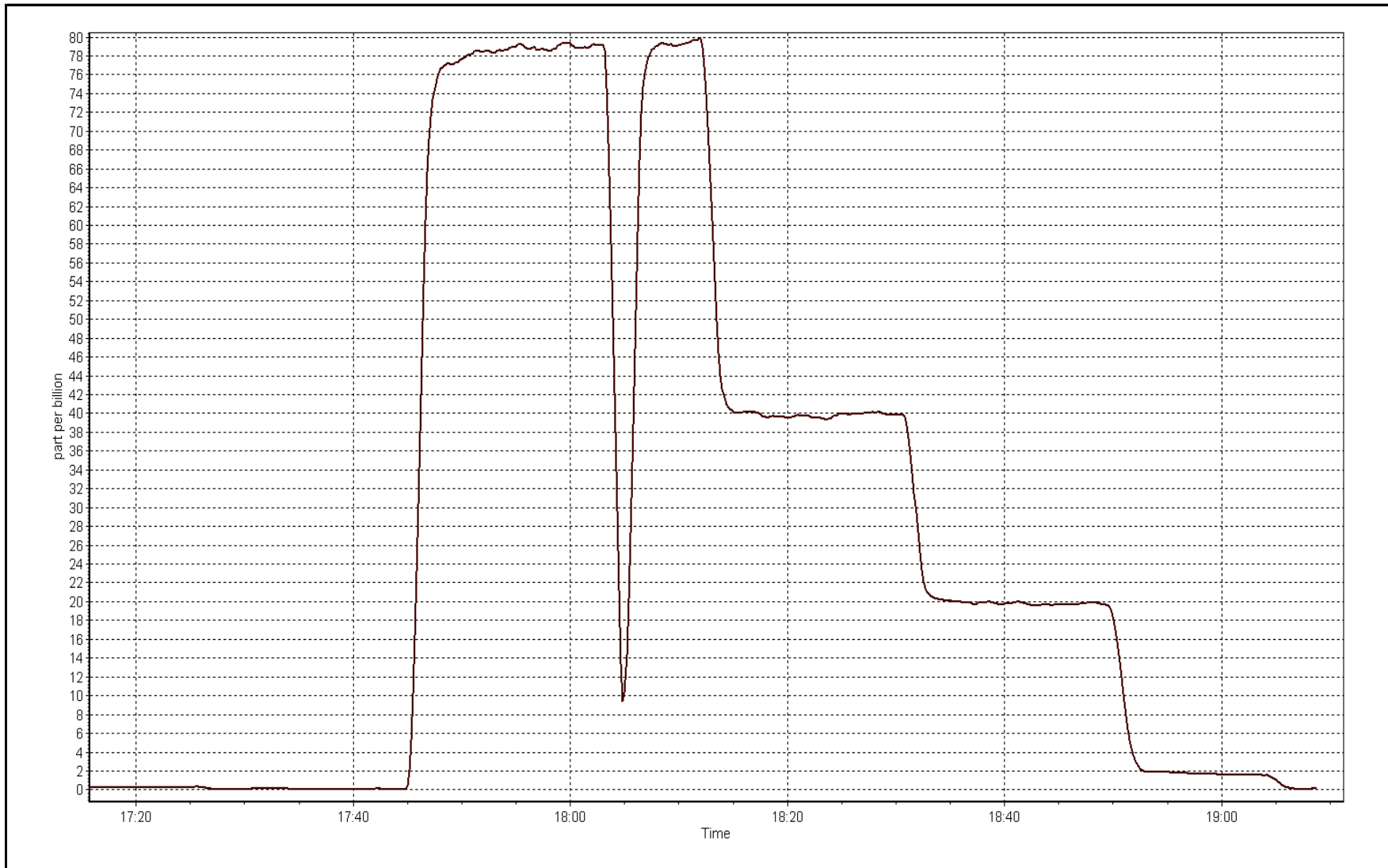
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999980
80.1	79.0	1.0134		
40.1	39.9	1.0047	Slope	1.013807
20.0	19.8	1.0087		
			Intercept	-0.137034



H2S Calibration Plot

Date: December 6, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	13:15	End Time (MST)	17:27
NO Cal Gas Conc	50.5 ppm	Gas Cert Reference	LL107928
NOx Cal Gas Conc	50.8 ppm	Cal Gas Expiry Date	September 8, 2018
Calibrator	API T700	Serial Number	451
Zero air Generator	Teledyne API T701	Serial Number	4604

DACs Information

DACs make & model	Campbell Scientific CR3000	DACs serial No.	2575
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.994696	0.993451	1.010949
	Data Offset	1.503710	1.280374	-0.158167
Current Calibration	Data Slope	0.996901	0.998184	0.980730
	Data Offset	1.894655	1.185111	0.940417

Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	723
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	0.999		1.030	
NOx coefficient	1.002		1.037	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.4		0.4	
NOx bkgrnd	1.4		1.4	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	315.4	Deg C	314.5	Deg C
PMT voltage	826	V	826	V
PMT Temp	6.9	Deg C	6.9	Deg C
O3 flow	85	ccm	86	ccm
R Cell press NO	5.1	mmHg	6.3	mmHg
R Cell Press Nox	4.9	mmHg	6.3	mmHg
NO sample flow	0.489	lpm	0.492	lpm
Nox sample Flow	0.484	lpm	0.492	lpm

Notes:

Sample inlet filter replaced after as founds. Did not adjust baseline but took new "calibrator zero" average after replacing the filter because it had slightly changed. Adjusted span. Did not take full 15 mins average for "as lefts" to being short on time.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 6, 2016 Station Number: AMS 500

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.8	-0.5	-0.3	----	----
as found span	5000	79.3	805.7	800.9	4.8	777.0	773.5	3.5	1.0369	1.0355
calibrator zero	5000	0.0	0.0	0.0	0.0	0.3	0.7	-0.4	----	----
high point	5000	79.3	805.7	800.9	4.8	807.3	802.1	5.2	0.9980	0.9986
second point	5000	39.6	402.3	400.0	2.4	400.7	398.8	1.9	1.0041	1.0030
third point	5000	19.8	201.2	200.0	1.2	197.7	197.2	0.6	1.0175	1.0144
as left zero	5000	0.0	0.0	0.0	0.0	-0.3	0.4	-0.7	----	----
as left span	5000	79.3	805.7	608.6	197.1	806.0	605.8	200.5	0.9996	1.0046
Average Correction Factor									1.0065	1.0053

Corrcted As found NO_x= 777.8 NO= 774.0 Percent Change NO_x= 3.9% NO= 4.0%
 Previous Response NO_x= 808.5 NO= 804.9

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 79.30 ccm NOx ref calc conc = 805.7 ppb NO ref calc conc = 800.9 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		4.8	807.8	800.3	-0.4	0.9974	1.0007	----	----
1st NO2 (600)	608.6	196.5	808.8	608.6	200.2	0.9961	----	0.9817	101.9%
2nd NO2 (400)	671.4	133.7	805.8	671.4	134.4	0.9998	----	0.9947	100.5%
3rd NO2 (200)	729.1	76.0	805.3	729.1	76.2	1.0005	----	0.9973	100.3%
2nd NO ref point		4.8	805.0	798.5	6.7	1.0009	1.0030	----	----
Average Correction Factor						0.9993		0.9912	100.9%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

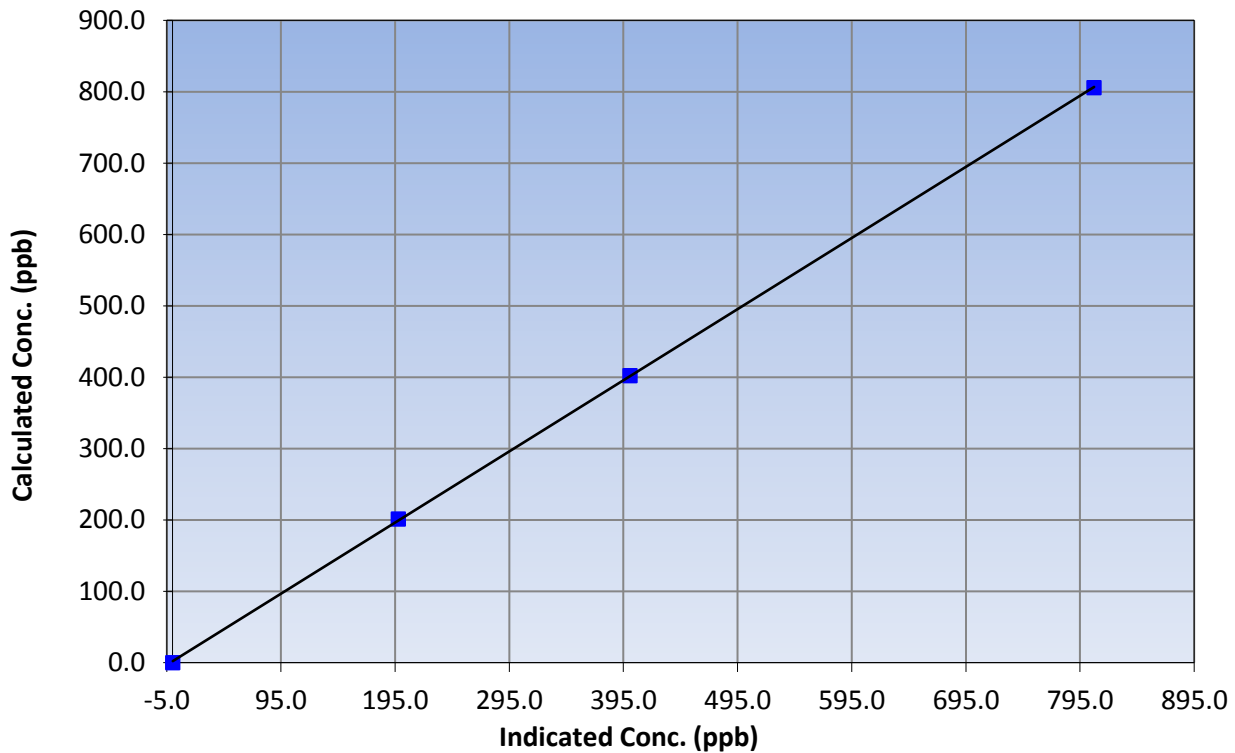
Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	13:15	End Time (MST)	17:27
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999968
805.7	807.3	0.9980		
402.3	400.7	1.0041	Slope	0.996901
201.2	197.7	1.0175		
			Intercept	1.894655

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

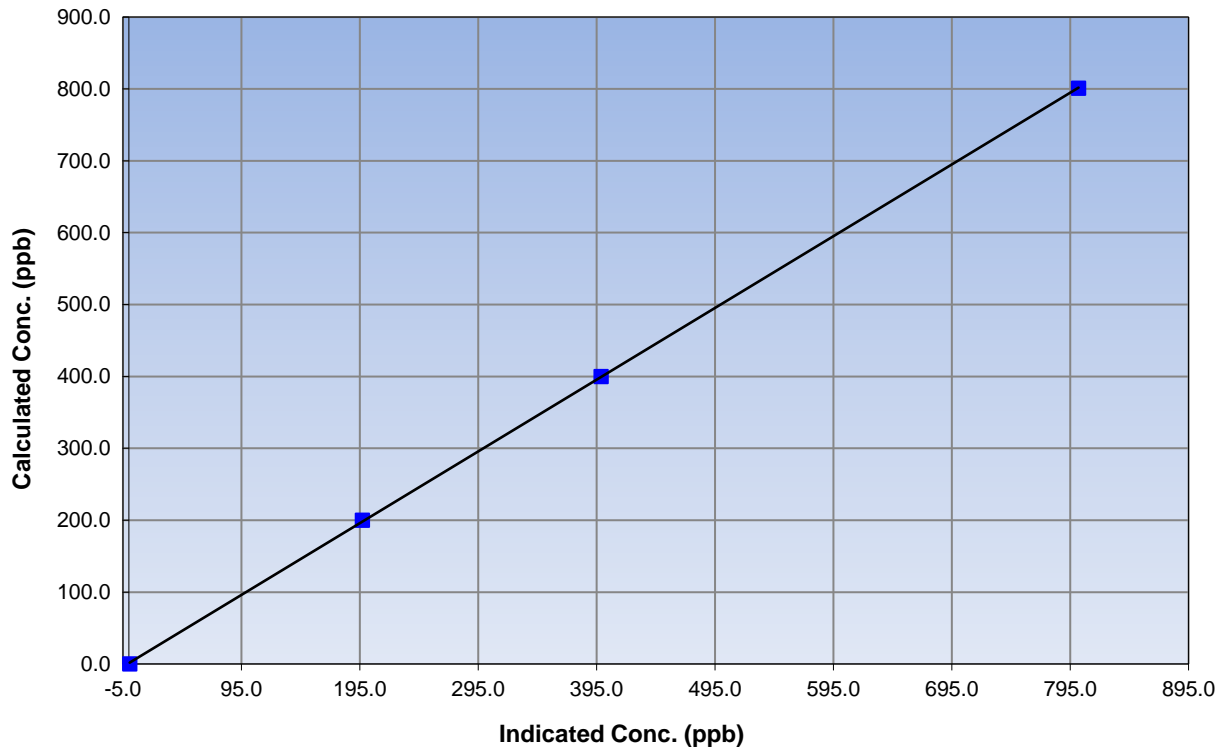
Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	13:15	End Time (MST)	17:27
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.7	N/A	Correlation Coefficient	0.999975
800.9	802.1	0.9986		
400.0	398.8	1.0030	Slope	0.998184
200.0	197.2	1.0144		
			Intercept	1.185111

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

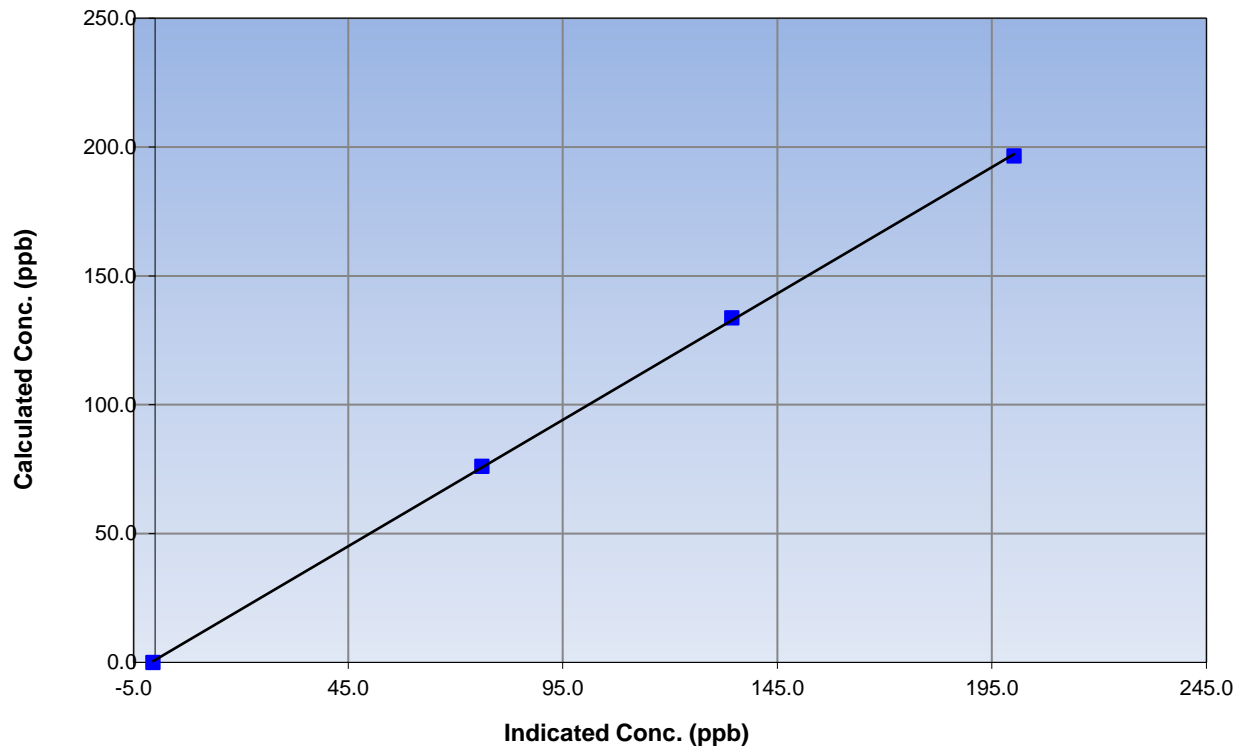
Station Information

Calibration Date	December 6, 2016	Previous Calibration	November 9, 2016
Station Number	Cenovus	Station Number	AMS 500
Start Time (MST)	13:15	End Time (MST)	17:27
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

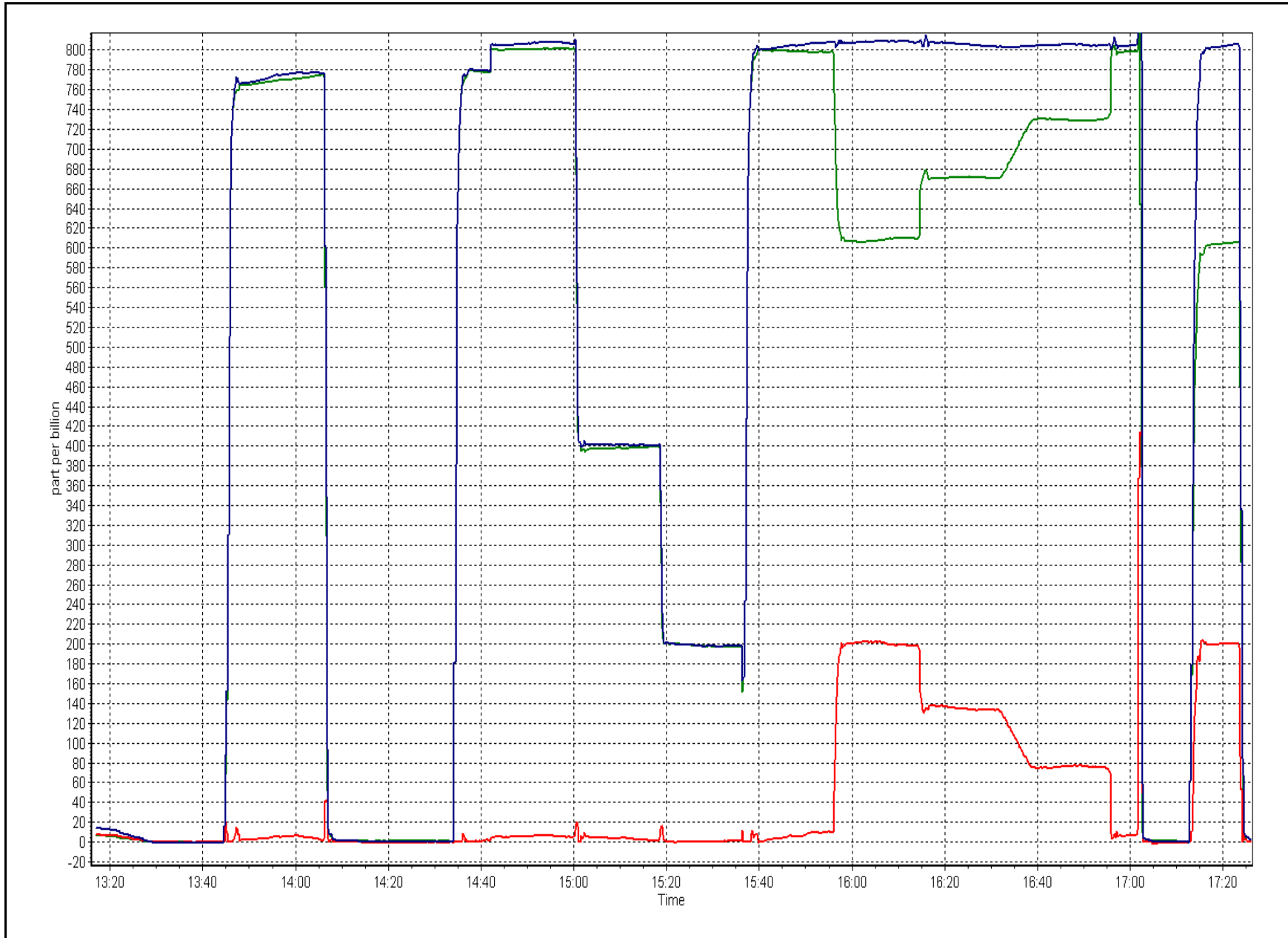
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	N/A	Correlation Coefficient	0.999914
196.5	200.2	0.9817		
133.7	134.4	0.9947	Slope	0.980730
76.0	76.2	0.9973		
			Intercept	0.940417

NO₂ Calibration Curve



NOX Calibration Plot

Date: December 6, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 502
CONOCOPHILLIPS
SURMONT
DECEMBER 2016**

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
 DECEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	684	35	36	99.86	10	0	4	0
H2S (ppb) Average	680	33	40	99.03	3	0	1	0
NO2 (ppb) Average	685	35	35	100.00	12	0	6	-
NO (ppb) Average	685	35	35	100.00	7	-	2	-
NOX (ppb) Average	685	35	35	100.00	15	-	7	-
Temperature 2 m (C) Average	720	0	0	100.00	15.4	-	10.7	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	98	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	32	-	23	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
 DECEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	706	1.5	2	-	0	0	0	1	2	4	16
H2S (ppb) Average	707	0.4	0	-	0	0	0	0	0	1	4
NO2 (ppb) Average	708	4	3	-	0	1	2	3	6	8	18
NO (ppb) Average	708	2.4	4	-	0	0	0	1	2	7	54
NOX (ppb) Average	708	6.5	6	-	0	1	2	5	9	15	69
Temperature 2 m (C) Average	744	-15	8.1	-	-29.6	-25.5	-21.6	-16.4	-7.6	-3.8	1.8
Relative Humidity (%) Average	744	81.3	7	-	60	75	77	81	85	90	97
Wind Speed 10 m (km/h) Average	744	15.1	8	-	1	5	8	14	22	26	37
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
DECEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	08 Dec 2016 14:00	08 Dec 2016 15:00	2	Unstable operation - excessive baseline drift
H2S	05 Dec 2016 12:00	05 Dec 2016 12:00	1	Unstable operation - excessive baseline drift
H2S	08 Dec 2016 14:00	08 Dec 2016 14:00	1	Unstable operation - excessive baseline drift



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

ConocoPhillips - Surmont - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 16 ppb on Dec 4 22:00	Maximum Daily Average: 5.4 ppb on Dec 4		Hours of Data:	706
Minimum Value: 0 ppb on Dec 11 08:00	Minimum Daily Average: 0.4 ppb on Dec 11		Hours of Missing Data:	38
Maximum Diurnal Average: 1.9 ppb at hour 19	Minimum Diurnal Average: 1.0 ppb at hour 2		Hours of Calibration:	36
Monthly Average: 1.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 4 P ₉₉ = 9		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0.4	1
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	1	1	1	1	1	1	1	0.7	2
3-Dec	1	Z	1	0	1	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0.5	1
4-Dec	0	0	Z	1	1	1	1	1	4	6	4	2	1	4	4	6	7	9	9	10	13	16	14	11	5.4	16
5-Dec	10	7	6	Z	4	2	4	3	2	7	9	5	5	4	4	3	5	4	3	3	2	2	2	2	4.2	10
6-Dec	2	2	2	1	Z	1	1	1	1	0	1	2	2	2	2	1	1	2	2	1	1	1	1	3	1.4	3
7-Dec	2	1	1	3	2	Z	3	2	2	2	3	6	7	6	5	6	6	3	2	1	1	1	1	2	3.0	7
8-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	UO	UO	1	1	2	2	2	2	1	1	1	1.2	2
9-Dec	1	Z	1	1	1	2	2	2	4	4	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1.7	4
10-Dec	1	0	Z	1	1	1	0	1	2	2	2	2	2	4	4	3	3	1	1	1	1	2	1	2	1.6	4
11-Dec	1	1	1	Z	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
12-Dec	0	2	5	7	Z	8	9	3	1	1	3	8	3	2	1	1	2	4	5	5	4	3	2	2	3.5	9
13-Dec	2	2	3	4	5	Z	1	1	2	3	C	C	C	C	C	2	0	0	2	0	0	0	0	0	1.6	5
14-Dec	Z	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	4	4	4	4	3	4	3	1.6	4
15-Dec	1	Z	1	1	1	1	2	3	1	1	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1.1	3
16-Dec	1	0	Z	1	1	0	2	4	3	1	3	3	1	1	1	1	1	1	1	1	1	0	0	0	1.1	4
17-Dec	0	0	1	Z	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	1	0.8	2
18-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.7	1
19-Dec	1	1	1	0	1	Z	1	1	1	1	1	1	1	1	1	4	2	4	11	13	6	1	1	1	2.2	13
20-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0.6	1
21-Dec	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0.5	1
22-Dec	0	0	Z	1	1	1	0	0	0	0	0	1	1	1	1	1	3	1	1	0	0	1	1	0	0.7	3
23-Dec	1	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.4	1
25-Dec	1	1	1	1	1	Z	1	1	0	0	0	0	1	1	1	1	1	1	2	1	1	1	1	0	0.8	2
26-Dec	Z	1	1	1	1	1	0	0	1	1	1	2	3	4	4	5	4	3	2	1	2	3	3	3	2.0	5
27-Dec	2	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0.8	2
28-Dec	1	1	Z	1	1	1	2	6	7	6	3	1	3	1	1	1	0	0	1	1	1	0	0	0	1.7	7
29-Dec	0	0	1	Z	1	0	0	0	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0.9	2
30-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	3	5	5	1.1	5
31-Dec	2	1	1	2	3	Z	2	1	2	2	2	5	7	7	5	4	4	4	4	1	0	0	0	1	2.6	7

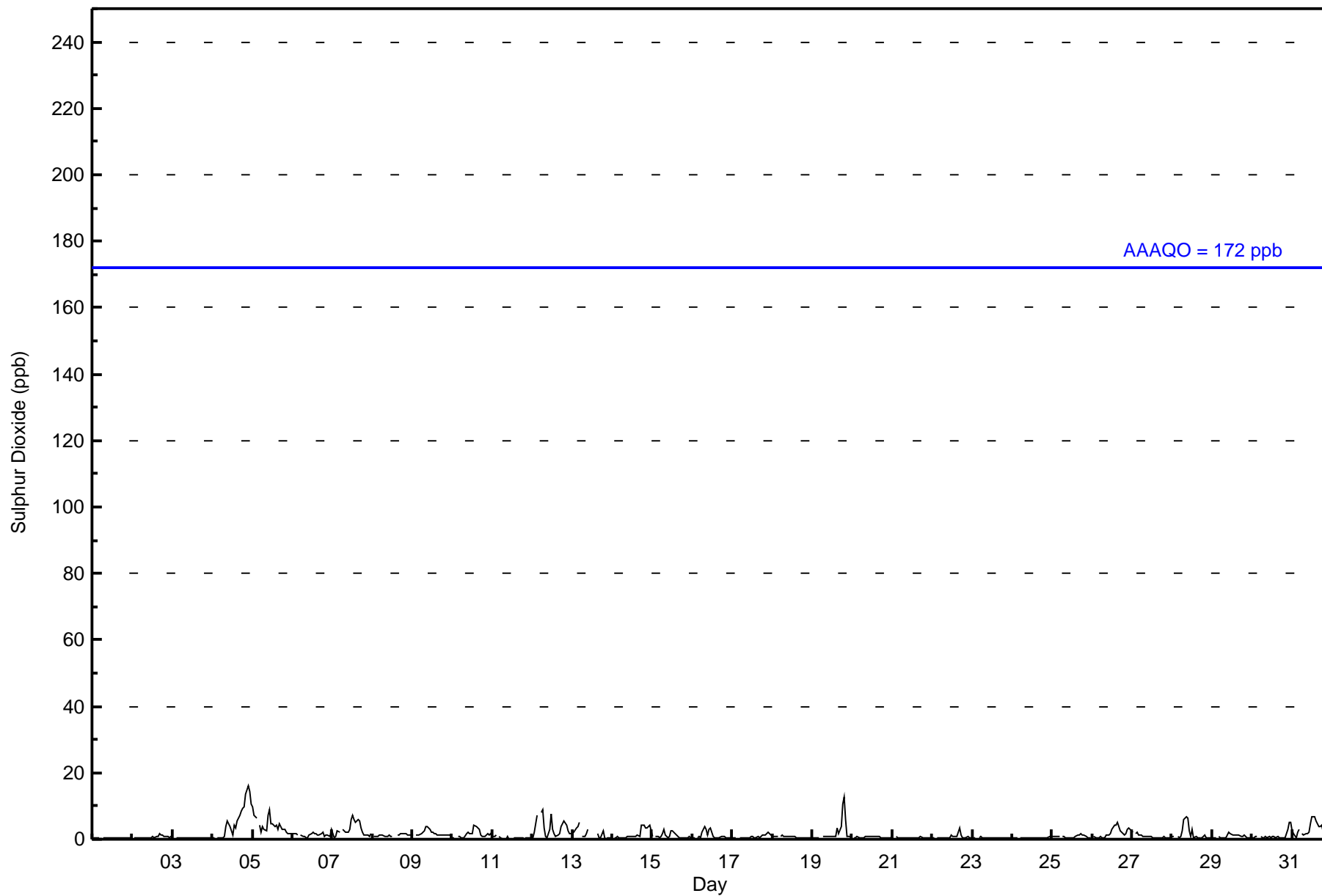
1.2	1.0	1.2	1.2	1.1	1.0	1.2	1.2	1.3	1.5	1.6	1.7	1.6	1.7	1.5	1.6	1.7	1.7	1.9	1.8	1.6	1.6	1.5	1.4	Diurnal Average
10	7	6	7	5	8	9	6	7	7	9	8	7	7	5	6	7	9	11	13	13	16	14	11	Diurnal Maximum

Z - zerospan C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



WBEA Data PC
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	700	99.15	99.15
11 - 20	6	0.85	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	13	1	7	7	4	11	6	22	78	60	47	92	84	151	49	68	700
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	13	1	7	7	4	11	6	22	78	60	47	92	84	151	55	68	706

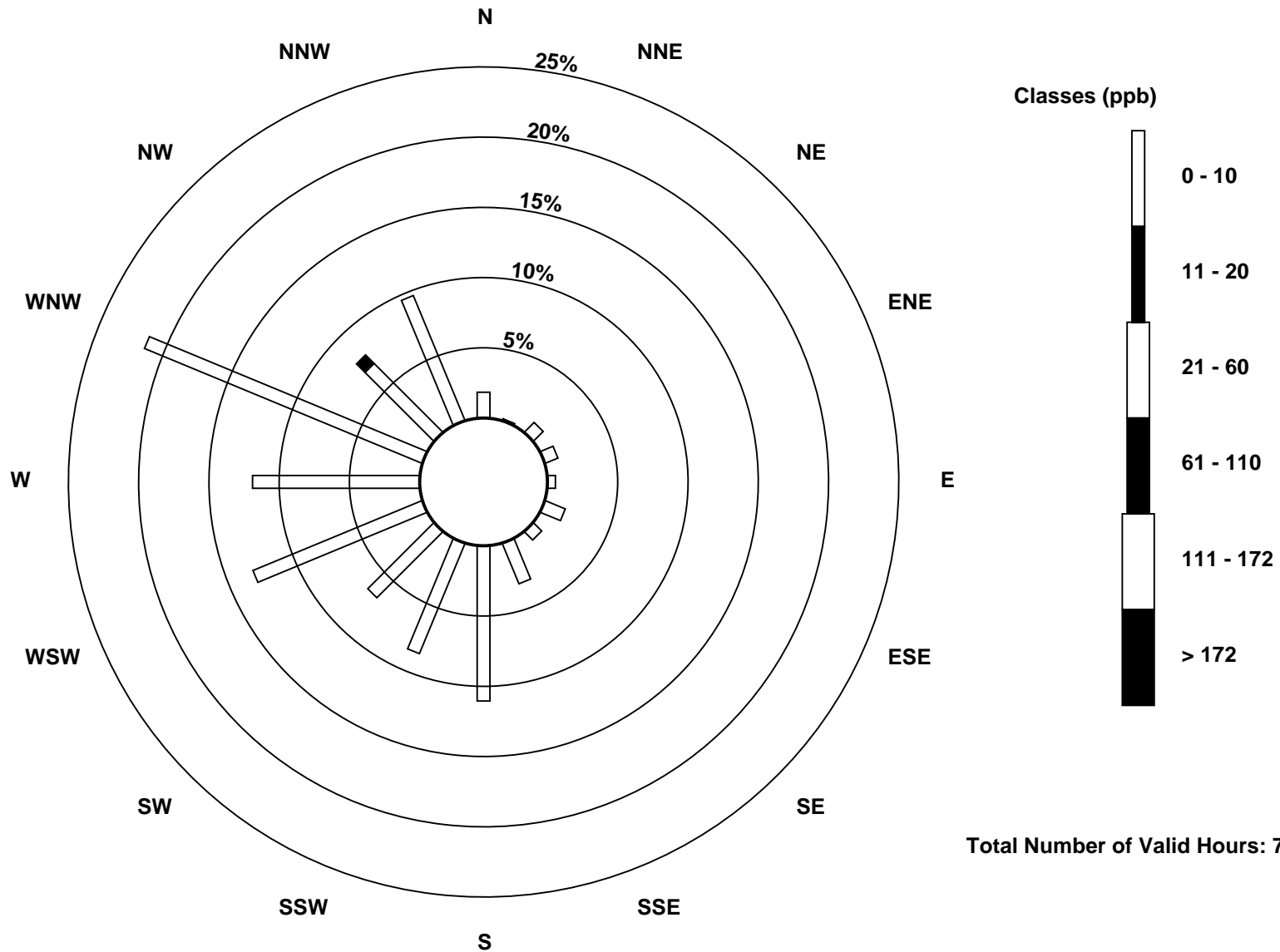
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont (AMS502)

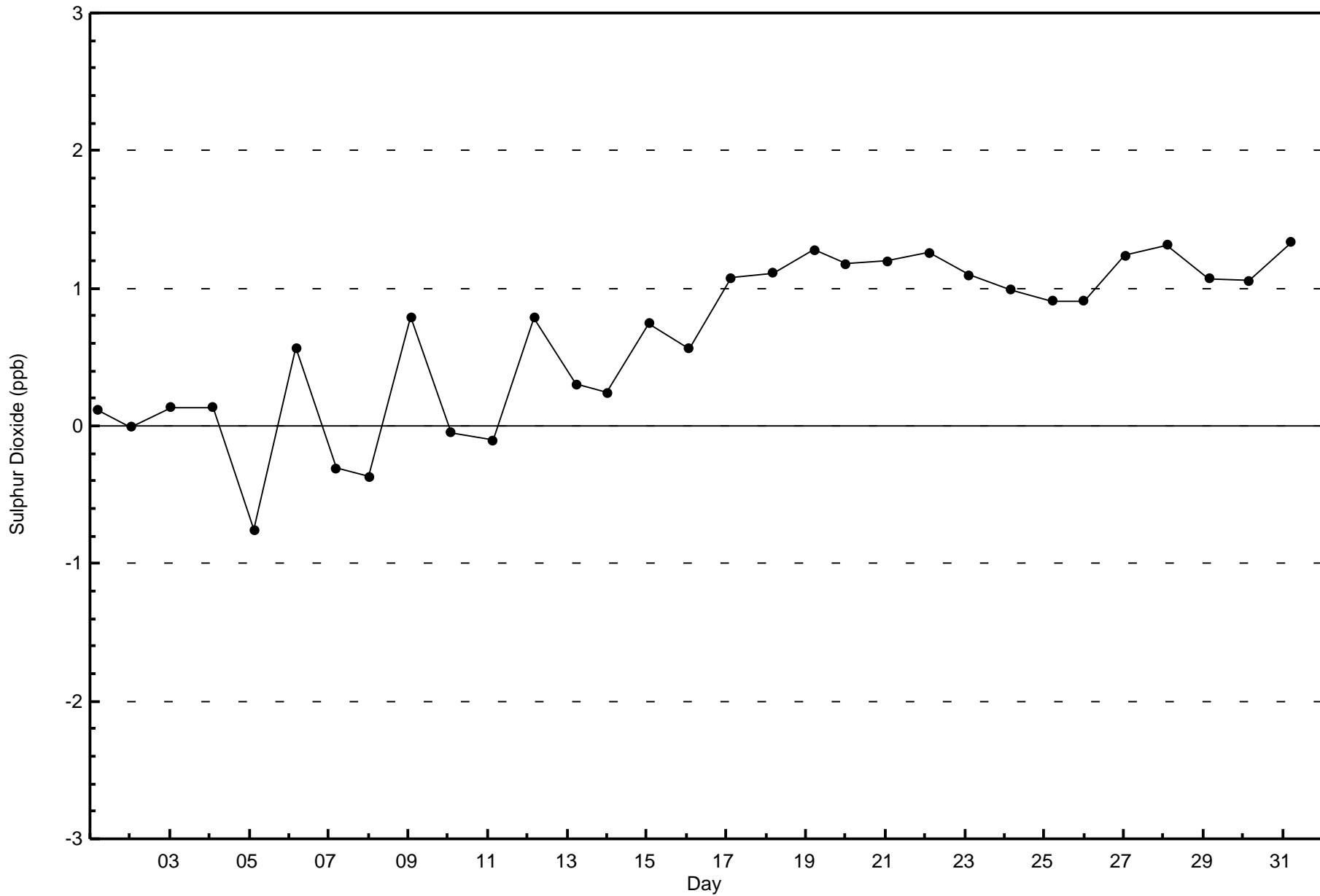


Total Number of Valid Hours: 706



WBEA Data PC
Zero Responses

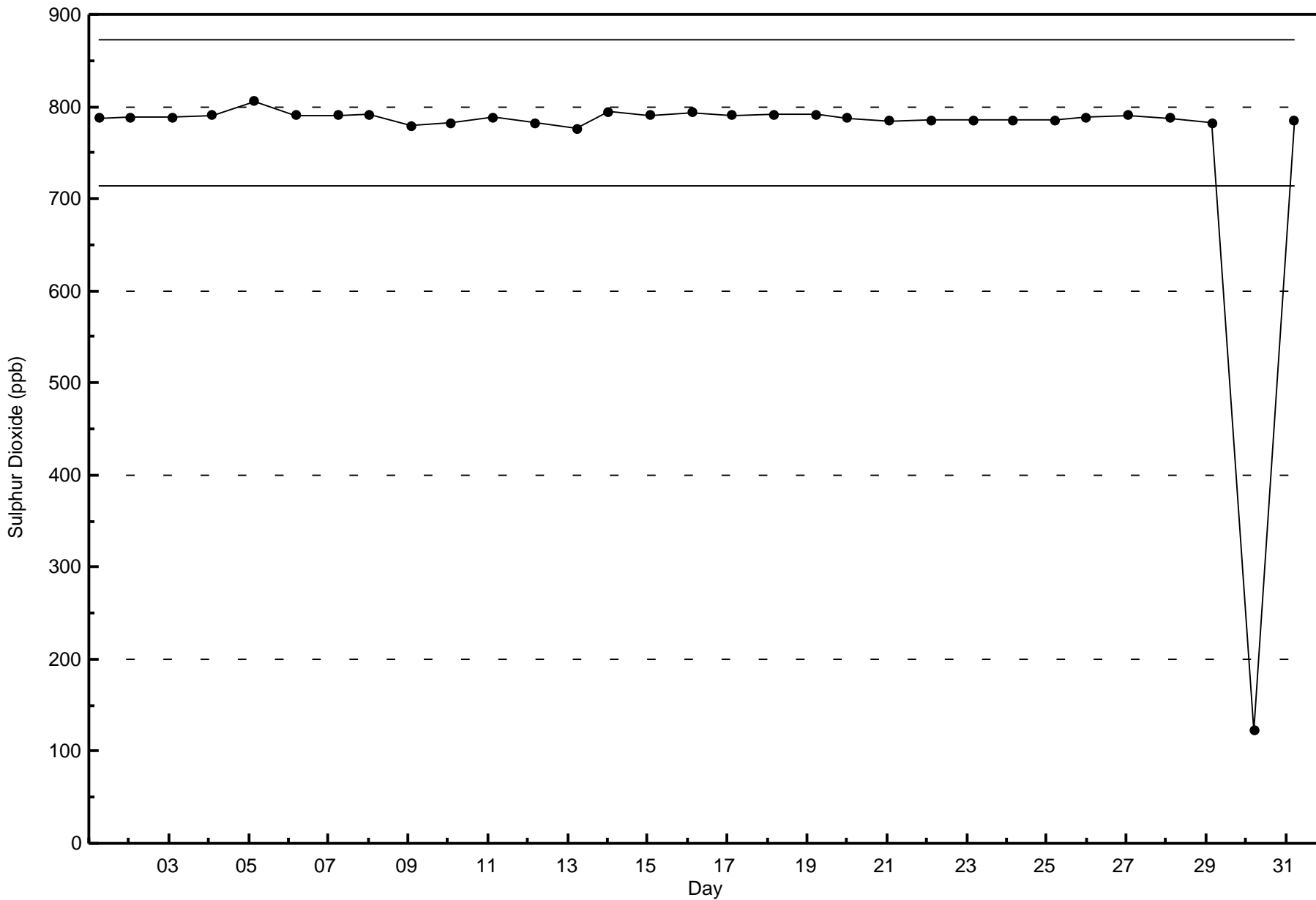
Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Span Responses

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surrmont - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

ConocoPhillips - Surmont - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 ppb on Dec 7 12:00	Maximum Daily Average: 1.1 ppb on Dec 8		Hours of Data:	707
Minimum Value: 0 ppb on Dec 9 05:00	Minimum Daily Average: 0.2 ppb on Dec 10		Hours of Missing Data:	37
Maximum Diurnal Average: 0.5 ppb at hour 12	Minimum Diurnal Average: 0.3 ppb at hour 24		Hours of Calibration:	35
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 2		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0.6	1
5-Dec	1	0	0	0	Z	0	0	0	0	0	0	UO	C	C	C	C	0	0	0	0	0	0	0	0	0.3	1	
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0.5	1
7-Dec	1	1	1	0	1	1	Z	0	0	0	1	4	1	1	1	1	2	2	1	1	1	0	0	0	1.0	4	
8-Dec	1	Z	1	1	1	1	1	2	2	1	1	1	1	UO	1	1	0	1	2	3	3	0	0	0	1.1	3	
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
12-Dec	0	0	1	1	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
13-Dec	0	0	0	0	0	0	Z	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1	
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	0	0	0.5	2	
15-Dec	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.3	1	
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1	
23-Dec	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1	
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
28-Dec	0	0	0	Z	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	1	
29-Dec	0	0	1	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0.6	1	
30-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
31-Dec	0	0	1	1	1	0	Z	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1	

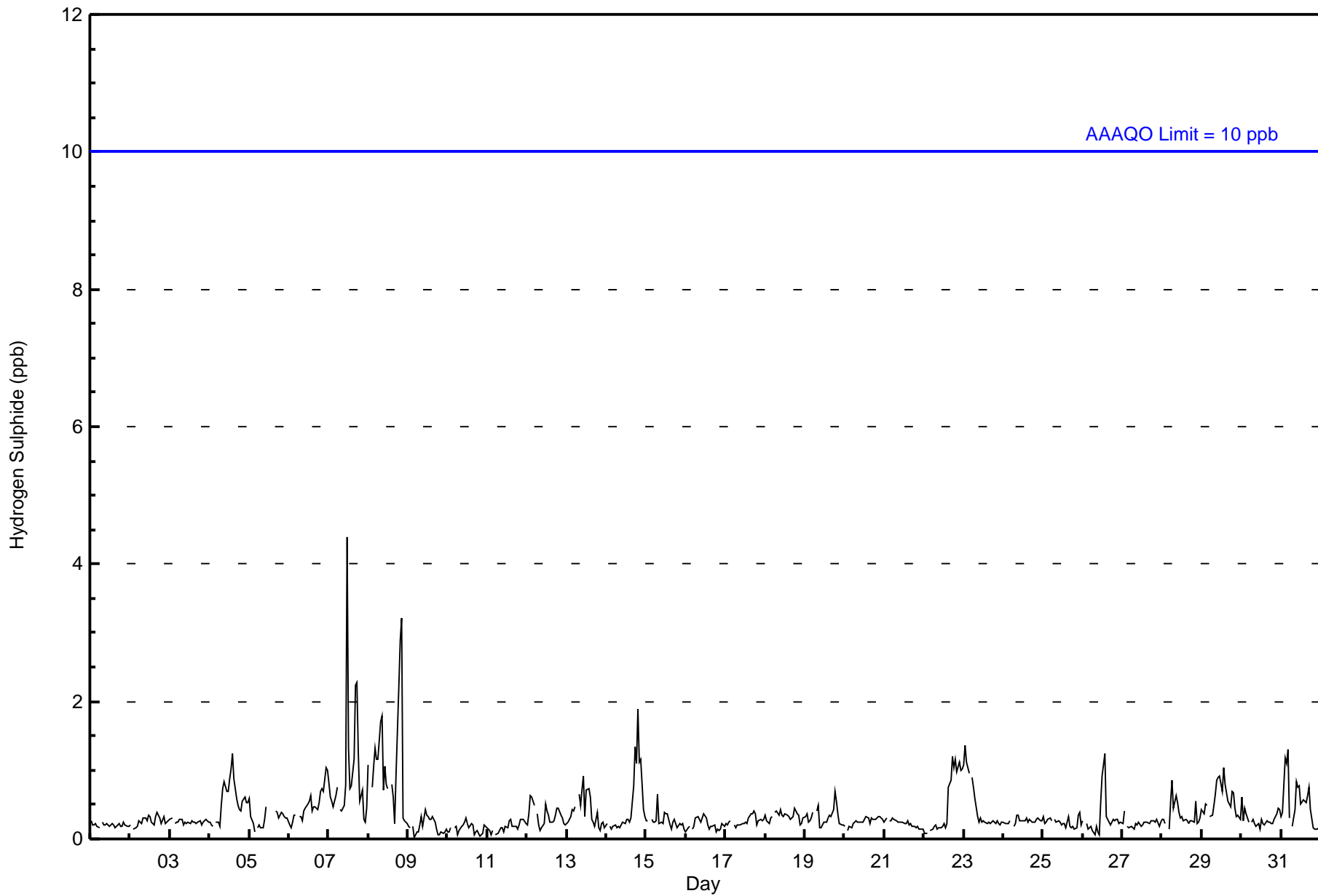
0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	Diurnal Average	
1	1	1	1	1	1	1	1	2	2	1	1	4	1	1	1	1	2	2	2	3	3	1	1	1		Diurnal Maximum	

Z - zerospan C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb



WBEA Data PC
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surrmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	704	99.58	99.58
3 - 4	3	0.42	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	15	1	7	7	4	11	6	22	79	60	46	94	82	146	57	67	704
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	1	7	7	4	11	6	22	79	60	46	94	82	146	57	70	707

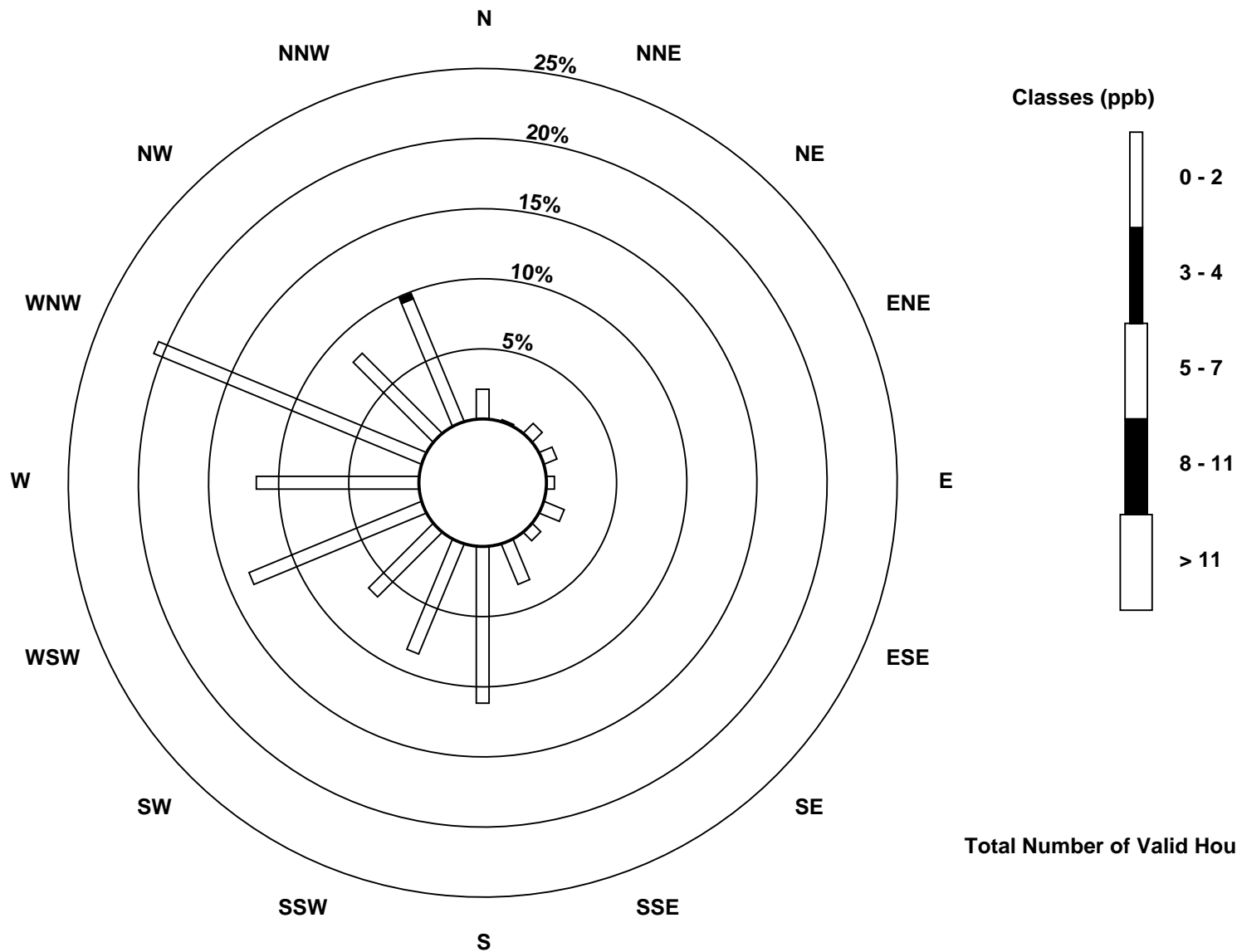
Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Wind Rose Dec 2016**

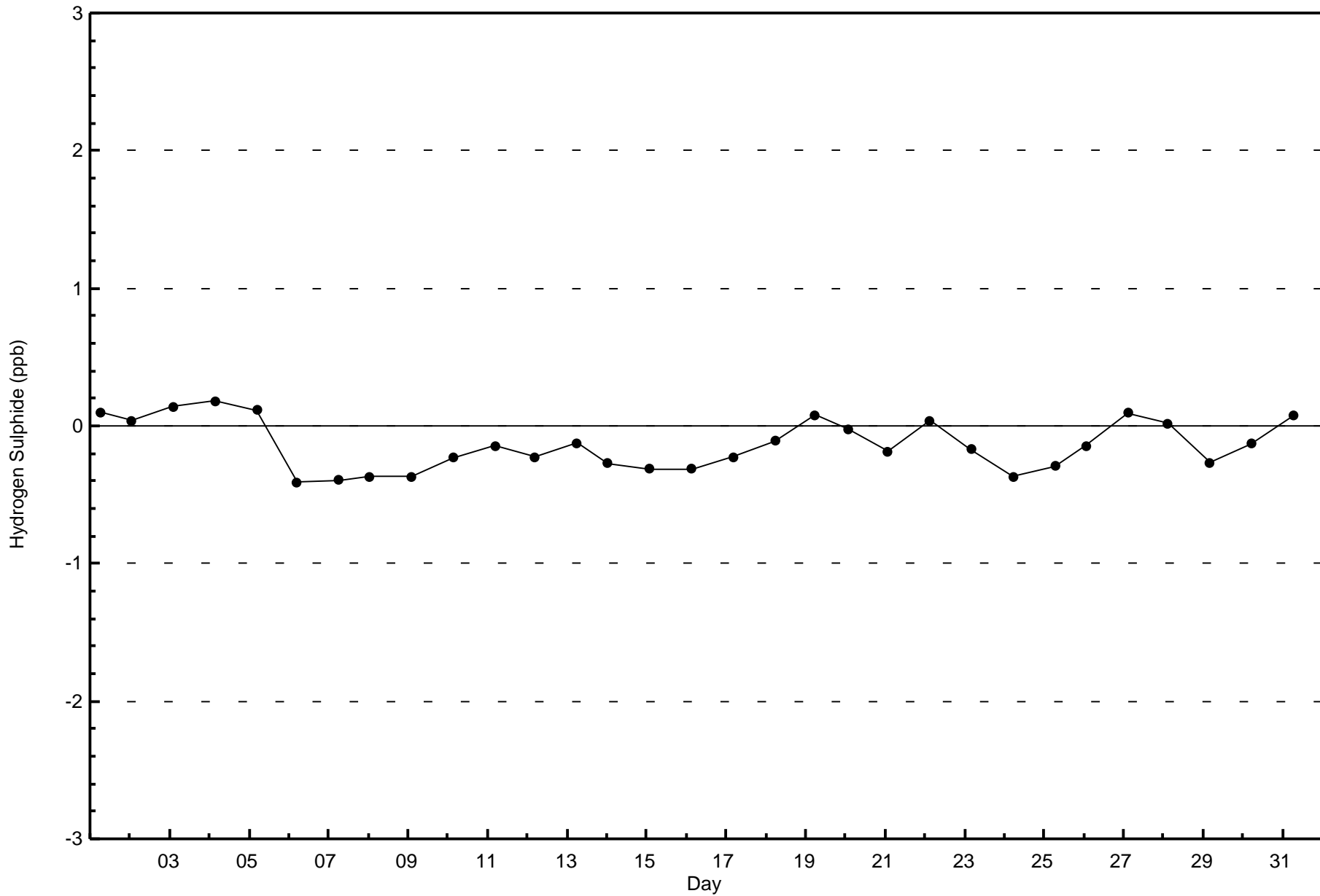
**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont (AMS502)**





WBEA Data PC
Zero Responses

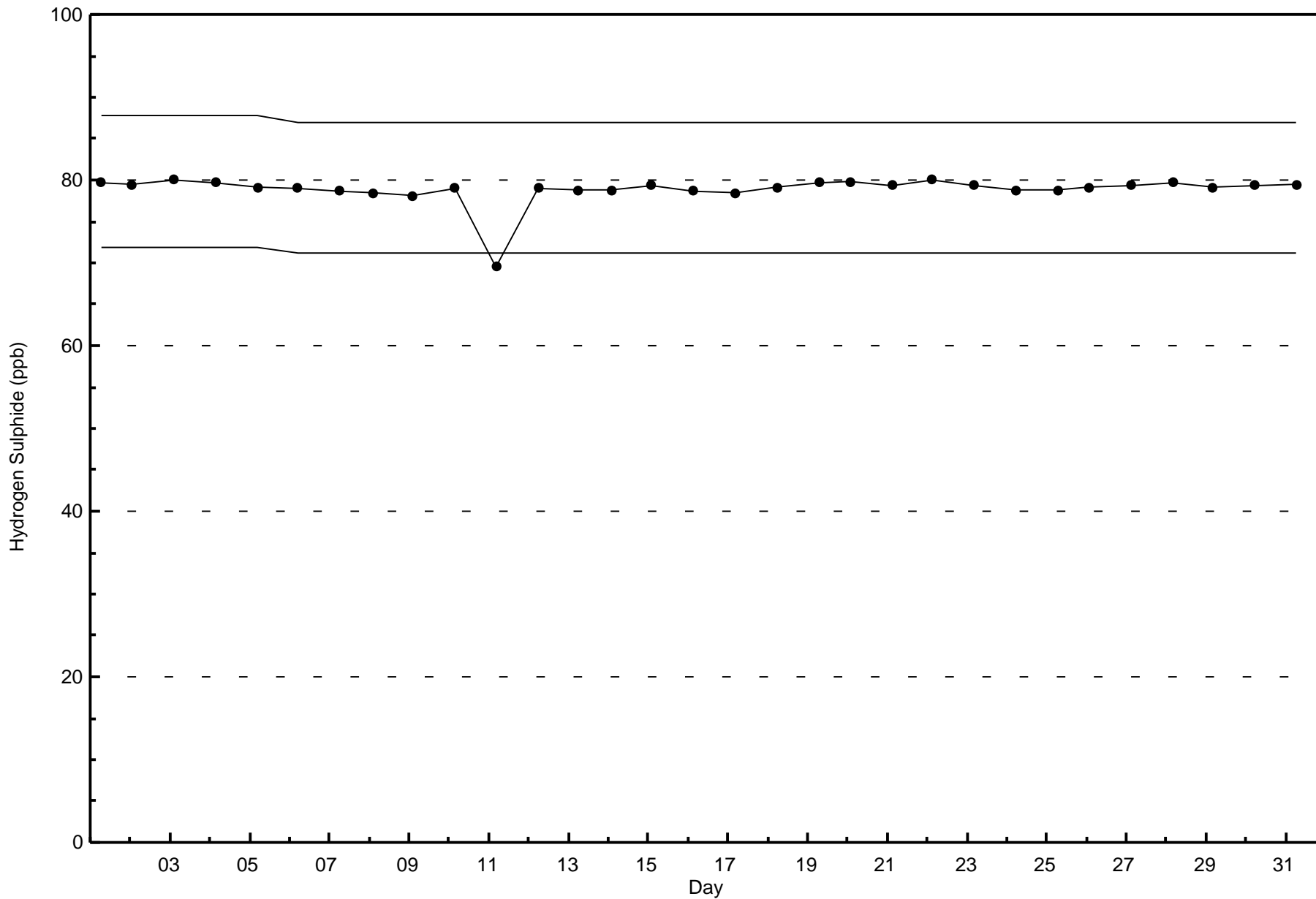
Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Span Responses

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

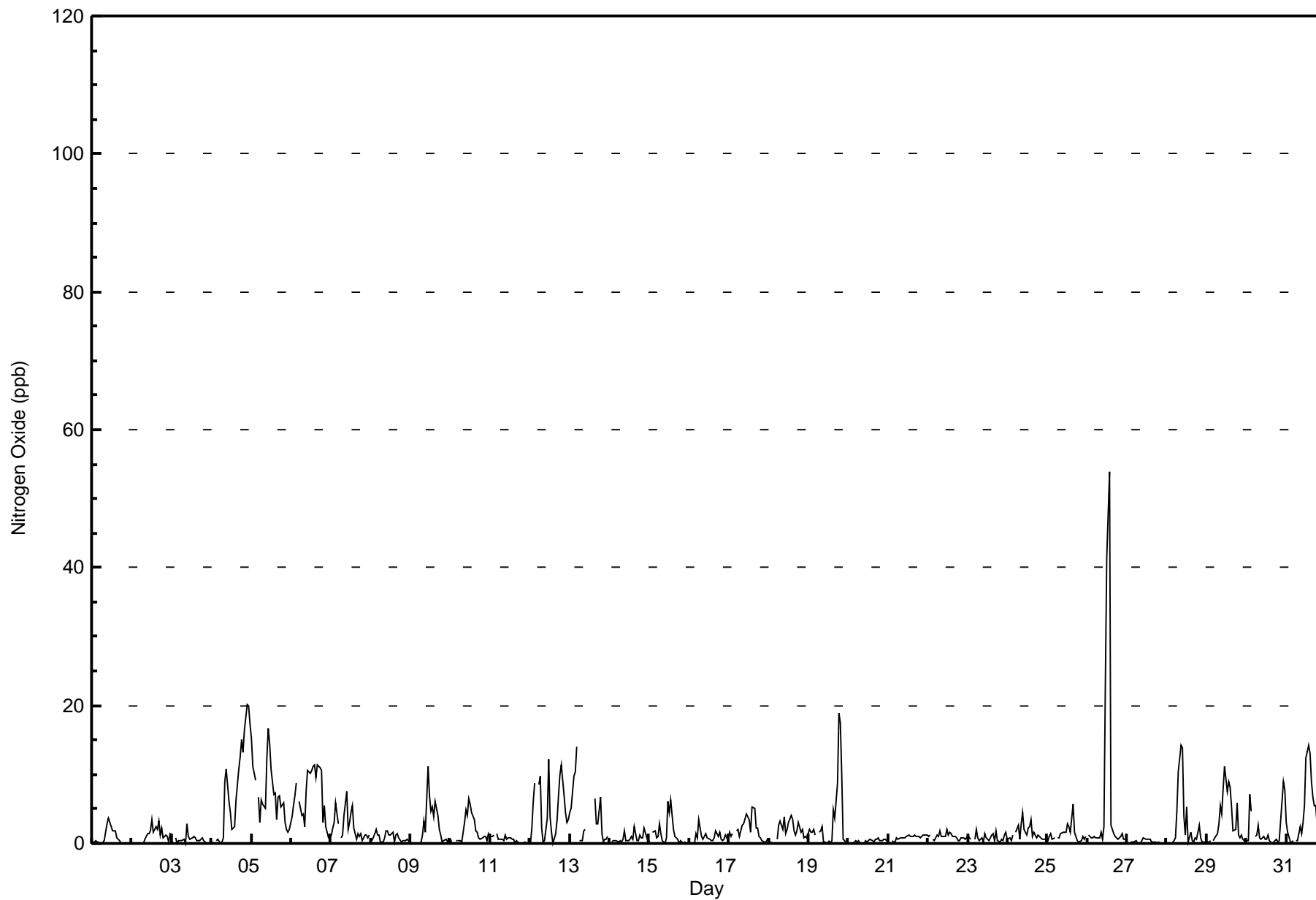
ConocoPhillips - Surmont - December 2016

Maximum Value: 54 ppb on Dec 26 14:00																		Maximum Daily Average: 7.5 ppb on Dec 4																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 1 18:00																		Minimum Daily Average: 0.2 ppb on Dec 27																		Hours of Data: 708			
Maximum Diurnal Average: 4.9 ppb at hour 14																		Minimum Diurnal Average: 1.4 ppb at hour 6																		Hours of Missing Data: 36			
Monthly Average: 2.4 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 7 P ₉₉ = 17																		Hours of Calibration: 36			
																																				Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	0	0	0	0	0	Z	0	0	2	3	4	2	2	2	2	1	0	0	0	0	0	0	0	0	0.8	4													
2-Dec	Z	0	0	0	0	0	0	0	1	1	1	2	3	2	3	2	3	1	2	1	1	1	0	1	1.1	3													
3-Dec	1	Z	1	0	0	0	0	1	0	3	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0.6	3													
4-Dec	0	0	Z	0	1	0	0	1	9	11	6	5	2	2	2	6	11	13	15	13	17	20	20	17	7.5	20													
5-Dec	15	11	9	Z	7	3	6	6	5	12	17	14	11	7	7	4	7	7	5	6	3	2	2	2	7.3	17													
6-Dec	4	6	7	9	Z	6	4	4	2	7	11	10	11	11	11	10	11	11	10	3	5	2	1	1	6.9	11													
7-Dec	1	2	3	6	3	Z	1	1	4	8	2	3	4	6	2	1	1	1	1	0	1	1	1	1	2.4	8													
8-Dec	Z	0	1	2	1	1	0	0	1	2	2	1	1	2	0	1	1	1	0	0	0	0	1	0	0.9	2													
9-Dec	0	Z	0	0	0	0	0	1	3	2	11	7	5	5	4	6	4	2	1	0	0	1	0	1	2.3	11													
10-Dec	1	0	Z	0	0	0	0	0	3	5	4	7	6	4	3	2	2	1	1	1	1	1	0	1	1.9	7													
11-Dec	1	1	1	Z	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1													
12-Dec	0	2	6	9	Z	8	10	2	0	0	4	12	4	2	0	1	3	7	10	11	7	5	3	3	4.8	12													
13-Dec	4	5	10	10	14	Z	0	0	2	2	C	C	C	C	C	7	3	3	7	1	0	1	1	1	3.9	14													
14-Dec	Z	0	0	0	0	0	0	0	1	2	1	1	1	1	1	2	0	0	1	1	1	2	1	0	0.7	2													
15-Dec	0	Z	2	2	1	1	3	1	0	0	1	6	4	6	2	1	1	1	0	0	0	0	0	0	1.4	6													
16-Dec	0	0	Z	0	1	1	3	1	1	1	1	1	0	0	1	2	1	2	1	0	1	1	0	0	0.9	3													
17-Dec	2	1	1	Z	2	2	1	2	3	3	4	4	3	2	5	5	2	2	1	1	0	0	0	1	2.1	5													
18-Dec	0	0	0	0	Z	1	3	3	2	4	1	2	3	4	3	2	1	2	3	2	2	1	1	1	1.8	4													
19-Dec	2	2	2	2	1	Z	2	2	2	0	0	0	0	0	0	5	4	9	19	17	10	1	0	0	3.5	19													
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	1	0	0.3	1													
21-Dec	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1													
22-Dec	1	1	Z	1	0	1	1	2	1	1	1	2	1	2	1	1	1	1	0	0	1	1	1	1	1.0	2													
23-Dec	1	1	1	Z	1	2	1	0	1	0	1	1	1	1	1	1	0	2	0	0	1	0	1	2	0.9	2													
24-Dec	1	1	0	1	Z	2	3	1	3	4	2	1	2	2	3	1	2	1	1	1	1	1	1	1	1.5	4													
25-Dec	0	1	1	1	1	Z	1	1	1	2	2	2	3	2	2	6	2	1	0	0	0	1	1	1	1.4	6													
26-Dec	Z	1	1	1	1	1	1	1	2	1	2	23	42	54	3	2	1	1	1	1	1	1	1	1	6.2	54													
27-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1													
28-Dec	0	0	Z	0	0	1	5	10	14	14	4	1	5	0	2	0	0	1	1	3	1	0	0	0	2.7	14													
29-Dec	0	0	0	Z	0	1	1	3	6	4	8	11	8	9	8	5	2	2	6	1	1	1	1	0	3.4	11													
30-Dec	0	0	7	5	Z	1	1	3	1	1	1	1	1	1	0	0	0	0	1	0	0	6	9	8	2.1	9													
31-Dec	3	2	0	0	0	Z	0	0	2	1	3	6	12	14	13	9	7	5	5	0	0	0	0	0	3.7	14													
1.5 1.5 2.1 1.9 1.5 1.4 1.6 1.6 2.3 3.1 3.3 4.2 4.6 4.9 2.8 2.7 2.4 2.5 3.1 2.2 1.9 1.7 1.5 1.5																								Diurnal Average															
15 11 10 10 14 8 10 10 14 14 17 23 42 54 13 10 11 13 19 17 17 20 20 17																								Diurnal Maximum															
Z - zerospan C - Calibration																																							



WBEA Data PC
Hourly Averages

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	99.58	99.58
21 - 40	1	0.14	99.72
41 - 80	2	0.28	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	14	1	7	7	4	11	6	22	75	60	47	92	84	151	55	69	705
21 - 40	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	14	1	7	7	4	11	6	22	78	60	47	92	84	151	55	69	708

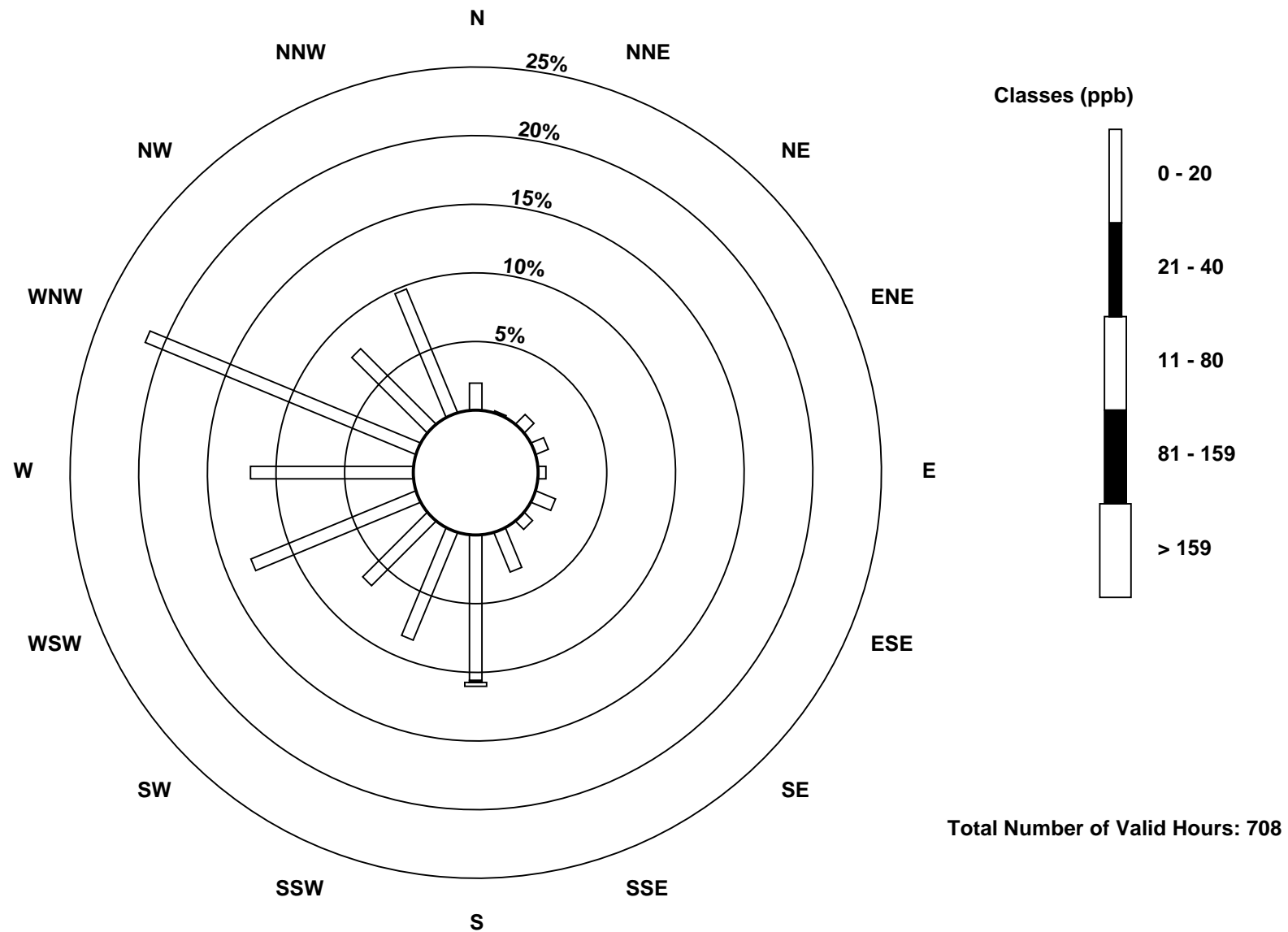
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

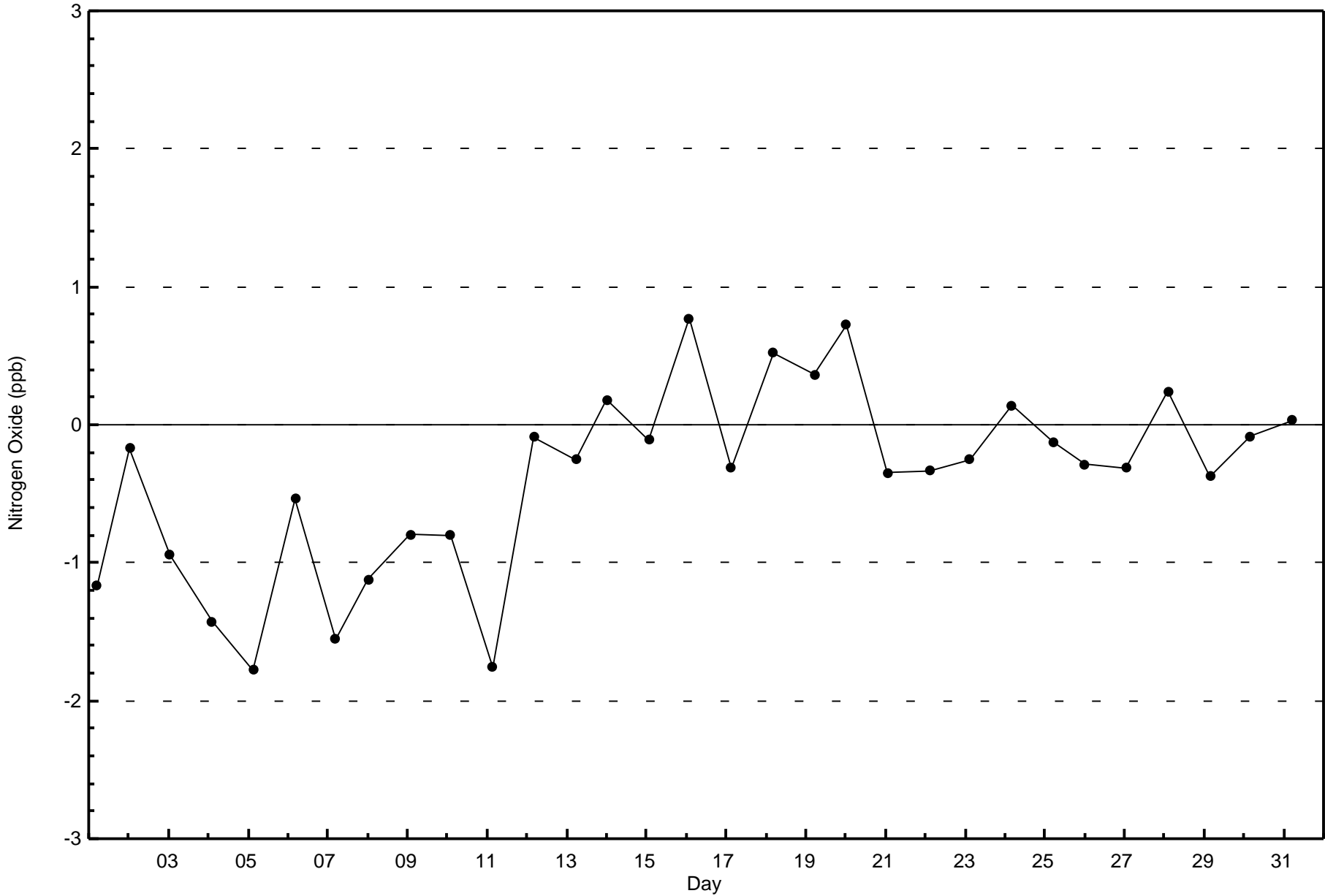
Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont (AMS502)





WBEA Data PC
Zero Responses

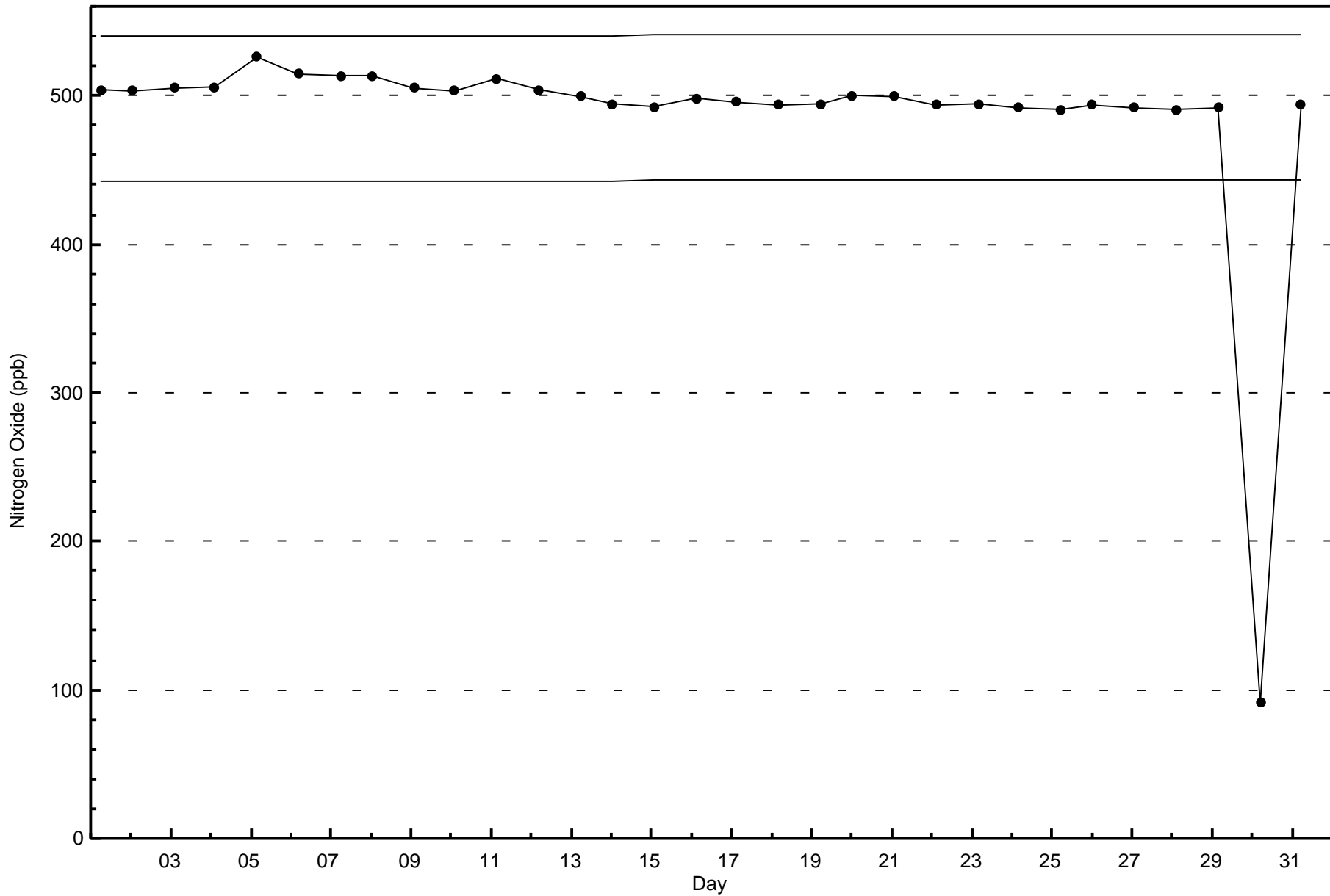
Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Span Responses

