



Wood Buffalo Environmental Association

NOVEMBER 2016 MONTHLY REPORT

CONTINUOUS MONITORING
INTEGRATED MONITORING
December 22, 2016

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



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December 22, 2016

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 November 2016
Wood Buffalo Environmental Association**

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Enclosed is the November 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

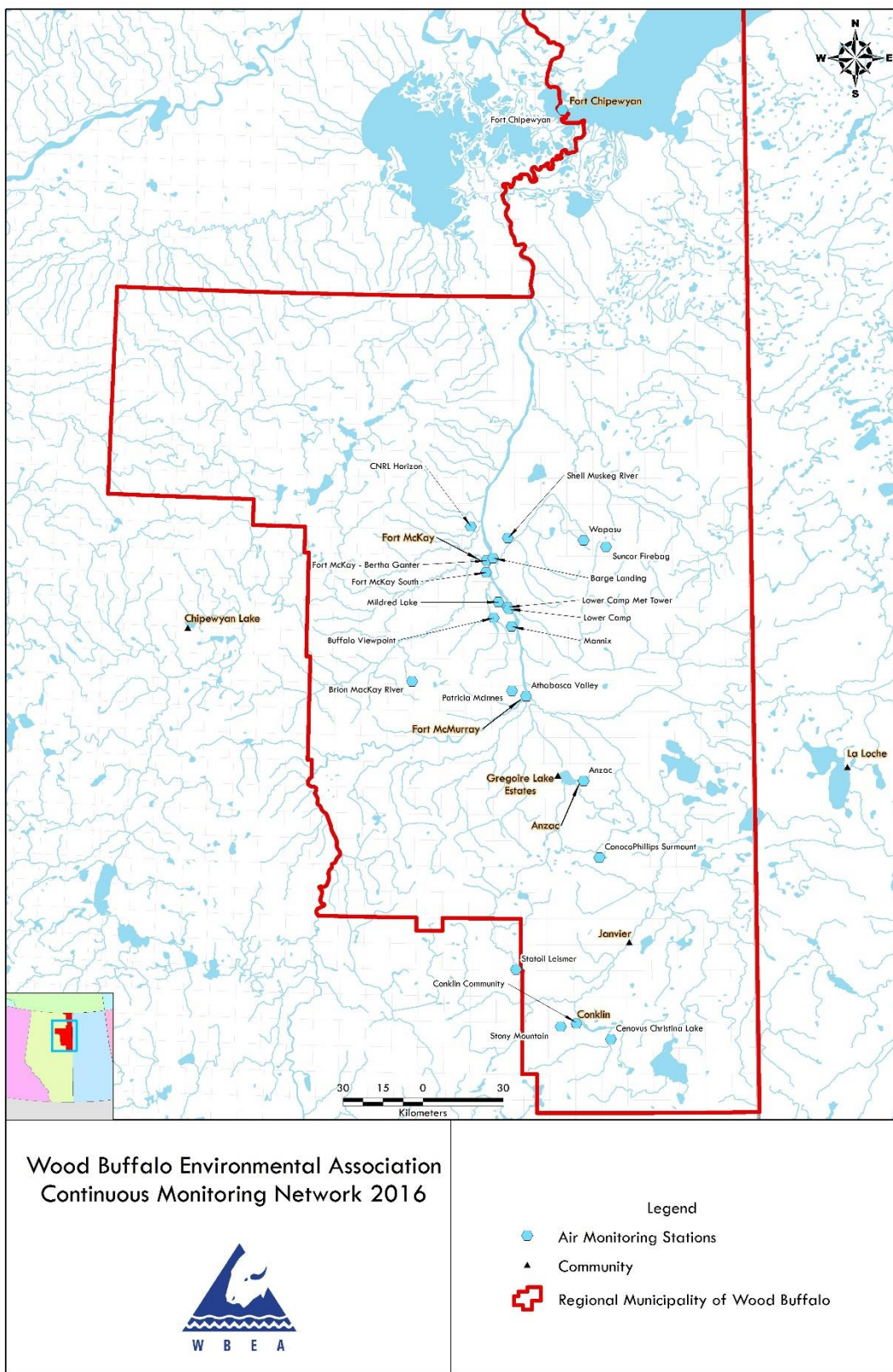


Figure 1: Map of WBEA Air Monitoring Network.

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, PM_{2.5}, CO, NO₂, O₃, and NH₃.

There were 10 H₂S ambient ground level concentrations in excess of the 1-hour and 24-hour H₂S air quality objectives reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were 9 concentrations in excess of the 1-hour H₂S air quality objective and 1 concentration in excess of the 24-hour H₂S air quality objective.

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

Site	Parameter	Date / Time	Reference	Period	Concentration ppb or ug/m ³		Status
					Reported	Final	
AMS 2 Mildred Lake	H ₂ S	11Nov16, 24:00	318211	1hr	17	17	exc
AMS 11 Lower Camp	H ₂ S	11Nov16, 16:00	318203	1hr	11	11	exc
AMS 11 Lower Camp	H ₂ S	24Nov16, 17:00	318601	1hr	16	16	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 10:00	318659	1hr	16	16	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 17:00	318666	1hr	16	15	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 18:00	318667	1hr	21	21	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 19:00	318668	1hr	20	19	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 20:00	318670	1hr	11	11	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 21:00	318671	1hr	15	15	exc
AMS 11 Lower Camp	H ₂ S	26Nov16, 24:00	318672	24hr	5.0	5.0	exc

*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

Wind speed and wind direction data has been revised and resubmitted to the AEP Airdata Warehouse for Firebag air monitoring station (AMS 19) for October 2016. Revised summary tables for Firebag AMS and Network Summary for October 2016 have been submitted with this report. Please refer to section 2.0 Operational Status, Continuous Monitoring, below, for further details.

2.0 Operational Status

Continuous Monitoring

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

The wind speed and wind direction sensors at Firebag AMS operated less than 90% of the time in October and November 2016, which is a contravention of the Air Monitoring Directive (1989, as amended), Chapter 6, Clause DQ 4-C. Following ice removal from the wind sensors on October 26, 2016, the wind direction sensor was incorrectly oriented with respect to true north. During the data validation process, it was discovered that the wind direction at Firebag AMS did not correlate with nearby air monitoring stations. WBEA field technicians were deployed on November 30, 2016, and found that the wind direction sensor was installed approximately 90 degrees east from true north. The sensor was oriented properly and returned to normal operation.

During data validation process, the wind speed and wind direction data at Firebag AMS was invalidated for a total of 140 hours in October and 710 hours in November. This resulted in wind speed and wind direction data being available for 81% of the time in October, and 1% of the time in November. This incident was reported to Alberta Environment and Parks on December 19, 2016 (AEP Reference #319325).

The WBEA has discussed the cause of this error and preventative measures to avoid future occurrences with all field technicians. Proper orientation of the wind direction sensor in

combination with a visual reference comparison to real time data following any sensor maintenance activities has been and will continue to be required by all field technicians.

In November 2016, there were 4 incidents of a monitoring instrument not required for air quality compliance operating less than 90% of the time.

1. The 167m meteorological sensors at Lower Camp Met Tower (AMS 3) had 75 hours of invalid data due to freezing temperatures and ice build-up.
2. The 75m meteorological sensors at Mannix (AMS 5) had 77 hours of invalid data due to freezing temperatures and ice build-up.
3. The precipitation collector at CNRL Horizon (AMS 15) had 400 hours of invalid data due to snow and ice blocking the tipping mechanism.
4. The precipitation collector at Wapasu (AMS 17) had 369 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 to 2 hours following the daily spans have been reported as invalid for a total of 49 hours this month.

Maintenance and cleaning of the sample manifold on November 15 interrupted the normal operations of all air quality analyzers for 1 hour.

Maintenance to replace the carrier gas cylinder on November 17 interrupted the routine operation of the THC analyzer for 2 hours.

Annual maintenance and calibration on November 17 interrupted the routine operation of the PM_{2.5} analyzer for 4 hours.

Maintenance to remove any built up ice and snow inside the collector bucket on November 17 interrupted the normal operation of the precipitation collector for 1 hour.

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 calibrate the input board on November 17 interrupted the routine operation of the THC analyzer for 9 hours.

Maintenance on the daily zero and span systems and confirmation of analyzers responses on November 25 interrupted the normal operations of all air quality analyzers for 1 hour.

Station 3, Lower Camp B - Meteorology

Flat lines in output signals of the sonic wind sensors at 20, 45, 100, and 167 m elevations resulted in 3, 3, 35, and 75 hours of downtime for each respective sensor.

Station 4, Buffalo Viewpoint

No operational issues to report this month.

Station 5, Mannix

Flat lines in output signals of the sonic wind sensors at 20, 45, 75, and 90 m elevations resulted in 3, 26, 77, and 5 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 36 hours this month.

Excessive baseline drift on November 1 interrupted the routine operation of the PM_{2.5} analyzer for 3 hours.

Maintenance performed during the calibration of the TRS analyzer on November 4 required 16 hours of stabilization time to return to normal operation. Adjustment of the baseline response and calibration on November 23 interrupted the routine operation of the TRS analyzer for 5 hours.

Station 7, Athabasca Valley

The PM_{2.5} analyzer filter tape broke on November 18 resulting in 20 hours of invalid data. Maintenance to repair the filter tape and verify operation on November 19 affected the normal operation of the PM_{2.5} analyzer for 2 hours.

Replacement of the sample manifold blower fan on November 24 interrupted the routine operation of all air quality analyzers for 1 hour.

Station 8, Fort Chipewyan

The O₃ analyzer was replaced on October 20 for repairs. The replacement analyzer span response was discovered to be outside of calibration acceptance criteria, resulting in 39 hours of invalid data in November. On site maintenance and calibration on November 2 returned the analyzer to normal operation. A follow up calibration on November 3 interrupted the routine operation of the O₃ analyzer for 4 hours.

Station 9, Barge Landing

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

Station 11, Lower Camp

A flat-line in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 13, Fort McKay South

Maintenance and cleaning of the sample manifold on November 10 interrupted the normal operations of the TRS and O₃ analyzers for 1 hour.

Three instances of unstable operation due to baseline drift on November 1 and 18 affected the normal operation of the PM_{2.5} analyzer for 9 hours this reporting period. Maintenance to verify baseline response on November 18 interrupted the routine operation of the PM_{2.5} analyzer for 3 hours.

Flat-lines in the output signal of the wind sensor resulted in 16 hours of invalid data this reporting period. Maintenance to replace a frozen wind speed sensor on November 29 interrupted the routine operations of the wind sensors for 3 hours.

Station 14, Anzac

Unstable operation due to baseline drift on November 21 affected the normal operation of the SO₂ analyzer for 6 hours.

Multiple instances of unstable baseline response interrupted the routine operation of the THC analyzer for 8 hours this reporting period. Maintenance to optimize analyzer response on November 21 interrupted the normal operation of the THC analyzer for 5 hours.

Unstable operation due to baseline drift on November 9 affected the normal 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 15, CNRL Horizon

Maintenance and cleaning of the sample manifold on November 7 interrupted the normal operations of all air quality analyzers for 1 hour.

Unstable operation due to lamp voltage fluctuation on November 26 affected the normal operation of the SO₂ analyzer for 6 hours.

Unstable operation due to baseline drift affected the normal operation of the PM_{2.5} analyzer for 14 hours this reporting period. Maintenance to verify analyzer zero response on November 18 interrupted the routine operation of the PM_{2.5} analyzer for 2 hours.

Flat-lines in the output signal of the wind sensor resulted in 20 hours of invalid data this reporting period.

Precipitation collector data was not collected from November 14 to December 1 due to snow and ice blocking the tipping mechanism, resulting in 400 hours of invalid data this reporting period.

Station 16, Shell Muskeg River

Maintenance to the station HVAC system on November 11 caused the station temperature to fluctuate, resulting in unstable operation of the THC analyzer for 11 hours.

Station 17, Wapasu

Three instances of unstable operation due to baseline drift on November 16 and 17 affected the normal operation of the PM_{2.5} analyzer for 6 hours. Maintenance to adjust the baseline response on November 17 interrupted the routine operation of the PM_{2.5} analyzer for 4 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 369 hours of invalid data this reporting period.

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

Station 18, Stony Mountain

Three instances of unstable operation due to baseline drift affected the normal operation of the PM_{2.5} analyzer for 29 hours this reporting period.

Maintenance and cleaning of the sample manifold on November 28 interrupted the normal operations of all air quality analyzers for 4 hours. Maintenance to the sample manifold wall-mounts on November 29 interrupted the normal operations of all quality analyzers for 1 hour.

Station 19, Firebag

The data acquisition system failed to record data on November 9 and 10 resulting in the absence of data for 1 to 3 hours for all parameters.

The wind direction sensor was incorrectly oriented with respect to true north following maintenance to remove ice build-up on October 26. This resulted in 710 hours of invalid data. The wind direction sensor orientation was corrected on November 30.

Station 20, Brion MacKay River

Four instances of intermittent unstable operation due to baseline drift affected the normal operation of the H₂S analyzer for a total of 4 hours this reporting period.

Station 21, Conklin Community

Maintenance to replace the sample manifold on November 8 interrupted the normal operations of all air quality analyzers for 1 hour.

The normal operation of the NO₂ analyzer was interrupted on November 8 for 3 hours to confirm analyzer response to in-situ calibrator O₃ concentrations.

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

Five instances of unstable operation due to baseline drift affected the normal operation of the PM_{2.5} analyzer for 10 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 500, Cenovus Christina Lake

No operational issues to report this month.

Station 502, ConocoPhillips Surmont

Maintenance and cleaning of the sample manifold on November 7 interrupted the normal operation of the H₂S analyzer for 1 hour. Four instances of intermittent unstable operation affected the normal operation of the H₂S analyzer for 6 hours this reporting period.

Unstable operation due to baseline drift on November 18 affected the normal operation of the SO₂ analyzer for 1 hour.

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



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

NOVEMBER 2016

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Prepared: Dec 20 2016 15:30

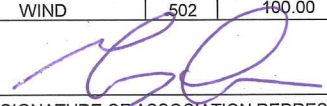
APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
	11	2016					
289664-00-00 254465-00-00 149968-00-01 48522-01-00 240008-00-03 48263-00-00 224816-00-03 189942-00-02	CONTINUOUS AMBIENT MONITORING						
			ONE-HOUR AVERAGE			24-HOUR AVERAGE	
	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
206355-00-00	SO2(ppm)	1	99.86	0.031	0	0.003	0
46586-00-00	SO2(ppm)	2	99.86	0.085	0	0.021	0
216466-00-04	SO2(ppm)	4	100.00	0.026	0	0.006	0
137467-00-00	SO2(ppm)	5	100.00	0.029	0	0.011	0
20809-01-00	SO2(ppm)	6	100.00	0.017	0	0.005	0
241311-00-00	SO2(ppm)	7	99.86	0.011	0	0.002	0
094-02-00	SO2(ppm)	8	100.00	0.011	0	0.003	0
305529-00-00	SO2(ppm)	11	100.00	0.101	0	0.025	0
026-02-00	SO2(ppm)	13	100.00	0.018	0	0.003	0
228044-00-00	SO2(ppm)	14	99.17	0.005	0	0.001	0
73203-01-00	SO2(ppm)	15	99.03	0.051	0	0.003	0
236394-00-00	SO2(ppm)	16	100.00	0.027	0	0.006	0
	SO2(ppm)	17	100.00	0.026	0	0.007	0
	SO2(ppm)	18	99.31	0.002	0	0.001	0
	SO2(ppm)	19	99.58	0.028	0	0.008	0
	SO2(ppm)	20	100.00	0.021	0	0.006	0
	SO2(ppm)	21	99.86	0.002	0	0.001	0
	SO2(ppm)	500	100.00	0.007	0	0.002	0
	SO2(ppm)	502	99.86	0.010	0	0.004	0
	H2S(ppm)	2	99.86	0.017	1	0.002	0
	H2S(ppm)	4	100.00	0.005	0	0.001	0
	H2S(ppm)	5	100.00	0.003	0	0.002	0
	H2S(ppm)	11	100.00	0.021	8	0.005	1
	H2S(ppm)	17	100.00	0.004	0	0.001	0
	H2S(ppm)	19	99.86	0.007	0	0.002	0
	H2S(ppm)	20	99.44	0.002	0	0.001	0
	H2S(ppm)	500	100.00	0.003	0	0.000	0
	H2S(ppm)	502	99.03	0.003	0	0.001	0
	TRS(ppm)	1	99.86	0.003	0	0.001	0
	TRS(ppm)	6	97.08	0.002	0	0.001	0
	TRS(ppm)	7	99.86	0.001	0	0.001	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	100.00	0.001	0	0.000	0
	TRS(ppm)	15	100.00	0.001	0	0.000	0
	TRS(ppm)	18	99.31	0.000	0	0.000	0
	TRS(ppm)	21	100.00	0.000	0	0.000	0
	THC(ppm)	1	99.58	4.0	-	2.9	-
	THC(ppm)	2	98.61	7.9	-	3.3	-
	THC(ppm)	4	100.00	4.4	-	2.6	-
	THC(ppm)	5	100.00	4.1	-	2.7	-
	THC(ppm)	6	100.00	2.4	-	2.2	-
	THC(ppm)	7	99.86	2.9	-	2.3	-
	THC(ppm)	9	100.00	3.7	-	3.0	-
	THC(ppm)	11	100.00	5.1	-	2.8	-
	THC(ppm)	13	100.00	5.8	-	3.5	-
	THC(ppm)	14	98.19	2.3	-	2.1	-
	THC(ppm)	15	99.86	5.5	-	2.5	-
	THC(ppm)	16	98.47	4.2	-	2.8	-
	THC(ppm)	17	100.00	2.7	-	2.3	-
	THC(ppm)	18	99.31	2.3	-	2.1	-
	THC(ppm)	19	99.72	2.9	-	2.4	-
	THC(ppm)	20	100.00	2.9	-	2.5	-
	THC(ppm)	21	99.58	2.2	-	2.1	-
	O3(ppm)	1	99.86	0.037	0	0.032	-
	O3(ppm)	6	100.00	0.040	0	0.035	-
	O3(ppm)	7	99.86	0.039	0	0.035	-

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

NOVEMBER 2016

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Prepared: Dec 20 2016 15:30

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	11	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01			ONE-HOUR AVERAGE		24-HOUR AVERAGE		
48522-01-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
240008-00-03	O3(ppm)	8	94.03	0.040	0	0.037	-
48263-00-00	O3(ppm)	13	99.86	0.037	0	0.031	-
224816-00-03	O3(ppm)	14	100.00	0.040	0	0.036	-
189942-00-02	O3(ppm)	17	100.00	0.037	0	0.031	-
206355-00-00	O3(ppm)	18	99.86	0.046	0	0.042	-
46586-00-00	O3(ppm)	21	100.00	0.043	0	0.036	-
216466-00-04	NO2(ppm)	1	99.86	0.028	0	0.017	-
137467-00-00	NO2(ppm)	6	100.00	0.030	0	0.014	-
20809-01-00	NO2(ppm)	7	99.86	0.032	0	0.018	-
241311-00-02	NO2(ppm)	8	100.00	0.020	0	0.012	-
094-02-00	NO2(ppm)	13	100.00	0.023	0	0.013	-
305529-00-00	NO2(ppm)	14	100.00	0.019	0	0.006	-
026-02-00	NO2(ppm)	15	99.86	0.026	0	0.01	-
228044-00-00	NO2(ppm)	16	100.00	0.028	0	0.019	-
73203-01-00	NO2(ppm)	17	100.00	0.017	0	0.008	-
236394-00-00	NO2(ppm)	18	99.31	0.006	0	0.003	-
	NO2(ppm)	19	99.72	0.018	0	0.008	-
	NO2(ppm)	20	100.00	0.024	0	0.012	-
	NO2(ppm)	21	99.44	0.014	0	0.005	-
	NO2(ppm)	500	100.00	0.018	0	0.008	-
	NO2(ppm)	502	100.00	0.012	0	0.006	-
	CO(ppm)	7	99.86	0.7	0	0.3	-
	NH3(ppm)	1	93.19	0.000	0	0.000	-
	NH3(ppm)	6	95.00	0.010	0	0.000	-
	PM2.5(ug/m3)	1	99.44	39.6	-	12.7	0
	PM2.5(ug/m3)	6	99.58	63.7	-	9.7	0
	PM2.5(ug/m3)	7	96.94	27.5	-	11.0	0
	PM2.5(ug/m3)	8	100.00	21.9	-	10.5	0
	PM2.5(ug/m3)	13	98.33	24.6	-	10.9	0
	PM2.5(ug/m3)	14	99.86	32.7	-	8.1	0
	PM2.5(ug/m3)	15	97.78	29.5	-	10.7	0
	PM2.5(ug/m3)	16	100.00	25.3	-	13.0	0
	PM2.5(ug/m3)	17	98.61	25.5	-	10.0	0
	PM2.5(ug/m3)	18	95.97	16.9	-	7.3	0
	PM2.5(ug/m3)	21	98.61	37.9	-	6.5	0
	WIND	1	100.00	-	-	-	-
	WIND	2	100.00	-	-	-	-
	WIND	4	100.00	-	-	-	-
	WIND	5	99.58	-	-	-	-
	WIND	6	100.00	-	-	-	-
	WIND	7	100.00	-	-	-	-
	WIND	8	100.00	-	-	-	-
	WIND	9	99.86	-	-	-	-
	WIND	11	99.86	-	-	-	-
	WIND	13	97.36	-	-	-	-
	WIND	14	99.86	-	-	-	-
	WIND	15	97.22	-	-	-	-
	WIND	16	100.00	-	-	-	-
	WIND	17	99.72	-	-	-	-
	WIND	18	100.00	-	-	-	-
	WIND	19	1.39	-	-	-	-
	WIND	20	100.00	-	-	-	-
	WIND	21	99.72	-	-	-	-
	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
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY - BERTHA GANTER (AMS 1)
 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	684	35	36	99.86	31	0	3	0
TRS(ppb) Average	686	33	34	99.86	3	0	1	0
THC(ppm) Average	682	35	38	99.58	4	-	2.9	-
NMHC(ppm) Average	682	35	38	99.58	0.712	-	0.271	-
CH4(ppm) Average	682	35	38	99.58	3.3	-	2.6	-
O3 (ppb) Average	685	34	35	99.86	37	0	32	-
NO2 (ppb) Average	683	36	37	99.86	28	0	17	-
NO (ppb) Average	683	36	37	99.86	75	-	25	-
NOX (ppb) Average	683	36	37	99.86	92	-	42	-
NH3 (ppb) Average	621	50	99	93.19	0	0	0	-
PM2.5 (ug/m3) Average	714	2	6	99.44	39.6	-	12.7	0
Wind Speed 10 m (km/h) Average	720	0	0	100.00	21	-	12	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	12.3	-	6.2	-
Temperature 10 m (C) Average	720	0	0	100.00	12.4	-	6.8	-
Relative Humidity (%) Average	720	0	0	100.00	97	-	94	-
Precipitation (mm) Total	719	0	1	99.86	0.7	-	3.1	-
Leaf Wetness (% of range) Average	720	0	0	100.00	50	-	7	-
Global Solar Radiation (W/m2) Average	720	0	0	100.00	300	-	54	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER FORT McKAY (AMS 1)
 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	684	0.7	2	-	0	0	0	0	1	2	31
TRS (ppb) Average	686	0.5	0	-	0	0	0	0	1	1	3
THC (ppm) Average	682	2.15	0.3	-	1.9	1.9	2	2	2.2	2.5	4
NMHC(ppm) Average	682	0.048	0.104	-	0	0	0	0	0	0.2	0.712
CH4(ppm) Average	682	2.11	0.2	-	1.9	1.9	2	2	2.1	2.4	3.3
O3 (ppb) Average	685	15.7	10	-	1	3	7	14	24	31	37
NO2 (ppb) Average	683	7.4	6	-	0	0	2	7	11	16	28
NO (ppb) Average	683	3.8	10	-	0	0	0	0	3	12	75
NOX (ppb) Average	683	11.2	14	-	0	0	2	7	15	26	92
NH3 (ppb) Average	621	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	714	5.56	4.9	-	0.3	0.9	2.2	4.8	7.1	10.5	39.6
Wind Speed 10 m (km/h) Average	720	6.3	3	-	0	2	4	6	8	11	21
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	-1.68	5.2	-	-11.9	-8.3	-5.3	-2.1	1.8	5.7	12.3
Temperature 10 m (C) Average	720	-1.14	5.4	-	-11.8	-8.2	-5.2	-1.6	3.2	6.3	12.4
Relative Humidity (%) Average	720	80.4	11	-	42	65	72	82	90	94	97
Precipitation (mm) Total	719	-	-	8.08	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	720	1.2	3	-	0	0	0	0	1	2	50
Global Solar Radiation (W/m2) Average	720	23.3	51	-	0	0	0	0	19	85	300

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	15 Nov 2016 10:00	15 Nov 2016 10:00	1	Maintenance - manifold cleaning
NMHC, CH4, THC	17 Nov 2016 11:00	17 Nov 2016 12:00	2	Maintenance - replaced carrier gas
NH3	01 Nov 2016 10:00	30 Nov 2016 09:00	49	Stabilization after daily span
PM2.5	17 Nov 2016 10:00	17 Nov 2016 13:00	4	Maintenance - annual foil calibration
PC	17 Nov 2016 11:00	17 Nov 2016 11:00	1	Maintenance - ice/snow in bucket removed



Summary of Hour Averages

Fort McKay - Bertha Ganter - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 31 ppb on Nov 4 14:00	Maximum Daily Average: 3.3 ppb on Nov 4		Hours of Data:	684
Minimum Value: 0 ppb on Nov 1 01:00	Minimum Daily Average: 0.0 ppb on Nov 1		Hours of Missing Data:	36
Maximum Diurnal Average: 2.8 ppb at hour 14	Minimum Diurnal Average: 0.2 ppb at hour 22		Hours of Calibration:	35
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 = 10		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-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
2-Nov	Z	0	0	0	0	0	0	0	0	1	1	2	2	2	1	1	2	0	1	0	0	0	0	0	0	0.6	2
3-Nov	0	Z	0	0	0	0	1	2	1	0	1	1	2	3	9	11	3	1	0	0	0	0	0	0	1.6	11	
4-Nov	0	0	Z	0	0	0	0	0	2	5	3	2	2	31	13	11	2	1	1	2	1	1	1	1	3.3	31	
5-Nov	1	0	0	Z	1	0	0	1	1	1	1	3	4	4	5	6	2	1	1	1	1	1	1	1	1.5	6	
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	0.1	0	
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0.2	2	
8-Nov	Z	0	0	0	0	0	0	0	0	0	1	2	2	1	3	1	2	1	1	0	0	0	0	0	0.7	3	
9-Nov	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
10-Nov	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	13	3	1	1	0	1	2	1	1	2	1.5	13	
11-Nov	1	2	2	Z	3	1	1	1	1	0	1	1	1	6	4	0	0	0	0	0	0	0	0	0	1.0	6	
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	
13-Nov	0	0	0	0	0	Z	0	0	0	0	0	2	5	4	3	3	2	0	1	0	0	0	0	0	0.9	5	
14-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	0.1	0	
15-Nov	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	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	0.2	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	0.2	0	
18-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1	1	
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	0.1	0	
20-Nov	Z	0	0	0	0	0	0	0	0	0	1	1	7	11	5	4	1	0	0	0	0	0	0	0	1.3	11	
21-Nov	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	2	1	1	1	0	0.4	2	
23-Nov	1	1	2	Z	2	2	2	1	2	2	1	1	1	1	3	2	1	2	3	1	0	0	0	0	1.5	3	
24-Nov	0	0	0	0	Z	0	1	1	1	1	1	0	0	0	1	4	0	0	0	0	0	0	0	0	0.6	4	
25-Nov	0	0	0	0	0	Z	0	0	1	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	3	
26-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	0	0	1	0	0	0	0	0.5	4	
27-Nov	1	Z	1	2	2	2	2	2	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.8	2	
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	0.1	0	
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	4	12	3	2	1	1	0	0	0	0	1	0	1.2	12	
30-Nov	1	1	4	4	Z	1	1	1	1	0	0	1	1	2	2	1	1	4	3	5	1	1	2	2	1.8	5	

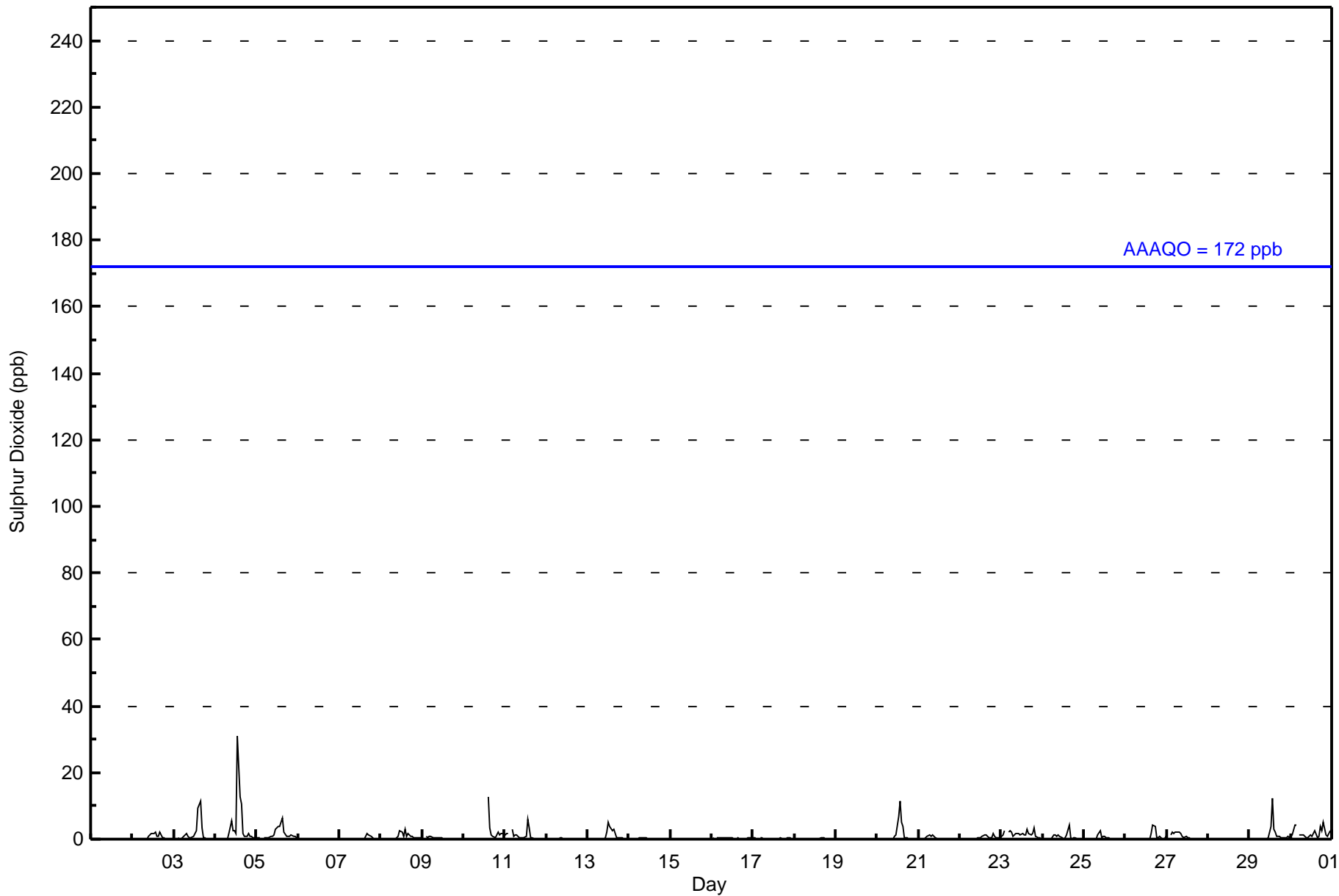
0.3	0.2	0.5	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.5	0.7	1.1	2.8	2.2	1.9	0.9	0.6	0.4	0.6	0.3	0.2	0.2	0.3	Diurnal Average	
1	2	4	4	3	2	2	2	2	2	5	3	3	7	31	13	11	4	4	3	5	2	1	2	2	Diurnal Maximum	

Z - zeronspan 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
Fort McKay - Bertha Ganter - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	677	98.98	98.98
11 - 20	6	0.88	99.85
21 - 60	1	0.15	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: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - 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	47	7	4	3	6	13	24	103	151	69	48	39	45	43	29	46	677
11 - 20	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	6
21 - 60	0	0	0	0	0	0	0	0	1	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	47	7	4	3	6	13	24	103	158	69	48	39	45	43	29	46	684

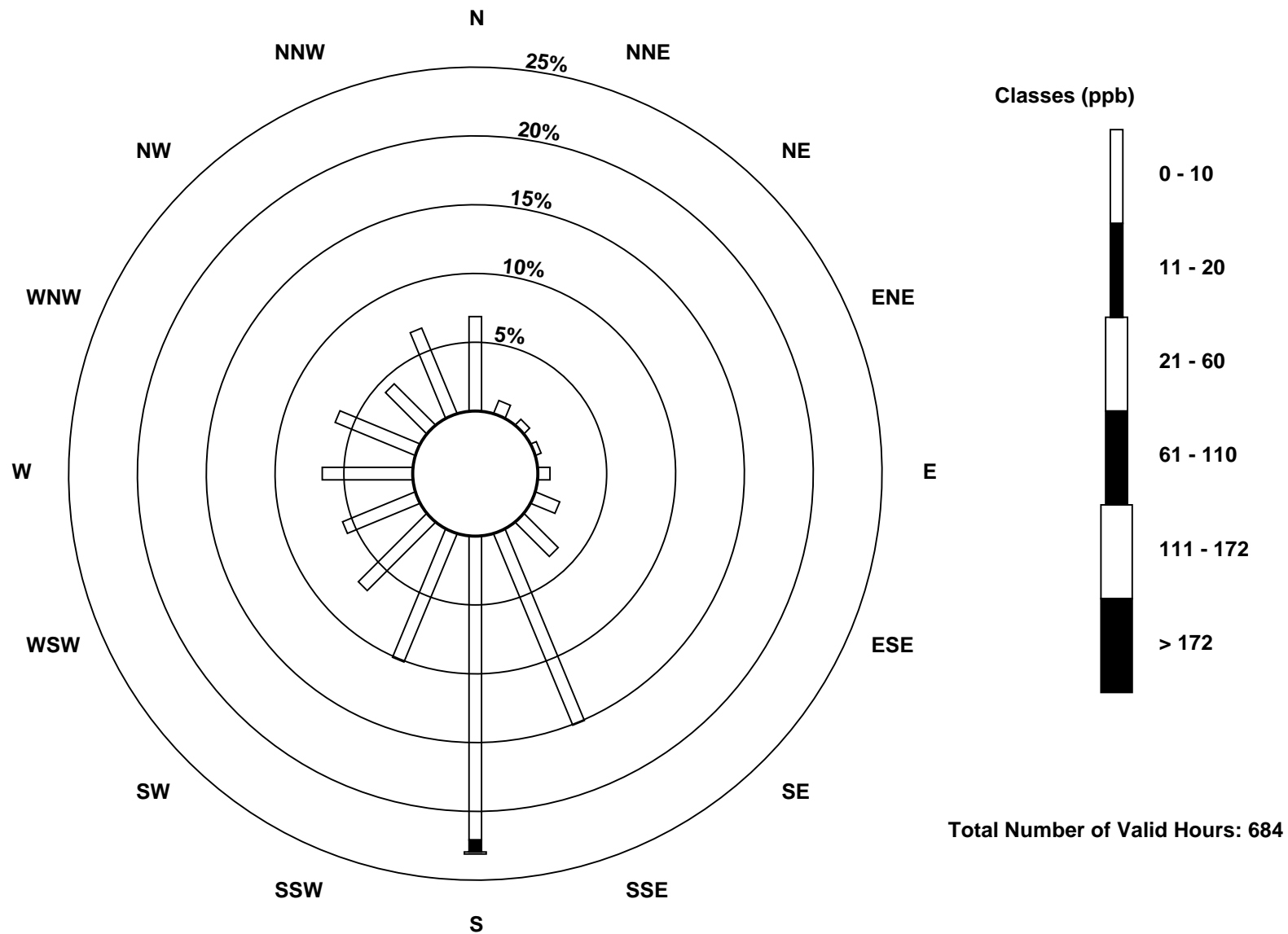
Total Number of Valid Hours: 684

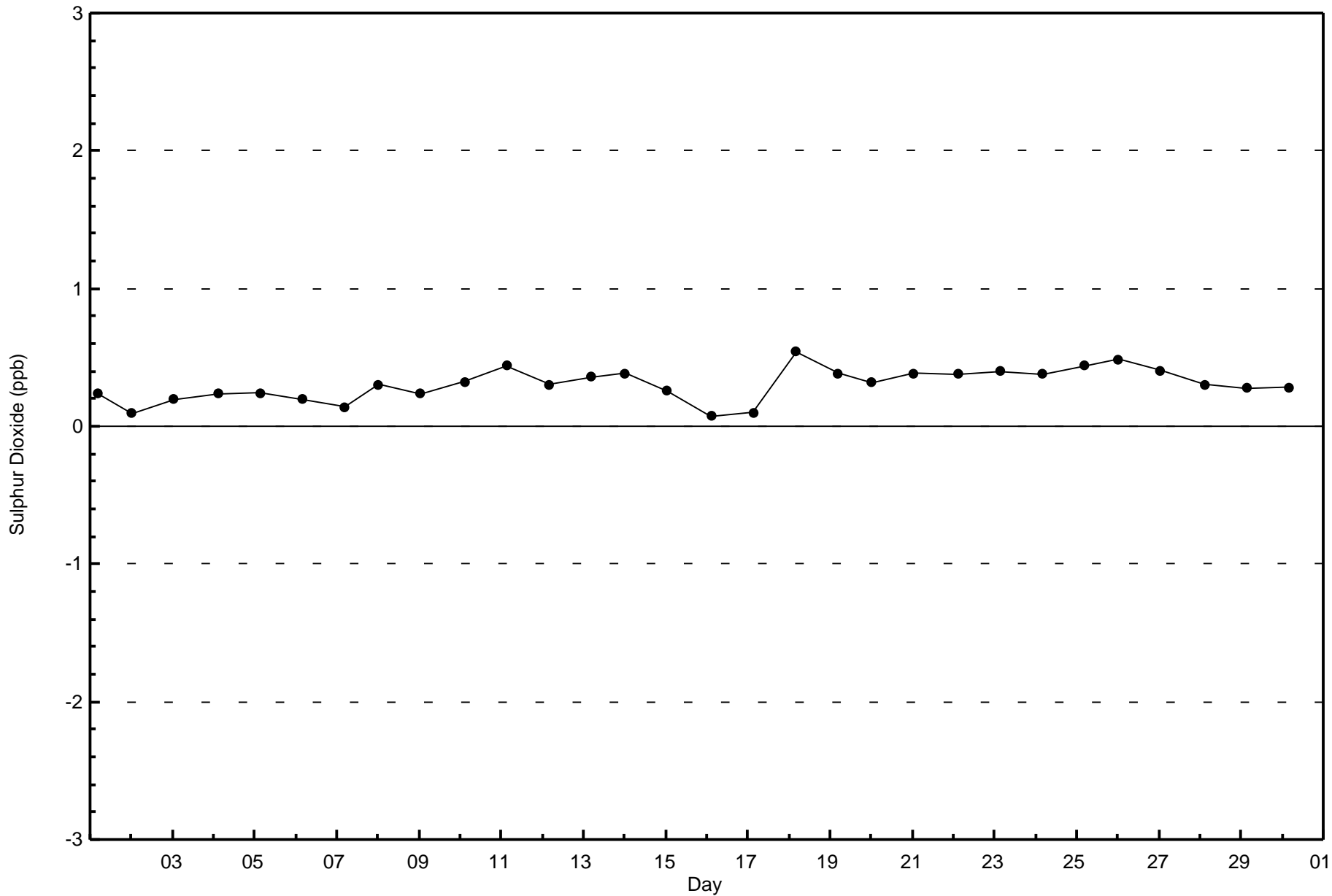
Total Number of Hours: 720

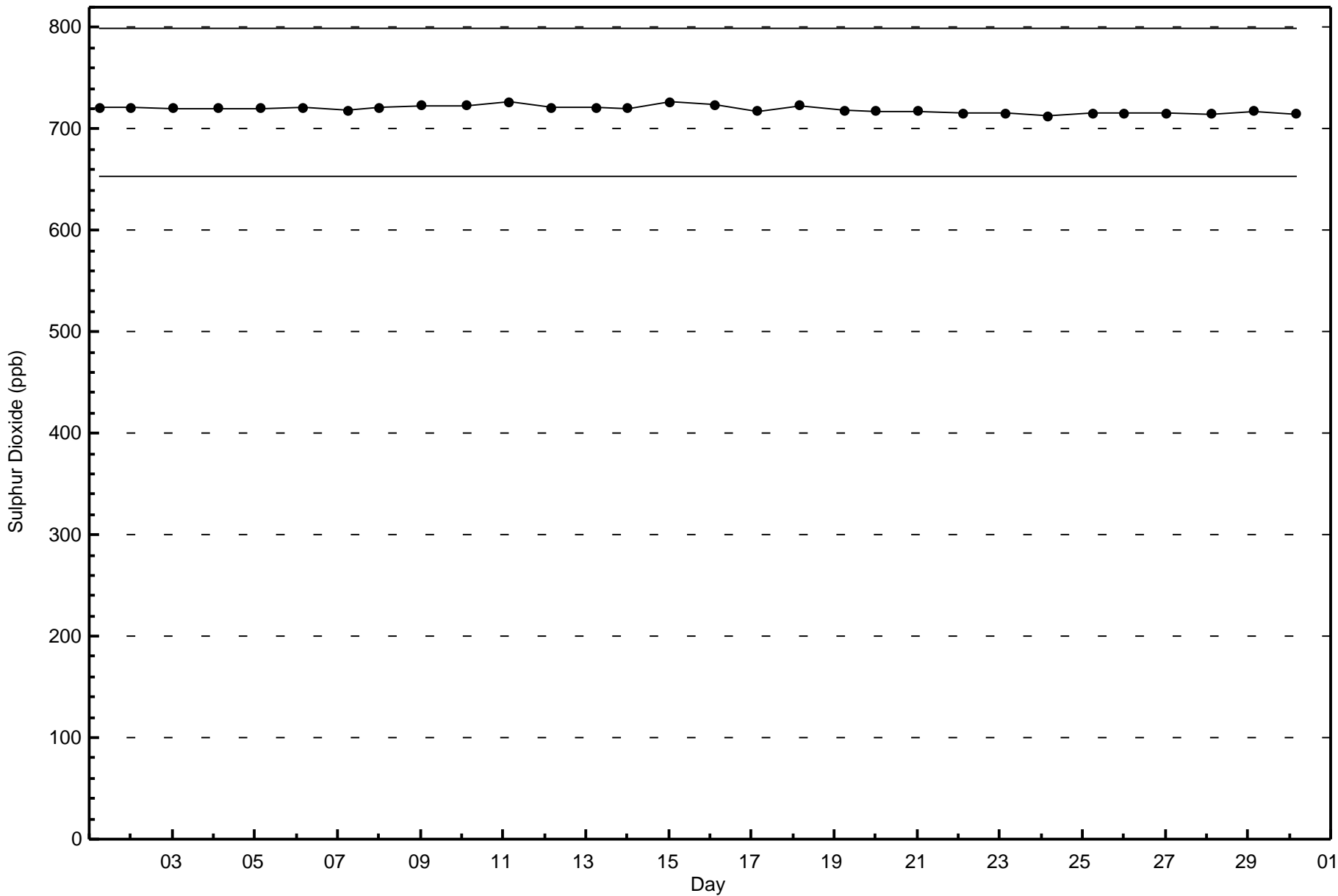


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Fort McKay - Bertha Ganter - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 3 ppb on Nov 13 18:00	Maximum Daily Average: 1.1 ppb on Nov 8		Hours of Data:	686
Minimum Value: 0 ppb on Nov 3 00:00	Minimum Daily Average: 0.3 ppb on Nov 1		Hours of Missing Data:	34
Maximum Diurnal Average: 0.7 ppb at hour 14	Minimum Diurnal Average: 0.4 ppb at hour 4		Hours of Calibration:	33
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:	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-Nov	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	0.3	0
2-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	0.3	1
3-Nov	0	0	1	Z	0	1	2	2	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.7	2	
4-Nov	0	0	0	0	Z	0	0	0	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	0.9	2	
5-Nov	1	1	1	0	1	Z	0	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1.1	2	
6-Nov	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-Nov	0	1	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	2	2	2	2	1	1	1	1	0.7	2	
8-Nov	1	1	Z	1	1	1	1	2	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1.1	2	
9-Nov	1	2	2	Z	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2	
10-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1	
11-Nov	1	1	1	1	2	Z	1	2	1	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0.8	2	
12-Nov	0	0	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
13-Nov	0	0	0	0	0	0	0	Z	0	0	1	1	2	2	1	1	2	3	2	1	1	0	0	0	0.9	3	
14-Nov	1	0	Z	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
15-Nov	0	0	0	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
16-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0.3	0	
17-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	0.3	0	
18-Nov	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	
19-Nov	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
20-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1	
21-Nov	0	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
22-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.4	1	
23-Nov	0	0	1	1	0	Z	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0.6	1	
24-Nov	0	0	0	0	0	0	Z	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1	
25-Nov	0	0	0	0	0	1	1	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1	
26-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.4	1	
27-Nov	0	0	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
28-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	0.3	0	
29-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0.4	1	
30-Nov	0	0	0	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	

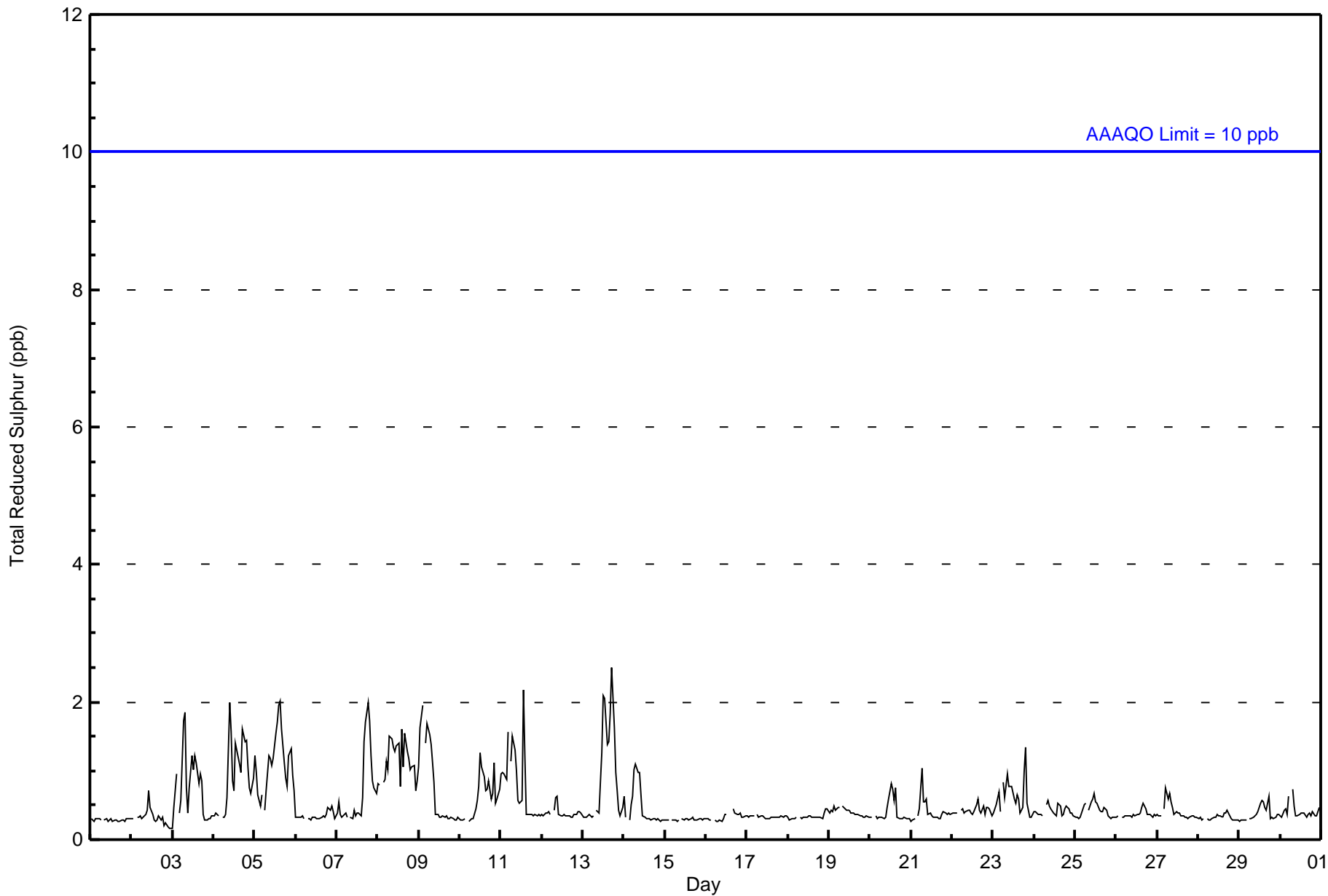
0.4	0.4	0.5	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.4	Diurnal Average
1	2	2	1	2	2	2	2	2	1	2	2	1	2	2	2	2	2	2	3	2	2	1	1	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	685	99.85	99.85
3 - 4	1	0.15	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: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - 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 - 2	49	4	6	3	5	12	24	104	160	68	48	39	45	43	31	44	685
3 - 4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
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	49	4	6	3	5	12	24	104	160	69	48	39	45	43	31	44	686

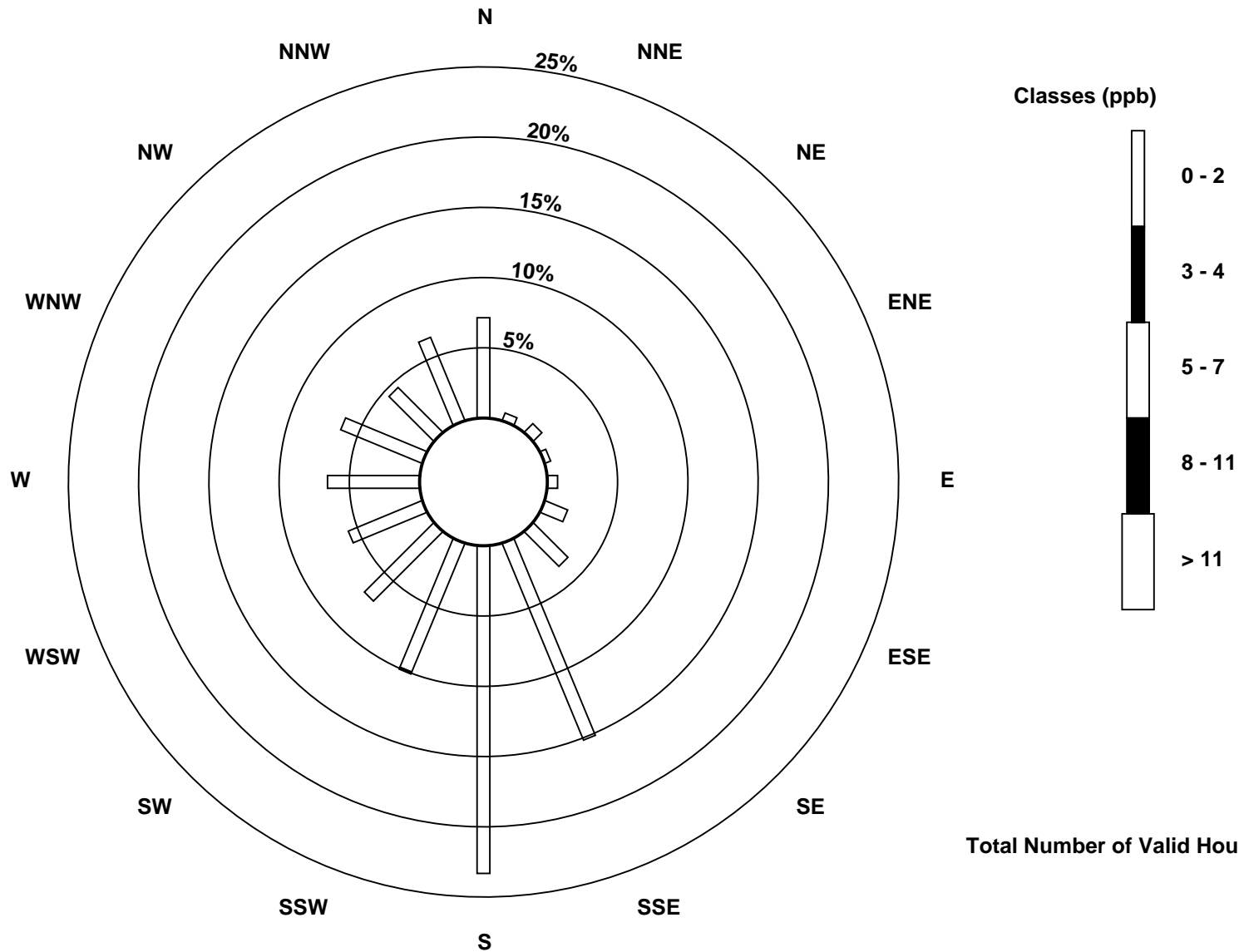
Total Number of Valid Hours: 686

Total Number of Hours: 720

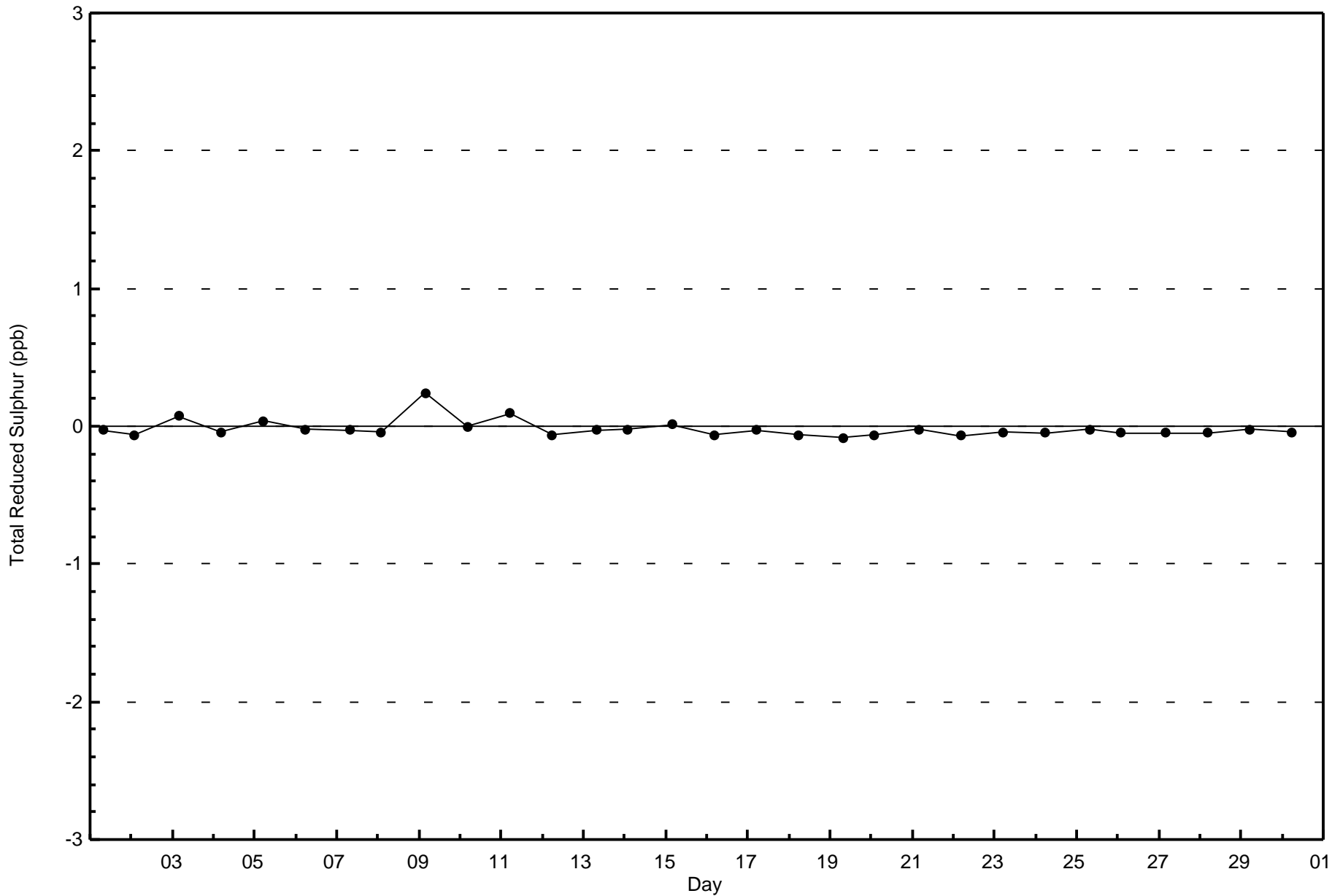


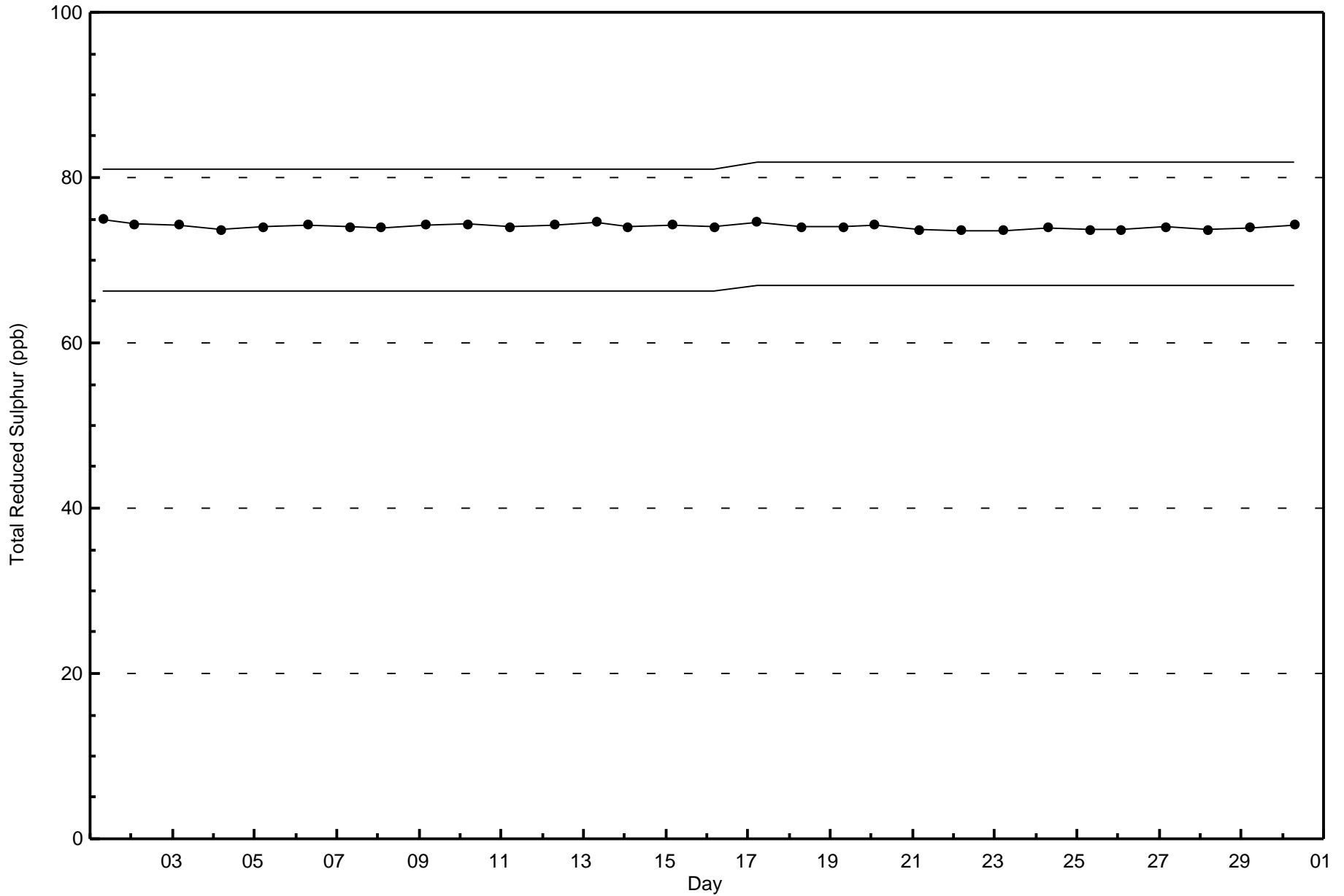
Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 686

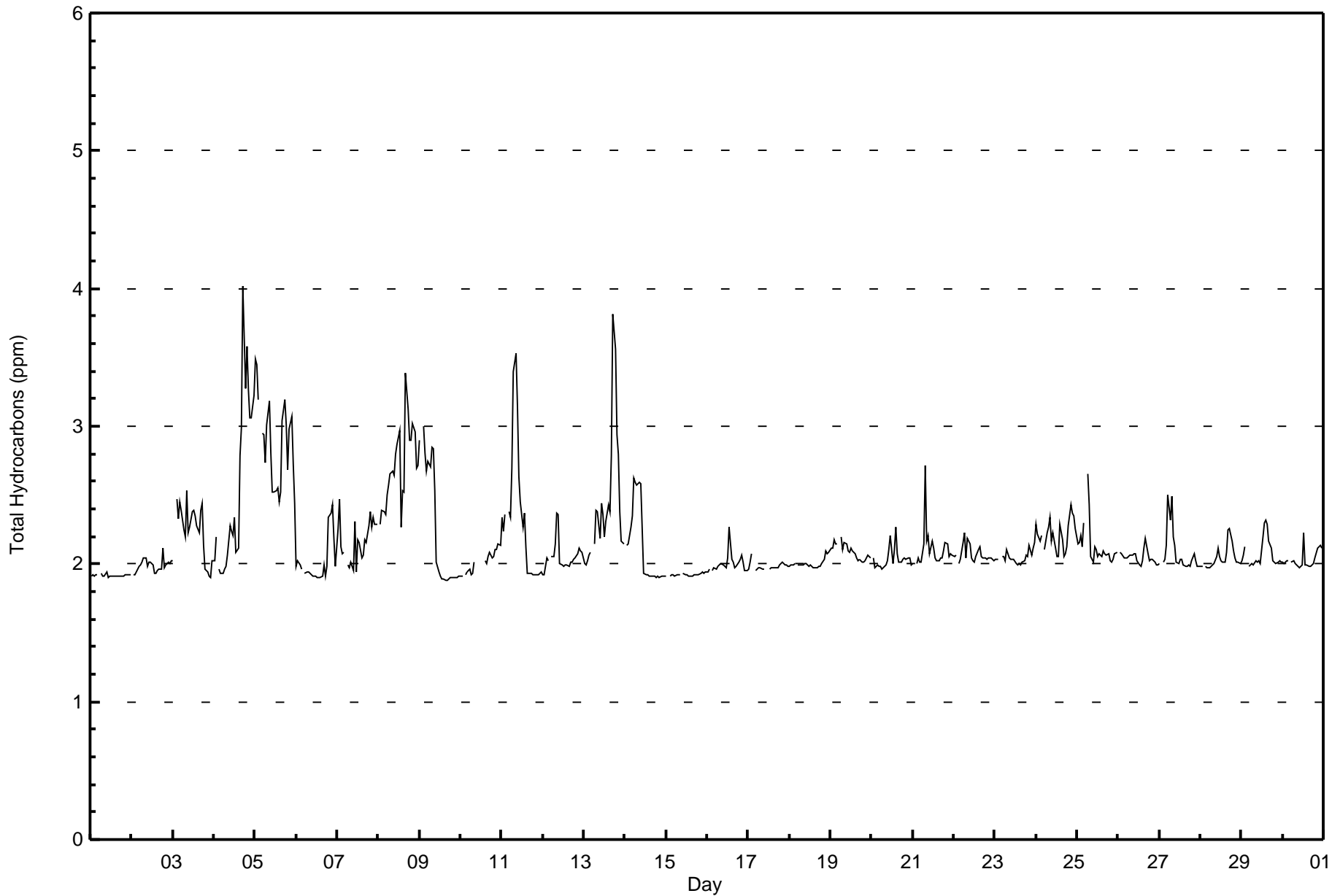






Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	375	54.99	54.99
2.1 - 3.0	287	42.08	97.07
3.1 - 10.0	20	2.93	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter - November 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	18	5	0	1	4	12	16	56	44	33	31	29	38	38	20	30	375
2.1 - 3.0	29	2	4	2	2	1	8	47	107	32	14	7	3	5	8	16	287
3.1 - 10.0	0	0	0	0	0	0	0	0	7	4	3	3	2	0	1	0	20
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	47	7	4	3	6	13	24	103	158	69	48	39	43	43	29	46	682

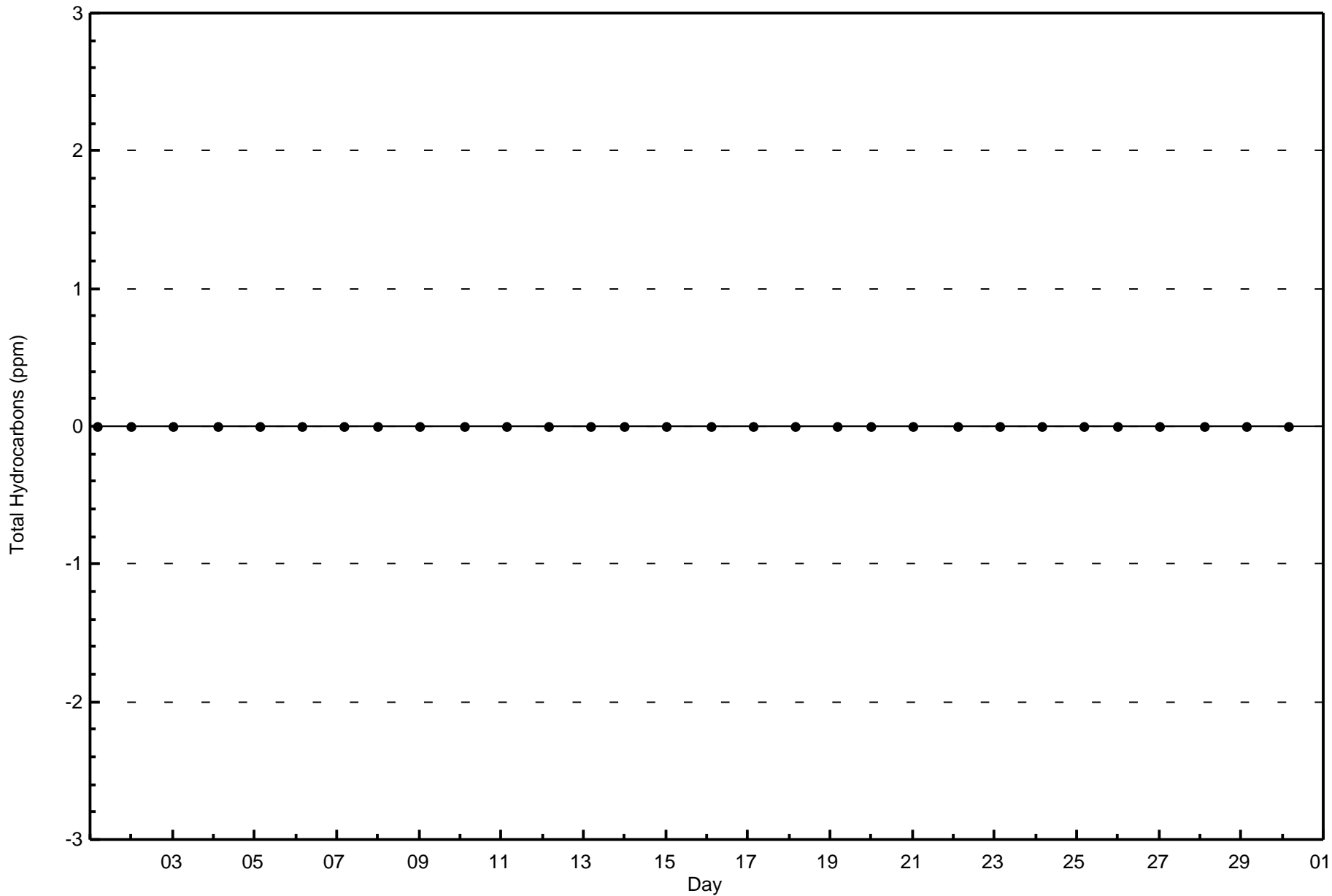
Total Number of Valid Hours: 682

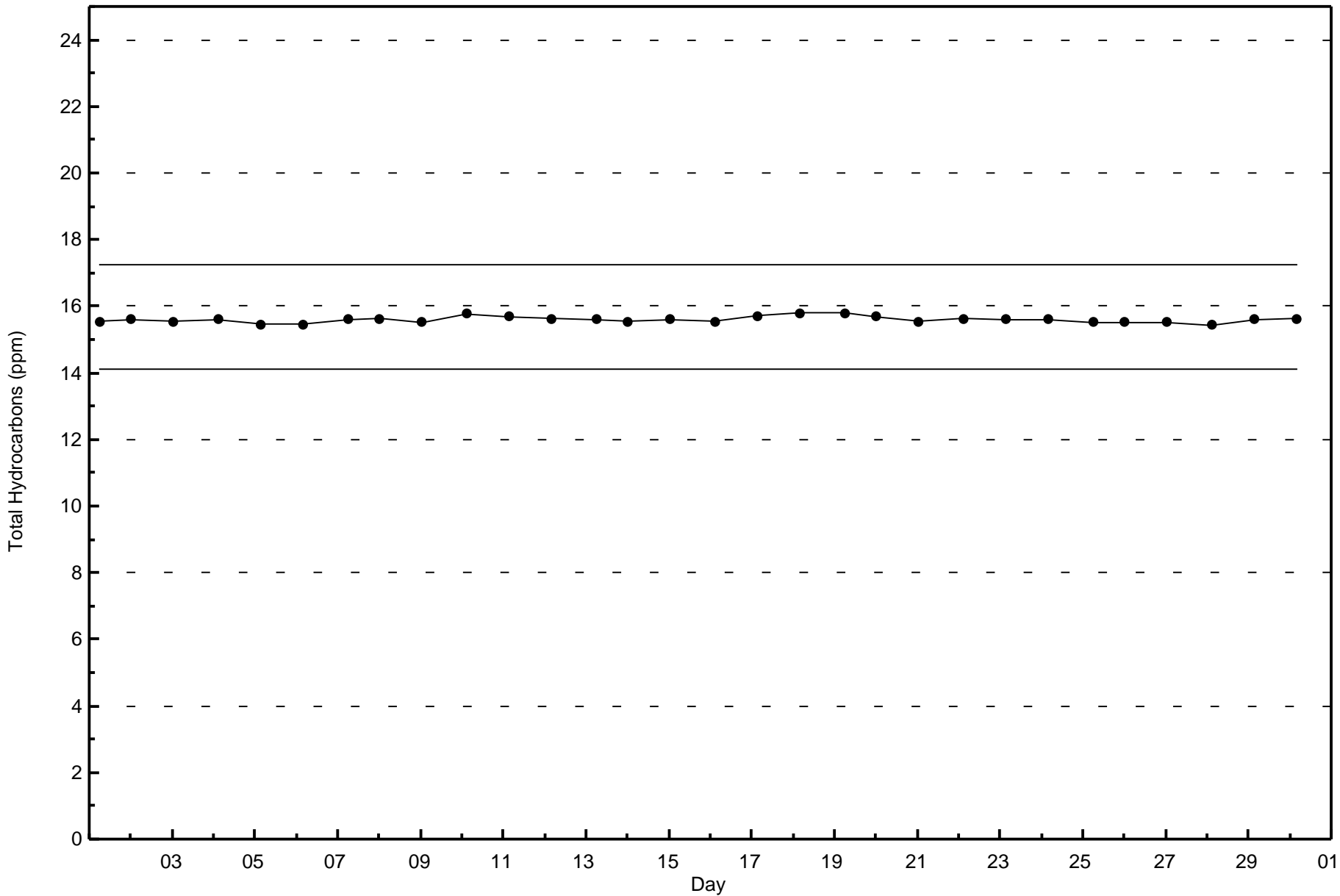
Total Number of Hours: 720



Wood Buffalo Environmental Association
Zero Responses

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

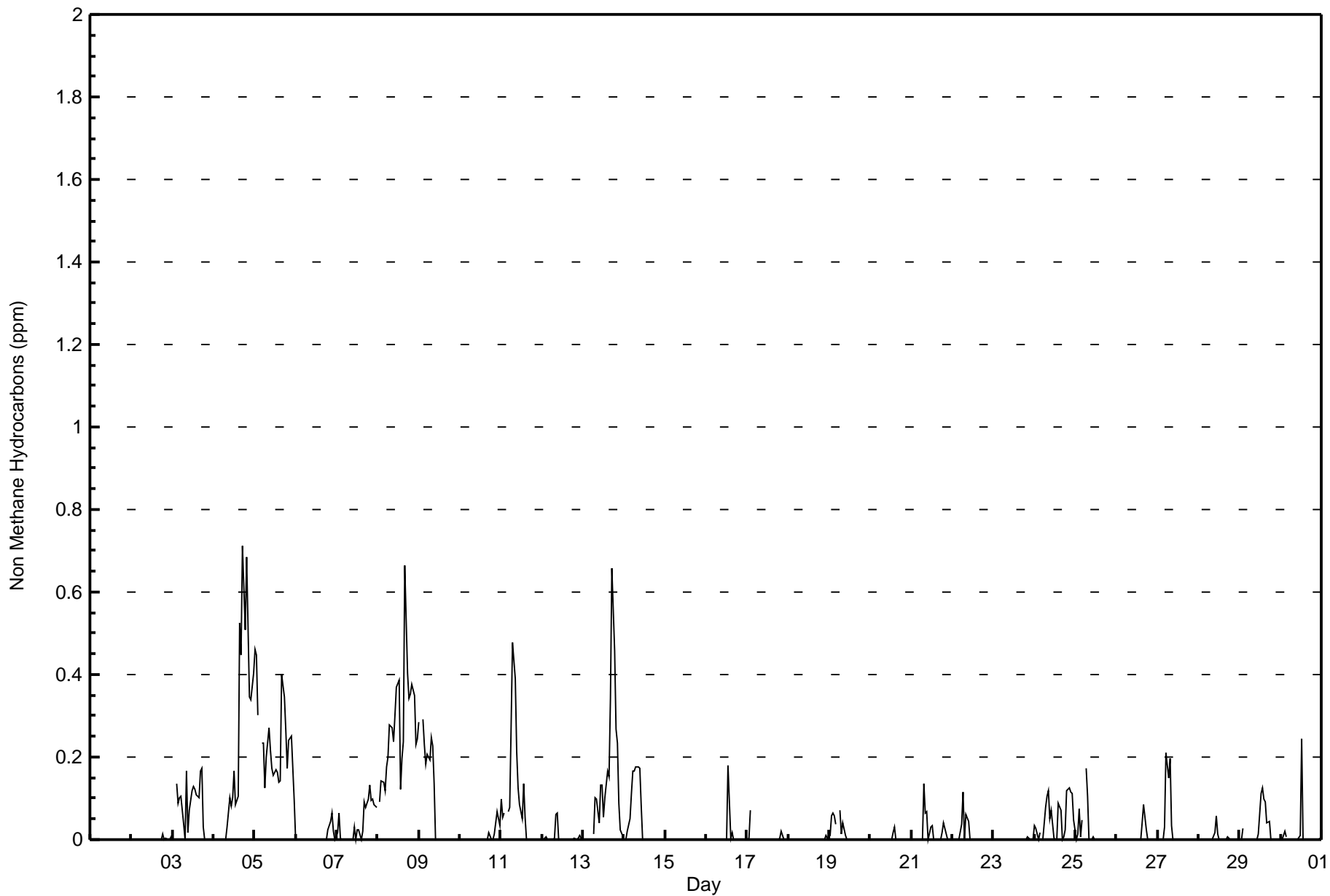






Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	451	66.13	66.13
0.006 - 0.05	68	9.97	76.10
0.06 - 0.1	84	12.32	88.42
> 0.1	79	11.58	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - November 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	30	5	0	3	5	12	18	67	65	39	34	34	38	41	20	40	451
0.006 - 0.05	12	1	2	0	0	1	3	11	20	6	4	1	3	1	2	1	68
0.06 - 0.1	3	0	2	0	0	0	2	15	33	13	3	1	0	1	6	5	84
> 0.1	2	1	0	0	1	0	1	10	40	11	7	3	2	0	1	0	79
Totals	47	7	4	3	6	13	24	103	158	69	48	39	43	43	29	46	682

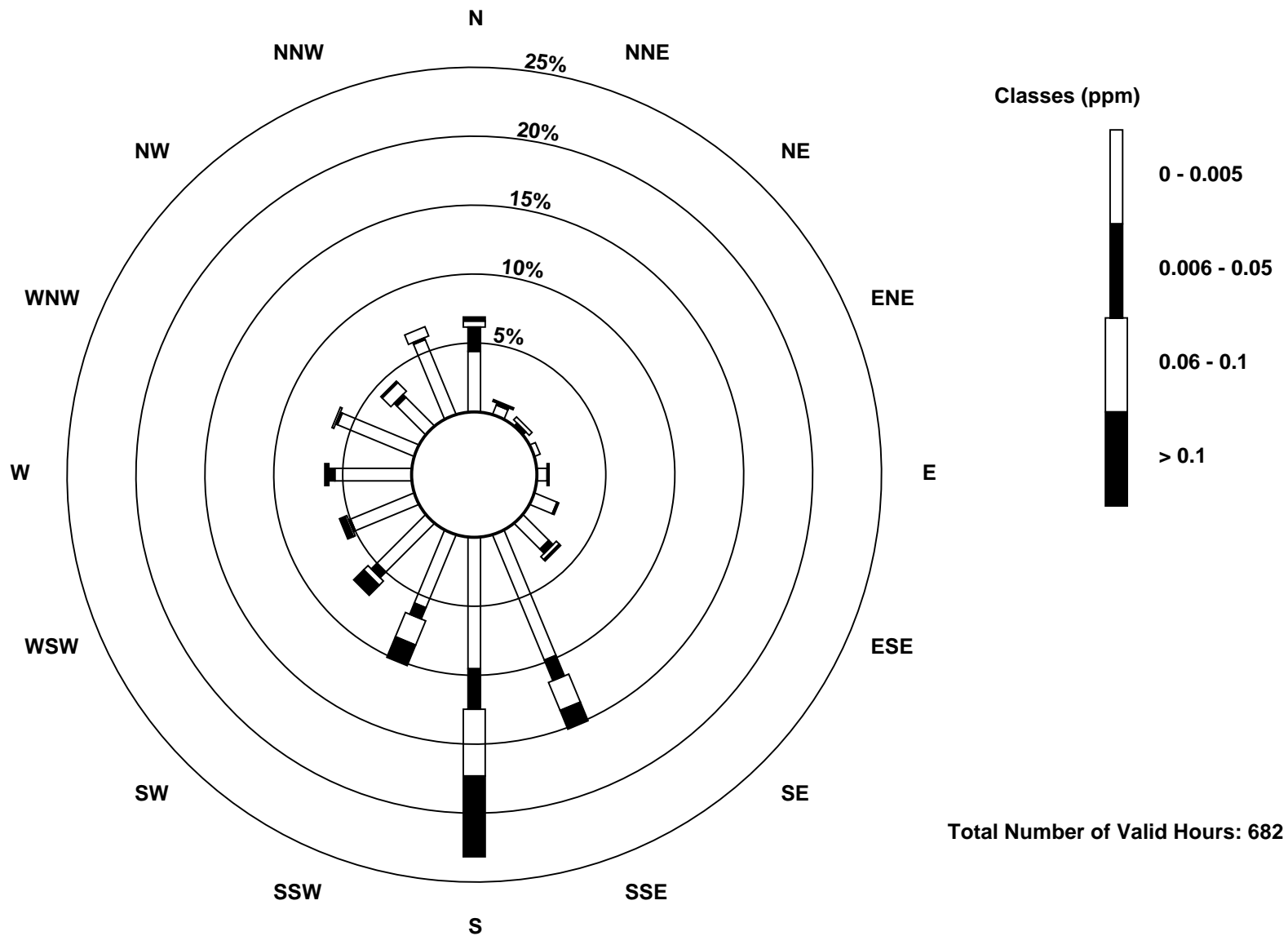
Total Number of Valid Hours: 682

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

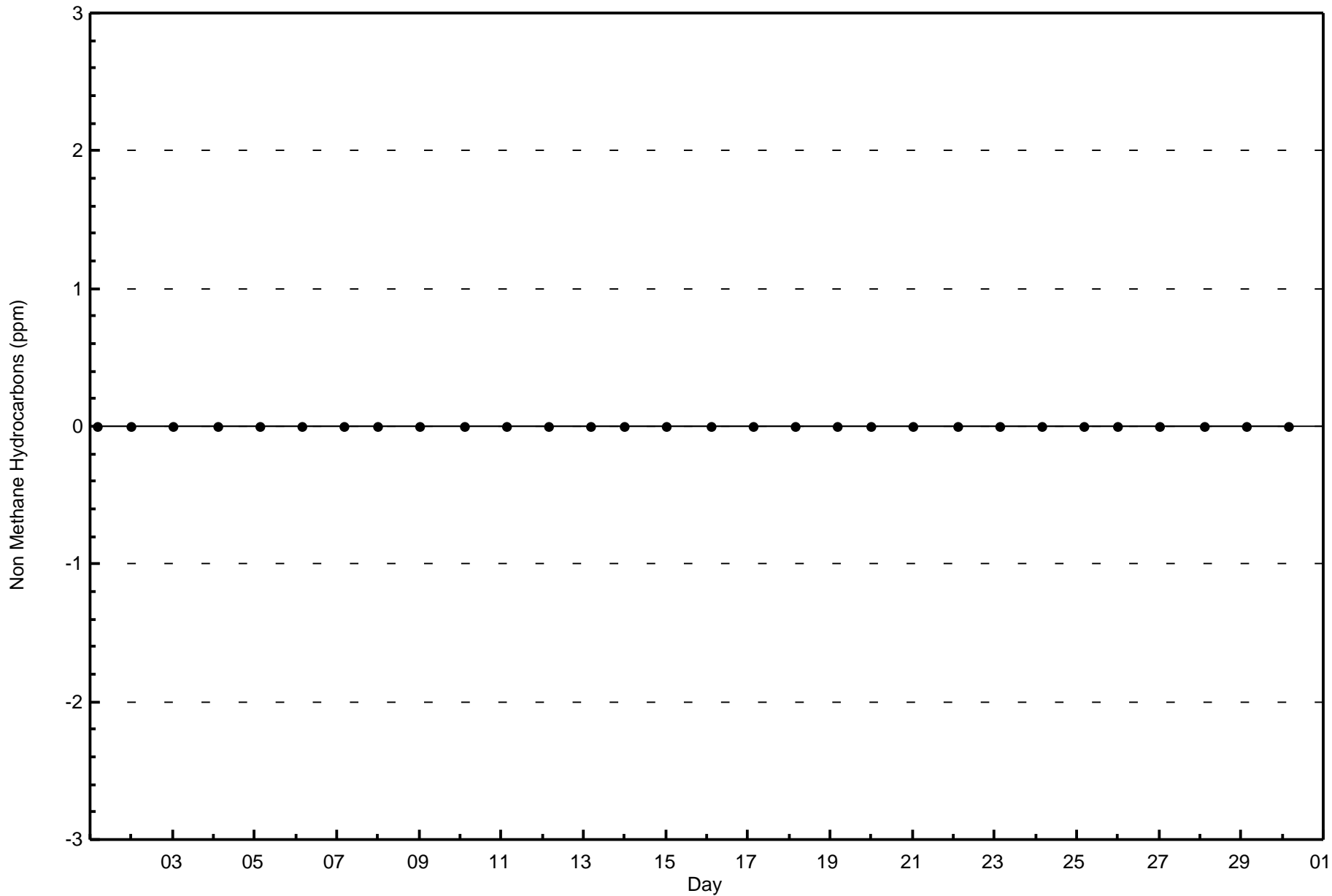
Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter (AMS 1)

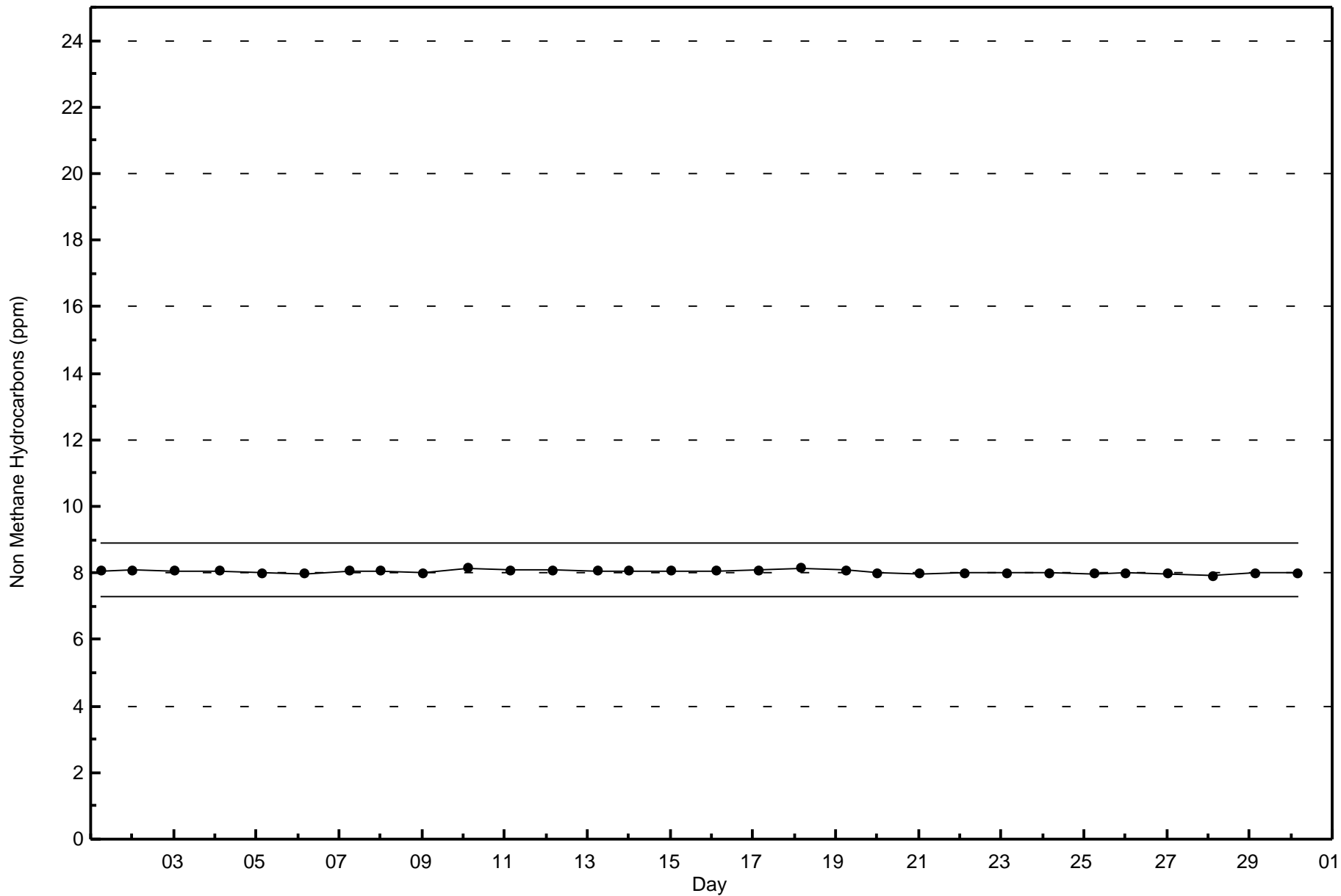




Wood Buffalo Environmental Association
Zero Responses

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

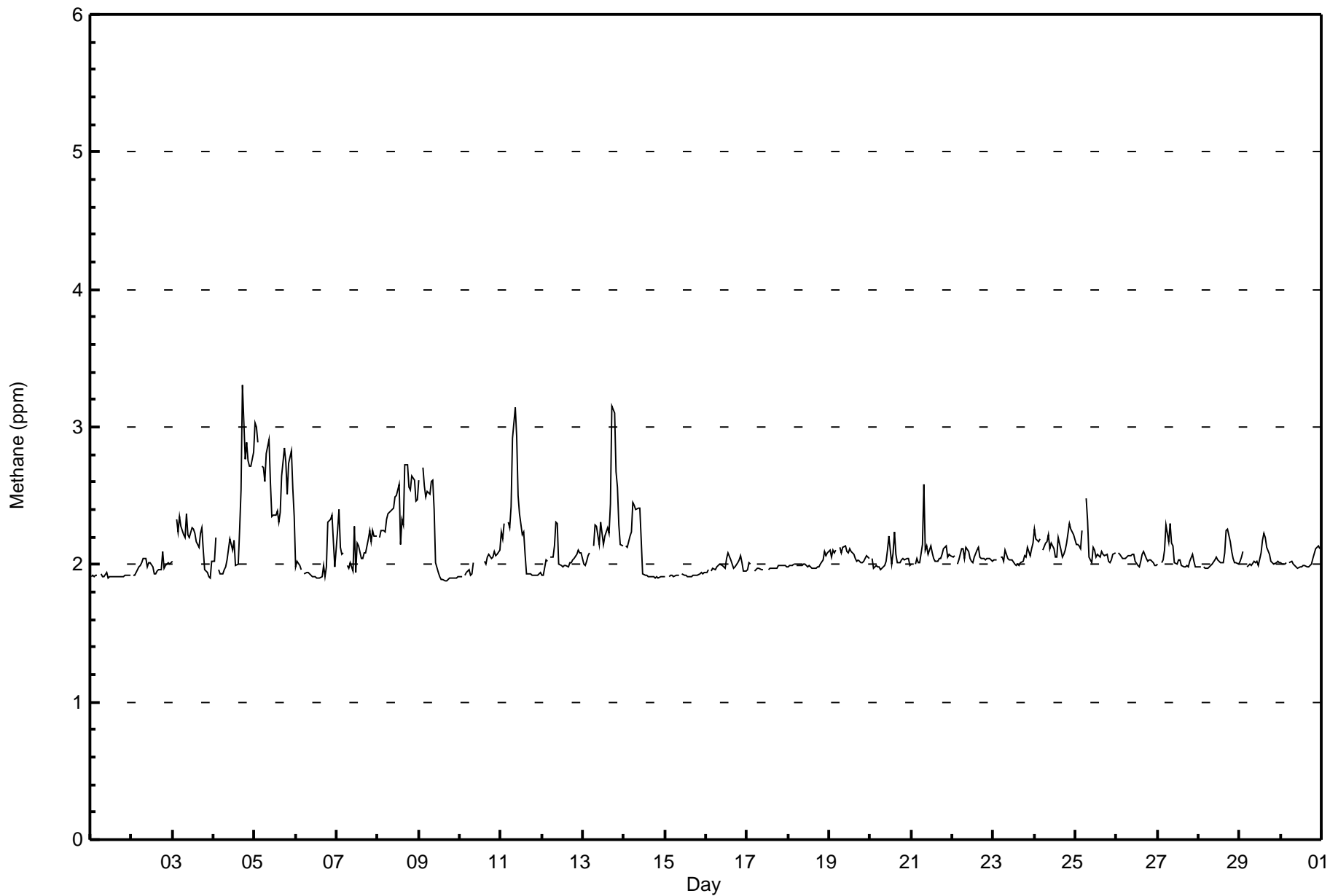






Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	385	56.45	56.45
2.1 - 3.0	293	42.96	99.41
3.1 - 10.0	4	0.59	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



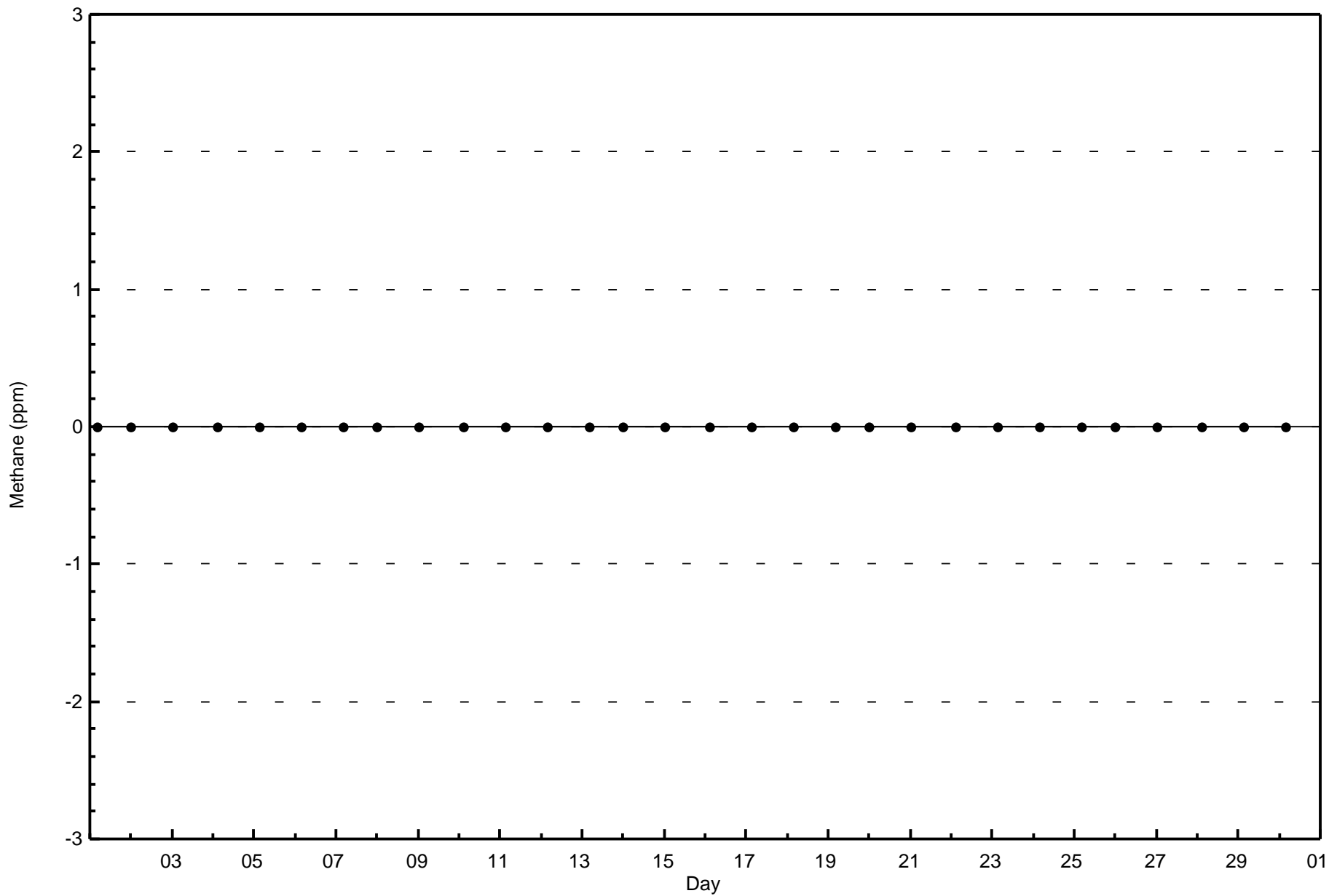
Wood Buffalo Environmental Association
Frequency Distribution

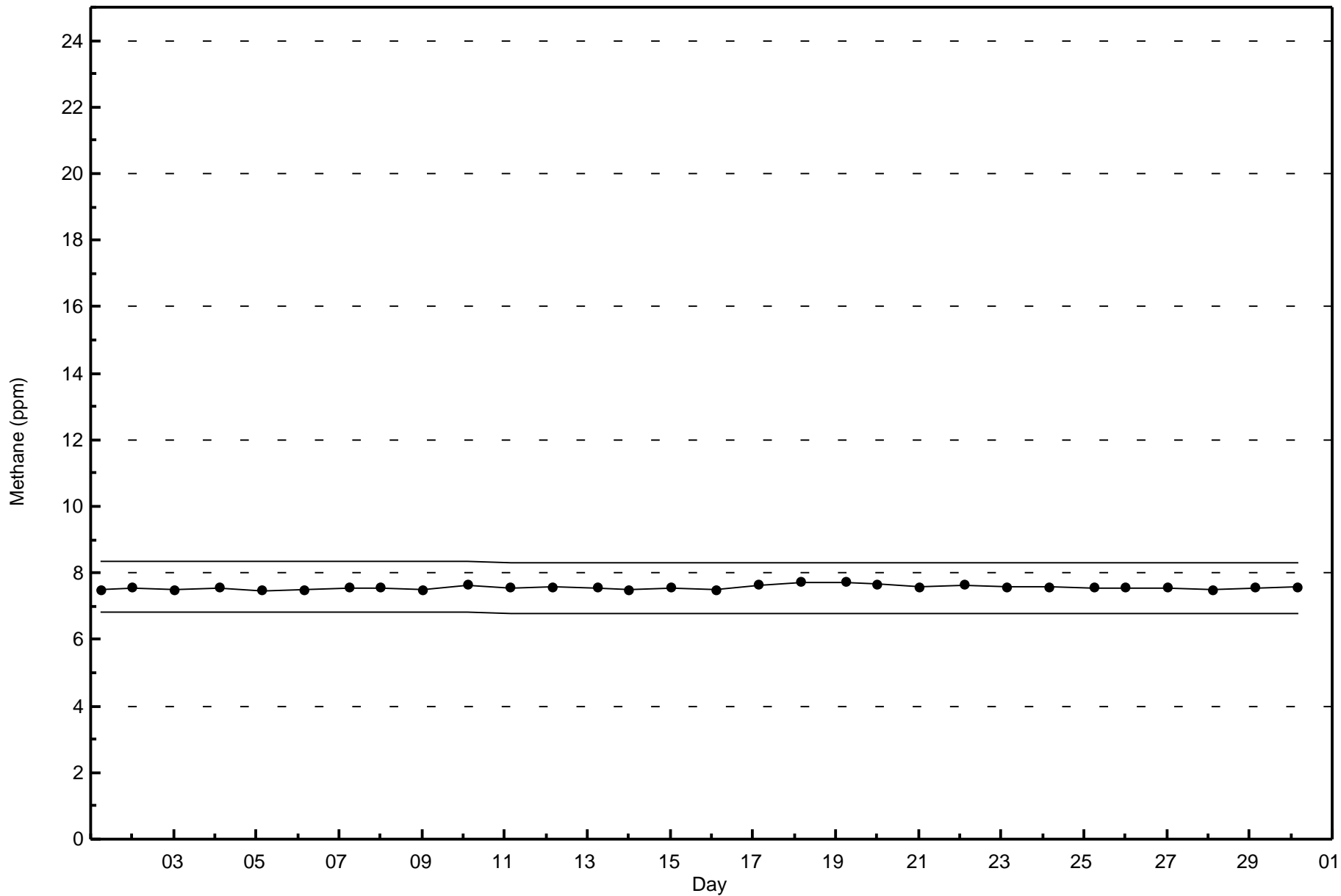
Methane (CH₄) - ppm
Fort McKay - Bertha Ganter - November 2016

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	18	5	0	1	4	12	17	58	48	33	33	29	38	38	21	30	385
2.1 - 3.0	29	2	4	2	2	1	7	45	109	33	15	10	5	5	8	16	293
3.1 - 10.0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	4
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	47	7	4	3	6	13	24	103	158	69	48	39	43	43	29	46	682

Total Number of Valid Hours: 682

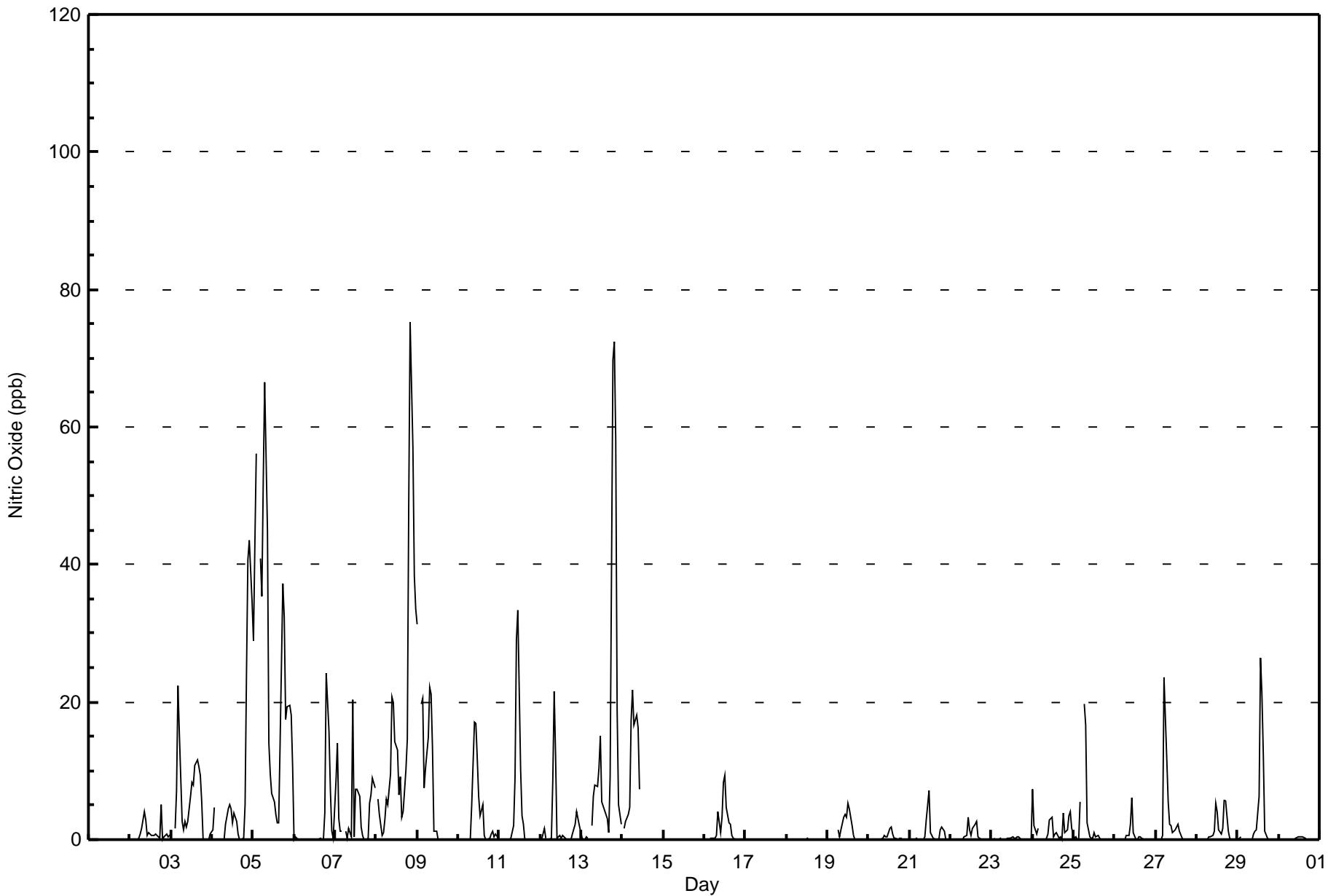
Total Number of Hours: 720







Maximum Value: 75 ppb on Nov 8 21:00																		Maximum Daily Average: 25.2 ppb on Nov 5						Hours in Service: 720		
Minimum Value: 0 ppb on Nov 1 01:00																		Minimum Daily Average: 0.0 ppb on Nov 15						Hours of Data: 683		
Maximum Diurnal Average: 6.8 ppb at hour 21																		Minimum Diurnal Average: 1.4 ppb at hour 17						Hours of Missing Data: 37		
Monthly Average: 3.8 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 3 P ₉₀ = 12 P ₉₉ = 56						Hours of Calibration: 36		
																		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-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	1	2	4	3	1	1	1	1	1	1	1	0	5	0	0	1	0	1	1.0	5
3-Nov	1	Z	2	7	22	15	3	1	3	2	3	6	8	8	11	12	11	9	6	0	0	0	0	1	5.6	22
4-Nov	2	5	Z	0	0	0	0	0	2	5	5	5	2	4	3	1	0	0	5	24	41	44	35	7.9	44	
5-Nov	29	43	56	Z	41	35	52	66	45	14	10	7	6	4	3	2	14	37	32	17	19	19	18	11	25.2	66
6-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	4	24	16	7	1	0	2.3	24
7-Nov	8	14	3	1	1	Z	1	0	2	0	20	0	7	7	6	2	1	0	0	0	5	6	9	8	4.5	20
8-Nov	Z	6	4	1	1	3	6	5	10	21	20	14	13	7	9	3	4	10	15	49	75	57	38	34	17.5	75
9-Nov	31	Z	20	21	7	10	15	22	21	13	1	1	0	0	0	0	0	0	0	0	0	0	0	0	7.1	31
10-Nov	0	0	Z	0	0	0	0	0	5	17	17	12	6	3	5	1	0	0	0	1	1	0	1	0	3.0	17
11-Nov	0	0	0	Z	0	0	0	0	2	9	29	33	10	4	2	0	0	0	0	0	0	0	0	0	3.9	33
12-Nov	0	0	2	0	Z	0	0	8	21	12	0	1	0	1	0	0	0	0	0	1	2	4	3	2	2.5	21
13-Nov	0	0	0	0	0	Z	2	6	8	8	10	15	6	5	4	3	1	9	70	72	58	19	5	2	13.2	72
14-Nov	Z	2	3	4	5	17	22	17	18	16	7	C	C	C	C	C	C	0	0	0	0	0	0	0	--	22
15-Nov	0	Z	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
16-Nov	0	0	Z	0	0	0	0	1	4	1	3	8	9	5	2	2	1	0	0	0	0	0	0	0	1.6	9
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
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	0
19-Nov	0	0	0	0	0	Z	1	0	1	3	4	3	5	5	2	1	0	0	0	0	0	0	0	0	1.1	5
20-Nov	Z	0	0	0	0	0	0	0	0	1	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0.3	2
21-Nov	0	Z	0	0	0	0	0	0	0	0	3	7	1	1	0	0	0	0	1	2	1	0	0	0	0.7	7
22-Nov	0	0	Z	0	0	0	0	0	0	1	3	1	1	2	2	3	0	0	0	0	0	0	0	0	0.6	3
23-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	0.1	0
24-Nov	7	2	1	2	Z	0	0	0	0	1	3	3	0	1	1	0	0	0	4	1	1	3	4	2	1.6	7
25-Nov	0	0	0	0	6	Z	20	17	2	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2.1	20
26-Nov	Z	0	0	0	0	0	0	1	1	2	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	6
27-Nov	0	Z	0	0	1	24	12	6	2	2	1	1	2	2	1	0	0	0	0	0	0	0	0	0	2.4	24
28-Nov	0	0	Z	0	0	0	0	0	0	1	1	5	4	1	1	2	6	6	1	0	0	0	0	0	1.2	6
29-Nov	0	0	0	Z	0	0	0	0	0	1	1	1	6	27	21	12	1	0	0	0	0	0	0	0	3.1	27
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	0.1	0
																		Diurnal Average								
																		Diurnal Maximum								
Z - zerospan																		C - Calibration						M - Maintenance		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	647	94.73	94.73
21 - 40	22	3.22	97.95
41 - 80	14	2.05	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter - 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	47	7	4	3	5	13	24	107	143	61	40	35	41	42	29	46	647
21 - 40	0	0	0	0	1	0	0	1	12	2	4	1	1	0	0	0	22
11 - 80	0	0	0	0	0	0	0	0	3	6	2	2	1	0	0	0	14
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	47	7	4	3	6	13	24	108	158	69	46	38	43	42	29	46	683

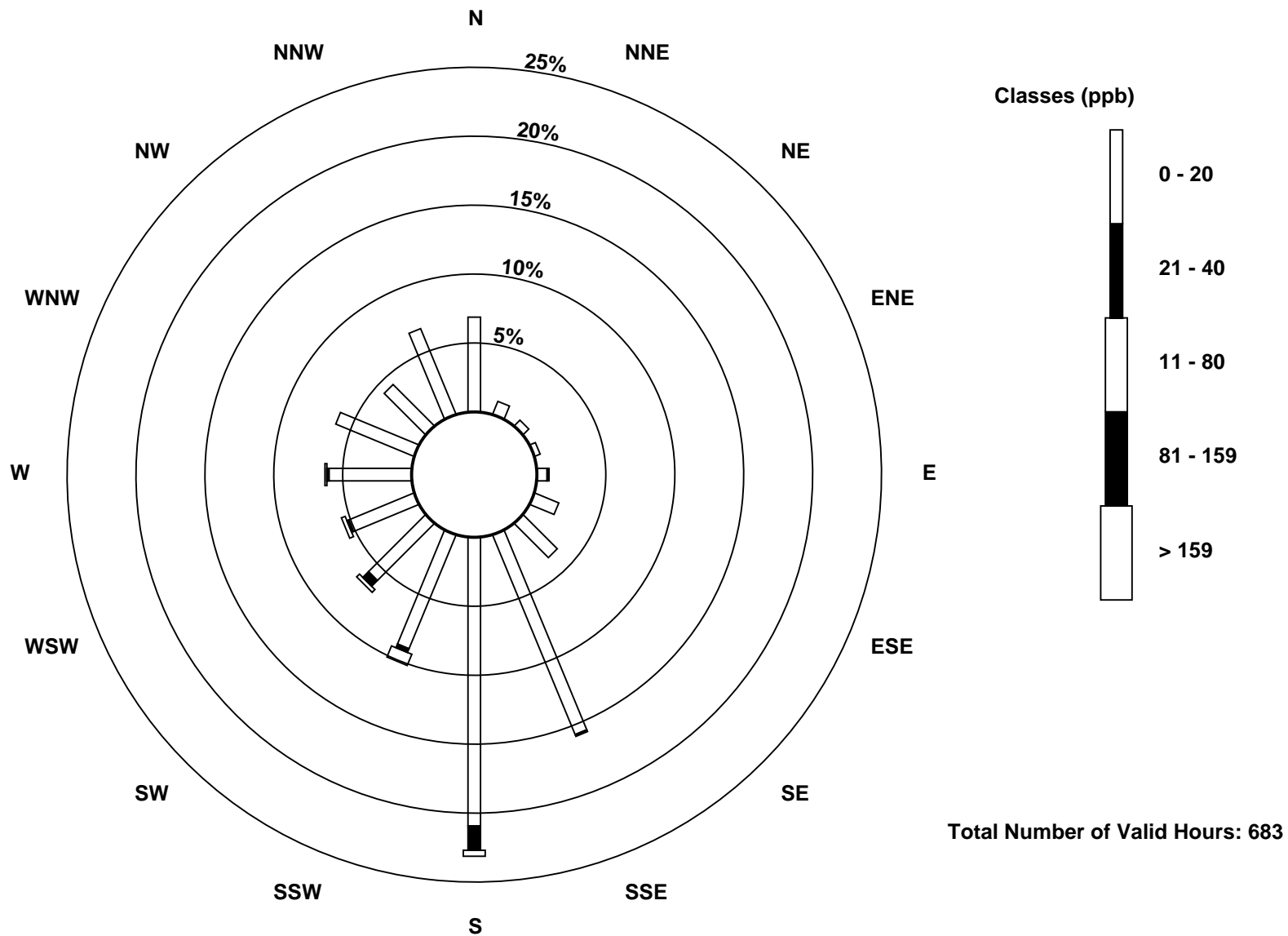
Total Number of Valid Hours: 683

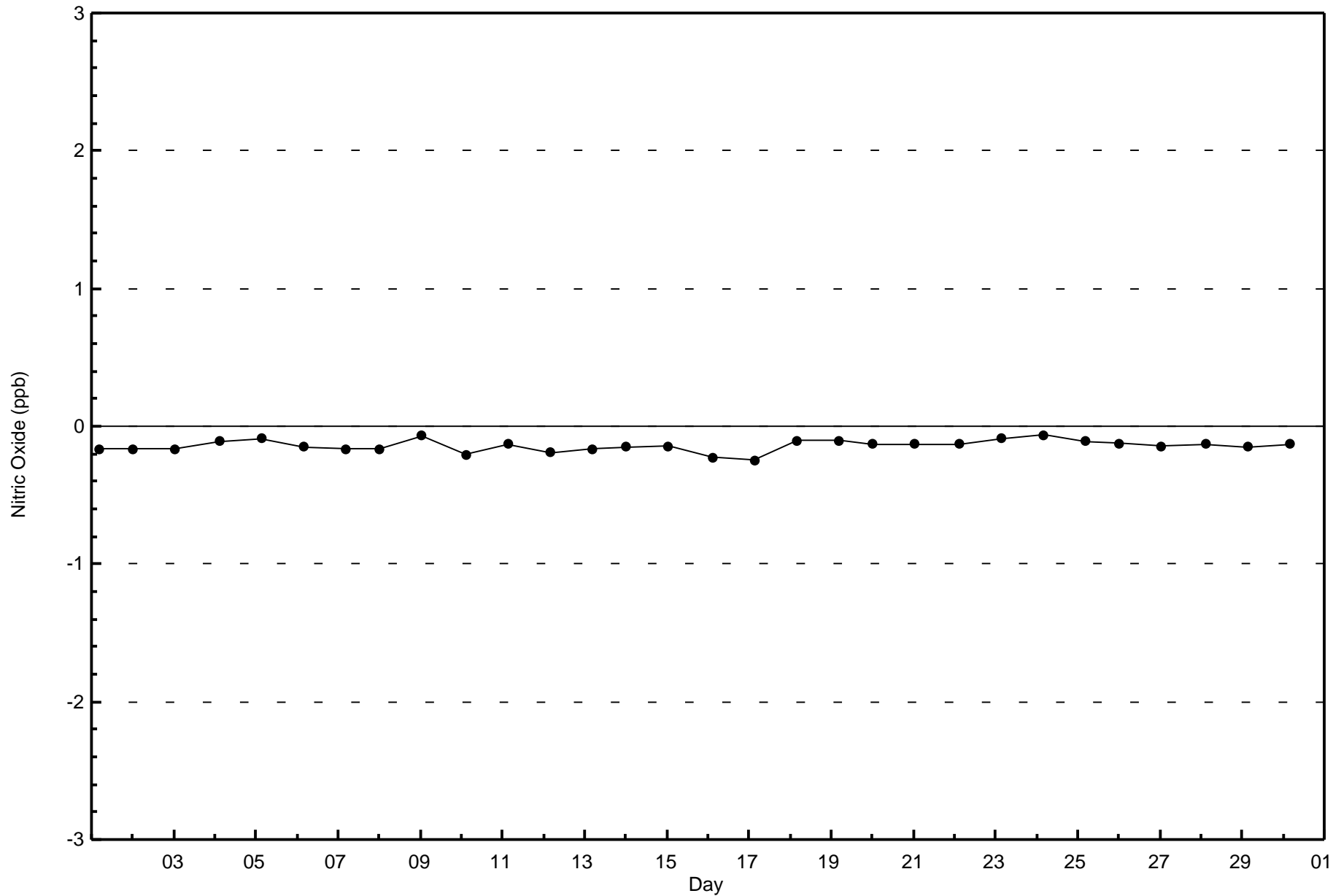
Total Number of Hours: 720

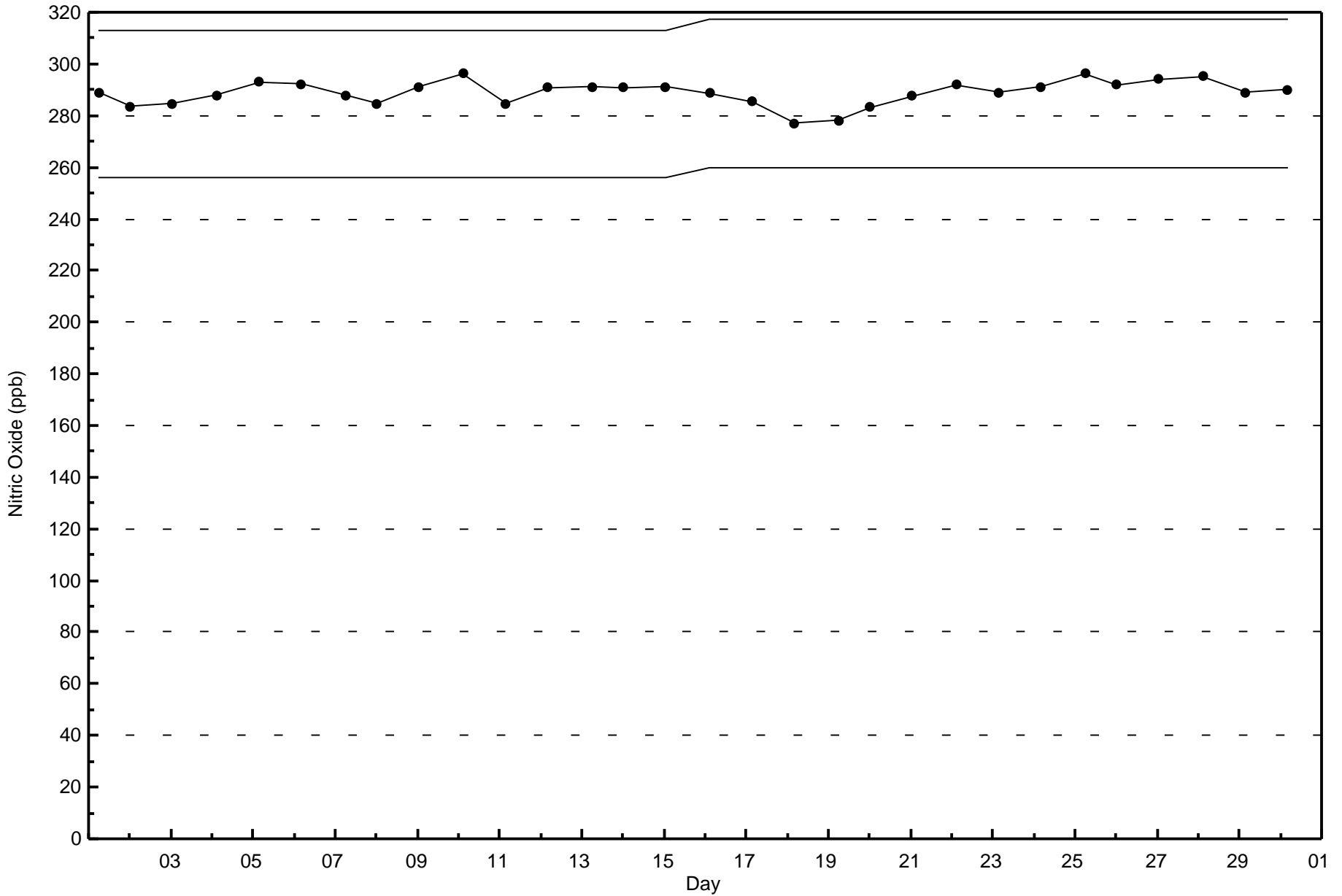


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort McKay - Bertha Ganter - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 28 ppb on Nov 4 02:00	Maximum Daily Average: 16.7 ppb on Nov 5
Minimum Value: 0 ppb on Nov 1 01:00	Hours of Data: 683
Maximum Diurnal Average: 9.1 ppb at hour 9	Hours of Missing Data: 37
Monthly Average: 7.4 ppb	Hours of Calibration: 36
Minimum Daily Average: 0.5 ppb on Nov 15	Percent Operational Time: 99.9
Minimum Diurnal Average: 5.8 ppb at hour 1	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 7 O ₃ = 11 P ₉₀ = 16 P ₉₉ = 22	

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	1	Z	1	0	1	2	0	0	0	0	0	0	0	1	0	1	1	1	0	3	0.5	3
2-Nov	Z	2	2	7	9	13	15	15	12	10	5	6	5	6	4	6	10	10	16	5	6	6	5	4	7.7	16
3-Nov	5	Z	10	13	13	10	11	12	11	9	8	7	6	6	8	11	12	15	9	1	1	1	1	17	8.6	17
4-Nov	17	28	Z	10	3	1	5	11	14	13	12	11	8	11	12	10	10	12	15	21	21	22	20	20	13.3	28
5-Nov	18	18	17	Z	15	17	18	20	18	15	13	12	12	13	13	14	18	23	20	20	20	18	19	15	16.7	23
6-Nov	3	8	6	8	Z	2	1	1	2	1	1	0	0	1	1	4	8	4	11	26	18	17	11	4	6.0	26
7-Nov	11	15	11	9	9	Z	11	8	11	2	17	2	13	14	15	12	15	18	14	15	20	14	17	14	12.4	20
8-Nov	Z	14	13	11	12	13	12	14	12	14	12	13	11	9	13	11	16	18	16	17	17	16	12	12	13.2	18
9-Nov	13	Z	11	10	9	9	9	10	10	8	3	2	0	1	1	0	0	1	0	0	0	0	0	1	4.3	13
10-Nov	0	0	Z	0	2	5	0	5	9	17	15	13	11	8	13	7	8	14	18	21	20	22	25	18	10.9	25
11-Nov	6	7	5	Z	6	4	9	11	12	16	21	19	12	9	7	2	2	3	1	1	1	1	1	1	6.8	21
12-Nov	0	0	14	14	Z	9	12	21	26	20	4	4	2	5	5	3	3	2	4	10	12	12	11	7	8.6	26
13-Nov	4	3	7	8	7	Z	9	11	11	9	13	17	12	10	8	10	13	16	20	18	13	9	7	8	10.6	20
14-Nov	Z	4	4	4	5	7	13	12	12	12	7	C	C	C	C	C	C	0	0	0	0	0	0	0	--	13
15-Nov	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	2	1	0	1	1	0	2	2	0.5	2
16-Nov	1	2	Z	4	6	5	6	5	7	3	4	8	11	12	13	11	10	10	7	8	9	6	0	0	6.3	13
17-Nov	1	4	5	Z	0	1	2	1	0	0	0	0	0	0	0	0	0	0	2	3	3	2	2	0	1.2	5
18-Nov	0	0	0	0	Z	0	1	1	1	1	1	1	2	1	0	0	1	3	2	1	4	13	13	9	2.3	13
19-Nov	7	12	13	13	20	Z	24	19	19	18	16	16	17	16	14	11	8	11	10	8	8	9	11	9	13.3	24
20-Nov	Z	7	1	1	2	7	4	7	8	6	3	2	6	9	7	7	10	8	10	11	14	11	6	4	6.6	14
21-Nov	2	Z	6	10	8	7	3	5	7	5	9	12	4	3	2	2	2	2	13	16	14	7	12	12	7.0	16
22-Nov	11	11	Z	2	3	6	9	7	8	7	11	6	3	7	11	14	10	5	3	5	4	2	5	4	6.7	14
23-Nov	7	8	10	Z	10	10	3	3	4	4	4	3	4	4	3	7	12	13	5	4	3	2	6	10	5.9	13
24-Nov	18	15	16	16	Z	5	7	9	8	7	4	8	7	4	7	8	8	6	6	13	11	11	11	10	9.5	18
25-Nov	7	8	6	4	9	Z	15	16	13	8	5	6	7	8	7	8	9	7	6	3	1	1	1	2	6.8	16
26-Nov	Z	2	2	2	1	2	2	3	4	5	7	3	1	1	5	11	14	10	4	3	3	2	1	2	3.9	14
27-Nov	3	Z	3	5	15	22	21	21	19	15	8	8	9	9	6	6	5	6	6	7	7	7	4	3	9.2	22
28-Nov	2	3	Z	3	3	1	1	6	6	5	4	9	7	4	6	10	16	16	13	9	6	5	5	3	6.0	16
29-Nov	3	6	8	Z	1	0	1	5	6	7	5	6	13	20	19	21	14	7	8	4	1	4	4	3	7.2	21
30-Nov	5	3	5	5	Z	4	5	4	3	2	3	4	4	4	5	5	5	3	3	4	4	4	3	3	4.0	5

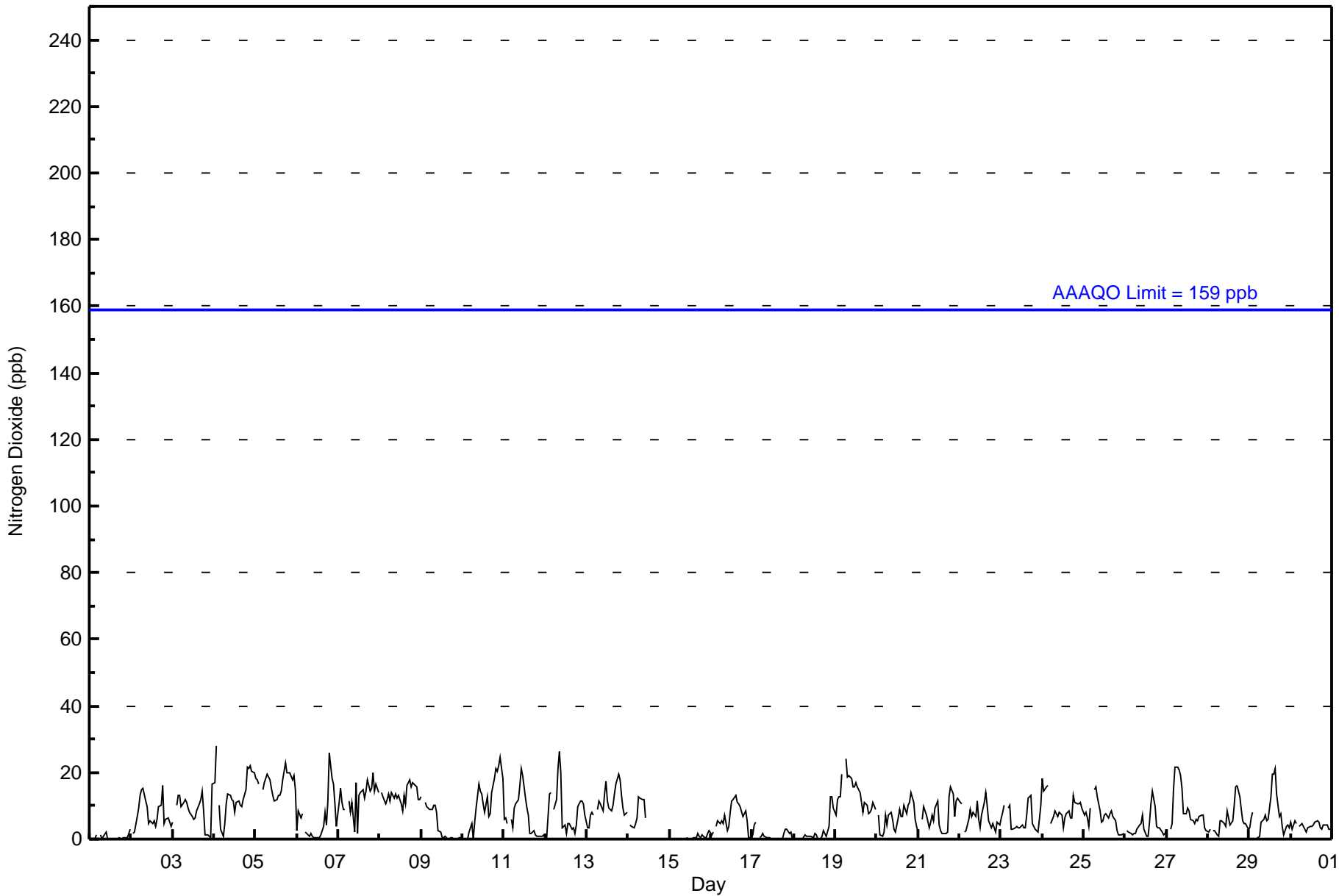
5.8	7.2	7.0	6.2	6.7	6.4	7.7	8.8	9.1	8.3	7.3	6.7	6.3	6.7	7.1	7.3	8.2	8.1	8.2	8.4	8.0	7.4	7.1	6.6	Diurnal Average	
18	28	17	16	20	22	24	21	26	20	21	19	17	20	19	21	18	23	20	26	21	22	25	20	Diurnal Maximum	

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
Fort McKay - Bertha Ganter - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	666	97.51	97.51
21 - 40	17	2.49	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - 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	45	7	3	3	5	13	24	105	155	66	46	37	41	42	28	46	666
21 - 40	2	0	1	0	1	0	0	3	3	3	0	1	2	0	1	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	47	7	4	3	6	13	24	108	158	69	46	38	43	42	29	46	683

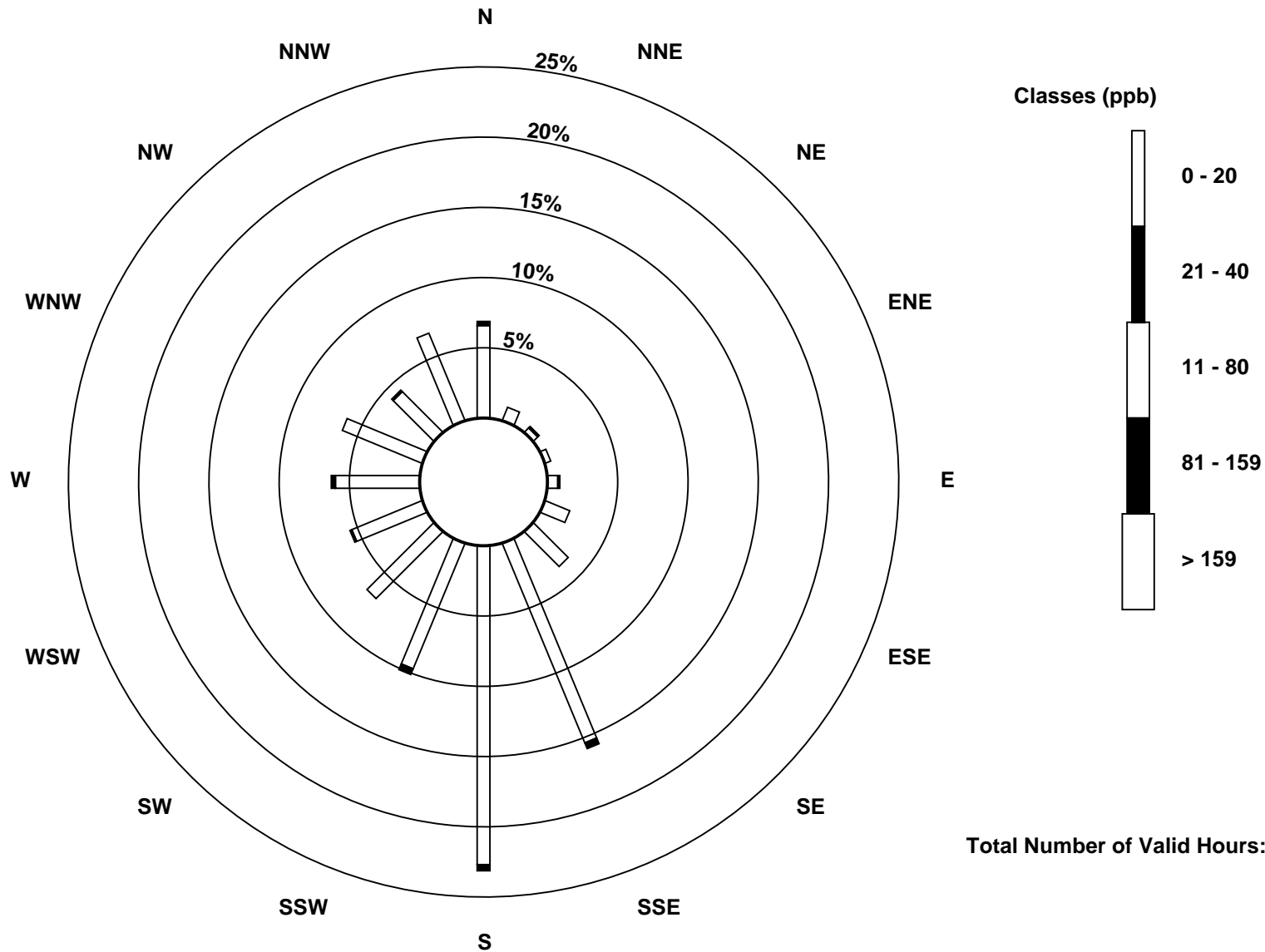
Total Number of Valid Hours: 683

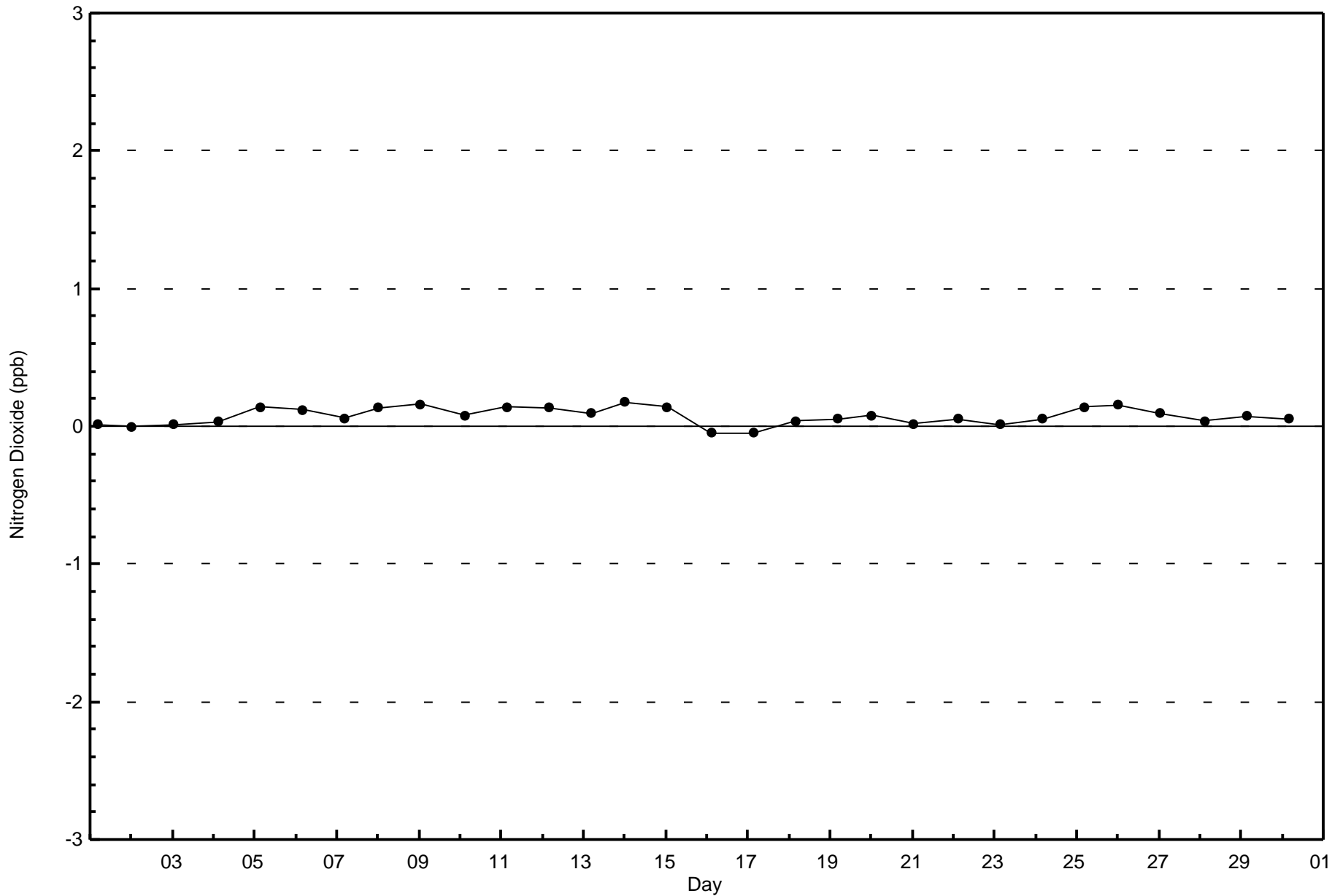
Total Number of Hours: 720

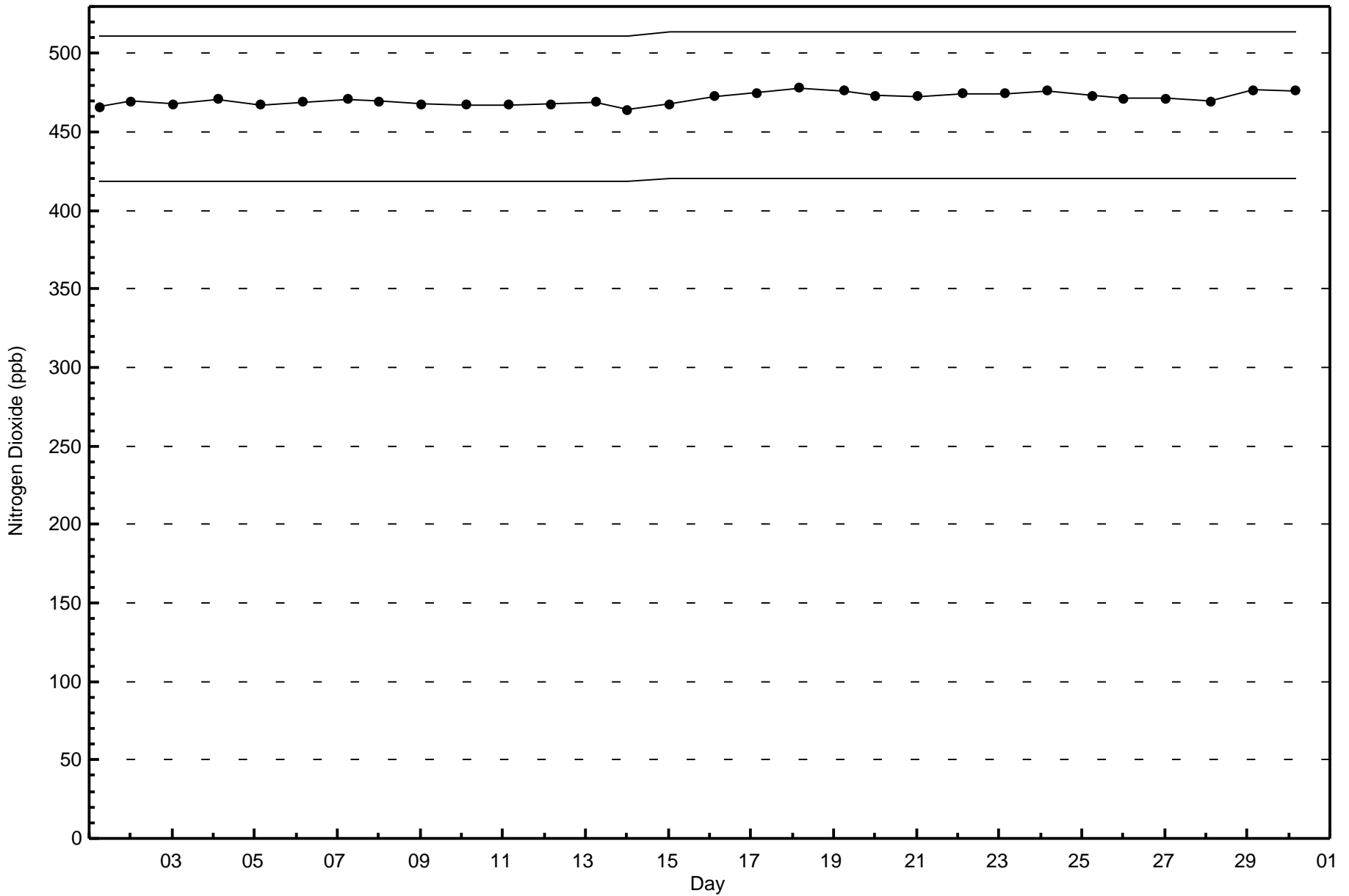


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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







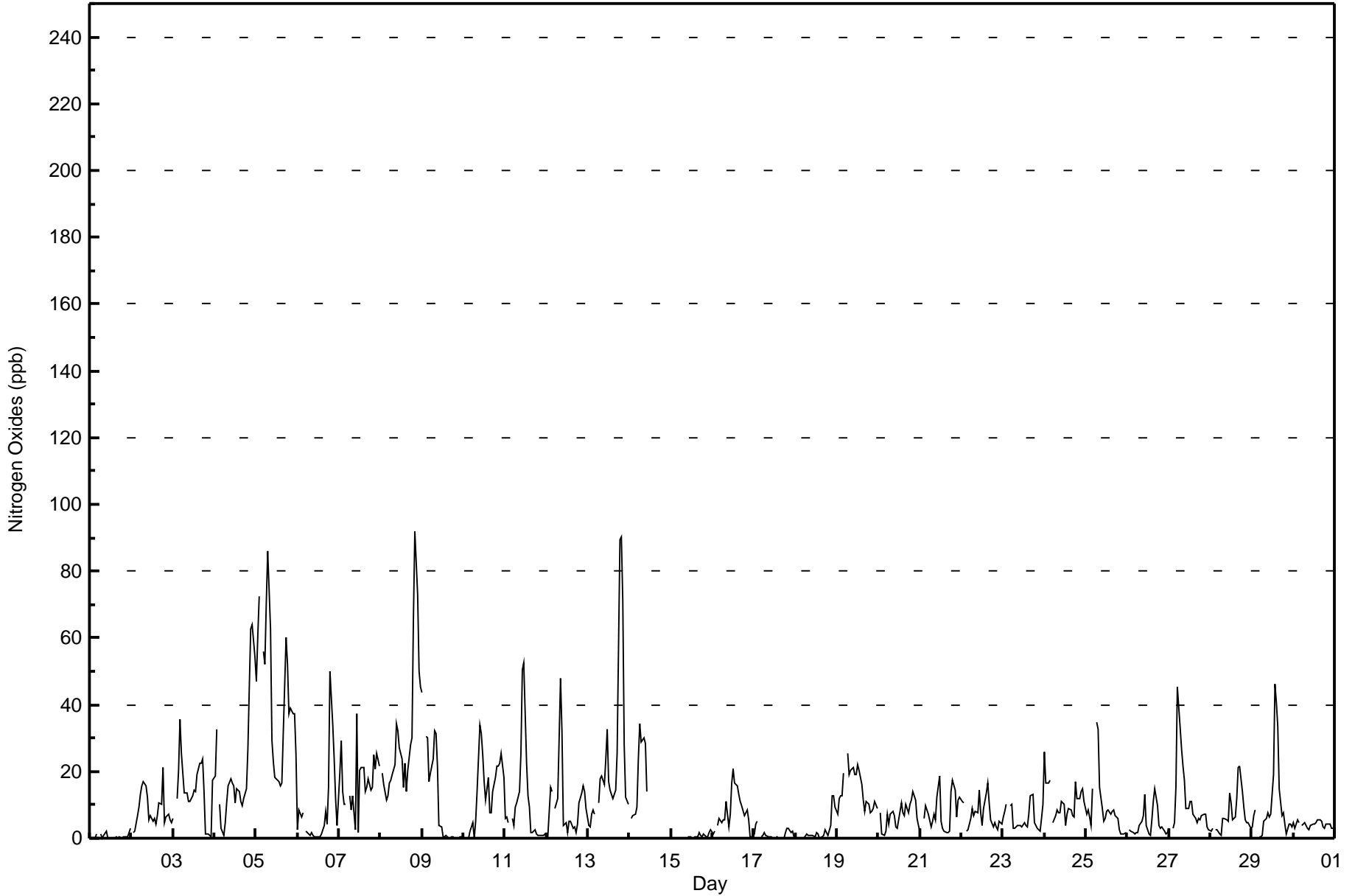


Maximum Value: 92 ppb on Nov 8 21:00																		Maximum Daily Average: 41.9 ppb on Nov 5						Hours in Service: 720			
Minimum Value: 0 ppb on Nov 1 17:00																		Minimum Daily Average: 0.5 ppb on Nov 15						Hours of Data: 683			
Maximum Diurnal Average: 14.8 ppb at hour 21																		Minimum Diurnal Average: 7.6 ppb at hour 4						Hours of Missing Data: 37			
Monthly Average: 11.2 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 7 O ₃ = 15 P ₉₀ = 26 P ₉₉ = 71						Hours of Calibration: 36			
																								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-Nov	0	0	0	0	1	Z	1	0	1	2	0	0	0	0	0	0	0	1	0	1	1	1	0	3	0.5	3	
2-Nov	Z	2	2	7	9	13	16	17	16	12	5	7	5	6	4	7	10	10	21	5	6	7	5	5	8.6	21	
3-Nov	6	Z	12	20	36	25	14	13	14	11	11	13	14	14	19	22	22	24	14	1	1	1	1	17	14.2	36	
4-Nov	19	33	Z	10	3	1	5	11	16	18	17	16	11	15	14	11	10	12	15	27	45	63	64	54	21.2	64	
5-Nov	47	60	73	Z	56	52	70	86	63	29	23	18	17	17	16	17	32	60	52	37	39	37	37	25	41.9	86	
6-Nov	3	9	6	7	Z	2	1	1	2	1	1	0	0	1	1	4	8	4	15	50	34	24	12	4	8.3	50	
7-Nov	19	29	14	10	10	Z	13	8	13	3	37	2	20	21	21	14	15	18	14	15	25	21	26	21	17.0	37	
8-Nov	Z	20	16	11	13	17	17	19	22	34	32	27	24	15	22	14	20	28	30	66	92	73	50	45	30.8	92	
9-Nov	44	Z	31	30	17	19	24	32	31	21	4	3	0	1	1	0	0	0	0	0	0	0	0	1	11.3	44	
10-Nov	0	0	Z	0	2	5	0	5	14	34	31	25	17	12	18	7	8	14	18	22	21	22	25	18	13.9	34	
11-Nov	6	6	5	Z	6	4	9	11	14	25	50	53	23	13	10	2	2	3	1	1	1	1	1	1	10.7	53	
12-Nov	0	0	15	14	Z	9	12	30	48	32	4	5	2	5	5	3	3	2	4	11	14	15	14	9	11.1	48	
13-Nov	4	3	7	8	7	Z	11	18	19	16	24	33	17	14	12	13	15	26	90	90	71	28	12	10	23.8	90	
14-Nov	Z	6	7	7	9	24	34	29	30	28	14	C	C	C	C	C	C	0	0	0	0	0	0	0	--	34	
15-Nov	0	Z	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	2	1	0	1	1	0	2	2	0.5	2
16-Nov	1	2	Z	4	6	5	6	5	11	3	7	16	21	17	16	13	11	10	7	7	9	6	0	0	7.9	21	
17-Nov	1	4	5	Z	0	1	2	1	0	0	0	0	0	0	0	0	0	0	2	3	3	2	2	0	1.2	5	
18-Nov	0	0	0	0	Z	0	1	1	1	1	1	1	2	1	0	0	1	3	2	1	4	13	13	9	2.3	13	
19-Nov	7	12	13	13	19	Z	26	19	21	21	19	19	22	20	16	12	8	11	10	8	8	9	11	9	14.5	26	
20-Nov	Z	7	1	1	2	7	4	7	8	7	3	3	8	11	8	7	10	8	10	11	14	11	6	4	6.9	14	
21-Nov	2	Z	6	10	9	7	3	5	7	6	12	19	5	3	2	2	2	2	14	17	15	7	12	12	7.7	19	
22-Nov	11	11	Z	2	3	6	9	7	8	7	15	7	4	9	13	17	11	5	3	4	3	2	5	4	7.3	17	
23-Nov	7	8	10	Z	10	10	3	3	4	4	4	3	5	4	3	7	13	13	5	4	3	2	6	10	6.1	13	
24-Nov	26	17	16	18	Z	5	7	9	8	8	11	10	4	7	9	9	7	6	17	12	12	14	15	11	11.1	26	
25-Nov	7	9	6	4	15	Z	35	32	15	9	5	6	8	8	7	8	9	7	6	3	1	1	1	2	8.9	35	
26-Nov	Z	2	2	2	1	2	2	4	5	7	13	4	1	1	5	11	15	10	4	3	3	2	1	2	4.4	15	
27-Nov	3	Z	3	5	15	45	33	27	21	17	9	9	11	11	7	6	5	6	6	7	7	7	3	3	11.6	45	
28-Nov	2	3	Z	3	2	1	1	6	6	5	5	14	11	6	6	12	21	22	14	9	5	5	5	3	7.3	22	
29-Nov	3	7	8	Z	1	0	1	5	6	8	7	7	19	46	40	33	15	7	8	4	1	4	4	3	10.4	46	
30-Nov	5	3	5	5	Z	4	5	4	3	2	4	4	4	5	5	5	5	3	3	4	4	4	3	3	4.1	5	
																		Diurnal Average									
																		Diurnal Maximum									
Z - zerospan																		C - Calibration						M - Maintenance			



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	579	84.77	84.77
21 - 40	75	10.98	95.75
41 - 80	25	3.66	99.41
81 - 159	4	0.59	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - 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	40	7	3	3	5	12	22	89	121	55	38	34	40	40	27	43	579
21 - 40	7	0	1	0	0	1	2	18	27	7	3	1	1	2	2	3	75
11 - 80	0	0	0	0	1	0	0	1	9	5	4	3	2	0	0	0	25
81 - 159	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	4
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	47	7	4	3	6	13	24	108	158	69	46	38	43	42	29	46	683

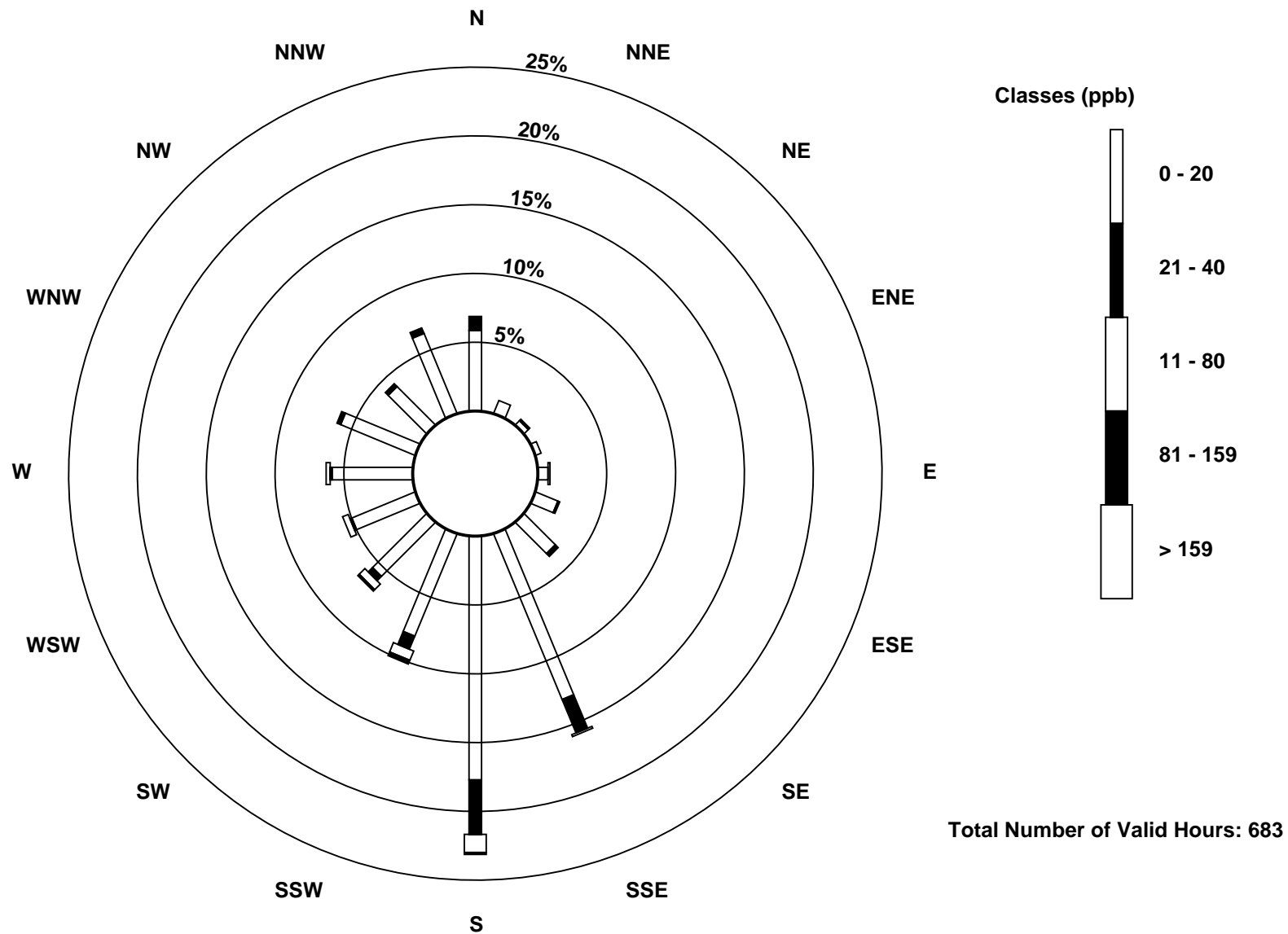
Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

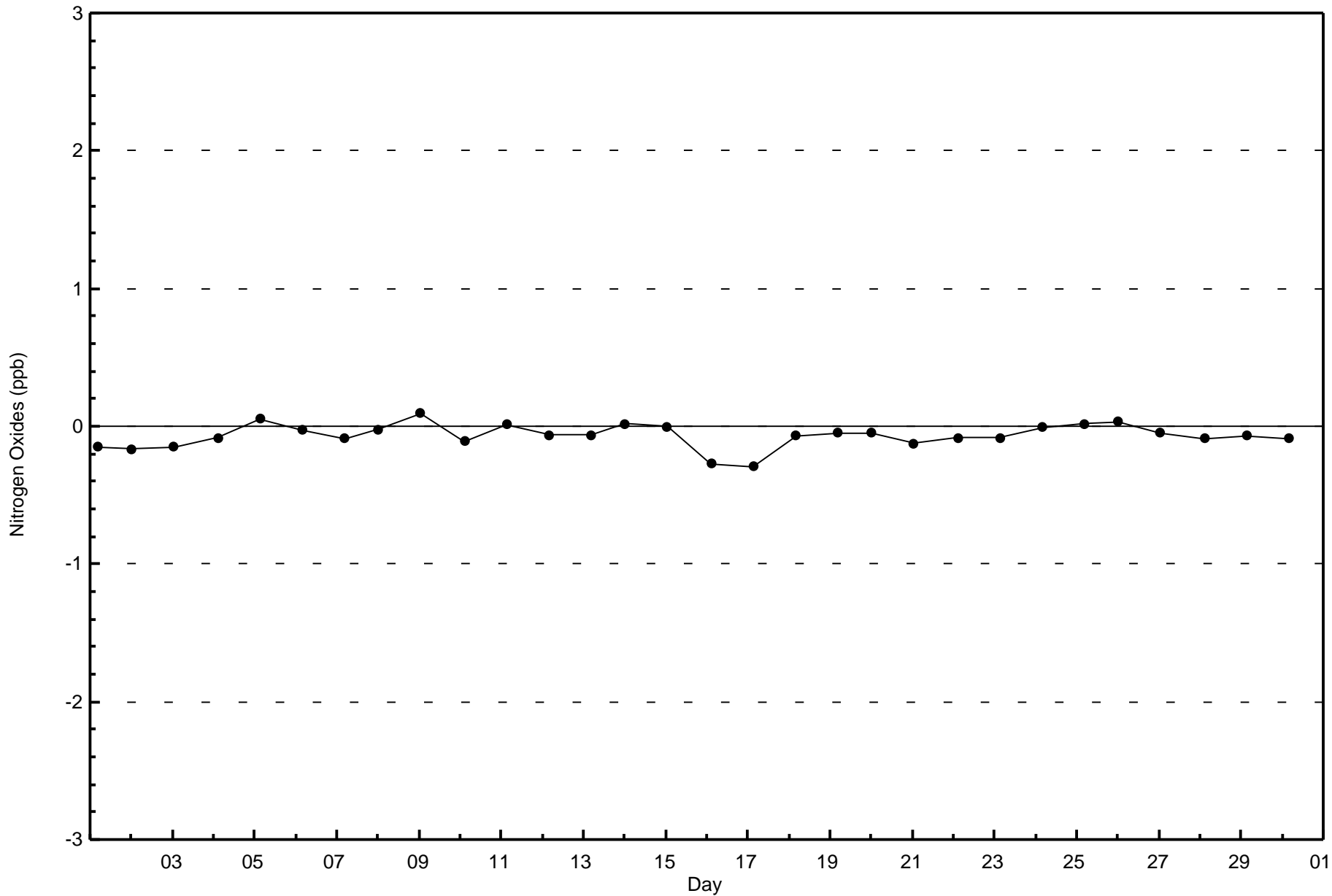
Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter (AMS 1)

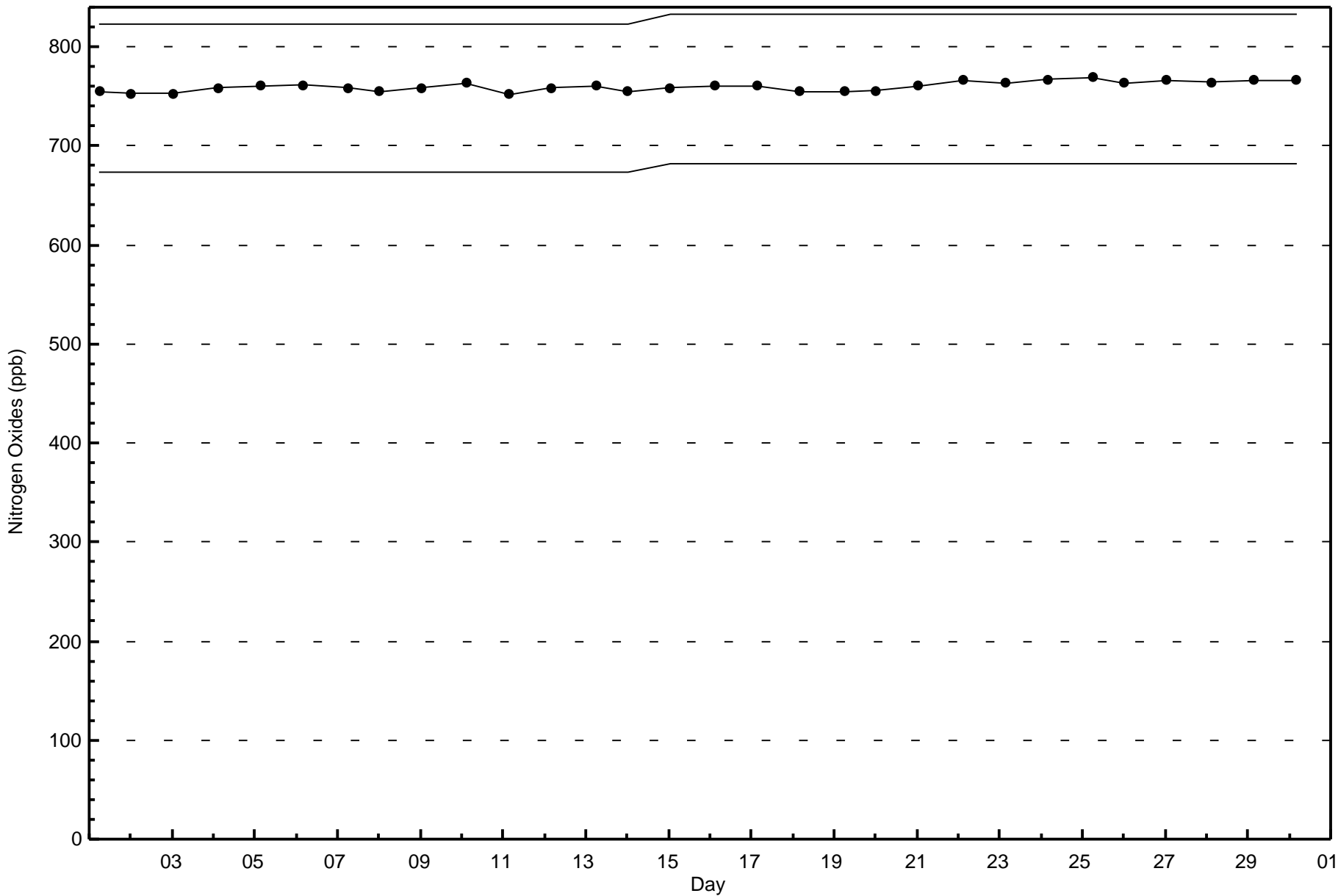




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - November 201







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

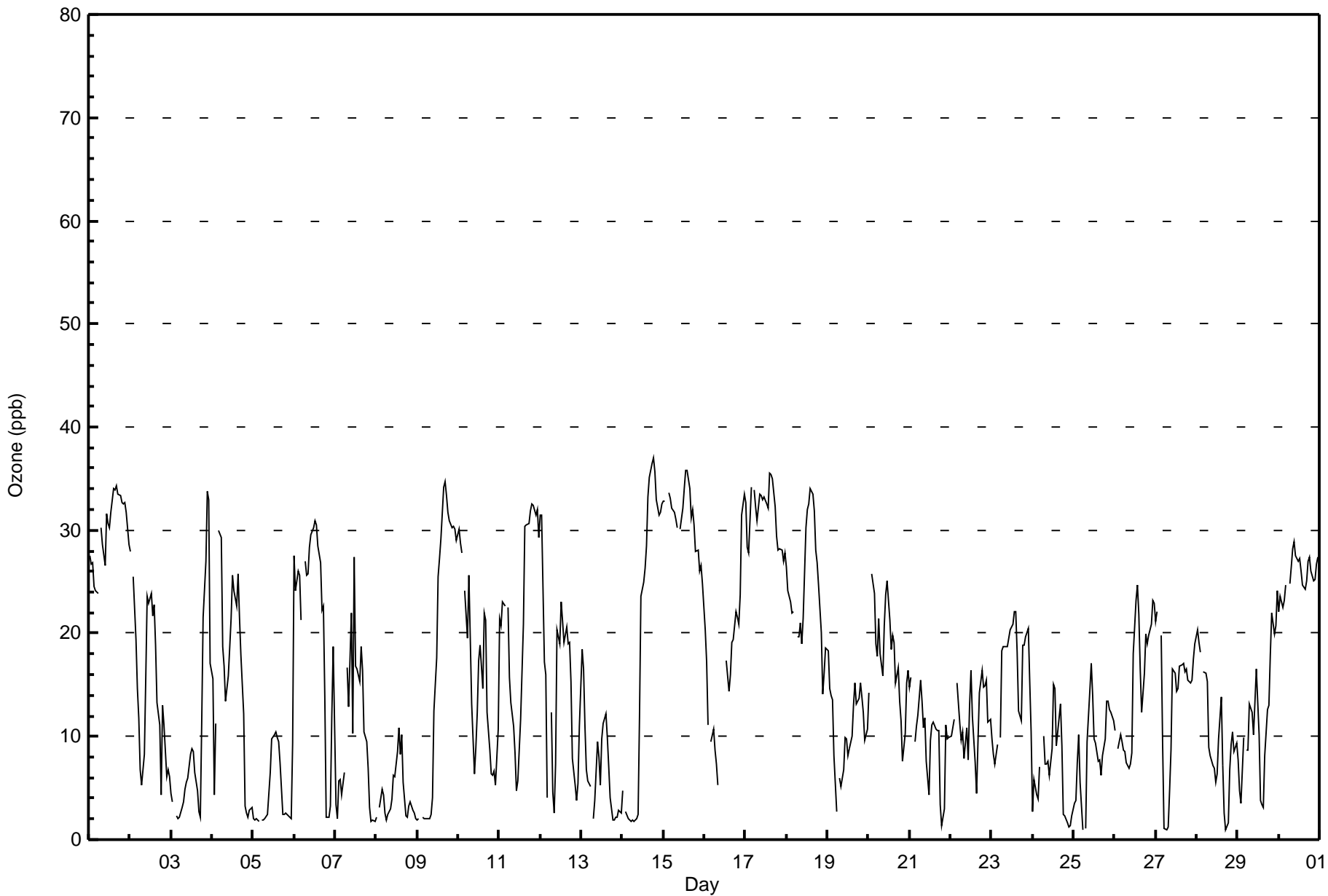
Fort McKay - Bertha Ganter - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 720																
Maximum Value: 37 ppb on Nov 14 19:00										Maximum Daily Average: 31.5 ppb on Nov 17										Hours of Data: 685						
Minimum Value: 1 ppb on Nov 27 07:00										Minimum Daily Average: 4.5 ppb on Nov 8										Hours of Missing Data: 35						
Maximum Diurnal Average: 19.0 ppb at hour 16										Minimum Diurnal Average: 11.8 ppb at hour 6										Hours of Calibration: 34						
Monthly Average: 15.7 ppb										Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 7 Median = 14 Q ₃ = 24 P ₉₀ = 31 P ₉₉ = 35										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-Nov	27	27	27	25	24	24	Z	30	29	27	32	31	30	32	34	34	34	33	33	33	32	33	32	29	30.0	34
2-Nov	28	Z	25	19	15	12	7	5	8	16	24	23	24	22	23	19	13	11	4	13	11	6	7	6	14.8	28
3-Nov	5	4	Z	2	2	2	3	4	5	6	6	8	9	9	6	5	3	2	11	22	27	34	33	17	9.7	34
4-Nov	16	4	11	Z	30	29	19	17	13	16	19	21	26	24	23	26	22	18	12	3	3	2	3	3	15.6	30
5-Nov	2	2	2	2	Z	2	2	2	2	5	6	10	10	10	10	9	7	2	2	3	2	2	2	9	4.7	10
6-Nov	27	24	26	26	21	Z	27	26	26	28	30	30	31	31	28	27	22	23	14	2	2	3	12	19	21.9	31
7-Nov	3	2	6	6	4	7	Z	17	13	22	10	27	17	17	15	19	16	10	9	7	3	2	2	2	10.3	27
8-Nov	2	Z	3	5	4	3	2	2	3	4	6	6	9	11	8	10	6	2	2	3	4	3	3	2	4.5	11
9-Nov	2	2	Z	2	2	2	2	2	2	4	13	18	26	27	29	34	35	33	32	31	30	30	30	29	18.1	35
10-Nov	30	29	28	Z	24	19	26	20	13	6	9	12	17	19	15	22	21	12	9	6	6	7	5	11	15.9	30
11-Nov	21	21	23	23	Z	22	16	13	11	8	5	6	12	16	21	30	30	31	32	33	32	32	32	29	21.7	33
12-Nov	32	31	17	16	4	Z	12	5	3	7	20	19	23	21	19	21	19	19	15	8	5	4	5	11	14.7	32
13-Nov	18	17	11	7	6	5	Z	2	4	10	8	5	10	11	12	10	7	4	2	2	2	2	3	3	7.0	18
14-Nov	5	Z	3	2	2	2	2	2	2	2	12	24	25	26	28	33	35	36	37	36	33	32	32	33	19.2	37
15-Nov	33	33	Z	34	33	32	32	31	30	M	30	32	34	36	36	34	31	32	31	28	28	26	27	25	31.2	36
16-Nov	20	17	11	Z	9	11	9	7	5	C	C	C	C	17	14	16	19	19	22	22	21	24	31	34	17.3	34
17-Nov	33	28	28	34	Z	34	32	31	34	33	33	33	33	32	36	35	35	32	29	28	28	28	27	28	31.5	36
18-Nov	26	24	23	22	22	Z	20	20	21	19	21	30	32	32	34	33	32	28	27	25	20	14	16	19	24.4	34
19-Nov	18	15	14	14	8	3	Z	6	5	7	10	10	8	9	10	13	15	13	14	15	14	12	10	11	11.0	18
20-Nov	14	Z	26	24	19	18	21	18	16	21	24	25	21	18	20	19	15	17	13	11	8	10	15	16	17.8	26
21-Nov	15	16	Z	9	11	12	15	13	11	12	8	4	10	11	11	11	11	11	3	1	3	11	10	10	10.0	16
22-Nov	10	11	12	Z	15	11	10	10	8	11	8	13	16	12	8	4	9	14	16	15	15	15	11	12	11.6	16
23-Nov	10	8	7	9	Z	10	18	19	19	19	20	21	22	22	18	12	12	19	19	20	21	15	10	16.1	22	
24-Nov	3	6	4	4	7	Z	10	7	7	8	6	9	15	15	9	12	13	9	2	2	2	1	1	2	6.7	15
25-Nov	3	4	8	10	6	1	Z	1	9	15	17	14	10	9	8	8	6	8	10	13	13	13	12	12	9.1	17
26-Nov	11	Z	9	10	9	9	8	8	7	7	8	18	23	25	22	17	12	16	20	19	20	21	23	23	15.0	25
27-Nov	21	22	Z	20	9	1	1	1	5	9	17	16	14	15	17	17	17	16	17	15	15	15	18	19	13.8	22
28-Nov	20	19	18	Z	16	16	15	9	8	7	7	6	6	10	14	7	3	1	2	7	9	10	8	9	10.0	20
29-Nov	8	5	4	10	Z	9	9	13	12	10	13	17	10	4	3	3	8	13	13	18	22	20	21	24	11.6	24
30-Nov	22	24	22	23	25	Z	25	26	28	29	28	27	27	26	25	24	25	27	27	26	25	25	27	27	25.7	29
16.2 15.7 14.7 14.3 13.2 11.8 13.7 12.2 12.0 13.1 15.4 17.7 18.9 19.0 18.7 19.0 17.9 16.9 16.0 15.5 15.2 15.3 15.8 16.1																								Diurnal Average		
33 33 28 34 33 34 32 31 34 33 33 33 34 36 36 35 35 36 37 36 33 34 33 34																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	460	67.15	67.15
21 - 50	225	32.85	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



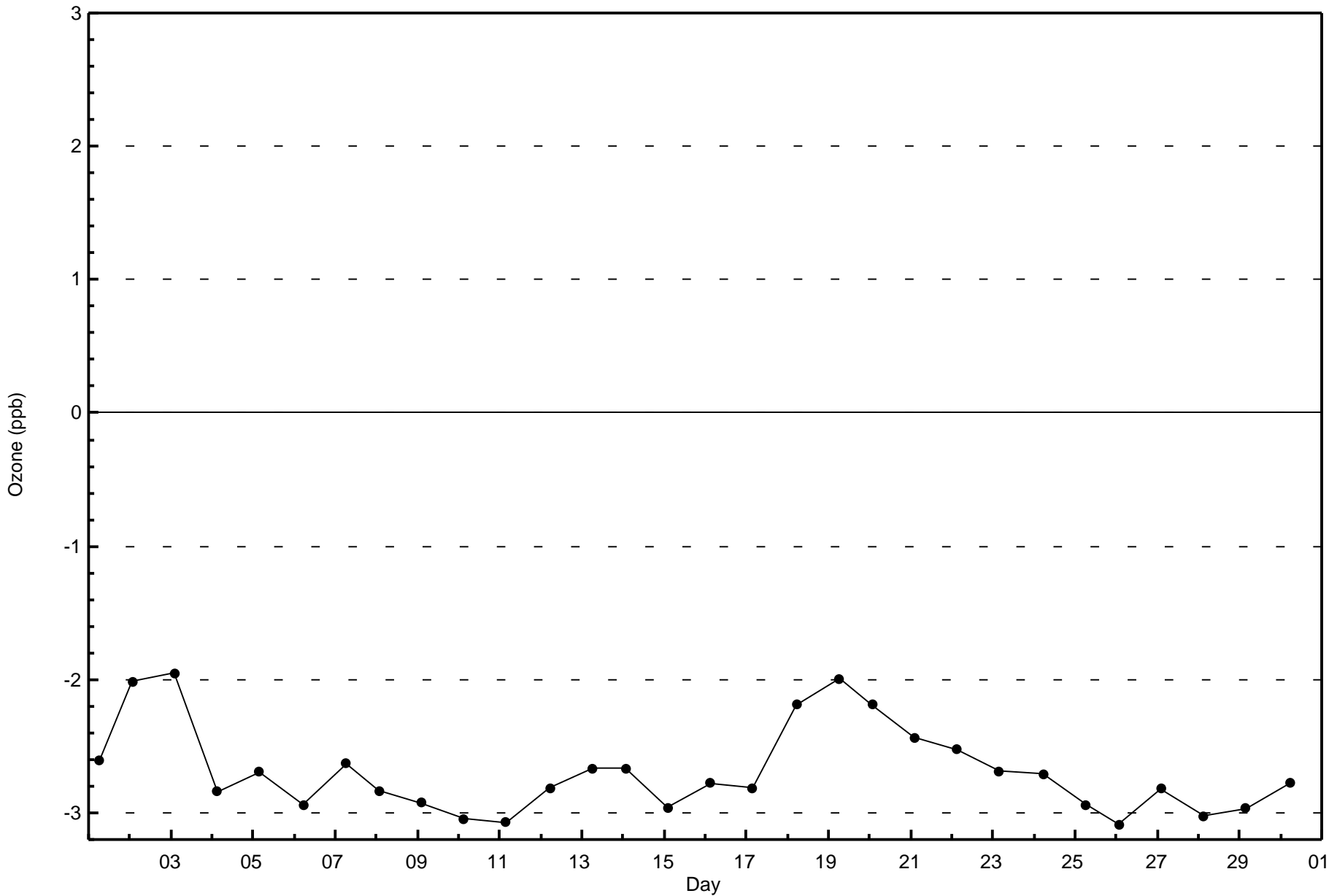
Wood Buffalo Environmental Association
Frequency Distribution

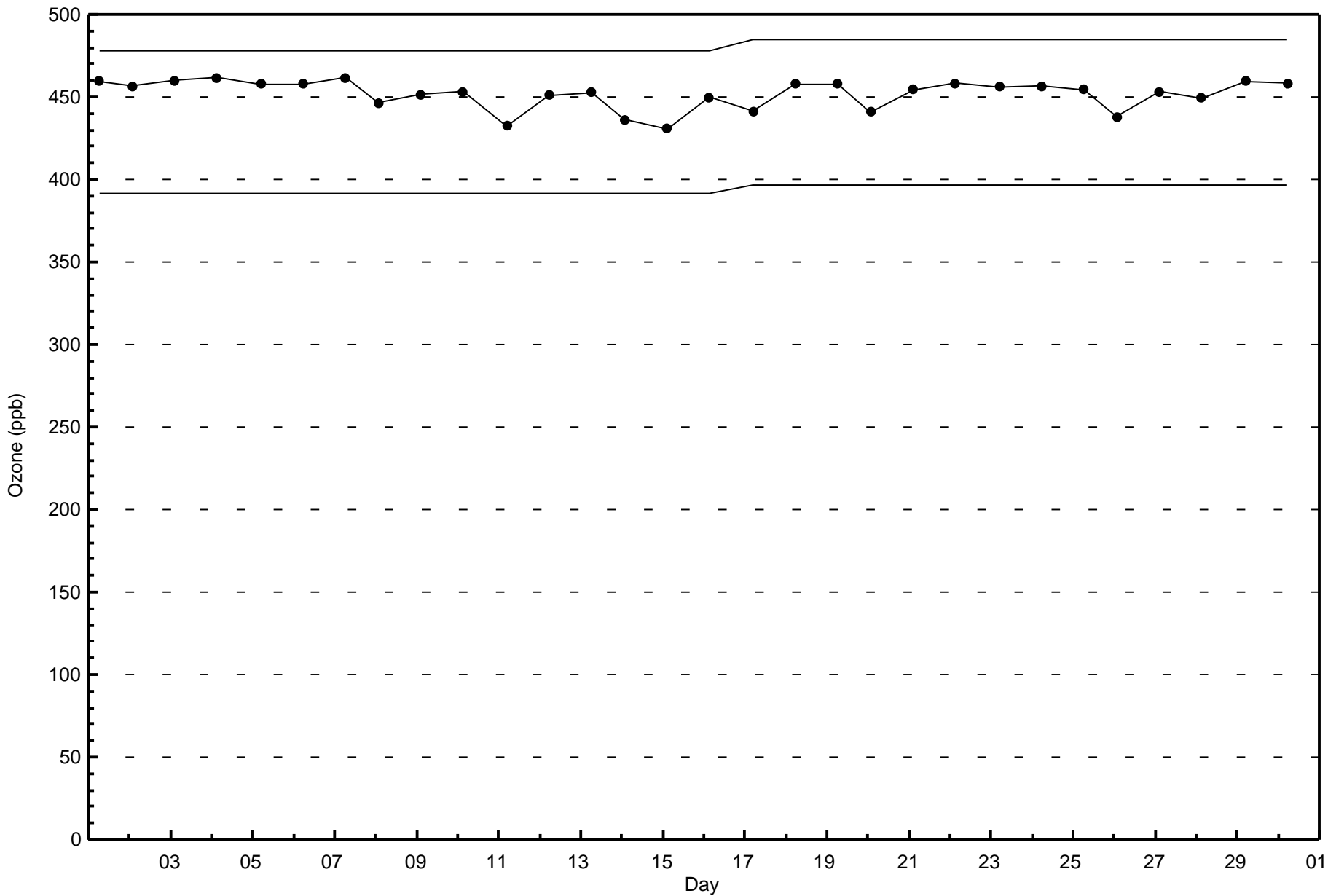
Ozone (O₃) - ppb
Fort McKay - Bertha Ganter - November 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	41	6	6	2	4	7	24	79	120	47	31	14	13	18	14	34	460
21 - 50	7	0	0	0	2	2	1	26	39	22	15	24	33	26	16	12	225
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	48	6	6	2	6	9	25	105	159	69	46	38	46	44	30	46	685

Total Number of Valid Hours: 685

Total Number of Hours: 720







Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 39.6 µg/m ³ on Nov 2 21:00	Maximum Daily Average: 12.7 µg/m ³ on Nov 26	Hours of Data:	714
Minimum Value: 0.3 µg/m ³ on Nov 14 23:00	Minimum Daily Average: 0.8 µg/m ³ on Nov 1	Hours of Missing Data:	6
Maximum Diurnal Average: 8.9 µg/m ³ at hour 21	Minimum Diurnal Average: 4.2 µg/m ³ at hour 1	Hours of Calibration:	2
Monthly Average: 5.56 µg/m ³	Percentiles: P ₁ = 0.4 P ₁₀ = 0.9 Q ₁ = 2.2 Median = 4.8 Q ₃ = 7.1 P ₉₀ = 10.5 P ₉₉ = 27.7	Percent Operational Time:	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-Nov	0.5	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.8	0.9	0.8	1.0	0.9	0.8	0.8	0.7	0.7	0.8	0.8	1.0	1.1	1.0	1.0	1.5	0.8	1.5
2-Nov	1.4	1.1	1.7	1.6	2.0	3.2	4.5	4.9	6.0	4.0	3.6	4.2	3.6	4.6	2.1	2.8	5.7	4.3	7.2	3.0	39.6	6.5	6.4	6.1	5.4	39.6
3-Nov	9.3	5.6	7.3	6.9	6.8	7.6	8.7	7.5	6.1	5.0	6.6	8.2	7.4	6.6	5.1	5.2	7.2	6.4	3.2	2.4	2.4	1.1	0.9	1.6	5.6	9.3
4-Nov	3.5	2.1	1.5	1.2	2.2	4.1	4.9	5.7	6.4	7.9	6.0	5.1	5.5	3.6	6.2	6.2	7.4	23.5	16.2	11.4	19.2	10.6	30.5	27.9	9.1	30.5
5-Nov	13.3	8.3	10.5	7.0	7.1	6.8	6.9	9.1	10.2	8.2	6.8	6.2	6.9	7.7	8.1	10.6	14.4	9.8	13.6	17.2	23.1	10.4	8.7	6.5	9.9	23.1
6-Nov	2.6	2.1	2.5	7.3	5.2	2.3	0.9	0.9	3.0	1.6	0.8	0.7	0.8	1.2	1.0	1.3	3.4	2.2	7.4	7.0	9.5	12.8	11.3	3.8	3.8	12.8
7-Nov	4.1	6.4	5.9	7.9	4.6	3.3	1.9	1.3	1.2	0.9	2.3	2.5	1.8	1.6	1.4	2.7	7.8	12.7	14.1	11.9	10.8	6.9	7.1	5.9	5.3	14.1
8-Nov	7.6	20.8	14.9	5.9	10.7	8.3	7.8	5.8	6.2	7.0	7.7	7.4	6.7	4.1	6.4	3.9	5.5	6.3	6.9	28.3	30.7	17.6	17.2	5.2	10.4	30.7
9-Nov	4.4	4.9	5.7	8.9	4.2	7.7	5.4	4.7	4.7	4.7	2.2	1.4	0.6	0.9	1.0	1.1	1.4	1.5	1.3	1.6	1.6	0.6	2.5	4.2	3.2	8.9
10-Nov	0.3	0.4	0.4	0.4	1.5	1.1	0.9	1.2	1.9	3.2	2.9	2.9	4.9	3.7	2.6	3.2	4.9	11.8	14.7	7.6	7.5	4.8	5.4	5.2	3.9	14.7
11-Nov	4.7	4.8	4.1	3.3	6.7	2.9	5.4	7.5	4.9	5.3	4.1	5.5	2.8	6.3	3.6	2.5	1.7	2.7	3.0	3.3	3.7	3.4	3.9	4.4	4.2	7.5
12-Nov	2.0	2.2	2.7	3.1	5.6	4.3	7.1	4.2	5.2	4.5	3.9	5.0	2.2	3.8	3.0	3.3	9.9	10.1	14.3	22.0	12.2	8.5	5.7	4.6	6.2	22.0
13-Nov	3.0	3.7	24.9	33.1	6.2	15.4	5.3	3.0	3.5	2.4	2.6	3.6	5.1	5.0	3.5	4.6	8.5	12.5	9.1	8.9	24.5	11.5	11.7	5.5	9.1	33.1
14-Nov	4.1	5.7	5.4	7.6	3.1	2.7	3.0	3.1	4.0	4.0	2.8	0.9	0.6	0.4	0.4	0.4	0.4	0.4	0.6	0.7	0.3	0.5	0.3	0.3	2.1	7.6
15-Nov	0.4	0.4	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.0	0.8	0.5	0.5	0.6	5.3	5.0	0.7	1.6	1.2	0.9	2.9	3.0	1.4	5.3
16-Nov	1.7	10.1	7.6	2.3	1.0	2.6	2.1	1.8	7.0	C	C	2.3	2.6	2.1	1.0	0.8	0.6	0.7	0.7	0.7	0.9	0.8	0.5	0.6	2.3	10.1
17-Nov	0.5	0.8	0.7	0.6	0.9	0.7	0.7	0.7	0.6	M	M	M	M	0.9	0.8	0.8	0.9	1.2	1.2	1.1	1.1	1.1	1.2	1.0	0.9	1.2
18-Nov	1.0	0.9	1.0	1.1	1.3	1.0	1.4	2.6	1.1	1.1	1.4	3.4	1.0	1.2	1.1	3.3	5.2	13.4	6.1	4.8	2.3	2.3	2.1	2.3	2.6	13.4
19-Nov	2.7	2.7	3.8	3.1	3.1	3.8	4.1	3.6	3.6	3.8	3.2	3.8	4.6	3.9	3.2	2.5	1.9	1.9	1.8	1.5	1.7	2.0	2.3	2.1	2.9	4.6
20-Nov	1.8	1.8	1.3	1.3	1.3	1.5	1.5	1.6	2.0	2.2	2.6	3.1	3.9	8.9	6.2	4.4	6.9	4.8	6.4	6.5	8.5	8.3	4.8	4.0	4.0	8.9
21-Nov	3.6	3.6	4.7	5.4	7.5	9.0	9.6	8.9	8.2	8.2	8.5	7.6	7.9	8.9	8.3	7.6	6.6	5.6	6.1	6.1	6.0	4.5	3.1	2.8	6.6	9.6
22-Nov	2.8	3.2	3.6	3.3	3.6	4.6	6.1	5.6	5.6	5.6	6.2	5.4	5.2	7.6	8.5	8.8	7.3	6.2	5.4	6.0	6.3	6.6	6.6	5.9	5.7	8.8
23-Nov	7.0	7.1	7.1	7.2	7.0	7.1	6.7	5.1	4.9	4.8	6.2	6.4	5.6	5.2	5.8	4.8	4.9	4.7	4.8	6.1	4.8	4.3	5.6	7.2	5.9	7.2
24-Nov	7.1	7.1	7.7	10.0	9.7	8.7	7.6	7.3	8.8	8.4	11.6	13.6	12.2	9.5	12.9	11.4	10.6	9.9	11.7	11.7	12.3	10.6	10.4	7.6	9.9	13.6
25-Nov	5.9	5.6	4.2	3.2	3.7	4.5	4.5	5.6	4.3	4.6	5.2	5.6	5.5	5.7	5.3	5.5	4.9	5.4	6.8	8.8	9.3	10.3	9.6	9.1	6.0	10.3
26-Nov	10.5	11.4	10.1	7.5	10.7	15.9	24.8	28.0	28.9	24.9	22.5	16.3	9.9	9.3	7.9	9.4	11.2	8.7	5.7	6.8	6.5	5.9	5.4	5.5	12.7	28.9
27-Nov	6.3	6.2	7.9	9.0	9.6	21.8	15.5	11.7	5.6	5.0	4.6	4.8	4.8	4.6	4.9	5.2	5.3	5.3	5.0	5.0	4.8	4.9	5.6	5.6	7.0	21.8
28-Nov	4.7	4.4	4.2	4.3	4.0	4.1	4.3	5.6	6.8	10.1	18.8	18.6	16.4	13.2	8.3	9.5	7.6	6.5	5.4	4.7	4.5	4.1	3.9	3.8	7.4	18.8
29-Nov	4.4	6.1	10.9	3.6	3.5	3.4	3.4	4.7	5.4	5.2	4.3	6.0	16.5	17.0	11.2	9.7	8.7	6.5	4.6	4.4	5.4	4.9	4.7	3.1	6.6	17.0
30-Nov	4.2	3.2	4.9	4.9	3.2	3.6	4.0	3.6	2.9	2.7	5.3	6.2	5.7	5.9	6.1	5.5	4.9	5.3	5.4	5.9	5.9	5.5	5.4	5.4	4.8	6.2

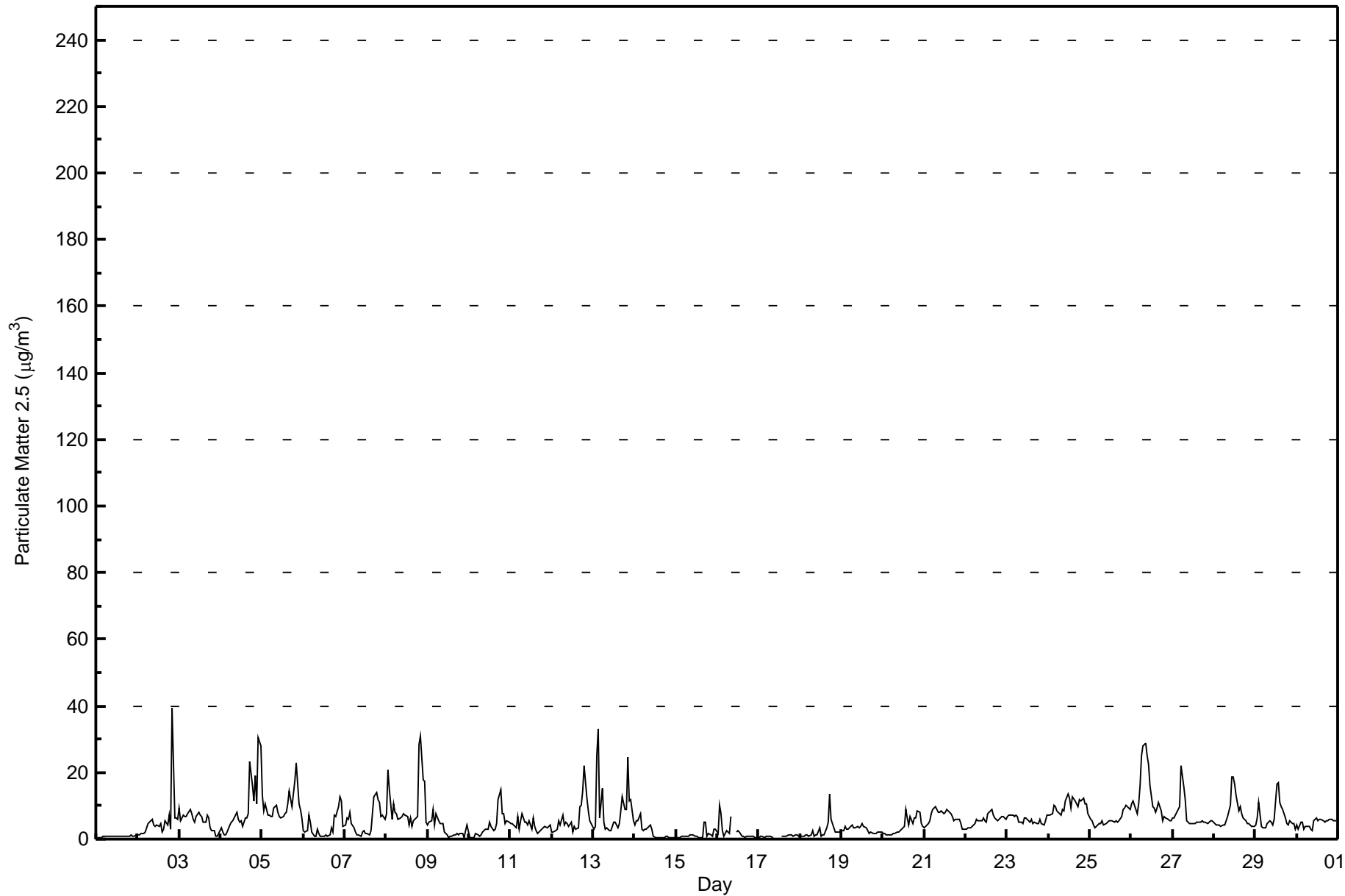
4.2	4.8	5.6	5.4	4.6	5.4	5.3	5.2	5.4	5.3	5.5	5.5	5.3	5.2	4.6	4.6	5.7	6.5	6.3	6.9	8.9	5.8	6.2	5.1	Diurnal Average	
13.3	20.8	24.9	33.1	10.7	21.8	24.8	28.0	28.9	24.9	22.5	18.6	16.5	17.0	12.9	11.4	14.4	23.5	16.2	28.3	39.6	17.6	30.5	27.9	Diurnal Maximum	

C - Calibration M - Maintenance
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	339	47.48	47.48
6 - 15	254	35.57	83.05
16 - 25	23	3.22	86.27
26 - 80	8	1.12	87.39
> 81.0	0	0.00	87.39

Total Number of Valid Hours: 714

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 McKay - Bertha Ganter - 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	35	4	4	2	4	9	7	62	77	36	13	16	19	15	9	27	339
6 - 15	8	1	1	1	1	2	17	45	75	28	27	11	6	10	12	9	254
16 - 25	0	0	1	0	1	1	1	2	9	5	1	1	1	0	0	0	23
26 - 80	0	0	0	0	0	0	0	0	3	3	2	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	43	5	6	3	6	12	25	109	164	72	43	28	26	25	21	36	624

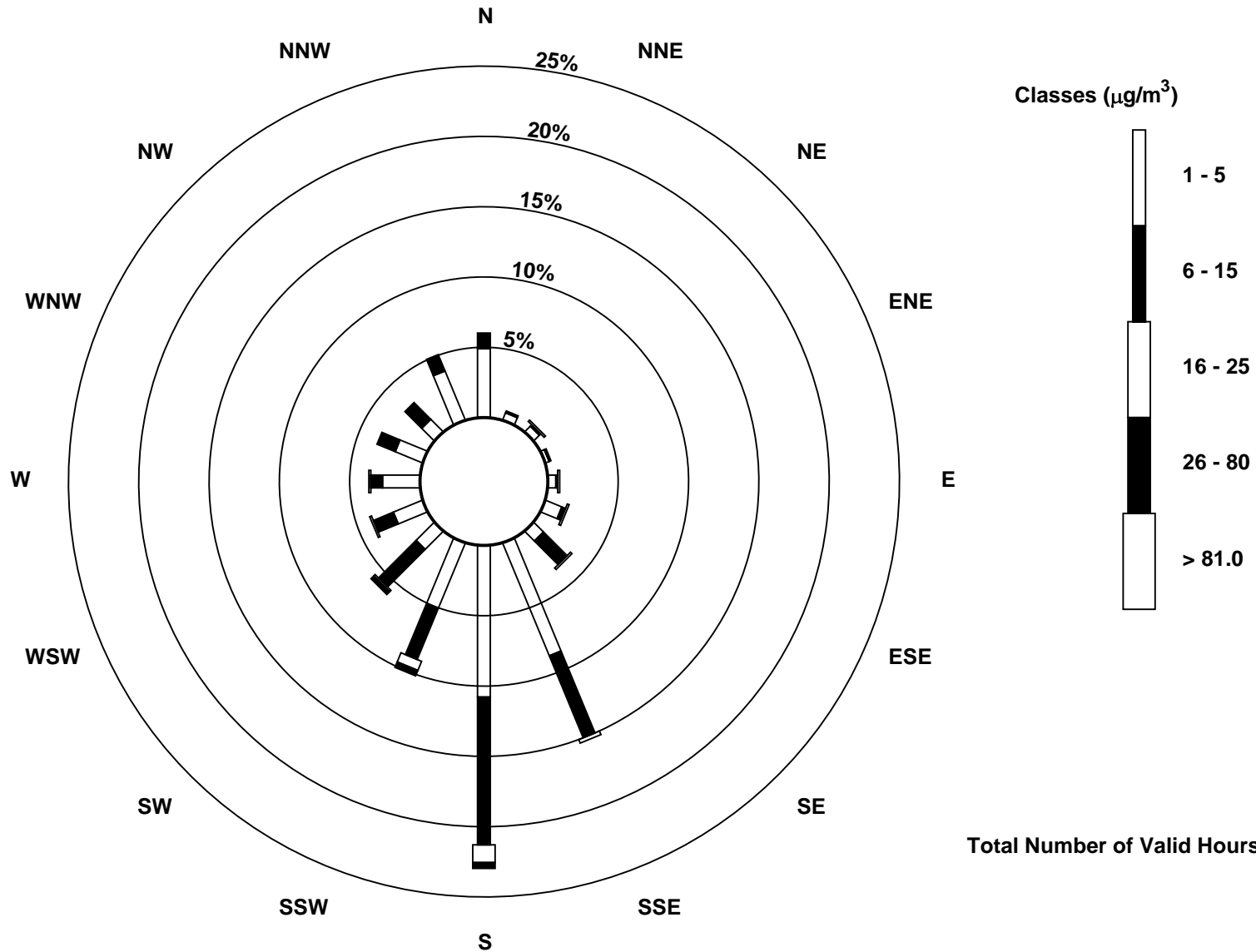
Total Number of Valid Hours: 714

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 McKay - Bertha Ganter (AMS 1)





Summary of Hour Averages

Fort McKay - Bertha Ganter - November 2016

Number of Exceedences (AAAQO): 1-hr: 0	Maximum Value: 0 ppb on Nov 1 01:00	Maximum Daily Average: 0.0 ppb on Nov 1	Hours in Service: 720
Minimum Value: 0 ppb on Nov 1 01:00	Maximum Diurnal Average: 0.0 ppb at hour 1	Minimum Daily Average: 0.0 ppb on Nov 1	Hours of Data: 621
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	Minimum Diurnal Average: 0.0 ppb at hour 1	Hours of Missing Data: 99
			Hours of Calibration: 50
			Percent Operational Time: 93.2

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-Nov	0	0	0	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
2-Nov	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	0.0	0
3-Nov	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	0.0	0
4-Nov	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	0
5-Nov	0	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
6-Nov	0	0	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
7-Nov	0	0	0	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
8-Nov	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	0.0	0
9-Nov	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	0.0	0
10-Nov	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	0
11-Nov	0	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
12-Nov	0	0	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
13-Nov	0	0	0	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
14-Nov	0	0	0	Z	RE	RE	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
15-Nov	0	0	0	0	Z	RE	RE	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	--	0
16-Nov	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	0
17-Nov	0	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
18-Nov	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
19-Nov	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
20-Nov	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	0.0	0
21-Nov	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
22-Nov	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
23-Nov	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
24-Nov	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
25-Nov	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
26-Nov	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
27-Nov	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	0.0	0
28-Nov	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
29-Nov	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
30-Nov	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

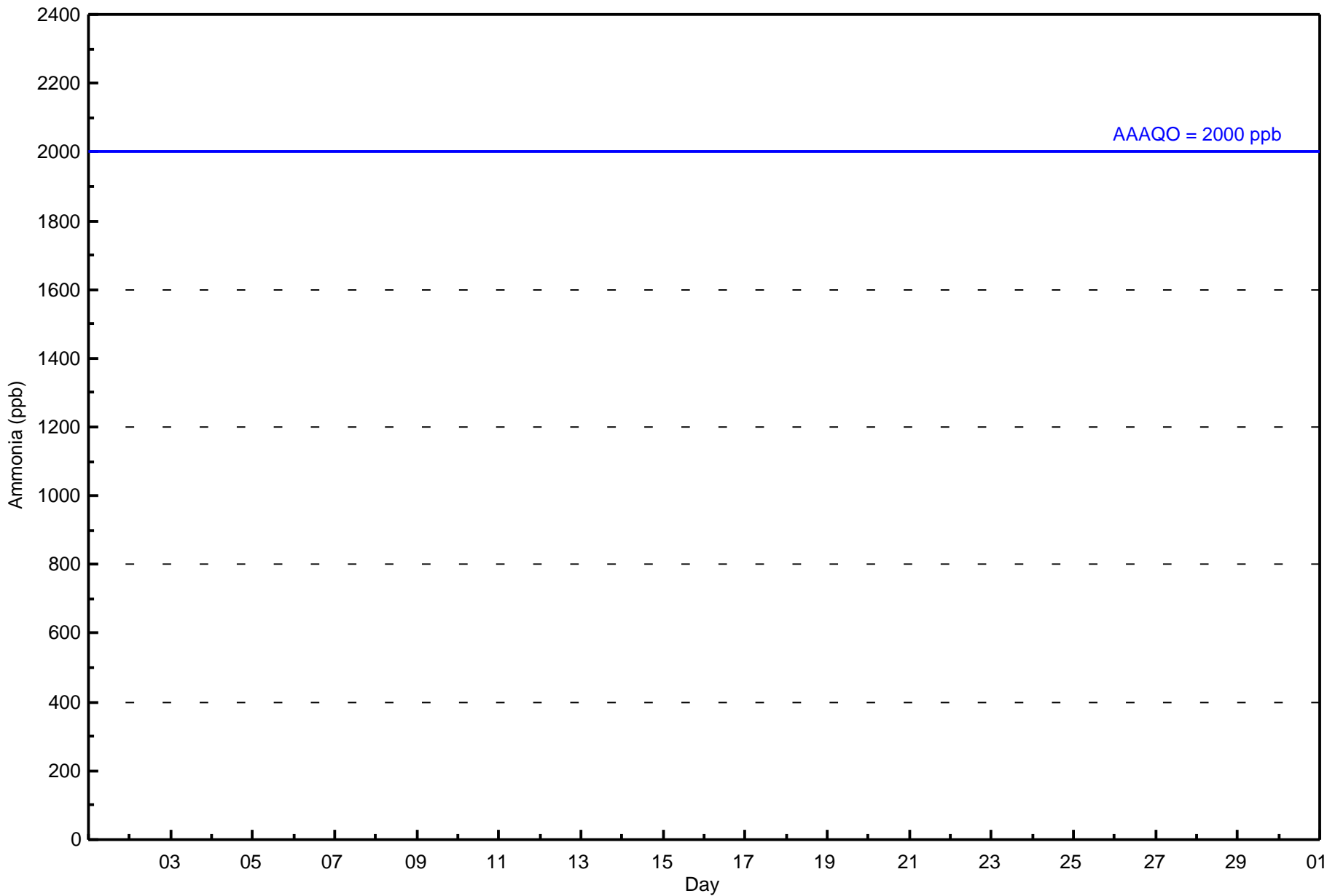
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

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 - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	621	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: 621

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - 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 - 5	45	6	5	3	3	13	21	96	142	65	41	30	40	35	30	46	621
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	45	6	5	3	3	13	21	96	142	65	41	30	40	35	30	46	621

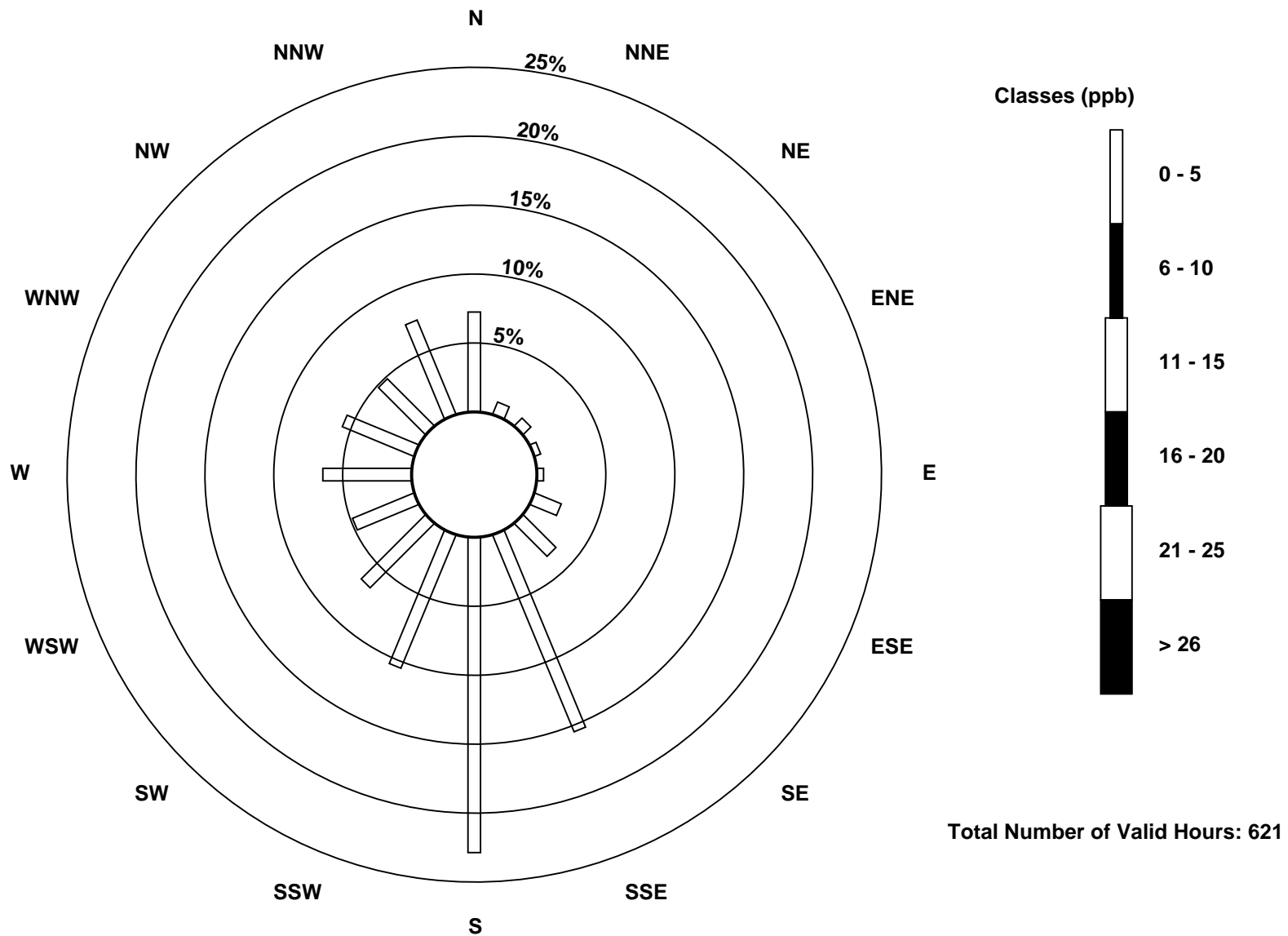
Total Number of Valid Hours: 621

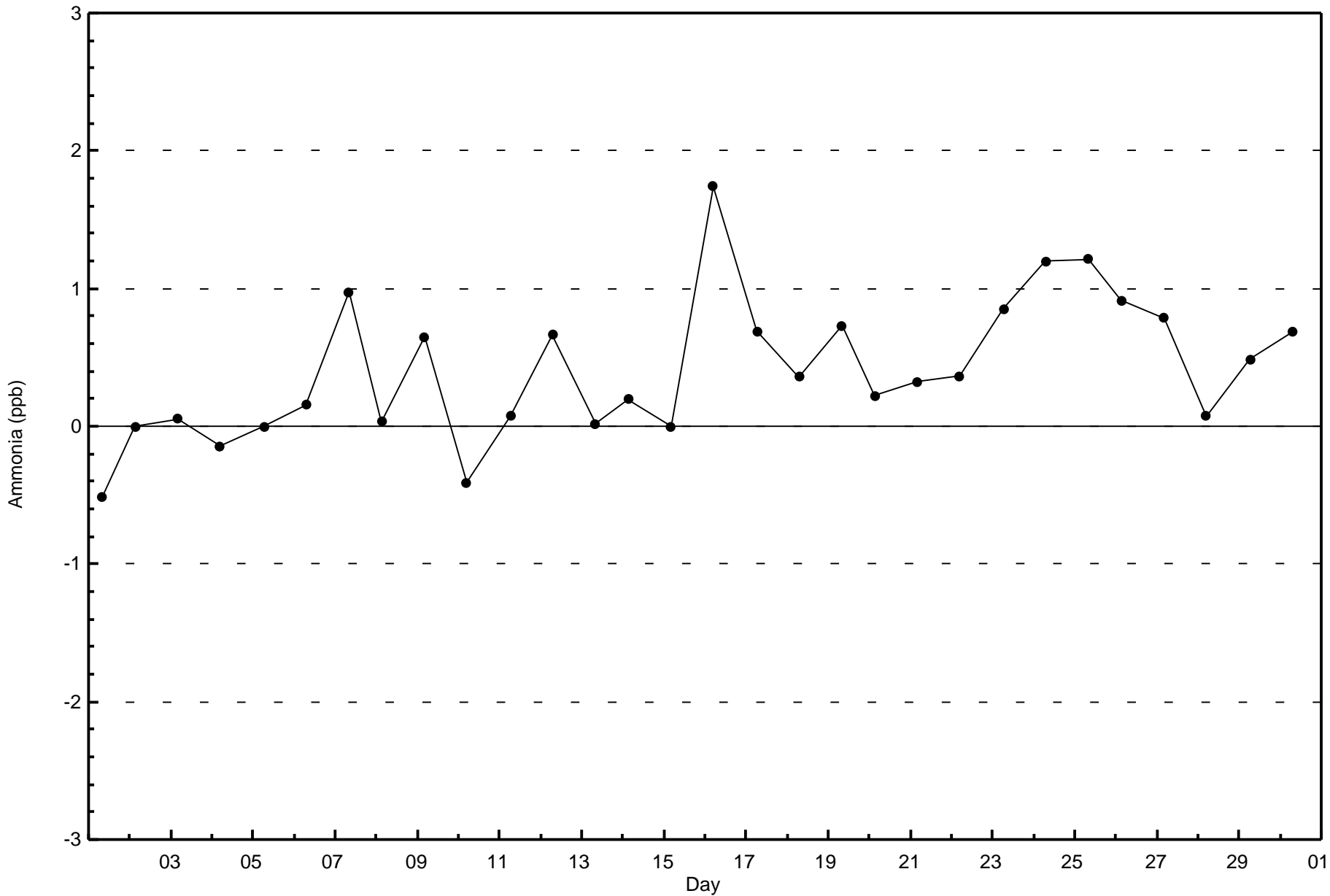
Total Number of Hours: 720

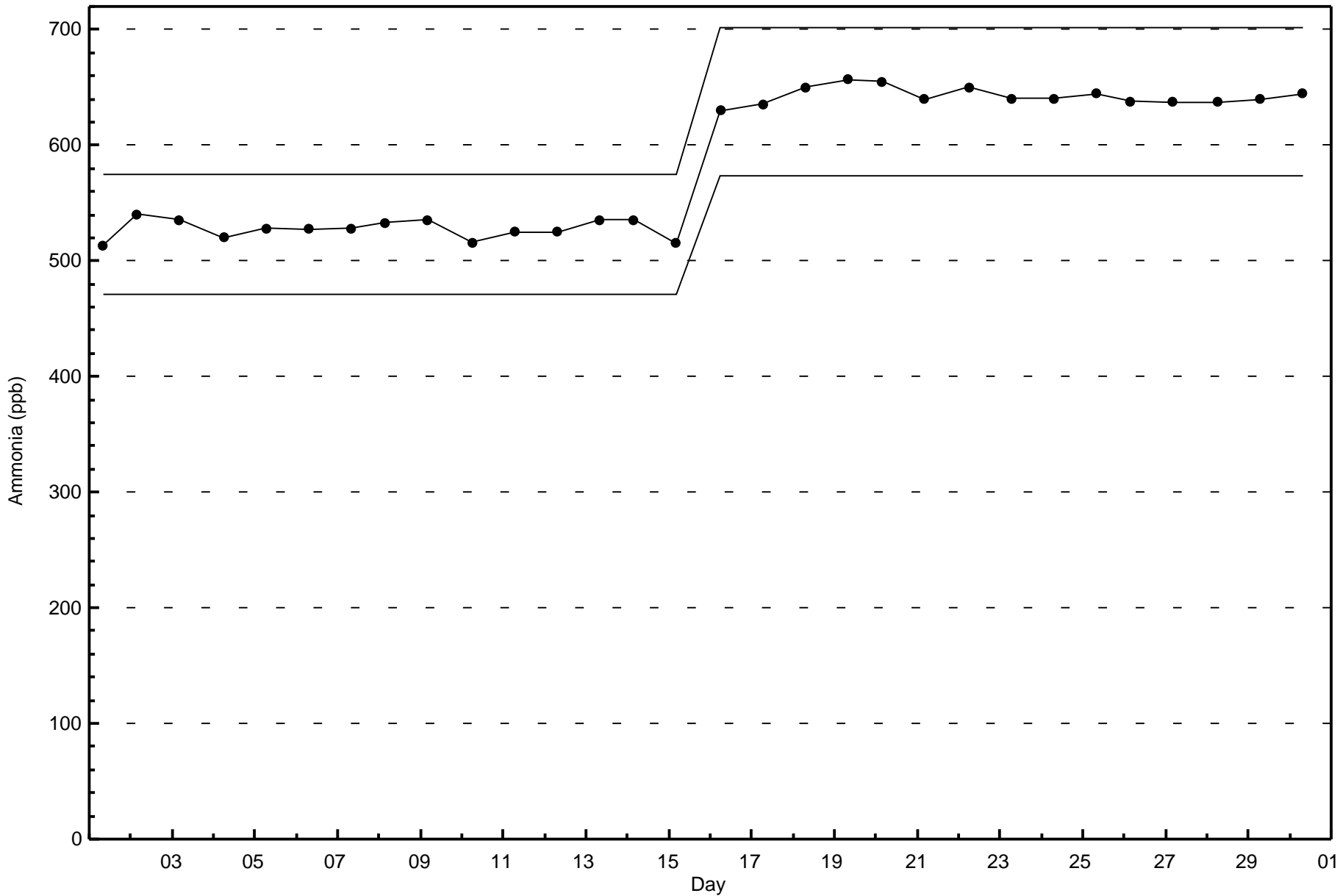


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 10 m (AT 10m) - C

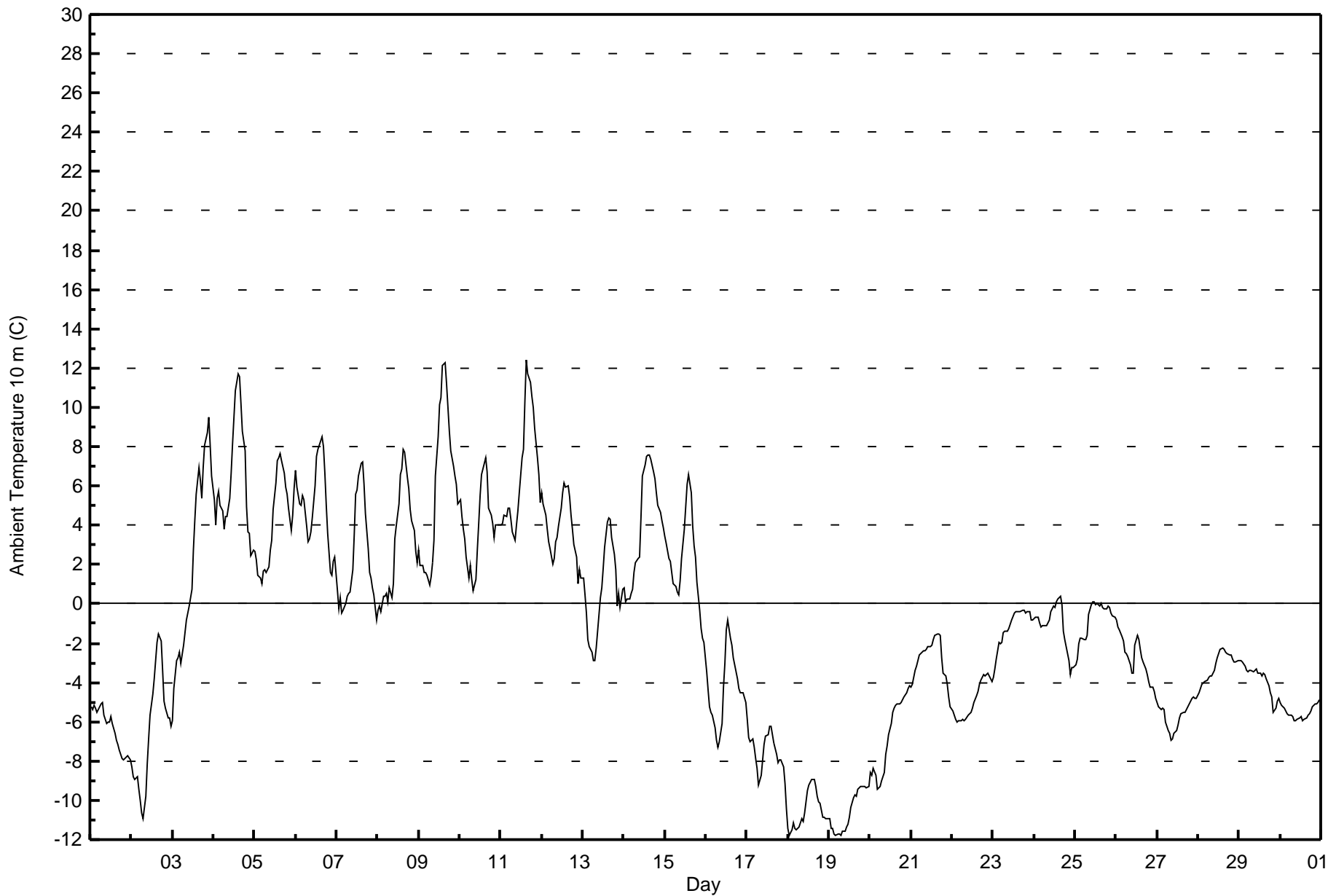
Fort McKay - Bertha Ganter - November 2016

Maximum Value: 12.4 C on Nov 11 16:00		Maximum Daily Average: 6.8 C on Nov 11		Hours in Service: 720																						
Minimum Value: -11.8 C on Nov 19 05:00		Minimum Daily Average: -10.6 C on Nov 19		Hours of Data: 720																						
Maximum Diurnal Average: 1.3 C at hour 16		Minimum Diurnal Average: -2.7 C at hour 7		Hours of Missing Data: 0																						
Monthly Average: -1.14 C		Percentiles: P ₁ = -11.6 P ₁₀ = -8.2 Q ₁ = -5.2 Median = -1.6 Q ₃ = 3.2 P ₉₀ = 6.3 P ₉₉ = 11.1		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-Nov	-5.2	-5.4	-5.1	-5.3	-5.5	-5.2	-5.1	-5.0	-5.6	-6.1	-6.0	-6.0	-5.7	-6.1	-6.6	-7.0	-7.1	-7.4	-7.9	-7.9	-7.8	-7.8	-7.7	-8.0	-6.4	-5.0
2-Nov	-8.3	-8.8	-8.9	-8.8	-9.5	-10.0	-10.6	-10.9	-9.8	-8.1	-6.9	-5.7	-4.6	-3.8	-2.9	-1.9	-1.6	-1.9	-3.4	-5.0	-5.3	-5.8	-5.8	-6.3	-6.4	-1.6
3-Nov	-5.9	-4.3	-2.9	-2.7	-2.4	-3.0	-2.1	-1.5	-0.8	-0.4	-0.1	0.7	2.7	4.2	5.6	6.9	6.3	5.3	6.9	8.1	8.7	9.5	8.1	6.5	2.2	9.5
4-Nov	5.3	4.0	5.4	5.7	5.0	4.7	3.8	4.4	4.4	5.3	6.7	8.2	9.5	10.9	11.7	11.5	10.2	8.8	7.8	4.9	3.7	3.6	2.5	2.7	6.3	11.7
5-Nov	2.7	2.3	1.4	1.3	1.1	1.7	1.7	1.6	1.9	2.7	3.3	4.8	6.1	7.3	7.5	7.7	7.3	6.6	5.9	5.6	4.8	3.8	4.5	5.8	4.1	7.7
6-Nov	6.8	5.9	5.1	5.0	5.5	5.3	3.9	3.2	3.3	3.7	4.4	6.0	7.5	7.9	8.1	8.5	8.0	6.6	5.0	3.6	1.6	1.4	2.2	2.4	5.0	8.5
7-Nov	0.7	-0.2	0.3	-0.5	-0.3	0.0	0.4	0.5	0.6	1.7	3.5	5.6	5.8	6.5	7.2	7.2	6.1	4.6	2.8	1.6	1.3	0.8	0.4	-0.8	2.3	7.2
8-Nov	-0.3	-0.1	-0.4	0.4	0.4	0.5	0.1	0.8	0.3	1.0	3.3	4.0	5.1	6.5	6.8	7.9	7.7	6.4	5.9	4.8	4.3	3.8	2.7	2.1	3.1	7.9
9-Nov	2.7	1.9	2.0	1.6	1.6	1.4	0.9	1.4	2.1	3.2	6.5	8.5	10.2	10.5	12.1	12.3	11.2	10.0	8.8	7.8	7.0	6.5	6.1	5.1	5.9	12.3
10-Nov	5.3	4.4	3.8	3.3	2.4	1.3	1.9	1.2	0.7	1.2	2.8	4.1	5.5	6.6	7.2	7.4	6.7	4.9	4.5	4.1	3.4	4.0	4.0	4.0	3.9	7.4
11-Nov	4.0	4.1	4.5	4.5	4.8	4.9	4.3	3.6	3.3	4.0	4.7	5.7	7.4	7.9	10.3	12.4	11.7	11.3	10.5	10.0	8.9	7.4	6.6	5.2	6.8	12.4
12-Nov	5.6	5.1	4.5	3.8	3.1	2.8	2.0	2.3	3.2	3.4	4.0	4.9	5.6	6.2	5.9	6.0	5.4	4.5	3.8	3.0	2.4	1.0	1.7	1.3	3.8	6.2
13-Nov	1.3	0.4	-0.4	-1.8	-2.2	-2.5	-2.9	-2.9	-2.2	-0.5	0.3	0.8	1.8	2.9	4.1	4.3	4.3	3.4	2.5	1.7	-0.1	0.6	-0.2	0.8	0.6	4.3
14-Nov	0.8	0.1	0.2	0.2	0.5	0.7	1.6	2.1	2.3	2.4	4.4	6.5	7.1	7.5	7.5	7.6	7.4	6.7	6.4	5.7	5.0	4.6	4.2	3.9	4.0	7.6
15-Nov	3.4	3.1	2.3	2.2	1.6	1.0	0.9	0.6	0.4	1.2	2.3	3.8	4.9	6.1	6.6	5.6	3.9	3.0	2.4	1.1	-0.4	-1.3	-1.7	-2.0	2.1	6.6
16-Nov	-3.4	-4.4	-5.2	-5.5	-5.6	-6.3	-7.0	-7.3	-7.0	-6.1	-4.2	-3.0	-1.3	-0.8	-1.8	-2.1	-2.7	-3.1	-3.8	-4.3	-4.5	-4.5	-4.5	-5.0	-4.3	-0.8
17-Nov	-5.9	-6.8	-7.0	-6.9	-7.3	-7.9	-8.3	-9.2	-8.7	-8.0	-7.2	-6.8	-6.7	-6.2	-6.2	-6.7	-7.1	-7.6	-8.1	-7.9	-7.9	-8.3	-9.2	-10.4	-7.6	-5.9
18-Nov	-11.5	-11.8	-11.5	-11.2	-11.4	-11.5	-11.4	-11.1	-10.9	-11.1	-10.7	-9.5	-9.2	-9.0	-9.0	-9.0	-9.3	-9.8	-10.1	-10.2	-10.8	-10.9	-10.9	-10.9	-10.5	-9.0
19-Nov	-10.9	-11.4	-11.4	-11.7	-11.8	-11.7	-11.7	-11.8	-11.6	-11.6	-11.4	-11.2	-10.9	-10.4	-9.9	-9.7	-9.8	-9.4	-9.3	-9.3	-9.3	-9.3	-9.3	-9.3	-10.6	-9.3
20-Nov	-8.6	-8.7	-8.4	-8.7	-9.5	-9.3	-9.3	-9.0	-8.6	-7.6	-7.2	-6.7	-6.1	-5.5	-5.3	-5.2	-5.1	-5.1	-5.0	-4.9	-4.7	-4.5	-4.3	-4.2	-6.7	-4.2
21-Nov	-4.3	-4.1	-3.4	-3.2	-2.9	-2.6	-2.4	-2.4	-2.4	-2.3	-2.2	-2.2	-2.1	-1.8	-1.6	-1.5	-1.6	-1.6	-2.7	-3.5	-3.7	-4.1	-4.7	-5.2	-2.9	-1.5
22-Nov	-5.5	-5.7	-5.9	-6.0	-6.0	-6.0	-5.9	-5.9	-5.9	-5.7	-5.6	-5.5	-5.3	-5.0	-4.7	-4.4	-4.1	-3.9	-3.6	-3.7	-3.6	-3.6	-3.7	-3.9	-5.0	-3.6
23-Nov	-3.7	-3.3	-2.8	-2.0	-2.0	-2.0	-1.5	-1.4	-1.4	-1.2	-1.1	-0.8	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.5	-0.4	-0.4	-0.8	-0.8	-1.2	-0.3
24-Nov	-0.8	-0.7	-0.7	-1.0	-1.1	-1.1	-1.1	-1.1	-0.9	-0.9	-0.4	-0.1	-0.2	0.1	0.3	0.4	0.1	-1.4	-1.8	-2.2	-2.9	-3.6	-3.3	-3.2	-1.2	0.4
25-Nov	-3.1	-2.8	-2.1	-1.7	-1.8	-1.8	-1.8	-1.6	-0.5	-0.1	0.1	0.1	0.0	0.0	-0.1	0.0	-0.2	-0.3	-0.2	-0.1	-0.2	-0.5	-0.6	-0.7	-0.8	0.1
26-Nov	-0.8	-1.2	-1.3	-1.7	-1.9	-2.4	-2.6	-2.6	-3.1	-3.5	-3.5	-2.1	-1.6	-1.8	-2.3	-2.7	-3.0	-3.3	-3.6	-4.0	-4.2	-4.3	-4.5	-4.8	-2.8	-0.8
27-Nov	-5.0	-5.3	-5.4	-5.3	-5.4	-6.0	-6.5	-6.6	-7.0	-6.9	-6.6	-6.4	-6.1	-5.8	-5.6	-5.5	-5.5	-5.3	-5.3	-5.1	-4.8	-4.7	-4.8	-4.8	-5.7	-4.7
28-Nov	-4.5	-4.3	-4.1	-4.0	-4.0	-3.9	-3.8	-3.7	-3.7	-3.4	-3.0	-2.8	-2.5	-2.3	-2.2	-2.3	-2.5	-2.6	-2.6	-2.6	-2.8	-2.9	-3.0	-2.9	-3.2	-2.2
29-Nov	-2.9	-2.9	-3.0	-3.2	-3.4	-3.5	-3.4	-3.4	-3.5	-3.4	-3.3	-3.6	-3.5	-3.7	-3.6	-3.6	-3.8	-4.2	-4.5	-4.7	-5.5	-5.3	-4.9	-4.8	-3.8	-2.9
30-Nov	-5.0	-5.2	-5.3	-5.5	-5.6	-5.7	-5.7	-5.7	-5.9	-5.9	-5.9	-5.8	-5.8	-5.9	-5.9	-5.8	-5.6	-5.6	-5.4	-5.2	-5.1	-5.1	-5.0	-4.9	-5.5	-4.9
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	434	60.28	60.28
0 - 10	272	37.78	98.06
10 - 20	14	1.94	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

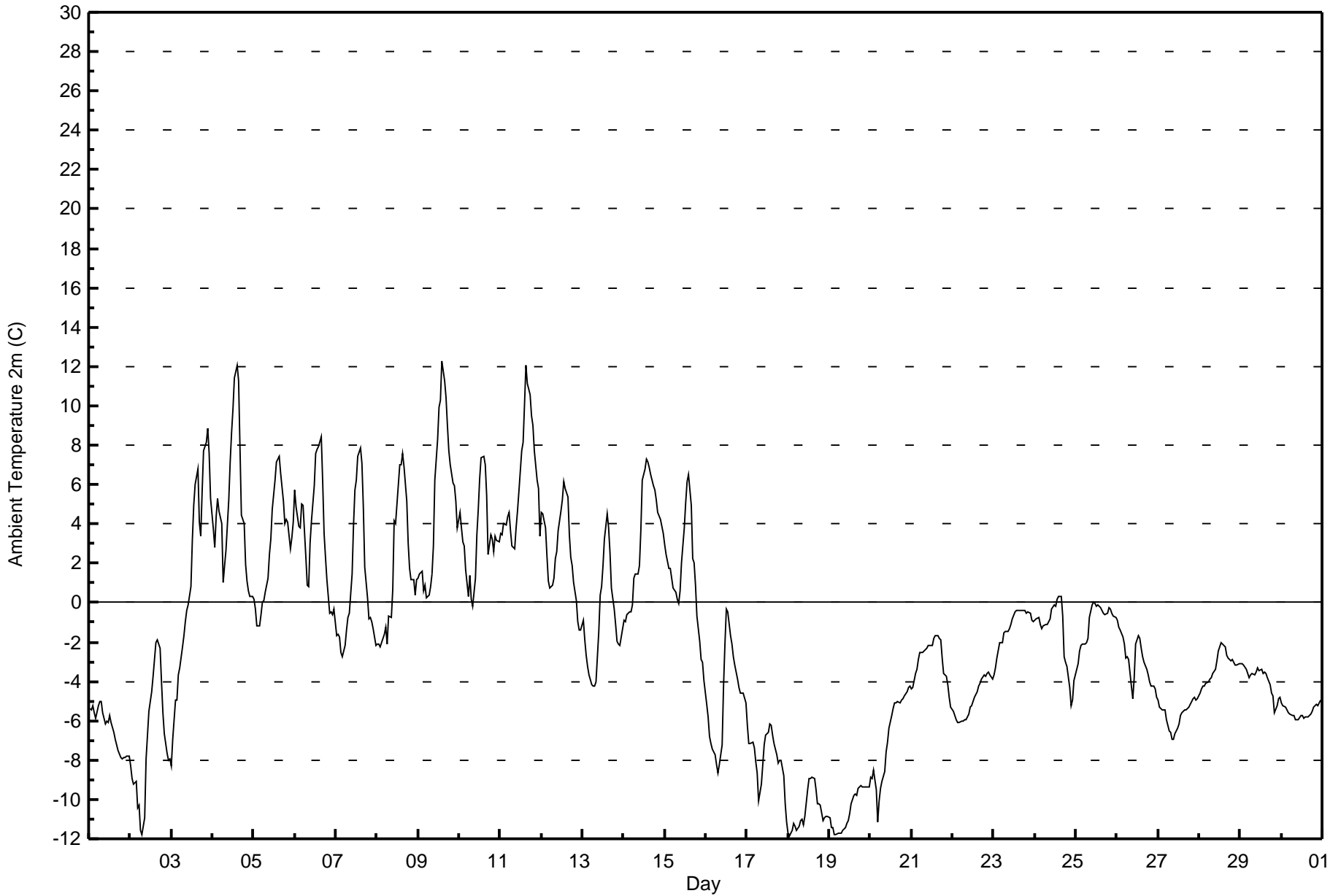


Maximum Value: 12.3 C on Nov 9 15:00		Maximum Daily Average: 6.2 C on Nov 11		Hours in Service: 720																							
Minimum Value: -11.9 C on Nov 18 02:00		Minimum Daily Average: -10.6 C on Nov 18		Hours of Data: 720																							
Maximum Diurnal Average: 1.2 C at hour 15		Minimum Diurnal Average: -3.3 C at hour 8		Hours of Missing Data: 0																							
Monthly Average: -1.68 C		Percentiles: P ₁ = -11.7 P ₁₀ = -8.3 Q ₁ = -5.3 Median = -2.1 Q ₃ = 1.8 P ₉₀ = 5.7 P ₉₉ = 11.0		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	-5.4	-5.5	-5.2	-5.6	-5.9	-5.2	-5.0	-5.0	-5.6	-6.1	-6.0	-6.1	-5.7	-6.1	-6.6	-7.0	-7.2	-7.5	-7.9	-7.9	-7.8	-7.9	-7.8	-7.8	-6.4	-5.0	
2-Nov	-8.3	-8.9	-9.2	-9.1	-10.5	-10.3	-11.6	-11.8	-10.9	-7.9	-6.8	-5.5	-4.5	-3.7	-2.9	-2.1	-1.9	-2.3	-4.1	-5.6	-6.6	-7.7	-8.0	-8.0	-7.0	-1.9	
3-Nov	-8.3	-6.9	-4.9	-4.9	-3.7	-3.3	-2.3	-1.7	-0.9	-0.4	-0.1	0.8	3.2	4.9	6.0	6.8	4.1	3.4	5.6	7.7	8.1	8.8	7.6	5.3	1.5	8.8	
4-Nov	3.8	2.8	4.4	5.3	4.6	4.0	1.0	1.9	2.7	5.2	7.2	8.6	9.9	11.4	12.1	11.2	7.9	4.5	4.0	1.9	1.1	0.6	0.3	0.3	4.9	12.1	
5-Nov	0.2	-0.3	-1.1	-1.2	-0.6	0.1	0.1	0.5	1.2	2.5	3.2	4.7	6.2	7.2	7.3	7.4	6.6	5.2	4.0	4.3	4.1	2.7	3.3	4.1	3.0	7.4	
6-Nov	5.7	4.8	3.9	3.8	5.0	4.9	2.3	0.9	0.8	3.0	4.1	5.9	7.6	7.8	7.9	8.4	6.1	3.5	2.3	1.2	-0.5	-0.5	-0.6	-0.3	3.7	8.4	
7-Nov	-1.7	-1.6	-1.7	-2.5	-2.8	-2.2	-1.4	-0.8	-0.6	1.4	3.9	5.7	6.2	7.4	7.8	7.0	4.9	1.8	0.2	-0.9	-0.7	-0.9	-1.3	-2.2	1.1	7.8	
8-Nov	-2.1	-2.1	-2.3	-1.8	-1.6	-1.3	-2.1	-0.7	-0.8	0.7	4.1	4.0	6.0	7.0	7.0	7.6	6.9	5.1	3.0	1.7	1.2	1.1	0.4	1.2	1.8	7.6	
9-Nov	1.3	1.5	1.6	0.6	0.9	0.3	0.4	0.8	1.5	2.9	6.2	8.3	9.9	10.3	12.3	11.3	10.4	9.0	7.7	7.0	6.1	5.9	5.2	3.8	5.2	12.3	
10-Nov	4.6	3.8	3.1	2.9	1.7	0.3	1.4	0.2	-0.2	1.2	3.4	4.8	6.3	7.3	7.4	7.0	5.4	2.5	3.5	3.2	2.6	3.4	3.2	3.1	3.4	7.4	
11-Nov	3.5	3.4	4.0	3.9	4.4	4.6	3.6	2.9	2.7	3.8	4.7	5.6	7.7	8.1	10.1	12.1	11.1	10.5	9.5	9.0	7.7	6.2	5.8	3.4	6.2	12.1	
12-Nov	4.6	4.5	3.8	2.4	1.1	0.8	0.9	1.2	2.2	2.6	3.7	4.7	5.2	6.2	5.8	5.4	3.5	2.3	1.9	1.0	0.1	-0.9	-1.4	-1.4	2.5	6.2	
13-Nov	-0.9	-1.9	-2.7	-3.2	-3.7	-4.1	-4.2	-4.2	-4.0	-1.4	0.4	0.8	1.9	3.2	4.5	3.8	2.5	0.7	-0.3	-1.1	-2.0	-2.1	-2.2	-1.3	-0.9	4.5	
14-Nov	-0.9	-1.0	-0.6	-0.5	-0.4	-0.1	1.2	1.5	1.4	1.8	3.6	6.2	6.8	7.3	7.2	6.8	6.5	5.9	5.7	5.2	4.6	4.3	3.9	3.5	3.3	7.3	
15-Nov	3.0	2.4	1.7	1.7	1.2	0.7	0.5	0.2	0.0	0.6	2.0	3.8	5.1	6.2	6.5	4.9	2.2	2.1	0.9	-0.7	-2.0	-2.9	-3.1	-3.9	1.4	6.5	
16-Nov	-5.2	-5.8	-6.8	-7.2	-7.5	-7.7	-8.2	-8.6	-8.3	-7.2	-4.3	-2.1	-0.4	-0.5	-1.7	-2.1	-2.8	-3.2	-3.9	-4.3	-4.6	-4.6	-4.6	-5.1	-4.9	-0.4	
17-Nov	-6.2	-7.1	-7.2	-7.1	-7.4	-8.1	-8.6	-10.1	-9.2	-8.3	-7.2	-6.7	-6.6	-6.2	-6.2	-6.7	-7.1	-7.7	-8.1	-8.0	-8.0	-8.8	-10.2	-11.1	-7.8	-6.2	
18-Nov	-11.7	-11.9	-11.6	-11.2	-11.4	-11.6	-11.4	-11.1	-11.0	-11.3	-10.9	-9.5	-8.9	-8.9	-8.9	-8.9	-9.5	-10.2	-10.2	-10.3	-11.0	-10.9	-10.9	-10.9	-10.6	-8.9	
19-Nov	-10.9	-11.4	-11.4	-11.8	-11.8	-11.7	-11.7	-11.7	-11.6	-11.4	-11.2	-11.1	-10.7	-10.2	-9.8	-9.7	-9.8	-9.4	-9.3	-9.4	-9.3	-9.4	-9.4	-9.4	-10.6	-9.3	
20-Nov	-8.8	-9.0	-8.5	-9.5	-11.1	-10.1	-9.5	-9.1	-8.6	-7.6	-7.1	-6.4	-5.8	-5.4	-5.1	-5.1	-5.0	-5.1	-4.9	-4.9	-4.7	-4.5	-4.3	-4.2	-6.8	-4.2	
21-Nov	-4.4	-4.3	-3.6	-3.4	-2.9	-2.6	-2.5	-2.5	-2.4	-2.3	-2.2	-2.2	-2.2	-1.8	-1.6	-1.7	-1.9	-1.9	-2.8	-3.6	-3.7	-4.2	-4.8	-5.3	-2.9	-1.6	
22-Nov	-5.5	-5.7	-5.9	-6.1	-6.1	-6.0	-6.0	-6.0	-6.0	-5.6	-5.3	-5.2	-5.0	-4.8	-4.5	-4.3	-4.1	-3.9	-3.7	-3.7	-3.6	-3.6	-3.6	-3.9	-4.9	-3.6	
23-Nov	-3.7	-3.3	-2.8	-2.0	-2.0	-2.0	-1.5	-1.5	-1.5	-1.3	-1.1	-0.8	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.9	-0.9	-1.2	-0.4	
24-Nov	-0.9	-0.8	-0.8	-1.1	-1.3	-1.2	-1.1	-1.1	-1.0	-0.8	-0.4	-0.1	-0.2	0.1	0.3	0.3	0.3	-0.7	-2.8	-3.0	-3.2	-4.3	-5.2	-4.9	-4.0	-1.6	0.3
25-Nov	-3.4	-3.1	-2.4	-2.2	-2.1	-2.1	-2.0	-1.8	-0.7	-0.1	0.0	0.0	-0.2	-0.1	-0.3	-0.4	-0.5	-0.6	-0.6	-0.2	-0.3	-0.6	-0.7	-0.8	-1.0	0.0	
26-Nov	-0.9	-1.2	-1.4	-1.7	-2.1	-2.8	-2.7	-2.9	-4.2	-4.8	-3.8	-2.1	-1.7	-1.8	-2.3	-2.7	-3.0	-3.4	-3.7	-4.0	-4.2	-4.3	-4.4	-4.8	-3.0	-0.9	
27-Nov	-4.9	-5.3	-5.5	-5.5	-5.4	-5.9	-6.5	-6.6	-7.0	-6.9	-6.6	-6.4	-6.1	-5.8	-5.6	-5.5	-5.5	-5.4	-5.3	-5.1	-4.9	-4.8	-4.9	-4.9	-5.7	-4.8	
28-Nov	-4.6	-4.4	-4.2	-4.2	-4.1	-4.0	-3.9	-3.8	-3.6	-3.4	-3.0	-2.5	-2.2	-2.1	-2.2	-2.3	-2.7	-2.8	-2.9	-2.9	-3.0	-3.2	-3.2	-3.1	-3.3	-2.1	
29-Nov	-3.1	-3.1	-3.2	-3.4	-3.6	-3.8	-3.7	-3.6	-3.7	-3.5	-3.3	-3.5	-3.4	-3.6	-3.6	-3.6	-3.8	-4.2	-4.6	-4.8	-5.6	-5.3	-4.9	-4.8	-3.9	-3.1	
30-Nov	-5.1	-5.2	-5.3	-5.5	-5.6	-5.7	-5.7	-5.8	-6.0	-6.0	-5.9	-5.8	-5.7	-5.9	-5.8	-5.8	-5.7	-5.7	-5.5	-5.3	-5.2	-5.2	-5.1	-5.0	-5.6	-5.0	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	478	66.39	66.39
0 - 10	231	32.08	98.47
10 - 20	11	1.53	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) - %

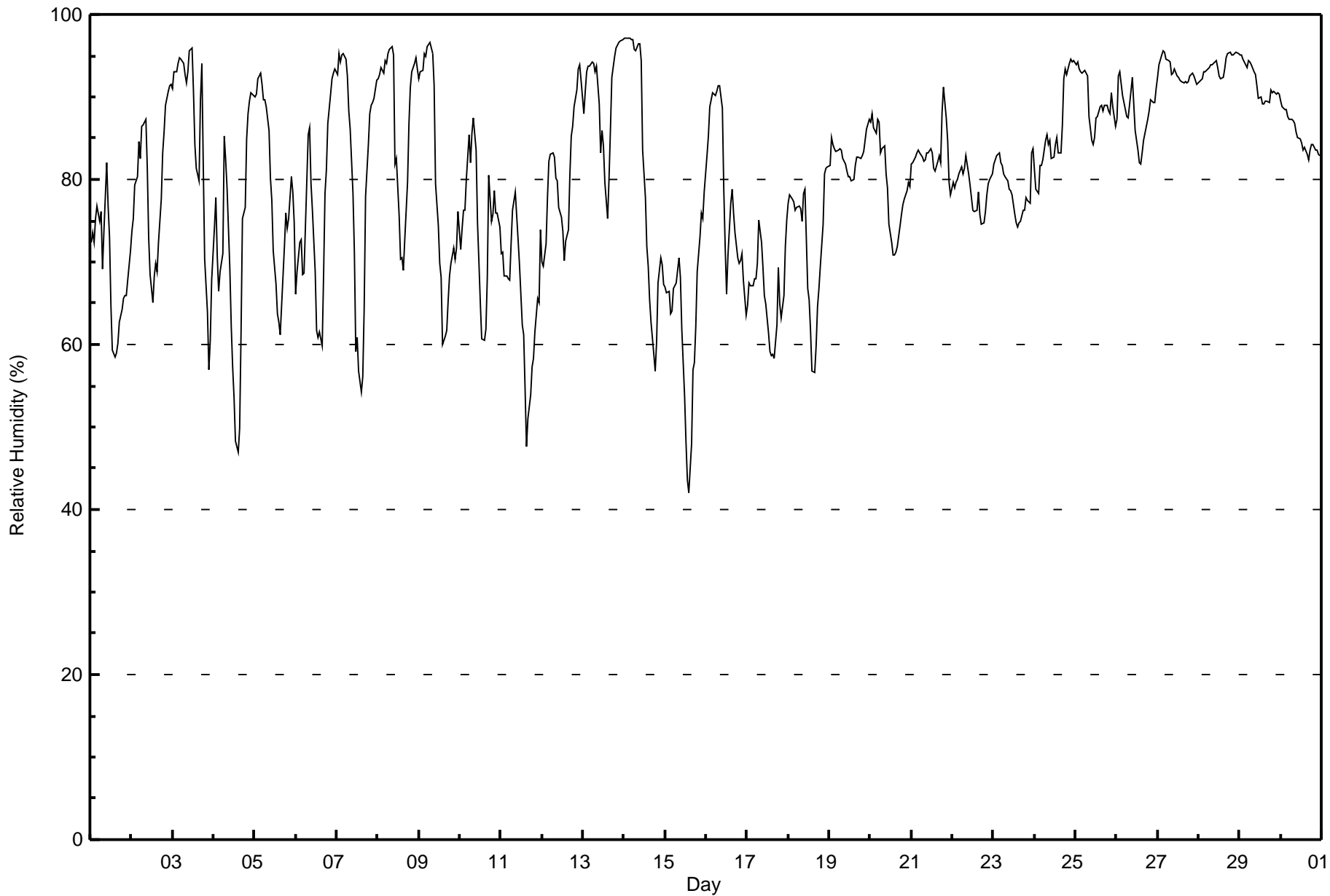
Fort McKay - Bertha Ganter - November 2016

Maximum Value: 97 % on Nov 14 03:00 Maximum Daily Average: 93.8 % on Nov 28																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 42 % on Nov 15 15:00 Minimum Daily Average: 63.1 % on Nov 15 Maximum Diurnal Average: 85.9 % at hour 8 Minimum Diurnal Average: 70.9 % at hour 15 Monthly Average: 80.4 % Percentiles: P ₁ = 50 P ₁₀ = 65 Q ₁ = 72 Median = 82 O ₃ = 90 P ₉₀ = 94 P ₉₉ = 97																										
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	72	74	72	75	77	75	76	69	74	82	77	73	65	59	58	59	60	63	64	66	66	66	68	71	69.2	82
2-Nov	74	75	79	80	85	83	86	87	87	81	73	68	65	68	70	69	72	78	83	86	89	91	91	92	79.7	92
3-Nov	91	93	93	94	95	95	94	93	92	93	96	96	91	84	81	80	90	94	82	70	64	57	61	68	85.2	96
4-Nov	74	78	71	66	69	71	85	82	79	69	62	57	54	48	47	50	61	75	77	85	88	89	91	90	71.6	91
5-Nov	90	90	92	93	92	90	90	89	86	80	77	71	67	64	63	61	65	72	76	74	75	80	78	75	78.8	93
6-Nov	66	69	72	73	68	69	80	85	86	80	76	69	62	61	62	60	69	78	81	87	90	92	93	93	75.9	93
7-Nov	93	95	94	95	95	95	93	88	86	78	71	59	61	57	54	56	64	78	84	88	89	89	90	92	81.1	95
8-Nov	92	93	93	93	94	94	95	96	96	95	82	83	76	70	71	69	73	80	87	91	93	94	95	93	87.4	96
9-Nov	92	93	93	95	95	96	97	96	95	91	80	74	70	68	60	61	62	65	68	70	72	70	72	76	79.7	97
10-Nov	72	74	76	76	80	85	82	86	88	84	75	70	65	61	61	62	68	80	75	76	79	76	76	74	75.0	88
11-Nov	71	71	68	68	68	68	72	76	78	76	73	70	62	61	55	48	51	54	57	58	62	66	65	74	65.5	78
12-Nov	70	69	72	78	82	83	83	83	80	80	77	75	74	70	73	74	81	85	86	89	91	93	94	92	80.6	94
13-Nov	88	91	93	94	94	94	94	93	94	89	83	86	84	80	75	80	86	92	95	96	96	97	97	97	90.3	97
14-Nov	97	97	97	97	97	97	96	96	97	96	94	84	78	72	69	65	63	59	57	60	67	71	70	67	81.0	97
15-Nov	67	66	67	64	64	67	67	69	71	68	62	54	48	44	42	48	57	58	62	69	73	76	75	78	63.1	78
16-Nov	83	85	89	90	91	90	91	91	91	89	79	72	66	71	77	79	76	74	71	70	70	71	68	64	79.0	91
17-Nov	65	67	67	67	68	68	70	75	72	69	66	65	61	59	59	59	58	62	69	65	63	66	72	75	66.2	75
18-Nov	77	78	78	77	76	77	77	76	75	78	79	67	65	62	57	57	60	65	67	70	75	81	81	82	72.3	82
19-Nov	82	85	84	84	83	84	84	84	83	82	81	80	80	80	80	82	83	83	83	83	83	85	86	87	82.9	87
20-Nov	87	88	86	86	87	87	83	84	84	81	79	74	72	71	71	71	72	74	76	77	78	79	80	79	79.4	88
21-Nov	82	82	83	83	84	83	83	82	82	83	83	84	83	81	81	82	83	82	88	91	87	85	80	78	83.2	91
22-Nov	80	79	80	80	81	82	81	81	83	81	79	78	76	76	76	79	76	75	75	76	78	79	80	81	78.7	83
23-Nov	82	82	83	83	82	82	81	80	80	79	79	78	76	75	74	75	76	76	76	78	78	77	83	84	79.0	84
24-Nov	81	79	78	82	82	82	85	85	84	85	83	83	84	85	83	83	87	92	93	93	94	95	94	94	86.1	95
25-Nov	94	94	93	93	93	93	93	93	88	85	84	85	88	88	89	89	88	89	89	88	88	91	89	87	89.5	94
26-Nov	87	92	93	90	89	88	88	87	91	92	89	86	84	82	82	83	85	86	87	88	90	89	89	91	87.9	93
27-Nov	92	94	95	96	95	95	94	94	93	93	93	93	92	92	92	92	92	92	92	92	93	93	92	92	93.0	96
28-Nov	92	92	92	93	93	93	94	94	94	94	94	94	92	92	92	93	95	95	95	95	95	95	95	95	93.8	95
29-Nov	95	95	95	94	93	94	94	94	93	93	91	90	90	89	89	89	89	89	91	91	91	90	90	90	91.7	95
30-Nov	89	89	89	89	88	87	87	87	87	86	85	85	84	83	84	83	82	84	84	84	84	84	83	83	85.4	89
82.6 83.7 84.0 84.3 84.7 84.9 85.8 85.9 85.6 83.7 80.1 76.7 73.9 71.8 70.9 71.3 74.1 77.7 79.0 80.2 81.3 82.2 82.6 83.2																								Diurnal Average		
97 97 97 97 97 97 97 96 97 96 96 96 92 92 92 93 95 95 95 96 96 97 97 97																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

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



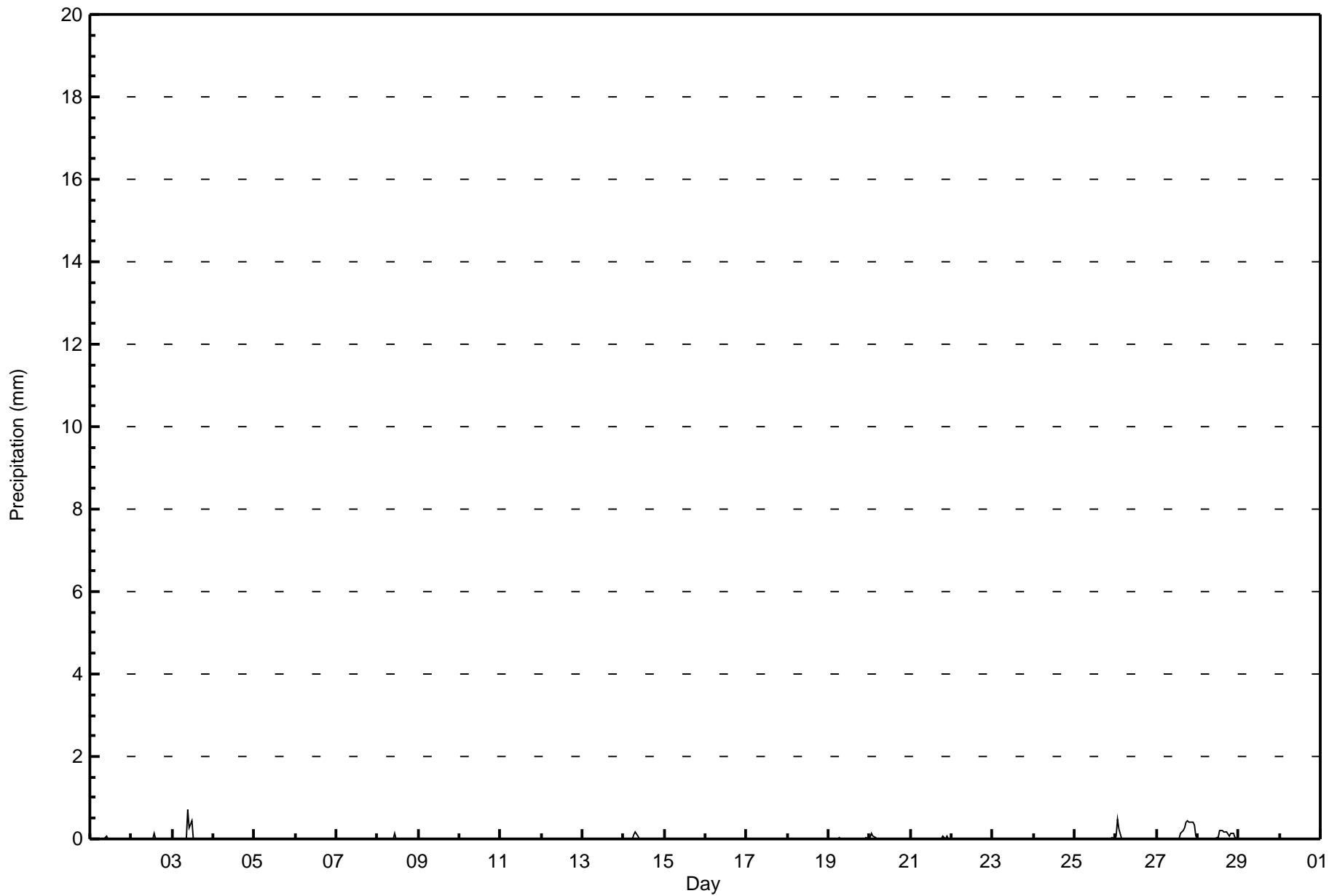


Maximum Value: 0.7 mm on Nov 3 10:00																			Maximum Daily Total: 3.1 mm on Nov 27																			Hours in Service: 720											
Minimum Value: 0.0 mm on Nov 1 01:00																			Minimum Daily Total: 0.0 mm on Nov 4																			Hours of Data: 719											
Maximum Diurnal Total: 0.8 mm at hour 10																			Minimum Diurnal Total: 0.0 mm at hour 5																			Hours of Missing Data: 1											
Monthly Total: 8.08 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 = 0.4																			Hours of Calibration: 0											
																																						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-Nov	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1																							
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	0.1	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																						
3-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.7																							
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																						
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																						
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																						
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																						
8-Nov	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1																						
9-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																						
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																						
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																						
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																						
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																						
14-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	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	0.4	0.2	0.4																						
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																						
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																						
17-Nov	0.0	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																						
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																						
19-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1																						
20-Nov	0.1	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	0.3	0.1	0.3																						
21-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	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1																						
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																						
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																						
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																						
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	0.0	0.1	0.0	0.1	0.1	0.1																						
26-Nov	0.1	0.5	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	0.0	0.0	0.0	0.0	0.0	0.8	0.5	0.8																						
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	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.1	3.1	0.4	3.1																						
28-Nov	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	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	1.5	0.2	1.5																						
29-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																						
30-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																						
																								0.1	0.6	0.3	0.1	0.0	0.0	0.2	0.2	0.1	0.8	0.4	0.5	0.1	0.3	0.4	0.4	0.4	0.6	0.5	0.6	0.5	0.6	0.5	0.1	Diurnal Average	
																								0.1	0.5	0.2	0.1	0.0	0.0	0.1	0.2	0.1	0.7	0.3	0.4	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.1	Diurnal Maximum	
M - Maintenance																																																	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

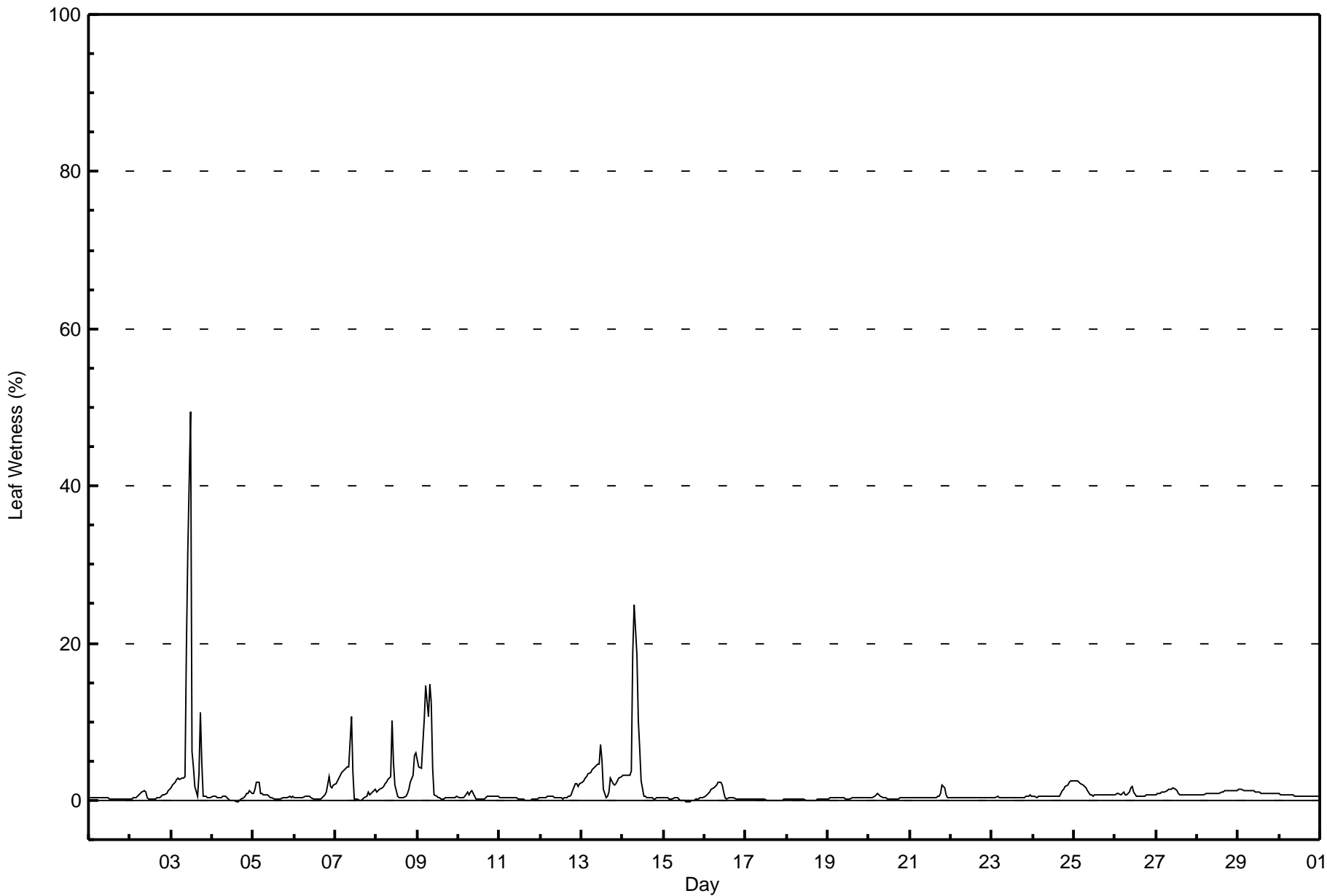
Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	711	98.89	98.89
0.4 - 0.5	7	0.97	99.86
0.6 - 0.7	1	0.14	100.00
0.8 - 1.4	0	0.00	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



Maximum Value: 50 % on Nov 3 12:00																	Maximum Daily Average: 6.5 % on Nov 3																	Hours in Service: 720	
Minimum Value: 0 % on Nov 15 15:00																	Minimum Daily Average: 0.1 % on Nov 17																	Hours of Data: 720	
Maximum Diurnal Average: 2.5 % at hour 10																	Minimum Diurnal Average: 0.3 % at hour 16																	Hours of Missing Data: 0	
Monthly Average: 1.2 %																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 12																	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0									
2-Nov	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.6	1									
3-Nov	2	2	2	3	3	3	3	3	3	19	32	50	6	4	2	1	3	11	5	1	0	0	0	6.5	50										
4-Nov	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1										
5-Nov	1	1	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2										
6-Nov	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	3	2	2	0.7	3										
7-Nov	2	3	3	3	3	4	4	4	4	11	4	0	0	0	0	0	0	0	1	1	1	1	1	2.2	11										
8-Nov	1	1	1	2	2	2	2	3	3	10	5	2	0	0	0	0	0	1	1	1	2	3	6	2.3	10										
9-Nov	5	4	4	7	10	15	11	15	12	4	1	0	0	0	0	0	0	0	0	0	0	0	0	3.9	15										
10-Nov	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0.5	1										
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	0.2	0										
12-Nov	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	2	0.7	2										
13-Nov	2	3	3	3	3	4	4	4	4	5	5	7	5	1	0	1	1	3	2	2	2	3	3	3.0	7										
14-Nov	3	3	3	3	3	4	19	25	18	10	7	3	1	0	0	0	0	0	0	0	0	0	0	4.4	25										
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	1	1	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0.8	2										
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	0.1	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	0.1	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	0.3	0										
20-Nov	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1										
21-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0.5	2										
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	0.3	0										
23-Nov	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										
24-Nov	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	2	2	3	3	0.9	3										
25-Nov	3	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	3										
26-Nov	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0.8	2										
27-Nov	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2										
28-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										
29-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										
30-Nov	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										
1.0																	1.0																	Diurnal Average	
5																	4																	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	238	33.90	33.90
0.4 - 0.5	158	22.51	56.41
0.6 - 0.7	75	10.68	67.09
0.8 - 1.4	108	15.38	82.48
1.5 - 10	103	14.67	97.15
> 10	15	2.14	99.29

Total Number of Valid Hours: 702

Total Number of Hours: 720

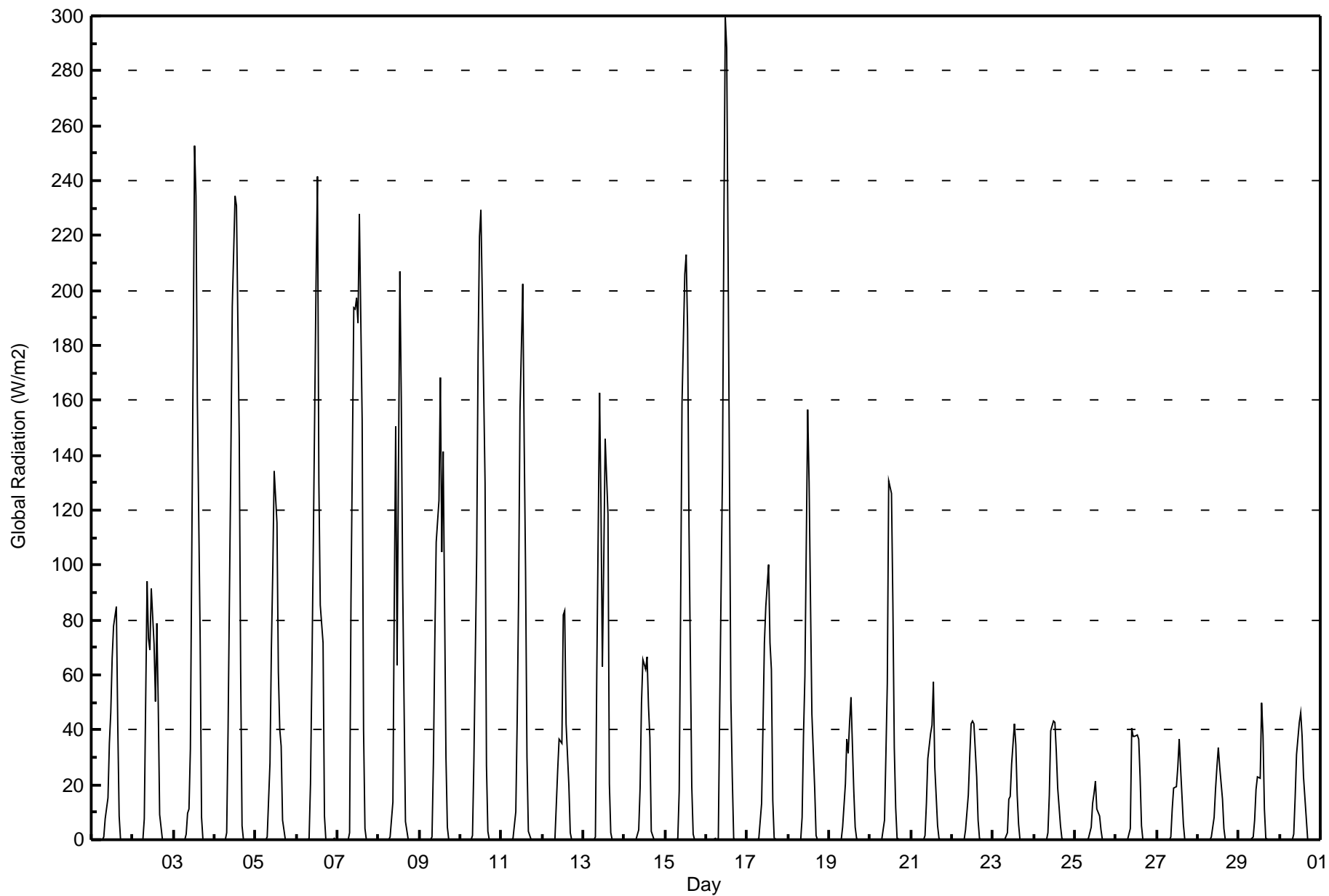


Maximum Value: 300 W/m2 on Nov 16 12:00																			Maximum Daily Average: 53.7 W/m2 on Nov 7						Hours in Service: 720	
Minimum Value: 0 W/m2 on Nov 1 02:00																			Minimum Daily Average: 3.4 W/m2 on Nov 25						Hours of Data: 720	
Maximum Diurnal Average: 116.1 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 3						Hours of Missing Data: 0	
Monthly Average: 23.3 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 19 P ₉₀ = 85 P ₉₉ = 229						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	1	8	15	35	46	66	78	85	42	9	0	0	0	0	0	0	0	16.1	85
2-Nov	0	0	0	0	0	0	0	8	94	73	69	92	71	50	79	49	9	0	0	0	0	0	0	0	24.8	94
3-Nov	0	0	0	0	0	0	0	2	10	11	33	176	253	235	160	73	8	0	0	0	0	0	0	0	40.0	253
4-Nov	0	0	0	0	0	0	0	3	41	140	194	214	234	231	146	62	5	0	0	0	0	0	0	0	52.9	234
5-Nov	0	0	0	0	0	0	0	1	28	70	98	134	116	61	40	34	7	0	0	0	13	0	0	0	24.5	134
6-Nov	0	0	0	0	0	0	0	1	21	61	107	204	242	130	86	71	9	0	0	0	0	0	0	0	38.8	242
7-Nov	0	0	0	0	0	0	0	2	88	194	193	197	188	228	152	40	4	0	0	0	0	0	0	0	53.7	228
8-Nov	0	0	0	0	0	0	0	1	14	87	150	64	207	161	94	49	6	0	0	0	0	0	0	0	34.7	207
9-Nov	0	0	0	0	0	0	0	1	28	72	108	124	168	105	141	30	5	0	0	0	0	0	0	0	32.6	168
10-Nov	0	0	0	0	0	0	0	1	29	104	177	220	230	198	129	27	3	0	0	0	0	0	0	0	46.6	230
11-Nov	0	0	0	0	0	0	0	0	10	44	88	156	202	145	98	30	3	0	0	0	0	0	0	0	32.4	202
12-Nov	0	0	0	0	0	0	0	0	13	26	37	35	82	84	42	20	2	0	0	0	0	0	0	0	14.2	84
13-Nov	0	0	0	0	0	0	0	1	62	163	120	63	103	146	119	21	2	0	0	0	0	0	0	0	33.3	163
14-Nov	0	0	0	0	0	0	0	0	4	19	50	66	62	66	49	37	3	0	0	0	0	0	0	0	14.8	66
15-Nov	0	0	0	0	0	0	0	1	18	84	158	206	213	186	115	19	2	0	0	0	0	0	0	0	41.8	213
16-Nov	0	0	0	0	0	0	0	0	48	135	224	300	289	212	51	23	1	0	0	0	0	0	0	0	53.5	300
17-Nov	0	0	0	0	0	0	0	1	13	42	72	85	100	71	62	14	1	0	0	0	0	0	0	0	19.2	100
18-Nov	0	0	0	0	0	0	0	0	8	38	59	156	130	87	46	19	1	0	0	0	0	0	0	0	22.7	156
19-Nov	0	0	0	0	0	0	0	0	5	20	37	32	42	52	18	4	0	0	0	0	0	0	0	0	8.8	52
20-Nov	0	0	0	0	0	0	0	0	7	31	57	131	126	85	33	12	0	0	0	0	0	0	0	0	20.1	131
21-Nov	0	0	0	0	0	0	0	0	1	13	29	38	42	58	27	5	0	0	0	0	0	0	0	0	8.9	58
22-Nov	0	0	0	0	0	0	0	0	3	16	30	42	43	42	23	7	0	0	0	0	0	0	0	0	8.6	43
23-Nov	0	0	0	0	0	0	0	0	2	15	16	27	42	35	16	6	0	0	0	0	0	0	0	0	6.6	42
24-Nov	0	0	0	0	0	0	0	0	3	16	40	43	43	32	19	5	1	0	0	0	0	0	0	0	8.4	43
25-Nov	0	0	0	0	0	0	0	0	1	4	13	17	21	11	9	4	0	0	0	0	0	0	0	0	3.4	21
26-Nov	0	0	0	0	0	0	0	0	4	41	38	38	38	37	23	5	0	0	0	0	0	0	0	0	9.3	41
27-Nov	0	0	0	0	0	0	0	0	1	11	19	19	27	37	26	6	0	0	0	0	0	0	0	0	6.1	37
28-Nov	0	0	0	0	0	0	0	0	1	8	18	27	33	26	15	4	0	0	0	0	0	0	0	0	5.5	33
29-Nov	0	0	0	0	0	0	0	0	1	7	18	23	23	50	38	11	0	0	0	0	0	0	0	0	7.2	50
30-Nov	0	0	0	0	0	0	0	0	2	15	31	43	46	38	23	8	0	0	0	0	0	0	0	0	8.6	46
																			0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.8 18.8 52.5 77.3 100.6 116.1 99.2 65.4 24.6 2.8 0.0 0.0 0.0 0.0 0.0 0.0 0.0						Diurnal Average	
																			0 0 0 0 0 0 0 8 94 194 224 300 289 235 160 73 9 0 0 0 0 0 0 0						Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	543	75.42	75.42
21 - 100	119	16.53	91.94
101 - 300	58	8.06	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

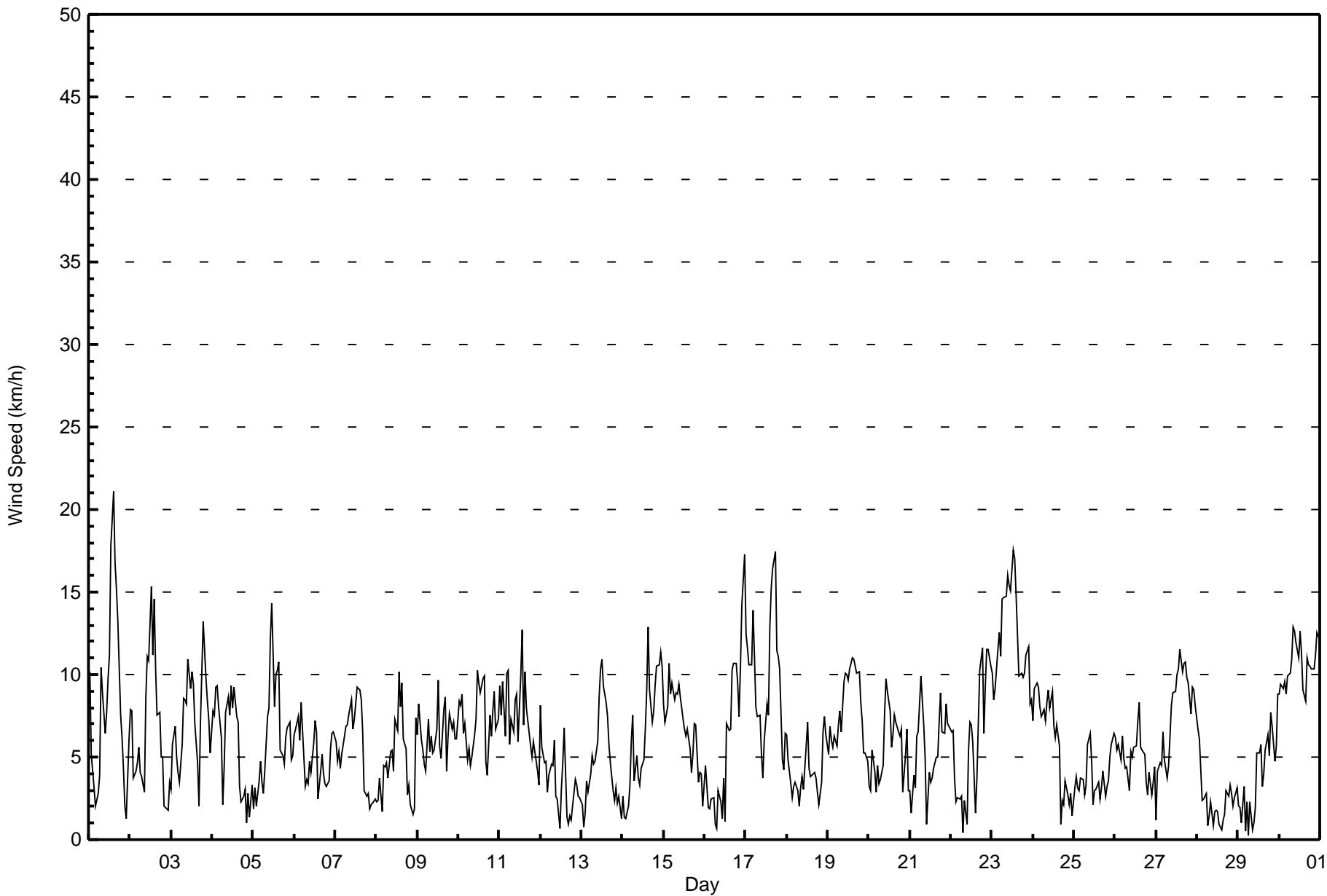


Maximum Speed: 21 km/h on Nov 1 15:00	Maximum Daily Speed Average: 12.1 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 29 07:00	Minimum Daily Speed Average: 0.5 km/h on Nov 25	Hours of Data: 720
Maximum Diurnal Speed Average: 4.4 km/h at hour 12	Minimum Diurnal Speed Average: 1.6 km/h at hour 19	Hours of Missing Data: 0
Monthly Average Velocity: 2.6 km/h 203.8 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 6 Q ₃ = 8 P ₉₀ = 11 P ₉₉ = 17	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	NNW10	NNW5	NNW4	NNW3	W2	SSW3	SW4	W10	NNW9	NW6	WNW8	WNW10	NNW11	NW18	NW21	NW17	NW15	NW13	NNW8	NNW6	N4	W2	WNW1	ESE6	NW6.9	NW21
2-Nov	SE8	SSE8	SSE4	SE4	SE5	SSE6	SSE4	SSE4	SSE3	SSE9	S11	SSE11	S15	S11	S15	S10	S8	S8	W5	WNW5	S2	SW2	SSW2	W3	S5.8	S15
3-Nov	SSW3	SSW6	S7	SSW5	SW4	S4	S6	S9	S8	S8	SSE11	SSE9	SSE10	SSE9	S7	S5	S2	SSE7	S10	SSW13	SSW10	WSW8	SW7	SSE5	S6.8	SSW13
4-Nov	S8	SSE8	S9	SSW9	SSW8	S6	SSE2	S4	S8	S9	SSE8	SSE9	SSE8	S9	S7	S7	S3	SSW2	WSW3	NW3	W1	W3	SW1	SW3	S5.2	SSE9
5-Nov	SW2	WSW3	WSW2	SSW4	SSW5	SW4	SSW3	S4	S7	S8	SSE12	S14	SSE8	S10	S10	S11	SSW5	SSW5	SSE5	S6	S7	S7	SSW5	SSW5	S6.0	S14
6-Nov	SSW6	S7	S7	S6	SSW8	SSW7	NNW3	NW4	SSW3	SW5	WSW4	WSW6	SW7	SW7	SSW2	SSE4	S5	SSW4	S3	WSW3	SSE4	S5	SSW6	SSW6	SSW4.4	SSW8
7-Nov	S6	SSE5	S5	S4	S5	S6	S7	SSW7	S8	S8	SSE7	SSW7	SSE8	SSE9	SSE9	S9	S6	S3	NW3	NW3	NW2	NNW2	WNW2	NNW2	S4.4	SSE9
8-Nov	NW2	SW2	S4	SSW2	S4	S4	S5	S4	S5	S5	SE4	S7	SSE7	SSE10	S8	S10	S6	S5	SW3	SSW3	SSW2	SSW2	S2	S7	S4.4	SSE10
9-Nov	S6	S8	S6	S5	S5	SSW4	S7	S5	S6	S5	SW5	WSW7	W10	SW6	WSW5	W8	W9	WSW4	W6	W8	W7	WSW7	SW6	WSW6	SW4.9	W10
10-Nov	W8	WSW8	W9	WSW6	SSE7	SSW5	W6	SSE4	S5	SSE6	SSE7	SSE10	SSE10	SSE9	S10	SSE10	SSE5	SE4	SSE8	SSE6	SSE8	SSE9	S7	S7	S5.7	SSE10
11-Nov	S9	SSE8	S10	S6	S10	S10	S6	S7	S7	S8	S9	S6	S10	SSE13	SSW7	SSW10	S8	SSW6	SSW6	SSW5	SSW6	WSW5	SW4	SW3	S7.1	SSE13
12-Nov	WSW8	WSW6	SSW5	SSW5	SW3	SSW4	S5	SSW5	S6	SW3	SW2	SW1	W3	S5	S7	SW1	SW1	WNW1	W1	SSE2	SSE4	SSE3	SSW3	SSW3	SSW3.0	WSW8
13-Nov	WSW2	S1	S2	S4	S3	S4	S5	S5	S5	S6	S9	SSE10	S11	SSE9	SSE8	S7	SW6	SW5	SSW3	SW2	S3	WSW2	SSW3	SSE1	S4.5	S11
14-Nov	WNW3	WSW1	SSW1	SW2	SSW3	SSE6	S8	S4	S5	SSE4	SSW3	SW4	SW5	WSW7	W9	WNW13	W9	W7	W8	W9	W10	WSW11	WSW11	W11	WSW5.1	WNW13
15-Nov	W8	WNW7	WNW8	W11	WSW9	W9	W8	W9	W9	W9	WSW9	WSW7	WSW7	WSW6	SW7	WSW5	SW4	WSW5	WNW7	WNW7	WNW3	WNW4	WNW4	WNW2	W6.6	W11
16-Nov	WNW5	WNW3	W2	SW2	W2	S3	S1	SE1	SW3	NW2	ESE1	SSE4	ESE1	NNE7	NNE7	N10	N11	N11	N10	N7	N11	N14	NNW17	N4.2	NNW17	
17-Nov	NNW12	NW12	NNW11	NNW11	NNW14	NW11	WNW8	WNW7	WNW8	WNW5	W4	W6	WNW8	W8	WNW13	WNW15	WNW16	NW17	NW11	NW11	NW10	WNW5	W4	WNW6	NW9.2	NW17
18-Nov	W6	WNW5	W3	WSW3	WSW3	W3	WSW3	WSW2	W3	WNW4	WNW3	W6	N7	NNW4	NW4	SSW4	SSW4	SSW4	SW3	WNW2	NW3	NNW7	NNW7	N6	WNW2.8	NNW7
19-Nov	N5	N7	N6	NNW6	N6	N6	N7	N8	N7	N10	NNW10	N10	N10	NNW10	N11	NNW11	N11	N10	N10	N8	NNW7	NNW5	N5	NNW5	N7.9	N11
20-Nov	NE3	NNE3	E5	E4	NNE3	E4	ESE3	ESE4	ESE5	SSE8	SSE10	SSE9	SSE8	S6	SSE6	SSE8	SSE7	SE7	SE6	SE7	SSE3	SE5	ESE7	E3	SE4.5	SSE10
21-Nov	N3	NE2	ESE4	ESE3	SE6	SSE7	S10	S8	S7	S5	WSW1	WNW4	W3	WNW4	WNW4	WNW5	WNW5	NW7	N9	N6	N6	N8	N7	N7	NNW0.8	S10
22-Nov	N7	N7	N4	E2	NNW3	N2	SSW3	SSW0	NNW2	ESE1	SE5	SE7	SE7	SSE6	SE2	SE4	S7	SSE10	SSE12	S6	SSE9	SSE12	SE12	SE11	SE3.7	SSE12
23-Nov	SE10	SE8	SE9	SSE12	SSE13	SSE11	SSE15	SSE15	SSE15	SSE16	SSE15	SSE15	SSE18	SSE17	SSE15	SSE12	SSE10	SSE10	SSE10	S11	S12	S8	S9	SSE12.1	SSE18	
24-Nov	S7	S9	S9	S9	S8	S7	SSE8	S7	S8	SSE9	S8	SSW9	SSW7	S6	SSE7	SSW6	S1	NNE2	N2	NW4	NW3	NNW2	SE3	NW1	S4.8	S9
25-Nov	N3	NE4	NE3	ENE3	NE4	N4	N3	SE3	SE6	SSE6	SE5	ENE2	NNW3	NW3	NNW3	WNW2	W3	WNW4	WSW3	SW3	SW4	SW5	WSW6	WSW6	W0.5	SSE6
26-Nov	SW6	SW5	SW6	WSW5	SW6	SSW5	SSW4	SSW4	S3	S5	S5	S6	SW6	S7	S8	SSW6	SSW5	SW5	SW3	SW3	SW4	WSW3	SSW4	SSW4	SSW4.7	S8
27-Nov	S1	NW4	NW5	NNW5	N6	E5	NE4	N4	N6	NNW8	NNW9	N9	N10	NNW10	N12	NNW10	NNW11	NNW11	N10	N10	NNW8	NNW9	NNW9	NNW8	NNW7.1	N12
28-Nov	NNW7	NNW6	NW4	W2	W2	W3	W1	S1	S2	SW1	SSW2	SE2	ESE2	ESE1	SE1	E1	NNW2	WNW3	NNW3	NNW3	NNW3	N2	WNW3	WNW3	NW1.3	NNW7
29-Nov	NW2	SW2	SW1	W3	ENE1	WNW2	N0	SSE2	NW1	SW1	SSW2	SSE5	SSE5	S6	SSW3	SSW4	S5	S6	SSW5	SSW8	SSW7	SSE5	SSE6	SSE9	S3.1	SSE9
30-Nov	S9	S9	S9	S10	S9	SSE10	SSE10	SSE11	SSE13	SSE13	S12	SSE11	SSE13	SSE11	SSE9	S8	S11	S11	S11	S10	S10	S11	S13	S12	S10.6	SSE13

WSW1.9 SW1.6SSW2.2SSW2.4SSW2.6 S3.1 S3.1 S3.2 S3.6 S3.9 S4.2 S4.4 S4.0 S3.8SSW3.1SSW3.1 SW2.6 SW2.2WSW1.6WSW2.0 SW1.9 SW2.0 SW2.0 SW1.9	Diurnal Average
NNW12 NW12 NW11 SSE12NNW14 NW11 SSE15 SSE15 SSE15 SSE16 SSE15 SSE15 SSE18 NW18 NW21 NW17WNW16 NW17 SSE12 SSW13 S11 S12 N14 NNW17	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 - November 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	328	45.56	45.56
6 - 11	348	48.33	93.89
12 - 19	43	5.97	99.86
20 - 28	1	0.14	100.00
29 - 38	0	0.00	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 McKay - Bertha Ganter - 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	13	3	6	3	6	11	14	24	51	50	39	21	22	28	18	19	328
6 - 11	35	4	0	0	0	2	10	66	107	22	11	19	27	13	7	25	348
12 - 19	2	0	0	0	0	0	1	19	7	1	0	0	0	4	6	3	43
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	50	7	6	3	6	13	25	109	165	73	50	40	49	45	32	47	720

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Nov 17 17:00																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Nov 28 13:00																									
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 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-Nov	3	2	1	1	1	1	2	4	3	2	2	4	5	5	3	5	3	3	2	2	1	1	1	2	5
2-Nov	1	2	1	2	1	2	1	2	2	4	3	3	4	3	4	2	2	3	2	2	1	1	1	1	4
3-Nov	2	1	1	1	1	2	1	2	2	2	3	3	2	2	2	1	1	2	3	4	3	3	3	2	4
4-Nov	2	2	2	2	2	2	1	1	3	2	2	2	2	2	2	1	2	1	1	1	1	2	1	1	3
5-Nov	1	2	1	1	1	2	2	1	2	2	2	3	2	2	2	2	2	1	2	2	2	2	3	2	3
6-Nov	2	2	2	3	3	2	2	1	1	2	2	3	3	3	2	1	1	1	1	1	1	3	1	1	3
7-Nov	1	1	1	1	2	1	1	1	1	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	2
8-Nov	1	1	2	1	2	1	2	2	1	2	1	2	2	2	2	2	1	1	2	1	1	1	2	2	2
9-Nov	2	2	2	2	3	2	2	3	2	2	2	3	4	2	2	2	3	3	3	2	2	3	2	2	4
10-Nov	3	3	3	3	2	2	3	2	1	1	1	2	2	2	2	2	1	1	1	1	2	2	2	2	3
11-Nov	2	2	2	1	2	2	1	2	2	2	2	2	2	4	3	3	2	2	2	1	2	2	2	2	4
12-Nov	3	2	2	1	1	2	2	2	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3
13-Nov	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1	1	1	1	1	2
14-Nov	1	1	1	1	1	2	2	2	2	2	2	2	3	5	4	3	3	3	3	3	4	4	4	5	5
15-Nov	3	3	3	4	4	4	3	3	3	4	3	3	3	2	3	3	1	2	2	3	2	2	2	1	4
16-Nov	2	2	1	1	1	1	1	1	1	1	1	1	1	3	2	2	3	3	3	3	2	2	5	4	5
17-Nov	2	2	2	2	3	2	2	1	2	1	2	2	3	3	5	4	6	3	3	2	2	2	2	1	6
18-Nov	2	2	1	1	1	1	1	1	1	1	1	2	2	3	2	2	1	1	1	1	1	2	1	2	3
19-Nov	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	2	2	2	1	1	2
20-Nov	1	1	1	1	1	1	1	1	2	2	3	2	2	2	1	2	1	1	2	1	2	2	1	1	3
21-Nov	1	1	1	1	1	2	2	2	2	1	1	2	1	1	1	1	2	2	3	2	2	2	2	2	3
22-Nov	1	2	2	2	1	1	1	1	1	2	1	1	1	1	1	1	2	2	3	2	3	3	2	2	3
23-Nov	2	2	2	3	3	3	3	3	3	3	3	3	4	4	3	3	3	3	2	2	4	3	3	2	4
24-Nov	2	2	2	2	2	1	1	1	2	2	2	3	2	2	2	2	1	1	1	2	1	1	1	1	3
25-Nov	1	1	1	1	1	2	1	2	1	2	2	1	1	1	1	0	1	1	1	1	2	2	2	3	3
26-Nov	3	2	2	2	2	1	2	1	1	1	1	2	3	3	2	2	2	2	1	1	2	1	2	1	3
27-Nov	2	1	2	1	1	1	1	2	2	3	3	2	2	2	2	2	1	1	1	2	1	1	1	1	3
28-Nov	1	1	2	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	1	2
29-Nov	1	0	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	2	2	1	2	2	2
30-Nov	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	3	3	2	2	3	3	3	3	3
Diurnal Maximum																									
3 3 3 4 4 4 3 4 3 4 3 4 5 5 5 5 6 3 3 4 4 4 5 5																									



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction (WD) - deg

Fort McKay - Bertha Ganter - November 2016

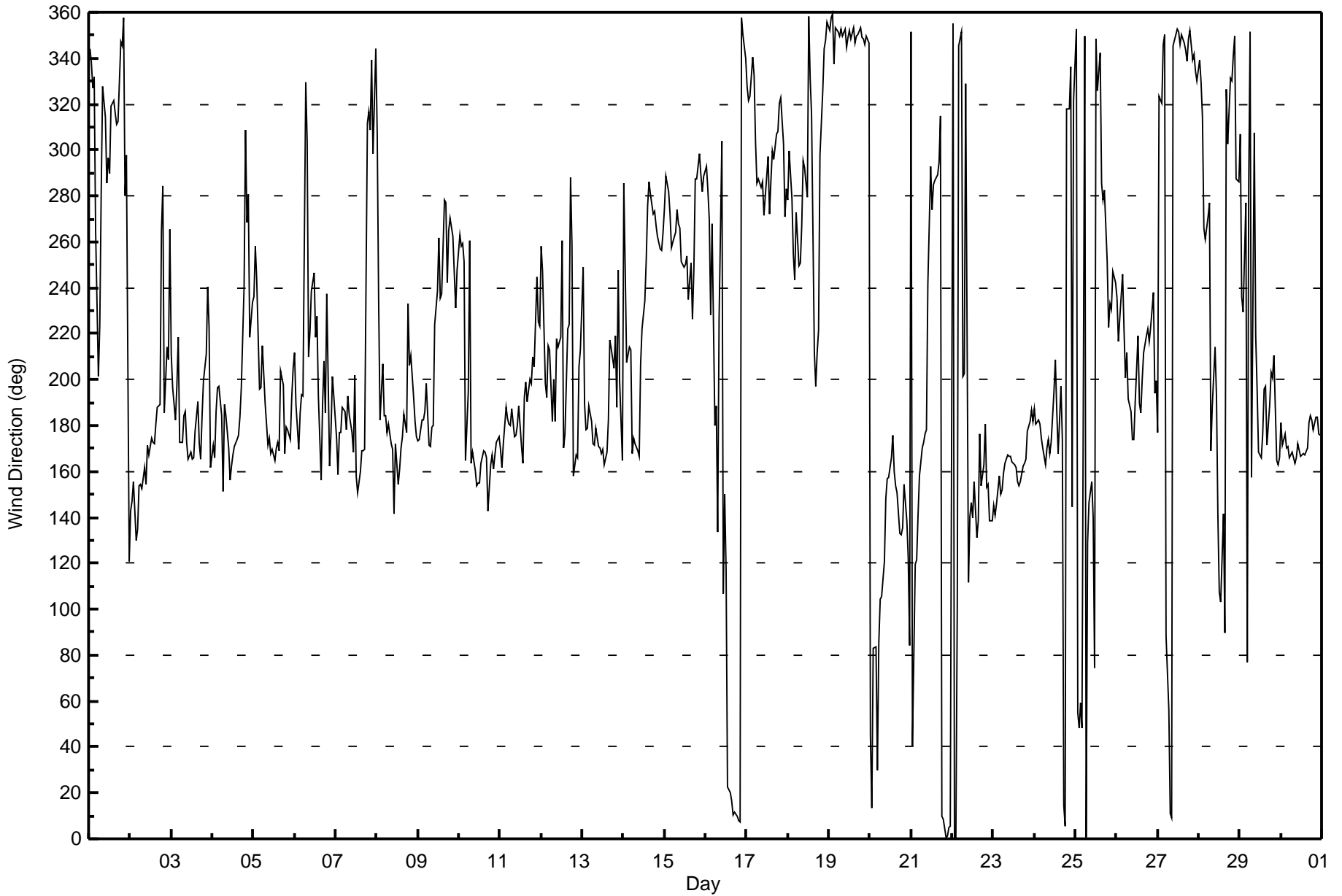
Direction of Maximum Speed: 322 deg on Nov 1 15:00 Direction of Maximum Daily Speed Average: 162.1 deg on Nov 23	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 351 deg on Nov 29 07:00 Direction of Minimum Daily Speed Average: 0.5 deg on Nov 25	Percent Operational Time: 100.0
Monthly Average Direction: 235.1 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-Nov	344	338	327	332	266	201	224	281	328	314	286	297	290	319	322	316	311	313	347	346	357	280	298	121	314.2
2-Nov	143	147	156	130	135	154	154	152	162	154	171	167	174	172	172	181	188	189	265	284	186	214	208	265	172.2
3-Nov	211	196	182	197	218	172	173	184	186	173	166	168	166	166	178	191	172	166	184	200	211	240	223	161	185.9
4-Nov	172	166	186	197	197	184	151	189	184	171	156	162	167	171	174	176	184	197	241	308	268	281	218	234	182.1
5-Nov	236	258	244	196	196	215	203	190	172	175	168	170	165	170	173	169	204	198	168	179	178	174	192	205	181.3
6-Nov	212	189	170	186	193	193	330	304	210	221	238	247	218	227	193	156	189	208	185	237	162	177	201	193	203.2
7-Nov	174	158	177	177	188	186	178	193	185	177	168	202	158	150	160	169	169	170	312	317	309	339	298	344	177.9
8-Nov	307	235	182	207	184	184	177	181	172	169	142	172	154	161	170	175	185	177	233	206	211	192	182	175	178.0
9-Nov	173	174	182	183	186	198	171	171	180	180	224	239	262	235	237	278	277	242	265	270	262	246	231	247	225.2
10-Nov	263	258	259	252	165	195	260	164	169	160	154	155	155	163	169	168	166	143	163	167	161	167	172	175	180.2
11-Nov	170	162	172	188	183	181	180	188	175	176	180	189	171	163	192	199	191	200	198	210	206	245	225	223	185.5
12-Nov	258	247	198	192	215	213	182	200	182	218	214	218	261	170	176	222	224	288	259	158	167	166	205	213	205.4
13-Nov	249	189	178	179	189	182	172	172	178	171	171	168	170	163	168	182	217	214	205	219	188	247	199	165	181.1
14-Nov	285	247	207	214	213	168	174	172	169	167	207	222	234	252	276	286	281	272	273	267	262	257	256	264	249.3
15-Nov	274	288	282	272	257	260	264	274	268	266	252	249	250	254	235	251	226	248	287	287	298	289	282	289	266.1
16-Nov	293	282	270	228	268	180	189	134	227	304	107	150	117	23	20	16	10	11	10	8	8	358	350	340	356.1
17-Nov	327	321	323	341	332	304	286	287	284	286	272	280	297	272	287	300	296	307	308	320	323	303	271	283	304.6
18-Nov	278	300	279	254	243	273	250	250	267	295	292	279	358	331	316	212	197	212	222	298	326	344	348	356	294.7
19-Nov	352	357	359	338	353	352	350	352	350	353	345	349	352	348	353	347	350	351	353	349	348	346	349	347	350.2
20-Nov	45	14	83	83	30	86	104	105	121	148	157	158	166	176	160	154	150	133	133	136	155	139	122	84	133.1
21-Nov	352	40	119	121	141	158	170	172	176	178	242	293	274	285	287	289	295	315	10	9	0	1	5	6	329.1
22-Nov	355	1	1	101	345	352	201	203	329	112	140	146	140	156	131	138	176	154	163	181	153	154	139	139	146.0
23-Nov	145	141	146	158	150	152	160	164	167	167	164	163	162	155	154	156	163	164	165	178	182	187	182	182	162.1
24-Nov	187	180	183	181	175	170	163	170	174	168	173	194	209	187	168	197	174	15	5	318	318	336	144	321	181.0
25-Nov	353	55	48	59	48	350	1	129	146	156	140	74	348	326	342	285	279	282	252	223	233	231	247	242	265.3
26-Nov	235	216	227	246	222	201	212	192	186	174	174	190	219	190	185	200	212	219	222	217	223	238	194	200	207.1
27-Nov	177	323	321	346	350	88	56	11	9	345	348	352	352	346	350	347	344	339	349	352	339	342	334	330	348.2
28-Nov	339	330	314	266	261	271	277	169	188	214	193	141	108	103	142	90	327	303	331	330	341	349	287	286	307.8
29-Nov	307	236	230	277	77	285	351	158	307	219	196	168	166	176	196	197	171	189	203	201	210	165	163	166	189.4
30-Nov	181	171	176	170	171	166	168	166	163	166	172	166	167	168	167	171	181	184	183	178	184	184	177	176	173.1

245.5 223.0 203.4 202.8 197.6 190.2 187.1 190.1 186.4 181.7 180.7 187.7 189.4 188.1 199.2 213.1 231.1 235.9 245.0 251.2 231.0 231.6 224.3 223.3

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 - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 96 deg on Nov 22 08:00			Hours of Data:	720
Minimum Value: 8 deg on Nov 3 03:00			Hours of Missing Data:	0
			Hours of Calibration:	0
			Percent Operational Time:	100.0
Percentiles: P ₁ = 9 P ₁₀ = 13 Q ₁ = 15 Median = 23 Q ₃ = 40 P ₉₀ = 53 P ₉₉ = 89				

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	11	23	25	49	45	37	42	27	35	31	21	20	27	14	14	15	12	14	18	20	18	44	63	15	63
2-Nov	15	12	31	39	25	13	15	34	51	20	17	16	14	15	16	13	14	26	31	58	42	50	49	21	58
3-Nov	26	14	8	16	13	67	15	15	12	15	14	17	13	16	22	30	63	9	17	21	31	43	48	41	67
4-Nov	11	12	15	19	22	31	68	27	18	16	13	16	18	15	14	13	47	39	41	42	80	30	76	29	80
5-Nov	55	38	52	25	34	35	47	34	20	14	13	12	15	15	13	14	25	33	50	21	18	9	47	48	55
6-Nov	26	19	15	36	23	35	59	30	47	41	60	50	41	43	37	16	10	28	44	41	30	26	11	16	60
7-Nov	17	11	15	18	18	19	14	14	13	12	21	23	18	11	13	11	16	33	27	28	51	62	49	41	62
8-Nov	51	59	33	67	17	29	28	50	26	15	17	15	22	12	13	12	16	16	48	27	64	58	66	16	67
9-Nov	15	13	29	26	48	65	22	26	44	33	44	50	41	40	51	22	22	46	31	28	38	42	35	32	65
10-Nov	41	34	35	65	27	41	57	48	35	16	12	12	13	16	13	12	20	27	11	22	13	13	18	19	65
11-Nov	13	15	13	14	12	13	15	16	15	14	13	22	19	15	43	23	21	25	25	32	23	41	51	42	51
12-Nov	43	48	48	15	37	50	22	33	21	60	59	81	76	45	21	90	80	54	60	69	38	32	51	60	90
13-Nov	66	90	62	20	41	16	19	14	27	24	15	13	13	14	13	19	12	18	49	44	41	45	49	82	90
14-Nov	33	77	78	46	31	23	16	40	18	43	53	42	49	45	38	18	22	31	38	34	37	41	41	43	78
15-Nov	30	29	25	29	49	45	41	27	34	45	50	53	51	44	47	40	26	39	33	31	51	45	34	53	53
16-Nov	30	31	57	58	24	28	83	75	29	44	92	27	90	34	36	29	18	18	19	17	15	15	16	15	92
17-Nov	9	9	9	11	10	16	12	13	16	20	45	31	28	39	23	15	16	10	17	10	11	28	20	15	45
18-Nov	19	32	31	53	40	24	40	74	41	22	21	33	27	46	62	41	19	28	35	49	31	14	15	15	74
19-Nov	12	13	18	15	13	14	15	11	12	13	11	13	13	13	13	11	11	12	12	13	15	18	17	15	18
20-Nov	35	31	18	19	27	24	20	28	26	16	22	18	21	27	19	16	13	13	14	13	54	24	13	31	54
21-Nov	24	63	19	32	14	15	13	12	11	15	62	13	45	38	20	15	23	15	20	17	16	18	17	17	63
22-Nov	12	18	60	67	28	55	24	96	30	91	18	16	14	15	81	25	14	17	15	15	20	15	14	11	96
23-Nov	14	17	16	16	16	15	13	12	13	14	13	13	13	14	13	14	14	13	12	13	16	14	16	17	17
24-Nov	15	13	14	14	13	14	12	12	12	12	17	23	27	30	15	28	87	35	55	43	35	53	48	77	87
25-Nov	32	40	50	47	44	39	53	67	15	17	25	42	29	36	18	17	23	12	29	32	41	31	45	44	67
26-Nov	50	30	40	47	32	21	37	40	39	15	9	19	36	27	25	23	30	33	40	47	44	55	32	29	55
27-Nov	93	30	52	29	18	20	48	36	22	14	16	14	13	11	14	12	13	9	12	11	10	11	10	11	93
28-Nov	10	10	14	25	25	24	56	54	18	45	35	36	31	64	87	47	30	14	25	20	15	24	18	24	87
29-Nov	67	23	53	27	86	24	81	49	82	63	57	27	21	17	28	22	17	27	21	22	29	25	15	17	86
30-Nov	17	14	13	13	14	13	13	14	13	14	14	15	14	14	12	16	16	15	14	14	16	16	13	13	17

93	90	78	67	86	67	83	96	82	91	92	81	90	64	87	90	87	54	60	69	80	62	76	82	
Diurnal Maximum																								



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 10, 2016	Last Calibration	October 24, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	13:45
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	813
Calculated slope	0.999646	0.999526	Chamber temp	45.0	45.2
Calculated intercept	1.482552	1.635588	Pressure	693.7	695.1
Analyzer Background	13.6	13.6	Flow	0.474	0.464
Analyzer Coefficient	0.934	0.934	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	5500	0.0	0.0	0.2	----
as found span	5500	81.3	734.7	731.3	1.005
calibrator zero	5500	0.0	0.0	0.1	----
high point	5500	81.3	734.7	734.2	1.001
second point	5500	45.6	412.1	410.2	1.005
third point	5500	22.8	206.0	202.4	1.018
as left zero	5500	0.0	0.0	0.5	----
as left span	5500	81.3	734.7	728.6	1.008
Average Correction Factor					1.008

Corrected As found 731.1 Previous response 733.4 % change 0.3%

Notes:

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



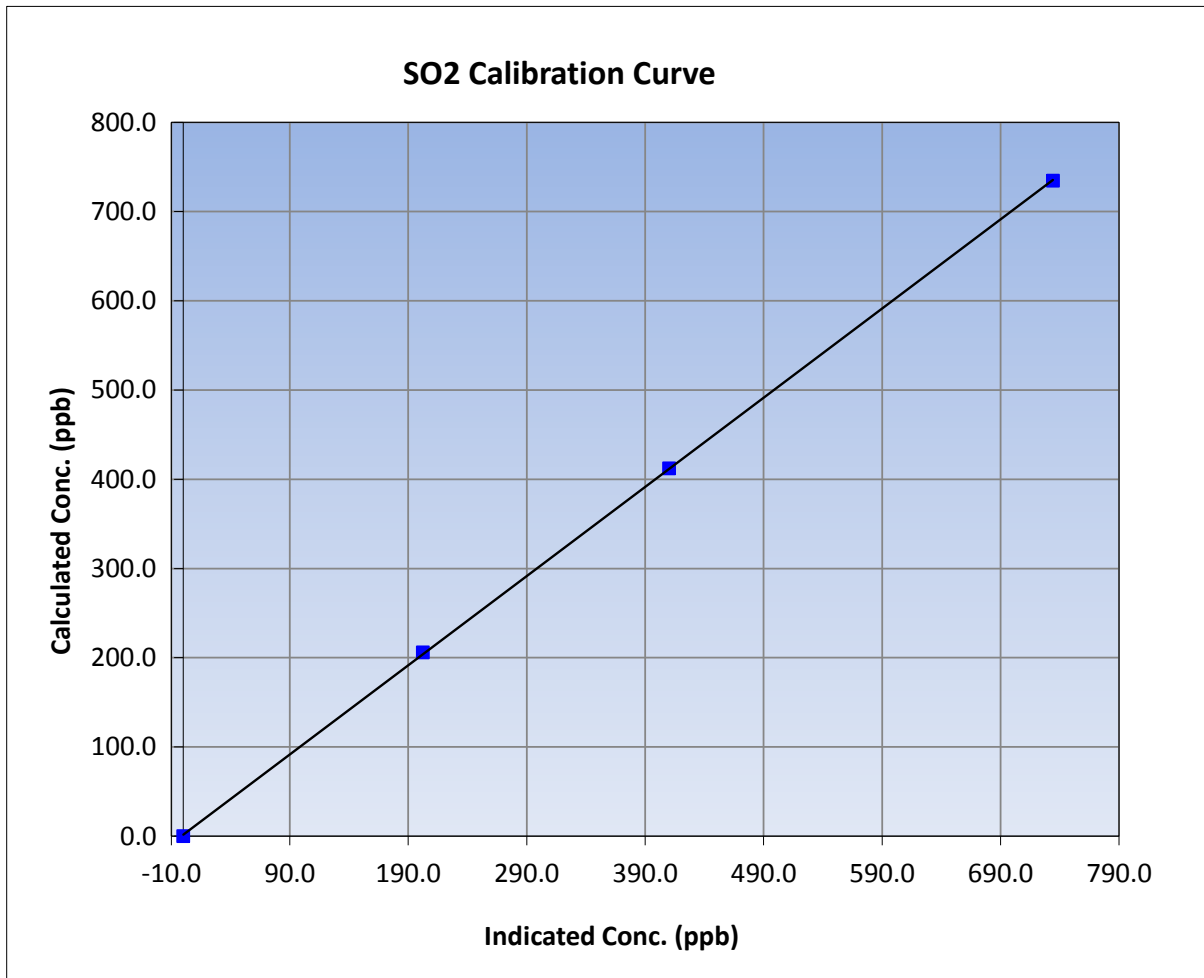
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 24, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	13:45
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

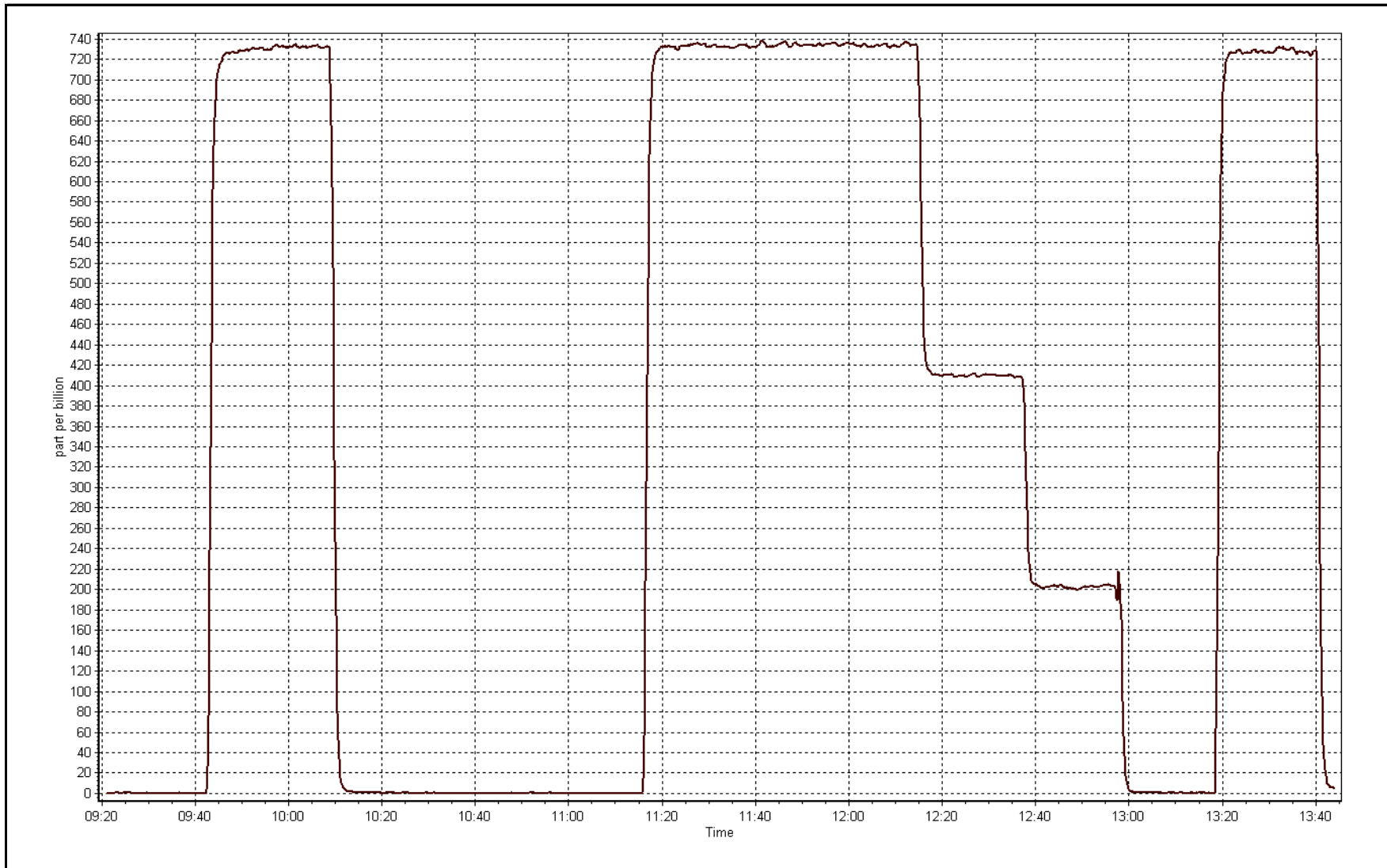
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999972
734.7	734.2	1.0006		
412.1	410.2	1.0046	Slope	0.999526
206.0	202.4	1.0180		
			Intercept	1.635588



SO2 Calibration Plot

Date: November 10, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 16, 2016	Last Calibration	October 25, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	12:50	End Time (MST)	16:00
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	-860
Analyzer IP address	192.168.1.44		Lamp voltage	1136	1137
Calculated slope	0.998949	1.004408	Chamber temp	45	45
Calculated intercept	-0.007800	-0.031622	Pressure	678.7	674.2
Analyzer Background	1.7	1.71	Flow	0.443	0.439
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	6000	0.0	0.0	-0.1	----
as found span	6000	91.1	75.0	74.3	1.010
SO2 scrubber check	5500	22.8	206.0	0.4	----
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	91.1	75.0	74.7	1.004
second point	6000	48.6	40.0	39.8	1.005
third point	6000	24.3	20.0	19.9	1.005
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	91.1	75.0	74.8	1.003
Average Correction Factor					1.004

Corrected As found	74.3	Previous response	75.1	% change	1.0%
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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



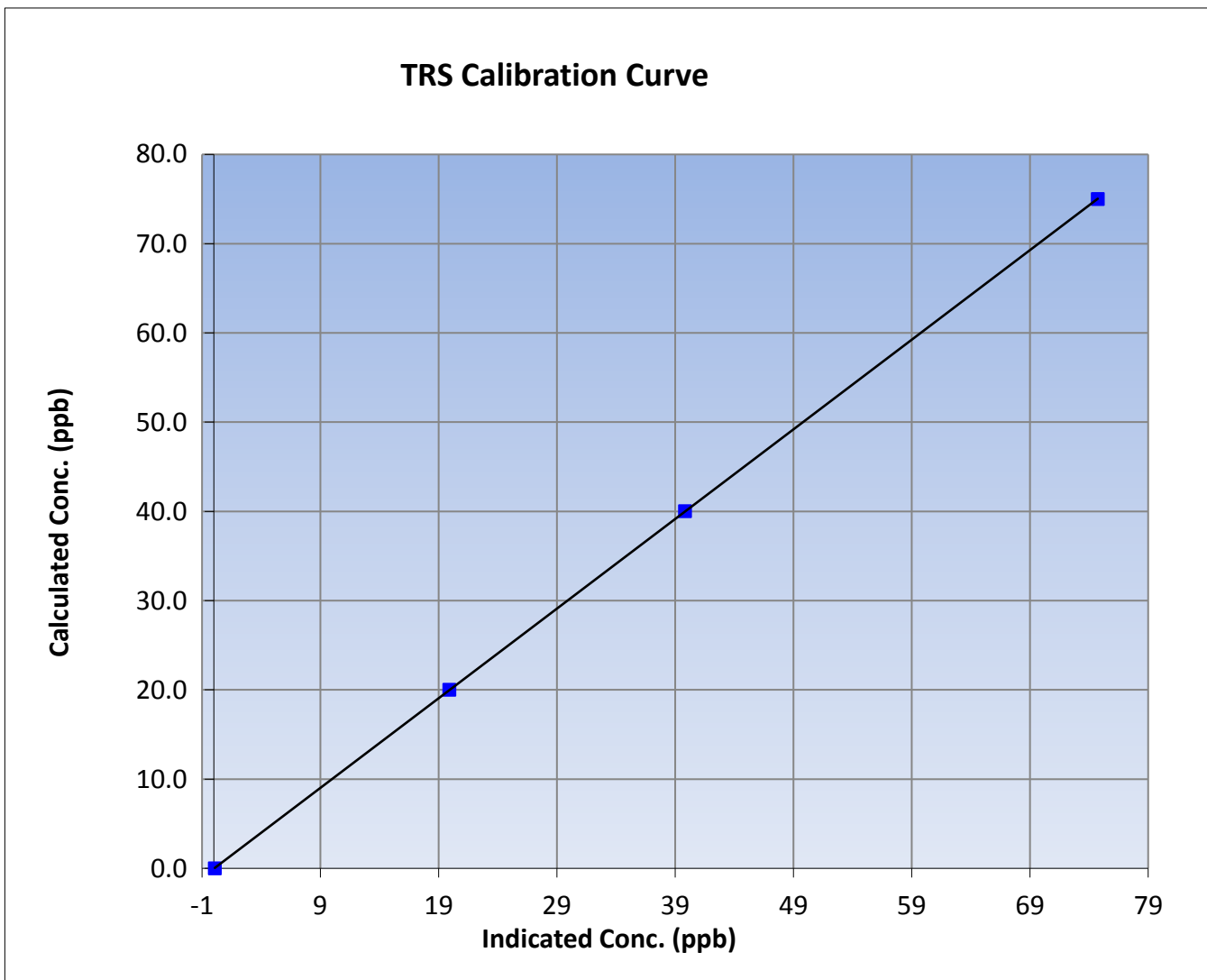
Wood Buffalo Environmental Association TRS Calibration Report

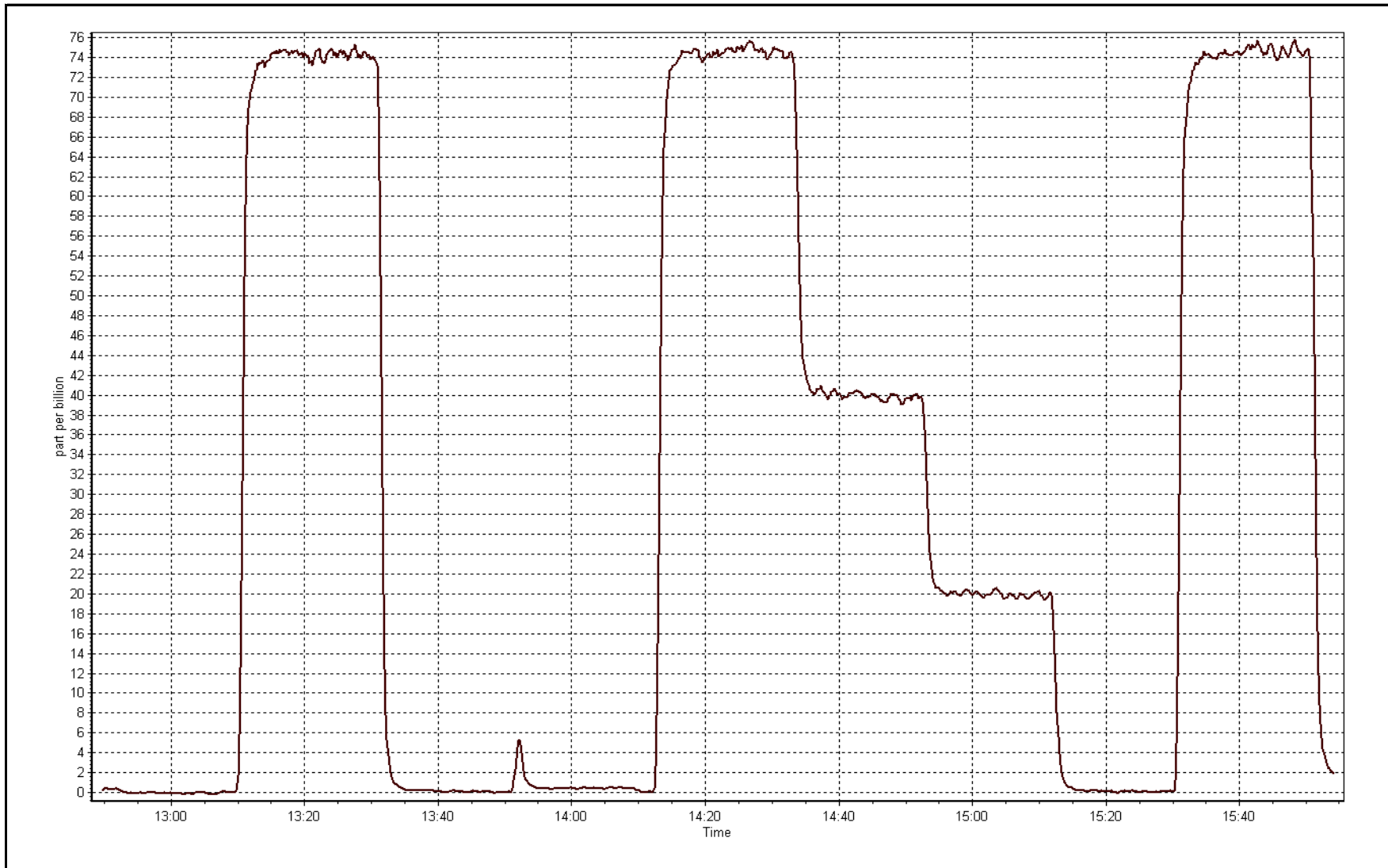
Station Information

Calibration Date	November 16, 2016	Previous Calibration	October 25, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	12:50	End Time (MST)	16:00
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	0.999998
75.0	74.7	1.0036		
40.0	39.8	1.0046	Slope	1.004408
20.0	19.9	1.0049		
			Intercept	-0.031622







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 10, 2016	Last Calibration	October 24, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	13:45
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

	Before	After		Before	After
THC Range (ppm)	0 - 100 ppm		Column Temp	75.3	75.0
NMHC Range (ppm)	0 - 50 ppm		Detector Temp	175.0	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.999388	1.000442	Carrier Pressure	37.3	37.3
THC Calc intercept	0.056245	0.063668	Fuel Pressure	44.3	47.7
NMHC Calc slope	0.999007	0.999439	Air Pressure	39.0	39.0
NMHC Calc intercept	0.003718	0.017091			

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	15.79	0.997
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.72	1.001
second point	5500	45.6	8.83	8.70	1.015
third point	5500	22.8	4.41	4.30	1.027
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	15.74	15.67	1.005
Average Correction Factor					1.014

Corrected As found 15.79 Previous response 15.70 % change -0.6%

Notes:

Inlet filter changed after as founds. Zero (blank) chromatogram completed and set to correct baseline. Flame optimized. 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	8.16	0.996
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	2.25	1.013
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	8.13	8.11	1.002
Average Correction Factor					1.007

Corrected As found 8.16 Previous response 8.13 % change -0.3%

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	7.63	0.998
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	7.61	7.59	1.003
second point	5500	45.6	4.27	4.17	1.024
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	7.57	1.006
Average Correction Factor					1.023

Corrected As found 7.63 Previous response 7.56 % change -0.9%



Wood Buffalo Environmental Association

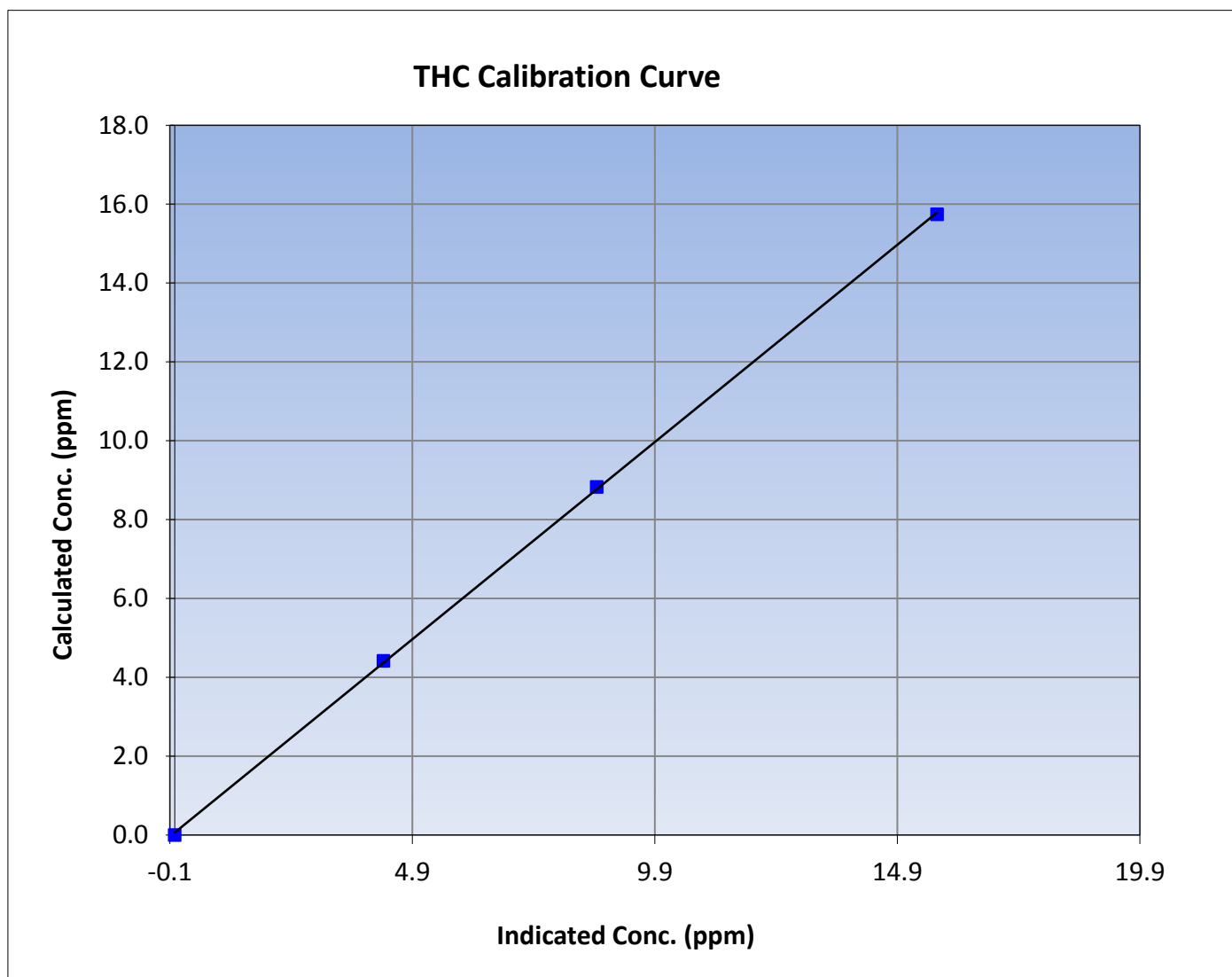
THC Calibration Summary

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)	9:20	End Time (MST)	13:45
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	0.999906
15.74	15.72	1.0014		
8.83	8.70	1.0149	Slope	1.000442
4.41	4.30	1.0267		
			Intercept	0.063668





Wood Buffalo Environmental Association

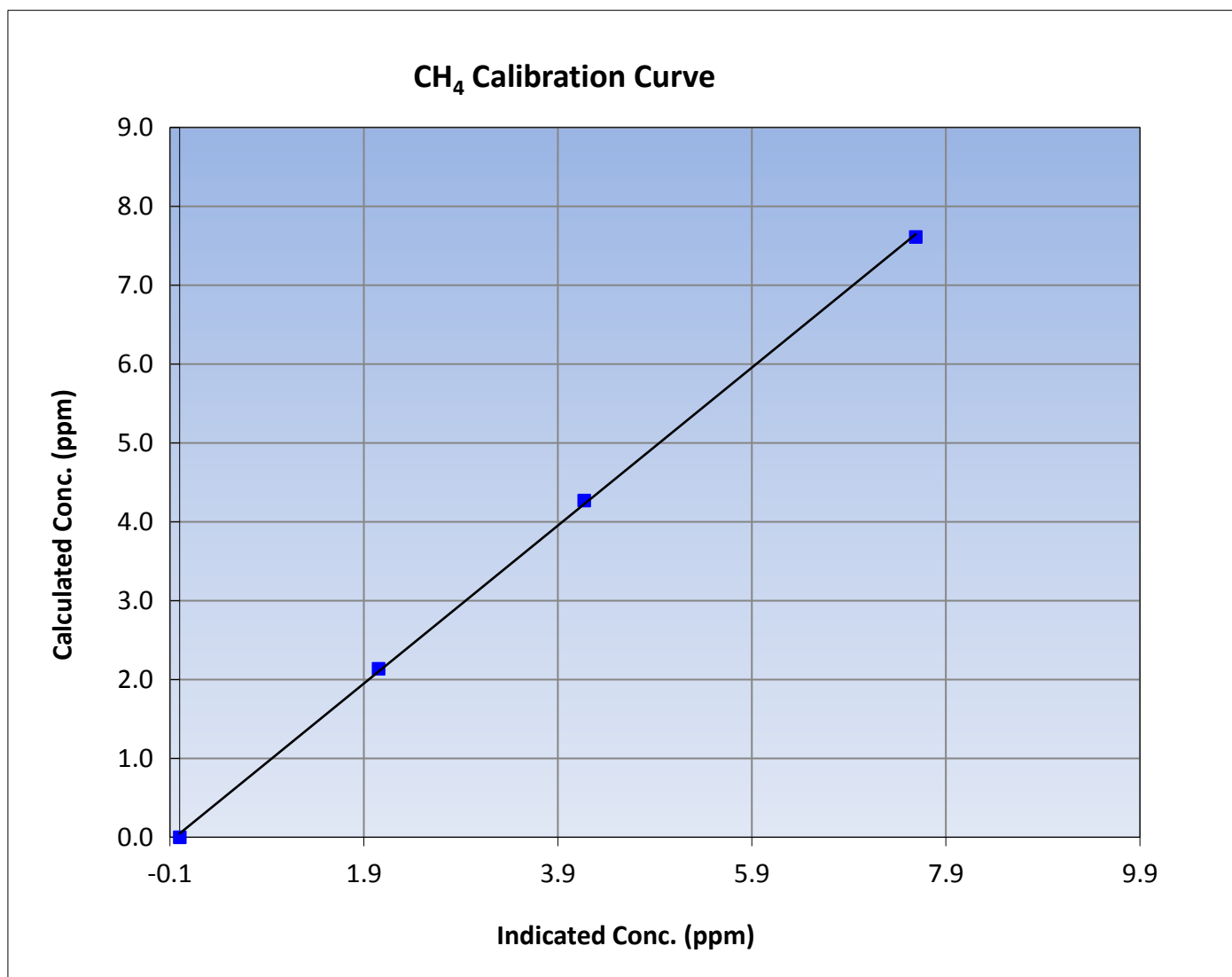
CH₄ Calibration Summary

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)	9:20	End Time (MST)	13:45
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	0.999783
7.61	7.59	1.0030		
4.27	4.17	1.0239	Slope	1.001465
2.13	2.05	1.0414		
			Intercept	0.046781





Wood Buffalo Environmental Association

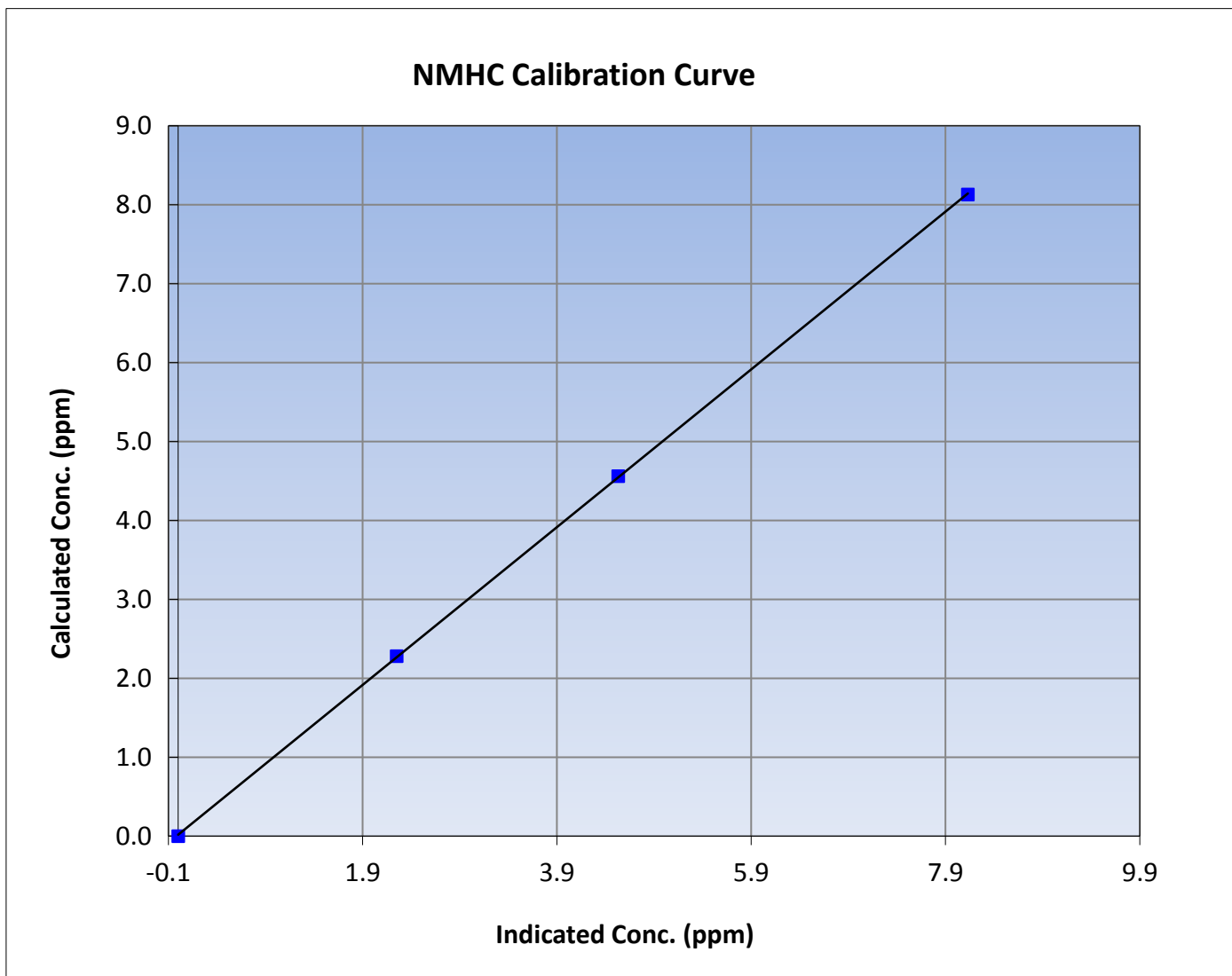
NMHC Calibration Summary

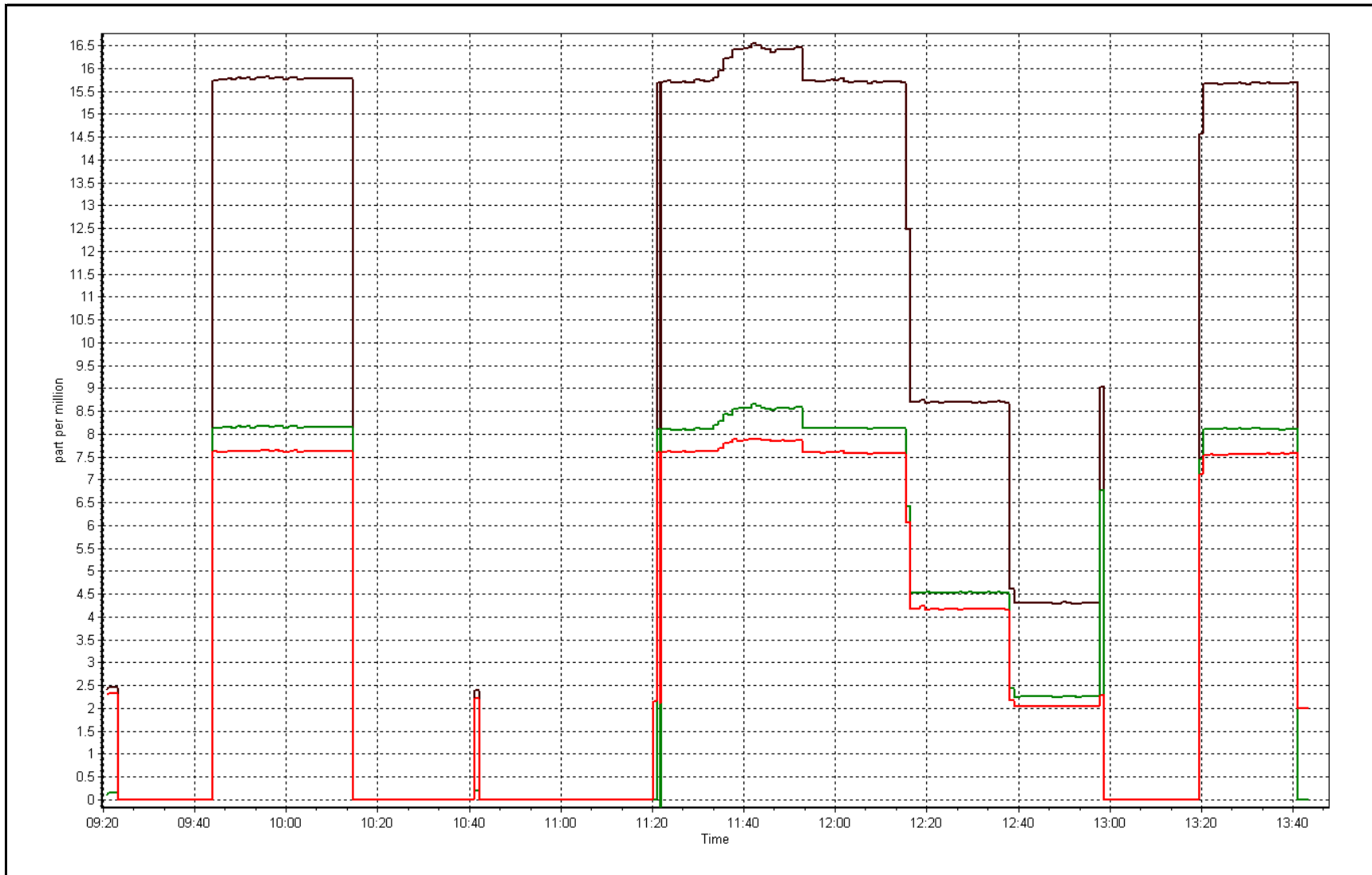
Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 24, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	13:45
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	0.999975
8.13	8.13	1.0000		
4.56	4.53	1.0066	Slope	0.999439
2.28	2.25	1.0133		
			Intercept	0.017091







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 16, 2016	Previous Calibration	October 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	12:55
NO2 GPT Ref date	November-14-16	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.	27.5	27.1
Analyzer IP address	192.168.1.49		Lamp temp.	53.6	53.6
Calculated slope	0.998538	0.998165	Pressure	722.3	723.7
Calculated intercept	-0.072584	-1.524111	Flow cell A	0.768	0.769
Analyzer Background	-2.3	-1.3	Flow cell B	0.823	0.822
Analyzer Coefficient	1.040	1.052	Cell A Intensity	71xxx	71xxx
			Cell B Intensity	86xxx	85xxx

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	0.8	----
as found span	5000	0.98	424.4	421.5	1.007
calibrator zero	5000	0.00	0.0	0.3	----
high point	5000	0.98	424.4	425.4	0.998
second point	5000	0.56	251.3	255.1	0.985
third point	5000	0.34	130.8	133.3	0.981
As Left Zero	5000	0.00	0.0	-0.2	----
As Left Span	5000	0.98	424.4	437.8	0.969
Average Correction Factor					0.988

Corrected As found	420.7	Previous response	425.1	% change	1.1%
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Notes:

Inlet filter changed after as founds. Zero and span adjusted.