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

ConocoPhillips - Surmont - December 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 18 ppb on Dec 29 19:00	Maximum Daily Average: 10.1 ppb on Dec 18		Hours of Data:	708
Minimum Value: 0 ppb on Dec 16 00:00	Minimum Daily Average: 1.0 ppb on Dec 20		Hours of Missing Data:	36
Maximum Diurnal Average: 5.0 ppb at hour 17	Minimum Diurnal Average: 3.1 ppb at hour 6		Hours of Calibration:	36
Monthly Average: 4.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 6 P ₉₀ = 8 P ₉₉ = 14		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	2	2	1	Z	1	1	2	3	4	4	3	2	4	3	4	3	3	3	3	3	3	3	2.6	4
2-Dec	Z	2	3	3	2	3	3	3	3	4	4	4	5	5	7	7	8	7	7	5	5	4	4	5	4.4	8
3-Dec	4	Z	4	3	2	2	2	2	2	4	3	2	2	3	3	4	4	3	3	2	3	2	1	1	2.7	4
4-Dec	1	1	Z	1	1	1	1	2	6	4	3	1	3	7	7	6	6	6	5	6	9	8	8	9	4.3	9
5-Dec	6	4	5	Z	4	2	3	3	3	6	6	6	5	4	5	2	4	3	3	3	2	1	1	2	3.6	6
6-Dec	2	4	5	4	Z	4	4	3	2	5	5	7	6	6	7	8	8	8	7	4	6	6	5	7	5.3	8
7-Dec	8	5	6	8	6	Z	9	10	10	6	5	7	8	8	6	7	10	9	10	6	10	7	7	11	7.7	11
8-Dec	Z	8	8	8	8	8	5	7	6	7	5	4	3	4	3	4	7	6	5	6	6	7	9	5	6.0	9
9-Dec	4	Z	2	4	3	4	5	5	10	8	13	10	7	8	8	12	11	9	6	4	4	4	4	4	6.4	13
10-Dec	4	4	Z	5	5	4	3	3	5	7	8	9	5	4	5	7	5	3	2	3	4	4	4	4	4.6	9
11-Dec	3	3	3	Z	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	3
12-Dec	1	3	6	7	Z	7	7	3	2	1	3	7	4	2	2	2	3	6	8	8	7	5	3	4	4.3	8
13-Dec	5	5	6	8	9	Z	3	4	5	5	C	C	C	C	C	5	4	3	4	2	1	2	2	2	4.0	9
14-Dec	Z	1	0	1	0	0	0	1	1	1	1	1	2	2	1	3	2	5	7	4	7	8	7	4	2.6	8
15-Dec	2	Z	2	2	1	2	3	4	2	2	2	4	3	5	3	2	1	2	1	1	1	0	0	0	2.0	5
16-Dec	0	1	Z	1	1	1	3	4	3	3	4	2	1	1	1	1	3	3	3	2	1	2	3	2	1.9	4
17-Dec	4	5	7	Z	5	5	2	2	3	5	5	5	4	2	8	12	10	7	7	6	6	6	6	8	5.5	12
18-Dec	10	8	7	7	Z	6	11	16	12	11	6	9	9	11	13	8	8	15	13	16	15	8	8	7	10.1	16
19-Dec	7	8	9	8	7	Z	7	8	9	2	1	1	1	1	1	4	3	4	9	10	7	3	6	1	5.0	10
20-Dec	Z	1	0	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1.0	2
21-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
22-Dec	1	1	Z	1	1	1	1	2	1	1	1	2	1	2	2	4	9	9	7	5	5	7	6	4	3.2	9
23-Dec	5	4	5	Z	7	7	6	4	3	2	2	2	1	1	2	0	2	2	1	1	1	0	0	1	2.5	7
24-Dec	0	1	1	0	Z	1	1	2	6	7	2	2	3	3	3	3	4	3	2	2	3	2	3	4	2.5	7
25-Dec	4	4	4	4	4	Z	4	5	4	4	3	2	2	3	3	4	6	6	5	4	3	2	2	2	3.6	6
26-Dec	Z	4	3	3	2	3	3	3	4	3	4	8	14	15	8	10	10	8	6	5	7	9	8	7	6.3	15
27-Dec	6	Z	3	4	4	4	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2	1	1	1	2.8	6
28-Dec	1	1	Z	1	1	2	4	7	8	7	4	2	4	1	2	1	1	1	1	3	2	1	1	1	2.3	8
29-Dec	3	5	6	Z	5	4	6	9	11	12	11	12	8	12	13	10	9	9	18	9	5	4	3	2	8.0	18
30-Dec	5	3	10	7	Z	6	4	4	3	1	1	1	2	1	2	2	1	1	1	1	1	4	6	5	3.2	10
31-Dec	3	2	2	5	5	Z	3	3	3	4	4	6	7	10	8	7	6	6	5	1	1	0	1	1	3.9	10

3.5	3.4	4.1	3.7	3.3	3.1	3.5	3.9	4.3	4.2	3.8	4.1	4.0	4.3	4.4	4.6	5.0	4.9	5.0	4.1	4.1	3.6	3.7	3.4	Diurnal Average	
10	8	10	8	9	8	11	16	12	12	13	12	14	15	13	12	11	15	18	16	15	9	9	11	Diurnal Maximum	

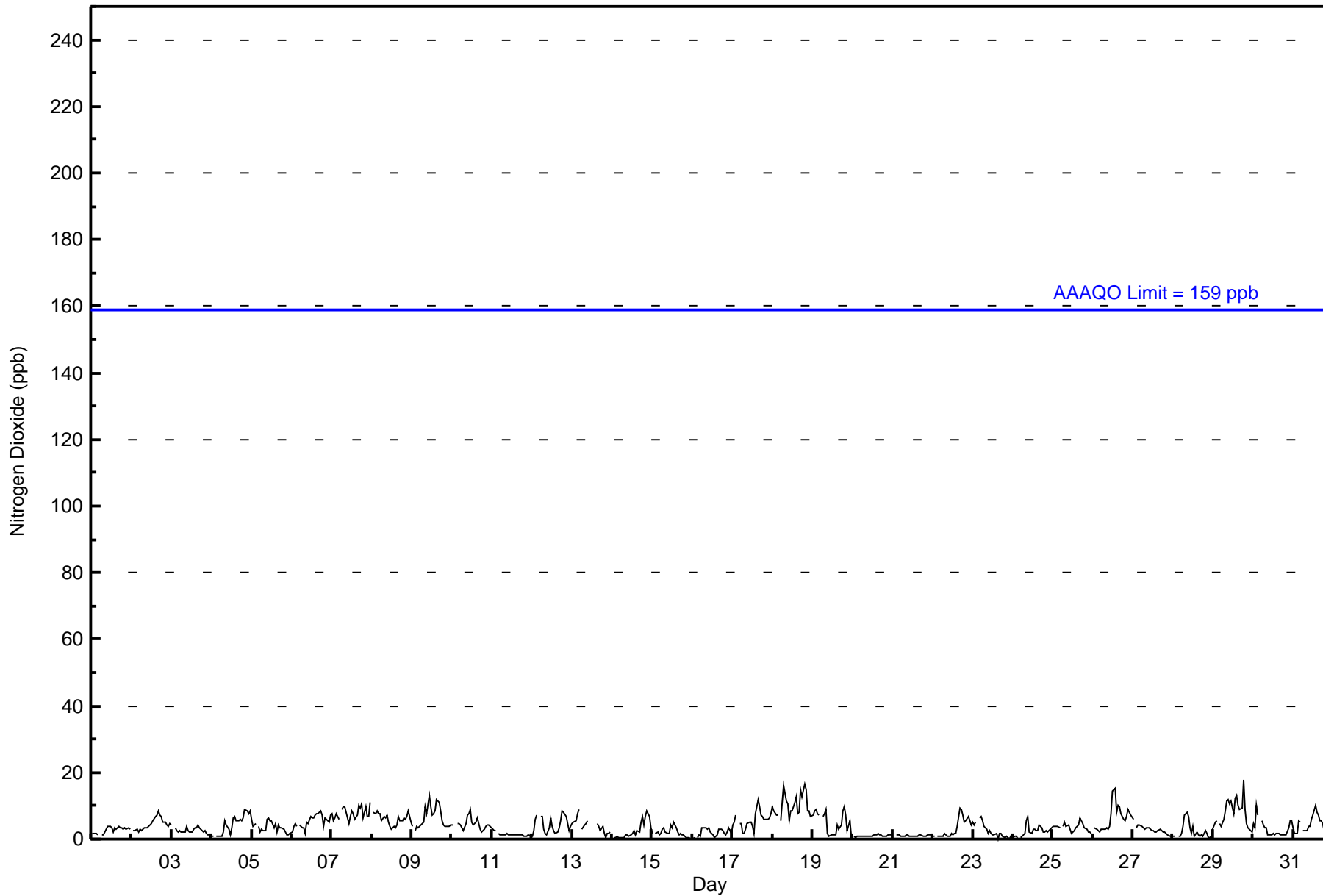
Z - zerospan C - Calibration

Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



WBEA Data PC
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	14	1	7	7	4	11	6	22	78	60	47	92	84	151	55	69	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	14	1	7	7	4	11	6	22	78	60	47	92	84	151	55	69	708

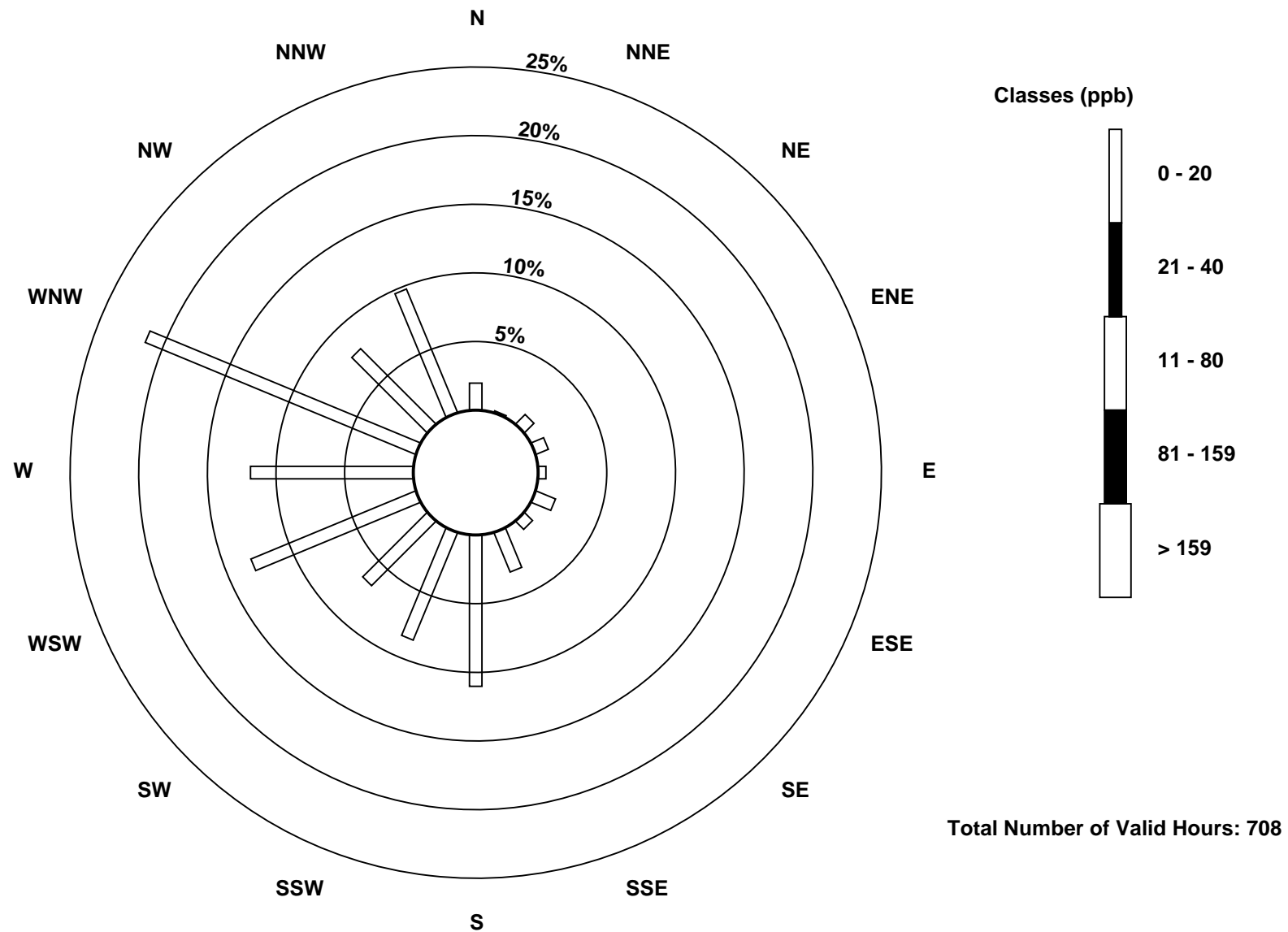
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

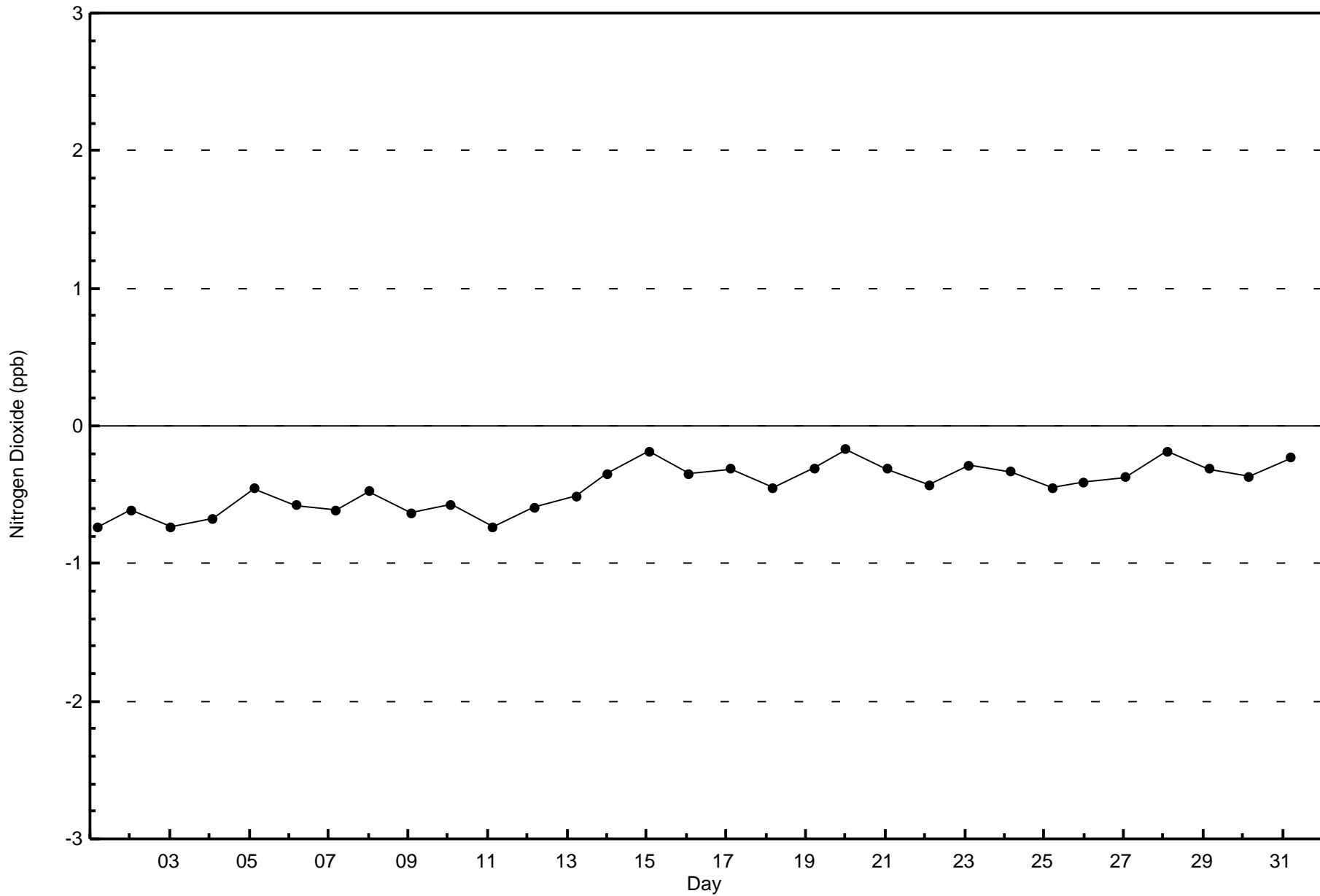
Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont (AMS502)





WBEA Data PC
Zero Responses

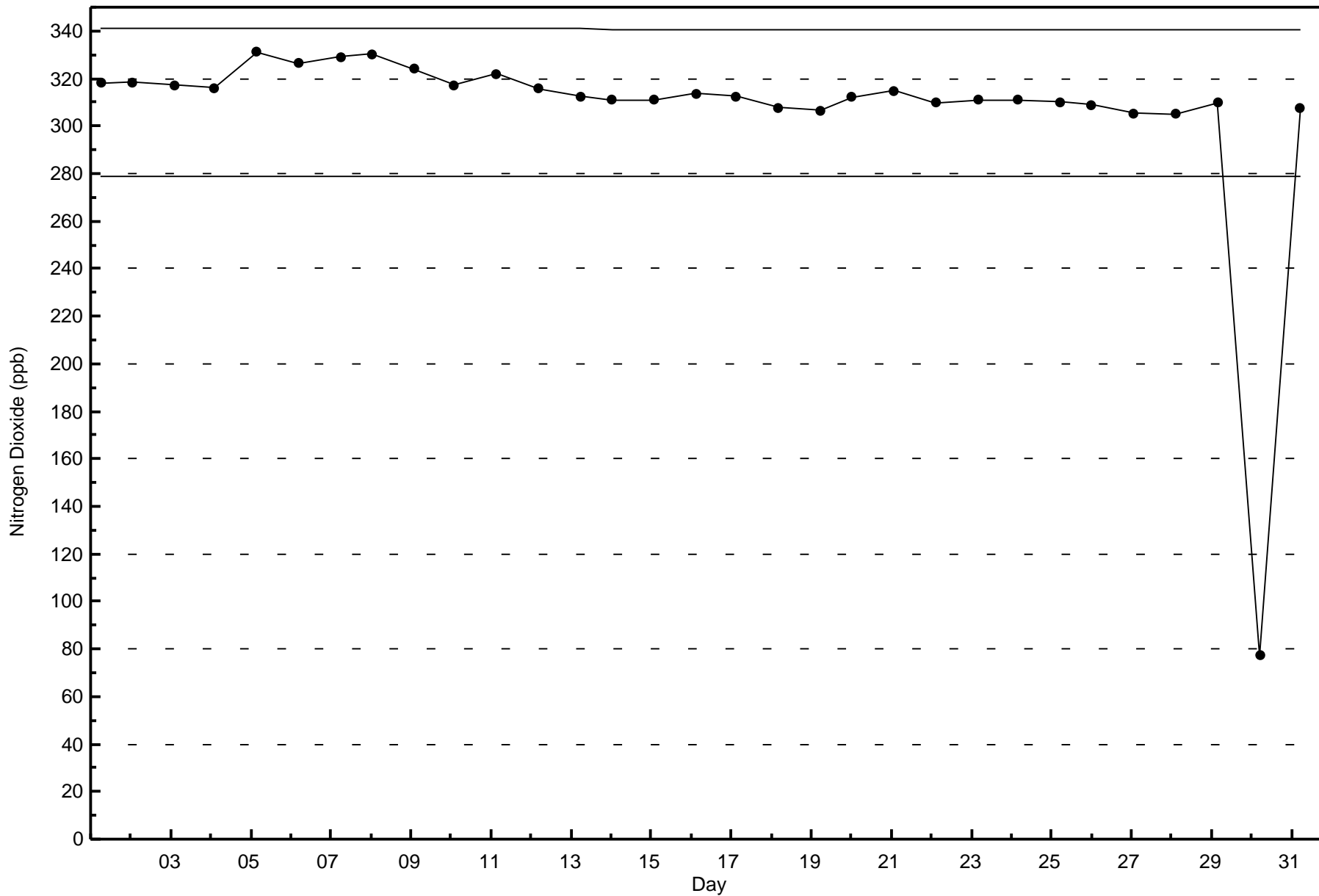
Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Span Responses

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - December 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

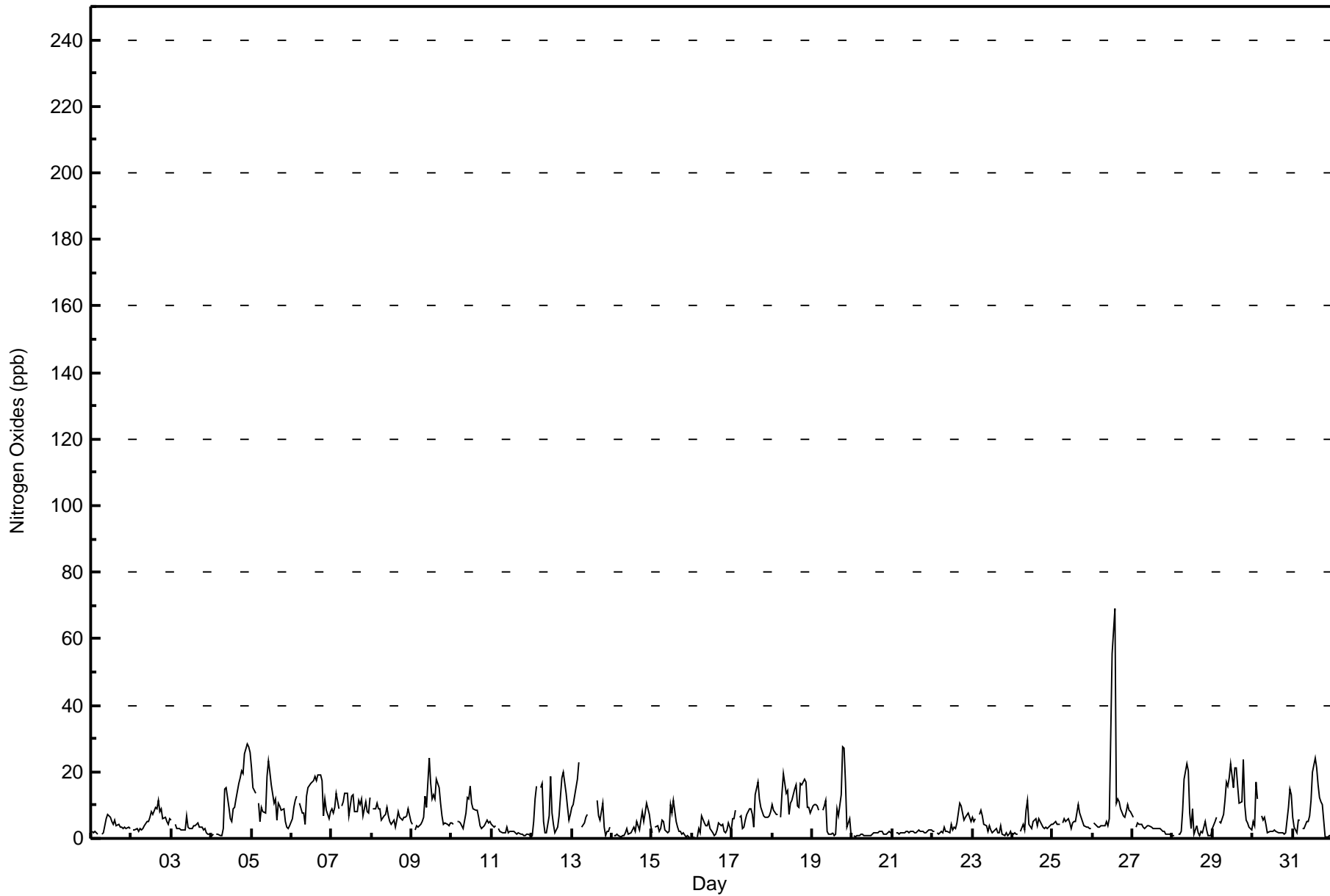
ConocoPhillips - Surmont - December 2016

Maximum Value: 69 ppb on Dec 26 14:00		Maximum Daily Average: 12.4 ppb on Dec 26		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 16 00:00		Minimum Daily Average: 1.3 ppb on Dec 20		Hours of Data: 708																							
Maximum Diurnal Average: 9.2 ppb at hour 14		Minimum Diurnal Average: 4.5 ppb at hour 6		Hours of Missing Data: 36																							
Monthly Average: 6.5 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 5 Q ₃ = 9 P ₉₀ = 15 P ₉₉ = 27		Hours of Calibration: 36																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2	2	2	2	1	Z	1	2	4	6	7	6	5	4	5	4	4	3	3	3	3	3	3	3	3.4	7	
2-Dec	Z	2	3	3	2	3	2	3	4	5	5	6	8	7	9	9	11	8	9	6	6	5	4	6	5.6	11	
3-Dec	6	Z	4	3	3	3	3	3	2	7	3	3	3	4	4	4	5	4	3	3	3	2	1	1	3.3	7	
4-Dec	1	1	Z	1	1	1	1	3	15	15	9	6	5	9	9	12	16	18	21	19	25	29	28	26	11.8	29	
5-Dec	21	15	14	Z	11	5	9	8	8	19	23	20	16	11	12	6	11	10	9	9	5	3	3	4	10.9	23	
6-Dec	6	9	11	13	Z	11	8	8	4	13	15	17	17	18	19	17	19	19	18	7	12	8	6	8	12.2	19	
7-Dec	9	8	9	13	9	Z	10	11	14	14	7	10	13	13	8	8	12	10	12	7	11	8	8	12	10.2	14	
8-Dec	Z	9	9	11	9	9	6	7	7	9	7	5	4	6	3	5	8	6	6	7	6	7	9	5	6.9	11	
9-Dec	4	Z	2	4	3	4	5	6	13	9	24	17	12	13	12	18	15	11	7	4	4	4	4	5	8.8	24	
10-Dec	5	4	Z	5	5	5	4	3	8	12	12	16	11	9	8	8	6	4	3	4	5	5	5	5	6.5	16	
11-Dec	4	4	4	Z	3	2	2	2	2	3	2	2	2	2	2	1	2	1	1	1	1	1	1	1	2.0	4	
12-Dec	1	5	12	16	Z	15	17	5	2	2	7	19	8	4	2	4	7	13	18	20	14	9	6	7	9.1	20	
13-Dec	9	10	15	18	23	Z	3	5	6	7	C	C	C	C	C	11	7	5	11	3	1	2	2	3	7.9	23	
14-Dec	Z	1	1	1	1	1	1	1	2	3	1	2	2	3	2	5	2	5	8	5	8	11	7	4	3.3	11	
15-Dec	2	Z	3	4	2	3	6	5	3	2	2	10	8	12	5	3	2	2	1	2	1	1	0	0	3.4	12	
16-Dec	0	0	Z	1	3	2	7	5	4	4	5	3	2	1	1	2	5	4	4	2	2	2	5	2	2.8	7	
17-Dec	6	6	8	Z	6	7	3	3	6	7	9	9	7	3	13	17	12	9	8	7	7	6	7	8	7.6	17	
18-Dec	10	8	7	7	Z	6	14	20	14	14	7	11	12	15	16	10	9	17	16	18	17	9	9	8	11.9	20	
19-Dec	10	10	10	10	8	Z	8	10	11	2	1	1	2	1	1	9	7	13	27	27	17	3	6	1	8.5	27	
20-Dec	Z	1	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	1.3	2	
21-Dec	2	Z	2	2	1	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	1.9	3	
22-Dec	2	2	Z	2	1	2	2	3	2	2	2	4	2	3	3	5	10	10	7	6	6	8	6	5	4.2	10	
23-Dec	6	5	6	Z	7	9	7	4	4	2	4	3	2	2	3	2	2	4	1	1	2	1	2	3.4	9		
24-Dec	1	2	1	1	Z	2	4	2	8	11	4	3	5	6	6	4	6	4	3	3	3	3	4	4	4.0	11	
25-Dec	4	5	5	4	4	Z	4	6	5	6	5	3	5	5	5	10	8	7	5	4	4	3	3	3	4.9	10	
26-Dec	Z	5	4	3	3	4	4	4	5	4	6	31	56	69	11	12	11	9	7	6	8	10	9	8	12.4	69	
27-Dec	6	Z	4	5	4	4	3	3	3	4	4	3	3	3	3	3	3	3	2	2	1	1	1	1	3.0	6	
28-Dec	1	1	Z	1	1	2	8	18	22	21	8	3	9	1	4	2	1	2	2	5	2	1	1	1	5.0	22	
29-Dec	3	5	6	Z	5	5	7	11	17	16	18	23	15	21	21	16	11	11	24	10	5	5	3	3	11.4	24	
30-Dec	5	4	17	12	Z	7	5	6	4	2	2	2	2	3	2	2	2	2	2	1	2	9	15	13	5.2	17	
31-Dec	6	3	2	5	6	Z	3	3	5	5	7	12	20	24	21	16	12	11	10	1	1	0	1	1	7.6	24	
		5.1	4.9	6.3	5.6	4.8	4.5	5.1	5.5	6.6	7.3	7.0	8.3	8.6	9.2	7.2	7.3	7.4	7.4	8.1	6.3	5.9	5.3	5.2	5.0	Diurnal Average	
		21	15	17	18	23	15	17	20	22	21	24	31	56	69	21	18	19	19	27	27	25	29	28	26	Diurnal Maximum	
Z - zerospan		C - Calibration																									



WBEA Data PC
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	686	96.89	96.89
21 - 40	20	2.82	99.72
41 - 80	2	0.28	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - December 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	14	1	7	7	4	11	5	22	74	59	46	92	83	149	43	69	686
21 - 40	0	0	0	0	0	0	1	0	2	1	1	0	1	2	12	0	20
11 - 80	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	14	1	7	7	4	11	6	22	78	60	47	92	84	151	55	69	708

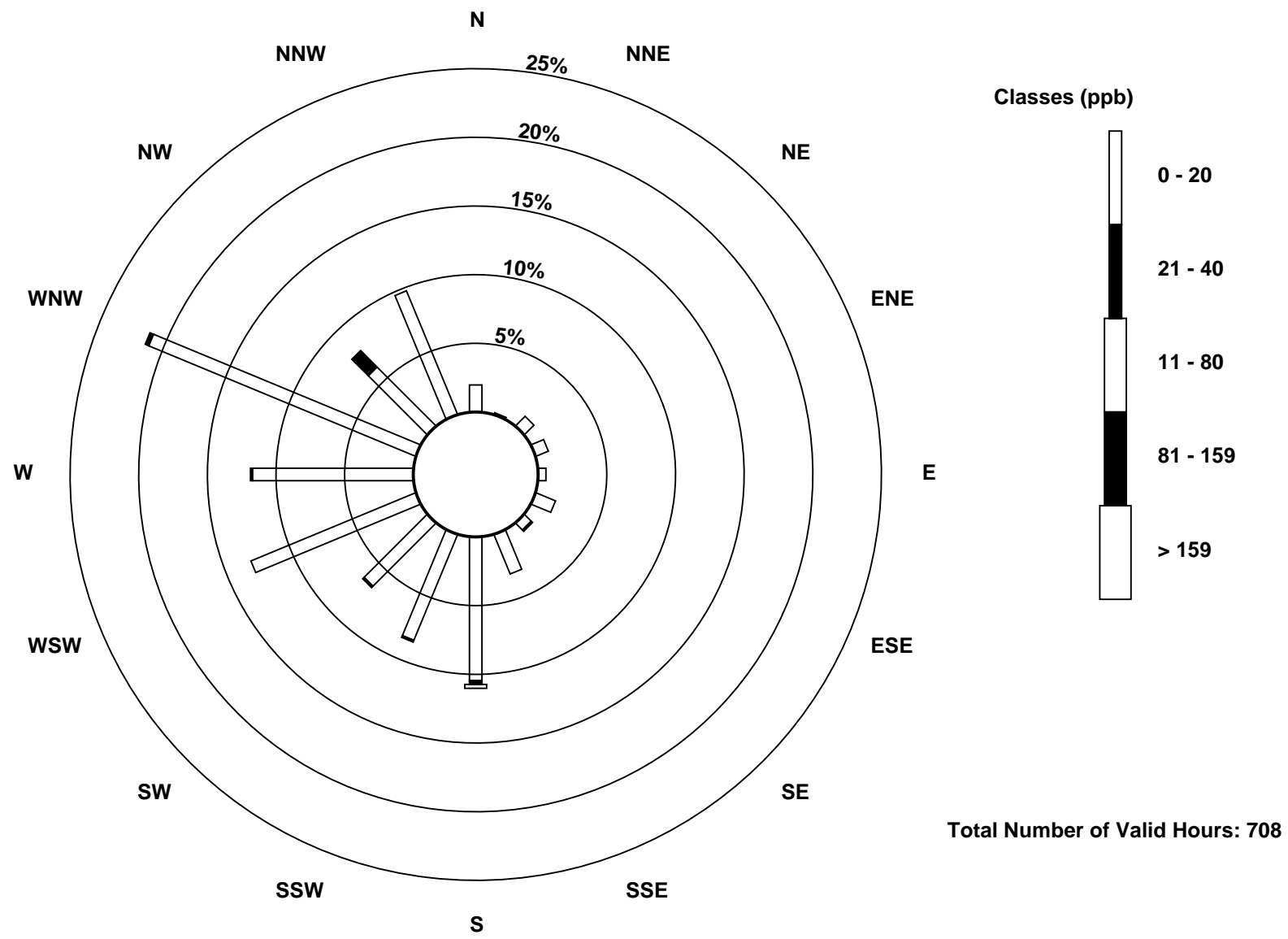
Total Number of Valid Hours: 708

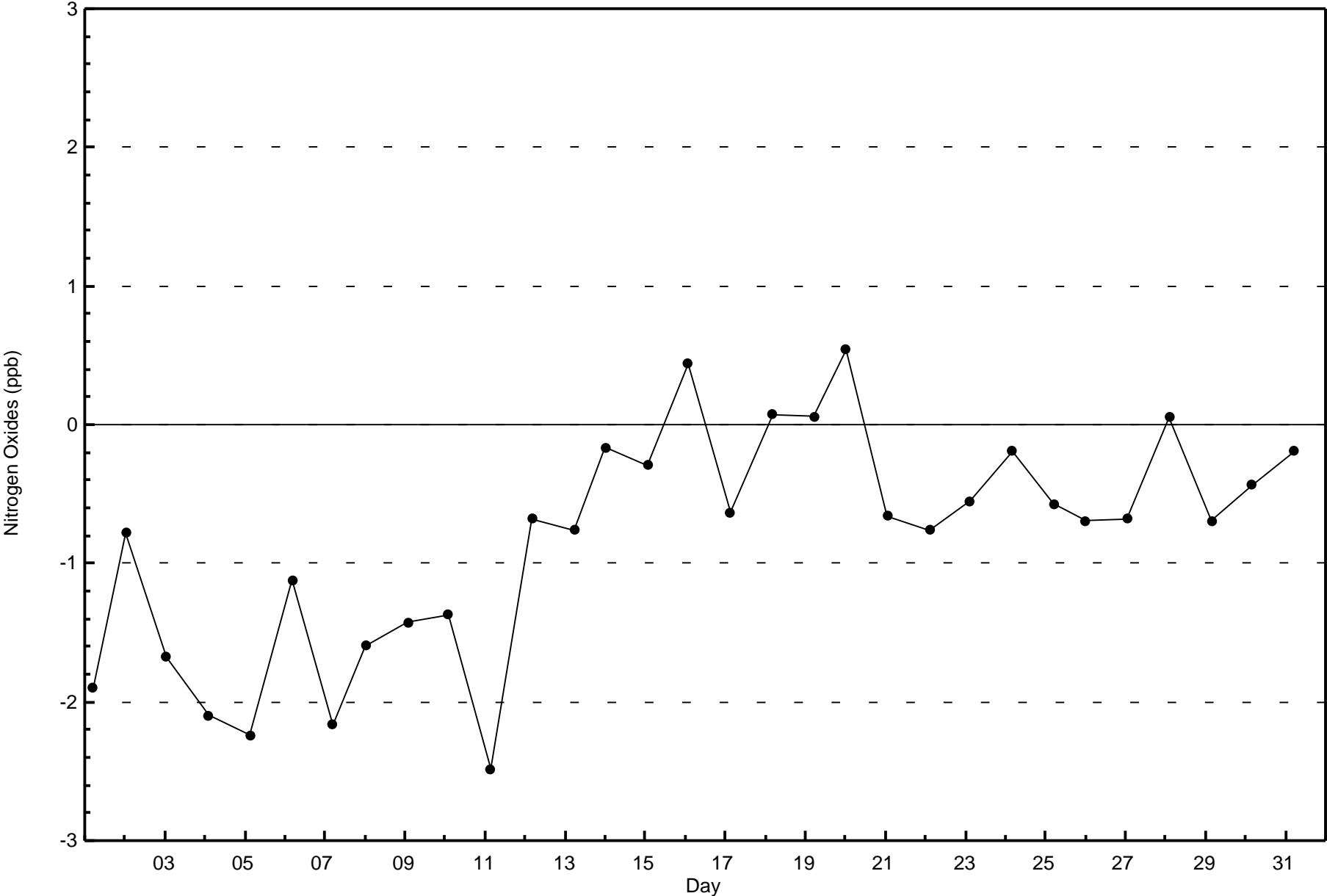
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont (AMS502)

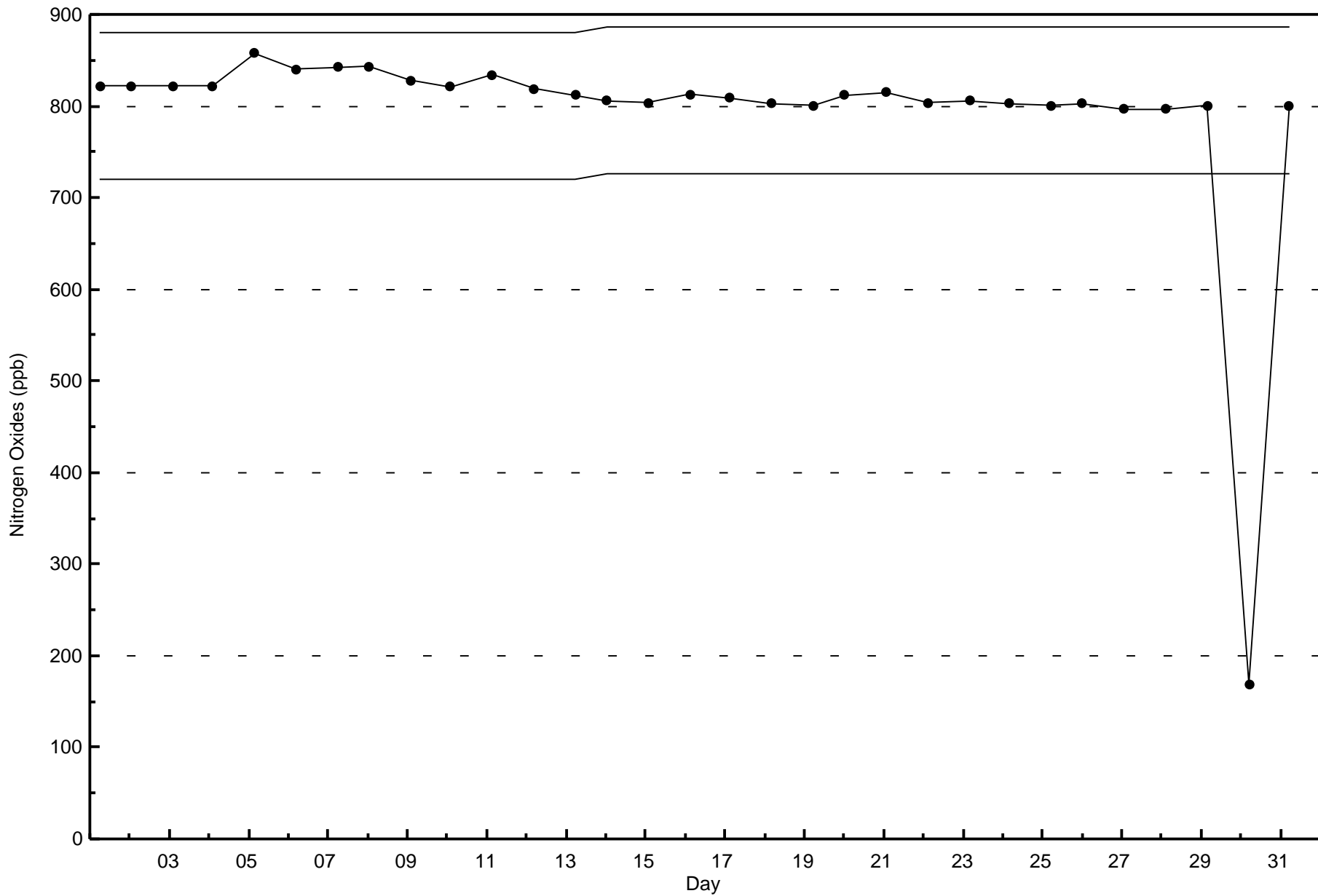






WBEA Data PC
Span Responses

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - December 2016



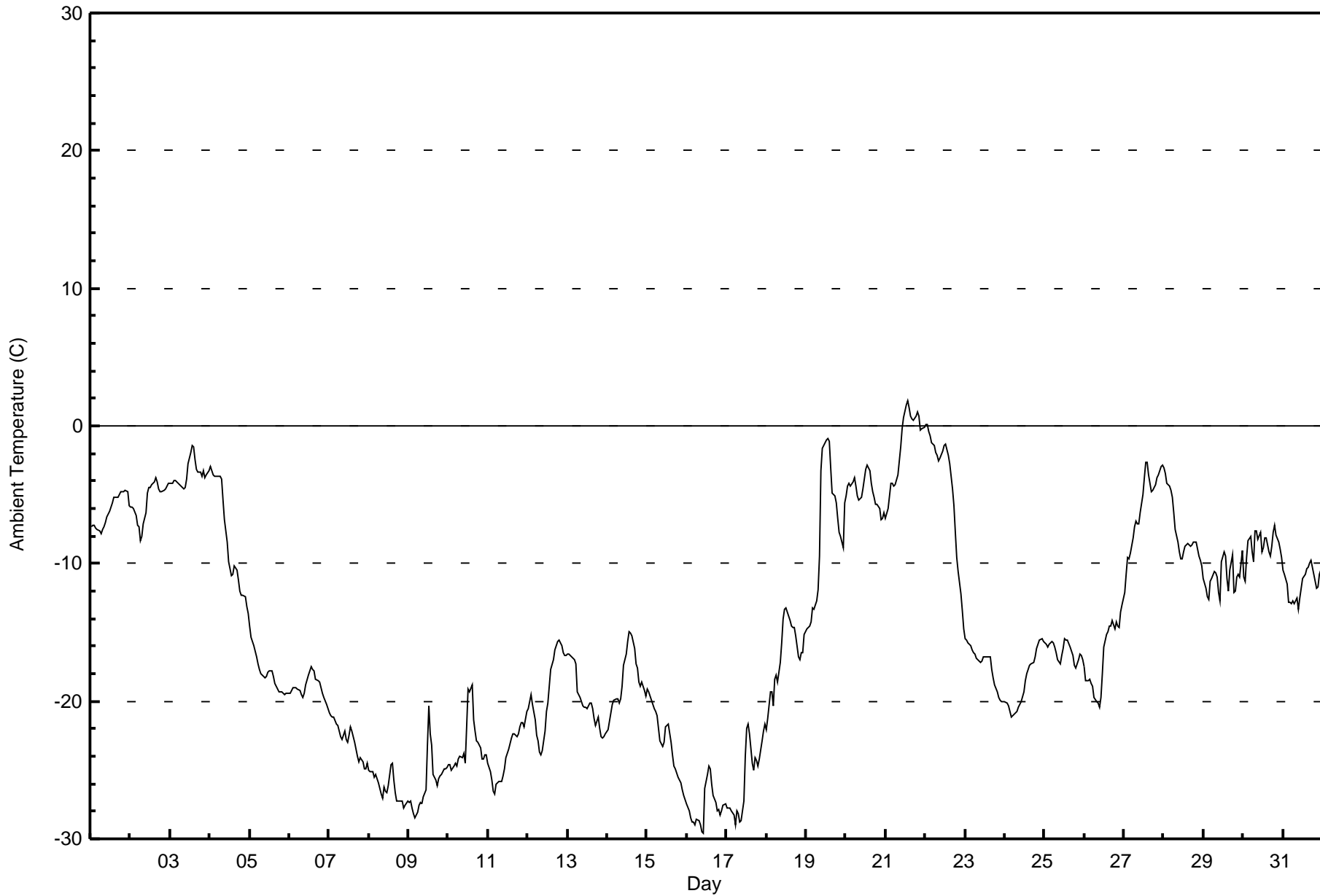


Maximum Value: 1.8 C on Dec 21 14:00 Maximum Daily Average: -1.4 C on Dec 21																						Hours in Service:	744			
Minimum Value: -29.6 C on Dec 16 11:00 Minimum Daily Average: -27.7 C on Dec 16																						Hours of Data:	744			
Maximum Diurnal Average: -13.3 C at hour 14 Minimum Diurnal Average: -15.9 C at hour 9																						Hours of Missing Data:	0			
Monthly Average: -15.00 C Percentiles: P ₁ = -28.7 P ₁₀ = -25.5 Q ₁ = -21.6 Median = -16.4 Q ₃ = -7.6 P ₉₀ = -3.8 P ₉₉ = 0.6																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-7.3	-7.2	-7.3	-7.4	-7.5	-7.6	-7.8	-7.6	-7.3	-7.0	-6.6	-6.2	-5.9	-5.6	-5.2	-5.2	-5.2	-5.0	-4.8	-4.8	-4.8	-4.7	-4.8	-5.8	-6.2	-4.7
2-Dec	-5.9	-5.9	-6.0	-6.5	-7.2	-7.3	-8.3	-8.0	-7.1	-6.3	-4.8	-4.4	-4.5	-4.2	-4.0	-3.8	-4.1	-4.6	-4.8	-4.8	-4.7	-4.5	-4.4	-4.2	-5.4	-3.8
3-Dec	-4.1	-4.1	-4.0	-4.0	-4.1	-4.2	-4.3	-4.4	-4.5	-4.5	-3.9	-2.7	-1.9	-1.4	-1.5	-2.4	-3.1	-3.3	-3.4	-3.6	-3.3	-3.7	-3.6	-3.3	-3.5	-1.4
4-Dec	-3.0	-3.2	-3.6	-3.7	-3.7	-3.7	-3.7	-3.8	-5.4	-6.8	-8.4	-9.8	-10.4	-10.9	-10.8	-10.2	-10.5	-11.2	-12.0	-12.3	-12.4	-12.4	-13.1	-13.6	-8.3	-3.0
5-Dec	-14.6	-15.4	-16.0	-16.4	-16.8	-17.3	-17.7	-18.0	-18.2	-18.3	-18.2	-17.8	-18.2	-18.7	-18.9	-19.1	-19.4	-19.3	-19.4	-19.4	-19.6	-19.5	-19.4	-18.0	-14.6	-17.5
6-Dec	-19.4	-19.2	-19.0	-19.0	-19.0	-19.1	-19.3	-19.5	-19.7	-19.4	-18.8	-18.1	-17.8	-17.5	-17.7	-17.8	-18.4	-18.5	-18.6	-19.1	-19.4	-19.7	-20.3	-20.6	-19.0	-17.5
7-Dec	-20.8	-21.0	-21.1	-21.2	-21.6	-21.8	-22.1	-22.6	-22.8	-22.2	-22.7	-23.0	-22.5	-21.9	-22.2	-23.0	-23.5	-24.0	-24.4	-24.1	-24.5	-24.9	-24.9	-24.5	-22.8	-20.8
8-Dec	-25.0	-25.1	-25.1	-25.5	-25.3	-25.6	-25.9	-26.7	-27.0	-26.2	-26.6	-26.6	-26.1	-24.6	-24.5	-25.7	-26.6	-27.2	-27.3	-27.2	-27.3	-27.8	-27.6	-27.2	-26.2	-24.5
9-Dec	-27.4	-27.3	-27.8	-28.1	-28.4	-28.1	-27.5	-27.4	-27.4	-27.0	-26.4	-23.2	-20.3	-22.4	-23.2	-25.3	-25.7	-26.1	-25.6	-25.4	-25.3	-24.9	-24.9	-24.9	-25.8	-20.3
10-Dec	-24.7	-24.6	-25.0	-24.7	-24.5	-24.7	-24.2	-24.0	-24.1	-23.8	-24.5	-21.9	-19.1	-19.4	-18.8	-21.4	-22.2	-22.9	-23.0	-23.3	-24.2	-24.2	-23.9	-23.9	-23.2	-18.8
11-Dec	-24.5	-25.1	-25.7	-26.5	-26.8	-26.0	-25.8	-25.9	-25.9	-25.4	-24.9	-24.1	-23.5	-23.1	-22.7	-22.4	-22.4	-22.6	-22.4	-21.8	-21.6	-21.5	-21.8	-20.8	-23.9	-20.8
12-Dec	-20.6	-20.1	-19.6	-20.2	-21.4	-22.5	-22.9	-23.7	-23.9	-23.6	-22.2	-20.7	-20.1	-18.9	-17.7	-16.9	-16.3	-16.0	-15.7	-15.6	-15.9	-16.4	-16.6	-16.7	-19.3	-15.6
13-Dec	-16.6	-16.6	-16.8	-16.9	-17.0	-17.3	-19.3	-19.7	-20.1	-20.3	-20.5	-20.5	-20.5	-20.2	-20.2	-20.6	-21.3	-21.8	-21.1	-22.0	-22.5	-22.7	-22.5	-22.4	-20.0	-16.6
14-Dec	-22.1	-21.4	-20.8	-20.2	-19.9	-19.8	-19.8	-20.1	-19.9	-18.9	-17.4	-16.6	-15.6	-15.0	-15.3	-16.2	-17.3	-17.6	-18.6	-18.9	-18.6	-19.2	-19.6	-19.6	-18.5	-15.0
15-Dec	-19.2	-19.4	-19.7	-20.2	-20.5	-20.7	-21.0	-21.9	-22.9	-23.3	-23.0	-21.9	-21.8	-21.7	-23.0	-23.9	-24.7	-24.9	-25.2	-25.5	-26.0	-26.4	-26.8	-27.2	-23.0	-19.2
16-Dec	-27.5	-27.9	-28.5	-28.7	-28.8	-29.0	-28.6	-28.7	-29.0	-29.5	-29.6	-26.4	-25.3	-24.7	-24.9	-26.0	-26.8	-27.4	-27.9	-27.8	-28.3	-28.0	-27.6	-27.5	-27.7	-24.7
17-Dec	-27.8	-27.7	-27.8	-28.0	-28.3	-29.0	-28.0	-28.2	-28.8	-28.7	-27.2	-24.0	-22.0	-21.7	-22.4	-24.5	-25.1	-24.1	-24.3	-24.7	-24.2	-22.8	-22.2	-21.6	-25.5	-21.6
18-Dec	-22.1	-21.3	-19.3	-19.3	-20.3	-18.4	-18.1	-18.6	-17.2	-15.8	-14.0	-13.4	-13.2	-13.9	-14.2	-14.6	-14.7	-14.7	-15.3	-16.7	-17.0	-16.5	-16.5	-15.2	-16.7	-13.2
19-Dec	-14.7	-14.6	-14.6	-14.3	-13.2	-13.3	-12.7	-11.9	-9.4	-3.3	-1.6	-1.2	-1.0	-0.9	-1.1	-3.1	-4.8	-5.1	-5.6	-6.7	-7.8	-8.0	-8.9	-5.6	-7.6	-0.9
20-Dec	-5.1	-4.4	-4.2	-4.4	-4.0	-3.8	-4.4	-5.1	-5.3	-5.2	-4.6	-3.9	-3.2	-2.8	-3.2	-4.2	-4.8	-5.1	-5.6	-5.7	-6.0	-6.8	-6.7	-6.3	-4.8	-2.8
21-Dec	-6.7	-6.0	-5.1	-4.2	-4.2	-4.4	-4.2	-3.5	-2.5	-1.6	-0.2	0.6	1.5	1.8	1.4	0.7	0.5	0.4	0.7	1.0	0.7	-0.4	-0.2	-0.1	-1.4	1.8
22-Dec	0.1	0.1	-0.4	-0.7	-1.2	-1.4	-1.9	-2.2	-2.6	-2.3	-1.8	-1.4	-1.4	-1.7	-2.2	-2.7	-4.6	-5.8	-7.7	-9.5	-10.6	-12.2	-13.4	-14.8	-4.3	0.1
23-Dec	-15.4	-15.6	-15.8	-16.0	-16.3	-16.4	-16.5	-16.8	-17.1	-17.2	-17.1	-16.8	-16.8	-16.8	-16.8	-17.7	-18.3	-18.8	-19.3	-19.7	-19.9	-20.0	-20.0	-17.4	-15.4	-15.4
24-Dec	-20.0	-20.1	-20.4	-20.8	-21.1	-21.0	-20.8	-20.7	-20.4	-20.2	-20.0	-19.3	-18.5	-18.0	-17.7	-17.4	-17.3	-17.2	-16.8	-16.2	-15.9	-15.6	-15.6	-18.6	-15.5	-15.5
25-Dec	-15.8	-15.9	-16.1	-15.8	-15.7	-15.8	-16.0	-16.4	-17.0	-17.3	-16.7	-16.2	-15.5	-15.5	-15.6	-16.1	-16.3	-16.6	-17.4	-17.6	-16.9	-16.6	-16.7	-17.0	-16.4	-15.5
26-Dec	-17.5	-18.5	-18.5	-18.4	-18.7	-18.9	-19.7	-20.1	-20.1	-20.5	-19.7	-18.0	-16.0	-15.2	-15.0	-14.5	-14.6	-14.1	-14.7	-14.2	-14.6	-14.6	-13.6	-13.0	-16.8	-13.0
27-Dec	-12.1	-10.7	-9.5	-9.7	-9.2	-8.2	-7.4	-6.9	-7.1	-7.2	-6.3	-5.0	-3.7	-2.6	-2.7	-3.6	-4.7	-4.7	-4.4	-4.2	-3.8	-3.5	-2.9	-2.8	-6.0	-2.6
28-Dec	-3.0	-3.5	-4.2	-4.3	-4.7	-5.2	-6.3	-7.5	-8.4	-9.2	-9.6	-9.6	-9.2	-8.8	-8.6	-8.7	-8.7	-8.6	-8.5	-8.4	-9.0	-9.5	-9.8	-10.2	-7.6	-3.0
29-Dec	-11.1	-11.7	-12.4	-12.7	-11.2	-11.1	-10.6	-10.7	-11.0	-12.1	-12.7	-9.9	-9.2	-9.5	-11.1	-12.0	-10.4	-9.3	-12.1	-12.0	-11.0	-10.8	-11.0	-9.0	-11.0	-9.0
30-Dec	-11.0	-11.3	-9.5	-8.4	-8.1	-9.2	-9.9	-7.6	-7.6	-8.3	-7.7	-9.2	-8.9	-8.1	-8.1	-9.1	-9.4	-8.7	-7.7	-7.3	-7.9	-8.4	-9.0	-9.5	-8.7	-7.3
31-Dec	-10.5	-10.8	-11.5	-12.8	-12.8	-12.9	-12.7	-12.9	-12.5	-13.3	-12.6	-11.8	-11.1	-10.7	-10.4	-10.3	-9.9	-9.8	-10.3	-11.3	-11.8	-11.7	-10.8	-10.4	-11.5	-9.8
																								Diurnal Average	-15.3	
																								Diurnal Maximum	0.1	



WBEA Data PC
Hourly Averages

Ambient Temperature (AT) - C
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
ConocoPhillips - Surmont - December 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	238	31.99	31.99
-20 - 0	494	66.40	98.39
0 - 10	12	1.61	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

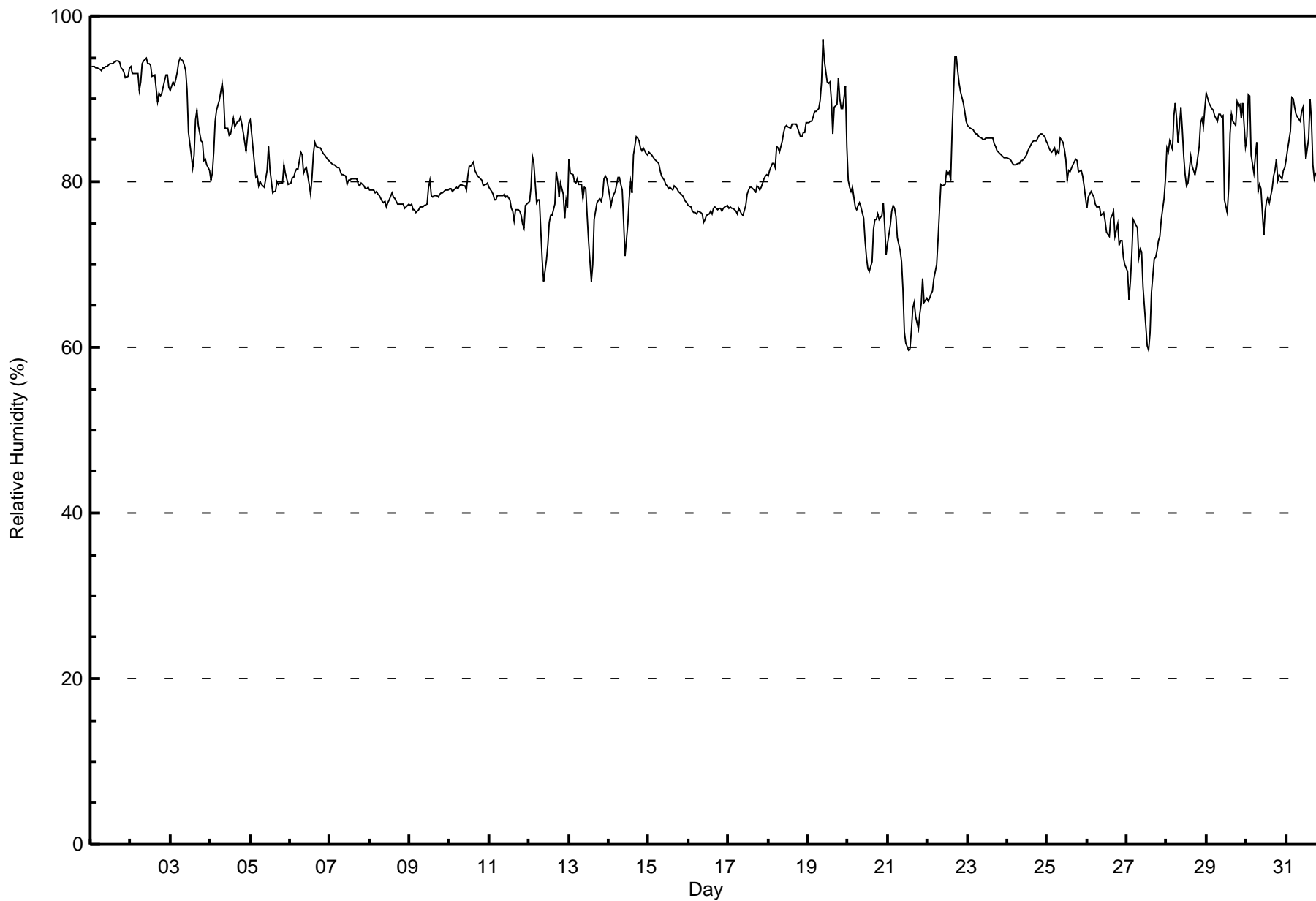
ConocoPhillips - Surmont - December 2016

Maximum Value: 97 % on Dec 19 10:00 Maximum Daily Average: 93.8 % on Dec 1																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 60 % on Dec 27 14:00 Minimum Daily Average: 67.7 % on Dec 21 Maximum Diurnal Average: 82.2 % at hour 7 Minimum Diurnal Average: 79.5 % at hour 13 Monthly Average: 81.3 % Percentiles: P ₁ = 62 P ₁₀ = 75 Q ₁ = 77 Median = 81 O ₃ = 85 P ₉₀ = 90 P ₉₉ = 95																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	94	94	94	94	94	94	93	94	94	94	94	94	94	94	95	95	94	94	93	93	92	93	94	93.8	95		
2-Dec	94	93	93	93	93	91	92	94	95	95	94	94	94	93	93	91	90	91	90	91	92	93	93	91	92.6	95	
3-Dec	91	92	92	92	93	94	95	95	94	93	91	86	83	82	83	87	89	87	85	85	83	83	82	81	88.3	95	
4-Dec	80	81	84	87	89	90	91	92	90	86	86	86	87	88	87	87	87	88	87	86	84	85	87	86.7	92		
5-Dec	87	86	82	81	81	79	80	80	79	80	81	84	82	79	79	79	80	80	80	80	82	81	80	80	80.9	87	
6-Dec	80	81	81	81	81	81	84	83	81	81	82	80	79	80	83	85	84	84	84	84	83	83	83	83	82.1	85	
7-Dec	82	82	82	82	82	82	81	81	81	81	80	80	80	80	80	80	80	80	80	80	79	79	79	79	80.5	82	
8-Dec	79	79	79	79	79	79	78	78	77	78	77	77	78	79	78	78	78	77	77	77	77	77	77	77	77.8	79	
9-Dec	77	77	77	77	76	77	77	77	77	77	77	79	80	78	78	78	78	78	79	79	79	79	79	79	77.9	80	
10-Dec	79	79	79	79	79	79	79	80	80	80	79	81	82	82	82	81	81	81	81	80	80	80	80	80	80.0	82	
11-Dec	79	79	78	78	78	78	78	78	78	79	78	78	78	77	76	75	77	77	77	76	75	74	77	77	77.3	79	
12-Dec	78	79	83	82	77	78	78	74	71	68	70	72	75	76	76	77	81	80	78	80	78	76	78	77	76.8	83	
13-Dec	83	81	81	80	80	80	80	80	78	79	79	76	73	68	70	75	76	77	78	78	78	80	81	80	78.0	83	
14-Dec	78	77	78	79	79	81	81	80	79	75	71	75	78	80	79	83	85	85	85	84	84	84	83	83	80.2	85	
15-Dec	84	83	83	83	83	82	82	81	81	80	80	80	79	79	79	80	79	79	79	79	78	78	78	77	80.2	84	
16-Dec	77	77	76	76	76	76	76	76	76	75	75	76	76	76	76	77	77	77	77	77	77	77	77	77	76.4	77	
17-Dec	77	77	77	77	77	76	77	76	76	76	77	78	79	79	79	79	79	80	79	79	79	80	81	81	78.1	81	
18-Dec	81	81	82	82	82	84	84	84	85	86	87	87	87	86	87	87	87	87	86	85	85	86	86	87	85.1	87	
19-Dec	87	87	87	88	88	88	89	90	92	97	95	92	92	92	90	86	89	89	93	90	89	89	92	84	89.8	97	
20-Dec	80	79	79	79	77	77	77	77	77	76	73	71	69	69	70	74	75	75	76	75	76	77	75	71	75.3	80	
21-Dec	73	75	76	77	77	76	73	72	70	67	62	60	60	60	62	65	65	64	62	64	65	68	65	66	67.7	77	
22-Dec	66	66	67	67	68	70	73	76	80	79	80	81	81	81	80	86	95	95	93	92	91	89	88	87	80.5	95	
23-Dec	87	87	86	86	86	86	86	85	85	85	85	85	85	85	85	85	85	84	84	83	83	83	83	83	85.0	87	
24-Dec	83	83	83	82	82	82	82	82	82	83	83	84	84	84	84	85	85	85	85	86	86	86	85	85	83.7	86	
25-Dec	85	84	84	84	84	83	84	83	85	85	84	83	80	81	81	82	82	83	82	81	81	81	79	78	82.5	85	
26-Dec	77	78	79	78	78	77	77	77	76	76	76	75	74	73	76	76	76	73	75	72	73	73	71	70	75.3	79	
27-Dec	69	66	68	71	75	75	74	71	72	72	67	63	60	60	62	67	71	71	72	73	73	75	78	80	70.2	80	
28-Dec	84	84	85	84	88	89	88	85	89	86	83	81	79	80	83	82	81	81	82	84	87	88	87	89	84.5	89	
29-Dec	91	90	89	89	89	88	87	88	88	88	88	88	78	76	79	86	88	87	87	90	89	89	88	89	84	86.9	91
30-Dec	85	91	90	83	81	83	85	79	80	79	74	76	78	78	77	79	81	81	83	80	81	80	81	82	81.1	91	
31-Dec	83	84	86	90	90	89	88	88	87	89	89	86	83	85	90	87	82	80	81	81	83	84	84	85	85.6	90	
81.6 81.6 81.9 81.9 82.0 82.1 82.2 81.8 81.8 81.4 80.5 79.9 79.5 79.5 80.3 81.2 81.9 81.6 81.7 81.4 81.5 81.5 81.5 81.6 81.2																								Diurnal Average			
94 94 94 94 94 94 95 95 95 97 95 94 94 94 94 95 95 95 95 94 93 93 93 93 94																								Diurnal Maximum			



WBEA Data PC
Hourly Averages

Relative Humidity (RH) - %
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Relative Humidity (RH) - %
ConocoPhillips - Surmont - December 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	3	0.40	0.40
60 - 80	332	44.62	45.03
80 - 100	409	54.97	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 37 km/h on Dec 21 12:00	Maximum Daily Speed Average: 29.0 km/h on Dec 21	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 18 08:00	Minimum Daily Speed Average: 1.2 km/h on Dec 18	Hours of Data: 744
Maximum Diurnal Speed Average: 11.4 km/h at hour 19	Minimum Diurnal Speed Average: 9.3 km/h at hour 21	Hours of Missing Data: 0
Monthly Average Velocity: 10.3 km/h 273.3 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 8 Median = 14 Q ₃ = 22 P ₉₀ = 26 P ₉₉ = 33	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S9	SSW10	SSW8	SSW10	SSW8	SSW7	SW8	SSW7	SSW7	SW7	SW6	SW5	SW7	SSW6	WSW5	SW5	SSW5	SSW5	W8	W6	SW5	WSW7	WSW5	WSW8	SW6.2	SSW10	
2-Dec	WSW9	WSW12	SW5	SSW7	SW10	SSW7	SSW9	SSW10	S10	SSW11	S13	S15	SSE14	S14	S14	S16	S20	S19	S21	S21	S20	S20	S19	S19	S13.1	S21	
3-Dec	S19	S17	S15	SSW14	SSW14	SSW15	SSW17	SSW15	SSW16	SSW14	SW16	SW17	SW15	SW15	SSW12	SW14	SW13	WSW23	WSW24	SW10	S10	SSW10	WSW21	WSW23	SSW14.6	WSW24	
4-Dec	WSW14	WSW15	WSW16	WSW20	WSW21	WSW19	W16	NW15	NW19	NNW25	NNW27	NNW27	NNW26	NNW25	NNW22	NNW21	NW21	NW21	NW24	NW23	NW23	NW25	NW22	NW25	NW18.5	NNW27	
5-Dec	NW26	NNW29	NNW30	NNW31	NNW31	NNW31	NNW31	NNW30	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW28	NNW27.0	NNW32	
6-Dec	NNW27	NNW27	NNW24	NNW24	NNW23	NNW23	NNW23	NNW23	NNW23	NNW24	NW21	NW20	NW20	NW21	NW20	NW20	NW22	NW21	NW20	NNW20	NNW20	NNW16	NNW20	NNW22	NW21.2	NNW27	
7-Dec	NNW20	NNW21	NNW19	NNW19	NNW19	NNW17	NW13	NNW16	NW17	NNW19	NNW21	NNW22	NNW19	NNW21	NNW21	NNW19	NNW13	NNW14	NNW15	NW13	NNW12	NW10	NW10	NW10	NNW16.3	NNW22	
8-Dec	NNW13	NNW13	NNW12	NNW13	NNW11	NNW12	NNW10	N9	NNW11	NNW9	NNW11	N9	N9	NNW6	N6	N5	N5	N7	NNW6	NNW5	NNW3	W3	NNW1	SSE1	NNW7.6	NNW13	
9-Dec	SSW2	S3	SSW3	SW5	WSW5	WSW5	WSW4	SW3	SW5	SW5	SW5	SW4	W2	E2	SE3	SSE3	S6	SSW5	SSW6	SW6	SW5	WSW5	WSW6	SW6	SW3.8	S6	
10-Dec	SW7	SW7	SW7	SW4	SW6	SW7	WSW10	WSW9	WSW8	W2	E2	SW1	WSW7	W6	WSW3	SSW5	SSW6	WSW8	WSW14	WSW17	W16	W12	W13	NNW14	WSW7.3	WSW17	
11-Dec	W17	W19	NNW19	NNW17	NNW18	NNW25	W23	W21	W22	NNW23	W23	W27	NNW26	W26	W23	W22	NNW21	NNW22	W21	W22	NNW24	NNW18	W14	W25	W21.5	W27	
12-Dec	NNW22	NNW21	NW18	NW20	NNW20	NNW21	NNW23	NNW22	NNW23	NNW23	NNW23	NNW24	NNW20	NNW19	NNW24	NNW24	NNW24	NNW25	NNW27	NW25	NW22	NNW24	NNW25	NNW27	NNW30	NNW22.7	NNW30
13-Dec	NNW26	NNW30	NNW30	NNW31	NW28	NW28	NNW25	NNW24	NNW27	NNW22	NNW19	NNW20	NNW22	NNW23	NW18	NW17	NNW14	NNW18	NW15	NNW12	NNW13	NNW14	NNW15	NNW14	NW19.9	NNW31	
14-Dec	NNW13	NNW13	NNW14	NNW14	NNW13	W15	W15	W15	W17	W11	WSW12	W12	W14	NNW15	NNW15	NNW15	NNW14	NNW16	NNW13	NNW12	NNW13	NNW11	NW9	W9	W10	NNW11.7	W17
15-Dec	W12	NNW14	NNW12	NNW11	NNW14	NNW15	NNW16	NW12	W12	W13	NNW16	NNW16	NNW16	NNW18	NNW17	NNW14	W15	NNW14	NNW17	NNW15	NNW15	NNW13	W13	NNW17	NNW14.3	NNW18	
16-Dec	NNW17	NNW15	NNW14	NNW17	NNW14	NNW12	NW13	NW10	NNW9	WSW8	SW9	WSW8	W8	W7	NNW8	W6	WSW6	SW9	WSW9	WSW9	WSW11	WSW10	WSW10	WSW10	W9.4	NNW17	
17-Dec	WSW11	SE3	SSW2	SW6	SSW7	SW10	SSW8	SW8	SW9	SW8	SW8	SW6	SSW5	S6	S6	S5	S9	S11	S9	SSW10	SSW10	SSW9	SSW8	SSW8	SSW7.2	S11	
18-Dec	SSW8	SSW8	SSW5	SW4	SSW7	W5	W1	W1	ENE3	S3	SW5	NE3	NNE4	NE4	NE5	ENE4	NE4	NW1	N3	ENE3	ENE4	SE5	SSE7	SSW8	S1.2	SSW8	
19-Dec	S8	S6	SSE5	S8	S10	S14	S14	SSW11	SSW11	SW15	WSW20	WSW22	WSW24	WSW22	NNW31	NNW33	NNW32	NNW33	NW29	NW23	NNW15	NNW12	NNW3	WSW22	W12.9	NNW33	
20-Dec	WSW22	WSW27	WSW27	WSW28	WSW29	WSW26	WSW26	WSW30	WSW29	WSW27	WSW27	WSW27	WSW23	W18	W17	W17	W27	W28	W28	W22	W20	WSW23	WSW28	W28	WSW25.1	WSW30	
21-Dec	WSW29	WSW30	W25	W29	W32	W35	W35	W35	W34	W32	W34	W37	W36	W35	W32	W29	W29	W27	W26	W20	WSW16	SW17	WSW24	WSW24	W29.0	W37	
22-Dec	WSW23	WSW23	WSW24	WSW25	WSW25	WSW29	WSW27	W22	W20	W23	NNW17	NNW14	NNW13	NNW13	NNW12	NNW13	NNW15	NNW14	NNW15	NNW16	NNW13	NNW16	NNW14	NNW13	NNW14.1	WSW29	
23-Dec	NNW12	NNW10	NNW10	N8	NNW9	N8	N8	N7	N8	N7	NE4	NE5	NE4	ENE5	ENE6	ENE6	E7	E7	ESE7	ESE6	ESE7	ESE6	ESE7	ESE7	NE4.4	NNW12	
24-Dec	ESE6	ESE6	ESE7	ESE6	SE7	SE7	SE7	SE6	SSE7	SSE6	SSE6	SSE6	SSE6	SSE7	SSE7	S9	S7	S9	S8	SSE10	S10	S10	S9	S10	SSE7.0	S10	
25-Dec	S10	S12	S11	S10	S9	S10	S7	S7	S12	S11	S9	S9	SSE8	SSE9	SSE11	SSE11	SSE13	S14	S14	S14	SSW14	SSW14	SSW11	SSW11	S10.7	S14	
26-Dec	S12	S13	S10	SSW12	SSW16	S11	S12	S14	S17	S18	S17	S16	S14	S15	S14	S17	S14	S14	SSW16	SSW15	S14	S15	S15	S17	S14.2	S18	
27-Dec	SSW17	SSW18	SSW19	SW23	SW24	SW20	WSW24	WSW25	WSW25	WSW25	WSW25	WSW28	WSW26	WSW26	WSW24	WSW24	WSW24	WSW25	WSW30	WSW27	W25	W22	W18	W17	NNW16	WSW21.9	WSW30
28-Dec	NNW17	NNW18	NNW14	NNW17	NNW14	NW14	NW17	NNW23	NNW24	NNW22	NNW20	NNW20	NNW18	NNW16	NNW17	NNW19	NNW19	NNW19	NNW19	NNW14	NNW10	NNW11	NNW11	NNW7	NNW16.4	NNW24	
29-Dec	N2	N2	NW2	NNW2	SW4	SSW4	S3	S4	SSE9	S8	SSE7	S4	SSE4	SSW5	W1	SSW6	SSW6	S2	SE3	S5	SSW9	WSW3	NNW5	SSW5	SSW3.3	SSW9	
30-Dec	NNW5	NNW8	WSW8	WSW9	WSW7	NNW3	SSE2	W4	NNW7	WSW23	WSW26	WSW29	WSW32	WSW28	W21	WSW25	WSW27	WSW28	WSW25	W23	NNW24	NNW23	NW18	NW16	W16.3	WSW32	
31-Dec	NNW16	NW13	NNW12	NNW15	NNW11	NNW12	NNW15	NNW13	NW15	NNW19	NNW16	NW16	NW19	NW22	NW21	NW20	NW19	NW17	NNW19	W18	W21	W25	W29	NNW30	NNW16.6	NNW30	