Calibration Performed By: Devin Russell



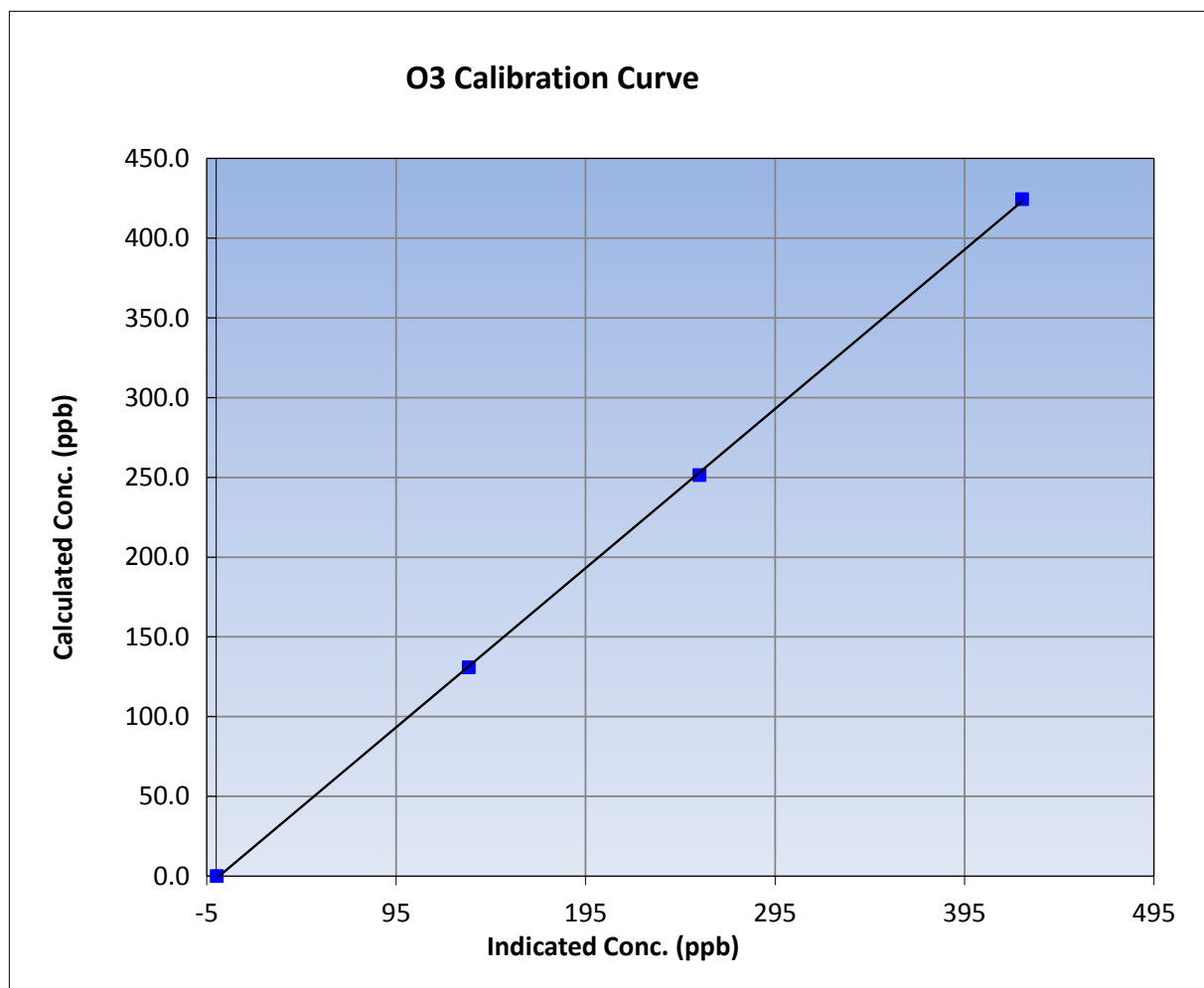
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	November-16-16	Previous Calibration	October-12-16
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:30	End Time (MST)	12:55
Analyzer make	Thermo 49i	Analyzer serial #	1152220026

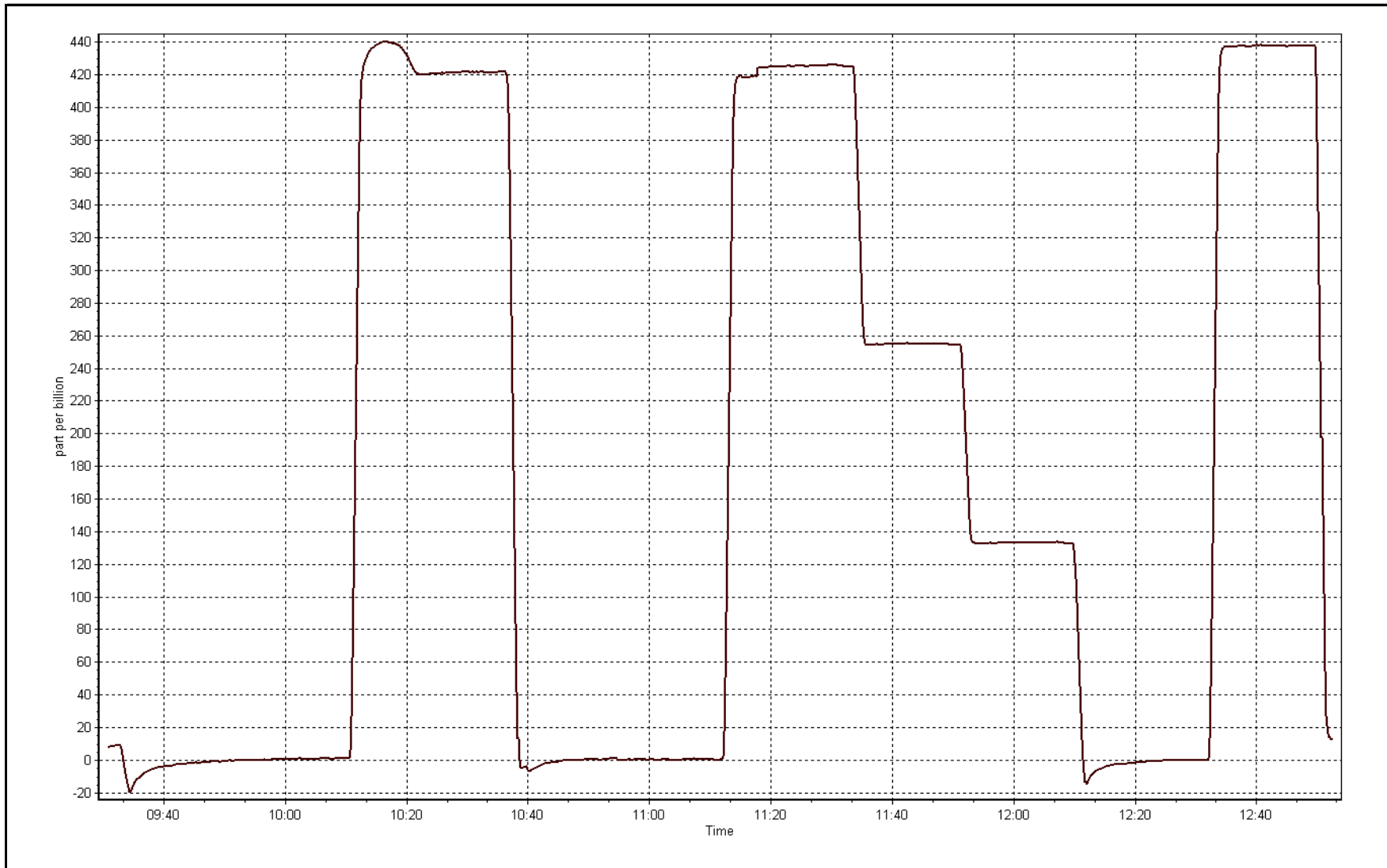
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999930
424.4	425.4	0.9976		
251.3	255.1	0.9853	Slope	0.998165
130.8	133.3	0.9811		
			Intercept	-1.524111



O3 Calibration Plot

Date: November 16, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	11:10	End Time (MST)	16:30
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	0.999342	1.001423	0.999902
	Data Offset	1.347403	1.349687	0.617400
Current Calibration	Data Slope	0.997480	0.997243	1.003165
	Data Offset	0.808606	1.022354	0.215063

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	1.164		1.179	
NOX coefficient	1.005		1.003	
NO2 coefficient	1.000		1.000	
NO bkgrnd	5.9		6.0	
NOX bkgrnd	6.0		6.2	
Chamber Temp	50.2	Deg C	50.6	Deg C
Moly Temp	324.5	Deg C	325.5	Deg C
PMT voltage	-791.4	V	-791.8	V
PMT Temp	-3.1	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	172	mmHg	169.3	mmHg
R Cell Press Nox	172	mmHg	169.3	mmHg
NO sample flow	0.603	lpm	0.586	lpm
Nox sample Flow	0.603	lpm	0.586	lpm

Notes:

Inlet filter changed after as founds. Span adjusted.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 14, 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	-0.1	0.1	----	----
as found span	5500	81.4	753.3	750.4	3.0	748.2	742.5	5.6	1.0069	1.0106
calibrator zero	5500	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
high point	5500	81.4	753.3	750.4	3.0	754.4	751.4	3.0	0.9986	0.9986
second point	5500	45.6	422.0	420.3	1.7	423.1	421.3	1.9	0.9973	0.9978
third point	5500	22.8	211.0	210.2	0.8	209.1	208.0	1.1	1.0093	1.0105
as left zero	5500	0.0	0.0	0.0	0.0	0.2	0.0	0.2	----	----
as left span	5500	81.4	753.3	328.6	424.7	755.0	316.6	438.4	0.9978	1.0380
Average Correction Factor									1.0018	1.0023

Corrcted As found NO_x= 748.1 NO= 742.6 Percent Change NO_x= 0.6% NO= 0.7%
 Previous Response NO_x= 752.5 NO= 747.9

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	755.6	753.0	0.1	0.9970	0.9966	----	----
1st NO2 (300)	328.6	427.3	754.3	328.6	425.7	0.9988	----	1.0039	99.6%
2nd NO2 (200)	501.7	254.2	755.5	501.7	253.8	0.9971	----	1.0017	99.8%
3rd NO2 (100)	622.1	133.8	754.4	622.1	132.3	0.9986	----	1.0113	98.9%
2nd NO ref point	----	3.0	754.0	752.0	2.0	0.9991	0.9978	----	----
Average Correction Factor						0.9984		1.0056	99.4%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

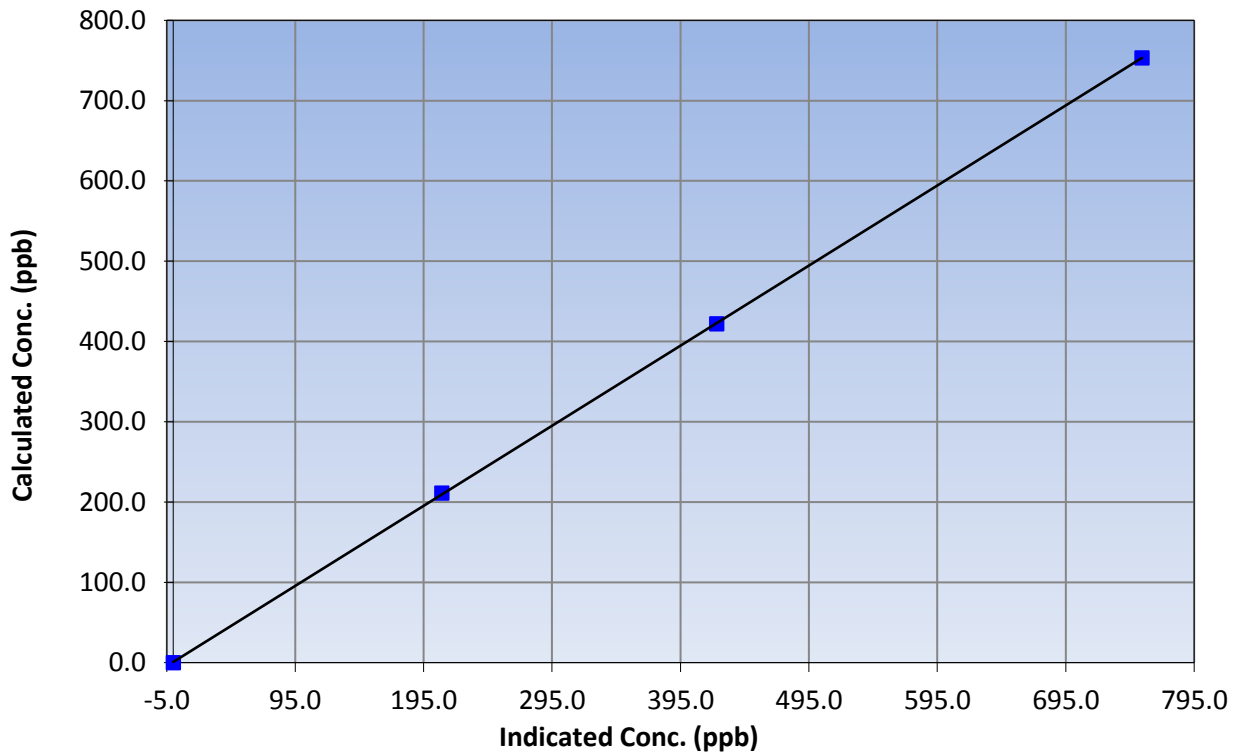
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	11:10	End Time (MST)	16:30
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	----	Correlation Coefficient	0.999986
753.3	754.4	0.9986		
422.0	423.1	0.9973	Slope	0.997480
211.0	209.1	1.0093		
			Intercept	0.808606

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

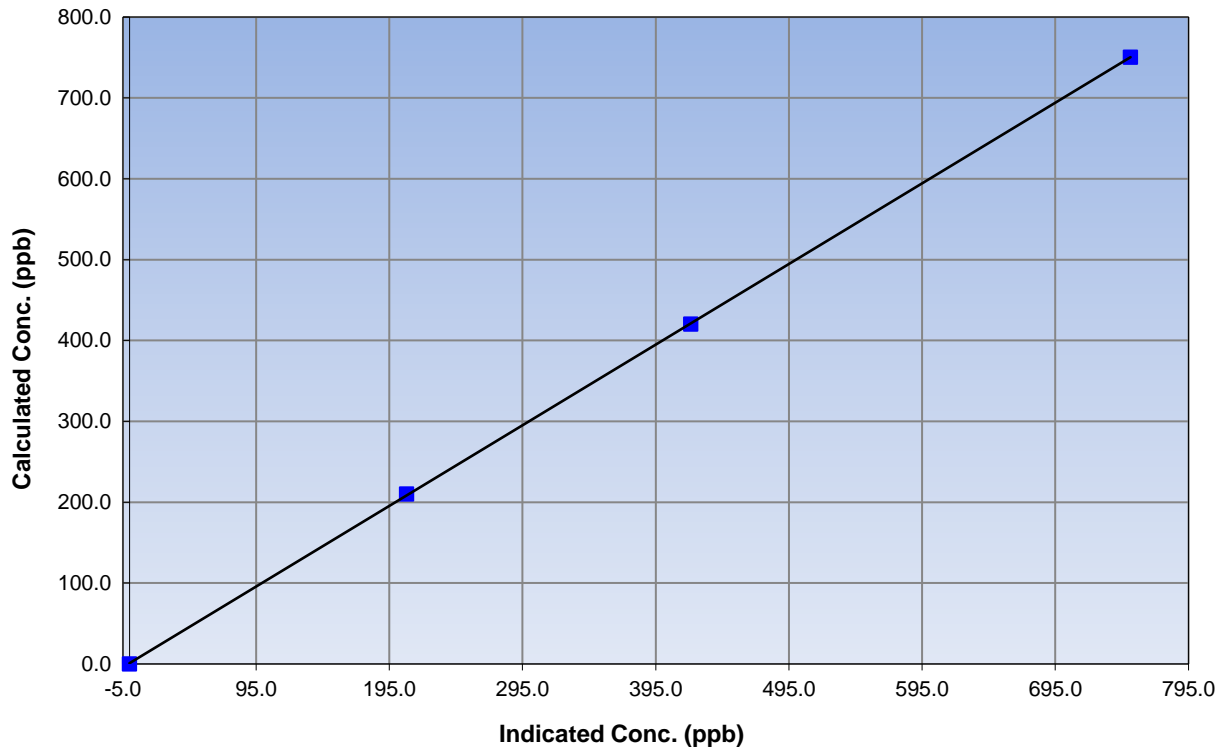
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	11:10	End Time (MST)	16:30
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
750.4	751.4	0.9986		
420.3	421.3	0.9978	Slope	0.997243
210.2	208.0	1.0105		
			Intercept	1.022354

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

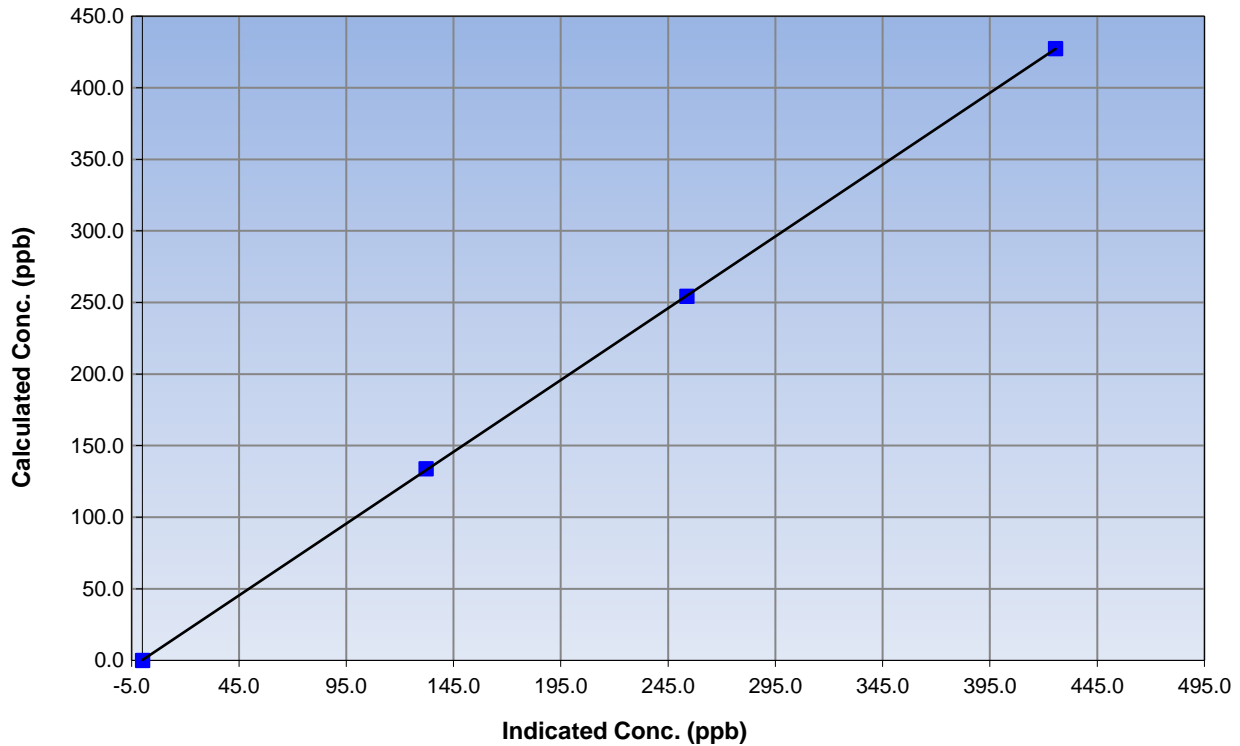
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Number	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	11:10	End Time (MST)	16:30
Analyzer make	Routine	Analyzer serial #	1218153357

Calibration Information

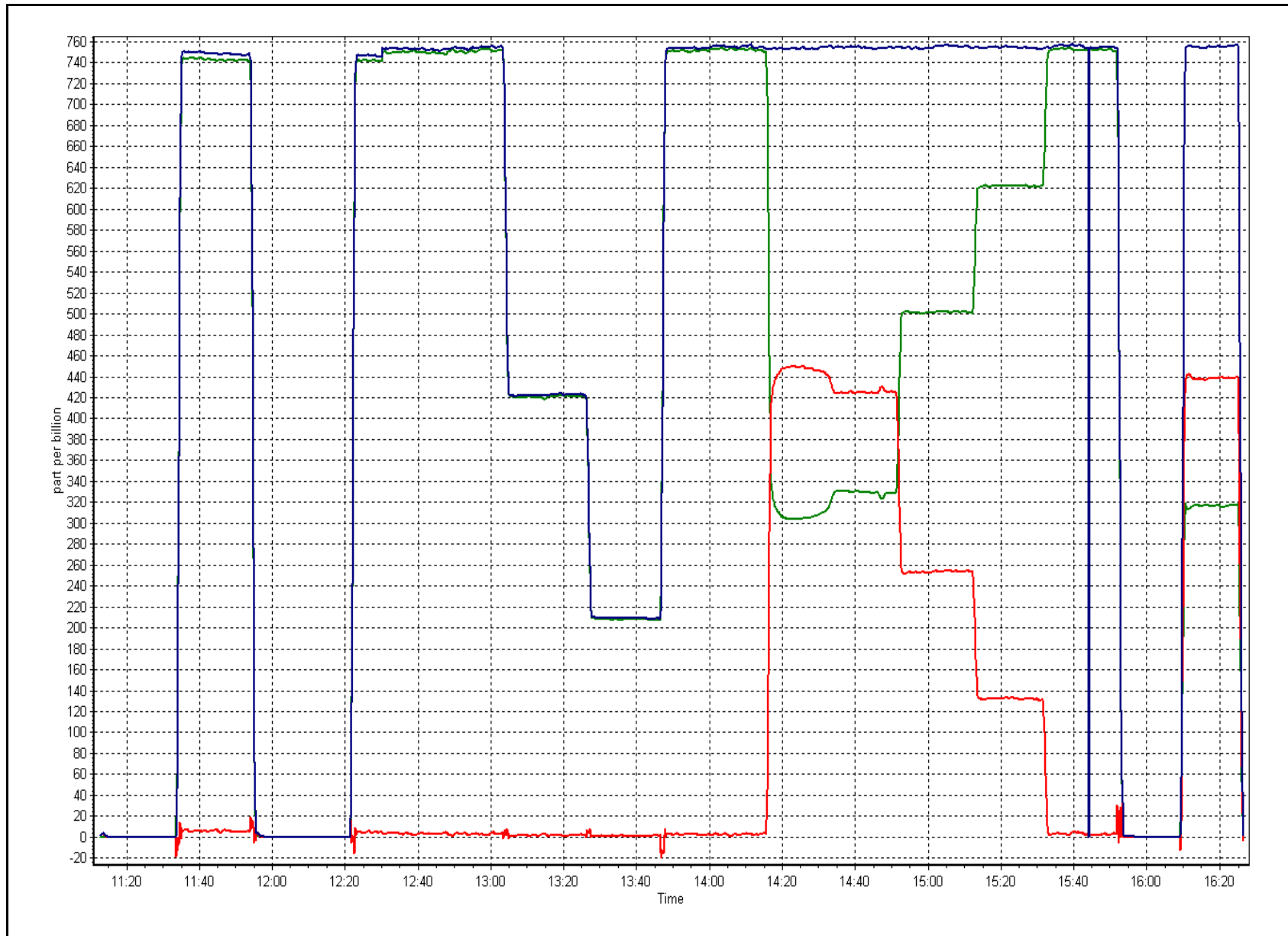
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999987
427.3	425.7	1.0039		
254.2	253.8	1.0017	Slope	1.003165
133.8	132.3	1.0113		
			Intercept	0.215063

NO₂ Calibration Curve



NOX Calibration Plot

Date: November 14, 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	November 14, 2016	NOX Previous Cal Date	October 11, 2016
NH3 Calibration Date	November 15, 2016	NH3 Previous Cal Date	October 12, 2016
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	16:00
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
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Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.003053	0.991559	0.998720	1.002328	1.001866
	Data Offset	-6.563764	-8.2485339	0.238996	0.242260	0.246005
Cal Stats After	Data Slope	1.011487	1.000389	0.997956	0.997687	1.007721
	Data Offset	-12.37	-12.67	1.731690	1.368045	-0.861258
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	-0.2		0.0	
NOx BKG	-0.2		0.0	
Nt BKG	-0.1		0.0	
NO coefficient	1.191		1.195	
NO2 coefficient	1.000		1.000	
NOx coefficient	1.339		1.337	
NH3 coefficient	0.990		0.870	
Nt coefficient	1.396		1.376	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	316.1	Deg C	314.7	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	85.0	ccm	84.0	ccm
R Cell Press	5.4	mmHg	5.3	mmHg
PMT Voltage	645.0	v	645.0	v
Sample Flow 1 NO	553.0	ccm	540.0	ccm
Sample Flow 2 Nox	518.0	ccm	519.0	ccm
Sample Flow 3 Nt	514.0	ccm	510.0	ccm

Notes:

Inlet filter changed after as founds. NO/Nox/TNx Zero and span adjusted. NH3 converter core replaced, NH3 span adjusted.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

November 15, 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	1.0	0.3	0.6	----	----
as found NO	5500	81.4	753.3	753.3	----	759.3	745.2	14.1	0.992	----
calibrator zero	5500	0.0	0.0	0.0	0.0	0.3	-0.1	0.4	----	----
high NO point	5500	81.4	753.3	753.3	----	750.5	753.7	-3.2	1.004	----
NO/O ₃ point	5500	81.4	753.3	753.3	----	751.3	751.1	0.3	1.003	----
as found NH ₃	5000	94.2	1799.2	NA	1799.2	1775.7	21.2	1754.3	1.013	1.026
first NH ₃	5000	94.2	1799.2	NA	1799.2	1801.0	19.8	1781.2	0.999	1.010
second NH ₃	5000	52.4	1000.8	NA	1000.8	1026.3	11.9	1014.4	0.975	0.987
third NH ₃	5000	26.2	500.4	NA	500.4	522.4	6.4	516.0	0.958	0.970
Average Correction Factor									1.0033	0.9889

Nt Corrected As Found Nt = 758.3 ppb
 NOx Corrected As Found NOx = 744.9 ppb
 NH₃ Previous Converter Efficiency = 99.0 %

Previous Response Nt = 768.0 ppb
 Previous Response NOx = 754.0 ppb
 NH₃ Current Converter Efficiency = 87.0 %

Nt percent change 1.3%
 NOx percent change 1.2%
 NH₃ percent change -12.0%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date:

November 14, 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	1.9	1.3	1.9	----	----
as found span	5500	81.4	753.3	750.4	753.3	753.1	749.4	760.9	1.0003	1.0013
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.1	-0.2	0.3	----	----
high point	5500	81.4	753.3	750.4	753.3	753.7	750.8	750.5	0.9995	0.9995
second point	5500	45.6	422.0	420.3	422.0	421.4	421.1	418.2	1.0016	0.9983
third point	5500	22.8	211.0	210.2	211.0	207.3	207.0	205.9	1.0181	1.0154
Average Correction Factor									1.0064	1.0044

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	759.0	751.2	748.0	----
Previous Response	768.0	754.0	748.4	----
Percent Change	1.2%	0.4%	0.0%	0.3%

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	----	3.0	751.1	749.3	1.7	1.0030	1.0014	----	----
1st NO ₂ (300)	321.3	431.0	749.6	321.3	428.3	1.0050	----	1.0063	99.4%
2nd NO ₂ (200)	500.9	251.4	751.0	500.9	250.1	1.0031	----	1.0050	99.5%
3rd NO ₂ (100)	624.4	127.9	753.3	624.4	129.0	1.0000	----	0.9919	100.8%
2nd NO ref point	----	3.0	753.6	753.4	0.3	0.9996	0.9960	----	----
Average Correction Factor						1.0019	0.9987	1.0011	99.9%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

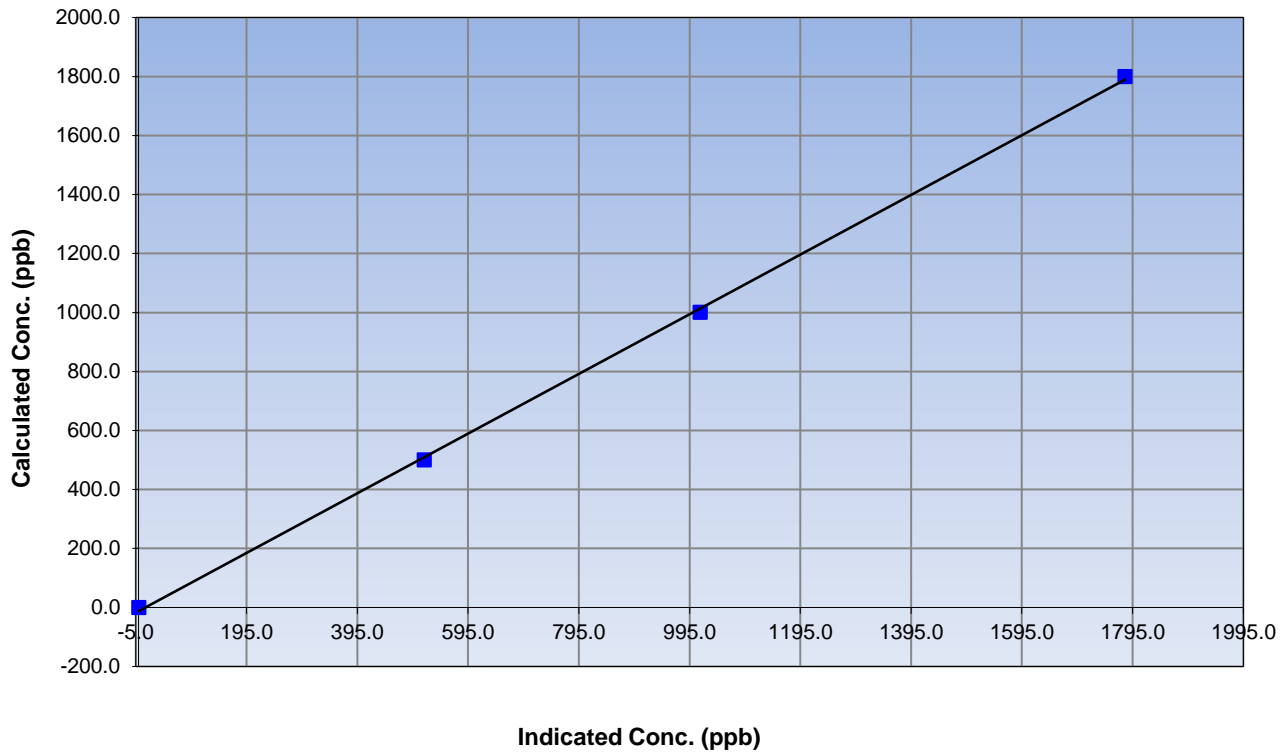
Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:10	End Time (MST)	16:00
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	0.4	----	Correlation Coefficient	0.999722
1799.2	1781.2	1.0101		
1000.8	1014.4	0.9867	Slope	1.011487
500.4	516.0	0.9698		
			Intercept	-12.368361

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

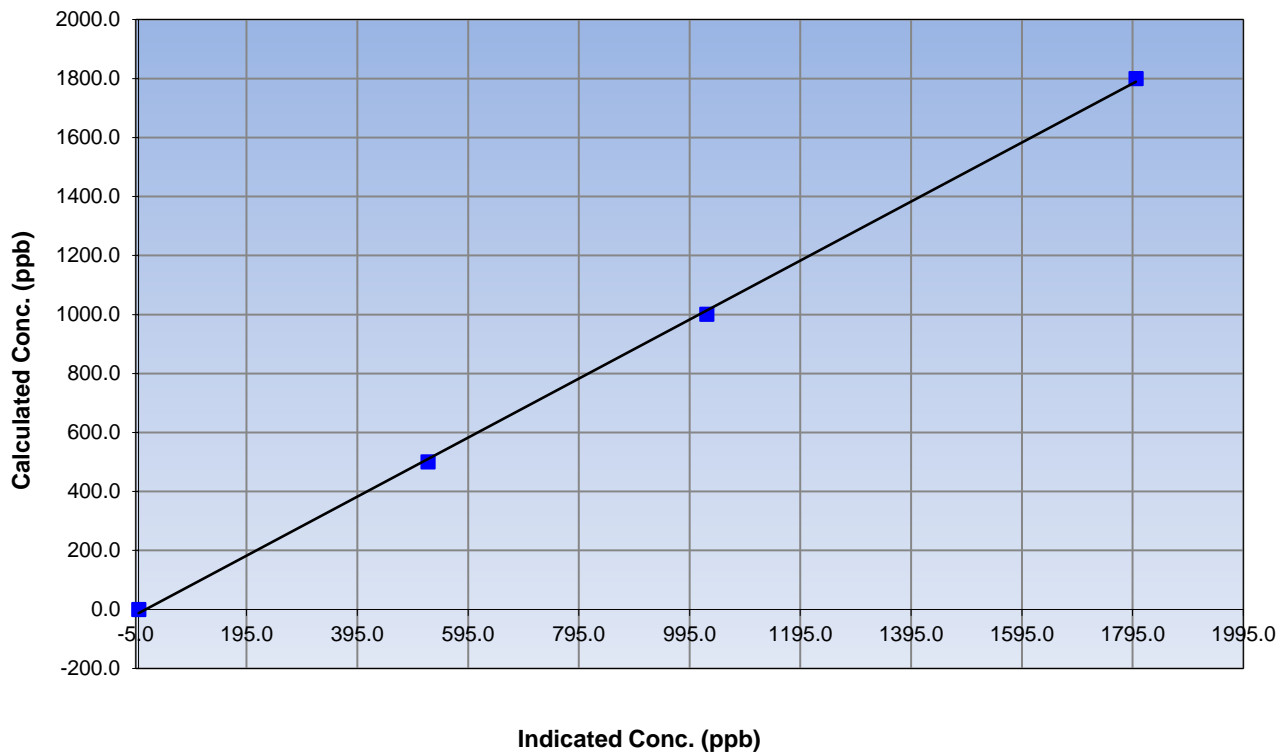
Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:10	End Time (MST)	16:00
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	0.3	----	Correlation Coefficient	0.999705
1799.2	1801.0	0.9990		
1000.8	1026.3	0.9752	Slope	1.000389
500.4	522.4	0.9580		
			Intercept	-12.673034

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

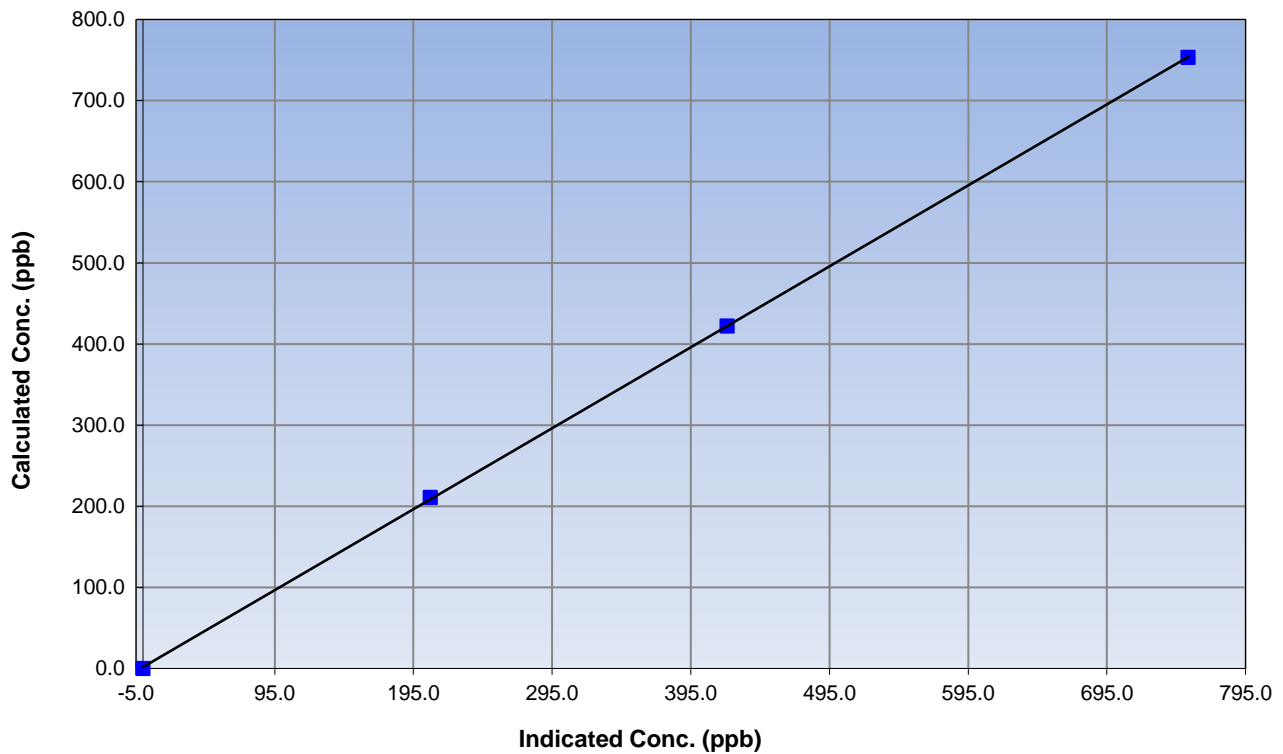
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:10	End Time (MST)	16:00
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	-0.1	----	Correlation Coefficient	0.999971
753.3	753.7	0.9995		
422.0	421.4	1.0016	Slope	0.997956
211.0	207.3	1.0181		
			Intercept	1.731690

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

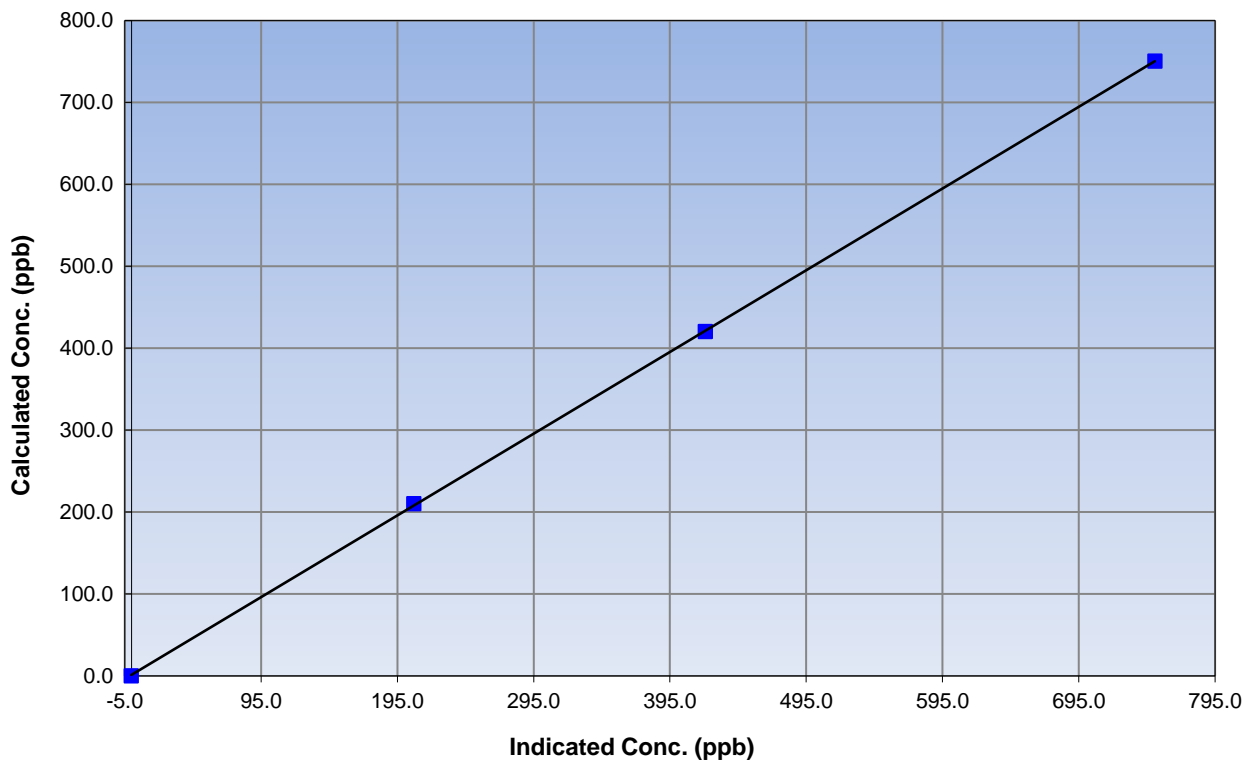
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:10	End Time (MST)	16:00
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	-0.2	----	Correlation Coefficient	0.999974
750.4	750.8	0.9995		
420.3	421.1	0.9983	Slope	0.997687
210.2	207.0	1.0154		
			Intercept	1.368045

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

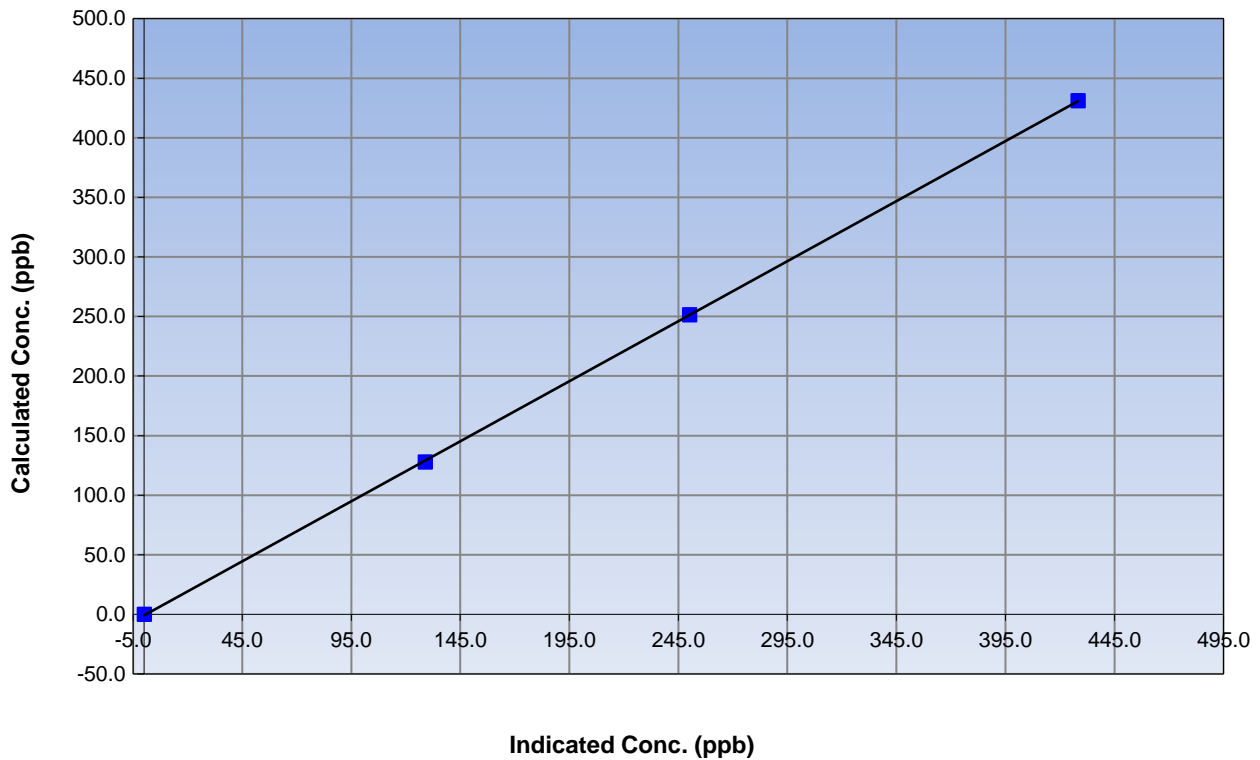
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 11, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:10	End Time (MST)	16:00
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

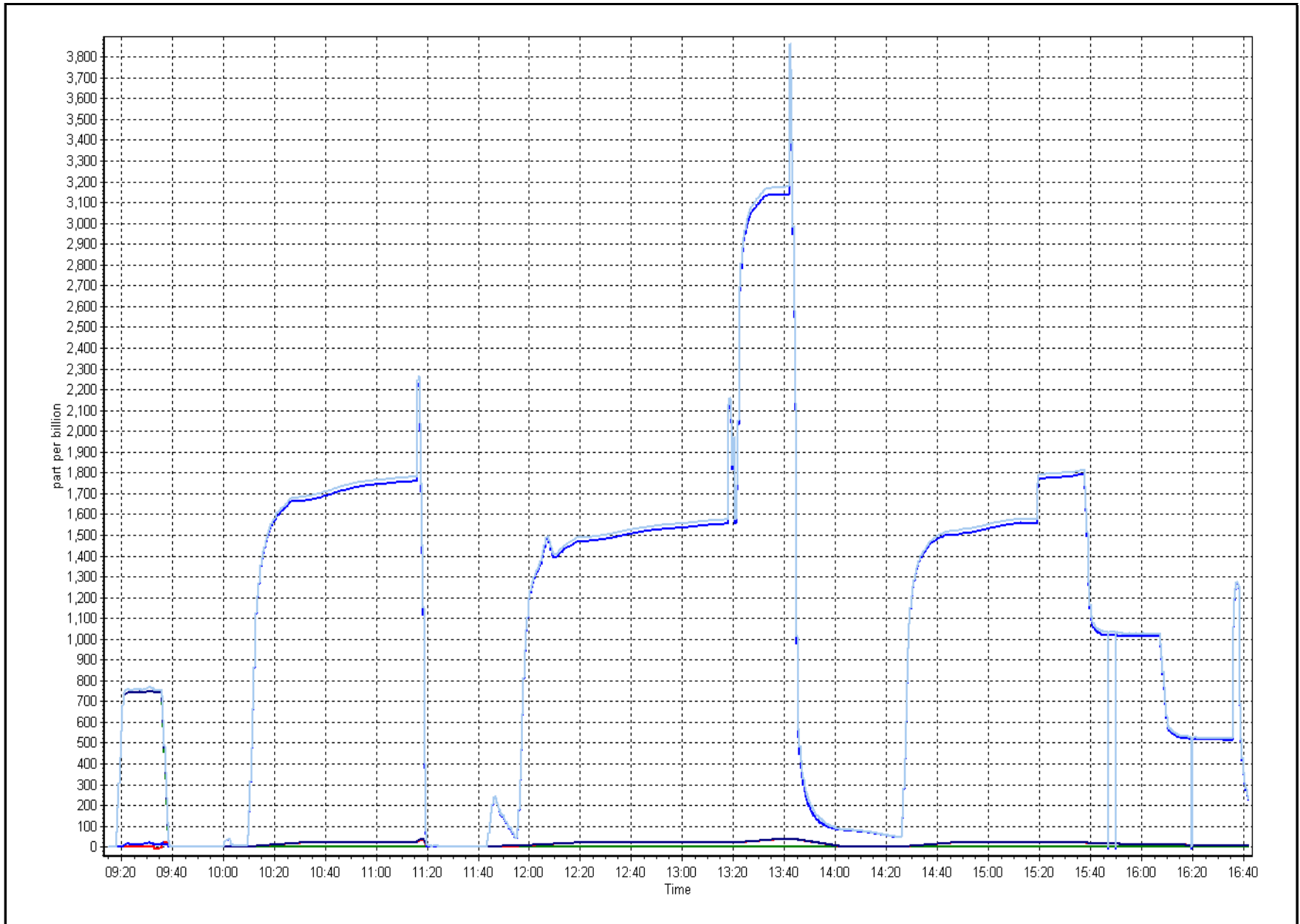
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999980
431.0	428.3	1.0063		
251.4	250.1	1.0050	Slope	1.007721
127.9	129.0	0.9919		
			Intercept	-0.861258

NO₂ Calibration Curve



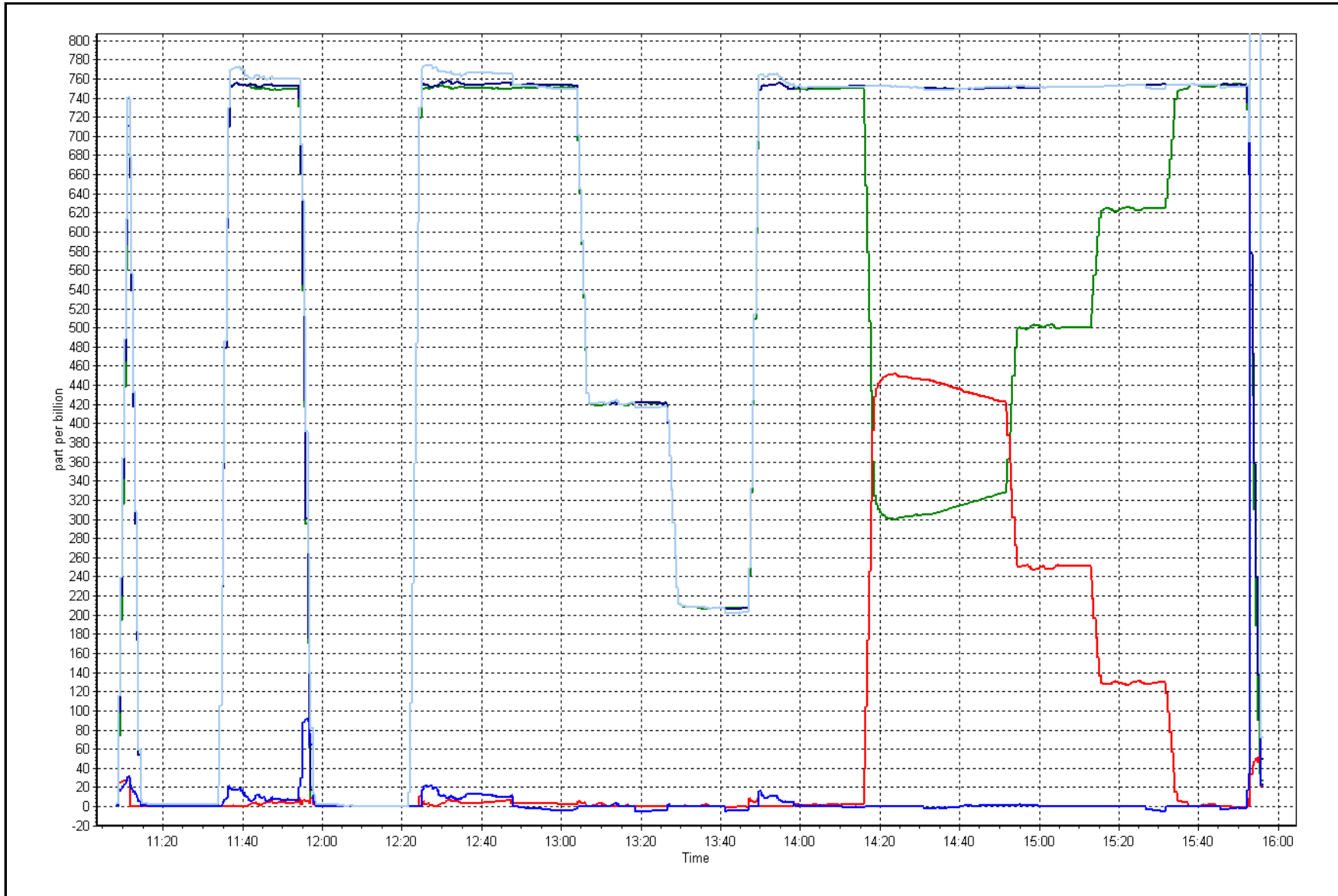
NH₃ Calibration Plot

Date: 15-Nov-2016



NOx Calibration Plot

Date: 14-Nov-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:	November 16, 2016	Last Cal Date:	October 12, 2016
Start time (MST):	9:37	End time (MST):	10:45
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)	-6	-5.7	-6	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	976	975.51	976	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1005	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0	-----	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>June 8, 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 clean head. No adjustments required for T1, P3, flow or Nephelometer.

Calibration by: Devin Russell



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:	November 17, 2016	Last Cal Date:	November 16, 2016
Start time (MST):	9:35	End time (MST):	12:25
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

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	-7	-6.8	-7	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	990	989.38	990	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1007.4	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 type="checkbox"/>		PM2.5 Cyclone <input 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: <u>1186</u>	S/N: <u>2582</u>
	Date of check: <u>November 17, 2016</u>	Last Cal Date: <u>June 8, 2016</u>
	New Correction Factor: <u>7018</u>	Previous Correction Factor: <u>7001</u>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	25	24.01	25	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	23	24.01	23	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	24	24.01	24	<input type="checkbox"/>	+/- 2 °C
RH (%)	37	13.91	14	<input checked="" type="checkbox"/>	+/- 10%

Notes: Cyclone head not cleaned because it was replaced with a clean head yesterday. RH adjusted from 37% to 14%. Foil calibration completed; correction factor changed from 7001 to 7018. Final nephelometer zero check showed response of -0.1 ug/m3.

Calibration by: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 2 MILDRED LAKE NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
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	684	35	36	99.86	85	0	21	0
H2S (ppb) Average	685	34	35	99.86	17	1	2	0
THC (ppm) Average	675	35	45	98.61	7.9	-	3.3	-
Temperature (C) Average	720	0	0	100.00	11.2	-	6.8	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	97	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	25	-	16	-
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 - MILDRED LAKE (AMS 2)
 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	684	3.3	8	-	0	0	0	0	3	10	85
H2S (ppb) Average	685	0.7	1	-	0	0	0	0	1	2	17
THC (ppm) Average	675	2.54	0.6	-	2	2.1	2.2	2.3	2.7	3.3	7.9
Temperature 2 m (C) Average	720	-0.94	5.5	-	-11.9	-8.2	-5.6	-1.5	3.9	6.6	11.2
Relative Humidity (%) Average	720	78.9	11	-	46	63	70	80	88	95	98
Wind Speed 10 m (km/h) Average	720	9	4	-	0	4	6	9	12	15	25
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	25 Nov 2016 10:00	25 Nov 2016 10:00	1	Maintenance - verified operation of the daily QA checks
THC	17 Nov 2016 10:00	17 Nov 2016 18:00	9	Maintenance - input board calibration



Wood Buffalo Environmental Association

Summary of Hour Averages

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

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 85 ppb on Nov 15 02:00	Maximum Daily Average: 20.5 ppb on Nov 15		Hours of Data:	684
Minimum Value: 0 ppb on Nov 1 05:00	Minimum Daily Average: 0.1 ppb on Nov 1		Hours of Missing Data:	36
Maximum Diurnal Average: 7.1 ppb at hour 2	Minimum Diurnal Average: 1.2 ppb at hour 17		Hours of Calibration:	35
Monthly Average: 3.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 3 P ₉₀ = 10 P ₉₉ = 33		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-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	0.1	0
2-Nov	0	Z	1	1	8	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	16	1	0	1.5	16
3-Nov	2	1	Z	0	0	3	15	2	0	0	0	0	2	9	4	0	0	0	0	0	0	0	0	0	1.8	15
4-Nov	0	0	0	Z	0	0	0	0	5	5	0	C	C	C	C	C	4	3	3	6	6	22	21	16	5.1	22
5-Nov	13	14	1	0	Z	2	8	2	0	1	1	2	1	7	4	1	0	6	2	1	2	1	0	11	3.4	14
6-Nov	1	0	0	0	0	Z	0	1	3	1	4	14	4	0	0	0	1	0	0	0	0	0	0	0	1.3	14
7-Nov	Z	11	16	6	0	0	0	0	0	0	0	0	0	0	3	16	3	14	15	6	7	3	4	9	4.9	16
8-Nov	8	Z	2	1	0	0	0	0	0	0	0	0	1	1	7	0	1	2	3	6	3	2	2	2	1.8	8
9-Nov	2	0	Z	1	1	1	0	0	0	10	3	8	20	11	30	8	4	4	3	17	19	17	4	21	8.0	30
10-Nov	13	8	4	Z	7	14	16	1	1	2	6	10	9	8	5	1	2	11	17	9	14	14	12	3	8.2	17
11-Nov	1	3	1	17	Z	1	1	1	0	1	1	1	1	2	1	0	0	0	6	2	0	1	0	33	3.1	33
12-Nov	11	10	2	1	1	6	27	12	1	Z	15	1	1	2	3	7	5	2	1	1	0	1	0	0	4.8	27
13-Nov	Z	4	1	2	0	0	0	0	0	3	11	3	3	0	7	4	3	1	0	0	2	10	23	14	4.0	23
14-Nov	9	12	20	Z	2	1	12	7	4	3	15	15	16	8	4	0	0	1	5	45	68	37	33	34	15.3	68
15-Nov	57	85	Z	50	34	25	30	28	32	8	9	22	27	23	18	8	1	9	2	1	0	0	0	0	20.5	85
16-Nov	0	1	0	Z	0	0	0	1	1	11	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0.9	11
17-Nov	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
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	3	1	2	2	1	0	0.5	3
19-Nov	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
20-Nov	0	Z	1	2	4	3	2	3	4	4	0	1	1	0	0	4	1	0	0	1	2	1	8	12	2.4	12
21-Nov	10	5	Z	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	10
22-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	1	5	5	0.7	5
23-Nov	2	4	6	4	Z	1	0	0	0	0	0	0	0	0	5	9	5	0	0	0	0	0	0	0	1.6	9
24-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	11	4	2	2	3	4	7	1.4	11	
25-Nov	Z	10	9	11	9	10	5	1	1	M	0	0	3	3	4	0	0	0	0	0	3	4	2	2	3.5	11
26-Nov	3	Z	2	5	4	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1.2	7
27-Nov	13	17	Z	9	8	5	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	17
28-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0.3	2
29-Nov	0	0	0	0	Z	0	0	0	0	0	2	3	2	6	1	0	0	0	0	0	0	0	0	0	0.7	6
30-Nov	0	0	0	0	2	Z	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	3

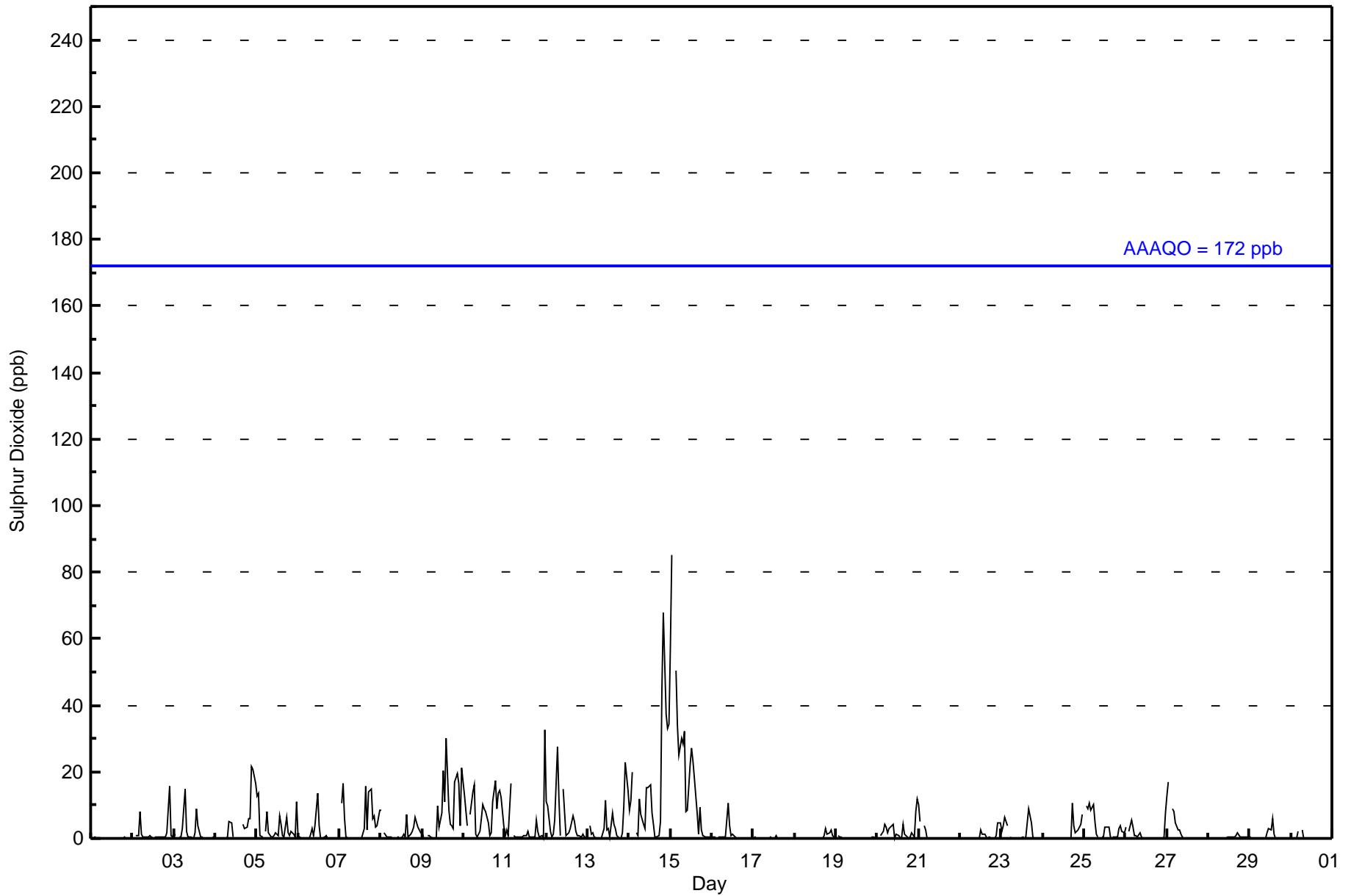
5.8	7.1	2.7	4.7	3.4	2.9	4.1	2.1	1.9	1.8	2.4	2.8	3.3	2.9	3.0	2.2	1.2	2.4	2.1	3.2	4.5	4.6	4.1	6.0	Diurnal Average	
57	85	20	50	34	25	30	28	32	11	15	22	27	23	30	16	9	14	17	45	68	37	33	34	Diurnal Maximum	

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
Mildred Lake - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	617	90.20	90.20
11 - 20	44	6.43	96.64
21 - 60	21	3.07	99.71
61 - 110	2	0.29	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



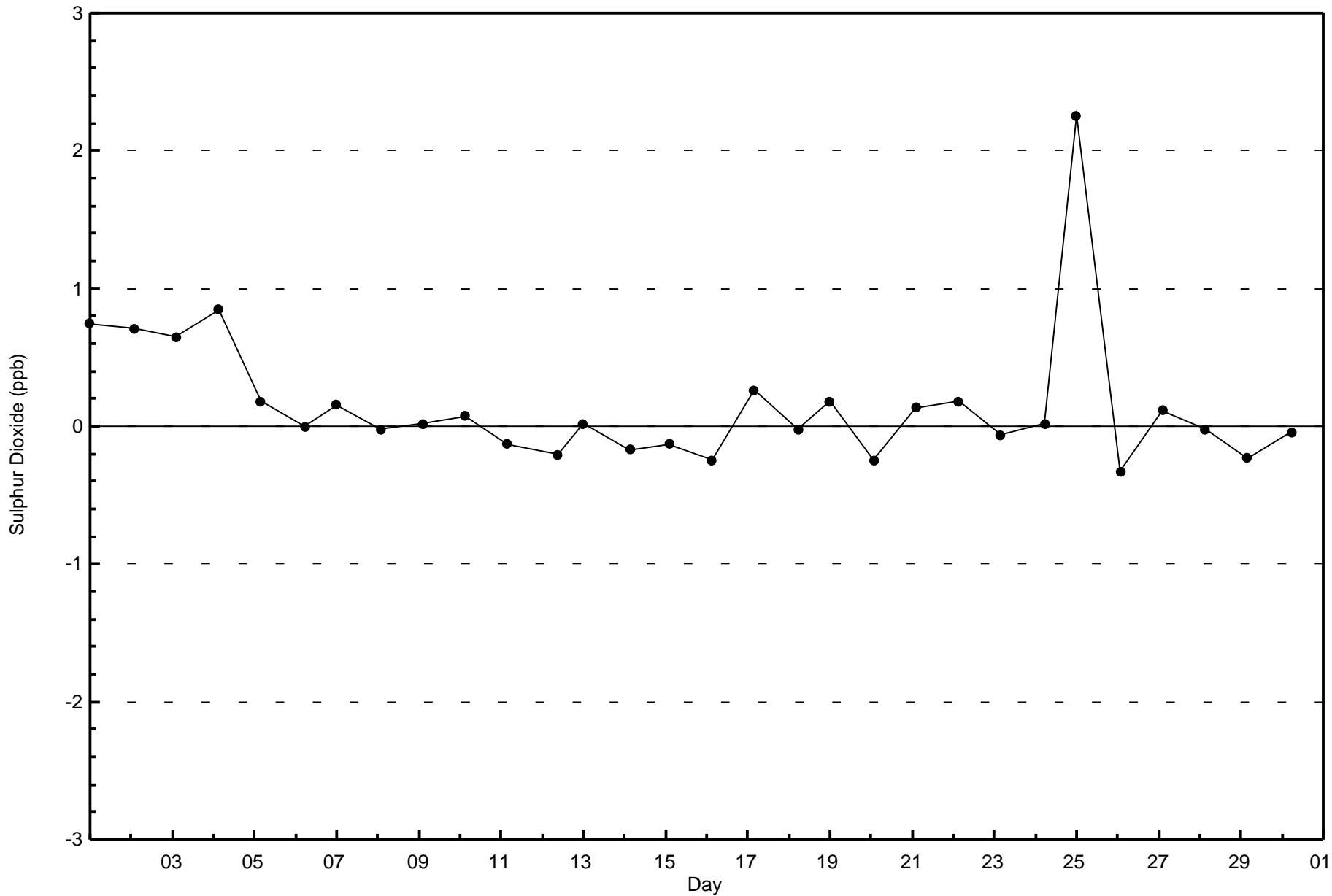
**Wood Buffalo Environmental Association
Frequency Distribution**

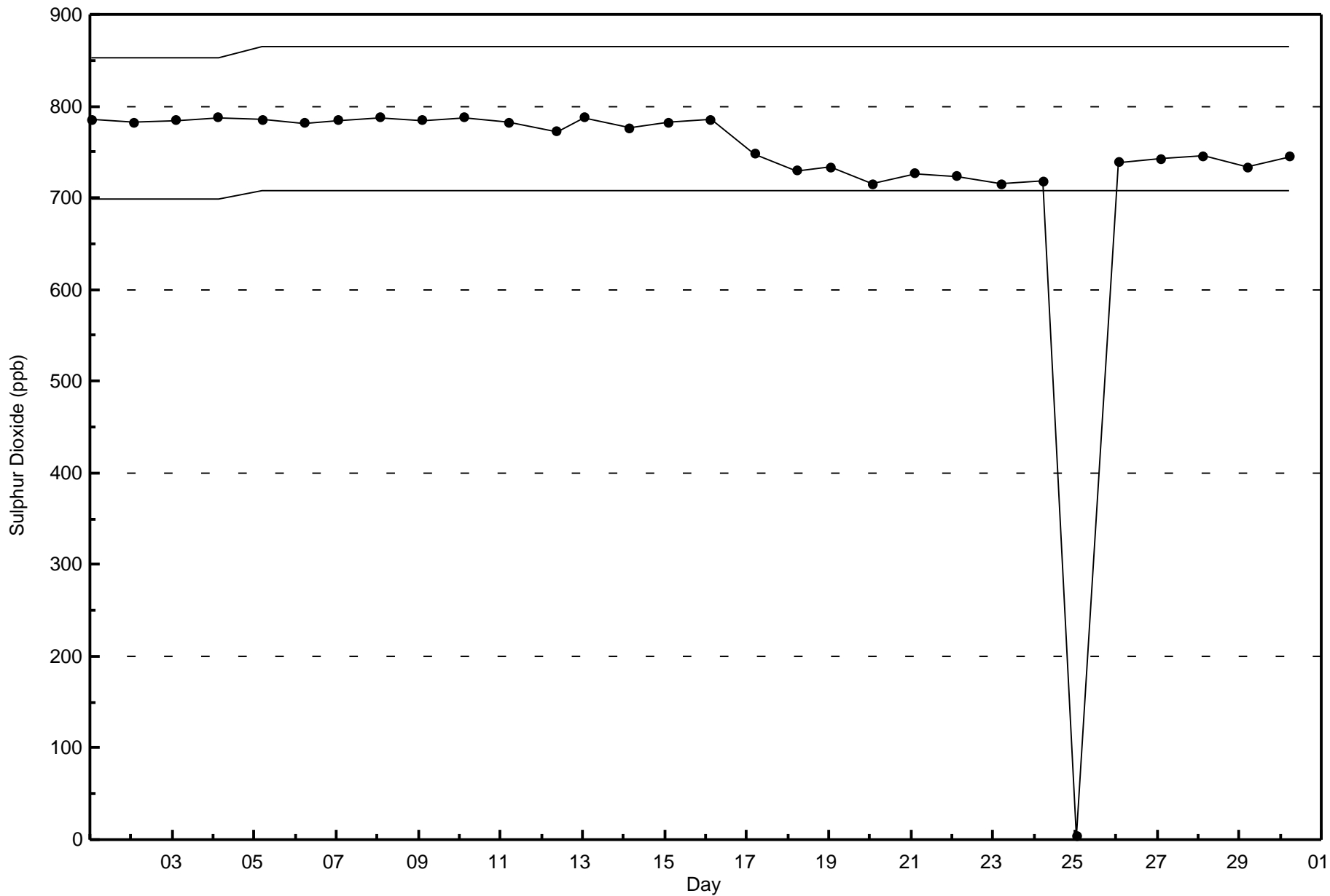
**Sulphur Dioxide (SO₂) - ppb
Mildred Lake - November 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	32	33	21	9	17	19	14	120	113	56	38	39	20	27	28	31	617
11 - 20	0	0	0	0	2	0	4	19	0	1	0	6	6	6	0	0	44
21 - 60	0	0	0	0	0	1	0	3	0	0	0	1	11	5	0	0	21
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
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	33	21	9	19	20	18	142	113	57	38	46	37	40	28	31	684

Total Number of Valid Hours: 684

Total Number of Hours: 720







Number of Exceedences (AAAQO):	1-hr: 1	24-hr: 0	Hours in Service:	720
Maximum Value: 17 ppb on Nov 12 00:00	Maximum Daily Average: 2.0 ppb on Nov 13		Hours of Data:	685
Minimum Value: 0 ppb on Nov 11 16:00	Minimum Daily Average: 0.1 ppb on Nov 17		Hours of Missing Data:	35
Maximum Diurnal Average: 1.5 ppb at hour 24	Minimum Diurnal Average: 0.4 ppb at hour 12		Hours of Calibration:	34
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 = 5		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-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	0.2	0
2-Nov	0	0	Z	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4	2	1	0.6	4
3-Nov	2	1	1	Z	1	1	4	1	0	0	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0.9	4
4-Nov	0	0	0	0	Z	0	0	0	C	C	C	C	2	1	0	0	2	1	1	2	2	4	4	3	1.3	4
5-Nov	2	3	1	0	0	Z	3	1	0	0	1	1	2	2	2	1	1	2	2	2	2	0	1	1.3	3	
6-Nov	0	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
7-Nov	0	Z	1	0	0	0	0	0	0	0	0	0	0	1	4	1	3	3	1	1	1	1	1	2	1.0	4
8-Nov	2	1	Z	1	1	6	2	2	1	1	1	0	0	1	1	2	0	1	2	2	2	3	3	2	1.6	6
9-Nov	2	0	0	Z	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0.5	2
10-Nov	1	1	1	0	Z	1	2	0	0	0	1	2	1	1	1	1	1	2	2	1	2	2	2	1	1.1	2
11-Nov	0	1	0	3	1	Z	1	1	1	1	0	1	1	1	0	0	0	0	3	1	0	0	0	17	1.5	17
12-Nov	5	5	1	0	0	1	6	3	0	0	Z	0	0	1	1	3	2	1	1	1	0	1	1	1	1.5	6
13-Nov	1	Z	2	4	1	0	0	0	0	1	3	1	1	0	2	2	2	1	1	1	2	6	8	6	2.0	8
14-Nov	3	2	5	2	Z	1	5	4	3	1	1	1	1	0	0	1	0	1	0	1	1	1	2	1	1.5	5
15-Nov	1	1	1	1	Z	1	1	1	1	0	0	1	1	1	1	0	0	0	2	3	1	1	1	1	0.9	3
16-Nov	0	0	0	0	Z	0	0	1	1	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	4
17-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	0.1	0
18-Nov	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
19-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	0.2	0
20-Nov	0	0	Z	0	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0.5	1
21-Nov	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
22-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0.3	1
23-Nov	1	1	2	1	1	Z	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0.5	2
24-Nov	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	3	1	1	1	1	1	1	1	0.6	3
25-Nov	1	Z	1	1	1	1	1	1	0	0	M	0	1	1	1	0	0	0	0	0	0	0	0	0	0.7	1
26-Nov	1	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.4	1
27-Nov	2	2	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
28-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.3	1
29-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
30-Nov	0	0	0	0	1	2	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2

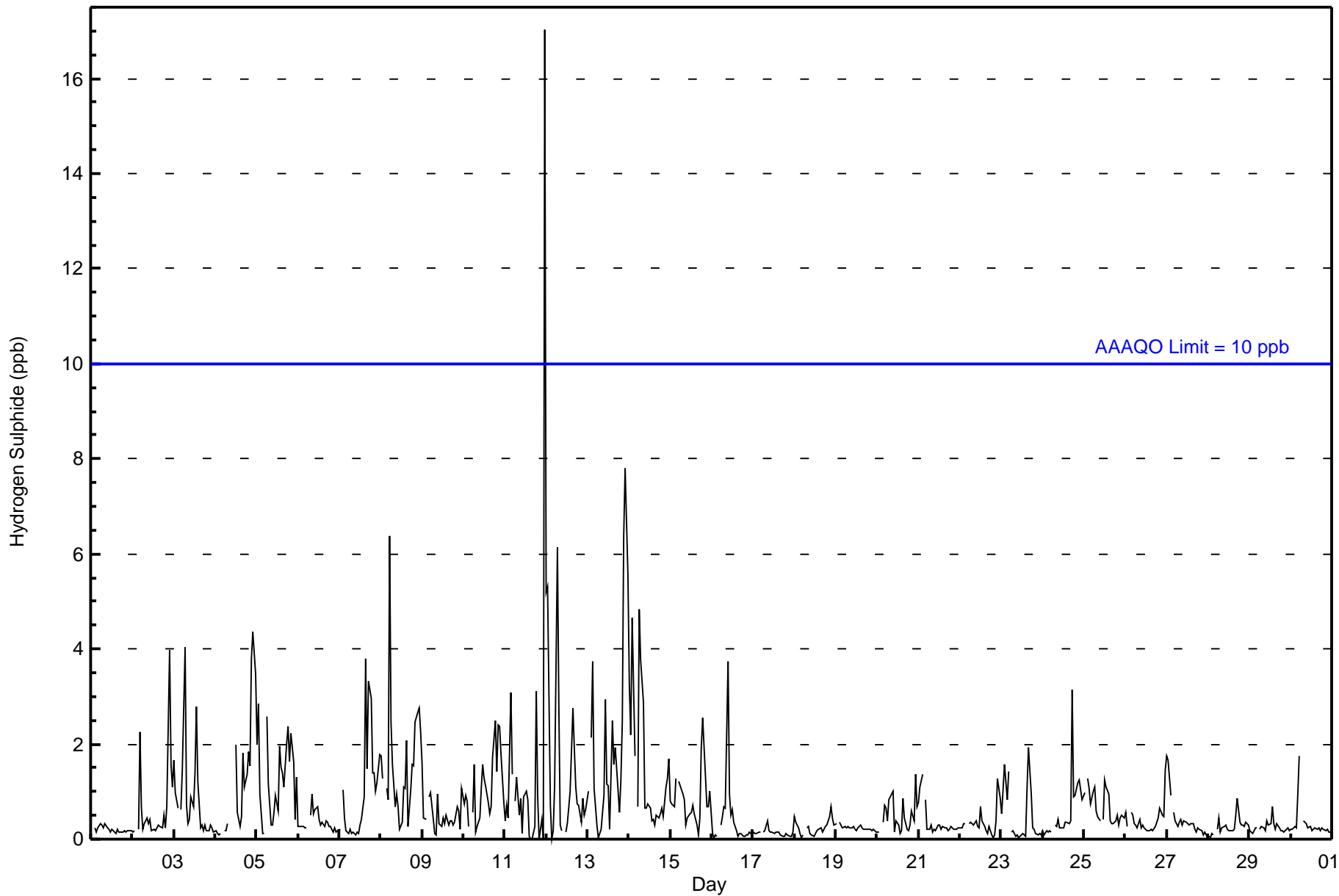
0.9	0.9	0.8	0.7	0.6	0.8	1.1	0.6	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.6	0.7	1.0	1.0	1.5	Diurnal Average	
5	5	5	4	2	6	6	4	3	4	3	2	2	3	2	4	2	3	3	3	3	2	6	8	17	Diurnal Maximum

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
Mildred Lake - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	650	94.89	94.89
3 - 4	25	3.65	98.54
5 - 7	8	1.17	99.71
8 - 11	1	0.15	99.85
> 11	1	0.15	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Mildred Lake - 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 - 2	30	32	22	9	18	19	13	127	106	59	38	41	36	40	27	33	650
3 - 4	1	0	0	0	1	1	3	12	4	1	0	1	0	0	1	0	25
5 - 7	0	0	0	0	0	1	1	3	0	1	0	2	0	0	0	0	8
8 - 11	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
> 11	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Totals	31	32	22	9	19	21	17	143	110	61	38	45	36	40	28	33	685

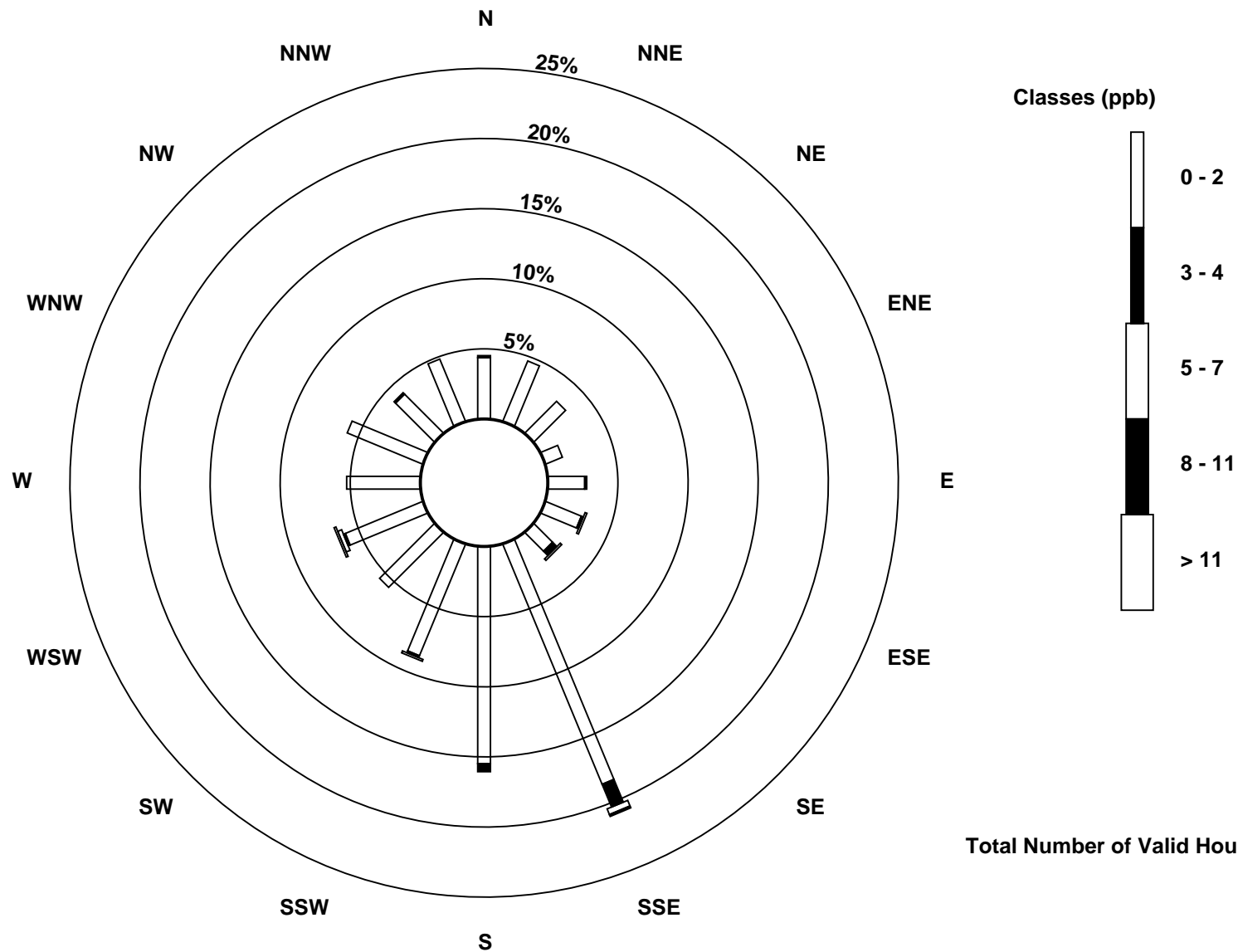
Total Number of Valid Hours: 685

Total Number of Hours: 720

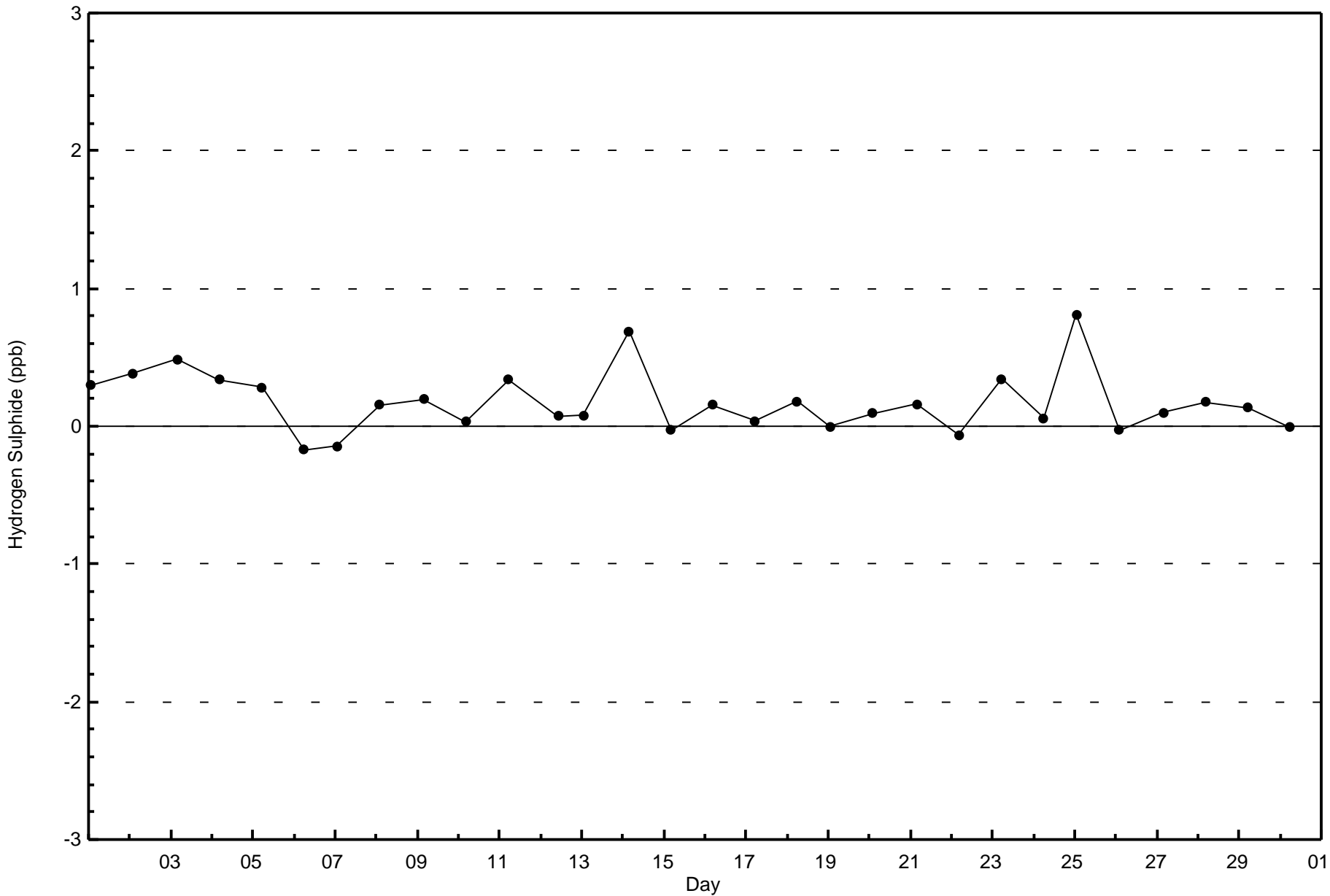


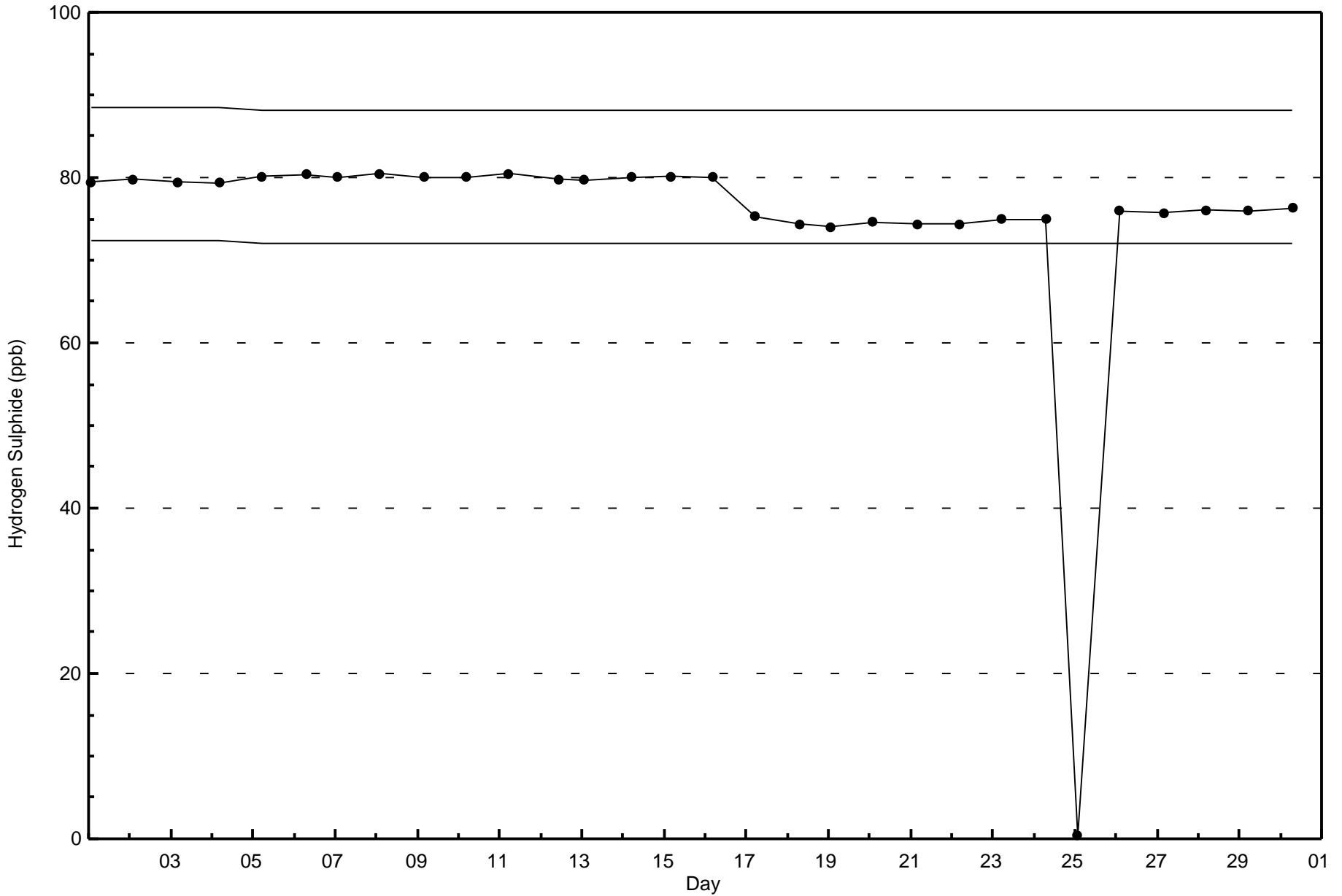
Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 685



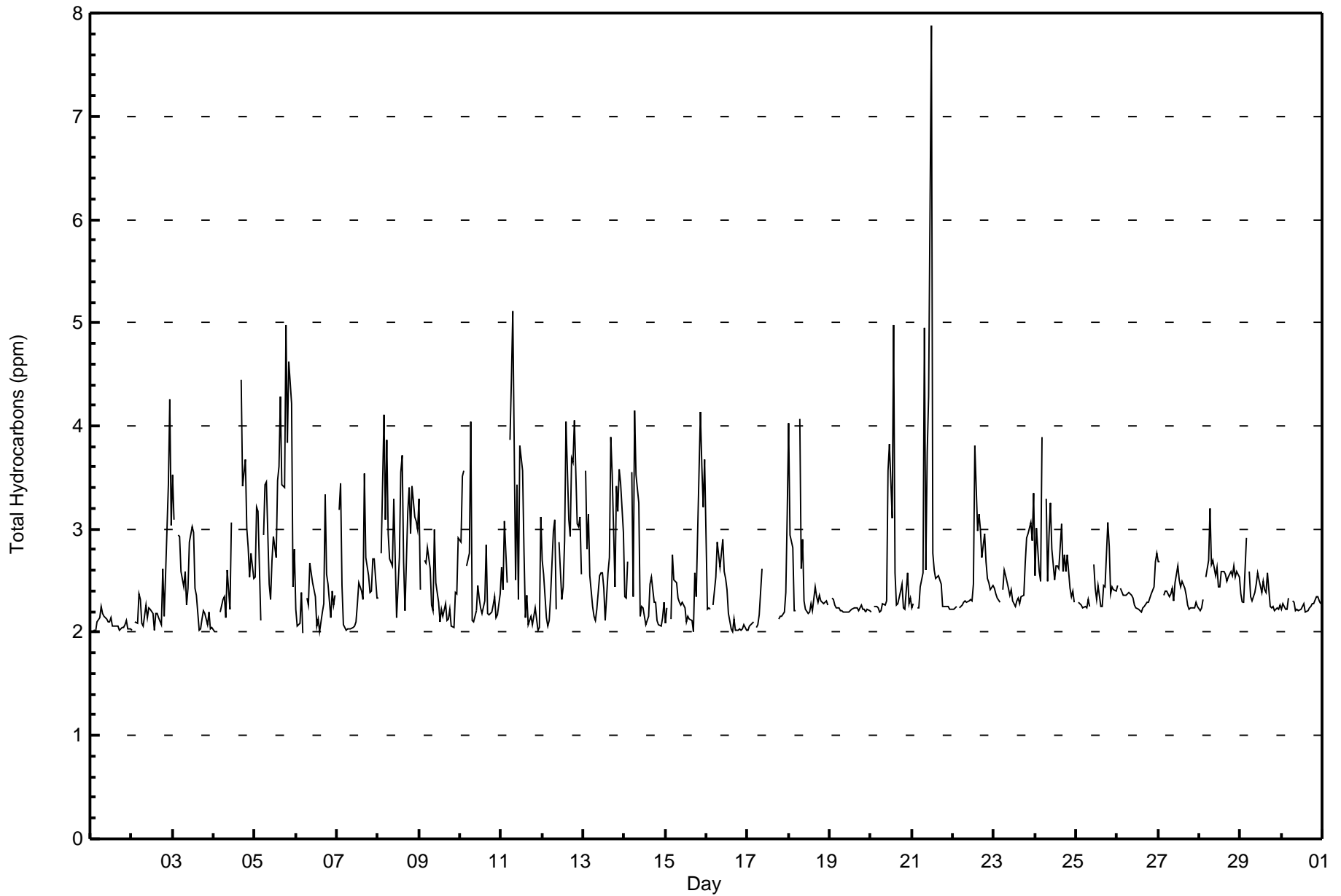




Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 7.9 ppm on Nov 21 12:00																				Maximum Daily Average: 3.3 ppm on Nov 5					Hours in Service: 720		
Minimum Value: 2.0 ppm on Nov 6 05:00																				Minimum Daily Average: 2.1 ppm on Nov 1					Hours of Data: 675		
Maximum Diurnal Average: 2.7 ppm at hour 7																				Minimum Diurnal Average: 2.4 ppm at hour 13					Hours of Missing Data: 45		
Monthly Average: 2.54 ppm																				Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.7 P ₉₀ = 3.3 P ₉₉ = 4.4					Hours of Calibration: 35		
																									Percent Operational Time: 98.6		
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-Nov	Z	2.0	2.0	2.0	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	2.0	2.1	2.0	2.1	2.1	2.0	2.0	2.1	2.2	
2-Nov	2.0	Z	2.1	2.1	2.4	2.3	2.1	2.1	2.3	2.1	2.2	2.2	2.2	2.0	2.2	2.2	2.1	2.1	2.6	2.2	2.6	3.4	4.3	3.0	2.4	4.3	
3-Nov	3.5	3.1	Z	2.9	2.9	2.6	2.4	2.6	2.3	2.4	2.9	3.0	3.0	2.4	2.4	2.0	2.0	2.1	2.2	2.2	2.1	2.2	2.0	2.0	2.5	3.5	
4-Nov	2.0	2.0	2.0	Z	2.2	2.3	2.3	2.1	2.6	2.2	3.1	C	C	C	C	C	4.4	3.4	3.7	3.0	2.8	2.5	2.8	2.5	2.7	4.4	
5-Nov	2.5	3.2	3.2	2.1	Z	2.9	3.4	3.5	2.5	2.3	2.7	2.9	2.7	3.5	3.6	4.3	3.4	3.4	5.0	3.8	4.6	4.2	2.4	2.8	3.3	5.0	
6-Nov	2.2	2.1	2.1	2.4	2.0	Z	2.3	2.3	2.7	2.6	2.5	2.3	2.1	2.1	2.0	2.2	2.3	3.3	2.6	2.5	2.1	2.4	2.3	2.4	2.3	3.3	
7-Nov	Z	3.2	3.5	2.5	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.5	2.4	2.3	3.5	2.7	2.5	2.4	2.4	2.7	2.7	2.3	2.4	3.5	
8-Nov	2.3	Z	2.8	4.1	3.1	3.9	3.0	2.7	2.6	3.3	2.7	2.1	2.7	3.6	3.7	2.7	2.2	3.2	3.4	3.0	3.4	3.1	3.1	3.0	3.0	4.1	
9-Nov	3.3	2.4	Z	2.7	2.7	2.8	2.6	2.3	2.2	3.0	2.5	2.3	2.1	2.2	2.2	2.3	2.1	2.1	2.2	2.1	2.1	2.4	2.4	2.9	2.4	3.3	
10-Nov	2.9	3.5	3.6	Z	2.7	2.8	4.0	2.1	2.1	2.2	2.4	2.3	2.2	2.2	2.3	2.9	2.2	2.2	2.2	2.3	2.3	2.1	2.2	2.4	2.5	4.0	
11-Nov	2.6	2.4	3.1	2.5	Z	3.9	4.4	5.1	2.5	3.4	2.3	3.8	3.6	2.8	2.1	2.4	2.1	2.2	2.1	2.2	2.2	2.0	2.1	3.1	2.8	5.1	
12-Nov	2.7	2.6	2.1	2.1	2.1	2.4	3.0	3.1	2.2	Z	2.9	2.3	2.4	2.9	4.0	3.1	2.9	3.7	3.7	4.1	3.0	3.0	3.1	2.6	2.9	4.1	
13-Nov	Z	3.6	2.8	3.2	2.6	2.2	2.1	2.1	2.2	2.6	2.6	2.4	2.1	2.6	2.7	3.9	3.5	2.4	3.4	3.2	3.6	3.4	3.0	2.8	3.9	3.9	
14-Nov	2.4	2.3	2.7	Z	3.5	2.3	4.2	3.5	3.3	2.1	2.3	2.2	2.1	2.1	2.2	2.5	2.5	2.3	2.3	2.1	2.1	2.1	2.3	2.5	4.2	4.2	
15-Nov	2.1	2.2	Z	2.1	2.7	2.5	2.5	2.3	2.3	2.3	2.3	2.2	2.1	2.2	2.1	2.1	2.0	2.6	2.3	3.0	4.1	3.6	3.2	3.7	2.6	4.1	
16-Nov	2.2	2.2	2.2	Z	2.3	2.5	2.9	2.8	2.6	2.9	2.6	2.5	2.4	2.2	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.3	2.9	
17-Nov	2.0	2.1	2.1	2.1	Z	2.0	2.1	2.2	2.6	M	M	M	M	M	M	M	M	M	M	2.1	2.2	2.2	2.2	2.4	3.1	--	3.1
18-Nov	4.0	2.9	2.8	2.2	2.2	Z	4.1	2.6	2.9	2.3	2.2	2.2	2.2	2.3	2.2	2.4	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.5	4.1	
19-Nov	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	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	
20-Nov	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	3.6	3.8	3.1	5.0	2.6	2.3	2.3	2.4	2.5	2.2	2.2	2.6	2.3	2.3	2.6	5.0	
21-Nov	2.2	2.3	Z	2.2	2.2	2.4	2.6	4.9	2.6	3.7	4.3	7.9	2.8	2.6	2.5	2.5	2.5	2.5	2.2	2.2	2.3	2.3	2.2	2.2	2.9	7.9	
22-Nov	2.2	2.2	2.2	Z	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	3.8	3.0	3.1	3.0	2.7	3.0	2.7	2.5	2.5	2.4	2.5	2.6	3.8	
23-Nov	2.4	2.4	2.3	2.3	Z	2.4	2.6	2.6	2.4	2.4	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.7	2.9	3.0	3.1	2.9	3.3	2.5	3.3	
24-Nov	2.5	3.0	2.6	2.5	3.9	Z	3.3	2.5	2.9	3.3	2.8	2.5	2.6	2.7	2.6	3.0	2.6	2.8	2.6	2.7	2.4	2.3	2.4	2.3	2.7	3.9	
25-Nov	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	M	2.7	2.4	2.3	2.5	2.2	2.3	2.5	2.4	3.1	2.8	2.4	2.4	2.4	2.4	2.4	3.1	
26-Nov	2.5	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.7	2.8	2.4	2.8	
27-Nov	2.7	2.7	Z	2.4	2.4	2.4	2.3	2.4	2.4	2.3	2.5	2.6	2.5	2.4	2.5	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.7	
28-Nov	2.2	2.2	2.3	Z	2.5	2.7	3.2	2.7	2.7	2.5	2.6	2.4	2.4	2.6	2.6	2.6	2.5	2.5	2.6	2.6	2.6	2.5	2.6	2.5	2.6	3.2	
29-Nov	2.4	2.3	2.3	2.9	Z	2.6	2.4	2.3	2.4	2.5	2.6	2.5	2.4	2.5	2.4	2.4	2.6	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.9	
30-Nov	2.2	2.3	2.2	2.2	2.3	Z	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Mildred Lake - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	35	5.19	5.19
2.1 - 3.0	549	81.33	86.52
3.1 - 10.0	91	13.48	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 675

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Mildred Lake - November 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	6	3	0	1	2	0	0	0	3	8	5	1	0	0	1	35
2.1 - 3.0	23	26	18	8	17	17	17	118	82	44	30	37	34	34	17	27	549
3.1 - 10.0	4	1	0	1	1	1	1	24	31	10	0	4	2	4	4	3	91
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	33	21	9	19	20	18	142	113	57	38	46	37	38	21	31	675

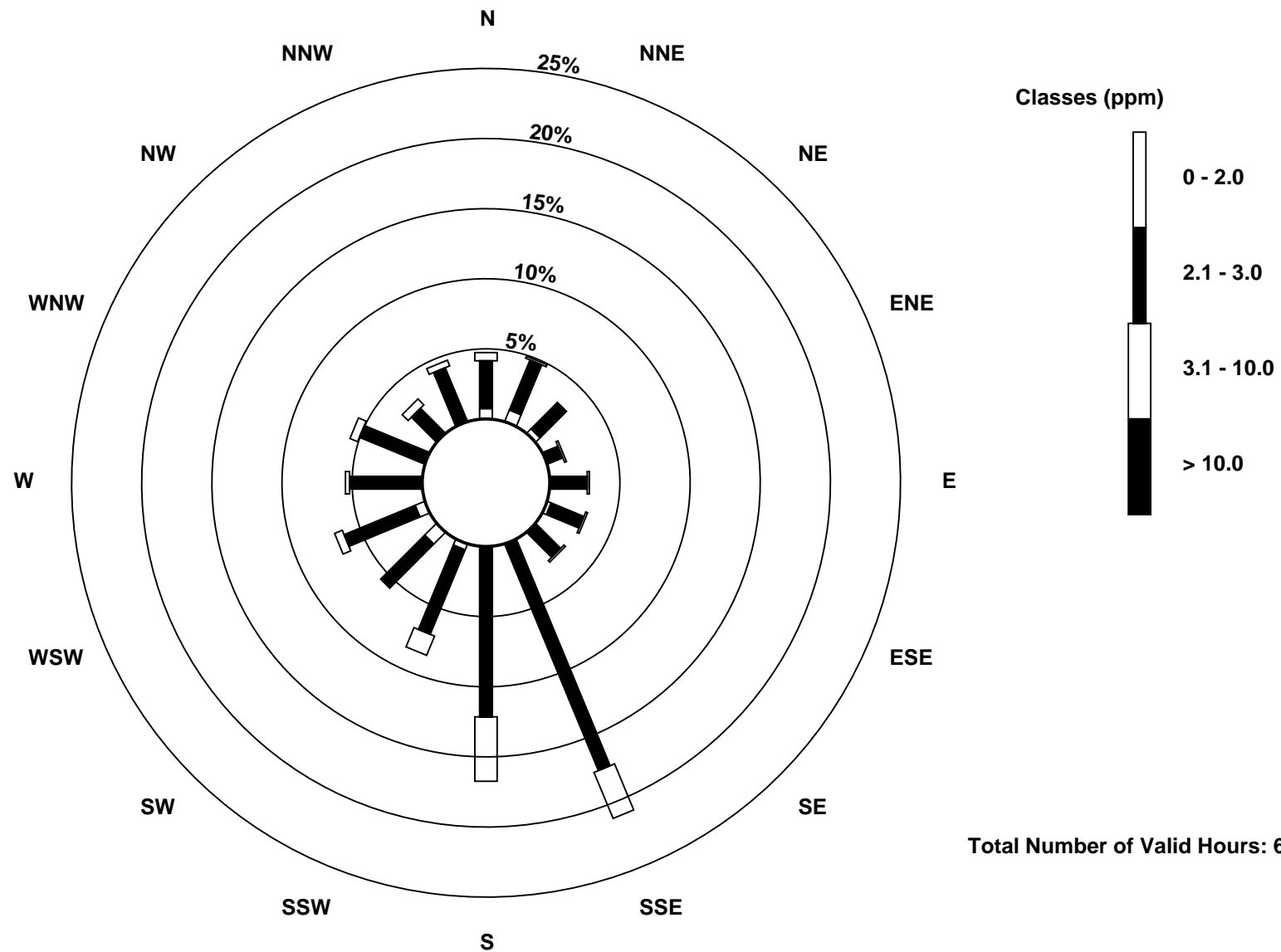
Total Number of Valid Hours: 675

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

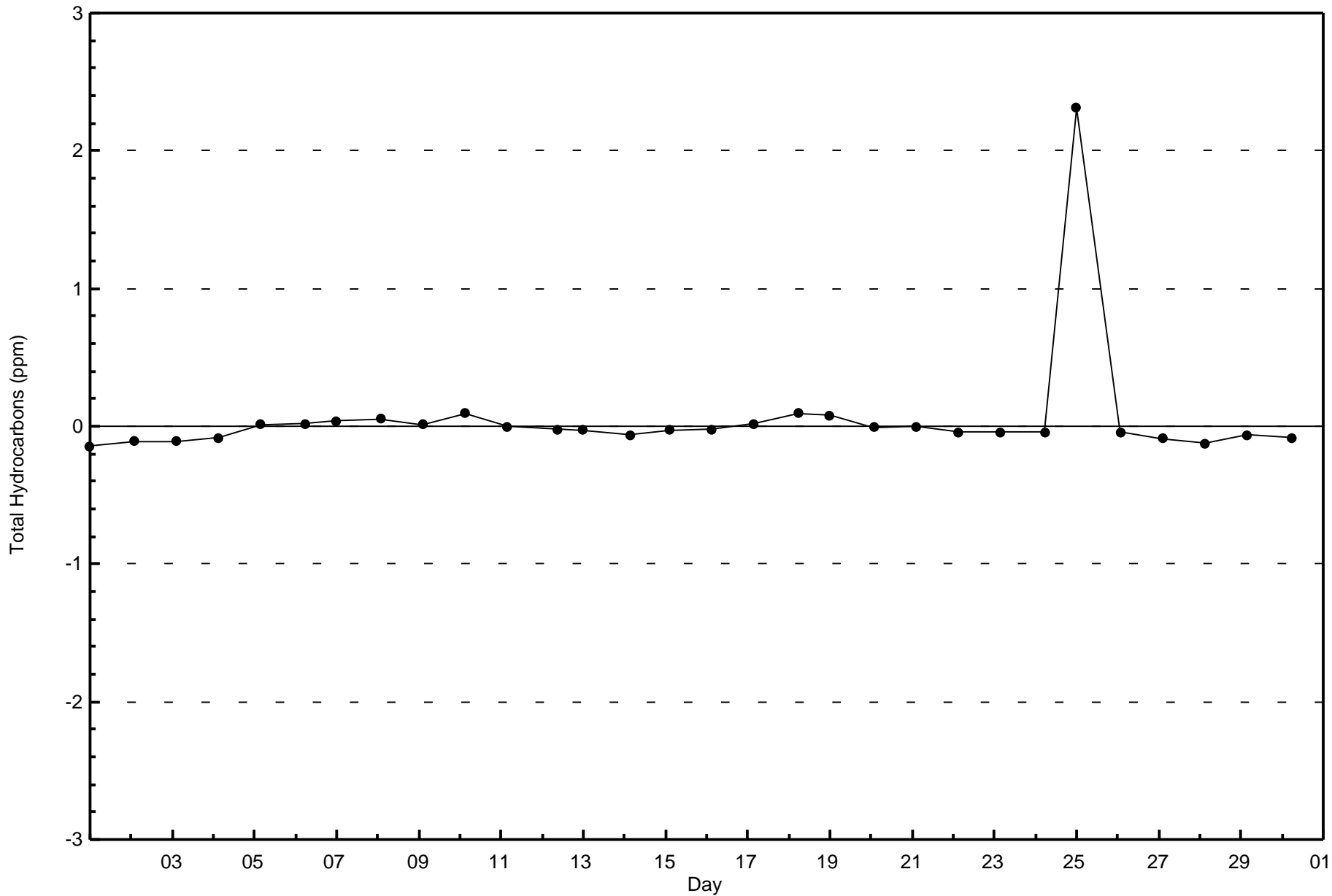
Total Hydrocarbons (THC) - ppm
Mildred Lake (AMS 2)

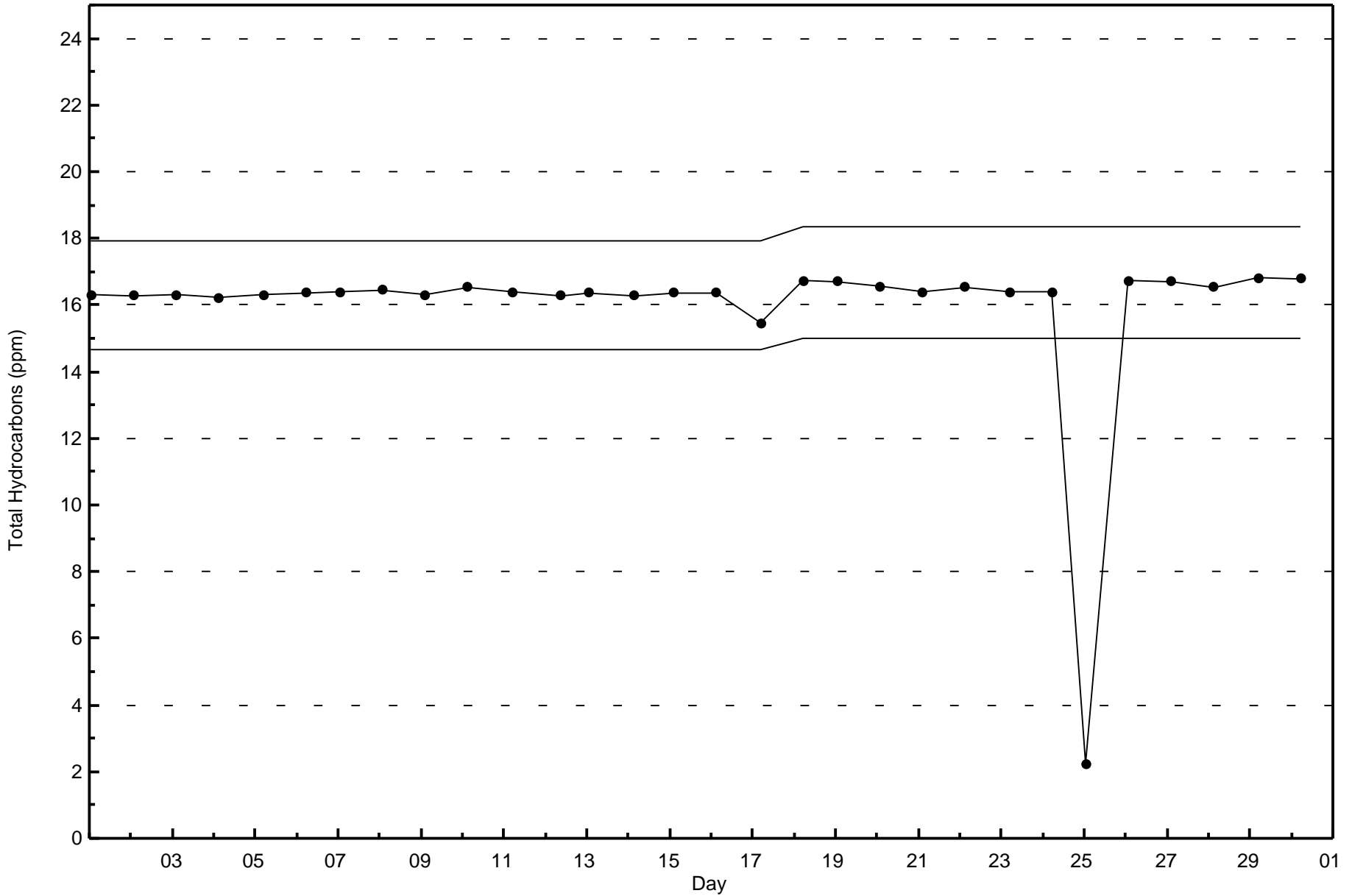




Wood Buffalo Environmental Association
Zero Responses

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







Wood Buffalo Environmental Association
Summary of Hour Averages

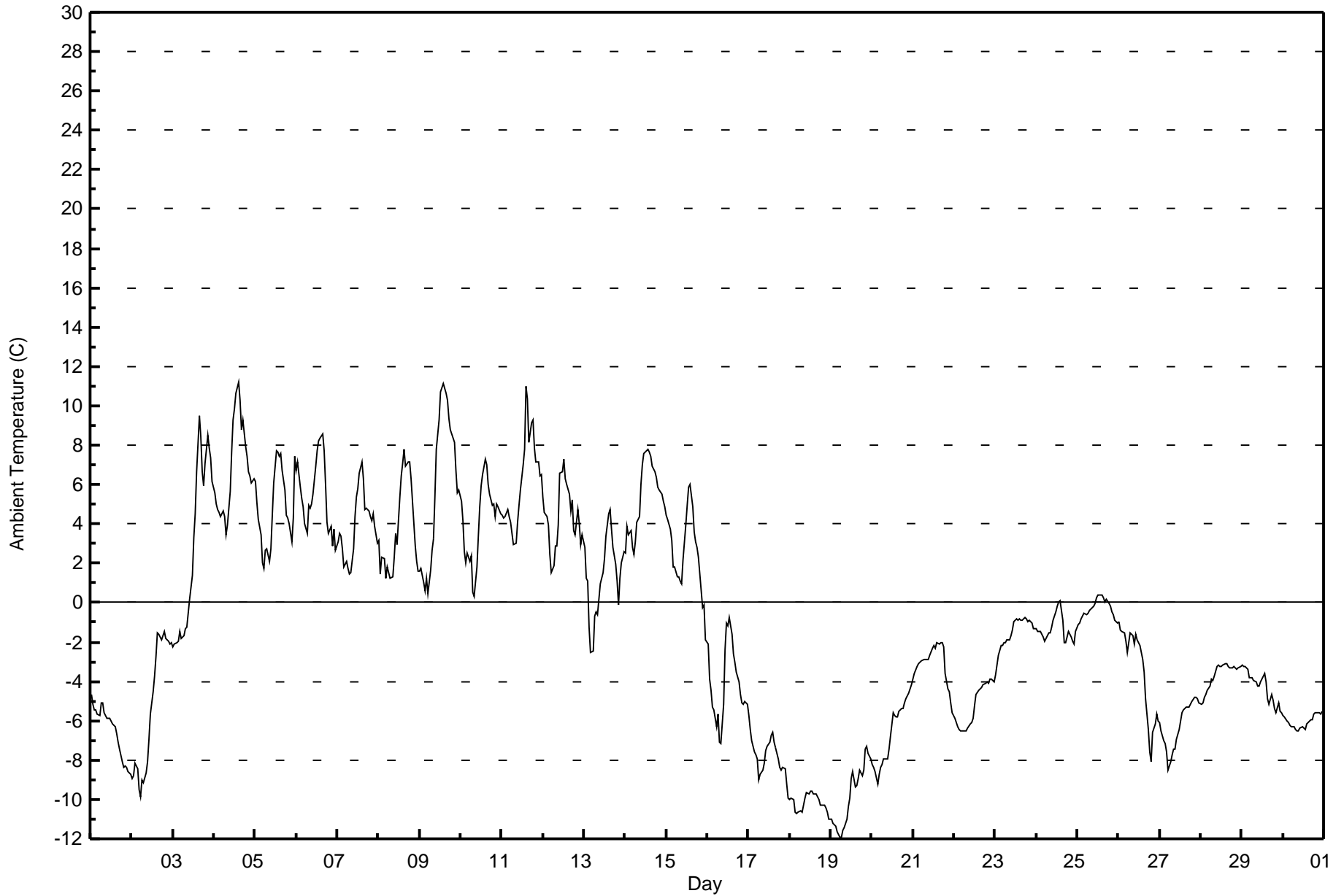
Ambient Temperature (AT) - C
Mildred Lake - November 2016

Maximum Value: 11.2 C on Nov 4 15:00 Maximum Daily Average: 6.8 C on Nov 4																								Hours in Service: 720		
Minimum Value: -11.9 C on Nov 19 07:00 Minimum Daily Average: -10.2 C on Nov 18																								Hours of Data: 720		
Maximum Diurnal Average: 1.0 C at hour 15 Minimum Diurnal Average: -2.6 C at hour 6																								Hours of Missing Data: 0		
Monthly Average: -0.94 C Percentiles: P₁ = -11.3 P₁₀ = -8.2 Q₁ = -5.6 Median = -1.5 Q₃ = 3.9 P₉₀ = 6.6 P₉₉ = 10.6																								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-Nov	-4.7	-5.2	-5.5	-5.5	-5.7	-5.7	-5.1	-5.1	-5.6	-5.9	-5.9	-5.9	-6.0	-6.2	-6.3	-6.7	-7.1	-7.5	-8.1	-8.4	-8.3	-8.4	-8.6	-8.7	-6.5	-4.7
2-Nov	-8.9	-8.8	-8.1	-8.4	-9.5	-9.9	-9.0	-9.1	-8.7	-8.1	-7.0	-5.7	-4.5	-3.7	-2.7	-1.5	-1.6	-1.9	-1.7	-1.4	-1.8	-2.0	-2.1	-2.0	-5.3	-1.4
3-Nov	-2.3	-2.1	-2.0	-2.0	-1.4	-1.8	-1.7	-1.3	-1.3	-0.6	0.2	1.4	3.3	4.5	6.6	9.5	8.4	6.6	6.0	7.1	8.5	7.9	7.4	6.2	2.8	9.5
4-Nov	5.6	5.0	4.7	4.6	4.4	4.7	4.4	3.5	3.9	5.7	7.6	9.3	9.9	10.7	11.2	10.3	8.8	9.3	8.0	7.4	6.7	6.4	6.1	6.3	6.8	11.2
5-Nov	6.2	5.1	4.2	3.5	2.1	1.7	2.6	2.7	2.1	2.7	4.5	6.1	7.7	7.6	7.5	7.5	6.7	5.7	4.5	4.3	4.0	3.1	4.3	7.5	4.7	7.7
6-Nov	6.7	7.1	5.9	5.3	4.8	4.0	3.5	4.9	4.8	5.0	5.5	7.0	7.7	8.2	8.4	8.6	7.7	6.0	4.1	3.5	3.8	2.9	3.7	2.7	5.5	8.6
7-Nov	3.1	3.5	3.4	2.7	1.8	2.1	1.7	1.4	1.5	2.8	4.3	5.4	5.8	6.6	7.1	6.3	4.7	4.8	4.6	4.4	4.2	4.5	3.9	3.0	3.9	7.1
8-Nov	3.2	1.5	2.3	2.2	1.3	1.8	1.6	1.3	1.3	2.3	3.5	3.0	5.4	6.5	7.1	7.8	6.9	7.1	7.2	6.3	5.2	2.9	2.1	1.6	3.8	7.8
9-Nov	1.6	1.7	1.0	0.6	1.2	0.5	1.6	2.7	3.2	5.4	7.8	9.3	10.7	10.9	11.1	10.6	10.3	9.4	8.8	8.6	8.2	6.7	5.6	5.7	6.0	11.1
10-Nov	5.1	4.1	2.6	2.0	2.5	2.1	2.4	0.5	0.3	1.8	3.4	4.8	5.9	6.5	7.3	7.0	6.0	5.5	5.0	5.0	4.4	5.0	4.9	4.5	4.1	7.3
11-Nov	4.4	4.3	4.4	4.7	4.4	4.1	3.5	3.0	3.0	4.1	5.0	5.7	7.0	7.8	11.0	10.3	8.1	9.1	9.3	7.9	7.1	7.1	6.5	6.5	6.2	11.0
12-Nov	5.3	4.6	4.4	3.9	2.4	1.5	1.9	2.9	2.9	4.0	6.6	6.6	7.3	6.3	6.0	5.5	4.7	5.2	3.7	3.5	4.7	4.0	3.0	3.5	4.4	7.3
13-Nov	2.8	1.2	1.1	-1.3	-2.5	-2.5	-0.7	-0.5	-0.6	1.0	1.2	1.5	2.3	3.4	4.5	4.7	3.8	2.8	2.0	1.1	-0.1	1.2	2.0	2.6	1.3	4.7
14-Nov	2.5	3.8	3.4	3.6	2.8	2.5	3.1	4.1	4.4	6.0	7.0	7.6	7.8	7.8	7.7	7.4	7.0	6.6	6.4	5.9	5.7	5.5	5.1	4.9	5.4	7.8
15-Nov	4.4	4.2	3.7	3.2	1.8	1.8	1.3	1.3	1.1	0.9	2.2	3.9	4.9	5.8	6.0	4.9	3.6	3.1	2.8	2.3	0.6	-0.2	-0.1	-1.9	2.6	6.0
16-Nov	-2.1	-3.9	-4.4	-5.3	-5.5	-6.3	-5.7	-7.1	-7.1	-5.1	-2.4	-1.0	-1.2	-0.7	-1.6	-2.6	-3.0	-3.6	-4.0	-4.6	-5.1	-5.2	-5.0	-5.2	-4.1	-0.7
17-Nov	-5.7	-6.4	-7.0	-7.6	-7.8	-8.0	-9.0	-8.8	-8.5	-8.1	-7.5	-7.3	-7.1	-6.7	-6.6	-7.1	-7.4	-7.9	-8.3	-8.5	-8.3	-8.4	-9.2	-9.9	-7.8	-5.7
18-Nov	-10.0	-9.9	-10.0	-10.7	-10.7	-10.7	-10.6	-10.6	-10.3	-9.9	-9.7	-9.7	-9.6	-9.6	-9.7	-9.7	-9.9	-10.0	-10.3	-10.3	-10.3	-10.4	-10.6	-11.0	-10.2	-9.6
19-Nov	-11.0	-11.2	-11.3	-11.4	-11.7	-11.9	-11.9	-11.6	-11.4	-11.0	-10.4	-10.0	-8.9	-8.6	-9.4	-9.3	-9.0	-8.5	-8.8	-8.5	-7.4	-7.3	-7.7	-7.9	-9.8	-7.3
20-Nov	-8.2	-8.4	-8.6	-9.2	-8.8	-8.4	-8.2	-7.9	-8.0	-8.0	-7.5	-6.8	-5.6	-5.7	-5.8	-5.8	-5.5	-5.4	-5.3	-5.1	-4.9	-4.6	-4.4	-4.2	-6.7	-4.2
21-Nov	-3.9	-3.6	-3.2	-3.1	-3.0	-2.9	-2.9	-2.9	-2.9	-2.9	-2.7	-2.3	-2.1	-2.3	-2.0	-2.1	-2.1	-2.0	-2.3	-3.6	-4.4	-4.5	-5.1	-5.6	-3.1	-2.0
22-Nov	-5.8	-6.1	-6.3	-6.4	-6.5	-6.5	-6.5	-6.5	-6.4	-6.2	-6.1	-5.9	-5.3	-4.7	-4.4	-4.3	-4.3	-4.2	-4.1	-4.0	-4.1	-3.9	-3.9	-4.0	-5.3	-3.9
23-Nov	-3.6	-3.2	-2.7	-2.2	-2.2	-2.0	-2.0	-1.9	-1.9	-1.7	-1.4	-1.0	-0.8	-0.9	-0.9	-0.9	-0.9	-0.7	-0.8	-0.9	-0.9	-1.0	-1.3	-1.3	-1.5	-0.7
24-Nov	-1.4	-1.4	-1.5	-1.6	-1.8	-2.0	-1.7	-1.5	-1.5	-1.2	-0.9	-0.4	-0.2	0.0	0.1	-0.9	-2.1	-2.0	-1.7	-1.5	-1.7	-2.0	-2.1	-1.5	-1.4	0.1
25-Nov	-1.1	-1.0	-0.8	-0.7	-0.5	-0.6	-0.6	-0.4	-0.3	-0.2	0.0	0.2	0.4	0.4	0.4	0.3	0.0	0.2	-0.1	-0.2	-0.4	-0.6	-0.9	-1.1	-0.3	0.4
26-Nov	-1.0	-1.4	-1.5	-1.6	-1.9	-2.6	-2.0	-1.6	-1.7	-2.1	-1.6	-1.9	-2.2	-2.5	-2.9	-3.5	-4.9	-6.4	-7.6	-8.1	-6.6	-6.2	-5.6	-6.1	-3.5	-1.0
27-Nov	-6.1	-6.5	-7.0	-7.1	-7.6	-8.5	-8.1	-7.8	-7.4	-7.5	-6.9	-6.5	-6.0	-5.6	-5.4	-5.3	-5.3	-5.3	-5.2	-5.0	-4.8	-4.8	-4.9	-5.1	-6.2	-4.8
28-Nov	-5.2	-5.1	-4.8	-4.6	-4.5	-4.3	-3.9	-4.0	-3.8	-3.3	-3.2	-3.2	-3.3	-3.2	-3.1	-3.1	-3.2	-3.3	-3.3	-3.2	-3.3	-3.4	-3.3	-3.3	-3.7	-3.1
29-Nov	-3.2	-3.3	-3.3	-3.4	-3.8	-3.8	-3.8	-3.9	-4.0	-4.3	-4.3	-4.0	-3.7	-3.6	-4.0	-4.9	-5.2	-4.7	-5.0	-5.4	-5.6	-5.1	-5.5	-5.6	-4.3	-3.2
30-Nov	-5.8	-5.8	-6.0	-6.1	-6.2	-6.3	-6.3	-6.4	-6.5	-6.5	-6.4	-6.3	-6.4	-6.4	-6.2	-6.1	-6.0	-5.9	-5.7	-5.6	-5.6	-5.6	-5.6	-5.5	-6.1	-5.5
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	419	58.19	58.19
0 - 10	291	40.42	98.61
10 - 20	10	1.39	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

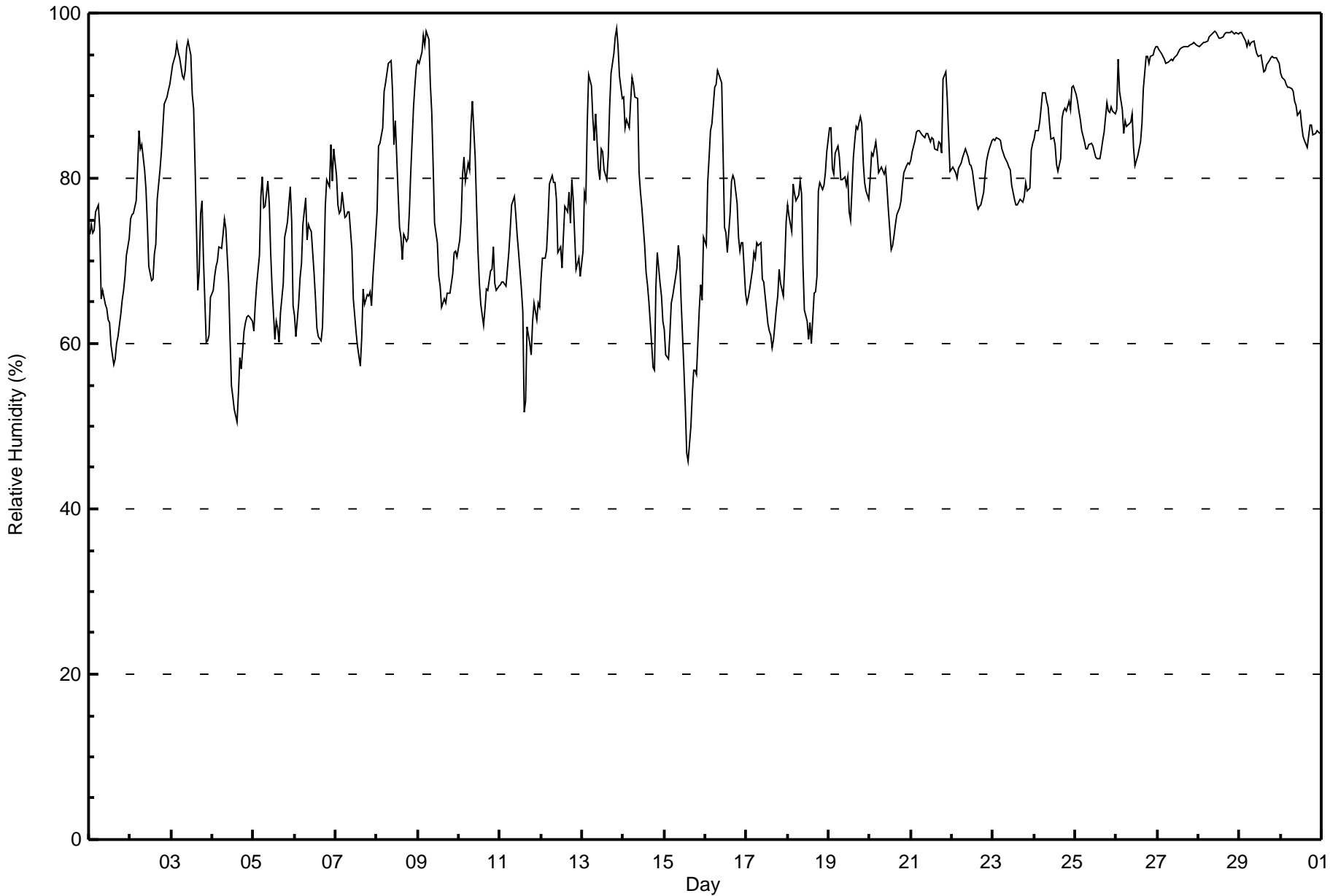
**Relative Humidity (RH) - %
Mildred Lake - November 2016**

Maximum Value: 98 % on Nov 13 21:00 Maximum Daily Average: 97.2 % on Nov 28																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 46 % on Nov 15 15:00 Minimum Daily Average: 60.8 % on Nov 15 Maximum Diurnal Average: 84.1 % at hour 6 Minimum Diurnal Average: 72.3 % at hour 15 Monthly Average: 78.9 % Percentiles: P ₁ = 53 P ₁₀ = 63 Q ₁ = 70 Median = 80 O ₃ = 88 P ₉₀ = 95 P ₉₉ = 98																										
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	73	74	73	74	76	77	74	65	66	65	64	63	63	60	58	58	60	61	64	65	67	68	71	73	67.1	77
2-Nov	75	76	76	77	81	86	84	84	81	79	74	69	68	68	71	72	77	81	83	86	89	90	91	91	79.5	91
3-Nov	93	94	95	96	95	95	92	92	93	96	97	95	90	88	82	66	69	76	77	70	60	60	61	66	83.3	97
4-Nov	66	68	69	70	72	72	73	75	74	67	61	55	53	52	51	54	58	57	62	62	63	63	63	63	63.5	75
5-Nov	61	65	67	71	78	80	77	77	80	77	71	67	60	63	62	60	64	67	73	74	75	79	75	65	70.2	80
6-Nov	63	61	65	68	70	74	78	73	74	74	74	68	65	62	61	60	62	69	77	80	79	84	80	84	71.0	84
7-Nov	80	77	76	76	78	75	75	76	76	71	65	63	61	60	57	61	67	65	66	66	66	65	68	73	69.4	80
8-Nov	76	84	84	86	91	91	93	94	94	91	84	87	78	74	73	70	73	72	73	76	81	89	91	94	83.3	94
9-Nov	94	94	95	97	96	98	97	91	88	82	75	72	68	67	64	65	65	66	66	66	68	71	71	71	78.7	98
10-Nov	73	75	81	83	80	82	81	87	89	83	77	71	67	65	62	64	67	66	69	69	72	67	66	67	73.4	89
11-Nov	67	68	67	67	69	71	74	77	78	76	73	71	67	64	52	53	62	60	59	63	65	63	65	64	66.4	78
12-Nov	68	70	70	71	75	79	80	80	79	77	71	72	69	73	77	76	78	75	80	77	69	70	70	68	74.0	80
13-Nov	71	78	77	87	92	91	87	85	88	81	80	84	83	81	80	83	89	93	95	97	98	96	92	90	86.6	98
14-Nov	90	86	87	86	89	92	91	90	90	81	78	76	72	69	67	65	62	57	57	67	71	67	66	63	75.8	92
15-Nov	62	59	58	61	65	66	68	69	72	70	65	57	52	47	46	50	54	57	57	56	64	67	65	73	60.8	73
16-Nov	72	79	83	86	87	91	91	93	93	92	83	74	73	71	76	80	80	80	77	73	71	72	72	66	79.8	93
17-Nov	65	66	67	69	71	70	72	72	72	68	67	66	62	61	61	60	61	64	66	69	67	66	70	75	66.9	75
18-Nov	77	75	74	79	78	77	78	80	78	70	64	63	61	63	60	66	66	68	78	79	79	79	81	83	73.2	83
19-Nov	86	86	81	81	83	84	83	80	80	80	79	80	76	75	83	85	86	86	87	87	82	80	79	77	81.8	87
20-Nov	80	83	83	84	83	81	81	81	81	81	79	76	71	72	73	74	76	77	77	79	81	82	82	82	79.1	84
21-Nov	82	83	85	86	86	86	85	85	85	85	85	84	85	85	84	83	84	84	83	92	93	90	85	81	85.3	93
22-Nov	81	81	81	80	81	82	83	83	83	83	82	82	81	80	77	76	77	77	78	80	82	83	83	85	80.8	85
23-Nov	85	85	85	85	85	84	83	83	82	81	81	79	77	77	77	77	77	77	78	80	78	79	83	84	80.9	85
24-Nov	85	86	86	87	89	90	90	89	89	87	85	85	84	82	81	82	87	88	89	88	89	88	91	91	87.0	91
25-Nov	90	89	88	87	86	84	84	84	84	84	84	83	83	82	82	83	85	86	89	88	88	89	88	88	85.8	90
26-Nov	88	94	91	88	85	87	86	86	87	88	84	81	83	84	84	87	91	95	95	94	95	95	96	96	89.1	96
27-Nov	96	96	95	95	94	94	94	94	94	94	95	95	95	96	96	96	96	96	96	96	96	96	96	96	95.3	96
28-Nov	96	96	96	96	97	97	97	97	97	97	98	98	97	97	97	98	98	98	98	98	98	98	98	97	97.2	98
29-Nov	98	98	97	97	96	97	96	96	97	96	95	95	95	94	93	93	94	94	95	95	95	95	94	94	95.3	98
30-Nov	93	92	92	91	91	91	91	91	89	89	88	88	87	85	85	84	85	86	86	85	86	86	85	85	88.0	93
	79.5	80.6	80.8	82.0	83.3	84.1	83.9	83.6	83.8	81.4	78.5	76.6	74.3	73.1	72.3	72.7	75.0	75.9	77.6	78.6	78.9	79.2	79.3	79.4	Diurnal Average	
	98	98	97	97	97	98	97	97	97	97	98	98	97	97	97	98	98	98	98	98	98	98	98	97	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





Maximum Speed: 25 km/h on Nov 14 23:00	Maximum Daily Speed Average: 16.1 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 8 23:00	Minimum Daily Speed Average: 1.6 km/h on Nov 21	Hours of Data: 720
Maximum Diurnal Speed Average: 5.2 km/h at hour 9	Minimum Diurnal Speed Average: 1.4 km/h at hour 19	Hours of Missing Data: 0
Monthly Average Velocity: 3.4 km/h 199.1 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 12 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-Nov	NNW10	N8	N7	NNE5	NE4	ENE3	NW8	NW16	WNNW16	NW15	NW14	NW14	NW14	NW16	NNW15	NNW16	NNW13	NNW14	N11	NNE9	NNE6	NE5	ESE6	E7	NNW8.3	WNNW16
2-Nov	ESE6	ESE6	S8	S8	SSE6	S7	S11	S12	S14	SSE13	S14	S15	S14	SSW13	S14	S12	S9	S9	S11	S9	SSE7	SSE8	S8	S8	S9.7	SSE15
3-Nov	SSE9	SSE13	SSE13	SSE11	SSE10	SSE12	SSE13	S12	S11	S9	S13	SSE12	SSE11	SE10	SSE8	SSW14	SSW13	S7	SSW0	SW8	WSW15	WSW12	WSW11	SW10	S9.0	WSW15
4-Nov	SW9	SW10	SW11	WSW9	SW9	WSW8	SW6	S7	SSE12	S10	S7	S9	SSE12	SSE10	SSE9	S7	SSE8	SSE12	S7	SSE6	SSE7	SSE8	SW8	SSE13	S7.8	SSE13
5-Nov	SSE10	S8	S7	SSW7	SSW4	SSE5	S7	S4	SSW5	SSW6	S7	SSE11	S6	SSE7	S9	SSE10	S7	S8	N2	SSE5	SSE2	S6	SW7	WNNW10	S5.8	SSE11
6-Nov	WSW12	WSW11	SW6	SSW7	SW8	SSW6	WSW6	W7	W5	W3	WSW9	WSW4	SW5	WSW7	W5	WSW4	WSW6	WSW4	WSW4	SSW3	WSW6	SW6	WSW6	SW7	WSW5.7	WSW12
7-Nov	WSW8	WSW7	WSW7	WSW7	SW6	WSW10	WSW10	SW9	SW8	SW10	WSW11	SW8	SSW9	S7	S7	SSE8	SSE8	SSE8	SSE7	SSE10	SSE9	SSE9	SSE10	SSE10	SSW6.6	WSW11
8-Nov	SSE6	S3	S9	SSW8	SSW6	SSW9	SSW9	SSW7	S8	SSW8	SSW8	SSW8	SSW6	S8	SSE9	S9	S8	SSE10	SSE12	SSE5	SSE6	ESE2	N0	ESE3	S6.6	SSE12
9-Nov	SSW6	SSW8	SSW1	S7	SE4	S4	SSW7	SSW7	SW10	WSW9	SW9	WSW7	WNNW15	WNNW10	WNNW11	W8	WNNW16	WNNW19	WNNW18	WNNW17	WNNW15	W10	WSW11	W11	W7.7	WNNW19
10-Nov	W10	W9	S3	SW10	WSW9	WSW10	W9	SSW5	SSW5	S7	SSE8	SSE9	SE10	SSE11	SSE12	SSE9	SSE10	SSE13	SSE12	SSE13	SSE12	SSE16	SSE15	SSE12	S7.7	SSE16
11-Nov	S13	S13	SSE13	SSE13	S12	S10	S8	S7	S7	S7	S7	S10	SSE11	S10	SW10	SW10	SW7	WSW7	WSW8	WSW6	WSW7	WSW9	WSW12	WSW10	SSW7.8	S13
12-Nov	WSW8	WSW6	SW6	SSW5	SSE5	ESE4	ESE4	SSW7	SSW6	SW5	WSW3	SSW4	NW3	S3	ENE2	E2	WSW4	NW4	N2	WNNW6	WNNW7	WNNW6	WNNW7	WNNW12	WSW2.9	WNNW12
13-Nov	WNNW9	WNNW6	WNNW5	S3	SW3	SW3	SSW8	SW6	SW6	S6	SSE10	SSE10	S9	S6	SSE8	SSE8	SSE7	S7	SSE4	S5	SE5	SSE6	SSE7	SE6	S4.7	SSE10
14-Nov	SE7	SE8	SSE9	SSE10	S7	S8	SSE8	S7	S8	WSW11	W11	W11	WNNW14	WNNW15	WNNW18	WNNW15	WNNW13	WNNW14	WNNW16	WNNW16	WNNW22	W25	W25	W25	W9.0	W25
15-Nov	WNNW18	WNNW16	WNNW19	W23	W16	W20	W16	W16	W11	WSW13	W12	W12	WNNW9	WNNW10	W10	W9	WSW9	W8	WNNW12	NW11	NW5	NW8	NW9	N6	WNNW11.6	W23
16-Nov	N7	NNE3	N4	NW4	NW4	SW3	WSW2	SE2	E2	S3	SSW4	SE2	E5	NE8	NE12	NE11	NE12	NE10	NNE13	NNE11	NNE10	NNE8	NNE9	N16	NNE5.3	N16
17-Nov	N15	N14	N15	N11	NW10	N11	NW9	NW9	NW10	NW10	WNNW9	WNNW11	NW11	NW12	NW13	NW17	NW16	NW20	NW19	NW14	NW12	NW9	NW8	NW6	NW11.3	NW20
18-Nov	NW7	NW9	NW8	E3	NE2	NE3	NNE2	NE2	N3	N7	N11	NW9	NW5	NW7	NW7	NW4	NNE3	SE2	SSE4	SSE3	ESE3	E4	NE4	NNE5	N3.2	N11
19-Nov	ENE5	E6	E6	E5	ENE4	NNE4	NE5	E9	ENE6	NE6	NE6	NE5	E7	ENE6	N11	NNE11	NNE9	NNE7	N8	NE6	ESE7	SE10	ESE13	ESE12	ENE5.5	ESE13
20-Nov	ESE11	ESE10	ESE10	ESE8	SE9	SSE13	SSE12	SSE10	SSE16	SSE13	S11	SSE12	SSE11	S9	SSE9	SSE9	SSE8	SSE9	SSE10	SSE12	SSE12	SSE9	SE10	SE10	SSE10.2	SSE16
21-Nov	SE11	SSE11	SSE12	SSE12	SSE13	S13	S13	S11	SSW11	SSW7	SSE4	SSW3	N8	NW9	NW7	NW11	NW8	NW10	N9	NE12	NE9	NE7	NE9	NNE7	ESE1.6	SSE13
22-Nov	NNE7	NNE9	NE7	NNE5	NNE4	NE4	E4	E4	E3	ESE4	ESE6	ESE7	SSE6	S8	S8	S10	S12	SSE13	S13	S12	SSE14	SSE12	SSE14	SSE12	SE5.2	SSE14
23-Nov	SSE15	SSE16	SSE17	SSE19	SSE18	SSE19	S17	S18	SSE20	SSE19	SSE19	SSE20	SSE19	SSE19	SSE17	SSE15	SSE15	SSE14	SSE13	S12	S16	S13	SSW11	S11	SSE16.1	SSE20
24-Nov	SSW9	S10	SSW10	SSW11	S11	SSW10	S9	S11	S10	S11	SSW12	SSW10	S9	SSE11	S9	SSW4	SSE4	SE7	SE7	SSE8	SE9	SSE18	SSE16	SSE17	S9.5	SSE18
25-Nov	SSE18	SE15	SSE17	SSE18	SSE18	SSE16	SSE17	SSE16	SSE13	S9	SSE8	SSE9	SSE8	SSE7	S4	S4	WNNW2	W5	WNNW7	NW10	WNNW11	WNNW10	W11	W11	S6.9	SSE18
26-Nov	W10	WSW11	WNNW11	W10	W11	W9	WSW9	W8	W8	SW8	WSW11	SW11	SW10	SW8	S8	SSW5	SSW4	SW2	ENE2	E2	WNNW2	S2	SSE2	ESE4	WSW5.5	SW11
27-Nov	E3	E4	E6	ENE4	E5	E5	ENE4	NNE5	NNE5	NNE8	NNE6	NNE7	NNE8	NNE9	NNE10	N9	NNE12	NNE12	NNE12	NNE10	NNE9	N9	N9	NW8	NNE6.6	NNE12
28-Nov	NW6	NW6	NW3	NW3	NW1	WNNW2	NW3	ENE1	S2	W3	W4	WSW3	SW3	SW3	S2	ESE2	ESE2	NW2	N3	N4	N7	N5	N4	N6	NW1.9	N7
29-Nov	NW6	N5	NW2	NW6	N3	SW1	NW3	E1	S3	SSW2	SW4	WSW4	SSW4	S8	SSW9	S8	S8	S8	SSW9	SSW9	SSW8	S10	S12	S11	SSW3.8	S12
30-Nov	SSW13	S12	S12	S13	SSE12	SSE12	SSE13	SSE15	S15	S14	S13	S13	S15	S13	S11	S12	SSW12	SSW10	SSW12	S15	S14	SSW14	SSW13	S12	S12.7	SSE15

SSW2.5SSW2.9 S3.3 S4.2 S3.8 S4.5SSW4.6SSW4.7SSW5.2SSW4.9SSW5.1SSW4.8SSW4.0SSW3.6SSW2.9SSW2.8SSW2.5 SW2.2WSW1.4 SW1.8SSW2.1SSW3.0SSW3.5SSW2.8	Diurnal Average
WNNW18 SSE16WNNW19 W23 SSE18 W20 SSE17 S18 SSE20 SSE19 SSE19 SSE20 SSE19 SSE19WNNW18 NW17WNNW16 NW20NWNW19WNNW17WNNW22 W25 W25 W25	Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

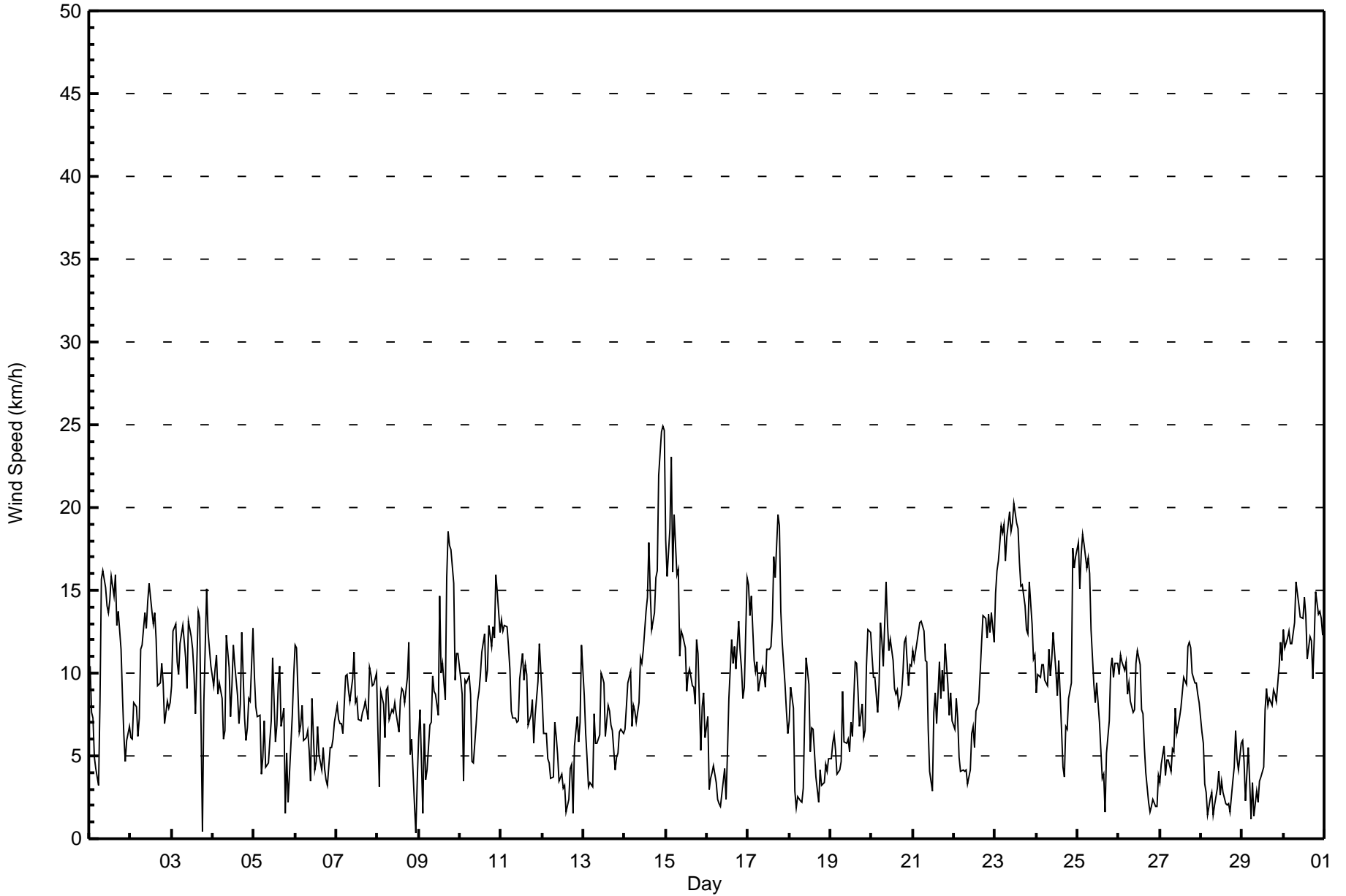
Wind Speed (WS) - km/h
Mildred Lake - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 14 22:00 Minimum Value: 1 km/h on Nov 16 04:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																	Hours in Service: 720 Hours of Data: 720 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-Nov	2	2	1	2	1	1	5	4	4	4	4	4	4	4	3	3	3	4	2	1	1	1	1	1	5
2-Nov	1	1	3	2	1	2	2	3	3	3	3	3	3	3	3	2	2	3	2	1	1	2	1	1	3
3-Nov	2	2	2	2	2	3	3	3	2	2	3	2	2	2	2	3	2	2	5	5	4	3	3	5	
4-Nov	2	3	3	2	3	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	2	3	3
5-Nov	3	2	2	2	2	2	2	2	1	2	2	3	3	2	2	2	2	2	2	3	2	2	3	3	3
6-Nov	4	3	3	2	2	2	2	3	2	1	3	3	2	3	3	1	2	2	1	1	1	1	2	2	4
7-Nov	3	2	2	3	3	3	3	2	2	2	3	2	2	1	1	1	1	1	1	2	2	2	2	2	3
8-Nov	3	2	3	2	1	2	3	2	2	1	1	1	2	2	2	2	1	2	2	1	2	1	2	2	3
9-Nov	2	2	2	3	2	3	2	3	2	3	2	3	4	4	4	3	5	4	5	5	4	3	3	4	5
10-Nov	3	3	3	2	2	3	3	2	1	2	2	2	2	2	3	2	2	3	2	3	3	3	3	3	3
11-Nov	3	2	2	2	3	3	2	2	1	2	2	2	2	3	3	2	2	2	3	2	2	3	3	3	3
12-Nov	3	3	3	3	2	1	1	1	2	2	2	3	3	3	2	2	2	2	2	3	2	2	2	2	3
13-Nov	2	2	3	1	1	1	2	3	3	3	2	2	2	2	2	2	1	2	2	1	1	1	1	1	3
14-Nov	2	2	2	2	1	2	2	1	1	4	4	4	4	4	5	4	3	4	5	6	6	8	7	7	8
15-Nov	6	5	6	7	5	6	6	6	4	4	4	5	3	3	3	3	3	3	3	3	2	2	2	1	7
16-Nov	1	1	1	1	1	1	1	1	1	1	1	2	1	2	3	3	3	3	4	3	3	2	3	4	4
17-Nov	4	3	3	2	3	3	2	2	3	3	3	3	3	4	4	5	4	5	4	3	2	2	2	1	5
18-Nov	1	2	2	2	1	1	1	1	1	2	2	2	3	2	1	2	1	1	1	2	1	1	2	1	3
19-Nov	1	1	2	1	1	2	2	2	2	1	1	1	3	2	2	2	2	1	1	1	3	3	3	3	3
20-Nov	2	2	2	2	3	3	3	3	4	3	3	2	2	2	2	2	2	2	2	3	3	2	3	3	4
21-Nov	3	2	3	3	2	2	2	2	2	3	2	1	3	2	2	2	2	2	2	3	2	2	3	2	3
22-Nov	2	2	2	1	1	1	1	1	2	2	1	1	1	2	2	2	3	3	4	3	3	3	3	3	4
23-Nov	3	3	3	4	4	3	3	3	3	4	3	4	4	4	3	3	3	3	2	2	3	2	2	2	4
24-Nov	2	2	1	2	2	2	2	2	2	2	3	2	2	2	2	1	1	1	2	2	3	5	4	4	5
25-Nov	4	4	5	5	6	5	4	3	3	3	2	2	2	2	2	1	1	2	3	3	3	3	3	3	6
26-Nov	3	3	4	3	4	3	3	3	2	2	3	3	3	2	2	2	1	1	2	1	1	1	1	1	4
27-Nov	1	1	1	1	1	1	1	1	2	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	2
28-Nov	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
29-Nov	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	1	2	3	2	2	2	2	3	2	3
30-Nov	3	3	3	3	2	2	2	3	3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	2	3
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	151	20.97	20.97
6 - 11	388	53.89	74.86
12 - 19	172	23.89	98.75
20 - 28	9	1.25	100.00
29 - 38	0	0.00	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
Mildred Lake - 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	11	10	9	8	14	10	5	12	13	16	10	9	6	4	4	10	151
6 - 11	18	20	10	2	6	10	12	67	74	35	30	35	21	17	13	18	388
12 - 19	4	4	3	0	0	2	1	70	31	10	0	5	5	20	10	7	172
20 - 28	0	0	0	0	0	0	0	2	0	0	0	0	5	1	1	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	33	34	22	10	20	22	18	151	118	61	40	49	37	42	28	35	720

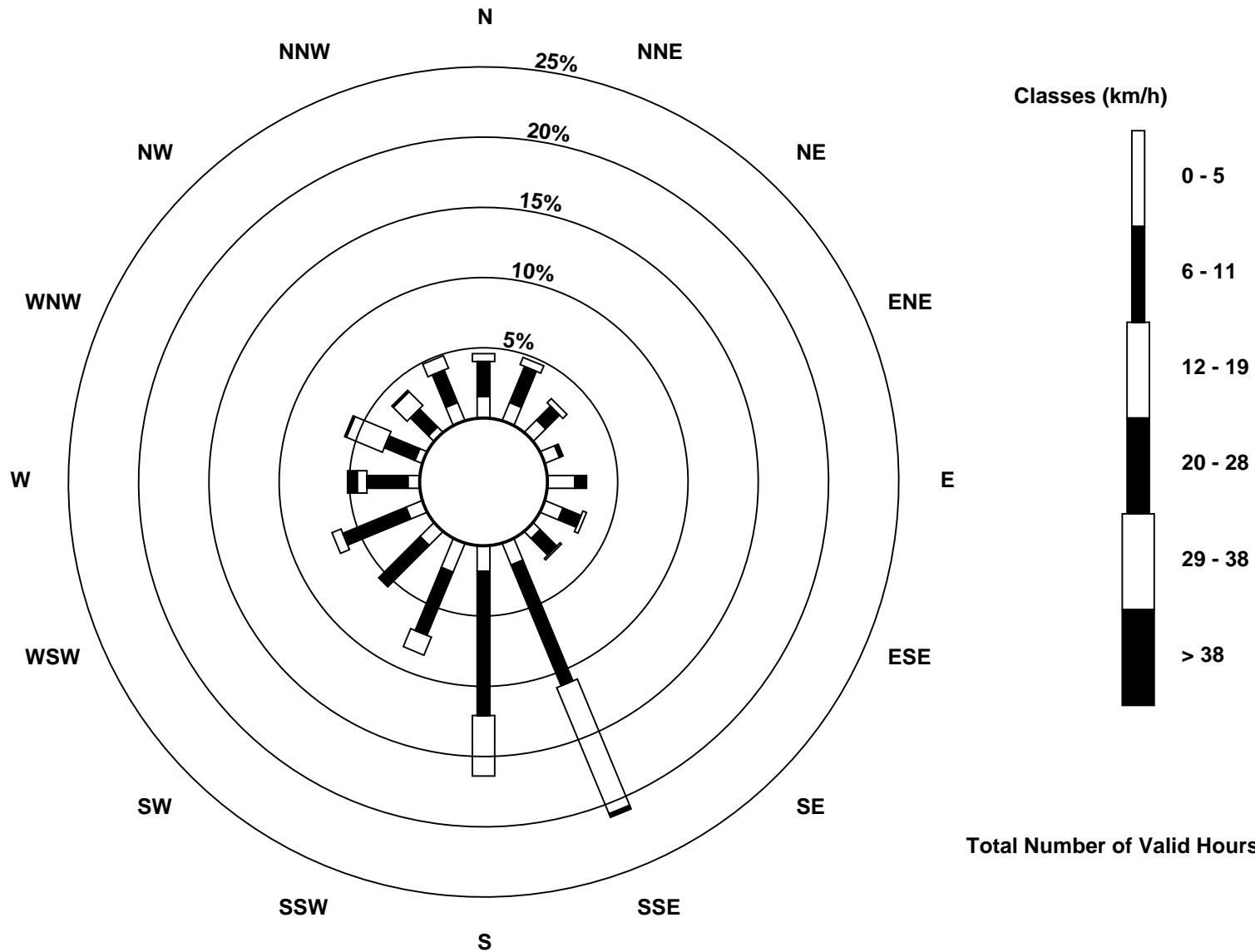
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 278 deg on Nov 14 23:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 168.1 deg on Nov 23	Hours of Data: 720
Direction of Minimum Speed: 353 deg on Nov 8 23:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.6 deg on Nov 21	Percent Operational Time: 100.0
Monthly Average Direction: 223.4 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-Nov	347	3	7	17	34	60	316	306	301	306	312	315	309	311	331	344	344	338	358	17	32	49	120	101	335.9
2-Nov	112	109	187	183	149	172	188	184	179	167	172	169	182	193	171	182	183	178	172	181	154	156	172	171	173.0
3-Nov	154	163	166	163	164	163	163	176	190	186	172	167	163	140	161	198	198	178	194	232	253	256	248	231	185.7
4-Nov	226	219	229	242	234	243	221	171	161	169	179	171	154	165	166	174	159	163	183	165	163	147	159	158	182.1
5-Nov	152	169	182	199	192	164	185	189	206	192	185	164	187	156	172	162	187	174	8	166	157	188	218	283	181.6
6-Nov	253	252	225	194	222	211	238	277	268	263	256	256	235	242	261	250	256	247	249	210	242	228	244	221	241.9
7-Nov	243	256	248	246	229	243	240	230	223	219	238	218	198	181	170	152	149	154	160	151	152	162	163	149	198.3
8-Nov	162	179	170	196	195	192	200	199	182	198	201	206	195	175	167	180	186	166	165	155	168	116	353	106	180.7
9-Nov	195	194	201	173	134	187	209	202	214	243	224	257	292	283	291	275	291	296	297	293	288	277	256	268	264.7
10-Nov	268	261	188	225	248	258	264	212	210	185	164	158	146	149	164	167	161	149	157	163	154	157	159	165	179.1
11-Nov	170	169	166	163	169	170	173	175	180	184	178	171	167	169	232	232	220	239	246	246	240	249	246	256	196.5
12-Nov	255	252	236	206	168	110	118	194	202	222	247	196	315	174	65	87	257	311	6	296	293	287	292	297	250.8
13-Nov	285	286	297	173	235	225	208	236	219	185	165	166	174	179	148	164	155	173	168	183	130	148	149	146	182.3
14-Nov	136	142	160	168	187	180	160	169	180	245	264	271	292	298	297	301	302	298	295	285	288	281	278	277	269.4
15-Nov	284	286	290	279	269	275	273	279	273	257	260	264	291	294	276	268	249	263	301	315	338	332	312	353	282.5
16-Nov	11	12	2	347	345	231	257	139	101	169	193	135	100	48	42	39	43	34	28	31	23	26	12	9	30.2
17-Nov	4	7	4	3	346	349	339	326	312	318	302	302	309	307	310	305	309	326	334	332	336	338	319	318	329.4
18-Nov	314	307	345	81	39	54	18	35	6	352	351	339	324	325	337	341	15	127	158	153	108	92	38	32	356.7
19-Nov	61	94	97	83	60	24	49	84	69	47	53	44	84	65	7	18	28	16	7	35	105	129	121	121	65.4
20-Nov	118	123	120	123	145	159	154	158	157	165	170	163	167	173	163	156	154	161	166	158	160	160	145	139	153.2
21-Nov	143	154	159	159	162	169	169	189	193	194	164	197	352	347	342	335	339	331	1	34	37	36	42	31	120.8
22-Nov	28	32	45	26	27	36	79	90	88	117	110	109	150	176	187	182	183	168	180	174	168	166	152	151	146.2
23-Nov	163	161	159	160	160	167	169	169	166	166	166	167	165	166	166	159	160	166	167	172	191	191	194	191	168.1
24-Nov	194	188	192	193	191	194	179	190	186	179	194	196	180	166	190	193	165	130	131	168	146	160	154	150	175.2
25-Nov	157	143	155	154	151	157	159	164	162	176	164	165	160	157	171	191	287	281	302	311	297	285	265	261	176.2
26-Nov	268	252	285	281	281	265	254	264	277	227	243	235	223	215	191	195	202	233	75	80	303	170	166	112	246.9
27-Nov	96	99	95	76	80	90	74	26	26	14	13	16	16	12	17	11	14	13	18	20	19	8	359	345	23.8
28-Nov	346	344	314	328	332	296	328	61	181	268	277	240	225	223	180	120	112	327	4	10	11	11	351	351	334.3
29-Nov	348	349	332	335	360	219	340	98	172	197	216	255	202	178	193	173	174	190	210	210	192	183	170	189	196.5
30-Nov	196	183	188	182	167	163	165	165	179	180	185	184	172	171	173	180	193	198	195	191	190	193	192	191	182.2

205.5 194.6 187.4 188.5 186.6 190.8 194.3 194.4 194.6 202.3 204.3 197.8 197.1 194.0 204.7 205.9 209.9 216.7 242.7 215.8 213.1 197.1 201.2 201.6

Diurnal Average

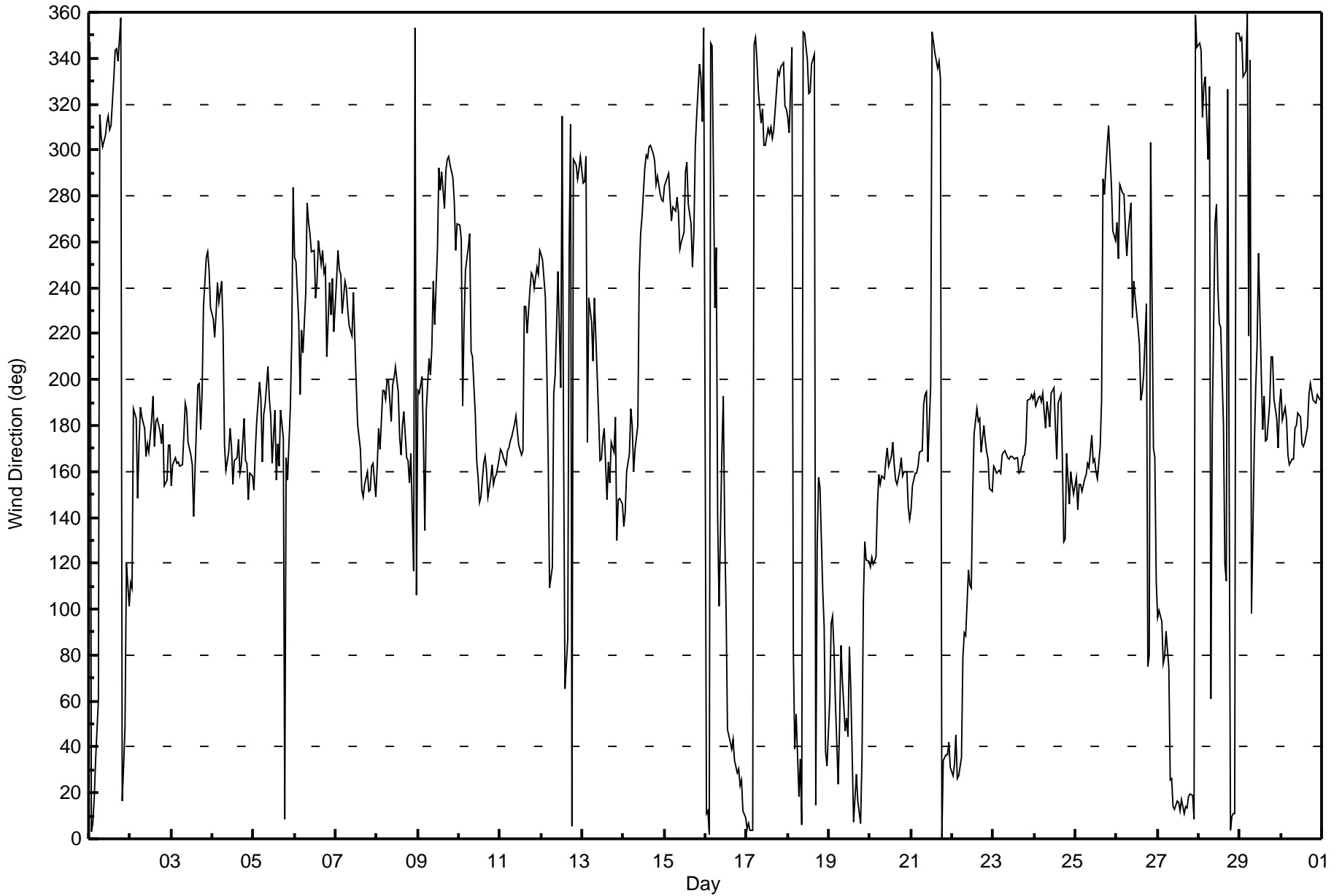
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Nov 8 23:00 Minimum Value: 8 deg on Nov 21 16:00 Percentiles: P ₁ = 10 P ₁₀ = 12 Q ₁ = 14 Median = 17 Q ₃ = 23 P ₉₀ = 37 P ₉₉ = 78																	Hours in Service: 720 Hours of Data: 720 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-Nov	10	12	11	28	17	46	35	16	17	17	19	18	19	19	22	13	17	13	16	15	18	34	16	12	46	
2-Nov	17	12	31	13	20	25	13	16	17	17	16	14	17	14	14	16	15	14	14	14	13	10	10	12	31	
3-Nov	13	11	10	10	15	13	12	14	16	19	16	13	13	21	34	11	11	36	98	25	23	22	20	19	98	
4-Nov	18	18	21	22	19	23	23	25	9	13	19	17	16	15	11	17	13	13	16	29	20	15	15	16	29	
5-Nov	16	17	23	14	43	33	17	44	34	16	19	17	34	18	17	14	36	22	78	69	63	23	33	20	78	
6-Nov	23	24	43	21	15	24	21	30	36	54	32	73	51	33	35	23	18	45	51	58	22	26	28	16	73	
7-Nov	24	30	29	32	34	24	24	24	22	21	22	21	14	18	18	15	17	11	14	13	12	17	10	12	34	
8-Nov	22	43	17	16	16	14	16	18	17	16	14	17	19	16	14	21	12	13	10	22	17	62	100	44	100	
9-Nov	22	14	89	36	73	79	19	34	17	26	23	39	17	26	23	29	18	16	16	16	17	27	21	24	89	
10-Nov	22	24	69	16	21	18	25	53	29	22	20	20	20	19	13	12	12	14	14	11	13	13	13	16	69	
11-Nov	11	13	11	12	14	14	17	15	15	14	15	14	11	22	22	19	15	27	23	31	27	23	22	23	31	
12-Nov	25	30	35	66	33	48	49	21	11	35	56	61	81	72	68	59	46	66	96	43	15	29	18	14	96	
13-Nov	14	20	76	46	17	30	17	29	40	42	14	17	20	26	19	11	13	10	39	13	12	13	15	20	76	
14-Nov	20	19	13	15	16	21	15	29	20	26	24	24	20	18	16	16	17	19	18	23	18	18	18	18	29	
15-Nov	19	25	20	18	19	19	21	21	24	22	23	25	26	24	24	21	21	26	16	15	28	17	15	18	28	
16-Nov	13	37	8	11	13	19	27	50	38	27	39	63	35	25	18	18	17	20	16	17	17	16	15	15	63	
17-Nov	14	14	13	13	9	15	9	11	15	16	19	19	20	20	17	17	17	16	11	11	12	12	14	13	20	
18-Nov	12	17	26	56	58	37	58	25	25	21	17	24	34	33	18	53	41	45	17	24	18	14	26	20	58	
19-Nov	20	16	17	15	24	16	28	13	23	21	18	20	28	40	14	14	17	18	10	22	25	19	15	14	40	
20-Nov	14	14	15	13	22	14	16	16	15	17	16	16	20	20	16	18	17	17	15	15	14	13	18	19	22	
21-Nov	22	17	14	14	12	12	12	16	12	51	59	59	33	12	16	8	13	13	24	17	17	19	18	20	59	
22-Nov	18	14	19	18	22	32	15	15	23	24	15	15	29	16	20	16	17	15	17	16	15	15	17	18	32	
23-Nov	13	13	14	13	13	11	11	12	11	11	12	12	12	12	12	13	13	13	11	14	12	12	12	11	14	
24-Nov	16	13	10	11	13	11	16	13	14	15	13	14	18	13	19	19	38	15	23	26	18	18	19	20	38	
25-Nov	16	18	17	18	17	17	15	13	14	16	15	13	16	16	18	17	69	26	29	16	17	23	21	22	69	
26-Nov	23	23	22	19	23	22	26	26	25	21	22	22	19	23	16	18	12	21	49	69	23	44	15	19	69	
27-Nov	24	18	16	23	22	23	20	19	25	14	16	15	15	14	15	14	13	14	14	14	14	12	15	11	25	
28-Nov	10	15	21	23	21	22	41	78	63	32	26	25	22	44	42	16	13	59	14	11	11	14	11	9	78	
29-Nov	13	15	13	11	32	74	14	60	40	57	28	29	27	20	17	13	16	20	22	24	19	17	13	15	74	
30-Nov	13	17	15	16	14	12	11	13	17	16	17	18	16	15	14	16	15	11	12	13	13	13	12	13	18	
																	25 43 89 66 73 79 58 78 63 57 59 73 81 72 68 59 69 66 98 69 63 62 100 44									
Diurnal Maximum																										





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	11:43	End Time (MST)	15:55
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

	<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	804	804
Calculated slope	0.995671	1.001354	Chamber temp	44.9	44.9
Calculated intercept	-3.019489	-2.992743	Pressure	692.9	693.8
Analyzer Background	19.1	19.1	Flow	0.492	0.492
Analyzer Coefficient	0.931	0.931	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	-0.6	----
as found span	5000	76.4	782.3	785.9	0.996
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	76.4	782.3	782.9	0.999
second point	5000	38.4	393.2	396.6	0.992
third point	5000	19.2	196.6	202.8	0.970
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	76.4	782.3	785.0	0.997
Average Correction Factor					0.987

Corrected As found 786.4 Previous response 788.8 % change 0.3%

Notes:

Changed inlet filter after as founds. Adjusted zero and span.

Calibration Performed By: Jayne Marcoux



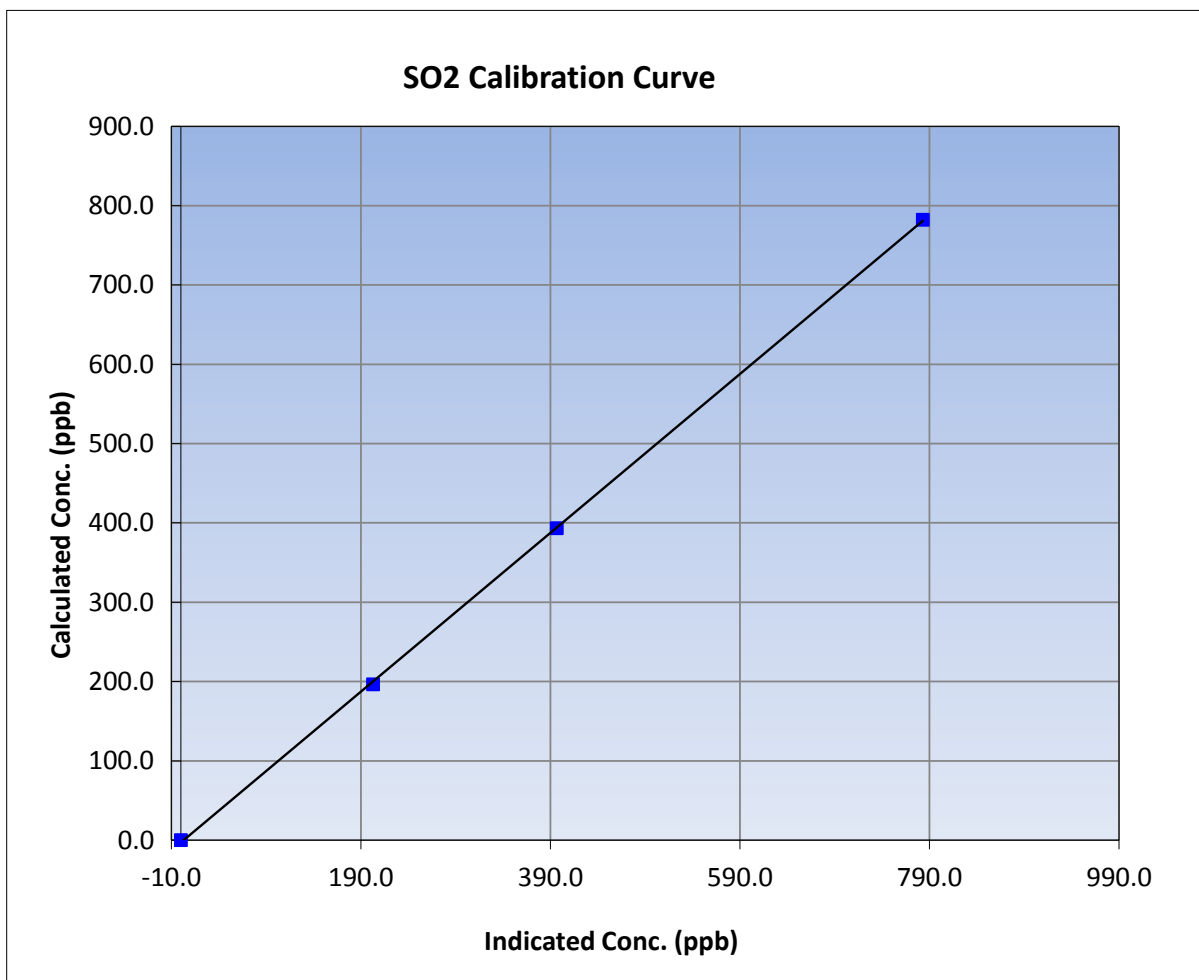
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	11:43	End Time (MST)	15:55
Analyzer make	TEI 43i	Analyzer serial #	JC1404901075

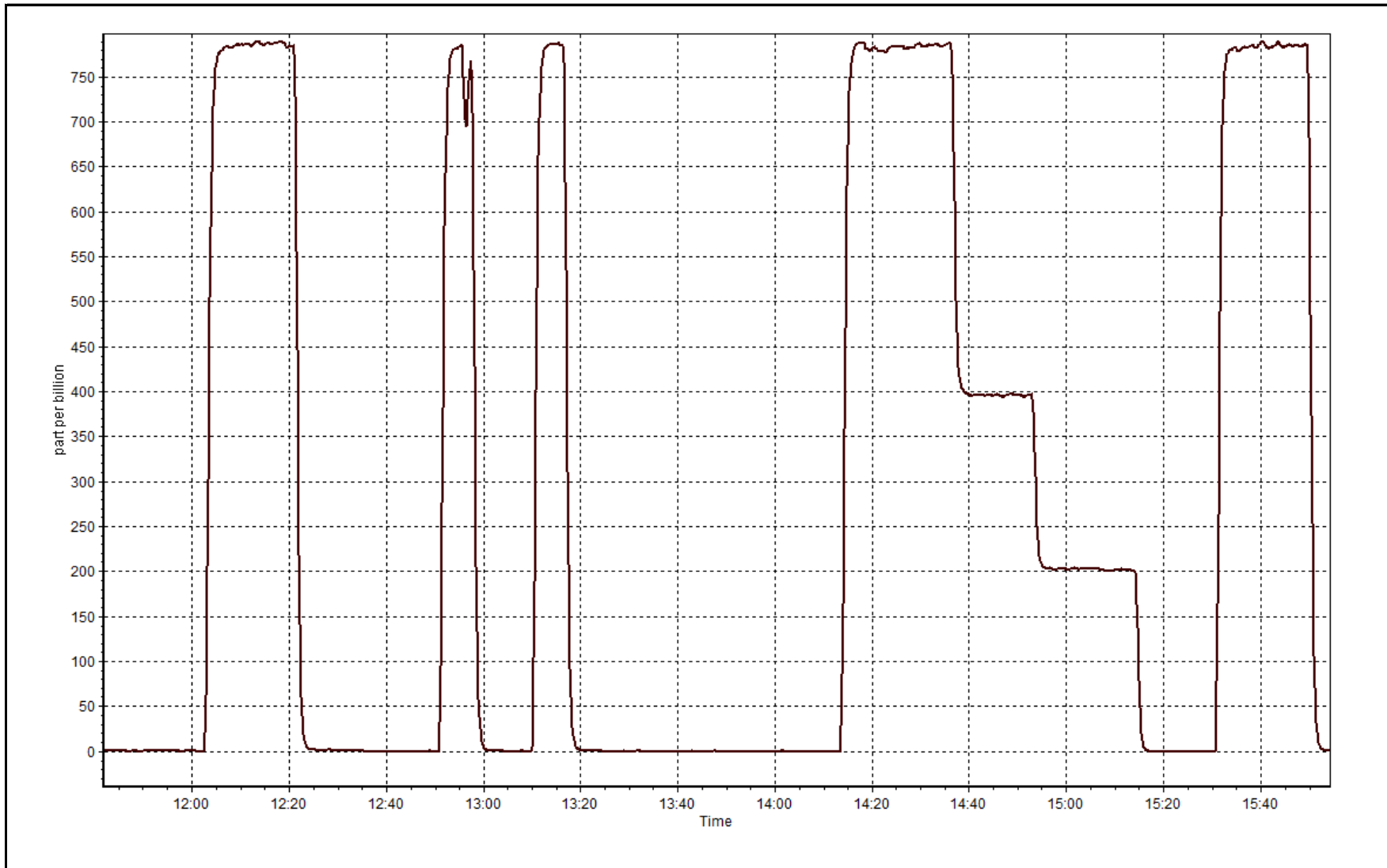
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999930
782.3	782.9	0.9992		
393.2	396.6	0.9916	Slope	1.001354
196.6	202.8	0.9697		
			Intercept	-2.992743



SO2 Calibration Plot

Date: November 4, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	8:37	End Time (MST)	11:52
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	787	786
Calculated slope	1.006116	0.999980	Chamber temp	45	45
Calculated intercept	-0.160152	0.136920	Pressure	546.3	545.1
Analyzer Background	15.1	15.9	Flow	1.026	1.022
Analyzer Coefficient	0.912	0.925	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	5000	0.0	0.0	0.4	----
as found span	5000	80.2	80.8	79.8	1.013
SO2 scrubber check	5000	19.1	195.6	1.7	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.2	80.8	80.8	1.001
second point	5000	40.2	40.5	40.2	1.007
third point	5000	20.2	20.4	20.2	1.009
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	80.2	80.8	80.9	0.999
Average Correction Factor					1.006

Corrected As found	79.3	Previous response	80.5	% change	1.5%
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Notes:

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

Calibration Performed By: Jayme Marcoux



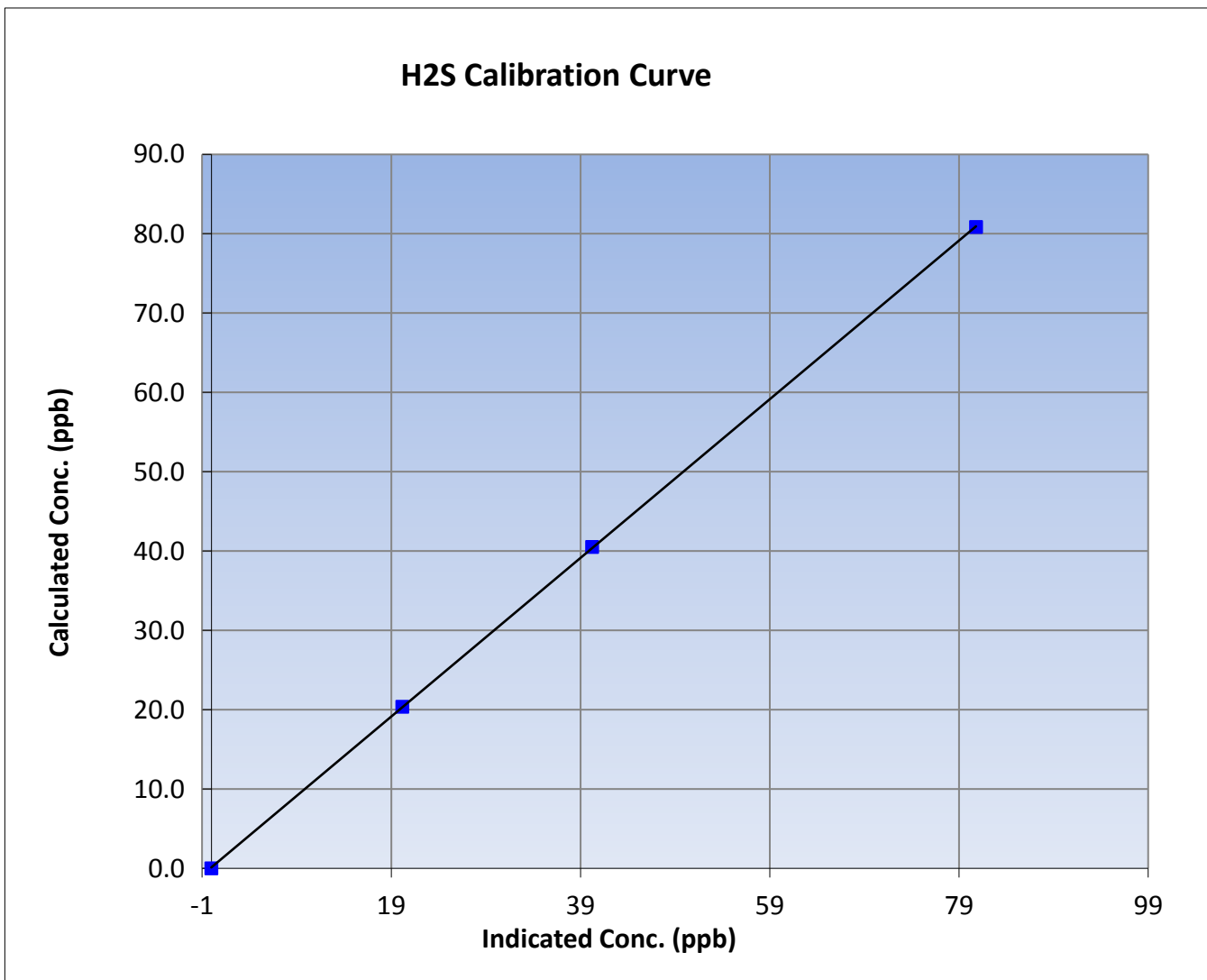
Wood Buffalo Environmental Association H2S Calibration Report

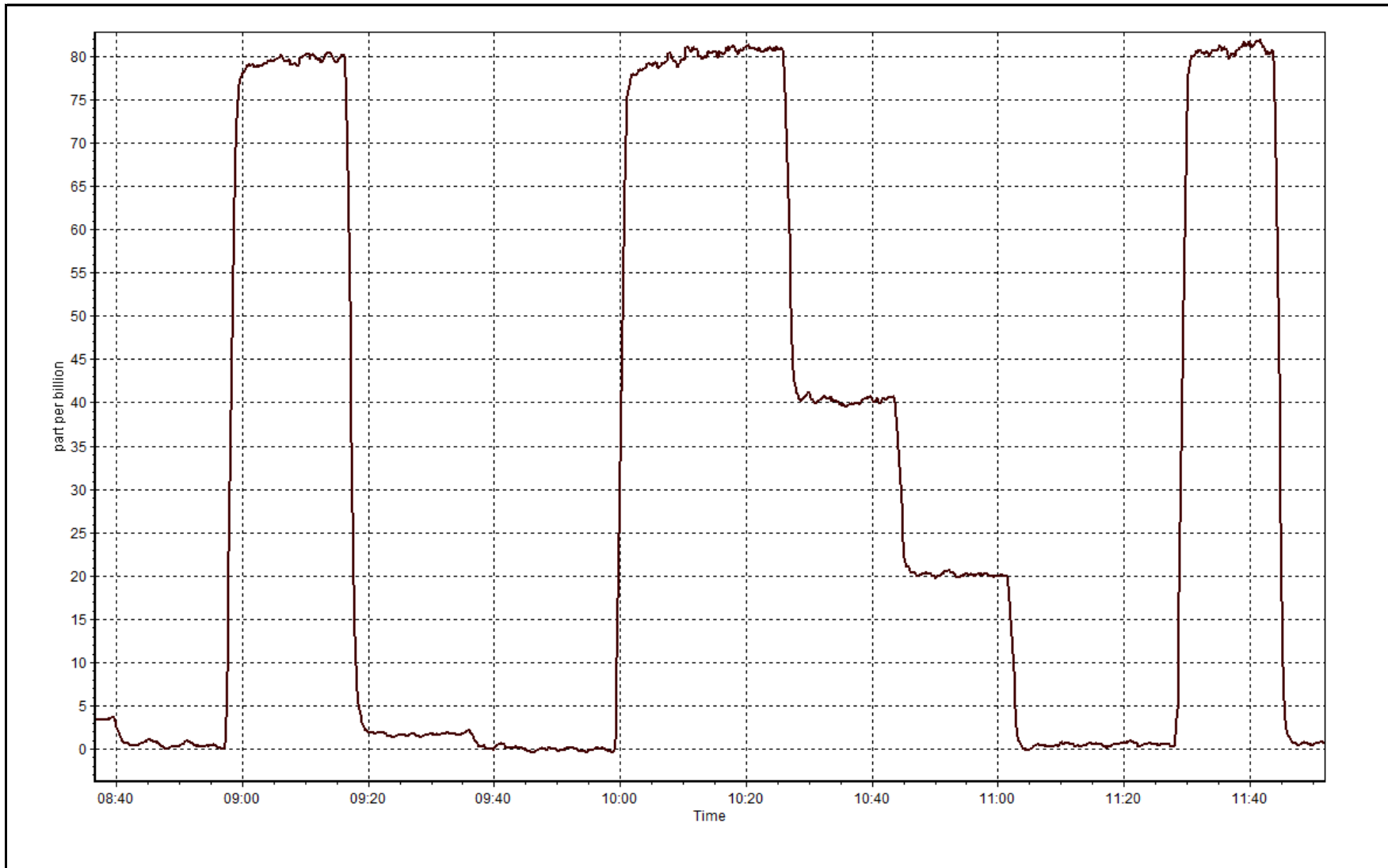
Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	8:37	End Time (MST)	11:52
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	0.999985
80.8	80.8	1.0005		
40.5	40.2	1.0075	Slope	0.999980
20.4	20.2	1.0090		
			Intercept	0.136920







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	11:43	End Time (MST)	15:55
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	6.6	6.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	39.9	39.9
Calculated slope	1.002816	1.001152	Fuel Pressure	25.7	25.7
Calculated intercept	-0.083654	-0.095742	Analyzer Coeff	4.526	4.554
			Analyzer BKG	2.29	2.19

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	16.29	1.014
calibrator zero	5000	0.0	0.00	0.01	----
high point	5000	76.4	16.52	16.55	0.998
second point	5000	38.4	8.30	8.43	0.985
third point	5000	19.2	4.15	4.33	0.959
as left zero	5000	0.0	0.00	0.01	----
as left span	5000	76.4	16.52	16.39	1.008
Average Correction Factor					0.981

Corrected As found	16.36	Previous response	16.55	% change	1.2%
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Notes:

Changed inlet filter after as founds. Adjusted zero and span. Calibration function was working improperly (adjusting the values a significant amount). Calibrated by manually adjusted the values. Following up with factory on firmware issue.

Calibration Performed By:

Jayme Marcoux



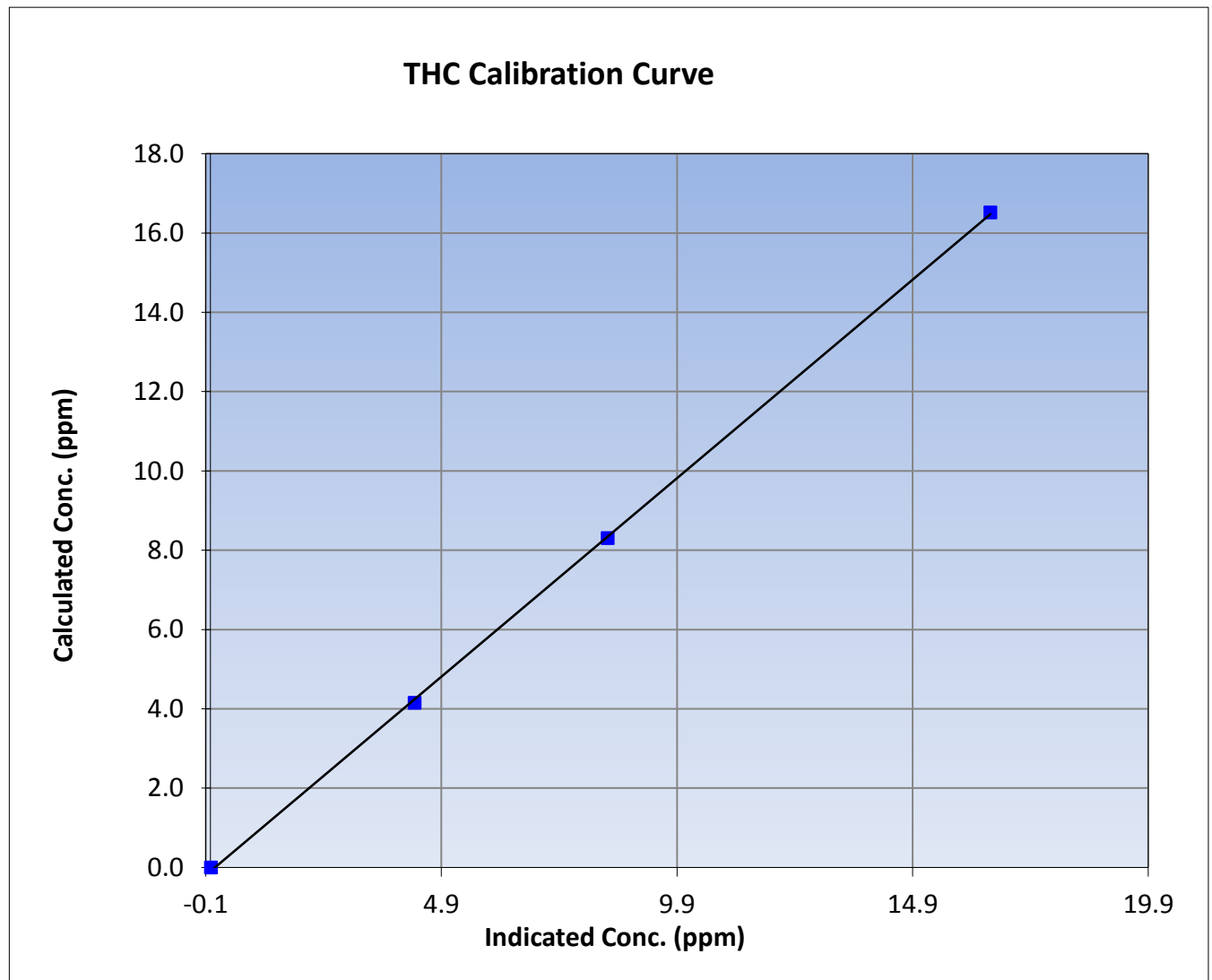
Wood Buffalo Environmental Association THC Calibration Report

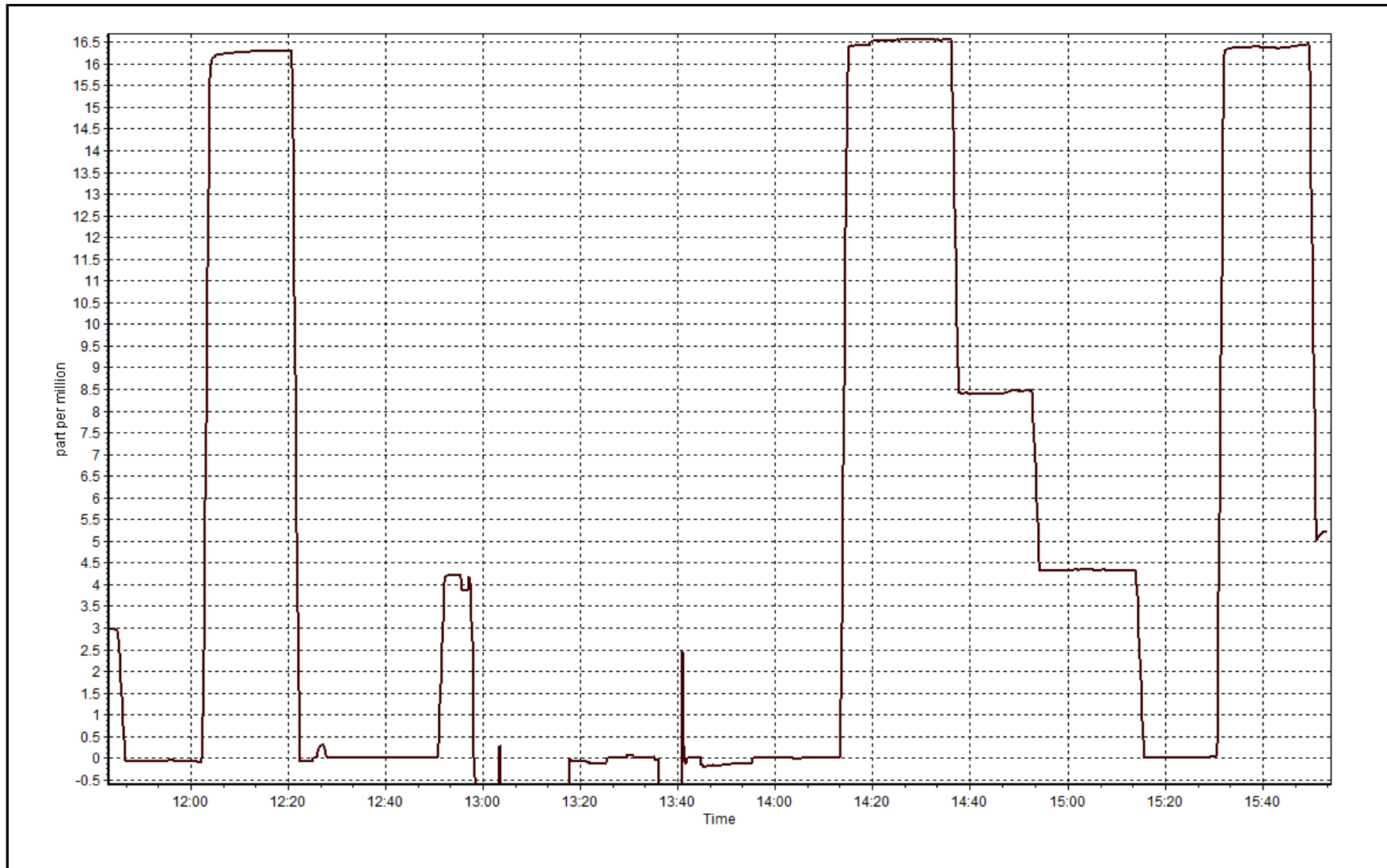
Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	11:43	End Time (MST)	15:55
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	0.999874
16.52	16.55	0.9980		
8.30	8.43	0.9848		
4.15	4.33	0.9587		
			Slope	1.001152
			Intercept	-0.095742







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 17, 2016	Last Calibration	November 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Other: <input type="checkbox"/>	Maintenance	
Start Time (MST)	9:43	End Time (MST)	17:19
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	39.8	39.8
Calculated slope	1.001152	0.997014	Fuel Pressure	25.7	25.6
Calculated intercept	-0.095742	-0.010577	Analyzer Coeff	4.554	4.843
			Analyzer BKG	2.19	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	0.06	----
as found span	5000	76.4	16.52	15.63	1.057
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.4	16.52	16.58	0.996
second point	5000	38.4	8.30	8.32	0.998
third point	5000	19.2	4.15	4.20	0.988
as left zero	5000	0.0	0.00	0.03	----
as left span	5000	76.4	16.52	16.56	0.997
Average Correction Factor					0.994

Corrected As found	15.57	Previous response	16.59	% change	6.6%
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Notes:

Completed an input board calibration. Appears to have reset the analyzer so that the calibration of the background and coefficient are independent of one another and appear to calibrate properly.

Calibration Performed By:

Jayme Marcoux



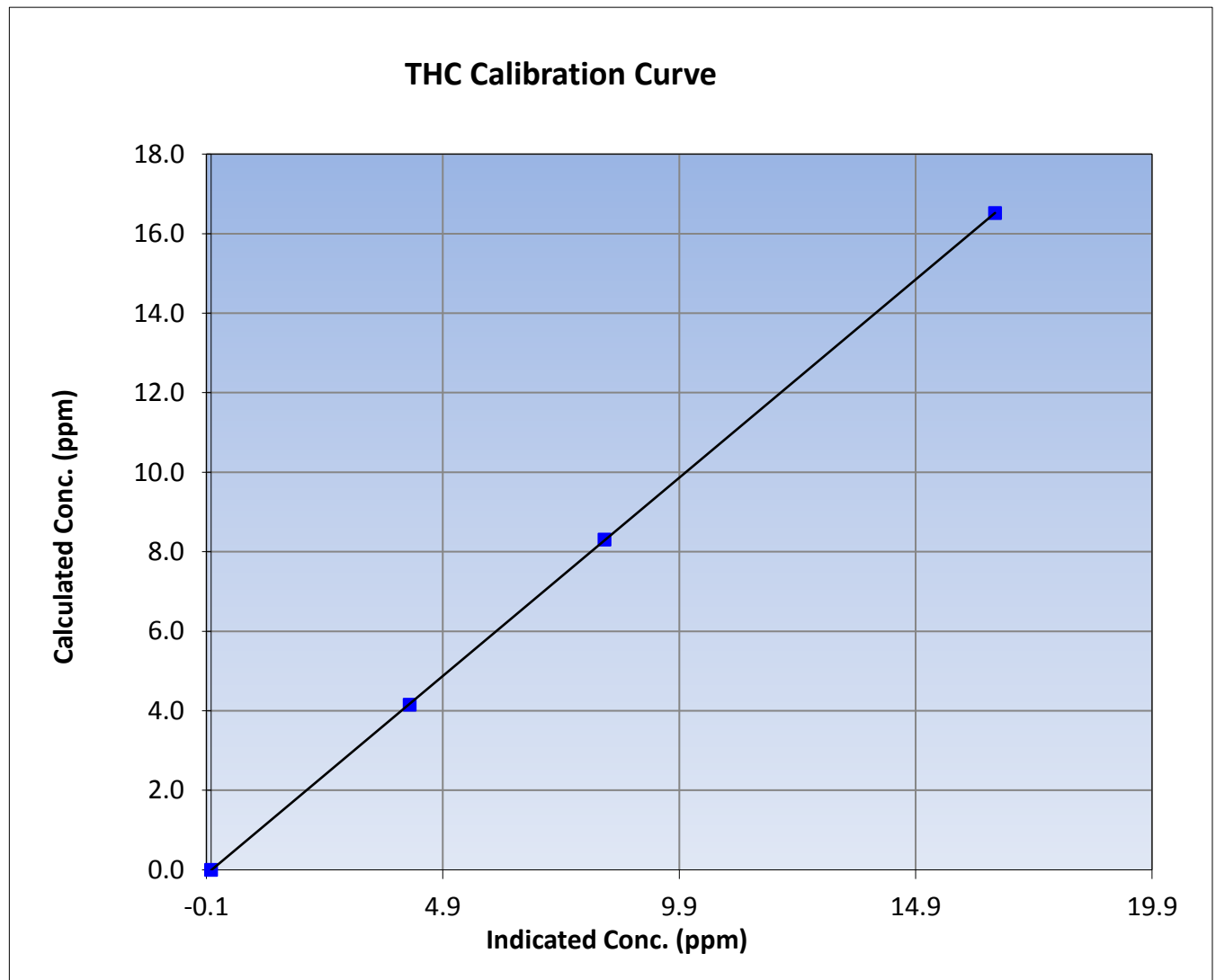
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 17, 2016	Previous Calibration	November 4, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	9:43	End Time (MST)	17:19
Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231

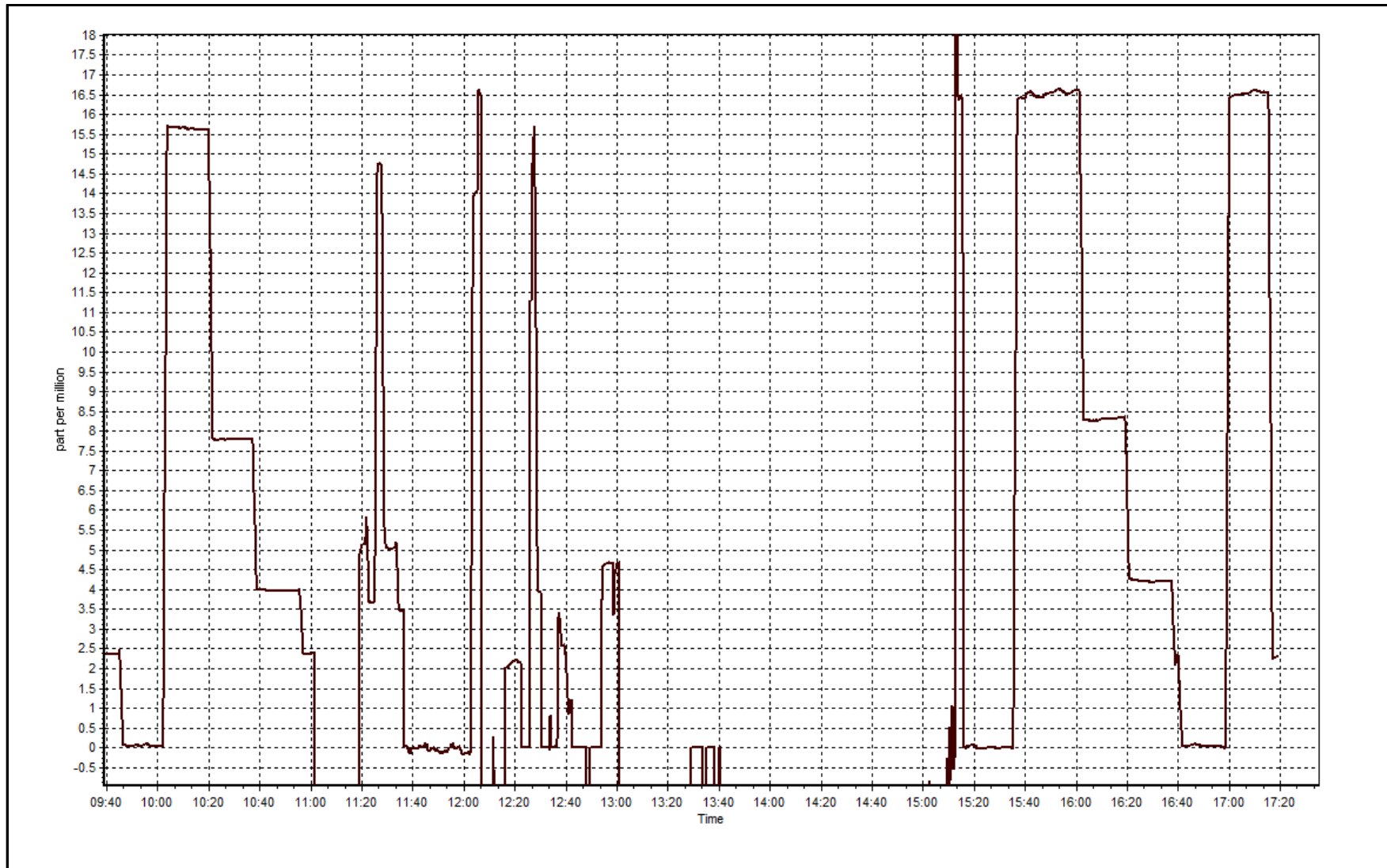
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999993
16.52	16.58	0.9962		
8.30	8.32	0.9978		
4.15	4.20	0.9883		
			Slope	0.997014
			Intercept	-0.010577



THC Calibration Plot

Date: November 17, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 3 LOWER CAMP METEOROLOGY NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
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
Temperature 20 m (C) Average	720	0	0	100.00	12.1	-	7.3	-
Temperature 45 m (C) Average	720	0	0	100.00	12.3	-	7.6	-
Temperature 100 m (C) Average	720	0	0	100.00	12.9	-	9.0	-
Temperature 167 m (C) Average	720	0	0	100.00	13.3	-	9.6	-
Relative Humidity 20 m (%) Average	720	0	0	100.00	96	-	93.0	-
Relative Humidity 45 m (%) Average	720	0	0	100.00	95	-	93.0	-
Relative Humidity 100 m (%) Average	720	0	0	100.00	96	-	95.0	-
Relative Humidity 167 m (%) Average	720	0	0	100.00	96	-	95.0	-
Wind Speed 20 m (km/h) Average	717	0	3	99.58	21	-	16.0	-
Wind Speed 45 m (km/h) Average	717	0	3	99.58	29	-	18.0	-
Wind Speed 100 m (km/h) Average	685	0	35	95.14	46	-	24.0	-
Wind Speed 167 m (km/h) Average	645	0	75	89.58	52	-	31.0	-
Wind Direction 20 m (deg) Average	717	0	3	99.58	-	-	-	-
Wind Direction 45 m (deg) Average	717	0	3	99.58	-	-	-	-
Wind Direction 100 m (deg) Average	685	0	35	95.14	-	-	-	-
Wind Direction 167 m (deg) Average	645	0	75	89.58	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	717	0	3	99.58	0.6	-	0.1	-
Vertical Wind Speed 45 m (km/h) Average	717	0	3	99.58	1.6	-	0.7	-
Vertical Wind Speed 100 m (km/h) Average	685	0	35	95.14	4.1	-	1.6	-
Vertical Wind Speed 167 m (km/h) Average	645	0	75	89.58	5.7	-	2.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
 NOVEMBER 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	720	-0.74	5.3	-	-11.5	-7.8	-4.9	-0.8	3.4	6.7	12.1
Temperature 45 m (C) Average	720	-0.59	5.5	-	-11.5	-7.8	-5	-0.7	3.9	6.8	12.3
Temperature 100 m (C) Average	720	-0.24	6.1	-	-11.9	-8.2	-5.4	-1	5.6	7.9	12.9
Temperature 167 m (C) Average	720	-0.22	6.6	-	-12.3	-8.6	-5.9	-1.4	6.3	8.7	13.3
Relative Humidity 20 m (%) Average	720	77.5	11	-	47	63	70	78	85	92	96
Relative Humidity 45 m (%) Average	720	75.8	11	-	46	61	68	77	84	91	95
Relative Humidity 100 m (%) Average	720	74.3	12	-	42	58	65	75	83	92	96
Relative Humidity 167 m (%) Average	720	73.3	14	-	41	55	62	75	84	93	96
Wind Speed 20 m (km/h) Average	717	8.3	5	-	0	2	4	8	12	15	21
Wind Speed 45 m (km/h) Average	717	10.8	6	-	0	3	6	11	15	19	29
Wind Speed 100 m (km/h) Average	685	15.6	8	-	1	5	9	15	21	27	46
Wind Speed 167 m (km/h) Average	645	19.5	10	-	0	7	13	19	25	32	52
Wind Direction 20 m (deg) Average	717	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	717	-	-	-	-	-	-	-	-	-	-
Wind Direction 100 m (deg) Average	685	-	-	-	-	-	-	-	-	-	-
Wind Direction 167 m (deg) Average	645	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	717	-0.04	0.2	-	-0.8	-0.3	-0.1	0	0.1	0.2	0.6
Vertical Wind Speed 45 m (km/h) Average	717	0.21	0.5	-	-1.4	-0.4	-0.1	0.2	0.6	0.9	1.6
Vertical Wind Speed 100 m (km/h) Average	685	0.46	0.8	-	-1.4	-0.4	0	0.3	0.8	1.7	4.1
Vertical Wind Speed 167 m (km/h) Average	645	0.84	1	-	-1.6	-0.2	0.2	0.6	1.3	2.2	5.7

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed. Wind Direction, Vertical Wind Speed 20 m	03 Nov 2016 10:00	03 Nov 2016 12:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 45 m	03 Nov 2016 10:00	03 Nov 2016 12:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 100 m	27 Nov 2016 07:00	28 Nov 2016 17:00	35	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 167 m	27 Nov 2016 06:00	30 Nov 2016 08:00	75	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association
Summary of Hour Averages

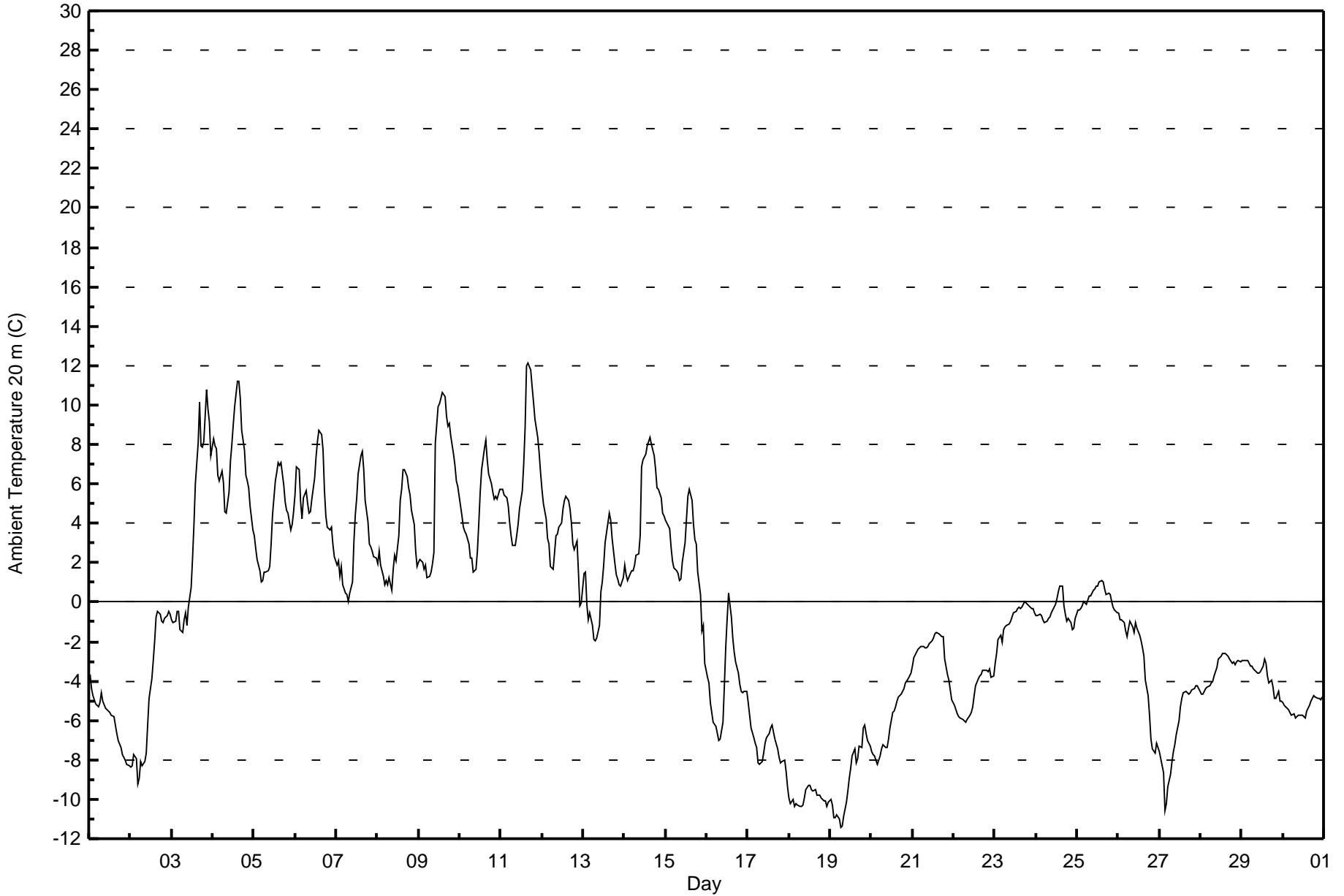
Ambient Temperature 20 m (AT20m) - C
Lower Camp Met Tower - November 2016

Maximum Value: 12.1 C on Nov 11 17:00		Maximum Daily Average: 7.3 C on Nov 4		Hours in Service: 720																						
Minimum Value: -11.5 C on Nov 19 07:00		Minimum Daily Average: -9.9 C on Nov 18		Hours of Data: 720																						
Maximum Diurnal Average: 1.4 C at hour 16		Minimum Diurnal Average: -2.3 C at hour 7		Hours of Missing Data: 0																						
Monthly Average: -0.74 C		Percentiles: P ₁ = -10.6 P ₁₀ = -7.8 Q ₁ = -4.9 Median = -0.8 Q ₃ = 3.4 P ₉₀ = 6.7 P ₉₉ = 10.7		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-Nov	-3.7	-4.4	-4.8	-5.0	-5.1	-5.3	-5.1	-4.6	-5.0	-5.4	-5.5	-5.5	-5.6	-5.7	-5.8	-6.2	-6.7	-7.0	-7.4	-7.8	-7.8	-8.0	-8.2	-8.3	-6.0	-3.7
2-Nov	-8.4	-8.3	-7.7	-7.9	-9.2	-9.0	-8.1	-8.3	-8.1	-7.7	-6.2	-4.9	-3.9	-2.9	-2.0	-0.8	-0.5	-0.6	-1.0	-1.1	-0.9	-0.7	-0.5	-0.6	-4.5	-0.5
3-Nov	-0.9	-1.1	-0.9	-0.5	-0.5	-1.4	-1.5	-0.9	-0.6	-1.1	-0.3	0.7	2.2	3.9	6.0	8.1	10.1	8.0	7.9	8.1	10.8	9.8	9.1	7.5	3.4	10.8
4-Nov	8.3	7.9	7.8	6.4	6.2	6.7	6.1	4.6	4.5	5.6	7.2	8.0	9.0	9.9	11.2	11.2	10.3	8.7	7.7	6.4	6.2	5.8	4.9	3.7	7.3	11.2
5-Nov	3.4	2.7	2.2	1.6	1.1	1.1	1.5	1.6	1.6	1.8	3.0	4.4	6.1	6.6	7.1	6.9	7.1	5.9	5.7	4.7	4.5	3.7	3.9	4.6	3.8	7.1
6-Nov	5.5	6.9	6.7	5.1	4.2	5.3	5.6	5.0	4.5	4.6	5.2	6.3	7.4	8.2	8.7	8.5	7.7	5.6	4.4	3.8	3.7	3.8	3.0	2.3	5.5	8.7
7-Nov	1.9	2.1	1.3	1.8	0.9	0.5	0.4	0.0	0.4	1.0	3.1	4.4	5.3	6.5	7.4	7.7	6.8	5.2	4.1	3.0	2.8	2.6	2.3	2.3	3.1	7.7
8-Nov	2.0	2.6	1.9	1.3	0.9	1.1	0.9	1.3	0.6	1.7	2.4	2.1	3.3	5.1	5.7	6.7	6.7	6.4	5.8	5.4	4.7	3.9	2.6	1.8	3.2	6.7
9-Nov	2.1	2.1	2.0	1.7	1.9	1.3	1.3	1.5	2.0	2.5	8.0	9.9	10.0	10.4	10.6	10.4	9.4	9.0	9.1	8.4	7.5	6.9	6.1	5.8	5.8	10.6
10-Nov	4.9	4.4	3.8	3.6	3.4	3.0	2.2	2.2	1.5	1.7	2.6	4.0	5.6	6.7	7.8	8.2	7.2	6.5	6.0	5.5	5.2	5.4	5.2	5.7	4.7	8.2
11-Nov	5.7	5.7	5.5	5.3	4.9	4.0	3.4	2.9	2.9	3.4	3.9	4.7	5.6	7.0	8.9	12.0	12.1	11.8	10.9	10.2	9.3	8.3	7.6	6.6	6.8	12.1
12-Nov	5.7	5.0	4.2	3.3	3.0	1.8	1.6	2.5	3.4	3.5	3.8	4.0	4.7	5.2	5.4	5.1	4.7	4.0	2.9	2.6	3.1	1.5	-0.2	0.0	3.4	5.7
13-Nov	1.4	1.5	-0.1	-0.9	-0.5	-1.2	-1.9	-1.9	-1.8	-1.2	0.5	1.1	1.9	3.0	4.0	4.5	4.2	3.3	1.9	1.4	1.2	0.9	0.8	1.2	1.0	4.5
14-Nov	1.9	1.4	1.1	1.5	1.6	1.6	1.9	2.4	2.5	3.3	6.8	7.2	7.5	7.9	8.2	8.4	8.0	7.4	6.8	5.8	5.7	5.3	4.5	4.4	4.7	8.4
15-Nov	4.2	4.0	3.7	2.8	2.1	1.7	1.6	1.5	1.1	1.2	2.0	3.0	4.2	5.3	5.8	5.2	3.9	3.2	2.9	1.5	0.4	-1.5	-1.2	-3.1	2.3	5.8
16-Nov	-3.8	-4.1	-5.1	-5.6	-6.1	-6.3	-6.6	-7.0	-7.0	-6.1	-4.2	-2.2	-0.8	0.5	-0.8	-1.8	-2.5	-3.1	-3.6	-4.2	-4.5	-4.6	-4.6	-4.6	-4.1	0.5
17-Nov	-5.1	-5.8	-6.4	-6.9	-7.2	-7.3	-8.1	-8.2	-8.1	-7.6	-7.2	-6.9	-6.6	-6.4	-6.2	-6.6	-6.9	-7.4	-7.8	-8.2	-8.1	-8.0	-8.6	-9.4	-7.3	-5.1
18-Nov	-9.9	-10.2	-10.0	-10.4	-10.2	-10.3	-10.4	-10.3	-10.3	-9.9	-9.5	-9.3	-9.3	-9.5	-9.6	-9.5	-9.8	-9.8	-9.8	-9.9	-10.1	-10.1	-10.4	-10.2	-9.9	-9.3
19-Nov	-10.0	-10.3	-10.9	-10.9	-10.8	-11.0	-11.5	-11.4	-10.9	-10.2	-9.6	-9.0	-8.4	-7.8	-7.4	-8.2	-8.0	-7.3	-7.4	-6.4	-6.3	-6.6	-7.0	-7.3	-8.9	-6.3
20-Nov	-7.6	-7.8	-7.8	-8.2	-8.0	-7.8	-7.5	-7.2	-7.4	-7.4	-7.0	-6.4	-5.6	-5.5	-5.3	-5.0	-4.8	-4.7	-4.5	-4.4	-4.1	-3.9	-3.7	-3.6	-6.0	-3.6
21-Nov	-3.2	-2.8	-2.5	-2.4	-2.3	-2.2	-2.3	-2.3	-2.3	-2.2	-2.1	-2.0	-1.8	-1.6	-1.6	-1.6	-1.7	-1.8	-1.7	-2.9	-3.7	-3.9	-4.5	-5.0	-2.5	-1.6
22-Nov	-5.2	-5.5	-5.7	-5.8	-5.9	-6.0	-6.0	-6.1	-6.0	-5.7	-5.6	-5.3	-4.8	-4.2	-3.9	-3.8	-3.7	-3.5	-3.4	-3.4	-3.5	-3.4	-3.8	-3.7	-4.7	-3.4
23-Nov	-3.1	-2.6	-1.9	-1.6	-2.0	-1.4	-1.3	-1.1	-1.1	-1.0	-0.7	-0.5	-0.4	-0.3	-0.3	-0.3	-0.3	0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.6	-0.9	0.0
24-Nov	-0.7	-0.7	-0.6	-0.7	-0.9	-1.0	-1.0	-0.8	-0.8	-0.5	-0.4	-0.1	0.2	0.5	0.8	0.8	0.2	-0.6	-1.0	-0.8	-1.1	-1.4	-1.4	-0.8	-0.5	0.8
25-Nov	-0.4	-0.4	-0.3	-0.2	0.0	-0.1	0.1	0.3	0.3	0.6	0.7	0.8	0.8	1.0	1.1	1.0	0.6	0.4	0.4	0.4	0.0	-0.3	-0.4	-0.5	0.2	1.1
26-Nov	-0.5	-0.9	-0.9	-1.1	-1.5	-1.7	-1.3	-0.9	-1.3	-1.5	-1.1	-1.3	-1.7	-2.0	-2.3	-2.8	-3.9	-4.8	-5.7	-6.9	-7.4	-7.7	-7.1	-7.4	-3.1	-0.5
27-Nov	-7.6	-7.9	-8.6	-10.6	-10.2	-9.4	-8.7	-8.1	-7.6	-7.2	-6.8	-6.0	-5.3	-4.9	-4.6	-4.5	-4.6	-4.6	-4.6	-4.5	-4.4	-4.3	-4.3	-4.4	-6.4	-4.3
28-Nov	-4.6	-4.7	-4.5	-4.4	-4.3	-4.2	-4.1	-4.1	-3.7	-3.3	-2.9	-2.8	-2.8	-2.6	-2.6	-2.7	-2.8	-2.9	-3.1	-3.1	-3.2	-3.1	-3.0	-3.0	-3.4	-2.6
29-Nov	-3.0	-3.0	-3.0	-3.0	-3.1	-3.2	-3.2	-3.4	-3.5	-3.6	-3.6	-3.5	-3.3	-2.9	-3.1	-3.7	-4.1	-3.9	-4.3	-4.9	-4.9	-4.5	-5.0	-5.0	-3.7	-2.9
30-Nov	-5.1	-5.2	-5.4	-5.5	-5.6	-5.7	-5.6	-5.9	-5.8	-5.8	-5.8	-5.7	-5.8	-5.9	-5.5	-5.2	-5.1	-4.8	-4.7	-4.8	-4.9	-4.9	-4.9	-4.8	-5.4	-4.7
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	410	56.94	56.94
0 - 10	296	41.11	98.06
10 - 20	14	1.94	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

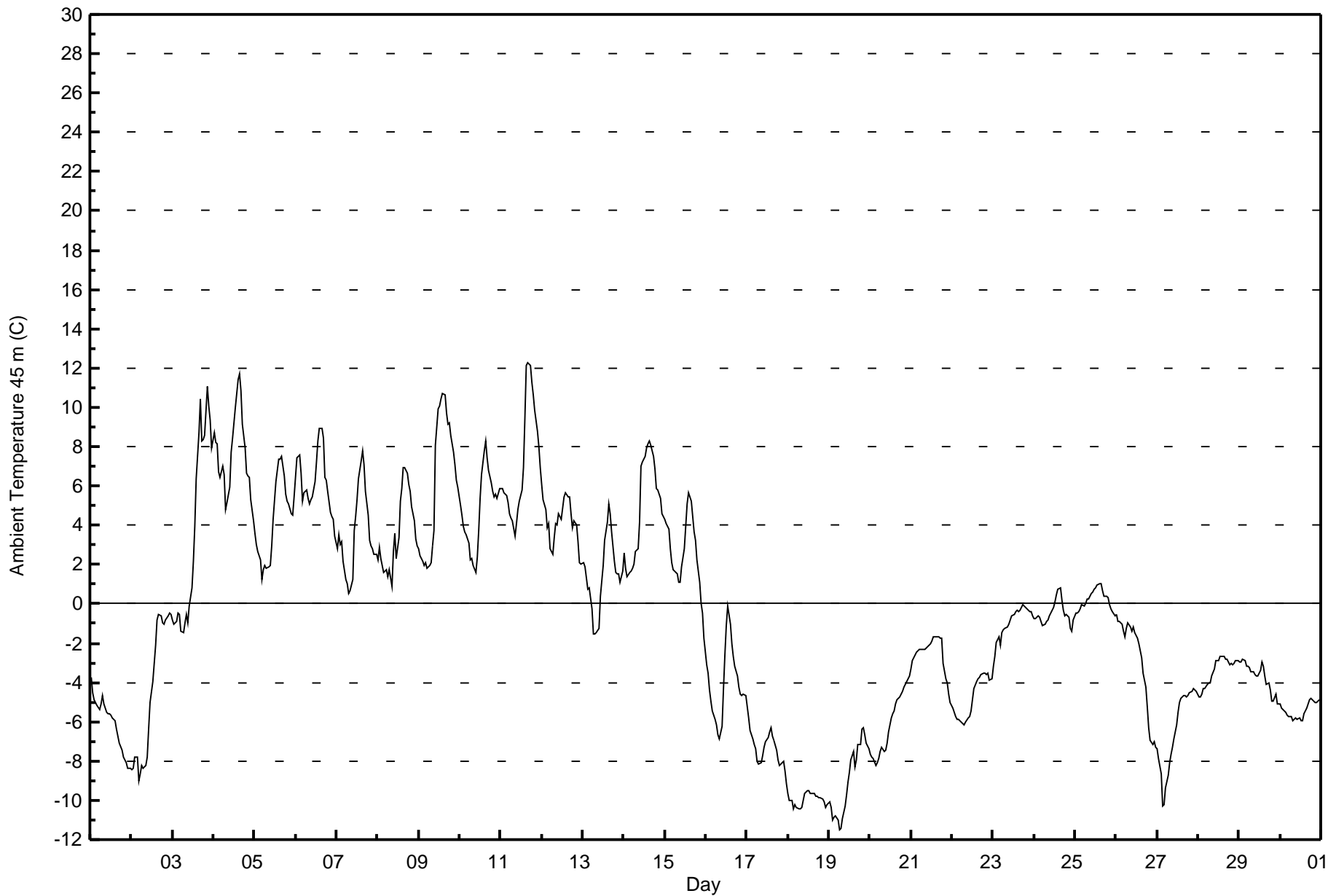


Maximum Value: 12.3 C on Nov 11 17:00																				Maximum Daily Average: 7.6 C on Nov 4					Hours in Service: 720	
Minimum Value: -11.5 C on Nov 19 07:00																				Minimum Daily Average: -10.0 C on Nov 18					Hours of Data: 720	
Maximum Diurnal Average: 1.5 C at hour 16																				Minimum Diurnal Average: -2.1 C at hour 7					Hours of Missing Data: 0	
Monthly Average: -0.59 C																				Percentiles: P ₁ = -10.4 P ₁₀ = -7.8 Q ₁ = -5.0 Median = -0.7 Q ₃ = 3.9 P ₉₀ = 6.8 P ₉₉ = 10.9					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-Nov	-3.8	-4.5	-4.9	-5.0	-5.2	-5.4	-5.1	-4.7	-5.1	-5.5	-5.6	-5.6	-5.7	-5.8	-6.0	-6.4	-6.7	-7.1	-7.4	-7.8	-7.9	-8.1	-8.3	-8.4	-6.1	-3.8
2-Nov	-8.5	-8.4	-7.8	-7.8	-9.0	-8.7	-8.2	-8.3	-8.2	-7.8	-6.3	-5.0	-4.0	-3.0	-2.1	-0.8	-0.5	-0.6	-1.0	-1.0	-0.8	-0.6	-0.4	-0.5	-4.6	-0.4
3-Nov	-0.8	-1.0	-0.9	-0.5	-0.5	-1.4	-1.5	-1.0	-0.6	-1.0	-0.1	0.8	2.2	3.9	6.4	8.7	10.5	8.3	8.3	8.5	11.0	10.1	9.3	7.9	3.6	11.0
4-Nov	8.7	8.2	8.1	6.7	6.4	7.0	6.6	4.8	5.1	6.0	7.8	8.4	9.2	10.0	11.4	11.7	10.8	9.2	7.9	6.6	6.5	6.4	5.3	4.2	7.6	11.7
5-Nov	3.6	3.1	2.7	2.2	1.2	1.7	2.0	1.8	1.9	2.0	3.0	4.3	6.2	6.8	7.4	7.3	7.5	6.5	5.6	5.2	5.1	4.6	4.5	5.4	4.2	7.5
6-Nov	6.4	7.4	7.6	6.7	5.2	5.6	5.8	5.3	5.1	5.3	5.5	6.2	7.3	8.3	9.0	9.0	8.4	6.4	6.3	5.7	4.7	4.4	4.3	3.4	6.2	9.0
7-Nov	2.8	3.6	3.0	3.2	2.2	1.3	1.0	0.6	0.7	1.3	3.7	4.4	5.3	6.4	7.3	7.8	7.1	5.7	4.5	3.2	2.9	2.8	2.5	2.6	3.6	7.8
8-Nov	2.2	2.9	2.3	1.6	1.6	1.8	1.4	1.7	0.9	2.7	3.6	2.3	3.4	5.2	5.9	6.9	6.9	6.6	6.0	5.7	5.0	4.2	3.3	3.0	3.6	6.9
9-Nov	2.8	2.4	2.2	1.9	2.1	1.8	2.0	2.1	2.9	3.7	8.1	9.9	10.1	10.4	10.7	10.6	9.7	9.2	9.2	8.6	7.7	7.1	6.3	5.9	6.2	10.7
10-Nov	5.0	4.5	3.9	3.7	3.5	3.1	2.3	2.3	2.0	1.6	2.4	3.7	5.4	6.6	7.8	8.3	7.4	6.8	6.2	5.8	5.4	5.6	5.4	5.9	4.8	8.3
11-Nov	5.8	5.9	5.7	5.5	5.2	4.6	4.4	4.2	3.4	4.1	4.8	5.2	5.8	7.0	9.4	12.1	12.3	12.1	11.3	10.6	9.9	8.8	8.0	6.9	7.2	12.3
12-Nov	6.1	5.3	4.8	3.8	4.1	2.8	2.6	3.4	4.1	4.0	4.6	4.3	4.8	5.5	5.6	5.4	5.5	4.6	3.9	4.2	4.0	3.2	2.1	2.0	4.2	6.1
13-Nov	2.1	1.9	1.3	0.7	0.8	-0.3	-1.5	-1.5	-1.5	-1.3	0.4	1.2	2.0	3.2	4.1	5.1	4.6	3.6	2.1	1.6	1.5	1.6	1.1	1.7	1.4	5.1
14-Nov	2.6	1.8	1.4	1.6	1.7	1.8	2.0	2.7	2.8	4.1	7.0	7.2	7.5	7.9	8.1	8.3	8.1	7.5	6.8	5.8	5.8	5.4	4.6	4.4	4.9	8.3
15-Nov	4.3	4.1	3.8	2.8	2.1	1.8	1.6	1.5	1.1	1.1	1.8	2.8	4.0	5.1	5.7	5.2	4.4	3.7	3.3	2.2	1.1	0.0	-0.4	-1.8	2.6	5.7
16-Nov	-3.1	-3.5	-4.3	-4.9	-5.5	-5.9	-6.2	-6.7	-6.8	-6.2	-4.3	-2.6	-1.1	-0.1	-1.0	-2.0	-2.7	-3.2	-3.7	-4.2	-4.6	-4.7	-4.6	-4.7	-4.0	-0.1
17-Nov	-5.2	-5.8	-6.4	-6.9	-7.2	-7.4	-8.0	-8.1	-8.1	-7.7	-7.3	-7.0	-6.8	-6.5	-6.3	-6.7	-7.0	-7.5	-7.9	-8.2	-8.1	-8.0	-8.5	-9.2	-7.3	-5.2
18-Nov	-9.6	-10.0	-10.0	-10.4	-10.3	-10.4	-10.4	-10.4	-10.3	-10.0	-9.6	-9.5	-9.5	-9.7	-9.7	-9.6	-9.8	-9.8	-9.8	-9.9	-9.9	-10.1	-10.3	-10.2	-10.0	-9.5
19-Nov	-10.1	-10.3	-11.0	-10.9	-10.8	-11.0	-11.5	-11.4	-10.9	-10.3	-9.7	-9.1	-8.6	-7.9	-7.5	-8.3	-7.9	-7.1	-7.1	-6.4	-6.3	-6.7	-7.1	-7.4	-9.0	-6.3
20-Nov	-7.7	-7.8	-7.9	-8.2	-8.1	-7.9	-7.5	-7.3	-7.5	-7.5	-7.1	-6.5	-5.8	-5.6	-5.4	-5.1	-4.9	-4.7	-4.6	-4.5	-4.2	-4.0	-3.8	-3.7	-6.1	-3.7
21-Nov	-3.3	-2.9	-2.6	-2.5	-2.4	-2.3	-2.3	-2.3	-2.3	-2.3	-2.2	-2.0	-1.9	-1.7	-1.7	-1.7	-1.7	-1.7	-1.8	-3.0	-3.8	-4.0	-4.6	-5.0	-2.6	-1.7
22-Nov	-5.3	-5.5	-5.8	-5.9	-5.9	-6.0	-6.1	-6.2	-6.0	-5.8	-5.7	-5.4	-4.8	-4.3	-4.0	-3.8	-3.7	-3.6	-3.5	-3.5	-3.6	-3.5	-3.9	-3.8	-4.8	-3.5
23-Nov	-3.2	-2.6	-2.0	-1.7	-2.1	-1.5	-1.4	-1.2	-1.2	-1.0	-0.8	-0.6	-0.5	-0.4	-0.3	-0.4	-0.3	0.0	-0.1	-0.2	-0.3	-0.4	-0.4	-0.6	-1.0	0.0
24-Nov	-0.7	-0.7	-0.6	-0.7	-0.9	-1.1	-1.0	-0.9	-0.8	-0.6	-0.5	-0.2	0.1	0.5	0.7	0.8	0.1	-0.3	-0.6	-0.5	-0.7	-1.2	-1.4	-0.8	-0.5	0.8
25-Nov	-0.5	-0.5	-0.4	-0.2	0.0	-0.1	0.0	0.2	0.3	0.5	0.6	0.7	0.8	1.0	1.0	1.0	1.0	0.7	0.4	0.4	0.3	0.0	-0.3	-0.4	0.2	1.0
26-Nov	-0.6	-0.9	-0.9	-1.0	-1.4	-1.7	-1.3	-0.9	-1.2	-1.4	-1.1	-1.4	-1.8	-2.1	-2.4	-2.8	-3.6	-4.2	-5.2	-6.3	-6.9	-7.1	-7.0	-7.3	-2.9	-0.6
27-Nov	-7.4	-7.9	-8.6	-10.3	-10.2	-9.4	-8.7	-8.1	-7.7	-7.3	-6.9	-6.1	-5.5	-5.0	-4.8	-4.7	-4.7	-4.7	-4.7	-4.5	-4.4	-4.3	-4.4	-4.4	-6.4	-4.3
28-Nov	-4.7	-4.7	-4.6	-4.3	-4.3	-4.1	-4.0	-4.0	-3.6	-3.3	-2.9	-2.9	-2.9	-2.7	-2.7	-2.7	-2.8	-2.8	-3.1	-3.0	-3.1	-3.0	-2.9	-2.9	-3.4	-2.7
29-Nov	-2.9	-3.0	-2.8	-2.9	-3.2	-3.2	-3.2	-3.5	-3.5	-3.6	-3.7	-3.7	-3.4	-3.0	-3.1	-3.7	-4.1	-4.0	-4.4	-5.0	-4.9	-4.6	-5.1	-5.1	-3.7	-2.8
30-Nov	-5.1	-5.3	-5.5	-5.5	-5.7	-5.8	-5.7	-6.0	-5.9	-5.8	-5.9	-5.8	-5.9	-5.9	-5.6	-5.3	-5.1	-4.9	-4.8	-4.9	-5.0	-5.0	-5.0	-4.9	-5.4	-4.8
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	407	56.53	56.53
0 - 10	297	41.25	97.78
10 - 20	16	2.22	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

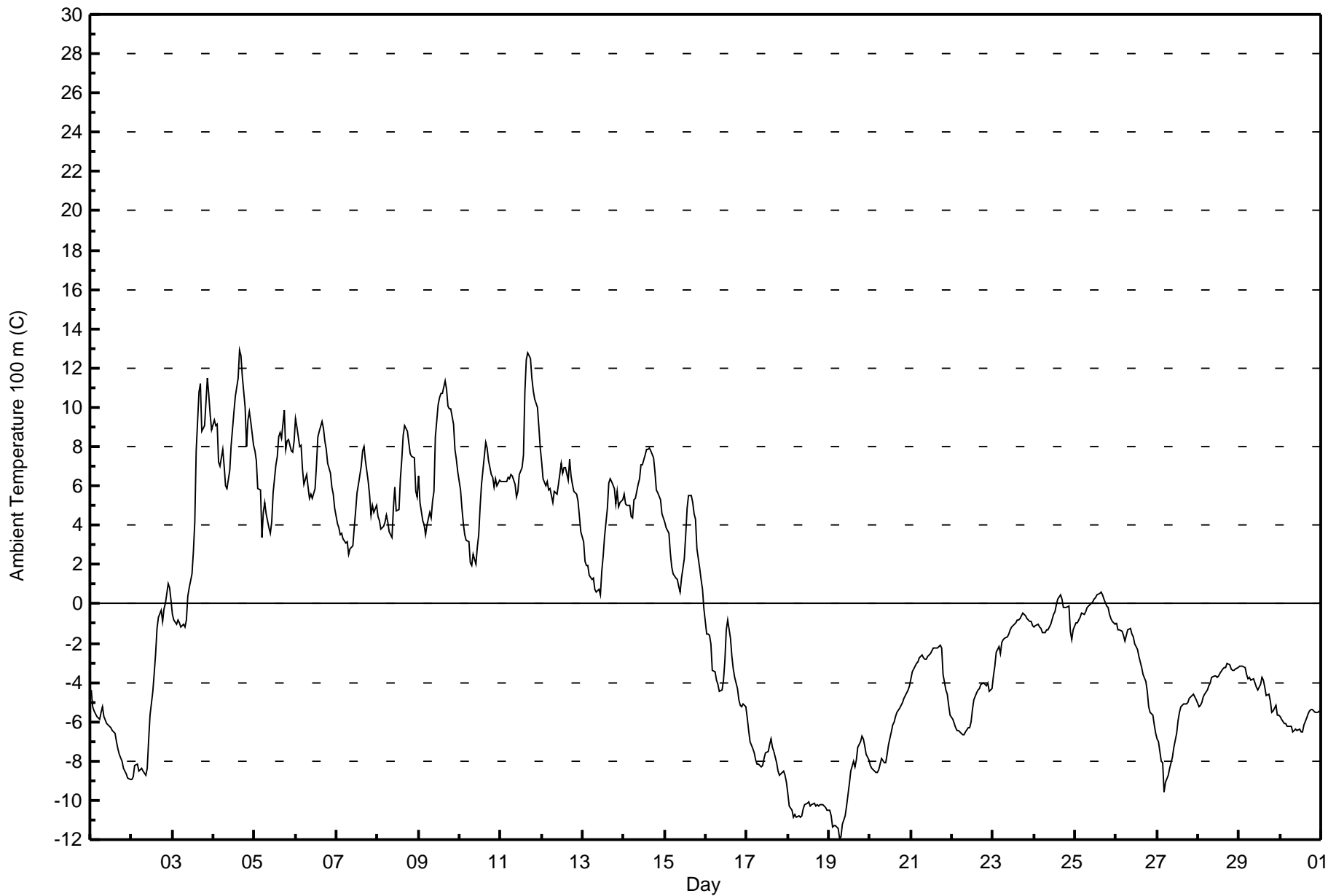
Ambient Temperature 100 m (AT100m) - C
Lower Camp Met Tower - November 2016

Maximum Value: 12.9 C on Nov 4 16:00		Maximum Daily Average: 9.0 C on Nov 4		Hours in Service: 720																							
Minimum Value: -11.9 C on Nov 19 07:00		Minimum Daily Average: -10.4 C on Nov 18		Hours of Data: 720																							
Maximum Diurnal Average: 1.5 C at hour 16		Minimum Diurnal Average: -1.5 C at hour 8		Hours of Missing Data: 0																							
Monthly Average: -0.24 C		Percentiles: P ₁ = -10.9 P ₁₀ = -8.2 Q ₁ = -5.4 Median = -1.0 Q ₃ = 5.6 P ₉₀ = 7.9 P ₉₉ = 11.5		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-Nov	-4.4	-5.2	-5.5	-5.6	-5.7	-5.9	-5.5	-5.2	-5.7	-6.1	-6.2	-6.2	-6.3	-6.4	-6.6	-7.0	-7.4	-7.7	-8.0	-8.4	-8.5	-8.7	-8.9	-9.0	-6.7	-4.4	
2-Nov	-9.0	-8.8	-8.2	-8.2	-8.5	-8.4	-8.4	-8.5	-8.7	-8.4	-6.9	-5.6	-4.5	-3.5	-2.5	-1.3	-0.7	-0.3	-0.9	-0.3	0.1	1.0	0.8	0.2	-4.6	1.0	
3-Nov	-0.5	-0.8	-1.0	-0.8	-0.9	-1.2	-1.0	-1.2	-0.8	0.4	0.8	1.5	2.7	4.2	7.8	10.8	11.2	8.8	8.9	9.1	11.5	10.6	9.6	8.9	4.1	11.5	
4-Nov	9.4	9.1	9.2	7.2	7.0	7.9	7.0	6.0	5.8	6.8	8.0	8.9	9.8	10.6	11.5	12.9	12.6	11.5	10.0	8.0	9.3	9.7	9.3	8.1	9.0	12.9	
5-Nov	7.8	7.3	5.9	5.8	3.4	4.6	5.1	4.6	3.8	3.6	4.2	5.7	7.1	7.5	8.5	8.7	8.4	9.9	7.9	8.3	8.4	7.8	7.7	8.3	6.7	9.9	
6-Nov	9.4	9.0	8.0	8.1	6.9	6.1	6.6	5.9	5.4	5.6	5.4	5.9	7.1	8.5	8.8	9.3	8.9	8.3	7.9	7.1	6.6	6.0	5.6	4.9	7.1	9.4	
7-Nov	4.1	3.9	3.5	3.6	3.3	3.1	3.2	2.5	2.8	2.9	3.9	4.7	5.6	6.1	7.0	7.8	8.0	7.3	6.3	5.5	4.5	5.0	4.7	5.0	4.8	8.0	
8-Nov	4.5	4.3	3.8	3.9	4.2	4.5	4.2	3.6	3.4	4.9	5.9	4.7	4.8	6.4	7.3	8.6	9.1	8.8	8.2	7.7	7.5	7.4	5.7	5.5	5.8	9.1	
9-Nov	6.5	5.2	4.2	4.0	3.5	4.0	4.7	4.4	5.2	5.7	8.5	10.1	10.5	10.7	10.7	11.4	10.9	10.1	9.9	9.9	9.1	7.9	7.4	6.7	7.6	11.4	
10-Nov	5.8	4.9	4.1	3.5	3.2	3.1	2.1	1.9	2.5	2.0	2.9	3.5	5.0	6.1	7.5	8.2	8.0	7.3	6.6	6.5	5.9	6.3	6.0	6.3	5.0	8.2	
11-Nov	6.2	6.2	6.2	6.2	6.5	6.4	6.6	6.5	6.1	5.5	5.7	6.6	6.9	7.6	10.8	12.4	12.7	12.5	11.5	10.9	10.4	10.0	9.0	8.0	8.2	12.7	
12-Nov	7.2	6.3	6.0	6.2	5.8	5.9	5.1	5.7	5.6	5.6	6.1	7.1	6.7	6.9	7.0	6.3	7.3	6.5	6.1	5.7	5.6	5.2	4.4	3.7	6.0	7.3	
13-Nov	3.2	2.1	2.0	1.9	1.5	1.2	1.3	0.8	0.6	0.8	0.4	1.7	2.5	3.5	4.8	6.1	6.3	6.2	5.9	5.1	5.7	4.9	5.2	5.3	3.3	6.3	
14-Nov	5.6	5.1	5.0	5.0	4.4	4.4	5.3	5.4	6.1	6.4	7.1	7.1	7.6	7.8	7.8	7.9	7.8	7.4	6.7	5.8	5.6	5.3	4.6	4.4	6.1	7.9	
15-Nov	4.2	3.9	3.6	2.6	1.9	1.5	1.3	1.2	0.9	0.6	1.3	2.3	3.5	4.8	5.5	5.5	5.2	4.6	4.3	2.8	1.8	1.2	0.8	-0.3	2.7	5.5	
16-Nov	-1.5	-1.5	-1.6	-2.1	-3.4	-3.5	-3.9	-4.1	-4.5	-4.4	-3.9	-2.9	-1.3	-0.8	-1.7	-2.6	-3.3	-3.8	-4.3	-4.9	-5.2	-5.2	-5.1	-5.3	-3.4	-0.8	
17-Nov	-5.8	-6.4	-7.0	-7.4	-7.6	-7.9	-8.2	-8.2	-8.3	-8.2	-7.9	-7.6	-7.5	-7.2	-6.9	-7.3	-7.5	-8.1	-8.5	-8.8	-8.6	-8.5	-8.7	-9.1	-7.8	-5.8	
18-Nov	-9.7	-10.3	-10.5	-10.9	-10.7	-10.8	-10.8	-10.9	-10.8	-10.5	-10.2	-10.1	-10.1	-10.3	-10.2	-10.1	-10.3	-10.2	-10.3	-10.2	-10.2	-10.3	-10.4	-10.5	-10.4	-9.7	-9.7
19-Nov	-10.5	-10.8	-11.4	-11.3	-11.3	-11.4	-11.9	-11.9	-11.2	-10.8	-10.3	-9.7	-9.2	-8.5	-8.0	-8.3	-7.9	-7.3	-7.1	-6.7	-6.9	-7.3	-7.7	-8.0	-9.4	-6.7	
20-Nov	-8.2	-8.3	-8.4	-8.6	-8.6	-8.4	-8.1	-7.9	-8.1	-8.1	-7.7	-7.2	-6.5	-6.2	-6.0	-5.7	-5.5	-5.3	-5.2	-5.0	-4.8	-4.5	-4.4	-4.2	-6.7	-4.2	
21-Nov	-3.8	-3.4	-3.1	-3.0	-3.0	-2.8	-2.6	-2.8	-2.8	-2.8	-2.7	-2.5	-2.4	-2.3	-2.3	-2.2	-2.2	-2.1	-2.2	-3.6	-4.4	-4.6	-5.2	-5.6	-3.1	-2.1	
22-Nov	-5.9	-6.1	-6.3	-6.5	-6.5	-6.6	-6.6	-6.7	-6.5	-6.3	-6.3	-6.0	-5.4	-4.9	-4.5	-4.4	-4.3	-4.1	-4.1	-4.1	-4.1	-4.0	-4.4	-4.3	-5.4	-4.0	
23-Nov	-3.7	-3.1	-2.4	-2.2	-2.5	-2.0	-1.8	-1.7	-1.7	-1.5	-1.3	-1.2	-1.0	-1.0	-0.8	-0.9	-0.7	-0.4	-0.6	-0.6	-0.8	-0.9	-0.9	-1.1	-1.5	-0.4	
24-Nov	-1.2	-1.1	-1.1	-1.2	-1.3	-1.4	-1.5	-1.4	-1.3	-1.2	-1.0	-0.6	-0.4	-0.1	0.2	0.5	0.2	-0.2	-0.2	-0.2	-0.1	-1.4	-1.8	-1.3	-0.8	0.5	
25-Nov	-0.9	-0.9	-0.8	-0.7	-0.5	-0.5	-0.4	-0.2	-0.1	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.4	0.2	-0.1	-0.2	-0.5	-0.7	-0.9	-1.0	-0.2	0.6	
26-Nov	-1.0	-1.3	-1.3	-1.4	-1.6	-1.9	-1.6	-1.3	-1.3	-1.5	-1.7	-2.0	-2.3	-2.6	-2.9	-3.2	-3.6	-3.9	-4.5	-5.2	-5.6	-5.6	-6.1	-6.6	-2.9	-1.0	
27-Nov	-6.9	-7.0	-8.0	-8.1	-9.6	-9.1	-8.8	-8.4	-8.1	-7.8	-7.3	-6.6	-5.9	-5.5	-5.3	-5.1	-5.1	-5.1	-5.0	-4.8	-4.7	-4.6	-4.7	-4.9	-6.5	-4.6	
28-Nov	-5.2	-5.2	-5.0	-4.7	-4.6	-4.4	-4.1	-4.1	-3.7	-3.7	-3.7	-3.7	-3.6	-3.5	-3.3	-3.3	-3.3	-3.3	-3.0	-3.1	-3.3	-3.4	-3.4	-3.3	-3.3	-3.8	-3.0
29-Nov	-3.2	-3.2	-3.2	-3.2	-3.6	-3.8	-3.8	-3.9	-3.8	-4.1	-4.3	-4.4	-4.1	-3.8	-3.9	-4.3	-4.7	-4.6	-5.0	-5.5	-5.5	-5.2	-5.7	-5.7	-4.3	-3.2	
30-Nov	-5.7	-5.9	-6.1	-6.1	-6.2	-6.2	-6.2	-6.5	-6.5	-6.4	-6.4	-6.4	-6.5	-6.5	-6.1	-5.8	-5.6	-5.4	-5.4	-5.4	-5.5	-5.5	-5.5	-5.4	-6.0	-5.4	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	402	55.83	55.83
0 - 10	294	40.83	96.67
10 - 20	24	3.33	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

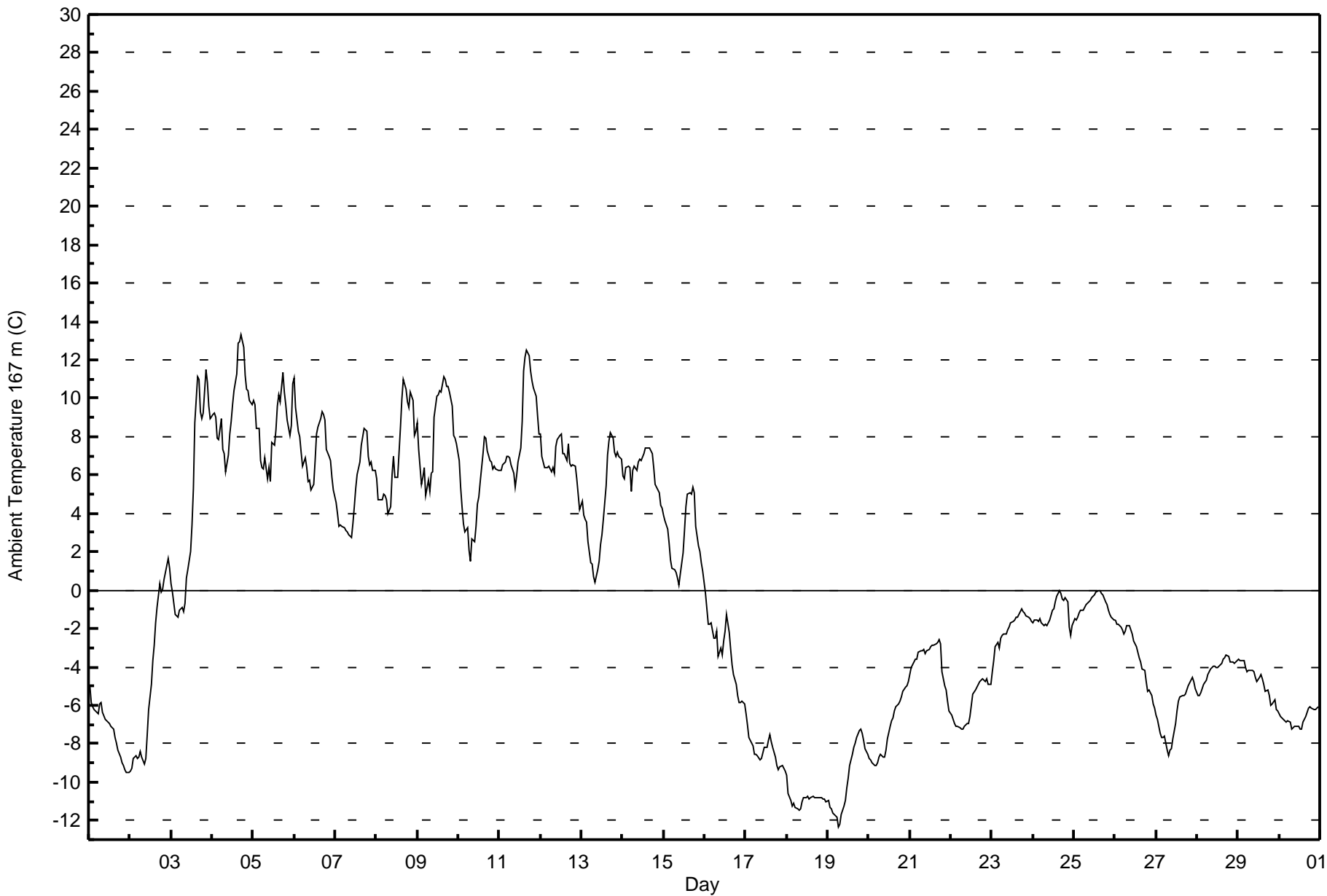
Ambient Temperature 167 m (AT167m) - C
Lower Camp Met Tower - November 2016

Maximum Value: 13.3 C on Nov 4 18:00 Maximum Daily Average: 9.6 C on Nov 4		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -12.3 C on Nov 19 07:00 Maximum Diurnal Average: 1.4 C at hour 17 Monthly Average: -0.22 C		Minimum Daily Average: -10.9 C on Nov 18 Minimum Diurnal Average: -1.6 C at hour 9 Percentiles: P ₁ = -11.4 P ₁₀ = -8.6 Q ₁ = -5.9 Median = -1.4 Q ₃ = 6.3 P ₉₀ = 8.7 P ₉₉ = 12.2																								
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-Nov	-5.0	-5.8	-6.1	-6.2	-6.3	-6.4	-6.0	-5.8	-6.4	-6.7	-6.8	-6.9	-6.9	-7.1	-7.3	-7.7	-8.0	-8.3	-8.7	-9.0	-9.2	-9.3	-9.5	-9.5	-7.3	-5.0
2-Nov	-9.4	-9.3	-8.8	-8.7	-8.7	-8.7	-8.4	-8.7	-9.1	-8.7	-7.5	-6.2	-4.9	-3.7	-2.9	-1.7	-0.9	0.3	-0.1	0.1	0.5	1.2	1.6	1.2	-4.6	1.6
3-Nov	0.4	-0.1	-1.2	-1.3	-1.4	-1.0	-0.9	-1.1	-0.7	0.6	1.1	2.0	3.4	5.3	8.7	11.1	11.0	9.3	9.0	9.2	11.5	10.8	9.6	9.0	4.3	11.5
4-Nov	9.2	9.2	9.0	7.9	7.8	8.9	7.4	7.1	6.2	7.1	8.1	8.8	9.7	10.4	11.3	12.9	12.9	13.3	12.6	11.2	10.4	10.4	9.9	9.6	9.6	13.3
5-Nov	9.9	9.6	8.5	8.5	6.7	6.4	6.3	6.9	5.8	6.4	5.7	7.7	7.6	8.3	9.6	10.2	9.8	11.3	10.3	9.7	8.8	8.1	8.5	10.8	8.4	11.3
6-Nov	11.0	9.5	8.3	8.0	7.2	6.5	6.9	6.4	5.6	5.7	5.2	5.5	6.8	8.2	8.5	9.0	9.3	9.1	8.8	7.4	7.0	6.7	5.8	5.2	7.4	11.0
7-Nov	4.6	4.0	3.3	3.4	3.3	3.2	3.1	3.0	2.9	2.8	3.5	4.4	5.3	6.0	6.7	7.6	8.0	8.4	8.3	6.9	6.5	6.7	6.2	6.3	5.2	8.4
8-Nov	5.8	4.7	4.7	4.7	5.0	4.9	4.7	4.0	4.4	6.1	6.9	5.9	5.9	7.2	8.5	9.9	11.0	10.5	9.8	9.6	10.3	9.9	8.1	8.3	7.1	11.0
9-Nov	8.7	7.3	5.5	5.9	6.4	5.0	5.7	5.2	6.1	6.2	9.0	10.1	10.2	10.4	10.4	11.1	11.0	10.6	10.6	10.4	9.6	8.1	7.9	7.6	8.3	11.1
10-Nov	6.8	5.4	4.4	3.5	3.1	3.2	2.1	1.5	2.7	2.5	3.3	4.5	4.9	5.6	7.1	8.0	7.9	7.3	6.8	6.7	6.3	6.4	6.3	6.2	5.1	8.0
11-Nov	6.3	6.3	6.5	6.6	7.0	7.0	6.9	6.6	6.1	5.4	5.9	6.7	7.4	8.8	11.4	12.2	12.5	12.2	11.4	10.9	10.6	10.1	9.1	8.1	8.4	12.5
12-Nov	8.2	7.0	6.4	6.4	6.4	6.5	6.2	6.4	6.1	7.5	7.9	8.0	8.1	7.1	7.1	6.7	7.6	6.6	6.4	6.6	6.4	5.8	5.0	4.2	6.7	8.2
13-Nov	4.6	3.9	3.7	3.5	2.5	1.4	1.4	0.7	0.4	1.1	1.5	2.4	2.9	3.7	5.5	7.1	7.8	8.2	7.9	7.2	6.9	7.2	6.9	6.9	4.4	8.2
14-Nov	5.9	5.8	6.4	6.5	6.4	5.2	6.3	6.4	6.3	6.7	6.8	6.8	7.1	7.4	7.4	7.4	7.4	7.1	6.4	5.5	5.4	5.1	4.4	4.3	6.3	7.4
15-Nov	3.9	3.6	3.2	2.4	1.6	1.2	1.0	0.9	0.6	0.3	0.9	1.9	3.1	4.4	5.0	5.1	5.0	5.3	5.0	3.3	2.3	2.0	1.4	1.0	2.7	5.3
16-Nov	-0.2	-1.0	-1.8	-1.8	-1.7	-2.5	-2.5	-2.1	-3.5	-3.0	-3.4	-2.7	-2.1	-1.3	-2.2	-3.1	-3.9	-4.4	-4.9	-5.5	-5.9	-5.9	-5.8	-5.9	-3.2	-0.2
17-Nov	-6.4	-7.0	-7.7	-7.9	-8.1	-8.5	-8.6	-8.6	-8.8	-8.8	-8.5	-8.2	-8.2	-7.8	-7.5	-7.9	-8.2	-8.7	-9.1	-9.3	-9.2	-9.1	-9.3	-9.4	-8.4	-6.4
18-Nov	-9.7	-10.6	-11.0	-11.2	-11.1	-11.3	-11.4	-11.5	-11.4	-11.0	-10.8	-10.8	-10.7	-10.9	-10.8	-10.7	-10.8	-10.8	-10.8	-10.8	-10.8	-10.9	-10.9	-11.0	-10.9	-9.7
19-Nov	-11.0	-11.3	-11.4	-11.6	-11.7	-11.8	-12.3	-12.2	-11.7	-11.3	-10.9	-10.3	-9.8	-9.1	-8.6	-8.2	-8.0	-7.7	-7.3	-7.2	-7.4	-7.9	-8.2	-8.5	-9.8	-7.2
20-Nov	-8.8	-8.9	-9.0	-9.1	-9.2	-9.0	-8.7	-8.5	-8.7	-8.7	-8.3	-7.8	-7.1	-6.8	-6.7	-6.3	-6.1	-6.0	-5.8	-5.6	-5.3	-5.1	-5.0	-4.8	-7.3	-4.8
21-Nov	-4.4	-4.0	-3.8	-3.6	-3.6	-3.2	-3.1	-3.2	-3.1	-3.3	-3.1	-3.1	-3.0	-2.9	-2.9	-2.8	-2.7	-2.6	-2.8	-4.2	-5.0	-5.2	-5.8	-6.3	-3.6	-2.6
22-Nov	-6.5	-6.8	-7.0	-7.1	-7.1	-7.2	-7.3	-7.2	-7.1	-7.0	-7.0	-6.6	-6.0	-5.4	-5.2	-5.0	-4.9	-4.7	-4.7	-4.7	-4.8	-4.6	-4.9	-4.9	-6.0	-4.6
23-Nov	-4.3	-3.7	-2.9	-2.7	-3.0	-2.5	-2.4	-2.3	-2.3	-2.1	-1.9	-1.7	-1.6	-1.5	-1.4	-1.4	-1.3	-1.0	-1.1	-1.2	-1.4	-1.4	-1.5	-1.6	-2.0	-1.0
24-Nov	-1.7	-1.5	-1.6	-1.6	-1.5	-1.7	-1.8	-1.8	-1.9	-1.7	-1.5	-1.0	-1.0	-0.6	-0.3	-0.1	-0.1	-0.5	-0.5	-0.4	-0.6	-1.9	-2.4	-1.9	-1.2	-0.1
25-Nov	-1.5	-1.5	-1.4	-1.2	-1.0	-1.1	-0.9	-0.8	-0.7	-0.5	-0.4	-0.3	-0.3	-0.1	0.0	0.0	-0.1	-0.3	-0.6	-0.8	-1.1	-1.2	-1.4	-1.5	-0.8	0.0
26-Nov	-1.5	-1.8	-1.8	-1.9	-2.1	-2.3	-2.1	-1.8	-1.8	-2.0	-2.3	-2.6	-3.0	-3.2	-3.5	-3.8	-4.1	-4.2	-4.7	-5.3	-5.2	-5.5	-5.9	-6.1	-3.3	-1.5
27-Nov	-6.5	-6.7	-7.5	-7.7	-7.7	-7.6	-8.4	-8.6	-8.4	-8.2	-7.7	-6.9	-6.3	-5.8	-5.6	-5.5	-5.5	-5.4	-5.2	-5.0	-4.7	-4.5	-4.7	-5.1	-6.5	-4.5
28-Nov	-5.5	-5.5	-5.3	-5.1	-4.9	-4.7	-4.4	-4.3	-4.1	-4.0	-4.0	-4.0	-4.0	-4.0	-3.8	-3.6	-3.5	-3.4	-3.5	-3.7	-3.7	-3.8	-3.8	-3.7	-4.2	-3.4
29-Nov	-3.6	-3.7	-3.7	-3.7	-4.0	-4.3	-4.2	-4.1	-4.2	-4.3	-4.5	-4.8	-4.5	-4.4	-4.6	-4.9	-5.3	-5.2	-5.5	-6.0	-5.9	-5.7	-6.2	-6.3	-4.7	-3.6
30-Nov	-6.4	-6.6	-6.8	-6.8	-6.9	-6.8	-6.9	-7.2	-7.2	-7.1	-7.1	-7.1	-7.3	-7.2	-6.9	-6.6	-6.3	-6.2	-6.1	-6.1	-6.2	-6.2	-6.2	-6.1	-6.7	-6.1
																								Diurnal Average		
																								Diurnal Maximum		
																								-0.2 11.0		
																								-0.6 9.6		
																								-1.0 9.0		
																								-1.1 8.5		
																								-1.2 7.8		
																								-1.4 8.9		
																								-1.4 7.4		
																								-1.5 7.1		
																								-1.6 6.3		
																								-1.3 7.5		
																								-1.0 9.0		
																								-0.5 10.1		
																								-0.1 10.2		
																								0.4 10.4		
																								0.9 11.4		
																								1.3 12.9		
																								1.4 12.9		
																								1.3 13.3		
																								1.1 12.6		
																								0.7 11.2		
																								0.5 11.5		
																								0.3 10.8		
																								0.0 9.9		
																								-0.1 10.8		



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	410	56.94	56.94
0 - 10	272	37.78	94.72
10 - 20	38	5.28	100.00
> 20	0	0.00	100.00

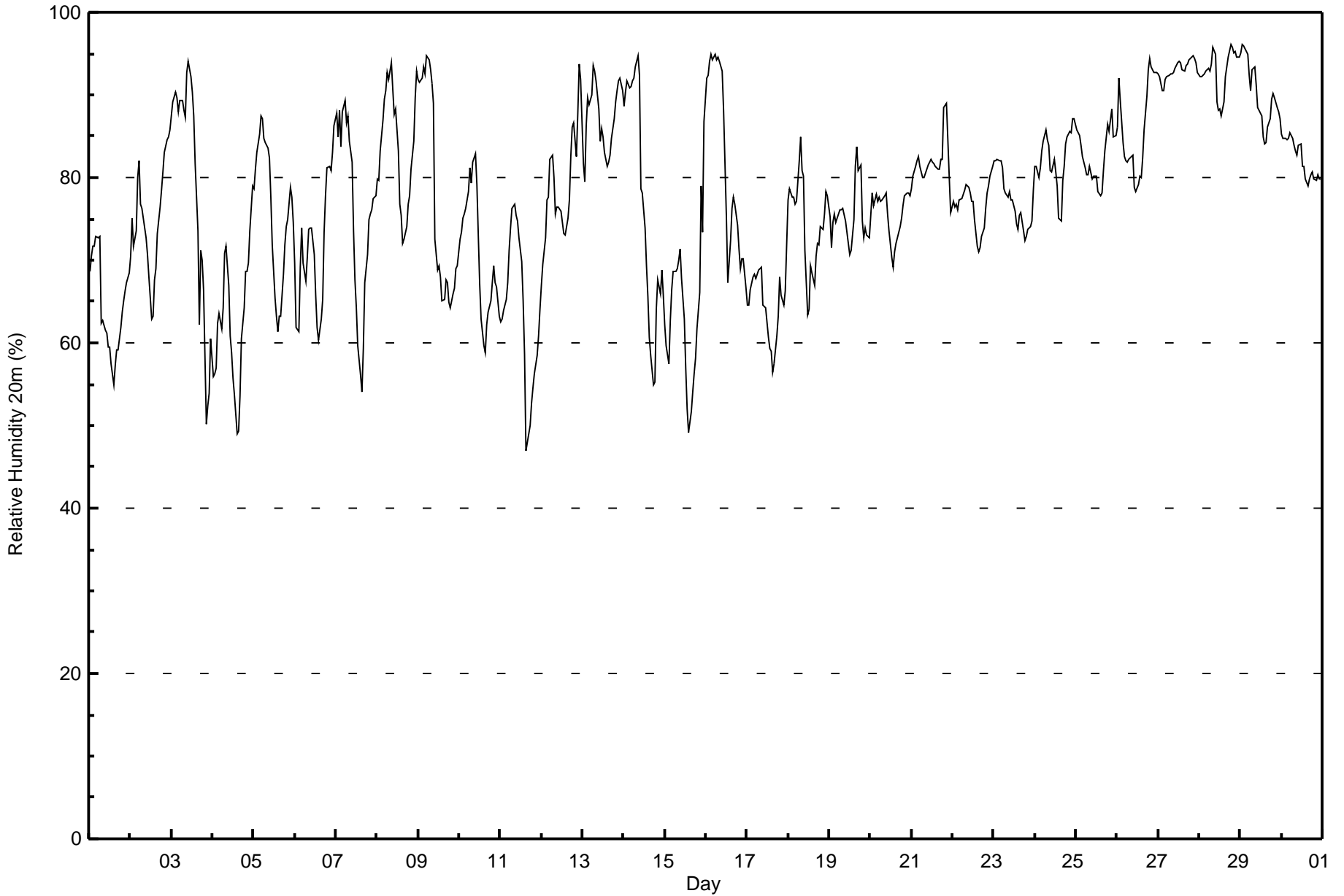
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	49	6.81	6.81
60 - 80	357	49.58	56.39
80 - 100	314	43.61	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



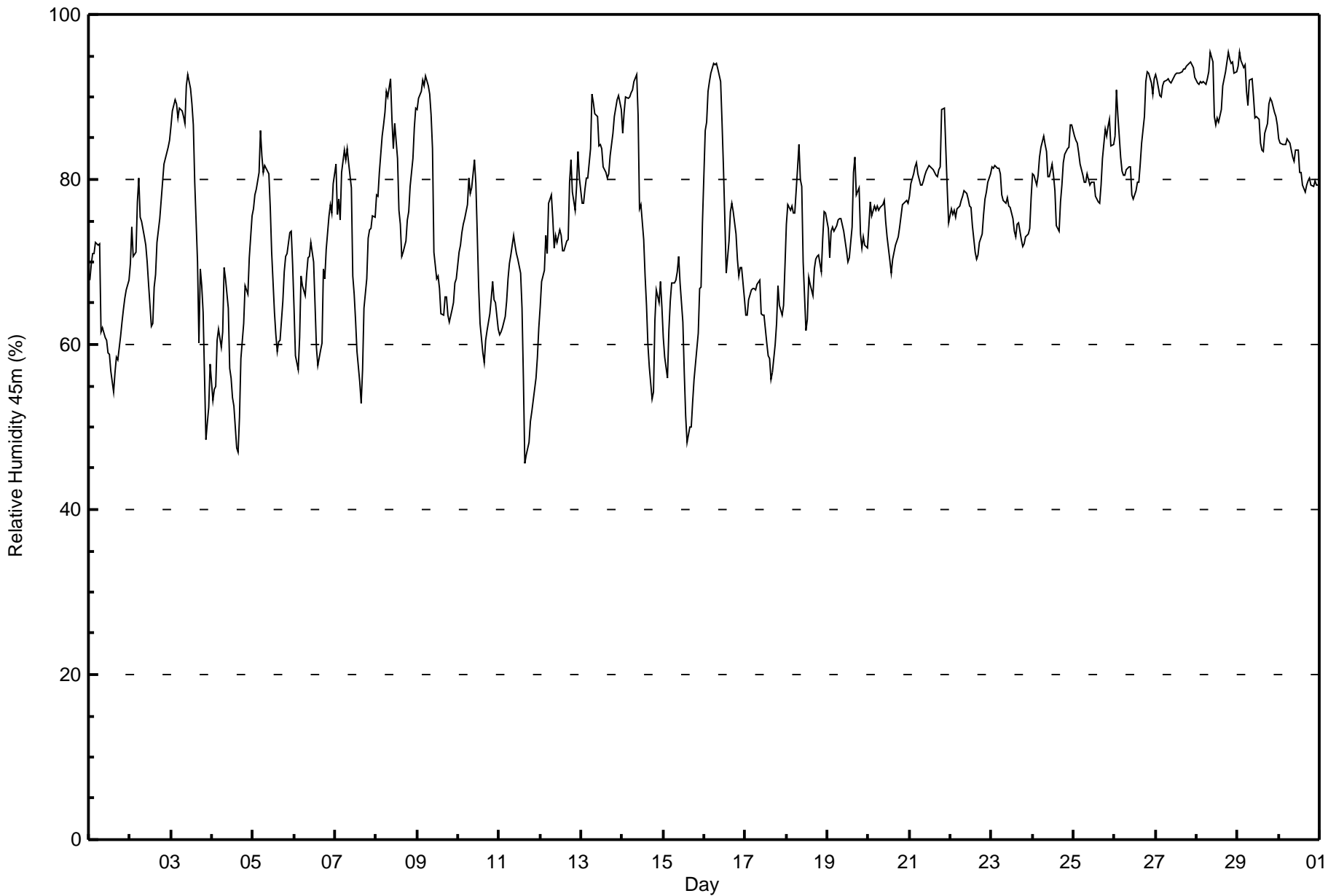
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 45m (RH45m) - %

Lower Camp Met Tower - November 2016

Maximum Value: 95 % on Nov 28 09:00 Maximum Daily Average: 92.5 % on Nov 27																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 46 % on Nov 11 16:00 Minimum Daily Average: 60.0 % on Nov 4 Maximum Diurnal Average: 80.6 % at hour 8 Minimum Diurnal Average: 69.0 % at hour 16 Monthly Average: 75.8 % Percentiles: P ₁ = 50 P ₁₀ = 61 Q ₁ = 68 Median = 77 O ₃ = 84 P ₉₀ = 91 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-Nov	68	70	71	71	72	72	72	62	62	61	60	59	59	57	54	57	58	58	61	63	64	66	67	68	63.8	72
2-Nov	70	74	71	71	77	80	75	75	73	72	70	67	62	63	67	68	72	75	78	80	82	83	84	85	74.0	85
3-Nov	86	88	90	89	88	89	88	88	87	91	93	91	89	87	80	70	60	69	67	64	48	50	52	58	77.6	93
4-Nov	53	55	55	60	62	60	62	69	68	64	57	56	54	52	48	47	51	58	62	67	67	66	71	76	60.0	76
5-Nov	77	78	79	81	86	83	81	82	81	81	77	71	64	61	59	60	65	69	71	71	74	74	70	73.0	86	
6-Nov	64	59	57	61	68	67	66	68	70	71	72	70	65	60	58	59	60	69	68	72	76	77	76	80	67.2	80
7-Nov	82	76	78	75	81	84	82	84	82	79	68	66	63	59	55	53	57	64	68	73	74	74	76	75	72.0	84
8-Nov	78	78	81	85	87	88	91	90	92	87	84	87	83	76	75	71	71	73	75	76	79	83	86	89	81.8	92
9-Nov	89	90	91	92	91	93	91	90	88	84	71	68	68	67	64	64	66	66	64	63	64	65	67	68	75.9	93
10-Nov	71	72	74	75	75	77	80	78	79	82	79	73	67	63	59	58	60	62	64	66	68	66	65	62	69.8	82
11-Nov	61	62	62	63	65	68	70	71	73	72	71	70	69	64	56	46	47	48	51	52	53	56	58	62	61.2	73
12-Nov	65	68	69	73	71	77	78	75	72	73	72	74	73	71	71	73	73	80	82	78	76	79	83	80	74.5	83
13-Nov	77	77	79	80	80	84	90	89	88	88	84	84	84	82	81	80	81	83	86	88	89	90	90	88	84.2	90
14-Nov	86	88	90	90	90	91	91	92	93	88	76	77	73	68	65	60	57	53	54	63	67	65	68	65	75.3	93
15-Nov	61	58	56	62	65	67	68	68	69	71	67	63	57	51	48	50	50	53	56	58	61	67	67	75	61.1	75
16-Nov	86	87	91	92	93	94	94	94	93	92	87	82	75	69	73	76	77	76	73	70	68	69	69	66	81.1	94
17-Nov	64	64	65	67	67	67	67	67	68	64	64	64	60	59	58	56	57	60	63	67	65	64	65	69	63.6	69
18-Nov	75	77	76	77	76	76	81	84	80	79	70	62	63	68	67	66	69	70	71	71	69	73	76	76	73.0	84
19-Nov	74	71	74	74	74	74	75	75	75	74	73	71	70	71	74	81	83	78	79	73	72	73	72	72	74.2	83
20-Nov	74	77	76	77	76	77	76	77	77	78	75	73	70	69	70	71	72	73	74	76	77	77	77	77	74.9	78
21-Nov	78	79	81	82	82	81	79	79	80	81	81	82	82	81	81	80	80	81	82	88	89	84	79	75	81.1	89
22-Nov	76	76	76	75	76	77	77	78	79	78	78	77	77	74	71	70	71	72	73	76	78	78	80	81	76.1	81
23-Nov	81	81	82	81	81	81	78	78	77	78	77	77	75	74	73	75	75	73	72	72	73	73	74	78	76.6	82
24-Nov	81	81	79	81	83	84	85	84	83	80	80	82	81	79	74	74	77	79	82	83	84	84	87	87	81.4	87
25-Nov	85	85	84	83	82	80	80	80	81	79	80	80	80	80	78	77	79	82	86	85	86	87	84	84	81.9	87
26-Nov	85	91	88	83	81	81	81	81	81	81	78	78	79	80	80	82	84	88	92	93	93	92	90	92	84.7	93
27-Nov	93	92	90	90	91	92	92	92	92	92	92	93	93	93	93	93	93	93	94	94	94	94	94	92	92.5	94
28-Nov	92	92	92	92	92	91	92	93	95	94	88	87	88	87	88	91	92	93	95	95	94	94	93	93	91.8	95
29-Nov	94	95	94	94	94	91	89	92	92	90	87	88	87	84	84	83	86	87	89	90	89	88	88	87	89.2	95
30-Nov	85	84	84	84	84	85	84	83	83	82	83	84	81	81	79	78	79	80	80	79	79	80	79	79	81.8	85
77.0 77.4 77.8 78.6 79.7 80.3 80.5 80.6 80.4 79.5 76.5 75.1 72.9 70.9 69.4 69.0 70.0 72.1 73.6 74.8 74.9 75.7 76.4 76.9																								Diurnal Average		
94 95 94 94 94 94 94 94 94 95 94 93 93 93 93 93 93 93 95 95 94 94 94 93																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	63	8.75	8.75
60 - 80	386	53.61	62.36
80 - 100	271	37.64	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 100m (RH100m) - %

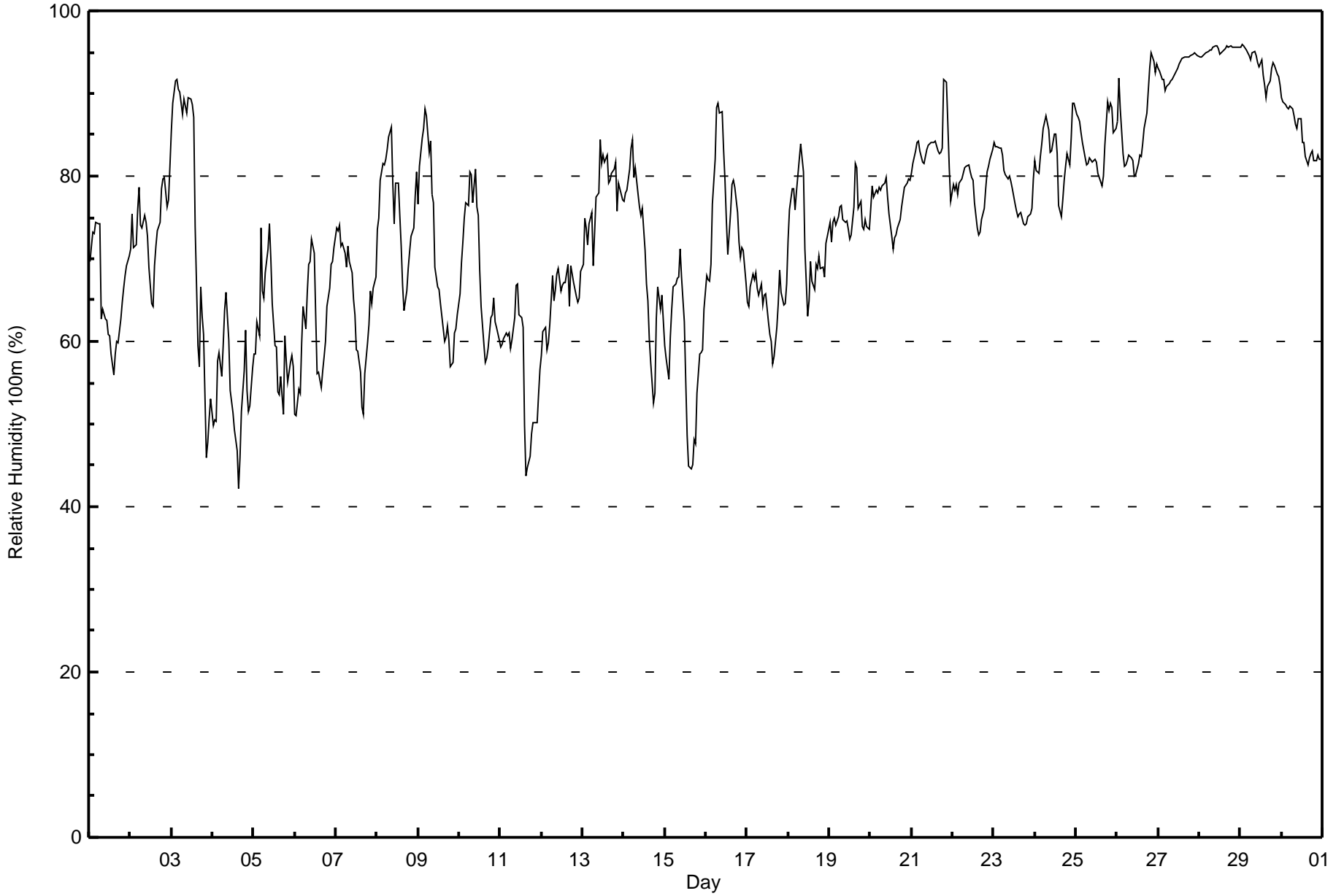
Lower Camp Met Tower - November 2016

Maximum Value: 96 % on Nov 29 02:00																			Maximum Daily Average: 95.3 % on Nov 28						Hours in Service: 720			
Minimum Value: 42 % on Nov 4 16:00																			Minimum Daily Average: 54.1 % on Nov 4						Hours of Data: 720			
Maximum Diurnal Average: 78.3 % at hour 9																			Minimum Diurnal Average: 68.7 % at hour 16						Hours of Missing Data: 0			
Monthly Average: 74.3 %																			Percentiles: P ₁ = 46 P ₁₀ = 58 Q ₁ = 65 Median = 75 O ₃ = 83 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-Nov	70	72	73	73	74	74	74	63	64	63	62	61	61	59	56	58	60	60	63	65	66	68	69	70	65.7	74		
2-Nov	71	75	71	72	76	79	74	74	75	74	73	69	64	64	69	72	73	74	78	80	80	76	77	81	73.9	81		
3-Nov	85	89	91	92	91	90	87	89	89	88	89	89	89	87	74	60	57	67	63	61	46	48	51	53	76.0	92		
4-Nov	50	50	50	58	59	56	60	64	66	60	54	53	51	49	47	42	46	52	57	61	54	52	52	57	54.1	66		
5-Nov	58	59	62	61	74	66	65	68	71	74	70	65	60	59	54	54	56	51	61	58	55	57	58	57	61.4	74		
6-Nov	51	51	54	54	60	64	61	66	69	70	72	71	63	56	56	54	56	58	60	64	66	69	70	71	62.1	72		
7-Nov	74	73	74	72	72	71	69	72	70	68	65	63	59	59	56	52	51	56	60	62	66	65	66	68	65.1	74		
8-Nov	73	75	80	82	81	82	83	85	86	79	74	79	79	75	71	67	64	66	69	71	73	74	78	80	76.1	86		
9-Nov	77	81	85	86	88	87	83	84	78	77	69	67	66	65	63	60	60	62	60	57	58	61	62	63	70.7	88		
10-Nov	66	69	72	75	77	76	81	80	77	81	76	75	69	64	60	57	58	59	63	63	65	62	62	60	68.7	81		
11-Nov	59	60	60	61	61	61	59	60	63	67	67	63	63	62	50	44	45	46	49	50	50	50	54	57	56.7	67		
12-Nov	58	61	62	59	60	62	68	65	66	68	69	66	67	67	67	69	64	69	68	67	65	65	65	68	65.3	69		
13-Nov	69	75	74	72	74	76	69	73	77	78	84	82	83	82	82	79	79	80	81	82	76	79	79	77	77.6	84		
14-Nov	77	78	78	81	83	84	80	81	78	76	75	76	71	67	65	60	57	53	54	63	67	64	66	63	70.7	84		
15-Nov	60	58	55	60	64	67	67	68	68	71	68	62	55	49	45	45	48	48	48	54	58	59	59	64	58.2	71		
16-Nov	68	68	67	69	77	82	88	89	88	88	83	80	75	71	76	79	79	79	76	72	70	71	71	67	76.3	89		
17-Nov	65	64	67	68	67	68	66	66	67	64	66	66	62	61	60	57	58	62	65	69	66	64	65	67	64.6	69		
18-Nov	72	76	78	78	76	78	82	84	82	80	71	63	65	70	67	66	69	69	70	69	69	68	72	73	72.9	84		
19-Nov	74	72	74	75	74	75	76	76	75	74	75	74	72	73	76	82	81	76	77	74	74	75	74	74	75.1	82		
20-Nov	76	79	77	78	78	79	78	79	79	80	78	75	73	71	72	73	74	75	76	77	79	79	80	79	76.9	80		
21-Nov	80	81	83	84	84	83	82	82	82	83	84	84	84	84	84	83	83	83	83	92	91	86	81	77	83.5	92		
22-Nov	79	78	79	78	79	80	80	81	81	81	81	80	80	77	74	73	73	75	76	79	80	81	82	83	78.7	83		
23-Nov	84	84	84	83	83	83	81	80	80	80	79	78	77	76	75	75	76	74	74	74	75	75	76	80	78.6	84		
24-Nov	82	81	80	82	84	86	87	86	86	83	83	85	85	83	76	75	77	80	81	83	81	85	89	89	82.9	89		
25-Nov	87	87	87	85	84	82	81	82	82	82	82	82	82	80	79	79	80	84	89	88	89	88	85	86	83.8	89		
26-Nov	87	92	88	83	81	81	82	83	82	82	80	80	81	83	82	84	86	88	90	93	95	94	93	94	85.9	95		
27-Nov	93	93	92	92	90	91	91	92	92	92	92	93	94	94	94	94	94	94	94	95	95	95	95	95	93.1	95		
28-Nov	94	94	95	95	95	95	95	95	96	96	96	96	95	95	95	95	96	96	96	96	96	96	96	96	95.3	96		
29-Nov	96	96	96	95	95	95	94	95	95	95	94	93	94	92	91	90	91	92	93	94	93	92	92	91	93.4	96		
30-Nov	89	89	89	88	88	88	88	87	86	86	87	87	84	84	82	81	82	83	83	82	82	83	82	82	85.1	89		
	74.2	75.3	75.9	76.3	77.7	78.0	77.8	78.2	78.3	78.0	76.6	75.2	73.4	71.9	70.0	68.7	69.1	70.3	71.9	73.1	72.7	72.7	73.2	74.0	Diurnal Average			
	96	96	96	95	95	95	95	95	96	96	96	95	95	95	95	95	96	96	96	96	96	96	96	96	Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	103	14.31	14.31
60 - 80	360	50.00	64.31
80 - 100	257	35.69	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 167m (RH167m) - %

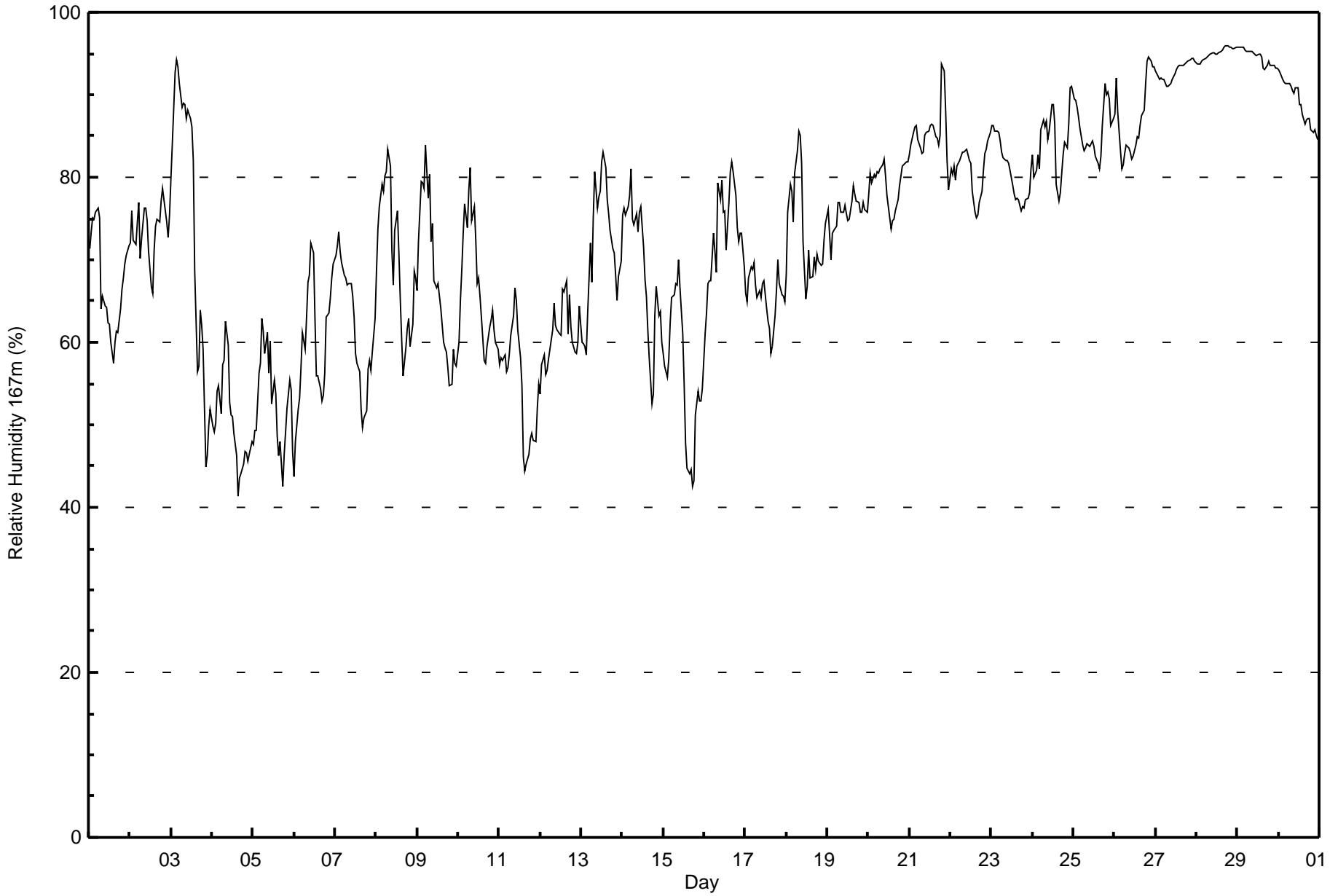
Lower Camp Met Tower - November 2016

Maximum Value: 96 % on Nov 28 18:00																			Maximum Daily Average: 95.0 % on Nov 28						Hours in Service: 720	
Minimum Value: 41 % on Nov 4 16:00																			Minimum Daily Average: 50.2 % on Nov 4						Hours of Data: 720	
Maximum Diurnal Average: 77.7 % at hour 9																			Minimum Diurnal Average: 68.8 % at hour 17						Hours of Missing Data: 0	
Monthly Average: 73.3 %																			Percentiles: P ₁ = 44 P ₁₀ = 55 Q ₁ = 62 Median = 75 Q ₃ = 84 P ₉₀ = 93 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-Nov	71	73	75	75	76	76	75	64	66	64	64	62	62	60	58	60	61	61	64	66	68	69	71	72	67.3	76
2-Nov	72	76	72	72	75	77	70	72	76	76	75	71	67	66	71	74	75	75	77	79	77	75	73	75	73.7	79
3-Nov	80	84	93	94	93	91	88	89	89	87	88	87	86	82	69	57	57	64	62	59	45	46	50	52	74.7	94
4-Nov	50	49	50	54	55	51	57	58	62	60	53	51	51	49	46	41	44	44	45	47	47	46	46	48	50.2	62
5-Nov	48	49	49	56	57	63	61	59	61	56	60	53	55	54	49	46	48	42	46	49	52	55	54	47	53.0	63
6-Nov	44	48	52	53	57	61	59	63	67	68	72	71	63	56	56	54	53	54	56	63	63	65	68	69	59.9	72
7-Nov	70	72	73	71	70	68	68	67	67	67	66	63	59	57	56	52	50	51	52	57	58	57	59	63	62.1	73
8-Nov	69	74	77	79	78	80	81	83	81	71	67	74	76	71	65	60	56	59	62	63	60	62	69	68	70.2	83
9-Nov	66	72	80	79	79	84	77	80	72	74	68	67	67	66	64	60	59	59	57	55	55	59	57	57	67.2	84
10-Nov	60	65	69	73	77	74	78	81	75	76	72	67	68	66	61	58	57	60	62	63	64	62	60	59	66.9	81
11-Nov	57	58	58	59	56	57	59	61	63	67	65	62	58	55	46	44	45	47	48	49	48	48	52	55	54.8	67
12-Nov	54	57	58	56	57	58	60	62	65	62	62	61	61	66	66	67	61	66	62	60	59	59	60	64	61.0	67
13-Nov	60	60	59	59	63	72	67	75	81	76	78	78	82	83	81	77	76	73	71	71	68	65	68	70	71.4	83
14-Nov	75	76	75	76	78	81	75	74	76	73	76	76	72	68	66	61	58	52	54	63	67	63	64	60	69.2	81
15-Nov	59	57	56	58	62	65	66	67	67	70	67	61	55	48	45	44	45	43	43	51	54	53	53	54	55.9	70
16-Nov	61	64	67	67	68	73	71	68	79	77	80	76	76	71	77	81	82	81	78	74	72	73	73	69	73.3	82
17-Nov	66	65	68	69	69	70	67	65	66	65	67	67	64	63	62	59	59	63	66	70	67	66	66	65	65.6	70
18-Nov	68	76	79	78	75	80	83	86	85	82	72	65	67	71	68	68	70	69	71	70	69	70	72	74	73.7	86
19-Nov	76	73	70	73	74	74	77	77	76	76	77	76	75	75	77	79	78	77	77	76	76	77	76	76	75.6	79
20-Nov	78	80	79	80	80	81	80	81	82	82	80	78	75	74	75	75	76	77	79	80	81	82	82	82	79.2	82
21-Nov	83	84	85	86	86	85	83	83	83	85	85	86	86	86	86	85	85	84	85	94	93	88	82	78	85.3	94
22-Nov	81	80	81	80	81	82	83	83	83	83	83	82	82	78	76	75	75	77	78	81	83	83	84	85	80.9	85
23-Nov	86	86	86	86	85	84	83	82	82	82	82	81	79	78	77	77	77	76	76	76	77	77	78	81	80.7	86
24-Nov	83	80	81	83	81	86	87	86	87	85	86	89	89	86	79	77	78	81	83	84	84	86	91	91	84.2	91
25-Nov	90	89	89	87	86	84	83	84	84	84	84	84	84	83	82	81	83	86	91	90	90	89	86	87	85.8	91
26-Nov	88	92	88	83	81	82	83	84	84	83	82	82	84	85	85	86	88	88	91	94	95	94	93	93	87.0	95
27-Nov	93	93	92	92	92	92	91	91	91	91	92	92	93	93	94	94	94	94	94	94	94	94	94	94	92.8	94
28-Nov	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	95.0	96
29-Nov	96	96	96	96	95	95	95	95	95	95	95	95	95	95	95	93	93	93	94	94	94	94	93	93	94.6	96
30-Nov	93	93	92	91	91	91	91	91	91	90	91	91	89	89	88	86	87	87	87	86	85	86	85	85	89.0	93
	72.3	73.8	74.8	75.4	75.7	77.1	76.5	76.9	77.7	76.8	76.1	74.8	73.8	72.2	70.4	69.0	68.8	69.3	70.3	71.7	71.3	71.3	71.8	72.1	Diurnal Average	
	96	96	96	96	95	95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	144	20.00	20.00
60 - 80	311	43.19	63.19
80 - 100	265	36.81	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 21 km/h on Nov 9 21:00	Maximum Daily Speed Average: 15.7 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 28 03:00	Minimum Daily Speed Average: 1.0 km/h on Nov 18	Hours of Data: 717
Maximum Diurnal Speed Average: 5.8 km/h at hour 9	Minimum Diurnal Speed Average: 2.4 km/h at hour 19	Hours of Missing Data: 3
Monthly Average Velocity: 4.1 km/h 178.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 8 Q ₃ = 12 P ₉₀ = 15 P ₉₉ = 19	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-Nov	NNW8	N6	N3	NNE3	ENE3	ENE3	W1	NW15	NNW16	NW15	NW12	NW13	NW12	NW14	NW12	NNW10	NNW9	NNW9	NNW8	N7	NNE5	NE3	ESE4	ESE5	NNW6.6	NNW16
2-Nov	ESE4	ESE4	S5	SSE4	ESE5	SE4	S11	S10	S13	SSE12	S9	SSE12	S13	SSW10	S11	S14	S12	SSE11	SE7	SSE14	SE12	SSE13	SSE14	SSE14	SSE9.3	SSE14
3-Nov	SSE14	SSE19	SSE17	SSE16	SSE14	SSE14	SSE13	SSE11	S9	AF	AF	AF	SSE15	SE11	SSE13	SSE12	S12	ESE6	SE15	SSE10	WSW19	W11	SW7	SSE7	SSE10.6	WSW19
4-Nov	SSW9	SW7	SW11	SW8	SW7	SW4	SSE12	SE11	SSE16	SSE11	SSE12	SSE10	SSE13	SSE8	SSE10	SSE10	SSE13	SE7	SE5	SE6	SSE8	SSE7	SSE10	SSE10	SSE8.2	SSE16
5-Nov	SSE10	SSE11	SSE9	SSE9	SE2	SSE6	SSE9	SSE7	SSE6	SSE5	SE8	SE9	SE7	SSE10	SSE10	SSE11	SSE7	SSE10	SE3	SSE7	SSE4	SE9	SSE14	S5	SSE7.7	SSE14
6-Nov	SSW5	SSW6	SSE6	SSE10	SE14	SE6	WSW4	NNW3	SSE2	SSE2	SW5	WSW5	WSW8	SSW3	SSE4	SSE3	SE3	SW1	S1	SSE7	SSE6	SSE7	SSE7	SSE11	S4.2	SE14
7-Nov	SE9	SSE10	SSE10	SSE10	SSE8	SE8	SE6	ESE4	SE3	SSE7	SSE8	SSE8	SSE9	SSE6	SSE6	SSE11	SSE11	SE7	SE3	SSE1	SE1	SSE4	SE3	SSE5	SSE6.6	SSE11
8-Nov	S2	S2	SSE4	SSE2	SSE5	SSE7	SSE8	SSE6	SSE6	SSE16	SSE18	SSE7	SSE6	SSE7	SE7	SSE9	SSE7	SSE10	SSE9	SSE8	SSE8	SSE5	NNW2	S1	SSE6.5	SSE18
9-Nov	SSE7	SSE10	SE3	SSE6	SE4	SSE2	SSE14	SE7	SSE13	SE11	WSW12	W13	W18	W13	WSW12	WSW12	W13	W13	WNW17	W19	W21	W13	W14	W18	WSW7.5	W21
10-Nov	W12	WNW7	SW3	S3	S3	W7	W3	S3	SSE5	SSE10	SSE9	SSE11	SE10	SSE11	SSE11	SSE10	SSE9	SE14	SSE13	SSE9	SSE11	SSE12	SSE11	SSE16	SSE6.9	SSE16
11-Nov	SSE15	SSE14	SSE10	SSE12	SSE14	SSE15	SSE15	SSE15	SSE15	SSE15	SSE17	SSE17	SSE15	SE12	SSE9	SW11	SW8	WSW8	WSW10	WSW10	WSW13	WSW12	W14	W12	S9.0	SSE17
12-Nov	W13	WSW6	SSE8	SE10	SSE5	SSE4	ESE2	SSE8	SSE12	S3	SSE9	SSE11	SSE4	SSE8	SE2	NW2	WSW1	W2	SE2	SE4	SSE3	SSE3	SSE4	SE5	SSE4.1	W13
13-Nov	SSW1	NNE0	SSE2	SSE5	SSE9	SSE8	SE9	SSE8	SE10	SE10	SSE7	SSE10	SSE8	SSE10	SSE10	SSE11	SSE9	SSE12	SSE11	SSE9	SSE10	SSE13	SSE14	SSE13	SSE8.7	SSE14
14-Nov	SSE13	SSE10	SSE14	SSE10	SE7	SE12	SSE12	SSE11	SE9	W7	W10	W10	W13	WNW14	NW18	NW13	WNW12	W8	W10	WNW16	W19	W17	W19	W19	WSW5.4	W19
15-Nov	W13	WNW9	W8	W18	W19	W18	W17	W13	W16	W19	W17	W16	WSW12	WSW9	WSW12	W11	W8	W10	NNW3	NNW2	NW1	N1	NNW2	W10.6	W19	
16-Nov	NNW1	NW3	N1	N2	NNW2	SE1	WSW0	SSW1	N1	NNW0	SSE1	NNW1	WSW2	N5	NNE9	NNE9	NNE8	NNE9	NNE10	NNE8	N8	NNE6	N6	N10	NNE3.8	N10
17-Nov	N11	N11	N12	NNW8	NNW7	NNW8	NW8	NW6	NW8	NW9	NW8	WNW8	WNW10	NNW9	WNW11	NW17	NW15	NW16	NW14	NW8	NW8	NW7	NW6	NNW5	NW9.0	NW17
18-Nov	NNW4	NW3	NNE2	NNE3	NNW3	NW3	NW2	WNW1	SW4	WNW1	N4	NNW5	W3	W4	SW1	W2	WNW2	SW4	W4	ESE2	ESE4	E3	ESE3	E3	NW1.0	NNW5
19-Nov	ESE3	ESE4	E2	NNE2	E3	NE2	NNE2	NE3	ENE4	E5	E6	ESE5	E8	E6	NE4	NNW5	N4	ENE0	NW4	ESE6	ESE7	SE11	SE13	SE12	E3.8	SE13
20-Nov	ESE11	ESE8	ESE9	ESE8	SE10	SE9	SE12	SSE10	SE14	S10	S12	SSE11	SSE13	S7	SSE11	SSE9	SE9	SSE10	SSE10	SSE14	SE13	SSE11	SE12	SE11	SSE10.1	SE14
21-Nov	SE12	SSE10	SSE11	SSE12	SSE15	S14	S17	S14	S12	S8	SSE5	SE2	E1	NW1	NNW1	WSW1	N2	N4	N5	NNE8	NNE7	NNE5	NE7	NNE6	SSE4.0	S17
22-Nov	N5	NNE6	NNE4	NNE5	NNW3	NNE4	ENE2	E2	ENE0	ESE2	ESE4	ESE3	S3	S7	S8	S11	SSW10	S12	S13	S12	S13	S10	SE10	SSE13	SSE4.1	S13
23-Nov	S12	SSE14	SSE16	SSE15	SE17	SSE17	S16	S19	S20	SSE21	S18	SSE19	SSE19	S19	S18	SSE16	SSE15	SSE16	S16	S16	S13	S10	S10	S10	SSE15.7	SSE21
24-Nov	S9	S9	SSW8	SSW8	S11	S10	SSE12	S11	SSE8	SSE14	S10	SSE9	S10	S8	S6	SSW5	SSW3	SE2	SE4	ESE2	SE6	SSE16	SSE15	SE17	SSE8.4	SE17
25-Nov	SSE19	SE19	SE17	SE15	SE15	SSE16	SSE17	SSE15	SSE11	S11	S9	S8	S8	S9	S5	SW4	WSW4	W3	WNW5	WNW6	WNW6	W10	W14	WSW13	S7.2	SE19
26-Nov	W15	WSW13	W13	W12	W12	WSW10	WSW9	WSW7	WSW8	SW7	SW13	WSW10	WSW8	SW6	SW5	S3	SW4	SSW1	NW1	NW1	SW1	SE4	SE4	SSE3	WSW6.2	W15
27-Nov	SSE4	SSE5	SE3	ESE3	SE2	SSE1	ENE2	NNE4	NNE4	N5	N5	N5	N6	NNW5	NNW5	NNW5	NNW4	NNW4	NNW4	NNW3	NNW4	NNW5	NNW6	NNW5	N2.5	NNW6
28-Nov	NNW5	NNW3	WSW0	NNW1	NNE1	ESE1	E1	ESE1	SE2	WSW2	WSW7	W6	SW3	S2	SSE2	ESE2	NNW1	NNW2	NW3	NNW3	N3	NW3	NW4	NNW2	WNW1.3	WSW7
29-Nov	NNW3	N3	NW2	NNW3	N2	WNW2	WNW2	NE1	NW1	NW4	WNW4	WNW3	ENE1	S4	SSW5	S7	S8	SSW8	SW10	SW9	SW7	S12	S10	S9	SSW2.9	S12
30-Nov	S12	S13	SSW12	S11	S12	SSE12	S14	S15	S15	S15	SSW11	SSW10	SSW12	SSW10	SSW12	SSW11	SSW9	S11	S13	SSW12	S12	S10	S12	S12	S11.9	S15

S3.6	SSE4.1	SSE4.5	SSE4.3	SSE4.7	SSE4.6	SSE5.7	S5.0	S5.8	S5.4	S5.1	S4.5	S5.0	S4.4	S4.2	SSW3.7	SSW3.2	S2.6	SSW2.4	S2.9	SSW3.2	S3.9	S4.2	S4.3	Diurnal Average
SSE19	SE19	SSE17	W18	W19	W18	S17	S19	S20	SSE21	S18	SSE19	SSE19	S19	S18	NW18	SSE15	SSE16	WNW17	W19	W21	W19	W17	W19	Diurnal Maximum

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



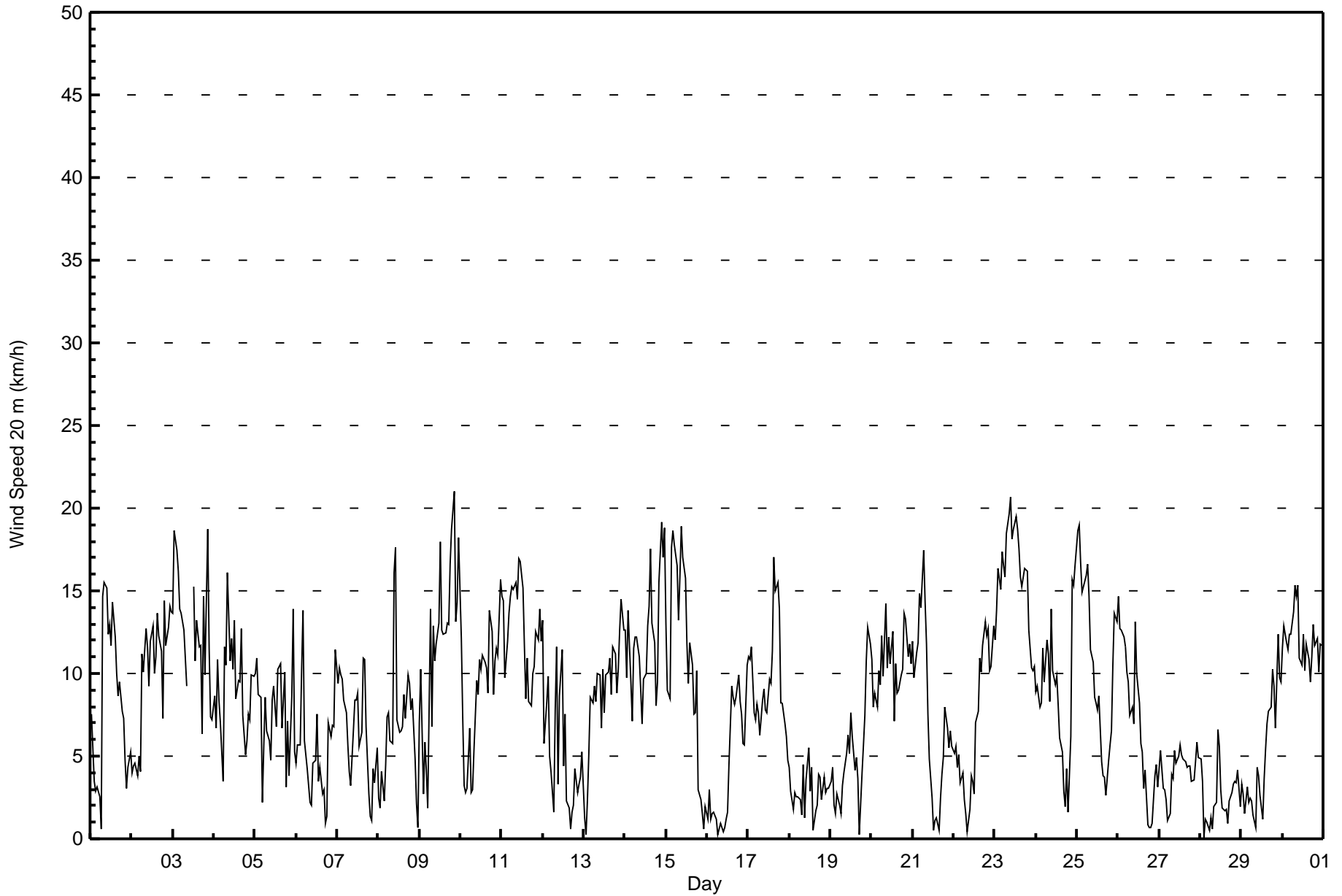
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 3 21:00	Hours in Service: 720 Hours of Data: 717 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6
Minimum Value: 0 km/h on Nov 16 07:00	
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-Nov	3	2	2	2	2	2	2	6	6	5	4	5	5	5	5	4	3	3	3	3	2	2	2	2	6
2-Nov	2	2	2	2	1	3	3	3	5	4	3	4	3	3	3	4	3	4	4	4	3	3	3	4	5
3-Nov	4	3	3	3	4	3	3	3	2	AF	AF	AF	4	5	3	3	3	3	2	3	8	4	3	3	8
4-Nov	3	3	5	4	4	3	5	4	3	3	3	3	4	4	3	4	2	3	2	3	3	3	4	5	5
5-Nov	3	2	2	3	2	3	2	4	3	2	4	4	3	4	3	3	3	3	4	4	2	4	6	3	6
6-Nov	3	4	2	4	3	4	3	2	1	1	3	3	2	2	2	2	2	1	1	3	2	3	4	2	4
7-Nov	2	2	2	2	2	2	2	1	2	3	2	3	2	1	4	2	2	2	2	1	1	3	3	3	4
8-Nov	2	1	2	2	2	3	4	2	3	4	4	4	4	4	2	3	3	4	3	3	3	3	2	1	4
9-Nov	3	3	3	4	2	3	3	5	5	5	5	4	4	3	3	3	3	5	6	6	7	4	5	6	7
10-Nov	5	5	2	3	2	5	3	2	2	3	3	3	3	4	3	2	2	5	4	3	3	3	4	5	5
11-Nov	4	4	2	2	3	2	2	3	3	3	3	4	5	4	4	3	3	3	2	2	3	3	3	3	5
12-Nov	3	3	5	3	2	2	2	4	3	2	5	4	4	3	1	1	1	2	1	1	2	1	1	2	5
13-Nov	1	2	1	2	2	3	2	2	3	3	3	4	4	3	4	3	2	3	4	3	3	4	4	3	4
14-Nov	2	4	4	3	3	3	3	3	3	5	3	3	3	3	4	5	6	6	4	3	4	6	7	6	7
15-Nov	6	5	5	7	6	6	6	6	4	6	6	5	4	2	3	3	2	2	4	2	1	2	1	1	7
16-Nov	1	1	1	1	1	1	0	0	1	1	1	1	2	3	4	4	3	3	5	3	3	2	4	4	5
17-Nov	4	4	5	3	2	3	2	2	3	3	4	3	4	4	5	6	5	5	4	3	3	2	2	1	6
18-Nov	1	1	1	1	1	1	1	1	3	1	3	3	2	3	1	2	1	1	1	1	1	2	2	2	3
19-Nov	2	3	2	1	2	2	1	2	2	3	3	2	3	2	2	2	2	2	2	3	3	4	5	4	5
20-Nov	4	4	4	3	4	5	4	3	5	4	4	4	4	2	3	3	3	4	4	4	5	4	4	4	5
21-Nov	4	4	3	3	4	3	4	4	3	3	3	2	1	1	1	1	1	1	2	3	3	3	3	3	4
22-Nov	2	2	2	2	2	2	1	1	1	1	1	1	2	2	3	3	3	3	4	4	4	3	5	4	5
23-Nov	3	4	5	5	5	4	4	5	5	7	5	5	6	5	5	4	4	4	4	4	3	3	3	3	7
24-Nov	2	2	2	3	3	2	3	3	3	5	3	2	3	3	2	2	3	2	3	2	4	6	5	6	6
25-Nov	6	6	6	5	5	5	5	5	4	3	3	3	3	3	2	2	1	2	2	2	3	4	4	4	6
26-Nov	4	4	4	4	4	3	4	2	2	3	3	4	3	2	2	3	2	1	1	1	1	1	1	3	4
27-Nov	2	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	3
28-Nov	2	1	0	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2
29-Nov	2	1	1	1	1	1	1	1	1	2	2	2	1	2	2	3	3	3	4	3	3	4	3	3	4
30-Nov	4	4	4	4	4	3	4	4	4	4	4	4	4	3	4	4	3	4	4	4	4	4	4	3	4
	6	6	6	7	6	6	6	6	6	7	6	5	6	5	5	6	6	5	6	6	8	7	6	7	
	Diurnal Maximum																								

AF - Analyzer Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	240	33.47	33.47
6 - 11	281	39.19	72.66
12 - 19	193	26.92	99.58
20 - 28	3	0.42	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

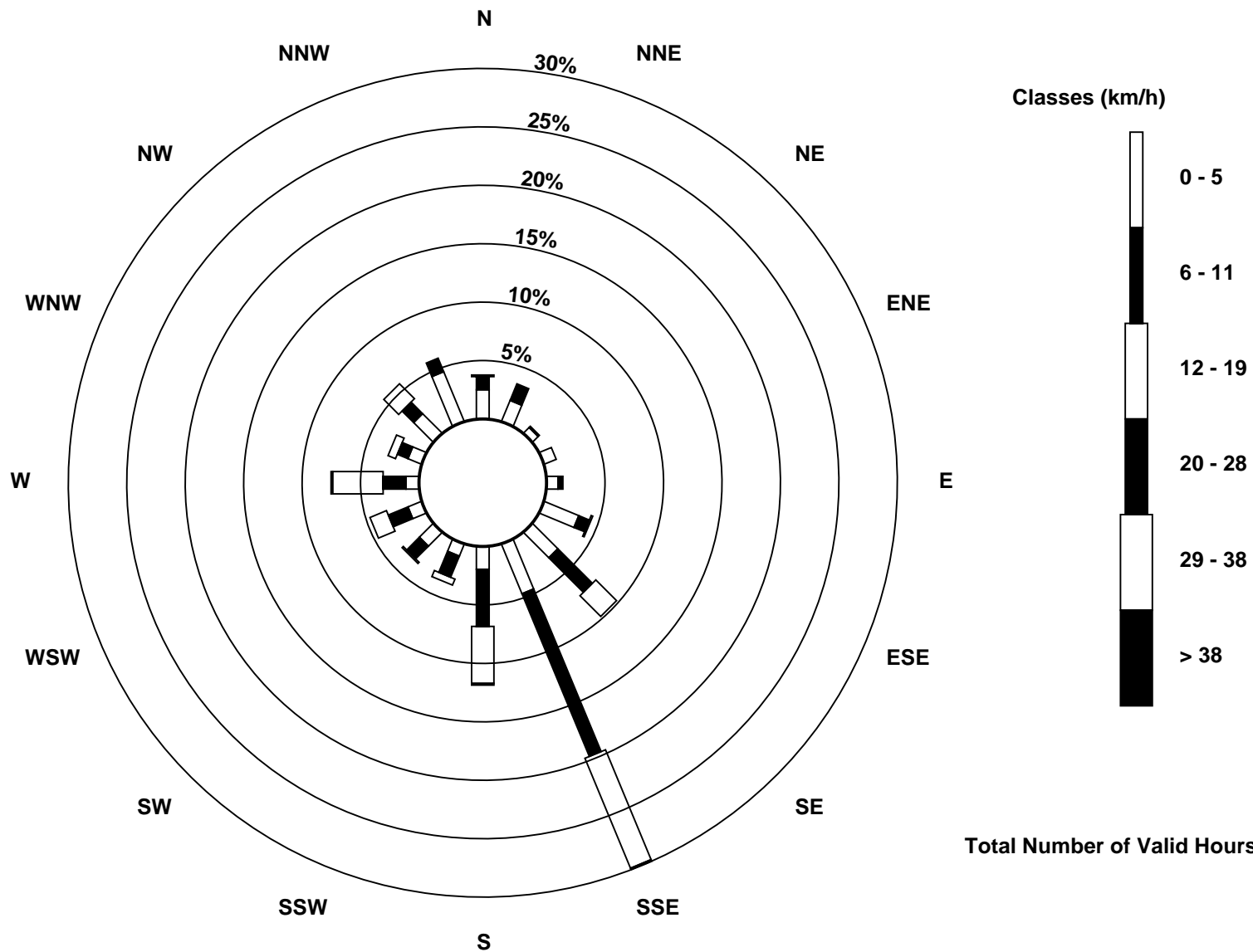
Total Number of Valid Hours: 717

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 45 m (WS45m) - km/h

Lower Camp Met Tower - November 2016

Maximum Speed: 29 km/h on Nov 9 21:00	Maximum Daily Speed Average: 18.1 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 16 06:00	Minimum Daily Speed Average: 1.2 km/h on Nov 18	Hours of Data: 717
Maximum Diurnal Speed Average: 7.1 km/h at hour 7	Minimum Diurnal Speed Average: 3.0 km/h at hour 19	Hours of Missing Data: 3
Monthly Average Velocity: 5.1 km/h 169.9 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 6 Median = 11 Q ₃ = 15 P ₉₀ = 19 P ₉₉ = 25	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-Nov	NNW10	N8	N5	NNE4	NE4	ENE3	W1WNW18	WNW20	WNW19	WNW16	NW16	NW15	WNW18	NW15	NNW13	NNW12	NNW13	NNW11	N10	NNE7	NE5	E6	E7	NW8.5	WNW20	
2-Nov	E5	ESE6	SSE5	SSE6	ESE8	SE6	SSE12	S12	SSE14	SSE14	SSE11	SSE15	S15	SSW12	SSE13	S15	SSE14	SE16	SE11	SE19	SE16	SE18	SE19	SE19	SSE11.9	SE19
3-Nov	SE19	SSE22	SSE20	SSE18	SSE16	SE17	SE16	SE13	S10	AF	AF	AF	SE21	SE17	SE17	SE12	S14	ESE8	SE14	SSE11	WSW26	WSW17	SW10	S8	SSE12.9	WSW26
4-Nov	SSW12	SSW10	SW15	SW11	SW9	SW7	SE13	SE14	SSE20	SE13	SSE14	SE12	SE17	SE12	SE13	SSE13	SE16	SE11	SE8	SE7	SSE11	SSE13	SE15	SE15	SSE11.1	SSE20
5-Nov	SE10	SE13	SE10	SE11	SE4	SE8	SE11	SE7	SE7	SE7	SE11	SE14	SE9	SE12	SE13	SE16	SE16	SE14	SE5	SE9	SE7	SE13	SE16	SSW5	SE9.9	SE16
6-Nov	SW9	SSW9	SSE5	SSE7	SE15	SE7	SW7	NW5	S1	SSW2	SW7	WSW7	WSW11	SW5	S5	SE2	SSE2	SSE2	S3	SSE9	S5	SSE7	SSE8	SE12	S4.7	SE15
7-Nov	SE10	SSE8	SE9	SSE8	SE11	SE9	SE7	ESE7	SE5	SE9	SSE8	SE11	SE11	SE6	SE8	SSE14	SE14	SE11	SE5	SE4	SE3	SE6	SE6	SE9	SE8.2	SE14
8-Nov	SSE5	SSE3	SE6	SE5	SE8	SE11	SE11	SE8	SE10	SSE20	SE22	SE9	SE7	SE9	SE8	SE10	SE9	SE13	SE13	SE11	SE11	SE7	N1	NE1	SE8.9	SE22
9-Nov	SE10	SE13	SE4	SE8	SE6	SE3	SE16	SE7	SSE14	SE11	WSW18	WSW19	W24	WSW19	WSW18	WSW18	WSW19	W18	W23	W26	W29	W19	WSW21	W25	WSW10.9	W29
10-Nov	W19	W12	WSW6	SW4	S4	WSW12	W6	SSW4	SSE7	SE13	SE12	SE15	SE14	SE14	SSE13	SSE12	SE12	SE20	SE17	SE13	SE15	SE17	SE16	SE21	SSE9.1	SE21
11-Nov	SE19	SE19	SE14	SE16	SE18	SE18	SE19	SE18	SE20	SE18	SE20	SE20	SE21	SE16	SSE10	SW15	SW12	WSW12	WSW14	WSW15	WSW19	WSW19	WSW20	W17	S11.7	SE21
12-Nov	WSW20	WSW9	SSE9	SE13	SE9	SE9	SE6	SE12	SE13	SE4	SE8	SE13	SE6	SE9	ESE4	NW2	SSE2	W2	SSE3	SSE5	SW3	SSE3	SE5	SSE3	SSE5.1	WSW20
13-Nov	WSW4	W2	W3	S3	SSE8	SSE9	SE12	SE11	SE13	SE13	SE10	SE15	SE12	SE11	SE14	SE16	SE12	SE14	SE16	SE13	SE16	SE17	SE19	SE16	SE11.0	SE19
14-Nov	SE14	SE11	SE19	SE14	SE10	SE14	SE17	SE15	SE16	SE8	WSW11	WSW14	WSW14	W18	W19	WNW23	WNW16	WNW16	W11	W13	W20	W26	W24	W25	WSW7.4	W26
15-Nov	W18	W12	W12	W23	W25	W24	W22	W18	WSW22	WSW27	W23	WSW22	WSW16	WSW13	WSW17	WSW15	WSW12	WSW13	W16	NNW5	NW4	NW3	NNW2	NW3	W14.7	WSW27
16-Nov	NNW2	WNW3	NNW3	NNW2	NNW3	SE0	SSW1	SSW1	N1	N0	SE1	NNW1	WSW2	N6	NNE14	NNE13	NNE13	NNE12	NNE15	NNE13	N10	N9	NNW8	N16	N5.6	N16
17-Nov	N16	N15	N16	NNW11	NNW10	NNW12	NW10	NW9	WNW12	NW11	WNW10	WNW10	W13	WNW12	WNW15	WNW22	WNW19	NNW19	NNW17	NNW10	NNW10	NW9	WNW9	NW7	NW11.7	WNW22
18-Nov	NNW6	NNW4	NNE3	NNE4	NNW3	NW3	NW3	W2	SW5	WNW2	NNW5	NNW7	W3	WSW5	WSW1	W2	WNW2	SW5	WSW4	ESE3	ESE5	E5	ESE4	E5	NW1.2	NNW7
19-Nov	E5	ESE6	E3	NE2	E4	ENE3	NE2	NE4	ENE6	E7	E8	E7	E10	E8	NE6	NNW7	N6	E3	NNW3	ESE8	ESE10	SE14	ESE17	ESE16	E5.5	ESE17
20-Nov	ESE14	ESE11	ESE12	ESE11	ESE13	SE12	SE16	SE12	SE18	SSE12	SSE14	SSE13	SSE14	S8	SE13	SE12	SE12	SE13	SE14	SE18	SE18	SE14	SE15	SE13	SE13.1	SE18
21-Nov	SE16	SE13	SSE14	SSE14	SSE18	SSE15	SSE19	SSE15	SSE12	SSE9	SSE6	SE3	ENE1	NW2	NNW2	W1	N4	NNW6	N8	N12	NNE9	NNE8	NNE10	NNE9	SE4.3	SSE19
22-Nov	N7	NNE8	NNE6	NNE7	NNW5	N5	NE3	E2	E1	ESE2	E5	ESE4	SSE3	S8	S9	S12	S13	SSE13	S15	S14	S14	SSE11	SE14	SE17	SE4.6	SE17
23-Nov	SSE14	SE17	SE20	SE20	SE22	SSE19	SSE18	SSE20	SSE22	SSE23	SSE20	SSE22	SE24	SSE21	SSE19	SSE19	SSE18	SSE17	SSE17	S15	S12	S12	S11	S11	SSE18.1	SE24
24-Nov	S10	S11	S11	S12	S13	SSE10	SSE14	SSE12	SSE10	SSE16	S12	SSE11	S11	S9	SSE8	S8	S4	ESE4	ESE8	SE4	SE12	SE22	SE20	SE22	SSE10.8	SE22
25-Nov	SE24	SE26	SE22	SE20	SE20	SE21	SE22	SSE18	SSE15	S13	SSE10	SSE9	SSE9	SSE10	S5	SSW5	SW6	WSW5	WNW6	WNW7	W9	WSW14	WSW19	WSW18	SSE9.2	SE26
26-Nov	WSW20	WSW18	WSW18	WSW17	WSW16	WSW15	WSW13	WSW10	WSW12	SW10	SW16	WSW13	SW10	SW7	SSW7	SSE4	SW5	SSW1	NNW0	NE1	SSE0	SE5	SE5	SE3	WSW8.3	WSW20
27-Nov	SE3	SE6	ESE4	E3	ESE2	SE1	NE3	N6	NNE6	N7	N7	N7	NNW8	NNW7	NNW7	NNW7	NNW7	NNW6	NNW6	NNW5	NNW5	NNW7	NNW8	NNW7	N4.1	NNW8
28-Nov	NW7	NW5	W1	NW2	NNW1	WNW1	ENE1	ESE2	SSE2	SW4	WSW10	WSW8	SW4	SSE2	SE2	ESE3	NNE1	NW3	NNW4	NNW6	NNW6	NW5	NW6	NW4	WNW2.0	WSW10
29-Nov	NNW5	NNW5	NW3	NNW5	N4	NW3	WNW3	NNE2	NW1	NW5	WNW5	W3	ENE1	SSE5	S7	SSE9	S10	S10	SSW13	SSW11	SSW9	S14	S12	S10	SSW3.3	SSE14
30-Nov	S14	S15	S16	S14	SSE13	SSE14	SSE15	S17	S18	S17	S15	S13	S16	S14	S15	S14	S13	S14	S15	S15	S15	S12	S13	SSE13	S14.4	S18

S4.2 SSE4.8 SSE5.3 SSE5.1 SSE5.9 SSE5.8 SSE7.1 SSE5.9 SSE6.9 SSE6.4 S6.1 S5.6 S6.2 S5.4 S5.0 S4.4 S3.9 S3.5 S3.0 SSE3.5 S4.1 S5.1 S5.4 SSE4.9	Diurnal Average
SE24 SE26 SE22 W23 W25 W24 SE22 SSE20 WSW22 WSW27 W23 SSE22 SE24 SSE21 SSE19 WNW23 WNW19 SE20 W23 W26 W29 W26 W24 W25	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

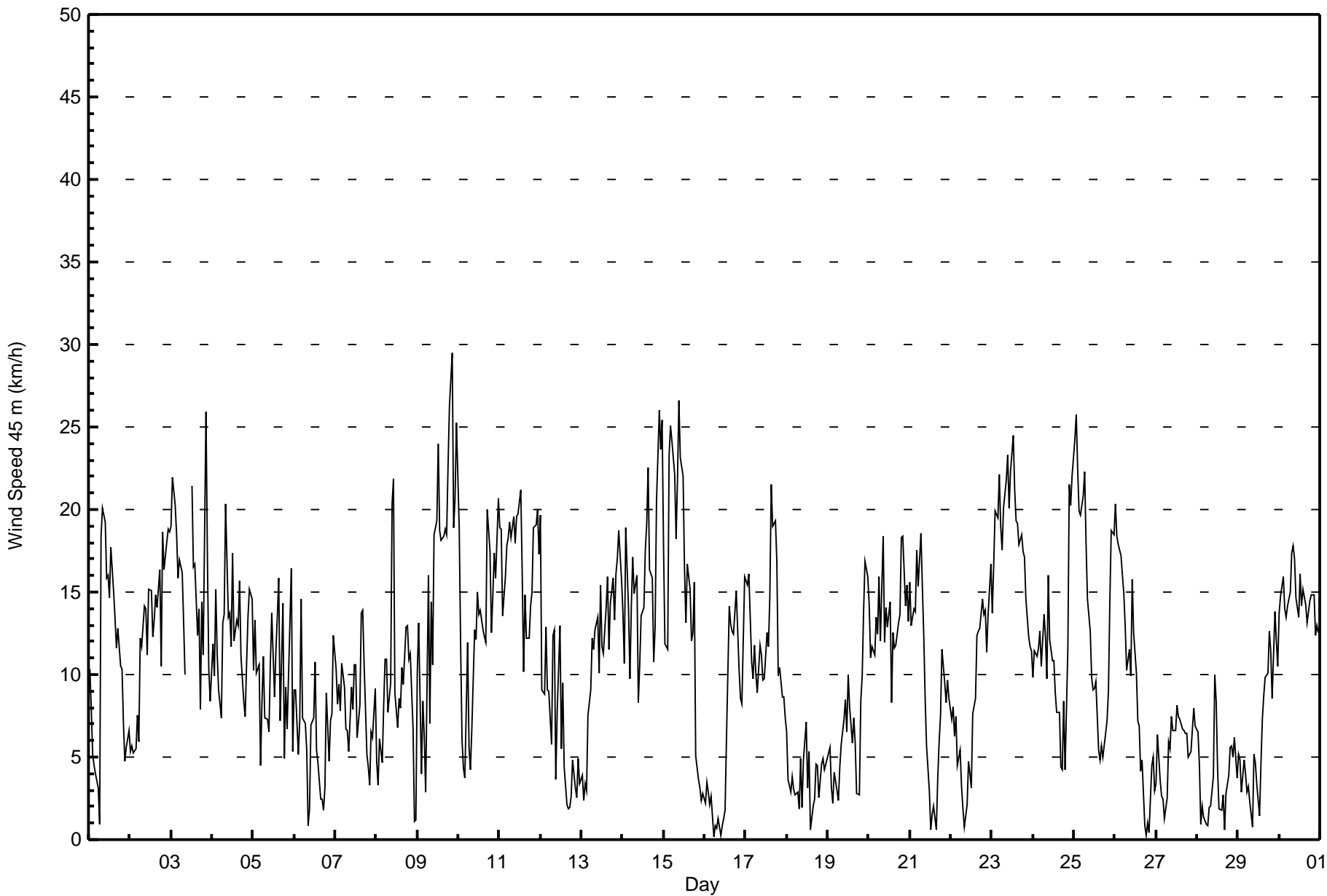
Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 3 21:00	Hours in Service: 720 Hours of Data: 717 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6
Minimum Value: 0 km/h on Nov 16 07:00	
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-Nov	3	3	3	3	2	2	3	6	6	5	4	4	5	5	5	4	4	3	4	3	3	2	2	2	6
2-Nov	2	2	2	2	1	3	2	3	5	5	4	5	3	3	3	3	4	4	5	4	3	2	3	3	5
3-Nov	3	2	3	3	4	2	3	2	2	AF	AF	AF	4	6	3	2	3	3	2	3	8	5	4	4	8
4-Nov	4	4	5	4	5	5	5	4	3	3	3	2	3	5	3	3	2	3	3	4	5	3	4	6	6
5-Nov	3	1	2	2	3	4	2	5	2	3	4	5	3	3	3	3	4	3	5	4	3	4	7	4	7
6-Nov	5	6	2	3	3	5	4	2	2	1	3	4	2	3	2	2	2	2	2	3	2	3	4	2	6
7-Nov	2	2	2	2	2	2	1	1	2	2	2	2	2	1	4	2	2	2	3	2	2	3	3	4	4
8-Nov	3	2	2	3	2	3	4	3	4	3	2	5	3	4	2	3	3	4	3	4	3	3	2	2	5
9-Nov	3	3	4	6	3	4	3	4	4	5	4	3	4	3	2	3	3	5	5	6	6	4	4	5	6
10-Nov	5	5	4	5	2	7	4	2	3	3	3	3	3	4	3	2	2	6	4	3	3	4	5	5	7
11-Nov	5	4	3	2	2	2	1	2	2	2	2	2	4	3	4	3	4	3	2	2	2	2	2	3	5
12-Nov	3	4	6	3	2	2	3	3	2	3	4	4	4	3	1	1	2	1	1	2	2	2	1	2	6
13-Nov	2	2	2	1	3	3	1	2	3	3	3	4	4	3	3	2	2	3	3	2	2	2	3	2	4
14-Nov	2	3	3	3	4	3	2	2	2	4	3	4	3	4	5	6	6	5	4	4	6	6	6	7	7
15-Nov	7	5	6	8	5	5	5	6	4	6	6	4	3	2	2	3	2	2	3	3	1	2	1	1	8
16-Nov	1	1	1	1	0	1	0	1	1	1	1	1	2	3	4	4	4	4	5	4	3	3	4	5	5
17-Nov	5	4	5	4	3	4	2	2	3	3	4	3	4	3	5	6	5	5	4	3	2	2	2	2	6
18-Nov	2	1	2	1	1	1	1	2	3	1	4	3	2	4	1	2	1	1	1	2	2	2	2	2	4
19-Nov	2	3	2	2	2	2	2	2	2	3	3	2	3	2	2	2	2	2	2	3	3	4	5	4	5
20-Nov	4	4	4	4	4	6	5	4	6	4	5	4	4	2	3	3	4	4	4	5	5	4	4	5	6
21-Nov	4	4	4	3	4	4	4	4	3	3	3	2	1	1	2	1	2	2	3	4	3	3	3	3	4
22-Nov	3	3	2	2	2	2	1	1	1	1	2	1	2	2	3	3	3	3	4	3	4	4	6	5	6
23-Nov	4	5	5	6	6	4	4	6	5	7	5	6	7	6	5	5	4	5	4	4	3	2	3	2	7
24-Nov	2	2	2	2	2	2	3	3	3	5	2	2	2	2	2	2	3	2	3	3	5	7	6	6	7
25-Nov	6	6	7	5	5	6	5	6	5	3	3	3	3	3	2	2	1	3	3	3	3	4	4	3	7
26-Nov	3	3	4	3	4	3	4	2	2	3	3	4	2	3	2	3	2	1	1	1	1	2	1	3	4
27-Nov	2	3	1	1	1	1	3	2	2	2	3	2	2	3	2	2	2	2	2	2	1	2	2	2	3
28-Nov	2	2	1	1	1	1	1	1	1	3	2	2	2	1	1	1	1	1	1	1	2	1	1	1	3
29-Nov	2	1	1	2	1	1	1	1	1	2	2	2	1	3	2	2	2	3	4	3	3	4	3	3	4
30-Nov	3	3	3	4	3	3	4	3	4	4	4	3	3	3	3	3	3	3	3	4	3	3	3	3	4

7	6	7	8	6	7	5	6	6	7	6	6	7	6	5	6	6	6	6	5	6	8	7	7	7	
Diurnal Maximum																									

AF - Analyzer Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	170	23.71	23.71
6 - 11	212	29.57	53.28
12 - 19	278	38.77	92.05
20 - 28	56	7.81	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

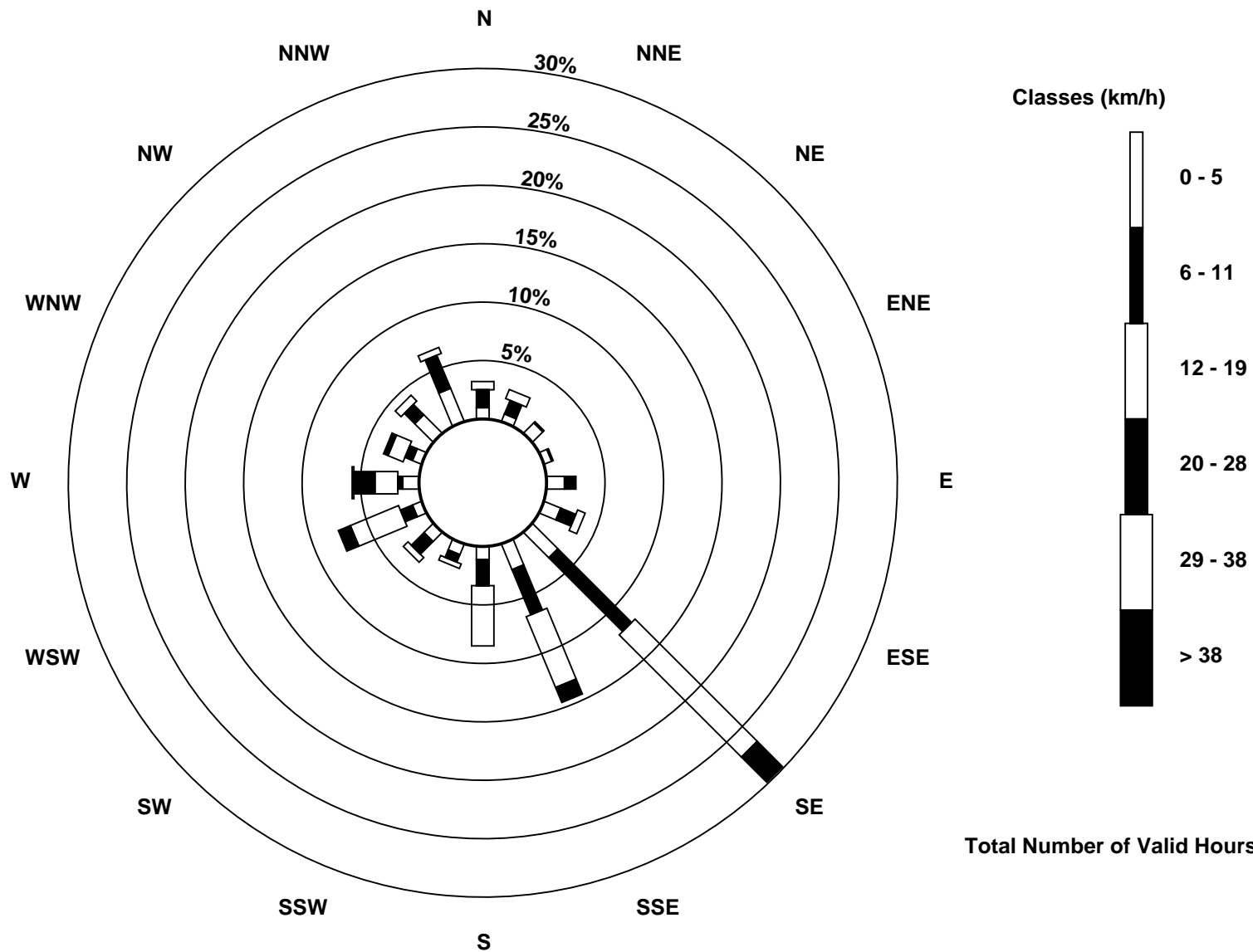
Total Number of Valid Hours: 717

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 100 m (WS100m) - km/h

Lower Camp Met Tower - November 2016

Maximum Speed: 46 km/h on Nov 9 21:00	Maximum Daily Speed Average: 23.7 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 16 13:00	Minimum Daily Speed Average: 2.1 km/h on Nov 18	Hours of Data: 685
Maximum Diurnal Speed Average: 9.7 km/h at hour 7	Minimum Diurnal Speed Average: 5.8 km/h at hour 20	Hours of Missing Data: 35
Monthly Average Velocity: 7.5 km/h 188.0 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 9 Median = 15 Q ₃ = 21 P ₉₀ = 27 P ₉₉ = 37	Percent Operational Time: 95.1

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-Nov	NNW15	N12	N9	NNE7	NE5	NE3	NW3	WNW25	WNW26	WNW25	WNW21	NW21	WNW20	WNW23	NW20	NNW18	NNW16	NNW18	NNW16	N13	NNE10	NE6	E7	E8	NW11.6	WNW26	
2-Nov	ESE9	ESE9	S8	SSE6	SE10	SSE11	S19	SSE17	SSE20	SSE20	SSE16	SE23	SSE16	S16	SSE19	SSE19	SSE20	SSE23	SE19	SSE22	SSE19	SSE15	SSE19	SSE19	SSE16.0	SSE23	
3-Nov	SSE21	SSE24	SSE22	SSE21	SSE19	SSE19	SE26	SSE16	S13	SSE17	SSE23	SSE23	SSE21	SE23	SSE15	S15	SSW18	SSE11	S9	SSW17	WSW38	WSW30	SW22	SW17	S16.8	WSW38	
4-Nov	SW24	SW28	SW33	SW25	SW25	SW27	S11	SSE13	SSE23	SSE19	SE18	SE12	SSE22	SSE16	SSE14	SSE13	SSE17	SSE19	SE18	SE16	SSE19	SSE23	SSE21	SE22	S16.9	SW33	
5-Nov	SE18	SE11	S5	S8	SSE6	S5	SSE8	SSE10	SSE6	SSE9	SSE15	SSE22	SSE8	SSE12	SSE8	SSE21	SSE12	SSE15	SSE10	SSE9	SSW5	SSW8	SSW8	W21	SSE9.7	SSE22	
6-Nov	WSW30	SW25	SW15	SW17	SSW11	SSW11	SW23	W15	WSW9	WSW11	WSW14	WSW16	WSW15	SW12	SW7	SW7	SW8	SW6	SW16	SW8	WSW18	SW14	SW12	SW9	SW13.3	WSW30	
7-Nov	SW8	WSW10	SW6	SW10	SW8	SW7	WSW7	WSW1	S1	S5	SSW8	SSE7	SSE7	SE6	SSE8	SSE16	SSE16	SE19	SE18	SE21	SE18	SE19	SSE17	SE19	SSE9.0	SE21	
8-Nov	SE18	SSE7	SSE12	SSE12	SSE15	SSE22	SSE22	SSE14	SSE17	SSE24	SSE24	SSE9	SSE9	SSE11	SSE15	SSE13	SSE14	SSE19	SSE21	SSE18	SSE18	SSE13	SSE3	SE4	SSE14.6	SSE24	
9-Nov	SSE8	SSE12	SSE9	SSE11	SE13	SW4	SW11	SW7	SW14	SW15	WSW27	WSW25	W34	WSW25	WSW21	WSW26	W32	W35	W37	W42	W46	W34	WSW34	WSW40	WSW20.2	W46	
10-Nov	WSW33	WSW25	WSW17	WSW14	SW10	WSW26	WSW17	SW9	SSW8	SSE12	SSE11	SE16	SE16	SE18	SSE17	SSE17	SE24	SE33	SE28	SE25	SE27	SE31	SE29	SSE30	S14.2	SE33	
11-Nov	SSE28	SSE28	SSE21	SE24	SSE22	SSE21	SSE19	S18	S19	SSE16	SSE17	SSE15	SSE18	SSE18	SSW15	SW24	SW22	WSW20	WSW21	WSW20	WSW25	WSW29	WSW29	WSW28	SSW15.7	WSW29	
12-Nov	WSW31	WSW21	SW10	SSW6	S5	SSE10	SSE14	S10	SSW6	WSW8	WSW10	S6	SSE5	S6	SSE4	E4	WSW3	W7	WNNW4	WSW7	W13	W10	W10	W12	SW6.7	WSW31	
13-Nov	W16	WSW15	W15	WSW13	WSW12	SW10	SSW6	SSW7	SW8	SSE12	SE17	SSE19	SSE16	SSE10	SE14	SSE16	SSE15	S13	SSE12	SSE11	SSE15	SSE18	SSE20	SSE18	S10.3	SSE20	
14-Nov	SE20	SE17	SE23	SSE19	SSE13	SSE10	SSE13	SSE13	S9	WSW14	WSW20	WSW24	W23	W26	W28	WNNW32	WNNW24	WNNW23	W19	W24	W32	W41	WSW39	WSW41	WSW14.9	W41	
15-Nov	W28	W20	W19	W37	WSW37	WSW36	W34	W29	WSW30	WSW34	WSW32	WSW28	WSW20	WSW18	WSW22	WSW24	WSW19	WSW22	W28	NW11	NW8	NW10	WNNW12	NW17	W22.6	WSW37	
16-Nov	N10	N9	NNW9	NNW6	NNW5	W3	WSW5	SSW2	SE3	SE4	SW4	NW1	NE1	NNE8	NNE18	NNE17	NNE17	NNE17	NNE20	NNE17	N14	N12	N12	N22	N8.2	N22	
17-Nov	N22	N23	N23	N17	NNW17	NNW17	NW16	NW19	WNNW21	NW17	WNNW13	WNNW12	W16	WNNW15	WNNW19	WNNW29	WNNW25	NW27	NW24	NW16	NW16	NW13	WNNW15	NW16	NW17.3	WNNW29	
18-Nov	NW11	NW5	N4	N4	NNW3	NW2	W4	WSW4	W5	NNW3	N7	NNW10	WNNW4	W6	WNNW2	WNNW3	NW3	W4	WSW4	SSE2	SE2	ESE6	SE6	ESE8	NW2.1	NW11	
19-Nov	ESE8	SE7	ESE9	ESE7	ESE10	E7	E7	E8	ESE10	E12	E11	ESE9	E12	E11	ENE8	NNE8	NE9	E11	ESE9	ESE14	ESE15	SE20	SE24	SE23	ESE10.3	SE24	
20-Nov	ESE20	SE18	SE18	SE19	SE21	SE20	SE23	SE18	SE26	SSE17	SSE18	SE18	SE17	S9	SE15	SE16	SE17	SE19	SE21	SE26	SE26	SE22	SE21	SE21	SE19.3	SE26	
21-Nov	SE22	SE22	SE21	SSE18	SSE23	SSE20	SSE24	SSE18	S15	S10	SSE7	S3	WNNW2	WNNW2	NNW2	NW1	NNW6	NNW11	NNW12	NNE16	NNE12	NNE12	NNE14	NNE12	SE5.5	SSE24	
22-Nov	N10	NNE11	NNE8	NNE10	N7	N7	NE4	E3	E3	ESE3	E6	ESE5	SSE4	S9	S10	S14	S15	SSE16	S17	SSE16	S16	SSE14	SE23	SE26	SE6.2	SE26	
23-Nov	SSE18	SE24	SE28	SE28	SE33	SSE24	SSE22	SSE24	SSE27	SSE29	SSE24	SSE30	SE34	SSE27	SSE25	SE27	SSE24	SSE23	SSE22	SSE19	S19	S17	S15	S16	SSE23.7	SE34	
24-Nov	S12	S15	SSW13	S14	S19	S17	SSE16	S16	S12	SSE18	S14	S10	SSE10	S10	S11	S8	SE12	SE22	SE18	SE29	SE30	SE30	SE31	SE31	SSE15.6	SE31	
25-Nov	SE34	SE35	SE33	SE30	SE29	SE31	SE33	SSE27	SE25	SSE17	SSE15	SSE12	SSE14	SSE12	S7	SSW6	SW10	WSW12	W9	W10	W15	WSW20	WSW24	WSW23	SSE14.1	SE35	
26-Nov	WSW25	WSW23	WSW23	WSW25	WSW24	WSW21	WSW19	WSW15	WSW17	SW16	SW19	WSW14	SW10	SW7	SSW7	SE6	SW5	WSW3	ESE2	SW1	NW3	ESE2	ESE3	E6	WSW10.8	WSW25	
27-Nov	ENE5	ENE8	ENE6	NNE6	NE8	NE7	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	NE8	
28-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	WNNW4	NNW5	N10	N10	N8	NNW7	----	N10
29-Nov	NNW10	NNW9	NNW6	NW7	NNW4	NW2	WNNW4	N2	E2	NNW4	W5	WSW4	ESE1	SSE7	S9	S10	S12	S11	SSW14	SSW13	SSW10	S15	S13	S12	SSW3.7	S15	
30-Nov	S15	S16	S18	S16	SSE16	SSE16	SSE18	S20	S21	S19	S18	S16	S19	S16	S17	S17	S17	S17	S17	S18	S17	S14	S16	S15	S16.8	S21	
SSW6.9 S6.8 S7.0 S7.3 S7.9 S8.2 S9.7 S8.0 S8.8 S8.9 S9.3 S8.2 S8.0 S7.3 S6.7 SSW6.7 SSW7.0 SSW6.5 SSW6.0 S5.8 SSW7.4 SSW7.8 S8.1 S7.6																								Diurnal Average			
SE34 SE35 SW33 W37 WSW37 WSW36 W34 W29 WSW30 WSW34 WSW32 SSE30 SE34 SSE27 W28 WNNW32 W32 W35 W37 W42 W46 W41 WSW39 WSW41																								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

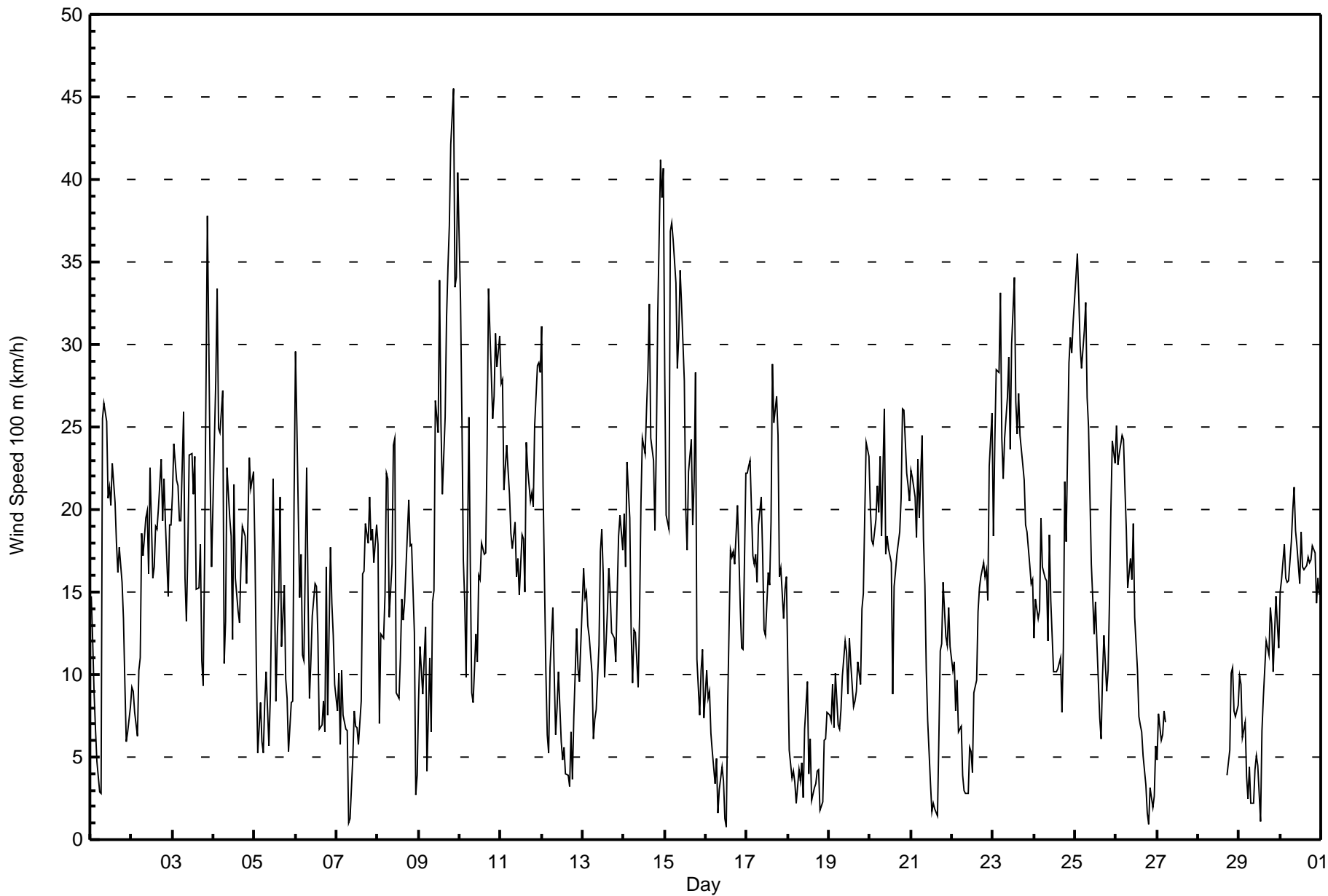
Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 10 km/h on Nov 3 20:00	Hours in Service: 720 Hours of Data: 685 Hours of Missing Data: 35 Hours of Calibration: 0 Percent Operational Time: 95.1
Minimum Value: 1 km/h on Nov 26 20:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Nov	3	2	3	3	1	2	4	5	5	4	4	4	5	4	4	4	4	3	4	3	2	2	1	2	5
2-Nov	1	2	3	2	2	4	3	5	6	6	6	5	4	4	4	5	5	4	5	4	4	4	3	3	6
3-Nov	2	4	4	4	3	4	2	5	3	5	4	4	4	3	5	5	4	4	3	10	8	4	6	6	10
4-Nov	4	4	3	6	9	6	4	4	2	4	4	3	2	3	3	3	2	3	2	5	3	2	2	5	9
5-Nov	3	5	1	2	2	3	4	7	3	2	3	4	4	3	3	3	4	3	5	3	2	2	4	6	7
6-Nov	4	7	4	2	3	4	4	3	3	3	4	3	1	3	2	2	2	4	4	3	5	5	4	2	7
7-Nov	3	3	3	2	3	4	3	2	1	2	2	2	3	1	5	2	3	1	2	2	4	3	3	3	5
8-Nov	4	6	4	5	5	3	4	6	4	3	3	5	3	3	2	3	3	4	3	3	2	4	2	4	6
9-Nov	3	4	5	3	3	3	4	5	6	7	4	4	3	4	2	2	2	4	5	5	3	2	3	3	7
10-Nov	3	5	4	8	5	7	5	4	5	4	3	2	2	3	4	5	3	4	4	4	4	3	6	5	8
11-Nov	5	5	4	3	3	3	3	3	3	3	3	3	4	5	7	3	2	3	2	2	3	2	2	2	7
12-Nov	2	4	6	3	2	4	2	3	2	2	2	2	3	3	2	1	2	2	2	1	2	2	2	2	6
13-Nov	3	5	3	3	4	3	2	2	3	5	2	3	4	3	2	3	3	3	3	2	2	1	2	2	5
14-Nov	3	3	3	5	3	3	2	3	2	7	4	3	2	3	5	6	9	5	5	7	5	4	7	9	9
15-Nov	8	6	7	8	4	4	5	7	3	4	5	2	4	2	2	3	1	2	4	6	3	4	2	1	8
16-Nov	1	1	1	1	2	1	2	1	1	2	1	1	1	4	3	3	3	3	4	3	3	2	4	4	4
17-Nov	4	3	3	4	2	4	3	2	2	3	3	3	5	4	5	5	5	5	4	3	2	2	2	1	5
18-Nov	3	1	2	1	2	1	1	1	3	1	5	3	2	3	1	2	1	1	1	1	1	1	1	2	5
19-Nov	2	2	3	3	3	3	2	3	3	2	2	3	3	2	1	2	2	2	4	3	4	4	4	4	4
20-Nov	3	4	4	4	4	5	3	5	4	6	5	4	4	3	2	2	2	2	3	3	3	4	3	4	6
21-Nov	4	4	4	4	4	4	3	4	3	3	2	2	1	1	2	1	3	2	2	3	3	3	3	2	4
22-Nov	2	2	2	2	2	2	1	1	2	2	1	1	2	2	4	3	3	4	4	4	4	4	7	4	7
23-Nov	5	5	4	6	5	5	6	7	6	7	6	6	5	7	6	4	5	5	4	5	4	3	3	3	7
24-Nov	2	3	3	3	3	3	3	3	3	5	3	3	2	3	3	3	3	5	4	7	2	3	4	4	7
25-Nov	5	4	6	4	5	4	4	8	6	4	4	4	4	3	2	2	1	2	3	3	4	3	2	2	8
26-Nov	2	2	4	3	4	3	3	2	2	2	2	3	2	2	2	3	3	2	1	1	1	1	1	1	4
27-Nov	1	1	1	2	4	4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	4
28-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1	2	1	2	1	1	1	2
29-Nov	1	1	1	2	1	1	1	1	1	2	3	2	1	3	2	3	3	3	4	3	3	3	3	3	4
30-Nov	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	5	4	4	4	3	5

8	7	7	8	9	7	6	8	6	7	6	6	5	7	7	6	9	5	5	10	8	5	7	7	
Diurnal Maximum																								

AF - Analyzer Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	74	10.80	10.80
6 - 11	165	24.09	34.89
12 - 19	248	36.20	71.09
20 - 28	148	21.61	92.70
29 - 38	44	6.42	99.12
> 38	6	0.88	100.00

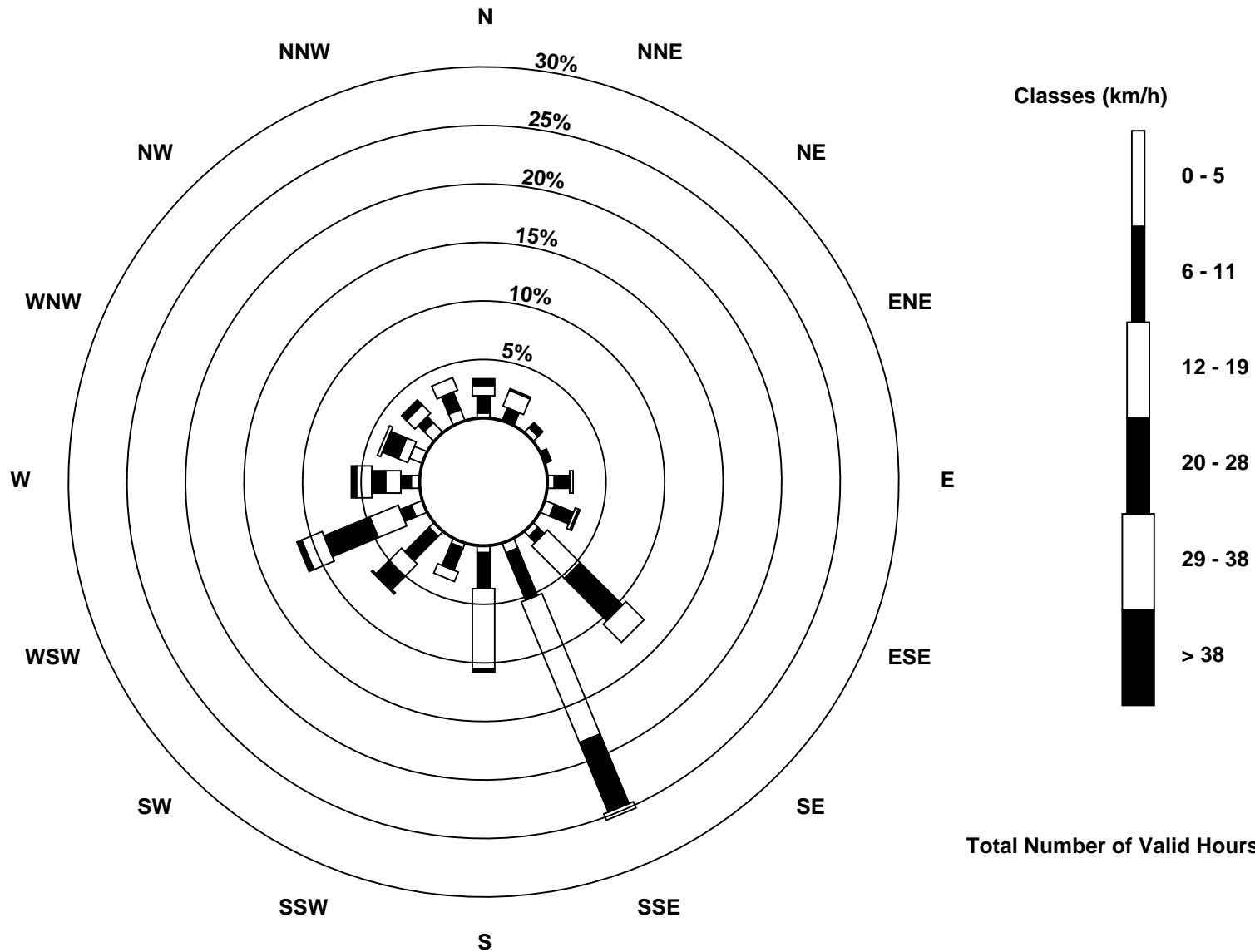
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 167 m (WS167m) - km/h

Lower Camp Met Tower - November 2016

Maximum Speed: 52 km/h on Nov 15 00:00	Maximum Daily Speed Average: 29.7 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 26 20:00	Minimum Daily Speed Average: 3.5 km/h on Nov 18	Hours of Data: 645
Maximum Diurnal Speed Average: 12.1 km/h at hour 10	Minimum Diurnal Speed Average: 8.3 km/h at hour 15	Hours of Missing Data: 75
Monthly Average Velocity: 9.9 km/h 209.0 deg	Percentiles: P ₁ = 2 P ₁₀ = 7 Q ₁ = 13 Median = 19 Q ₃ = 25 P ₉₀ = 32 P ₉₉ = 48	Percent Operational Time: 89.6

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-Nov	NNW17	N12	N9	N7	N4	N1	WNW7	WNW28	WNW29	WNW27	NW22	NW23	WNW22	WNW24	NW22	NNW20	NNW18	NNW20	NNW18	N14	NNE11	NE6	E6	E7	NW13.2	WNW29
2-Nov	ESE8	SE9	SSW10	S7	SSE9	S15	S20	S23	SSE22	SSE20	SSE17	SSE22	SSE19	S22	SSE20	SSE23	SSE25	S29	S26	S22	SSW17	SSW14	SSW20	SSW19	S17.4	S29
3-Nov	S16	S18	S23	S22	S19	S21	SSE24	SSE19	S19	S18	S24	S23	SSW16	S16	SSW18	SSW23	SSW28	SSW18	SSW19	SW31	WSW51	WSW46	WSW33	SW24	SSW20.5	WSW51
4-Nov	SW28	SW33	SW37	SW38	SW38	SW40	SW21	SSW16	SSE20	SSE18	S16	S15	SSE20	SSE17	S14	S14	SSE17	SSE21	SSE23	SSE26	S22	SSE23	S22	SSE25	SSW19.9	SW40
5-Nov	SSE20	SSE17	SE17	SSE14	SSE11	SSE10	SSE13	SSE16	SSE14	S17	S19	S19	S10	S10	SSE13	SSE21	SSW20	S13	SSW9	SSW9	WSW14	WSW19	WSW19	W37	S12.9	W37
6-Nov	WSW42	WSW37	WSW25	WSW22	SW24	SW27	SW32	WSW25	WSW18	WSW20	WSW23	WSW23	WSW21	WSW18	WSW11	WSW15	WSW17	WSW18	WSW27	WSW18	WSW21	WSW27	WSW23	WSW20	WSW22.8	WSW42
7-Nov	WSW22	WSW24	WSW16	WSW21	WSW19	WSW20	WSW15	WSW9	SW3	SW10	SW12	SSW6	SSW6	S3	SSE8	S14	S18	SSE16	SSE19	SSE24	SSE23	SSE24	SSE24	SSE24	SSW11.8	SSE24
8-Nov	SSE24	SSE13	SSE24	SSE21	SSE21	SSE24	SSE24	SSE19	SSE21	S24	S24	SSE15	SSE13	SSE14	SSE18	S22	S28	SSE23	S25	S23	S15	S13	S10	SW3	SSE18.8	S28
9-Nov	S6	S16	S13	S14	S10	SSW9	WSW23	SW10	WSW26	WSW30	W31	W29	W36	W28	W26	W31	W38	W43	WNW45	WNW46	W48	W38	W42	W48	W25.5	W48
10-Nov	W41	W36	W24	WSW26	WSW21	WSW35	WSW27	WSW16	SW12	SSW9	S8	S10	SSE13	SSE18	SSE20	SSE22	SSE26	SSE36	SSE28	SSE28	SSE30	SSE31	SSE32	SSE31	SSW15.9	W41
11-Nov	SSE31	SSE30	SSE24	SSE24	S29	S24	SSW18	SSW17	SSW15	S19	SSW14	SSW14	S14	SSW17	SW24	WSW28	WSW28	WSW29	W33	W29	W33	W36	WSW40	WSW40	SW19.6	WSW40
12-Nov	W38	WSW34	WSW21	SW14	SW15	SW9	SSW8	SW14	SW16	WSW26	WSW27	SW13	W8	WSW8	SW5	N3	WNW11	WNW11	NW10	WNW12	WNW19	WNW16	WNW13	WNW12	WSW13.2	W38
13-Nov	WNW22	W23	W23	W17	WSW21	WSW19	SW10	WSW15	WSW17	SSW8	SSE14	SSE16	SSE16	SSW11	S10	S14	SSW16	SSW20	SSW20	SSW17	SSW17	SSW16	S18	S17	SW12.8	W23
14-Nov	SSE19	SSE19	SSE20	S23	S16	SSW12	SSW11	SSW12	SW13	WSW27	WSW29	W32	W28	W31	W35	WNW38	WNW30	WNW28	W26	W34	W43	W51	W49	W52	WSW22.5	W52
15-Nov	W36	W29	W27	W47	W46	W46	W43	W37	W37	WSW42	W39	W32	W23	W21	W26	W29	WSW27	W35	W35	WNW20	WNW19	NW22	NW17	N13	W29.7	W47
16-Nov	NE13	NE12	NNE7	N9	N11	WNW6	W9	WSW4	NW2	WNW0	SSW3	ENE1	E6	NNE9	NNE18	NNE17	NNE19	NNE18	NNE22	NNE20	NNE16	N13	N14	N23	NNE9.7	N23
17-Nov	N25	N26	N26	N20	NNW20	NNW20	NNW18	NW21	WNW23	NW20	WNW14	WNW14	W18	WNW17	WNW21	WNW31	WNW29	NW30	NW27	NW20	NW19	NW15	NW15	NW15	NW19.3	WNW31
18-Nov	NW15	WNW9	NNW4	WNW6	NW3	W3	W5	WSW6	W6	NNW3	NNW8	NNW11	WNW5	W7	WNW5	NW4	NW5	WNW4	WSW4	SSW2	S2	ESE4	SE4	SE6	WNW3.5	NW15
19-Nov	SE6	SE9	ESE16	ESE13	ESE15	ESE12	ESE11	ESE13	ESE13	ESE14	ESE13	ESE11	E13	E12	E10	E10	E14	ESE15	ESE15	SE16	SE18	SE22	SE26	SE26	ESE13.9	SE26
20-Nov	SE23	SE21	SE21	SE23	SE25	SE23	SE25	SE21	SE28	SSE20	SSE19	SSE18	SSE17	S9	SE15	SE17	SE18	SE19	SE21	SE27	SE28	SE25	SE25	SE25	SE21.2	SE28
21-Nov	SE26	SE26	SSE23	SSE20	SSE23	SSE21	SSE22	S21	S19	SSW13	S8	SSW4	WNW4	WNW3	NW2	NW4	NNW8	NW16	N14	NNE17	NNE14	NNE14	NNE17	NNE15	SE5.2	SE26
22-Nov	NNE11	NNE12	NE9	NNE11	N7	NNE7	NE4	E4	E4	ESE3	E6	ESE7	SSE5	S11	S11	S16	S17	SSE18	S21	S20	S19	SSE17	SE27	SE30	SE7.5	SE30
23-Nov	SSE21	SSE27	SSE30	SSE30	SE37	SSE25	SSE26	SSE27	SSE30	SSE30	SSE27	SSE30	SSE35	SSE28	SSE27	SSE30	SSE27	SSE25	SSE23	S22	S22	S19	S17	S17	SSE25.9	SE37
24-Nov	SSW14	SSW19	SSW19	SSW19	SSW20	S19	S20	S16	S18	SSW18	SSW13	SSE11	S11	S11	S13	S12	SE17	SE27	SE25	SE31	SE32	SE33	SE35	SE35	S17.7	SE35
25-Nov	SE37	SE39	SE37	SE35	SE34	SE35	SE36	SSE30	SE28	SSE22	SSE19	SSE15	SSE17	SSE14	S10	SSW7	SW11	WSW15	W13	W14	W19	W24	WSW30	WSW29	S16.2	SE39
26-Nov	WSW31	WSW30	W29	W30	W31	WSW29	WSW25	WSW21	WSW21	WSW19	SW20	WSW15	SW11	SSW8	S8	SSE6	SSW4	SW5	WNW1	W0	NW5	N3	NNE1	ENE5	WSW13.5	WSW31
27-Nov	NNE4	NNE4	NNE5	NNE6	NNE13	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	NNE13
28-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	----	----
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	----	----
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	S25	S22	S20	S17	S20	S18	S19	S18	S21	S20	S20	S20	S20	S20	S25	----	S25

SW8.8	SSW9.3	SSW9.2	SSW9.5	SSW10.5	SSW12.5	SSW11.5	SSW11.5	SSW11.5	SSW11.5	SSW12.5	SSW11.7	SSW9.8	SSW8.8	SSW8.6	SSW8.3	SSW8.5	SSW9.8	SSW9.1	SW8.7	SSW8.7	SW10.2	SW10.5	SSW10.6	SW9.8	Diurnal Average
WSW42	SE39	SE37	W47	W46	W46	W43	W37	W37	WSW42	W39	W32	W36	W31	W35	WNW38	W38	W43	WNW45	WNW46	WSW51	W51	W49	W52	Diurnal Maximum	

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



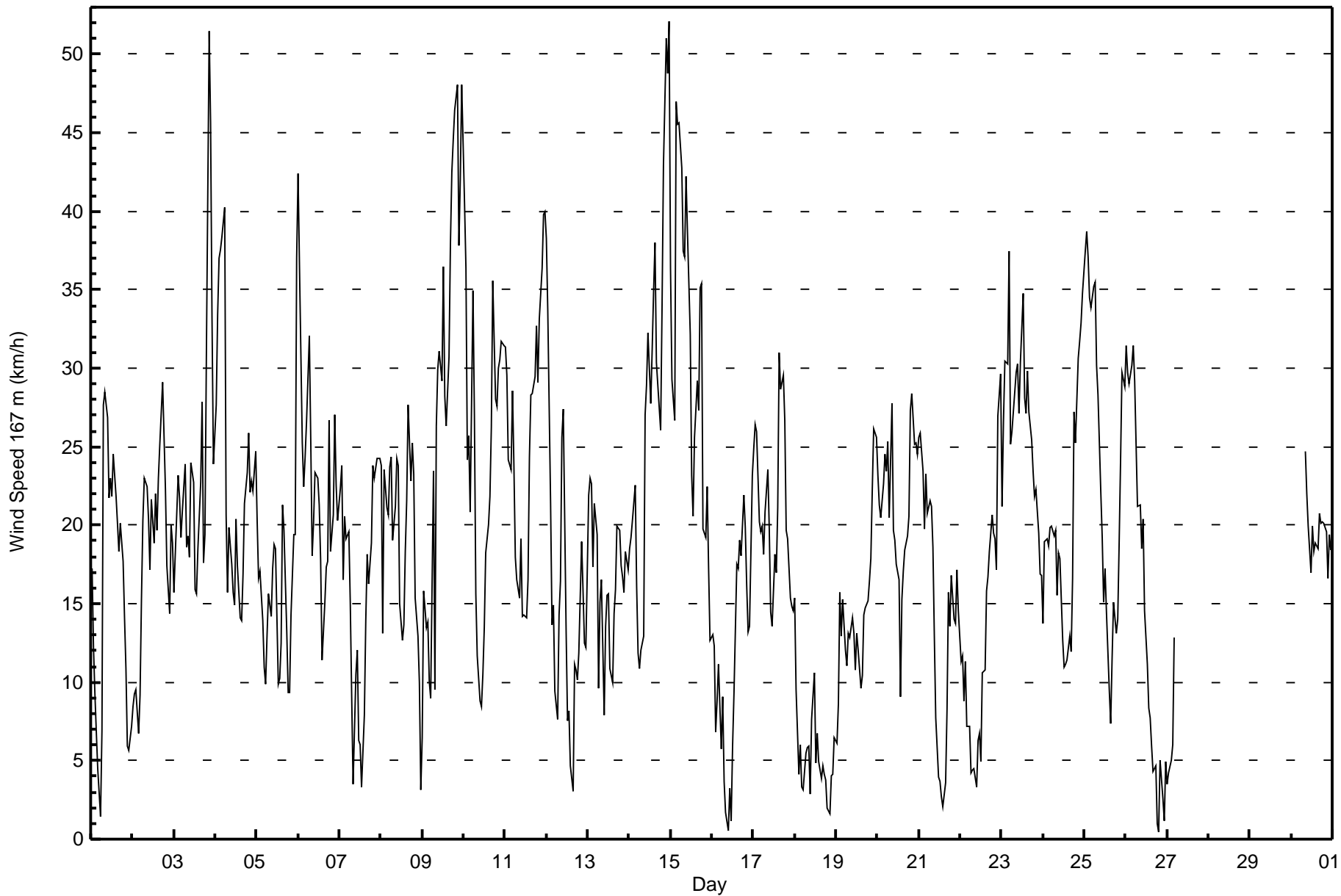
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Nov 12 03:00	Hours in Service: 720 Hours of Data: 645 Hours of Missing Data: 75 Hours of Calibration: 0 Percent Operational Time: 89.6
Minimum Value: 0 km/h on Nov 16 09:00	
Percentiles: P ₁ = 1 P ₁₀ = 2 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-Nov	2	2	3	3	1	1	5	5	4	3	4	4	5	4	3	3	4	2	4	3	2	3	1	2	5
2-Nov	2	2	3	1	2	5	1	2	6	5	6	5	3	3	4	4	4	3	4	2	3	2	3	3	6
3-Nov	2	2	2	3	2	2	3	4	4	2	3	3	3	3	6	4	4	4	6	9	8	5	7	8	9
4-Nov	5	2	2	3	5	2	7	4	2	3	2	2	2	2	2	2	2	3	4	3	3	3	4	7	
5-Nov	3	3	2	2	3	3	2	5	3	2	3	3	5	3	3	3	4	2	3	3	3	2	5	4	5
6-Nov	2	5	2	2	3	3	3	4	3	3	4	2	2	3	3	3	2	2	3	3	2	3	4	2	5
7-Nov	3	4	4	3	3	5	4	5	3	3	4	1	2	1	3	2	1	2	2	3	3	4	4	3	5
8-Nov	4	6	2	4	5	3	3	4	3	2	3	4	3	2	3	4	1	3	4	4	3	2	4	2	6
9-Nov	2	4	7	5	2	5	4	6	6	5	4	4	2	3	2	2	2	2	3	4	3	2	2	2	7
10-Nov	2	4	4	6	6	4	4	4	7	2	2	2	4	3	4	4	5	4	4	4	4	4	7	6	7
11-Nov	6	5	4	3	3	3	2	1	1	2	2	2	3	4	6	3	3	3	3	3	2	1	2	2	6
12-Nov	3	4	9	4	2	3	2	4	3	2	3	5	1	3	3	2	2	2	3	2	2	3	2	2	9
13-Nov	5	3	1	3	3	2	3	4	5	2	3	3	3	3	3	2	2	4	4	2	3	2	2	2	5
14-Nov	2	2	3	2	3	3	2	2	2	6	4	2	3	3	4	5	9	5	6	4	5	4	3	5	9
15-Nov	7	6	7	7	3	2	3	6	2	2	4	1	4	2	3	2	2	3	3	6	4	4	3	1	7
16-Nov	1	1	1	1	1	2	1	2	0	1	1	2	1	2	3	3	3	4	5	3	3	3	4	4	5
17-Nov	4	3	3	4	2	3	3	1	1	3	3	3	5	3	4	5	5	5	3	2	2	2	1	1	5
18-Nov	1	2	2	2	2	2	1	1	2	2	5	4	2	3	2	2	1	1	1	1	1	1	1	2	5
19-Nov	2	2	3	3	3	3	3	3	2	2	2	3	3	2	1	2	2	2	2	3	4	4	3	3	4
20-Nov	3	4	4	4	3	4	3	4	4	6	5	3	4	2	2	2	2	2	4	2	2	3	3	4	6
21-Nov	3	3	3	4	4	3	2	2	2	2	4	1	1	1	2	2	3	3	1	3	3	3	3	3	4
22-Nov	2	3	2	2	2	2	1	1	2	2	1	1	2	2	3	3	3	4	4	3	4	4	6	4	6
23-Nov	5	5	5	6	4	5	5	6	5	7	6	6	6	6	5	4	5	5	2	2	3	3	2	2	7
24-Nov	2	3	2	2	2	2	2	2	2	2	3	4	2	2	3	3	3	4	6	2	3	3	3	3	6
25-Nov	4	3	5	4	4	4	4	7	5	5	5	4	4	4	4	2	2	1	2	3	4	4	2	2	7
26-Nov	2	3	4	2	3	3	3	2	3	2	2	4	2	2	2	2	1	1	1	0	2	1	1	1	4
27-Nov	1	1	1	3	3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	3
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	3	3	3	3	3	3	3	4	3	3	3	4	3	3	3	2	4
Diurnal Maximum																									
7 6 9 7 6 5 7 7 7 7 6 6 6 6 6 5 9 5 6 9 8 5 7 8																									

AF - Analyzer Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	48	7.44	7.44
6 - 11	88	13.64	21.09
12 - 19	203	31.47	52.56
20 - 28	201	31.16	83.72
29 - 38	81	12.56	96.28
> 38	24	3.72	100.00

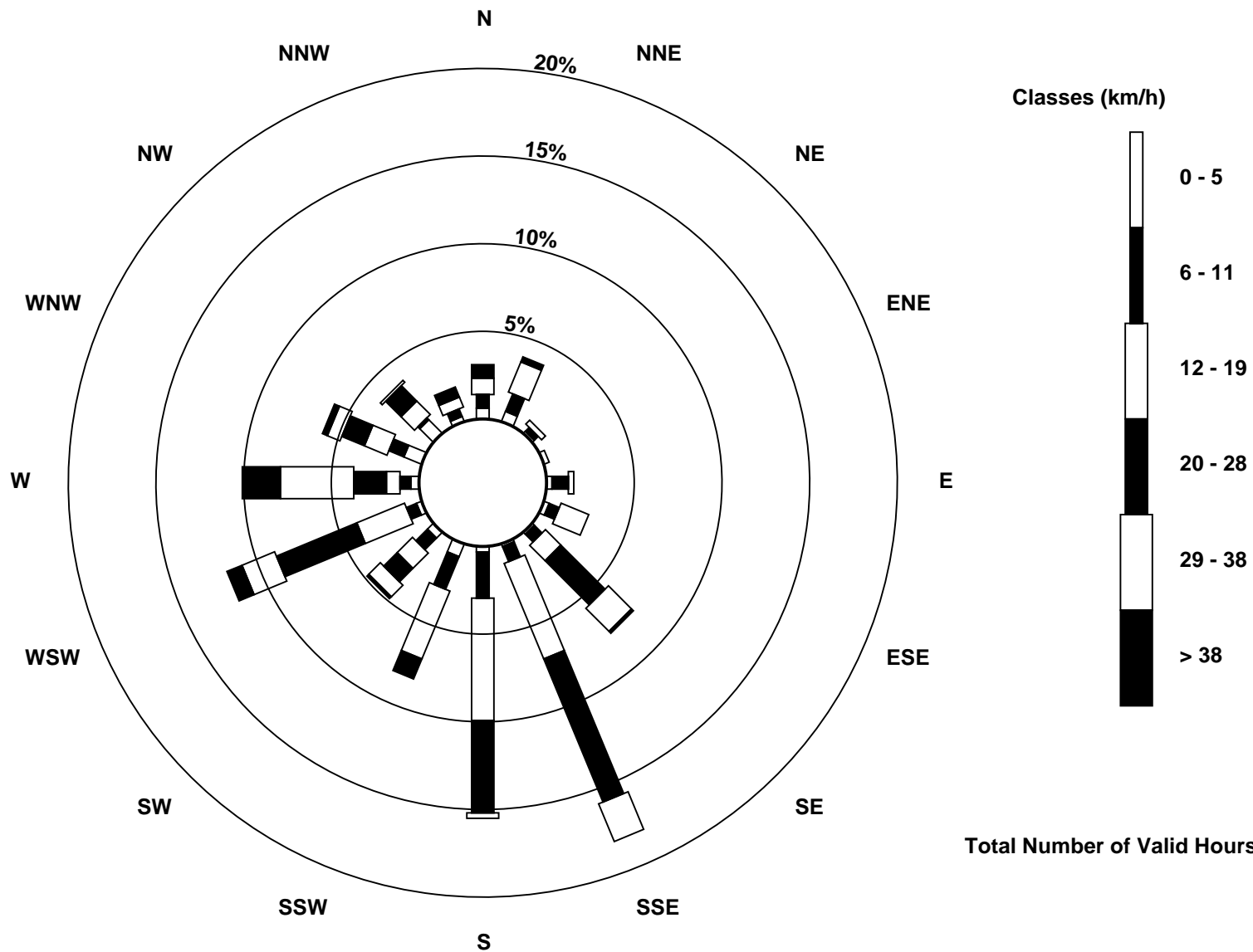
Total Number of Valid Hours: 645

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 645



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 274 deg on Nov 9 21:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 166.9 deg on Nov 23	Hours of Data: 717
Direction of Minimum Speed: 248 deg on Nov 28 03:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 1.0 deg on Nov 18	Percent Operational Time: 99.6
Monthly Average Direction: 213.2 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-Nov	348	0	357	26	59	78	273	307	302	307	312	320	316	312	321	337	340	337	338	354	24	53	105	103	330.6
2-Nov	105	117	178	153	121	145	177	181	174	163	172	163	189	209	175	184	169	155	136	150	145	147	152	152	163.0
3-Nov	150	158	159	163	165	155	153	157	181	AF	AF	AF	152	146	147	151	183	102	134	162	247	259	223	168	165.1
4-Nov	200	217	228	235	228	227	150	143	160	152	158	152	155	156	151	160	150	140	132	136	161	154	153	152	164.3
5-Nov	151	151	152	149	125	155	151	152	153	163	145	146	145	150	155	151	158	151	144	152	153	145	150	176	151.0
6-Nov	201	198	156	151	143	129	238	329	156	151	226	247	247	209	167	149	139	217	171	156	153	162	154	149	169.9
7-Nov	145	149	147	153	149	145	127	123	146	155	158	151	148	154	158	159	148	139	135	148	133	154	139	149	148.2
8-Nov	178	180	155	148	156	150	152	154	149	158	154	150	147	159	146	155	149	148	154	147	150	157	346	186	152.8
9-Nov	152	150	134	151	142	152	151	138	154	144	257	259	267	259	251	257	263	278	285	278	274	279	268	270	247.3
10-Nov	271	282	235	178	173	263	278	190	158	153	150	147	146	155	168	163	155	139	149	153	153	151	154	157	164.0
11-Nov	157	154	152	148	152	151	151	151	150	150	152	155	152	145	163	230	224	248	251	247	251	256	261	272	177.9
12-Nov	263	249	159	143	148	149	114	152	149	169	150	147	153	151	137	323	243	259	142	142	158	148	149	140	160.3
13-Nov	204	16	159	149	154	151	146	148	145	143	147	152	149	153	155	155	149	151	148	150	151	154	155	156	151.2
14-Nov	153	150	149	150	144	145	149	147	148	143	263	269	268	274	284	309	308	297	280	278	282	279	273	273	245.2
15-Nov	279	283	269	279	273	272	277	277	264	263	271	262	258	255	257	264	259	265	277	330	312	304	355	334	270.8
16-Nov	339	311	354	355	337	134	243	198	10	303	158	340	246	11	33	26	20	24	24	19	1	12	349	3	11.8
17-Nov	355	359	356	345	334	340	324	323	314	321	304	299	285	307	298	310	311	320	325	321	321	318	314	340	322.0
18-Nov	345	326	31	25	347	307	323	288	235	289	356	345	270	260	221	277	297	233	264	113	112	98	113	101	315.7
19-Nov	107	121	99	17	98	53	21	53	64	84	94	102	97	92	45	343	1	76	316	105	114	133	124	124	95.9
20-Nov	120	121	118	120	130	135	142	160	139	172	173	163	160	191	158	149	145	154	152	147	146	149	140	139	146.9
21-Nov	139	151	161	163	160	169	172	172	174	175	164	138	100	326	343	248	358	351	357	12	26	23	35	26	149.8
22-Nov	9	22	29	20	348	16	63	97	57	115	104	114	172	183	185	183	194	178	180	181	180	174	144	149	162.4
23-Nov	171	157	156	153	141	164	178	171	171	167	172	163	158	170	171	161	162	165	175	169	182	185	183	178	166.9
24-Nov	178	183	198	198	178	173	162	171	167	165	187	168	181	182	181	206	199	125	124	115	129	153	150	145	168.7
25-Nov	148	142	143	145	140	148	147	163	167	186	176	174	174	175	182	218	245	270	297	295	284	265	261	258	174.8
26-Nov	263	254	262	266	267	257	251	249	255	224	234	246	243	232	216	172	232	192	317	311	233	143	145	157	245.0
27-Nov	153	147	135	115	145	161	62	12	21	356	6	359	351	339	346	344	343	331	342	332	329	332	332	334	354.8
28-Nov	330	328	248	344	18	105	85	120	139	245	255	259	234	169	147	114	337	333	324	334	349	315	313	327	302.5
29-Nov	341	353	318	337	5	303	294	40	309	313	303	287	70	172	199	177	188	198	220	220	214	177	186	179	210.2
30-Nov	183	179	194	183	172	163	176	184	186	180	196	193	192	204	193	193	200	190	182	192	188	190	180	173	185.5

177.2 166.1 165.6 164.8 160.9 165.5 166.4 169.9 171.9 173.8 188.1 185.3 186.9 191.1 186.6 195.7 195.7 186.5 196.8 181.2 198.3 185.5 178.0 173.0

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

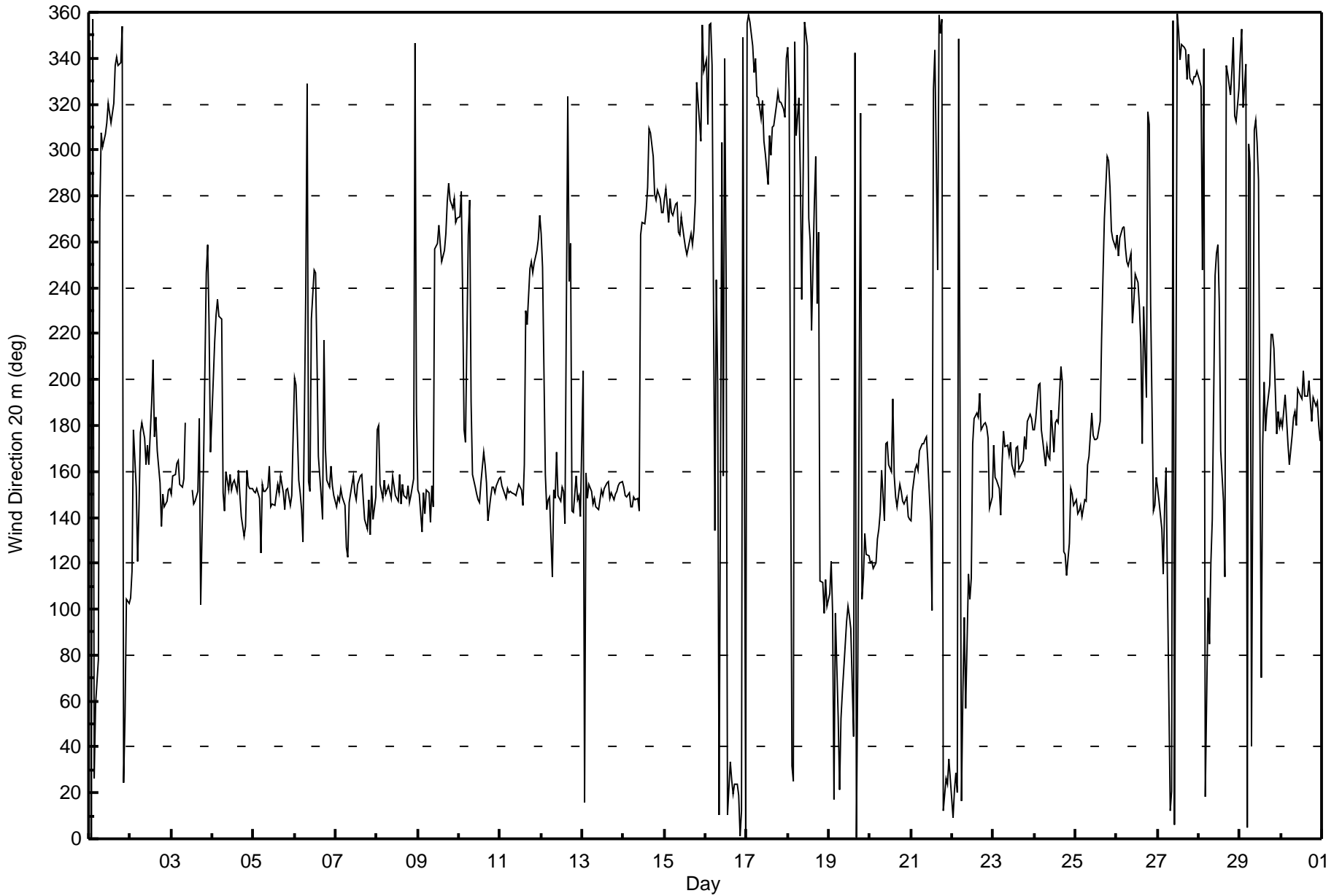
Wind Direction 20 m (WD20m) - deg
Lower Camp Met Tower - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 110 deg on Nov 13 02:00	Hours of Data: 717
Minimum Value: 5 deg on Nov 4 17:00	Hours of Missing Data: 3
Percentiles: P ₁ = 7 P ₁₀ = 11 Q ₁ = 14 Median = 18 Q ₃ = 30 P ₉₀ = 57 P ₉₉ = 89	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-Nov	18	24	36	54	33	41	86	17	19	17	20	17	18	18	21	19	18	17	20	20	30	49	26	21	86
2-Nov	23	23	35	42	13	41	11	15	17	24	20	20	12	11	21	12	14	14	29	10	13	11	10	10	42
3-Nov	12	7	7	10	11	9	11	10	18	AF	AF	AF	12	20	11	19	16	32	7	33	15	19	41	22	41
4-Nov	21	34	21	29	41	91	25	15	6	13	10	11	12	23	11	19	5	14	23	35	42	24	18	22	91
5-Nov	10	8	6	13	76	30	12	28	19	18	14	24	20	10	12	14	38	13	91	44	24	13	16	41	91
6-Nov	49	55	30	11	7	35	38	40	52	50	35	52	13	50	23	67	70	76	65	26	18	22	35	9	76
7-Nov	12	11	11	8	15	16	12	18	29	17	9	13	10	15	16	9	8	12	37	67	91	45	57	30	91
8-Nov	52	62	35	53	25	19	24	18	31	9	7	18	33	20	15	10	12	14	15	29	13	40	81	96	96
9-Nov	13	11	90	62	43	95	10	50	19	20	18	15	11	13	11	12	13	18	16	16	15	17	15	14	95
10-Nov	21	48	57	77	55	52	83	84	39	10	18	15	16	14	13	13	11	16	14	17	13	14	17	14	84
11-Nov	14	13	11	10	7	6	6	7	7	8	7	8	13	17	42	12	13	13	12	9	9	10	12	13	42
12-Nov	12	38	32	15	24	24	92	22	9	71	19	12	70	27	54	55	98	75	49	22	46	30	14	12	98
13-Nov	87	110	46	20	14	17	8	10	9	14	24	20	30	13	13	10	9	7	15	14	14	12	10	10	110
14-Nov	6	13	12	16	20	11	11	10	14	39	19	17	15	16	19	16	19	20	22	22	20	18	18	20	39
15-Nov	25	26	30	23	15	16	17	20	13	15	18	15	14	13	12	12	16	16	16	44	52	74	78	26	78
16-Nov	80	17	29	22	16	65	89	60	62	79	81	61	74	30	21	24	23	23	21	22	21	24	21	22	89
17-Nov	20	19	17	17	15	17	12	16	17	14	26	24	30	23	25	16	17	18	14	14	14	14	14	16	30
18-Nov	20	34	64	37	38	22	33	48	36	55	67	29	57	70	86	69	52	20	14	62	16	33	28	54	86
19-Nov	39	44	73	66	74	53	79	38	29	37	26	22	22	21	30	19	29	101	44	41	22	18	19	20	101
20-Nov	19	24	22	21	22	21	19	20	20	20	18	19	14	18	15	19	19	18	18	15	17	17	16	16	24
21-Nov	18	21	17	13	11	10	8	9	11	18	38	40	81	59	78	67	57	17	22	27	24	24	23	29	81
22-Nov	24	25	26	27	34	30	33	40	88	53	25	25	37	13	15	14	13	14	13	13	13	16	22	18	88
23-Nov	13	14	14	16	16	12	13	12	13	11	13	13	13	13	12	11	10	12	11	8	13	13	12	13	16
24-Nov	14	16	15	15	12	12	10	11	16	12	15	18	14	18	23	20	61	76	40	85	35	22	16	17	85
25-Nov	15	14	17	15	15	15	15	18	18	15	19	14	15	15	18	26	42	44	25	22	25	15	15	14	44
26-Nov	14	14	14	14	18	13	22	14	15	14	12	19	19	24	14	58	19	64	69	56	53	15	11	25	69
27-Nov	29	38	26	19	29	72	74	36	31	20	28	21	20	22	20	21	22	18	21	20	14	14	17	17	74
28-Nov	13	18	101	35	37	78	67	77	43	80	15	16	50	36	53	51	42	31	29	20	19	11	13	26	101
29-Nov	33	20	59	30	32	17	24	46	73	20	20	38	63	49	19	19	15	19	14	14	20	17	17	15	73
30-Nov	17	16	17	18	13	12	12	13	16	14	17	18	15	15	18	15	16	15	14	15	16	16	14	12	18

87	110	101	77	76	95	92	84	88	80	81	61	81	70	86	69	98	101	91	85	91	74	81	96	
Diurnal Maximum																								

AF - Analyzer Failure





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 265 deg on Nov 9 21:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 155.9 deg on Nov 23	Hours of Data: 717
Direction of Minimum Speed: 130 deg on Nov 16 06:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 1.2 deg on Nov 18	Percent Operational Time: 99.6
Monthly Average Direction: 208.2 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-Nov	341	360	356	24	50	71	280	298	292	297	303	312	308	302	313	331	334	330	334	349	19	45	97	97	324.2
2-Nov	97	109	165	153	118	146	168	170	163	152	158	149	176	195	160	171	157	143	132	140	137	138	141	141	151.1
3-Nov	140	148	150	154	155	143	142	146	170	AF	AF	AF	142	135	135	142	176	104	131	164	239	247	222	171	157.9
4-Nov	197	207	216	219	215	218	141	136	149	146	156	145	143	145	141	149	142	133	130	128	147	147	144	144	156.3
5-Nov	138	139	136	136	132	146	138	135	136	145	135	137	138	135	142	138	151	143	136	138	141	141	141	205	140.3
6-Nov	228	204	167	164	137	133	230	304	177	212	229	245	238	218	170	146	150	161	189	150	171	165	154	141	182.8
7-Nov	139	156	143	159	145	137	126	123	135	140	157	141	139	140	145	150	139	139	136	135	126	140	130	140	141.1
8-Nov	153	168	146	139	143	142	144	146	143	147	144	138	129	143	129	139	138	138	142	135	137	144	0	36	141.1
9-Nov	139	139	127	141	132	136	144	128	147	146	248	249	259	250	242	246	253	269	275	268	265	269	257	260	240.7
10-Nov	259	267	241	214	177	250	260	196	155	142	138	137	137	143	156	151	138	131	136	136	137	137	139	144	155.6
11-Nov	146	143	140	136	140	141	141	144	141	143	145	146	142	136	163	221	217	239	242	237	241	246	250	263	172.2
12-Nov	255	246	158	134	143	142	125	142	136	143	141	133	132	140	120	319	168	279	160	149	223	153	141	162	155.3
13-Nov	252	262	262	191	164	149	137	140	138	136	135	143	140	145	143	143	136	138	138	138	139	143	142	140	143.2
14-Nov	142	136	138	140	134	135	138	134	136	140	254	258	258	264	274	299	298	287	270	269	270	267	261	262	237.2
15-Nov	268	272	261	267	262	260	265	267	255	253	260	253	250	247	249	254	244	250	268	328	318	326	338	326	261.1
16-Nov	329	298	328	330	329	130	209	193	357	11	130	339	248	8	25	21	14	18	17	14	355	7	345	359	5.7
17-Nov	350	353	350	343	331	335	318	308	301	313	295	288	273	298	288	300	301	311	319	314	311	310	302	323	314.3
18-Nov	344	340	22	21	344	305	316	279	232	300	347	337	269	255	245	280	300	229	254	114	110	93	111	96	322.0
19-Nov	101	112	92	49	94	59	52	51	66	81	91	96	94	87	36	340	359	84	334	102	110	127	118	117	91.0
20-Nov	115	115	114	116	123	127	132	146	131	157	159	148	148	180	146	140	136	141	140	137	136	137	132	131	136.3
21-Nov	130	135	148	152	149	160	164	164	167	168	154	133	70	315	341	268	349	342	352	10	18	18	27	18	131.2
22-Nov	7	17	23	16	346	8	52	84	79	104	96	103	160	173	174	173	179	167	170	170	170	162	130	137	145.5
23-Nov	159	143	145	141	133	152	167	161	162	158	162	150	145	159	161	148	151	156	166	162	172	175	173	170	155.9
24-Nov	171	175	184	184	170	167	155	163	159	157	176	160	171	173	168	189	189	118	123	124	130	143	140	137	158.3
25-Nov	139	133	135	137	132	138	139	150	149	173	163	162	158	164	173	207	236	252	285	287	269	255	252	249	165.6
26-Nov	253	244	252	256	256	248	243	242	247	219	226	239	235	220	202	150	225	194	335	34	152	145	140	141	237.3
27-Nov	139	129	118	81	123	125	52	9	14	351	357	353	347	336	341	342	340	331	339	337	331	330	329	327	351.4
28-Nov	325	324	268	310	346	298	74	113	165	236	246	250	233	166	145	111	17	325	332	336	347	321	312	317	296.2
29-Nov	335	347	316	330	1	306	288	27	321	304	288	279	66	158	185	168	176	187	208	209	200	169	176	170	201.7
30-Nov	173	170	181	173	162	154	165	173	175	171	183	180	179	189	181	179	185	177	172	180	178	179	170	166	174.8

174.2 158.8 158.9 158.9 152.5 159.5 157.6 160.6 162.8 166.6 183.0 177.6 176.1 181.3 176.4 184.2 186.6 174.6 184.9 167.9 188.7 176.3 169.5 167.1

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

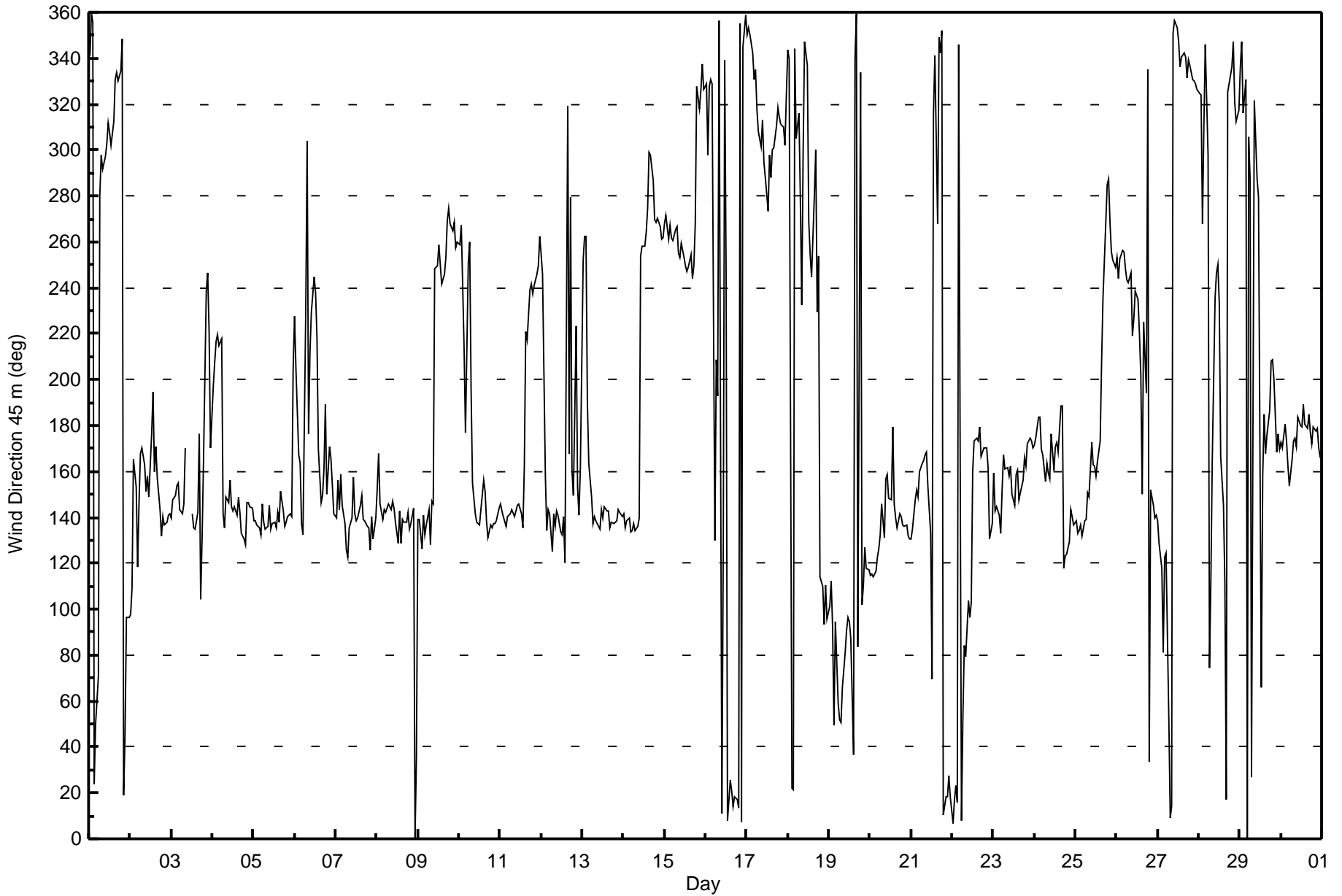
Wind Direction 45 m (WD45m) - deg
Lower Camp Met Tower - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 98 deg on Nov 26 19:00	Hours of Data: 717
Minimum Value: 3 deg on Nov 11 07:00	Hours of Missing Data: 3
Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 10 Median = 14 Q ₃ = 24 P ₉₀ = 48 P ₉₉ = 89	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-Nov	15	19	28	36	27	31	89	14	13	12	16	14	16	15	19	16	15	13	17	16	21	40	20	14	89
2-Nov	17	19	35	30	8	28	8	10	16	19	17	17	8	12	18	9	12	9	19	6	7	5	5	6	35
3-Nov	7	6	6	9	10	6	7	8	14	AF	AF	AF	7	14	8	22	11	31	9	31	11	12	36	25	36
4-Nov	17	22	13	27	33	50	25	11	5	9	9	10	7	16	7	8	4	7	14	28	32	10	12	13	50
5-Nov	10	5	6	5	43	19	10	30	14	10	10	16	13	7	7	7	39	7	88	28	15	7	36	46	88
6-Nov	32	48	38	19	9	34	33	34	82	58	22	30	7	40	29	87	89	83	32	13	29	22	25	8	89
7-Nov	12	16	10	16	10	17	11	11	15	10	10	6	6	14	10	6	5	6	30	23	43	32	24	14	43
8-Nov	27	31	14	27	11	9	10	23	19	4	3	13	44	14	9	8	9	10	10	17	8	15	85	78	85
9-Nov	10	7	89	56	21	86	8	29	12	29	10	9	6	8	6	7	9	12	11	10	9	11	9	9	89
10-Nov	12	26	54	70	38	34	64	59	40	6	10	9	11	11	11	13	9	10	10	13	11	10	12	12	70
11-Nov	12	10	8	7	4	3	3	4	4	6	4	4	7	10	41	10	11	9	7	6	5	4	8	8	41
12-Nov	7	19	43	8	7	8	34	6	8	90	18	8	56	20	44	51	76	46	40	19	45	52	13	35	90
13-Nov	38	85	33	34	22	22	5	6	6	8	17	12	15	11	8	4	7	4	7	6	5	5	4	5	85
14-Nov	7	9	5	8	14	8	5	5	6	45	12	12	10	11	14	13	17	17	20	16	15	12	12	14	45
15-Nov	21	20	24	17	10	10	11	15	9	9	11	9	8	7	8	9	9	12	10	29	41	65	33	33	65
16-Nov	49	15	15	17	12	91	40	65	62	82	69	61	70	25	15	18	16	16	15	16	16	19	18	18	91
17-Nov	16	17	14	14	12	13	9	13	12	12	22	20	23	20	21	14	15	16	12	14	12	14	11	15	23
18-Nov	14	20	69	31	33	19	26	48	39	43	65	23	58	70	93	67	46	18	14	58	15	16	21	31	93
19-Nov	24	28	61	65	33	49	81	30	22	23	18	18	15	16	26	14	28	66	67	30	17	14	13	14	81
20-Nov	13	18	16	15	16	18	14	18	14	20	16	17	12	14	11	13	14	13	13	10	11	13	11	14	20
21-Nov	13	15	14	12	9	9	6	7	8	15	30	56	85	59	63	75	38	11	21	23	17	16	17	19	85
22-Nov	20	19	20	21	25	24	29	44	91	50	18	19	33	8	13	10	9	11	9	10	9	15	17	14	91
23-Nov	12	13	11	13	11	11	10	10	10	10	11	13	11	12	11	10	9	10	7	7	8	7	7	8	13
24-Nov	10	10	8	8	8	9	10	9	12	9	9	15	9	14	20	13	56	26	19	79	20	13	12	12	79
25-Nov	11	9	12	11	11	11	10	16	16	11	18	12	16	12	15	23	22	28	22	18	19	9	10	8	28
26-Nov	8	8	10	9	13	9	18	9	11	10	9	16	15	23	13	62	22	78	98	65	95	12	11	69	98
27-Nov	26	24	21	24	36	65	62	27	23	16	21	16	14	16	16	16	16	15	16	17	11	12	13	12	65
28-Nov	11	12	55	22	40	72	69	61	33	46	8	9	51	38	52	14	67	32	25	13	12	9	9	13	72
29-Nov	24	15	22	26	21	18	23	36	79	15	17	33	62	43	15	13	9	15	13	12	18	12	11	10	79
30-Nov	11	10	11	13	11	10	9	7	9	9	11	11	9	11	12	8	10	7	9	9	10	10	10	9	13

49	85	89	70	43	91	89	65	91	90	69	61	85	70	93	87	89	83	98	79	95	65	85	78	
Diurnal Maximum																								

AF - Analyzer Failure





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 267 deg on Nov 9 21:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 154.7 deg on Nov 23	Hours of Data: 685
Direction of Minimum Speed: 51 deg on Nov 16 13:00	Hours of Missing Data: 35
Direction of Minimum Daily Speed Average: 2.1 deg on Nov 18	Percent Operational Time: 95.1
Monthly Average Direction: 213.9 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-Nov	343	1	2	21	36	51	309	297	291	296	303	309	303	302	313	331	333	329	339	357	19	49	95	99	324.2
2-Nov	111	123	175	163	140	158	174	166	159	150	150	146	167	183	155	164	158	155	146	159	158	164	162	160	157.2
3-Nov	153	160	159	159	158	153	141	151	174	167	160	157	153	139	154	187	197	159	183	208	239	242	231	218	175.9
4-Nov	218	217	222	217	219	220	177	156	150	155	162	162	147	152	154	162	153	148	148	143	151	147	149	144	173.7
5-Nov	145	158	180	172	150	169	167	157	166	155	153	151	164	149	153	152	168	158	152	166	203	210	211	260	166.0
6-Nov	242	231	223	222	196	201	228	262	253	252	239	247	239	232	223	231	235	214	228	221	241	228	229	221	232.2
7-Nov	221	237	216	228	220	227	237	245	186	191	204	164	163	137	147	153	157	146	143	140	141	142	148	144	164.2
8-Nov	142	159	155	159	148	148	148	157	155	149	147	159	157	152	151	159	166	156	154	150	151	148	167	139	152.2
9-Nov	166	160	159	159	146	214	214	222	219	236	249	255	264	258	252	258	263	270	276	273	267	264	253	257	252.5
10-Nov	257	258	252	242	231	248	248	224	192	151	151	140	138	144	153	152	143	141	145	144	144	146	144	151	171.7
11-Nov	152	151	149	146	156	159	164	171	173	167	162	167	154	150	210	230	230	242	247	243	249	253	248	254	194.8
12-Nov	255	252	224	194	174	156	149	179	201	241	241	175	152	172	154	95	244	266	282	246	269	264	262	260	227.9
13-Nov	260	252	260	254	238	233	193	208	216	158	144	151	151	160	143	151	158	172	168	163	157	152	153	153	177.5
14-Nov	145	132	140	149	158	168	154	153	171	238	253	255	260	266	273	294	292	284	268	266	267	263	258	258	247.7
15-Nov	265	267	266	262	257	257	260	261	257	252	256	252	254	254	253	255	241	249	270	315	312	316	302	336	261.8
16-Nov	356	356	346	338	333	261	257	196	132	146	219	311	51	21	26	21	18	18	16	15	4	6	351	360	6.7
17-Nov	351	353	353	351	339	339	325	307	298	308	291	284	270	297	288	298	299	310	319	315	313	318	303	306	314.8
18-Nov	317	323	3	350	338	319	274	258	263	330	350	335	290	261	299	291	323	259	245	153	140	103	130	116	310.6
19-Nov	120	124	108	109	112	100	88	88	104	97	98	103	97	94	57	24	53	99	103	119	122	130	125	125	105.9
20-Nov	123	126	125	131	131	134	136	142	136	150	152	145	145	175	144	141	137	140	141	138	138	139	135	134	137.9
21-Nov	135	137	144	149	147	158	159	164	173	179	160	169	294	298	329	316	342	329	347	20	24	22	28	22	130.4
22-Nov	10	20	30	19	359	10	53	94	98	107	100	108	148	176	176	174	176	162	169	168	170	151	130	137	138.9
23-Nov	153	143	145	142	138	152	162	159	159	156	159	148	146	156	156	145	149	158	163	165	175	178	179	177	154.7
24-Nov	183	185	192	189	178	179	166	172	170	161	183	178	168	172	169	180	174	127	140	139	143	145	141	139	160.8
25-Nov	141	137	138	139	137	141	142	148	143	166	153	154	147	161	171	201	228	243	267	269	259	254	251	249	165.1
26-Nov	252	244	254	256	256	251	244	244	251	230	228	238	229	215	196	145	223	243	108	222	307	111	120	101	241.1
27-Nov	78	70	68	22	40	54	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
28-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	--
29-Nov	331	347	341	322	333	319	292	9	90	328	276	255	114	154	183	171	179	187	206	211	196	173	179	173	205.4
30-Nov	174	172	179	173	162	159	161	172	173	171	180	178	177	185	180	178	180	176	173	180	178	179	173	170	174.3

195.9	184.2	179.5	183.8	173.5	183.4	179.6	185.8	184.8	185.6	190.4	186.6	184.8	188.2	187.8	195.2	197.9	192.6	195.5	187.4	201.4	194.0	190.3	190.2
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 100 m (WD100m) - deg
Lower Camp Met Tower - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 89 deg on Nov 7 08:00	Hours of Data: 685
Minimum Value: 2 deg on Nov 9 21:00	Hours of Missing Data: 35
	Hours of Calibration: 0
	Percent Operational Time: 95.1
Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 7 Median = 10 Q ₃ = 16 P ₉₀ = 28 P ₉₉ = 67	

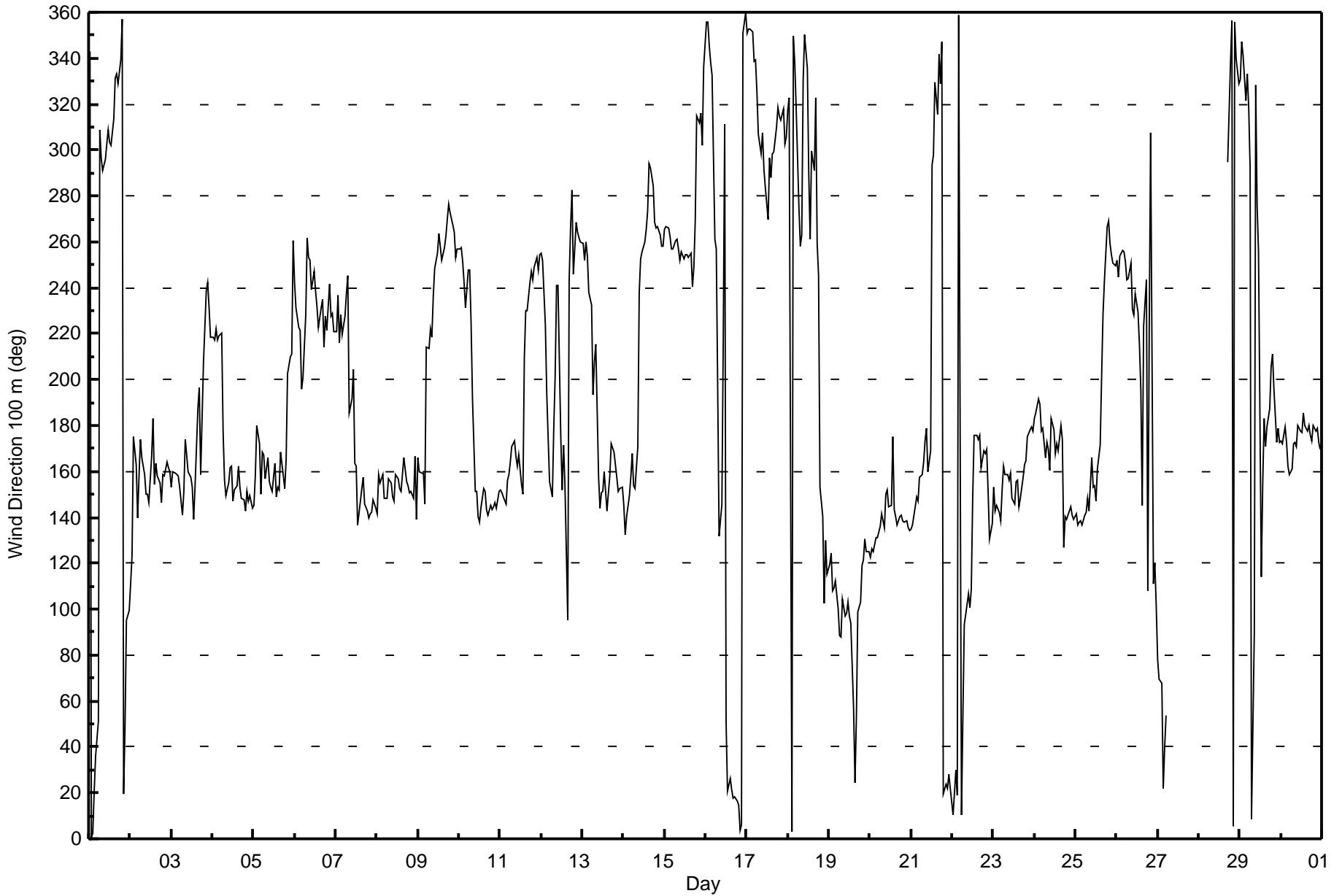
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	10	9	11	26	20	36	76	9	10	7	11	10	11	11	14	11	10	10	15	13	13	31	17	11	76
2-Nov	10	10	33	28	7	11	6	7	13	14	13	10	10	10	12	10	6	5	8	6	8	7	6	5	33
3-Nov	6	5	6	6	7	8	4	12	9	8	7	7	8	6	20	12	11	21	19	16	6	6	16	14	21
4-Nov	7	5	4	8	8	7	31	12	4	7	7	11	4	10	9	8	5	4	5	12	8	4	6	5	31
5-Nov	6	17	16	15	22	19	23	25	21	11	11	6	13	9	8	7	29	5	14	21	25	12	28	18	29
6-Nov	7	13	18	8	16	18	7	16	20	12	14	10	4	9	21	20	23	18	10	19	5	15	10	11	23
7-Nov	22	18	30	11	22	32	22	89	67	25	21	13	14	15	9	8	9	4	3	3	4	6	8	7	89
8-Nov	6	40	10	12	14	5	5	16	7	5	5	18	12	8	7	9	7	8	6	8	6	9	40	66	66
9-Nov	12	13	16	15	10	51	17	46	22	22	5	7	3	6	4	4	4	5	6	4	2	5	3	3	51
10-Nov	3	6	15	30	42	7	14	25	42	12	12	5	6	7	10	12	5	3	4	5	6	4	8	7	42
11-Nov	8	7	7	4	6	7	5	6	7	7	7	8	10	13	33	5	5	6	5	5	6	3	3	4	33
12-Nov	3	5	37	26	22	14	8	17	19	15	11	26	35	26	31	50	62	12	35	10	13	13	6	7	62
13-Nov	9	14	6	7	12	11	21	18	20	16	5	6	8	19	8	7	7	8	8	7	6	6	5	6	21
14-Nov	4	9	4	7	11	11	7	12	15	21	5	5	5	6	11	7	13	12	16	10	10	6	5	7	21
15-Nov	13	13	14	9	4	4	6	9	4	4	4	4	4	4	4	4	4	6	8	25	28	15	10	20	28
16-Nov	7	7	9	17	18	24	13	53	19	24	28	51	86	16	9	11	9	11	9	10	13	13	14	10	86
17-Nov	9	10	8	8	7	8	6	5	4	6	19	16	19	19	20	9	9	11	7	8	7	9	8	5	20
18-Nov	11	24	42	30	21	29	15	29	36	51	58	14	51	56	69	52	33	17	18	48	24	9	10	8	69
19-Nov	13	20	13	25	12	23	20	22	11	8	11	13	9	13	17	17	33	6	21	9	11	8	7	7	33
20-Nov	7	9	9	8	7	8	6	11	6	15	12	11	7	15	6	5	6	5	5	3	4	6	6	7	15
21-Nov	6	7	8	10	6	7	3	6	6	12	23	43	56	42	81	67	30	8	19	16	11	12	13	12	81
22-Nov	11	13	13	17	19	16	21	26	53	49	14	15	35	8	13	8	9	13	8	10	9	16	8	7	53
23-Nov	11	8	7	7	6	9	10	8	9	9	10	8	5	11	10	6	8	8	5	7	7	7	6	6	11
24-Nov	10	10	9	9	5	6	9	8	11	10	11	16	9	14	18	14	32	15	6	17	3	4	7	6	32
25-Nov	5	4	6	6	6	6	5	12	8	13	16	12	14	11	11	14	9	5	21	18	12	4	6	6	21
26-Nov	4	5	7	4	8	5	7	6	7	7	6	12	13	16	18	15	29	38	40	39	25	57	28	18	57
27-Nov	23	19	11	20	13	32	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	32
28-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	39	11	9	6	6	9	6	39
29-Nov	10	4	8	11	20	43	25	41	29	32	21	20	55	19	16	15	8	14	13	8	16	10	10	10	55
30-Nov	9	8	9	13	9	9	8	7	8	8	8	9	9	10	11	8	8	7	8	8	9	11	9	8	13
Diurnal Maximum																									
23 40 42 30 42 51 76 89 67 51 58 51 86 56 81 67 62 39 40 48 28 57 40 66																									

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

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





Maximum Value: 0.6 km/h on Nov 21 07:00		Maximum Daily Average: 0.1 km/h on Nov 6		Hours in Service: 720																						
Minimum Value: -0.8 km/h on Nov 9 13:00		Minimum Daily Average: -0.3 km/h on Nov 15		Hours of Data: 717																						
Maximum Diurnal Average: 0.0 km/h at hour 9		Minimum Diurnal Average: -0.1 km/h at hour 13		Hours of Missing Data: 3																						
Monthly Average: -0.04 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 = 0.3		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-Nov	0.1	0.2	0.2	0.0	-0.1	-0.2	-0.1	-0.4	-0.2	-0.3	-0.1	-0.3	-0.1	-0.4	-0.3	0.1	0.0	-0.2	0.1	-0.1	0.1	0.0	0.0	-0.2	-0.1	0.2
2-Nov	-0.1	-0.1	0.1	0.1	-0.2	0.4	0.3	0.3	0.3	0.2	0.2	0.0	0.1	0.0	0.1	0.3	0.1	-0.1	-0.2	-0.3	-0.1	0.0	0.0	-0.3	0.0	0.4
3-Nov	-0.1	-0.3	-0.2	0.1	0.0	-0.2	-0.2	-0.2	0.2	AF	AF	AF	-0.2	0.0	-0.1	0.4	0.3	-0.2	-0.1	0.1	-0.4	-0.3	-0.1	0.1	-0.1	0.4
4-Nov	0.1	0.2	0.2	-0.3	-0.1	0.1	0.1	-0.1	-0.3	0.0	0.3	0.1	-0.2	-0.1	-0.2	0.2	0.0	0.1	0.1	-0.1	-0.2	-0.3	-0.5	-0.3	0.0	0.3
5-Nov	-0.1	0.0	0.2	0.3	0.0	0.0	0.2	-0.1	0.2	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.5	-0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.2	0.0	0.3
6-Nov	0.1	0.0	0.3	0.3	0.2	0.1	0.0	0.0	0.1	0.2	-0.1	-0.1	-0.1	0.0	0.1	0.0	0.2	0.1	0.1	0.2	0.2	0.1	0.3	0.2	0.1	0.3
7-Nov	0.3	0.3	0.1	0.2	0.1	-0.1	0.0	0.0	0.1	0.2	0.3	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.3
8-Nov	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.1	0.0	0.1	-0.1	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.4	-0.4	0.0	0.1	0.1	0.0	0.1	0.0	0.2
9-Nov	0.1	0.1	0.0	0.0	0.1	0.0	0.3	0.2	0.3	0.3	-0.1	-0.2	-0.8	-0.2	-0.1	-0.2	-0.3	-0.4	-0.7	-0.5	-0.6	-0.2	-0.3	-0.5	-0.2	0.3
10-Nov	-0.4	-0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	0.0	-0.1	0.0	0.2	0.0	-0.1	-0.3	-0.1	-0.2	0.0	-0.1	0.0	-0.1	0.2
11-Nov	0.0	-0.1	0.2	-0.1	-0.1	-0.1	0.0	0.2	0.0	0.0	0.1	0.0	-0.2	-0.3	0.0	-0.1	-0.1	-0.2	-0.3	-0.2	-0.2	-0.1	-0.4	-0.4	-0.1	0.2
12-Nov	-0.3	-0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.4	0.1	0.3	0.2	0.1	0.2	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.4
13-Nov	0.0	0.0	0.2	0.3	0.4	0.2	0.3	0.1	0.3	-0.1	-0.3	-0.3	-0.3	0.1	-0.1	-0.3	0.2	0.1	0.0	-0.1	-0.1	0.0	-0.3	-0.2	0.0	0.4
14-Nov	-0.1	-0.1	-0.7	-0.3	0.0	0.0	-0.2	-0.2	-0.1	0.2	-0.2	-0.3	-0.4	-0.5	-0.3	-0.5	-0.5	-0.3	-0.3	-0.5	-0.6	-0.6	-0.5	-0.6	-0.3	0.2
15-Nov	-0.5	-0.4	-0.3	-0.6	-0.8	-0.6	-0.7	-0.6	-0.5	-0.5	-0.7	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.3	0.0	0.0
16-Nov	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.4	-0.1	-0.1	-0.1	0.1	-0.2	-0.1	0.0	-0.2	-0.1	0.0	-0.1	0.0	0.4
17-Nov	-0.1	0.0	-0.2	0.0	0.1	0.0	-0.2	0.0	-0.2	-0.3	-0.3	-0.1	-0.2	-0.3	-0.2	-0.6	-0.5	-0.4	-0.4	-0.2	-0.1	-0.1	-0.1	0.0	-0.2	0.1
18-Nov	-0.1	-0.2	0.0	-0.1	-0.1	-0.2	-0.1	-0.1	0.0	0.1	0.0	0.0	-0.1	0.0	-0.2	0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.3	-0.1	-0.1	-0.1	0.1
19-Nov	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.1	-0.1	-0.3	-0.2	-0.1	0.0	0.0	0.2	-0.1	-0.2	-0.1	-0.1	-0.3	-0.3	-0.1	0.2
20-Nov	-0.4	0.0	-0.1	-0.1	0.0	0.0	-0.1	0.2	-0.2	0.2	0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	-0.1	-0.2	0.0	0.2
21-Nov	-0.1	0.1	0.1	0.2	0.2	0.3	0.6	0.3	0.4	0.3	0.1	0.0	-0.1	0.0	0.1	0.0	-0.1	0.0	0.1	-0.1	-0.2	-0.1	-0.1	0.1	0.1	0.6
22-Nov	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.2	-0.2	-0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.0	-0.1	-0.1	0.0	0.2
23-Nov	0.2	-0.1	0.0	0.0	-0.3	-0.1	0.2	0.1	0.1	-0.1	0.2	0.0	0.0	0.0	0.1	0.0	-0.1	0.1	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.3
24-Nov	0.1	0.0	-0.1	-0.1	0.2	0.3	0.0	0.2	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	-0.2	-0.3	-0.1	0.0	0.0	0.3
25-Nov	-0.4	-0.2	-0.2	-0.1	-0.3	-0.3	0.0	0.1	0.1	0.1	0.1	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.3	-0.3	-0.2	-0.1	0.1
26-Nov	-0.5	-0.2	-0.4	-0.3	-0.3	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.3	-0.2	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1	-0.1	0.2
27-Nov	0.1	0.0	0.1	0.0	0.1	0.1	0.0	-0.1	0.0	-0.2	-0.1	-0.2	-0.1	0.2	0.2	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	-0.1	0.0	0.2
28-Nov	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.2	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.2
29-Nov	0.0	0.1	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	-0.1	-0.1	0.2	0.0	0.1	0.3	0.2	0.1	0.1	0.0	-0.1	0.0	0.3	0.1	0.2	0.1	0.3
30-Nov	0.0	0.1	-0.1	0.1	0.0	0.1	0.3	0.1	-0.1	0.1	-0.1	0.0	-0.3	-0.2	-0.3	-0.1	-0.2	-0.2	-0.1	-0.1	-0.2	-0.1	0.1	0.2	0.0	0.3
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 3.7 km/h on Nov 14 22:00	Hours of Data: 717
Minimum Value: 0.1 km/h on Nov 16 05:00	Hours of Missing Data: 3
Percentiles: P ₁ = 0.1 P ₁₀ = 0.5 Q ₁ = 0.8 Median = 1.3 Q ₃ = 1.8 P ₉₀ = 2.4 P ₉₉ = 3.2	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-Nov	1.6	1.5	1.1	1.0	0.8	0.7	0.6	2.7	3.0	2.7	2.4	2.3	2.3	2.6	2.2	2.0	1.8	1.9	1.6	1.6	1.3	1.1	1.0	1.1	3.0
2-Nov	1.0	1.0	1.0	0.7	0.6	0.9	1.3	1.4	1.9	2.3	2.0	2.4	1.6	1.3	1.8	1.7	1.6	2.0	1.7	1.9	1.9	1.7	1.8	2.0	2.4
3-Nov	2.2	1.9	1.8	1.8	1.7	1.5	1.6	1.3	1.1	AF	AF	AF	2.4	2.2	1.5	1.2	1.2	1.0	1.1	1.3	2.5	2.1	1.5	0.9	2.5
4-Nov	1.5	1.6	1.7	1.3	1.1	1.4	1.1	1.1	1.3	1.3	1.4	1.4	1.8	1.5	1.3	0.9	0.8	0.9	1.1	1.2	1.2	1.5	1.8	2.0	2.0
5-Nov	0.9	1.0	0.5	0.8	0.6	0.5	0.9	1.1	0.5	0.7	1.2	2.3	1.2	1.1	1.2	1.7	0.9	1.3	0.9	0.7	0.4	0.9	1.6	1.1	2.3
6-Nov	1.3	1.6	1.3	1.2	1.3	1.1	0.9	0.8	0.5	0.5	1.0	1.2	1.2	0.8	0.5	0.3	0.6	0.3	0.7	0.9	0.9	1.5	1.1	0.9	1.6
7-Nov	1.2	1.4	1.0	0.9	0.9	0.8	0.6	0.4	0.3	0.8	1.0	1.2	1.1	0.8	1.0	1.1	0.8	0.8	0.5	0.6	0.6	0.8	0.9	1.0	1.4
8-Nov	0.5	0.4	0.4	0.5	0.6	0.8	0.8	0.7	1.5	1.5	1.4	1.0	1.0	1.0	1.1	1.0	1.5	1.6	1.1	1.0	0.7	0.3	0.3	1.6	
9-Nov	0.6	1.2	0.8	0.8	0.6	0.4	1.5	0.8	1.3	1.6	2.1	2.1	2.5	1.8	1.6	1.5	1.7	2.5	3.0	3.2	3.5	2.4	2.3	2.9	3.5
10-Nov	2.4	2.0	1.0	1.4	0.9	2.2	1.6	1.0	0.7	1.3	1.7	2.0	1.9	1.7	1.4	1.1	1.0	2.5	2.3	1.4	1.7	2.2	2.0	2.7	2.7
11-Nov	2.4	2.3	1.3	1.3	1.2	1.0	1.2	1.5	1.4	1.4	1.6	1.8	2.3	2.0	1.4	1.5	1.2	1.0	1.0	0.9	1.3	1.4	1.6	1.7	2.4
12-Nov	1.8	0.9	1.2	1.1	0.5	0.5	0.5	0.9	1.3	0.5	1.0	1.3	0.8	0.9	0.5	0.3	0.3	0.2	0.3	0.4	0.8	0.4	0.3	0.6	1.8
13-Nov	0.9	1.1	0.6	0.7	1.2	1.1	0.7	0.8	1.1	1.6	1.6	1.8	1.4	1.1	1.5	1.3	0.8	1.1	1.5	1.4	1.6	1.8	1.8	1.6	1.8
14-Nov	0.9	1.2	2.0	1.7	1.1	1.3	1.7	1.4	1.6	1.1	1.3	1.7	1.7	2.2	2.7	3.2	2.6	2.1	1.4	1.9	3.1	3.7	3.1	3.4	3.7
15-Nov	2.6	1.9	1.8	3.3	3.1	3.1	3.0	2.6	2.3	3.2	3.2	2.6	1.9	1.3	1.7	1.5	0.8	0.8	1.6	0.7	0.4	0.3	0.2	0.1	3.3
16-Nov	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.3	0.6	0.8	0.9	1.3	2.3	2.1	2.2	2.1	2.5	2.1	1.9	1.4	1.5	2.5	2.5
17-Nov	2.3	2.3	2.3	1.6	1.3	1.7	1.0	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.3	3.0	2.8	2.8	2.5	1.4	1.4	1.2	1.0	0.9	3.0
18-Nov	0.6	0.4	0.8	0.8	0.6	0.5	0.4	0.5	0.6	0.4	1.2	1.3	1.1	1.2	0.7	0.6	0.4	0.4	0.3	0.4	0.5	0.6	0.6	0.8	1.3
19-Nov	1.0	1.0	0.8	0.9	0.9	0.7	0.8	0.9	1.0	1.4	1.4	1.2	1.7	1.4	1.0	1.0	0.9	0.7	1.0	1.3	1.6	2.1	2.5	2.5	2.5
20-Nov	2.2	2.0	2.1	1.8	2.3	2.2	2.5	2.0	2.9	1.9	1.9	2.1	2.0	1.1	1.7	1.7	2.0	2.0	2.1	2.7	2.7	2.3	2.3	2.1	2.9
21-Nov	2.4	2.1	1.9	1.7	2.2	1.6	1.6	1.5	1.3	1.3	1.0	0.6	0.4	0.4	0.5	0.3	0.6	0.7	1.1	2.0	1.6	1.4	1.6	1.6	2.4
22-Nov	1.3	1.5	1.1	1.3	0.8	1.0	0.6	0.5	0.3	0.6	0.9	0.8	0.7	0.9	1.1	1.4	1.4	1.6	1.6	1.7	1.6	1.5	2.3	2.6	2.6
23-Nov	1.8	2.4	2.8	2.8	3.2	2.4	2.1	2.4	2.6	2.8	2.4	2.7	3.2	2.5	2.2	2.3	2.1	2.1	1.7	1.5	1.7	1.4	1.3	1.3	3.2
24-Nov	1.1	1.3	1.4	1.5	1.4	1.3	1.6	1.5	1.4	1.9	1.6	1.3	1.2	1.1	1.1	0.9	0.7	0.5	1.1	1.0	1.8	2.6	2.8	3.0	3.0
25-Nov	3.4	3.4	3.2	2.9	2.8	2.9	3.2	2.5	2.2	1.5	1.4	1.2	1.4	1.2	0.8	0.4	0.4	0.7	1.1	1.2	1.4	1.7	2.1	2.0	3.4
26-Nov	2.4	1.9	2.0	1.9	1.9	1.6	1.4	1.0	1.0	0.9	1.4	1.4	1.2	1.0	0.8	0.7	0.4	0.3	0.2	0.1	0.2	0.5	0.5	0.6	2.4
27-Nov	0.5	0.9	0.5	0.4	0.6	0.6	0.8	1.1	1.0	1.2	1.2	1.1	1.3	1.2	1.1	1.1	1.1	1.0	1.0	0.8	0.6	0.9	1.2	1.0	1.3
28-Nov	0.9	0.6	0.1	0.2	0.2	0.1	0.3	0.2	0.4	0.6	1.0	0.9	0.8	0.5	0.3	0.2	0.1	0.3	0.3	0.5	0.6	0.4	0.5	0.3	1.0
29-Nov	0.5	0.5	0.2	0.5	0.5	0.2	0.4	0.3	0.2	0.6	0.8	0.8	0.6	0.9	1.2	0.9	1.3	1.4	1.5	1.3	1.3	1.6	1.5	1.3	1.6
30-Nov	1.6	1.6	1.9	1.8	1.6	1.6	1.6	1.9	2.0	1.9	1.9	1.7	2.0	1.8	1.7	1.8	1.7	1.6	1.7	1.7	1.7	1.6	1.5	1.5	2.0

3.4	3.4	3.2	3.3	3.2	3.1	3.2	2.7	3.0	3.2	3.2	3.2	2.7	3.2	2.6	2.7	3.2	2.8	2.8	3.0	3.2	3.5	3.7	3.1	3.4	
Diurnal Maximum																									

AF - Analyzer Failure



Wood Buffalo Environmental Association

Summary of Hour Averages

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

Lower Camp Met Tower - November 2016

Maximum Value: 1.6 km/h on Nov 11 08:00		Maximum Daily Average: 0.7 km/h on Nov 23		Hours in Service: 720																						
Minimum Value: -1.4 km/h on Nov 14 16:00		Minimum Daily Average: -0.6 km/h on Nov 17		Hours of Data: 717																						
Maximum Diurnal Average: 0.4 km/h at hour 9		Minimum Diurnal Average: 0.1 km/h at hour 19		Hours of Missing Data: 3																						
Monthly Average: 0.21 km/h		Percentiles: P ₁ = -1.2 P ₁₀ = -0.4 Q ₁ = -0.1 Median = 0.2 Q ₃ = 0.6 P ₉₀ = 0.9 P ₉₉ = 1.4		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-Nov	0.0	0.3	0.5	0.2	0.1	-0.1	-0.2	-1.1	-1.0	-1.0	-0.7	-0.7	-0.5	-1.0	-0.7	-0.2	-0.2	-0.5	0.1	0.0	0.2	0.1	0.2	0.1	-0.3	0.5
2-Nov	0.1	0.1	0.1	0.3	0.1	0.7	0.5	0.4	0.6	0.6	0.4	0.9	0.1	-0.2	0.7	0.3	0.8	0.7	0.4	0.8	0.8	1.2	1.1	0.8	0.5	1.2
3-Nov	0.9	0.9	0.8	0.9	0.7	0.7	0.6	0.5	0.6	AF	AF	AF	0.9	0.7	1.0	1.0	0.1	0.2	0.5	0.4	-0.4	-0.4	-0.1	0.3	0.5	1.0
4-Nov	0.0	0.2	0.4	-0.3	-0.1	0.2	0.8	0.5	0.8	0.9	1.0	0.7	0.8	0.6	0.7	1.2	1.0	0.6	0.5	0.3	0.1	0.5	0.3	0.5	0.5	1.2
5-Nov	0.3	0.9	0.9	0.9	0.2	0.5	1.1	0.2	0.7	0.3	0.6	0.6	0.4	0.4	0.6	0.4	0.3	0.9	0.4	0.7	0.5	1.2	1.2	0.3	0.6	1.2
6-Nov	0.2	0.2	0.2	0.4	1.0	0.5	-0.1	-0.2	0.1	0.0	-0.2	-0.1	-0.2	0.0	0.2	0.2	0.4	0.2	0.0	0.9	0.1	0.2	0.7	1.0	0.2	1.0
7-Nov	0.9	0.6	0.7	0.4	0.8	0.6	0.3	0.3	0.4	0.9	0.7	0.8	0.7	0.3	0.5	0.9	0.9	0.7	0.3	0.3	0.2	0.5	0.5	0.6	0.6	0.9
8-Nov	0.3	0.0	0.3	0.3	0.6	0.9	0.8	0.5	0.6	1.3	1.2	0.7	0.3	0.4	0.4	0.5	0.2	0.0	0.2	0.5	0.8	0.5	0.0	0.1	0.5	1.3
9-Nov	0.7	0.9	0.3	0.4	0.3	0.2	1.4	0.6	1.3	1.0	-0.1	-0.3	-1.1	-0.2	0.0	-0.3	-0.7	-0.9	-1.2	-1.4	-1.4	-0.8	-0.7	-0.9	-0.1	1.4
10-Nov	-0.1	-0.2	-0.1	0.4	0.1	0.2	0.0	-0.1	0.3	0.5	0.4	0.7	0.7	0.6	0.5	0.8	0.5	1.0	0.7	0.4	0.5	0.7	0.7	1.1	0.4	1.1
11-Nov	0.7	1.0	0.9	0.7	1.0	1.0	1.5	1.6	1.5	1.3	1.4	1.2	1.0	0.4	0.5	-0.1	-0.2	-0.3	-0.4	-0.2	-0.1	-0.3	-0.6	-0.7	0.5	1.6
12-Nov	-0.4	-0.2	0.5	1.4	0.8	0.6	0.4	1.0	1.4	0.3	0.7	1.0	0.4	0.7	0.5	-0.1	0.2	0.0	0.2	0.4	-0.1	0.2	0.4	0.3	0.4	1.4
13-Nov	-0.3	-0.2	-0.1	0.2	0.5	0.8	1.1	1.0	1.2	0.7	0.0	0.4	0.2	0.8	0.7	0.8	0.8	1.1	1.0	0.8	1.2	1.2	0.8	0.7	0.6	1.2
14-Nov	0.4	0.4	0.3	0.5	0.6	0.8	0.8	0.7	1.0	0.8	-0.3	-0.5	-0.5	-0.8	-1.0	-1.4	-1.1	-0.9	-0.5	-0.8	-1.0	-1.3	-0.6	-1.0	-0.2	1.0
15-Nov	-0.8	-0.5	-0.5	-1.1	-1.2	-1.1	-1.3	-1.1	-0.7	-0.8	-0.9	-0.5	-0.3	-0.3	-0.3	-0.5	-0.2	-0.2	-0.3	-0.1	-0.1	-0.1	0.0	0.0	-0.5	0.0
16-Nov	-0.1	-0.2	0.0	0.0	-0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.5	0.0	0.2	0.1	-0.1	-0.1	0.1	0.0	-0.2	0.0	-0.1	-0.2	0.0	0.5
17-Nov	-0.4	-0.3	-0.2	-0.1	-0.3	-0.4	-0.6	-0.5	-0.6	-0.7	-0.6	-0.5	-0.4	-0.5	-0.6	-1.4	-1.2	-1.1	-1.0	-0.5	-0.6	-0.5	-0.5	-0.2	-0.6	-0.1
18-Nov	-0.1	-0.3	0.2	-0.1	-0.2	-0.3	-0.3	-0.1	0.1	0.1	0.0	-0.2	-0.2	0.0	-0.2	0.1	-0.2	-0.1	-0.2	-0.1	0.1	-0.1	0.0	0.1	-0.1	0.2
19-Nov	0.2	0.2	0.2	0.0	0.1	0.1	0.1	0.0	0.0	0.3	0.2	0.2	0.2	0.1	0.0	-0.3	0.1	0.4	-0.1	0.3	0.3	0.6	0.7	0.6	0.2	0.7
20-Nov	0.2	0.5	0.4	0.2	0.8	0.7	0.7	0.7	0.8	0.7	0.7	0.5	0.6	-0.1	0.6	0.7	0.6	0.8	0.9	0.9	0.9	0.9	0.6	0.5	0.6	0.9
21-Nov	0.7	0.9	0.9	0.8	1.1	1.0	0.8	0.4	0.6	0.5	0.3	0.1	-0.2	-0.1	0.1	0.0	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.1	0.2	0.3	1.1
22-Nov	0.2	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.2	0.0	-0.2	-0.1	0.0	0.1	0.0	0.0	0.3	0.2	0.1	0.0	0.3	0.6	0.7	0.1	0.7
23-Nov	0.7	0.9	1.0	1.0	1.0	0.9	0.5	0.9	0.8	0.8	1.0	1.1	1.4	0.8	0.7	1.1	0.7	0.9	0.4	0.4	-0.1	0.0	0.0	0.3	0.7	1.4
24-Nov	0.2	-0.1	-0.1	-0.2	0.3	0.6	0.7	0.7	0.6	0.7	0.2	0.4	0.2	0.3	0.3	-0.1	0.3	0.2	0.3	0.3	0.8	1.0	0.9	0.9	0.4	1.0
25-Nov	1.0	1.1	0.9	0.9	0.8	0.7	0.9	0.9	1.2	0.1	0.3	0.4	0.5	0.0	0.1	0.1	0.0	0.1	-0.2	-0.3	-0.3	-0.4	-0.4	-0.3	0.3	1.2
26-Nov	-0.6	-0.3	-0.5	-0.5	-0.5	-0.3	0.0	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	0.0	-0.1	0.3	-0.1	0.1	0.1	0.1	0.1	0.4	0.2	0.3	-0.1	0.4
27-Nov	0.3	0.4	0.3	0.0	0.3	0.2	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0.1	0.1	0.0	0.1	0.0	-0.1	0.1	-0.1	-0.2	-0.3	-0.3	0.0	0.4
28-Nov	-0.2	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	0.2	0.2	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.2
29-Nov	-0.1	-0.1	0.0	0.0	0.0	-0.2	-0.1	-0.1	0.0	-0.2	-0.2	0.1	0.0	0.2	0.2	0.3	0.0	-0.1	-0.3	-0.4	-0.2	0.5	-0.1	0.3	0.0	0.5
30-Nov	-0.1	0.0	-0.5	0.2	0.6	0.7	0.7	0.0	-0.1	0.1	-0.2	0.0	-0.3	-0.3	-0.4	-0.1	-0.3	-0.3	-0.1	-0.1	-0.2	0.0	0.1	0.4	0.0	0.7
																								Diurnal Average		
																								Diurnal Maximum		
0.2 0.2 0.3 0.3 0.3 0.3 0.4 0.2 0.4 0.3 0.2 0.2 0.2 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.2 0.2																								0.2		
1.0 1.1 1.0 1.4 1.1 1.0 1.5 1.6 1.5 1.3 1.4 1.2 1.4 0.8 1.0 1.2 1.0 1.1 1.0 0.9 1.2 1.2 1.2 1.1																								1.1		
AF - Analyzer Failure																										



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 4.1 km/h on Nov 14 22:00	Hours of Data: 717
Minimum Value: 0.1 km/h on Nov 16 05:00	Hours of Missing Data: 3
Percentiles: P ₁ = 0.2 P ₁₀ = 0.5 Q ₁ = 0.8 Median = 1.3 Q ₃ = 1.8 P ₉₀ = 2.5 P ₉₉ = 3.4	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-Nov	1.9	1.6	1.2	1.2	0.8	0.7	0.7	2.9	3.2	2.9	2.6	2.6	2.6	2.9	2.6	2.4	2.2	2.2	2.1	1.7	1.4	1.1	1.0	1.1	3.2
2-Nov	1.0	1.1	1.2	0.7	0.6	1.0	1.5	1.6	2.2	2.4	2.1	2.5	1.8	1.5	2.0	2.0	1.7	1.9	1.8	1.4	1.5	1.3	1.4	1.5	2.5
3-Nov	1.7	1.7	1.6	1.8	1.7	1.2	1.3	1.2	1.2	AF	AF	AF	1.8	2.0	1.1	1.2	1.5	1.3	1.2	1.8	2.9	2.2	1.7	1.2	2.9
4-Nov	1.7	1.9	2.1	1.8	1.6	1.9	1.3	1.1	1.0	1.1	1.4	1.0	1.4	1.2	1.0	1.0	0.7	0.8	1.2	1.2	1.2	1.4	1.6	1.6	2.1
5-Nov	0.8	0.7	0.5	0.6	0.7	0.6	0.7	1.1	0.5	0.6	1.1	2.2	1.0	0.8	0.8	1.3	1.0	1.2	0.9	0.7	0.5	0.9	1.4	1.4	2.2
6-Nov	1.6	1.8	1.6	1.2	1.1	1.3	1.2	1.0	0.6	0.7	1.4	1.4	0.8	0.8	0.7	0.5	0.7	0.4	1.0	1.2	1.1	1.6	1.4	1.0	1.8
7-Nov	1.3	1.5	1.0	1.1	1.2	1.1	0.9	0.5	0.5	0.8	0.8	0.9	0.7	0.6	0.9	1.0	0.7	0.7	0.6	0.8	0.7	0.9	1.0	1.0	1.5
8-Nov	0.7	0.6	0.5	0.6	0.7	0.8	0.9	0.8	1.5	1.1	0.9	0.9	0.7	0.7	0.9	0.8	1.1	1.5	1.5	1.2	1.0	0.7	0.4	0.3	1.5
9-Nov	0.5	1.0	1.0	0.7	0.6	0.5	1.3	0.9	1.5	1.8	2.0	1.8	2.2	1.4	1.2	1.0	1.5	2.9	3.5	3.3	3.5	2.7	2.4	2.9	3.5
10-Nov	2.5	2.4	1.3	1.6	1.1	2.4	1.8	1.2	0.8	1.0	1.5	1.6	1.6	1.6	1.3	1.3	1.2	2.2	2.3	1.7	1.8	2.2	2.1	2.7	2.7
11-Nov	2.5	2.4	1.3	1.0	1.0	0.6	0.7	0.9	0.9	0.9	1.1	1.3	1.8	1.8	1.6	1.8	1.4	1.1	1.0	0.8	0.9	0.9	1.4	1.7	2.5
12-Nov	1.5	1.1	1.4	1.0	0.6	0.7	0.6	0.8	0.9	0.6	1.0	0.9	0.7	0.9	0.6	0.2	0.4	0.3	0.4	0.6	1.0	0.6	0.5	0.7	1.5
13-Nov	1.2	1.5	0.8	0.8	1.3	1.4	0.7	0.8	1.2	1.2	1.7	1.7	1.6	1.0	1.2	0.9	0.9	0.9	1.3	1.1	1.1	1.1	1.1	1.2	1.7
14-Nov	0.7	1.0	1.3	1.3	1.0	0.9	1.1	0.9	1.1	1.4	1.6	2.0	1.8	2.2	3.0	3.7	2.7	2.5	1.7	2.4	3.6	4.1	3.4	3.7	4.1
15-Nov	2.9	2.5	2.3	3.8	3.2	3.3	3.3	2.9	2.3	3.0	3.2	2.3	1.6	1.1	1.4	1.5	0.7	0.7	1.9	0.9	0.6	0.4	0.4	0.2	3.8
16-Nov	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.6	0.8	0.9	1.2	2.2	2.1	2.1	2.1	2.5	2.1	1.9	1.5	1.5	2.7	2.7
17-Nov	2.4	2.4	2.5	1.9	1.6	1.8	1.0	1.4	1.8	1.7	1.8	1.7	2.3	2.1	2.6	3.2	3.1	3.2	2.8	1.7	1.6	1.3	1.2	1.1	3.2
18-Nov	0.7	0.5	0.9	0.8	0.6	0.5	0.5	0.6	0.7	0.6	1.4	1.5	1.3	1.3	0.9	0.7	0.6	0.5	0.3	0.4	0.5	0.5	0.6	0.8	1.5
19-Nov	1.0	1.0	1.1	1.0	1.1	0.9	1.0	1.1	1.0	1.3	1.5	1.3	1.6	1.4	1.1	1.2	1.1	0.9	1.2	1.4	1.7	2.2	2.5	2.6	2.6
20-Nov	2.1	2.0	2.1	1.9	2.5	2.1	2.4	2.2	2.7	2.2	2.1	2.1	1.8	1.3	1.6	1.6	1.9	1.9	2.1	2.4	2.4	2.3	2.0	2.1	2.7
21-Nov	2.4	2.3	2.0	1.9	2.1	1.8	1.7	1.6	1.5	1.4	1.3	0.6	0.5	0.5	0.5	0.3	0.5	0.8	1.2	2.0	1.6	1.4	1.8	1.7	2.4
22-Nov	1.4	1.5	1.1	1.2	1.0	1.0	0.7	0.5	0.4	0.7	0.9	0.8	0.8	1.1	1.3	1.6	1.5	1.8	2.0	2.0	1.9	1.8	2.3	2.6	2.6
23-Nov	2.1	2.5	2.9	2.9	2.9	2.6	2.4	2.8	3.0	3.0	2.8	2.8	3.2	2.8	2.5	2.4	2.1	2.3	1.8	1.6	1.9	1.5	1.4	1.4	3.2
24-Nov	1.1	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.5	1.8	1.6	1.3	1.1	1.2	1.2	0.9	0.9	0.8	1.3	1.3	2.2	2.2	2.6	2.7	2.7
25-Nov	2.9	3.0	3.0	2.7	2.7	2.7	2.9	2.8	2.4	1.8	1.6	1.4	1.5	1.4	0.9	0.4	0.5	0.9	1.3	1.5	1.8	1.6	2.0	1.8	3.0
26-Nov	2.1	1.8	1.9	1.9	2.0	1.5	1.5	1.1	1.0	1.0	1.6	1.4	1.4	1.0	0.8	0.8	0.3	0.4	0.2	0.1	0.2	0.5	0.5	0.6	2.1
27-Nov	0.4	0.7	0.4	0.4	0.6	0.6	0.8	1.1	1.0	1.2	1.2	1.1	1.4	1.5	1.4	1.3	1.3	1.2	1.2	0.9	0.7	1.0	1.4	1.0	1.5
28-Nov	1.0	0.7	0.2	0.2	0.2	0.2	0.4	0.3	0.5	0.6	0.8	0.9	0.8	0.6	0.3	0.2	0.1	0.2	0.3	0.6	0.6	0.4	0.5	0.4	1.0
29-Nov	0.5	0.4	0.2	0.4	0.4	0.3	0.4	0.3	0.2	0.6	0.9	0.9	0.6	1.0	1.0	0.9	1.1	1.4	1.4	1.2	1.2	1.7	1.5	1.5	1.7
30-Nov	1.7	1.6	1.8	1.9	1.8	1.7	1.8	2.0	2.1	2.0	1.7	1.6	1.8	1.6	1.7	1.6	1.6	1.5	1.8	1.8	1.8	1.6	1.7	1.6	2.1
	2.9	3.0	3.0	3.8	3.2	3.3	3.3	2.9	3.2	3.0	3.2	2.8	3.2	2.9	3.0	3.7	3.1	3.2	3.5	3.3	3.6	4.1	3.4	3.7	

Diurnal Maximum

AF - Analyzer Failure



Maximum Value: 4.1 km/h on Nov 23 12:00 Maximum Daily Average: 1.6 km/h on Nov 23																								Hours in Service: 720 Hours of Data: 685		
Minimum Value: -1.4 km/h on Nov 14 16:00 Minimum Daily Average: -0.4 km/h on Nov 17																								Hours of Missing Data: 35 Hours of Calibration: 0		
Maximum Diurnal Average: 0.6 km/h at hour 12 Minimum Diurnal Average: 0.2 km/h at hour 14																								Percent Operational Time: 95.1		
Monthly Average: 0.46 km/h Percentiles: P ₁ = -0.9 P ₁₀ = -0.4 Q ₁ = 0.0 Median = 0.3 Q ₃ = 0.8 P ₉₀ = 1.7 P ₉₉ = 2.8																										
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	-0.2	1.7	1.3	0.9	0.3	0.0	0.0	-1.2	-0.8	-0.7	-0.6	-0.5	-0.3	-0.7	-0.6	-0.1	-0.3	-0.7	0.2	0.7	0.6	0.3	0.1	0.1	0.0	1.7
2-Nov	0.2	0.4	0.5	0.3	0.2	0.8	0.3	0.7	1.2	1.3	2.4	2.8	1.2	-0.2	2.4	0.7	1.8	2.2	1.8	0.4	0.5	0.2	0.7	0.3	1.0	2.8
3-Nov	0.8	0.7	0.3	0.6	0.7	0.6	0.8	0.8	0.7	0.2	0.2	0.5	0.8	0.8	0.5	0.6	0.4	-0.1	-0.9	0.3	0.9	0.6	0.4	0.3	0.5	0.9
4-Nov	0.9	2.0	2.7	0.5	1.1	2.4	0.0	0.2	0.9	1.4	0.9	0.5	1.4	1.0	0.6	0.6	0.4	1.3	1.5	1.2	0.4	1.8	1.0	1.7	1.1	2.7
5-Nov	0.3	0.2	-0.1	0.2	0.3	0.0	0.4	0.4	0.3	0.3	0.4	1.6	0.2	0.2	0.4	1.0	0.3	0.5	0.6	0.1	0.0	0.0	0.0	1.0	0.4	1.6
6-Nov	2.5	1.7	-0.6	0.4	0.1	0.1	1.9	0.7	0.1	0.0	-0.2	0.3	0.0	0.2	0.0	0.2	0.3	0.1	0.5	-0.1	0.8	0.5	0.4	0.1	0.4	2.5
7-Nov	-0.1	-0.1	0.1	0.1	0.4	0.0	-0.2	0.0	0.0	0.1	0.0	0.3	0.2	0.1	0.6	1.1	0.5	1.7	1.3	2.2	1.4	1.6	1.5	1.6	0.6	2.2
8-Nov	1.2	0.2	0.4	0.4	1.0	1.7	1.6	0.3	2.0	1.8	1.0	0.5	0.4	0.5	0.7	0.3	0.0	0.0	0.5	1.0	1.3	0.8	0.1	0.2	0.7	2.0
9-Nov	0.0	0.5	0.2	0.2	0.6	0.0	0.0	-0.1	0.4	1.1	1.3	0.5	-0.2	0.3	0.3	0.1	0.0	-0.1	-0.5	-0.8	-0.3	0.1	1.2	0.4	0.2	1.3
10-Nov	2.6	2.4	0.7	2.4	0.0	3.1	1.4	-0.4	0.3	0.4	0.5	0.7	0.6	0.9	1.2	1.1	1.5	2.2	2.1	1.5	1.9	2.6	2.4	2.5	1.4	3.1
11-Nov	2.1	2.2	1.5	1.2	0.8	0.5	0.5	0.5	0.0	0.4	0.5	0.4	0.7	0.4	0.5	1.3	0.7	0.0	-0.3	-0.1	0.0	0.2	0.2	0.6	0.6	2.2
12-Nov	0.7	0.4	0.4	0.0	0.0	0.6	1.0	0.2	-0.1	0.0	0.2	0.1	0.2	0.3	0.3	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	-0.1	0.1	0.2	1.0
13-Nov	-0.9	-1.3	-0.3	0.5	-0.1	-0.2	0.1	-0.1	-0.4	0.4	1.1	1.6	0.8	0.3	0.9	0.9	0.2	0.3	0.5	0.4	0.9	1.8	1.1	0.6	0.4	1.8
14-Nov	0.5	0.4	0.8	1.0	0.4	0.0	0.3	0.3	0.1	0.2	0.4	0.0	0.0	-0.3	-0.5	-1.4	-1.0	-0.7	-0.2	-0.8	-0.5	0.1	0.2	0.3	0.0	1.0
15-Nov	-0.6	-0.1	-0.4	0.2	-0.1	0.4	-0.4	-0.3	-0.1	0.9	0.4	0.5	0.3	0.3	0.2	0.2	0.3	0.5	0.3	0.3	-0.1	-0.1	-0.6	0.0	0.1	0.9
16-Nov	0.1	0.0	0.1	0.1	0.1	0.0	-0.1	0.1	0.2	0.2	0.1	0.0	0.6	0.4	0.1	-0.1	0.4	0.0	-0.1	-0.1	-0.1	0.5	-0.2	0.2	0.1	0.6
17-Nov	0.1	-0.3	0.6	0.5	-0.4	-0.8	-0.7	-0.5	-0.7	-0.8	-0.6	0.2	0.4	-0.2	-0.2	-1.3	-0.8	-0.7	-0.9	-0.3	-0.6	-0.4	-0.5	0.1	-0.4	0.6
18-Nov	0.0	-0.1	0.3	-0.2	-0.4	-0.2	-0.4	0.2	-0.1	0.3	0.0	0.0	-0.1	0.1	-0.5	0.1	-0.4	0.1	-0.1	0.0	0.1	0.1	0.1	0.5	0.0	0.5
19-Nov	0.3	0.1	0.6	0.7	0.5	0.2	0.5	-0.1	0.2	0.8	0.1	0.4	-0.2	-0.5	0.1	0.0	0.9	1.5	0.8	0.6	0.6	1.0	1.0	0.6	0.4	1.5
20-Nov	0.8	0.9	0.6	1.0	1.4	1.6	1.8	2.4	2.1	2.0	2.6	2.2	1.0	0.0	1.2	1.0	1.4	1.8	1.7	1.7	1.5	2.1	1.1	0.7	1.4	2.6
21-Nov	1.0	2.5	2.3	1.9	2.2	1.7	0.4	0.0	0.2	0.8	0.6	0.2	-0.3	0.0	0.3	-0.2	-0.2	-0.1	-0.1	0.2	0.0	0.1	0.0	0.0	0.6	2.5
22-Nov	0.6	-0.1	0.0	-0.3	0.4	-0.1	-0.1	0.0	0.0	0.0	0.1	-0.2	-0.1	-0.5	-0.2	-0.6	-0.3	1.0	-0.4	0.0	-0.3	0.6	2.0	2.6	0.2	2.6
23-Nov	1.7	2.5	2.9	2.7	2.2	2.9	1.2	1.3	0.9	1.8	1.9	4.1	3.8	2.8	1.6	3.0	1.9	0.9	-0.2	-0.4	-0.4	-0.5	-0.4	-0.4	1.6	4.1
24-Nov	-0.1	0.1	0.6	0.5	-0.2	-0.1	0.6	0.4	0.8	1.1	0.1	-0.2	0.0	0.0	0.6	-0.1	0.5	0.6	1.2	1.8	3.3	2.2	1.8	1.9	0.7	3.3
25-Nov	1.7	1.6	1.7	1.4	1.2	1.2	1.5	2.4	3.8	0.5	1.3	0.9	1.6	-0.4	-0.1	0.1	0.6	1.5	0.4	0.0	0.1	0.3	0.4	0.3	1.0	3.8
26-Nov	0.5	0.1	0.1	0.2	0.2	0.4	0.7	0.2	0.3	0.3	0.7	0.5	-0.1	0.3	0.1	0.7	0.3	0.0	0.1	0.0	0.0	0.1	0.2	0.1	0.2	0.7
27-Nov	0.1	-0.1	-0.1	0.2	0.9	0.5	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.9
28-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	--	0.1
29-Nov	-0.2	-0.1	0.0	-0.2	0.0	-0.2	0.1	-0.1	0.2	-0.2	-0.2	0.4	-0.1	0.9	0.5	0.0	-0.4	-0.1	0.0	-0.6	-0.3	0.0	-0.5	0.0	0.0	0.9
30-Nov	-0.5	-0.5	-1.0	0.2	1.1	1.2	0.7	-0.6	-0.7	-0.5	-0.5	0.0	-0.3	-0.3	-0.9	-0.3	-0.6	-0.7	-0.7	-0.6	-0.5	0.0	-0.3	-0.1	-0.3	1.2
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 4.0 km/h on Nov 14 21:00	Hours of Data: 685
Minimum Value: 0.1 km/h on Nov 26 20:00	Hours of Missing Data: 35
Percentiles: P ₁ = 0.2 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.4 Q ₃ = 1.9 P ₉₀ = 2.4 P ₉₉ = 3.3	Hours of Calibration: 0
	Percent Operational Time: 95.1

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-Nov	1.9	1.6	1.7	1.6	1.0	0.7	1.4	2.6	2.8	2.2	2.4	2.7	2.5	2.6	2.6	2.6	2.1	2.2	2.3	2.1	2.0	1.5	1.3	1.4	2.8
2-Nov	0.9	1.0	1.3	0.8	0.6	1.2	1.1	1.6	2.3	2.2	2.3	2.3	2.0	1.6	2.4	2.3	2.0	1.8	2.0	1.4	1.4	1.1	1.4	1.2	2.4
3-Nov	1.4	1.7	1.8	2.2	1.8	1.5	1.2	1.4	1.3	1.3	1.6	1.7	1.6	1.6	1.7	1.3	1.7	1.8	1.8	2.2	3.0	2.3	2.0	1.2	3.0
4-Nov	2.1	2.4	1.7	2.3	2.3	2.8	2.3	1.3	1.5	1.7	1.3	1.2	1.5	1.2	1.2	1.1	1.1	1.1	1.2	1.7	1.4	1.3	1.4	1.3	2.8
5-Nov	0.8	1.0	0.6	0.8	0.8	0.6	0.9	1.1	0.7	0.7	1.2	1.8	1.0	0.8	0.8	1.1	1.1	0.9	1.0	1.1	0.8	1.0	1.2	1.9	1.9
6-Nov	1.6	2.2	2.3	1.3	1.5	1.8	1.3	1.3	1.3	1.4	2.1	1.5	0.7	0.9	0.9	0.8	1.3	1.0	1.5	1.6	1.1	1.8	1.5	1.0	2.3
7-Nov	1.6	2.1	1.6	1.5	1.6	1.7	1.6	1.1	0.7	0.7	1.1	0.8	0.9	0.4	0.8	1.3	1.3	0.8	0.8	0.8	1.0	1.3	1.2	1.2	2.1
8-Nov	1.4	1.0	1.1	0.9	1.2	1.2	1.3	1.1	1.4	1.3	1.3	1.2	0.8	0.8	1.0	1.0	1.3	1.4	1.4	1.4	1.1	0.8	0.4	0.5	1.4
9-Nov	0.7	1.0	1.1	0.9	1.2	0.5	1.2	0.9	1.9	2.6	1.6	1.0	0.9	0.8	1.0	0.6	0.8	2.1	2.6	1.8	1.5	1.5	1.3	1.3	2.6
10-Nov	1.3	2.0	1.8	2.7	2.0	2.2	2.2	1.8	1.0	1.1	1.2	0.9	1.4	1.6	1.5	1.6	1.6	1.6	2.1	1.9	2.1	2.0	1.9	2.9	2.9
11-Nov	2.8	2.7	1.9	1.5	1.8	1.3	1.2	1.1	1.0	1.2	1.3	1.3	1.3	2.0	2.2	1.7	1.3	1.5	1.2	1.3	0.9	0.8	1.1	1.0	2.8
12-Nov	0.8	1.1	1.7	0.8	0.8	0.9	0.8	0.9	1.0	0.6	1.1	0.8	0.5	1.0	0.6	0.4	0.7	0.5	0.8	1.0	1.4	0.7	0.6	0.8	1.7
13-Nov	1.6	2.4	1.3	1.3	1.9	1.4	0.9	1.1	1.5	0.9	1.3	1.2	1.3	0.9	0.8	1.1	1.2	1.0	1.0	0.9	1.1	0.9	1.1	1.2	2.4
14-Nov	1.1	1.0	0.8	1.1	1.1	0.9	0.9	1.0	1.2	1.8	1.6	1.7	1.2	1.9	2.9	3.0	2.7	2.3	2.1	2.8	4.0	3.0	2.6	3.5	4.0
15-Nov	3.0	3.2	3.1	3.3	2.3	2.5	2.6	2.7	1.5	2.1	2.3	1.5	1.1	1.1	1.0	0.8	0.7	0.8	1.5	1.4	0.9	1.0	1.1	0.5	3.3
16-Nov	0.7	0.5	0.3	0.3	0.3	0.4	0.5	0.3	0.2	0.3	0.3	0.4	0.8	1.5	2.2	1.8	2.3	2.3	2.8	2.4	2.3	2.0	1.8	2.3	2.8
17-Nov	2.5	2.1	2.5	1.9	1.4	1.9	0.8	0.7	1.1	1.1	1.7	2.1	2.5	2.3	2.5	2.7	2.8	2.8	2.1	1.7	1.3	1.2	0.5	1.0	2.8
18-Nov	1.0	0.8	1.0	0.9	0.8	0.5	0.5	0.9	0.8	0.9	1.5	1.9	1.9	1.5	1.2	1.1	0.7	0.8	0.5	0.3	0.5	0.3	0.4	0.9	1.9
19-Nov	0.9	1.3	1.2	1.4	1.3	1.0	1.5	1.3	0.9	1.2	1.5	1.6	1.8	1.5	1.3	1.5	1.4	1.0	1.6	1.5	2.1	2.4	2.2	2.2	2.4
20-Nov	1.8	2.1	2.0	1.9	2.1	1.9	2.2	2.1	2.2	2.4	2.4	1.9	1.7	1.6	1.4	1.4	1.5	1.3	1.7	1.6	1.7	1.8	2.1	2.2	2.4
21-Nov	2.2	2.0	2.0	1.9	2.0	2.1	1.4	1.4	1.2	1.4	1.7	0.6	0.7	0.7	0.6	0.6	0.5	0.9	1.0	2.2	1.7	1.8	2.2	1.9	2.2
22-Nov	1.7	1.8	1.3	1.6	1.3	1.3	1.1	0.7	0.5	0.9	1.2	0.9	0.8	1.1	1.6	1.7	1.8	2.7	2.1	2.2	2.1	2.0	2.4	2.5	2.7
23-Nov	2.6	2.7	2.8	2.6	2.6	3.0	3.1	3.3	3.3	3.8	3.4	3.0	2.9	3.8	3.0	2.2	2.4	3.0	1.7	1.4	1.7	1.6	1.3	1.3	3.8
24-Nov	1.1	1.3	1.2	1.3	1.2	1.3	1.8	1.6	1.7	1.8	1.5	1.4	1.4	1.6	1.3	1.2	1.3	1.0	1.3	2.1	1.5	1.7	2.2	2.5	2.5
25-Nov	2.4	2.2	2.6	2.4	2.7	2.5	2.5	2.9	2.4	2.4	1.9	1.9	2.0	1.4	1.0	0.7	0.6	0.9	1.8	2.1	1.7	1.2	1.4	1.5	2.9
26-Nov	1.6	1.4	1.6	1.5	1.4	1.4	1.6	1.1	0.9	1.3	1.8	1.9	2.0	1.4	1.0	0.9	0.5	0.6	0.2	0.1	0.2	0.4	0.4	0.3	2.0
27-Nov	0.4	0.5	0.5	0.5	2.0	2.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.1
28-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.6	0.4	0.3	0.3	0.4	0.6	0.3	0.6
29-Nov	0.4	0.3	0.2	0.5	0.2	0.5	0.5	0.2	0.4	0.6	0.9	0.8	0.4	1.4	1.1	1.0	1.3	1.5	1.8	1.7	1.6	1.6	1.7	1.5	1.8
30-Nov	1.5	1.7	1.9	2.1	2.3	2.1	2.2	1.9	2.2	1.9	1.8	1.7	1.9	1.7	1.8	1.6	1.7	1.7	1.8	1.9	1.9	1.9	1.8	1.6	2.3

3.0	3.2	3.1	3.3	2.7	3.0	3.1	3.3	3.3	3.3	3.8	3.4	3.0	2.9	3.8	3.0	3.0	2.8	3.0	2.8	2.8	4.0	3.0	2.6	3.5	
Diurnal Maximum																									

AF - Analyzer Failure



Maximum Value: 5.7 km/h on Nov 25 09:00	Maximum Daily Average: 2.0 km/h on Nov 23	Hours in Service: 720
Minimum Value: -1.6 km/h on Nov 30 09:00	Minimum Daily Average: -0.1 km/h on Nov 17	Hours of Data: 645
Maximum Diurnal Average: 1.2 km/h at hour 6	Minimum Diurnal Average: 0.5 km/h at hour 14	Hours of Missing Data: 75
Monthly Average: 0.84 km/h	Percentiles: $P_1 = -1.1$ $P_{10} = -0.2$ $Q_1 = 0.2$ Median = 0.6 $Q_3 = 1.3$ $P_{90} = 2.2$ $P_{99} = 4.3$	Hours of Calibration: 0
		Percent Operational Time: 89.6

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-Nov	-0.1	1.8	1.2	1.1	0.3	0.0	0.1	-1.2	-0.2	-0.5	-0.2	-0.4	-0.1	-0.3	-0.6	0.0	-0.2	-0.9	0.3	0.8	0.6	0.5	0.1	0.3	0.1	1.8	
2-Nov	0.5	0.9	1.0	0.4	0.2	0.7	0.2	1.2	1.6	1.5	3.1	3.0	2.0	0.6	2.4	1.2	1.8	1.3	1.1	0.4	1.2	1.0	2.1	1.7	1.3	3.1	
3-Nov	0.4	0.2	-0.4	0.2	0.2	0.4	0.6	0.7	0.8	0.6	-0.4	0.2	0.8	0.2	1.3	2.7	2.4	0.8	-0.5	2.6	2.3	1.8	1.7	1.4	0.9	2.7	
4-Nov	1.9	3.2	3.2	2.8	3.7	5.4	1.0	0.9	0.6	1.1	0.9	0.6	1.1	1.2	0.2	0.3	0.2	1.0	1.4	1.7	-0.1	1.1	0.4	1.7	1.5	5.4	
5-Nov	0.2	0.5	0.6	0.7	0.3	0.5	0.8	0.8	0.7	0.2	0.1	0.9	0.6	0.1	0.4	1.2	0.9	0.4	0.6	0.4	0.4	0.7	0.9	2.6	0.6	2.6	
6-Nov	3.8	3.2	0.4	1.2	2.1	2.7	3.8	2.2	0.8	0.7	1.1	1.2	0.7	0.9	0.5	0.7	1.3	1.0	1.2	0.6	1.2	1.7	1.1	1.0	1.5	3.8	
7-Nov	1.3	0.4	1.0	0.6	2.0	0.9	0.2	0.3	0.2	0.4	0.6	0.4	0.3	0.2	0.5	0.6	0.1	0.7	1.1	2.4	2.1	2.0	1.9	2.1	0.9	2.4	
8-Nov	1.2	0.4	1.7	1.6	1.2	1.5	1.6	0.9	2.5	0.7	0.3	0.8	0.6	0.7	1.0	0.5	0.1	-0.3	0.2	0.5	0.4	0.2	0.3	0.2	0.8	2.5	
9-Nov	0.3	0.5	0.3	0.5	0.5	0.4	0.8	0.5	1.8	2.5	1.5	0.4	-0.4	0.3	0.3	0.2	0.3	0.6	-0.3	-0.8	-0.1	0.5	1.8	0.7	0.5	2.5	
10-Nov	3.3	4.5	2.0	5.3	1.2	4.6	2.6	0.3	0.5	0.7	0.4	0.3	0.6	1.2	1.3	1.1	1.8	2.0	2.2	1.9	2.0	2.4	2.3	2.0	1.9	5.3	
11-Nov	1.8	1.9	1.1	0.6	0.3	0.4	1.3	1.3	1.0	0.7	1.0	1.3	0.8	0.3	1.7	1.8	1.3	0.5	0.2	0.2	0.2	0.2	0.8	1.4	0.9	1.9	
12-Nov	0.7	1.1	1.0	0.7	0.7	0.7	0.4	1.1	0.7	0.9	1.5	0.5	0.2	0.6	0.2	0.0	-0.3	-0.1	-0.2	-0.3	-0.1	-0.1	0.0	0.0	0.4	1.5	
13-Nov	-0.8	-1.3	-0.1	0.4	0.3	-0.1	0.6	0.4	-0.2	0.5	1.1	1.2	0.6	0.9	0.3	0.2	0.7	2.1	1.8	1.7	1.5	1.7	0.4	0.8	0.6	2.1	
14-Nov	0.2	0.8	0.6	0.5	0.6	0.7	0.6	0.5	0.9	1.1	1.1	0.7	0.5	0.0	0.0	-1.1	-0.5	-0.2	0.3	0.1	0.2	0.8	1.1	1.4	0.5	1.4	
15-Nov	0.0	0.2	0.1	1.0	1.0	1.3	0.5	0.5	0.3	1.6	1.3	0.7	0.6	0.6	0.4	0.7	0.9	1.0	0.8	0.3	-0.3	-0.2	-0.3	0.1	0.6	1.6	
16-Nov	0.1	0.1	0.2	0.2	0.4	0.2	0.0	0.2	0.1	0.1	0.3	0.1	0.7	0.6	0.1	-0.2	0.4	0.4	-0.1	-0.2	-0.2	0.3	0.0	0.0	0.2	0.7	
17-Nov	0.0	-0.2	0.6	0.6	-0.3	-0.8	-0.6	-0.2	-0.5	-0.7	-0.1	1.0	1.2	0.3	0.5	-1.2	-0.4	-0.6	-0.9	-0.2	-0.5	-0.3	-0.2	0.0	-0.1	1.2	
18-Nov	0.0	0.4	0.2	-0.3	-0.1	0.0	-0.1	0.7	0.1	0.4	0.0	0.0	0.1	0.0	-1.0	0.2	-0.5	0.0	0.0	0.2	0.1	0.3	0.2	0.7	0.1	0.7	
19-Nov	0.5	0.6	1.9	1.5	1.6	1.3	1.7	0.5	0.5	1.4	0.4	0.5	0.1	-0.3	0.4	0.9	1.8	2.2	1.7	0.8	1.0	1.4	1.4	1.0	1.0	2.2	
20-Nov	1.2	1.5	1.0	1.5	2.0	2.2	2.5	3.3	2.8	3.0	3.1	2.6	0.9	0.4	1.2	0.8	1.8	2.2	1.7	1.7	1.7	3.0	1.1	1.0	1.8	3.3	
21-Nov	1.5	3.6	3.2	2.5	2.5	1.7	0.5	0.0	0.5	1.8	1.1	0.5	-0.3	0.1	0.2	-0.1	-0.2	-0.1	0.1	0.4	0.1	0.1	0.0	0.0	0.8	3.6	
22-Nov	0.4	-0.2	0.1	-0.2	0.3	0.2	-0.1	0.2	0.2	0.1	0.3	0.0	0.1	-0.2	0.2	-0.5	-0.2	1.4	-0.3	0.1	0.0	1.2	3.5	4.1	0.4	4.1	
23-Nov	2.2	3.4	3.7	3.7	2.8	3.0	1.2	1.0	0.7	1.9	1.5	4.8	4.4	3.5	2.1	4.3	2.5	0.5	0.0	-0.4	-0.4	0.2	0.6	0.7	2.0	4.8	
24-Nov	1.2	1.8	2.2	2.1	1.5	1.8	0.8	1.2	1.0	1.2	1.7	0.5	0.2	0.3	0.8	0.3	0.7	1.1	1.6	2.7	2.9	2.0	2.2	2.3	1.4	2.9	
25-Nov	1.7	2.0	2.3	1.7	1.8	1.0	1.3	3.3	5.7	1.2	2.2	2.1	2.6	-0.2	0.0	0.7	1.0	2.2	1.1	1.5	1.2	0.7	0.9	0.8	1.6	5.7	
26-Nov	0.9	0.7	0.5	0.7	0.7	0.8	1.2	0.7	0.6	0.9	1.5	1.1	0.1	0.9	0.7	0.6	0.7	0.4	0.1	0.0	0.0	0.2	0.2	0.3	0.6	1.5	
27-Nov	0.2	0.0	0.1	0.1	1.2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	1.2	
28-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	--	--	
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	--	--	
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	-1.6	-1.1	-0.7	-0.1	-0.2	0.2	-0.6	0.0	-0.4	-0.7	-0.5	-0.2	-0.2	0.3	-0.3	-0.2	--	0.3
	0.9	1.2	1.1	1.2	1.1	1.2	0.9	0.8	0.8	0.8	0.9	0.9	0.7	0.5	0.5	0.6	0.7	0.7	0.5	0.7	0.6	0.9	0.9	1.1		Diurnal Average	
	3.8	4.5	3.7	5.3	3.7	5.4	3.8	3.3	5.7	3.0	3.1	4.8	4.4	3.5	2.4	4.3	2.5	2.2	2.2	2.7	2.9	3.0	3.5	4.1		Diurnal Maximum	

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 4.2 km/h on Nov 23 14:00	Hours of Data: 645
Minimum Value: 0.1 km/h on Nov 26 20:00	Hours of Missing Data: 75
Percentiles: P ₁ = 0.3 P ₁₀ = 0.7 Q ₁ = 0.9 Median = 1.2 Q ₃ = 1.8 P ₉₀ = 2.4 P ₉₉ = 3.5	Hours of Calibration: 0
	Percent Operational Time: 89.6

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-Nov	1.5	1.7	1.8	1.7	0.8	0.8	1.6	2.4	2.9	2.3	2.7	3.0	2.6	2.9	2.5	2.4	2.1	1.8	2.2	2.4	1.9	1.5	1.1	1.0	3.0
2-Nov	0.7	1.0	1.3	0.5	0.8	1.0	0.7	0.9	2.2	2.0	2.4	2.6	1.7	1.2	2.3	2.1	1.7	1.5	1.6	1.2	0.9	0.8	1.2	1.0	2.6
3-Nov	0.9	0.7	1.0	1.3	1.2	1.0	1.7	1.3	1.1	1.0	1.0	1.3	1.1	1.6	1.6	1.2	1.9	1.6	2.5	2.3	2.6	1.8	1.9	1.8	2.6
4-Nov	2.1	1.9	1.4	1.4	1.3	1.1	2.8	1.3	1.2	1.4	0.7	0.8	1.5	1.2	0.8	0.9	1.1	1.4	1.4	1.4	1.0	1.2	1.5	1.5	2.8
5-Nov	1.1	1.1	0.6	0.8	0.7	0.9	1.0	1.1	0.8	0.8	1.0	1.4	0.9	0.7	0.8	0.9	1.1	0.9	1.1	1.3	1.2	1.0	1.1	1.3	1.4
6-Nov	1.1	1.6	1.2	1.3	1.4	2.0	0.9	1.1	0.9	1.0	2.0	1.2	0.5	0.9	0.9	1.0	0.9	0.7	0.7	1.4	0.7	0.8	1.0	0.9	2.0
7-Nov	1.2	1.7	1.8	1.5	1.9	1.6	2.1	1.7	1.1	1.6	1.4	0.7	0.7	0.3	0.7	1.0	0.9	1.0	1.2	1.5	1.4	1.6	1.6	1.8	2.1
8-Nov	2.0	1.2	1.2	1.1	1.4	1.3	1.4	1.3	1.4	1.0	1.1	0.9	0.7	0.8	1.0	0.8	0.8	1.5	1.2	1.1	0.8	0.7	0.5	0.5	2.0
9-Nov	0.5	0.7	1.1	0.9	0.8	0.7	0.9	0.9	1.7	2.5	1.4	1.0	1.1	1.1	1.1	0.6	0.6	1.1	1.4	1.4	1.5	0.9	1.1	0.9	2.5
10-Nov	1.2	1.5	1.9	2.0	2.0	1.3	1.6	1.9	0.6	0.8	0.8	0.7	1.4	1.7	1.5	1.4	1.7	2.4	2.6	2.2	2.1	2.6	2.7	3.2	3.2
11-Nov	3.2	3.0	2.2	1.7	1.1	1.0	0.9	0.7	0.9	0.9	1.0	1.0	1.2	1.7	2.1	1.8	1.5	1.7	1.1	1.0	0.8	0.7	0.9	1.0	3.2
12-Nov	0.5	1.0	1.6	1.0	0.6	0.9	0.8	1.0	1.2	0.8	1.0	0.9	0.6	0.9	0.5	0.6	0.9	0.6	1.3	0.9	0.9	1.0	0.6	0.7	1.6
13-Nov	1.1	1.6	0.7	0.9	1.1	1.0	1.0	1.1	1.5	0.8	1.3	1.2	1.1	1.1	0.6	0.7	1.3	1.0	1.1	0.8	0.8	0.9	0.9	1.1	1.6
14-Nov	1.2	1.4	1.1	1.0	1.1	0.9	0.8	1.3	1.1	1.5	1.1	1.2	1.5	1.7	2.7	2.6	2.9	2.6	2.0	2.3	3.0	2.4	2.0	2.9	3.0
15-Nov	3.2	3.1	3.6	2.8	1.5	1.5	1.8	2.1	1.0	1.1	1.2	1.0	1.2	1.4	1.1	0.8	0.8	0.6	1.1	1.7	1.3	1.3	1.0	0.7	3.6
16-Nov	0.8	0.6	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.4	0.3	0.7	1.5	2.2	1.7	2.3	2.2	2.7	2.4	2.3	2.3	1.9	2.4	2.7
17-Nov	2.4	1.8	2.3	1.9	1.2	1.4	1.0	0.7	0.9	0.8	1.8	2.3	2.4	2.4	3.0	2.6	3.2	2.7	2.1	1.4	0.9	1.2	0.6	0.6	3.2
18-Nov	0.7	1.0	1.0	0.8	0.5	0.4	0.6	0.8	0.6	1.3	1.6	1.7	2.1	1.4	1.4	1.2	0.7	0.8	0.6	0.4	0.3	0.3	0.4	1.0	2.1
19-Nov	1.0	1.6	0.9	1.1	0.9	0.9	1.7	1.6	1.0	0.9	1.4	1.7	1.7	1.4	1.1	1.3	1.3	1.0	1.6	1.9	2.4	2.5	2.0	2.2	2.5
20-Nov	1.8	1.8	2.0	1.8	1.8	2.2	2.1	2.0	2.2	2.6	2.6	2.3	1.8	1.2	1.4	1.3	1.4	1.4	2.0	1.9	2.1	2.0	2.0	2.1	2.6
21-Nov	2.3	1.9	2.1	2.0	2.1	1.7	1.4	1.0	1.0	1.0	1.8	0.6	0.8	0.7	0.6	0.9	0.8	1.0	1.0	2.0	1.6	1.7	2.1	1.8	2.3
22-Nov	1.8	1.7	1.3	1.5	1.4	1.5	1.0	0.7	0.4	0.7	1.1	0.6	1.0	0.7	1.1	1.2	1.2	2.9	1.9	1.9	1.8	2.0	2.1	2.4	2.9
23-Nov	2.8	2.7	3.1	2.8	2.8	3.3	3.3	3.0	3.2	4.0	3.5	3.4	3.2	4.2	3.5	2.3	2.8	2.7	1.7	1.0	1.2	1.1	0.9	1.0	4.2
24-Nov	0.9	0.9	0.8	0.8	0.9	0.9	1.0	0.9	1.0	1.0	1.0	1.3	1.2	1.3	1.2	1.0	1.4	1.0	1.5	2.5	1.7	1.8	2.0	2.3	2.5
25-Nov	2.3	1.9	2.3	2.3	2.3	2.4	2.7	3.6	2.5	2.6	2.1	2.2	2.0	1.3	0.9	0.6	0.6	0.5	1.9	2.1	1.5	0.9	0.9	1.2	3.6
26-Nov	1.1	1.0	1.4	1.1	1.3	1.1	1.4	1.0	1.0	1.2	1.7	2.1	2.5	1.6	1.0	0.9	0.4	0.5	0.2	0.1	0.5	0.7	0.3	0.3	2.5
27-Nov	0.6	0.6	0.7	0.6	1.8	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1.8
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	1.7	1.4	1.4	1.2	1.3	1.2	1.3	1.3	1.3	1.2	1.3	1.4	1.5	1.4	1.3	1.0	1.7
Diurnal Maximum																									

AF - Analyzer Failure



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 4 BUFFALO VIEWPOINT NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
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	686	34	34	100.00	26	0	6	0
H2S (ppb) Average	687	33	33	100.00	5	0	1	0
THC (ppm) Average	686	34	34	100.00	4.4	-	2.6	-
Temperature (C) Average	720	0	0	100.00	12.3	-	6.5	-
Relative Humidity (%) Average	720	0	0	100.00	97	-	95	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	28	-	16	-
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 - BUFFALO VIEWPOINT (AMS 4)
 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	686	0.5	2	-	0	0	0	0	0	0	0	26
H2S (ppb) Average	687	0.3	0	-	0	0	0	0	0	0	0	5
THC (ppm) Average	686	2.34	0.2	-	2.1	2.2	2.2	2.3	2.4	2.5	2.5	4.4
Temperature 2 m (C) Average	720	-0.98	5.6	-	-11.6	-8.2	-5.5	-1.7	3.5	7	12.3	12.3
Relative Humidity (%) Average	720	77.6	12	-	45	62	69	78	87	94	97	97
Wind Speed 10 m (km/h) Average	720	9.6	5	-	1	4	7	9	12	15	28	28
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

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



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 26 ppb on Nov 27 03:00	Maximum Daily Average: 5.5 ppb on Nov 27		Hours of Data:	686
Minimum Value: 0 ppb on Nov 7 03:00	Minimum Daily Average: 0.1 ppb on Nov 15		Hours of Missing Data:	34
Maximum Diurnal Average: 1.3 ppb at hour 3	Minimum Diurnal Average: 0.1 ppb at hour 21		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 = 0 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-Nov	1	0	0	1	0	Z	0	C	C	C	C	0	0	0	0	0	0	0	2	0	0	0	1	1	0.5	2	
2-Nov	Z	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3
3-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
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	0.2	0
5-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	0.3	0
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	0.1	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	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-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	0.2	0
10-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
11-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	0.2	0
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0.3	3
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	0.1	0
14-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
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	0.1	0
16-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	3	15	0	0	0	0	0	0	0	0	0	0	0	0.9	15
17-Nov	0	0	0	Z	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	3
18-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	2	0	1	1	2	0	0	0	0	0	3	1	0	0.5	3
19-Nov	1	2	2	1	1	Z	3	3	1	5	2	0	0	0	4	0	1	2	0	0	0	0	0	0	1.2	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	0.1	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	0	0.1	0
22-Nov	0	0	Z	0	0	0	0	6	4	2	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.9	6
23-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	0.2	0
24-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	0.2	0
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	0.1	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	3	0.2	3	
27-Nov	16	Z	26	15	21	20	19	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5.5	26	
28-Nov	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	0.3	1
29-Nov	0	0	0	Z	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2
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

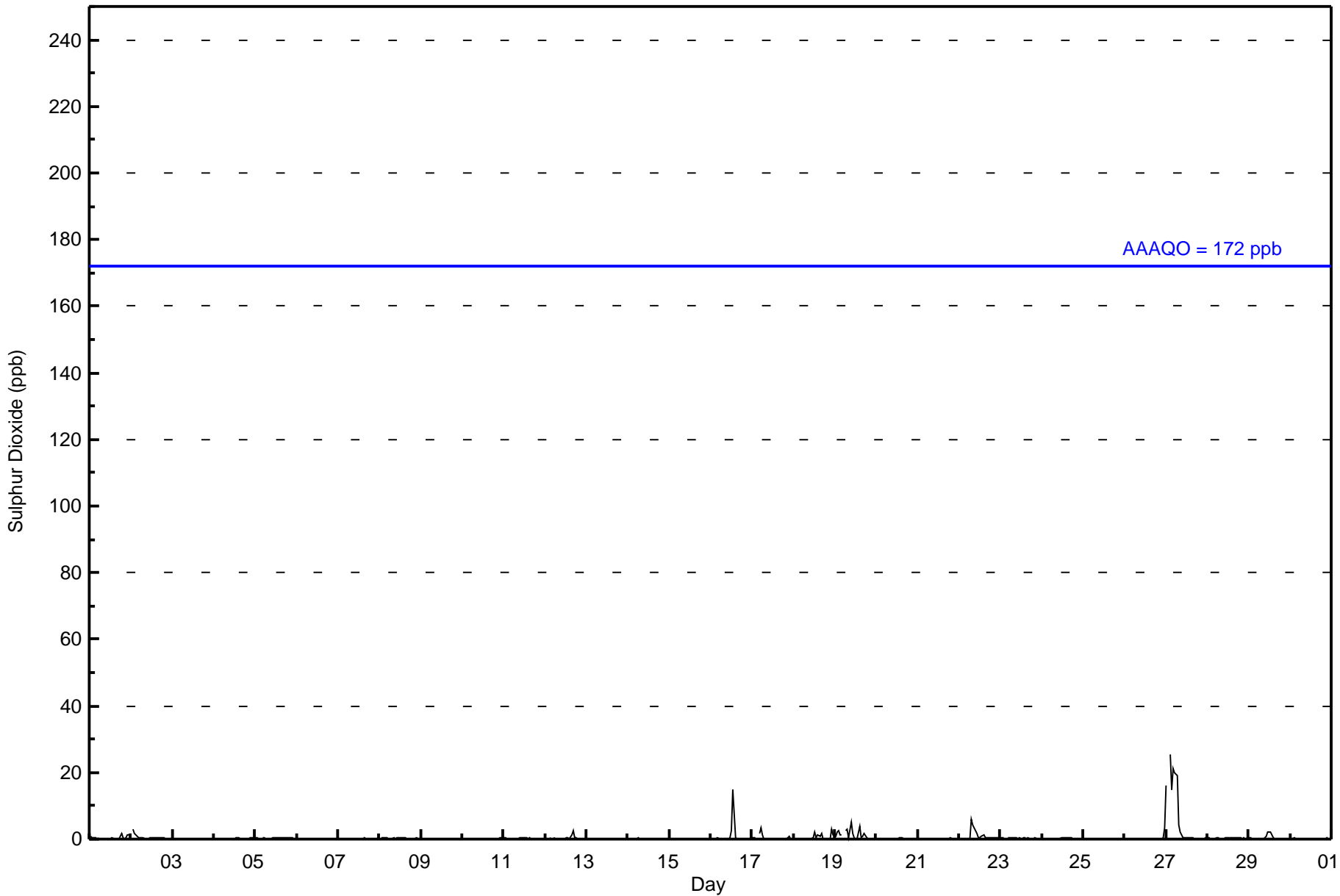
0.9	0.4	1.3	0.8	1.1	1.1	0.9	0.6	0.4	0.4	0.3	0.3	0.3	0.4	0.8	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.3	0.3	Diurnal Average	
16	3	26	15	21	20	19	6	4	5	2	2	3	15	4	1	3	2	2	0	0	1	3	3	Diurnal Maximum		

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 - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	679	98.98	98.98
11 - 20	5	0.73	99.71
21 - 60	2	0.29	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: 686

Total Number of Hours: 720



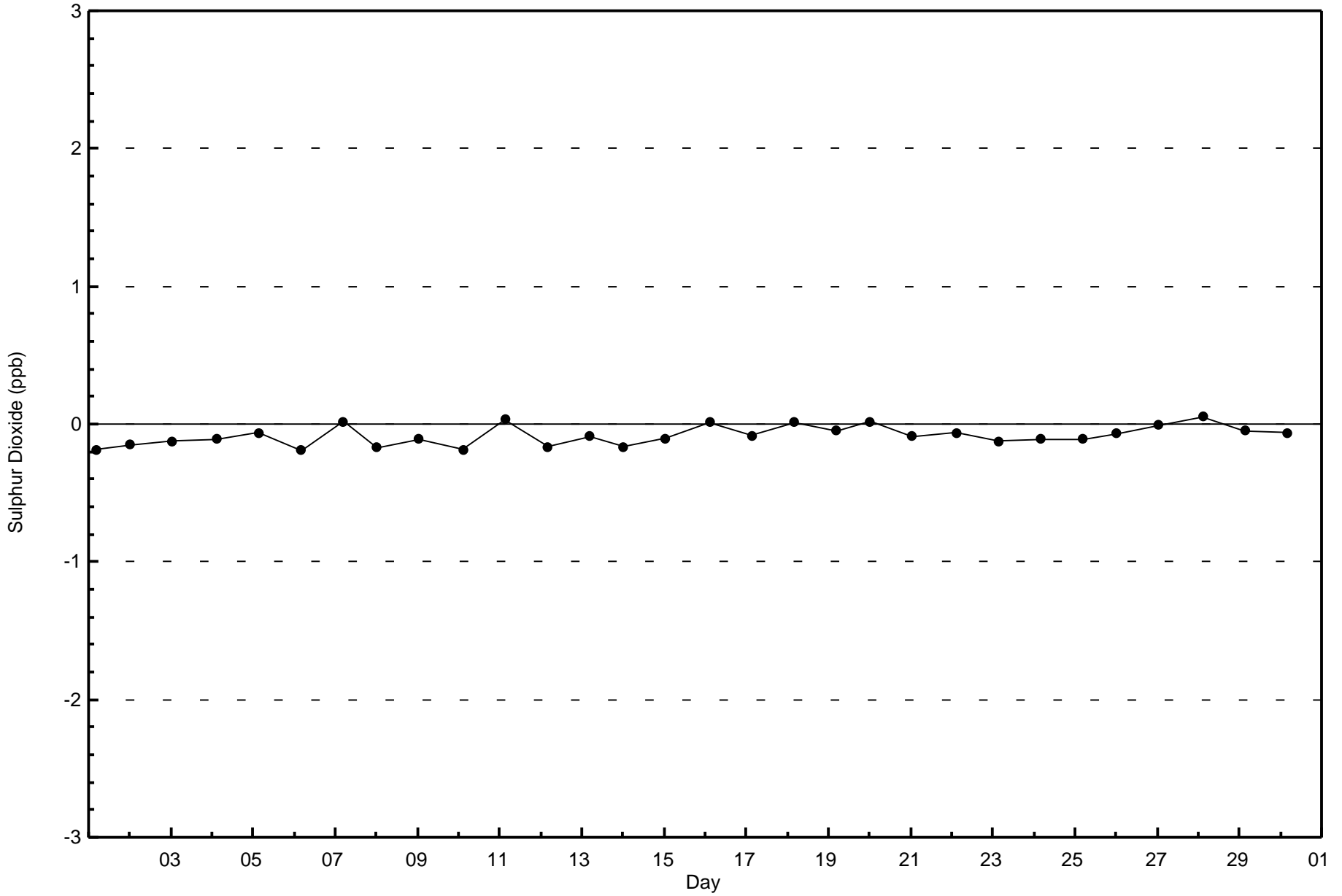
**Wood Buffalo Environmental Association
Frequency Distribution**

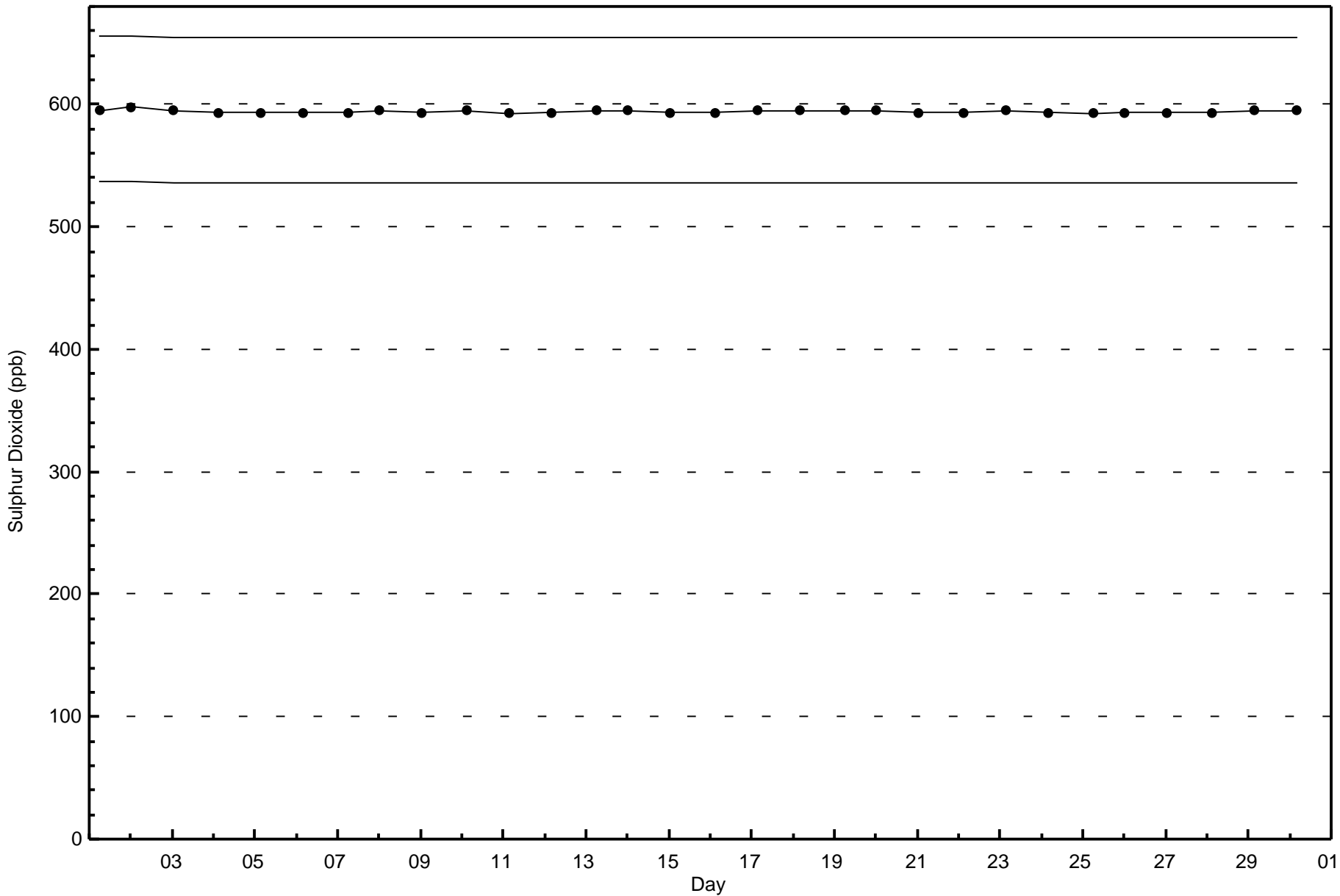
**Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - November 2016**

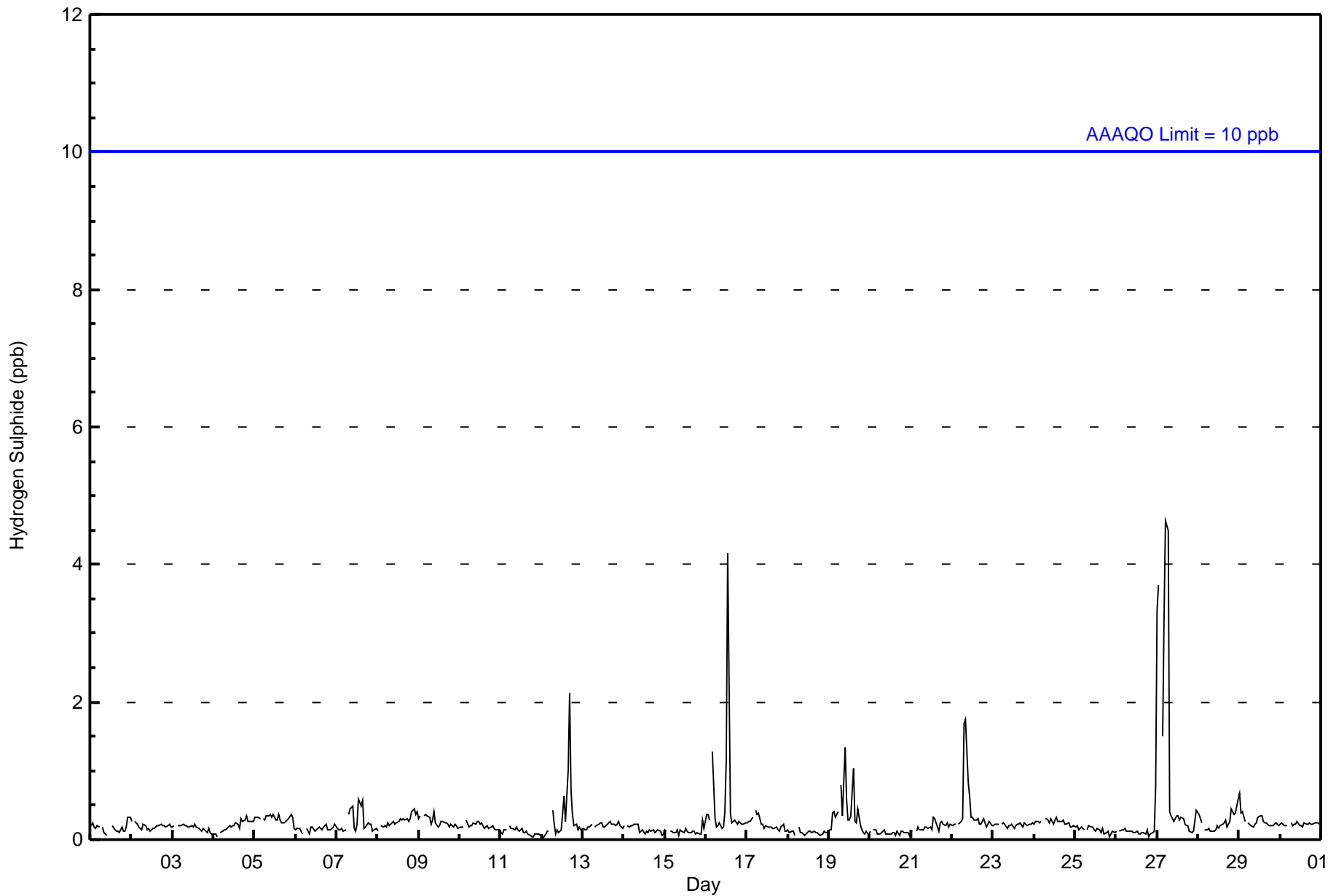
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	28	20	5	6	11	8	113	191	42	28	48	77	42	20	26	14	679
11 - 20	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5
21 - 60	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	28	21	10	6	12	8	113	191	42	28	48	77	42	20	26	14	686

Total Number of Valid Hours: 686

Total Number of Hours: 720









**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	681	99.13	99.13
3 - 4	5	0.73	99.85
5 - 7	1	0.15	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - 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 - 2	30	19	7	5	12	9	112	192	42	26	48	74	43	23	26	13	681
3 - 4	0	1	3	0	1	0	0	0	0	0	0	0	0	0	0	0	5
5 - 7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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	30	20	11	5	13	9	112	192	42	26	48	74	43	23	26	13	687

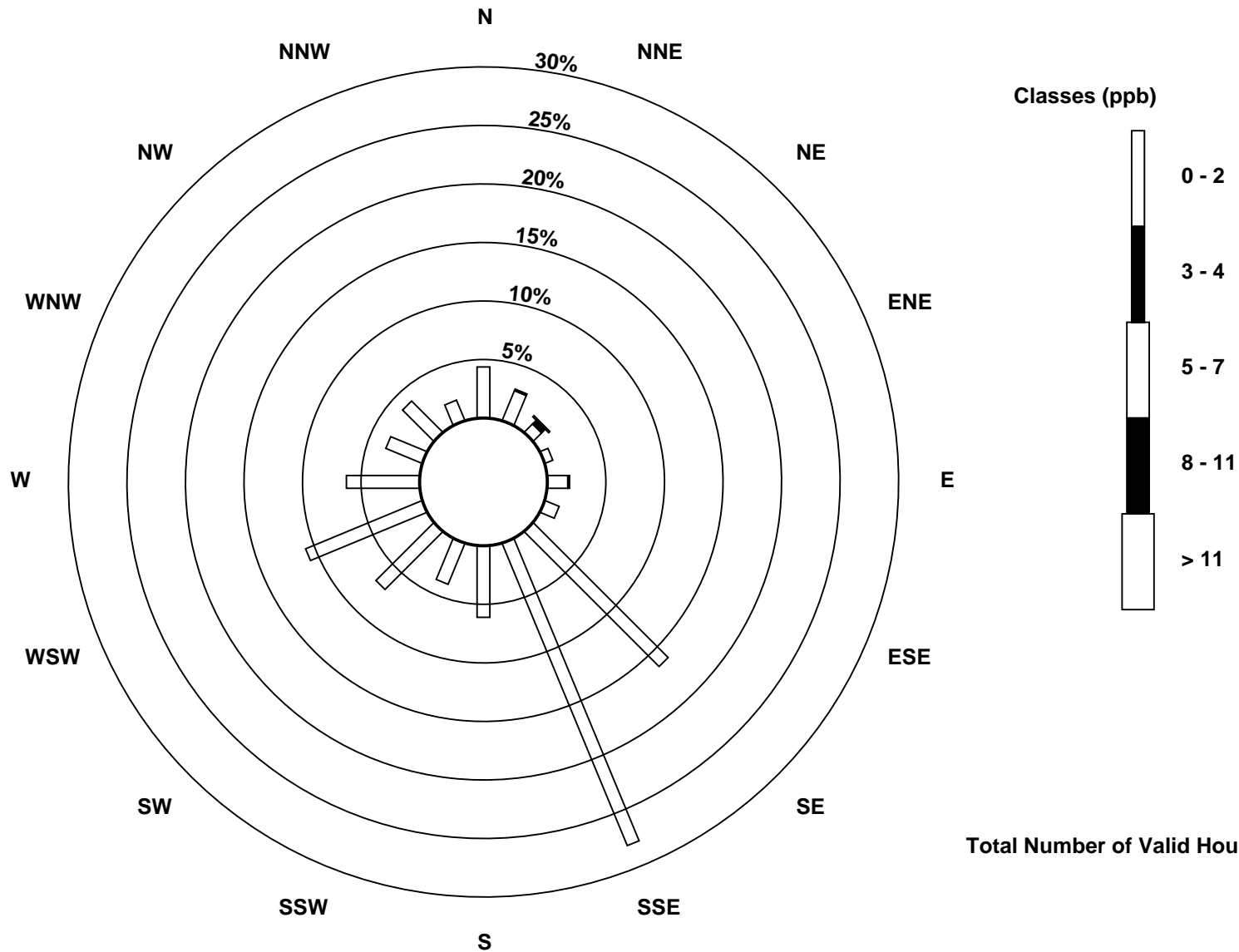
Total Number of Valid Hours: 687

Total Number of Hours: 720

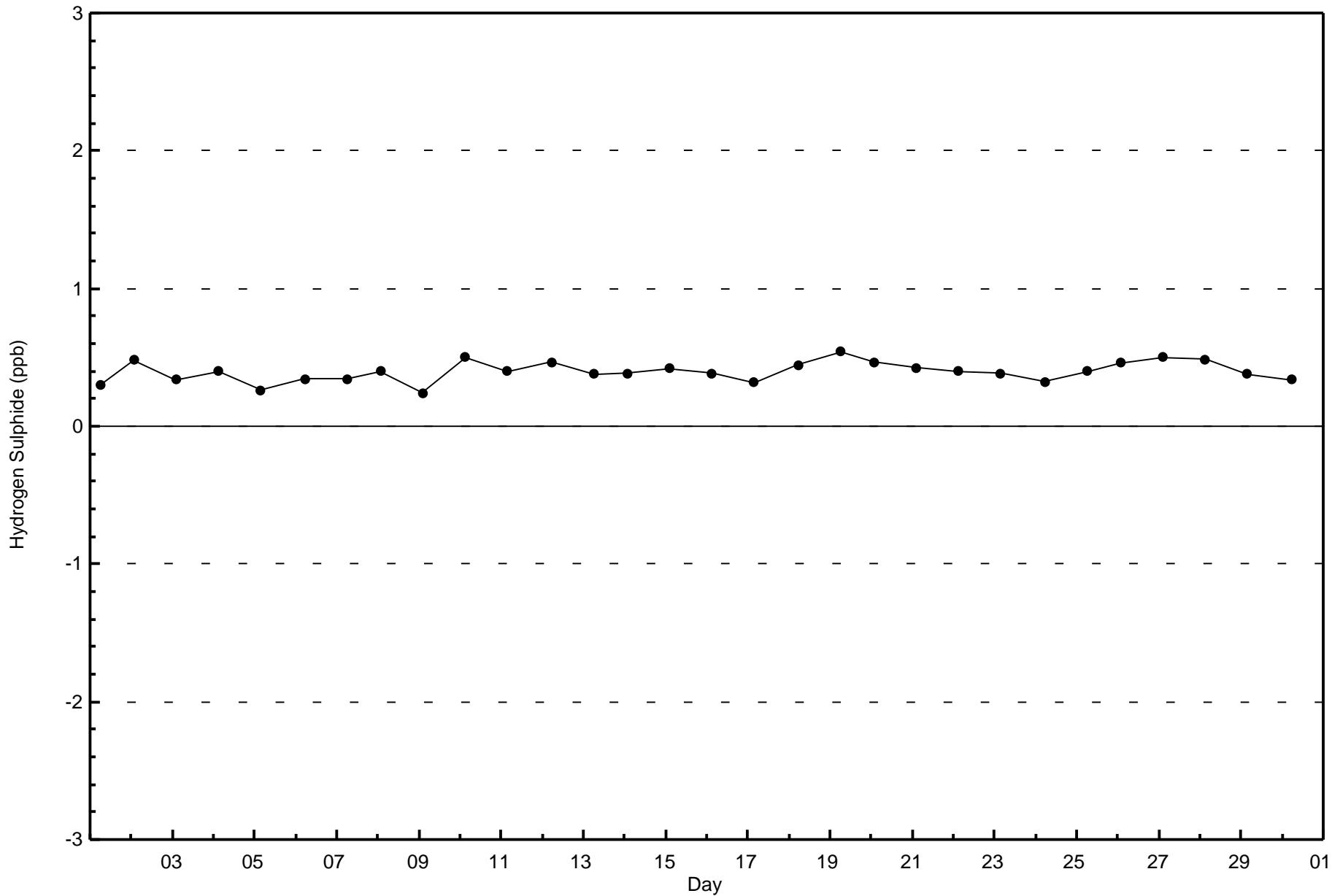


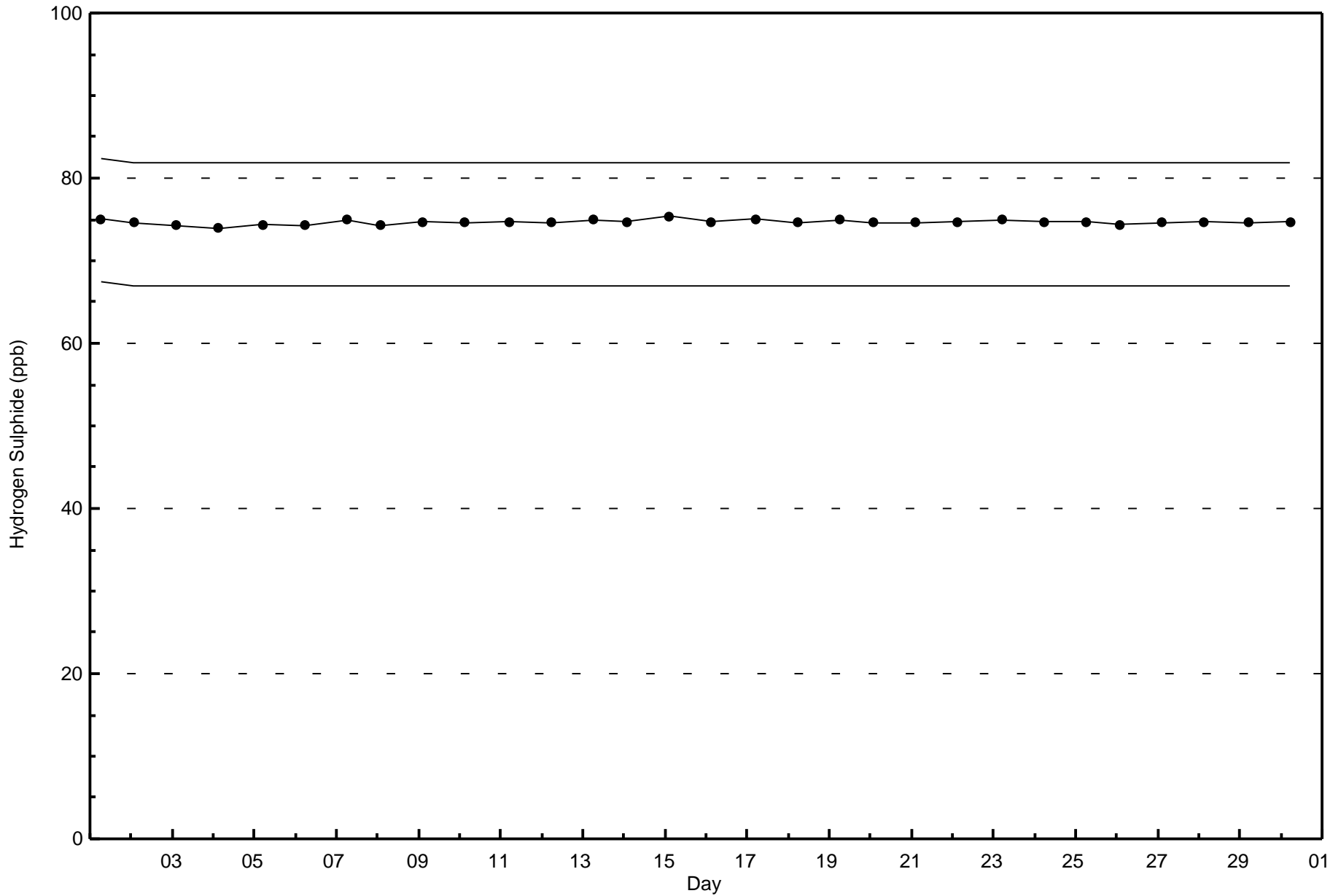
Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 687







Wood Buffalo Environmental Association
Summary of Hour Averages

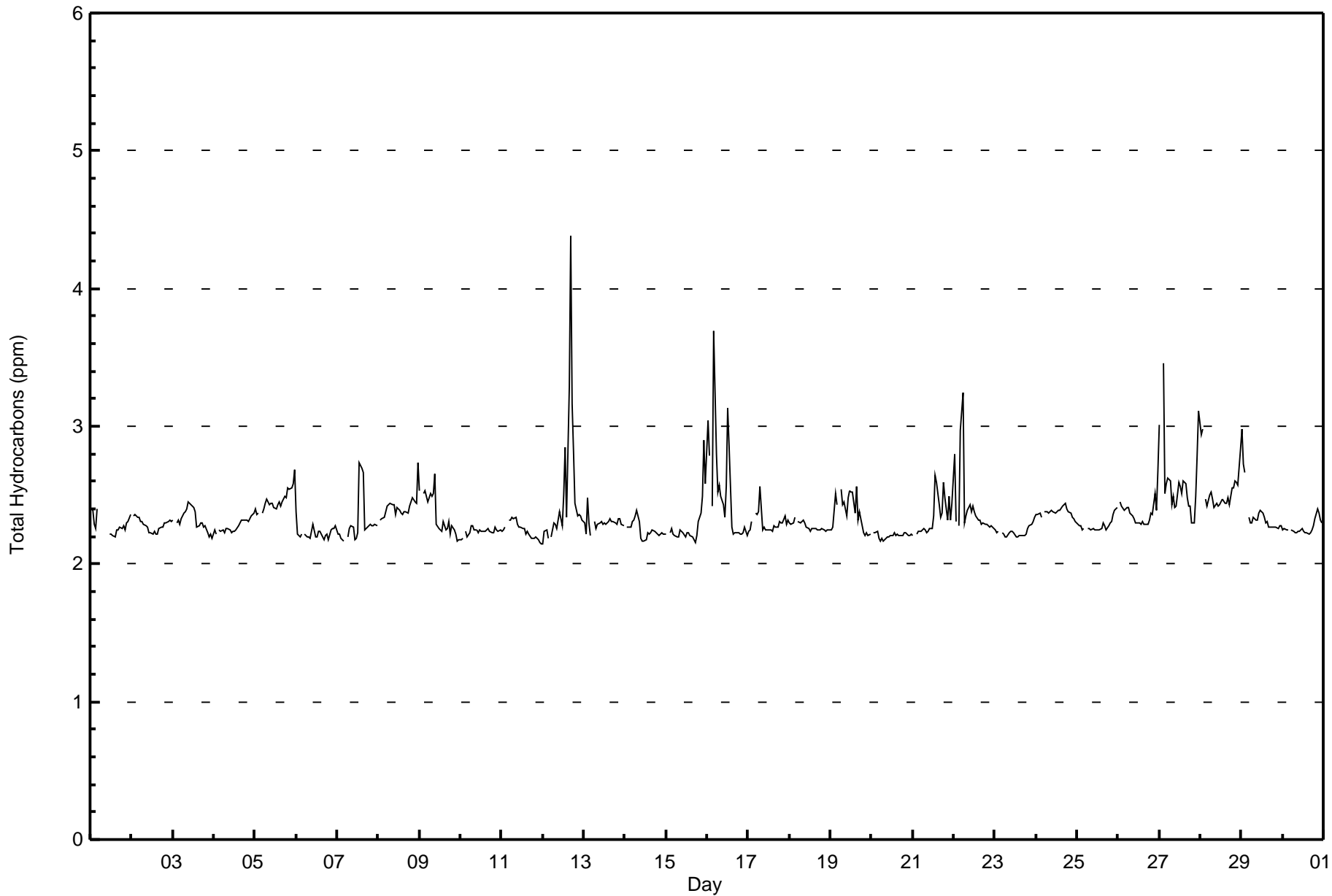
Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - November 2016

Maximum Value: 4.4 ppm on Nov 12 17:00																	Maximum Daily Average: 2.6 ppm on Nov 27																	Hours in Service: 720	
Minimum Value: 2.1 ppm on Nov 12 01:00																	Minimum Daily Average: 2.2 ppm on Nov 20																	Hours of Data: 686	
Maximum Diurnal Average: 2.4 ppm at hour 1																	Minimum Diurnal Average: 2.3 ppm at hour 11																	Hours of Missing Data: 34	
Monthly Average: 2.34 ppm																	Percentiles: P ₁ = 2.2 P ₁₀ = 2.2 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.4 P ₉₀ = 2.5 P ₉₉ = 3.1																	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-Nov	2.4	2.4	2.3	2.3	2.4	Z	2.2	C	C	C	C	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.3	2.4	2.3	2.4									
2-Nov	Z	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	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3									
3-Nov	2.3	Z	2.3	2.3	2.3	2.3	2.4	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	2.2	2.2	2.2	2.2	2.3	2.4									
4-Nov	2.2	2.2	Z	2.2	2.2	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	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.4									
5-Nov	2.4	2.4	2.4	Z	2.4	2.4	2.4	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.5	2.5	2.6	2.5	2.5	2.6	2.7	2.5	2.7									
6-Nov	2.4	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.4									
7-Nov	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.7	2.7	2.7	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.7									
8-Nov	Z	2.3	2.3	2.3	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	2.4	2.5	2.5	2.4	2.7	2.4	2.7									
9-Nov	2.5	Z	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.3	2.3	2.3	2.2	2.3	2.2	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.4	2.7									
10-Nov	2.2	2.2	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.3									
11-Nov	2.2	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	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.3									
12-Nov	2.1	2.2	2.2	2.2	Z	2.2	2.3	2.3	2.3	2.3	2.4	2.3	2.5	2.8	2.3	3.3	4.4	3.2	2.8	2.4	2.4	2.4	2.3	2.3	2.5	4.4									
13-Nov	2.3	2.2	2.5	2.3	2.2	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	2.5									
14-Nov	Z	2.3	2.3	2.3	2.3	2.3	2.4	2.4	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	2.4									
15-Nov	2.2	Z	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	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.9	2.6	2.3									
16-Nov	3.0	2.8	Z	2.4	3.7	2.8	2.5	2.6	2.5	2.4	2.3	2.6	3.1	2.9	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.5	3.7									
17-Nov	2.2	2.2	2.3	Z	2.4	2.4	2.4	2.6	2.2	2.3	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.6									
18-Nov	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.3									
19-Nov	2.2	2.3	2.4	2.5	2.4	Z	2.5	2.4	2.5	2.3	2.5	2.5	2.5	2.5	2.4	2.6	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.4	2.6									
20-Nov	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	2.2									
21-Nov	2.2	Z	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.6	2.6	2.4	2.3	2.4	2.6	2.5	2.3	2.5	2.3	2.4	2.3	2.6									
22-Nov	2.8	2.3	Z	2.3	3.0	3.2	2.3	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	2.3	2.3	2.3	2.3	2.4									
23-Nov	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	2.3	2.3	2.2	2.3									
24-Nov	2.4	2.4	2.4	2.3	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	2.4	2.3	2.3	2.3	2.4	2.4									
25-Nov	2.3	2.3	2.3	2.2	2.3	Z	2.3	2.3	2.2	2.3	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.4									
26-Nov	Z	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	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.4	2.7	2.4	2.7									
27-Nov	3.0	Z	3.5	2.5	2.6	2.6	2.6	2.4	2.5	2.4	2.4	2.6	2.6	2.5	2.6	2.6	2.5	2.4	2.4	2.3	2.3	2.5	2.8	3.1	2.6	3.5									
28-Nov	2.9	3.0	Z	2.5	2.4	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.5	2.4	2.5	2.6	2.6	2.6	2.6	2.8	2.5	3.0									
29-Nov	3.0	2.7	2.7	Z	2.3	2.3	2.3	2.3	2.3	2.3	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	2.4	3.0									
30-Nov	2.2	2.3	2.2	2.2	Z	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	2.2	2.3	2.3	2.4	2.4	2.3	2.3	2.4									
																								Diurnal Average											
																								Diurnal Maximum											
																								Z - zerospan C - Calibration											



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	678	98.83	98.83
3.1 - 10.0	8	1.17	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - November 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	28	20	9	5	11	8	113	191	42	27	47	77	42	20	24	14	678
3.1 - 10.0	0	1	1	1	1	0	0	0	0	1	1	0	0	0	2	0	8
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	28	21	10	6	12	8	113	191	42	28	48	77	42	20	26	14	686

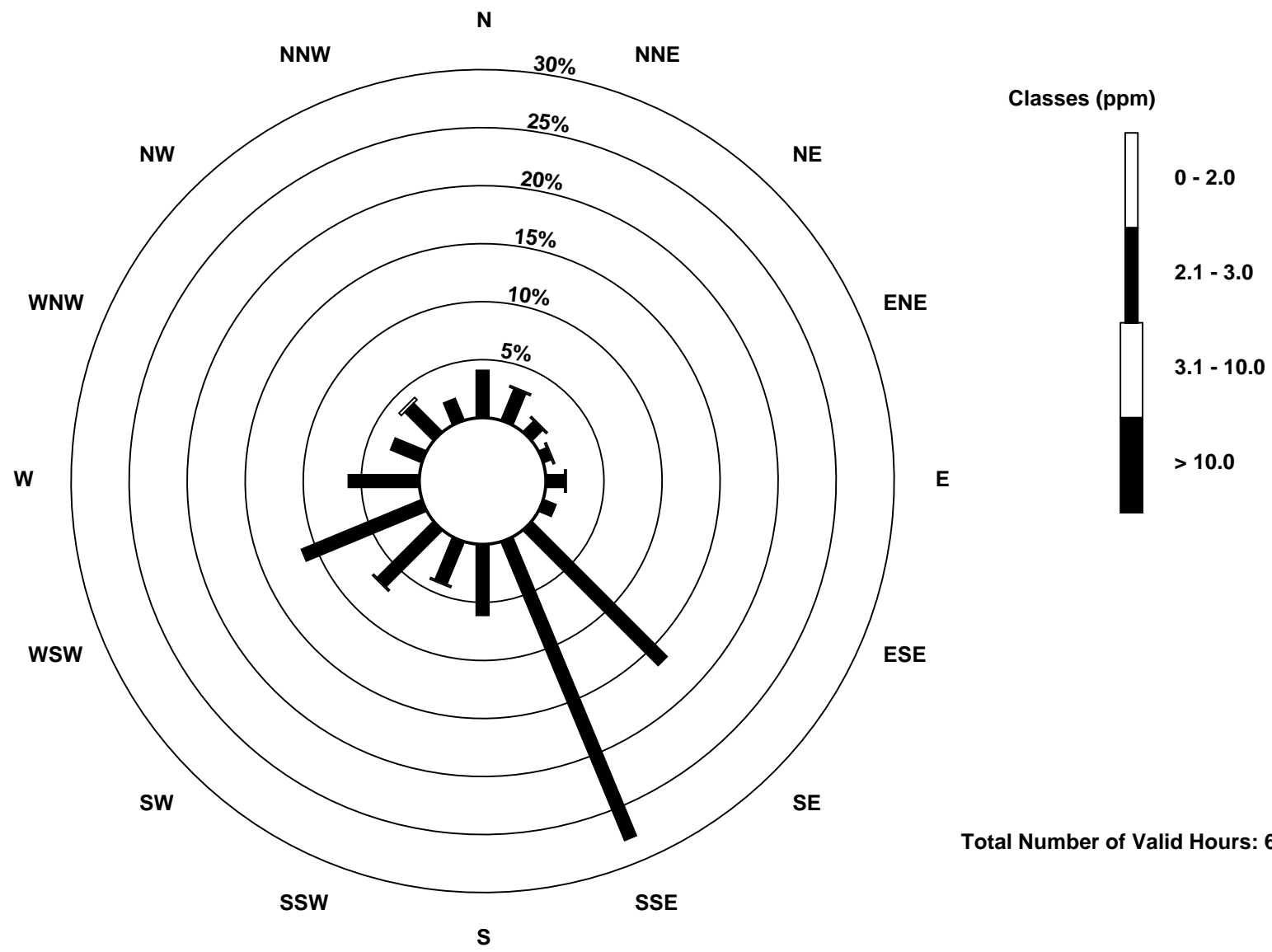
Total Number of Valid Hours: 686

Total Number of Hours: 720

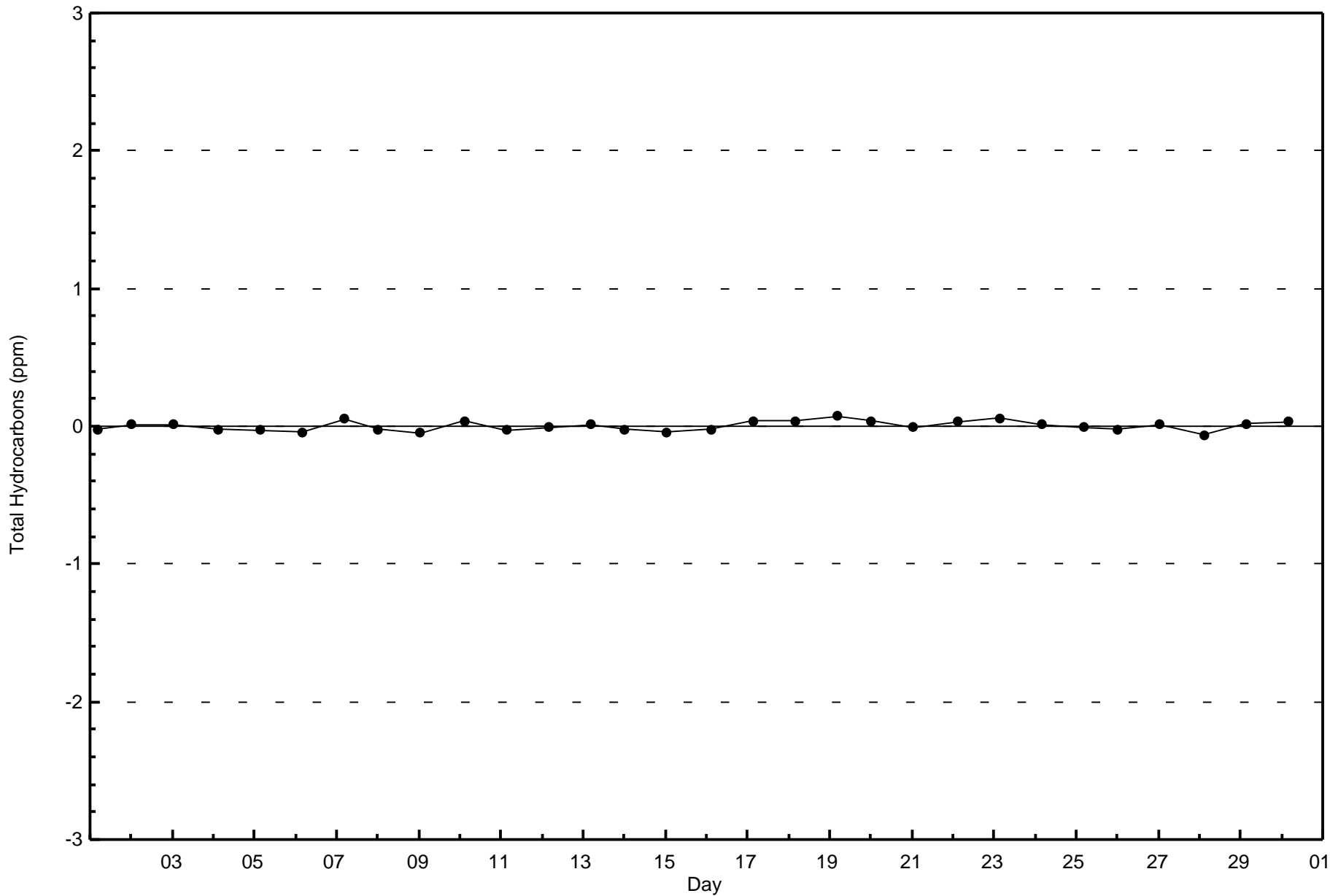


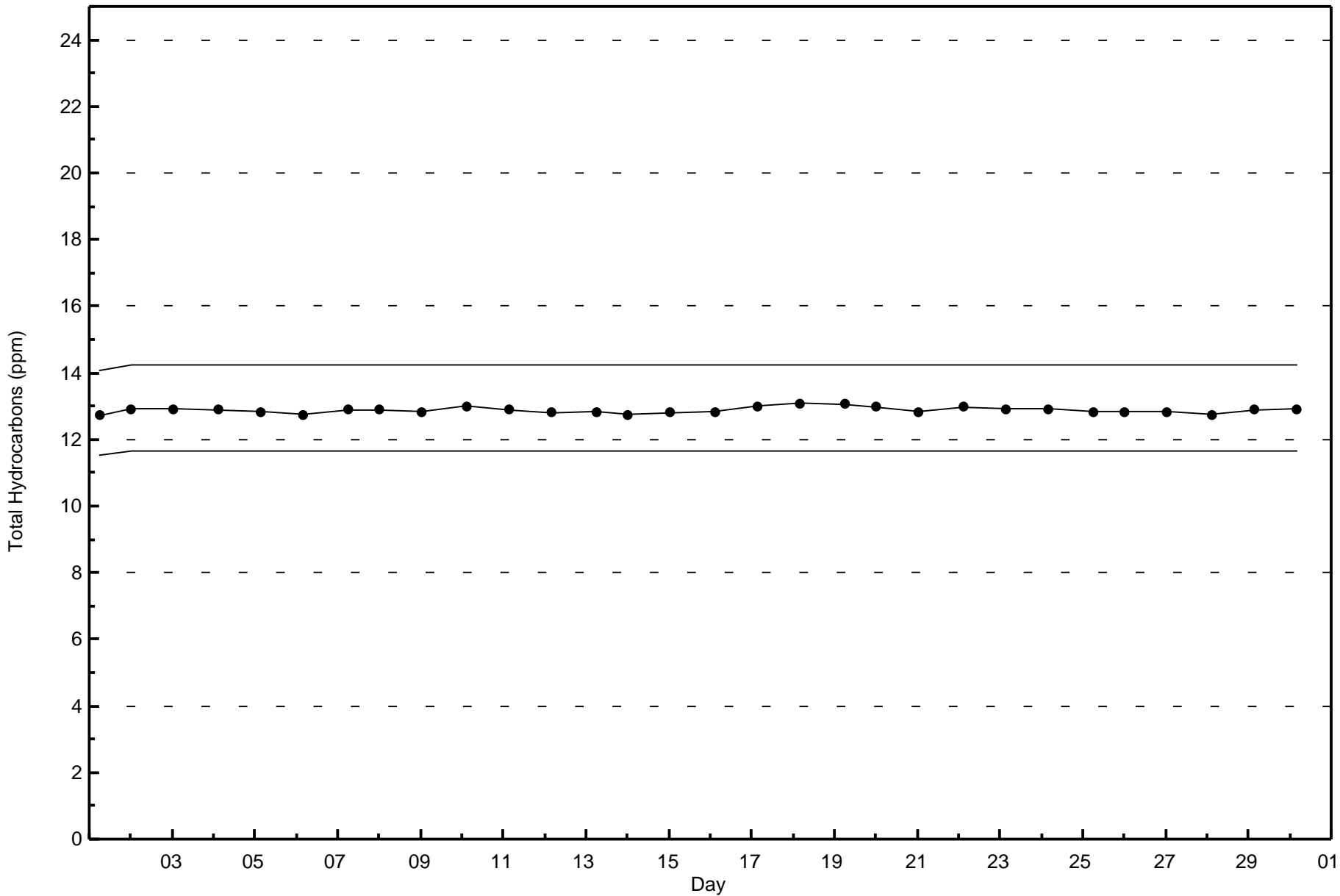
Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 686



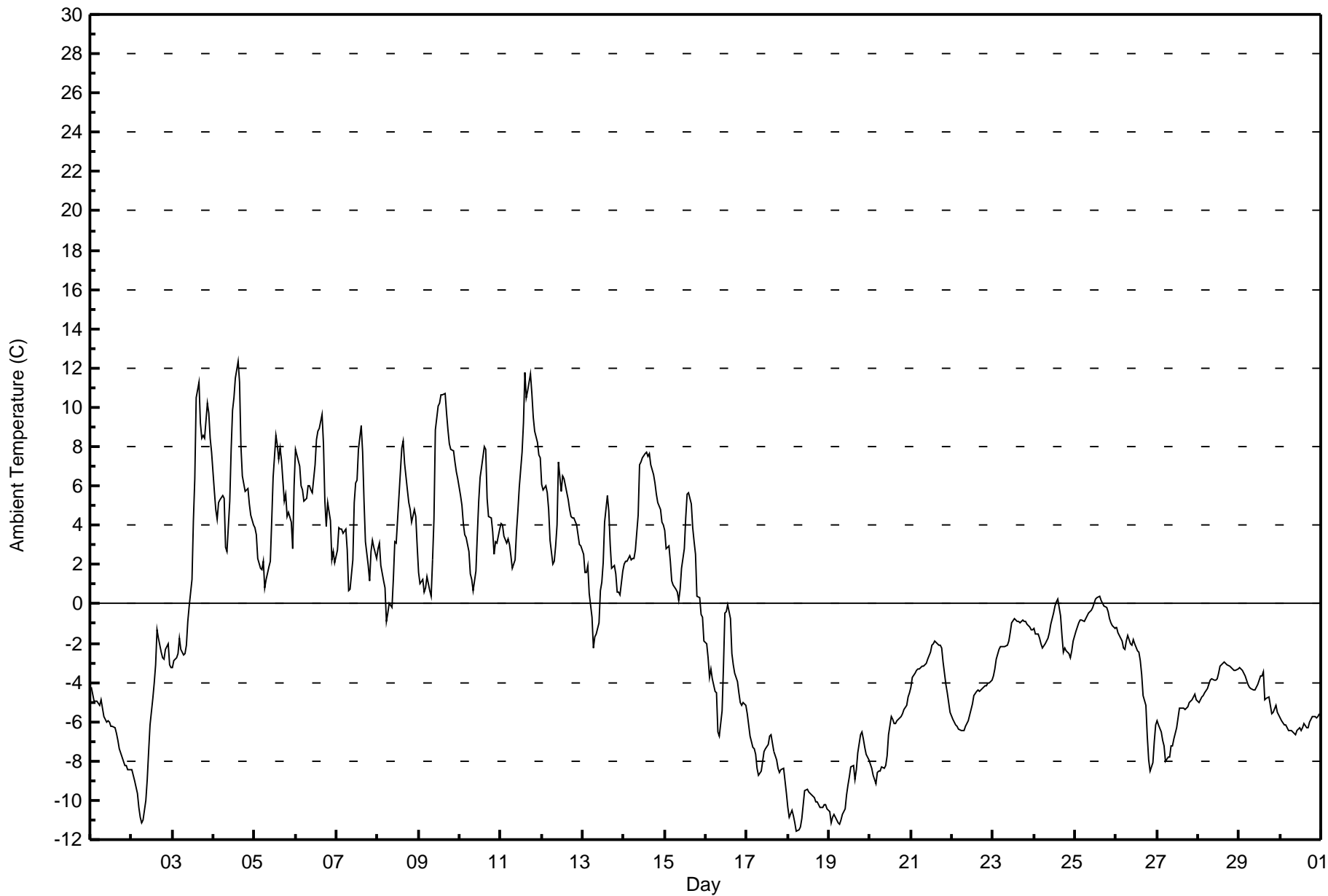




Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 12.3 C on Nov 4 15:00		Maximum Daily Average: 6.5 C on Nov 4		Hours in Service: 720																							
Minimum Value: -11.6 C on Nov 18 06:00		Minimum Daily Average: -10.4 C on Nov 18		Hours of Data: 720																							
Maximum Diurnal Average: 1.4 C at hour 15		Minimum Diurnal Average: -2.8 C at hour 8		Hours of Missing Data: 0																							
Monthly Average: -0.98 C		Percentiles: P ₁ = -11.2 P ₁₀ = -8.2 Q ₁ = -5.5 Median = -1.7 Q ₃ = 3.5 P ₉₀ = 7.0 P ₉₉ = 10.6		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-Nov	-4.2	-4.6	-5.0	-4.9	-5.0	-5.2	-4.9	-5.3	-5.8	-6.0	-6.0	-6.0	-6.2	-6.2	-6.3	-6.6	-6.9	-7.4	-7.8	-8.0	-8.2	-8.2	-8.5	-8.5	-6.3	-4.2	
2-Nov	-8.4	-8.7	-9.0	-9.7	-10.4	-10.9	-11.1	-11.0	-10.0	-8.9	-7.5	-6.1	-4.8	-4.0	-3.1	-1.3	-1.7	-2.5	-2.7	-2.8	-2.3	-2.1	-3.1	-3.2	-6.1	-1.3	
3-Nov	-3.3	-2.9	-2.8	-2.6	-1.7	-2.3	-2.6	-2.5	-2.1	-0.9	-0.1	1.2	4.2	6.3	10.5	11.3	9.2	8.4	8.6	8.4	10.2	9.7	8.4	7.7	3.4	11.3	
4-Nov	5.7	4.8	4.3	5.1	5.3	5.5	5.4	2.8	2.7	5.2	7.8	9.8	10.5	11.5	12.3	11.3	8.0	6.5	5.7	5.8	5.9	5.1	4.5	4.0	6.5	12.3	
5-Nov	3.9	3.5	2.3	1.8	1.8	2.2	0.8	1.3	1.9	2.2	4.2	6.5	8.6	8.1	7.4	7.9	7.3	5.2	5.6	4.5	4.7	4.2	2.8	6.0	4.4	8.6	
6-Nov	7.9	7.6	7.0	6.0	5.8	5.2	5.4	6.0	6.0	5.8	5.6	7.0	8.4	8.8	8.9	9.6	8.2	5.2	4.0	5.2	4.2	2.3	2.7	2.1	6.0	9.6	
7-Nov	2.8	3.9	3.8	3.8	3.6	3.8	2.7	0.7	0.7	2.3	5.2	6.2	6.3	7.9	9.1	7.7	5.2	3.2	2.0	1.2	2.7	3.2	2.9	2.3	3.9	9.1	
8-Nov	2.8	3.1	2.0	1.2	0.8	-0.9	-0.4	0.1	-0.2	1.3	3.1	3.1	5.5	6.7	7.9	8.3	7.1	5.8	5.2	4.8	4.2	4.8	4.5	3.0	3.5	8.3	
9-Nov	1.6	1.1	1.2	0.6	0.8	1.4	0.7	0.4	2.2	4.3	8.8	10.1	10.2	10.7	10.7	10.7	9.7	8.9	8.1	7.8	7.8	7.2	6.7	6.3	5.8	10.7	
10-Nov	5.5	5.0	4.1	3.5	3.4	2.7	1.5	1.2	0.6	1.7	3.5	5.2	6.5	6.9	8.0	7.9	5.3	4.5	4.4	3.7	2.5	3.1	3.1	3.8	4.1	8.0	
11-Nov	4.1	4.0	3.4	3.1	3.3	3.0	2.5	1.8	2.2	3.7	4.7	5.9	7.7	9.2	11.8	10.5	10.9	11.7	10.7	9.5	8.8	8.2	7.6	7.4	6.5	11.8	
12-Nov	6.1	5.8	6.0	5.6	4.8	3.2	2.0	2.2	2.9	4.0	7.2	5.7	6.5	6.3	6.0	5.3	4.8	4.5	4.4	4.3	4.0	3.5	3.0	2.9	4.6	7.2	
13-Nov	2.5	1.6	1.6	1.9	0.5	-0.7	-2.3	-1.7	-1.6	-0.9	0.7	1.1	2.1	4.2	5.5	4.8	3.0	1.8	1.9	1.5	0.6	0.6	0.4	1.6	1.3	5.5	
14-Nov	2.0	2.2	2.2	2.4	2.2	2.3	2.3	2.8	4.5	7.1	7.2	7.5	7.7	7.7	7.5	7.7	7.1	6.6	6.1	5.6	5.2	4.8	4.2	4.0	5.0	7.7	
15-Nov	3.8	2.8	2.9	2.2	1.2	1.0	0.8	0.6	0.2	0.7	1.8	2.8	4.4	5.6	5.7	5.1	3.9	3.2	2.5	0.4	0.3	-0.5	-0.7	-1.9	2.0	5.7	
16-Nov	-2.1	-2.8	-3.8	-3.3	-3.8	-4.4	-4.6	-6.5	-6.7	-5.4	-3.2	-0.4	-0.4	-0.1	-0.7	-2.6	-3.1	-3.5	-3.9	-4.5	-5.0	-5.1	-5.1	-5.1	-3.6	-0.1	
17-Nov	-5.6	-6.1	-6.7	-7.3	-7.4	-7.6	-8.3	-8.7	-8.5	-8.0	-7.5	-7.4	-7.2	-6.7	-6.7	-7.1	-7.5	-7.9	-8.4	-8.6	-8.5	-8.4	-9.0	-9.6	-7.7	-5.6	
18-Nov	-10.4	-10.9	-10.5	-10.8	-11.2	-11.6	-11.5	-11.4	-10.9	-10.2	-9.5	-9.4	-9.6	-9.7	-9.7	-9.9	-10.1	-10.1	-10.3	-10.4	-10.4	-10.2	-10.3	-10.4	-10.4	-9.4	-9.4
19-Nov	-10.6	-11.1	-10.8	-10.7	-10.8	-11.2	-11.2	-11.0	-10.7	-10.4	-9.7	-9.3	-8.8	-8.3	-8.2	-8.9	-8.5	-7.6	-6.6	-6.5	-6.9	-7.3	-7.7	-7.9	-9.2	-6.5	
20-Nov	-8.1	-8.3	-8.7	-9.1	-8.6	-8.5	-8.5	-8.3	-8.4	-8.2	-7.8	-6.7	-5.7	-5.8	-6.1	-6.1	-6.0	-5.8	-5.7	-5.6	-5.4	-5.2	-4.8	-4.5	-6.9	-4.5	
21-Nov	-4.3	-3.7	-3.5	-3.4	-3.3	-3.3	-3.2	-3.2	-3.1	-3.1	-2.8	-2.5	-2.1	-2.0	-1.9	-2.0	-2.1	-2.1	-2.2	-2.9	-4.1	-4.5	-5.0	-5.6	-3.2	-1.9	
22-Nov	-5.9	-6.0	-6.1	-6.3	-6.4	-6.5	-6.4	-6.4	-6.3	-5.9	-5.7	-5.4	-5.1	-4.7	-4.5	-4.4	-4.4	-4.4	-4.3	-4.2	-4.2	-4.0	-4.0	-3.9	-5.2	-3.9	
23-Nov	-3.6	-3.3	-2.8	-2.3	-2.2	-2.2	-2.2	-2.2	-2.1	-1.9	-1.5	-1.0	-0.8	-0.8	-0.9	-0.9	-1.0	-0.9	-0.9	-0.9	-1.0	-1.1	-1.3	-1.4	-1.6	-0.8	
24-Nov	-1.3	-1.5	-1.6	-1.8	-2.0	-2.2	-2.0	-1.9	-1.7	-1.5	-1.1	-0.5	-0.1	0.1	0.3	0.6	-1.6	-2.5	-2.2	-2.4	-2.5	-2.7	-2.4	-1.9	-1.6	0.3	
25-Nov	-1.4	-1.2	-1.0	-0.8	-0.8	-0.9	-0.8	-0.6	-0.5	-0.3	-0.2	0.0	0.2	0.3	0.4	0.2	0.0	-0.1	-0.2	-0.4	-0.8	-1.0	-1.1	-1.2	-0.5	0.4	
26-Nov	-1.2	-1.5	-1.6	-1.9	-2.2	-2.3	-1.9	-1.6	-2.1	-2.1	-1.8	-2.0	-2.4	-2.5	-2.9	-3.6	-4.7	-5.1	-6.7	-8.0	-8.5	-8.1	-7.0	-6.2	-3.7	-1.2	
27-Nov	-5.9	-6.2	-6.5	-6.9	-7.2	-8.0	-7.8	-7.8	-7.3	-7.2	-6.9	-6.3	-5.8	-5.3	-5.3	-5.3	-5.4	-5.3	-5.2	-5.0	-4.9	-4.8	-4.6	-4.9	-6.1	-4.6	
28-Nov	-5.0	-4.9	-4.7	-4.6	-4.5	-4.3	-4.1	-3.9	-3.8	-3.9	-3.9	-3.8	-3.5	-3.2	-3.0	-2.9	-3.0	-3.1	-3.1	-3.2	-3.3	-3.4	-3.4	-3.3	-3.7	-2.9	
29-Nov	-3.2	-3.3	-3.4	-3.7	-3.9	-4.1	-4.3	-4.3	-4.4	-4.4	-4.2	-4.1	-3.7	-3.7	-3.5	-4.9	-4.8	-4.8	-5.2	-5.6	-5.5	-5.1	-5.6	-5.7	-4.4	-3.2	
30-Nov	-5.8	-6.0	-6.1	-6.1	-6.3	-6.5	-6.4	-6.5	-6.6	-6.7	-6.4	-6.3	-6.5	-6.3	-6.1	-6.3	-6.3	-6.0	-5.8	-5.8	-5.7	-5.8	-5.7	-5.6	-6.2	-5.6	
		-1.4	-1.6	-1.8	-2.0	-2.1	-2.4	-2.7	-2.8	-2.6	-1.9	-0.9	-0.2	0.5	1.0	1.4	1.2	0.4	-0.1	-0.4	-0.7	-0.9	-1.0	-1.3	-1.3	Diurnal Average	
		7.9	7.6	7.0	6.0	5.8	5.5	5.4	6.0	6.0	7.1	8.8	10.1	10.5	11.5	12.3	11.3	10.9	11.7	10.7	9.5	10.2	9.7	8.4	7.7	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Buffalo Viewpoint - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	423	58.75	58.75
0 - 10	280	38.89	97.64
10 - 20	17	2.36	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



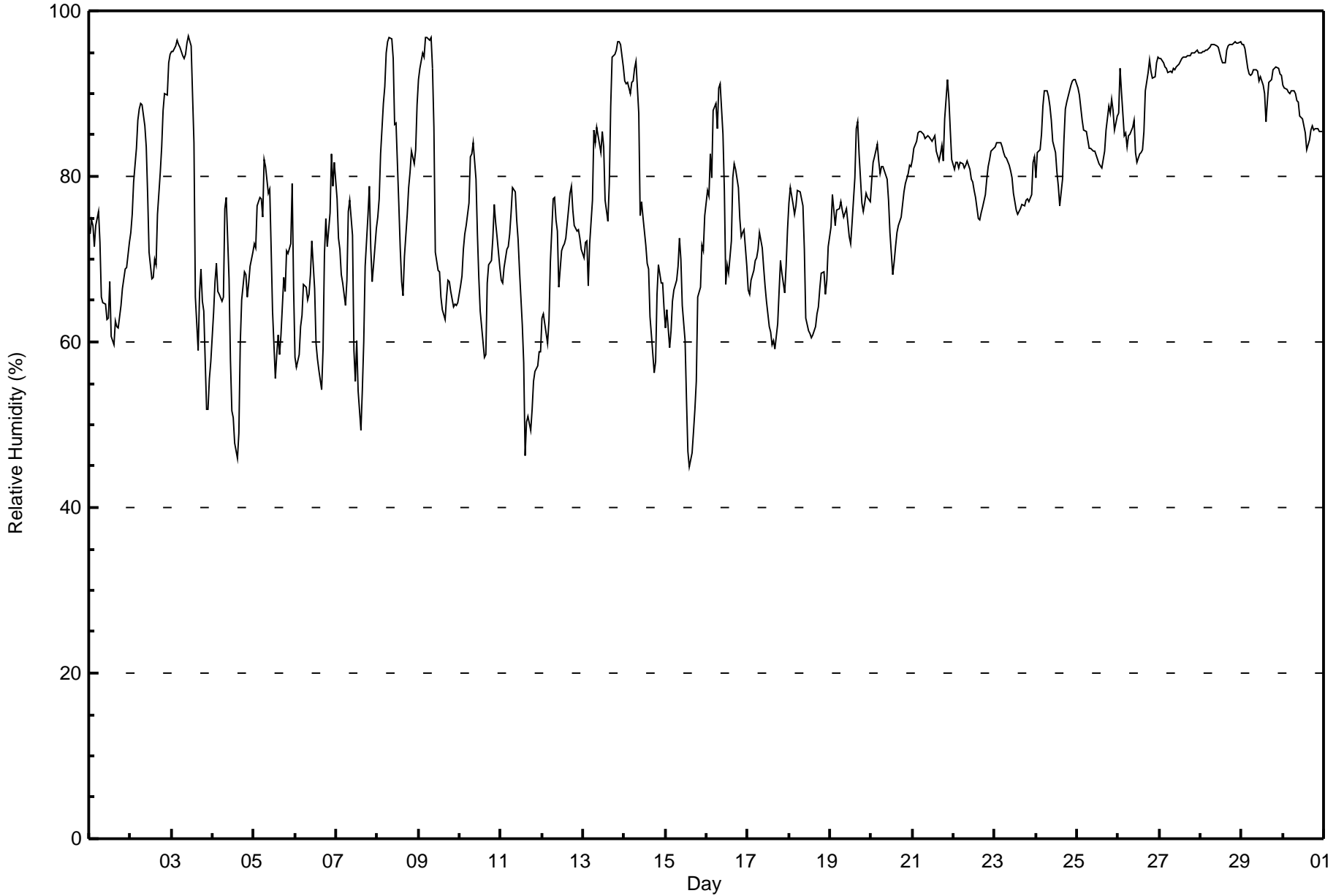
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Buffalo Viewpoint - November 2016

Maximum Value: 97 % on Nov 3 11:00 Maximum Daily Average: 95.4 % on Nov 28																	Hours in Service: 720 Hours of Data: 720																										
Minimum Value: 45 % on Nov 15 15:00 Minimum Daily Average: 61.6 % on Nov 15 Maximum Diurnal Average: 83.4 % at hour 8 Minimum Diurnal Average: 69.4 % at hour 15 Monthly Average: 77.6 % Percentiles: P ₁ = 49 P ₁₀ = 62 Q ₁ = 69 Median = 78 Q ₃ = 87 P ₉₀ = 94 P ₉₉ = 96																	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-Nov	73	75	74	72	74	76	72	65	65	65	63	63	67	61	60	63	62	62	64	66	68	69	69	72	67.4	76																	
2-Nov	73	75	79	83	87	88	89	89	86	84	78	71	68	68	70	69	75	80	84	88	90	90	94	95	81.4	95																	
3-Nov	95	95	96	96	96	96	95	94	95	96	97	96	90	84	65	59	66	69	65	64	52	52	56	58	80.2	97																	
4-Nov	64	67	70	66	66	65	65	76	78	68	58	52	51	48	46	49	60	65	68	68	65	67	69	71	63.4	78																	
5-Nov	72	71	76	77	77	75	82	81	78	78	71	64	56	59	61	58	61	68	66	71	71	72	79	67	70.5	82																	
6-Nov	58	57	58	62	63	67	67	65	66	68	72	66	60	58	57	54	59	71	75	72	76	83	79	82	66.4	83																	
7-Nov	77	73	71	68	67	64	67	76	77	73	59	55	60	54	49	54	60	69	75	79	71	67	69	74	67.1	79																	
8-Nov	75	77	83	89	91	95	96	97	97	94	86	86	77	71	67	66	70	75	79	80	83	82	83	89	82.9	97																	
9-Nov	92	93	95	94	97	97	96	97	93	86	71	69	68	65	64	63	65	67	67	66	64	65	64	65	77.7	97																	
10-Nov	67	68	71	73	74	77	82	83	84	80	73	68	64	62	58	58	67	69	70	72	77	74	73	69	71.4	84																	
11-Nov	68	67	69	71	71	73	76	79	78	75	72	69	62	57	46	50	51	49	52	55	56	57	59	59	63.4	79																	
12-Nov	63	63	61	60	63	70	77	77	75	73	67	71	72	72	73	76	78	79	76	74	73	73	73	71	71.2	79																	
13-Nov	70	72	72	67	72	77	86	84	86	84	83	85	84	77	75	79	88	94	95	95	96	96	96	93	83.6	96																	
14-Nov	92	91	91	90	91	91	93	94	88	75	77	75	72	69	69	63	61	56	58	66	69	67	67	64	76.3	94																	
15-Nov	62	64	59	61	65	66	67	69	72	70	64	60	53	47	45	47	49	52	55	65	67	72	71	75	61.6	75																	
16-Nov	78	78	83	80	88	89	86	91	91	85	78	67	69	68	72	80	82	81	79	75	73	73	74	69	78.6	91																	
17-Nov	66	66	67	69	70	70	71	73	71	69	67	65	62	61	60	60	59	62	66	70	68	66	69	74	66.7	74																	
18-Nov	77	79	77	75	76	78	78	77	76	71	63	61	61	61	61	62	63	64	66	68	69	66	67	72	69.6	79																	
19-Nov	74	78	76	74	76	76	77	76	75	76	74	73	72	74	80	86	87	83	77	76	77	78	77	77	77.0	87																	
20-Nov	79	82	82	84	82	80	81	81	80	80	77	73	68	70	72	73	74	75	77	78	79	80	81	81	77.9	84																	
21-Nov	82	83	84	85	85	85	85	85	85	85	85	84	85	85	83	82	83	84	82	87	92	89	86	82	84.7	92																	
22-Nov	81	82	82	81	82	81	81	81	82	81	80	79	78	77	75	75	76	76	78	80	81	82	83	83	79.9	83																	
23-Nov	84	84	84	84	84	83	82	82	81	81	80	78	76	75	76	76	77	76	77	77	77	78	82	82	79.8	84																	
24-Nov	80	83	83	85	89	90	90	90	88	87	84	83	80	79	77	80	84	88	89	90	91	92	92	92	86.0	92																	
25-Nov	91	90	88	87	86	85	84	83	83	83	83	83	82	81	81	82	83	86	89	88	89	88	86	87	85.3	91																	
26-Nov	88	93	90	85	85	84	85	85	86	87	83	82	83	83	83	85	90	92	94	93	92	92	94	94	87.8	94																	
27-Nov	94	94	94	93	93	93	93	93	93	93	93	94	94	94	94	94	94	95	95	95	95	95	95	95	93.9	95																	
28-Nov	95	95	95	95	95	96	96	96	96	96	96	96	95	94	94	94	95	96	96	96	96	96	96	96	95.4	96																	
29-Nov	96	96	95	93	92	92	92	93	93	93	92	92	91	90	87	89	91	92	93	93	93	93	92	92	92.3	96																	
30-Nov	91	91	91	90	90	90	90	90	89	89	87	87	86	85	83	84	86	86	86	86	86	85	85	85	87.5	91																	
																	78.5	79.4	79.9	79.7	80.9	81.7	82.8	83.4	82.9	80.8	77.1	74.8	72.8	71.0	69.4	70.4	73.3	75.4	76.4	77.8	77.9	78.0	78.7	78.8	Diurnal Average		
																	96	96	96	96	97	97	96	97	97	96	97	96	94	94	94	95	96	96	96	96	96	96	96	96	96	Diurnal Maximum	





Maximum Speed: 28 km/h on Nov 14 22:00	Maximum Daily Speed Average: 15.3 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 22 09:00	Minimum Daily Speed Average: 0.9 km/h on Nov 21	Hours of Data: 720
Maximum Diurnal Speed Average: 5.2 km/h at hour 11	Minimum Diurnal Speed Average: 2.0 km/h at hour 16	Hours of Missing Data: 0
Monthly Average Velocity: 3.7 km/h 192.9 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 7 Median = 9 Q ₃ = 12 P ₉₀ = 15 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-Nov	NW15	NNW11	N10	NNW11	NNW7	N4	NNW15	NNW20	NNW18	NNW18	NNW16	NNW17	W15	NNW17	NW17	NW16	NW17	NW18	NNW16	N14	NNE8	NE5	E5	E4	NW11.0	NNW20
2-Nov	SE5	SSE7	SSE6	SE6	SE5	SSE7	SSE9	SSE9	SSE10	SSE12	SSE12	SSE13	SSE13	SSE10	SSE12	SSE12	SSE10	SSE12	SSE12	SE10	SE8	SSE8	SE10	SE8	SSE9.3	SSE13
3-Nov	SE9	SSE11	SSE11	SSE11	SSE9	SE9	SE9	SSE8	SSE8	SSE8	SSE13	SSE11	SSE8	SSE9	S11	S9	S11	SSW14	SSW16	SSW15	SW21	SW19	SW17	SSW11	S9.9	SW21
4-Nov	SSE10	SSE11	SSE11	S11	SSW11	SSW12	SSE11	SE12	SE13	SE9	SSE9	SE7	SE9	SSE11	SSE8	SE7	SE10	SE11	SSE10	SE12	SE9	SE10	SE8	SE10	SSE9.6	SE13
5-Nov	SE11	SSE8	SE7	SSE8	S5	SSE8	SSE8	SSE7	SSE9	SE9	SSE9	SE10	SSE7	SE8	SE8	SSE11	S8	SSE8	SSE2	SSE6	SW3	S8	SSE8	WNW8	SSE6.7	SSE11
6-Nov	SW13	SW13	SW12	S8	S8	SSW9	SSW9	SW9	WSW7	W7	W8	W11	W7	W5	SW5	W4	SSW4	S7	SSW10	SW6	SW4	SSW8	SW9	SSW8	SW7.0	SW13
7-Nov	SW12	WSW12	W11	WSW8	SW12	SW13	SSW6	S7	SE5	SSE5	SW9	SW7	SSE4	NE4	NE4	SE3	SE9	SE10	SE8	SE9	SSE11	SSE11	SSE11	SE11	S5.3	SW13
8-Nov	SSE10	SSE9	SSE5	S5	SSE6	SSE6	SSE7	S6	SE7	SSE8	SSE9	SSE6	SSE7	SE7	SE9	SE8	SSE12	SE13	SE14	SE13	SE10	SE5	SSE4	E3	SSE7.7	SE14
9-Nov	SSE8	SSE9	SSE6	SSE8	SE9	SSW3	SSE6	SE2	S4	WSW7	WSW12	WSW15	WSW16	WSW13	WSW13	WSW12	WSW18	W19	W17	W16	W21	WSW22	WSW17	WSW22	WSW9.8	WSW22
10-Nov	WSW19	W17	W12	WSW12	SW8	WSW14	W10	SW8	SSE6	SSE6	SE7	SE8	SE9	SE11	SSE13	SSE10	SE9	SE12	SSE11	SSE8	SSE12	SSE12	SSE10	SSE13	S6.6	WSW19
11-Nov	SSE13	SSE10	SSE8	SE9	SSE8	SSE6	SSE6	SSE6	SSE8	SSE8	SSE7	SSE8	SSE8	SSE8	SSW10	SSE7	SSW11	SW13	SW12	SW10	WSW8	WSW10	WSW11	WSW15	S7.3	WSW15
12-Nov	W11	W11	SW11	SSW11	S8	SE7	SE8	SSE7	SSE9	SW4	WSW9	SE9	ENE3	SSE5	SE5	NE5	SSW3	SW5	W4	WSW6	W9	WSW7	W8	W12	SW4.3	W12
13-Nov	W9	SW5	W9	SW6	SSW3	SSE5	SSE8	S6	S5	SE8	SE7	SE8	SSE7	SE7	SE8	SE7	SE10	SE11	SSE11	SSE8	SE10	SE9	SSE8	SE9	SSE6.0	SSE11
14-Nov	SE9	SE9	SE10	SE9	SSE8	SSE9	SE9	SE10	S8	WSW16	WSW18	WSW20	WSW19	W16	W16	WNW21	W17	W15	WSW18	WSW26	W24	WSW28	WSW26	WSW28	WSW11.5	WSW28
15-Nov	WSW22	WNW11	WSW24	WSW27	WSW21	WSW24	WSW22	WSW19	W13	WSW21	WSW21	WSW19	WSW17	WSW15	WSW16	WSW12	SW10	WSW12	W13	NW8	W9	WNW9	NNW10	NW9	WSW15.3	WSW27
16-Nov	NNW5	NNW5	N8	N4	NW5	WSW6	WSW5	S4	SSE4	SSE5	S4	N2	ENE5	NE7	NNE15	NNE14	NNE15	NNE16	NNE16	NNE16	N16	NNE15	N14	N23	N7.2	N23
17-Nov	N23	N24	N23	N20	NNW15	NNW16	NW14	NW12	NW14	WNW10	W11	W12	WNW13	WNW13	WNW17	NW22	WNW22	NW24	NW21	NW17	NW15	NW14	NW12	WNW10	NW14.8	N24
18-Nov	W11	W12	W10	WNW7	W6	SW6	SW6	SW7	WSW6	W8	WNW9	WNW9	W8	W7	W7	W6	WSW4	SW4	SW5	SW5	SSW4	SSE3	S3	S3	WSW5.4	W12
19-Nov	SSE4	SE4	E5	ESE6	ESE7	E6	ENE6	E7	E6	ENE6	E7	E8	ESE9	E7	NNE8	NNE10	NE9	ENE6	ESE9	ESE12	ESE12	SE14	SE16	SE15	E7.0	SE16
20-Nov	ESE13	SE11	ESE9	SE8	SE10	SE11	SE9	SSE9	SE12	SSE11	SSE13	SSE11	SSE10	SSE8	SSE10	SE8	SSE7	SSE7	SSE9	SE9	SSE9	SSE7	SE9	SE10	SE9.4	SSE13
21-Nov	SE7	SE9	SE8	SE9	SSE8	SSE8	SSE9	SSE9	SSE8	SSE7	SSE8	SSW4	WNW6	WNW7	NNW4	NW9	NW10	NW10	NW10	N13	NNE13	NNE11	NNE13	NNE11	ENE0.9	N13
22-Nov	NNE11	NNE8	NE5	NNE3	N6	NNE6	ENE4	E4	SE1	E3	ESE3	SE6	SSE6	SSE7	SSE7	SSE9	SSE8	SSE10	SSE8	SSE10	SSE10	SE10	SE13	SE13	SE4.4	SSE13
23-Nov	SSE14	SE13	SE14	SSE15	SSE17	SSE14	SSE13	SSE15	SSE15	SSE15	SSE15	SSE15	SSE15	SSE14	SSE12	SE12	SE11	SSE10	SSE9	SSE10	S11	S9	S9	S7	SSE12.7	SSE17
24-Nov	S8	SSE8	SSE7	SSE8	SSE9	SSE8	SSE9	SSE9	SSE9	SSE9	SSE9	S7	SSE8	SE8	SSE8	SSE6	SE7	SE7	SE10	SSE7	SSE9	SSE13	SE14	SE14	SSE8.6	SE14
25-Nov	SE13	SE17	SE16	SE16	SE15	SE10	SE11	SSE13	SSE12	SSE10	SE8	SE7	SE5	SE5	SE2	SSW3	SW5	WSW6	WSW8	WSW9	WSW11	WSW12	WSW13	WSW13	SSE6.6	SE17
26-Nov	WSW14	WSW12	WSW13	WSW14	WSW13	WSW12	SW9	SW10	SW7	SSW7	SW11	SW10	SW7	S6	S6	SW4	WSW5	WSW3	W2	S3	SW3	SSE3	SSW2	SW1	SW6.8	WSW14
27-Nov	NNE2	E4	E2	NE6	NE6	NE6	NE8	NNE8	NNE7	N8	N8	N9	N9	N9	N9	N8	N10	NNW9	N11	N9	N8	NNW7	NNW7	NW7	N6.4	N11
28-Nov	NW6	NW5	WNW4	WSW3	WSW3	WSW5	WSW5	SW3	WSW5	WSW5	WSW4	WSW5	SSW3	SW3	SW3	S2	SSE2	SW1	N3	N4	N6	N5	NNW3	N3	W2.0	N6
29-Nov	NW5	NNW5	NW4	W4	W3	WSW3	W4	WSW2	S3	WNW1	SW4	SSW5	S6	SSE7	S7	SSE6	S7	S8	SSW8	SSW7	SSE6	SSE10	SSE9	S8	SSW3.9	SSE10
30-Nov	S11	S11	SSE10	SSE10	SE10	SE8	SSE9	SSE11	SSE12	SSE12	SSE11	SSE10	SSE11	SSE11	SSE9	SSE10	S10	S9	S10	SSE11	S11	S12	SSE11	S10	SSE10.3	SSE12

SSW3.4	S3.1	SSW3.0	S3.8	S4.3	S4.4	S4.4	S4.8	S4.8	S4.5	SSW5.2	SSW4.7	SSW4.0	S3.6	SSW3.2	SSW2.0	SSW3.2	SSW3.5	SSW3.3	SSW2.9	SSW3.2	SSW3.9	S4.0	SSW3.6	Diurnal Average
N23	N24	WSW24	WSW27	WSW21	WSW24	WSW22	WNW20	NNW18	WSW21	WSW21	WSW20	WSW19	NNW17	NNW17	NW22	WNW22	NW24	NW21	WSW26	WSW24	WSW28	WSW26	WSW28	Diurnal Maximum

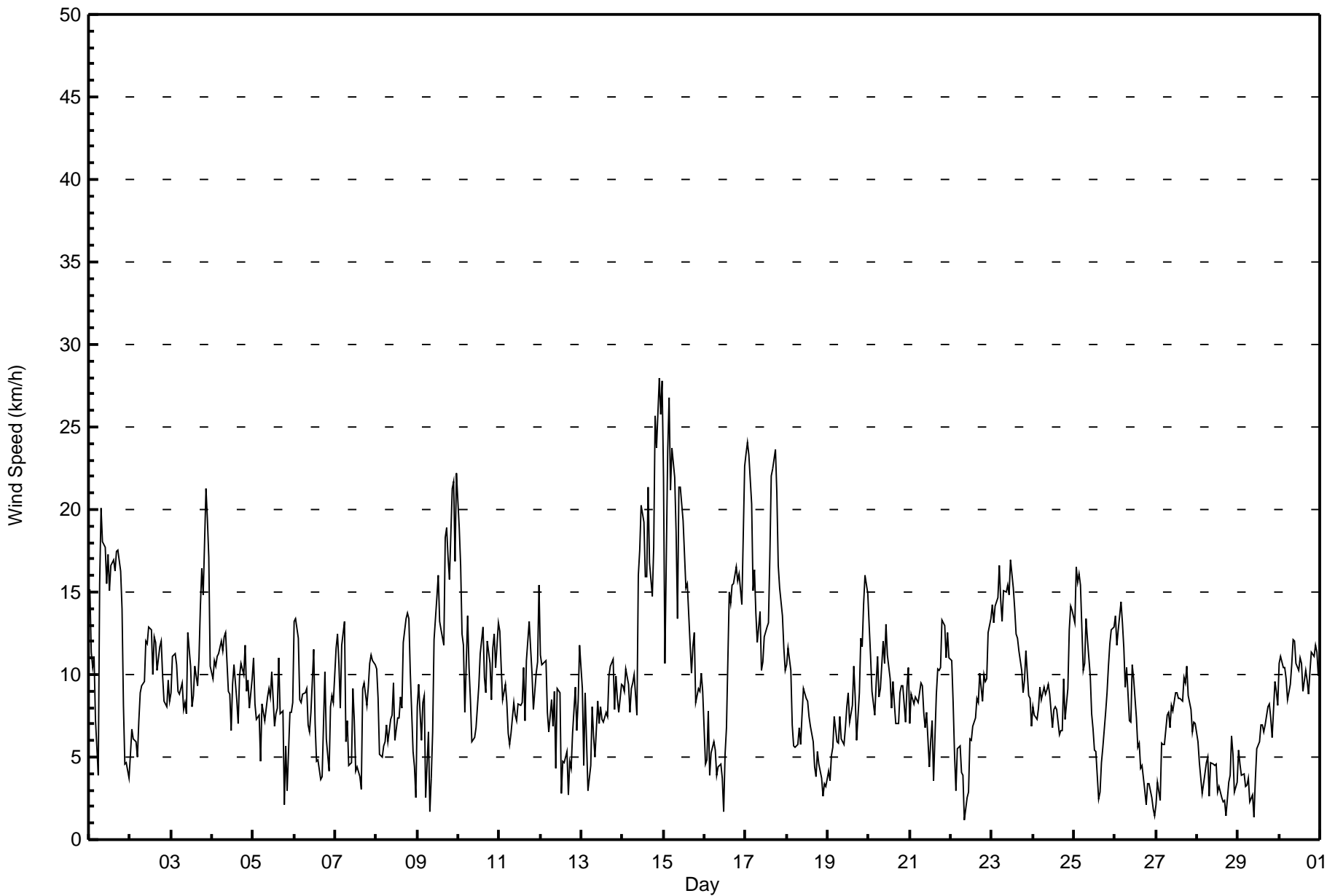
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 15 03:00 Minimum Value: 1 km/h on Nov 28 17:00 Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																	Hours in Service: 720 Hours of Data: 720 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-Nov	3	3	2	3	2	3	5	5	5	4	4	4	4	4	4	3	4	4	4	3	2	1	1	1	5
2-Nov	2	2	1	1	1	2	2	2	2	3	3	3	3	3	3	3	2	2	3	2	2	2	1	1	3
3-Nov	1	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	3	3	3	5	5	4	4	3	5
4-Nov	2	2	1	2	2	1	1	2	2	3	2	2	3	2	2	2	2	2	2	3	1	1	2	2	3
5-Nov	2	1	2	1	2	2	2	2	1	2	2	3	3	2	2	2	2	2	2	3	2	2	3	1	3
6-Nov	2	3	2	1	2	2	2	2	2	2	3	3	2	2	1	1	2	1	2	2	2	1	1	2	3
7-Nov	2	3	3	3	3	3	3	2	3	2	3	2	2	1	2	1	2	1	1	2	2	2	2	2	3
8-Nov	2	2	2	1	2	1	2	1	1	2	2	2	3	2	2	2	2	2	2	2	1	1	2	2	3
9-Nov	1	2	3	2	2	2	1	2	2	4	3	3	4	3	3	3	4	4	4	4	4	4	4	4	4
10-Nov	4	4	3	5	4	3	3	2	1	1	2	2	2	3	3	2	1	2	2	2	2	2	2	3	5
11-Nov	3	2	2	2	2	2	2	1	2	2	2	2	3	3	3	1	3	3	3	2	2	2	2	3	3
12-Nov	3	3	3	2	1	3	1	1	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	3
13-Nov	2	1	2	1	2	2	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
14-Nov	2	2	3	2	2	1	1	1	3	4	4	4	4	4	4	6	4	4	5	6	5	5	5	5	6
15-Nov	7	3	8	5	4	5	5	4	4	4	4	4	4	3	3	3	2	2	3	2	1	1	2	2	8
16-Nov	2	1	1	1	1	1	1	1	1	1	2	2	2	1	3	3	3	3	4	3	3	3	3	4	4
17-Nov	4	4	4	3	3	4	2	3	3	3	3	3	3	4	4	5	5	5	5	4	4	3	3	2	5
18-Nov	2	2	2	2	2	1	1	1	2	2	2	3	2	2	2	2	1	2	1	1	1	1	1	1	3
19-Nov	1	2	1	2	2	1	1	2	2	2	2	3	2	2	2	2	2	2	3	3	3	4	4	4	4
20-Nov	3	3	2	2	3	3	3	2	3	3	4	3	3	2	2	2	2	2	2	2	2	2	2	3	4
21-Nov	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	3	3	3	2	4	3	3	3	2	4
22-Nov	3	3	2	1	1	2	1	1	1	1	1	2	2	2	2	3	2	3	3	4	3	3	3	3	4
23-Nov	4	3	3	4	4	4	3	4	4	4	4	4	4	4	3	3	3	3	2	3	3	2	3	2	4
24-Nov	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	3	3	3	4	4
25-Nov	4	4	5	5	5	3	3	4	3	2	2	2	1	1	1	1	1	1	2	2	2	3	3	3	5
26-Nov	3	3	3	3	3	3	2	3	2	2	3	3	2	2	2	1	1	1	1	1	1	1	1	1	3
27-Nov	1	1	1	2	1	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
28-Nov	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	2
29-Nov	2	1	1	2	1	1	1	1	1	1	1	1	2	2	2	1	2	3	2	2	3	2	2	3	3
30-Nov	3	3	3	3	2	2	2	3	3	3	3	3	3	4	3	3	3	3	3	3	3	4	3	3	4
																	Diurnal Maximum								





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	122	16.94	16.94
6 - 11	409	56.81	73.75
12 - 19	160	22.22	95.97
20 - 28	29	4.03	100.00
29 - 38	0	0.00	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
Buffalo Viewpoint - 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	2	5	3	8	1	11	14	11	10	18	14	7	3	3	5	122
6 - 11	15	10	6	3	6	5	86	150	32	14	20	15	22	11	8	6	409
12 - 19	4	9	0	0	0	3	21	36	1	4	10	33	15	9	12	3	160
20 - 28	5	0	0	0	0	0	0	0	0	0	1	16	1	3	3	0	29
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	31	21	11	6	14	9	118	200	44	28	49	78	45	26	26	14	720

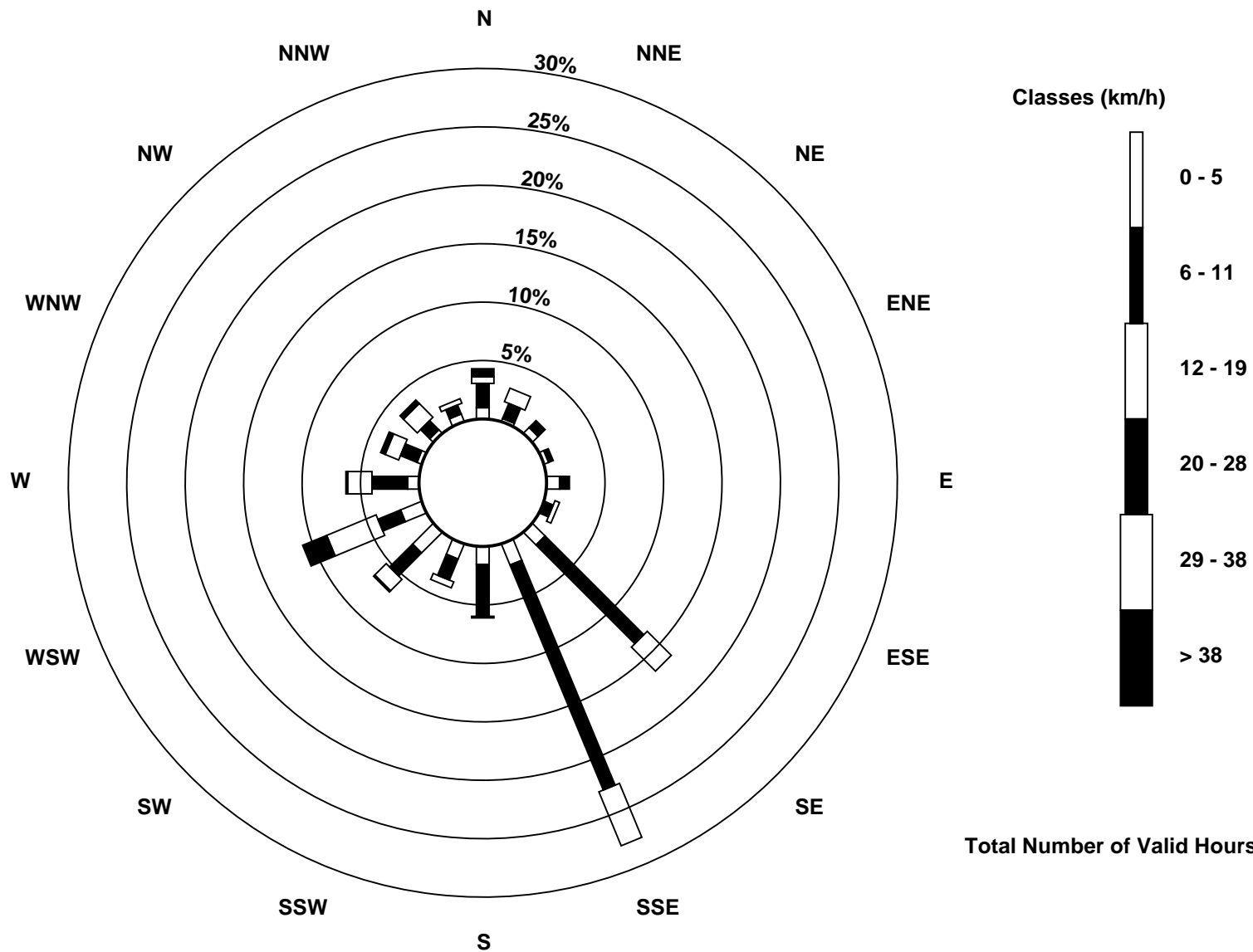
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 253 deg on Nov 14 22:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 256.4 deg on Nov 15	Hours of Data: 720
Direction of Minimum Speed: 144 deg on Nov 22 09:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 0.9 deg on Nov 21	Percent Operational Time: 100.0
Monthly Average Direction: 209.6 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-Nov	325	340	355	335	334	351	303	294	288	285	287	295	278	286	305	321	317	324	335	7	26	43	91	84	315.4
2-Nov	146	155	153	143	142	160	158	154	162	154	159	155	162	166	157	165	164	163	155	146	146	147	133	139	154.5
3-Nov	136	150	154	155	156	141	146	166	168	155	154	151	149	152	184	170	184	195	201	206	229	234	220	211	180.7
4-Nov	165	151	160	178	195	193	167	141	137	140	153	146	134	147	147	144	139	141	151	145	139	136	139	146	152.0
5-Nov	138	150	145	151	183	151	153	163	151	145	149	144	167	137	141	154	169	153	166	150	221	188	153	302	155.4
6-Nov	235	216	216	177	174	193	213	233	246	263	265	260	270	268	222	270	206	177	202	236	230	204	215	202	222.5
7-Nov	234	258	266	255	234	227	193	169	144	152	219	217	149	47	45	145	142	138	141	146	151	152	150	145	184.6
8-Nov	159	167	150	173	156	155	164	173	146	162	163	166	157	138	145	141	155	142	142	137	139	125	149	90	150.4
9-Nov	154	151	159	156	138	199	159	134	185	255	250	258	256	252	251	244	252	259	272	268	259	254	249	251	242.8
10-Nov	257	261	261	252	233	257	268	230	161	150	141	128	125	128	152	157	145	144	156	164	151	149	154	157	184.4
11-Nov	156	159	151	145	154	157	159	167	162	166	153	152	155	159	199	159	207	231	231	226	239	238	244	253	188.7
12-Nov	266	263	227	195	174	144	132	162	159	226	241	139	73	163	140	36	193	228	265	249	267	242	271	272	216.4
13-Nov	271	228	273	220	193	154	147	190	188	137	138	138	155	150	136	139	137	145	150	156	137	143	150	141	157.8
14-Nov	138	135	139	144	157	147	142	134	185	245	252	252	257	263	269	293	280	270	256	257	259	253	250	252	244.5
15-Nov	258	286	256	252	245	245	243	246	261	252	253	250	256	256	253	247	220	239	266	310	280	294	292	306	256.4
16-Nov	327	343	5	0	306	258	257	178	151	163	177	1	62	45	20	19	18	21	14	15	11	13	11	1	10.9
17-Nov	358	1	358	359	327	339	322	313	305	292	275	277	285	283	295	314	301	311	319	311	313	314	305	290	318.2
18-Nov	269	275	274	292	260	228	226	224	254	272	299	299	280	265	267	263	240	218	225	221	202	167	175	182	257.9
19-Nov	167	140	96	120	116	100	65	81	85	62	97	99	102	90	33	17	38	76	108	116	123	126	126	125	99.3
20-Nov	123	129	118	126	135	134	143	149	145	159	159	152	154	166	148	145	153	151	149	142	147	148	132	130	143.0
21-Nov	133	141	142	144	148	154	156	161	165	162	150	199	292	302	335	304	306	311	320	10	19	21	27	25	64.2
22-Nov	26	24	37	19	7	17	74	89	144	81	117	144	150	158	168	163	159	149	161	160	150	142	136	146	129.2
23-Nov	148	146	145	148	149	154	158	153	152	153	151	149	150	149	144	145	160	154	164	169	169	171	181	153.3	
24-Nov	186	159	162	162	159	156	151	160	156	159	163	175	155	145	156	167	141	126	145	148	148	147	136	142	153.3
25-Nov	140	137	136	137	137	140	140	148	149	156	142	144	136	134	138	206	230	239	254	257	252	248	241	245	168.7
26-Nov	245	237	249	255	251	244	227	232	224	205	222	223	234	185	176	221	237	238	274	188	232	147	200	224	231.4
27-Nov	30	99	98	39	49	55	46	23	13	3	6	6	5	352	355	349	354	346	355	359	351	332	338	315	4.8
28-Nov	314	312	282	244	254	245	252	228	237	242	242	248	209	222	230	173	167	219	5	6	10	5	346	352	275.3
29-Nov	317	334	304	265	261	237	274	245	190	282	226	213	178	166	179	155	172	188	205	198	162	161	166	172	195.5
30-Nov	171	173	166	160	146	144	148	149	160	164	167	159	165	160	168	163	173	178	172	168	173	171	168	170	164.2

206.8 187.8 193.4 185.0 182.2 184.6 179.9 180.6 177.0 190.8 198.2 196.6 194.0 187.9 194.8 205.0 202.7 202.4 210.8 197.8 204.6 196.9 188.9 205.4

Diurnal Average

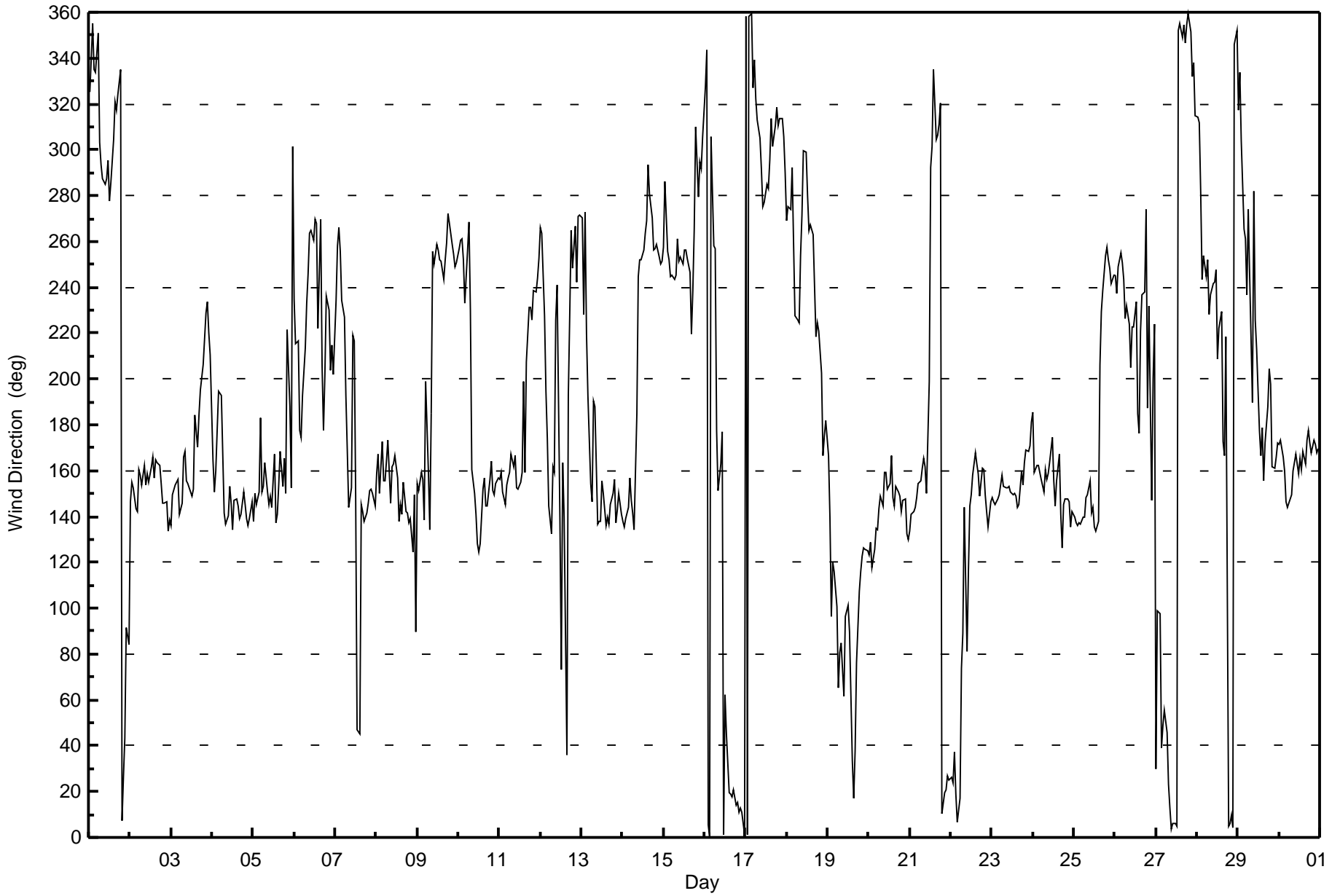
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Nov 5 19:00		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: 5 deg on Nov 13 18:00 Percentiles: P ₁ = 8 P ₁₀ = 12 Q ₁ = 15 Median = 18 Q ₃ = 21 P ₉₀ = 29 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-Nov	13	20	22	15	21	57	16	18	17	18	19	18	19	22	17	17	18	14	21	17	19	29	17	31	57	
2-Nov	26	18	12	12	16	21	14	16	20	20	20	20	19	20	18	18	16	15	16	11	15	15	8	8	26	
3-Nov	10	14	14	15	15	16	17	16	17	20	18	18	24	29	17	18	18	17	15	18	13	15	14	20	29	
4-Nov	19	16	18	13	13	10	13	11	10	17	20	24	17	20	18	18	11	12	12	21	12	10	13	16	24	
5-Nov	12	17	12	15	45	15	21	33	13	13	16	18	24	21	17	15	28	20	100	60	71	24	56	21	100	
6-Nov	20	13	11	20	19	20	15	16	22	27	29	16	25	34	24	37	42	12	12	36	47	19	15	16	47	
7-Nov	15	14	16	19	15	17	35	22	75	38	17	20	53	27	35	61	18	9	10	14	16	16	17	15	75	
8-Nov	16	19	29	22	24	20	18	22	16	17	18	25	22	18	20	15	12	9	8	8	11	23	48	65	65	
9-Nov	13	14	34	16	51	67	32	87	85	53	18	15	13	15	14	14	12	13	16	16	13	11	12	12	87	
10-Nov	13	15	15	15	49	12	13	18	34	17	19	21	18	18	19	16	13	15	16	16	15	14	18	18	49	
11-Nov	19	18	16	14	15	18	23	17	14	18	19	19	21	36	20	23	17	16	15	17	30	15	12	13	36	
12-Nov	17	23	20	12	17	19	14	18	7	59	27	17	55	43	31	21	76	45	48	14	11	26	12	14	76	
13-Nov	15	26	15	25	63	42	11	21	43	15	17	16	21	18	15	12	6	5	9	17	6	8	10	12	63	
14-Nov	10	12	13	15	19	20	8	7	47	14	13	12	13	16	18	17	17	17	14	12	14	11	11	12	47	
15-Nov	19	23	17	12	14	14	14	16	19	12	11	13	13	14	12	16	12	15	15	20	11	7	12	19	23	
16-Nov	21	19	16	31	21	10	18	36	14	13	26	75	40	18	14	15	14	15	15	15	15	14	15	17	75	
17-Nov	19	20	19	20	17	19	13	13	15	22	23	22	22	20	20	15	16	16	14	14	15	17	17	16	23	
18-Nov	17	17	16	26	43	19	10	10	23	26	21	28	31	26	26	20	19	34	13	20	31	30	20	27	43	
19-Nov	20	26	15	25	22	18	18	19	21	23	28	24	20	29	26	16	19	26	19	17	18	19	18	18	29	
20-Nov	17	19	17	18	19	19	19	19	20	21	19	22	26	27	21	20	19	19	19	18	19	19	18	19	27	
21-Nov	21	20	19	20	18	18	18	17	19	16	15	27	29	19	46	18	17	16	14	24	16	15	17	17	46	
22-Nov	16	18	20	24	24	25	21	25	76	34	49	23	24	22	23	22	21	19	20	22	20	19	19	19	76	
23-Nov	19	19	18	19	19	19	19	19	20	19	19	18	20	21	20	19	19	20	17	19	19	19	19	21	21	
24-Nov	23	18	16	16	17	16	17	17	16	19	19	22	20	22	21	18	19	14	18	20	17	18	18	20	23	
25-Nov	19	18	20	18	18	21	20	21	19	20	20	20	23	20	32	14	11	13	13	13	12	14	15	14	32	
26-Nov	14	15	13	12	12	14	17	14	18	17	17	19	28	31	24	35	22	26	47	23	25	49	52	67	67	
27-Nov	63	32	50	17	18	20	17	16	18	16	14	14	15	16	16	13	14	12	14	14	13	13	18	12	63	
28-Nov	11	16	20	21	15	16	13	44	17	16	16	15	20	16	34	21	13	45	42	20	14	15	18	20	45	
29-Nov	17	18	22	41	27	19	16	48	27	49	17	17	23	21	21	15	19	22	22	22	25	19	25	22	49	
30-Nov	21	21	21	20	18	17	17	19	19	20	22	23	22	21	24	18	19	20	20	19	19	20	20	18	24	
		63	32	50	41	63	67	35	87	85	59	49	75	55	43	46	61	76	45	100	60	71	49	56	67	
		Diurnal Maximum																								





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:20	End Time (MST)	10:30
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	834	834
Calculated slope	1.007512	0.997298	Chamber temp	45.0	45.0
Calculated intercept	0.434380	0.724135	Pressure	691.6	691.6
Analyzer Background	11.4	11.6	Flow	0.497	0.497
Analyzer Coefficient	0.804	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	588.6	1.020
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	60.4	600.4	601.0	0.999
second point	5000	30.2	300.2	301.6	0.995
third point	5000	15.1	150.1	148.2	1.013
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	60.4	600.4	600.9	0.999
Average Correction Factor					1.002

Corrected As found 588.8 Previous response 595.5 % change 1.1%

Notes:

no maintenance done, filter changed out, span adjusted

Calibration Performed By: Melissa Lemay



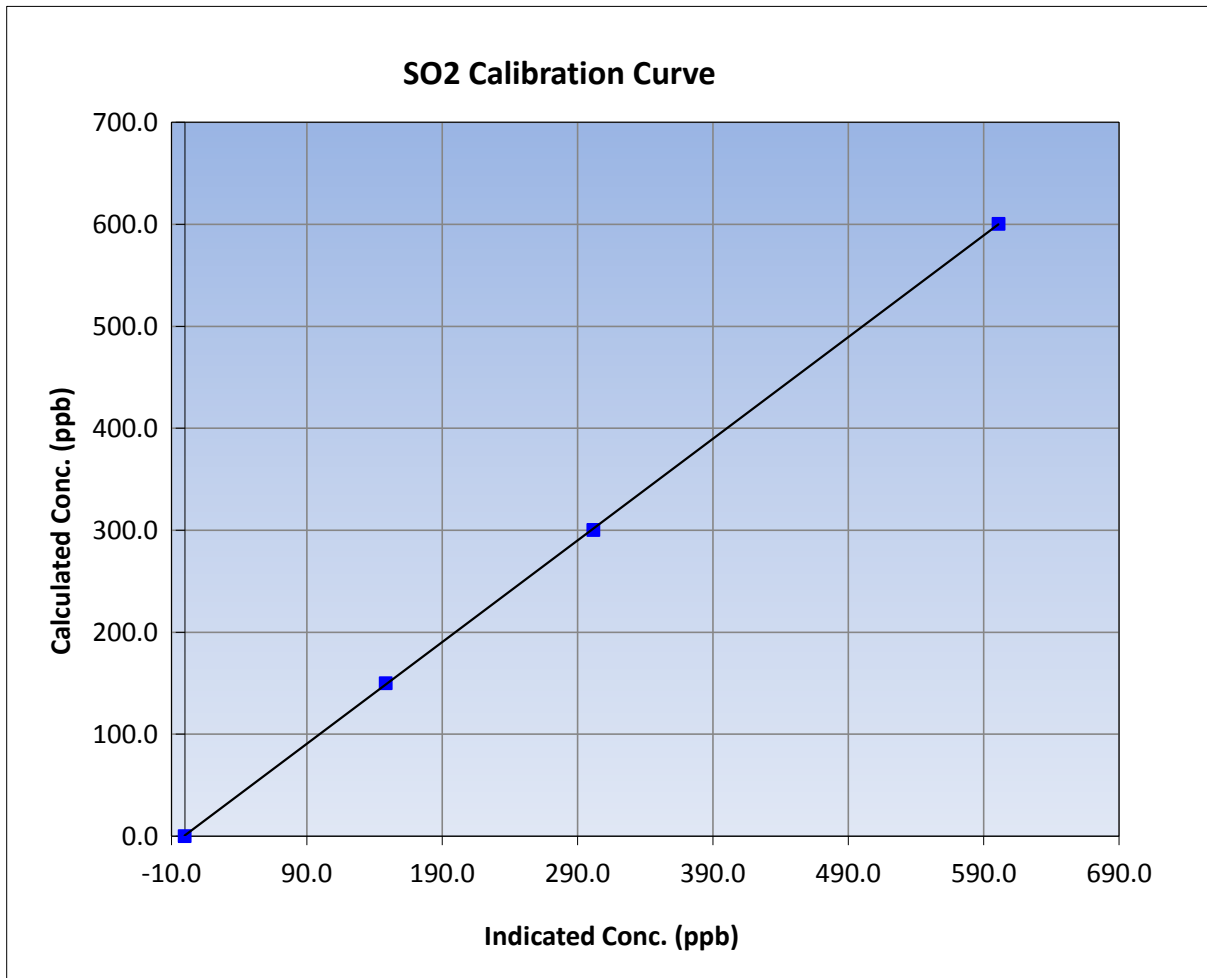
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:20	End Time (MST)	10:30
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

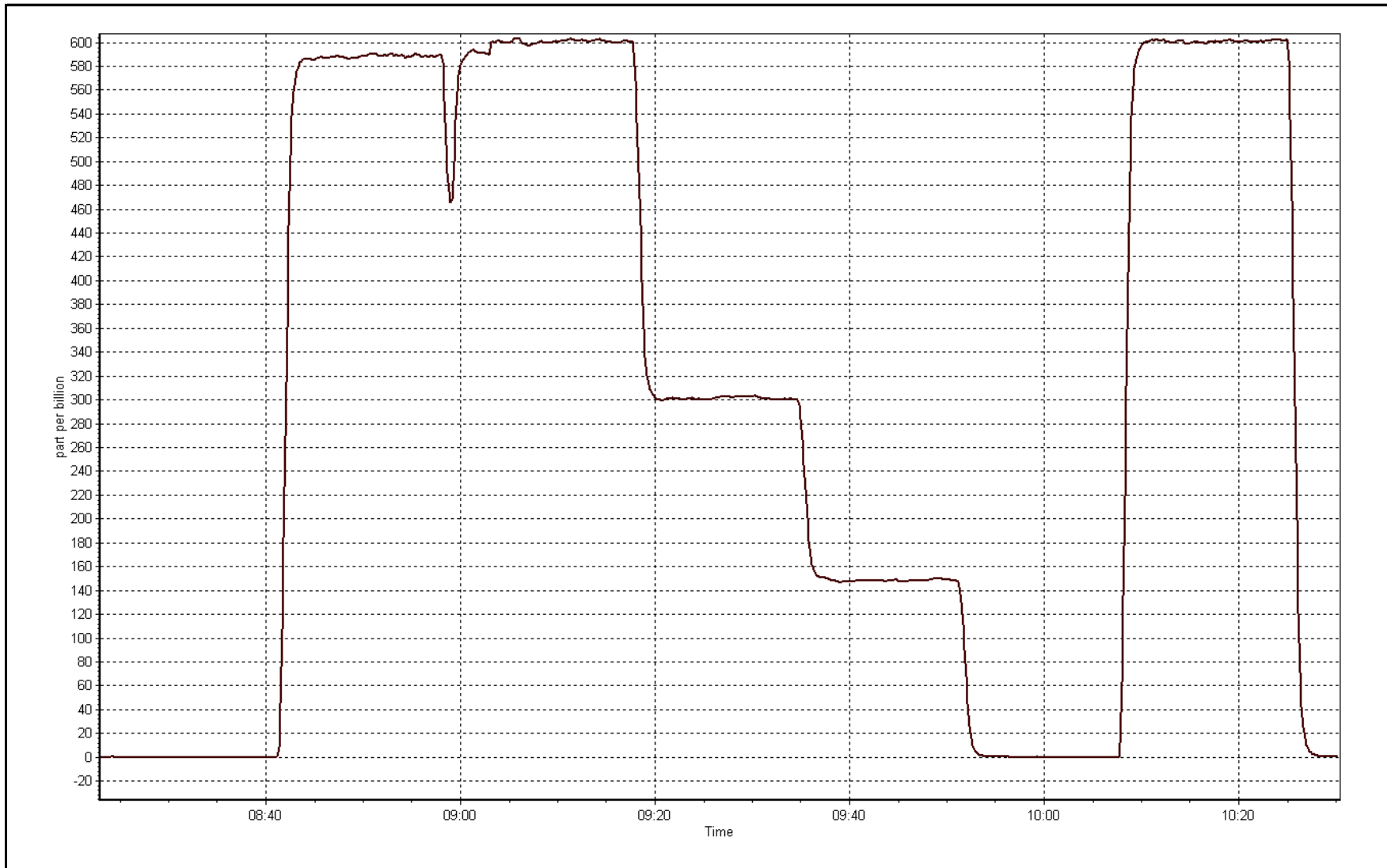
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999977
600.4	601.0	0.9990		
300.2	301.6	0.9953	Slope	0.997298
150.1	148.2	1.0128		
			Intercept	0.724135



SO2 Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	13:03
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	-616	-616
Analyzer IP address	192.168.1.42		Lamp voltage	876	876
Calculated slope	1.006833	0.993960	Chamber temp	45	45
Calculated intercept	-0.226619	-0.267235	Pressure	545.4	545.4
Analyzer Background	13.4	14.1	Flow	1.042	1.042
Analyzer Coefficient	0.832	0.849	Intensity	94	94
			Converter temp.	328	328
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	0.3	----
as found span	6000	46.1	74.9	73.5	1.019
SO2 scrubber check	5000	15.1	150.1	1.9	----
calibrator zero	6000	0.0	0.0	0.3	----
high point	6000	46.1	74.9	75.6	0.991
second point	6000	25.8	41.9	42.6	0.984
third point	6000	15.4	25.0	25.3	0.989
as left zero	6000	0.0	0.0	0.6	----
as left span	6000	46.2	75.1	74.9	1.002
Average Correction Factor					0.988

Corrected As found 73.2 Previous response 74.6 % change 2.0%

Notes:

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

Calibration Performed By:

Melissa Lemay



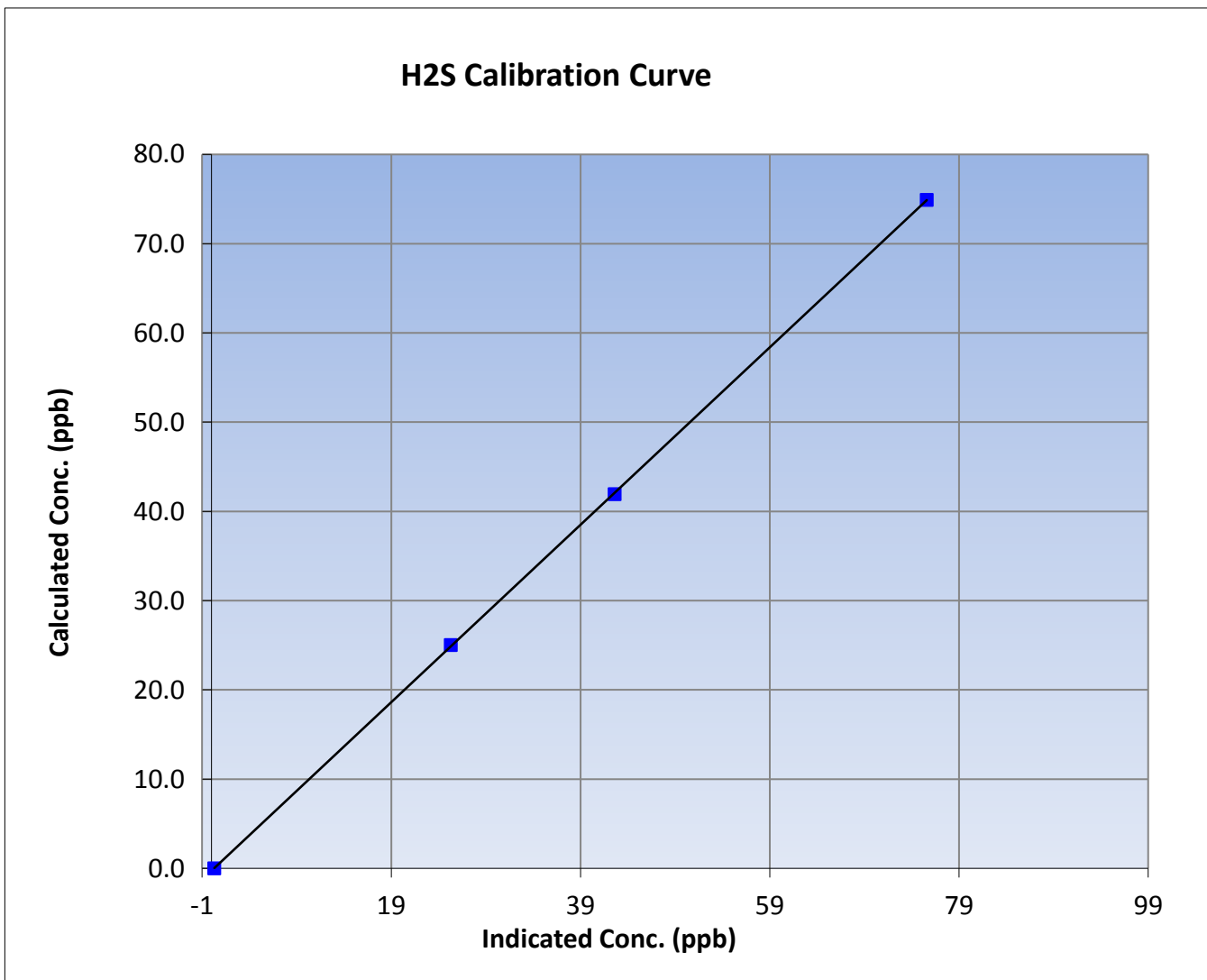
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:30	End Time (MST)	13:03
Analyzer make	Routine	Analyzer serial #	1336160094

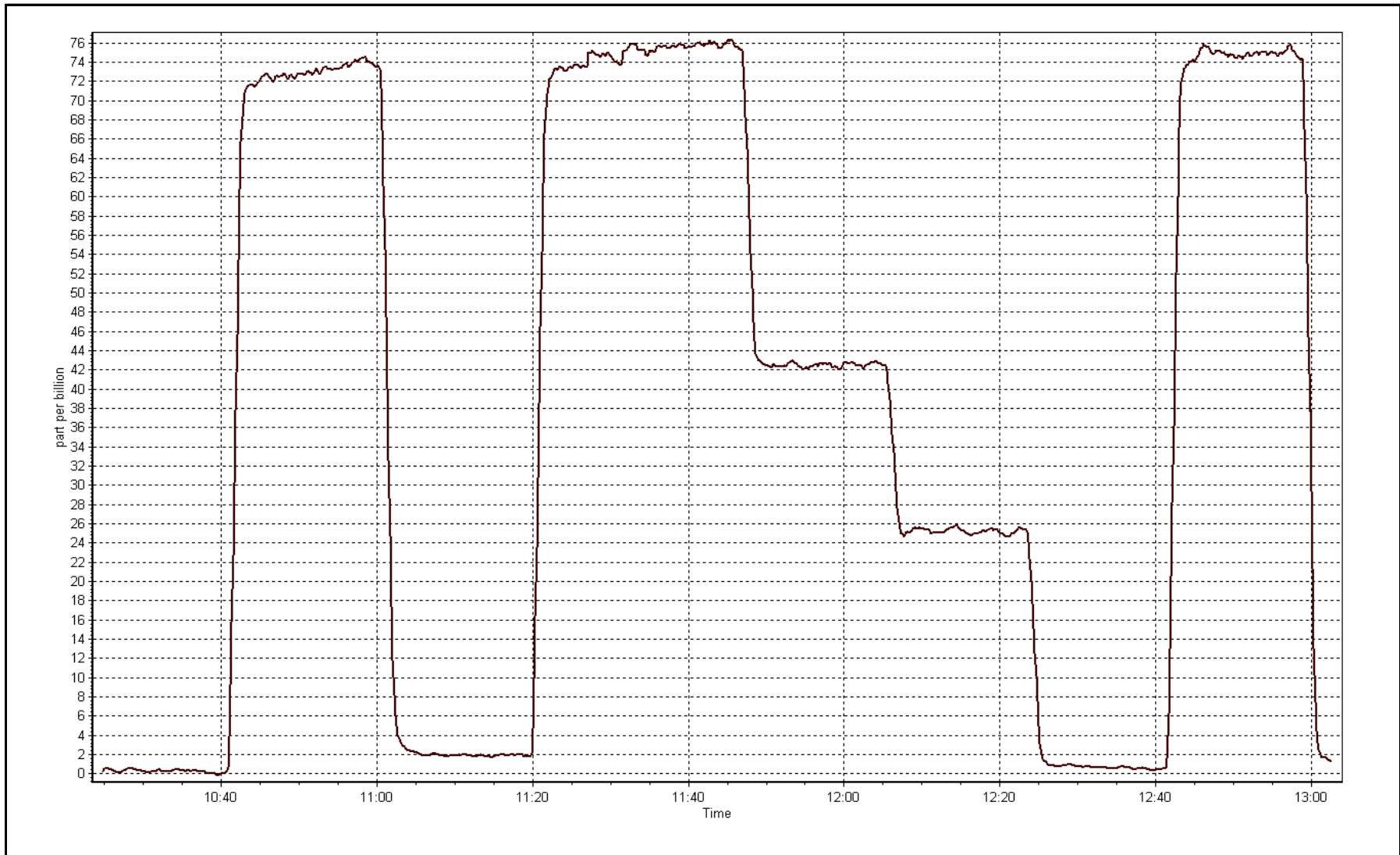
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999984
74.9	75.6	0.9909		
41.9	42.6	0.9842	Slope	0.993960
25.0	25.3	0.9891		
			Intercept	-0.267235



H2S Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:20	End Time (MST)	10:29
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	1.000000	0.998141	Fuel Pressure	19.9	19.9
Calculated intercept	-0.013796	0.004146	Analyzer Coeff	4.149	4.275
			Analyzer BKG	0.810	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	12.43	1.031
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	60.4	12.82	12.82	1.000
second point	5000	30.2	6.41	6.46	0.992
third point	5000	15.1	3.20	3.20	1.002
as left zero	5000	0.0	0.00	0.03	----
as left span	5000	60.4	12.82	12.98	0.988
Average Correction Factor					0.998

Corrected As found	12.45	Previous response	12.83	% change	3.1%
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Notes:

No maintenance done, filter changed out, span adjusted

Calibration Performed By:

Melissa Lemay



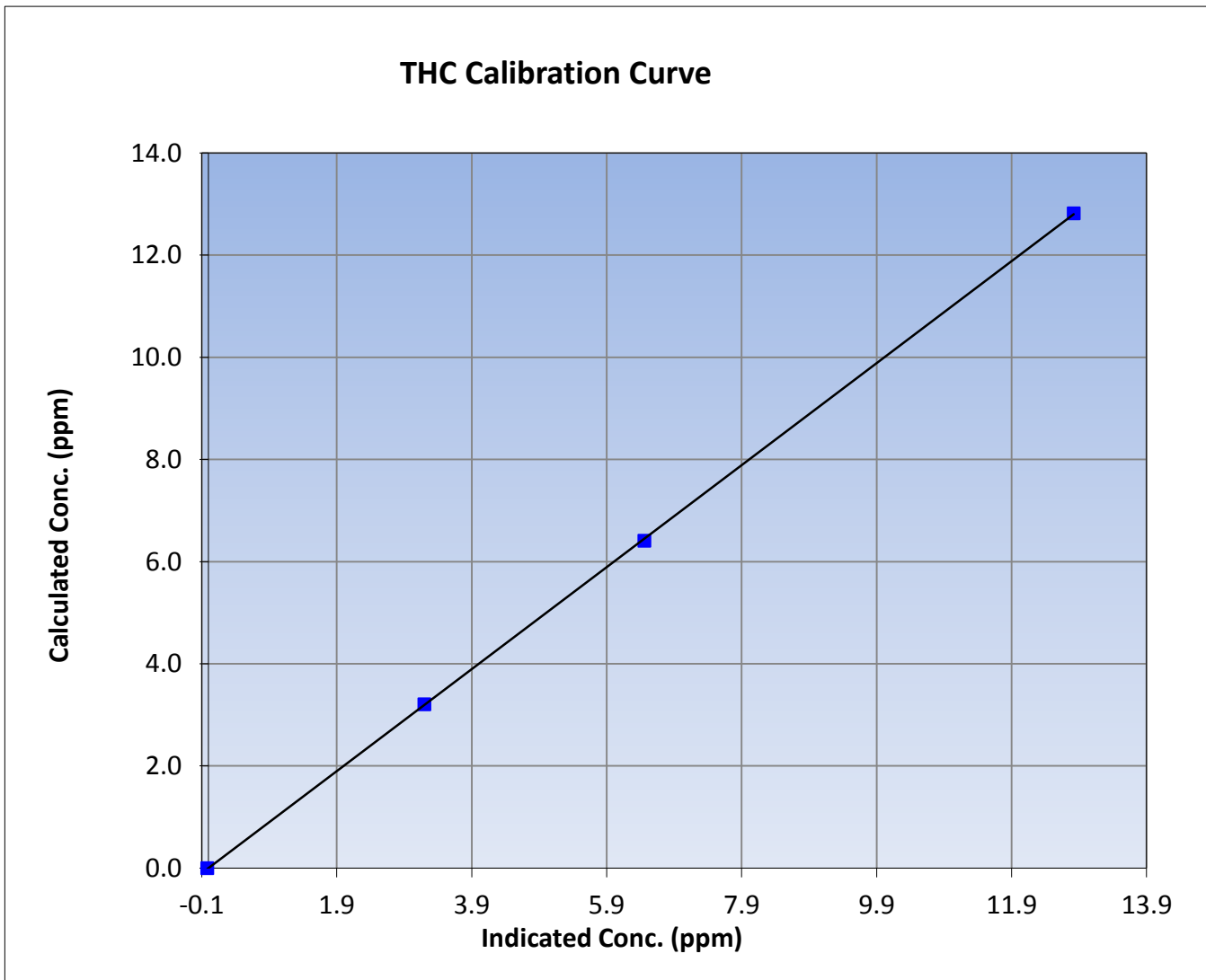
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:20	End Time (MST)	10:29
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

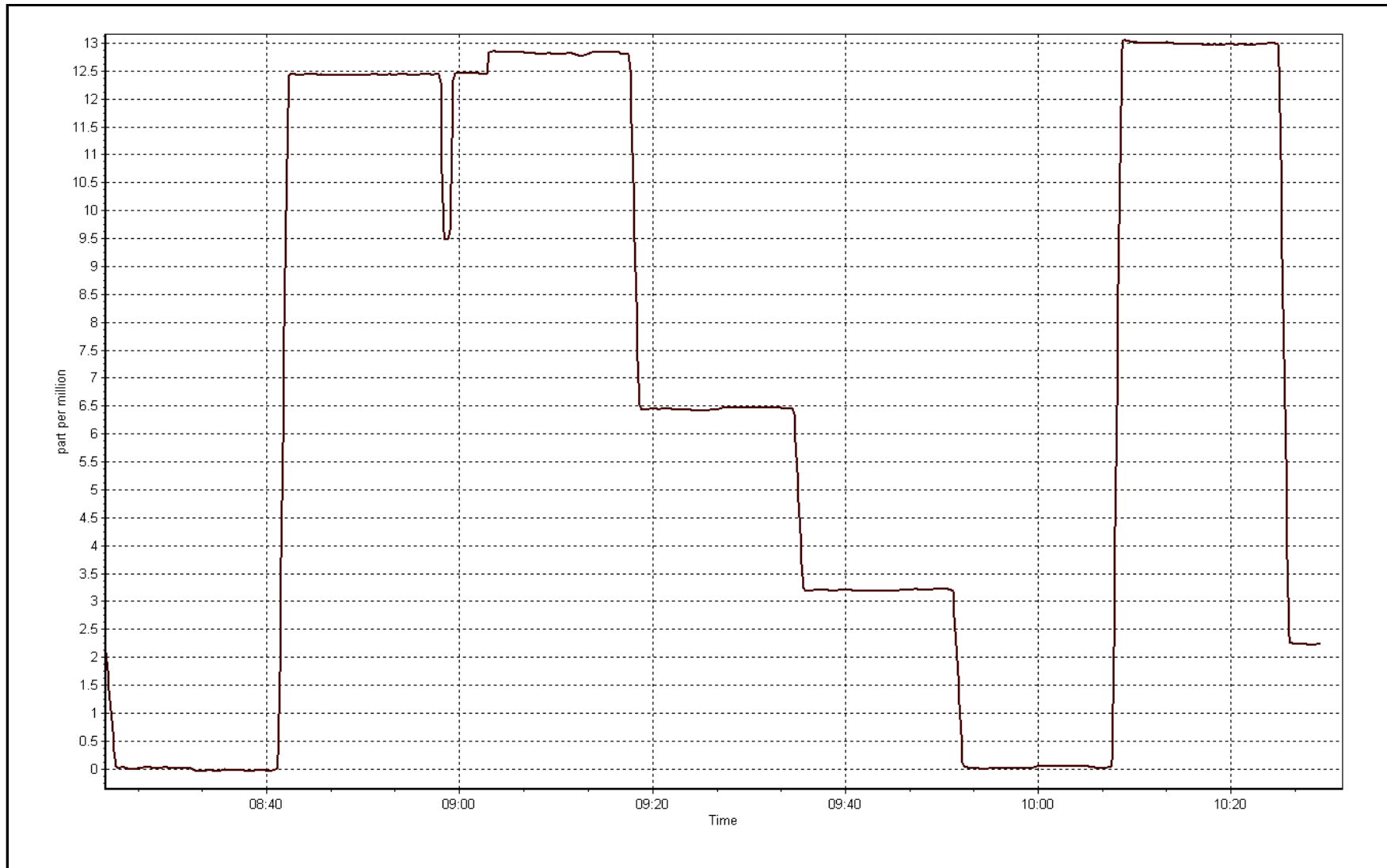
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999973
12.82	12.82	1.0000		
6.41	6.46	0.9923	Slope	0.998141
3.20	3.20	1.0016		
			Intercept	0.004146



THC Calibration Plot

Date: November 1, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 5 MANNIX NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
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	688	32	32	100.00	29	0	11	0
H2S (ppb) Average	687	33	33	100.00	3	0	2	0
THC (ppm) Average	688	32	32	100.00	4.1	-	2.7	-
Temperature 2 m (C) Average	720	0	0	100.00	11.2	-	6.1	-
Temperature 20 m (C) Average	720	0	0	100.00	11.7	-	7.7	-
Temperature 45 m (C) Average	720	0	0	100.00	12.1	-	8.5	-
Temperature 75 m (C) Average	720	0	0	100.00	12.8	-	9.2	-
Temperature 90 m (C) Average	720	0	0	100.00	13.5	-	9.4	-
Relative Humidity 2 m (%) Average	720	0	0	100.00	96	-	94	-
Relative Humidity 20 m (%) Average	720	0	0	100.00	96	-	95	-
Relative Humidity 45 m (%) Average	720	0	0	100.00	96	-	95	-
Relative Humidity 75 m (%) Average	720	0	0	100.00	96	-	95	-
Relative Humidity 90 m (%) Average	720	0	0	100.00	96	-	95	-
Wind Speed 20 m (km/h) Average	717	0	3	99.58	33	-	18	-
Wind Speed 45 m (km/h) Average	694	0	26	96.39	39	-	24	-
Wind Speed 75 m (km/h) Average	643	0	77	89.31	45	-	27	-
Wind Speed 90 m (km/h) Average	715	0	5	99.31	47	-	29	-
Wind Direction 20 m (deg) Average	717	0	3	99.58	-	-	-	-
Wind Direction 45 m (deg) Average	694	0	26	96.39	-	-	-	-
Wind Direction 75 m (deg) Average	643	0	77	89.31	-	-	-	-
Wind Direction 90 m (deg) Average	715	0	5	99.31	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	717	0	3	99.58	1.4	-	0.8	-
Vertical Wind Speed 45 m (km/h) Average	694	0	26	96.39	2	-	1.3	-
Vertical Wind Speed 75 m (km/h) Average	643	0	77	89.31	1.5	-	0.6	-
Vertical Wind Speed 90 m (km/h) Average	715	0	5	99.31	3.2	-	1.7	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
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	688	0.9	3	-	0	0	0	0	0	1	29
H2S (ppb) Average	687	0.4	0	-	0	0	0	0	0	1	3
THC (ppm) Average	688	2.32	0.2	-	2.1	2.2	2.2	2.3	2.4	2.5	4.1
Temperature 2 m (C) Average	720	-1.18	5.3	-	-11.3	-8.1	-5.6	-1.7	3.2	5.8	11.2
Temperature 20 m (C) Average	720	-0.67	5.9	-	-11.6	-8.3	-5.5	-1.4	4.7	7.3	11.7
Temperature 45 m (C) Average	720	-0.5	6.2	-	-11.9	-8.5	-5.7	-1.5	5.2	7.8	12.1
Temperature 75 m (C) Average	720	-0.4	6.6	-	-12.3	-8.8	-6	-1.8	6	8.5	12.8
Temperature 90 m (C) Average	720	-0.37	6.7	-	-12.3	-8.8	-6.1	-1.8	6.2	8.6	13.5
Relative Humidity 2 m (%) Average	720	78.5	11	-	44	64	70	79	88	93	96
Relative Humidity 20 m (%) Average	720	75.1	12	-	42	59	66	76	84	92	96
Relative Humidity 45 m (%) Average	720	74.1	13	-	42	56	63	75	84	93	96
Relative Humidity 75 m (%) Average	720	73.4	14	-	41	54	62	75	85	93	96
Relative Humidity 90 m (%) Average	720	73.2	15	-	38	53	62	74	86	93	96
Wind Speed 20 m (km/h) Average	717	10.9	5	-	0	5	7	11	14	18	33
Wind Speed 45 m (km/h) Average	694	15.3	7	-	0	7	10	16	19	23	39
Wind Speed 75 m (km/h) Average	643	18.2	8	-	0	8	12	19	23	28	45
Wind Speed 90 m (km/h) Average	715	19	9	-	1	7	12	19	25	29	47
Wind Direction 20 m (deg) Average	717	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	694	-	-	-	-	-	-	-	-	-	-
Wind Direction 75 m (deg) Average	643	-	-	-	-	-	-	-	-	-	-
Wind Direction 90 m (deg) Average	715	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	717	0.18	0.4	-	-1	-0.4	-0.1	0.2	0.5	0.7	1.4
Vertical Wind Speed 45 m (km/h) Average	694	0.4	0.7	-	-1.5	-0.5	-0.2	0.4	1	1.3	2
Vertical Wind Speed 75 m (km/h) Average	643	0.23	0.4	-	-0.9	-0.2	0	0.2	0.4	0.7	1.5
Vertical Wind Speed 90 m (km/h) Average	715	0.64	0.7	-	-1.2	0	0.2	0.5	0.9	1.6	3.2

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	03 Nov 2016 10:00	03 Nov 2016 12:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	03 Nov 2016 10:00	03 Nov 2016 12:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	27 Nov 2016 07:00	27 Nov 2016 19:00	13	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	28 Nov 2016 09:00	28 Nov 2016 18:00	10	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	03 Nov 2016 10:00	03 Nov 2016 12:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	27 Nov 2016 06:00	27 Nov 2016 17:00	12	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	27 Nov 2016 19:00	30 Nov 2016 08:00	62	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	27 Nov 2016 06:00	27 Nov 2016 10:00	5	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 29 ppb on Nov 27 19:00	Maximum Daily Average: 10.8 ppb on Nov 27
Minimum Value: 0 ppb on Nov 4 01:00	Hours of Data: 688
Maximum Diurnal Average: 1.9 ppb at hour 19	Hours of Missing Data: 32
Monthly Average: 0.9 ppb	Hours of Calibration: 32
Minimum Daily Average: 0.1 ppb on Nov 30	Percent Operational Time: 100.0
Minimum Diurnal Average: 0.4 ppb at hour 7	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 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-Nov	Z	4	2	1	2	3	2	0	0	0	0	0	0	0	0	10	9	14	8	3	1	0	1	2	2.8	14
2-Nov	2	Z	1	1	1	1	0	0	C	C	1	0	1	0	1	1	0	0	0	1	0	0	0	0	0.6	2
3-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	0.2	0
4-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
5-Nov	0	0	0	0	Z	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0.4	1
6-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
7-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	0.3	0
8-Nov	0	Z	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
9-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	0.2	0
10-Nov	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	1
11-Nov	0	0	1	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1
13-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
14-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	0.2	0
15-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	0.1	0
16-Nov	0	0	0	Z	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	5
17-Nov	1	1	1	4	Z	4	1	2	0	0	0	0	0	0	0	0	0	3	8	7	10	1	2	0	2.0	10
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	5	3	6	12	6	6	4	5	1	1	3	3	4	2.6	12
19-Nov	Z	4	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4
20-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	0.2	0
21-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	1	0	0	0	0	0.4	2
22-Nov	0	0	0	Z	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.4	1
23-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	0.1	0
24-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
25-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
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	0.5	6
27-Nov	5	1	Z	7	12	4	2	11	12	6	6	11	11	18	10	18	24	23	29	16	9	8	5	1	10.8	29
28-Nov	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	2	4	2	2	0.9	4
29-Nov	1	2	5	1	Z	0	0	0	0	0	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0.8	5
30-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	0.1	0

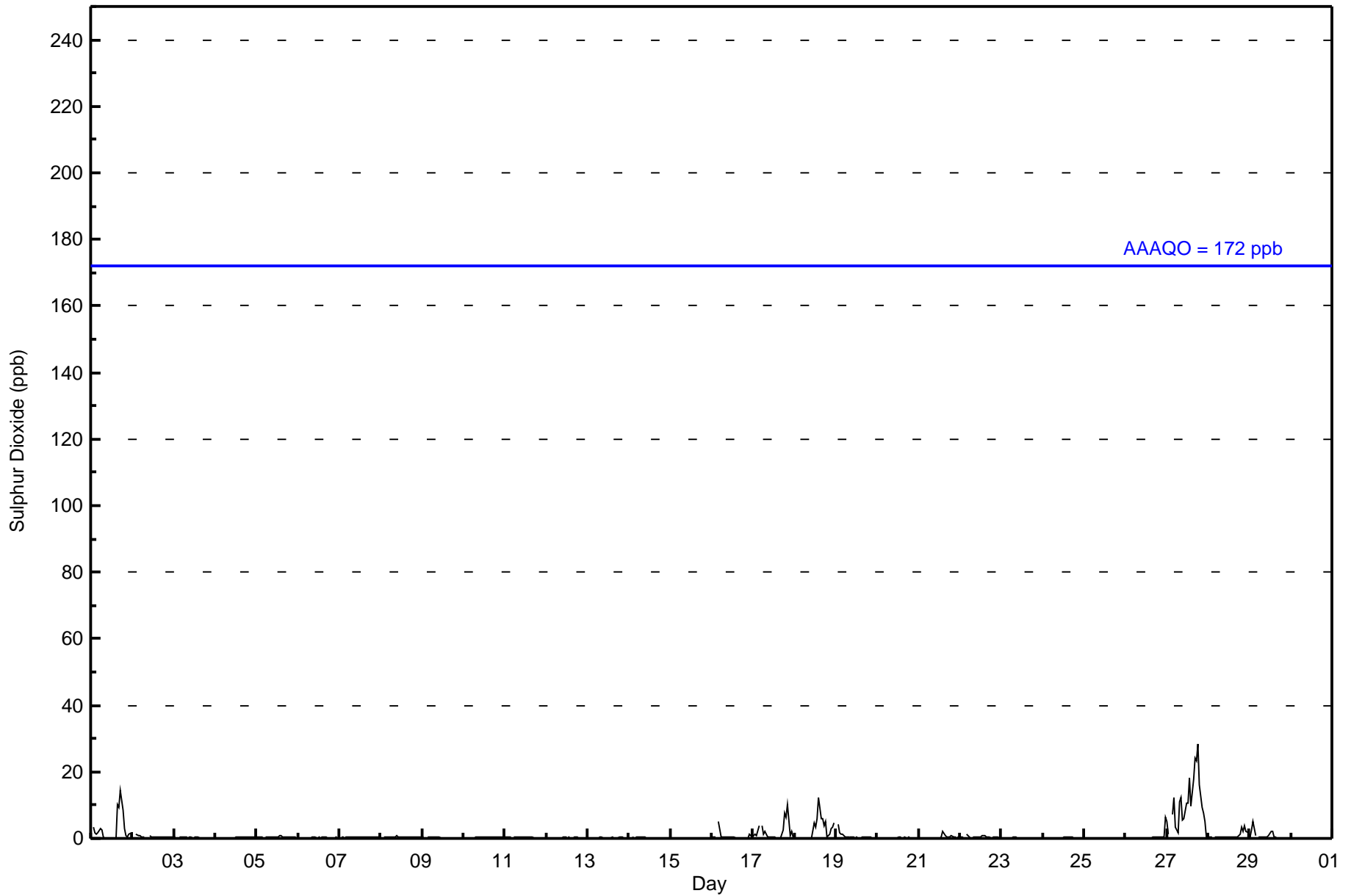
0.5	0.7	0.6	0.8	1.0	0.7	0.4	0.7	0.7	0.4	0.5	0.7	0.8	1.1	1.0	1.4	1.6	1.7	1.9	1.2	1.0	0.7	0.7	0.7	Diurnal Average
5	4	5	7	12	4	2	11	12	6	6	11	11	18	12	18	24	23	29	16	10	8	5	6	Diurnal Maximum

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
Mannix - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Mannix - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	675	98.11	98.11
11 - 20	10	1.45	99.56
21 - 60	3	0.44	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: 688

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Mannix - 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	22	18	6	8	13	11	127	201	28	18	38	76	61	19	12	14	672
11 - 20	4	3	0	0	0	0	0	0	0	0	0	0	1	1	0	1	10
21 - 60	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
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	28	21	6	8	13	11	127	201	28	18	38	76	62	20	12	16	685

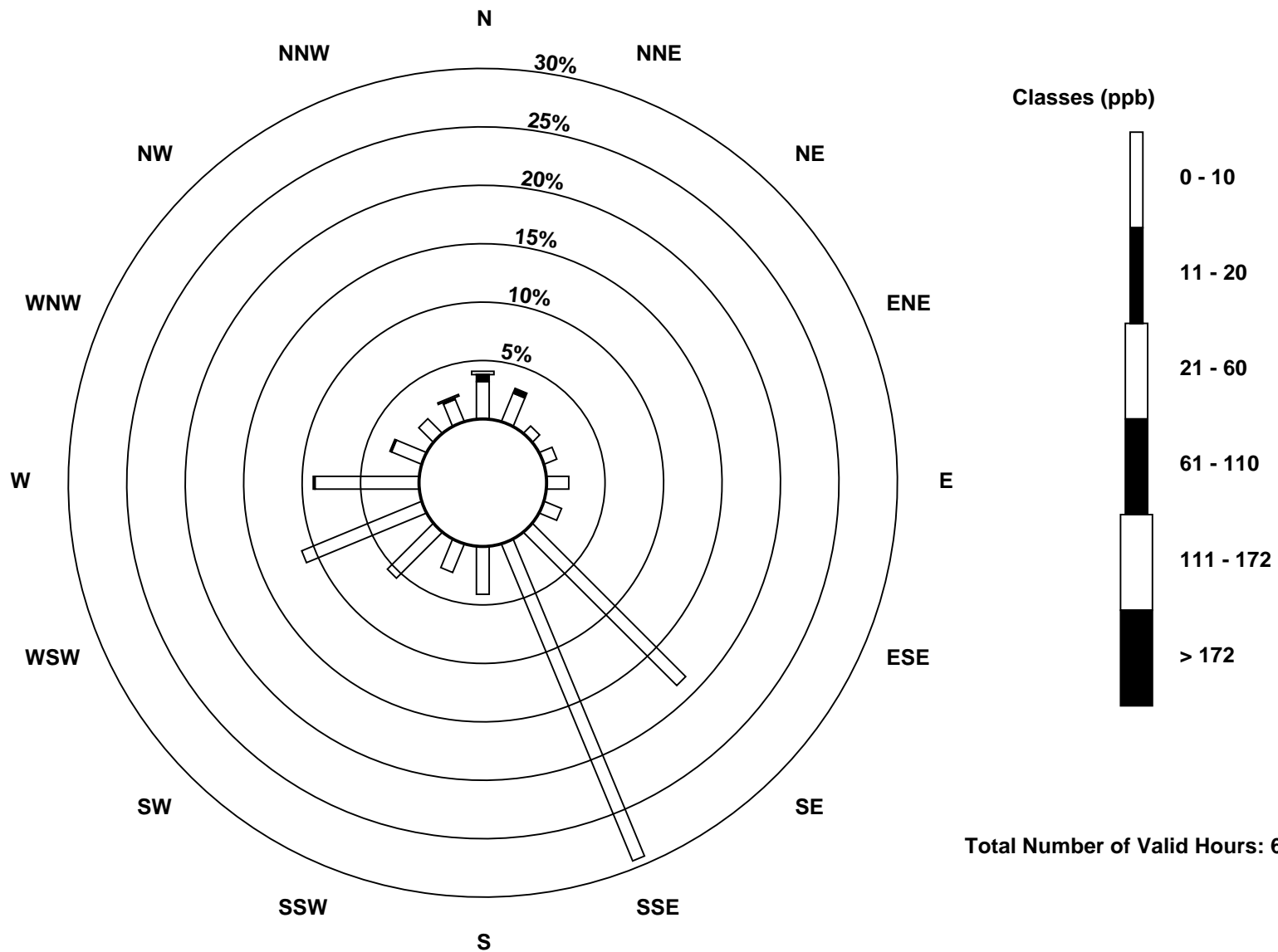
Total Number of Valid Hours: 685

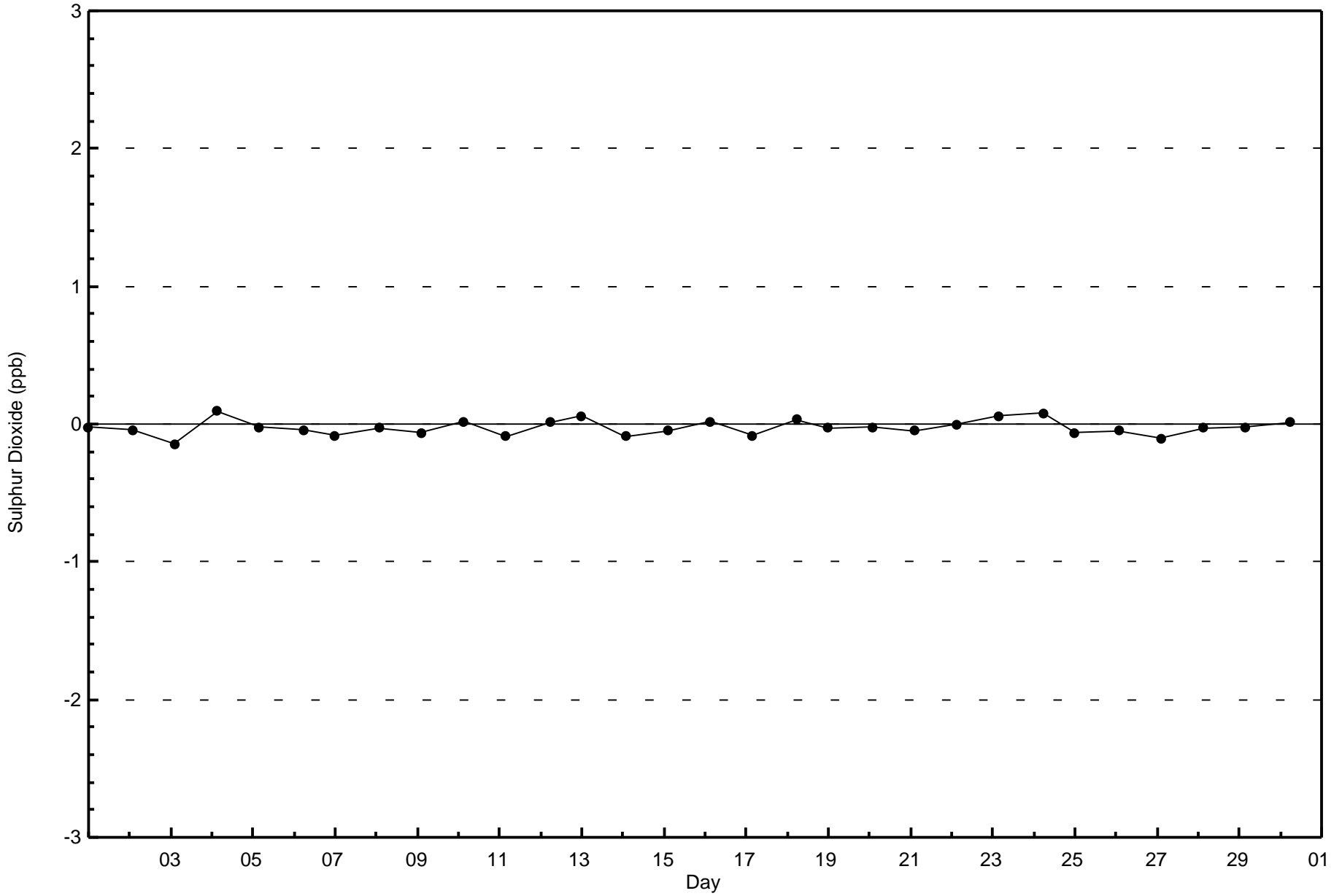
Total Number of Hours: 720

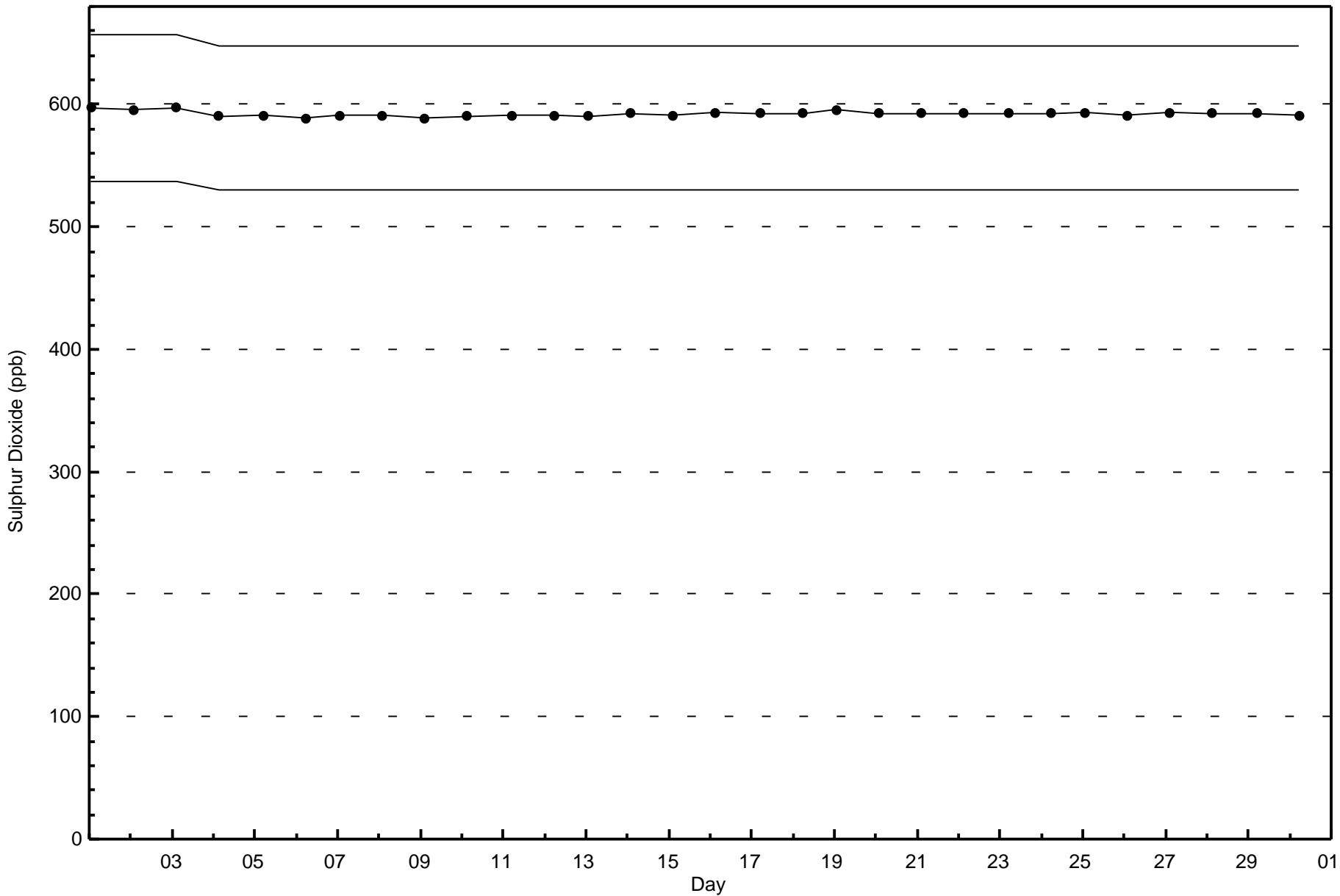


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 3 ppb on Nov 27 19:00	Maximum Daily Average: 1.5 ppb on Nov 27		Hours of Data:	687
Minimum Value: 0 ppb on Nov 15 02:00	Minimum Daily Average: 0.1 ppb on Nov 18		Hours of Missing Data:	33
Maximum Diurnal Average: 0.4 ppb at hour 19	Minimum Diurnal Average: 0.3 ppb at hour 6		Hours of Calibration:	33
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 = 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-Nov	1	Z	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.4	1
2-Nov	0	0	Z	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-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	0.2	0
4-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1
5-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0.3	1
6-Nov	0	0	0	0	0	0	Z	0	0	1	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0.3	1
7-Nov	0	Z	1	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1	1	1	0	0	0	0.5	1
8-Nov	1	1	Z	0	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1	0	0	0	0	0	0.5	1
9-Nov	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Nov	0	0	0	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Nov	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Nov	0	0	0	0	0	0	Z	0	0	0	1	1	0	1	1	1	2	1	1	0	0	0	0	0	0.6	2
13-Nov	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.4	1
14-Nov	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
15-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1
16-Nov	2	1	1	2	Z	1	0	0	0	0	0	0	1	1	0	1	1	0	0	1	0	0	0	0	0.6	2
17-Nov	0	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
18-Nov	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
19-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	0.3	0
20-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	0.2	0
21-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0.5	1
22-Nov	0	1	1	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
23-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
24-Nov	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-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	0.2	0
26-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0.3	1
27-Nov	2	2	1	Z	1	1	0	2	2	1	1	1	1	2	2	1	1	3	3	1	1	3	3	1	1.5	3
28-Nov	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.5	1
29-Nov	1	1	2	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
30-Nov	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

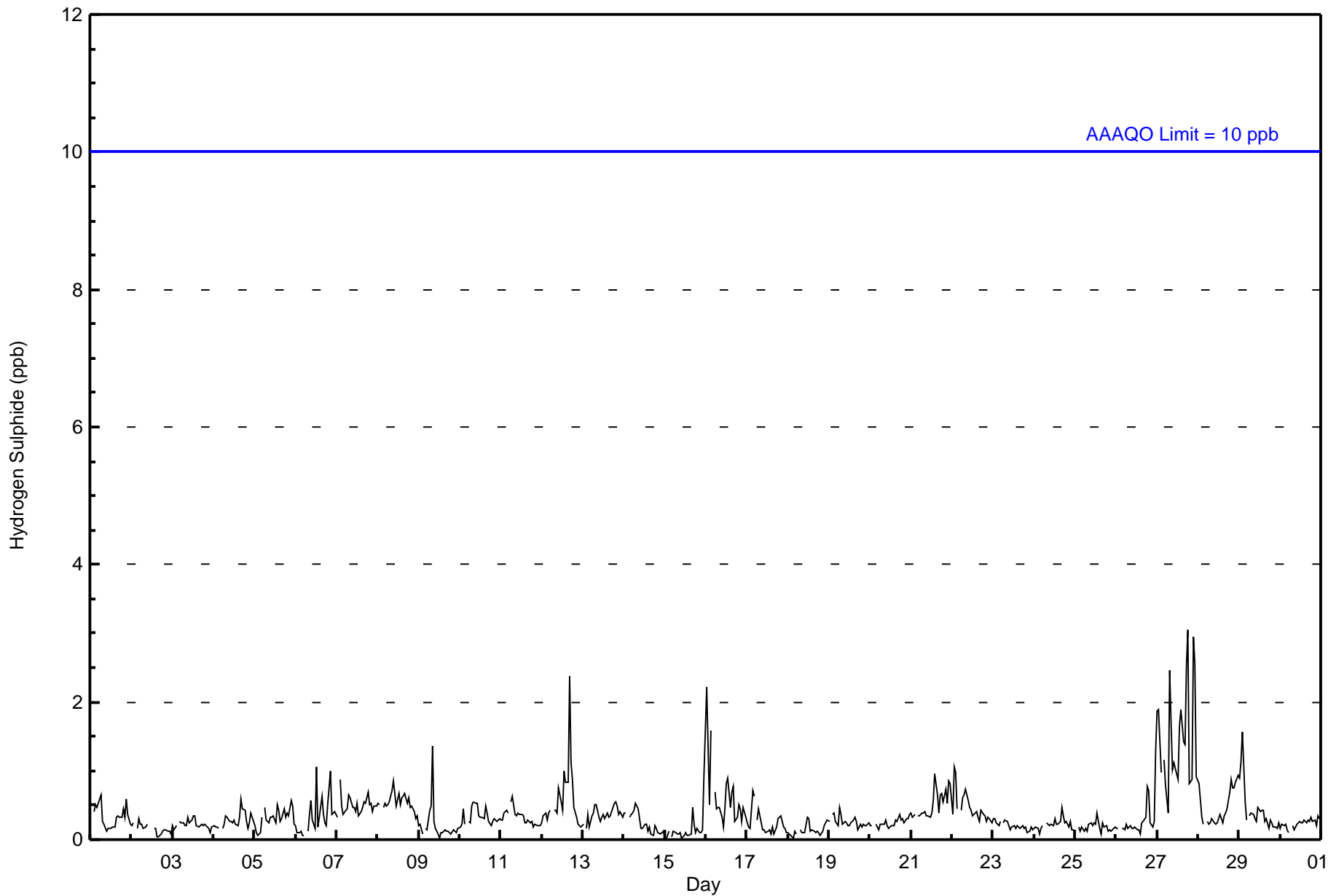
0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	Diurnal Average
2	2	2	2	1	1	1	2	2	1	1	1	1	2	2	1	2	3	3	1	1	3	3	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Mannix - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Mannix - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	683	99.42	99.42
3 - 4	4	0.58	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: 687

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Mannix - 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 - 2	25	20	7	8	13	11	128	199	27	19	38	74	64	20	11	16	680
3 - 4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4
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	26	20	7	8	13	11	128	199	27	19	38	74	64	20	12	18	684

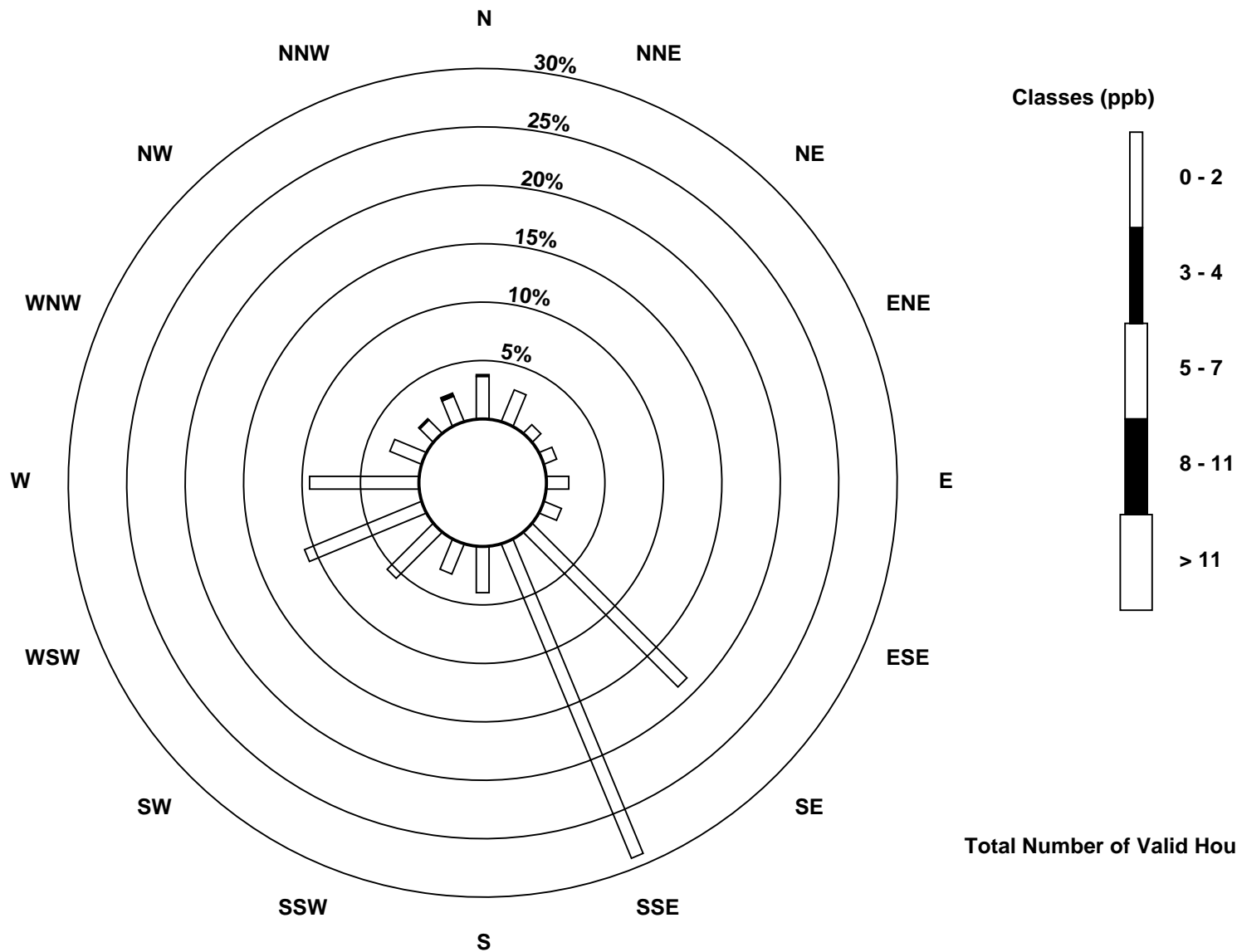
Total Number of Valid Hours: 684

Total Number of Hours: 720

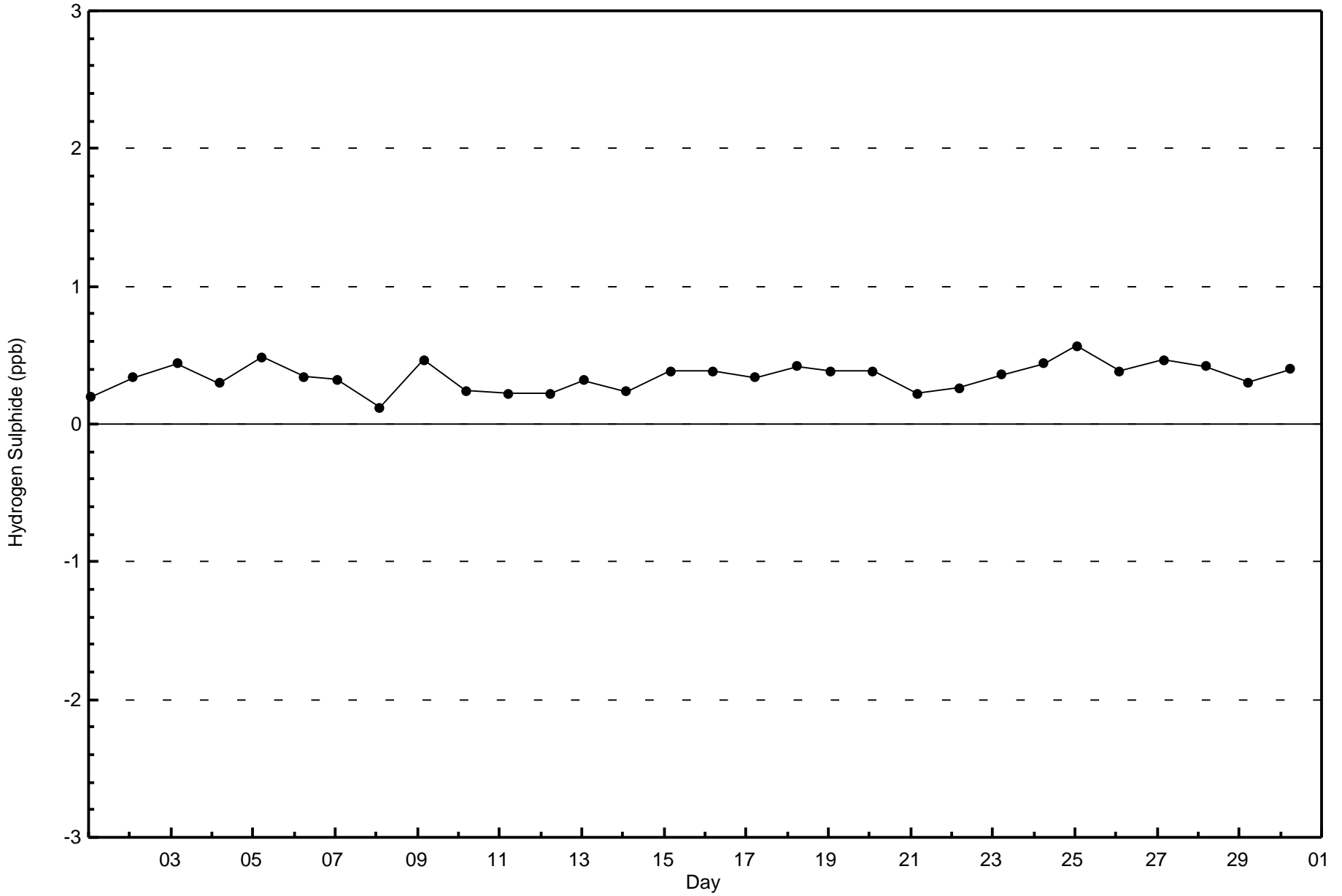


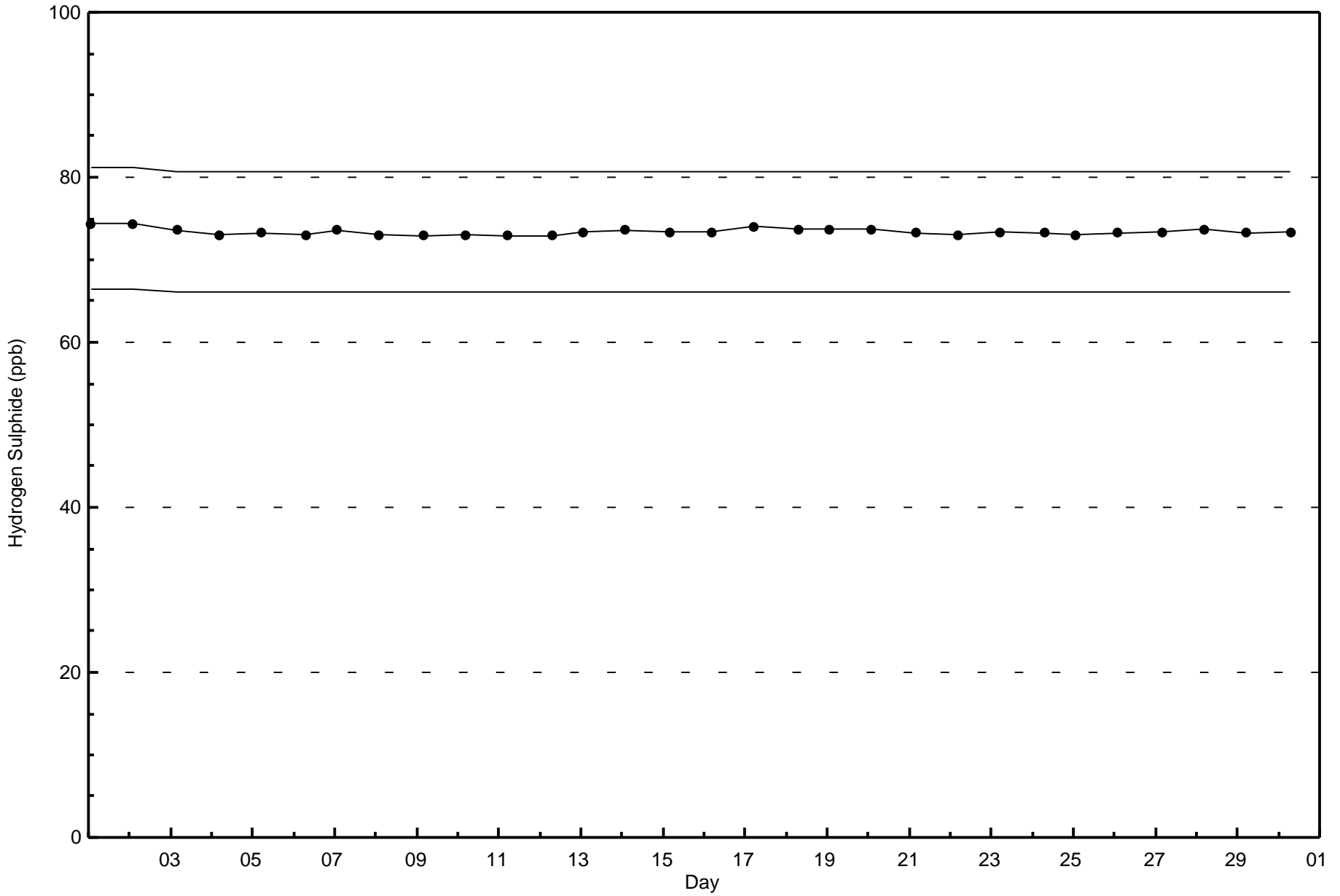
Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 684







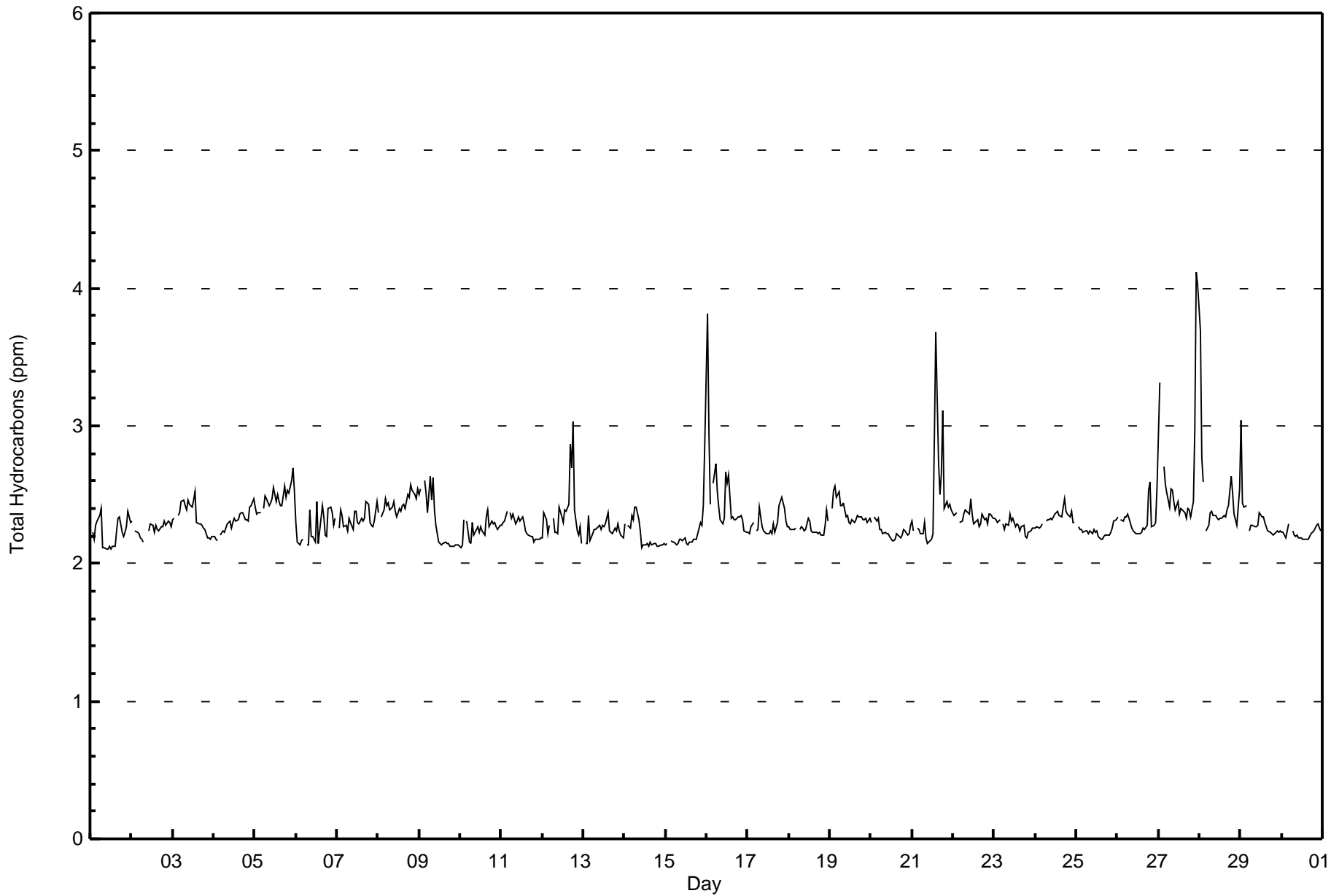
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Mannix - November 2016

Maximum Value: 4.1 ppm on Nov 27 23:00																	Maximum Daily Average: 2.7 ppm on Nov 27																	Hours in Service: 720	
Minimum Value: 2.1 ppm on Nov 1 10:00																	Minimum Daily Average: 2.2 ppm on Nov 14																	Hours of Data: 688	
Maximum Diurnal Average: 2.5 ppm at hour 1																	Minimum Diurnal Average: 2.3 ppm at hour 11																	Hours of Missing Data: 32	
Monthly Average: 2.32 ppm																	Percentiles: P ₁ = 2.1 P ₁₀ = 2.2 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.4 P ₉₀ = 2.5 P ₉₉ = 3.0																	Hours of Calibration: 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-Nov	Z	2.2	2.2	2.3	2.3	2.4	2.4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.2	2.2	2.3	2.4	2.3	2.2	2.4									
2-Nov	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	C	C	2.2	2.3	2.3	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									
3-Nov	2.3	2.3	Z	2.4	2.4	2.4	2.5	2.4	2.4	2.5	2.4	2.4	2.5	2.5	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.5									
4-Nov	2.2	2.2	2.2	Z	2.2	2.2	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	2.4	2.5	2.3	2.5									
5-Nov	2.4	2.4	2.4	2.4	Z	2.4	2.5	2.5	2.4	2.4	2.5	2.6	2.5	2.5	2.5	2.4	2.4	2.4	2.6	2.5	2.5	2.5	2.6	2.7	2.5	2.5	2.7								
6-Nov	2.3	2.2	2.1	2.2	2.2	Z	2.1	2.1	2.4	2.2	2.2	2.2	2.4	2.1	2.2	2.4	2.3	2.2	2.2	2.4	2.4	2.4	2.3	2.3	2.3	2.4									
7-Nov	Z	2.3	2.4	2.3	2.3	2.3	2.2	2.3	2.3	2.2	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.5	2.3	2.5									
8-Nov	2.4	Z	2.3	2.4	2.5	2.4	2.4	2.4	2.4	2.5	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.6	2.5	2.5	2.5	2.5	2.4	2.6									
9-Nov	2.5	2.5	Z	2.6	2.5	2.4	2.6	2.5	2.6	2.4	2.3	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.6									
10-Nov	2.1	2.1	2.3	Z	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4									
11-Nov	2.3	2.3	2.3	2.4	Z	2.4	2.3	2.4	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	2.3	2.4									
12-Nov	2.2	2.4	2.3	2.2	2.3	Z	2.3	2.2	2.2	2.2	2.4	2.3	2.3	2.4	2.4	2.4	2.9	2.7	3.0	2.4	2.2	2.2	2.3	2.1	2.4	3.0									
13-Nov	Z	2.1	2.1	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.3	2.4	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.4									
14-Nov	2.3	Z	2.3	2.3	2.4	2.3	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	2.1	2.1	2.1	2.2	2.4									
15-Nov	2.1	2.1	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	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.9	2.2	2.9									
16-Nov	3.8	3.0	2.4	Z	2.6	2.7	2.5	2.4	2.3	2.3	2.3	2.7	2.6	2.6	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.2	2.2	2.5	3.8									
17-Nov	2.2	2.2	2.3	2.3	Z	2.2	2.2	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.4	2.5	2.5	2.4	2.3	2.3	2.3	2.5									
18-Nov	2.3	2.2	2.2	2.2	2.3	Z	2.2	2.3	2.3	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.3	2.3	2.4									
19-Nov	Z	2.4	2.5	2.6	2.5	2.5	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.6									
20-Nov	2.3	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3									
21-Nov	2.3	2.2	Z	2.3	2.2	2.2	2.2	2.3	2.2	2.1	2.2	2.2	2.2	2.9	3.7	2.7	2.5	2.7	3.1	2.4	2.5	2.4	2.4	2.4	2.4	3.7									
22-Nov	2.3	2.4	2.4	Z	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.5									
23-Nov	2.3	2.3	2.3	2.3	Z	2.3	2.2	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4									
24-Nov	2.3	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.4	2.5	2.4	2.4	2.3	2.4	2.3	2.3	2.3	2.5									
25-Nov	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.3									
26-Nov	2.3	Z	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.5	2.6	2.3	2.3	2.3	2.5	2.3	2.6									
27-Nov	2.9	3.3	Z	2.7	2.6	2.5	2.4	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.4	2.3	2.5	3.0	4.1	4.0	2.7	4.1									
28-Nov	3.7	2.8	2.6	Z	2.2	2.3	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	2.6	2.5	2.4	2.3	2.3	2.5	3.7									
29-Nov	3.0	2.4	2.4	2.4	Z	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	3.0									
30-Nov	2.2	2.2	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	2.3	2.3	2.3	2.2	2.2	2.3									
																								Diurnal Average											
																								Diurnal Maximum											
2.5 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 2.4 2.3 2.3 2.3 2.4 2.4																								2.2											
3.8 3.3 2.6 2.7 2.6 2.7 2.6 2.5 2.6 2.5 2.5 2.7 2.6 2.9 3.7 2.7 2.9 2.7 3.1 2.6 2.5 3.0 4.1 4.0																								2.2											
Z - zerospan C - Calibration																																			





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	681	98.98	98.98
3.1 - 10.0	7	1.02	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 688

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - November 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	28	20	6	7	13	11	127	201	28	18	38	76	62	17	10	16	678
3.1 - 10.0	0	1	0	1	0	0	0	0	0	0	0	0	0	3	2	0	7
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	28	21	6	8	13	11	127	201	28	18	38	76	62	20	12	16	685

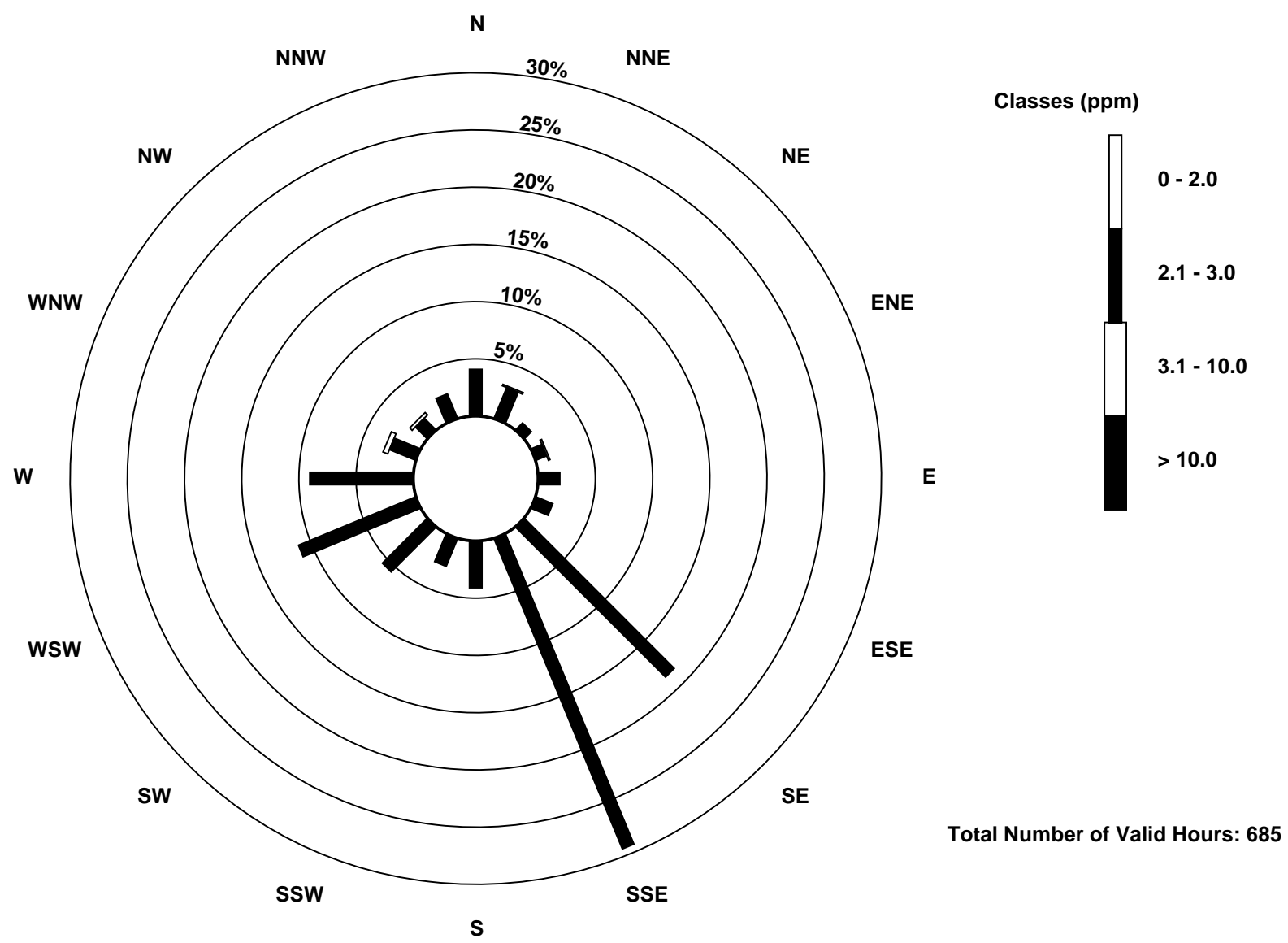
Total Number of Valid Hours: 685

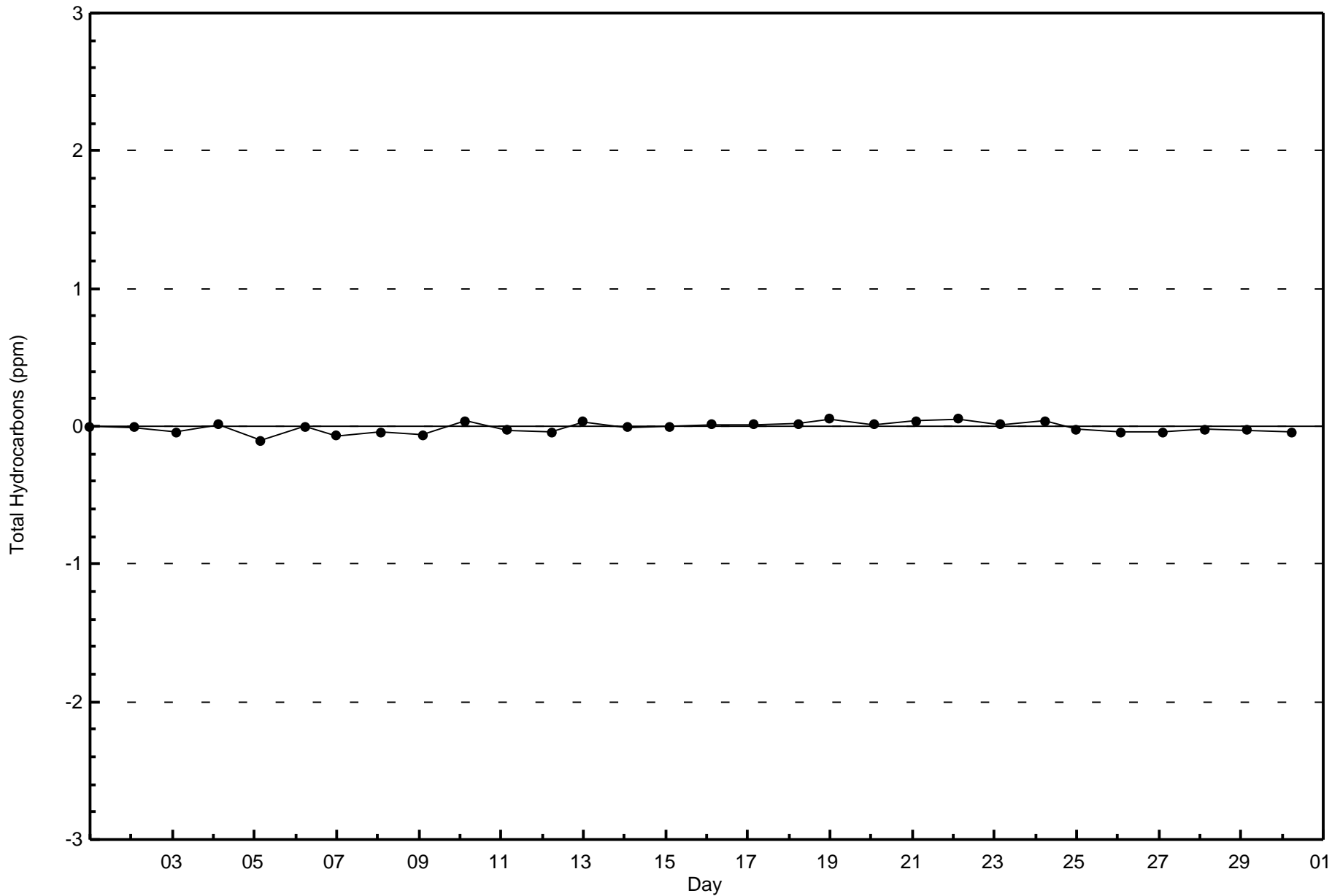
Total Number of Hours: 720

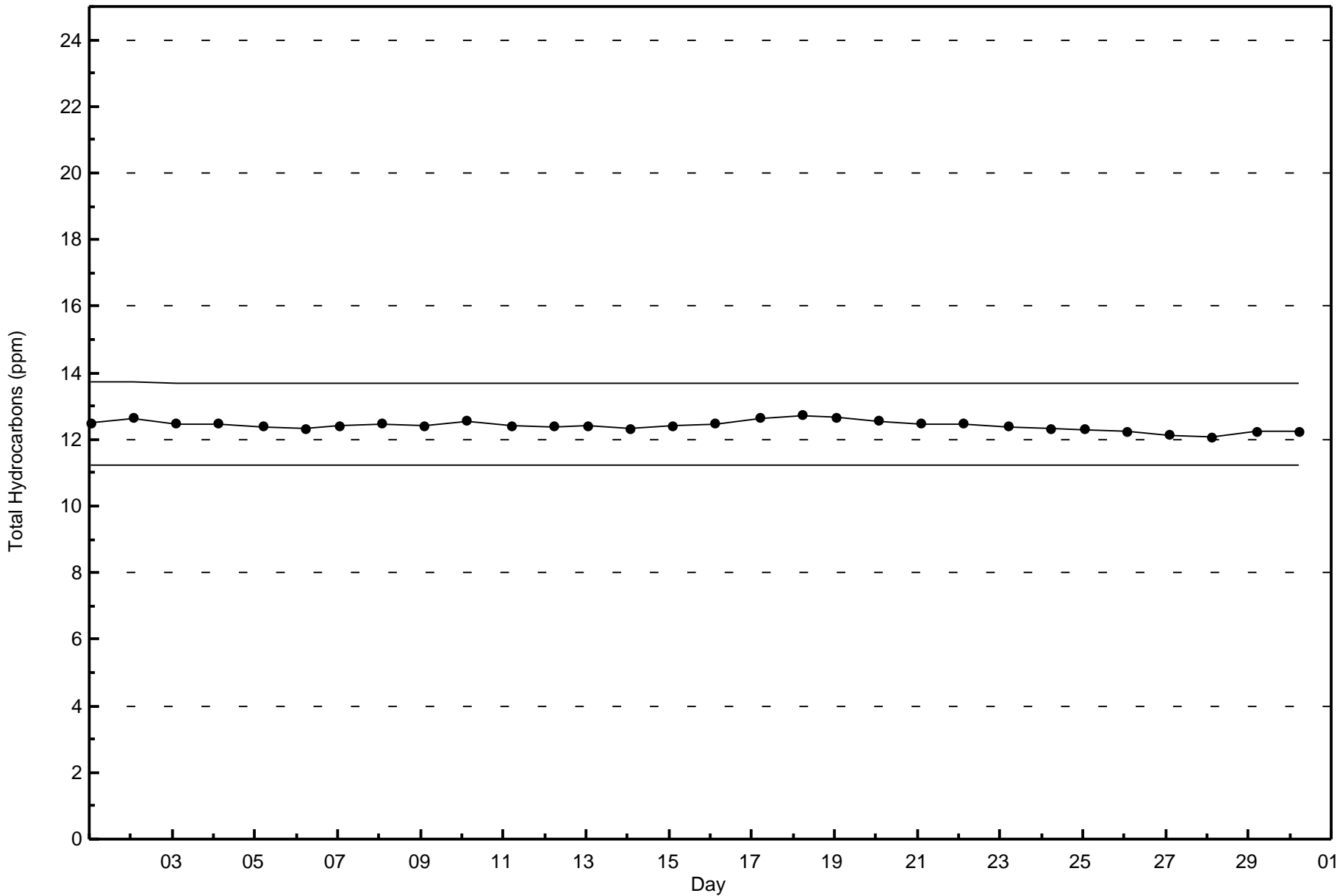


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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