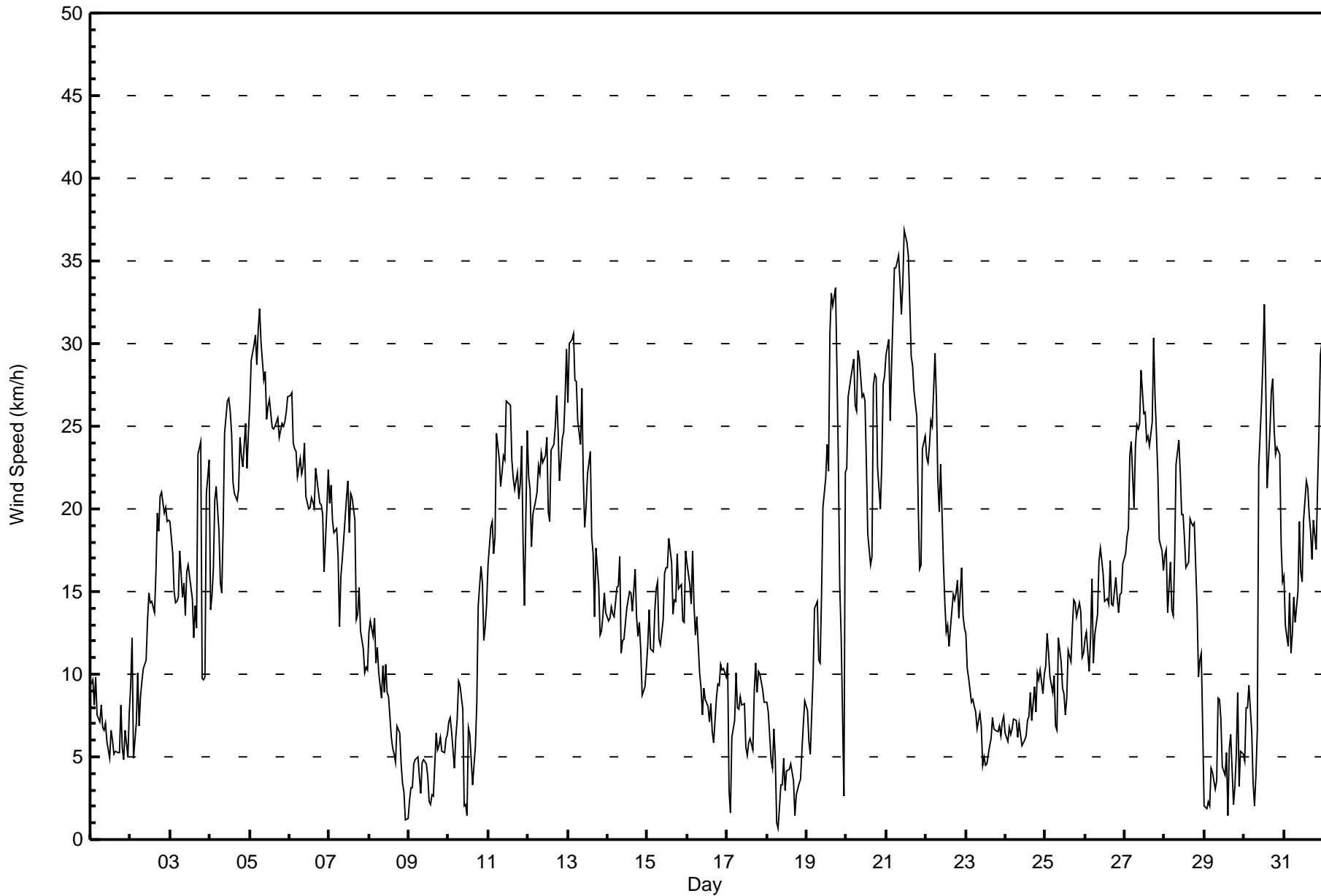
W9.9 W10.1 W9.4 W10.5 W10.9 W10.9 W10.5 W10.4 W10.1 W10.9 W10.5 W10.9 W10.9 W10.3 W10.1 W9.9 W10.1 W11.0 W11.4 W9.9 W9.3 W9.4 W10.0 W11.2	Diurnal Average
WSW29WSW30WNNW30WNNW31 W32 W35 W35 W35 W34 W32 W34 W37 W36 W35 W32 W29 W29 W27 W26 W20WSW16 SW17WSW24WSW24	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods



WBEA Data PC
Hourly Averages

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - December 2016





WBEA Data PC
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - December 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	91	12.23	12.23
6 - 11	191	25.67	37.90
12 - 19	224	30.11	68.01
20 - 28	197	26.48	94.49
29 - 38	41	5.51	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



WBEA Data PC
Frequency Distribution

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - December 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	1	7	5	2	1	3	5	8	12	16	8	8	6	1	3	91
6 - 11	10	0	0	2	2	10	4	15	34	34	22	22	9	9	5	13	191
12 - 19	0	0	0	0	0	0	0	2	36	17	8	9	23	73	21	35	224
20 - 28	0	0	0	0	0	0	0	0	5	0	3	50	30	55	30	24	197
29 - 38	0	0	0	0	0	0	0	0	0	0	0	9	14	17	1	0	41
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	1	7	7	4	11	7	22	83	63	49	98	84	160	58	75	744

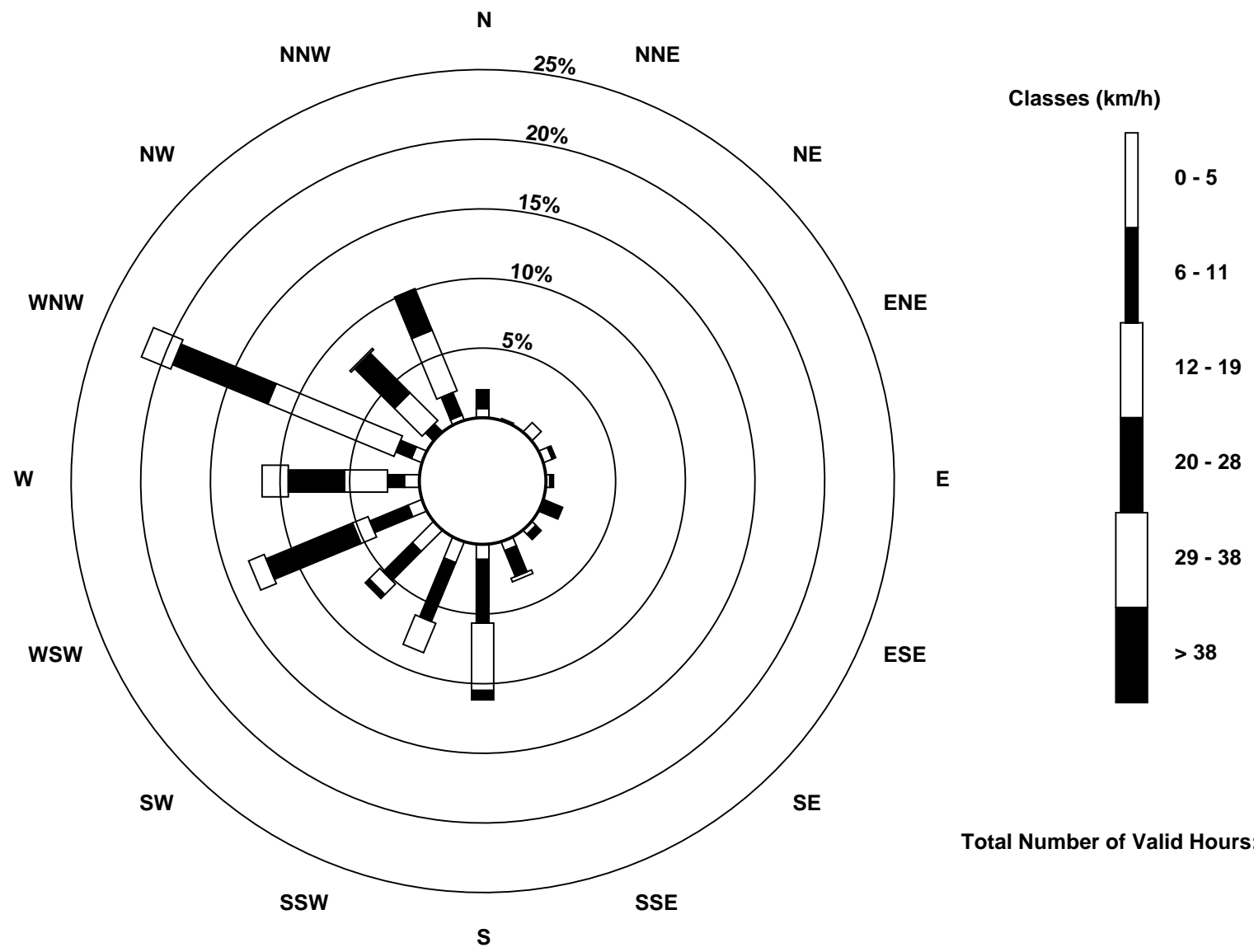
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Dec 2016

Wind Speed (WS) - km/h
ConocoPhillips - Surmont (AMS502)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 19 15:00														Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0											
Minimum Value: 0 km/h on Dec 8 23:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 7																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	3	3	2	3	2	2	2	2	2	2	2	1	1	2	2	1	1	1	2	2	1	1	1	2	3
2-Dec	2	2	2	2	1	2	2	2	3	3	3	3	3	3	4	4	5	5	5	5	5	4	4	4	5
3-Dec	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	6	6	3	3	3	8	5	8	
4-Dec	5	4	3	3	3	3	3	4	4	5	5	5	5	4	4	4	5	4	4	4	5	4	4	5	
5-Dec	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	4	4	4	4	4	5	
6-Dec	4	4	4	4	4	4	4	4	3	5	4	4	4	5	4	4	4	4	4	4	4	3	4	4	5
7-Dec	4	4	4	4	4	3	2	2	3	4	3	4	3	4	3	3	3	2	2	2	3	2	2	2	4
8-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	1	1	1	1	0	1	2
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	2
10-Dec	1	1	1	1	2	2	2	1	3	1	1	2	2	1	1	1	1	2	2	2	2	4	4	3	4
11-Dec	3	4	5	4	4	4	4	4	5	5	5	5	5	5	5	4	4	4	3	4	4	5	4	4	5
12-Dec	3	4	4	5	4	4	5	4	3	4	5	5	4	5	5	5	5	5	6	4	5	5	5	6	6
13-Dec	5	6	6	6	6	6	6	5	6	5	3	4	5	5	4	3	2	3	3	2	1	2	2	2	6
14-Dec	2	2	2	2	2	3	2	3	2	3	4	3	3	3	3	2	3	3	2	2	2	2	1	2	4
15-Dec	2	2	2	2	2	3	3	4	2	2	3	3	3	4	4	2	2	3	2	2	2	3	2	2	4
16-Dec	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	1	1	2	2	1	1	1	1	1	3
17-Dec	1	1	2	1	1	1	1	1	1	2	1	1	1	2	1	3	3	3	2	2	2	2	2	2	3
18-Dec	2	2	2	1	2	3	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	2	2	2	3
19-Dec	2	2	1	2	2	3	3	2	2	4	3	4	4	4	9	7	7	7	7	5	6	2	4	4	9
20-Dec	4	4	4	5	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	3	3	4	4	5
21-Dec	4	4	4	7	6	6	6	6	6	5	6	6	6	6	5	5	5	4	4	4	3	5	4	4	7
22-Dec	4	4	4	4	4	4	4	4	3	4	3	3	3	2	2	3	3	3	3	3	2	3	2	3	4
23-Dec	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
25-Dec	2	2	2	3	2	2	1	2	3	3	2	2	2	2	3	3	3	3	3	3	4	4	3	3	4
26-Dec	3	3	3	4	4	4	3	3	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	4	4
27-Dec	4	4	4	7	5	5	5	4	3	3	4	4	4	4	4	4	4	5	4	4	4	3	3	3	7
28-Dec	3	3	2	3	3	4	4	6	5	4	4	4	4	3	4	4	3	3	3	3	1	2	2	2	6
29-Dec	2	2	1	1	2	2	2	2	3	2	3	2	1	2	2	1	2	2	2	2	2	2	2	2	3
30-Dec	2	2	2	2	2	3	1	2	4	4	4	5	5	5	4	4	4	4	4	4	4	4	4	3	5
31-Dec	3	2	2	3	3	2	2	2	3	4	4	5	5	5	4	5	5	4	4	3	3	4	6	6	6
														5 6 6 7 6 6 6 6 6 6 5 6 6 6 6 9 7 7 7 7 5 6 5 8 6											
Diurnal Maximum																									



Wood Buffalo Environmental Association
Summary of Hour Averages

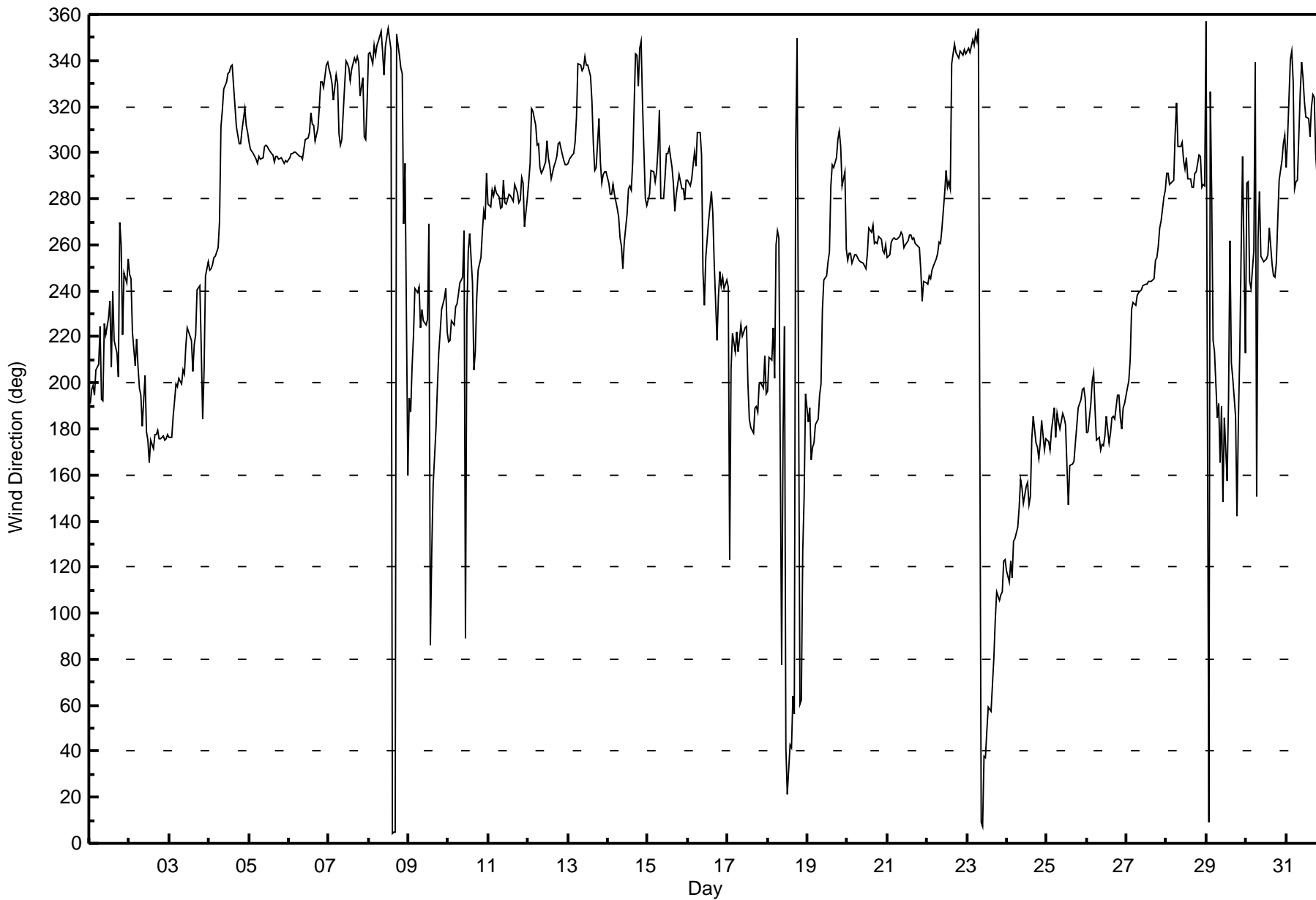
Wind Direction (WD) - deg
ConocoPhillips - Surmont - December 2016

Direction of Maximum Speed: 260 deg on Dec 21 12:00																							Hours in Service:	744	
Direction of Maximum Daily Speed Average: 259.4 deg on Dec 21																							Hours of Data:	744	
Direction of Minimum Speed: 263 deg on Dec 18 08:00											Direction of Minimum Daily Speed Average: 1.2 deg on Dec 18												Hours of Missing Data:	0	
Monthly Average Direction: 274.5 deg																							Percent Operational Time:	100.0	
Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	191	197	199	194	206	208	224	193	192	226	221	228	235	207	240	218	213	203	270	260	221	248	244	254	218.5
2-Dec	247	245	222	208	219	207	198	194	181	203	179	175	166	175	172	177	177	179	176	175	177	175	176	178	184.9
3-Dec	176	176	186	192	199	198	202	199	205	204	216	224	220	218	205	217	221	240	242	214	184	206	246	253	212.9
4-Dec	249	249	252	255	255	258	270	311	319	328	330	334	335	338	338	329	311	308	304	304	310	319	312	308	306.3
5-Dec	305	301	299	298	297	295	298	297	298	302	303	302	301	299	299	296	299	298	297	298	297	295	296	296	298.7
6-Dec	298	300	300	300	300	300	298	298	297	301	306	306	309	317	312	312	305	311	320	331	331	328	338	339	309.7
7-Dec	336	334	330	323	334	330	308	303	306	329	340	339	337	331	336	341	340	342	339	325	333	307	306	322	329.4
8-Dec	343	343	338	347	342	346	348	353	344	334	346	350	354	345	4	5	5	352	342	337	335	269	295	160	345.3
9-Dec	194	187	207	220	241	239	242	224	232	227	225	228	269	86	126	156	180	198	213	222	232	237	241	222	218.5
10-Dec	218	218	227	225	233	234	238	243	246	266	89	229	258	265	243	206	213	237	249	255	266	275	271	291	249.3
11-Dec	278	277	283	282	285	283	280	276	276	288	278	277	282	281	280	279	286	283	278	280	289	287	268	280	280.8
12-Dec	287	295	319	318	312	303	304	294	291	292	296	305	298	294	289	294	296	299	304	305	299	297	295	295	298.7
13-Dec	295	297	299	300	305	316	339	338	336	337	342	338	338	333	322	304	292	294	315	296	287	291	292	292	313.9
14-Dec	287	282	282	286	282	276	272	263	259	250	261	274	284	286	284	296	343	342	329	345	348	321	280	277	290.5
15-Dec	279	282	292	292	287	291	302	318	280	280	289	300	299	302	293	286	275	282	286	290	285	284	279	288	289.6
16-Dec	288	286	289	295	300	294	309	309	299	248	234	255	270	276	283	274	252	219	237	248	242	246	241	245	272.5
17-Dec	241	124	206	221	213	222	213	219	225	220	224	224	199	184	180	178	189	190	188	200	200	198	212	195	206.1
18-Dec	197	211	210	224	202	260	266	263	78	178	225	42	22	43	41	64	56	304	349	61	62	127	151	195	170.1
19-Dec	183	189	167	172	174	182	184	195	199	232	244	246	253	257	285	295	293	298	306	309	303	286	291	258	263.7
20-Dec	253	256	256	252	256	256	255	253	253	252	251	249	256	267	265	269	261	261	261	263	262	257	256	260	257.0
21-Dec	255	256	261	262	263	262	262	263	265	264	259	260	262	264	264	263	263	261	260	259	249	236	244	244	259.4
22-Dec	243	246	246	249	251	254	256	261	261	267	282	292	285	287	284	339	347	343	343	341	344	342	345	343	282.5
23-Dec	344	346	343	349	347	351	349	354	9	7	38	37	49	59	58	69	81	97	109	105	108	109	122	123	35.1
24-Dec	118	113	123	115	131	133	137	146	158	154	147	155	157	147	151	176	185	174	172	167	174	184	171	176	155.7
25-Dec	175	175	171	179	189	176	187	183	180	186	185	182	164	147	164	165	166	174	181	189	193	197	197	193	179.7
26-Dec	178	179	191	201	205	189	175	177	171	173	172	177	185	174	178	185	186	185	195	195	185	180	189	191	183.7
27-Dec	198	201	210	232	235	234	238	239	240	240	242	243	243	244	244	244	245	253	254	259	267	270	281	284	243.7
28-Dec	291	291	286	288	288	308	322	303	303	305	296	293	298	288	289	285	285	291	292	299	298	285	286	285	294.6
29-Dec	357	9	326	282	219	213	185	191	165	190	148	185	158	193	262	209	202	186	142	183	213	258	299	213	198.7
30-Dec	287	288	244	241	258	339	151	263	283	255	252	253	254	256	267	252	247	246	252	270	288	297	304	307	263.8
31-Dec	294	306	340	344	331	284	287	288	326	339	333	322	316	315	307	320	325	324	299	279	265	269	281	287	305.0
267.1	269.3	272.2	271.6	269.2	270.4	271.6	271.8	271.6	273.3	272.3	276.2	278.4	280.0	281.0	277.9	273.8	273.1	275.2	275.6	273.8	271.5	270.9	270.8		
Diurnal Average																									
All monthly, daily, and diurnal averages have been calculated using vector methods																									



WBEA Data PC
Hourly Averages

Wind Direction (WD) - deg
ConocoPhillips - Surmont - December 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
ConocoPhillips - Surmont - December 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Dec 18 08:00 Minimum Value: 4 deg on Dec 17 05:00 Percentiles: P ₁ = 5 P ₁₀ = 8 Q ₁ = 10 Median = 12 Q ₃ = 16 P ₉₀ = 24 P ₉₉ = 78																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	21	21	23	21	22	22	22	21	22	21	24	21	14	25	31	19	22	29	14	25	20	15	16	10	31
2-Dec	10	7	59	21	11	21	19	21	19	19	17	14	18	15	18	17	17	16	16	16	15	14	13	13	59
3-Dec	13	14	18	18	18	18	16	15	15	17	15	15	14	15	17	14	14	10	10	25	21	23	14	10	25
4-Dec	17	12	10	8	8	9	10	26	16	12	12	11	11	10	10	13	15	13	11	10	13	14	13	12	26
5-Dec	11	10	9	10	10	8	9	9	9	10	11	10	10	10	10	10	10	10	10	9	9	9	9	9	11
6-Dec	9	9	9	9	9	9	8	9	8	10	12	13	13	16	14	15	11	12	12	12	13	12	10	10	16
7-Dec	11	12	12	12	12	13	17	15	14	13	10	10	12	12	12	9	13	13	9	14	16	16	16	19	19
8-Dec	10	10	14	9	16	11	13	15	10	18	11	14	14	26	16	14	14	14	12	16	17	15	60	50	60
9-Dec	33	26	27	14	11	11	16	25	13	12	13	16	69	42	36	24	17	19	17	15	15	14	13	19	69
10-Dec	17	16	16	20	16	14	11	9	11	80	47	81	12	18	38	17	16	15	8	8	9	18	14	12	81
11-Dec	11	11	17	12	13	10	10	10	10	13	12	11	10	11	10	10	10	9	8	9	10	11	11	9	17
12-Dec	8	11	18	15	14	11	12	9	9	8	11	12	10	11	11	11	10	11	13	13	11	10	9	10	18
13-Dec	11	10	10	12	12	20	12	11	11	12	10	13	13	17	14	12	8	14	12	7	8	8	8	8	20
14-Dec	9	9	10	8	8	8	8	8	10	9	16	11	11	11	11	14	11	12	20	10	13	28	12	10	28
15-Dec	9	9	9	10	8	9	16	29	9	9	9	12	14	14	10	10	8	9	10	7	9	9	8	7	29
16-Dec	7	8	8	8	10	9	14	20	14	37	20	14	14	16	11	13	21	12	11	6	4	5	4	5	37
17-Dec	4	67	61	14	4	5	5	7	7	10	8	14	22	19	25	30	16	15	17	16	16	19	19	17	67
18-Dec	17	18	23	33	15	49	90	101	29	42	21	24	16	26	21	16	25	69	51	30	22	30	23	18	101
19-Dec	19	19	21	24	20	14	14	12	14	14	9	10	10	11	13	11	11	10	13	12	15	10	93	8	93
20-Dec	9	8	9	8	8	8	8	8	8	9	9	9	9	11	13	13	8	8	8	8	8	8	7	8	13
21-Dec	8	7	8	9	9	9	9	9	9	8	9	9	10	10	9	9	9	8	9	10	10	12	9	8	12
22-Dec	9	9	8	9	8	8	8	8	8	9	10	10	10	10	11	24	14	11	10	11	12	10	12	12	24
23-Dec	11	11	14	16	13	23	15	18	14	14	23	27	23	19	16	14	14	11	11	12	11	13	12	13	27
24-Dec	12	12	12	9	10	10	12	14	18	15	15	19	19	12	15	16	19	15	16	11	13	14	14	13	19
25-Dec	11	11	12	16	16	14	14	17	15	15	17	17	22	17	15	18	17	17	15	17	18	17	16	18	22
26-Dec	16	15	19	19	17	19	14	15	14	13	14	16	18	14	15	13	14	16	13	16	16	15	15	16	19
27-Dec	15	14	15	15	12	13	9	8	8	8	8	8	8	9	9	9	8	9	9	9	9	9	10	11	15
28-Dec	9	9	8	9	9	28	19	11	11	13	10	10	12	11	12	11	9	9	9	13	19	9	8	18	28
29-Dec	67	80	70	82	72	77	57	53	26	19	22	36	39	22	88	25	11	67	50	32	13	47	27	36	88
30-Dec	64	12	15	9	44	73	63	38	61	9	9	8	8	10	11	10	8	8	9	12	11	10	13	14	73
31-Dec	10	20	14	11	21	8	9	9	25	12	19	22	16	15	13	19	17	16	18	9	9	9	10	10	25
Diurnal Maximum																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Last Calibration	November 7, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	14:47
Gas Cert Reference	LL104215	Station temp.	21 Deg C
Cal Gas Concentration	48.3 ppm	Cal Gas Exp Date	February 12, 2018
Calibrator Make/Model	API T700	Serial Number	622
ZAG Make/Model	API 701	Serial Number	4865
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9035

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	518	518
Analyzer IP address	192.168.1.73		Lamp voltage	1598	1549
Calculated slope	0.997462	0.994953	Chamber temp	50.0	50.0
Calculated intercept	1.649369	1.741373	Pressure	21.5	21.5
Analyzer Background	24.2	22.5	Flow	0.526	0.527
Analyzer Coefficient	1.031	1.027	Intensity	39	38
Analyzer make	API T100		Analyzer serial #	598	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.9	----
as found span	5000	83.2	803.7	808.1	0.995
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	83.2	803.7	807.2	0.996
second point	5000	41.6	401.9	400.2	1.004
third point	5000	20.8	200.9	199.4	1.008
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	83.2	803.7	797.6	1.008
Average Correction Factor					1.003

Corrected As found 808.9 Previous response 804.1 % change -0.6%

Notes:

Sample inlet filter replaced after as founds. Adjusted both zero and span.

Calibration Performed By:

Asad Hidayat



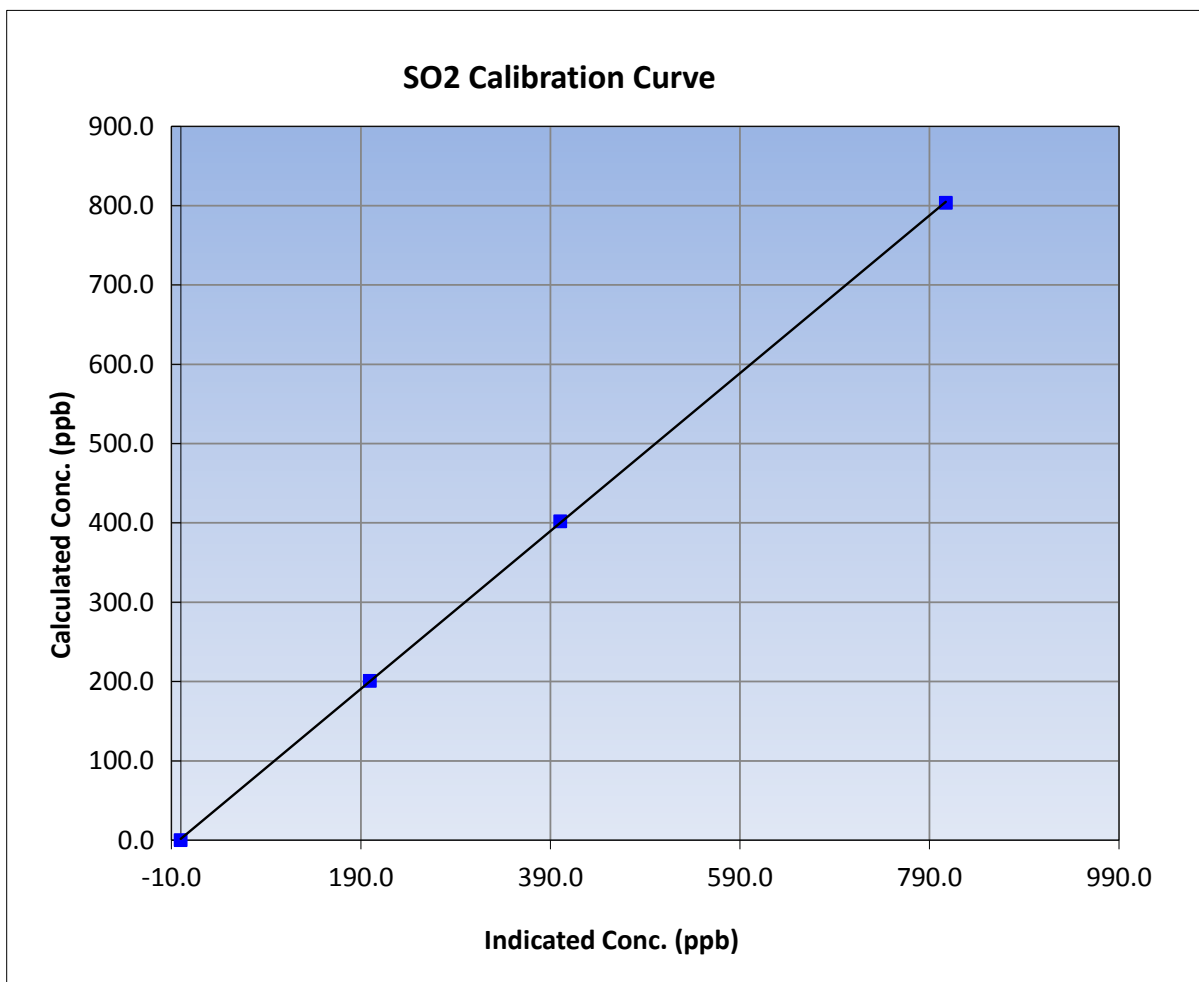
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 7, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Start Time (MST)	10:40	End Time (MST)	14:47
Analyzer make	API T100	Analyzer serial #	598

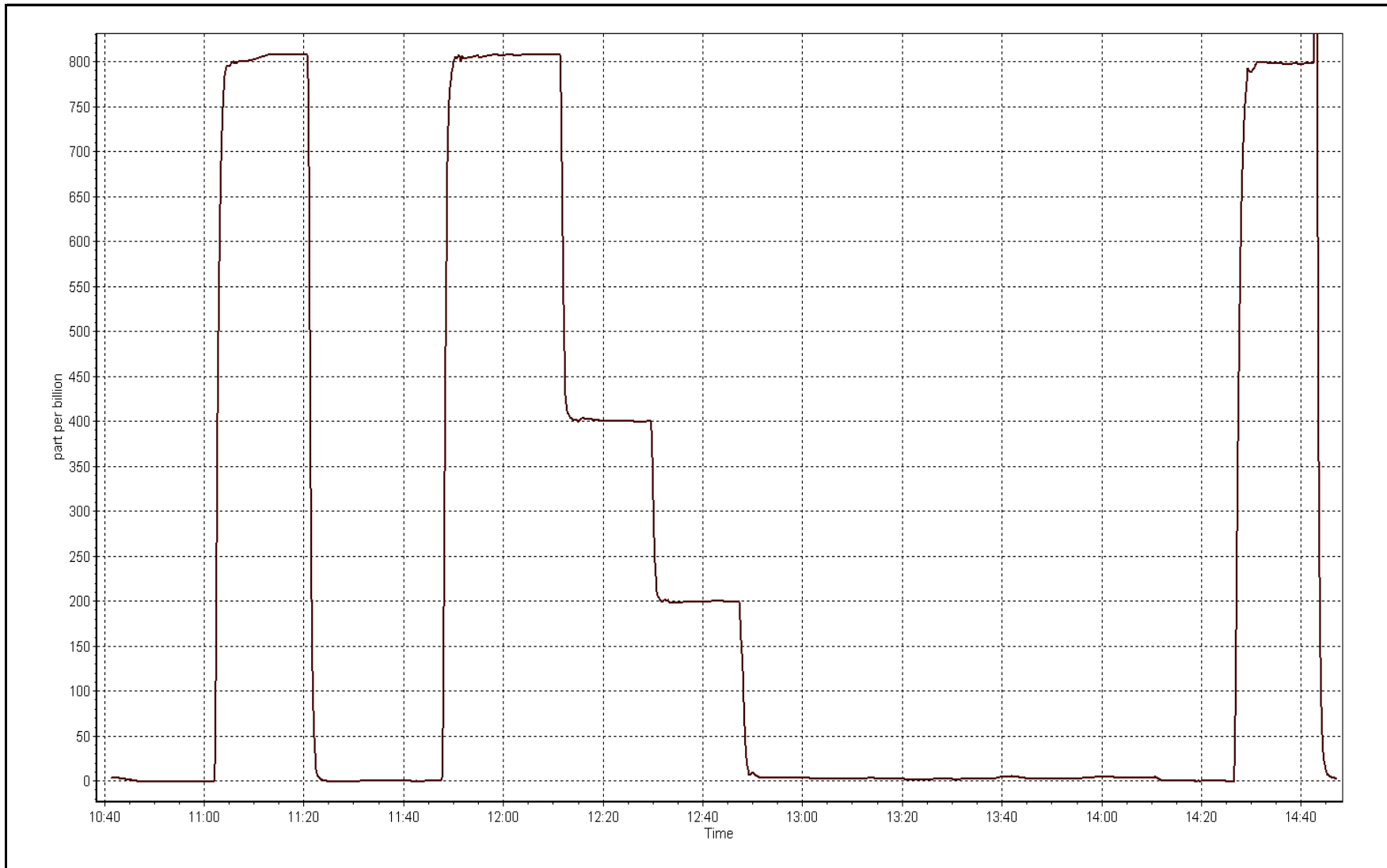
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999977
803.7	807.2	0.9957		
401.9	400.2	1.0041	Slope	0.994953
200.9	199.4	1.0078		
			Intercept	1.741373



SO2 Calibration Plot

Date: December 13, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 5, 2016	Last Calibration	November 4, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	12:20	End Time (MST)	15:35
Gas Cert Reference	LL34303	Station temp.	21 Deg C
Cal Gas Concentration	10.4 ppm	Cal Gas Exp Date	May 30, 2016
Calibrator Make/Model	API T700	Serial Number	622
ZAG air Make/Model	API 701	Serial Number	4865
DACS make/model	Campbell Scientific CR3000	Serial Number	9035
SO2 gas concentration	48.3 ppm	SO2 gas cert/exp	LL104215 February 12, 2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	497	497
Analyzer IP address	192.168.1.75		Lamp voltage	2342	2322
Calculated slope	0.999993	1.005900	Chamber temp	50.0	50.0
Calculated intercept	0.058751	-0.099994	Pressure	23.3	23.5
Analyzer Background	20.6	21.1	Flow (SLPM)	0.594	0.604
Analyzer Coefficient	0.978	0.982	Intensity	52	52
			Converter temp.	317	314

Analyzer make/model	API T101	Analyzer serial #	197
Converter make/model	N/A	Converter serial #	N/A

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.5	----
as found span	5000	38.5	80.1	80.5	0.995
SO2 scrubber check	5000	20.7	200.0	3.9	----
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	38.5	80.1	79.8	1.004
second point	5000	19.3	40.1	40.0	1.004
third point	5000	12.0	25.0	24.7	1.009
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	38.5	80.1	79.9	1.002
Average Correction Factor					1.006

Corrected As found	80.0	Previous response	80.0	% change	0.1%
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Notes:

Sample inlet filter replaced after as founds. Scrubber check done after as founds. Adjusted zero. Took new average for "high point" after adjusting baseline.

Calibration Performed By: Asad Hidayat



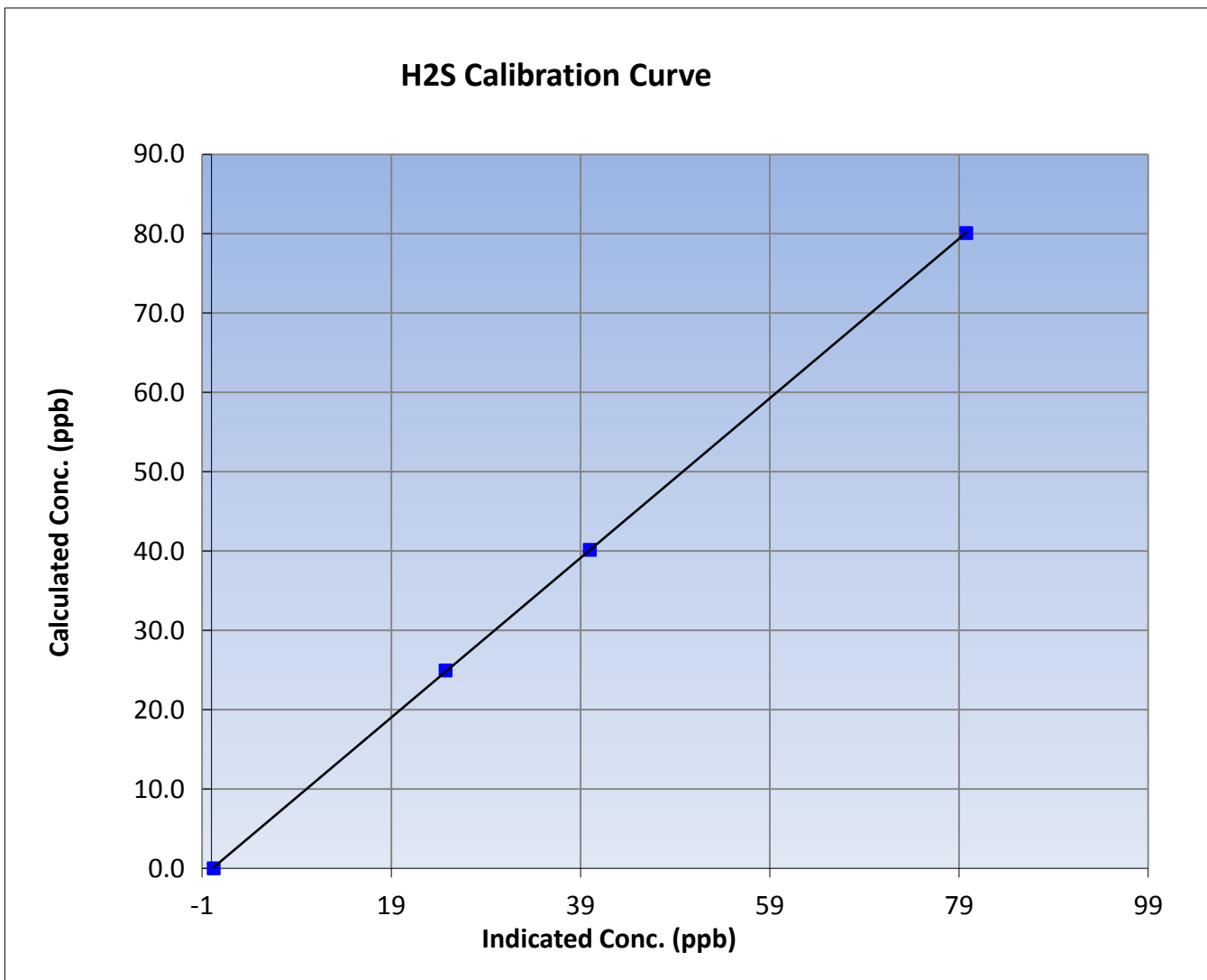
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	December 5, 2016	Previous Calibration	November 4, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	12:20	End Time (MST)	15:35
Analyzer make	API T101	Analyzer serial #	197

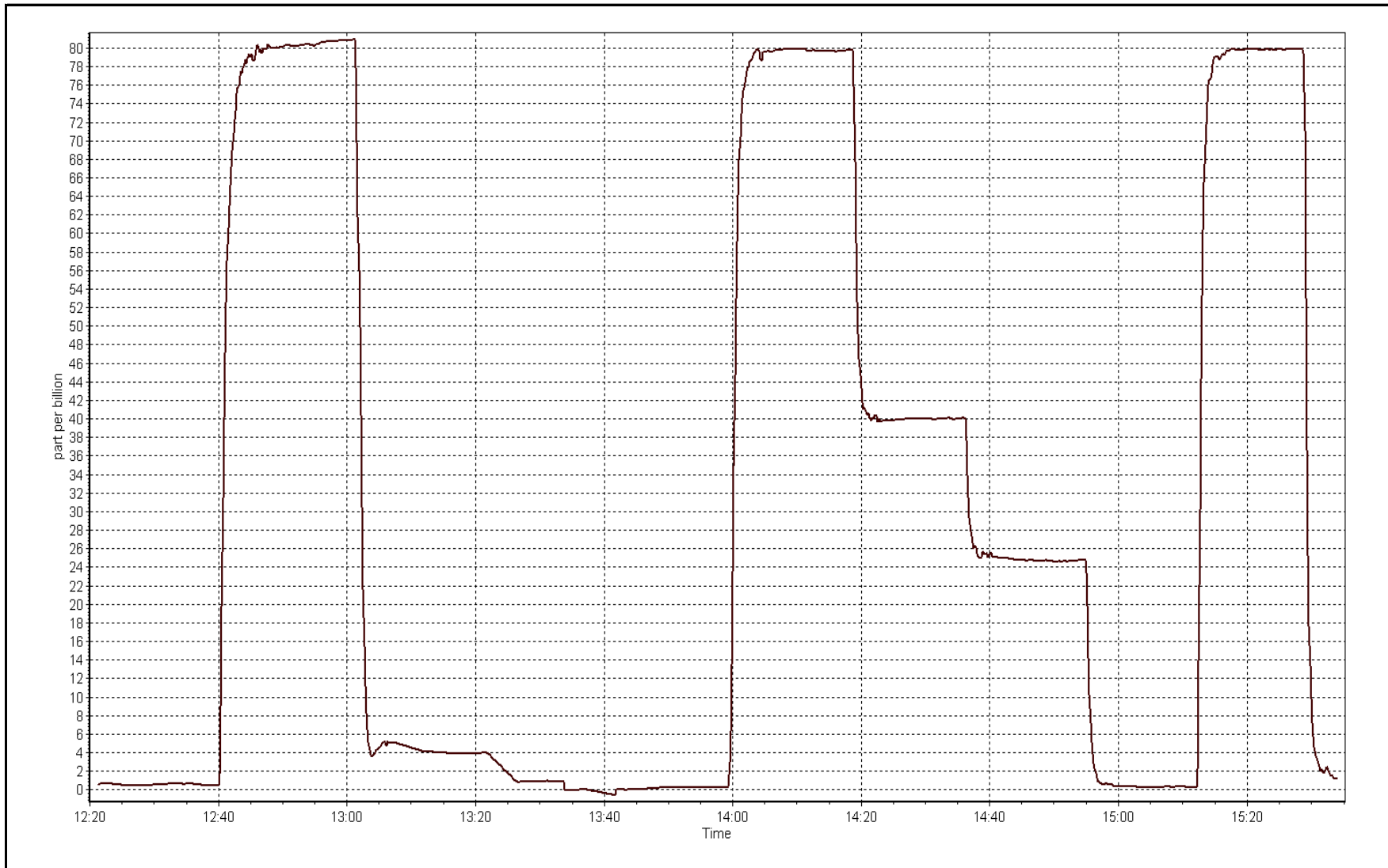
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999984
80.1	79.8	1.0039		
40.1	40.0	1.0036	Slope	1.005900
25.0	24.7	1.0093		
			Intercept	-0.099994



H2S Calibration Plot

Date: December 5, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 7, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	14:47
NO Cal Gas Conc	48.1 ppm	Gas Cert Reference	LL104215
NOX Cal Gas Conc	48.1 ppm	Cal Gas Expiry Date	February 12, 2018
Calibrator	API T700	Serial Number	622
Zero air Generator	Teledyne API T701	Serial Number	4865

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9035
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.000214	1.000691	0.999153
	Data Offset	2.806152	2.395474	-0.126861
Current Calibration	Data Slope	0.998822	0.999687	0.998903
	Data Offset	2.031060	1.769688	0.190504

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153356
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.984		0.946	
NOX coefficient	1.000		1.001	
NO2 coefficient	1.001		1.000	
NO bkgrnd	6.5		5.3	
NOX bkgrnd	7.3		5.8	
Chamber Temp	50.3	Deg C	50.6	Deg C
Moly Temp	322.4	Deg C	322.6	Deg C
PMT voltage	-866.9	V	-866.1	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	160.6	mmHg	159.1	mmHg
R Cell Press Nox	160.3	mmHg	159.1	mmHg
NO sample flow	0.687	lpm	0.688	lpm
Nox sample Flow	0.687	lpm	0.687	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted both zero and span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: December 13, 2016 Station Number: AMS 502

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-1.4	-1.1	-0.3	----	----
as found span	5000	83.2	800.4	800.4	0.0	831.0	830.8	0.2	0.9631	0.9634
calibrator zero	5000	0.0	0.0	0.0	0.0	0.3	0.5	-0.2	----	----
high point	5000	83.2	800.4	800.4	0.0	800.8	800.3	0.5	0.9995	1.0001
second point	5000	41.6	400.2	400.2	0.0	396.4	396.3	0.0	1.0097	1.0098
third point	5000	20.8	200.1	200.1	0.0	196.7	196.9	-0.2	1.0172	1.0161
as left zero	5000	0.0	0.0	0.0	0.0	-0.4	0.0	-0.4	----	----
as left span	5000	83.2	800.4	492.7	307.7	801.8	493.1	308.7	0.9982	0.9991
Average Correction Factor									1.0088	1.0086

Corrected As found NO_x= 832.5 NO= 831.9 Percent Change NO_x= -4.2% NO= -4.1%
 Previous Response NO_x= 797.4 NO= 797.4

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 83.20 ccm NOx ref calc conc = 800.4 ppb NO ref calc conc = 800.4 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	799.9	798.8	-0.2	1.0007	1.0020	----	----
1st NO2 (300)	492.7	306.1	799.0	492.7	306.3	1.0017	----	0.9995	100.1%
2nd NO2 (200)	587.3	211.5	798.9	587.3	211.6	1.0019	----	0.9997	100.0%
3rd NO2 (100)	685.7	113.1	798.6	685.7	113.0	1.0022	----	1.0012	99.9%
2nd NO ref point		0.0	798.4	797.8	0.6	1.0025	1.0032	----	----
Average Correction Factor						1.0021		1.0001	100.0%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

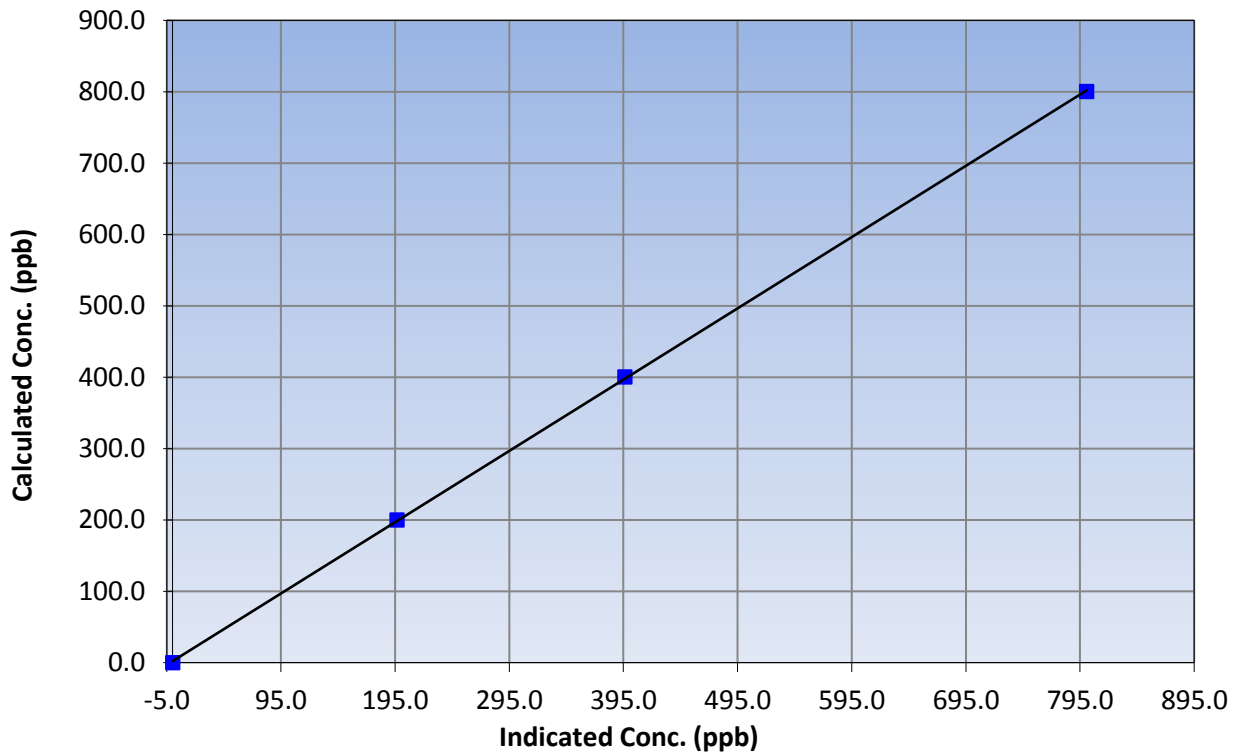
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 7, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:40	End Time (MST)	14:47
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999956
800.4	800.8	0.9995		
400.2	396.4	1.0097	Slope	0.998822
200.1	196.7	1.0172		
			Intercept	2.031060

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

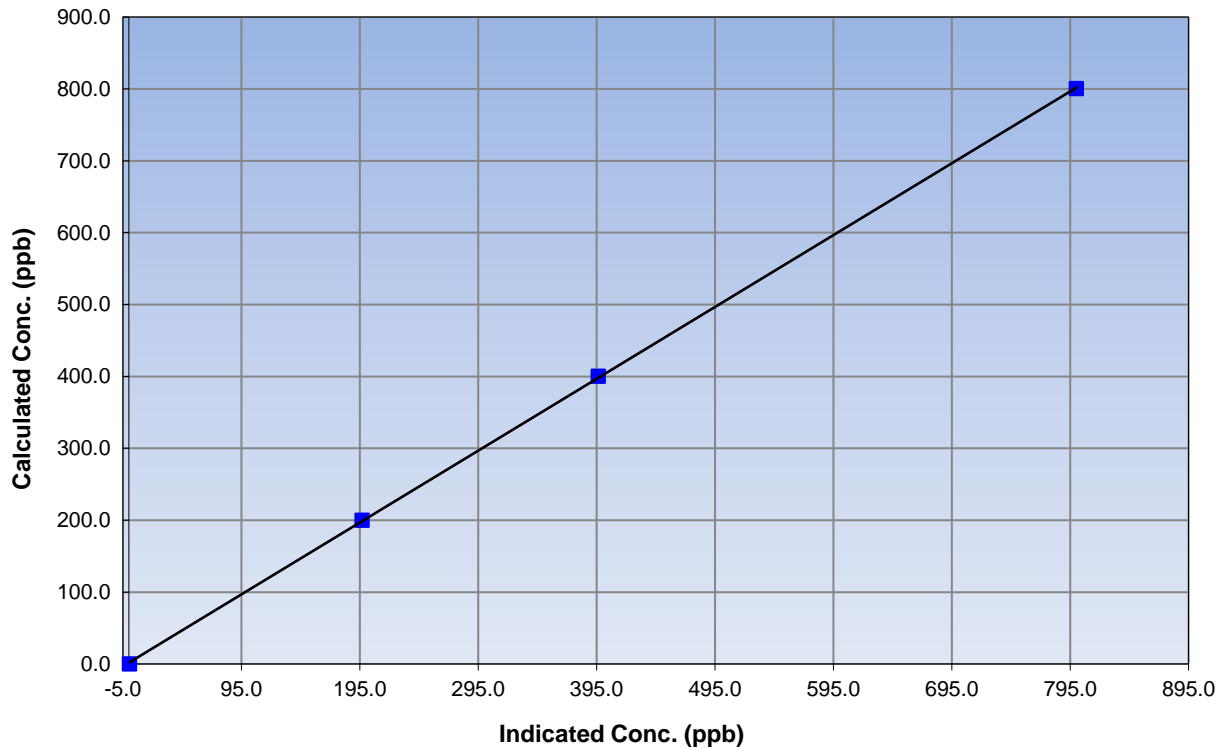
Station Information

Calibration Date	December 13, 2016	Previous Calibration	November 7, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:40	End Time (MST)	14:47
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	N/A	Correlation Coefficient	0.999959
800.4	800.3	1.0001		
400.2	396.3	1.0098	Slope	0.999687
200.1	196.9	1.0161		
			Intercept	1.769688

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

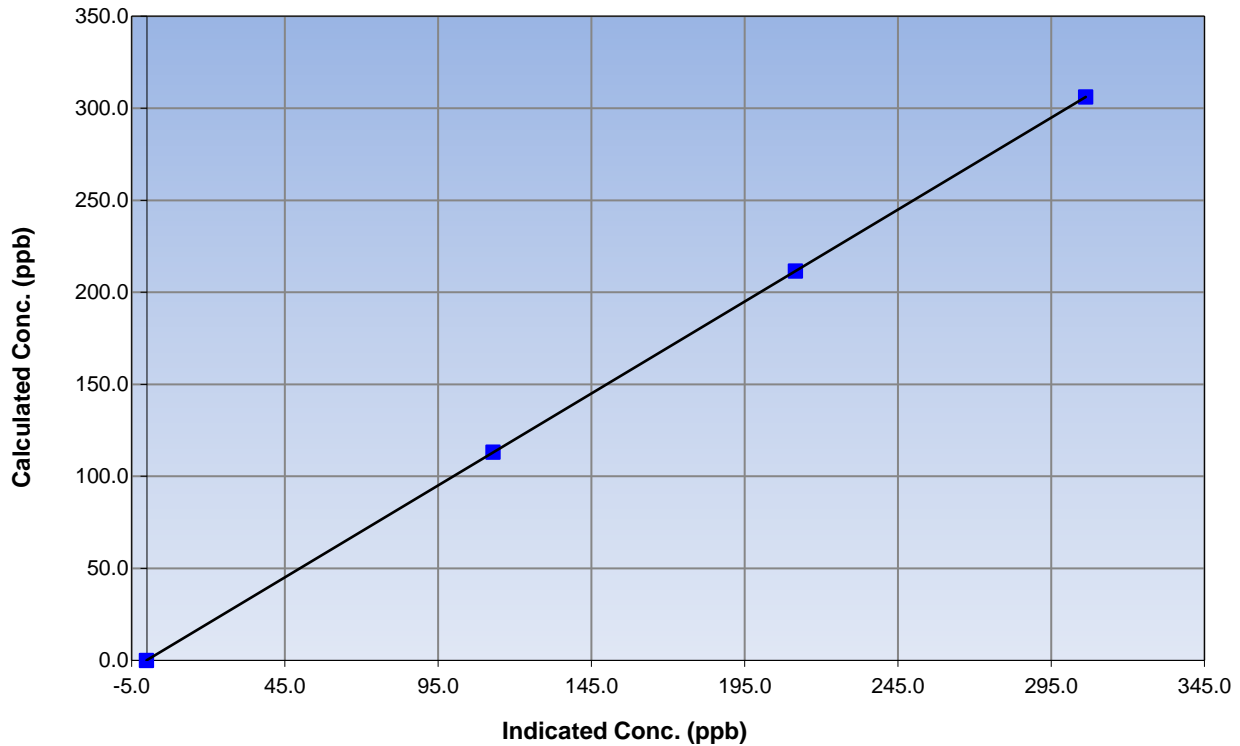
Station Information

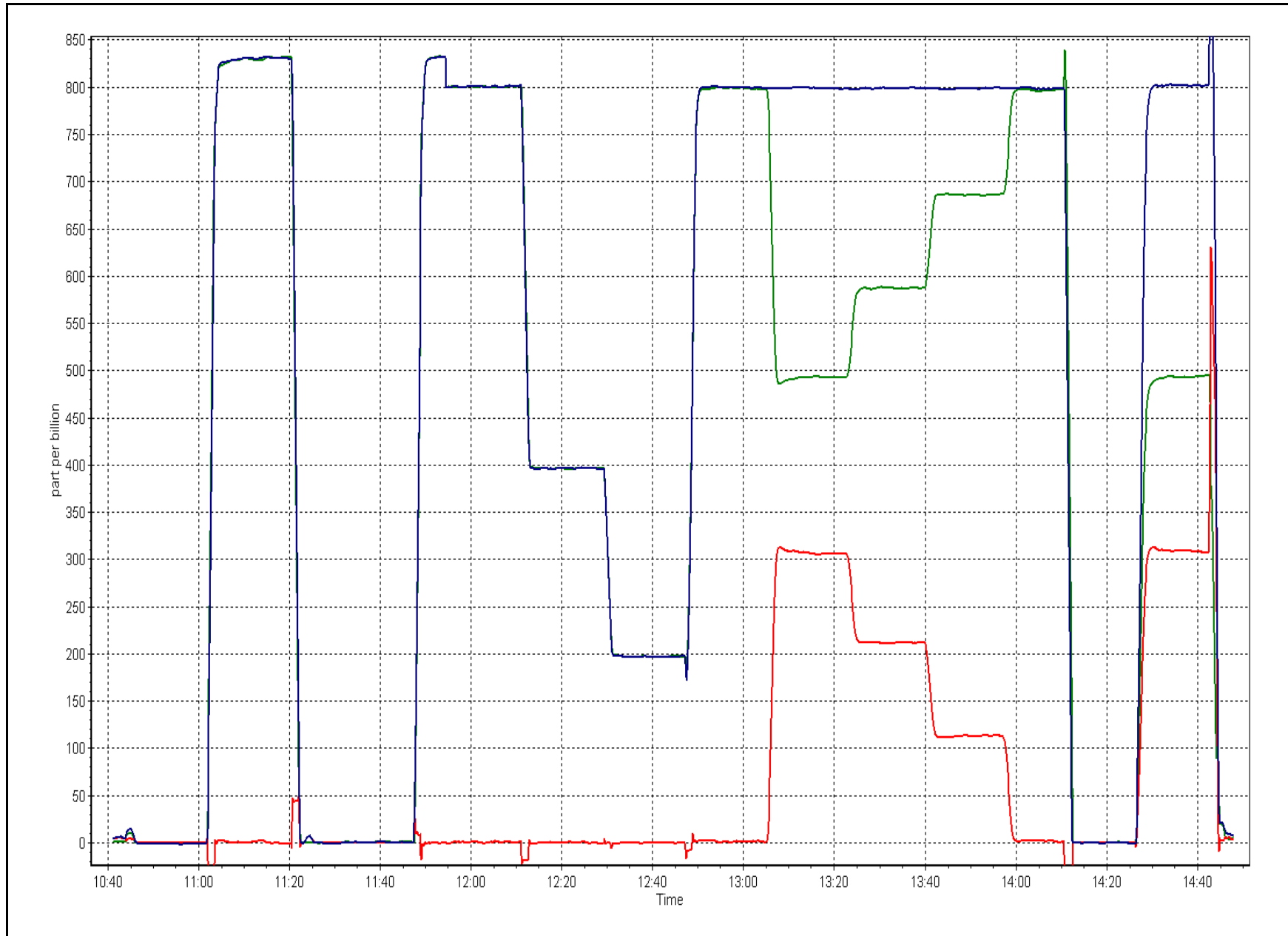
Calibration Date	December 13, 2016	Previous Calibration	November 7, 2016
Station Number	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:40	End Time (MST)	14:47
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	1.000000
306.1	306.3	0.9995		
211.5	211.6	0.9997	Slope	0.998903
113.1	113.0	1.0012		
			Intercept	0.190504

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 4 BUFFALO VIEWPOINT SEPTEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

Revision – January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
 SEPTEMBER 2016

MONTHLY SUMMARY for
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	682	38	38	100.00	34	0	6	0
H2S (ppb) Average	650	37	70	95.42	2	0	1	0
THC (ppm) Average	685	35	35	100.00	4.7	-	2.7	-
Temperature (C) Average	720	0	0	100.00	24.3	-	15	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	92	-
Wind Speed 10 m (km/h) Average	718	0	2	99.72	43	-	27	-
Wind Direction 10 m (deg) Average	718	0	2	99.72	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
 SEPTEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	682	0.6	3	-	0	0	0	0	0	1	34
H2S (ppb) Average	650	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	685	2.25	0.2	-	2	2.1	2.2	2.2	2.3	2.4	4.7
Temperature 2 m (C) Average	720	11.42	4.4	-	1.6	6.1	8.3	11.1	14.2	17.2	24.3
Relative Humidity (%) Average	720	70.8	18	-	29	43	56	73	85	94	99
Wind Speed 10 m (km/h) Average	718	11.3	6	-	0	5	7	10	13	19	43
Wind Direction 10 m (deg) Average	718	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
SEPTEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	27 Sep 2016 03:00	27 Sep 2016 13:00	11	Unstable operation - excessive baseline drift
H2S	27 Sep 2016 19:00	28 Sep 2016 09:00	15	Unstable operation - excessive baseline drift
H2S	28 Sep 2016 10:00	28 Sep 2016 16:00	7	Maintenance - replace SOx scrubber
Wind Speed, Wind Direction	16 Sep 2016 10:00	16 Sep 2016 11:00	2	Maintenance - sensor calibration



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 34 ppb on Sep 15 13:00	Maximum Daily Average: 5.7 ppb on Sep 20		Hours of Data:	682
Minimum Value: 0 ppb on Sep 21 15:00	Minimum Daily Average: 0.1 ppb on Sep 24		Hours of Missing Data:	38
Maximum Diurnal Average: 2.1 ppb at hour 13	Minimum Diurnal Average: 0.2 ppb at hour 6		Hours of Calibration:	38
Monthly Average: 0.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 14		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Sep	0	0	0	1	Z	0	0	0	0	1	0	0	0	13	2	0	0	1	0	0	0	0	0	0	0.9	13
2-Sep	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Sep	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.2	1
4-Sep	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Sep	0	0	0	0	0	Z	0	0	0	1	5	6	8	1	0	1	1	0	0	1	1	0	0	0	1.2	8
9-Sep	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
10-Sep	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Sep	4	6	Z	7	2	0	0	0	0	0	0	1	2	0	1	1	1	1	2	1	1	1	1	0	1.5	7
12-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Sep	0	0	0	0	0	Z	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0.4	2
15-Sep	Z	0	0	0	0	0	0	1	1	5	23	27	34	4	3	1	1	1	1	1	0	0	0	0	4.5	34
16-Sep	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1
20-Sep	0	0	0	0	0	Z	0	0	0	0	2	5	15	23	16	30	13	8	4	8	3	2	1	0	5.7	30
21-Sep	Z	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
22-Sep	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0.2	1
23-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0.1	1
26-Sep	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.3	1
27-Sep	Z	0	0	0	0	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0.2	0
28-Sep	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
29-Sep	0	0	Z	1	0	0	0	0	0	0	0	2	1	1	1	1	1	1	4	4	1	0	1	1	0.8	4
30-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

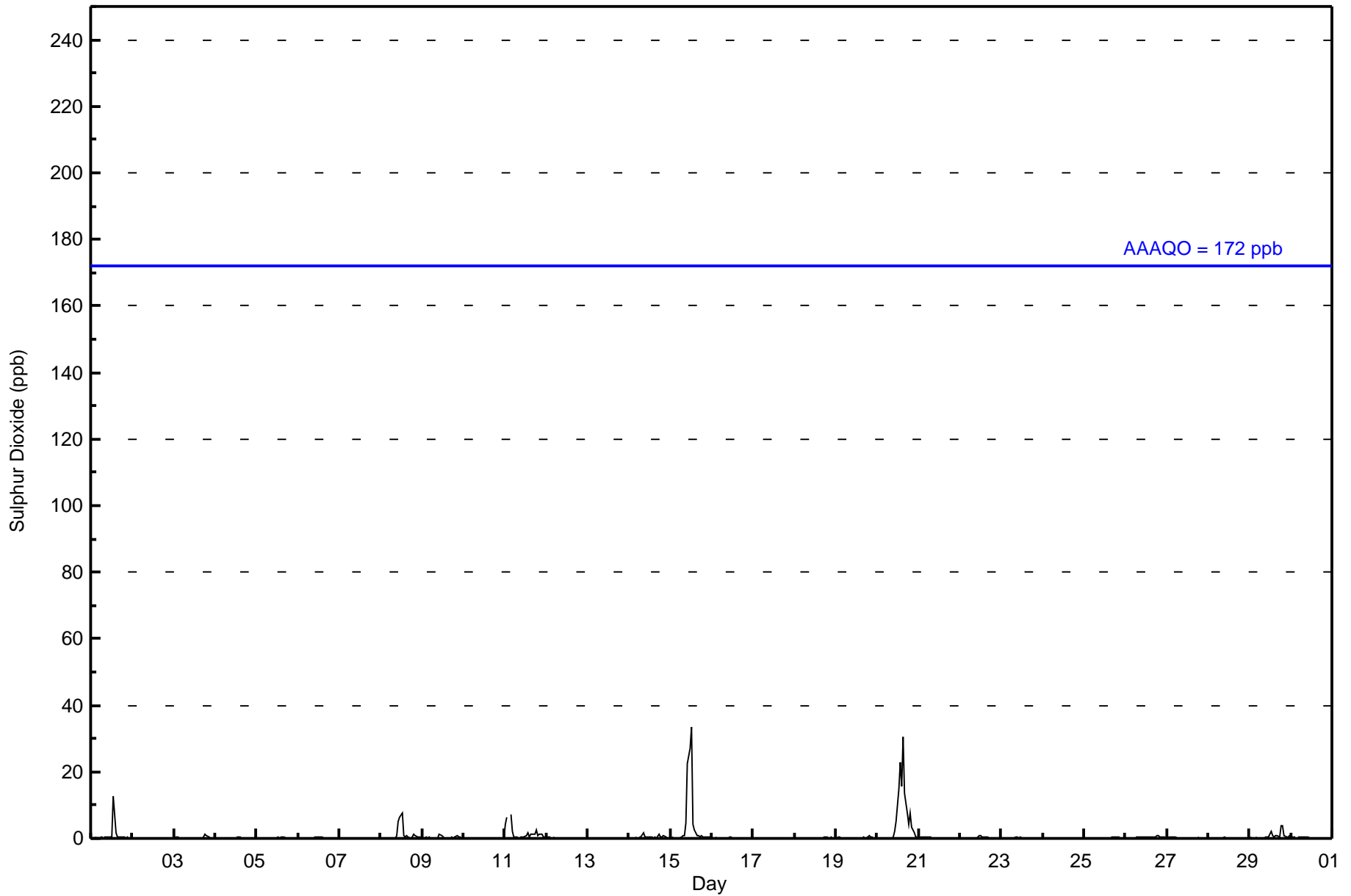
0.3	0.4	0.2	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.4	1.2	1.5	2.1	1.6	0.9	1.3	0.7	0.5	0.6	0.7	0.4	0.3	0.2	0.2	Diurnal Average
4	6	0	7	2	0	0	1	2	5	23	27	34	23	16	30	13	8	4	8	3	2	1	1	Diurnal Maximum	

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - September 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - September 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	673	98.68	98.68
11 - 20	4	0.59	99.27
21 - 60	5	0.73	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - September 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	48	24	7	1	9	19	57	150	39	34	44	53	58	46	53	29	671
11 - 20	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	4
21 - 60	0	1	1	0	0	2	1	0	0	0	0	0	0	0	0	0	5
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	48	26	9	2	10	21	58	150	39	34	44	53	58	46	53	29	680

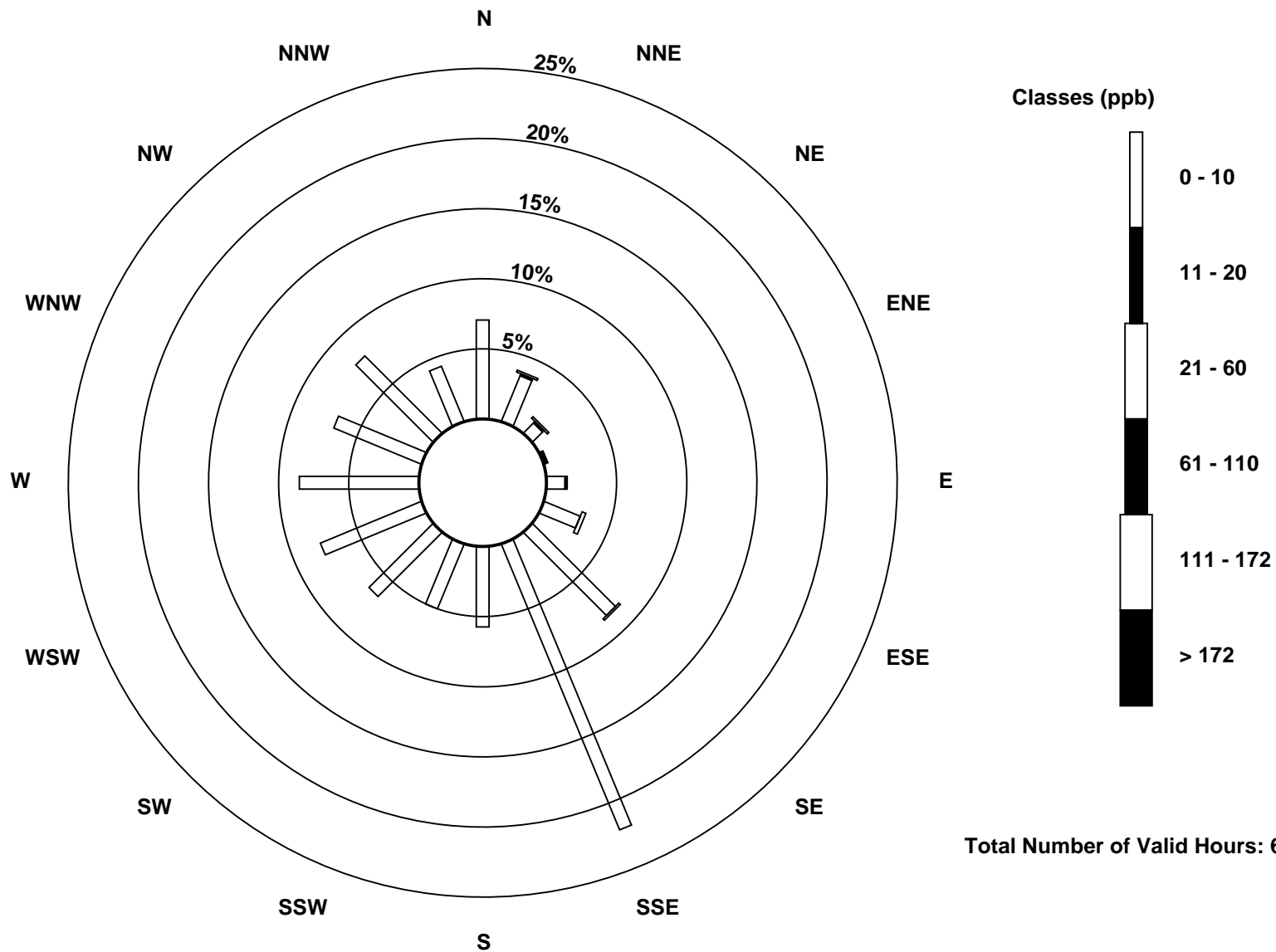
Total Number of Valid Hours: 680

Total Number of Hours: 720

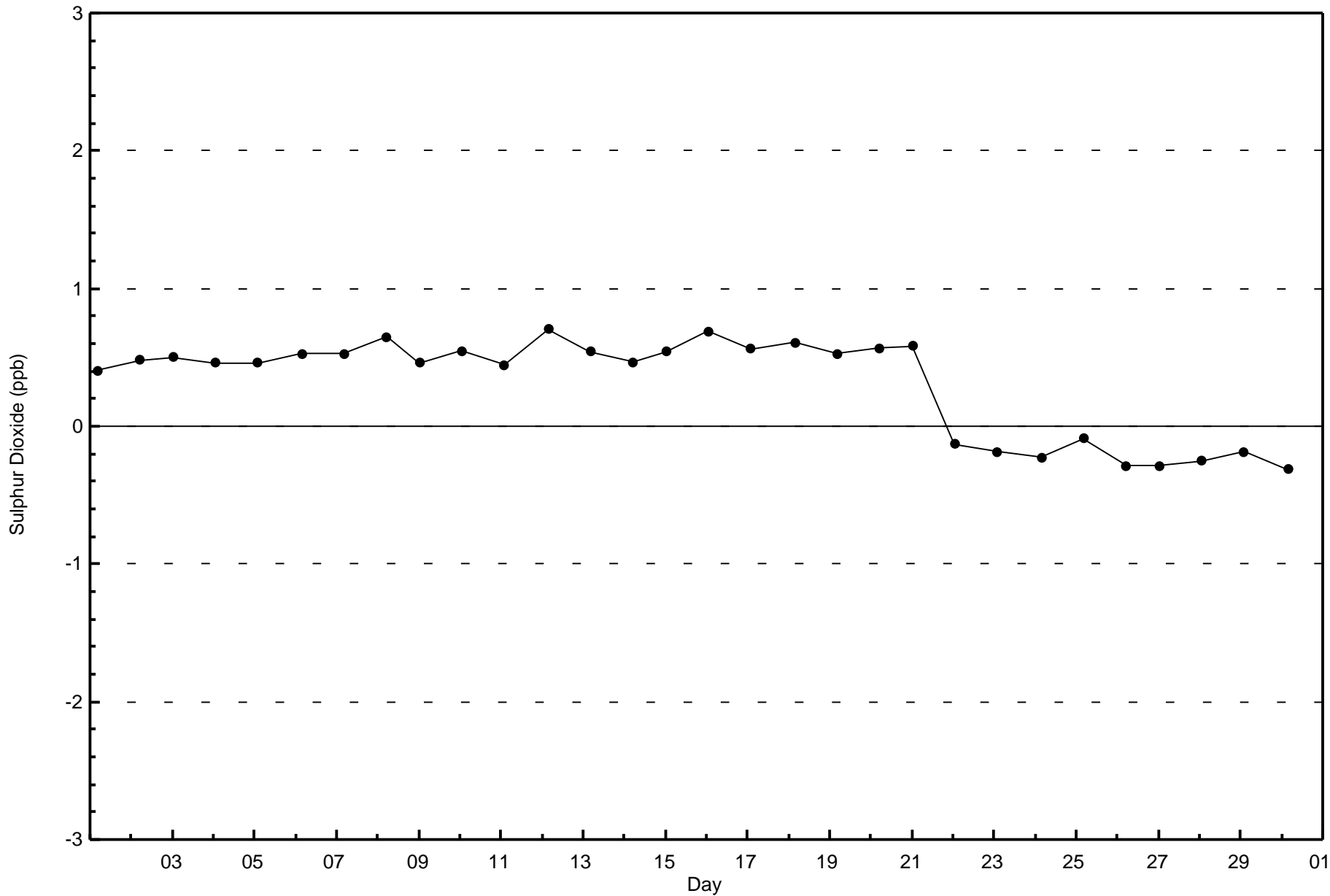


Wood Buffalo Environmental Association
Wind Rose Sep 2016

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint (AMS 4)