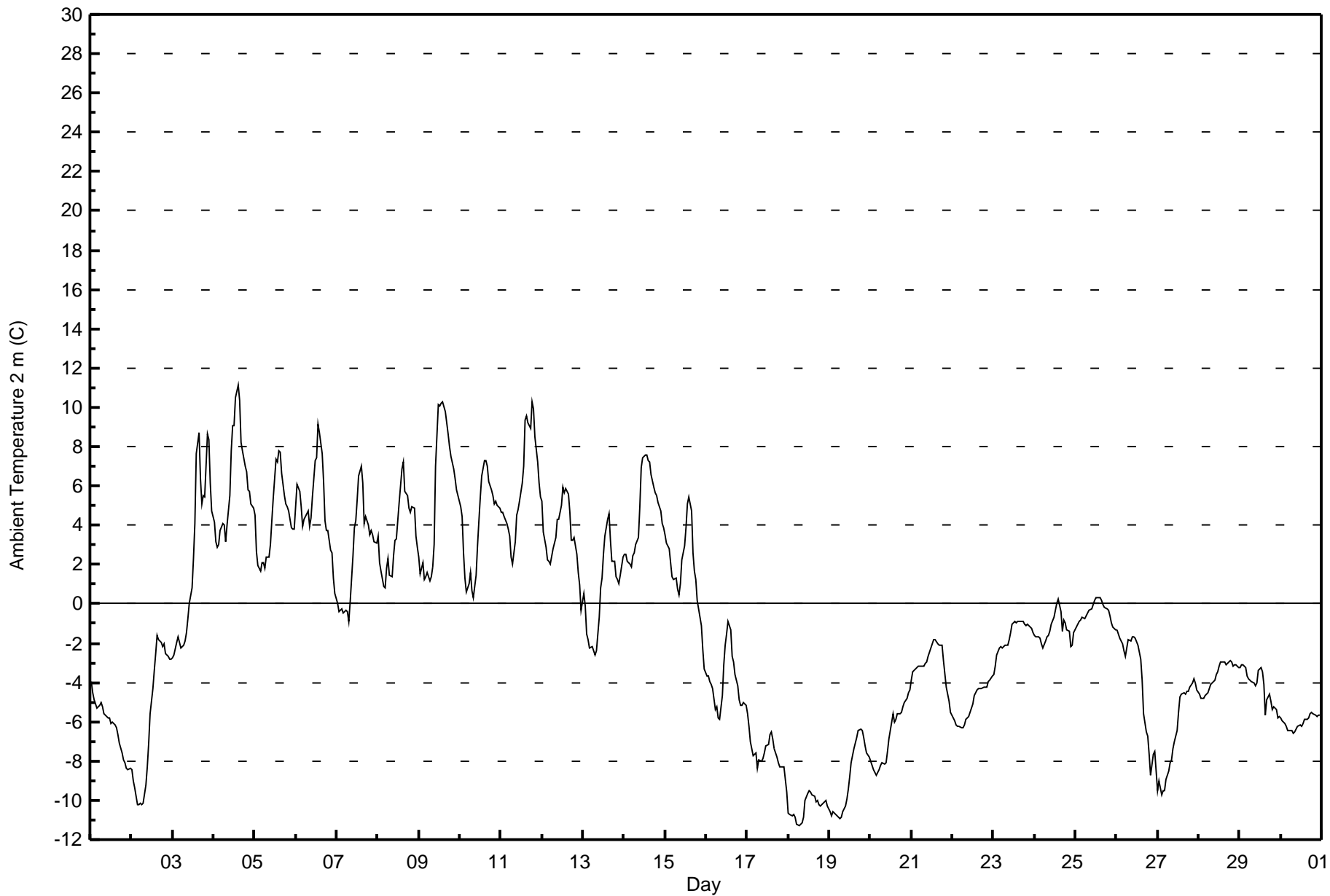


Maximum Value: 11.2 C on Nov 4 15:00 Maximum Daily Average: 6.1 C on Nov 4																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: -11.3 C on Nov 18 07:00 Minimum Daily Average: -10.4 C on Nov 18 Maximum Diurnal Average: 1.1 C at hour 15 Minimum Diurnal Average: -2.7 C at hour 5 Monthly Average: -1.18 C Percentiles: P ₁ = -10.9 P ₁₀ = -8.1 Q ₁ = -5.6 Median = -1.7 Q ₃ = 3.2 P ₉₀ = 5.8 P ₉₉ = 10.1																											
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-Nov	-4.0	-4.5	-4.9	-5.1	-5.3	-5.1	-5.0	-5.2	-5.6	-5.8	-5.8	-5.8	-6.1	-6.0	-6.2	-6.3	-6.7	-7.1	-7.6	-8.0	-8.1	-8.4	-8.5	-8.4	-6.2	-4.0	
2-Nov	-8.4	-9.0	-9.4	-10.2	-10.2	-10.2	-10.2	-10.2	-9.2	-8.3	-7.1	-5.6	-4.3	-3.4	-2.6	-1.6	-1.8	-2.0	-2.2	-2.0	-2.6	-2.7	-2.8	-2.8	-5.8	-1.6	
3-Nov	-2.7	-2.6	-1.9	-1.7	-2.0	-2.2	-2.1	-1.9	-1.5	-0.7	0.0	0.8	2.3	4.1	7.6	8.7	6.3	5.1	5.5	5.5	8.7	8.3	6.2	4.7	2.3	8.7	
4-Nov	4.2	3.1	2.9	3.0	3.7	4.1	4.0	3.2	4.0	5.5	7.8	9.0	9.1	10.5	11.2	10.4	8.2	7.8	7.0	6.7	5.8	5.7	5.1	4.9	6.1	11.2	
5-Nov	4.5	2.7	2.0	1.7	2.1	2.1	1.8	2.4	2.4	3.0	4.3	5.4	7.3	7.2	7.8	7.7	6.7	5.5	5.1	4.9	4.8	3.9	3.8	3.8	4.3	7.8	
6-Nov	5.0	6.1	5.7	5.0	3.9	4.3	4.6	4.7	3.9	4.4	5.4	7.3	7.5	9.1	8.7	7.7	6.3	4.2	3.7	3.7	2.7	2.6	1.3	0.6	4.9	9.1	
7-Nov	0.0	-0.4	-0.3	-0.2	-0.4	-0.3	-0.4	-0.9	0.1	2.5	3.9	4.2	5.3	6.5	7.0	6.2	4.1	4.4	4.0	3.5	3.7	3.5	3.2	3.1	2.6	7.0	
8-Nov	3.4	2.1	1.7	0.9	0.8	1.8	2.3	1.5	1.4	2.4	3.2	3.3	5.1	6.0	6.8	7.2	5.7	5.5	4.9	4.7	4.9	4.9	3.4	2.9	3.6	7.2	
9-Nov	2.4	1.5	2.1	1.3	1.4	1.6	1.2	1.3	1.9	3.0	7.0	10.1	10.1	10.2	10.3	9.8	9.2	8.6	8.0	7.5	6.9	6.4	5.8	5.5	5.5	10.3	
10-Nov	5.0	4.4	2.6	1.3	0.6	1.1	1.6	0.7	0.3	1.5	2.9	4.2	5.5	6.5	7.3	7.3	7.0	6.2	5.8	5.5	5.1	5.2	5.0	4.9	4.1	7.3	
11-Nov	4.6	4.6	4.4	4.1	3.8	3.5	2.4	2.1	3.2	4.5	4.8	5.2	6.2	7.0	9.4	9.6	9.2	8.9	10.3	9.9	8.5	7.2	6.1	5.5	6.0	10.3	
12-Nov	5.2	3.7	2.9	2.2	2.2	2.0	2.8	3.1	3.3	4.3	4.3	5.0	5.9	5.7	5.8	5.6	4.7	3.2	3.2	3.4	2.5	1.6	0.9	-0.3	3.5	5.9	
13-Nov	0.5	-0.1	-1.6	-1.8	-2.2	-2.2	-2.4	-2.6	-2.4	-0.7	0.8	1.3	2.5	3.4	4.3	4.6	3.2	2.2	2.2	1.4	1.2	1.1	1.5	2.4	0.7	4.6	
14-Nov	2.5	2.5	2.1	2.0	1.9	2.4	2.6	3.0	3.4	4.9	6.9	7.4	7.6	7.3	7.2	6.6	5.9	5.7	5.5	5.2	4.7	4.1	3.9	3.9	4.7	7.6	
15-Nov	3.5	3.1	2.8	2.1	1.4	1.3	1.3	0.8	0.5	1.0	2.2	3.0	3.9	5.1	5.4	4.7	2.6	1.7	1.2	0.2	-0.7	-1.1	-2.3	-3.3	1.7	5.4	
16-Nov	-3.7	-3.7	-4.0	-4.1	-4.3	-5.4	-5.2	-5.8	-5.9	-4.6	-3.1	-2.1	-1.6	-0.9	-1.3	-2.7	-3.0	-3.6	-4.2	-4.9	-5.1	-5.2	-5.0	-5.1	-3.9	-0.9	
17-Nov	-5.6	-6.3	-7.0	-7.7	-7.7	-7.6	-8.3	-7.9	-8.0	-7.9	-7.6	-7.3	-7.1	-6.7	-6.5	-6.9	-7.4	-7.8	-8.1	-8.3	-8.3	-8.3	-8.9	-9.6	-7.6	-5.6	
18-Nov	-10.6	-10.7	-10.8	-10.7	-10.8	-11.2	-11.3	-11.2	-11.1	-10.8	-10.0	-9.6	-9.5	-9.6	-9.7	-9.8	-10.1	-10.0	-10.2	-10.3	-10.1	-10.1	-10.0	-10.3	-10.4	-9.5	
19-Nov	-10.6	-10.8	-10.6	-10.6	-10.7	-10.9	-10.9	-10.9	-10.6	-10.3	-9.9	-9.4	-8.8	-8.1	-7.4	-7.1	-6.8	-6.4	-6.4	-6.5	-6.8	-7.3	-7.6	-7.8	-8.9	-6.4	
20-Nov	-8.0	-8.2	-8.5	-8.7	-8.6	-8.4	-8.2	-8.1	-8.2	-8.0	-7.5	-6.9	-6.0	-5.6	-6.0	-5.9	-5.6	-5.6	-5.5	-5.3	-5.0	-4.8	-4.6	-4.4	-6.7	-4.4	
21-Nov	-3.9	-3.5	-3.3	-3.2	-3.2	-3.2	-3.2	-3.1	-3.0	-3.0	-2.7	-2.2	-2.0	-1.8	-1.8	-2.0	-2.1	-2.1	-2.1	-2.9	-4.2	-4.6	-4.9	-5.5	-3.1	-1.8	
22-Nov	-5.8	-5.9	-6.1	-6.2	-6.2	-6.3	-6.3	-6.2	-5.9	-5.7	-5.5	-5.3	-5.1	-4.7	-4.4	-4.3	-4.3	-4.3	-4.2	-4.2	-4.2	-4.0	-3.9	-3.7	-5.1	-3.7	
23-Nov	-3.6	-3.2	-2.6	-2.3	-2.2	-2.2	-2.2	-2.1	-2.1	-1.8	-1.4	-1.0	-0.9	-1.0	-0.9	-0.9	-0.9	-0.9	-1.0	-1.1	-1.0	-1.2	-1.2	-1.5	-1.6	-0.9	
24-Nov	-1.6	-1.7	-1.7	-1.7	-2.0	-2.3	-1.9	-1.7	-1.6	-1.4	-1.0	-0.7	-0.3	0.0	0.3	0.3	-0.4	-1.4	-0.9	-1.0	-1.4	-1.4	-2.2	-2.1	-1.4	-1.3	0.3
25-Nov	-1.2	-1.0	-0.9	-0.8	-0.7	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	0.1	0.3	0.3	0.3	0.2	0.0	-0.2	-0.2	-0.3	-0.6	-1.0	-1.2	-1.3	-0.4	0.3	
26-Nov	-1.3	-1.5	-1.8	-2.0	-2.4	-2.7	-2.2	-1.8	-1.9	-1.7	-1.6	-1.8	-2.1	-2.5	-2.8	-3.9	-5.6	-6.6	-6.7	-7.7	-8.7	-7.7	-7.5	-8.5	-3.9	-1.3	
27-Nov	-9.5	-9.0	-9.7	-9.5	-9.5	-8.9	-8.5	-8.1	-7.9	-7.4	-7.0	-6.5	-5.5	-4.7	-4.6	-4.5	-4.6	-4.5	-4.5	-4.2	-4.0	-3.8	-4.0	-4.4	-6.5	-3.8	
28-Nov	-4.6	-4.8	-4.8	-4.8	-4.7	-4.5	-4.3	-4.1	-4.0	-3.9	-3.6	-3.5	-3.1	-3.0	-2.9	-3.0	-3.1	-3.0	-2.9	-3.0	-3.2	-3.1	-3.1	-3.2	-3.7	-2.9	
29-Nov	-3.2	-3.1	-3.1	-3.2	-3.7	-3.8	-3.9	-4.0	-4.1	-4.2	-4.0	-3.4	-3.3	-3.4	-4.1	-5.7	-4.9	-4.6	-4.9	-5.4	-5.2	-5.4	-5.8	-5.7	-4.2	-3.1	
30-Nov	-5.8	-6.0	-6.1	-6.2	-6.4	-6.4	-6.5	-6.6	-6.5	-6.4	-6.2	-6.2	-6.2	-6.1	-5.9	-5.9	-5.8	-5.6	-5.5	-5.6	-5.7	-5.7	-5.7	-5.7	-6.0	-5.5	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2 m (AT2m) - C
Mannix - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	432	60.00	60.00
0 - 10	280	38.89	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



Summary of Hour Averages

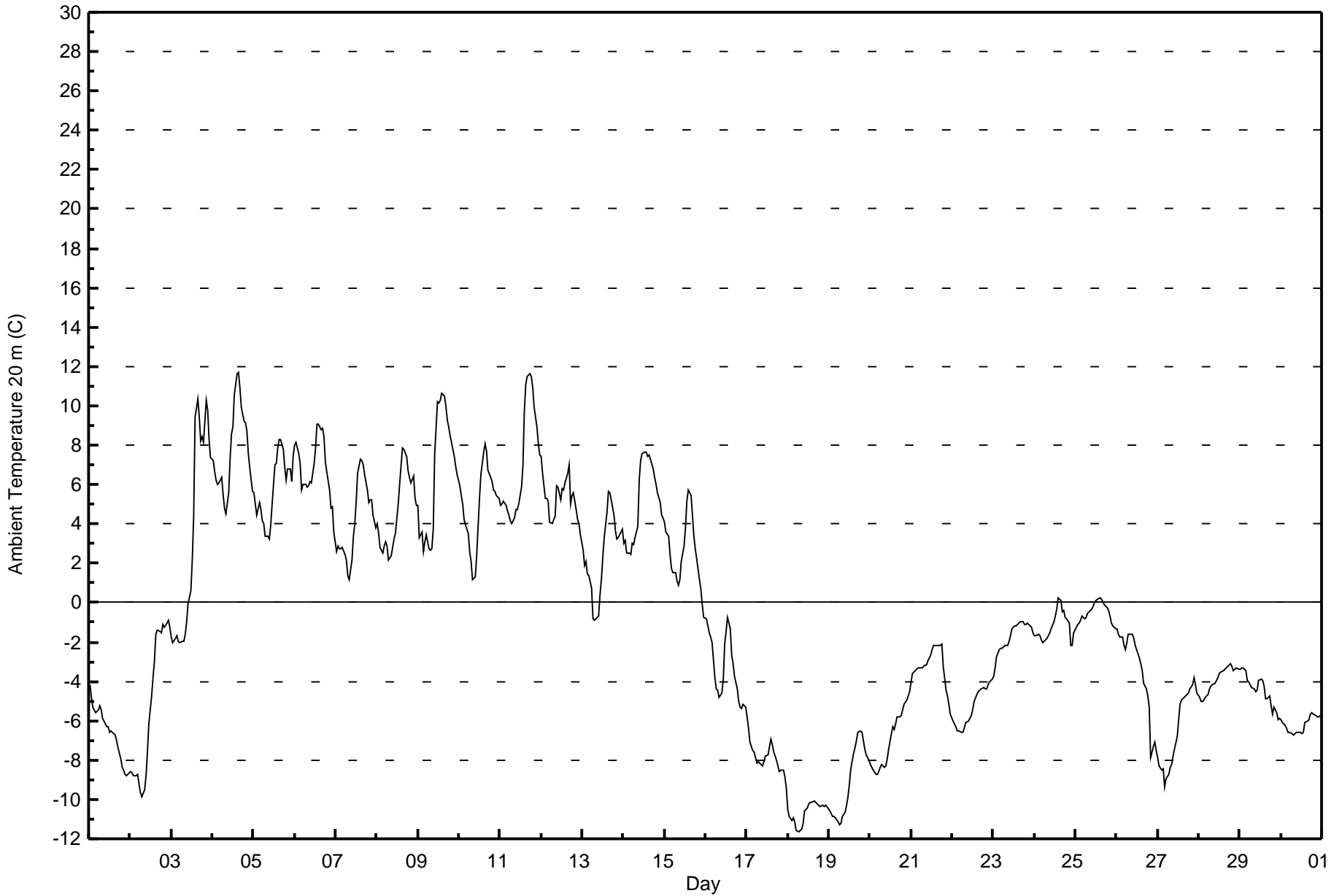
Mannix - November 2016

Maximum Value: 11.7 C on Nov 4 16:00 Maximum Daily Average: 7.7 C on Nov 4																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -11.6 C on Nov 18 07:00 Minimum Daily Average: -10.7 C on Nov 18 Maximum Diurnal Average: 1.2 C at hour 16 Minimum Diurnal Average: -2.2 C at hour 8 Monthly Average: -0.67 C Percentiles: P ₁ = -11.1 P ₁₀ = -8.3 Q ₁ = -5.5 Median = -1.4 Q ₃ = 4.7 P ₉₀ = 7.3 P ₉₉ = 10.8																										
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	-4.2	-4.8	-5.3	-5.4	-5.6	-5.5	-5.3	-5.5	-5.9	-6.2	-6.3	-6.3	-6.6	-6.5	-6.7	-6.8	-7.1	-7.4	-7.9	-8.3	-8.5	-8.7	-8.8	-8.7	-6.6	-4.2
2-Nov	-8.6	-8.6	-8.8	-8.8	-8.7	-9.2	-9.7	-9.9	-9.5	-8.8	-7.6	-6.1	-4.8	-3.8	-2.9	-1.6	-1.4	-1.5	-1.6	-1.1	-1.3	-1.1	-0.9	-1.2	-5.3	-0.9
3-Nov	-1.8	-2.0	-1.8	-1.7	-2.0	-2.1	-1.9	-1.9	-1.6	-1.0	0.0	0.6	2.2	4.4	9.4	10.4	9.4	8.3	8.4	8.2	10.3	9.8	8.3	7.4	3.3	10.4
4-Nov	7.2	6.7	6.2	6.0	6.1	6.4	5.5	4.8	4.5	5.6	7.3	8.6	8.9	10.6	11.7	11.7	10.9	9.9	9.2	9.2	8.7	7.6	6.8	5.7	7.7	11.7
5-Nov	5.6	5.0	4.4	5.1	4.8	4.1	4.0	3.4	3.4	3.2	4.0	5.0	7.0	7.1	7.8	8.3	8.3	7.8	6.9	6.2	6.8	6.8	6.1	7.4	5.8	8.3
6-Nov	8.0	8.1	7.6	7.1	5.7	6.0	6.0	5.9	5.9	6.2	6.1	7.1	7.9	9.0	9.1	8.8	8.9	8.4	7.2	6.7	5.7	4.8	4.9	3.6	6.9	9.1
7-Nov	2.6	2.9	2.7	2.8	2.8	2.5	2.2	1.4	1.1	2.1	3.4	4.0	5.1	6.6	7.3	7.2	7.0	6.5	5.7	5.1	5.2	5.2	4.4	3.8	4.2	7.3
8-Nov	4.0	3.5	2.8	2.5	2.9	3.1	2.9	2.2	2.4	2.8	3.2	3.5	5.0	6.0	6.9	7.8	7.8	7.4	6.8	6.4	6.1	6.5	5.3	5.0	4.7	7.8
9-Nov	4.9	3.3	3.6	2.6	3.1	3.4	2.7	2.7	2.7	3.7	7.5	10.2	10.1	10.3	10.6	10.5	10.0	9.3	8.9	8.5	7.8	7.5	7.0	6.5	6.6	10.6
10-Nov	5.9	5.4	5.0	4.3	4.0	3.5	2.6	2.1	1.2	1.3	2.3	3.9	5.3	6.5	7.7	8.0	7.7	6.7	6.4	6.2	5.7	5.7	5.5	5.3	4.9	8.0
11-Nov	5.0	5.0	5.1	4.9	4.7	4.4	4.2	4.0	4.3	4.7	4.7	5.0	5.9	7.0	9.7	11.0	11.5	11.7	11.5	10.9	9.9	8.9	8.1	7.5	7.1	11.7
12-Nov	7.4	6.6	5.3	5.3	5.2	4.1	4.0	4.3	4.4	5.9	5.8	5.2	5.8	5.8	6.1	6.6	7.0	5.0	5.5	5.6	4.7	4.2	4.0	3.4	5.3	7.4
13-Nov	2.6	1.9	2.1	1.4	1.4	0.8	-0.8	-0.9	-0.8	-0.7	0.4	1.2	2.3	3.3	4.6	5.6	5.6	5.2	4.4	3.7	3.2	3.3	3.5	3.8	2.4	5.6
14-Nov	3.1	3.1	2.5	2.5	2.4	3.1	3.0	3.3	3.9	6.2	7.2	7.6	7.6	7.6	7.4	7.5	7.3	6.8	6.4	6.0	5.6	5.1	4.5	4.3	5.2	7.6
15-Nov	4.1	3.6	3.4	2.5	1.7	1.5	1.5	1.1	0.9	1.2	2.1	2.9	3.8	5.2	5.7	5.5	4.5	3.4	2.7	2.2	1.2	0.7	-0.1	-0.7	2.5	5.7
16-Nov	-0.8	-1.2	-1.5	-1.7	-2.0	-3.8	-4.4	-4.5	-4.8	-4.6	-3.9	-2.1	-1.4	-0.7	-1.3	-2.7	-3.1	-3.8	-4.4	-5.0	-5.3	-5.4	-5.2	-5.3	-3.3	-0.7
17-Nov	-5.8	-6.4	-7.1	-7.5	-7.6	-7.9	-8.2	-8.1	-8.3	-8.3	-8.1	-7.8	-7.7	-7.3	-7.0	-7.2	-7.6	-8.0	-8.3	-8.5	-8.5	-8.5	-8.8	-9.5	-7.8	-5.8
18-Nov	-10.5	-10.9	-11.1	-10.9	-11.1	-11.6	-11.6	-11.6	-11.5	-11.2	-10.6	-10.5	-10.2	-10.2	-10.1	-10.1	-10.2	-10.2	-10.3	-10.4	-10.3	-10.3	-10.3	-10.4	-10.7	-10.1
19-Nov	-10.6	-10.7	-10.9	-10.8	-11.0	-11.1	-11.3	-11.2	-10.9	-10.6	-10.3	-9.9	-9.2	-8.4	-7.7	-7.3	-7.0	-6.6	-6.5	-6.6	-7.0	-7.4	-7.7	-8.0	-9.1	-6.5
20-Nov	-8.2	-8.4	-8.5	-8.7	-8.7	-8.6	-8.4	-8.2	-8.3	-8.3	-7.9	-7.4	-6.7	-6.3	-6.4	-6.2	-5.8	-5.8	-5.7	-5.5	-5.2	-5.0	-4.7	-4.5	-7.0	-4.5
21-Nov	-4.0	-3.6	-3.5	-3.4	-3.3	-3.3	-3.3	-3.3	-3.2	-3.1	-3.0	-2.7	-2.4	-2.2	-2.1	-2.2	-2.2	-2.2	-2.1	-3.2	-4.5	-4.7	-5.1	-5.7	-3.3	-2.1
22-Nov	-6.0	-6.2	-6.3	-6.5	-6.5	-6.6	-6.6	-6.4	-6.1	-6.0	-5.9	-5.7	-5.5	-5.0	-4.7	-4.5	-4.5	-4.4	-4.3	-4.4	-4.4	-4.1	-4.0	-3.9	-5.4	-3.9
23-Nov	-3.7	-3.3	-2.7	-2.4	-2.3	-2.3	-2.2	-2.2	-2.0	-1.7	-1.4	-1.2	-1.2	-1.1	-1.0	-1.0	-0.9	-1.1	-1.1	-1.1	-1.1	-1.2	-1.3	-1.5	-1.8	-0.9
24-Nov	-1.7	-1.7	-1.6	-1.7	-1.9	-2.0	-1.9	-1.8	-1.7	-1.5	-1.3	-1.0	-0.7	-0.3	0.2	0.1	-0.4	-0.4	-0.8	-0.8	-1.0	-2.2	-2.2	-1.5	-1.2	0.2
25-Nov	-1.3	-1.1	-1.0	-0.9	-0.7	-0.8	-0.7	-0.6	-0.4	-0.3	-0.2	0.0	0.1	0.2	0.2	0.2	0.0	-0.1	-0.3	-0.4	-0.7	-1.1	-1.2	-1.3	-0.5	0.2
26-Nov	-1.3	-1.6	-1.7	-1.8	-2.2	-2.4	-2.1	-1.6	-1.6	-1.6	-1.8	-2.2	-2.6	-2.9	-3.1	-3.4	-4.1	-4.4	-4.7	-5.3	-7.9	-7.3	-7.1	-7.5	-3.4	-1.3
27-Nov	-7.9	-8.3	-8.5	-8.5	-9.4	-9.0	-8.7	-8.4	-8.2	-7.8	-7.4	-6.8	-6.0	-5.2	-5.0	-4.8	-4.7	-4.7	-4.6	-4.4	-4.1	-3.8	-4.1	-4.6	-6.4	-3.8
28-Nov	-4.8	-5.0	-5.0	-5.0	-4.8	-4.7	-4.4	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.6	-3.4	-3.4	-3.3	-3.2	-3.1	-3.2	-3.5	-3.4	-3.3	-3.4	-3.9	-3.1
29-Nov	-3.4	-3.3	-3.3	-3.5	-3.9	-4.1	-4.2	-4.3	-4.4	-4.5	-4.5	-3.9	-3.9	-3.9	-4.2	-4.9	-4.9	-4.7	-5.2	-5.6	-5.3	-5.6	-6.0	-5.9	-4.5	-3.3
30-Nov	-5.9	-6.1	-6.3	-6.4	-6.6	-6.6	-6.6	-6.7	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	-6.1	-6.0	-5.9	-5.7	-5.6	-5.6	-5.7	-5.8	-5.8	-5.8	-6.2	-5.6
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 20 m (AT20m) - C
Mannix - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	417	57.92	57.92
0 - 10	287	39.86	97.78
10 - 20	16	2.22	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Summary of Hour Averages

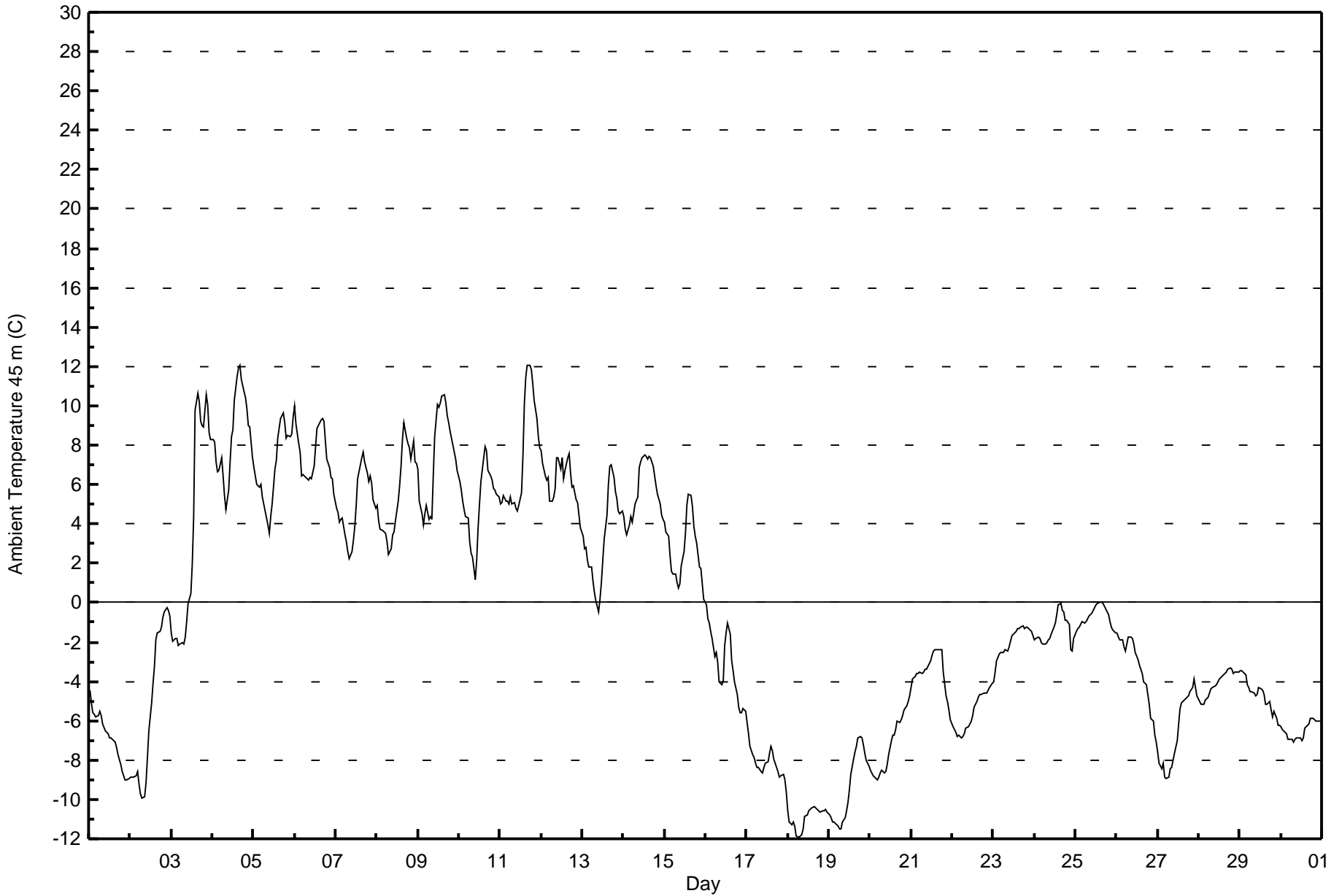
Mannix - November 2016

Maximum Value: 12.1 C on Nov 11 18:00		Maximum Daily Average: 8.5 C on Nov 4		Hours in Service: 720																							
Minimum Value: -11.9 C on Nov 18 07:00		Minimum Daily Average: -10.9 C on Nov 18		Hours of Data: 720																							
Maximum Diurnal Average: 1.3 C at hour 17		Minimum Diurnal Average: -2.0 C at hour 9		Hours of Missing Data: 0																							
Monthly Average: -0.50 C		Percentiles: P ₁ = -11.4 P ₁₀ = -8.5 Q ₁ = -5.7 Median = -1.5 Q ₃ = 5.2 P ₉₀ = 7.8 P ₉₉ = 11.4		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-Nov	-4.4	-5.1	-5.6	-5.7	-5.8	-5.7	-5.5	-5.7	-6.2	-6.5	-6.6	-6.6	-6.9	-6.9	-7.0	-7.1	-7.4	-7.7	-8.2	-8.6	-8.8	-9.0	-9.0	-9.0	-6.9	-4.4	
2-Nov	-8.9	-8.8	-8.8	-8.8	-8.6	-9.2	-9.7	-10.0	-9.8	-9.1	-7.9	-6.5	-5.1	-4.1	-3.2	-1.9	-1.5	-1.4	-1.2	-0.8	-0.5	-0.3	-0.4	-0.7	-5.3	-0.3	
3-Nov	-1.5	-1.9	-1.8	-1.9	-2.2	-2.1	-2.1	-2.1	-1.7	-0.9	-0.1	0.5	2.0	4.4	9.7	10.6	10.2	9.2	9.0	8.9	10.5	10.1	8.6	8.3	3.5	10.6	
4-Nov	8.3	8.2	7.1	6.6	6.7	7.4	6.4	5.4	4.7	5.7	7.2	8.4	8.8	10.3	11.5	12.0	12.1	11.4	10.7	10.5	9.8	9.0	9.0	7.3	8.5	12.1	
5-Nov	6.8	6.5	6.0	5.9	6.0	5.4	5.0	4.6	3.9	3.5	4.3	5.0	6.8	7.3	8.3	8.8	9.4	9.7	9.1	8.3	8.5	8.4	8.5	9.4	6.9	9.7	
6-Nov	10.0	9.1	8.1	7.6	6.4	6.5	6.4	6.3	6.2	6.4	6.3	6.9	7.9	8.8	9.0	9.3	9.3	9.2	8.2	7.3	6.9	6.4	6.3	5.5	7.5	10.0	
7-Nov	4.8	4.6	4.1	4.3	4.3	3.5	3.1	2.6	2.3	2.6	3.2	3.9	4.9	6.3	7.0	7.3	7.7	7.2	6.6	6.2	6.4	6.1	5.2	4.8	5.0	7.7	
8-Nov	4.9	4.2	3.7	3.6	3.6	3.5	3.1	2.5	2.8	3.4	3.6	4.2	5.1	6.0	6.9	8.3	9.1	8.3	8.0	7.9	7.3	8.2	7.2	7.1	5.5	9.1	
9-Nov	6.8	5.1	4.5	3.9	4.5	4.9	4.2	4.4	4.2	6.4	8.4	10.1	10.0	10.1	10.5	10.6	10.2	9.5	9.2	8.7	8.0	7.7	7.3	6.7	7.3	10.6	
10-Nov	6.1	5.8	5.2	4.7	4.4	4.3	3.1	2.6	2.3	1.1	2.2	3.8	5.0	6.1	7.4	8.0	7.7	6.7	6.4	6.3	5.8	5.7	5.5	5.3	5.1	8.0	
11-Nov	5.0	5.1	5.4	5.2	5.2	5.0	5.4	5.0	5.1	4.8	4.6	4.9	5.6	7.4	10.0	11.4	12.0	12.1	11.8	11.1	10.3	9.4	8.4	7.9	7.4	12.1	
12-Nov	7.7	7.1	6.4	6.2	6.4	5.2	5.2	5.4	5.8	7.4	7.4	6.8	7.4	6.3	6.7	7.4	7.6	6.6	5.9	5.9	5.2	5.1	4.5	3.8	6.2	7.7	
13-Nov	3.4	2.8	2.8	2.2	1.8	1.8	1.1	0.5	0.1	-0.5	0.2	1.0	2.1	3.2	4.4	6.0	7.0	7.0	6.3	5.6	5.3	4.7	4.5	4.7	3.3	7.0	
14-Nov	4.3	3.8	3.5	3.9	4.3	4.1	4.5	5.0	5.4	6.9	7.2	7.4	7.5	7.5	7.3	7.4	7.3	6.9	6.4	5.9	5.5	5.0	4.4	4.3	5.7	7.5	
15-Nov	4.1	3.6	3.4	2.4	1.6	1.4	1.4	1.1	0.8	1.0	1.9	2.6	3.5	4.9	5.5	5.4	4.9	3.8	3.4	3.0	1.8	1.8	0.9	0.1	2.7	5.5	
16-Nov	-0.1	-0.8	-1.1	-1.5	-1.8	-2.8	-2.5	-3.0	-4.0	-4.2	-4.0	-2.2	-1.5	-1.0	-1.6	-3.0	-3.4	-4.1	-4.6	-5.3	-5.6	-5.6	-5.4	-5.5	-3.1	-0.1	
17-Nov	-6.1	-6.6	-7.3	-7.7	-7.9	-8.1	-8.4	-8.4	-8.6	-8.6	-8.4	-8.1	-8.1	-7.7	-7.3	-7.5	-7.9	-8.3	-8.6	-8.8	-8.8	-8.8	-9.0	-9.7	-8.1	-6.1	
18-Nov	-10.5	-11.1	-11.3	-11.1	-11.4	-11.8	-11.9	-11.9	-11.8	-11.5	-10.9	-10.8	-10.6	-10.5	-10.4	-10.4	-10.4	-10.5	-10.6	-10.7	-10.6	-10.6	-10.5	-10.6	-10.9	-10.4	
19-Nov	-10.8	-10.9	-11.2	-11.1	-11.2	-11.4	-11.5	-11.5	-11.2	-11.0	-10.6	-10.2	-9.5	-8.7	-8.0	-7.6	-7.3	-6.9	-6.8	-6.9	-7.2	-7.7	-8.0	-8.3	-9.4	-6.8	
20-Nov	-8.5	-8.6	-8.8	-9.0	-9.0	-8.9	-8.6	-8.5	-8.6	-8.6	-8.2	-7.7	-7.0	-6.7	-6.7	-6.4	-6.0	-6.1	-6.0	-5.7	-5.5	-5.2	-5.0	-4.8	-7.3	-4.8	
21-Nov	-4.3	-3.9	-3.7	-3.6	-3.6	-3.5	-3.6	-3.5	-3.4	-3.4	-3.3	-3.0	-2.6	-2.5	-2.4	-2.4	-2.4	-2.4	-2.4	-3.5	-4.7	-5.0	-5.4	-6.0	-3.5	-2.4	
22-Nov	-6.3	-6.5	-6.6	-6.8	-6.7	-6.9	-6.8	-6.7	-6.4	-6.3	-6.1	-6.0	-5.7	-5.3	-5.0	-4.8	-4.7	-4.7	-4.6	-4.6	-4.6	-4.4	-4.3	-4.1	-5.6	-4.1	
23-Nov	-4.0	-3.5	-3.0	-2.6	-2.5	-2.5	-2.5	-2.4	-2.4	-2.2	-1.9	-1.6	-1.5	-1.5	-1.3	-1.3	-1.2	-1.2	-1.3	-1.3	-1.3	-1.4	-1.5	-1.7	-2.0	-1.2	
24-Nov	-1.9	-1.8	-1.8	-1.8	-2.0	-2.1	-2.1	-2.0	-1.9	-1.8	-1.6	-1.3	-1.0	-0.6	-0.1	0.0	-0.4	-0.5	-0.9	-0.9	-1.1	-2.4	-2.4	-1.8	-1.4	0.0	
25-Nov	-1.5	-1.4	-1.3	-1.1	-1.0	-1.1	-1.0	-0.8	-0.7	-0.5	-0.4	-0.2	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.5	-0.6	-0.9	-1.3	-1.4	-1.5	-0.7	0.0	
26-Nov	-1.5	-1.8	-1.9	-1.9	-2.3	-2.4	-2.1	-1.7	-1.8	-1.8	-2.1	-2.5	-2.9	-3.2	-3.4	-3.6	-4.0	-4.2	-4.7	-5.2	-5.9	-6.0	-6.8	-7.1	-3.4	-1.5	
27-Nov	-7.6	-8.2	-8.5	-8.1	-8.9	-8.9	-8.8	-8.5	-8.4	-8.0	-7.7	-7.0	-6.2	-5.4	-5.1	-4.9	-4.9	-4.8	-4.7	-4.6	-4.3	-3.9	-4.3	-4.7	-6.5	-3.9	
28-Nov	-5.0	-5.2	-5.2	-5.1	-5.0	-4.8	-4.6	-4.4	-4.3	-4.3	-4.2	-4.1	-3.9	-3.8	-3.7	-3.6	-3.5	-3.4	-3.3	-3.4	-3.6	-3.5	-3.5	-3.6	-4.1	-3.3	
29-Nov	-3.5	-3.5	-3.5	-3.7	-4.2	-4.3	-4.5	-4.5	-4.6	-4.8	-4.7	-4.3	-4.4	-4.4	-4.7	-5.1	-5.1	-5.0	-5.5	-5.8	-5.6	-5.8	-6.2	-6.2	-4.7	-3.5	
30-Nov	-6.3	-6.4	-6.6	-6.7	-6.9	-7.0	-6.9	-7.1	-6.9	-6.9	-6.9	-6.9	-7.0	-6.9	-6.4	-6.2	-6.2	-5.9	-5.9	-5.9	-6.0	-6.0	-6.0	-6.0	-6.5	-5.9	
		-0.7	-1.0	-1.3	-1.4	-1.5	-1.7	-1.8	-1.9	-2.0	-1.7	-1.3	-0.8	-0.2	0.3	0.9	1.2	1.3	1.0	0.7	0.4	0.2	0.0	-0.3	-0.5	Diurnal Average	
		10.0	9.1	8.1	7.6	6.7	7.4	6.4	6.3	6.2	7.4	8.4	10.1	10.0	10.3	11.5	12.0	12.1	12.1	11.8	11.1	10.5	10.1	9.0	9.4	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 45 m (AT45m) - C
Mannix - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	418	58.06	58.06
0 - 10	278	38.61	96.67
10 - 20	24	3.33	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Summary of Hour Averages

Mannix - November 2016

Maximum Value: 12.8 C on Nov 4 18:00		Maximum Daily Average: 9.2 C on Nov 4		Hours in Service: 720																						
Minimum Value: -12.3 C on Nov 18 07:00		Minimum Daily Average: -11.2 C on Nov 18		Hours of Data: 720																						
Maximum Diurnal Average: 1.2 C at hour 17		Minimum Diurnal Average: -1.8 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -0.40 C		Percentiles: P ₁ = -11.7 P ₁₀ = -8.8 Q ₁ = -6.0 Median = -1.8 Q ₃ = 6.0 P ₉₀ = 8.5 P ₉₉ = 11.7		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-Nov	-4.8	-5.4	-5.8	-6.0	-6.1	-6.0	-5.8	-6.1	-6.5	-6.8	-7.0	-7.0	-7.3	-7.2	-7.3	-7.4	-7.7	-8.1	-8.6	-8.9	-9.1	-9.3	-9.4	-9.3	-7.2	-4.8
2-Nov	-9.2	-9.1	-9.0	-8.9	-8.7	-9.2	-9.6	-9.8	-10.1	-9.5	-8.2	-6.8	-5.4	-4.4	-3.5	-2.2	-1.6	-1.4	-0.6	-0.6	0.0	0.6	0.2	-0.2	-5.3	0.6
3-Nov	-1.2	-1.7	-1.8	-1.9	-2.3	-2.0	-1.9	-2.0	-1.6	0.0	0.1	0.5	2.0	5.8	10.1	10.7	10.3	9.4	9.2	9.2	10.7	10.2	8.8	8.5	3.7	10.7
4-Nov	8.6	8.8	7.9	7.0	7.2	7.9	7.3	6.3	5.1	5.9	7.3	8.5	9.1	10.4	11.5	12.4	12.7	12.8	12.7	11.7	10.5	9.9	9.6	9.5	9.2	12.8
5-Nov	9.1	8.0	7.2	6.6	6.9	6.0	5.9	8.4	6.7	6.8	5.8	5.9	6.8	7.9	8.8	9.8	10.6	11.1	10.6	10.1	10.0	8.9	9.1	10.5	8.2	11.1
6-Nov	10.6	9.4	8.3	7.8	6.6	6.7	6.5	6.4	6.2	6.2	6.2	6.7	7.8	8.6	8.8	9.2	9.2	9.2	8.4	7.5	7.3	7.1	6.7	6.5	7.7	10.6
7-Nov	5.9	5.0	4.5	4.6	4.3	3.5	3.2	3.0	3.0	3.1	3.2	3.9	5.1	6.3	7.1	7.5	7.8	8.0	7.8	7.4	7.5	6.9	6.1	6.1	5.5	8.0
8-Nov	6.1	5.0	4.3	4.1	3.8	3.8	3.4	2.9	3.0	4.4	5.1	5.5	6.8	7.1	8.3	9.4	10.7	9.8	9.5	9.5	10.3	10.2	9.3	8.7	6.7	10.7
9-Nov	8.1	7.4	7.2	6.4	7.0	6.2	5.6	6.3	6.0	7.6	9.0	9.8	9.7	9.9	10.3	10.5	10.1	9.5	9.2	8.7	8.1	7.7	7.4	6.7	8.1	10.5
10-Nov	6.1	5.8	5.1	4.9	4.4	4.3	3.5	2.6	3.1	2.3	2.8	3.7	4.8	6.0	7.3	7.9	7.7	6.7	6.5	6.3	5.9	5.8	5.6	5.4	5.2	7.9
11-Nov	5.2	5.2	5.7	5.6	5.6	5.7	5.8	5.8	5.4	4.8	4.6	5.1	5.6	8.9	10.6	11.5	12.1	12.1	11.9	11.1	10.3	9.4	8.5	8.1	7.7	12.1
12-Nov	7.8	7.5	7.1	6.5	6.7	6.3	5.7	6.0	6.6	8.5	8.3	8.1	8.6	7.3	7.6	7.6	7.6	6.9	6.3	6.3	5.9	5.5	4.9	4.3	6.8	8.6
13-Nov	4.3	4.1	3.5	2.7	2.2	1.9	1.4	0.5	0.4	0.8	0.9	1.2	2.2	3.4	5.4	7.0	7.5	8.1	7.7	7.0	7.0	6.4	5.9	5.9	4.1	8.1
14-Nov	5.4	5.1	5.0	5.9	6.0	5.6	6.6	6.4	6.4	6.9	7.0	7.2	7.2	7.2	7.0	7.2	7.2	6.8	6.3	5.7	5.3	4.9	4.3	4.2	6.1	7.2
15-Nov	3.9	3.4	3.2	2.3	1.5	1.3	1.3	0.9	0.5	0.7	1.6	2.3	3.2	4.6	5.2	5.2	4.7	4.0	3.8	3.5	2.6	2.4	1.4	0.5	2.7	5.2
16-Nov	0.0	-0.6	-1.0	-1.5	-1.9	-2.3	-2.2	-2.0	-3.1	-3.9	-3.9	-2.3	-2.0	-1.4	-1.9	-3.3	-3.8	-4.4	-5.0	-5.6	-5.9	-6.0	-5.7	-5.9	-3.2	0.0
17-Nov	-6.4	-6.9	-7.6	-8.0	-8.2	-8.5	-8.7	-8.7	-8.9	-9.0	-8.8	-8.5	-8.4	-8.0	-7.6	-7.9	-8.3	-8.7	-8.9	-9.2	-9.1	-9.1	-9.3	-9.9	-8.4	-6.4
18-Nov	-10.5	-11.4	-11.6	-11.4	-11.7	-12.1	-12.3	-12.2	-12.1	-11.8	-11.2	-11.1	-10.9	-10.8	-10.8	-10.7	-10.8	-10.8	-10.9	-11.0	-10.9	-10.9	-10.8	-11.0	-11.2	-10.5
19-Nov	-11.1	-11.2	-11.4	-11.4	-11.5	-11.7	-11.8	-11.8	-11.5	-11.3	-10.9	-10.5	-9.9	-9.0	-8.3	-8.0	-7.6	-7.2	-7.1	-7.2	-7.6	-8.0	-8.3	-8.6	-9.7	-7.1
20-Nov	-8.8	-9.0	-9.1	-9.3	-9.4	-9.2	-9.0	-8.8	-9.0	-8.9	-8.6	-8.0	-7.2	-7.0	-7.0	-6.8	-6.4	-6.4	-6.3	-6.1	-5.8	-5.5	-5.3	-5.1	-7.6	-5.1
21-Nov	-4.6	-4.2	-4.0	-3.9	-3.9	-3.9	-3.9	-3.8	-3.7	-3.7	-3.6	-3.3	-3.0	-2.8	-2.7	-2.7	-2.7	-2.6	-2.7	-3.8	-5.1	-5.3	-5.8	-6.3	-3.8	-2.6
22-Nov	-6.6	-6.8	-7.0	-7.1	-7.1	-7.2	-7.1	-7.0	-6.7	-6.6	-6.5	-6.3	-6.1	-5.7	-5.3	-5.1	-5.0	-5.0	-4.9	-5.0	-4.9	-4.7	-4.6	-4.5	-5.9	-4.5
23-Nov	-4.3	-3.9	-3.3	-2.9	-2.9	-2.8	-2.8	-2.7	-2.7	-2.6	-2.3	-2.0	-1.8	-1.8	-1.7	-1.6	-1.5	-1.5	-1.6	-1.5	-1.6	-1.7	-1.7	-2.0	-2.3	-1.5
24-Nov	-2.1	-2.0	-2.0	-2.1	-2.2	-2.3	-2.4	-2.3	-2.2	-2.1	-1.9	-1.6	-1.3	-0.9	-0.4	-0.3	-0.5	-0.6	-1.1	-1.0	-1.3	-2.7	-2.7	-2.1	-1.7	-0.3
25-Nov	-1.8	-1.7	-1.6	-1.4	-1.3	-1.4	-1.3	-1.1	-1.0	-0.9	-0.7	-0.5	-0.4	-0.4	-0.3	-0.3	-0.3	-0.4	-0.7	-0.8	-1.2	-1.5	-1.7	-1.8	-1.0	-0.3
26-Nov	-1.8	-2.0	-2.1	-2.1	-2.4	-2.6	-2.3	-2.0	-2.0	-2.1	-2.4	-2.8	-3.2	-3.5	-3.7	-3.9	-4.2	-4.4	-4.7	-5.3	-5.4	-5.9	-6.6	-7.0	-3.5	-1.8
27-Nov	-7.5	-8.1	-8.3	-8.0	-8.1	-8.5	-8.8	-8.3	-8.5	-8.2	-7.9	-7.2	-6.3	-5.5	-5.2	-5.1	-5.1	-4.9	-4.9	-4.8	-4.4	-4.1	-4.4	-4.9	-6.5	-4.1
28-Nov	-5.2	-5.3	-5.4	-5.3	-5.1	-5.0	-4.8	-4.5	-4.5	-4.4	-4.4	-4.3	-4.1	-4.1	-3.9	-3.8	-3.7	-3.5	-3.5	-3.6	-3.8	-3.7	-3.7	-3.8	-4.3	-3.5
29-Nov	-3.7	-3.7	-3.7	-3.9	-4.3	-4.4	-4.6	-4.4	-4.5	-4.8	-4.8	-4.5	-4.6	-4.7	-4.9	-5.3	-5.4	-5.3	-5.7	-6.1	-5.8	-6.1	-6.5	-6.4	-4.9	-3.7
30-Nov	-6.6	-6.7	-6.9	-7.0	-7.3	-7.3	-7.3	-7.4	-7.3	-7.3	-7.2	-7.3	-7.5	-7.3	-6.9	-6.7	-6.5	-6.2	-6.2	-6.2	-6.3	-6.3	-6.3	-6.3	-6.9	-6.2
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 75 m (AT75m) - C
Mannix - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	415	57.64	57.64
0 - 10	272	37.78	95.42
10 - 20	33	4.58	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 13.5 C on Nov 4 19:00 Maximum Daily Average: 9.4 C on Nov 4																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -12.3 C on Nov 18 07:00 Minimum Daily Average: -11.3 C on Nov 18 Maximum Diurnal Average: 1.2 C at hour 17 Minimum Diurnal Average: -1.7 C at hour 9 Monthly Average: -0.37 C Percentiles: P ₁ = -11.8 P ₁₀ = -8.8 Q ₁ = -6.1 Median = -1.8 Q ₃ = 6.2 P ₉₀ = 8.6 P ₉₉ = 12.0																										
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	-4.9	-5.4	-5.9	-6.1	-6.2	-6.1	-6.0	-6.2	-6.7	-7.0	-7.1	-7.1	-7.4	-7.4	-7.5	-7.6	-7.8	-8.2	-8.7	-9.1	-9.2	-9.5	-9.5	-9.4	-7.3	-4.9
2-Nov	-9.3	-9.2	-9.1	-9.0	-8.8	-9.1	-9.4	-9.8	-10.2	-9.6	-8.4	-7.0	-5.6	-4.5	-3.7	-2.3	-1.7	-1.2	-0.1	-0.5	0.2	0.7	0.5	0.0	-5.3	0.7
3-Nov	-1.1	-1.7	-1.8	-1.9	-2.2	-1.9	-1.7	-1.9	-1.3	0.4	0.2	0.6	2.2	6.5	10.1	10.7	10.3	9.5	9.2	9.2	10.7	10.3	8.8	8.5	3.8	10.7
4-Nov	8.6	8.9	8.2	7.2	7.4	8.1	7.6	6.6	5.2	6.0	7.4	8.5	9.1	10.3	11.4	12.5	12.9	13.4	13.5	12.1	10.6	9.9	9.7	9.9	9.4	13.5
5-Nov	10.1	8.8	7.6	7.2	7.4	6.8	7.1	9.0	7.6	7.2	6.4	6.3	7.4	8.2	9.1	10.2	11.1	11.3	10.8	10.3	10.2	9.0	9.4	10.9	8.7	11.3
6-Nov	10.7	9.5	8.4	7.8	6.7	6.8	6.5	6.5	6.2	6.2	6.2	6.6	7.8	8.5	8.7	9.2	9.1	9.1	8.4	7.5	7.3	7.2	6.8	6.6	7.7	10.7
7-Nov	6.0	5.1	4.5	4.6	4.3	3.5	3.2	3.1	3.0	3.1	3.3	3.9	5.3	6.2	6.9	7.4	7.8	8.2	8.3	7.9	7.8	7.2	6.4	6.4	5.6	8.3
8-Nov	6.2	5.2	4.5	4.2	3.9	4.0	3.5	3.1	3.4	5.2	5.7	6.0	7.4	7.6	8.6	9.7	11.0	10.7	10.3	10.2	11.5	10.9	10.0	9.3	7.2	11.5
9-Nov	8.5	8.1	8.4	7.3	7.7	6.6	5.8	6.8	6.5	7.8	9.1	9.7	9.6	9.8	10.1	10.4	10.1	9.5	9.2	8.7	8.2	7.7	7.4	6.7	8.3	10.4
10-Nov	6.1	5.8	5.0	4.9	4.4	4.2	3.5	2.6	3.1	2.8	3.4	3.9	4.7	5.8	7.1	7.8	7.6	6.6	6.6	6.4	6.0	5.9	5.7	5.4	5.2	7.8
11-Nov	5.2	5.3	5.9	5.6	5.7	5.9	6.0	5.9	5.4	4.8	4.6	5.4	5.8	9.4	10.7	11.5	12.1	12.1	11.8	11.0	10.3	9.4	8.5	8.1	7.8	12.1
12-Nov	7.8	7.6	7.2	6.6	6.8	6.5	6.0	6.1	6.9	9.0	8.5	8.3	8.7	7.6	7.7	7.6	7.6	6.9	6.4	6.6	6.1	5.7	5.0	4.6	7.0	9.0
13-Nov	4.7	4.8	4.1	2.9	2.4	1.9	1.3	0.6	0.5	1.1	1.5	1.5	2.3	3.7	5.7	7.0	7.6	8.2	7.9	7.3	7.3	6.8	6.2	6.3	4.3	8.2
14-Nov	5.6	5.5	5.7	6.4	6.2	6.1	6.8	6.6	6.6	6.9	7.1	7.1	7.1	6.9	7.1	7.1	6.7	6.2	5.6	5.2	4.8	4.2	4.1	4.1	6.2	7.1
15-Nov	3.8	3.3	3.1	2.2	1.4	1.2	1.2	0.8	0.4	0.6	1.5	2.2	3.1	4.5	5.1	5.1	4.7	4.1	4.1	3.7	2.8	2.6	1.4	0.7	2.7	5.1
16-Nov	0.0	-0.6	-1.0	-1.6	-1.9	-2.3	-2.3	-2.0	-2.9	-3.6	-3.3	-2.0	-2.0	-1.5	-2.1	-3.5	-3.9	-4.5	-5.1	-5.8	-6.1	-6.1	-5.8	-6.0	-3.2	0.0
17-Nov	-6.5	-7.1	-7.7	-8.1	-8.3	-8.6	-8.8	-8.8	-9.0	-9.1	-8.9	-8.6	-8.5	-8.2	-7.8	-8.0	-8.4	-8.8	-9.1	-9.3	-9.2	-9.2	-9.4	-10.0	-8.6	-6.5
18-Nov	-10.5	-11.4	-11.6	-11.5	-11.8	-12.2	-12.3	-12.3	-12.2	-11.9	-11.3	-11.2	-11.0	-10.9	-10.9	-10.8	-10.9	-11.0	-11.0	-11.1	-11.0	-11.0	-11.0	-11.1	-11.3	-10.5
19-Nov	-11.2	-11.3	-11.5	-11.5	-11.7	-11.8	-12.0	-12.0	-11.6	-11.4	-11.1	-10.6	-10.0	-9.1	-8.4	-8.1	-7.7	-7.3	-7.2	-7.3	-7.7	-8.1	-8.5	-8.7	-9.8	-7.2
20-Nov	-8.9	-9.1	-9.2	-9.4	-9.5	-9.3	-9.1	-9.0	-9.1	-9.1	-8.7	-8.1	-7.4	-7.2	-7.2	-6.9	-6.5	-6.5	-6.4	-6.2	-5.9	-5.6	-5.4	-5.2	-7.7	-5.2
21-Nov	-4.7	-4.3	-4.2	-4.1	-4.0	-4.0	-4.0	-3.9	-3.9	-3.9	-3.7	-3.4	-3.1	-2.9	-2.8	-2.9	-2.8	-2.7	-2.8	-4.0	-5.2	-5.4	-5.9	-6.5	-4.0	-2.7
22-Nov	-6.8	-6.9	-7.1	-7.2	-7.2	-7.3	-7.2	-7.1	-6.8	-6.7	-6.6	-6.5	-6.2	-5.8	-5.4	-5.2	-5.2	-5.1	-5.1	-5.1	-5.1	-4.9	-4.7	-4.6	-6.1	-4.6
23-Nov	-4.4	-4.0	-3.4	-3.0	-3.0	-3.0	-2.9	-2.9	-2.9	-2.7	-2.4	-2.1	-2.0	-2.0	-1.8	-1.8	-1.6	-1.6	-1.7	-1.6	-1.7	-1.8	-1.9	-2.1	-2.4	-1.6
24-Nov	-2.2	-2.0	-2.1	-2.1	-2.3	-2.4	-2.4	-2.3	-2.3	-2.2	-2.1	-1.6	-1.5	-1.0	-0.5	-0.4	-0.5	-0.7	-1.1	-1.1	-1.4	-2.8	-2.9	-2.2	-1.8	-0.4
25-Nov	-1.9	-1.8	-1.7	-1.5	-1.4	-1.5	-1.4	-1.3	-1.1	-1.0	-0.8	-0.6	-0.6	-0.5	-0.4	-0.4	-0.4	-0.5	-0.8	-1.0	-1.3	-1.6	-1.8	-1.9	-1.1	-0.4
26-Nov	-1.9	-2.1	-2.2	-2.2	-2.5	-2.6	-2.4	-2.1	-2.1	-2.2	-2.5	-3.0	-3.4	-3.6	-3.8	-4.0	-4.3	-4.5	-4.8	-5.3	-5.4	-5.9	-6.6	-7.0	-3.6	-1.9
27-Nov	-7.3	-8.0	-8.2	-8.0	-7.9	-8.2	-8.5	-8.1	-8.5	-8.3	-8.0	-7.2	-6.4	-5.5	-5.3	-5.2	-5.1	-5.0	-4.9	-4.9	-4.4	-4.1	-4.3	-4.9	-6.5	-4.1
28-Nov	-5.3	-5.4	-5.4	-5.3	-5.2	-5.1	-4.9	-4.6	-4.5	-4.5	-4.5	-4.4	-4.2	-4.1	-4.0	-3.9	-3.7	-3.5	-3.6	-3.7	-3.9	-3.8	-3.8	-3.8	-4.4	-3.5
29-Nov	-3.7	-3.7	-3.8	-3.9	-4.3	-4.4	-4.6	-4.4	-4.4	-4.4	-4.7	-4.7	-4.6	-4.7	-4.8	-5.0	-5.4	-5.4	-5.4	-5.8	-6.1	-5.8	-6.2	-6.5	-5.0	-3.7
30-Nov	-6.7	-6.8	-7.0	-7.1	-7.4	-7.4	-7.4	-7.5	-7.4	-7.4	-7.3	-7.4	-7.6	-7.4	-7.0	-6.8	-6.6	-6.4	-6.3	-6.4	-6.4	-6.5	-6.5	-6.4	-7.0	-6.3
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 90 m (AT90m) - C
Mannix - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	413	57.36	57.36
0 - 10	269	37.36	94.72
10 - 20	38	5.28	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) - %

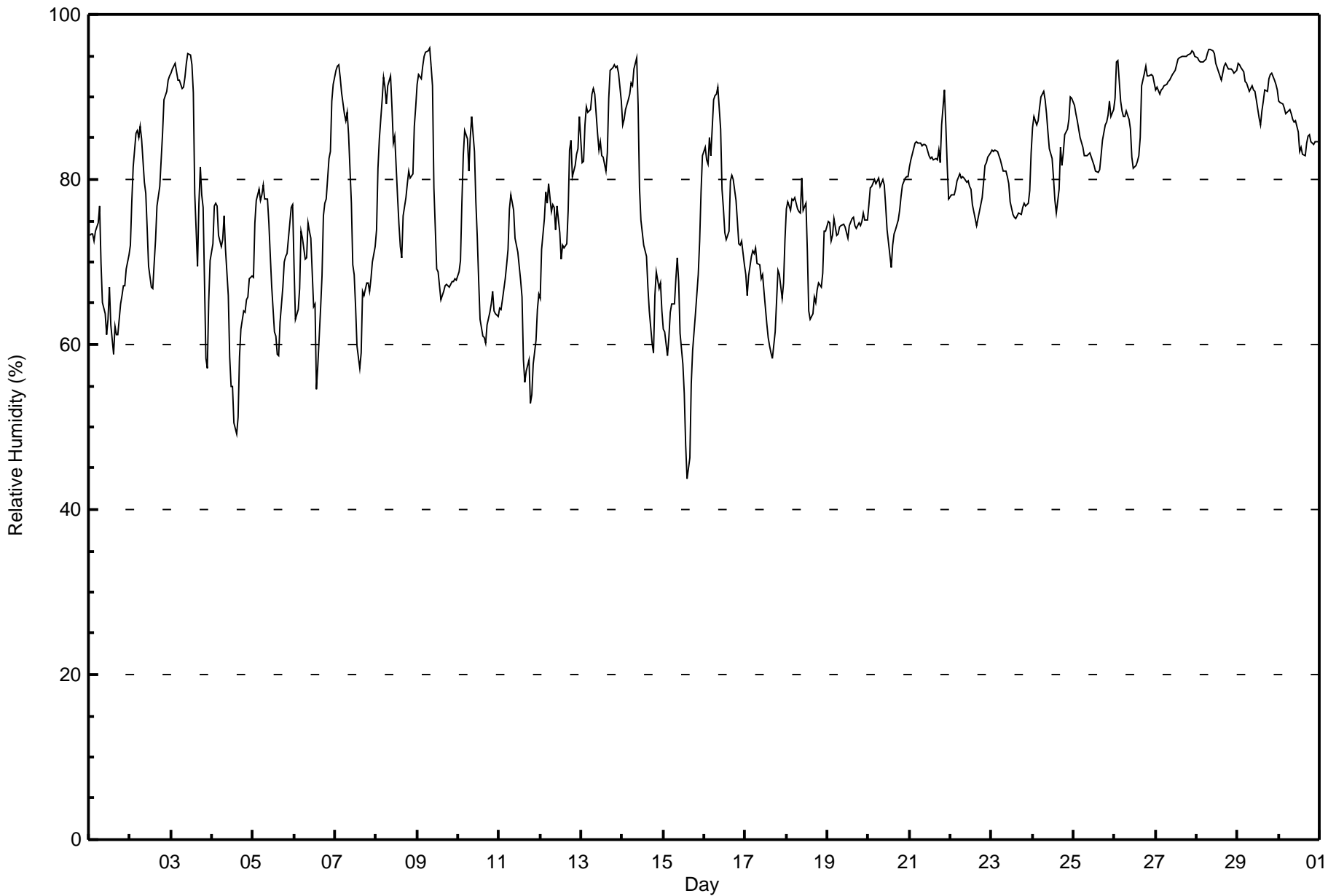
Mannix - November 2016

Maximum Value: 96 % on Nov 9 08:00 Maximum Daily Average: 94.0 % on Nov 28																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 44 % on Nov 15 15:00 Minimum Daily Average: 62.3 % on Nov 15 Maximum Diurnal Average: 83.3 % at hour 8 Minimum Diurnal Average: 70.9 % at hour 15 Monthly Average: 78.5 % Percentiles: P ₁ = 54 P ₁₀ = 64 Q ₁ = 70 Median = 79 Q ₃ = 88 P ₉₀ = 93 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-Nov	73	73	73	73	74	75	77	70	65	64	61	63	67	62	59	62	61	61	65	66	67	67	69	71	67.4	77
2-Nov	72	77	82	86	86	85	86	85	80	78	74	69	67	67	70	73	77	79	82	86	90	91	92	93	80.2	93
3-Nov	93	93	94	93	92	92	91	91	92	94	95	95	94	90	78	69	77	82	78	77	58	57	65	70	83.9	95
4-Nov	72	77	77	77	73	72	73	76	72	66	59	55	55	51	49	51	58	62	64	64	65	66	68	68	65.4	77
5-Nov	68	75	77	79	77	78	79	78	78	75	71	67	61	61	59	59	63	67	70	71	71	75	77	77	71.3	79
6-Nov	69	63	64	67	74	73	70	71	75	74	73	65	65	55	57	64	68	76	77	78	83	83	90	92	71.8	92
7-Nov	93	94	94	92	91	88	87	88	85	77	70	68	65	60	57	59	67	66	67	68	66	68	70	72	75.5	94
8-Nov	74	81	85	90	92	91	89	91	93	89	84	85	78	75	72	70	76	78	80	81	80	81	86	89	82.9	93
9-Nov	91	93	92	94	95	95	96	96	94	91	79	69	69	67	65	66	67	67	67	67	68	68	68	68	78.8	96
10-Nov	69	70	77	83	86	85	81	85	88	83	77	73	68	63	61	61	60	62	64	65	66	64	64	63	71.6	88
11-Nov	64	64	65	68	70	72	76	78	76	73	72	71	68	66	58	55	57	58	53	54	58	61	64	66	65.3	78
12-Nov	66	71	75	79	77	79	76	77	77	74	77	74	70	72	72	72	76	84	85	80	82	83	84	88	77.0	88
13-Nov	82	82	87	89	88	89	90	91	90	86	83	85	83	83	81	83	90	93	93	94	93	94	93	90	88.0	94
14-Nov	87	87	89	90	90	92	91	93	95	89	79	75	72	71	71	67	64	60	59	66	69	67	67	64	77.2	95
15-Nov	62	62	59	61	64	65	65	68	70	68	61	58	54	48	44	46	55	59	61	64	68	72	79	83	62.3	83
16-Nov	84	82	82	85	83	90	90	90	91	86	79	76	73	73	74	80	80	80	78	75	72	72	73	70	79.9	91
17-Nov	68	66	68	71	71	71	72	70	70	68	68	66	63	61	60	59	58	62	65	69	68	66	67	73	66.7	73
18-Nov	76	77	76	78	78	78	76	76	76	80	76	77	71	64	63	64	66	65	67	67	67	69	74	74	72.3	80
19-Nov	75	75	72	73	75	73	73	74	74	75	74	73	73	74	75	75	74	74	75	74	75	76	75	75	74.4	76
20-Nov	77	79	79	80	80	80	80	79	80	79	77	74	71	69	72	73	74	75	76	78	79	80	80	80	77.2	80
21-Nov	82	82	84	84	85	84	84	84	84	84	84	83	83	83	82	83	82	84	82	87	91	87	82	78	83.6	91
22-Nov	78	78	78	79	80	81	80	80	80	80	80	79	79	77	75	74	75	76	78	80	82	82	83	83	79.0	83
23-Nov	83	83	84	83	83	82	82	81	81	80	79	77	76	75	75	76	76	76	77	77	77	77	79	83	79.3	84
24-Nov	86	88	87	87	89	90	91	90	88	86	84	83	80	77	76	79	84	82	83	85	86	87	90	90	85.3	91
25-Nov	89	88	87	86	85	84	83	83	83	83	83	82	82	81	81	81	83	85	87	87	88	89	88	89	84.8	89
26-Nov	90	94	94	90	88	88	88	88	87	86	83	81	82	82	83	85	91	93	94	93	93	93	93	92	88.7	94
27-Nov	91	91	90	91	91	91	92	92	92	92	93	93	94	95	95	95	95	95	95	95	95	96	95	95	93.3	96
28-Nov	95	94	94	94	94	95	95	96	96	96	95	94	94	93	92	93	94	94	93	93	93	93	93	93	94.0	96
29-Nov	94	94	94	93	92	92	91	91	91	91	91	90	87	87	88	89	91	91	92	93	93	92	92	91	91.2	94
30-Nov	90	89	89	89	88	88	89	88	87	87	87	86	83	84	83	83	84	85	85	85	84	85	85	85	86.1	90
79.8 80.8 81.7 82.7 83.0 83.2 83.2 83.3 83.0 81.1 78.3 76.3 74.2 72.2 70.9 71.6 74.1 75.7 76.4 77.2 77.6 78.0 79.4 80.1																		Diurnal Average								
95 94 94 94 95 95 96 96 96 96 95 95 94 95 95 95 95 95 95 95 95 96 95 95																		Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Mannix - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Mannix - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	36	5.00	5.00
60 - 80	345	47.92	52.92
80 - 100	339	47.08	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

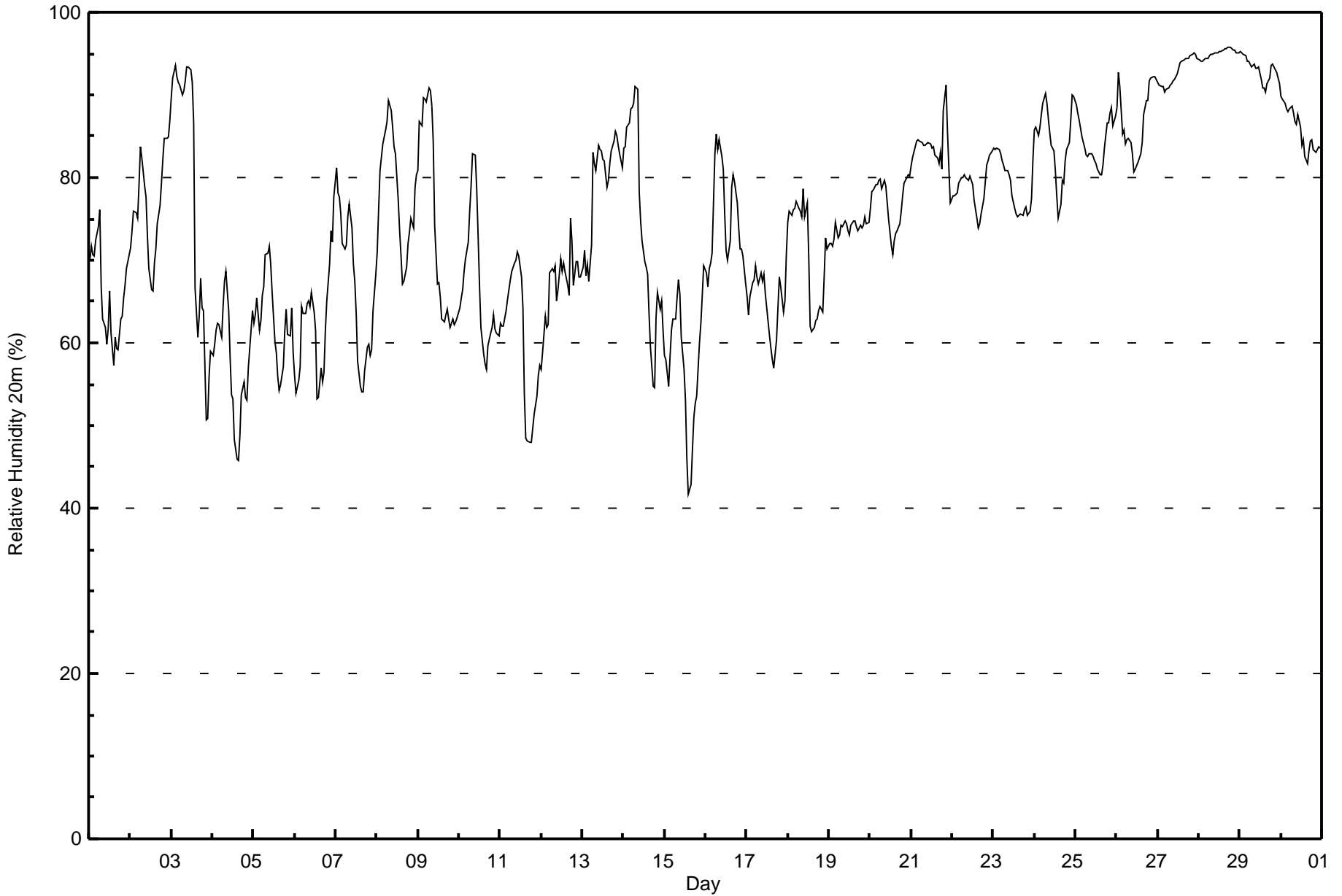


Maximum Value: 96 % on Nov 28 19:00 Maximum Daily Average: 95.0 % on Nov 28																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 42 % on Nov 15 15:00 Minimum Daily Average: 57.5 % on Nov 15 Maximum Diurnal Average: 80.0 % at hour 9 Minimum Diurnal Average: 69.1 % at hour 16 Monthly Average: 75.1 % Percentiles: P ₁ = 48 P ₁₀ = 59 Q ₁ = 66 Median = 76 O ₃ = 84 P ₉₀ = 92 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-Nov	70	72	71	70	72	74	76	67	63	62	60	62	66	61	57	61	59	59	63	63	65	67	69	71	65.9	76
2-Nov	72	74	76	76	75	79	84	82	79	78	73	69	66	66	70	71	74	77	79	82	85	85	85	87	76.8	87
3-Nov	90	92	93	92	92	91	90	91	92	93	93	93	92	87	67	61	63	68	64	64	51	51	56	59	78.5	93
4-Nov	58	60	62	62	62	61	64	68	69	64	58	54	53	48	46	46	49	54	55	53	53	57	59	64	57.5	69
5-Nov	62	63	65	61	63	66	67	71	71	72	70	66	60	59	56	54	55	57	61	64	61	61	64	59	62.9	72
6-Nov	56	54	55	57	64	64	64	65	65	64	66	64	61	53	53	57	55	56	62	65	69	74	72	78	62.3	78
7-Nov	81	78	78	76	72	71	72	75	77	74	70	67	63	58	55	54	54	57	60	60	59	59	64	68	66.7	81
8-Nov	71	76	81	84	85	86	87	89	88	86	84	83	77	74	70	67	67	69	72	73	75	74	79	80	78.3	89
9-Nov	81	87	86	90	89	89	91	90	89	84	74	67	67	66	63	63	63	64	63	62	63	62	63	63	74.1	91
10-Nov	64	65	66	69	70	72	76	79	83	83	79	73	67	62	59	57	57	60	61	62	63	62	61	61	67.1	83
11-Nov	62	62	62	64	65	67	68	69	70	70	71	71	68	64	54	49	48	48	48	50	51	54	56	57	60.3	71
12-Nov	57	59	63	62	62	68	69	69	69	65	66	70	69	70	69	67	66	75	72	67	70	70	68	68	67.1	75
13-Nov	69	71	68	70	67	72	83	82	81	84	83	83	82	82	79	80	82	83	84	86	85	84	83	81	79.3	86
14-Nov	84	84	86	87	88	89	89	91	91	78	75	72	70	69	68	64	59	55	55	63	66	64	65	61	73.8	91
15-Nov	58	58	55	58	62	63	63	65	68	66	61	57	53	46	42	43	47	51	53	54	60	62	66	69	57.5	69
16-Nov	68	67	69	70	71	83	85	83	85	82	81	76	71	70	72	79	80	80	77	74	71	71	70	67	75.1	85
17-Nov	66	63	66	67	68	69	68	67	68	68	68	66	62	61	59	58	57	60	64	68	67	64	65	71	65.0	71
18-Nov	75	76	75	76	76	77	76	76	75	79	75	77	70	62	61	62	63	63	64	64	64	68	73	71	70.8	79
19-Nov	72	72	72	73	75	73	73	74	74	75	74	74	73	74	75	75	74	74	74	74	74	75	74	75	73.8	75
20-Nov	76	78	78	79	79	80	80	79	80	79	77	75	72	71	72	73	74	74	76	78	79	80	80	80	77.1	80
21-Nov	81	82	84	84	85	84	84	84	84	84	84	84	84	84	83	82	82	83	81	88	91	86	81	77	83.6	91
22-Nov	78	78	78	78	79	80	80	80	80	80	80	80	79	77	75	74	74	76	77	80	82	82	83	83	78.8	83
23-Nov	83	83	84	83	83	82	81	81	81	80	80	78	76	76	75	75	76	75	76	76	75	76	78	82	79.0	84
24-Nov	86	86	85	86	88	89	90	89	87	85	84	83	81	78	75	77	80	79	82	83	84	87	90	90	84.4	90
25-Nov	89	88	87	86	85	84	83	83	83	83	83	82	82	81	80	80	82	84	87	87	88	88	86	87	84.4	89
26-Nov	88	93	91	85	86	84	85	85	84	83	81	81	82	82	83	84	88	89	89	92	92	92	92	92	86.8	93
27-Nov	92	91	91	91	90	91	91	91	91	92	92	93	93	94	94	94	94	94	94	95	95	95	95	94	92.8	95
28-Nov	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	96	96	96	96	96	95	95	95	95	95.0	96
29-Nov	95	95	95	95	94	94	94	93	94	93	93	93	92	91	91	90	91	92	93	94	93	93	92	91	93.0	95
30-Nov	90	89	89	88	88	88	89	88	87	86	88	86	84	84	83	82	83	84	85	83	83	83	84	83	85.8	90
																			75.6 76.4 76.9 77.1 77.7 78.8 79.8 80.0 80.0 78.9 77.3 75.8 73.7 71.5 69.4 69.1 69.8 71.2 72.3 73.3 73.7 74.0 75.0 75.5				Diurnal Average			
																			95 95 95 95 94 94 95 95 95 95 95 95 95 95 95 96 96 96 96 96 95 95 95 95				Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	82	11.39	11.39
60 - 80	353	49.03	60.42
80 - 100	285	39.58	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 45m (RH45m) - %

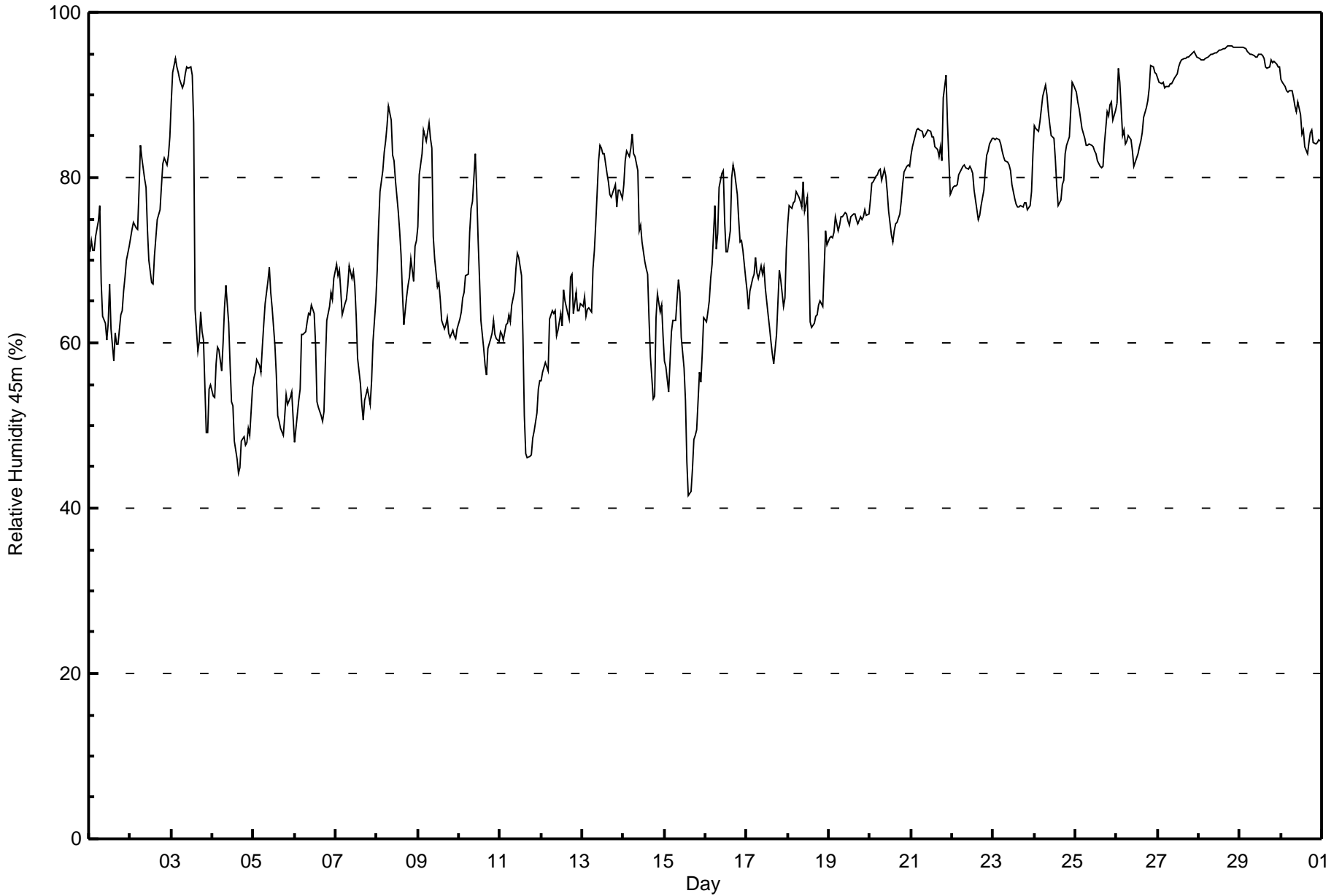
Mannix - November 2016

Maximum Value: 96 % on Nov 28 19:00 Maximum Daily Average: 95.2 % on Nov 28																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 42 % on Nov 15 15:00 Minimum Daily Average: 53.5 % on Nov 4 Maximum Diurnal Average: 78.6 % at hour 9 Minimum Diurnal Average: 68.8 % at hour 17 Monthly Average: 74.1 % Percentiles: P ₁ = 46 P ₁₀ = 56 Q ₁ = 63 Median = 75 O ₃ = 84 P ₉₀ = 93 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-Nov	71	72	71	71	73	75	77	67	63	62	60	62	67	62	58	61	60	60	63	64	66	68	70	72	66.5	77
2-Nov	73	74	74	74	74	79	84	82	80	79	74	70	67	67	70	73	75	76	79	82	82	82	83	85	76.5	85
3-Nov	89	93	94	93	93	92	91	91	93	93	93	93	92	87	64	59	60	64	61	60	49	49	54	55	77.7	94
4-Nov	54	53	57	59	59	57	60	64	67	62	57	53	52	48	46	44	45	48	49	48	48	50	49	55	53.5	67
5-Nov	56	56	58	57	56	60	62	65	68	69	66	64	60	56	51	51	50	49	51	54	53	53	54	51	57.0	69
6-Nov	48	50	53	54	61	61	61	63	64	63	65	64	60	53	52	51	50	52	58	63	64	66	65	68	58.7	68
7-Nov	69	68	69	66	63	65	65	67	69	68	69	67	63	58	55	53	51	53	54	54	53	55	60	65	61.7	69
8-Nov	69	74	78	81	83	84	86	89	87	83	82	80	76	74	71	66	62	66	67	68	70	67	72	72	75.3	89
9-Nov	74	80	83	86	85	84	87	85	84	73	70	67	67	65	63	62	62	63	61	61	61	61	61	62	71.1	87
10-Nov	63	64	65	66	68	68	73	76	77	83	79	73	68	63	59	57	56	59	61	61	63	61	60	60	66.0	83
11-Nov	61	61	60	62	62	63	63	65	66	69	71	70	68	61	51	47	46	46	46	48	49	52	54	55	58.3	71
12-Nov	55	57	58	57	57	63	64	63	64	61	61	64	62	66	65	64	63	68	68	63	66	64	64	65	62.6	68
13-Nov	64	66	63	64	64	64	69	71	75	82	84	84	83	83	80	79	78	78	79	79	76	79	78	77	75.0	84
14-Nov	79	82	83	82	84	85	83	83	81	74	74	72	70	69	68	63	58	53	54	63	66	64	65	61	71.5	85
15-Nov	58	57	54	58	61	63	63	65	68	66	61	57	53	46	42	42	45	48	49	50	56	55	59	63	55.7	68
16-Nov	63	64	65	68	70	77	71	73	79	81	81	75	71	71	74	80	82	81	78	75	72	72	71	68	73.3	82
17-Nov	66	64	66	68	68	70	68	68	69	68	69	67	63	62	60	59	57	61	65	69	68	64	66	71	65.7	71
18-Nov	74	77	76	77	77	78	78	77	76	79	76	78	71	63	62	62	63	63	65	65	64	69	74	72	71.5	79
19-Nov	73	73	73	73	75	74	74	75	75	76	76	75	74	75	76	76	75	74	75	75	75	76	75	76	74.7	76
20-Nov	77	79	79	80	80	81	81	80	81	80	78	76	73	72	74	74	75	76	77	79	81	81	82	81	78.2	82
21-Nov	83	84	85	86	86	86	86	85	85	85	86	86	85	85	84	83	83	84	82	90	92	87	82	78	84.8	92
22-Nov	79	79	79	79	80	81	81	82	81	81	81	81	80	79	76	75	75	77	79	81	83	83	84	85	80.0	85
23-Nov	85	85	85	85	84	83	83	82	82	82	81	79	78	77	76	76	77	76	77	77	76	77	78	83	80.1	85
24-Nov	86	86	86	87	88	90	91	90	88	86	85	85	82	79	77	77	79	80	83	84	85	88	92	91	85.2	92
25-Nov	90	89	88	87	86	85	84	84	84	84	84	83	83	82	81	81	81	84	88	87	89	89	87	88	85.4	90
26-Nov	89	93	92	85	86	84	84	85	85	83	81	82	83	84	84	85	87	88	89	91	93	93	93	92	87.2	93
27-Nov	92	91	91	92	91	91	91	91	91	92	92	93	93	94	94	94	94	95	95	95	95	95	95	95	93.0	95
28-Nov	94	94	94	94	94	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	96	96	95.2	96
29-Nov	96	96	96	96	95	95	95	95	95	95	95	95	95	95	94	93	93	93	94	94	94	94	93	93	94.5	96
30-Nov	92	91	91	91	90	90	91	90	89	88	89	88	85	86	84	83	84	85	86	84	84	84	85	84	87.2	92
	74.1	75.1	75.6	76.0	76.5	77.4	78.0	78.2	78.6	78.1	77.2	75.8	74.0	71.8	69.6	68.9	68.8	69.9	70.9	71.9	72.4	72.5	73.3	74.0	Diurnal Average	
	96	96	96	96	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	96	96	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	107	14.86	14.86
60 - 80	334	46.39	61.25
80 - 100	279	38.75	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

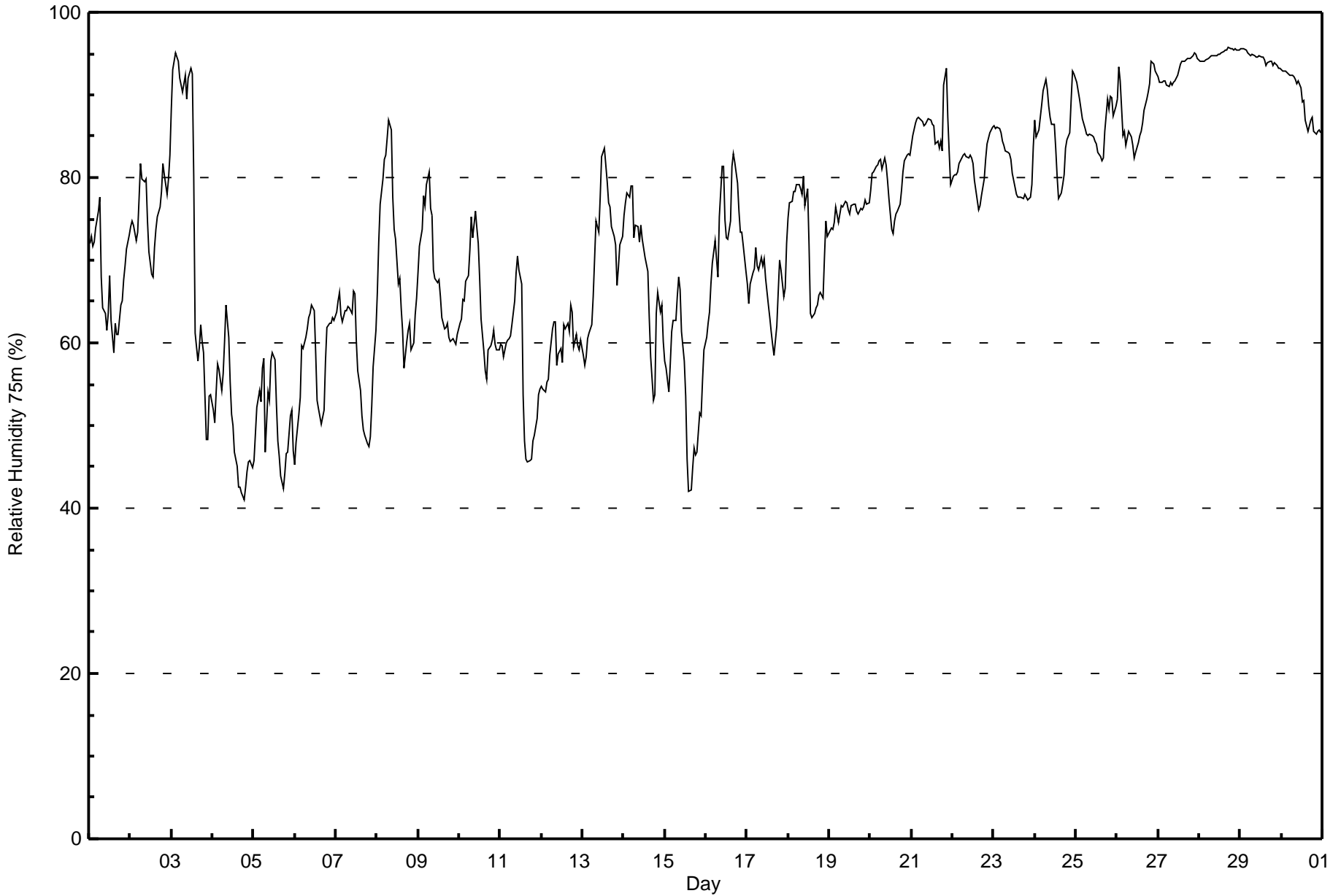


Maximum Value: 96 % on Nov 28 18:00																			Maximum Daily Average: 94.9 % on Nov 28						Hours in Service: 720		
Minimum Value: 41 % on Nov 4 19:00																			Minimum Daily Average: 50.2 % on Nov 4						Hours of Data: 720		
Maximum Diurnal Average: 77.5 % at hour 9																			Minimum Diurnal Average: 68.6 % at hour 17						Hours of Missing Data: 0		
Monthly Average: 73.4 %																			Percentiles: P ₁ = 42 P ₁₀ = 54 Q ₁ = 62 Median = 75 O ₃ = 85 P ₉₀ = 93 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-Nov	72	73	72	72	74	76	78	68	64	64	62	63	68	63	59	62	61	61	65	65	68	69	71	73	67.6	78	
2-Nov	74	75	74	72	73	77	82	80	79	80	75	71	68	68	72	74	75	76	78	82	80	78	80	83	76.1	83	
3-Nov	88	93	95	95	94	92	90	91	92	89	92	93	93	80	61	58	60	62	60	59	48	48	54	54	76.7	95	
4-Nov	52	50	54	57	57	54	56	60	65	61	55	51	50	47	45	43	43	42	41	42	44	46	46	45	50.2	65	
5-Nov	46	49	52	54	53	57	58	47	54	53	58	59	58	53	48	46	44	42	44	47	47	51	52	47	50.8	59	
6-Nov	45	48	51	53	60	59	61	62	63	64	65	64	59	53	52	50	51	52	58	62	62	62	63	63	57.6	65	
7-Nov	64	65	66	63	62	64	64	64	64	64	66	66	60	57	54	51	49	49	48	48	49	52	57	62	58.7	66	
8-Nov	66	72	77	80	82	83	85	87	86	78	74	73	67	68	64	62	57	60	62	62	59	60	63	65	70.5	87	
9-Nov	69	72	74	78	77	79	81	76	75	69	68	67	68	66	63	62	62	62	61	60	60	60	60	61	67.9	81	
10-Nov	62	63	65	65	67	68	71	75	73	76	74	72	68	63	59	57	56	59	60	60	62	60	59	59	64.7	76	
11-Nov	60	60	58	60	60	61	61	62	65	68	71	69	67	54	48	46	46	46	46	48	49	51	54	54	56.8	71	
12-Nov	55	54	54	55	56	58	62	62	62	57	59	59	58	62	62	62	61	65	64	59	61	60	59	60	59.5	65	
13-Nov	58	57	58	60	61	62	66	70	75	73	78	82	83	84	79	77	76	74	73	72	67	69	72	73	70.9	84	
14-Nov	75	77	78	78	79	79	73	74	74	72	74	73	70	70	69	63	58	53	54	64	66	64	65	60	69.2	79	
15-Nov	58	57	54	58	61	63	63	66	68	66	61	58	54	46	42	42	45	47	46	47	52	51	55	59	55.0	68	
16-Nov	61	62	64	67	70	72	70	68	75	81	81	75	73	73	75	81	83	82	79	76	73	73	72	69	73.2	83	
17-Nov	67	65	67	69	69	72	69	69	70	69	70	68	65	63	61	60	58	62	66	70	69	66	67	72	66.8	72	
18-Nov	75	77	77	78	78	79	79	79	78	80	77	79	72	64	63	64	64	65	66	66	65	70	75	73	72.6	80	
19-Nov	74	74	74	75	76	75	76	77	76	77	77	76	76	77	77	77	76	76	76	76	76	77	77	77	76.0	77	
20-Nov	78	80	81	81	82	82	82	81	82	82	80	77	74	73	75	76	76	77	79	81	82	83	83	83	79.5	83	
21-Nov	84	85	87	87	87	87	87	86	86	87	87	87	86	86	84	84	84	84	83	91	93	87	83	79	86.0	93	
22-Nov	80	80	80	81	82	82	83	83	83	82	83	82	82	80	77	76	77	78	80	82	84	85	85	86	81.4	86	
23-Nov	86	86	86	86	85	84	84	83	83	83	82	80	79	78	78	78	78	78	78	78	77	78	79	84	81.3	86	
24-Nov	87	85	86	87	89	90	92	91	89	87	86	86	84	80	78	78	79	80	84	85	85	89	93	93	86.0	93	
25-Nov	92	90	90	88	87	86	85	85	85	85	85	84	84	83	82	82	82	86	90	88	90	90	87	89	86.5	92	
26-Nov	90	93	92	85	86	84	85	86	85	84	82	83	84	85	86	87	88	89	90	91	94	94	93	93	87.8	94	
27-Nov	92	92	91	92	92	91	91	91	91	91	92	92	93	94	94	94	94	94	94	94	95	95	95	94	92.9	95	
28-Nov	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	95	96	96	96	95	96	96	95	94.9	96	
29-Nov	96	96	96	95	95	95	95	95	95	95	95	95	95	95	94	94	94	94	94	94	94	94	93	93	94.4	96	
30-Nov	93	93	93	93	92	92	92	92	92	91	92	91	89	89	87	86	86	87	87	86	85	86	86	85	89.4	93	
	73.1	73.9	74.7	75.3	76.0	76.7	77.1	76.8	77.5	76.8	76.4	75.7	74.0	71.5	69.4	68.8	68.6	69.3	70.0	71.0	71.1	71.4	72.4	72.8	Diurnal Average		
	96	96	96	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	96	96	96	95	96	96	95	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

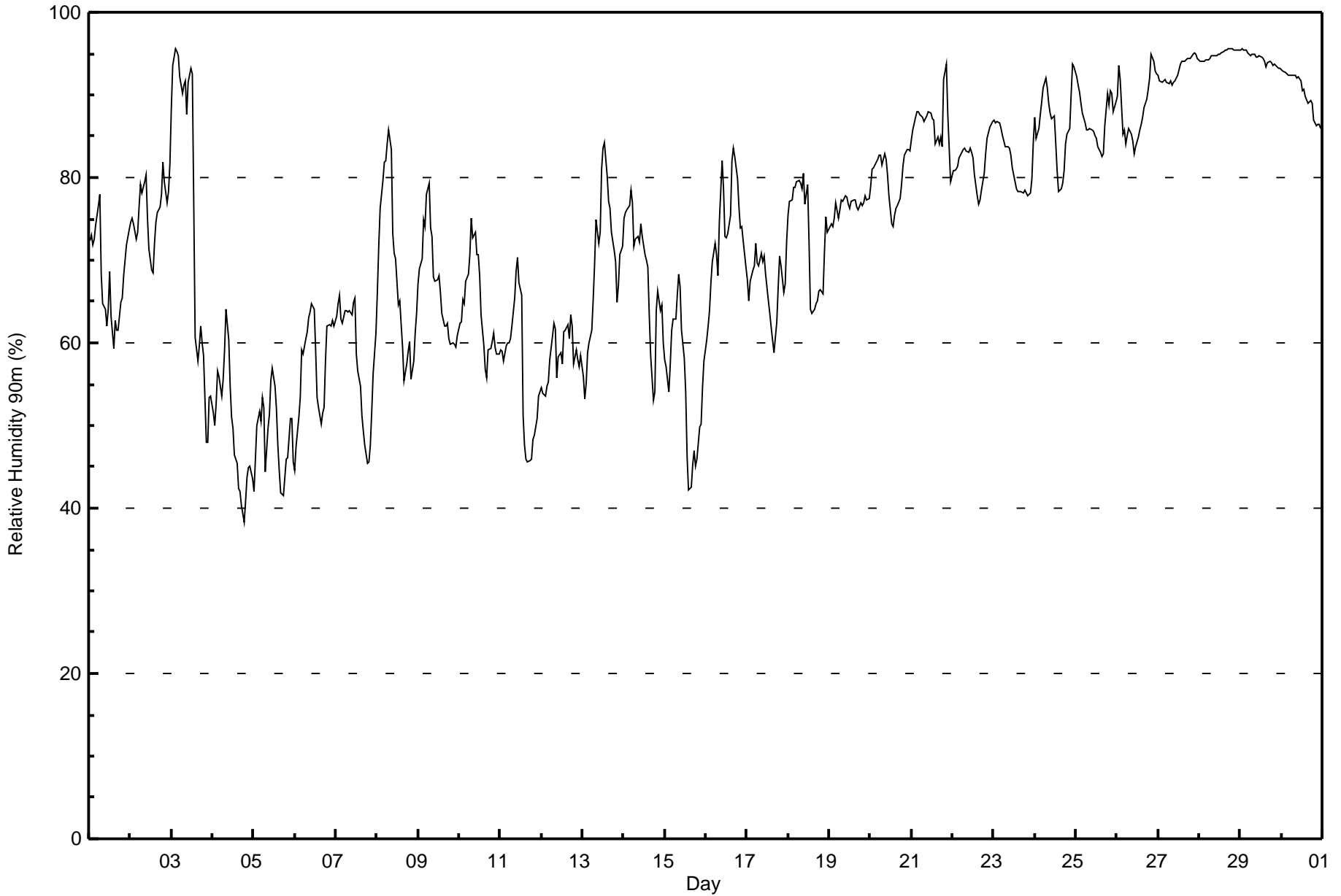
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	139	19.31	19.31
60 - 80	315	43.75	63.06
80 - 100	266	36.94	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 96 % on Nov 28 18:00																		Maximum Daily Average: 94.9 % on Nov 28																		Hours in Service: 720														
Minimum Value: 38 % on Nov 4 19:00																		Minimum Daily Average: 48.7 % on Nov 5																		Hours of Data: 720														
Maximum Diurnal Average: 77.3 % at hour 9																		Minimum Diurnal Average: 68.8 % at hour 17																		Hours of Missing Data: 0														
Monthly Average: 73.2 %																		Percentiles: P ₁ = 42 P ₁₀ = 53 Q ₁ = 62 Median = 74 O ₃ = 86 P ₉₀ = 93 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-Nov	72	73	72	73	74	77	78	68	65	64	62	64	69	63	59	63	62	62	65	65	68	70	72	74	68.0	78																								
2-Nov	75	75	74	73	73	76	79	78	80	80	75	71	69	68	72	75	76	76	78	82	80	77	78	82	75.9	82																								
3-Nov	88	94	96	95	95	92	90	91	92	88	92	93	93	77	61	58	60	62	60	59	48	48	53	54	76.5	96																								
4-Nov	52	50	53	57	56	54	56	59	64	60	55	51	50	46	45	42	40	38	41	44	45	45	44	49.5	64																									
5-Nov	42	46	50	52	51	53	52	44	50	51	55	57	55	52	48	45	42	41	44	46	46	51	51	46	48.7	57																								
6-Nov	45	48	51	53	59	59	60	61	63	64	65	64	59	53	52	50	52	52	58	62	62	62	63	62	57.5	65																								
7-Nov	63	65	66	63	62	64	64	64	64	63	65	65	59	57	55	51	49	48	45	46	48	52	56	61	58.1	66																								
8-Nov	66	72	76	80	82	82	84	86	83	73	71	70	65	65	62	60	55	57	59	60	56	58	61	64	68.6	86																								
9-Nov	67	69	70	75	74	78	79	74	73	68	67	68	68	66	64	62	62	62	61	60	60	60	59	61	67.0	79																								
10-Nov	62	63	65	65	67	68	71	75	73	73	71	71	68	63	60	57	56	59	59	60	61	59	59	59	64.3	75																								
11-Nov	59	59	58	60	60	60	61	62	65	69	70	67	66	51	48	46	46	46	46	48	49	51	54	54	56.4	70																								
12-Nov	55	54	53	55	55	58	61	62	62	56	58	59	57	61	61	62	60	63	62	57	59	58	57	58	58.6	63																								
13-Nov	56	53	55	59	60	62	65	70	75	72	73	81	83	84	80	77	76	73	71	70	65	67	71	72	69.6	84																								
14-Nov	75	76	76	77	79	77	72	73	73	72	74	73	71	70	69	63	58	53	54	64	66	64	65	60	68.9	79																								
15-Nov	58	57	54	57	61	63	63	66	68	67	62	58	54	46	42	43	45	47	45	46	50	50	55	58	54.8	68																								
16-Nov	60	62	64	67	70	72	71	68	75	82	79	73	73	73	75	82	84	82	80	76	74	74	72	69	73.2	84																								
17-Nov	68	65	68	69	69	72	70	69	71	70	71	68	65	64	62	60	59	63	67	71	69	66	67	72	67.2	72																								
18-Nov	75	77	77	79	79	79	80	79	79	81	77	79	72	64	64	64	65	65	66	66	66	71	75	73	73.0	81																								
19-Nov	74	74	74	75	77	75	76	77	77	78	78	77	76	77	77	77	77	76	77	77	77	78	77	77	76.5	78																								
20-Nov	79	81	81	82	82	83	83	82	83	82	80	78	74	74	75	76	77	77	79	81	83	83	83	83	80.1	83																								
21-Nov	85	86	87	88	88	88	87	87	87	87	88	88	87	87	84	85	84	85	84	92	94	88	84	79	86.6	94																								
22-Nov	81	81	81	81	82	83	83	83	83	83	83	83	82	80	78	77	77	78	81	83	85	85	86	87	82.0	87																								
23-Nov	87	87	87	87	86	85	84	84	84	83	83	81	79	78	78	78	78	78	78	78	78	80	84	84	81.9	87																								
24-Nov	87	85	86	88	89	91	92	91	89	88	87	87	84	81	78	79	79	81	84	85	86	90	94	93	86.4	94																								
25-Nov	92	91	90	89	88	87	86	86	86	86	86	85	85	84	83	83	83	86	90	89	90	90	88	89	87.1	92																								
26-Nov	90	94	92	85	86	84	85	86	85	84	83	84	85	86	86	87	89	90	91	92	95	94	93	93	88.2	95																								
27-Nov	92	92	92	92	92	92	91	92	91	91	92	92	93	94	94	94	94	94	94	94	95	95	95	94	93.0	95																								
28-Nov	94	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	96	96	96	95	96	95	95	94.9	96																								
29-Nov	96	96	95	95	95	95	95	95	95	95	95	95	95	94	94	93	94	94	94	94	94	93	93	93	94.4	96																								
30-Nov	93	93	93	93	92	92	92	92	92	92	92	92	91	91	90	89	89	89	89	87	86	86	87	86	90.4	93																								
																								72.9	73.6	74.4	75.2	76.0	76.5	76.8	76.6	77.3	76.6	76.1	75.6	74.0	71.6	69.8	69.1	68.8	69.3	69.8	70.9	70.9	71.3	72.3	72.6	Diurnal Average		
																								96	96	96	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	96	96	96	95	96	95	95	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	1	0.14	0.14
40 - 60	153	21.25	21.39
60 - 80	300	41.67	63.06
80 - 100	266	36.94	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 33 km/h on Nov 14 21:00	Maximum Daily Speed Average: 16.8 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 6 13:00	Minimum Daily Speed Average: 1.7 km/h on Nov 21	Hours of Data: 717
Maximum Diurnal Speed Average: 6.4 km/h at hour 11	Minimum Diurnal Speed Average: 3.5 km/h at hour 20	Hours of Missing Data: 3
Monthly Average Velocity: 4.8 km/h 181.2 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 7 Median = 11 Q ₃ = 14 P ₉₀ = 18 P ₉₉ = 25	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-Nov	NNW12	N11	NNW8	N6	N3	N3	WSW6	W21	W23	W26	W22	W21	W20	W22WNW20WNW15WNW17WNW18	NW15	NNW10	N7	NE7	NE6	E5	W26	W26	W26	W26	W26	W26	
2-Nov	SE6	SSE8	SSE8	SE7	SSE8	SSE10	SSE11	SSE12	SSE14	SE13	SSE16	SSE14	SSE14	SSE13	SSE13	SSE15	SSE13	SSE14	SSE16	SSE13	SSE14	SSE11	SSE13	SSE13	SSE11.9	SSE16	
3-Nov	SSE13	SSE14	SSE13	SSE14	SSE12	SE10	SE11	SSE10	SSE9	AF	AF	AF	SE9	SE8	S9	S11	S13	SSE12	S10	S11	SW23	SW19	SSW14	S10	S10.4	SW23	
4-Nov	S13	SSW14	SSW12	SSW14	SSW15	SSW16	S9	SSE10	SE9	SE7	SSE10	SE12	SE12	SE12	SSE11	SSE7	SSE9	SSE11	SE13	SSE12	SSE13	SSE14	SE11	SE13	SE14	SSE10.5	SSW16
5-Nov	SE10	SSE12	SSE10	S8	SSE6	S3	SSE7	SSE10	SSE8	SSE8	SSE12	SE12	SE12	SSE7	SSE8	SSE14	S10	SE10	SSE9	SSE9	SE3	S4	SE7	W9	SSE7.9	SSE14	
6-Nov	SW14	SW18	SW11	S8	S12	SSW13	WSW9	WSW11	SW2	SSW5	SSW5	SW3	SSW0	WSW5	S1	SE2	S6	SSW9	SSW10	SE3	SSE3	SSE6	SSE7	SSE7	SSW6.1	SW18	
7-Nov	SSE5	SSE5	ESE3	SE5	S6	SSE7	SSE8	SE6	SSE8	SSE8	SE7	SE7	SE7	SE7	SE8	SSE10	SSE10	SE8	SE10	SE11	SSE13	SSE13	SSE12	SE13	SSE8.1	SE13	
8-Nov	SE16	SSE12	SSE12	SSE11	SE9	SE13	SE13	SSE10	SSE10	SE12	SSE11	SSE9	SSE11	SSE9	SSE11	SSE11	SSE11	SE10	SSE9	SE10	SE11	SE11	SSE7	SE4	SSE10.4	SE16	
9-Nov	SSE8	SSE11	SSE10	SSE9	SSE9	SSW5	SSE3	SSE7	SSE6	SW7	W15	W20	W25	W19	W18	WSW15	WSW20	WSW17	W21	W23	W26	W20	WSW16	WSW16	WSW11.3	W26	
10-Nov	WSW13	WSW14	S3	SW7	SSE4	SW15	WSW9	SE5	SSE8	SSE9	SE7	SE8	SE9	SE13	SSE11	SE11	SE13	SE19	SE16	SE14	SE15	SE18	SE19	SE19	SSE8.9	SE19	
11-Nov	SE18	SE17	SE12	SE10	SE12	SE11	SSE10	SSE11	SSE13	SSE13	SSE12	SSE13	SE13	SSE13	S10	SW12	SW14	SW11	WSW14	WSW15	W17	WSW13	WSW13	WSW11	S9.1	SE18	
12-Nov	WSW10	SSW4	SSE4	SSW9	SSE3	SE6	SE9	SSE10	SSE7	SW6	SSE3	SSE9	SSE6	SSE5	SSE6	ENE1	W3	W4	WSW6	WSW9	WSW8	WSW10	W7	WSW8	SSW4.1	WSW10	
13-Nov	WSW11	WSW10	W8	SW2	SW7	S7	SSE9	SSE7	SSE8	SE11	SSE12	SE13	SSE11	SSE7	SE8	SSE12	SSE11	SSE12	SSE9	SSE10	SSE9	SSE9	SSE12	SSE13	SSE7.8	SSE13	
14-Nov	SE11	SE8	SSE10	SSE12	SSE10	SSE9	SSE9	SE8	SSE9	SW11	WSW14	WSW18	WSW19	W20	W22	W25	W21	W20	W19	W29	W33	WSW32	WSW28	WSW30	WSW13.2	W33	
15-Nov	W25	W26	W24	WSW27	WSW25	WSW26	WSW25	WSW17	W21	WSW23	WSW21	WSW21	WSW17	W14	WSW14	WSW11	SW11	WSW10	W14	WNNW10	WNNW9	W9	W8	WNNW5	WSW16.8	WSW27	
16-Nov	NNE4	N6	N7	NNW5	N3	W5	W7	W4	WSW2	SW3	SW4	NW0	ENE5	NE6	NNE16	NNE14	NNE13	NNE17	NNE18	NNE15	NNE16	NNE15	N14	NNW17	N7.1	NNE18	
17-Nov	NNW15	NNW18	NNW17	NNW14	NNW13	NNW12	NNW10	NW11	W14	W12	WSW11	W16	W16	W15	W19	WNNW20	WNNW23	WNNW24	NW21	NW15	NW14	NW13	WNNW11	W11	WNNW13.4	WNNW24	
18-Nov	WSW11	W15	WSW9	WSW5	WSW7	WSW7	WSW8	WSW7	WSW8	WSW7	W7	NW6	WNNW7	W10	W7	W7	WSW4	WSW4	WSW4	WSW4	WSW3	E1	W2	SSE7	WSW5.8	W15	
19-Nov	SSE6	SE7	E9	ESE8	E8	E9	ENE11	E11	ESE8	E11	E12	E11	E11	E9	E10	ENE11	E12	ESE11	ESE12	ESE13	ESE14	ESE15	SE17	ESE15	ESE10.4	SE17	
20-Nov	ESE15	ESE12	ESE11	SE12	SE12	SE12	SE11	SE13	SE13	SSE13	SSE14	SE13	SSE12	SSE9	SSE8	SE8	SE10	SSE9	SSE11	SE11	SE12	SE10	SE15	SE15	SE11.5	ESE15	
21-Nov	SE11	SE14	SE12	SE13	SE12	SE12	SSE11	SSE12	SSE11	SSE9	S6	SSW5	W4	NW6	WNNW6	WNNW10	WNNW11	WNNW9	NW10	N12	NNE14	NNE10	NNE13	NNE14	ESE1.7	NNE14	
22-Nov	NNE11	NNE11	NNE10	N6	N7	N4	NE4	NE5	ENE3	NE4	SSE3	SSE6	SSE6	SSE9	SSE8	SSE11	SSE11	SE12	SSE11	SSE14	SSE12	SE12	SE15	SE18	ESE5.3	SE18	
23-Nov	SE15	SE16	SE16	SE18	SE19	SE18	SE16	SE17	SE17	SE18	SE19	SE20	SE20	SE19	SE16	SE16	SE14	SE13	SSE12	SSE13	SSE17	SSE14	SSE12	SSE11	SE15.8	SE20	
24-Nov	S8	SSE12	S9	SSE11	SSE12	SSE12	SSE13	SSE11	SSE11	SSE13	SSE12	SSE9	SSE11	SSE10	SSE10	SSE8	SSE6	SE11	SE13	SE9	SE13	SE19	SE17	SE18	SSE11.3	SE19	
25-Nov	SE16	SE19	SE20	SE21	SE18	SE18	SE18	SE15	SE14	SSE12	SE10	SE9	SE8	SE7	SE4	SSW3	SW5	WSW7	WSW7	WSW10	WSW10	WSW12	WSW13	WSW14	SSE8.3	SE21	
26-Nov	WSW15	WSW13	WSW13	WSW13	WSW13	WSW12	SW8	SW11	SW10	SW9	SW13	SW9	SW8	S6	SSE6	SSE2	WSW5	WNNW4	ENE2	NNW1	WSW6	W3	WSW2	N2	SW6.9	WSW15	
27-Nov	NE1	ENE3	NE4	NNE7	NNE7	NNE8	N9	N9	NNE6	N6	N6	NNE10	N9	NNW7	NNW5	N6	N9	NNW6	N8	N9	N8	NNW4	NW6	NNW7	N6.2	NNE10	
28-Nov	WNNW7	W7	WSW7	WSW6	SW6	SW7	SW4	SW5	SW6	SW6	SW5	WSW4	SW3	SW4	SW2	SSW3	SW3	W5	NNW4	N5	N8	N9	N8	NW4	W3.1	N9	
29-Nov	WNNW6	NNW7	N5	W7	W8	WSW4	W6	W4	SW4	W7	W5	SSW3	SSE8	SSE9	SSE9	S8	SSE11	S10	S12	SSW9	S8	SSE15	SSE12	SSE12	SSW4.8	SSE15	
30-Nov	SSE13	SSE14	SSE14	SSE13	SE11	SE12	SE14	SSE17	SSE19	SSE17	SSE14	SSE15	SSE16	SSE15	SSE14	SSE14	SSE11	SSE14	SSE16	SSE14	SSE15	SSE16	SSE14	SSE13	SSE14.2	SSE19	

S4.4	S4.6	SSE4.2	S5.0	SSE5.1	S5.5	SSE5.3	S5.6	S6.1	S6.2	S6.4	S5.6	S5.5	S5.3	S4.4	S4.3	SSW4.5	S4.2	SSW4.1	SSW3.5	SSW3.9	S4.2	S4.8	S5.0	Diurnal Average
W25	W26	W24	WSW27	WSW25	WSW26	WSW25	W21	W23	W26	W22	W21	W25	W22	W22	W25	WNNW23	WNNW24	W21	W29	W33	WSW32	WSW28	WSW30	Diurnal Maximum

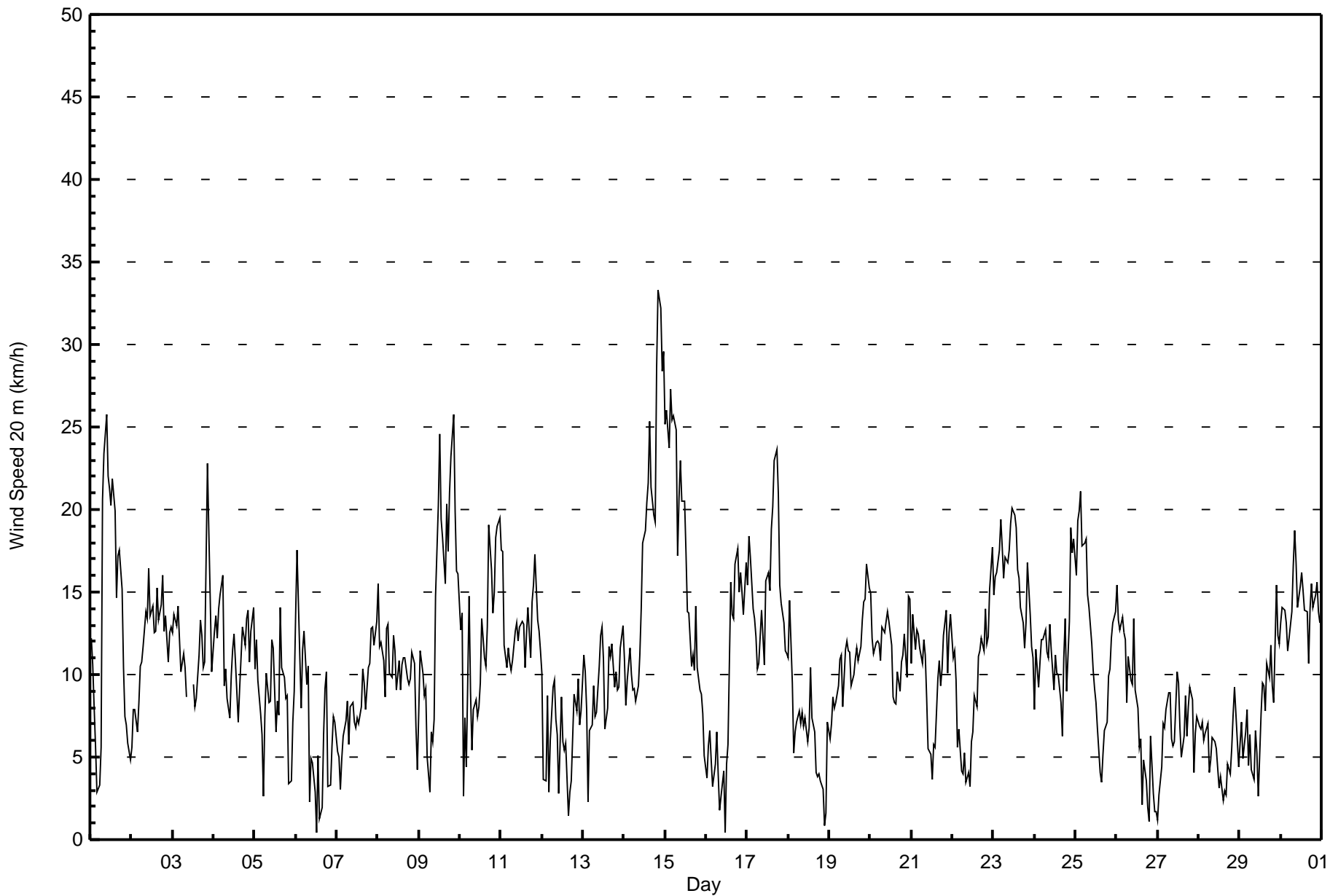
AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Nov 25 04:00																	Hours in Service: 720 Hours of Data: 717 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6								
Minimum Value: 0 km/h on Nov 26 23:00																									
Percentiles: P ₁ = 1 P ₁₀ = 2 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-Nov	4	3	2	2	2	2	5	5	4	5	3	4	4	4	5	3	4	5	4	3	2	2	2	2	5
2-Nov	2	2	2	2	1	2	2	2	4	4	4	4	4	3	3	3	3	3	3	3	3	2	2	2	4
3-Nov	2	3	3	3	3	3	3	3	3	AF	AF	AF	3	3	4	3	3	3	3	4	6	5	4	2	6
4-Nov	3	3	3	3	3	3	2	3	3	2	3	3	3	3	2	2	2	2	2	3	2	3	2	3	3
5-Nov	2	2	2	2	3	2	2	3	2	2	4	4	3	3	3	3	3	3	4	4	2	2	3	3	4
6-Nov	2	3	3	2	3	3	2	3	2	2	1	2	2	2	1	1	2	1	2	1	2	2	1	2	3
7-Nov	2	2	1	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	3	4	4	4
8-Nov	3	3	2	2	2	3	2	3	2	2	2	2	3	2	2	2	2	2	2	3	2	2	4	3	4
9-Nov	3	4	4	4	3	2	2	2	4	2	5	5	4	4	3	2	4	4	3	3	3	4	3	3	5
10-Nov	3	3	3	3	2	3	2	3	2	2	2	3	3	4	3	2	3	6	4	4	4	4	5	5	6
11-Nov	5	5	3	3	2	2	1	2	3	3	3	4	3	4	3	2	3	3	3	3	3	3	2	2	5
12-Nov	2	2	2	4	2	2	3	2	2	2	3	3	3	3	3	2	2	2	3	2	2	1	3	1	4
13-Nov	2	3	2	1	3	2	1	2	2	3	3	3	3	2	3	2	2	2	2	2	3	3	2	3	3
14-Nov	3	3	3	2	2	3	2	2	2	4	3	5	5	4	4	5	4	5	4	5	6	6	6	6	6
15-Nov	6	6	5	5	5	6	5	4	4	5	5	4	4	3	3	2	2	2	2	2	1	3	2	6	6
16-Nov	1	1	1	2	2	3	1	2	1	1	2	1	1	2	4	4	4	4	5	4	4	4	4	5	5
17-Nov	5	5	5	4	3	4	3	4	4	4	3	3	3	3	4	5	6	5	5	4	3	3	2	1	6
18-Nov	2	3	3	2	2	2	2	2	2	2	2	4	2	2	2	2	2	1	1	2	1	1	2	2	4
19-Nov	2	2	2	3	3	3	2	3	3	3	3	3	3	2	2	3	3	3	4	5	5	5	5	5	5
20-Nov	5	4	4	4	4	4	3	4	4	3	4	4	3	3	2	2	3	2	3	3	3	2	4	5	5
21-Nov	4	4	4	4	3	3	2	3	2	2	2	2	2	2	1	2	2	2	2	5	3	3	3	4	5
22-Nov	3	3	3	2	2	1	1	2	2	2	2	2	2	3	3	3	4	3	4	4	4	3	5	5	5
23-Nov	4	5	4	5	6	5	5	4	5	5	6	6	5	5	5	4	4	3	3	3	4	3	3	6	6
24-Nov	2	2	2	2	3	2	3	3	2	3	3	3	3	3	2	2	2	4	4	2	4	6	5	6	6
25-Nov	5	6	6	6	5	6	5	4	4	3	3	3	3	2	2	1	1	1	1	2	2	3	3	3	6
26-Nov	3	3	3	3	3	3	2	3	2	3	4	3	3	3	2	1	1	2	1	1	1	1	0	1	4
27-Nov	2	1	1	2	2	2	3	3	2	3	2	3	3	3	2	2	3	3	3	3	3	2	1	2	3
28-Nov	1	1	1	1	1	2	1	3	2	1	1	1	1	1	1	1	1	1	2	2	2	3	2	2	3
29-Nov	1	3	2	2	2	1	1	2	1	1	1	2	3	2	3	2	3	4	3	3	3	4	3	3	4
30-Nov	3	3	4	4	3	3	4	4	4	4	4	5	4	4	4	3	3	3	3	3	4	3	3	5	5
Diurnal Maximum																									
AF - Analyzer Failure																									





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	97	13.53	13.53
6 - 11	321	44.77	58.30
12 - 19	254	35.43	93.72
20 - 28	41	5.72	99.44
29 - 38	4	0.56	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 717

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 20 m (WS20m) - km/h
Mannix - 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	4	6	2	1	6	12	4	9	14	12	10	2	2	5	97
6 - 11	20	9	3	2	9	4	50	113	20	4	18	31	16	11	5	6	321
12 - 19	2	11	0	0	2	7	75	85	4	7	6	26	14	3	4	8	254
20 - 28	0	0	0	0	0	0	4	0	0	0	1	9	22	4	1	0	41
29 - 38	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	4
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	29	21	7	8	13	12	135	210	28	20	39	80	64	20	12	19	717

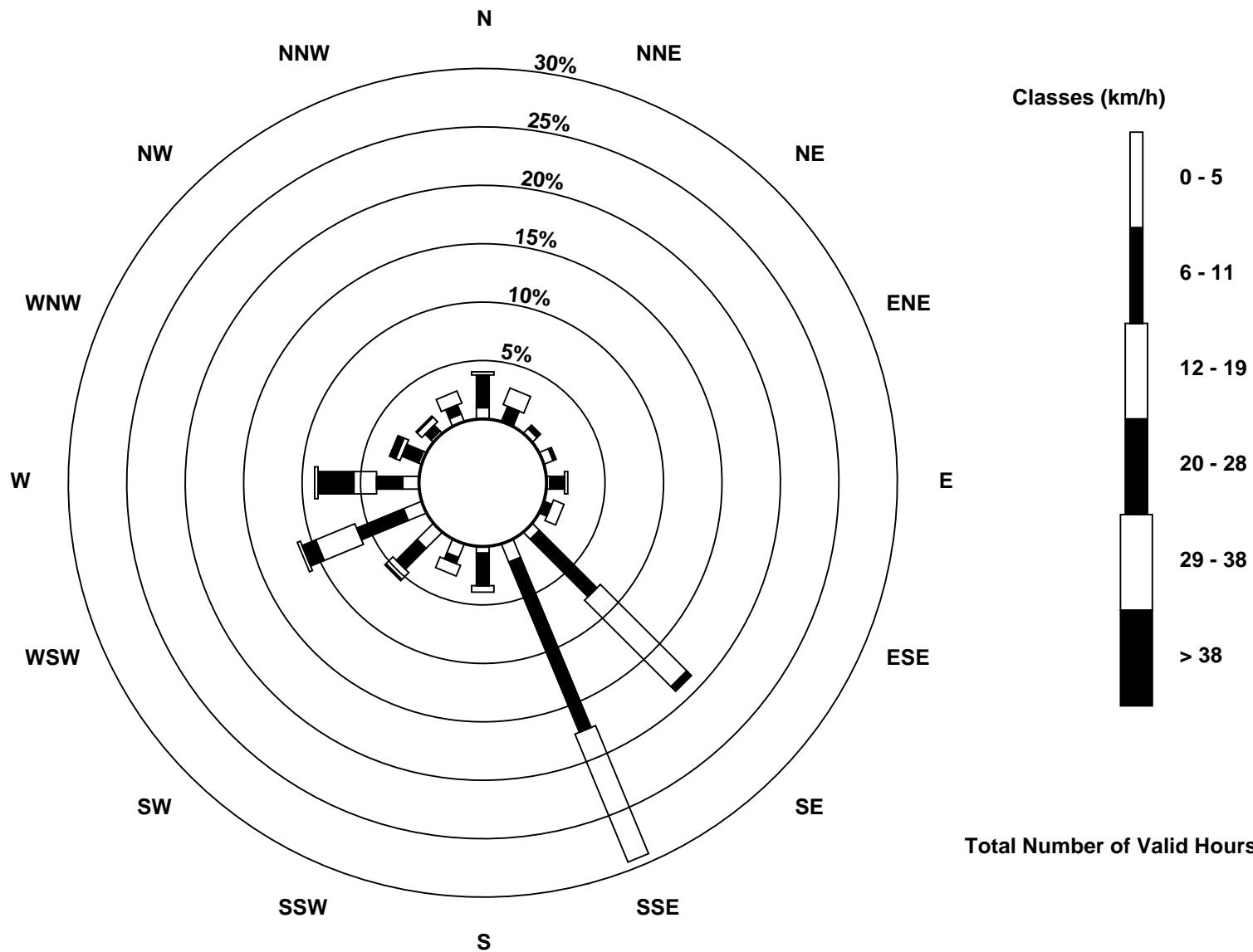
Total Number of Valid Hours: 717

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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





Maximum Speed: 39 km/h on Nov 14 22:00	Maximum Daily Speed Average: 22.0 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 12 16:00	Minimum Daily Speed Average: 2.0 km/h on Nov 21	Hours of Data: 694
Maximum Diurnal Speed Average: 9.4 km/h at hour 9	Minimum Diurnal Speed Average: 5.9 km/h at hour 20	Hours of Missing Data: 26
Monthly Average Velocity: 7.3 km/h 178.1 deg	Percentiles: P ₁ = 3 P ₁₀ = 7 Q ₁ = 10 Median = 16 Q ₃ = 19 P ₉₀ = 23 P ₉₉ = 33	Percent Operational Time: 96.4

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-Nov	NNW16	NNW14	NNW11	NNW7	NNW4	NNW4	WSW7	W23	W26	W28	W24	W24	W22	W24	W23	WNW18	WNW21	WNW22	WNW19	NNW14	N9	NNE7	NE6	ENE5	WNW12.7	W28	
2-Nov	ESE6	SSE9	SSE11	SE9	SE11	SE15	SSE16	SE17	SE18	SE16	SE19	SE16	SE17	SSE16	SE16	SSE19	SSE19	SSE21	SSE23	SSE19	SSE21	SSE18	SSE21	SSE20	SSE16.3	SSE23	
3-Nov	SSE20	SSE21	SSE20	SE20	SE17	SE16	SE16	SE16	SSE14	AF	AF	AF	SE12	SSE12	S17	S19	S23	SSE19	SSW19	S19	SW32	SW28	SSW24	S16	S16.3	SW32	
4-Nov	S19	SSW26	SSW24	SSW25	SSW26	SSW26	S18	SE18	SE14	SE13	SE15	SE16	SE18	SSE16	SSE10	SSE15	SSE18	SE21	SE20	SSE24	SSE22	SE20	SE21	SE22	SSE17.4	SSW26	
5-Nov	SE17	SE19	SE15	SSE9	SE12	SSE8	SSE14	SE18	SSE15	SSE15	SSE19	SE18	SSE10	SE14	SSE14	SSE22	SSE19	SSE20	SSE16	SE14	SE7	SW6	S10	WSW18	SSE13.2	SSE22	
6-Nov	WSW26	SW29	SW20	SSW15	S20	SSW22	SW16	WSW18	WSW7	SW9	SW8	SW5	W4	SW7	SSW3	SSW3	SSW5	SW13	SW19	S7	SSE6	S7	S6	S10	SW11.1	SW29	
7-Nov	SSW11	SW9	SSW5	S6	SSW11	SSW11	SSW10	SSE9	SSE15	S13	SE9	SE9	SE10	SSE9	SE10	SSE15	SSE15	SE15	SE17	SE20	SE23	SE22	SSE21	SE24	SSE12.1	SE24	
8-Nov	SE26	SE19	SE19	SE18	SE13	SE19	SE19	SE16	SE15	SE19	SE17	SE15	SE17	SE13	SE15	SE17	SSE20	SSE18	SSE19	SSE20	SSE20	SE20	SSE16	SE5	SE17.2	SE26	
9-Nov	SSE13	SSE20	SSE18	SSE17	SSE18	S11	SSE8	SSE15	SSE10	SW17	WSW22	WSW24	WSW29	WSW24	W21	WSW21	WSW27	WSW25	W27	W28	W31	WSW25	WSW23	WSW23	SW15.4	W31	
10-Nov	WSW19	WSW21	SW4	SW12	SSW6	WSW20	WSW17	SSE6	SSE11	SSE12	SE9	SE10	SE12	SE17	SSE14	SE15	SE19	SE27	SE24	SE21	SE22	SE26	SE27	SE28	SSE12.0	SE28	
11-Nov	SE26	SE25	SE18	SE17	SE19	SE18	SSE18	SSE19	SSE21	SSE19	SSE17	SSE18	SE18	SSE19	S18	SW19	SW22	SW17	WSW21	WSW21	WSW23	WSW21	WSW19	WSW17	S14.0	SE26	
12-Nov	WSW16	SW10	SSW12	SSW18	SSW11	SE11	SE15	SSE16	S13	WSW15	SW7	SSE12	SSE7	SSE9	SSE10	NNE0	WNW7	WSW9	W9	WSW11	W14	W17	W13	W13	SW8.0	SSW18	
13-Nov	WSW18	WSW18	W15	WSW9	SW11	SSW9	SSE10	SSW8	S8	SE15	SE17	SE18	SE16	SSE10	SE12	SSE19	SSE18	SSE20	SSE19	SSE19	SSE17	SSE19	SSE22	SSE23	SSE12.0	SSE23	
14-Nov	SE20	SE11	SE15	SE18	SE21	SSE16	SE17	SSE15	S14	SW18	WSW19	WSW23	WSW23	WSW23	WSW25	W30	W26	W24	WSW24	WSW33	WSW39	WSW39	WSW37	WSW38	SW17.0	WSW39	
15-Nov	WSW31	WSW31	WSW29	WSW34	WSW32	WSW32	WSW33	WSW32	WSW23	WSW24	WSW29	WSW26	WSW25	WSW20	WSW16	WSW17	WSW15	SW18	WSW17	W21	W18	WNW16	WNW15	WNW14	NW11	WSW22.0	WSW34
16-Nov	N8	NNE10	NNE10	N9	NNW5	W7	W13	W10	W5	W4	SW4	W1	ENE5	NE7	NNE18	NNE17	NNE17	N21	N22	NNE19	NNE21	N19	NNW19	NNW23	N9.9	NNW23	
17-Nov	NNW20	NNW25	NNW24	NNW18	NNW18	NNW16	NNW15	NNW14	W16	W15	WSW12	WSW17	WSW18	W17	W22	WNW25	WNW29	WNW30	NW27	WNW20	WNW17	NW17	WNW15	W12	WNW16.9	WNW30	
18-Nov	WSW14	W16	WSW10	WSW6	WSW8	WSW8	WSW8	WSW8	WSW9	WSW8	W8	NW7	W7	W11	WSW8	WSW8	WSW5	SW5	WSW5	SW4	WSW3	E1	WSW2	SSE8	WSW6.7	W16	
19-Nov	SSE7	SE8	E10	E9	E10	E10	ENE12	E12	ESE9	E14	E13	E13	E13	E11	E12	ENE12	E13	E13	ESE13	ESE15	ESE16	ESE16	ESE19	ESE16	E11.8	ESE19	
20-Nov	ESE16	ESE13	ESE13	ESE13	ESE14	ESE14	SE13	SE16	SE16	SE16	SE17	SE16	SE13	SSE10	SE10	SE10	SE12	SE11	SE13	SE14	SE16	SE13	ESE17	ESE17	SE13.5	ESE17	
21-Nov	SE13	SE17	SE14	SE16	SE16	SE14	SE14	SSE15	SSE14	SSE11	SSE8	SSW7	W5	WNW7	WNW7	WNW12	WNW14	WNW13	WNW13	N15	NNE17	NNE13	NNE15	NNE17	ESE2.0	NNE17	
22-Nov	N13	NNE14	NNE12	N7	N8	N5	NNE4	NE6	ENE4	NE4	SSE3	SSE7	SSE7	SSE10	SSE10	SSE14	SE14	SE15	SE14	SE17	SE15	SE16	SE19	SE22	ESE6.5	SE22	
23-Nov	SE19	SE20	SE21	SE22	SE25	SE22	SE20	SE22	SE22	SE22	SE24	SE25	SE25	SE24	SE21	SE19	SE18	SE17	SE16	SSE18	SSE21	SSE18	SSE16	SSE15	SE20.2	SE25	
24-Nov	S12	SSE16	SSE14	SSE15	SSE17	SSE17	SSE15	SSE15	SSE17	SSE15	SE11	SE13	SE12	SSE12	SSE12	SE11	ESE14	SE18	SE13	SE19	SE23	ESE20	SE22	SE14.9	SE23		
25-Nov	SE19	ESE22	ESE23	ESE25	ESE21	SE21	SE22	SE19	SE18	SE15	SE13	SE11	SE11	SE9	SE5	S5	SW8	SW11	WSW11	WSW13	WSW14	WSW16	WSW17	WSW18	SSE9.9	ESE25	
26-Nov	WSW20	SW17	WSW17	WSW18	WSW18	WSW18	SW13	SW16	SW14	SSW13	SW17	SW12	SW10	S7	SSE7	SE3	SW5	W3	E3	NE2	WNW7	NNW4	NNW2	N3	SW8.7	WSW20	
27-Nov	NE2	NE4	NE5	N9	N10	NNE11	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	N12	N12	NNW7	NW8	NNW10	----	N12	
28-Nov	WNW8	W7	WSW8	WSW8	WSW9	SW9	WSW5	SW5	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	N5	N7	N10	N13	N10	NW6	----	N13
29-Nov	WNW8	NNW11	N6	WNW8	W9	WSW6	W7	W5	SW4	WSW7	WSW6	S4	SSE10	SE12	SSE11	SSE12	SSE14	S14	S17	S13	SSE12	SSE19	SSE15	SSE15	S6.0	SSE19	
30-Nov	SSE16	SSE17	SSE19	SSE17	SE14	SE15	SE17	SE21	SSE22	SSE21	SSE18	SSE19	SSE20	SSE20	SSE18	SSE17	SSE14	SSE17	SSE19	SSE19	SSE18	SSE20	SSE17	SSE16	SSE17.8	SSE22	

S6.1	S6.5	SSE6.1	S6.9	S7.5	S7.9	S8.3	S8.9	S9.4	S9.1	S9.2	S8.4	S8.0	S7.8	S6.9	S7.0	S7.8	S7.4	S7.1	S5.9	SSW6.0	S6.0	S6.8	S6.7	Diurnal Average
WSW31	WSW31	WSW29	WSW34	WSW32	WSW33	WSW32	W23	W26	WSW29	WSW26	WSW25	WSW29	W24	WSW25	W30	WNW29	WNW30	WSW27	WSW33	WSW39	WSW39	WSW37	WSW38	Diurnal Maximum

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



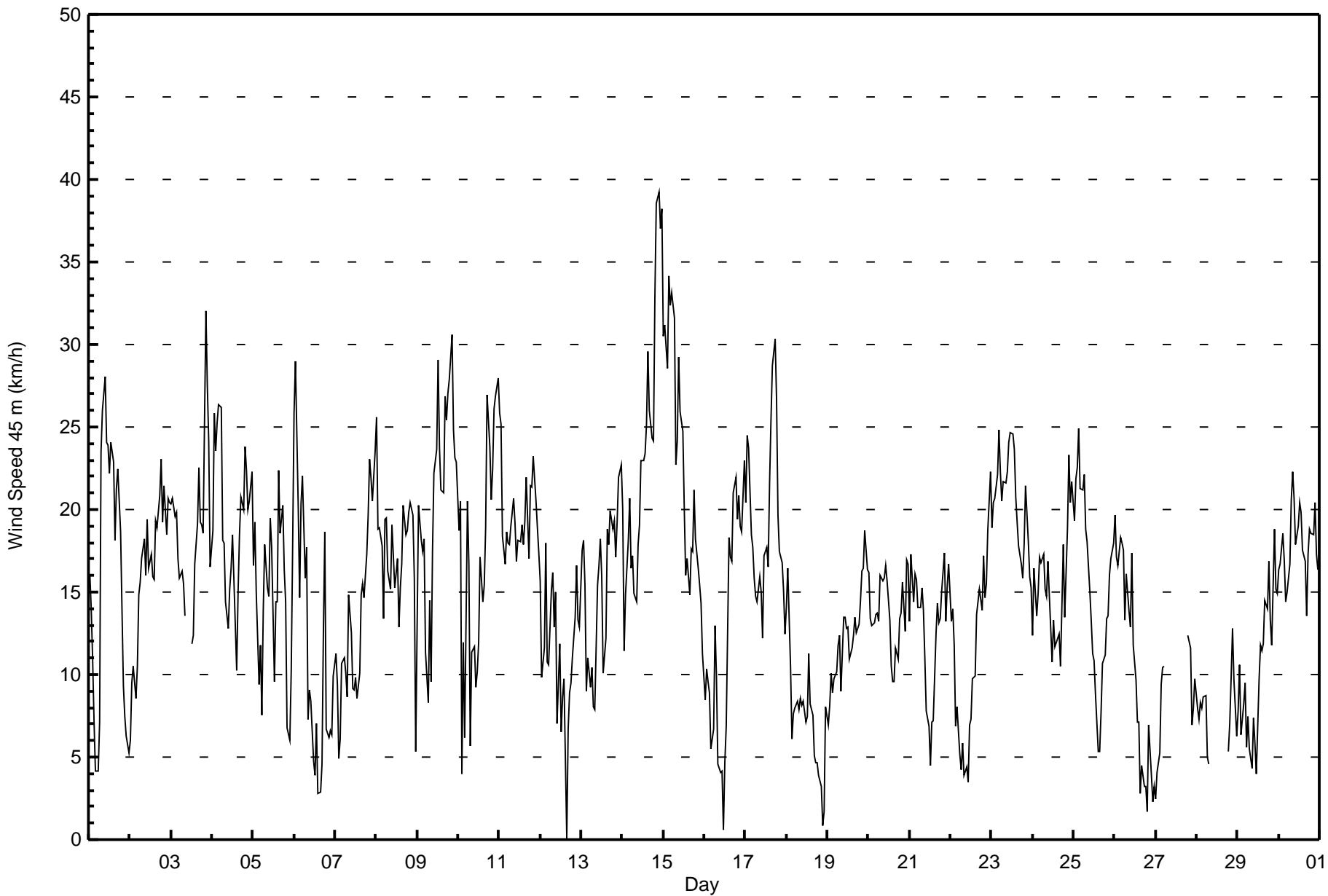
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 7 km/h on Nov 24 22:00	Hours of Data: 694
Minimum Value: 1 km/h on Nov 16 09:00	Hours of Missing Data: 26
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 6	Hours of Calibration: 0
	Percent Operational Time: 96.4

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-Nov	3	2	3	2	1	2	5	4	4	4	3	3	4	3	4	3	4	4	4	3	3	2	2	2	5
2-Nov	2	2	2	2	2	1	2	2	4	3	3	3	3	3	3	3	3	3	3	3	4	3	1	1	4
3-Nov	2	2	2	3	2	3	3	4	3	AF	AF	AF	3	3	5	2	3	3	4	5	6	4	3	3	6
4-Nov	3	2	2	3	3	3	3	3	3	3	2	3	3	3	2	2	1	2	1	3	2	3	1	3	3
5-Nov	3	1	2	2	2	2	2	3	3	2	4	4	3	3	4	2	2	3	4	4	3	5	2	4	5
6-Nov	2	2	4	2	3	3	2	3	2	2	2	3	2	2	1	3	2	2	3	4	2	2	3	4	4
7-Nov	2	2	2	3	2	1	2	1	3	3	2	2	1	2	2	3	1	2	2	2	4	4	4	4	4
8-Nov	3	4	2	3	2	3	2	4	2	2	2	3	3	2	2	2	2	2	2	3	2	2	5	3	5
9-Nov	3	6	6	5	3	3	2	4	5	3	4	6	4	3	3	2	3	3	3	3	3	3	3	3	6
10-Nov	3	3	3	3	2	3	2	3	3	2	2	3	4	4	2	2	3	5	4	3	4	4	4	5	5
11-Nov	4	5	4	3	2	2	1	2	2	3	3	4	3	2	2	3	2	3	4	3	3	3	2	2	5
12-Nov	2	2	4	5	3	3	2	1	1	4	2	4	2	5	4	2	2	2	3	2	2	2	2	2	5
13-Nov	3	3	1	4	3	3	2	2	2	2	3	2	2	5	1	2	1	2	3	3	3	2	2	5	5
14-Nov	5	3	2	2	2	3	2	1	2	4	3	5	5	4	4	4	4	4	5	6	5	6	6	6	6
15-Nov	7	6	6	5	5	6	5	5	5	4	5	5	5	3	3	2	1	2	2	2	1	2	2	2	7
16-Nov	1	2	2	1	1	4	1	3	1	1	2	1	1	2	5	4	4	4	5	4	4	3	4	4	5
17-Nov	4	5	4	4	3	3	3	4	3	4	2	2	3	3	4	5	5	5	5	4	2	3	2	2	5
18-Nov	1	2	3	2	1	1	1	2	1	2	2	2	4	2	2	2	2	1	1	2	1	1	2	2	4
19-Nov	2	2	2	3	3	3	2	4	3	2	3	3	3	2	2	2	3	3	4	5	4	5	6	5	6
20-Nov	5	4	4	4	4	3	3	4	4	3	4	3	3	2	2	2	3	2	3	3	3	3	4	5	5
21-Nov	4	4	4	4	3	3	3	2	2	2	2	3	2	1	2	2	2	3	2	5	4	3	4	4	5
22-Nov	3	3	3	2	2	1	1	2	3	2	2	2	2	2	3	3	3	4	3	4	3	3	5	5	5
23-Nov	4	5	4	5	5	5	4	5	5	5	6	6	5	5	4	4	4	3	3	3	3	2	3	6	6
24-Nov	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	3	4	3	4	7	5	6	7
25-Nov	5	6	6	6	6	6	5	5	5	3	3	3	3	2	2	1	1	1	1	2	2	3	3	3	6
26-Nov	3	3	3	3	3	3	2	3	2	3	3	4	3	3	2	2	1	1	1	1	2	2	1	1	4
27-Nov	1	1	1	2	3	3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	3	2	2	1	1	3
28-Nov	1	1	1	1	1	1	1	2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2	2	2	3	2	2	3
29-Nov	1	4	2	3	2	1	1	2	1	1	1	2	2	2	2	2	3	3	3	3	3	4	3	2	4
30-Nov	3	3	3	4	3	3	4	4	4	4	4	4	4	3	4	3	3	3	3	3	3	3	3	3	4
	7	6	6	6	6	6	5	5	5	5	6	6	5	5	5	5	5	5	5	5	6	7	6	6	
	Diurnal Maximum																								

AF - Analyzer Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	50	7.20	7.20
6 - 11	152	21.90	29.11
12 - 19	331	47.69	76.80
20 - 28	141	20.32	97.12
29 - 38	18	2.59	99.71
> 38	2	0.29	100.00

Total Number of Valid Hours: 694

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 45 m (WS45m) - km/h
Mannix - 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	3	2	5	3	2	0	3	1	1	5	8	5	7	0	0	5	50
6 - 11	11	4	3	0	5	2	19	31	9	9	12	23	7	9	4	4	152
12 - 19	6	10	0	2	8	15	101	94	14	5	15	28	12	12	1	8	331
20 - 28	2	1	0	0	0	5	42	28	2	7	3	28	14	4	1	4	141
29 - 38	0	0	0	0	0	0	0	0	0	0	2	12	2	2	0	0	18
> 38	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Totals	22	17	8	5	15	22	165	154	26	26	40	98	42	27	6	21	694

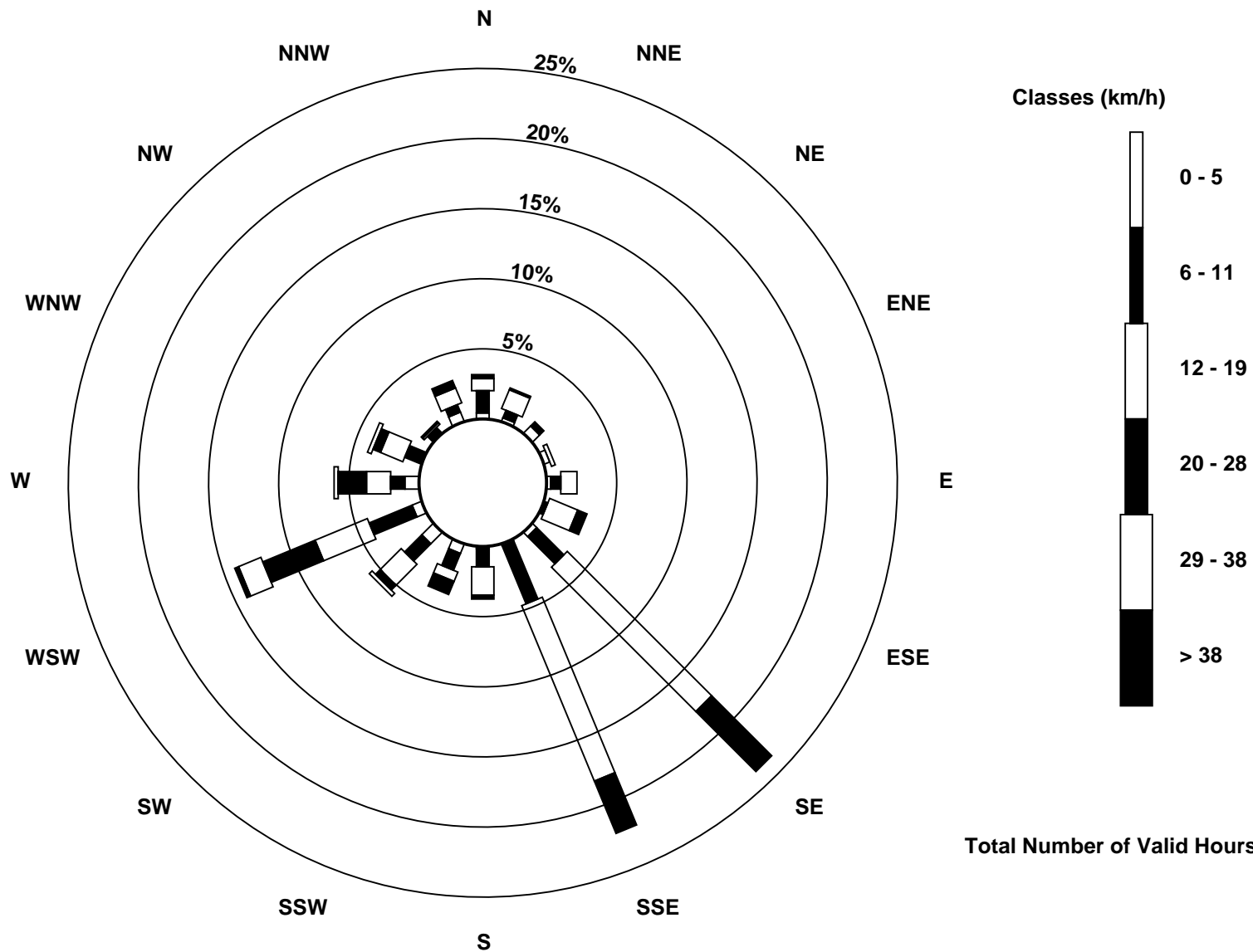
Total Number of Valid Hours: 694

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 694



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Speed: 45 km/h on Nov 15 00:00	Maximum Daily Speed Average: 25.8 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 9 00:00	Minimum Daily Speed Average: 2.5 km/h on Nov 21	Hours of Data: 643
Maximum Diurnal Speed Average: 11.2 km/h at hour 11	Minimum Diurnal Speed Average: 7.1 km/h at hour 3	Hours of Missing Data: 77
Monthly Average Velocity: 8.8 km/h 184.9 deg	Percentiles: P ₁ = 2 P ₁₀ = 8 Q ₁ = 12 Median = 19 Q ₃ = 23 P ₉₀ = 28 P ₉₉ = 39	Percent Operational Time: 89.3

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	NNW18	NNW15	NNW13	NNW8	NNW5	NNW4	WSW8	W25	W26	W28	W25	W24	W23	W25	W23WNNW19	NNW22	NNW23	NW20	NNW15	N11	NNE8	NE7	ENE6	WNN13.4	W28	
2-Nov	ESE5	SE10	SSE11	SE8	SE12	SE19	SSE22	SSE23	SE23	SE17	SE21	SE18	SE19	SSE18	SE18	SSE22	SSE24	SSE27	SSE31	SSE24	S27	S20	SSE22	S24	SSE19.0	SSE31
3-Nov	SSE24	SSE26	SSE24	SSE24	SSE21	SE22	SE20	SE20	SSE20	AF	AF	AF	SSE14	S19	SSW22	S24	S26	S23	SSW26	SSW24	SW39	SW34	SW30	SSW20	S20.8	SW39
4-Nov	SSW22	SSW30	SSW31	SSW33	SSW35	SW34	SSW23	S20	SE21	SE18	SSE21	SE21	SE24	SSE20	SSE13	SSE17	SSE22	SE25	SE30	SSE33	SSE29	SSE26	SSE26	SE29	SSE22.1	SSW35
5-Nov	SE25	SE23	SE14	SE13	SE15	SE12	SE17	SE22	SE21	SSE22	SSE28	SSE24	S13	SSE17	SSE20	SSE26	S25	SSE22	SSE14	SSE11	SW4	WSW12	SW14	WSW26	SSE15.7	SSE28
6-Nov	WSW33	SW35	SW27	SSW20	S25	SSW28	SW21	WSW23	WSW12	SW12	SW12	WSW7	WSW7	SW9	SSW5	WSW6	SW6	SW15	SW23	SW11	SSW6	SW11	SW8	SW12	SW15.0	SW35
7-Nov	SW16	WSW16	WSW11	SW9	SW13	SW13	SSW11	S12	SSW12	SSE11	SE11	SSE11	SSE9	SSE11	SSE17	SSE19	SE19	SE24	SE28	SE30	SE29	SSE29	SE33	SSE13.9	SE33	
8-Nov	SE34	SE25	SE18	SE19	SE12	SE22	SE23	SE21	SE16	SE23	SE23	SE19	SE22	SE17	SE21	SE20	SSE27	SSE29	SSE29	SSE27	S23	SSE17	SSE16	NNE0	SE20.4	SE34
9-Nov	SSE15	SSE24	SSE23	S22	SSE19	S14	SSE6	SSE12	S10	WSW26	WSW29	WSW26	WSW32	WSW26	W23	WSW25	WSW32	WSW32	W32	W33	W36	WSW29	WSW28	WSW28	WSW18.8	W36
10-Nov	WSW24	WSW25	WSW7	WSW15	SW9	WSW24	WSW22	SSW4	SSE8	SSE13	SSE11	SE12	SE14	SE20	SSE18	SE19	SE23	SE31	SE31	SE26	SE29	SE33	SE34	SE35	SSE14.0	SE35
11-Nov	SE33	SE33	SE26	SE22	SE24	SE24	SSE23	SSE25	SSE24	SSE24	SSE21	SSE21	SSE21	S22	SSW21	SW23	SW26	SW21	WSW26	WSW26	WSW28	WSW26	WSW25	WSW24	S17.7	SE33
12-Nov	WSW21	WSW18	SW20	SSW24	SSW17	S8	SSE11	S15	SW17	WSW25	WSW15	SSW12	SW8	S6	S7	NW3	WNNW10	W12	WNNW13	W15	W20	W20	W19	W20	WSW11.9	WSW25
13-Nov	W25	W26	W22	WSW16	WSW11	SW11	SSW8	SW10	SW10	SSE14	SE19	SE23	SSE20	SSE13	SSE15	SSE19	S19	S22	S22	S18	S18	SSE23	SSE28	SSE26	S13.7	SSE28
14-Nov	SE25	SE17	SE17	SSE24	S24	S19	S18	SSW15	SSW16	SW23	WSW23	WSW27	WSW26	WSW26	WSW27	W32	W29	W27	W27	WSW36	WSW43	WSW45	WSW44	WSW45	SW20.9	WSW45
15-Nov	WSW35	WSW35	WSW33	WSW40	WSW38	WSW40	WSW37	WSW28	WSW27	WSW34	WSW30	WSW27	WSW21	WSW17	WSW19	WSW17	SW21	WSW23	W28	W25	WNNW21	WNNW21	WNNW19	NW14	WSW25.8	WSW40
16-Nov	NNE12	NNE16	NNE13	N11	N7	NW5	WNNW10	W10	NNW3	WNNW2	SW3	ENE1	ENE5	NNE8	NNE20	NNE20	NNE20	NNE24	NNE25	NNE23	NNE24	NNE21	N21	NNW25	N12.2	NNW25
17-Nov	NNW23	NNW28	NNW27	NNW21	NNW20	NNW17	NNW17	NW16	W17	W16	WSW13	WSW18	WSW18	W17	W22	WNNW27	WNNW30	WNNW32	NW28	NW21	NW18	NW17	WNNW16	W14	WNNW18.1	WNNW32
18-Nov	W15	W18	W11	W7	WSW8	WSW8	WSW9	WSW8	WSW9	WSW9	W9	NW7	WNNW8	W11	WSW8	WSW8	WSW5	SW5	WSW4	SW4	WSW3	E1	WSW1	SE8	W6.8	W18
19-Nov	SE7	SE8	E8	ESE7	E8	E8	ENE12	E11	ESE7	E11	E12	E10	E11	E10	E11	ENE13	E12	ESE10	ESE10	ESE11	ESE12	ESE13	ESE14	ESE12	E10.0	ESE14
20-Nov	ESE12	ESE11	ESE10	ESE10	ESE11	ESE11	SE14	SE18	SE16	SE18	SE18	SE16	SE14	SSE11	SE10	SE10	SE12	SE13	SE15	SE15	SE17	SE15	ESE14	ESE13	SE13.3	SE18
21-Nov	SE14	SE19	SE16	SE18	SE18	SE16	SE17	SSE18	SSE16	SSE12	S9	SSW7	W5	NW7	WNNW8	WNNW13	WNNW15	WNNW14	NW14	N16	NNE21	NNE16	NNE18	NNE20	ESE2.5	NNE21
22-Nov	NNE15	NNE16	NNE14	NNE8	N9	NNE6	NE5	NE7	NE4	NE4	SSE3	SSE7	SSE7	SSE10	SSE11	SSE15	SE16	SE17	SE16	SE19	SE16	SE16	SE20	SE24	ESE7.3	SE24
23-Nov	SE22	SE23	SE24	SE25	SE28	SE26	SE23	SE25	SE25	SE25	SE27	SE27	SE26	SE26	SE23	SE21	SE20	SE20	SE19	SSE21	SSE24	SSE21	SSE19	SSE18	SE22.9	SE28
24-Nov	S15	SSE19	S17	SSE18	SSE20	SSE21	SSE18	SSE17	SSE19	SSE16	SSE12	SE15	SE12	SE12	SSE13	SSE15	SE13	ESE12	SE19	SE16	SE21	SE23	SE18	SE20	SSE16.5	SE23
25-Nov	SE19	ESE19	ESE19	SE22	ESE18	SE20	SE23	SE21	SE21	SE17	SE15	SE13	SE12	SE9	SE6	S7	SW9	SW12	WSW14	WSW16	WSW16	WSW19	WSW20	WSW21	SSE10.0	SE23
26-Nov	WSW23	WSW20	WSW20	WSW22	WSW22	WSW22	SW17	SW19	SW16	SW15	SW19	SW13	SW10	S8	SSE7	SE3	S3	SW1	E3	ENE2	NW7	NNW6	NNE2	NNE3	SW9.8	WSW23
27-Nov	NNE2	NE5	NE5	NNE10	N12	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	N11	AF	AF	AF	AF	AF	AF	----	N12
28-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	----	----
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	----	----
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	SSE25	SSE23	SSE19	SSE21	SSE22	SSE21	SSE19	SSE18	SSE16	SSE20	SSE20	SSE21	SSE20	SSE22	SSE20	SSE19	----	SSE25

S7.7	S8.0	S7.1	S8.2	S8.6	S10.2	S9.7	S10.4	S10.7	S11.0	S11.2	S9.9	S9.1	S8.9	S7.9	S7.9	SSW9.0	S7.9	SSW9.0	SSW8.2	SSW8.3	SSW7.9	S8.8	S8.4	Diurnal Average
WSW35	WSW35	WSW33	WSW40	WSW38	WSW40	WSW37	WSW28	WSW27	WSW34	WSW30	WSW27	WSW32	SE26	WSW27	W32	WSW32	WNNW32	W32	WSW36	WSW43	WSW45	WSW44	WSW45	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

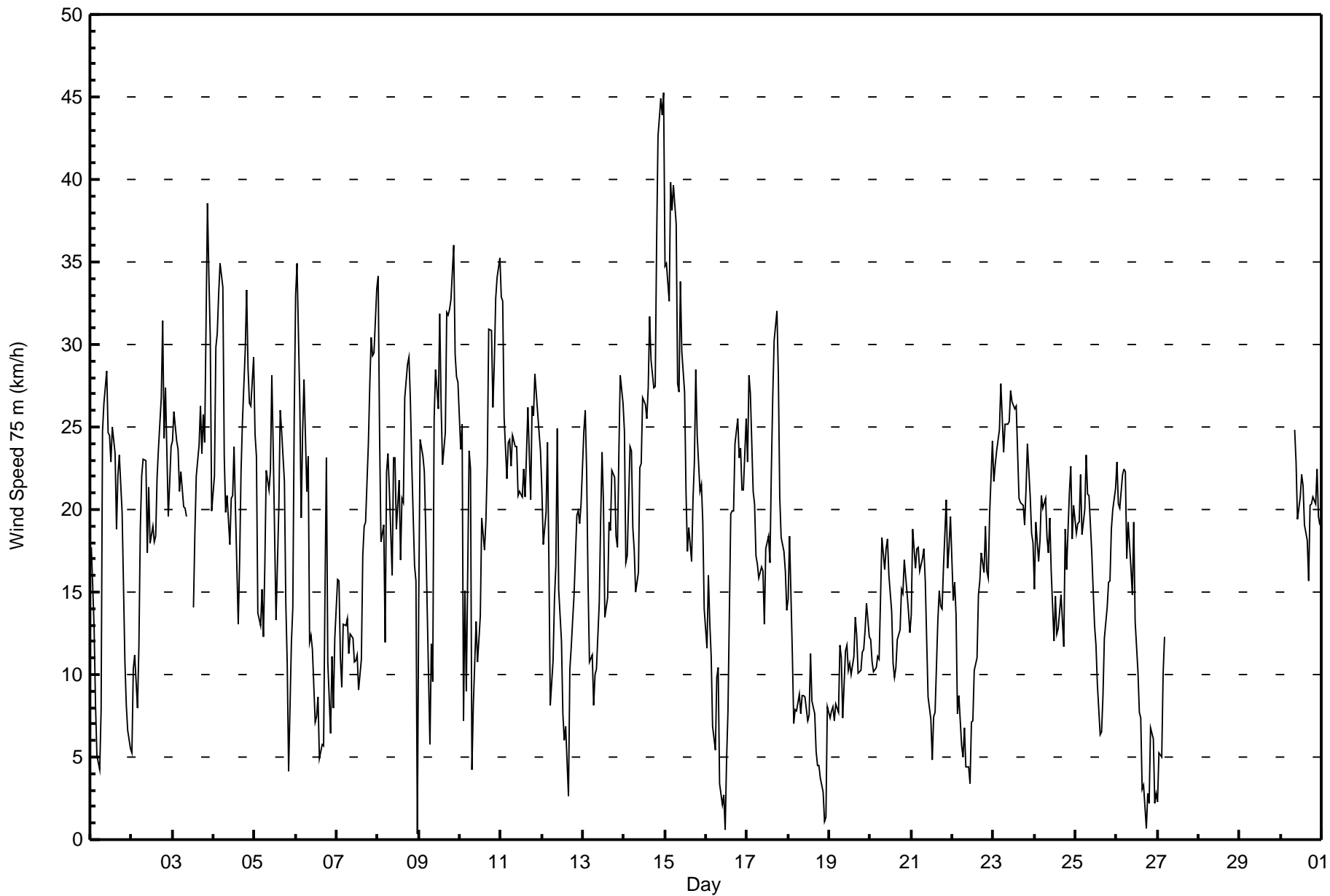
Wind Speed 75 m (WS75m) - km/h
Mannix - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Nov 24 22:00 Minimum Value: 1 km/h on Nov 2 23:00 Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 7																	Hours in Service: 720 Hours of Data: 643 Hours of Missing Data: 77 Hours of Calibration: 0 Percent Operational Time: 89.3								
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	3	2	3	2	1	2	5	4	4	4	3	3	3	3	4	3	3	4	4	3	3	2	2	2	5
2-Nov	2	2	2	3	3	2	2	2	4	4	3	4	3	3	3	3	2	3	3	3	4	1	1	1	4
3-Nov	1	2	2	2	2	2	5	5	4	AF	AF	AF	2	4	4	2	3	3	5	6	6	5	3	4	6
4-Nov	4	3	2	2	2	3	2	4	3	2	2	2	3	2	2	3	2	2	2	3	2	2	1	2	4
5-Nov	3	5	3	2	3	2	3	3	2	2	3	3	3	4	3	2	3	2	3	3	2	6	3	4	6
6-Nov	2	2	4	2	3	3	2	3	3	2	3	3	3	2	2	1	3	3	2	5	4	3	4	3	5
7-Nov	2	3	3	3	2	1	2	2	2	2	2	1	1	2	1	3	1	2	1	2	2	3	3	3	3
8-Nov	2	4	4	4	4	4	3	4	2	3	3	3	2	3	1	2	2	1	1	2	2	4	4	3	4
9-Nov	3	7	7	6	7	5	4	4	6	4	4	5	4	3	3	3	4	3	4	3	3	3	3	3	7
10-Nov	3	3	5	2	3	3	3	3	3	1	2	2	3	4	2	2	3	6	3	3	4	3	4	5	6
11-Nov	5	4	4	3	2	2	1	1	2	2	3	3	3	3	3	3	3	4	4	3	3	3	2	2	5
12-Nov	2	2	3	5	3	2	2	2	2	4	3	2	2	3	2	2	3	1	3	2	2	1	1	2	5
13-Nov	2	3	1	4	2	3	2	2	3	3	2	2	3	2	4	2	2	1	2	2	2	2	2	1	4
14-Nov	3	3	4	3	2	3	2	2	2	3	4	5	4	4	4	5	4	4	5	5	6	5	5	6	6
15-Nov	7	6	7	5	5	5	5	5	6	4	5	4	4	3	3	2	1	2	3	3	2	2	2	2	7
16-Nov	2	3	2	1	2	1	1	3	1	1	1	1	2	3	5	5	4	4	4	4	4	3	4	4	5
17-Nov	4	5	4	3	3	3	3	3	3	4	2	2	3	3	3	5	5	4	4	4	2	3	2	2	5
18-Nov	2	2	3	3	1	1	1	2	1	2	2	2	4	2	2	2	2	1	1	2	1	1	2	2	4
19-Nov	2	2	3	3	3	3	2	4	3	3	3	3	3	3	3	2	3	4	4	4	4	5	6	4	6
20-Nov	5	4	4	4	5	4	4	4	5	3	4	4	2	2	2	3	3	2	3	4	3	3	5	5	5
21-Nov	6	5	4	4	4	3	2	2	2	2	1	3	2	1	2	1	2	3	2	6	3	3	3	3	6
22-Nov	3	3	3	2	1	2	1	2	3	2	2	2	2	2	3	3	3	4	3	5	4	4	6	6	6
23-Nov	4	5	5	5	6	5	4	4	5	5	6	7	6	6	5	5	4	4	3	3	3	2	3	7	7
24-Nov	2	2	2	1	2	2	2	2	2	2	2	3	2	2	2	1	2	4	6	5	5	9	7	7	9
25-Nov	6	8	7	9	7	7	6	5	5	4	3	3	4	2	2	1	1	1	1	2	2	3	3	3	9
26-Nov	3	3	3	2	3	3	3	2	2	2	3	3	3	3	2	2	1	1	1	1	2	1	1	2	3
27-Nov	2	1	2	2	2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	3	AF	AF	AF	AF	AF	AF	3
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	4	4	5	4	4	3	4	3	3	3	4	3	3	3	3	3	5
Diurnal Maximum																									
AF - Analyzer Failure																									



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	36	5.60	5.60
6 - 11	111	17.26	22.86
12 - 19	205	31.88	54.74
20 - 28	235	36.55	91.29
29 - 38	49	7.62	98.91
> 38	7	1.09	100.00

Total Number of Valid Hours: 643

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 75 m (WS75m) - km/h
Mannix - 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	0	4	4	4	2	1	1	1	1	1	2	5	4	1	1	2	3	36
6 - 11	5	5	2	1	9	10	9	17	7	4	12	16	5	4	3	2	111	
12 - 19	2	8	0	2	2	12	61	40	12	5	17	17	9	7	5	6	205	
20 - 28	1	10	0	0	0	0	60	59	14	10	9	38	20	5	3	6	235	
29 - 38	0	0	0	0	0	0	14	6	0	4	4	14	5	2	0	0	49	
> 38	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	0	7	
Totals	8	27	6	7	13	23	145	123	34	25	48	95	40	19	13	17	643	

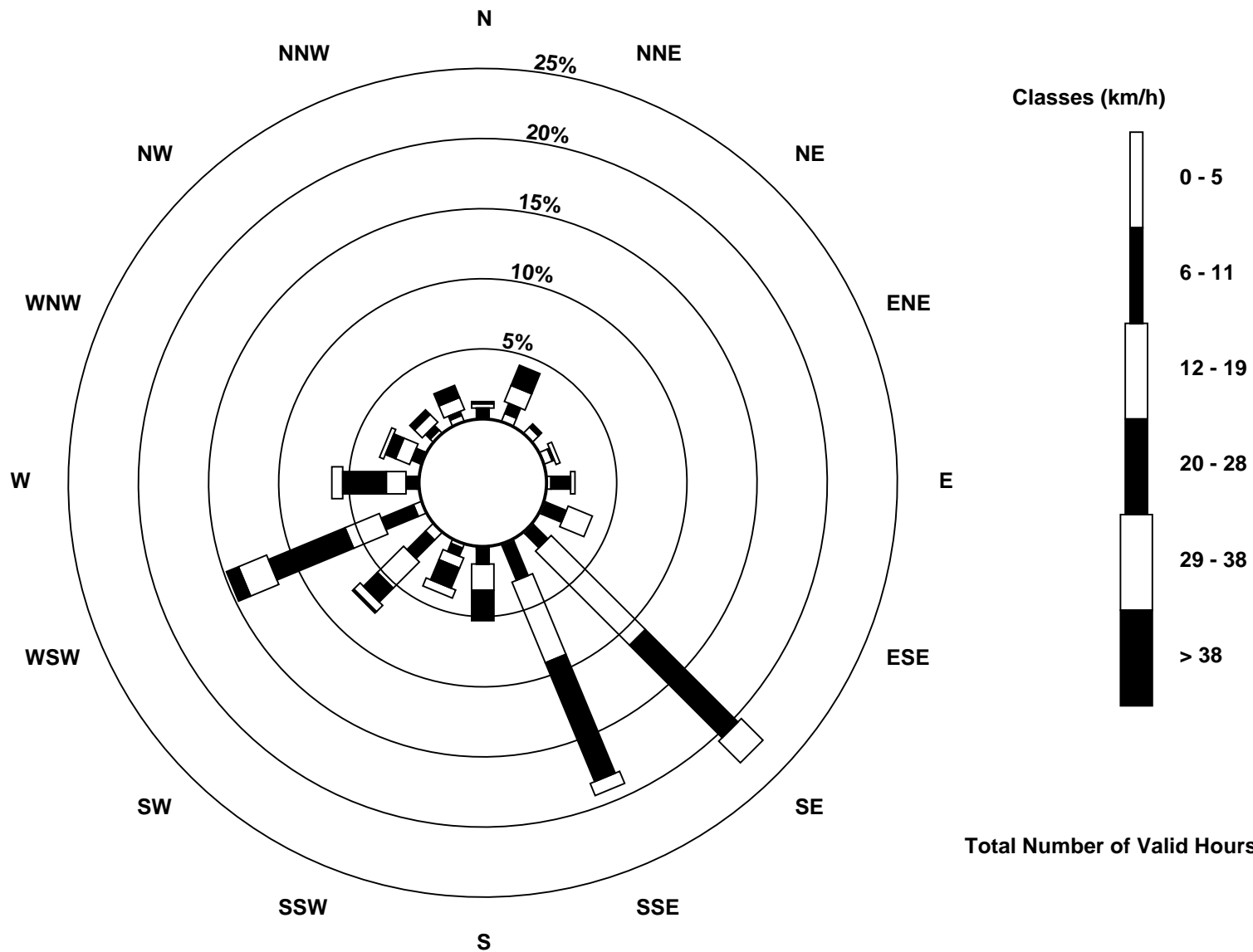
Total Number of Valid Hours: 643

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

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





Maximum Speed: 47 km/h on Nov 15 00:00	Maximum Daily Speed Average: 26.8 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 29 09:00	Minimum Daily Speed Average: 3.2 km/h on Nov 21	Hours of Data: 715
Maximum Diurnal Speed Average: 11.7 km/h at hour 10	Minimum Diurnal Speed Average: 7.3 km/h at hour 22	Hours of Missing Data: 5
Monthly Average Velocity: 9.0 km/h 188.2 deg	Percentiles: P ₁ = 2 P ₁₀ = 7 Q ₁ = 12 Median = 19 Q ₃ = 25 P ₉₀ = 29 P ₉₉ = 41	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-Nov	NNW18	NNW16	NNW13	NNW8	NNW5	NNW4	WSW8	W25	W26	W28	W24	W24	W23	W25	W23	WNW19	WNW22	WNW23	NW20	NNW16	N11	NNE8	NE6	ENE6	WNW13.4	W28	
2-Nov	ESE6	SSE11	S12	SE8	SE13	SSE21	SSE26	SSE26	SSE26	SE19	SE23	SE20	SSE21	SSE20	SE20	SSE24	SSE27	SSE31	SSE36	S27	S29	S19	S21	S24	SSE20.6	SSE36	
3-Nov	SSE25	SSE28	SSE26	SSE26	SSE23	SE25	SE24	SE22	SSE23	SSE25	SSE29	SSE27	SSE16	S22	SSW24	S25	S28	S25	SSW29	SSW27	SW41	SW37	SW33	SSW22	S23.2	SW41	
4-Nov	SSW24	SSW31	SW33	SSW37	SSW39	SW36	SSW26	S20	SE24	SE20	SSE23	SSE23	SE25	SSE23	SSE14	SSE17	SSE24	SE30	SSE35	SSE37	SSE30	SSE28	SSE28	SSE33	S24.2	SSW39	
5-Nov	SE29	SE26	SE17	SE16	SE17	SE14	SE20	SSE22	SSE24	SSE24	SSE30	SSE25	S15	SSE15	SSE20	SSE25	S27	S20	S13	S9	WSW7	WSW15	SW17	WSW29	SSE16.5	SSE30	
6-Nov	WSW35	SW37	SW29	SW22	SSW26	SSW31	SW24	WSW26	WSW14	SW14	SW13	WSW9	WSW8	WSW9	SW6	WSW7	WSW7	SW17	WSW25	SW13	SW8	WSW13	WSW11	SW14	SW16.9	SW37	
7-Nov	WSW18	WSW18	WSW14	SW12	SW14	SW14	SW15	SW13	SSW12	SSW13	S11	SSE12	S12	SSE9	SSE12	SSE18	S21	SE21	SE27	SE32	SE34	SE33	SSE35	SSE38	S15.2	SSE38	
8-Nov	SE38	SE28	SE21	SE23	SE15	SE27	SE27	SE25	SE19	SE25	SE25	SE21	SE22	SE18	SSE23	SSE23	SSE28	SSE33	SSE35	SSE28	S22	S12	S12	NNW3	SE22.0	SE38	
9-Nov	SSE12	SSE23	S22	S21	SSE16	S12	S4	SSE9	SSW9	WSW29	WSW31	WSW27	W32	WSW27	W23	WSW26	WSW33	WSW34	W34	W35	W38	W31	WSW30	WSW30	WSW19.9	W38	
10-Nov	WSW26	WSW27	WSW9	WSW17	WSW11	WSW25	WSW24	SW6	S7	S12	S11	SSE13	SE15	SE21	SSE20	SE22	SE26	SE35	SE35	SE30	SE33	SE37	SE38	SE40	SSE15.5	SE40	
11-Nov	SE37	SE37	SE30	SE25	SE27	SSE27	SSE24	S26	S24	S26	SSE23	S22	SSE22	SSW25	SSW22	SW25	SW28	WSW22	WSW28	WSW27	WSW30	WSW28	WSW27	WSW26	S19.6	SE37	
12-Nov	WSW24	WSW21	SW22	SSW27	SW20	SSW9	SSE9	SSW15	SW20	WSW29	WSW18	SSW14	SW9	SSW5	S6	NW4	WNW12	W13	WNW14	W17	W21	WNW21	WNW21	W23	WSW13.8	WSW29	
13-Nov	W27	W27	W25	W19	WSW13	WSW12	SW9	WSW12	SW13	SSE12	SSE18	SSE24	SSE23	S16	SSE14	S19	S19	S23	S22	SSW19	SSW19	S22	S28	S26	SSW14.3	SSE28	
14-Nov	SSE27	SE21	SE22	SSE27	S22	SSW19	SSW18	SSW17	SW18	WSW24	WSW24	WSW27	WSW27	W26	W28	W32	W30	W28	W29	W37	W43	WSW46	WSW45	WSW47	WSW22.4	WSW47	
15-Nov	W36	W36	W34	WSW41	WSW40	WSW41	WSW39	WSW29	W28	WSW35	WSW30	WSW27	WSW21	WSW18	WSW19	WSW18	SW22	WSW25	W31	W27	WNW23	NW23	NW20	NW15	W26.8	WSW41	
16-Nov	NNE13	NNE18	NNE14	N12	N8	NW6	NNW8	W9	NNW3	NNW2	SSW2	E2	ENE5	NNE8	NNE20	NNE21	NNE21	NNE25	NNE27	NNE25	NNE24	NNE22	N22	NNW26	N12.9	NNE27	
17-Nov	NNW24	NNW29	NNW28	NNW22	NNW21	NNW18	NNW17	NW16	W16	W16	WSW13	W17	W18	W17	W22	WNW27	WNW30	WNW32	NW28	NW21	NW18	NW17	NW16	NNW15	NW18.3	NNW32	
18-Nov	W15	W19	W12	WNW7	WSW8	W8	W9	WSW7	WSW9	W9	W9	NW7	WNW7	W11	WSW8	WSW8	WSW5	WSW5	WSW4	SW4	WSW3	ESE2	SW1	SSE8	W6.8	W19	
19-Nov	SE8	SE9	E11	ESE10	E10	E10	ENE13	E13	ESE9	E15	E15	E14	E15	E12	E13	ENE14	E16	ESE14	ESE15	ESE17	ESE20	ESE19	ESE20	ESE20	ESE13.4	ESE20	
20-Nov	ESE19	ESE16	ESE15	ESE15	ESE15	ESE14	SE17	SE20	SE19	SE19	SE20	SE17	SE15	SSE11	SE11	SE12	SE14	SE14	SE17	SE17	SE19	SE17	ESE18	ESE18	SE15.9	SE20	
21-Nov	SE17	SE21	SE19	SE20	SE20	SE18	SE19	SSE19	SSE17	SSE13	S9	SSW8	W5	NW7	WNW8	WNW13	WNW15	WNW14	NW14	N17	NNE22	NNE17	NNE18	NNE21	ESE3.2	NNE22	
22-Nov	NNE15	NNE16	NNE14	NNE8	NNE9	NNE6	NE5	ENE7	ENE5	ENE4	SSE4	SSE8	SSE8	SSE11	SSE12	SSE16	SSE17	SE19	SE18	SE20	SE18	SE18	SE23	SE28	ESE8.2	SE28	
23-Nov	SE24	SE26	SE27	SE28	SE31	SE28	SE26	SE28	SE28	SE28	SE30	SE29	SE29	SE28	SE26	SE24	SE22	SE23	SSE21	SSE23	SSE26	SSE22	S20	SSE20	SE25.3	SE31	
24-Nov	S16	S21	S19	S20	SSE23	SSE22	SSE23	SSE20	SSE19	SSE21	SSE17	SSE13	SSE16	SE14	SSE14	SSE16	SE16	ESE16	SE22	SE19	SE24	SE28	SE24	SE26	SSE18.5	SE28	
25-Nov	SE23	ESE27	ESE27	SE28	ESE24	SE25	SE27	SE24	SE23	SE19	SE17	SE15	SE14	SE11	SE7	S7	SW9	SW12	WSW15	WSW16	WSW16	WSW20	WSW21	WSW22	SSE11.9	ESE28	
26-Nov	WSW24	WSW22	WSW21	WSW23	WSW24	WSW24	SW19	SW21	SW18	SW16	SW20	SW14	SW10	S8	SSE8	SE4	S4	SSE2	E4	ENE2	NNW6	N7	NE2	NE2	SW10.3	WSW24	
27-Nov	NNE2	NE5	NE5	NNE10	N13	AF	AF	AF	AF	AF	N10	N13	N14	N12	N12	N14	N18	N13	N17	N17	NNE15	N11	NNW8	NW10	N11.1	N18	
28-Nov	NW8	WNW7	W9	W10	WSW11	WSW11	WSW8	WSW8	WSW12	WSW12	WSW10	WSW7	SW5	SW5	WSW4	SW4	WSW5	NW5	N7	N8	N12	N15	N11	NNW7	WNW5.6	N15	
29-Nov	NW8	NNW13	N7	WNW7	WNW9	WNW4	WNW7	NW4	S1	WSW6	SW7	S5	SSE11	SSE13	SSE13	S14	SSE17	S16	S18	SSW14	SSE14	SSE22	SSE18	SSE17	S6.2	SSE22	
30-Nov	SSE19	SSE20	SSE21	SSE20	SE19	SE20	SE21	SE26	SSE27	SSE24	SSE20	SSE22	SSE23	SSE22	SSE20	SSE19	SSE17	SSE22	SSE22	SSE22	SSE22	SSE22	SSE24	SSE21	SSE21	SSE21.3	SSE27

SSW7.9	S8.0	S7.6	S8.8	S8.8	S10.4	S10.2	S10.8	S11.2	S11.7	S11.4	S10.0	S9.0	S8.9	S7.9	S7.8	SSW8.8	S8.6	SSW8.9	SSW7.9	SSW7.5	SSW7.3	SSW8.5	SSW8.4	Diurnal Average
SE38	SE37	W34	WSW41	WSW40	WSW41	WSW39	WSW29	W28	WSW35	WSW31	SE29	W32	SE28	W28	W32	WSW33	SE35	SSE36	SSE37	W43	WSW46	WSW45	WSW47	Diurnal Maximum

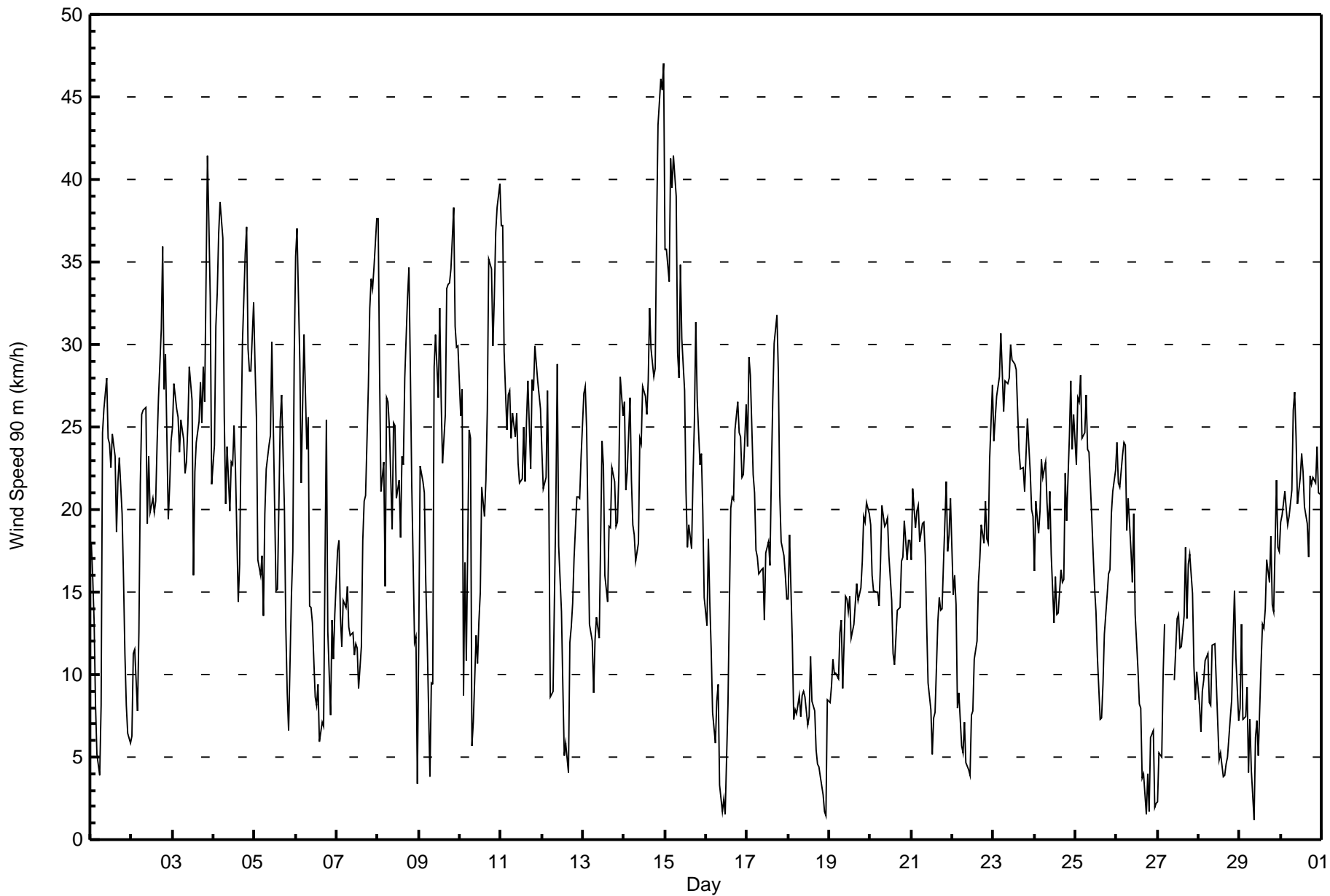
AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 24 22:00 Minimum Value: 1 km/h on Nov 28 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: 720 Hours of Data: 715 Hours of Missing Data: 5 Hours of Calibration: 0 Percent Operational Time: 99.3									
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	3	2	3	2	1	2	5	4	3	4	3	3	3	3	4	3	3	4	4	3	3	2	1	2	5	
2-Nov	2	2	2	2	2	3	2	2	5	3	3	3	3	3	3	3	2	3	3	3	5	1	1	1	5	
3-Nov	1	1	2	2	2	1	4	5	4	2	3	2	2	3	4	2	3	3	5	7	6	5	3	4	7	
4-Nov	4	4	2	2	2	3	2	4	3	2	2	1	2	2	2	3	2	2	3	1	1	1	1	2	4	
5-Nov	2	5	3	3	3	4	3	2	2	3	2	2	3	3	2	2	4	3	3	3	2	6	3	4	6	
6-Nov	2	2	4	2	3	2	3	3	3	2	3	4	2	2	2	1	4	3	2	5	5	3	4	2	5	
7-Nov	3	3	3	3	2	1	2	1	2	2	2	1	2	2	1	3	1	2	1	2	2	3	3	3	3	
8-Nov	2	4	5	4	4	3	3	4	2	2	2	2	2	1	1	1	1	1	1	2	3	4	4	2	5	
9-Nov	4	7	7	7	7	4	3	3	7	4	4	5	4	3	3	3	4	3	4	3	3	4	3	3	7	
10-Nov	3	3	6	2	3	3	3	4	2	1	2	2	3	3	2	2	3	5	3	3	4	3	3	4	6	
11-Nov	5	4	4	3	2	2	1	1	2	2	2	3	3	3	3	3	3	4	4	4	3	3	2	2	5	
12-Nov	2	2	3	5	3	3	2	3	3	3	3	2	2	2	2	3	3	2	3	2	2	1	2	2	5	
13-Nov	1	1	1	4	2	3	2	3	3	3	4	2	2	3	2	1	2	1	2	2	2	2	2	1	4	
14-Nov	2	3	3	2	3	2	1	2	3	4	4	5	5	4	4	5	4	4	5	5	6	5	5	6	6	
15-Nov	7	6	7	5	5	5	5	6	6	4	5	4	4	3	3	3	2	2	3	4	2	2	1	2	7	
16-Nov	2	3	2	1	2	1	1	2	1	1	1	1	2	3	5	5	4	4	4	4	4	3	4	4	5	
17-Nov	4	5	4	4	3	3	3	3	3	3	2	2	3	2	3	5	4	4	4	4	2	3	2	2	5	
18-Nov	3	2	3	3	1	1	1	2	1	2	2	2	4	1	2	2	2	1	1	2	1	2	2	2	4	
19-Nov	2	2	3	3	4	3	2	4	4	2	3	3	3	2	2	2	3	4	5	4	5	5	6	5	6	
20-Nov	5	4	4	3	3	3	3	4	4	3	4	3	2	2	2	3	3	2	3	3	3	2	4	4	5	
21-Nov	5	4	3	4	3	3	2	2	2	2	1	3	2	1	1	1	2	3	2	6	3	3	3	3	6	
22-Nov	3	3	3	2	1	2	2	2	3	2	2	2	2	2	3	3	3	4	3	4	3	4	5	5	5	
23-Nov	4	5	4	5	5	5	4	4	5	5	5	6	5	5	5	4	4	4	3	2	3	3	2	3	6	
24-Nov	2	2	2	1	3	2	1	2	2	2	2	3	2	2	2	1	2	3	4	5	4	8	5	5	8	
25-Nov	5	6	6	6	5	5	5	5	4	4	3	3	3	2	2	1	1	1	1	2	2	3	3	3	6	
26-Nov	3	3	3	3	3	3	3	2	2	2	3	3	2	3	2	2	1	2	2	1	2	1	1	1	3	
27-Nov	2	1	2	2	2	AF	AF	AF	AF	AF	2	3	3	4	4	4	3	5	5	3	2	3	1	1	5	
28-Nov	1	1	1	1	1	1	1	3	1	1	1	2	2	1	1	2	1	1	3	2	2	2	3	2	3	
29-Nov	2	4	2	2	2	1	2	2	1	1	2	2	2	2	2	2	3	3	2	2	3	3	2	2	4	
30-Nov	3	3	3	3	3	2	4	4	4	4	5	4	4	3	4	3	3	3	4	3	3	3	3	3	5	
	7	7	7	7	7	5	5	6	7	5	5	6	5	5	5	5	4	5	5	7	6	8	6	6		
Diurnal Maximum																										
AF - Analyzer Failure																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	43	6.01	6.01
6 - 11	108	15.10	21.12
12 - 19	214	29.93	51.05
20 - 28	268	37.48	88.53
29 - 38	71	9.93	98.46
> 38	11	1.54	100.00

Total Number of Valid Hours: 715

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 90 m (WS90m) - km/h
Mannix - 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	0	1	5	4	2	1	1	2	4	2	5	6	1	1	3	5	43
6 - 11	9	6	1	2	3	3	5	12	8	3	8	22	8	8	6	4	108
12 - 19	14	9	0	2	8	13	38	34	17	10	15	23	11	7	6	7	214
20 - 28	1	10	0	0	0	8	63	72	26	9	10	33	20	7	4	5	268
29 - 38	0	0	0	0	0	0	19	12	1	4	5	14	13	2	0	1	71
> 38	0	0	0	0	0	0	1	0	0	1	1	7	1	0	0	0	11
Totals	24	26	6	8	13	25	127	132	56	29	44	105	54	25	19	22	715

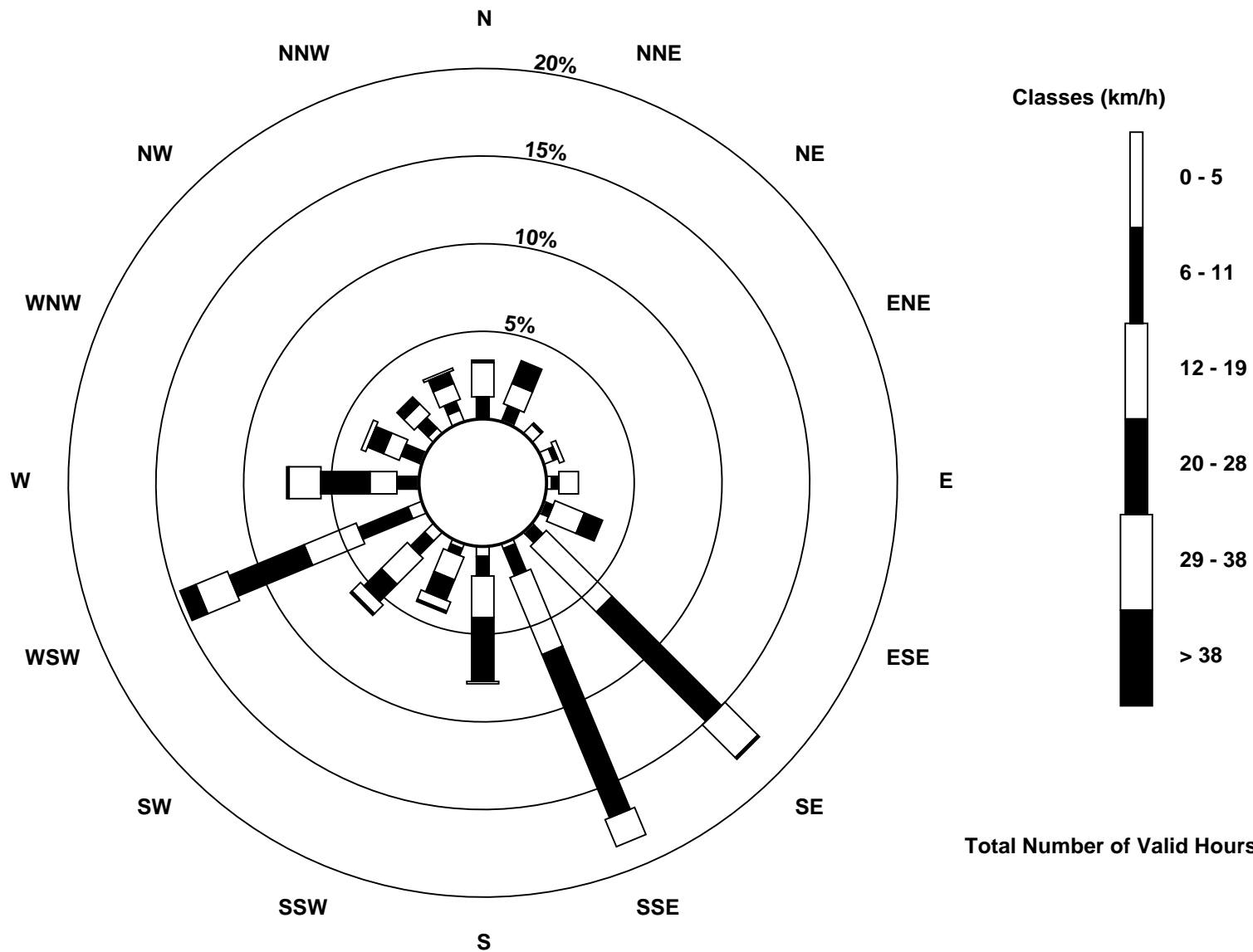
Total Number of Valid Hours: 715

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 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 - November 2016

Direction of Maximum Speed: 260 deg on Nov 14 21:00		Hours in Service: 720
Direction of Maximum Daily Speed Average: 257.6 deg on Nov 15		Hours of Data: 717
Direction of Minimum Speed: 200 deg on Nov 6 13:00		Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 1.7 deg on Nov 21		Percent Operational Time: 99.6
Monthly Average Direction: 206.5 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-Nov	339	350	342	354	2	359	243	280	271	271	266	273	268	267	282	295	301	302	307	339	354	35	52	83	294.2
2-Nov	128	159	163	146	150	157	156	153	151	144	151	148	152	165	149	157	154	152	156	152	161	148	153	154	153.0
3-Nov	150	152	151	149	151	140	131	152	168	AF	AF	AF	140	142	184	171	171	157	191	183	232	232	208	171	171.5
4-Nov	170	193	201	207	210	210	181	154	130	126	151	145	144	153	147	151	150	144	150	154	155	138	143	144	162.6
5-Nov	142	153	165	174	163	182	164	156	155	156	155	143	164	148	152	153	170	145	150	147	145	171	157	259	158.0
6-Nov	236	222	215	185	184	206	239	251	232	205	192	226	200	239	189	132	171	199	211	143	158	148	148	156	203.8
7-Nov	157	155	113	142	170	166	157	138	158	162	145	137	146	146	137	148	150	129	139	144	148	150	149	139	147.3
8-Nov	141	150	150	151	146	143	144	149	148	144	152	164	148	149	147	153	161	146	152	142	145	144	156	144	148.4
9-Nov	160	154	157	159	151	195	148	152	151	220	266	263	260	259	266	256	258	254	263	264	265	263	247	250	245.2
10-Nov	254	253	188	222	168	235	253	146	154	152	145	139	141	146	152	140	134	132	140	137	137	138	138	142	156.6
11-Nov	143	143	144	137	143	145	150	151	156	162	155	153	146	161	187	215	214	220	244	253	260	249	256	253	183.5
12-Nov	249	211	166	200	168	135	138	161	166	231	164	150	152	158	153	74	278	265	255	241	256	258	268	258	204.3
13-Nov	251	255	264	225	224	177	154	160	155	142	150	146	148	152	142	152	151	160	149	157	148	154	151	151	163.3
14-Nov	141	138	147	153	153	156	148	146	153	227	243	247	253	261	262	275	275	272	263	262	260	257	251	251	244.0
15-Nov	262	261	261	255	254	251	255	254	263	250	248	251	258	262	250	244	223	249	268	289	295	280	268	299	257.6
16-Nov	19	358	0	343	355	267	277	267	238	233	227	312	74	49	17	23	28	15	15	19	19	17	351	345	6.4
17-Nov	341	345	344	333	336	342	340	307	277	268	245	260	261	273	277	295	289	293	310	307	307	315	303	270	301.5
18-Nov	255	267	255	247	238	237	244	242	247	246	271	320	285	264	264	260	258	241	253	242	256	101	259	157	254.2
19-Nov	159	136	93	108	96	87	74	86	113	93	91	95	96	89	87	72	85	106	119	121	115	120	124	120	103.3
20-Nov	123	123	118	124	127	128	138	142	136	149	148	142	153	164	150	146	144	152	147	137	136	144	130	127	137.7
21-Nov	131	135	138	135	137	144	147	156	160	165	171	196	276	304	294	287	288	291	305	9	19	19	21	22	121.5
22-Nov	16	28	27	2	11	9	34	56	73	48	153	155	154	153	160	161	151	144	147	148	149	135	135	138	122.3
23-Nov	143	135	137	136	135	142	146	143	145	139	145	138	137	144	140	134	138	139	149	154	165	166	167	164	144.0
24-Nov	177	159	169	166	160	162	156	160	161	155	166	147	149	152	159	162	151	128	136	139	134	132	129	133	149.8
25-Nov	133	127	128	130	128	132	134	139	140	150	140	144	140	135	152	202	230	237	245	256	249	243	240	246	157.3
26-Nov	242	238	244	248	245	241	225	228	232	215	222	226	233	189	166	151	246	298	77	329	255	264	252	351	234.2
27-Nov	37	58	43	12	20	22	10	358	16	351	356	13	3	345	343	349	359	339	355	6	8	346	309	299	359.8
28-Nov	296	270	244	241	234	228	232	217	215	227	221	245	225	216	235	193	216	264	347	360	355	5	359	309	263.3
29-Nov	294	337	9	280	267	244	264	265	215	260	266	197	165	151	156	169	163	179	182	199	171	157	159	160	191.7
30-Nov	157	153	164	153	136	138	142	148	153	156	168	161	165	167	161	159	160	154	156	167	162	165	158	155	157.0

183.7	177.5	167.4	172.3	168.0	175.2	168.3	169.9	173.3	183.5	185.7	182.8	181.9	188.1	190.2	188.0	193.9	189.0	196.9	193.1	200.0	183.2	175.8	176.2
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

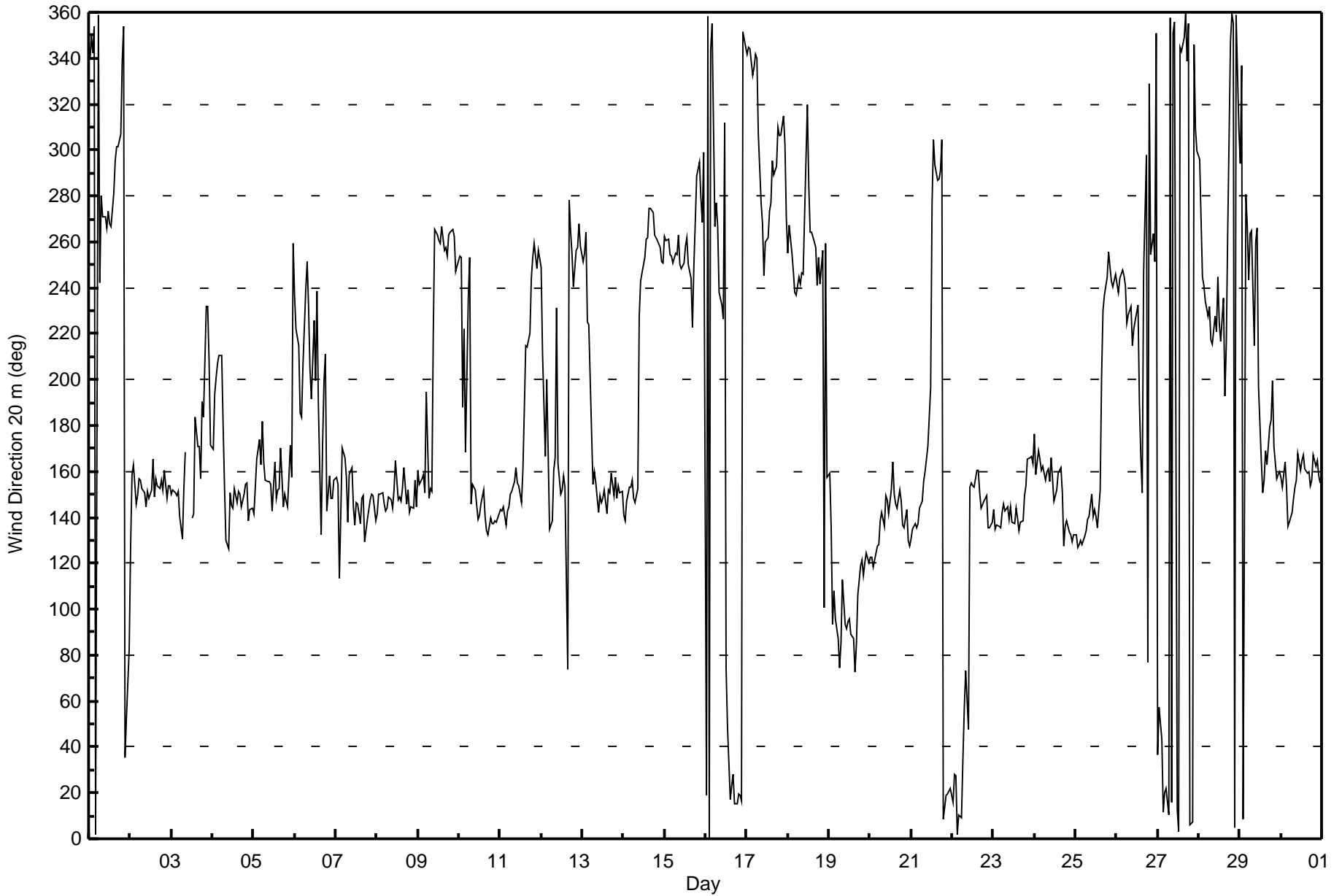
Wind Direction 20 m (WD20m) - deg
Mannix - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 100 deg on Nov 16 12:00	Hours of Data: 717
Minimum Value: 4 deg on Nov 13 18:00	Hours of Missing Data: 3
Percentiles: P ₁ = 6 P ₁₀ = 8 Q ₁ = 10 Median = 12 Q ₃ = 16 P ₉₀ = 26 P ₉₉ = 63	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-Nov	14	13	13	19	59	29	61	14	10	9	9	11	11	10	13	14	13	12	19	16	24	16	21	29	61
2-Nov	18	8	7	10	7	8	8	9	12	14	10	11	9	11	12	9	8	8	7	9	7	7	7	6	18
3-Nov	8	9	9	9	9	11	9	14	13	AF	AF	AF	13	14	40	13	10	7	21	20	11	12	12	21	40
4-Nov	9	13	9	10	10	7	16	17	10	14	11	11	10	18	18	9	9	7	10	11	8	8	6	8	18
5-Nov	10	6	13	13	22	57	20	19	15	11	12	10	25	11	15	8	26	11	13	16	25	46	27	25	57
6-Nov	18	9	14	15	14	16	17	8	51	24	23	40	94	19	52	24	15	13	9	38	57	24	9	25	94
7-Nov	16	25	13	21	25	15	13	9	18	11	11	13	10	12	10	10	12	7	7	8	7	11	12	9	25
8-Nov	8	10	8	9	13	9	9	18	14	8	9	14	10	10	10	11	9	11	9	10	8	8	43	77	77
9-Nov	23	13	17	17	17	37	43	40	54	32	11	9	8	9	8	9	7	9	9	5	5	7	9	8	54
10-Nov	9	10	66	35	37	8	19	27	15	9	13	16	12	11	10	11	9	8	9	10	9	8	10	10	66
11-Nov	10	10	9	8	7	8	7	8	6	9	10	9	9	13	16	10	8	12	10	10	7	9	7	8	16
12-Nov	8	27	46	29	39	11	12	10	12	22	56	11	32	45	35	62	64	41	14	13	9	8	27	8	64
13-Nov	6	8	11	50	16	26	9	13	16	12	10	11	11	19	12	7	7	4	10	9	13	10	8	8	50
14-Nov	10	13	11	8	11	14	10	10	9	26	11	11	11	9	9	8	9	8	9	8	8	9	10	10	26
15-Nov	12	9	10	10	10	10	10	13	10	9	10	10	11	10	11	13	8	9	7	13	10	10	14	30	30
16-Nov	26	17	13	19	62	42	12	41	37	16	34	100	27	29	10	11	14	11	11	12	11	12	13	13	100
17-Nov	14	11	13	12	11	14	13	25	13	25	15	11	10	12	16	11	10	11	13	13	11	13	23	7	25
18-Nov	9	7	11	16	15	13	11	12	12	13	15	33	26	15	16	17	29	22	23	25	21	91	71	13	91
19-Nov	14	29	12	16	19	10	12	12	22	12	12	13	13	13	13	13	12	17	13	12	13	12	13	13	29
20-Nov	12	12	12	11	10	10	12	12	11	11	12	13	14	24	11	12	13	10	11	11	9	11	9	10	24
21-Nov	11	11	11	10	10	10	10	9	8	10	14	26	22	14	16	9	8	10	11	17	11	14	12	12	26
22-Nov	11	12	12	17	11	15	19	20	50	24	37	20	18	13	16	13	12	11	12	12	12	10	10	10	50
23-Nov	11	10	10	9	9	11	11	10	10	10	11	11	10	11	12	9	9	10	10	11	10	11	9	9	12
24-Nov	15	9	11	8	8	7	9	9	9	11	11	18	10	13	12	15	28	10	11	12	9	11	10	13	28
25-Nov	10	10	9	9	10	10	10	12	11	10	11	13	15	14	13	18	10	10	10	10	10	9	11	11	18
26-Nov	9	9	10	10	9	10	20	14	11	14	12	20	28	39	25	37	18	23	48	52	8	17	30	50	52
27-Nov	71	29	16	13	14	11	11	15	16	20	23	11	15	22	24	21	15	21	21	13	12	28	15	10	71
28-Nov	14	14	11	10	10	9	15	25	15	11	10	14	29	20	29	21	27	15	29	16	12	12	12	28	29
29-Nov	15	21	18	20	15	12	12	24	19	11	11	42	18	11	13	13	15	18	21	18	22	12	11	12	42
30-Nov	10	9	14	18	10	9	9	9	9	9	11	14	12	12	12	9	10	9	11	10	9	11	11	10	18

71	29	66	50	62	57	61	41	54	32	56	100	94	45	52	62	64	41	48	52	57	91	71	77	
Diurnal Maximum																								

AF - Analyzer Failure





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 45 m (WD45m) - deg

Mannix - November 2016

Direction of Maximum Speed: 251 deg on Nov 14 22:00															Hours in Service: 720						
Direction of Maximum Daily Speed Average: 253.7 deg on Nov 15															Hours of Data: 694						
Direction of Minimum Speed: 30 deg on Nov 12 16:00										Direction of Minimum Daily Speed Average: 2.0 deg on Nov 21										Hours of Missing Data: 26	
Monthly Average Direction: 206.2 deg															Percent Operational Time: 96.4						

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	333	342	339	346	348	343	241	276	265	266	261	269	262	261	276	288	295	297	302	335	349	28	44	74	290.8	
2-Nov	122	149	162	136	134	146	151	146	145	138	143	142	145	158	143	150	147	147	154	156	166	154	152	156	149.0	
3-Nov	149	149	149	145	146	136	125	145	165	AF	AF	AF	141	148	186	171	174	166	193	189	228	229	209	183	172.2	
4-Nov	181	193	198	204	205	210	186	157	130	126	146	143	140	149	149	150	148	138	143	150	154	138	146	135	162.1	
5-Nov	127	137	137	156	143	157	152	143	150	151	153	143	165	145	148	150	166	148	149	144	137	223	182	256	152.5	
6-Nov	238	221	216	195	184	201	228	240	237	222	215	228	259	235	203	196	199	216	223	191	167	189	178	187	213.9	
7-Nov	201	220	213	186	202	195	193	167	160	171	146	135	146	147	138	148	154	130	133	139	143	145	147	138	155.5	
8-Nov	137	145	139	138	131	133	135	139	144	131	138	144	138	136	137	143	163	151	156	151	148	145	157	144	142.8	
9-Nov	151	156	153	162	150	173	154	149	151	232	257	256	255	253	259	250	252	249	259	260	260	256	243	247	232.8	
10-Nov	252	252	223	234	207	237	254	150	152	149	143	138	137	140	148	136	130	129	136	132	134	135	134	138	155.7	
11-Nov	139	138	138	131	137	139	147	153	156	161	154	151	143	166	186	215	216	224	240	247	253	243	246	244	180.2	
12-Nov	244	233	203	203	201	144	142	164	188	238	228	155	165	155	155	30	285	256	271	251	262	264	272	263	216.5	
13-Nov	258	254	259	251	233	212	165	197	182	140	144	142	145	153	141	149	156	163	159	158	156	151	148	150	168.7	
14-Nov	135	126	132	150	156	161	156	158	169	230	240	243	248	256	256	270	269	266	257	255	254	251	246	246	232.9	
15-Nov	256	255	255	249	247	245	248	248	257	245	243	245	252	255	246	240	221	241	260	275	282	295	290	307	253.7	
16-Nov	359	17	13	354	341	281	273	269	272	262	225	279	64	37	13	17	18	9	10	13	12	10	346	341	357.7	
17-Nov	337	340	338	329	330	336	332	302	273	264	243	255	256	268	272	289	283	288	305	302	302	311	299	271	298.4	
18-Nov	258	264	256	257	241	239	246	239	246	247	269	313	281	259	256	253	253	236	246	234	255	101	247	150	252.6	
19-Nov	147	125	88	100	91	84	67	80	106	86	85	90	90	82	80	66	80	100	111	115	107	113	116	112	96.6	
20-Nov	114	114	111	116	120	121	132	137	130	142	142	136	146	160	143	137	136	142	139	131	130	135	122	119	130.7	
21-Nov	126	130	132	131	132	137	141	149	154	161	168	193	273	300	290	282	286	291	301	3	14	12	15	14	115.8	
22-Nov	10	19	21	2	5	8	32	50	58	45	154	149	151	147	154	155	144	138	140	143	143	130	129	132	116.9	
23-Nov	138	132	133	133	131	137	140	139	140	135	140	133	132	139	135	130	134	135	144	149	159	161	163	160	139.8	
24-Nov	173	157	166	162	155	159	151	156	157	150	162	144	143	144	153	155	145	120	129	132	128	126	122	125	144.8	
25-Nov	125	118	119	122	121	124	128	135	135	142	134	135	133	131	145	190	222	234	243	252	245	240	237	242	153.6	
26-Nov	239	235	240	244	244	240	225	224	229	213	217	222	224	185	157	137	224	279	83	49	285	336	336	8	231.3	
27-Nov	39	54	43	7	5	14	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	357	1	347	312	300	--	
28-Nov	297	272	246	244	239	230	242	228	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	349	352	353	358	353	314	--
29-Nov	302	329	357	282	270	252	266	280	216	254	251	191	160	145	151	165	159	173	178	190	166	151	154	155	186.0	
30-Nov	152	148	159	148	133	133	137	143	147	150	162	154	159	161	156	154	155	149	152	162	157	160	153	152	151.9	

183.3 178.5 168.2 173.6 169.3 174.8 170.7 169.1 170.6 180.2 180.6 175.0 174.5 178.0 180.5 181.4 188.4 183.7 190.2 185.0 191.7 181.8 177.7 177.5

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 45 m (WD45m) - deg

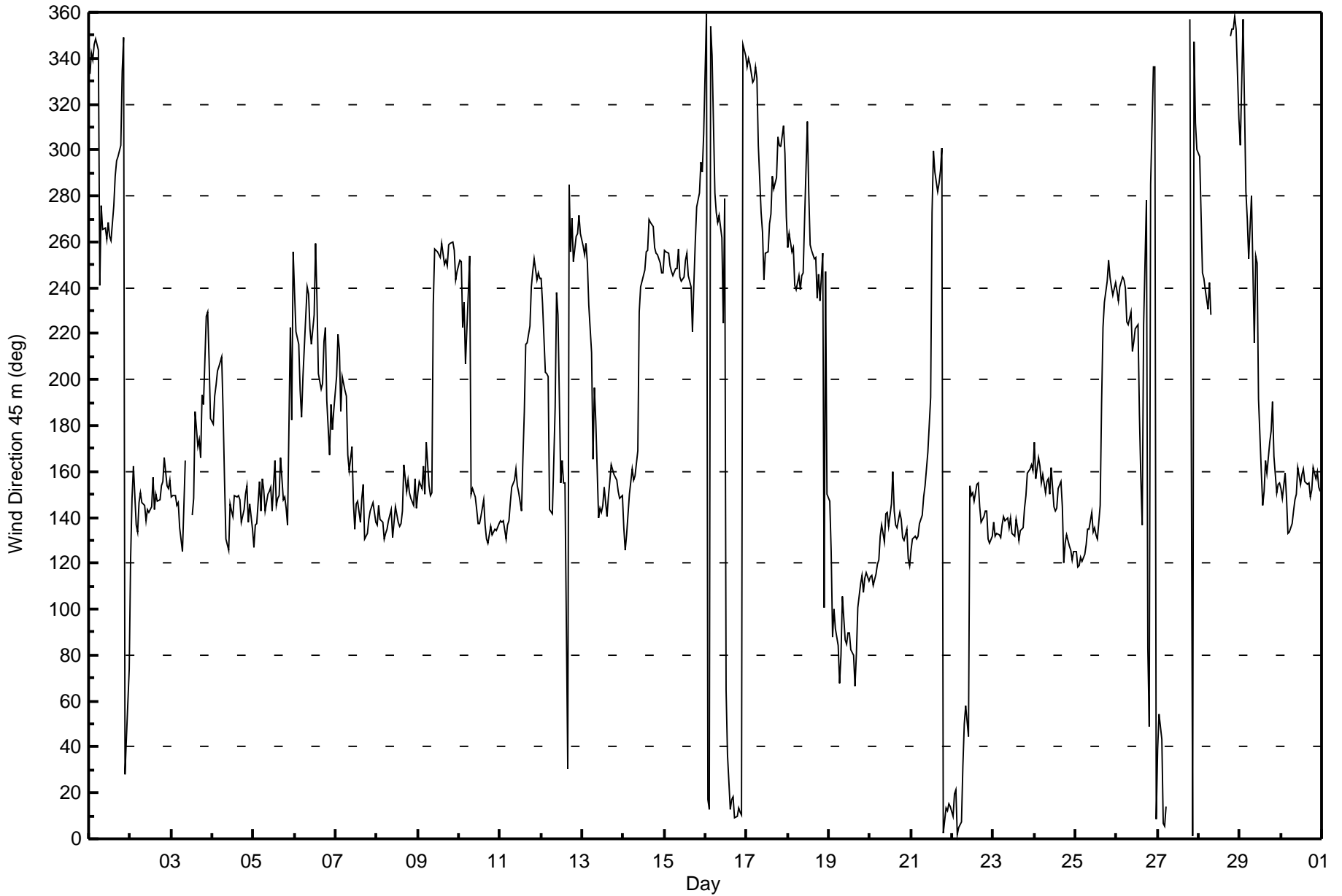
Mannix - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 96 deg on Nov 12 16:00			Hours of Data:	694
Minimum Value: 2 deg on Nov 13 18:00			Hours of Missing Data:	26
			Hours of Calibration:	0
			Percent Operational Time:	96.4
Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 7 Median = 9 Q ₃ = 12 P ₉₀ = 20 P ₉₉ = 54				

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	10	8	8	16	22	28	31	13	9	7	7	9	10	9	11	13	11	9	17	11	23	12	17	26	31	
2-Nov	18	9	11	10	5	6	6	5	9	11	8	9	7	7	9	7	6	5	4	5	4	5	4	3	18	
3-Nov	5	6	5	5	6	8	6	10	8	AF	AF	AF	12	14	17	6	5	7	12	14	8	10	7	17	17	
4-Nov	8	10	4	5	4	2	14	16	9	8	9	7	6	14	14	6	8	5	6	7	6	7	7	7	16	
5-Nov	4	6	8	11	9	20	8	10	9	5	7	7	19	7	9	4	21	5	5	8	20	59	22	13	59	
6-Nov	10	4	9	11	8	12	12	4	16	12	20	33	73	13	25	31	16	11	4	31	40	32	33	18	73	
7-Nov	15	13	25	26	13	7	14	16	9	9	11	10	7	8	7	9	13	3	3	5	3	8	6	6	26	
8-Nov	4	6	6	4	8	5	6	9	9	4	6	7	6	7	6	12	4	5	5	6	4	3	23	43	43	
9-Nov	9	10	8	10	7	18	14	24	37	20	6	8	7	7	7	6	5	6	7	4	4	5	6	5	37	
10-Nov	6	5	73	8	27	4	5	43	12	7	11	14	9	8	8	9	5	6	6	6	6	6	7	7	73	
11-Nov	7	7	7	5	4	6	5	3	4	6	7	5	5	17	10	7	5	10	7	7	5	6	4	6	17	
12-Nov	6	9	25	10	8	8	9	8	15	8	33	13	31	30	22	96	36	7	8	9	5	6	4	5	96	
13-Nov	5	4	4	10	5	19	11	15	27	9	7	8	9	15	9	3	10	2	4	4	8	3	3	3	27	
14-Nov	8	6	5	7	7	8	5	7	16	13	9	9	9	8	8	6	7	6	7	7	6	6	7	8	16	
15-Nov	10	7	9	7	8	7	7	10	8	6	7	7	9	9	8	11	5	6	4	9	7	6	6	18	18	
16-Nov	15	8	15	6	13	19	6	5	14	21	30	79	26	22	8	8	11	7	8	9	8	9	10	8	79	
17-Nov	9	8	8	9	8	10	9	21	11	21	12	9	8	9	14	9	8	9	10	12	9	9	19	5	21	
18-Nov	6	7	10	16	14	11	11	10	10	10	11	29	27	12	13	15	20	16	19	24	20	93	73	11	93	
19-Nov	13	23	10	15	18	10	11	11	20	10	10	11	10	11	11	10	11	17	12	11	11	11	11	11	23	
20-Nov	11	11	12	11	9	7	10	9	9	9	9	10	11	20	9	10	10	8	8	8	7	8	7	9	20	
21-Nov	12	8	10	8	8	7	8	7	6	8	10	26	19	13	12	6	6	6	8	19	8	10	10	9	26	
22-Nov	8	9	9	13	8	12	22	19	47	20	38	16	15	11	14	11	10	9	10	11	10	9	8	8	47	
23-Nov	8	8	8	8	8	9	9	8	8	8	8	9	8	9	10	7	7	9	8	9	7	7	6	6	10	
24-Nov	9	6	7	5	5	4	6	7	7	9	8	16	8	10	10	12	21	9	9	9	6	10	9	12	21	
25-Nov	9	9	9	8	8	9	8	11	9	9	9	9	12	11	13	14	9	5	5	7	7	7	9	9	14	
26-Nov	6	8	8	7	6	7	14	10	8	11	9	19	22	36	21	32	38	25	42	55	7	33	36	38	55	
27-Nov	42	15	9	13	10	11	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	8	7	19	11	6	42	
28-Nov	10	13	9	6	7	5	11	16	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	25	11	8	7	9	18	25
29-Nov	10	14	15	21	8	7	8	17	36	8	12	29	15	8	10	10	12	13	17	13	17	9	10	10	36	
30-Nov	8	7	11	16	8	7	7	7	8	8	7	11	9	8	10	7	8	8	9	7	7	8	9	9	16	
	42	23	73	26	27	28	31	43	47	21	38	79	73	36	25	96	38	25	42	55	40	93	73	43		

Diurnal Maximum

AF - Analyzer Failure





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 75 m (WD75m) - deg

Mannix - November 2016

Direction of Maximum Speed: 249 deg on Nov 15 00:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 256.1 deg on Nov 15	Hours of Data: 643
Direction of Minimum Speed: 20 deg on Nov 9 00:00	Hours of Missing Data: 77
Direction of Minimum Daily Speed Average: 2.5 deg on Nov 21	Percent Operational Time: 89.3
Monthly Average Direction: 209.3 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-Nov	334	342	345	347	344	339	248	277	267	269	263	271	265	263	278	291	297	300	305	338	353	29	47	72	294.1	
2-Nov	119	145	167	139	131	145	153	148	145	140	142	140	145	155	143	150	147	148	159	165	176	172	167	170	152.9	
3-Nov	160	158	159	151	152	139	129	142	163	AF	AF	AF	153	172	194	176	181	178	197	198	229	232	214	197	179.0	
4-Nov	196	203	206	207	208	215	202	171	138	132	148	145	141	150	156	154	147	135	145	155	160	149	156	143	167.6	
5-Nov	135	130	127	137	130	136	136	142	146	154	158	154	172	148	149	155	175	162	168	158	215	245	217	252	157.4	
6-Nov	242	226	222	207	190	205	224	237	237	230	229	238	256	236	212	239	234	230	233	222	208	229	231	223	224.9	
7-Nov	231	241	239	228	220	216	217	202	183	198	163	145	161	157	152	157	163	137	136	137	137	140	147	141	165.6	
8-Nov	138	140	130	129	126	129	131	132	135	132	132	134	134	132	137	140	156	153	156	160	169	163	166	20	142.1	
9-Nov	155	156	164	170	157	175	162	149	176	241	255	256	256	254	259	251	253	252	261	262	262	258	246	250	236.3	
10-Nov	254	253	245	244	233	242	252	194	168	165	159	145	139	140	148	138	132	131	137	134	135	135	135	138	160.4	
11-Nov	139	139	140	133	140	145	155	162	166	166	160	160	147	189	200	220	222	232	243	248	253	245	244	245	185.6	
12-Nov	245	240	216	206	210	178	152	187	217	240	241	193	221	176	172	314	292	272	286	270	271	275	280	269	238.2	
13-Nov	268	262	261	255	248	229	201	227	222	148	146	145	150	167	150	161	169	180	178	183	186	167	159	161	186.7	
14-Nov	145	134	134	151	169	188	189	195	202	235	243	244	249	257	258	271	271	268	259	256	256	252	248	249	236.1	
15-Nov	257	258	256	251	248	246	249	250	257	246	245	245	253	255	246	242	225	244	260	273	288	302	299	318	256.1	
16-Nov	13	30	26	4	355	317	291	270	336	302	220	68	58	33	17	18	19	12	13	15	13	12	350	345	6.3	
17-Nov	340	343	340	334	333	338	331	305	277	269	249	257	257	269	273	290	285	290	308	305	305	314	303	280	302.1	
18-Nov	272	269	267	275	252	252	253	245	252	258	275	316	282	259	256	253	253	235	245	233	256	97	237	146	259.3	
19-Nov	138	125	93	102	94	91	71	83	106	88	87	92	91	85	81	70	84	104	113	117	110	116	117	113	97.9	
20-Nov	116	116	114	116	120	121	132	136	130	140	141	137	142	157	140	134	132	140	137	131	130	134	122	119	131.4	
21-Nov	127	131	133	132	132	137	141	149	154	162	170	195	277	304	296	286	292	297	307	6	16	16	18	15	106.0	
22-Nov	15	21	24	12	10	16	42	54	56	53	152	147	150	147	153	155	144	138	140	143	142	131	130	133	116.2	
23-Nov	138	133	134	134	133	138	141	140	141	137	140	134	133	140	136	132	135	137	145	152	159	162	165	163	141.0	
24-Nov	174	164	169	165	156	161	152	158	160	152	164	149	143	142	152	153	144	121	129	132	129	127	124	126	147.7	
25-Nov	127	122	121	124	122	126	130	136	135	141	135	135	132	133	143	183	219	234	249	255	247	243	239	245	159.7	
26-Nov	241	237	242	247	246	243	230	226	233	215	217	222	221	183	154	137	189	235	79	60	316	348	28	24	232.7	
27-Nov	25	56	43	13	2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	353	AF	AF	AF	AF	AF	AF	--	
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	148	151	159	152	158	158	155	153	153	150	153	162	157	160	154	153	--	

190.6	185.0	180.5	179.8	176.2	182.1	177.7	176.9	176.4	184.6	182.5	177.5	178.2	183.0	183.5	185.4	192.0	189.9	194.5	191.6	202.0	196.6	190.5	189.0
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 - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 91 deg on Nov 18 22:00			Hours of Data:	643
Minimum Value: 2 deg on Nov 4 06:00			Hours of Missing Data:	77
			Hours of Calibration:	0
			Percent Operational Time:	89.3
Percentiles: P ₁ = 3 P ₁₀ = 4 Q ₁ = 6 Median = 8 Q ₃ = 12 P ₉₀ = 18 P ₉₉ = 75				

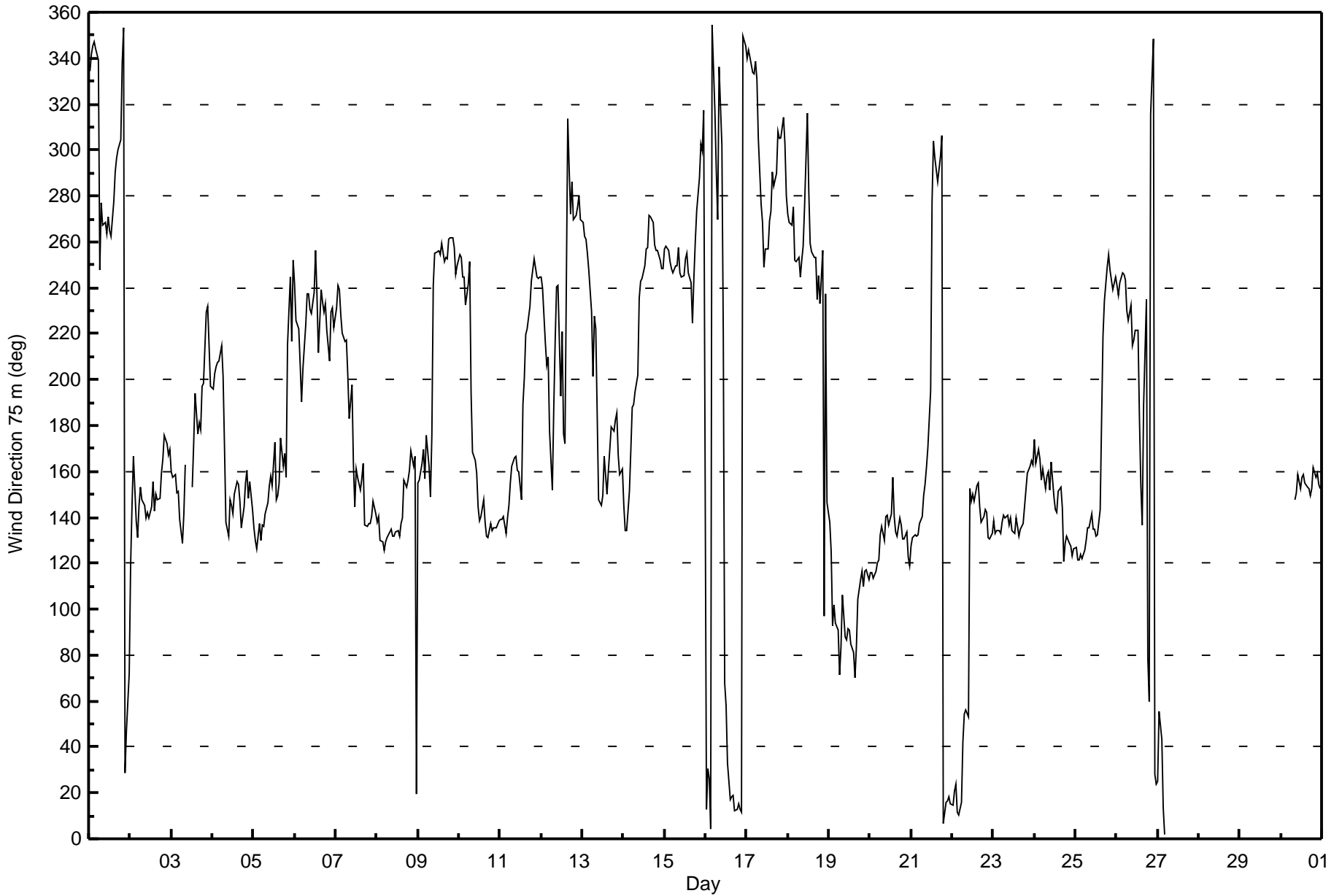
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	9	7	6	12	21	40	28	13	8	6	7	8	10	8	10	12	10	8	17	10	21	11	15	22	40
2-Nov	19	9	17	13	5	7	4	3	7	10	7	8	6	7	7	6	4	3	5	5	5	4	4	4	19
3-Nov	4	4	4	4	5	7	6	9	5	AF	AF	AF	12	16	10	5	5	7	8	11	7	8	6	14	16
4-Nov	7	8	5	4	3	2	10	19	7	4	7	5	3	13	10	5	7	4	4	6	4	6	5	4	19
5-Nov	7	5	7	10	7	9	6	7	8	5	5	5	15	9	5	4	16	4	8	18	34	17	15	5	34
6-Nov	8	4	7	8	7	10	10	3	10	9	14	24	25	11	13	18	19	7	3	18	53	21	26	10	53
7-Nov	8	6	11	14	11	5	9	13	7	10	15	8	10	8	8	10	11	4	4	3	3	6	4	4	15
8-Nov	3	5	6	5	8	5	5	4	6	4	5	5	4	6	4	11	3	3	4	3	5	6	18	84	84
9-Nov	8	3	8	8	10	33	30	21	39	13	5	7	6	6	7	5	4	5	6	4	4	5	5	5	39
10-Nov	5	4	83	4	12	3	2	58	11	8	14	13	7	6	8	9	5	5	5	5	5	4	6	6	83
11-Nov	6	5	5	5	3	7	5	3	4	5	7	5	4	20	10	6	7	9	6	6	5	5	3	6	20
12-Nov	5	6	17	5	5	26	14	15	10	4	15	17	21	30	20	77	26	5	6	6	5	5	5	3	77
13-Nov	3	3	3	4	5	11	14	9	22	10	4	6	8	11	7	3	10	3	4	10	8	4	3	3	22
14-Nov	9	6	8	9	6	13	7	9	13	8	8	8	8	7	7	6	7	7	7	7	6	5	5	6	13
15-Nov	10	7	9	6	6	6	6	9	7	5	6	6	9	8	7	9	5	6	4	6	8	5	4	19	19
16-Nov	15	6	13	4	12	14	11	16	24	32	43	91	24	16	6	7	8	6	6	7	6	8	8	7	91
17-Nov	8	6	6	7	6	10	8	20	9	18	11	8	7	9	14	8	8	9	9	11	9	9	18	6	20
18-Nov	4	5	10	15	15	12	12	13	10	11	10	28	30	12	11	13	19	14	18	27	24	91	78	12	91
19-Nov	11	19	15	17	17	13	12	13	19	13	12	14	13	12	12	8	12	17	15	13	14	13	13	13	19
20-Nov	13	13	14	13	12	11	9	8	9	8	7	9	9	19	10	9	9	7	7	8	7	6	10	12	19
21-Nov	13	8	8	7	7	6	6	6	6	7	8	24	19	10	8	5	6	5	8	18	7	8	8	7	24
22-Nov	7	8	7	12	8	12	14	15	35	23	40	14	15	10	14	10	9	8	9	10	9	8	8	7	40
23-Nov	8	7	7	7	7	7	8	7	7	6	7	8	7	8	8	7	7	7	7	8	6	7	6	6	8
24-Nov	6	6	6	4	5	4	5	8	6	7	7	14	7	9	10	10	16	12	9	9	6	11	11	13	16
25-Nov	9	11	10	10	10	10	8	10	8	8	8	8	11	11	12	13	10	7	4	6	5	6	8	7	13
26-Nov	5	6	6	6	5	5	13	9	8	11	8	18	21	35	18	28	38	81	33	48	9	18	23	27	81
27-Nov	57	9	13	10	3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	10	AF	AF	AF	AF	AF	AF	57
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	7	7	7	9	8	7	9	7	6	7	8	6	7	7	8	8	9
	57	19	83	17	21	40	30	58	39	32	43	91	30	35	20	77	38	81	33	48	53	91	78	84	
	Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

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

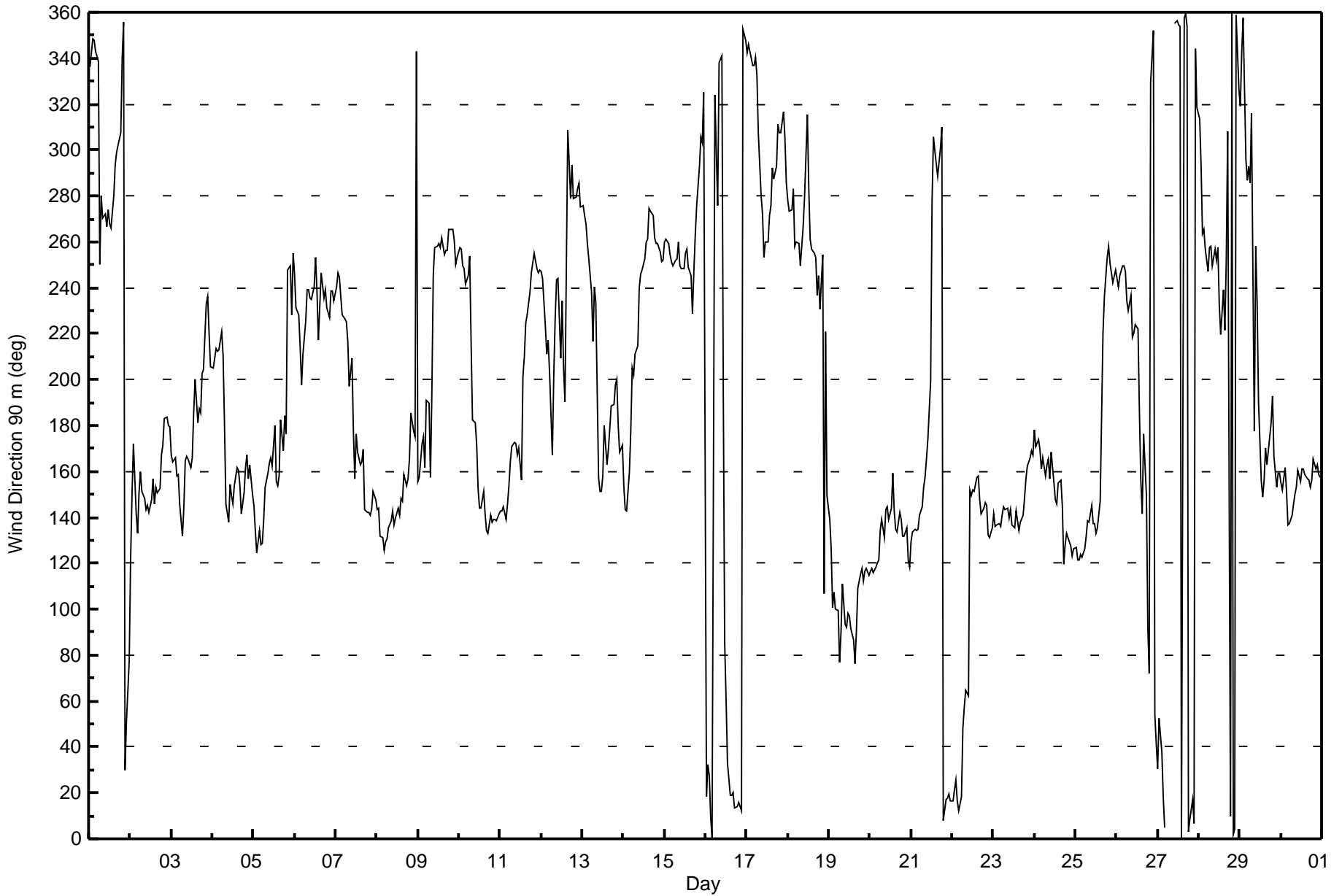




Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 90 m (WD90m) - deg
Mannix - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 82 deg on Nov 29 09:00		Hours in Service: 720 Hours of Data: 715 Hours of Missing Data: 5 Hours of Calibration: 0 Percent Operational Time: 99.3																							
Minimum Value: 2 deg on Nov 8 01:00 Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 7 Q ₃ = 11 P ₉₀ = 17 P ₉₉ = 64																									
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	8	7	6	10	23	40	27	13	7	6	7	8	10	7	9	11	9	8	17	10	20	11	16	24	40
2-Nov	18	8	18	14	4	7	3	2	6	10	7	8	6	6	7	6	4	4	4	5	5	4	5	5	18
3-Nov	4	4	3	4	5	6	6	8	5	5	5	6	10	13	9	6	6	7	7	10	7	8	6	13	13
4-Nov	7	8	5	3	2	3	8	21	7	3	6	5	3	12	8	5	6	3	4	5	3	5	4	2	21
5-Nov	4	7	4	7	7	7	9	8	8	3	5	4	14	11	5	4	14	5	11	24	21	12	11	5	24
6-Nov	7	4	7	8	6	9	9	3	7	8	12	19	9	12	14	18	5	3	13	44	17	15	8	44	
7-Nov	6	6	9	11	10	5	7	10	7	9	17	8	10	9	8	8	9	6	3	2	2	4	3	3	17
8-Nov	2	4	6	4	6	3	5	4	7	4	6	7	5	6	3	9	3	3	4	8	5	11	25	61	61
9-Nov	12	3	9	7	13	36	49	29	64	11	5	7	6	6	6	4	4	5	6	4	4	5	5	5	64
10-Nov	5	4	80	4	9	3	2	49	14	8	13	13	7	6	7	9	5	4	4	5	4	3	5	5	80
11-Nov	5	5	4	4	2	7	5	3	4	4	5	7	5	18	9	6	7	9	5	6	5	5	3	6	18
12-Nov	5	5	16	4	6	26	17	15	8	3	11	14	14	28	24	64	23	3	7	7	5	4	5	3	64
13-Nov	3	3	4	4	4	9	12	7	17	14	5	5	8	10	10	2	9	5	6	11	8	5	3	5	17
14-Nov	9	5	6	9	7	12	6	7	10	7	8	8	8	7	7	6	7	6	7	7	6	5	5	6	12
15-Nov	9	6	9	6	6	6	6	8	7	5	6	6	9	8	8	9	5	6	4	5	7	5	3	19	19
16-Nov	15	5	12	5	10	14	14	15	20	28	47	58	25	14	6	6	7	5	6	6	6	8	8	6	58
17-Nov	7	5	6	7	6	9	8	20	9	17	10	8	7	9	13	8	7	8	9	10	9	9	17	5	20
18-Nov	4	4	10	14	15	13	12	13	10	12	10	28	31	12	11	11	18	12	17	27	25	74	82	12	82
19-Nov	10	17	11	15	20	11	12	12	19	9	10	11	10	10	11	8	11	15	13	11	10	9	11	11	20
20-Nov	10	11	11	9	8	7	9	7	8	8	6	9	9	18	9	8	8	6	7	7	6	6	7	8	18
21-Nov	11	7	7	7	6	6	5	6	5	6	7	23	21	10	9	4	6	5	8	17	5	7	7	7	23
22-Nov	7	8	7	12	7	10	13	15	43	26	36	14	14	10	12	9	9	8	8	10	8	9	7	7	43
23-Nov	8	7	7	6	7	7	8	6	7	7	7	7	7	8	7	6	7	6	7	8	6	6	5	5	8
24-Nov	5	6	6	3	5	4	4	8	6	7	7	14	6	9	9	10	16	7	8	8	5	9	8	10	16
25-Nov	8	7	6	7	6	9	7	10	7	7	8	8	10	11	11	12	10	7	4	6	5	5	7	7	12
26-Nov	5	6	6	6	4	5	12	8	7	10	7	17	20	33	17	23	28	65	31	57	14	13	33	28	65
27-Nov	62	13	13	8	3	AF	AF	AF	AF	AF	12	8	8	9	8	8	5	12	11	5	8	11	11	7	62
28-Nov	8	18	6	5	7	6	11	21	17	15	17	14	17	14	11	14	13	22	14	8	6	4	8	17	22
29-Nov	11	11	20	21	10	15	7	38	82	13	12	18	11	7	6	13	10	11	16	13	15	8	9	8	82
30-Nov	7	7	9	14	6	5	6	6	6	7	7	9	7	6	8	7	6	7	8	6	7	6	8	7	14
	62	18	80	21	23	40	49	49	82	28	47	58	31	33	24	64	28	65	31	57	44	74	82	61	
	Diurnal Maximum																								
AF - Analyzer Failure																									





Maximum Value: 1.4 km/h on Nov 20 03:00 Maximum Daily Average: 0.8 km/h on Nov 19																						Hours in Service: 720 Hours of Data: 717				
Minimum Value: -1.0 km/h on Nov 15 00:00 Minimum Daily Average: -0.5 km/h on Nov 15 Maximum Diurnal Average: 0.3 km/h at hour 9 Minimum Diurnal Average: 0.1 km/h at hour 6 Monthly Average: 0.18 km/h Percentiles: $P_1 = -0.8$ $P_{10} = -0.4$ $Q_1 = -0.1$ Median = 0.2 $Q_3 = 0.5$ $P_{90} = 0.7$ $P_{99} = 1.2$																						Hours of Missing Data: 3 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-Nov	-0.1	-0.2	0.0	-0.1	0.1	0.0	0.0	-0.6	-0.4	-0.4	-0.3	-0.3	-0.4	-0.2	-0.4	-0.1	-0.4	-0.3	-0.5	-0.2	0.0	0.3	0.5	0.6	-0.1	0.6
2-Nov	0.4	0.3	0.2	0.4	0.5	0.4	0.5	0.5	0.6	0.7	0.6	0.8	0.7	0.2	0.6	0.7	0.6	0.7	0.8	0.7	0.6	0.6	0.8	0.7	0.6	0.8
3-Nov	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.4	0.3	AF	AF	AF	0.5	0.5	0.1	0.2	0.1	0.7	0.0	0.0	-0.7	-0.8	-0.4	0.1	0.3	0.7
4-Nov	0.1	-0.2	-0.3	-0.4	-0.5	-0.8	-0.1	0.3	0.5	0.4	0.5	0.5	0.6	0.3	0.4	0.5	0.5	0.5	0.4	0.5	0.7	0.6	0.7	0.5	0.3	0.7
5-Nov	0.5	0.4	0.2	0.1	0.2	0.1	0.1	0.3	0.3	0.3	0.6	0.6	0.3	0.5	0.4	0.6	0.3	0.5	0.3	0.4	0.2	0.0	0.2	-0.2	0.3	0.6
6-Nov	-0.7	-0.7	-0.3	-0.1	-0.1	-0.4	-0.3	-0.4	0.0	-0.1	0.0	-0.1	0.5	-0.1	0.0	0.2	0.0	-0.2	-0.4	0.2	0.0	0.1	0.3	0.2	-0.1	0.5
7-Nov	0.2	0.2	0.2	0.2	0.0	0.0	0.2	0.3	0.2	0.2	0.5	0.5	0.4	0.5	0.6	0.6	0.5	0.6	0.5	0.5	0.4	0.5	0.5	0.6	0.4	0.6
8-Nov	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.3	0.5	0.5	0.4	0.2	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.3	0.2	0.4	0.6
9-Nov	0.2	0.5	0.4	0.3	0.4	0.0	0.2	0.3	0.2	-0.2	-0.4	-0.5	-0.6	-0.4	-0.2	-0.5	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4	-0.7	-0.7	-0.2	0.5
10-Nov	-0.4	-0.5	0.1	-0.3	0.1	-0.7	-0.5	0.2	0.3	0.3	0.5	0.5	0.7	0.8	0.5	0.5	0.8	1.0	0.7	0.7	0.8	0.7	0.8	0.9	0.4	1.0
11-Nov	0.8	0.7	0.5	0.5	0.4	0.4	0.5	0.6	0.7	0.6	0.5	0.7	0.7	0.5	-0.1	-0.5	-0.6	-0.4	-0.5	-0.5	-0.4	-0.5	-0.4	-0.4	0.2	0.8
12-Nov	-0.4	-0.1	0.1	-0.2	0.1	0.4	0.7	0.3	0.1	-0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.3	0.0	-0.1	0.0	0.7
13-Nov	-0.4	-0.3	-0.1	0.0	-0.2	0.0	0.2	0.1	0.2	0.6	0.5	0.6	0.5	0.4	0.6	0.6	0.5	0.5	0.3	0.3	0.3	0.4	0.6	0.6	0.3	0.6
14-Nov	0.5	0.4	0.4	0.5	0.5	0.3	0.2	0.0	0.3	-0.3	-0.5	-0.6	-0.6	-0.5	-0.4	-0.5	-0.4	-0.4	-0.4	-0.8	-0.9	-1.0	-0.9	-1.0	-0.2	0.5
15-Nov	-0.6	-0.6	-0.4	-0.9	-0.8	-1.0	-0.8	-0.5	-0.6	-0.9	-0.7	-0.8	-0.6	-0.3	-0.4	-0.3	-0.4	-0.3	-0.2	-0.2	-0.4	-0.2	-0.1	0.0	-0.5	0.0
16-Nov	0.1	-0.1	0.1	-0.1	0.0	-0.2	-0.2	0.0	0.0	-0.1	-0.2	0.0	0.2	0.3	-0.1	0.2	0.5	0.0	0.0	0.4	0.3	0.1	-0.2	-0.3	0.0	0.5
17-Nov	-0.3	-0.5	-0.3	-0.5	-0.5	-0.3	-0.1	-0.1	-0.1	-0.4	-0.3	-0.4	-0.2	-0.2	-0.5	-0.5	-0.6	-0.5	-0.6	-0.3	-0.4	-0.2	-0.3	-0.1	-0.3	-0.1
18-Nov	-0.4	-0.2	-0.3	-0.1	0.0	-0.2	-0.2	-0.2	-0.2	-0.1	0.1	0.0	-0.1	-0.3	-0.2	-0.1	0.1	0.0	0.0	-0.1	0.1	0.2	0.1	0.2	-0.1	0.2
19-Nov	0.4	0.6	0.8	0.8	0.8	0.7	0.5	0.6	0.7	0.9	0.8	0.6	0.8	0.5	0.8	0.9	0.8	0.9	1.2	1.0	1.2	1.2	1.2	1.1	0.8	1.2
20-Nov	1.2	1.2	1.4	1.0	0.6	0.5	0.5	0.5	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.6	0.5	0.4	0.6	0.5	0.4	0.4	0.6	0.6	1.4
21-Nov	0.5	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.4	0.2	0.3	0.0	0.1	0.0	0.0	-0.2	-0.2	0.0	-0.1	0.0	0.3	0.3	0.2	0.1	0.3	0.7
22-Nov	0.0	0.3	0.3	0.0	0.0	0.2	0.1	0.3	0.6	0.5	0.3	0.2	0.3	0.3	0.4	0.2	0.6	0.6	0.4	0.6	0.5	0.6	0.7	0.8	0.4	0.8
23-Nov	0.6	0.8	0.8	0.7	0.9	0.7	0.8	0.8	1.0	0.9	0.8	0.8	0.9	0.8	0.8	0.7	0.5	0.7	0.7	0.5	0.4	0.3	0.3	0.5	0.7	1.0
24-Nov	0.1	0.6	0.1	0.3	0.5	0.5	0.6	0.5	0.4	0.6	0.3	0.4	0.5	0.6	0.2	0.2	0.6	0.4	0.4	0.7	0.8	0.7	0.7	0.7	0.5	0.8
25-Nov	0.7	1.0	0.9	1.0	0.7	0.6	0.7	0.7	0.7	0.6	0.4	0.5	0.5	0.4	0.1	0.0	-0.1	-0.2	-0.2	-0.2	-0.5	-0.5	-0.4	-0.5	0.3	1.0
26-Nov	-0.8	-0.5	-0.4	-0.5	-0.5	-0.5	-0.2	-0.3	-0.2	-0.3	-0.5	-0.1	-0.1	0.2	0.1	0.1	0.0	0.0	0.1	0.0	-0.2	-0.1	0.0	0.0	-0.2	0.2
27-Nov	0.0	0.2	0.1	-0.1	0.0	0.0	0.0	-0.2	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.0	-0.2	0.0	0.2
28-Nov	-0.1	0.0	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	0.0	-0.1	0.1
29-Nov	0.0	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.2	0.1	0.6	0.3	0.2	0.3	0.1	0.2	-0.2	0.3	0.7	0.6	0.6	0.2	0.7
30-Nov	0.6	0.7	0.4	0.6	0.6	0.6	0.8	0.8	0.9	0.9	0.2	0.5	0.4	0.3	0.5	0.5	0.6	0.7	0.7	0.3	0.7	0.6	0.6	0.7	0.6	0.9
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.8 km/h on Nov 15 00:00 Minimum Value: 0.1 km/h on Nov 26 23:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.5 Q ₁ = 0.8 Median = 1.2 Q ₃ = 1.6 P ₉₀ = 2.1 P ₉₉ = 3.1																								Hours in Service: 720 Hours of Data: 717 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-Nov	1.8	1.4	1.1	0.8	0.7	0.8	0.9	1.9	1.8	1.9	1.8	1.9	1.7	1.9	1.8	1.8	1.8	1.9	1.7	1.6	1.3	1.1	1.1	1.0	1.9
2-Nov	0.9	0.6	0.6	0.6	0.6	0.8	1.0	1.3	1.8	1.7	1.8	1.8	1.7	1.5	1.7	1.7	1.4	1.4	1.3	1.2	1.1	0.9	1.0	1.0	1.8
3-Nov	1.2	1.3	1.4	1.6	1.4	1.4	1.5	1.3	1.1	AF	AF	AF	1.3	1.1	1.5	1.3	1.2	0.9	1.6	1.4	2.8	2.2	2.0	1.1	2.8
4-Nov	0.9	1.4	1.3	1.6	1.7	1.4	1.0	1.1	1.1	1.1	1.2	1.6	1.6	1.6	1.0	0.7	0.5	0.9	0.7	1.2	0.9	1.0	0.8	1.3	1.7
5-Nov	1.0	0.7	0.6	0.3	0.4	0.3	0.5	1.0	0.8	0.9	1.4	1.5	1.0	1.0	0.7	1.2	0.9	0.8	0.7	0.9	0.5	0.6	0.5	0.3	1.5
6-Nov	1.1	1.6	1.4	0.8	1.2	1.4	0.8	1.0	0.5	0.6	0.6	0.8	0.9	0.7	0.3	0.2	0.3	0.5	0.9	0.5	0.8	0.7	0.5	0.5	1.6
7-Nov	0.4	0.5	0.5	0.7	0.6	0.4	0.5	0.5	0.7	0.8	1.0	1.0	0.9	1.0	0.9	0.9	0.7	0.8	0.9	1.0	1.1	1.3	1.2	1.6	1.6
8-Nov	1.7	1.0	0.9	0.8	0.6	1.1	1.3	1.1	0.9	1.1	0.9	0.8	1.3	1.0	1.0	1.0	0.8	0.9	0.7	1.0	1.1	0.8	0.6	0.5	1.7
9-Nov	0.5	0.9	0.9	0.8	0.9	0.5	0.4	0.7	0.8	0.7	1.3	1.8	2.4	1.7	1.4	1.5	1.9	2.3	1.7	1.3	1.4	1.3	1.5	1.7	2.4
10-Nov	1.5	1.4	0.7	0.4	0.4	0.9	1.1	0.6	0.7	0.9	1.1	1.0	1.4	1.9	1.2	1.2	1.5	2.3	2.0	1.8	1.9	2.3	2.5	2.6	2.6
11-Nov	2.2	2.2	1.4	1.2	1.0	0.9	0.5	0.6	0.9	1.2	1.2	1.4	1.6	1.4	1.4	1.2	1.4	1.3	1.7	1.8	1.4	1.2	0.9	0.7	2.2
12-Nov	0.8	0.5	0.7	1.0	0.4	0.7	0.9	0.6	0.5	0.4	0.4	0.9	0.5	0.7	0.6	0.4	0.3	0.3	0.3	0.4	0.4	0.7	0.5	0.3	1.0
13-Nov	0.6	0.7	0.4	0.3	0.4	0.6	0.4	0.4	0.6	1.2	1.5	1.6	1.3	1.0	1.1	1.0	0.7	0.5	0.6	0.5	0.7	0.6	1.1	1.2	1.6
14-Nov	1.2	0.7	0.8	0.8	0.8	0.9	0.9	1.0	0.9	1.5	1.8	2.6	2.3	1.9	2.0	2.0	1.7	1.6	1.8	2.7	3.1	3.5	3.7	3.8	3.8
15-Nov	2.6	2.5	2.5	3.2	3.3	3.4	3.1	2.4	1.8	2.8	2.7	2.6	1.9	1.4	1.8	1.2	0.8	0.9	0.6	0.8	0.7	0.3	0.6	0.4	3.4
16-Nov	0.3	0.4	0.5	0.4	0.2	0.4	0.7	0.4	0.2	0.4	0.6	0.7	1.0	1.2	1.7	1.8	1.9	2.1	2.4	2.2	2.2	2.1	2.0	2.3	2.4
17-Nov	2.2	2.6	2.5	1.8	1.9	1.8	1.6	1.5	1.4	1.6	1.4	1.5	1.6	1.5	1.8	2.3	2.4	2.5	2.4	1.8	1.5	1.5	1.2	0.7	2.6
18-Nov	1.0	1.2	1.0	0.7	0.9	0.8	0.9	0.8	0.9	0.9	1.0	1.2	1.0	1.1	0.9	0.9	0.8	0.7	0.6	0.5	0.5	0.6	0.5	0.8	1.2
19-Nov	0.8	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.5	1.5	1.5	1.5	1.3	1.4	1.4	1.5	1.7	2.0	2.1	2.1	2.2	2.5	2.4	2.5
20-Nov	2.3	1.9	1.9	1.9	1.8	1.6	1.5	1.8	1.8	1.7	1.8	1.6	1.5	1.4	1.1	1.1	1.3	1.2	1.4	1.6	1.6	1.4	1.8	2.1	2.3
21-Nov	1.7	1.9	1.7	1.7	1.7	1.4	1.4	1.3	1.1	1.0	0.9	0.9	0.7	0.7	0.7	0.9	1.0	1.1	1.2	1.5	1.9	1.7	1.8	1.8	1.9
22-Nov	1.4	1.5	1.4	0.8	0.8	0.7	0.7	0.8	0.9	0.8	0.7	1.0	1.0	1.1	1.2	1.2	1.3	1.6	1.6	1.7	1.4	1.6	2.0	2.3	2.3
23-Nov	2.0	2.2	2.2	2.3	2.6	2.4	2.1	2.2	2.1	2.3	2.6	2.8	2.6	2.5	2.2	2.1	1.8	1.9	1.5	1.6	1.8	1.5	1.3	1.2	2.8
24-Nov	1.0	1.1	1.1	1.0	1.1	1.0	1.3	1.2	1.2	1.4	1.4	1.2	1.4	1.2	1.1	0.9	0.8	1.3	1.7	1.1	1.7	2.6	2.3	2.7	2.7
25-Nov	2.1	2.8	2.8	2.8	2.5	2.4	2.3	2.1	2.1	1.5	1.4	1.3	1.3	0.9	0.6	0.4	0.4	0.6	0.8	1.2	1.3	1.5	1.6	1.8	2.8
26-Nov	1.8	1.6	1.6	1.7	1.6	1.5	1.0	1.4	1.1	1.3	1.6	1.3	1.1	1.1	1.1	0.5	0.3	0.2	0.3	0.2	0.4	0.3	0.1	0.2	1.8
27-Nov	0.2	0.4	0.3	0.5	0.8	1.0	1.2	1.4	0.9	1.1	1.0	1.4	1.4	1.2	0.9	1.1	1.5	1.1	1.5	1.5	1.2	0.8	0.6	0.8	1.5
28-Nov	0.6	0.5	0.7	0.6	0.7	0.7	0.6	0.6	0.9	0.6	0.6	0.6	0.7	0.6	0.5	0.3	0.3	0.3	0.6	0.8	1.0	1.3	0.9	0.6	1.3
29-Nov	0.6	1.2	0.8	0.7	0.5	0.5	0.6	0.5	0.4	0.4	0.4	0.7	1.1	1.1	0.9	0.8	1.3	1.4	1.6	1.4	1.3	1.7	1.3	1.3	1.7
30-Nov	1.4	1.3	1.7	1.6	1.5	1.6	1.7	1.8	1.7	1.6	1.6	1.7	2.0	1.7	1.6	1.3	1.2	1.4	1.5	1.7	1.5	1.7	1.4	1.4	2.0
Diurnal Maximum																									
AF - Analyzer Failure																									



Maximum Value: 2.0 km/h on Nov 20 03:00 Minimum Value: -1.5 km/h on Nov 17 03:00 Maximum Diurnal Average: 0.6 km/h at hour 9 Monthly Average: 0.40 km/h																								Hours in Service: 720 Hours of Data: 694 Hours of Missing Data: 26 Hours of Calibration: 0 Percent Operational Time: 96.4																									
Maximum Daily Average: 1.3 km/h on Nov 23 Minimum Daily Average: -0.7 km/h on Nov 17 Minimum Diurnal Average: 0.3 km/h at hour 21 Percentiles: P ₁ = -1.1 P ₁₀ = -0.5 Q ₁ = -0.2 Median = 0.4 Q ₃ = 1.0 P ₉₀ = 1.3 P ₉₉ = 1.6																																																	
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-Nov	-0.8	-0.8	-0.5	-0.3	0.0	-0.2	0.0	-0.8	-0.4	-0.3	-0.5	-0.2	-0.5	0.0	-0.5	0.0	-0.8	-0.7	-0.9	-0.7	-0.1	0.1	0.3	0.7	-0.3	0.7																							
2-Nov	0.5	0.4	0.5	0.6	0.7	0.9	0.9	1.0	1.4	1.4	1.1	1.7	1.1	0.9	1.0	1.1	1.4	1.4	1.6	1.5	1.0	1.4	1.6	1.5	1.1	1.7																							
3-Nov	1.5	1.4	1.4	1.4	1.2	1.1	1.0	0.9	0.7	AF	AF	AF	1.0	0.9	0.6	0.9	0.9	1.1	0.3	0.4	-0.5	-0.4	-0.2	0.5	0.8	1.5																							
4-Nov	0.4	0.1	0.0	-0.2	-0.2	-0.4	0.3	1.0	1.0	0.9	1.0	1.0	1.4	0.9	0.8	0.9	1.1	1.4	1.3	1.5	1.4	1.4	1.4	1.7	0.8	1.7																							
5-Nov	1.3	1.3	1.1	0.5	0.8	0.4	0.8	1.2	1.0	0.9	1.4	1.3	0.6	1.1	1.0	1.4	0.9	1.4	1.1	1.1	0.5	0.0	0.2	-0.5	0.9	1.4																							
6-Nov	-0.6	-0.5	-0.1	0.1	0.4	-0.1	-0.3	-0.5	-0.1	0.0	-0.1	-0.1	0.5	-0.1	0.1	0.1	0.0	-0.1	-0.3	0.2	0.2	0.1	0.4	0.2	0.0	0.5																							
7-Nov	0.1	0.1	0.1	0.4	0.2	0.1	0.1	0.6	0.6	0.4	0.7	0.9	0.8	0.7	0.8	1.1	0.9	1.2	1.3	1.1	1.1	1.2	1.3	1.3	0.7	1.3																							
8-Nov	1.2	1.0	1.2	1.1	1.0	1.2	1.1	0.8	1.0	1.4	0.9	0.9	1.0	0.8	0.9	1.1	1.1	1.2	1.0	1.5	1.4	1.5	1.0	0.3	1.1	1.5																							
9-Nov	0.8	1.4	1.2	0.9	1.4	0.5	0.4	1.0	0.4	-0.4	-0.5	-0.5	-0.6	-0.5	-0.4	-0.6	-0.6	-0.5	-0.5	-0.7	-0.9	-0.7	-0.7	-0.7	0.0	1.4																							
10-Nov	-0.5	-0.4	0.1	-0.2	0.0	-0.5	-0.5	0.3	0.8	0.7	0.7	0.7	1.2	1.3	1.0	1.0	1.2	1.7	1.6	1.3	1.4	1.5	1.6	1.8	0.7	1.8																							
11-Nov	1.4	1.6	1.2	1.1	1.1	1.0	1.1	1.2	1.4	1.2	1.2	1.3	1.4	1.0	0.4	-0.3	-0.3	-0.3	-0.5	-0.5	-0.6	-0.6	-0.6	-0.6	0.6	1.6																							
12-Nov	-0.6	-0.2	0.2	0.0	0.1	0.9	1.6	0.6	0.1	-0.4	0.0	0.6	0.2	0.5	0.4	0.1	-0.2	0.0	-0.3	-0.3	-0.5	-0.3	-0.2	-0.4	0.1	1.6																							
13-Nov	-0.5	-0.4	-0.3	-0.1	-0.1	0.1	0.3	0.1	0.3	1.2	1.1	1.3	1.1	0.7	1.1	1.4	1.1	1.1	0.9	0.9	0.8	1.2	1.6	1.8	0.7	1.8																							
14-Nov	1.5	0.8	1.1	1.2	1.4	0.7	0.8	0.5	0.6	-0.3	-0.4	-0.4	-0.6	-0.5	-0.6	-0.8	-0.4	-0.4	-0.4	-0.7	-1.0	-0.9	-1.1	-1.0	0.0	1.5																							
15-Nov	-0.6	-0.4	-0.6	-0.6	-0.8	-0.7	-0.6	-0.4	-0.5	-0.7	-0.6	-0.6	-0.6	-0.2	-0.4	-0.3	-0.3	-0.4	-0.5	-0.5	-0.8	-0.8	-0.5	-0.3	-0.5	-0.2																							
16-Nov	-0.2	-0.2	0.0	-0.3	-0.3	-0.1	-0.2	-0.2	0.0	-0.1	-0.1	0.1	0.0	0.2	-0.6	-0.4	-0.2	-0.7	-0.6	-0.2	-0.4	-0.7	-0.8	-1.3	-0.3	0.2																							
17-Nov	-1.1	-1.4	-1.5	-1.0	-1.3	-0.9	-0.6	-0.3	-0.1	-0.5	-0.2	-0.4	-0.1	-0.2	-0.6	-0.8	-0.9	-0.9	-1.2	-0.7	-0.8	-0.8	-0.8	-0.3	-0.7	-0.1																							
18-Nov	-0.4	-0.3	-0.2	-0.1	0.1	-0.2	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	0.1	-0.2	-0.1	-0.1	0.3	0.0	0.2	0.0	0.1	0.4	0.2	0.3	0.0	0.4																							
19-Nov	0.5	0.9	0.7	1.0	0.9	0.5	0.2	0.2	1.2	0.5	0.4	0.4	0.4	0.2	0.5	0.7	0.6	0.9	1.9	1.6	1.3	1.4	1.4	1.6	0.8	1.9																							
20-Nov	1.3	1.8	2.0	1.3	0.6	0.4	0.9	0.9	1.0	1.2	1.0	0.7	0.7	0.9	0.4	0.4	0.9	0.8	0.7	0.9	0.8	0.7	0.4	0.6	0.9	2.0																							
21-Nov	0.7	0.8	1.0	0.8	0.9	1.0	1.0	0.9	0.8	0.7	0.5	0.1	0.2	0.0	-0.1	-0.4	-0.4	-0.3	-0.5	-0.5	-0.2	-0.3	-0.4	-0.6	0.2	1.0																							
22-Nov	-0.5	-0.2	-0.1	-0.2	-0.4	0.1	-0.2	-0.1	0.6	0.6	0.3	0.4	0.7	0.5	0.5	0.9	1.0	1.2	0.9	1.3	1.0	0.9	1.0	1.4	0.5	1.4																							
23-Nov	1.2	1.1	1.3	1.3	1.3	1.5	1.7	1.5	1.6	1.4	1.5	1.3	1.5	1.6	1.4	1.1	1.0	1.1	1.4	1.2	1.1	1.0	0.8	1.0	1.3	1.7																							
24-Nov	0.5	1.2	0.7	0.8	1.1	1.0	1.1	1.0	0.9	1.2	0.8	0.9	0.8	0.9	0.6	0.7	0.6	0.7	0.7	0.9	1.0	1.3	0.8	1.2	0.9	1.3																							
25-Nov	0.7	1.3	1.1	1.1	0.8	0.8	1.0	1.1	1.3	1.0	0.7	0.9	0.6	0.4	0.1	0.1	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4	-0.2	-0.4	0.4	1.3																							
26-Nov	-0.6	-0.4	-0.3	-0.4	-0.4	-0.4	-0.2	-0.2	-0.1	0.0	-0.1	0.3	0.2	0.4	0.3	0.3	0.2	0.0	0.2	0.1	-0.3	-0.2	-0.1	0.0	-0.1	0.4																							
27-Nov	0.0	0.2	0.1	-0.2	-0.2	-0.2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	-0.7	-0.5	-0.1	-0.2	-0.2	--	0.2																						
28-Nov	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	-0.2	-0.4	-0.6	-0.6	-0.7	-0.1	--	-0.1																						
29-Nov	-0.1	-0.2	-0.2	-0.1	0.0	-0.2	-0.3	-0.3	0.0	-0.1	-0.1	0.4	0.6	0.9	0.7	0.6	0.6	0.7	0.7	0.4	0.6	1.2	1.1	1.0	0.3	1.2																							
30-Nov	1.1	1.2	1.0	1.1	0.9	0.9	1.0	1.4	1.3	1.5	0.9	1.2	1.4	1.1	1.0	0.9	0.9	1.2	1.3	1.0	1.3	1.4	1.1	1.3	1.1	1.5																							
																								0.3	1.5	0.4	1.8	0.4	2.0	0.3	1.4	0.4	1.4	0.3	1.5	0.3	1.5	0.4	1.5	0.4	1.7	0.3	1.4	0.3	1.5	0.3	1.6	0.4	1.8
																								Diurnal Average																								Diurnal Maximum	

AF - Analyzer Failure



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 3.9 km/h on Nov 15 00:00			Hours of Data:	694
Minimum Value: 0.2 km/h on Nov 26 18:00			Hours of Missing Data:	26
Percentiles: P ₁ = 0.2 P ₁₀ = 0.5 Q ₁ = 0.7 Median = 1.2 Q ₃ = 1.8 P ₉₀ = 2.4 P ₉₉ = 3.2			Hours of Calibration:	0
			Percent Operational Time:	96.4

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-Nov	2.0	1.4	1.2	0.9	0.8	0.8	1.1	2.0	2.1	2.1	1.8	2.0	2.0	2.1	2.1	2.0	2.0	2.0	1.8	1.5	1.5	1.4	1.2	2.1		
2-Nov	1.3	0.7	0.5	0.7	0.7	0.8	1.1	1.2	2.0	2.0	2.1	2.3	1.9	1.5	1.8	1.8	1.5	1.3	1.2	1.1	0.9	0.6	0.8	0.6	2.3	
3-Nov	1.0	1.2	1.3	1.4	1.2	1.5	1.4	1.2	1.0	AF	AF	AF	1.2	1.2	1.5	1.1	1.1	1.2	1.8	1.5	2.9	2.2	1.9	1.2	2.9	
4-Nov	1.1	0.9	0.9	1.2	1.1	0.6	0.7	0.9	1.1	1.0	1.1	1.4	1.5	1.4	0.9	0.5	0.4	0.7	0.7	1.2	0.8	0.9	0.6	0.9	1.5	
5-Nov	0.8	0.6	0.5	0.4	0.6	0.4	0.4	0.7	0.6	0.6	1.2	1.3	1.1	0.9	0.7	0.9	0.8	0.7	0.8	1.2	1.0	1.0	0.6	0.5	1.3	
6-Nov	0.6	1.0	1.1	0.8	0.8	0.9	0.8	0.8	0.9	0.7	0.7	0.9	1.2	0.9	0.4	0.4	0.4	0.4	0.5	0.8	1.4	1.1	0.8	0.6	1.4	
7-Nov	0.6	0.7	0.9	1.1	1.0	0.5	0.7	0.6	0.6	0.6	0.8	1.1	0.8	0.8	0.9	0.7	0.5	0.7	0.6	0.8	0.9	1.0	1.2	1.4	1.4	
8-Nov	1.4	0.8	0.7	0.6	0.7	1.2	1.2	1.0	0.7	0.8	0.9	0.5	1.2	1.0	0.8	0.7	0.6	0.7	0.7	0.7	0.6	0.5	0.8	0.6	1.4	
9-Nov	0.4	0.7	1.0	0.8	1.0	0.8	0.7	1.2	1.2	0.6	1.4	2.0	2.2	1.8	1.6	1.3	1.7	2.0	1.8	1.5	1.6	1.5	1.1	1.5	2.2	
10-Nov	1.4	1.2	1.1	0.4	0.6	0.6	0.7	0.9	0.7	0.8	1.1	1.1	1.6	2.0	1.2	1.1	1.5	2.3	2.1	1.8	1.9	2.3	2.5	2.8	2.8	
11-Nov	2.4	2.3	1.5	1.1	0.8	0.9	0.5	0.5	0.7	1.1	1.1	1.1	1.3	1.4	1.2	1.1	1.1	1.7	1.8	1.8	1.5	0.9	1.0	0.8	2.4	
12-Nov	1.0	0.8	1.0	0.8	0.4	0.7	0.6	0.5	0.5	0.4	0.4	0.9	0.5	0.6	0.6	0.6	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.6	1.0	
13-Nov	0.3	0.5	0.3	0.3	0.3	0.7	0.5	0.7	0.7	1.1	1.3	1.5	1.2	0.9	1.1	0.7	0.6	0.3	0.4	0.6	0.6	0.6	1.0	0.9	1.5	
14-Nov	0.9	0.7	0.9	0.5	0.6	0.9	0.7	0.8	1.0	1.7	2.1	2.9	2.7	2.3	2.2	2.2	1.9	1.7	2.0	3.1	3.2	3.6	3.7	3.9	3.9	
15-Nov	3.0	2.6	2.8	3.4	3.2	3.5	3.2	2.7	2.0	2.7	2.8	2.6	1.9	1.6	1.8	1.2	0.5	0.6	0.7	0.7	0.6	0.5	0.6	0.5	3.5	
16-Nov	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.2	0.3	0.5	0.8	1.2	1.6	1.8	2.0	2.1	2.1	2.4	2.5	2.3	2.1	2.2	2.5	2.5	
17-Nov	2.5	2.6	2.5	2.3	2.0	2.0	1.7	1.6	1.7	1.6	1.7	1.6	1.8	1.8	2.1	2.3	2.4	2.4	2.5	2.0	1.6	1.7	1.0	0.8	2.6	
18-Nov	0.6	1.4	0.9	0.8	0.9	0.8	0.9	0.9	0.9	1.0	1.2	1.5	1.2	1.3	1.2	1.2	0.9	0.8	0.7	0.6	0.7	0.9	0.7	0.9	1.5	
19-Nov	1.1	1.3	1.4	1.5	1.5	1.2	1.4	1.3	1.7	1.5	1.6	1.6	1.6	1.4	1.6	1.5	1.5	2.1	2.4	2.5	2.4	2.8	3.0	2.9	3.0	
20-Nov	2.7	2.4	2.4	2.3	2.1	1.8	1.8	2.0	2.1	2.0	2.1	1.7	2.0	1.9	1.4	1.6	1.6	1.3	1.6	1.7	1.7	1.5	2.0	2.5	2.7	
21-Nov	2.0	2.2	1.9	1.8	1.9	1.7	1.6	1.4	1.3	1.1	0.9	0.9	0.8	0.9	0.7	0.7	0.7	0.8	1.3	1.7	2.0	1.8	2.1	2.0	2.2	
22-Nov	1.5	1.8	1.5	0.8	0.9	0.9	0.9	1.0	1.1	1.1	0.9	1.1	1.3	1.2	1.5	1.4	1.5	1.9	1.8	2.0	1.8	1.8	2.4	2.7	2.7	
23-Nov	2.4	2.5	2.6	2.7	3.0	2.7	2.4	2.5	2.6	2.5	3.0	3.1	2.7	2.9	2.5	2.3	2.1	2.2	1.7	1.6	1.8	1.5	1.2	1.2	3.1	
24-Nov	0.8	0.9	1.0	0.9	1.0	0.9	1.2	1.2	1.0	1.4	1.2	1.2	1.5	1.5	1.2	0.9	0.6	1.4	1.8	1.2	1.7	2.8	2.5	3.0	3.0	
25-Nov	2.4	3.2	3.0	3.0	2.9	2.8	2.7	2.5	2.4	1.7	1.6	1.7	1.5	1.1	0.8	0.3	0.2	0.3	0.6	1.2	1.2	1.5	1.6	1.9	3.2	
26-Nov	1.8	1.6	1.8	1.8	1.6	1.6	1.1	1.3	1.2	1.4	1.6	1.5	1.3	1.3	1.4	0.6	0.5	0.2	0.4	0.2	0.2	0.3	0.2	0.2	1.8	
27-Nov	0.2	0.4	0.4	0.4	0.7	1.0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1.3	1.1	0.8	0.6	0.7	1.3	
28-Nov	0.6	0.4	0.4	0.4	0.6	0.5	0.6	0.4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.7	0.8	0.9	1.1	0.8	0.9	1.1
29-Nov	0.8	1.5	0.8	0.6	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.7	1.1	1.1	1.0	0.7	1.3	1.4	1.5	1.4	1.3	1.8	1.4	1.4	1.8	
30-Nov	1.5	1.6	1.6	1.6	1.8	1.7	1.9	2.1	2.1	1.9	1.5	1.7	2.0	1.7	1.7	1.3	1.4	1.8	1.6	1.6	1.5	1.8	1.5	1.5	2.1	
	3.0	3.2	3.0	3.4	3.2	3.5	3.2	2.7	2.6	2.7	3.0	3.1	2.7	2.9	2.5	2.3	2.4	2.4	2.5	3.1	3.2	3.6	3.7	3.9		
	Diurnal Maximum																									

AF - Analyzer Failure



Wood Buffalo Environmental Association

Summary of Hour Averages

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

Mannix - November 2016

Maximum Value: 1.5 km/h on Nov 19 19:00 Minimum Value: -0.9 km/h on Nov 17 03:00 Maximum Diurnal Average: 0.4 km/h at hour 14 Monthly Average: 0.23 km/h		Maximum Daily Average: 0.6 km/h on Nov 2 Minimum Daily Average: -0.1 km/h on Nov 16 Minimum Diurnal Average: 0.1 km/h at hour 6 Percentiles: $P_1 = -0.5$ $P_{10} = -0.2$ $Q_1 = 0.0$ Median = 0.2 $Q_3 = 0.4$ $P_{90} = 0.7$ $P_{99} = 1.2$		Hours in Service: 720 Hours of Data: 643 Hours of Missing Data: 77 Hours of Calibration: 0 Percent Operational Time: 89.3																							
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	-0.3	-0.4	-0.2	0.0	0.0	0.0	0.2	0.3	0.7	0.8	0.2	0.8	0.0	0.8	0.4	0.9	0.2	0.3	-0.1	-0.4	0.3	0.0	0.2	0.8	0.2	0.9	
2-Nov	0.3	0.0	0.3	0.1	0.1	0.4	0.7	0.7	0.7	0.7	0.3	0.7	0.5	0.7	0.4	0.6	0.8	0.9	1.1	0.9	0.6	0.5	0.7	0.7	0.6	1.1	
3-Nov	1.0	1.1	0.9	1.0	0.8	0.4	0.1	0.3	0.6	AF	AF	AF	0.6	0.7	0.3	0.5	0.5	0.6	0.1	0.2	-0.1	0.0	0.0	0.3	0.5	1.1	
4-Nov	-0.2	-0.3	-0.3	-0.3	-0.3	-0.4	0.1	0.5	0.3	0.1	0.6	0.4	0.5	0.4	0.5	0.6	0.6	0.1	0.6	1.1	1.0	0.9	1.0	0.7	0.3	1.1	
5-Nov	0.1	-0.1	-0.2	0.1	0.1	0.2	0.1	0.4	0.6	0.8	1.3	1.0	0.3	0.6	0.8	0.9	0.5	0.8	0.4	0.5	0.2	0.1	0.0	0.0	0.4	1.3	
6-Nov	0.0	-0.2	0.1	0.0	0.1	-0.3	-0.2	-0.2	0.0	0.2	0.0	0.1	1.0	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.1	0.2	0.1	0.1	1.0	
7-Nov	0.1	0.3	0.4	0.3	0.2	0.1	0.0	0.3	0.2	0.0	0.3	0.7	0.4	0.5	0.4	0.7	0.6	0.2	0.2	0.1	-0.1	0.3	0.8	0.3	0.3	0.8	
8-Nov	0.0	0.2	0.2	0.0	0.0	-0.1	-0.2	-0.1	0.1	-0.1	-0.2	0.0	0.0	0.1	0.3	1.2	1.3	1.1	1.2	0.5	0.7	0.7	0.1	0.3	1.3		
9-Nov	0.6	1.3	0.8	0.6	0.9	0.3	0.2	0.4	0.0	0.0	0.1	0.2	0.3	0.1	0.3	0.0	0.1	0.1	0.2	0.0	-0.2	-0.2	-0.3	-0.3	0.2	1.3	
10-Nov	0.0	0.2	0.3	0.0	0.1	-0.2	0.1	0.2	0.4	0.3	0.2	0.2	0.5	0.4	0.5	0.3	0.0	-0.1	0.1	0.1	0.1	-0.2	-0.1	0.2	0.1	0.5	
11-Nov	0.2	0.2	0.3	-0.1	0.1	0.4	0.8	0.9	0.6	0.7	0.8	0.8	0.8	0.4	0.1	-0.2	-0.2	-0.1	-0.1	0.0	0.0	-0.2	-0.3	-0.4	0.2	0.9	
12-Nov	-0.3	-0.1	0.4	-0.1	0.1	0.3	0.7	0.0	-0.1	-0.2	0.1	0.1	0.0	0.2	0.2	0.1	0.1	0.2	0.0	0.0	0.0	0.2	0.4	0.0	0.1	0.7	
13-Nov	0.0	0.3	0.2	0.3	0.1	0.1	0.1	0.0	0.1	0.6	0.6	0.5	0.6	0.4	0.8	0.8	0.5	0.6	0.5	0.3	0.1	0.5	1.2	1.2	0.4	1.2	
14-Nov	0.7	0.0	0.1	0.6	0.8	0.1	0.2	0.0	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.3	0.6	0.4	0.4	0.2	0.2	0.1	-0.2	-0.1	0.2	0.8	
15-Nov	0.1	0.4	0.2	0.2	0.0	0.2	0.4	0.2	0.0	-0.1	-0.1	-0.3	0.0	0.3	0.0	-0.1	-0.1	-0.1	0.1	0.3	0.1	0.0	0.3	0.3	0.1	0.4	
16-Nov	0.0	0.0	0.2	-0.1	-0.3	0.0	0.3	0.3	0.1	0.1	0.1	0.2	-0.1	0.2	-0.3	-0.2	0.1	-0.4	0.0	0.0	-0.2	-0.3	-0.3	-0.7	-0.1	0.3	
17-Nov	-0.5	-0.5	-0.9	-0.6	-0.9	-0.3	-0.2	0.3	0.5	0.0	0.1	-0.1	0.3	0.4	0.4	0.3	0.4	0.1	0.2	-0.1	-0.1	-0.1	0.1	0.1	0.0	0.5	
18-Nov	0.0	0.2	0.0	0.0	0.3	0.0	0.1	0.0	-0.1	-0.1	0.2	0.2	0.4	0.1	0.1	0.1	0.6	0.2	0.5	0.0	0.2	0.2	0.4	0.1	0.2	0.6	
19-Nov	0.0	0.8	0.3	0.9	0.8	0.3	0.0	-0.2	1.1	0.0	0.0	0.1	-0.1	-0.1	0.1	0.6	0.2	0.7	1.5	0.9	0.9	0.5	0.5	0.9	0.5	1.5	
20-Nov	0.5	1.1	1.5	0.6	-0.1	-0.6	0.0	-0.1	-0.1	0.3	0.1	0.0	0.1	0.7	-0.1	-0.2	0.1	0.2	0.0	0.1	-0.1	0.0	-0.7	-0.3	0.1	1.5	
21-Nov	-0.2	-0.2	0.0	-0.2	0.1	0.2	0.2	0.5	0.4	0.5	0.4	0.2	0.4	0.3	0.2	0.1	0.2	0.5	0.1	-0.1	0.1	0.0	-0.3	-0.5	0.1	0.5	
22-Nov	-0.2	-0.1	0.1	-0.1	-0.3	0.1	-0.2	-0.3	0.5	0.7	0.2	0.2	0.6	0.2	0.3	0.6	0.4	0.3	0.4	0.6	0.3	-0.1	-0.1	0.1	0.2	0.7	
23-Nov	0.3	0.0	0.0	0.2	-0.2	0.4	0.8	0.1	0.3	0.1	0.3	0.1	0.0	0.6	0.2	0.0	0.0	0.2	0.6	0.7	0.7	0.7	0.6	0.7	0.3	0.8	
24-Nov	0.1	0.7	0.4	0.4	0.7	0.7	0.6	0.6	0.8	0.5	0.5	0.2	0.3	0.3	0.4	0.2	-0.2	-0.2	0.0	-0.1	0.0	-0.3	0.0	0.3	0.3	0.8	
25-Nov	-0.3	0.0	-0.2	-0.4	-0.4	-0.4	-0.3	0.1	0.1	0.4	0.0	0.3	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.4	
26-Nov	-0.2	-0.2	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.2	0.0	0.6	0.3	0.5	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.6	
27-Nov	0.0	0.2	0.0	-0.1	-0.3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	-0.3	AF	AF	AF	AF	AF	AF	--	0.2	
28-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	--	--
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	--	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.7	1.2	1.0	0.8	1.1	0.7	0.6	0.5	0.7	0.4	0.8	0.7	0.9	1.0	0.6	0.7	--	1.2
																								Diurnal Average			
																								Diurnal Maximum			

AF - Analyzer Failure



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

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

Mannix - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 3.5 km/h on Nov 15 00:00			Hours of Data:	643
Minimum Value: 0.2 km/h on Nov 25 18:00			Hours of Missing Data:	77
			Hours of Calibration:	0
			Percent Operational Time:	89.3
Percentiles: P ₁ = 0.2 P ₁₀ = 0.5 Q ₁ = 0.7 Median = 1.2 Q ₃ = 1.8 P ₉₀ = 2.4 P ₉₉ = 3.3				

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	1.9	1.2	1.1	0.9	0.8	0.8	1.3	1.9	2.2	2.3	2.0	2.2	2.2	2.3	2.2	2.2	2.1	2.0	1.9	1.7	1.5	1.4	1.5	1.5	2.3
2-Nov	1.6	0.8	0.4	0.6	0.6	0.6	0.9	0.6	1.8	2.2	1.9	2.2	1.7	1.5	1.6	1.6	1.4	1.1	1.1	1.4	0.9	0.5	0.6	0.4	2.2
3-Nov	0.6	0.7	0.9	1.0	1.0	1.0	1.5	0.8	1.0	AF	AF	AF	0.9	1.0	1.6	1.0	1.4	1.3	2.0	1.7	3.0	2.2	1.7	1.5	3.0
4-Nov	1.2	0.9	0.8	1.0	0.9	0.5	0.4	0.6	1.0	0.8	0.8	0.9	1.0	1.0	0.7	0.4	0.4	0.6	0.7	1.1	0.7	0.7	0.4	0.6	1.2
5-Nov	1.0	1.3	1.3	0.7	1.2	0.6	0.7	0.6	0.6	0.5	0.8	0.7	0.8	0.5	0.5	0.5	0.7	0.7	0.9	1.5	1.0	1.2	0.7	0.7	1.5
6-Nov	0.7	0.9	0.9	0.8	0.7	0.8	0.9	0.9	1.1	1.0	0.8	1.1	1.5	0.8	0.5	0.5	0.4	0.5	0.5	1.0	1.8	1.3	0.9	0.6	1.8
7-Nov	1.0	1.0	1.2	1.2	1.1	0.6	0.8	0.6	0.6	0.4	0.6	0.8	0.6	0.7	0.7	0.5	0.4	0.4	0.4	0.5	0.6	1.0	1.1	0.7	1.2
8-Nov	0.7	0.8	1.1	1.0	1.4	1.5	1.2	0.9	0.8	0.8	1.0	0.7	1.0	1.1	0.6	1.0	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.6	1.5
9-Nov	0.5	0.5	0.6	0.8	0.6	1.1	0.9	1.1	1.7	0.6	1.5	2.2	2.2	1.7	1.8	1.2	1.8	1.8	1.9	1.7	1.8	1.7	1.1	1.8	2.2
10-Nov	1.6	1.3	1.5	0.6	0.8	0.7	0.7	1.0	0.5	0.5	0.9	0.9	1.3	1.7	1.0	1.1	1.5	2.3	1.7	1.6	1.5	1.7	2.2	2.4	2.4
11-Nov	2.0	2.0	1.3	0.9	0.6	0.8	0.5	0.4	0.6	1.0	1.0	0.7	0.8	1.4	1.4	1.4	1.3	2.1	1.8	1.9	1.7	1.0	1.0	1.0	2.1
12-Nov	1.1	1.1	0.9	0.9	0.5	0.5	0.4	0.7	0.6	0.4	0.4	0.8	0.5	0.6	0.6	0.7	0.5	0.5	0.3	0.3	0.3	0.3	0.5	0.6	1.1
13-Nov	0.3	0.4	0.3	0.5	0.3	0.8	0.7	0.6	0.7	0.7	0.8	1.0	0.9	0.7	0.6	0.4	0.5	0.6	0.6	0.9	0.6	0.6	0.7	0.6	1.0
14-Nov	0.8	0.8	1.2	0.8	0.8	0.7	0.5	1.1	1.2	1.9	2.3	2.9	2.8	2.4	2.3	2.3	2.1	2.1	2.2	3.4	3.4	3.4	3.2	3.5	3.5
15-Nov	3.2	2.9	3.2	3.1	2.9	3.2	3.0	2.9	2.2	2.2	2.3	2.4	2.1	1.6	1.8	1.3	0.7	0.6	0.6	0.9	0.4	0.5	0.7	0.6	3.2
16-Nov	0.7	0.5	0.6	0.5	0.6	0.4	0.6	0.5	0.2	0.2	0.4	0.8	1.1	1.8	1.6	1.6	1.7	1.8	2.2	2.4	2.1	2.0	2.1	2.2	2.4
17-Nov	2.3	2.2	2.2	2.1	1.7	1.9	1.5	1.7	1.7	1.5	1.7	1.7	1.9	1.9	2.0	2.5	2.3	2.5	2.4	2.0	1.8	1.7	1.0	0.8	2.5
18-Nov	0.4	1.0	0.9	0.8	0.9	0.7	0.8	0.8	0.8	0.9	1.1	1.5	1.4	1.5	1.4	1.4	1.1	0.9	0.8	0.6	0.8	1.0	0.9	1.0	1.5
19-Nov	1.0	1.7	2.0	2.1	2.1	1.8	1.6	1.9	2.1	2.2	2.2	2.3	2.4	1.9	1.9	1.7	2.1	2.6	3.0	2.9	3.2	3.2	3.3	3.4	3.4
20-Nov	3.1	2.8	2.8	2.6	2.4	1.9	1.7	2.0	2.2	2.0	2.0	1.9	2.0	1.9	1.4	1.5	1.7	1.4	1.6	1.7	1.7	1.5	2.2	2.7	3.1
21-Nov	2.1	2.3	2.0	1.8	1.8	1.6	1.5	1.3	1.1	1.0	0.9	0.9	0.8	0.9	0.7	0.7	0.7	0.8	1.3	1.5	1.8	1.9	1.9	1.8	2.3
22-Nov	1.4	1.6	1.4	0.9	0.9	1.0	0.9	1.0	1.3	1.2	1.0	1.2	1.4	1.1	1.6	1.5	1.4	1.9	1.8	2.1	1.8	1.9	2.4	2.6	2.6
23-Nov	2.4	2.4	2.5	2.6	2.9	2.8	2.5	2.4	2.5	2.4	2.7	3.1	2.7	2.8	2.4	2.4	2.0	2.1	1.6	1.4	1.7	1.5	1.2	1.1	3.1
24-Nov	0.6	0.9	1.0	0.8	0.9	0.8	1.0	1.0	0.9	1.1	1.2	1.1	1.4	1.4	1.1	0.7	0.8	1.9	2.0	1.3	1.8	2.7	2.7	3.1	3.1
25-Nov	2.4	3.2	3.2	3.1	2.8	2.9	2.8	2.5	2.4	1.8	1.6	1.7	1.6	1.2	0.7	0.4	0.3	0.2	0.5	1.1	1.0	1.4	1.5	1.8	3.2
26-Nov	1.6	1.6	1.6	1.5	1.5	1.4	1.1	1.3	1.2	1.4	1.5	1.5	1.5	1.4	1.5	0.8	0.4	0.2	0.7	0.2	0.2	0.4	0.2	0.3	1.6
27-Nov	0.5	0.4	0.3	0.3	0.4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1.2	AF	AF	AF	AF	AF	AF	1.2
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	2.1	1.9	1.4	1.8	2.0	1.7	1.8	1.4	1.5	1.7	1.6	1.6	1.5	1.7	1.5	1.4	2.1
Diurnal Maximum																									
3.2 3.2 3.2 3.1 2.9 3.2 3.0 2.9 2.5 2.4 2.7 3.1 2.8 2.8 2.4 2.5 2.3 2.6 3.0 3.4 3.4 3.4 3.3 3.5																									

AF - Analyzer Failure



Maximum Value: 3.2 km/h on Nov 17 18:00		Maximum Daily Average: 1.7 km/h on Nov 17		Hours in Service: 720																						
Minimum Value: -1.2 km/h on Nov 20 23:00		Minimum Daily Average: -0.1 km/h on Nov 20		Hours of Data: 715																						
Maximum Diurnal Average: 0.9 km/h at hour 19		Minimum Diurnal Average: 0.3 km/h at hour 6		Hours of Missing Data: 5																						
Monthly Average: 0.64 km/h		Percentiles: $P_1 = -0.9$ $P_{10} = 0.0$ $Q_1 = 0.2$ Median = 0.5 $Q_3 = 0.9$ $P_{90} = 1.6$ $P_{99} = 2.7$		Hours of Calibration: 0																						
				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-Nov	1.3	0.9	0.9	0.8	0.4	0.3	0.5	2.2	2.6	2.7	1.7	2.6	1.5	2.5	2.2	2.6	2.2	2.6	2.0	1.0	1.3	0.3	0.3	0.8	1.5	2.7
2-Nov	0.1	0.0	0.2	0.1	0.1	0.5	0.7	0.6	0.8	0.7	0.3	0.7	0.5	0.8	0.4	0.7	0.8	0.9	1.0	0.9	0.6	0.5	0.7	0.7	0.6	1.0
3-Nov	0.7	0.8	0.7	0.9	0.8	0.8	0.1	0.4	0.6	0.7	0.9	1.0	0.6	0.6	0.0	0.6	0.4	0.5	-0.2	0.0	0.6	0.7	0.1	0.1	0.5	1.0
4-Nov	-0.4	-0.4	-0.3	-0.4	-0.3	-0.3	-0.1	0.3	0.6	0.4	0.7	0.4	0.7	0.6	0.5	0.4	0.8	0.6	1.0	1.0	0.6	1.0	0.9	1.2	0.4	1.2
5-Nov	0.7	0.1	-0.7	0.0	-0.3	-0.1	0.3	0.7	0.7	0.7	1.2	0.9	0.3	0.5	0.8	0.7	0.2	0.5	0.3	0.4	0.4	0.6	0.2	1.5	0.4	1.5
6-Nov	1.1	0.2	0.4	0.0	-0.2	-0.4	0.1	0.4	0.3	0.5	0.3	0.4	1.4	0.2	0.1	0.4	0.2	0.3	0.6	0.4	0.5	0.5	0.4	0.4	0.4	1.4
7-Nov	0.7	1.0	0.8	0.5	0.4	0.3	0.2	0.3	0.0	0.0	0.1	0.8	0.3	0.3	0.3	0.6	0.6	0.6	0.7	0.5	0.4	0.6	1.1	0.9	0.5	1.1
8-Nov	0.5	0.5	0.2	0.1	-0.4	-0.3	-0.2	0.1	0.2	0.5	0.0	0.4	0.5	0.3	0.7	0.5	1.0	1.2	1.1	0.9	0.3	0.4	0.4	0.4	0.4	1.2
9-Nov	0.4	1.0	0.6	0.6	0.6	0.4	0.2	0.3	0.1	1.0	1.6	1.6	2.0	1.5	1.6	1.2	1.8	1.9	2.4	2.0	2.0	1.5	0.9	0.9	1.2	2.4
10-Nov	1.4	1.5	0.8	0.6	0.4	0.6	1.2	0.4	0.3	0.2	0.2	0.3	0.5	0.5	0.6	0.4	0.2	0.0	0.5	0.4	0.6	0.4	0.3	0.7	0.5	1.5
11-Nov	0.6	0.6	0.6	0.4	0.5	0.6	0.5	0.6	0.6	0.6	0.7	0.6	0.8	0.2	-0.2	-0.1	0.1	0.3	0.9	1.1	1.4	0.9	0.6	0.6	0.6	1.4
12-Nov	0.5	0.7	0.8	-0.2	0.1	0.3	0.5	-0.1	0.1	0.7	0.7	0.1	0.2	0.2	0.1	0.4	1.2	1.4	1.6	1.4	1.9	2.1	2.3	1.9	0.8	2.3
13-Nov	2.2	2.6	2.1	1.4	0.8	0.4	0.1	0.3	0.4	0.5	0.6	0.8	0.7	0.4	0.7	0.4	0.3	0.4	0.3	0.1	-0.1	0.6	0.8	0.8	0.7	2.6
14-Nov	0.9	0.4	0.5	0.7	0.6	0.0	-0.1	0.0	0.1	0.8	0.8	1.3	1.3	1.6	1.8	2.8	2.7	2.4	2.1	2.2	2.7	2.4	1.8	2.1	1.3	2.8
15-Nov	2.1	2.5	2.1	2.2	1.8	1.8	2.2	1.5	1.6	1.4	1.0	0.8	1.1	1.3	0.8	0.5	0.1	0.9	1.9	2.5	2.4	2.5	2.4	1.9	1.6	2.5
16-Nov	0.6	0.6	0.8	0.6	0.2	0.5	1.1	1.1	0.3	0.3	0.1	0.2	0.0	0.5	0.7	0.8	1.2	1.0	1.6	1.4	1.3	1.1	1.4	1.4	0.8	1.6
17-Nov	1.5	1.8	1.4	1.3	0.9	1.3	1.4	1.9	1.8	1.2	0.6	0.9	1.3	1.5	2.1	2.9	2.9	3.2	3.0	2.3	1.8	1.6	1.6	1.4	1.7	3.2
18-Nov	1.2	1.6	0.8	0.6	0.8	0.5	0.6	0.3	0.4	0.5	0.9	0.9	1.1	0.8	0.5	0.5	0.9	0.4	0.7	0.0	0.4	0.2	0.5	0.1	0.6	1.6
19-Nov	-0.1	0.5	-0.1	0.4	0.4	0.1	0.0	-0.2	0.7	-0.2	-0.1	-0.1	-0.2	-0.2	0.1	0.6	0.1	0.5	0.7	0.0	0.2	-0.3	-0.3	-0.1	0.1	0.7
20-Nov	-0.4	0.2	0.6	-0.1	-0.8	-1.2	0.0	0.0	-0.3	0.5	0.2	0.0	0.0	0.7	-0.1	-0.3	0.0	0.2	0.1	0.0	-0.1	0.1	-1.2	-1.0	-0.1	0.7
21-Nov	-0.3	-0.2	0.1	-0.1	0.1	0.3	0.2	0.6	0.4	0.5	0.3	0.3	0.7	1.0	1.0	1.4	1.7	1.9	1.4	1.0	1.3	1.0	0.5	0.5	0.7	1.9
22-Nov	0.6	0.5	0.7	0.3	0.2	0.4	-0.1	-0.2	0.6	0.7	0.2	0.3	0.6	0.1	0.2	0.7	0.4	0.3	0.5	0.6	0.4	-0.2	-0.1	0.2	0.3	0.7
23-Nov	0.5	0.1	0.0	0.3	-0.2	0.3	0.8	0.2	0.5	0.2	0.5	0.2	0.0	0.8	0.4	0.1	0.1	0.3	0.6	0.8	0.7	0.7	0.5	0.5	0.4	0.8
24-Nov	0.2	0.6	0.4	0.3	0.6	0.5	0.7	0.5	0.5	0.8	0.4	0.5	0.3	0.3	0.5	0.1	-0.8	-0.5	0.0	-0.3	-0.5	-0.9	-0.4	0.2	0.8	
25-Nov	-0.7	-0.9	-1.1	-1.1	-1.2	-1.0	-0.5	0.1	0.1	0.5	0.0	0.2	-0.1	-0.2	-0.1	0.0	0.0	0.2	0.8	1.1	0.7	0.7	0.6	0.8	0.0	1.1
26-Nov	0.5	0.3	0.6	0.9	0.9	0.9	0.3	0.3	0.4	0.3	0.2	0.8	0.5	0.6	0.2	0.1	0.2	0.1	0.1	0.1	0.6	0.6	0.2	0.2	0.4	0.9
27-Nov	0.2	0.3	0.1	0.4	0.6	AF	AF	AF	AF	AF	0.9	2.8	2.2	2.1	1.0	1.5	1.0	1.5	1.1	0.6	0.7	0.7	0.6	1.0	1.0	2.8
28-Nov	0.8	0.8	0.7	0.9	0.7	0.5	0.8	1.2	1.8	1.8	1.3	0.8	0.2	0.1	0.2	0.0	0.3	0.5	0.4	0.3	0.1	0.3	-0.1	0.5	0.6	1.8
29-Nov	0.7	0.8	0.3	1.2	1.4	0.5	0.7	0.4	0.2	0.5	0.2	0.6	0.3	0.0	0.3	0.4	0.3	0.6	0.5	0.5	0.6	0.6	0.7	0.8	0.5	1.4
30-Nov	0.7	0.5	0.7	0.2	-0.3	-0.3	0.0	0.2	0.3	0.6	0.8	0.7	1.0	0.4	0.4	0.4	0.6	0.4	0.7	0.6	0.8	0.9	0.7	0.8	0.5	1.0
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Summary of Hour Standard Deviations

Mannix - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.8 km/h on Nov 15 00:00	Hours in Service: 720 Hours of Data: 715 Hours of Missing Data: 5 Hours of Calibration: 0 Percent Operational Time: 99.3
Minimum Value: 0.2 km/h on Nov 28 16:00	
Percentiles: P ₁ = 0.3 P ₁₀ = 0.5 Q ₁ = 0.7 Median = 1.1 Q ₃ = 1.7 P ₉₀ = 2.3 P ₉₉ = 3.3	

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	1.9	1.2	1.1	1.0	0.8	0.8	1.4	1.9	2.3	2.3	2.0	2.2	2.2	2.4	2.1	2.0	2.0	2.0	2.0	1.7	1.6	1.4	1.4	1.4	2.4
2-Nov	1.4	0.8	0.5	0.4	0.4	0.5	0.7	0.4	1.7	2.0	1.7	2.1	1.7	1.5	1.4	1.7	1.3	1.0	1.0	1.5	1.0	0.7	0.6	0.6	2.1
3-Nov	0.5	0.7	0.9	1.0	0.9	0.9	1.1	0.5	1.0	0.8	1.1	1.0	0.9	1.1	1.7	1.1	1.5	1.5	2.0	1.9	3.3	2.3	1.8	1.6	3.3
4-Nov	1.3	1.0	0.8	1.0	0.8	0.5	0.5	0.7	0.9	0.6	0.7	0.9	0.8	0.9	0.6	0.4	0.3	0.5	0.6	1.0	0.8	0.6	0.5	0.5	1.3
5-Nov	0.6	1.1	1.2	0.7	1.0	0.7	0.7	0.6	0.5	0.5	0.7	0.7	0.7	0.5	0.5	0.4	0.7	0.8	1.0	1.5	1.2	1.3	0.7	0.9	1.5
6-Nov	0.8	0.9	0.9	0.9	0.7	0.8	0.9	1.0	1.2	1.1	0.9	1.2	1.5	0.8	0.6	0.6	0.5	0.6	0.6	1.3	2.0	1.4	1.1	0.9	2.0
7-Nov	1.3	1.1	1.4	1.4	1.2	0.6	0.9	0.6	0.6	0.4	0.5	0.7	0.7	0.6	0.7	0.4	0.4	0.3	0.4	0.5	0.6	1.0	1.0	0.7	1.4
8-Nov	0.6	0.8	0.8	0.7	1.0	1.0	1.0	0.7	0.7	0.5	0.6	0.6	0.8	0.9	0.5	0.5	0.5	0.5	0.4	0.6	0.5	0.7	0.7	0.7	1.0
9-Nov	0.6	0.5	0.6	0.8	0.5	1.1	0.9	1.2	1.9	1.0	1.5	2.4	2.3	1.7	1.9	1.3	1.8	1.9	2.0	1.8	1.7	1.7	1.2	1.8	2.4
10-Nov	1.7	1.5	1.6	0.8	1.0	0.8	0.8	1.1	0.5	0.4	0.9	0.8	1.1	1.6	0.9	0.9	1.2	1.9	1.7	1.5	1.2	1.5	1.9	2.2	2.2
11-Nov	1.7	1.8	1.3	0.8	0.7	0.8	0.5	0.4	0.4	0.9	0.9	0.6	0.8	1.4	1.6	1.6	1.5	2.3	2.0	2.0	1.7	1.2	1.1	1.1	2.3
12-Nov	1.2	1.2	1.0	0.8	0.5	0.6	0.5	0.8	0.6	0.4	0.6	0.7	0.5	0.6	0.6	0.7	0.7	0.5	0.4	0.5	0.4	0.4	0.5	0.6	1.2
13-Nov	0.4	0.5	0.4	0.7	0.4	0.9	0.7	0.6	0.8	0.6	0.7	0.8	0.8	0.6	0.5	0.3	0.6	0.6	0.7	0.9	0.6	0.7	0.7	0.6	0.9
14-Nov	0.6	0.7	1.0	0.8	0.8	0.5	1.0	1.2	2.1	2.5	3.0	2.9	2.5	2.3	2.4	2.1	2.2	2.4	3.6	3.6	3.5	3.3	3.8	3.8	3.8
15-Nov	3.3	2.9	3.6	3.3	2.9	3.3	3.3	2.9	2.3	2.3	2.5	2.6	2.3	1.8	1.8	1.3	0.7	0.8	0.7	0.9	0.6	0.6	0.7	0.8	3.6
16-Nov	0.9	0.6	0.8	0.7	0.8	0.5	0.6	0.7	0.3	0.3	0.3	0.7	0.9	1.8	1.6	1.4	1.7	1.8	2.2	2.2	2.1	2.1	2.2	2.3	2.3
17-Nov	2.2	2.2	2.0	1.9	1.5	1.8	1.5	1.6	1.7	1.7	1.7	1.8	2.0	2.0	2.1	2.2	2.3	2.4	2.4	1.9	1.9	1.8	1.1	0.8	2.4
18-Nov	0.4	1.0	1.0	0.9	1.0	0.8	0.8	0.8	0.8	0.9	1.0	1.5	1.5	1.6	1.5	1.5	1.1	0.9	0.8	0.6	0.8	0.9	0.8	1.0	1.6
19-Nov	0.9	1.4	1.4	1.7	1.5	1.3	1.4	1.3	1.7	1.4	1.6	1.6	1.6	1.4	1.5	1.4	1.5	2.0	2.4	2.7	2.4	2.7	2.9	2.9	2.9
20-Nov	2.7	2.5	2.4	2.2	2.2	1.7	1.6	2.0	2.1	1.8	1.9	1.9	2.0	1.9	1.4	1.3	1.7	1.3	1.5	1.5	1.5	1.2	2.0	2.4	2.7
21-Nov	2.0	2.1	1.8	1.6	1.6	1.5	1.3	1.2	1.2	1.0	0.9	0.8	0.8	0.9	0.6	0.7	0.8	0.9	1.3	1.5	1.8	1.8	1.9	1.8	2.1
22-Nov	1.5	1.6	1.5	1.0	0.9	1.1	0.8	0.9	1.2	1.1	1.0	1.2	1.4	1.1	1.7	1.5	1.4	1.8	1.7	2.0	1.9	1.7	2.3	2.6	2.6
23-Nov	2.4	2.5	2.4	2.5	2.6	2.7	2.5	2.4	2.5	2.3	2.6	3.0	2.6	2.7	2.2	2.2	2.0	2.0	1.5	1.4	1.7	1.5	1.3	1.1	3.0
24-Nov	0.7	1.0	1.0	0.7	0.8	0.7	0.8	1.0	0.9	1.0	1.1	1.1	1.4	1.5	1.1	0.7	0.7	1.7	1.8	1.3	1.4	2.4	2.4	2.8	2.8
25-Nov	2.3	2.8	2.9	2.8	2.6	2.6	2.6	2.4	2.4	1.8	1.5	1.6	1.5	1.1	0.7	0.4	0.3	0.2	0.6	1.1	1.2	1.4	1.5	1.8	2.9
26-Nov	1.7	1.7	1.7	1.6	1.4	1.5	1.1	1.4	1.3	1.4	1.5	1.6	1.6	1.5	1.6	0.8	0.4	0.3	0.4	0.2	0.4	0.6	0.2	0.3	1.7
27-Nov	0.3	0.4	0.2	0.3	0.5	AF	AF	AF	AF	AF	1.4	2.0	2.2	1.9	1.6	1.7	1.7	2.3	2.2	1.2	1.1	0.8	0.7	0.7	2.3
28-Nov	0.7	0.4	0.4	0.3	0.6	0.7	1.0	1.3	1.9	1.6	1.5	1.1	0.5	0.4	0.4	0.2	0.3	0.5	0.9	0.8	0.9	1.0	0.7	1.0	1.9
29-Nov	0.9	1.1	0.9	0.9	0.5	0.4	0.4	0.5	0.3	0.3	0.5	0.7	1.1	1.0	0.9	0.8	1.3	1.6	1.3	1.3	1.0	1.6	1.3	1.3	1.6
30-Nov	1.5	1.4	1.3	1.5	1.4	1.3	1.7	1.7	2.0	1.9	1.4	1.8	2.1	1.8	1.8	1.5	1.5	1.7	1.7	1.6	1.6	1.8	1.5	1.5	2.1
	3.3	2.9	3.6	3.3	2.9	3.3	3.3	2.9	2.5	2.3	2.6	3.0	2.9	2.7	2.3	2.4	2.3	2.4	2.4	3.6	3.6	3.5	3.3	3.8	

Diurnal Maximum

AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 14, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:05
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	817	817
Calculated slope	0.998158	1.000120	Chamber temp	45.0	45.0
Calculated intercept	0.997545	0.188548	Pressure	696.8	696.8
Analyzer Background	7.4	7.5	Flow	0.474	0.474
Analyzer Coefficient	0.974	0.995	Intensity	91	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	586.1	1.024
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.0	600.0	599.7	1.001
second point	5000	30.0	300.0	300.1	1.000
third point	5000	15.0	150.0	149.3	1.005
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	60.0	600.0	599.1	1.002
Average Correction Factor					1.002

Corrected As found 586.1 Previous response 600.1 % change 2.4%

Notes:

No maintenance done, filter changed out, span adjusted

Calibration Performed By: Melissa Lemay



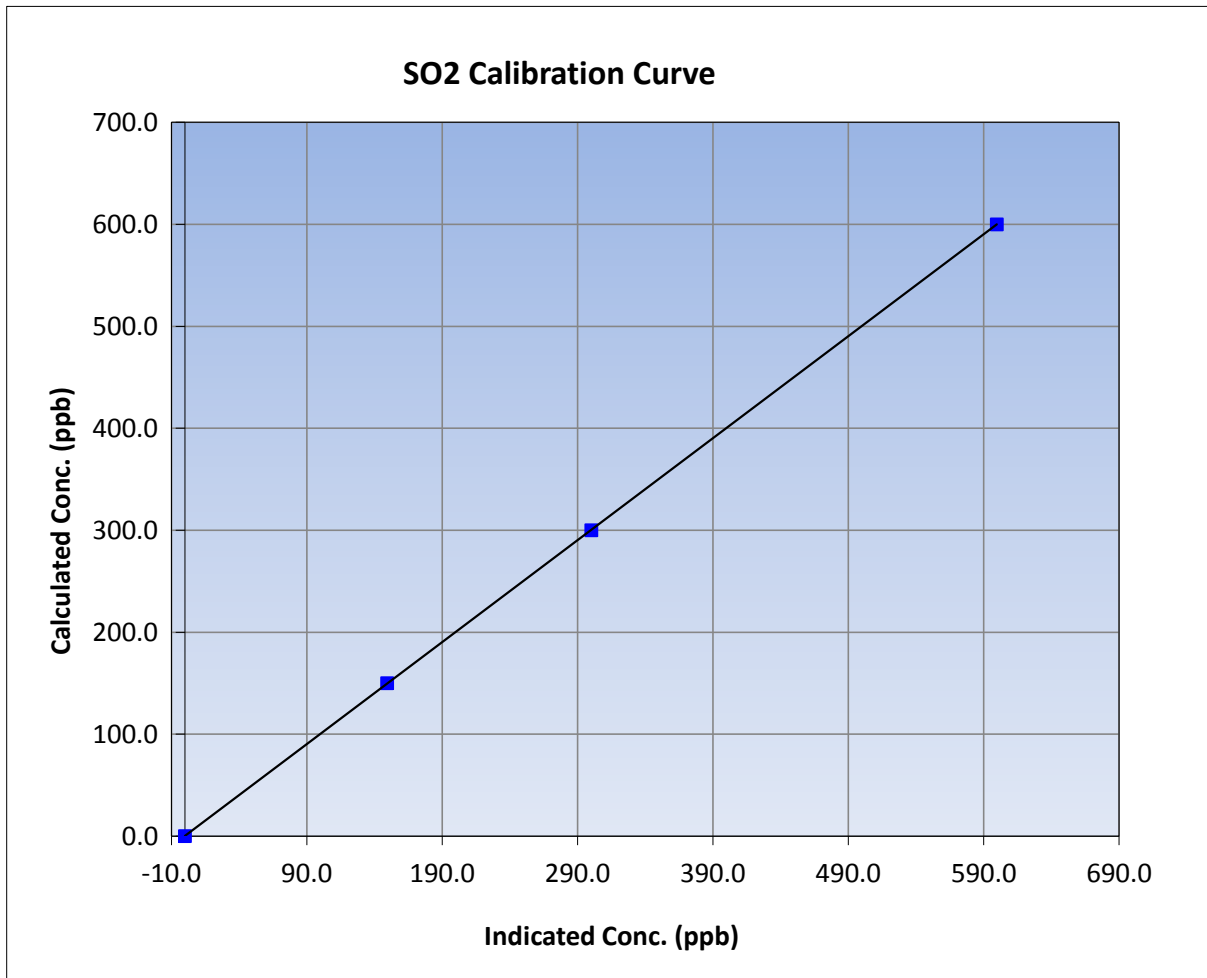
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 14, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	7:50	End Time (MST)	10:05
Analyzer make	TEI 43i	Analyzer serial #	1008841399

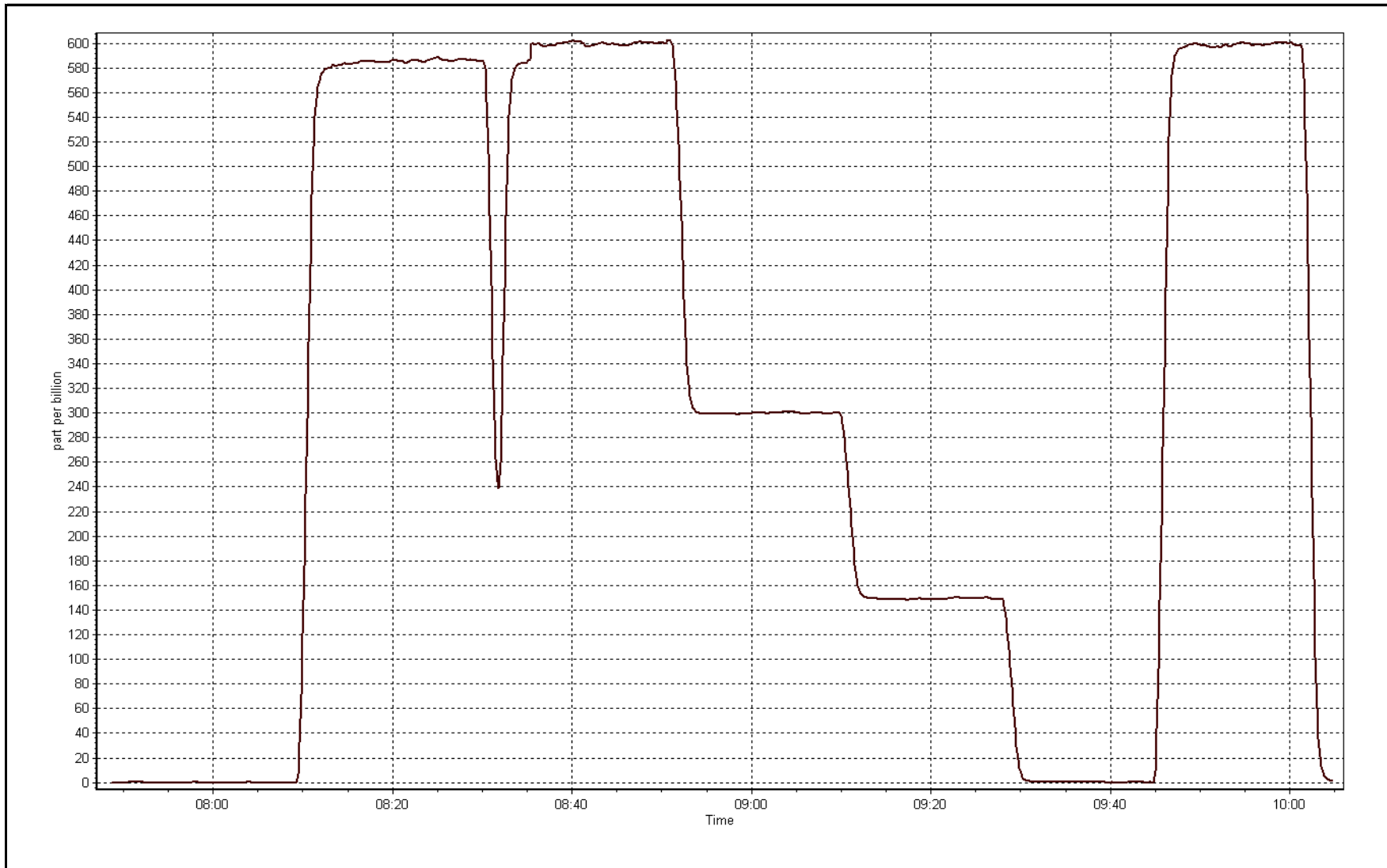
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999998
600.0	599.7	1.0005		
300.0	300.1	0.9997	Slope	1.000120
150.0	149.3	1.0047		
			Intercept	0.188548



SO2 Calibration Plot

Date: November 2, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 14, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	10:02	End Time (MST)	12:40
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	0.995072	1.000440	Chamber temp	45	45
Calculated intercept	-0.217097	-0.311876	Pressure	508.9	508.9
Analyzer Background	15.4	15.7	Flow	1.011	1.011
Analyzer Coefficient	0.962	0.978	Intensity	96	96
			Converter temp.	325	325

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	73.3	1.021
SO2 scrubber check	5000	15.0	150.0	1.5	----
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	74.4	74.8	75.1	0.997
second point	5000	41.7	42.0	42.3	0.992
third point	5000	24.8	24.9	25.2	0.989
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	74.4	74.8	75.3	0.994
Average Correction Factor					0.992

Corrected As found	73.0	Previous response	75.4	% change	3.3%
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Notes:

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

Calibration Performed By:

Melissa Lemay



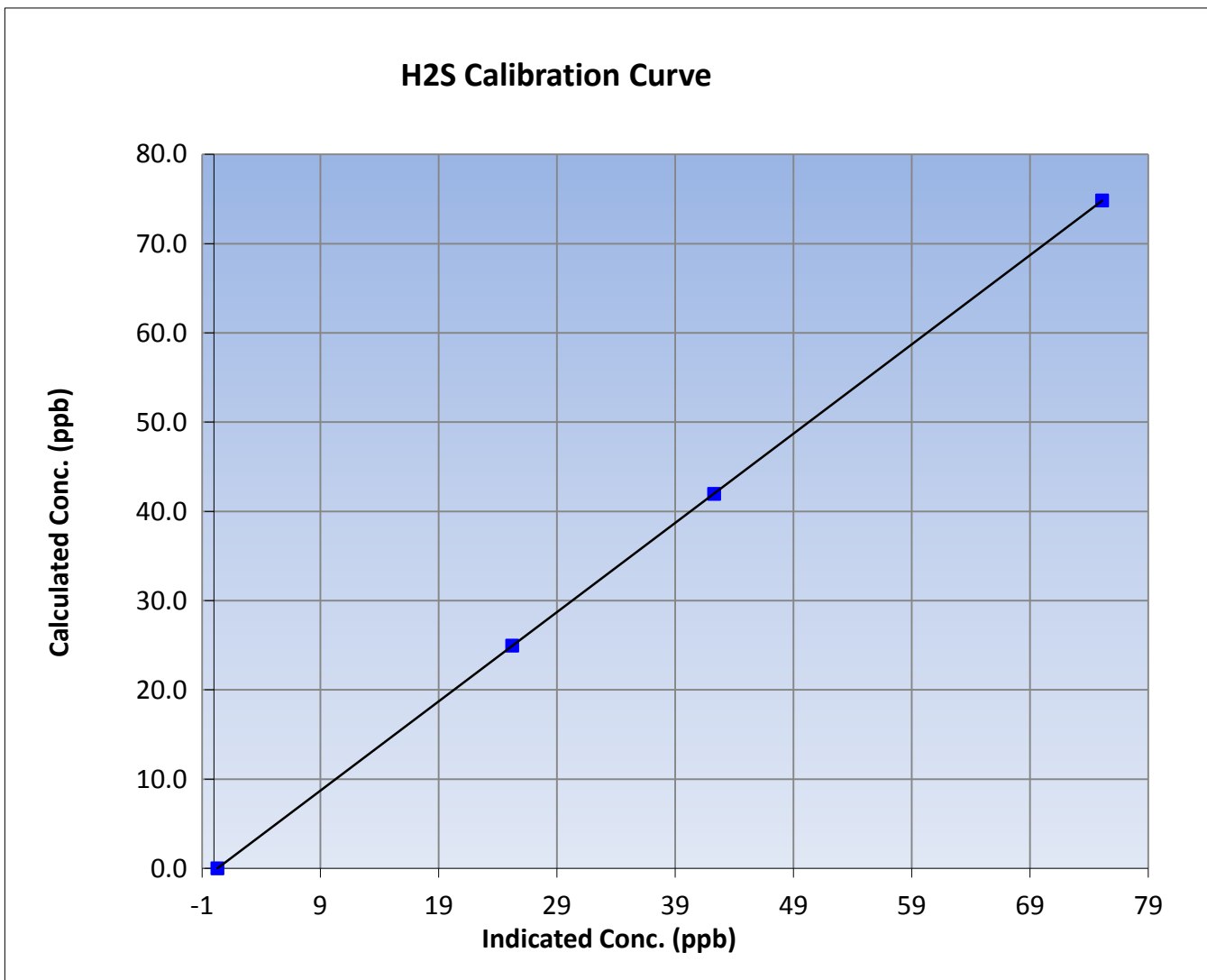
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

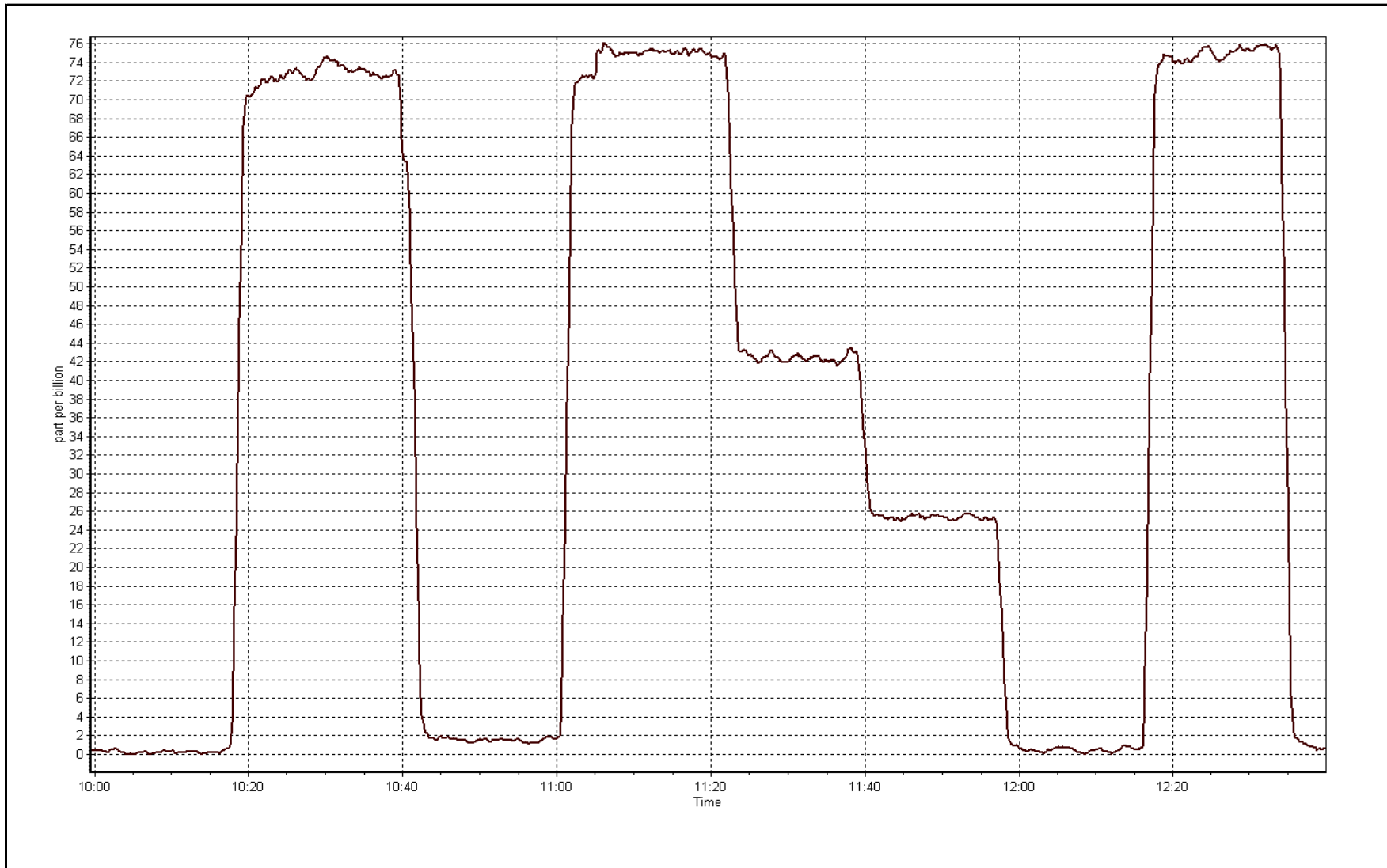
Calibration Date	November 2, 2016	Previous Calibration	October 14, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	10:02	End Time (MST)	12:40
Analyzer make	Thermo 450i	Analyzer serial #	815129108

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999999
74.8	75.1	0.9966		
42.0	42.3	0.9917	Slope	1.000440
24.9	25.2	0.9889		
			Intercept	-0.311876



Melissa Lemay





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 14, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:03
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	0.993239	1.001279	Fuel Pressure	20.2	20.2
Calculated intercept	0.053728	0.000039	Analyzer Coeff	3.473	3.398
			Analyzer BKG	3.03	2.96

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	0.01	----
as found span	5000	60.0	12.46	12.23	1.018
calibrator zero	5000	0.0	0.00	0.01	----
high point	5000	60.0	12.46	12.45	1.000
second point	5000	30.0	6.23	6.20	1.005
third point	5000	15.0	3.11	3.11	1.001
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.0	12.46	12.45	1.000
Average Correction Factor					1.002

Corrected As found	12.22	Previous response	12.49	% change	2.2%
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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

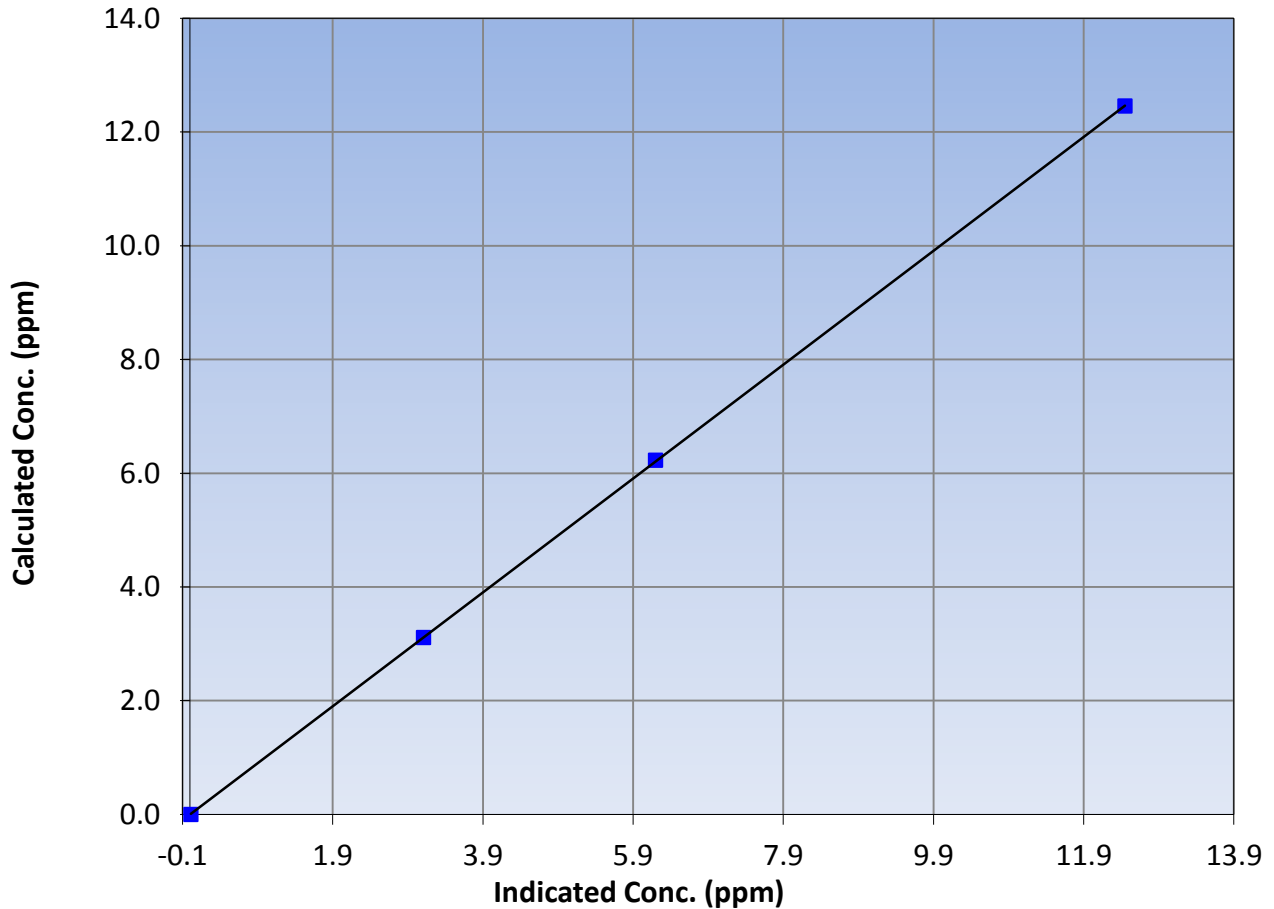
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 14, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	7:50	End Time (MST)	10:03
Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295

Calibration Data

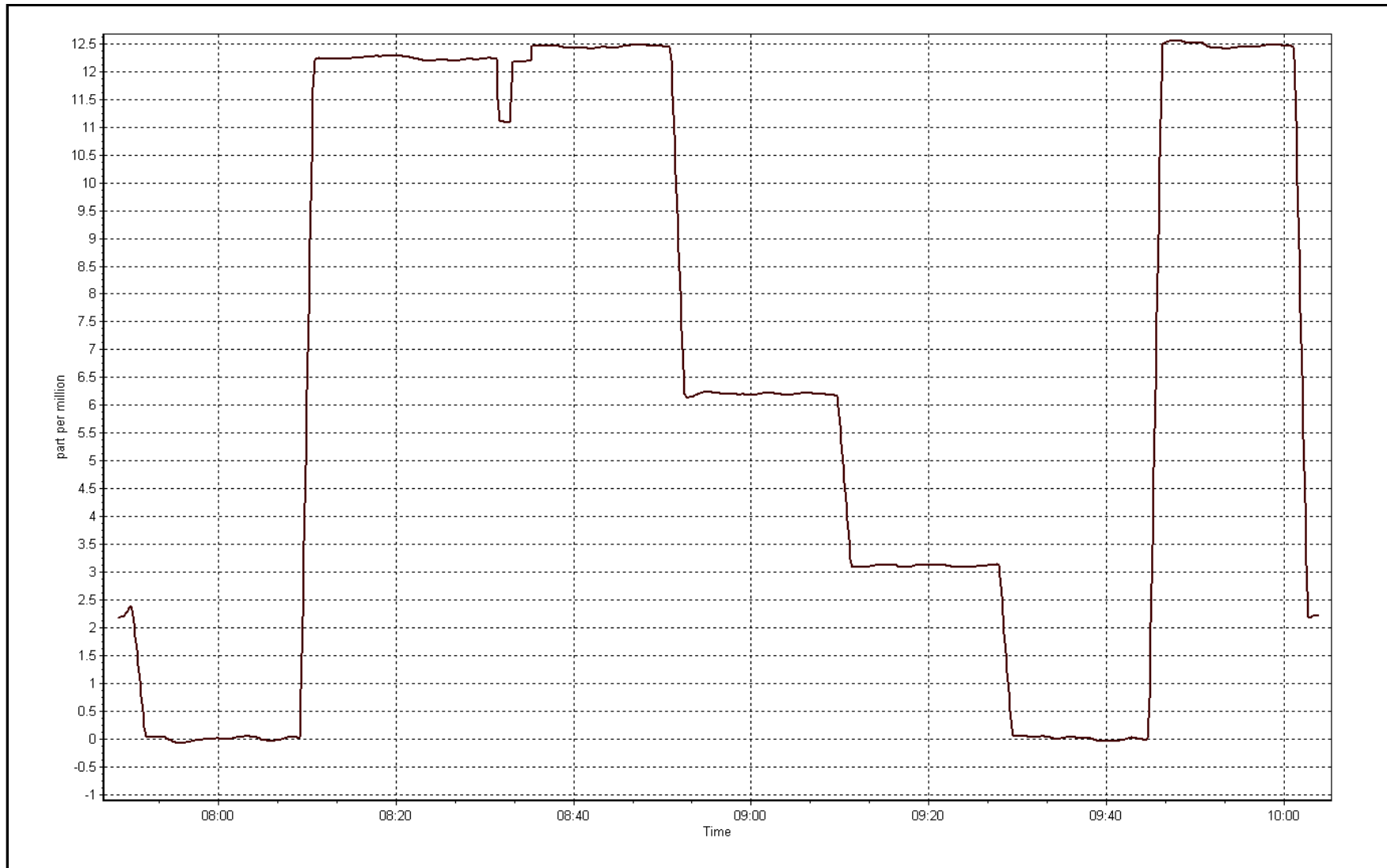
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.01	----	Correlation Coefficient	0.999993
12.46	12.45	1.0005		
6.23	6.20	1.0045	Slope	1.001279
3.11	3.11	1.0013		
			Intercept	0.000039

THC Calibration Curve



THC Calibration Plot

Date: November 2, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 6
PATRICIA MCINNES
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
 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	686	34	34	100.00	17	0	5	0
TRS (ppb) Average	662	37	58	97.08	2	0	1	0
THC (ppm) Average	686	34	34	100.00	2.4	-	2.2	-
NMHC(ppm) Average	686	34	34	100.00	0.049	-	0.004	-
CH4(ppm) Average	686	34	34	100.00	2.4	-	2.2	-
O3 (ppb) Average	684	36	36	100.00	40	0	35	-
NO2 (ppb) Average	685	35	35	100.00	30	0	14	-
NO (ppb) Average	685	35	35	100.00	54	-	14	-
NOX (ppb) Average	685	35	35	100.00	78	-	26	-
NH3 (ppb) Average	645	39	75	95.00	10	0	0	-
PM2.5 (ug/m3) Average	715	2	5	99.58	63.7	-	9.7	0
Temperature 2 m (C) Average	720	0	0	100.00	12.9	-	6.4	-
Relative Humidity (%) Average	720	0	0	100.00	96	-	93	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	27	-	15	-
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 - PATRICIA McINNES (AMS 6)
 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	686	0.4	1	-	0	0	0	0	0	1	17
TRS (ppb) Average	662	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	686	2	0.1	-	1.9	1.9	1.9	2	2	2.1	2.4
NMHC(ppm) Average	686	0.001	0.005	-	0	0	0	0	0	0	0.049
CH4(ppm) Average	686	2	0.1	-	1.9	1.9	1.9	2	2	2.1	2.4
O3 (ppb) Average	684	21.4	9	-	5	9	14	22	29	34	40
NO2 (ppb) Average	685	6.1	6	-	0	1	2	4	9	15	30
NO (ppb) Average	685	2.9	6	-	0	0	0	1	2	7	54
NOX (ppb) Average	685	9.1	11	-	0	1	2	5	11	23	78
NH3 (ppb) Average	645	0	0	-	0	0	0	0	0	0	10
PM2.5 (ug/m3) Average	715	4.57	4.4	-	0.6	1.1	1.8	3.3	5.8	9.5	63.7
Temperature 2 m (C) Average	720	-1.04	5.7	-	-13.9	-8.3	-5.6	-1.4	3.5	7	12.9
Relative Humidity (%) Average	720	77.3	11	-	42	61	69	79	86	92	96
Wind Speed 10 m (km/h) Average	720	9.6	4	-	1	4	6	9	12	15	27
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS	04 Nov 2016 16:00	05 Nov 2016 07:00	16	Stabilization following maintenance
TRS	23 Nov 2016 09:00	23 Nov 2016 13:00	5	Maintenance - baseline adjustment and recalibration
NH3	01 Nov 2016 02:00	30 Nov 2016 07:00	36	Stabilization after daily span
PM2.5	01 Nov 2016 07:00	01 Nov 2016 09:00	3	Unstable operation - excessive baseline drift



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 17 ppb on Nov 27 14:00	Maximum Daily Average: 5.0 ppb on Nov 27		Hours of Data:	686
Minimum Value: 0 ppb on Nov 1 08:00	Minimum Daily Average: 0.0 ppb on Nov 26		Hours of Missing Data:	34
Maximum Diurnal Average: 0.9 ppb at hour 14	Minimum Diurnal Average: 0.2 ppb at hour 19		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 = 7		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	2	1	Z	0	5	3	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	2	3	8	1.2	8	
2-Nov	7	3	Z	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	7
3-Nov	0	0	0	Z	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-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	0.2	0
5-Nov	0	0	0	0	0	0	Z	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0.4	1
6-Nov	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	0.1	0
7-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
8-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	0.3	0
9-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
10-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
11-Nov	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
12-Nov	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	0.1	0
13-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
14-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	0.1	0
15-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
16-Nov	0	0	0	0	0	Z	0	0	0	0	0	1	3	3	2	0	0	0	0	2	1	1	1	1	1	0.7	3
17-Nov	1	7	3	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	7
18-Nov	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1	1
19-Nov	0	2	Z	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
20-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	0.1	0
21-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
22-Nov	0	0	0	0	0	Z	4	3	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0.7	4
23-Nov	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
24-Nov	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	0.1	0
25-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
26-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
27-Nov	0	0	1	2	Z	1	2	1	9	12	14	12	13	17	5	3	3	3	2	3	3	3	3	2	2	5.0	17
28-Nov	2	2	2	2	2	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1.0	2
29-Nov	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	0.1	0
30-Nov	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	0.1	0

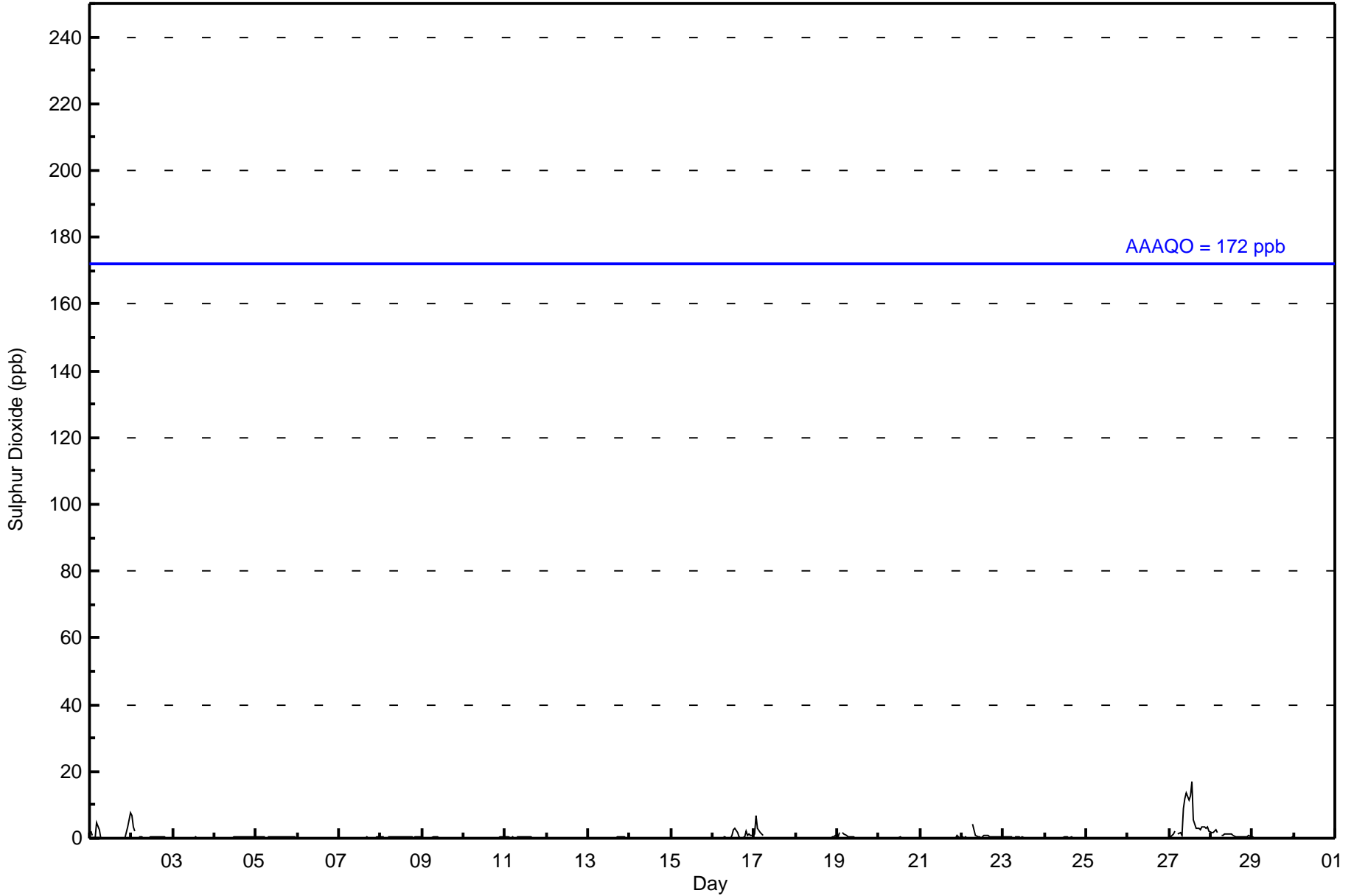
0.5	0.6	0.5	0.4	0.5	0.3	0.4	0.3	0.5	0.6	0.6	0.6	0.7	0.9	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.5	Diurnal Average	
7	7	3	2	5	3	4	3	9	12	14	12	13	17	5	3	3	3	2	3	3	3	3	8	Diurnal Maximum	

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 - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	99.27	99.27
11 - 20	5	0.73	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: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - 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	33	6	4	7	8	38	108	65	78	48	98	68	45	24	26	25	681
11 - 20	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
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	38	6	4	7	8	38	108	65	78	48	98	68	45	24	26	25	686

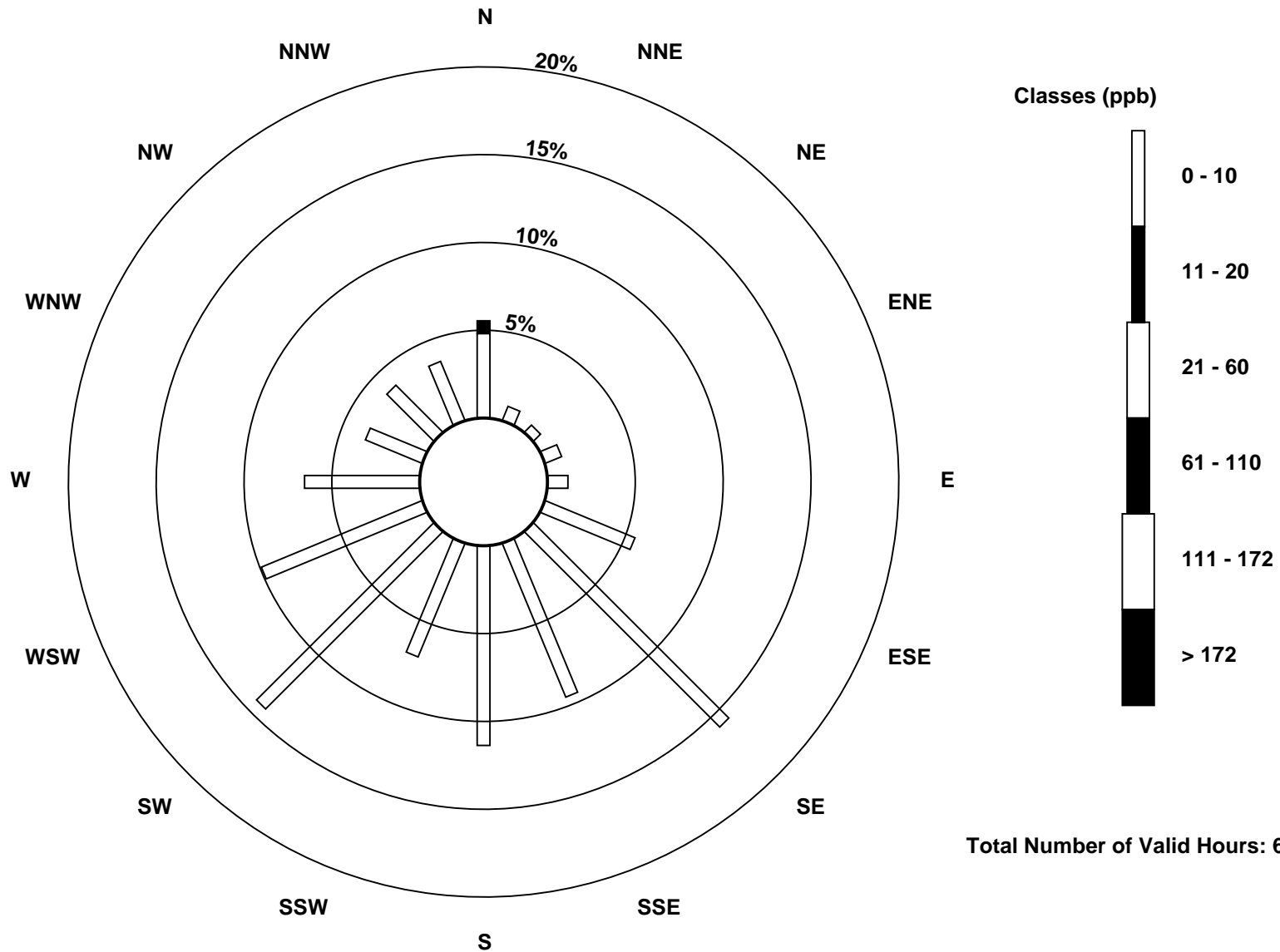
Total Number of Valid Hours: 686

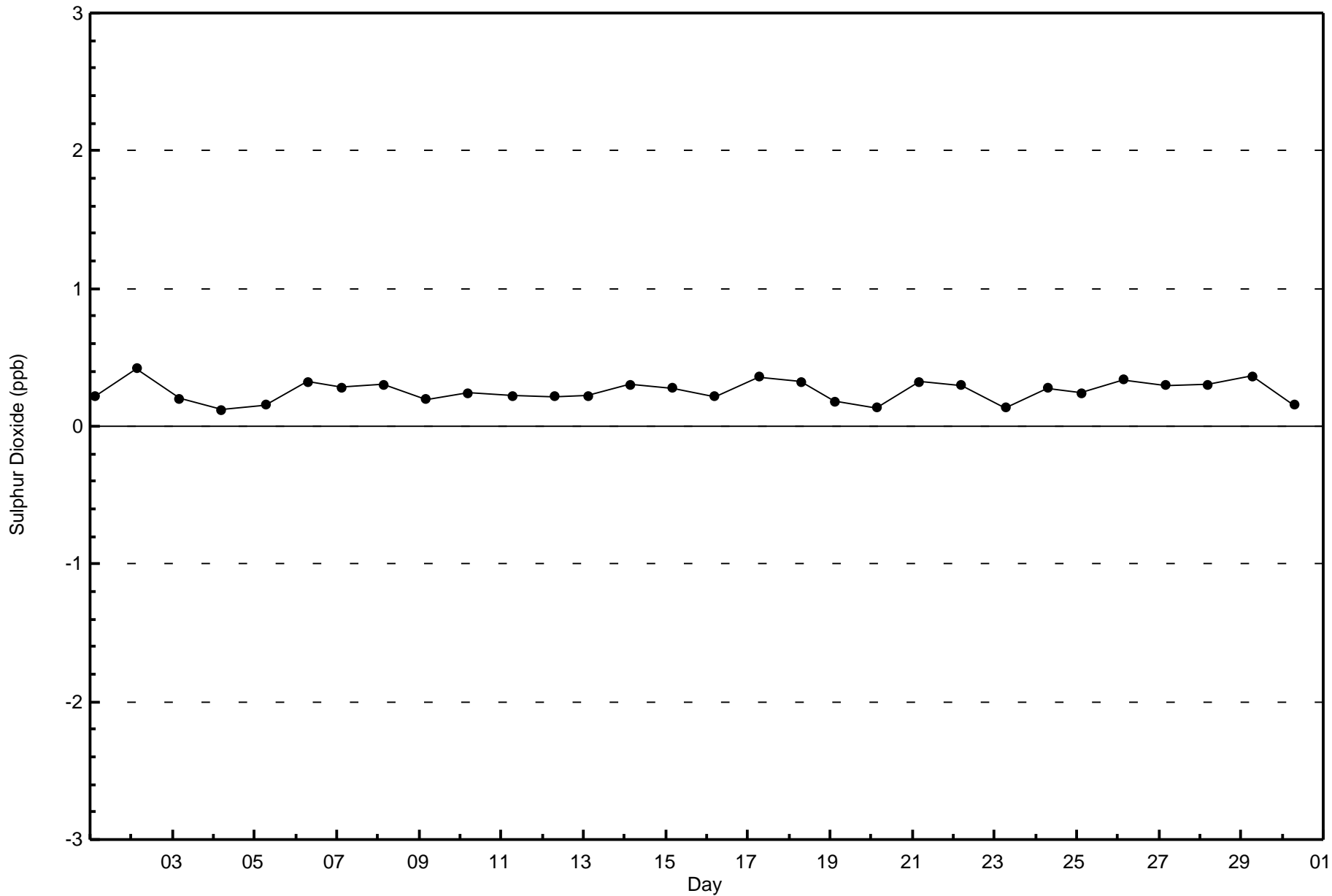
Total Number of Hours: 720

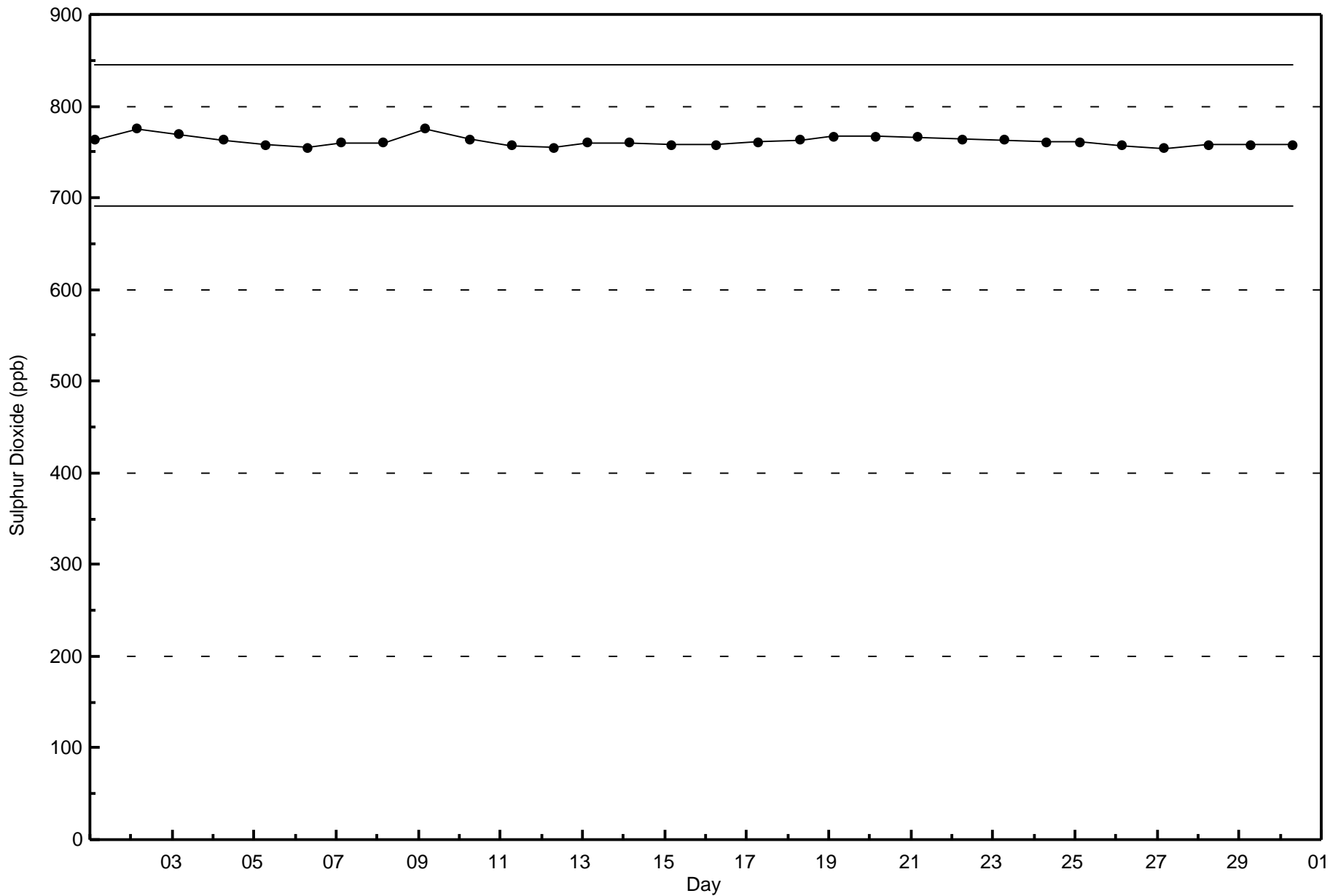


Wood Buffalo Environmental Association
Wind Rose Nov 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

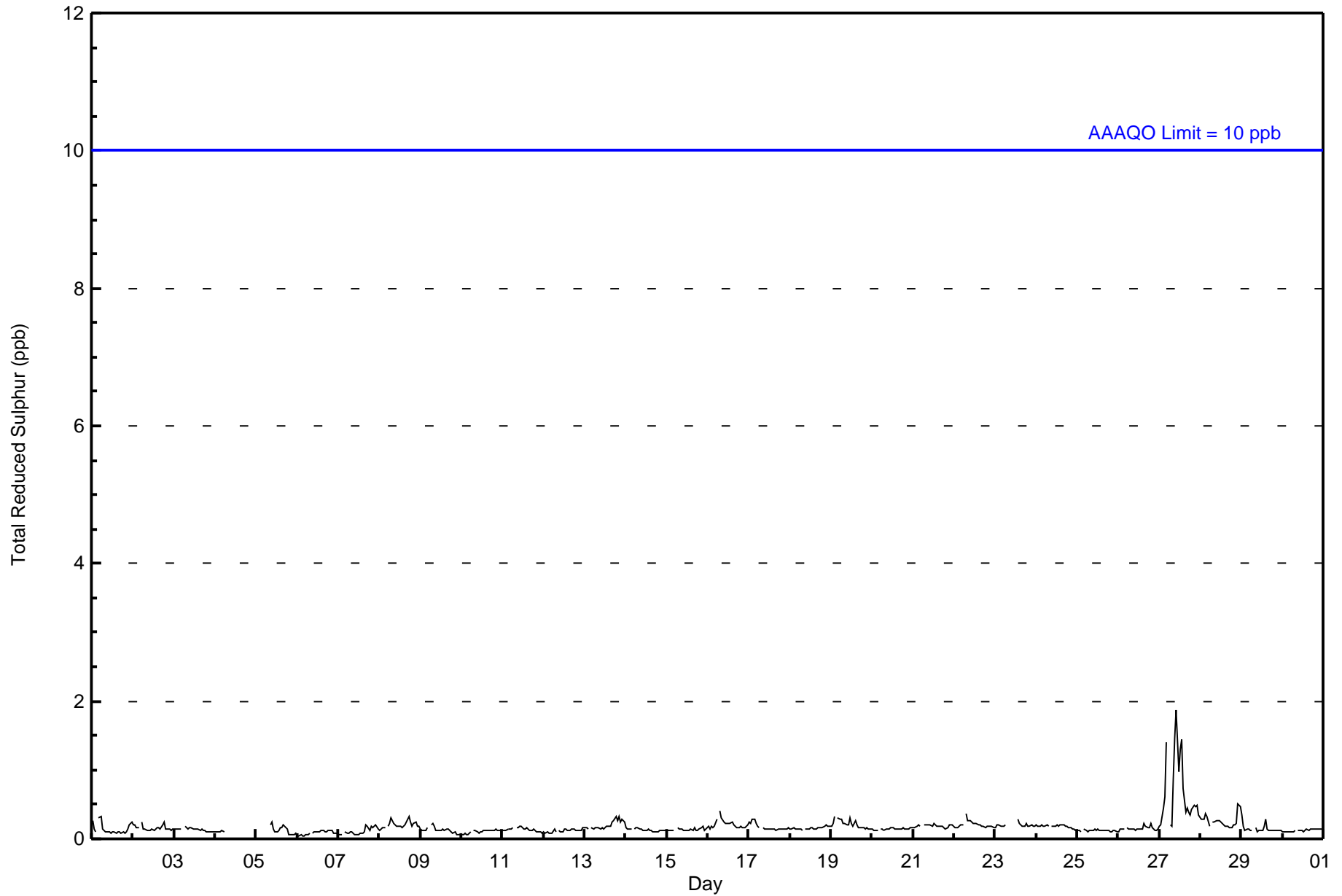
Patricia McInnes - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 720													
Maximum Value: 2 ppb on Nov 27 11:00														Maximum Daily Average: 0.7 ppb on Nov 27													
Minimum Value: 0 ppb on Nov 6 01:00														Minimum Daily Average: 0.1 ppb on Nov 6													
Maximum Diurnal Average: 0.2 ppb at hour 5														Minimum Diurnal Average: 0.1 ppb at hour 2													
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													
														Hours of Service: 720													
														Hours of Data: 662													
														Hours of Missing Data: 58													
														Hours of Calibration: 37													
														Percent Operational Time: 97.1													
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-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	0.1	0
2-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	0.2	0
3-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
4-Nov	0	0	0	0	0	0	Z	0	C	C	C	C	C	C	C	M	M	M	M	M	M	M	M	M	M	--	0
5-Nov	M	M	M	M	M	M	M	Z	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	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-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
8-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	0.2	0
9-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
10-Nov	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	0.1	0
11-Nov	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	0.1	0
12-Nov	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	0.1	0
13-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	0.2	0
14-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
15-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
16-Nov	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
17-Nov	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	0.2	0
18-Nov	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	0.2	0
19-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	0.2	0
20-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
21-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	0.2	0
22-Nov	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
23-Nov	0	0	0	0	0	0	0	Z	M	M	M	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Nov	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	0.2	0
25-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	0.1	0
26-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	0.2	0
27-Nov	0	0	0	1	1	Z	0	0	1	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.7	2
28-Nov	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
29-Nov	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	0.1	0
30-Nov	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	0.1	0
																								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
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	662	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: 662

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Patricia McInnes - 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 - 2	35	7	4	7	9	35	104	56	69	44	97	67	47	26	29	26	662
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	35	7	4	7	9	35	104	56	69	44	97	67	47	26	29	26	662

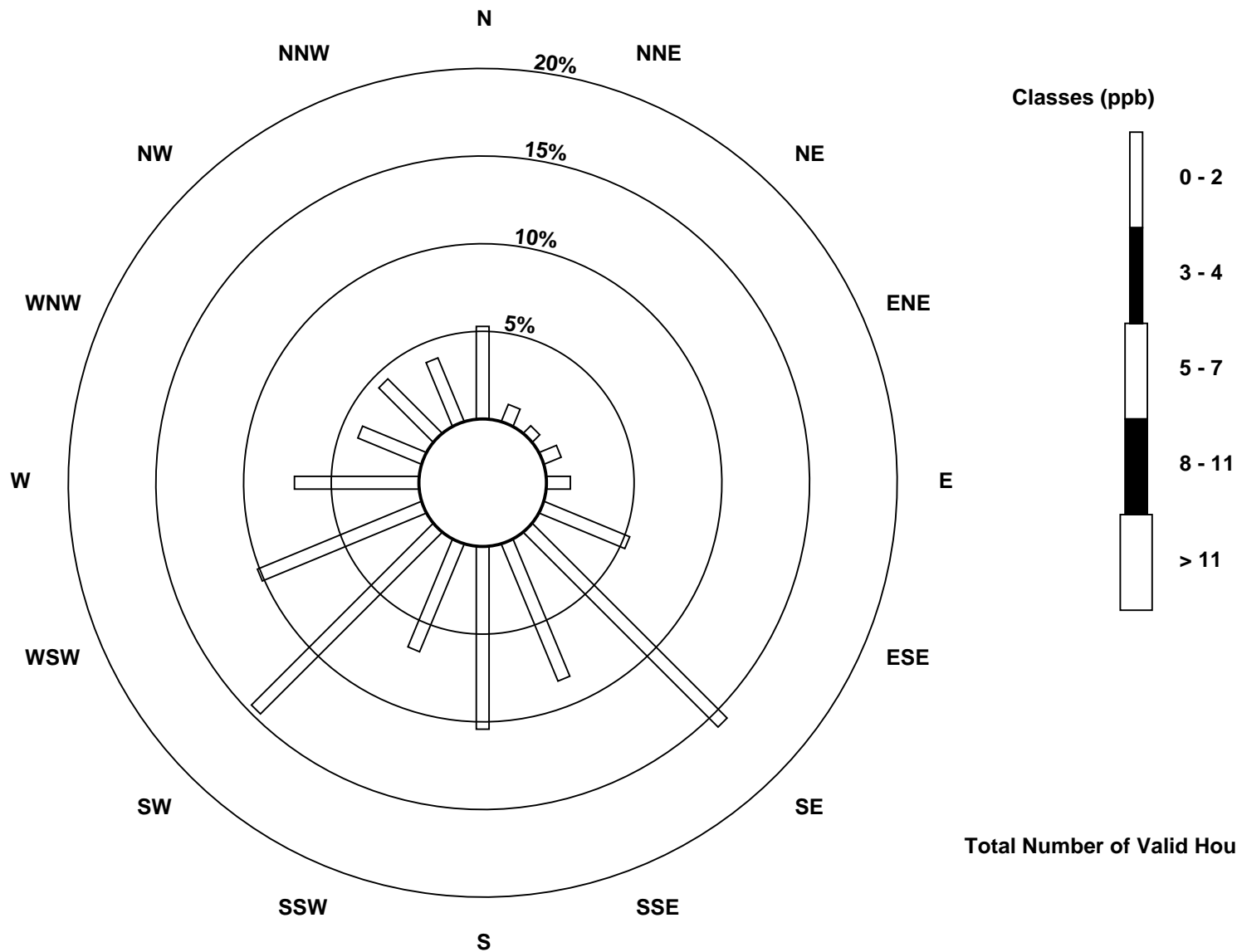
Total Number of Valid Hours: 662

Total Number of Hours: 720

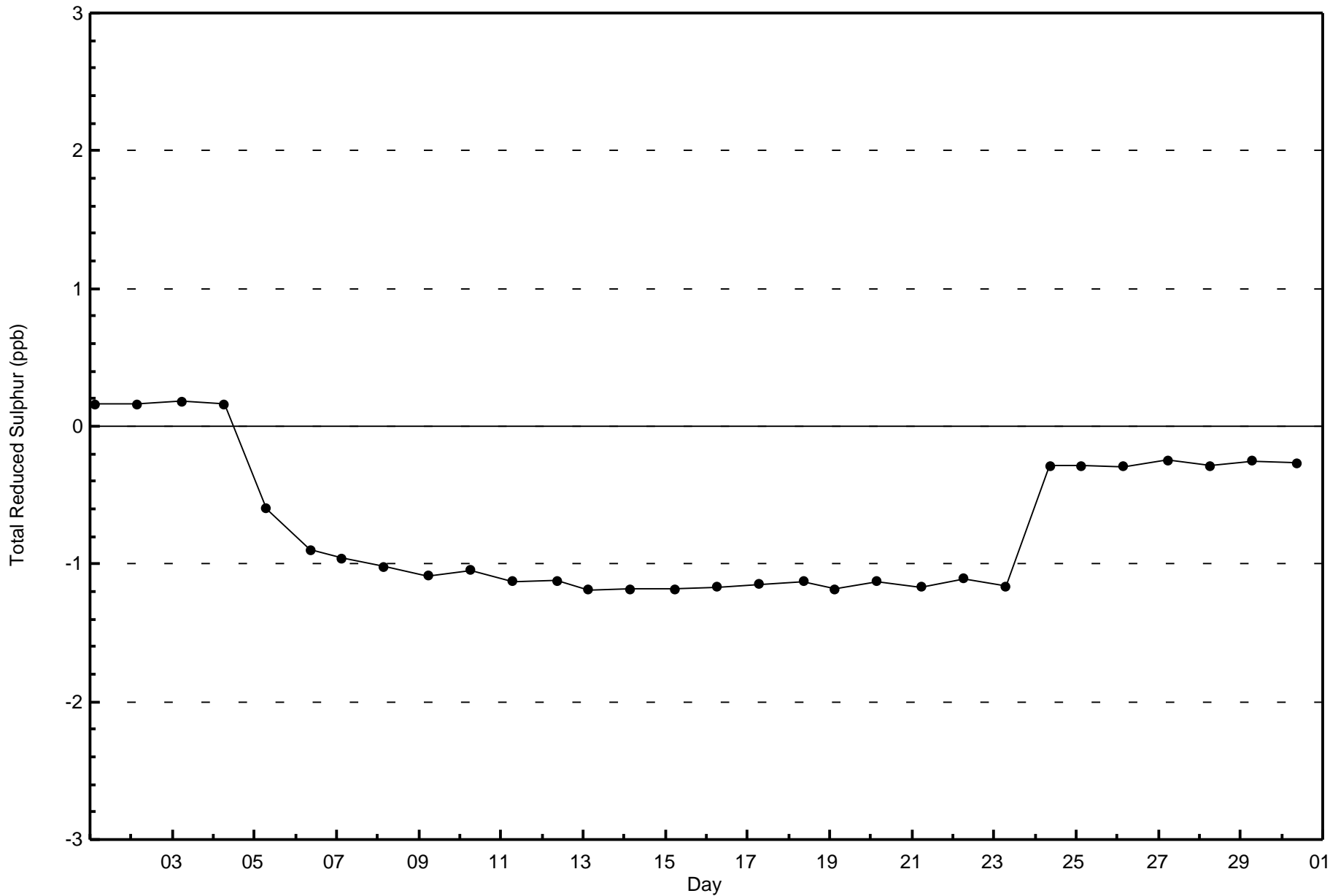


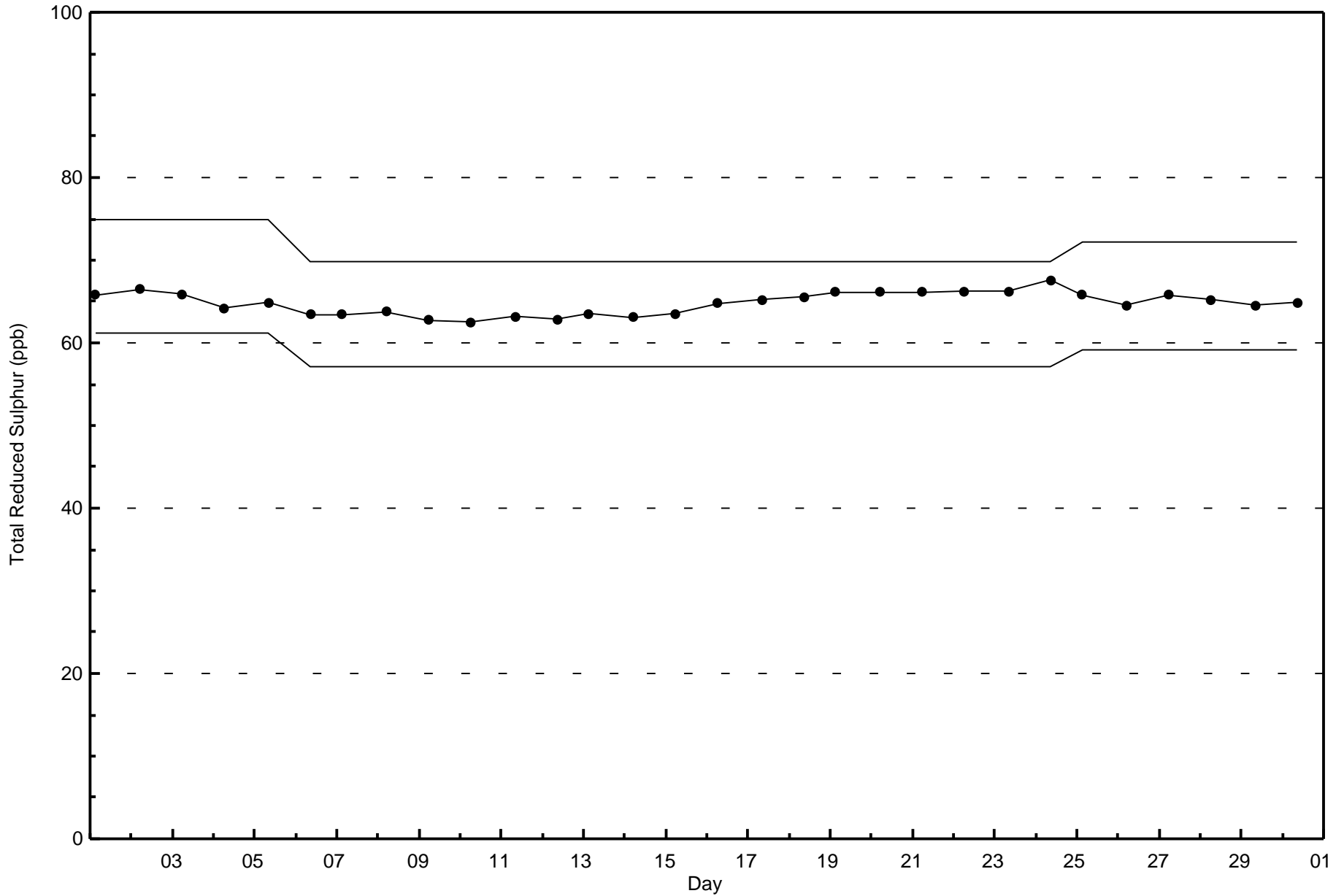
Wood Buffalo Environmental Association
Wind Rose Nov 2016

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



Total Number of Valid Hours: 662

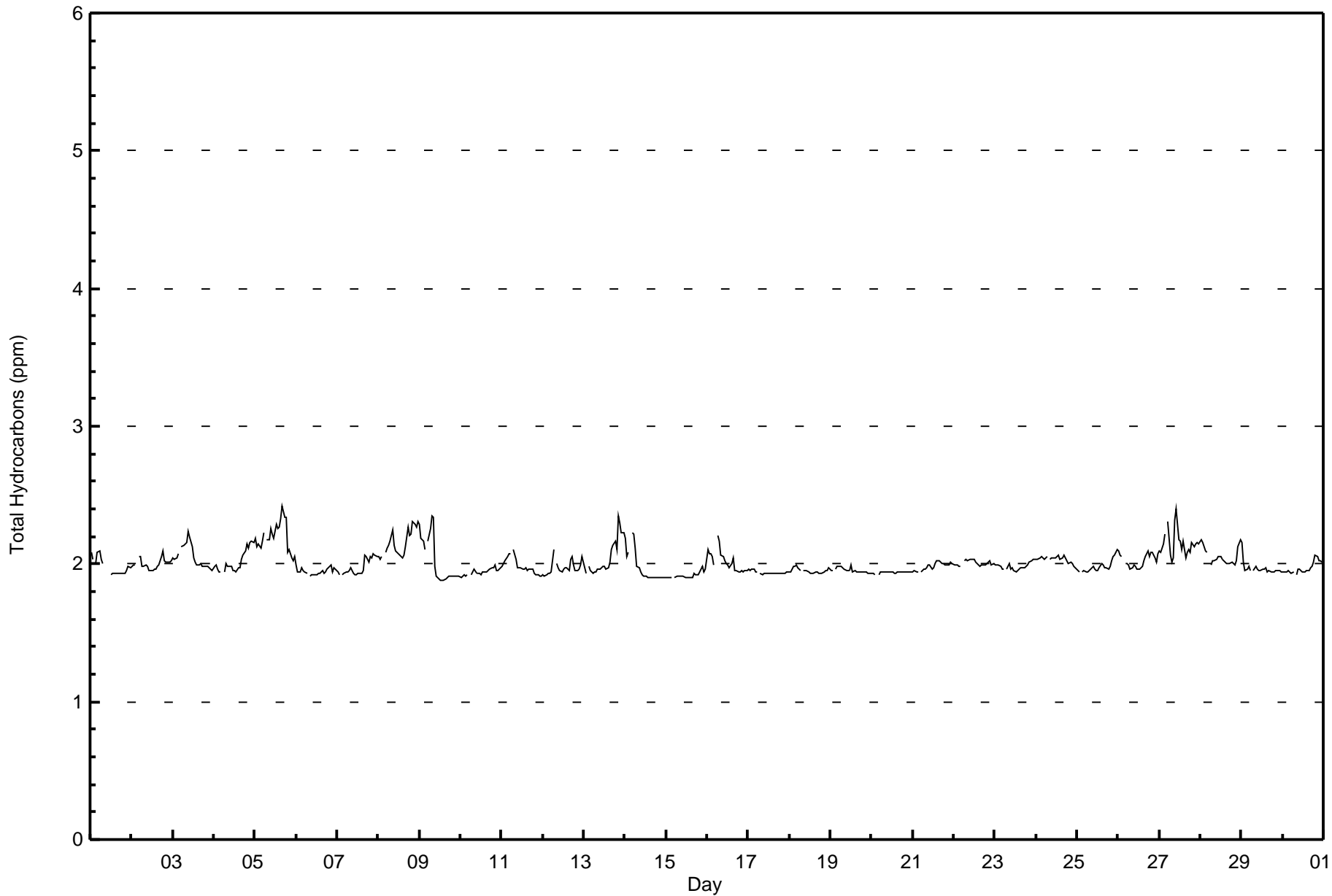






Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	532	77.55	77.55
2.1 - 3.0	154	22.45	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Patricia McInnes - November 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	26	5	3	7	8	36	90	32	45	38	86	57	45	21	17	16	532
2.1 - 3.0	12	1	1	0	0	2	18	33	33	10	12	11	0	3	9	9	154
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	38	6	4	7	8	38	108	65	78	48	98	68	45	24	26	25	686

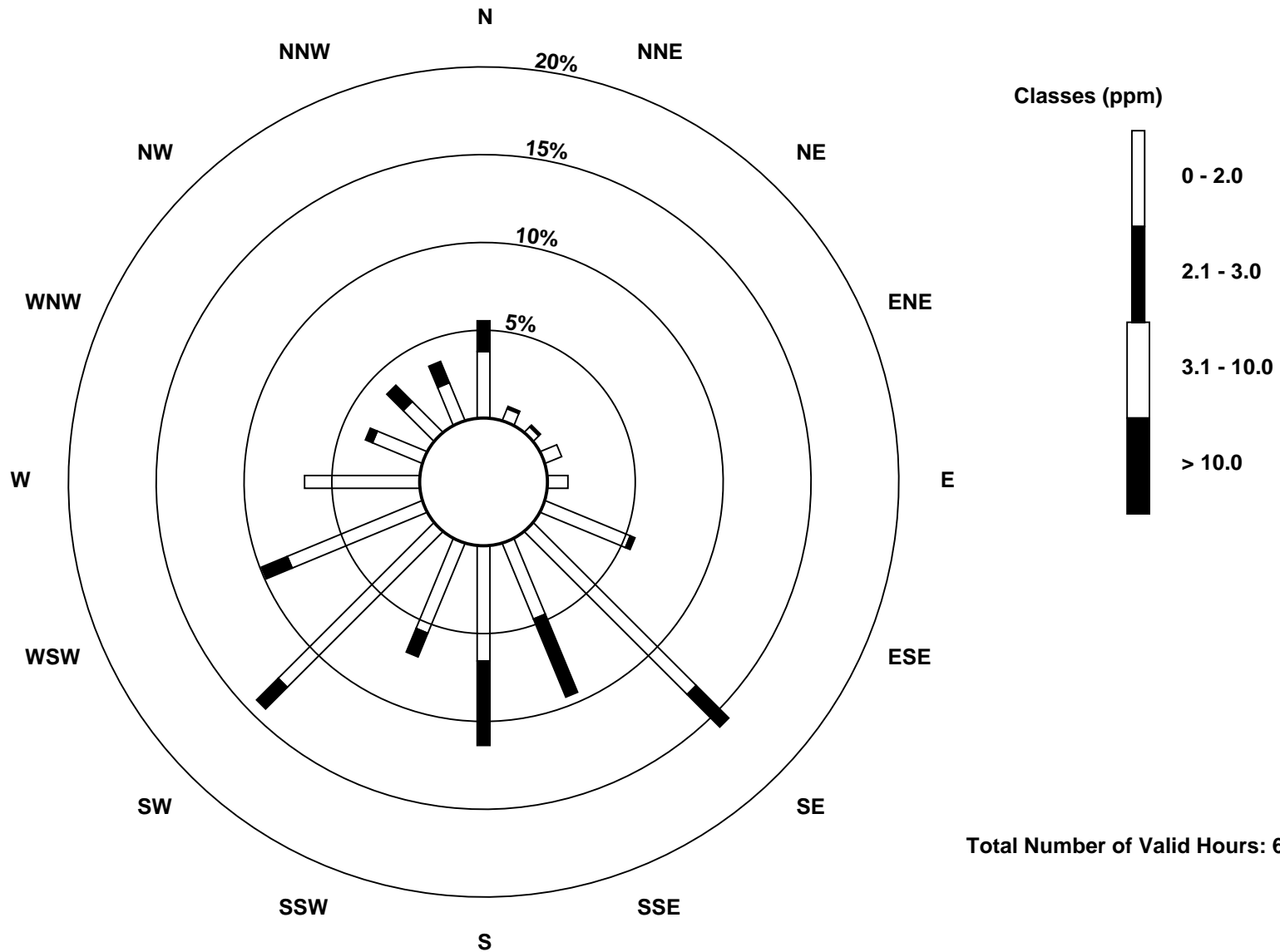
Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

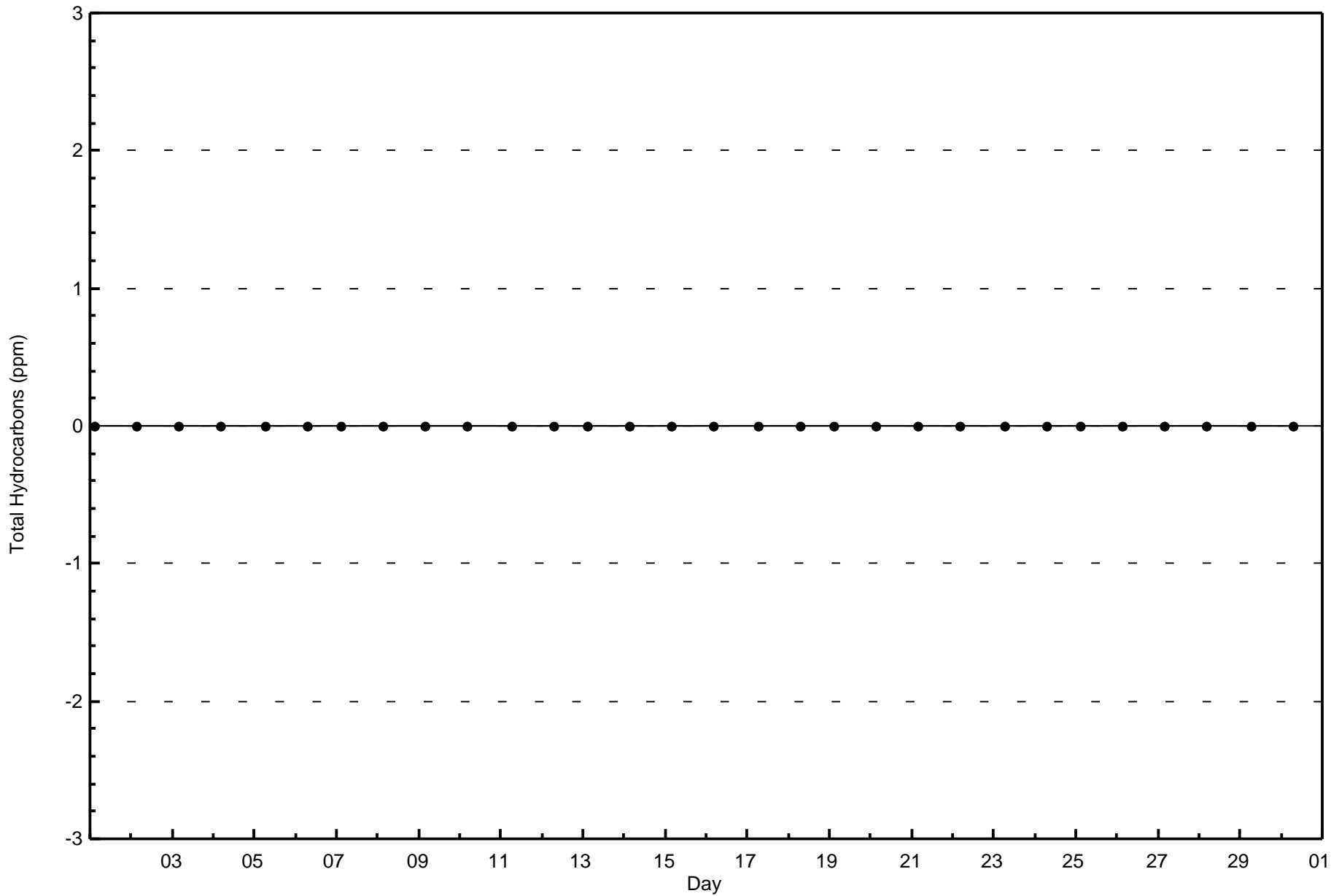
Total Hydrocarbons (THC) - ppm
Patricia McInnes (AMS 6)

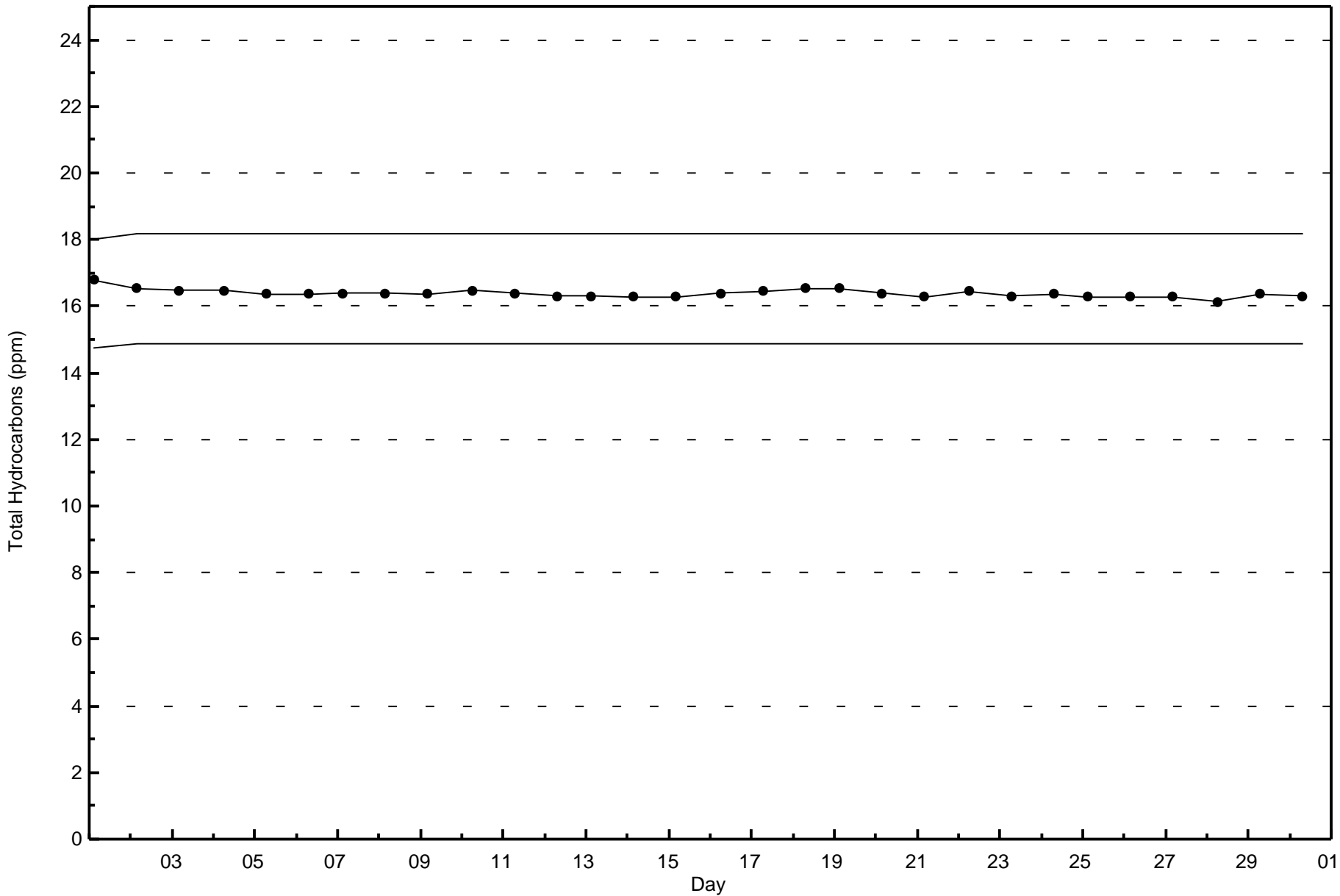




Wood Buffalo Environmental Association
Zero Responses

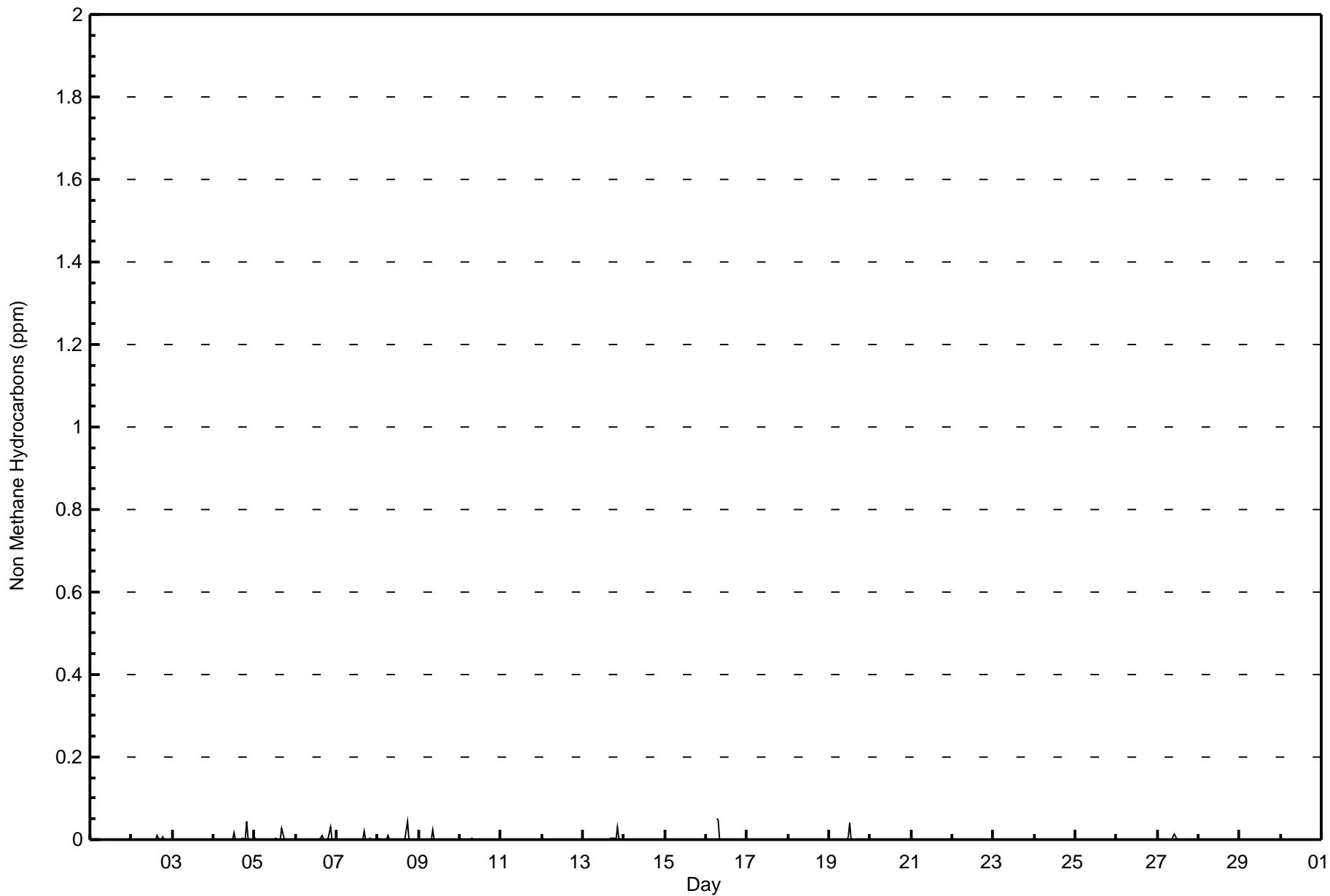
Total Hydrocarbons (THC) - ppm
Patricia McInnes - November 2016







Maximum Value: 0.049 ppm on Nov 16 07:00		Maximum Daily Average: 0.004 ppm on Nov 16		Hours in Service: 720																														
Minimum Value: 0.000 ppm on Nov 1 01:00		Minimum Daily Average: 0.000 ppm on Nov 1		Hours of Data: 686																														
Maximum Diurnal Average: 0.002 ppm at hour 7		Minimum Diurnal Average: 0.000 ppm at hour 2		Hours of Missing Data: 34																														
Monthly Average: 0.001 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: 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-Nov	0.000	0.000	Z	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	0.000	0.000	0.000	0.000	0.000	0.000	
2-Nov	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	0.012	0.002	0.000	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	0.001	0.012
3-Nov	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	0.000
4-Nov	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.045	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.045	
5-Nov	0.004	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	0.005	0.000	0.000	0.000	0.027	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	
6-Nov	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	0.010	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.030	
7-Nov	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	0.021	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.021	
8-Nov	0.000	0.000	0.000	Z	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.043	
9-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.025	
10-Nov	0.000	0.000	0.000	0.000	0.000	Z	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	0.000	0.000	0.000	0.000	0.000	
11-Nov	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	0.000	0.000	0.000	
12-Nov	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	0.000	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-Nov	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	0.005	0.002	0.003	0.000	0.031	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.031	
14-Nov	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	0.000	
15-Nov	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	
16-Nov	0.001	0.000	0.000	0.000	0.000	Z	0.049	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.049		
17-Nov	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	0.000	0.000	0.000	
18-Nov	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
19-Nov	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.041	
20-Nov	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
21-Nov	0.000	0.000	0.000	0.000	Z	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
22-Nov	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	
23-Nov	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	0.000	0.000	0.000	
24-Nov	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	0.000	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-Nov	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	0.000	
26-Nov	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	0.000	
27-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.007	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	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.012	
28-Nov	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	
29-Nov	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	0.000	0.000	0.000	
30-Nov	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	0.000	0.000	0.000	
																								Diurnal Average										
																								Diurnal Maximum										
																								Z - zerospan C - Calibration										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	669	97.52	97.52
0.006 - 0.05	17	2.48	100.00
0.06 - 0.1	0	0.00	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes - November 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	36	6	4	5	8	37	106	62	76	47	95	68	45	23	26	25	669
0.006 - 0.05	2	0	0	2	0	1	2	3	2	1	3	0	0	1	0	0	17
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	0	0	0	0	0	0	0	0	0
Totals	38	6	4	7	8	38	108	65	78	48	98	68	45	24	26	25	686

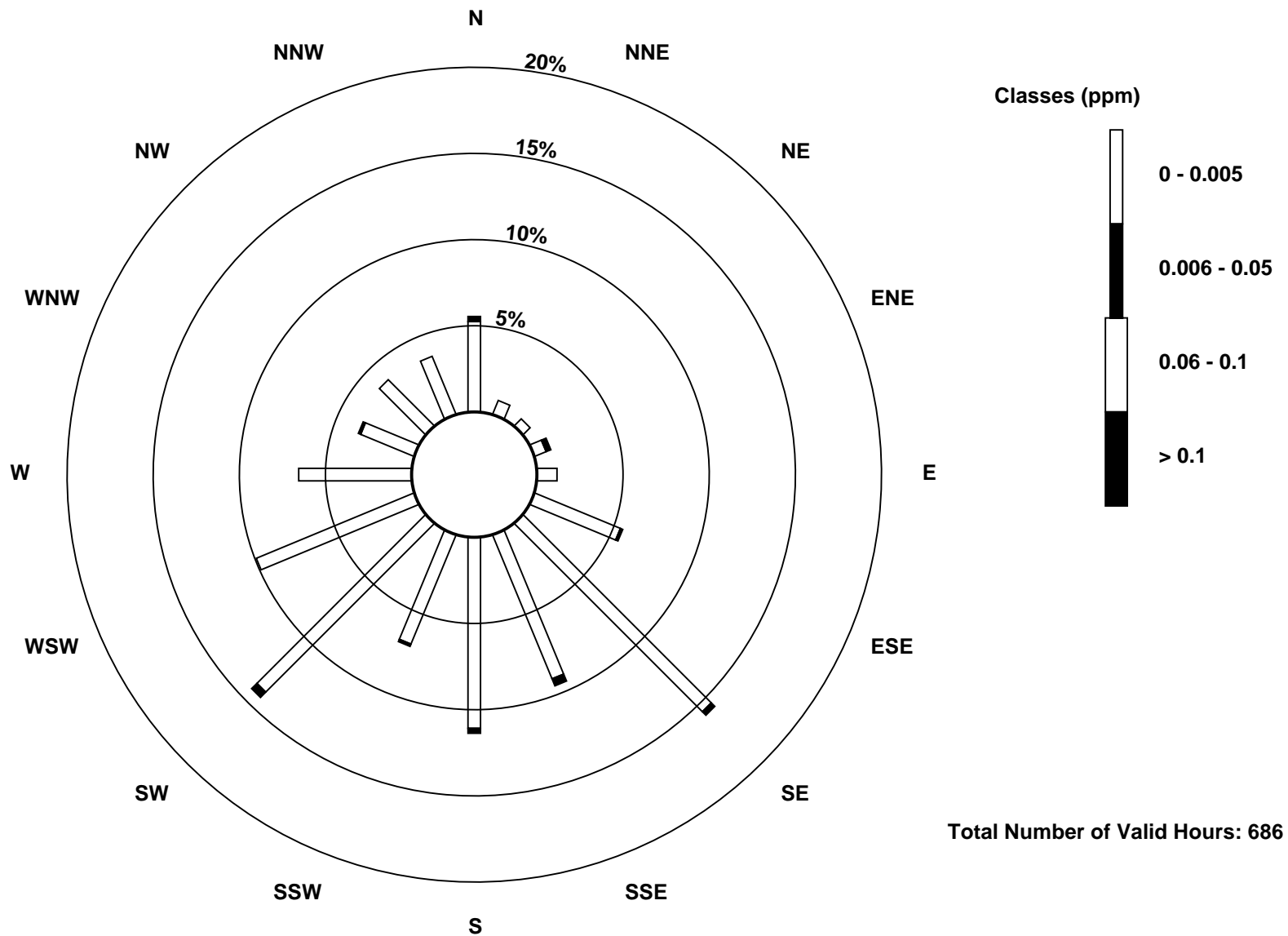
Total Number of Valid Hours: 686

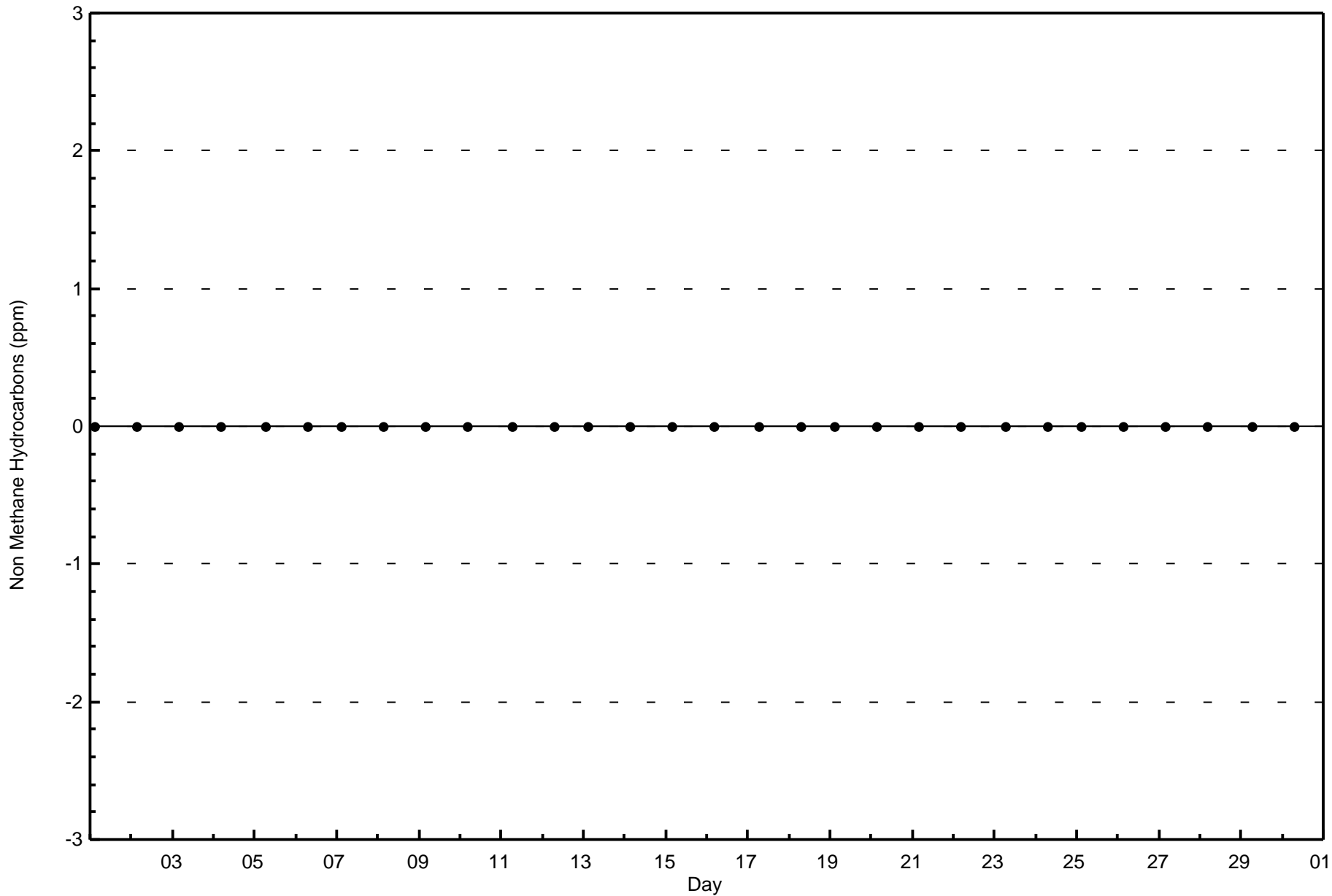
Total Number of Hours: 720

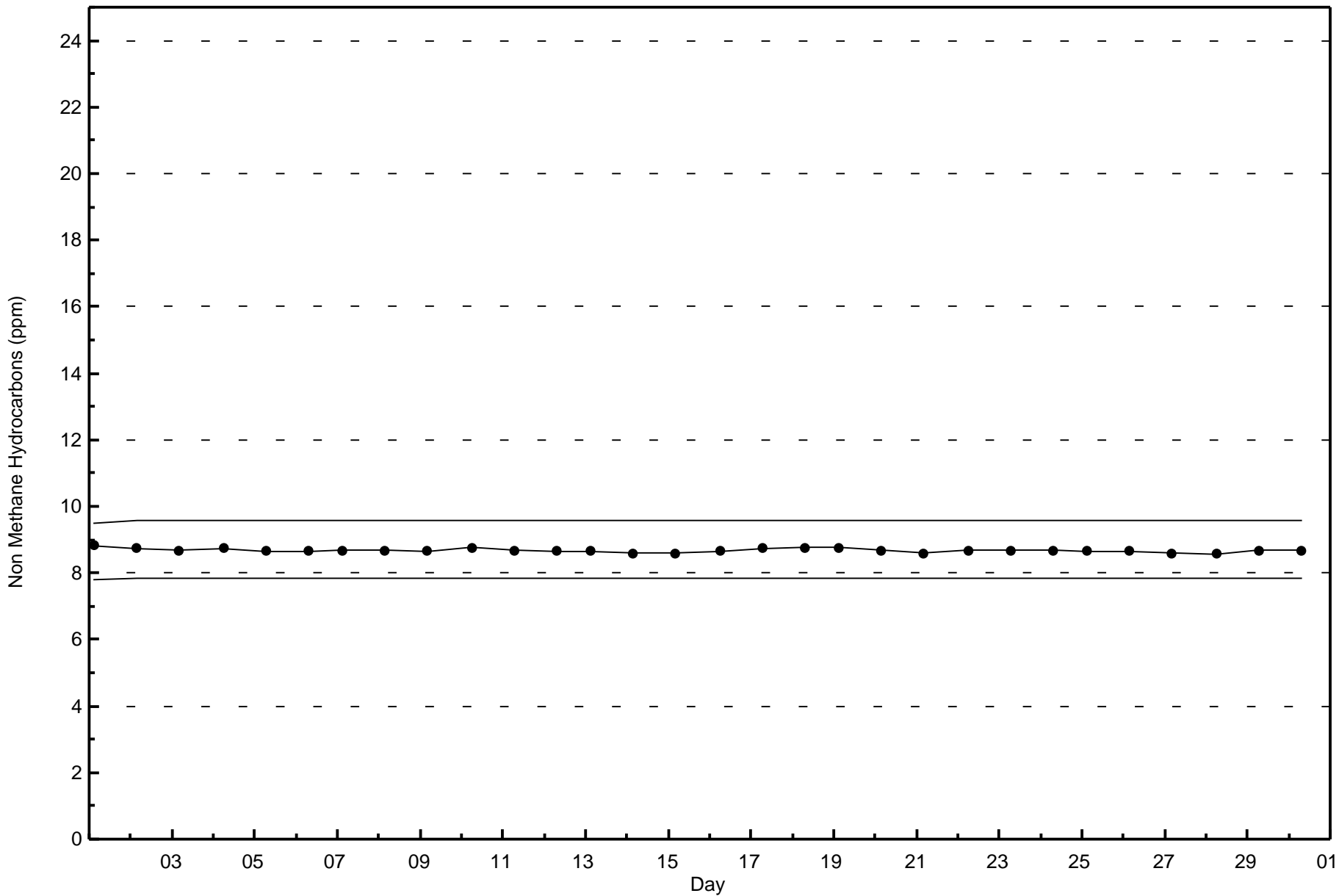


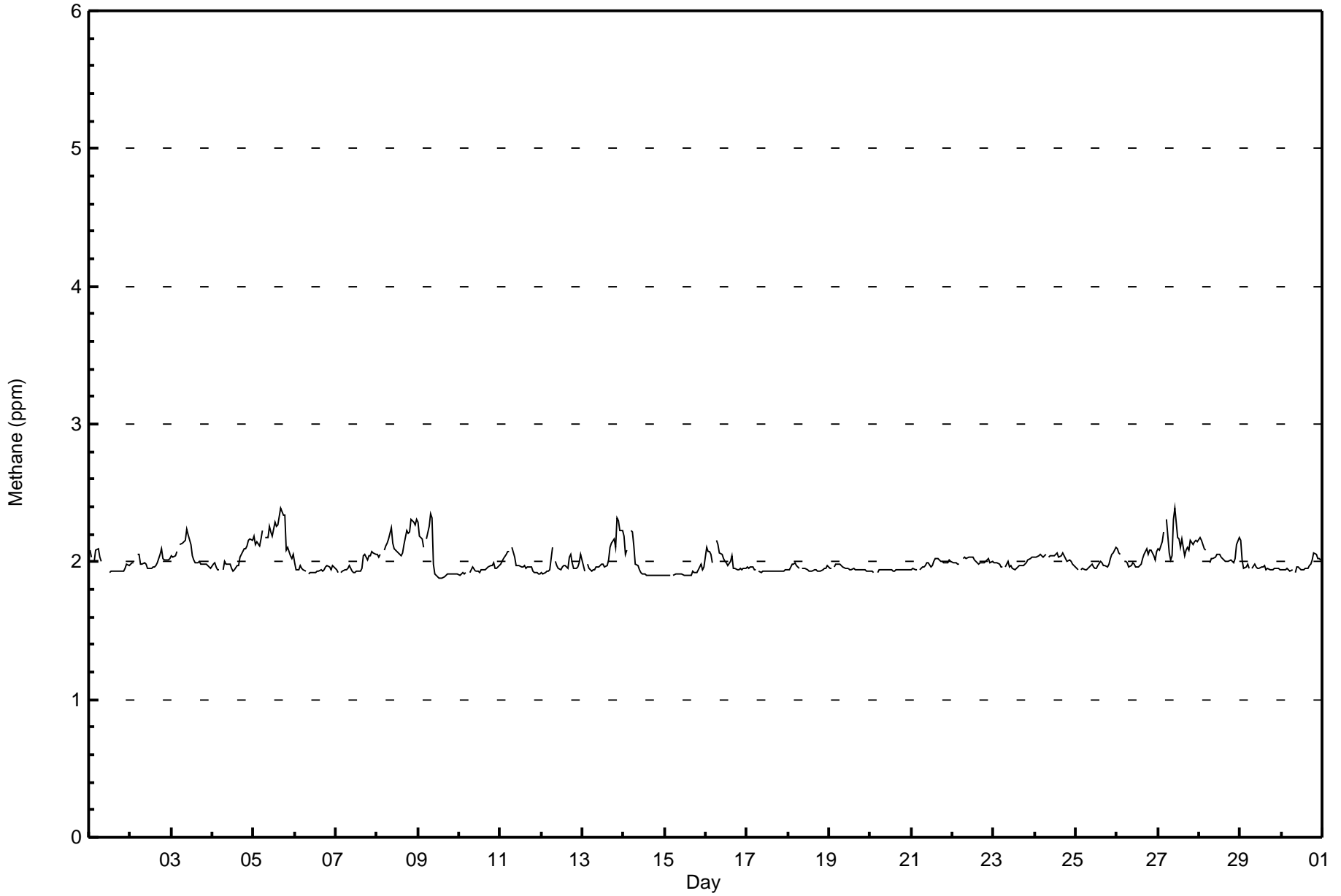
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes (AMS 6)











Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Patricia McInnes - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	533	77.70	77.70
2.1 - 3.0	153	22.30	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Methane (CH₄) - ppm
Patricia McInnes - November 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	26	5	3	7	8	36	90	33	45	38	86	57	45	21	17	16	533
2.1 - 3.0	12	1	1	0	0	2	18	32	33	10	12	11	0	3	9	9	153
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	38	6	4	7	8	38	108	65	78	48	98	68	45	24	26	25	686

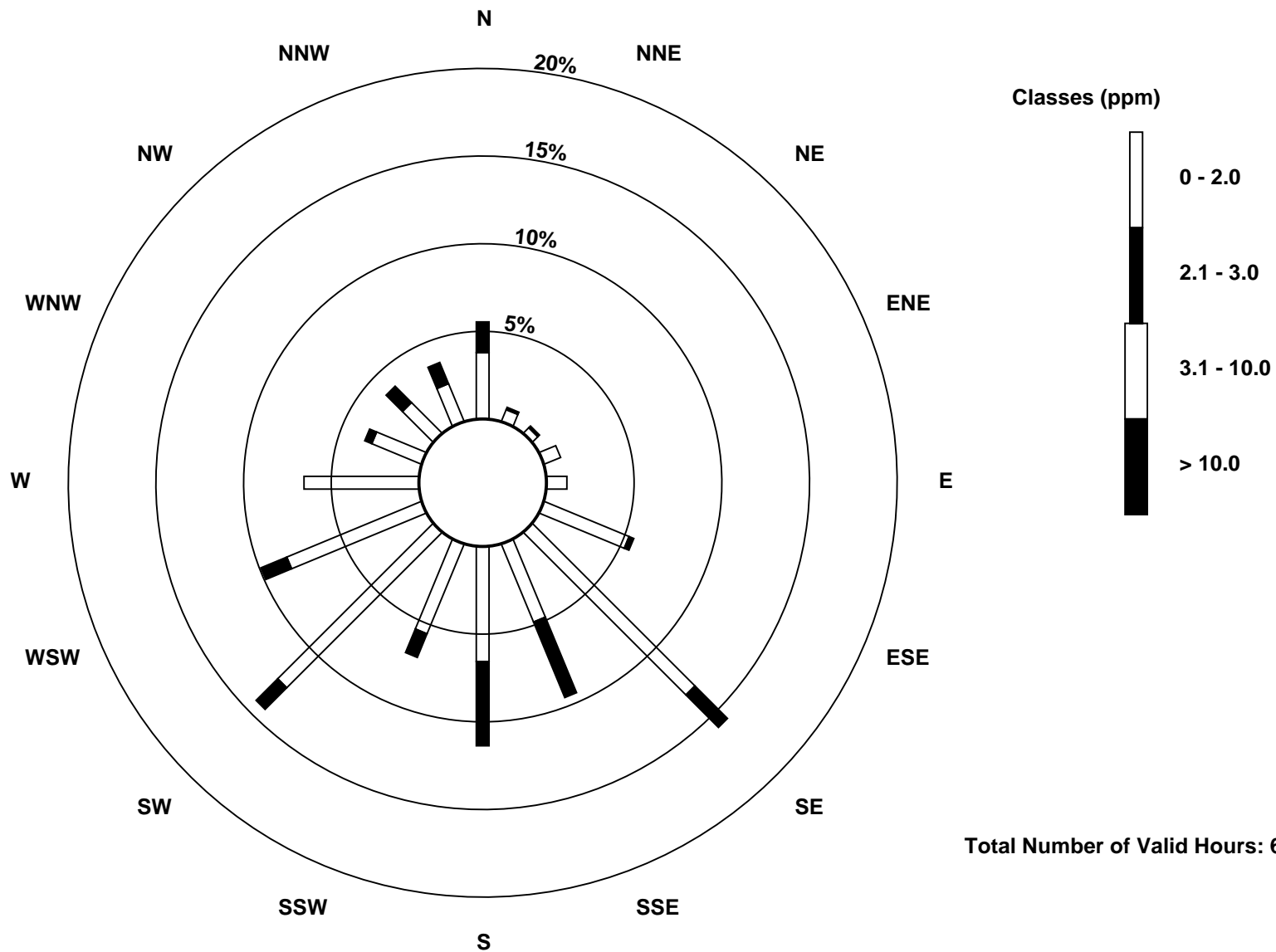
Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Methane (CH₄) - ppm
Patricia McInnes (AMS 6)



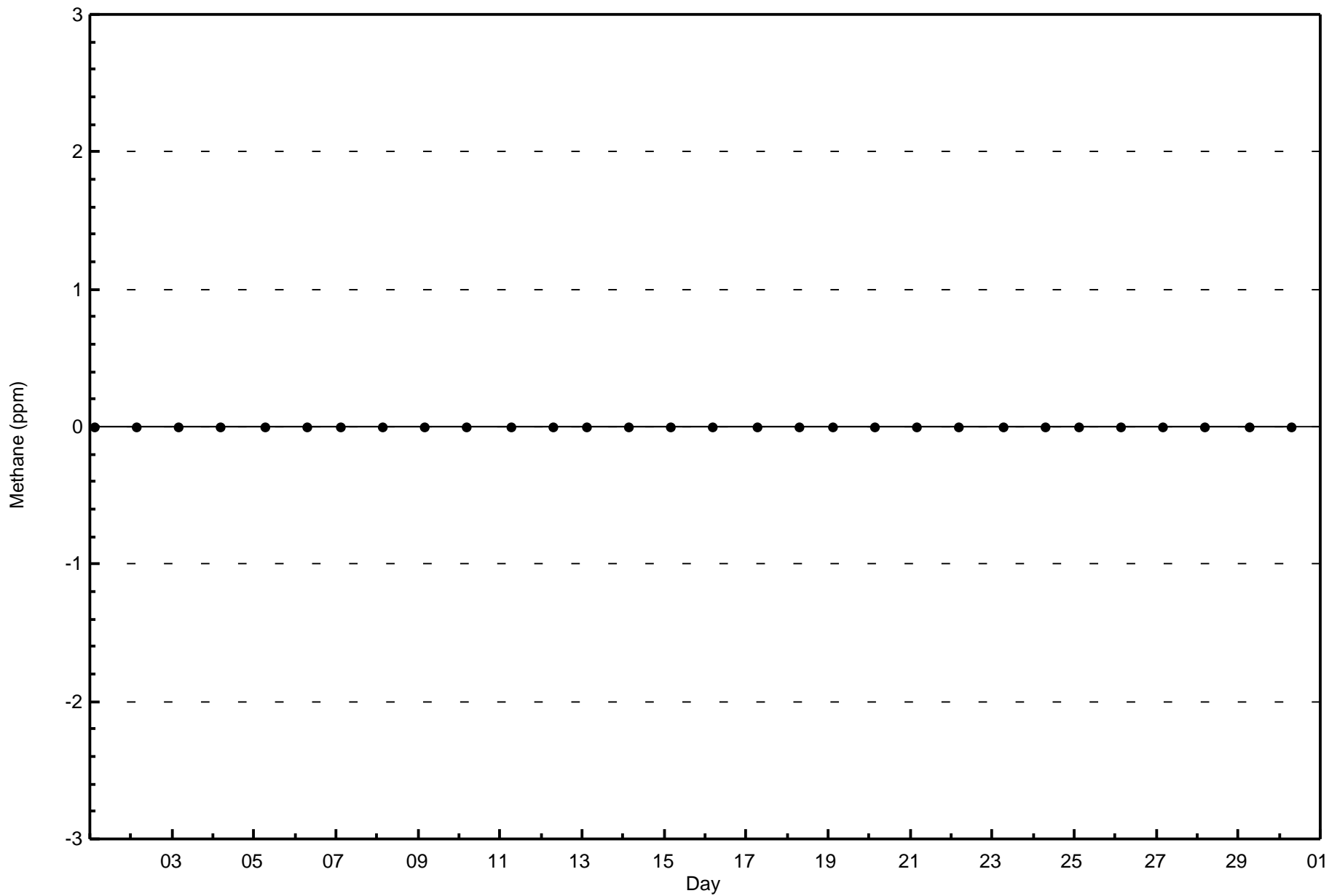


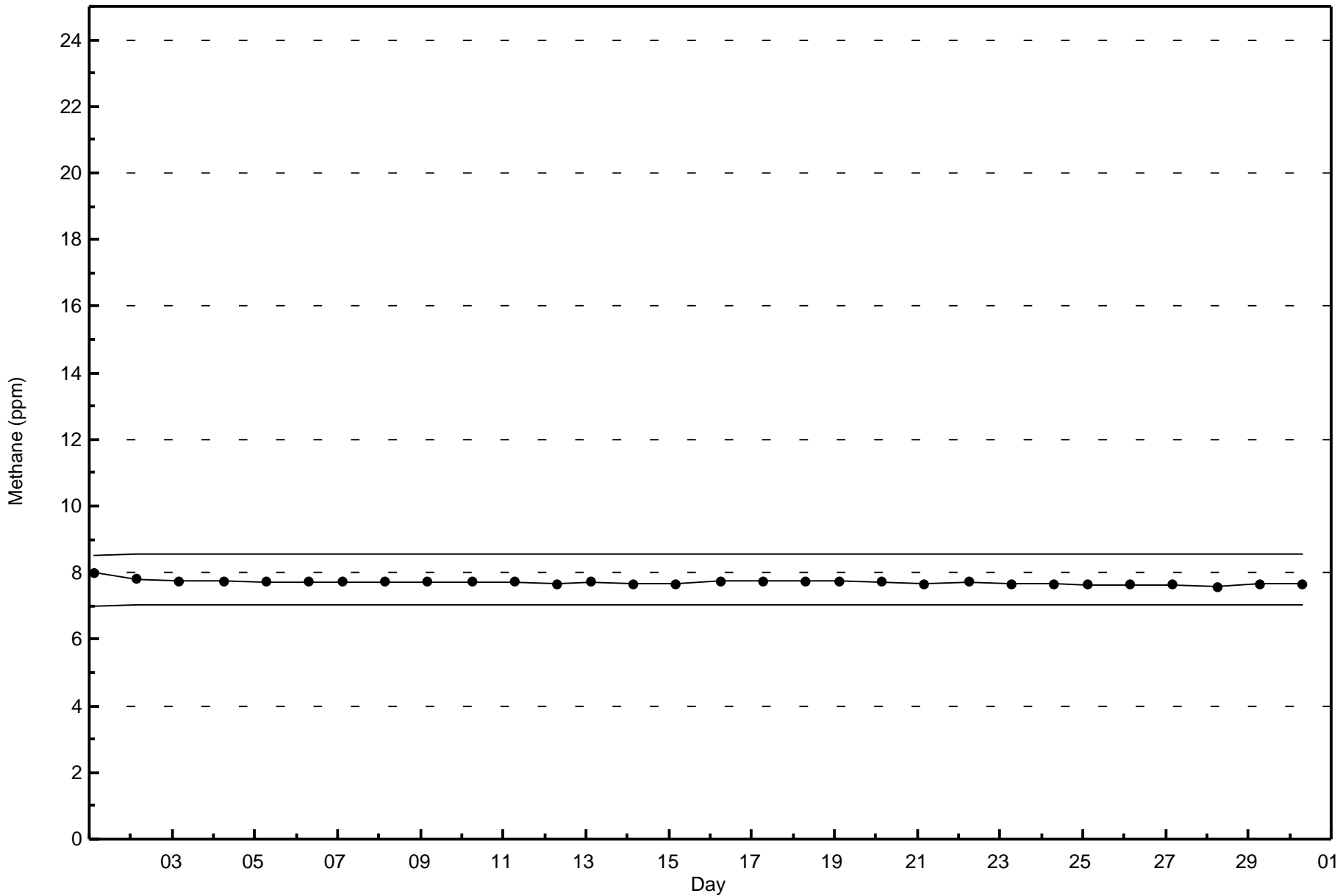
Wood Buffalo Environmental Association

Zero Responses

Methane (CH₄) - ppm

Patricia McInnes - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Patricia McInnes - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 40 ppb on Nov 15 15:00	Maximum Daily Average: 34.9 ppb on Nov 17		Hours of Data:	684
Minimum Value: 5 ppb on Nov 9 08:00	Minimum Daily Average: 10.6 ppb on Nov 8		Hours of Missing Data:	36
Maximum Diurnal Average: 23.8 ppb at hour 14	Minimum Diurnal Average: 18.1 ppb at hour 7		Hours of Calibration:	36
Monthly Average: 21.4 ppb	Percentiles: P ₁ = 5 P ₁₀ = 9 Q ₁ = 14 Median = 22 Q ₃ = 29 P ₉₀ = 34 P ₉₉ = 38		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	23	Z	26	26	20	22	25	29	33	35	34	34	34	33	33	34	35	35	36	36	35	30	29	25	30.4	36
2-Nov	21	18	Z	12	7	5	16	12	14	19	22	23	21	19	17	14	9	5	7	14	16	16	15	14	14.6	23
3-Nov	13	15	14	Z	9	7	7	9	7	5	7	9	14	19	22	22	21	24	25	24	25	28	30	32	17.0	32
4-Nov	30	27	32	31	Z	28	28	19	19	22	23	27	27	28	24	18	9	10	8	6	10	9	9	9	19.6	32
5-Nov	12	13	16	16	12	Z	6	8	8	6	12	15	16	15	12	9	6	7	6	21	17	20	23	22	13.0	23
6-Nov	27	35	35	34	34	35	Z	36	36	33	33	33	36	35	34	31	32	29	19	17	22	28	24	27	30.7	36
7-Nov	29	Z	29	29	29	28	27	25	22	29	30	31	32	33	33	27	9	6	12	8	11	7	9	15	22.2	33
8-Nov	22	20	Z	17	15	13	8	5	5	10	13	13	14	15	15	12	6	8	5	6	6	6	6	5	10.6	22
9-Nov	6	9	8	Z	5	7	5	5	5	C	C	C	C	C	C	36	36	36	36	35	35	36	35	34	--	36
10-Nov	32	31	30	30	Z	24	24	22	15	24	25	26	28	26	26	26	24	19	20	24	21	27	27	25	25.0	32
11-Nov	25	25	25	24	20	Z	12	11	18	23	20	22	23	24	25	28	27	25	21	30	32	34	34	34	24.5	34
12-Nov	34	33	33	32	31	26	Z	13	15	21	26	27	23	21	23	25	16	16	21	26	26	23	21	13	23.6	34
13-Nov	23	Z	31	22	26	26	25	27	21	21	19	17	15	20	21	14	7	5	6	6	6	5	5	5	16.1	31
14-Nov	9	16	Z	10	9	13	12	20	23	26	28	29	30	33	34	36	38	38	38	36	35	36	36	37	27.0	38
15-Nov	37	37	37	Z	34	32	31	31	30	29	30	35	38	39	40	39	28	33	35	36	23	19	26	19	32.1	40
16-Nov	6	9	9	9	Z	13	10	7	9	10	15	19	20	23	19	18	25	25	27	28	28	29	30	29	18.1	30
17-Nov	31	32	34	33	34	Z	37	35	37	36	37	35	34	35	36	37	37	38	38	36	34	33	32	31	34.9	38
18-Nov	31	29	23	20	15	18	Z	24	24	24	24	30	36	36	36	35	35	35	35	35	31	29	28	25	28.6	36
19-Nov	26	Z	21	22	20	19	18	21	25	26	26	25	26	25	24	26	29	28	29	29	31	31	31	31	25.7	31
20-Nov	31	30	Z	30	29	29	30	29	28	27	26	25	25	25	24	24	22	21	21	22	22	21	22	22	25.5	31
21-Nov	22	22	22	Z	19	18	15	14	12	14	14	17	18	19	20	18	18	17	16	16	16	16	15	18	17.2	22
22-Nov	23	21	21	18	Z	18	13	13	10	8	9	10	11	12	15	14	15	20	19	17	16	16	15	18	15.3	23
23-Nov	18	18	18	20	19	Z	20	20	20	19	21	25	26	26	24	22	23	23	24	25	24	23	22	21	21.8	26
24-Nov	20	18	18	16	16	14	Z	11	11	12	12	12	12	11	12	11	7	9	13	18	17	19	20	22	14.4	22
25-Nov	22	Z	23	23	24	24	24	24	24	24	23	23	23	23	22	20	20	20	18	17	16	17	16	13	21.1	24
26-Nov	14	13	Z	16	17	19	21	25	23	21	24	27	28	26	24	11	11	11	12	11	10	14	20	19	18.1	28
27-Nov	19	18	14	Z	5	5	9	15	11	8	10	11	14	11	11	13	11	11	13	11	11	11	10	8	11.3	19
28-Nov	8	10	11	8	Z	13	11	10	10	11	11	12	12	13	13	12	11	11	10	15	17	15	13	9	11.7	17
29-Nov	6	13	19	18	17	Z	16	16	10	15	16	20	17	14	16	26	26	26	28	29	28	27	29	31	20.2	31
30-Nov	30	31	31	30	29	29	Z	30	31	30	31	30	31	30	28	30	29	30	30	29	30	31	30	32	30.0	32

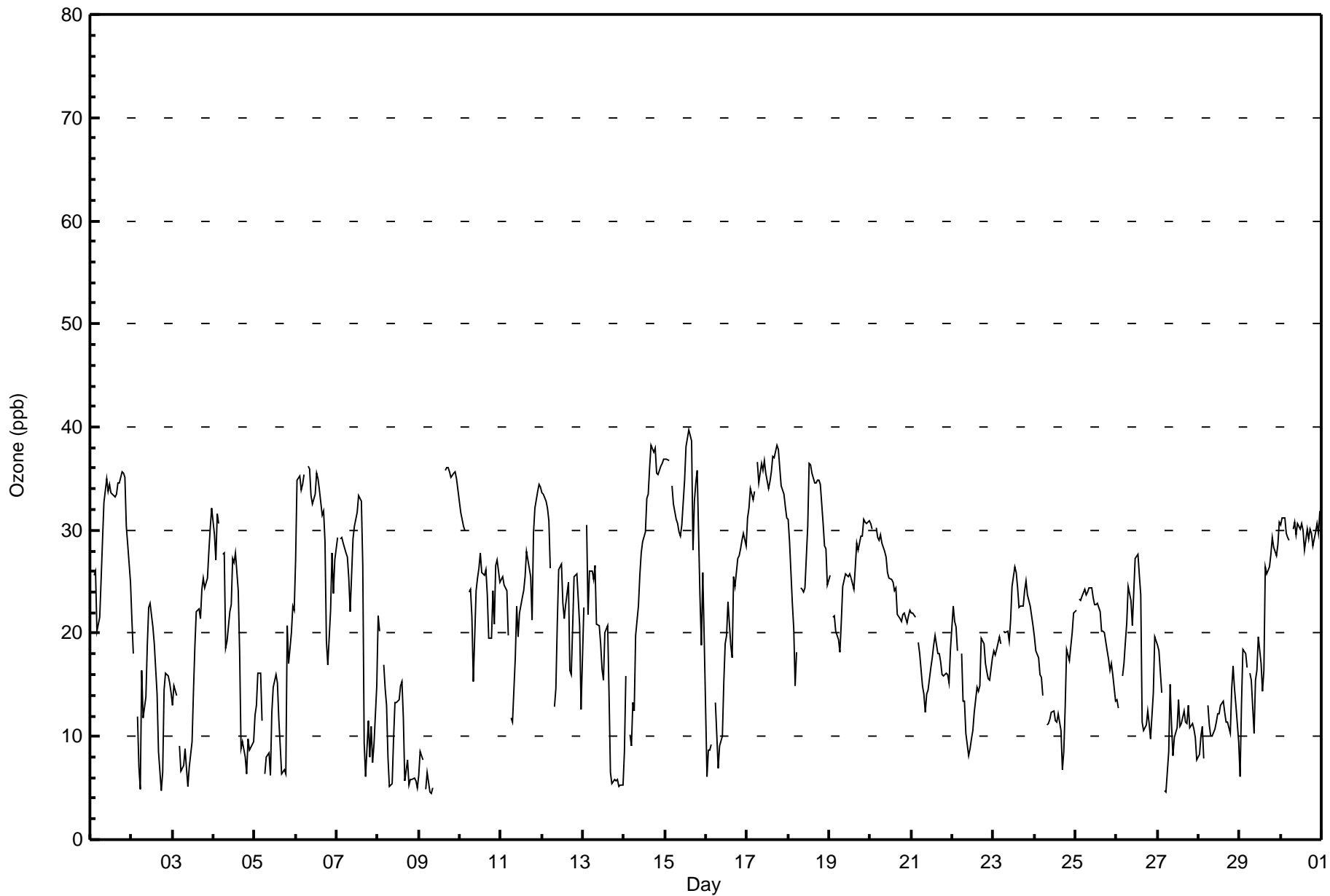
21.6	21.8	23.1	21.8	19.8	19.4	18.1	18.8	18.6	20.3	21.5	22.9	23.5	23.8	23.5	23.0	20.7	20.7	20.9	22.0	21.8	21.8	22.0	21.5	Diurnal Average		
37	37	37	34	34	35	37	36	37	36	37	35	38	39	40	39	38	38	38	38	36	35	36	36	37	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Patricia McInnes - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	313	45.76	45.76
21 - 50	371	54.24	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - 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	21	4	1	1	4	6	55	49	53	28	25	24	1	8	16	17	313
21 - 50	16	3	3	6	5	29	54	16	26	20	74	43	39	17	13	7	371
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	37	7	4	7	9	35	109	65	79	48	99	67	40	25	29	24	684

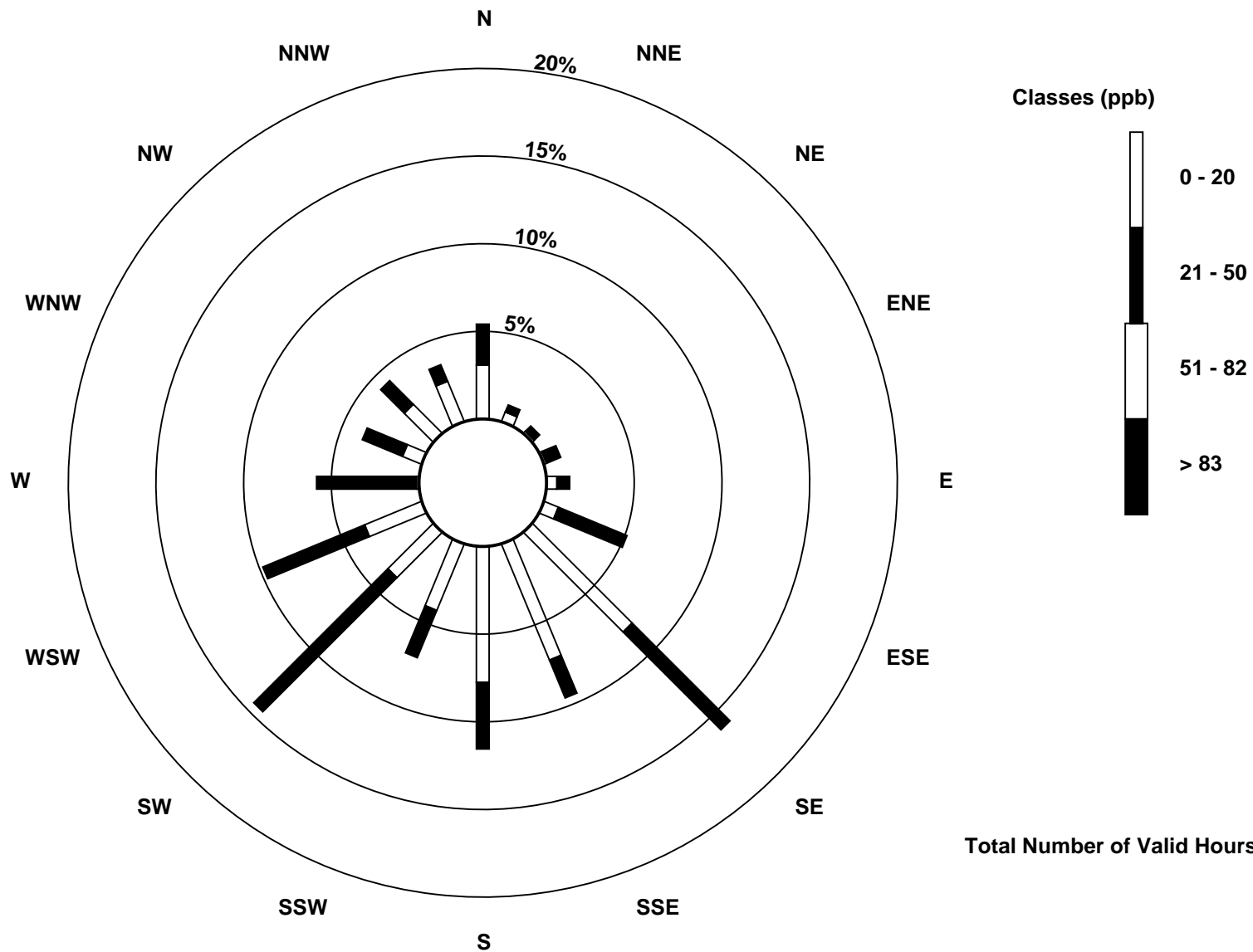
Total Number of Valid Hours: 684

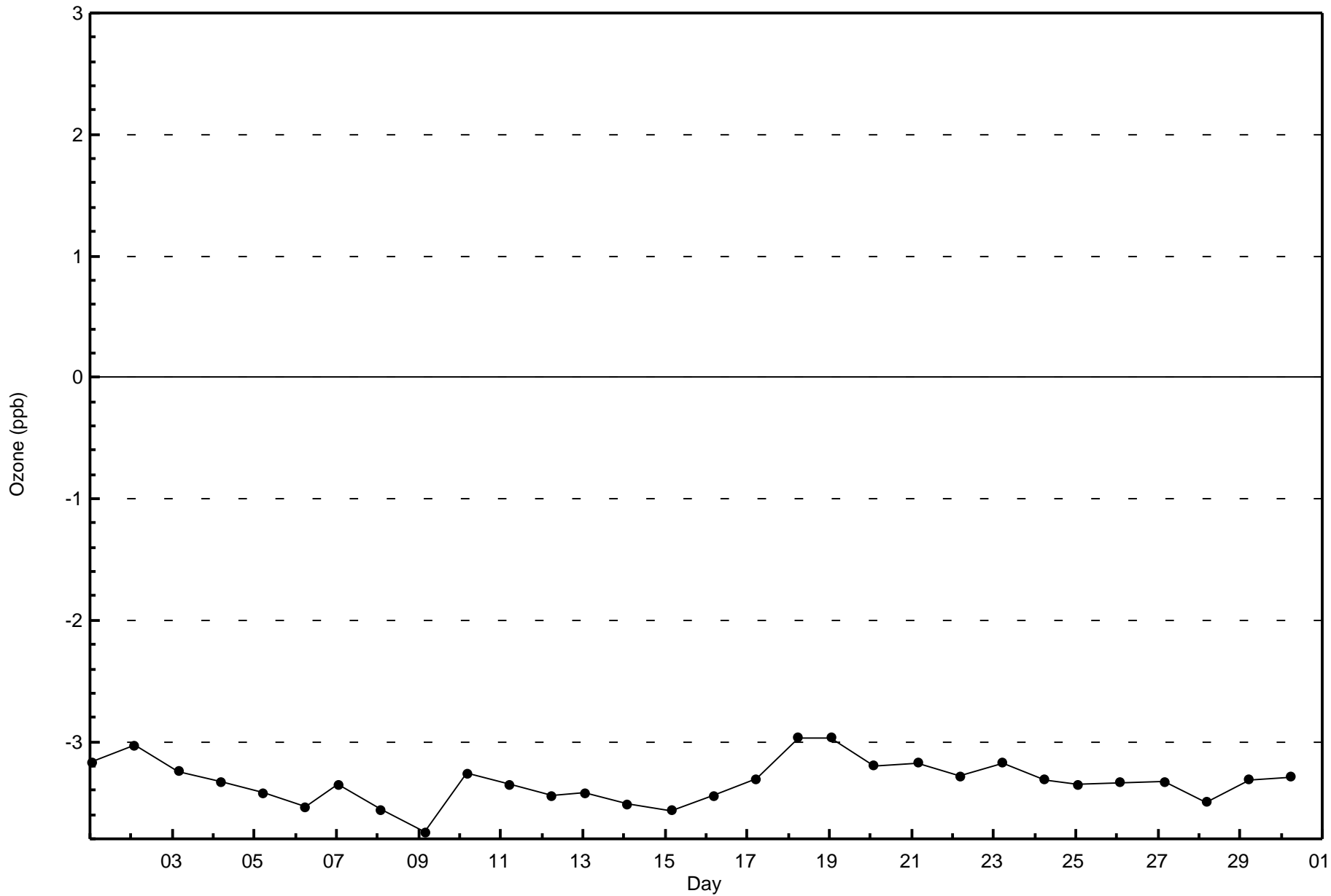
Total Number of Hours: 720

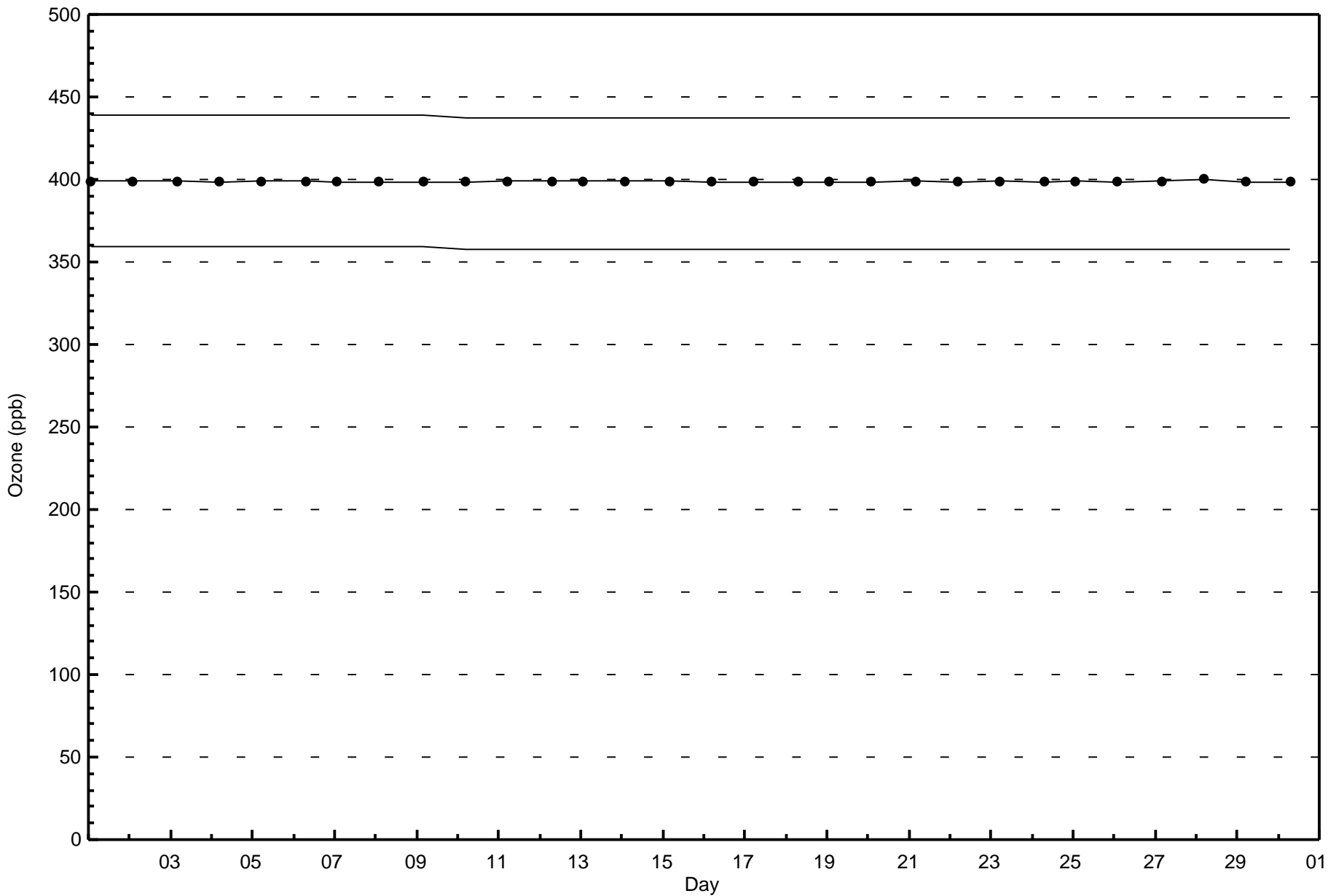


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Patricia McInnes (AMS 6)







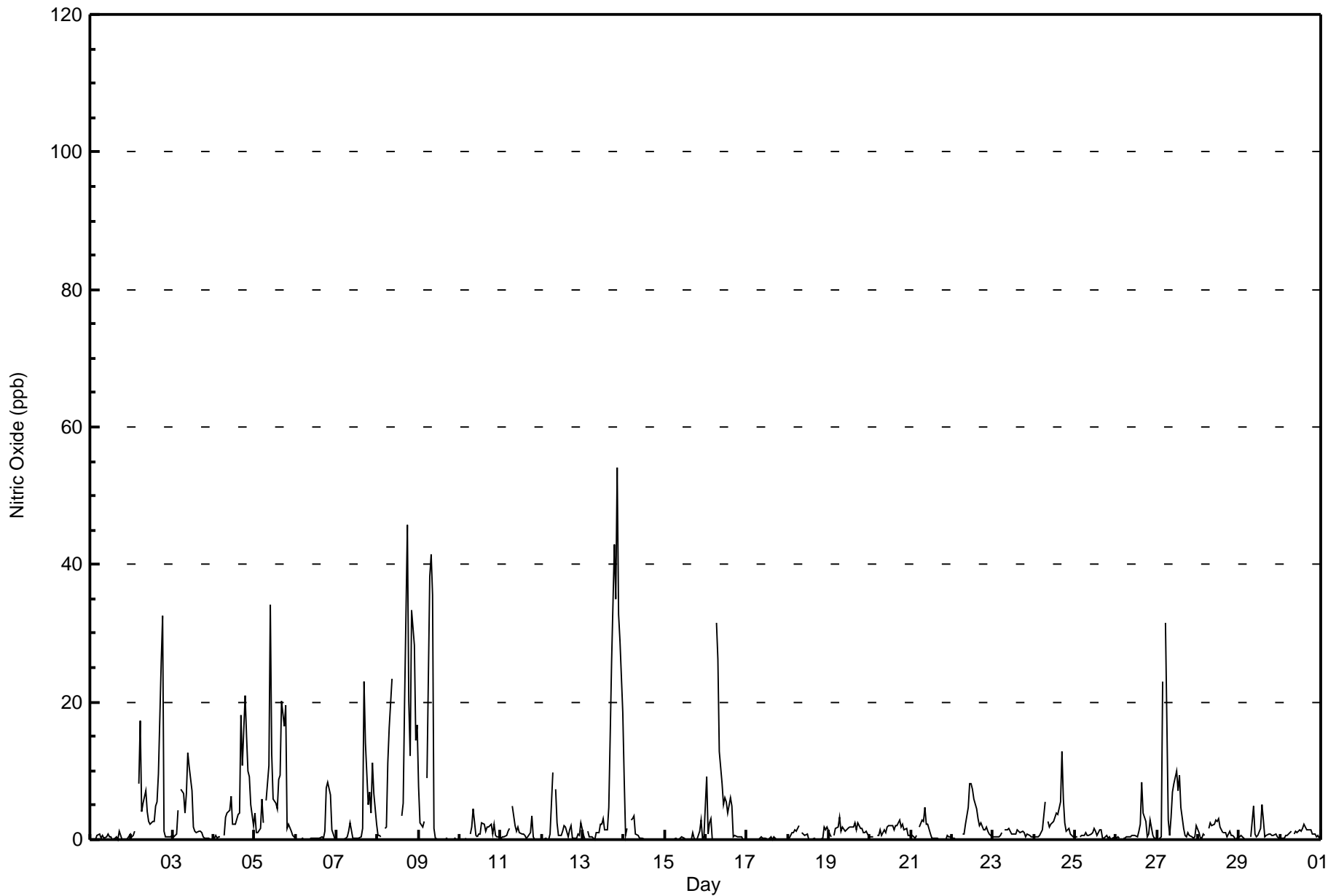


Maximum Value: 54 ppb on Nov 13 21:00																	Maximum Daily Average: 14.2 ppb on Nov 8																	Hours in Service: 720			
Minimum Value: 0 ppb on Nov 1 02:00																	Minimum Daily Average: 0.1 ppb on Nov 17																	Hours of Data: 685			
Maximum Diurnal Average: 5.6 ppb at hour 19																	Minimum Diurnal Average: 0.4 ppb at hour 2																	Hours of Missing Data: 35			
Monthly Average: 2.9 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 7 P ₉₉ = 35																	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	Z	0	1	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0.3	1											
2-Nov	0	1	1	Z	8	17	4	5	7	4	3	2	3	3	5	6	9	26	33	1	0	0	0	0	6.0	33											
3-Nov	1	0	1	4	Z	7	7	4	7	13	11	7	2	1	1	1	1	1	0	0	0	0	0	3.0	13												
4-Nov	0	1	0	0	0	Z	1	3	4	4	6	2	2	2	4	4	18	11	21	15	10	9	5	2	5.4	21											
5-Nov	4	1	1	2	6	2	Z	6	11	34	12	6	5	4	9	9	20	16	19	2	2	1	1	0	7.6	34											
6-Nov	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	7	8	7	1	1	0	1.2	8											
7-Nov	0	0	Z	0	0	0	0	1	2	0	0	0	0	0	0	2	23	14	5	7	4	11	7	2	3.5	23											
8-Nov	1	1	0	Z	2	2	11	16	23	C	C	C	C	C	3	5	20	46	20	12	33	28	14	17	14.2	46											
9-Nov	8	2	2	3	Z	9	38	41	36	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.1	41											
10-Nov	0	0	0	0	0	Z	1	2	5	1	0	1	1	2	2	1	2	2	2	2	1	2	1	0	1.1	5											
11-Nov	0	0	0	1	1	2	Z	5	2	1	2	1	1	1	1	0	0	1	3	0	0	0	0	0	1.0	5											
12-Nov	0	0	0	0	0	1	10	Z	7	2	1	1	1	2	2	0	1	2	0	0	0	1	1	2	1.5	10											
13-Nov	1	0	Z	1	0	0	0	0	1	1	2	2	3	1	1	5	15	26	43	35	54	33	29	18	11.9	54											
14-Nov	9	1	2	Z	3	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	9											
15-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	0	0	0.3	3											
16-Nov	9	1	2	3	0	Z	32	26	13	8	5	6	5	4	6	5	0	1	0	0	0	0	0	0	5.6	32											
17-Nov	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-Nov	0	0	1	1	1	1	2	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	2	2	2	0.7	2											
19-Nov	1	0	Z	1	2	2	3	1	2	1	1	2	2	2	2	2	1	2	2	2	1	1	1	0	1.5	3											
20-Nov	0	0	0	Z	1	1	1	1	1	1	2	2	2	2	1	2	2	3	2	2	1	2	1	1	1.4	3											
21-Nov	0	1	0	1	Z	2	3	3	5	2	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0.9	5											
22-Nov	0	0	0	0	0	Z	1	1	2	5	8	8	7	6	4	3	2	2	1	1	2	1	1	1	2.5	8											
23-Nov	0	0	0	1	1	1	Z	1	1	2	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0.9	2											
24-Nov	0	0	0	1	1	1	5	Z	3	2	2	3	3	4	4	5	13	6	2	1	2	1	1	0	2.7	13											
25-Nov	0	0	Z	0	1	1	1	1	1	1	1	2	1	1	1	1	0	0	1	0	0	0	0	0	0.7	2											
26-Nov	0	0	0	Z	0	0	0	0	0	1	1	1	0	1	2	8	4	3	0	1	3	1	0	0	1.2	8											
27-Nov	0	0	0	23	Z	31	3	1	3	7	8	10	7	9	5	2	1	0	1	1	0	0	0	2	5.0	31											
28-Nov	1	0	0	1	1	Z	2	2	2	2	3	3	3	2	1	1	1	0	1	1	1	0	0	0	1.2	3											
29-Nov	0	1	0	0	0	0	Z	0	5	1	0	1	2	5	3	0	1	1	1	1	1	1	0	0	1.0	5											
30-Nov	0	0	0	1	1	1	1	Z	1	1	1	1	1	2	2	1	1	1	1	1	1	1	0	1	1.0	2											
																								Diurnal Average													
																								Diurnal Maximum													
1.3 0.4 0.6 1.7 1.2 3.4 5.2 4.9 4.9 3.4 2.6 2.2 1.9 1.9 2.1 2.3 4.7 5.6 5.6 3.1 4.2 3.3 2.2 1.8																																					
9 2 2 23 8 31 38 41 36 34 12 10 7 9 9 9 23 46 43 35 54 33 29 18																																					
Z - zerospan C - Calibration																																					



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Patricia McInnes - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Patricia McInnes - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	663	96.79	96.79
21 - 40	18	2.63	99.42
41 - 80	4	0.58	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
Patricia McInnes - 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	36	6	4	7	8	37	105	55	69	48	97	68	45	26	27	25	663
21 - 40	2	0	0	0	0	1	1	6	6	0	1	0	0	1	0	0	18
11 - 80	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	4
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	38	6	4	7	8	38	107	62	77	48	98	68	45	27	27	25	685

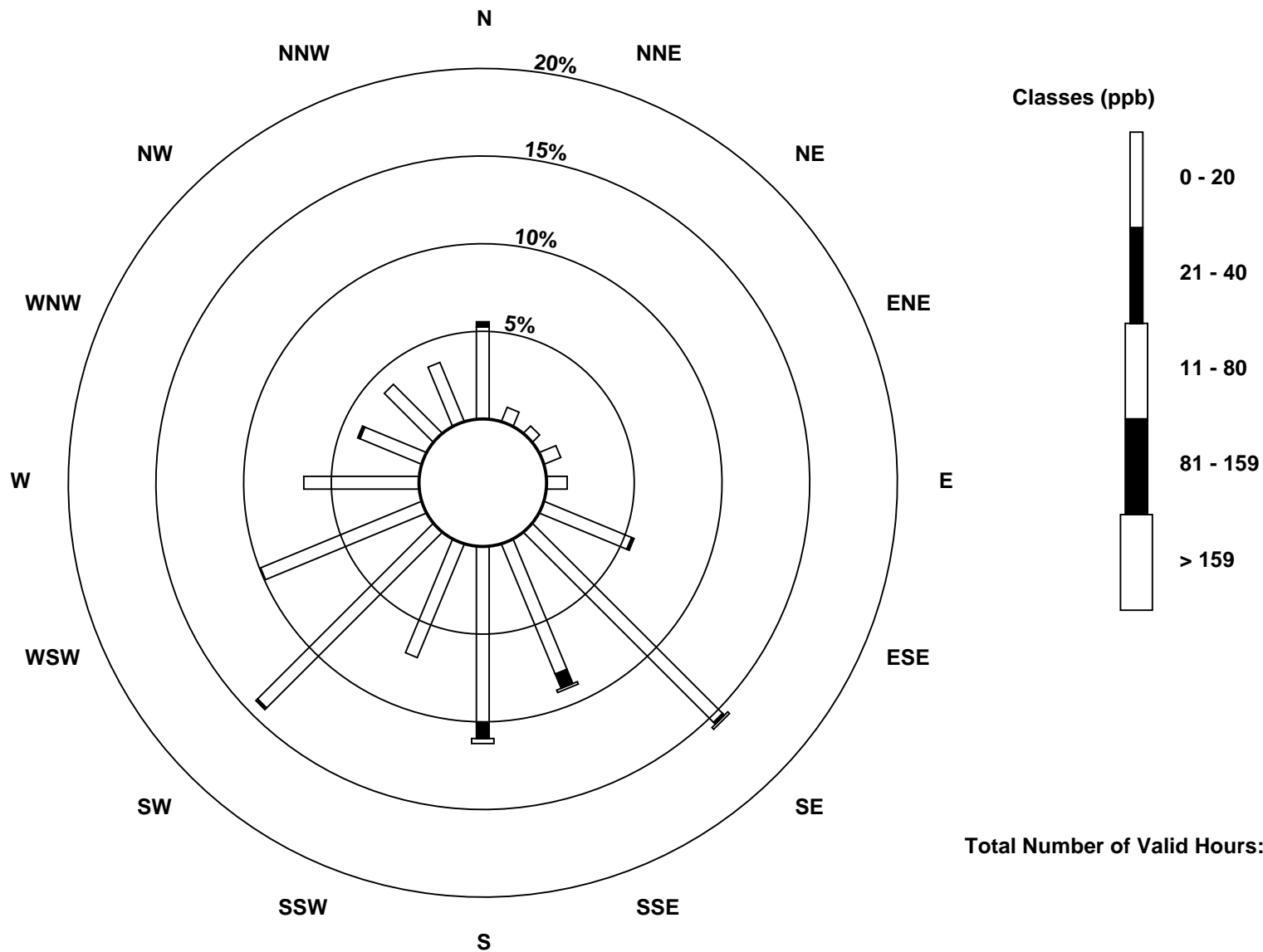
Total Number of Valid Hours: 685

Total Number of Hours: 720

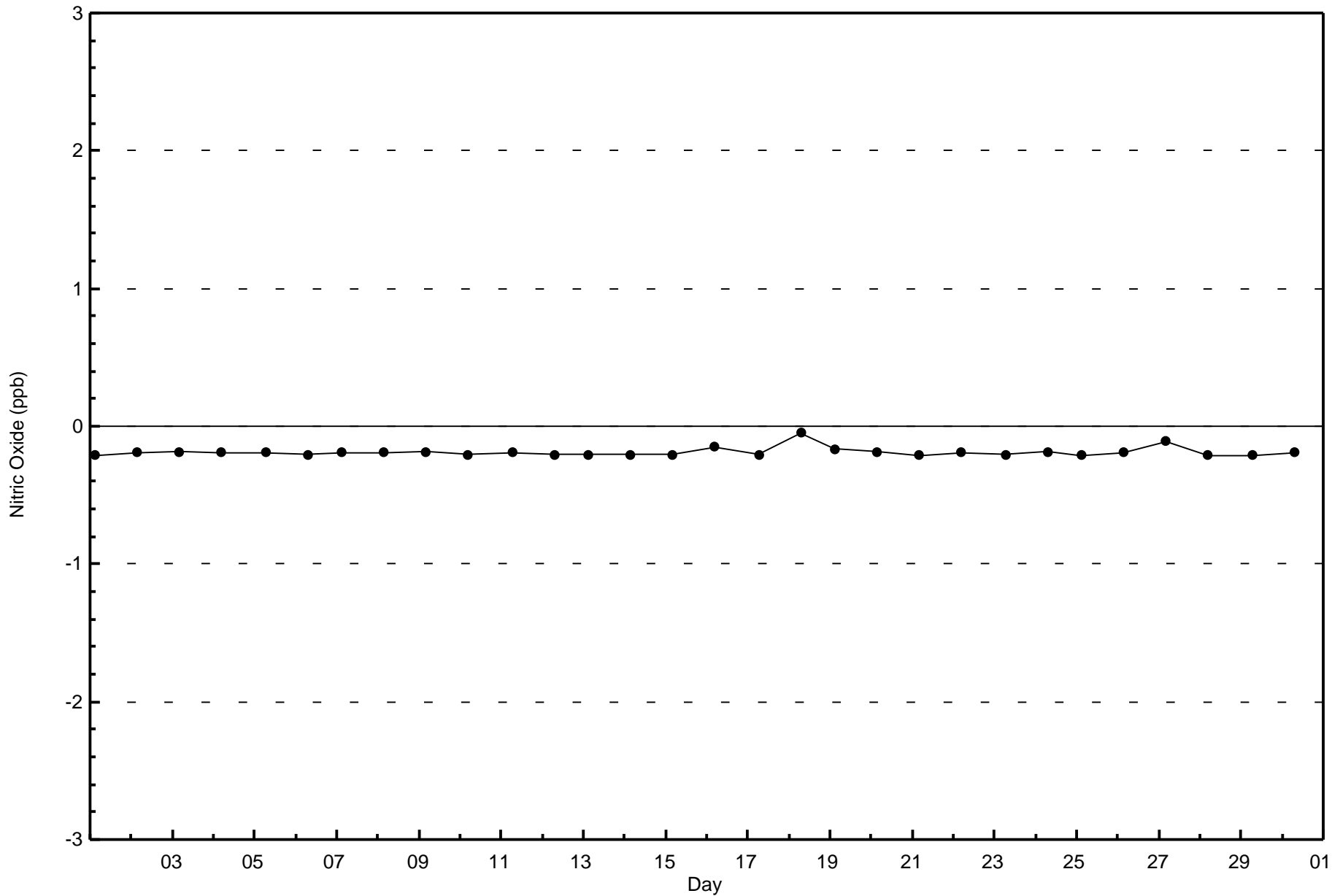


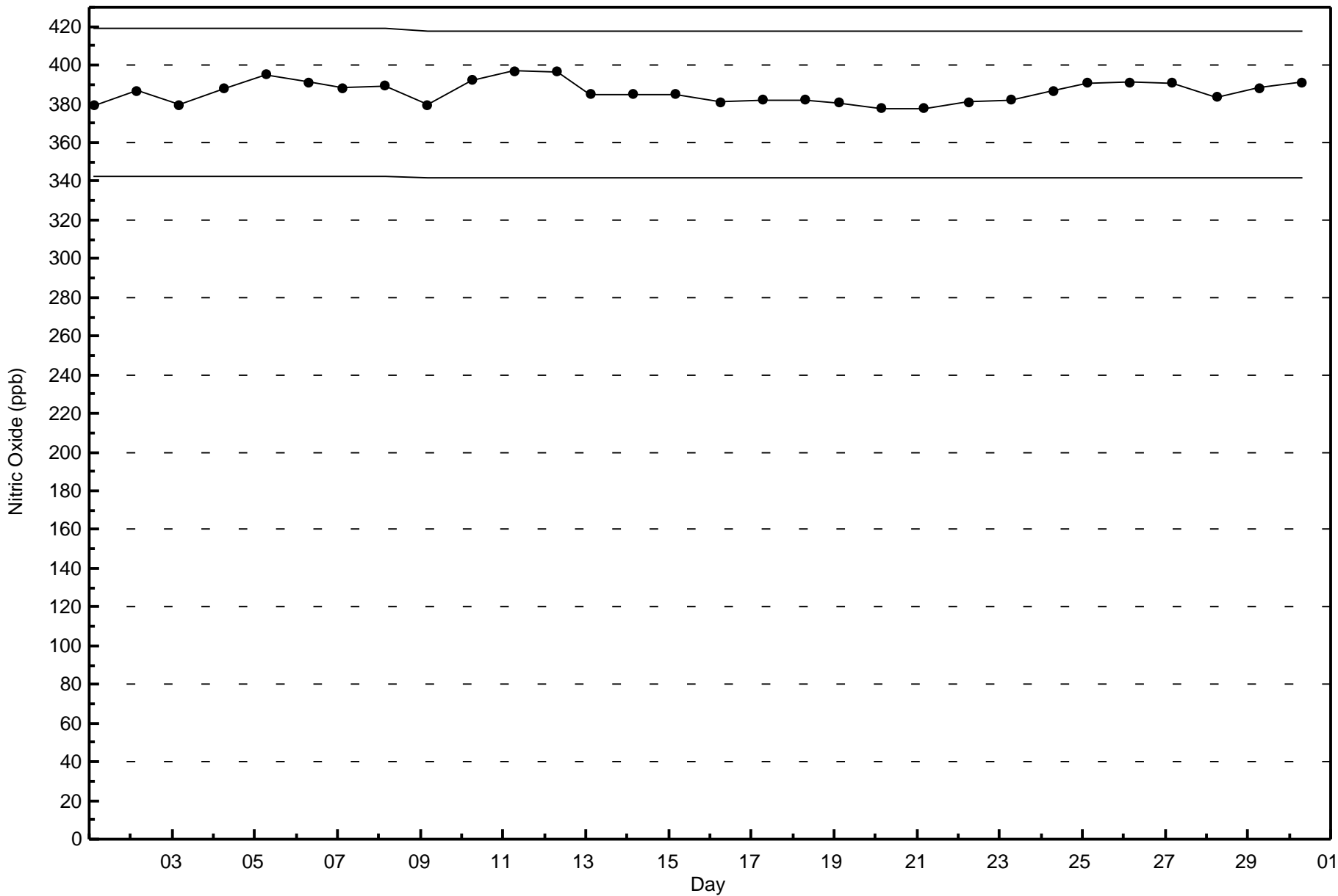
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Patricia McInnes (AMS 6)



Total Number of Valid Hours: 685







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

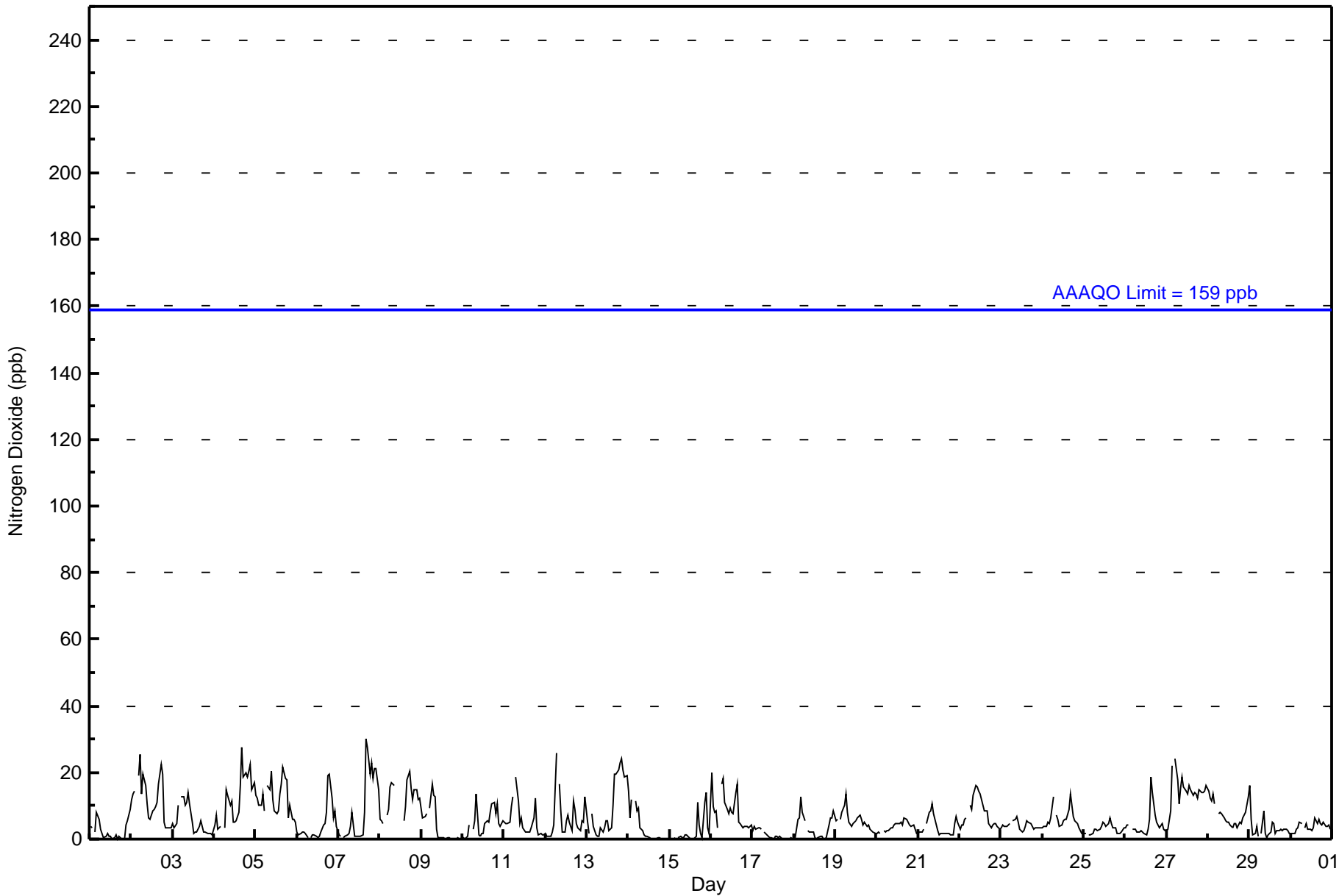
Patricia McInnes - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 30 ppb on Nov 7 17:00 Maximum Daily Average: 14.0 ppb on Nov 27										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 Maximum Diurnal Average: 8.9 ppb at hour 17 Monthly Average: 6.1 ppb										Minimum Daily Average: 1.2 ppb on Nov 17 Minimum Diurnal Average: 3.8 ppb at hour 13 Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 4 O ₃ = 9 P ₉₀ = 15 P ₉₉ = 24																	
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	4	3	Z	2	8	6	3	2	1	1	2	1	1	0	1	1	0	1	0	0	0	4	6	9	2.4	9	
2-Nov	12	14	15	Z	19	25	14	20	16	11	6	6	8	9	10	11	17	22	20	5	3	3	3	4	11.8	25	
3-Nov	5	3	5	10	Z	13	13	10	11	14	10	5	2	2	2	4	6	4	2	2	2	2	2	1	5.6	14	
4-Nov	4	7	3	4	4	Z	4	15	13	10	11	5	5	6	8	16	27	19	20	19	21	23	15	17	11.9	27	
5-Nov	13	12	10	10	14	9	Z	16	15	20	12	9	8	9	14	17	21	18	18	6	10	6	6	5	12.0	21	
6-Nov	2	1	2	2	2	2	0	Z	1	1	1	1	1	1	2	4	5	8	19	19	12	6	8	4	4.5	19	
7-Nov	1	1	Z	0	1	1	2	4	8	1	1	1	1	1	1	8	30	28	19	23	18	21	21	15	9.0	30	
8-Nov	6	6	5	Z	7	9	16	17	16	C	C	C	C	C	5	10	18	20	15	12	15	15	12	12	12.0	20	
9-Nov	9	7	7	8	Z	9	16	13	13	3	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3.8	16	
10-Nov	0	0	1	1	4	Z	3	5	13	1	1	2	2	5	6	5	8	11	11	8	11	5	4	5	4.8	13	
11-Nov	5	5	5	5	10	13	Z	19	11	5	6	3	2	2	2	2	3	6	12	3	1	2	1	1	5.4	19	
12-Nov	2	1	1	1	2	4	26	Z	17	8	2	2	6	7	5	3	11	9	5	4	3	5	5	13	6.1	26	
13-Nov	5	2	Z	8	4	1	1	1	4	2	4	5	6	2	4	10	19	19	21	23	24	21	19	19	9.7	24	
14-Nov	14	6	12	Z	12	9	9	3	3	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	3.1	14	
15-Nov	0	0	0	0	Z	1	1	1	1	1	1	1	0	0	0	1	11	4	2	0	11	14	3	2	2.4	14	
16-Nov	20	10	8	8	3	Z	17	18	11	9	8	9	8	8	14	17	5	5	3	4	4	4	4	4	8.7	20	
17-Nov	3	4	3	4	3	3	Z	2	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	0	1.2	4	
18-Nov	0	1	6	7	13	8	5	Z	3	2	2	2	0	0	0	1	1	0	0	1	4	6	6	9	3.4	13	
19-Nov	6	6	Z	6	8	10	14	8	5	4	5	5	5	6	7	6	4	5	4	4	3	2	2	2	5.5	14	
20-Nov	2	2	2	Z	2	2	3	3	3	3	3	4	5	5	5	4	6	6	5	4	4	4	3	2	3.6	6	
21-Nov	2	2	2	3	Z	5	8	9	11	8	6	3	1	2	2	2	2	2	2	1	1	5	7	5	3.8	11	
22-Nov	3	4	4	6	6	Z	10	9	13	16	16	15	13	12	9	8	8	5	4	4	5	5	4	3	7.8	16	
23-Nov	3	4	4	4	4	5	Z	6	6	7	5	3	2	3	4	5	5	5	4	3	3	3	3	3	4.1	7	
24-Nov	3	4	4	5	5	6	13	Z	7	6	4	4	5	6	6	9	13	10	7	5	5	3	2	2	5.9	13	
25-Nov	2	2	Z	1	1	2	3	3	3	3	4	5	5	4	5	6	5	3	3	2	2	2	2	3	3.0	6	
26-Nov	3	4	4	Z	3	3	3	2	2	3	2	2	1	3	6	19	14	7	5	4	3	5	3	3	4.5	19	
27-Nov	3	3	9	22	Z	24	18	11	15	19	16	14	13	16	15	13	14	14	12	15	14	14	14	16	14.0	24	
28-Nov	15	12	11	14	10	Z	8	8	8	6	6	5	5	4	4	5	5	3	5	5	6	7	8	13	7.5	15	
29-Nov	16	6	1	2	4	1	Z	2	8	2	1	1	2	5	5	2	3	3	3	3	3	3	3	2	3.4	16	
30-Nov	2	2	2	3	4	5	5	Z	4	5	3	3	2	4	6	5	6	5	4	5	4	4	4	3	3.8	6	
5.4 4.4 5.0 5.4 6.1 7.0 8.5 8.2 8.0 5.9 4.8 4.0 3.8 4.2 4.9 6.5 8.9 8.1 7.5 6.1 6.4 6.5 5.7 5.8 20 14 15 22 19 25 26 20 17 20 16 15 13 16 15 19 30 28 21 23 24 23 21 19																								Diurnal Average Diurnal Maximum			
Z - zeronspan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	667	97.37	97.37
21 - 40	18	2.63	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
Patricia McInnes - 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	36	6	4	7	8	37	104	55	73	47	98	68	45	27	27	25	667
21 - 40	2	0	0	0	0	1	3	7	4	1	0	0	0	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	38	6	4	7	8	38	107	62	77	48	98	68	45	27	27	25	685

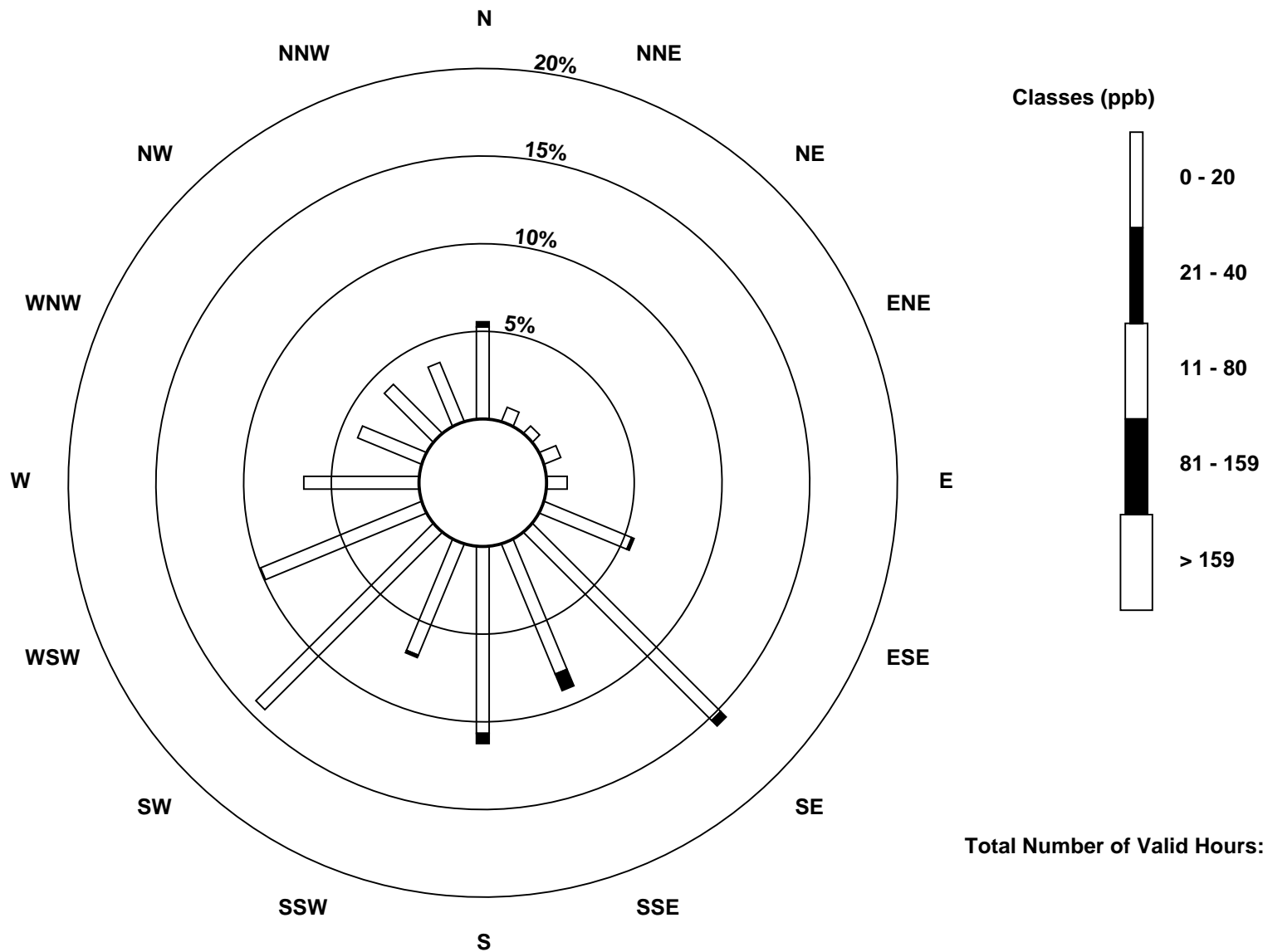
Total Number of Valid Hours: 685

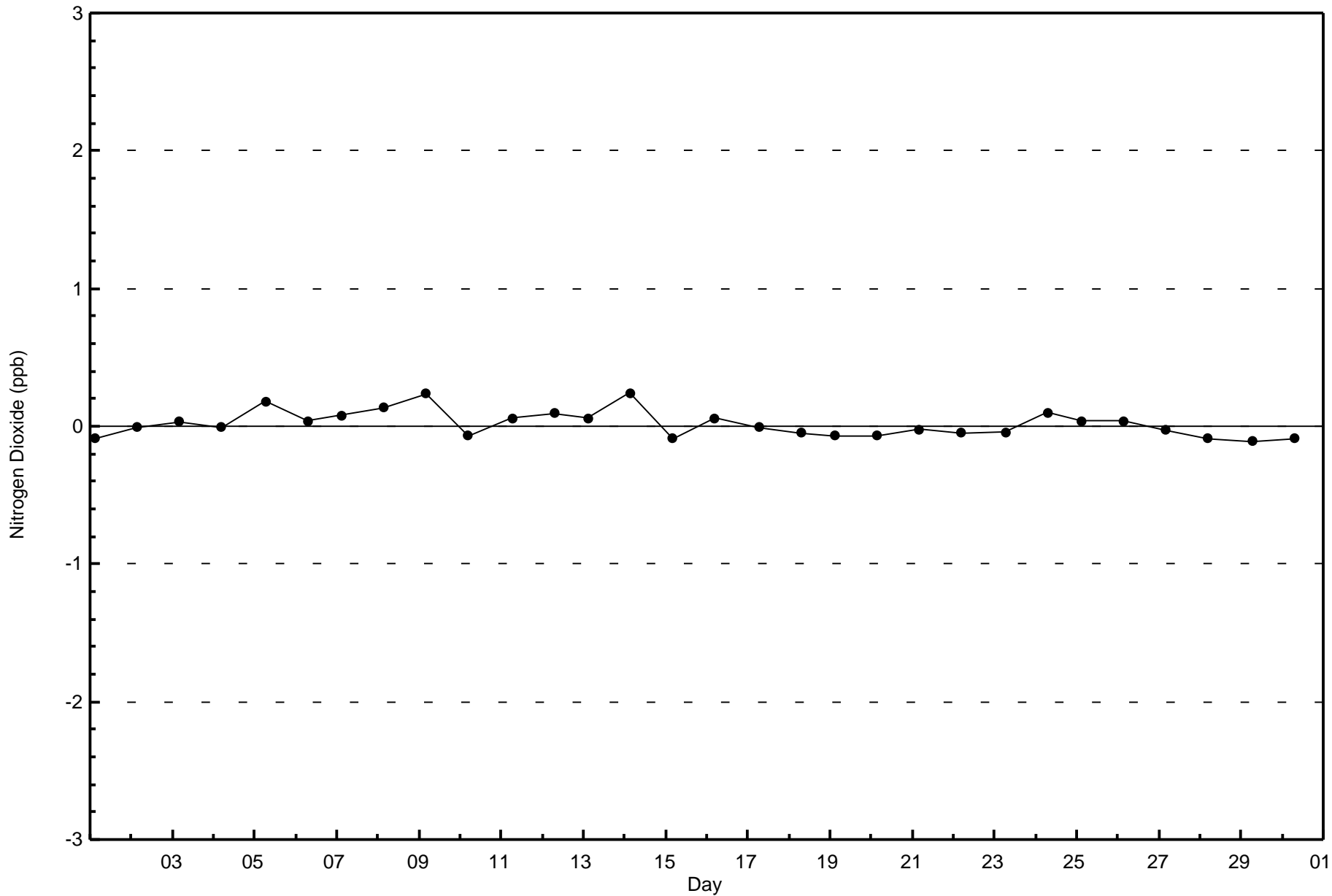
Total Number of Hours: 720

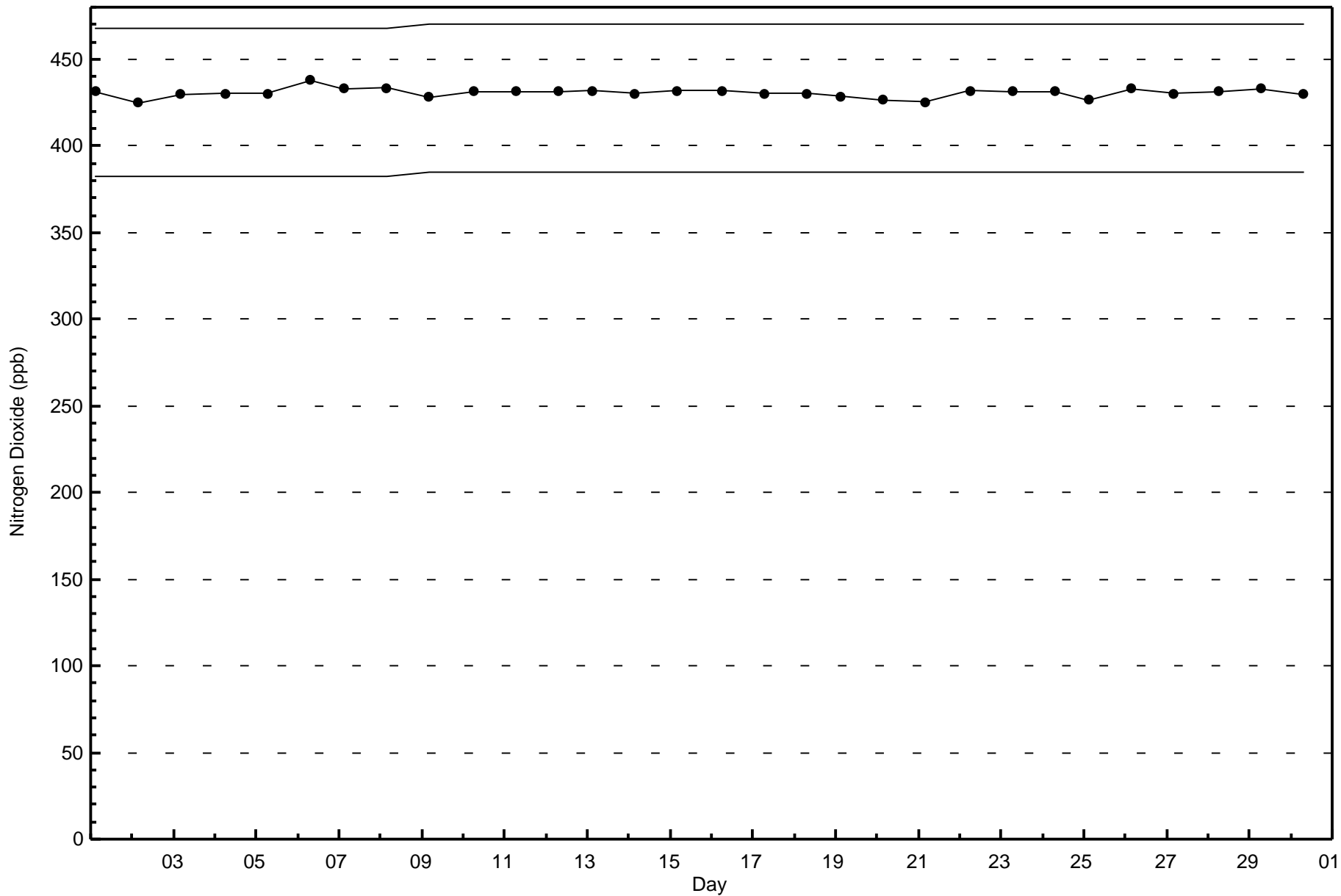


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association
Summary of Hour Averages

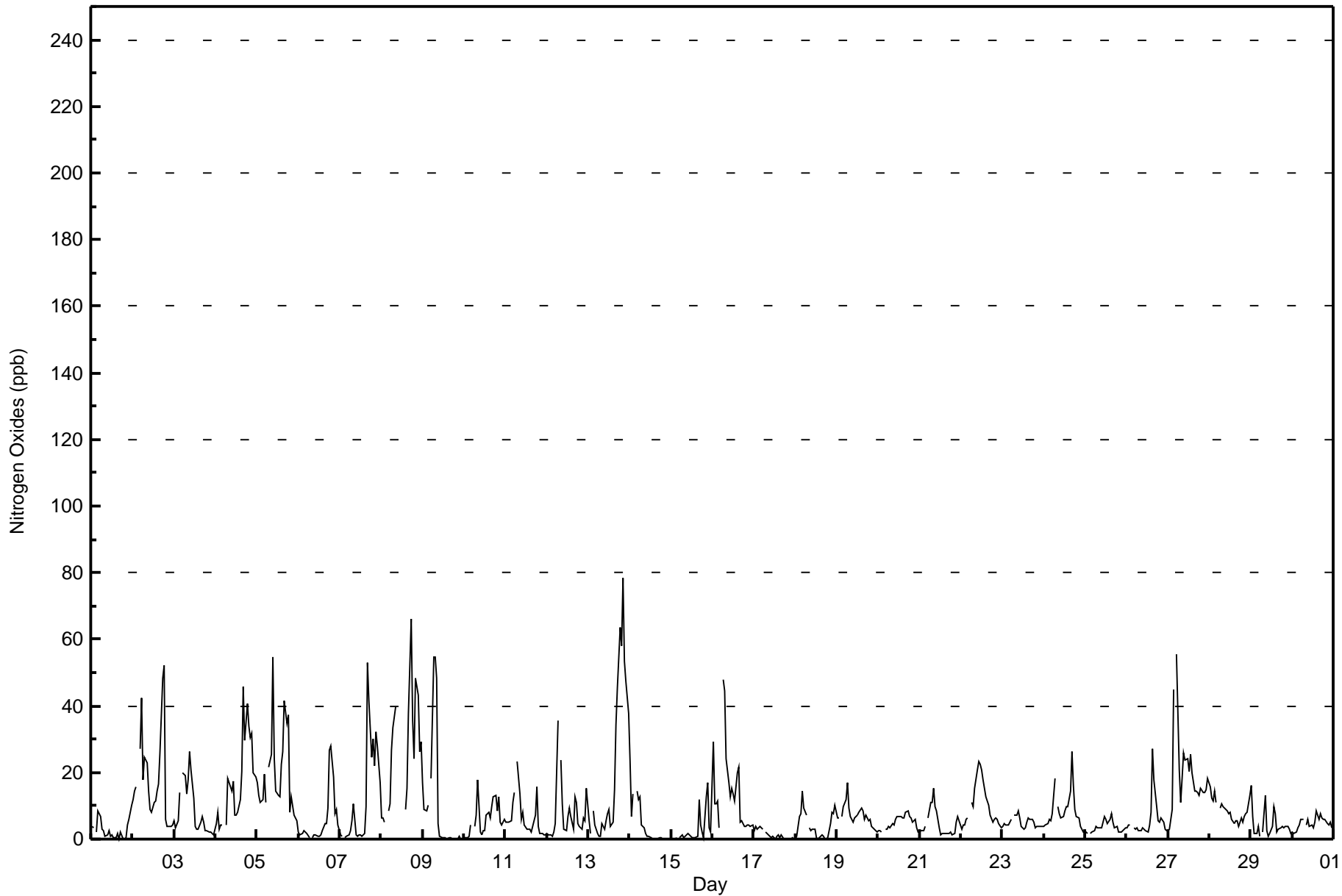
Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - November 2016

Maximum Value: 78 ppb on Nov 13 21:00 Maximum Daily Average: 26.2 ppb on Nov 8		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: 1.3 ppb on Nov 17 Maximum Diurnal Average: 13.7 ppb at hour 18 Minimum Diurnal Average: 4.8 ppb at hour 2 Monthly Average: 9.1 ppb Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 5 Q ₃ = 11 P ₉₀ = 23 P ₉₉ = 55																										
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	4	3	Z	2	9	7	3	3	1	1	3	1	1	0	1	2	0	2	0	0	0	4	6	10	2.7	10
2-Nov	12	14	16	Z	27	42	18	25	23	14	9	8	11	11	14	16	26	48	52	6	4	4	4	4	17.8	52
3-Nov	6	4	6	14	Z	20	19	14	18	26	21	12	4	3	3	5	7	5	3	3	2	2	2	1	8.6	26
4-Nov	4	8	3	4	4	Z	4	18	17	15	18	7	7	8	12	20	46	30	41	34	30	32	20	19	17.4	46
5-Nov	17	13	11	12	20	11	Z	22	26	55	24	15	13	13	22	26	42	35	37	8	13	7	7	5	19.6	55
6-Nov	2	1	2	2	2	2	0	Z	1	1	1	1	1	1	3	4	5	9	27	28	19	8	9	4	5.8	28
7-Nov	1	1	Z	0	1	1	2	5	10	1	1	1	1	1	2	10	53	42	24	30	22	32	28	17	12.5	53
8-Nov	6	6	5	Z	9	11	27	33	40	C	C	C	C	C	9	15	38	66	36	24	48	43	26	29	26.2	66
9-Nov	17	9	9	10	Z	18	55	55	48	5	1	0	0	0	0	0	0	0	0	0	0	1	0	0	10.0	55
10-Nov	0	0	1	1	4	Z	4	7	18	2	1	3	3	7	8	6	10	13	13	8	13	5	4	6	6.0	18
11-Nov	5	5	5	6	11	14	Z	23	13	6	8	4	3	3	3	2	4	7	16	4	1	2	1	1	6.4	23
12-Nov	2	1	1	1	2	5	35	Z	24	11	3	3	7	9	7	3	13	11	5	4	3	6	6	15	7.6	35
13-Nov	6	2	Z	9	4	2	1	1	4	3	6	7	9	4	5	15	34	45	64	58	78	53	47	38	21.5	78
14-Nov	23	7	14	Z	15	12	13	4	3	2	1	1	0	0	0	0	0	1	0	0	0	0	0	0	4.1	23
15-Nov	0	0	0	0	Z	0	1	0	1	1	2	1	0	0	0	1	12	4	2	0	13	17	3	2	2.7	17
16-Nov	29	10	10	11	3	Z	48	45	24	17	13	15	13	12	20	21	5	5	4	4	4	4	4	4	14.2	48
17-Nov	3	4	3	4	3	3	Z	2	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	1.3	4
18-Nov	0	1	7	7	14	9	7	Z	4	3	3	3	0	0	0	1	1	0	0	0	5	8	8	10	4.0	14
19-Nov	6	6	Z	7	10	12	17	9	7	5	6	7	7	8	9	9	6	7	5	6	4	3	3	2	7.0	17
20-Nov	2	3	2	Z	3	3	4	3	5	4	6	7	7	7	6	6	8	9	7	6	5	6	3	2	5.0	9
21-Nov	2	3	2	4	Z	7	11	11	15	10	8	3	1	2	2	2	2	2	2	1	2	5	7	5	4.7	15
22-Nov	3	4	4	6	6	Z	11	10	15	21	24	23	21	18	13	11	10	7	5	6	6	6	5	3	10.3	24
23-Nov	4	5	4	4	5	6	Z	7	7	9	6	4	3	3	5	7	6	6	5	3	4	4	4	4	5.0	9
24-Nov	4	4	5	6	6	8	18	Z	10	8	6	7	9	10	10	14	26	16	9	7	6	4	3	2	8.5	26
25-Nov	2	2	Z	2	2	2	4	3	3	4	5	7	6	5	6	8	5	4	4	2	2	2	3	3	3.7	8
26-Nov	4	4	4	Z	3	3	3	3	3	3	3	3	2	4	8	27	18	10	6	5	6	5	3	3	5.8	27
27-Nov	3	3	9	45	Z	56	21	11	18	26	24	24	20	26	20	15	15	14	13	15	14	14	15	18	19.0	56
28-Nov	16	12	12	14	11	Z	9	11	10	9	9	8	8	6	5	5	6	4	6	5	7	7	8	13	8.7	16
29-Nov	16	7	2	2	4	1	Z	2	13	3	1	2	4	10	7	2	3	3	4	3	4	4	3	2	4.4	16
30-Nov	2	2	2	4	4	6	Z	4	6	4	4	4	4	5	9	6	8	6	6	6	5	4	5	3	4.8	9
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	608	88.76	88.76
21 - 40	52	7.59	96.35
41 - 80	25	3.65	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
Patricia McInnes - 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	30	6	3	7	7	36	93	42	56	43	94	68	45	26	27	25	608
21 - 40	6	0	1	0	1	1	11	12	13	4	3	0	0	0	0	0	52
11 - 80	2	0	0	0	0	1	3	8	8	1	1	0	0	1	0	0	25
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	38	6	4	7	8	38	107	62	77	48	98	68	45	27	27	25	685

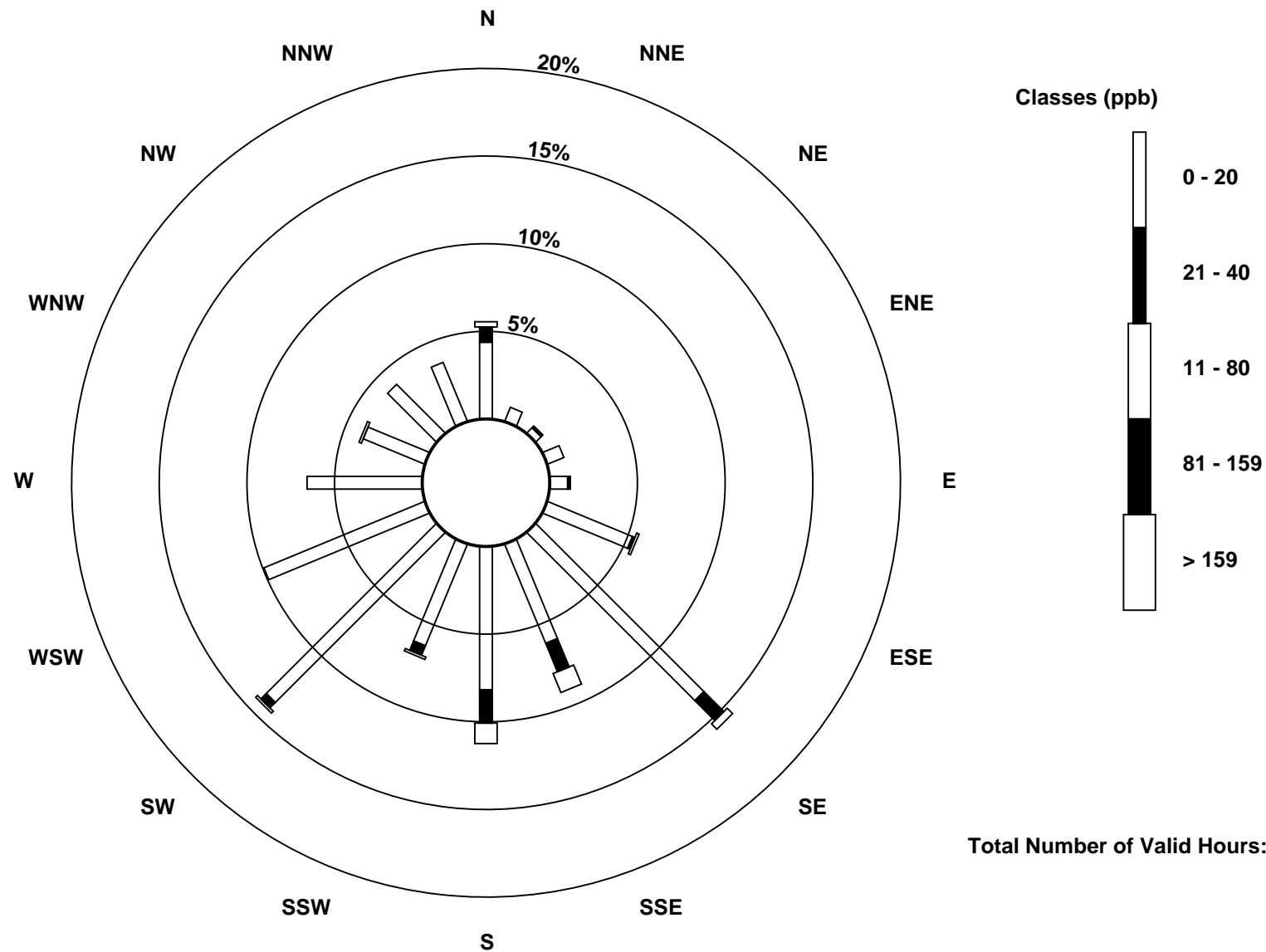
Total Number of Valid Hours: 685

Total Number of Hours: 720

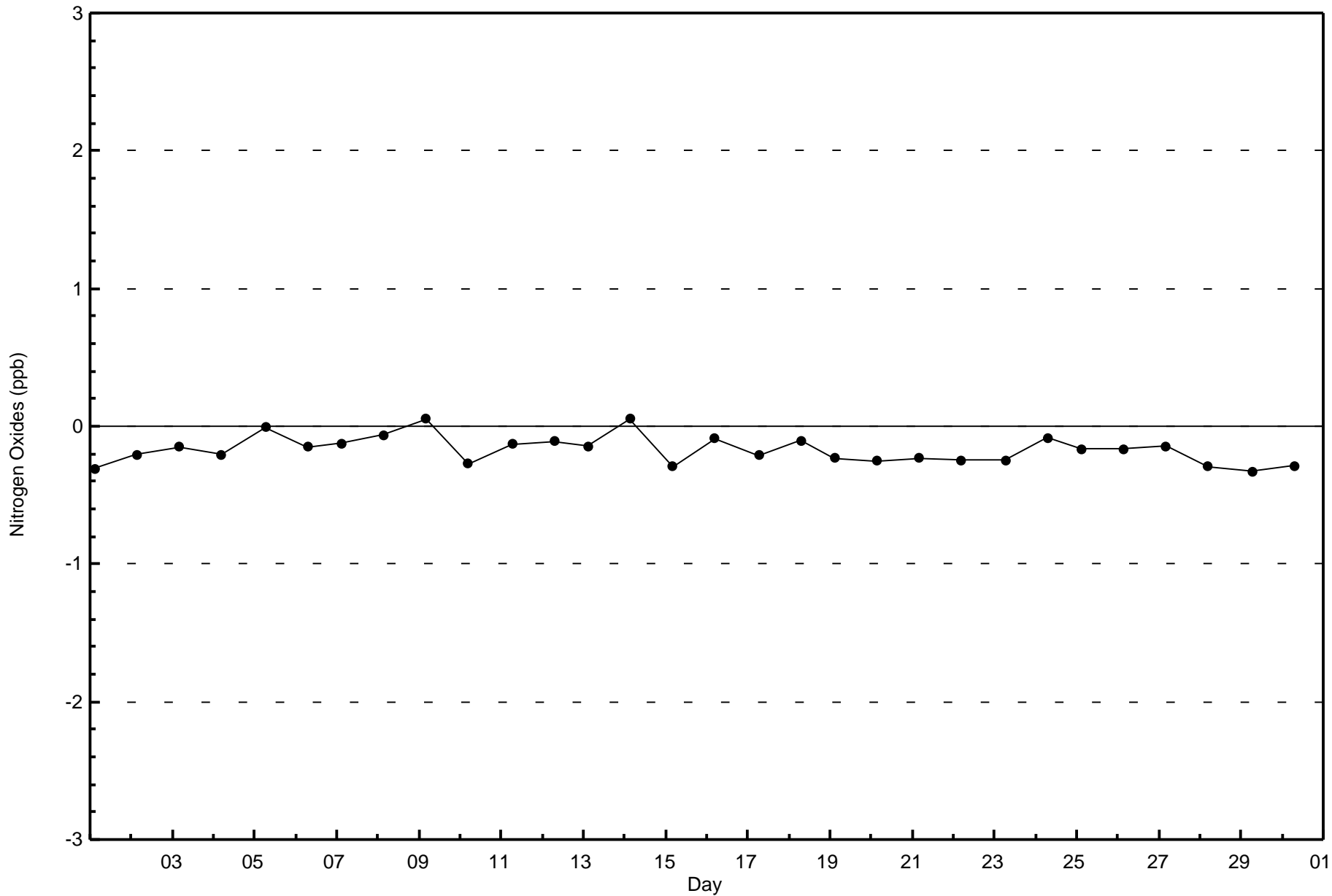


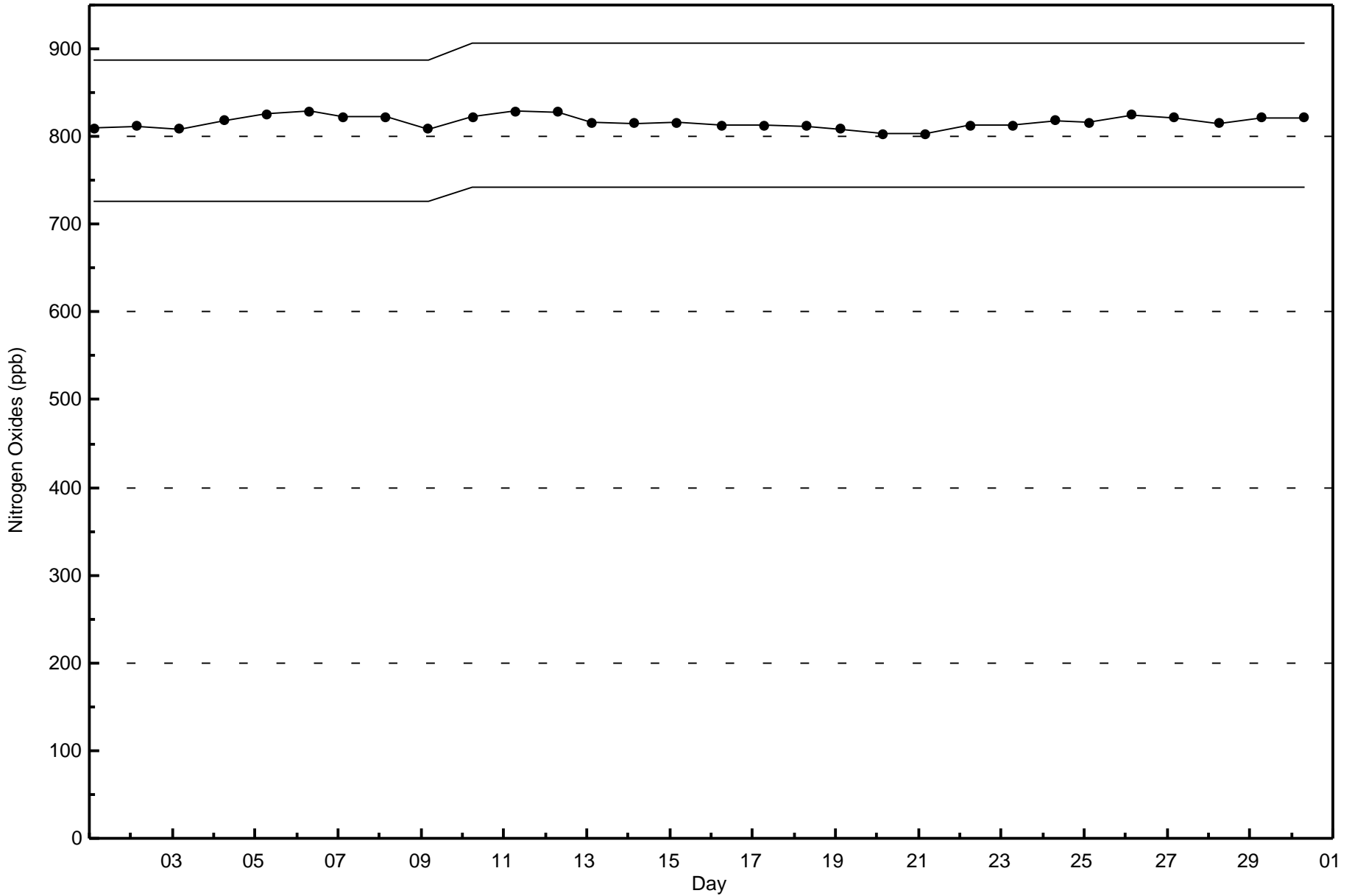
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes (AMS 6)



Total Number of Valid Hours: 685







Number of Exceedences (AAAQO): 1-hr: 0	Maximum Value: 10 ppb on Nov 8 22:00	Maximum Daily Average: 0.0 ppb on Nov 1	Hours in Service: 720
Minimum Value: 0 ppb on Nov 1 03:00	Maximum Diurnal Average: 0.3 ppb at hour 22	Minimum Daily Average: 0.0 ppb on Nov 1	Hours of Data: 645
Monthly Average: 0.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 0		Hours of Missing Data: 75
			Hours of Calibration: 39
			Percent Operational Time: 95.0

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	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
2-Nov	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
3-Nov	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
4-Nov	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
5-Nov	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	0.0	0
6-Nov	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
7-Nov	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
8-Nov	0	Z	RE	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	10	0	0	--	10	
9-Nov	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	0
10-Nov	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
11-Nov	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	0.0	0
12-Nov	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	0
13-Nov	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
14-Nov	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	0
15-Nov	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
16-Nov	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
17-Nov	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
18-Nov	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
19-Nov	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
20-Nov	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
21-Nov	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
22-Nov	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
23-Nov	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
24-Nov	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
25-Nov	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
26-Nov	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
27-Nov	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	0
28-Nov	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
29-Nov	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
30-Nov	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

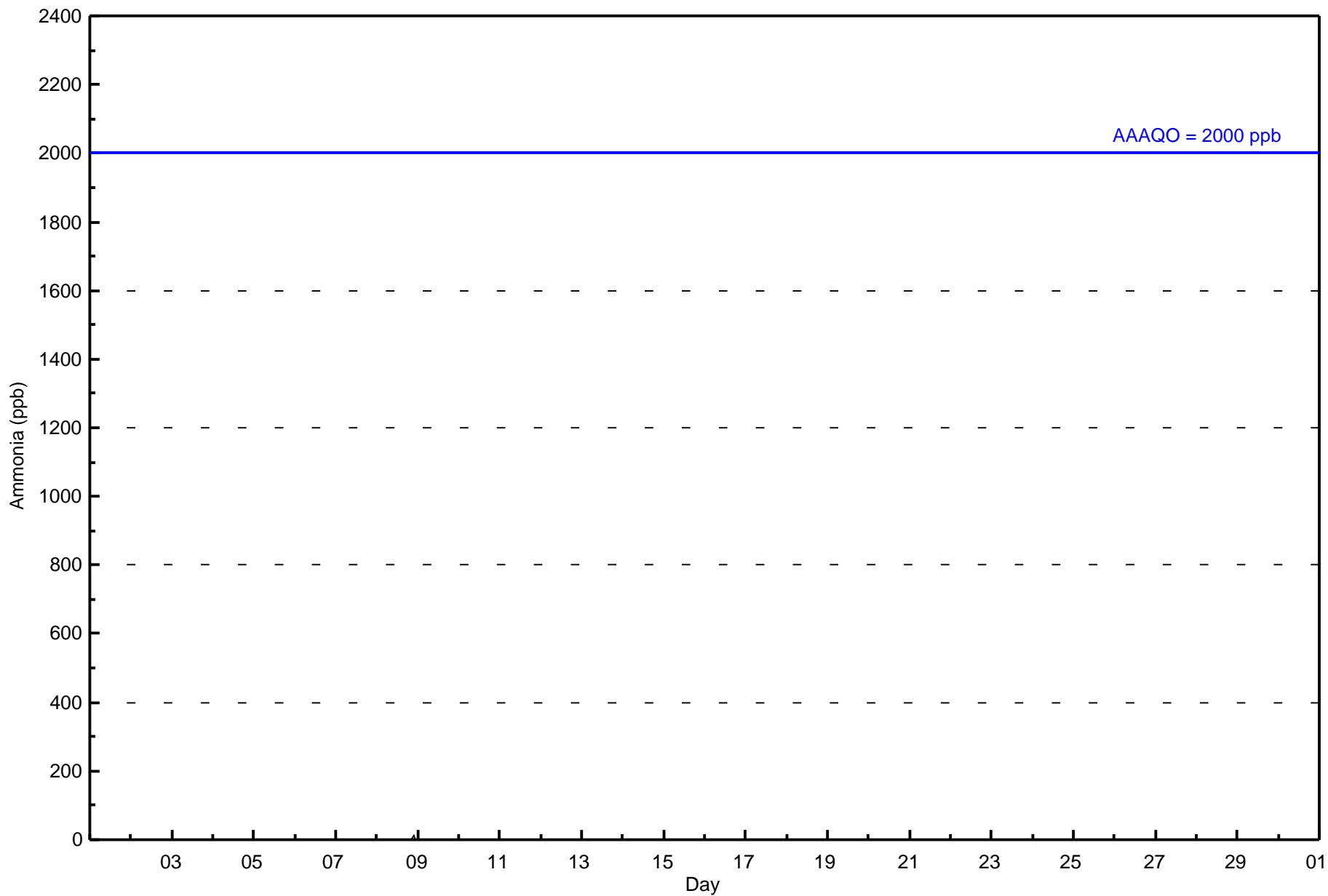
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	Diurnal Maximum

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 - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ammonia (NH₃) - ppb
Patricia McInnes - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	644	99.84	99.85
6 - 10	1	0.16	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: 645

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ammonia (NH₃) - ppb
Patricia McInnes - 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 - 5	33	6	4	7	9	32	101	59	71	45	92	65	43	24	29	24	644
6 - 10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
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	33	6	4	7	9	32	101	59	72	45	92	65	43	24	29	24	645

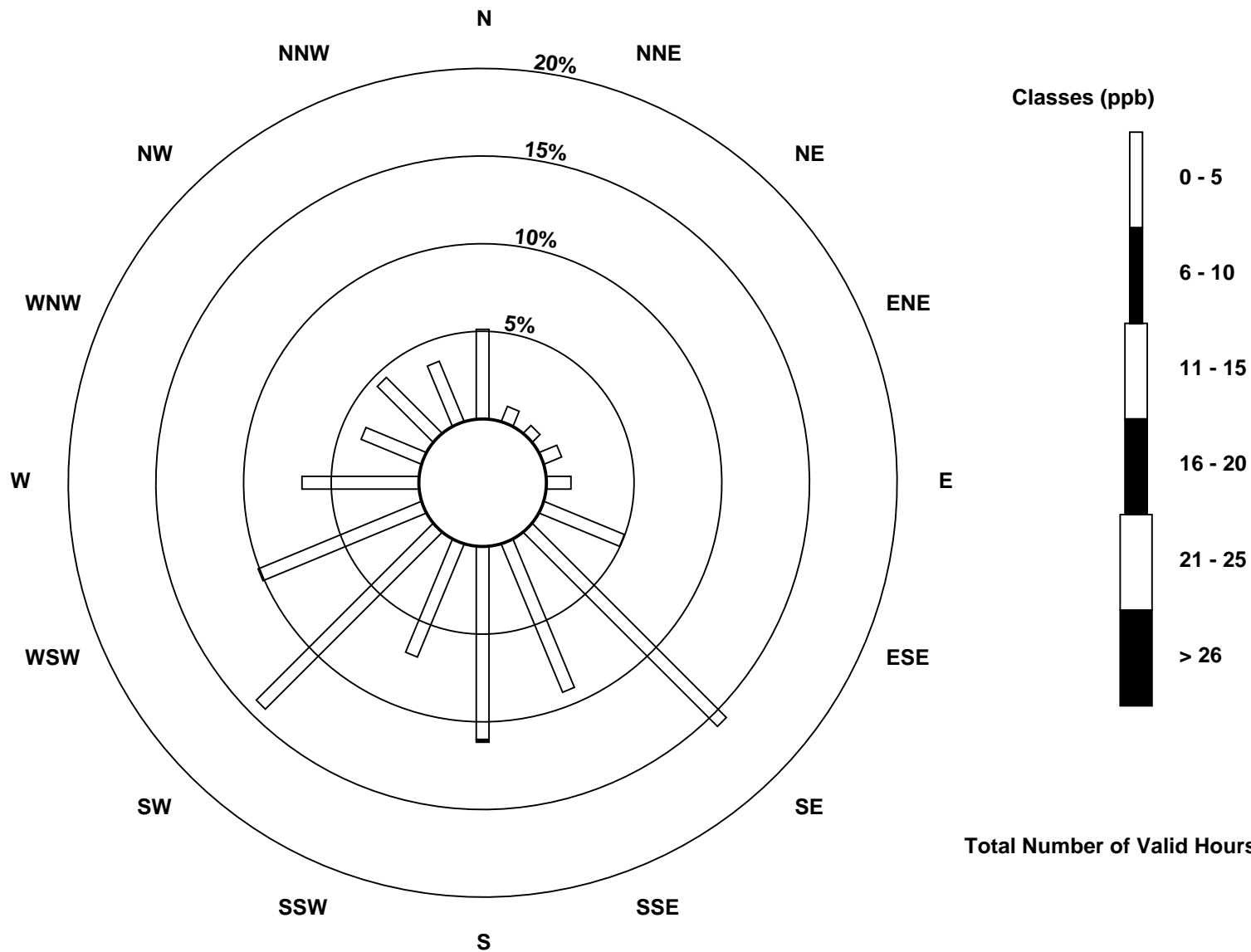
Total Number of Valid Hours: 645

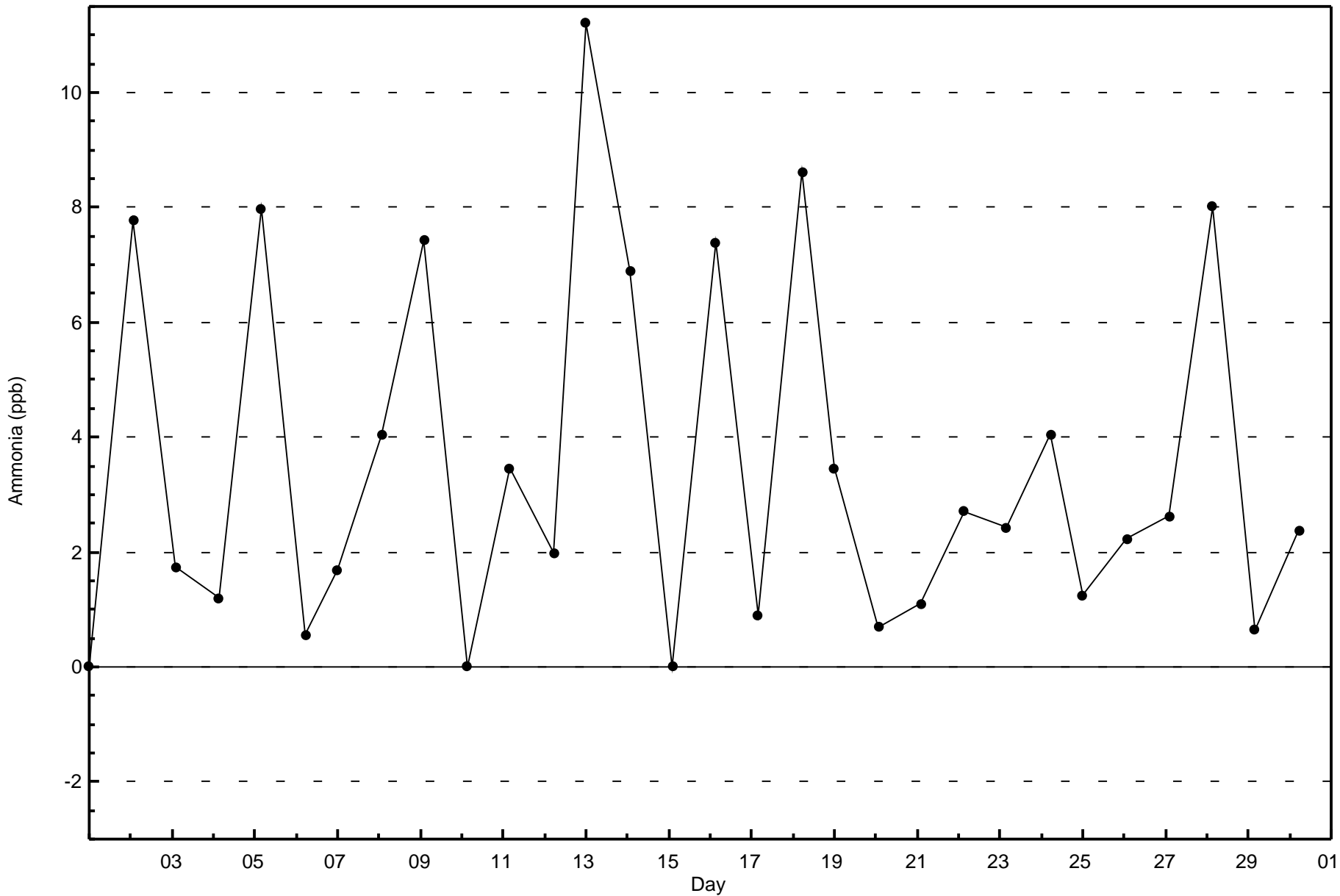
Total Number of Hours: 720

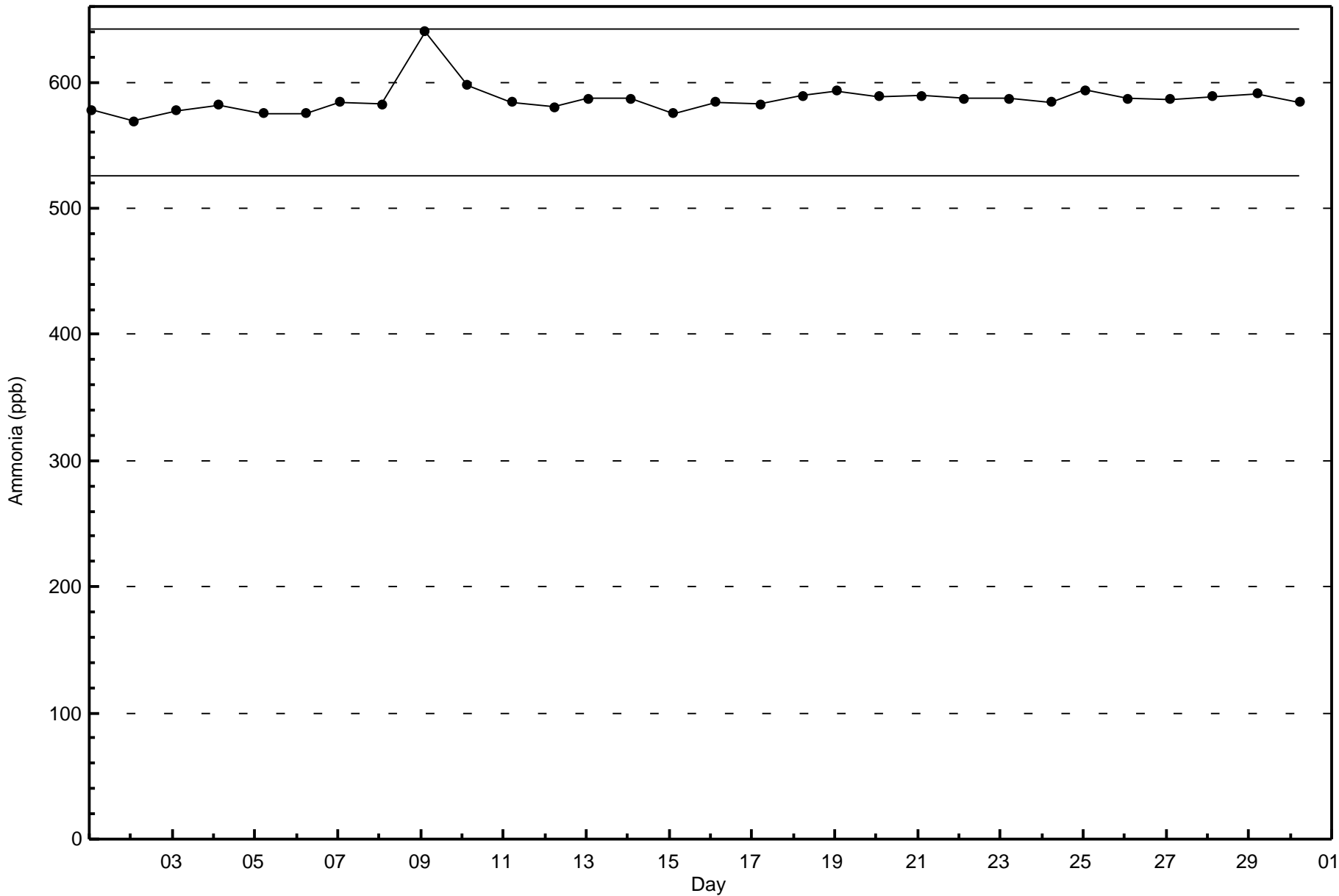


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ammonia (NH₃) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

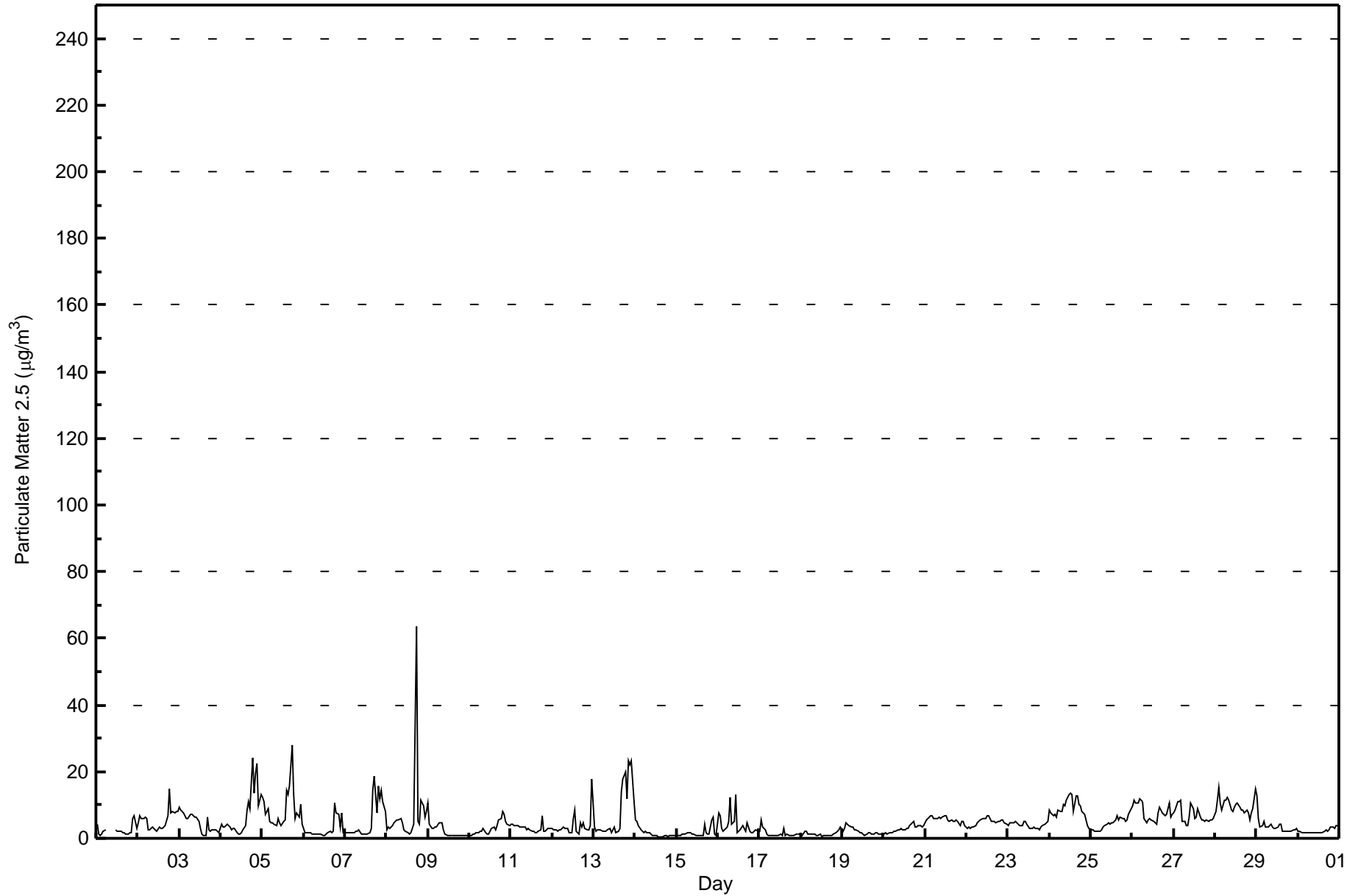
Patricia McInnes - November 2016

Number of Exceedences (AAAQO): 24-hr: 0																			Hours in Service: 720																													
Maximum Value: 63.7 µg/m ³ on Nov 8 18:00																			Maximum Daily Average: 9.7 µg/m ³ on Nov 28					Hours of Data: 715																								
Minimum Value: 0.6 µg/m ³ on Nov 14 15:00																			Minimum Daily Average: 1.4 µg/m ³ on Nov 18					Hours of Missing Data: 5																								
Maximum Diurnal Average: 7.7 µg/m ³ at hour 18																			Minimum Diurnal Average: 3.4 µg/m ³ at hour 12					Hours of Calibration: 2																								
Monthly Average: 4.57 µg/m ³																			Percentiles: P ₁ = 0.6 P ₁₀ = 1.1 Q ₁ = 1.8 Median = 3.3 Q ₃ = 5.8 P ₉₀ = 9.5 P ₉₉ = 21.4					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-Nov	4.4	1.3	0.8	1.5	2.2	2.5	UO	UO	UO	C	C	2.6	2.2	2.0	1.9	1.9	1.5	1.2	1.2	1.8	1.5	5.9	6.7	3.0	2.4	6.7																						
2-Nov	4.6	6.6	5.7	5.8	6.2	6.0	2.6	2.7	3.2	2.8	2.6	2.2	3.3	2.9	3.0	3.4	3.8	7.0	14.9	7.5	8.1	7.5	8.1	8.1	5.4	14.9																						
3-Nov	9.3	8.5	7.7	6.7	5.8	6.1	7.2	7.3	6.7	6.5	6.2	5.1	3.1	1.5	1.0	1.0	6.3	2.5	2.3	2.6	2.6	2.5	2.1	1.7	4.7	9.3																						
4-Nov	4.4	3.2	3.4	4.0	4.1	3.5	2.7	3.1	3.0	1.8	1.4	1.2	1.5	2.5	3.7	8.5	10.9	9.1	24.3	13.4	19.6	22.6	9.6	13.2	7.3	24.3																						
5-Nov	12.4	11.2	7.4	8.9	5.0	4.5	4.8	4.0	3.9	5.8	4.8	3.7	5.1	5.3	14.2	13.1	15.8	27.8	13.2	5.9	7.4	6.3	10.0	4.2	8.5	27.8																						
6-Nov	2.8	1.9	1.7	1.7	1.6	1.4	1.4	1.2	1.2	1.2	1.2	1.1	1.0	1.3	1.6	2.3	1.5	2.3	10.5	7.5	7.1	3.2	7.5	1.8	2.7	10.5																						
7-Nov	1.8	1.9	1.8	1.8	1.8	1.8	2.0	2.1	2.4	1.3	1.1	1.2	1.3	1.4	1.8	3.1	14.3	18.7	7.6	15.8	11.9	14.3	10.9	8.1	5.4	18.7																						
8-Nov	2.5	3.2	2.9	3.7	4.6	5.0	5.7	5.7	5.8	4.5	2.7	2.3	1.7	1.4	1.6	3.0	4.1	63.7	5.3	4.3	11.4	9.9	6.5	8.2	7.1	63.7																						
9-Nov	10.5	4.4	2.9	2.9	3.5	3.3	4.6	4.5	4.7	2.4	1.1	0.8	0.7	0.7	0.8	0.9	1.0	0.9	0.9	0.9	0.8	0.8	0.7	0.8	2.3	10.5																						
10-Nov	0.8	0.8	1.1	1.3	1.7	1.7	2.1	2.3	3.0	1.6	1.4	1.5	1.9	3.2	3.3	2.5	3.7	5.4	6.1	8.1	7.4	5.3	4.1	3.9	3.1	8.1																						
11-Nov	4.0	4.2	3.9	3.9	3.8	3.3	3.5	3.5	3.3	2.6	2.9	2.6	2.2	2.1	1.8	1.8	2.0	2.6	6.8	2.1	2.0	3.1	3.0	2.8	3.1	6.8																						
12-Nov	3.1	2.6	2.6	2.3	2.4	2.4	3.4	2.9	3.1	2.8	1.8	1.7	5.7	8.4	2.3	1.5	4.5	3.5	4.8	3.1	2.6	2.7	3.9	17.9	3.8	17.9																						
13-Nov	3.4	2.0	2.6	2.5	2.6	2.1	2.2	2.3	2.6	2.8	1.5	2.5	3.4	1.9	2.1	3.0	14.2	17.8	19.9	11.8	23.4	21.9	23.1	10.9	7.6	23.4																						
14-Nov	5.4	4.9	4.0	2.5	2.2	1.9	2.1	1.7	1.5	1.1	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	1.5	5.4																						
15-Nov	0.8	0.9	0.9	1.1	1.3	1.4	1.6	1.6	1.7	1.3	1.1	1.0	0.9	0.8	0.8	0.9	4.1	1.9	1.4	1.3	5.6	6.4	1.4	1.0	1.7	6.4																						
16-Nov	7.6	6.8	2.8	2.0	2.4	3.4	5.2	12.5	4.0	5.2	13.1	1.9	2.1	2.4	3.6	3.1	2.3	4.5	2.0	1.8	1.8	2.2	2.4	2.0	4.0	13.1																						
17-Nov	2.2	5.6	3.3	2.5	1.4	1.0	0.7	1.0	0.8	0.7	0.7	0.8	1.1	1.0	3.1	0.9	1.3	1.0	1.0	1.0	1.0	1.1	1.2	1.1	1.5	5.6																						
18-Nov	1.0	1.0	2.3	2.3	1.3	1.2	1.4	1.3	1.2	0.9	1.0	1.2	0.6	0.7	1.0	0.9	0.8	0.8	0.9	1.3	1.8	2.2	2.4	3.6	1.4	3.6																						
19-Nov	2.2	2.8	4.6	4.2	3.8	3.5	3.4	2.5	2.4	1.9	1.7	1.6	1.1	1.0	1.1	1.5	1.7	1.5	1.4	1.7	1.5	1.4	1.4	1.4	2.1	4.6																						
20-Nov	1.4	1.5	1.4	1.5	1.7	1.9	2.0	2.2	2.5	2.4	3.1	2.6	2.6	2.9	3.0	3.9	4.2	5.0	3.5	3.5	4.0	3.8	3.6	3.6	2.8	5.0																						
21-Nov	4.6	5.7	6.4	6.9	6.6	5.8	6.0	5.7	6.2	6.1	6.4	6.6	6.7	5.5	5.0	5.4	5.1	5.1	5.4	5.0	3.9	5.0	5.3	3.9	5.6	6.9																						
22-Nov	3.1	3.2	2.8	3.5	3.5	4.0	4.8	5.3	5.5	6.0	5.9	5.7	6.6	6.8	5.2	5.2	5.1	4.8	4.9	5.1	5.3	5.5	4.8	4.3	4.9	6.8																						
23-Nov	4.0	4.6	4.6	4.5	5.1	4.5	4.1	3.7	3.8	4.9	5.0	4.3	3.1	3.2	3.1	3.3	2.8	2.9	2.7	3.2	3.7	4.2	4.6	4.9	3.9	5.1																						
24-Nov	8.6	7.7	6.9	7.0	6.3	8.4	8.0	7.8	10.1	9.7	11.6	13.0	13.6	13.0	8.2	12.5	12.5	10.4	9.5	8.0	7.1	5.5	3.8	2.9	8.8	13.6																						
25-Nov	2.4	2.4	2.3	2.2	1.9	1.9	2.4	3.3	3.8	4.3	4.5	4.3	4.6	4.9	5.6	6.7	5.6	6.2	5.8	5.8	5.1	5.4	7.1	8.9	4.5	8.9																						
26-Nov	9.9	11.6	10.8	10.6	11.7	11.6	10.9	5.8	4.8	5.6	6.0	5.4	5.2	4.8	4.4	7.7	9.3	7.5	7.4	6.7	7.0	10.5	6.4	7.0	7.9	11.7																						
27-Nov	7.6	8.5	10.9	11.0	11.3	5.1	5.1	3.8	3.9	6.4	10.5	9.0	5.9	6.5	9.0	6.5	5.3	5.3	5.3	5.3	5.0	5.4	5.4	5.9	6.8	11.3																						
28-Nov	8.1	11.6	15.5	10.6	8.5	11.3	11.3	12.2	11.3	8.4	8.0	9.5	10.3	10.4	9.2	8.3	8.5	7.8	8.4	7.4	5.6	7.7	8.7	15.0	9.7	15.5																						
29-Nov	12.7	5.8	3.5	4.0	5.1	3.5	3.5	3.5	4.2	3.6	3.1	3.0	3.3	4.2	4.1	2.2	2.2	2.0	2.0	2.1	2.1	2.5	2.7	3.0	3.7	12.7																						
30-Nov	2.1	2.0	1.7	1.9	1.9	1.7	1.8	1.8	1.7	1.7	1.6	1.7	1.5	1.8	1.9	2.0	2.5	2.3	2.7	3.4	3.3	3.1	3.9	4.0	2.3	4.0																						
																								4.9	4.6	4.3	4.2	4.0	3.9	4.0	4.0	3.9	3.7	3.9	3.4	3.5	3.5	3.6	3.9	5.2	7.7	6.1	4.9	5.7	6.0	5.4	5.3	Diurnal Average
																								12.7	11.6	15.5	11.0	11.7	11.6	11.3	12.5	11.3	9.7	13.1	13.0	13.6	13.0	14.2	13.1	15.8	63.7	24.3	15.8	23.4	22.6	23.1	17.9	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}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - November 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	459	64.20	64.20
6 - 15	185	25.87	90.07
16 - 25	12	1.68	91.75
26 - 80	2	0.28	92.03
> 81.0	0	0.00	92.03

Total Number of Valid Hours: 715

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - 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	25	5	2	7	8	32	81	40	47	31	74	45	12	15	16	19	459
6 - 15	13	2	2	0	2	5	30	27	26	14	26	19	1	3	8	7	185
16 - 25	0	0	0	0	0	1	2	2	6	1	0	0	0	0	0	0	12
26 - 80	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	38	7	4	7	10	38	113	69	81	46	100	64	13	18	24	26	658

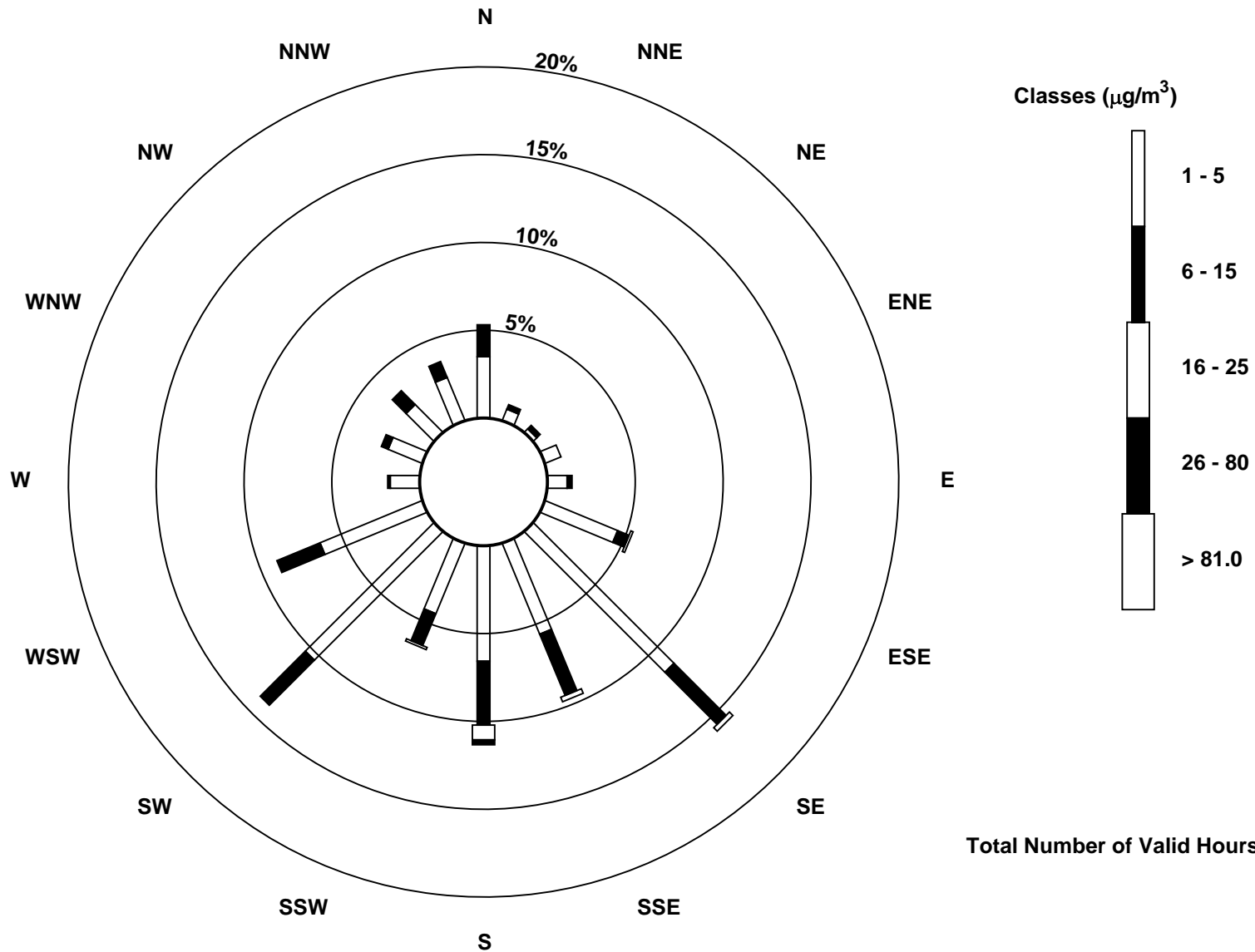
Total Number of Valid Hours: 715

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes (AMS 6)





Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

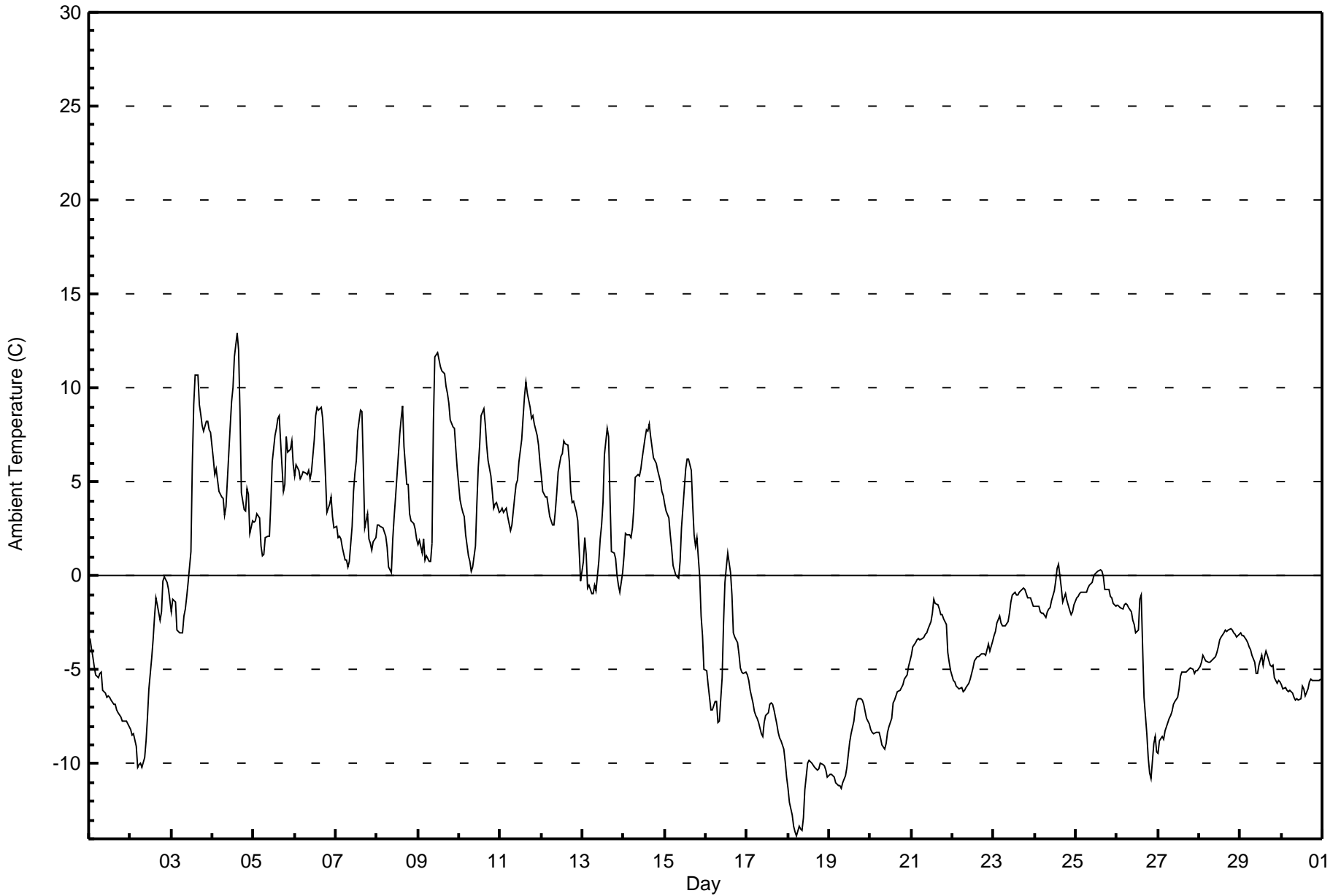
Patricia McInnes - November 2016

Maximum Value: 12.9 C on Nov 4 15:00		Maximum Daily Average: 6.4 C on Nov 9		Hours in Service: 720																							
Minimum Value: -13.9 C on Nov 18 06:00		Minimum Daily Average: -11.4 C on Nov 18		Hours of Data: 720																							
Maximum Diurnal Average: 1.7 C at hour 15		Minimum Diurnal Average: -2.8 C at hour 8		Hours of Missing Data: 0																							
Monthly Average: -1.04 C		Percentiles: P ₁ = -12.9 P ₁₀ = -8.3 Q ₁ = -5.6 Median = -1.4 Q ₃ = 3.5 P ₉₀ = 7.0 P ₉₉ = 10.9		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-Nov	-3.3	-3.8	-4.3	-4.8	-5.2	-5.4	-5.2	-5.2	-6.1	-6.2	-6.4	-6.4	-6.5	-6.6	-6.9	-6.8	-7.1	-7.3	-7.5	-7.8	-7.7	-7.8	-7.8	-8.0	-6.3	-3.3	
2-Nov	-8.2	-8.5	-8.4	-9.1	-10.2	-10.0	-10.0	-10.2	-9.7	-8.8	-7.5	-6.0	-4.4	-3.4	-2.2	-1.2	-1.5	-2.3	-1.9	-0.3	0.0	-0.4	-0.7	-1.4	-5.3	0.0	
3-Nov	-1.9	-1.2	-1.4	-2.9	-3.0	-3.1	-3.1	-2.2	-1.7	-1.1	-0.3	1.3	6.0	9.1	10.7	10.7	9.1	8.6	8.0	7.7	8.2	8.2	7.8	7.6	3.4	10.7	
4-Nov	6.2	5.4	5.7	5.1	4.5	4.2	4.1	3.3	3.7	6.5	7.9	9.2	10.0	11.7	12.9	12.0	8.8	4.4	3.5	3.5	4.6	4.3	2.3	2.9	6.1	12.9	
5-Nov	2.9	2.9	3.3	3.1	1.6	1.1	1.1	2.0	2.1	2.1	3.9	6.0	7.4	7.9	8.4	8.5	7.1	4.5	4.9	7.4	6.6	6.7	7.2	5.9	4.8	8.5	
6-Nov	5.3	5.9	5.6	5.2	5.3	5.5	5.5	5.4	5.6	5.2	5.5	7.2	8.6	9.0	8.8	8.9	8.4	7.0	5.3	3.4	3.8	4.2	3.2	2.6	5.9	9.0	
7-Nov	2.6	2.1	2.1	2.0	1.5	0.9	0.8	0.5	0.8	2.6	4.5	5.5	6.1	7.7	8.8	8.7	5.8	2.6	3.3	1.9	1.7	1.4	1.8	2.0	3.2	8.8	
8-Nov	2.7	2.7	2.6	2.5	2.3	2.1	1.5	0.5	0.2	2.0	3.1	4.2	6.4	7.6	8.4	9.0	6.9	4.9	4.9	3.3	3.0	2.8	2.5	2.0	3.7	9.0	
9-Nov	1.6	1.9	1.2	1.9	0.9	1.1	0.8	0.7	1.7	8.1	11.7	11.9	11.5	11.2	10.9	10.8	10.1	9.8	9.2	8.3	7.9	7.8	6.7	5.7	6.4	11.9	
10-Nov	4.1	3.7	3.4	3.2	2.2	1.1	0.8	0.3	0.5	1.6	3.8	5.8	7.0	8.5	8.9	8.1	6.9	6.1	5.3	4.5	3.6	3.8	3.9	3.4	4.2	8.9	
11-Nov	3.5	3.6	3.4	3.6	3.1	2.7	2.4	2.7	4.2	4.9	5.1	6.1	7.3	8.4	9.6	10.3	9.7	9.0	8.4	8.5	8.1	7.5	7.0	6.0	6.0	10.3	
12-Nov	5.3	4.5	4.2	4.2	3.7	3.2	2.7	2.7	3.5	4.4	5.5	6.3	6.5	7.1	7.0	6.9	6.0	4.5	3.9	4.0	3.4	2.9	1.4	-0.2	4.3	7.1	
13-Nov	0.8	2.0	1.2	-0.6	-0.5	-0.9	-1.0	-0.5	-0.8	0.8	2.0	2.7	3.9	6.4	7.9	7.4	4.1	1.3	1.2	0.9	0.0	-0.5	-0.9	0.2	1.5	7.9	
14-Nov	1.1	2.3	2.2	2.1	2.0	2.6	3.6	5.2	5.4	5.3	6.3	7.3	7.8	7.7	8.0	7.4	6.3	6.1	6.0	5.6	5.0	4.5	4.2	5.0	5.0	8.0	
15-Nov	3.8	3.5	3.1	2.2	1.4	0.6	0.1	-0.1	-0.1	0.8	2.6	4.7	5.7	6.2	6.2	5.6	3.7	2.2	1.6	2.0	-0.1	-2.2	-3.2	-5.0	1.9	6.2	
16-Nov	-5.0	-5.8	-6.5	-7.1	-7.2	-6.7	-6.7	-7.8	-7.7	-5.5	-2.5	-0.3	0.5	1.2	0.2	-1.0	-3.0	-3.3	-3.5	-4.2	-4.9	-5.1	-5.2	-5.1	-4.3	1.2	
17-Nov	-5.3	-5.6	-6.1	-6.7	-7.2	-7.4	-7.6	-7.8	-8.4	-8.6	-7.8	-7.5	-7.3	-6.9	-6.7	-6.8	-7.2	-7.9	-8.3	-8.6	-8.8	-9.2	-9.9	-10.7	-7.7	-5.3	
18-Nov	-11.3	-12.1	-12.7	-13.3	-13.6	-13.9	-13.3	-13.5	-13.5	-12.9	-11.4	-10.0	-9.8	-9.9	-10.0	-10.2	-10.3	-10.3	-10.3	-10.0	-10.0	-10.2	-10.3	-10.7	-11.4	-9.8	
19-Nov	-10.5	-10.6	-10.7	-10.7	-11.0	-11.2	-11.1	-11.3	-11.0	-10.6	-10.2	-9.5	-8.8	-8.4	-7.8	-7.1	-6.7	-6.5	-6.5	-6.6	-6.8	-7.2	-7.6	-7.9	-9.0	-6.5	
20-Nov	-8.2	-8.3	-8.4	-8.3	-8.3	-8.3	-8.6	-9.0	-9.2	-8.9	-8.4	-8.0	-7.6	-6.7	-6.6	-6.4	-6.1	-6.1	-5.9	-5.8	-5.5	-5.2	-4.9	-4.5	-7.2	-4.5	
21-Nov	-4.2	-3.8	-3.6	-3.4	-3.4	-3.4	-3.3	-3.3	-3.1	-3.1	-2.8	-2.4	-2.0	-1.3	-1.5	-1.6	-1.8	-2.1	-2.1	-2.3	-2.6	-4.1	-4.6	-5.1	-2.9	-1.3	
22-Nov	-5.5	-5.7	-5.8	-5.9	-6.0	-6.0	-6.2	-6.1	-5.9	-5.7	-5.5	-5.2	-4.9	-4.6	-4.3	-4.3	-4.3	-4.1	-4.1	-4.2	-3.9	-3.6	-4.0	-3.5	-5.0	-3.5	
23-Nov	-3.2	-2.9	-2.5	-2.1	-2.5	-2.6	-2.6	-2.7	-2.4	-2.0	-1.4	-1.0	-0.9	-1.0	-1.0	-0.9	-0.8	-0.7	-0.7	-1.0	-1.2	-1.2	-1.4	-1.6	-1.7	-0.7	
24-Nov	-1.6	-1.6	-1.6	-1.9	-2.0	-2.0	-2.2	-1.9	-1.7	-1.7	-1.3	-0.8	-0.3	0.4	0.6	-0.6	-1.4	-1.2	-0.9	-1.3	-1.9	-2.1	-1.9	-1.5	-1.4	0.6	
25-Nov	-1.2	-1.1	-0.9	-0.9	-0.9	-0.9	-0.8	-0.7	-0.5	-0.3	-0.1	0.1	0.2	0.3	0.3	0.3	0.3	-0.1	-0.7	-0.8	-0.7	-1.1	-1.2	-1.5	-1.6	-0.6	0.3
26-Nov	-1.5	-1.6	-1.7	-1.8	-1.5	-1.5	-1.5	-1.7	-2.0	-2.4	-2.6	-3.0	-2.9	-1.3	-1.0	-3.8	-6.5	-8.4	-9.7	-10.5	-10.8	-9.0	-8.5	-9.4	-4.4	-1.0	
27-Nov	-9.5	-8.8	-8.6	-8.7	-8.2	-8.1	-7.6	-7.4	-7.2	-6.9	-6.7	-6.4	-6.0	-5.3	-5.1	-5.1	-5.1	-5.1	-5.0	-4.9	-5.0	-5.2	-5.1	-5.1	-6.5	-4.9	
28-Nov	-4.8	-4.6	-4.2	-4.4	-4.6	-4.6	-4.6	-4.5	-4.5	-4.3	-4.1	-3.8	-3.4	-3.2	-3.0	-2.9	-3.0	-2.9	-2.9	-2.8	-2.9	-3.1	-3.1	-3.3	-3.1	-3.7	-2.8
29-Nov	-3.0	-3.2	-3.2	-3.4	-3.6	-3.8	-3.9	-4.2	-4.6	-5.2	-5.2	-4.8	-4.2	-4.8	-4.3	-4.0	-4.2	-4.8	-4.8	-4.8	-5.5	-5.7	-5.5	-5.7	-4.4	-3.0	
30-Nov	-5.8	-6.0	-5.9	-6.1	-6.2	-6.1	-6.3	-6.5	-6.6	-6.5	-6.6	-6.6	-5.9	-6.0	-6.4	-6.0	-5.6	-5.5	-5.6	-5.6	-5.6	-5.6	-5.6	-5.5	-6.0	-5.5	
		-1.8	-1.8	-2.0	-2.2	-2.6	-2.7	-2.7	-2.8	-2.6	-1.9	-1.0	-0.2	0.7	1.4	1.7	1.6	0.6	-0.3	-0.5	-0.7	-0.9	-1.1	-1.5	-1.8	Diurnal Average	
		6.2	5.9	5.7	5.2	5.3	5.5	5.5	5.4	5.6	8.1	11.7	11.9	11.5	11.7	12.9	12.0	10.1	9.8	9.2	8.5	8.2	8.2	7.8	7.6	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Patricia McInnes - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Patricia McInnes - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	425	59.03	59.03
0 - 10	282	39.17	98.19
10 - 20	13	1.81	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) - %

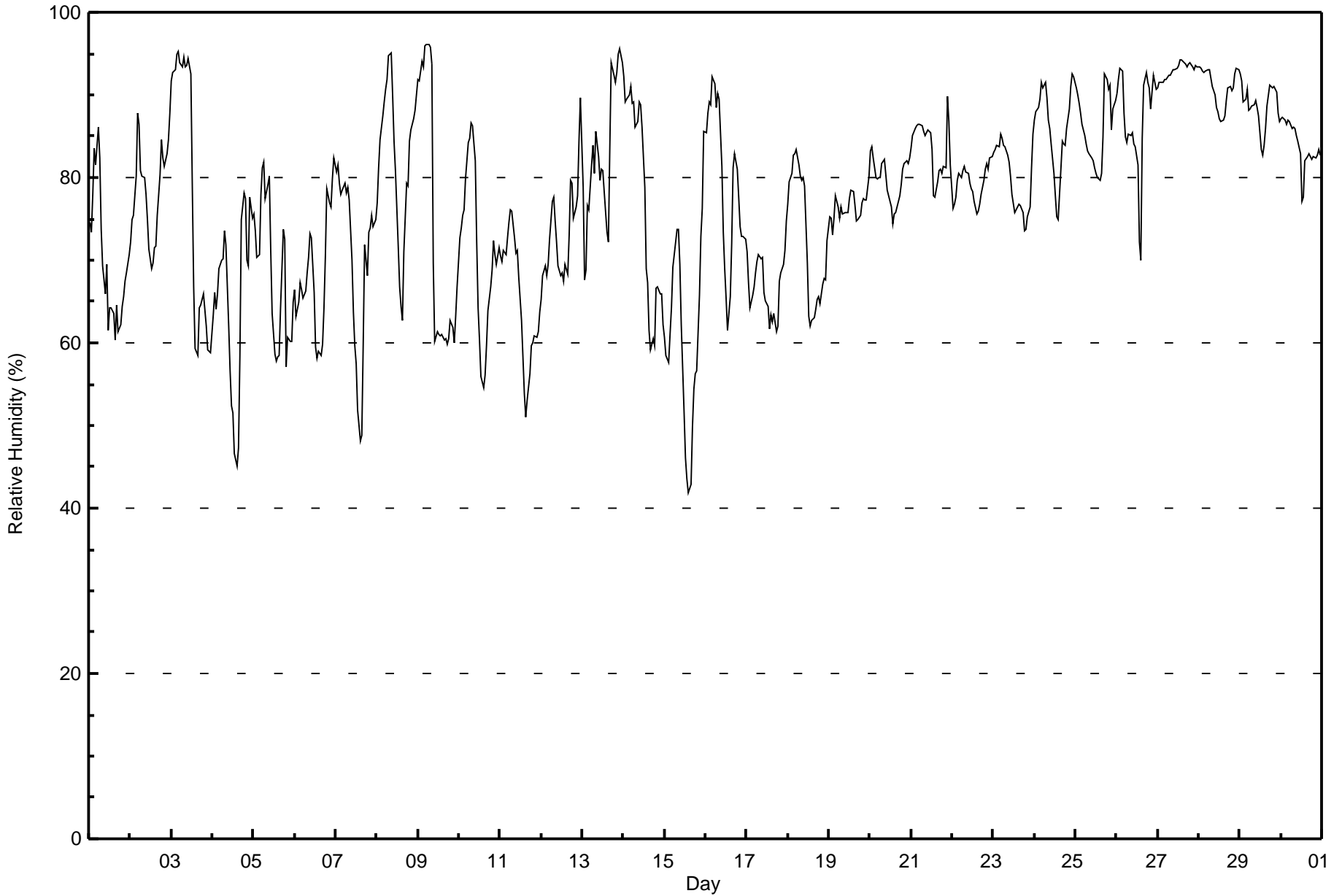
Patricia McInnes - November 2016

Maximum Value: 96 % on Nov 9 06:00 Maximum Daily Average: 92.9 % on Nov 27																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 42 % on Nov 15 15:00 Minimum Daily Average: 61.1 % on Nov 15 Maximum Diurnal Average: 83.0 % at hour 6 Minimum Diurnal Average: 67.9 % at hour 15 Monthly Average: 77.3 % Percentiles: P ₁ = 48 P ₁₀ = 61 Q ₁ = 69 Median = 79 Q ₃ = 86 P ₉₀ = 92 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-Nov	75	73	78	84	81	86	82	74	69	66	69	61	64	64	64	60	65	61	62	64	66	67	68	71	69.8	86
2-Nov	72	75	75	80	88	86	81	80	80	78	75	71	69	70	71	72	75	80	85	82	81	83	85	88	78.5	88
3-Nov	92	93	93	95	95	94	93	95	93	94	94	93	79	67	59	59	64	65	65	66	62	59	59	59	78.6	95
4-Nov	63	66	64	66	69	70	70	74	72	62	57	52	52	47	45	47	58	75	78	78	70	69	78	75	64.9	78
5-Nov	76	73	70	71	78	81	82	77	79	80	71	64	59	58	58	58	64	74	73	57	61	60	60	65	68.7	82
6-Nov	66	63	65	67	66	65	66	69	70	73	73	66	59	58	59	59	60	64	71	79	77	76	80	82	68.1	82
7-Nov	81	81	79	78	78	79	78	79	77	70	64	60	58	52	48	49	60	72	68	73	74	76	74	75	70.1	81
8-Nov	77	81	85	87	89	91	92	95	95	90	84	81	72	67	64	63	71	79	79	84	86	87	88	90	82.4	95
9-Nov	92	92	94	93	96	96	96	96	94	70	60	61	61	61	61	60	61	60	60	63	62	60	63	67	74.1	96
10-Nov	73	74	75	76	80	84	85	87	86	82	72	64	60	56	55	56	60	64	67	69	72	71	70	71	71.2	87
11-Nov	71	70	71	71	73	75	76	76	73	71	71	68	63	58	54	51	53	56	60	60	61	61	61	64	65.2	76
12-Nov	65	68	69	68	70	72	77	78	75	72	69	68	68	67	70	68	73	80	79	75	76	78	84	90	73.4	90
13-Nov	79	68	69	77	76	82	84	81	86	82	80	81	81	78	73	72	84	94	92	91	93	95	96	94	82.8	96
14-Nov	92	89	90	90	91	89	89	86	87	89	89	86	79	69	67	62	59	61	60	67	67	66	66	62	77.1	92
15-Nov	61	58	58	61	64	69	72	74	74	69	62	52	46	43	42	43	50	54	56	57	66	73	76	86	61.1	86
16-Nov	85	88	89	89	92	91	88	90	89	81	73	69	65	62	66	72	81	83	81	78	74	73	73	73	79.4	92
17-Nov	71	67	64	66	67	68	70	71	70	70	66	65	64	62	63	63	64	61	62	67	69	70	71	75	66.9	75
18-Nov	77	79	81	83	83	83	82	80	80	80	79	70	63	62	63	63	64	65	66	65	67	68	68	72	72.6	83
19-Nov	75	75	73	75	78	76	75	76	76	76	76	76	77	79	78	77	75	75	75	77	77	77	77	80	76.4	80
20-Nov	83	84	82	80	80	80	80	82	82	80	78	78	76	74	76	76	76	78	79	81	82	82	82	82	79.7	84
21-Nov	84	85	86	86	86	87	86	86	85	85	86	85	83	78	78	80	81	81	80	81	81	90	87	82	83.7	90
22-Nov	76	77	78	80	81	80	81	81	81	81	79	79	78	77	76	76	77	78	80	81	82	81	82	82	79.3	82
23-Nov	83	83	84	84	85	85	84	84	83	82	80	78	76	76	77	77	76	74	74	74	75	76	81	85	79.9	85
24-Nov	87	88	88	89	92	91	92	90	87	86	84	80	78	75	75	81	84	84	84	86	88	91	93	92	86.0	93
25-Nov	91	90	89	88	86	85	84	83	83	82	82	81	80	80	80	80	85	93	92	91	91	86	88	89	85.8	93
26-Nov	90	92	93	93	88	85	84	85	85	85	84	84	81	72	70	85	91	93	92	91	88	92	92	91	86.9	93
27-Nov	91	92	92	91	92	92	92	92	93	93	93	93	94	94	94	94	94	93	94	94	93	93	94	93	92.9	94
28-Nov	93	93	93	93	93	93	93	92	91	90	89	88	87	87	87	87	89	91	91	91	91	93	93	93	90.8	93
29-Nov	93	92	89	89	91	88	88	89	89	89	88	87	83	83	84	86	89	91	91	91	91	90	88	87	88.6	93
30-Nov	87	87	87	86	87	87	86	86	86	85	84	83	77	78	82	83	83	82	82	83	82	83	83	83	83.9	87
80.0 79.9 80.1 81.2 82.5 83.0 83.0 82.8 82.3 79.8 77.1 74.1 71.2 68.4 67.9 68.6 72.2 75.4 75.9 76.5 76.9 77.5 78.7 79.9																		Diurnal Average								
93 93 94 95 96 96 96 96 95 94 94 93 94 94 94 94 94 94 94 94 93 95 96 94																		Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Patricia McInnes - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Patricia McInnes - November 2016

Maximum Speed: 27 km/h on Nov 15 01:00	Maximum Daily Speed Average: 13.5 km/h on Nov 15	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 22 09:00	Minimum Daily Speed Average: 1.7 km/h on Nov 21	Hours of Data: 720
Maximum Diurnal Speed Average: 5.6 km/h at hour 10	Minimum Diurnal Speed Average: 2.7 km/h at hour 17	Hours of Missing Data: 0
Monthly Average Velocity: 3.8 km/h 205.7 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 12 P ₉₀ = 15 P ₉₉ = 24	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	N13	NNW13	NNW10	N8	NNE7	NNW5	W7	NW14	WNW18	WNW16	NW16	WNW18	WNW15	WNW16	WNW16	NW17	WNW15	NW15	NW14	NNW10	NNW7	NNE5	NE4	NE6	NW10.4	WNW18	
2-Nov	ENE5	ESE3	ESE4	E4	SSE3	S5	S7	S6	SE8	SE9	SE11	SE11	SE9	SE8	SE9	SE8	SE8	SE6	S10	SSW15	SW15	SSW14	SW12	SSW10	SSE6.4	SSW15	
3-Nov	S9	SSW12	S9	SSE8	SSE8	SE8	SE7	SSE7	SW4	SE5	S8	S9	SW13	SSW14	SW14	SSW11	SSW10	SW15	SW15	SW14	SW18	SW12	SW14	SW14	SSW9.5	SW18	
4-Nov	S7	SSW9	SW11	SW10	SW11	SW11	SW12	SSW8	SSW8	S5	ESE5	SSE8	ESE9	SSE8	SE5	SSE6	SSE4	SE2	S6	S6	S8	SSE6	S6	S5	S6.3	SW12	
5-Nov	SSE8	SSE7	SSE9	S10	SSW4	SW2	S5	SSE8	S3	S5	S7	SSE5	SSE8	SSE6	SSE5	SSE5	SSW5	S4	S8	SW9	SSW7	SW8	SW4	SW10	S5.7	S10	
6-Nov	SW12	WSW12	WSW11	SSW10	SW9	WSW11	WSW14	WSW15	WSW16	WSW12	WSW10	WSW13	WSW13	SW10	WSW7	SW5	WSW7	SW8	SW5	SW7	SW5	SW10	SW8	SW8	SW9.7	WSW16	
7-Nov	SW12	WSW14	WSW17	WSW16	WSW16	WSW13	SW14	SW9	SSW8	SW11	SW11	SW10	SW10	SW10	SW11	SW10	SSW6	SSE4	SE5	SE6	S5	SSE5	SSE4	SSE7	SSE9	SW8.1	WSW17
8-Nov	SE9	SE10	SE11	SE10	SE8	SE8	SSE7	S6	S5	SE8	SSE9	SSE6	S4	SE6	SSE9	S6	SSW4	S6	SSW6	SSW7	SSE8	S8	S5	SE3	SSE6.6	SE11	
9-Nov	S6	S7	SSW6	S4	SSE8	S4	SSE5	SSE7	SSE6	WSW14	W18	W18	W22	W18	W16	W14	W18	W19	W17	W20	W18	W17	W16	WSW17	WSW10.8	W22	
10-Nov	WSW14	WSW17	WSW18	WSW14	SW7	SW10	SW11	SSW6	SSW9	SW11	SW11	S9	S9	SE7	SE9	SE11	SE11	SE15	SE12	SE7	SE8	SE12	SE16	SE13	S7.4	WSW18	
11-Nov	SE15	SE13	SE10	SE9	SE6	SE8	SE8	S9	S9	S11	SSW8	SSW10	SW15	SW14	SW13	SW15	SW10	SW8	SW8	SW12	WSW11	WSW12	WSW14	WSW13	SSW8.1	SW15	
12-Nov	WSW12	WSW13	SW14	SW12	WSW8	SW5	SSE4	SW4	SSW5	SSW8	SW10	SW8	SSW6	SSW3	SW7	SW8	N5	WNW5	W8	WSW7	W7	SW7	SW7	S5	SW6.5	SW14	
13-Nov	W8	W10	W9	SW4	SW9	WSW12	WSW12	WSW9	SSW10	SSW9	S8	S6	S7	SSW9	S7	SSE7	SE4	S4	S7	SSE2	SE4	ESE4	SSE6	SSE7	SSW5.2	WSW12	
14-Nov	SE6	SSE7	S5	S5	SSW6	SSW8	SW8	SW10	SW11	SW12	SW14	SW13	WSW18	W20	W20	WNW22	W19	WSW11	W14	W22	W24	W26	W27	W26	WSW12.7	W27	
15-Nov	W27	W25	W25	W24	W22	W22	WSW18	WSW21	WSW13	SW8	SW10	WSW9	W14	W15	W15	W29	SW7	WSW9	W11	W13	SW2	SSW5	SW6	WNW5	WSW13.5	W27	
16-Nov	NE3	NW2	NW3	WSW4	WNW4	NW7	WNW2	SW3	SW3	SSW2	SSW2	SSE5	SE7	ESE6	NNE10	N13	N12	N14	N15	N17	NNE14	N12	N10	NNW6	N4.6	N17	
17-Nov	NNW12	N14	N16	N16	N14	NNW11	NW12	NNW11	WNW13	WNW10	WNW11	WNW11	W13	WNW14	WNW13	WNW12	NW15	NW19	NW20	NW16	NW13	NW11	NW8	WNW8	NW11.9	NW20	
18-Nov	W7	W7	SSW4	S5	S3	SW5	SW6	SW9	SW8	SSW7	SSW5	N1	W8	W8	WSW7	WSW7	WSW5	W4	W4	NW3	NE3	ESE6	ESE6	SE6	SW3.5	SW9	
19-Nov	ESE7	E9	E9	E9	E8	E8	ENE9	NE9	E11	E10	ENE10	ENE9	ENE9	ENE10	ENE9	E11	ESE13	ESE12	ESE13	ESE14	ESE16	ESE16	ESE15	ESE14	E10.3	ESE16	
20-Nov	ESE12	ESE11	ESE12	SE12	ESE10	SE11	SE15	SE12	SE13	SE13	SE8	ESE11	ESE10	SE8	ESE9	ESE10	ESE10	SE10	ESE10	ESE11	ESE11	ESE9	ESE12	ESE12	SE10.7	SE15	
21-Nov	ESE10	SE10	SE9	ESE9	SE9	SE8	SE6	SE8	SE5	SSE6	S5	SW6	W4	NW5	NNW8	NW6	NW9	NW7	NNW6	NW8	NNW13	N15	NNE13	N13	NE1.7	N15	
22-Nov	N14	N9	N9	N8	NNW6	NNW6	N6	NNW5	SE1	SSE1	SE4	SE6	SE6	SE6	SE8	ESE8	SSE9	SSE12	SSE15	SE11	SE10	SE11	SE11	SE15	ESE3.7	SSE15	
23-Nov	SE16	SE15	SE13	SE13	SE12	SSE13	SSE13	SSE13	SSE14	SSE15	SE15	SE16	SE21	SE17	SE14	SE12	SE12	SSE12	S15	S16	S13	S12	S9	S9	SSE13.3	SE21	
24-Nov	S7	S6	S7	SSE6	SSE9	S7	SSE5	S7	S8	S9	S9	S9	SSE7	SE8	SE9	SE8	ESE7	ESE11	SE15	SE15	SE15	SE16	ESE15	SE16	SE8.8	SE16	
25-Nov	SE17	SE19	SE22	SE19	SE19	SE18	SE17	SE17	SE15	SE14	SE11	SE11	SE10	SE10	SSE7	SSW4	SW4	WSW6	WSW7	WSW9	WSW10	WSW12	WSW10	SW12	SSE8.8	SE22	
26-Nov	WSW11	SW11	WSW8	SW8	WSW10	WSW9	SW11	WSW12	SW11	SSW12	SSW12	SW13	SW10	SW4	SE3	E2	WSW2	NW3	NW5	NW5	WNW1	N5	NNW4	NNW4	WSW5.7	SW13	
27-Nov	NNW5	NNW5	N6	N5	NNE5	N6	N6	N5	N7	N6	N8	N9	N8	N7	N9	NNW11	NNW12	NNW12	NNW12	NNW12	NNW10	NNW8	NW4	WSW3	SW4	N6.7	NNW12
28-Nov	WSW4	WSW4	N2	SW3	WSW6	WSW7	SW5	SW7	SW8	SW9	SW9	SW8	SW7	WSW8	WSW7	WSW5	WSW6	WNW3	NNW4	N9	N8	NNW5	NW4	NW4	WSW4.2	SW9	
29-Nov	NW4	WNW5	NW7	NW7	WNW7	WNW6	WSW5	WSW5	SSW5	WSW10	WSW8	SW4	SSE5	S6	SSW6	SW10	SSW10	SW10	SSW10	S9	S12	SSE10	S10	S12	SW5.3	S12	
30-Nov	S11	S12	SSE11	SE10	SE9	SE9	SE11	SSE10	S13	SSE10	SSE12	SSE10	SSE11	S10	SSE9	SSE11	S10	SSE12	S13	S12	S12	S12	SSE10	S11	SSE10.5	S13	

SSW3.1SSW3.7SSW3.4	S3.2SSW3.2SSW3.7SSW4.6SSW4.7SSW5.2SSW5.6SSW5.0SSW4.9SSW5.0SSW4.5SSW3.5	SW2.8	SW2.7	SW2.9	SW3.7	SW3.9	SW3.3SSW3.1SSW3.4SSW4.1	Diurnal Average																
W27	W25	W25	W24	W22	WSW22	WSW18	WSW21	WNW18	WNW16	W18	WNW18	W22	W20	W20	WNW22	W19	NW19	NW20	W22	W24	W26	W27	W26	Diurnal Maximum

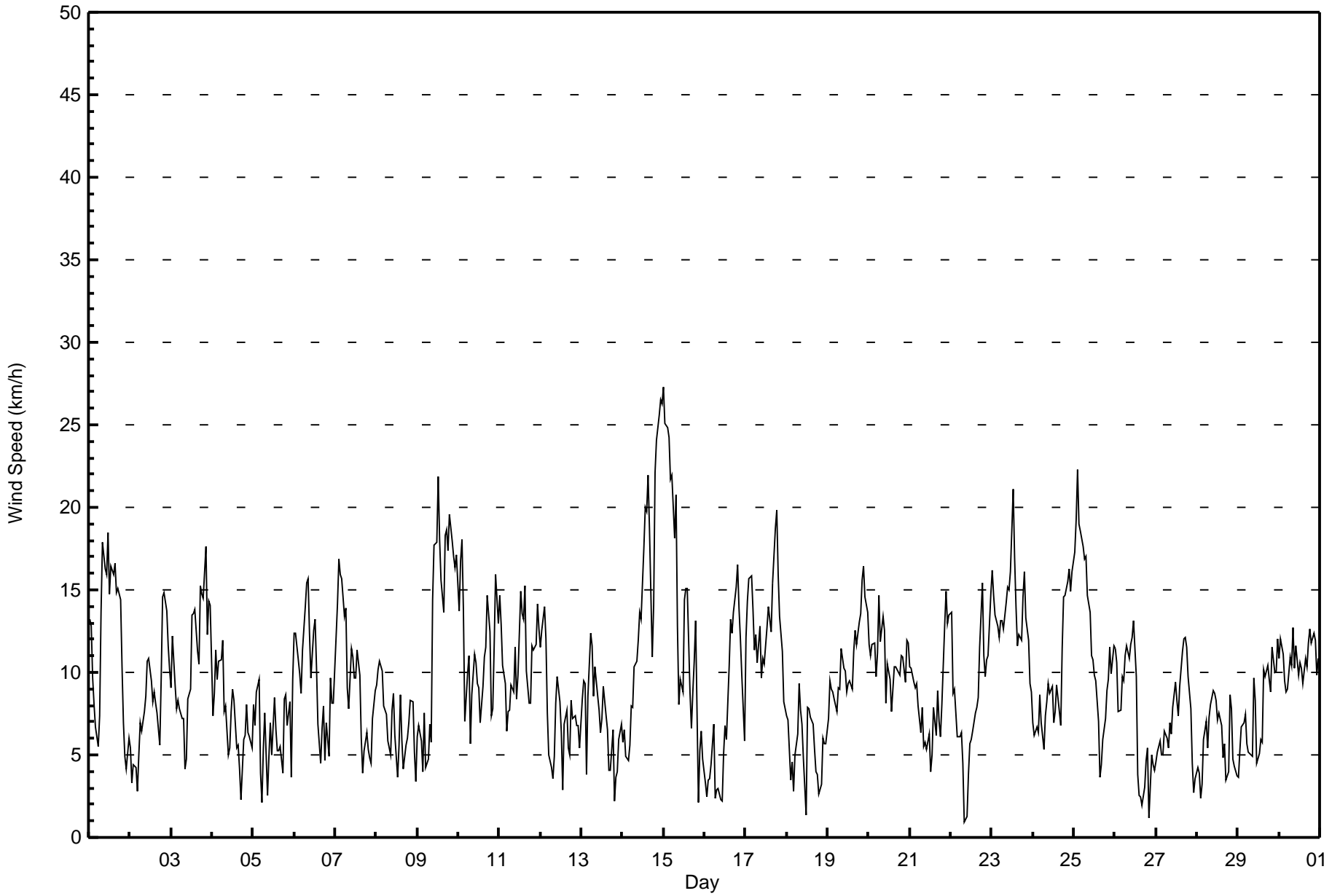
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Patricia McInnes - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Nov 25 03:00																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Nov 26 19:00																									
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-Nov	3	3	2	2	2	1	2	5	4	4	4	4	3	3	4	4	3	3	4	3	2	2	2	1	5
2-Nov	1	1	1	1	2	1	2	1	2	2	2	3	2	2	2	2	2	1	3	3	3	3	2	2	3
3-Nov	2	2	3	1	1	1	1	3	1	2	2	2	3	3	3	2	2	4	3	3	3	3	3	3	4
4-Nov	2	1	1	1	2	2	2	1	2	1	2	2	2	2	2	1	2	1	2	1	2	2	2	1	2
5-Nov	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	1	2	2	3	3	2	3	2	2	3
6-Nov	1	2	2	2	3	2	2	2	2	2	2	2	3	2	3	1	1	1	3	2	4	2	1	2	4
7-Nov	1	2	2	2	2	2	2	3	2	3	2	2	2	2	3	1	1	1	2	1	2	2	1	2	3
8-Nov	2	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
9-Nov	3	3	3	2	2	2	1	2	2	4	4	4	4	5	3	3	4	4	3	3	3	3	3	4	5
10-Nov	2	3	3	4	2	2	2	2	2	3	3	2	3	2	3	2	2	3	3	2	2	3	3	3	4
11-Nov	3	2	3	2	1	2	1	2	1	2	2	2	3	3	2	3	2	1	1	2	2	1	3	2	3
12-Nov	1	2	2	2	1	2	2	3	2	2	3	3	2	2	2	1	2	1	1	1	1	2	3	1	3
13-Nov	3	1	1	2	2	2	2	3	2	2	2	2	2	2	1	1	1	1	1	2	1	1	1	1	3
14-Nov	1	2	1	1	2	1	2	2	2	2	2	2	6	4	5	6	4	3	5	5	5	5	5	5	6
15-Nov	5	5	5	4	4	4	3	4	5	2	2	4	4	3	3	4	1	1	2	2	2	1	1	2	5
16-Nov	1	1	1	1	1	0	2	1	1	1	1	1	1	2	3	3	3	3	3	3	3	3	2	2	3
17-Nov	4	3	3	3	3	2	2	2	3	2	2	2	3	3	3	3	5	4	4	3	3	2	2	1	5
18-Nov	1	1	1	1	2	1	1	2	2	1	1	2	2	3	2	2	2	1	1	1	2	2	1	1	3
19-Nov	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	3	3	4	3	4	4	3	3	4
20-Nov	3	3	3	3	3	4	4	3	3	3	2	2	2	2	2	2	2	2	2	3	3	2	3	3	4
21-Nov	2	2	2	2	2	3	2	2	1	1	1	1	1	2	1	1	2	2	2	2	3	3	3	3	3
22-Nov	3	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	3	3	2	3	2	4	4
23-Nov	4	3	3	3	3	3	3	3	3	4	4	4	5	4	3	3	2	3	4	4	3	2	2	2	5
24-Nov	2	1	1	1	1	2	1	1	2	2	2	2	1	1	2	2	2	3	3	4	4	4	4	5	5
25-Nov	4	5	6	5	5	5	4	4	4	4	3	3	2	2	2	1	1	1	1	2	2	2	2	2	6
26-Nov	2	2	2	2	2	2	2	3	2	3	3	3	2	3	2	1	1	1	0	1	2	1	1	1	3
27-Nov	1	1	1	1	1	1	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2
28-Nov	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2
29-Nov	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	2	2	2	3	2	2	2	2	3	3
30-Nov	3	3	2	2	2	2	2	3	3	2	2	2	2	2	3	3	2	3	3	3	3	3	2	2	3
Diurnal Maximum																									
5 5 6 5 5 5 4 5 5 4 4 4 6 5 5 6 5 4 5 5 5 5 5 5 5																									





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Patricia McInnes - November 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	133	18.47	18.47
6 - 11	370	51.39	69.86
12 - 19	197	27.36	97.22
20 - 28	20	2.78	100.00
29 - 38	0	0.00	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
Patricia McInnes - 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	6	3	2	1	2	4	11	15	20	12	19	9	3	7	11	8	133
6 - 11	18	2	2	6	8	21	62	44	49	29	58	31	12	8	7	13	370
12 - 19	14	2	0	0	0	13	38	10	12	7	26	30	18	11	10	6	197
20 - 28	0	0	0	0	0	0	2	0	0	0	0	2	14	1	1	0	20
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	38	7	4	7	10	38	113	69	81	48	103	72	47	27	29	27	720

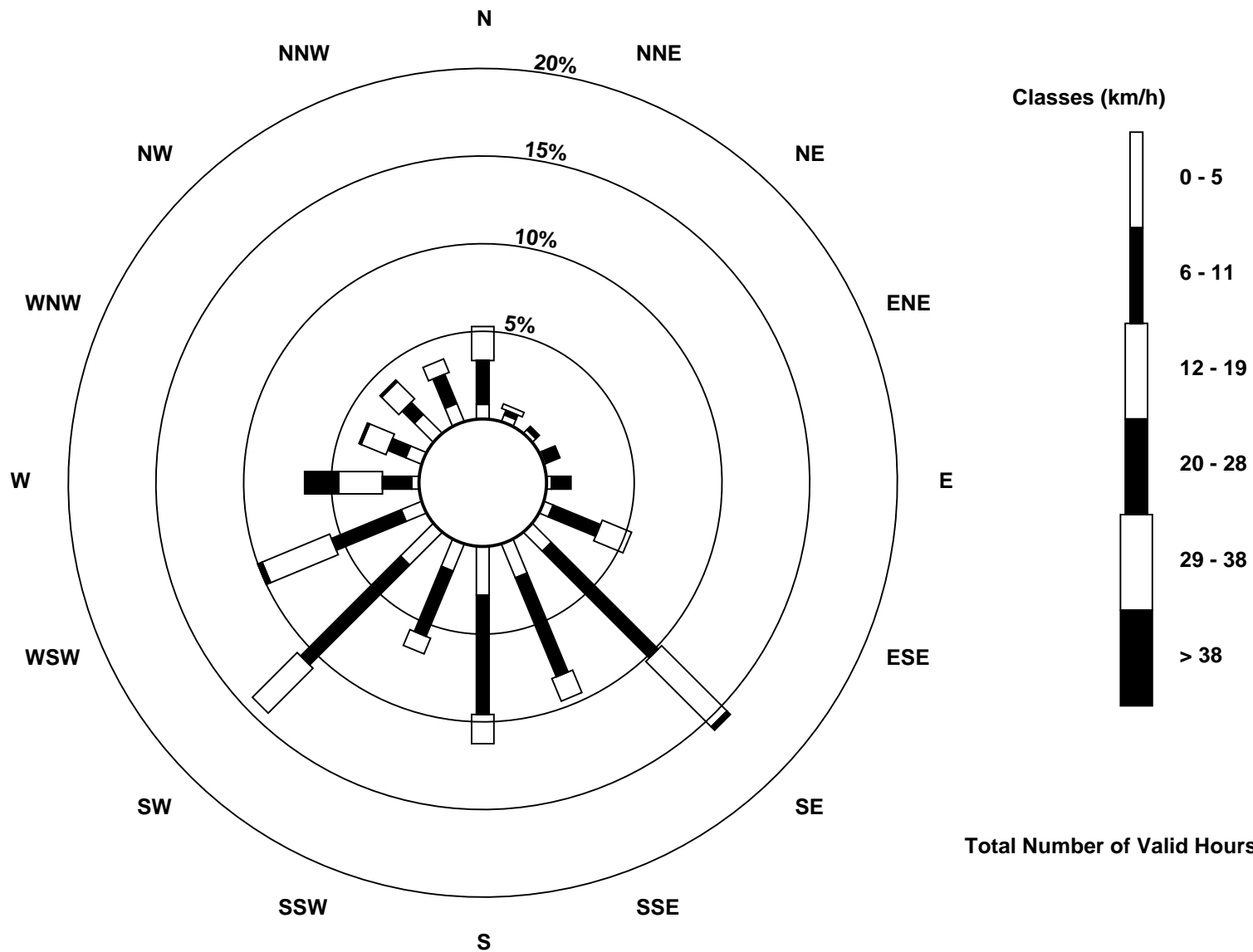
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Patricia McInnes (AMS 6)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Patricia McInnes - November 2016

Direction of Maximum Speed: 266 deg on Nov 15 01:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 258.5 deg on Nov 15	Hours of Data: 720
Direction of Minimum Speed: 141 deg on Nov 22 09:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.7 deg on Nov 21	Percent Operational Time: 100.0
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-Nov	357	341	342	356	20	336	271	305	298	296	310	296	299	289	290	304	299	311	315	337	329	18	55	47	315.2
2-Nov	59	119	103	96	155	181	170	170	143	125	133	135	136	136	131	125	138	142	178	198	214	212	214	211	161.2
3-Nov	183	193	182	147	153	134	134	161	214	144	170	172	215	207	214	199	209	217	221	227	229	232	229	227	201.6
4-Nov	187	193	220	227	221	223	221	203	198	169	115	152	122	168	138	168	160	139	186	187	183	161	172	179	186.5
5-Nov	159	162	163	173	197	232	179	163	175	172	171	149	165	150	156	149	207	184	179	222	210	225	226	221	181.4
6-Nov	233	241	237	201	222	240	251	251	247	240	239	242	237	233	239	230	242	232	215	232	226	236	216	229	236.0
7-Nov	234	240	244	245	243	241	231	217	212	229	234	221	235	229	219	198	149	140	133	171	157	154	147	148	219.1
8-Nov	138	145	138	144	144	144	163	183	173	146	147	149	175	143	160	175	207	179	203	207	167	174	174	135	159.8
9-Nov	186	190	201	174	158	190	150	156	166	249	271	262	273	277	261	267	278	277	272	273	272	277	262	256	258.1
10-Nov	246	244	247	248	214	218	230	212	196	231	226	189	173	146	126	128	132	135	137	143	135	133	134	137	183.7
11-Nov	135	130	136	132	129	145	141	179	180	185	194	211	224	216	219	236	231	219	220	234	243	250	252	247	201.9
12-Nov	240	237	229	228	238	226	167	221	208	203	225	218	198	213	215	233	355	286	261	254	261	230	214	183	229.9
13-Nov	281	278	261	216	231	240	251	252	213	201	171	173	185	196	177	149	134	170	191	154	128	116	152	156	207.1
14-Nov	140	156	179	189	194	194	214	229	222	236	236	235	256	272	273	283	279	258	262	264	269	270	269	271	255.1
15-Nov	266	266	265	268	261	259	246	256	253	232	229	256	265	260	263	260	224	253	265	280	223	212	233	294	258.5
16-Nov	46	320	305	248	293	309	284	220	217	198	202	157	133	123	29	8	357	1	4	6	13	10	6	348	2.3
17-Nov	340	352	2	358	352	343	320	330	301	289	299	292	278	291	301	297	304	310	307	307	309	304	308	282	315.1
18-Nov	277	259	208	190	177	229	230	224	214	208	204	1	274	271	247	238	252	264	274	313	34	114	112	132	232.4
19-Nov	111	86	93	83	85	81	76	48	88	84	73	70	76	76	67	89	104	112	120	109	111	110	105	109	93.1
20-Nov	110	115	122	129	122	130	134	140	130	143	140	123	122	124	118	115	122	124	122	122	122	118	110	121	124.3
21-Nov	120	127	128	122	124	127	134	137	134	150	182	224	269	324	332	325	322	316	329	322	332	5	13	11	41.0
22-Nov	5	9	5	351	329	341	4	336	141	155	128	133	133	134	127	119	155	159	155	143	142	140	124	139	116.7
23-Nov	145	144	140	139	139	151	151	151	148	147	144	142	143	142	139	140	146	162	189	179	173	176	177	175	152.3
24-Nov	176	178	171	163	161	175	163	170	172	171	190	179	152	133	129	129	117	118	129	135	125	125	115	129	144.6
25-Nov	129	127	126	127	126	128	136	144	141	145	137	135	135	141	154	198	232	242	242	249	249	252	242	234	152.4
26-Nov	243	235	238	233	245	243	234	237	223	210	213	229	234	215	145	95	240	320	325	310	290	1	334	332	240.5
27-Nov	337	343	355	5	12	9	359	1	354	360	2	8	3	360	355	348	346	339	346	342	336	324	247	234	350.4
28-Nov	242	255	6	231	242	238	219	218	229	226	231	234	236	247	251	242	246	287	336	350	4	347	304	306	256.0
29-Nov	309	303	317	304	297	290	247	255	193	238	250	222	155	190	193	215	203	221	206	190	177	158	178	171	216.5
30-Nov	175	173	156	131	132	138	145	152	172	154	159	156	163	191	164	162	174	162	173	172	176	171	165	172	162.9

197.8 203.5 198.2 188.0 191.8 204.8 199.0 205.0 198.4 198.7 202.5 200.5 208.2 213.3 210.9 214.8 228.2 223.1 219.5 232.8 216.6 204.4 196.5 195.8

Diurnal Average

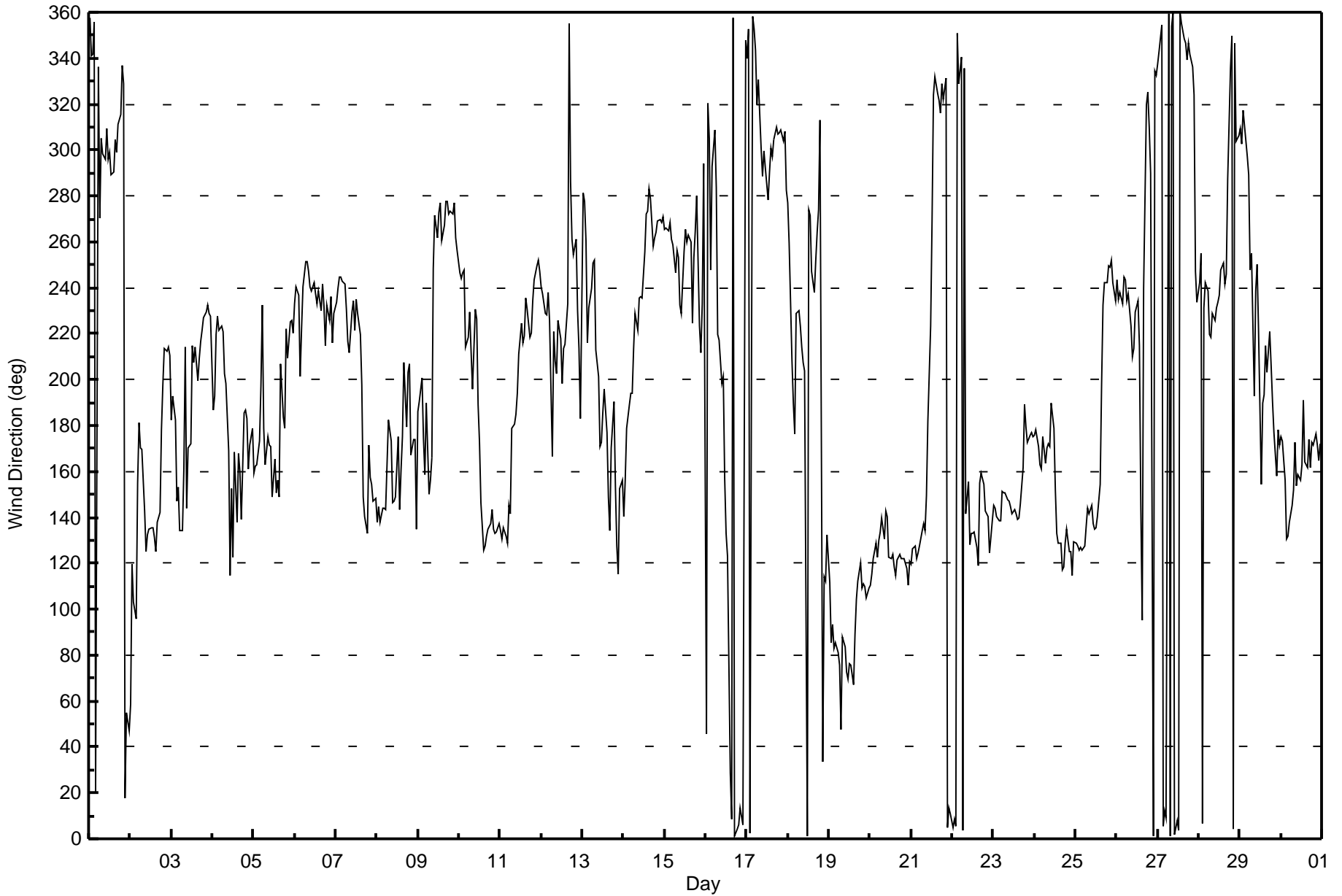
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Patricia McInnes - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 93 deg on Nov 18 12:00 Minimum Value: 3 deg on Nov 16 06:00 Percentiles: P ₁ = 7 P ₁₀ = 10 Q ₁ = 12 Median = 14 Q ₃ = 18 P ₉₀ = 28 P ₉₉ = 69																	Hours in Service: 720 Hours of Data: 720 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-Nov	17	14	15	12	13	28	24	13	14	16	14	14	16	14	14	12	12	13	15	15	22	24	29	21	29
2-Nov	24	22	13	12	60	12	12	15	17	19	16	16	16	14	15	13	12	9	15	12	11	11	12	11	60
3-Nov	12	14	19	8	11	12	18	23	35	28	15	15	14	13	15	14	10	12	10	12	11	12	11	12	35
4-Nov	22	16	7	7	7	8	8	14	12	34	40	17	15	25	19	20	20	53	19	22	17	25	21	17	53
5-Nov	13	12	14	11	44	68	27	25	80	31	17	35	17	18	19	14	22	29	14	56	30	28	69	12	80
6-Nov	10	9	10	13	27	9	7	10	8	9	12	11	11	14	19	14	8	7	39	11	58	10	11	8	58
7-Nov	7	9	8	8	8	9	10	19	16	12	13	17	14	15	15	11	42	14	14	22	19	38	13	7	42
8-Nov	12	16	12	13	15	13	14	11	21	17	14	26	38	34	17	20	28	12	14	18	14	16	48	44	48
9-Nov	31	36	17	44	24	57	24	19	46	19	13	13	14	13	12	12	11	12	11	10	10	10	11	10	57
10-Nov	8	8	9	13	32	21	10	34	24	14	13	21	22	29	19	12	11	11	12	23	10	12	13	12	34
11-Nov	11	12	11	9	9	15	10	12	10	12	14	16	13	15	12	10	10	11	9	8	10	9	9	9	16
12-Nov	14	8	10	10	11	20	24	49	27	14	10	17	15	64	24	10	38	33	9	12	9	19	14	18	64
13-Nov	33	17	7	44	15	9	10	30	12	18	18	25	15	14	16	21	19	17	14	69	37	24	9	12	69
14-Nov	20	12	19	21	28	11	12	10	10	11	12	11	14	12	13	12	12	17	14	12	12	12	11	11	28
15-Nov	10	12	11	11	10	9	10	11	19	18	16	31	15	12	13	22	10	14	12	13	69	27	11	34	69
16-Nov	36	45	15	16	22	3	56	18	22	26	58	25	18	33	18	12	14	14	14	14	13	14	17	21	58
17-Nov	15	14	14	15	13	14	14	18	11	14	16	20	16	16	13	16	16	13	11	10	11	11	10	9	20
18-Nov	11	8	36	18	51	12	13	9	12	14	19	93	37	32	26	20	18	30	26	30	58	22	17	16	93
19-Nov	15	11	14	11	14	13	16	16	13	16	14	14	14	13	13	14	14	14	13	13	14	12	13	12	16
20-Nov	13	13	14	15	14	16	14	15	15	15	19	13	14	19	16	13	15	14	14	15	13	13	12	14	19
21-Nov	14	14	13	11	12	15	24	15	16	19	13	27	25	15	12	11	15	12	12	11	14	13	13	15	27
22-Nov	12	14	14	13	10	14	13	19	74	80	30	19	22	21	18	13	21	17	14	16	13	16	14	15	80
23-Nov	14	13	13	13	13	12	13	12	13	13	14	15	14	14	13	13	13	13	15	15	13	12	13	12	15
24-Nov	14	12	13	10	11	12	18	16	12	12	13	15	23	16	14	12	18	12	13	14	13	15	17	19	23
25-Nov	15	15	14	14	15	16	15	14	15	13	16	14	18	20	15	27	12	11	11	10	11	10	12	10	27
26-Nov	11	11	13	11	11	14	11	12	11	13	15	13	18	41	49	47	35	35	9	5	63	15	18	14	63
27-Nov	14	16	12	12	11	11	13	19	15	15	14	12	15	14	13	10	9	9	10	9	7	25	44	12	44
28-Nov	14	15	39	64	12	13	13	14	11	10	11	11	13	12	10	11	11	33	17	14	13	13	10	14	64
29-Nov	24	27	13	10	9	13	17	18	16	15	14	33	20	12	14	16	18	13	18	23	21	13	17	13	33
30-Nov	15	17	14	14	13	13	14	17	14	14	15	16	18	11	20	16	13	15	15	14	14	15	12	14	20
																	36 45 39 64 60 68 56 49 80 80 58 93 38 64 49 47 42 53 39 69 69 38 69 44								
Diurnal Maximum																									





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:15	End Time (MST)	11:25
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-678	-678
Analyzer IP address	192.168.1.43		Lamp voltage	759	758
Calculated slope	0.997604	0.999052	Chamber temp	45.1	45.0
Calculated intercept	1.160841	1.685163	Pressure	698.2	694.3
Analyzer Background	6.0	6.0	Flow	0.448	0.444
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	771.3	1.007
calibrator zero	5500	0.0	0.0	0.5	----
high point	5500	84.1	776.8	777.1	1.000
second point	5500	42.1	388.9	385.9	1.008
third point	5500	21.1	194.9	191.6	1.017
as left zero	5500	0.0	0.0	0.4	----
as left span	5500	84.1	776.8	776.7	1.000
Average Correction Factor					1.008

Corrected As found 771.0 Previous response 777.5 % change 0.8%

Notes:

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



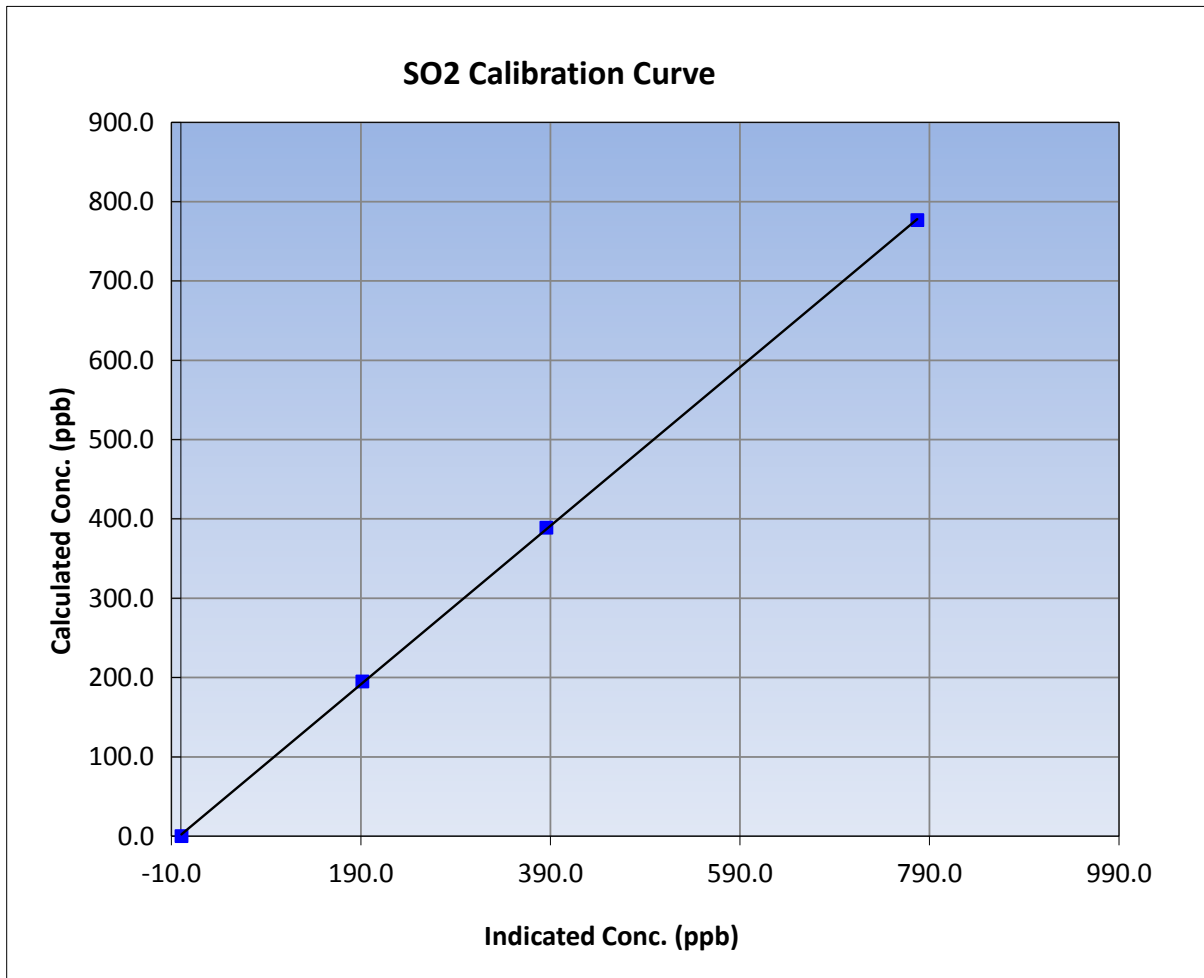
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:25
Analyzer make	Thermo 43i	Analyzer serial #	1008841397

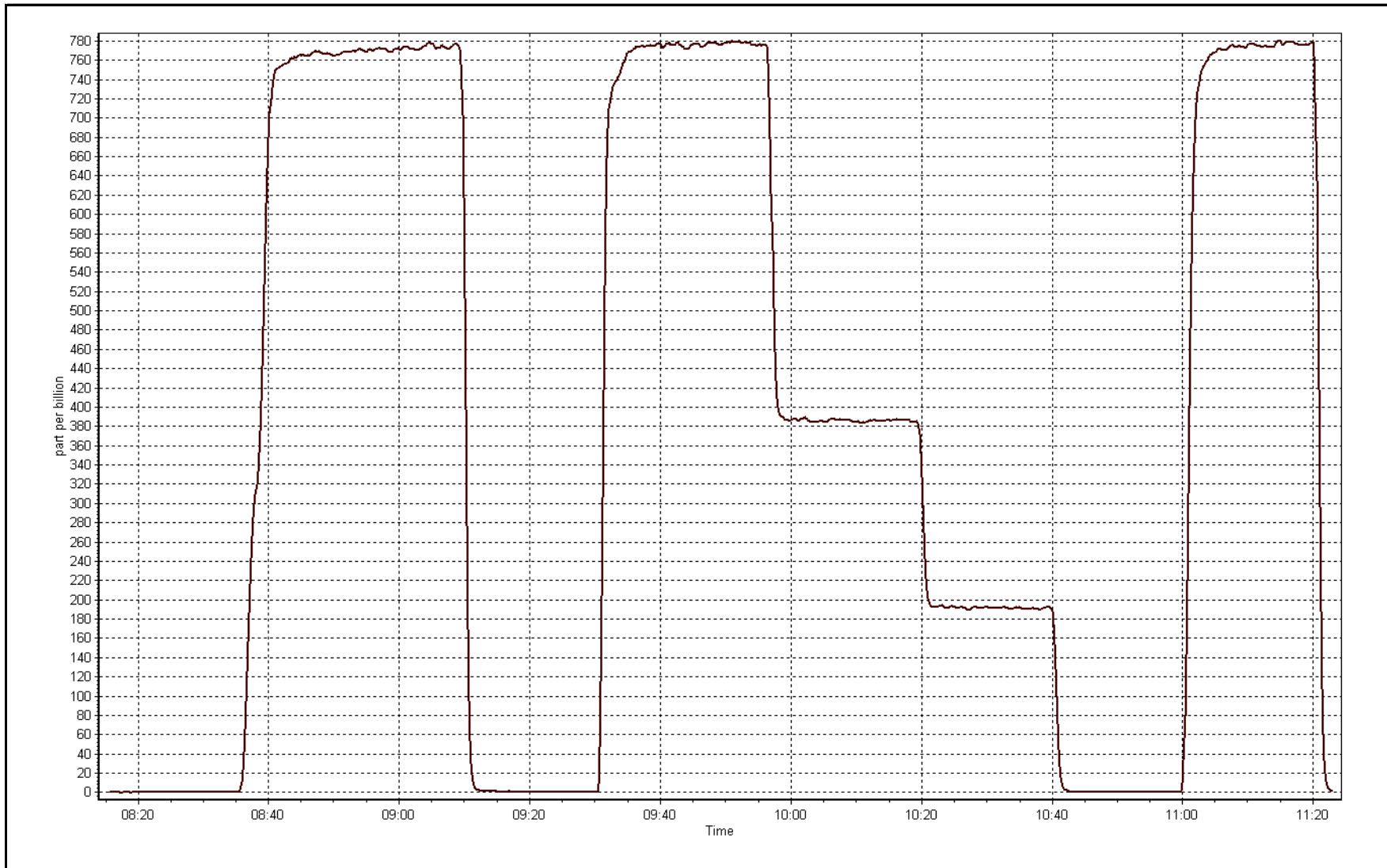
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999962
776.8	777.1	0.9996		
388.9	385.9	1.0078	Slope	0.999052
194.9	191.6	1.0173		
			Intercept	1.685163



SO2 Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 13, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	14:45
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	192.168.1.42		Lamp voltage	990	994
Calculated slope	1.003335	1.013048	Chamber temp	45	45
Calculated intercept	-0.274752	-1.089323	Pressure	681.8	685.7
Analyzer Background	2.05	3.48	Flow	0.430	0.431
Analyzer Coefficient	1.131	1.154	Intensity	91	91
			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	5500	0.0	0.0	0.2	----
as found span	5500	73.1	70.2	67.9	1.033
SO2 scrubber check	5500	21.1	191.1	0.8	----
calibrator zero	5500	0.0	0.0	1.2	----
high point	5500	73.1	70.2	70.3	0.998
second point	5500	41.8	40.1	40.9	0.980
third point	5500	20.9	20.1	20.6	0.976
as left zero	5500	0.0	0.0	0.8	----
as left span	5500	73.1	70.2	70.2	1.000
Average Correction Factor					0.985

Corrected As found	67.8	Previous response	70.2	% change	3.6%
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Notes:

As founds completed. Kicker assembly replaced after as founds to try and fix slow span stabilization issue. Zero was slow to stabilize afterwards. Conditioned with zero air and ambient air. Zero and span adjusted. Scrubber check completed before as left span.

Calibration Performed By:

Devin Russell



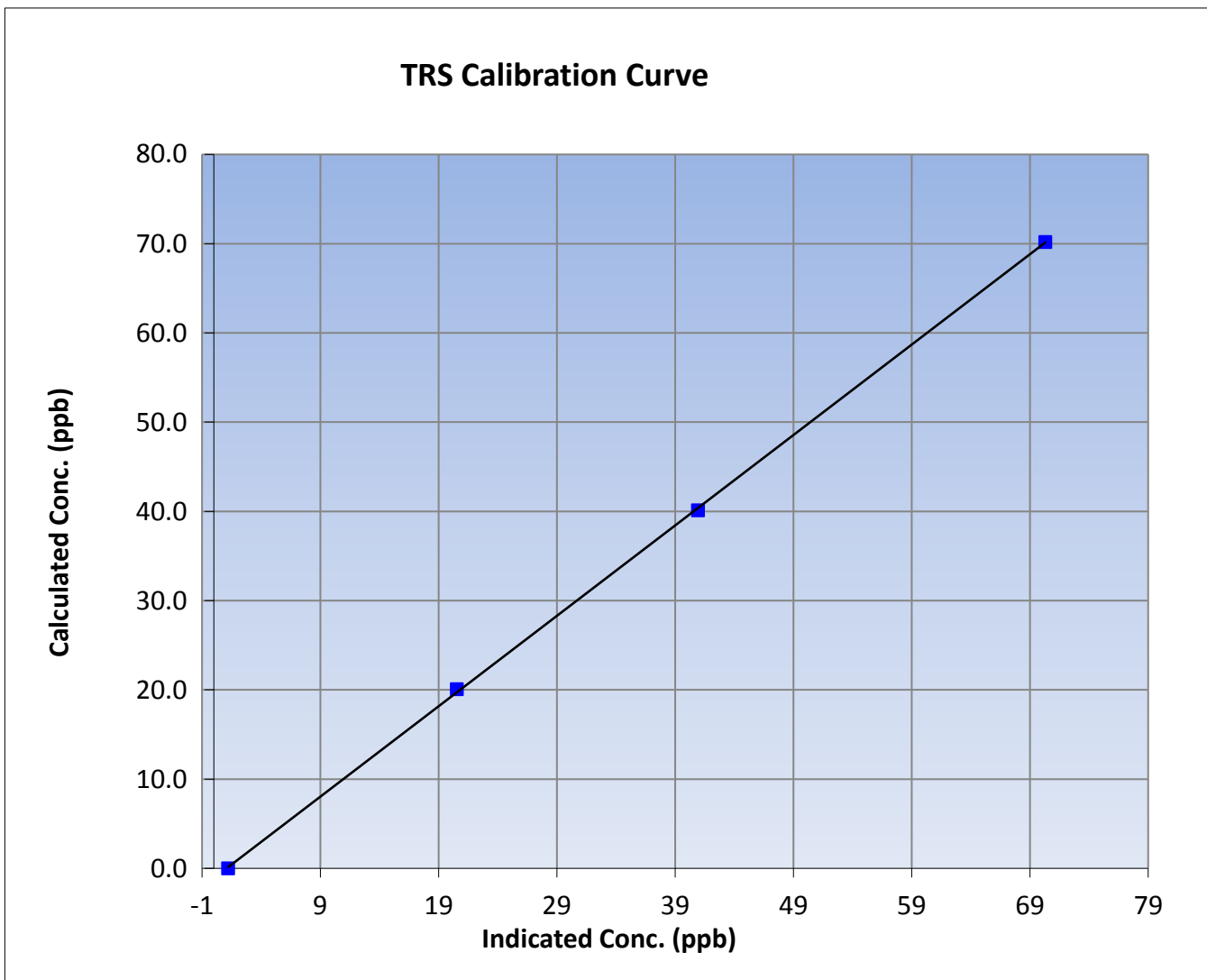
Wood Buffalo Environmental Association TRS Calibration Report

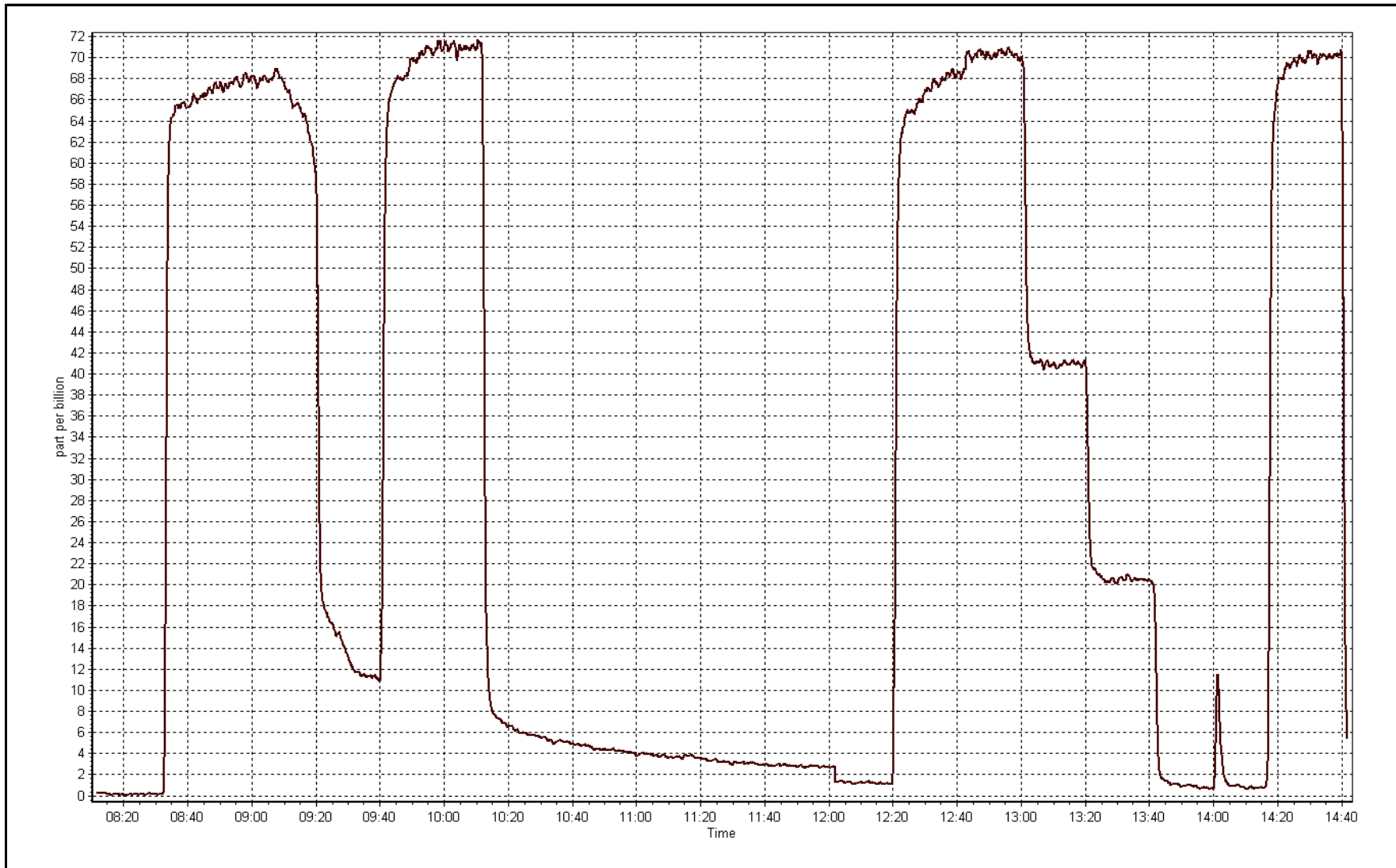
Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 13, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:10	End Time (MST)	14:45
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	1.2	----	Correlation Coefficient	0.999928
70.2	70.3	0.9982		
40.1	40.9	0.9804	Slope	1.013048
20.1	20.6	0.9764		
			Intercept	-1.089323







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 23, 2016	Last Calibration	November 4, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance		
Start Time (MST)	8:35	End Time (MST)	13:00
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	994	999
Calculated slope	1.013048	1.003760	Chamber temp	45	45
Calculated intercept	-1.089323	0.035042	Pressure	685.7	683.6
Analyzer Background	3.48	2.46	Flow	0.431	0.430
Analyzer Coefficient	1.154	1.107	Intensity	91	91
			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	5500	0.0	0.0	-1.2	----
as found span	5500	73.1	70.2	69.0	1.018
SO2 scrubber check	5500	21.1	191.1	0.1	----
calibrator zero	5500	0.0	0.0	0.0	----
high point	5500	73.1	70.2	69.8	1.005
second point	5500	41.8	40.1	40.1	1.000
third point	5500	20.9	20.1	19.8	1.012
as left zero	5500	0.0	0.0	-0.1	----
as left span	5500	73.1	70.2	69.4	1.011
Average Correction Factor					1.006

Corrected As found	70.1	Previous response	70.4	% change	0.3%
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Notes:

As founds completed. Original Kicker assembly installed. Zero and span adjusted. Scrubber check completed after as founds.

Calibration Performed By: _____

Devin Russell



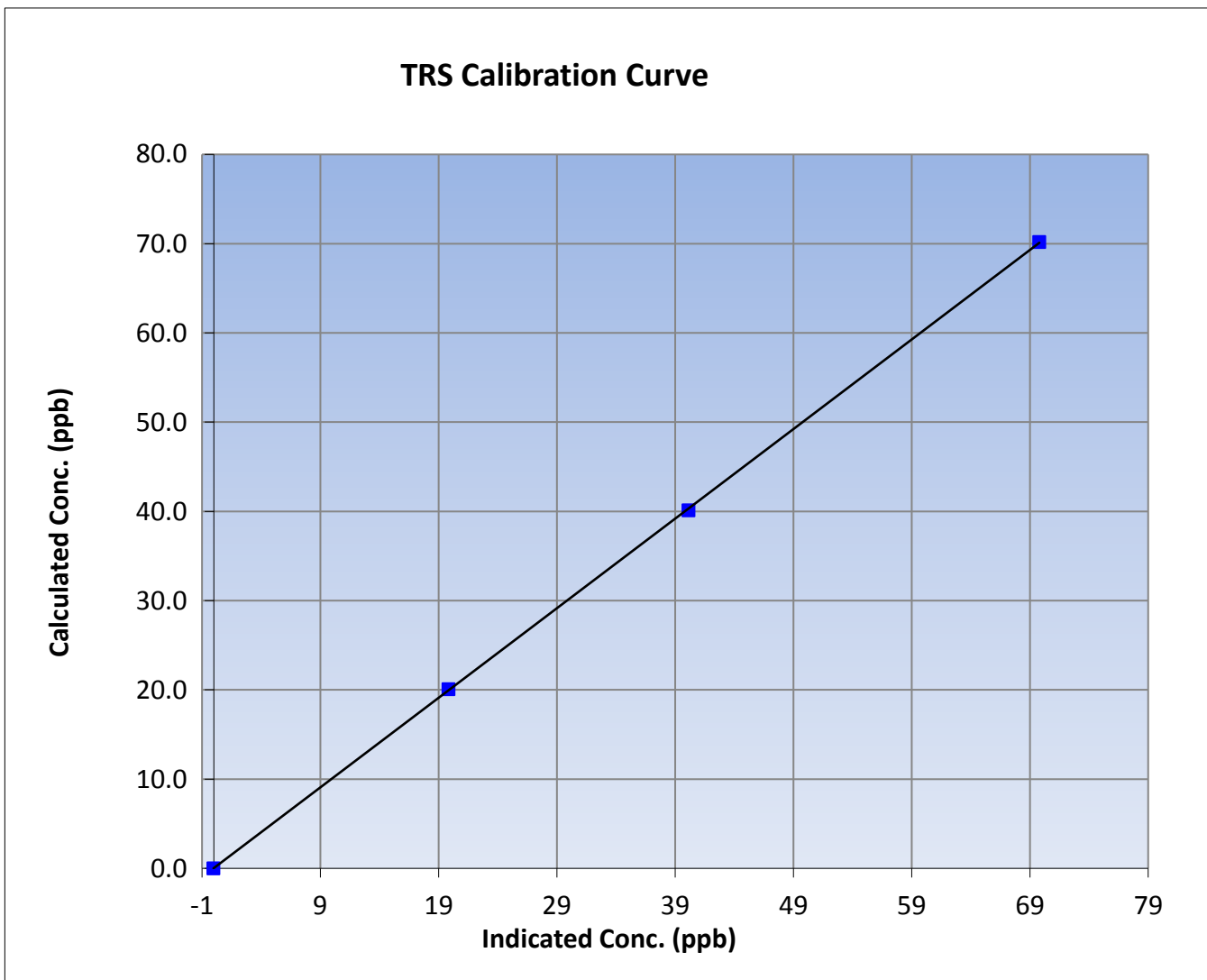
Wood Buffalo Environmental Association TRS Calibration Report

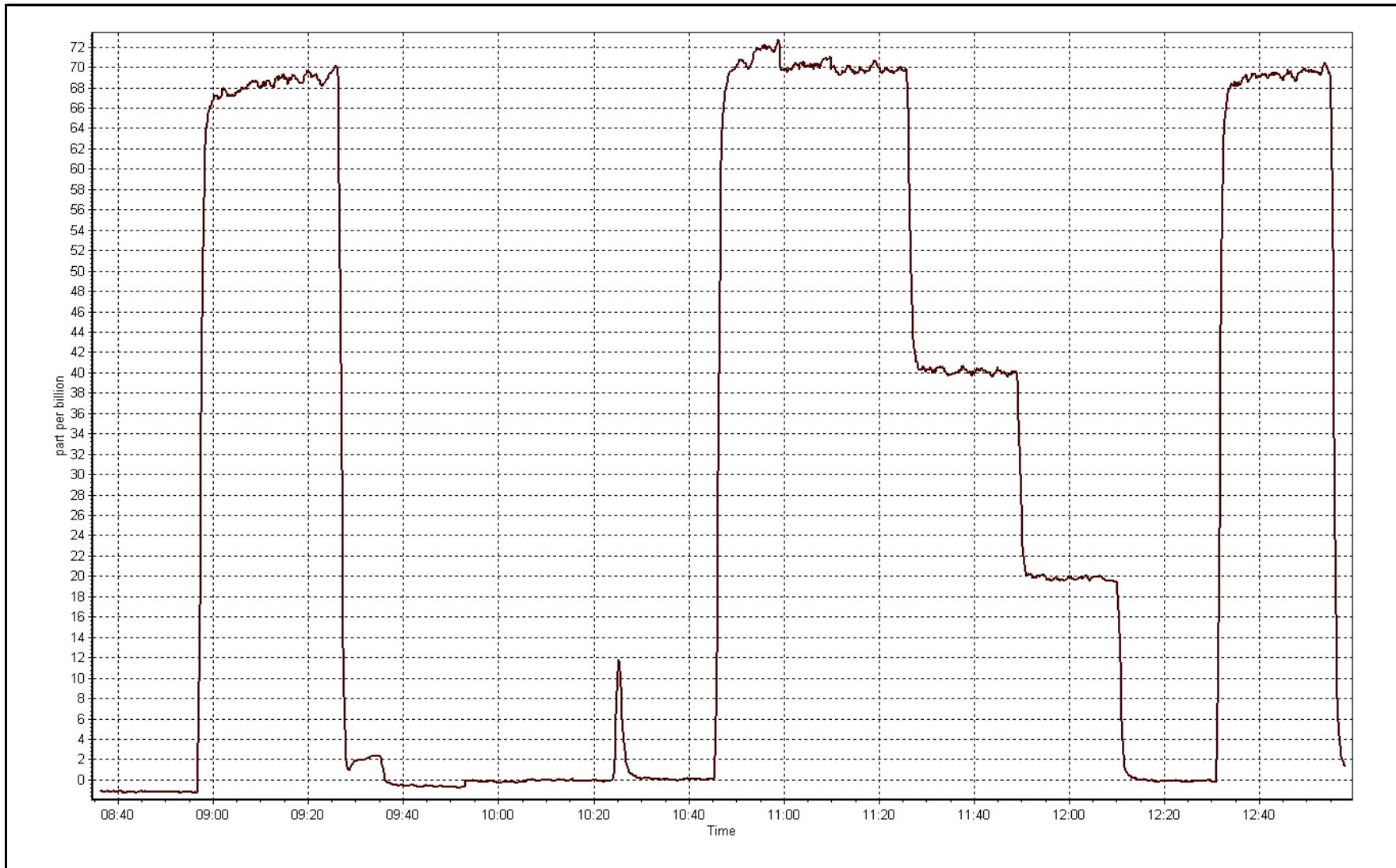
Station Information

Calibration Date	November 23, 2016	Previous Calibration	November 4, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:35	End Time (MST)	13:00
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	0.0	----	Correlation Coefficient	0.999977
70.2	69.8	1.0054		
40.1	40.1	0.9997	Slope	1.003760
20.1	19.8	1.0118		
			Intercept	0.035042







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November-01-16	Last Calibration	October-03-16
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:15	End Time (MST)	11:25
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	74.9	75.2
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	1.000949	0.994423	Carrier Pressure	34.5	34.6
THC Calc intercept	0.044023	0.068019	Fuel Pressure	42.3	42.3
NMHC Calc slope	0.999172	0.992521	Air Pressure	32.4	32.4
NMHC Calc intercept	0.020172	0.040203			

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	16.81	0.972
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	84.1	16.34	16.41	0.996
second point	5500	42.1	8.18	8.09	1.011
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	16.44	0.994
Average Correction Factor					1.010

Corrected As found 16.81 Previous response 16.28 % change -3.1%

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	8.81	0.978
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	84.1	8.62	8.67	0.994
second point	5500	42.1	4.32	4.27	1.011
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	8.69	0.992
Average Correction Factor					1.010

Corrected As found 8.81 Previous response 8.61 % change -2.3%

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	8.00	0.965
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	84.1	7.72	7.73	0.999
second point	5500	42.1	3.87	3.82	1.012
third point	5500	21.1	1.94	1.90	1.020
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	84.1	7.72	7.75	0.996
Average Correction Factor					1.010

Corrected As found 8.00 Previous response 7.68 % change -4.1%



Wood Buffalo Environmental Association

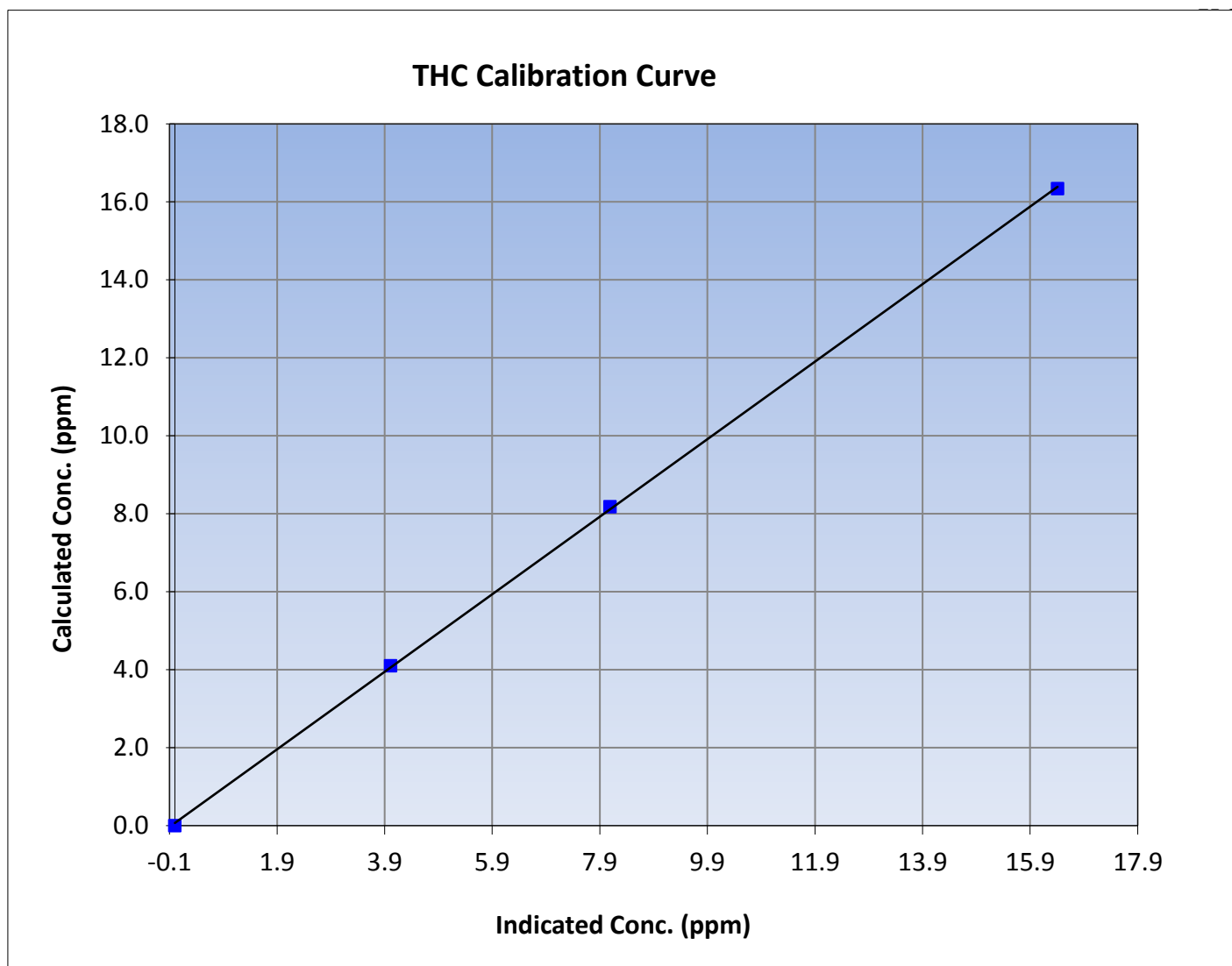
THC Calibration Summary

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:25
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	0.999910
16.34	16.41	0.9959		
8.18	8.09	1.0112	Slope	0.994423
4.10	4.01	1.0225		
			Intercept	0.068019





Wood Buffalo Environmental Association

CH₄ Calibration Summary

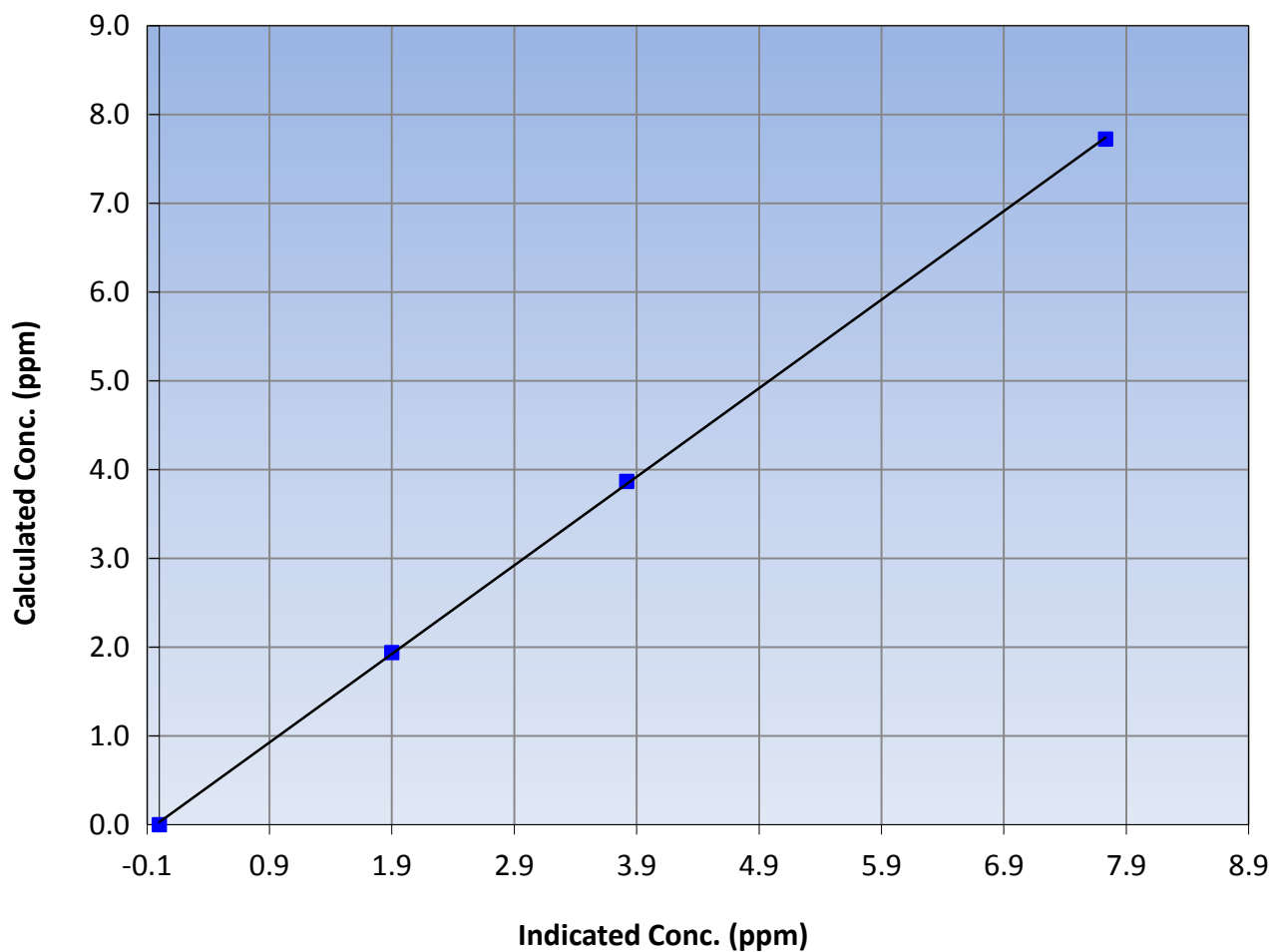
Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:25
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	0.999939
7.72	7.73	0.9990		
3.87	3.82	1.0119	Slope	0.997887
1.94	1.90	1.0197		
			Intercept	0.025808

CH₄ Calibration Curve





Wood Buffalo Environmental Association

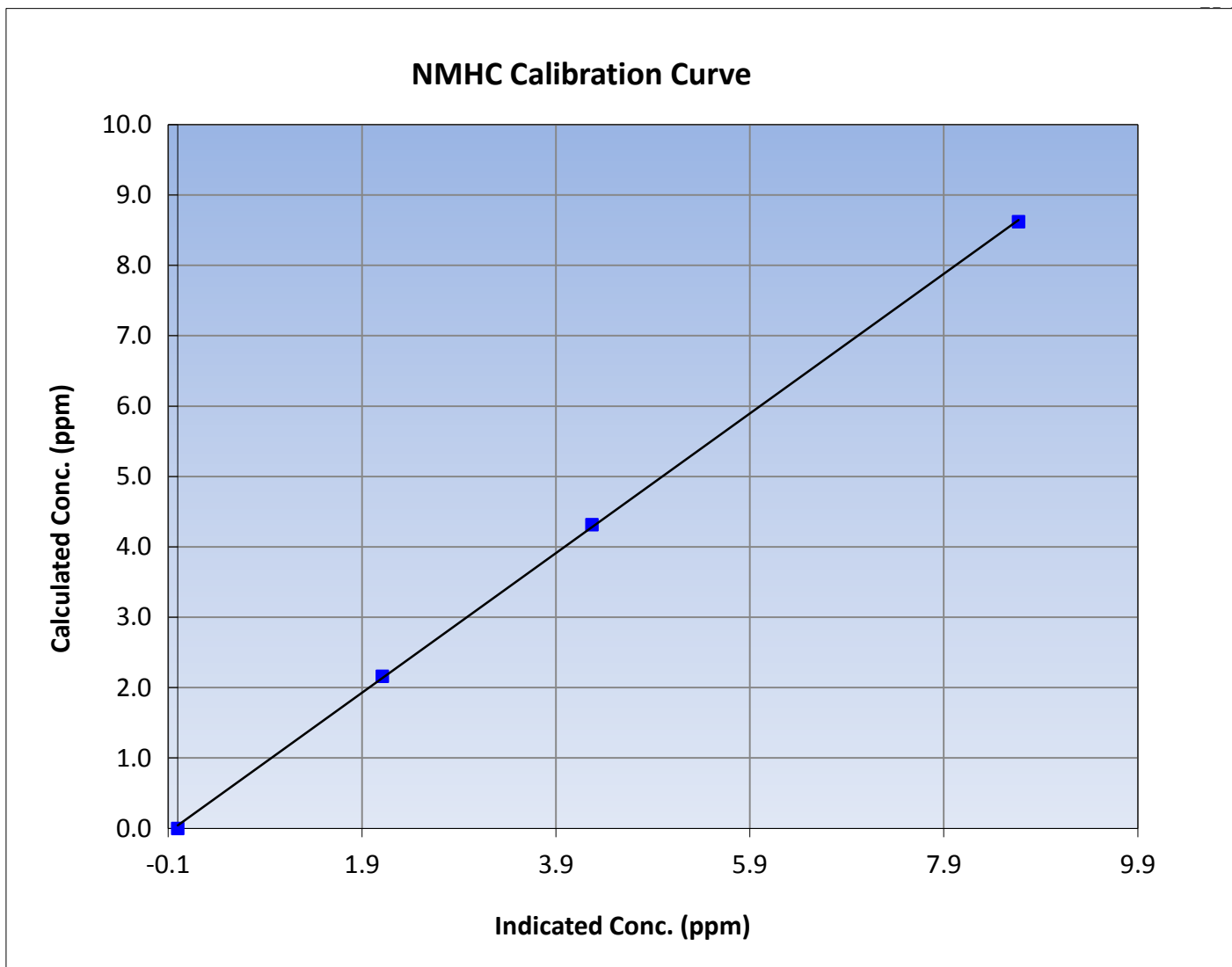
NMHC Calibration Summary

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:25
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

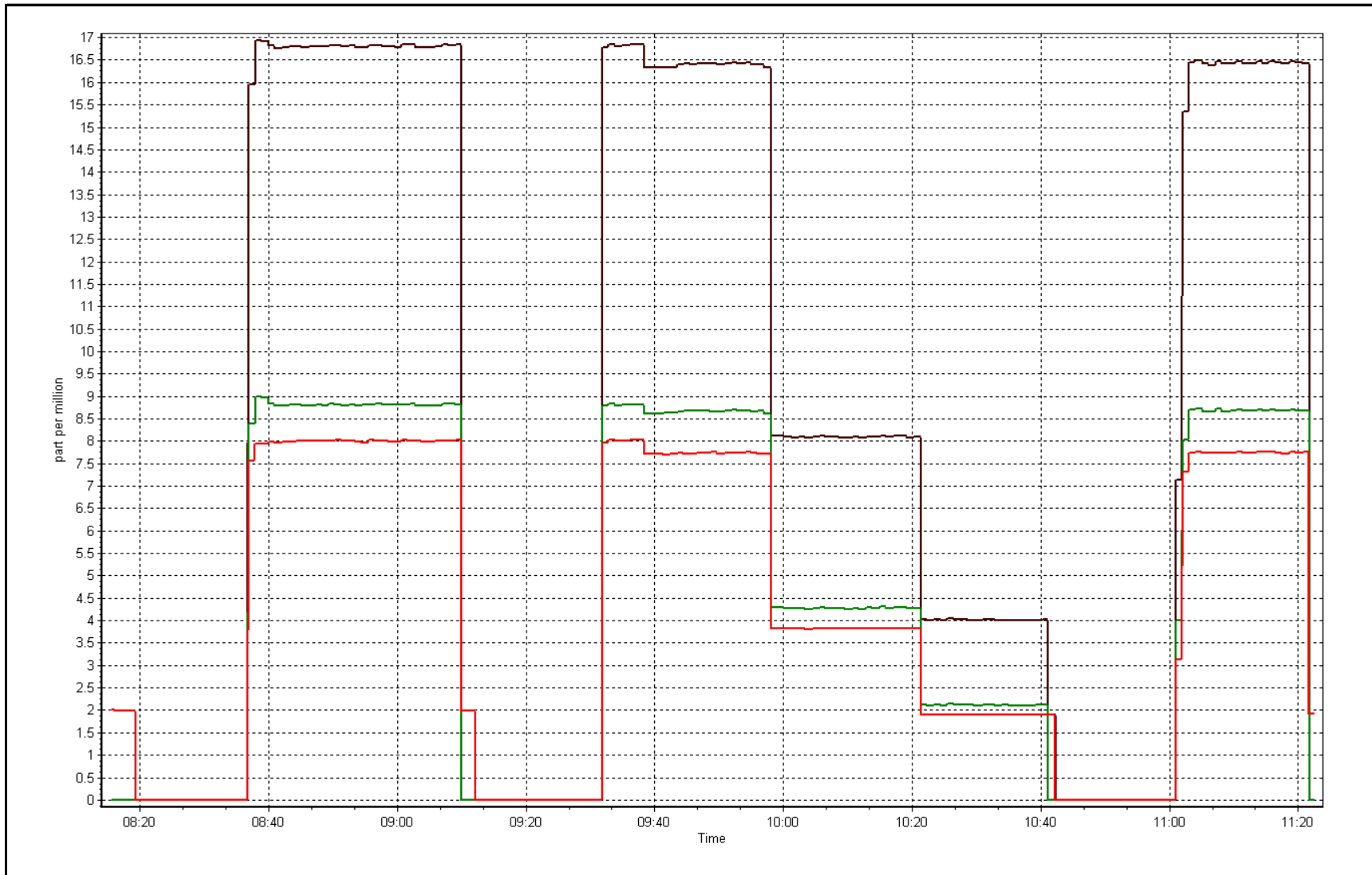
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999891
8.62	8.67	0.9943		
4.32	4.27	1.0106	Slope	0.992521
2.16	2.11	1.0250		
			Intercept	0.040203



THC Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 18, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:17	End Time (MST)	13:25
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.	28.3	27.8
Analyzer IP address	192.168.1.49		Lamp temp.	53.5	53.5
Calculated slope	1.003741	1.002802	Pressure	665.9	666.7
Calculated intercept	-2.280681	-2.345476	Flow cell A	0.711	0.704
Analyzer Background	-0.4	-0.7	Flow cell B	0.728	0.727
Analyzer Coefficient	0.993	0.993	Cell A Intensity	82621	82189
			Cell B Intensity	82948	82075

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	-0.7	----
as found span	5500	1097.5	400.0	398.0	1.005
calibrator zero	5500	800.0	0.0	0.1	----
high point	5500	1100.5	400.0	400.0	1.000
second point	5500	926.4	200.0	203.0	0.985
third point	5500	823.3	100.0	104.2	0.960
as left zero	5500	800.0	0.0	-0.2	----
as left span	5500	1096.5	400.0	398.2	1.004
Average Correction Factor					0.982

Corrected As found	398.7	Previous response	400.8	% change	0.5%
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Notes:

Inlet filter changed after as founds. Zero adjusted slightly

Calibration Performed By: Devin Russell



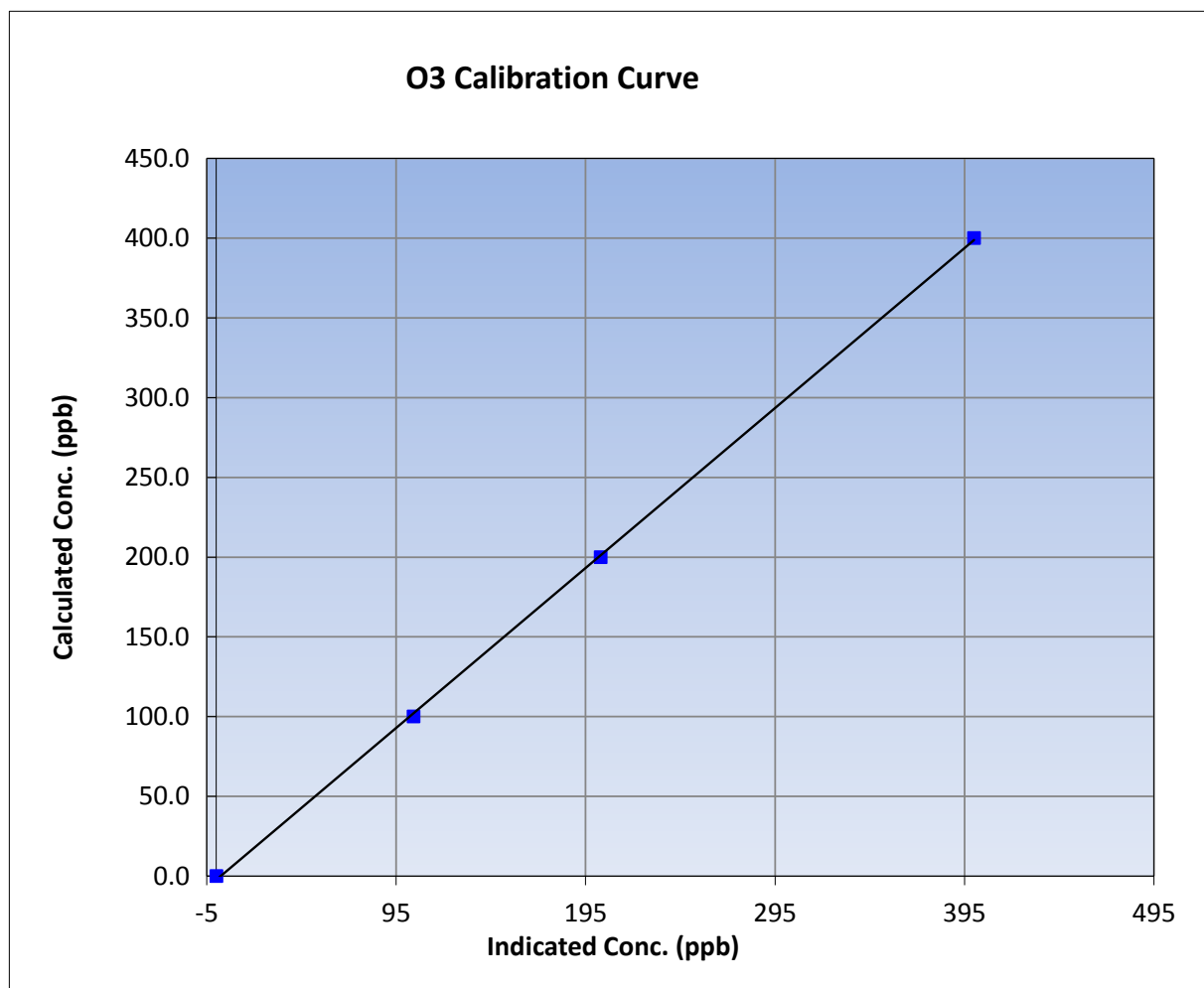
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	November-09-16	Previous Calibration	October-18-16
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:17	End Time (MST)	13:25
Analyzer make	Thermo 49i	Analyzer serial #	1300156234

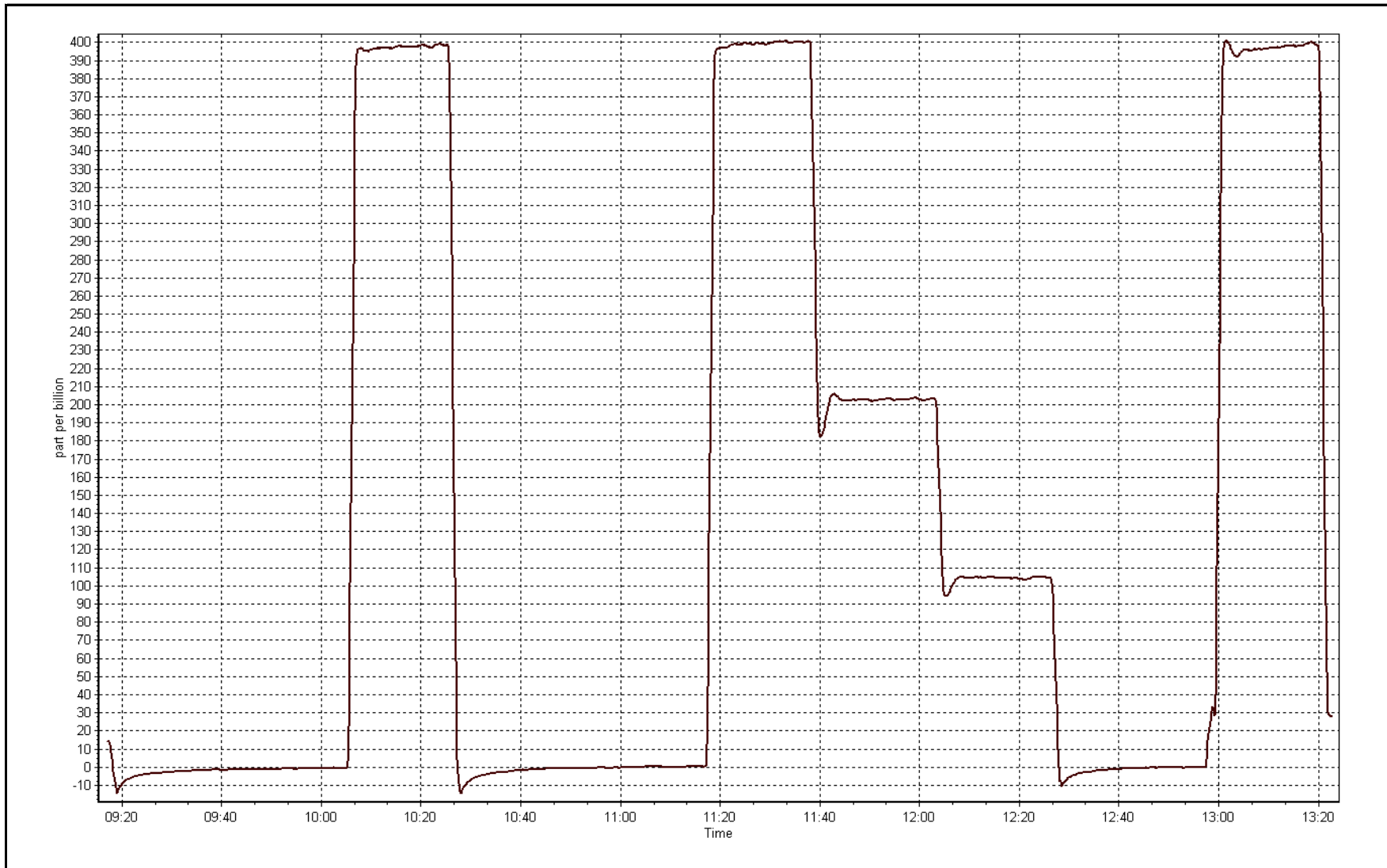
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999856
400.0	400.0	0.9999		
200.0	203.0	0.9851	Slope	1.002802
100.0	104.2	0.9595		
			Intercept	-2.345476



O3 Calibration Plot

Date: November 9, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:47	End Time (MST)	13:20
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	0.997518	0.996992	0.994569
	Data Offset	1.892577	1.802359	-0.775218
Current Calibration	Data Slope	0.998561	0.998496	0.998120
	Data Offset	1.827192	1.967340	-0.023471

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153460
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.047		1.043	
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	50.5	Deg C	50.4	Deg C
Moly Temp	322.1	Deg C	327.1	Deg C
PMT voltage	-772.6	V	-772.6	V
PMT Temp	-2.9	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	184.2	mmHg	184.8	mmHg
R Cell Press Nox	184.2	mmHg	184.8	mmHg
NO sample flow	0.758	lpm	0.755	lpm
Nox sample Flow	0.758	lpm	0.755	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: November 8, 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	0.3	-0.2	0.4	----	----
as found span	5500	84.1	801.2	801.2	0.0	804.2	803.6	0.6	0.9963	0.9970
calibrator zero	5500	0.0	0.0	0.0	0.0	0.2	-0.1	0.3	----	----
high point	5500	84.1	801.2	801.2	0.0	801.6	801.4	0.2	0.9996	0.9998
second point	5500	42.1	401.1	401.1	0.0	398.8	398.8	-0.1	1.0059	1.0057
third point	5500	21.1	201.0	201.0	0.0	197.5	197.5	0.0	1.0177	1.0178
as left zero										
as left span										
Average Correction Factor									1.0077	1.0078

Corrected As found NO_x= 804.0 NO= 803.8 Percent Change NO_x= -0.3% NO= -0.2%
 Previous Response NO_x= 801.3 NO= 801.9

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	803.1	801.6	0.3	1.0309	1.0329	----	----
1st NO2 (400)	380.6	421.0	802.7	380.6	422.0	1.0315	----	0.9975	100.3%
2nd NO2 (200)	604.1	197.5	801.4	604.1	197.4	1.0331	----	1.0008	99.9%
3rd NO2 (100)	700.2	101.4	801.8	700.2	101.6	1.0326	----	0.9978	100.2%
2nd NO ref point	----	0.0	801.7	800.2	1.5	1.0327	1.0346	----	----
Average Correction Factor						1.0325		0.9987	100.1%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

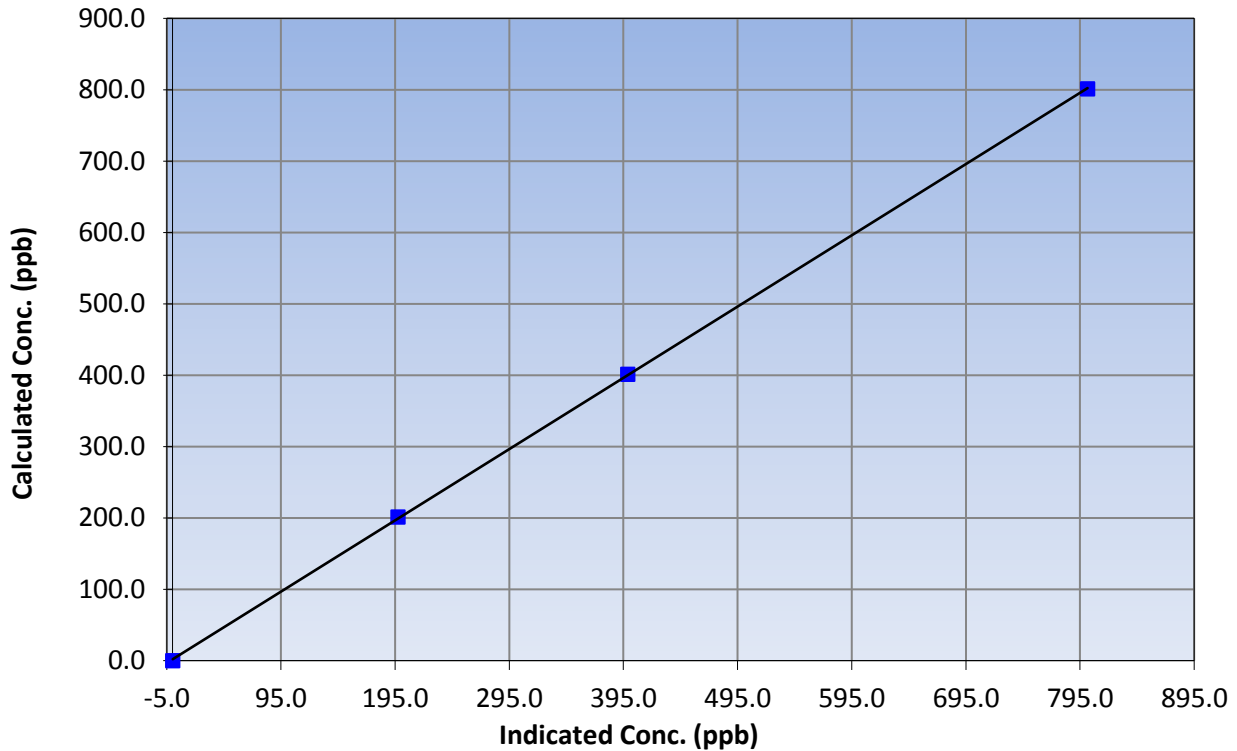
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	13:20
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	0.2	----	Correlation Coefficient	0.999971
801.2	801.6	0.9996		
401.1	398.8	1.0059	Slope	0.998561
201.0	197.5	1.0177		
			Intercept	1.827192

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

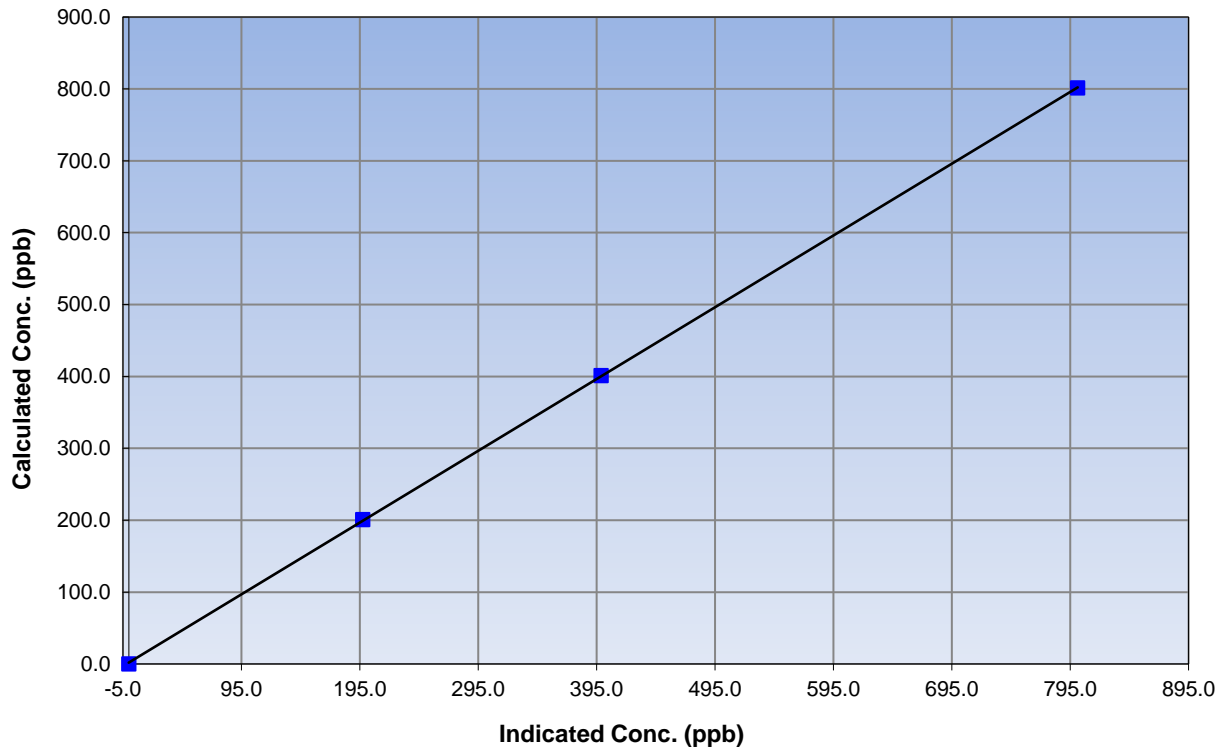
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	13:20
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	0.999976
801.2	801.4	0.9998		
401.1	398.8	1.0057	Slope	0.998496
201.0	197.5	1.0178		
			Intercept	1.967340

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

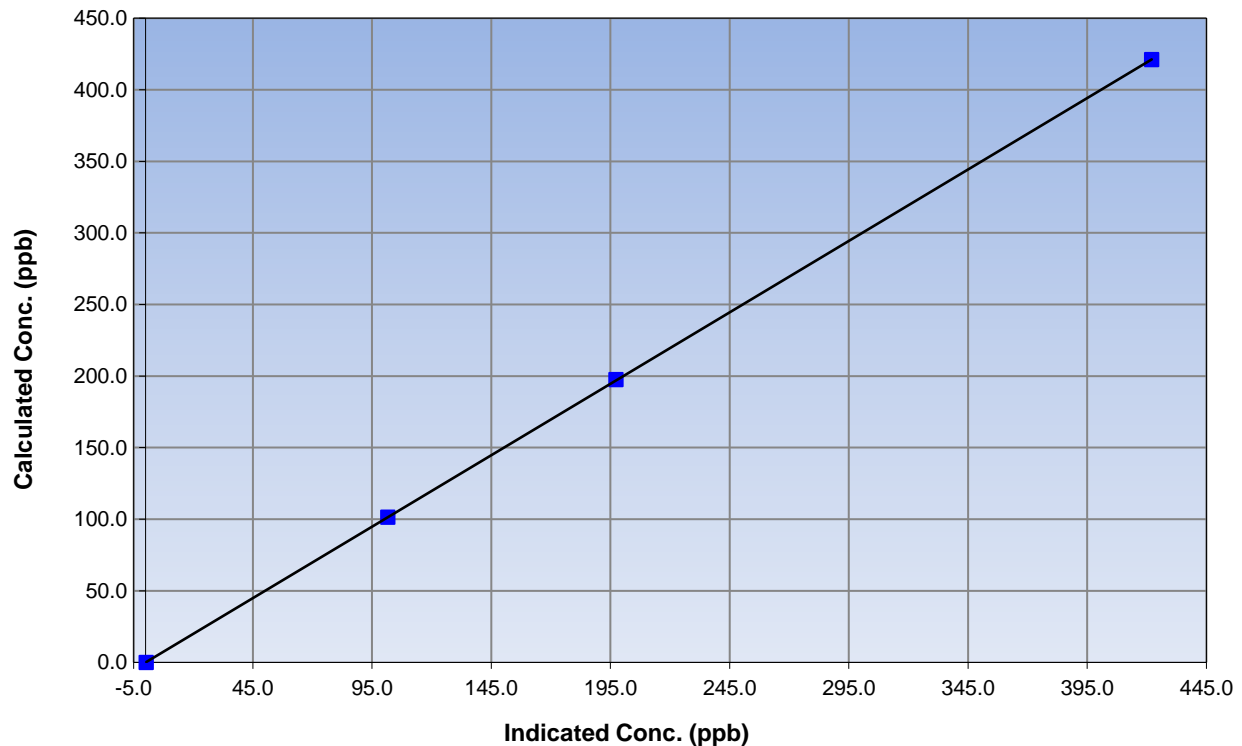
Station Information

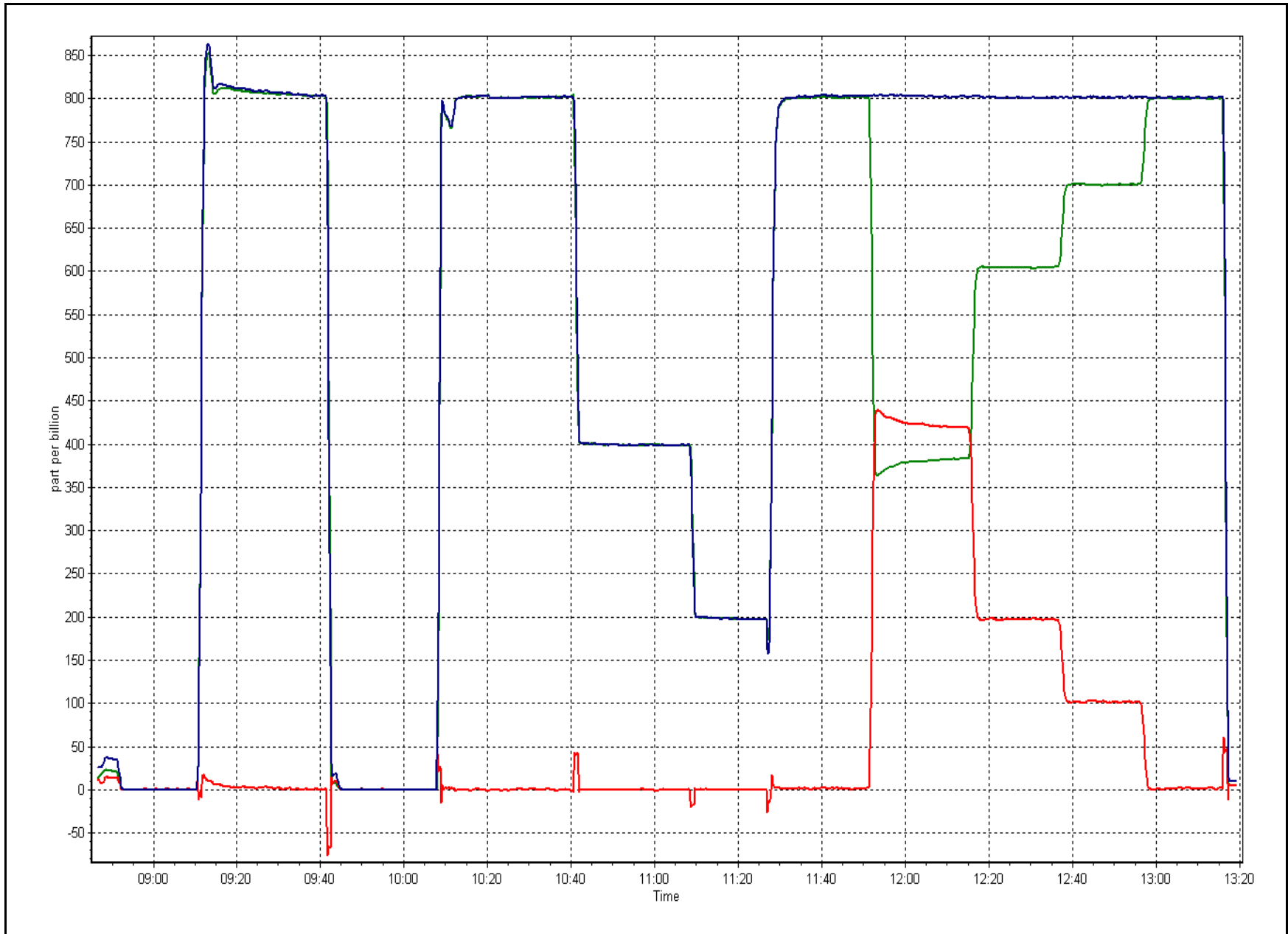
Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Number	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	13:20
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999995
421.0	422.0	0.9975		
197.5	197.4	1.0008	Slope	0.998120
101.4	101.6	0.9978		
			Intercept	-0.023471

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	November 8, 2016	NOX Previous Cal Date	October 14, 2016
NH3 Calibration Date	November 8, 2016	NH3 Previous Cal Date	October 17, 2016
Reason:	Routine		
Start Time (MST)	8:47	End Time (MST)	15:30
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	0.998250	0.973542	0.998401	1.000099	0.999542
	Data Offset	-1.019545	-2.6584893	0.238443	2.017402	-0.505916
Cal Stats After	Data Slope	1.005609	0.981655	1.002528	0.999921	1.005262
	Data Offset	-2.571842	-5.81241096	1.964712	2.196755	0.352616
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		-3.1	ppb
Nt BKG	-0.3		-0.3	
NO coefficient	1.061		1.061	
NO2 coefficient	1.000		1.000	ppb
NOx coefficient	1.080		1.080	
NH3 coefficient	1.080		1.080	
Nt coefficient	1.094		1.094	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	315.6	Deg C	316.3	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	85.0	ccm	86.0	ccm
R Cell Press	6.0	"Hg	6.1	mmHg
PMT Voltage	693.0	v	693.0	v
Sample Flow 1 NO	563.0	ccm	556.0	ccm
Sample Flow 2 Nox	563.0	ccm	556.0	ccm
Sample Flow 3 Nt	551.0	ccm	544.0	ccm

Notes:

Inlet filter changed after as founds. No adjustments to zero or NO/Nox span. Second High NO point used for GPT reference. No adjustments made to NH3.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

November 8, 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	0.9	1.2	-0.3	----	----
as found NO	5500	84.1	801.2	801.2	----	795.3	802.6	-7.5	1.007	----
calibrator zero	5500	0.0	0.0	0.0	0.0	-1.2	-0.1	-1.1	----	----
high NO point	5500	84.1	801.2	801.2	----	802.6	798.4	4.2	0.998	----
NO/O ₃ point	5500	84.1	801.2	801.2	----	808.3	802.3	6.0	0.991	----
as found NH ₃	3540	73.5	1980.8	NA	1980.8	2018.0	48.6	1969.2	0.982	1.006
first NH ₃	3540	73.5	1980.8	NA	1980.8	2018.0	48.6	1969.2	0.982	1.006
second NH ₃	3540	36.8	991.7	NA	991.7	1025.9	31.5	994.1	0.967	0.998
third NH ₃	3540	18.5	498.6	NA	498.6	516.9	17.2	499.7	0.964	0.998
Average Correction Factor									0.9948	1.0004

Nt Corrected As Found Nt = 794.4 ppb
 NOx Corrected As Found NOx = 801.4 ppb
 NH₃ Previous Converter Efficiency = 108.0 %

Previous Response Nt = 825.7 ppb
 Previous Response NOx = 802.3 ppb
 NH₃ Current Converter Efficiency = 108.0 %

Nt percent change 3.9%
 NOx percent change 0.1%
 NH₃ percent change 0.0%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date: November 8, 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	1.2	1.1	0.9	----	----
as found span	5500	84.1	801.2	801.2	801.2	802.6	800.2	795.3	0.9983	1.0013
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.1	-0.4	-1.2	----	----
high point	5500	84.1	801.2	801.2	801.2	798.4	800.3	802.6	1.0036	1.0012
second point	5500	42.1	401.1	401.1	401.1	396.7	397.1	397.2	1.0111	1.0101
third point	5500	21.1	201.0	201.0	201.0	197.0	197.7	197.7	1.0205	1.0169
Average Correction Factor									1.0117	1.0094

	<u>Nt</u>	<u>NO_x</u>	<u>NO</u>	<u>NO₂</u>
Corrected As found	794.4	801.4	799.1	----
Previous Response	825.7	802.3	799.1	----
Percent Change	3.9%	0.1%	0.0%	0.1%

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	802.3	801.8	0.4	1.0320	1.0326	----	----
1st NO ₂ (400)	383.4	418.4	799.5	383.4	416.1	1.0356	----	1.0056	99.4%
2nd NO ₂ (200)	607.1	194.8	800.5	607.1	193.4	1.0342	----	1.0068	99.3%
3rd NO ₂ (100)	703.0	98.8	800.0	703.0	97.0	1.0349	----	1.0187	98.2%
2nd NO ref point	----	0.0	804.8	803.5	1.4	1.0287	1.0305	----	----
Average Correction Factor						1.0333	1.0315	1.0104	99.0%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

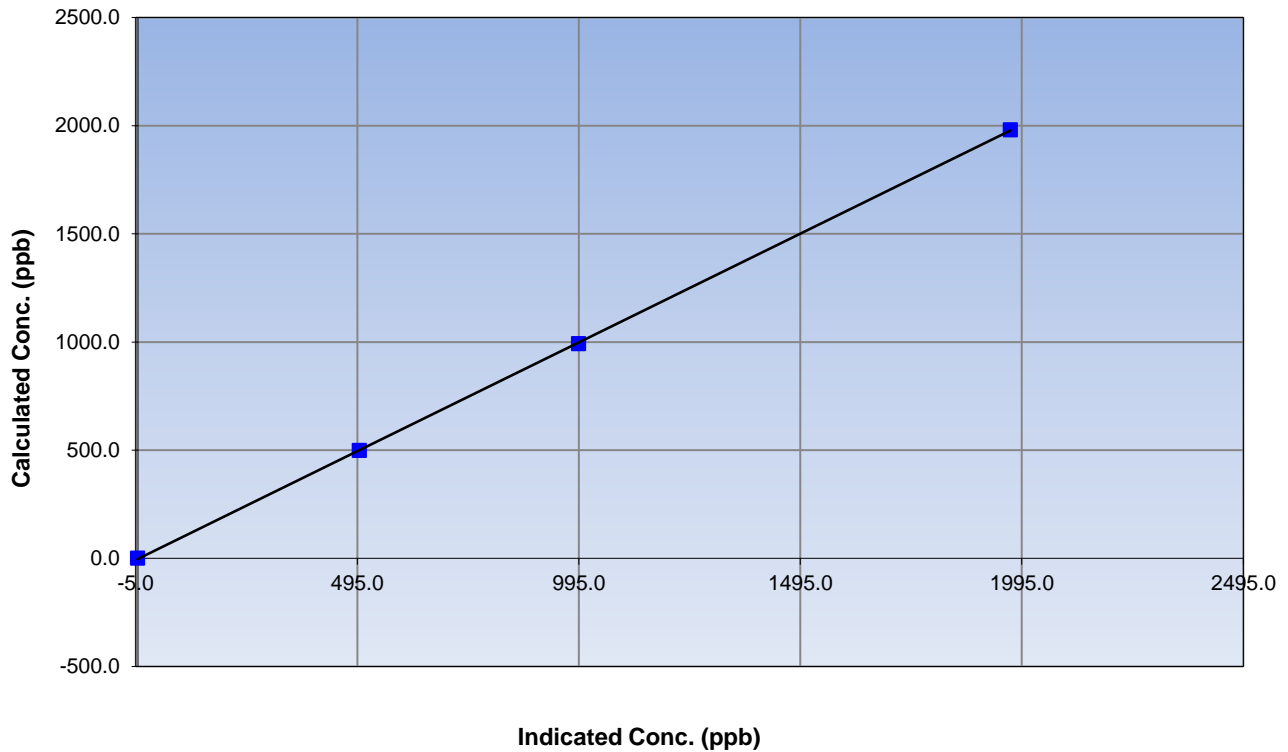
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	15:30
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	-1.1	----	Correlation Coefficient	0.999975
1980.8	1969.2	1.0059		
991.7	994.1	0.9976	Slope	1.005609
498.6	499.7	0.9977		
			Intercept	-2.571842

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

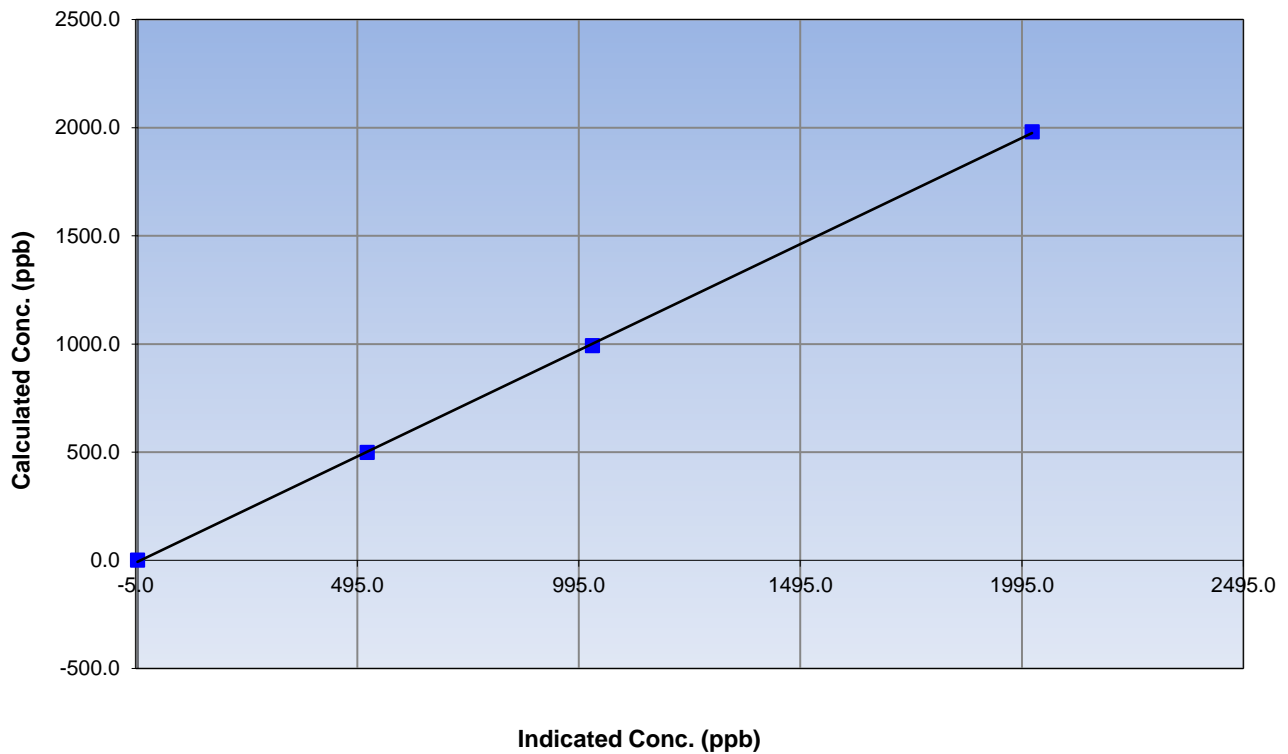
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	15:30
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	-1.2	----	Correlation Coefficient	0.999916
1980.8	2018.0	0.9816		
991.7	1025.9	0.9667	Slope	0.981655
498.6	516.9	0.9644		
			Intercept	-5.812411

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

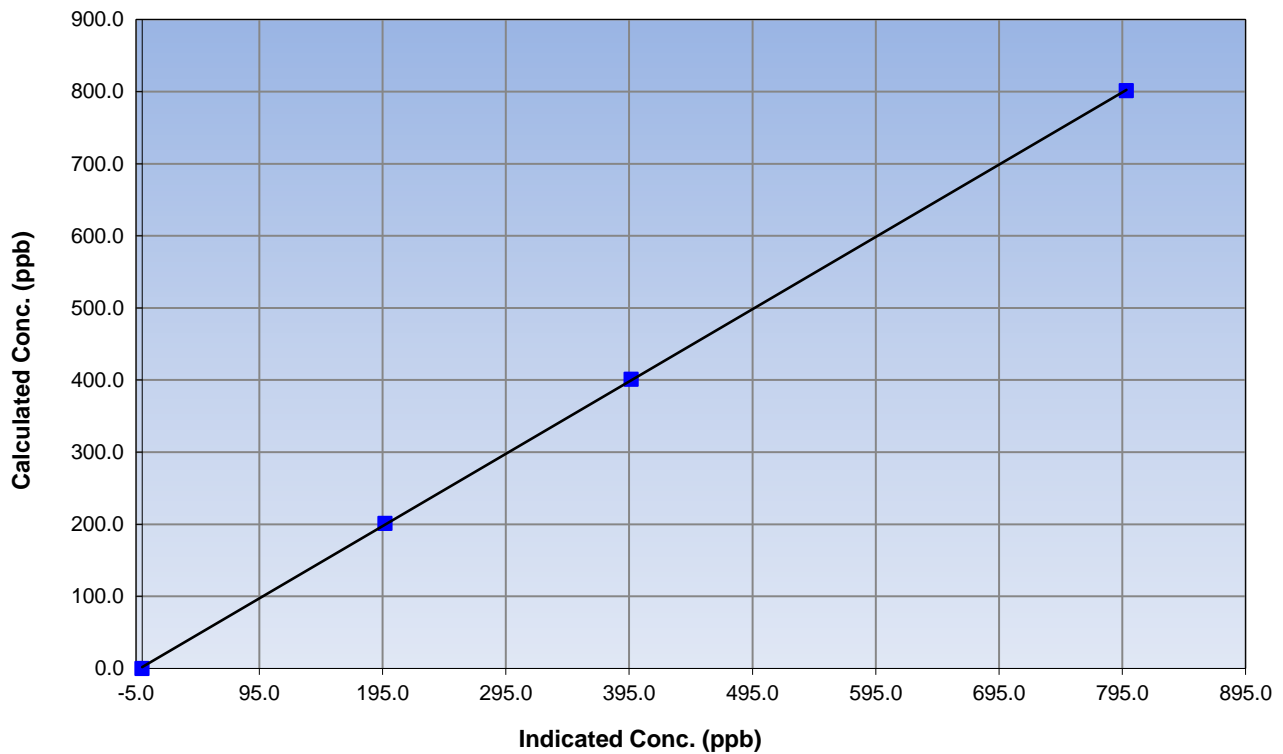
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	15:30
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	-0.1	----	Correlation Coefficient	0.999973
801.2	798.4	1.0036		
401.1	396.7	1.0111	Slope	1.002528
201.0	197.0	1.0205		
			Intercept	1.964712

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

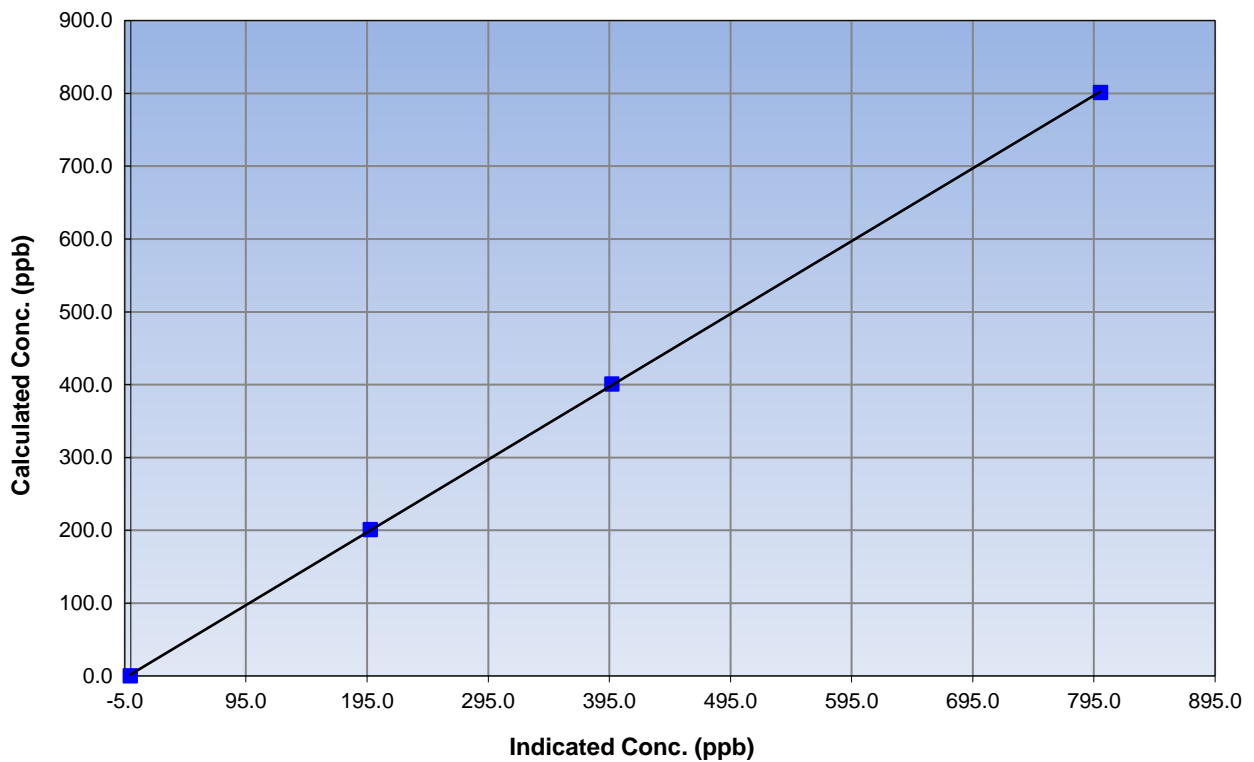
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	15:30
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	-0.4	----	Correlation Coefficient	0.999973
801.2	800.3	1.0012		
401.1	397.1	1.0101	Slope	0.999921
201.0	197.7	1.0169		
			Intercept	2.196755

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

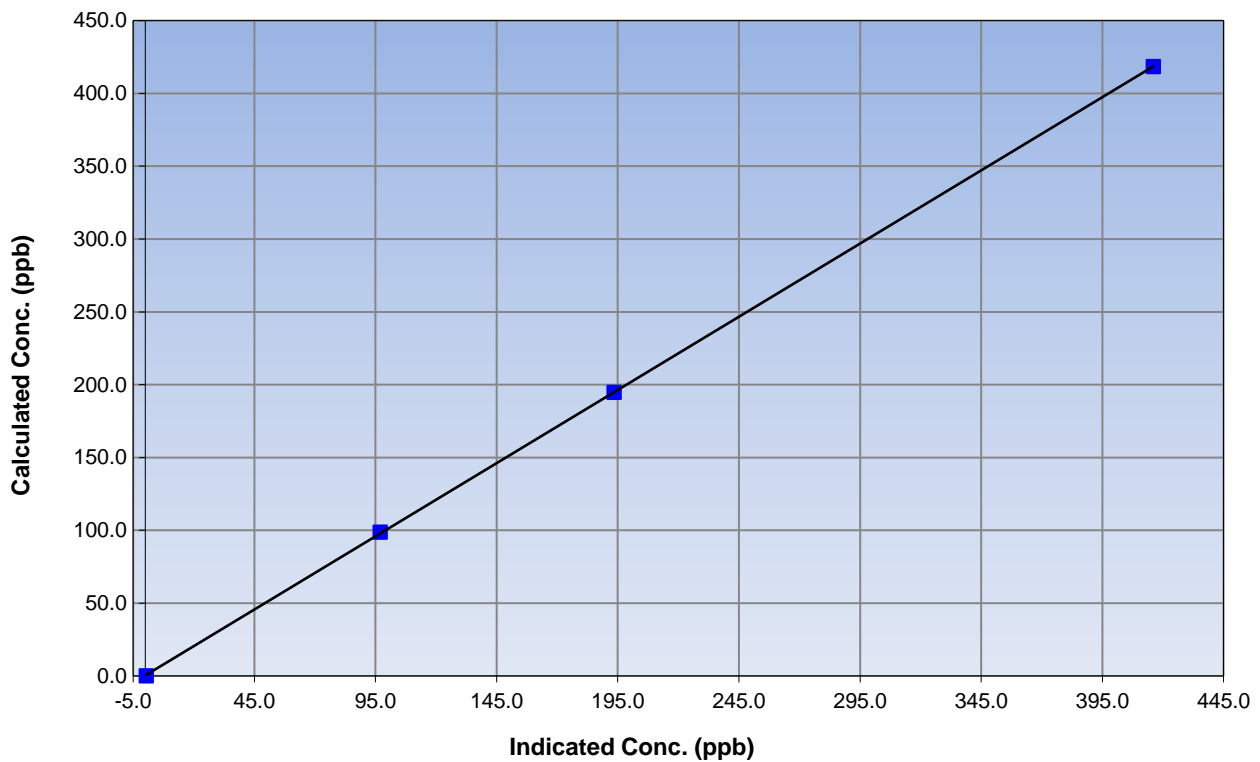
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 14, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:47	End Time (MST)	15:30
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

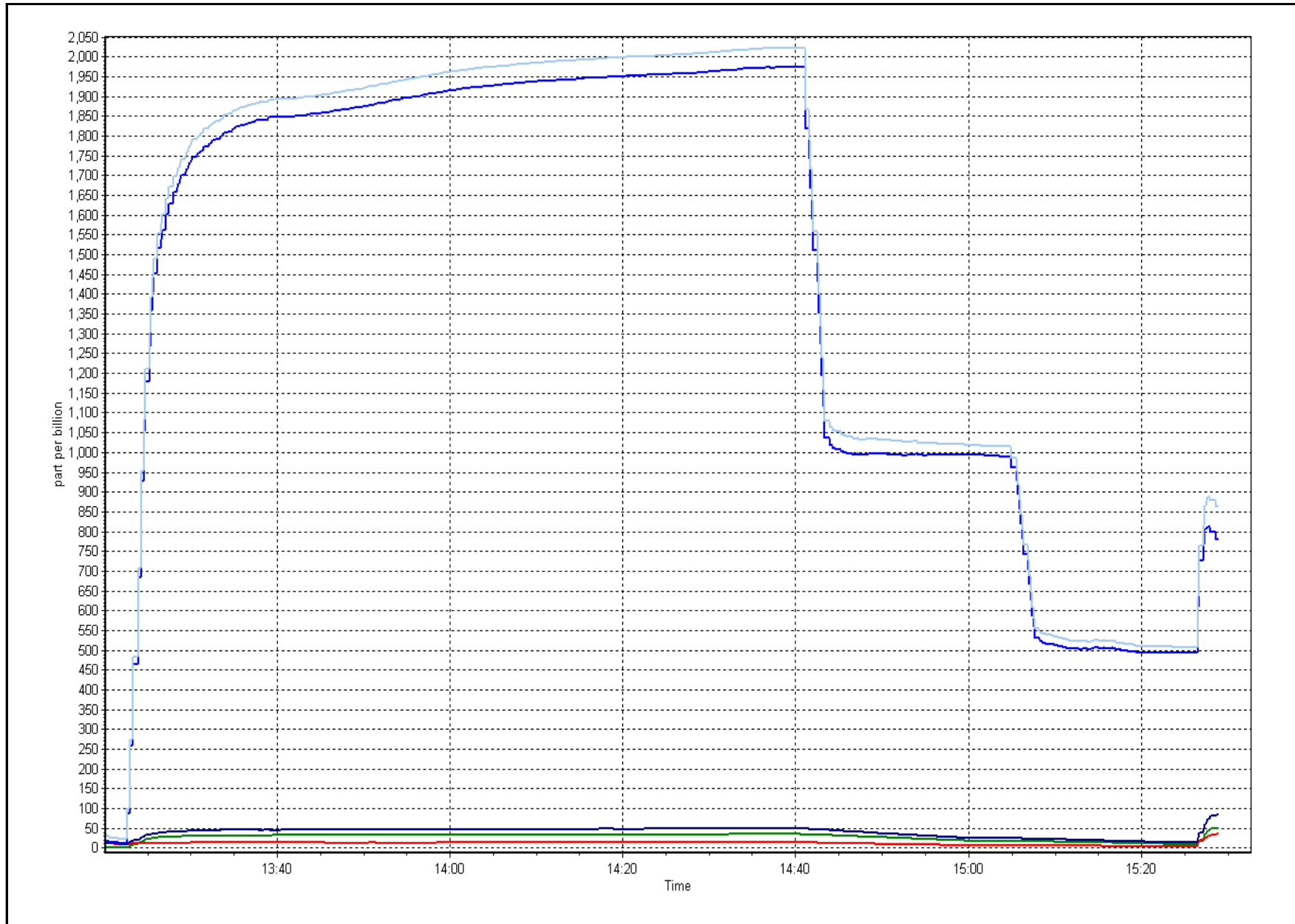
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999985
418.4	416.1	1.0056		
194.8	193.4	1.0068	Slope	1.005262
98.8	97.0	1.0187		
			Intercept	0.352616

NO₂ Calibration Curve



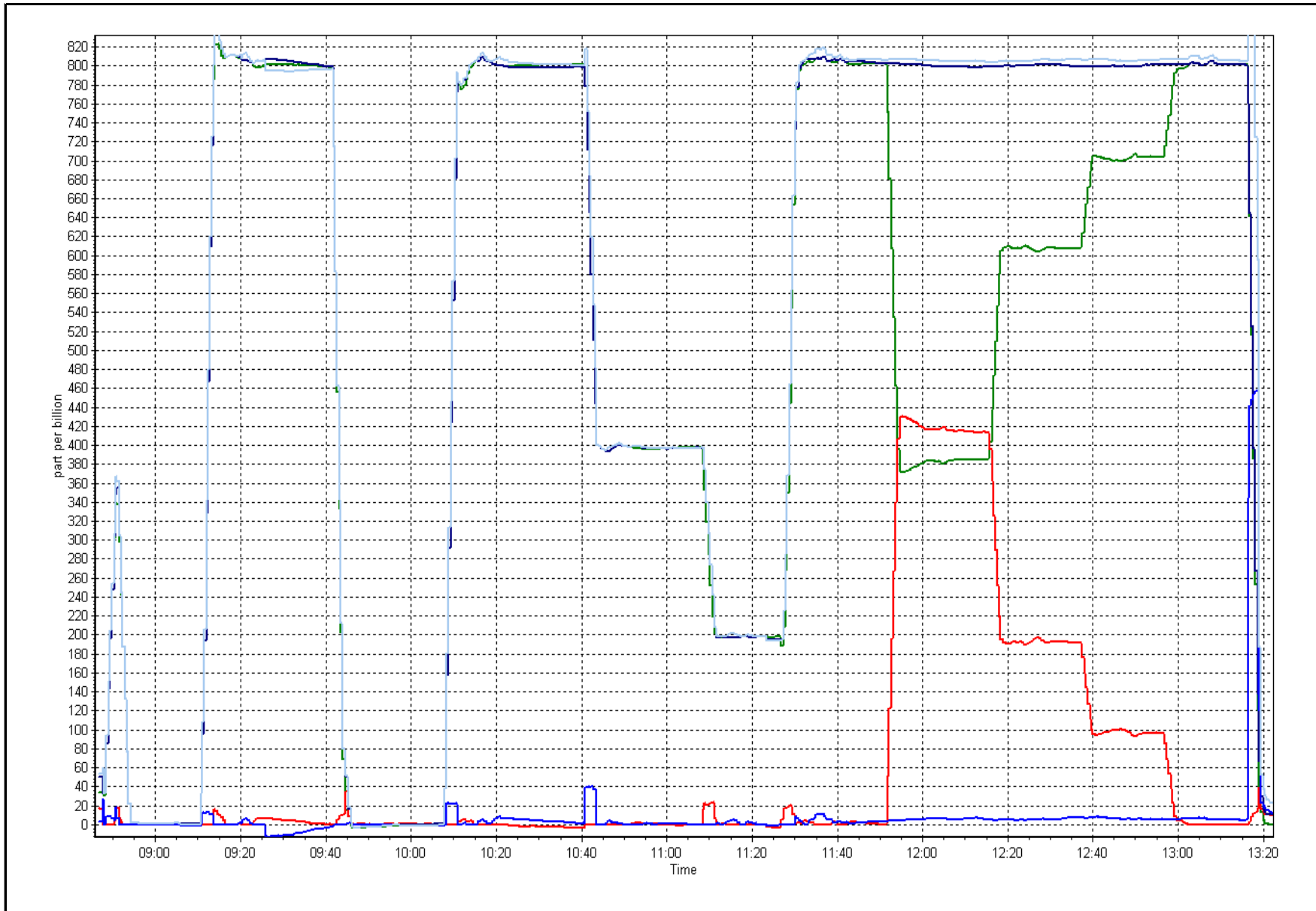
NH₃ Calibration Plot

Date: November 8, 2016



NOX Calibration Plot

Date: November 8, 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:	November 1, 2016	Last Cal Date:	October 18, 2016
Start time (MST):	8:20	End time (MST):	10:45
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)	-7	-6	-7	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	966	961.65	966	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	999	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.5	-----	0.2	<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: Cyclone head replaced with clean head. Nephelometer zeroed.