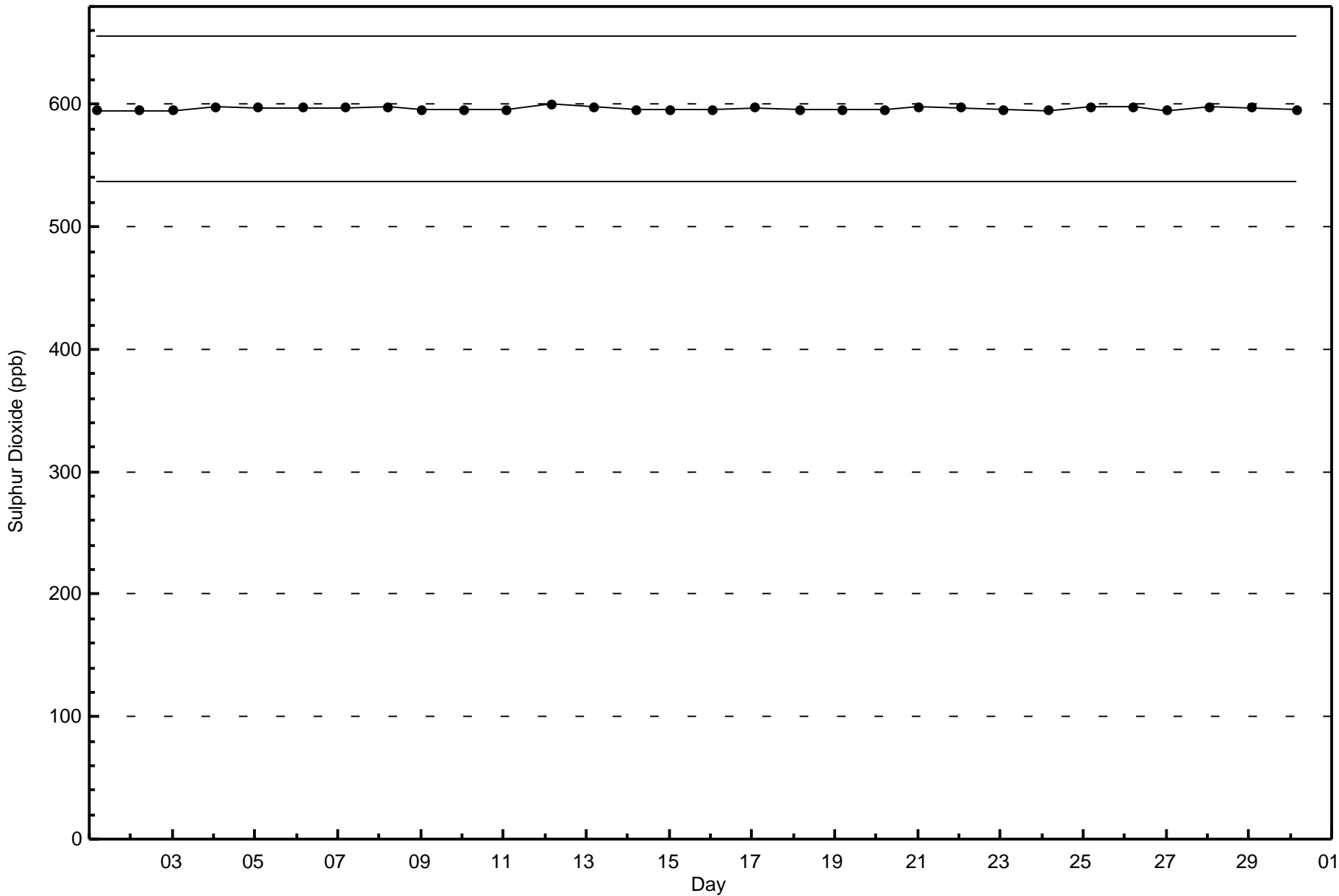
Total Number of Valid Hours: 680





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - September 2016





Number of Exceedences (AAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Sep 1 02:00	Maximum Daily Average: 0.7 ppb on Sep 1		Hours of Data:	650
Minimum Value: 0 ppb on Sep 25 13:00	Minimum Daily Average: 0.1 ppb on Sep 17		Hours of Missing Data:	70
Maximum Diurnal Average: 0.3 ppb at hour 2	Minimum Diurnal Average: 0.2 ppb at hour 17		Hours of Calibration:	37
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		Percent Operational Time:	95.4

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Sep	2	2	1	1	0	Z	0	0	0	0	0	1	2	1	1	1	1	1	1	0	1	0	0	0	0.7	2
2-Sep	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Sep	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Sep	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Sep	0	0	0	1	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
9-Sep	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Sep	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Sep	0	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
15-Sep	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
16-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Sep	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Sep	0	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	1	0	1	1	1	1	0	0.5	1
21-Sep	0	Z	0	0	0	1	1	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	1
22-Sep	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Sep	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Sep	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Sep	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
27-Sep	0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	AF	AF	AF	AF	AF	AF	--	0
28-Sep	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	M	M	M	M	0	0	0	0	0	0	0	--	0
29-Sep	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	0.5	2
30-Sep	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1

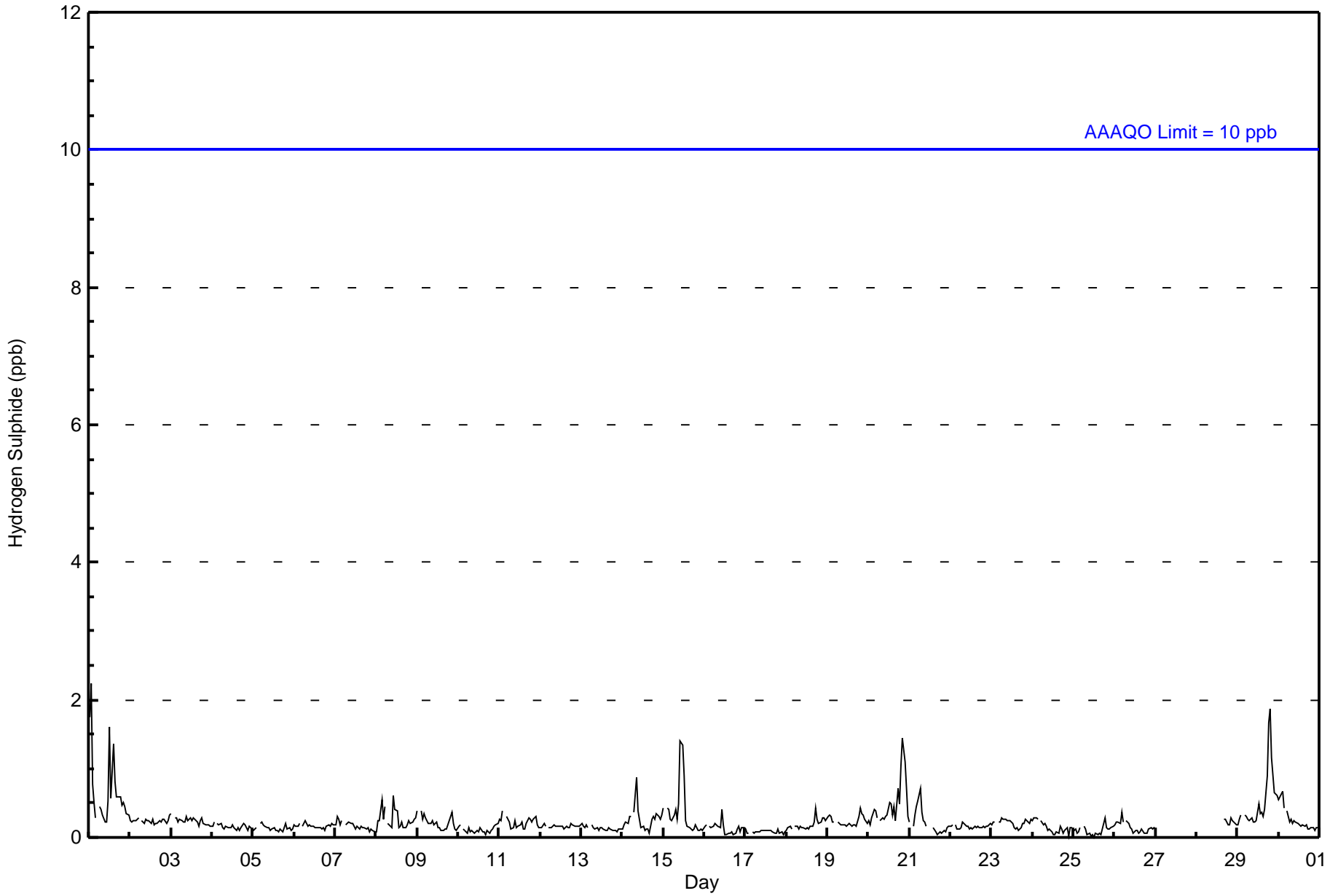
0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	Diurnal Average		
2	2	1	1	0	1	1	0	1	0	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1	1	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAQO): 1-hr 10 ppb 24-hr 3 ppb



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - September 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - September 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	650	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 650

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - September 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	47	26	9	2	10	20	58	140	39	35	39	43	55	42	53	30	648
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	47	26	9	2	10	20	58	140	39	35	39	43	55	42	53	30	648

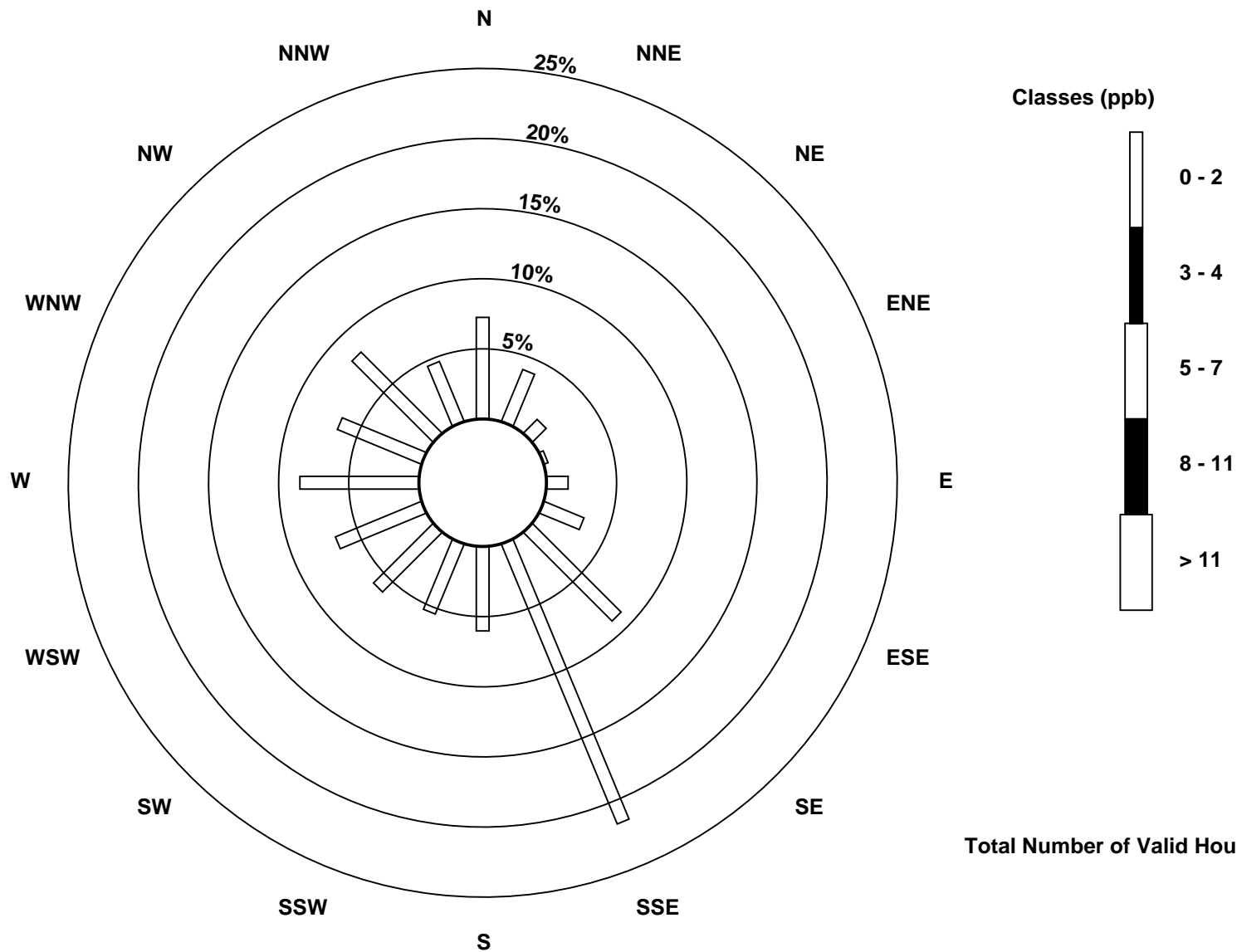
Total Number of Valid Hours: 648

Total Number of Hours: 720

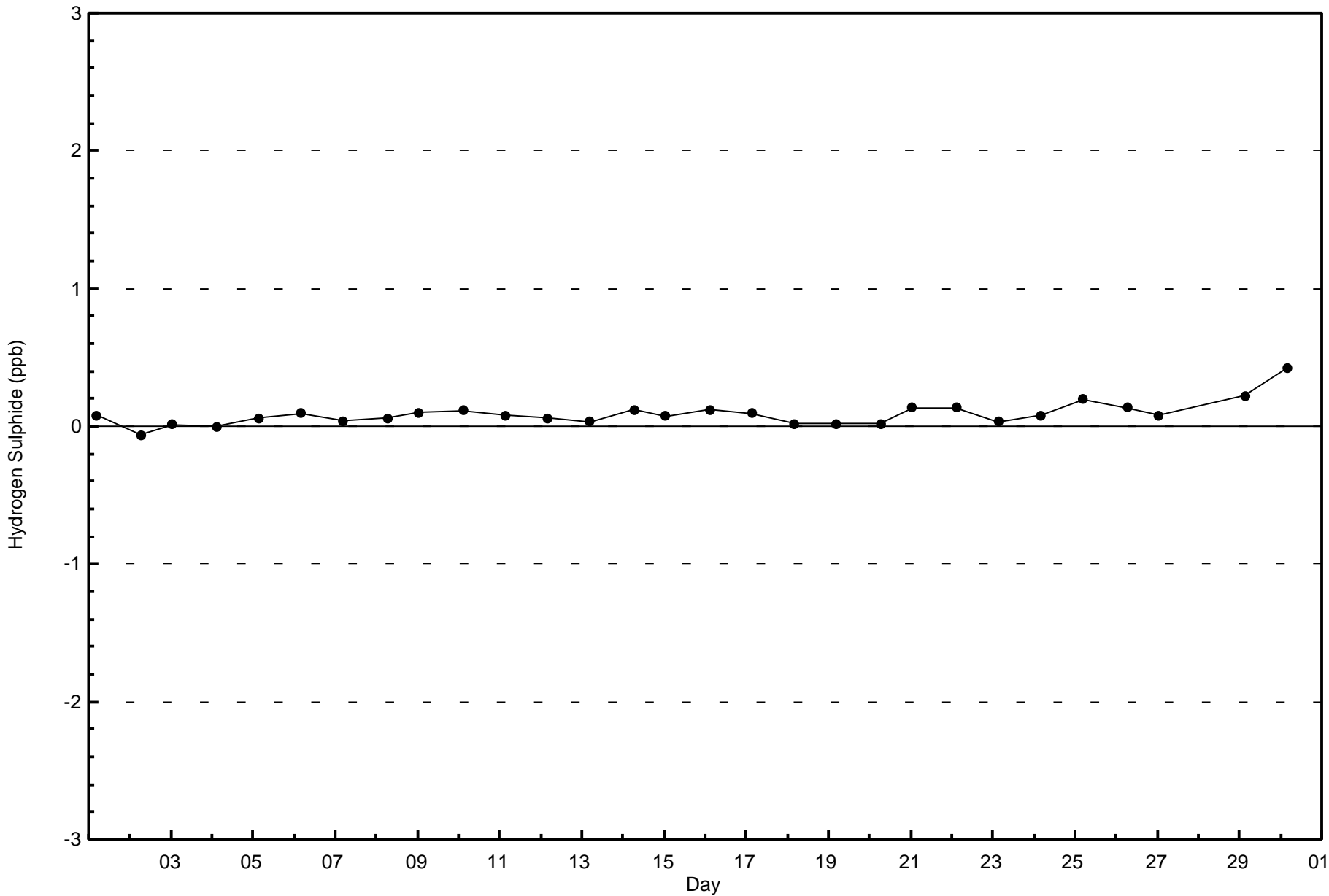


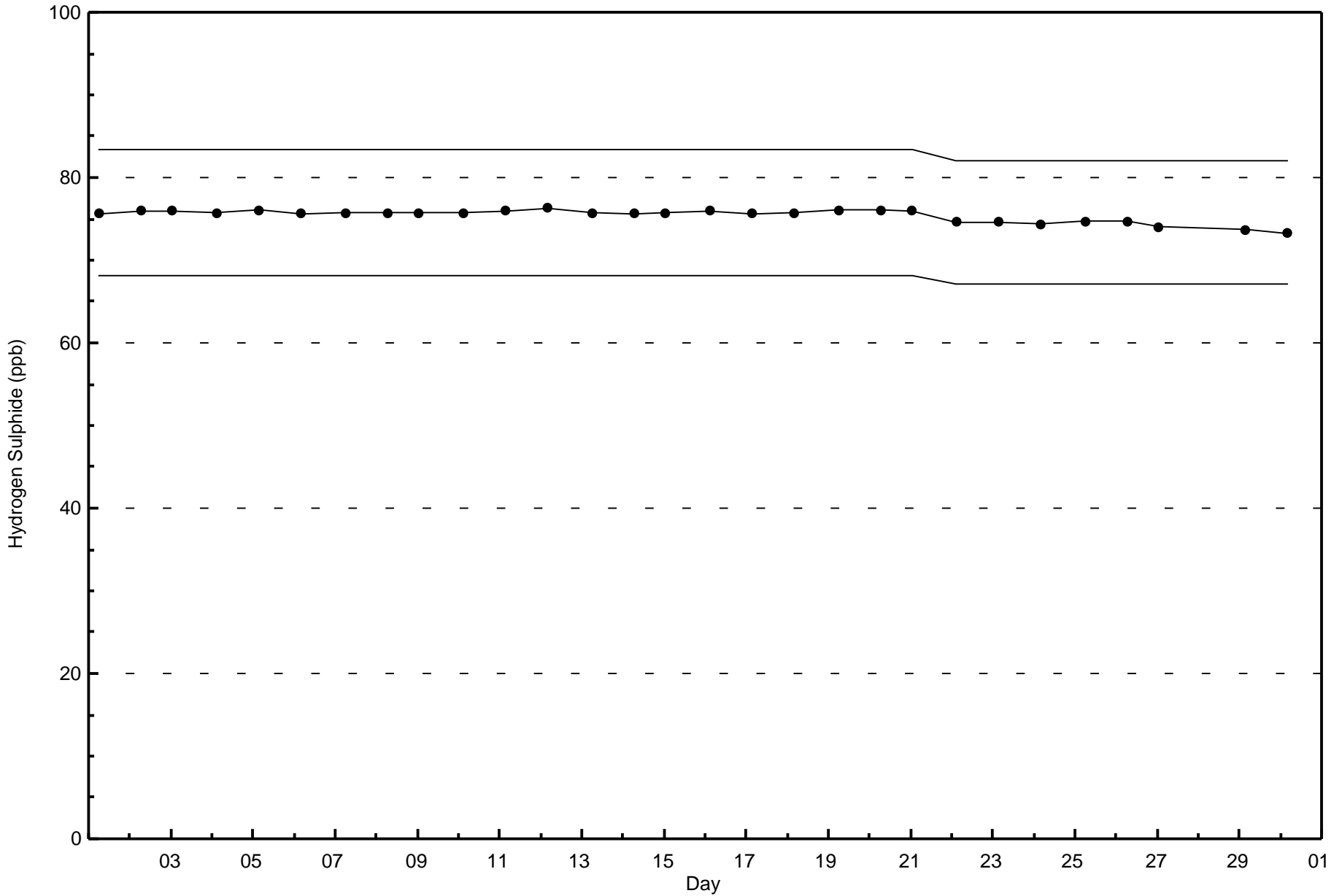
Wood Buffalo Environmental Association
Wind Rose Sep 2016

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 648







Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - September 2016

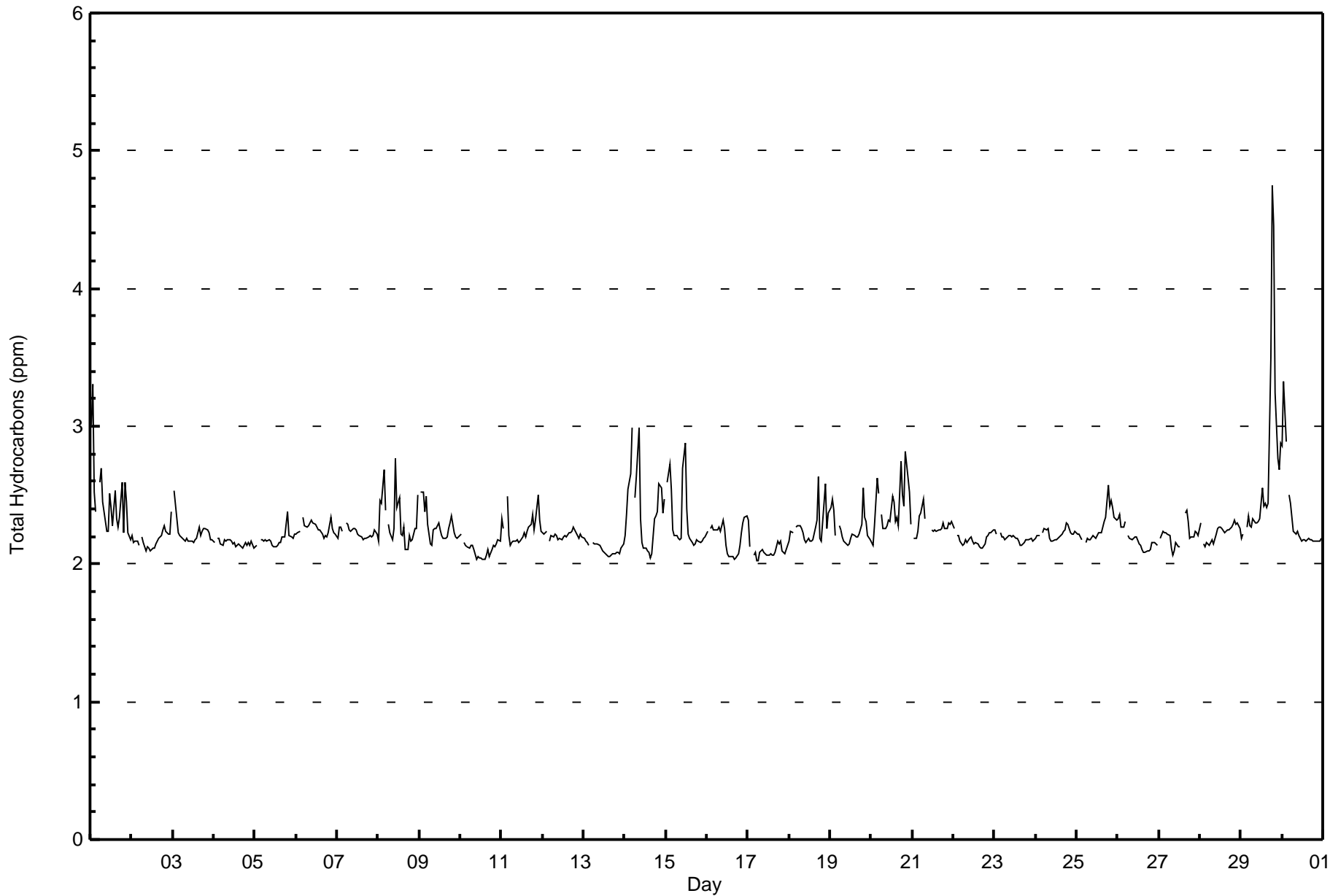
Maximum Value: 4.7 ppm on Sep 29 19:00		Maximum Daily Average: 2.7 ppm on Sep 29		Hours in Service: 720																						
Minimum Value: 2.0 ppm on Sep 17 06:00		Minimum Daily Average: 2.1 ppm on Sep 17		Hours of Data: 685																						
Maximum Diurnal Average: 2.4 ppm at hour 2		Minimum Diurnal Average: 2.2 ppm at hour 14		Hours of Missing Data: 35																						
Monthly Average: 2.25 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.2 Q ₃ = 2.3 P ₉₀ = 2.4 P ₉₉ = 2.9		Hours of Calibration: 35																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Sep	3.0	3.3	2.5	2.4	Z	2.6	2.7	2.5	2.4	2.2	2.2	2.5	2.4	2.3	2.5	2.3	2.3	2.3	2.6	2.2	2.6	2.4	2.2	2.2	2.5	3.3
2-Sep	2.2	2.2	2.2	2.2	2.1	Z	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.4	2.2	2.4
3-Sep	Z	2.5	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.5
4-Sep	2.2	Z	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.2
5-Sep	2.1	2.1	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.2	2.2	2.2	2.2	2.4
6-Sep	2.2	2.2	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.3	2.3
7-Sep	2.2	2.3	2.3	2.2	Z	2.3	2.3	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
8-Sep	2.2	2.5	2.4	2.7	2.4	Z	2.3	2.2	2.2	2.3	2.8	2.4	2.5	2.2	2.2	2.3	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.5	2.3	2.8
9-Sep	Z	2.5	2.5	2.4	2.5	2.3	2.1	2.1	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.2	2.2	2.2	2.2	2.3	2.5
10-Sep	2.2	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2
11-Sep	2.3	2.3	Z	2.5	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.2	2.3	2.5	2.3	2.2	2.3	2.5
12-Sep	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3
13-Sep	2.2	2.2	2.2	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
14-Sep	2.2	2.4	2.5	2.7	3.0	Z	2.5	2.6	3.0	2.3	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.3	2.3	2.4	2.6	2.6	2.4	2.5	2.4	3.0
15-Sep	Z	2.6	2.7	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.7	2.9	2.4	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.9
16-Sep	2.2	Z	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.3	2.2	2.3
17-Sep	2.3	2.1	Z	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.3
18-Sep	2.2	2.2	2.2	Z	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.6	2.2	2.2	2.4	2.6	2.3	2.4	2.3	2.6
19-Sep	2.4	2.5	2.4	2.2	Z	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.6	2.3	2.3	2.2	2.2	2.3	2.6
20-Sep	2.2	2.1	2.3	2.6	2.5	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.5	2.5	2.3	2.3	2.3	2.7	2.5	2.4	2.8	2.6	2.5	2.3	2.4	2.8
21-Sep	Z	2.2	2.2	2.2	2.4	2.4	2.5	2.3	C	C	C	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5
22-Sep	2.3	Z	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3
23-Sep	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
24-Sep	2.2	2.2	2.2	Z	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3
25-Sep	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.6	2.4	2.5	2.4	2.3	2.3	2.3	2.6
26-Sep	2.3	2.4	2.3	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.2	2.4
27-Sep	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.1	C	C	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.4
28-Sep	2.3	Z	2.1	2.1	2.2	2.1	2.2	2.2	2.1	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3
29-Sep	2.2	2.2	Z	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6	2.4	2.4	2.4	2.4	3.5	4.7	4.5	3.2	2.8	2.7	2.9	2.7	4.7
30-Sep	2.9	3.3	2.9	Z	2.5	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	3.3
																								Diurnal Average		
																								Diurnal Maximum		
																								2.3 3.0		
																								2.4 3.3		
																								2.3 2.9		
																								2.3 2.7		
																								2.3 3.0		
																								2.2 2.6		
																								2.2 2.7		
																								2.2 2.6		
																								2.2 3.0		
																								2.2 2.8		
																								2.2 2.9		
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																								2.2 2.5		
																								2.2 2.5		
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																								2.3 3.3		

Z - zerospan C - Calibration



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - September 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - September 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	10	1.46	1.46
2.1 - 3.0	669	97.66	99.12
3.1 - 10.0	6	0.88	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - September 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	1	1	2	4	2	0	0	0	10
2.1 - 3.0	48	26	9	2	8	19	58	150	37	33	42	50	58	46	53	28	667
3.1 - 10.0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	0	1	6
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	48	26	9	2	10	21	58	150	39	34	44	54	60	46	53	29	683

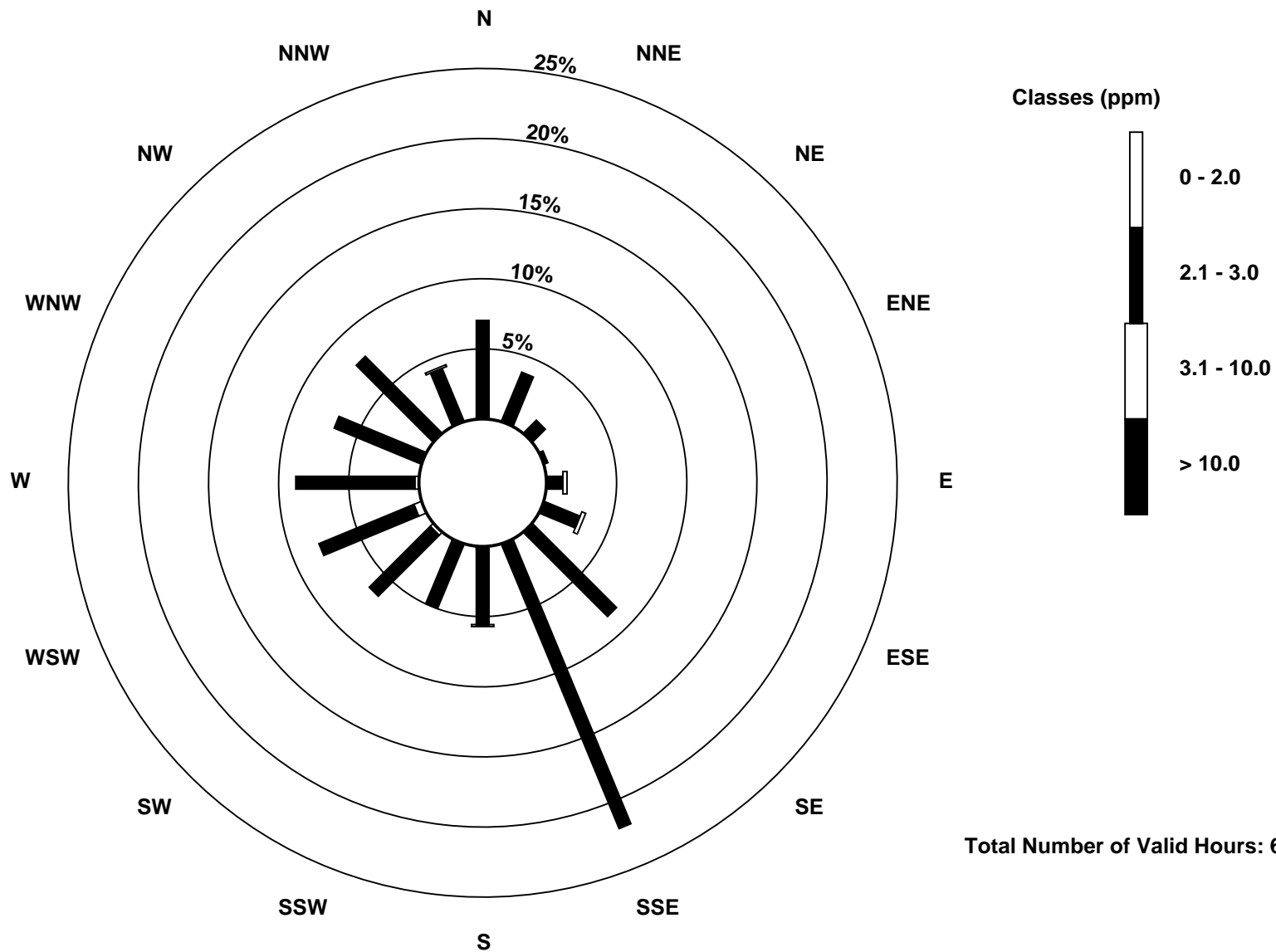
Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Sep 2016

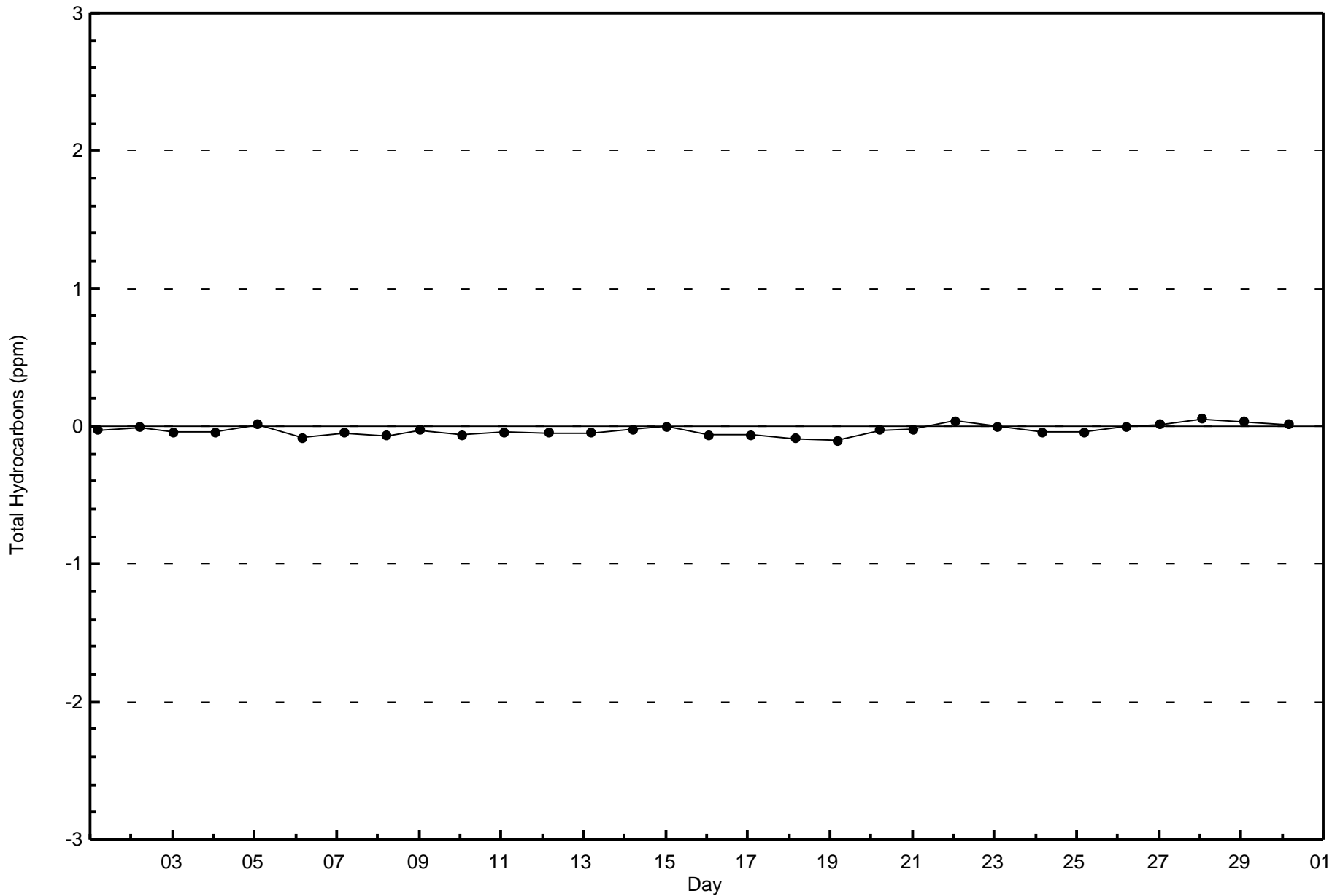
Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint (AMS 4)

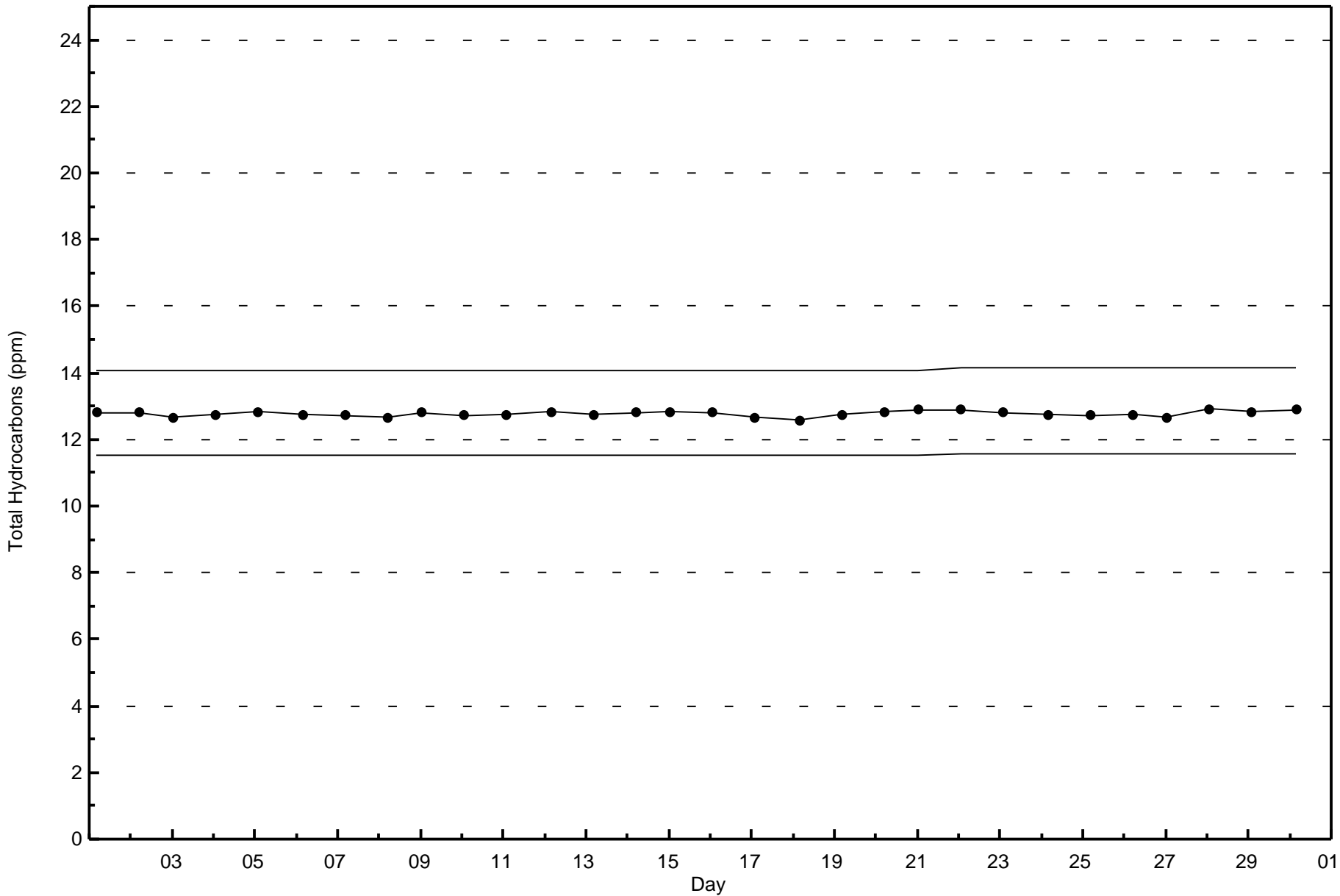




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - September 2016







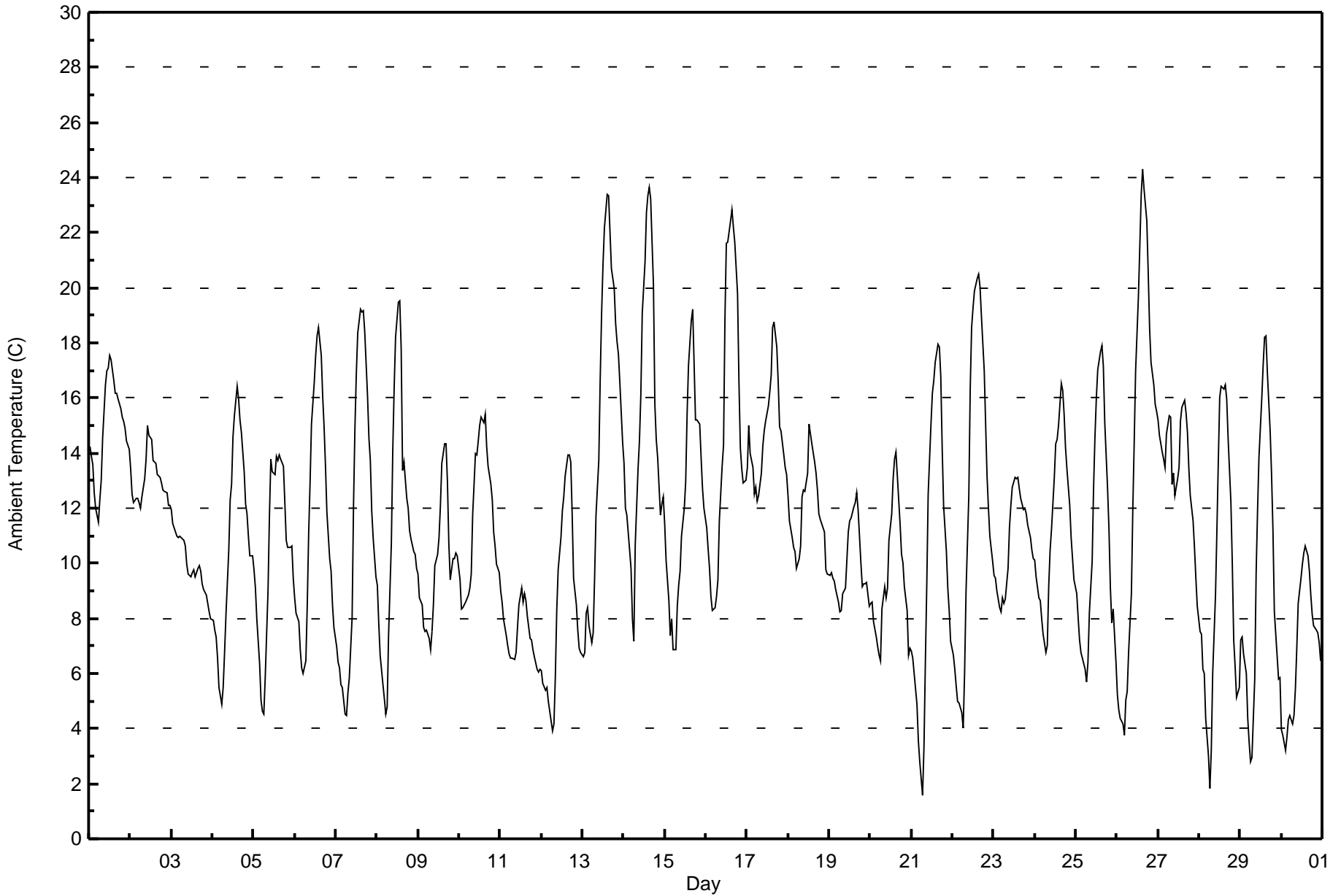
Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

Buffalo Viewpoint - September 2016

Maximum Value: 24.3 C on Sep 26 16:00		Maximum Daily Average: 15.0 C on Sep 14		Hours in Service: 720																							
Minimum Value: 1.6 C on Sep 21 07:00		Minimum Daily Average: 6.9 C on Sep 30		Hours of Data: 720																							
Maximum Diurnal Average: 16.3 C at hour 16		Minimum Diurnal Average: 7.0 C at hour 7		Hours of Missing Data: 0																							
Monthly Average: 11.42 C		Percentiles: P ₁ = 3.2 P ₁₀ = 6.1 Q ₁ = 8.3 Median = 11.1 Q ₃ = 14.2 P ₉₀ = 17.2 P ₉₉ = 23.3		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Sep	14.2	13.9	13.6	12.6	12.0	11.5	12.3	13.0	14.5	16.5	17.0	17.1	17.6	17.4	16.6	16.2	16.2	15.9	15.6	15.3	15.1	14.9	14.4	14.1	14.9	17.6	
2-Sep	13.4	12.5	12.2	12.3	12.3	12.2	12.0	12.4	13.0	13.8	15.0	14.6	14.5	13.7	13.7	13.6	13.2	13.1	12.9	12.6	12.6	12.6	12.1	12.1	13.0	15.0	
3-Sep	11.9	11.4	11.1	11.0	10.9	11.0	10.9	10.8	10.6	10.0	9.6	9.5	9.7	9.8	9.5	9.8	9.9	9.7	9.2	9.0	8.8	8.5	8.2	8.0	10.0	11.9	
4-Sep	7.9	7.6	7.3	6.6	5.5	4.9	5.5	6.8	8.2	10.5	12.3	12.9	14.6	15.4	16.4	15.9	15.2	14.7	13.3	12.1	11.8	11.0	10.3	10.3	10.7	16.4	
5-Sep	9.8	9.1	8.0	6.3	5.0	4.6	4.5	5.8	9.0	11.7	13.8	13.3	13.2	13.9	13.7	13.9	13.8	13.5	12.2	10.8	10.6	10.6	10.6	9.4	10.3	13.9	
6-Sep	8.7	8.2	7.9	6.9	6.2	6.0	6.4	8.5	11.1	12.9	15.1	16.6	17.6	18.2	18.6	17.6	16.1	14.9	13.5	11.8	10.1	9.7	8.5	7.7	11.6	18.6	
7-Sep	7.0	6.4	6.2	5.6	5.5	4.5	4.5	5.3	5.8	8.0	12.1	14.9	16.9	18.4	19.2	19.1	19.2	18.4	16.0	14.5	13.7	11.9	10.9	9.5	11.4	19.2	
8-Sep	9.2	7.8	6.7	5.6	5.1	4.5	4.8	7.4	10.7	14.1	16.4	18.2	19.5	19.5	17.8	13.4	13.7	12.3	12.0	11.2	10.9	10.4	10.3	9.8	11.3	19.5	
9-Sep	9.6	8.8	8.5	7.7	7.5	7.6	7.3	6.9	7.5	8.5	9.9	10.3	10.9	12.1	13.6	14.3	14.3	13.0	10.7	9.4	10.2	10.2	10.4	10.3	10.0	14.3	
10-Sep	9.4	8.4	8.4	8.5	8.6	8.9	9.1	9.6	11.8	14.0	13.9	14.4	15.0	15.3	15.1	15.4	14.2	13.5	12.9	12.3	11.2	10.6	10.0	9.6	11.7	15.4	
11-Sep	9.0	8.6	8.0	7.4	7.0	6.7	6.6	6.6	6.5	6.8	7.7	8.5	9.1	8.6	8.9	8.6	8.1	7.3	7.2	6.9	6.6	6.2	6.1	6.2	7.5	9.1	
12-Sep	6.1	5.7	5.4	5.5	5.0	4.6	3.9	4.2	5.9	8.3	9.7	10.9	11.9	12.4	13.2	13.9	13.9	13.7	11.8	9.5	8.5	7.6	6.9	6.8	8.6	13.9	
13-Sep	6.6	6.7	8.2	8.4	7.7	7.1	7.5	9.4	11.8	13.7	16.7	19.1	20.8	22.1	23.4	23.4	22.0	20.7	20.0	18.7	18.1	17.6	16.6	14.4	15.0	23.4	
14-Sep	13.6	12.0	11.8	10.5	9.8	8.0	7.2	10.7	13.4	14.4	16.1	19.1	21.0	22.7	23.3	23.6	23.2	20.1	15.8	14.5	13.8	11.7	12.1	12.4	15.0	23.6	
15-Sep	11.4	10.1	8.6	7.4	8.0	6.9	6.9	8.4	9.2	9.7	11.0	12.0	13.0	15.4	17.2	18.8	19.2	17.2	15.2	15.2	15.0	13.8	12.7	12.0	12.3	19.2	
16-Sep	11.3	10.5	9.8	8.8	8.3	8.4	8.8	9.4	11.5	13.5	14.3	18.9	21.6	21.6	22.4	22.8	22.2	21.6	19.8	16.6	14.2	13.4	12.9	13.0	14.8	22.8	
17-Sep	13.5	15.0	14.0	13.5	12.5	12.8	12.3	12.4	13.3	14.2	14.8	15.2	15.7	16.2	16.8	18.6	18.8	17.9	16.6	15.0	14.8	13.9	13.5	13.2	14.8	18.8	
18-Sep	12.4	11.6	10.9	10.6	10.4	9.8	10.2	10.6	12.4	12.7	12.6	13.3	15.1	14.7	14.3	13.7	13.3	12.7	11.8	11.6	11.3	11.1	9.8	9.6	11.9	15.1	
19-Sep	9.6	9.6	9.5	9.4	9.1	8.6	8.2	8.3	8.9	9.1	10.1	11.1	11.5	11.6	12.1	12.2	12.6	12.0	10.0	9.1	9.2	9.3	9.3	8.4	10.0	12.6	
20-Sep	8.5	8.6	7.9	7.3	7.0	6.7	6.5	8.3	9.1	8.8	9.1	10.8	11.8	13.1	13.8	14.0	13.2	11.4	10.3	10.0	9.1	8.3	6.7	6.9	9.5	14.0	
21-Sep	6.8	6.5	5.4	4.9	3.6	2.8	1.6	3.3	6.4	9.2	12.5	15.1	16.2	16.6	17.3	18.0	17.8	16.8	14.2	12.1	10.4	9.1	8.3	7.2	10.1	18.0	
22-Sep	6.7	6.2	5.5	5.0	4.9	4.6	4.0	6.1	8.9	12.5	16.3	18.5	19.3	19.9	20.4	20.5	20.0	19.0	17.0	15.0	13.2	12.0	11.0	10.1	12.4	20.5	
23-Sep	9.6	9.5	9.0	8.4	8.3	8.8	8.5	8.7	9.8	11.3	12.1	12.7	13.1	13.1	13.1	12.7	12.3	11.9	12.0	11.8	11.4	10.9	10.5	10.2	10.8	13.1	
24-Sep	10.1	9.5	8.7	8.7	8.0	7.4	6.7	7.0	9.1	10.5	11.2	13.1	14.3	14.5	15.0	16.5	16.2	15.4	14.2	13.4	12.1	10.9	10.2	9.4	11.3	16.5	
25-Sep	8.9	8.1	7.2	6.8	6.5	6.2	5.7	6.4	8.2	10.1	12.7	14.6	16.0	17.0	17.7	17.9	17.2	15.1	12.7	11.2	9.1	7.8	8.3	6.4	10.7	17.9	
26-Sep	5.2	4.7	4.4	4.2	3.8	5.0	5.3	6.7	8.9	12.0	14.4	17.0	19.7	21.5	23.4	24.3	23.6	22.4	20.6	18.5	17.3	16.5	15.7	15.5	13.8	24.3	
27-Sep	15.2	14.6	14.1	13.8	13.5	14.7	15.3	15.3	12.9	13.3	12.5	13.1	13.5	15.2	15.7	15.9	15.5	14.7	13.4	12.4	11.6	10.6	9.5	8.5	13.5	15.9	
28-Sep	7.5	7.4	6.1	6.0	4.4	3.0	1.8	3.2	6.0	8.8	11.2	13.7	16.0	16.4	16.3	16.5	16.0	14.5	12.2	10.0	7.2	6.2	5.2	5.5	9.2	16.5	
29-Sep	7.2	7.3	6.7	6.0	4.4	3.5	2.8	2.9	5.8	9.7	11.9	13.8	16.0	17.2	18.2	18.3	17.0	14.8	13.2	11.2	8.2	6.6	5.8	5.9	9.8	18.3	
30-Sep	4.0	3.7	3.2	3.7	4.3	4.5	4.2	4.5	5.4	6.9	8.5	9.5	10.0	10.4	10.6	10.3	9.7	8.8	8.2	7.7	7.6	7.5	7.1	6.4	6.9	10.6	
		9.5	9.0	8.5	8.0	7.5	7.2	7.0	8.0	9.5	11.2	12.7	14.1	15.2	15.8	16.2	16.3	15.9	14.9	13.5	12.3	11.5	10.7	10.1	9.6	Diurnal Average	
		15.2	15.0	14.1	13.8	13.5	14.7	15.3	15.3	14.5	16.5	17.0	19.1	21.6	22.7	23.4	24.3	23.6	22.4	20.6	18.7	18.1	17.6	16.6	15.5	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Buffalo Viewpoint - September 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	300	41.67	41.67
10 - 20	393	54.58	96.25
> 20	27	3.75	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



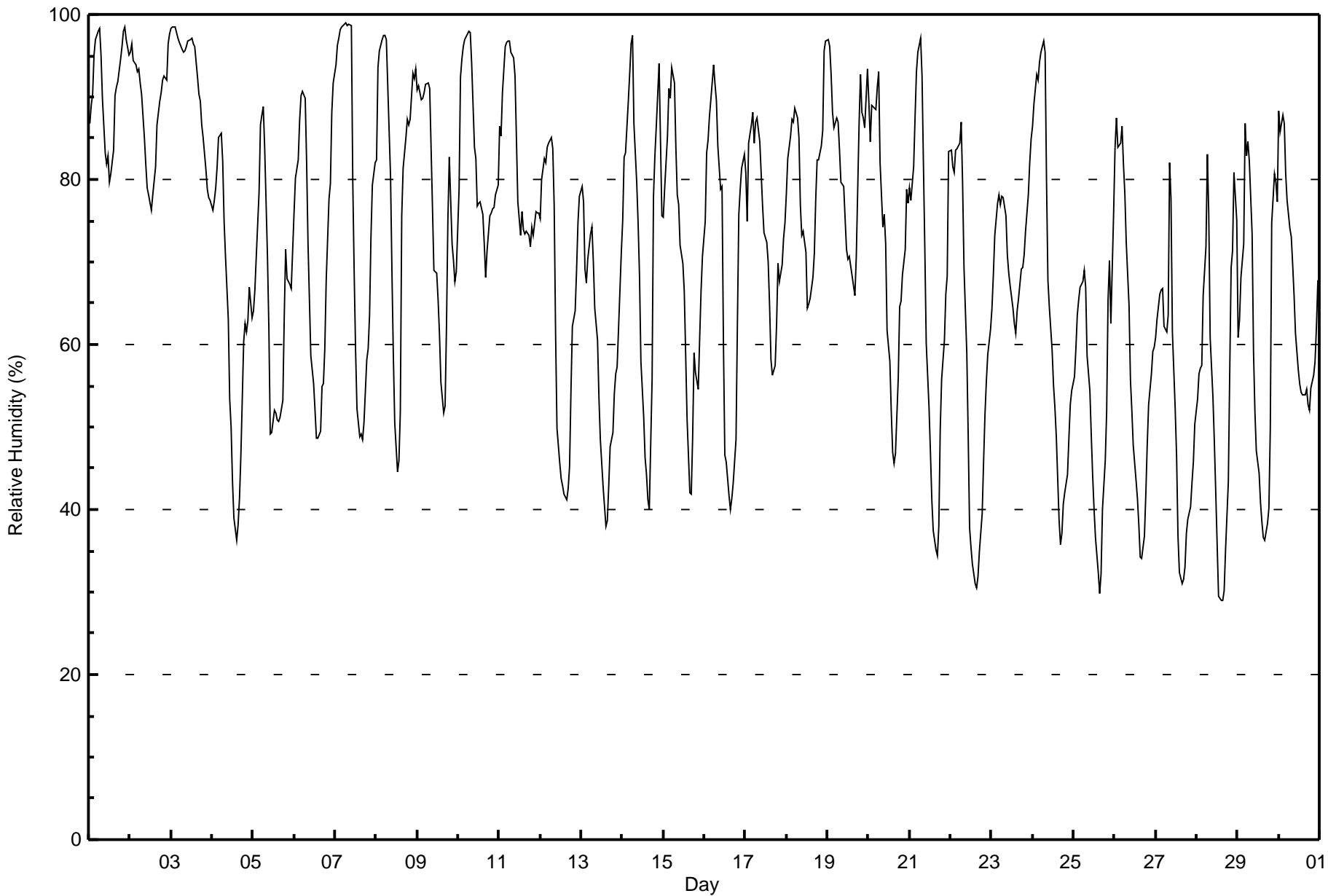
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Buffalo Viewpoint - September 2016

Maximum Value: 99 % on Sep 7 07:00 Maximum Daily Average: 92.2 % on Sep 3																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 29 % on Sep 28 16:00 Minimum Daily Average: 52.1 % on Sep 27 Maximum Diurnal Average: 87.7 % at hour 7 Minimum Diurnal Average: 51.6 % at hour 16 Monthly Average: 70.8 % Percentiles: P ₁ = 31 P ₁₀ = 43 Q ₁ = 56 Median = 73 Q ₃ = 85 P ₉₀ = 94 P ₉₉ = 99																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Sep	87	89	90	95	97	98	98	95	90	83	82	83	80	81	84	90	91	92	95	96	98	98	97	95	91.0	98
2-Sep	95	96	94	94	93	93	92	90	85	82	79	78	76	78	80	81	87	89	91	92	93	92	97	98	88.6	98
3-Sep	98	99	99	98	97	97	96	95	96	96	97	97	97	96	96	92	90	89	87	85	81	79	78	78	92.2	99
4-Sep	76	77	79	81	85	86	82	75	71	63	53	50	43	39	36	38	41	47	60	63	61	63	67	63	62.6	86
5-Sep	64	67	71	78	87	88	89	84	71	62	49	49	52	52	51	51	51	53	63	72	68	67	67	71	65.7	89
6-Sep	76	80	82	87	90	91	90	82	72	65	59	55	52	49	49	50	55	55	59	68	78	80	88	92	71.0	92
7-Sep	94	96	97	98	99	99	99	99	99	99	80	69	59	52	49	49	48	51	58	60	64	73	79	82	77.1	99
8-Sep	82	93	96	97	98	97	97	91	80	69	59	50	45	46	52	76	81	85	87	87	87	93	92	93	80.6	98
9-Sep	91	91	90	90	90	92	92	91	84	76	69	69	65	61	55	52	52	62	75	83	72	70	68	69	75.4	92
10-Sep	79	92	95	96	97	98	98	98	94	84	83	77	77	77	76	72	68	71	76	76	76	77	78	79	83.1	98
11-Sep	86	85	91	96	97	97	97	95	95	93	85	77	73	76	74	73	74	73	72	74	73	76	76	76	82.7	97
12-Sep	75	80	83	82	84	84	85	84	77	61	50	46	44	43	42	41	43	45	54	62	64	69	75	78	64.6	85
13-Sep	79	77	69	67	70	73	74	70	64	61	54	48	46	43	38	39	43	48	49	54	56	57	62	71	58.9	79
14-Sep	75	83	83	90	93	96	97	87	80	75	68	58	51	46	44	41	40	56	78	83	86	94	85	76	73.5	97
15-Sep	75	79	85	91	90	93	92	84	78	77	72	70	66	59	51	42	42	49	59	57	55	61	66	71	69.3	93
16-Sep	75	83	85	88	90	94	92	90	84	79	79	60	47	46	42	40	41	43	49	63	76	79	81	83	70.3	94
17-Sep	81	75	84	87	88	84	87	88	85	81	77	73	72	70	65	58	56	57	62	70	68	70	73	75	74.4	88
18-Sep	78	83	85	87	87	89	88	85	77	73	74	71	64	65	66	68	71	78	82	82	84	86	96	97	79.8	97
19-Sep	97	96	93	88	86	87	87	83	80	79	75	72	70	71	68	67	66	71	87	93	88	87	86	93	82.1	97
20-Sep	89	85	89	89	88	91	93	82	74	76	72	62	58	52	47	46	47	56	65	65	68	72	79	77	71.7	93
21-Sep	79	77	82	87	93	95	97	93	82	72	60	52	47	41	37	35	34	38	50	56	61	66	68	83	66.1	97
22-Sep	84	82	81	84	84	84	87	79	69	59	49	38	35	33	31	31	32	35	40	46	51	56	59	62	57.9	87
23-Sep	64	69	73	77	78	77	78	78	76	71	69	67	64	63	61	64	66	69	69	71	74	78	82	85	71.8	85
24-Sep	86	89	93	92	94	95	97	95	80	68	65	59	55	52	49	39	36	37	41	42	44	49	53	54	65.2	97
25-Sep	56	59	64	65	67	68	69	67	59	54	49	44	40	37	32	30	32	40	46	52	65	70	62	76	54.3	76
26-Sep	84	88	84	84	86	82	78	72	65	56	52	48	44	41	38	34	34	37	42	48	53	56	59	60	59.3	88
27-Sep	61	63	66	67	67	62	62	64	82	78	61	52	46	37	32	31	32	33	37	39	40	43	46	50	52.1	82
28-Sep	53	56	57	57	66	72	83	76	61	54	48	42	36	30	29	29	30	35	43	57	69	71	81	75	54.6	83
29-Sep	61	63	68	72	87	83	85	82	73	59	52	47	44	41	39	37	36	38	40	50	75	81	80	77	61.2	87
30-Sep	88	86	88	87	81	77	74	73	70	66	61	57	55	54	54	54	55	53	52	55	56	58	62	68	66.0	88
79.1 81.3 83.1 85.1 86.9 87.4 87.7 84.2 78.3 72.3 66.0 60.7 56.9 54.3 52.2 51.6 52.5 56.2 62.3 66.6 69.5 72.4 74.7 76.9																								Diurnal Average		
98 99 99 98 99 99 99 99 99 99 99 97 97 97 96 96 92 91 92 95 96 98 98 97 98																								Diurnal Maximum		





Maximum Speed: 43 km/h on Sep 11 07:00	Maximum Daily Speed Average: 26.1 km/h on Sep 11	Hours in Service: 720
Minimum Speed Value: 0 km/h on Sep 4 19:00	Minimum Daily Speed Average: 1.5 km/h on Sep 9	Hours of Data: 718
Maximum Diurnal Speed Average: 5.6 km/h at hour 16	Minimum Diurnal Speed Average: 1.3 km/h at hour 19	Hours of Missing Data: 2
Monthly Average Velocity: 2.7 km/h 254.9 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 7 Median = 10 Q ₃ = 13 P ₉₀ = 19 P ₉₉ = 33	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Sep	E8	ESE9	E5	N5	NNE7	NNE7	N9	NNE9	NNE9	NNE8	N8	NNE8	E10	E9	E7	SE2	NNE8	SW2	N7	NNW4	WNW9	W9	W9WSW13	NNE3.5	WSW13	
2-Sep	WSW11	SSW8	WSW9	W16WSW13	SW9WSW10	SSW4	WSW9	WSW9	W9WSW11	W10	WSW9	SW8	W11	W8	WSW6	NW5	W6	WNW9	W11	W13	NW18	W8.9	NW18			
3-Sep	NNW21	NW16WNW13	W12	W13	W15	W16	W18WNW17WNW21	NW22	NW23	NW19	NW20	NW20	NW22	NW21	NW25	NW25	NW21	NW24	NW21	NW20WNW17	NW18.4	NW25				
4-Sep	WNW22WNW21WNW16	W14WSW12	W13	W12	W10WSW11	W11	W13	W12WNW10	WNW9	NW8	WNW6	WSW4	SW3	W0	NE4	SW7	SSW7	SSW7WSW11	W8.7	WNW22						
5-Sep	WSW10	SW7	S6	SSE7	SSE8	SSE7	SSE7	SSE7	SSE6	S7	S12	S12	SSW11	S10	SSE7	ESE8	SE10	SE9	SE7	SE8	SE10	SE9	SSE9	SSE10	SSE7.2	S12
6-Sep	SE10	SE11	SE11	SE8	SE7	SSE7	SSE7	SSE9	SSE9	SSE10	SSE11	SE11	SE11	SE11	SE13	SSE16	S9	SSE12	SSE10	SSE9	SE8	SSE9	SE7	SSE9	SSE9.7	SSE16
7-Sep	SSE7	SSE7	SSE8	SSE9	SSE9	SSE8	SSE9	SSE9	SSE7	SSE4	ESE7	ESE9	ESE9	ESE10	SE8	SSE4	SE7	SSE5	SSW7	SW5	SSW7	SSW7	S5	SSE4	SSE6.1	ESE10
8-Sep	SSW3	S6	S6	SSE7	SSE8	SSE8	SSE8	S6	S5	NW5	NNW4	NNW4	NW6	NW7	W8	NW7	SW5	W3	N10	SW2	WNW6	NNW17	NNW13	NW10	WNW1.9	NNW17
9-Sep	NW12	NW12	NW13	NW12	NNW10	N9	NNE13	NNE13	N13	N10	NNE6	NW4	SW5	SW6	SW5	S5	SSE5	SE8	SE6	SE8	SE11	SE12	SE14	SSE12	NNE1.5	SE14
10-Sep	SSE13	SE12	SE13	SE15	SSE15	SSE14	SSE14	SE12	SSE8	SW12	W14WSW16WSW15	W16	W16	WNW19	WNW24	W18	W16	WNW19	WNW17	WNW18	WSW8.2	WNW24				
11-Sep	NNW27	NNW34	NNW32	NNW33	NNW39	N41	N43	N39	N37	N37	N35	N30	NNW31	N27	N24	N21	NNW18	NW19	NNW14	NNW14	NNW11	NW11	WNW13	WNW11	NNW26.1	N43
12-Sep	WNW10	W9	W9	WSW8	WSW5	WSW10	WSW11	WSW8	SSW3	SW7	WSW8	SSW9	SSW10	SSW11	SSW10	SSW9	S10	S7	SSE8	SSE9	SSE9	SSE9	SSE11	SSE12	SSW6.3	SSE12
13-Sep	SE12	SE10	S12	S12	SSE11	SSE10	S7	SSW10	SSW9	SSW8	SSW10	SSW10	SSW15	SW14	WSW16	SW14	SW13	SW13	SW13	SW14	SW14	WSW14	W15	W11	SSW10.1	WSW16
14-Sep	WNW11	NW7	W4	NW5	WNW3	SSE5	SSE5	SE1	NNE2	SE7	SE9	ESE9	ESE9	S9	SW10	WSW14	WSW13	NNW22	NNW15	N5	SSW5	S7	WSW8	WNW11	WSW2.6	NNW22
15-Sep	NW10	WNW9	NNW7	N7	ENE4	NE8	NE8	NE9	NE10	NE6	ESE4	ESE4	SE7	ESE9	SE10	ESE11	SE11	ESE7	SE6	SSE11	SSE12	SE8	SSE9	SSE10	ESE4.2	SSE12
16-Sep	SE10	SE7	SSE7	SSE8	SE8	SE8	SSE6	SSE7	SSE7	M	M	SSW9	SW15	SW17	WSW19	WSW17	WSW12	SW10	SW9	SSE8	SSE7	SSE9	SE10	SSE10	S7.7	WSW19
17-Sep	SSE9	SW12	SSW9	S7	SSE8	SSW9	S8	S6	S8	SSW6	SW7	SW8	SW8	SW9	WSW11	WSW13	W15	WNW12	SW8	SW9	SW10	WSW12	WSW15	W10	SW8.0	WSW15
18-Sep	W9	W8	SW6	WSW5	WSW5	SSW5	W11	W11	WNW11	WNW16	WNW19	WNW18	NW22	NW23	NW21	NW19	NNW17	N13	N12	N11	NNW7	NNW11	NNE7	N7	NNW9.9	NW23
19-Sep	N6	NW11	NW12	NW13	NW14	WNW11	WNW13	WNW18	WNW15	WNW16	WNW13	NW12	NW14	NW14	NW17	NW16	NW14	WNW11	NNW8	NNW8	NW11	NW9	NW14	N16	NW12.1	WNW18
20-Sep	N17	N20	N9	NW10	N12	N10	N8	N11	N11	NNW5	NW6	NNW4	NE5	NNE5	NNE7	NE6	ENE5	ESE6	SE5	E5	ESE5	E2	SE8	SE7	NNE5.1	N20
21-Sep	SE6	SSE7	SSE7	S7	S6	S6	S7	SSE6	S5	SSW6	SSE6	SSE8	SSW7	SW8	SW10	WSW10	WSW9	SW9	SSW7	S8	SSE9	SSE10	SE10	SE11	S6.6	SE11
22-Sep	SE10	SE11	SE7	SE8	SSE7	SSE7	SSE6	SSE6	SSE8	SE6	SSE5	SSW15	SSW16	SSW14	S14	S14	S12	S12	SSE12	SSE11	SSE11	SSE10	SSE11	SSE13	SSE9.6	SSW16
23-Sep	SSE15	SSE11	SSE11	SSE11	SSE14	SSE15	SSE15	SSE11	SSE11	SSE16	SSW20	SSE16	SSE17	SSE17	SSE18	SSE13	SSE14	SSE14	SSE15	SSE13	SSE12	SSE13	SSE13	SSE12	SSE14.0	SSE20
24-Sep	SSE12	SSE10	SSE11	SSE11	SSE10	SSE9	SSE8	SSE7	SW10	WSW17	WSW19	W19	W22	W23	WNW19	WNW24	WNW26	WNW19	W9	WSW11	WSW12	W14	W14	WSW10.0	WNW26	
25-Sep	WSW18	W15	W11	W12	W13	W13	W14	W13	W18	W13	WNW14	WNW15	NW14	NW13	NW14	NW15	NNW13	NNW10	SE1	S5	SSW5	SW6	SW6	SSE6	W9.6	WSW18
26-Sep	SSE7	SE9	SSE8	SSE9	SSE9	SE9	SSE9	SSE11	SSE11	SSE13	SSE12	SSE12	SSE14	SSE14	SSE15	S15	S14	S12	SSE13	SSE12	SSE11	SSE11	SSE12	SE13	SSE11.3	SSE15
27-Sep	SE12	SSE8	SSE7	SSE7	SSE9	WSW11	W13	WSW15	SW12	W14	NW23	WNW21	W17	WNW22	WNW24	W24	W21	WSW16	SW13	WSW14	WSW15	WSW17	WSW10	W10	WSW11.7	W24
28-Sep	WSW9	WSW10	WSW11	WSW11	S5	SSE6	SE8	SE7	SSE8	SE6	SE5	ESE3	N6	SW8	SW8	SW7	SW7	SSW6	S5	S6	SSE9	SSE9	SE10	SE5	S4.9	WSW11
29-Sep	E5	ESE5	SE4	SE5	SSE7	SSE7	S7	SSE7	SSE6	SSE3	ESE5	ESE4	NNE6	NNE6	N9	N8	NE5	E7	ESE6	E4	S6	SSE6	N4	N5	ESE2.5	N9
30-Sep	NNW3	NNW8	N11	N11	N13	N13	NNE12	N14	N14	N18	N22	NNE24	NNE26	NNE30	NNE32	N33	NNE32	N30	NNE29	NNE28	NNE27	NNE27	NNE25	N22	N20.9	N33

WSW1.9	WSW2.2	WSW2.2	WSW2.6	SSW2.0	SSW2.0	SW1.9	WSW1.9	WSW2.0	W3.3	W3.8	W3.7	W3.8	W4.4	W4.9	W5.6	W4.5	W3.4	W1.3	SW1.5	SW3.1	SW3.1	SW2.8	WSW2.5	Diurnal Average
NNW27	NNW34	NNW32	NNW33	NNW39	N41	N43	N39	N37	N37	N35	N30	NNW31	NNE30	NNE32	N33	NNE32	N30	NNE29	NNE28	NNE27	NNE27	NNE25	N22	Diurnal Maximum

M - Maintenance
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

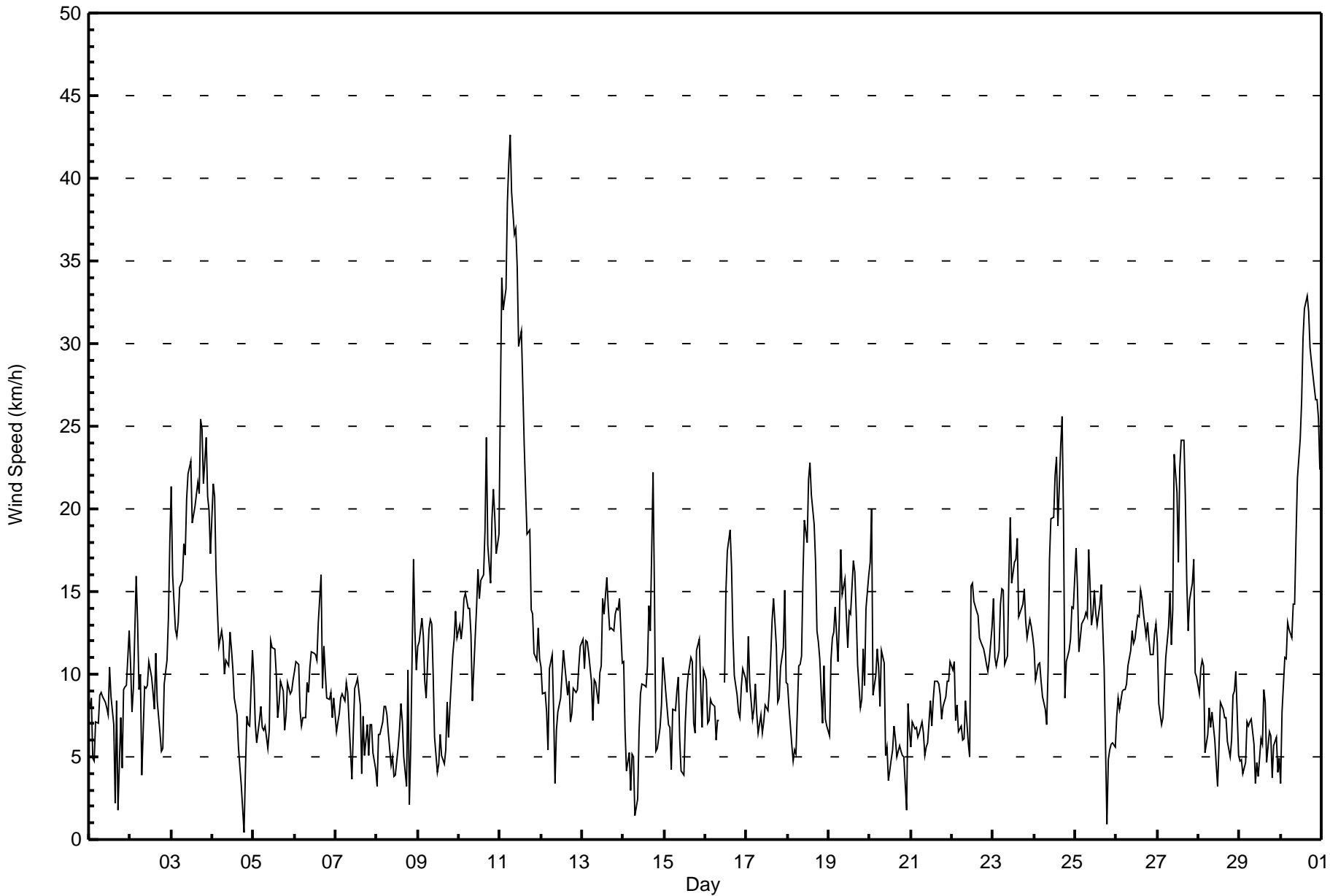
Wind Speed (WS) - km/h
Buffalo Viewpoint - September 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 12 km/h on Sep 8 16:00	Hours of Data: 718
Minimum Value: 1 km/h on Sep 29 22:00	Hours of Missing Data: 2
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 7	Hours of Calibration: 0
	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Sep	1	2	1	1	1	1	2	2	2	2	2	3	3	3	3	2	5	1	2	2	3	2	2	3	5
2-Sep	3	2	3	4	4	2	3	2	3	3	2	3	3	2	2	3	3	2	3	1	3	3	3	3	4
3-Sep	5	3	3	3	3	4	4	5	4	5	5	5	4	4	4	5	5	6	6	5	5	4	4	4	6
4-Sep	5	5	4	4	3	3	3	3	3	3	3	4	3	3	3	2	2	2	1	1	2	2	2	4	5
5-Sep	4	2	1	1	2	1	1	2	2	3	4	3	3	3	3	3	3	3	1	1	2	2	2	2	4
6-Sep	2	2	2	1	1	2	2	2	3	3	3	4	4	3	4	5	3	3	3	2	1	2	2	2	5
7-Sep	1	1	1	1	1	1	2	2	2	2	2	2	3	3	2	3	2	1	3	3	1	1	1	2	3
8-Sep	2	1	1	2	1	1	2	2	1	2	2	2	2	2	4	12	8	3	7	1	1	5	3	2	12
9-Sep	3	3	3	3	2	2	3	3	3	3	2	2	2	3	2	2	2	2	1	2	3	3	3	3	3
10-Sep	3	3	3	4	4	4	3	3	3	4	5	4	4	5	4	5	6	5	4	5	5	5	5	5	6
11-Sep	7	6	6	7	7	7	7	7	6	6	6	6	6	5	4	4	4	5	3	3	3	2	3	3	7
12-Sep	2	2	2	2	2	2	2	3	1	2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	3
13-Sep	2	3	3	3	2	3	2	3	3	3	3	3	4	4	4	4	3	3	3	3	3	3	4	2	4
14-Sep	2	2	1	2	1	1	1	2	1	2	3	2	3	3	3	4	4	8	4	5	2	1	2	2	8
15-Sep	4	2	2	2	1	2	1	2	2	2	2	2	2	2	3	3	3	2	2	2	3	2	2	2	4
16-Sep	2	1	1	1	1	1	1	2	1	M	M	3	4	5	5	5	4	2	1	1	1	2	1	1	5
17-Sep	2	4	2	2	1	3	1	1	2	1	2	2	2	3	3	5	4	4	1	1	2	3	3	4	5
18-Sep	2	2	1	2	2	2	3	3	4	4	5	5	5	5	5	4	4	2	2	2	2	3	3	2	5
19-Sep	1	3	2	3	3	3	4	4	3	4	3	3	4	3	3	4	3	2	3	2	2	3	5	4	5
20-Sep	4	4	3	2	3	3	2	3	3	2	2	2	2	2	2	2	1	1	1	1	1	2	1	1	4
21-Sep	1	1	1	1	1	1	1	1	1	2	2	3	3	3	4	4	4	2	1	1	1	1	1	1	4
22-Sep	1	2	1	1	2	1	2	2	2	1	3	4	4	4	4	4	4	4	3	2	2	2	2	3	4
23-Sep	3	2	2	2	3	3	4	3	3	5	5	5	5	5	5	4	4	4	4	4	3	4	3	3	5
24-Sep	3	2	2	2	2	2	2	1	4	5	5	5	7	6	6	7	7	7	2	2	2	2	3	3	7
25-Sep	4	4	3	3	3	3	3	4	4	3	4	4	4	4	4	4	3	1	2	1	1	1	1	1	4
26-Sep	1	1	1	1	2	2	2	3	3	4	3	3	4	4	4	5	4	3	3	2	2	2	2	2	5
27-Sep	3	2	2	2	2	6	4	5	4	8	6	5	5	6	6	7	6	4	3	3	4	4	3	2	8
28-Sep	2	2	2	2	2	1	1	1	2	1	2	1	2	3	3	3	2	1	1	1	2	2	1	2	3
29-Sep	1	1	2	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	2	1	1	2	1	2
30-Sep	3	1	1	2	2	3	3	3	3	4	4	5	5	7	6	7	6	6	6	6	6	6	5	5	7