Calibration by: Devin Russell



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 7
ATHABASCA VALLEY
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
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	684	35	36	99.86	11	0	2	0
TRS (ppb) Average	685	34	35	99.86	1	0	1	0
THC (ppm) Average	679	40	41	99.86	2.9	-	2.3	-
NMHC (ppm) Average	679	40	41	99.86	0.516	-	0.034	-
CH4(ppm) Average	679	40	41	99.86	2.9	-	2.3	-
O3 (ppb) Average	684	35	36	99.86	39	0	35	-
NO2 (ppb) Average	684	35	36	99.86	32	0	18	-
NO (ppb) Average	684	35	36	99.86	76	-	19	-
NOX (ppb) Average	684	35	36	99.86	102	-	37	-
PM2.5 (ug/m3) Average	696	2	24	96.94	27.5	-	11	0
CO(ppm) Average	686	33	34	99.86	0.7	0	0.3	-
Temperature 2 m (C) Average	720	0	0	100.00	12.1	-	5.5	-
Barometric Pressure (inHg) Average	720	0	0	100.00	29.5	-	29.5	-
Relative Humidity (%) Average	720	0	0	100.00	97	-	94	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	29	-	15	-
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 - ATHABASCA VALLEY (AMS 7)
 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	684	0.5	1	-	0	0	0	0	1	1	11
TRS (ppb) Average	685	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	679	2.05	0.2	-	1.9	1.9	1.9	2	2.1	2.2	2.9
NMHC (ppm) Average	679	0.006	0.03	-	0	0	0	0	0	0	0.516
CH4(ppm) Average	679	2.04	0.2	-	1.9	1.9	1.9	2	2.1	2.2	2.9
O3 (ppb) Average	684	17.2	10	-	4	6	8	15	25	32	39
NO2 (ppb) Average	684	9.4	6	-	1	2	5	8	13	17	32
NO (ppb) Average	684	7.4	11	-	0	0	1	3	10	21	76
NOX (ppb) Average	684	16.8	16	-	1	3	6	12	23	35	102
PM2.5 (ug/m3) Average	696	6.4	3.6	-	1.3	2.5	3.8	5.5	8.3	11.4	27.5
CO(ppm) Average	686	0.16	0.1	-	0.1	0.1	0.1	0.1	0.2	0.3	0.7
Temperature 2 m (C) Average	720	-1.07	4.8	-	-12	-7.3	-4.6	-1	1.8	5.8	12.1
Barometric Pressure (inHg) Average	720	28.89	0.2	-	28.4	28.6	28.7	28.9	29	29.2	29.5
Relative Humidity (%) Average	720	78.6	11	-	41	64	71	79	87	93	97
Wind Speed 10 m (km/h) Average	720	8.2	5	-	0	3	4	8	11	15	29
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	24 Nov 2016 10:00	24 Nov 2016 10:00	1	Maintenance - manifold blower replaced
PM2.5	18 Nov 2016 17:00	19 Nov 2016 12:00	20	Analyzer Failure - filter tape broken
PM2.5	19 Nov 2016 13:00	19 Nov 2016 14:00	2	Maintenance - filter tape repaired



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 11 ppb on Nov 27 12:00	Maximum Daily Average: 2.2 ppb on Nov 27		Hours of Data:	684
Minimum Value: 0 ppb on Nov 18 03:00	Minimum Daily Average: 0.1 ppb on Nov 18		Hours of Missing Data:	36
Maximum Diurnal Average: 0.8 ppb at hour 5	Minimum Diurnal Average: 0.4 ppb at hour 21		Hours of Calibration:	35
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 = 4		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-Nov	4	2	0	1	5	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	5	6	1.4	6
2-Nov	Z	2	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.7	2
3-Nov	0	Z	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0.4	1
4-Nov	0	0	Z	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0.4	1
5-Nov	0	0	0	Z	0	0	0	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0.4	1
6-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0.4	1
7-Nov	0	0	0	0	0	Z	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0.5	1
8-Nov	Z	0	1	1	0	0	0	0	C	C	C	C	C	1	1	1	1	1	1	0	0	0	0	0	0.5	1
9-Nov	0	Z	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
10-Nov	0	0	Z	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0.5	1
11-Nov	1	1	1	Z	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0.6	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	0.4	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	0.3	0
14-Nov	Z	0	0	0	0	0	0	1	0	0	0	0	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	0.2	0
16-Nov	0	0	Z	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0.3	1
17-Nov	1	2	2	Z	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
18-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1	1
19-Nov	1	2	2	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
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	0.3	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	0.4	0
22-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
23-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	1	0	0	0.6	1
24-Nov	0	0	0	1	Z	0	1	1	1	1	M	1	1	1	1	1	0	1	0	0	0	0	0	0	0.5	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	0.1	0
26-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.2	1
27-Nov	0	Z	2	2	4	1	1	2	1	4	4	11	1	1	1	2	2	2	2	2	2	2	2	2	2.2	11
28-Nov	2	2	Z	2	2	1	1	2	2	2	1	1	1	1	1	0	0	0	0	1	1	0	0	1	1.1	2
29-Nov	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
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	0.1	0

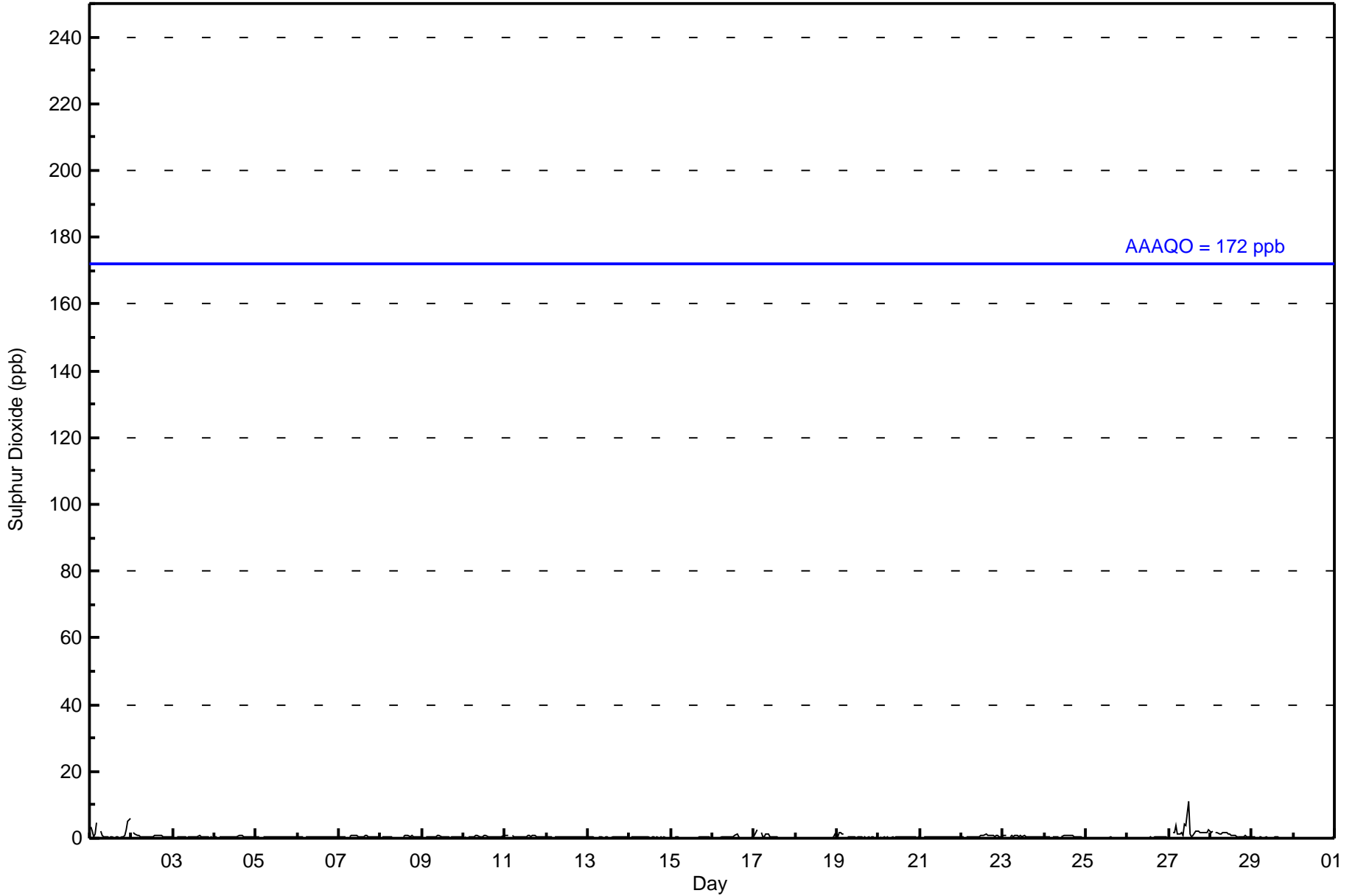
0.6	0.6	0.6	0.5	0.8	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.8	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.6	Diurnal Average		
4	2	2	2	5	1	2	2	2	2	4	4	11	1	1	1	2	2	2	2	2	2	2	3	5	6	Diurnal Maximum	

Z - zerspan 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
Athabasca Valley - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	683	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - 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	15	5	2	12	26	31	227	91	44	33	45	34	23	24	20	51	683
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	15	5	2	12	26	31	227	91	44	33	45	34	23	24	20	52	684

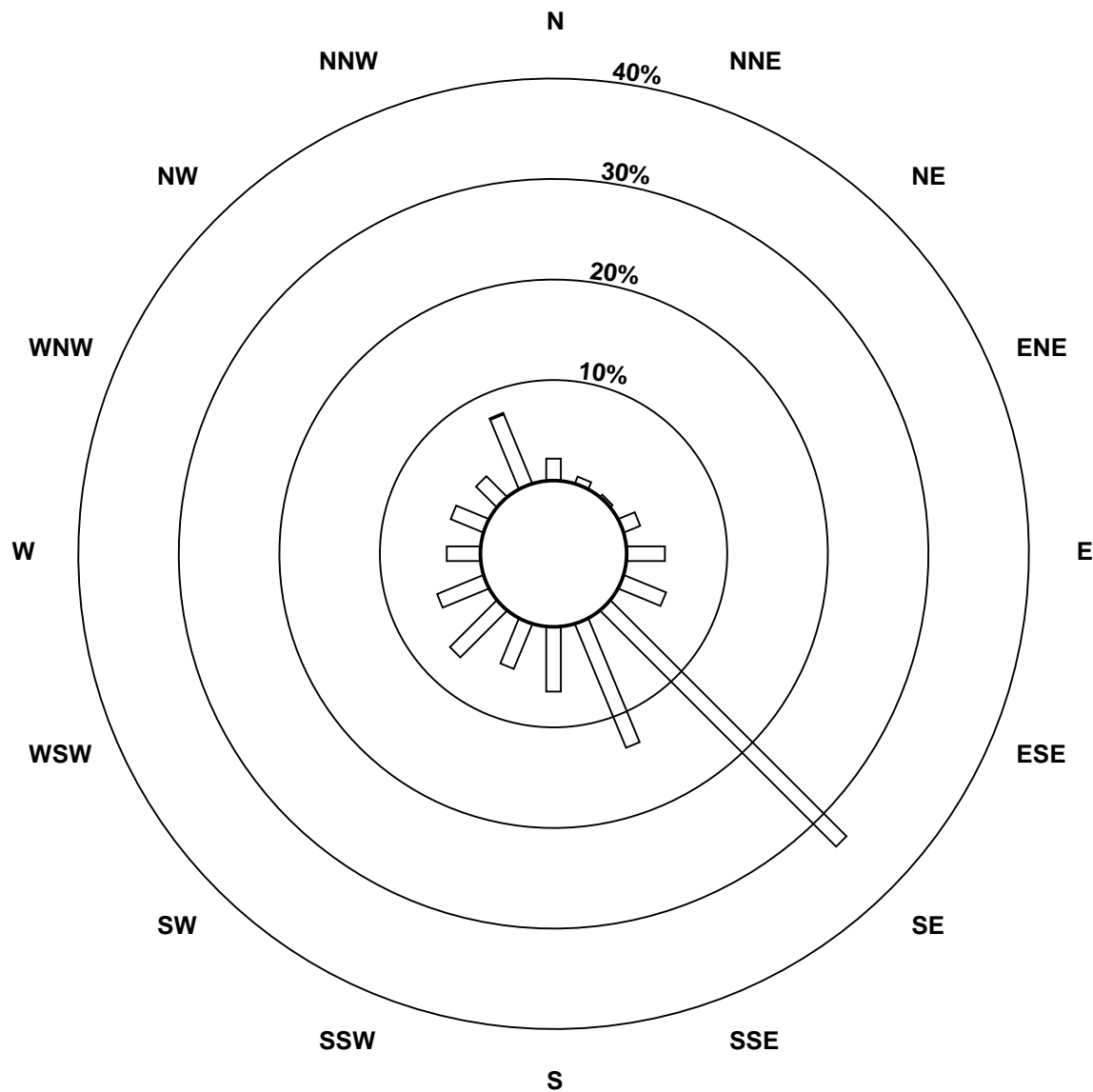
Total Number of Valid Hours: 684

Total Number of Hours: 720

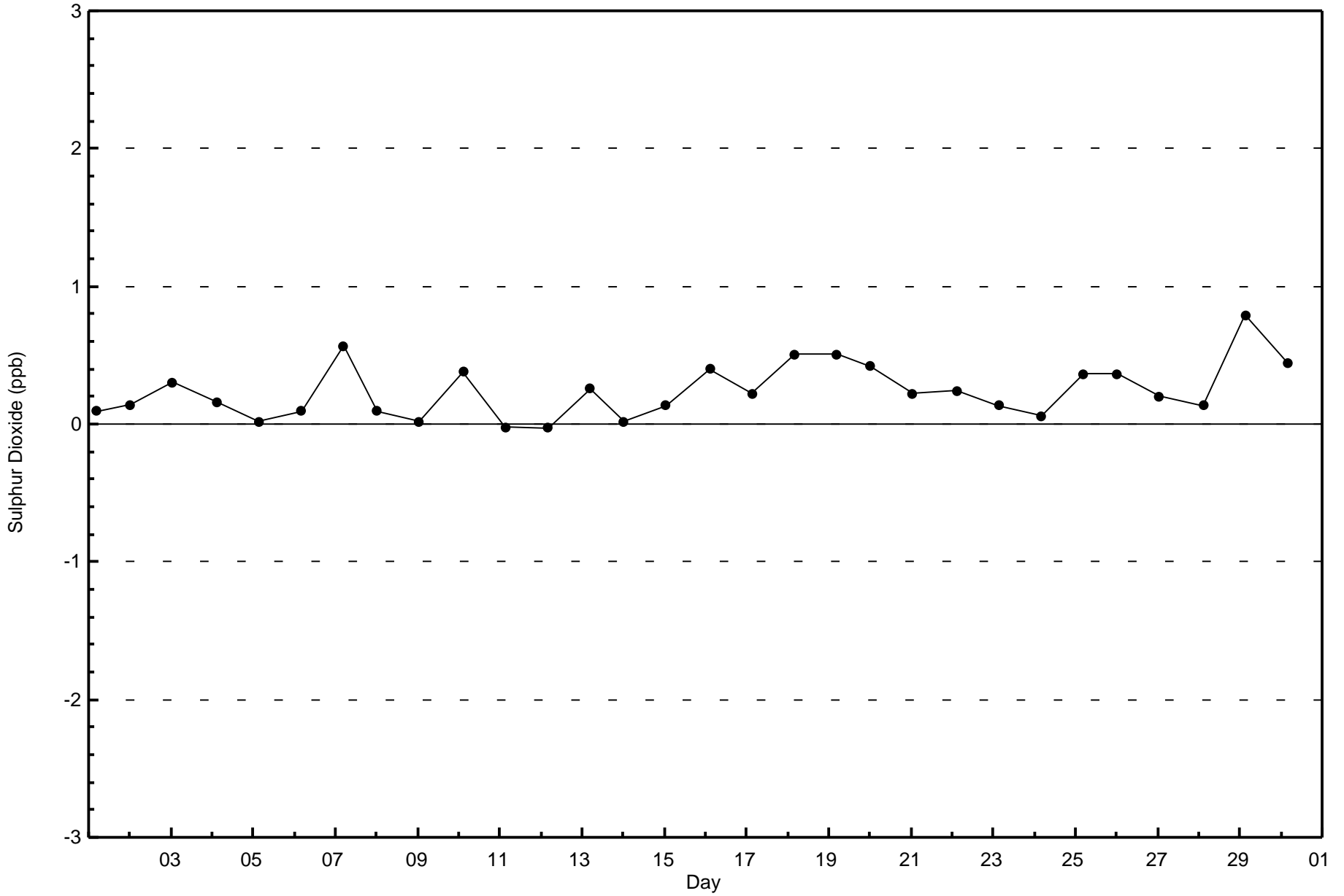


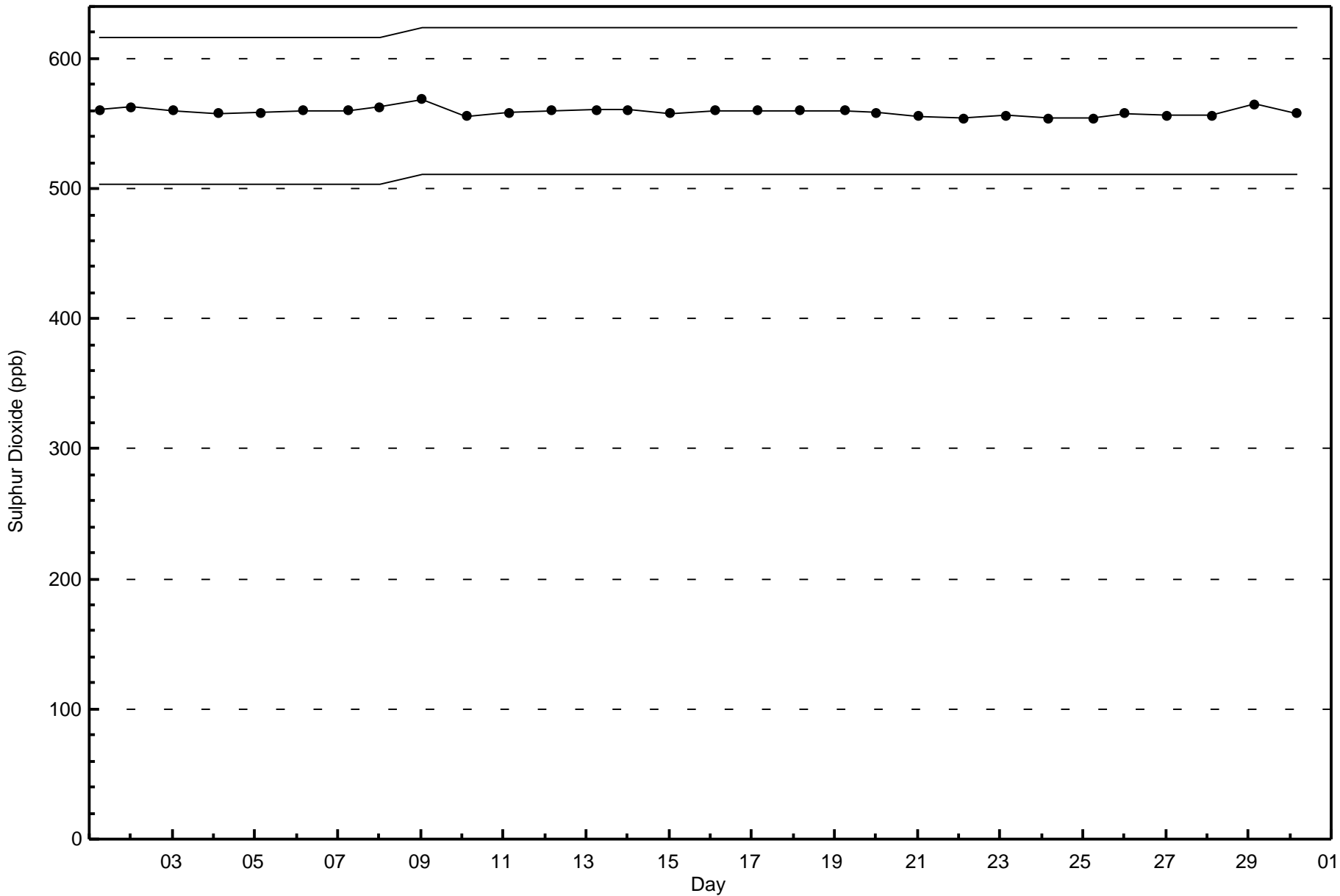
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 684







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Athabasca Valley - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Nov 26 19:00	Maximum Daily Average: 0.7 ppb on Nov 27		Hours of Data:	685
Minimum Value: 0 ppb on Nov 13 10:00	Minimum Daily Average: 0.2 ppb on Nov 18		Hours of Missing Data:	35
Maximum Diurnal Average: 0.4 ppb at hour 20	Minimum Diurnal Average: 0.3 ppb at hour 14		Hours of Calibration:	34
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 = 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-Nov	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-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	0.3	0
3-Nov	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
4-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	0.3	0
5-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	0.3	0
6-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	0.3	0
7-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0.4	0
9-Nov	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-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	0.2	0
11-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.4	1
12-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0.3	1
13-Nov	1	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0.4	1
14-Nov	0	Z	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
15-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	0.3	0
16-Nov	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
17-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	0.3	0
18-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	0.2	0
19-Nov	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-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	0.3	0
21-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	0.3	0
22-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	0.3	0
23-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	0.2	0
24-Nov	0	0	0	0	0	0	Z	0	0	0	M	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	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	0	0.5	1
27-Nov	0	0	Z	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0.7	1
28-Nov	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0.4	1
29-Nov	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	0.4	1
30-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	0.3	0

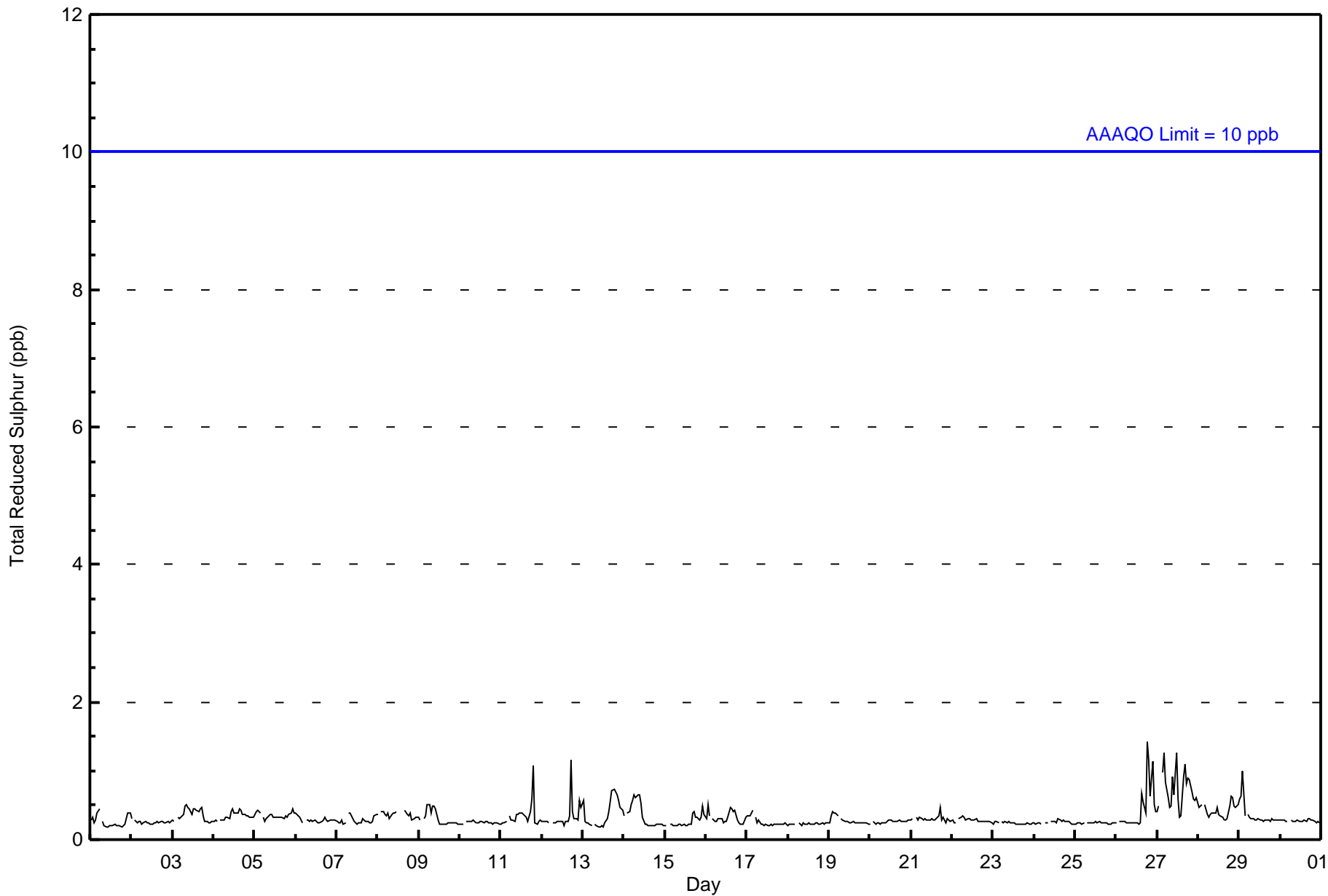
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	Diurnal Average		
1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	685	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: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - 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 - 2	16	6	3	14	24	31	225	95	44	32	45	33	22	24	21	50	685
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	16	6	3	14	24	31	225	95	44	32	45	33	22	24	21	50	685

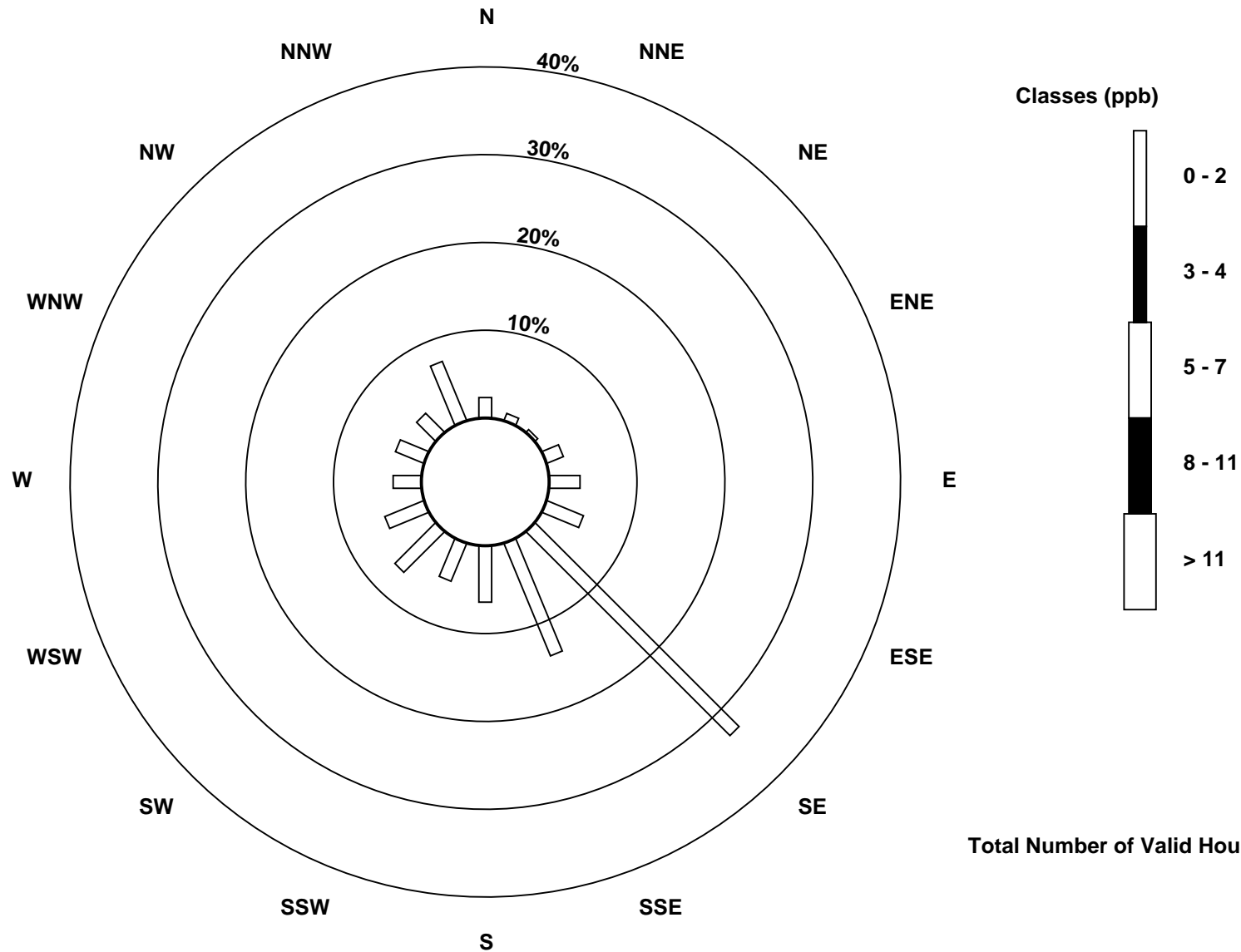
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Reduced Sulphur (TRS) - ppb
Athabasca Valley (AMS 7)

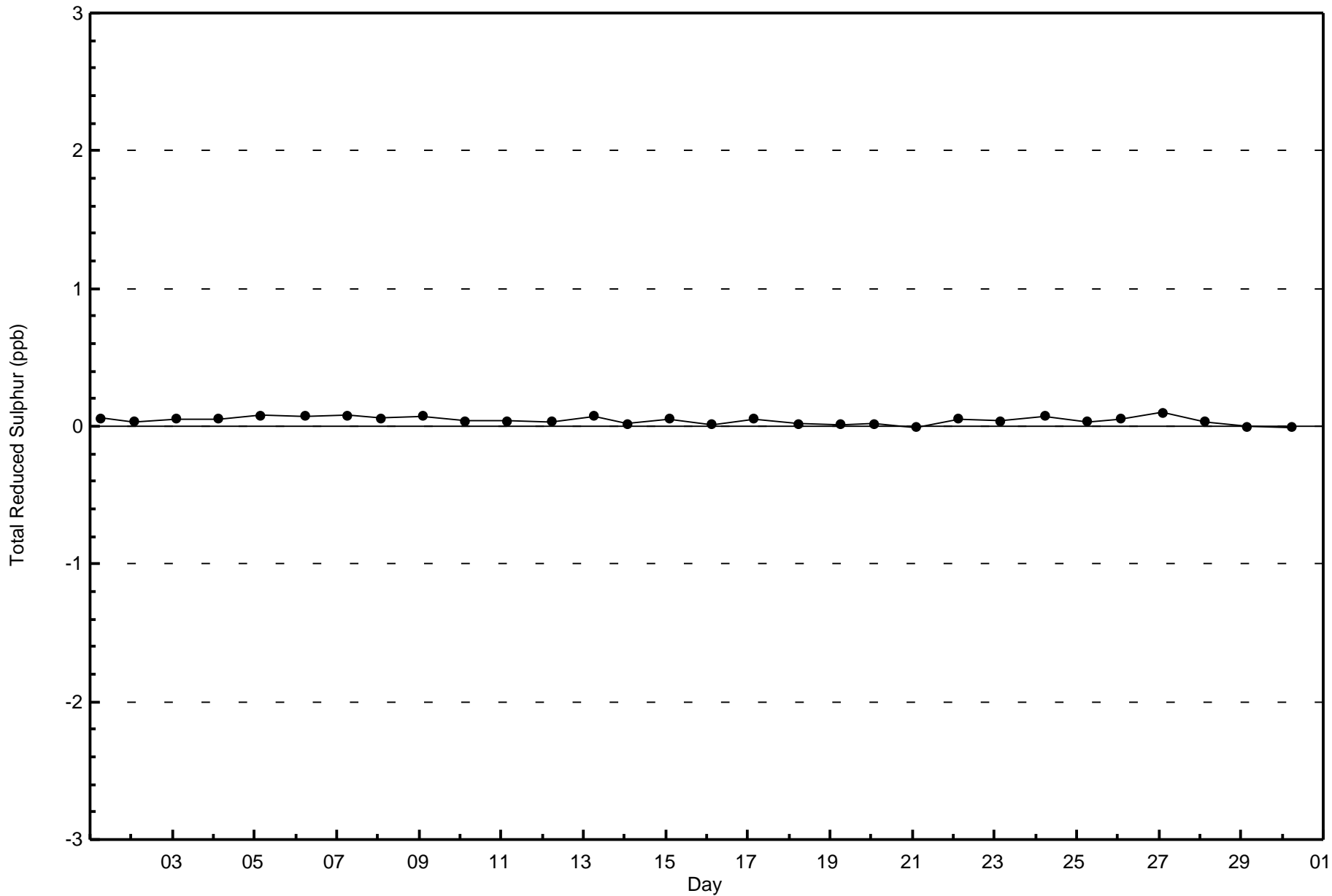


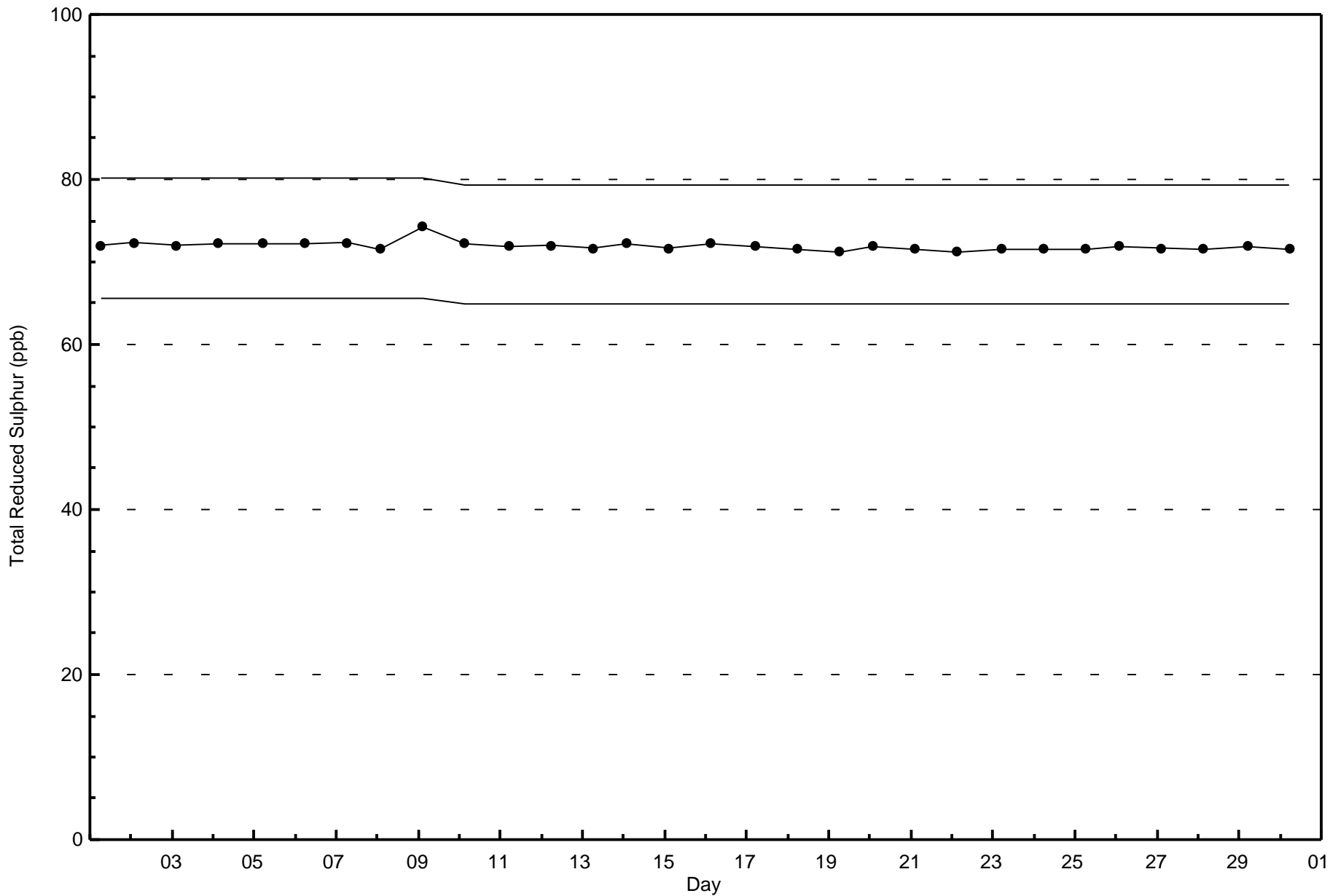
Total Number of Valid Hours: 685



Wood Buffalo Environmental Association
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - November 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Athabasca Valley - November 2016

Maximum Value: 2.9 ppm on Nov 6 01:00	Maximum Daily Average: 2.3 ppm on Nov 5	Hours in Service: 720
Minimum Value: 1.9 ppm on Nov 14 19:00	Minimum Daily Average: 1.9 ppm on Nov 17	Hours of Data: 679
Maximum Diurnal Average: 2.1 ppm at hour 1	Minimum Diurnal Average: 2.0 ppm at hour 14	Hours of Missing Data: 41
Monthly Average: 2.05 ppm	Percentiles: $P_1 = 1.9$ $P_{10} = 1.9$ $Q_1 = 1.9$ Median = 2.0 $Q_3 = 2.1$ $P_{90} = 2.2$ $P_{99} = 2.7$	Hours of Calibration: 40
		Percent Operational Time: 99.9

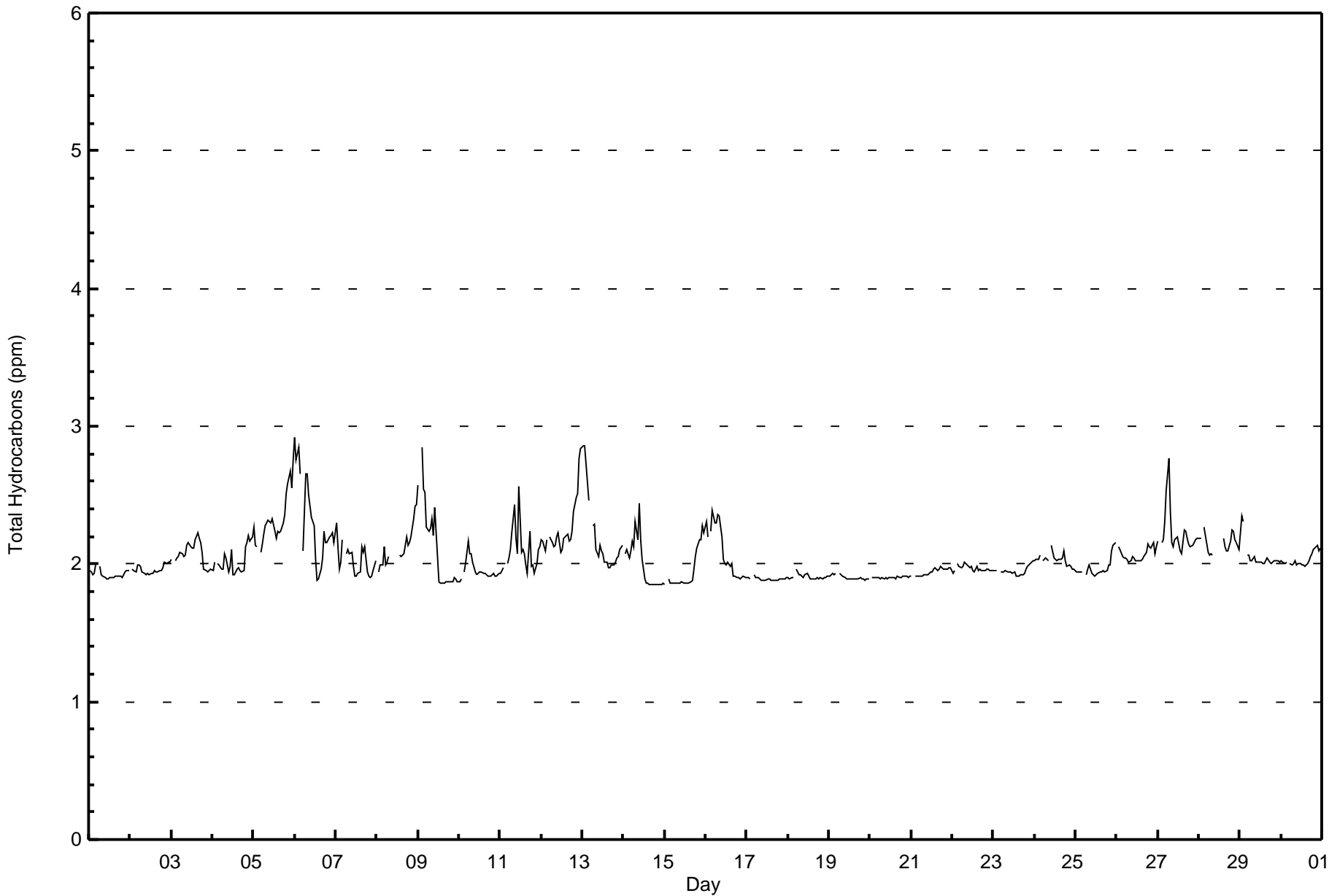
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Nov	1.9	1.9	1.9	1.9	2.0	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	
2-Nov	Z	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	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
3-Nov	2.0	Z	2.0	2.0	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	2.0	1.9	1.9	2.0	2.0	2.1	2.2	2.1
4-Nov	1.9	2.0	Z	2.0	2.0	2.0	2.0	2.1	2.0	1.9	2.0	2.1	1.9	1.9	2.0	2.0	2.0	1.9	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
5-Nov	2.3	2.1	2.1	Z	2.1	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.5	2.8	2.3	2.8	
6-Nov	2.9	2.8	2.8	2.7	Z	2.1	2.7	2.7	2.5	2.4	2.3	2.3	2.0	1.9	1.9	2.0	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.9
7-Nov	2.3	2.1	2.0	2.0	2.2	Z	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	2.1	2.1	2.1	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.3
8-Nov	Z	1.9	2.0	2.0	2.1	2.0	2.0	2.1	C	C	C	C	C	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.3	2.4	2.4	2.1	2.4	
9-Nov	2.6	Z	2.8	2.5	2.5	2.3	2.2	2.3	2.3	2.2	2.4	2.1	1.9	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	2.8
10-Nov	1.9	1.9	Z	1.9	2.0	2.2	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.2
11-Nov	1.9	2.0	2.0	Z	2.0	2.0	2.1	2.2	2.4	2.2	2.1	2.6	2.1	2.1	2.1	2.0	1.9	2.2	2.0	2.0	1.9	2.0	2.1	2.1	2.1	2.1	2.6
12-Nov	2.2	2.2	2.1	2.2	Z	2.2	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.5	2.5	2.8	2.8	2.3	2.8	
13-Nov	2.9	2.9	2.7	2.6	2.5	Z	2.3	2.3	2.1	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	2.1	2.1	2.2	2.9	
14-Nov	Z	2.1	2.1	2.0	2.1	2.2	2.1	2.3	2.2	2.4	2.2	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	2.4
15-Nov	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	2.0	2.1	2.2	2.2	2.3	2.2	1.9	2.3
16-Nov	2.3	2.2	Z	2.2	2.4	2.3	2.3	2.4	2.4	2.2	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	2.1	2.4
17-Nov	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
18-Nov	1.9	1.9	1.9	1.9	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	2.0
19-Nov	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
20-Nov	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
21-Nov	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	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
22-Nov	1.9	2.0	Z	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	2.0	2.0	2.0	2.0
23-Nov	1.9	2.0	2.0	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	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0
24-Nov	2.0	2.0	2.0	2.1	Z	2.0	2.0	2.0	2.0	2.0	M	2.1	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	2.1
25-Nov	1.9	1.9	1.9	1.9	1.9	Z	1.9	2.0	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	2.1	2.1	2.2	2.0	2.2
26-Nov	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2
27-Nov	2.2	Z	2.2	2.2	2.3	2.5	2.8	2.4	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.3	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.8
28-Nov	2.2	2.2	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.3
29-Nov	2.2	2.3	2.3	Z	2.1	2.1	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	2.0	2.0	2.0	2.0	2.1	2.3
30-Nov	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	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1
																								Diurnal Average			
																								Diurnal Maximum			

Z - zerospan C - Calibration M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Athabasca Valley - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Athabasca Valley - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	435	64.06	64.06
2.1 - 3.0	244	35.94	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 679

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Athabasca Valley - November 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	11	3	2	11	22	14	154	47	19	17	33	23	19	22	16	22	435
2.1 - 3.0	4	2	0	1	4	17	73	44	25	16	7	11	4	2	4	30	244
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	15	5	2	12	26	31	227	91	44	33	40	34	23	24	20	52	679

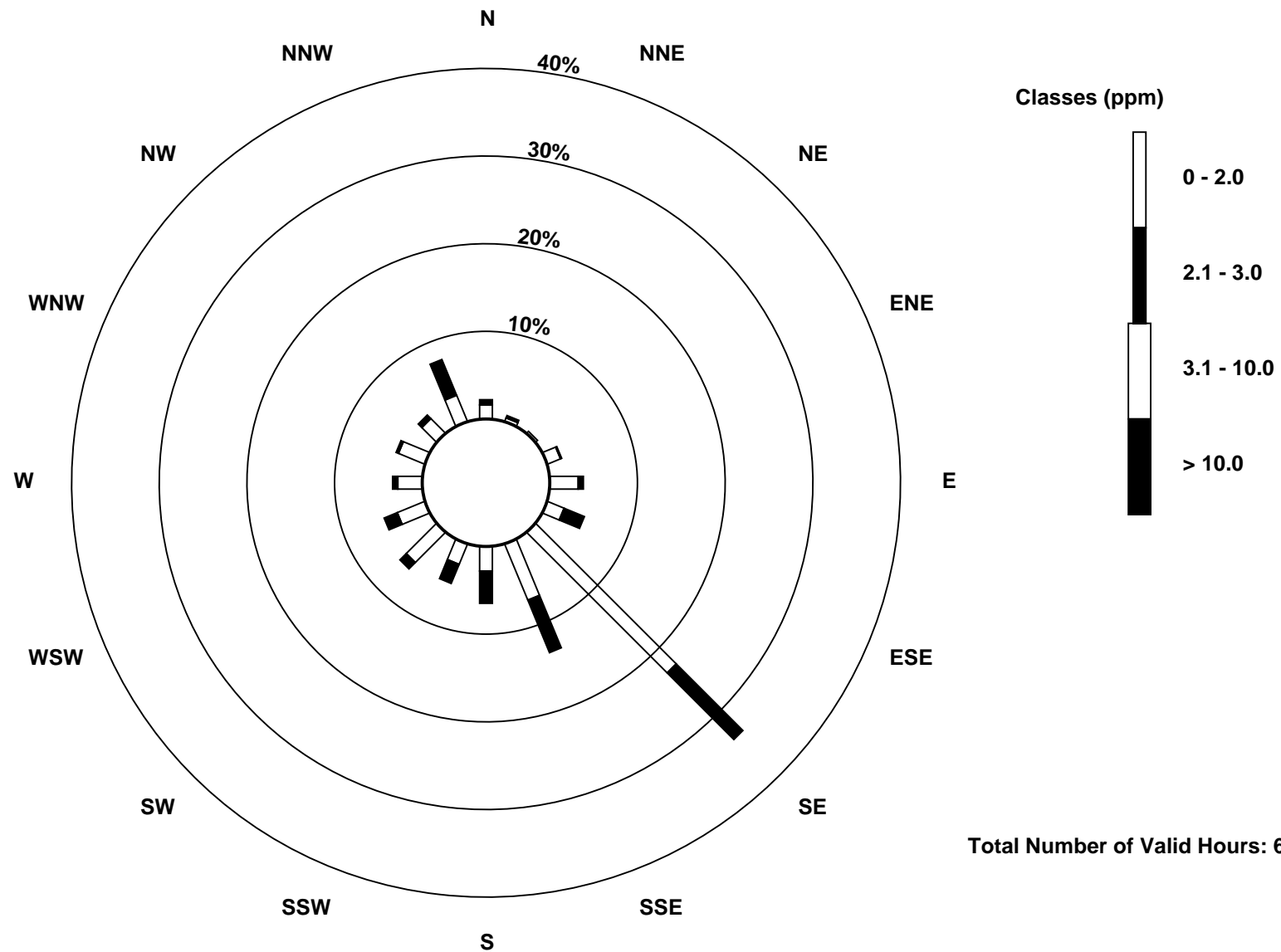
Total Number of Valid Hours: 679

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Athabasca Valley (AMS 7)

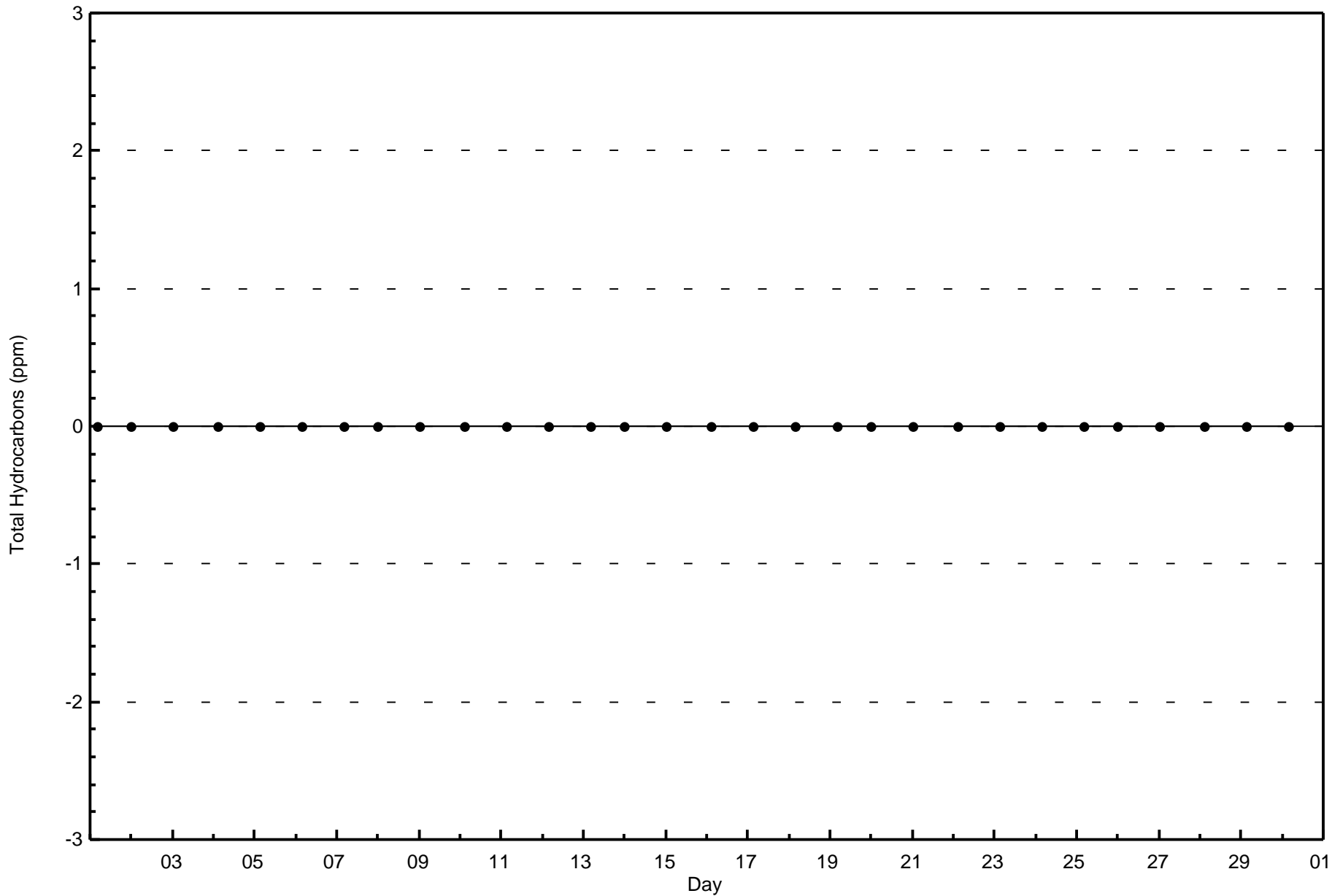


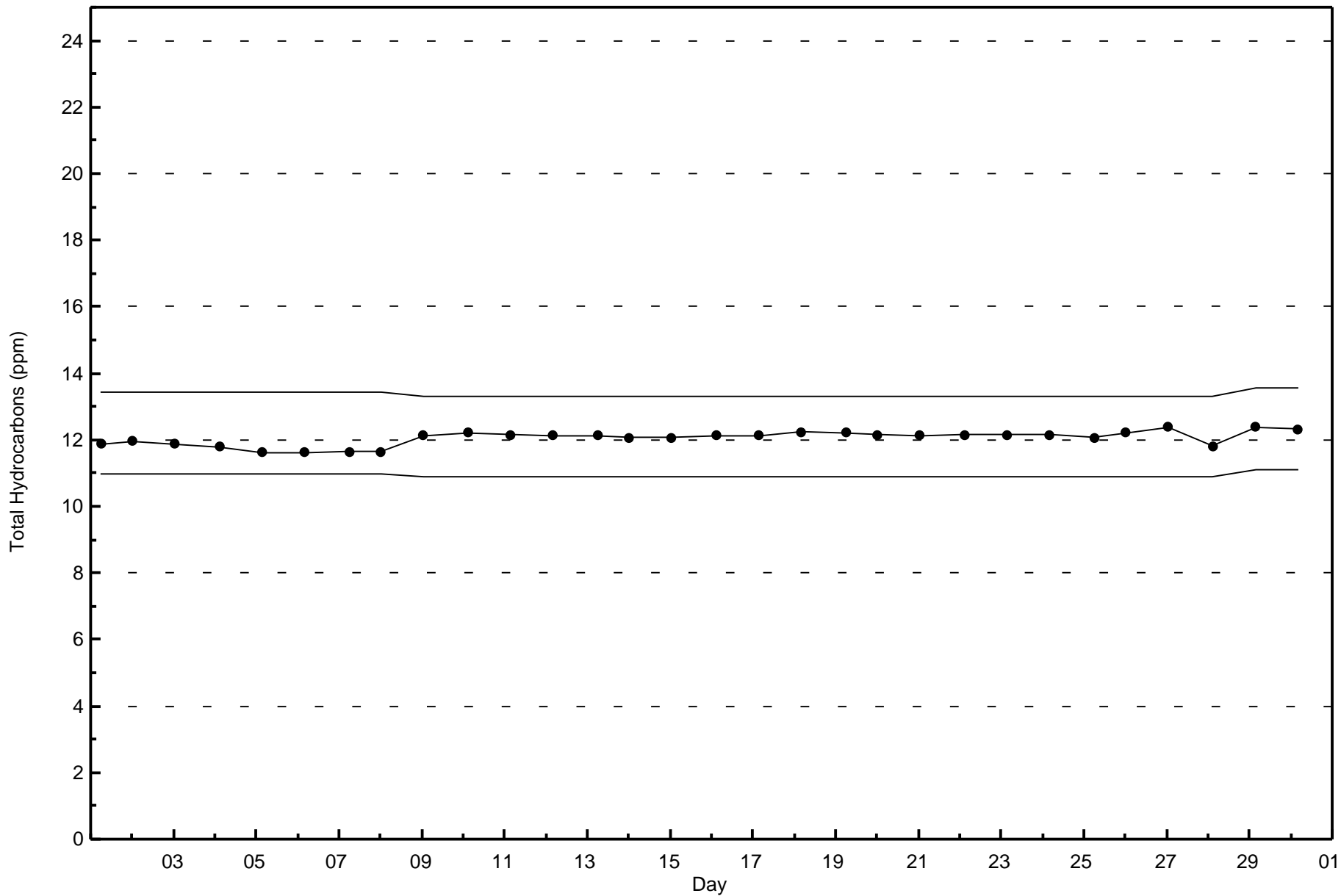
Total Number of Valid Hours: 679



Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Athabasca Valley - November 2016



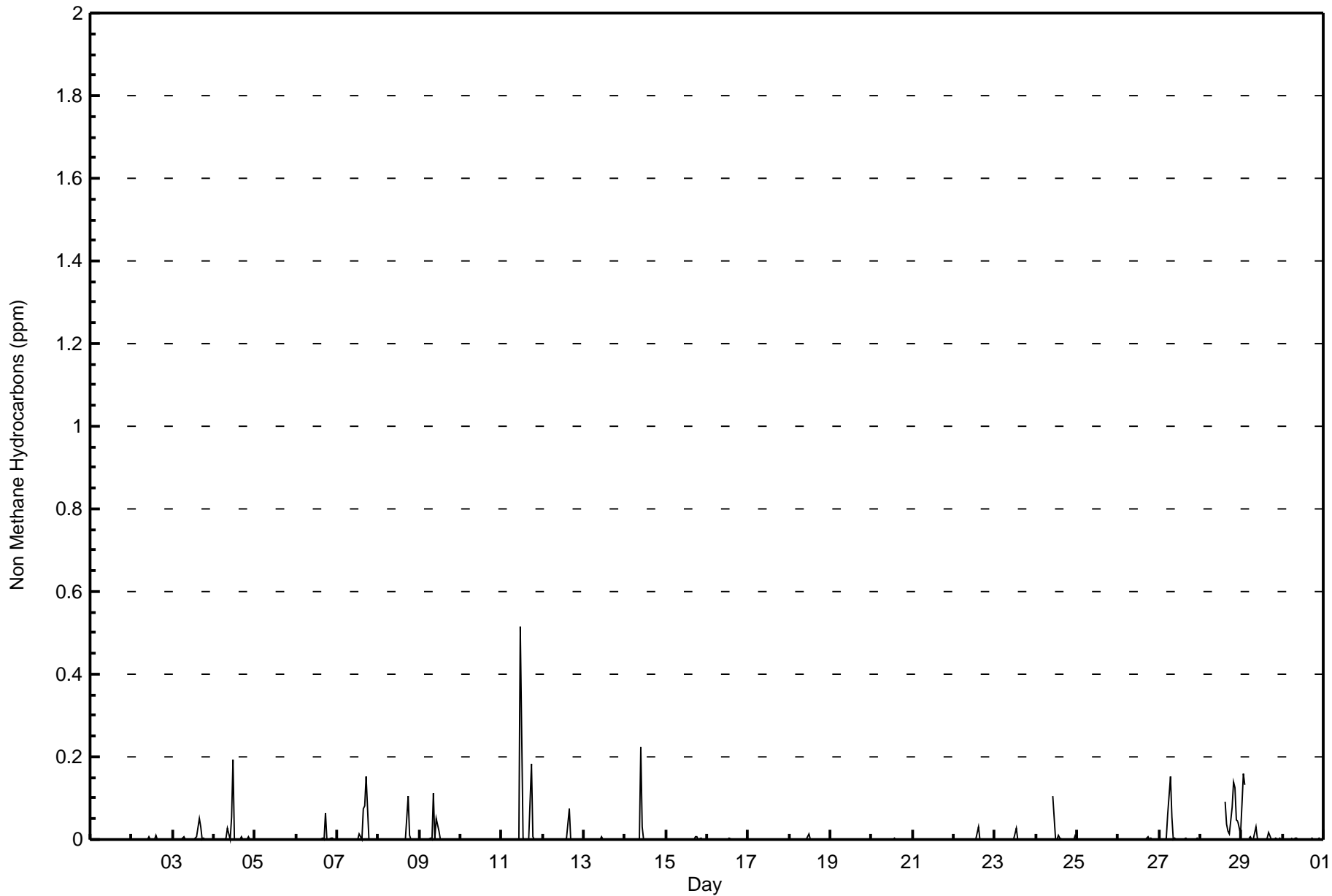




Wood Buffalo Environmental Association
 Summary of Hour Averages

Non Methane Hydrocarbons (NMHC) - ppm
 Athabasca Valley - November 2016

Maximum Value: 0.516 ppm on Nov 11 12:00																						Hours in Service:		720																												
Maximum Daily Average: 0.034 ppm on Nov 28																						Hours of Data:		679																												
Minimum Value: 0.000 ppm on Nov 1 01:00																						Hours of Missing Data:		41																												
Minimum Daily Average: 0.000 ppm on Nov 10																						Hours of Calibration:		40																												
Maximum Diurnal Average: 0.027 ppm at hour 12																						Percent Operational Time:		99.9																												
Minimum Diurnal Average: 0.000 ppm at hour 4																																																				
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																																																				
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	0.000	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	0.000																		
2-Nov	Z	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	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010																				
3-Nov	0.000	Z	0.000	0.000	0.000	0.000	0.008	0.002	0.000	0.000	0.000	0.000	0.002	0.007	0.051	0.030	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.051																						
4-Nov	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.004	0.027	0.000	0.055	0.192	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.013	0.192																							
5-Nov	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	0.000	0.000	0.000	0.000	0.000																				
6-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.005	0.000	0.065	0.000	0.000	0.002	0.005	0.000	0.000	0.000	0.000	0.000	0.003	0.065																								
7-Nov	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.075	0.081	0.154	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.154																								
8-Nov	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	C	0.000	0.000	0.000	0.000	0.106	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.106																									
9-Nov	0.000	Z	0.000	0.000	0.000	0.000	0.002	0.000	0.113	0.000	0.051	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.113																									
10-Nov	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																				
11-Nov	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.516	0.004	0.000	0.000	0.000	0.000	0.183	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.516																									
12-Nov	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	0.005	0.073	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.003	0.073																										
13-Nov	0.000	0.000	0.000	0.000	0.000	Z	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	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.008																									
14-Nov	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.225	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.225																										
15-Nov	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	0.006	0.007	0.000	0.004	0.000	0.000	0.000	0.000	0.001	0.007																										
16-Nov	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005																					
17-Nov	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-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	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	0.000	0.000	0.000	0.001	0.014																									
19-Nov	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-Nov	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	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.004																				
21-Nov	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-Nov	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	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.029																									
23-Nov	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.028																										
24-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	M	0.105	0.000	0.000	0.011	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.105																									
25-Nov	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	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001																				
26-Nov	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	0.007	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007																					
27-Nov	0.000	Z	0.000	0.000	0.004	0.062	0.153	0.056	0.001	0.004	0.001	0.001	0.002	0.000	0.000	0.003	0.001	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.013	0.153																									
28-Nov	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	C	0.092	0.037	0.019	0.015	0.077	0.137	0.126	0.048	0.043	0.015	0.034	0.137																									
29-Nov	0.086	0.161	0.132	Z	0.005	0.007	0.000	0.000	0.032	0.002	0.000	0.000	0.000	0.000	0.000	0.003	0.016	0.000	0.001	0.000	0.002	0.000	0.002	0.000	0.020	0.161																										
30-Nov	0.000	0.000	0.000	0.001	Z	0.003	0.001	0.002	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.004																									
0.003																												0.006	0.005	0.000	0.000	0.003	0.005	0.002	0.006	0.009	0.009	0.027	0.001	0.001	0.005	0.008	0.005	0.018	0.004	0.005	0.005	0.002	0.002	0.001	Diurnal Average	
0.086																												0.161	0.132	0.001	0.005	0.062	0.153	0.056	0.113	0.225	0.105	0.516	0.028	0.015	0.092	0.075	0.081	0.183	0.077	0.137	0.126	0.048	0.043	0.015	Diurnal Maximum	
Z - zerspan																												C - Calibration				M - Maintenance																				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	625	92.05	92.05
0.006 - 0.05	32	4.71	96.76
0.06 - 0.1	15	2.21	98.97
> 0.1	7	1.03	100.00

Total Number of Valid Hours: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - November 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	14	5	2	11	26	30	209	82	42	28	38	33	21	24	17	43	625
0.006 - 0.05	0	0	0	1	0	0	12	5	2	3	2	1	2	0	2	2	32
0.06 - 0.1	1	0	0	0	0	0	4	2	0	2	0	0	0	0	1	5	15
> 0.1	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	2	7
Totals	15	5	2	12	26	31	227	91	44	33	40	34	23	24	20	52	679

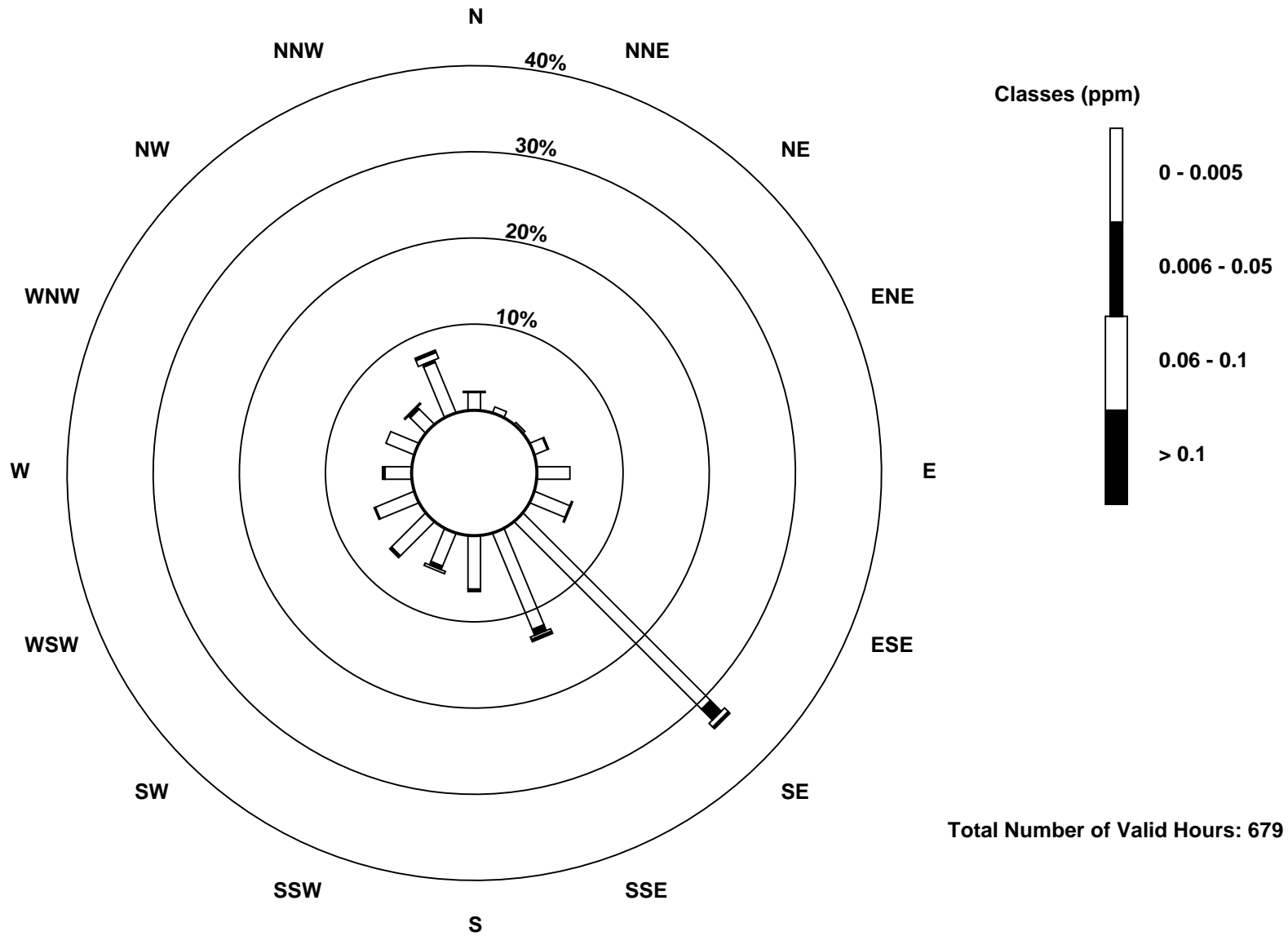
Total Number of Valid Hours: 679

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

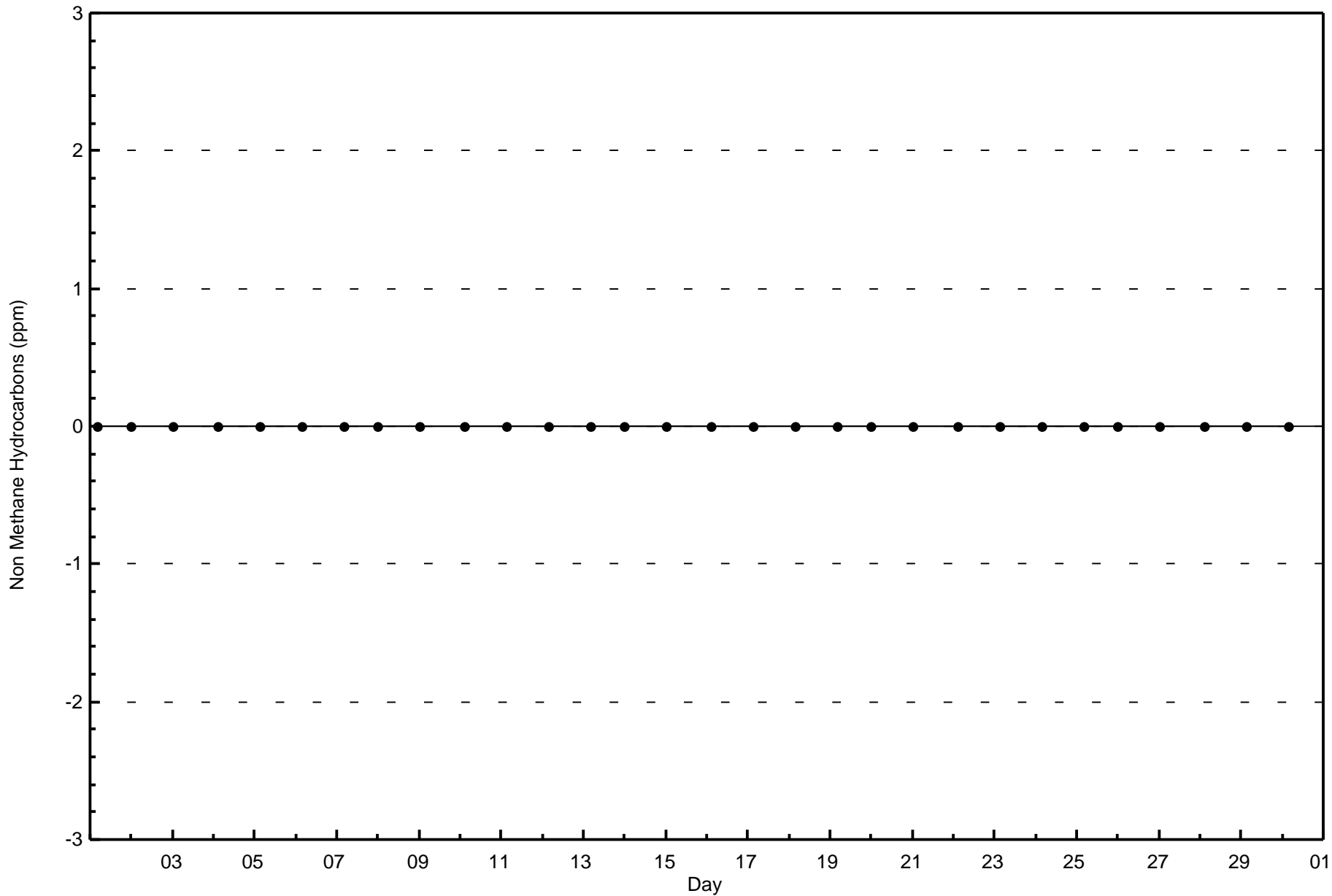
Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley (AMS 7)

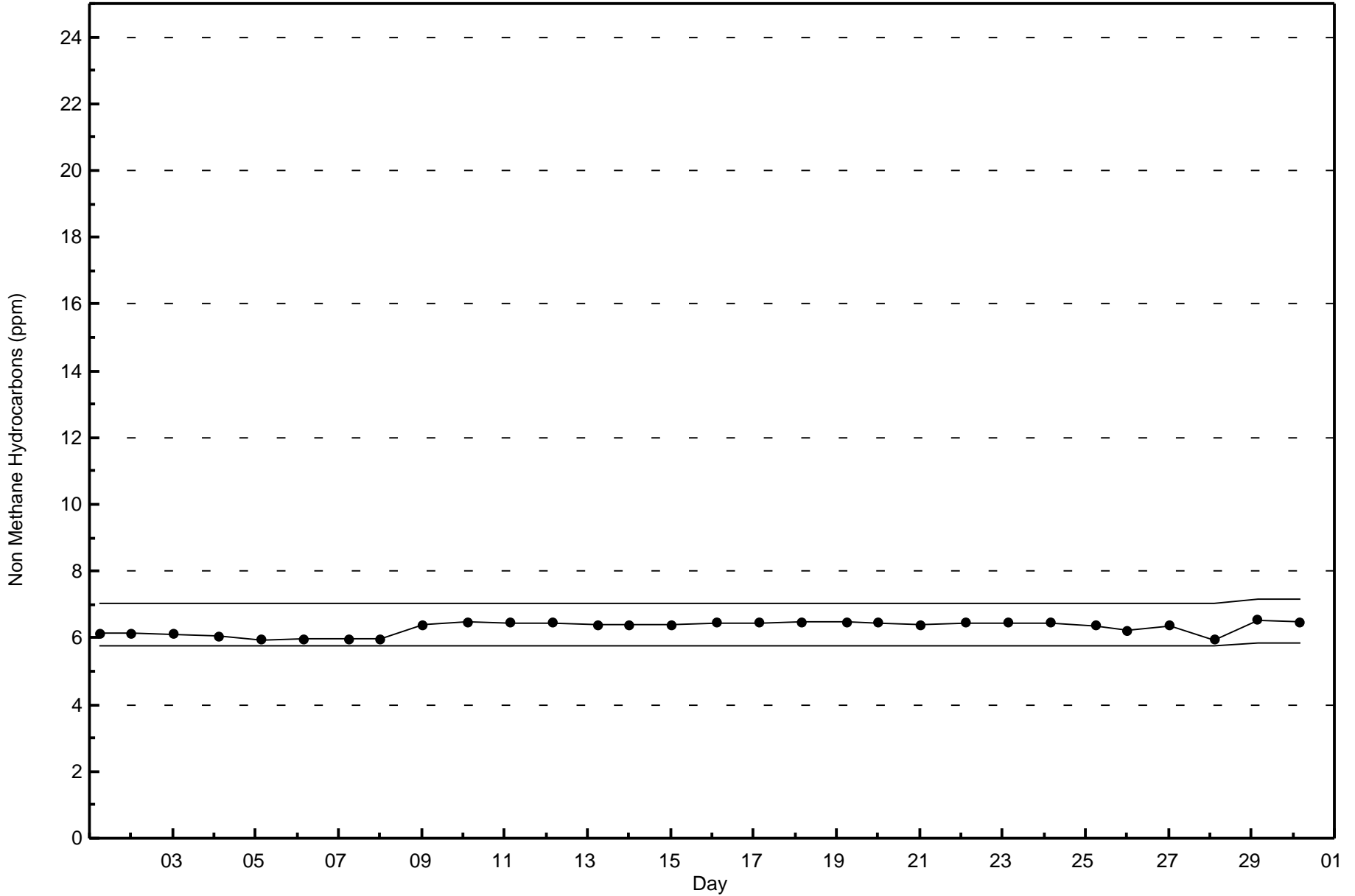




Wood Buffalo Environmental Association
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

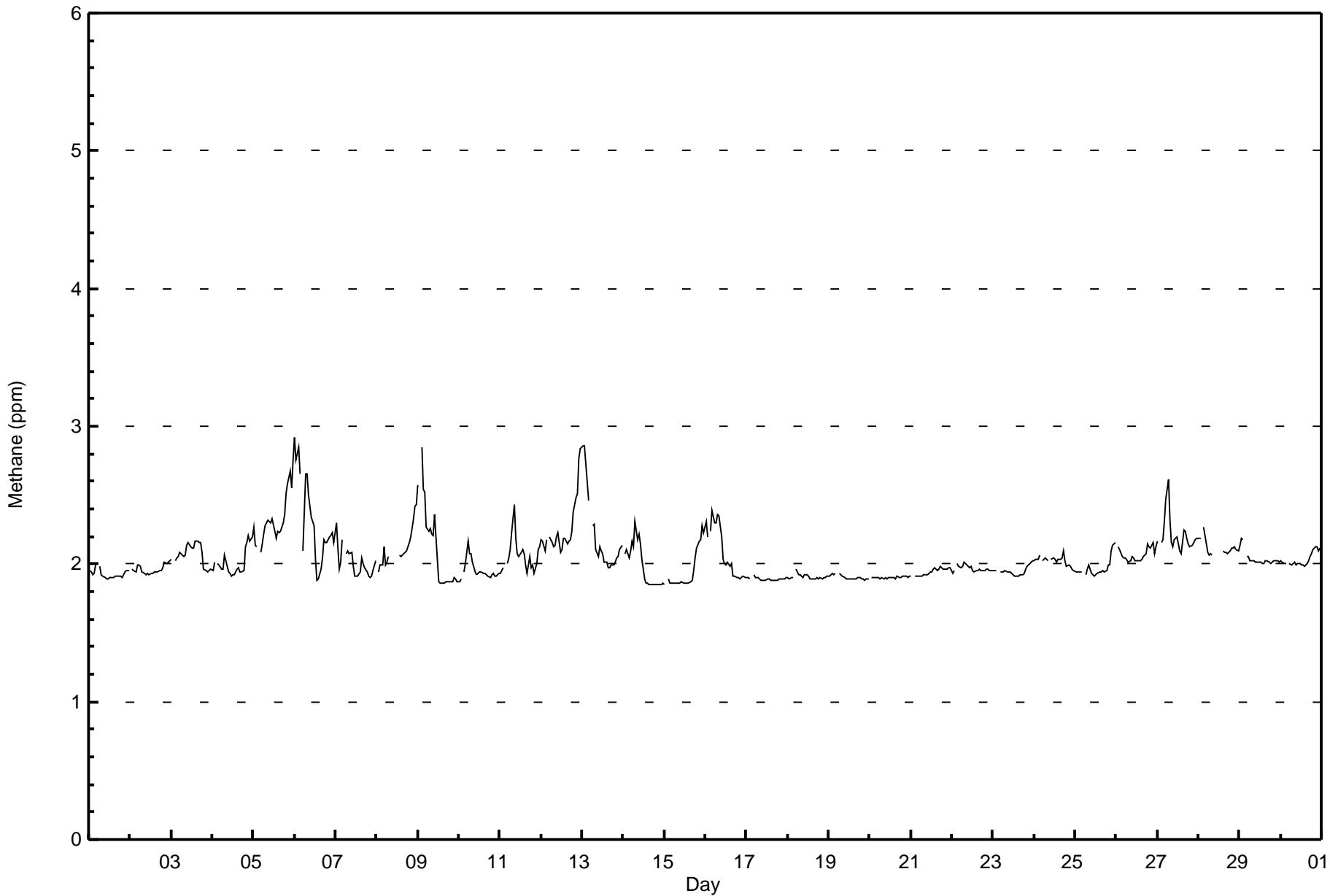
Athabasca Valley - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2.9 ppm on Nov 6 01:00	Maximum Daily Average: 2.3 ppm on Nov 5		Hours of Data:	679
Minimum Value: 1.9 ppm on Nov 14 19:00	Minimum Daily Average: 1.9 ppm on Nov 17		Hours of Missing Data:	41
Maximum Diurnal Average: 2.1 ppm at hour 1	Minimum Diurnal Average: 2.0 ppm at hour 14		Hours of Calibration:	40
Monthly Average: 2.04 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.1 P ₉₀ = 2.2 P ₉₉ = 2.7		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-Nov	1.9	1.9	1.9	1.9	2.0	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	2.0	2.0	1.9	2.0	
2-Nov	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	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
3-Nov	2.0	Z	2.0	2.0	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	2.0	1.9	1.9	2.0	2.0	2.1	
4-Nov	1.9	2.0	Z	2.0	2.0	2.0	2.0	2.1	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.1	2.2	2.2	2.2	2.2	2.0	
5-Nov	2.3	2.1	2.1	Z	2.1	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.5	2.8	2.3	
6-Nov	2.9	2.8	2.8	2.7	Z	2.1	2.7	2.7	2.5	2.4	2.3	2.3	2.0	1.9	1.9	2.0	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	
7-Nov	2.3	2.1	2.0	2.0	2.2	Z	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	
8-Nov	Z	1.9	2.0	2.0	2.1	2.0	2.0	2.1	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.4	2.1	
9-Nov	2.6	Z	2.8	2.5	2.5	2.3	2.2	2.3	2.2	2.2	2.4	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	2.1	
10-Nov	1.9	1.9	Z	1.9	2.0	2.2	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	1.9	1.9	1.9	1.9	1.9	2.0	
11-Nov	1.9	2.0	2.0	Z	2.0	2.0	2.1	2.2	2.4	2.2	2.1	2.0	2.1	2.1	2.1	2.0	1.9	2.1	2.0	2.0	1.9	2.0	2.1	2.1	2.1	
12-Nov	2.2	2.2	2.1	2.2	Z	2.2	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.2	2.4	2.5	2.5	2.8	2.8	2.3	
13-Nov	2.9	2.9	2.7	2.6	2.5	Z	2.3	2.3	2.1	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	
14-Nov	Z	2.1	2.1	2.0	2.1	2.2	2.1	2.3	2.2	2.2	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	2.0	
15-Nov	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	2.0	2.1	2.2	2.2	2.3	1.9	
16-Nov	2.3	2.2	Z	2.2	2.4	2.3	2.3	2.4	2.4	2.2	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	2.1	
17-Nov	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	
18-Nov	1.9	1.9	1.9	1.9	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	
19-Nov	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	
20-Nov	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	
21-Nov	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	
22-Nov	1.9	2.0	Z	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	2.0	2.0	
23-Nov	1.9	2.0	2.0	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	1.9	2.0	2.0	2.0	2.0	2.0	1.9	
24-Nov	2.0	2.0	2.0	2.1	Z	2.0	2.0	2.0	2.0	2.0	M	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	
25-Nov	1.9	1.9	1.9	1.9	1.9	Z	1.9	2.0	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	2.1	2.1	2.2	2.0	
26-Nov	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	
27-Nov	2.2	Z	2.2	2.2	2.3	2.5	2.6	2.3	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	
28-Nov	2.2	2.2	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
29-Nov	2.1	2.2	2.2	Z	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	2.0	2.0	2.0	
30-Nov	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	2.1	2.1	2.1	2.1	2.1	2.0	

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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	Diurnal Average
2.9	2.9	2.8	2.7	2.5	2.5	2.7	2.7	2.5	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.8	Diurnal Maximum

Z - zerspan C - Calibration M - Maintenance





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Athabasca Valley - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	443	65.24	65.24
2.1 - 3.0	236	34.76	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Athabasca Valley - November 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	11	3	2	11	22	14	158	49	19	18	33	23	20	22	16	22	443
2.1 - 3.0	4	2	0	1	4	17	69	42	25	15	7	11	3	2	4	30	236
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	15	5	2	12	26	31	227	91	44	33	40	34	23	24	20	52	679

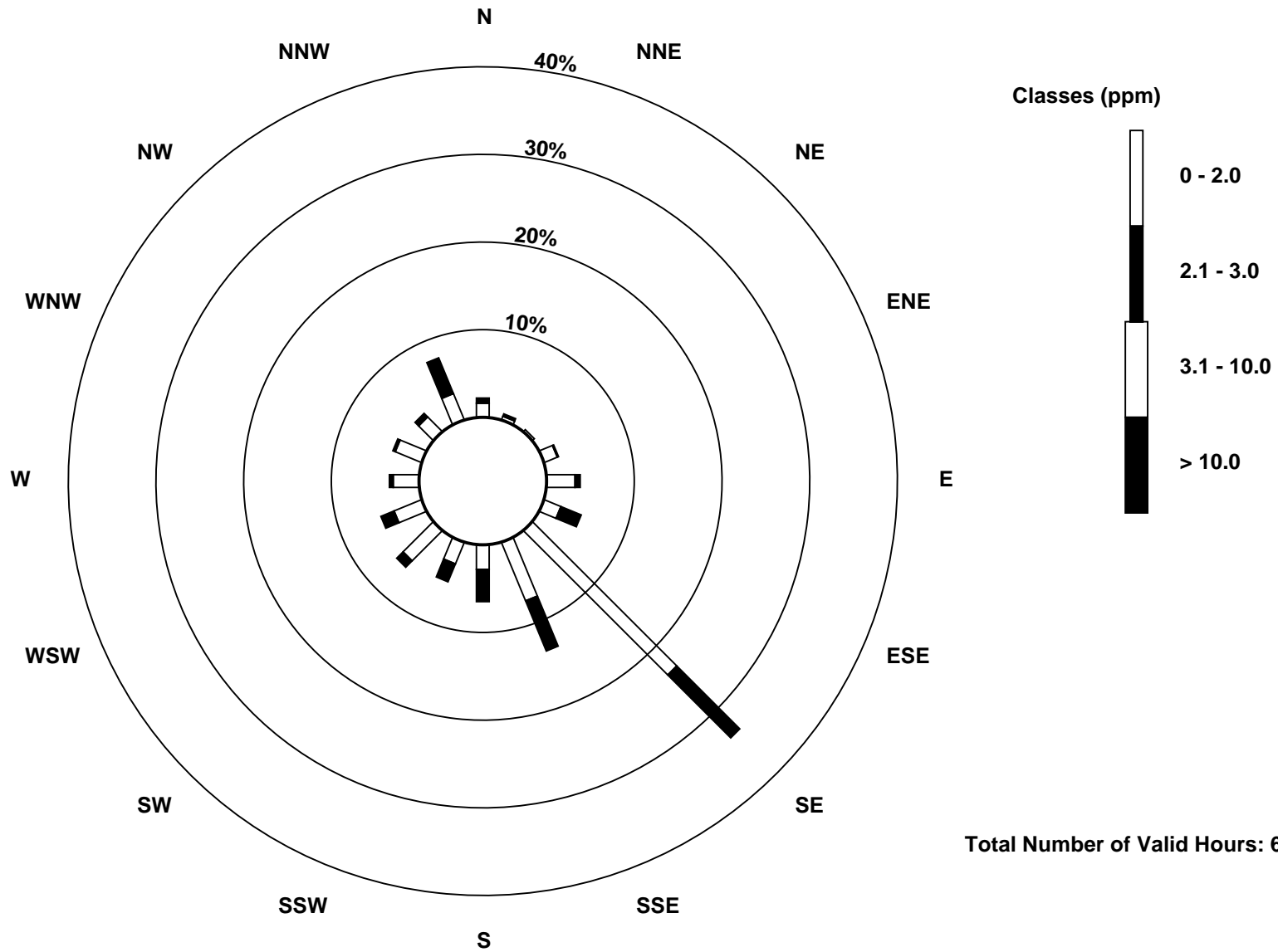
Total Number of Valid Hours: 679

Total Number of Hours: 720

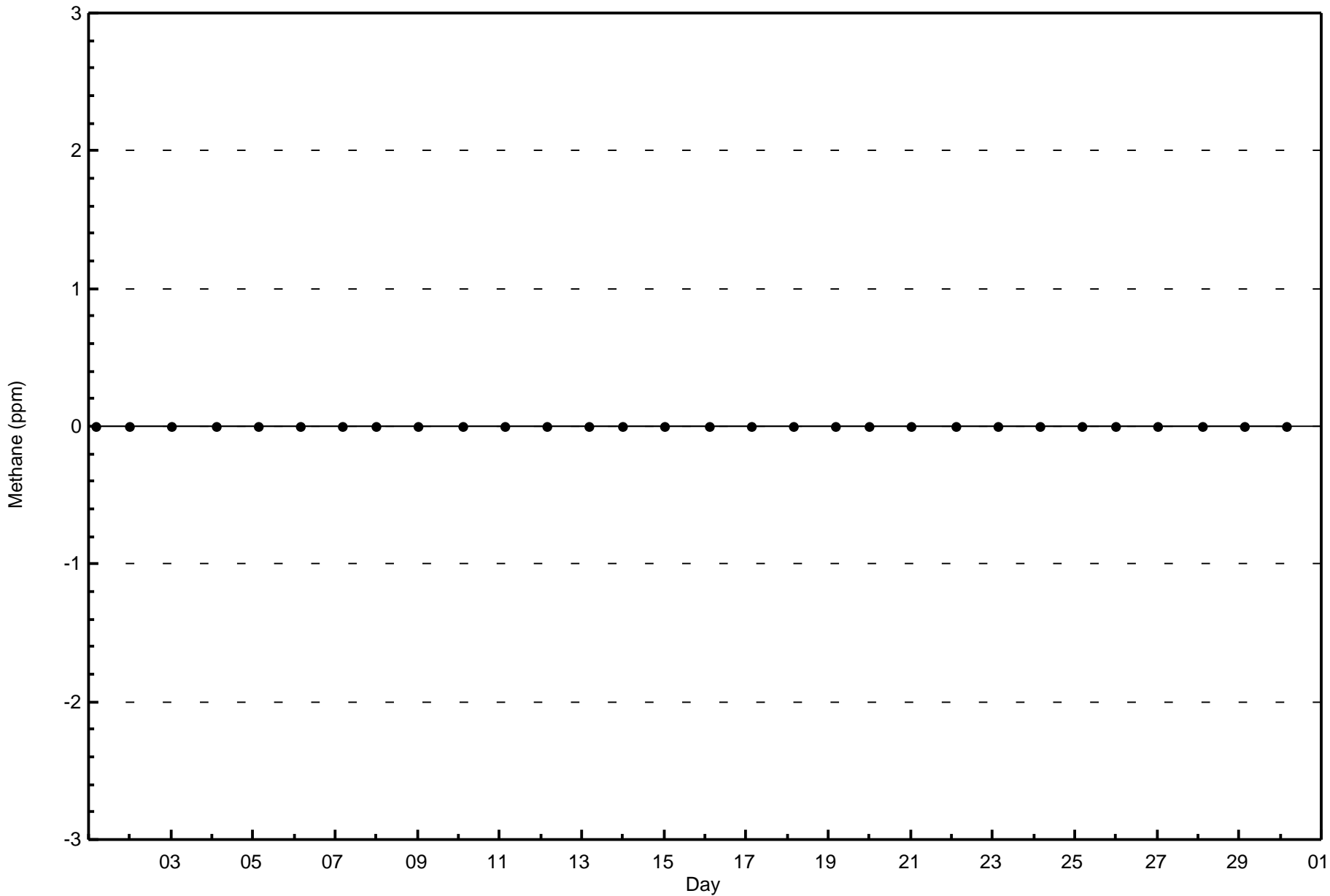


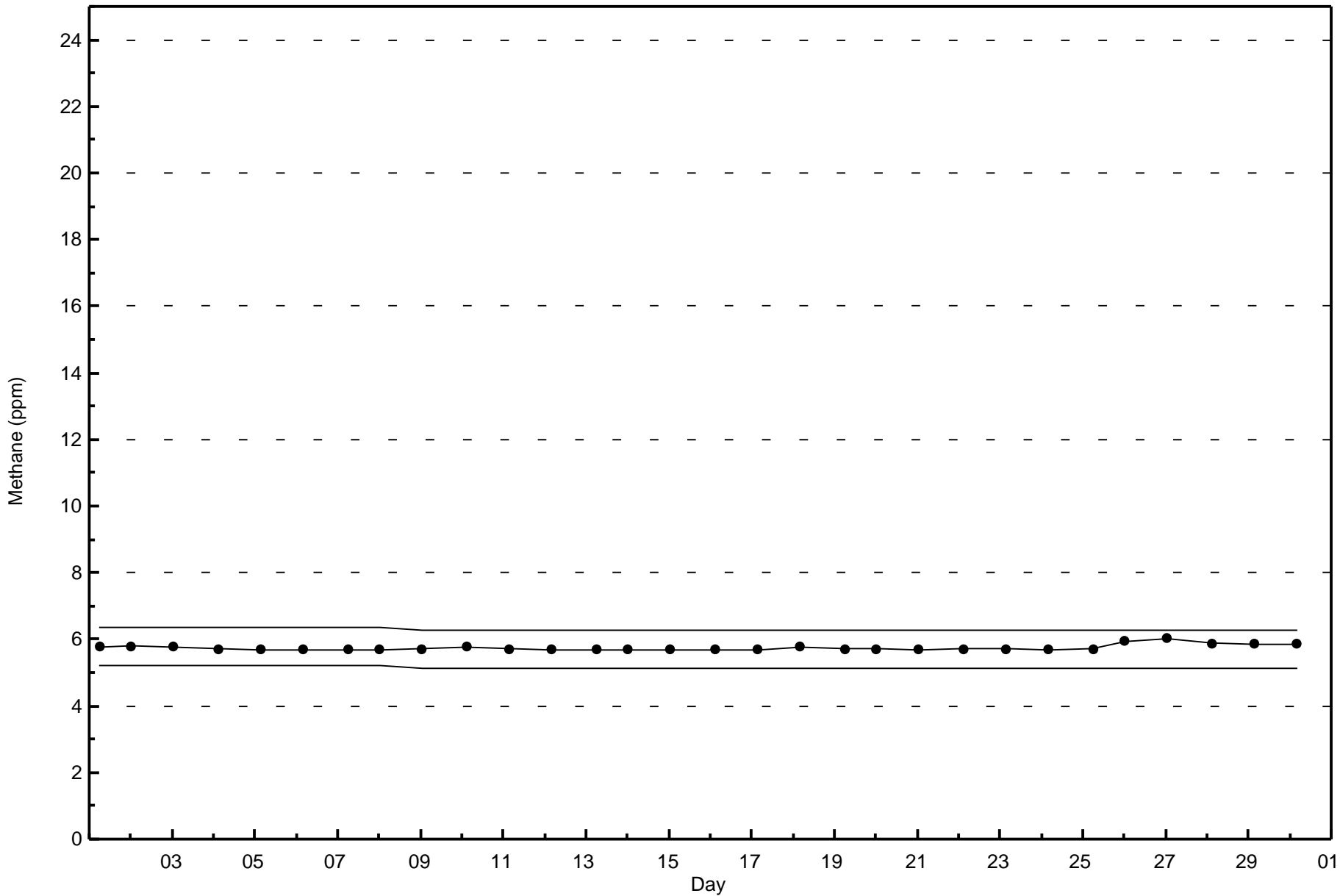
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Methane (CH₄) - ppm
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 679







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

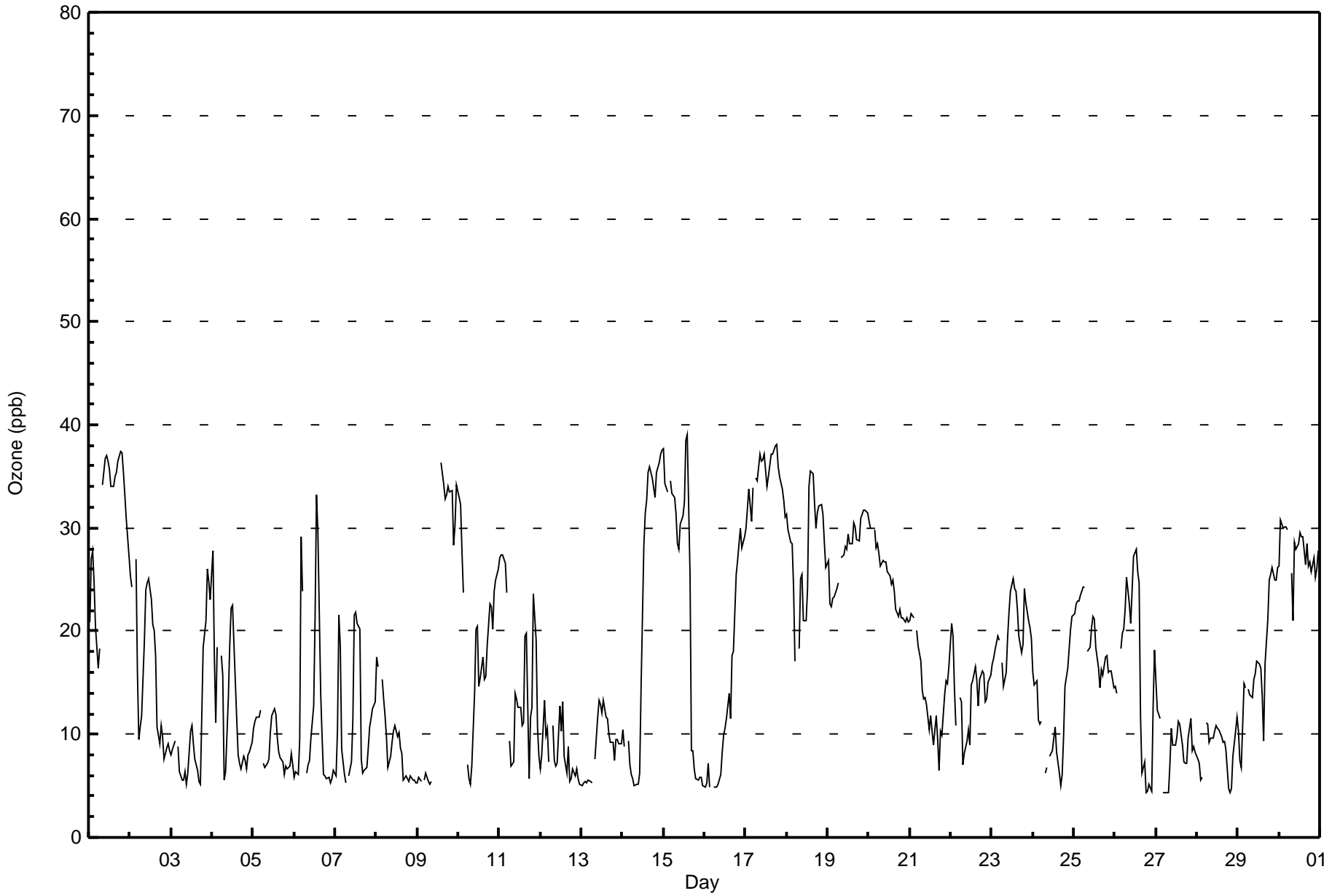
Athabasca Valley - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 39 ppb on Nov 15 15:00	Maximum Daily Average: 34.8 ppb on Nov 17		Hours of Data:	684
Minimum Value: 4 ppb on Nov 28 20:00	Minimum Daily Average: 8.2 ppb on Nov 12		Hours of Missing Data:	36
Maximum Diurnal Average: 20.2 ppb at hour 14	Minimum Diurnal Average: 12.5 ppb at hour 8		Hours of Calibration:	35
Monthly Average: 17.2 ppb	Percentiles: P ₁ = 4 P ₁₀ = 6 Q ₁ = 8 Median = 15 Q ₃ = 25 P ₉₀ = 32 P ₉₉ = 37		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-Nov	21	27	28	25	20	16	18	Z	34	37	37	36	36	34	34	35	35	36	37	37	35	33	31	27	31.0	37
2-Nov	25	24	Z	27	16	10	11	12	19	24	25	25	23	21	20	18	11	9	11	10	8	9	9	8	16.2	27
3-Nov	8	9	9	Z	9	6	6	6	6	5	6	10	11	9	8	6	5	5	12	18	21	26	25	23	10.9	26
4-Nov	28	18	11	18	Z	18	16	6	6	14	19	22	23	19	11	8	7	7	8	7	7	8	8	9	12.9	28
5-Nov	11	11	12	12	12	Z	7	7	7	8	10	12	13	12	10	8	8	7	6	7	7	7	8	7	9.0	13
6-Nov	6	6	6	9	29	24	Z	6	7	7	10	13	21	33	30	14	10	6	6	6	6	5	6	6	11.9	33
7-Nov	6	11	22	19	9	6	5	Z	6	7	11	22	22	21	20	8	6	6	7	9	11	12	13	13	11.7	22
8-Nov	17	17	Z	15	13	12	10	7	8	9	10	11	10	10	9	8	6	6	6	5	6	6	6	5	9.2	17
9-Nov	5	6	5	Z	6	6	5	5	5	C	C	C	C	C	36	34	33	33	34	33	34	28	30	34	20.8	36
10-Nov	33	32	28	24	Z	7	6	5	7	14	20	20	15	15	18	15	16	19	23	22	20	24	25	26	18.8	33
11-Nov	27	27	27	27	24	Z	9	7	7	14	13	13	13	11	11	20	20	6	12	13	24	19	11	8	15.7	27
12-Nov	7	8	13	10	11	7	Z	11	8	7	7	13	10	13	8	6	9	5	6	7	6	7	6	5	8.2	13
13-Nov	5	5	5	5	6	5	5	Z	8	12	13	13	12	13	12	11	10	9	9	7	9	10	9	9	8.9	13
14-Nov	10	9	Z	9	7	6	6	5	5	6	14	28	31	33	35	36	35	34	33	33	35	36	37	38	21.5	38
15-Nov	38	34	34	Z	35	33	33	31	28	28	30	31	33	39	39	25	8	8	7	6	6	6	6	5	23.6	39
16-Nov	5	5	7	5	Z	5	5	5	5	6	8	10	11	12	14	12	18	18	25	27	29	30	28	29	13.8	30
17-Nov	30	32	34	31	34	Z	35	35	37	36	37	37	34	35	36	37	37	38	38	36	35	34	33	31	34.8	38
18-Nov	31	30	29	28	24	17	Z	18	25	25	21	21	24	34	36	35	32	30	31	32	32	31	29	26	28.0	36
19-Nov	27	23	22	23	23	24	25	Z	27	27	28	28	29	28	28	30	30	29	29	31	31	32	32	31	27.8	32
20-Nov	31	30	Z	30	28	28	28	26	27	27	27	26	25	25	25	24	22	21	22	21	21	21	21	21	25.1	31
21-Nov	21	22	21	Z	20	19	17	14	13	14	13	10	12	10	9	12	10	6	10	10	14	15	15	17	14.1	22
22-Nov	21	20	14	11	Z	14	13	7	8	9	10	9	15	15	16	15	13	15	16	16	13	13	15	16	13.7	21
23-Nov	17	17	18	20	19	Z	17	15	16	19	22	24	25	24	24	22	19	18	19	24	23	21	20	19	20.1	25
24-Nov	16	15	15	11	11	11	Z	6	7	M	8	8	10	11	8	6	5	6	10	15	16	18	20	21	11.6	21
25-Nov	22	23	23	23	23	24	Z	18	18	20	21	21	18	16	14	16	16	16	18	18	16	16	16	14	19.2	24
26-Nov	15	14	Z	18	20	20	22	25	23	21	24	27	28	26	25	12	6	7	4	4	5	4	13	18	16.6	28
27-Nov	15	12	12	Z	4	4	4	4	7	11	9	9	10	11	11	9	7	7	7	10	11	8	9	8	8.7	15
28-Nov	8	7	6	6	Z	11	11	9	10	10	10	11	11	10	10	9	9	9	5	4	5	8	9	12	8.6	12
29-Nov	10	7	7	15	14	Z	14	14	14	14	15	16	17	17	16	14	9	17	21	25	25	26	25	26	17.0	26
30-Nov	26	31	30	30	30	Z	26	21	29	28	28	30	29	29	26	28	26	27	26	27	25	26	28	28	27.7	31

18.0	17.7	17.5	18.0	17.9	14.6	14.1	12.5	14.0	16.4	17.2	18.7	19.6	20.2	20.0	17.5	16.3	15.6	16.7	17.3	18.0	17.9	18.0	18.1	Diurnal Average	
38	34	34	31	35	33	35	35	37	37	37	37	36	39	39	37	37	38	38	37	35	36	37	38	Diurnal Maximum	

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Athabasca Valley - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	430	62.87	62.87
21 - 50	254	37.13	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Athabasca Valley - 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	8	4	2	6	9	21	156	71	34	25	23	16	3	4	9	39	430
21 - 50	8	2	0	8	16	11	67	22	13	10	21	17	17	21	11	10	254
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	16	6	2	14	25	32	223	93	47	35	44	33	20	25	20	49	684

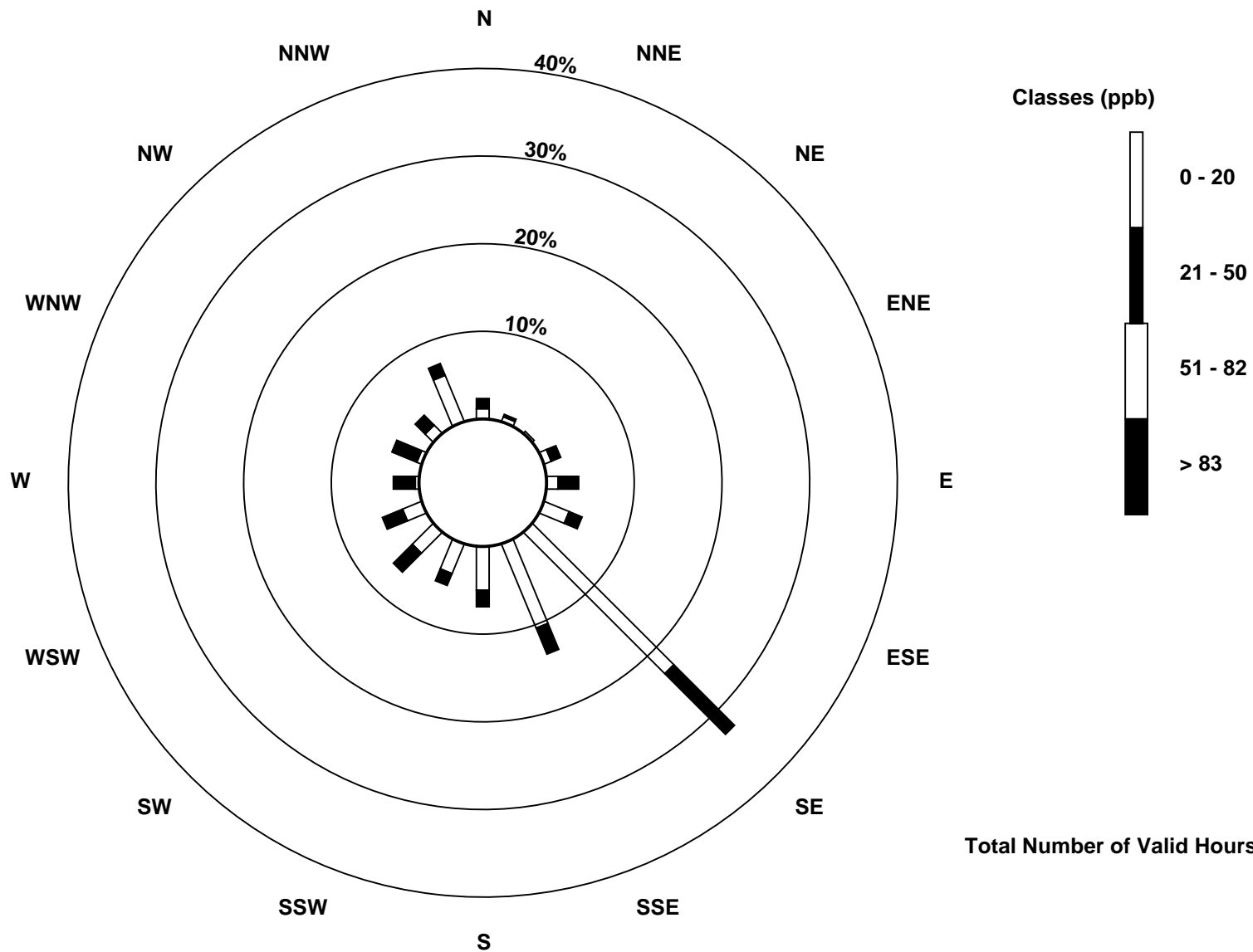
Total Number of Valid Hours: 684

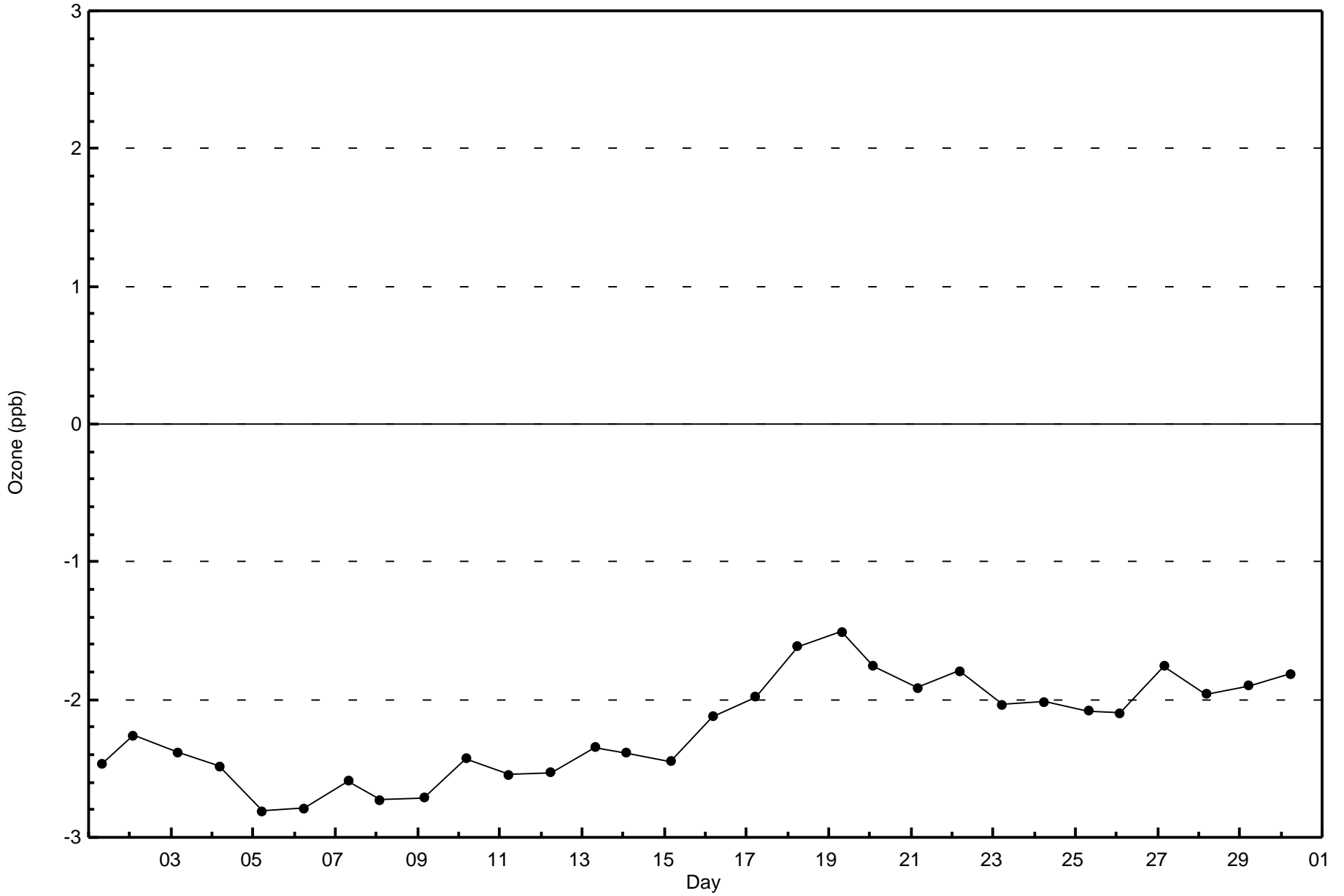
Total Number of Hours: 720

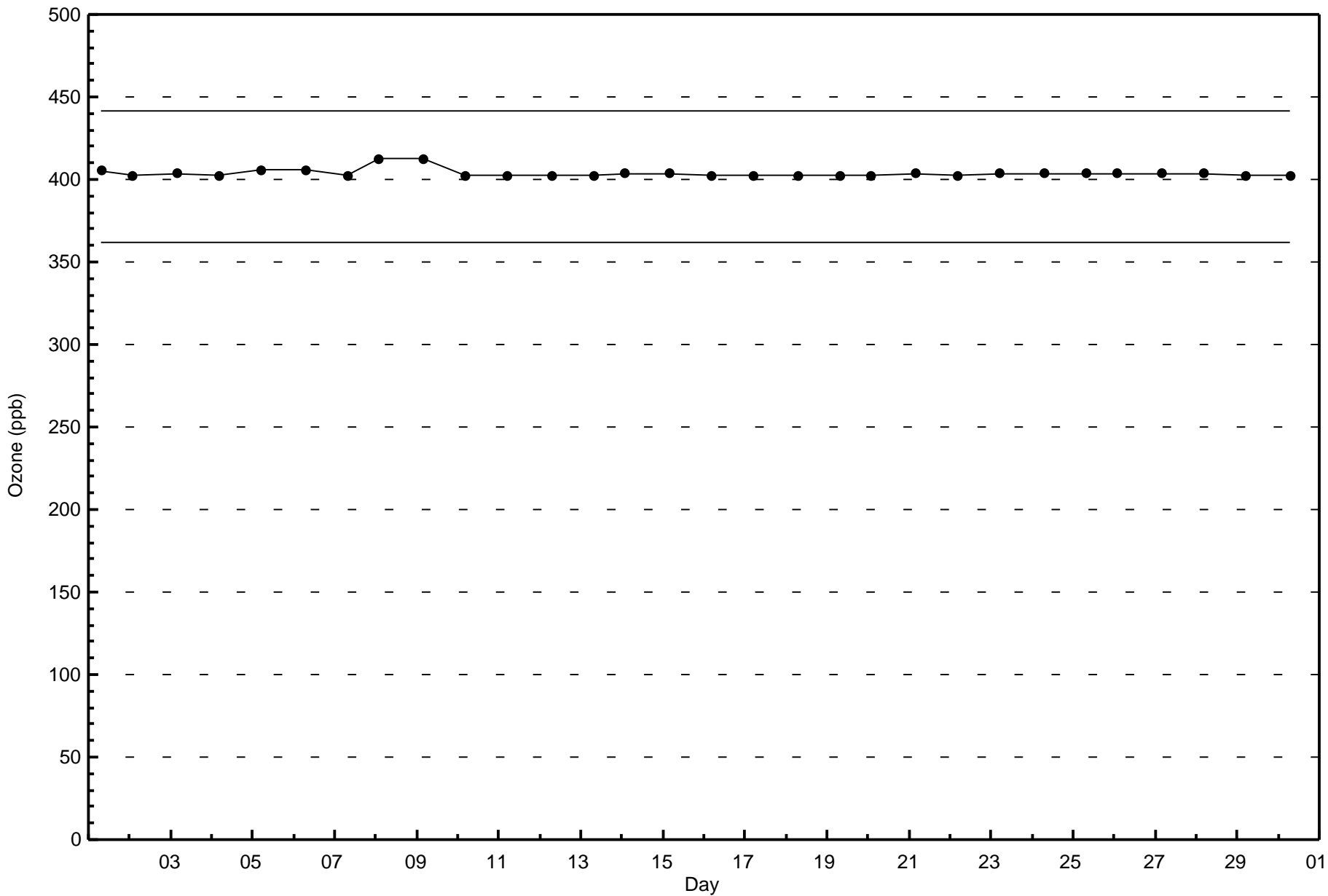


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Athabasca Valley (AMS 7)







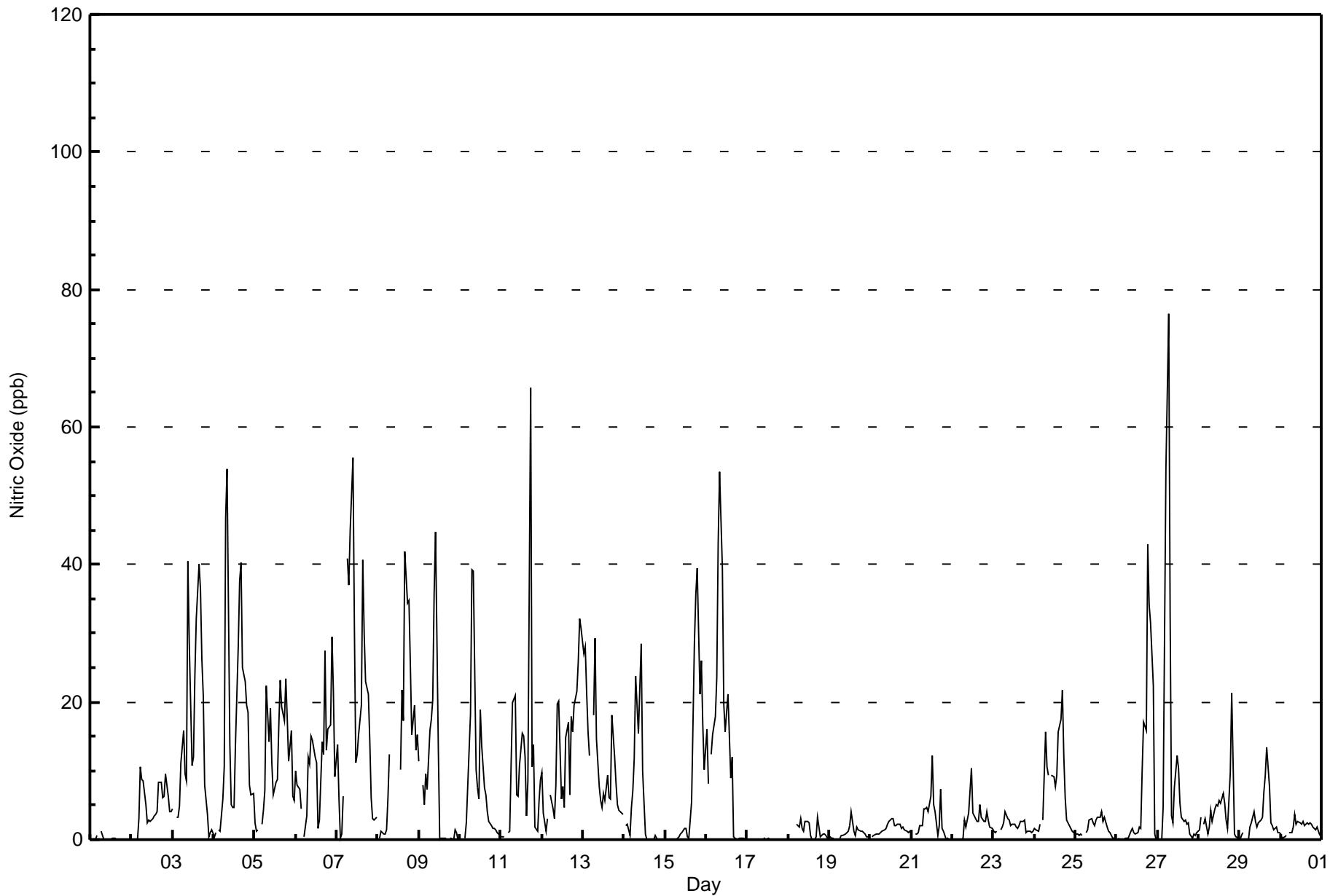


Maximum Value: 76 ppb on Nov 27 07:00																		Maximum Daily Average: 19.1 ppb on Nov 7																		Hours in Service: 720			
Minimum Value: 0 ppb on Nov 1 11:00																		Minimum Daily Average: 0.0 ppb on Nov 17																		Hours of Data: 684			
Maximum Diurnal Average: 13.2 ppb at hour 8																		Minimum Diurnal Average: 2.1 ppb at hour 3																		Hours of Missing Data: 36			
Monthly Average: 7.4 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 3 Q ₃ = 10 P ₉₀ = 21 P ₉₉ = 45																		Hours of Calibration: 35			
																																				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-Nov	0	0	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1													
2-Nov	Z	0	0	0	3	11	9	9	5	2	3	3	3	4	4	4	8	8	6	6	10	6	4	4	4.9	11													
3-Nov	4	Z	3	3	5	11	16	10	9	40	29	11	12	24	32	40	36	26	21	8	4	0	1	2	15.1	40													
4-Nov	0	1	Z	1	1	6	11	47	54	14	5	5	14	28	38	40	25	23	20	19	8	6	7	16.4	54														
5-Nov	2	1	1	Z	2	4	7	22	14	19	11	7	8	9	17	23	19	17	23	18	11	16	6	6	11.6	23													
6-Nov	10	8	7	4	Z	0	3	12	11	15	14	12	11	2	3	14	12	27	13	16	17	29	22	9	11.9	29													
7-Nov	14	6	0	1	6	Z	41	37	45	56	31	11	12	15	19	41	30	23	21	14	6	3	3	3	19.1	56													
8-Nov	Z	0	1	1	1	1	6	12	C	C	C	C	C	10	22	17	42	34	35	25	15	20	13	15	15.1	42													
9-Nov	11	Z	8	5	10	7	16	17	20	36	45	13	0	0	0	0	0	0	0	0	0	1	1	0	8.4	45													
10-Nov	0	0	Z	0	2	13	18	39	39	10	8	6	19	14	7	7	4	3	2	2	2	1	1	1	8.6	39													
11-Nov	0	0	0	Z	1	1	11	20	21	6	6	11	15	15	12	4	9	66	11	14	2	1	6	9	10.5	66													
12-Nov	10	4	1	3	Z	7	5	3	8	20	20	6	8	5	15	17	7	18	16	19	22	26	32	31	13.1	32													
13-Nov	27	28	21	16	12	Z	18	29	15	8	6	5	7	6	9	6	6	18	12	8	5	4	4	4	11.9	29													
14-Nov	Z	2	2	1	5	7	12	24	15	22	28	10	1	0	0	0	0	0	1	0	0	0	0	0	5.7	28													
15-Nov	0	Z	0	0	0	0	0	0	0	1	1	2	2	0	0	5	17	28	36	39	21	26	17	10	9.0	39													
16-Nov	16	8	Z	12	15	18	24	43	54	40	20	16	18	21	9	12	0	0	0	0	0	0	0	0	14.2	54													
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													
18-Nov	0	0	0	0	Z	2	2	3	2	1	3	3	2	1	0	0	0	3	2	0	1	1	1	0	1.2	3													
19-Nov	0	0	0	0	0	Z	0	1	1	1	1	1	2	4	1	1	2	1	1	1	1	1	0	0	0.9	4													
20-Nov	Z	0	1	1	1	1	1	1	1	2	2	3	3	3	2	2	2	2	2	2	2	1	1	1	1.6	3													
21-Nov	1	Z	1	1	1	2	2	5	4	5	4	6	12	5	4	1	2	7	2	1	0	0	0	0	2.9	12													
22-Nov	0	0	Z	0	0	0	0	3	2	4	7	10	4	3	3	3	5	3	3	3	4	3	2	2	2.7	10													
23-Nov	1	1	1	Z	1	2	2	4	3	3	2	2	2	2	2	2	3	3	3	1	1	1	1	1	2.0	4													
24-Nov	2	1	1	2	Z	3	16	11	9	M	9	9	8	9	16	17	22	12	6	3	2	2	1	1	7.4	22													
25-Nov	1	1	1	1	1	Z	1	2	3	3	2	2	3	3	3	4	3	3	2	1	1	1	0	0	1.8	4													
26-Nov	Z	0	0	0	0	0	0	0	1	2	1	1	1	2	2	10	17	16	43	34	32	22	1	0	8.0	43													
27-Nov	0	Z	0	5	29	54	76	32	4	3	8	12	10	5	3	3	3	2	2	1	0	1	1	1	11.1	76													
28-Nov	1	3	Z	2	3	1	2	4	3	4	5	5	6	5	7	5	3	2	10	21	11	1	0	0	4.6	21													
29-Nov	0	1	1	Z	0	0	2	2	4	3	2	3	3	3	7	9	13	8	2	2	1	2	1	1	3.1	13													
30-Nov	1	0	0	1	Z	1	1	2	4	2	3	3	2	3	2	2	2	2	2	2	1	2	1	1	1.7	4													
																		Diurnal Average				Diurnal Maximum																	
4.1 2.7 2.1 2.4 4.0 6.1 10.1 13.2 12.1 11.4 9.5 6.0 6.2 6.2 7.6 9.6 10.3 12.0 10.0 8.8 6.3 6.0 4.2 3.6																																							
27 28 21 16 29 54 76 47 54 56 45 16 19 24 32 41 42 66 43 39 32 29 32 31																																							
Z - zerospan C - Calibration M - Maintenance																																							



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Athabasca Valley - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Athabasca Valley - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	612	89.47	89.47
21 - 40	58	8.48	97.95
41 - 80	14	2.05	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Athabasca Valley - 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	12	5	2	11	26	25	207	68	37	28	44	34	23	24	20	46	612
21 - 40	2	0	0	1	0	5	17	17	6	5	1	0	0	0	0	4	58
41 - 80	1	0	0	0	0	1	3	6	1	0	0	0	0	0	0	2	14
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	5	2	12	26	31	227	91	44	33	45	34	23	24	20	52	684

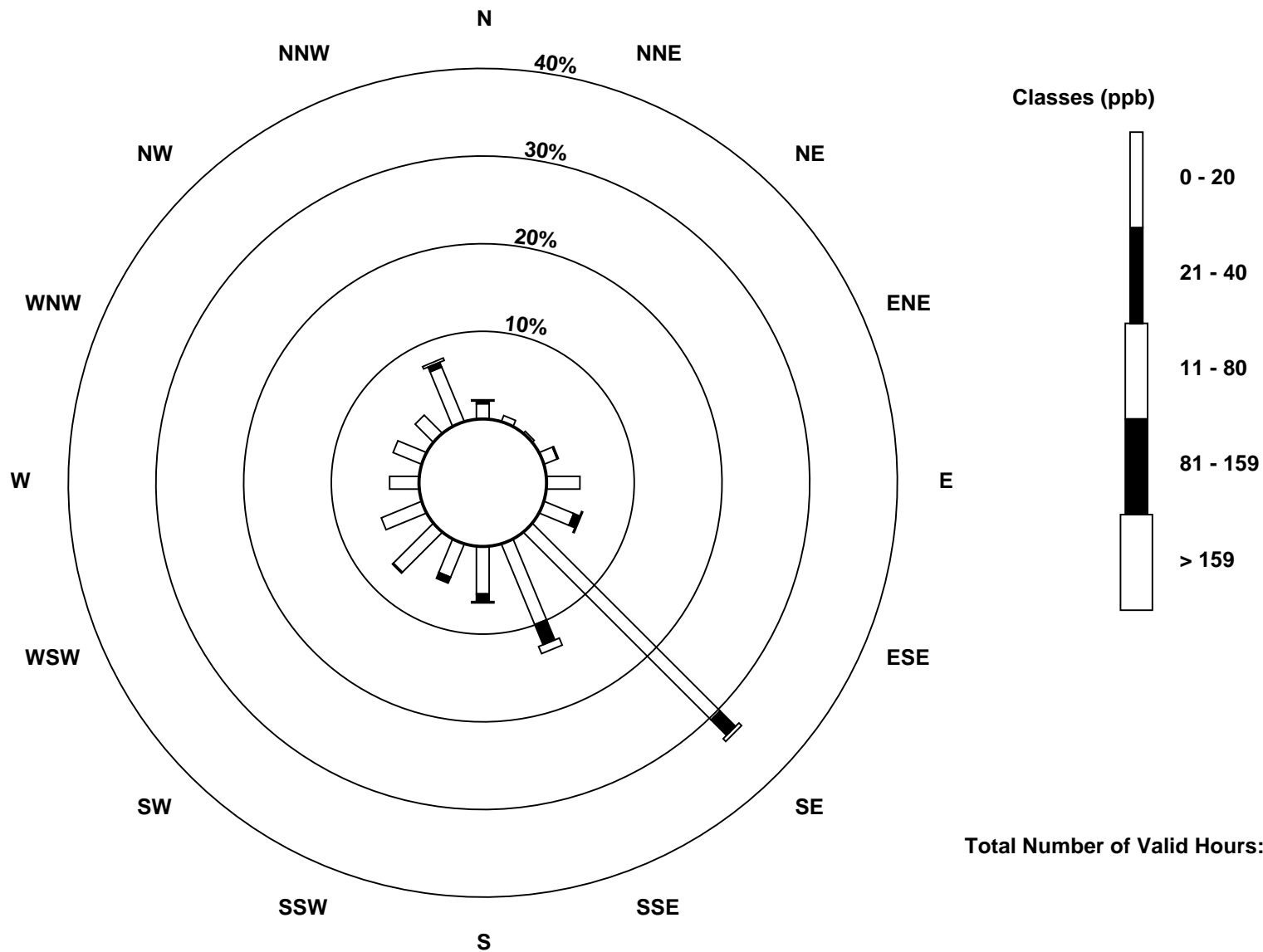
Total Number of Valid Hours: 684

Total Number of Hours: 720

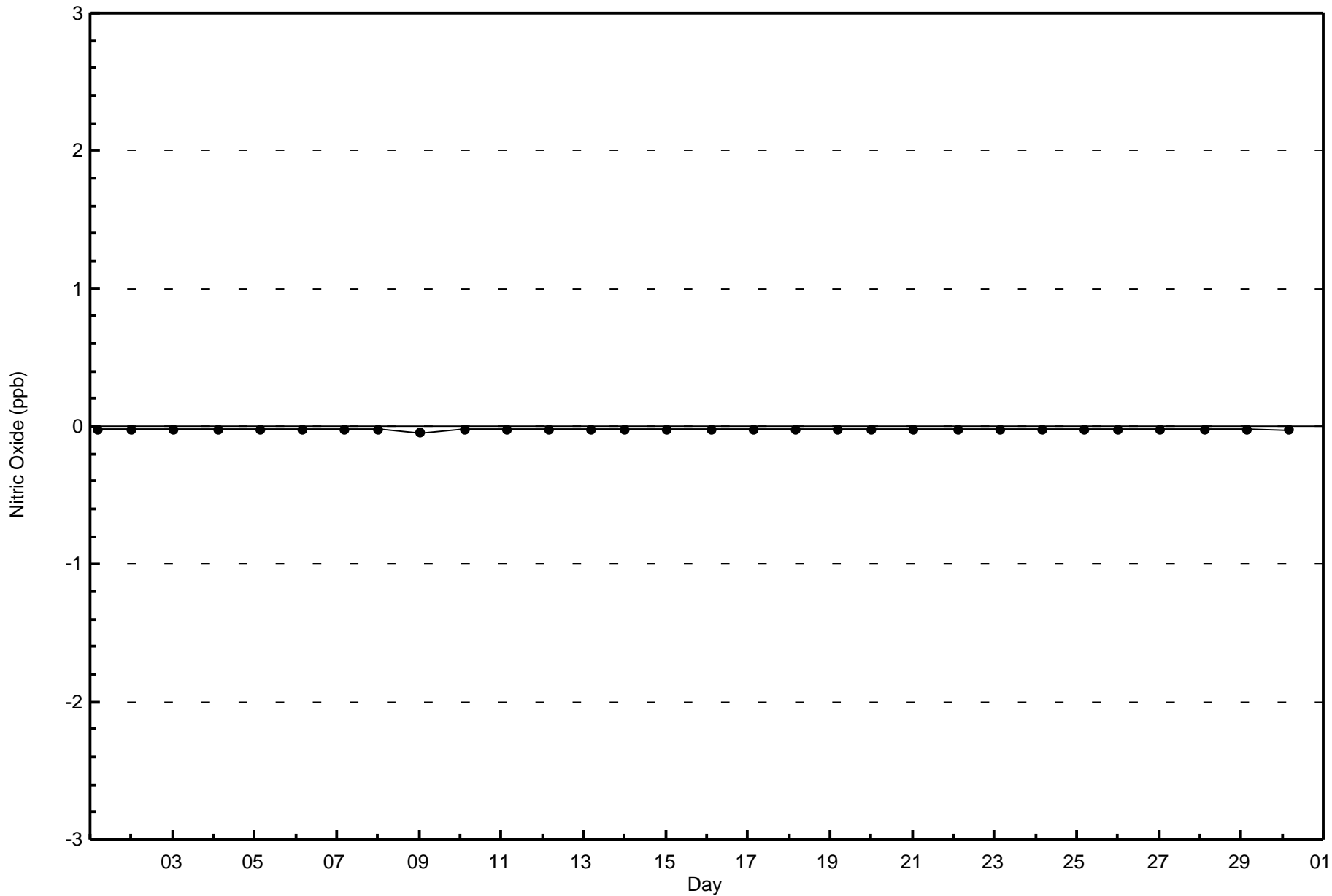


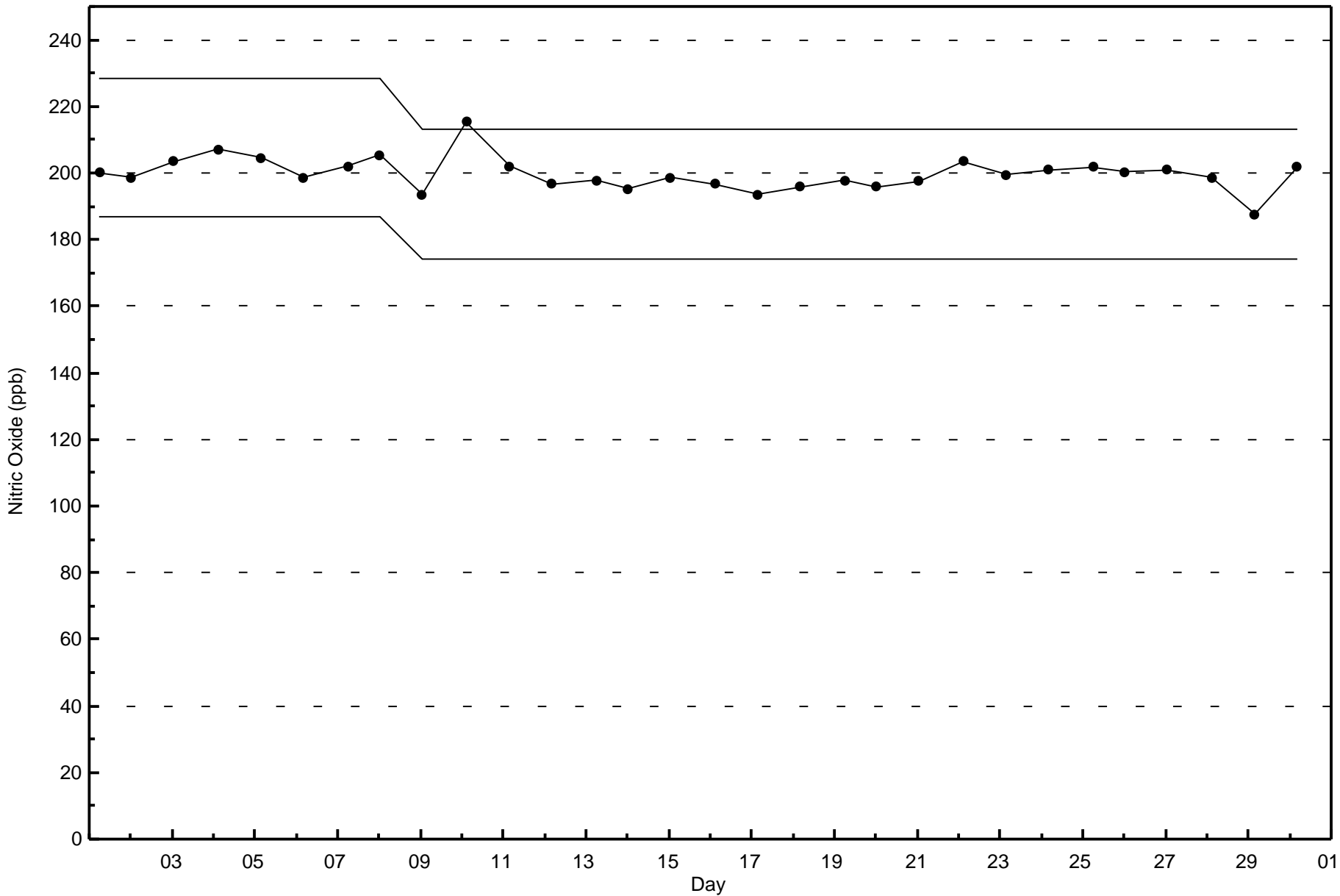
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 684







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Athabasca Valley - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 32 ppb on Nov 7 16:00	Maximum Daily Average: 18.3 ppb on Nov 7
Minimum Value: 1 ppb on Nov 10 00:00	Hours of Data: 684
Maximum Diurnal Average: 13.1 ppb at hour 17	Hours of Missing Data: 36
Monthly Average: 9.4 ppb	Hours of Calibration: 35
Minimum Daily Average: 2.6 ppb on Nov 17	Percent Operational Time: 99.9
Minimum Diurnal Average: 6.1 ppb at hour 3	
Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 5 Median = 8 O ₃ = 13 P ₉₀ = 17 P ₉₉ = 28	

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	7	3	4	5	10	Z	11	7	2	2	1	2	2	3	2	2	2	2	1	1	3	4	5	8	3.9	11
2-Nov	Z	8	5	2	13	22	21	20	12	7	7	6	8	9	8	8	15	16	13	13	15	13	10	9	11.4	22
3-Nov	8	Z	6	7	8	10	11	8	7	14	13	7	6	10	13	17	18	14	15	11	7	4	7	10	10.0	18
4-Nov	7	15	Z	13	11	13	15	27	25	11	7	8	8	14	25	29	25	19	18	18	15	12	10	8	15.3	29
5-Nov	9	7	7	Z	6	7	9	11	10	9	7	5	8	11	12	16	14	12	15	12	11	12	10	10	9.9	16
6-Nov	12	10	10	10	Z	6	10	11	11	14	13	12	13	5	10	23	23	24	18	17	14	17	16	12	13.5	24
7-Nov	13	13	5	10	22	Z	28	27	25	27	22	14	15	15	16	32	31	26	22	16	10	9	10	12	18.3	32
8-Nov	Z	5	8	7	6	6	9	11	C	C	C	C	C	6	11	12	16	13	13	10	9	9	8	9	9.3	16
9-Nov	8	Z	6	6	6	4	6	6	7	9	11	7	2	3	3	4	5	5	3	2	2	7	5	1	5.1	11
10-Nov	1	1	Z	5	14	19	22	25	24	13	8	8	16	15	14	18	17	13	10	10	10	7	7	6	12.4	25
11-Nov	5	5	5	Z	7	11	18	19	18	13	13	16	14	16	16	9	12	30	14	16	7	9	18	21	13.4	30
12-Nov	22	17	11	15	Z	16	12	9	14	16	16	12	12	8	15	17	13	15	14	11	12	12	14	11	13.6	22
13-Nov	10	9	11	10	10	Z	14	16	14	9	7	7	8	7	9	9	11	13	10	11	8	7	6	6	9.7	16
14-Nov	Z	6	6	4	8	9	10	12	11	11	14	12	2	3	2	3	4	5	4	1	1	1	1	1	5.7	14
15-Nov	1	Z	4	1	1	1	1	2	4	4	3	4	4	2	3	14	30	26	26	28	24	21	20	17	10.5	30
16-Nov	14	13	Z	10	12	12	12	14	17	15	11	11	13	17	15	23	14	13	6	5	4	5	7	5	11.6	23
17-Nov	5	4	4	Z	4	4	4	4	3	3	2	2	2	1	1	1	3	2	2	2	1	2	2	3	2.6	5
18-Nov	2	2	2	1	Z	11	9	9	3	3	7	7	8	3	2	2	5	8	5	4	3	3	3	3	4.6	11
19-Nov	3	5	6	4	4	Z	3	2	2	3	2	2	2	4	3	3	3	5	6	3	3	2	2	2	3.2	6
20-Nov	Z	4	3	3	5	4	5	6	6	5	5	6	6	6	6	6	7	7	6	6	6	5	4	4	5.2	7
21-Nov	4	Z	4	4	4	6	7	10	11	10	10	12	10	11	12	8	10	14	8	9	4	6	8	7	8.1	14
22-Nov	5	7	Z	14	11	10	11	17	15	13	13	15	9	9	7	8	11	9	7	7	9	8	6	5	9.7	17
23-Nov	6	6	6	Z	6	8	11	13	12	8	6	6	5	6	6	7	10	11	10	5	5	7	6	6	7.4	13
24-Nov	8	9	8	11	Z	9	15	15	14	M	11	10	9	8	11	13	14	13	11	9	6	4	3	3	9.8	15
25-Nov	3	3	3	3	3	Z	4	6	11	11	9	8	8	10	12	13	11	8	5	3	3	3	3	3	6.1	13
26-Nov	Z	4	4	3	3	3	3	3	4	4	3	3	3	4	6	19	22	19	24	21	19	19	10	5	9.0	24
27-Nov	6	Z	9	15	20	22	25	22	18	14	16	17	16	13	14	16	18	18	18	15	13	16	16	16	16.2	25
28-Nov	16	16	Z	16	13	8	8	10	8	8	8	7	7	7	8	8	7	8	12	14	15	15	14	11	10.6	16
29-Nov	10	14	14	Z	6	7	4	4	5	3	2	3	3	3	7	15	16	13	7	7	5	6	6	5	7.2	16
30-Nov	6	3	4	4	Z	5	6	11	16	8	8	7	6	6	5	10	8	10	9	9	8	10	10	8	7.7	16

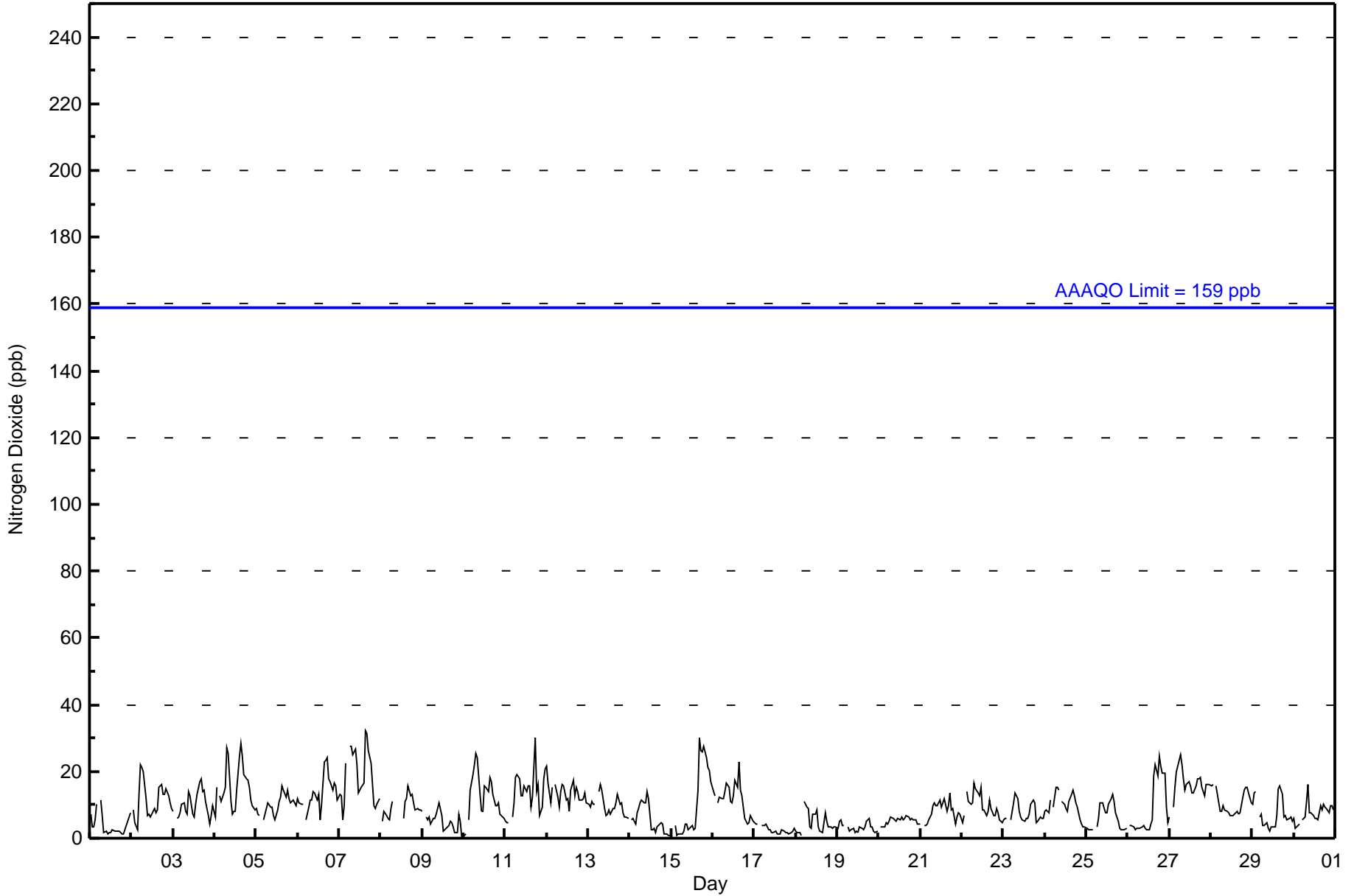
7.6	7.5	6.1	7.4	8.5	9.4	10.8	11.9	11.3	9.5	8.7	8.0	7.7	7.9	9.1	12.1	13.1	13.0	11.1	10.0	8.4	8.4	8.2	7.5	Diurnal Average	
22	17	14	16	22	22	28	27	25	27	22	17	16	17	25	32	31	30	26	28	24	21	20	21	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	645	94.30	94.30
21 - 40	39	5.70	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - 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	14	5	2	12	26	30	211	77	42	33	45	34	23	24	20	47	645
21 - 40	1	0	0	0	0	1	16	14	2	0	0	0	0	0	0	5	39
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	5	2	12	26	31	227	91	44	33	45	34	23	24	20	52	684

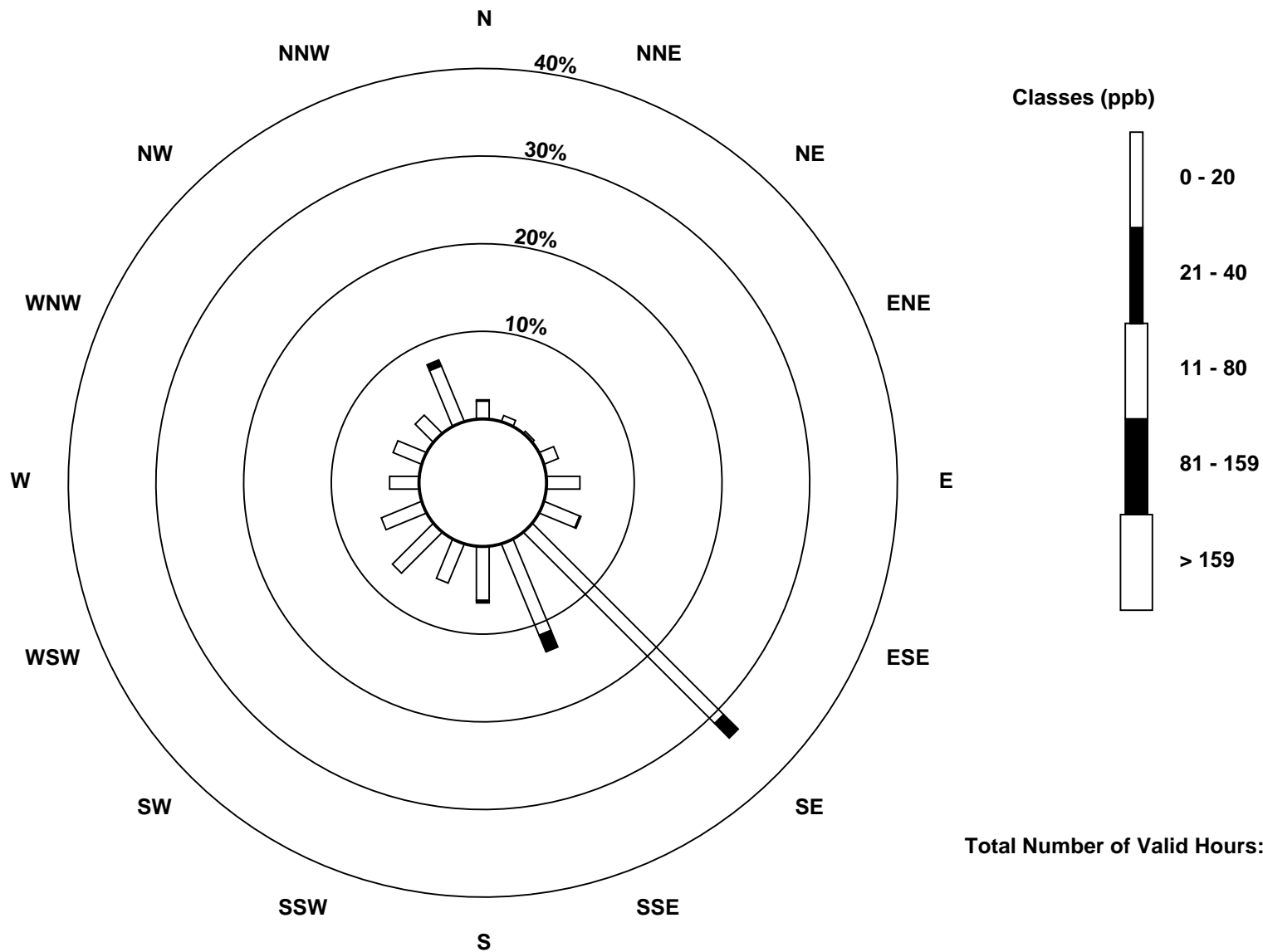
Total Number of Valid Hours: 684

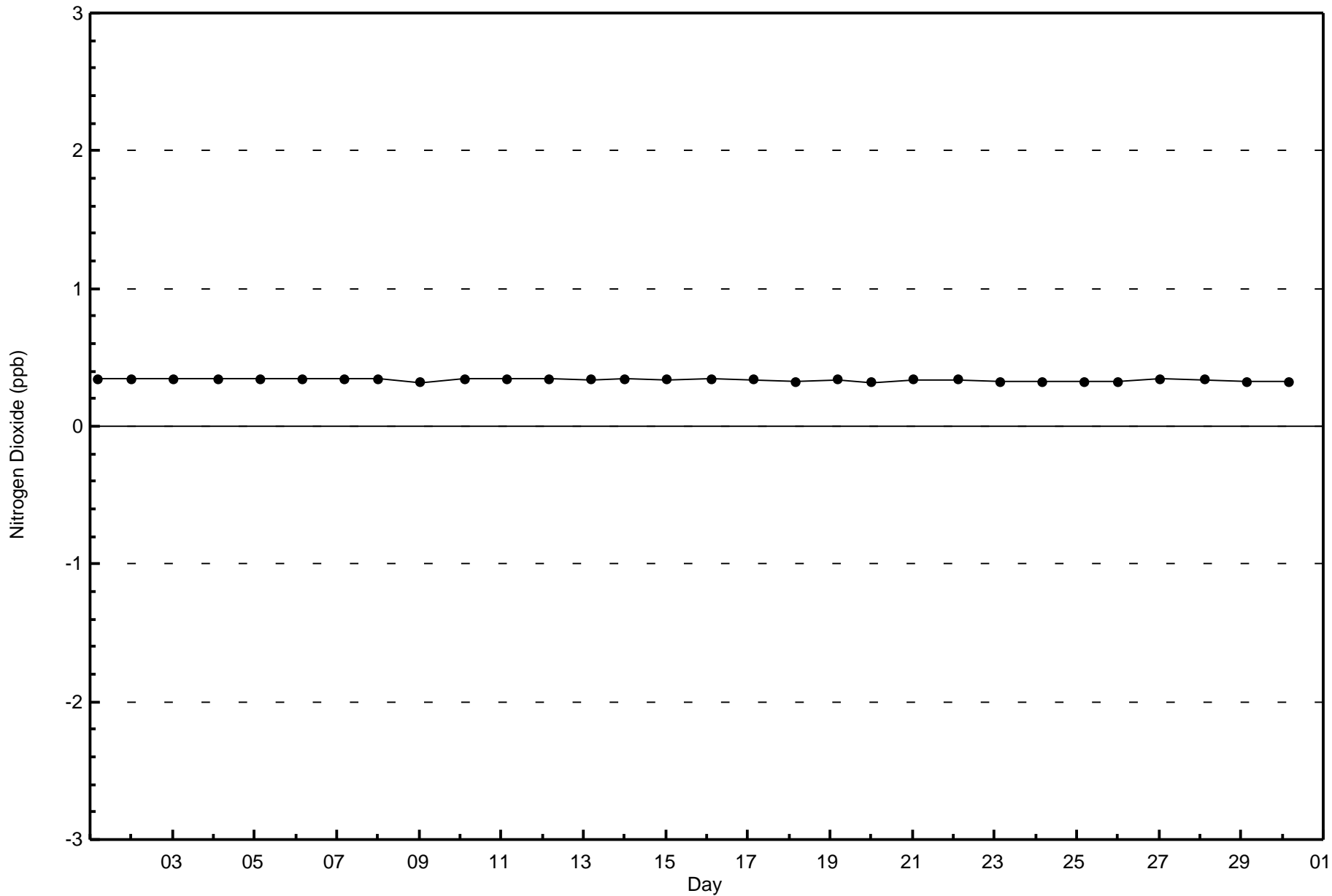
Total Number of Hours: 720

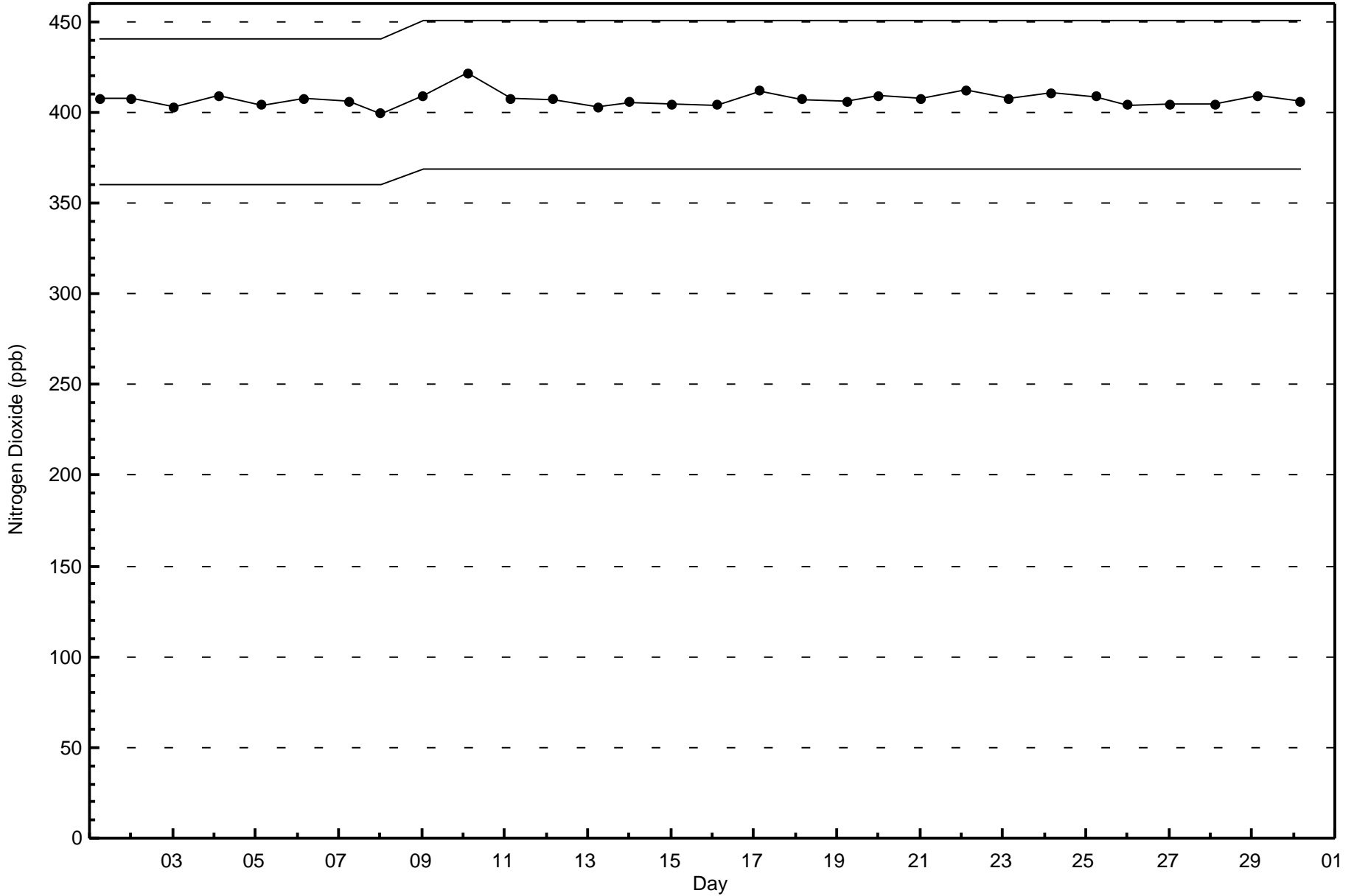


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley (AMS 7)





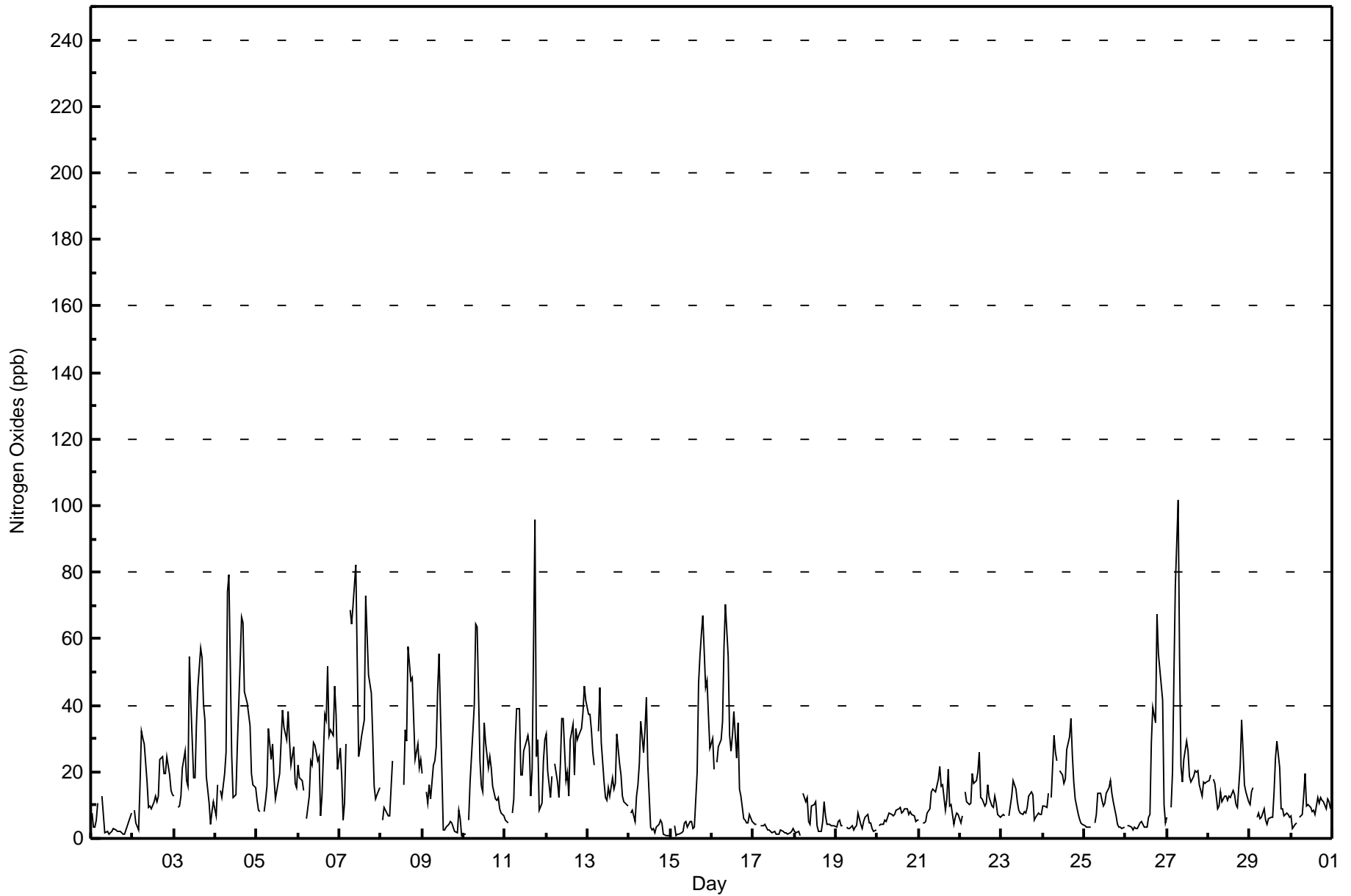




Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - November 2016

Maximum Value: 102 ppb on Nov 27 07:00		Maximum Daily Average: 37.4 ppb on Nov 7		Hours in Service: 720																																													
Minimum Value: 1 ppb on Nov 10 00:00		Minimum Daily Average: 2.6 ppb on Nov 17		Hours of Data: 684																																													
Maximum Diurnal Average: 25.1 ppb at hour 8		Minimum Diurnal Average: 8.2 ppb at hour 3		Hours of Missing Data: 36																																													
Monthly Average: 16.8 ppb		Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 6 Median = 12 Q ₃ = 23 P ₉₀ = 35 P ₉₉ = 73		Hours of Calibration: 35																																													
				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-Nov	7	3	4	5	11	Z	13	7	2	2	1	2	2	3	3	2	2	2	1	1	3	4	5	8	4.0	13																							
2-Nov	Z	8	5	2	16	32	30	28	17	9	10	9	11	13	11	13	24	25	19	19	24	19	15	13	16.2	32																							
3-Nov	13	Z	9	10	13	21	26	18	16	54	41	18	18	34	45	57	54	40	35	19	10	4	8	11	25.1	57																							
4-Nov	7	16	Z	14	12	19	26	74	79	25	12	13	13	28	53	66	65	44	41	37	34	19	16	15	31.7	79																							
5-Nov	11	9	8	Z	8	11	16	33	24	28	18	12	17	20	29	39	34	40	38	29	22	27	17	15	21.5	39																							
6-Nov	22	18	17	14	Z	6	13	23	22	29	28	23	24	7	13	37	35	52	31	33	31	46	37	21	25.4	52																							
7-Nov	27	19	6	11	29	Z	68	64	70	82	53	25	27	31	36	73	61	49	44	30	16	12	13	15	37.4	82																							
8-Nov	Z	5	9	8	7	7	15	24	C	C	C	C	C	16	33	29	58	47	48	36	24	29	21	24	24.4	58																							
9-Nov	19	Z	14	11	16	12	22	24	27	44	55	20	2	3	3	4	5	5	3	2	2	8	6	1	13.5	55																							
10-Nov	1	1	Z	5	17	32	40	65	63	23	16	14	35	29	21	25	21	16	12	12	12	9	8	7	21.0	65																							
11-Nov	6	5	5	Z	8	12	29	39	39	19	19	26	29	31	28	13	21	96	25	30	9	11	23	30	23.9	96																							
12-Nov	31	20	12	18	Z	22	17	12	22	36	36	17	20	13	30	34	19	33	30	31	33	38	46	42	26.7	46																							
13-Nov	37	37	32	26	22	Z	32	45	29	17	12	12	15	13	18	15	17	31	22	19	13	11	10	10	21.6	45																							
14-Nov	Z	8	8	5	13	16	22	35	26	33	42	22	3	3	2	3	4	5	5	1	1	1	1	1	11.4	42																							
15-Nov	1	Z	4	1	1	1	2	2	4	5	4	5	5	3	3	20	47	55	61	67	45	47	37	27	19.5	67																							
16-Nov	30	21	Z	23	28	30	35	57	70	55	31	26	31	38	24	35	15	13	6	5	5	5	7	5	25.8	70																							
17-Nov	5	4	4	Z	4	4	4	4	2	2	2	1	2	1	1	1	2	2	2	2	1	2	2	3	2.6	5																							
18-Nov	2	2	2	1	Z	13	11	12	5	4	10	10	11	4	2	2	5	11	7	4	4	4	4	4	5.8	13																							
19-Nov	3	5	6	4	4	Z	4	3	3	4	3	3	4	8	4	3	5	6	7	5	4	3	2	3	4.1	8																							
20-Nov	Z	4	4	4	6	5	6	8	7	7	7	8	9	9	7	8	9	9	7	8	7	7	5	6	6.8	9																							
21-Nov	5	Z	5	5	5	8	9	14	15	15	14	18	22	16	16	9	12	21	10	10	4	6	8	7	11.0	22																							
22-Nov	5	7	Z	14	11	10	11	20	17	17	20	26	12	12	10	11	16	12	10	9	13	11	7	6	12.4	26																							
23-Nov	7	7	7	Z	7	10	13	17	15	11	8	8	7	8	8	10	13	14	13	6	7	8	7	7	9.4	17																							
24-Nov	10	10	9	14	Z	12	31	26	24	M	20	19	16	18	27	31	36	25	17	12	7	6	4	4	17.2	36																							
25-Nov	4	3	3	3	3	Z	5	7	13	14	11	10	11	14	15	17	14	11	7	4	3	3	3	3	7.9	17																							
26-Nov	Z	4	4	3	3	3	3	3	5	5	4	4	4	6	7	29	39	35	67	56	51	42	10	4	17.0	67																							
27-Nov	6	Z	9	20	49	76	102	54	21	17	24	29	26	19	17	18	20	20	21	16	13	17	17	17	27.3	102																							
28-Nov	17	19	Z	18	16	9	10	14	11	13	13	12	13	12	14	13	10	9	22	36	26	16	14	11	15.1	36																							
29-Nov	10	14	15	Z	6	7	6	6	9	6	4	6	6	6	14	24	29	21	9	9	7	8	7	6	10.3	29																							
30-Nov	7	3	4	5	Z	6	7	13	20	10	10	9	8	9	7	12	11	12	12	11	9	12	11	9	9.4	20																							
																								11.8	10.1	8.2	9.7	12.5	15.5	20.9	25.1	23.3	20.9	18.3	14.0	13.9	14.1	16.8	21.7	23.4	25.0	21.0	18.7	14.7	14.4	12.4	11.1	Diurnal Average	
																								37	37	32	26	49	76	102	74	79	82	55	29	35	38	53	73	65	96	67	67	51	47	46	42	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance																					





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	489	71.49	71.49
21 - 40	143	20.91	92.40
41 - 80	49	7.16	99.56
81 - 159	3	0.44	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - 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	11	4	2	10	22	17	160	48	20	16	43	33	23	24	19	37	489
21 - 40	2	1	0	2	4	11	51	25	21	14	1	1	0	0	1	9	143
11 - 80	2	0	0	0	0	3	15	17	3	3	1	0	0	0	0	5	49
81 - 159	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	3
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	15	5	2	12	26	31	227	91	44	33	45	34	23	24	20	52	684

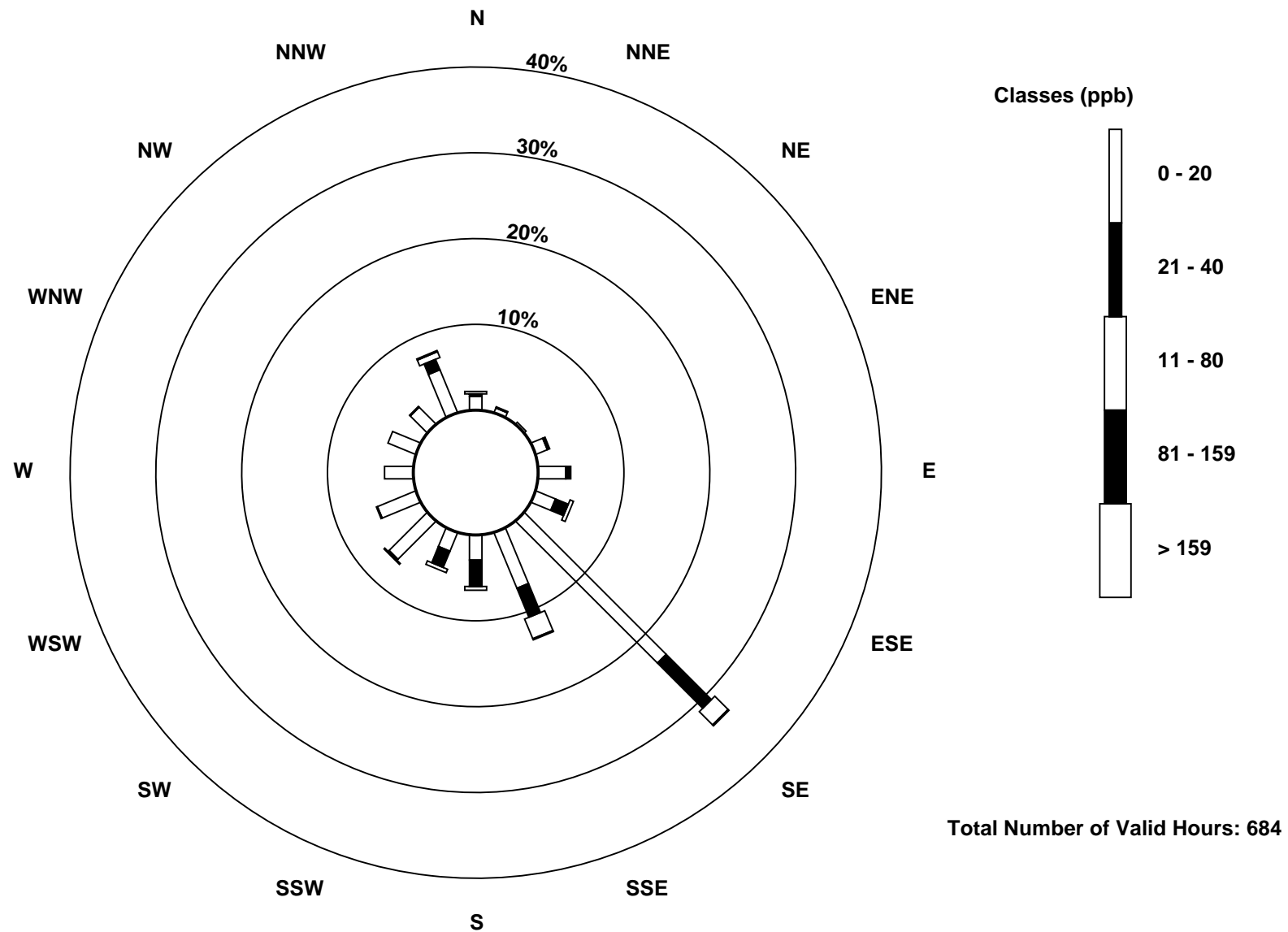
Total Number of Valid Hours: 684

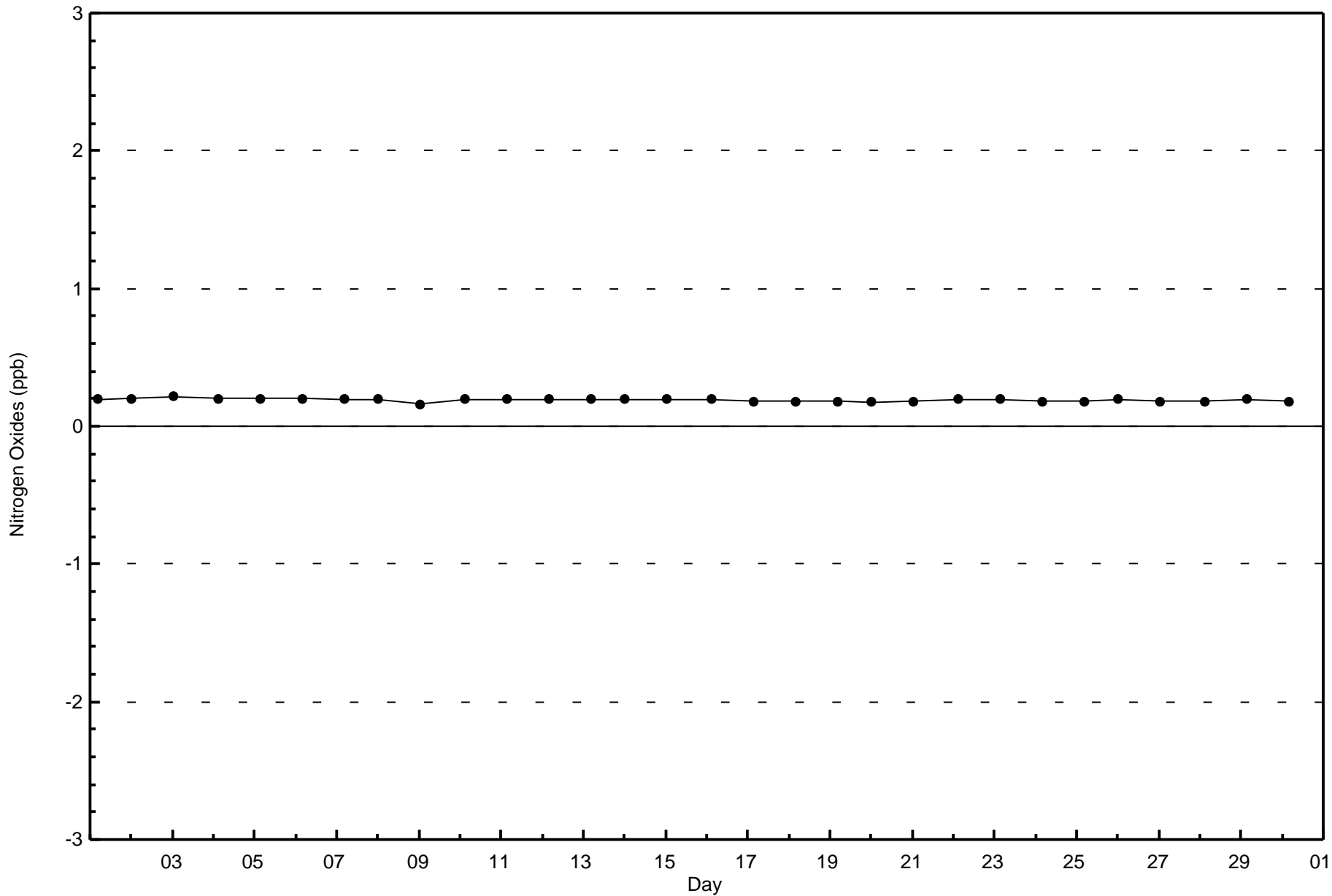
Total Number of Hours: 720

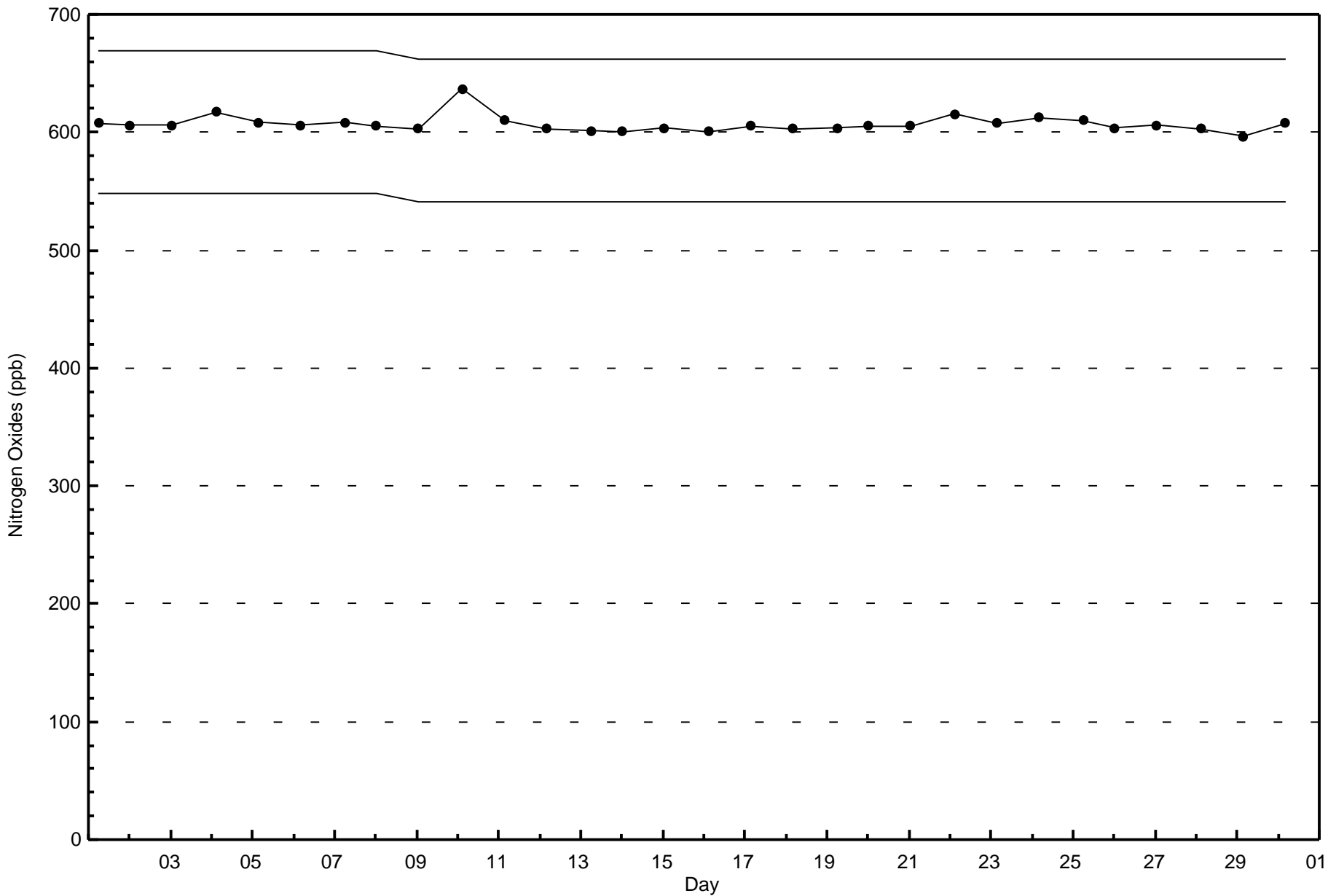


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Athabasca Valley (AMS 7)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Athabasca Valley - November 2016

Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 27.5 µg/m ³ on Nov 4 16:00	Maximum Daily Average: 11.0 µg/m ³ on Nov 28	Hours of Data:	696
Minimum Value: 1.3 µg/m ³ on Nov 1 03:00	Minimum Daily Average: 2.7 µg/m ³ on Nov 17	Hours of Missing Data:	24
Maximum Diurnal Average: 8.7 µg/m ³ at hour 17	Minimum Diurnal Average: 5.3 µg/m ³ at hour 8	Hours of Calibration:	2
Monthly Average: 6.40 µg/m ³	Percentiles: P ₁ = 1.4 P ₁₀ = 2.5 Q ₁ = 3.8 Median = 5.5 Q ₃ = 8.3 P ₉₀ = 11.4 P ₉₉ = 18.9	Percent Operational Time:	96.9

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-Nov	2.3	3.4	1.3	2.3	3.1	4.1	3.7	1.9	1.5	1.9	1.7	2.0	2.1	2.5	2.6	2.6	2.5	2.4	2.3	2.7	3.4	8.7	6.5	4.3	3.0	8.7
2-Nov	5.9	6.9	5.5	4.2	5.3	7.5	6.8	6.3	5.0	4.7	4.8	5.1	5.8	5.6	6.0	7.5	9.2	9.4	8.4	9.4	10.8	11.0	9.6	8.9	7.1	11.0
3-Nov	10.0	9.9	12.3	12.3	13.1	11.9	9.9	8.3	9.4	12.4	12.6	11.9	9.9	9.8	9.5	8.2	8.5	11.3	7.9	3.9	2.9	2.9	2.7	2.4	8.9	13.1
4-Nov	1.8	2.7	4.5	4.7	3.9	3.6	3.6	7.5	8.7	4.4	3.7	3.7	3.7	11.9	15.9	27.5	22.2	11.8	10.1	12.9	11.9	10.1	7.5	6.9	8.5	27.5
5-Nov	8.5	6.7	5.6	4.7	4.3	4.6	4.9	5.7	5.8	7.2	5.9	5.9	8.0	10.2	17.4	19.9	15.8	9.4	12.6	10.8	10.6	12.9	13.3	12.6	9.3	19.9
6-Nov	15.0	12.8	10.8	8.1	2.0	1.6	4.3	5.2	5.6	7.4	7.7	6.9	4.9	2.5	2.8	12.4	10.7	11.9	9.3	8.7	10.1	9.7	6.9	5.0	7.6	15.0
7-Nov	6.3	4.3	1.8	1.8	2.9	3.4	4.2	5.1	6.0	7.7	6.2	5.9	9.7	C	C	23.2	21.9	14.3	10.0	7.5	5.9	4.9	5.1	4.9	7.4	23.2
8-Nov	3.8	3.8	4.3	4.4	4.5	4.2	4.5	4.3	4.4	4.2	4.0	4.3	4.0	4.2	5.2	4.2	7.0	8.0	8.5	6.7	5.8	6.5	5.7	5.7	5.1	8.5
9-Nov	5.9	5.5	5.5	5.3	5.1	4.5	4.8	4.5	5.2	7.7	9.4	5.9	2.3	2.1	2.1	2.8	3.5	3.0	2.9	2.9	3.3	3.3	3.0	2.4	4.3	9.4
10-Nov	2.5	2.5	3.0	3.1	3.5	4.3	4.1	4.1	4.9	4.2	4.7	4.6	9.0	8.2	8.2	9.4	10.5	8.4	7.0	8.3	9.5	7.9	5.7	5.2	5.9	10.5
11-Nov	4.9	4.5	5.0	3.7	3.6	4.1	4.7	5.3	5.6	4.8	5.1	6.1	7.3	10.3	11.4	7.1	9.4	23.9	8.2	7.4	4.3	5.1	6.9	7.6	6.9	23.9
12-Nov	7.1	6.3	5.1	4.6	4.4	4.8	4.4	3.9	5.4	7.0	7.4	7.2	6.7	5.2	7.3	8.3	7.7	8.3	11.0	10.8	12.4	10.9	13.1	12.5	7.6	13.1
13-Nov	11.4	12.3	11.5	9.6	7.4	6.2	5.1	4.9	4.8	4.3	4.4	4.7	4.5	4.4	4.9	4.3	5.2	6.2	5.9	5.9	5.8	5.2	5.0	4.4	6.2	12.3
14-Nov	3.6	3.8	4.4	3.9	3.6	3.8	4.1	4.6	4.9	5.8	6.0	4.1	2.2	2.0	2.0	2.1	3.5	4.5	4.5	3.5	2.6	2.6	2.4	2.6	3.6	6.0
15-Nov	3.0	3.6	3.8	3.4	3.4	3.5	3.1	3.0	2.9	3.1	3.3	4.0	4.1	2.6	2.9	8.7	23.0	17.0	12.9	13.9	10.1	9.5	7.2	6.2	6.6	23.0
16-Nov	6.2	5.2	4.0	6.0	4.5	3.9	4.8	5.7	7.6	8.0	7.1	6.7	7.8	9.9	8.2	8.4	4.3	4.0	3.3	3.2	3.2	2.9	3.0	2.6	5.4	9.9
17-Nov	3.0	3.7	3.2	3.6	3.6	3.3	2.8	3.2	2.7	2.8	2.7	2.4	2.5	2.3	2.3	2.3	2.2	2.4	2.3	2.3	2.3	2.5	2.6	2.6	2.7	3.7
18-Nov	2.5	2.4	2.4	2.4	2.5	3.0	2.8	2.9	3.0	3.5	4.5	4.4	4.5	3.1	2.7	2.9	AF	AF	AF	AF	AF	AF	AF	AF	--	4.5
19-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	1.7	1.9	1.9	1.8	1.9	1.5	1.4	1.4	1.5	1.4	--	1.9
20-Nov	1.4	1.4	1.3	1.3	1.4	1.4	1.5	1.6	1.7	1.8	2.7	2.9	3.3	4.8	5.5	5.7	5.7	5.5	4.5	4.6	5.1	4.8	5.1	5.1	3.3	5.7
21-Nov	5.7	7.9	8.7	8.0	7.5	7.0	6.4	6.9	8.3	9.5	9.8	9.9	9.2	9.5	9.3	8.8	10.3	11.8	10.6	9.6	7.0	5.5	5.4	4.5	8.2	11.8
22-Nov	4.0	3.7	4.0	4.7	5.4	6.9	6.7	7.1	7.4	7.5	7.9	10.2	10.4	8.7	7.7	7.2	7.9	7.5	7.3	7.3	8.5	7.7	6.3	5.7	7.0	10.4
23-Nov	5.8	6.6	7.1	7.2	6.9	6.7	5.4	5.0	6.8	8.2	8.0	6.6	5.8	6.2	5.6	5.1	4.5	4.8	5.1	4.0	4.6	4.8	4.9	5.0	5.9	8.2
24-Nov	5.2	5.3	4.9	4.8	5.2	5.8	5.4	4.8	5.0	7.1	11.0	15.3	15.4	9.4	8.2	8.0	8.5	10.9	11.1	9.6	7.7	6.2	4.0	3.3	7.6	15.4
25-Nov	3.5	3.7	3.8	3.6	3.2	3.1	4.0	5.4	6.4	7.1	6.7	6.5	6.7	7.2	8.4	8.5	7.6	8.0	8.1	7.4	7.3	7.1	9.3	10.9	6.4	10.9
26-Nov	12.8	15.4	14.2	12.4	12.0	12.6	12.2	6.8	6.0	7.4	7.4	7.0	6.5	5.9	6.3	8.8	9.8	8.8	9.6	8.9	9.1	9.1	8.3	8.3	9.4	15.4
27-Nov	10.1	10.1	11.9	13.9	15.1	13.1	10.7	9.0	7.1	7.0	8.3	11.0	8.0	7.6	8.8	9.1	8.3	7.7	6.6	6.0	5.8	6.5	7.2	7.4	9.0	15.1
28-Nov	8.0	7.7	8.7	8.5	9.4	11.8	12.6	13.2	12.2	10.8	12.7	13.4	14.0	13.8	12.9	11.8	12.1	12.9	14.1	14.5	11.4	6.2	5.9	5.9	11.0	14.5
29-Nov	8.8	12.8	11.3	7.0	6.9	6.6	5.1	4.9	4.6	4.3	4.1	4.0	3.9	4.0	4.2	4.7	4.1	3.7	3.5	3.5	3.2	3.0	3.4	3.6	5.2	12.8
30-Nov	4.1	3.8	3.9	3.9	3.6	3.4	3.3	3.4	4.0	3.9	4.2	4.2	4.0	3.8	3.7	4.5	4.9	5.4	5.7	5.5	5.4	5.5	5.0	4.7	4.3	5.7

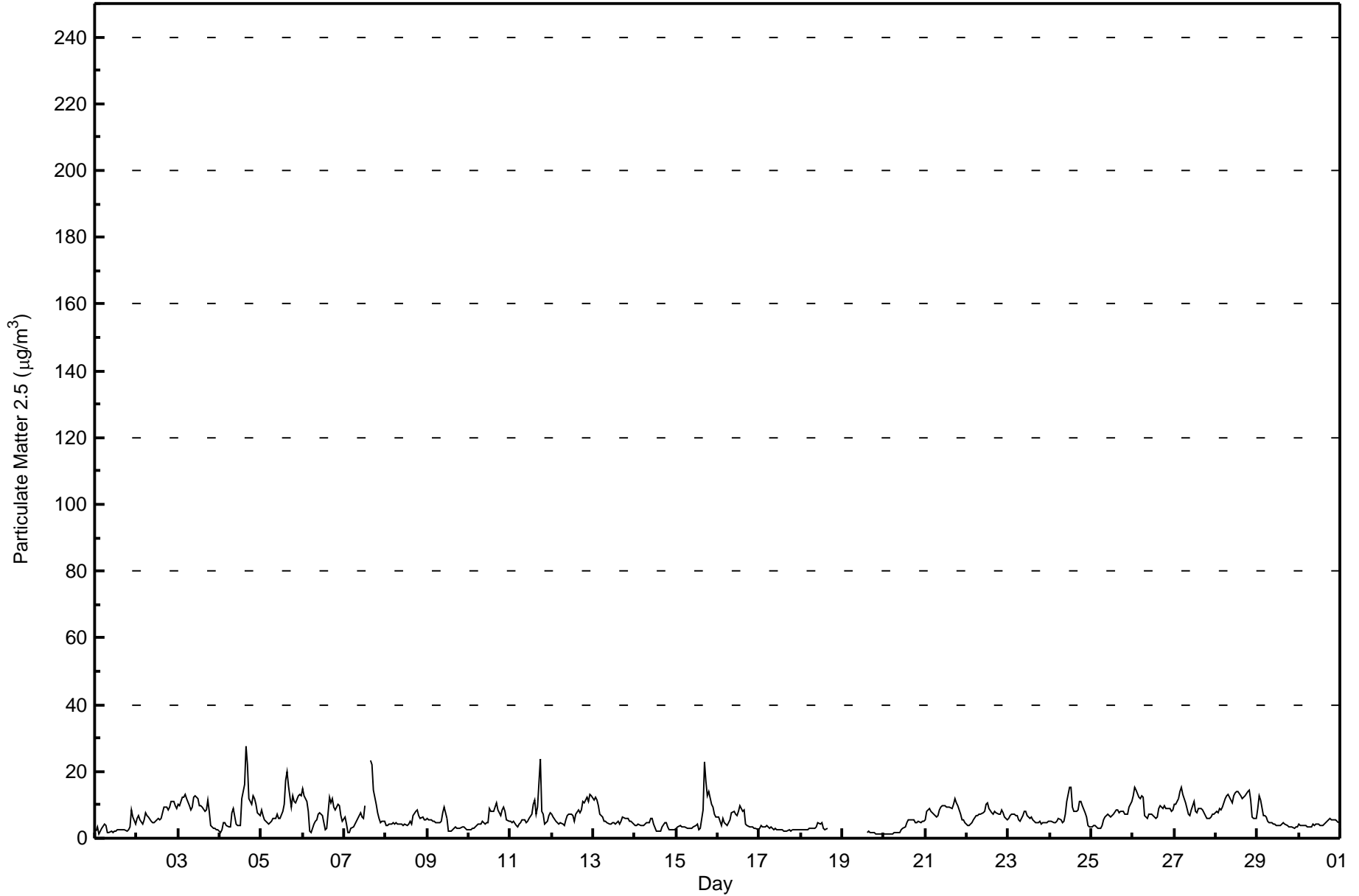
6.0	6.2	6.0	5.6	5.4	5.5	5.4	5.3	5.6	6.1	6.3	6.4	6.4	6.3	6.7	8.2	8.7	8.4	7.4	7.0	6.6	6.4	5.9	5.6	Diurnal Average	
15.0	15.4	14.2	13.9	15.1	13.1	12.6	13.2	12.2	12.4	12.7	15.3	15.4	13.8	17.4	27.5	23.0	23.9	14.1	14.5	12.4	12.9	13.3	12.6	Diurnal Maximum	

C - Calibration M - Maintenance AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - November 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	345	49.57	49.57
6 - 15	340	48.85	98.42
16 - 25	10	1.44	99.86
26 - 80	1	0.14	100.00
> 81.0	0	0.00	100.00

Total Number of Valid Hours: 696

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Athabasca Valley - November 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	0	2	5	4	19	111	49	16	18	21	16	21	23	14	16	345
6 - 15	6	6	0	5	10	14	125	43	25	17	22	18	2	3	7	37	340
16 - 25	0	0	0	0	0	0	2	4	4	0	0	0	0	0	0	0	10
26 - 80	0	0	0	0	0	0	0	1	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	16	6	2	10	14	33	238	97	45	35	43	34	23	26	21	53	696

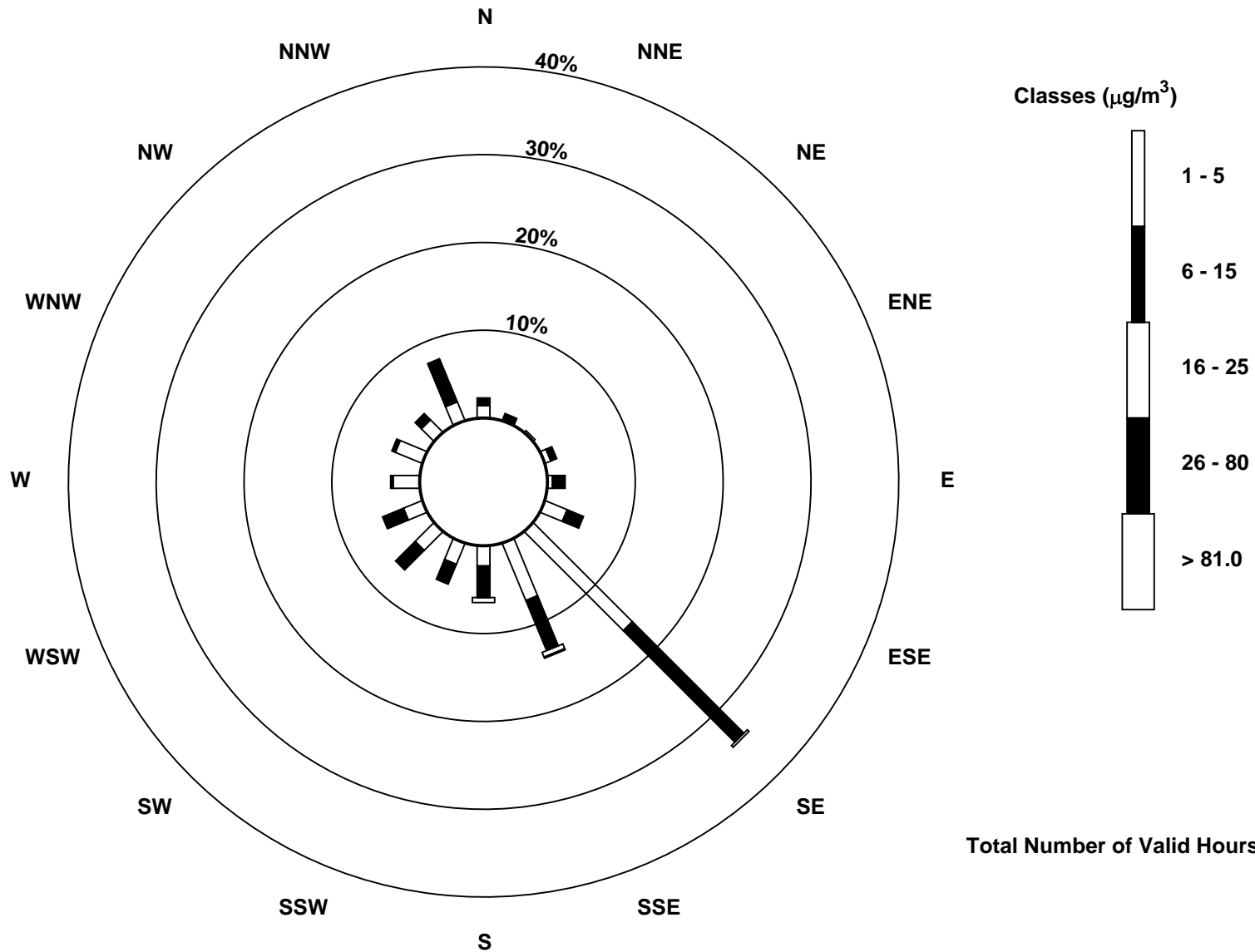
Total Number of Valid Hours: 696

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley (AMS 7)

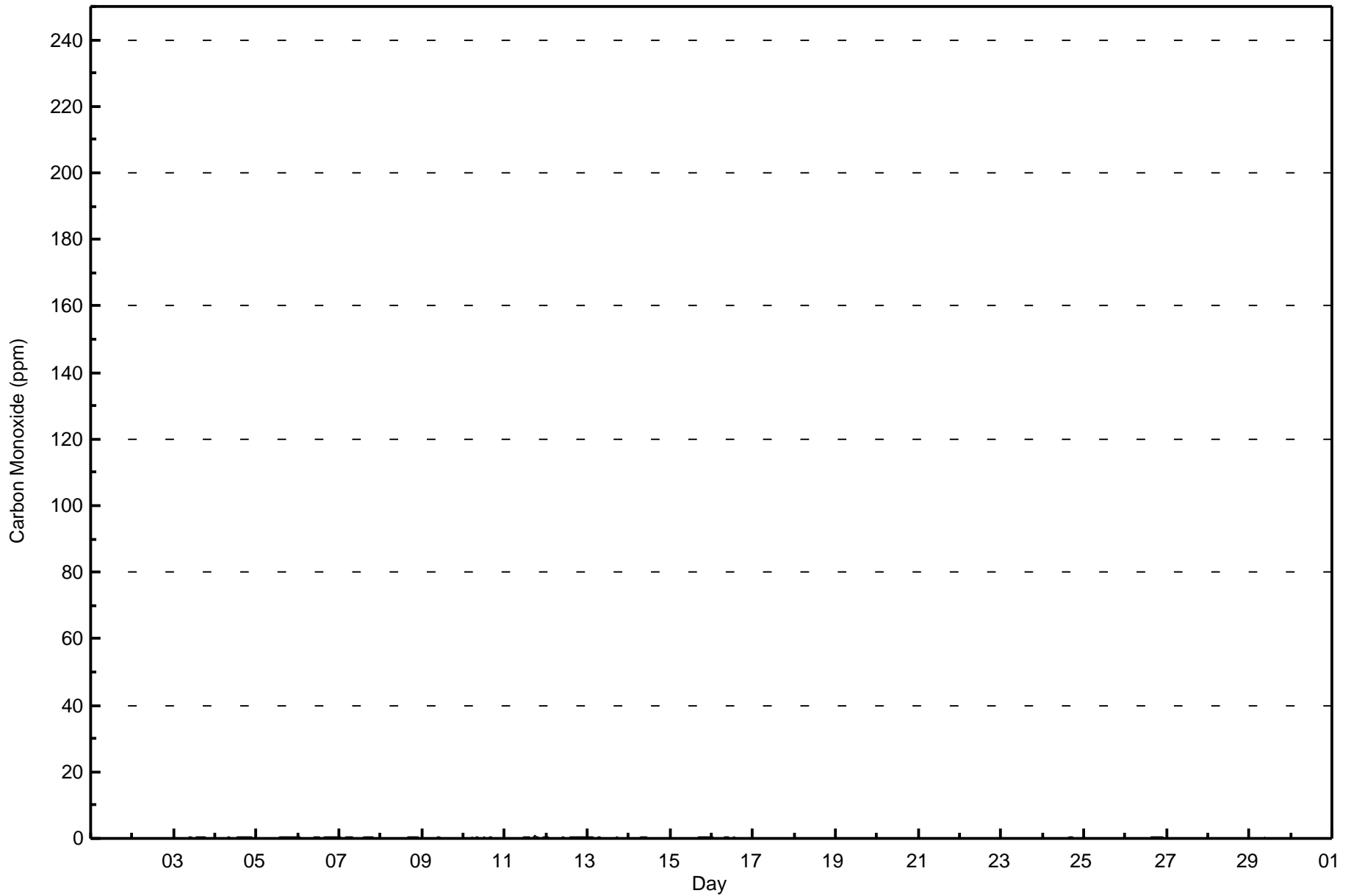


Total Number of Valid Hours: 696



Wood Buffalo Environmental Association
Hourly Averages

Carbon Monoxide (CO) - ppm
Athabasca Valley - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Carbon Monoxide (CO) - ppm
Athabasca Valley - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.3	659	96.06	96.06
0.4 - 0.5	26	3.79	99.85
0.6 - 0.7	1	0.15	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: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Carbon Monoxide (CO) - ppm
Athabasca Valley - November 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	16	6	3	14	26	28	215	82	41	33	44	32	23	25	21	50	659
0.4 - 0.5	0	0	0	0	0	2	11	10	2	1	0	0	0	0	0	0	26
0.6 - 0.7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
0.8 - 1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	16	6	3	14	26	30	226	93	43	34	44	32	23	25	21	50	686

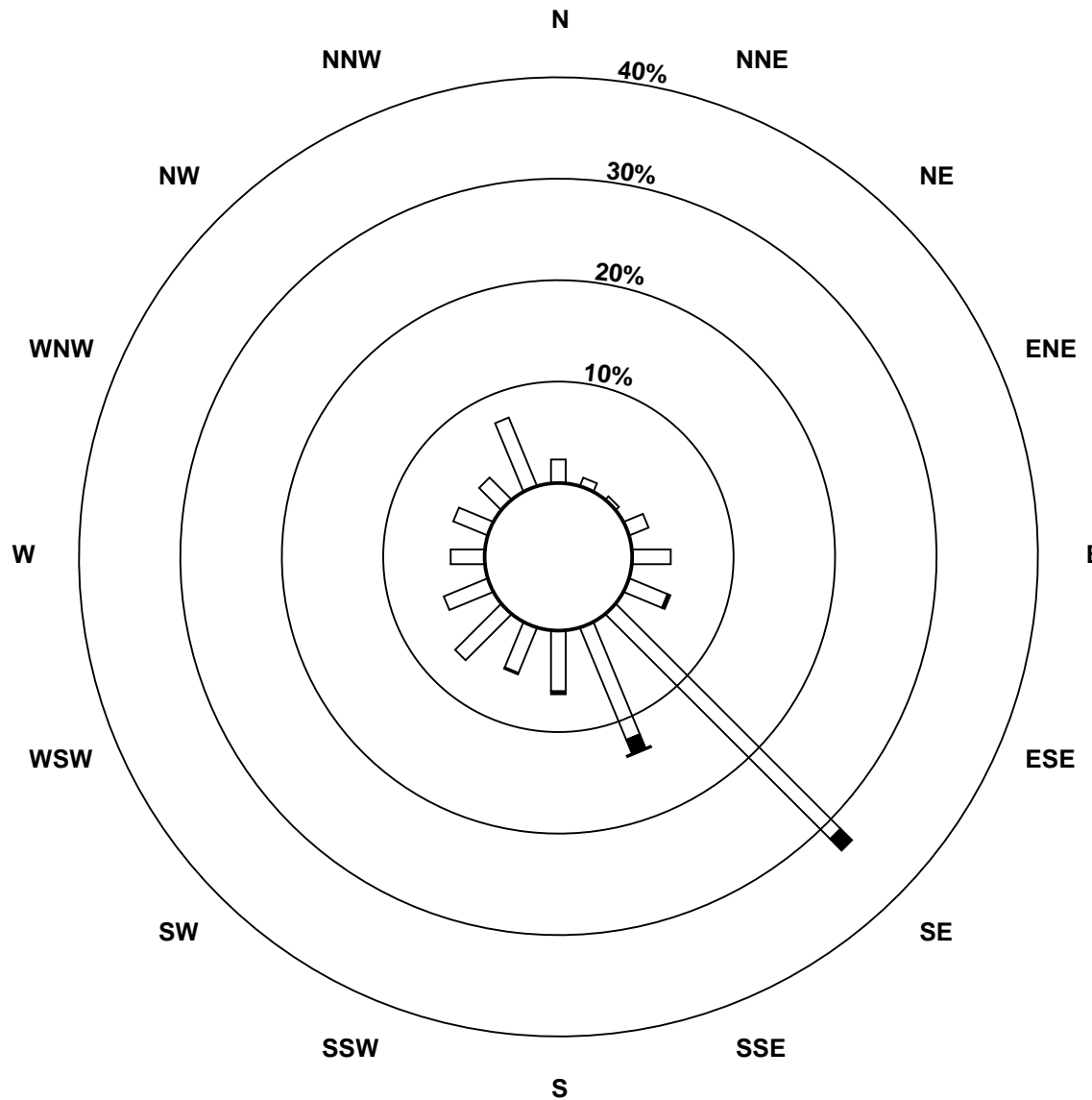
Total Number of Valid Hours: 686

Total Number of Hours: 720

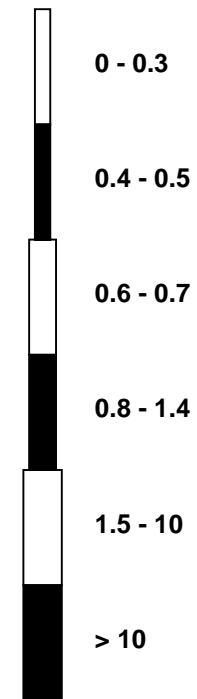


Wood Buffalo Environmental Association
Wind Rose Nov 2016

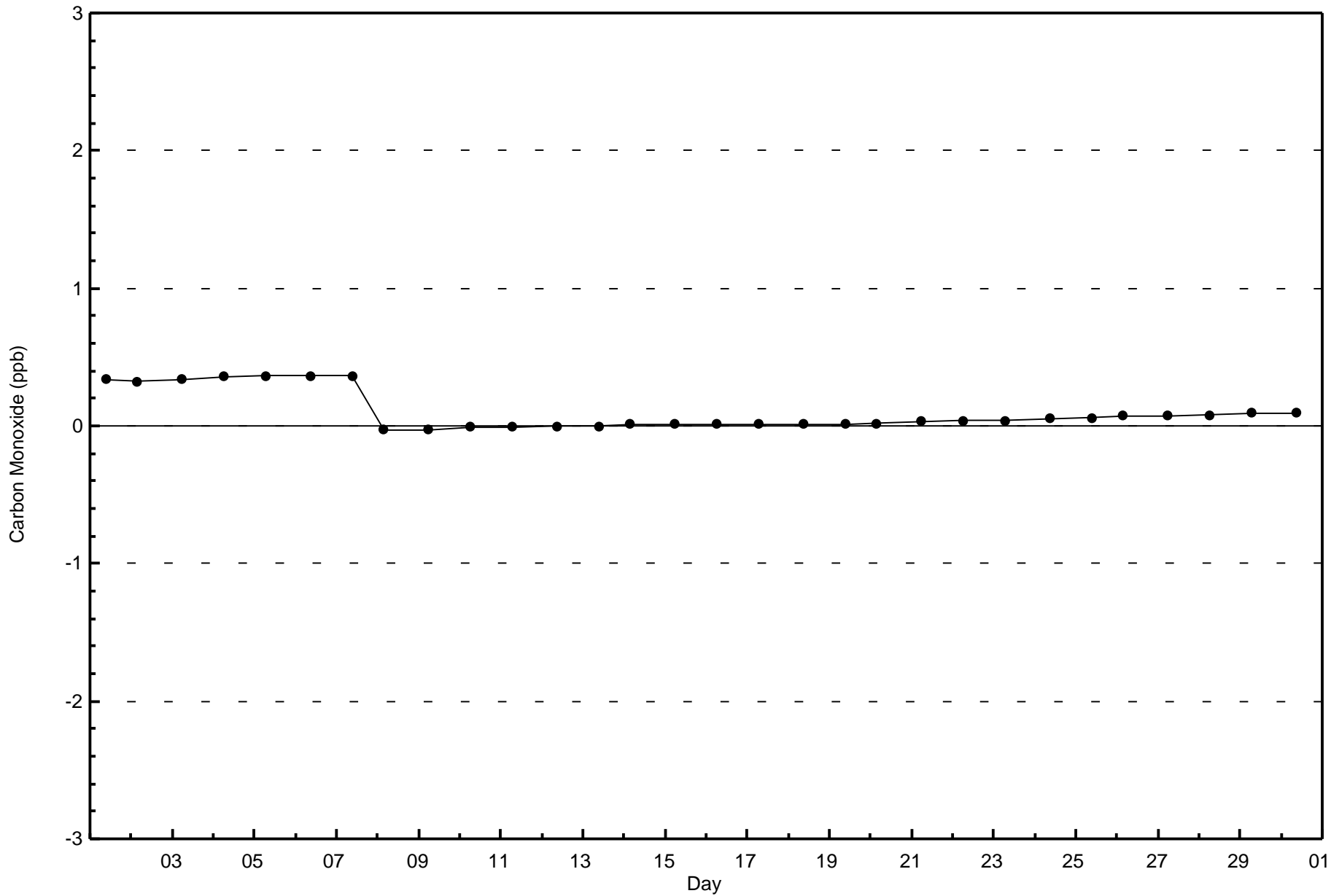
Carbon Monoxide (CO) - ppm
Athabasca Valley (AMS 7)

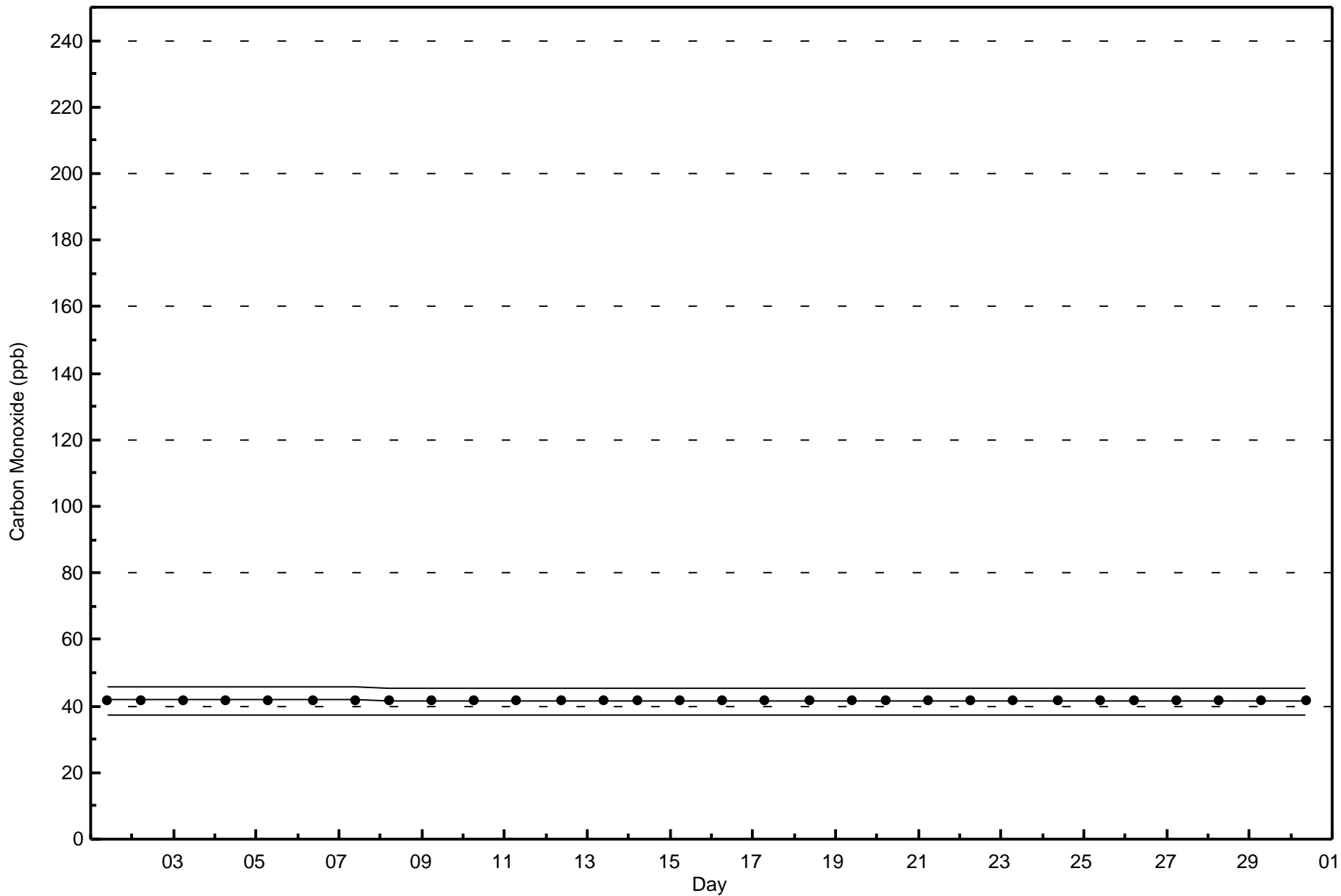


Classes (ppm)



Total Number of Valid Hours: 686







Wood Buffalo Environmental Association
Summary of Hour Averages

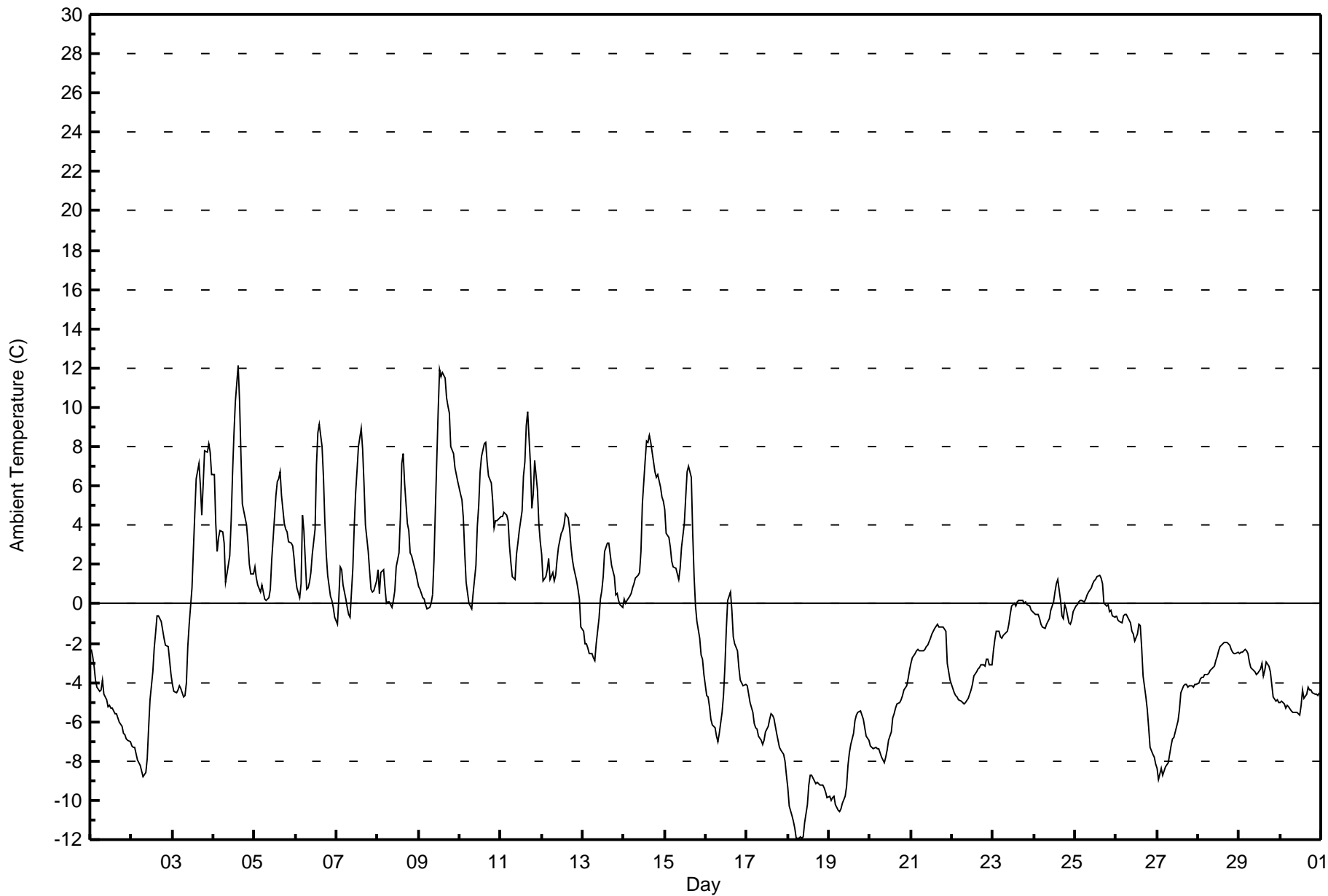
Ambient Temperature (AT) - C
Athabasca Valley - November 2016

Maximum Value: 12.1 C on Nov 4 15:00 Maximum Daily Average: 5.5 C on Nov 9		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -12.0 C on Nov 18 09:00 Maximum Diurnal Average: 1.6 C at hour 15 Monthly Average: -1.07 C		Minimum Daily Average: -10.2 C on Nov 18 Minimum Diurnal Average: -2.9 C at hour 8 Percentiles: P ₁ = -11.2 P ₁₀ = -7.3 Q ₁ = -4.6 Median = -1.0 Q ₃ = 1.8 P ₉₀ = 5.8 P ₉₉ = 10.3																								
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	-2.3	-2.7	-3.2	-3.9	-4.3	-4.4	-4.4	-3.9	-4.6	-4.9	-5.2	-5.2	-5.3	-5.3	-5.6	-5.6	-5.8	-6.0	-6.3	-6.6	-6.7	-6.9	-6.9	-7.0	-5.1	-2.3
2-Nov	-7.2	-7.3	-7.3	-7.9	-8.1	-8.2	-8.5	-8.8	-8.6	-7.9	-6.3	-4.9	-3.5	-2.2	-1.5	-0.6	-0.6	-0.9	-1.4	-1.7	-2.1	-2.2	-2.9	-3.6	-4.8	-0.6
3-Nov	-4.1	-4.5	-4.5	-4.4	-4.2	-4.3	-4.7	-4.7	-4.0	-2.2	-1.1	0.8	2.8	4.6	6.3	7.1	6.0	4.5	6.1	7.8	7.7	8.2	7.7	6.6	1.4	8.2
4-Nov	6.5	4.1	2.7	3.4	3.8	3.7	3.1	1.1	1.5	2.5	4.2	6.7	8.7	10.3	12.1	10.4	7.6	5.1	4.4	4.0	3.2	2.0	1.6	1.5	4.7	12.1
5-Nov	1.9	1.3	0.9	0.6	1.0	0.6	0.2	0.1	0.3	0.7	2.2	3.3	5.5	6.2	6.4	6.7	5.5	4.1	3.8	3.7	3.2	3.1	3.0	2.3	2.8	6.7
6-Nov	1.4	0.8	0.3	1.0	4.5	3.7	0.7	0.8	1.1	1.6	2.5	3.8	7.1	8.7	9.2	8.0	6.4	4.1	2.6	1.5	0.4	0.2	-0.2	-0.7	2.9	9.2
7-Nov	-1.0	0.3	1.9	1.7	0.9	0.3	-0.2	-0.5	-0.7	1.8	4.0	5.6	6.8	8.0	8.9	7.9	6.1	4.0	2.6	1.6	0.8	0.6	0.7	1.2	2.6	8.9
8-Nov	1.7	0.5	1.6	1.7	0.8	0.0	0.1	0.1	-0.2	0.2	0.7	1.9	2.6	4.4	7.1	7.6	6.1	4.1	3.7	2.6	2.4	1.9	1.6	1.3	2.3	7.6
9-Nov	0.9	0.7	0.3	0.2	0.0	-0.2	-0.2	0.0	0.4	2.1	4.8	9.8	11.9	11.6	11.8	11.5	10.5	10.1	9.7	8.0	7.7	7.0	6.5	6.2	5.5	11.9
10-Nov	5.5	5.3	4.4	2.6	1.1	0.0	-0.1	-0.3	0.6	1.9	4.0	5.0	6.7	7.5	8.1	8.2	7.2	6.5	6.1	5.2	3.9	4.2	4.3	4.4	4.3	8.2
11-Nov	4.5	4.5	4.6	4.5	4.3	3.0	2.1	1.3	1.2	2.5	3.1	3.7	4.7	6.5	7.2	9.1	9.8	7.1	4.9	5.6	7.3	5.8	4.1	3.2	4.8	9.8
12-Nov	2.5	1.2	1.4	1.7	2.3	1.2	1.6	1.2	1.4	2.2	2.9	3.6	3.7	4.0	4.6	4.4	3.8	2.9	2.2	1.8	1.2	0.7	0.2	-1.2	2.2	4.6
13-Nov	-1.4	-2.1	-2.0	-2.3	-2.5	-2.5	-2.7	-2.9	-2.1	-0.8	0.2	0.7	1.4	2.6	3.1	3.1	2.5	2.0	1.4	0.4	0.5	0.2	-0.1	-0.2	-0.1	3.1
14-Nov	0.2	0.1	0.2	0.4	0.5	0.8	1.0	1.3	1.5	1.6	2.7	5.1	7.3	8.3	8.3	8.6	8.2	7.3	6.7	6.4	6.6	5.9	5.5	5.2	4.1	8.6
15-Nov	4.8	3.6	3.4	2.9	2.1	1.9	1.8	1.5	1.2	1.8	2.9	4.1	5.4	6.7	7.0	6.4	3.6	1.4	-0.1	-0.9	-1.7	-2.6	-2.8	-3.6	2.1	7.0
16-Nov	-4.6	-4.8	-5.3	-5.9	-6.2	-6.3	-6.7	-7.0	-6.6	-5.5	-4.6	-3.3	-1.3	0.2	0.6	-0.3	-1.7	-2.0	-2.4	-3.3	-3.9	-4.0	-4.2	-4.1	-3.9	0.6
17-Nov	-4.1	-4.6	-5.0	-5.6	-6.1	-6.3	-6.4	-6.7	-6.9	-7.2	-7.0	-6.5	-6.2	-5.9	-5.6	-5.7	-5.8	-6.6	-7.0	-7.3	-7.4	-7.7	-8.0	-8.8	-6.4	-4.1
18-Nov	-9.4	-10.3	-10.8	-11.1	-11.5	-11.9	-11.9	-11.8	-12.0	-11.8	-11.1	-10.3	-9.2	-8.7	-8.8	-9.0	-9.1	-9.1	-9.1	-9.2	-9.2	-9.4	-9.6	-9.9	-10.2	-8.7
19-Nov	-9.8	-10.0	-9.9	-9.8	-10.2	-10.5	-10.6	-10.4	-10.1	-9.8	-9.3	-8.2	-7.6	-7.1	-6.6	-6.0	-5.7	-5.5	-5.4	-5.6	-5.9	-6.3	-6.7	-7.0	-8.1	-5.4
20-Nov	-7.2	-7.3	-7.4	-7.3	-7.4	-7.4	-7.6	-7.8	-8.1	-7.8	-7.4	-7.0	-6.5	-5.8	-5.6	-5.3	-5.1	-5.1	-4.9	-4.7	-4.4	-4.2	-3.8	-3.4	-6.2	-3.4
21-Nov	-3.0	-2.7	-2.5	-2.4	-2.3	-2.4	-2.4	-2.4	-2.3	-2.2	-2.1	-1.8	-1.6	-1.4	-1.2	-1.0	-1.1	-1.2	-1.2	-1.2	-1.4	-3.0	-3.5	-3.9	-2.1	-1.0
22-Nov	-4.3	-4.5	-4.6	-4.7	-4.9	-4.9	-5.1	-5.1	-5.0	-4.8	-4.6	-4.4	-4.1	-3.7	-3.4	-3.3	-3.2	-3.1	-3.1	-3.2	-2.8	-2.8	-3.1	-3.1	-4.0	-2.8
23-Nov	-2.4	-1.8	-1.4	-1.4	-1.7	-1.8	-1.6	-1.6	-1.4	-1.0	-0.5	-0.1	0.0	-0.1	0.1	0.2	0.2	0.2	0.0	0.1	-0.1	-0.1	-0.3	-0.4	-0.7	0.2
24-Nov	-0.5	-0.6	-0.5	-0.7	-1.1	-1.2	-1.3	-1.0	-0.9	-0.7	-0.3	0.1	0.6	1.0	1.2	0.2	-0.6	-0.7	0.0	-0.3	-1.0	-1.1	-0.8	-0.4	-0.4	1.2
25-Nov	-0.1	-0.1	0.1	0.2	0.2	0.1	0.2	0.4	0.6	0.8	1.0	1.2	1.3	1.4	1.5	1.3	1.1	0.0	-0.1	0.0	-0.4	-0.3	-0.6	-0.7	0.4	1.5
26-Nov	-0.6	-0.8	-0.9	-1.0	-0.6	-0.6	-0.5	-0.7	-1.0	-1.4	-1.6	-1.9	-1.5	-1.0	-1.1	-2.2	-3.7	-4.7	-5.4	-6.3	-7.3	-7.7	-7.8	-8.2	-2.9	-0.5
27-Nov	-8.3	-8.9	-8.4	-8.7	-8.5	-8.3	-8.1	-7.6	-7.2	-6.9	-6.8	-6.2	-5.9	-5.3	-4.6	-4.2	-4.1	-4.1	-4.2	-4.2	-4.2	-4.2	-4.1	-4.1	-6.1	-4.1
28-Nov	-4.0	-3.8	-3.8	-3.7	-3.6	-3.6	-3.6	-3.4	-3.3	-3.2	-2.9	-2.7	-2.4	-2.2	-2.0	-1.9	-1.9	-1.9	-2.1	-2.3	-2.4	-2.6	-2.5	-2.4	-2.8	-1.9
29-Nov	-2.5	-2.5	-2.4	-2.3	-2.4	-2.5	-3.0	-3.2	-3.4	-3.4	-3.6	-3.5	-3.3	-3.0	-3.7	-3.4	-3.0	-3.1	-3.5	-4.1	-4.7	-4.9	-4.9	-5.0	-3.4	-2.3
30-Nov	-5.0	-5.0	-5.1	-5.3	-5.2	-5.2	-5.5	-5.5	-5.5	-5.5	-5.5	-5.7	-5.2	-4.4	-4.8	-4.6	-4.3	-4.4	-4.4	-4.5	-4.6	-4.6	-4.6	-4.5	-4.9	-4.3
	-1.7	-2.1	-2.1	-2.2	-2.3	-2.6	-2.8	-2.9	-2.8	-2.2	-1.5	-0.5	0.4	1.2	1.6	1.6	1.0	0.2	-0.2	-0.6	-0.8	-1.2	-1.4	-1.7		Diurnal Average
	6.5	5.3	4.6	4.5	4.5	3.7	3.1	1.5	1.5	2.5	4.8	9.8	11.9	11.6	12.1	11.5	10.5	10.1	9.7	8.0	7.7	8.2	7.7	6.6		Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Athabasca Valley - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Athabasca Valley - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	422	58.61	58.61
0 - 10	289	40.14	98.75
10 - 20	9	1.25	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

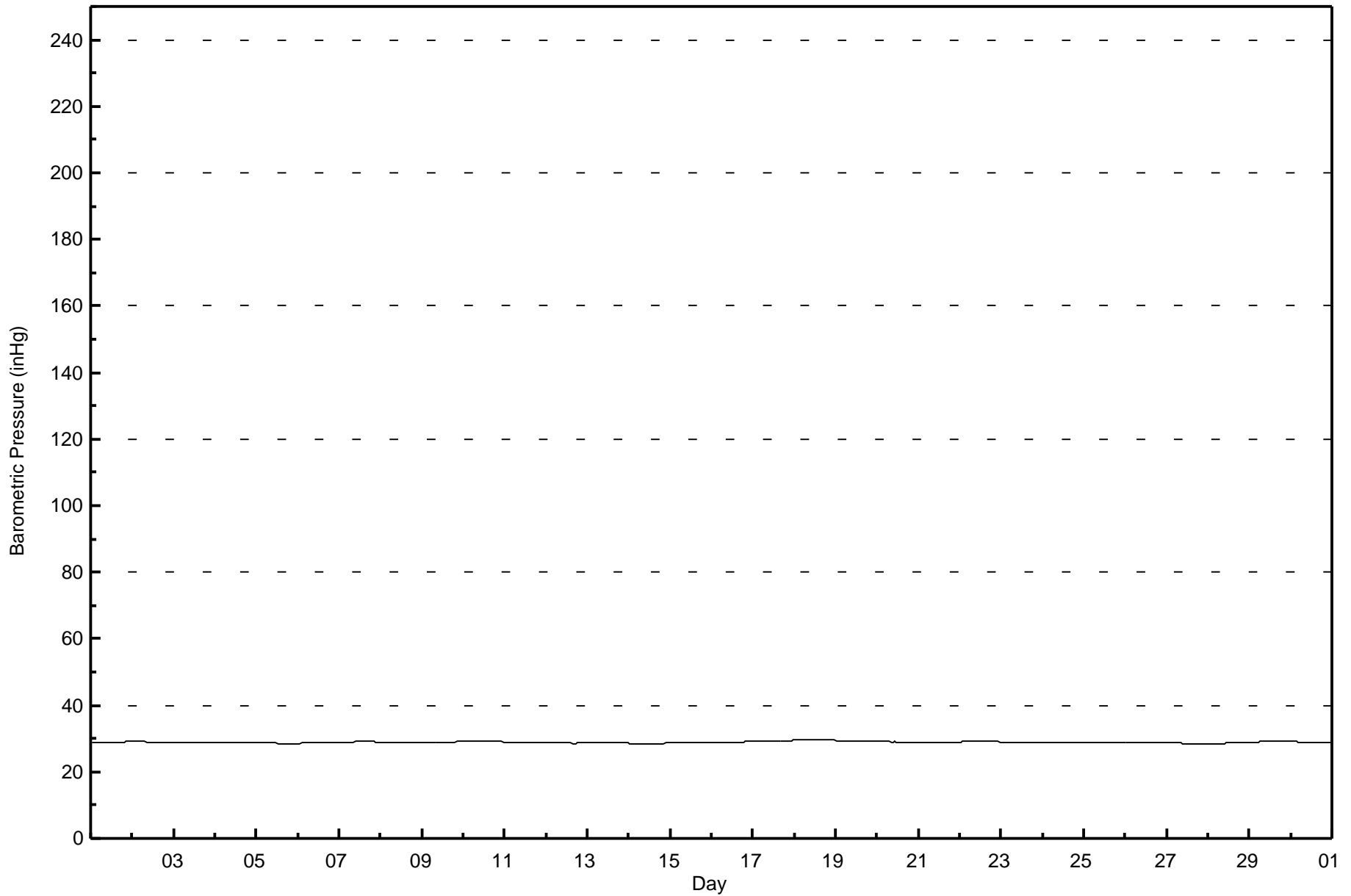
Barometric Pressure (BP) - inHg
Athabasca Valley - November 2016

Maximum Value: 29.5 inHg on Nov 18 11:00 Maximum Daily Average: 29.5 inHg on Nov 18																						Hours in Service: 720							
Minimum Value: 28.4 inHg on Nov 27 23:00 Minimum Daily Average: 28.5 inHg on Nov 14																						Hours of Data: 720							
Maximum Diurnal Average: 28.9 inHg at hour 11 Minimum Diurnal Average: 28.9 inHg at hour 15																						Hours of Missing Data: 0							
Monthly Average: 28.89 inHg Percentiles: $P_1 = 28.5$ $P_{10} = 28.6$ $Q_1 = 28.7$ Median = 28.9 $Q_3 = 29.0$ $P_{90} = 29.2$ $P_{99} = 29.5$																						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-Nov	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	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	28.9	29.0		
2-Nov	29.0	29.1	29.1	29.1	29.1	29.1	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	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.1	
3-Nov	28.9	28.9	28.9	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	28.8	28.8	28.8	28.9	28.9	28.9	28.9	
4-Nov	28.9	28.9	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	29.0	
5-Nov	28.8	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	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.8	
6-Nov	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	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	28.9	
7-Nov	28.9	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	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.1	29.1	
8-Nov	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.8	28.9	29.0	
9-Nov	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.9	28.9	28.9	29.0	29.0	29.0	29.1	29.1	29.1	28.8	28.9	29.1	29.1	
10-Nov	29.1	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	29.3	29.3	29.2	29.2	29.2	29.2	29.1	29.1	29.0	29.0	29.2	29.2	29.3	29.3	
11-Nov	29.0	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	29.0	
12-Nov	28.8	28.8	28.8	28.7	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	28.6	28.7	28.7	28.8	28.8	
13-Nov	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.7	28.8	28.8	
14-Nov	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	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	
15-Nov	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	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	
16-Nov	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.1	29.1	29.1	29.1	28.9	29.0	29.1	29.1	29.1	
17-Nov	29.1	29.1	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	29.3	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.5	29.5	29.5	
18-Nov	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	
19-Nov	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.3	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.3	29.4	
20-Nov	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	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	29.0	29.1	
21-Nov	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	28.8	28.9	29.0	29.0	
22-Nov	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	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.1	29.2	29.2	
23-Nov	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	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
24-Nov	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	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	
25-Nov	28.9	28.9	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	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	28.9	
26-Nov	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.8	28.9	
27-Nov	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.5	28.6	28.7	28.7	
28-Nov	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	28.6	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	
29-Nov	28.9	28.9	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	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	
30-Nov	29.1	29.1	29.1	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	28.9	28.9	28.9	28.9	28.9	29.0	29.1	29.1	
																						Diurnal Average							
																						Diurnal Maximum							



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - inHg
Athabasca Valley - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

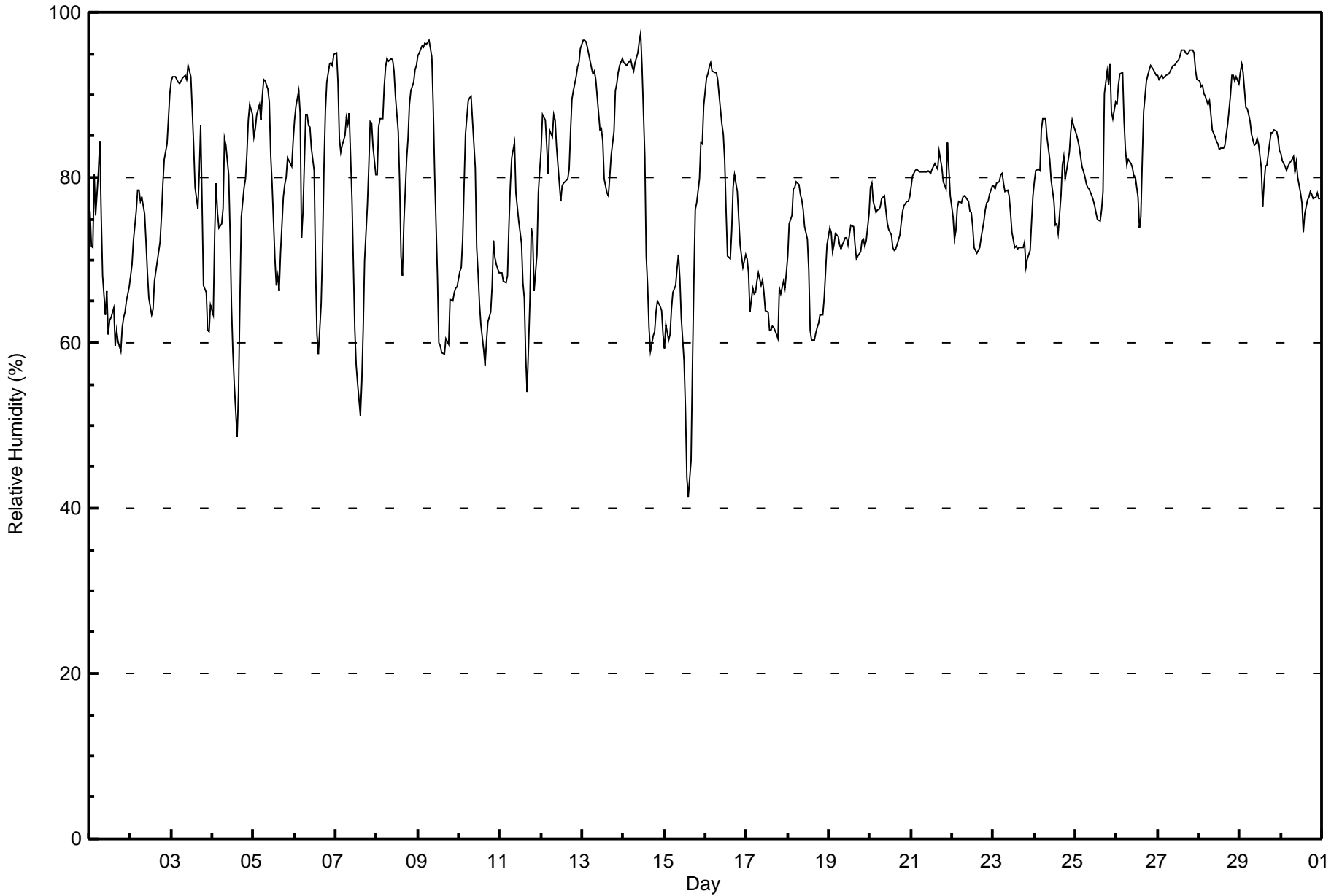
Athabasca Valley - November 2016

Maximum Value: 97 % on Nov 14 11:00 Maximum Daily Average: 93.7 % on Nov 27																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 41 % on Nov 15 15:00 Minimum Daily Average: 65.2 % on Nov 15 Maximum Diurnal Average: 84.0 % at hour 8 Minimum Diurnal Average: 69.2 % at hour 15 Monthly Average: 78.6 % Percentiles: P ₁ = 54 P ₁₀ = 64 Q ₁ = 71 Median = 79 O ₃ = 87 P ₉₀ = 93 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-Nov	76	72	72	80	75	81	84	75	68	63	66	61	63	64	60	61	60	59	62	63	64	65	67	67.7	84	
2-Nov	68	69	72	76	78	78	77	78	76	72	68	65	63	64	67	69	70	72	75	79	82	84	87	90	74.3	90
3-Nov	92	92	92	92	92	91	92	92	92	92	94	92	88	84	79	76	81	86	77	67	66	61	61	65	83.2	94
4-Nov	63	73	79	76	74	74	76	85	84	80	73	64	59	55	49	54	65	75	79	80	83	87	89	88	73.5	89
5-Nov	85	86	88	89	87	90	92	92	91	89	83	79	70	67	68	66	71	78	79	80	82	82	81	84	81.6	92
6-Nov	87	89	90	88	73	76	88	88	86	86	84	81	69	61	59	65	71	81	88	92	94	94	94	95	82.3	95
7-Nov	95	92	85	83	84	85	87	86	88	77	70	62	57	55	51	55	62	70	77	81	87	87	84	80	76.6	95
8-Nov	80	86	87	87	91	93	94	94	94	94	93	90	86	79	71	68	74	82	85	89	90	92	93	94	87.0	94
9-Nov	95	95	96	96	96	96	97	96	95	88	81	68	60	60	59	59	61	60	60	65	65	66	67	67	76.9	97
10-Nov	69	69	73	79	85	89	90	90	87	81	72	69	65	62	59	57	60	63	64	67	72	70	69	68	72.0	90
11-Nov	68	69	68	67	68	74	79	82	84	78	76	75	72	67	65	58	54	65	74	73	66	71	78	81	71.4	84
12-Nov	83	88	87	84	81	86	85	88	87	84	81	77	79	79	79	80	81	86	89	91	92	93	94	96	85.4	96
13-Nov	97	97	96	96	95	93	93	93	92	88	86	86	84	80	78	78	80	83	86	91	91	93	94	94	89.2	97
14-Nov	94	94	94	94	94	93	93	94	95	97	97	93	82	70	67	62	59	61	61	64	65	64	64	61	79.7	97
15-Nov	59	62	60	61	64	66	67	69	71	68	63	58	52	44	41	46	57	67	76	77	80	84	84	89	65.2	89
16-Nov	92	93	93	94	93	93	93	92	90	86	85	82	76	71	70	74	79	80	78	75	72	70	69	71	82.1	94
17-Nov	70	68	64	67	66	66	68	68	67	68	66	64	64	62	61	62	62	61	60	67	66	67	67	68	65.4	70
18-Nov	71	74	75	79	79	79	79	78	77	76	74	73	69	62	60	60	61	62	62	63	63	65	69	72	70.2	79
19-Nov	74	73	71	72	73	73	72	71	72	73	73	72	73	74	74	72	70	70	71	72	73	72	72	76	72.4	76
20-Nov	79	79	77	76	76	76	76	77	78	76	75	74	73	72	71	71	72	73	75	76	77	77	77	78	75.4	79
21-Nov	79	80	81	81	81	81	81	81	81	81	81	81	81	81	82	81	83	82	81	79	79	84	81	78	80.8	84
22-Nov	75	73	74	76	77	77	78	78	78	77	76	76	74	72	71	71	71	73	75	76	77	77	78	79	75.3	79
23-Nov	79	79	79	80	80	81	79	78	78	78	76	73	72	72	71	71	71	72	72	69	70	71	75	78	75.2	81
24-Nov	79	81	81	81	86	87	87	85	84	82	80	77	74	74	73	78	82	83	80	81	83	86	87	86	81.5	87
25-Nov	85	85	84	83	81	80	79	79	79	78	77	77	76	75	75	76	78	90	93	91	94	88	87	89	82.4	94
26-Nov	89	91	92	93	87	83	82	82	82	81	80	80	78	74	75	82	88	92	92	93	93	93	93	92	86.2	93
27-Nov	92	92	92	92	92	92	93	93	93	94	94	94	94	95	95	95	95	95	95	95	95	95	93	92	93.7	95
28-Nov	92	91	91	90	90	89	89	88	86	85	84	84	83	84	84	84	85	86	90	92	92	92	92	91	88.1	92
29-Nov	93	94	93	89	88	88	87	85	84	84	85	84	81	76	79	81	82	84	85	85	86	86	85	83	85.3	94
30-Nov	83	82	81	81	81	82	82	83	81	82	80	78	77	73	76	77	78	78	78	77	78	78	77	78	79.2	83
81.4 82.2 82.3 82.6 82.3 83.1 83.9 84.0 83.3 81.3 79.1 76.3 73.2 70.2 69.2 69.6 72.2 75.7 77.2 78.3 79.2 79.8 80.2 81.0																								Diurnal Average		
97 97 96 96 96 96 97 96 95 97 97 94 94 95 95 95 95 95 95 95 95 95 94 96																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Athabasca Valley - November 2016





Maximum Speed: 29 km/h on Nov 9 13:00	Maximum Daily Speed Average: 13.9 km/h on Nov 17	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 6 21:00	Minimum Daily Speed Average: 2.3 km/h on Nov 8	Hours of Data: 720
Maximum Diurnal Speed Average: 4.1 km/h at hour 10	Minimum Diurnal Speed Average: 1.9 km/h at hour 16	Hours of Missing Data: 0
Monthly Average Velocity: 2.8 km/h 166.8 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 4 Median = 8 Q ₃ = 11 P ₉₀ = 15 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-Nov	N13	NNW16	NNW16	NNW9	NE6	NW5	WSW6	WNW12	WNW23	WNW21	NW20	WNW22	WNW21	WNW18	WNW19	WNW17	WNW19	NW19	WNW19	NW14	NNW9	NNW8	NNE5	ENE6	NW12.5	WNW23	
2-Nov	ENE5	E4	E5	E6	ESE5	SE6	SE8	SSE7	SSE12	SE11	SE11	SE13	SE12	SE13	SE17	SE16	SE15	SE15	SE14	SE14	SE10	SE11	SE10	SE12	SE10.1	SE17	
3-Nov	SE13	SE13	SE13	SE13	SE13	SE8	SE8	E5	E5	SSE4	SE8	SE12	SE10	SE9	SSE9	SSE9	SSE9	SSE11	S8	SSW10	SW11	SSW5	SSW6	S4	SSE7.9	SE13	
4-Nov	SSE5	ESE3	S2	S3	SE3	S5	SSE6	SSE6	SSE3	SE2	SE8	SE10	SE9	SSE5	SSE4	SSE6	S4	SSW3	SSW4	S4	SSW2	S3	S2	S5	SSE4.1	SE10	
5-Nov	SSE5	SSE3	SSE4	S2	E1	NNW3	SSW3	S3	SSE1	SSW4	SSW5	S3	S3	SSE4	S3	SSE4	S4	SSW3	SSW4	S4	S4	SSE5	SSE8	SSE4	S3.2	SSE8	
6-Nov	SE5	SE5	SE5	SSE5	SSW5	SE2	E5	SE8	SE9	SE7	ESE7	ESE5	SSW6	SW8	S2	SE4	SSE3	SSE3	SSW1	S1	SSE0	SSE2	S3	SSE2	SSE3.6	SE9	
7-Nov	SE4	SE4	SW3	ESE4	SE5	SE4	SSE3	SE3	SSE2	SE4	SE6	S5	S4	S4	SE4	SE5	SE6	SE4	SSE3	S3	SW2	SSE3	SE6	SSE8	SSE3.8	SSE8	
8-Nov	SE9	SE4	SSE9	SE8	SE4	NW1	ENE1	SW2	SSE0	SSE1	ENE1	NE2	WNW2	W2	SSW2	SSW3	S3	SSW4	SW3	S3	SSW4	SSW3	S3	SSE3	SSE2.3	SE9	
9-Nov	S4	SSE5	S4	SSE3	S5	ESE2	SSE4	SE3	SE7	SSE5	SE5	W12	W29	W22	WSW13	W10	W11	W15	WSW16	WSW14	WSW14	SSW8	SW11	SW17	WSW7.5	W29	
10-Nov	SW16	SW13	SSE5	SE4	SE6	SE5	SE6	SE6	SSE5	SE3	SSW8	SE4	SE5	SSE8	SSE9	SE9	SE11	SE16	SE18	SE11	SE8	SE14	SE16	SE17	SSE8.1	SE18	
11-Nov	SE17	SE18	SE16	SE16	SE12	SE5	SE4	S2	SSE5	SE11	SE7	SSE6	SE7	SE9	SE8	SW5	WSW4	SSE2	SSW2	SSW3	SW9	SSE5	SE6	SE4	SSE6.8	SE18	
12-Nov	SSE4	SE4	SE3	ESE5	SSE4	SE4	SSE5	ESE2	SE4	SSE5	SSE5	SE8	SE3	W1	ESE1	SE2	NNE1	N1	SSW2	S2	SSE3	S4	SE0	ESE3	SE2.7	SE8	
13-Nov	ESE3	SE4	SE5	SE5	SE6	SE6	SE5	SE10	SE11	SE11	SE11	SE11	SE8	SE9	SE10	SE11	SE9	SE9	SSE9	SE7	SE12	SE14	SE11	SE9	SE8.3	SE14	
14-Nov	SE11	SE6	SE6	SE3	SSE5	SE5	SSE6	SSE6	SE6	ESE4	SE4	SSW4	WSW12	W19	W21	WNW22	W19	WSW11	WSW9	WSW6	W20	W24	W24	W27	WSW7.6	W27	
15-Nov	W20	SSW3	SSW4	WSW17	WSW18	WSW17	WSW20	WSW11	W6	WSW6	WSW10	SW9	SW8	W15	W15	WSW5	S2	SE2	SSE3	SE6	SE4	SE3	SE2	ESE2	WSW7.1	W20	
16-Nov	ESE3	SE0	S2	ESE2	ESE3	SE2	ESE3	ESE3	SE4	ESE5	E5	E5	E4	ENE2	NNW8	NNW11	NNW15	NNW16	N15	N14	N11	N13	N10	NW9	N4.4	NNW16	
17-Nov	NNW12	N13	N16	NNW17	NNW16	NNW14	NW15	NNW14	WNW15	WNW14	WNW13	NW9	W12	WNW16	WNW15	WNW14	WNW18	NW22	NW23	NW18	NNW19	NNW14	NW9	WNW5	NW13.9	NW23	
18-Nov	WNW4	SW8	SW9	SW10	SSE5	SSE5	SE6	SSE6	SW9	SW8	SSE4	SE4	ENE2	W7	W7	W5	WSW6	SW5	SW5	S5	E5	E7	E6	E7	SSW3.3	SW10	
19-Nov	E7	E7	E7	E8	E8	E7	E6	NE6	E7	E7	ENE5	ENE6	E8	ENE6	ENE6	E9	ESE10	ESE9	SE10	ESE11	ESE12	ESE14	ESE13	ESE10	E7.9	ESE14	
20-Nov	ESE9	ESE8	SE10	SE11	SE8	SE10	SE11	SE11	SE12	SSE12	SE11	SE10	SE9	SE8	SE9	SE9	SE10	SE10	SE13	SE12	SE10	SE8	ESE7	SE9	SE9.9	SE13	
21-Nov	SE9	SE11	SE11	SE11	SE12	SE11	SE10	SE8	SE7	SE7	SE6	SSE4	E3	E3	ENE3	NNW6	NNW6	NNW5	N3	NW8	NW14	N14	NNW13	N12	E2.4	NW14	
22-Nov	NNW14	NNW10	N10	NNW9	NW9	NNW9	NNW7	NNE3	ENE4	E4	ESE4	SE6	SE6	SE7	SE9	SE7	SE10	SE11	SE15	SE12	SE9	SE10	SE12	SE12	ESE3.4	SE15	
23-Nov	SE13	SE12	SE12	SE12	SE10	SE10	SE11	SSE11	SE13	SE13	SE13	SE16	SE20	SE17	SE16	SE14	SE12	SE11	SSE10	S13	SSE12	SSE10	SSE9	SSE9	SE12.3	SE20	
24-Nov	SSE5	SSE5	SSE6	SE7	SE8	SE8	SE6	SE8	SE10	SE10	SE7	SE8	SE9	SE9	SSE8	SSE5	SE3	SE8	SE11	SE12	SE13	SE14	SE15	SE16	SE8.6	SE16	
25-Nov	SE14	SE17	SE17	SE17	SE16	SE17	SE17	SE17	SE13	SSE10	SE11	SE10	SE11	SE10	SE9	SSE6	SSW4	SW4	SW6	SW7	WSW10	SW9	WSW11	WSW10	WSW11	SSE8.1	SE17
26-Nov	WSW13	WSW13	WSW8	WSW8	WSW11	WSW9	WSW10	WSW10	SW12	SW13	SW12	SW11	SW6	S1	N3	NW1	ESE1	ENE1	N5	NNW4	N2	NNW5	NNW8	NNW7	WSW5.2	WSW13	
27-Nov	NNW4	NNE4	NNW7	NNW7	NNW6	NNW7	NNW8	NNW6	NNW10	NNW9	N10	NNW15	NNW15	NNW13	NNW12	NNW13	NNW12	NNW11	NNW11	NNW8	NNW8	NW5	WNW4	SW5	NNW8.3	NNW15	
28-Nov	WSW4	SSW3	ESE3	S4	SW5	WSW8	WSW6	SW7	WSW11	SW10	SW8	SW7	SW6	SW5	SSW5	SW4	WSW5	W3	NNW4	N3	NNW6	NNW6	NW4	NW4	WSW4.0	WSW11	
29-Nov	NNW2	NNW3	NW5	WNW9	WNW7	NNW3	SW7	SW7	SSW6	SW9	SW8	SW6	SSW5	SW6	SW5	S3	S7	S7	S7	SSE11	SSE11	SE10	SE10	SE11	SSW4.0	SE11	
30-Nov	SSE9	SSE11	SSE11	SE12	SE11	SE11	SE12	SSE10	SSE10	SE11	SSE12	SSE10	SE11	S9	SSW9	S9	SSE13	SSE12	SSE11	S9	SSE10	SSE10	SE9	SSE9	SSE10.0	SSE13	

SSE3.0	SE3.4	SE3.3	SE3.1	SSE3.5	SSE2.7	SSE3.5	SSE3.0	S3.6	SSE4.1	SSE3.8	SSE3.6	S3.2	SSW3.0	SSW2.6	SSW1.9	SSW2.0	S2.1	S2.5	S2.7	SSW2.3	SSE2.4	SSE3.0	SSE3.5	Diurnal Average	
W20	SE18	SE17	NNW17	WSW18	SE17	WSW20	NNW14	WNW23	WNW21	NW20	WNW22	W29	W22	W21	WNW22	W19	NW22	NW23	NW18	W20	W24	W24	W27	Diurnal Maximum	

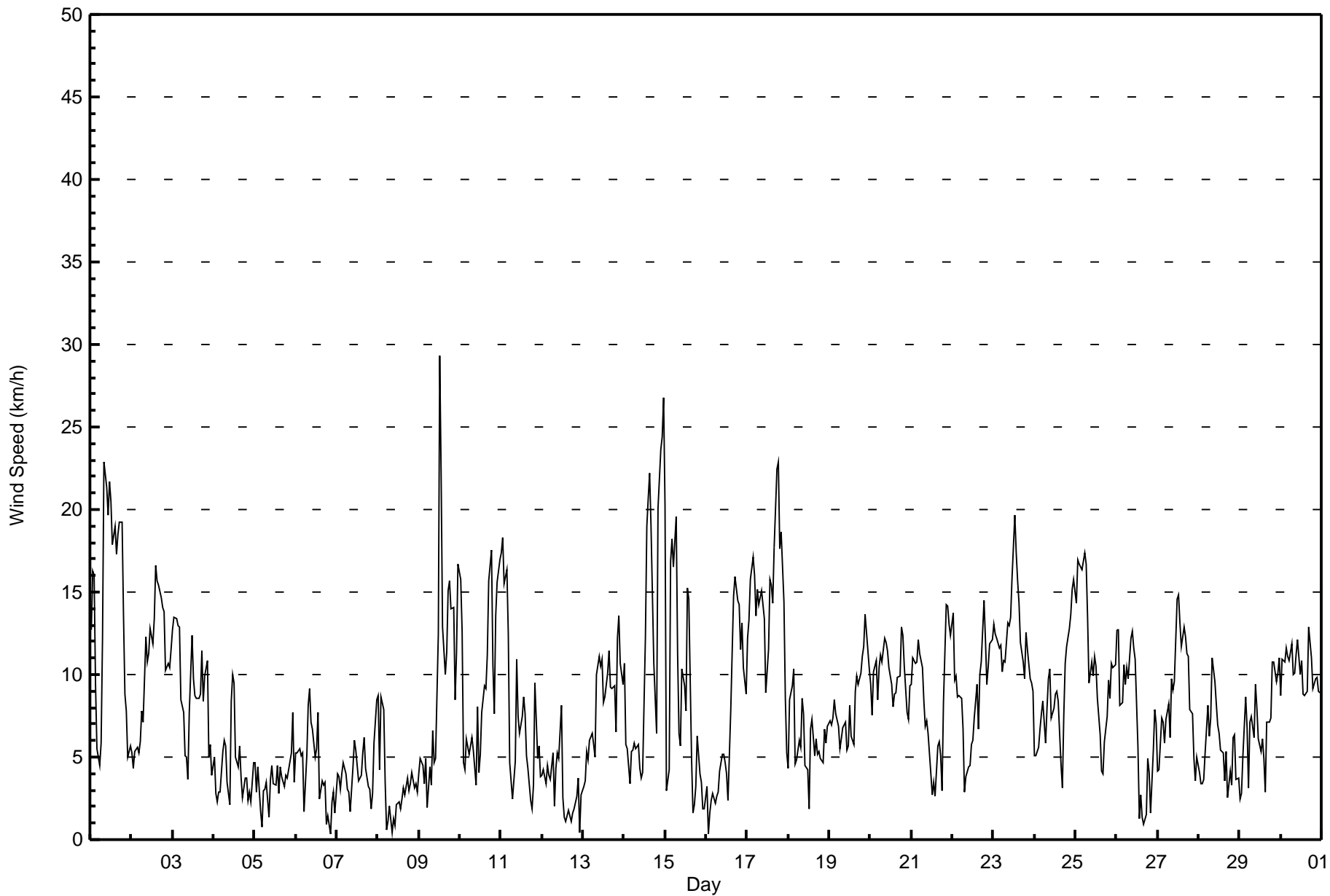
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Athabasca Valley - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Nov 9 12:00 Minimum Value: 0 km/h on Nov 16 05:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 3 P ₉₉ = 5																	Hours in Service: 720 Hours of Data: 720 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-Nov	4	3	3	3	1	2	1	7	4	4	3	4	4	3	3	4	4	3	3	4	2	2	2	2	7
2-Nov	1	1	1	1	1	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	3
3-Nov	2	2	3	3	3	3	2	2	2	2	4	3	2	2	2	2	3	2	2	5	3	4	3	2	5
4-Nov	2	1	1	2	2	2	3	2	2	2	2	2	3	2	2	2	2	1	2	2	2	2	2	1	3
5-Nov	2	1	2	1	1	3	2	2	2	2	2	3	3	2	2	2	3	2	1	3	2	2	3	1	3
6-Nov	1	3	2	2	2	2	2	3	2	2	2	1	3	3	2	4	2	1	1	1	1	1	1	1	4
7-Nov	2	2	2	1	2	1	1	1	1	2	1	2	1	1	2	1	2	2	2	2	1	2	2	2	2
8-Nov	2	3	3	3	3	1	1	2	2	2	2	2	1	2	2	2	1	1	2	2	2	2	2	1	3
9-Nov	2	4	2	1	2	2	1	2	2	1	2	12	5	5	3	3	2	3	3	2	2	4	4	3	12
10-Nov	3	5	2	2	2	2	2	1	2	2	3	2	1	2	2	2	2	3	3	4	3	3	4	4	5
11-Nov	3	3	3	3	3	2	2	2	3	3	2	2	2	2	2	4	3	2	2	4	4	2	2	2	4
12-Nov	2	2	2	2	1	2	2	2	2	1	2	2	2	1	1	1	2	2	1	2	1	1	1	2	2
13-Nov	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	2	2	3
14-Nov	3	2	2	2	1	1	2	1	2	1	2	2	4	4	4	6	4	2	2	5	5	4	5	5	6
15-Nov	4	4	3	5	4	3	4	5	4	3	2	2	3	4	3	2	2	1	3	1	2	2	2	1	5
16-Nov	1	1	1	1	0	1	1	1	1	1	1	2	1	1	1	3	3	2	3	4	3	3	3	2	4
17-Nov	3	3	4	3	3	2	3	3	3	2	3	3	3	4	3	3	4	4	5	3	3	3	4	2	5
18-Nov	2	2	2	3	1	1	1	2	2	2	2	2	1	3	2	3	2	2	2	2	1	2	1	1	3
19-Nov	1	1	2	1	1	2	2	2	2	2	2	2	2	2	3	2	3	3	3	3	3	4	3	3	4
20-Nov	3	2	3	3	2	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3	3	2	2	3
21-Nov	3	3	2	2	3	2	2	2	2	2	1	2	1	1	1	1	1	1	1	3	3	3	3	3	3
22-Nov	4	3	3	1	1	1	2	1	1	1	2	1	2	2	2	2	2	2	4	3	2	2	2	3	4
23-Nov	3	3	3	3	3	2	2	2	3	3	4	4	5	4	3	3	3	3	3	4	3	3	2	2	5
24-Nov	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	3	4	4	4	4	4	4
25-Nov	4	4	5	5	4	5	4	3	3	3	2	3	2	3	2	1	1	1	1	1	2	2	2	3	5
26-Nov	3	2	2	2	3	2	2	2	2	3	3	3	3	1	2	2	2	2	2	1	2	1	1	1	3
27-Nov	2	1	2	1	1	2	1	2	2	2	2	3	2	3	3	2	2	2	2	1	2	1	1	1	3
28-Nov	1	1	1	1	3	2	1	2	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	3
29-Nov	1	1	1	1	2	1	2	1	1	2	3	1	2	2	1	1	3	2	2	2	2	2	2	2	3
30-Nov	2	3	2	2	2	2	3	2	2	3	3	2	2	3	2	3	3	3	3	2	2	2	2	2	3
Diurnal Maximum																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Athabasca Valley - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	261	36.25	36.25
6 - 11	299	41.53	77.78
12 - 19	142	19.72	97.50
20 - 28	17	2.36	99.86
29 - 38	1	0.14	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
Athabasca Valley - 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	4	6	1	9	13	21	50	51	39	26	14	3	4	4	7	9	261
6 - 11	4	0	2	5	14	9	124	40	7	9	25	21	5	2	5	27	299
12 - 19	8	0	0	0	0	3	64	6	1	0	6	10	6	15	6	17	142
20 - 28	0	0	0	0	0	0	1	0	0	0	0	1	7	5	3	0	17
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	16	6	3	14	27	33	239	97	47	35	45	35	23	26	21	53	720

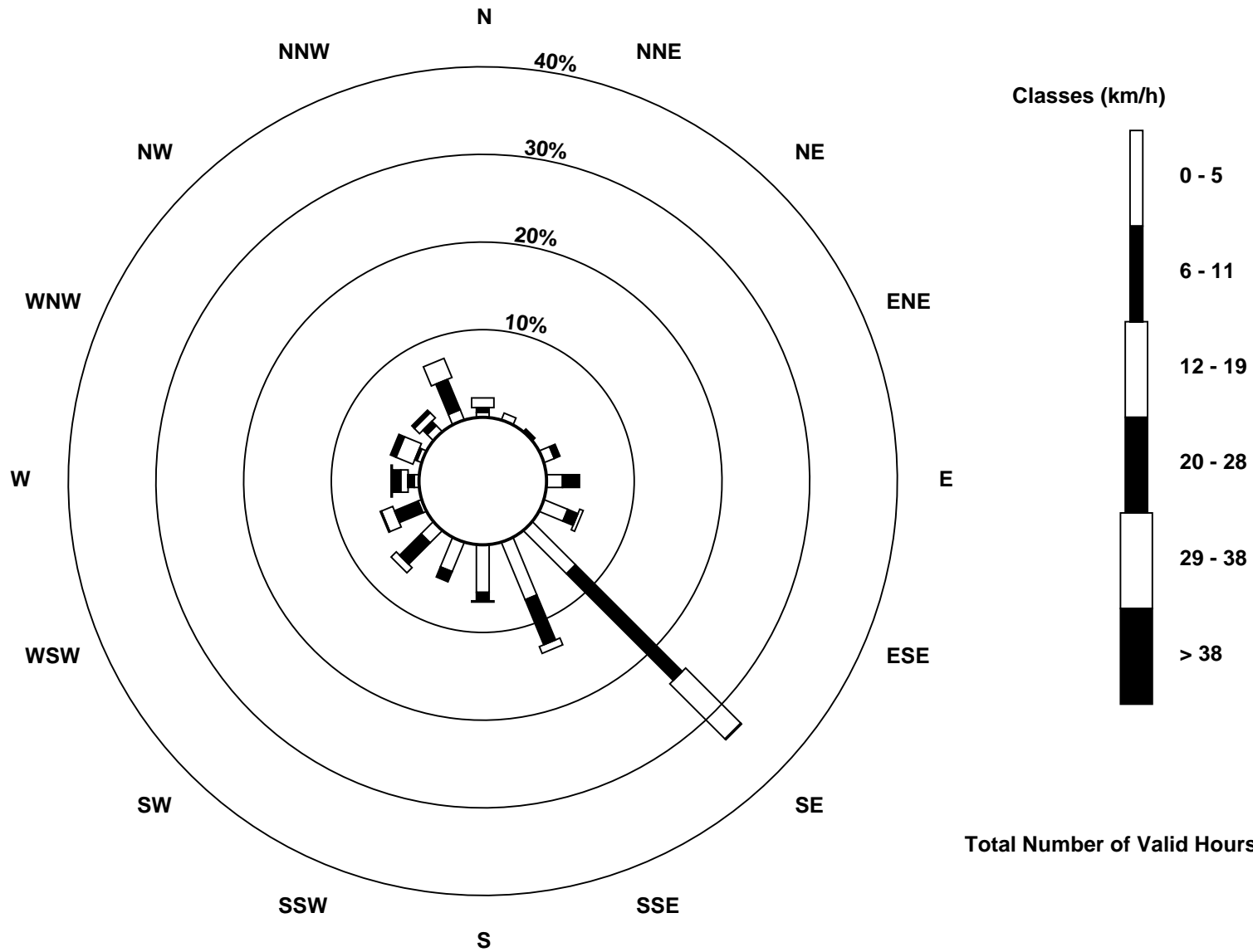
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Athabasca Valley (AMS 7)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Athabasca Valley - November 2016

Direction of Maximum Speed: 274 deg on Nov 9 13:00 Direction of Maximum Daily Speed Average: 312.3 deg on Nov 17	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 160 deg on Nov 6 21:00 Direction of Minimum Daily Speed Average: 2.3 deg on Nov 8	Percent Operational Time: 100.0
Monthly Average Direction: 192.9 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-Nov	354	337	331	344	34	322	258	295	301	283	310	291	287	285	282	293	302	311	302	324	327	341	24	63	308.4
2-Nov	63	96	86	92	123	143	145	156	148	141	136	134	132	135	133	132	140	139	142	144	143	132	130	130	133.8
3-Nov	132	135	133	138	143	141	128	89	82	162	138	145	140	143	147	149	152	154	189	211	221	193	192	172	149.9
4-Nov	164	117	170	188	140	178	160	149	168	144	131	135	132	147	166	150	177	209	210	179	204	184	182	183	158.7
5-Nov	162	161	163	176	99	330	204	179	162	206	194	183	171	148	189	158	181	200	200	182	189	159	154	161	175.1
6-Nov	141	139	136	154	199	125	98	132	137	124	119	109	198	229	184	136	156	154	198	172	160	160	172	150	148.3
7-Nov	138	129	223	112	140	143	162	133	154	139	137	188	176	177	130	146	142	144	147	175	224	162	142	149	150.8
8-Nov	143	133	148	138	145	309	60	216	168	153	59	38	288	266	202	193	172	201	218	191	212	203	176	154	168.6
9-Nov	173	162	177	156	173	120	152	146	145	156	127	271	274	270	258	263	267	265	254	238	246	207	214	229	239.9
10-Nov	228	216	153	130	136	126	139	134	165	145	203	134	146	150	149	143	134	140	142	138	138	133	144	146	151.4
11-Nov	145	142	144	137	138	139	143	178	147	146	139	150	133	140	138	223	240	151	211	212	227	167	135	141	150.8
12-Nov	157	141	125	102	168	143	147	107	141	153	161	140	139	264	123	135	19	11	210	183	159	173	140	105	144.2
13-Nov	102	134	145	141	133	130	135	133	136	141	137	133	138	134	146	138	135	143	151	133	140	142	138	141	138.1
14-Nov	141	127	141	131	149	145	149	152	145	122	130	195	247	274	272	286	278	253	238	258	267	264	265	269	251.0
15-Nov	260	201	213	249	247	257	252	253	268	255	239	235	232	261	270	227	190	127	147	141	128	131	140	114	243.4
16-Nov	112	134	176	121	119	126	110	106	128	112	83	85	88	60	336	337	339	338	352	358	358	350	6	324	5.7
17-Nov	334	351	349	340	335	330	314	333	294	282	295	308	281	294	302	303	300	310	310	311	309	301	307	282	312.3
18-Nov	294	228	229	222	157	155	141	168	214	216	162	135	73	265	268	267	242	227	226	182	91	91	94	96	199.6
19-Nov	98	81	95	80	79	79	91	56	97	85	63	74	81	75	69	98	107	114	124	114	115	111	107	110	95.8
20-Nov	119	115	124	129	133	131	140	146	139	147	135	125	132	143	127	124	125	128	129	127	131	126	118	136	130.9
21-Nov	135	129	129	130	130	135	134	146	140	140	139	152	92	88	69	341	332	334	349	314	319	359	348	352	91.8
22-Nov	344	348	351	334	315	328	347	17	74	86	105	138	128	138	131	125	144	138	141	137	142	133	137	140	111.1
23-Nov	139	144	137	138	143	145	145	149	144	140	136	134	139	139	138	138	141	137	154	176	160	158	155	147	144.0
24-Nov	162	165	152	143	136	133	143	144	138	132	139	133	132	139	163	154	132	125	140	137	125	125	124	133	136.9
25-Nov	132	127	128	129	129	128	134	141	148	146	136	133	136	143	159	209	217	228	234	237	236	243	243	238	155.6
26-Nov	237	237	241	242	237	239	239	245	224	222	223	232	223	176	11	318	120	58	351	341	358	340	335	336	247.8
27-Nov	347	29	340	339	341	339	338	335	336	346	350	341	336	344	347	338	338	330	339	334	335	314	285	228	337.7
28-Nov	244	202	121	191	225	241	238	233	240	233	228	235	225	229	212	221	255	261	330	349	331	340	317	322	245.7
29-Nov	338	339	323	299	286	334	229	230	208	232	233	222	209	223	226	178	176	187	187	149	151	141	137	135	199.6
30-Nov	149	158	147	132	136	129	138	150	164	145	154	163	141	172	211	172	154	165	155	172	166	151	144	154	153.9

155.4 142.7 137.8 141.9 150.9 149.2 161.6 163.7 169.7 168.0 158.3 162.5 179.2 202.3 202.0 193.4 195.2 186.5 190.3 179.1 196.8 156.6 152.1 161.1

Diurnal Average

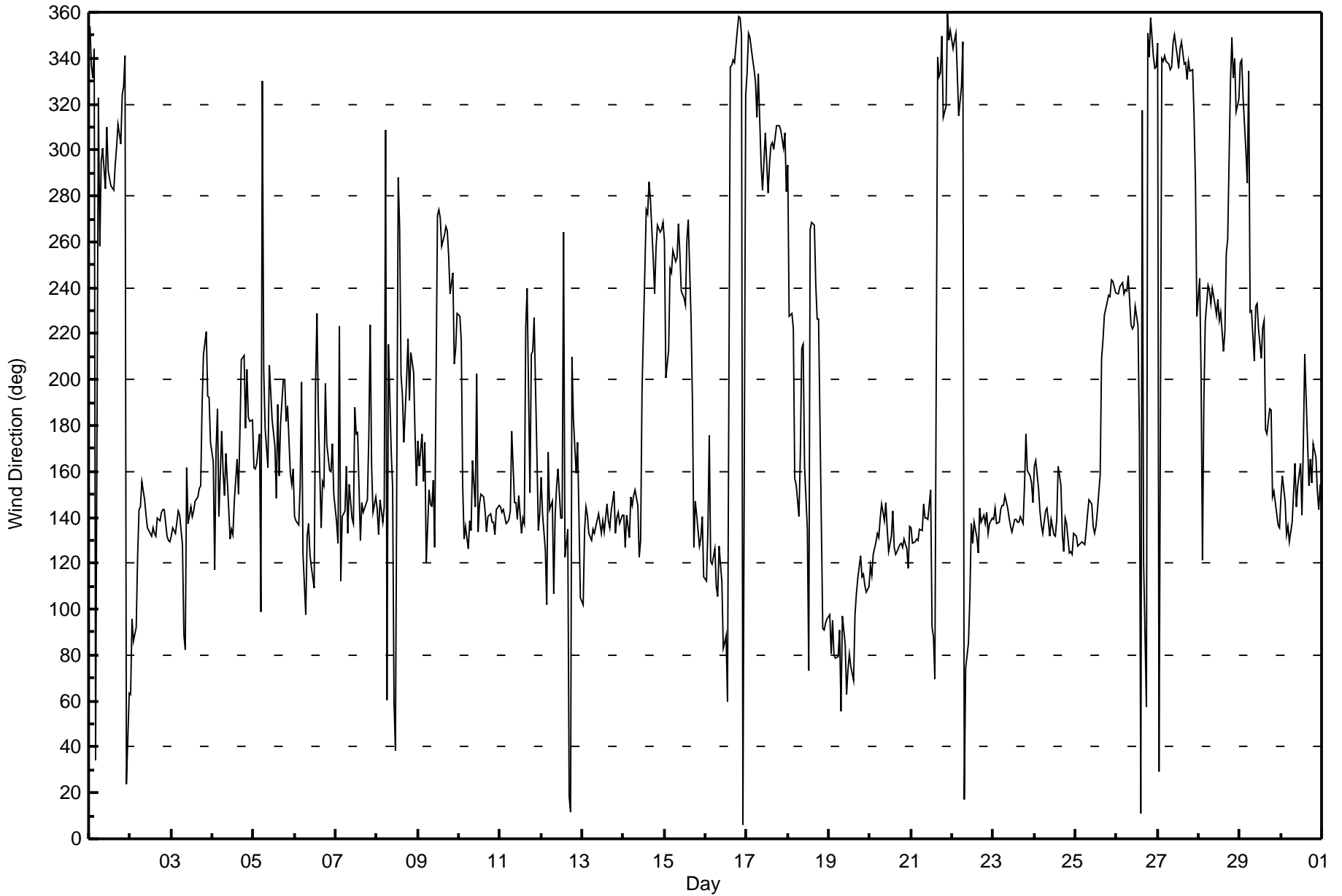
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Athabasca Valley - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Nov 8 06:00 Minimum Value: 8 deg on Nov 18 03:00 Percentiles: P ₁ = 9 P ₁₀ = 12 Q ₁ = 15 Median = 19 Q ₃ = 36 P ₉₀ = 59 P ₉₉ = 96																		Hours in Service: 720 Hours of Data: 720 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-Nov	19	11	12	28	19	39	30	26	14	13	13	20	17	18	15	15	14	13	14	14	26	16	29	21	39
2-Nov	25	18	13	11	23	19	18	22	18	16	17	16	15	14	13	12	11	11	12	11	12	14	12	12	25
3-Nov	10	11	13	15	14	21	17	25	16	49	24	14	14	14	14	16	9	23	22	18	60	59	67	67	
4-Nov	41	55	69	77	67	31	41	44	55	82	17	18	15	43	28	28	36	30	30	41	63	57	62	27	82
5-Nov	30	43	38	75	97	60	43	53	94	39	48	61	85	45	66	44	45	54	24	52	42	34	26	49	97
6-Nov	23	31	30	43	55	96	44	31	19	23	24	30	52	19	40	57	56	38	84	71	101	57	39	64	101
7-Nov	40	67	72	53	33	30	37	27	53	20	18	29	30	43	39	12	25	35	42	56	80	60	27	13	80
8-Nov	19	48	23	43	81	102	90	77	91	72	98	75	31	74	76	80	48	40	57	34	45	59	62	52	102
9-Nov	53	71	47	50	36	68	41	48	24	34	40	87	11	11	14	14	12	13	14	11	11	42	21	12	87
10-Nov	14	41	37	52	31	29	22	21	43	59	23	47	25	17	15	12	13	13	11	24	21	15	17	13	59
11-Nov	13	12	12	12	12	50	47	62	39	17	17	21	21	16	21	77	60	58	92	89	29	53	41	55	92
12-Nov	53	35	70	44	46	46	35	62	28	21	22	31	67	88	81	51	91	100	70	71	54	46	100	53	100
13-Nov	28	24	14	26	17	18	21	36	14	12	18	14	15	16	13	12	15	17	20	30	14	12	13	15	36
14-Nov	14	23	30	52	27	20	21	22	21	30	45	61	16	12	11	14	11	13	16	55	13	12	12	10	61
15-Nov	15	79	80	14	11	12	11	22	50	71	17	17	25	18	14	24	72	59	59	24	44	59	92	61	92
16-Nov	38	90	49	37	33	34	23	30	18	20	10	36	30	57	14	15	11	8	18	18	18	18	19	21	90
17-Nov	20	22	18	13	11	10	14	15	23	13	20	30	23	17	16	18	20	13	11	12	11	14	39	31	39
18-Nov	47	13	8	13	37	17	18	35	17	24	33	40	85	43	32	49	28	34	23	23	39	18	22	15	85
19-Nov	22	21	20	13	16	18	23	24	20	27	23	29	14	21	26	19	21	21	20	20	20	21	19	21	29
20-Nov	20	23	19	15	17	16	18	17	16	18	15	18	21	22	19	20	20	19	14	14	16	23	21	19	23
21-Nov	17	15	14	13	13	14	15	24	24	18	15	37	44	31	32	14	12	13	37	11	12	18	16	18	44
22-Nov	15	16	17	16	11	15	25	40	12	14	44	25	23	20	15	24	17	15	16	15	17	15	15	14	44
23-Nov	16	15	16	16	15	16	15	15	12	15	17	15	14	15	14	14	14	15	20	21	16	14	14	14	21
24-Nov	26	23	19	15	14	14	24	19	11	14	17	15	15	16	17	36	51	18	16	19	17	17	17	18	51
25-Nov	19	16	17	16	17	16	17	17	19	19	15	16	19	26	31	18	13	13	9	9	11	11	12	11	31
26-Nov	10	10	13	13	11	10	12	14	13	13	18	25	40	70	43	57	79	78	15	26	37	15	15	18	79
27-Nov	46	29	21	12	15	14	11	17	10	18	20	14	9	17	17	8	9	8	10	12	14	21	29	15	46
28-Nov	19	21	37	23	22	14	16	17	11	15	18	17	17	17	16	32	16	35	28	18	15	12	16	24	37
29-Nov	39	39	13	13	26	23	18	13	15	13	18	16	42	14	15	39	20	25	26	15	19	21	14	13	42
30-Nov	17	17	19	13	16	14	14	19	15	17	20	20	21	36	17	27	20	16	18	17	15	17	15	17	36
																		53 90 80 77 97 102 90 77 94 82 98 87 85 88 81 80 91 100 92 89 101 60 100 67							
Diurnal Maximum																									





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Last Calibration	October 11, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:00	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	0.993998	0.999116	Chamber temp	43.8	43.8
Calculated intercept	1.952165	0.952306	Pressure	691.8	691.8
Analyzer Background	17.3	17.3	Flow	0.473	0.473
Analyzer Coefficient	1.022	1.022	Intensity	43386	43386
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	0.1	----
as found span	5000	59.1	581.5	573.1	1.015
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	59.1	581.5	581.7	1.000
second point	5000	29.5	290.3	288.7	1.005
third point	5000	14.8	145.6	144.0	1.011
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	59.1	581.5	579.0	1.004
Average Correction Factor					1.005

Corrected As found	573.0	Previous response	583.1	% change	1.8%
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Notes:

No maintenance or adjustments done, filter changed out

Calibration Performed By:

Melissa Lemay



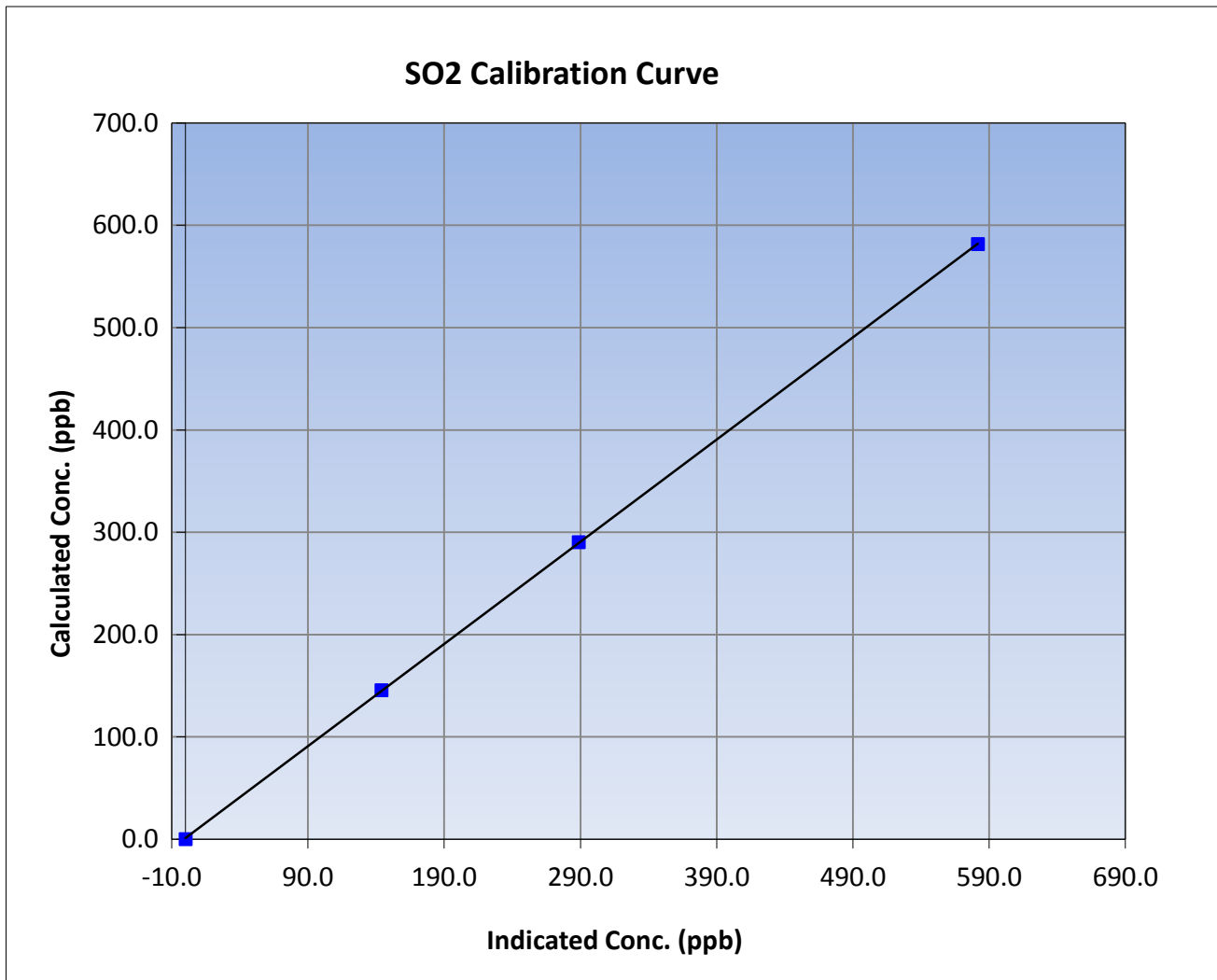
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 11, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:35
Analyzer make	Thermo 45C	Analyzer serial #	630718530

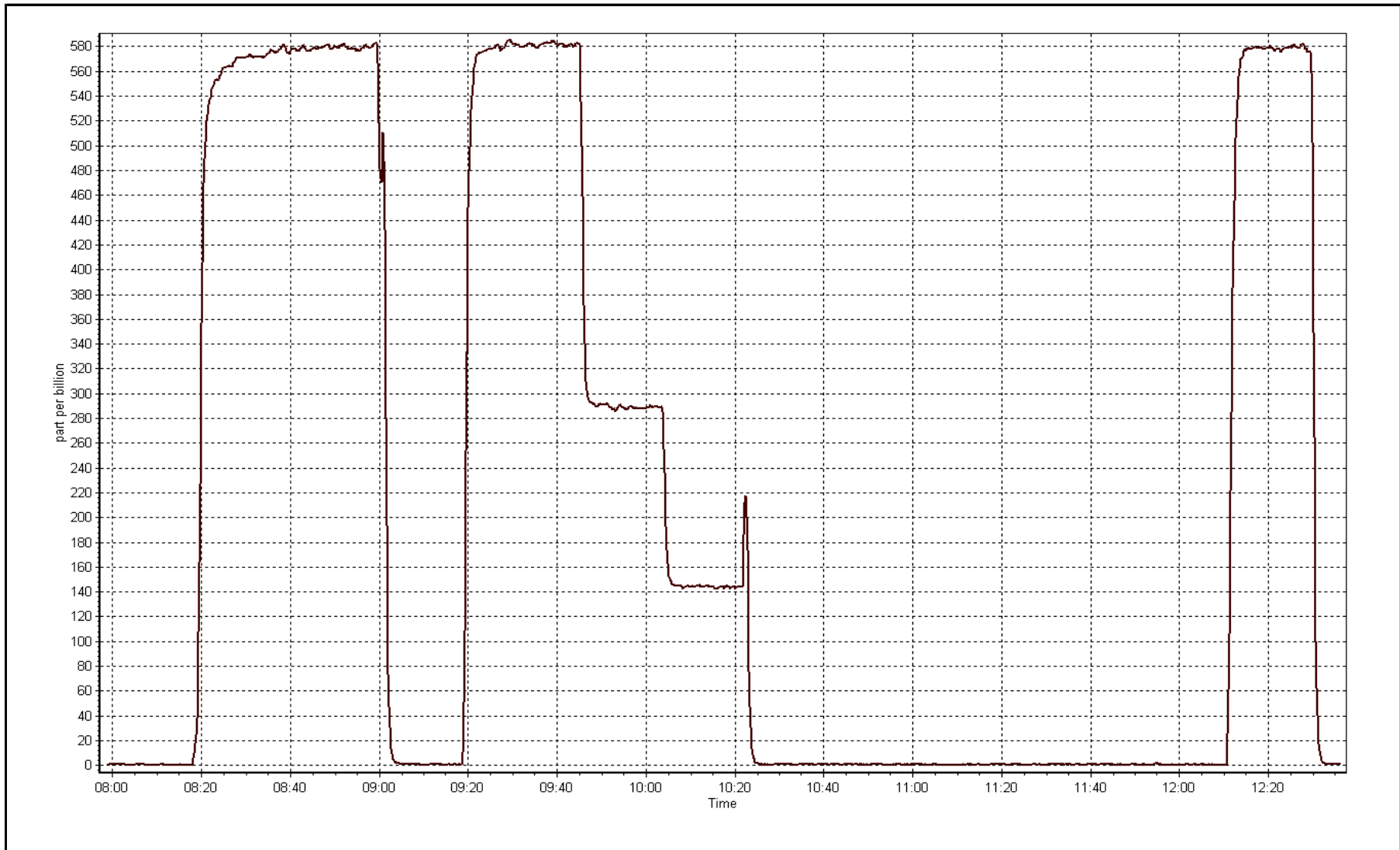
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999984
581.5	581.7	0.9997		
290.3	288.7	1.0055	Slope	0.999116
145.6	144.0	1.0113		
			Intercept	0.952306



SO2 Calibration Plot

Date: November 8, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	November 8, 2016	Last Calibration	October 25, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	12:30	End Time (MST)	15:05
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	-669.3	-669.3
Analyzer IP address	192.168.1.44		Lamp voltage	1123	1123
Calculated slope	1.003297	1.000452	Chamber temp	45	45
Calculated intercept	-0.001348	-0.155369	Pressure	699.8	699.8
Analyzer Background	2.3	2.4	Flow	0.442	0.442
Analyzer Coefficient	0.981	1.000	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	0.1	----
as found span	5000	75.0	75.3	73.5	1.024
SO2 scrubber check	5000	14.8	148.0	0.3	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	75.0	75.3	75.4	0.999
second point	5000	40.0	40.2	40.3	0.997
third point	5000	20.0	20.1	20.3	0.989
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	75.0	75.3	74.9	1.005
Average Correction Factor					0.995

Corrected As found	73.4	Previous response	75.1	% change	2.3%
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Notes:

span adjusted, no maintenance done, filter changed out

Calibration Performed By:

Melissa Lemay



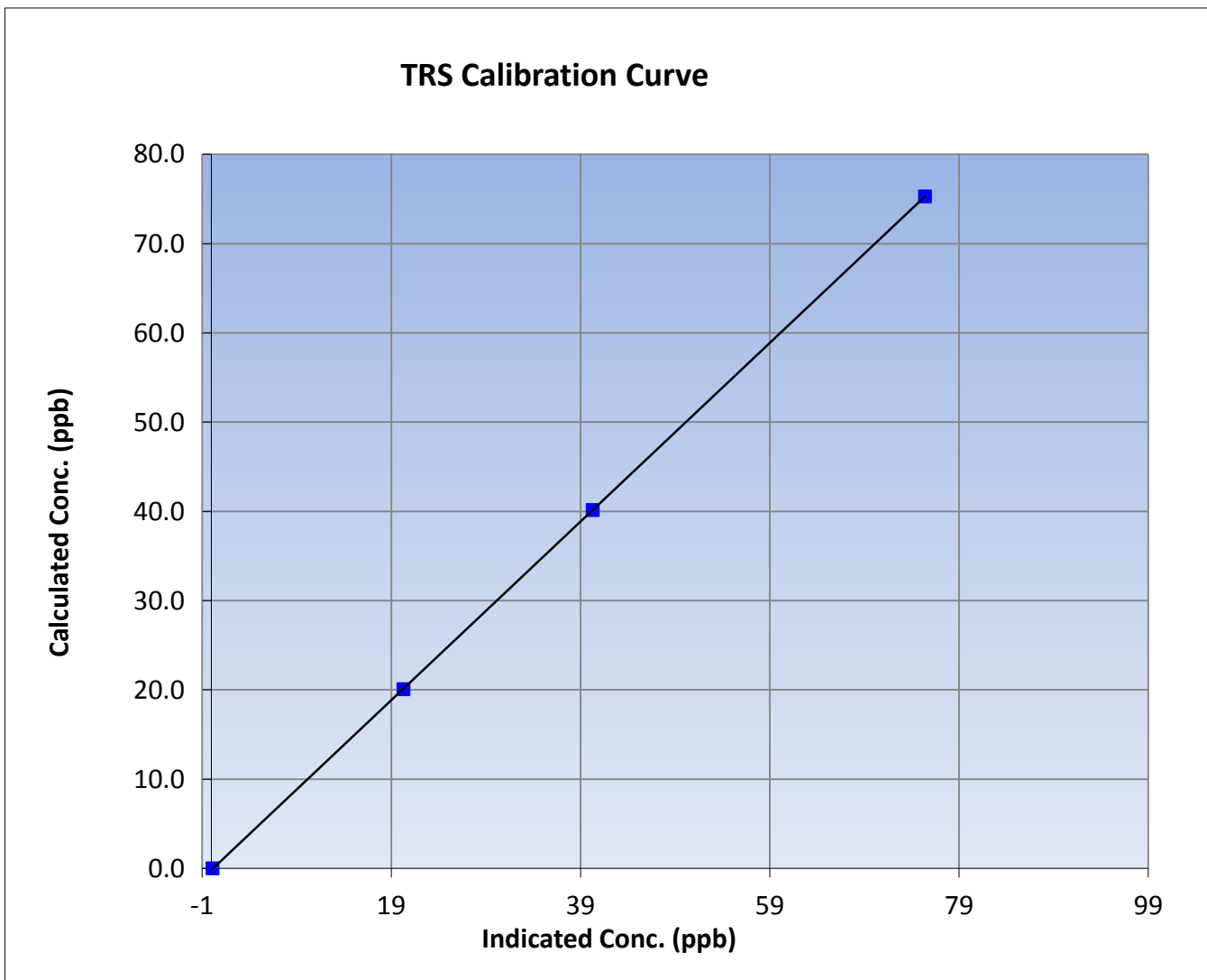
Wood Buffalo Environmental Association TRS Calibration Report

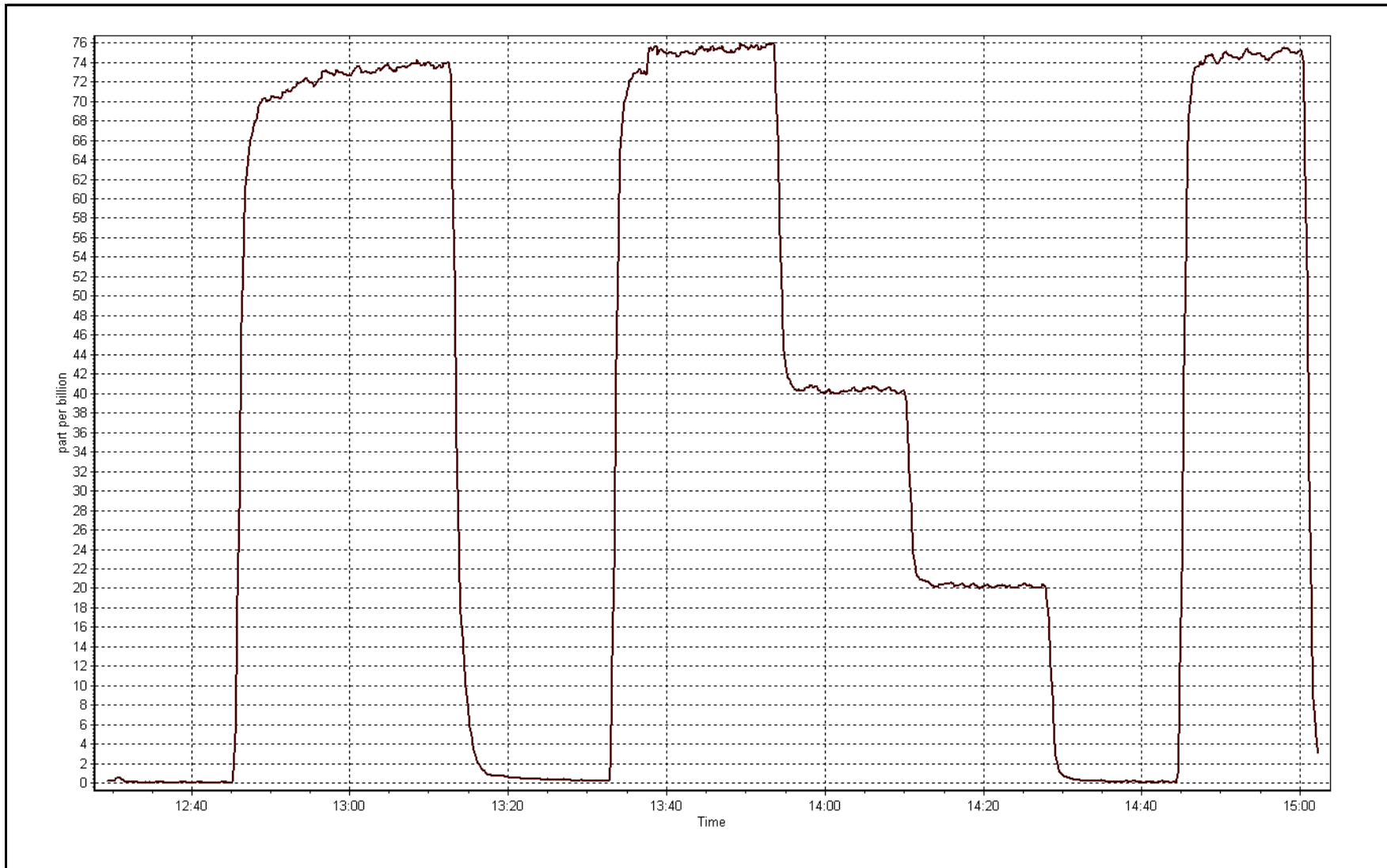
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 25, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	12:30	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	0.1	----	Correlation Coefficient	0.999997
75.3	75.4	0.9987		
40.2	40.3	0.9965	Slope	1.000452
20.1	20.3	0.9892		
			Intercept	-0.155369







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 8, 2016	Last Calibration	October 24, 2016
Station Name	Athabasca Valley	Station Number	AMS 7

Reason: Routine

Start Time (MST)	8:00	End Time (MST)	12:33
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	75.2	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	0.998149	0.996087	Carrier Pressure	35.3	35.3
THC Calc intercept	0.032108	0.038120	Fuel Pressure	45.9	45.9
NMHC Calc slope	1.000083	0.994628	Air Pressure	32.8	32.8
NMHC Calc intercept	0.004049	0.012000			

Analyzer make Thermo 55i Analyzer serial # 1501663728

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	11.66	1.049
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	12.24	12.27	0.997
second point	5000	29.5	6.11	6.06	1.008
third point	5000	14.8	3.06	3.01	1.018
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	12.24	12.22	1.001
Average Correction Factor					1.008

Corrected As found 11.66 Previous response 12.23 % change 4.9%

Notes:

Zero and span adjusted, Nitrogen changed out, Peaks in span chromatogram were lower then Oct 24,2016 chromatogram; After nitrogen change out NMHC span went up to only 3% low

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	6.00	1.078
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	6.47	6.50	0.995
second point	5000	29.5	3.23	3.22	1.003
third point	5000	14.8	1.62	1.61	1.006
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	6.47	6.47	1.000
Average Correction Factor					1.001

Corrected As found 6.00 Previous response 6.46 % change 7.7%

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	5.67	1.017
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	5.77	5.77	1.000
second point	5000	29.5	2.88	2.84	1.014
third point	5000	14.8	1.44	1.40	1.032
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	5.77	5.75	1.003
Average Correction Factor					1.015

Corrected As found 5.67 Previous response 5.76 % change 1.6%



Wood Buffalo Environmental Association

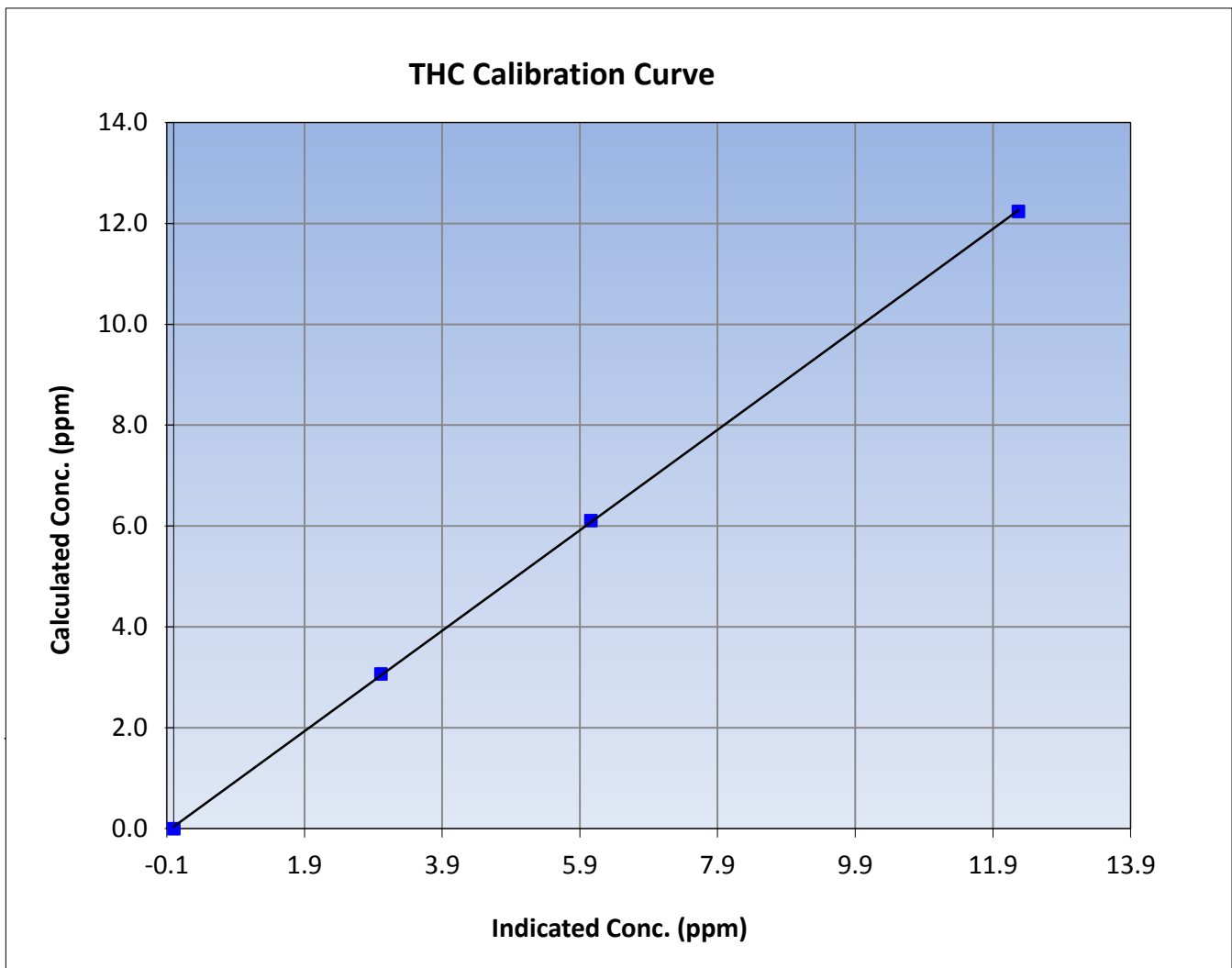
THC Calibration Summary

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 24, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:33
Analyzer make	Thermo 55i	Analyzer serial #	1501663728
		0.528	

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999952
12.24	12.27	0.9973		
6.11	6.06	1.0079	Slope	0.996087
3.06	3.01	1.0181		
			Intercept	0.038120





Wood Buffalo Environmental Association

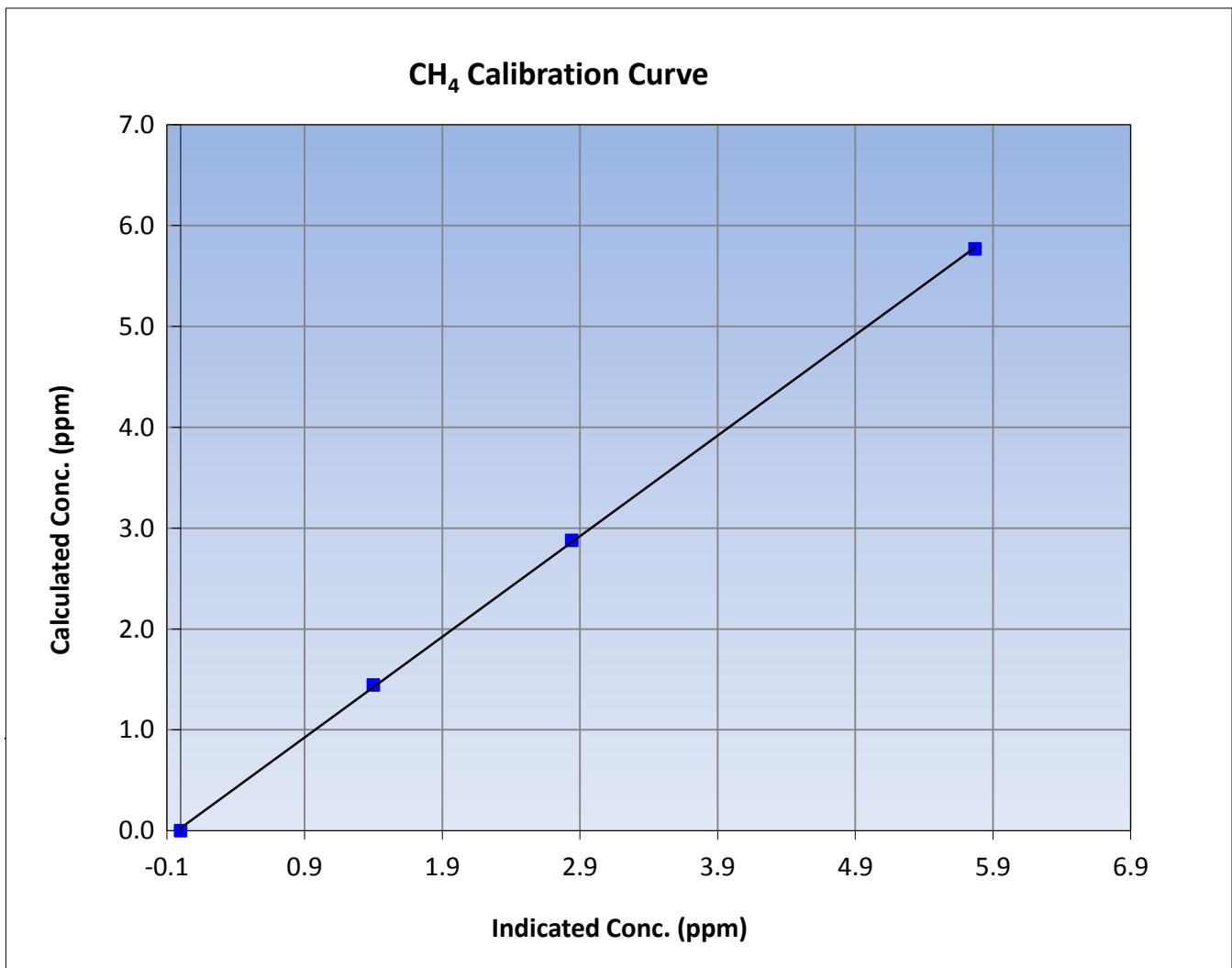
CH₄ Calibration Summary

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 24, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:33
Analyzer make	Thermo 55i	Analyzer serial #	1501663728
		0.528	

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999904
5.77	5.77	0.9997		
2.88	2.84	1.0138	Slope	0.997711
1.44	1.40	1.0318		
			Intercept	0.026189





Wood Buffalo Environmental Association

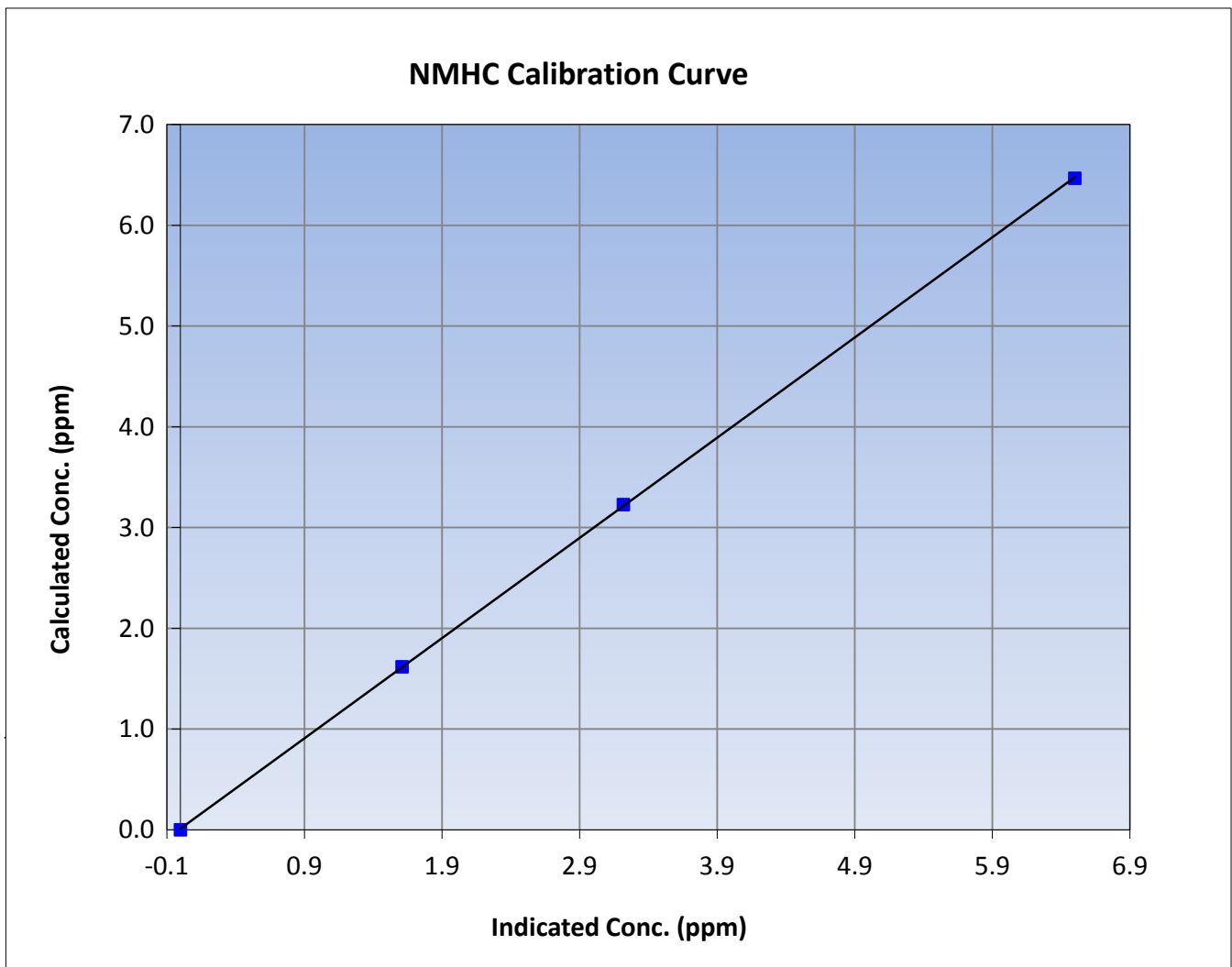
NMHC Calibration Summary

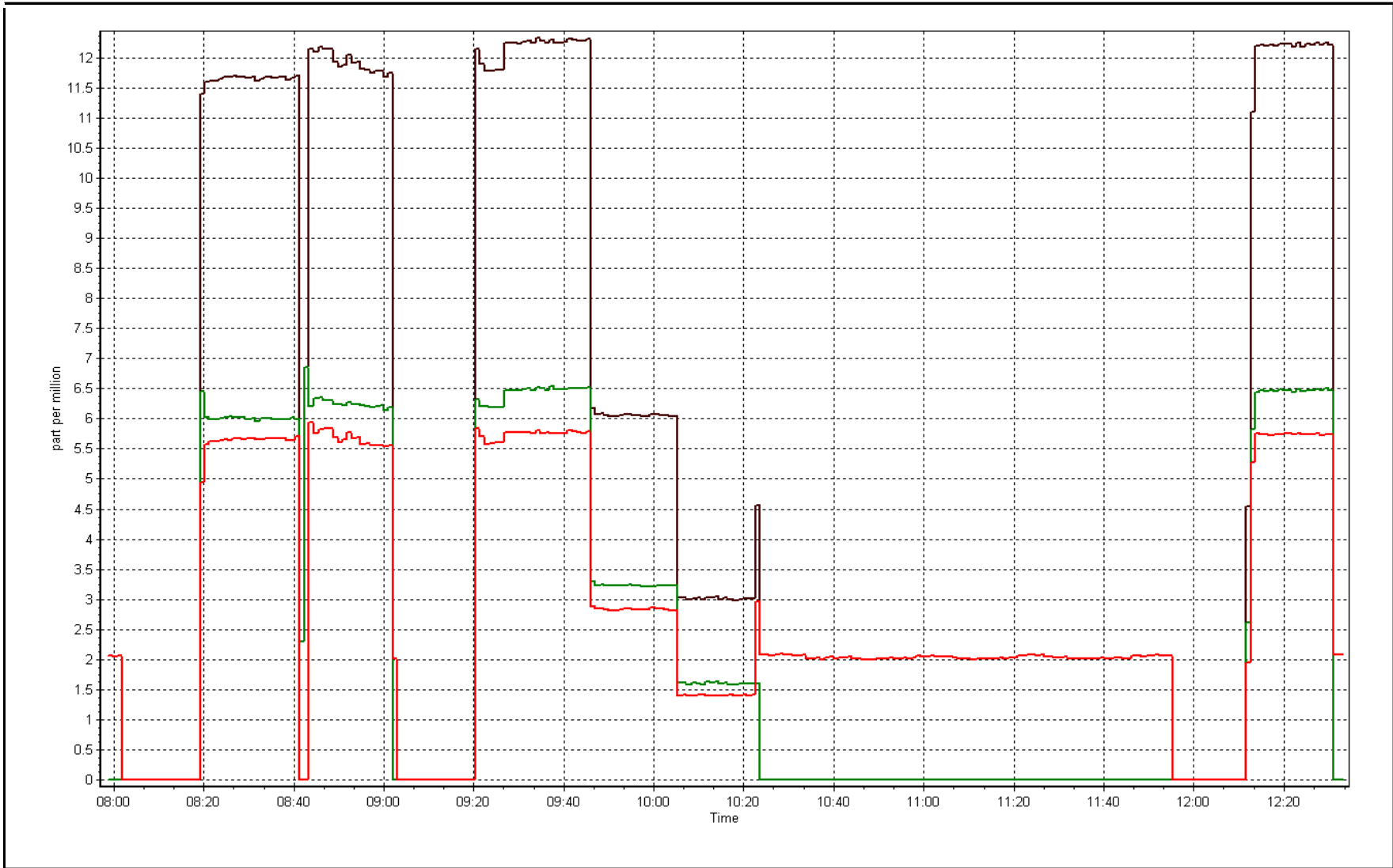
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 24, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:33
Analyzer make	Thermo 55i	Analyzer serial #	1501663728
0.528			

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999980
6.47	6.50	0.9952		
3.23	3.22	1.0027	Slope	0.994628
1.62	1.61	1.0061		
			Intercept	0.012000







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 28, 2016	Last Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7

Reason: Removal

Start Time (MST)	9:35	End Time (MST)	11:00
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	75.2	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	0.996087	1.024970	Carrier Pressure	35.3	35.3
THC Calc intercept	0.038120	0.045460	Fuel Pressure	45.9	45.9
NMHC Calc slope	0.994628	1.075753	Air Pressure	32.9	32.8
NMHC Calc intercept	0.012000	0.010808			