7	6	6	7	7	7	7	7	7	6	8	6	6	7	7	6	12	8	8	7	6	6	6	5	5	
Diurnal Maximum																									

M - Maintenance





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Buffalo Viewpoint - September 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	78	10.86	10.86
6 - 11	374	52.09	62.95
12 - 19	202	28.13	91.09
20 - 28	46	6.41	97.49
29 - 38	14	1.95	99.44
> 38	4	0.56	100.00

Total Number of Valid Hours: 718

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Buffalo Viewpoint - September 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	4	2	3	2	5	7	8	9	7	6	7	4	3	1	4	6	78
6 - 11	20	12	6	0	5	14	48	108	23	25	26	29	22	14	13	9	374
12 - 19	11	3	0	0	0	0	10	39	11	5	12	24	32	24	23	8	202
20 - 28	6	6	0	0	0	0	0	1	0	0	0	0	4	10	16	3	46
29 - 38	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	14
> 38	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
Totals	50	27	9	2	10	21	66	157	41	36	45	57	61	49	56	31	718

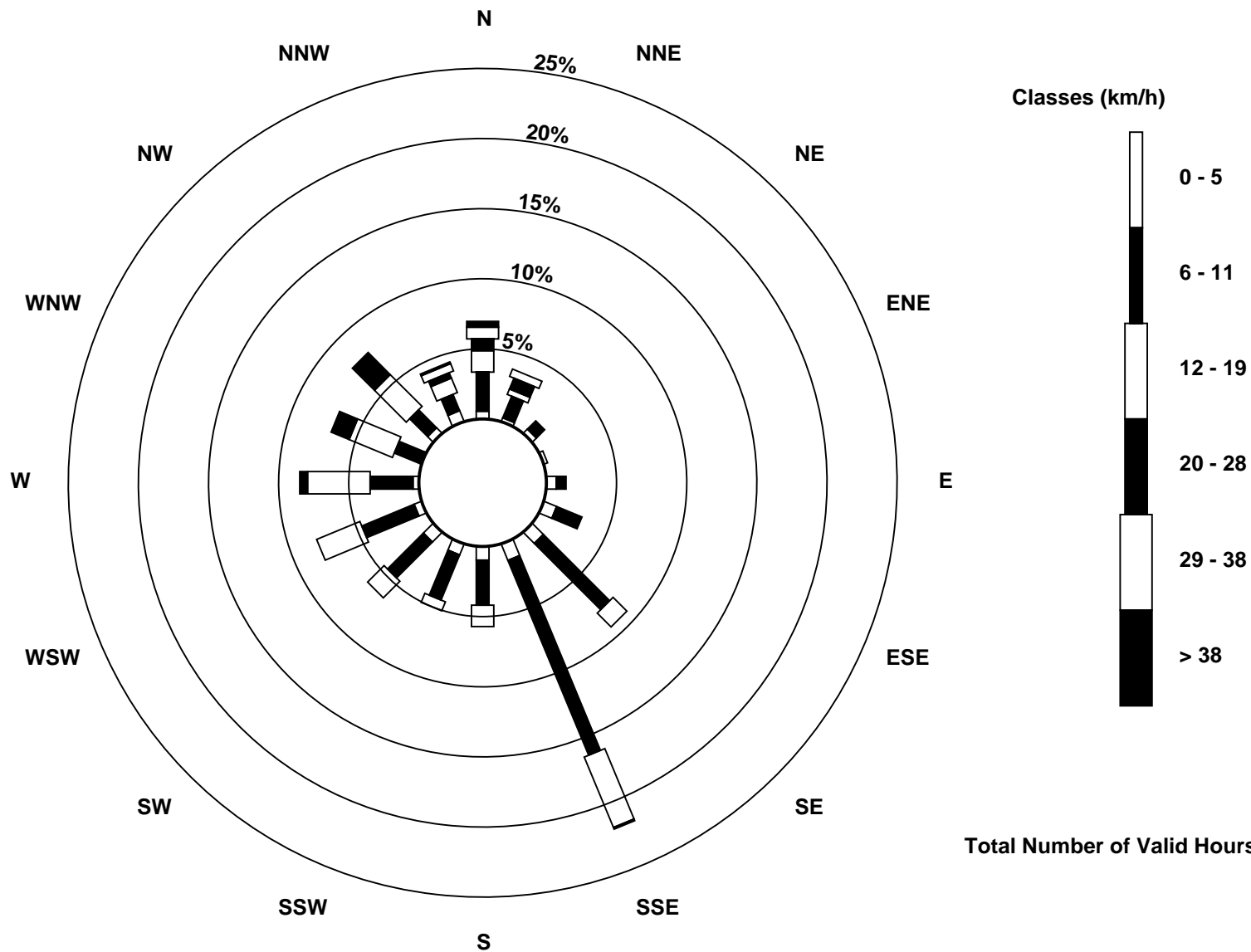
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Sep 2016

Wind Speed (WS) - km/h
Buffalo Viewpoint (AMS 4)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Buffalo Viewpoint - September 2016

Direction of Maximum Speed: 349 deg on Sep 11 07:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 344.0 deg on Sep 11	Hours of Data: 718
Direction of Minimum Speed: 266 deg on Sep 4 19:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 1.5 deg on Sep 9	Percent Operational Time: 99.7
Monthly Average Direction: 248.3 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Sep	86	108	93	358	19	13	4	25	30	25	3	26	88	84	96	145	25	220	2	348	302	271	260	250	22.0
2-Sep	248	198	246	260	243	232	252	201	244	257	266	253	270	247	236	273	269	257	307	272	285	264	278	310	260.0
3-Sep	343	309	298	281	277	273	270	268	284	296	305	307	304	307	311	317	309	317	322	320	323	313	306	299	305.0
4-Sep	300	300	297	281	257	261	271	265	254	270	277	281	294	299	318	283	255	236	266	38	215	211	203	241	274.9
5-Sep	246	227	178	153	148	149	155	149	165	171	181	191	197	183	152	123	127	133	127	129	137	141	151	149	160.9
6-Sep	146	143	143	142	140	157	156	154	154	148	150	140	142	142	138	165	174	162	158	153	146	152	138	148	149.8
7-Sep	159	152	154	149	156	161	157	162	160	148	106	115	106	113	127	154	125	154	203	233	213	193	183	153	152.1
8-Sep	213	181	172	152	162	161	150	169	190	310	342	334	306	310	272	318	229	268	9	232	298	346	343	323	287.6
9-Sep	321	316	318	315	331	357	16	21	8	10	14	324	223	221	217	176	158	125	125	137	139	141	142	152	17.6
10-Sep	147	139	142	146	150	153	149	146	168	234	268	258	253	274	276	293	300	274	278	284	281	284	288	293	252.0
11-Sep	338	345	343	340	344	349	349	349	350	351	351	351	347	351	356	353	342	323	332	346	330	316	302	294	344.0
12-Sep	285	269	272	257	248	257	251	247	198	215	247	196	199	201	211	211	191	171	149	150	153	149	147	152	208.6
13-Sep	145	146	176	181	167	165	180	198	203	207	208	209	210	220	245	231	225	219	228	221	226	238	266	270	211.1
14-Sep	283	306	264	319	283	162	158	128	22	134	129	111	119	180	223	239	252	329	344	353	198	191	253	295	256.0
15-Sep	309	302	329	6	71	48	49	37	45	56	112	123	125	117	117	121	127	123	141	148	148	154	160	151	105.9
16-Sep	144	139	156	159	146	137	155	157	147	M	M	193	214	226	238	244	237	233	214	166	163	148	141	149	187.1
17-Sep	152	214	200	184	159	197	185	184	183	197	216	218	215	221	249	254	261	282	236	218	234	243	251	269	223.9
18-Sep	269	266	231	247	246	195	270	277	288	284	290	291	306	317	314	323	333	349	3	2	335	337	15	11	308.0
19-Sep	8	320	308	306	310	303	293	299	289	299	297	304	310	306	307	313	316	296	327	340	320	311	325	1	311.5
20-Sep	356	356	352	320	351	7	1	3	11	333	306	338	36	20	24	42	64	112	131	90	116	87	138	140	14.4
21-Sep	145	161	164	185	179	183	169	158	179	192	160	165	208	218	224	239	238	219	200	186	168	153	139	135	182.4
22-Sep	134	136	144	143	152	163	160	156	156	134	155	199	197	196	191	185	178	175	165	161	156	153	157	154	166.7
23-Sep	154	159	153	153	154	155	153	158	155	153	152	155	150	149	148	155	151	147	152	157	156	156	153	157	153.2
24-Sep	161	159	152	154	156	160	163	162	221	242	254	265	265	280	285	286	296	290	270	255	253	252	259	262	251.7
25-Sep	256	264	279	270	271	275	271	271	259	269	284	297	304	305	307	321	331	330	141	190	193	215	227	164	278.9
26-Sep	148	144	153	149	153	146	151	148	153	153	157	158	161	159	156	182	179	169	162	152	154	149	151	146	156.6
27-Sep	145	158	147	167	158	254	264	255	214	264	305	286	281	283	284	263	260	248	234	244	244	255	254	261	256.3
28-Sep	245	253	240	245	171	158	136	142	156	135	135	122	356	214	234	223	221	201	175	180	158	152	143	143	188.0
29-Sep	101	109	143	144	165	163	176	161	152	161	119	116	14	22	353	355	49	99	105	82	181	167	7	358	111.7
30-Sep	332	335	2	356	355	3	13	1	360	1	11	14	14	15	13	11	13	9	13	15	20	22	18	9	10.4

248.9 253.5 236.4 237.6 209.7 212.9 232.7 241.1 242.4 270.3 281.2 264.5 266.3 266.5 273.7 275.9 276.7 271.5 267.6 223.6 223.0 227.2 234.8 243.8

Diurnal Average

M - Maintenance

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

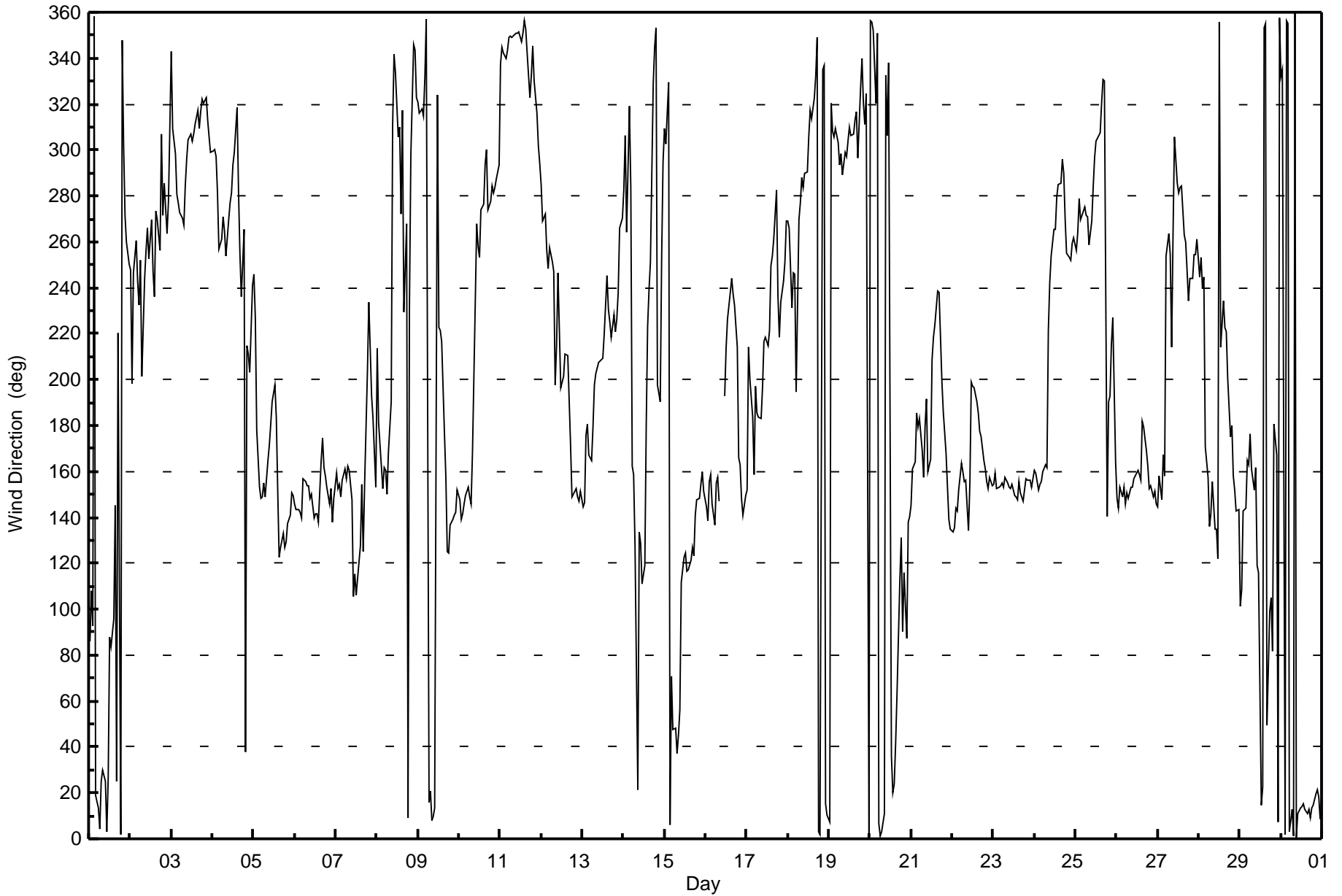
Wind Direction (WD) - deg
Buffalo Viewpoint - September 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 93 deg on Sep 8 16:00	Hours of Data: 718
Minimum Value: 5 deg on Sep 16 23:00	Hours of Missing Data: 2
Percentiles: P ₁ = 8 P ₁₀ = 14 Q ₁ = 16 Median = 18 Q ₃ = 24 P ₉₀ = 36 P ₉₉ = 78	Hours of Calibration: 0
	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Sep	15	16	29	34	15	13	15	15	16	19	17	43	24	27	31	74	51	68	23	50	17	23	22	14	74
2-Sep	16	22	20	18	20	20	17	36	21	30	24	22	25	19	22	21	22	24	70	18	17	20	18	15	70
3-Sep	19	14	15	18	17	18	17	17	19	16	14	14	14	14	14	14	14	13	13	13	14	14	14	16	19
4-Sep	15	15	16	21	17	19	16	22	21	25	25	26	29	43	41	50	61	86	59	14	22	22	17	86	
5-Sep	18	24	19	15	16	15	15	21	28	36	29	23	23	29	32	26	20	19	14	15	18	17	18	17	36
6-Sep	16	15	14	11	16	20	20	20	25	27	27	28	25	30	24	23	23	20	19	16	14	18	19	17	30
7-Sep	17	14	13	12	14	15	14	20	25	55	39	26	25	25	31	70	24	25	30	48	27	19	23	28	70
8-Sep	31	17	9	18	11	21	13	19	36	44	50	52	35	29	25	93	48	79	52	68	14	20	23	11	93
9-Sep	14	14	12	13	15	21	17	19	17	20	32	56	60	47	59	52	42	17	14	12	19	20	21	22	60
10-Sep	21	20	21	20	22	21	20	20	32	21	20	17	17	24	18	20	19	19	17	19	17	18	19	19	32
11-Sep	20	18	16	16	16	20	18	19	18	18	17	18	18	19	18	21	17	14	17	15	16	17	15	16	21
12-Sep	16	16	16	19	27	13	13	23	50	29	33	41	33	23	27	31	22	21	16	16	18	16	14	18	50
13-Sep	16	17	20	20	17	15	24	22	25	29	26	25	20	20	19	19	16	13	15	13	15	17	25	15	29
14-Sep	16	22	38	17	45	21	16	81	57	26	24	24	26	40	23	21	18	36	15	72	15	24	29	16	81
15-Sep	14	15	28	34	26	13	14	16	19	39	45	58	23	24	22	23	22	15	22	19	18	19	29	16	58
16-Sep	14	17	18	8	11	10	22	16	14	M	M	36	19	19	19	18	18	16	16	12	21	11	5	9	36
17-Sep	16	17	17	27	17	21	16	23	22	19	21	17	19	20	20	21	18	16	18	11	14	15	13	23	27
18-Sep	18	13	29	31	25	34	21	18	21	18	18	18	18	15	16	15	15	17	16	17	17	24	16	16	34
19-Sep	18	20	13	15	14	17	16	14	18	18	17	21	17	17	16	15	17	18	26	19	12	20	25	16	26
20-Sep	17	18	18	18	19	15	16	16	20	35	35	71	57	40	32	26	22	14	13	32	17	87	9	15	87
21-Sep	16	16	14	8	10	10	9	12	27	32	46	36	49	29	26	27	24	16	8	9	12	8	12	6	49
22-Sep	7	8	8	9	12	13	15	18	20	24	53	22	22	24	25	25	25	21	18	17	15	16	17	18	53
23-Sep	17	19	18	17	16	18	19	21	22	22	21	23	22	22	20	21	22	21	21	22	20	20	20	20	23
24-Sep	20	19	17	18	18	16	16	14	25	17	15	18	21	18	20	19	18	17	19	13	14	13	15	15	25
25-Sep	14	17	19	18	16	16	16	19	14	20	24	18	21	21	22	16	14	8	84	25	24	15	17	36	84
26-Sep	15	11	15	10	30	20	18	20	19	21	24	24	24	23	23	26	23	20	17	16	15	15	17	16	30
27-Sep	17	29	26	25	18	47	17	22	18	39	16	19	19	21	19	19	16	15	15	14	15	13	15	14	47
28-Sep	15	15	15	14	48	25	7	14	18	26	42	69	49	61	32	38	24	17	21	11	16	15	5	39	69
29-Sep	23	17	32	26	15	11	11	11	20	74	40	68	35	40	17	18	32	11	12	36	12	17	76	40	76
30-Sep	82	18	12	15	16	17	14	16	16	17	16	16	17	16	17	18	17	16	16	17	16	15	15	17	82

82	29	38	34	48	47	24	81	57	74	53	71	60	61	59	93	51	79	86	72	27	87	76	40	
Diurnal Maximum																								

M - Maintenance





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	September 21, 2016	Last Calibration	August 5, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:42
Gas Cert Reference	LL107929	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	08-Spet-2018
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-593	-593
Analyzer IP address	192.168.1.43		Lamp voltage	827	829
Calculated slope	0.993969	0.990551	Chamber temp	45.0	45.1
Calculated intercept	0.331207	1.087149	Pressure	709.1	701.5
Analyzer Background	10.5	11.4	Flow	0.507	0.501
Analyzer Coefficient	0.804	0.804	Intensity	85	85

Analyzer make TEI 43i Analyzer serial # JC1327300932

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.6	----
as found span	5000	60.4	600.4	605.0	0.992
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	60.4	600.4	605.0	0.992
second point	5000	30.2	300.2	303.0	0.991
third point	5000	15.1	150.1	148.5	1.011
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	60.4	600.4	602.7	0.996
Average Correction Factor					0.998

Corrected As found 604.3 Previous response 603.7 % change -0.1%

Notes:

Inlet filter changed after as founds. Adjusted zero

Calibration Performed By: Evan Magill



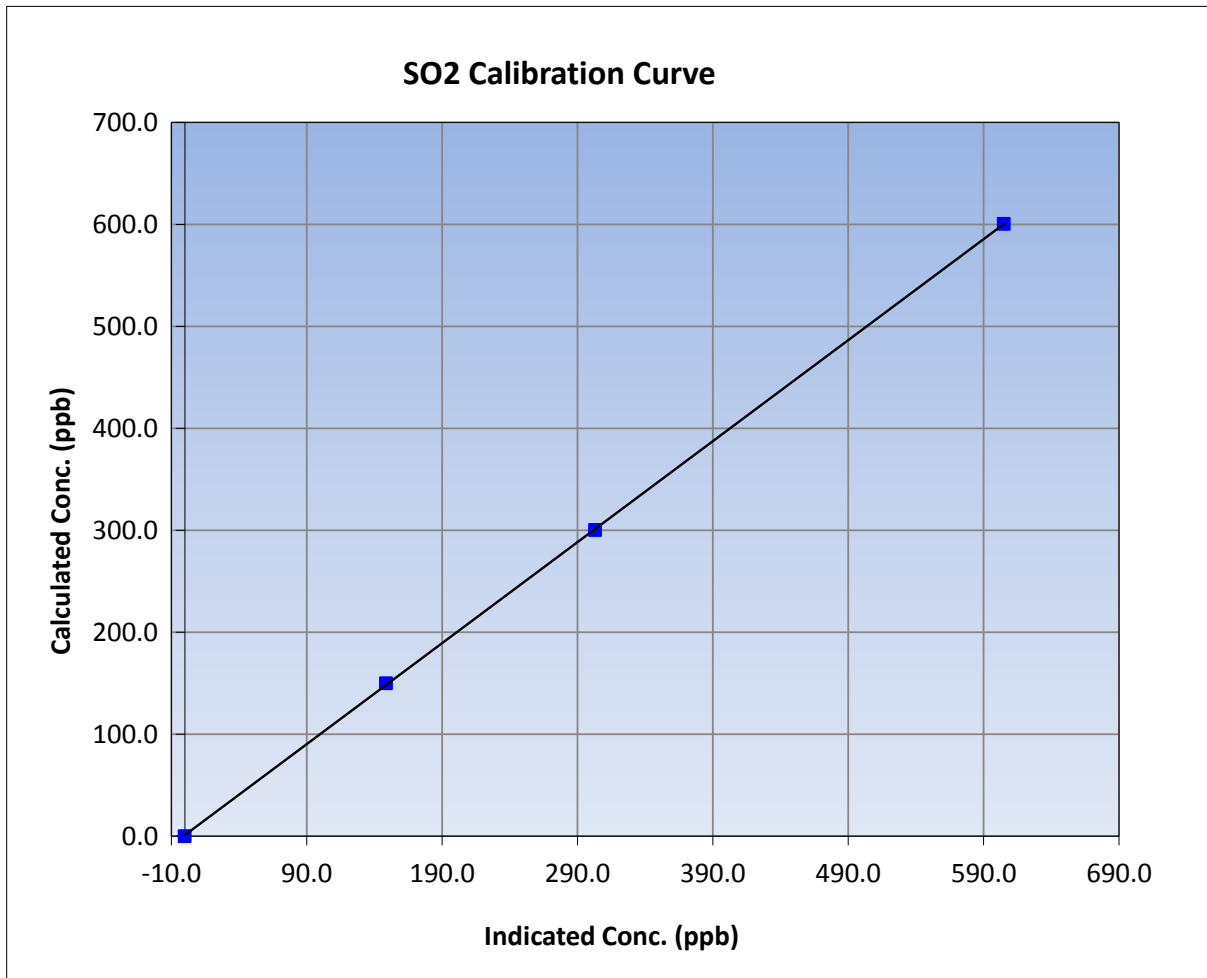
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	September 21, 2016	Previous Calibration	August 5, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	7:50	End Time (MST)	10:42
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

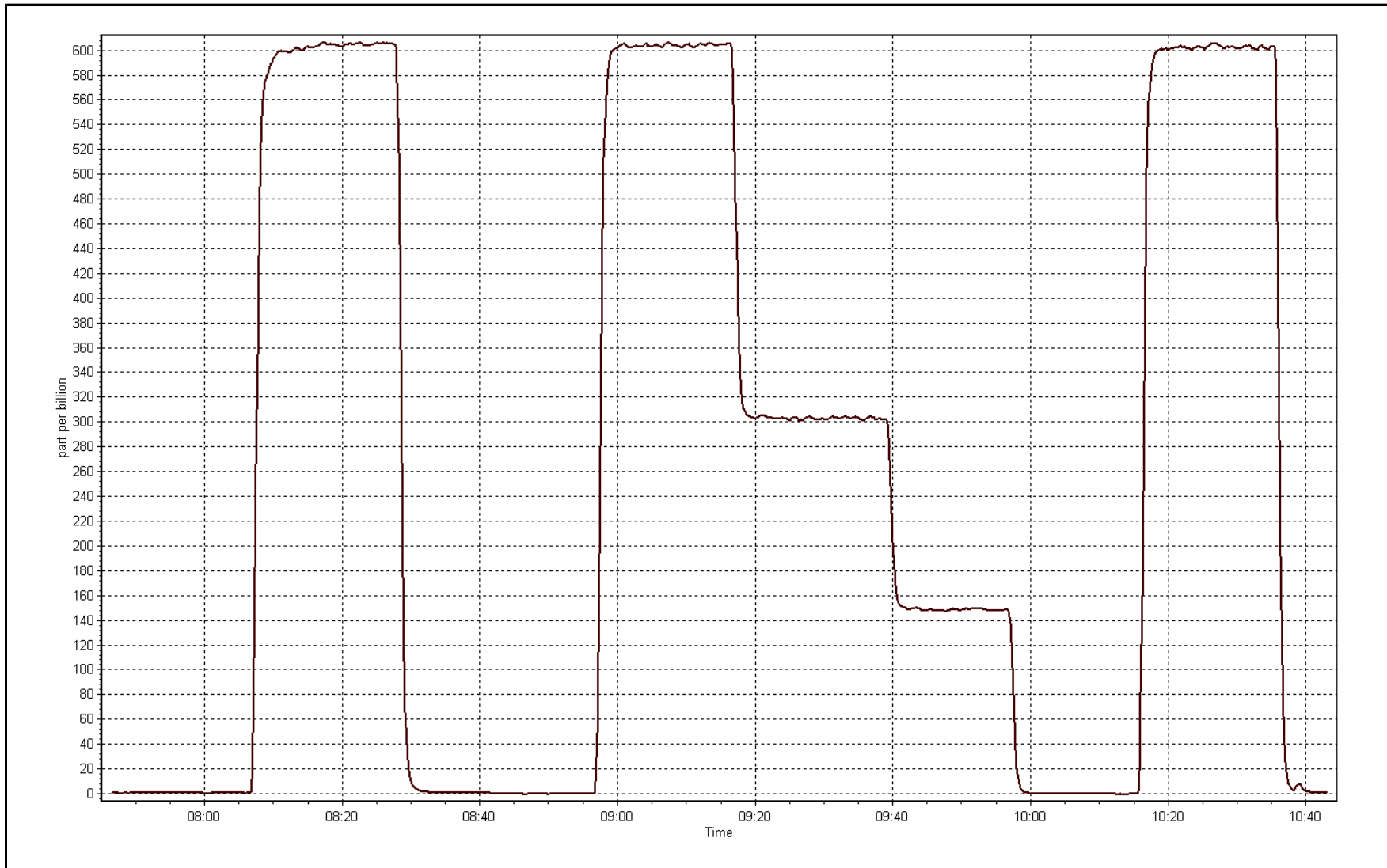
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999972
600.4	605.0	0.9924		
300.2	303.0	0.9907	Slope	0.990551
150.1	148.5	1.0107		
			Intercept	1.087149



SO2 Calibration Plot

Date: September 21, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	September 21, 2016	Last Calibration	August 5, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	10:51	End Time (MST)	13:35
Gas Cert Reference	LL101590	Station temp.	22 Deg C
Cal Gas Concentration	9.75 ppm	Cal Gas Exp Date	2/22/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG air Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	LL107929 08-Spet-2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-616	-618
Analyzer IP address	192.168.1.42		Lamp voltage	873	874
Calculated slope	0.988388	1.001484	Chamber temp	45	45
Calculated intercept	-0.107853	-0.036422	Pressure	553.2	543.9
Analyzer Background	13.8	13.6	Flow	1.050	1.034
Analyzer Coefficient	0.845	0.832	Intensity	94	94
			Converter temp.	330	331

Analyzer make/model	TEI 450i	Analyzer serial #	1336160094
Converter make/model	na	Converter serial #	na

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.0	----
as found span	6000	46.2	75.1	76.0	0.988
SO2 scrubber check	5000	15.1	150.1	1.6	----
calibrator zero	6000	0.0	0.0	0.0	----
high point	6000	46.2	75.1	74.9	1.002
second point	6000	25.8	41.9	42.1	0.996
third point	6000	15.4	25.0	25.0	1.003
as left zero	5000	0.0	0.0	0.2	----
as left span	6000	46.2	75.1	74.5	1.007
Average Correction Factor					1.000

Corrected As found	76.0	Previous response	76.1	% change	0.2%
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Notes:

Inlet filter changed and scrubber check done after as founds. Adjusted span.

Calibration Performed By: Evan Magill



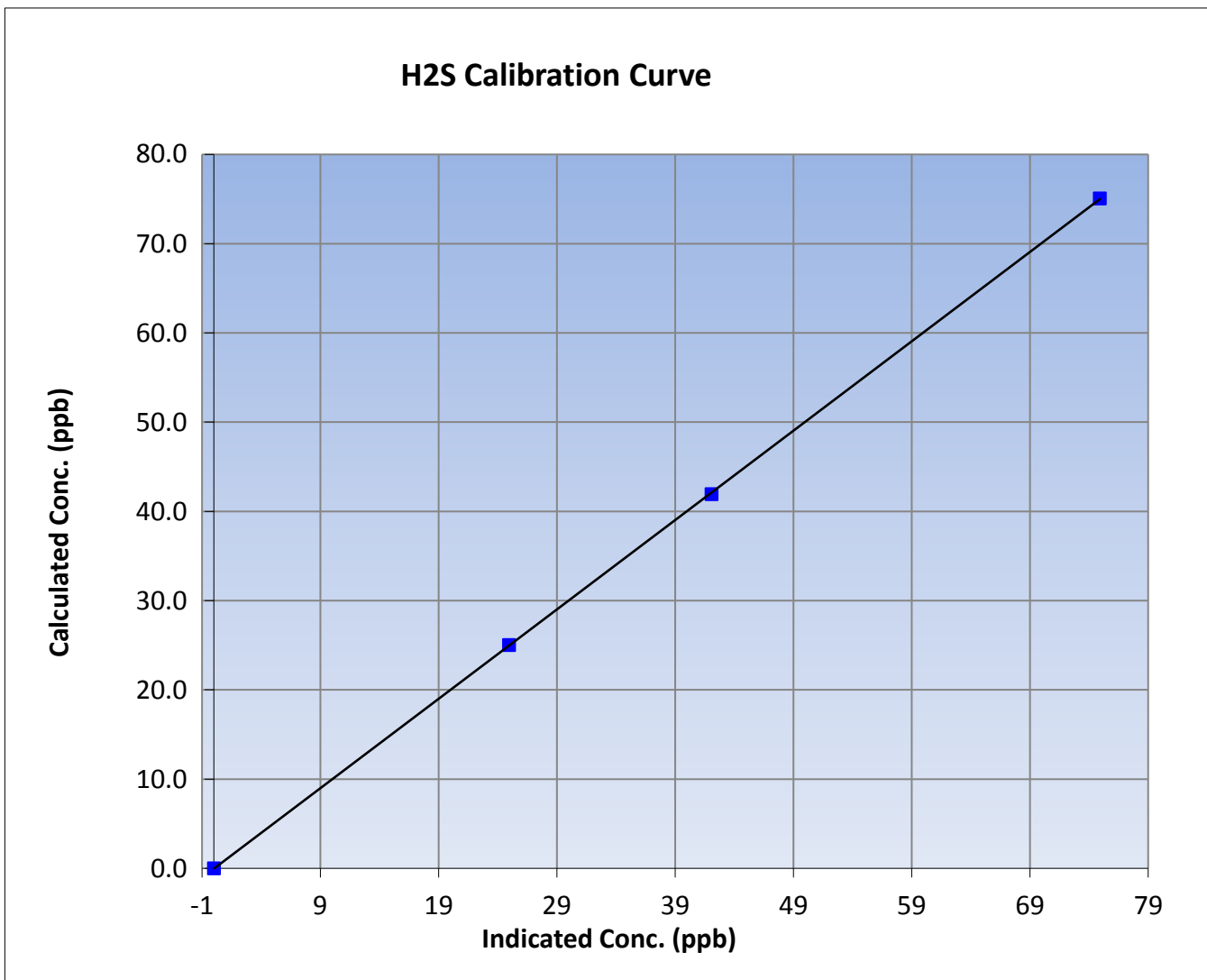
Wood Buffalo Environmental Association H2S Calibration Report

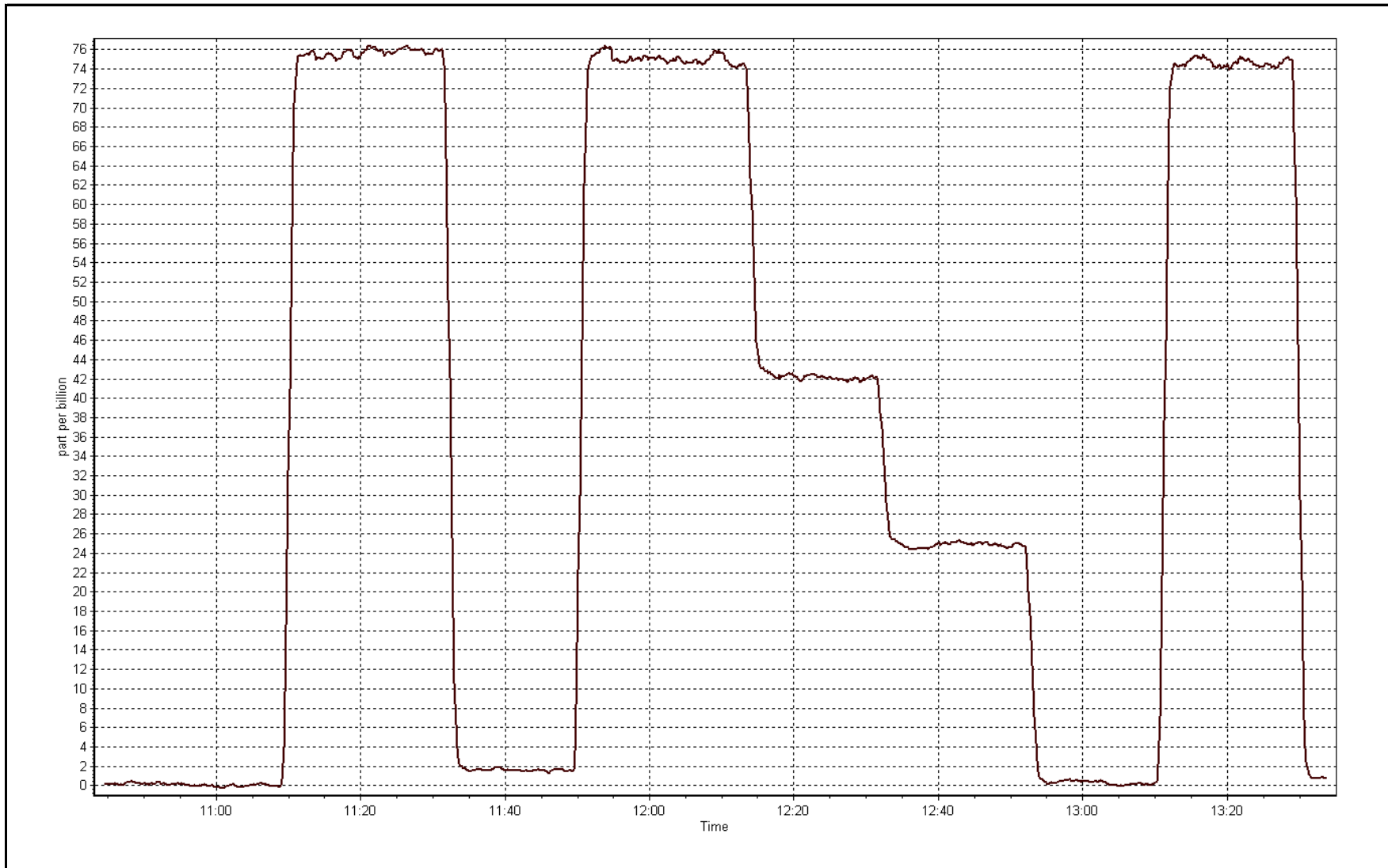
Station Information

Calibration Date	September 21, 2016	Previous Calibration	August 5, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	10:51	End Time (MST)	13:35
Analyzer make	TEI 450i	Analyzer serial #	1336160094

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999985
75.1	74.9	1.0021		
41.9	42.1	0.9963	Slope	1.001484
25.0	25.0	1.0026		
			Intercept	-0.036422







Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	September 28, 2016	Last Calibration	September 21, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance: Changing Sox Scrubber		
Start Time (MST)	8:25	End Time (MST)	13:55
Gas Cert Reference	LL101590	Station temp.	22 Deg C
Cal Gas Concentration	9.75 ppm	Cal Gas Exp Date	2/22/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG air Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	LL107929 08-Spet-2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-618	-606
Analyzer IP address	192.168.1.42		Lamp voltage	874	874
Calculated slope	1.001484	1.019961	Chamber temp	45	45
Calculated intercept	-0.036422	-1.492649	Pressure	543.9	560.1
Analyzer Background	13.6	13.4	Flow	1.034	1.064
Analyzer Coefficient	0.832	0.832	Intensity	94	94
			Converter temp.	331	329

Analyzer make/model	TEI 450i	Analyzer serial #	1336160094
Converter make/model	na	Converter serial #	na

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.4	----
as found span	6000	46.1	74.9	74.7	1.004
SO2 scrubber check	5000	15.1	150.1	1.6	----
calibrator zero	6000	0.0	0.0	1.8	----
high point	6000	46.1	74.9	75.0	0.999
second point	6000	25.8	41.9	42.8	0.980
third point	6000	15.4	25.0	25.4	0.985
as left zero	6000	0.0	0.0	1.0	----
as left span	6000	46.2	75.1	74.6	1.007
Average Correction Factor					0.988

Corrected As found	74.3	Previous response	74.8	% change	0.7%
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Notes:

As founds completed. Scrubber check completed after as founds with 150 and 600 ppb SO2. SO2 was breaking through; scrubber was replaced. Scrubber check completed again at 150 and 600 ppb, showing 1.5 ppb and 6 ppb respectively. After settling back down to baseline, multipoint completed. Sensitivity and linearity were good.

Calibration Performed By:

Devin Russell



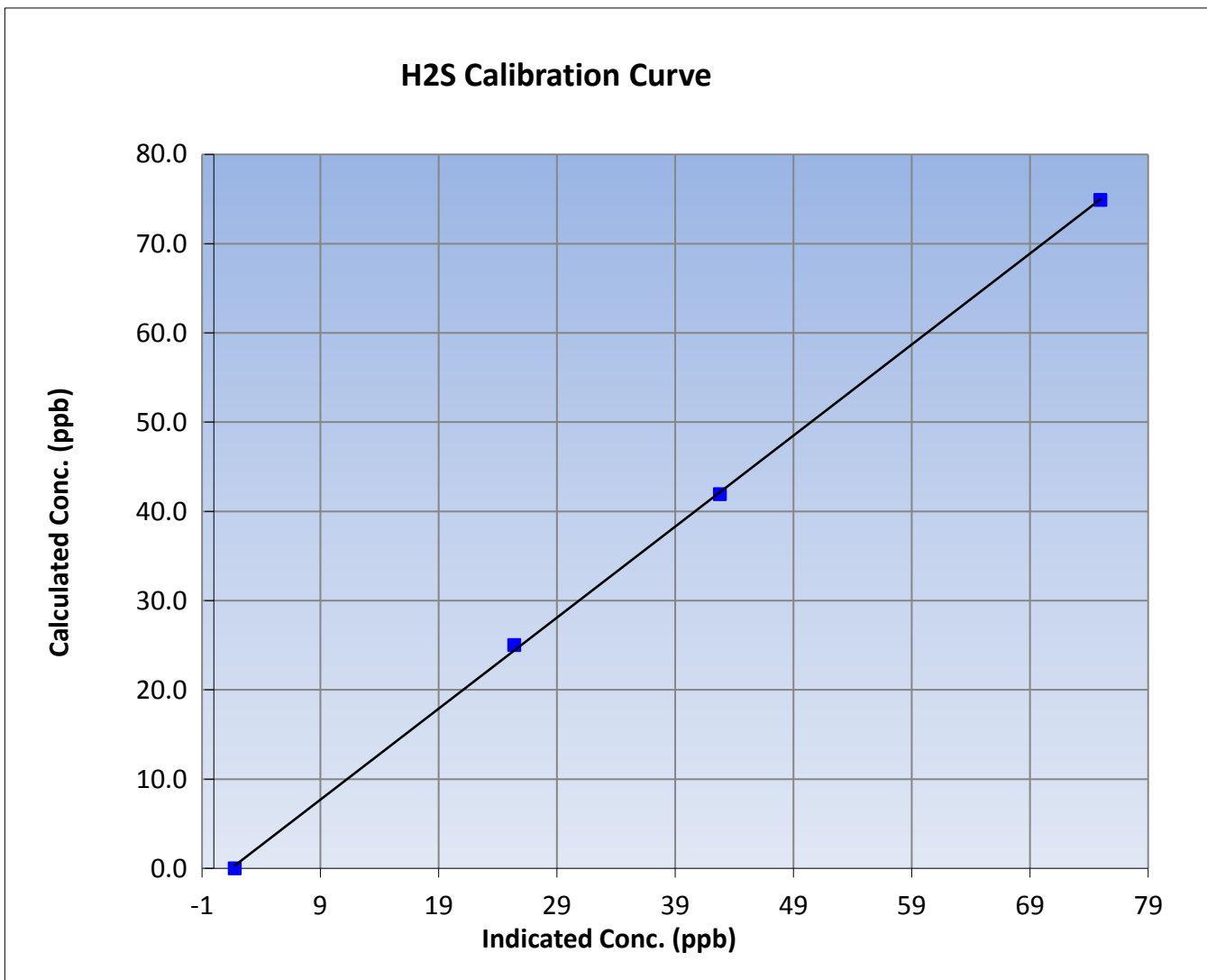
Wood Buffalo Environmental Association H2S Calibration Report

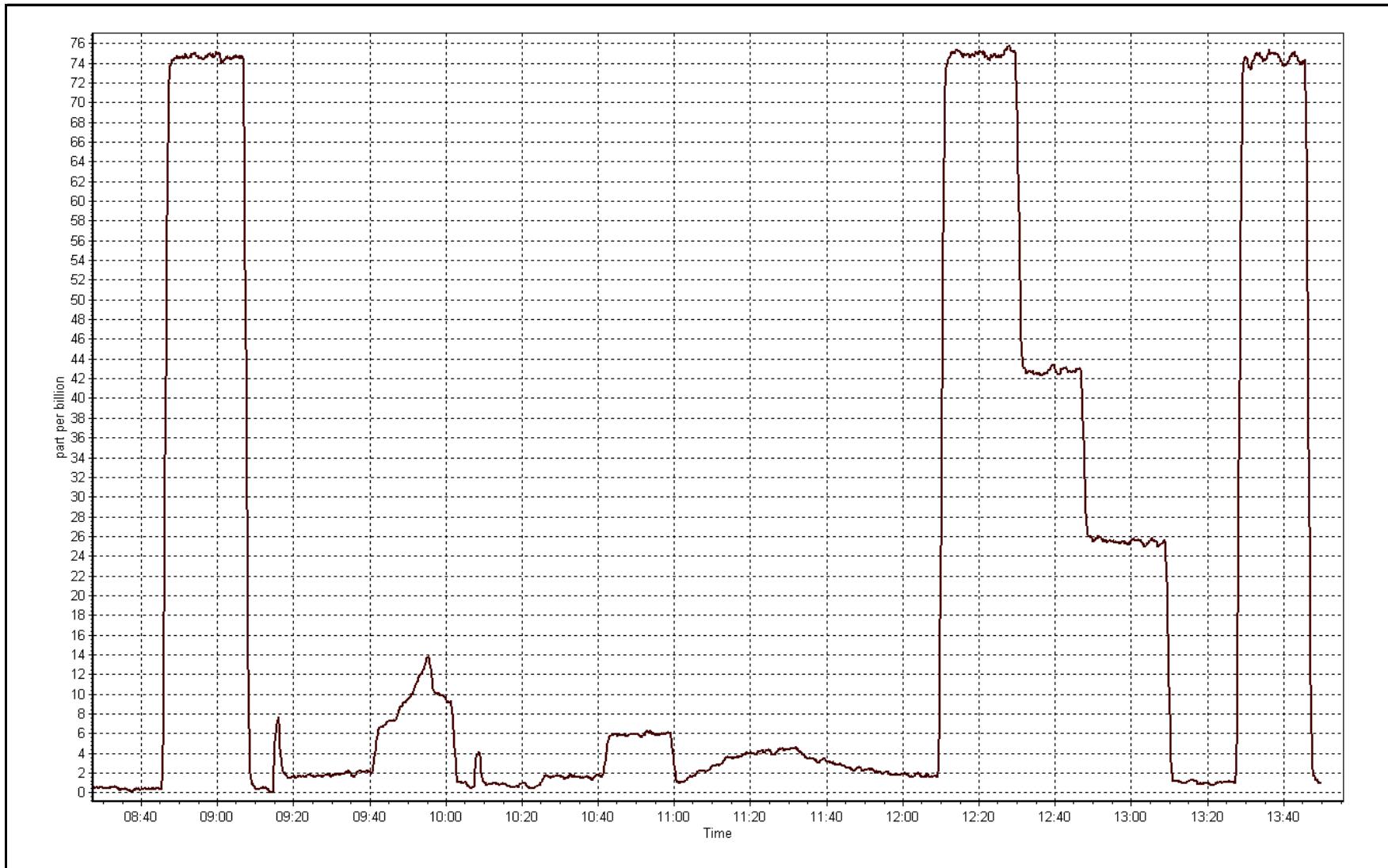
Station Information

Calibration Date	September 28, 2016	Previous Calibration	September 21, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:25	End Time (MST)	13:55
Analyzer make	TEI 450i	Analyzer serial #	1336160094

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.8	----	Correlation Coefficient	0.999827
74.9	75.0	0.9992		
41.9	42.8	0.9796	Slope	1.019961
25.0	25.4	0.9848		
			Intercept	-1.492649







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	September-21-16	Last Calibration	August-05-16
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:42
Gas Cert Reference	LL107929	Cal Gas Expiry Date	08-Sep-18
CH4 Cal Gas Conc.	514 ppm	CH4 Equiv Conc.	1061.3 ppm
C3H8 Cal Gas Conc.	199 ppm	Station temp.	21 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG make/model	Teledyne API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	30.4	30.4
Calculated slope	0.999913	1.012929	Fuel Pressure	19.9	19.9
Calculated intercept	0.014190	-0.086487	Analyzer Coeff	4.2	4.1
			Analyzer BKG	0.880	0.810

Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.06	----
as found span	5000	60.4	12.82	12.70	1.009
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	60.4	12.82	12.70	1.009
second point	5000	30.2	6.41	6.49	0.988
third point	5000	15.1	3.20	3.26	0.983
as left zero	5000	0.0	0.00	0.06	----
as left span	5000	60.4	12.82	12.92	0.992
Average Correction Factor					0.993

Corrected As found	12.76	Previous response	12.81	% change	0.4%
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Notes:

Inlet filter changed after as founds. Adjusted zero.

Calibration Performed By: Evan Magill



Wood Buffalo Environmental Association THC Calibration Report

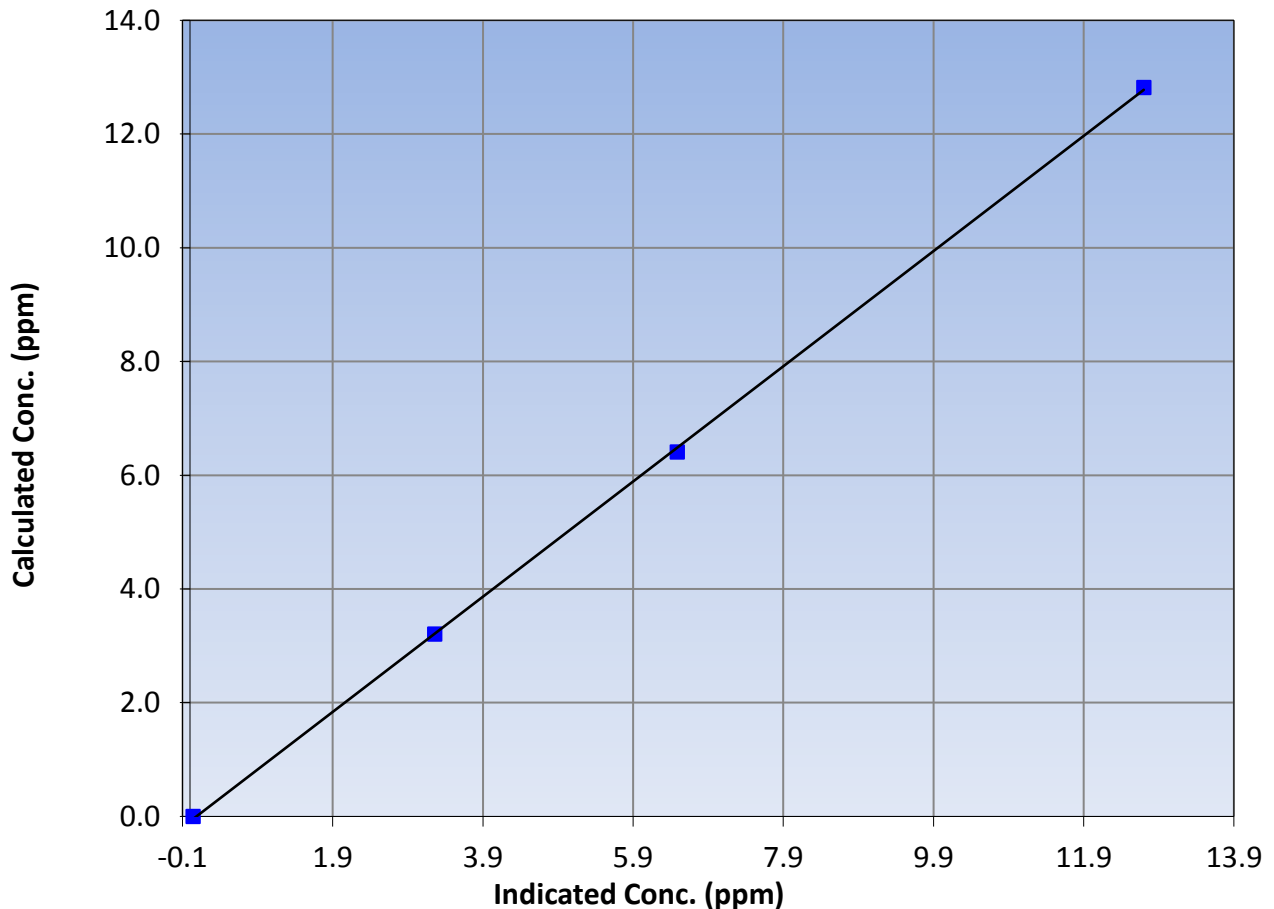
Station Information

Calibration Date	September 21, 2016	Previous Calibration	August 5, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	7:50	End Time (MST)	10:42
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

Calibration Data

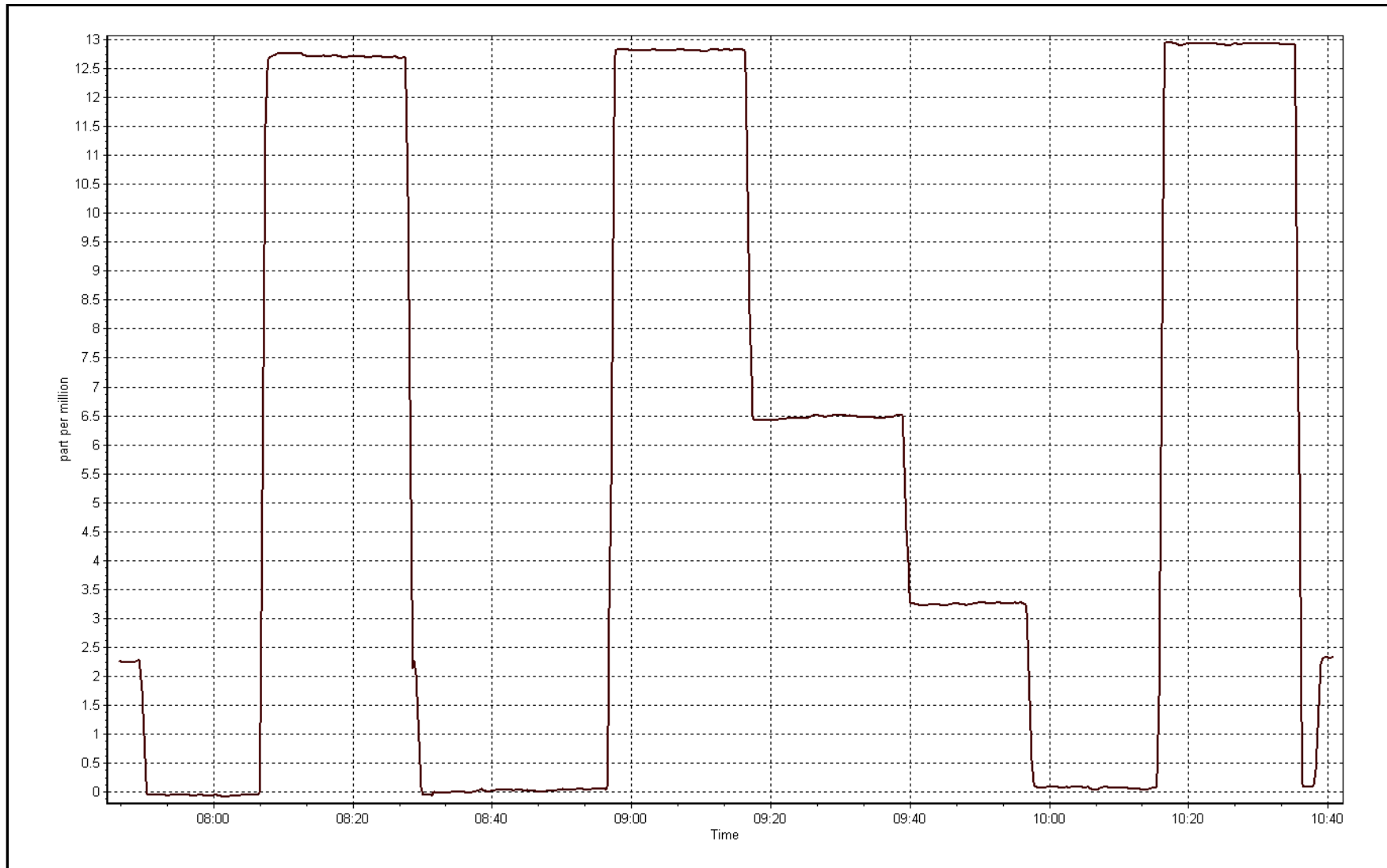
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999889
12.82	12.70	1.0094		
6.41	6.49	0.9877	Slope	1.012929
3.20	3.26	0.9831		
			Intercept	-0.086487

THC Calibration Curve



THC Calibration Plot

Date: September 21, 2016





Wood Buffalo Environmental Association

WS/WD Calibration Report

Station Information

Calibration Date	September 16, 2016	Previous Calibration	August 7, 2015
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	<input checked="" type="checkbox"/> Routine	<input type="checkbox"/> Installation	<input type="checkbox"/> Removal
Start Time (MST)	8:44	End Time (MST)	10:16
Barometric Press	n/a	Station Temp	22 Deg C
WS Calibrator	MetOne 053	Serial Number	J6774

WIND SPEED

Sensor make/model	Met One 010C-1	Sensor serial #	G3211
DACS make	Campbel Scientific CR3000	DACS serial No.	2635
DACS voltage range	5000	DACS channel #	N/A
	<u>Before</u>		<u>After</u>
Calculated slope	1.00048201	Calculated slope	0.998843
Calculated intercept	-0.08588355	Calculated intercept	-0.025014

Wind Speed Calibration Data

Shaft RPM	Actual Speed (K/hr)	Indicated Speed (K/hr)	Correction factor
0	0.0	0.0	n/a
200	20.2	20.3	0.9957
400	39.4	39.4	0.9990
600	58.6	58.7	0.9977
800	77.8	77.8	0.9989
Average Correction Factor			0.9978

WIND DIRECTION

Sensor make/model	Met One 020C-1	Sensor serial #	P10612
DACS make	Campbel Scientific CR3000	DACS serial No.	2635
DACS voltage range	5000	DACS channel #	N/A
	<u>Before</u>		<u>After</u>
Calculated slope	1.002144745	Calculated slope	1.007776
Calculated intercept	1.55767774	Calculated intercept	0.689078
As Found Declination (west of North)	14	As Left Declination (west of North)	14

Wind Direction Calibration Data

Physical Direction (Degrees)	Indicated Direction (Degrees)	Correction factor
0	0.3	n/a
90	88.0	1.0227
180	177.5	1.0142
270	266.0	1.0152
357	354.9	1.0059
Average Correction Factor		1.0145

Notes:

Annual audit. Declination captured using compass method.

Calibration Performed By: Evan Magill and Jayme Marcoux

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION
MONTHLY AIR MONITORING SUMMARY
for AMD SECTION III.B.1(c)

SEPTEMBER 2016

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Prepared: Jan 25 2017 10:59

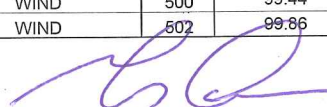
APPROVAL NUMBERS	REPORT DATE					
	MONTH	YEAR				
289664-00-00	9	2016				
254465-00-00	CONTINUOUS AMBIENT MONITORING					
149968-00-01	CONTINUOUS AMBIENT MONITORING					
48522-01-00	CONTINUOUS AMBIENT MONITORING					
240008-00-03	CONTINUOUS AMBIENT MONITORING					
48263-00-00	CONTINUOUS AMBIENT MONITORING					
224816-00-03	CONTINUOUS AMBIENT MONITORING					
189942-00-02	CONTINUOUS AMBIENT MONITORING					
206355-00-00	CONTINUOUS AMBIENT MONITORING					
46586-00-00	CONTINUOUS AMBIENT MONITORING					
216466-00-04	CONTINUOUS AMBIENT MONITORING					
137467-00-00	CONTINUOUS AMBIENT MONITORING					
20809-01-00	CONTINUOUS AMBIENT MONITORING					
241311-00-00	CONTINUOUS AMBIENT MONITORING					
094-02-00	CONTINUOUS AMBIENT MONITORING					
305529-00-00	CONTINUOUS AMBIENT MONITORING					
026-02-00	CONTINUOUS AMBIENT MONITORING					
228044-00-00	CONTINUOUS AMBIENT MONITORING					
73203-01-00	CONTINUOUS AMBIENT MONITORING					
			ONE-HOUR AVERAGE		24-HOUR AVERAGE	
PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
SO2(ppm)	1	99.58	0.039	0	0.006	0
SO2(ppm)	2	99.72	0.033	0	0.006	0
SO2(ppm)	4	100.00	0.034	0	0.006	0
SO2(ppm)	5	100.00	0.124	0	0.036	0
SO2(ppm)	6	99.86	0.019	0	0.007	0
SO2(ppm)	7	99.72	0.018	0	0.006	0
SO2(ppm)	8	100.00	0.010	0	0.001	0
SO2(ppm)	11	100.00	0.060	0	0.014	0
SO2(ppm)	13	99.86	0.040	0	0.006	0
SO2(ppm)	14	99.17	0.012	0	0.002	0
SO2(ppm)	15	100.00	0.026	0	0.004	0
SO2(ppm)	16	100.00	0.045	0	0.006	0
SO2(ppm)	17	100.00	0.029	0	0.005	0
SO2(ppm)	18	92.22	0.002	0	0.001	0
SO2(ppm)	19	99.86	0.016	0	0.004	0
SO2(ppm)	20	100.00	0.006	0	0.001	0
SO2(ppm)	21	99.86	0.003	0	0.001	0
SO2(ppm)	500	99.86	0.019	0	0.003	0
SO2(ppm)	502	100.00	0.020	0	0.006	0
H2S(ppm)	2	99.58	0.004	0	0.002	0
H2S(ppm)	4	95.42	0.002	0	0.001	0
H2S(ppm)	5	98.89	0.012	1	0.003	0
H2S(ppm)	11	100.00	0.011	1	0.002	0
H2S(ppm)	17	99.86	0.001	0	0.000	0
H2S(ppm)	19	99.72	0.001	0	0.000	0
H2S(ppm)	20	100.00	0.000	0	0.000	0
H2S(ppm)	500	100.00	0.001	0	0.000	0
H2S(ppm)	502	99.86	0.002	0	0.001	0
TRS(ppm)	1	99.72	0.002	0	0.001	0
TRS(ppm)	6	100.00	0.001	0	0.000	0
TRS(ppm)	7	15.56	0.001	0	0.000	0
TRS(ppm)	9	100.00	0.002	0	0.001	0
TRS(ppm)	13	99.86	0.002	0	0.001	0
TRS(ppm)	14	97.50	0.001	0	0.000	0
TRS(ppm)	15	99.86	0.001	0	0.000	0
TRS(ppm)	18	92.22	0.000	0	0.000	0
TRS(ppm)	21	99.86	0.001	0	0.000	0
THC(ppm)	1	99.58	3.1	-	2.3	-
THC(ppm)	2	95.00	4.0	-	2.7	-
THC(ppm)	4	100.00	4.7	-	2.7	-
THC(ppm)	5	100.00	4.2	-	2.5	-
THC(ppm)	6	99.86	2.8	-	2.1	-
THC(ppm)	7	100.00	3.2	-	2.1	-
THC(ppm)	9	100.00	3.1	-	2.4	-
THC(ppm)	11	100.00	9.7	-	2.7	-
THC(ppm)	13	100.00	3.5	-	2.6	-
THC(ppm)	14	95.97	2.5	-	2.0	-
THC(ppm)	15	100.00	3.8	-	2.4	-
THC(ppm)	16	99.44	8.4	-	2.9	-
THC(ppm)	17	100.00	2.7	-	2.3	-
THC(ppm)	18	91.94	2.2	-	2.1	-
THC(ppm)	19	81.11	2.8	-	2.3	-
THC(ppm)	20	100.00	2.5	-	2.3	-
THC(ppm)	21	99.72	3.1	-	2.2	-
O3(ppm)	1	99.58	0.043	0	0.028	-
O3(ppm)	6	99.86	0.043	0	0.032	-
O3(ppm)	7	99.58	0.041	0	0.031	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION
 MONTHLY AIR MONITORING SUMMARY
 for AMD SECTION III.B.1(c)

SEPTEMBER 2016

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Prepared: Jan 25 2017 10:59

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	9	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01							
48522-01-00							
240008-00-03				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
48263-00-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
224816-00-03							
189942-00-02							
206355-00-00	O3(ppm)	8	99.58	0.039	0	0.030	-
46586-00-00	O3(ppm)	13	99.86	0.041	0	0.027	-
216466-00-04	O3(ppm)	14	99.86	0.039	0	0.031	-
137467-00-00	O3(ppm)	17	99.86	0.040	0	0.030	-
20809-01-00	O3(ppm)	18	92.36	0.046	0	0.039	-
241311-00-02	O3(ppm)	21	100.00	0.044	0	0.034	-
094-02-00	NO2(ppm)	1	93.06	0.027	0	0.007	-
305529-00-00	NO2(ppm)	6	99.86	0.026	0	0.009	-
026-02-00	NO2(ppm)	7	99.31	0.023	0	0.012	-
228044-00-00	NO2(ppm)	8	100.00	0.006	0	0.003	-
73203-01-00	NO2(ppm)	13	100.00	0.022	0	0.007	-
	NO2(ppm)	14	99.72	0.008	0	0.003	-
	NO2(ppm)	15	100.00	0.022	0	0.008	-
	NO2(ppm)	16	100.00	0.032	0	0.015	-
	NO2(ppm)	17	100.00	0.015	0	0.005	-
	NO2(ppm)	18	92.22	0.008	0	0.002	-
	NO2(ppm)	19	99.86	0.015	0	0.004	-
	NO2(ppm)	20	100.00	0.015	0	0.004	-
	NO2(ppm)	21	99.44	0.014	0	0.002	-
	NO2(ppm)	500	99.86	0.015	0	0.004	-
	NO2(ppm)	502	100.00	0.008	0	0.003	-
	CO(ppm)	7	99.58	0.5	0	0.1	-
	NH3(ppm)	1	91.53	0.028	0	0.001	-
	NH3(ppm)	6	95.14	0.000	0	0.000	-
	PM2.5(ug/m3)	1	99.72	20.9	-	10.1	0
	PM2.5(ug/m3)	6	100.00	22.7	-	6.7	0
	PM2.5(ug/m3)	7	99.03	40.1	-	9.2	0
	PM2.5(ug/m3)	8	98.33	8.2	-	4.7	0
	PM2.5(ug/m3)	13	99.17	20.6	-	8.8	0
	PM2.5(ug/m3)	14	94.31	13.4	-	5.0	0
	PM2.5(ug/m3)	15	99.58	36.2	-	12.6	0
	PM2.5(ug/m3)	16	100.00	32.8	-	12.0	0
	PM2.5(ug/m3)	17	93.33	20.8	-	6.8	0
	PM2.5(ug/m3)	18	100.00	16.0	-	5.7	0
	PM2.5(ug/m3)	21	100.00	37.1	-	7.0	0
	WIND	1	99.72	-	-	-	-
	WIND	2	100.00	-	-	-	-
	WIND	4	99.72	-	-	-	-
	WIND	5	99.58	-	-	-	-
	WIND	6	100.00	-	-	-	-
	WIND	7	99.72	-	-	-	-
	WIND	8	99.86	-	-	-	-
	WIND	9	99.86	-	-	-	-
	WIND	11	100.00	-	-	-	-
	WIND	13	99.86	-	-	-	-
	WIND	14	99.58	-	-	-	-
	WIND	15	100.00	-	-	-	-
	WIND	16	100.00	-	-	-	-
	WIND	17	99.86	-	-	-	-
	WIND	18	89.17	-	-	-	-
	WIND	19	99.86	-	-	-	-
	WIND	20	99.86	-	-	-	-
	WIND	21	99.31	-	-	-	-
	WIND	500	99.44	-	-	-	-
	WIND	502	99.86	-	-	-	-
							
SIGNATURE OF ASSOCIATION REPRESENTATIVE				FOR ALBERTA ENVIRONMENT USE ONLY			



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 8
FORT CHIPEWYAN
NOVEMBER 2016

Operations, Data Collection,
QA/QC, Data Validation and Reporting by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta

Revision – January 25, 2017



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
NOVEMBER 2016

MONTHLY SUMMARY for
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	685	35	35	100.00	11	0	3	0
O3(ppb) Average	642	35	78	94.03	40	0	37	-
NO2(ppb) Average	685	35	35	100.00	20	0	12	-
NO(ppb) Average	685	35	35	100.00	5	-	1	-
NOX(ppb) Average	685	35	35	100.00	25	-	13	-
PM2.5(ug/m3) Average	717	3	3	100.00	21.9	-	10.5	0
Wind Speed 10 m (km/h) Average	720	0	0	100.00	32	-	24	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	12.2	-	6.3	-
Relative Humidity (%) Average	720	0	0	100.00	100	-	96	-
Precipitation (mm) Total	661	0	59	91.81	0.5	-	0.8	-
Leaf Wetness (% of range) Average	720	0	0	100.00	38	-	5	-
Global Solar Radiation (W/m2) Average	720	0	0	100.00	280	-	54	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
NOVEMBER 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	685	0.4	1	-	0	0	0	0	0	1	11
O3(ppb) Average	642	26	8	-	7	15	21	25	33	36	40
NO2(ppb) Average	685	1.8	3	-	0	0	0	1	2	5	20
NO(ppb) Average	685	0.1	0	-	0	0	0	0	0	0	5
NOX(ppb) Average	685	2	3	-	0	0	0	1	2	6	25
PM2.5(ug/m3) Average	717	3.75	3.1	-	0.5	0.9	1.7	2.9	4.8	7.8	21.9
Wind Speed 10 m (km/h) Average	720	13.3	6	-	1	6	9	13	17	22	32
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	-2.29	6	-	-15.1	-10.3	-6.4	-2.1	2.4	5.7	12.2
Relative Humidity (%) Average	720	83.6	10	-	47	68	78	85	91	95	100
Precipitation (mm) Total	661	-	-	2.29	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	720	0.9	2	-	-1	0	0	0	1	1	38
Global Solar Radiation (W/m2) Average	720	25	53	-	0	0	0	0	24	93	280

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
O3	01 Nov 2016 01:00	02 Nov 2016 15:00	39	Analyzer failure - operating outside of acceptance criteria
O3	03 Nov 2016 09:00	03 Nov 2016 12:00	4	Maintenance - follow up calibration
Precipitation Collector	28 Nov 2016 14:00	01 Dec 2016 00:00	59	Analyzer Failure



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Fort Chipewyan - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 11 ppb on Nov 30 00:00	Maximum Daily Average: 3.5 ppb on Nov 5		Hours of Data:	685
Minimum Value: 0 ppb on Nov 1 14:00	Minimum Daily Average: 0.0 ppb on Nov 16		Hours of Missing Data:	35
Maximum Diurnal Average: 0.7 ppb at hour 24	Minimum Diurnal Average: 0.1 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 6		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Nov	Z	0	0	0	0	0	0	0	0	3	C	C	C	C	C	2	3	6	7	6	3	1	0	0	1.7	7
3-Nov	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
4-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	3	2	2	2	4	0.9	4	
5-Nov	5	3	2	Z	4	4	4	4	4	7	7	4	4	3	4	4	4	5	2	1	1	0	0	3.5	7	
6-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	3	0.4	3
8-Nov	Z	0	0	1	2	2	4	5	4	5	5	4	4	3	1	1	1	1	1	1	1	0	0	2.1	5	
9-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
10-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1	
11-Nov	0	0	1	Z	1	1	2	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3	
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
13-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1	
14-Nov	Z	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
15-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
16-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
18-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
19-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
20-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
21-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
22-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0.3	3	
23-Nov	0	0	0	Z	0	0	0	0	0	0	1	1	1	2	2	0	0	0	0	0	0	0	0	0.4	2	
24-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	6	6	1	0	0.8	6	
25-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
26-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
27-Nov	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
28-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	11	0.7	11
30-Nov	5	4	4	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.8	5	

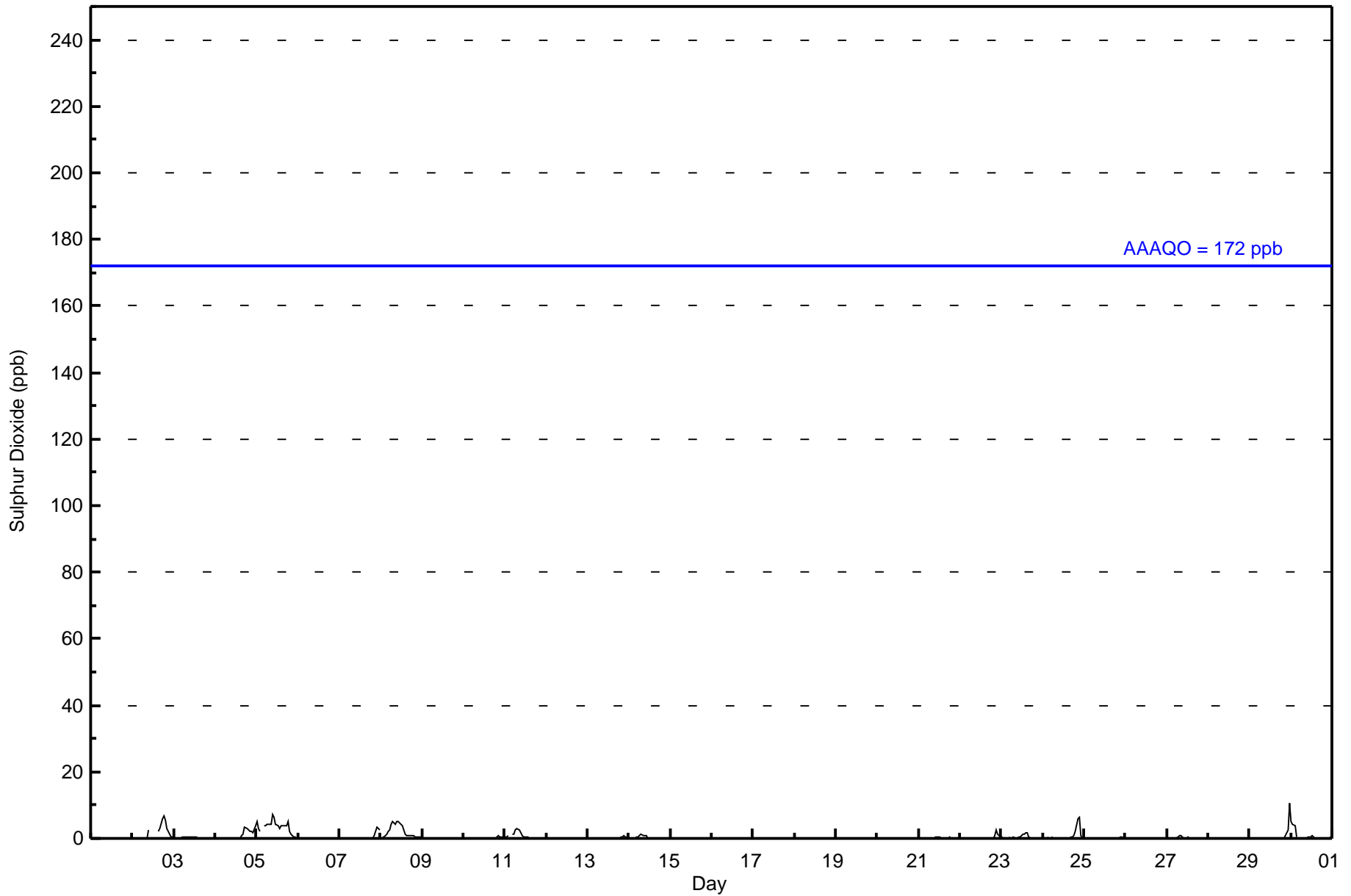
0.5	0.3	0.3	0.1	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.4	0.4	0.3	0.3	0.4	0.3	0.5	0.6	0.5	0.6	0.6	0.4	0.7	Diurnal Average
5	4	4	1	4	4	4	5	4	7	7	4	4	3	4	4	4	4	6	7	6	6	6	3	11	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	684	99.85	99.85
11 - 20	1	0.15	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - November 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	6	3	8	17	61	57	39	71	37	42	41	43	107	71	64	17	684
11 - 20	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	3	8	17	61	57	39	72	37	42	41	43	107	71	64	17	685

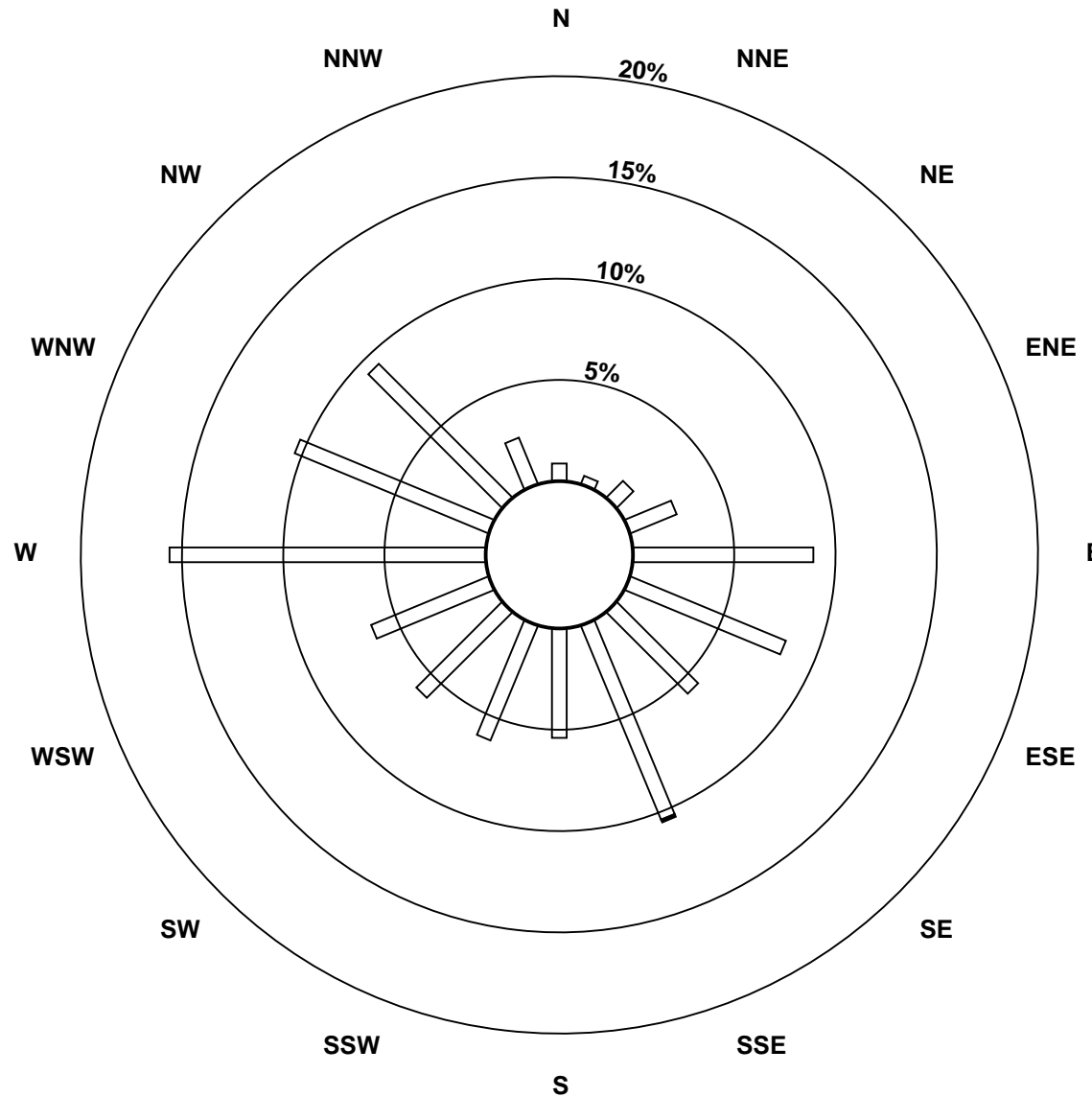
Total Number of Valid Hours: 685

Total Number of Hours: 720

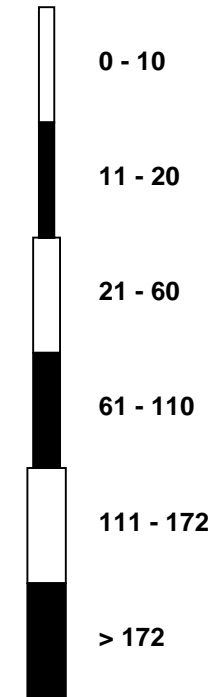


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan (AMS 8)