Analyzer make Thermo 55i Analyzer serial # 1501663728

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	11.92	1.027
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	12.24	11.92	1.027
second point	5000	29.5	6.11	5.88	1.039
third point	5000	14.8	3.06	2.91	1.053
as left zero					
as left span					
Average Correction Factor					1.039

Corrected As found 11.92 Previous response 12.25 % change 2.7%

Notes:

Removed to put original Thermo 55i back in

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	6.01	1.076
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	6.47	6.01	1.076
second point	5000	29.5	3.23	2.98	1.083
third point	5000	14.8	1.62	1.49	1.087
as left zero					
as left span					
Average Correction Factor					1.082

Corrected As found 6.01 Previous response 6.49 % change 8.0%

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	5000	0	0.00	0.00	----
as found span	5000	59.1	5.77	5.90	0.978
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	5.77	5.90	0.978
second point	5000	29.5	2.88	2.90	0.993
third point	5000	14.8	1.44	1.43	1.010
as left zero					
as left span					
Average Correction Factor					0.994

Corrected As found 5.90 Previous response 5.76 % change -2.5%



Wood Buffalo Environmental Association

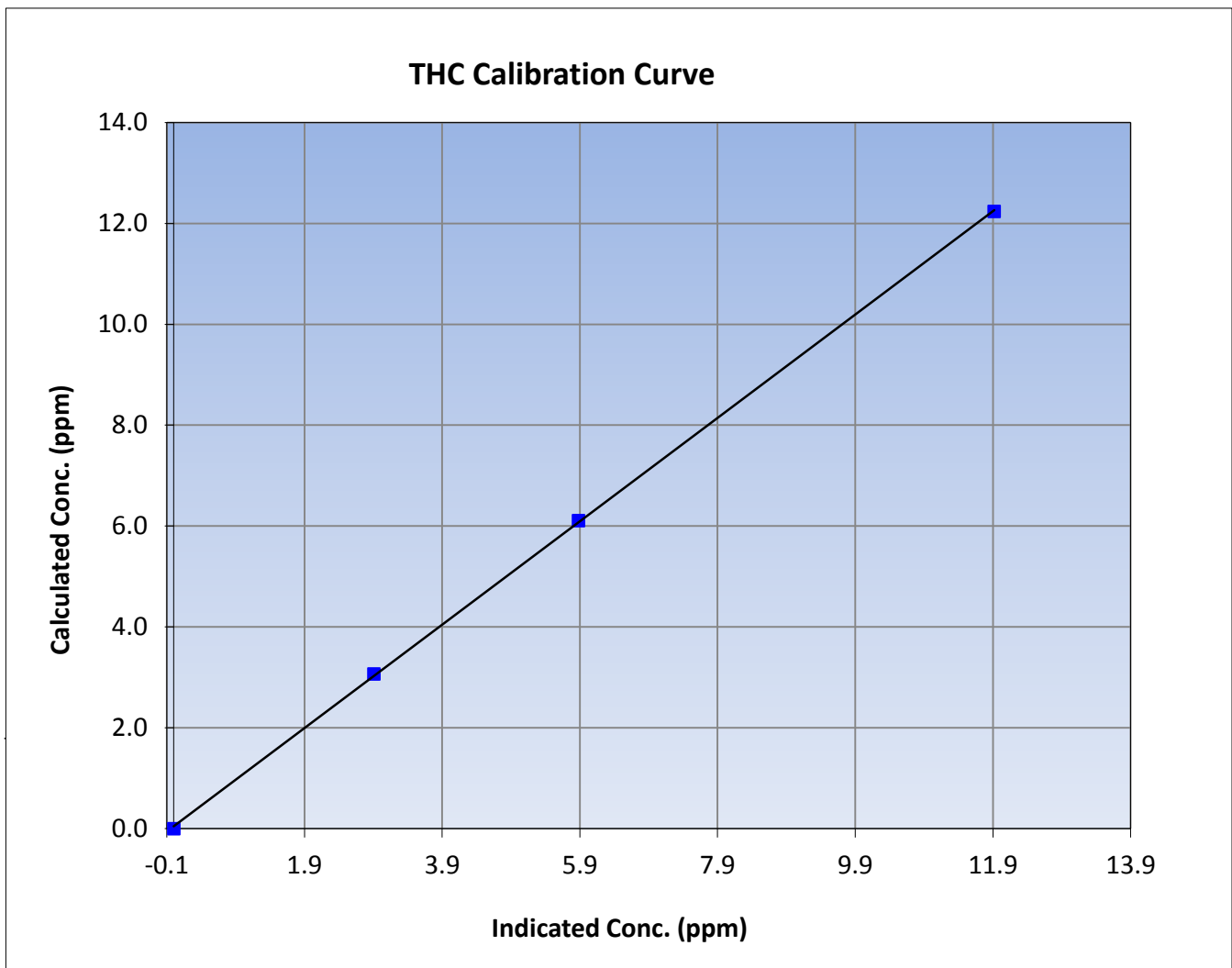
THC Calibration Summary

Station Information

Calibration Date	November 28, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	11:00
Analyzer make	Thermo 55i	Analyzer serial #	1501663728
		0.528	

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999935
12.24	11.92	1.0266		
6.11	5.88	1.0388	Slope	1.024970
3.06	2.91	1.0530		
			Intercept	0.045460





Wood Buffalo Environmental Association

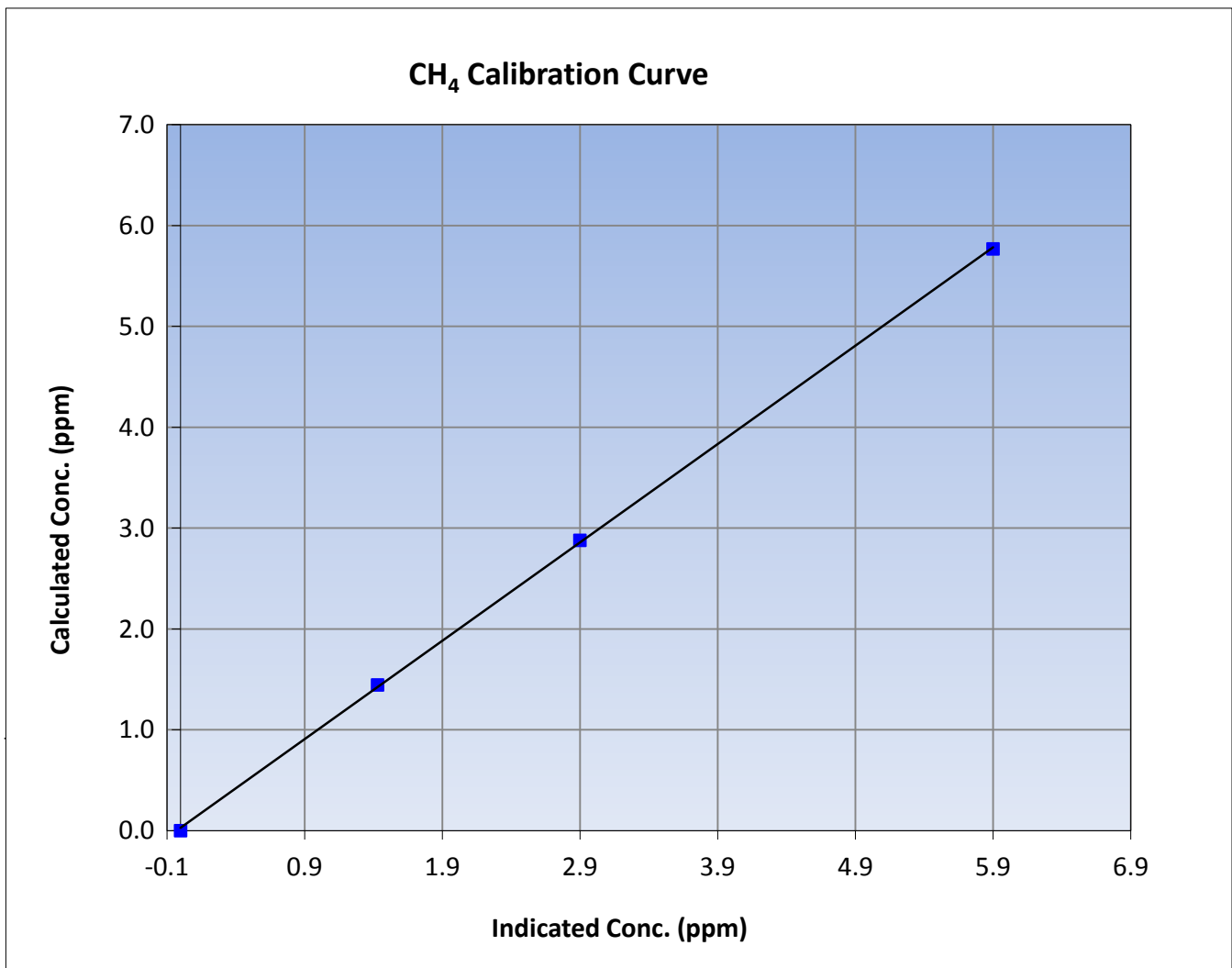
CH₄ Calibration Summary

Station Information

Calibration Date	November 28, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	11:00
Analyzer make	Thermo 55i	Analyzer serial #	1501663728
		0.528	

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999891
5.77	5.90	0.9777		
2.88	2.90	0.9928	Slope	0.975702
1.44	1.43	1.0101		
			Intercept	0.027601





Wood Buffalo Environmental Association

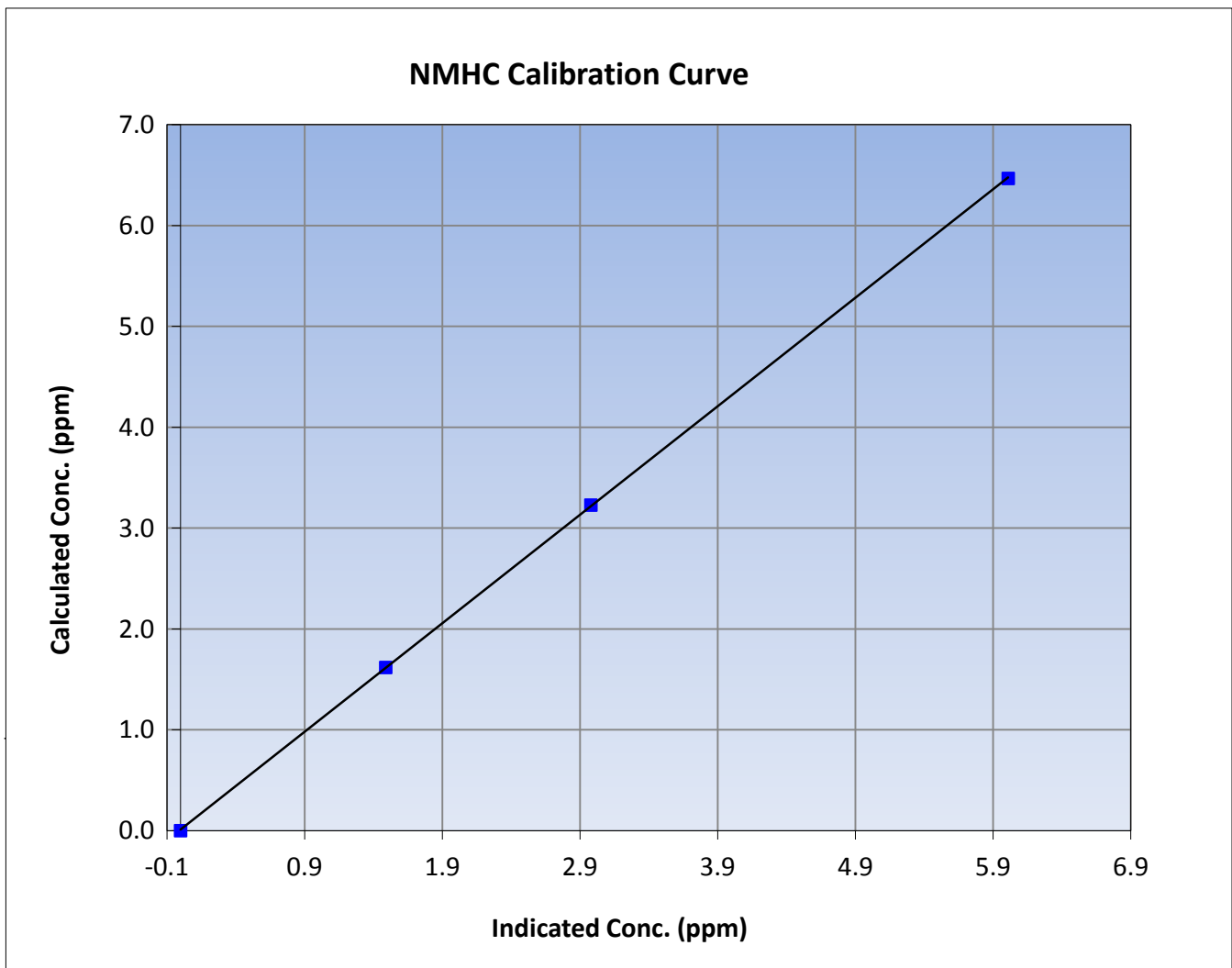
NMHC Calibration Summary

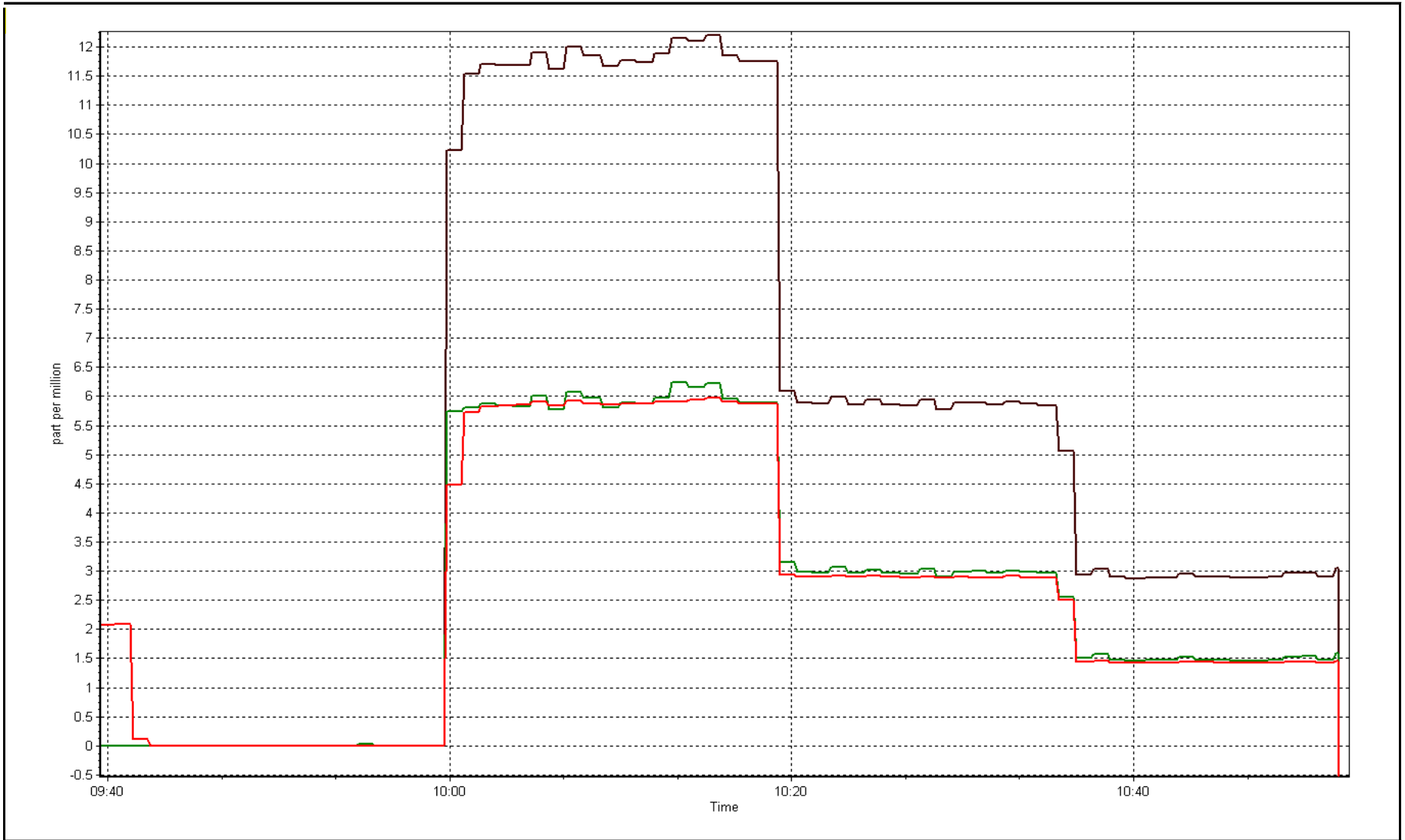
Station Information

Calibration Date	November 28, 2016	Previous Calibration	November 8, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	11:00
Analyzer make	Thermo 55i	Analyzer serial #	1501663728
0.528			

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999984
6.47	6.01	1.0763		
3.23	2.98	1.0835	Slope	1.075753
1.62	1.49	1.0872		
			Intercept	0.010808







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 28, 2016	Last Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Install		
Start Time (MST)	9:35	End Time (MST)	13:15
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	75.2	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	Carrier Pressure	35.9	35.9
THC Calc intercept		-0.039822	Fuel Pressure	44.7	44.7
NMHC Calc slope		1.004502	Air Pressure	25.9	25.9
NMHC Calc intercept		-0.043594			

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					
as found span					
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	12.24	12.23	1.001
second point	5000	29.5	6.11	6.15	0.993
third point	5000	14.8	3.06	3.14	0.976
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	12.24	12.25	0.999
Average Correction Factor					0.990

Corrected As found NA Previous response NA % change NA

Notes:

Installed- putting original back in, fixed at the FOC

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					
as found span					
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	59.1	6.47	6.46	1.001
second point	5000	29.5	3.23	3.28	0.984
third point	5000	14.8	1.62	1.70	0.953
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	59.1	6.47	6.46	1.001
Average Correction Factor					0.980

Corrected As found NA Previous response NA % change NA

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					
as found span					
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	5.80	0.995
Average Correction Factor					1.001

Corrected As found NA Previous response NA % change NA



Wood Buffalo Environmental Association

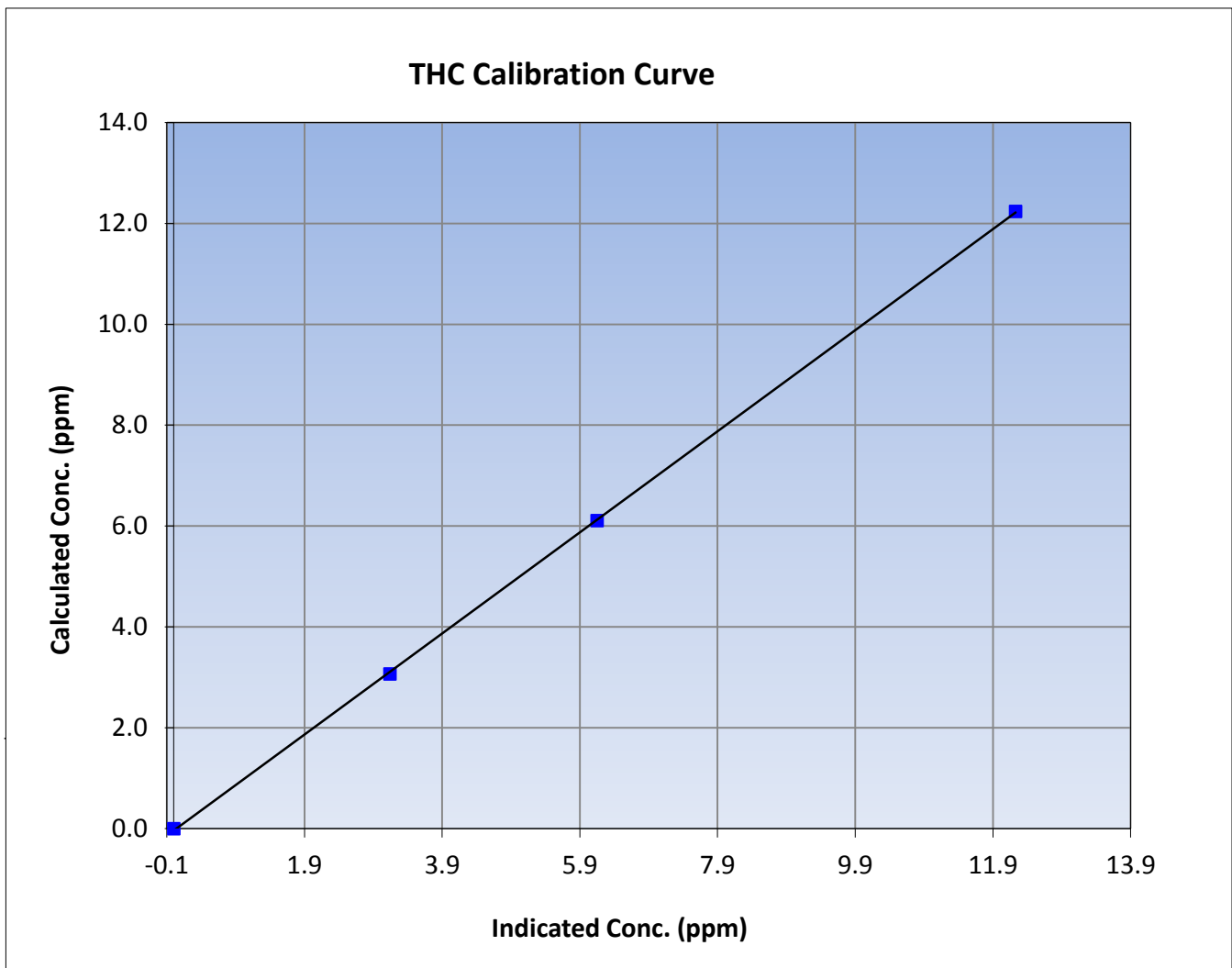
THC Calibration Summary

Station Information

Calibration Date	November 28, 2016	Previous Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	13:15
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	0.999951
12.24	12.23	1.0005		
6.11	6.15	0.9932	Slope	1.002242
3.06	3.14	0.9759		
			Intercept	-0.039822





Wood Buffalo Environmental Association

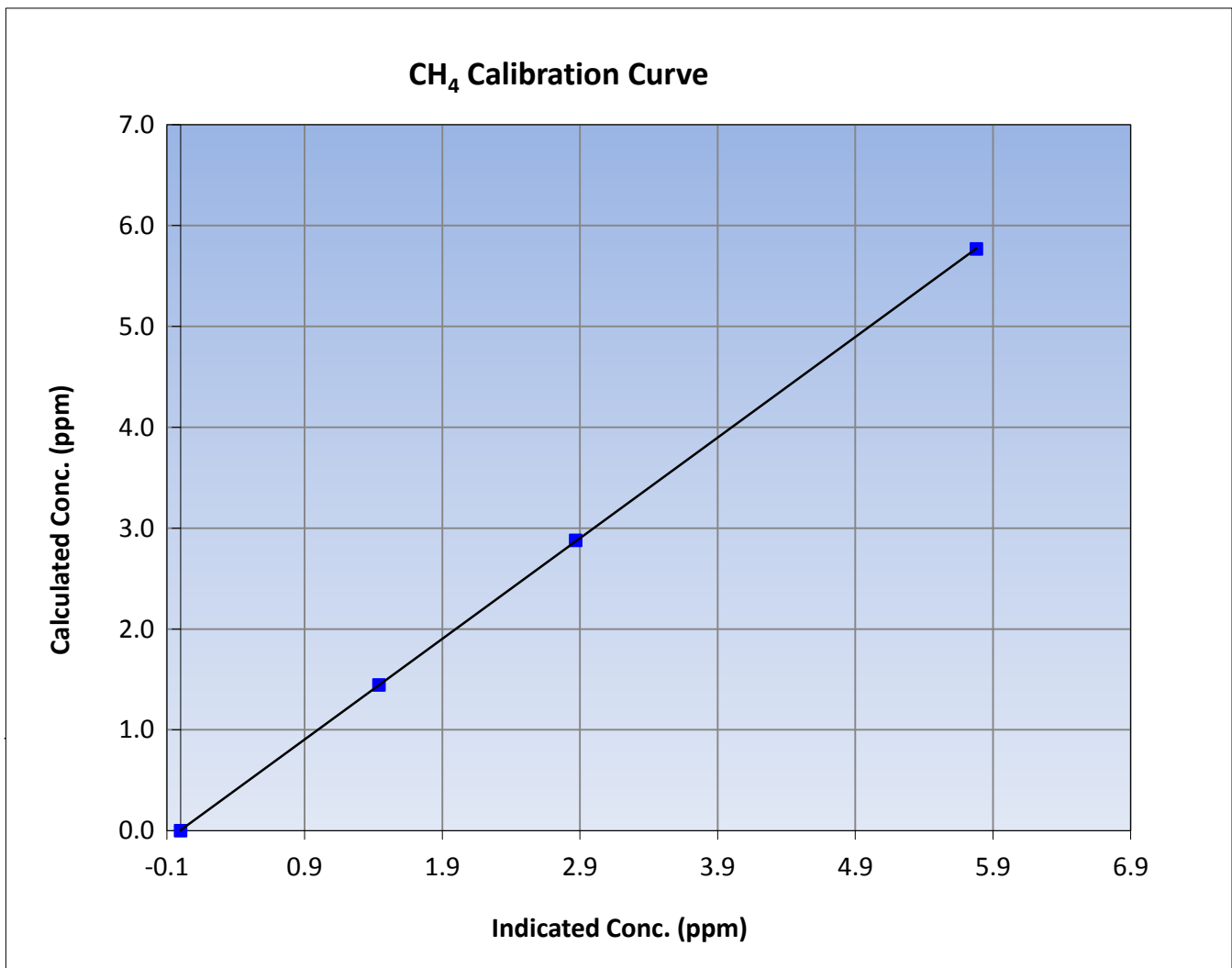
CH₄ Calibration Summary

Station Information

Calibration Date	November 28, 2016	Previous Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	13:15
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

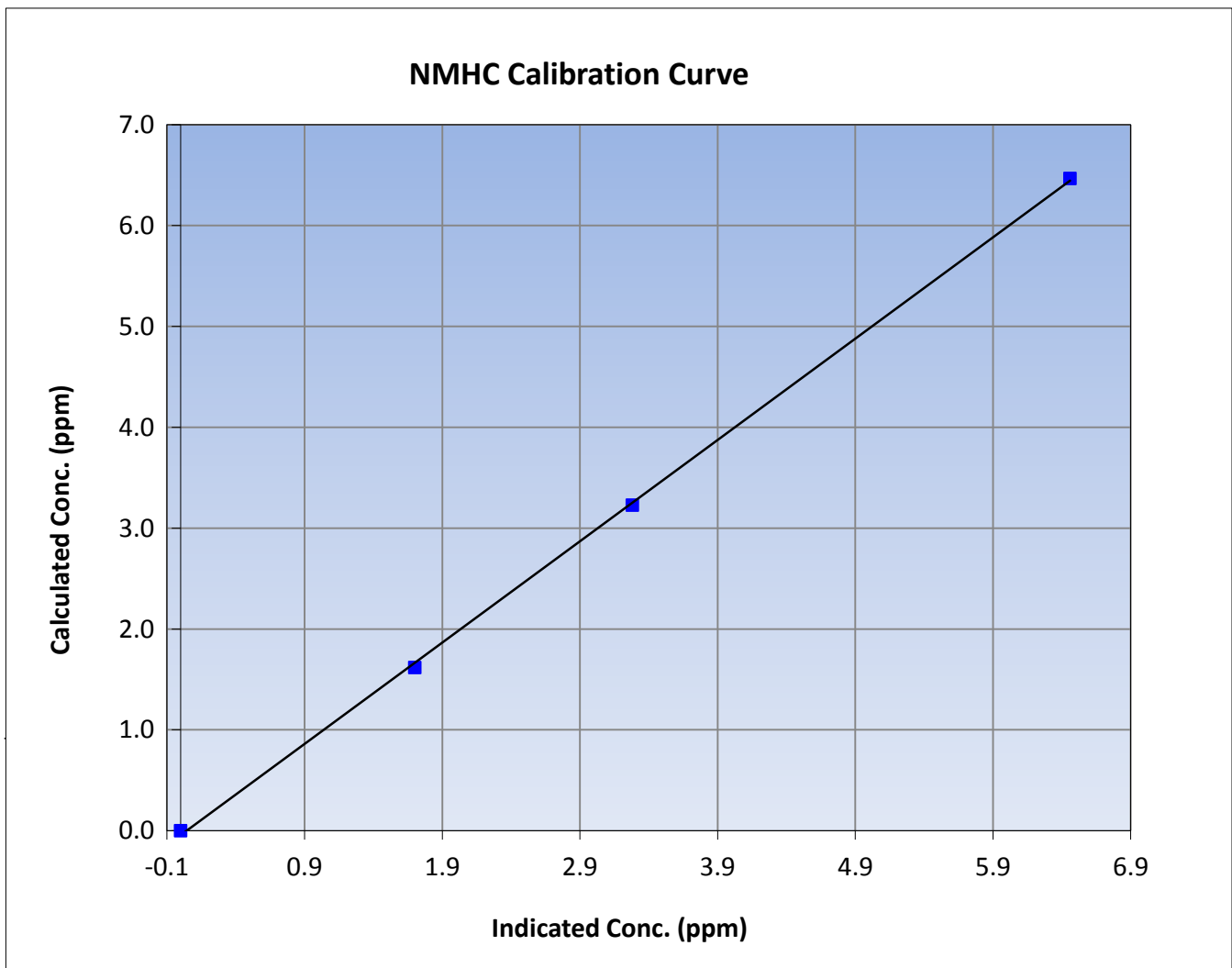
NMHC Calibration Summary

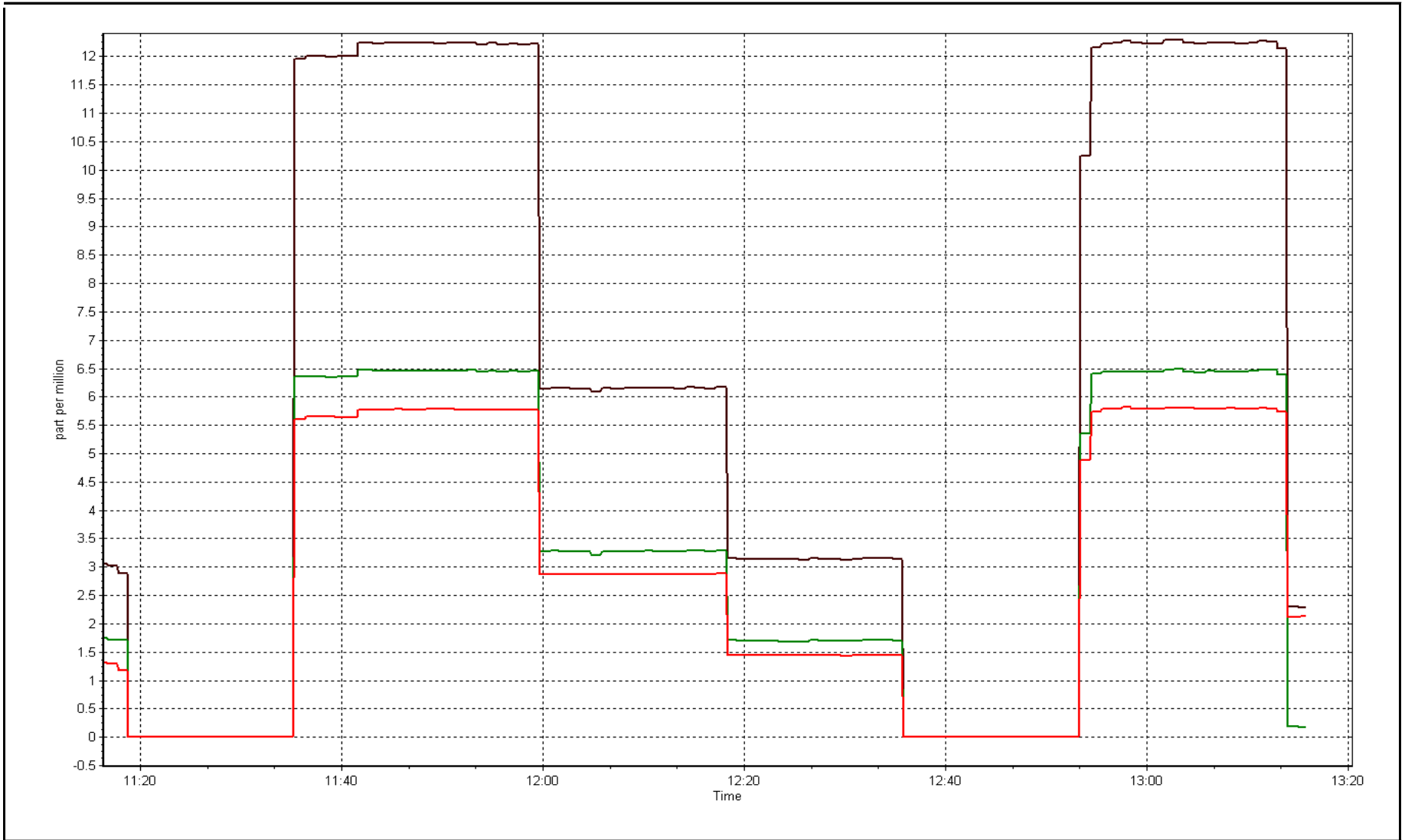
Station Information

Calibration Date	November 28, 2016	Previous Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	13:15
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	0.999786
6.47	6.46	1.0013		
3.23	3.28	0.9844	Slope	1.004502
1.62	1.70	0.9529		
			Intercept	-0.043594







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 25, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	13:26
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.	26.5	26.9
Analyzer IP address	192.168.1.48		Lamp temp.	67.8	67.9
Calculated slope	0.994233	0.998019	Pressure	705.6	731.2
Calculated intercept	0.338047	-0.776129	Flow cell A	0.751	0.769
Analyzer Background	-2.0	-2.2	Flow cell B	0.771	0.783
Analyzer Coefficient	1.056	1.027	Cell A Intensity	62731	112680
			Cell B Intensity	55714	97494

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	-0.1	----
as found span	5000	995.40	400.0	411.1	0.973
calibrator zero	5000	0.00	0.0	0.1	----
high point	5000	994.20	400.0	401.2	0.997
second point	5000	842.70	200.0	201.6	0.992
third point	5000	750.90	100.0	101.6	0.984
as left zero	5000	0.00	0.0	0.3	----
as left span	5000	994.10	400.0	404.1	0.990
Average Correction Factor					0.991

Corrected As found	411.2	Previous response	402.0	% change	-2.2%
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Notes:

Lamp was peaked, and Bench lamp settings adjusted, filter changed out, zero and span adjusted

Calibration Performed By: Melissa Lemay



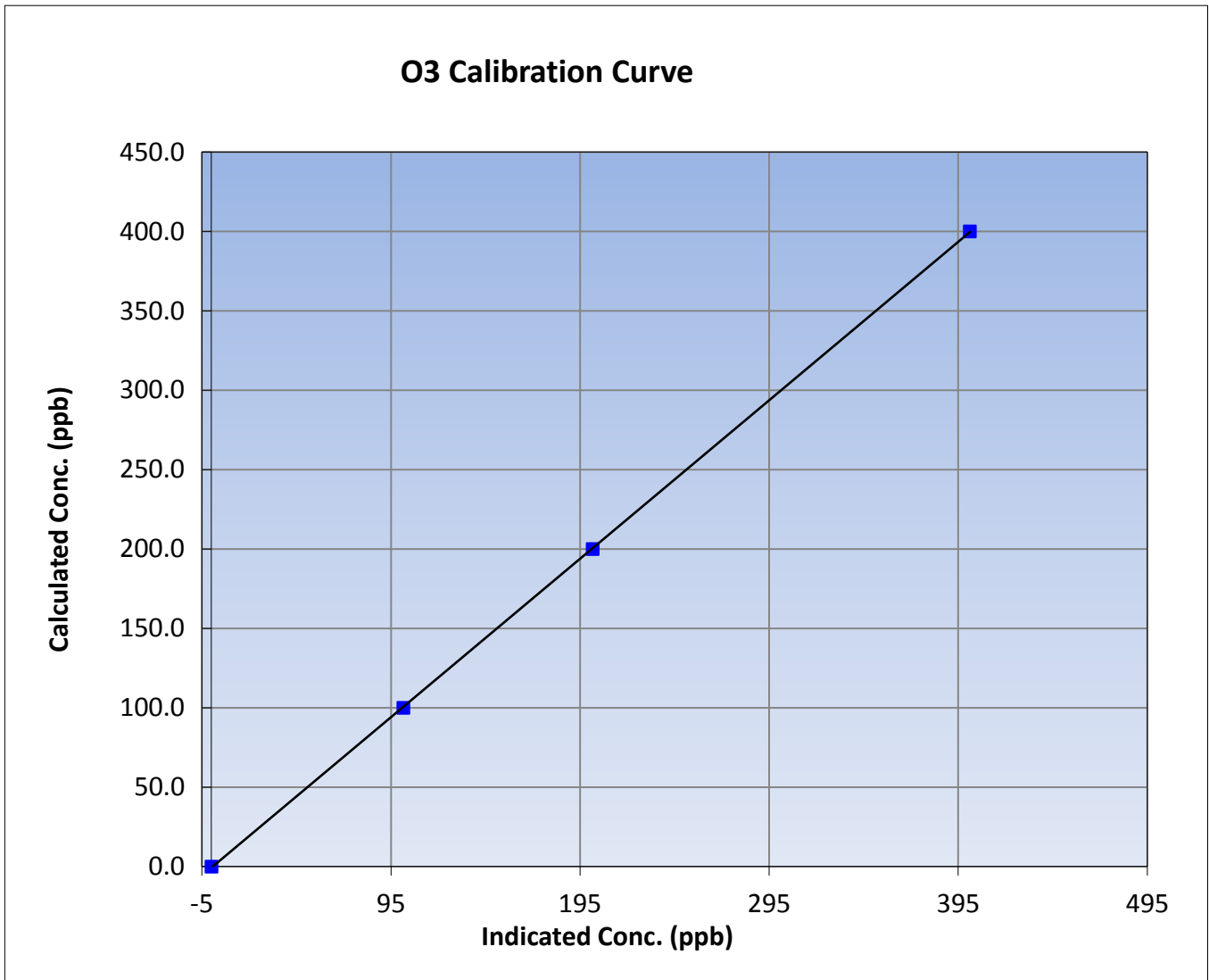
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	November-09-16	Previous Calibration	October 25, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:05	End Time (MST)	13:26
Analyzer make	TEI 49i	Analyzer serial #	1507964700

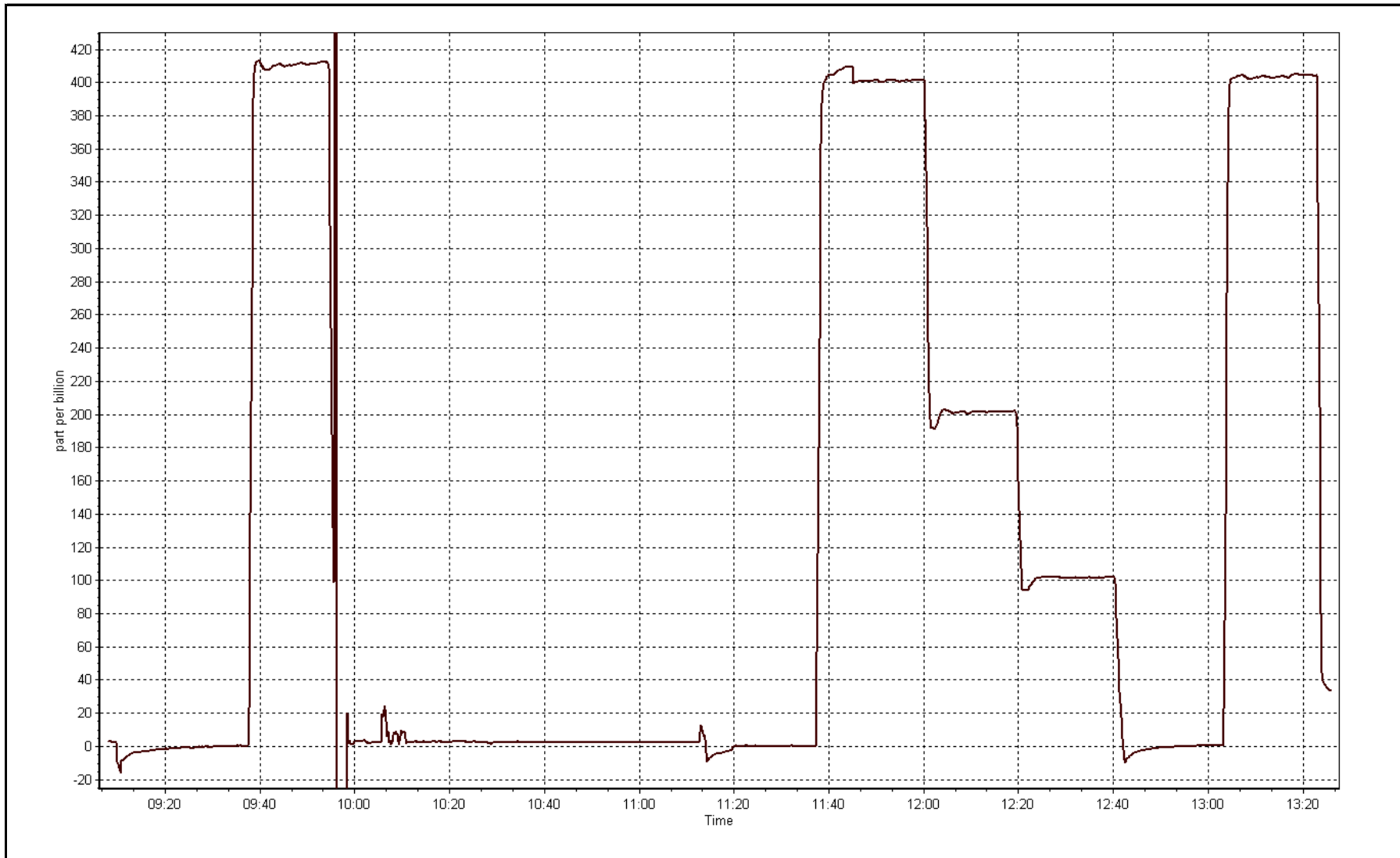
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999987
400.0	401.2	0.9970		
200.0	201.6	0.9921	Slope	0.998019
100.0	101.6	0.9843		
			Intercept	-0.776129



O3 Calibration Plot

Date: November 9, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 11, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:00	End Time (MST)	12:34
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	0.990161	0.991919	1.003930
	Data Offset	1.134571	1.414138	-0.493852
Current Calibration	Data Slope	0.994290	0.995250	1.002736
	Data Offset	0.938858	1.158864	-0.204368

Analyzer Information

Analyzer make/model	Thermo 42C	Analyzer serial #	601114773
---------------------	------------	-------------------	-----------

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	49.8	Deg C	49.6	Deg C
Moly Temp	323	Deg C	323	Deg C
PMT voltage	-784	V	-784	V
PMT Temp	-3.5	Deg C	-3.5	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	135.4	mmHg	135.6	mmHg
R Cell Press Nox	135.4	mmHg	135.6	mmHg
NO sample flow	0.910	lpm	0.909	lpm
Nox sample Flow	0.910	lpm	0.909	lpm

Notes:

No adjustments or maintenance done, filter changed out



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 8, 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	0.0	0.3	----	----
as found span	5000	59.1	600.5	600.5	0.0	602.1	600.2	1.9	0.9973	1.0004
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	0.0	0.3	----	----
high point	5000	59.1	600.5	600.5	0.0	603.5	602.7	0.9	0.9950	0.9963
second point	5000	29.5	299.7	299.7	0.0	300.0	299.5	0.4	0.9991	1.0007
third point	5000	14.8	150.4	150.4	0.0	149.1	148.7	0.5	1.0085	1.0112
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	193.6	406.9	601.2	190.5	410.6	0.9988	1.0163
Average Correction Factor									1.0008	1.0027

Corrcted As found NO_x= 601.9 NO= 600.2 Percent Change NO_x= 0.6% NO= 0.6%
 Previous Response NO_x= 605.3 NO= 603.9

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	603.9	603.5	0.3	0.9943	0.9950	----	----
1st NO2 (300)	193.6	409.9	602.8	193.6	409.1	0.9961	----	1.0020	99.8%
2nd NO2 (200)	408.2	195.3	603.0	408.2	194.7	0.9958	----	1.0031	99.7%
3rd NO2 (100)	506.8	96.7	603.4	506.8	96.7	0.9951	----	1.0000	100.0%
2nd NO ref point		0.0	603.1	603.3	-0.1	0.9956	0.9953	----	----
Average Correction Factor						0.9957		1.0017	99.8%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

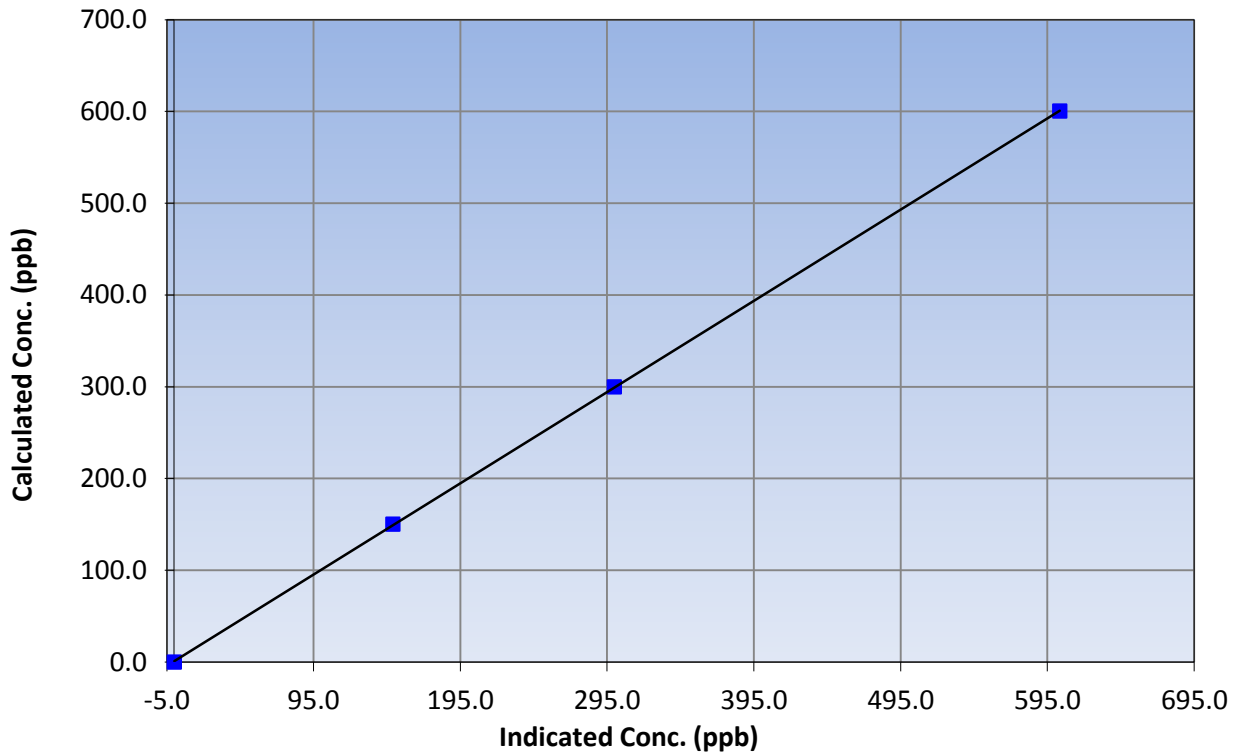
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 11, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:34
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	0.999984
600.5	603.5	0.9950		
299.7	300.0	0.9991	Slope	0.994290
150.4	149.1	1.0085		
			Intercept	0.938858

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

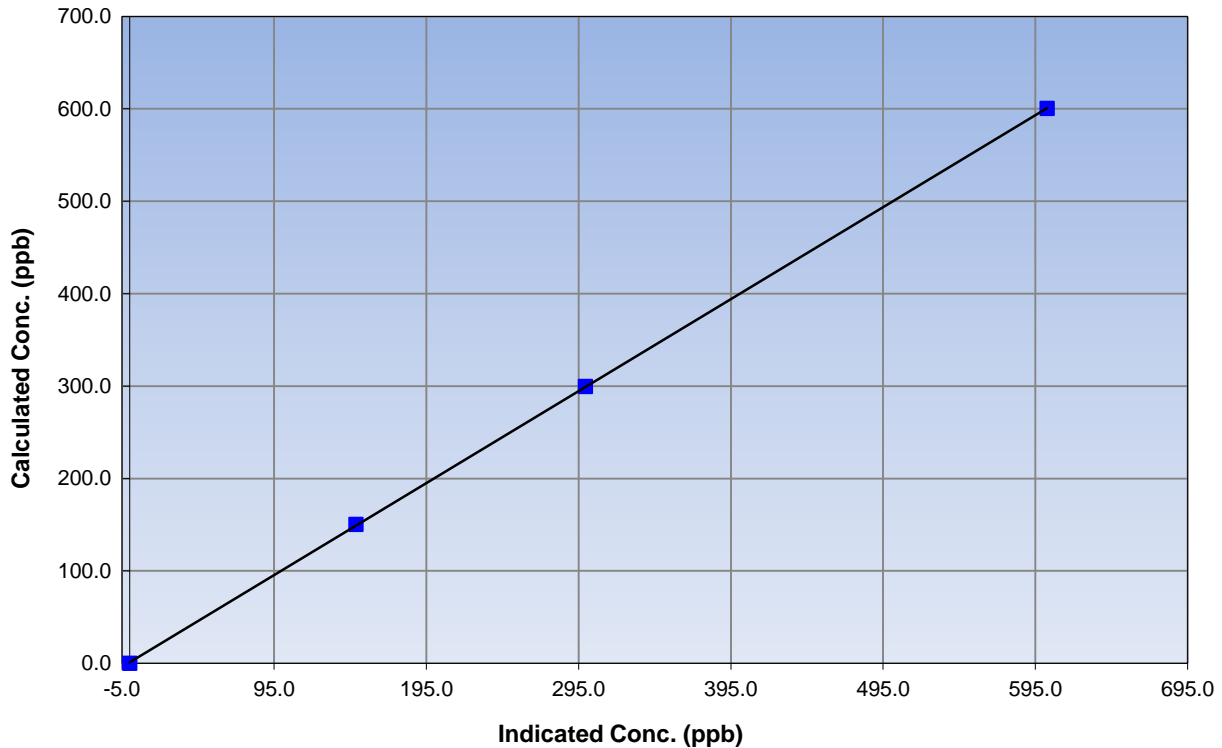
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 11, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:34
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	0.999983
600.5	602.7	0.9963		
299.7	299.5	1.0007	Slope	0.995250
150.4	148.7	1.0112		
			Intercept	1.158864

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

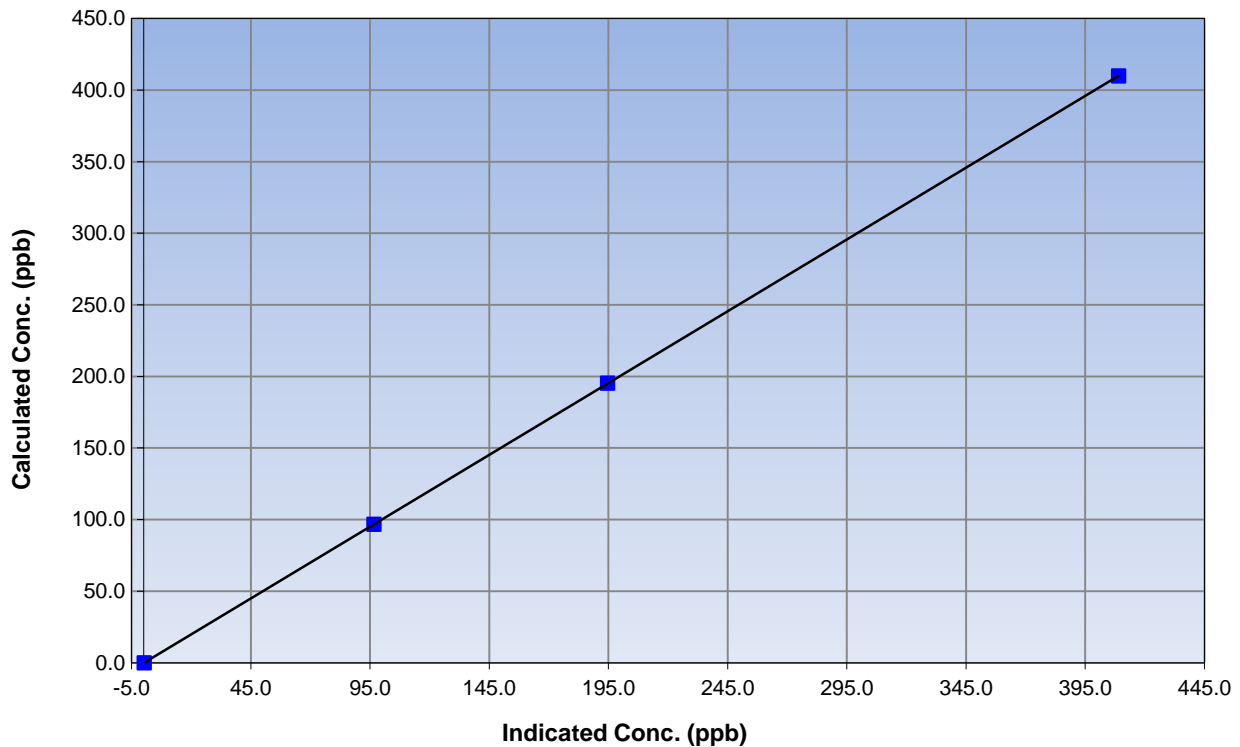
Station Information

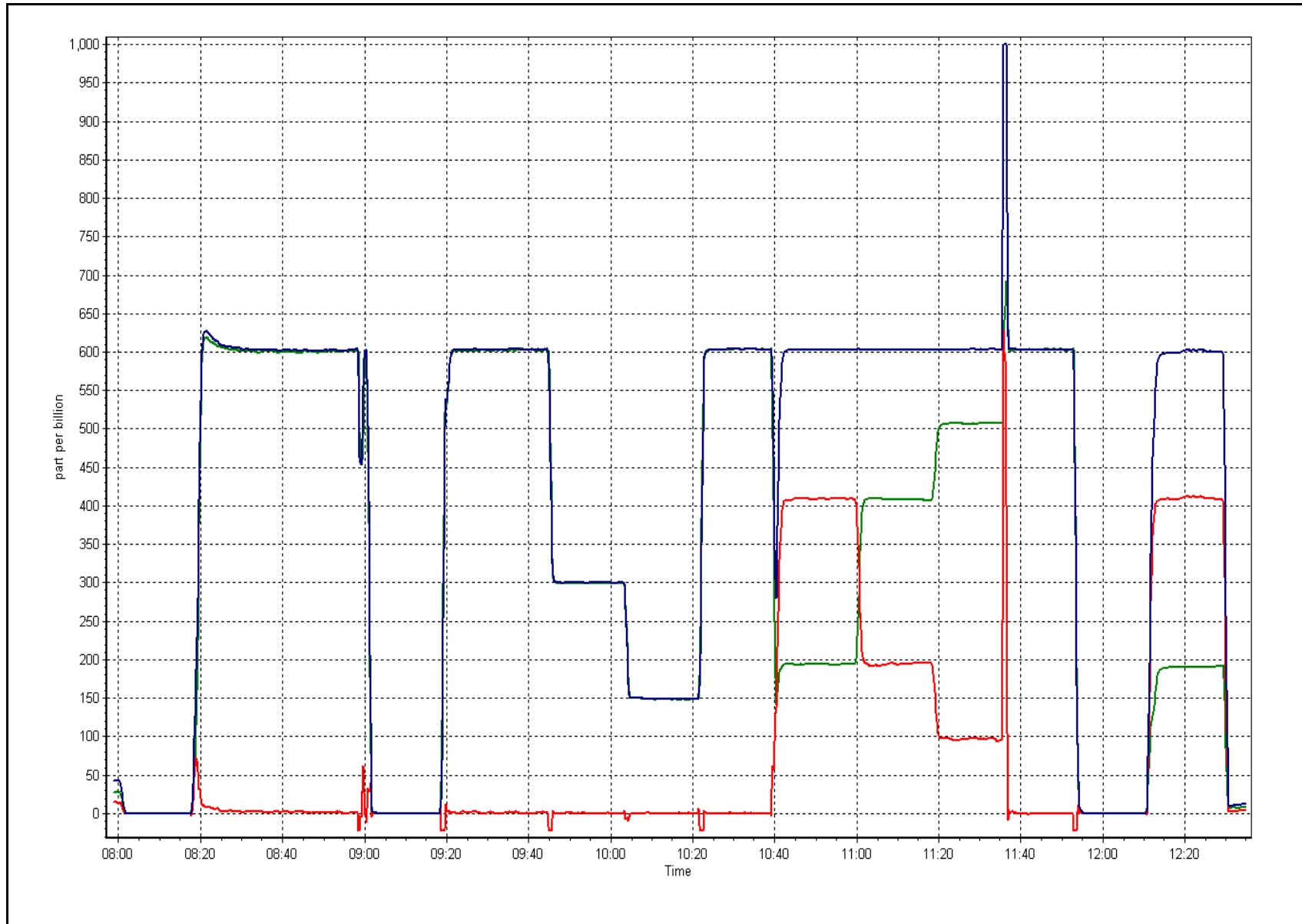
Calibration Date	November 8, 2016	Previous Calibration	October 11, 2016
Station Number	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:00	End Time (MST)	12:34
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999999
409.9	409.1	1.0020		
195.3	194.7	1.0031		
96.7	96.7	1.0000		
			Slope	1.002736
			Intercept	-0.204368

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:	November 7, 2016	Last Cal Date:	October 25, 2016
Start time (MST):	13:17	End time (MST):	14:28
Sharp Model:	Thermo 5030	S/N:	E515
Particulate Fraction:	PM2.5	C14 Source S/N:	3256
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)	9	7.6	9	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	988	985	988	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1000	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-1.1	-----	0	<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

				Tolerance
Leak Test:	Date of check:	<u>Sep 22,2016</u>	Last Cal Date:	<u>July 22,2016</u>
	Flow w/o adaptor:	<u>16.66</u>	Flow w/ adaptor:	<u>16.25</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)				<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, zero adjusted

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:	November 19, 2016	Last Cal Date:	November 7, 2016
Start time (MST):	11:15	End time (MST):	13:25
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)	-6	-6.5	-6	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	996	990	996	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	995	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	2.1	-----	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

				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: SHARP had flat lined since 16:00 MST on Nov 18. Filter tape had broken off. Completed audit post fixing the issue. Adjusted nephelometer zero. Leak check completed; passed.

Calibration by: Asad Hidayat



Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	November 7, 2016	Last Calibration	October 4, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	10:30	End Time (MST)	13:12
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.	48.0	48.0
Analyzer IP address	192.168.1.48		Pressure	733.1	733.1
Calculated slope	0.999437	0.998683	Flow	0.494	0.494
Calculated intercept	-0.175006	-0.011606	Intensity	199688	199688
Analyzer Background	6.045	6.609	S/R ratio	1.170207	1.170207
Analyzer Coefficient	1.065	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	0.4	----
as found span	5000	69.7	41.4	41.7	0.993
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	69.7	41.4	41.4	0.999
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	41.3	1.001
Average Correction Factor					0.997

Corrected As found 41.3 Previous response 41.6 % change 0.7%

Notes:

Inlet filter changed. No maintenance done, Zero and span adjusted

Calibration Performed By: Melissa Lemay



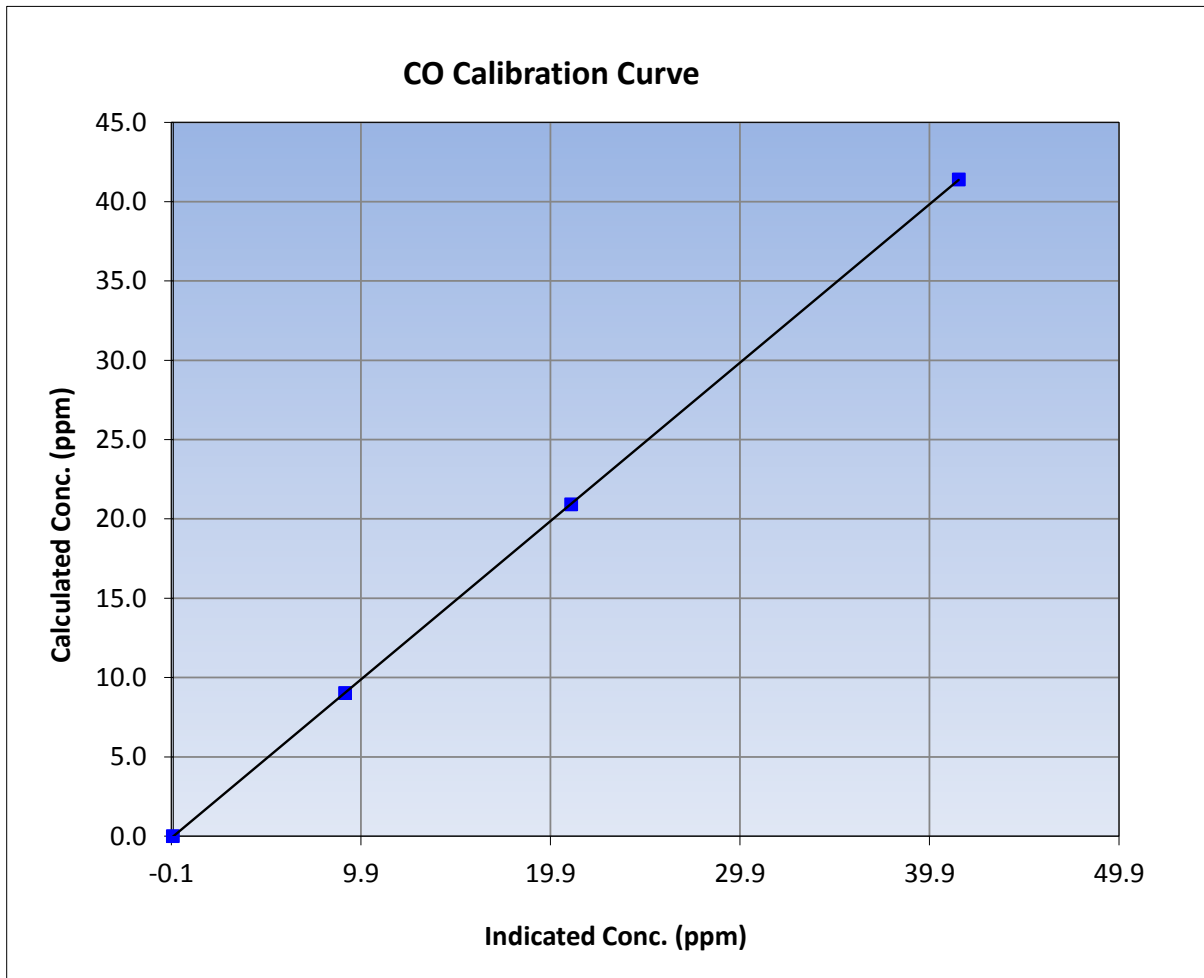
Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	November 7, 2016	Previous Calibration	October 4, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	10:30	End Time (MST)	13:12
Analyzer make	Thermo 48i-TLE	Analyzer serial #	1408761381

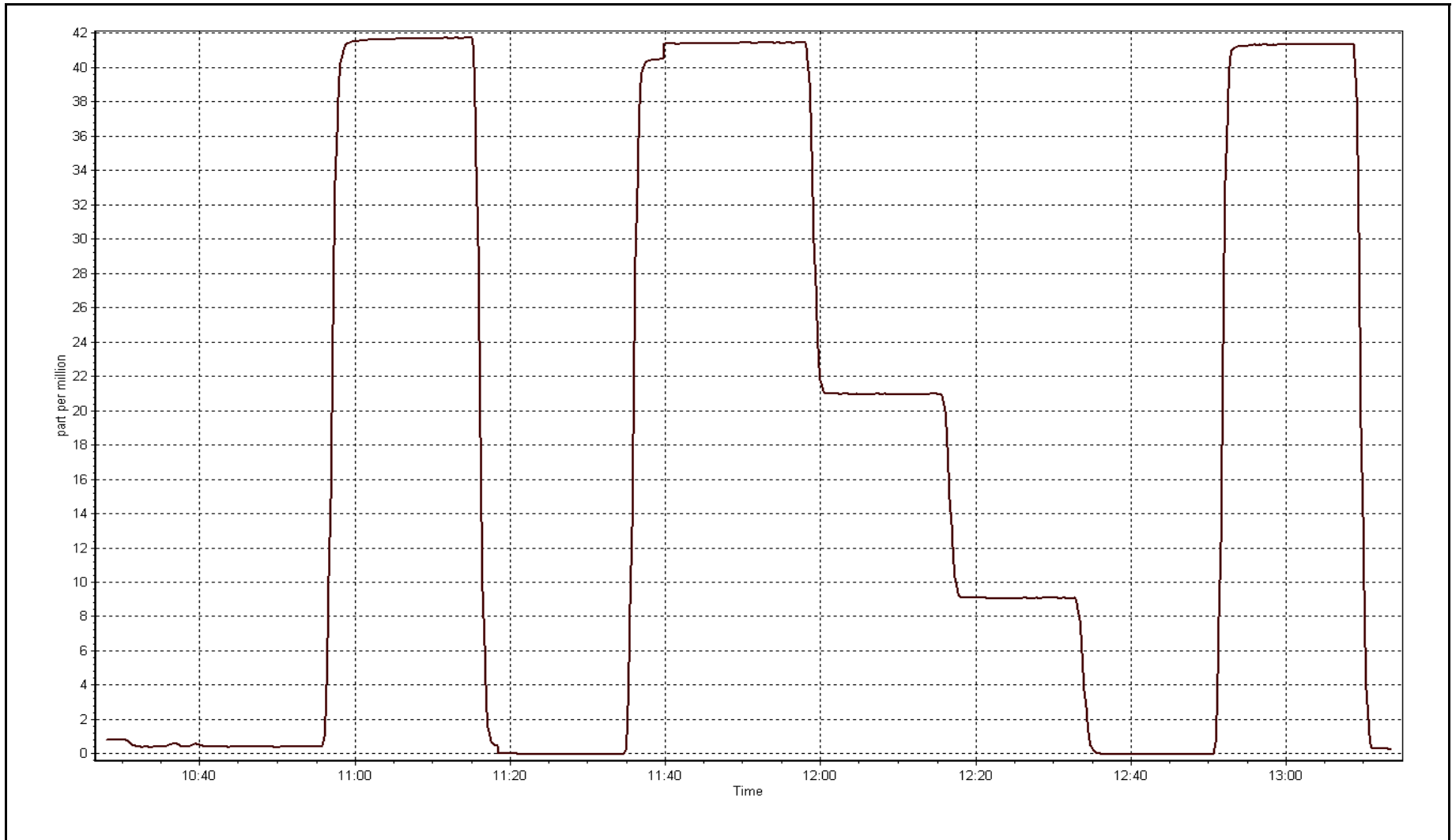
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999995
41.4	41.4	0.9991		
20.9	21.0	0.9957	Slope	0.998683
9.0	9.1	0.9966		
			Intercept	-0.011606



CO Calibration Plot

Date: November 7, 2016





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

December 22, 2016



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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	720	0	0	100.00	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	720	-	-	2.54	-	-	-	-	-	-	-
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



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	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	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	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	0	0.9	4
5-Nov	5	3	2	Z	4	4	4	4	4	7	7	4	4	3	4	4	4	4	5	2	1	1	0	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	0.0	0
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	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	0	1	0	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	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	0.0	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	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	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	0.0	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	0.0	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	0.0	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	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	0	1	3	1	0	0.3	3
23-Nov	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	2	2	0	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	0	1	2	6	6	1	0	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	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	0.0	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	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	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	0	2	3	11	0.7	11
30-Nov	5	4	4	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.8	5

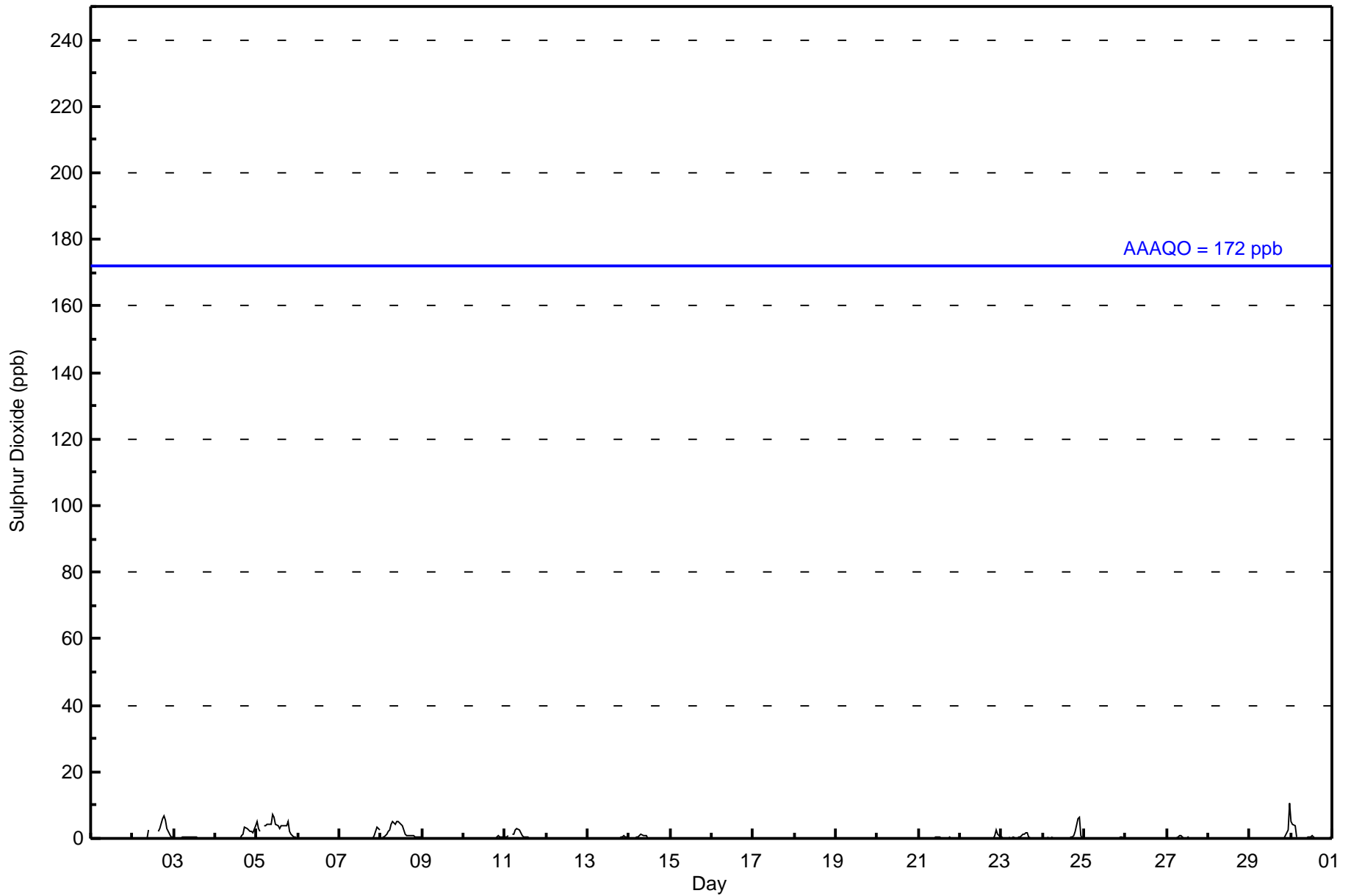
0.5	0.3	0.3	0.1	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.4	0.4	0.3	0.3	0.4	0.3	0.5	0.6	0.5	0.6	0.6	0.4	0.7	Diurnal Average	
5	4	4	1	4	4	4	4	5	4	7	7	4	4	3	4	4	4	6	7	6	6	6	3	11	Diurnal Maximum	

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

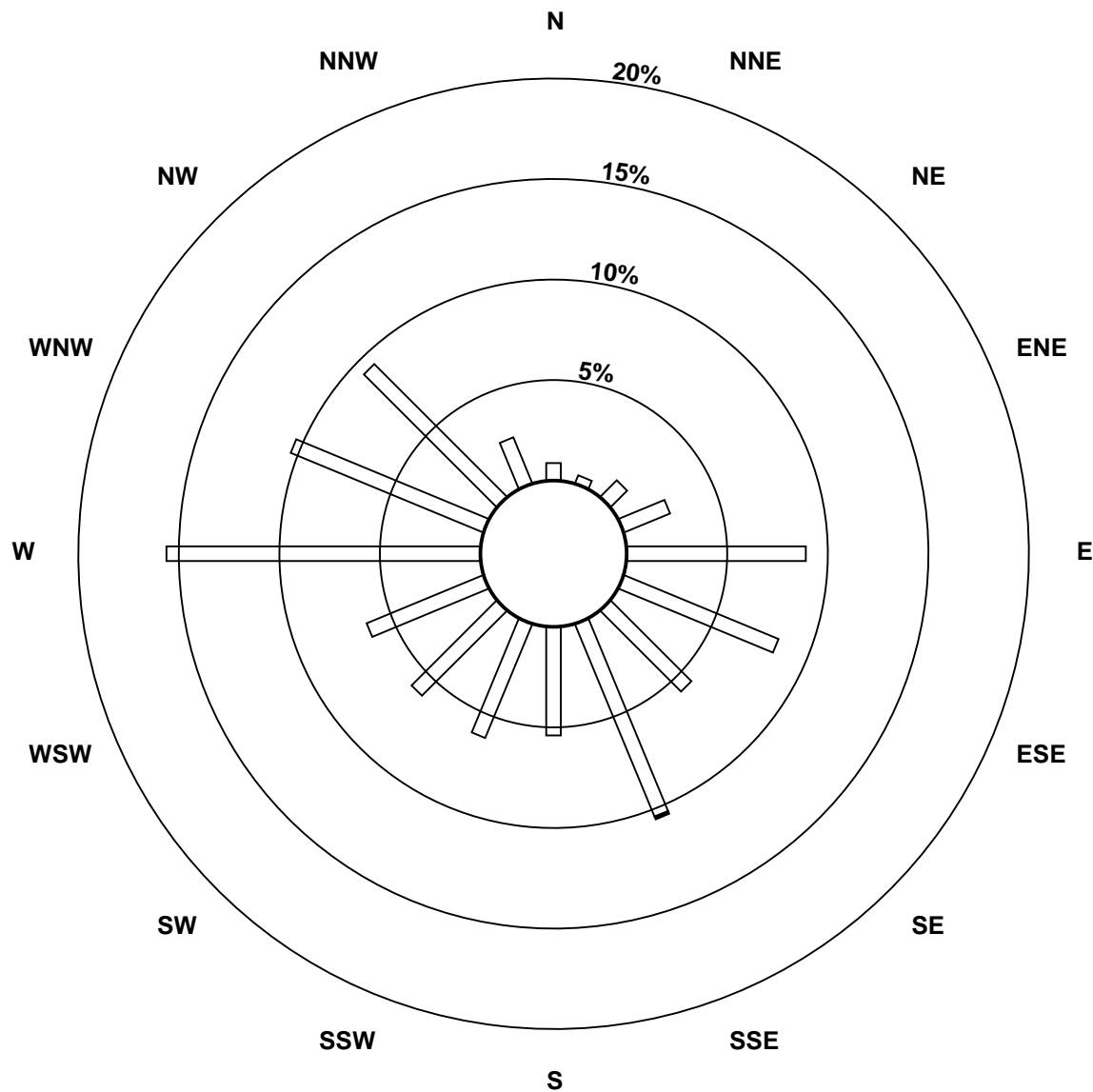
Total Number of Valid Hours: 685

Total Number of Hours: 720

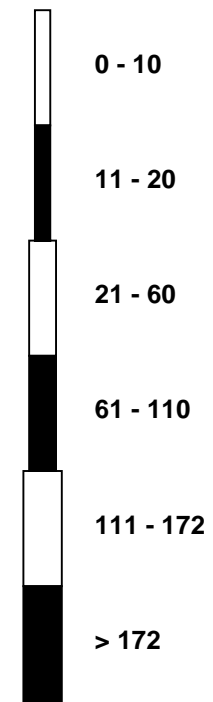


Wood Buffalo Environmental Association
Wind Rose Nov 2016

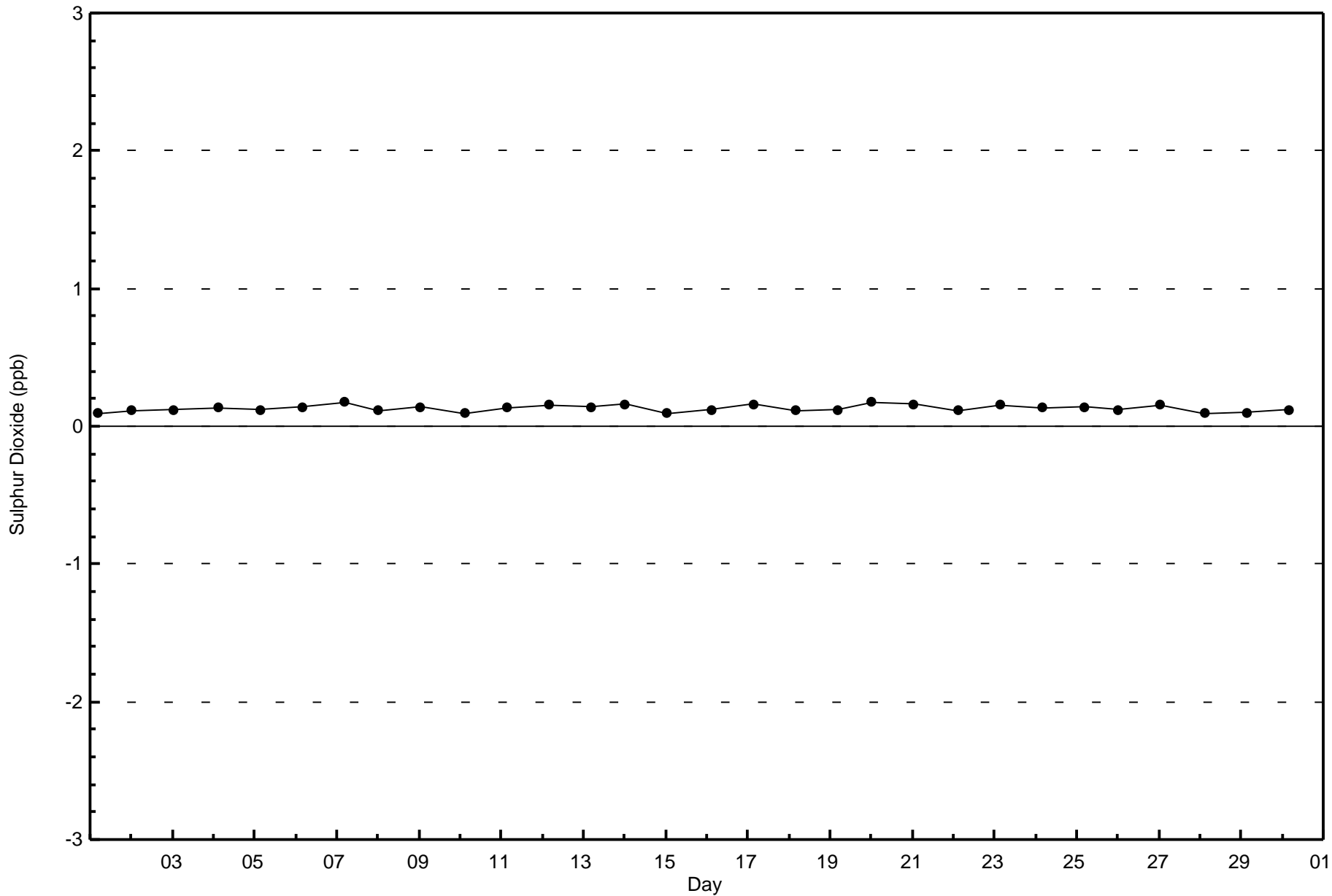
Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan (AMS 8)



Classes (ppb)



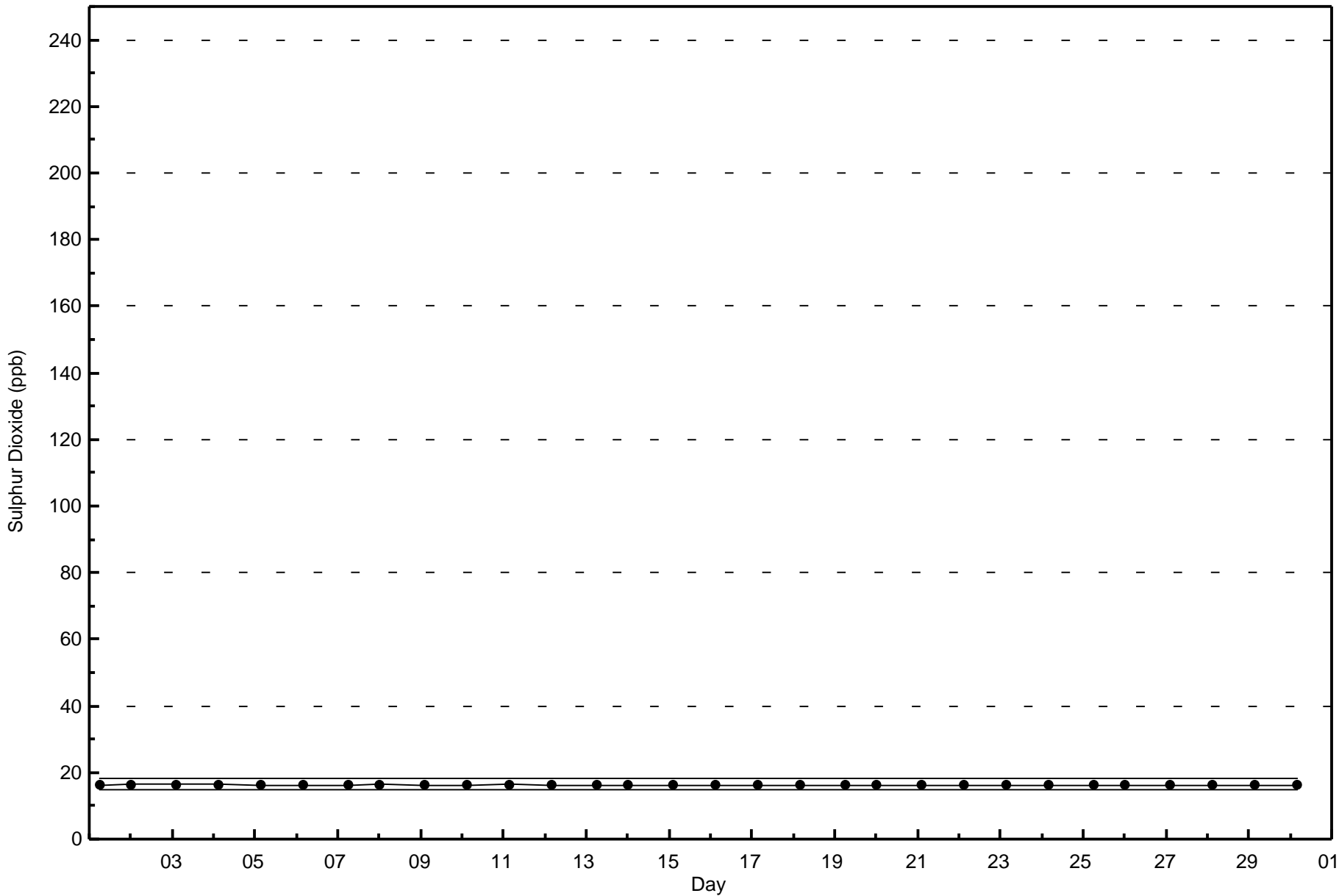
Total Number of Valid Hours: 685





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - November 2016



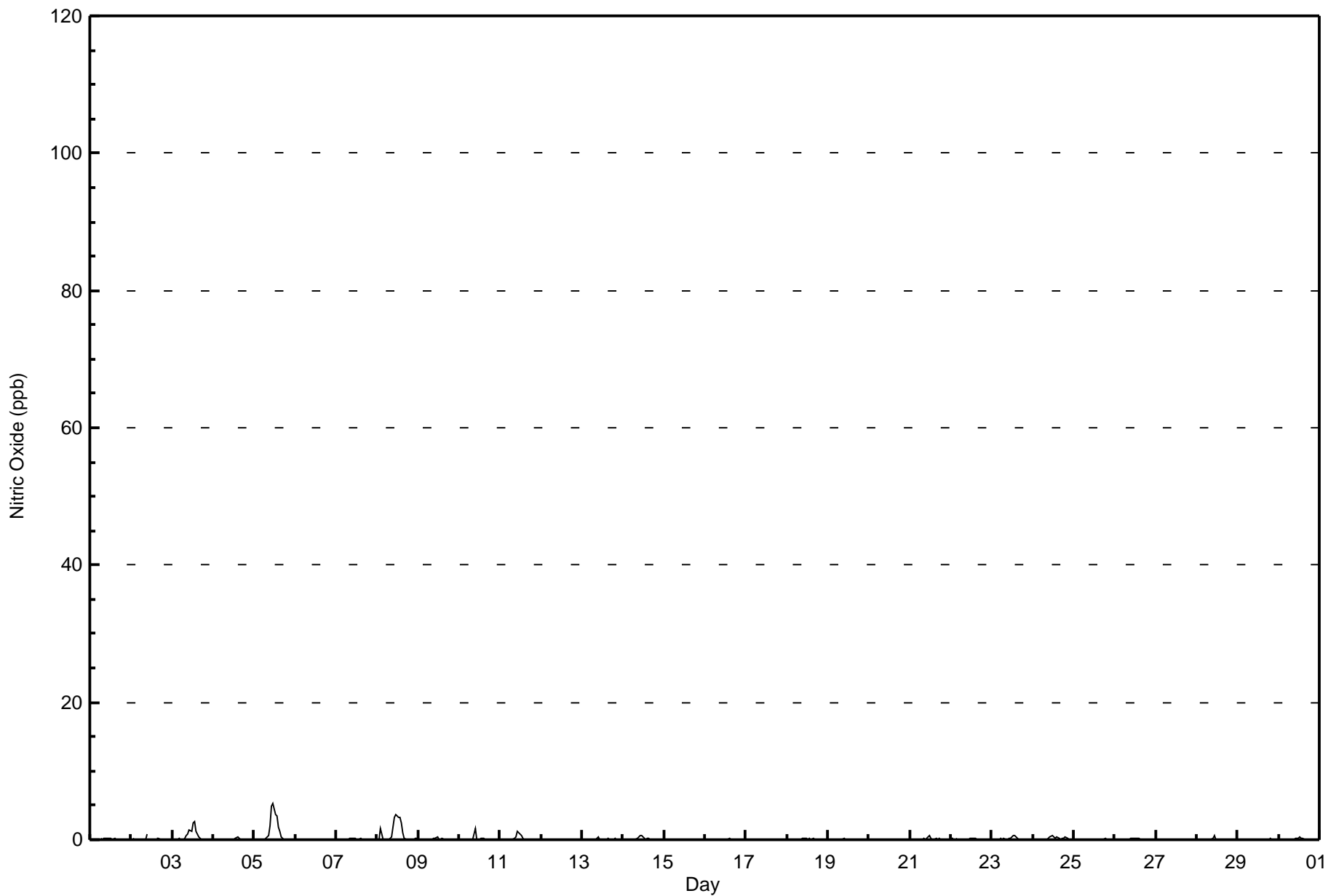


Maximum Value: 5 ppb on Nov 5 12:00 Maximum Daily Average: 1.0 ppb on Nov 5																		Hours in Service: 720 Hours of Data: 685 Hours of Missing Data: 35 Hours of Calibration: 35 Percent Operational Time: 100.0								
Minimum Value: 0 ppb on Nov 1 19:00 Minimum Daily Average: 0.0 ppb on Nov 12 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	0.1	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	0.1	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	0.5	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	0.1	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	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
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	0.1	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	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	0.1	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	0.1	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	0.2	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
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
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	0.1	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
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
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
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	0.1	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
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
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	0.1	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	0.1	0
23-Nov	0	0	0	Z	0	0	0	0	0	0	0	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	0.2	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
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	0.1	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
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	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
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	0.1	0
																								Diurnal Average		
																								Diurnal Maximum		
																								0.0 0.0 0.1 0.0 0.0 0.0 0.0 0.0 0.1 0.3 0.5 0.5 0.4 0.4 0.3 0.2 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		
																								0 0 2 0 0 0 0 0 0 1 2 5 5 4 3 2 1 0 0 0 0 0 0 0 0 0		
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

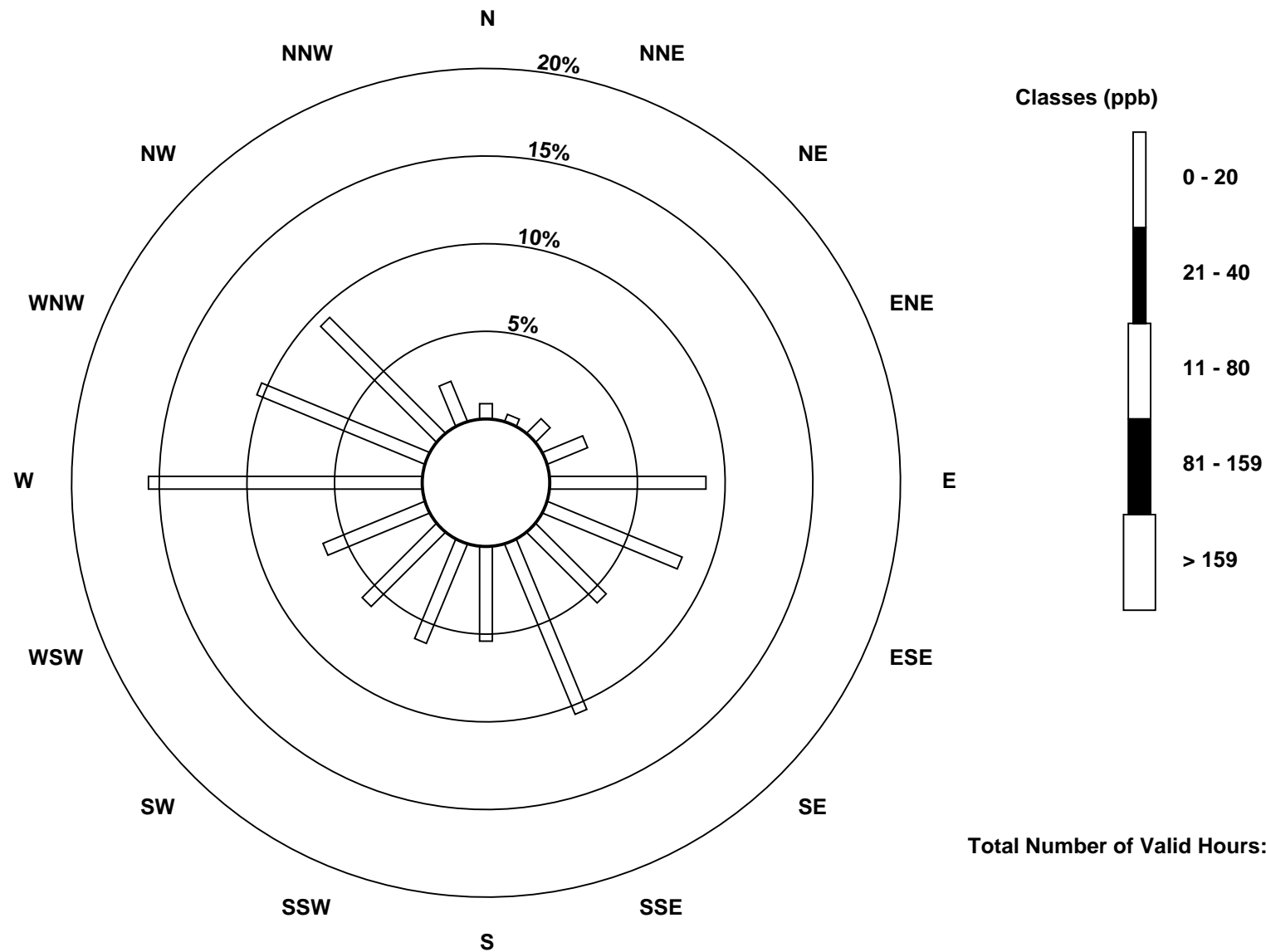
Total Number of Valid Hours: 685

Total Number of Hours: 720

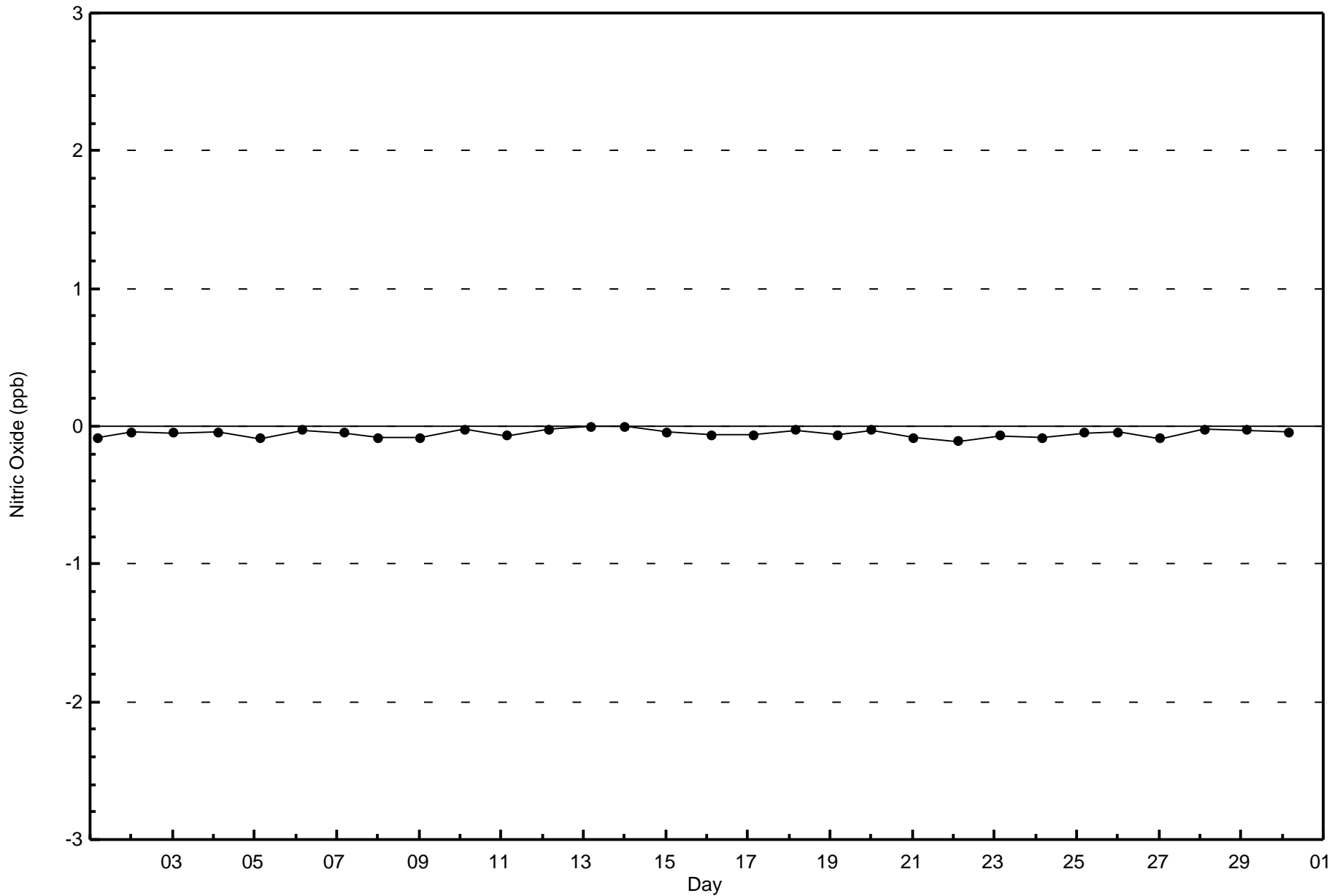


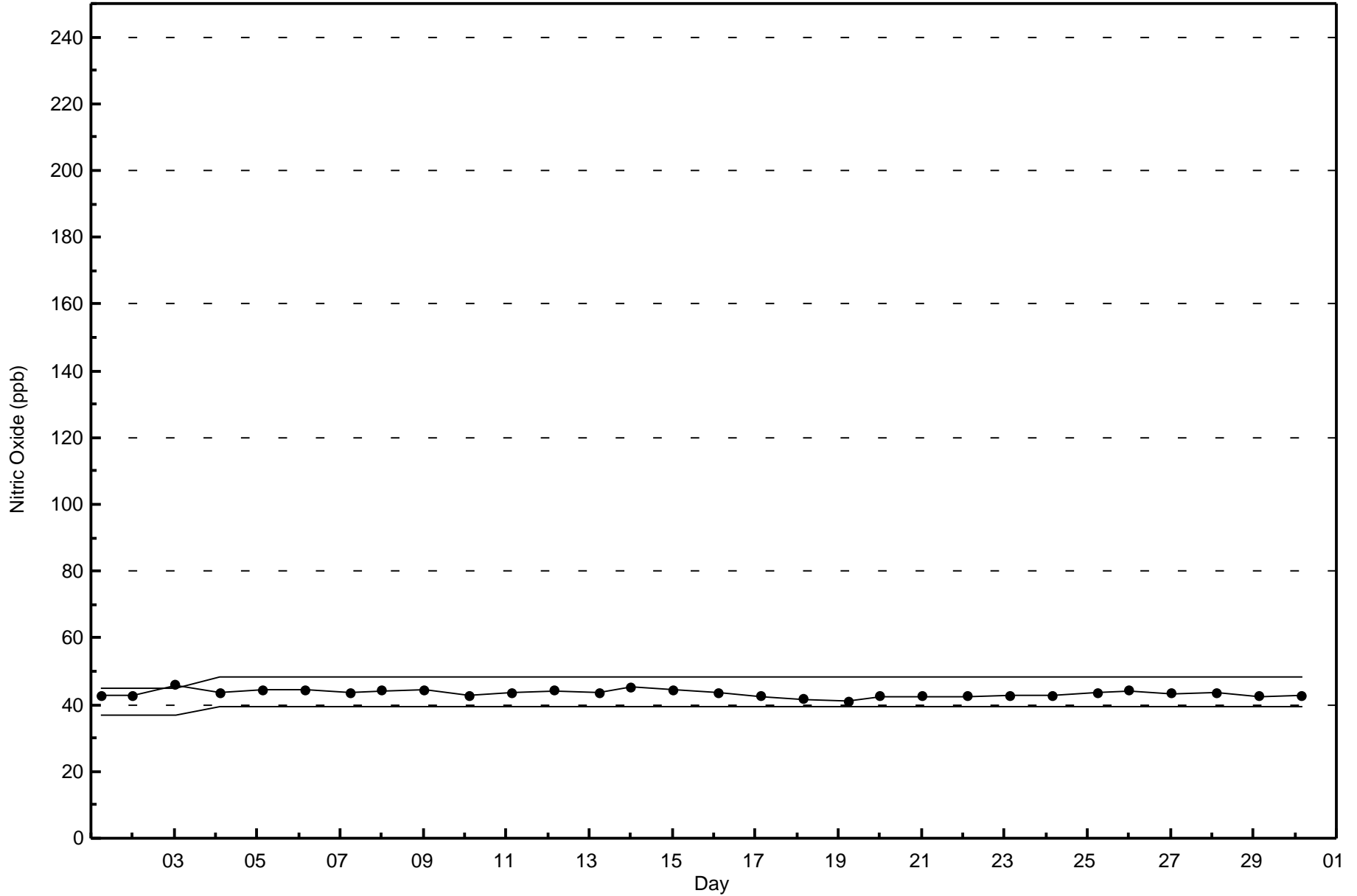
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 685







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	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	0	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

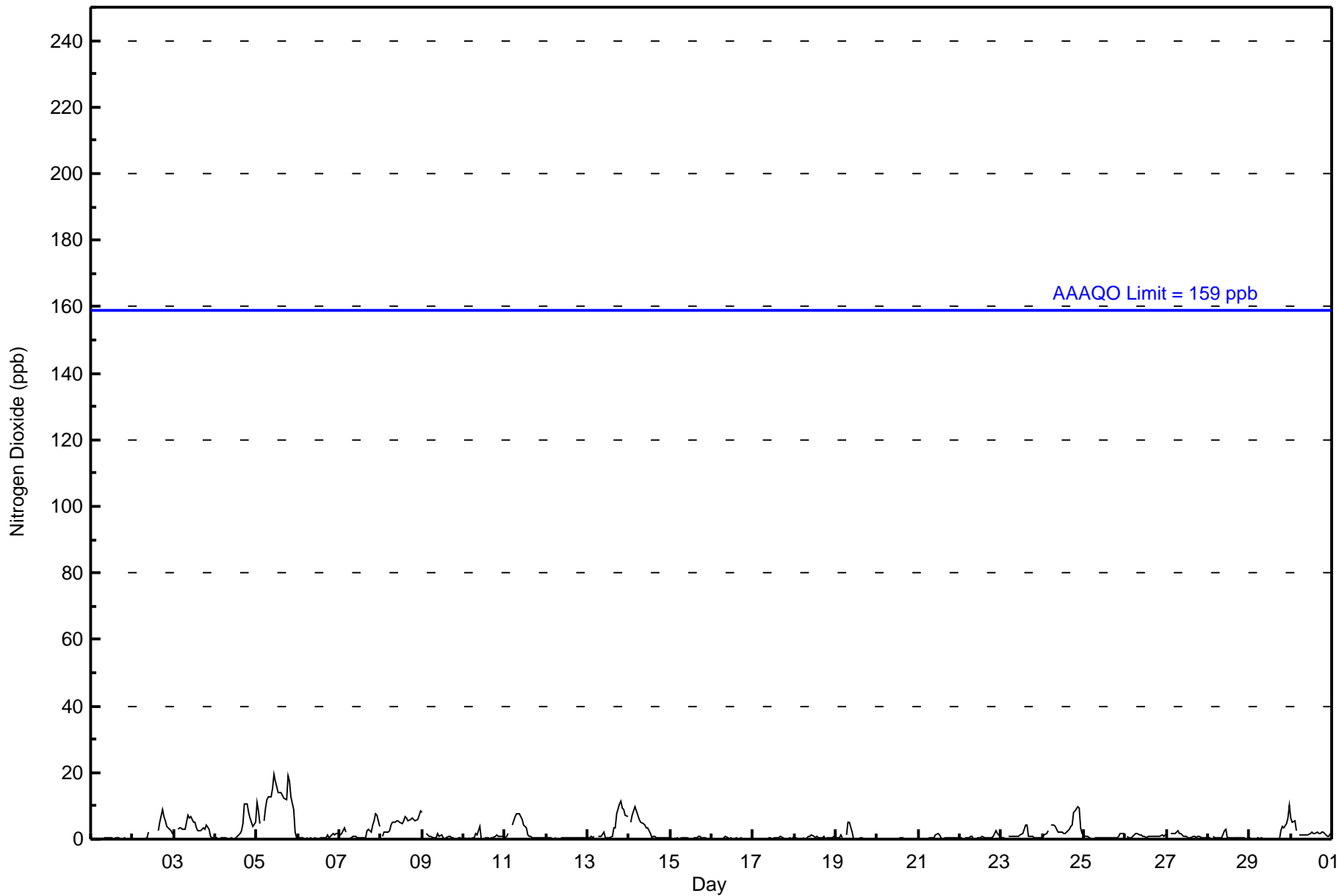
1.4	1.2	1.5	1.3	1.4	1.7	1.7	1.9	2.0	2.1	2.0	1.7	1.5	1.4	1.5	1.7	1.8	2.2	2.7	2.7	2.4	2.2	1.7	1.7	Diurnal Average
11	8	7	10	9	9	12	13	13	15	20	18	14	14	14	13	12	12	19	17	13	9	7	10	Diurnal Maximum

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
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

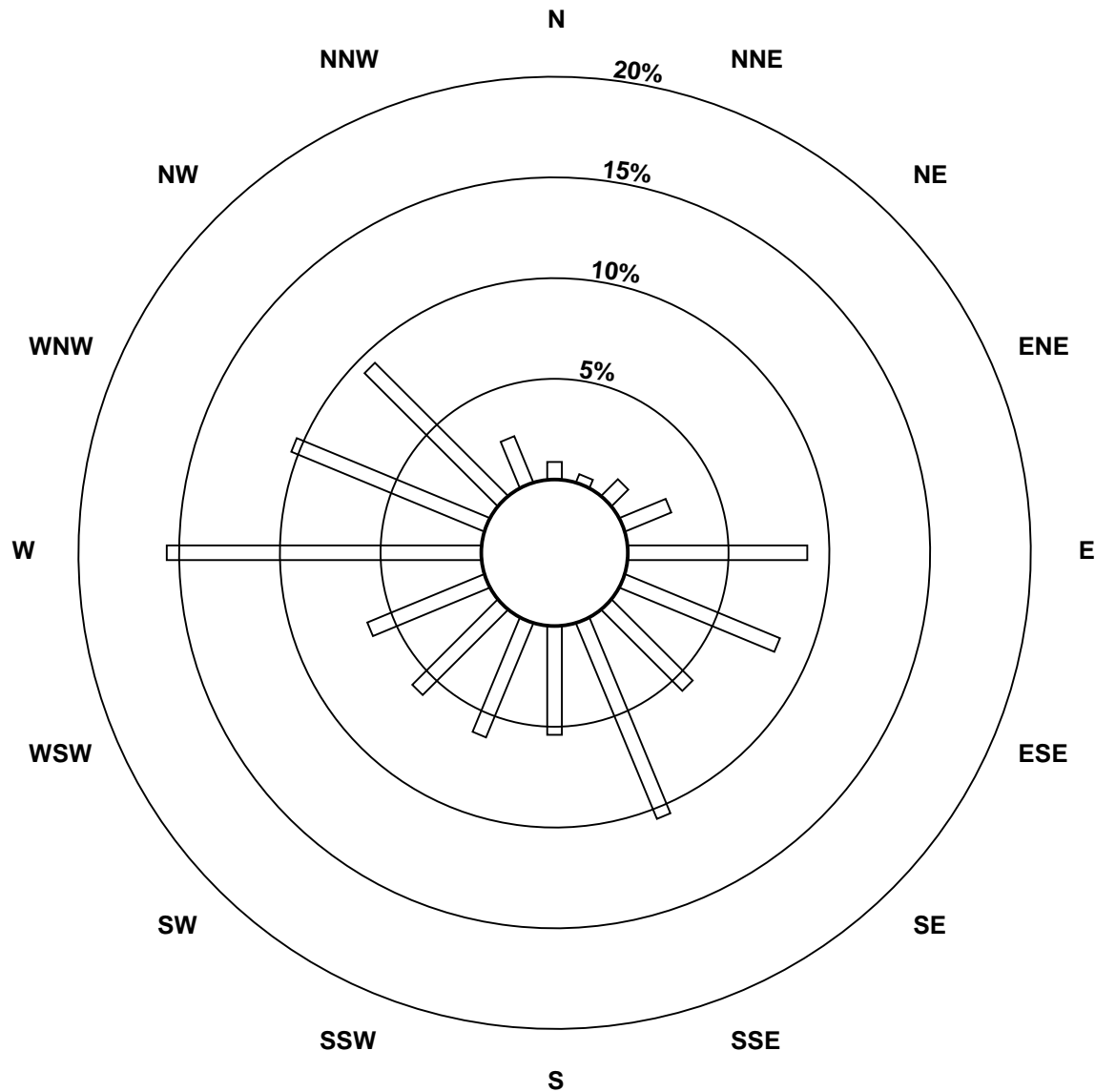
Total Number of Valid Hours: 685

Total Number of Hours: 720

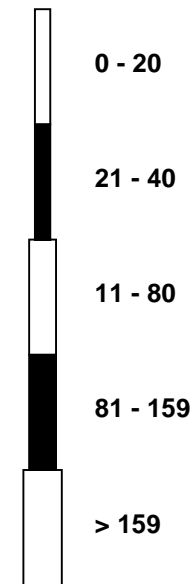


Wood Buffalo Environmental Association
Wind Rose Nov 2016

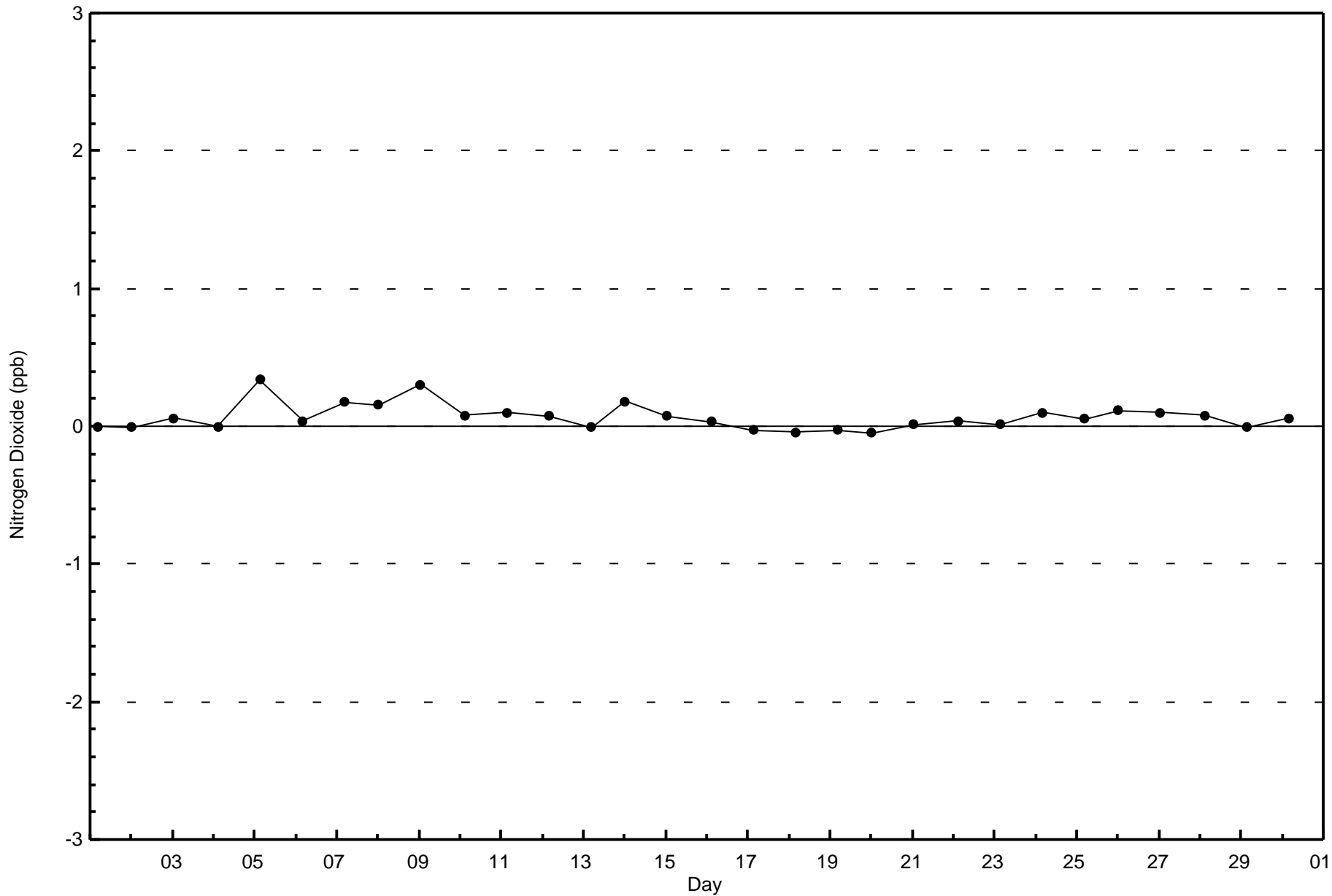
Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan (AMS 8)

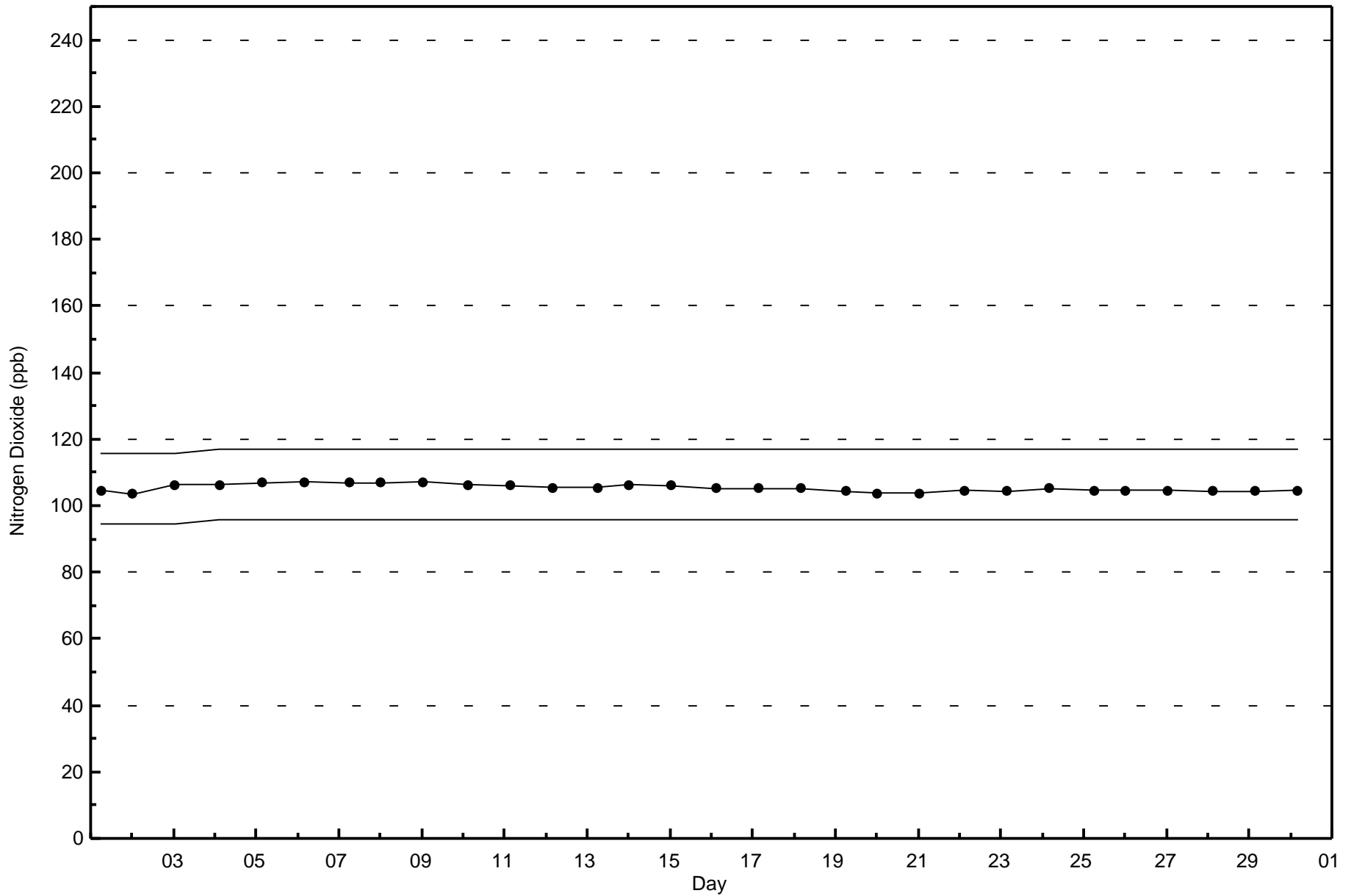


Classes (ppb)



Total Number of Valid Hours: 685







Wood Buffalo Environmental Association
Summary of Hour Averages

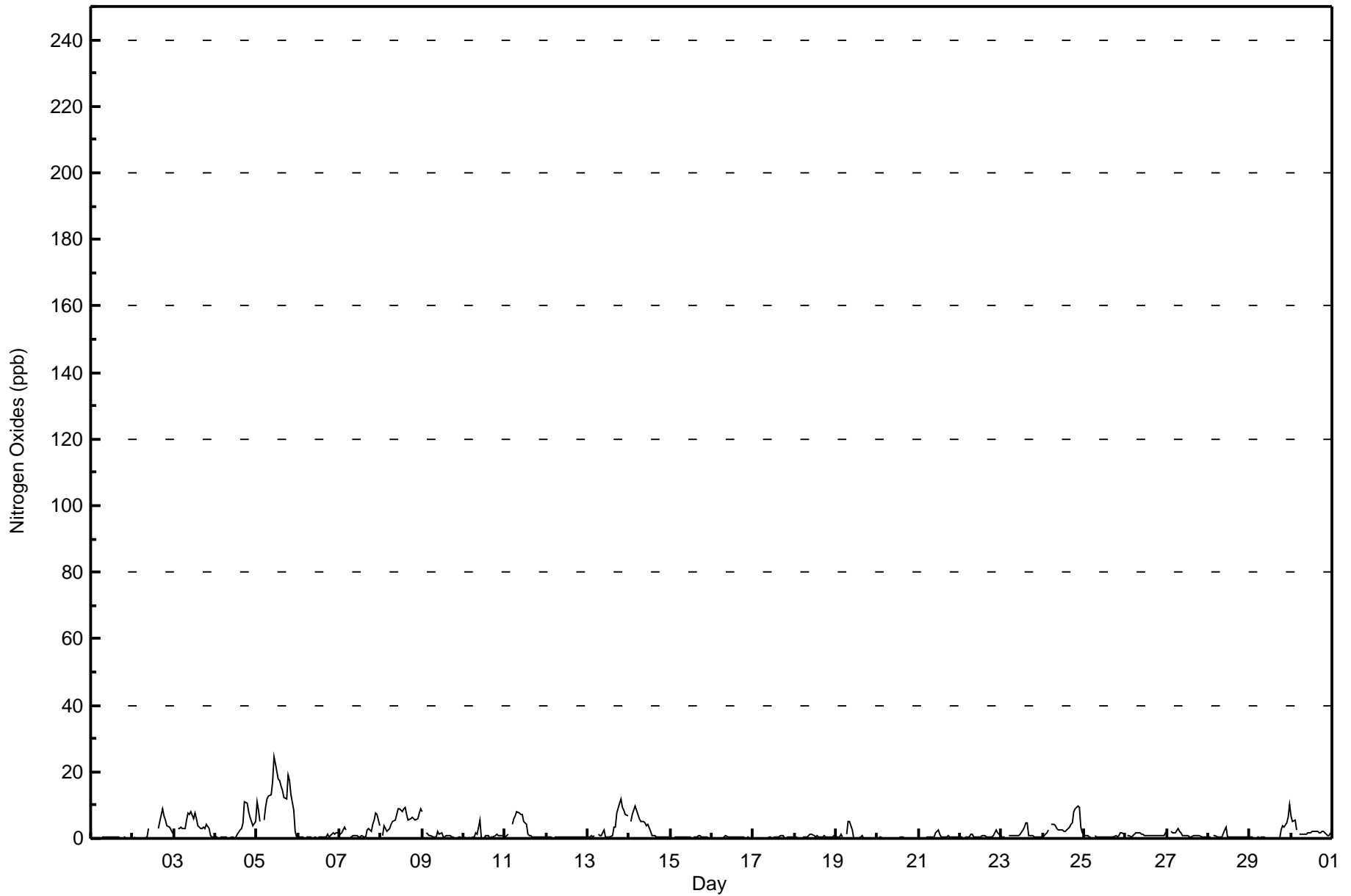
Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - November 2016

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	1	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

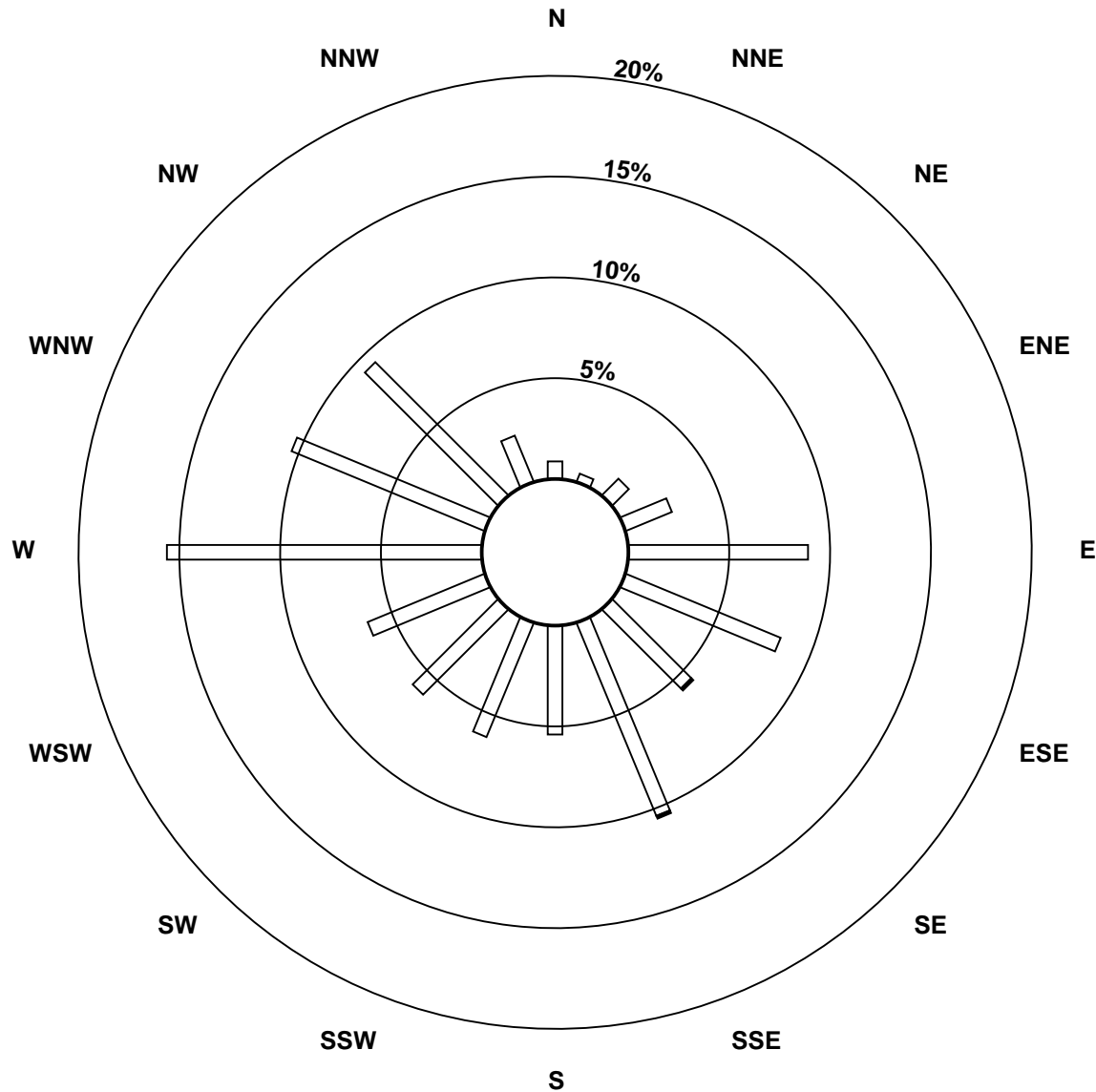
Total Number of Valid Hours: 685

Total Number of Hours: 720

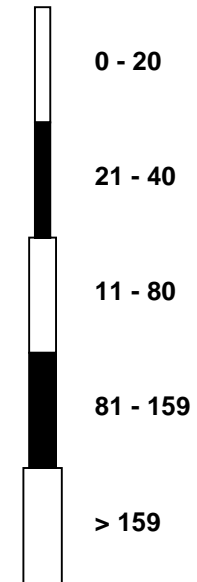


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan (AMS 8)



Classes (ppb)

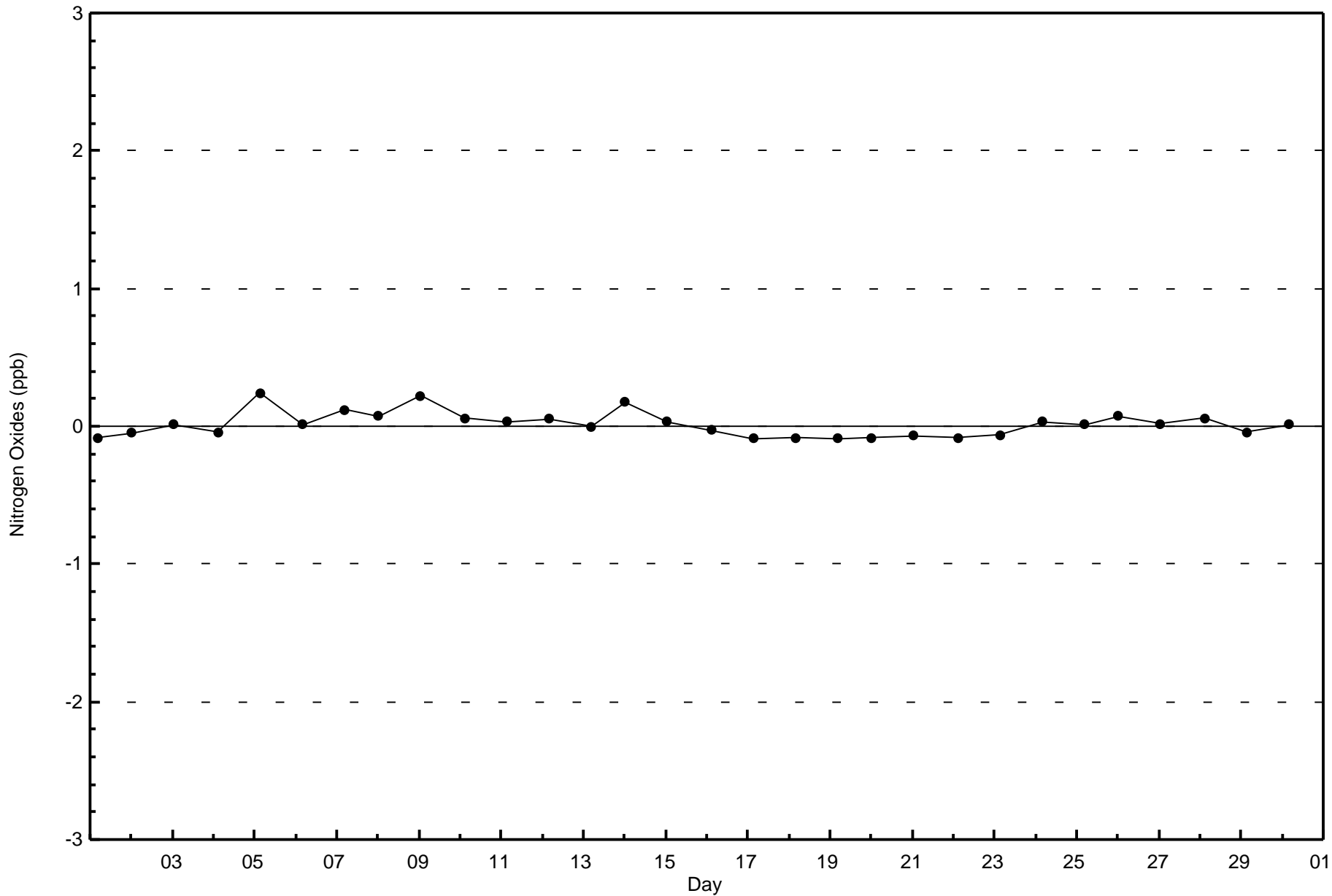


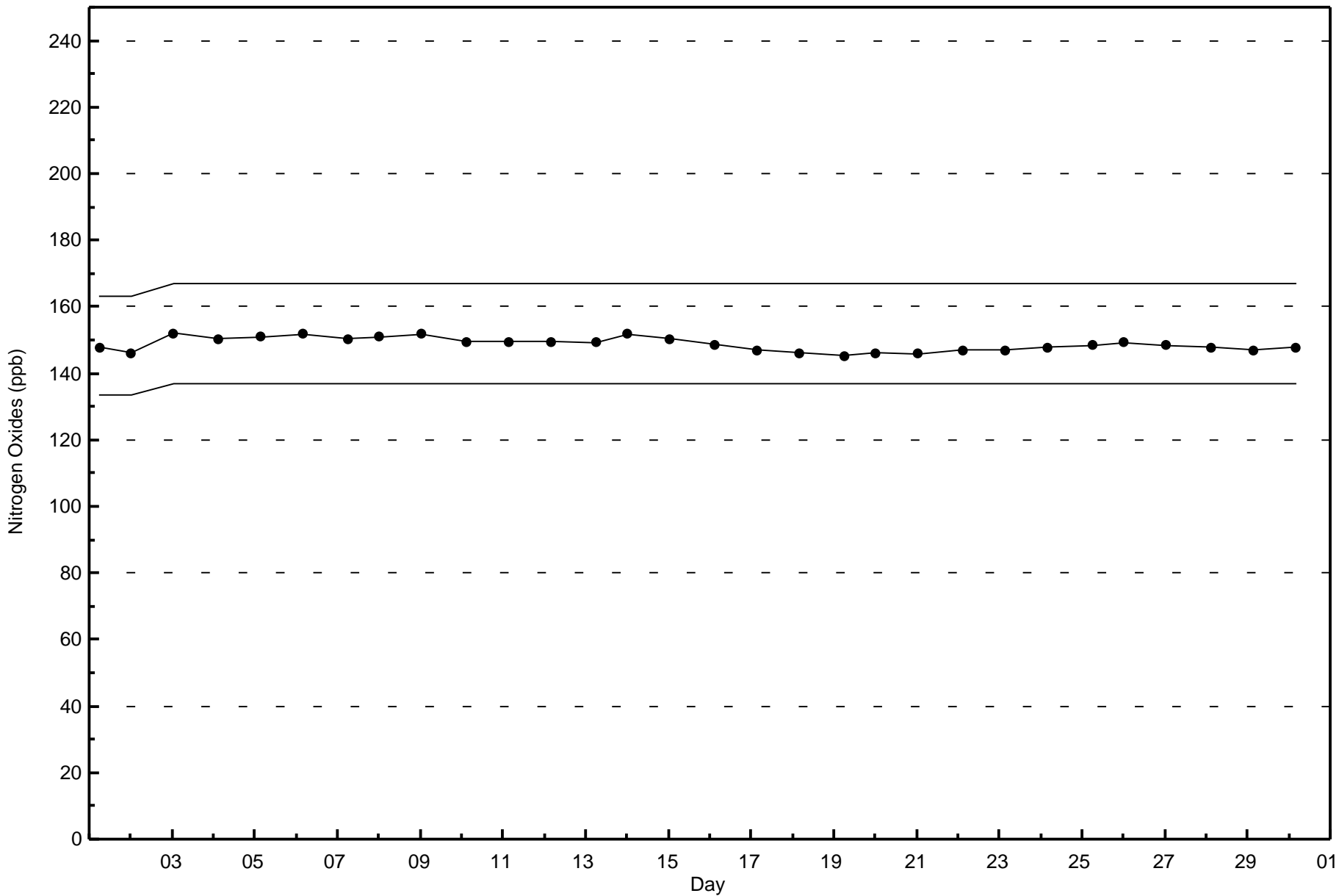
Total Number of Valid Hours: 685



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	C	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	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

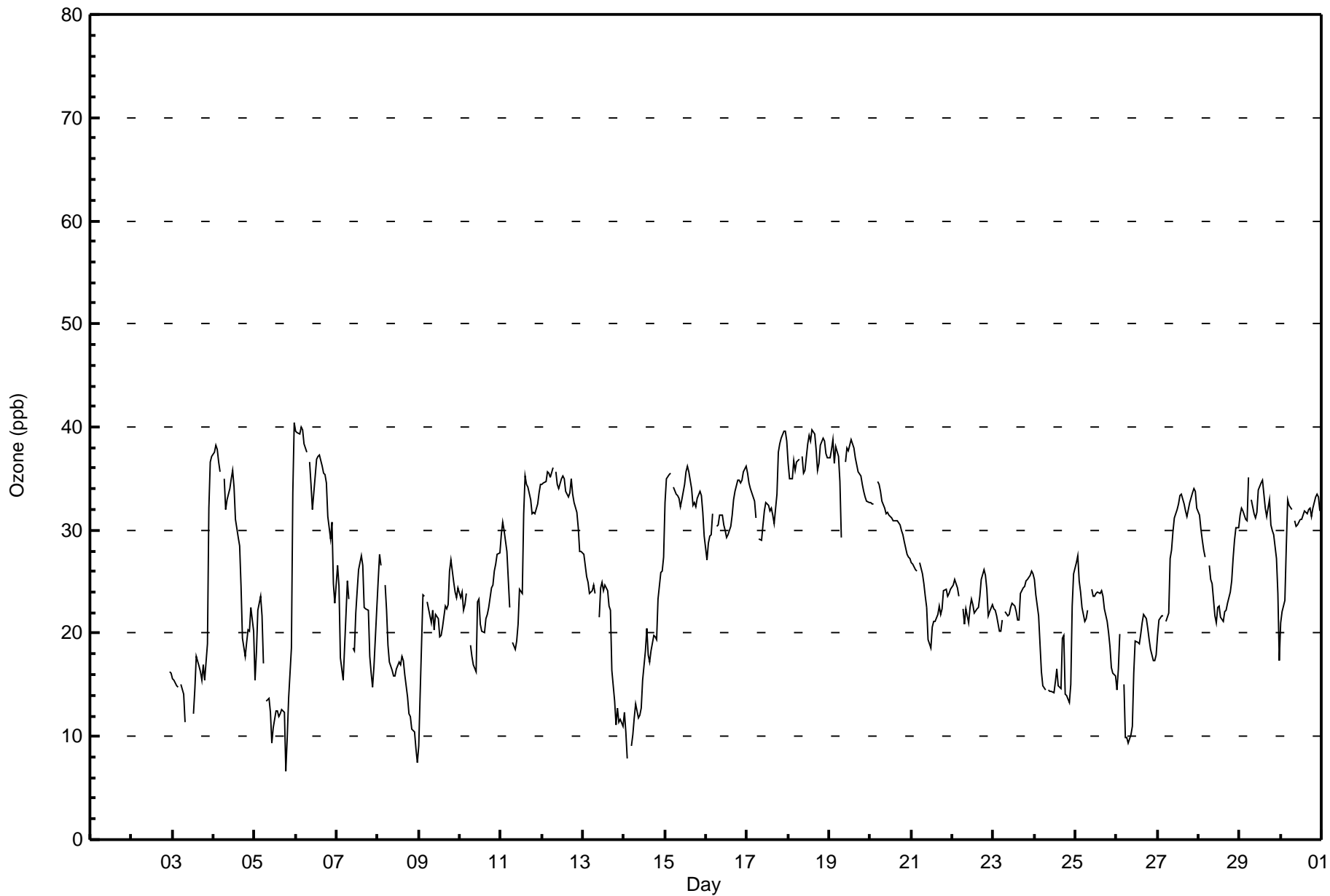
26.5	27.0	26.9	27.5	26.8	25.5	25.5	23.1	25.0	24.6	25.2	26.3	26.1	26.5	26.6	26.3	26.2	25.9	25.4	25.3	25.6	26.0	26.3	26.4	Diurnal Average
40	40	39	40	40	38	38	33	37	37	38	38	39	39	40	39	38	36	38	38	39	40	40	40	Diurnal Maximum

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

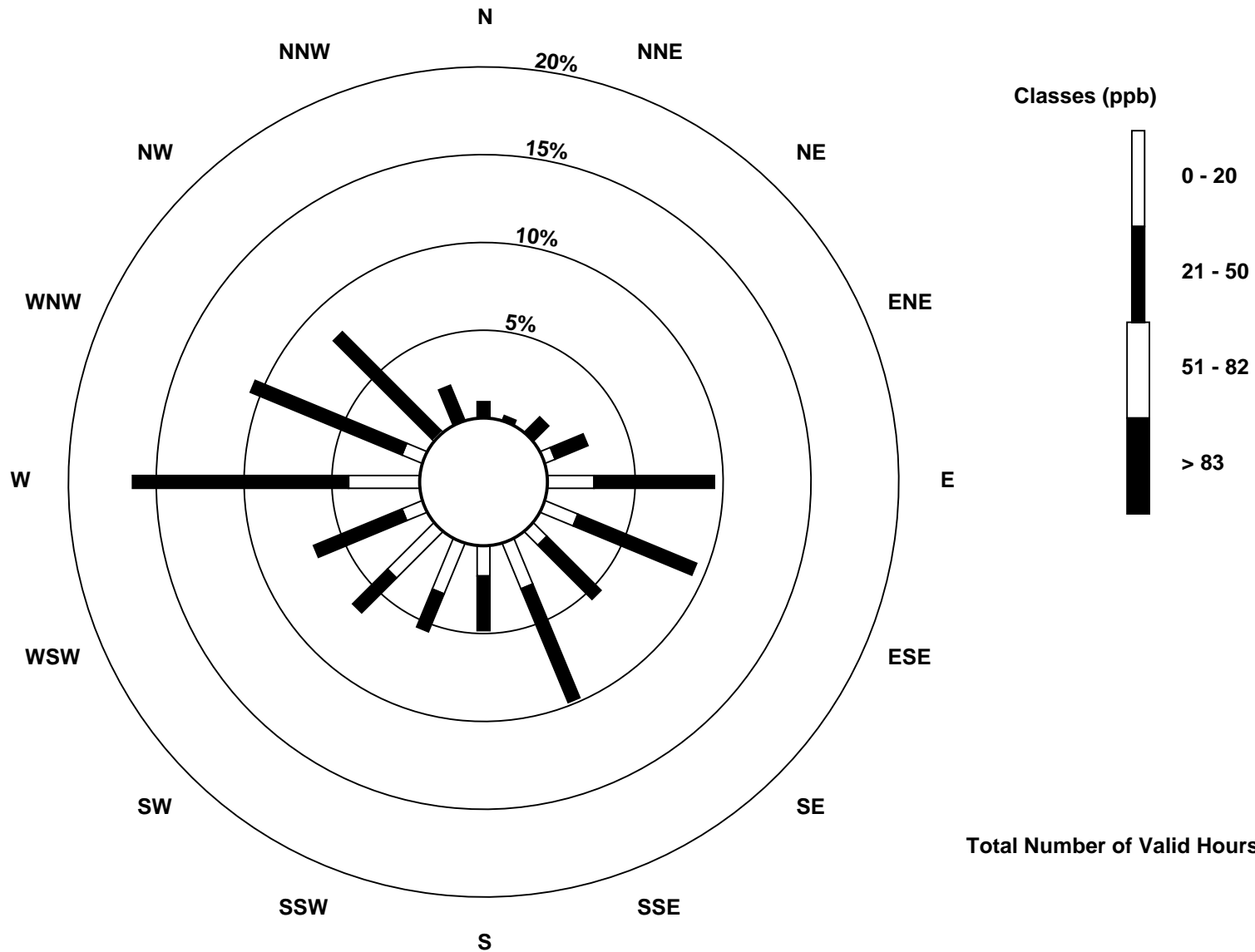
Total Number of Valid Hours: 642

Total Number of Hours: 720

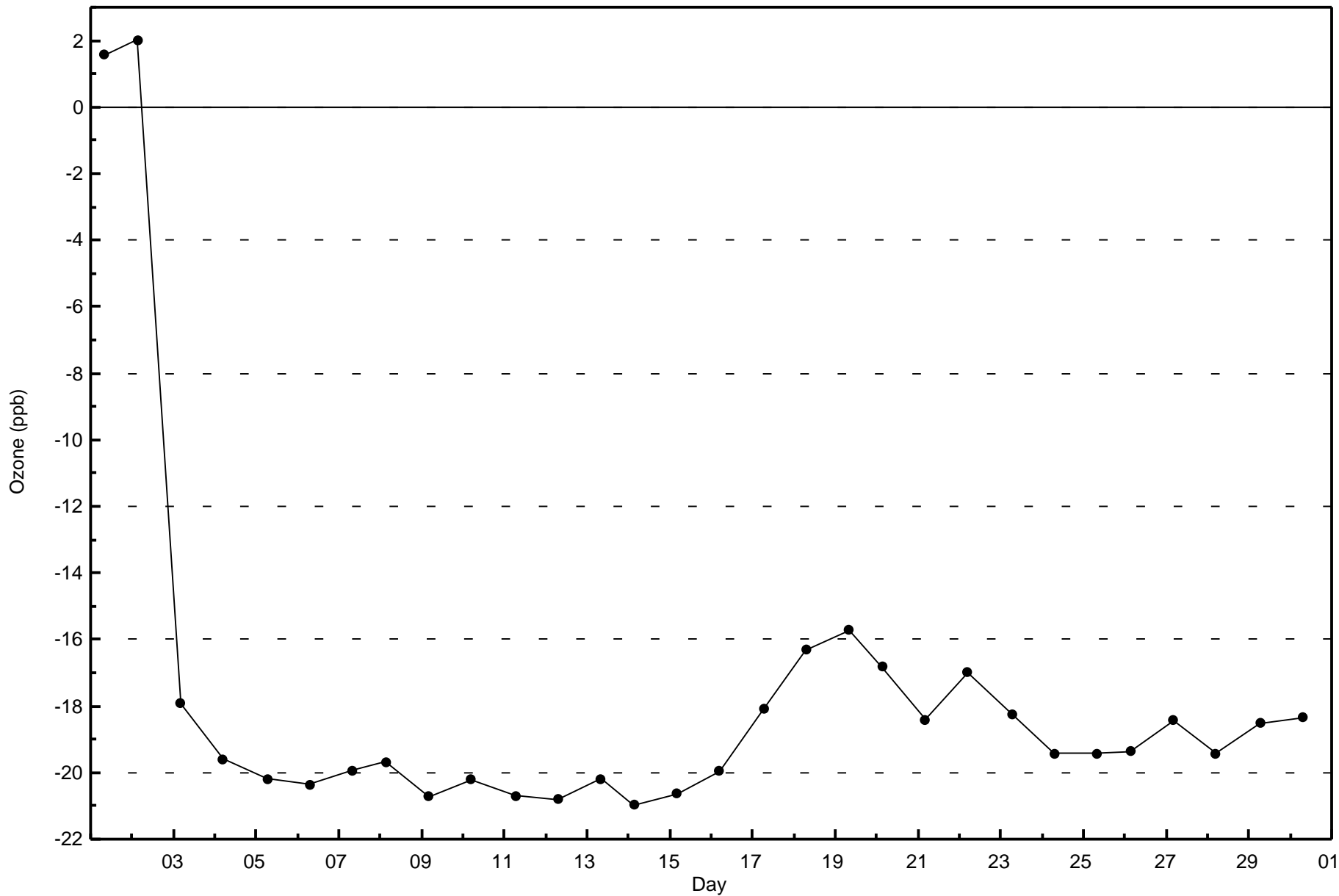


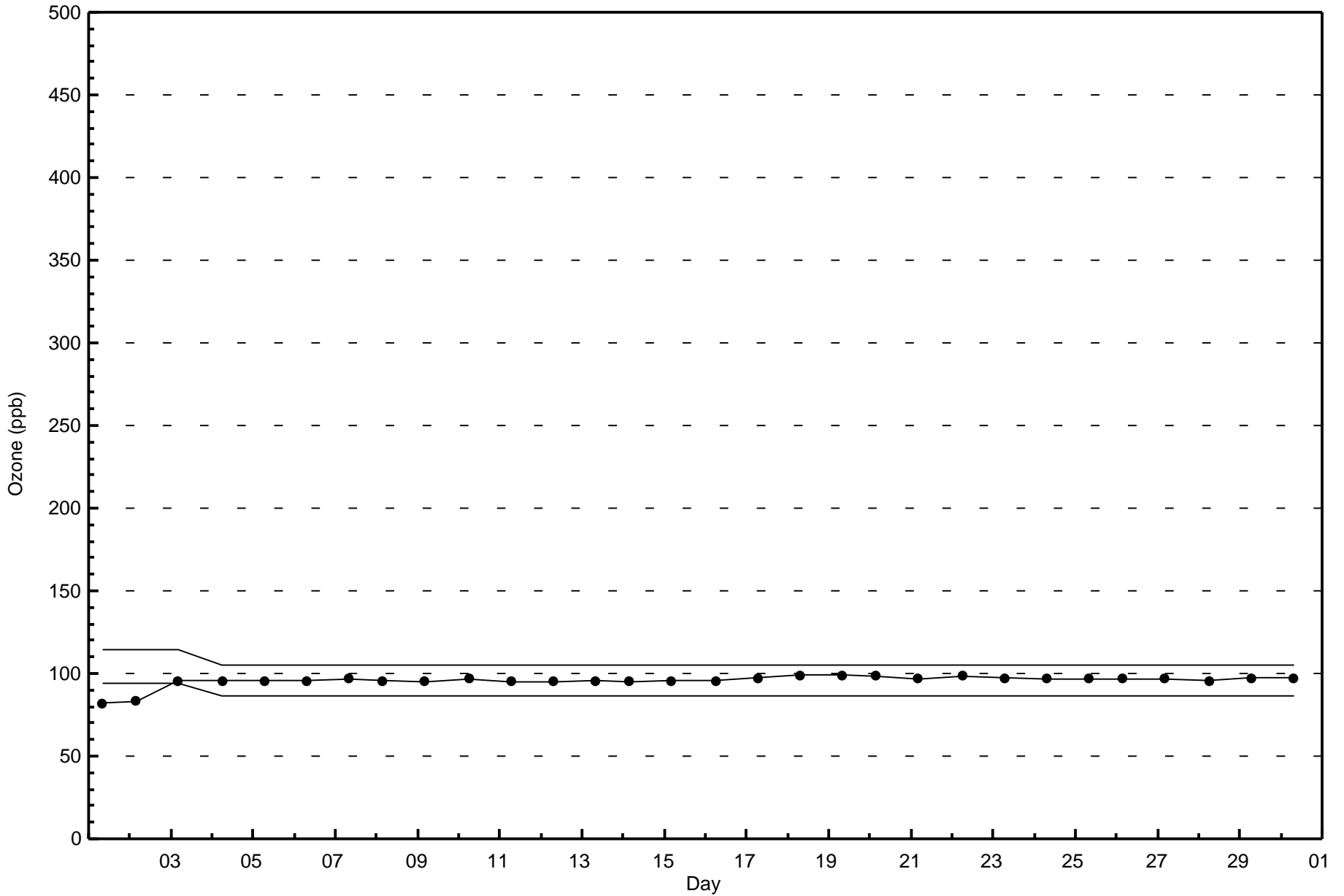
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O_3) - ppb
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 642







Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 21.9 µg/m ³ on Nov 26 08:00	Maximum Daily Average: 10.5 µg/m ³ on Nov 26	Hours of Data:	717
Minimum Value: 0.5 µg/m ³ on Nov 10 12:00	Minimum Daily Average: 1.0 µg/m ³ on Nov 1	Hours of Missing Data:	3
Maximum Diurnal Average: 4.6 µg/m ³ at hour 24	Minimum Diurnal Average: 3.1 µg/m ³ at hour 15	Hours of Calibration:	3
Monthly Average: 3.75 µg/m ³	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	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

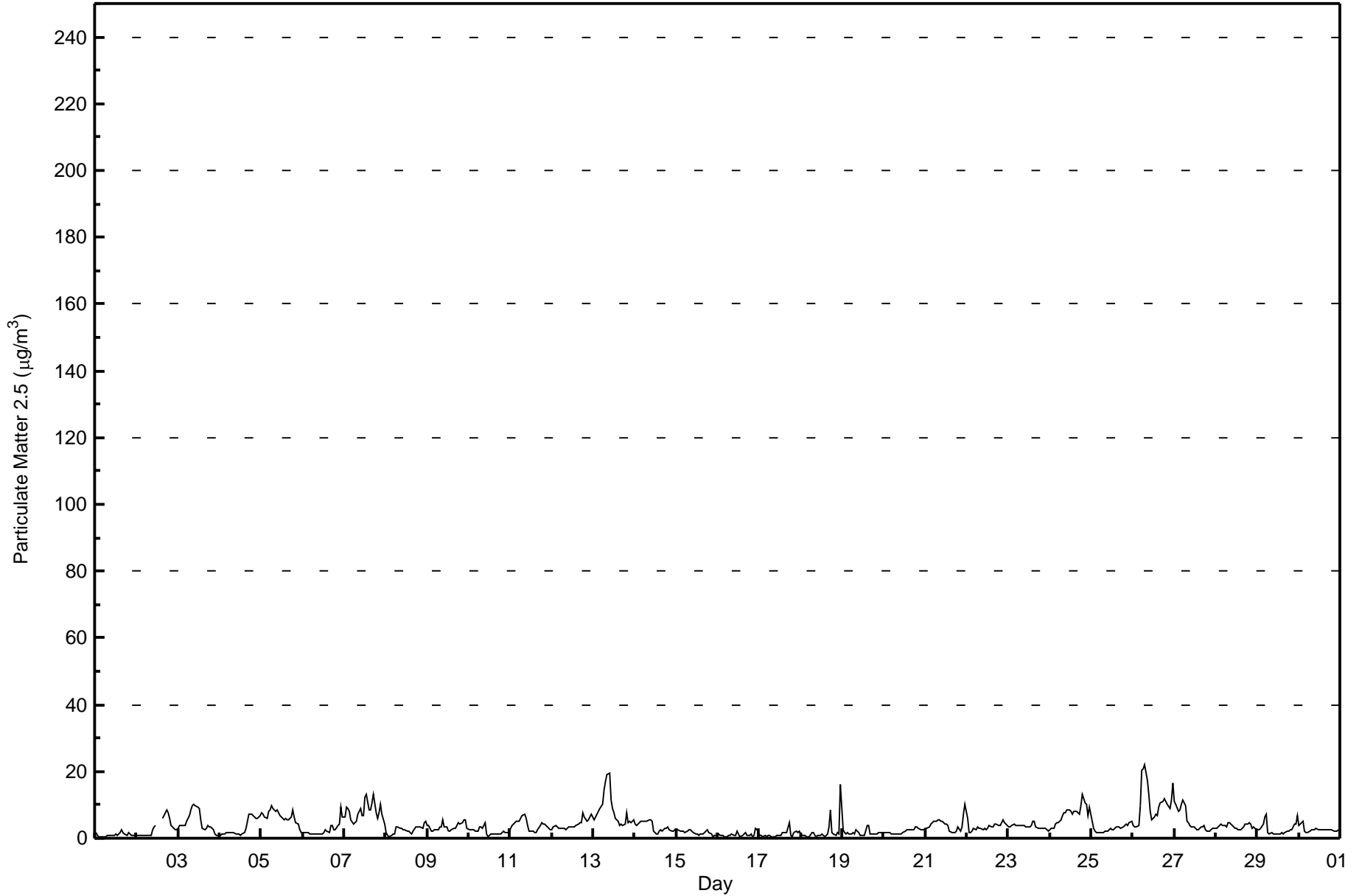
3.3	3.2	3.1	3.2	3.5	4.0	4.3	4.4	4.5	4.5	3.6	3.3	3.3	3.2	3.1	3.3	3.7	4.3	4.1	4.1	3.7	3.7	3.9	4.6	Diurnal Average
11.2	10.3	8.8	8.7	10.1	20.3	20.9	21.9	19.2	19.4	11.3	9.4	12.5	13.1	8.7	9.2	10.8	13.0	11.7	13.3	10.8	10.1	11.3	16.5	Diurnal Maximum

C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



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}) - μg/m³
Fort Chipewyan - November 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	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

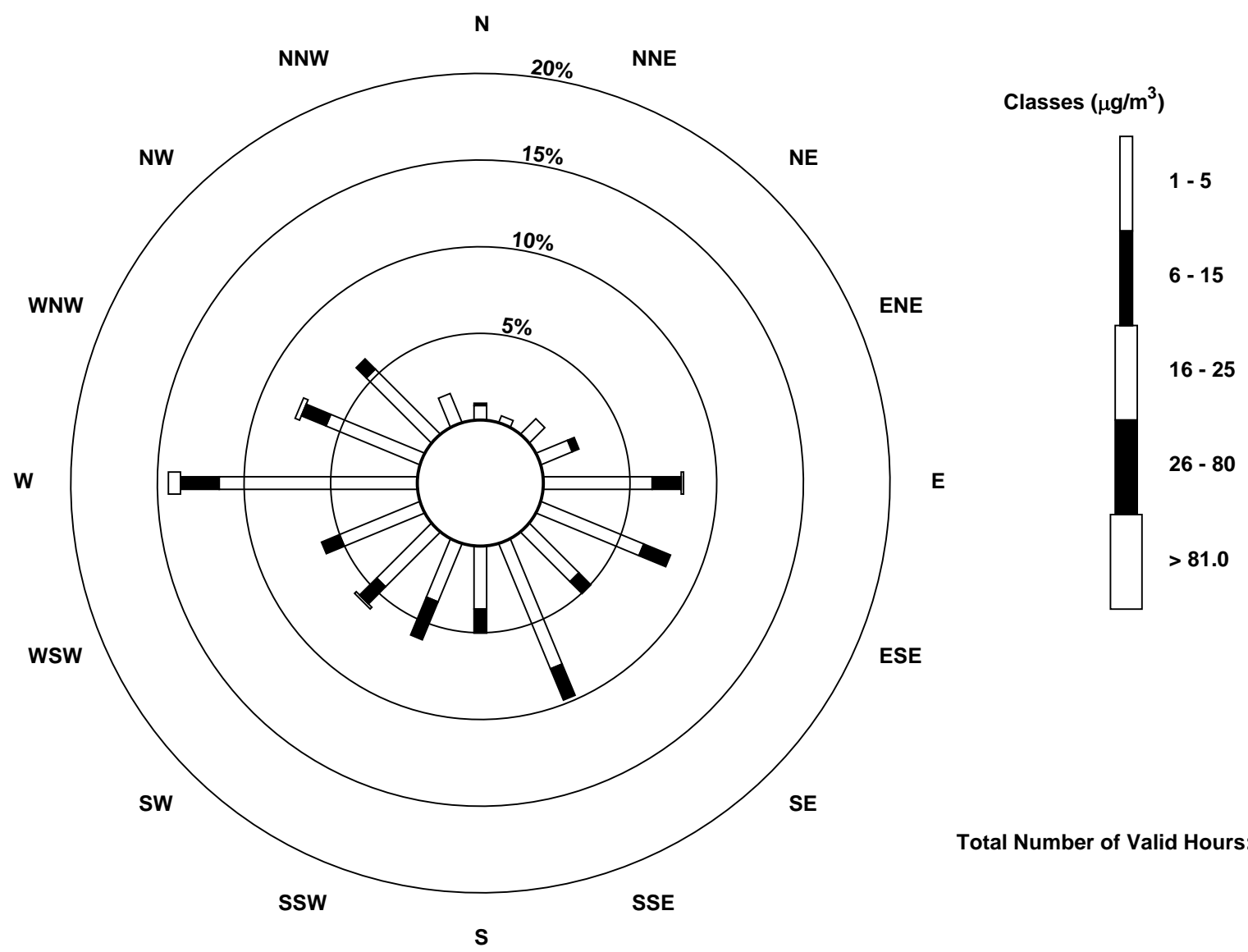
Total Number of Valid Hours: 717

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)



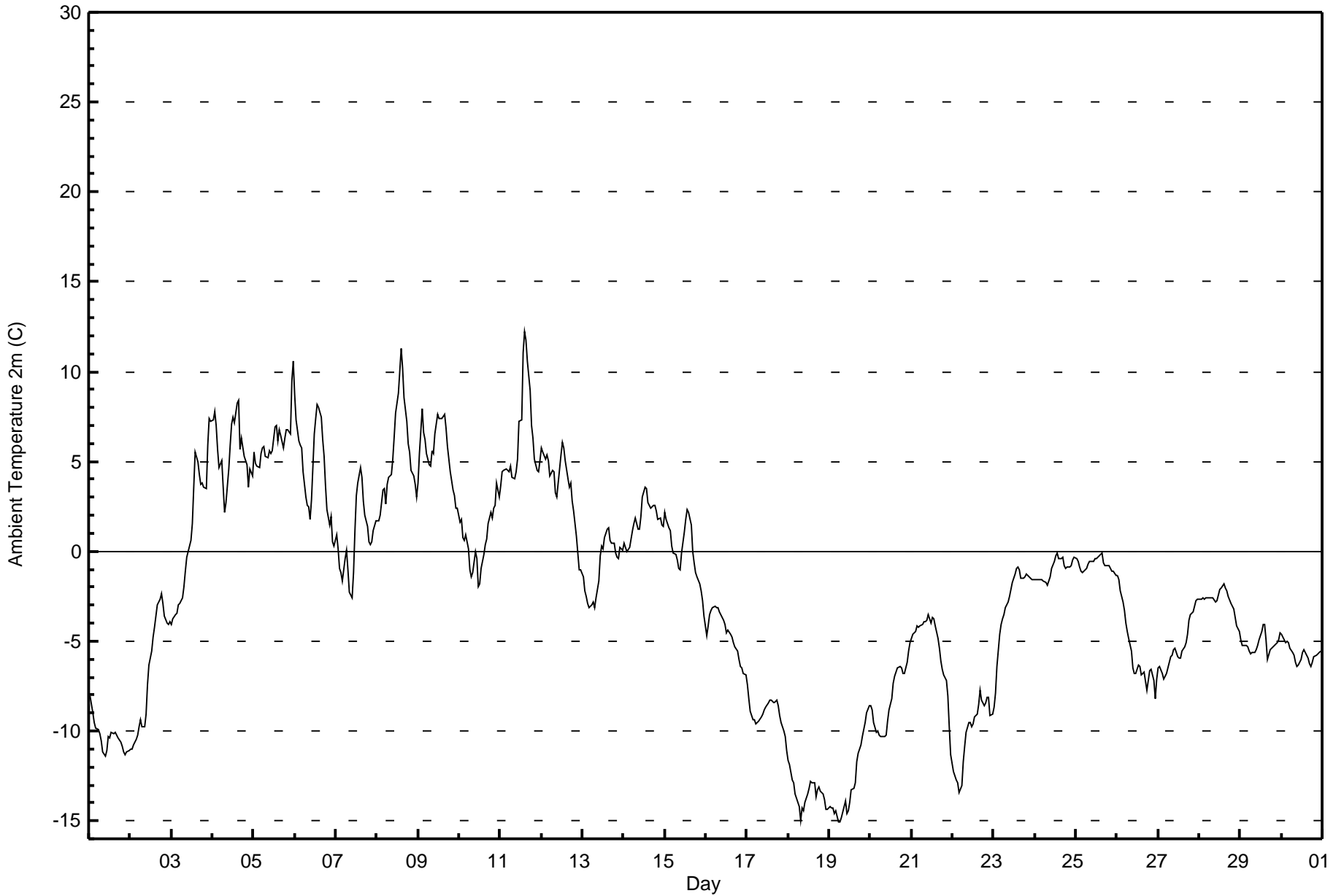


Maximum Value: 12.2 C on Nov 11 15:00																				Maximum Daily Average: 6.3 C on Nov 11					Hours in Service: 720	
Minimum Value: -15.1 C on Nov 19 07:00																				Minimum Daily Average: -13.4 C on Nov 18					Hours of Data: 720	
Maximum Diurnal Average: -0.8 C at hour 15																				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	2.3	1.8	1.8	1.4	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	-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) - %

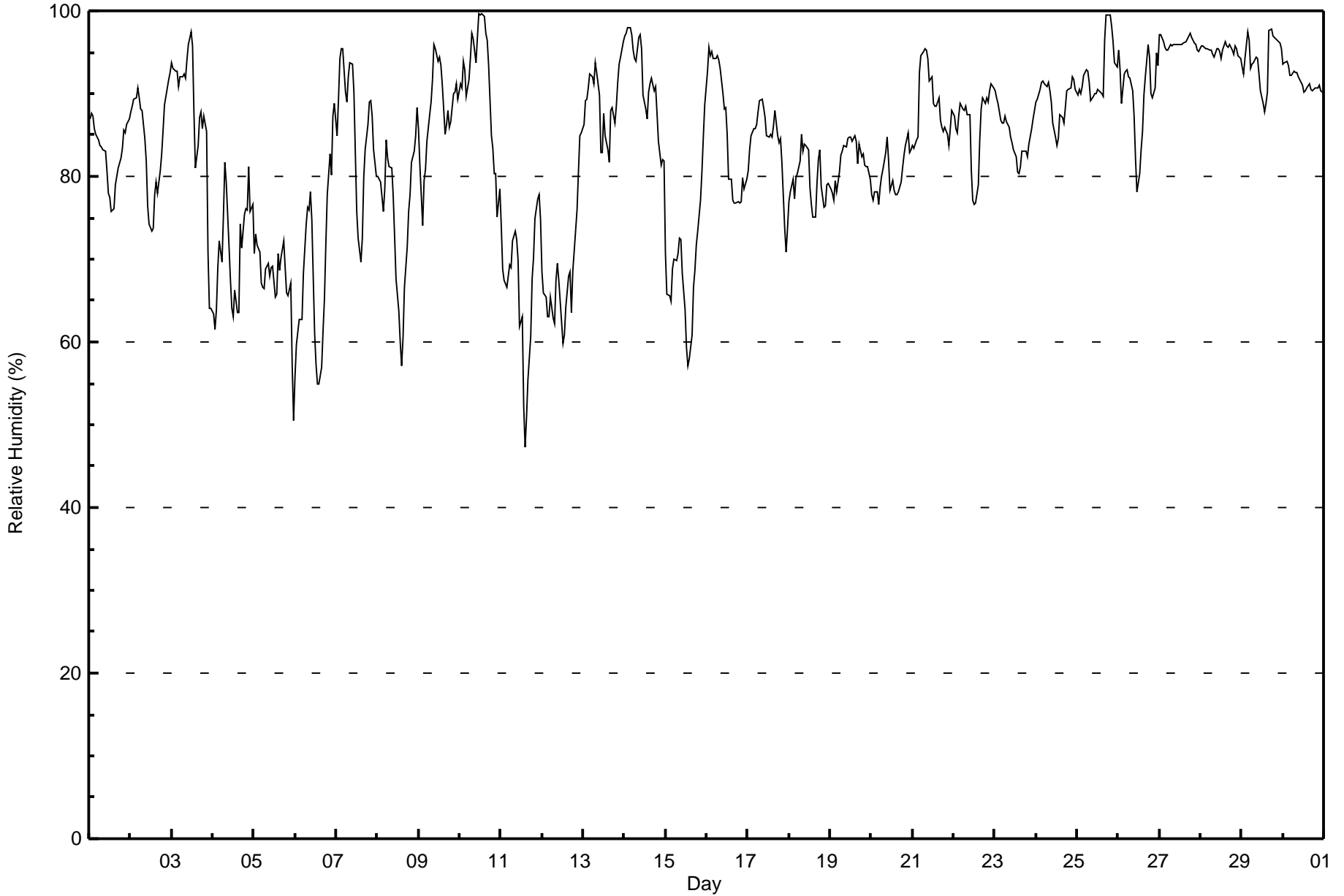
Fort Chipewyan - November 2016

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

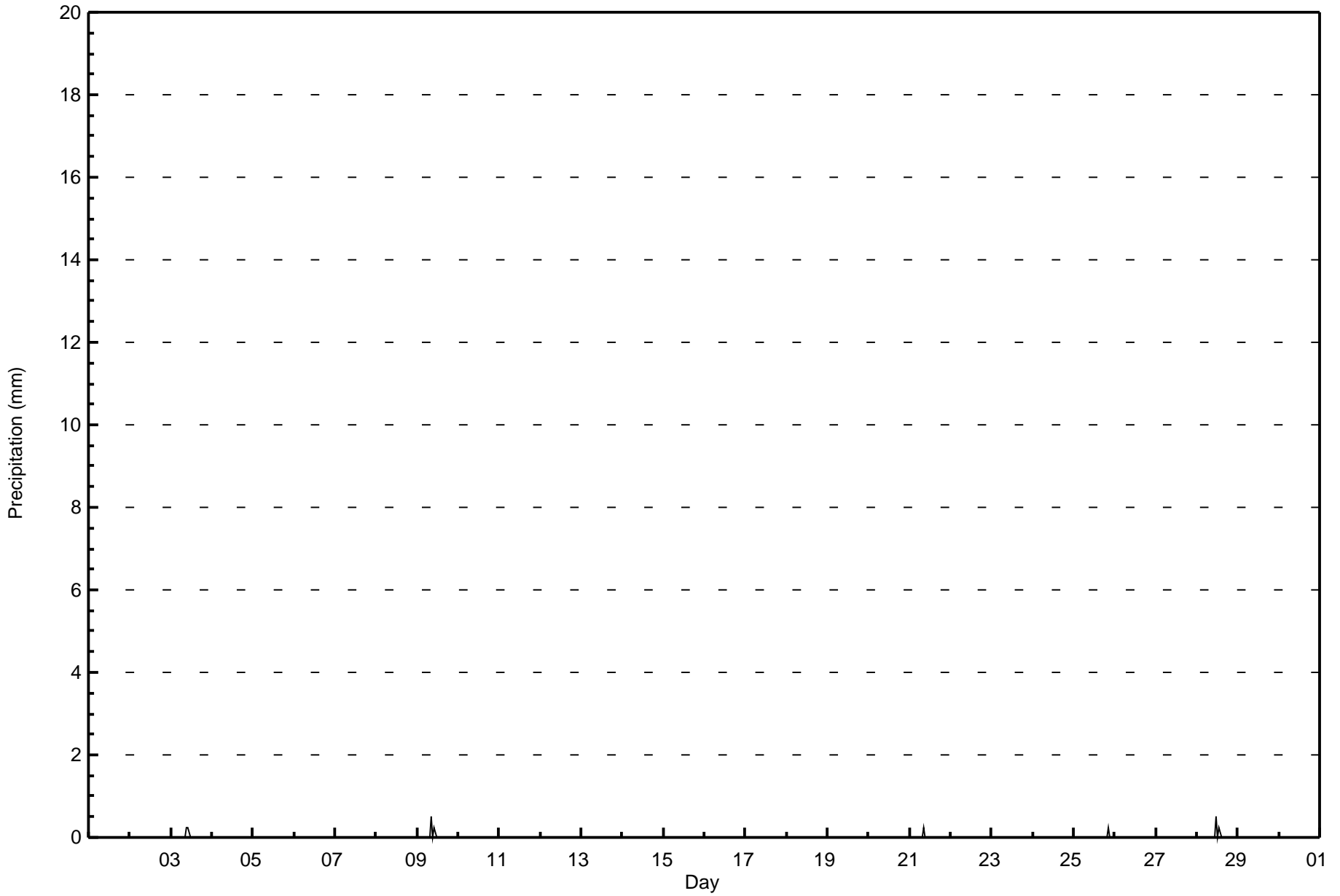
Fort Chipewyan - November 2016

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: 720																									
Maximum Diurnal Total: 0.8 mm at hour 9		Minimum Diurnal Total: 0.0 mm at hour 1		Hours of Missing Data: 0																									
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 = 0.3		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-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	0.0	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	
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	0.0	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	
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	0.0	0.0	0.0	0.0	0.3	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	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	
29-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	
30-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	
																								Diurnal Average					
																								Diurnal Maximum					



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

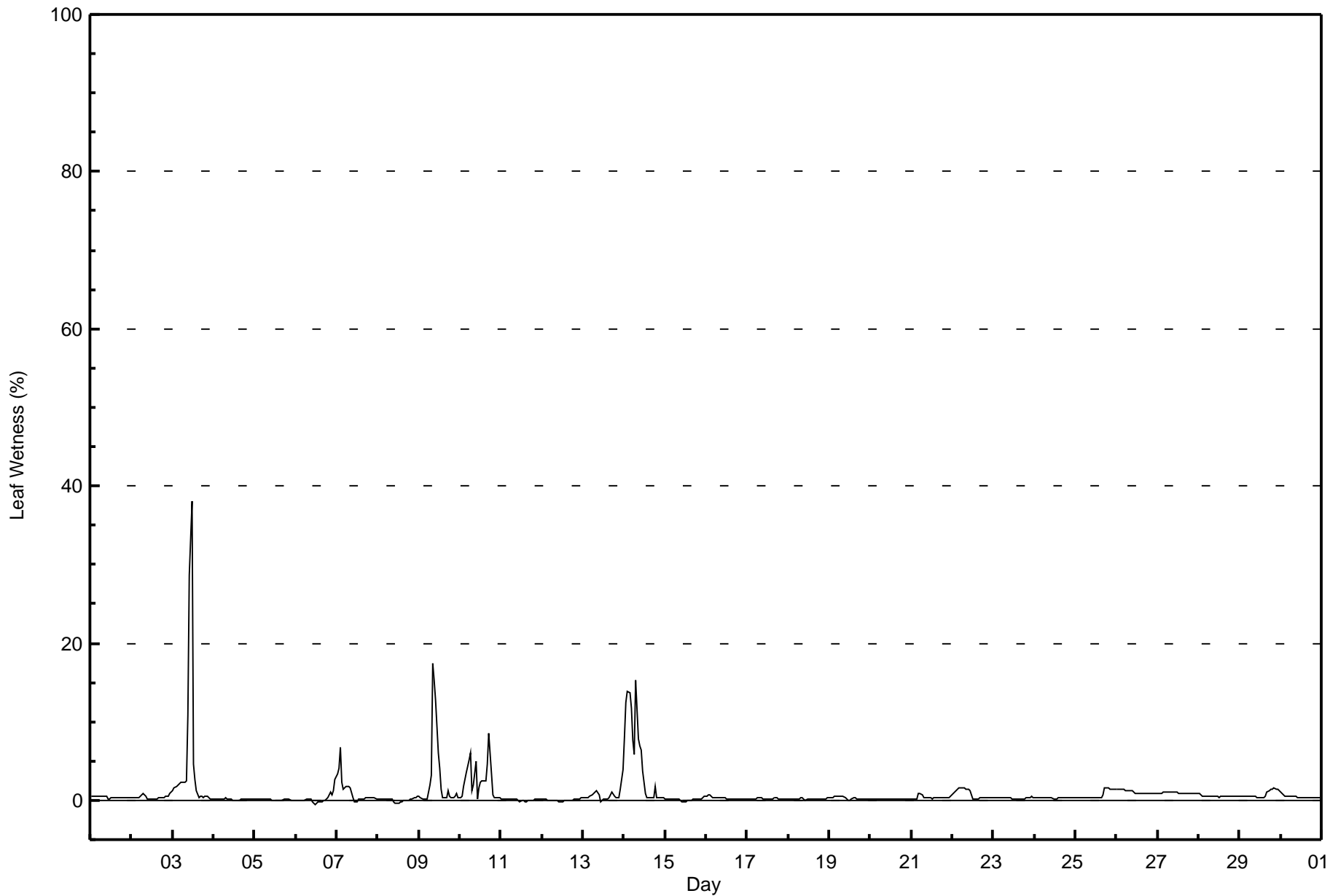
Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	718	99.72	99.72
0.4 - 0.5	2	0.28	100.00
0.6 - 0.7	0	0.00	100.00
0.8 - 1.4	0	0.00	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



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	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	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	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	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	3	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	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	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	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	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	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	4	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	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	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	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	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	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	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	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	1	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	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	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	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	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	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	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	0.5	1			
29-Nov	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	1	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	0.5	1			
																												Diurnal Average	
																												Diurnal Maximum	
0.8														1.0														8	
1.1														1.0														14	
1.0														1.0														14	
1.0														1.0														12	
1.0														1.0														8	
1.0														1.0														6	
1.2														1.2														15	
1.4														1.4														18	
1.6														1.6														15	
1.8														1.8														29	
1.8														1.8														38	
0.5														0.5														5	
0.4														0.4														3	
0.3														0.3														3	
0.3														0.3														3	
0.5														0.5														5	
0.7														0.7														9	
0.5														0.5														3	
0.4														0.4														2	
0.4														0.4														2	
0.4														0.4														1	
0.5														0.5														1	
0.6														0.6														4	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Fort Chipewyan - November 2016

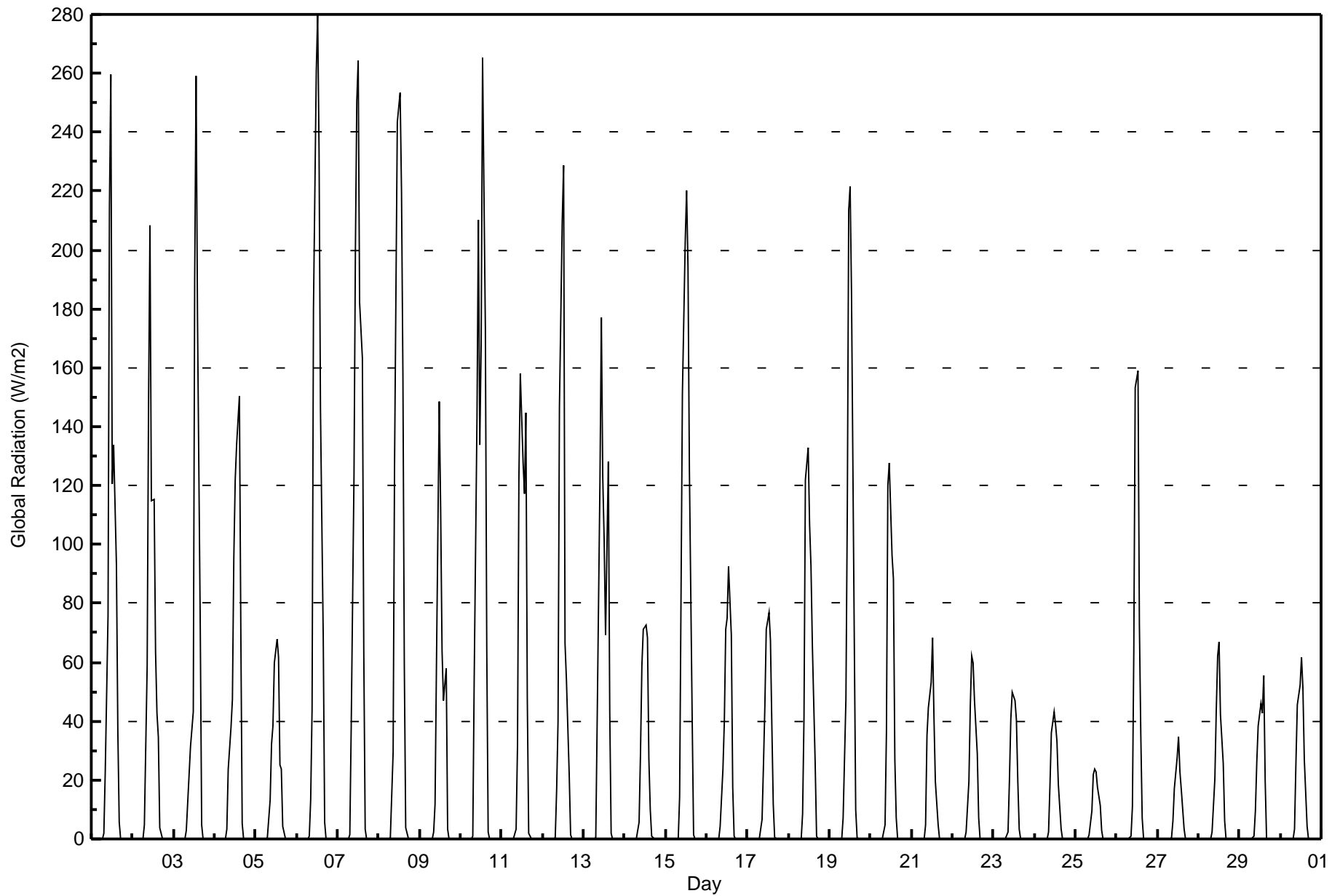
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	390	57.35	57.35
0.4 - 0.5	108	15.88	73.24
0.6 - 0.7	25	3.68	76.91
0.8 - 1.4	83	12.21	89.12
1.5 - 10	54	7.94	97.06
> 10	11	1.62	98.68

Total Number of Valid Hours: 680

Total Number of Hours: 720



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														Diurnal Maximum	





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



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	WNW8	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	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																			
SSW2.5SSW2.2SSW2.2SSW2.7SSW3.0																								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																					

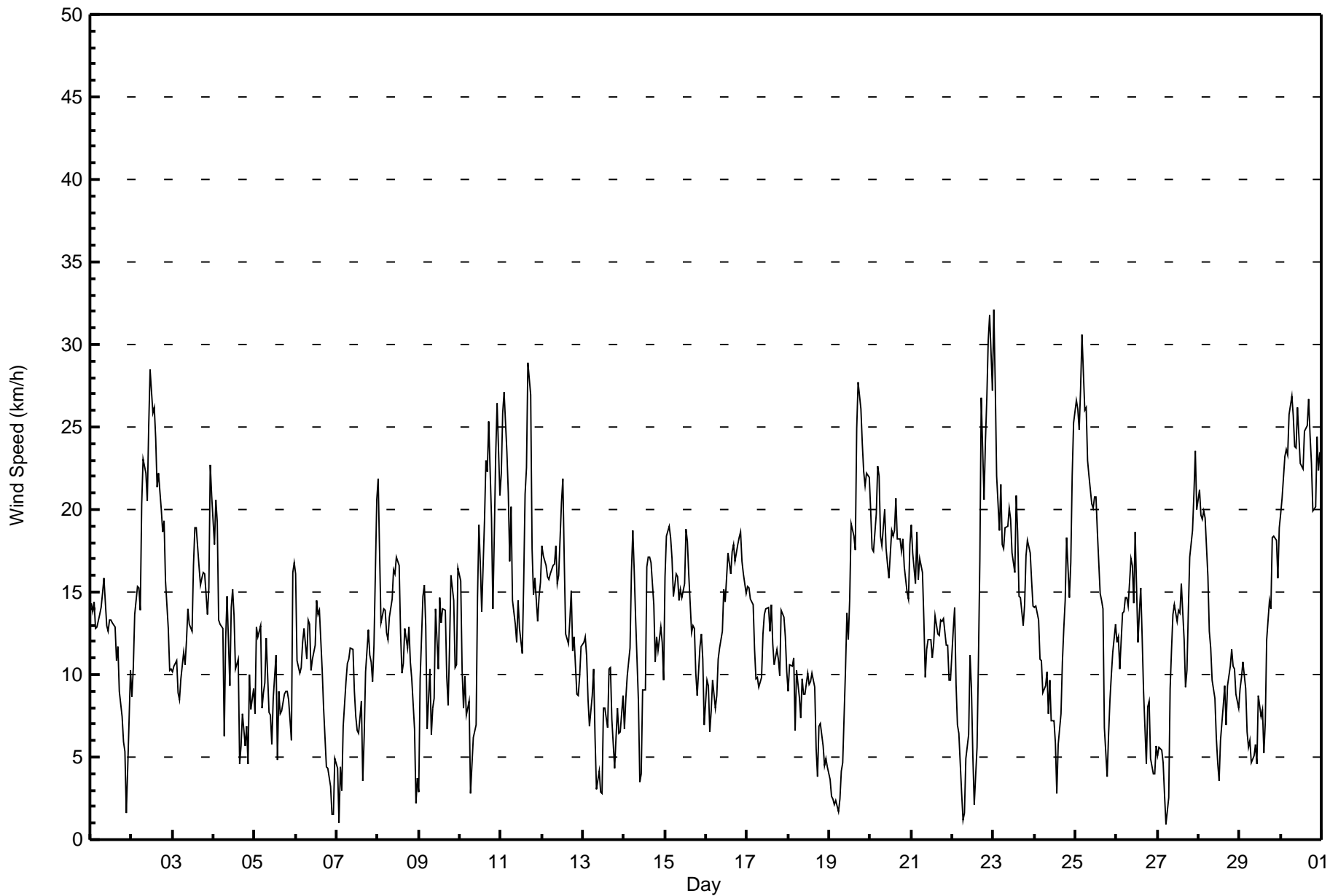
All monthly, daily, and diurnal averages have been calculated using vector methods



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 Minimum Value: 1 km/h on Nov 19 03:00 Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																		Hours in Service: 720 Hours of Data: 720 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-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	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																									





**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

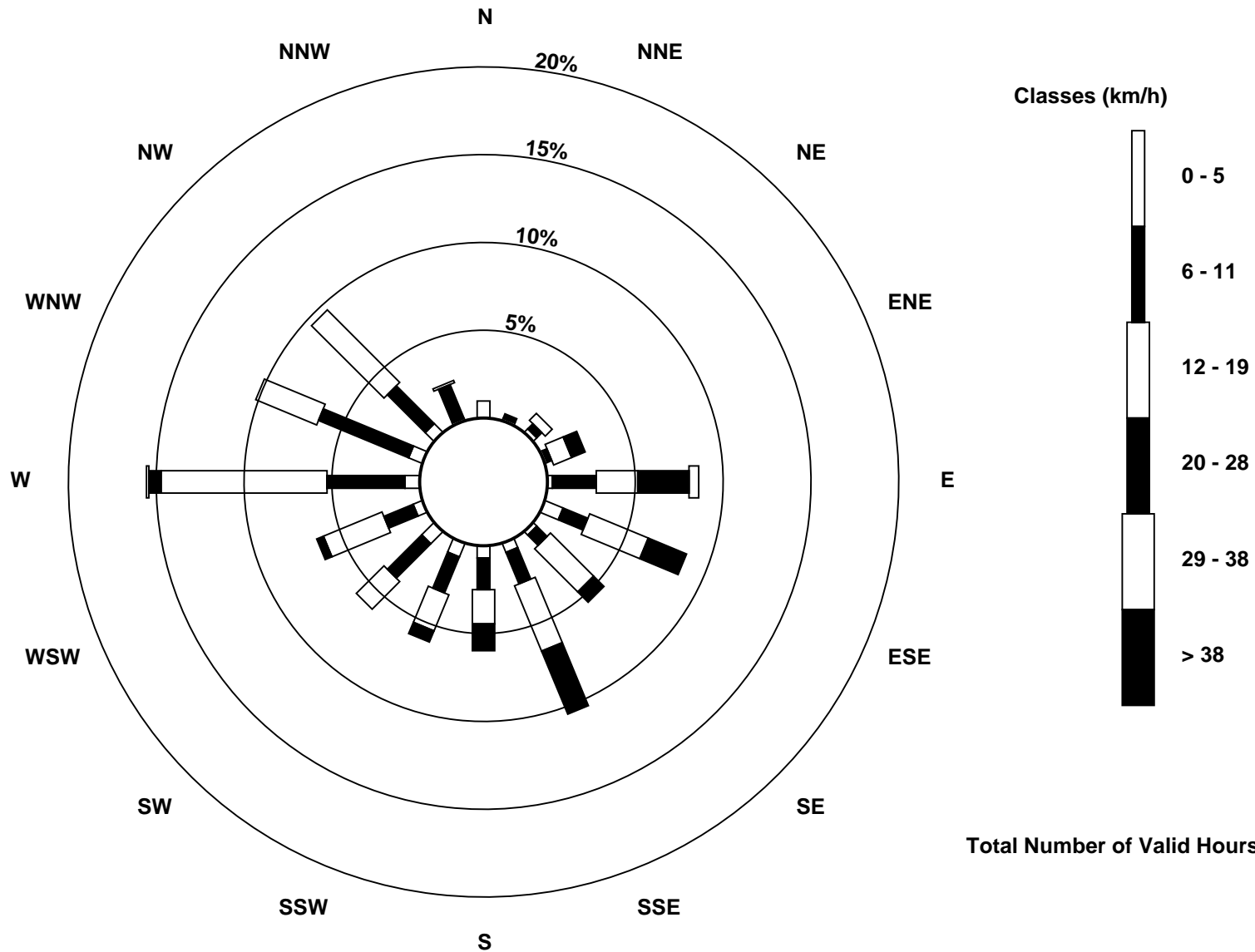
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 720



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 Direction of Maximum Daily Speed Average: 157.2 deg on Nov 30	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 311 deg on Nov 27 06:00 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

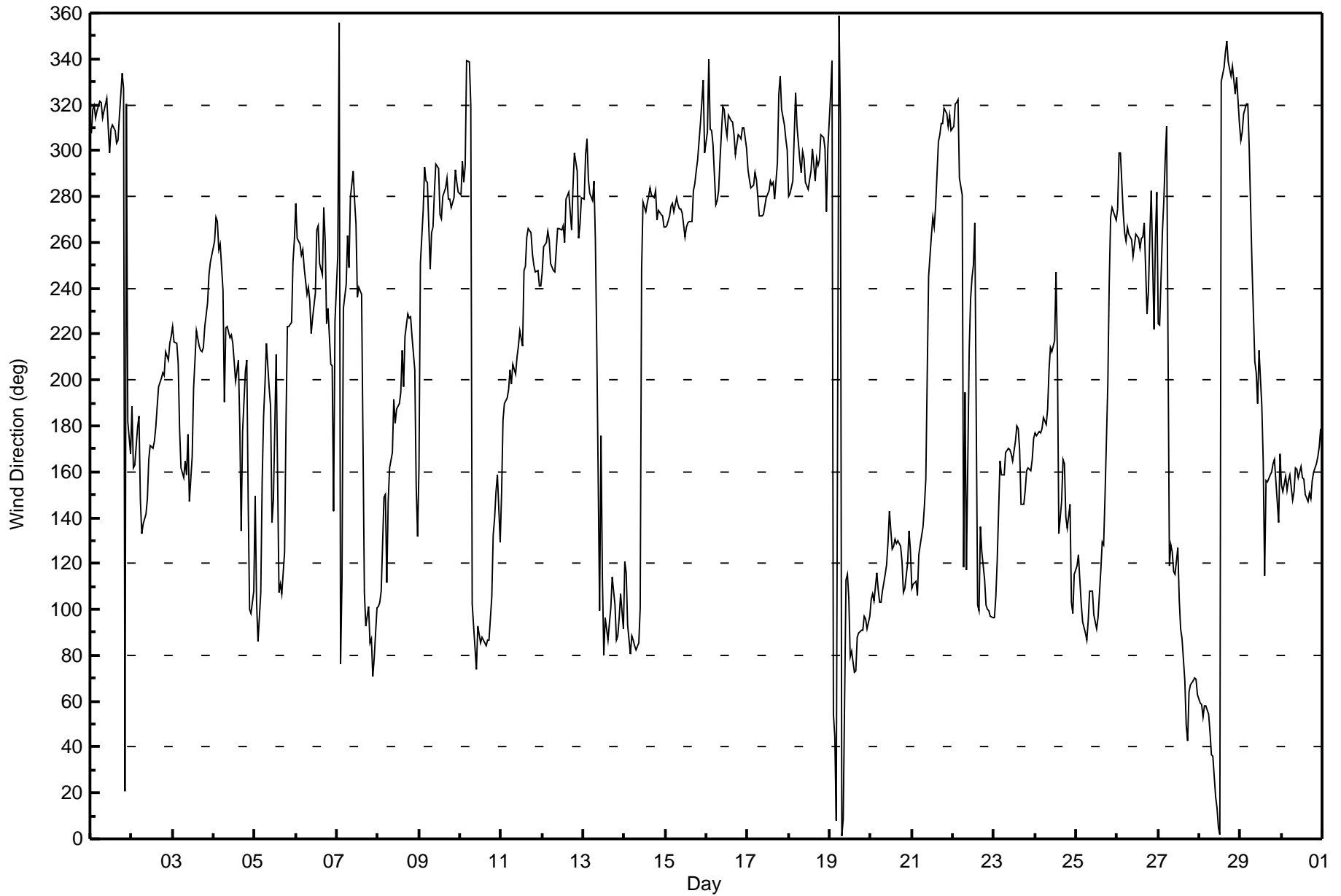
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	15	17	18	17	18	18	18	16	18	21	18	18	16	19	21	18	16	23	25	39	22	86	61	24	86
2-Nov	22	25	17	18	13	15	7	10	9	11	11	9	9	8	11	8	8	8	8	9	7	8	12	10	25
3-Nov	12	10	10	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

	Before	After		Before	After
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



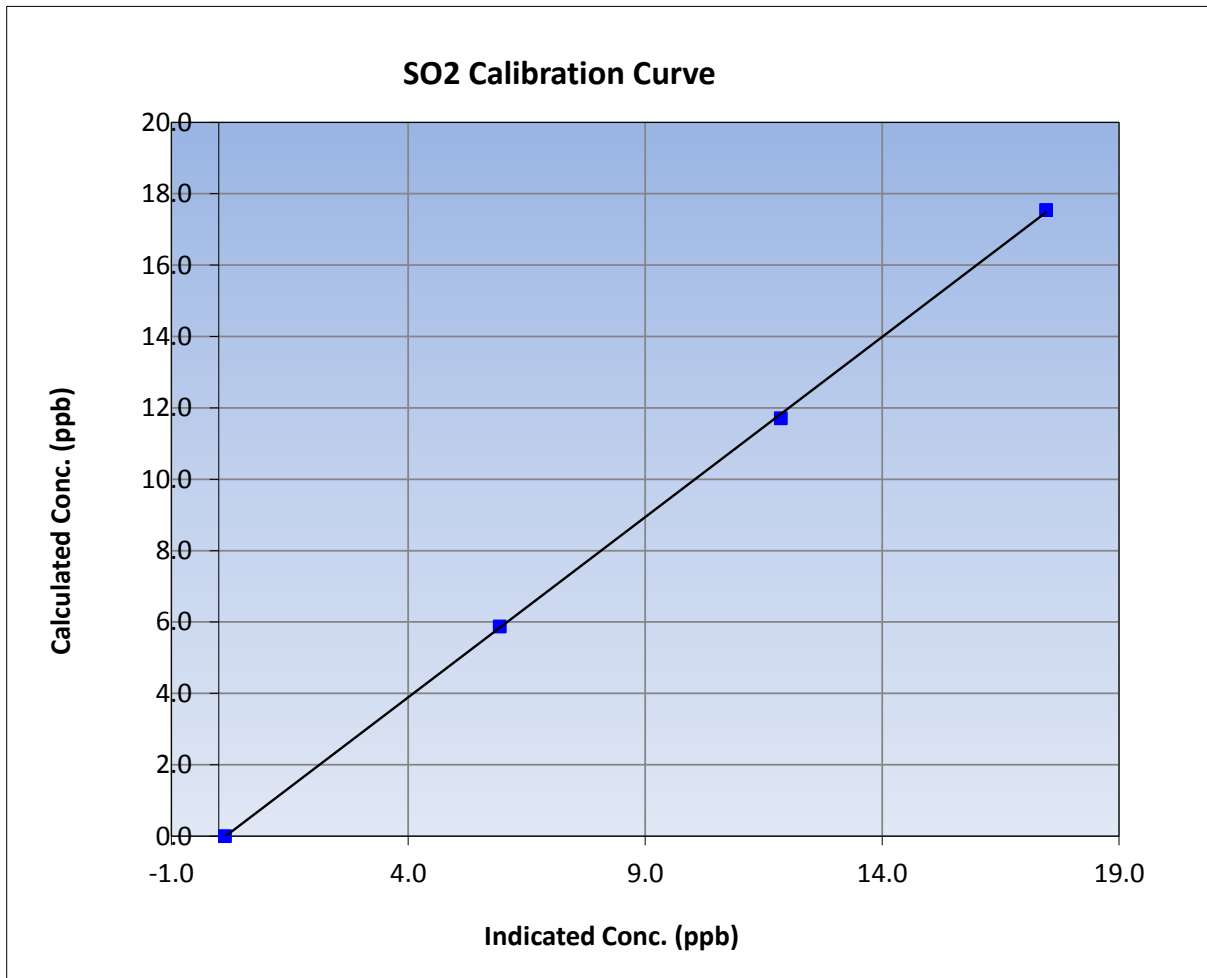
Wood Buffalo Environmental Association SO2 Calibration Report

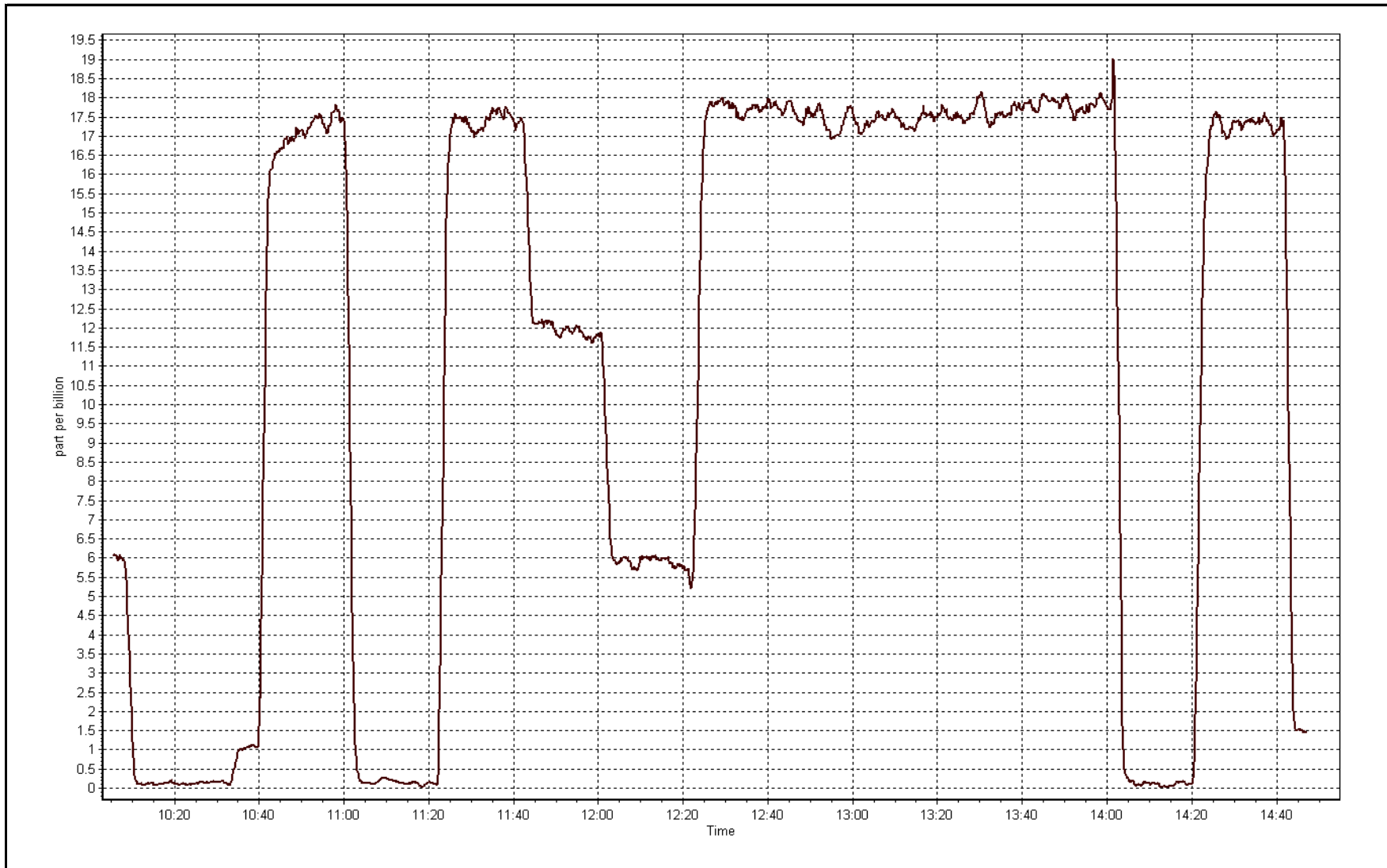
Station Information

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



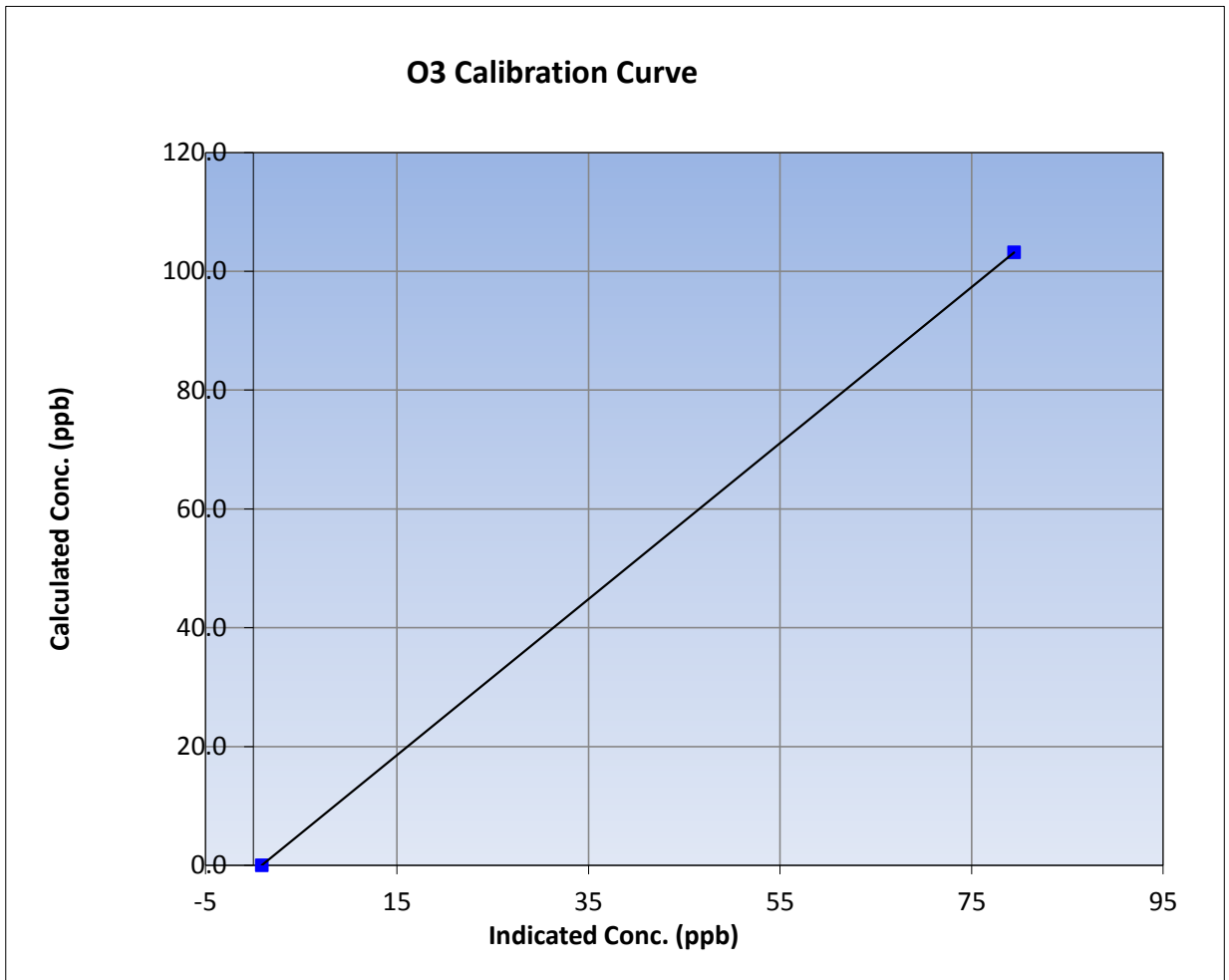
Wood Buffalo Environmental Association O3 Calibration Report

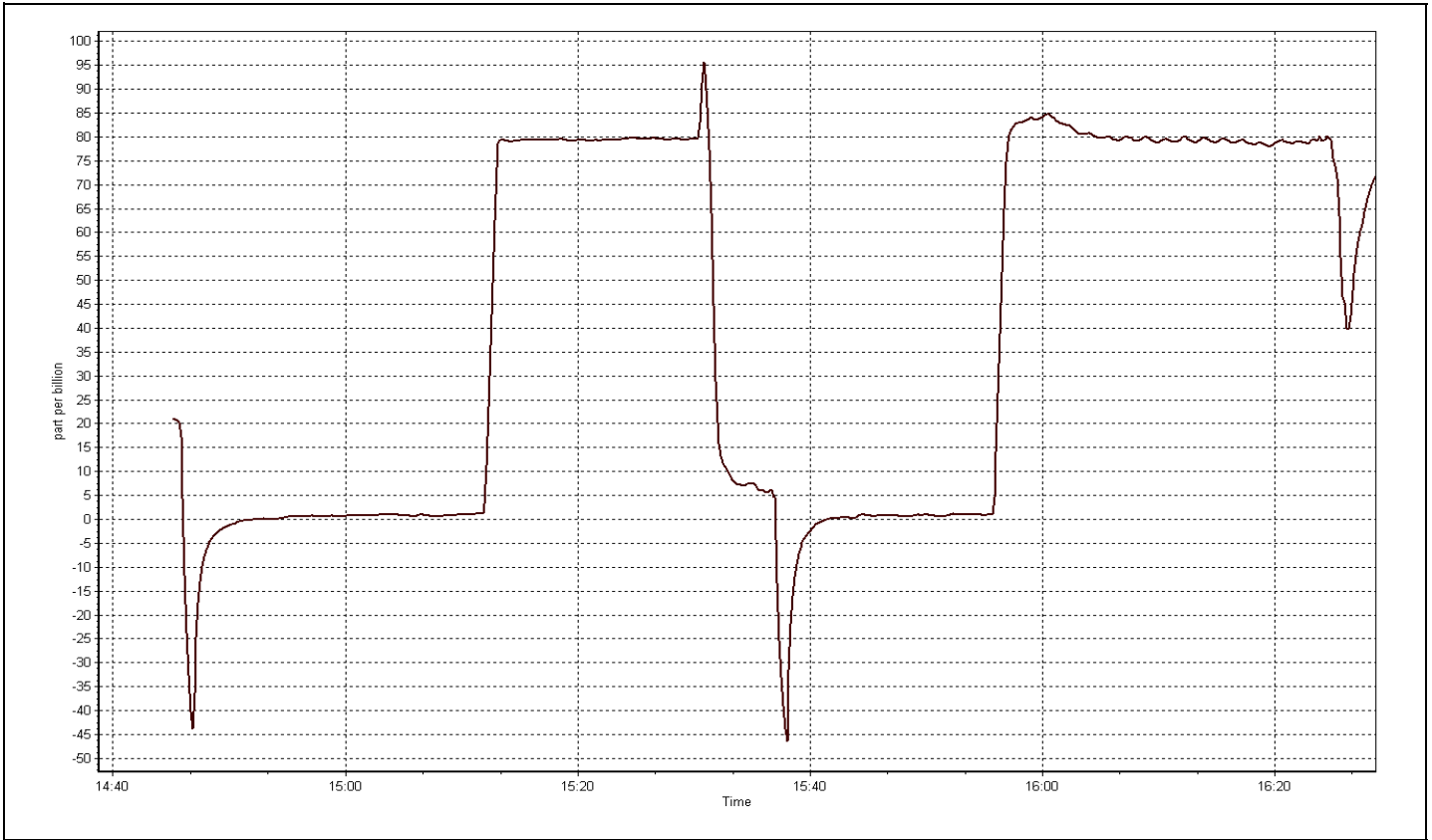
Station Information

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







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



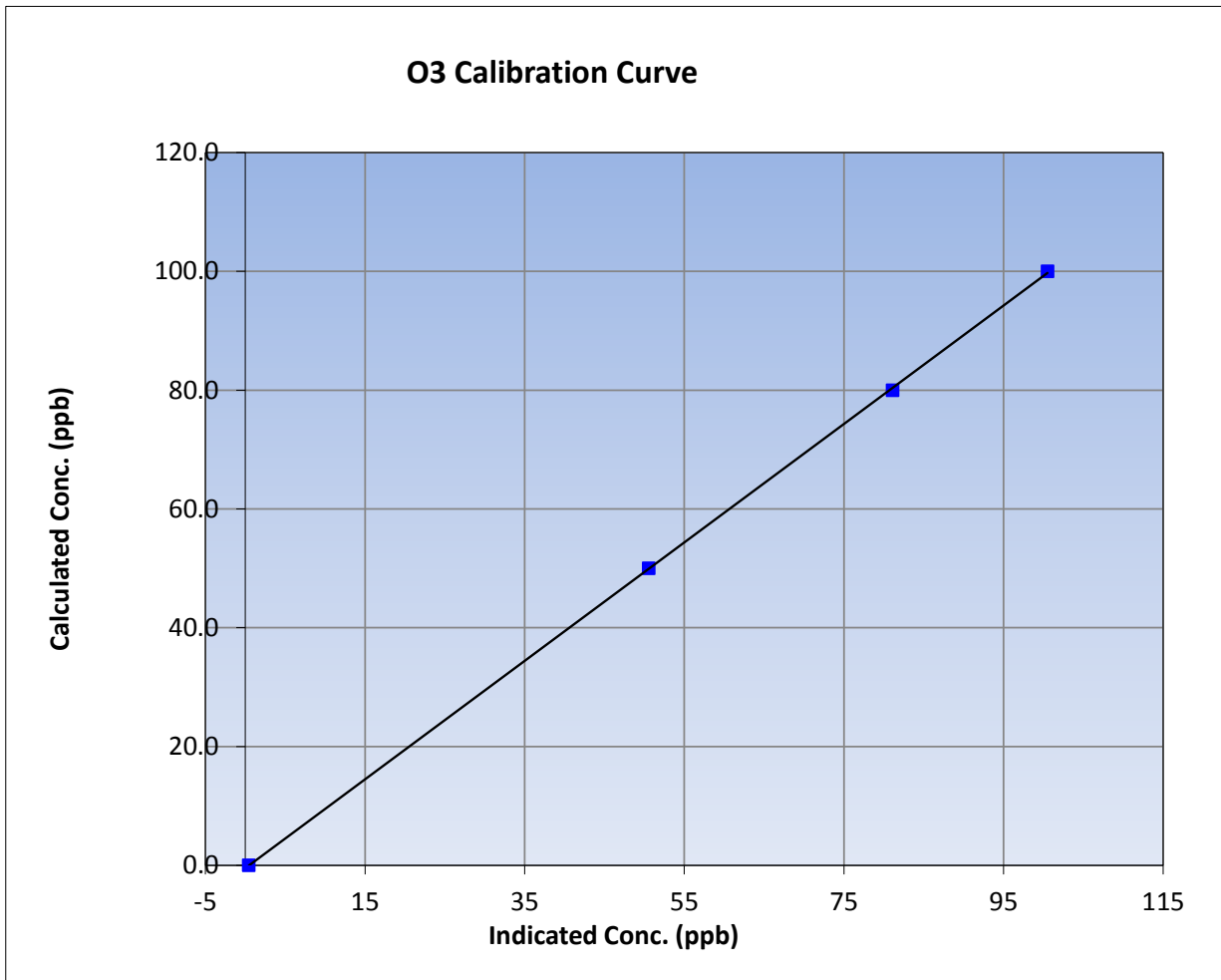
Wood Buffalo Environmental Association O3 Calibration Report

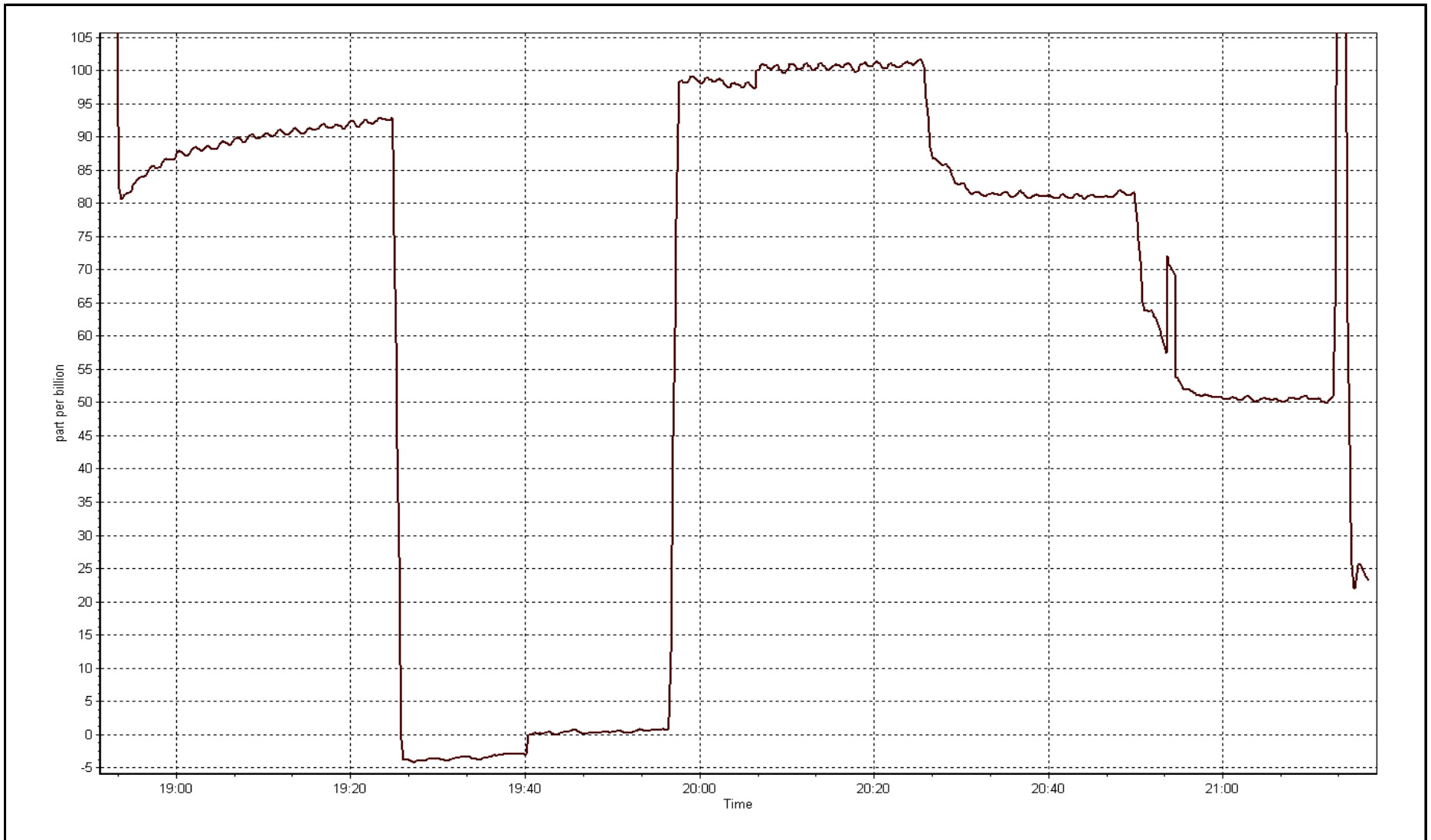
Station Information

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







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:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Routine</td> </tr> </table>			Routine
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



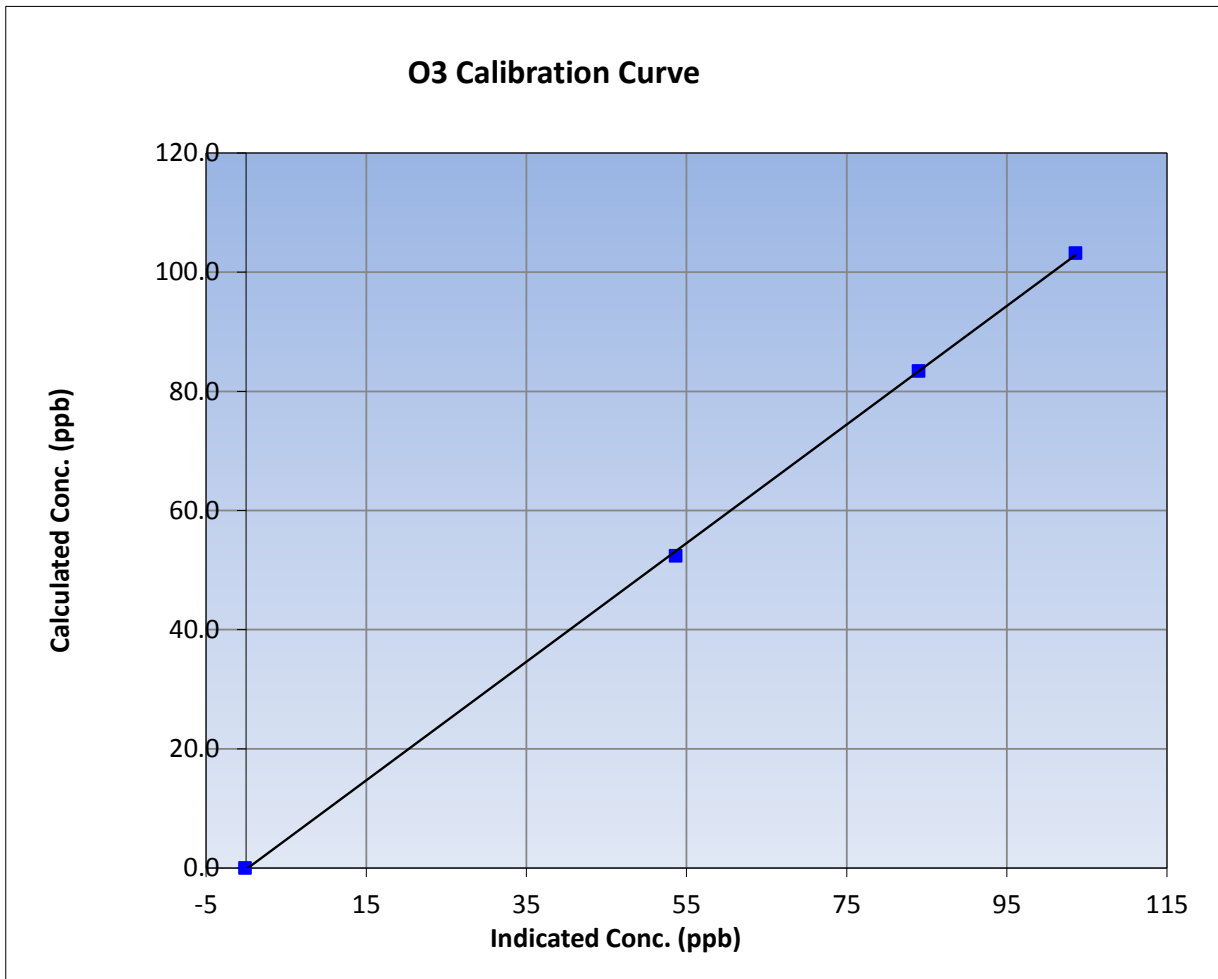
Wood Buffalo Environmental Association O3 Calibration Report

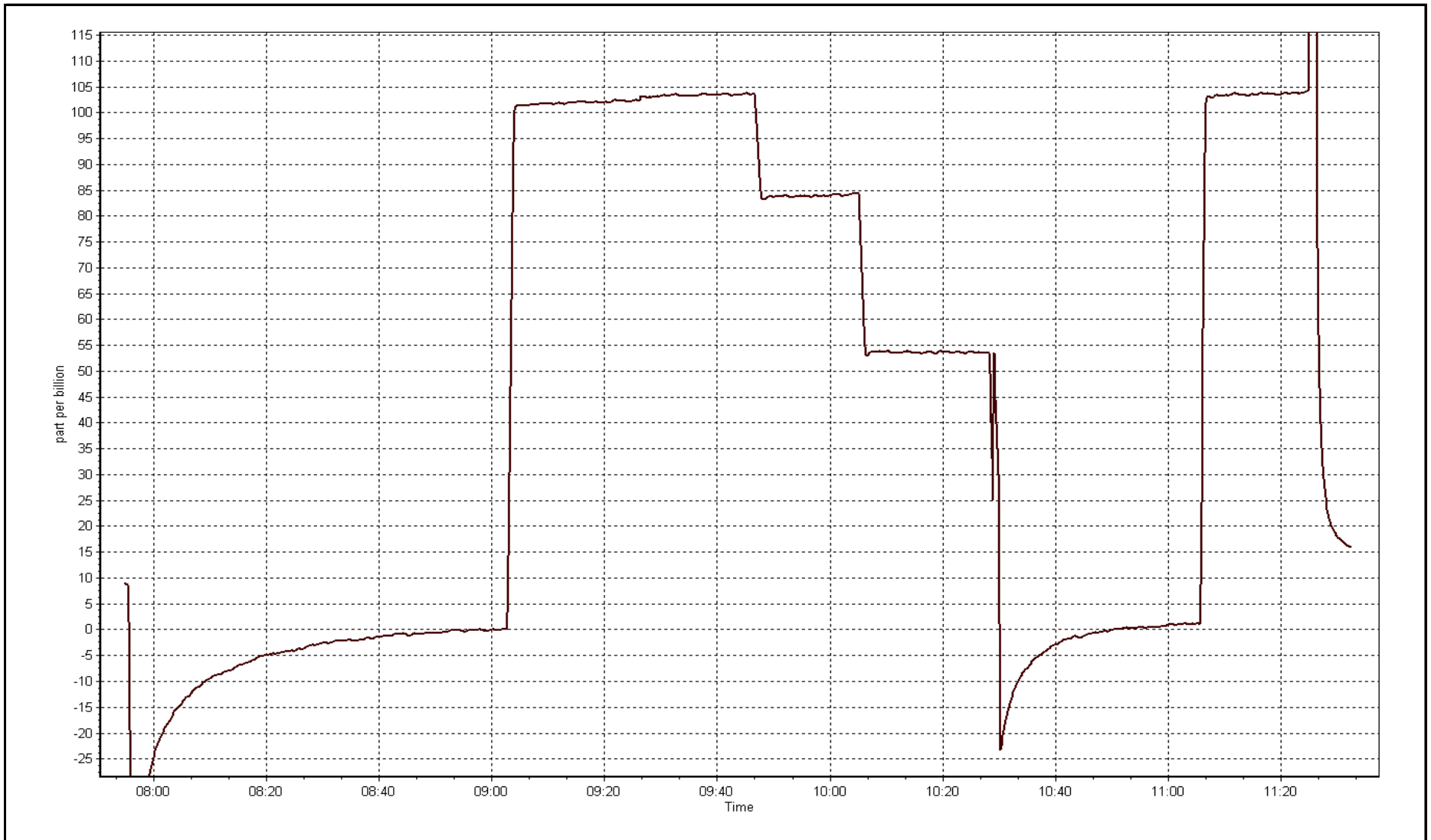
Station Information

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
	Data Offset	0.607461	0.695711
Current Calibration	Data Slope	0.997620	0.997797
	Data Offset	0.504265	0.570834

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

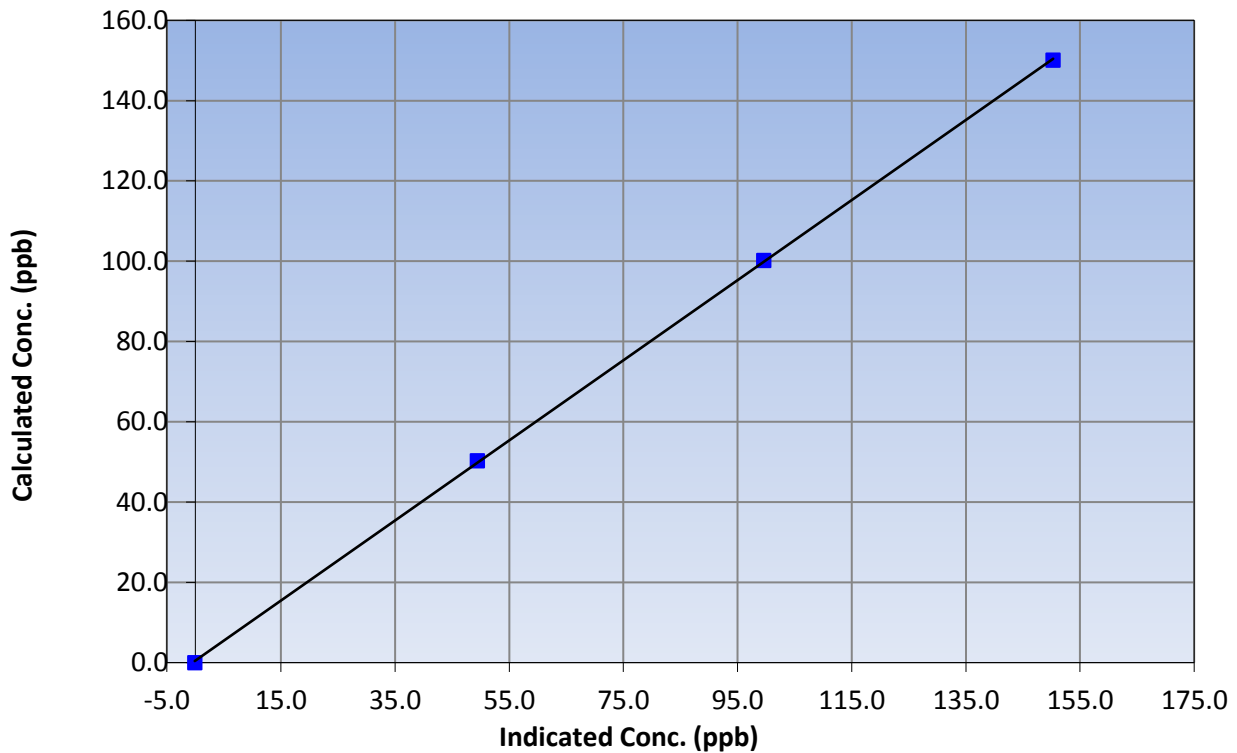
Station Information

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

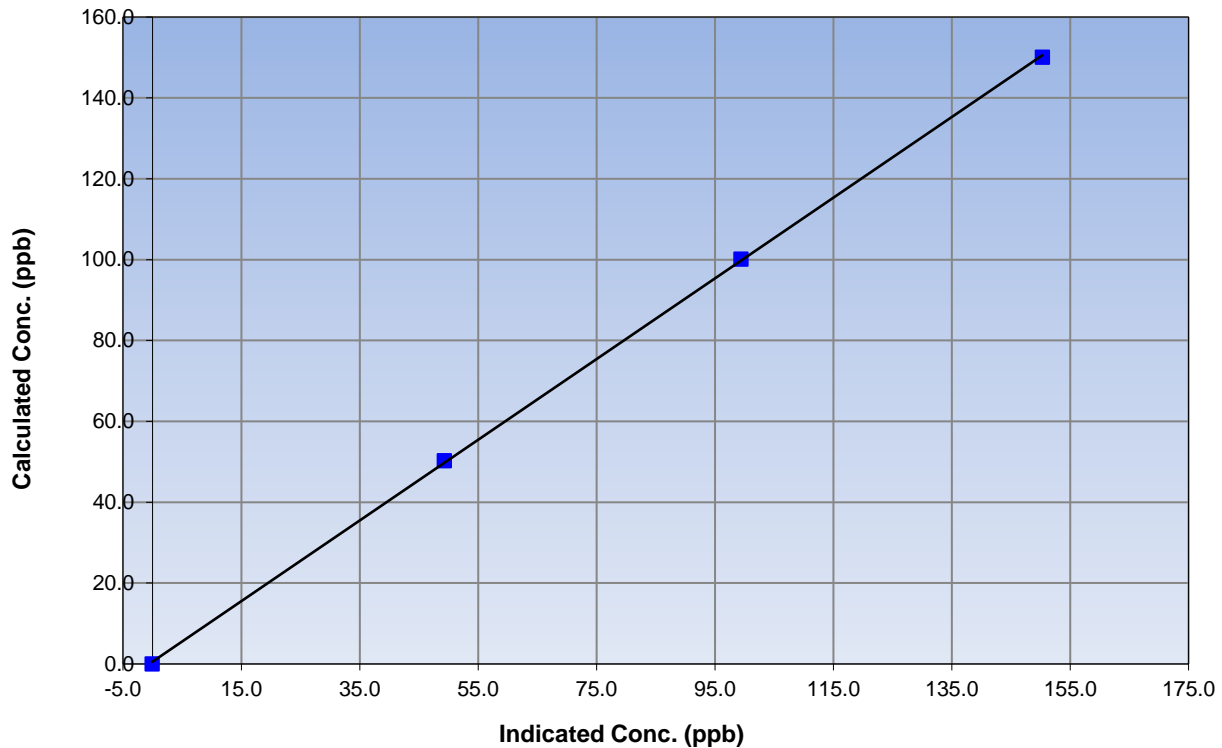
Station Information

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

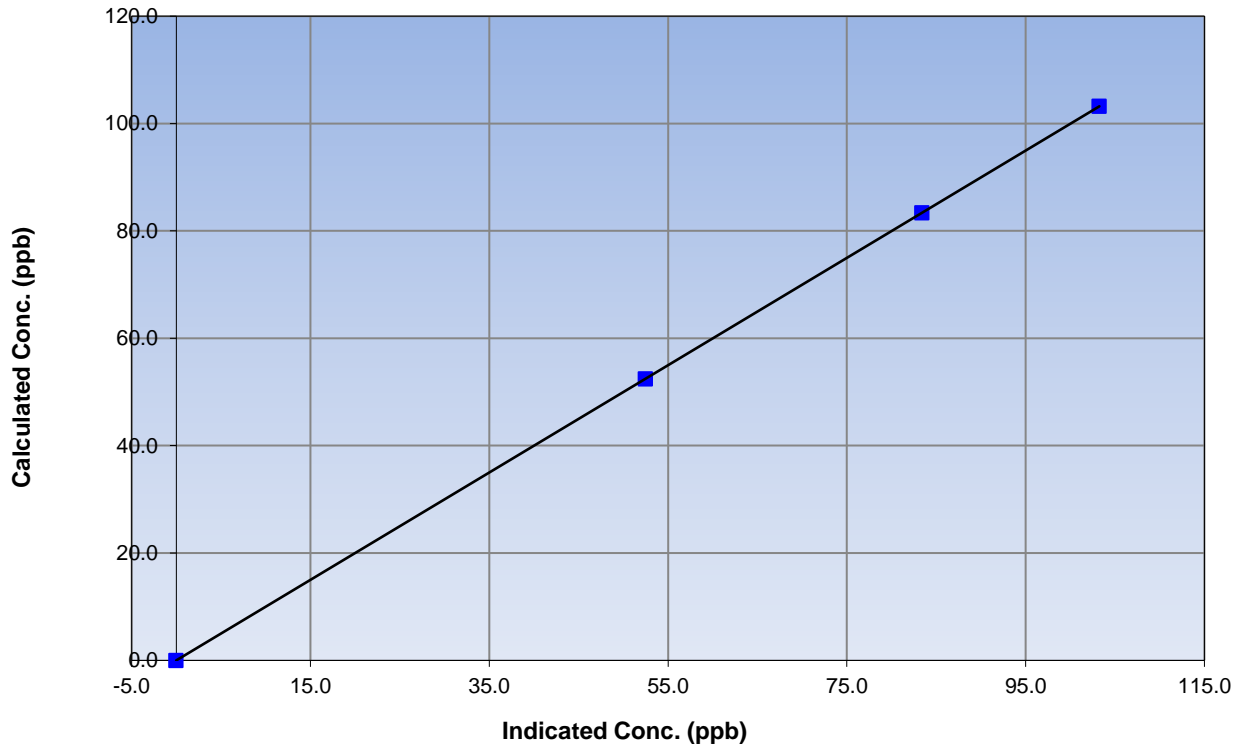
Station Information

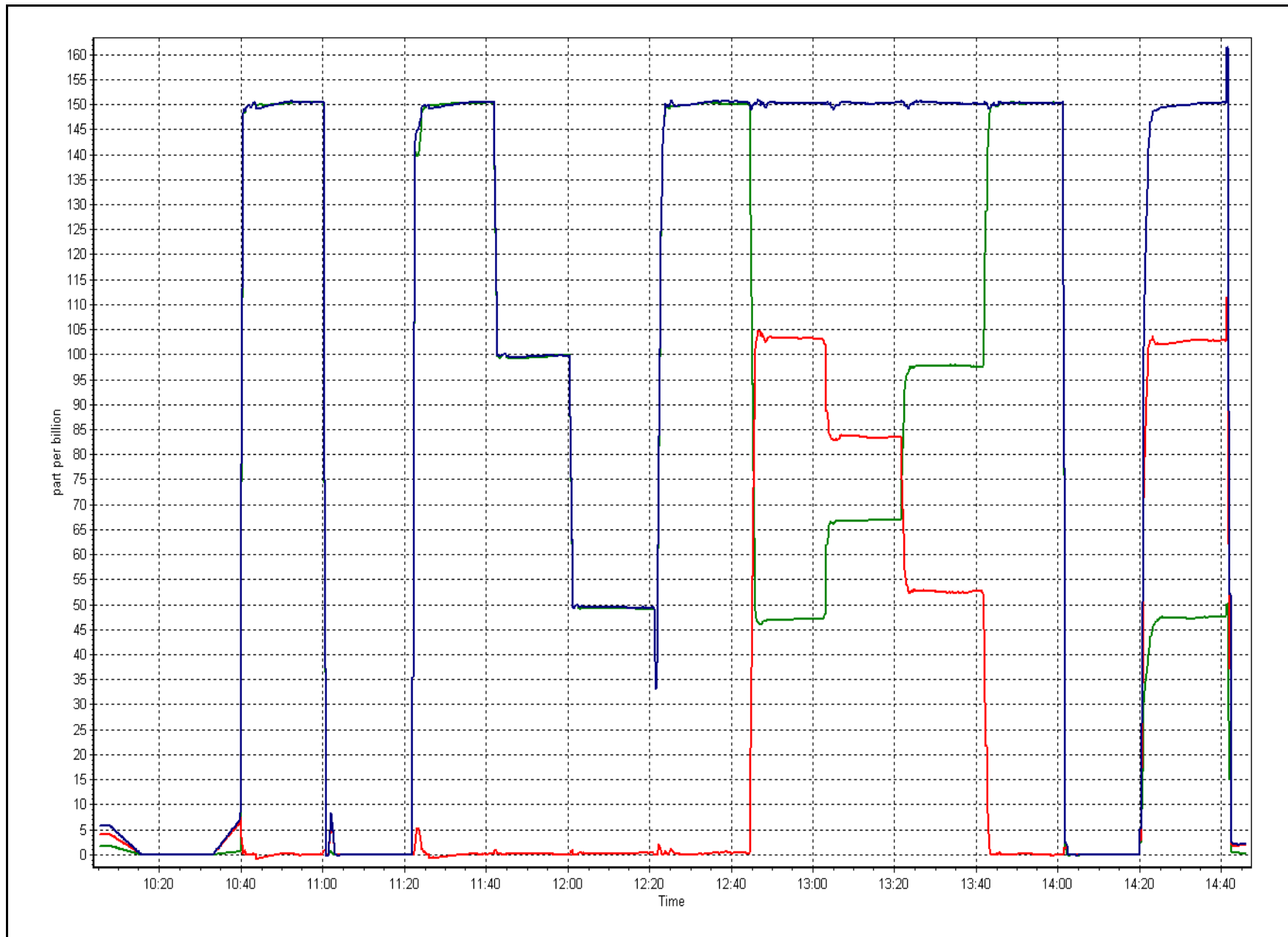
Calibration Date	November 2, 2016	Previous Calibration	October 5, 2016
Station Number	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:05	End Time (MST)	14:50
Analyzer make	Teledyne API T200u	Analyzer serial #	172

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

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
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: _____

<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 cleaned. No adjustments needed to flow, temperature, pressure or nephelometer.

Calibration by: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 9
BARGE LANDING
NOVEMBER 2016**

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 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
TRS(ppb) Average	687	33	33	100.00	2	0	1	0
THC(ppm) Average	684	36	36	100.00	3.7	-	3	-
Temperature (C) Average	720	0	0	100.00	12.1	-	6.3	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	96	-
Wind Speed 10 m (km/h) Average	719	0	1	99.86	17	-	10	-
Wind Direction 10 m (deg) Average	719	0	1	99.86	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 NOVEMBER 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	687	0.4	0	-	0	0	0	0	0	1	2
THC(ppm) Average	684	2.33	0.3	-	2	2.1	2.1	2.2	2.4	2.7	3.7
Temperature (C) Average	720	-1.44	5.4	-	-11.9	-8.3	-5.4	-2	2.8	6.1	12.1
Relative Humidity (%) Average	720	80.8	11	-	44	65	73	82	91	95	98
Wind Speed 10 m (km/h) Average	719	5.5	3	-	0	2	3	5	7	9	17
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	28 Nov 2016 07:00	28 Nov 2016 07:00	1	Flat line in sensor output signal -sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Nov 14 00:00	Maximum Daily Average: 1.4 ppb on Nov 8		Hours of Data:	687
Minimum Value: 0 ppb on Nov 6 15:00	Minimum Daily Average: 0.2 ppb on Nov 1		Hours of Missing Data:	33
Maximum Diurnal Average: 0.5 ppb at hour 8	Minimum Diurnal Average: 0.3 ppb at hour 3		Hours of Calibration:	33
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 = 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-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0.4	1
3-Nov	0	1	Z	1	1	1	1	0	0	0	1	C	C	C	1	1	1	1	0	0	0	0	0	0	0.6	1	
4-Nov	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	0.9	2	
5-Nov	1	1	1	1	Z	1	1	1	2	1	1	2	2	2	2	1	1	2	1	1	1	1	1	1	1.3	2	
6-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	
7-Nov	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1	
8-Nov	0	Z	1	1	1	1	2	2	1	1	1	1	1	1	2	2	2	2	1	1	2	2	2	1	1.4	2	
9-Nov	1	2	Z	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2	
10-Nov	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1	
11-Nov	0	0	0	1	Z	1	1	2	1	1	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0.6	2	
12-Nov	0	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
13-Nov	0	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	2	2	2	1	1	1	1	2	1.0	2	
14-Nov	1	Z	1	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	
15-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	0.2	0	
16-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	0.2	0	
17-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	0.2	0	
18-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	
19-Nov	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	
20-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.3	1	
21-Nov	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-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	0.3	0	
23-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	0.3	0	
24-Nov	0	0	0	0	0	Z	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1	
25-Nov	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-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	0.2	0	
27-Nov	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	
28-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1	
29-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	0.2	0	
30-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	

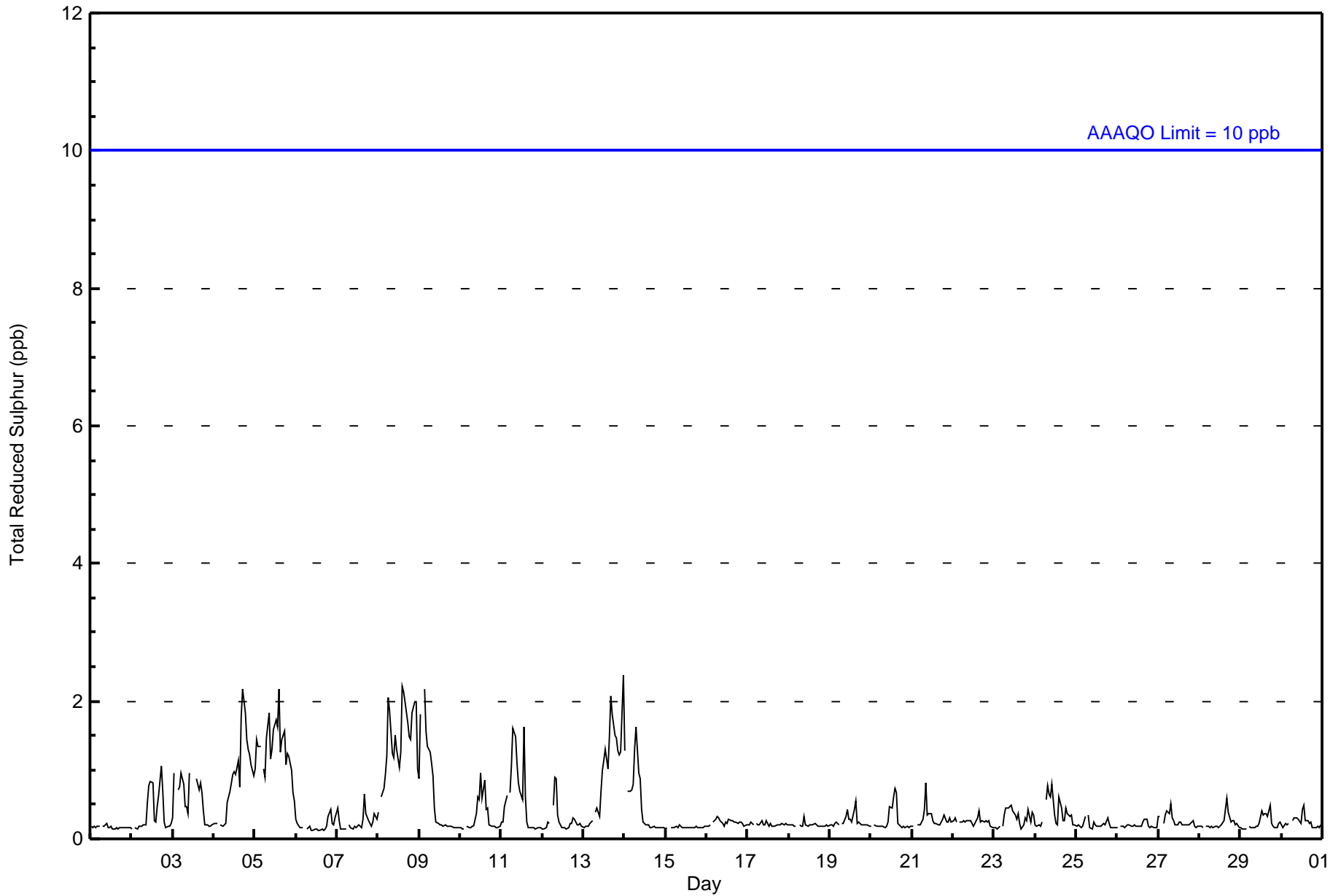
0.3	0.3	0.3	0.4	0.3	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	Diurnal Average
1	2	1	2	2	1	2	2	2	2	1	1	2	2	2	2	2	2	2	2	1	2	2	2	2	Diurnal Maximum

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
Barge Landing - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Barge Landing - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	687	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: 687

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Barge Landing - 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 - 2	35	19	17	15	15	13	36	83	132	83	62	66	29	23	21	37	686
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	35	19	17	15	15	13	36	83	132	83	62	66	29	23	21	37	686

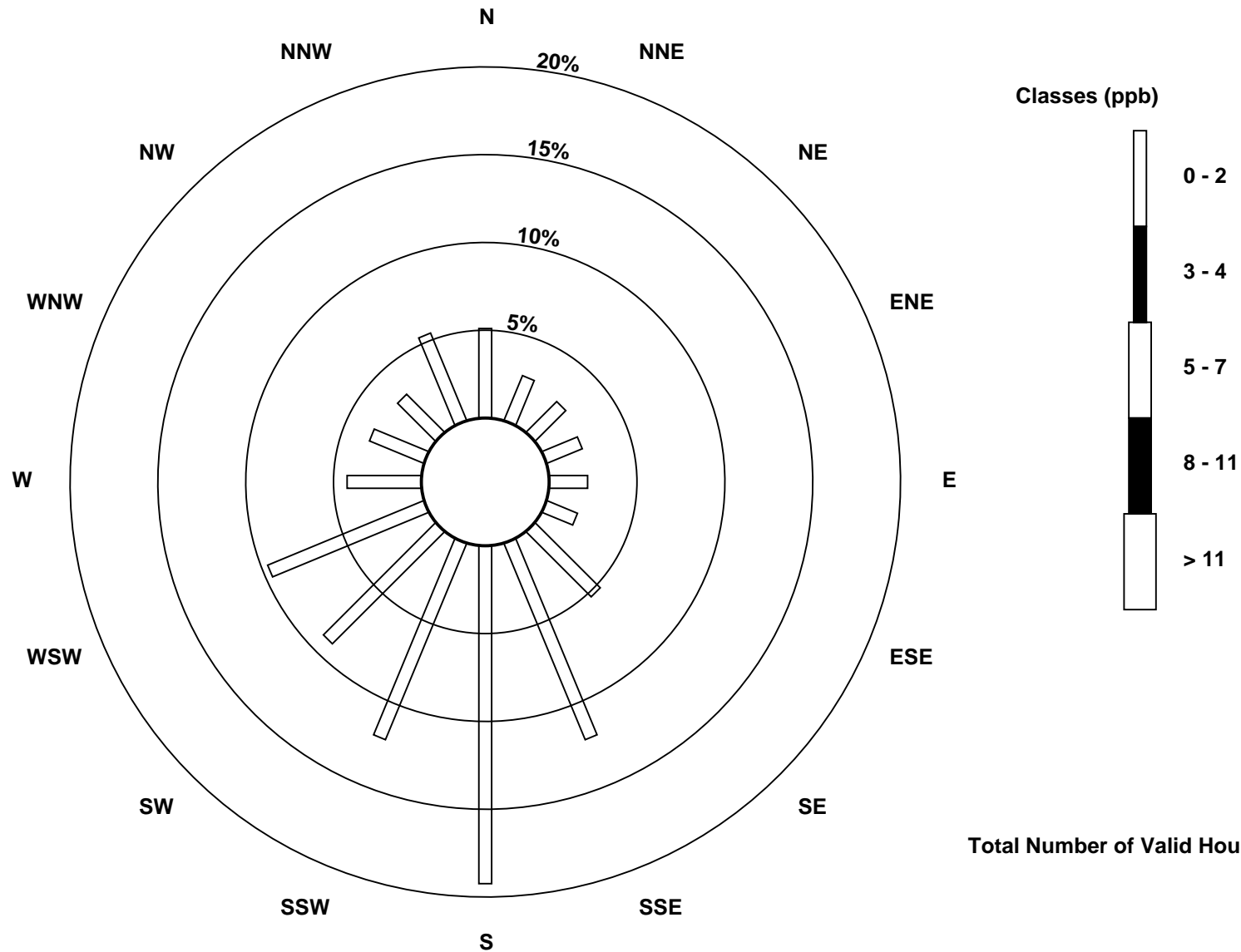
Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Reduced Sulphur (TRS) - ppb
Barge Landing (AMS 9)

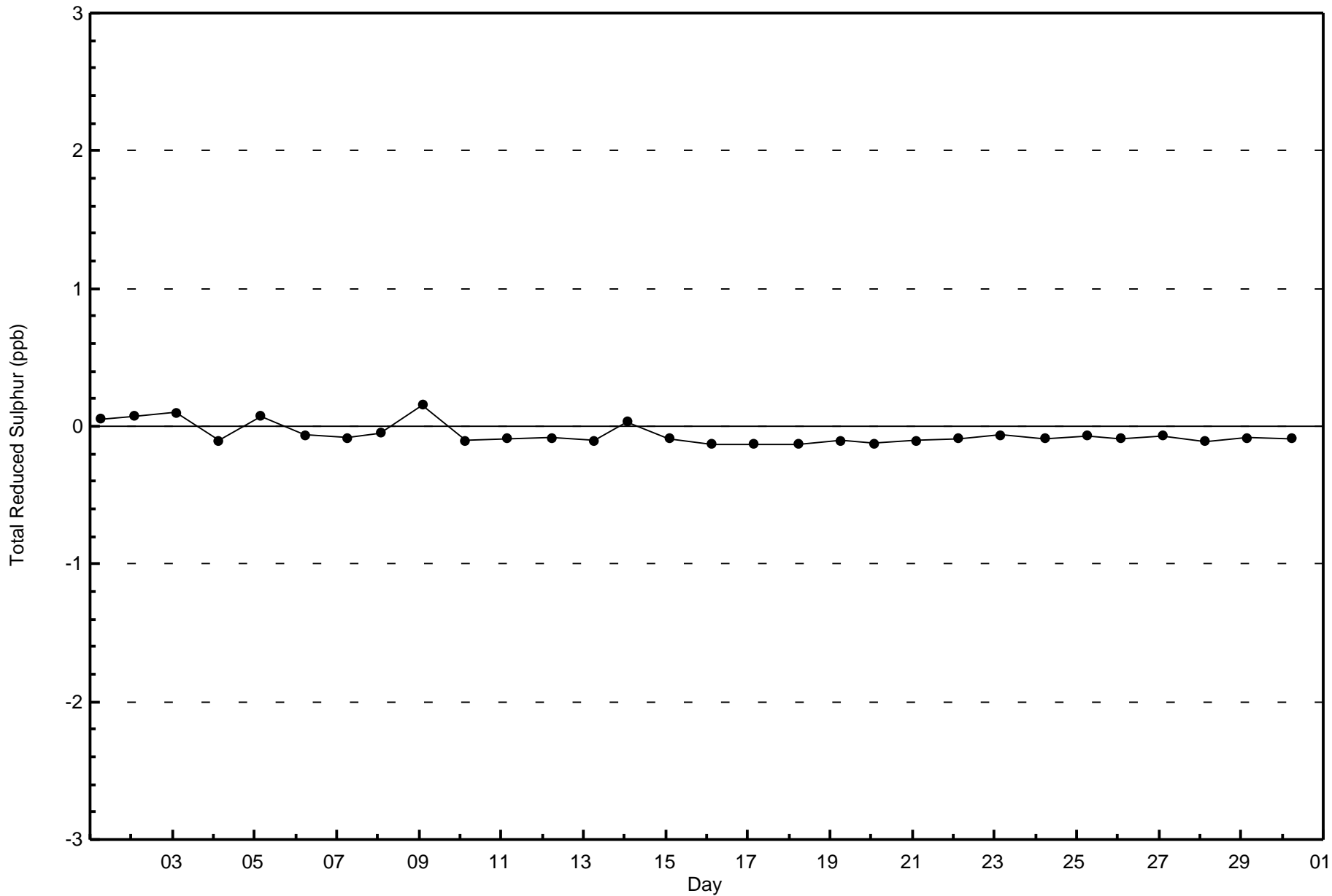


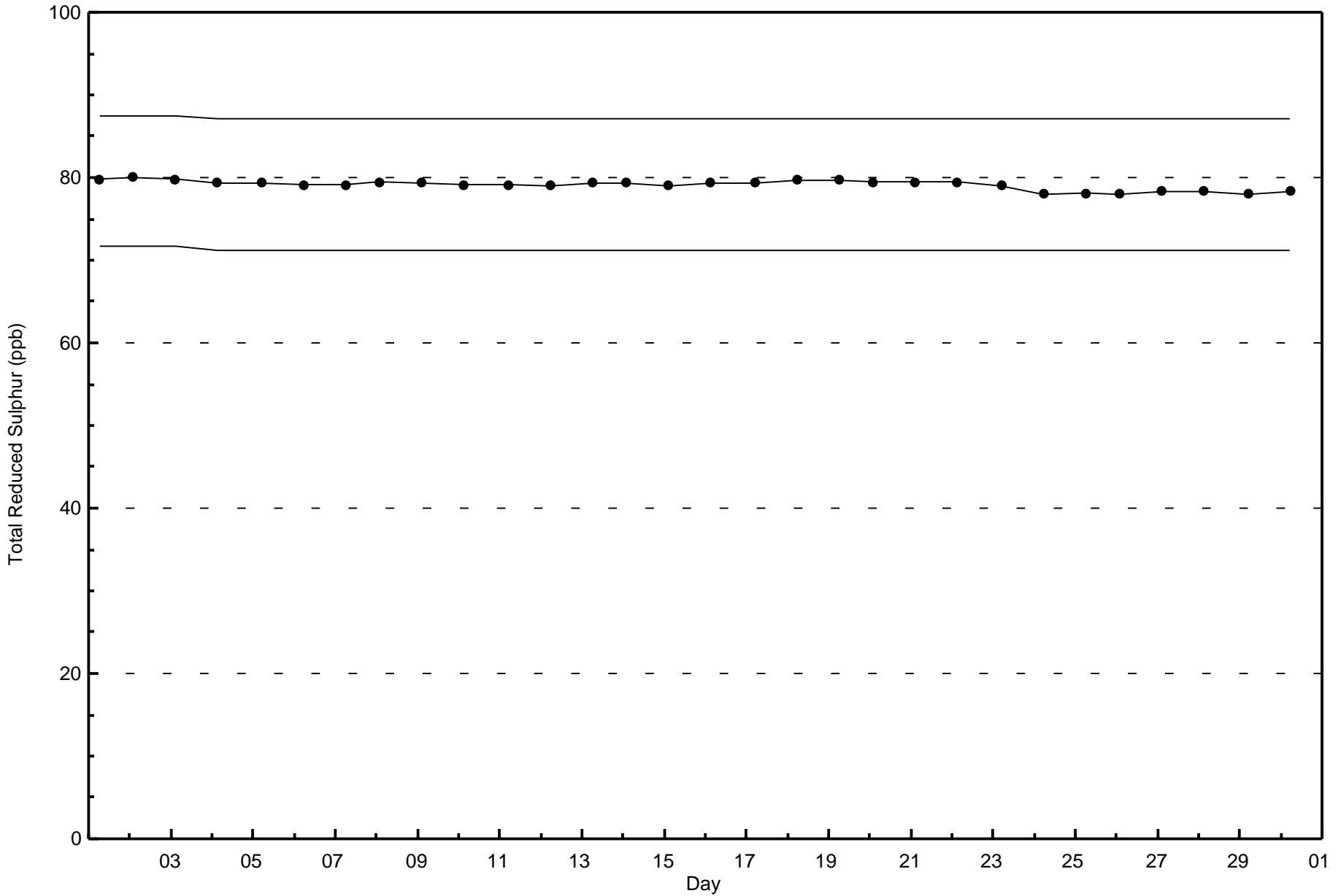
Total Number of Valid Hours: 686

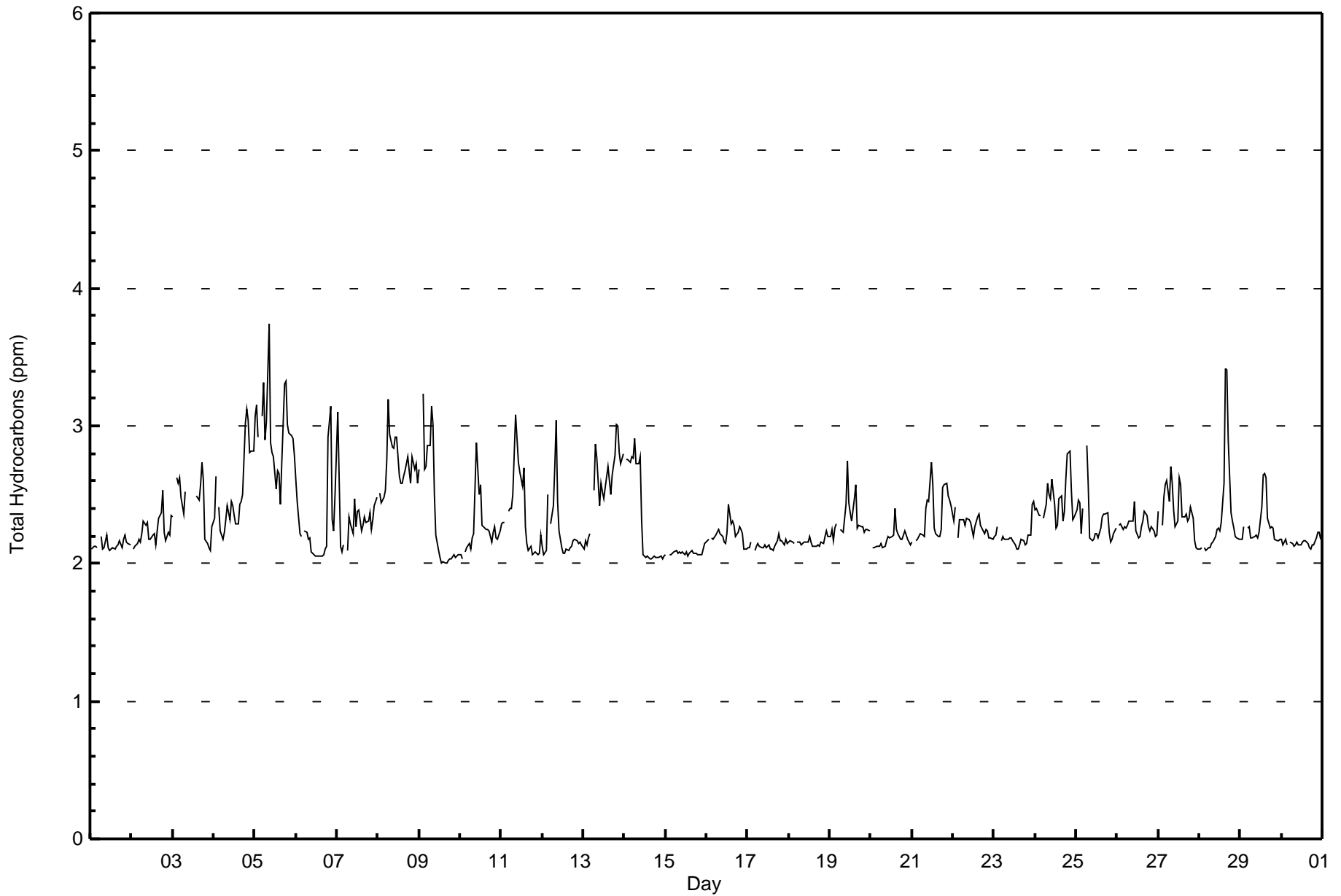


Wood Buffalo Environmental Association
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Barge Landing - November 2016









**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Barge Landing - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	19	2.78	2.78
2.1 - 3.0	649	94.88	97.66
3.1 - 10.0	16	2.34	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Barge Landing - November 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	2	7	9	1	0	0	19
2.1 - 3.0	34	18	17	15	15	14	37	86	120	81	55	58	20	22	20	36	648	
3.1 - 10.0	1	1	0	0	0	0	0	3	6	1	3	1	0	0	0	0	16	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	35	19	17	15	15	14	37	89	126	82	60	66	29	23	20	36	683	

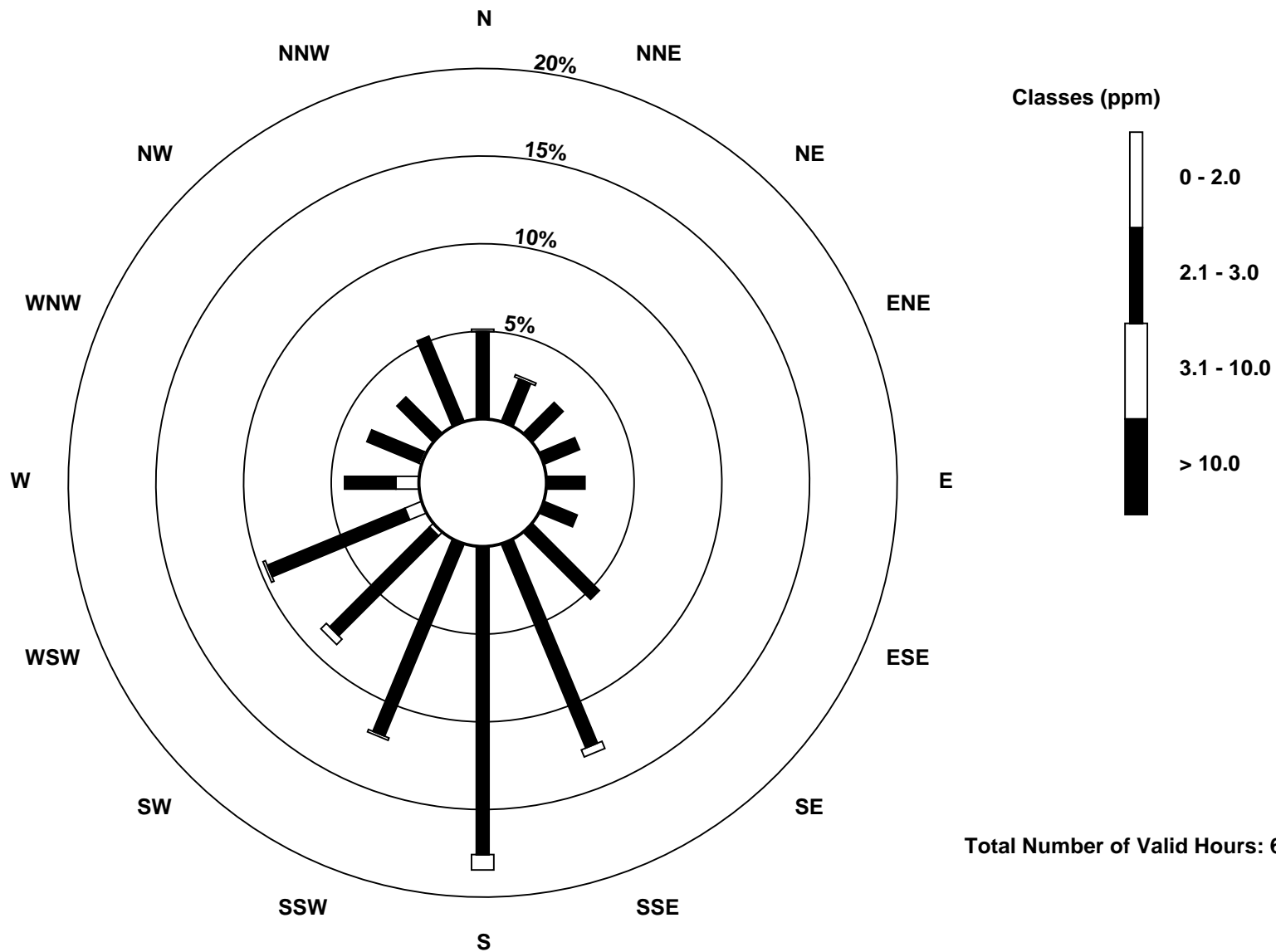
Total Number of Valid Hours: 683

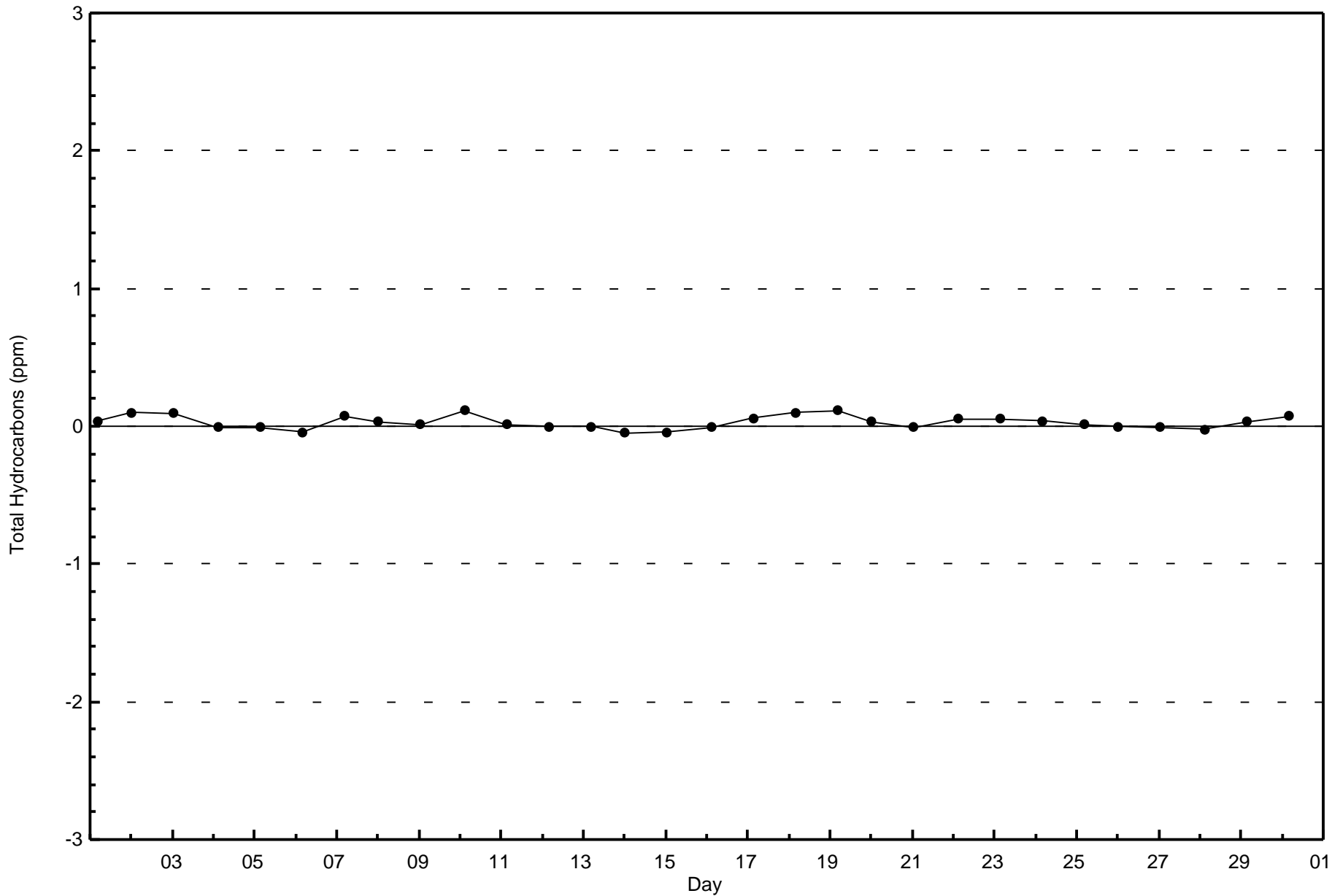
Total Number of Hours: 720

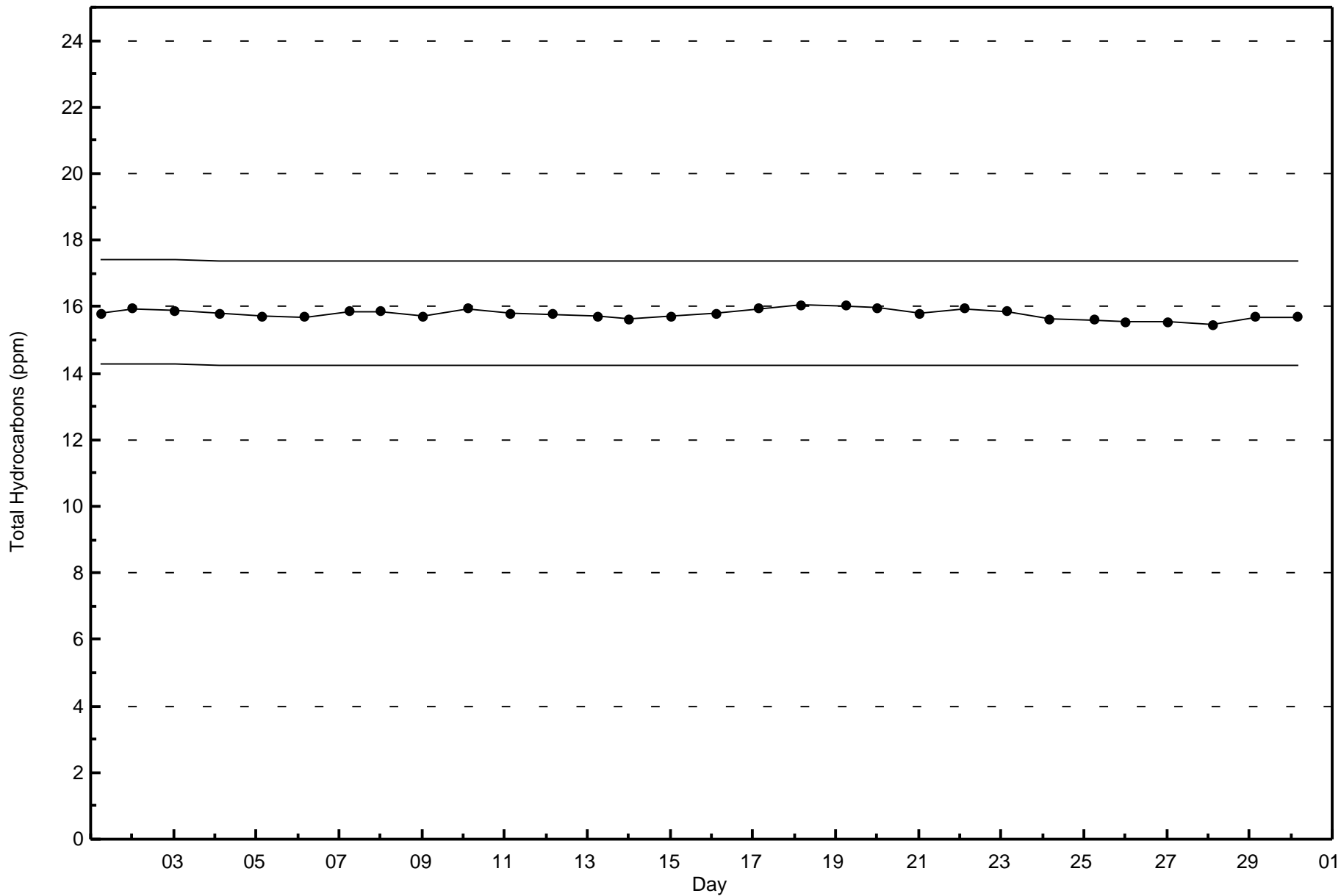


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Barge Landing (AMS 9)









Wood Buffalo Environmental Association
Summary of Hour Averages

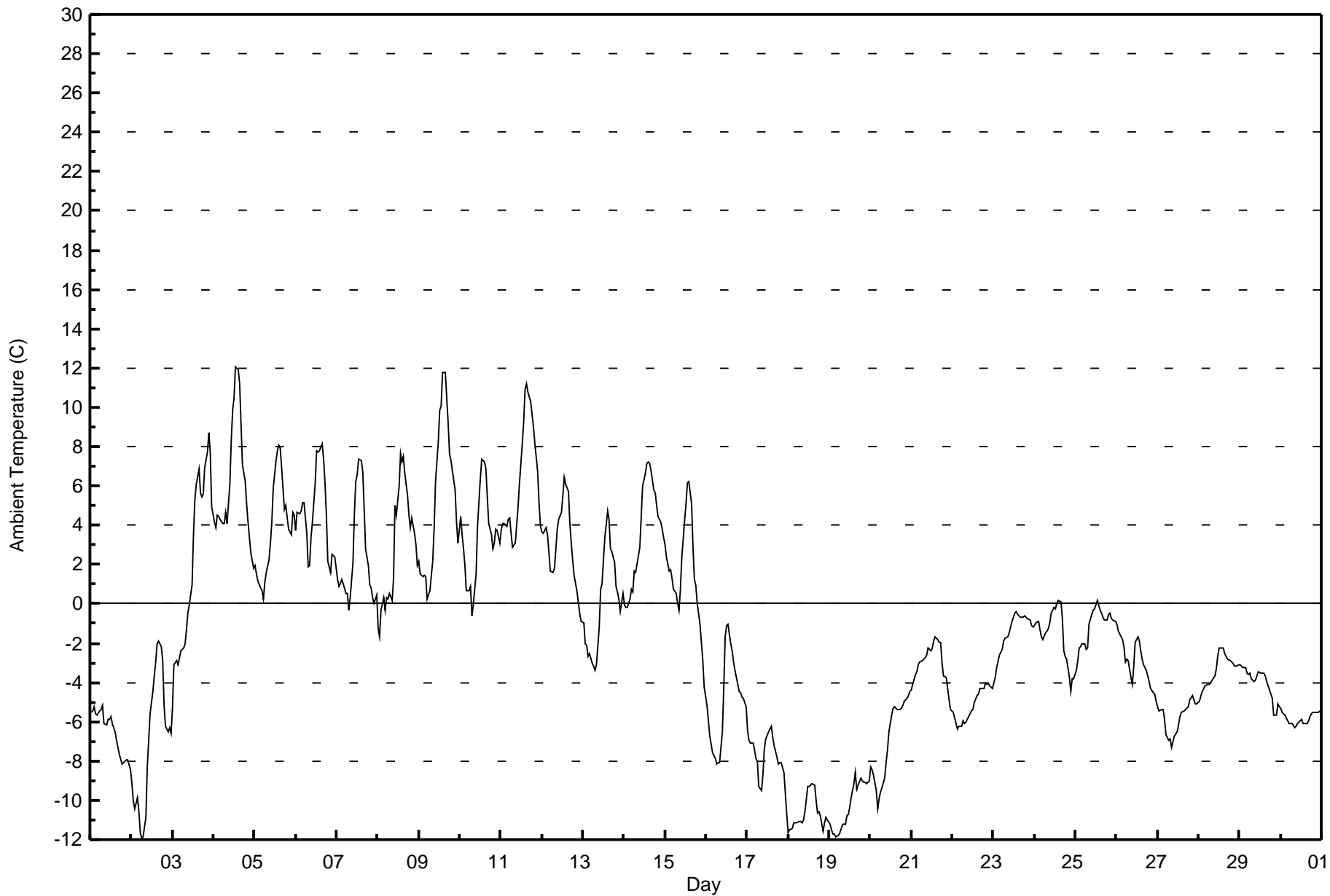
Ambient Temperature (AT) - C
Barge Landing - November 2016

Maximum Value: 12.1 C on Nov 4 14:00 Maximum Daily Average: 6.3 C on Nov 11		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -11.9 C on Nov 2 07:00 Maximum Diurnal Average: 1.1 C at hour 15 Monthly Average: -1.44 C		Minimum Daily Average: -10.7 C on Nov 18 Minimum Diurnal Average: -3.1 C at hour 8 Percentiles: P ₁ = -11.7 P ₁₀ = -8.3 Q ₁ = -5.4 Median = -2.0 Q ₃ = 2.8 P ₉₀ = 6.1 P ₉₉ = 10.7																								
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-Nov	-5.5	-5.5	-5.2	-5.6	-5.7	-5.5	-5.4	-5.1	-6.1	-6.1	-5.9	-5.9	-5.7	-6.1	-6.5	-7.0	-7.3	-7.6	-8.2	-8.1	-8.0	-7.9	-8.0	-8.4	-6.5	-5.1
2-Nov	-9.1	-10.0	-10.4	-9.9	-10.6	-11.7	-11.9	-11.9	-10.9	-8.3	-6.9	-5.6	-4.5	-3.7	-2.9	-2.0	-1.9	-2.2	-2.9	-5.1	-6.3	-6.5	-6.3	-6.6	-7.0	-1.9
3-Nov	-5.3	-3.1	-2.9	-3.1	-2.8	-2.4	-2.2	-2.0	-1.3	-0.5	-0.1	1.0	3.6	5.3	6.1	6.9	5.7	5.5	5.6	7.0	7.7	8.7	7.7	5.0	2.1	8.7
4-Nov	4.2	3.9	4.5	4.5	4.3	4.1	4.1	4.7	4.1	6.1	8.3	9.9	10.5	12.1	11.9	11.2	9.2	7.1	6.2	5.1	4.2	3.4	2.6	1.8	6.2	12.1
5-Nov	2.0	1.5	1.2	0.8	0.6	0.2	1.1	1.6	2.2	3.1	4.2	5.9	7.3	7.8	8.1	7.9	6.9	4.8	5.0	4.4	3.8	3.5	4.6	4.5	3.9	8.1
6-Nov	3.7	4.7	4.6	4.7	5.1	5.2	3.6	1.9	2.0	3.4	4.2	6.1	7.8	7.7	7.8	8.2	7.4	6.1	4.5	2.2	1.6	2.5	2.4	2.4	4.6	8.2
7-Nov	1.2	0.9	1.0	1.2	1.0	0.5	0.5	-0.3	0.3	2.1	4.6	6.3	6.6	7.4	7.3	6.7	4.8	2.8	1.9	0.9	0.8	0.3	0.0	0.5	2.5	7.4
8-Nov	-1.3	-1.7	-0.3	0.3	-0.4	0.3	0.2	0.5	0.2	1.3	5.0	4.5	6.0	7.6	7.2	7.5	6.6	5.5	4.5	3.8	4.3	3.6	3.0	2.0	2.9	7.6
9-Nov	2.1	1.5	1.4	1.5	1.4	0.3	0.7	1.5	2.2	3.8	6.2	8.3	9.8	10.1	11.7	11.7	10.5	9.2	7.7	7.3	6.3	5.8	4.1	3.1	5.3	11.7
10-Nov	4.5	3.5	2.8	1.9	0.6	0.7	0.9	-0.6	-0.1	1.6	4.0	5.2	6.4	7.4	7.2	6.9	5.5	4.1	3.5	2.8	3.1	3.8	3.7	3.1	3.4	7.4
11-Nov	3.8	4.1	4.1	3.9	4.3	4.4	3.6	2.9	3.1	4.0	4.9	6.2	8.1	9.3	10.9	11.2	10.8	10.3	9.7	9.0	8.2	6.7	5.1	3.9	6.3	11.2
12-Nov	3.7	3.6	3.9	3.5	2.7	1.7	1.6	1.8	2.8	3.8	4.3	4.6	5.5	6.5	6.1	5.7	4.1	3.1	2.3	1.4	0.7	0.1	-0.5	-0.9	3.0	6.5
13-Nov	-1.0	-2.1	-2.1	-2.7	-2.5	-3.1	-3.2	-3.4	-3.1	-1.2	0.8	1.1	2.3	3.4	4.7	4.3	2.8	2.6	2.1	0.9	0.6	0.3	-0.4	0.5	0.1	4.7
14-Nov	-0.1	-0.2	-0.2	0.3	0.8	0.6	1.6	1.6	2.4	2.9	4.5	6.0	6.7	7.1	7.2	7.1	6.8	5.8	5.7	5.0	4.4	4.2	3.8	3.4	3.6	7.2
15-Nov	3.0	2.4	1.7	1.7	1.3	0.7	0.5	0.1	-0.3	0.7	2.4	4.2	5.1	6.2	6.2	5.1	2.8	1.2	1.0	0.0	-1.1	-2.0	-2.9	-4.2	1.5	6.2
16-Nov	-5.2	-5.9	-6.7	-7.2	-7.6	-7.9	-8.2	-8.1	-8.1	-6.5	-4.2	-1.6	-1.1	-1.0	-2.0	-2.4	-2.9	-3.4	-4.1	-4.5	-4.5	-4.7	-4.8	-5.2	-4.9	-1.0
17-Nov	-6.4	-7.0	-7.1	-7.1	-7.5	-7.9	-8.0	-9.3	-9.5	-8.6	-7.4	-6.9	-6.5	-6.4	-6.2	-6.8	-7.2	-7.8	-8.2	-8.1	-8.1	-8.6	-9.6	-10.7	-7.8	-6.2
18-Nov	-11.6	-11.5	-11.5	-11.2	-11.2	-11.1	-11.1	-11.1	-11.2	-11.0	-10.6	-9.3	-9.3	-9.2	-9.2	-9.3	-10.0	-10.6	-10.6	-10.8	-11.6	-11.2	-10.8	-11.0	-10.7	-9.2
19-Nov	-11.2	-11.5	-11.8	-11.7	-11.8	-11.8	-11.7	-11.5	-11.2	-11.2	-10.8	-10.7	-10.4	-9.8	-9.2	-8.6	-9.4	-9.2	-8.9	-9.0	-9.1	-9.1	-9.1	-9.0	-10.3	-8.6
20-Nov	-8.3	-8.5	-8.7	-9.5	-10.4	-9.9	-9.6	-9.3	-8.9	-8.1	-7.4	-6.5	-5.6	-5.3	-5.3	-5.3	-5.4	-5.4	-5.3	-5.2	-5.0	-4.8	-4.7	-4.5	-7.0	-4.5
21-Nov	-4.4	-4.1	-3.6	-3.5	-3.1	-3.0	-2.9	-2.8	-2.7	-2.6	-2.2	-2.4	-2.2	-1.9	-1.7	-1.8	-2.0	-2.0	-3.0	-3.6	-3.8	-4.3	-4.9	-5.4	-3.1	-1.7
22-Nov	-5.6	-5.8	-6.1	-6.4	-6.2	-6.2	-6.0	-6.1	-6.0	-5.7	-5.6	-5.5	-5.3	-5.0	-4.7	-4.6	-4.3	-4.3	-4.3	-4.0	-4.1	-4.0	-4.2	-4.3	-5.2	-4.0
23-Nov	-4.0	-3.7	-3.3	-2.6	-2.5	-2.3	-1.9	-1.8	-1.7	-1.4	-1.2	-0.9	-0.5	-0.4	-0.6	-0.6	-0.7	-0.7	-0.6	-0.7	-0.8	-0.8	-1.1	-1.2	-1.5	-0.4
24-Nov	-1.1	-1.0	-0.9	-1.3	-1.7	-1.8	-1.5	-1.4	-1.2	-1.0	-0.5	-0.1	-0.2	0.0	0.2	0.1	-0.8	-2.4	-2.7	-2.8	-3.8	-4.4	-3.8	-3.8	-1.6	0.2
25-Nov	-3.4	-2.9	-2.2	-2.2	-2.0	-2.0	-2.3	-2.2	-1.1	-0.5	-0.3	-0.3	-0.1	0.2	0.2	-0.3	-0.5	-0.7	-0.9	-0.8	-0.5	-0.5	-0.7	-0.9	-1.2	0.2
26-Nov	-1.0	-1.4	-1.6	-1.8	-2.2	-2.9	-2.8	-2.9	-3.8	-4.1	-3.2	-1.9	-1.7	-1.9	-2.4	-2.9	-3.1	-3.4	-3.7	-4.0	-4.3	-4.5	-4.6	-4.9	-3.0	-1.0
27-Nov	-5.3	-5.4	-5.4	-5.4	-5.9	-6.7	-7.0	-6.9	-7.3	-7.0	-6.7	-6.5	-6.1	-5.7	-5.5	-5.4	-5.4	-5.3	-5.2	-4.9	-4.7	-4.9	-5.1	-5.1	-5.8	-4.7
28-Nov	-4.9	-4.7	-4.5	-4.3	-4.2	-4.1	-4.1	-4.0	-3.9	-3.7	-3.3	-2.7	-2.3	-2.2	-2.3	-2.6	-2.7	-2.8	-2.9	-2.9	-3.1	-3.2	-3.2	-3.1	-3.4	-2.2
29-Nov	-3.1	-3.2	-3.2	-3.3	-3.6	-3.6	-3.5	-3.8	-3.9	-3.9	-3.7	-3.4	-3.5	-3.5	-3.5	-3.7	-4.0	-4.4	-4.6	-4.8	-5.7	-5.7	-5.1	-5.2	-4.0	-3.1
30-Nov	-5.3	-5.5	-5.6	-5.8	-5.9	-6.1	-6.1	-6.1	-6.3	-6.2	-6.1	-5.9	-5.9	-6.1	-6.1	-6.1	-6.0	-5.7	-5.6	-5.5	-5.6	-5.5	-5.5	-5.4	-5.8	-5.3
	-2.5	-2.6	-2.6	-2.7	-2.8	-3.0	-3.0	-3.1	-3.0	-2.2	-1.1	-0.2	0.5	1.0	1.1	1.0	0.3	-0.3	-0.7	-1.2	-1.5	-1.7	-1.9	-2.3	Diurnal Average	
	4.5	4.7	4.6	4.7	5.1	5.2	4.1	4.7	4.1	6.1	8.3	9.9	10.5	12.1	11.9	11.7	10.8	10.3	9.7	9.0	8.2	8.7	7.7	5.0	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Barge Landing - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Barge Landing - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	444	61.67	61.67
0 - 10	264	36.67	98.33
10 - 20	12	1.67	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) - %

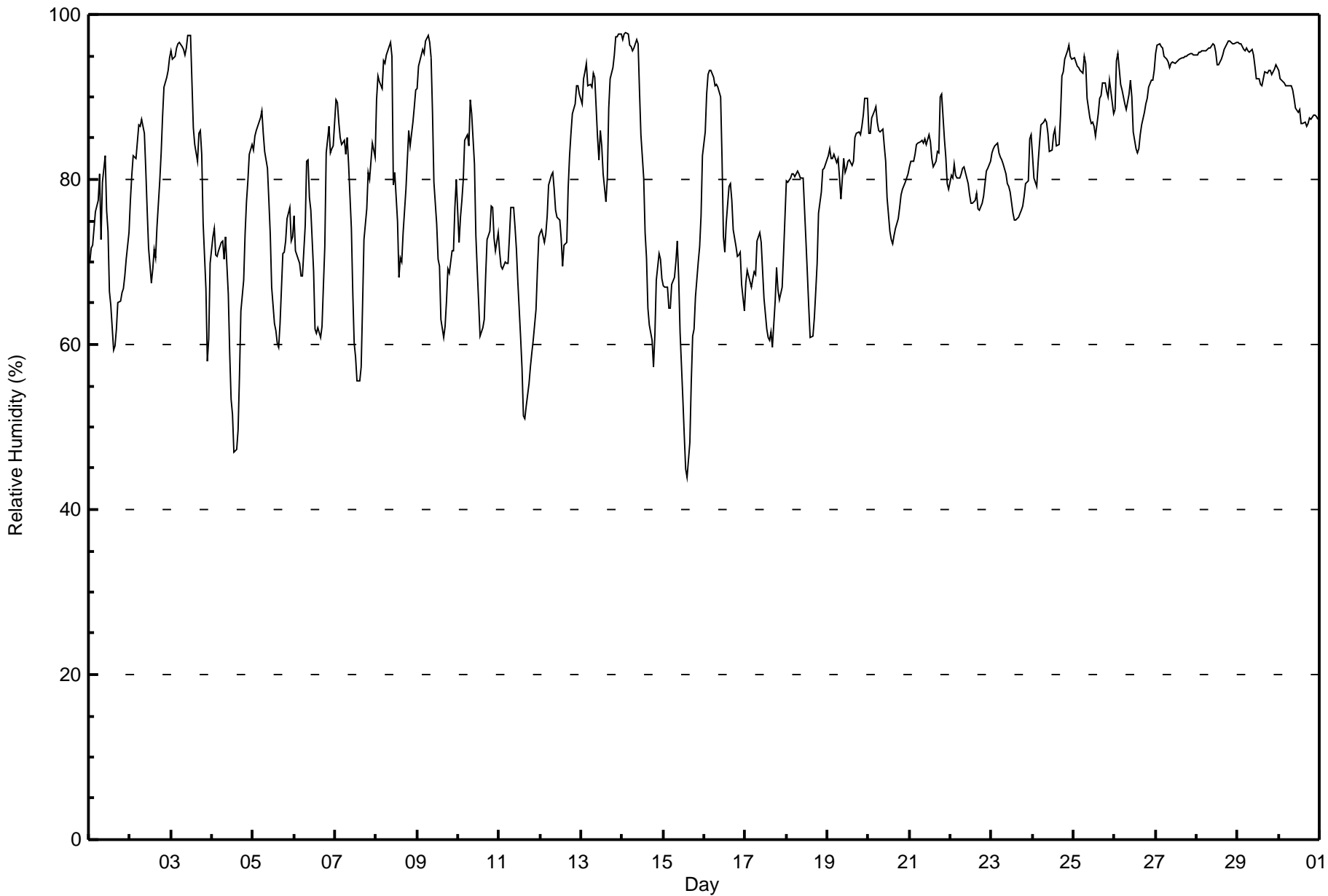
Barge Landing - November 2016

Maximum Value: 98 % on Nov 14 03:00 Maximum Daily Average: 95.7 % on Nov 28																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 44 % on Nov 15 15:00 Minimum Daily Average: 63.4 % on Nov 15 Maximum Diurnal Average: 86.0 % at hour 8 Minimum Diurnal Average: 72.1 % at hour 15 Monthly Average: 80.8 % Percentiles: P ₁ = 51 P ₁₀ = 65 Q ₁ = 73 Median = 82 Q ₃ = 91 P ₉₀ = 95 P ₉₉ = 97																										
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	70	72	72	74	76	77	81	73	80	83	76	74	66	65	59	60	62	65	65	66	67	68	70	74	70.6	83
2-Nov	77	81	83	83	85	87	87	87	86	81	76	72	67	69	71	70	74	80	83	88	91	92	93	95	81.6	95
3-Nov	96	95	95	96	96	97	96	96	95	96	97	97	92	86	84	82	86	86	83	75	67	58	61	70	86.7	97
4-Nov	73	74	71	71	71	72	73	70	73	66	59	53	52	47	47	50	56	64	68	73	77	80	83	84	67.0	84
5-Nov	84	85	86	87	87	88	86	83	81	77	73	67	63	62	60	60	62	71	71	73	75	77	73	73	75.2	88
6-Nov	76	71	70	70	68	68	74	82	82	78	76	69	62	61	62	61	62	67	72	83	86	83	84	84	73.1	86
7-Nov	90	89	87	85	84	85	83	85	82	74	66	60	59	56	56	57	65	73	76	81	80	82	84	83	75.9	90
8-Nov	90	93	92	91	94	94	95	96	97	95	79	81	75	68	71	70	74	79	82	86	84	87	89	91	85.4	97
9-Nov	91	94	95	96	95	97	97	97	95	88	80	75	70	70	63	61	62	65	69	69	71	71	77	80	80.3	97
10-Nov	72	75	77	80	85	85	84	90	88	82	73	69	65	61	62	63	68	73	74	77	77	73	71	74	74.9	90
11-Nov	71	70	69	70	70	70	73	77	77	74	71	68	61	57	51	51	53	55	57	59	61	64	69	73	65.4	77
12-Nov	74	74	72	73	76	79	81	81	79	76	75	75	73	70	72	72	79	83	86	88	89	91	91	90	79.2	91
13-Nov	89	92	93	94	91	92	91	93	92	85	82	86	84	81	77	80	89	92	94	95	97	97	98	98	90.1	98
14-Nov	97	98	98	98	96	96	96	96	97	96	91	85	80	74	71	64	62	61	57	61	68	71	70	68	81.3	98
15-Nov	67	67	67	64	64	67	68	70	73	68	62	53	49	45	44	48	55	61	62	66	70	72	76	83	63.4	83
16-Nov	86	90	93	93	93	92	91	92	91	90	83	73	71	75	79	80	77	74	72	71	71	71	67	64	80.8	93
17-Nov	67	69	68	67	68	69	69	73	74	72	69	66	62	61	60	62	60	65	69	67	65	67	71	75	67.3	75
18-Nov	80	80	80	81	81	80	81	81	80	80	80	73	69	65	61	61	63	66	70	76	79	81	81	82	75.4	82
19-Nov	83	84	82	83	83	82	83	80	78	83	81	81	82	82	82	82	85	86	86	85	86	88	90	90	83.6	90
20-Nov	86	86	87	88	89	87	86	86	86	84	82	78	74	73	72	73	74	75	77	78	79	80	81	81	80.8	89
21-Nov	81	82	82	83	84	84	85	85	84	85	84	85	85	83	82	82	83	83	90	90	85	83	80	79	83.7	90
22-Nov	81	80	82	81	80	80	81	81	82	80	79	78	77	77	77	78	76	76	77	78	80	81	81	82	79.4	82
23-Nov	83	84	84	84	83	83	82	82	81	80	79	78	76	75	75	75	76	76	77	78	80	80	85	85	80.0	85
24-Nov	83	80	79	82	84	87	87	87	87	86	83	84	85	86	84	84	88	93	93	95	96	96	95	95	87.4	96
25-Nov	95	94	94	94	93	93	95	94	90	87	87	87	86	85	88	90	90	92	92	91	90	92	91	88	90.7	95
26-Nov	89	94	95	91	91	90	89	89	90	92	90	86	84	83	84	85	87	88	89	90	91	92	92	93	89.4	95
27-Nov	95	96	96	96	96	95	95	94	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	94.9	96
28-Nov	95	95	95	96	96	96	96	96	96	96	96	96	96	94	94	95	95	96	96	97	97	97	96	96	95.7	97
29-Nov	97	97	96	96	96	96	96	95	96	95	94	92	92	92	91	92	93	93	93	93	93	93	94	94	94.1	97
30-Nov	93	92	92	92	91	91	91	91	91	90	89	88	88	87	87	87	86	87	87	87	88	88	88	87	89.1	93
83.6 84.4 84.5 84.6 85.0 85.3 85.7 86.0 85.8 83.8 80.3 77.4 74.6 72.7 72.1 72.4 74.6 77.3 78.8 80.3 81.1 81.7 82.5 83.5																								Diurnal Average		
97 98 98 98 96 97 97 97 97 96 97 97 94 94 95 95 96 96 97 97 97 97 98 98																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Barge Landing - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Barge Landing - November 2016

Maximum Speed: 17 km/h on Nov 14 23:00	Maximum Daily Speed Average: 9.5 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 14 01:00	Minimum Daily Speed Average: 1.0 km/h on Nov 25	Hours of Data: 719
Maximum Diurnal Speed Average: 4.2 km/h at hour 13	Minimum Diurnal Speed Average: 1.4 km/h at hour 19	Hours of Missing Data: 1
Monthly Average Velocity: 2.7 km/h 201.8 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 3 Median = 5 Q ₃ = 7 P ₉₀ = 9 P ₉₉ = 14	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-Nov	N6	N5	NNE4	NNE3	N1	SSW3	SW3	WNW8	N5	NW5	WNW6	WNW7	WNW9	NW10	NW12	NNW9	NW8	NNW8	N6	N6	N4	N2	E2	SE5	NNW4.1	NNW12
2-Nov	SE5	SE6	SSE5	SE5	SE6	SE7	SE7	SE6	SSE5	SSE6	S8	S7	S9	S9	S9	S7	S7	SSW7	WSW3	NNW3	WSW2	S3	SW3	WSW3	S4.8	S9
3-Nov	SSW6	S8	S7	SSW6	SW4	S6	S6	SSW6	SSW7	S7	S8	S8	SSW9	S7	SSW4	SSW3	SSW4	S8	S8	SW12	WSW12	WSW12	WSW11	SSE5	SSW6.4	SW12
4-Nov	S7	S9	S8	SSW7	SSW7	SSW7	S4	SSW6	S6	S7	S6	S6	S7	SSW6	SSW7	S6	S5	SSW4	SW3	SW3	SSE3	SSW2	SSE4	S3	S5.4	S9
5-Nov	SSW4	SW4	SW4	S3	S4	WSW4	SSW4	SSW5	SSE7	SSE7	S9	SSE9	SSW7	SSE7	SSE7	S7	SSW6	S2	SSE5	SE5	SSE5	SSE7	SSW4	SSW6	S5.0	SSE9
6-Nov	S6	SSW7	SSW7	SSW7	SSW7	SSW6	NW2	NNW1	WSW4	WSW7	WSW6	WSW8	SW9	WSW10	SW2	SSW3	SW5	SW5	S2	SSE3	S5	SSW5	SW6	SW7	SW4.9	WSW10
7-Nov	SW6	SW5	WSW8	SW8	SW5	SW7	SW7	SSW5	SSW7	SSW9	SSW7	SW6	SSW6	SSW7	S7	S6	SSE5	SE5	ESE3	ESE3	SE3	NNW0	SW3	SE5	SSW4.6	SSW9
8-Nov	NNW1	SSE2	SSE6	S4	SSE6	S6	S6	S5	SSE6	S5	SSW5	S6	S7	S8	S7	S8	S5	S6	SSW3	SW4	SSW4	S3	SSE4	SSE7	S4.9	S8
9-Nov	SSE5	SSE6	SSE4	SSE6	SSE4	SSW3	SSE6	S6	S6	SW6	SSW6	WSW9	WSW14	WSW10	WSW7	W7	W9	WSW6	WSW7	W9	WSW9	SW8	S6	SSW6	SW5.1	WSW14
10-Nov	SW7	SW6	SW6	SSE5	S5	SW6	WSW4	S5	SSE4	SSE5	S6	S8	S7	S7	SSE8	SSE8	SSE6	SSE8	SSE6	SSE7	SSE9	SSE8	S6	S5	S5.6	SSE9
11-Nov	S9	S8	S8	S6	S8	S7	S5	S7	S7	S7	S8	SSW8	SSW9	SSW9	SW8	SW8	SW8	SW7	WSW7	WSW8	WSW9	WSW7	S4	S4	SSW6.7	SSW9
12-Nov	S3	SW5	SW5	SSW6	SW4	SE2	S5	SSW4	S5	SSW4	WSW4	W2	W4	SSW4	SSW6	SW3	SSW2	SW1	SW1	SSE2	SSW3	SE5	SSW2	SW5	SSW3.0	SSW6
13-Nov	WSW3	SSE1	SSW2	SSE4	SSE3	S4	SSE5	SSE5	SSE5	SSE5	S6	SSE7	S7	S8	SSW6	SSW5	SSW6	SSW6	SSW6	SSW4	S5	SW4	SSW4	S3	S4.4	S8
14-Nov	N0	SE1	SE3	SSE4	S4	S5	S6	SW3	S5	S4	WSW6	WSW6	WSW7	WSW10	W10	WNW8	W10	W7	W8	W13	W13	W15	W17	W11	WSW6.0	W17
15-Nov	W13	W7	W8	W16	W15	W15	W14	W8	WSW6	WSW10	WSW9	WSW9	WSW10	WSW8	WSW10	WSW9	SW5	SW5	WNW3	NW4	NW3	NW3	W3	ESE0	W7.8	W16
16-Nov	NNW1	N1	WSW1	SSE1	WSW2	WSW2	SSW1	SSE2	SSW2	W2	WNW1	S3	NE1	NE7	NE7	NE7	NNE7	NNE9	NNE8	NNE8	NNE7	NNE7	N9	NNW11	NNE3.0	NNW11
17-Nov	NNW7	NNW6	NNW6	N7	N9	NW5	WNW6	WNW4	WNW4	WNW3	W4	WNW6	WNW6	W8	NNW10	NW9	NNW10	NNW10	NNW9	NNW7	NNW6	NW3	W4	WNW3	NW5.8	NW10
18-Nov	WNW3	WNW3	W4	SW2	SW3	WSW3	SW3	SW3	SW2	WNW2	NW4	NW3	NNW4	NNW3	WNW3	SW2	SW3	SSW4	SW3	SE3	NNW0	ENE3	NE3	ENE4	W1.3	NW4
19-Nov	ENE3	ENE5	ENE6	NE3	ENE4	ENE3	ENE3	NE4	ENE2	N4	NNW5	NNW6	NNW5	NNW6	N6	NNE5	N4	N4	N4	NNW4	N4	NNW3	N3	ENE2	NNE3.4	ENE6
20-Nov	ESE4	ESE4	E4	E4	E4	ESE6	ESE5	ESE4	ESE6	SSE6	SSE7	SSE7	S5	SSW4	S4	SSE4	SSE5	SE5	SE5	SE6	SSE5	SE6	SE5	ESE3	SE4.3	SSE7
21-Nov	E2	SE5	SE5	SE5	SSE7	SSE6	SSE6	S5	S6	S5	WSW1	NNW3	WNW3	W4	WNW3	NW2	NW2	NNW4	NE7	NE6	NNE6	NNE7	NE7	NNE5	E1.0	NE7
22-Nov	NE5	NNE5	ENE4	ENE3	ENE3	ENE3	ENE2	E2	NE2	NE1	SE4	SE6	SE5	SE5	SSE2	SSE4	S7	SSE6	SSE5	SSE7	SE8	SSE8	SE10	SE9	SE3.7	SE10
23-Nov	SSE10	SE9	SSE10	SSE10	SSE12	SSE10	SSE10	S10	S12	SSE11	S11	S12	SSE13	SSE11	SSE11	SSE10	SSE11	S7	SSE8	SSE8	S7	S7	SSW6	SSW6	SSE9.5	SSE13
24-Nov	SSW6	SSW7	SSW7	SSW7	S6	SSE5	SSE7	S6	S7	S6	SW8	SSW7	SSW5	S6	SW5	SSE0	E4	E3	NNE2	ENE1	ESE3	SE4	ESE0	ESE0	S4.1	SW8
25-Nov	NNE2	E5	E3	E2	E3	NNE2	N3	SE4	SSE6	SSE5	SE4	ESE2	ESE3	SE2	NNW2	NNW1	NW2	NNW2	WSW3	WSW5	WSW6	WSW7	WSW9	WSW10	SSW1.0	WSW10
26-Nov	WSW10	WSW8	WSW8	WSW8	WSW8	WSW6	WSW7	WSW7	SW3	S4	SSW6	SW7	WSW8	SW7	SSW7	SW5	SSW5	SW5	SW4	SW4	WSW5	SW3	S3	SSW3	SW5.6	WSW10
27-Nov	SSE3	SE3	NNE0	N2	NE4	E4	ENE5	NE5	N5	N5	N6	N5	N5	N6	N6	N5	N5	N5	N5	NNE6	N4	NNW4	NNW5	NNW5	N3.6	N6
28-Nov	NNW4	NNW3	NW2	WNW2	WSW2	WSW2	AF	SE1	SSW2	SSW2	WSW2	WSW1	W1	NNE1	NE1	NNE1	N1	NNW2	N2	NNW2	N2	NNW2	NW2	WNW2	NW1.1	NNW4
29-Nov	NW1	WSW1	WSW3	W2	ESE0	N1	E2	SE2	NE1	SSE2	E2	S3	S4	SSW4	WSW3	SW2	S4	S5	SW4	SSW6	WSW7	S3	S5	S6	SSW2.3	WSW7
30-Nov	S6	S7	S7	S7	S7	SSE7	SSE7	SSE8	SSE8	S8	S8	S8	S8	S9	S8	S7	SSW7	SSW10	SSW7	S8	S8	S7	S8	S9	S7.6	SSW10

SSW1.9	S2.2	S2.6	SSW2.7	S2.9	SSW3.1	S3.1	S2.9	S3.4	S3.6	SSW3.7	SSW4.1	SSW4.2	SSW3.8	SW3.2	SW2.5	SW2.5	SSW2.0	SW1.4	SW1.7	SW2.2	SW2.0	SSW2.3	SSW2.1	Diurnal Average	
W13	SE9	SSE10	W16	W15	W15	W14	S10	S12	SSE11	S11	S12	WSW14	SSE11	NNW12	SSE10	SSE11	NW10	NW9	W13	W13	W15	W17	NNW11	Diurnal Maximum	

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



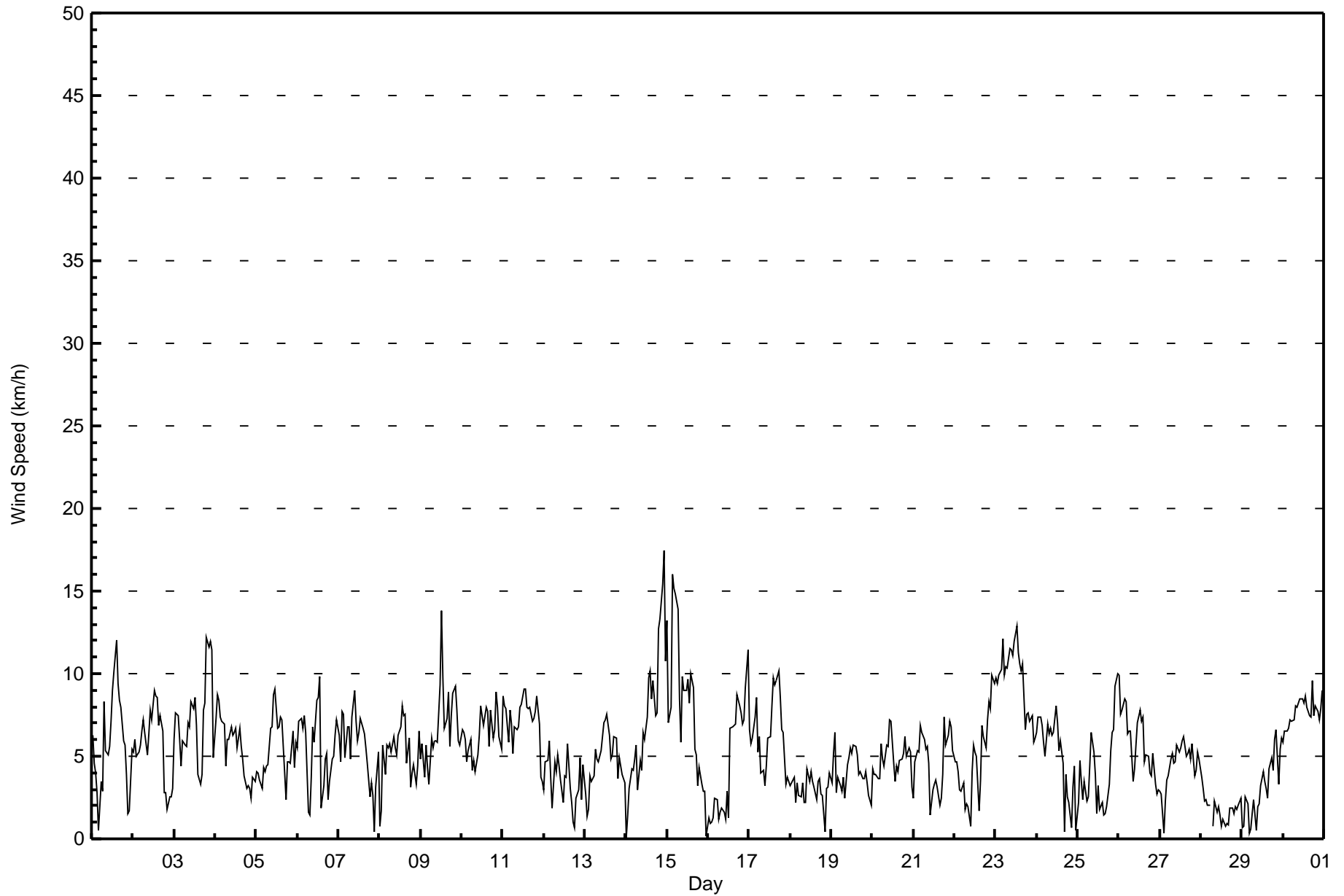
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Barge Landing - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Nov 15 00:00	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 0 km/h on Nov 28 21:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 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-Nov	2	2	1	1	2	1	2	3	2	2	2	3	3	4	4	3	3	3	2	2	1	1	2	1	4
2-Nov	1	1	1	1	1	1	1	1	2	2	3	3	3	3	3	2	2	3	1	1	1	2	1	1	3
3-Nov	3	2	2	1	1	2	2	2	3	2	3	3	3	2	2	2	1	2	2	4	3	3	4	1	4
4-Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	2
5-Nov	1	1	1	1	2	1	2	1	2	2	3	3	2	2	2	2	2	1	1	1	1	1	2	2	3
6-Nov	1	2	2	3	3	3	1	1	2	2	2	2	2	3	2	2	1	1	1	2	1	2	2	2	3
7-Nov	1	2	2	2	1	2	2	2	2	3	2	2	2	2	2	2	2	1	1	1	2	1	1	1	3
8-Nov	1	2	1	1	1	1	2	2	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2
9-Nov	2	2	1	2	2	2	2	2	2	2	2	3	4	2	2	2	3	3	3	3	3	2	1	3	4
10-Nov	4	2	2	1	2	2	2	1	1	1	2	3	2	2	3	2	1	2	1	1	3	2	2	1	4
11-Nov	3	3	2	2	2	2	1	2	2	2	3	3	3	3	3	3	2	2	2	2	2	2	1	1	3
12-Nov	1	2	2	2	1	1	1	2	1	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1	2
13-Nov	2	1	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	2	2	1	1	1	1	1	3
14-Nov	1	1	1	1	1	1	2	2	1	1	2	2	2	3	4	3	3	3	3	4	4	5	5	6	6
15-Nov	4	3	3	5	4	4	4	3	3	3	3	3	3	3	3	3	1	2	3	2	1	1	1	1	5
16-Nov	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3
17-Nov	2	2	2	2	3	2	3	1	2	2	2	2	2	3	4	3	4	4	3	2	2	1	1	1	4
18-Nov	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	2	2	1	2
19-Nov	1	2	2	1	1	1	1	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1	2
20-Nov	2	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	2	2	1	1	1	2
21-Nov	1	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
22-Nov	2	2	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	2	2	3	3	2	3	3	3
23-Nov	3	3	3	4	5	3	4	4	4	4	4	4	4	4	3	4	2	3	3	2	3	2	3	5	
24-Nov	2	2	3	2	2	1	2	2	2	2	2	3	2	2	2	2	1	1	1	1	1	2	1	3	3
25-Nov	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	1	1	2	2	3	3
26-Nov	2	2	2	2	2	2	2	2	2	1	2	2	2	2	3	2	2	1	1	1	1	1	1	1	3
27-Nov	1	1	1	1	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	2	1	1	1	1	2
28-Nov	1	1	1	1	1	1	AF	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1
29-Nov	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	1	2	2	1	2	2	2
30-Nov	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	2	3	3	3	2	2	3	3	3
	4	3	3	5	5	4	4	4	4	4	4	4	4	4	4	3	4	4	3	4	4	5	5	6	
	Diurnal Maximum																								

AF - Analyzer Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	371	51.60	51.60
6 - 11	330	45.90	97.50
12 - 19	18	2.50	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: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - 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	27	11	11	16	15	13	28	39	43	38	42	23	9	15	14	27	371
6 - 11	10	9	6	1	0	2	12	50	92	48	21	42	12	9	7	9	330
12 - 19	0	0	0	0	0	0	0	2	2	0	1	3	9	0	0	1	18
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	37	20	17	17	15	15	40	91	137	86	64	68	30	24	21	37	719

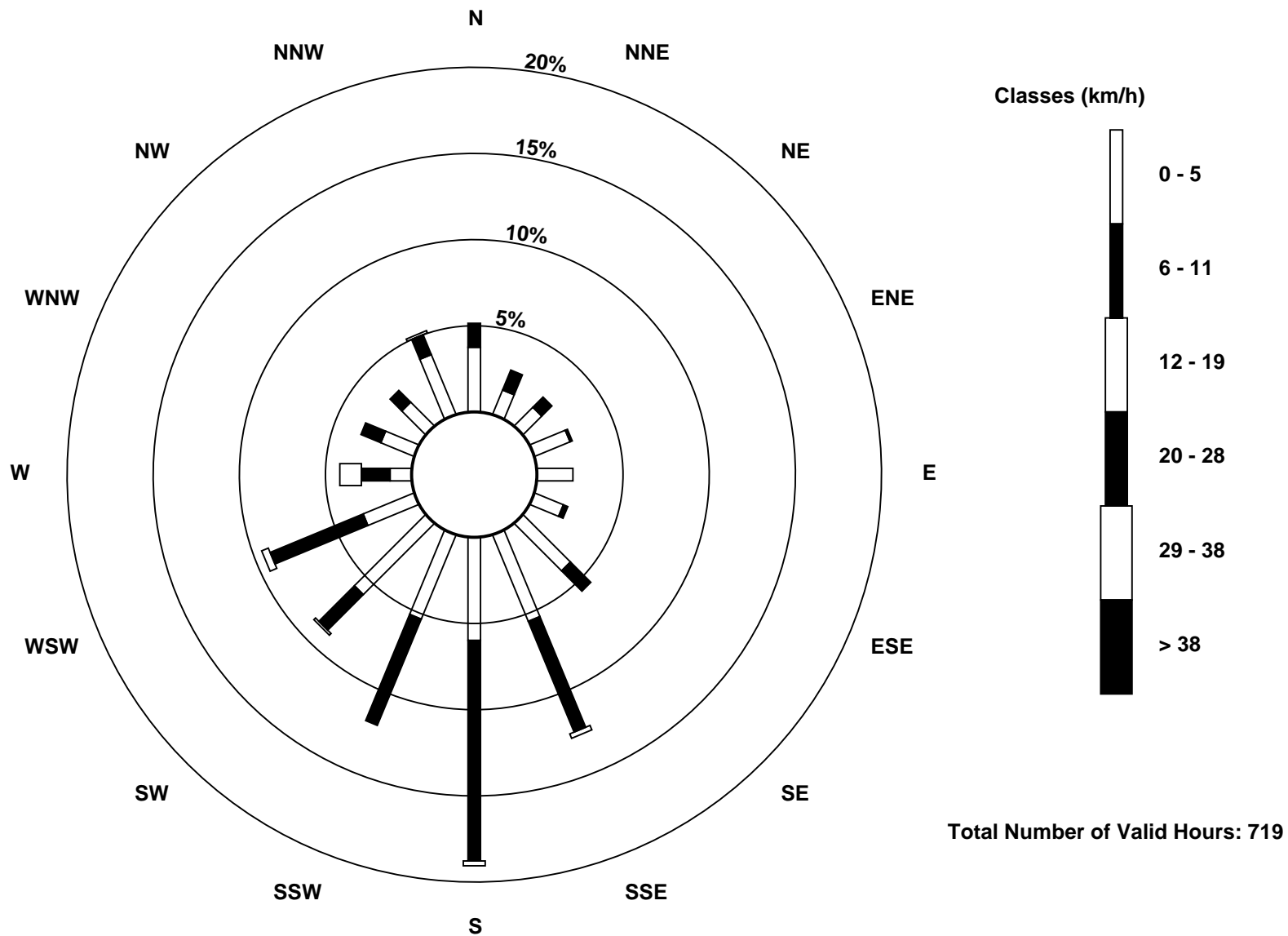
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Barge Landing (AMS 9)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Barge Landing - November 2016

Direction of Maximum Speed: 263 deg on Nov 14 23:00		Hours in Service: 720
Direction of Maximum Daily Speed Average: 164.9 deg on Nov 23		Hours of Data: 719
Direction of Minimum Speed: 9 deg on Nov 14 01:00		Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 1.0 deg on Nov 25		Percent Operational Time: 99.9
Monthly Average Direction: 222.9 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-Nov	7	354	20	13	351	209	214	287	3	306	296	282	284	324	326	327	325	331	357	4	11	356	84	136	326.8
2-Nov	143	146	148	137	130	143	141	142	149	155	179	177	189	181	175	190	191	193	241	336	257	175	222	256	169.6
3-Nov	192	176	189	207	219	173	170	197	199	182	172	182	192	184	213	201	194	170	182	216	241	258	250	161	200.2
4-Nov	180	176	190	192	200	211	183	212	184	174	178	189	176	194	203	182	178	208	229	226	164	194	162	178	189.2
5-Nov	192	216	216	176	176	241	200	200	166	161	175	166	193	167	165	169	202	173	166	132	166	159	198	207	179.6
6-Nov	182	197	199	197	208	208	305	341	245	242	248	246	236	239	230	207	222	215	179	159	185	195	216	233	217.8
7-Nov	217	220	237	233	218	225	223	196	210	213	209	223	196	193	186	174	155	128	108	104	134	332	219	138	199.9
8-Nov	327	162	153	177	151	177	177	186	156	169	194	186	189	179	187	186	174	182	206	221	203	173	156	148	177.5
9-Nov	150	155	151	155	166	201	162	172	170	215	213	238	255	249	247	263	272	254	258	265	257	231	177	212	223.9
10-Nov	236	234	230	164	177	217	250	173	163	161	179	179	180	173	162	167	155	148	151	157	156	158	169	183	177.0
11-Nov	178	180	182	185	186	185	184	187	183	184	190	208	198	197	221	214	217	231	240	243	240	241	178	180	202.6
12-Nov	182	230	227	207	217	142	170	195	188	212	245	278	277	208	193	230	195	228	227	161	198	130	195	231	205.8
13-Nov	250	165	213	149	168	176	152	155	168	159	173	162	177	176	196	192	211	202	211	207	188	231	199	185	183.9
14-Nov	9	124	128	168	188	174	182	223	189	183	243	238	243	254	269	292	274	269	273	267	268	263	263	277	252.1
15-Nov	269	280	274	269	261	259	262	269	250	252	242	243	251	249	247	253	231	234	287	312	309	310	278	106	260.6
16-Nov	339	356	253	168	251	237	192	161	212	277	303	184	39	41	43	41	30	31	27	25	21	14	4	347	17.7
17-Nov	335	344	329	358	353	321	299	302	284	286	275	282	303	265	286	311	312	321	321	323	330	325	271	297	312.1
18-Nov	299	303	275	228	216	248	232	233	229	289	318	326	339	331	284	225	215	208	221	124	327	64	50	64	273.5
19-Nov	63	57	69	42	70	64	59	48	59	351	346	347	345	340	8	20	349	353	351	345	354	345	355	71	16.3
20-Nov	118	113	93	98	89	103	106	105	121	158	160	167	172	210	174	168	157	139	144	144	150	140	129	105	137.6
21-Nov	84	131	135	134	149	157	164	173	180	185	256	327	289	272	291	319	317	347	36	43	20	23	39	29	88.4
22-Nov	46	25	78	71	59	70	64	87	42	41	127	130	140	145	165	159	175	154	149	167	146	152	137	144	130.5
23-Nov	149	146	151	154	160	164	168	171	169	164	171	169	168	167	162	152	151	173	164	165	181	184	195	197	164.9
24-Nov	203	199	198	193	173	162	168	180	174	176	182	215	208	213	186	217	157	98	83	16	63	111	134	103	182.1
25-Nov	30	93	87	81	82	28	358	132	148	158	141	114	121	138	340	332	326	330	258	252	246	241	250	250	202.3
26-Nov	250	242	245	253	247	242	247	243	225	185	205	224	237	223	211	220	204	229	231	233	243	222	186	205	231.5
27-Nov	149	132	25	352	44	94	78	45	9	352	357	358	359	355	355	353	359	356	4	16	5	340	340	334	8.1
28-Nov	343	332	325	287	257	242	AF	146	205	198	238	240	259	19	43	31	3	331	356	338	349	347	318	303	310.6
29-Nov	325	253	245	281	105	10	94	132	56	150	97	180	187	202	240	215	180	185	228	212	237	182	177	169	196.0
30-Nov	182	178	181	174	170	164	166	166	168	181	182	182	172	188	177	182	198	194	194	190	184	186	181	185	180.5

200.9 184.0 191.1 192.0 187.1 191.9 185.3 186.8 179.8 191.1 199.2 207.0 213.4 212.8 216.5 214.7 215.0 209.4 221.8 222.8 225.6 213.8 207.1 199.4

Diurnal Average

AF - Analyzer Failure

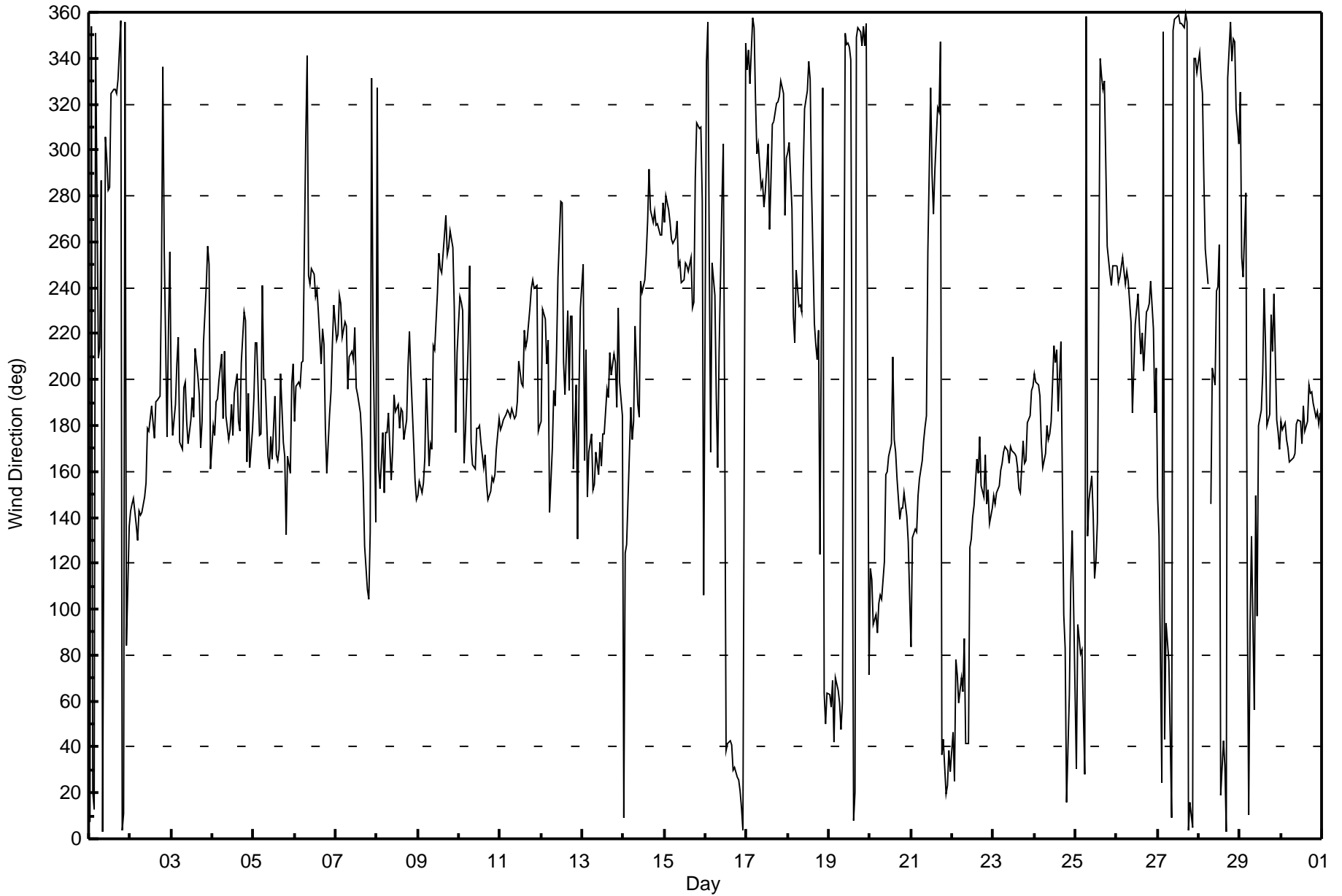
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Barge Landing - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 94 deg on Nov 27 03:00 Minimum Value: 9 deg on Nov 2 07:00 Percentiles: P ₁ = 12 P ₁₀ = 17 Q ₁ = 20 Median = 24 O ₃ = 31 P ₉₀ = 47 P ₉₉ = 87																			Hours in Service: 720 Hours of Data: 719 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-Nov	19	23	22	23	87	31	35	29	29	35	31	29	29	23	21	23	21	21	26	25	28	71	56	16	87
2-Nov	16	10	14	15	12	10	9	12	24	24	30	33	24	28	27	23	24	45	57	18	36	42	35	30	57
3-Nov	26	19	18	18	21	21	20	24	23	26	26	27	26	29	45	52	32	15	21	25	21	18	22	25	52
4-Nov	21	19	24	25	24	24	31	25	24	25	29	27	30	34	27	23	31	26	18	39	40	35	39	48	48
5-Nov	34	33	26	47	38	21	28	32	22	21	24	24	27	24	20	24	30	75	34	22	31	18	51	30	75
6-Nov	19	23	23	29	26	28	67	46	41	17	23	18	23	18	81	45	19	19	58	42	20	29	24	15	81
7-Nov	16	32	14	15	20	20	22	32	22	21	23	23	29	27	29	24	30	11	23	14	40	77	40	21	77
8-Nov	87	66	17	24	19	21	19	33	17	20	29	23	29	25	24	23	25	18	48	24	38	34	22	20	87
9-Nov	27	18	22	19	59	45	26	27	24	31	28	26	18	16	18	23	22	37	22	22	24	24	23	38	59
10-Nov	55	26	24	36	32	29	55	39	46	25	27	27	29	28	26	20	19	16	12	14	18	18	27	25	55
11-Nov	22	23	22	23	20	22	22	20	21	23	27	27	27	27	26	27	27	23	18	16	16	54	47	42	54
12-Nov	58	28	45	23	47	75	24	36	28	27	43	53	56	39	25	53	41	67	87	41	37	13	55	21	87
13-Nov	62	81	26	25	27	23	16	20	23	25	26	21	30	27	25	25	27	19	22	30	21	21	28	36	81
14-Nov	77	79	30	23	37	37	27	50	20	27	18	18	16	19	23	31	23	26	27	23	22	19	19	36	79
15-Nov	22	33	27	22	18	17	20	31	41	23	23	20	18	20	18	16	21	26	57	41	42	24	44	91	91
16-Nov	31	66	41	60	9	20	61	43	34	44	69	52	94	21	19	19	19	18	19	18	21	23	21	21	94
17-Nov	19	21	19	21	22	23	28	34	37	38	30	32	33	28	30	25	26	21	21	20	21	27	18	23	38
18-Nov	20	24	20	33	28	35	40	28	46	40	25	50	37	40	40	50	18	19	30	10	92	41	37	32	92
19-Nov	23	24	22	31	24	22	17	29	49	20	21	20	21	18	28	31	28	21	34	24	19	16	21	44	49
20-Nov	23	17	18	15	12	14	15	16	23	25	26	28	49	49	33	28	21	16	16	17	24	17	14	31	49
21-Nov	25	21	16	14	18	22	23	23	24	24	48	18	31	32	25	23	39	27	19	20	19	21	18	22	48
22-Nov	27	22	23	28	22	21	75	72	54	81	21	18	22	22	56	29	23	22	20	27	20	18	14	15	81
23-Nov	19	15	17	19	23	23	23	24	25	25	25	25	25	25	23	19	19	23	23	22	26	24	22	28	28
24-Nov	25	23	25	25	20	20	22	23	25	24	27	28	30	32	27	28	91	17	54	52	76	26	28	88	91
25-Nov	53	17	34	43	25	49	34	21	17	20	25	31	17	85	19	15	21	11	19	14	13	18	16	16	85
26-Nov	16	16	16	17	15	14	16	18	31	30	25	22	24	29	25	30	32	21	22	34	21	32	40	50	50
27-Nov	40	57	94	36	40	24	24	21	26	21	20	19	21	20	20	20	19	18	18	17	22	18	17	17	94
28-Nov	16	14	17	19	20	18	AF	55	30	29	21	19	64	14	51	23	39	12	19	13	14	22	19	24	64
29-Nov	59	57	28	34	70	37	71	42	57	50	43	42	37	32	25	30	26	28	22	29	18	36	26	24	71
30-Nov	25	27	24	26	25	23	23	24	27	25	26	28	28	30	25	27	24	25	22	26	23	25	24	24	30
																			87 81 94 60 87 75 75 72 57 81 69 53 94 85 81 53 91 75 87 52 92 77 56 91						
Diurnal Maximum																									
AF - Analyzer Failure																									





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 3, 2016	Last Calibration	October 17, 2016
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	10:47	End Time (MST)	14:08
Gas Cert Reference	LL29997	Station temp.	22 Deg C
Cal Gas Concentration	5.18 ppm	Cal Gas Exp Date	2/12/2019
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
Dil air Make/Model	API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	DACS serial No.	5564
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	LL104180 12/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-689	-690
Analyzer IP address	192.168.1.42		Lamp voltage	1020	1023
Calculated slope	1.008228	1.002437	Chamber temp	45	45
Calculated intercept	-0.367672	-0.157058	Pressure	689.2	702.8
Analyzer Background	1.9	2.05	Flow	0.431	0.444
Analyzer Coefficient	1.041	1.04	Intensity	90	89
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1331259320	
Converter make/model	CDN-101		Converter serial #	519	

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	77.2	80.0	79.7	1.003
SO2 scrubber check	5000	15.4	147.2	0.2	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	77.2	80.0	79.8	1.002
second point	5000	38.6	40.0	40.3	0.994
third point	5000	19.3	20.0	20.3	0.987
as left zero	6000	0.0	0.0	0.0	----
as left span	5000	77.2	80.0	79.8	1.003
Average Correction Factor					0.994

Corrected As found	79.5	Previous response	79.7	% change	0.2%
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Notes:

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

Calibration Performed By:

Jayme Marcoux



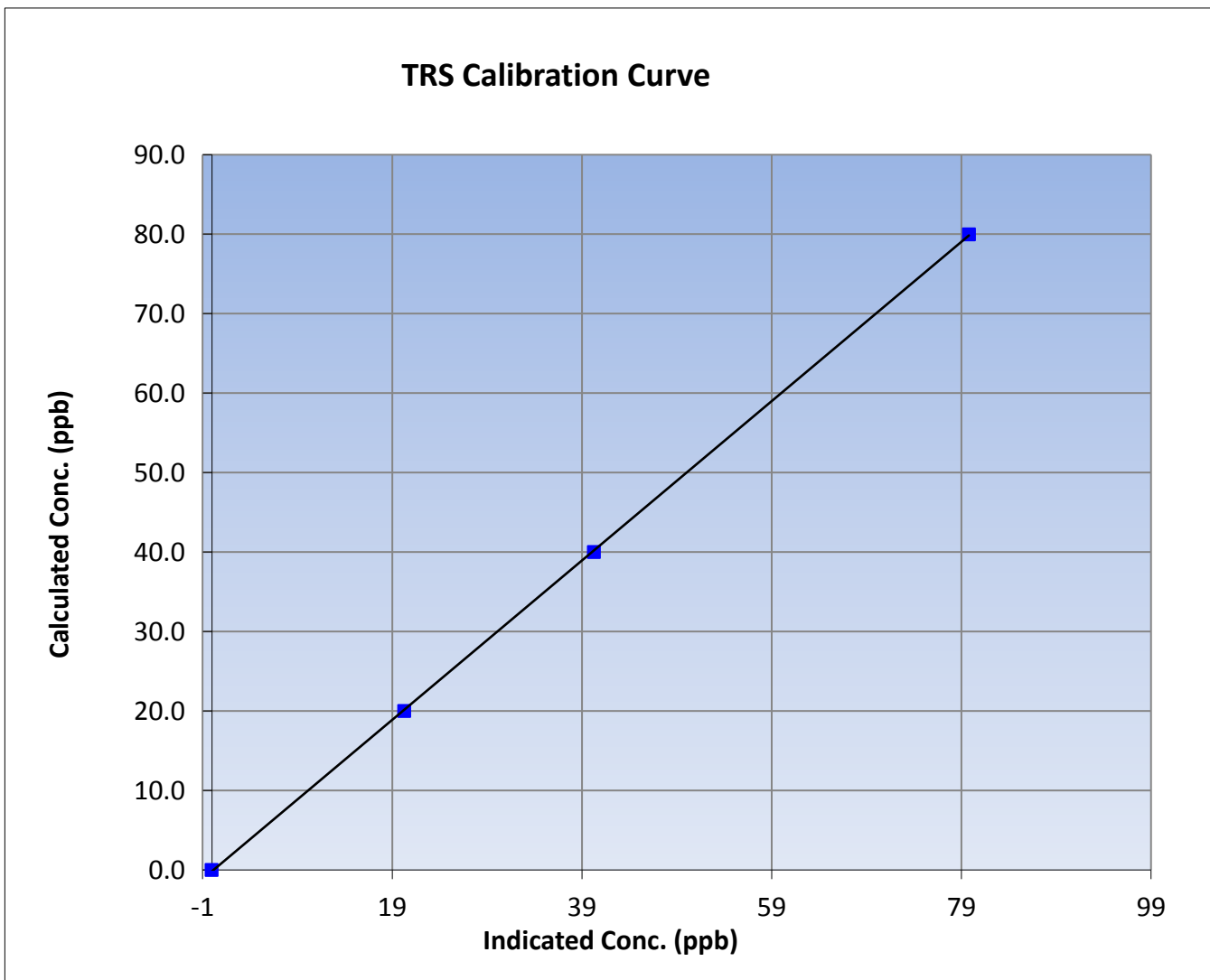
Wood Buffalo Environmental Association TRS Calibration Report

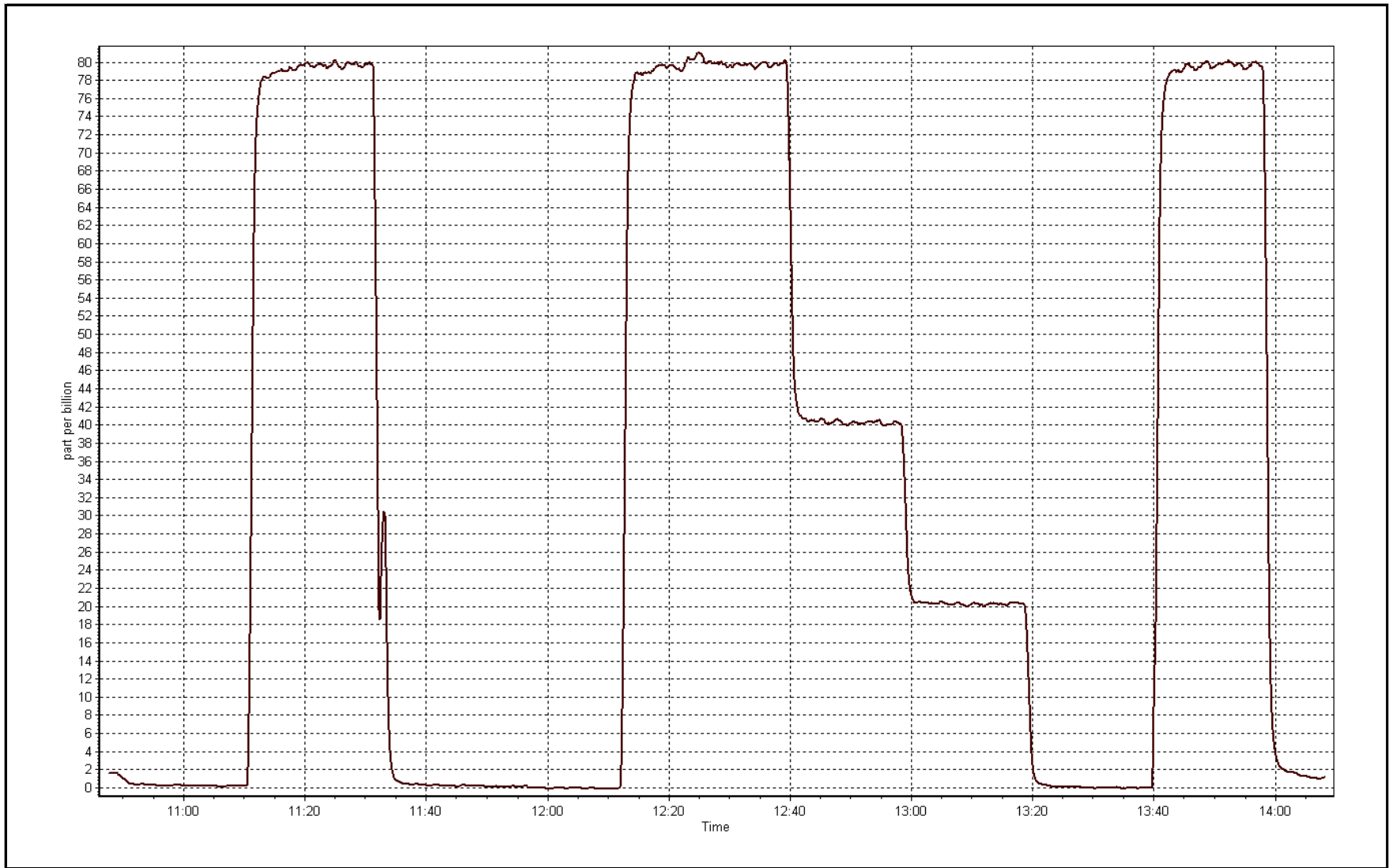
Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 17, 2016
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	10:47	End Time (MST)	14:08
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1331259320

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999962
80.0	79.8	1.0022		
40.0	40.3	0.9935	Slope	1.002437
20.0	20.3	0.9869		
			Intercept	-0.157058







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 3, 2016	Last Calibration	October 17, 2016
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	8:12	End Time (MST)	10:59
Gas Cert Reference	LL104180	Cal Gas Expiry Date	February 12, 2018
CH4 Cal Gas Conc.	490 ppm	CH4 Equiv Conc.	1023.5 ppm
C3H8 Cal Gas Conc.	194 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
ZAG make/model	Teledyne API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	Serial Number	5564

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	9.1	9.1
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.7	34.7
Calculated slope	1.003006	0.998112	Fuel Pressure	24.1	24.1
Calculated intercept	-0.021584	0.011755	Analyzer Coeff	4.270	4.306
			Analyzer BKG	5.45	5.45

Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296
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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	0.08	----
as found span	5000	76.7	15.70	15.82	0.992
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.7	15.70	15.72	0.999
second point	5000	41.0	8.39	8.40	0.999
third point	5000	15.4	3.15	3.13	1.007
as left zero	5000	0.0	0.00	0.02	----
as left span	5000	76.7	15.70	15.88	0.989
Average Correction Factor					1.002

Corrected As found	15.74	Previous response	15.68	% change	-0.4%
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Notes:

Inlet filter changed after as founds. Adjusted zero and span.