Classes (ppb)

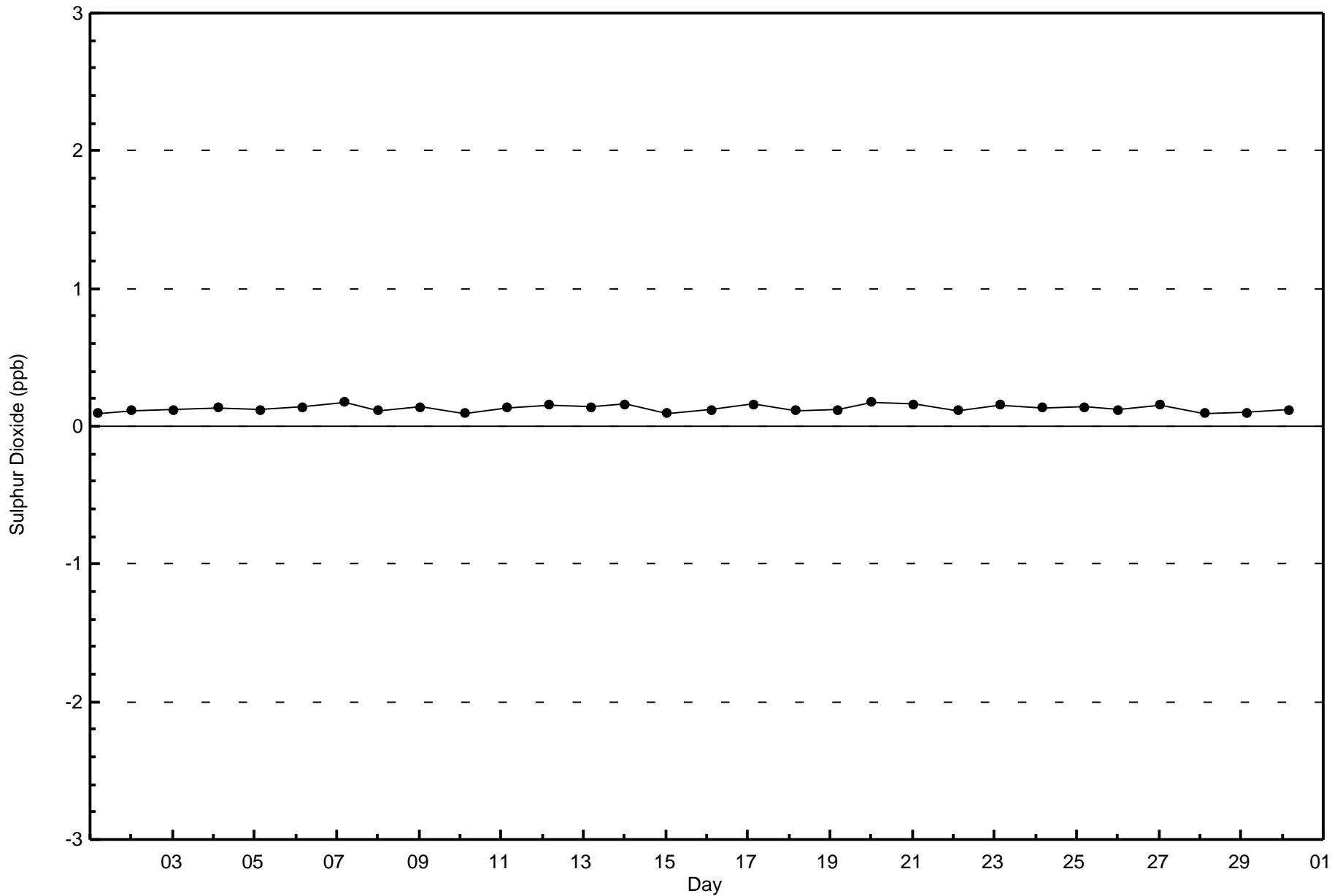


Total Number of Valid Hours: 685



Wood Buffalo Environmental Association
Zero Responses

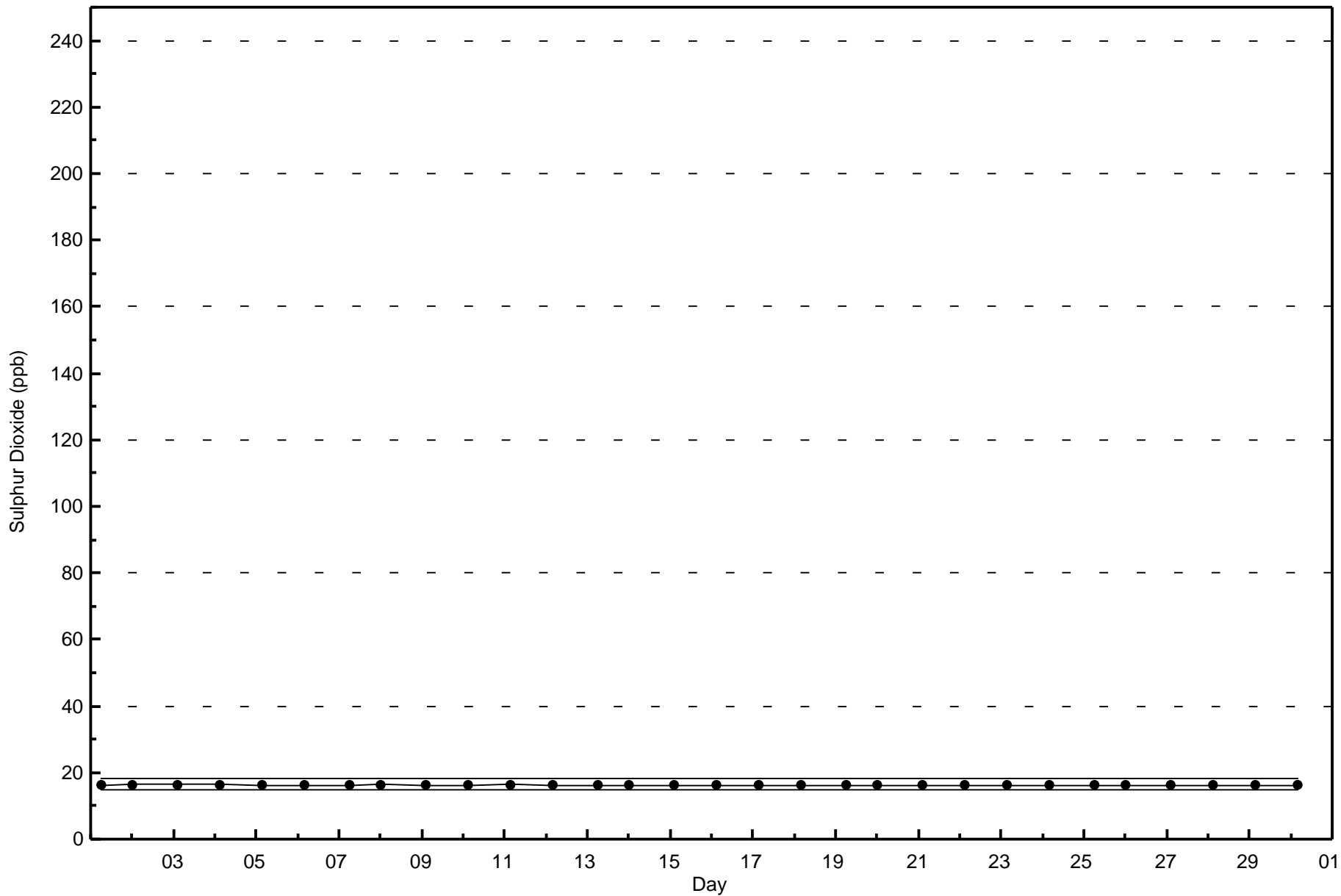
Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - November 2016



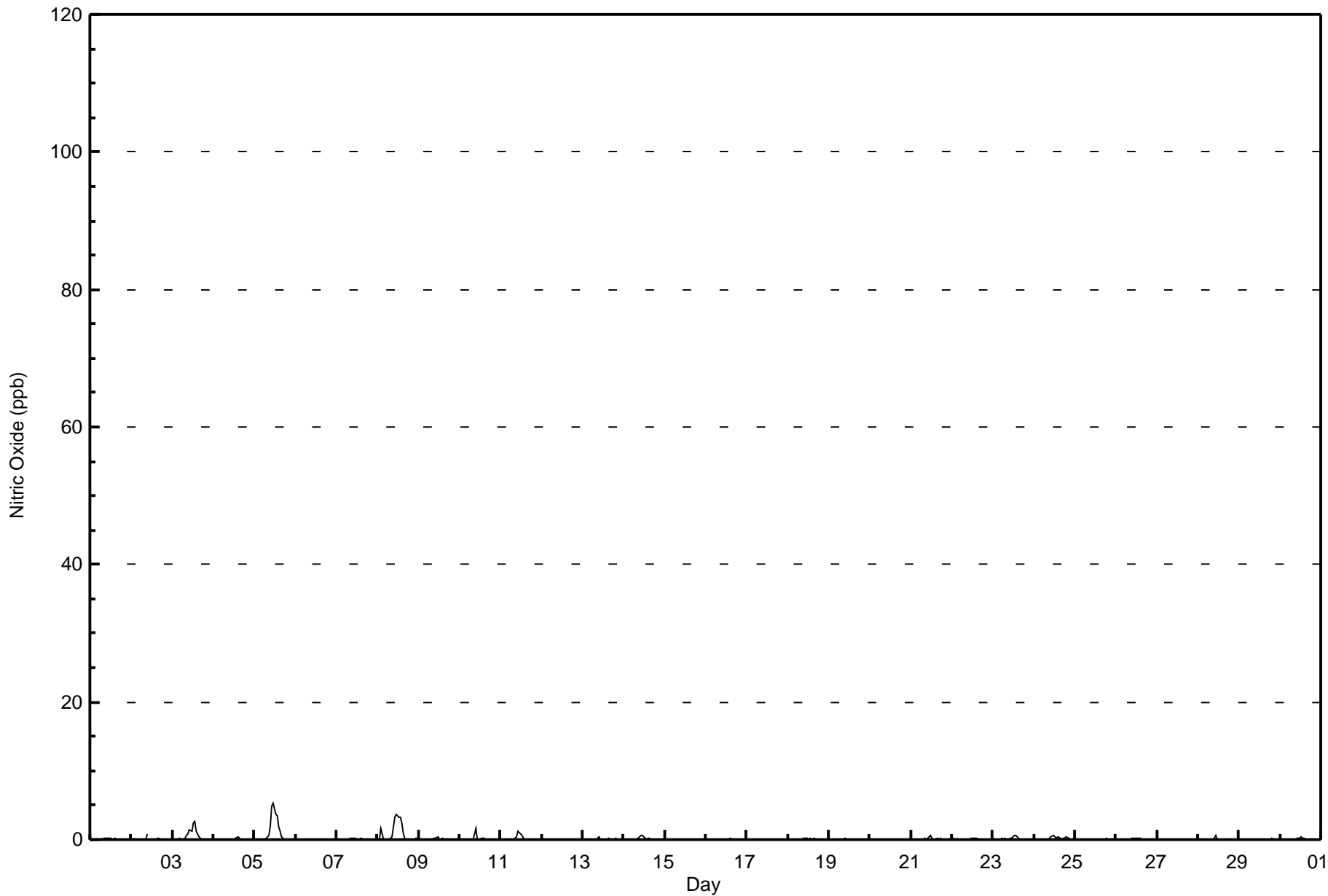


Maximum Value: 5 ppb on Nov 5 12:00 Maximum Daily Average: 1.0 ppb on Nov 5																		Hours in Service: 720 Hours of Data: 685 Hours of Missing Data: 35 Hours of Calibration: 35 Percent Operational Time: 100.0									
Minimum Value: 0 ppb on Nov 1 19:00 Minimum Daily Average: 0.0 ppb on Nov 12 Maximum Diurnal Average: 0.5 ppb at hour 12 Minimum Diurnal Average: 0.0 ppb at hour 4 Monthly Average: 0.1 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 3																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Nov	Z	0	0	0	0	0	0	0	0	1	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	1
3-Nov	0	Z	0	0	0	0	0	0	1	1	1	1	3	3	1	0	0	0	0	0	0	0	0	0	0	0.5	3
4-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Nov	0	0	0	Z	0	0	0	0	1	2	5	5	4	3	2	1	0	0	0	0	0	0	0	0	0	1.0	5
6-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Nov	Z	0	2	0	0	0	0	0	0	2	3	4	3	3	2	1	0	0	0	0	0	0	0	0	0	1.0	4
9-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Nov	0	0	Z	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2
11-Nov	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Nov	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
15-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Nov	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
22-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Nov	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
24-Nov	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
25-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
27-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Nov	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
																								Diurnal Average			
																								Diurnal Maximum			
																								Z - zerospan C - Calibration			



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Fort Chipewyan - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	685	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort Chipewyan - November 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	3	8	17	61	57	39	72	37	42	41	43	107	71	64	17	685
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	3	8	17	61	57	39	72	37	42	41	43	107	71	64	17	685

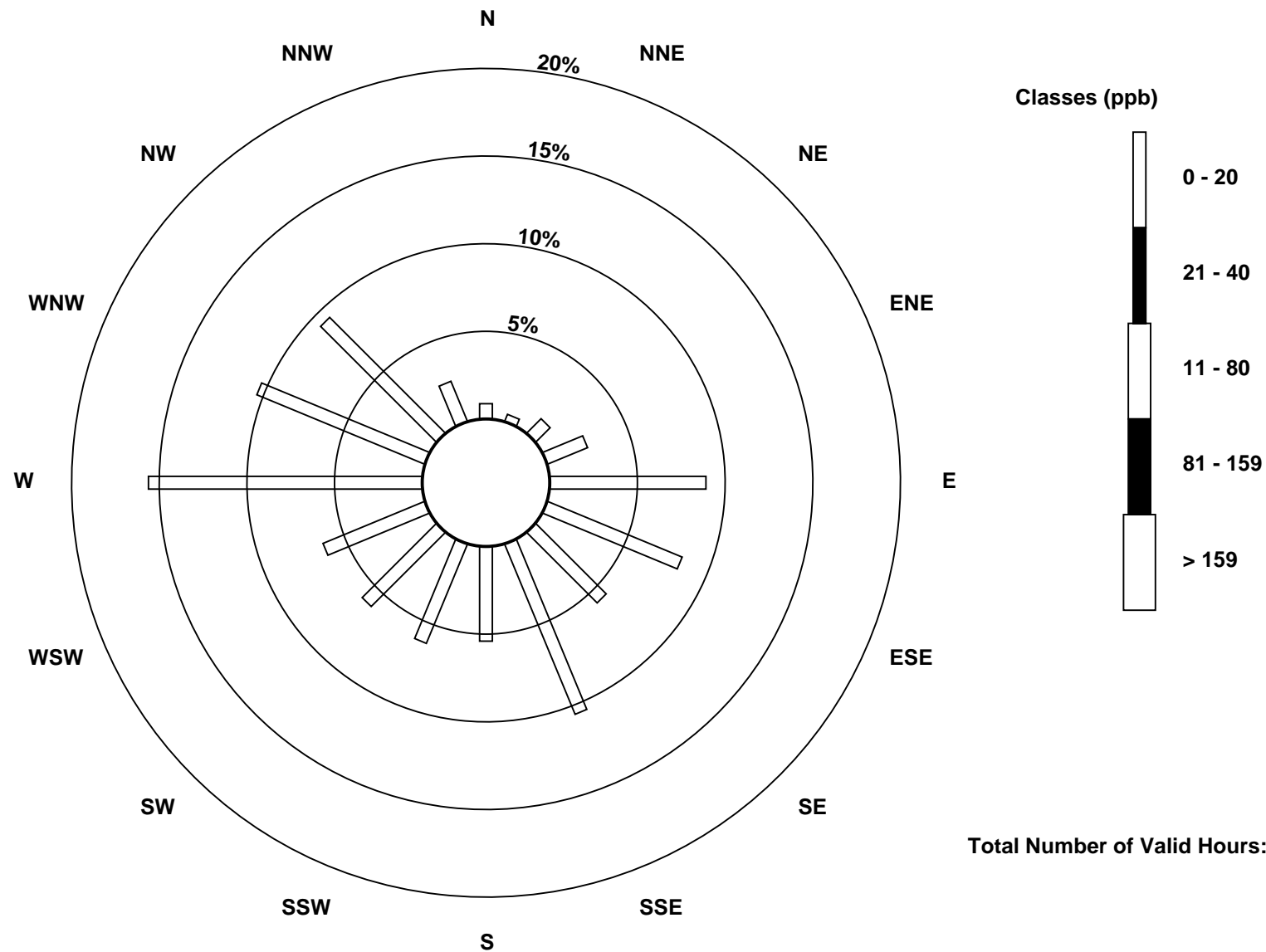
Total Number of Valid Hours: 685

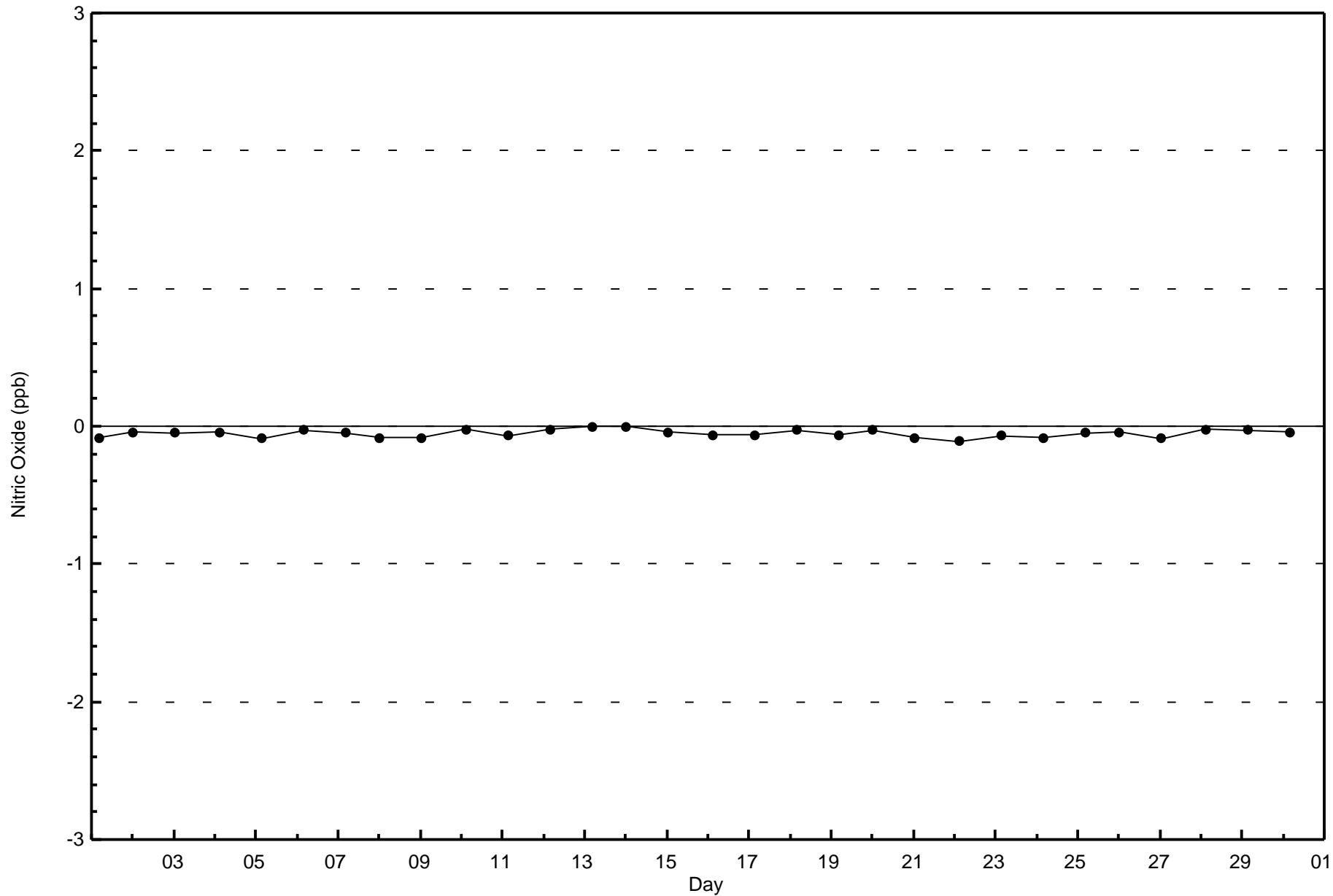
Total Number of Hours: 720

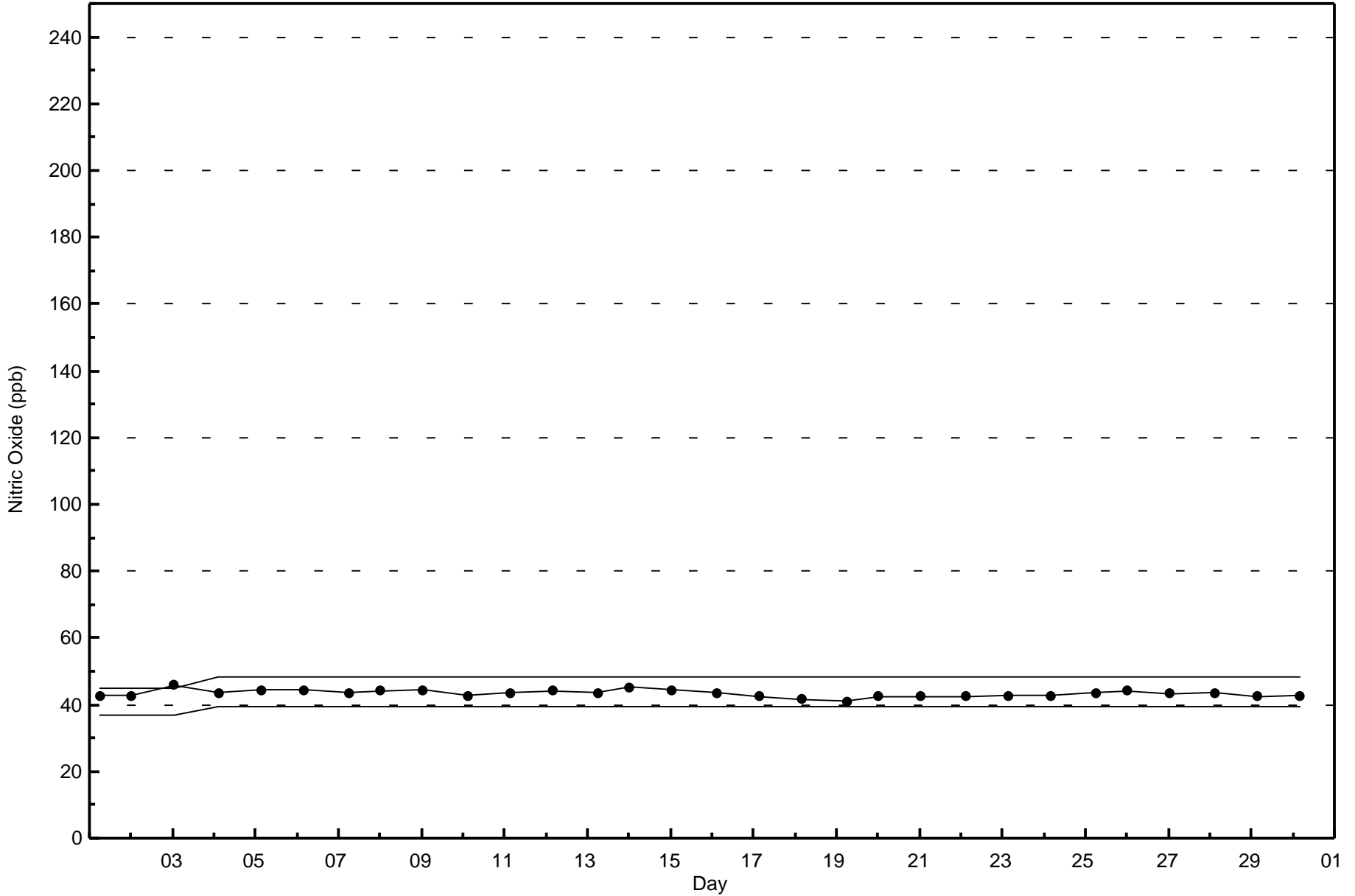


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Fort Chipewyan (AMS 8)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort Chipewyan - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 20 ppb on Nov 5 11:00	Maximum Daily Average: 11.6 ppb on Nov 5		Hours of Data:	685
Minimum Value: 0 ppb on Nov 1 22:00	Minimum Daily Average: 0.2 ppb on Nov 20		Hours of Missing Data:	35
Maximum Diurnal Average: 2.7 ppb at hour 20	Minimum Diurnal Average: 1.2 ppb at hour 2		Hours of Calibration:	35
Monthly Average: 1.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 5 P ₉₉ = 14		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Nov	Z	0	0	0	0	0	0	0	0	2	C	C	C	C	C	3	5	9	7	5	4	3	2	2	2.4	9
3-Nov	2	Z	3	3	3	3	3	5	7	6	7	5	5	3	3	2	3	3	3	4	3	1	1	0	3.4	7
4-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	2	3	5	11	11	8	6	5	4	5	2.8	11
5-Nov	11	8	5	Z	5	9	12	13	13	15	20	18	14	14	2	13	12	12	19	17	13	9	2	0	11.6	20
6-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	1	2	2	0.6	2	
7-Nov	1	2	3	4	2	Z	1	0	1	1	1	0	0	1	1	0	3	3	2	4	5	8	7	4	2.2	8
8-Nov	Z	1	2	2	2	3	4	5	5	5	6	5	5	6	7	6	5	6	6	6	6	6	7	9	5.0	9
9-Nov	8	Z	2	1	1	1	1	0	1	2	1	1	0	0	1	1	1	0	0	0	0	0	0	0	1.0	8
10-Nov	0	0	Z	0	0	0	0	2	1	4	0	0	0	1	1	0	0	1	1	1	1	1	1	1	0.7	4
11-Nov	1	1	2	Z	4	6	7	8	8	7	6	4	4	1	1	1	1	1	1	0	0	0	0	0	2.7	8
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	1	1	0.4	1
13-Nov	0	1	1	1	1	Z	1	1	1	2	1	1	0	0	1	3	3	8	11	12	9	9	7	7	3.5	12
14-Nov	Z	5	7	10	9	7	6	5	5	4	3	3	2	1	1	1	1	0	0	0	0	0	1	1	3.1	10
15-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.3	1
16-Nov	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0.3	1
18-Nov	0	0	0	0	Z	0	0	0	1	1	1	1	0	1	0	0	1	1	0	0	0	0	0	1	0.5	1
19-Nov	0	0	0	1	0	Z	1	5	5	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.8	5
20-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Nov	0	Z	0	0	0	0	0	0	0	0	1	2	1	1	0	0	1	1	1	0	0	0	0	1	0.5	2
22-Nov	0	0	Z	0	1	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	2	3	2	1	0.7	3
23-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	2	3	4	4	1	1	1	1	1	1	0	0	1.2	4
24-Nov	1	1	2	3	Z	4	4	4	3	2	2	2	2	2	3	4	4	8	9	10	9	3	2	3.7	10	
25-Nov	1	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2	2	0.7	2
26-Nov	Z	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
27-Nov	1	Z	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	3
28-Nov	1	1	Z	1	1	1	0	0	0	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	4	5	6	10	1.5	10
30-Nov	7	5	5	2	Z	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1	2	2.1	7

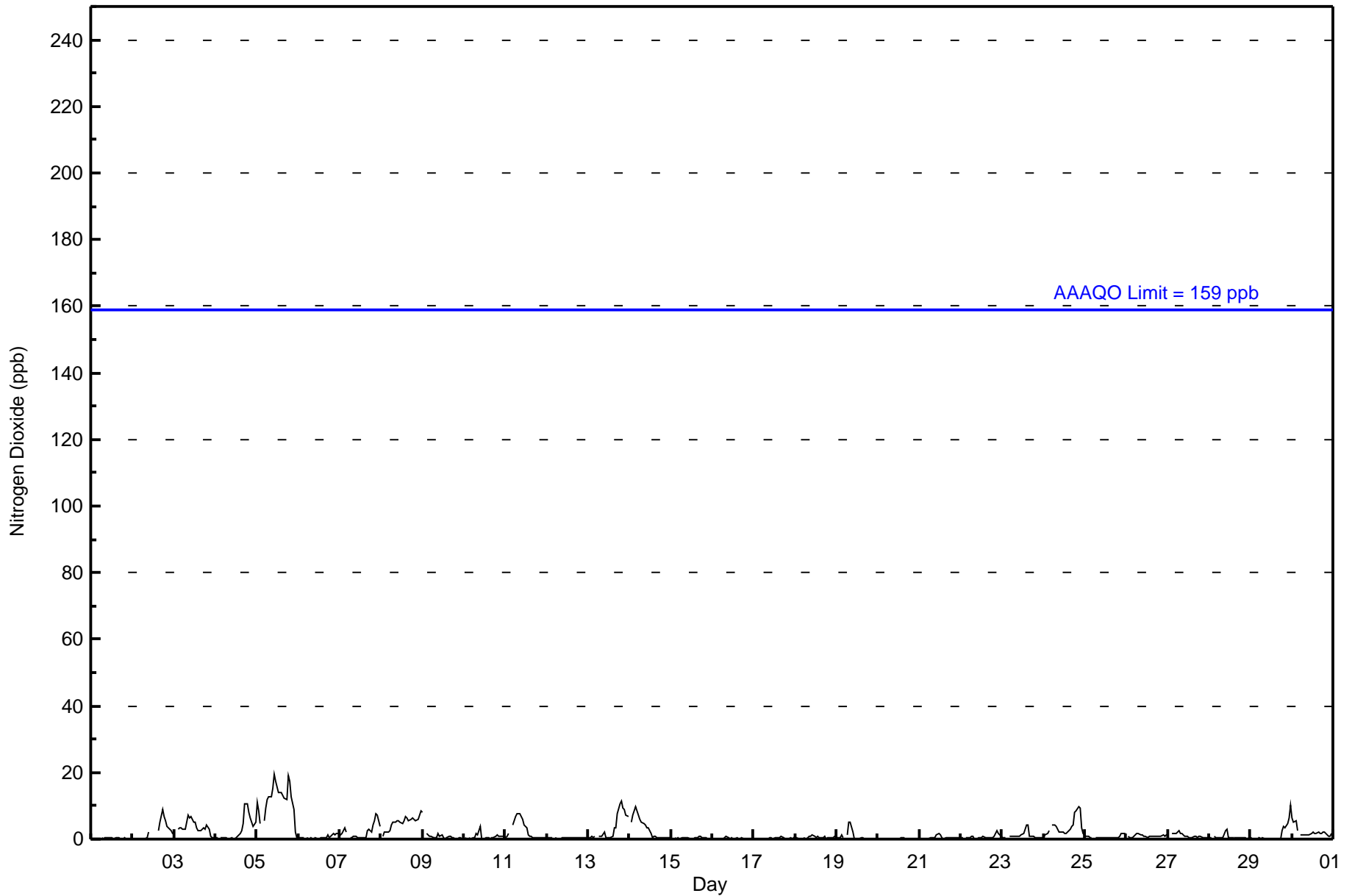
1.4	1.2	1.5	1.3	1.4	1.7	1.7	1.9	2.0	2.1	2.0	1.7	1.5	1.4	1.5	1.7	1.8	2.2	2.7	2.7	2.4	2.2	1.7	1.7	Diurnal Average
11	8	7	10	9	9	12	13	13	15	20	18	14	14	14	13	12	12	19	17	13	9	7	10	Diurnal Maximum

Z - zerospan C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	685	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - November 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	3	8	17	61	57	39	72	37	42	41	43	107	71	64	17	685
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	3	8	17	61	57	39	72	37	42	41	43	107	71	64	17	685

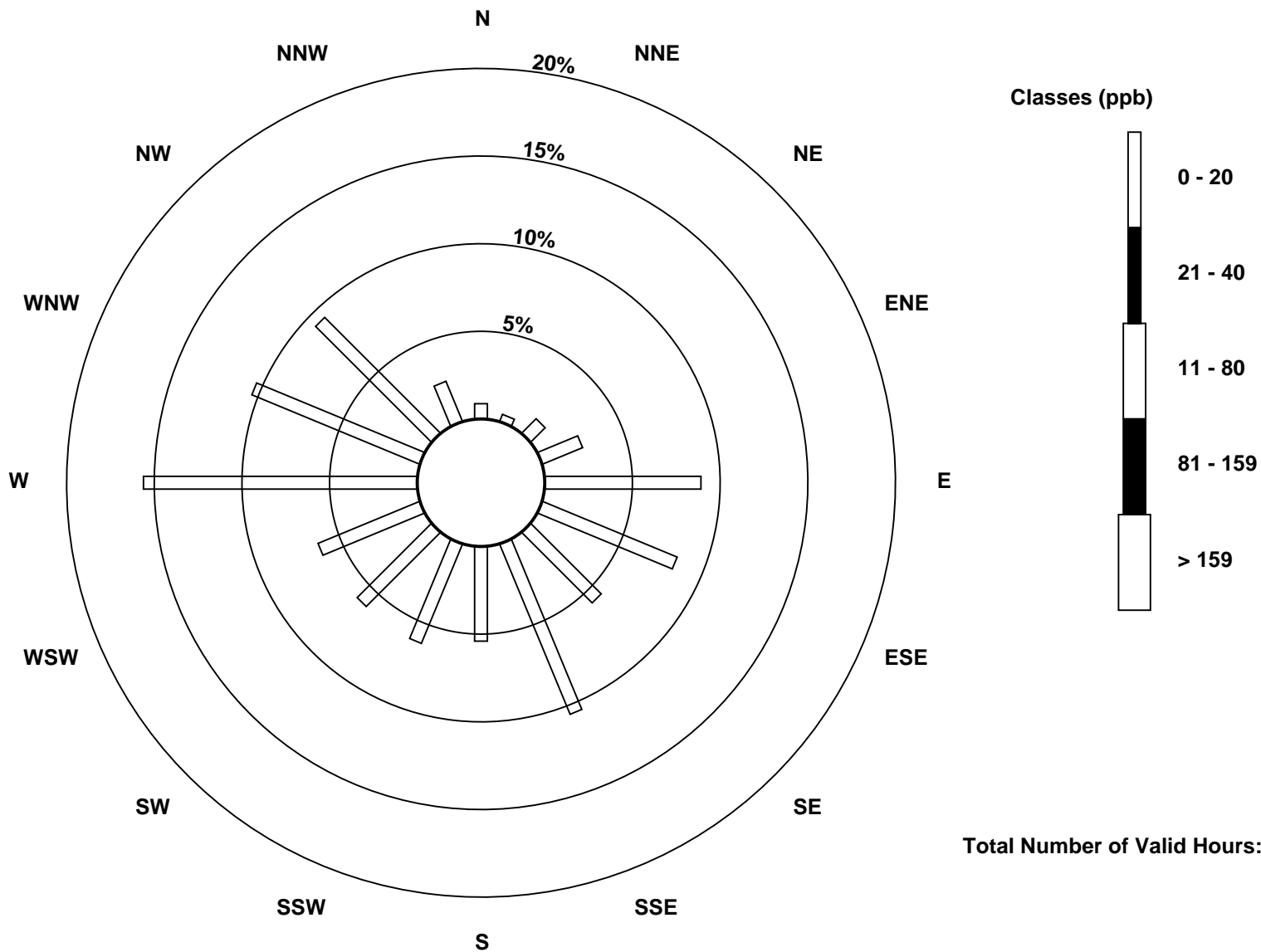
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

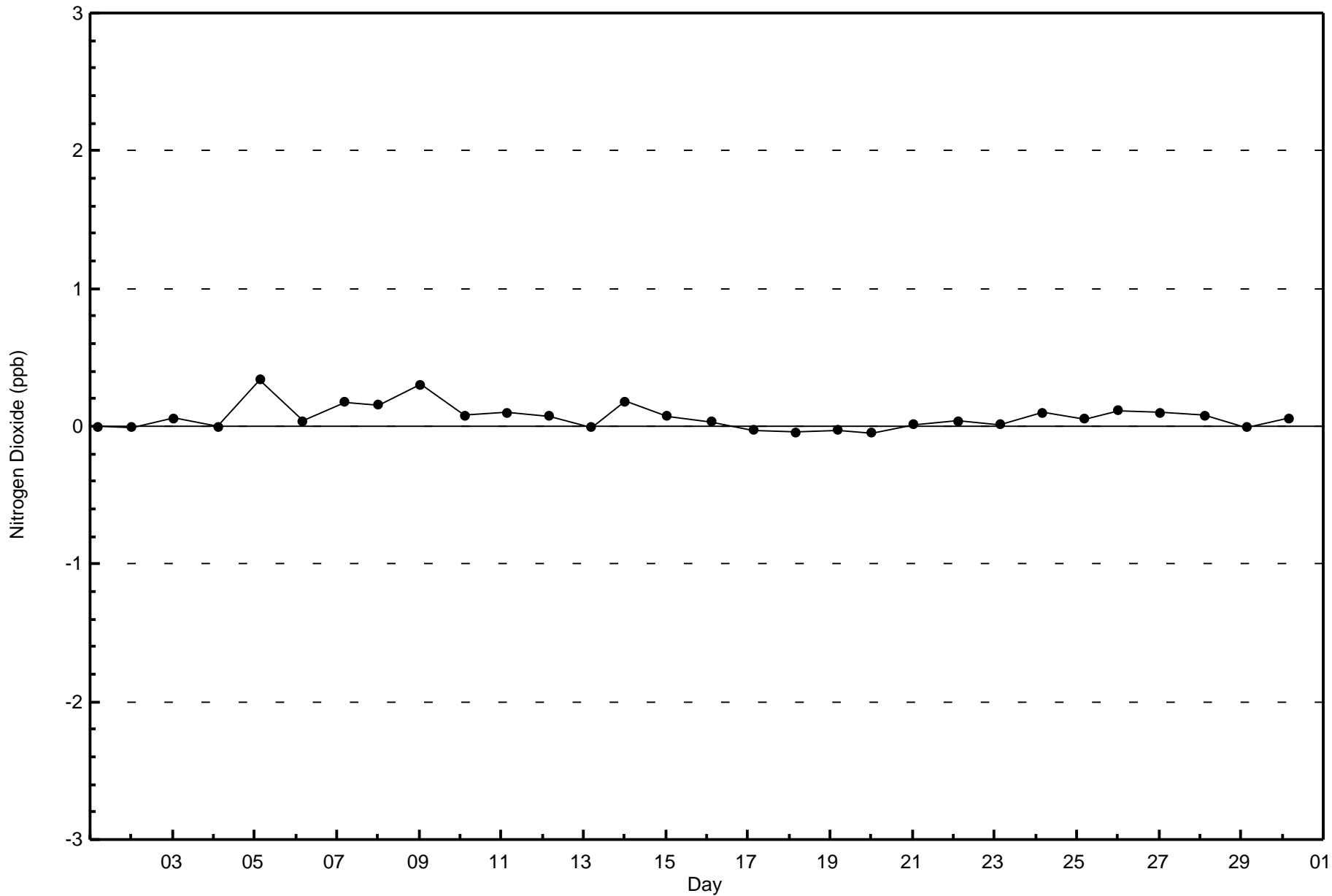
Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan (AMS 8)

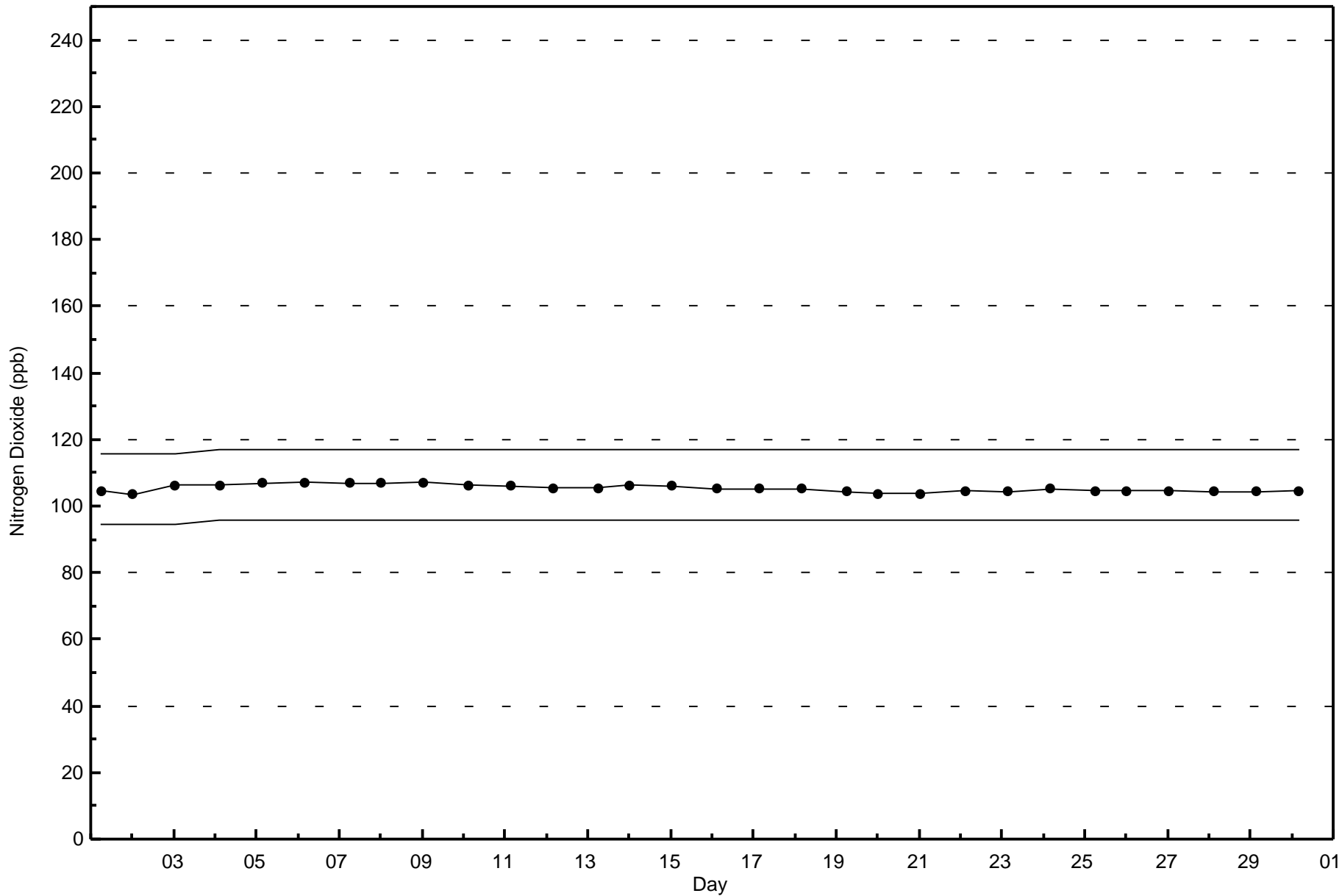




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - November 2016





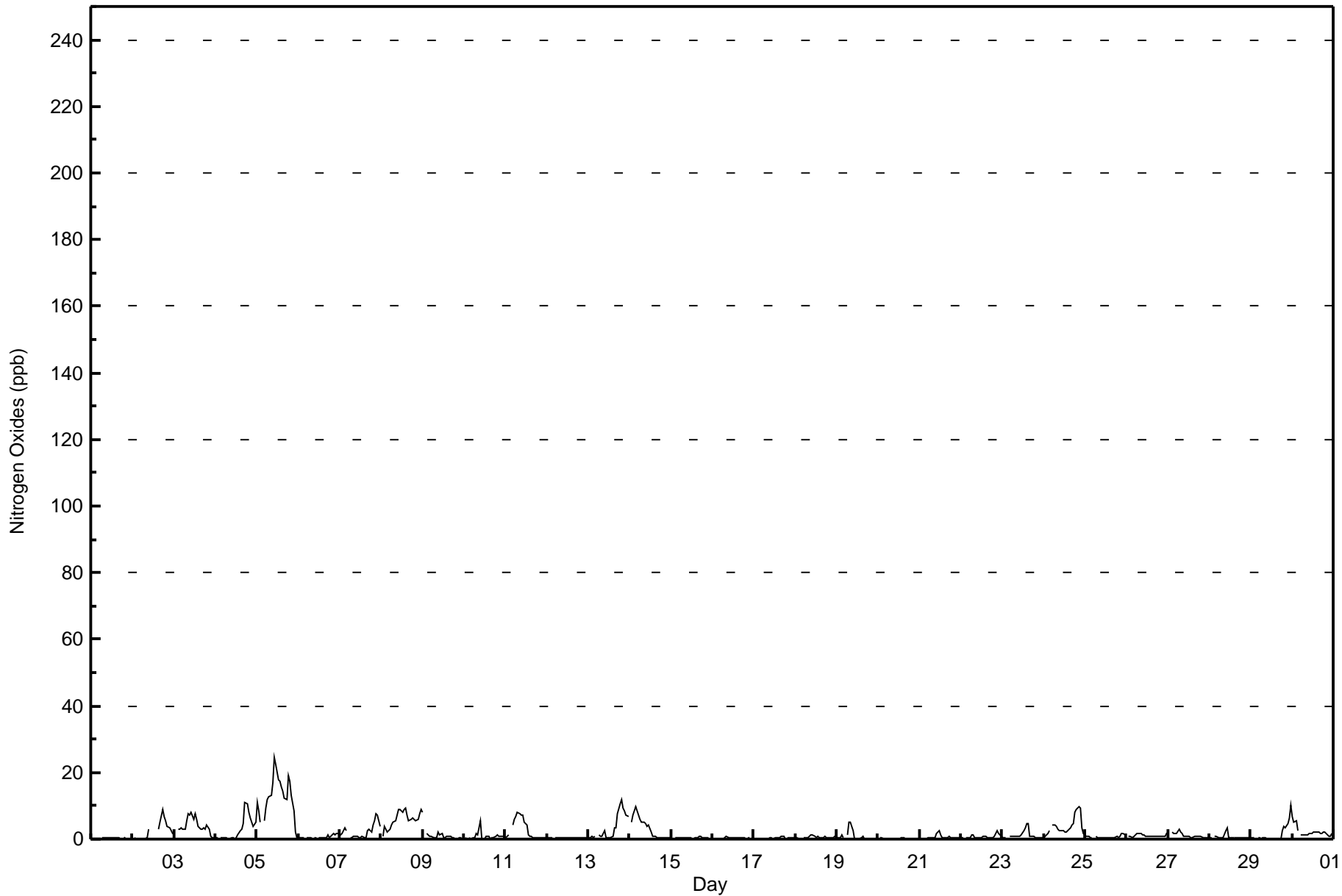


Maximum Value: 25 ppb on Nov 5 11:00																		Maximum Daily Average: 12.7 ppb on Nov 5						Hours in Service: 720			
Minimum Value: 0 ppb on Nov 2 05:00																		Minimum Daily Average: 0.2 ppb on Nov 20						Hours of Data: 685			
Maximum Diurnal Average: 2.7 ppb at hour 20																		Minimum Diurnal Average: 1.2 ppb at hour 2						Hours of Missing Data: 35			
Monthly Average: 2.0 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 6 P ₉₉ = 17						Hours of Calibration: 35			
																		Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Nov	0	0	0	0	0	Z	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0.3	1	
2-Nov	Z	0	0	0	0	0	0	0	1	3	C	C	C	C	C	3	5	9	7	5	4	3	2	2	2.5	9	
3-Nov	2	Z	3	3	3	3	3	5	8	7	8	6	8	6	4	3	3	3	3	4	3	1	0	0	3.9	8	
4-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	2	3	5	11	11	8	6	5	4	5	2.8	11	
5-Nov	11	8	5	Z	5	9	12	13	13	17	25	23	18	17	16	14	12	12	19	17	13	9	2	0	12.7	25	
6-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	1	2	2	0.6	2	
7-Nov	1	2	2	3	2	Z	1	0	1	1	1	0	0	1	1	0	3	3	2	4	6	8	7	4	2.3	8	
8-Nov	Z	1	4	2	2	3	4	5	5	7	9	9	8	9	9	7	6	6	6	6	6	6	8	9	6.0	9	
9-Nov	8	Z	2	1	1	1	0	0	1	2	1	2	0	0	1	1	1	0	0	0	0	0	0	0	1.0	8	
10-Nov	0	0	Z	0	0	1	0	2	1	5	0	0	0	1	1	0	0	1	1	1	1	1	1	1	0.8	5	
11-Nov	1	1	1	Z	4	6	7	8	8	7	7	5	4	1	1	1	1	1	1	0	0	0	0	0	2.8	8	
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0.4	1	
13-Nov	0	1	1	0	1	Z	1	1	1	2	1	0	0	0	1	3	3	8	11	12	9	9	7	7	3.5	12	
14-Nov	Z	5	7	10	9	7	6	5	5	5	4	4	2	1	1	1	0	0	0	0	0	0	0	0	3.2	10	
15-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0.3	1	
16-Nov	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0.3	1	
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0.3	1	
18-Nov	0	0	0	0	Z	0	0	0	1	1	1	1	0	1	1	0	1	1	0	0	0	0	0	1	0.5	1	
19-Nov	0	0	0	1	0	Z	1	5	5	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.9	5	
20-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
21-Nov	0	Z	0	0	0	0	0	0	1	0	2	2	1	1	0	0	1	1	1	0	0	1	1	1	0.6	2	
22-Nov	1	0	Z	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	2	3	2	1	0.8	3	
23-Nov	1	0	1	Z	1	1	1	1	1	1	1	1	2	4	5	4	1	1	1	1	1	0	0	0	1.3	5	
24-Nov	1	1	2	3	Z	4	4	4	3	2	3	3	2	2	3	3	4	5	8	9	10	9	3	2	3.9	10	
25-Nov	1	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2	1	0.7	2	
26-Nov	Z	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	2	
27-Nov	1	Z	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	3	
28-Nov	1	1	Z	1	1	1	0	0	0	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4	
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	5	6	10	1.5	10	
30-Nov	7	5	5	2	Z	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2.2	7	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration																											



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	683	99.71	99.71
21 - 40	2	0.29	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - November 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	3	8	17	61	57	38	71	37	42	41	43	107	71	64	17	683
21 - 40	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	3	8	17	61	57	39	72	37	42	41	43	107	71	64	17	685

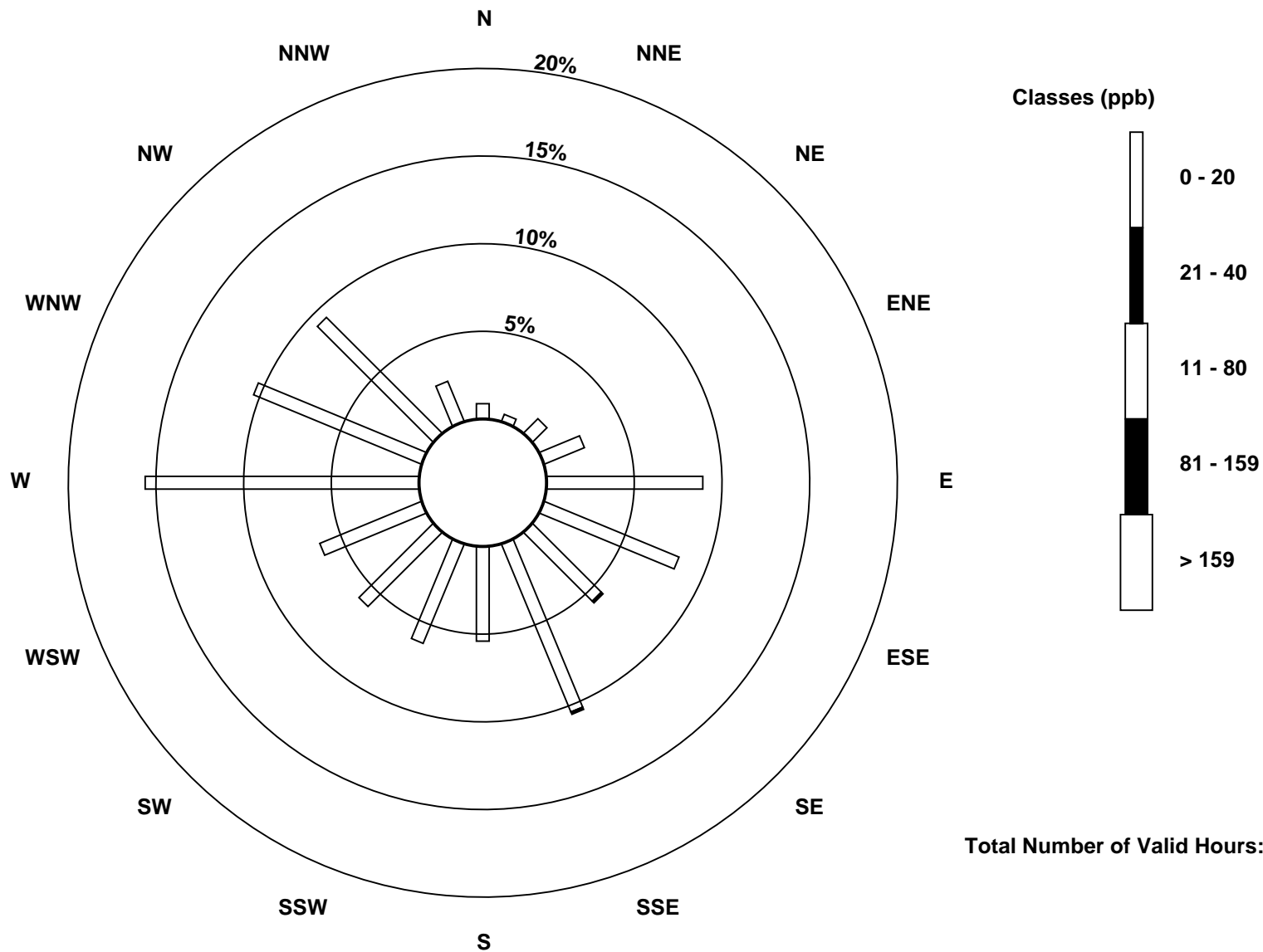
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

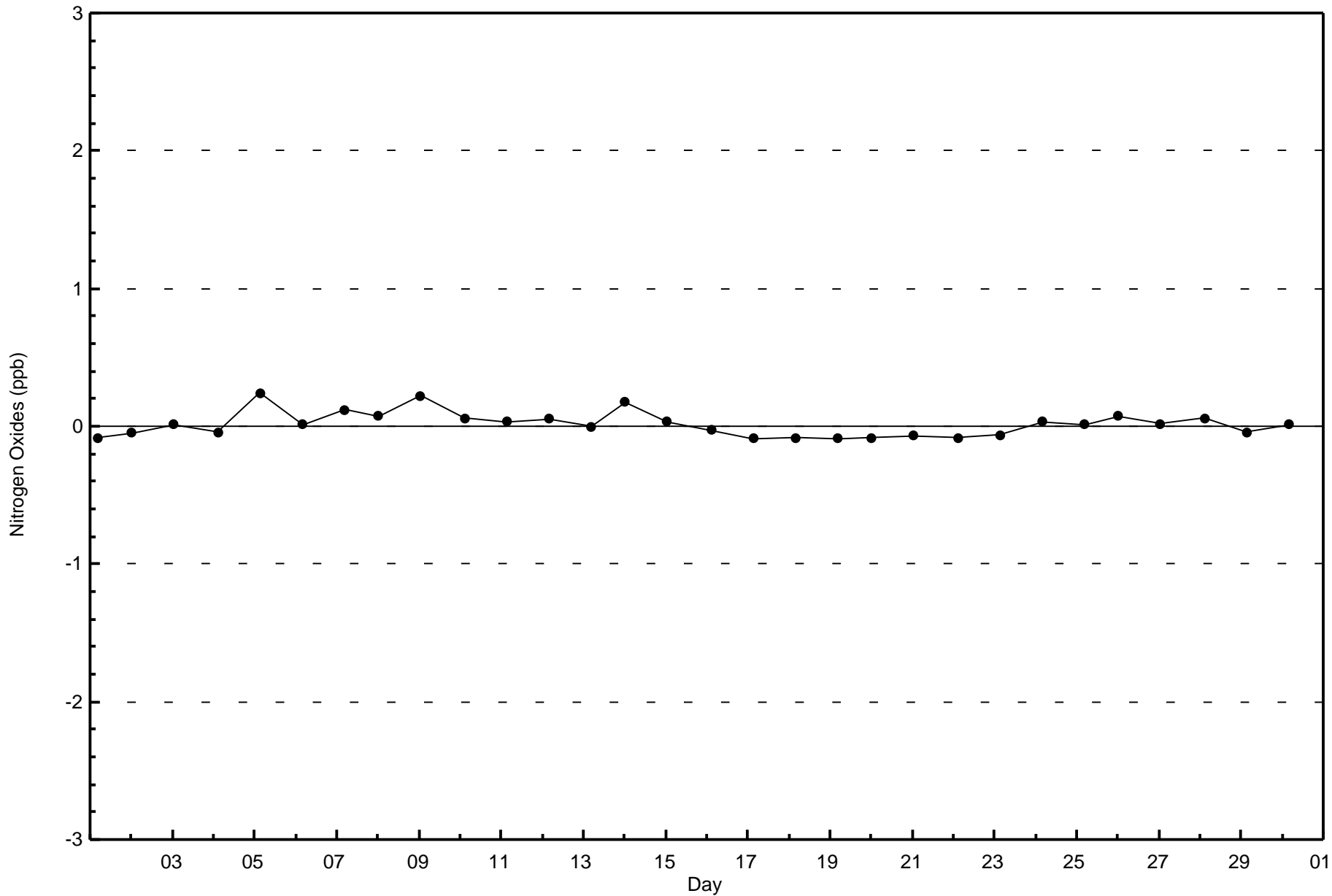
Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan (AMS 8)

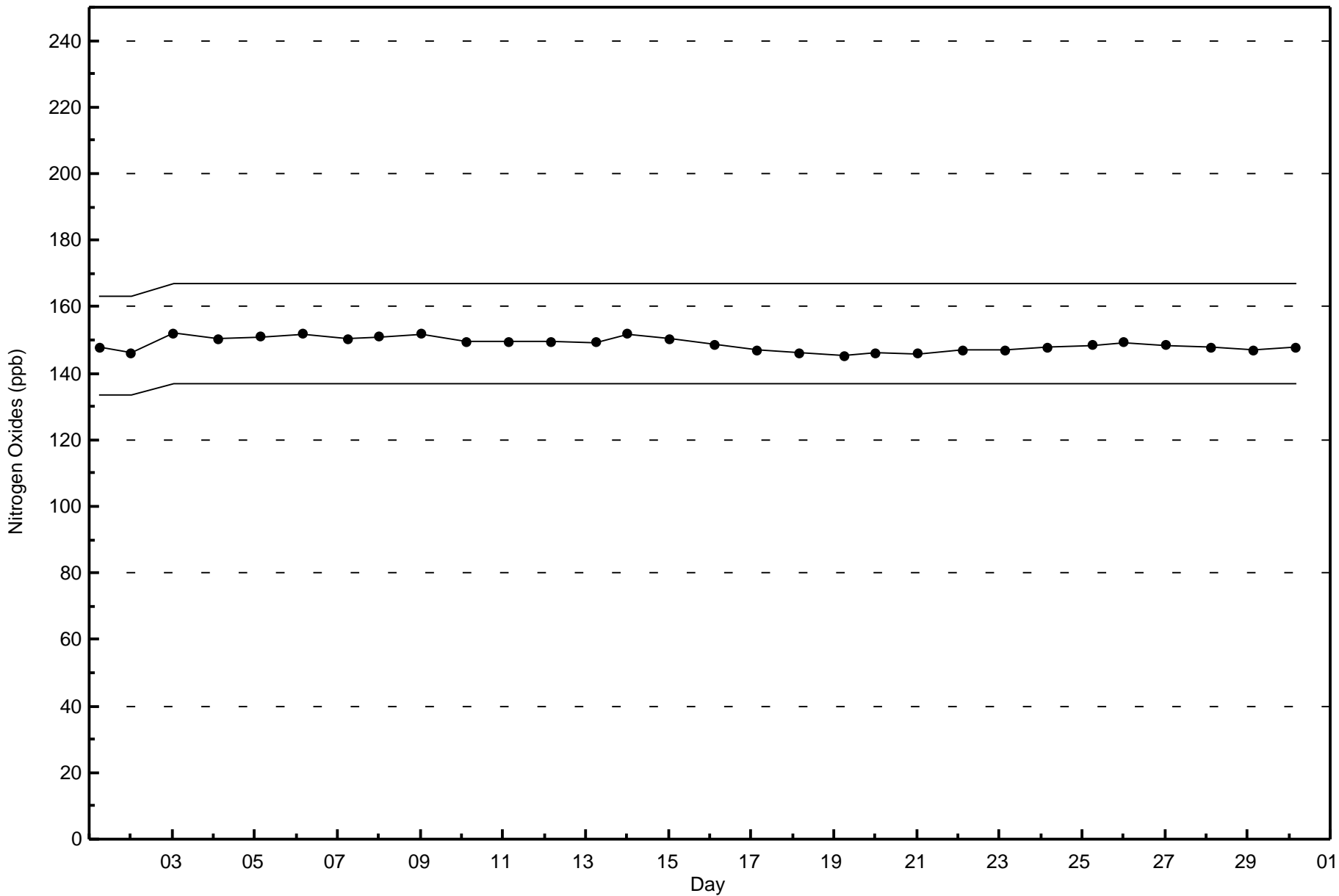




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Fort Chipewyan - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 40 ppb on Nov 6 00:00	Maximum Daily Average: 37.2 ppb on Nov 18		Hours of Data:	642
Minimum Value: 7 ppb on Nov 5 19:00	Minimum Daily Average: 16.3 ppb on Nov 5		Hours of Missing Data:	78
Maximum Diurnal Average: 27.5 ppb at hour 4	Minimum Diurnal Average: 23.1 ppb at hour 8		Hours of Calibration:	35
Monthly Average: 26.0 ppb	Percentiles: P ₁ = 9 P ₁₀ = 15 Q ₁ = 21 Median = 25 Q ₃ = 33 P ₉₀ = 36 P ₉₉ = 40		Percent Operational Time:	94.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
2-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	C	C	16	16	--	16
3-Nov	16	15	15	15	Z	15	14	11	M	M	M	M	12	15	18	17	16	15	17	15	19	32	37	37	18.5	37	
4-Nov	38	38	38	37	36	Z	35	32	33	34	35	36	34	31	29	28	25	19	18	19	20	20	22	20	29.5	38	
5-Nov	16	18	22	24	22	17	Z	13	14	12	9	11	13	12	12	12	13	12	7	10	14	19	34	40	16.3	40	
6-Nov	40	40	39	40	40	38	38	Z	37	34	32	35	37	37	37	36	35	35	35	31	29	31	25	23	35.0	40	
7-Nov	27	25	18	17	15	22	25	23	Z	19	18	22	24	26	27	27	22	22	22	18	16	15	17	22	21.3	27	
8-Nov	25	28	27	Z	25	22	19	17	16	16	16	17	17	17	18	17	16	14	12	12	11	10	9	7	16.9	28	
9-Nov	9	14	24	24	Z	23	22	21	22	20	22	21	20	20	21	23	22	23	26	27	25	24	23	24	21.7	27	
10-Nov	23	24	22	23	24	Z	19	18	17	16	23	23	21	20	20	21	22	22	24	25	26	27	28	28	22.5	28	
11-Nov	30	31	30	28	25	22	Z	19	18	19	21	24	24	32	35	34	34	33	32	32	32	33	34	35	28.5	35	
12-Nov	34	35	35	36	35	35	36	Z	36	34	34	35	35	35	34	33	34	35	33	33	32	30	28	28	33.7	36	
13-Nov	28	27	25	25	24	24	25	24	Z	22	24	25	24	25	24	23	22	16	13	11	13	11	12	11	20.8	28	
14-Nov	12	10	8	Z	9	10	12	13	12	12	13	15	18	20	18	17	18	20	19	23	26	26	27	27	16.5	27	
15-Nov	33	35	35	36	Z	34	33	33	33	32	33	35	36	36	36	34	32	33	32	33	34	33	32	29	33.6	36	
16-Nov	27	29	29	30	32	Z	30	30	31	31	31	30	29	30	30	32	33	34	35	35	35	35	36	36	31.7	36	
17-Nov	35	35	34	33	33	31	Z	29	29	31	32	33	32	32	32	32	31	34	38	38	39	40	40	39	33.9	40	
18-Nov	37	35	35	37	36	37	37	Z	37	36	36	38	39	39	40	39	38	36	37	38	39	39	37	37	37.2	40	
19-Nov	37	38	39	36	38	37	35	29	Z	37	38	38	38	39	38	37	36	36	35	34	34	33	33	33	36.0	39	
20-Nov	33	33	32	Z	35	34	34	33	32	32	32	31	31	31	31	31	31	30	30	30	29	28	27	27	31.1	35	
21-Nov	27	27	26	26	Z	27	26	25	24	23	19	19	21	21	21	22	23	22	22	24	24	24	24	24	23.4	27	
22-Nov	25	25	25	24	24	Z	22	21	22	21	23	23	23	22	22	22	24	25	26	26	24	22	22	23	23.3	26	
23-Nov	22	22	22	20	20	21	Z	22	22	22	23	23	23	22	21	21	24	24	24	25	25	26	26	26	22.9	26	
24-Nov	25	24	22	19	16	15	15	Z	15	14	14	14	15	17	15	20	20	14	14	13	15	23	26	26	17.3	26	
25-Nov	27	28	25	24	23	21	21	22	Z	24	24	24	24	24	24	24	24	24	22	21	20	19	17	16	16	22.3	28
26-Nov	15	17	20	Z	15	10	10	9	10	11	16	19	19	19	20	21	22	21	21	19	18	17	17	18	16.7	22	
27-Nov	20	21	22	22	Z	21	22	27	28	30	31	32	33	33	34	33	32	31	32	33	34	34	34	32	29.1	34	
28-Nov	31	30	29	28	27	Z	27	25	25	22	21	22	23	22	21	22	22	23	24	25	27	29	30	30	25.5	31	
29-Nov	32	32	32	31	31	35	Z	33	32	31	32	34	35	35	34	32	31	33	30	30	30	27	24	17	31.0	35	
30-Nov	21	22	23	28	33	32	32	Z	31	30	30	31	31	31	32	32	32	32	31	32	33	33	33	32	30.5	33	

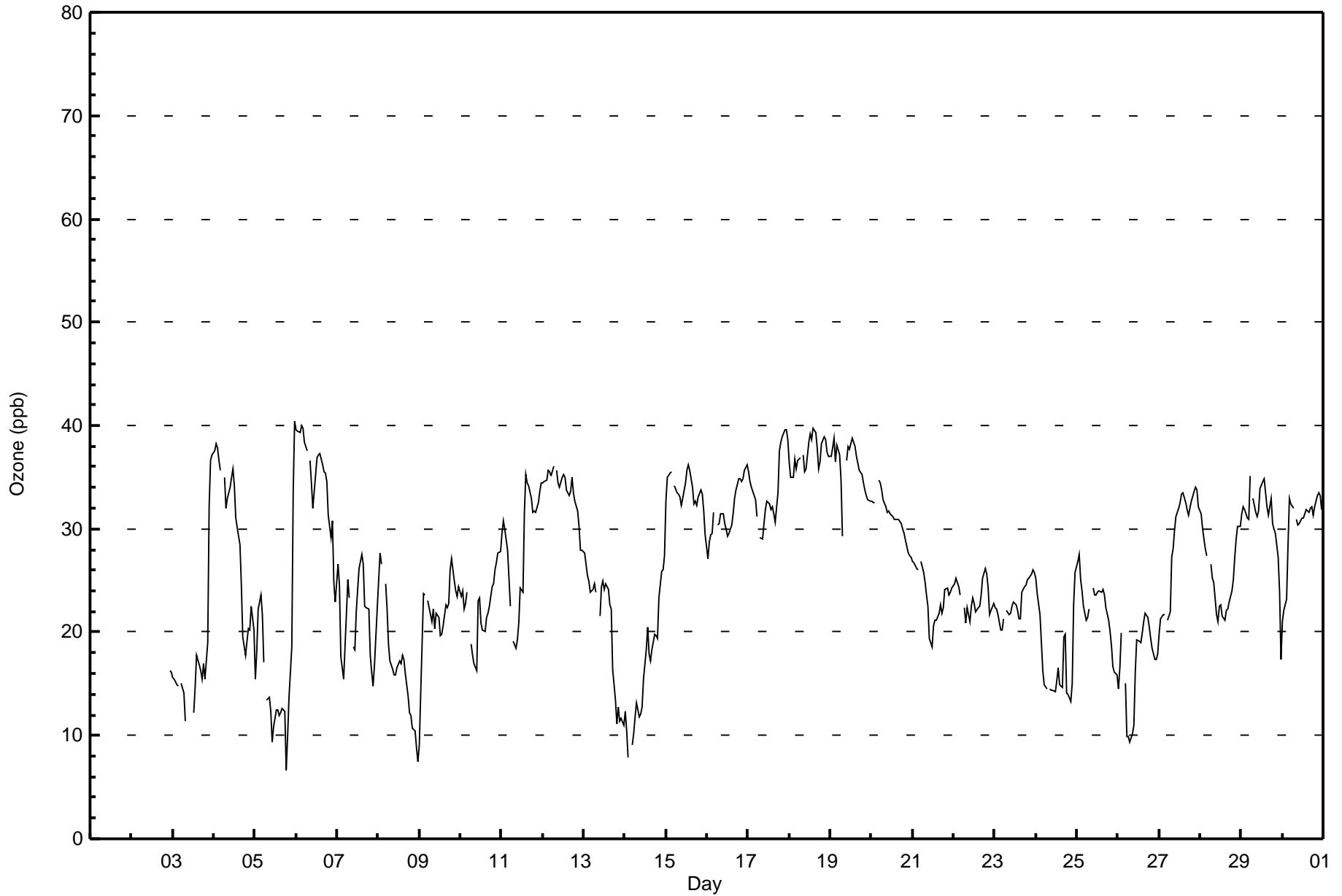
26.5	27.0	26.9	27.5	26.8	25.5	25.5	23.1	25.0	24.6	25.2	26.3	26.1	26.5	26.6	26.3	26.2	25.9	25.4	25.3	25.6	26.0	26.3	26.4	Diurnal Average	
40	40	39	40	40	38	38	33	37	37	38	38	39	39	40	39	38	36	38	38	39	40	40	40	Diurnal Maximum	

Z - zerspan C - Calibration M - Maintenance AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Fort Chipewyan - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	157	24.45	24.45
21 - 50	485	75.55	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 642

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Fort Chipewyan - November 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	0	0	0	4	17	13	7	18	11	20	24	8	26	8	1	0	157
21 - 50	6	2	8	13	44	47	28	45	20	15	18	35	79	60	51	14	485
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	2	8	17	61	60	35	63	31	35	42	43	105	68	52	14	642

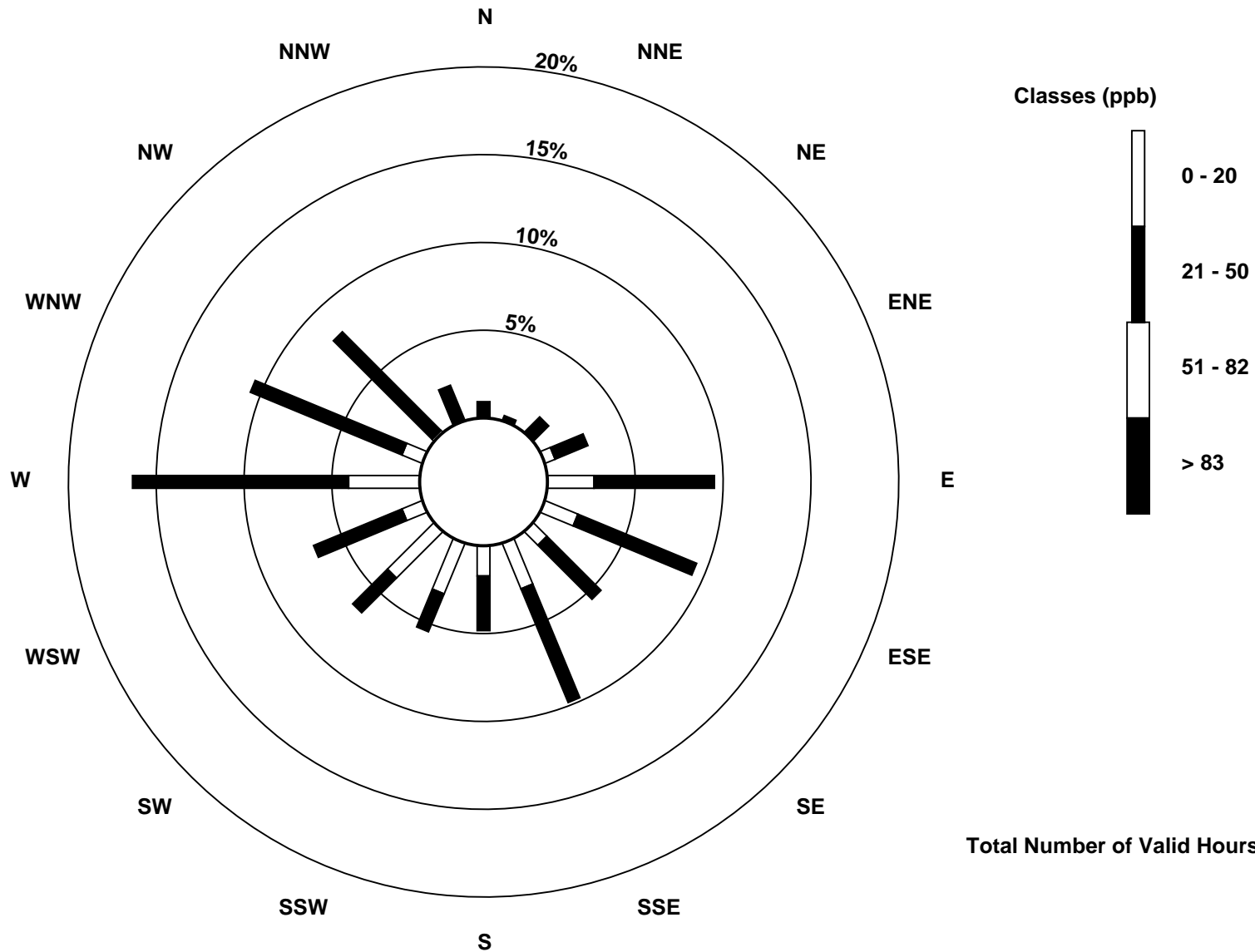
Total Number of Valid Hours: 642

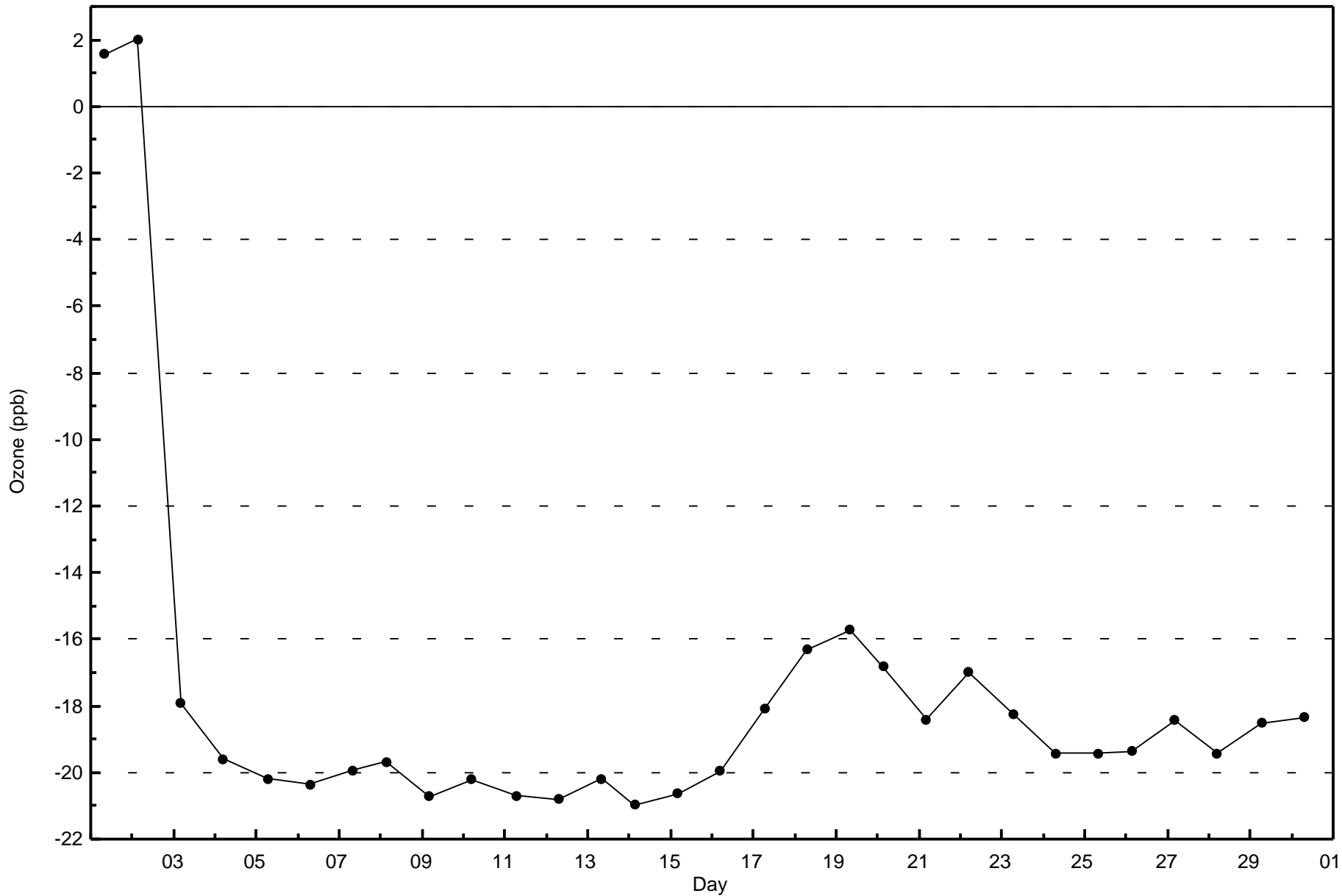
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Fort Chipewyan (AMS 8)

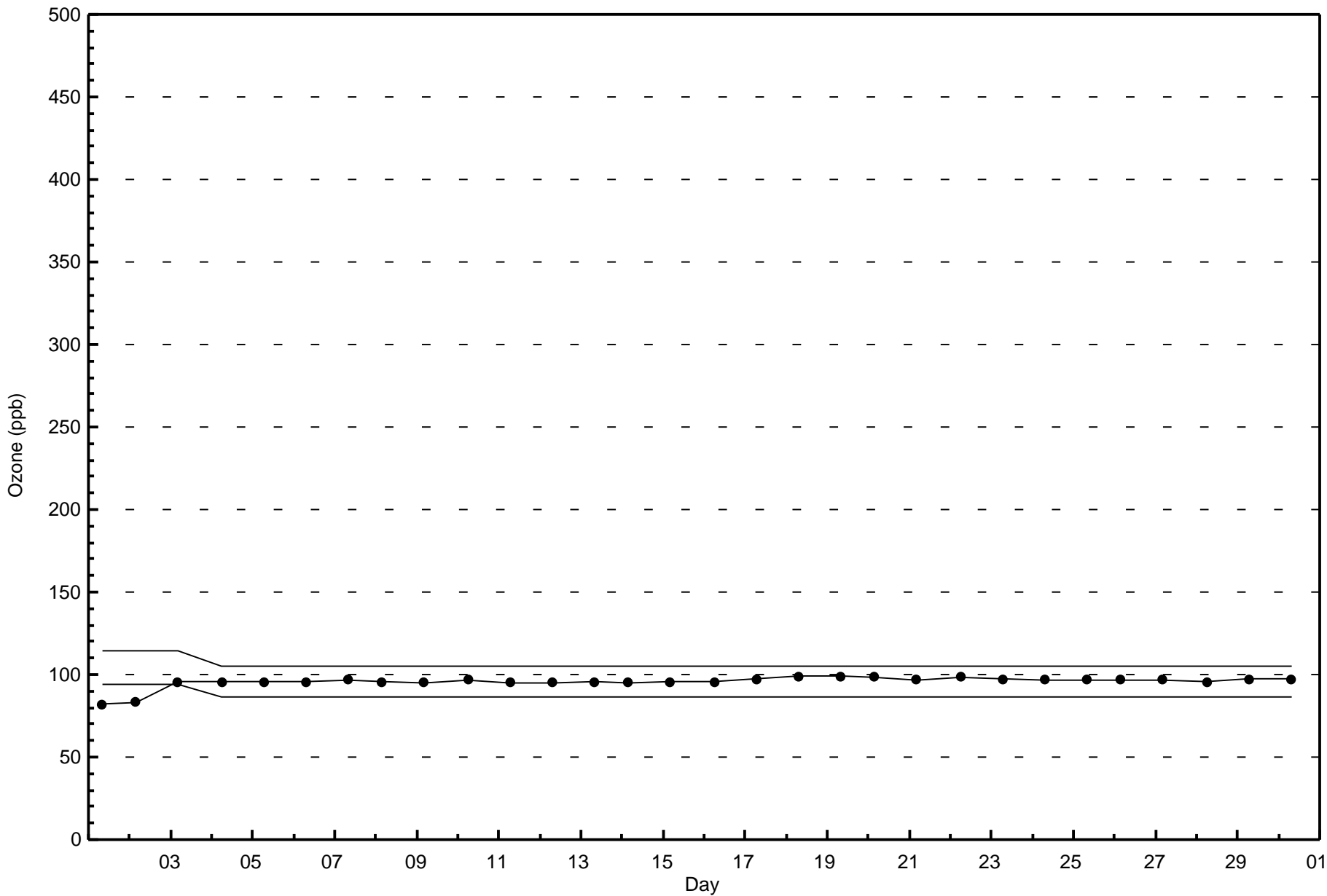






Wood Buffalo Environmental Association
Span Responses

Ozone (O₃) - ppb
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Fort Chipewyan - November 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 21.9 µg/m ³ on Nov 26 08:00		Maximum Daily Average: 10.5 µg/m ³ on Nov 26		Hours in Service: 720 Hours of Data: 717																																												
Minimum Value: 0.5 µg/m ³ on Nov 10 12:00 Maximum Diurnal Average: 4.6 µg/m ³ at hour 24 Monthly Average: 3.75 µg/m ³		Minimum Daily Average: 1.0 µg/m ³ on Nov 1 Minimum Diurnal Average: 3.1 µg/m ³ at hour 15 Percentiles: P ₁ = 0.5 P ₁₀ = 0.9 Q ₁ = 1.7 Median = 2.9 Q ₃ = 4.8 P ₉₀ = 7.8 P ₉₉ = 16.7		Hours of Missing Data: 3 Hours of Calibration: 3 Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Nov	1.7	0.8	0.6	0.6	0.6	0.6	0.5	0.9	0.8	0.9	0.8	0.8	1.5	1.0	1.8	2.5	1.6	1.5	0.8	1.8	1.1	0.7	0.7	0.7	1.0	2.5																						
2-Nov	0.7	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.8	2.7	3.2	3.9	C	C	C	5.8	7.0	8.3	7.5	6.0	4.0	2.9	2.7	2.7	3.0	8.3																						
3-Nov	3.2	3.7	3.9	3.9	3.9	5.0	6.6	8.3	9.6	10.4	9.8	9.4	8.8	5.4	3.0	2.5	2.9	3.7	3.6	3.5	2.7	1.3	1.0	0.9	4.9	10.4																						
4-Nov	0.9	1.1	1.3	1.5	1.7	1.8	1.8	1.8	1.6	1.3	1.3	1.1	1.0	1.2	1.7	2.8	4.9	7.0	7.4	6.7	6.2	6.1	5.9	6.7	3.1	7.4																						
5-Nov	7.8	7.4	6.3	5.8	8.2	8.5	9.6	9.0	8.0	8.3	7.8	6.8	6.1	5.6	5.9	5.7	5.7	6.3	8.5	6.4	4.8	4.2	2.6	1.7	6.5	9.6																						
6-Nov	1.7	1.8	1.8	1.5	1.5	1.4	1.3	1.4	1.4	1.5	1.3	1.3	1.5	2.4	2.0	1.8	3.8	3.8	2.5	2.6	3.6	4.0	9.4	6.2	2.6	9.4																						
7-Nov	6.4	9.4	8.8	8.1	5.4	4.1	4.8	5.3	7.4	8.7	6.6	7.0	12.5	13.1	8.7	8.3	10.6	13.0	7.5	6.0	7.7	10.0	7.3	4.3	8.0	13.1																						
8-Nov	1.7	0.7	0.5	0.8	1.1	1.5	3.5	3.2	3.1	3.2	2.7	2.6	2.3	2.1	1.5	1.4	2.0	3.4	3.6	3.4	3.2	3.0	4.5	5.0	2.5	5.0																						
9-Nov	3.9	3.8	1.9	2.0	2.4	2.7	2.7	3.5	3.2	5.3	3.6	3.2	1.9	2.1	2.5	2.9	3.0	3.6	4.6	4.2	4.8	5.5	5.3	3.0	3.4	5.5																						
10-Nov	2.5	2.7	2.7	2.7	2.3	2.0	3.3	3.6	3.1	4.6	1.2	0.5	0.7	1.2	1.2	1.2	1.2	1.4	1.5	1.9	2.0	1.8	1.9	1.9	2.0	4.6																						
11-Nov	3.0	3.6	4.3	4.9	5.0	4.9	5.8	6.7	7.1	5.9	4.0	2.3	1.9	2.0	1.8	1.7	2.5	3.8	4.8	4.4	4.1	3.4	2.8	2.7	3.9	7.1																						
12-Nov	2.5	3.5	3.6	3.5	3.1	3.0	3.0	2.8	2.7	3.2	3.4	3.6	3.3	3.5	4.0	4.4	4.8	4.6	7.4	6.5	5.1	5.5	6.3	7.2	4.2	7.4																						
13-Nov	5.3	6.5	7.1	7.9	9.1	10.3	14.2	17.0	19.2	19.4	11.3	8.8	7.5	5.9	5.2	4.0	4.3	4.0	4.1	7.6	4.5	4.9	4.8	5.3	8.3	19.4																						
14-Nov	4.0	3.8	4.4	5.1	5.2	5.1	5.2	5.0	5.3	5.6	5.0	2.2	1.5	1.4	2.1	2.4	2.2	3.1	3.1	3.2	2.6	2.1	2.1	2.7	3.5	5.6																						
15-Nov	2.3	2.4	2.3	1.9	1.9	1.9	2.3	2.6	2.4	2.0	1.5	1.2	1.1	1.0	1.1	1.1	1.5	2.3	2.6	1.5	1.2	0.6	0.7	1.0	1.7	2.6																						
16-Nov	1.2	0.7	0.9	0.7	0.6	0.6	0.8	0.7	1.2	0.8	0.7	2.1	1.1	0.6	0.8	1.1	1.9	0.8	1.0	1.1	0.5	0.7	2.8	2.0	1.1	2.8																						
17-Nov	1.0	0.8	0.6	0.7	0.5	0.6	0.8	0.5	0.5	0.6	0.6	0.9	1.0	1.5	1.6	1.7	1.5	4.5	0.8	0.5	1.8	2.2	1.9	2.1	1.2	4.5																						
18-Nov	1.2	0.9	0.9	0.6	0.5	0.5	1.8	1.6	1.0	0.6	0.9	0.8	1.4	0.8	0.6	1.1	3.5	8.3	1.6	1.5	1.0	1.8	1.5	16.0	2.1	16.0																						
19-Nov	2.3	1.6	1.4	1.7	1.2	1.4	1.6	1.5	2.5	1.7	0.8	0.8	0.8	0.9	3.9	4.0	1.2	1.5	1.4	1.4	1.4	1.5	1.7	1.7	1.7	4.0																						
20-Nov	1.8	1.7	1.7	1.5	1.3	1.2	1.3	1.3	1.3	1.3	1.4	1.6	2.0	2.4	2.6	2.6	2.6	2.7	3.4	3.4	2.9	2.7	2.4	2.5	2.1	3.4																						
21-Nov	3.0	3.1	3.5	4.4	4.7	5.3	5.0	5.4	5.3	5.1	5.3	4.4	4.2	3.8	2.1	1.7	1.9	1.8	2.0	3.5	2.3	3.3	7.3	10.1	4.1	10.1																						
22-Nov	6.1	1.8	1.6	2.0	2.8	2.7	3.4	2.9	2.8	2.5	2.8	2.4	3.1	3.7	3.3	3.5	4.2	4.1	3.9	3.8	4.7	5.4	4.8	3.7	3.4	6.1																						
23-Nov	3.5	3.3	3.7	4.0	3.9	3.7	3.8	4.0	3.9	3.6	3.4	3.4	3.6	4.0	5.1	5.3	3.3	3.1	3.0	3.1	3.1	2.8	2.6	2.3	3.6	5.3																						
24-Nov	2.4	2.8	3.1	4.0	4.6	4.7	5.7	6.7	7.5	7.7	8.4	8.5	8.0	7.4	7.9	8.0	7.7	7.1	9.6	13.3	10.8	10.1	6.6	9.2	7.2	13.3																						
25-Nov	5.1	2.8	2.0	1.7	1.5	1.5	1.6	1.7	1.9	2.2	2.6	2.9	2.7	2.6	3.2	3.3	3.4	3.1	3.4	3.7	4.0	3.8	4.6	5.2	2.9	5.2																						
26-Nov	3.8	3.2	3.4	3.9	9.9	20.3	20.9	21.9	17.4	13.0	7.9	5.3	6.3	7.0	7.0	9.2	10.8	10.9	11.7	10.9	10.0	9.1	11.3	16.5	10.5	21.9																						
27-Nov	11.2	10.3	8.1	8.7	10.1	11.6	9.7	5.1	4.7	3.9	3.3	3.2	2.8	2.5	2.5	3.2	3.2	3.7	2.7	2.3	2.2	2.5	2.8	3.1	5.1	11.6																						
28-Nov	2.9	3.4	3.7	4.1	3.8	3.6	3.5	4.6	4.5	3.6	3.2	3.0	2.9	2.6	2.7	3.1	3.2	4.0	4.3	4.5	4.1	3.0	3.3	2.7	3.5	4.6																						
29-Nov	2.4	2.6	3.1	4.2	6.2	7.0	1.6	1.5	1.5	1.5	1.3	1.3	1.4	1.4	1.5	1.5	1.7	2.0	2.2	2.7	2.4	4.1	4.4	6.9	2.8	7.0																						
30-Nov	3.8	4.3	4.9	2.2	1.6	1.8	2.3	2.4	2.6	2.7	3.1	2.6	2.6	2.6	2.4	2.7	2.5	2.5	2.4	2.3	2.1	2.0	2.1	2.4	2.6	4.9																						
																								3.3	3.2	3.1	3.2	3.5	4.0	4.3	4.4	4.5	4.5	3.6	3.3	3.3	3.2	3.1	3.3	3.7	4.3	4.1	4.1	3.7	3.7	3.9	4.6	Diurnal Average
																								11.2	10.3	8.8	8.7	10.1	20.3	20.9	21.9	19.2	19.4	11.3	9.4	12.5	13.1	8.7	9.2	10.8	13.0	11.7	13.3	10.8	10.1	11.3	16.5	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																

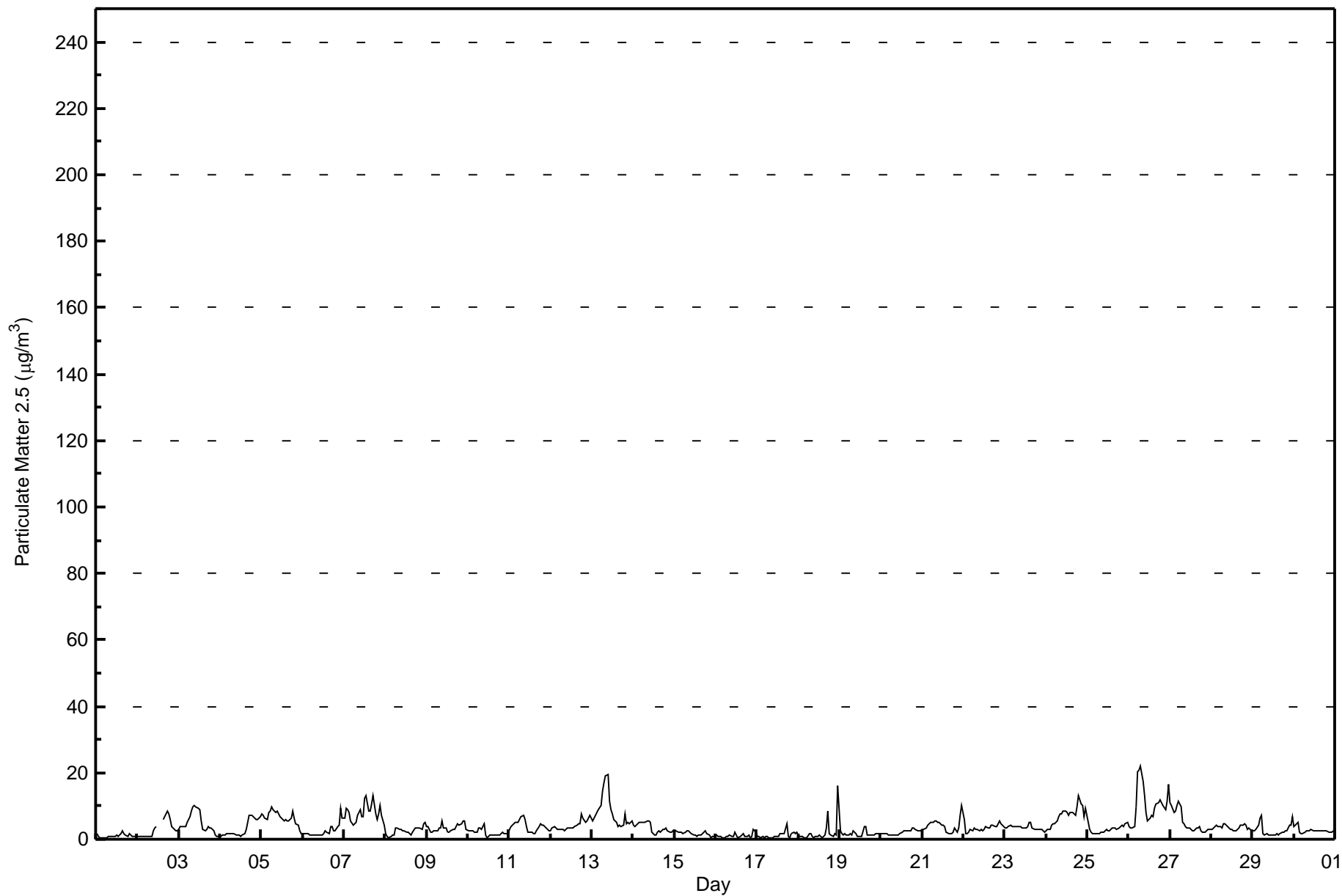


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$

Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - November 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	503	70.15	70.15
6 - 15	127	17.71	87.87
16 - 25	9	1.26	89.12
26 - 80	0	0.00	89.12
> 81.0	0	0.00	89.12

Total Number of Valid Hours: 717

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - November 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	6	3	9	14	45	46	29	56	26	26	32	36	82	42	38	13	503
6 - 15	1	0	0	3	12	12	7	14	10	17	10	8	16	11	6	0	127
16 - 25	0	0	0	0	1	0	0	0	0	0	1	0	5	2	0	0	9
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	7	3	9	17	58	58	36	70	36	43	43	44	103	55	44	13	639

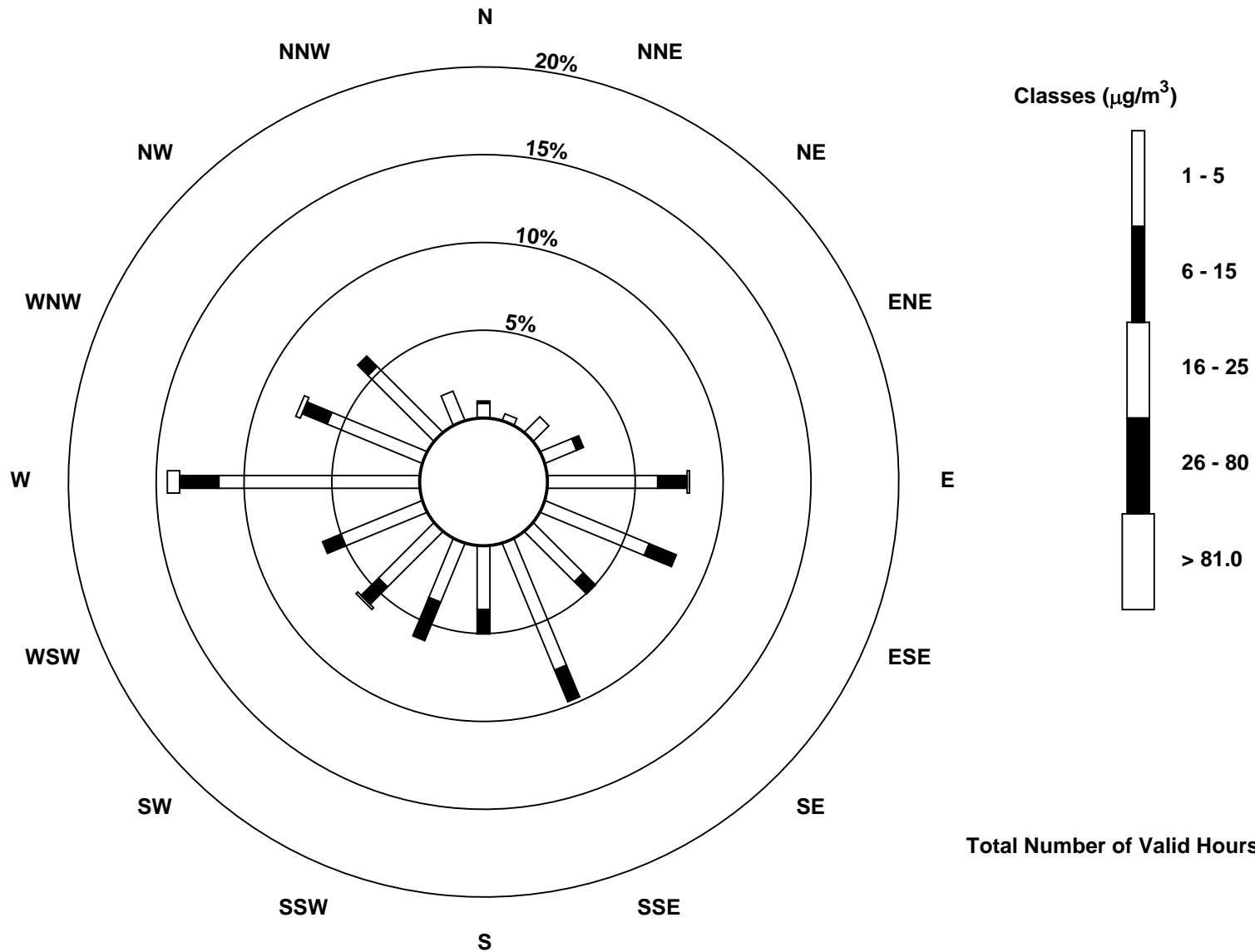
Total Number of Valid Hours: 717

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan (AMS 8)





Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 2m (AT 2m) - C

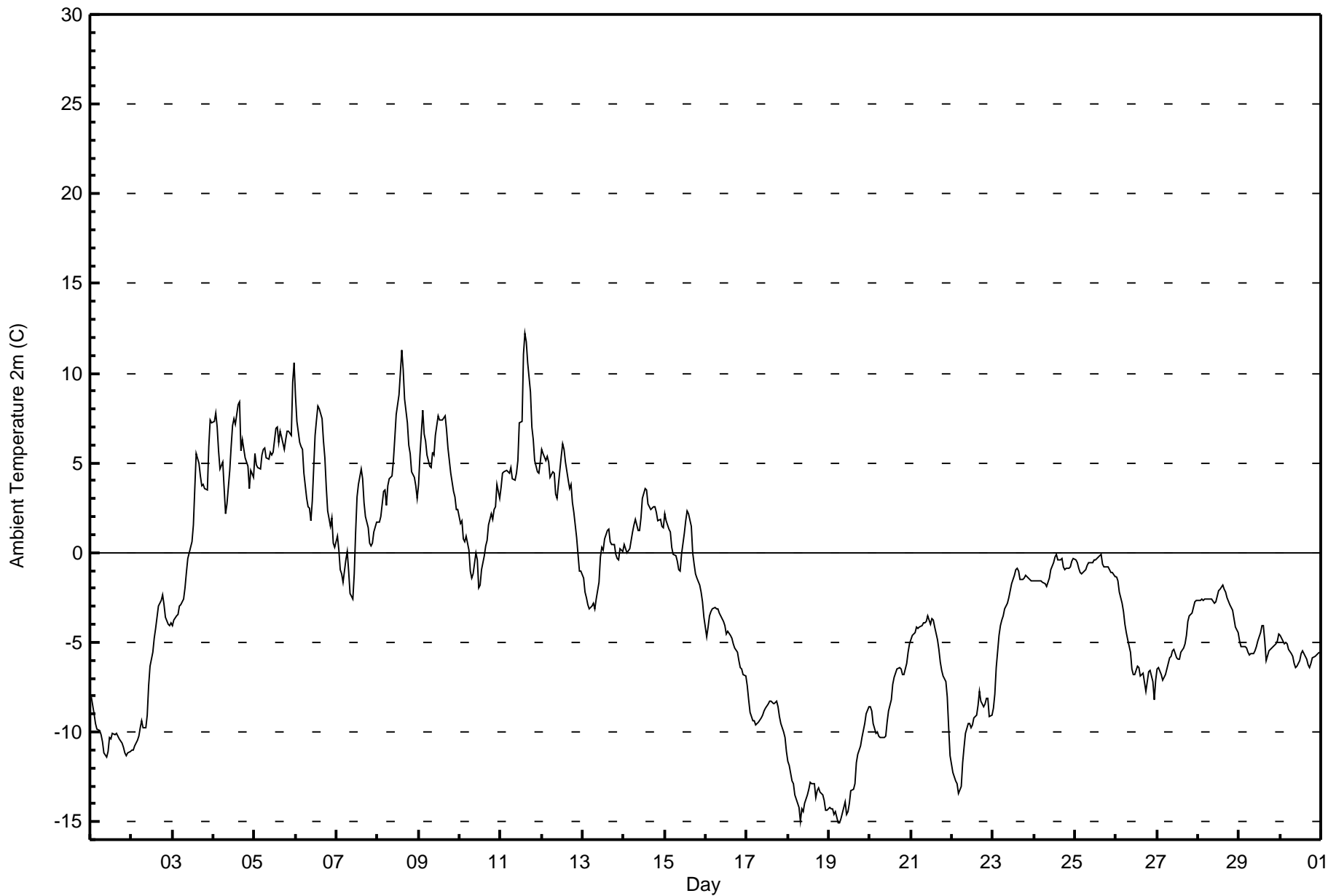
Fort Chipewyan - November 2016

Maximum Value: 12.2 C on Nov 11 15:00																				Maximum Daily Average: 6.3 C on Nov 11					Hours in Service: 720	
Minimum Value: -15.1 C on Nov 19 07:00																				Minimum Daily Average: -13.4 C on Nov 18					Hours of Data: 720	
Maximum Diurnal Average: -0.8 C at hour 15																				Minimum Diurnal Average: -3.2 C at hour 8					Hours of Missing Data: 0	
Monthly Average: -2.29 C																				Percentiles: P ₁ = -14.5 P ₁₀ = -10.3 Q ₁ = -6.4 Median = -2.1 Q ₃ = 2.4 P ₉₀ = 5.7 P ₉₉ = 10.0					Hours of Calibration: 0	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Nov	-8.0	-8.5	-9.0	-9.5	-9.8	-10.0	-10.1	-10.5	-11.1	-11.4	-11.1	-10.3	-10.4	-10.0	-10.1	-10.1	-10.3	-10.4	-10.6	-10.8	-11.1	-11.3	-11.2	-11.1	-10.3	-8.0
2-Nov	-11.0	-11.0	-10.7	-10.5	-10.2	-9.8	-9.4	-9.8	-9.8	-9.0	-7.4	-6.3	-5.5	-4.8	-4.2	-3.6	-3.0	-2.6	-2.4	-2.9	-3.6	-4.0	-4.0	-3.9	-6.6	-2.4
3-Nov	-4.1	-3.7	-3.6	-3.5	-3.0	-2.9	-2.6	-2.0	-1.1	-0.3	0.0	0.6	1.5	3.6	5.5	5.0	4.3	3.8	3.8	3.5	3.5	5.9	7.4	7.2	1.2	7.4
4-Nov	7.3	7.7	7.0	5.7	4.7	5.0	3.5	2.2	2.7	4.6	5.9	7.1	7.5	7.2	8.2	8.4	5.7	6.3	5.3	5.1	4.8	3.6	4.6	4.2	5.6	8.4
5-Nov	5.6	4.9	4.8	4.7	5.4	5.7	5.8	5.3	5.2	5.6	5.4	5.6	6.9	7.0	6.1	6.7	6.4	5.8	6.3	6.8	6.7	6.5	9.5	10.6	6.2	10.6
6-Nov	8.7	7.3	6.2	5.9	5.8	4.4	3.0	2.5	2.5	1.8	2.9	6.5	7.4	8.2	8.1	7.5	6.2	5.3	3.7	2.4	1.4	2.0	0.5	0.3	4.6	8.7
7-Nov	0.9	0.1	-0.9	-1.2	-1.6	-0.4	0.1	-1.0	-2.3	-2.6	-1.1	1.2	3.1	3.8	4.6	4.1	2.8	2.0	1.4	0.6	0.3	0.5	1.2	1.7	0.7	4.6
8-Nov	1.7	1.7	2.0	3.4	3.5	2.6	3.7	4.1	4.3	5.1	6.3	7.7	8.8	10.0	11.3	10.2	8.6	7.2	6.0	5.5	4.5	4.2	3.7	3.0	5.4	11.3
9-Nov	3.8	5.4	7.9	6.6	6.2	5.4	4.8	4.7	5.6	5.4	6.5	7.6	7.4	7.4	7.4	7.7	6.8	5.8	5.1	4.5	3.4	3.1	2.4	2.4	5.6	7.9
10-Nov	1.6	1.8	0.8	0.6	0.9	0.1	-1.0	-1.4	-1.2	0.0	-0.4	-2.0	-1.8	-1.0	-0.2	0.4	0.7	1.5	2.2	1.9	2.4	2.5	3.8	3.0	0.6	3.8
11-Nov	3.6	4.4	4.5	4.6	4.5	4.4	4.7	4.1	4.0	4.4	5.1	7.3	7.3	11.0	12.2	11.8	10.6	9.0	7.0	6.3	5.1	4.5	4.5	5.0	6.3	12.2
12-Nov	5.7	5.5	5.1	5.3	5.1	4.2	4.5	4.4	3.2	3.0	3.8	5.3	6.1	5.8	5.0	4.0	3.5	3.8	2.8	2.2	0.9	-0.1	-1.0	-1.0	3.6	6.1
13-Nov	-1.4	-2.2	-2.5	-2.9	-3.1	-3.0	-2.8	-3.2	-2.6	-1.7	-0.3	0.3	0.1	0.8	1.3	1.3	0.6	0.4	0.4	-0.1	-0.4	-0.4	0.2	0.1	-0.9	1.3
14-Nov	0.5	0.2	0.0	0.2	0.7	1.2	1.5	1.9	1.2	1.2	1.9	3.0	3.6	3.5	2.7	2.6	2.4	2.5	2.5	2.3	1.8	1.8	1.4	1.4	1.8	3.6
15-Nov	2.2	1.7	1.3	1.2	0.3	-0.1	-0.2	-0.5	-1.0	-1.0	-0.1	1.0	1.8	2.3	2.1	1.5	0.0	-0.6	-1.2	-1.5	-1.8	-2.2	-2.7	-3.6	0.0	2.3
16-Nov	-4.7	-4.1	-3.5	-3.3	-3.1	-3.0	-3.1	-3.2	-3.4	-3.6	-3.9	-4.1	-4.6	-4.4	-4.6	-4.7	-5.1	-5.3	-5.5	-6.0	-6.4	-6.5	-6.8	-6.9	-4.6	-3.0
17-Nov	-7.4	-8.2	-8.9	-9.4	-9.4	-9.6	-9.5	-9.5	-9.2	-9.0	-8.8	-8.6	-8.5	-8.3	-8.3	-8.4	-8.4	-8.3	-8.6	-9.1	-9.6	-10.0	-10.3	-11.1	-9.0	-7.4
18-Nov	-11.6	-11.8	-12.7	-12.9	-13.5	-13.8	-14.2	-15.0	-14.3	-14.4	-14.0	-13.5	-13.2	-12.8	-12.9	-12.9	-13.6	-13.3	-13.1	-13.3	-13.5	-13.8	-14.3	-14.4	-13.4	-11.6
19-Nov	-14.2	-14.3	-14.3	-14.6	-14.4	-15.0	-15.1	-14.8	-14.5	-13.9	-14.6	-14.4	-14.0	-13.3	-13.2	-12.9	-11.7	-11.2	-10.8	-10.3	-10.0	-9.6	-9.0	-8.6	-12.9	-8.6
20-Nov	-8.6	-8.8	-9.5	-10.1	-10.0	-10.2	-10.3	-10.3	-10.3	-10.2	-9.5	-8.9	-8.2	-7.4	-7.0	-6.7	-6.5	-6.4	-6.5	-6.8	-6.8	-6.2	-5.5	-5.1	-8.1	-5.1
21-Nov	-4.9	-4.6	-4.5	-4.2	-4.3	-4.1	-4.0	-3.9	-3.9	-3.8	-3.5	-4.0	-3.7	-3.8	-4.2	-4.8	-5.4	-6.1	-6.6	-6.9	-7.2	-8.1	-9.7	-11.3	-5.3	-3.5
22-Nov	-12.2	-12.5	-12.7	-12.9	-13.5	-13.1	-11.7	-10.8	-10.1	-9.5	-9.6	-9.8	-9.6	-9.2	-9.1	-8.5	-7.7	-8.3	-8.6	-8.5	-8.1	-8.2	-9.1	-9.1	-10.1	-7.7
23-Nov	-8.6	-7.9	-6.4	-4.6	-4.1	-3.8	-3.5	-3.1	-2.8	-2.5	-2.1	-1.8	-1.3	-0.9	-0.9	-1.0	-1.5	-1.5	-1.4	-1.3	-1.4	-1.5	-1.6	-1.6	-2.8	-0.9
24-Nov	-1.6	-1.5	-1.6	-1.6	-1.6	-1.6	-1.7	-1.9	-1.7	-1.4	-1.0	-0.6	-0.2	-0.1	-0.4	-0.4	-0.3	-0.8	-1.0	-0.9	-0.9	-0.8	-0.5	-0.3	-1.0	-0.1
25-Nov	-0.4	-0.6	-0.9	-1.1	-1.2	-1.0	-1.0	-0.7	-0.6	-0.6	-0.5	-0.4	-0.4	-0.4	-0.2	-0.1	-0.6	-0.8	-0.8	-0.8	-0.9	-1.1	-1.1	-1.3	-0.7	-0.1
26-Nov	-1.4	-1.6	-2.2	-2.8	-3.3	-4.0	-4.5	-4.8	-5.6	-6.5	-6.8	-6.8	-6.4	-6.4	-6.9	-6.8	-6.7	-7.7	-7.2	-6.6	-6.6	-7.2	-8.2	-7.1	-5.6	-1.4
27-Nov	-6.5	-6.4	-6.8	-7.1	-7.0	-6.8	-6.2	-5.8	-5.8	-5.5	-5.4	-5.9	-5.9	-5.6	-5.3	-5.1	-4.7	-3.9	-3.5	-3.4	-3.1	-2.7	-2.6	-5.3	-2.6	
28-Nov	-2.7	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.8	-2.8	-2.4	-2.1	-2.0	-1.8	-2.0	-2.2	-2.5	-2.9	-3.1	-3.2	-3.6	-4.2	-4.4	-2.7	-1.8
29-Nov	-4.9	-5.2	-5.3	-5.3	-5.3	-5.6	-5.7	-5.7	-5.7	-5.5	-5.2	-4.9	-4.5	-4.1	-4.1	-4.9	-6.1	-5.5	-5.4	-5.3	-5.2	-5.1	-5.0	-4.6	-5.2	-4.1
30-Nov	-4.7	-4.7	-5.1	-5.0	-5.1	-5.4	-5.6	-5.8	-6.2	-6.4	-6.4	-6.0	-5.6	-5.5	-5.7	-6.0	-6.3	-6.4	-6.2	-5.9	-5.8	-5.7	-5.6	-5.5	-5.7	-4.7
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	467	64.86	64.86
0 - 10	245	34.03	98.89
10 - 20	8	1.11	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

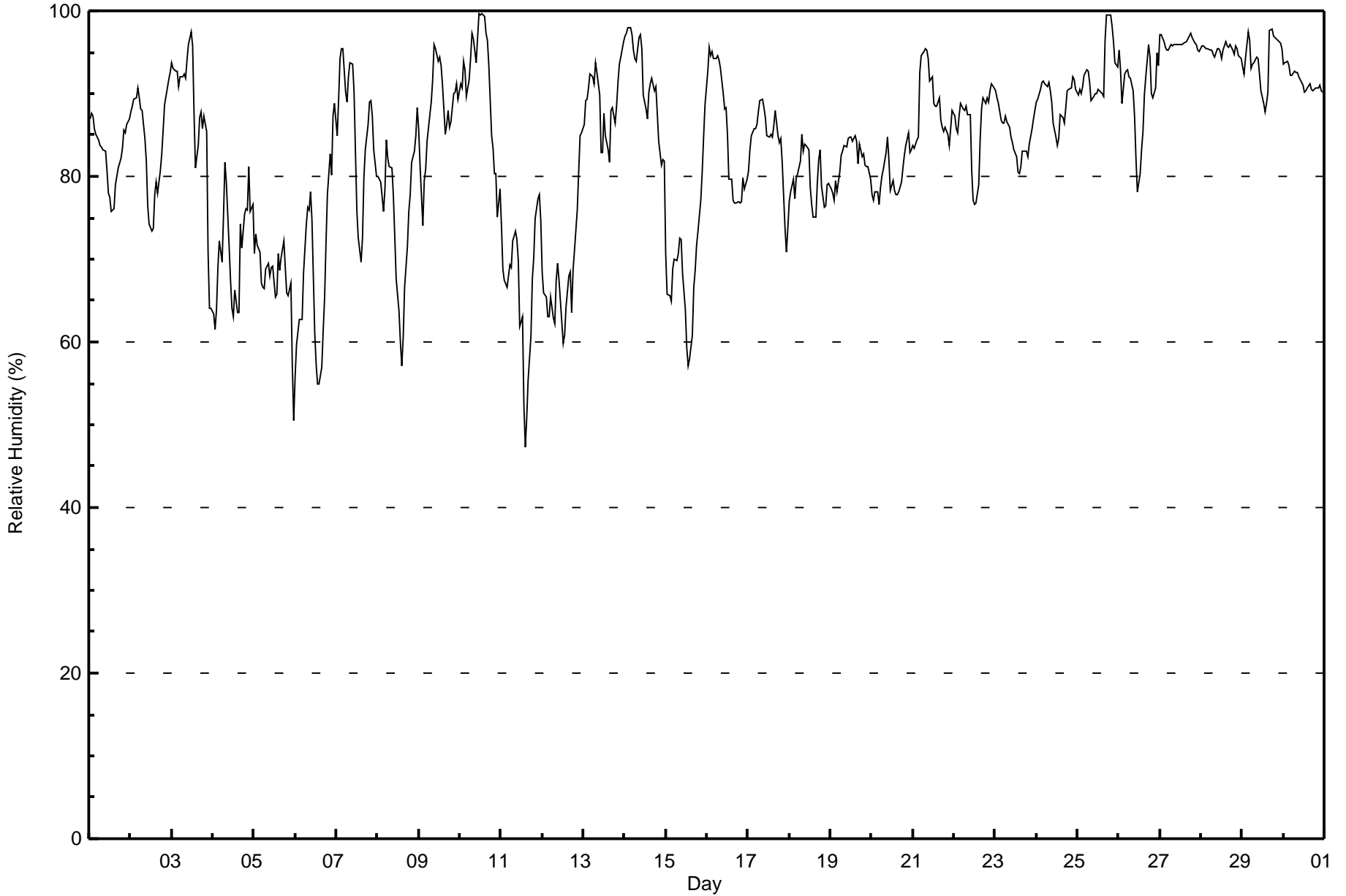
Fort Chipewyan - November 2016

Maximum Value: 100 % on Nov 10 14:00																			Maximum Daily Average: 96.1 % on Nov 27						Hours in Service: 720																								
Minimum Value: 47 % on Nov 11 15:00																			Minimum Daily Average: 66.9 % on Nov 11						Hours of Data: 720																								
Maximum Diurnal Average: 86.6 % at hour 9																			Minimum Diurnal Average: 79.0 % at hour 15						Hours of Missing Data: 0																								
Monthly Average: 83.6 %																			Percentiles: P ₁ = 55 P ₁₀ = 68 Q ₁ = 78 Median = 85 Q ₃ = 91 P ₉₀ = 95 P ₉₉ = 99						Hours of Calibration: 0																								
																									Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Nov	87	88	87	86	85	84	84	84	83	83	81	78	77	76	76	79	80	81	82	83	86	85	86	87	82.8	88																							
2-Nov	88	89	89	89	91	89	88	88	85	82	77	74	73	74	78	79	78	81	83	86	89	91	92	93	84.3	93																							
3-Nov	94	93	93	93	91	92	92	92	94	96	98	96	88	81	84	87	88	86	87	85	71	64	64	64	87.5	98																							
4-Nov	63	62	64	69	72	70	75	82	79	72	67	64	63	66	64	64	74	71	75	76	76	81	76	77	70.9	82																							
5-Nov	71	73	72	71	67	67	66	69	69	68	69	69	65	66	71	69	70	72	69	66	66	67	57	51	67.5	73																							
6-Nov	56	60	63	63	63	68	74	76	76	78	75	61	57	55	55	57	61	65	72	78	83	80	87	89	68.8	89																							
7-Nov	85	89	94	95	95	90	89	92	94	94	90	83	76	73	70	73	80	83	86	89	89	87	83	80	85.8	95																							
8-Nov	80	80	79	76	79	84	82	81	81	78	73	68	64	60	57	60	67	71	76	78	82	83	85	88	75.5	88																							
9-Nov	86	81	74	80	81	84	88	89	92	96	95	94	94	93	91	85	86	88	86	87	90	90	91	89	87.9	96																							
10-Nov	91	91	94	93	90	92	94	97	97	94	97	100	100	100	99	97	96	93	85	83	80	80	75	78	91.5	100																							
11-Nov	74	69	67	67	68	69	69	72	73	72	70	62	63	52	47	51	55	61	68	70	75	77	78	75	66.9	78																							
12-Nov	69	66	65	63	63	65	63	62	68	69	68	62	60	61	64	68	68	64	69	71	76	80	85	85	68.1	85																							
13-Nov	86	89	89	91	92	92	91	94	92	90	83	83	88	85	83	82	88	88	86	88	91	94	94	96	89.0	96																							
14-Nov	97	97	98	98	97	95	94	94	97	97	95	90	88	87	90	91	92	90	91	88	84	81	82	82	91.5	98																							
15-Nov	71	66	66	65	69	70	70	71	73	72	68	64	59	57	58	61	67	69	72	73	77	81	85	89	69.6	89																							
16-Nov	93	96	95	95	94	94	95	94	93	90	88	88	85	80	80	77	77	77	77	77	77	80	78	80	85.8	96																							
17-Nov	81	83	85	86	86	86	88	89	89	88	87	85	85	85	85	86	88	85	84	85	82	74	71	74	84.0	89																							
18-Nov	77	78	80	77	80	80	82	85	83	84	84	83	79	77	75	75	79	82	83	79	76	77	79	79	79.7	85																							
19-Nov	78	78	77	79	78	80	82	83	84	83	85	85	85	84	85	84	82	84	82	83	81	81	81	80	81.9	85																							
20-Nov	78	77	78	78	77	79	80	81	83	85	82	78	80	78	78	78	79	81	83	84	85	83	83	83	80.2	85																							
21-Nov	84	83	84	85	93	95	95	95	95	94	92	92	89	89	89	89	87	86	85	86	85	84	86	88	88.7	95																							
22-Nov	87	86	85	87	89	88	88	88	87	87	81	77	77	77	79	84	88	89	89	89	89	90	91	91	86.1	91																							
23-Nov	90	89	89	87	86	86	87	87	86	85	84	83	82	81	80	81	83	83	83	82	84	86	87	88	85.0	90																							
24-Nov	89	89	91	91	91	91	91	91	90	89	86	85	84	85	87	87	86	88	90	91	91	92	92	91	89.1	92																							
25-Nov	90	90	90	91	92	93	93	91	89	90	90	90	90	90	90	90	96	100	100	99	98	96	94	93	92.7	100																							
26-Nov	95	93	89	92	93	93	92	92	90	87	82	78	80	83	86	90	92	96	94	90	89	91	95	93	89.8	96																							
27-Nov	97	97	96	96	95	95	96	96	96	96	96	96	96	96	96	96	97	97	97	97	96	96	95	95	96.1	97																							
28-Nov	96	96	96	95	95	95	95	95	94	95	95	95	94	95	96	96	96	96	95	95	96	95	95	94	95.3	96																							
29-Nov	93	92	94	97	96	93	94	94	94	94	92	90	89	88	89	90	98	98	97	97	97	96	96	95	93.9	98																							
30-Nov	94	94	94	93	92	92	93	93	93	92	92	91	90	90	91	91	91	90	90	91	91	91	90	90	91.6	94																							
																								83.9	83.8	83.9	84.3	84.7	85.2	85.7	86.6	86.6	86.0	84.0	81.5	80.3	79.0	79.0	79.8	82.2	83.2	83.8	84.2	84.8	84.8	84.5	84.5	Diurnal Average	
																								97	97	98	98	97	95	96	97	97	97	97	100	100	100	100	99	97	98	100	100	99	98	96	96	96	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Fort Chipewyan - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	17	2.36	2.36
60 - 80	211	29.31	31.67
80 - 100	492	68.33	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

Fort Chipewyan - November 2016

Maximum Value: 0.5 mm on Nov 9 09:00	Maximum Daily Total: 0.8 mm on Nov 9	Hours in Service: 720
Minimum Value: 0.0 mm on Nov 1 01:00	Minimum Daily Total: 0.0 mm on Nov 1	Hours of Data: 661
Maximum Diurnal Total: 0.8 mm at hour 9	Minimum Diurnal Total: 0.0 mm at hour 1	Hours of Missing Data: 59
Monthly Total: 2.29 mm	Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.3	Hours of Calibration: 0
		Percent Operational Time: 91.8

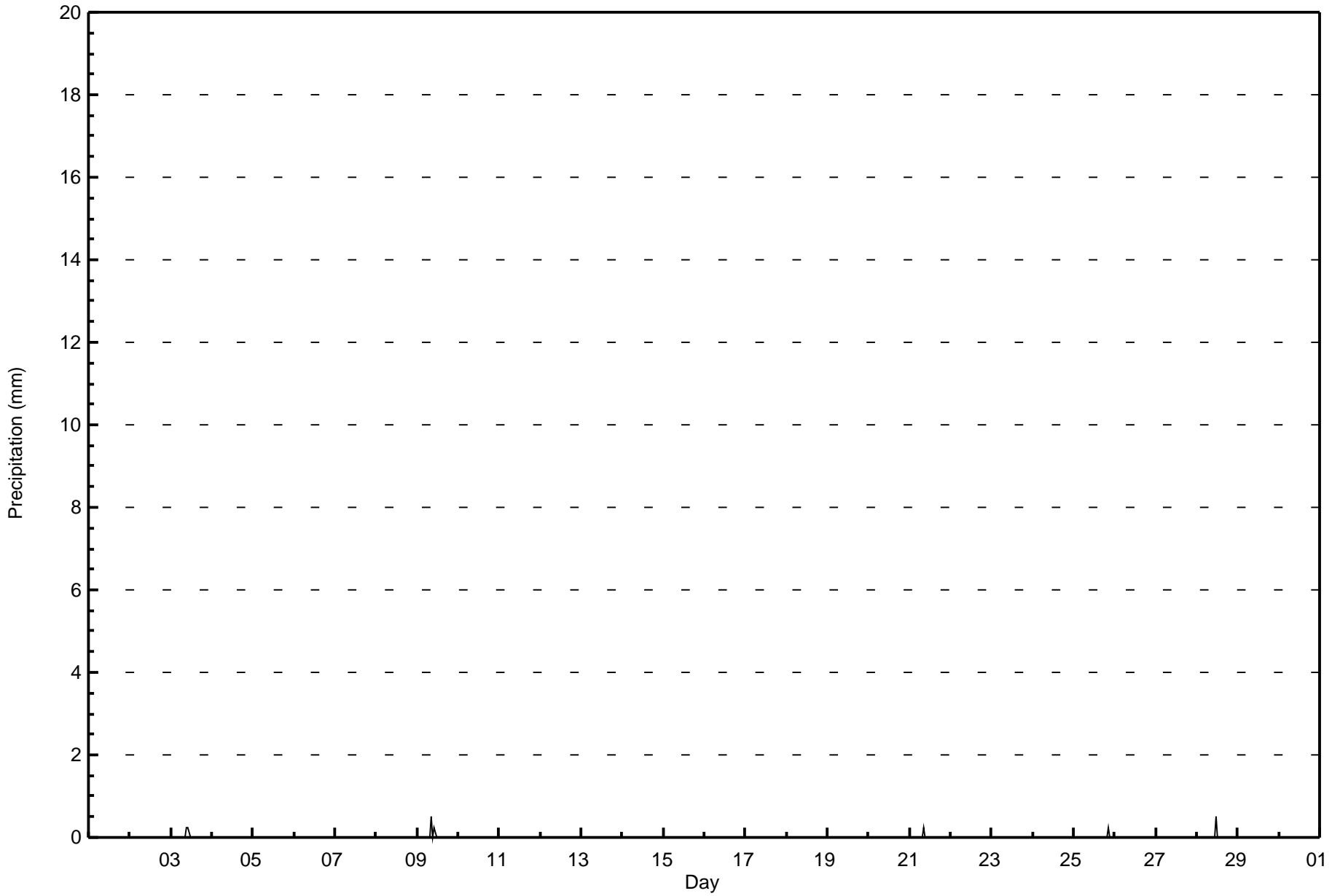
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
26-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF
29-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF
																								Diurnal Average	Diurnal Maximum			
																								0.0	0.0			
																								0.0	0.0			

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Precipitation (PC) - mm
Fort Chipewyan - November 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	659	99.70	99.70
0.4 - 0.5	2	0.30	100.00
0.6 - 0.7	0	0.00	100.00
0.8 - 1.4	0	0.00	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 661

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (SW) - %

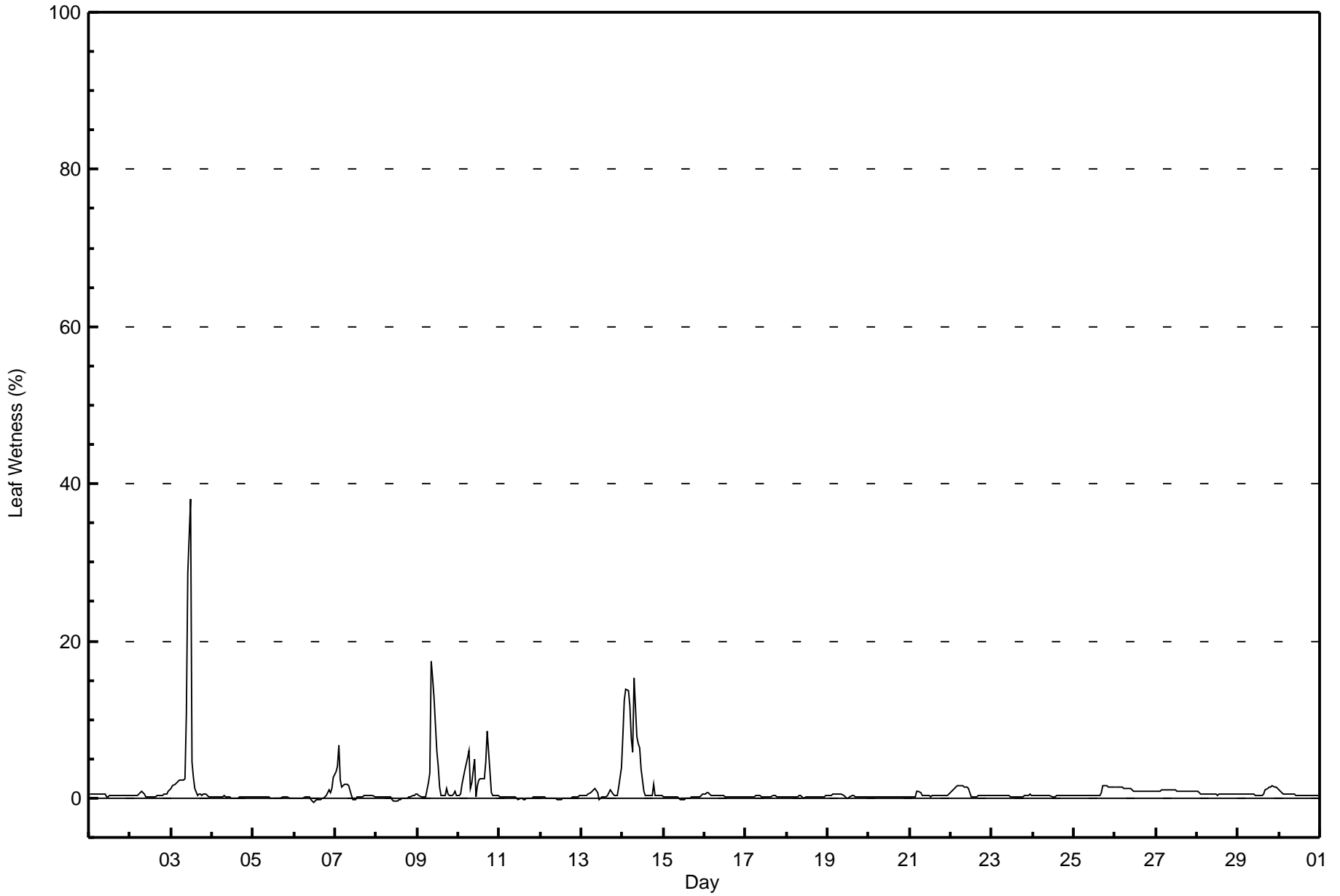
Fort Chipewyan - November 2016

Maximum Value: 38 % on Nov 3 12:00														Maximum Daily Average: 5.0 % on Nov 14														Hours in Service: 720			
Minimum Value: -1 % on Nov 6 12:00														Minimum Daily Average: 0.0 % on Nov 12														Hours of Data: 720			
Maximum Diurnal Average: 1.8 % at hour 11														Minimum Diurnal Average: 0.3 % at hour 16														Hours of Missing Data: 0			
Monthly Average: 0.9 %														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 14														Hours of Calibration: 0			
																												Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24							
1-Nov	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1					
2-Nov	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1					
3-Nov	1	2	2	2	2	2	2	2	2	11	29	38	5	3	1	0	1	0	0	0	0	0	0	4.5	38						
4-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0						
5-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0						
6-Nov	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	1	1	1	0.2	3						
7-Nov	3	4	7	2	1	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	7						
8-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0						
9-Nov	0	0	0	0	0	0	2	3	18	15	13	6	4	1	0	0	0	1	0	0	0	1	1	0	2.9	18					
10-Nov	0	1	2	3	3	5	6	1	2	5	0	2	2	2	3	3	5	9	3	1	0	0	0	2.4	9						
11-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0						
12-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0						
13-Nov	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	0.7	4						
14-Nov	8	12	14	14	12	8	6	15	8	7	6	4	1	0	0	0	0	0	2	0	0	0	0	5.0	15						
15-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0						
16-Nov	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1						
17-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0						
18-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0						
19-Nov	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1						
20-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0						
21-Nov	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1						
22-Nov	1	1	1	1	2	2	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.8	2						
23-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0						
24-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0						
25-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	1	0.7	2						
26-Nov	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1						
27-Nov	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1						
28-Nov	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0	0.5	1						
29-Nov	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	1	1	0.7	2						
30-Nov	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1						
														0.8 1.0 1.1 1.0 1.0 1.0 1.0 1.2 1.4 1.6 1.8 1.8 0.5 0.4 0.3 0.3 0.5 0.7 0.5 0.4 0.4 0.4 0.5 0.6														Diurnal Average			
														8 12 14 14 12 8 6 15 18 15 29 38 5 3 3 3 5 9 3 2 2 1 1 4														Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (SW) - %
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Fort Chipewyan - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	390	57.35	57.35
0.4 - 0.5	108	15.88	73.24
0.6 - 0.7	25	3.68	76.91
0.8 - 1.4	83	12.21	89.12
1.5 - 10	54	7.94	97.06
> 10	11	1.62	98.68

Total Number of Valid Hours: 680

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Global Radiation (GR) - W/m2

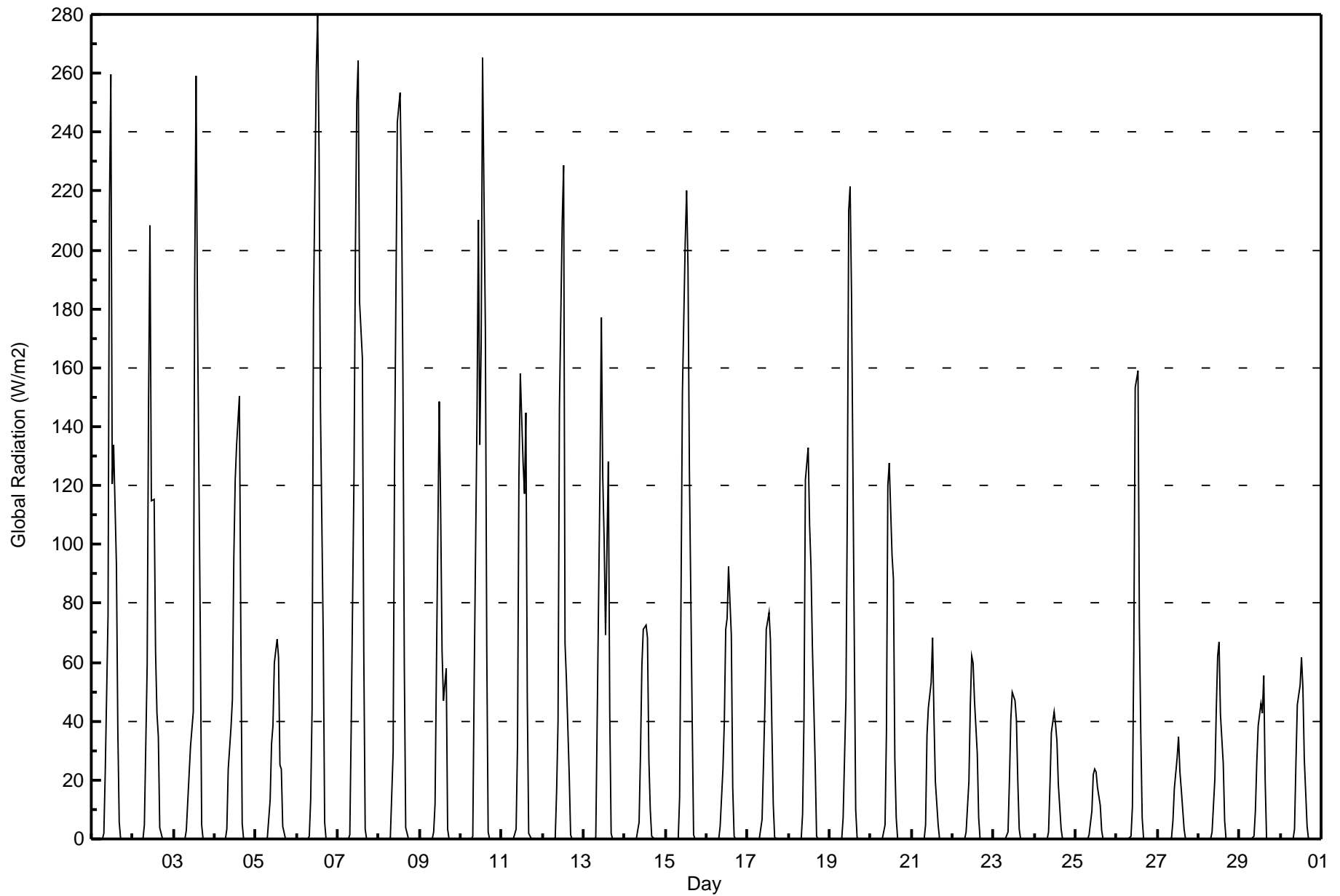
Fort Chipewyan - November 2016

Maximum Value: 280 W/m2 on Nov 6 13:00														Maximum Daily Average: 53.7 W/m2 on Nov 7														Hours in Service: 720	
Minimum Value: 0 W/m2 on Nov 1 03:00														Minimum Daily Average: 4.6 W/m2 on Nov 25														Hours of Data: 720	
Maximum Diurnal Average: 120.9 W/m2 at hour 13														Minimum Diurnal Average: 0.0 W/m2 at hour 7														Hours of Missing Data: 0	
Monthly Average: 25.0 W/m2														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 24 P ₉₀ = 93 P ₉₉ = 250														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Nov	0	0	0	0	0	0	0	2	23	76	215	260	121	134	93	37	6	0	0	0	0	0	0	0	40.2	260			
2-Nov	0	0	0	0	0	0	0	5	59	148	209	115	115	64	43	35	4	0	0	0	0	0	0	0	33.1	209			
3-Nov	0	0	0	0	0	0	0	3	12	22	31	43	190	259	178	71	5	0	0	0	0	0	0	0	33.9	259			
4-Nov	0	0	0	0	0	0	0	3	24	38	47	96	122	134	151	72	5	0	0	0	0	0	0	0	28.8	151			
5-Nov	0	0	0	0	0	0	0	0	13	32	39	60	68	62	25	24	4	0	0	0	0	0	0	0	13.6	68			
6-Nov	0	0	0	0	0	0	0	1	13	44	180	261	280	233	146	68	6	0	0	0	0	0	0	0	51.3	280			
7-Nov	0	0	0	0	0	0	0	1	38	123	200	250	264	182	163	64	3	0	0	0	0	0	0	0	53.7	264			
8-Nov	0	0	0	0	0	0	0	1	29	126	185	244	253	220	158	59	4	0	0	0	0	0	0	0	53.3	253			
9-Nov	0	0	0	0	0	0	0	0	2	12	59	149	112	64	47	58	3	0	0	0	0	0	0	0	21.1	149			
10-Nov	0	0	0	0	0	0	0	1	54	143	210	134	169	265	173	64	2	0	0	0	0	0	0	0	50.6	265			
11-Nov	0	0	0	0	0	0	0	0	3	32	122	158	128	117	145	48	2	0	0	0	0	0	0	0	31.5	158			
12-Nov	0	0	0	0	0	0	0	0	17	40	147	210	229	66	54	22	2	0	0	0	0	0	0	0	32.8	229			
13-Nov	0	0	0	0	0	0	0	1	40	122	177	123	102	69	128	43	2	0	0	0	0	0	0	0	33.6	177			
14-Nov	0	0	0	0	0	0	0	0	6	29	59	71	72	68	27	10	1	0	0	0	0	0	0	0	14.3	72			
15-Nov	0	0	0	0	0	0	0	0	14	82	152	203	220	194	125	40	1	0	0	0	0	0	0	0	43.0	220			
16-Nov	0	0	0	0	0	0	0	0	4	24	40	71	75	93	69	18	1	0	0	0	0	0	0	0	16.5	93			
17-Nov	0	0	0	0	0	0	0	0	7	25	45	71	77	67	38	12	0	0	0	0	0	0	0	0	14.3	77			
18-Nov	0	0	0	0	0	0	0	0	9	41	122	133	107	93	65	26	1	0	0	0	0	0	0	0	24.8	133			
19-Nov	0	0	0	0	0	0	0	0	7	48	113	214	222	185	67	10	0	0	0	0	0	0	0	0	36.0	222			
20-Nov	0	0	0	0	0	0	0	0	5	37	120	128	96	88	27	7	0	0	0	0	0	0	0	0	21.2	128			
21-Nov	0	0	0	0	0	0	0	0	5	35	45	53	68	41	20	5	0	0	0	0	0	0	0	0	11.3	68			
22-Nov	0	0	0	0	0	0	0	0	2	20	45	62	60	47	29	7	0	0	0	0	0	0	0	0	11.3	62			
23-Nov	0	0	0	0	0	0	0	0	3	20	41	50	47	40	20	3	0	0	0	0	0	0	0	0	9.3	50			
24-Nov	0	0	0	0	0	0	0	0	2	18	36	43	39	33	19	3	0	0	0	0	0	0	0	0	8.1	43			
25-Nov	0	0	0	0	0	0	0	0	1	9	22	24	23	17	11	3	0	0	0	0	0	0	0	0	4.6	24			
26-Nov	0	0	0	0	0	0	0	0	1	11	64	153	159	73	36	7	0	0	0	0	0	0	0	0	21.0	159			
27-Nov	0	0	0	0	0	0	0	0	1	6	17	28	34	23	17	3	0	0	0	0	0	0	0	0	5.4	34			
28-Nov	0	0	0	0	0	0	0	0	2	20	44	62	67	42	26	6	0	0	0	0	0	0	0	0	11.2	67			
29-Nov	0	0	0	0	0	0	0	0	1	10	26	39	46	43	55	20	0	0	0	0	0	0	0	0	10.0	55			
30-Nov	0	0	0	0	0	0	0	0	3	26	45	52	62	51	27	4	0	0	0	0	0	0	0	0	11.3	62			
														0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.6 13.3 47.3 95.2 118.6 120.9 102.3 72.7 28.3 1.8 0.0 0.0 0.0 0.0 0.0 0.0 0.0														Diurnal Average	
														0 0 0 0 0 0 0 5 59 148 215 261 280 265 178 72 6 0 0 0 0 0 0 0 0														Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Global Radiation (GR) - W/m²
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Fort Chipewyan - November 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	534	74.17	74.17
21 - 100	118	16.39	90.56
101 - 300	68	9.44	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Fort Chipewyan - November 2016

Maximum Speed: 32 km/h on Nov 23 01:00	Maximum Daily Speed Average: 23.3 km/h on Nov 30	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 27 06:00	Minimum Daily Speed Average: 1.0 km/h on Nov 13	Hours of Data: 720
Maximum Diurnal Speed Average: 5.8 km/h at hour 12	Minimum Diurnal Speed Average: 2.2 km/h at hour 2	Hours of Missing Data: 0
Monthly Average Velocity: 3.4 km/h 196.5 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 13 Q ₃ = 17 P ₉₀ = 22 P ₉₉ = 27	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Nov	NW14	NW14	NW14	NW13	NW13	NW14	NW14	NW15	NW16	NW13	NW13	NW13	NW13	NW13	NW13	NW12	NW9	NNW7	NNW6	NEE5	NW2	S4	SSE10	NW10.0	NW16		
2-Nov	S9	SSE10	SSE14	S15	S15	SSE14	SE20	SE23	SE22	SSE21	SSE25	S28	S26	S26	S24	S21	SSW22	SSW20	SSW19	SSW19	SSW16	SSW13	SW10	SW10	S16.9	S28	
3-Nov	SW10	SW10	SW11	SSW9	S8	SSE10	SSE11	SSE11	SSE12	S14	SSE13	SSE13	SSW17	SSW19	SW19	SW16	SSW15	SSW16	SW16	SW16	SW14	WSW15	WSW23	WSW21	SSW12.2	WSW23	
4-Nov	W18	W21	W19	WSW13	W13	WSW13	S6	SW12	SW15	SW9	SW14	SW15	SSW14	SSW10	SSW11	S5	SE6	S8	SSW6	SSW7	SSE5	E10	E8	ESE9	SW7.8	W21	
5-Nov	SSE8	ESE13	E12	ESE13	SSE8	S9	SSW9	SW12	SSW8	S8	SE6	SSE9	SSW11	SSE5	ESE9	ESE8	ESE8	SE9	S9	SW9	SW8	SW6	WSW16	W17	S5.7	W17	
6-Nov	W16	W11	W10	WSW10	WSW12	WSW13	WSW11	WSW13	SW13	SW10	SW11	WSW12	W14	W14	WSW14	WSW10	W8	W6	SW4	SW4	SSW3	SSW2	SE1	SW5	WSW9.0	W16	
7-Nov	WSW4	N1	ENE4	ESE3	SW7	WSW10	W11	WSW11	W12	WNW12	W9	W7	SW7	WSW6	WSW8	S4	ESE6	E10	E13	E11	E11	ENE10	ENE12	E21	S1.0	E21	
8-Nov	E22	ESE17	ESE13	SSE14	SSE14	ESE13	SSE12	SSE13	SSE15	SSW16	S16	S17	S17	SSW13	SSW10	SSW11	SW13	SW12	SW13	SW11	SW10	SSW7	SSE2	SE4	S9.5	ESE22	
9-Nov	SSE3	WSW10	W15	WNW15	WNW13	WNW7	WSW10	W6	W8	WNW9	WNW14	WNW10	W15	W13	W14	WNW14	WNW10	W8	W12	W16	W14	WNW10	WNW11	WNW16	W11.0	WNW16	
10-Nov	W16	WNW10	WNW8	WNW10	NNW8	NNW8	NW3	ESE5	E6	ENE7	E15	E19	E17	E14	E19	E23	E22	E25	ESE19	SE14	SE19	SSE23	SSE26	SE21	ESE8.6	SSE26	
11-Nov	SSE22	S26	S27	SSW23	SSW21	SSW17	SSW20	SSW14	SSW13	SSW12	SW15	SW13	SW11	WSW16	WSW21	W23	W29	W27	WSW18	WSW15	WSW16	WSW13	WSW15	WSW16	SW15.6	W29	
12-Nov	WSW18	WSW17	W17	W16	W16	WSW16	WSW17	WSW17	WSW18	W16	W16	W20	W22	W17	W12	WNW12	W13	W15	WNW11	WNW12	WNW9	W9	W10	W12	W14.5	W22	
13-Nov	W12	WNW12	NW11	WNW8	WNW7	W9	WNW10	W6	SW3	E4	S3	ESE3	E8	E8	E7	E10	E10	ESE7	ESE4	E6	E8	E6	ESE7	E9	ENE1.0	WNW12	
14-Nov	ESE7	ESE9	E10	E12	E16	E19	E16	E13	E8	E3	WSW4	W9	W9	W17	W17	WNW17	W17	W14	WNW11	W12	W11	W13	W12	W10	WNW2.6	E19	
15-Nov	W16	W18	W19	W18	W17	W15	W16	W16	W15	W15	W15	W16	W19	W18	W16	W13	WNW13	WNW13	WNW10	WNW9	NW12	NW12	NNW11	WNW7	W13.9	W19	
16-Nov	NW10	NNW9	NW6	NW8	WNW10	W8	W9	WNW11	WNW12	NW13	NW15	NW14	NW16	NW17	NW16	NW17	NW18	WNW17	NW18	NW18	NW19	NW17	NW16	WNW15	NW13.4	NW19	
17-Nov	WNW15	WNW15	WNW15	WNW14	WNW12	WNW10	W10	W9	W10	W12	W14	W14	WNW14	WNW13	WNW14	WNW12	W11	WNW12	NW11	NNW10	NW14	NW13	NW12	WNW10	WNW11.9	WNW15	
18-Nov	W9	W11	WNW11	NW11	NW7	NW10	WNW9	WNW7	WNW10	WNW9	WNW9	WNW10	WNW9	WNW10	WNW10	WNW9	WNW5	WNW4	WNW7	NW7	NW6	WNW4	W5	WNW4	WNW7.9	NW11	
19-Nov	NW4	NNW3	NE2	NE2	N2	N2	NW2	N4	N5	ESE10	ESE14	ESE12	E15	E19	ENE18	ENE18	E25	E28	E26	E24	E22	E21	E22	E22	E12.2	E28	
20-Nov	ESE20	ESE18	ESE17	ESE20	ESE23	ESE22	ESE18	ESE18	ESE20	ESE18	SE17	SE16	SE19	SE18	SE19	SE21	SE18	SE18	ESE17	ESE18	ESE17	ESE15	SE15	SE18	ESE17.9	ESE23	
21-Nov	ESE19	ESE17	ESE16	ESE19	SE16	SE17	SE16	SE13	SSE10	SSW12	WSW12	W12	W11	W12	W14	NW12	NW12	NW13	NW13	NW13	NW12	NW12	NW10	NW10	SW1.4	ESE19	
22-Nov	NW13	NW14	NW9	NW7	WNW6	W3	ESE1	SSW2	ESE5	SW6	SW11	WSW9	WSW5	W2	ESE6	E11	SE17	SE27	ESE21	ESE24	E27	E30	E32	E27	ESE6.4	E32	
23-Nov	E32	ESE28	ESE22	SSE19	SSE22	SSE18	SSE18	SSE19	S19	S20	SSE19	SSE17	S16	S21	S19	S15	SE15	SE13	SSE14	SSE17	SSE18	SSE17	SSE16	S14	SSE17.0	E32	
24-Nov	S14	S14	S13	S11	S11	S9	S9	S10	SSW8	SW10	SSW7	SW7	WSW6	SSW3	SE6	SSE8	SSE11	SSE13	SE15	SE18	SE15	ESE17	E22	ESE25	SSE9.4	ESE25	
25-Nov	ESE27	SE26	ESE25	ESE27	E31	E26	E26	E23	ESE22	ESE20	E20	E21	E21	E19	ESE15	SE14	SE14	SE14	SSE7	SSW4	WSW6	W8	W10	W11	W13	ESE13.6	E31
26-Nov	W12	WNW12	WNW10	W14	W14	W15	W15	W14	W17	WSW17	W14	W19	W12	WSW14	W15	W12	W9	SW5	WSW8	W8	WNW5	SW4	W4	WNW6	W11.1	W19	
27-Nov	SW5	SW6	W5	W5	WNW3	NW1	ESE3	SE9	SE11	ESE14	ESE14	SE13	ESE14	E14	E15	ENE12	NE9	NE10	ENE14	ENE17	ENE19	ENE21	ENE24	ENE20	E8.7	ENE24	
28-Nov	ENE21	ENE20	NE19	ENE20	ENE19	NE16	NE13	NE12	NE10	NNE9	NNE6	N5	N4	NNW6	NNW8	NNW9	NNW7	NNW9	NNW10	NNW12	NNW10	NW10	NNW9	NW8	NNE8.9	ENE21	
29-Nov	NW9	NW10	NW11	NW9	NW6	WNW6	W6	WSW5	SSW5	SSW6	S5	SSW9	S7	SSE8	ESE5	SSE7	SSE12	SSE14	SSE14	SSE18	SSE18	SSE18	SE16	SSE19	S5.5	SSE19	
30-Nov	SSE20	SSE21	SSE23	SSE24	SSE23	SSE26	SSE27	SSE26	SSE24	SSE24	SSE26	SSE23	SSE23	SSE22	SSE25	SSE25	SSE27	SSE25	SSE23	SSE20	SSE20	SSE24	S22	S23	SSE23.3	SSE27	

SSW2.5	SSW2.2	SSW2.2	SSW2.7	SSW3.0	S3.0	S3.8	S4.7	SSW4.8	SSW5.0	SSW5.3	SSW5.8	SW5.1	SW4.7	SW4.0	SSW2.9	SSW3.1	S3.3	S3.0	SSW2.7	S2.4	SSE2.5	SSE2.5	S3.3	Diurnal Average
E32	ESE28	S27	ESE27	E31	E26	SSE27	SSE26	SSE24	SSE24	SSE26	S28	S26	S26	SSE25	SSE25	W29	E28	E26	ESE24	E27	E30	E32	E27	Diurnal Maximum

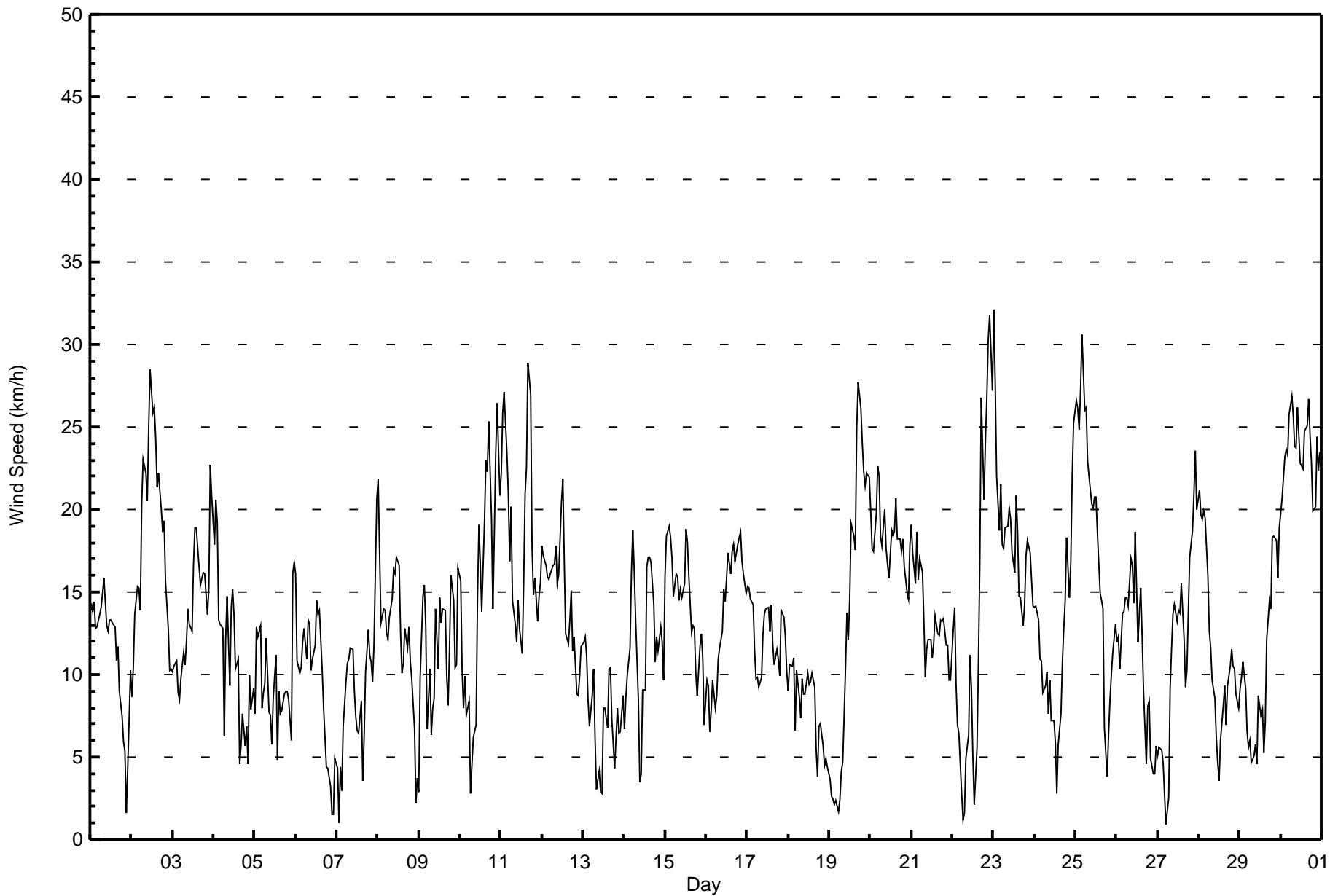
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort Chipewyan - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Nov 11 16:00																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 1 km/h on Nov 19 03:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Nov	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	3	3	3	2	2	2	2	2	3	4
2-Nov	3	3	3	3	3	3	2	3	3	3	5	5	4	4	4	3	3	4	3	3	3	2	2	2	5
3-Nov	2	2	2	3	2	2	2	2	2	4	3	3	3	3	3	3	3	2	3	2	3	5	4	5	
4-Nov	4	5	4	3	2	3	2	2	3	2	3	2	3	2	3	1	1	3	2	2	2	1	2	3	5
5-Nov	2	2	2	1	2	2	3	2	2	1	2	2	2	2	1	2	2	1	2	2	3	3	5	4	5
6-Nov	4	3	4	3	4	3	1	2	2	2	2	3	3	3	3	2	1	2	1	1	1	1	1	1	4
7-Nov	1	2	2	1	2	3	2	3	3	3	3	2	2	2	2	1	1	1	1	1	1	2	2	4	4
8-Nov	2	3	4	4	4	2	3	3	3	3	3	3	3	6	3	4	2	2	2	2	2	1	2	6	
9-Nov	1	2	3	2	3	2	4	2	2	3	3	2	4	4	3	3	2	1	2	3	3	2	3	4	
10-Nov	3	3	1	1	2	2	2	2	2	2	3	2	2	2	3	2	2	2	3	2	3	5	4	3	5
11-Nov	3	4	3	3	3	3	3	3	2	2	3	2	4	5	4	7	7	7	4	3	3	3	3	3	7
12-Nov	3	3	3	3	3	3	3	3	3	3	4	4	5	3	3	2	3	4	3	2	2	1	2	2	5
13-Nov	2	2	2	1	1	1	1	2	2	2	1	1	1	2	1	1	1	1	2	2	1	1	2	2	2
14-Nov	2	1	2	2	2	2	2	2	3	1	3	2	2	5	4	4	3	3	2	3	2	3	3	2	5
15-Nov	4	4	4	5	4	3	3	3	3	3	3	4	4	4	4	3	2	2	3	2	3	3	3	2	5
16-Nov	2	4	2	2	3	1	2	2	3	4	4	5	4	5	5	5	5	5	5	5	5	5	5	4	5
17-Nov	4	4	3	3	3	2	2	2	2	3	3	3	3	3	3	3	2	3	4	4	4	4	4	3	4
18-Nov	2	2	2	3	2	3	2	2	3	2	2	3	3	3	3	3	1	2	2	3	2	2	1	1	3
19-Nov	1	1	1	1	1	1	1	1	1	4	2	2	2	2	3	3	2	4	2	2	2	2	2	2	4
20-Nov	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	1	2	1	3
21-Nov	2	2	1	2	2	2	2	2	1	3	3	3	3	3	3	3	3	3	4	4	4	3	3	2	4
22-Nov	2	3	2	1	1	1	1	1	1	2	2	2	1	1	2	2	3	3	3	2	2	3	3	3	3
23-Nov	4	4	3	3	3	3	3	3	3	3	3	3	3	3	4	2	2	1	2	2	3	2	2	2	4
24-Nov	1	2	2	1	1	1	2	1	1	2	1	1	1	1	2	1	2	2	2	2	3	3	2	2	3
25-Nov	3	3	2	3	3	2	3	1	2	3	2	1	2	2	2	1	2	2	1	1	2	2	3	3	3
26-Nov	3	3	4	3	3	4	4	4	4	4	4	5	3	3	4	3	2	1	2	2	2	2	2	2	5
27-Nov	2	1	1	2	1	1	2	2	2	2	2	3	2	2	2	2	1	2	3	2	3	2	3	3	3
28-Nov	3	3	3	3	3	3	2	2	2	2	1	2	2	2	3	3	2	3	3	3	4	3	3	2	4
29-Nov	3	3	3	3	2	2	1	2	1	1	2	1	1	2	2	2	3	3	3	3	3	2	2	4	4
30-Nov	3	4	5	4	5	4	4	4	4	4	4	4	4	4	4	3	3	4	4	3	5	4	5	4	5
Diurnal Maximum																									
4 5 5 5 5 4 4 4 4 4 5 5 5 6 5 7 7 7 5 5 5 5 5 4																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort Chipewyan - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	67	9.31	9.31
6 - 11	227	31.53	40.83
12 - 19	319	44.31	85.14
20 - 28	102	14.17	99.31
29 - 38	5	0.69	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort Chipewyan - November 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	7	1	2	1	2	8	2	4	5	6	7	4	6	6	5	1	67
6 - 11	0	2	3	2	18	11	6	14	13	16	20	13	32	40	22	15	227
12 - 19	0	0	4	8	17	26	25	29	14	16	16	26	68	27	42	1	319
20 - 28	0	0	0	6	21	17	6	28	11	5	0	3	5	0	0	0	102
29 - 38	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	5
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	7	3	9	17	62	62	39	75	43	43	43	46	112	73	69	17	720

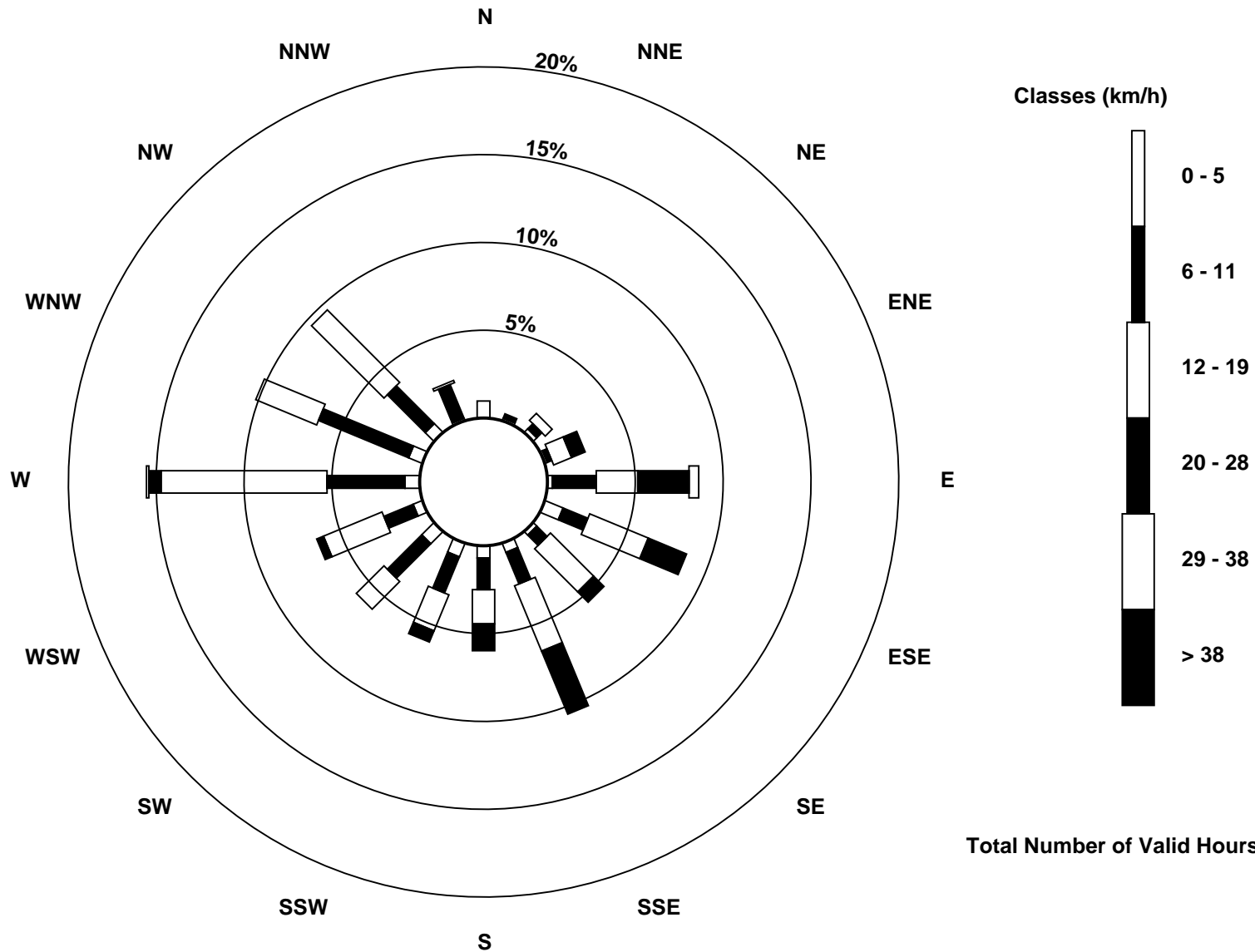
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Fort Chipewyan (AMS 8)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort Chipewyan - November 2016

Direction of Maximum Speed: 96 deg on Nov 23 01:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 157.2 deg on Nov 30	Hours of Data: 720
Direction of Minimum Speed: 311 deg on Nov 27 06:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.0 deg on Nov 13	Percent Operational Time: 100.0
Monthly Average Direction: 257.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	307	318	320	314	317	321	321	314	317	323	311	299	309	311	309	303	305	315	334	327	21	320	182	168	313.2
2-Nov	189	161	163	179	185	148	133	137	142	148	165	171	170	173	180	189	197	201	203	202	212	209	216	219	176.2
3-Nov	223	216	216	207	179	161	157	165	158	176	147	167	197	208	222	215	213	212	214	224	234	246	252	254	208.0
4-Nov	260	271	269	257	259	239	190	223	223	218	219	216	208	199	209	181	134	178	204	208	148	100	99	108	221.8
5-Nov	150	103	86	107	156	184	198	216	197	188	138	148	211	159	108	111	107	125	180	223	223	225	251	261	172.8
6-Nov	277	262	259	255	257	249	237	240	234	220	227	238	266	267	251	246	275	261	225	232	207	207	143	226	248.8
7-Nov	255	355	76	113	231	241	263	249	280	291	278	268	236	240	237	174	107	93	101	86	87	71	78	101	172.1
8-Nov	101	103	108	149	150	112	147	161	168	192	181	187	190	195	213	197	219	229	227	228	219	204	154	132	172.2
9-Nov	162	250	274	293	287	286	248	264	267	282	294	292	272	270	280	284	288	279	279	275	280	292	286	282	278.6
10-Nov	281	295	286	294	339	339	319	103	92	74	93	89	86	88	85	84	87	87	105	133	140	152	159	130	103.4
11-Nov	151	182	190	192	196	204	198	207	203	210	215	222	215	247	249	262	266	264	255	250	247	248	241	241	223.2
12-Nov	247	258	260	265	261	251	248	247	256	266	266	266	267	260	279	282	273	266	284	299	291	262	268	279	264.8
13-Nov	279	298	305	288	282	278	287	260	214	99	176	114	80	97	86	94	101	114	102	86	88	96	107	91	75.2
14-Nov	121	116	93	80	89	87	84	83	86	101	248	278	273	277	280	284	280	280	282	270	274	272	272	266	286.0
15-Nov	267	267	271	276	277	273	280	276	275	275	273	263	267	269	269	269	283	286	291	296	312	321	331	299	278.8
16-Nov	308	340	310	309	302	276	278	282	296	319	318	310	307	315	313	313	307	298	307	306	305	310	310	301	306.8
17-Nov	292	287	284	285	290	287	280	272	271	272	276	279	283	287	285	286	279	295	324	332	318	311	305	300	290.6
18-Nov	280	281	287	306	325	311	296	290	299	297	286	283	288	291	301	287	297	294	296	307	306	301	274	301	294.6
19-Nov	324	339	54	44	8	359	313	1	8	113	115	105	80	82	73	73	88	90	91	91	97	96	92	97	86.5
20-Nov	104	107	104	116	109	103	103	108	116	119	130	143	126	128	130	128	130	128	121	107	109	120	134	126	118.2
21-Nov	109	111	112	106	124	128	136	145	157	202	245	263	271	267	275	304	307	312	312	318	316	310	315	309	235.1
22-Nov	310	321	321	322	288	281	118	195	117	214	236	245	250	268	102	100	136	125	113	102	100	99	97	96	107.8
23-Nov	96	106	121	165	159	159	159	168	170	170	168	165	174	180	179	170	146	146	152	160	162	161	165	175	155.2
24-Nov	177	176	178	177	179	184	181	187	204	214	213	217	247	210	133	147	165	163	140	136	146	103	98	115	158.3
25-Nov	119	124	113	102	94	89	87	95	108	108	98	95	92	96	117	129	128	149	199	242	271	275	273	270	108.2
26-Nov	274	299	299	273	264	260	267	263	261	254	259	263	262	257	262	262	268	229	239	263	283	222	262	282	264.8
27-Nov	225	224	265	279	296	311	119	128	125	117	115	127	104	92	87	69	50	43	64	67	69	70	70	63	84.7
28-Nov	59	59	53	58	58	54	47	37	36	18	13	5	2	330	336	343	348	339	332	337	331	324	332	312	21.6
29-Nov	304	308	316	320	321	301	275	250	208	203	190	213	188	164	115	156	155	159	160	163	165	147	138	168	180.0
30-Nov	155	152	158	152	156	159	148	151	162	161	157	162	157	157	150	147	151	148	156	160	164	167	171	179	157.2

195.7 200.7 207.8 203.7 194.9 188.5 185.0 190.8 193.5 197.4 200.8 210.0 214.5 216.8 219.4 207.1 194.4 182.9 183.7 191.7 183.9 161.9 167.3 175.8

Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Fort Chipewyan - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 92 deg on Nov 10 07:00	Hours of Data: 720
Minimum Value: 4 deg on Nov 22 21:00	Hours of Missing Data: 0
Percentiles: P ₁ = 5 P ₁₀ = 7 Q ₁ = 10 Median = 14 Q ₃ = 17 P ₉₀ = 24 P ₉₉ = 68	Hours of Calibration: 0
	Percent Operational Time: 100.0

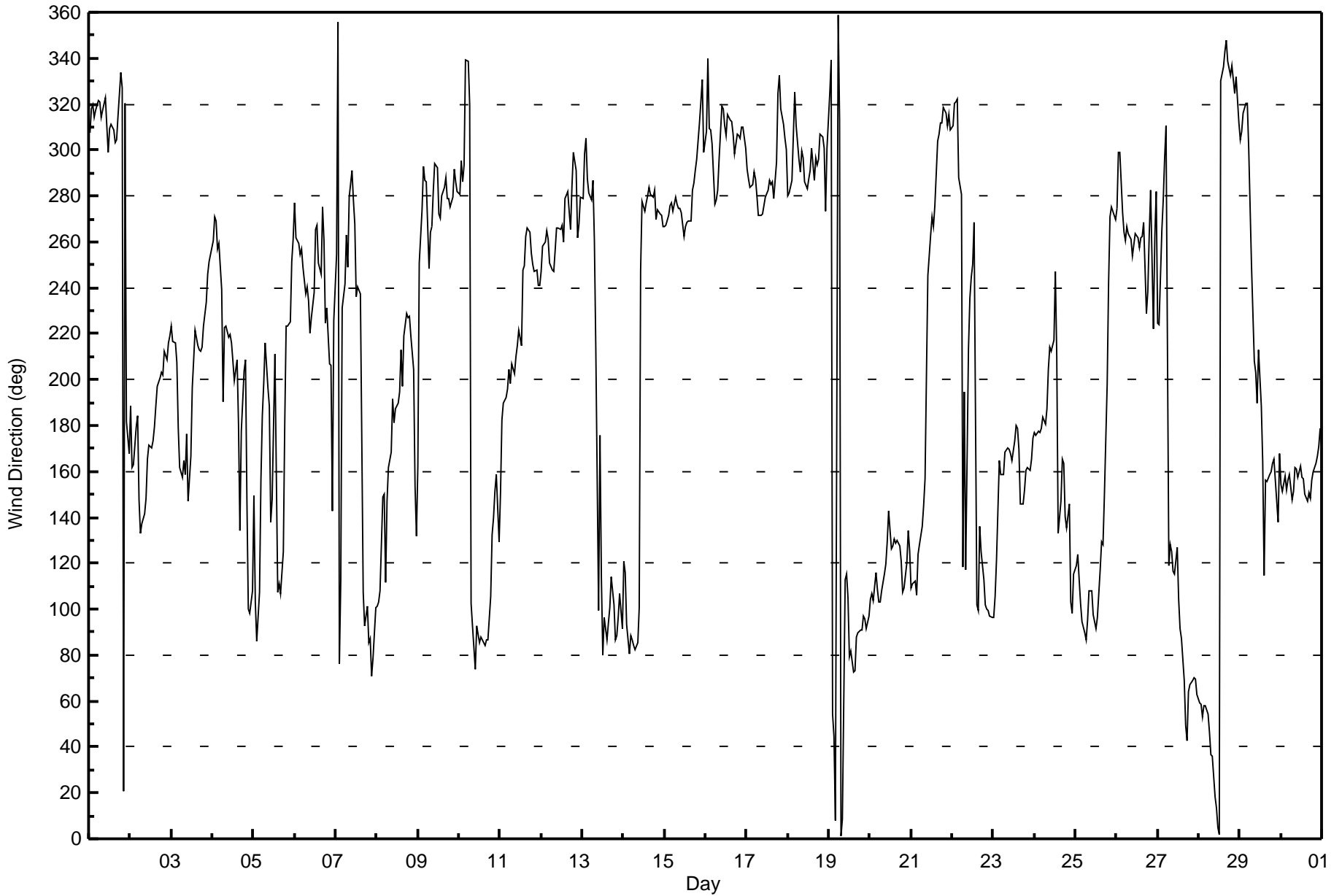
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	15	17	18	17	18	18	18	16	18	21	18	18	16	19	21	18	16	23	25	39	22	86	61	24	86
2-Nov	22	25	17	18	13	15	7	10	9	11	11	9	9	8	11	8	8	8	8	9	7	8	12	10	25
3-Nov	12	10	10	16	19	15	15	16	16	17	26	13	11	8	9	7	8	13	11	10	10	13	13	13	26
4-Nov	14	14	13	15	12	14	42	10	9	14	9	7	11	14	13	46	18	20	27	16	44	10	22	23	46
5-Nov	20	14	11	8	28	13	20	10	20	17	26	30	8	51	10	17	18	13	19	18	16	47	14	16	51
6-Nov	14	16	26	20	15	12	8	10	8	12	10	19	14	13	14	12	11	11	21	15	44	45	63	7	63
7-Nov	18	62	52	34	13	17	13	13	18	15	17	17	32	24	13	42	16	6	9	10	11	14	16	8	62
8-Nov	6	9	9	21	29	10	16	14	13	13	16	8	8	18	15	28	9	12	9	11	10	25	66	47	66
9-Nov	49	16	14	10	14	24	23	38	27	21	14	14	15	16	13	13	22	19	13	11	14	17	12	11	49
10-Nov	12	16	13	17	20	19	92	42	10	17	5	5	5	5	5	6	5	4	13	10	16	22	10	9	92
11-Nov	16	10	7	7	8	10	7	9	9	11	8	10	13	15	13	15	14	14	13	13	12	13	11	11	16
12-Nov	14	12	12	12	13	12	12	12	12	12	13	13	13	12	18	14	14	15	18	14	17	10	9	11	18
13-Nov	13	11	9	14	12	17	10	33	45	39	58	47	9	15	12	6	8	12	27	12	7	10	15	10	58
14-Nov	23	17	12	8	6	7	7	10	24	20	52	13	12	14	14	13	13	12	13	14	12	13	12	13	52
15-Nov	15	13	14	14	14	13	13	13	13	12	15	14	14	14	14	13	13	12	15	14	18	16	20	19	20
16-Nov	20	29	28	17	20	16	15	14	18	19	19	18	16	17	18	17	17	17	18	16	16	18	16	19	29
17-Nov	15	15	14	14	15	14	14	14	14	13	14	14	14	15	13	14	15	16	25	22	18	16	16	16	25
18-Nov	12	13	13	17	26	17	17	15	15	19	19	19	21	23	23	17	16	23	16	21	24	24	14	25	26
19-Nov	24	38	11	72	37	70	73	13	22	32	10	11	9	5	7	8	7	6	6	7	6	6	7	6	73
20-Nov	5	6	6	12	7	5	6	6	6	6	9	8	8	8	6	6	7	6	8	7	7	7	8	6	12
21-Nov	5	6	6	8	6	5	8	7	13	12	20	14	14	14	14	16	16	16	16	18	19	15	15	13	20
22-Nov	10	13	14	15	15	45	60	76	30	16	13	14	21	69	23	20	12	7	14	5	4	5	5	6	76
23-Nov	5	7	23	10	11	12	10	9	8	8	8	9	10	8	8	16	7	7	8	8	9	9	8	7	23
24-Nov	6	7	6	7	7	7	7	6	11	9	12	16	18	42	15	12	14	17	11	7	12	12	5	6	42
25-Nov	10	6	6	6	4	5	5	5	6	5	5	4	4	5	12	5	5	15	24	15	15	13	14	13	24
26-Nov	14	22	19	14	15	15	14	15	15	14	15	15	16	15	13	14	12	20	15	19	17	36	49	15	49
27-Nov	28	23	17	23	29	58	52	23	16	14	13	12	14	11	11	13	10	11	13	8	8	7	7	9	58
28-Nov	8	8	8	8	8	8	10	12	14	15	16	20	33	18	20	19	20	20	19	20	23	21	23	21	33
29-Nov	17	17	19	20	22	22	16	14	22	18	29	9	10	13	37	23	21	13	12	10	11	11	8	15	37
30-Nov	12	13	11	10	11	10	9	12	10	11	10	11	11	10	10	8	11	8	9	11	12	10	13	11	13

49	62	52	72	37	70	92	76	45	39	58	47	33	69	37	46	22	23	27	39	44	86	66	47	
Diurnal Maximum																								



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Fort Chipewyan - November 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 5, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	14:50
Gas Cert Reference	LL79696	Station temp.	22 Deg C
Cal Gas Concentration	2.35 ppm	Cal Gas Exp Date	2/13/18
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG Make/Model	Teledyne API T701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11039

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-827	-827
Analyzer IP address	192.168.1.43		Lamp voltage	995	1001
Calculated slope	0.996306	1.009479	Chamber temp	44.9	45.0
Calculated intercept	-0.061584	-0.145717	Pressure	722.5	712.2
Analyzer Background	1.21	1.22	Flow	0.443	0.438
Analyzer Coefficient	1.093	1.093	Intensity	91	91

Analyzer make Thermo 43i-TLE Analyzer serial # 1136451241

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.1	----
as found span	6000	44.8	17.5	17.4	1.011
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	44.8	17.5	17.5	1.005
second point	6000	29.9	11.7	11.9	0.987
third point	6000	15.0	5.9	5.9	0.991
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	44.8	17.5	17.4	1.011
Average Correction Factor					0.994

Corrected As found 17.2 Previous response 17.7 % change 2.6%

Notes:

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



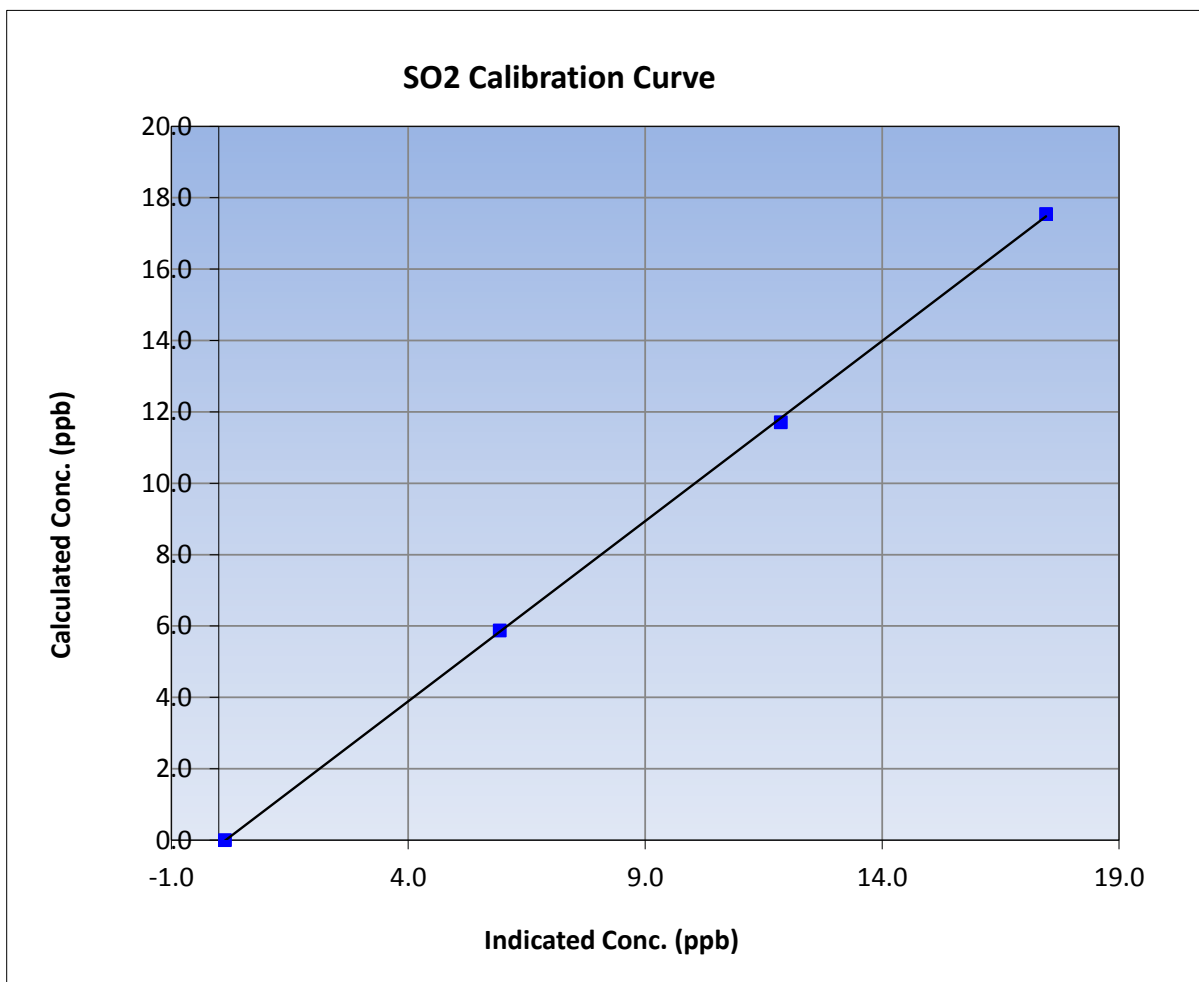
Wood Buffalo Environmental Association SO2 Calibration Report

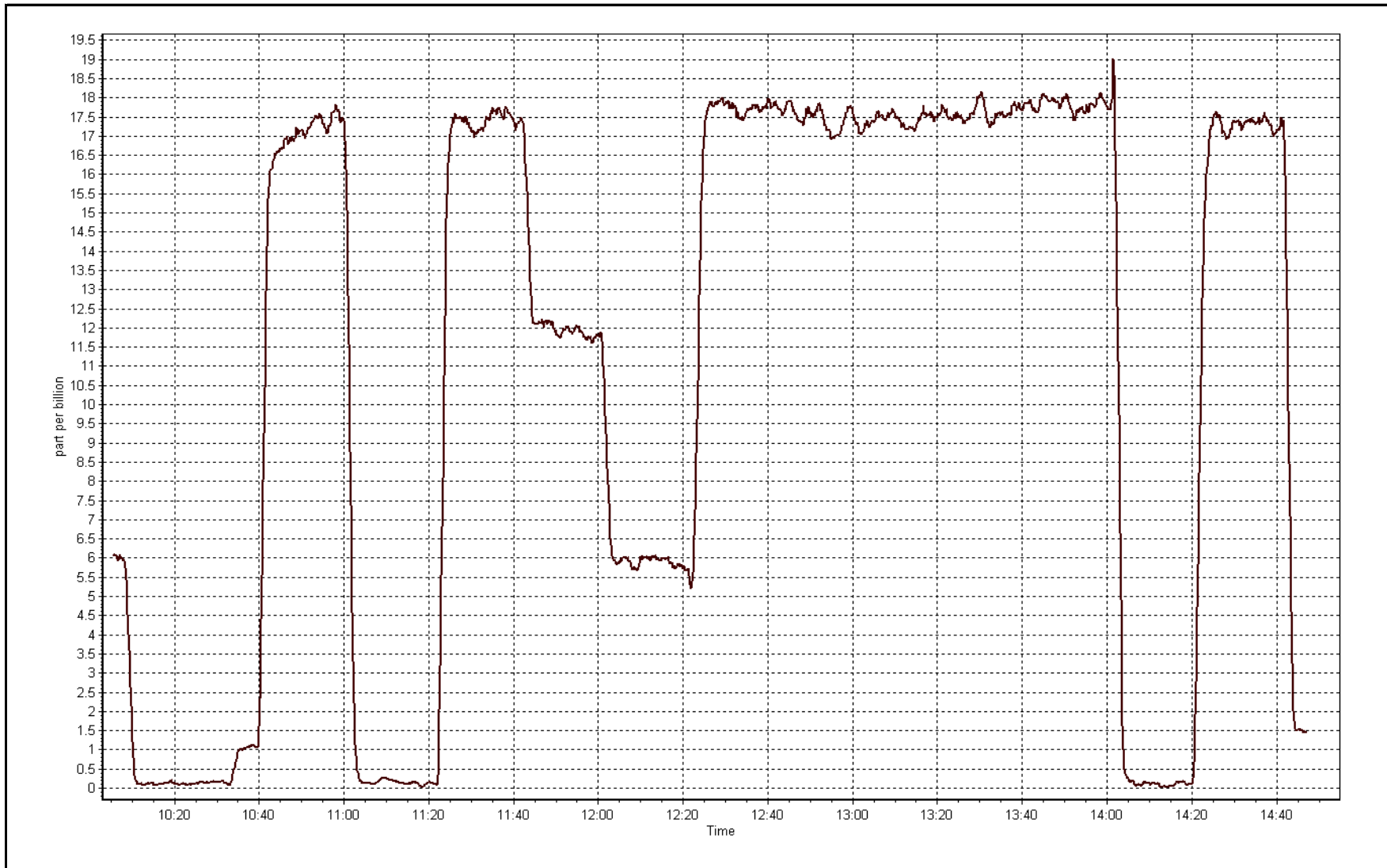
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:05	End Time (MST)	14:50
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1136451241

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999887
17.5	17.5	1.0050		
11.7	11.9	0.9874	Slope	1.009479
5.9	5.9	0.9907		
			Intercept	-0.145717







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 20, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> As founds		
Start Time (MST)	14:45	End Time (MST)	16:30
NO2 GPT Ref date	NA	Transfer Standard	NA
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	747
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.6	27.6
Analyzer IP address	192.168.1.49		Lamp temp.	53.6	53.6
Calculated slope	1.307182	1.313646	Pressure	678.2	678.2
Calculated intercept	-0.781852	-1.156008	Flow cell A	0.728	0.728
Analyzer Background	0.9	0.9	Flow cell B	0.730	0.730
Analyzer Coefficient	1.001	1.001	O3 Measure	102029	102029
			O3 Reference	92796	92796

Analyzer make	Thermo 49i	Analyzer serial #	1300156233
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero	6000	0.00	0.0	0.9	----
As found span	6000	237.4/829.8	103.2	79.4	1.299
calibrator zero	6000	0.00	0.0	0.9	----
high point	6000	237.4/829.8	103.2	79.4	1.299
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.299

Corrected As found	78.6	Previous response	79.7	% change	1.5%
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Notes:

As founds completed with station calibrator and portable calibrator. Both showed similar response, around 30% lower than target value. Maintenance completed. See DoClt note for details.

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association O3 Calibration Report

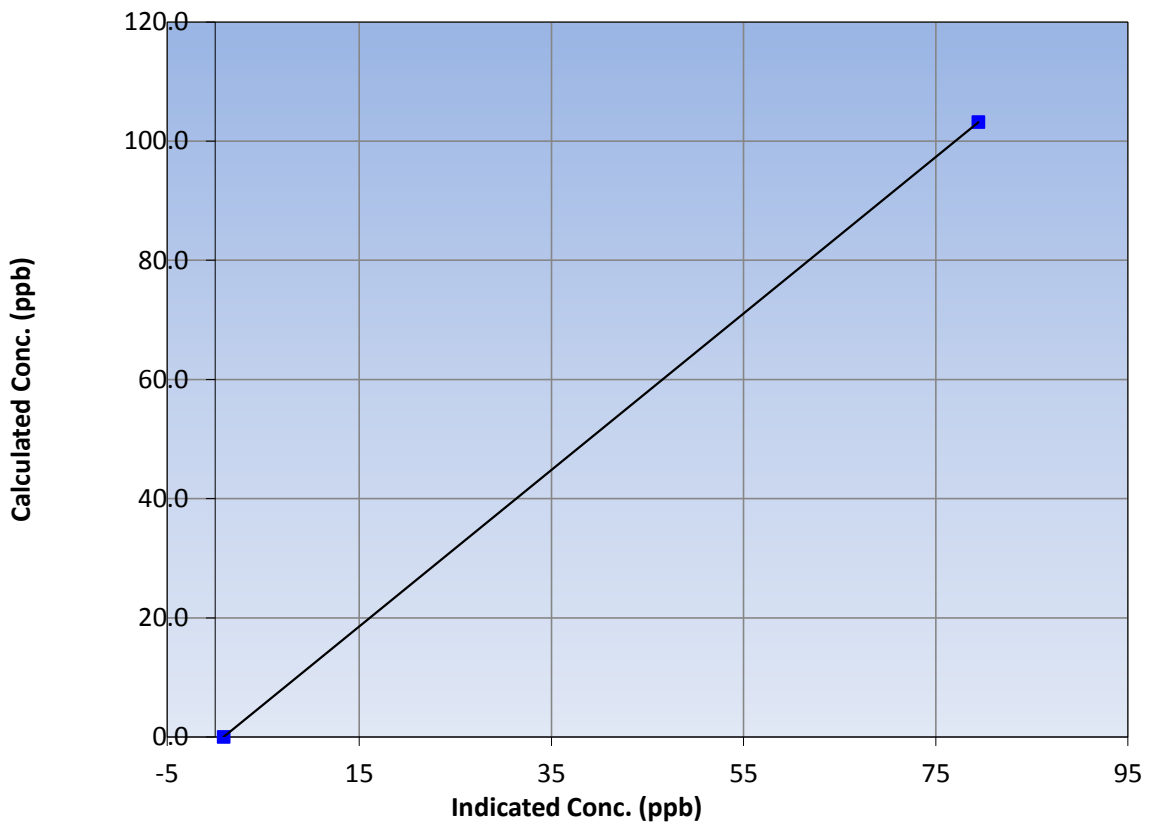
Station Information

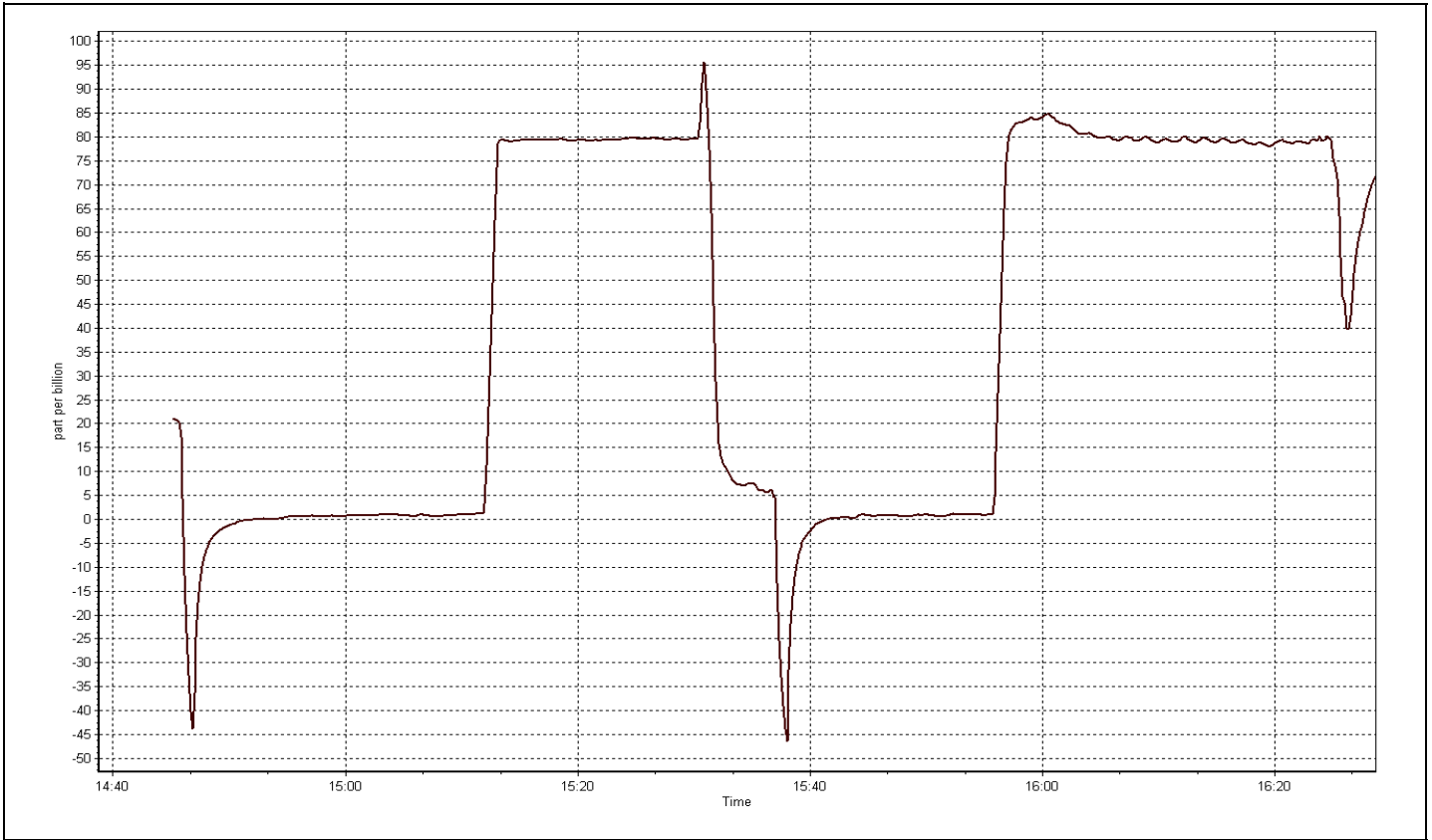
Calibration Date	November-02-16	Previous Calibration	October 20, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	14:45	End Time (MST)	16:30
Analyzer make	Thermo 49i	Analyzer serial #	1300156233

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.9	----	Correlation Coefficient	1.000000
103.2	79.4	1.2991		
			Slope	1.313646
			Intercept	-1.156008

O3 Calibration Curve







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 20, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance		
Start Time (MST)	18:55	End Time (MST)	21:20
NO2 GPT Ref date	NA	Transfer Standard	NA
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API T750	Serial Number	72
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.6	26.0
Analyzer IP address	192.168.1.49		Lamp temp.	53.6	53.6
Calculated slope	1.313646	0.996993	Pressure	678.2	662.4
Calculated intercept	-1.156008	-0.472669	Flow cell A	0.728	0.717
Analyzer Background	0.9	-2.2	Flow cell B	0.730	0.718
Analyzer Coefficient	1.001	1.029	O3 Measure	102029	100902
			O3 Reference	92796	97879

Analyzer make	Thermo 49i	Analyzer serial #	1300156233
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero					
As found span					
calibrator zero	6000	0.00	0.0	0.4	----
high point	6000	778.10	100.0	100.5	0.995
second point	6000	724.30	80.0	81.1	0.986
third point	6000	647.20	50.0	50.5	0.989
as left zero					
as left span					
Average Correction Factor					0.990

Corrected As found	NA	Previous response	NA	% change	NA
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Notes:

Calibration with portable calibrator after maintenance was completed. See DocIt note for maintenance details. Zero and Span adjusted

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association O3 Calibration Report

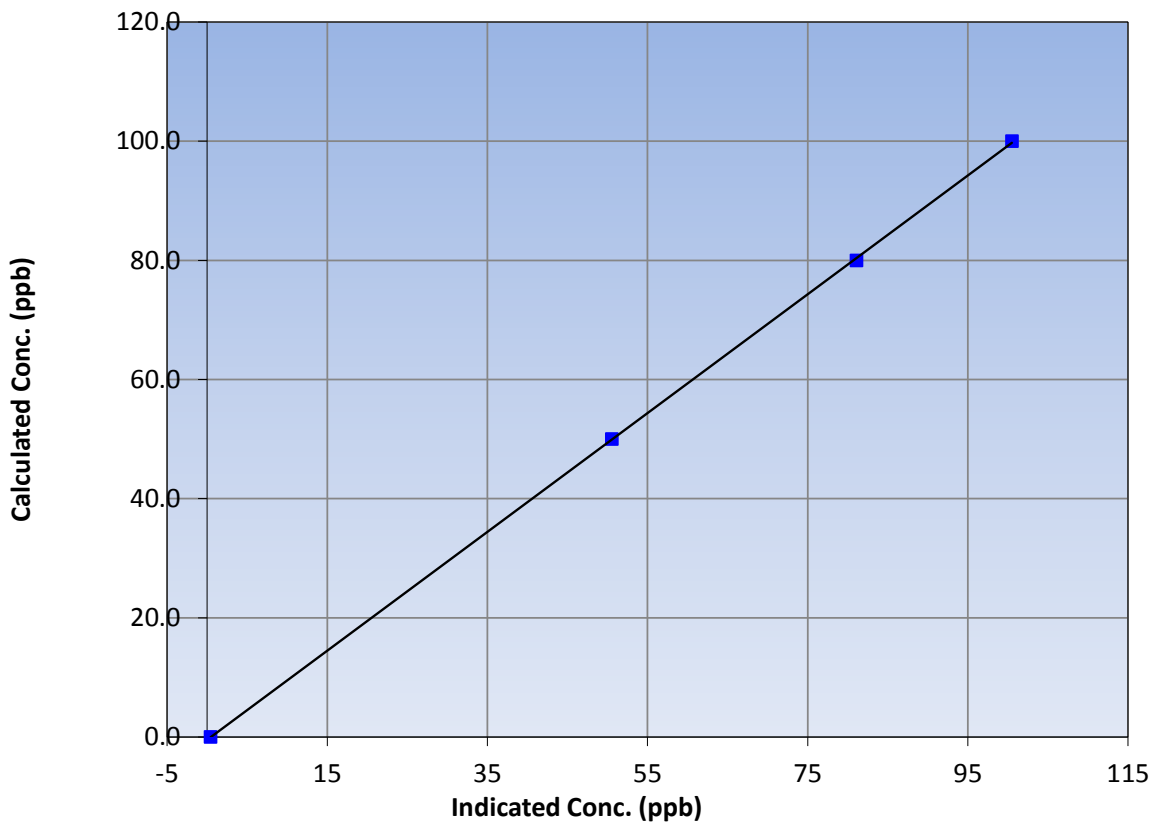
Station Information

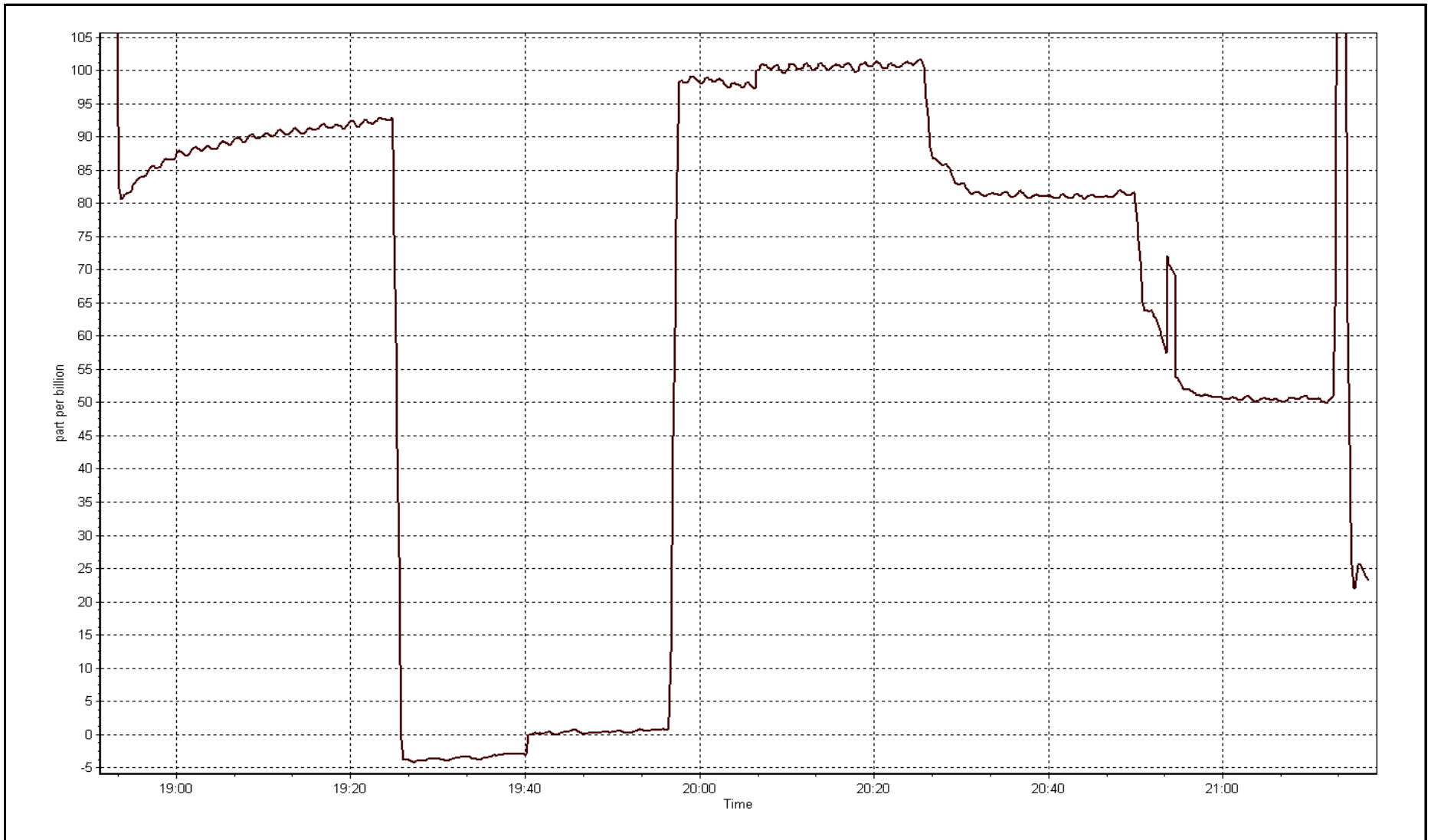
Calibration Date	November-02-16	Previous Calibration	October 20, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	18:55	End Time (MST)	21:20
Analyzer make	Thermo 49i	Analyzer serial #	1300156233

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999958
100.0	100.5	0.9950		
80.0	81.1	0.9863	Slope	0.996993
50.0	50.5	0.9893		
			Intercept	-0.472669

O3 Calibration Curve







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 3, 2016	Previous Calibration	November 2, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	<input type="text" value="Routine"/>		
Start Time (MST)	8:00	End Time (MST)	11:35
NO2 GPT Ref date	November-02-16	Transfer Standard	NA
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.0	26.7
Analyzer IP address	192.168.1.49		Lamp temp.	53.6	53.5
Calculated slope	0.996993	0.995249	Pressure	662.4	651.7
Calculated intercept	-0.472669	-0.218724	Flow cell A	0.717	0.708
Analyzer Background	-2.2	-2.2	Flow cell B	0.718	0.711
Analyzer Coefficient	1.029	1.037	O3 Measure	100902	102145
			O3 Reference	97879	99350

Analyzer make	Thermo 49i	Analyzer serial #	1300156233
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero	6000	0.00	0.0	-0.1	----
As found span	6000	830.30	103.2	102.2	1.010
calibrator zero	6000	0.00	0.0	-0.1	----
high point	6000	830.30	103.2	103.6	0.997
second point	6000	799.20	83.4	84.0	0.993
third point	6000	733.10	52.4	53.6	0.977
as left zero	6000	0.00	0.0	0.8	----
as left span	6000	830.30	103.2	103.7	0.995
Average Correction Factor					0.989

Corrected As found	102.3	Previous response	104.0	% change	1.7%
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Notes:

Zero very slow to stabilise. Slight adjustment to span.

Calibration Performed By: Devin Russell



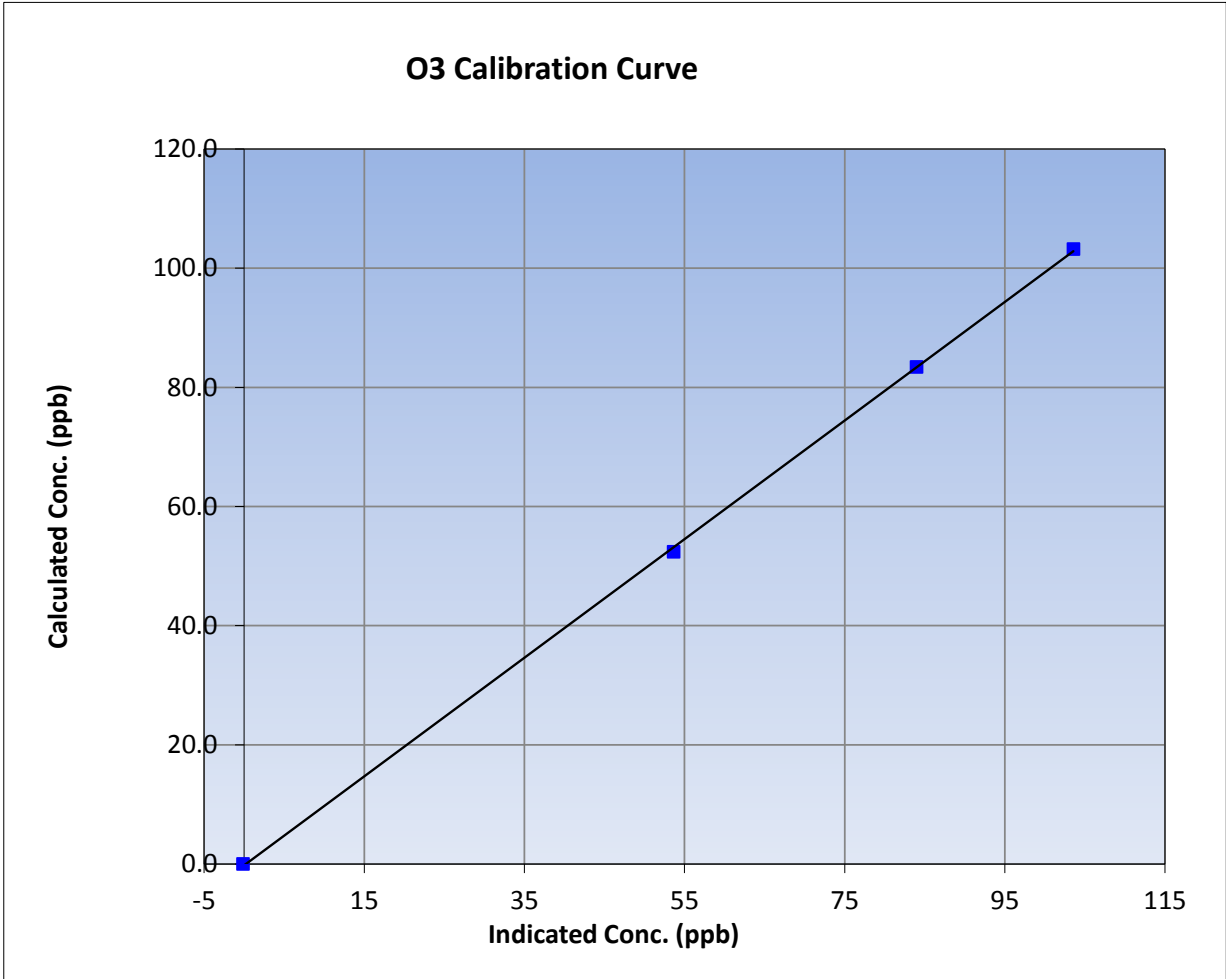
Wood Buffalo Environmental Association O3 Calibration Report

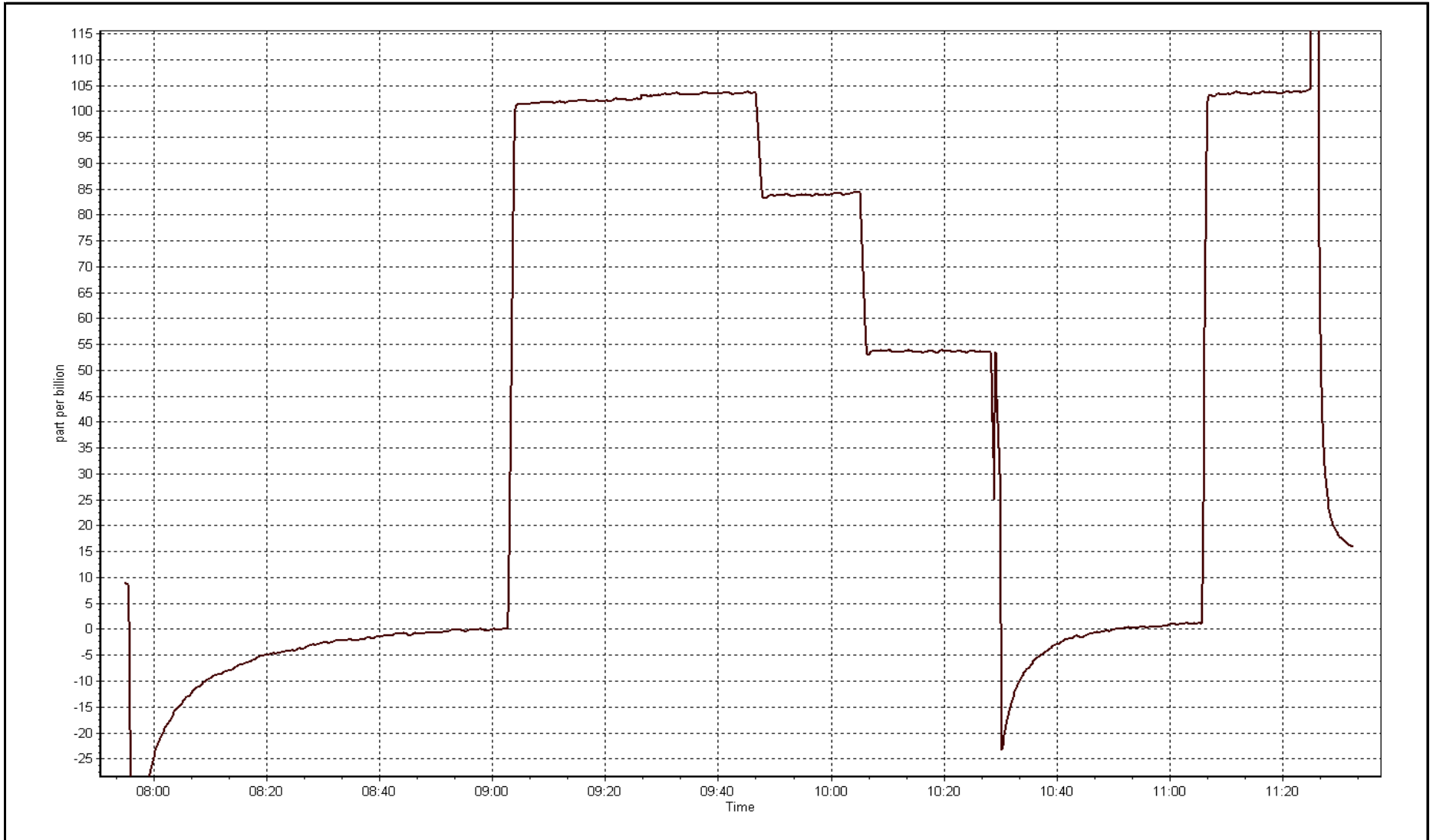
Station Information

Calibration Date	November-03-16	Previous Calibration	November-02-16
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	8:00	End Time (MST)	11:35
Analyzer make	Thermo 49i	Analyzer serial #	1300156233

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999861
103.2	103.6	0.9965		
83.4	84.0	0.9933	Slope	0.995249
52.4	53.6	0.9769		
			Intercept	-0.218724







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	14:50
NO Cal Gas Conc	20.1 ppm	Gas Cert Reference	LL79696
NOx Cal Gas Conc	20.1 ppm	Cal Gas Expiry Date	2/13/18
Calibrator	Teledyne API T700	Serial Number	747
Zero air Generator	Teledyne API 701	Serial Number	4698

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11039
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Calibration Statistics

Parameter	NOx	NO	NO2	
As Found (last calibration results)	Data Slope	0.998109	0.999671	1.002943
	Data Offset	0.607461	0.695711	0.166821
Current Calibration	Data Slope	0.997620	0.997797	0.999553
	Data Offset	0.504265	0.570834	0.014215

Analyzer Information

Analyzer make/model	Teledyne API T200u	Analyzer serial #	172
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Test Point	before		after	
Concentration range	0-200	ppb	0-200	ppb
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.272		1.272	
NOx coefficient	1.285		1.285	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.1		0.1	
NOx bkgrnd	0.2		0.2	
Chamber Temp	40	Deg C	40	Deg C
Moly Temp	315.5	Deg C	314.1	Deg C
PMT voltage	502	V	502	V
PMT Temp	5	Deg C	5.1	Deg C
O3 flow	89	ccm	88	ccm
R Cell press NO	3.9	"Hg	3.8	"Hg
R Cell Press Nox	3.9	"Hg	3.8	"Hg
NO sample flow	1125	cc/min	1107	cc/min
Nox sample Flow	1102	cc/min	1083	cc/min

Notes:

Inlet filter changed after as founds. No adjustments made.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

November 2, 2016

Station Number:

AMS 8

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as found span	6000	44.8	150.1	150.1	0.0	150.3	150.3	0.0	0.9987	0.9986
calibrator zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	6000	44.8	150.1	150.1	0.0	150.3	150.3	0.0	0.9986	0.9986
second point	6000	29.9	100.2	100.2	0.0	99.6	99.4	0.2	1.0059	1.0078
third point	6000	15.0	50.3	50.3	0.0	49.4	49.3	0.2	1.0168	1.0199
as left zero	6000	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	----	----
as left span	6000	44.8	150.1	47.0	103.1	150.2	47.4	102.8	0.9995	0.9924
Average Correction Factor									1.0071	1.0088

Corrected As found

NO_x= 150.4

NO= 150.3

Percent Change

NO_x= -0.4%

NO= -0.6%

Previous Response

NO_x= 149.8

NO= 149.4

GPT Calibration Data

Dilution Flow (total) 6000 ccm

Source Gas Flow 44.80 ccm

NOx ref calc conc = 150.1 ppb

NO ref calc conc = 150.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	150.5	150.2	0.0	0.9971	0.9990	----	----
1st NO2 (100)	47.0	103.2	150.3	47.0	103.3	0.9987	----	0.9996	100.0%
2nd NO2 (80)	66.8	83.4	150.2	66.8	83.4	0.9990	----	1.0000	100.0%
3rd NO2 (50)	97.8	52.4	150.3	97.8	52.5	0.9988	----	0.9994	100.1%
2nd NO ref point	----	0.0	150.3	150.2	0.0	0.9989	0.9989	----	----
Average Correction Factor						0.9988		0.9997	100.0%

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

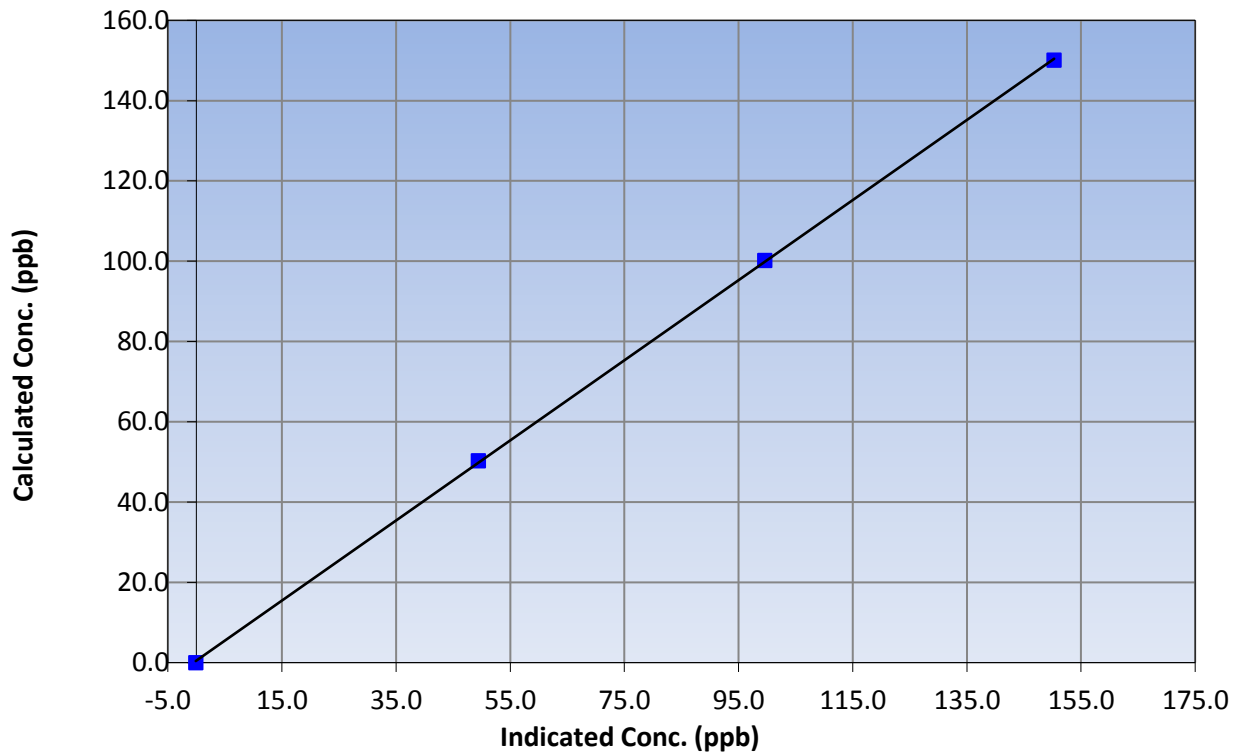
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:05	End Time (MST)	14:50
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999953
150.1	150.3	0.9986		
100.2	99.6	1.0059	Slope	0.997620
50.3	49.4	1.0168		
			Intercept	0.504265

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

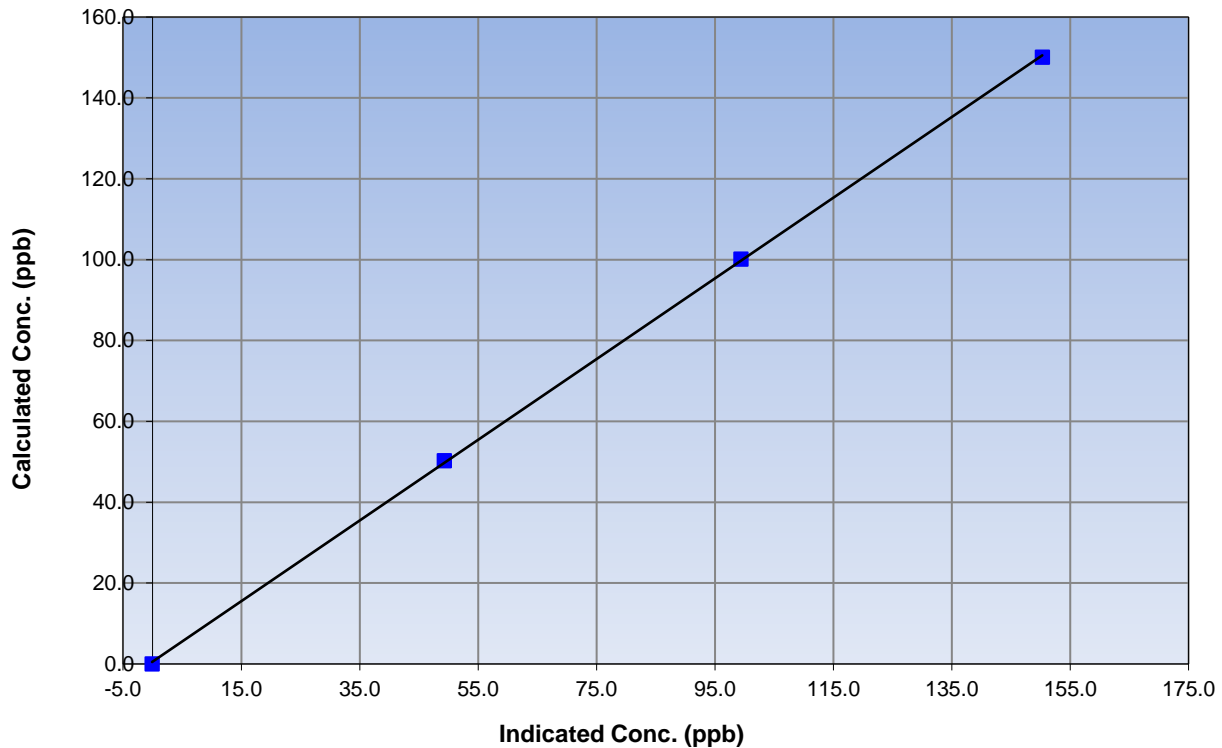
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:05	End Time (MST)	14:50
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999929
150.1	150.3	0.9986		
100.2	99.4	1.0078	Slope	0.997797
50.3	49.3	1.0199		
			Intercept	0.570834

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

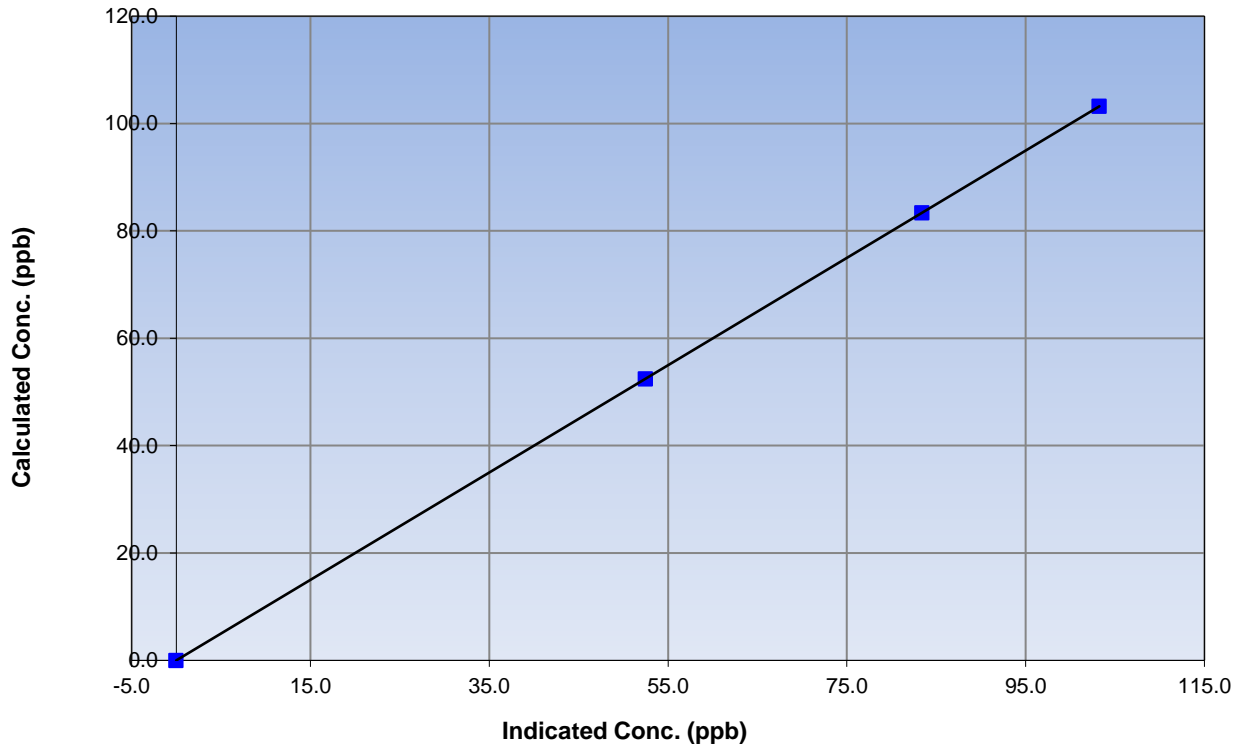
Station Information

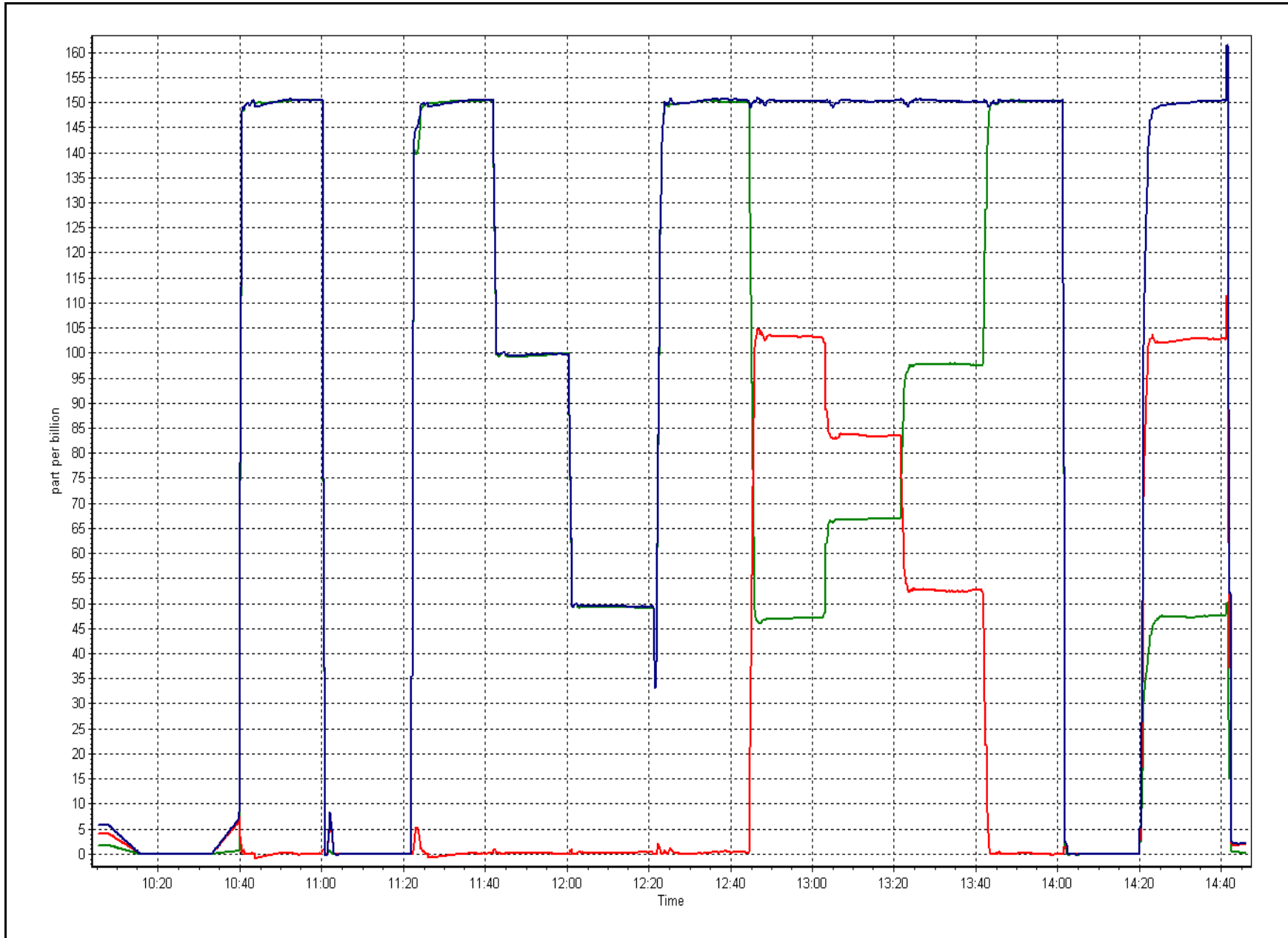
Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Number	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:05	End Time (MST)	14:50
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	1.000000
103.2	103.3	0.9996		
83.4	83.4	1.0000	Slope	0.999553
52.4	52.5	0.9994		
			Intercept	0.014215

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Fort Chipewyan	Station number:	AMS 8
Calibration Date:	November 2, 2016	Last Cal Date:	October 5, 2016
Start time (MST):	12:30	End time (MST):	13:53
Sharp Model:	Thermo 5030	S/N:	E-2025
Particulate Fraction:	PM2.5	C14 Source S/N:	7414
Flow Standard Model:	Delta Cal	S/N:	1451
Temp/RH standard:	Delta Cal	S/N:	1451

Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-6	-5.5	-6	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	979	979.78	979	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1009.2	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.1	----	0.1	<input type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning:	PM10 Cyclone <input checked="" type="checkbox"/>		PM2.5 Cyclone <input checked="" type="checkbox"/>		
Filter Tape Installed:	<input type="checkbox"/>				

Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date: <u>September 1, 2016</u>	<u>Tolerance</u>
	Flow w/o adaptor: _____	Flow w/ adaptor: _____	0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass: _____	S/N: _____
	Date of check: _____	Last Cal Date: _____
	New Correction Factor: _____	Previous Correction Factor: _____

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)				<input type="checkbox"/>	+/- 2 °C
T3 (°C)				<input type="checkbox"/>	+/- 2 °C
T4 (°C)				<input type="checkbox"/>	+/- 2 °C
RH (%)				<input type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned. No adjustments needed to flow, temperature, pressure or nephelometer.

Calibration by: Devin Russell