Calibration Performed By:

Jayme Marcoux



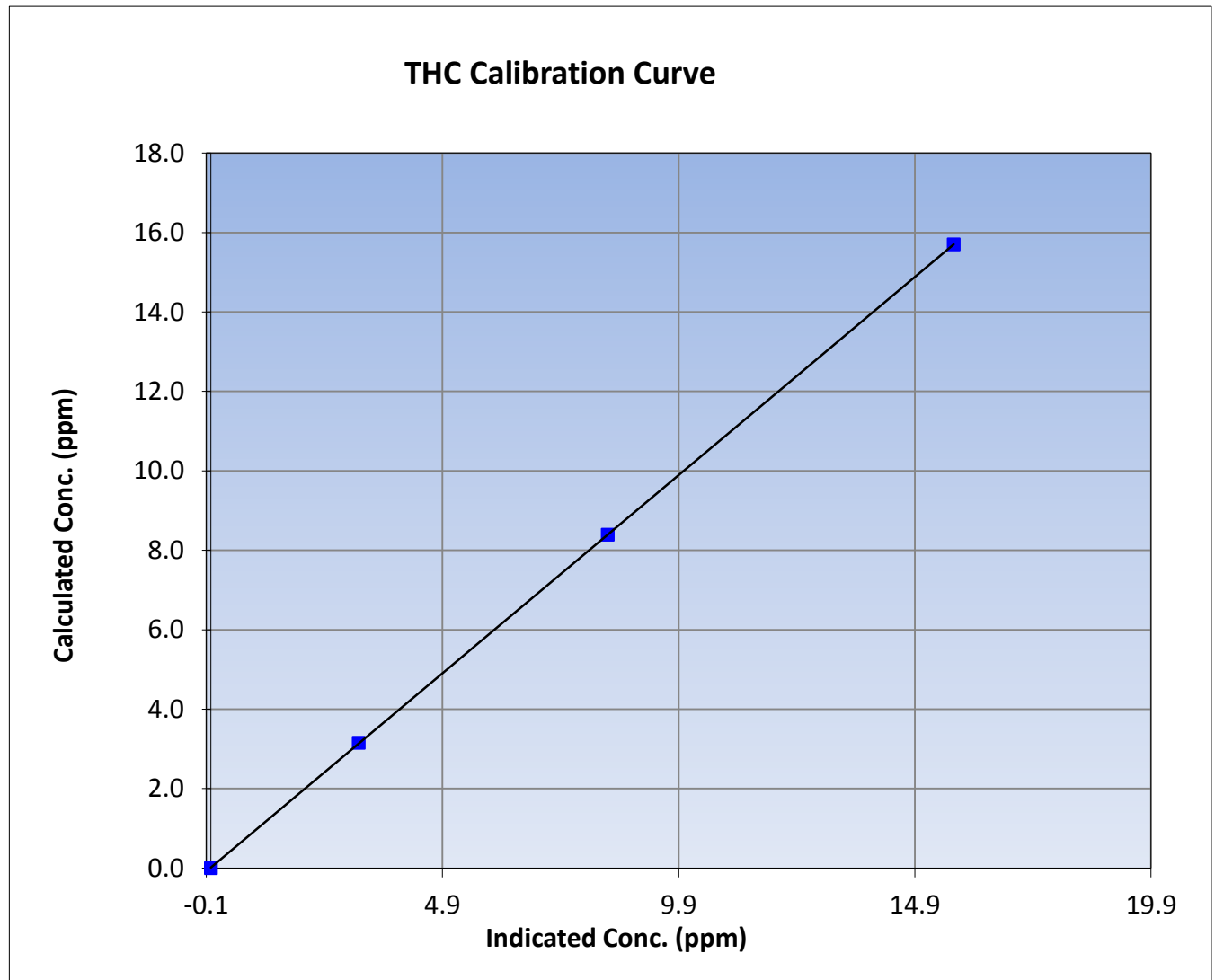
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 17, 2016
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	8:12	End Time (MST)	10:59
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296

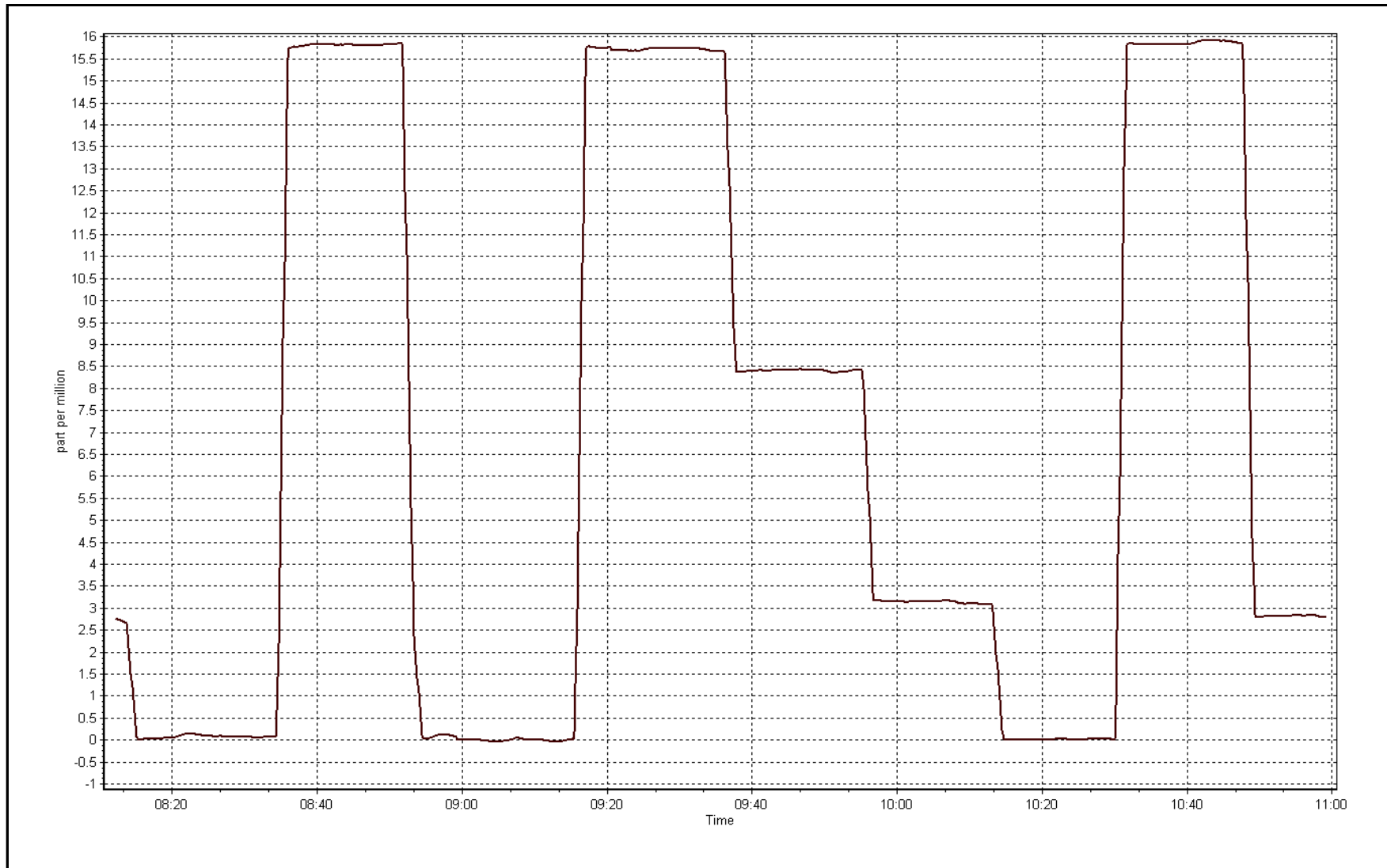
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999997
15.70	15.72	0.9988		
8.39	8.40	0.9991	Slope	0.998112
3.15	3.13	1.0072		
			Intercept	0.011755



THC Calibration Plot

Date: November 3, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 11
LOWER CAMP
NOVEMBER 2016**

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
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	687	33	33	100.00	101	0	25	0
H2S (ppb) Average	686	34	34	100.00	21	8	5	1
THC (ppm) Average	687	33	33	100.00	5.1	-	2.8	-
Temperature (C) Average	720	0	0	100.00	11.9	-	6.4	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	93	-
Wind Speed 10 m (km/h) Average	719	0	1	99.86	27	-	16	-
Wind Direction 10 m (deg) Average	719	0	1	99.86	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 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	687	3.8	11	-	0	0	0	1	2	10	101
H2S (ppb) Average	686	0.7	2	-	0	0	0	0	1	1	21
THC (ppm) Average	687	2.39	0.3	-	2	2.1	2.2	2.3	2.5	2.8	5.1
Temperature 2 m (C) Average	720	-0.99	4.9	-	-10.9	-7.4	-4.7	-1.1	2.5	5.6	11.9
Relative Humidity (%) Average	720	79.3	11	-	48	65	72	79	88	94	98
Wind Speed 10 m (km/h) Average	719	9.4	5	-	0	3	5	9	13	16	27
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	28 Nov 2016 03:00	28 Nov 2016 03:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb
Lower Camp - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 101 ppb on Nov 26 10:00	Maximum Daily Average: 25.1 ppb on Nov 26
Minimum Value: 0 ppb on Nov 2 00:00	Minimum Daily Average: 0.4 ppb on Nov 13
Maximum Diurnal Average: 10.5 ppb at hour 17	Minimum Diurnal Average: 1.1 ppb at hour 24
Monthly Average: 3.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 10 P ₉₉ = 65
	Hours of Data: 687
	Hours of Missing Data: 33
	Hours of Calibration: 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-Nov	0	0	0	0	0	Z	1	2	6	4	2	0	3	2	0	0	0	0	0	0	0	0	0	0	1.0	6
2-Nov	Z	0	4	18	1	1	0	0	1	C	C	C	4	3	26	8	2	10	2	1	1	0	1	1	4.1	26
3-Nov	1	Z	2	2	3	1	0	1	4	1	1	4	1	0	0	0	1	0	0	2	7	1	13	3	2.1	13
4-Nov	6	9	Z	11	11	19	5	1	1	1	2	0	1	1	1	1	4	5	2	2	2	3	1	1	3.9	19
5-Nov	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	1	0	0	0	0.5	1
6-Nov	1	15	2	1	Z	1	14	2	1	1	1	3	1	6	2	2	4	2	1	1	1	1	1	1	2.8	15
7-Nov	0	1	1	0	0	Z	0	1	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4
8-Nov	Z	9	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	1	1.1	9
9-Nov	0	Z	1	1	0	1	0	0	0	1	4	1	0	1	1	0	1	1	0	0	0	0	1	1	0.7	4
10-Nov	1	1	Z	23	53	20	4	30	4	1	1	0	0	1	1	1	0	0	2	1	0	0	1	6	6.6	53
11-Nov	8	10	1	Z	1	0	0	0	0	0	0	1	1	1	16	86	56	11	1	2	0	0	1	1	8.6	86
12-Nov	1	3	4	1	Z	1	1	0	0	0	1	0	0	0	0	1	1	2	1	1	1	0	1	1	0.9	4
13-Nov	1	1	1	1	1	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
14-Nov	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	1	17	10	7	7	0	0	0	1	1	2.1	17
15-Nov	0	Z	1	0	1	1	0	1	1	2	1	1	1	2	2	2	12	3	1	1	2	1	0	0	1.6	12
16-Nov	0	0	Z	0	0	0	0	1	7	1	1	8	6	2	0	0	0	0	0	0	0	0	0	0	1.3	8
17-Nov	0	0	0	Z	0	0	0	0	0	0	1	3	3	3	7	0	0	0	0	0	0	0	0	0	0.9	7
18-Nov	0	0	0	0	Z	0	2	13	14	1	0	0	6	15	4	6	2	2	1	3	3	2	2	5	3.6	15
19-Nov	3	2	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
20-Nov	Z	0	0	0	0	1	1	1	0	3	17	10	2	3	6	7	0	2	17	1	1	1	0	0	3.2	17
21-Nov	0	Z	5	6	6	4	1	0	0	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	1.4	6
22-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	2	1	1	3	1	2	3	2	0	0	0.9	3
23-Nov	4	6	28	Z	3	43	13	12	10	35	26	28	27	23	12	3	8	8	1	1	1	1	1	1	12.9	43
24-Nov	2	1	2	3	Z	1	0	0	0	0	1	1	1	1	2	20	88	18	4	5	2	20	23	5	8.7	88
25-Nov	11	0	1	1	0	Z	22	71	23	14	8	5	2	2	1	22	16	1	1	2	1	1	1	1	9.0	71
26-Nov	Z	1	1	1	0	0	1	1	18	101	11	2	3	7	22	2	100	97	90	47	57	12	1	2	25.1	101
27-Nov	1	Z	2	11	10	3	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	11
28-Nov	0	0	Z	0	0	0	0	0	1	8	1	2	23	2	6	5	4	2	1	1	0	0	0	0	2.6	23
29-Nov	0	0	0	Z	0	0	0	0	0	0	1	1	3	10	19	10	1	3	23	26	22	1	3	1	5.5	26
30-Nov	1	0	2	2	Z	3	2	1	0	0	2	1	1	3	4	1	1	1	0	1	0	0	0	0	1.2	4

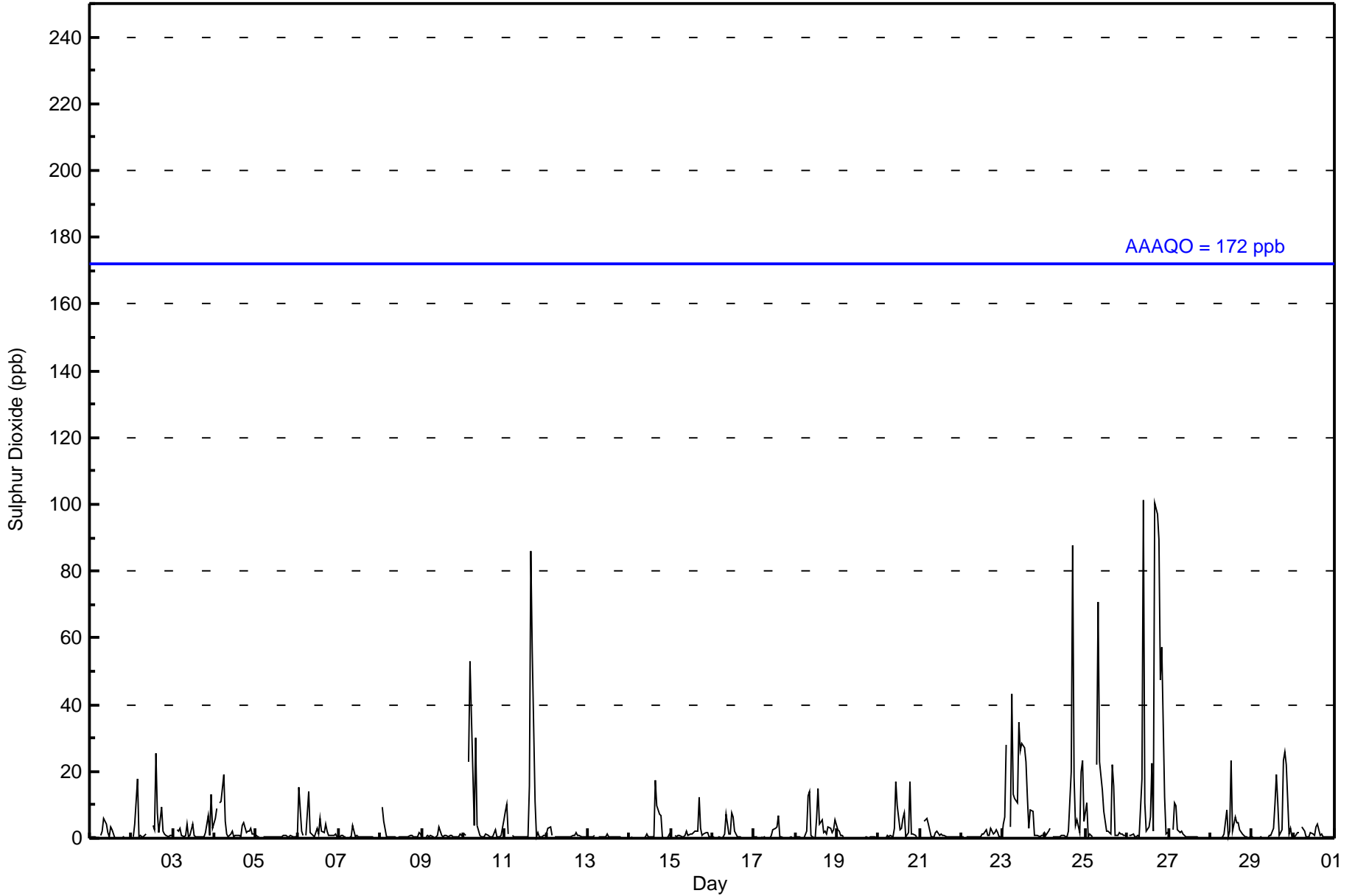
1.7	2.5	2.7	3.3	3.7	4.0	2.4	4.7	3.4	6.3	2.9	2.6	3.2	3.1	4.6	6.6	10.5	6.0	5.3	3.4	3.5	1.7	1.9	1.1	Diurnal Average	
11	15	28	23	53	43	22	71	23	101	26	28	27	23	26	86	100	97	90	47	57	20	23	6	Diurnal Maximum	

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
Lower Camp - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Lower Camp - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	626	91.12	91.12
11 - 20	31	4.51	95.63
21 - 60	23	3.35	98.98
61 - 110	7	1.02	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Lower Camp - 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	21	16	5	7	27	44	225	59	32	5	0	45	47	41	31	21	626
11 - 20	1	0	0	1	2	0	5	8	1	2	3	2	4	1	0	1	31
21 - 60	0	0	0	0	0	0	8	4	2	5	3	0	1	0	0	0	23
61 - 110	0	0	0	0	1	0	1	0	0	3	1	0	1	0	0	0	7
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	22	16	5	8	30	44	239	71	35	15	7	47	53	42	31	22	687

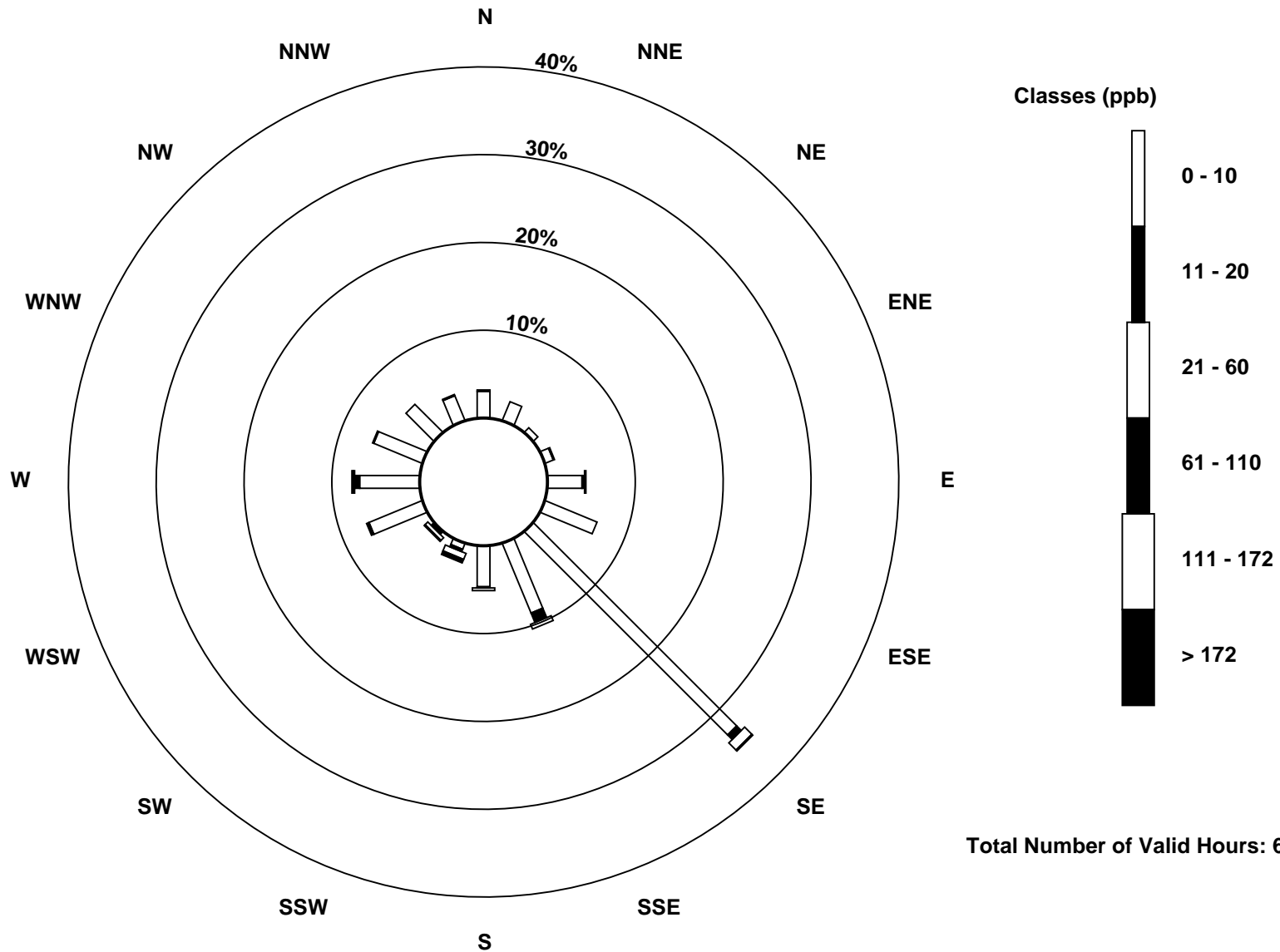
Total Number of Valid Hours: 687

Total Number of Hours: 720

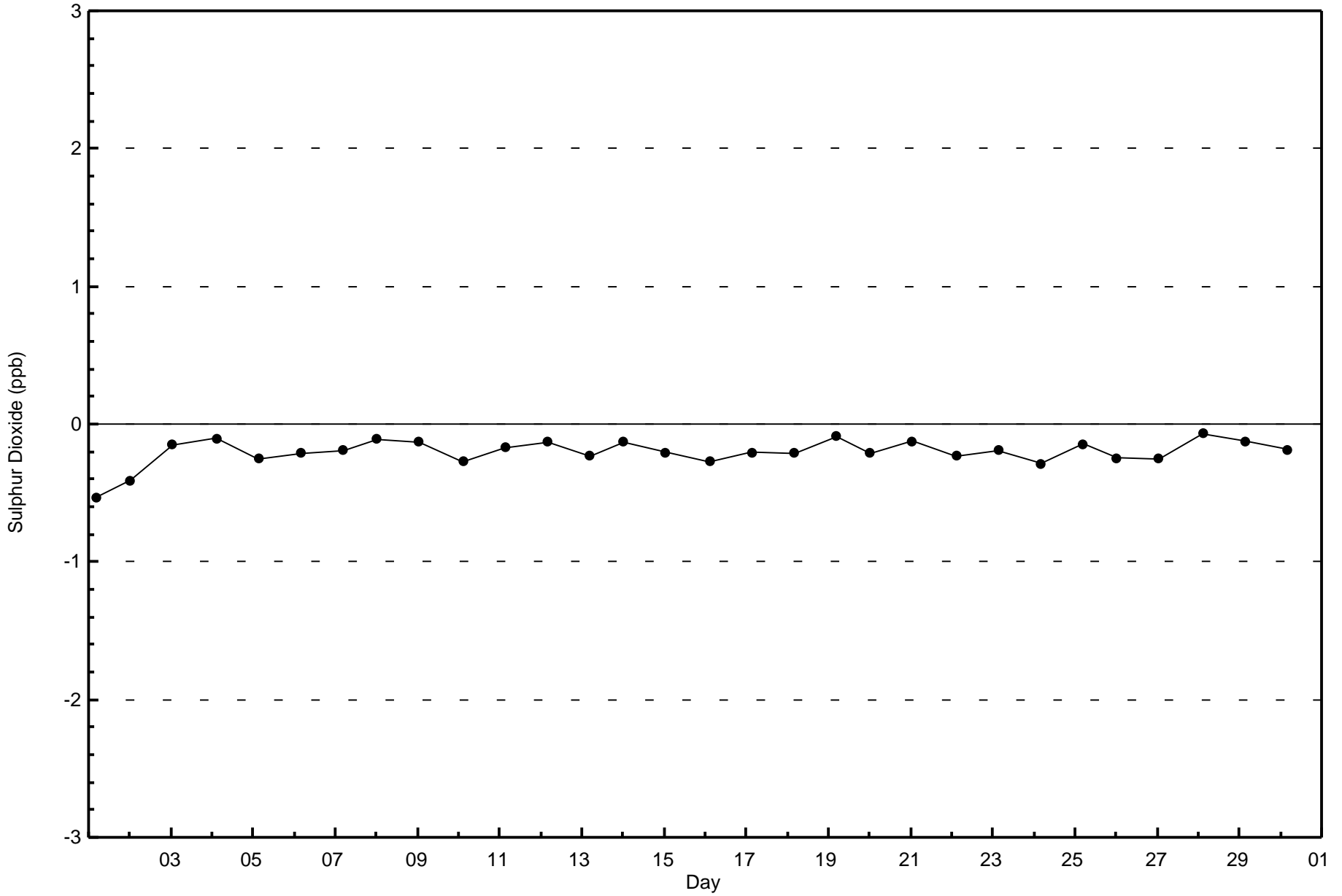


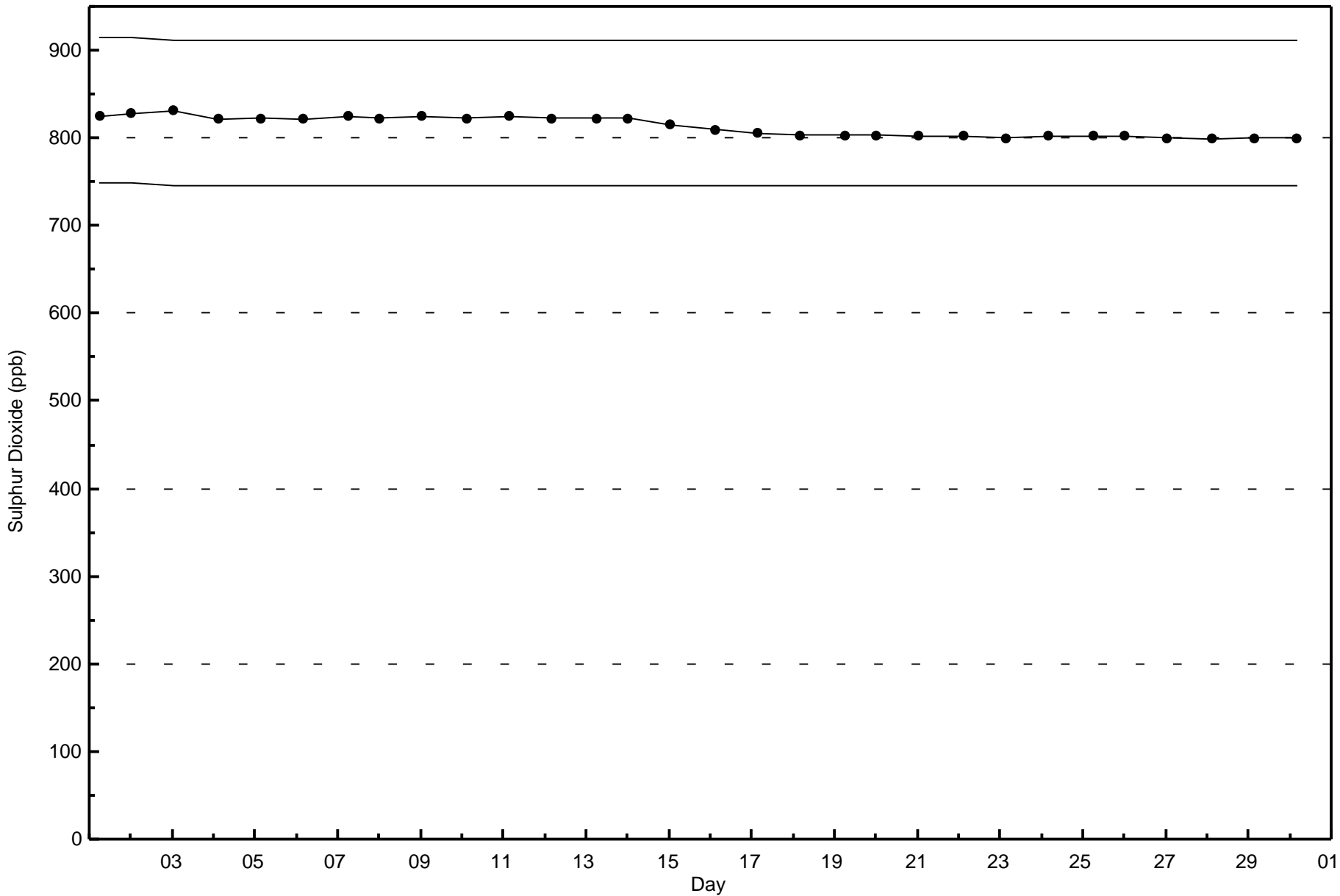
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Lower Camp (AMS 11)



Total Number of Valid Hours: 687







Wood Buffalo Environmental Association
Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb
Lower Camp - November 2016

Number of Exceedences (AAAQO): 1-hr: 8 24-hr: 1	Hours in Service: 720
Maximum Value: 21 ppb on Nov 26 18:00	Maximum Daily Average: 5.0 ppb on Nov 26
Minimum Value: 0 ppb on Nov 1 01:00	Minimum Daily Average: 0.0 ppb on Nov 1
Maximum Diurnal Average: 1.8 ppb at hour 17	Minimum Diurnal Average: 0.3 ppb at hour 1
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 = 9
	Hours of Data: 686
	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-Nov	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	0
2-Nov	0	Z	0	2	0	0	0	0	0	0	1	C	C	C	C	0	1	1	1	0	0	0	0	0	0	0.5	2
3-Nov	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0.4	1
4-Nov	1	1	1	Z	1	2	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.7	2
5-Nov	1	0	1	1	Z	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0.5	1	
6-Nov	1	3	1	1	0	Z	3	0	0	0	0	0	1	1	1	2	1	1	1	1	1	1	1	0	0.9	3	
7-Nov	0	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
8-Nov	0	Z	2	1	0	0	0	1	1	0	0	1	1	0	0	0	0	1	1	1	1	1	2	1	0.7	2	
9-Nov	1	1	Z	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
10-Nov	0	0	0	Z	5	2	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.7	5	
11-Nov	1	1	0	0	Z	0	0	0	0	1	0	0	0	0	3	11	6	2	0	0	0	0	0	0	1.2	11	
12-Nov	0	1	1	1	0	Z	1	1	0	0	0	0	0	0	0	1	0	1	1	3	1	1	1	2	0.8	3	
13-Nov	1	1	1	1	2	1	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.7	2	
14-Nov	1	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0.4	1	
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	1	1	0.4	2	
16-Nov	0	0	0	Z	0	0	0	1	2	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0.5	2	
17-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	0.1	0	
18-Nov	0	0	0	0	0	Z	0	2	2	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0.4	2	
19-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0.3	1	
21-Nov	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-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	0.2	0	
23-Nov	0	0	2	2	Z	3	1	1	1	3	2	2	2	2	1	0	1	1	0	0	0	0	0	0	1.1	3	
24-Nov	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	2	16	6	2	1	0	3	3	1	1.7	16	
25-Nov	1	0	0	0	0	1	Z	3	1	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0.6	3	
26-Nov	0	Z	0	0	0	0	0	0	3	16	2	0	1	1	3	0	15	21	19	11	15	6	1	1	5.0	21	
27-Nov	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
28-Nov	0	0	0	Z	0	0	0	0	1	2	0	0	5	0	1	1	1	1	1	0	0	0	0	0	0.8	5	
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	2	1	0	0	3	4	3	0	0	0	0.7	4	
30-Nov	0	0	0	0	1	Z	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.3	1	

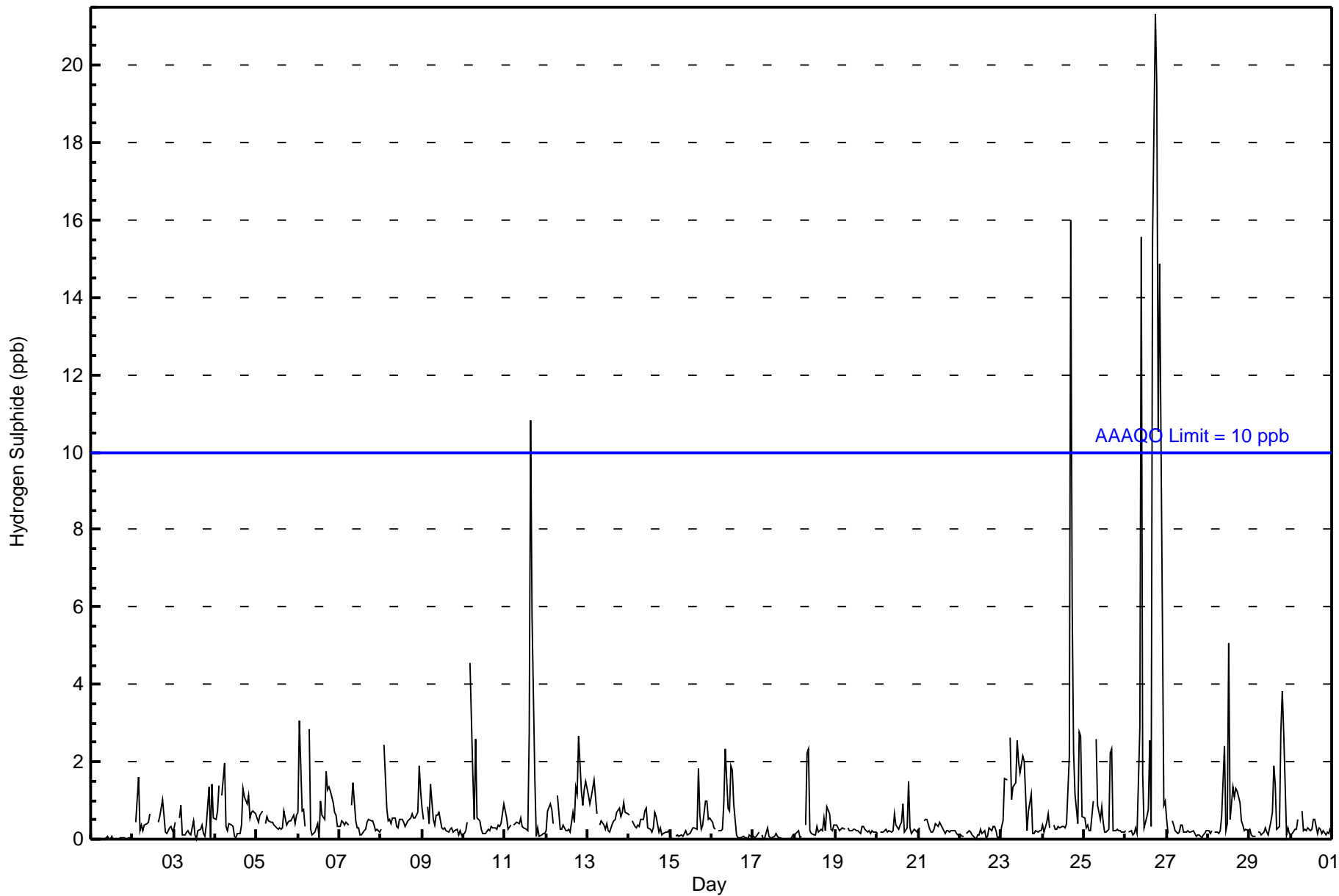
0.3	0.4	0.5	0.5	0.6	0.6	0.5	0.6	0.6	0.6	1.0	0.4	0.4	0.5	0.4	0.5	0.8	1.8	1.4	1.2	0.9	1.0	0.6	0.5	0.4	Diurnal Average
1	3	2	2	5	3	3	3	3	3	16	2	2	5	2	3	11	16	21	19	11	15	6	3	2	Diurnal Maximum

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
Lower Camp - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	658	95.92	95.92
3 - 4	15	2.19	98.11
5 - 7	5	0.73	98.83
8 - 11	0	0.00	98.83
> 11	8	1.17	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - 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 - 2	21	16	4	9	29	41	236	68	32	8	3	46	51	42	29	22	657
3 - 4	0	0	0	0	0	0	5	3	1	3	1	1	0	0	0	1	15
5 - 7	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	5
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	1	0	0	0	0	3	2	0	2	0	0	0	8
Totals	22	16	4	9	30	41	242	71	34	15	7	47	53	42	29	23	685

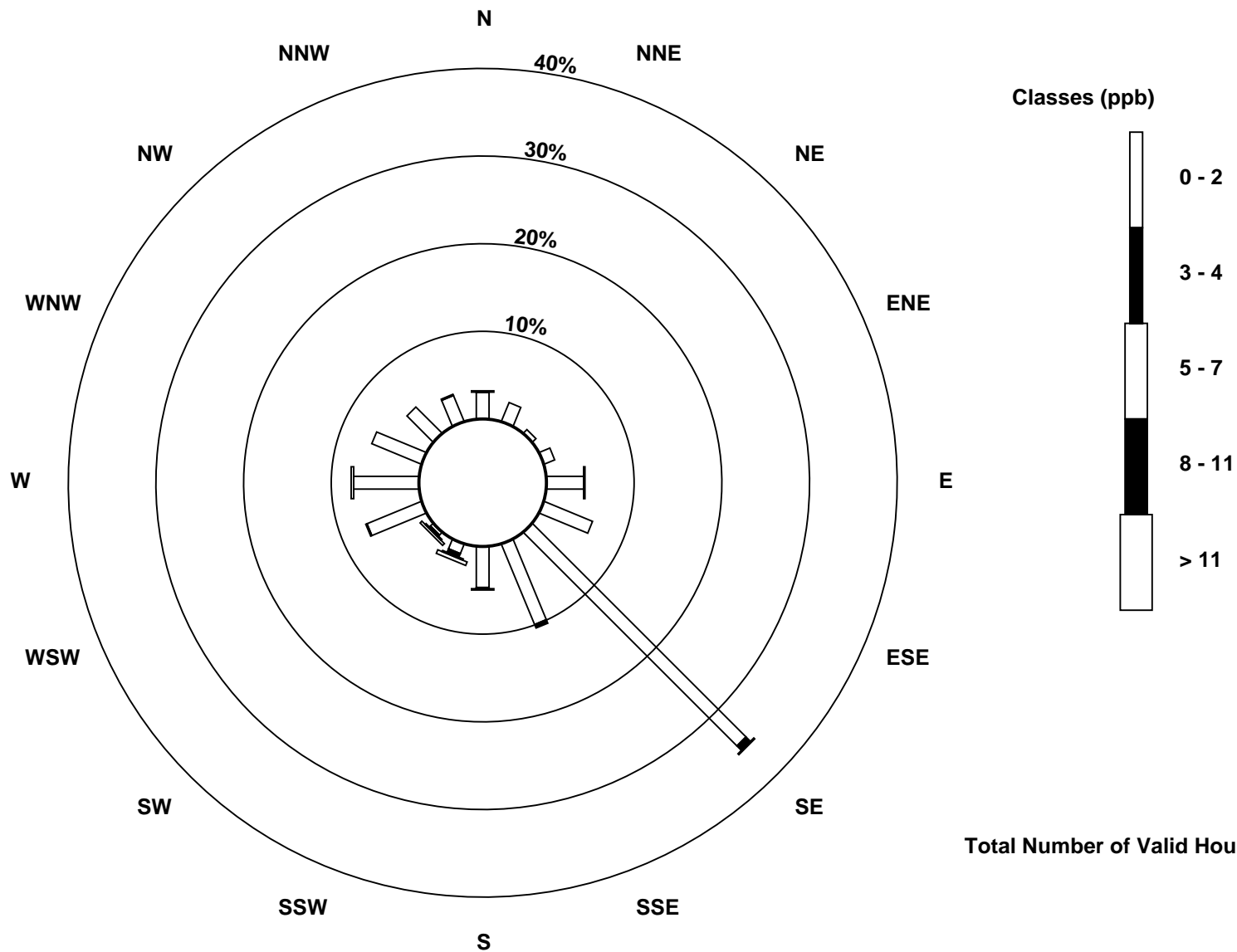
Total Number of Valid Hours: 685

Total Number of Hours: 720

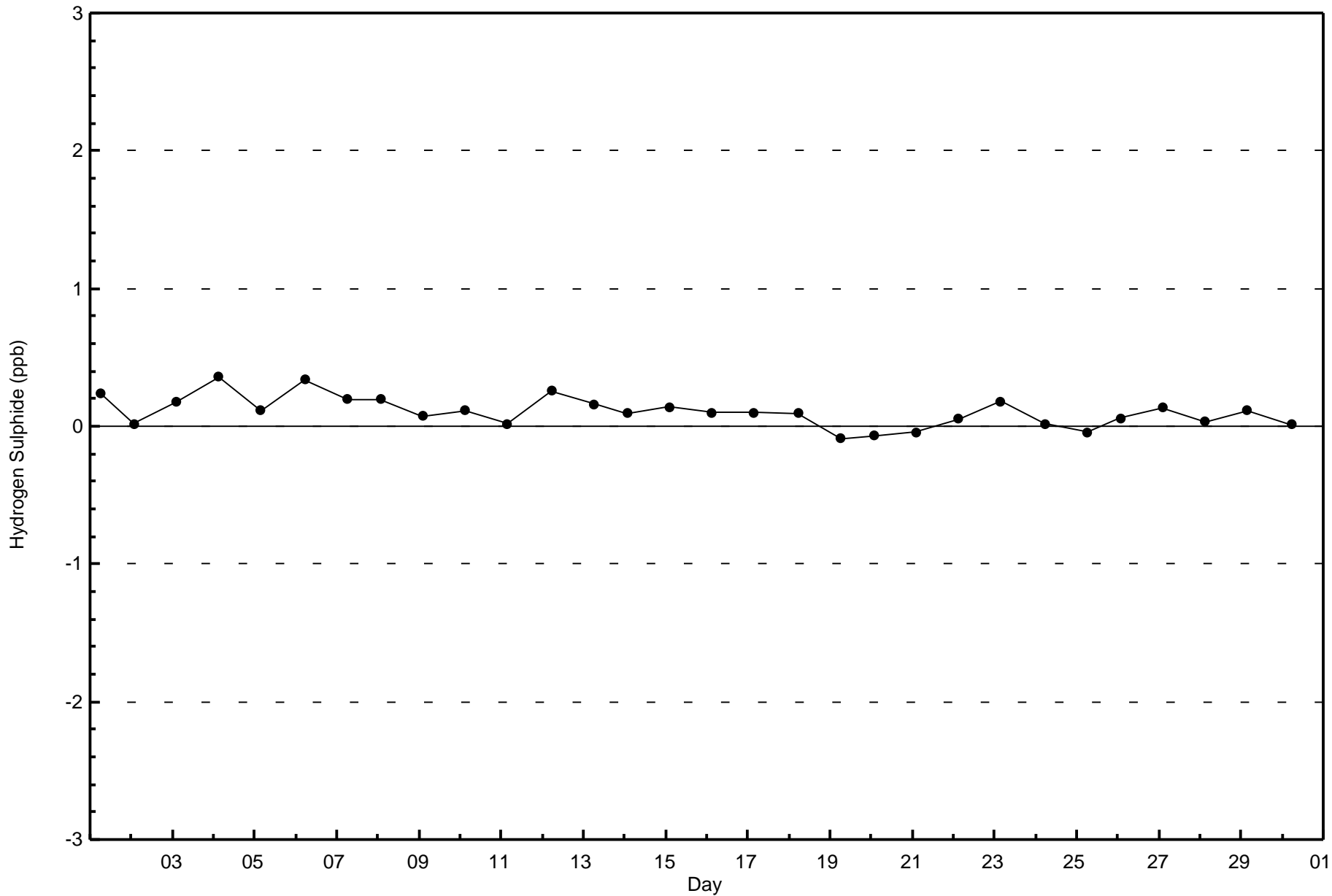


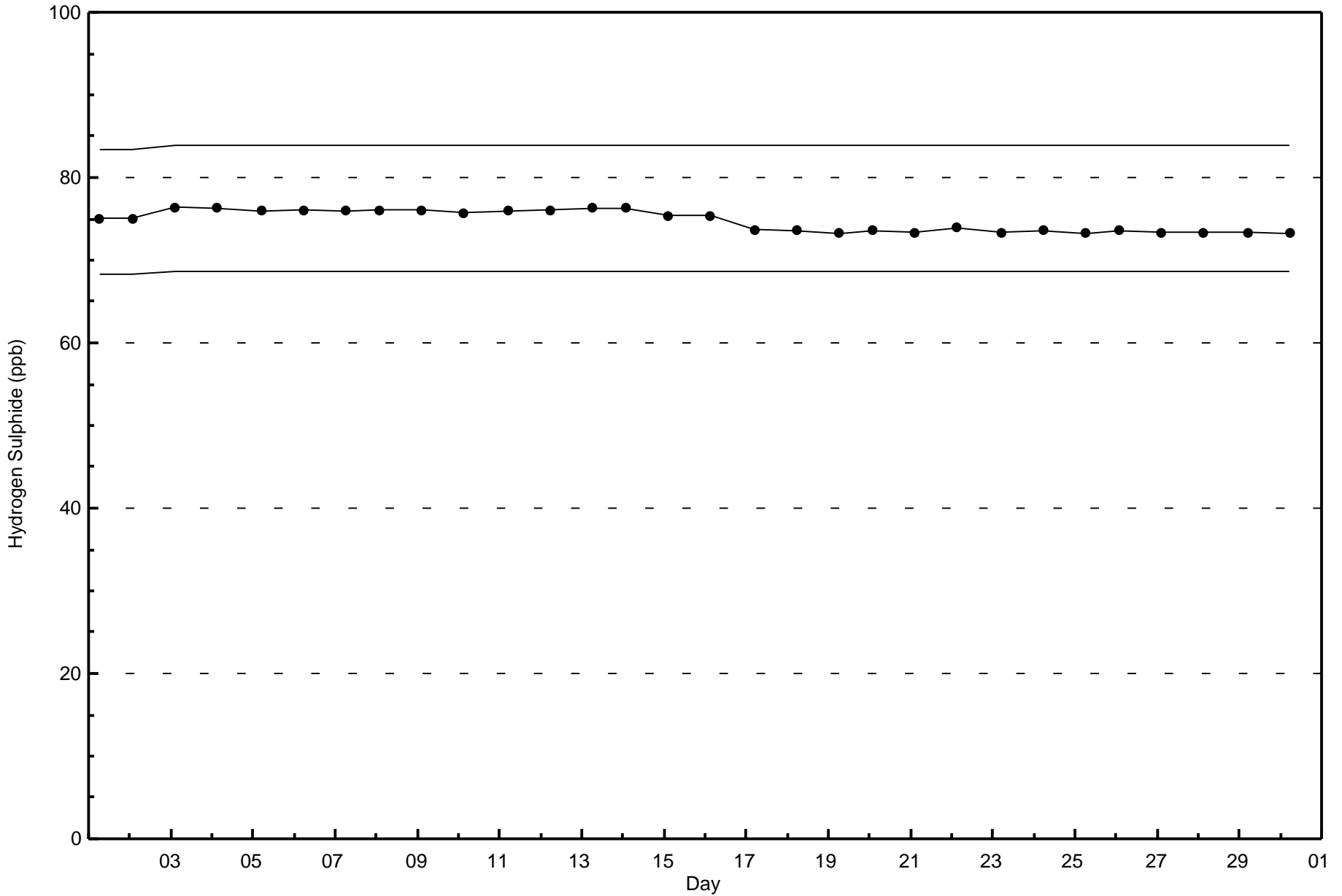
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Hydrogen Sulphide (H₂S) - ppb
Lower Camp (AMS 11)



Total Number of Valid Hours: 685







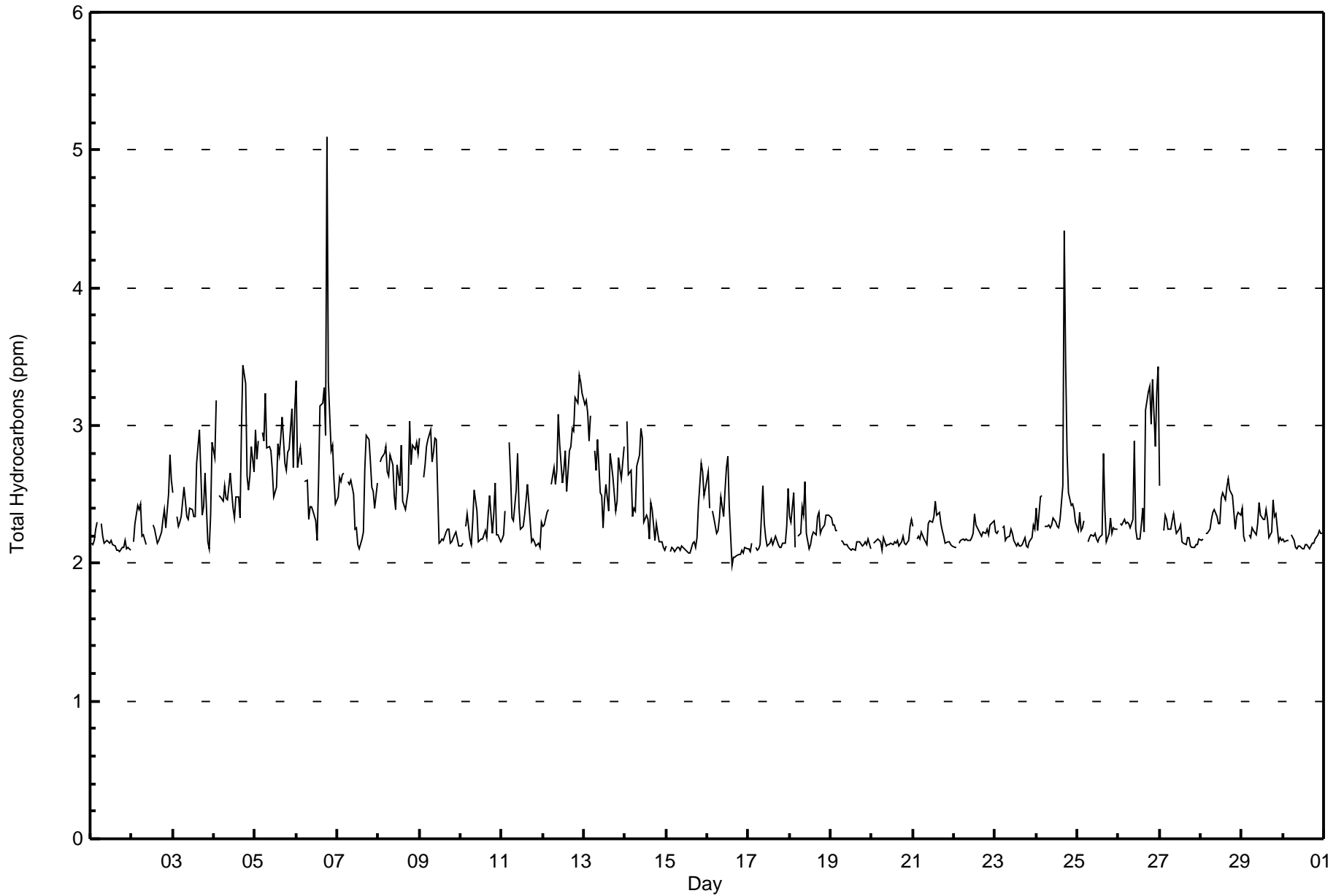
Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Lower Camp - November 2016

Maximum Value: 5.1 ppm on Nov 6 19:00	Maximum Daily Average: 2.8 ppm on Nov 5	Hours in Service: 720
Minimum Value: 2.0 ppm on Nov 16 15:00	Minimum Daily Average: 2.2 ppm on Nov 1	Hours of Data: 687
Maximum Diurnal Average: 2.5 ppm at hour 19	Minimum Diurnal Average: 2.3 ppm at hour 12	Hours of Missing Data: 33
Monthly Average: 2.39 ppm	Percentiles: P ₁ = 2.1 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.5 P ₉₀ = 2.8 P ₉₉ = 3.3	Hours of Calibration: 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-Nov	2.1	2.1	2.2	2.2	2.3	Z	2.3	2.2	2.1	2.2	2.2	2.1	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	2.3
2-Nov	Z	2.2	2.3	2.4	2.4	2.4	2.2	2.2	2.1	C	C	C	2.3	2.2	2.2	2.1	2.2	2.2	2.3	2.4	2.3	2.5	2.8	2.6	2.3	2.8	
3-Nov	2.5	Z	2.3	2.3	2.3	2.3	2.5	2.5	2.3	2.3	2.4	2.4	2.3	2.3	2.7	3.0	2.7	2.3	2.4	2.7	2.2	2.1	2.4	2.9	2.4	3.0	
4-Nov	2.8	3.2	Z	2.5	2.5	2.5	2.6	2.5	2.5	2.7	2.5	2.4	2.3	2.5	2.5	2.3	3.0	3.4	3.3	2.6	2.5	2.6	2.8	2.7	2.7	3.4	
5-Nov	3.0	2.8	2.9	Z	2.9	2.9	3.2	2.8	2.8	2.8	2.7	2.5	2.6	2.9	2.8	2.9	3.1	2.7	2.7	2.8	2.8	3.1	2.7	3.1	2.8	3.2	
6-Nov	3.3	2.7	2.8	2.7	Z	2.6	2.6	2.3	2.4	2.4	2.4	2.3	2.2	2.6	3.1	3.2	3.3	2.9	5.1	3.3	2.8	2.9	2.6	2.4	2.8	5.1	
7-Nov	2.5	2.6	2.6	2.6	2.7	Z	2.6	2.6	2.6	2.5	2.2	2.3	2.1	2.1	2.2	2.2	2.7	2.9	2.9	2.7	2.5	2.5	2.4	2.6	2.5	2.9	
8-Nov	Z	2.7	2.8	2.8	2.8	2.7	2.6	2.8	2.7	2.5	2.4	2.7	2.6	2.9	2.4	2.4	2.4	2.5	3.0	2.7	2.9	2.8	2.9	2.8	2.7	3.0	
9-Nov	2.9	Z	2.6	2.7	2.8	2.9	3.0	2.7	2.8	2.9	2.9	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.1	2.2	2.2	2.2	2.2	2.1	2.5	3.0	
10-Nov	2.1	2.1	Z	2.3	2.4	2.2	2.1	2.3	2.5	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5	2.2	2.4	2.6	2.2	2.2	2.2	2.3	2.6	
11-Nov	2.2	2.2	2.4	Z	2.9	2.6	2.3	2.3	2.5	2.8	2.4	2.3	2.3	2.4	2.4	2.6	2.4	2.2	2.2	2.2	2.1	2.1	2.1	2.3	2.4	2.9	
12-Nov	2.3	2.3	2.4	2.4	Z	2.6	2.7	2.6	2.7	3.1	2.9	2.6	2.7	2.8	2.5	2.8	2.8	3.0	3.0	3.2	3.2	3.4	3.3	3.2	2.8	3.4	
13-Nov	3.2	3.2	3.1	2.9	3.1	Z	2.8	2.7	2.9	2.5	2.5	2.3	2.5	2.6	2.4	2.8	2.7	2.6	2.4	2.5	2.8	2.7	2.6	2.9	2.7	3.2	
14-Nov	Z	3.0	2.6	2.7	2.3	2.4	2.4	2.7	2.8	3.0	2.9	2.3	2.3	2.3	2.2	2.4	2.4	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.4	3.0	
15-Nov	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	2.2	2.1	2.2	2.4	2.7	2.7	2.5	2.5	2.2	2.7
16-Nov	2.7	2.4	Z	2.4	2.3	2.2	2.2	2.3	2.5	2.3	2.5	2.7	2.8	2.4	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.8
17-Nov	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.6	2.3	2.2	2.1	2.1	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.3	2.5	2.2	2.6	
18-Nov	2.3	2.3	2.5	2.1	Z	2.2	2.2	2.4	2.3	2.6	2.2	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.6	
19-Nov	2.3	2.3	2.3	2.2	2.2	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	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.3	
20-Nov	Z	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.2	2.1	2.1	2.2	2.3	2.3	2.2	2.3	
21-Nov	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.3	2.3	2.3	2.3	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.2	2.5	
22-Nov	2.1	2.1	Z	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.4	
23-Nov	2.2	2.2	2.2	Z	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	2.2	2.1	2.1	2.2	2.2	2.3	2.3	2.2	2.3	
24-Nov	2.4	2.2	2.5	2.5	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6	4.4	3.4	2.8	2.5	2.4	2.4	2.4	2.3	2.5	4.4	
25-Nov	2.2	2.4	2.2	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.8	2.4	2.2	2.2	2.3	2.2	2.3	2.2	2.2	2.3	2.8	
26-Nov	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.9	2.2	2.2	2.2	2.3	2.4	2.2	3.1	3.2	3.3	3.0	3.3	2.8	3.2	3.4	2.6	3.4	
27-Nov	2.6	Z	2.2	2.4	2.3	2.3	2.2	2.3	2.4	2.3	2.2	2.2	2.3	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.6	
28-Nov	2.2	2.2	Z	2.2	2.2	2.2	2.3	2.4	2.4	2.3	2.3	2.3	2.5	2.5	2.5	2.6	2.6	2.5	2.5	2.4	2.3	2.3	2.4	2.4	2.4	2.6	
29-Nov	2.4	2.2	2.2	Z	2.2	2.2	2.3	2.2	2.2	2.3	2.4	2.4	2.3	2.3	2.4	2.3	2.2	2.2	2.5	2.3	2.4	2.2	2.2	2.2	2.3	2.5	
30-Nov	2.2	2.2	2.2	2.2	Z	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	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	
																								Diurnal Average			
																								Diurnal Maximum			

Z - zerospan C - Calibration





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Lower Camp - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	3	0.44	0.44
2.1 - 3.0	653	95.05	95.49
3.1 - 10.0	31	4.51	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Lower Camp - November 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	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2.1 - 3.0	20	14	5	8	29	36	224	70	34	14	5	47	52	42	31	22	653
3.1 - 10.0	1	0	0	0	1	8	15	1	1	1	2	0	1	0	0	0	31
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	22	16	5	8	30	44	239	71	35	15	7	47	53	42	31	22	687

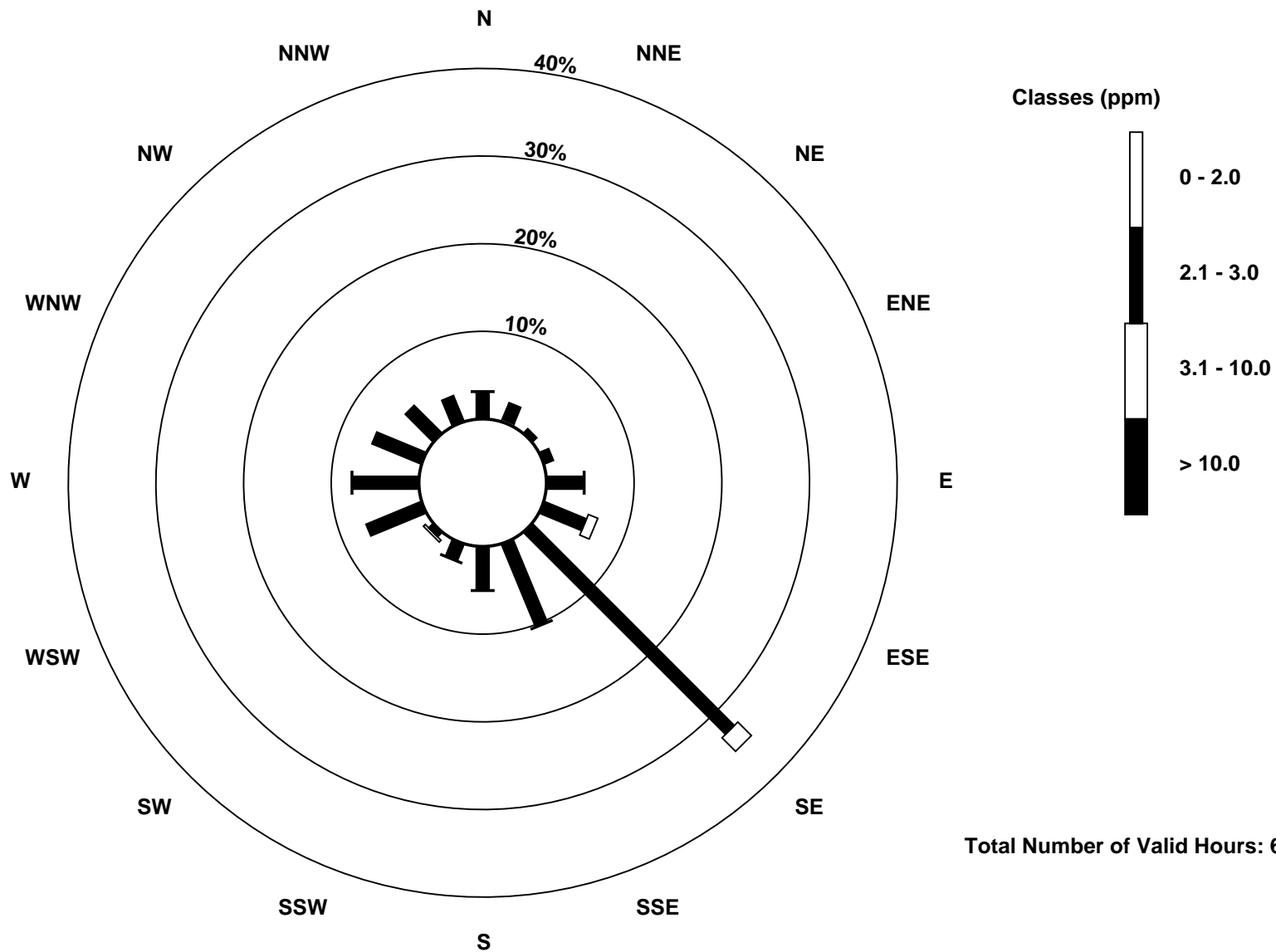
Total Number of Valid Hours: 687

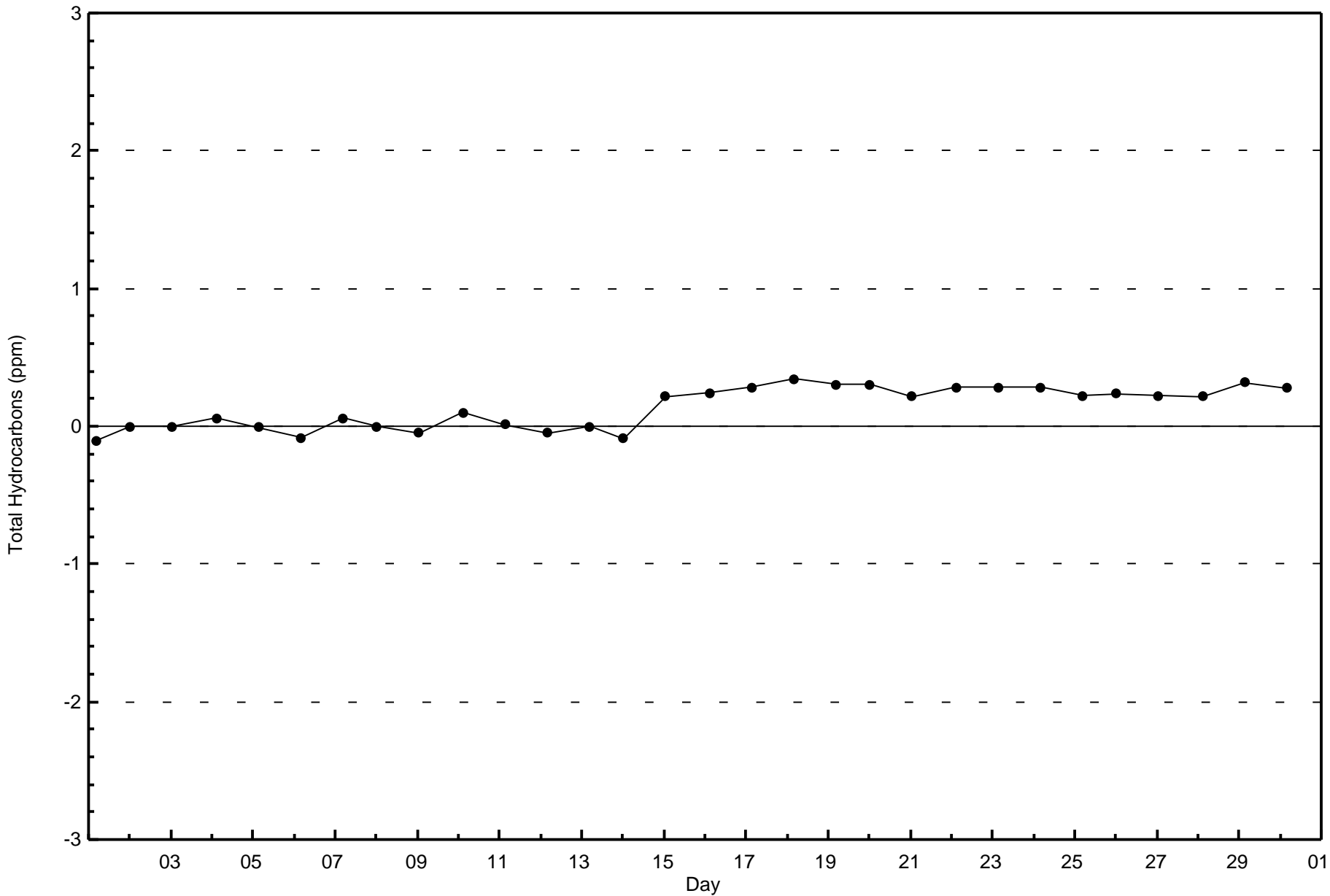
Total Number of Hours: 720

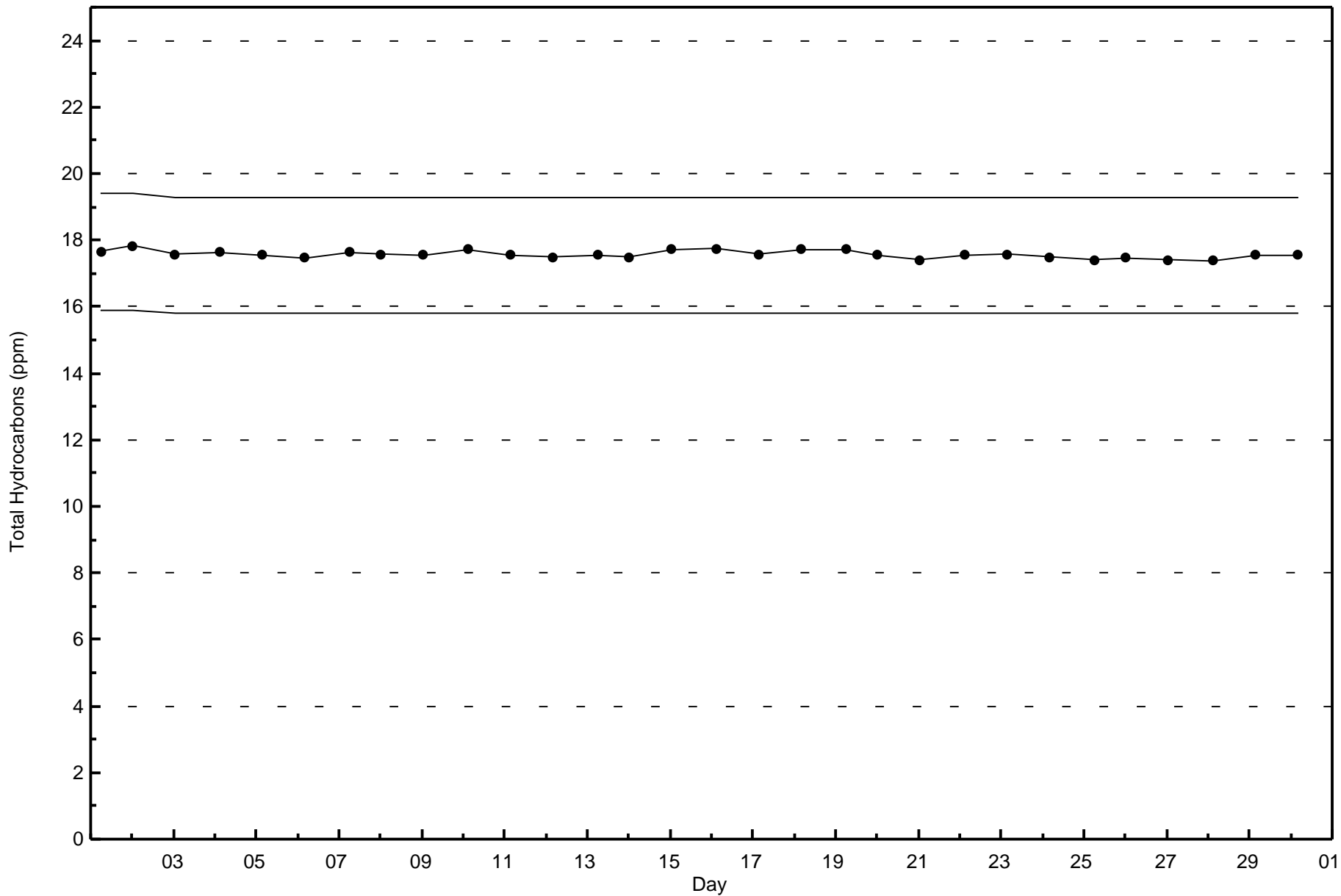


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Lower Camp (AMS 11)









Wood Buffalo Environmental Association
Summary of Hour Averages

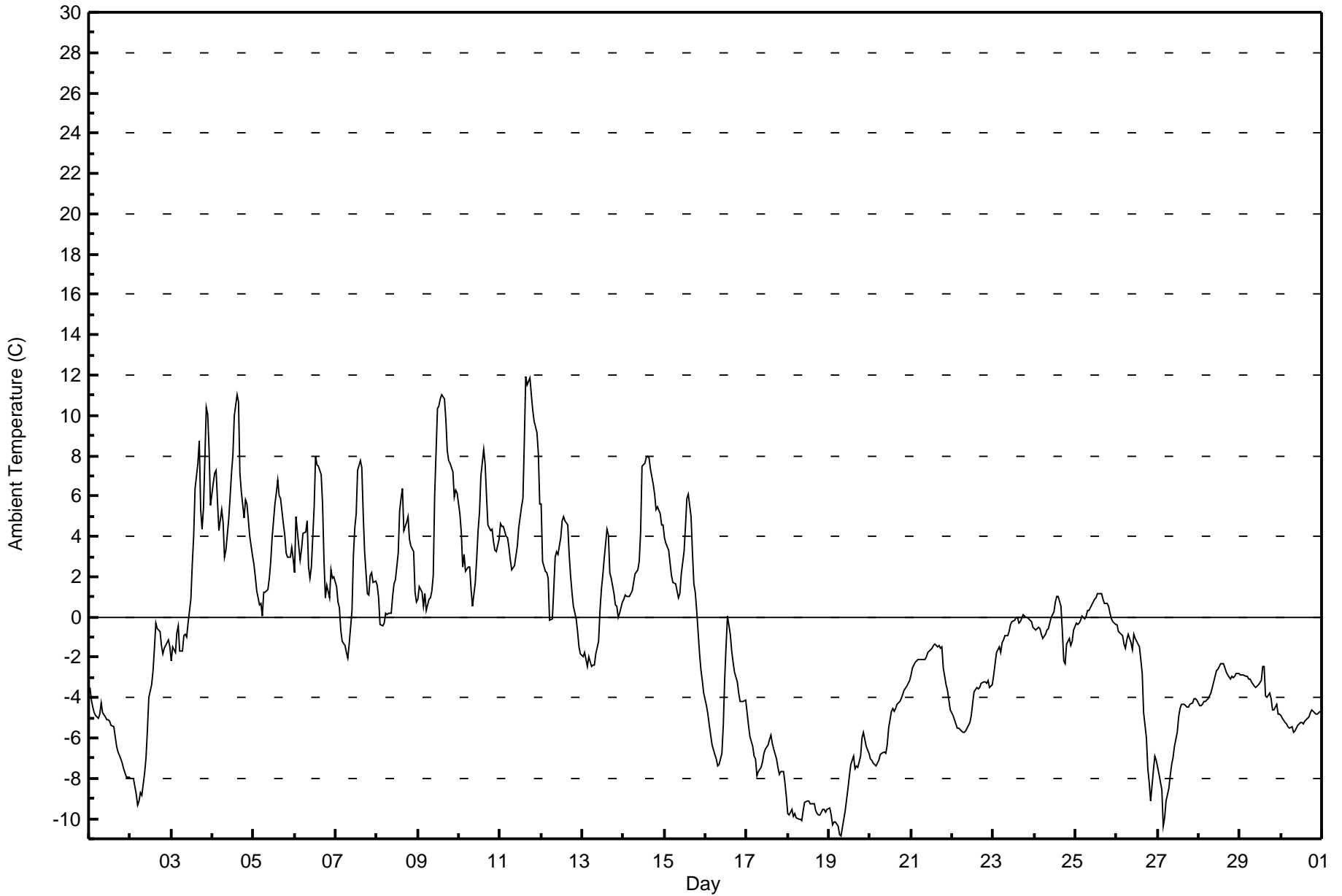
Ambient Temperature (AT) - C
Lower Camp - November 2016

Maximum Value: 11.9 C on Nov 11 16:00 Maximum Daily Average: 6.4 C on Nov 11																								Hours in Service: 720			
Minimum Value: -10.9 C on Nov 19 08:00 Minimum Daily Average: -9.6 C on Nov 18																								Hours of Data: 720			
Maximum Diurnal Average: 1.4 C at hour 15 Minimum Diurnal Average: -2.5 C at hour 6																								Hours of Missing Data: 0			
Monthly Average: -0.99 C Percentiles: P₁ = -10.2 P₁₀ = -7.4 Q₁ = -4.7 Median = -1.1 Q₃ = 2.5 P₉₀ = 5.6 P₉₉ = 10.7																								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-Nov	-3.5	-4.1	-4.5	-4.7	-4.9	-5.0	-4.8	-4.2	-4.7	-5.0	-5.1	-5.1	-5.2	-5.4	-5.5	-5.9	-6.4	-6.7	-7.1	-7.3	-7.5	-7.7	-7.9	-7.9	-5.7	-3.5	
2-Nov	-8.0	-8.0	-8.0	-8.7	-9.3	-9.1	-8.7	-8.8	-7.8	-7.0	-5.6	-4.0	-3.4	-2.6	-1.6	-0.3	-0.6	-0.7	-1.4	-1.8	-1.5	-1.2	-1.1	-1.5	-4.6	-0.3	
3-Nov	-2.2	-1.5	-1.8	-0.8	-0.5	-1.7	-1.7	-0.9	-0.8	-1.0	-0.3	0.9	2.6	4.0	6.3	7.6	8.8	5.3	4.4	5.4	10.4	10.0	8.3	5.5	2.8	10.4	
4-Nov	6.7	7.1	7.3	5.7	4.3	5.3	4.7	3.0	3.3	4.9	5.9	7.1	8.0	10.0	11.1	10.7	7.1	6.2	4.9	5.8	5.6	4.9	4.0	3.0	6.1	11.1	
5-Nov	2.6	2.0	1.3	0.6	0.7	0.1	1.2	1.2	1.3	1.9	2.8	4.0	5.6	6.2	6.8	6.0	5.9	4.6	4.1	3.2	2.9	2.9	3.5	2.9	3.1	6.8	
6-Nov	2.2	5.0	3.5	2.8	3.4	4.1	4.2	4.8	2.5	2.0	2.5	5.4	8.0	7.5	7.0	5.6	2.8	0.9	1.6	0.9	2.3	1.9	2.0	3.8	8.0		
7-Nov	1.5	0.8	0.4	-0.7	-1.2	-1.4	-1.8	-2.0	-1.3	0.3	3.0	4.4	5.1	7.2	7.8	7.4	5.1	3.2	1.1	1.1	2.1	2.2	1.7	1.8	2.0	7.8	
8-Nov	1.6	1.0	-0.3	-0.5	-0.3	0.2	0.1	0.2	0.2	1.1	1.6	1.9	3.2	5.2	5.9	6.3	4.3	4.7	5.0	3.9	3.5	3.2	1.2	0.7	2.2	6.3	
9-Nov	0.9	1.5	1.2	0.5	1.1	0.3	0.9	1.0	1.3	2.1	6.0	10.4	10.5	10.8	11.0	10.8	9.8	8.3	7.8	7.6	7.2	6.0	6.3	6.1	5.4	11.0	
10-Nov	5.1	4.2	2.5	3.1	2.2	2.5	2.5	1.4	0.6	1.7	2.9	4.3	5.2	7.0	8.3	7.6	6.0	4.6	4.3	4.3	3.7	3.3	3.3	3.9	3.9	8.3	
11-Nov	4.6	4.5	4.5	4.0	3.9	3.4	2.8	2.3	2.6	3.1	3.5	4.4	5.5	5.9	8.7	11.9	11.5	11.9	11.1	10.2	9.7	9.1	8.1	5.6	6.4	11.9	
12-Nov	5.6	2.8	2.2	2.2	1.9	-0.2	-0.1	1.3	3.0	3.3	3.1	3.9	4.8	5.0	4.8	4.6	3.1	2.1	1.2	0.5	-0.1	-0.7	-1.5	-1.8	2.1	5.6	
13-Nov	-2.0	-1.7	-2.1	-2.4	-1.9	-2.5	-2.4	-2.4	-1.8	-1.2	0.4	1.4	2.0	2.9	4.3	4.1	2.2	2.0	1.2	0.6	0.5	0.0	0.2	0.7	0.1	4.3	
14-Nov	0.9	1.1	1.0	1.0	1.1	1.3	1.7	2.2	2.3	2.8	4.2	7.5	7.6	7.9	8.0	7.9	7.3	6.6	6.1	5.3	5.5	5.2	4.6	4.6	4.3	8.0	
15-Nov	4.0	3.7	3.3	2.7	2.1	1.7	1.6	1.3	1.0	1.1	2.1	3.2	4.5	5.9	6.1	5.0	3.2	1.6	1.3	0.3	-1.8	-2.6	-3.2	-3.8	1.8	6.1	
16-Nov	-4.4	-4.8	-5.4	-5.9	-6.3	-6.8	-7.0	-7.4	-7.3	-6.8	-5.4	-3.1	-1.4	0.0	-0.8	-1.7	-2.2	-2.7	-3.2	-3.8	-4.2	-4.2	-4.2	-4.1	-4.3	0.0	
17-Nov	-4.8	-5.4	-5.9	-6.4	-6.9	-7.0	-7.9	-7.6	-7.4	-7.2	-6.8	-6.6	-6.4	-6.0	-5.9	-6.2	-6.5	-7.0	-7.4	-7.8	-7.7	-7.7	-8.2	-8.9	-6.9	-4.8	
18-Nov	-9.8	-9.8	-9.5	-9.9	-9.7	-9.9	-10.0	-10.0	-10.1	-9.6	-9.2	-9.1	-9.1	-9.2	-9.3	-9.3	-9.6	-9.8	-9.8	-9.8	-9.6	-9.5	-9.7	-9.5	-9.6	-9.1	-9.1
19-Nov	-9.4	-9.8	-10.3	-10.2	-10.2	-10.4	-10.8	-10.9	-10.4	-9.6	-9.1	-8.5	-7.9	-7.3	-6.9	-7.5	-7.4	-7.5	-6.9	-6.0	-5.7	-6.0	-6.4	-6.8	-8.4	-5.7	
20-Nov	-7.1	-7.1	-7.2	-7.4	-7.2	-7.1	-6.8	-6.7	-6.7	-6.8	-6.3	-5.5	-4.7	-4.5	-4.7	-4.5	-4.3	-4.2	-4.0	-3.8	-3.6	-3.4	-3.3	-3.1	-5.4	-3.1	
21-Nov	-2.9	-2.5	-2.3	-2.2	-2.1	-2.1	-2.1	-2.1	-2.1	-2.0	-1.8	-1.6	-1.5	-1.4	-1.3	-1.5	-1.4	-1.6	-1.5	-2.6	-3.4	-3.6	-4.1	-4.6	-2.3	-1.3	
22-Nov	-4.9	-5.1	-5.3	-5.5	-5.5	-5.6	-5.7	-5.8	-5.6	-5.4	-5.3	-4.9	-4.3	-3.7	-3.5	-3.5	-3.5	-3.3	-3.2	-3.2	-3.3	-3.2	-3.5	-3.4	-4.4	-3.2	
23-Nov	-2.9	-2.3	-1.7	-1.5	-1.8	-1.2	-1.1	-0.9	-0.9	-0.7	-0.4	-0.2	-0.1	0.0	0.0	-0.3	-0.2	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.5	-0.7	0.1	
24-Nov	-0.6	-0.6	-0.5	-0.6	-0.9	-1.1	-0.8	-0.6	-0.6	-0.3	0.0	0.3	0.7	1.0	1.0	0.5	-0.7	-2.2	-2.3	-1.4	-1.1	-1.4	-1.2	-0.7	-0.6	1.0	
25-Nov	-0.3	-0.4	-0.3	-0.2	0.0	-0.1	0.1	0.3	0.3	0.6	0.8	0.9	0.9	1.2	1.2	1.2	0.9	0.7	0.7	0.5	0.2	-0.1	-0.2	-0.4	0.4	1.2	
26-Nov	-0.4	-0.7	-0.8	-0.9	-1.3	-1.6	-1.1	-0.9	-1.2	-1.6	-0.9	-1.0	-1.3	-1.5	-2.1	-2.8	-4.7	-6.0	-7.5	-8.2	-9.1	-7.6	-6.9	-7.1	-3.2	-0.4	
27-Nov	-7.5	-7.8	-8.6	-10.4	-10.0	-9.1	-8.5	-7.9	-7.3	-6.9	-6.4	-5.7	-5.0	-4.5	-4.3	-4.3	-4.4	-4.5	-4.4	-4.4	-4.2	-4.1	-4.0	-4.1	-6.2	-4.0	
28-Nov	-4.4	-4.4	-4.3	-4.2	-4.2	-4.0	-3.9	-3.8	-3.5	-2.9	-2.7	-2.6	-2.5	-2.3	-2.3	-2.5	-2.7	-2.9	-3.1	-2.9	-3.0	-2.9	-2.8	-2.8	-3.2	-2.3	
29-Nov	-2.9	-2.8	-2.9	-2.9	-2.9	-3.1	-3.1	-3.2	-3.4	-3.5	-3.4	-3.4	-3.1	-2.5	-2.5	-3.9	-4.0	-3.8	-4.1	-4.6	-4.6	-4.3	-4.8	-4.8	-3.5	-2.5	
30-Nov	-4.9	-5.0	-5.3	-5.3	-5.5	-5.5	-5.4	-5.7	-5.6	-5.5	-5.4	-5.2	-5.2	-5.3	-5.1	-5.0	-4.9	-4.7	-4.6	-4.7	-4.8	-4.8	-4.8	-4.7	-5.1	-4.6	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Lower Camp - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Lower Camp - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	424	58.89	58.89
0 - 10	282	39.17	98.06
10 - 20	14	1.94	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

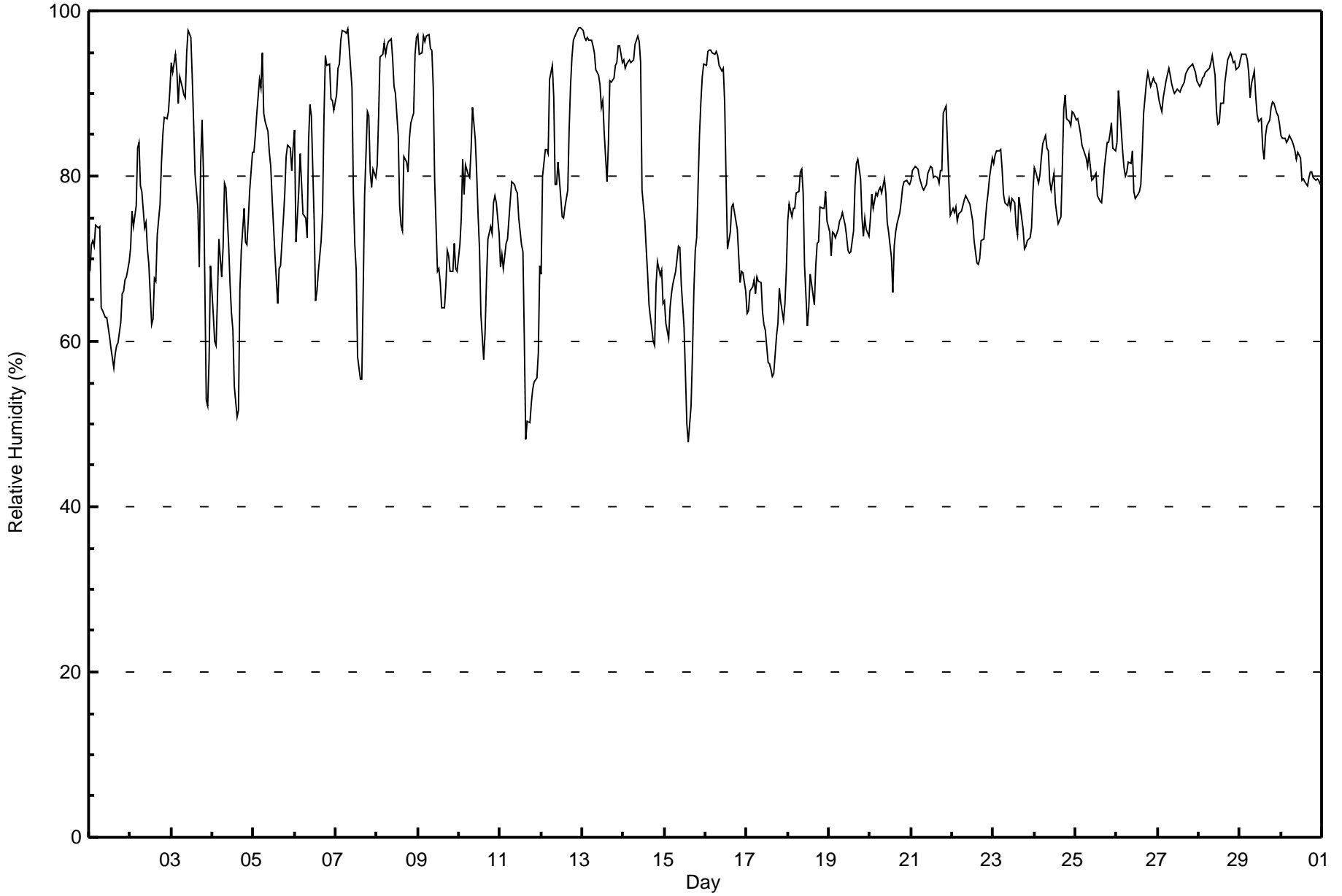
Relative Humidity (RH) - % Lower Camp - November 2016

Maximum Value: 98 % on Nov 12 23:00		Maximum Daily Average: 92.5 % on Nov 13		Hours in Service: 720																							
Minimum Value: 48 % on Nov 15 15:00		Minimum Daily Average: 63.2 % on Nov 17		Hours of Data: 720																							
Maximum Diurnal Average: 83.9 % at hour 6		Minimum Diurnal Average: 70.2 % at hour 15		Hours of Missing Data: 0																							
Monthly Average: 79.3 %		Percentiles: P ₁ = 52 P ₁₀ = 65 Q ₁ = 72 Median = 79 O ₃ = 88 P ₉₀ = 94 P ₉₉ = 98		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	68	72	72	71	74	74	74	64	64	63	63	62	60	59	57	58	60	60	62	66	66	67	68	70	65.6	74	
2-Nov	71	76	74	76	83	84	79	78	74	74	71	69	62	63	68	67	73	77	81	85	87	87	88	90	76.6	90	
3-Nov	94	92	95	93	89	92	91	90	90	95	98	97	92	86	80	76	69	82	87	80	53	52	58	69	83.3	98	
4-Nov	63	60	59	65	72	68	71	79	79	72	67	63	61	55	51	52	66	71	76	72	72	75	78	83	68.0	83	
5-Nov	83	85	87	92	91	95	88	87	85	83	81	77	71	67	65	69	69	75	78	82	84	83	81	84	80.9	95	
6-Nov	86	72	78	83	79	75	75	72	84	89	87	75	65	66	68	72	76	87	95	93	94	89	89	88	80.7	95	
7-Nov	90	93	93	96	98	97	97	98	96	91	78	72	69	58	55	55	66	78	88	87	80	79	81	80	82.3	98	
8-Nov	81	87	94	95	96	95	96	96	97	94	91	90	85	76	74	73	82	82	80	85	86	88	95	97	88.2	97	
9-Nov	97	95	95	97	96	97	97	95	95	91	79	68	69	67	64	64	67	71	70	68	69	72	69	68	80.1	97	
10-Nov	72	75	82	78	81	80	80	83	88	84	80	75	71	63	58	61	67	72	74	73	77	78	77	73	75.2	88	
11-Nov	69	70	69	72	72	75	77	79	79	78	78	75	72	71	60	48	50	50	53	54	55	56	59	69	66.3	79	
12-Nov	68	80	83	83	83	92	93	89	79	79	82	78	75	75	76	78	86	91	94	96	97	98	98	98	85.5	98	
13-Nov	98	97	96	97	97	96	96	95	93	92	91	88	89	85	79	84	91	91	92	93	94	96	96	94	92.5	98	
14-Nov	94	93	93	94	94	94	94	96	97	96	94	78	75	71	68	64	63	60	59	67	70	68	69	65	79.8	97	
15-Nov	65	62	60	64	66	67	68	70	72	71	67	62	56	50	48	52	58	66	71	73	85	89	92	94	67.8	94	
16-Nov	93	95	95	95	95	95	95	95	93	93	93	89	80	71	73	76	77	76	74	70	67	69	68	66	83.0	95	
17-Nov	63	64	66	67	68	66	68	67	67	64	62	61	58	57	57	56	56	61	62	66	65	63	65	69	63.2	69	
18-Nov	75	77	75	76	76	78	78	80	81	78	69	62	64	68	67	64	69	72	72	76	76	76	78	75	73.4	81	
19-Nov	73	70	73	73	72	74	75	75	76	74	73	71	71	71	73	79	81	82	80	75	73	75	73	73	74.3	82	
20-Nov	75	78	76	78	78	78	79	78	80	78	74	73	70	66	71	73	74	76	77	79	79	79	79	79	76.1	80	
21-Nov	80	81	81	81	81	80	79	78	79	79	80	81	81	80	80	80	79	81	81	88	88	84	79	75	80.6	88	
22-Nov	76	76	76	75	75	76	77	77	78	77	77	76	75	72	69	69	70	72	72	75	77	78	80	82	75.2	82	
23-Nov	82	83	83	83	83	81	78	77	76	77	76	77	77	74	73	77	76	74	71	72	72	72	74	78	76.9	83	
24-Nov	81	81	79	80	82	84	85	83	83	79	78	80	77	75	74	75	81	88	90	87	87	86	88	88	82.2	90	
25-Nov	87	87	86	85	84	83	82	81	83	80	80	80	80	80	78	77	77	79	81	84	84	85	86	83	83	82.2	87
26-Nov	84	90	88	83	81	80	80	82	81	83	78	77	78	78	79	83	88	91	92	92	91	92	91	91	84.8	92	
27-Nov	90	89	88	89	91	92	93	92	91	90	90	91	90	90	91	91	92	93	93	93	94	93	93	92	91.3	94	
28-Nov	91	91	92	92	93	93	93	94	95	92	88	86	86	89	89	91	93	94	95	94	94	94	93	93	91.9	95	
29-Nov	94	95	95	95	94	93	89	91	93	90	87	87	87	83	82	85	86	87	88	89	89	88	87	86	89.1	95	
30-Nov	85	85	85	84	84	85	84	84	83	82	83	82	79	80	79	79	80	80	81	80	79	80	79	79	81.7	85	
		80.9	81.6	82.4	83.1	83.6	83.9	83.7	83.6	83.6	82.3	79.8	76.8	74.1	71.5	70.2	71.1	74.2	77.3	79.1	79.8	79.4	79.7	80.2	81.0	Diurnal Average	
		98	97	96	97	98	97	97	98	97	96	98	97	92	90	91	91	93	94	95	96	97	98	98	98	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Lower Camp - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Lower Camp - November 2016

Maximum Speed: 27 km/h on Nov 15 00:00	Maximum Daily Speed Average: 15.3 km/h on Nov 20	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 26 18:00	Minimum Daily Speed Average: 1.5 km/h on Nov 18	Hours of Data: 719
Maximum Diurnal Speed Average: 5.2 km/h at hour 9	Minimum Diurnal Speed Average: 1.6 km/h at hour 19	Hours of Missing Data: 1
Monthly Average Velocity: 3.8 km/h 157.0 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 9 Q ₃ = 13 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-Nov	NNW11	N12	N9	NNE7	NE6	ENE4	NE1	NNW19	WNW20	NNW18	NNW17	NNW17	NNW16	NNW18	NW16	NW14	NNW12	NNW13	NNW12	N11	NNE9	ENE6	E7	E8	NW8.5	WNW20	
2-Nov	E7	ESE8	SSE5	SSE4	ESE7	SSE4	S8	S7	SSE12	SE13	SE11	SE16	SSE9	SSW10	SSE10	SSE11	SSE10	SE11	SE13	SE13	SE15	SE14	SE13	SE14	SE9.5	SE16	
3-Nov	SE13	SE14	SE12	SE12	SSE10	SE11	SE11	SE9	SE8	SE13	SE14	SE14	SE18	SE17	SE14	SSE11	SSE10	ESE6	ESE5	SSE7	WSW18	WSW16	SSW6	SE7	SSE9.6	WSW18	
4-Nov	S7	S8	SSW11	SSE2	ENE2	E2	SE11	SE11	SE12	SE10	SE14	SE11	SE15	SE11	SE11	SE9	SE9	ESE9	SE9	SE11	SE11	SE13	SE13	SE9.1	SE15		
5-Nov	SE11	SE10	SE6	SE9	ESE4	SE4	SE9	SE11	SE6	SE7	SE13	SE18	SE10	SE12	SE12	SE16	SE7	SE12	SE3	SE8	SE3	SE9	SE12	SE8	SE9.1	SE18	
6-Nov	ESE7	SSE7	SE10	SE10	SE13	SE5	NNW2	NW5	SSE2	SE2	SE5	WSW2	WSW6	SSE4	SE5	SE1	SE4	SE1	ESE3	SE6	SE5	SE11	SE9	SE10	SE4.5	SE13	
7-Nov	SE10	SE8	SE7	SE6	ESE6	ESE5	ESE3	SE2	SSE1	SE6	SE10	SE11	SE10	SE8	SE7	SSE8	SE9	SE8	SE3	ESE4	SE8	SE10	SE9	SE10	SE6.9	SE11	
8-Nov	SSE6	S1	SSE1	N1	SE5	SE9	SE9	SE6	SE11	SE14	SE16	SE10	SE11	SE9	SE12	SE10	SE12	SE15	SE16	SE12	SE12	SE5	WNW2	SE1	SE8.4	SE16	
9-Nov	SE6	SE11	SE6	SE6	SE6	SSE2	SE12	SE7	SE11	SE12	SSW7	WSW16	W20	WSW16	WSW15	WSW16	WSW16	W11	W14	W22	W25	W11	W15	W21	SW8.2	W25	
10-Nov	WSW14	WNW7	SSE2	SE3	S3	W8	WSW8	S4	SE7	SE10	SE13	SE15	SE12	SE12	SSE9	SE9	SE8	SE13	SE12	SE9	SE10	SE12	SE12	SE14	SE6.9	SE15	
11-Nov	SE13	SE14	SE10	SE9	SE10	SE11	SE13	SE13	SE14	SE13	SE15	SE16	SE17	SE17	SSE9	SSW8	SSW7	WSW11	WSW10	WSW10	WSW16	WSW18	WSW17	W7	SSE8.0	WSW18	
12-Nov	WSW12	ESE2	SE8	SE8	SE4	E2	NNE1	SE5	SE12	SSE4	SE8	SE13	SE5	SE9	SE5	W2	ESE1	W1	ESE2	SE3	ESE3	ESE3	ESE3	ESE4	SE4.0	SE13	
13-Nov	ESE5	SE7	SE5	SE6	SE5	SE7	SE8	SE6	SE10	SE12	SE13	SE13	SE11	SE9	SE13	SE11	SE6	SE10	SE12	SE12	SE14	SE13	SE16	SE15	SE9.9	SE16	
14-Nov	SE12	SE12	SE16	SE17	SE13	SE14	SE16	SE14	SE15	SE10	SSW1	W13	W13	W16	W17	WNW18	WNW13	W12	W10	W11	W20	W25	W24	W27	SW6.6	W27	
15-Nov	W17	W13	W12	W24	W23	W23	W21	W15	WSW16	WSW22	W21	WSW18	WSW14	WSW12	WSW13	WSW11	W5	W7	W10	W4	WNW2	WNW2	ENE1	NW2	W12.7	W24	
16-Nov	WNW2	NW3	NW2	WNW3	WNW3	E1	ENE1	E1	NNW0	W1	SSW1	W1	W3	NNW4	NNE15	NNE13	N13	N13	NNE16	N14	N9	N11	NNW8	N16	N5.6	N16	
17-Nov	NNW15	N15	N15	NNW11	NW10	NW12	WNW9	NNW10	WNW14	NW12	WNW9	W12	W14	WNW13	WNW16	WNW22	WNW23	NW20	NW18	NW12	NW11	WNW10	WNW9	NNW7	NW12.2	WNW23	
18-Nov	NW4	W4	N5	NNE5	N4	NW4	W5	W4	SW6	W3	NNW5	NNW7	WNW5	W6	WNW2	W3	NW4	WSW5	WSW3	E3	E5	E6	E5	E6	NW1.5	NNW7	
19-Nov	E8	E6	E5	E6	E8	ENE5	ENE7	NE7	NNE7	ENE9	E11	E11	E12	E9	NE7	NNW7	NNW4	WSW2	NW3	E7	ESE13	ESE18	ESE19	ESE18	E7.0	ESE19	
20-Nov	ESE16	ESE16	ESE16	ESE17	ESE20	ESE17	ESE18	SE13	SE23	SE12	SE12	SE15	SE14	SSE7	SE12	SE13	SE15	SE14	SE15	SE19	SE19	SE16	ESE19	ESE16	SE15.3	ESE23	
21-Nov	ESE17	SE15	SE12	SE10	SE13	SSE10	SSE12	SSE10	SSE7	SSE6	SE6	ESE5	NNE2	WNW4	NNW3	WNW4	NNW4	NNW5	NNW7	N11	NNE9	NNE8	NE9	NNE8	ESE3.5	ESE17	
22-Nov	N8	N8	NNE7	NNE7	N6	N5	NE4	E3	ENE2	E4	E5	E3	SE1	S6	S7	S8	S8	SSE9	S9	SSE9	SSE9	SE9	ESE16	SE18	ESE3.6	SE18	
23-Nov	SSE10	SE14	SE17	SE17	ESE22	SE14	SSE11	SSE14	SSE14	SSE16	SSE13	SE18	SE22	SSE15	SSE13	SE15	SE13	SE12	SSE11	SSE11	SSE9	SSE7	SSE6	SSE7	SE13.0	ESE22	
24-Nov	SSE6	SSE7	S8	S7	SSE8	SSE7	SE11	SSE9	SE10	SE12	SSE9	SSE8	SSE7	SSE6	SSE6	SSW5	SSW2	N1	E4	ESE5	SE16	SE19	SE20	SE22	SE8.2	SE22	
25-Nov	SE24	SE24	SE23	SE21	ESE20	SE20	SE21	SE15	SE13	SSE7	SE7	SSE6	SE7	SE6	S3	SSW3	SW5	WSW7	WSW8	W10	WSW11	WSW12	WSW16	WSW15	SSE7.8	SE24	
26-Nov	WSW16	WSW13	WSW14	WSW13	WSW14	WSW13	WSW11	WSW6	WSW7	SSW5	SW12	WSW9	WSW7	SSW5	SSW5	SE4	SW2	E0	W2	W2	SW1	SE5	SE6	SE5	SW6.1	WSW16	
27-Nov	SE6	SE7	ESE4	E3	SE4	ESE2	E3	N5	NNE4	NNW7	N6	N6	NNW6	NW8	NW7	NW7	NW6	WNW8	NW6	WNW6	WNW6	WNW6	NW8	NW6	NNW3.1	NW8	
28-Nov	NW7	NW5	AF	N2	N1	ESE1	E2	S1	E2	WSW6	WSW7	WSW8	SW6	SE4	ESE2	ESE2	W1	NW4	WNW4	WNW5	NW4	W5	WNW5	WNW4	W2.1	WSW8	
29-Nov	NW3	NW4	WNW2	WNW4	NW3	WNW3	W5	NNW2	WNW1	W5	WNW5	WNW5	NE2	SE5	S5	SSE4	S7	S7	SSW7	SW10	SSW6	SSE9	S7	SSE7	SSW2.4	SW10	
30-Nov	S9	SSE9	S9	SSE9	SSE9	SE9	SSE9	S11	S11	S11	S10	S8	S9	S9	S9	S9	S9	S9	S9	S9	S9	S8	S9	SSE9	SSE9	S9.0	S11

SE3.6	SE4.4	SE4.7	SE4.2	SE4.7	SSE3.7	SSE4.8	SSE3.9	SSE5.2	SSE5.1	SSE5.1	SSE4.9	S4.7	S4.4	S3.6	S2.8	S2.2	S2.1	S1.6	SSE2.3	S3.4	SSE4.0	SSE4.4	SE4.3	Diurnal Average	
SE24	SE24	SE23	W24	W23	W23	W21	WNW19	ESE23	WSW22	W21	SE18	SE22	WNW18	W17	WNW22	WNW23	NW20	NW18	W22	W25	W25	W24	W27	Diurnal Maximum	

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



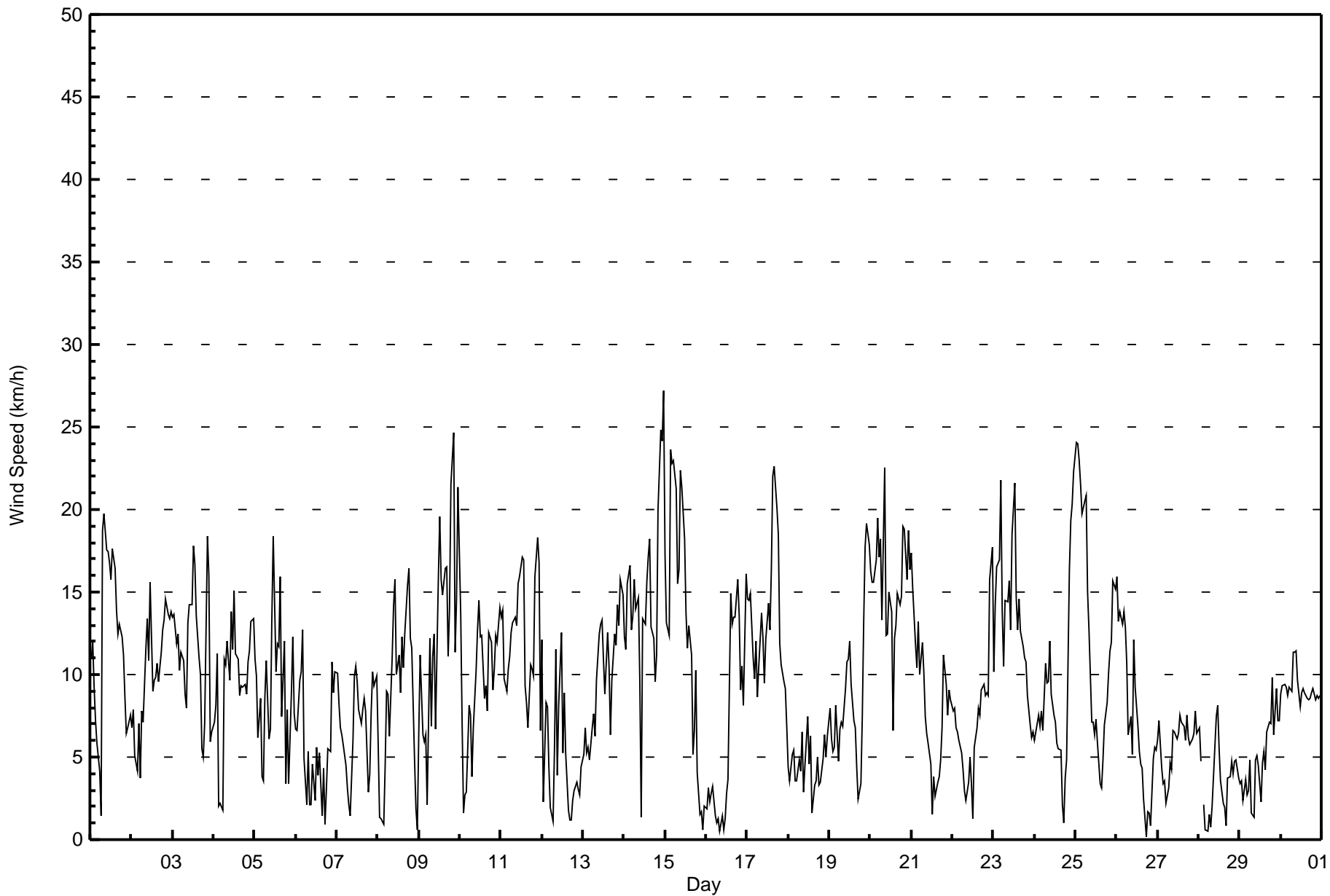
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Lower Camp - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Nov 25 08:00	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 0 km/h on Nov 16 04:00	
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	2	2	2	2	1	2	2	4	4	4	4	4	4	4	3	3	2	3	3	3	2	2	1	2	4
2-Nov	1	2	2	1	2	2	2	3	4	6	5	5	3	3	4	4	3	2	3	2	2	2	2	2	6
3-Nov	3	3	3	3	3	2	2	3	2	2	3	3	3	3	2	3	3	4	1	3	6	4	5	3	6
4-Nov	3	3	3	3	2	2	3	3	3	3	3	2	2	3	2	2	1	2	2	3	3	2	2	3	3
5-Nov	3	3	2	2	3	2	3	5	2	2	2	3	2	2	3	2	3	2	4	4	2	3	5	2	5
6-Nov	4	4	2	2	3	3	1	2	2	1	3	3	2	1	1	2	2	2	1	2	3	2	2	2	4
7-Nov	2	1	2	1	1	2	2	1	1	3	2	2	1	1	2	2	2	2	2	2	3	4	3	3	4
8-Nov	2	2	1	2	2	2	2	3	3	2	2	4	3	4	2	2	2	3	2	2	2	3	2	1	4
9-Nov	2	3	5	5	3	3	2	4	4	2	3	3	3	3	2	2	4	3	4	4	4	3	4	4	5
10-Nov	4	3	1	2	2	5	4	2	2	2	3	2	1	2	3	2	3	6	4	4	2	3	5	4	6
11-Nov	4	4	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	4	3	4	4	4
12-Nov	3	1	4	2	2	2	2	3	2	2	3	3	3	2	2	2	2	2	1	1	1	1	2	1	4
13-Nov	1	1	1	1	2	2	2	2	2	2	2	3	3	3	2	2	2	3	3	2	2	3	2	2	3
14-Nov	2	3	3	2	2	3	2	2	2	3	3	3	3	3	4	4	3	2	2	3	5	5	4	6	6
15-Nov	5	5	4	5	5	4	4	4	3	5	5	3	3	2	2	2	2	3	3	3	2	2	1	1	5
16-Nov	1	2	1	0	1	1	1	2	1	1	1	1	1	4	3	3	3	3	3	2	3	2	3	4	4
17-Nov	3	3	4	3	2	3	2	2	3	3	3	2	3	3	4	5	4	5	3	2	2	2	1	2	5
18-Nov	1	1	3	2	2	1	2	1	1	1	3	3	2	2	2	2	1	1	1	3	2	1	2	2	3
19-Nov	1	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	2	2	3	4	3	3	3	3	4
20-Nov	3	3	4	4	3	4	3	5	4	6	5	4	4	3	3	2	3	3	3	3	3	3	3	4	6
21-Nov	2	4	3	4	4	3	3	3	2	2	3	2	1	1	2	1	1	1	2	3	2	2	2	2	4
22-Nov	2	2	2	2	1	1	1	1	1	2	1	2	2	2	3	3	3	3	3	3	3	2	5	4	5
23-Nov	4	4	5	4	5	4	4	5	5	5	4	5	5	5	4	4	4	3	3	3	3	2	2	2	5
24-Nov	2	2	2	2	2	2	3	2	3	3	3	2	2	2	2	2	2	1	3	3	4	4	4	4	4
25-Nov	5	4	5	4	3	4	4	6	4	3	3	2	3	2	2	1	1	2	2	2	2	3	2	6	6
26-Nov	3	3	3	2	3	3	2	2	2	2	3	3	2	2	2	2	2	2	1	1	1	1	1	2	3
27-Nov	2	2	2	1	1	1	1	2	1	2	1	1	1	2	1	1	1	1	2	1	1	1	1	1	2
28-Nov	1	1	AF	1	1	1	1	2	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2
29-Nov	1	1	2	1	1	1	1	1	1	1	2	1	1	4	2	1	2	3	2	3	2	3	3	2	4
30-Nov	3	3	3	3	3	3	3	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	4
Diurnal Maximum																									

AF - Analyzer Failure





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Lower Camp - November 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	185	25.73	25.73
6 - 11	299	41.59	67.32
12 - 19	204	28.37	95.69
20 - 28	31	4.31	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Lower Camp - 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	8	4	3	6	17	22	31	12	6	8	3	4	18	20	14	9	185
6 - 11	9	9	2	4	13	6	105	54	29	8	3	17	10	9	11	10	299
12 - 19	6	4	0	0	1	15	108	9	0	0	1	26	13	11	6	4	204
20 - 28	0	0	0	0	0	4	9	0	0	0	0	1	13	3	1	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	23	17	5	10	31	47	253	75	35	16	7	48	54	43	32	23	719

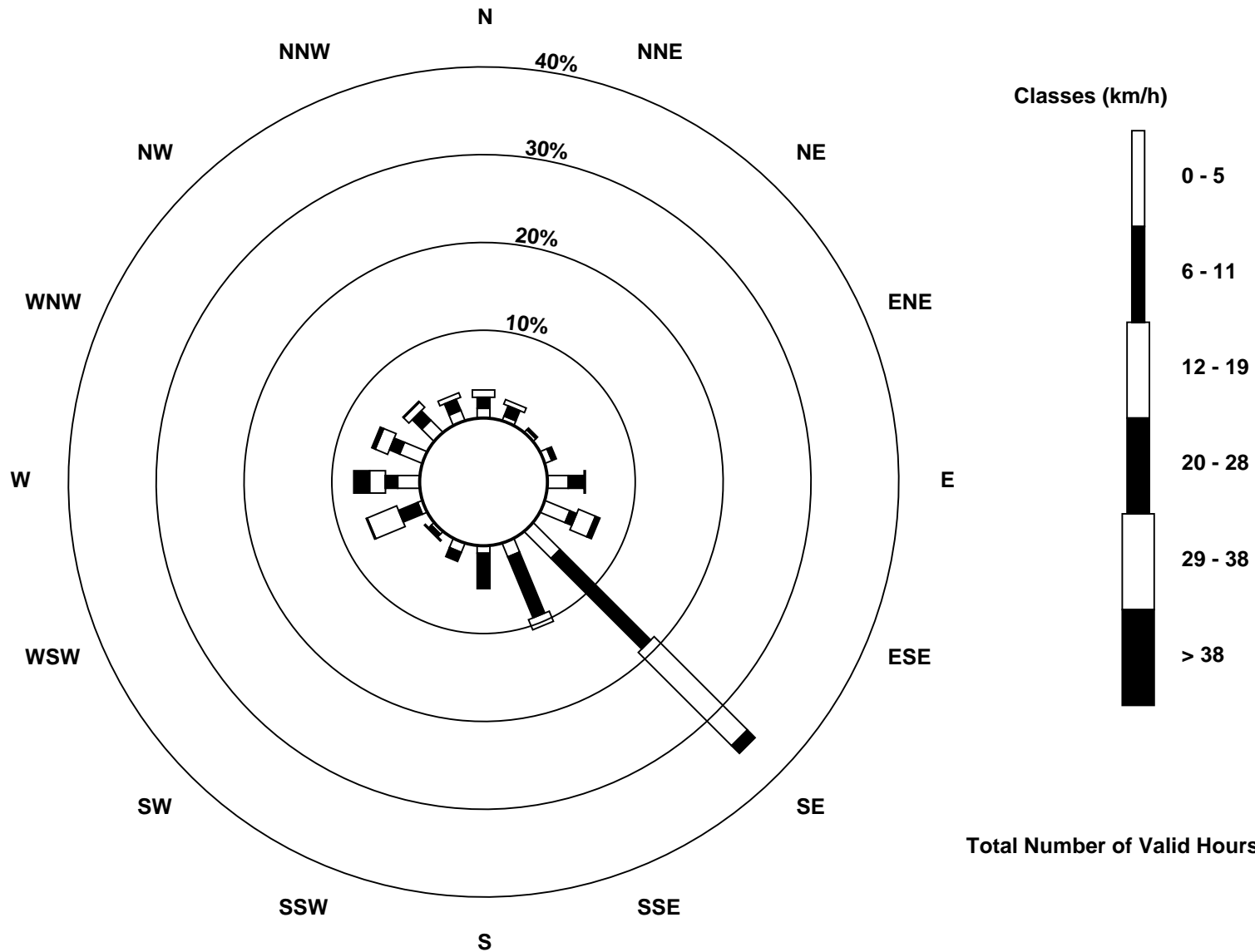
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Lower Camp (AMS 11)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Lower Camp - November 2016

Direction of Maximum Speed: 259 deg on Nov 15 00:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 124.9 deg on Nov 20	Hours of Data: 719
Direction of Minimum Speed: 84 deg on Nov 26 18:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 1.5 deg on Nov 18	Percent Operational Time: 99.9
Monthly Average Direction: 203.5 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-Nov	334	11	11	28	56	72	42	298	284	289	299	302	293	289	310	325	329	327	332	3	19	61	87	89	325.3
2-Nov	91	108	148	155	111	168	169	172	157	143	146	137	166	199	150	168	153	144	129	133	133	139	139	128	143.9
3-Nov	131	140	135	141	147	134	140	140	146	137	138	137	136	135	139	147	160	121	115	151	238	249	207	144	148.5
4-Nov	173	183	198	149	58	97	132	127	136	139	140	134	136	137	138	139	135	125	112	138	143	134	137	135	139.3
5-Nov	138	138	141	128	110	136	140	139	142	142	135	134	133	138	139	136	142	141	138	139	130	137	144	138	137.2
6-Nov	122	147	130	129	139	133	337	313	158	132	136	247	247	147	140	132	134	130	115	138	130	143	141	142	140.2
7-Nov	139	140	138	135	123	116	122	125	162	137	138	135	135	141	140	148	134	130	126	118	134	142	138	143	136.1
8-Nov	156	186	147	350	127	136	132	126	140	134	135	141	136	138	134	137	130	135	141	134	139	144	294	144	136.7
9-Nov	133	137	145	134	134	150	141	139	144	141	200	251	259	251	246	245	251	264	270	263	259	275	262	260	234.7
10-Nov	258	299	166	146	169	259	258	179	133	134	134	131	130	136	148	143	144	124	130	134	139	128	131	134	145.0
11-Nov	137	133	139	134	140	140	141	140	139	139	139	141	137	128	156	210	209	243	253	245	245	247	250	275	168.4
12-Nov	255	108	138	136	134	87	25	138	143	150	134	140	143	136	131	272	106	267	113	126	121	113	118	116	139.6
13-Nov	114	127	124	131	139	137	137	137	139	134	129	139	135	128	137	138	124	132	133	139	135	129	135	137	133.7
14-Nov	133	138	135	129	135	136	137	138	138	135	209	265	262	262	269	291	284	278	271	277	270	265	260	259	230.1
15-Nov	270	272	267	266	261	261	268	269	258	255	261	257	254	250	252	253	261	270	265	279	292	282	61	309	262.3
16-Nov	303	320	307	298	293	95	70	82	327	265	195	273	262	346	27	17	10	11	14	11	351	1	341	358	1.5
17-Nov	346	352	353	346	314	325	303	304	301	314	289	272	265	283	282	300	299	304	311	305	304	299	295	332	307.5
18-Nov	310	261	11	25	10	311	262	261	232	263	335	328	289	260	294	275	306	237	258	91	100	79	90	81	310.7
19-Nov	84	97	88	85	97	63	59	41	33	65	89	99	97	83	40	336	333	242	311	94	106	120	110	107	86.5
20-Nov	104	109	109	113	117	120	122	134	124	141	146	135	134	156	132	131	124	129	128	128	126	128	123	120	124.9
21-Nov	119	124	138	145	145	153	166	161	161	158	130	123	26	299	339	298	328	327	346	9	33	23	34	24	112.3
22-Nov	9	11	29	15	360	358	43	83	63	95	83	88	142	170	178	176	179	157	169	161	164	144	117	125	120.4
23-Nov	148	133	137	132	123	144	160	151	152	148	148	139	136	148	152	138	142	146	166	162	163	162	161	157	145.0
24-Nov	158	165	174	177	160	154	144	150	147	149	164	149	167	168	157	201	199	5	85	114	125	133	129	127	145.9
25-Nov	127	125	125	125	119	124	125	136	135	166	145	153	146	160	170	195	236	247	258	260	257	253	250	250	154.4
26-Nov	252	246	251	255	255	249	241	246	240	209	234	242	245	202	192	137	215	84	278	278	229	128	135	134	235.6
27-Nov	138	139	117	95	130	103	85	3	20	341	354	349	336	320	323	321	311	299	305	291	294	303	311	318	330.1
28-Nov	322	312	AF	359	358	121	101	188	99	238	243	251	229	131	121	119	270	318	294	294	312	280	284	295	275.8
29-Nov	326	325	282	303	323	288	278	345	300	274	300	299	40	131	181	166	173	179	200	225	197	166	170	159	213.8
30-Nov	171	167	183	164	152	145	157	176	173	169	184	169	172	190	184	178	188	185	170	179	174	171	165	160	172.0

143.9 133.5 137.6 134.3 136.0 146.8 150.3 155.2 155.1 157.0 157.5 163.6 169.4 174.2 170.3 188.2 188.9 183.3 186.5 167.5 175.3 163.6 155.5 143.5

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

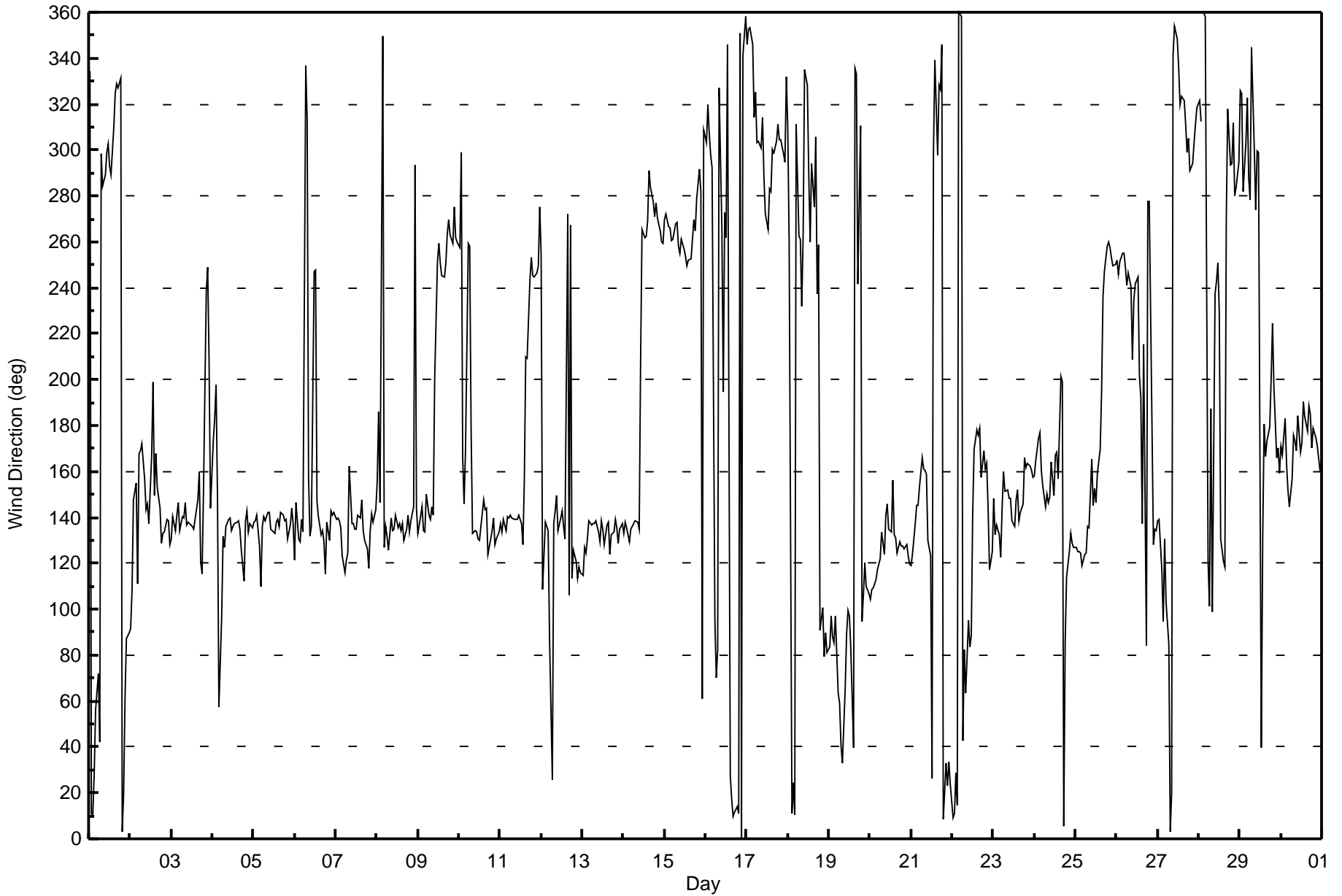
Wind Direction (WD) - deg
Lower Camp - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 103 deg on Nov 9 00:00	Hours of Data: 719
Minimum Value: 5 deg on Nov 5 12:00	Hours of Missing Data: 1
Percentiles: P ₁ = 6 P ₁₀ = 9 Q ₁ = 12 Median = 18 Q ₃ = 29 P ₉₀ = 56 P ₉₉ = 89	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-Nov	14	10	13	26	18	46	87	13	17	13	12	14	16	18	17	15	14	15	21	18	17	28	18	16	87
2-Nov	17	16	34	27	23	43	20	27	29	25	25	19	29	25	30	27	21	13	16	10	9	8	8	10	43
3-Nov	13	13	15	17	18	12	13	17	21	9	11	11	6	7	9	14	17	69	28	29	19	15	57	23	69
4-Nov	39	36	27	96	84	86	30	19	13	15	9	8	7	9	8	11	8	14	10	31	13	11	7	12	96
5-Nov	10	11	19	15	51	62	17	13	18	17	7	5	14	6	11	6	53	9	97	41	50	14	27	17	97
6-Nov	39	58	11	10	9	67	84	35	54	39	58	92	25	37	12	94	48	89	29	52	41	9	24	11	94
7-Nov	9	8	19	16	13	20	26	48	62	16	6	6	12	11	14	12	12	30	46	19	20	12	15	62	
8-Nov	23	87	86	77	59	13	12	15	10	8	5	25	8	13	6	10	10	9	8	12	9	53	89	103	103
9-Nov	20	11	47	71	31	86	9	62	28	10	53	12	10	11	12	9	12	14	13	10	10	13	14	12	86
10-Nov	17	43	89	77	46	38	69	34	15	11	9	8	7	9	21	15	17	21	18	22	18	17	20	21	89
11-Nov	19	16	12	17	10	9	8	7	8	7	5	7	6	10	44	29	31	17	15	13	11	10	13	38	44
12-Nov	16	61	20	13	40	69	83	62	9	61	15	9	60	16	35	56	89	87	37	36	19	25	63	15	89
13-Nov	18	13	14	13	35	14	13	17	9	9	11	11	12	31	7	9	17	23	10	10	7	11	6	6	35
14-Nov	8	9	8	10	8	8	6	9	6	28	86	12	12	12	11	12	13	12	14	15	12	11	11	12	86
15-Nov	19	14	20	13	11	12	11	15	12	12	12	12	12	11	11	11	50	47	24	48	79	84	82	49	84
16-Nov	77	34	12	15	17	40	35	48	69	56	81	75	32	56	14	19	15	18	14	15	19	19	21	18	81
17-Nov	20	20	20	23	14	13	12	14	12	11	27	12	13	19	20	11	11	13	12	13	12	14	10	20	27
18-Nov	35	28	49	33	47	22	35	39	16	20	59	35	46	32	70	34	30	21	22	62	34	16	30	19	70
19-Nov	15	27	29	31	20	41	29	22	17	19	16	13	14	19	15	27	49	79	75	67	16	13	11	10	79
20-Nov	10	14	14	14	10	11	12	21	10	27	22	16	16	38	13	11	11	11	12	9	9	12	10	10	38
21-Nov	10	12	20	20	16	21	22	21	22	23	40	18	59	32	44	19	28	24	23	24	16	18	19	17	59
22-Nov	20	18	22	24	23	27	28	26	54	48	21	59	87	28	31	29	29	30	27	25	27	26	16	12	87
23-Nov	23	16	15	14	11	19	30	22	23	20	22	16	13	23	24	15	18	20	25	21	24	22	22	20	30
24-Nov	20	21	21	24	19	18	15	17	17	17	25	24	29	29	36	27	90	76	81	57	11	10	11	10	90
25-Nov	9	8	9	9	9	10	9	22	19	31	30	28	26	27	39	26	17	17	19	13	12	11	11	11	39
26-Nov	11	12	12	11	13	12	16	18	18	26	15	21	28	38	33	47	63	89	56	45	75	11	11	12	89
27-Nov	10	10	28	20	28	63	43	32	29	18	18	21	18	16	15	15	16	10	16	14	9	10	10	14	63
28-Nov	9	14	AF	16	27	92	25	80	50	35	10	10	32	15	64	37	65	26	24	14	16	11	16	20	92
29-Nov	35	23	46	22	31	11	14	63	66	26	21	16	40	71	31	26	27	27	28	16	29	27	30	22	71
30-Nov	25	26	27	26	23	20	25	27	28	27	27	29	31	27	27	27	27	25	27	25	25	25	25	21	31

77	87	89	96	84	92	87	80	69	61	86	92	87	71	70	94	90	89	97	67	79	84	89	103	
Diurnal Maximum																								

AF - Analyzer Failure





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 12, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	11:43
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	798	800
Calculated slope	0.998634	1.001818	Chamber temp	44.9	45.2
Calculated intercept	0.573167	-0.022004	Pressure	711.4	711.7
Analyzer Background	11.7	11.5	Flow	0.485	0.484
Analyzer Coefficient	1.015	1.015	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	-0.5	----
as found span	5000	83.8	829.6	826.9	1.003
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	83.8	829.6	827.7	1.002
second point	5000	42.4	419.8	420.2	0.999
third point	5000	21.2	209.9	208.8	1.005
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	83.8	829.6	825.7	1.005
Average Correction Factor					1.002

Corrected As found 827.4 Previous response 830.2 % change 0.3%

Notes:

Changed inlet filter after as founds. Adjusted zero.

Calibration Performed By:

Jayne Marcoux



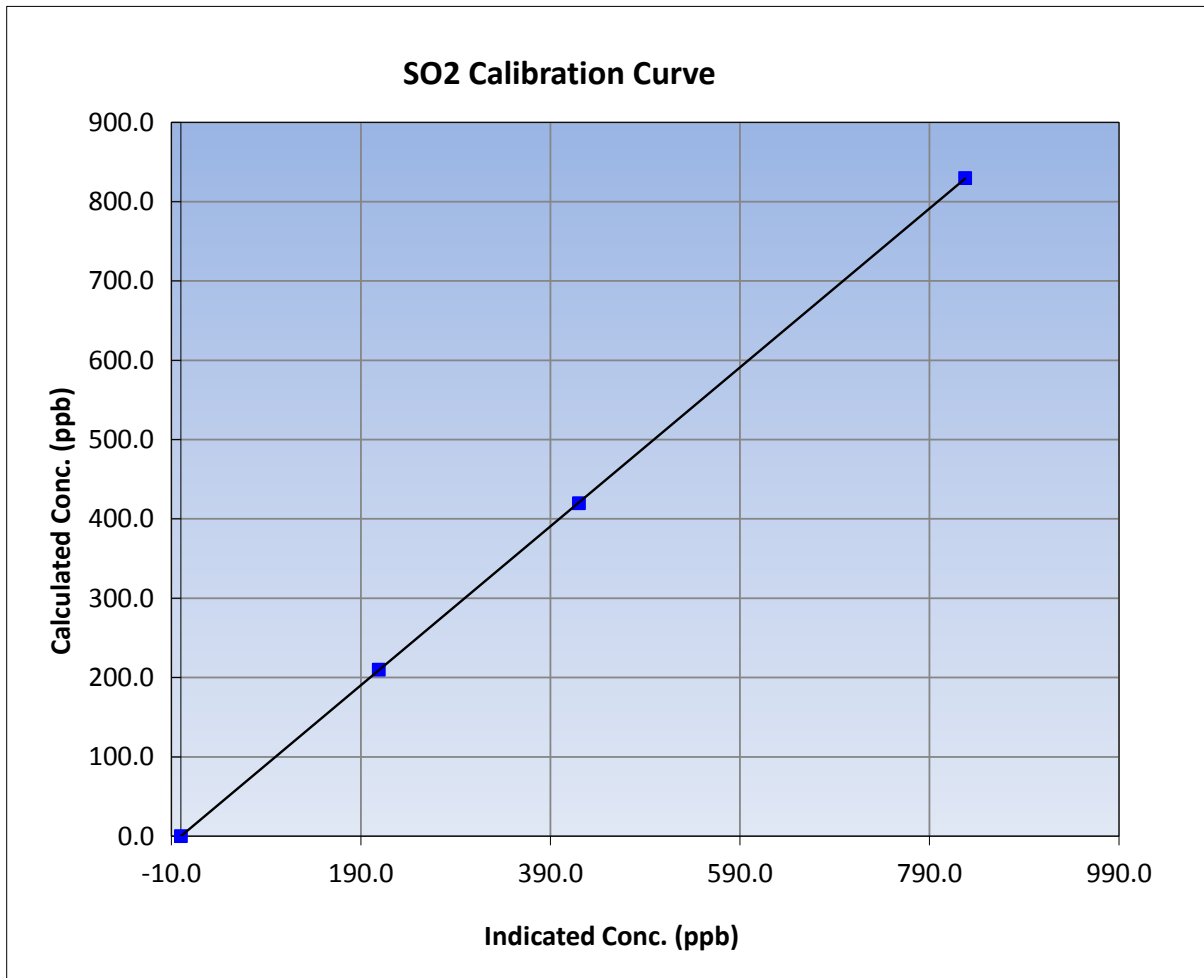
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	8:55	End Time (MST)	11:43
Analyzer make	TEI 43i	Analyzer serial #	100841398

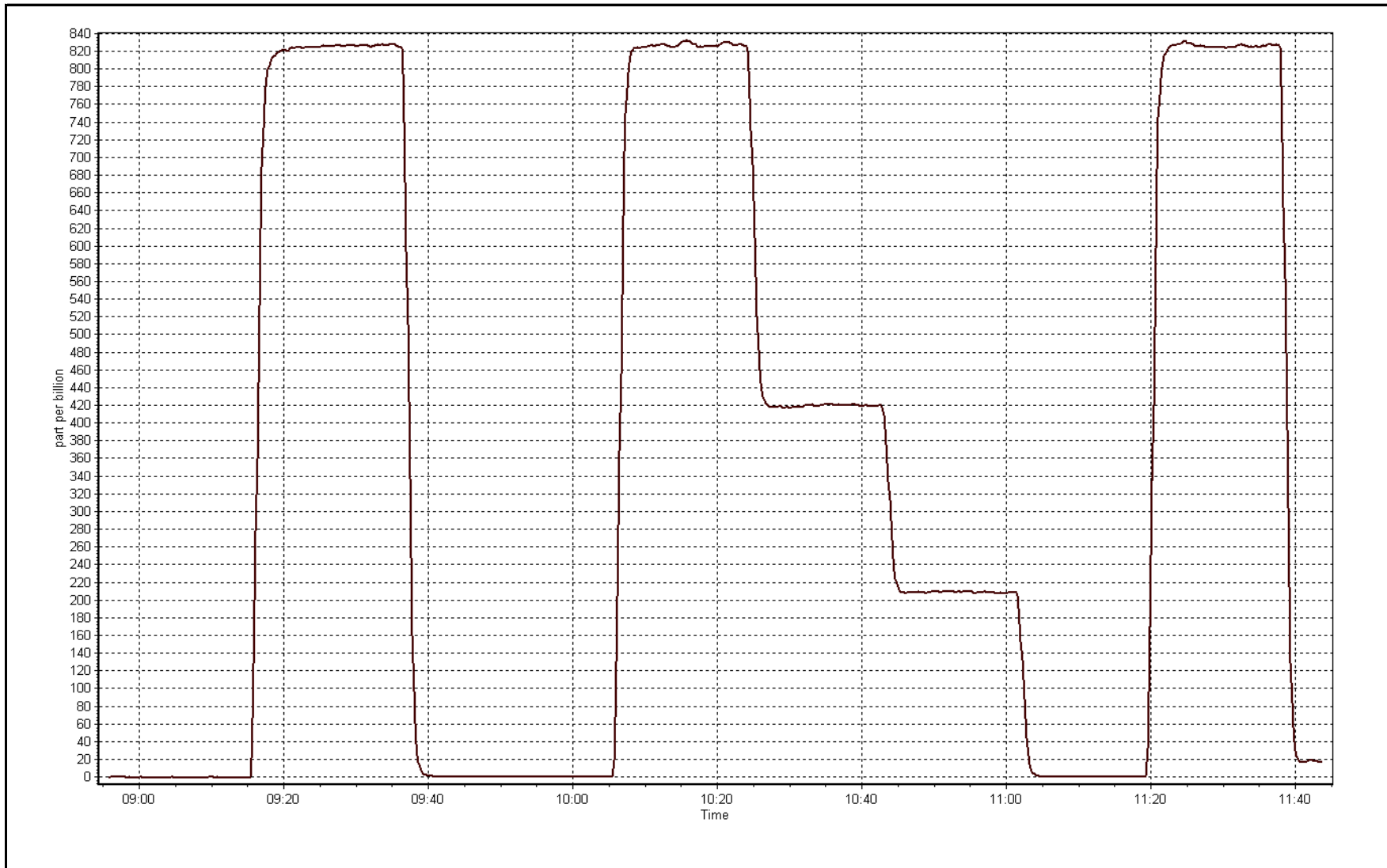
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999995
829.6	827.7	1.0023		
419.8	420.2	0.9990	Slope	1.001818
209.9	208.8	1.0052		
			Intercept	-0.022004



SO2 Calibration Plot

Date: November 2, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 12, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	11:40	End Time (MST)	14:20
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	0.989863	0.998212	Chamber temp	45	45
Calculated intercept	-0.086169	-0.154290	Pressure	546.0	547.9
Analyzer Background	11.2	11.4	Flow	0.929	0.996
Analyzer Coefficient	1.202	1.218	Intensity	91	91
			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	74.0	1.013
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	75.2	0.998
second point	5000	38.8	40.0	40.4	0.990
third point	5000	19.4	20.0	20.3	0.987
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	72.8	75.0	75.7	0.991
Average Correction Factor					0.991

Corrected As found	74.0	Previous response	75.8	% change	2.5%
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Notes:

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

Calibration Performed By: Jayme Marcoux



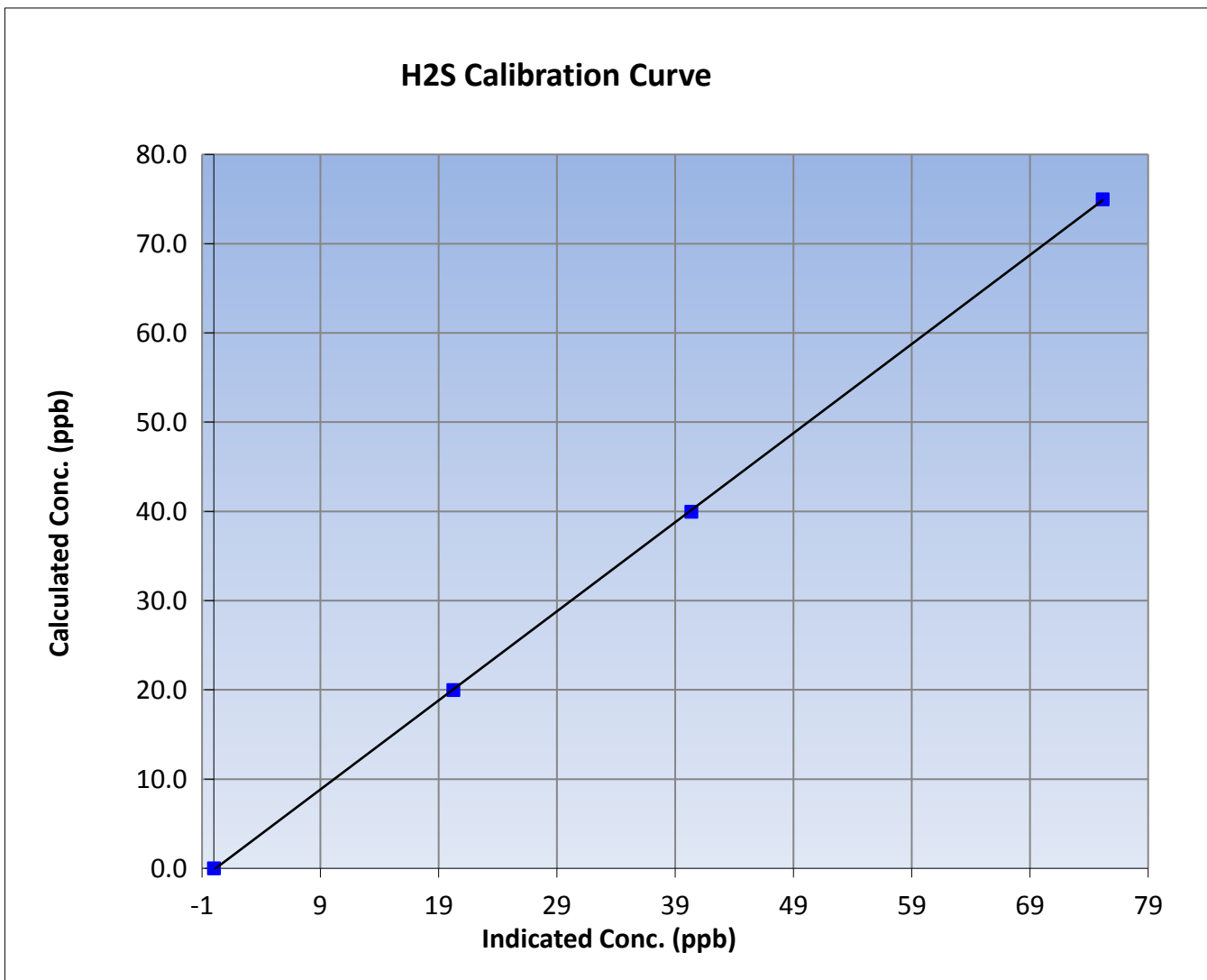
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	11:40	End Time (MST)	14:20
Analyzer make	Thermo 450i	Analyzer serial #	1410661328

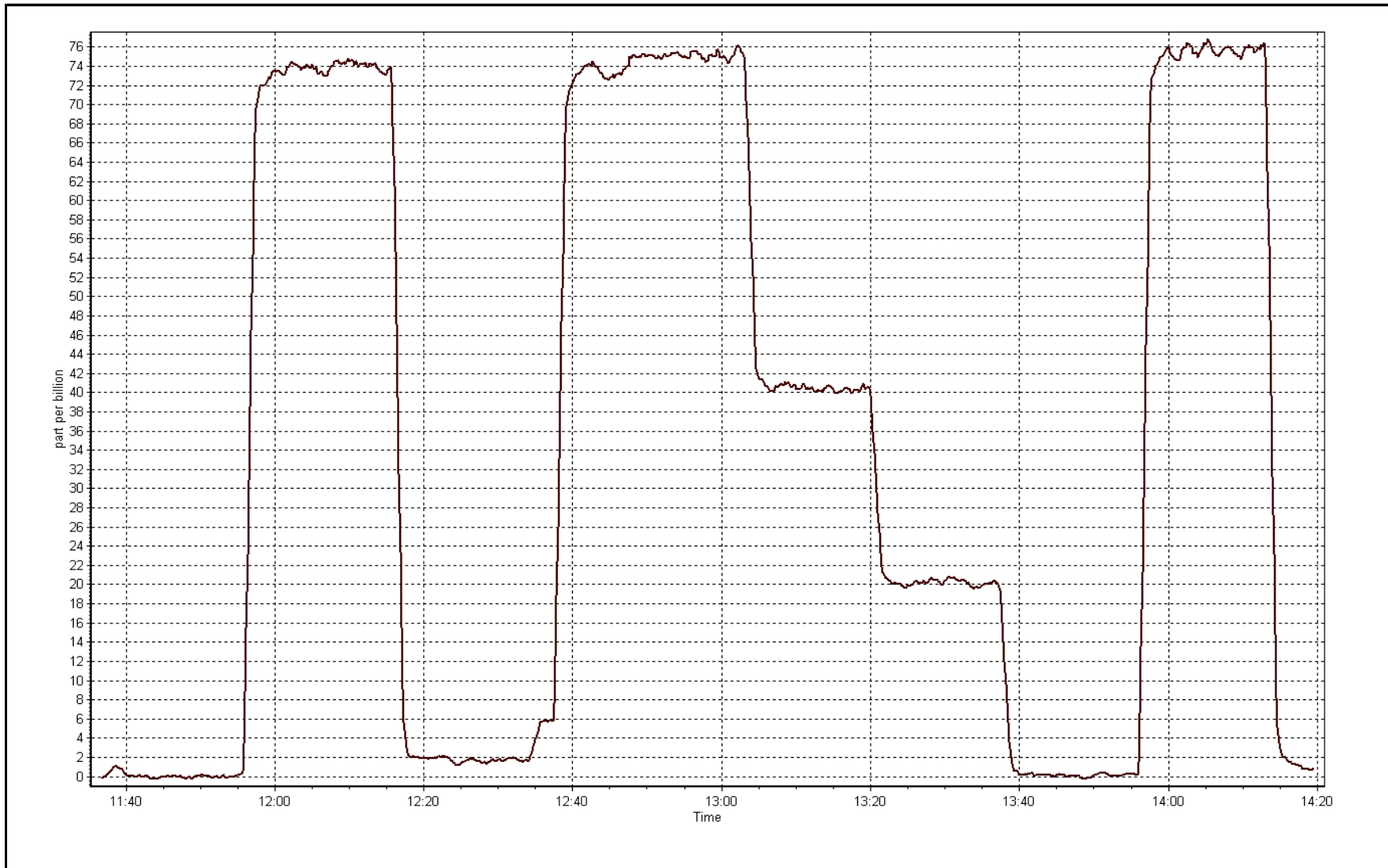
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999975
75.0	75.2	0.9978		
40.0	40.4	0.9897	Slope	0.998212
20.0	20.3	0.9868		
			Intercept	-0.154290



H2S Calibration Plot

Date: November 2, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 12, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	11:42
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	0.998842	0.999717	Fuel Pressure	25.1	25.1
Calculated intercept	-0.004171	-0.015906	Analyzer Coeff	4.457	4.411
			Analyzer BKG	3.16	3.05

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	-0.01	----
as found span	5000	83.8	17.48	17.68	0.989
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	83.8	17.48	17.48	1.000
second point	5000	42.4	8.84	8.89	0.995
third point	5000	21.2	4.42	4.47	0.989
as left zero	5000	0.0	0.00	0.08	----
as left span	5000	83.8	17.48	17.56	0.995
Average Correction Factor					0.995

Corrected As found 17.69 Previous response 17.51 % change -1.0%

Notes:

Changed inlet filter after as founds. Adjusted zero and span.

Calibration Performed By:

Jayne Marcoux



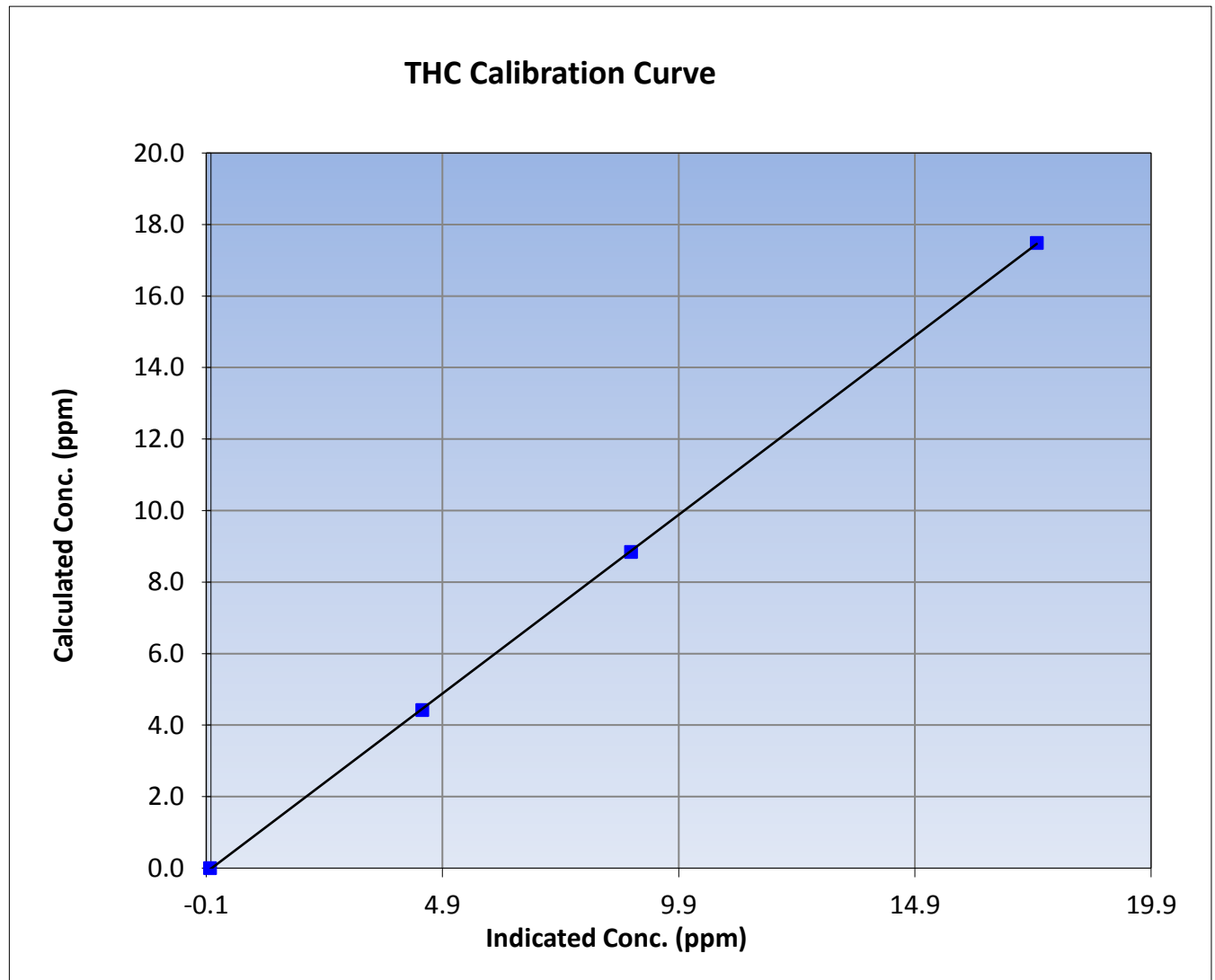
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	8:55	End Time (MST)	11:42
Analyzer make	51i-LT	Analyzer serial #	1218153353

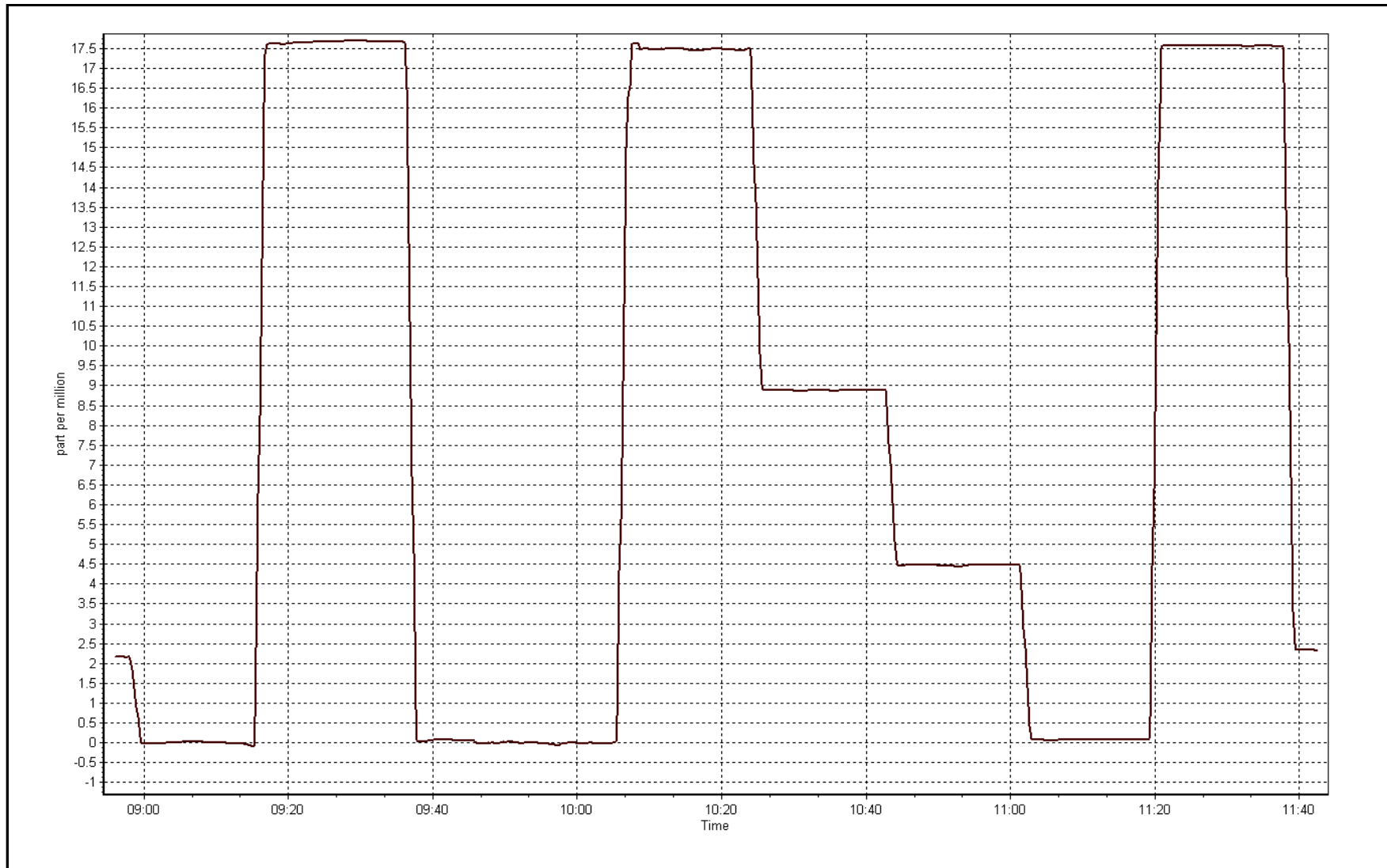
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999980
17.48	17.48	1.0000		
8.84	8.89	0.9949	Slope	0.999717
4.42	4.47	0.9893		
			Intercept	-0.015906



THC Calibration Plot

Date: November 2, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 13
FORT MCKAY SOUTH
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
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	686	34	34	100.00	18	0	3	0
TRS(ppb) Average	686	33	34	99.86	2	0	1	0
THC(ppm) Average	685	35	35	100.00	5.8	-	3.5	-
O3(ppb) Average	686	33	34	99.86	37	0	31	-
NO2(ppb) Average	686	34	34	100.00	23	0	13	-
NO(ppb) Average	686	34	34	100.00	76	-	33	-
NOX(ppb) Average	686	34	34	100.00	85	-	43	-
PM2.5(ug/m3) Average	707	1	13	98.33	24.6	-	10.9	0
ET(C) Average	720	0	0	100.00	11.6	-	5.4	-
RH(%) Average	720	0	0	100.00	98	-	95	-
WS(km/h) Average	701	0	19	97.36	18	-	14	-
WD(deg) Average	701	0	19	97.36	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 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	686	0.7	1	-	0	0	0	0	1	2	18
TRS(ppb) Average	686	0.3	0	-	0	0	0	0	0	1	2
THC(ppm) Average	685	2.44	0.5	-	2	2.1	2.2	2.2	2.5	3.1	5.8
O3(ppb) Average	686	14.5	10	-	1	2	6	13	22	30	37
NO2(ppb) Average	686	5.6	5	-	0	0	2	5	9	12	23
NO(ppb) Average	686	4.1	10	-	0	0	0	0	2	12	76
NOX(ppb) Average	686	9.7	12	-	0	0	2	6	12	24	85
PM2.5(ug/m3) Average	707	4.54	3.5	-	0	0.6	2.1	3.9	6.3	8.7	24.6
Temperature 2 m (C) Average	720	-2.19	5.2	-	-14.8	-9.1	-5.5	-2.6	0.6	5.3	11.6
Relative Humidity (%) Average	720	82	12	-	44	65	74	84	92	96	98
Wind Speed 10 m (km/h) Average	701	6.2	4	-	0	2	3	6	9	11	18
Wind Direction 10 m (deg) Average	701	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -FORT McKAY SOUTH (AMS 13)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS	10 Nov 2016 10:00	10 Nov 2016 10:00	1	Maintenance - cleaned glass manifold
O3	10 Nov 2016 10:00	10 Nov 2016 10:00	1	Maintenance - cleaned glass manifold
PM2.5	01 Nov 2016 01:00	01 Nov 2016 01:00	1	Unstable operation - baseline drift
PM2.5	01 Nov 2016 14:00	01 Nov 2016 20:00	7	Unstable operation - baseline drift
PM2.5	18 Nov 2016 11:00	18 Nov 2016 13:00	3	Maintenance - verified baseline response
PM2.5	18 Nov 2016 14:00	18 Nov 2016 14:00	1	Unstable operation - baseline drift
Wind Speed, Wind Direction	28 Nov 2016 07:00	28 Nov 2016 07:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Nov 2016 10:00	28 Nov 2016 13:00	4	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Nov 2016 15:00	28 Nov 2016 17:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Nov 2016 19:00	28 Nov 2016 20:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Nov 2016 02:00	29 Nov 2016 02:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Nov 2016 05:00	29 Nov 2016 09:00	5	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Nov 2016 10:00	29 Nov 2016 12:00	3	Maintenance - replaced WS sensor



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 18 ppb on Nov 27 01:00	Maximum Daily Average: 2.5 ppb on Nov 30
Minimum Value: 0 ppb on Nov 7 08:00	Minimum Daily Average: 0.1 ppb on Nov 18
Maximum Diurnal Average: 1.7 ppb at hour 14	Minimum Diurnal Average: 0.4 ppb at hour 5
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 = 7
	Hours of Data: 686
	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-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
2-Nov	0	Z	0	0	0	0	0	0	0	5	1	1	1	4	2	2	1	1	0	0	0	0	0	0	0.9	5
3-Nov	1	1	Z	1	1	1	1	1	1	0	1	1	1	3	9	5	1	1	0	0	0	0	0	0	1.3	9
4-Nov	0	0	0	Z	0	0	0	0	0	1	1	2	1	4	4	3	1	0	0	0	0	1	1	1	1.0	4
5-Nov	1	1	1	1	Z	1	1	1	2	1	1	1	2	2	3	2	1	1	1	1	1	1	1	1	1.3	3
6-Nov	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
7-Nov	Z	1	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
8-Nov	0	Z	0	0	0	0	0	0	0	0	2	4	3	3	1	1	2	1	1	1	1	1	1	1	1.0	4
9-Nov	1	1	Z	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Nov	0	0	0	Z	0	0	0	0	C	C	C	C	5	6	6	1	0	0	0	1	1	2	2	1	1.5	6
11-Nov	0	0	0	1	Z	1	1	0	0	1	1	1	1	6	1	0	0	1	0	0	0	0	0	0	0.7	6
12-Nov	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
13-Nov	Z	0	0	0	0	0	0	0	0	0	1	2	2	2	2	1	0	0	0	1	1	1	0	0	0.6	2
14-Nov	0	Z	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
15-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	0.1	0
16-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
17-Nov	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
18-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	0.1	0
19-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	0.1	0
20-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	6	9	3	3	2	1	1	3	6	7	1	0	1.9	9
21-Nov	0	0	Z	1	2	2	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4
22-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	2	2	1	0	1	3	1	0	1	1	0.7	3
23-Nov	1	2	2	2	Z	2	1	0	0	1	1	0	1	1	0	2	2	2	1	1	1	0	0	0	1.0	2
24-Nov	0	0	0	0	0	Z	3	1	0	2	1	0	0	1	2	1	0	0	0	0	0	0	0	0	0.6	3
25-Nov	Z	0	0	0	0	0	0	5	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.6	5
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	5	2	0	0	1	0	0	5	0.7	5	
27-Nov	18	5	Z	9	3	4	3	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	2.2	18
28-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	0.1	0
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	9	4	3	2	1	0	0	0	0	1	1	0	1.0	9
30-Nov	0	2	9	4	1	Z	3	2	1	0	2	2	1	2	2	1	3	4	4	6	2	2	3	3	2.5	9

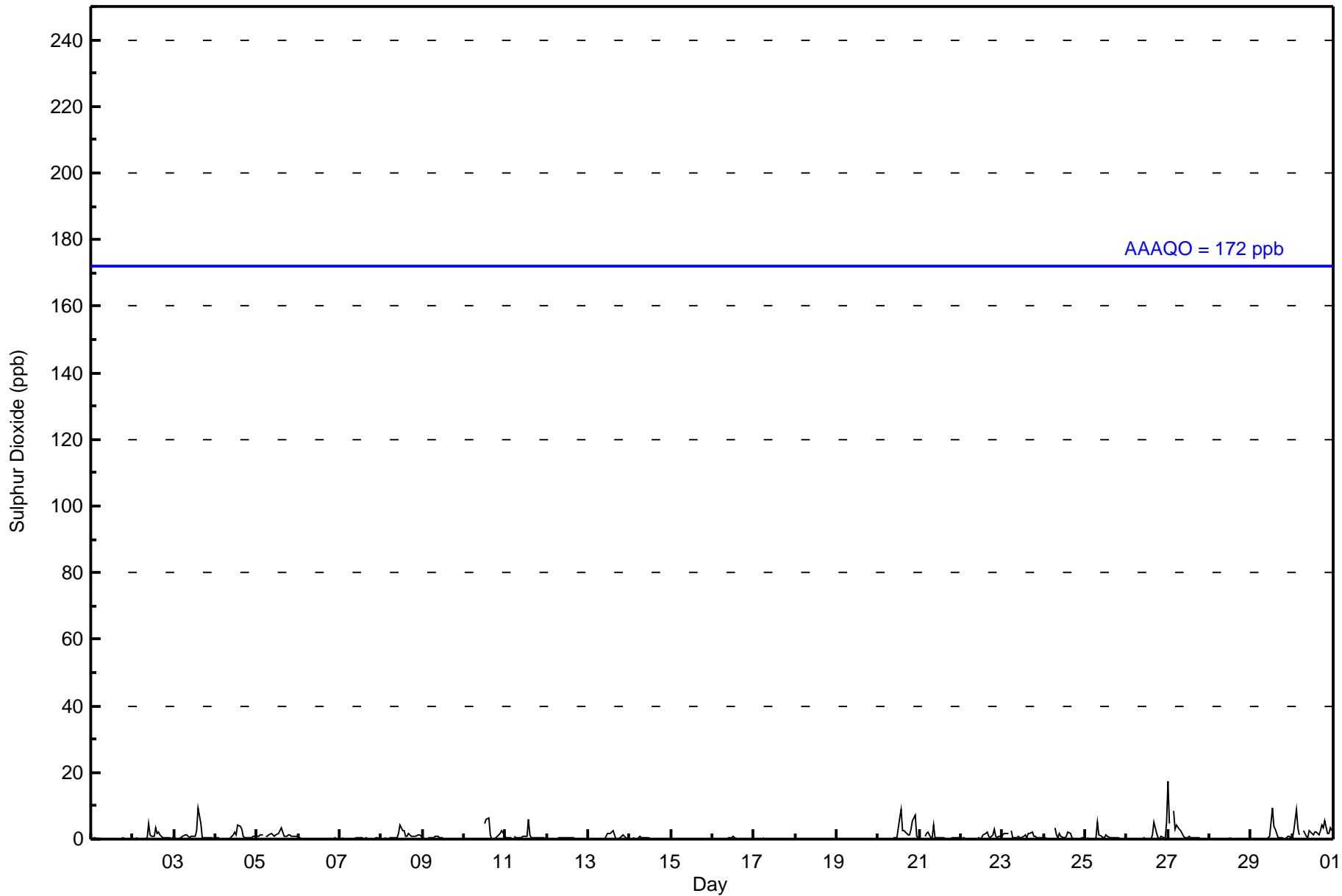
1.0	0.6	0.6	0.8	0.4	0.6	0.5	0.6	0.5	0.6	0.5	0.7	1.3	1.7	1.5	1.0	0.7	0.6	0.4	0.7	0.6	0.6	0.5	0.5	Diurnal Average	
18	5	9	9	3	4	3	5	4	5	2	4	9	9	9	5	5	4	4	6	6	7	3	5	Diurnal Maximum	

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 McKay South - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	685	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: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - 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	46	24	6	5	5	4	13	89	133	86	59	78	43	28	24	24	667
11 - 20	0	0	0	0	0	0	1	0	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	46	24	6	5	5	4	14	89	133	86	59	78	43	28	24	24	668

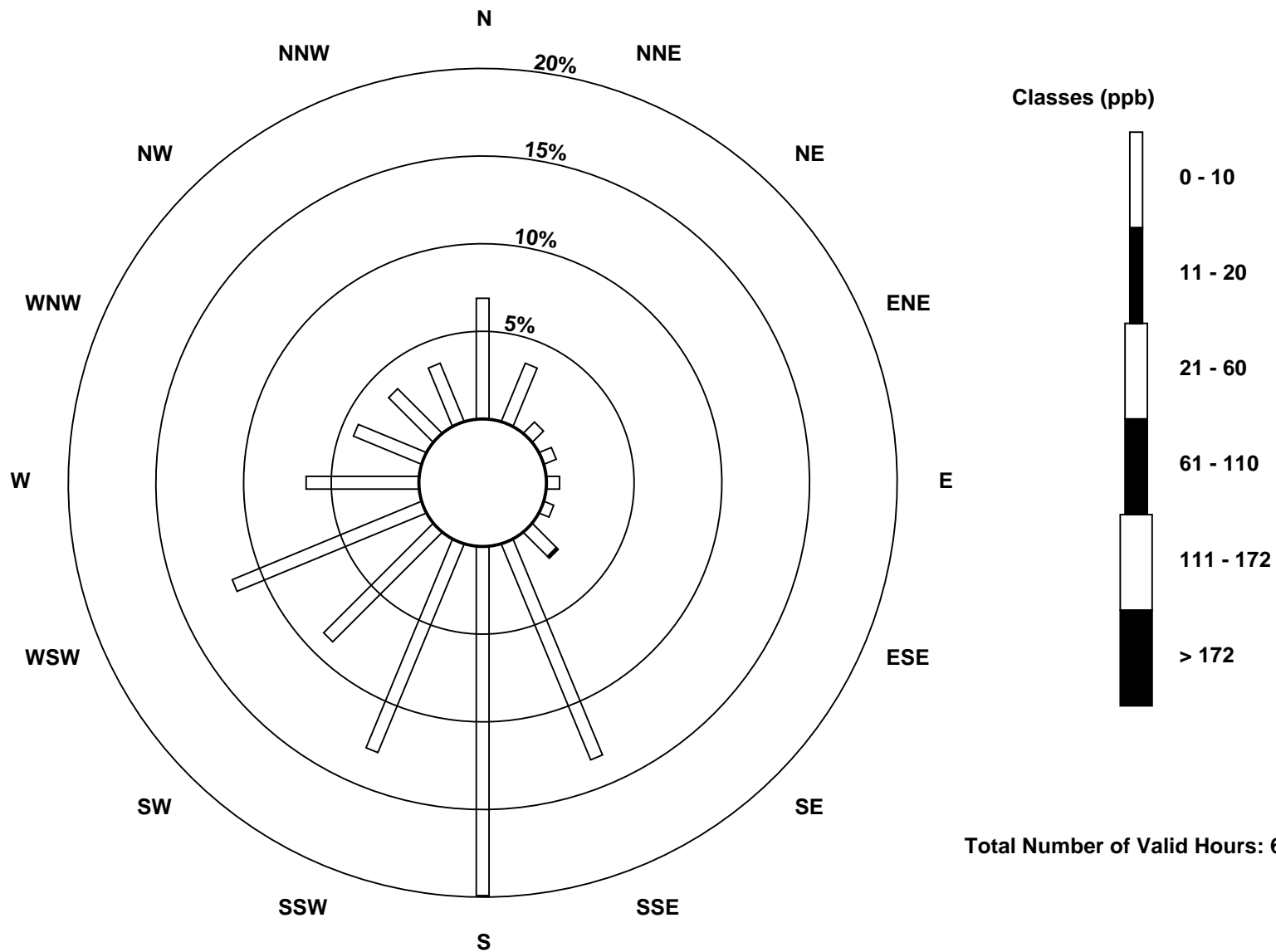
Total Number of Valid Hours: 668

Total Number of Hours: 720

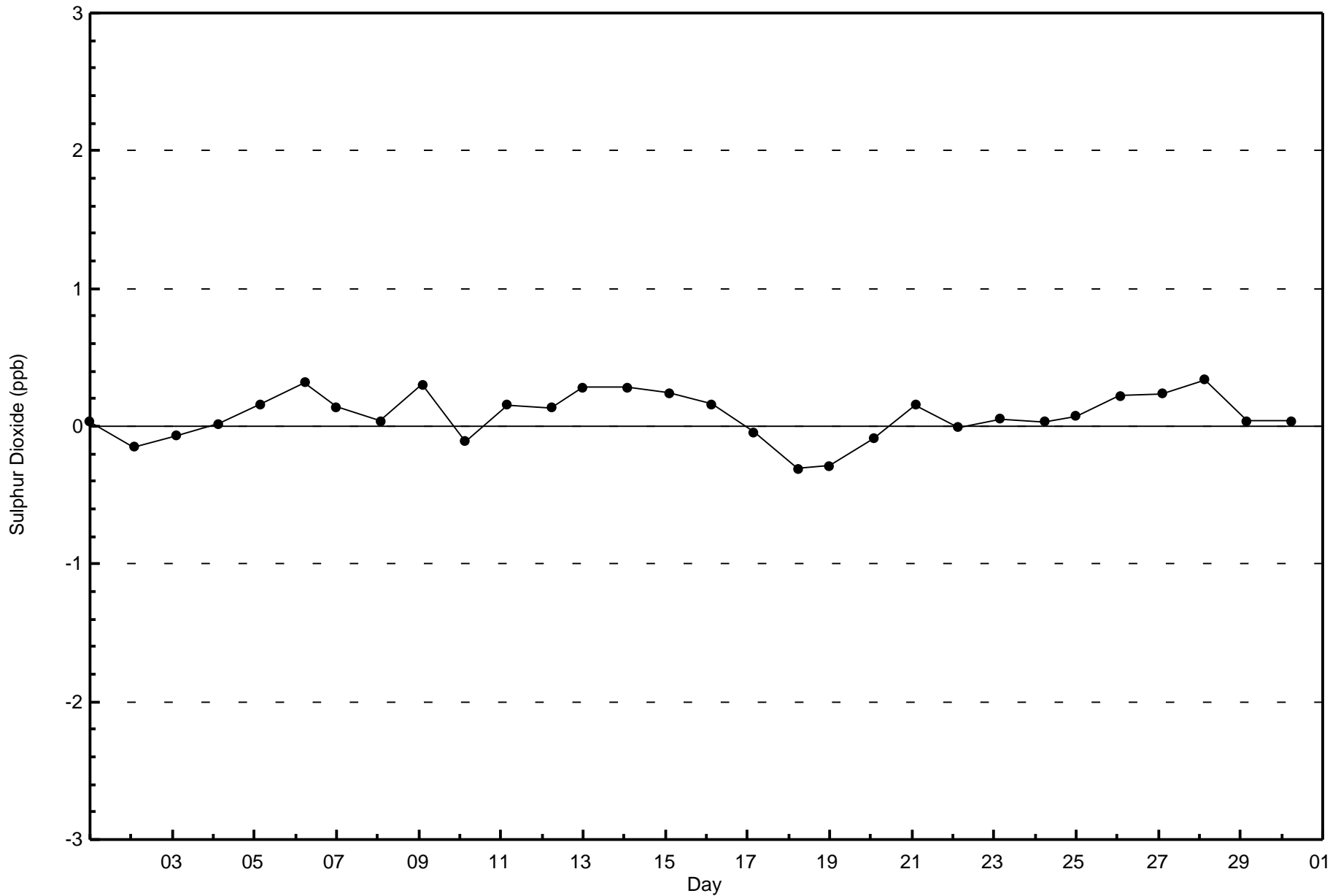


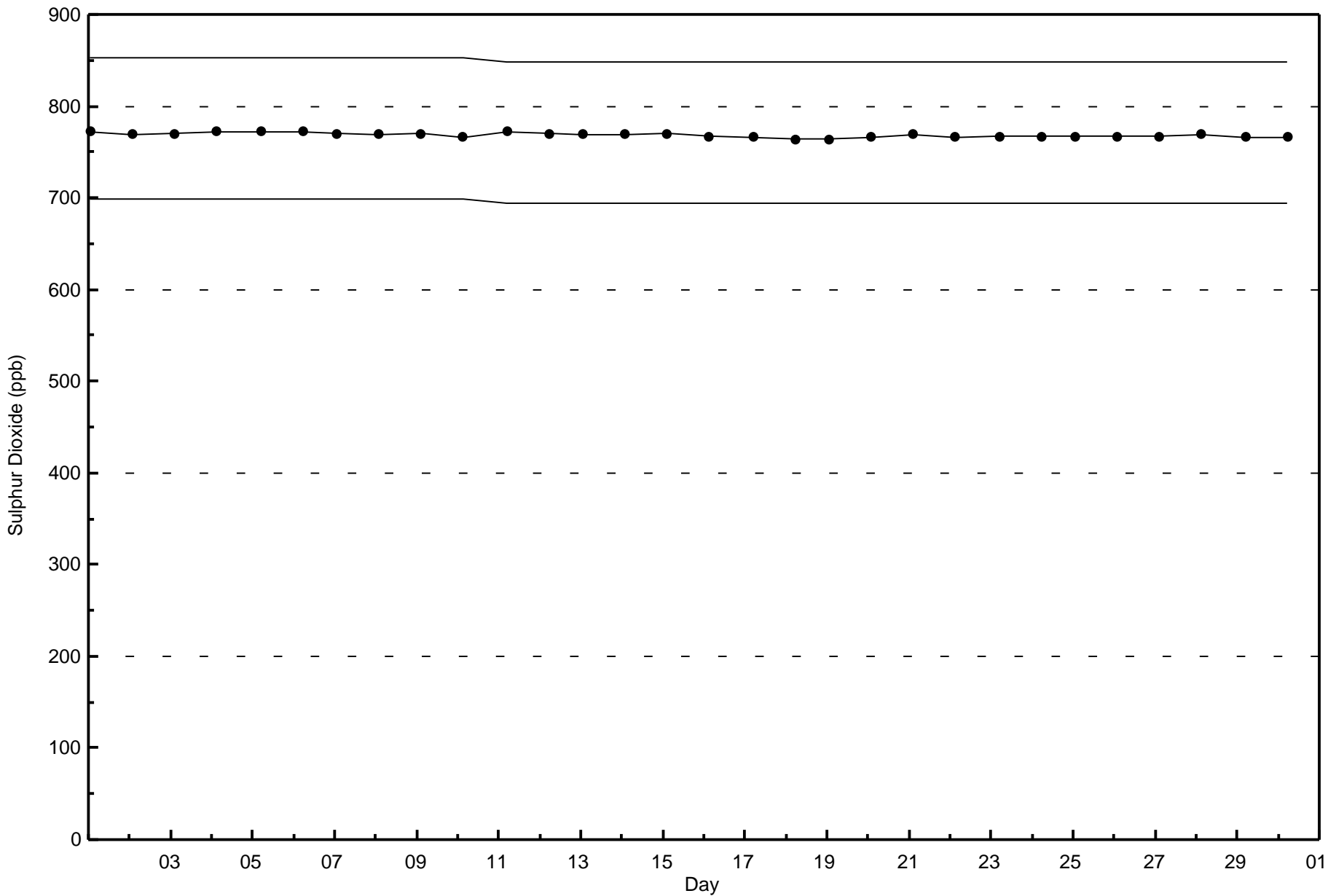
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Fort McKay South (AMS 13)



Total Number of Valid Hours: 668







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Fort McKay South - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Nov 11 14:00	Maximum Daily Average: 0.7 ppb on Nov 8		Hours of Data:	686
Minimum Value: 0 ppb on Nov 7 06:00	Minimum Daily Average: 0.1 ppb on Nov 17		Hours of Missing Data:	34
Maximum Diurnal Average: 0.4 ppb at hour 14	Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration:	33
Monthly Average: 0.3 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:	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-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	0.1	0
2-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	0.2	0
3-Nov	0	0	0	Z	0	0	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1
4-Nov	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	2	1	1	1	1	0	0	0	0.6	2
5-Nov	1	1	0	0	0	Z	0	0	0	1	1	1	1	1	2	1	1	1	1	0	0	0	0	0	0.6	2
6-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.2	1
8-Nov	1	0	Z	0	0	0	0	1	1	1	1	1	2	1	1	1	2	1	1	1	1	0	0	0	0.7	2
9-Nov	0	0	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Nov	0	0	0	0	Z	0	0	0	0	M	0	0	1	1	1	1	0	0	1	1	1	1	1	1	0.4	1
11-Nov	0	0	0	0	1	Z	1	1	1	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0.4	2
12-Nov	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
13-Nov	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.5	1
14-Nov	0	0	Z	0	0	0	1	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	1
15-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	0.1	0
16-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	0.1	0
17-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	0.1	0
18-Nov	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
19-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	0.2	0
20-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.3	1
21-Nov	0	0	0	Z	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
22-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	0.2	0
23-Nov	0	1	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
24-Nov	0	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
25-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	0.2	0
26-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	0.1	0
27-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	0.2	0
28-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	0.1	0
29-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	0.1	0
30-Nov	0	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1

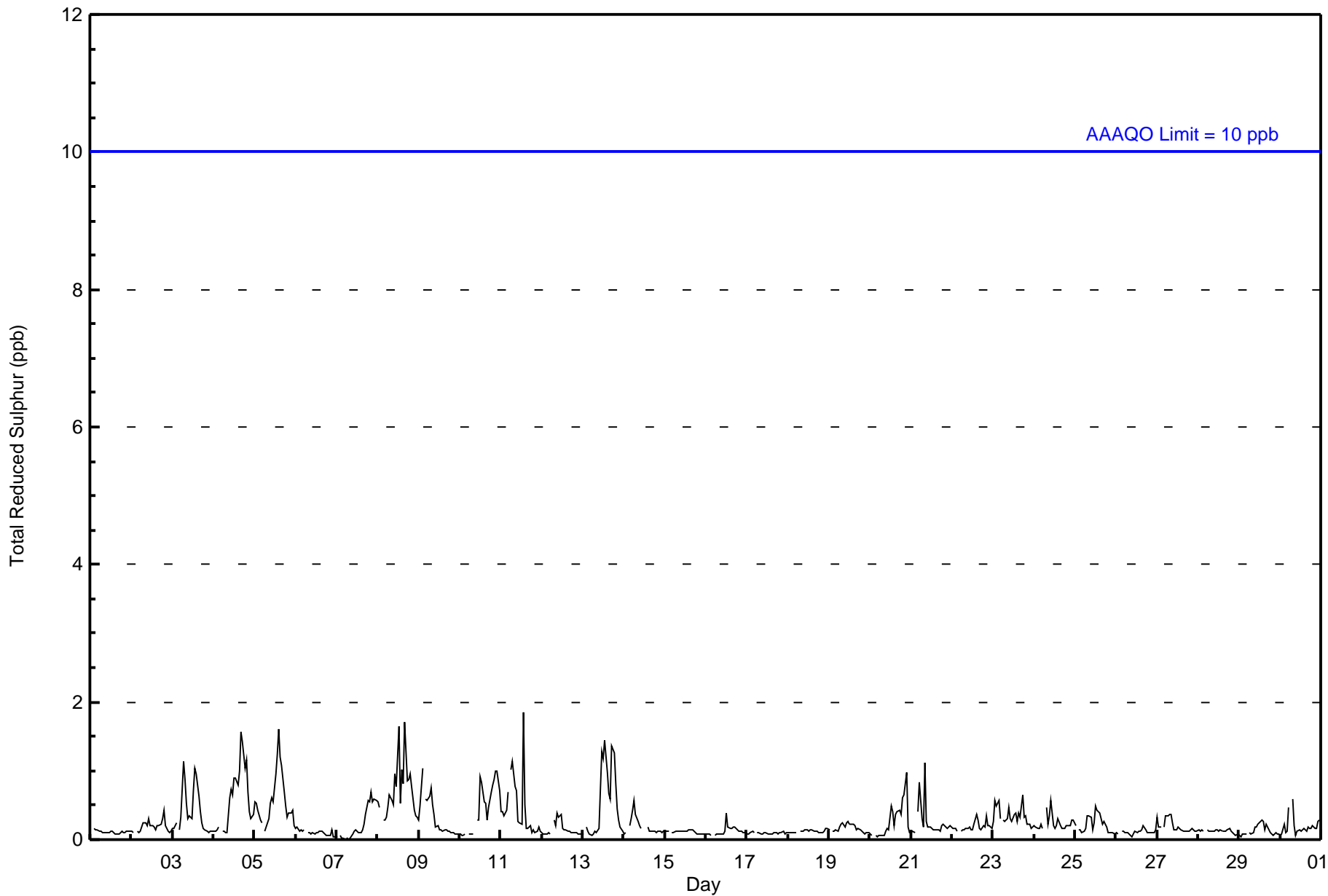
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1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	1	1	1	1	1	1	1	1	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Fort McKay South - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	686	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: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - 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 - 2	46	23	7	4	5	4	15	87	140	81	62	75	45	28	23	23	668
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	46	23	7	4	5	4	15	87	140	81	62	75	45	28	23	23	668

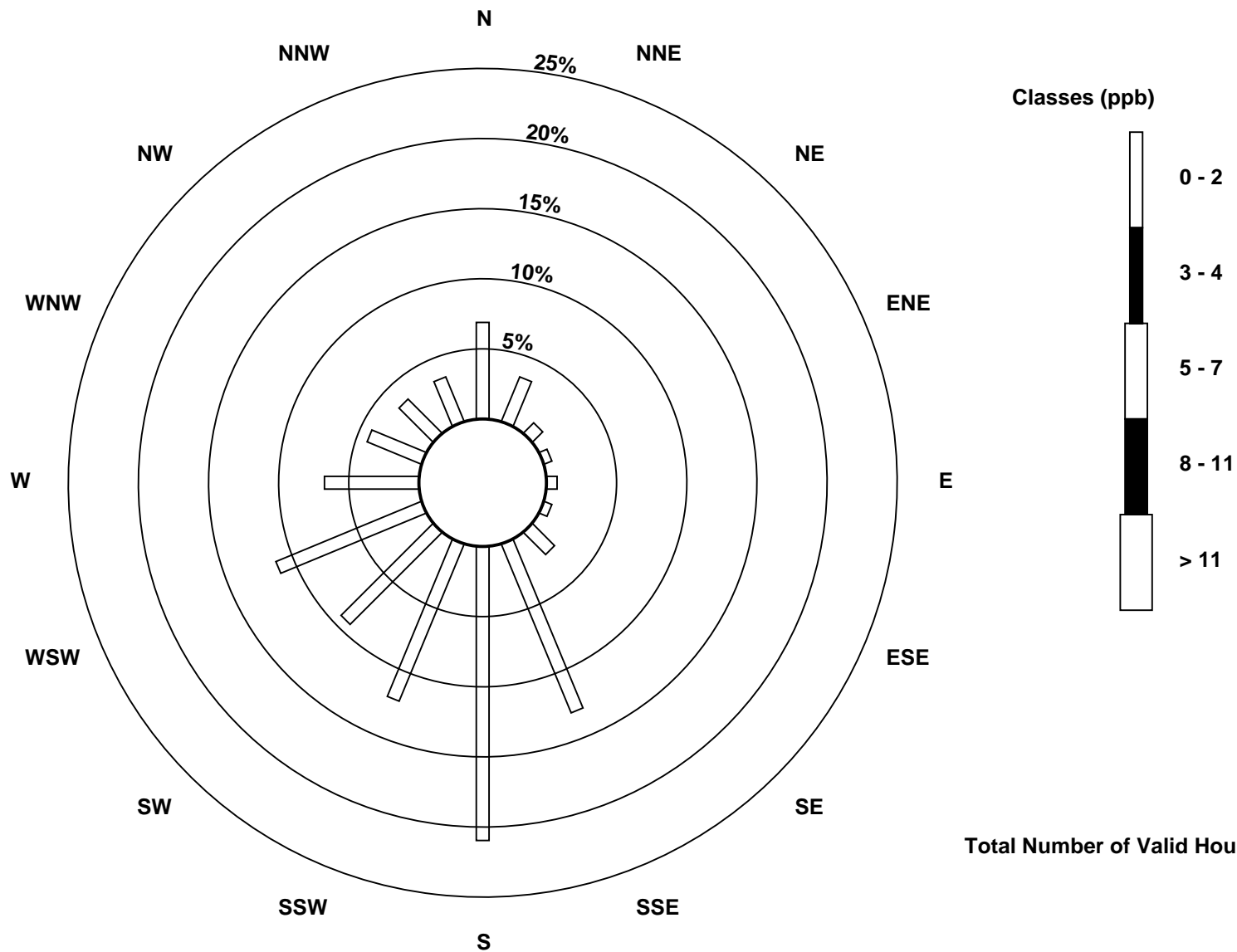
Total Number of Valid Hours: 668

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Reduced Sulphur (TRS) - ppb
Fort McKay South (AMS 13)

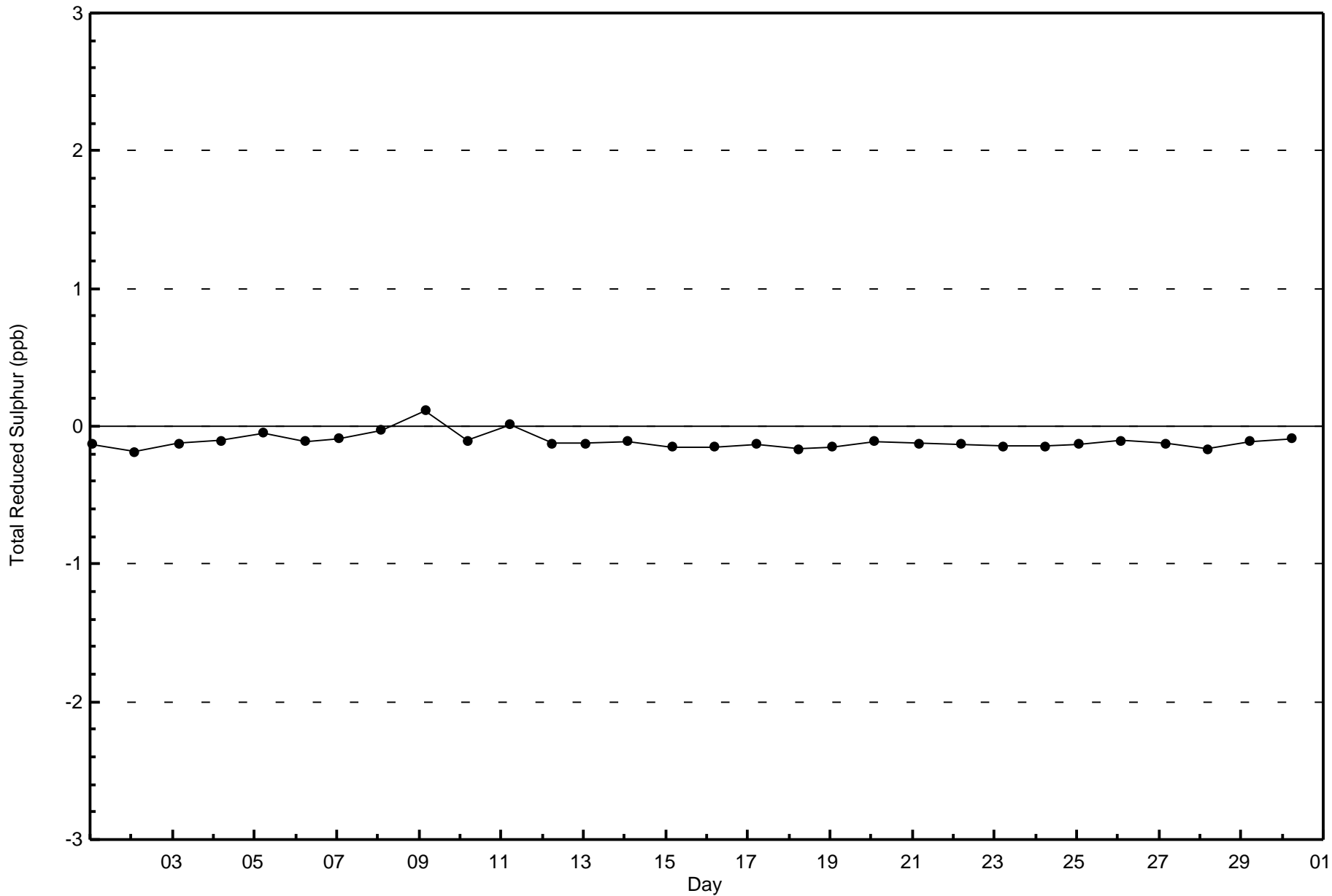


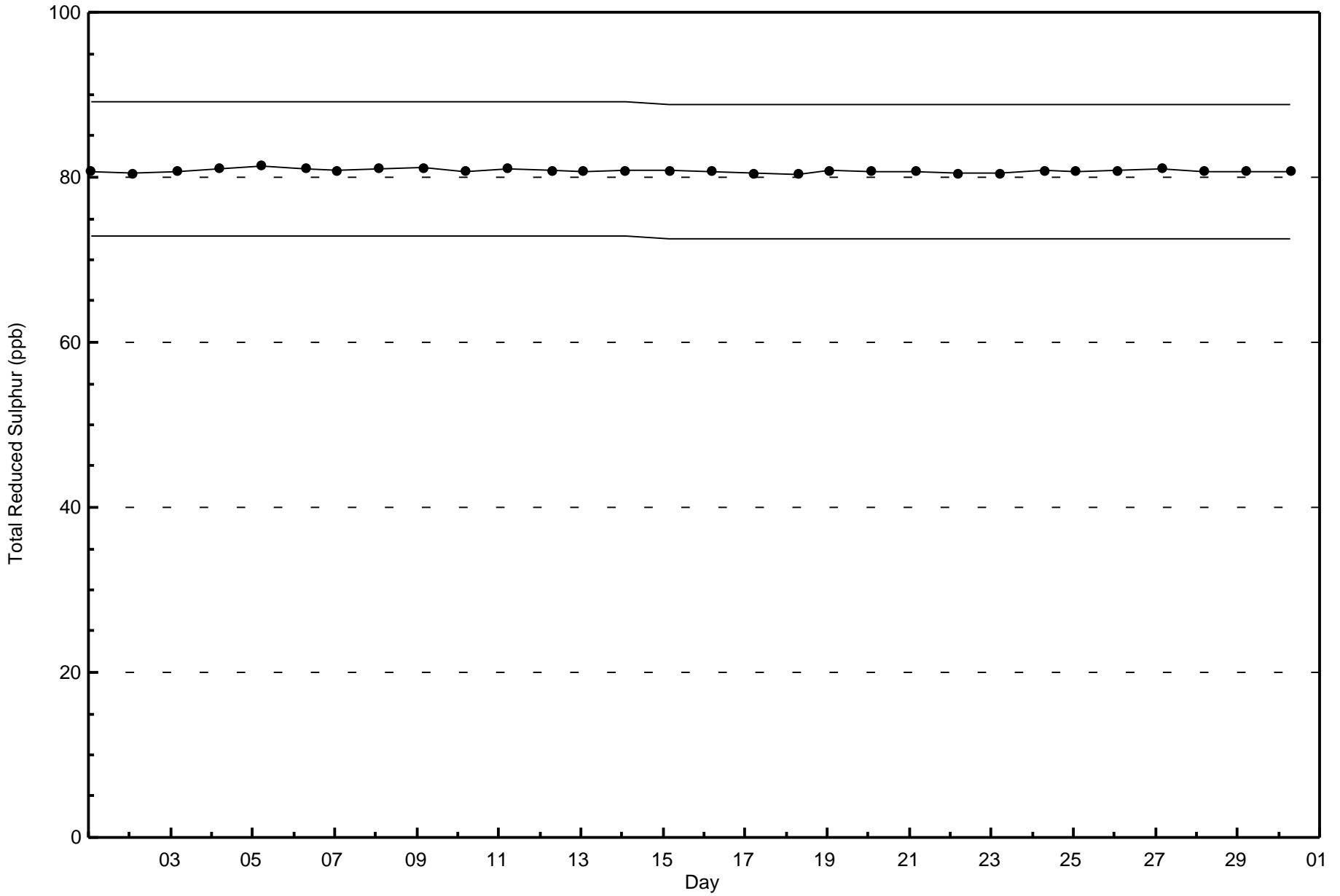
Total Number of Valid Hours: 668

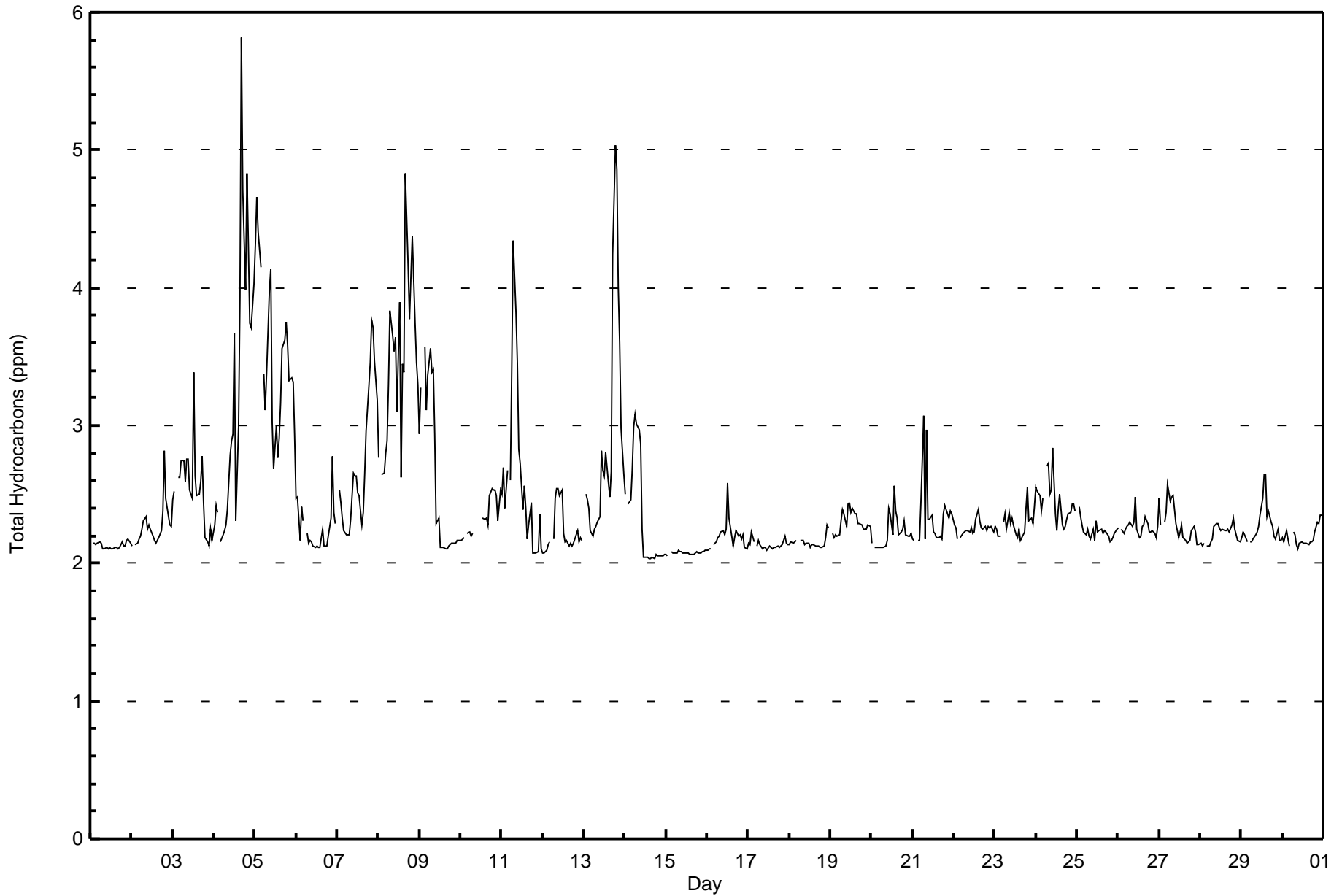


Wood Buffalo Environmental Association
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - November 2016









**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Fort McKay South - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	7	1.02	1.02
2.1 - 3.0	609	88.91	89.93
3.1 - 10.0	69	10.07	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
Fort McKay South - November 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	3	2	2	0	0	7
2.1 - 3.0	46	24	6	5	5	4	12	88	106	70	51	67	35	25	24	23	591
3.1 - 10.0	0	0	0	0	0	0	1	1	27	16	8	8	6	1	0	1	69
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	46	24	6	5	5	4	13	89	133	86	59	78	43	28	24	24	667

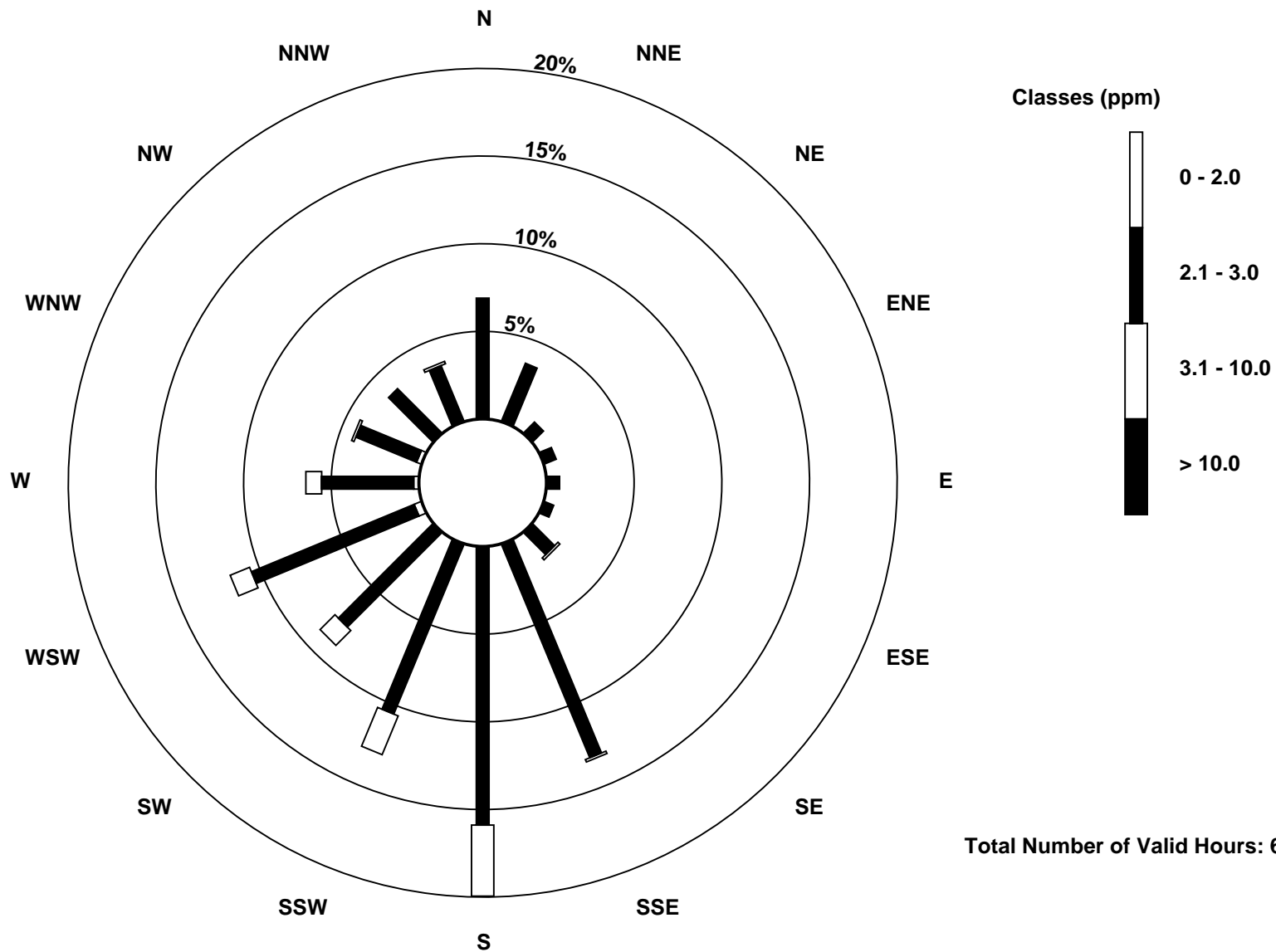
Total Number of Valid Hours: 667

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

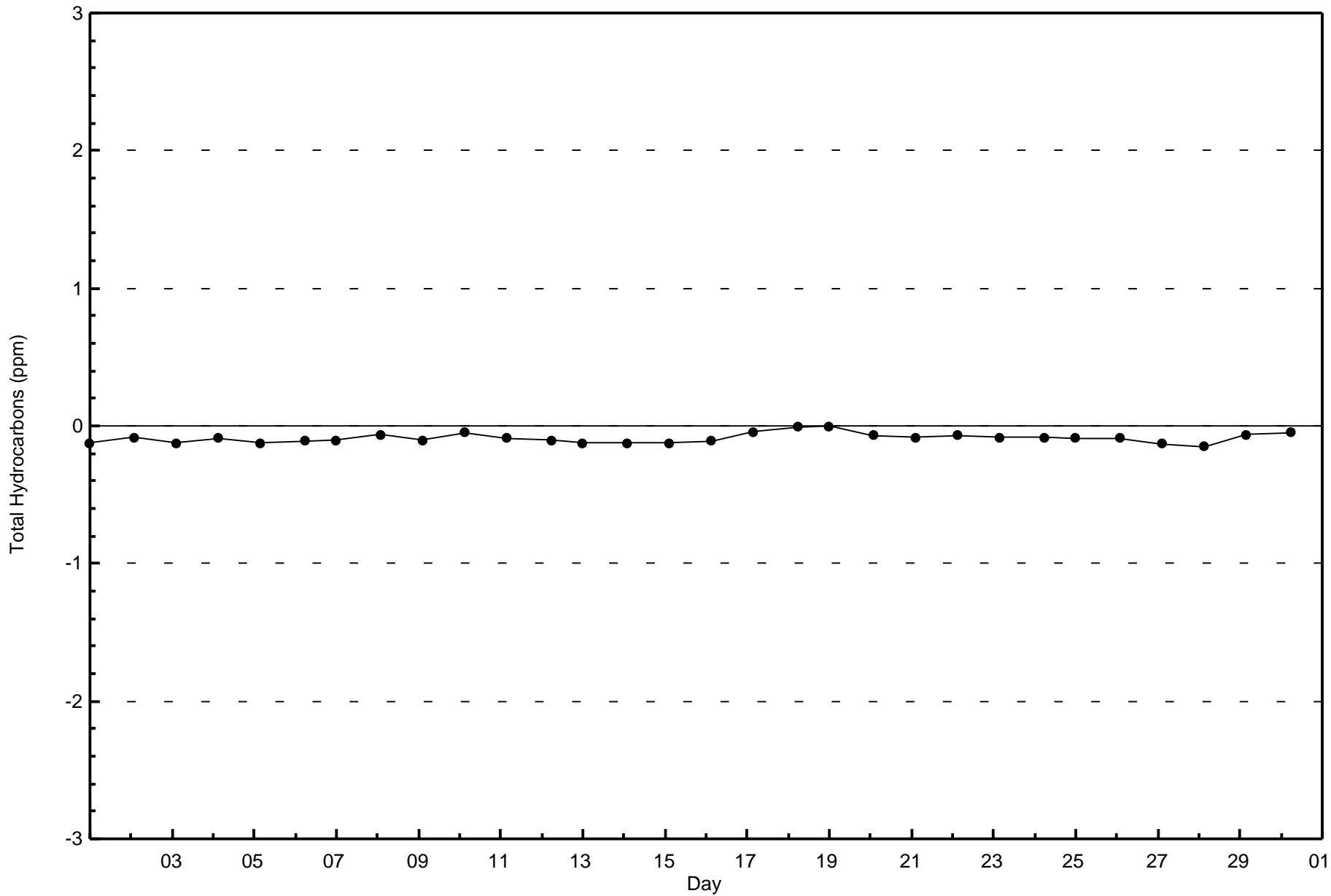
Total Hydrocarbons (THC) - ppm
Fort McKay South (AMS 13)

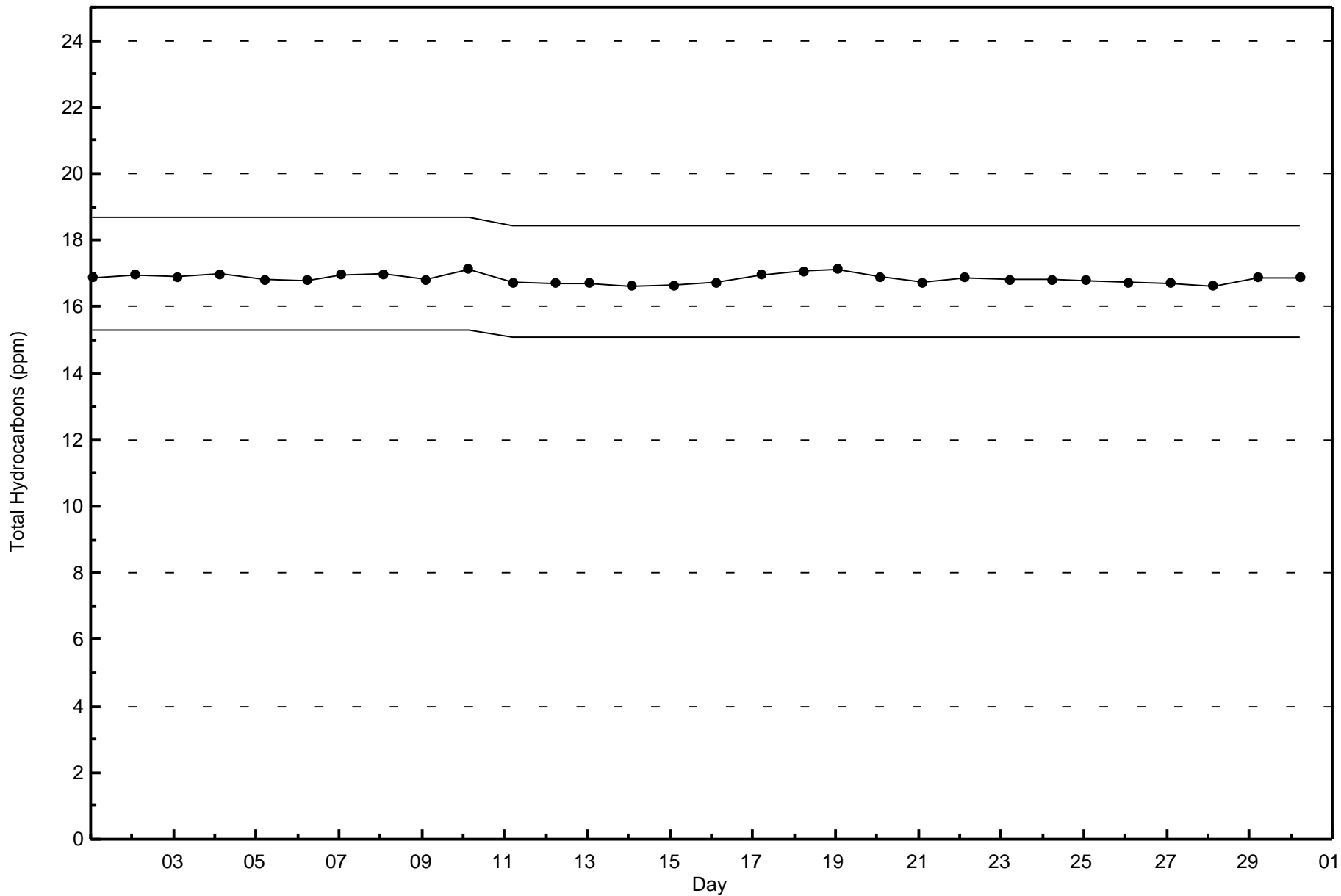




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Fort McKay South - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Fort McKay South - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 37 ppb on Nov 14 19:00	Maximum Daily Average: 31.4 ppb on Nov 17		Hours of Data:	686
Minimum Value: 1 ppb on Nov 3 05:00	Minimum Daily Average: 2.8 ppb on Nov 5		Hours of Missing Data:	34
Maximum Diurnal Average: 18.4 ppb at hour 13	Minimum Diurnal Average: 9.5 ppb at hour 9		Hours of Calibration:	33
Monthly Average: 14.5 ppb	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 6 Median = 13 Q ₃ = 22 P ₉₀ = 30 P ₉₉ = 36		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-Nov	25	23	22	Z	11	10	18	29	30	31	31	29	28	30	32	32	32	33	31	31	30	28	25	26	26.8	33
2-Nov	27	20	18	14	Z	6	5	2	5	13	21	22	22	18	19	16	11	8	3	2	1	1	2	2	11.2	27
3-Nov	1	1	1	1	1	Z	2	2	4	4	3	6	9	7	5	3	1	1	10	19	25	31	22	23	7.8	31
4-Nov	8	13	10	4	28	20	Z	5	2	12	20	20	24	24	23	20	11	6	2	1	2	1	1	1	11.2	28
5-Nov	1	1	1	1	1	1	1	Z	1	1	3	7	9	6	6	7	5	1	1	1	1	1	1	4	2.8	9
6-Nov	14	15	28	10	16	16	18	14	Z	11	26	29	30	30	21	15	14	8	6	4	2	1	2	2	14.4	30
7-Nov	1	1	2	Z	2	2	5	4	2	3	5	7	12	13	16	12	8	3	2	2	2	1	1	1	4.7	16
8-Nov	2	2	3	3	Z	1	1	2	2	3	5	6	8	9	12	10	5	2	2	2	2	2	2	2	3.8	12
9-Nov	2	3	3	3	3	Z	3	3	3	6	13	17	27	29	30	32	34	31	32	31	32	30	28	23	18.0	34
10-Nov	29	24	26	27	20	11	Z	20	5	M	8	11	C	C	C	21	16	9	3	11	16	15	14	20	16.1	29
11-Nov	23	24	23	23	22	18	8	Z	11	11	6	9	12	15	12	24	18	11	30	28	28	33	16	29	19.0	33
12-Nov	32	22	14	10	21	13	7	3	Z	9	7	7	17	18	18	23	19	12	10	9	6	8	8	22	13.7	32
13-Nov	27	4	3	Z	7	6	4	3	8	13	6	7	10	10	11	8	4	3	2	2	2	2	2	2	6.5	27
14-Nov	2	3	2	3	Z	2	3	2	2	2	20	27	27	27	29	35	36	36	37	36	33	32	32	33	20.1	37
15-Nov	34	34	34	34	33	Z	32	32	30	30	31	33	34	36	36	34	26	31	33	29	28	20	20	14	30.4	36
16-Nov	10	11	9	8	8	6	Z	6	3	5	9	8	11	16	22	23	20	19	21	19	21	22	29	33	14.9	33
17-Nov	33	31	27	32	32	33	32	Z	33	31	32	32	33	32	36	35	35	33	32	31	29	26	27	26	31.4	36
18-Nov	26	25	23	22	22	21	21	20	Z	25	28	32	34	34	34	34	31	21	16	15	14	15	16	16	23.8	34
19-Nov	14	13	17	Z	16	16	11	5	8	13	7	7	9	8	7	7	11	12	11	12	12	11	10	8	10.7	17
20-Nov	25	27	27	21	Z	21	20	13	11	15	25	26	22	19	21	19	15	10	11	15	11	11	12	13	17.9	27
21-Nov	13	16	10	11	10	Z	15	14	10	12	7	5	11	12	12	12	11	12	9	5	5	6	8	10	10.3	16
22-Nov	13	14	19	18	17	14	Z	8	6	8	10	15	16	9	6	8	11	13	15	15	14	15	9	9	12.2	19
23-Nov	7	13	14	15	7	10	17	Z	18	18	19	21	22	22	22	19	14	17	18	18	21	20	18	11	16.6	22
24-Nov	3	4	5	4	12	12	8	10	Z	5	8	8	16	10	10	15	11	5	3	2	2	2	3	2	6.9	16
25-Nov	3	3	5	Z	11	9	11	15	21	21	21	17	15	10	7	5	3	11	13	16	14	13	13	12	11.7	21
26-Nov	11	10	10	11	Z	9	7	7	5	3	4	19	24	22	17	17	12	14	20	16	18	19	23	19	13.7	24
27-Nov	9	15	15	13	13	Z	1	2	4	8	13	16	13	12	15	15	16	14	14	12	12	14	16	18	12.1	18
28-Nov	19	17	16	15	15	15	Z	7	7	6	7	7	8	8	8	9	6	4	3	1	7	7	10	10	9.1	19
29-Nov	8	7	9	11	10	5	7	Z	6	10	14	12	4	3	5	12	10	9	12	19	21	18	24	24	11.3	24
30-Nov	24	24	21	25	25	24	24	25	Z	27	25	26	26	26	26	23	25	27	28	26	25	27	27	28	25.4	28

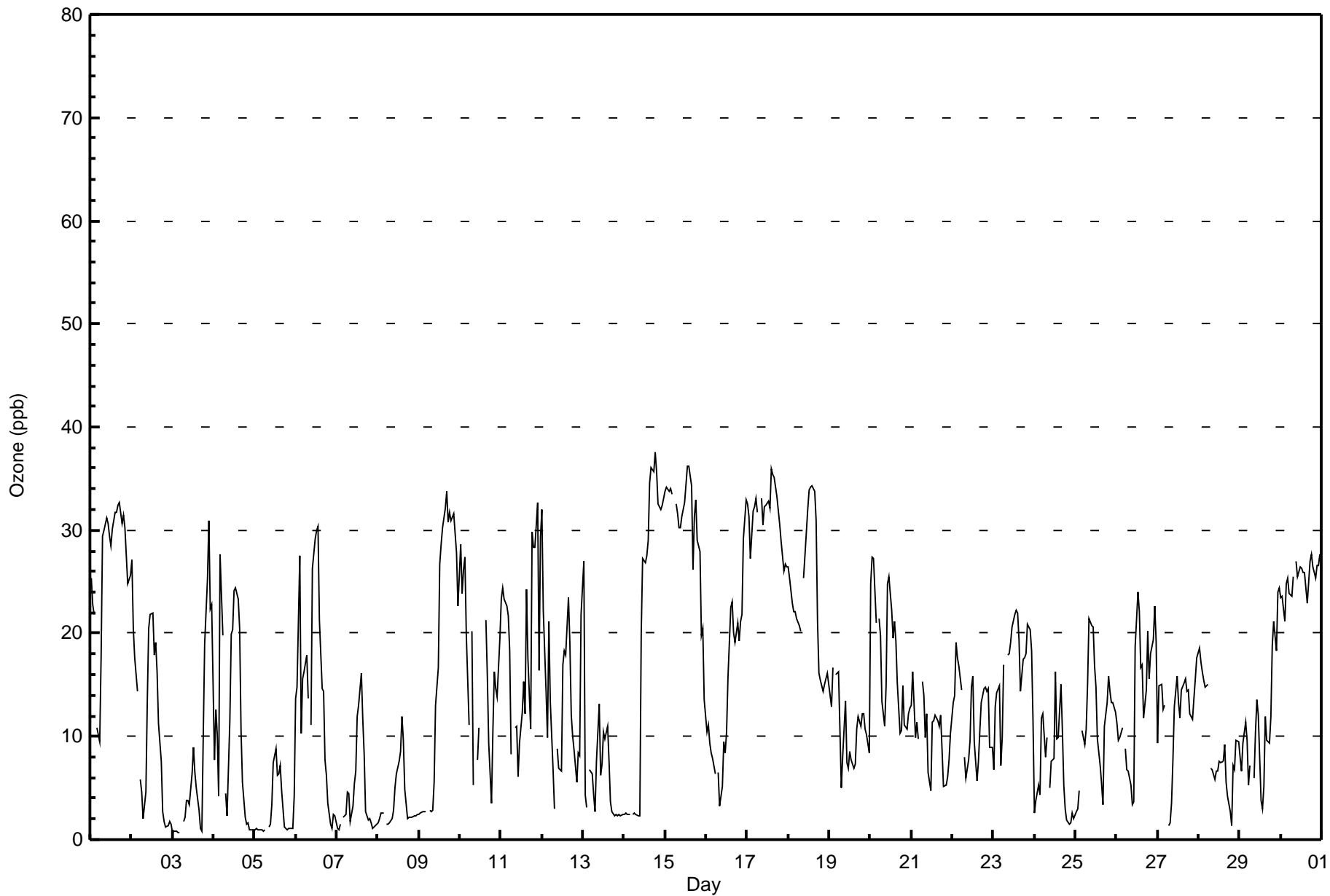
14.8	14.0	13.9	13.6	14.4	12.2	11.2	10.1	9.5	12.3	14.4	16.3	18.4	17.8	17.9	18.2	15.7	13.9	14.3	14.4	14.6	14.4	14.0	14.8	Diurnal Average	
34	34	34	34	33	33	32	32	33	31	32	33	34	36	36	35	36	36	37	36	33	33	32	33	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Fort McKay South - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Fort McKay South - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	489	71.28	71.28
21 - 50	197	28.72	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Fort McKay South - 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	40	23	4	3	2	4	13	62	108	70	43	38	18	15	15	14	472
21 - 50	7	1	2	1	4	0	1	21	31	11	18	40	27	13	8	12	197
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	47	24	6	4	6	4	14	83	139	81	61	78	45	28	23	26	669

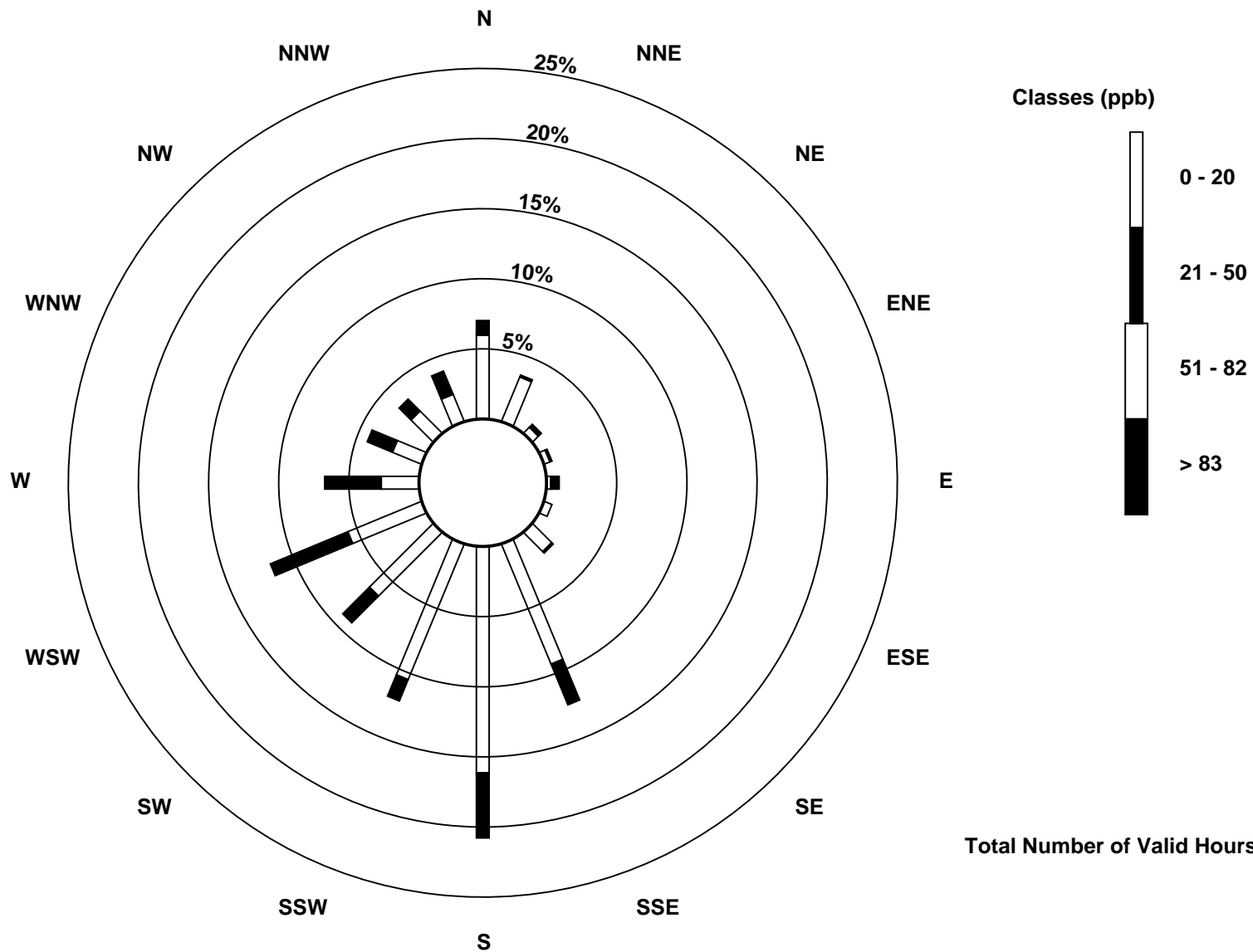
Total Number of Valid Hours: 669

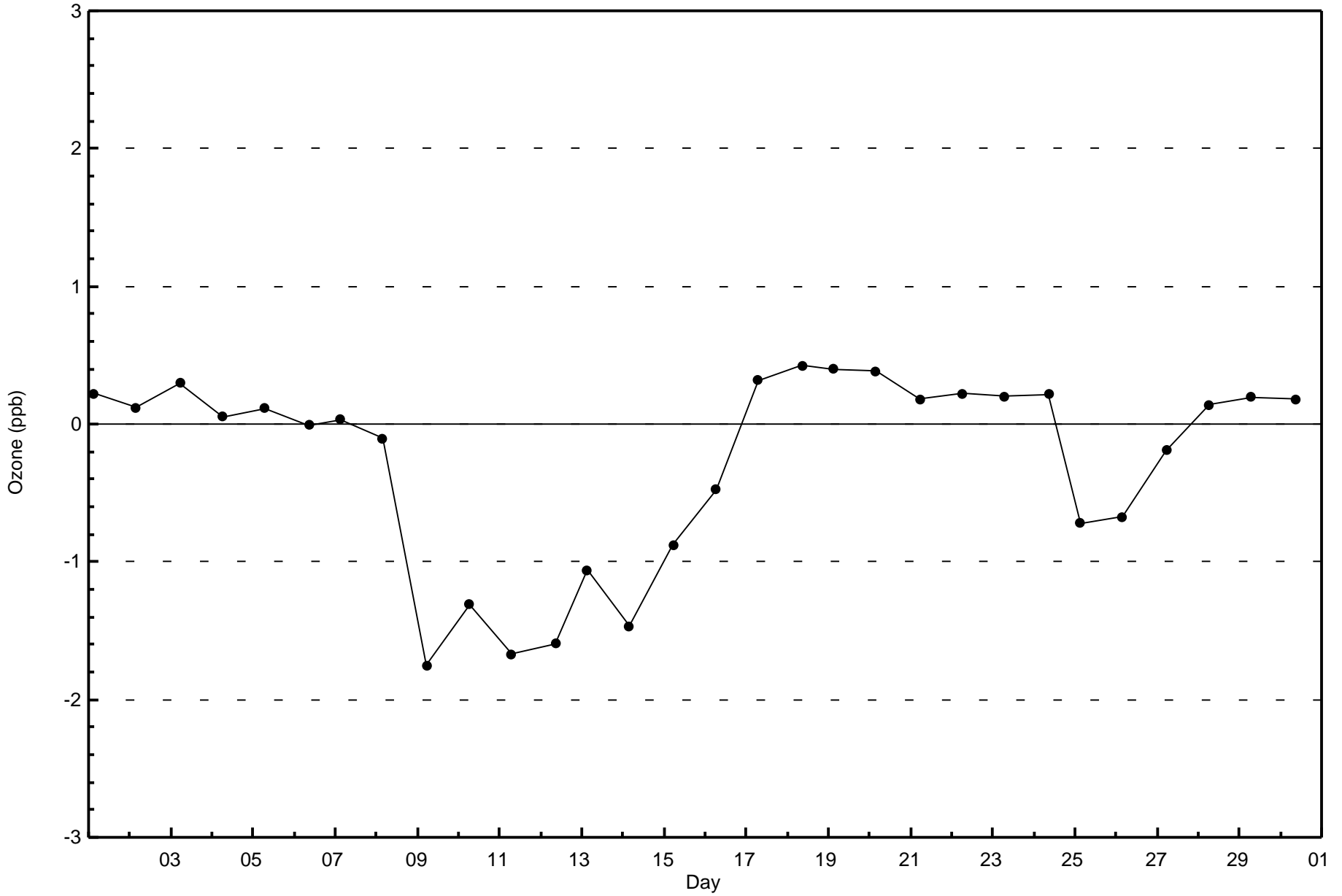
Total Number of Hours: 720

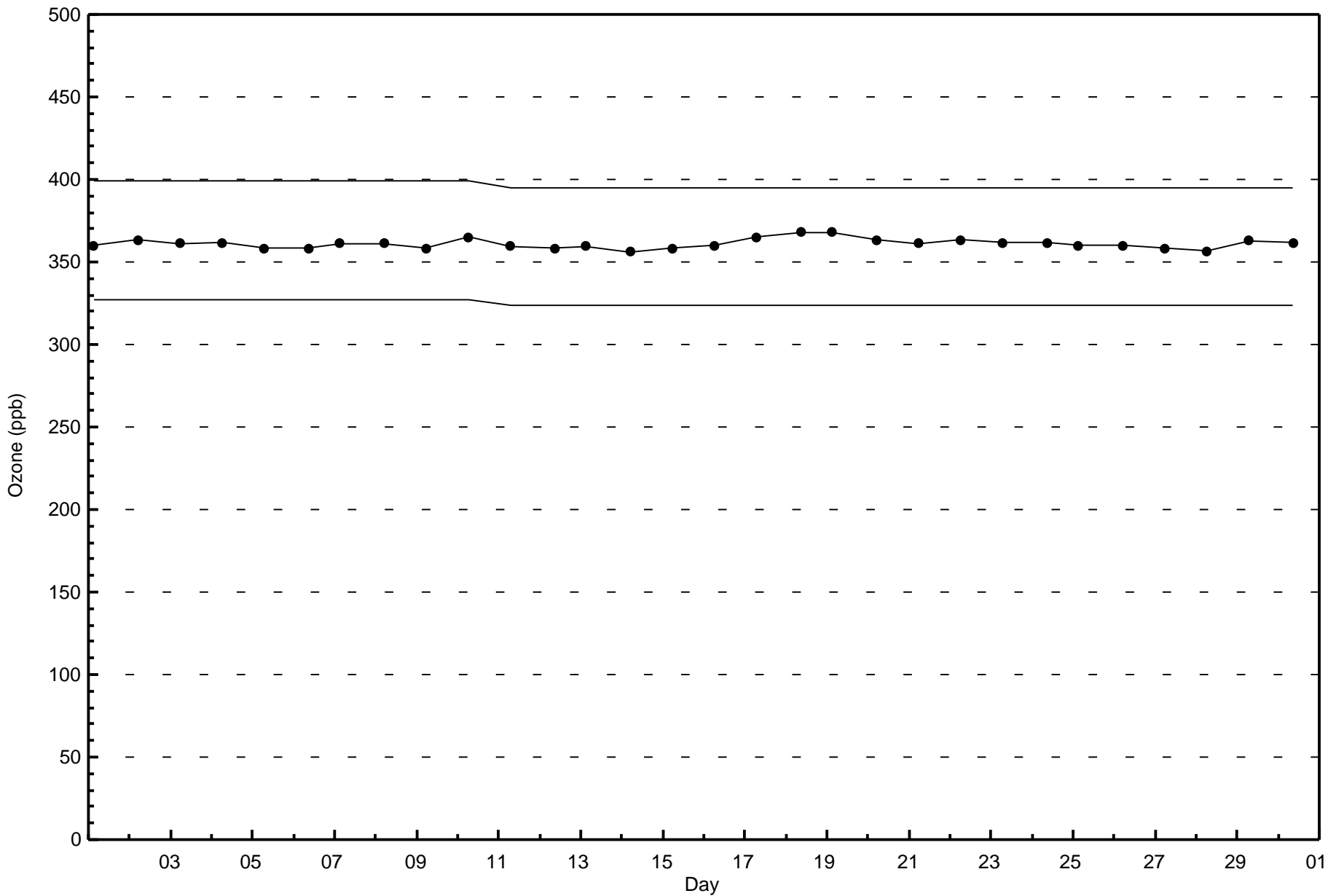


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Fort McKay South (AMS 13)







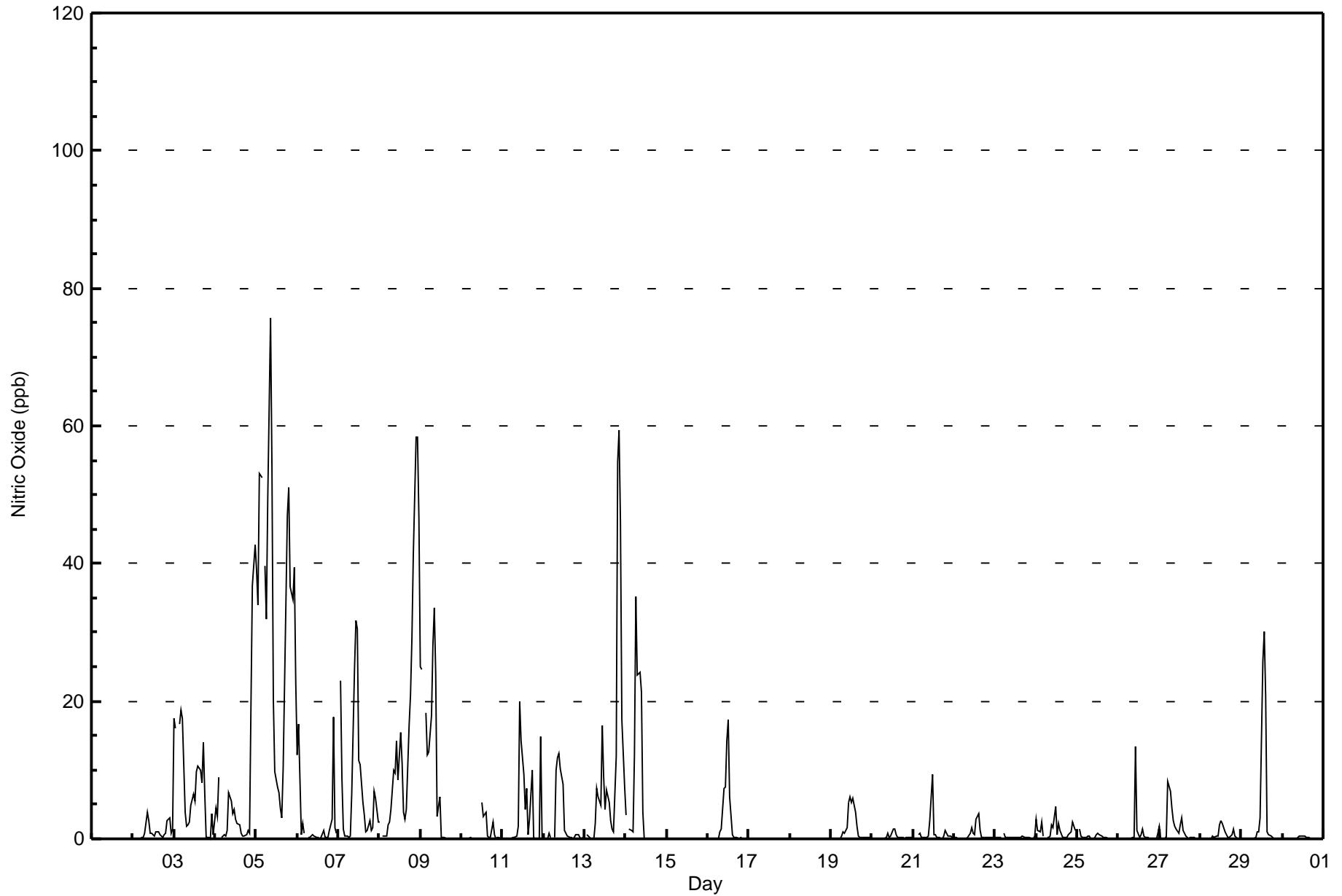


Maximum Value: 76 ppb on Nov 5 09:00																	Maximum Daily Average: 32.9 ppb on Nov 5																	Hours in Service: 720			
Minimum Value: 0 ppb on Nov 1 08:00																	Minimum Daily Average: 0.0 ppb on Nov 15																	Hours of Data: 686			
Maximum Diurnal Average: 6.5 ppb at hour 9																	Minimum Diurnal Average: 1.1 ppb at hour 17																	Hours of Missing Data: 34			
Monthly Average: 4.1 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 2 P ₉₀ = 12 P ₉₉ = 53																	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-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											
2-Nov	0	Z	0	0	0	0	0	1	4	3	1	1	0	1	1	1	0	1	1	3	3	1	1	1.0	4												
3-Nov	17	16	Z	17	19	17	4	2	2	2	5	6	5	10	11	10	8	14	7	0	0	4	1	7.7	19												
4-Nov	5	3	9	Z	0	1	0	1	7	5	4	4	3	2	2	1	0	0	1	1	1	19	37	43	6.5	43											
5-Nov	39	34	53	53	Z	40	32	49	76	54	20	10	7	7	4	3	10	35	47	51	37	35	23	32.9	76												
6-Nov	12	17	1	2	1	Z	0	0	0	1	0	0	0	0	0	1	0	0	0	1	3	18	2	1	2.6	18											
7-Nov	Z	23	9	1	1	0	0	0	6	25	32	30	11	11	5	3	1	1	3	1	2	7	6	3	7.9	32											
8-Nov	2	Z	0	0	0	2	2	4	10	9	14	9	15	11	4	3	4	16	21	29	41	58	58	47	15.8	58											
9-Nov	25	25	Z	18	12	13	18	28	34	24	3	6	0	0	0	0	0	0	0	0	0	0	0	0	9.0	34											
10-Nov	0	0	0	Z	0	0	0	0	C	C	C	C	5	3	4	0	0	0	2	1	0	0	0	0	0.9	5											
11-Nov	0	0	0	0	Z	0	0	0	0	2	20	14	9	4	7	1	3	10	0	0	0	0	15	0	3.8	20											
12-Nov	0	0	0	1	0	Z	0	10	12	12	10	8	1	1	0	0	0	0	0	1	1	0	0	0	2.5	12											
13-Nov	Z	1	0	0	0	0	2	7	6	5	17	9	4	7	5	3	1	1	12	55	59	46	17	7	11.6	59											
14-Nov	4	Z	1	1	1	12	35	24	24	21	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5.6	35											
15-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											
16-Nov	0	0	0	Z	0	0	0	1	1	7	7	14	17	6	1	0	0	0	0	0	0	0	0	0	2.5	17											
17-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											
18-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											
19-Nov	Z	0	0	0	0	0	0	1	1	2	5	6	5	6	4	2	0	0	0	0	0	0	0	0	1.5	6											
20-Nov	0	Z	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1											
21-Nov	0	0	Z	1	1	0	0	0	0	0	3	9	1	1	0	0	0	0	0	1	0	0	0	0	0.9	9											
22-Nov	0	0	0	Z	0	0	0	0	0	1	2	1	1	3	4	1	0	0	0	0	0	0	0	0	0.6	4											
23-Nov	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1											
24-Nov	3	1	1	2	0	Z	0	0	0	2	2	5	1	2	1	0	0	0	0	1	1	2	2	1	1.2	5											
25-Nov	Z	1	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											
26-Nov	0	Z	0	0	0	0	0	0	0	0	13	1	0	1	2	0	0	0	0	0	0	0	0	1	0.8	13											
27-Nov	2	0	Z	0	0	8	7	4	3	2	1	1	2	3	1	0	0	0	0	0	0	0	0	0	1.6	8											
28-Nov	0	0	0	Z	0	0	0	0	0	0	0	2	3	2	1	1	0	0	1	1	0	0	0	0	0.6	3											
29-Nov	0	0	0	0	Z	0	0	0	0	1	1	3	26	30	21	1	1	0	0	0	0	0	0	0	3.7	30											
30-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	0.1	0											
																	4.4 4.9 3.0 3.9 1.4 3.8 3.5 4.5 6.5 6.2 5.7 4.9 4.0 3.8 2.7 1.1 1.1 2.7 3.2 4.8 5.0 6.3 6.1 4.3																	Diurnal Average			
																	39 34 53 53 19 40 35 49 76 54 32 30 26 30 21 10 10 35 47 55 59 58 58 47																	Diurnal Maximum			
Z - zerospan																	C - Calibration																				



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort McKay South - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay South - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	643	93.73	93.73
21 - 40	28	4.08	97.81
41 - 80	15	2.19	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay South - 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	46	24	6	5	5	4	14	89	120	75	52	72	39	28	23	23	625
21 - 40	0	0	0	0	0	0	0	0	9	8	5	1	3	0	1	1	28
11 - 80	0	0	0	0	0	0	0	0	4	3	2	5	1	0	0	0	15
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	46	24	6	5	5	4	14	89	133	86	59	78	43	28	24	24	668

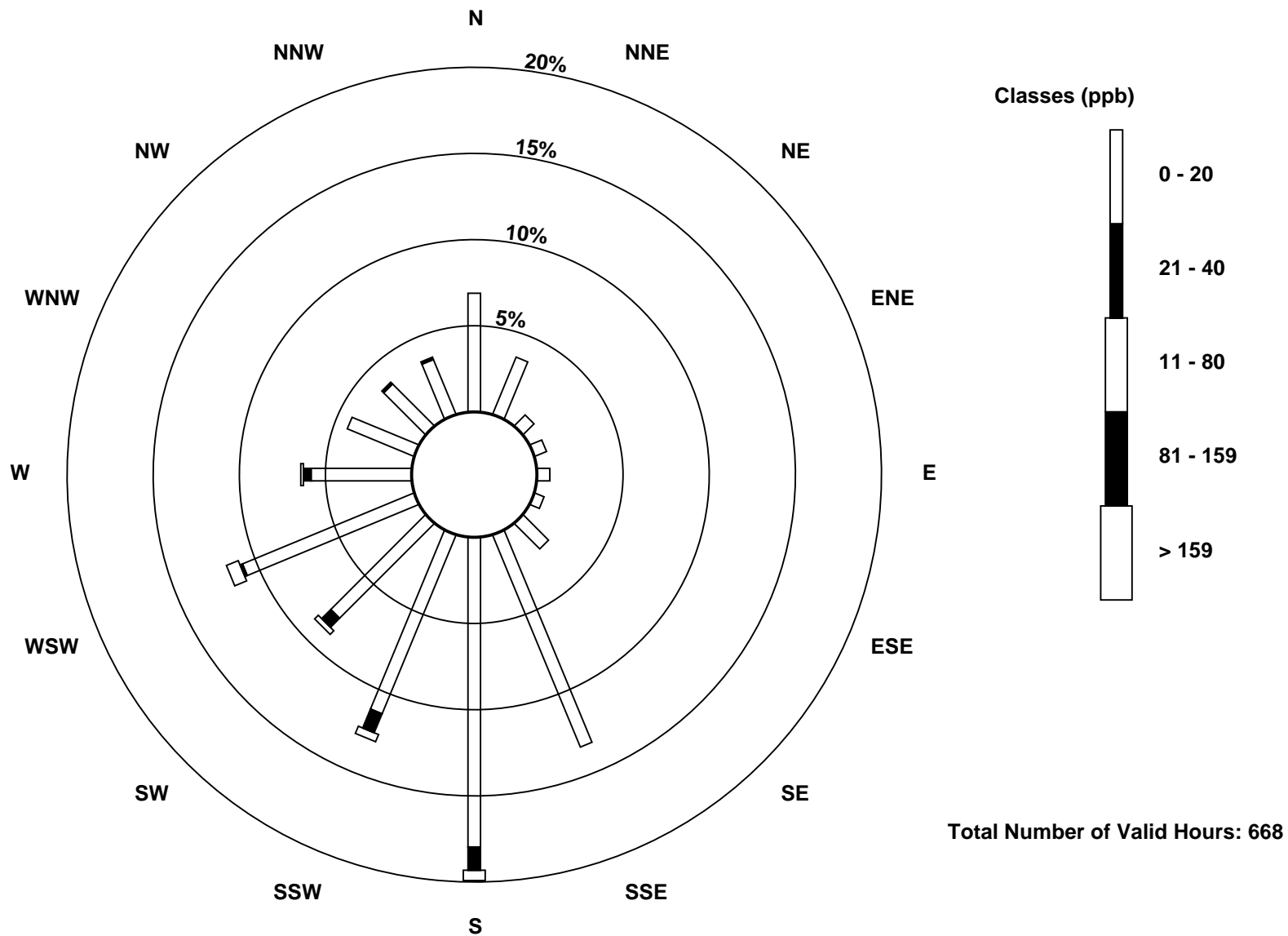
Total Number of Valid Hours: 668

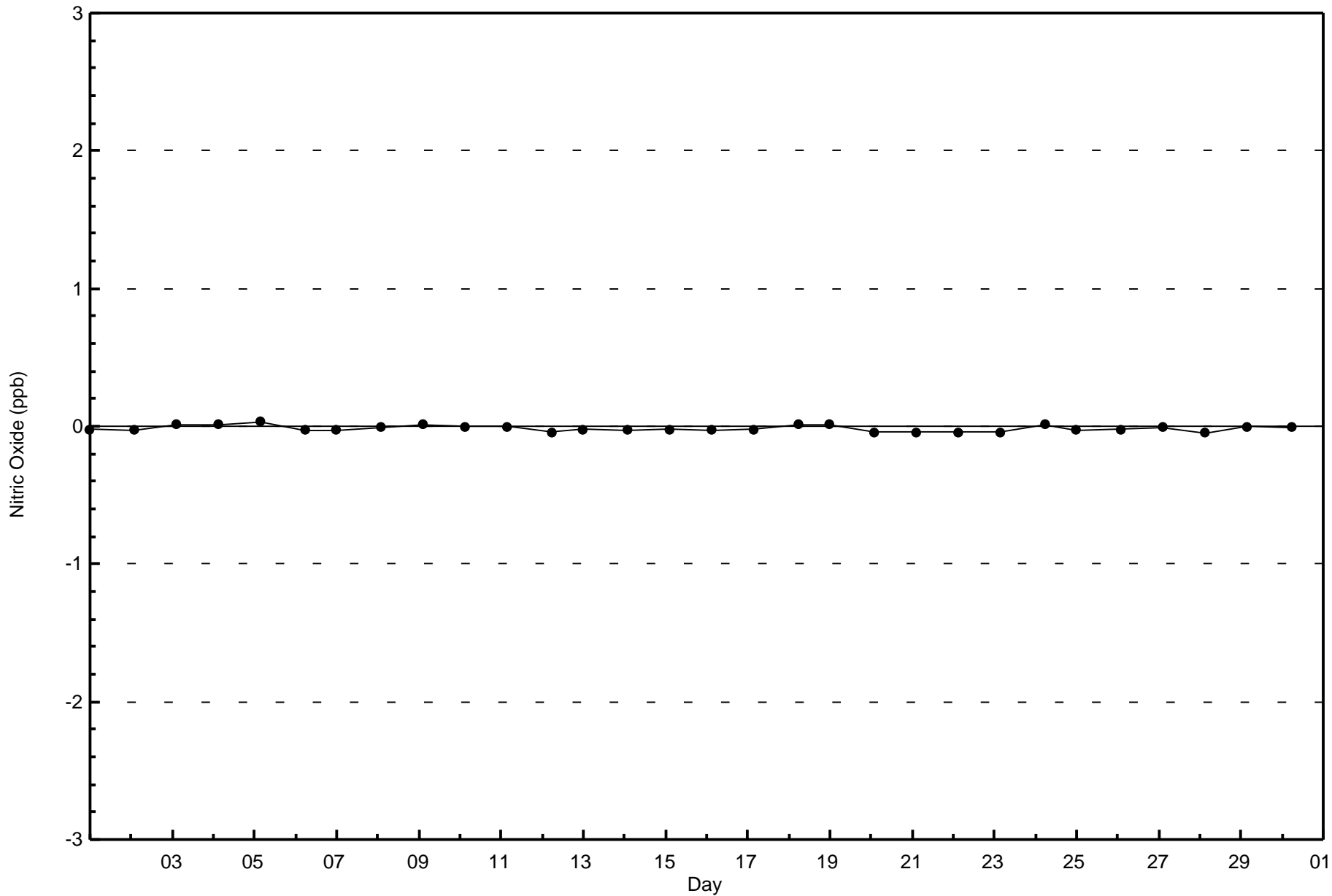
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Fort McKay South (AMS 13)





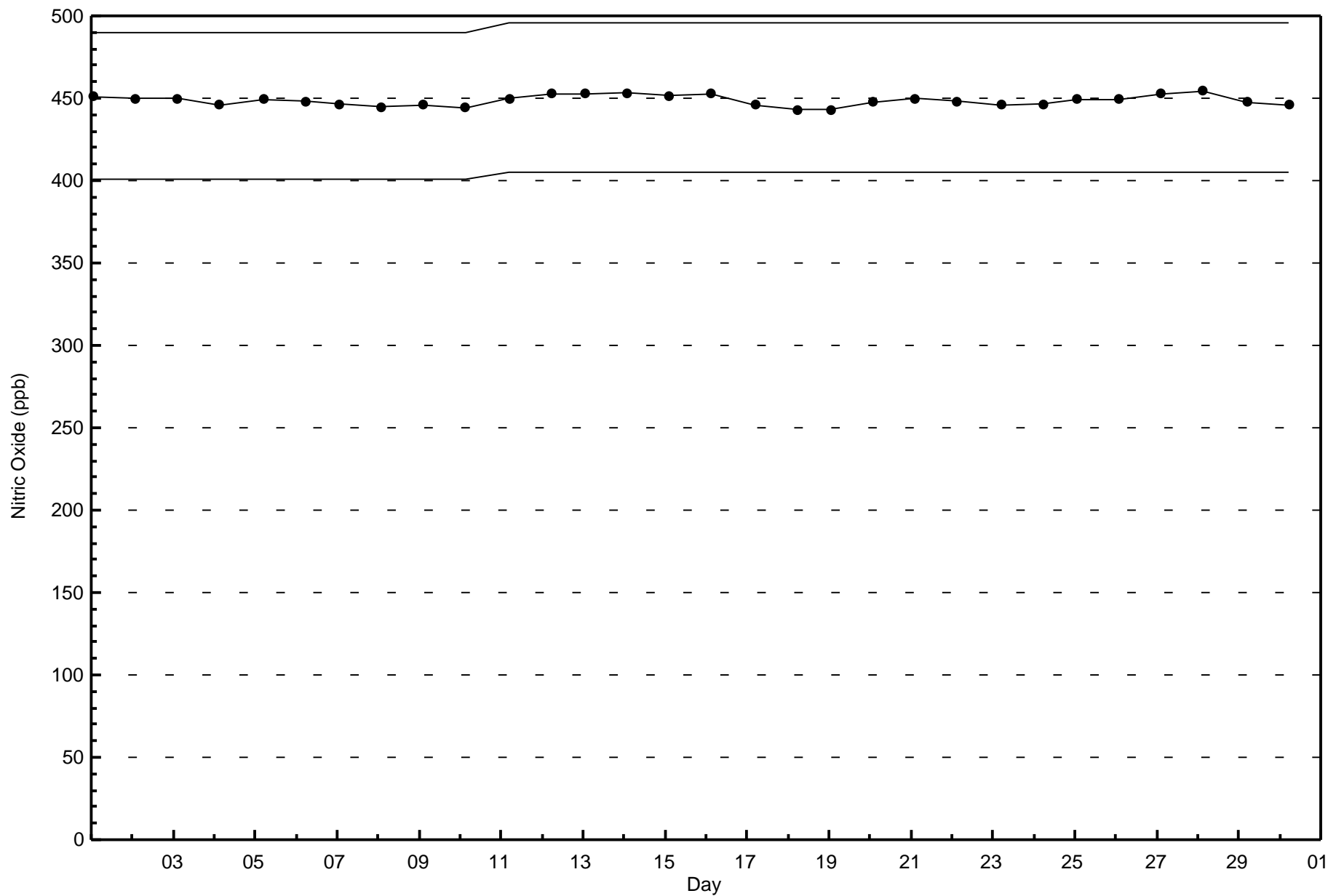


Wood Buffalo Environmental Association

Span Responses

Nitric Oxide (NO) - ppb

Fort McKay South - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort McKay South - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 23 ppb on Nov 4 03:00	Maximum Daily Average: 12.8 ppb on Nov 19
Minimum Value: 0 ppb on Nov 18 01:00	Hours of Data: 686
Maximum Diurnal Average: 7.1 ppb at hour 12	Hours of Missing Data: 34
Monthly Average: 5.6 ppb	Hours of Calibration: 34
Minimum Daily Average: 0.5 ppb on Nov 15	Percent Operational Time: 100.0
Minimum Diurnal Average: 4.0 ppb at hour 5	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 5 O ₃ = 9 P ₉₀ = 12 P ₉₉ = 20	

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	Z	1	1	1	1	1	2	0	0	0	0	0	0	0	1	0	0	1	1	1	3	2	2	0.8	3	
2-Nov	2	Z	1	3	4	7	9	11	9	9	5	4	4	7	5	6	9	10	9	7	8	6	3	2	6.0	11
3-Nov	7	9	Z	6	3	6	9	11	9	9	10	6	5	6	8	8	4	10	7	2	2	1	11	5	6.6	11
4-Nov	11	17	23	Z	3	10	13	12	9	10	10	11	9	7	9	8	7	8	11	8	5	7	6	6	9.5	23
5-Nov	6	5	6	5	Z	5	4	7	10	10	12	12	12	14	13	13	15	13	11	10	10	8	17	20	10.2	20
6-Nov	16	18	3	22	19	Z	7	2	2	2	1	1	1	1	6	1	0	1	4	7	12	4	2	5.7	22	
7-Nov	Z	6	5	1	1	1	1	2	5	12	19	22	16	16	13	15	13	9	9	7	7	7	8	9	8.8	22
8-Nov	11	Z	3	3	3	5	5	6	5	4	8	9	11	10	9	9	12	10	8	7	6	5	5	6	7.0	12
9-Nov	5	4	Z	4	6	3	4	5	4	6	3	5	1	1	1	1	1	1	1	1	1	1	1	1	2.4	6
10-Nov	1	1	0	Z	2	4	1	2	C	C	C	C	9	7	10	5	5	10	16	10	6	8	9	5	5.7	16
11-Nov	3	3	3	3	Z	5	7	4	7	10	19	14	12	9	17	6	12	19	1	1	1	1	17	3	7.7	19
12-Nov	1	1	1	3	6	Z	7	16	17	16	13	15	4	4	3	2	4	2	2	5	6	1	1	1	5.7	17
13-Nov	Z	6	5	3	1	1	5	7	7	6	15	14	10	11	9	8	6	6	6	7	6	4	2	2	6.4	15
14-Nov	1	Z	1	1	1	4	9	4	3	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1.4	9
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	2	0.5	2
16-Nov	0	0	1	Z	1	1	2	4	5	4	6	11	17	12	6	3	9	10	7	10	8	7	1	1	5.5	17
17-Nov	2	2	6	2	Z	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	0	1.1	6
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	9	1.2	10
19-Nov	Z	10	8	9	9	7	13	20	16	11	18	19	17	17	18	17	13	12	13	10	10	10	10	9	12.8	20
20-Nov	2	Z	0	0	0	2	2	3	4	7	2	2	5	8	5	6	9	12	12	7	11	11	9	8	5.5	12
21-Nov	4	4	Z	9	11	6	4	5	8	4	10	12	3	2	2	2	2	1	7	12	11	11	14	12	6.7	14
22-Nov	8	8	2	Z	2	4	5	6	6	7	8	4	3	10	13	11	9	6	5	4	4	3	8	7	6.1	13
23-Nov	9	4	4	4	Z	10	4	4	4	4	3	3	3	3	5	10	6	5	4	2	2	3	9	4.6	10	
24-Nov	18	16	14	15	6	Z	8	5	6	9	7	9	5	11	8	5	3	3	4	5	5	6	8	8	7.9	18
25-Nov	Z	8	6	5	3	4	8	7	2	3	3	6	8	8	6	3	2	4	3	1	1	1	1	2	4.1	8
26-Nov	2	Z	2	2	2	2	2	1	1	1	6	4	1	4	11	9	14	10	3	3	4	3	2	5	4.0	14
27-Nov	15	8	Z	11	11	21	20	20	20	17	11	7	10	11	8	7	6	7	7	10	10	7	5	3	11.0	21
28-Nov	2	3	3	Z	1	1	1	3	4	3	2	4	5	5	4	6	6	8	8	6	7	5	4	3	4.1	8
29-Nov	2	3	1	0	Z	0	0	0	2	8	6	9	17	19	17	10	9	10	9	3	2	5	3	3	6.1	19
30-Nov	3	3	6	3	3	Z	5	4	3	4	5	4	4	4	3	6	5	3	3	3	3	3	3	3	3.6	6

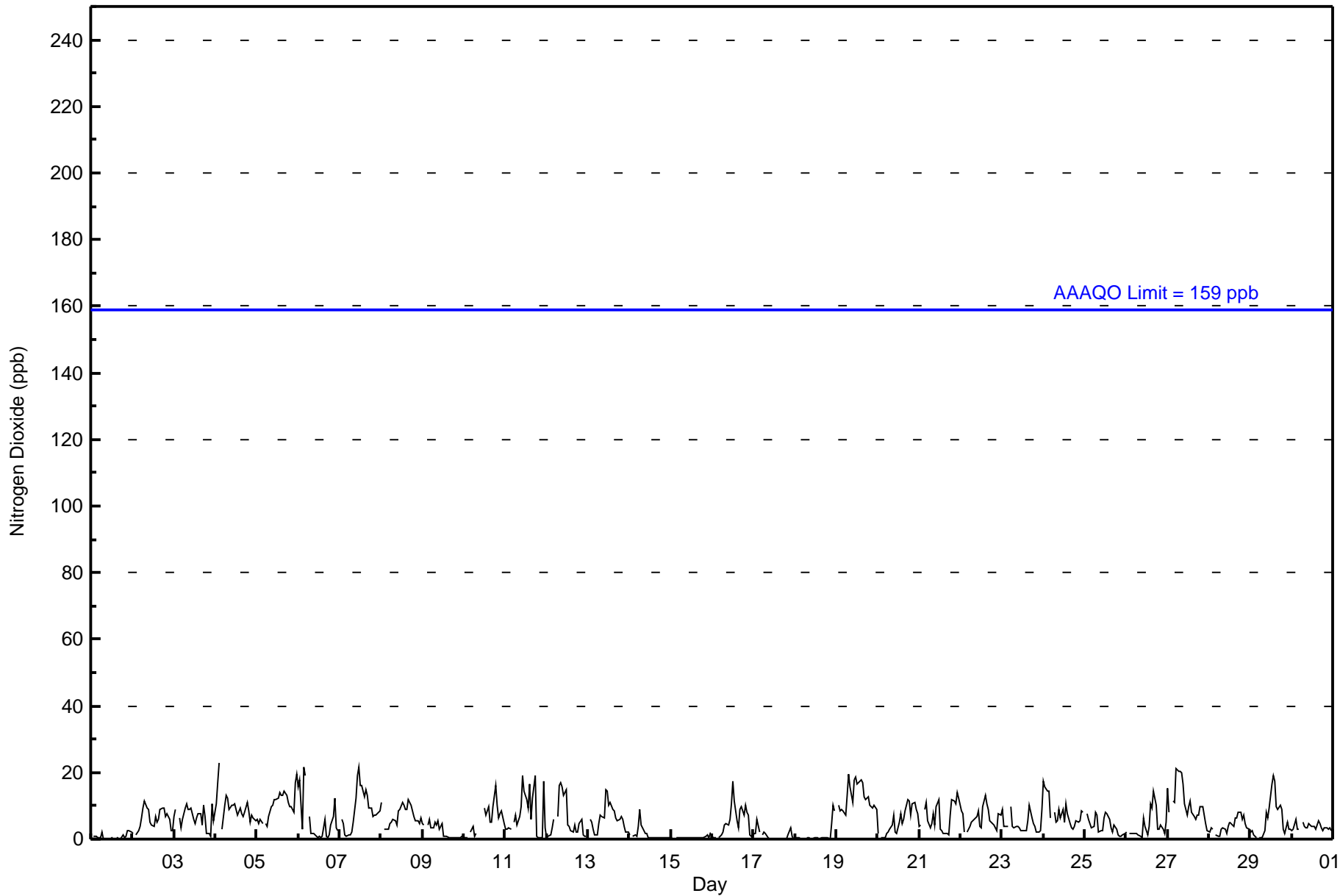
5.2	5.5	4.3	4.6	4.0	4.4	5.3	5.8	5.8	6.1	7.0	7.1	6.4	6.9	6.6	5.9	6.2	6.4	5.7	4.9	4.8	4.9	5.5	4.9	Diurnal Average
18	18	23	22	19	21	20	20	20	17	19	22	17	19	18	17	15	19	16	12	11	12	17	20	Diurnal Maximum

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 South - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	682	99.42	99.42
21 - 40	4	0.58	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: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - 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	46	24	5	5	5	4	14	89	132	84	59	78	43	28	24	24	664
21 - 40	0	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	4
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	46	24	6	5	5	4	14	89	133	86	59	78	43	28	24	24	668

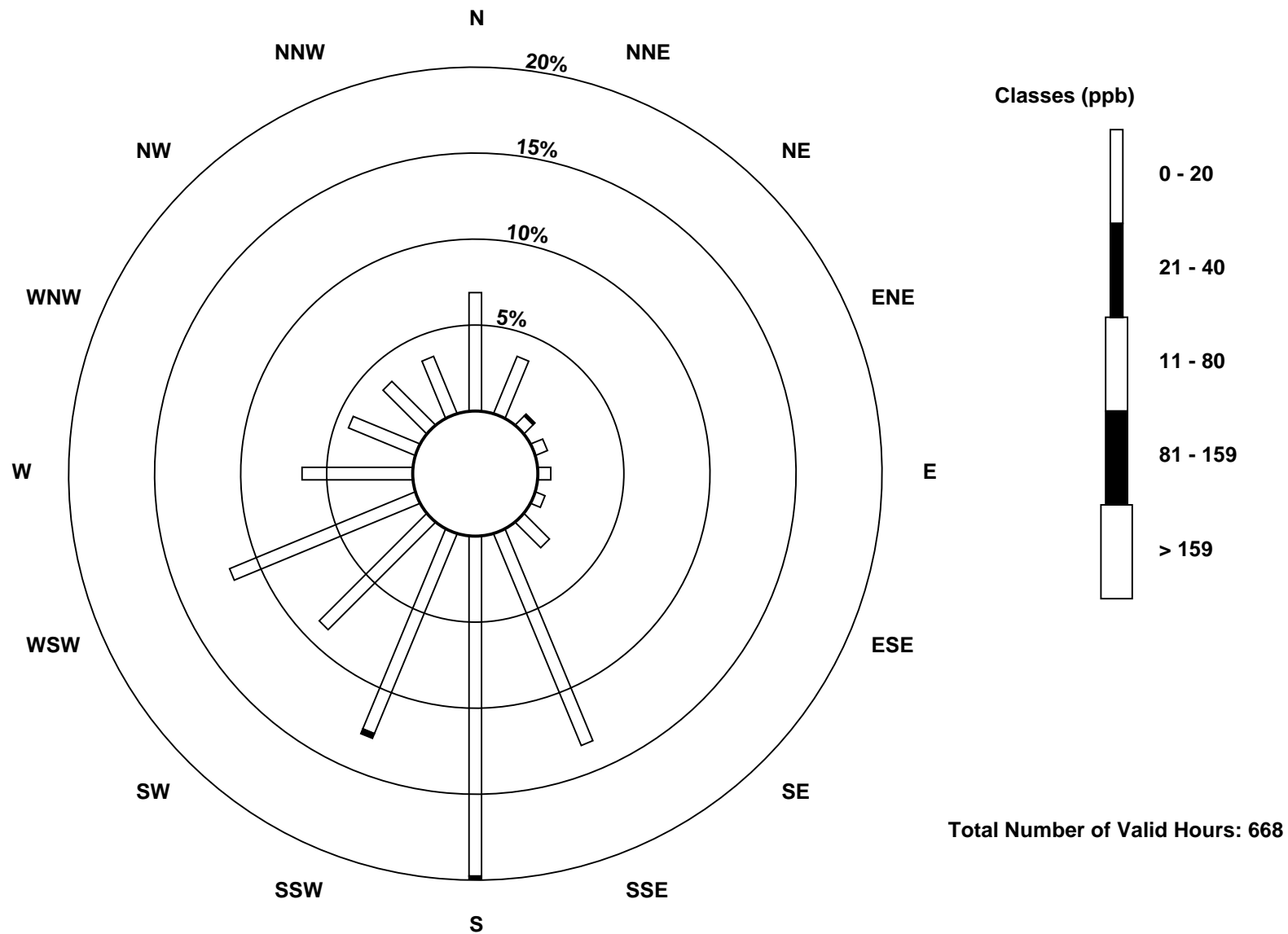
Total Number of Valid Hours: 668

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

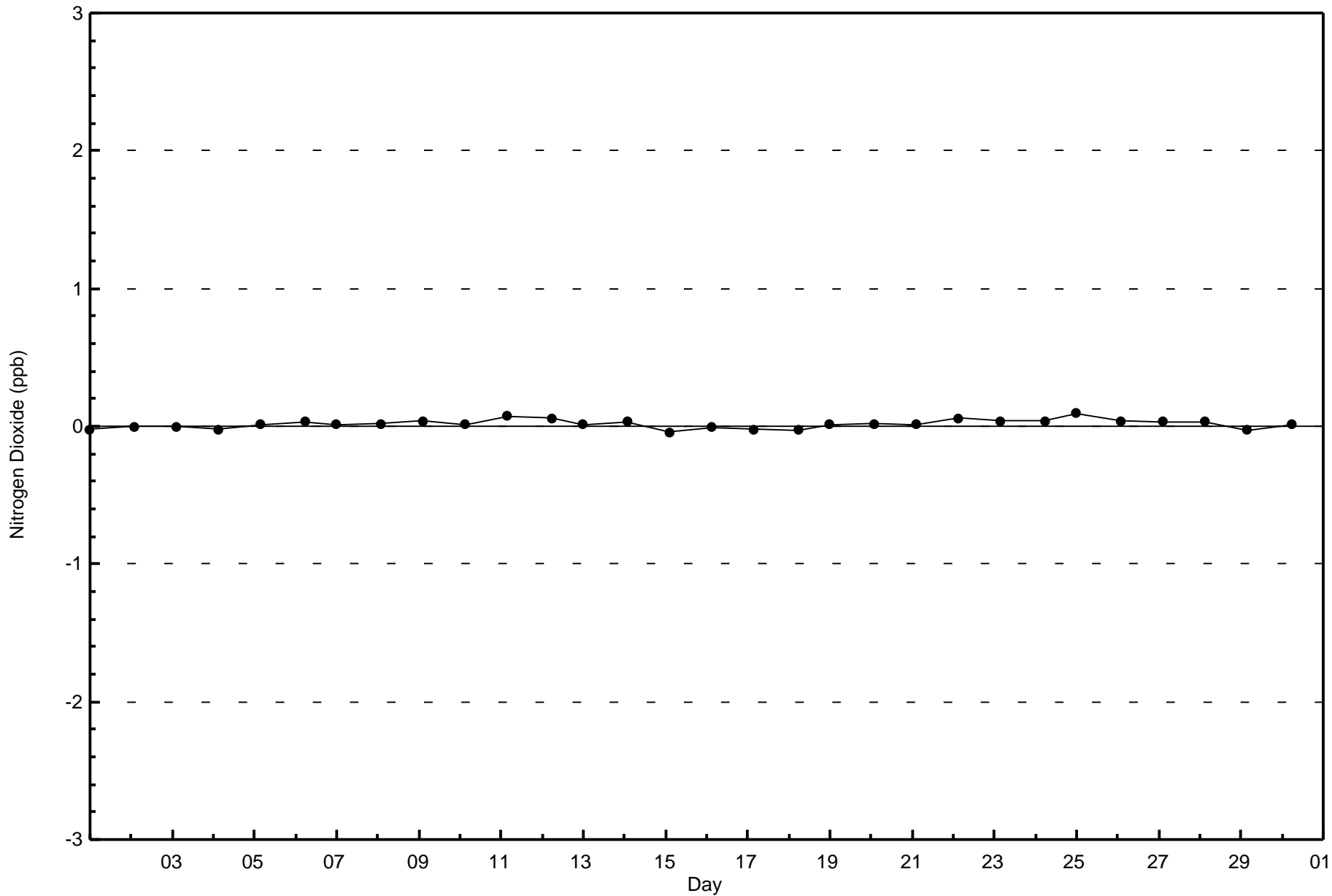
Nitrogen Dioxide (NO₂) - ppb
Fort McKay South (AMS 13)

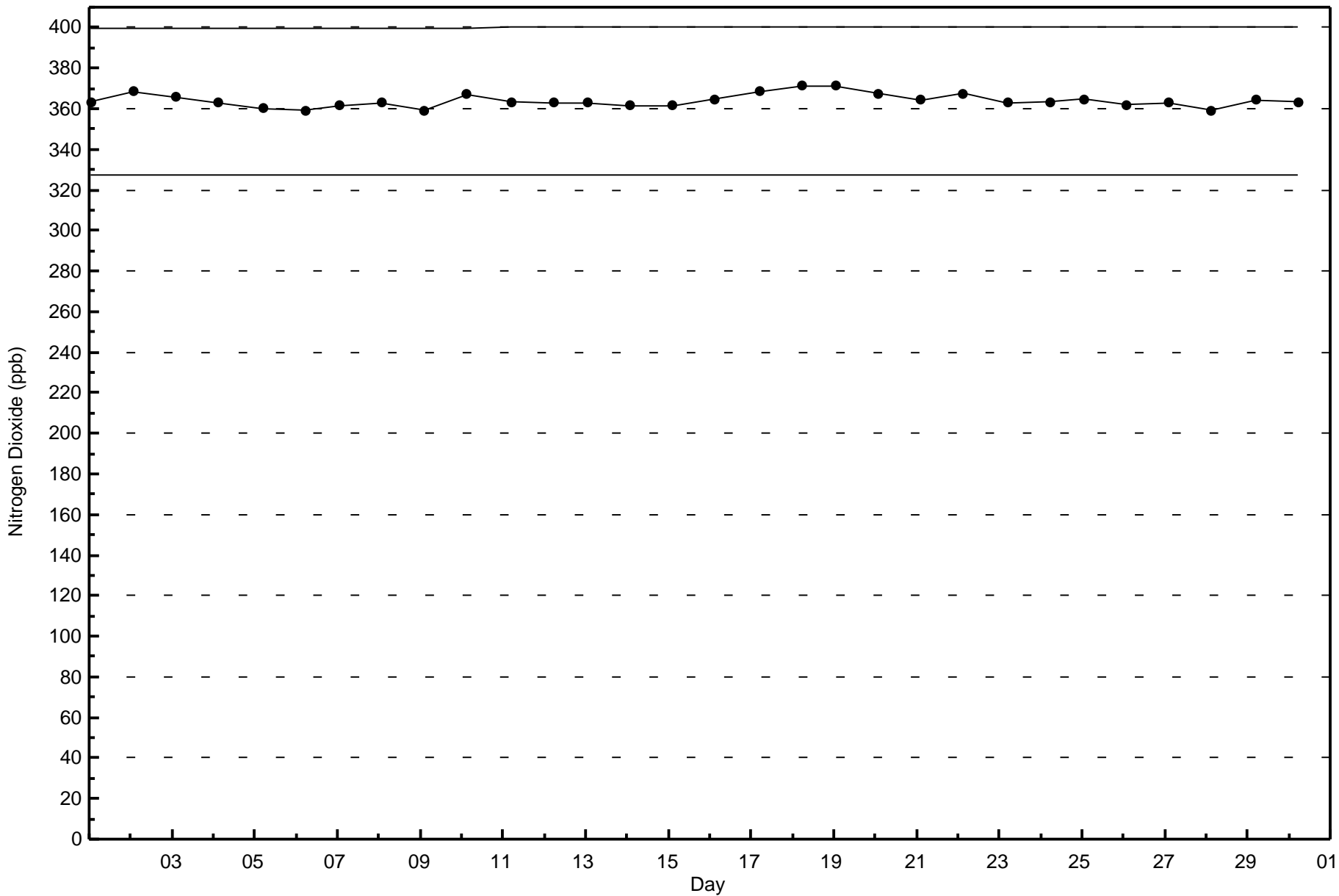




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

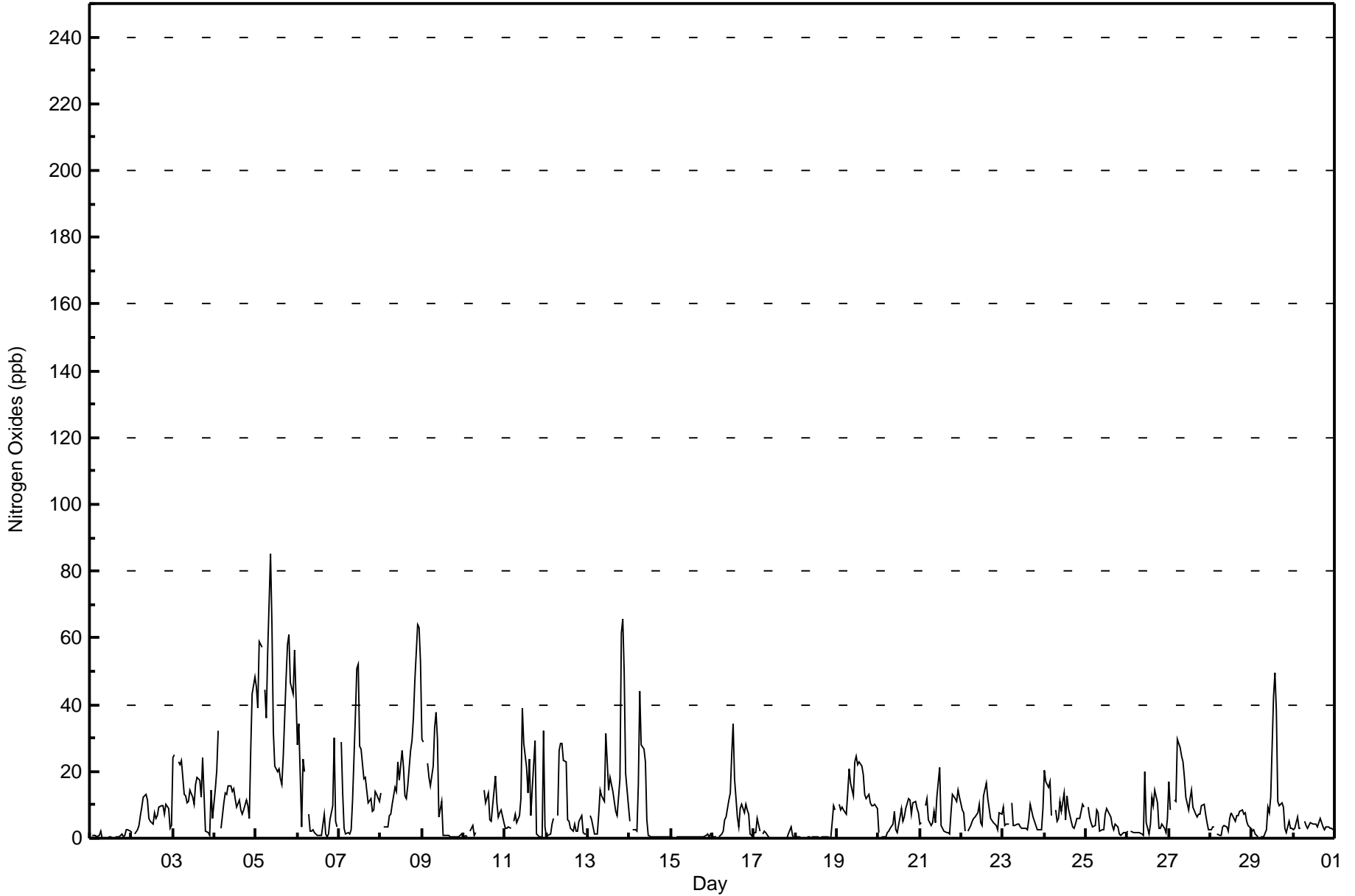
Fort McKay South - November 2016

Maximum Value: 85 ppb on Nov 5 09:00																		Maximum Daily Average: 43.2 ppb on Nov 5						Hours in Service: 720		
Minimum Value: 0 ppb on Nov 18 10:00																		Minimum Daily Average: 0.5 ppb on Nov 15						Hours of Data: 686		
Maximum Diurnal Average: 12.8 ppb at hour 11																		Minimum Diurnal Average: 5.4 ppb at hour 5						Hours of Missing Data: 34		
Monthly Average: 9.7 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 6 O ₃ = 12 P ₉₀ = 24 P ₉₉ = 61						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-Nov	Z	1	1	1	1	1	2	0	0	0	0	0	0	0	1	0	0	1	1	1	2	2	2	0.8	2	
2-Nov	2	Z	1	3	4	7	9	12	13	12	6	5	4	8	6	7	9	10	10	7	10	9	3	4	7.0	13
3-Nov	24	25	Z	23	22	23	13	13	11	11	14	12	10	16	18	17	12	24	13	2	2	1	14	6	14.3	25
4-Nov	15	20	32	Z	3	11	13	13	16	16	14	15	12	9	7	8	11	10	6	26	43	48	16.0	48		
5-Nov	45	39	59	57	Z	44	36	56	85	64	32	22	20	21	18	16	25	48	58	61	46	43	56	42	43.2	85
6-Nov	28	34	3	24	20	Z	7	2	2	2	2	1	1	1	7	1	0	1	5	10	30	5	3	8.4	34	
7-Nov	Z	29	14	3	1	2	1	2	11	37	51	52	28	27	18	18	14	10	12	8	9	14	13	11	16.8	52
8-Nov	13	Z	3	3	3	7	7	10	15	14	23	18	26	21	13	12	16	26	29	36	47	64	63	53	22.8	64
9-Nov	30	29	Z	22	18	16	22	33	38	30	6	11	1	1	1	1	1	1	1	1	1	1	1	1	11.4	38
10-Nov	1	1	1	Z	2	4	1	2	C	C	C	C	15	11	14	6	5	10	19	11	6	8	9	5	6.6	19
11-Nov	3	3	4	3	Z	5	7	4	7	12	39	28	21	13	24	7	15	29	1	1	1	1	32	3	11.5	39
12-Nov	1	1	1	4	6	Z	7	26	29	28	23	23	6	5	3	2	4	2	2	5	7	2	1	1	8.2	29
13-Nov	Z	7	5	3	1	1	7	14	13	11	31	23	14	18	14	11	8	7	18	61	66	50	20	10	17.9	66
14-Nov	5	Z	2	2	2	16	44	28	27	23	5	1	1	0	0	0	0	0	0	0	0	0	0	0	6.9	44
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1
16-Nov	0	0	0	Z	1	1	2	5	6	12	13	25	34	18	6	3	9	10	8	10	8	7	1	0	7.9	34
17-Nov	2	2	6	2	Z	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	1.0	6
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	9	1.2	10
19-Nov	Z	10	9	9	9	7	13	21	17	13	23	25	22	23	22	19	13	12	13	10	10	10	10	9	14.2	25
20-Nov	2	Z	0	0	0	2	2	3	4	8	2	2	7	9	5	6	9	12	12	7	11	11	9	8	5.7	12
21-Nov	4	4	Z	10	12	6	4	5	8	5	12	21	4	3	2	2	2	1	7	13	12	11	14	12	7.6	21
22-Nov	8	8	2	Z	2	4	5	6	6	7	10	5	4	13	17	12	9	6	5	4	4	3	8	7	6.7	17
23-Nov	9	4	4	4	Z	11	4	4	4	4	3	3	3	3	5	10	6	5	4	2	2	3	9	4.8	11	
24-Nov	20	17	15	17	7	Z	8	5	6	11	8	14	6	13	9	5	3	3	4	6	6	8	10	9	9.2	20
25-Nov	Z	9	6	5	4	4	9	8	2	3	3	7	9	8	6	4	2	4	3	1	1	1	2	2	4.4	9
26-Nov	2	Z	2	2	2	2	2	1	1	1	20	5	1	4	12	10	15	10	3	3	4	3	2	6	4.9	20
27-Nov	17	8	Z	11	11	30	27	25	23	18	12	8	12	15	9	7	6	7	7	10	10	7	5	3	12.5	30
28-Nov	2	3	3	Z	1	1	1	3	4	3	2	6	8	7	5	7	7	8	9	7	8	5	4	3	4.6	9
29-Nov	2	3	1	0	Z	0	0	0	3	9	8	12	42	49	38	11	10	11	9	3	2	5	3	3	9.8	49
30-Nov	3	3	6	3	3	Z	5	4	3	4	5	4	4	4	3	6	5	3	3	3	3	3	3	3	3.7	6
																								Diurnal Average		
																								Diurnal Maximum		
9.6 10.4 7.3 8.5 5.4 8.2 8.7 10.3 12.2 12.3 12.8 12.0 10.5 10.7 9.3 7.0 7.3 9.0 8.9 9.7 9.8 11.2 11.6 9.1																										
45 39 59 57 22 44 44 56 85 64 51 52 42 49 38 19 25 48 58 61 66 64 63 53																										
Z - zerospan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	593	86.44	86.44
21 - 40	65	9.48	95.92
41 - 80	27	3.94	99.85
81 - 159	1	0.15	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay South - 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	40	20	5	5	4	4	11	83	105	66	49	72	38	27	23	23	575
21 - 40	6	4	1	0	1	0	3	6	19	12	6	1	3	1	1	1	65
11 - 80	0	0	0	0	0	0	0	0	8	8	4	5	2	0	0	0	27
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	46	24	6	5	5	4	14	89	133	86	59	78	43	28	24	24	668

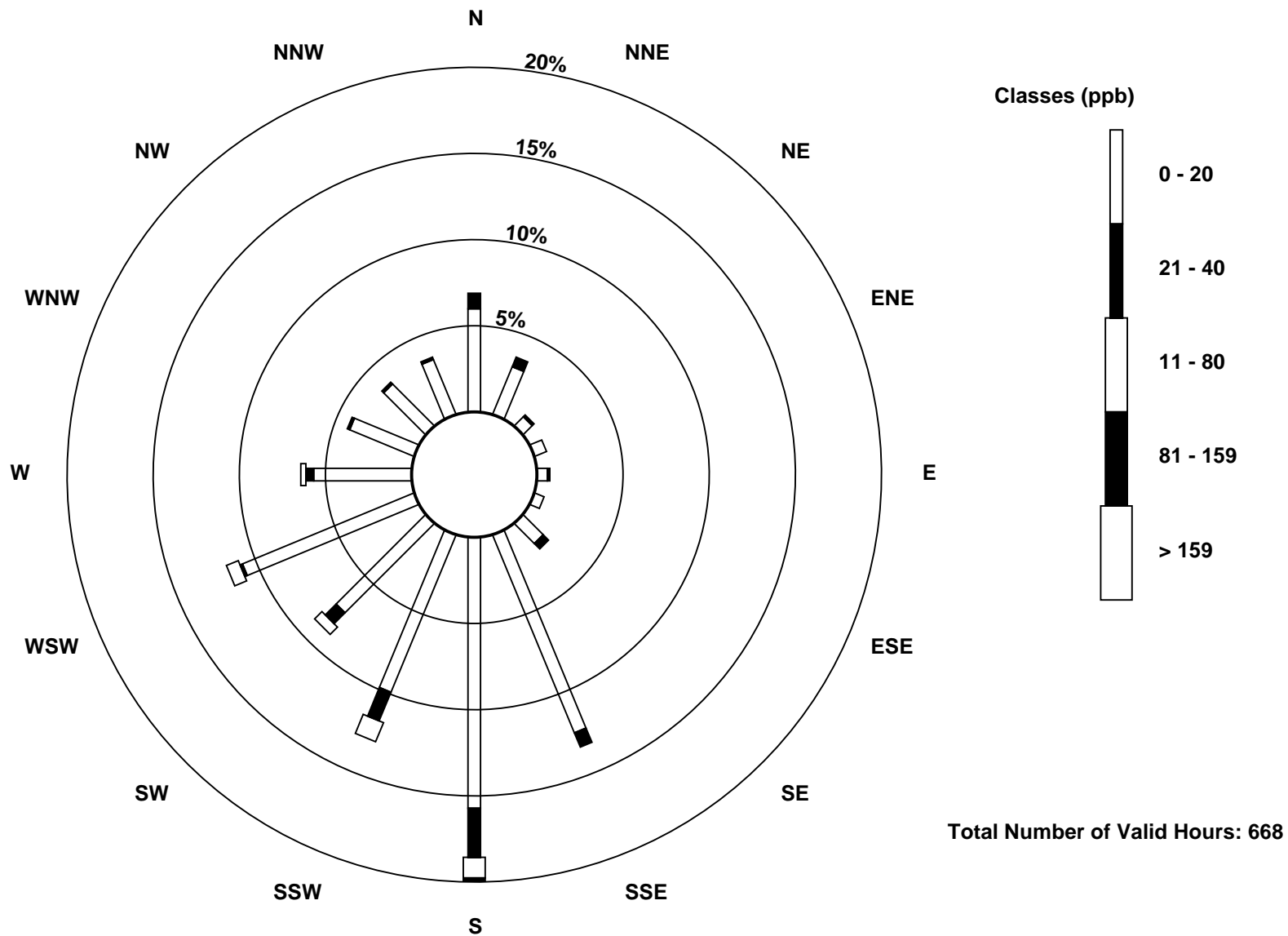
Total Number of Valid Hours: 668

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

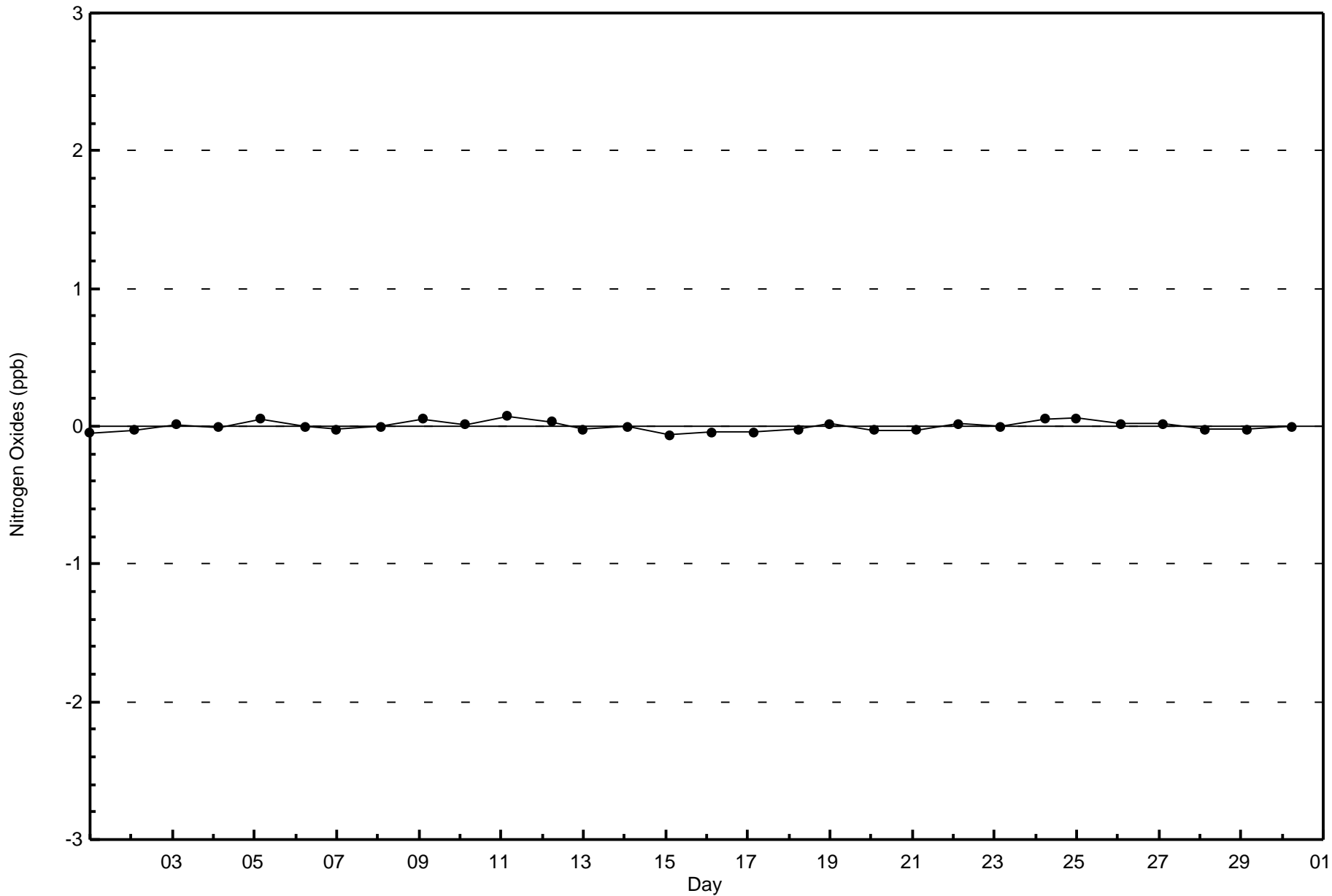
Nitrogen Oxides (NO_x) - ppb
Fort McKay South (AMS 13)

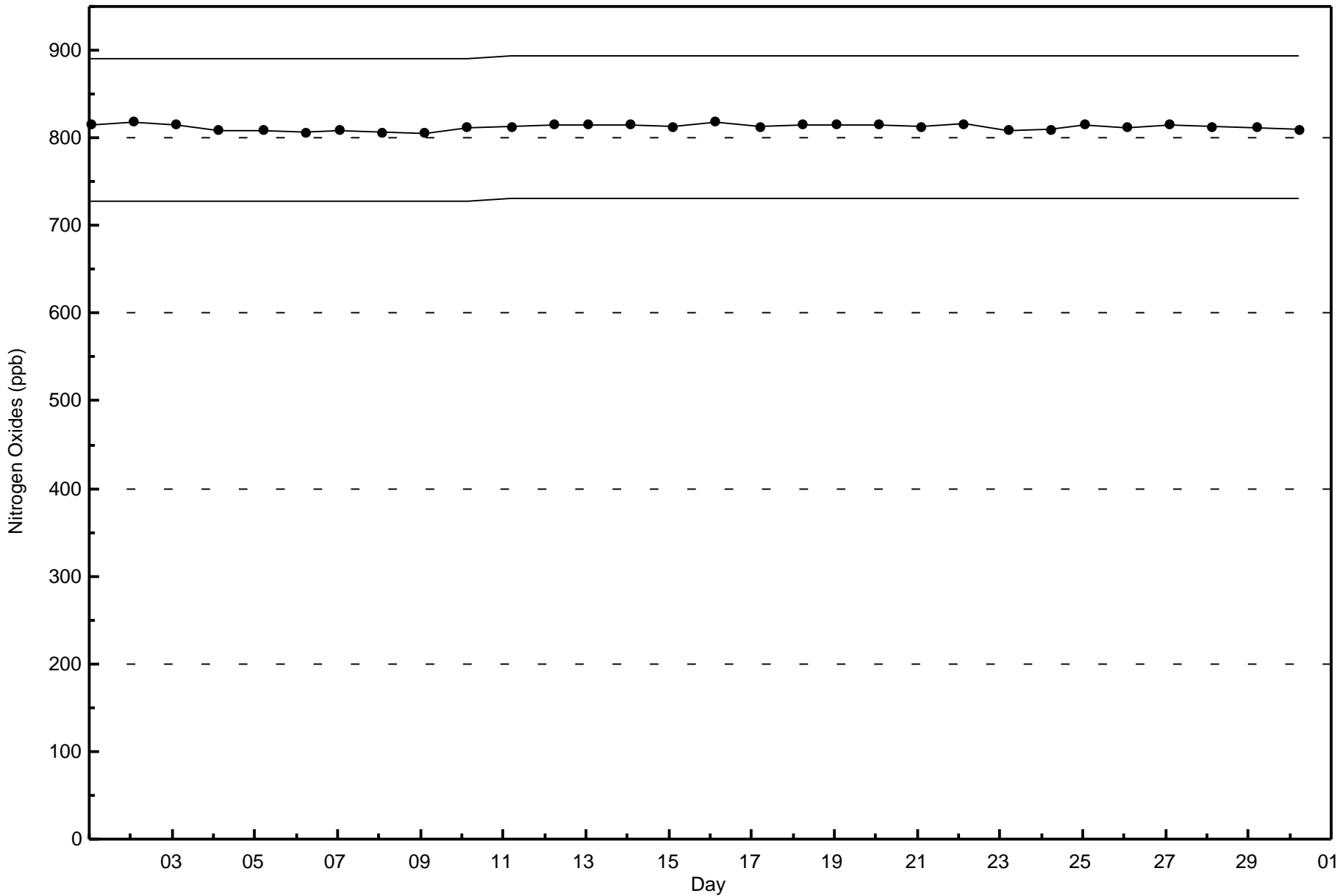




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Fort McKay South - November 2016

Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 24.6 µg/m ³ on Nov 26 08:00	Maximum Daily Average: 10.9 µg/m ³ on Nov 26	Hours of Data:	707
Minimum Value: 0.0 µg/m ³ on Nov 14 16:00	Minimum Daily Average: 0.4 µg/m ³ on Nov 17	Hours of Missing Data:	13
Maximum Diurnal Average: 5.5 µg/m ³ at hour 11	Minimum Diurnal Average: 3.6 µg/m ³ at hour 24	Hours of Calibration:	1
Monthly Average: 4.54 µg/m ³	Percentiles: P ₁ = 0.1 P ₁₀ = 0.6 Q ₁ = 2.1 Median = 3.9 Q ₃ = 6.3 P ₉₀ = 8.7 P ₉₉ = 16.7	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-Nov	UO	0.4	0.6	0.5	0.5	0.6	0.7	0.2	0.2	0.2	0.3	0.4	0.6	UO	UO	UO	UO	UO	UO	UO	0.3	0.4	0.4	0.4	--	0.7
2-Nov	0.2	0.2	0.2	0.5	0.8	2.7	3.3	3.9	3.5	4.5	3.1	2.1	2.3	5.1	1.9	3.2	4.1	4.2	5.2	5.6	4.1	3.1	2.5	4.0	2.9	5.6
3-Nov	11.2	17.1	14.6	12.7	10.1	13.1	15.4	10.0	8.1	7.6	8.9	12.1	11.5	8.8	6.8	6.2	6.1	5.3	5.6	3.9	2.5	1.5	1.4	1.5	8.4	17.1
4-Nov	1.9	2.5	1.8	2.3	3.3	5.1	5.3	6.1	6.4	4.5	3.8	4.8	5.2	5.3	4.9	7.4	8.3	8.4	13.5	10.4	8.9	9.0	9.5	6.0	13.5	
5-Nov	9.6	7.8	8.0	7.5	7.4	6.7	6.2	7.5	9.3	9.2	8.1	6.4	6.9	7.9	9.4	8.7	8.0	7.9	7.7	7.2	7.4	6.6	7.5	4.4	7.6	9.6
6-Nov	3.4	3.4	2.2	2.4	2.2	2.1	1.8	1.7	2.3	2.3	1.7	1.3	0.9	1.0	1.2	2.6	1.6	1.9	2.3	2.4	2.4	3.5	2.1	1.8	2.1	3.5
7-Nov	4.2	5.6	5.0	3.6	3.0	2.8	2.7	2.6	3.4	4.5	4.4	3.4	2.3	2.0	1.6	3.2	6.6	8.0	8.5	7.1	7.9	8.0	7.6	7.8	4.8	8.5
8-Nov	8.8	8.3	9.9	10.1	9.3	7.3	6.3	8.3	8.1	7.8	10.0	7.4	8.2	4.9	4.1	4.3	5.6	5.5	5.8	5.6	5.9	5.7	5.3	5.0	7.0	10.1
9-Nov	3.9	4.0	6.1	5.4	5.2	5.6	6.1	7.0	6.8	5.3	4.3	2.7	1.8	1.5	1.2	1.0	1.1	1.3	1.6	1.5	1.3	1.2	1.1	1.3	3.3	7.0
10-Nov	1.5	1.2	1.5	1.5	1.4	1.9	2.5	2.2	2.5	3.8	3.5	3.5	6.2	3.6	3.8	4.8	5.0	8.4	8.4	7.5	7.5	7.4	7.1	5.4	4.3	8.4
11-Nov	3.4	3.8	3.5	3.8	5.4	5.5	7.1	5.6	5.3	4.9	4.9	4.5	3.0	6.6	3.8	2.6	2.8	3.7	2.7	2.6	2.9	2.4	3.2	2.6	4.0	7.1
12-Nov	3.5	3.9	4.6	5.5	5.1	4.4	4.6	5.6	4.6	5.3	5.1	5.2	4.1	4.1	3.2	2.9	3.1	3.1	3.1	3.9	4.2	3.1	2.9	3.2	4.1	5.6
13-Nov	2.2	2.9	3.6	3.6	2.7	2.9	3.3	3.4	2.8	2.9	5.1	5.0	5.4	6.3	4.6	4.8	6.3	8.4	9.4	9.7	7.8	6.2	4.4	4.0	4.9	9.7
14-Nov	3.7	4.0	4.2	4.8	5.4	6.0	7.2	6.1	5.2	4.6	3.9	C	0.6	0.1	0.0	0.0	0.0	0.2	0.1	0.3	0.6	0.7	0.5	0.4	2.5	7.2
15-Nov	0.2	0.1	0.1	0.1	0.3	0.4	0.4	0.6	1.0	0.7	0.5	0.3	0.0	0.0	0.1	0.3	0.7	1.1	1.0	1.0	1.2	1.2	0.9	1.2	0.6	1.2
16-Nov	1.1	1.0	1.0	0.9	0.8	0.9	1.0	1.3	1.3	2.2	2.4	2.3	2.8	2.1	1.1	1.1	1.1	1.1	0.9	0.9	0.8	0.7	0.4	0.1	1.2	2.8
17-Nov	0.1	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.3	0.4	0.4	0.2	0.0	0.1	0.5	0.5	0.6	0.7	0.6	0.6	0.7	0.5	0.5	0.4	0.7
18-Nov	0.9	0.9	1.0	1.0	0.9	0.9	0.6	0.5	0.5	0.5	M	M	M	UO	0.1	0.4	0.5	0.9	1.0	1.0	1.0	1.3	1.3	1.2	0.8	1.3
19-Nov	1.4	1.5	1.5	3.0	5.3	4.5	5.1	6.0	4.9	3.9	5.2	5.6	5.7	6.9	5.7	5.0	3.6	3.0	2.9	2.4	2.1	2.2	2.4	2.5	3.9	6.9
20-Nov	1.7	1.5	1.4	1.3	0.9	1.3	1.5	1.4	1.6	2.9	2.2	1.8	3.4	8.7	3.9	3.3	5.4	6.3	7.4	6.7	6.4	6.3	5.4	5.1	3.7	8.7
21-Nov	4.7	5.3	5.4	9.0	8.8	10.3	8.6	7.7	8.9	8.8	9.1	8.8	9.0	8.3	8.0	7.6	6.7	5.0	5.2	6.1	5.5	4.8	2.9	2.4	7.0	10.3
22-Nov	2.1	2.0	1.9	2.4	2.9	3.5	3.7	3.8	3.4	3.4	3.8	3.9	4.3	7.3	6.5	5.9	4.5	3.3	3.8	4.1	4.5	4.5	5.3	4.5	4.0	7.3
23-Nov	5.8	6.0	5.6	6.5	7.1	7.0	5.1	3.9	4.3	4.7	5.3	5.3	4.9	4.5	4.0	4.0	4.1	4.3	3.5	3.6	4.1	4.3	5.3	7.0	5.0	7.1
24-Nov	6.2	5.8	6.6	8.8	9.5	8.3	7.9	7.9	8.1	8.1	11.7	12.7	9.0	10.0	10.0	8.1	7.3	7.4	7.5	8.1	8.0	8.3	7.0	5.7	8.2	12.7
25-Nov	5.3	5.0	4.1	3.4	2.7	2.6	2.7	2.7	2.8	3.3	3.3	4.1	4.2	3.8	4.1	4.0	3.9	5.2	5.5	6.4	6.8	7.3	6.9	6.5	4.4	7.3
26-Nov	8.8	9.1	7.9	7.3	9.5	17.8	22.1	24.6	23.5	21.4	19.9	12.4	8.0	7.4	6.9	7.3	8.6	6.5	4.7	5.2	5.8	4.8	4.7	7.4	10.9	24.6
27-Nov	14.3	8.6	10.9	15.9	10.0	16.5	15.9	11.8	6.2	4.7	4.5	4.2	4.4	3.7	3.9	4.4	4.0	3.8	3.9	4.0	3.8	3.5	3.4	4.1	7.1	16.5
28-Nov	3.6	3.6	3.6	3.3	3.3	3.6	4.1	4.1	7.1	9.7	12.7	13.9	14.0	12.9	11.0	8.8	8.4	6.4	5.7	5.4	4.4	4.0	3.5	3.3	6.7	14.0
29-Nov	4.0	3.8	3.5	3.4	3.5	3.5	3.5	3.2	3.1	3.7	5.7	11.0	9.1	8.9	6.7	4.8	5.3	3.4	3.4	3.1	3.2	3.2	2.1	2.0	4.5	11.0
30-Nov	2.6	2.7	3.8	3.0	2.5	3.0	3.2	2.8	2.1	2.2	3.9	3.5	3.8	3.7	3.3	4.0	4.6	3.8	3.2	3.3	3.9	4.0	4.1	3.9	3.4	4.6

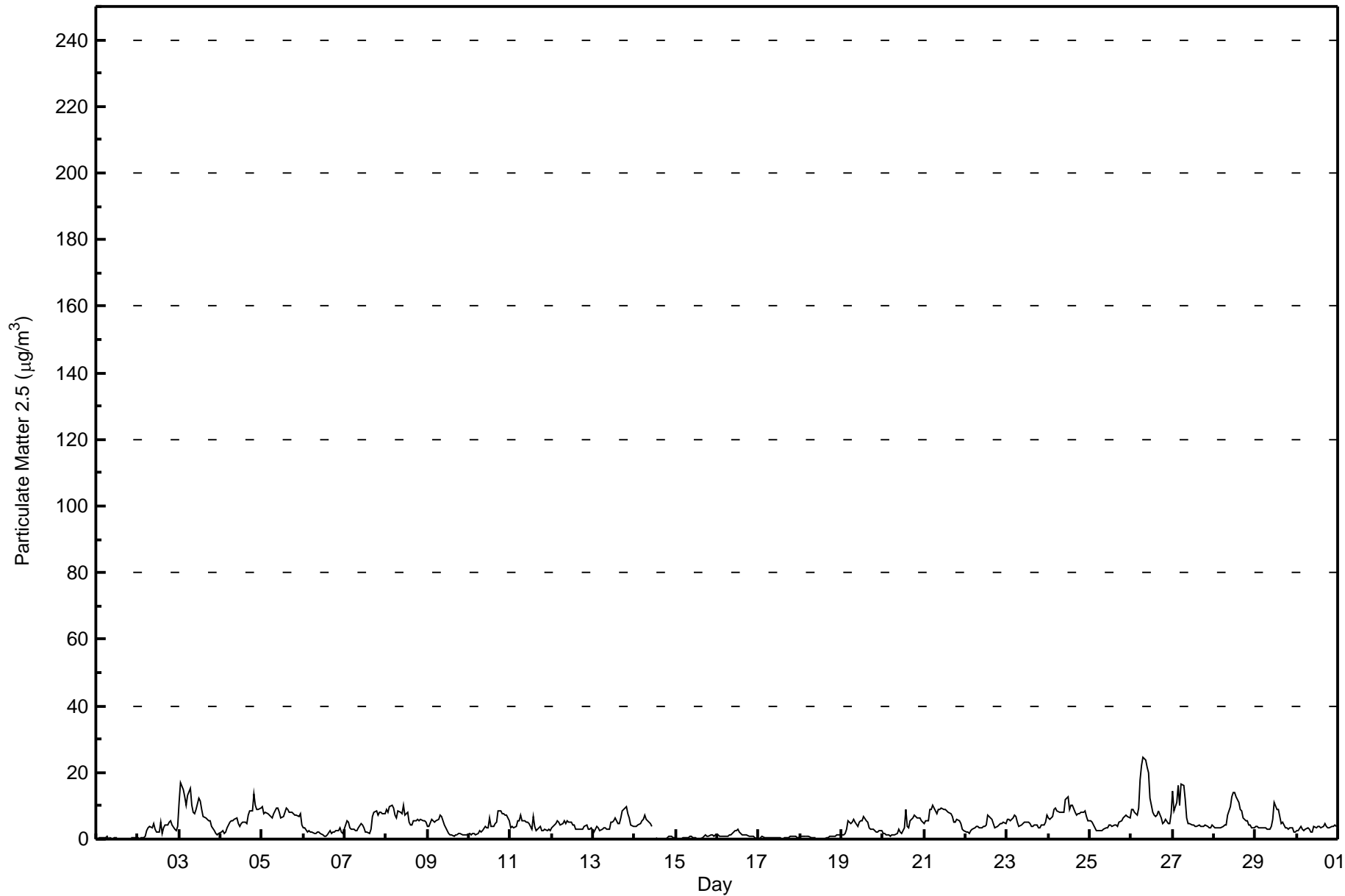
4.1	4.1	4.2	4.5	4.4	5.0	5.3	5.1	4.9	5.0	5.5	5.3	4.9	5.2	4.2	4.1	4.4	4.4	4.5	4.6	4.2	4.0	3.7	3.6	Diurnal Average	
14.3	17.1	14.6	15.9	10.1	17.8	22.1	24.6	23.5	21.4	19.9	13.9	14.0	12.9	11.0	8.8	8.6	8.4	9.4	13.5	10.4	8.9	9.0	9.5	Diurnal Maximum	

C - Calibration M - Maintenance UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	387	54.74	54.74
6 - 15	208	29.42	84.16
16 - 25	10	1.41	85.57
26 - 80	0	0.00	85.57
> 81.0	0	0.00	85.57

Total Number of Valid Hours: 707

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Fort McKay South - November 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	32	19	5	4	6	4	9	61	80	47	35	38	11	7	8	12	378
6 - 15	8	3	1	0	0	0	5	30	55	35	19	16	10	8	6	2	198
16 - 25	1	1	1	0	0	0	0	0	5	2	0	0	0	0	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	41	23	7	4	6	4	14	91	140	84	54	54	21	15	14	14	586

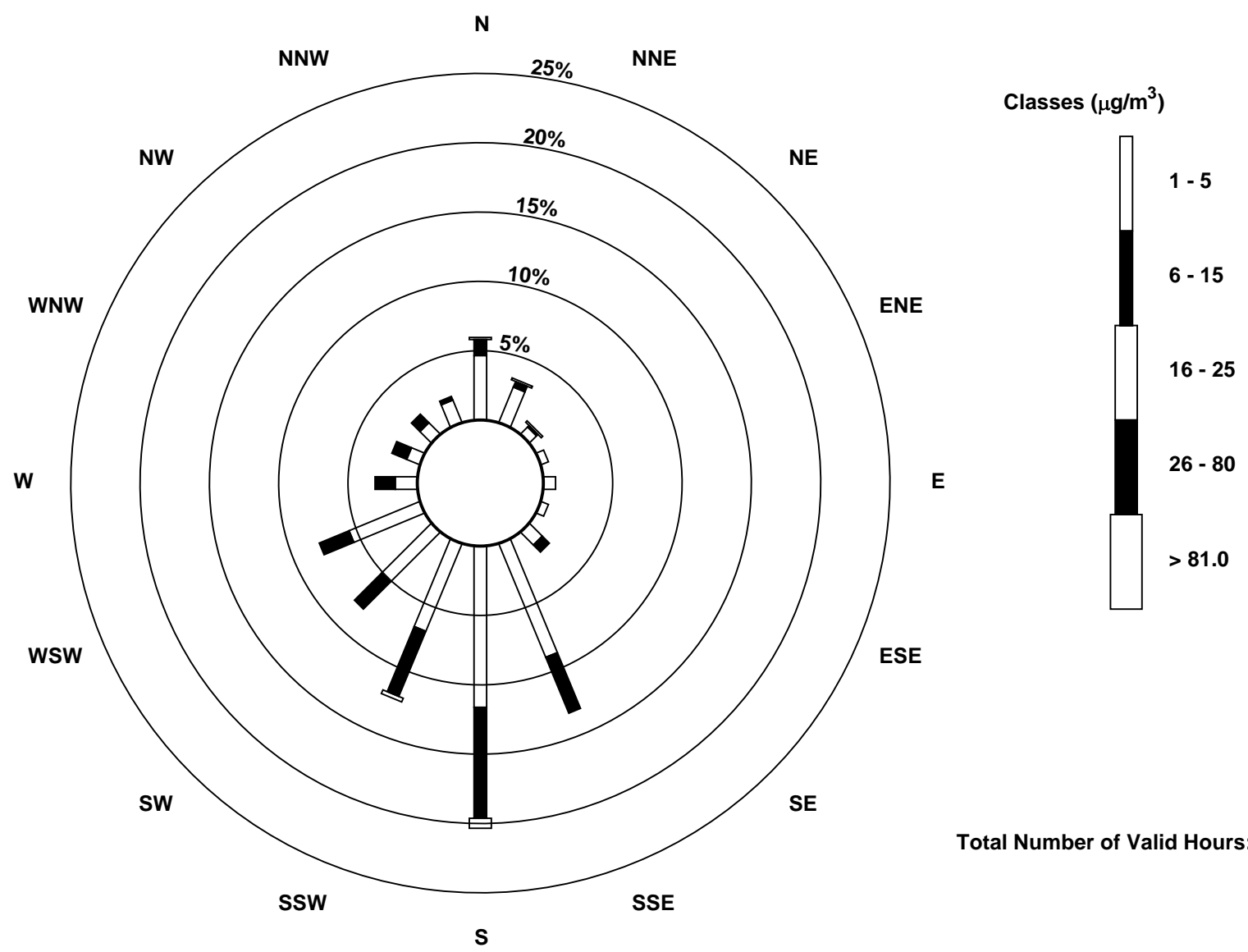
Total Number of Valid Hours: 688

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 McKay South (AMS 13)



Total Number of Valid Hours: 688



Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

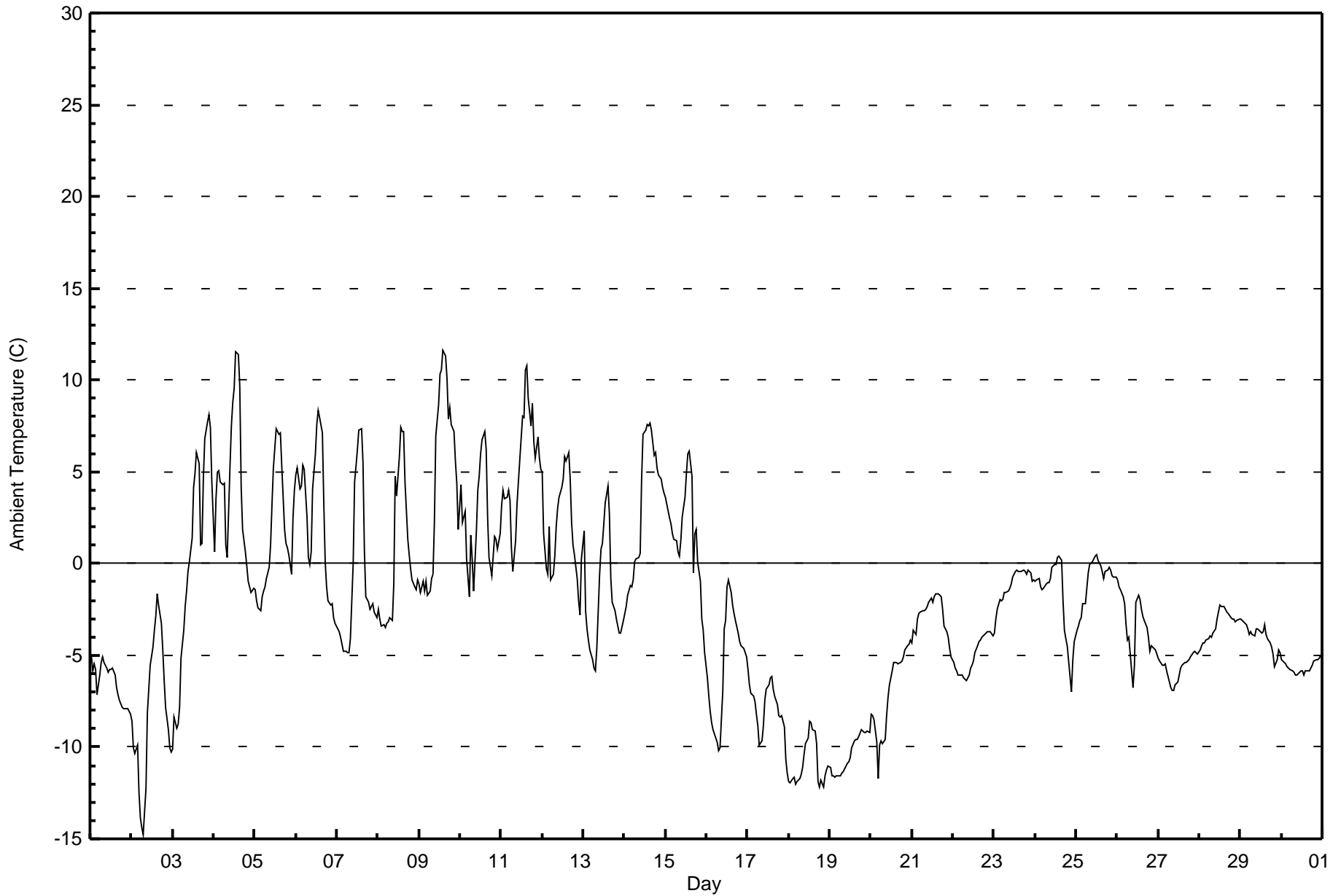
Fort McKay South - November 2016

Maximum Value: 11.6 C on Nov 9 15:00 Maximum Daily Average: 5.4 C on Nov 11		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -14.8 C on Nov 2 08:00 Maximum Diurnal Average: 1.1 C at hour 15 Monthly Average: -2.19 C		Minimum Daily Average: -10.9 C on Nov 18 Minimum Diurnal Average: -4.1 C at hour 8 Percentiles: P ₁ = -12.1 P ₁₀ = -9.1 Q ₁ = -5.5 Median = -2.6 Q ₃ = 0.6 P ₉₀ = 5.3 P ₉₉ = 10.5																								
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-Nov	-5.0	-5.8	-5.5	-5.8	-7.1	-6.1	-5.4	-5.1	-5.4	-5.7	-5.9	-5.8	-5.7	-5.7	-6.1	-6.7	-7.1	-7.4	-7.8	-7.9	-7.9	-7.9	-7.9	-8.2	-6.5	-5.0
2-Nov	-8.6	-10.0	-10.3	-9.9	-12.5	-13.9	-14.4	-14.8	-12.2	-8.2	-6.9	-5.6	-4.5	-3.6	-2.9	-1.7	-2.2	-3.3	-4.7	-6.4	-7.8	-9.1	-10.0	-10.3	-8.1	-1.7
3-Nov	-10.1	-8.3	-9.0	-8.8	-7.9	-5.2	-3.7	-2.4	-1.5	-0.4	0.1	1.4	4.1	4.9	6.1	5.5	1.0	1.1	4.7	6.8	7.8	8.1	7.4	4.5	0.3	8.1
4-Nov	0.7	3.5	5.0	5.1	4.4	4.3	4.4	1.0	0.3	5.3	7.5	8.8	9.6	11.5	11.4	9.6	4.1	1.9	0.6	-0.1	-0.9	-1.3	-1.6	-1.4	3.9	11.5
5-Nov	-1.4	-2.0	-2.4	-2.6	-1.8	-1.5	-1.3	-0.8	-0.2	1.0	3.2	5.2	7.3	7.2	7.0	7.1	5.3	1.9	1.1	0.8	0.5	-0.6	2.5	4.0	1.6	7.3
6-Nov	4.8	5.2	4.1	4.3	5.3	5.1	2.5	0.3	0.0	0.6	4.0	6.0	7.6	8.4	8.0	7.1	3.3	0.1	-1.3	-2.1	-2.3	-2.2	-2.9	-3.3	2.6	8.4
7-Nov	-3.5	-3.7	-4.0	-4.4	-4.8	-4.8	-4.8	-4.9	-4.1	0.0	4.4	5.3	6.2	7.3	7.3	5.6	0.7	-1.8	-2.1	-2.5	-2.4	-2.2	-2.6	-3.0	-0.8	7.3
8-Nov	-2.5	-3.1	-3.4	-3.3	-3.5	-3.2	-3.2	-2.9	-3.1	-1.1	4.8	3.7	5.8	7.5	7.2	7.2	4.4	1.4	0.5	-0.3	-0.9	-1.3	-1.4	-0.9	0.4	7.5
9-Nov	-1.1	-1.6	-1.0	-1.5	-0.9	-1.7	-1.5	-0.8	-0.6	2.2	7.0	8.6	10.3	10.5	11.6	11.3	10.1	7.9	8.5	7.5	7.2	5.6	4.3	1.8	4.3	11.6
10-Nov	4.3	2.2	2.5	2.9	0.3	-1.8	1.6	0.3	-1.5	1.8	4.0	4.8	5.9	6.7	7.2	6.2	2.6	0.3	-0.7	0.4	1.5	1.3	0.8	1.6	2.3	7.2
11-Nov	3.2	4.0	3.5	3.6	4.0	3.4	0.8	-0.5	1.3	3.2	4.5	5.7	8.0	8.0	10.5	10.8	9.0	7.5	8.7	6.7	5.8	6.9	5.7	5.1	5.4	10.8
12-Nov	5.0	1.7	-0.3	-0.6	2.0	-0.9	-0.5	0.4	2.0	3.0	3.6	4.2	4.6	5.8	5.6	6.1	4.6	2.3	1.0	0.5	-0.8	-2.0	-2.8	0.3	1.9	6.1
13-Nov	1.8	-2.5	-3.5	-4.2	-4.7	-5.2	-5.7	-5.8	-4.6	-0.6	0.8	1.1	2.2	3.3	4.2	2.7	-0.8	-2.1	-2.6	-3.1	-3.4	-3.8	-3.8	-3.1	-1.8	4.2
14-Nov	-2.7	-2.3	-1.8	-1.2	-1.2	-0.9	0.1	0.2	0.3	0.6	4.6	7.0	7.3	7.6	7.5	7.7	7.3	5.9	6.1	5.2	4.9	4.6	4.2	3.9	3.1	7.7
15-Nov	3.6	3.2	2.5	2.2	1.7	1.4	1.2	0.7	0.4	1.2	2.6	3.6	4.9	6.0	6.1	4.8	-0.5	1.6	1.8	0.1	-1.0	-3.1	-3.6	-4.9	1.5	6.1
16-Nov	-6.2	-7.2	-8.1	-8.7	-9.0	-9.5	-9.8	-10.2	-10.0	-6.9	-3.5	-3.1	-1.3	-0.9	-1.6	-2.3	-2.7	-3.1	-3.8	-4.3	-4.5	-4.6	-4.6	-5.1	-5.5	-0.9
17-Nov	-5.8	-6.6	-7.0	-7.2	-7.5	-8.2	-8.8	-9.9	-9.7	-8.8	-7.4	-6.9	-6.6	-6.2	-6.2	-6.8	-7.2	-7.7	-8.3	-8.4	-8.3	-8.9	-10.7	-11.4	-7.9	-5.8
18-Nov	-11.9	-11.9	-11.7	-11.6	-12.0	-11.9	-11.7	-11.5	-11.1	-10.5	-9.8	-9.5	-8.6	-8.7	-9.1	-9.1	-9.8	-11.9	-12.1	-11.8	-12.2	-11.6	-11.3	-11.0	-10.9	-8.6
19-Nov	-11.1	-11.6	-11.5	-11.7	-11.6	-11.6	-11.6	-11.4	-11.3	-11.1	-10.9	-10.8	-10.5	-10.1	-9.7	-9.6	-9.6	-9.4	-9.0	-9.2	-9.2	-9.2	-9.1	-9.2	-10.4	-9.0
20-Nov	-8.2	-8.3	-8.5	-9.7	-11.7	-9.9	-9.7	-9.8	-9.5	-8.3	-7.3	-6.6	-5.9	-5.4	-5.4	-5.4	-5.5	-5.4	-5.3	-5.1	-4.7	-4.5	-4.4	-4.2	-7.0	-4.2
21-Nov	-4.3	-3.6	-3.8	-3.0	-2.7	-2.7	-2.6	-2.6	-2.5	-2.4	-2.1	-1.9	-2.1	-1.8	-1.6	-1.7	-1.8	-1.8	-2.5	-3.4	-3.7	-4.0	-4.6	-5.1	-2.8	-1.6
22-Nov	-5.4	-5.7	-5.9	-6.1	-6.1	-6.1	-6.2	-6.3	-6.3	-6.1	-5.7	-5.5	-5.3	-4.9	-4.5	-4.3	-4.2	-4.0	-3.8	-3.8	-3.7	-3.7	-3.7	-4.0	-5.1	-3.7
23-Nov	-3.8	-3.1	-2.5	-2.0	-2.0	-1.9	-1.6	-1.5	-1.4	-1.1	-0.7	-0.4	-0.3	-0.4	-0.4	-0.4	-0.5	-0.4	-0.4	-0.6	-0.4	-0.5	-0.9	-0.9	-1.2	-0.3
24-Nov	-1.0	-0.9	-0.8	-1.3	-1.4	-1.4	-1.1	-1.1	-1.0	-0.8	-0.2	0.0	-0.1	0.3	0.4	0.2	-2.0	-3.6	-4.1	-4.5	-6.1	-7.0	-5.2	-4.2	-2.0	0.4
25-Nov	-3.6	-3.4	-3.1	-2.9	-2.2	-2.2	-1.3	-0.5	0.0	0.1	0.3	0.4	0.5	0.1	-0.2	-0.4	-0.8	-0.4	-0.3	-0.2	-0.4	-0.7	-0.7	-0.7	-1.0	0.5
26-Nov	-0.9	-1.3	-1.5	-1.8	-2.2	-3.4	-4.2	-4.0	-5.8	-6.7	-5.5	-2.1	-1.7	-2.0	-2.5	-2.9	-3.1	-3.5	-4.0	-4.8	-4.5	-4.6	-4.7	-4.9	-3.4	-0.9
27-Nov	-5.2	-5.3	-5.6	-5.5	-5.5	-5.9	-6.5	-6.8	-6.9	-6.9	-6.6	-6.4	-6.1	-5.7	-5.5	-5.4	-5.4	-5.3	-5.2	-5.1	-4.8	-4.8	-4.9	-4.9	-5.7	-4.8
28-Nov	-4.7	-4.5	-4.3	-4.3	-4.2	-4.1	-4.0	-4.0	-3.8	-3.6	-3.0	-2.7	-2.3	-2.4	-2.3	-2.5	-2.6	-2.7	-3.0	-3.0	-3.0	-3.2	-3.1	-3.0	-3.3	-2.3
29-Nov	-3.0	-3.1	-3.2	-3.3	-3.6	-3.9	-3.7	-3.9	-4.0	-3.6	-3.6	-3.6	-3.8	-3.7	-3.4	-3.8	-4.1	-4.3	-4.5	-5.0	-5.6	-5.2	-4.7	-4.9	-4.0	-3.0
30-Nov	-5.2	-5.4	-5.4	-5.6	-5.7	-5.8	-5.9	-5.9	-6.1	-6.1	-6.0	-5.8	-5.8	-6.1	-5.9	-5.9	-5.8	-5.7	-5.5	-5.3	-5.3	-5.2	-5.2	-5.0	-5.7	-5.0
	-3.1	-3.4	-3.6	-3.6	-3.8	-4.0	-4.0	-4.1	-3.9	-2.7	-1.1	-0.4	0.5	0.9	1.1	0.8	-0.8	-1.7	-1.9	-2.3	-2.5	-2.8	-3.0	-3.1	Diurnal Average	
	5.0	5.2	5.0	5.1	5.3	5.1	4.4	1.0	2.0	5.3	7.5	8.8	10.3	11.5	11.6	11.3	10.1	7.9	8.7	7.5	7.8	8.1	7.4	5.1	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Fort McKay South - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Fort McKay South - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	512	71.11	71.11
0 - 10	199	27.64	98.75
10 - 20	9	1.25	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) - %

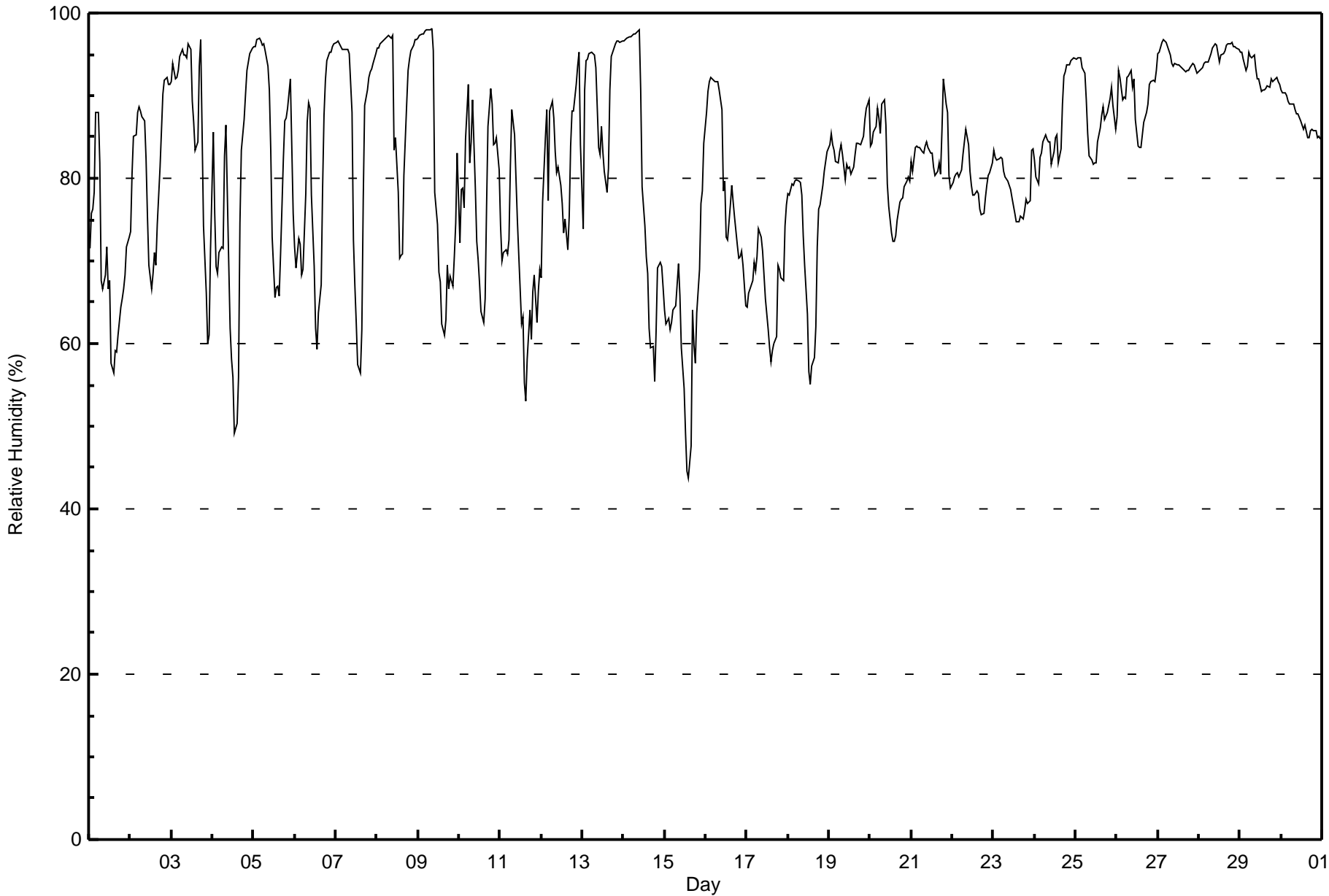
Fort McKay South - November 2016

Maximum Value: 98 % on Nov 9 09:00 Maximum Daily Average: 95.1 % on Nov 28																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 44 % on Nov 15 15:00 Minimum Daily Average: 62.4 % on Nov 15 Maximum Diurnal Average: 87.6 % at hour 8 Minimum Diurnal Average: 72.0 % at hour 15 Monthly Average: 82.0 % Percentiles: P ₁ = 54 P ₁₀ = 65 Q ₁ = 74 Median = 84 Q ₃ = 92 P ₉₀ = 96 P ₉₉ = 98																										
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	71	76	76	78	88	88	82	68	67	68	72	67	68	58	56	59	59	61	64	65	67	68	72	73	69.6	88
2-Nov	74	81	85	85	88	89	88	87	87	82	75	69	67	69	71	69	74	81	86	90	92	92	91	91	81.9	92
3-Nov	92	94	92	92	93	95	96	95	95	96	96	96	89	87	83	84	94	97	86	74	66	60	61	71	86.7	97
4-Nov	86	76	69	69	71	72	72	83	86	70	62	58	56	49	50	56	75	83	87	90	93	94	95	96	74.9	96
5-Nov	96	96	97	97	97	96	96	95	94	91	83	73	66	67	67	66	71	82	87	87	89	92	84	76	85.1	97
6-Nov	72	69	73	72	68	69	78	87	89	88	78	69	62	59	64	67	79	88	92	94	95	95	96	96	79.2	96
7-Nov	96	97	96	96	96	96	96	96	95	88	73	67	63	58	57	62	77	89	91	92	93	93	94	95	85.5	97
8-Nov	96	96	96	97	97	97	97	97	97	97	83	85	78	70	71	71	80	89	93	94	95	96	97	97	90.3	97
9-Nov	97	97	98	97	98	98	98	98	98	95	78	74	69	67	62	61	63	70	67	68	67	71	75	83	81.2	98
10-Nov	72	79	79	76	85	91	82	84	90	79	72	70	67	64	63	65	77	86	91	89	84	84	85	81	79.0	91
11-Nov	74	70	71	71	71	72	82	88	85	80	75	71	62	63	55	53	58	64	60	66	68	62	66	69	69.2	88
12-Nov	68	77	85	88	77	88	89	87	83	81	81	79	77	73	75	71	75	84	88	88	91	94	95	84	82.6	95
13-Nov	74	91	94	94	95	95	95	95	93	84	83	86	83	81	78	81	91	95	96	96	97	97	97	97	90.3	97
14-Nov	97	97	97	97	97	97	97	98	98	98	91	79	74	70	68	62	59	60	55	62	69	70	69	67	80.4	98
15-Nov	64	62	63	62	63	64	65	67	70	66	59	55	49	45	44	48	64	60	58	64	69	77	78	84	62.4	84
16-Nov	88	91	92	92	92	92	92	92	91	88	78	80	73	73	77	79	77	75	72	70	70	71	70	65	80.8	92
17-Nov	64	66	67	68	70	69	71	74	73	71	68	65	62	59	58	59	60	61	69	69	68	68	74	77	67.1	77
18-Nov	78	78	79	79	80	80	80	79	78	73	70	64	57	55	57	58	62	72	76	77	79	81	82	83	73.2	83
19-Nov	84	85	84	83	82	82	83	84	83	80	82	81	81	80	81	83	84	84	84	85	85	87	88	89	83.6	89
20-Nov	84	84	86	86	89	87	85	89	89	86	79	77	73	72	72	73	75	77	77	78	79	80	80	80	80.8	89
21-Nov	82	81	84	84	84	84	83	83	84	84	84	83	83	81	80	81	82	81	86	92	89	88	80	79	83.4	92
22-Nov	79	80	81	81	80	81	83	84	86	84	81	79	78	78	78	76	76	76	76	78	79	80	81	82	80.0	86
23-Nov	83	83	82	82	83	82	81	80	80	79	79	78	76	75	75	75	75	76	76	77	77	77	83	83	79.0	83
24-Nov	82	80	79	82	83	84	85	85	84	84	82	83	85	85	82	83	89	92	93	94	94	94	94	95	86.5	95
25-Nov	94	95	95	95	93	93	90	85	83	82	82	82	82	84	86	88	89	87	88	89	90	91	89	86	88.1	95
26-Nov	87	93	92	90	90	90	92	92	93	91	92	87	84	84	84	85	87	88	89	91	92	92	92	93	89.6	93
27-Nov	95	95	97	97	97	97	96	95	94	94	94	94	94	94	93	93	93	93	93	93	94	94	93	93	94.3	97
28-Nov	93	93	93	94	94	94	95	95	96	96	96	96	95	94	95	95	96	96	96	96	96	96	96	96	95.1	96
29-Nov	95	95	94	93	93	95	95	95	95	93	92	92	91	91	91	91	91	91	92	92	92	92	92	91	92.7	95
30-Nov	91	90	90	90	89	89	89	89	88	88	88	87	86	86	86	85	85	86	86	86	86	85	85	85	87.3	91
83.6 84.9 85.5 85.6 86.0 86.8 87.0 87.6 87.4 84.6 80.3 77.5 74.3 72.4 72.0 72.7 77.3 80.7 81.8 82.9 83.5 84.0 84.5 84.5																								Diurnal Average		
97 97 98 97 98 98 98 98 98 98 96 96 94 95 95 95 96 97 96 96 97 97 97 97																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Fort McKay South - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Fort McKay South - November 2016

Maximum Speed: 18 km/h on Nov 23 12:00	Maximum Daily Speed Average: 14.0 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 14 03:00	Minimum Daily Speed Average: 0.4 km/h on Nov 21	Hours of Data: 701
Maximum Diurnal Speed Average: 4.9 km/h at hour 12	Minimum Diurnal Speed Average: 2.1 km/h at hour 19	Hours of Missing Data: 19
Monthly Average Velocity: 2.9 km/h 204.5 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 3 Median = 6 Q ₃ = 9 P ₉₀ = 11 P ₉₉ = 17	Percent Operational Time: 97.4

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-Nov	NNW9	NW3	NW3	NW2	WSW2	SSW2	WSW4	WNN9	W8	WNN7	WNN7	WNN8	W8	NW9	NNW12	NNW12	NNW10	NNW11	N8	N9	N5	W1	SW1	SSE5	NW5.1	NNW12	
2-Nov	SE6	S2	SSW2	NW1	SW2	SSW2	WSW2	WSW2	SSW2	SSE9	SSE12	S13	SSE14	SSE13	SSE13	S11	S7	S10	SSW5	W2	SW2	SSW2	WSW3	SSW1	S5.1	SSE14	
3-Nov	S4	S5	S5	SSW4	SW3	S4	S7	S8	S7	S7	S10	S9	S12	SSE10	SSE6	S3	SSW6	S8	SSW10	SSW13	SSW11	SW9	SSW10	SSW6	S7.0	SSW13	
4-Nov	SSW7	SSW11	SSW12	SSW12	SSW10	SW10	SSW5	SW3	SSW4	S7	SSE8	S8	S7	SSE8	S9	S6	SSW3	SSW3	WSW2	WNN2	SW2	W2	SW3	WSW2	SSW5.5	SSW12	
5-Nov	W1	SW3	W2	SSW3	S4	SSW3	SSW2	SSW3	S5	S4	SSE7	SSE10	SSE7	SSE7	SSE8	S7	SSW5	SSW3	SW2	S5	S4	S5	S6	SW6	S4.4	SSE10	
6-Nov	SW9	SSW9	SSW7	SSW7	SW10	SSW8	NNW1	N2	SSW1	S2	WSW7	WSW9	SW9	SW6	SSE1	SSE1	SSW3	SW6	S2	WSW3	SSW4	S5	SW3	WSW3	SW4.4	SW10	
7-Nov	SW2	NNW2	SW2	WSW2	SW2	SW2	NNW1	WSW1	SSW3	S7	S6	S8	S9	S9	S10	S8	SSW4	SW3	WSW1	W2	SW2	NNW2	SSW2	SSW2	SSW3.1	S10	
8-Nov	WNN1	W1	SSW3	SW2	SSW3	SSW3	S1	SSW2	S3	S3	SSE4	S8	SE7	SSE9	S8	S10	S4	S4	SW3	W2	WSW2	WSW2	SSW2	S6	S3.5	S10	
9-Nov	S4	S6	S5	SSW5	S3	S3	S5	W1	S3	SSW4	SW5	WSW8	WSW11	WSW6	WSW6	W6	WSW7	WSW6	WSW10	WSW11	WSW8	SW7	SW7	WSW4	SW5.3	WSW11	
10-Nov	WSW10	SW4	WSW12	WSW13	S7	SSW3	WSW11	SW2	S5	SSE4	S8	S10	SE9	SSE10	SSE10	S9	S5	S3	S5	S8	S8	SSW5	S7	S9	SSW5.9	WSW13	
11-Nov	S12	S14	S12	S11	S11	S7	S5	SSW6	S7	S7	S10	S10	S12	SSE11	S8	SSW11	S9	SSW6	SW5	SW5	SW6	WSW8	SSW7	SW9	S8.1	S14	
12-Nov	WSW8	SSW4	S3	SW4	SSW4	SW2	SSW3	S3	S6	SSW1	SW1	NNE2	E1	SSE4	SSW3	WSW9	WNN2	NNW1	SSW1	W1	S2	SE1	S2	W8	SW2.3	WSW9	
13-Nov	W8	ENE2	NNE1	SSW2	SSW1	SSE1	S3	SSE2	S3	SSE6	SE5	SSE7	SSE8	SE8	SSE9	S5	WSW3	SW3	WSW3	WSW2	SW3	W2	WSW2	WNN1	S2.6	SSE9	
14-Nov	WNN2	SW2	SW0	WSW1	SSW2	S3	SSW4	NW2	WSW2	SW2	WSW7	WSW7	WSW7	WSW8	W9	WNN11	WNN8	W6	W9	W11	W13	WSW14	WSW15	WSW15	WSW6.1	WSW15	
15-Nov	W10	W10	W9	W12	WSW13	WSW12	WSW12	W9	WSW12	WSW13	WSW12	WSW11	W8	WSW8	WSW8	WSW5	SSW5	WSW7	W8	WNN4	W6	W2	W3	WNN2	WSW8.1	WSW13	
16-Nov	SSW1	SW1	WSW2	WSW1	WSW2	S2	SSE2	S2	WSW2	NE1	ESE2	E2	SE2	NNE8	NE10	NE8	NNE11	NNE12	NNE12	NNE12	N10	N10	N11	N15	NNE4.4	N15	
17-Nov	NNW11	NNW9	NNW9	NNW10	NNW9	NNW7	WNN6	W6	W6	W3	WSW4	W7	WNN7	W7	WNN10	WNN10	WNN9	NNW11	NNW9	NNW5	NW4	W4	W6	W7	NW6.4	NNW11	
18-Nov	W8	W4	WSW1	SW2	SW3	WSW2	WSW2	SW2	WSW2	WNN3	NNW3	NW5	SW7	WSW8	SW3	SW4	SSW3	SW3	WSW3	SSW1	WNN2	NW4	NW5	N5	W2.6	W8	
19-Nov	N4	NNE6	N7	NNE6	NNE6	NNE5	N5	N6	N6	N8	N8	N9	N9	N10	N10	N9	N9	NNW9	N9	N8	N6	N4	NNE6	N3	N6.8	N10	
20-Nov	E5	E4	E4	E3	ENE2	ENE4	ENE2	NNW2	SSW1	S6	SSE12	SSE11	SSE9	S8	SSE7	SSE7	S4	S4	S5	SSE6	SSE7	SE7	ESE4	ESE3	SSE4.2	SSE12	
21-Nov	NE2	SE5	SE2	SSE10	SSE9	SSE11	S11	S9	S6	S5	SSE2	WNN2	WNN5	WNN3	NW4	WNN4	WNN4	NW5	N10	NNE8	N7	N7	NNE9	NNE8	ESE0.4	S11	
22-Nov	NNE6	NNE5	ENE4	NE3	N3	NNE1	SSE2	SSE1	W1	SSW2	SSE4	SE6	SSE5	SSE5	SSE2	SSE5	S8	SSE10	SSE11	S8	SSE10	SSE12	SE12	SE9	SSE4.1	SE12	
23-Nov	SSE10	SSE14	SSE16	SSE17	SSE15	SSE13	SSE16	SSE17	S17	SSE16	SSE17	SSE18	SSE17	SSE17	SSE16	SSE15	SSE12	SSE11	SSE10	SSE11	S14	S13	SSW9	S9	SSE14.0	SSE18	
24-Nov	S8	S9	S9	S9	S8	S8	SSE8	S9	SSE9	SSE8	S9	SSW10	SSW7	S7	SSE8	SSW5	SW1	NNW1	NW3	NW2	WSW1	W2	SE4	W1	S5.3	SSW10	
25-Nov	NNE4	NNE3	NNE3	N4	NNE4	N3	SE5	SSE10	SSE13	SSE12	SSE9	SE6	ESE4	N2	NNW2	WNN2	WSW1	WNN3	WSW4	SW3	WSW5	SW6	SW6	SW7	S1.8	SSE13	
26-Nov	SW7	SW5	WSW6	WSW6	SW5	SSW5	S4	S4	S3	SSW4	S6	SSW6	SSW7	S9	SSW8	SSW5	SW5	SSW5	SW4	WSW2	WSW4	SW2	SW3	SSW3	SSW4.6	S9	
27-Nov	SE3	WNN2	N2	N4	N6	NE5	NNE4	NNE5	NNE7	N8	N8	N8	N9	N10	N11	N10	N10	NNW9	N9	N8	N7	NNW6	NNW7	NNW6	N6.4	N11	
28-Nov	NNW5	NNW5	NW3	W3	WSW2	W3	AF	SSE1	SSE2	AF	AF	AF	AF	NE2	AF	AF	AF	NW2	AF	AF	NNW3	NNW2	NW2	W2	----	NNW5	
29-Nov	NW2	AF	WSW2	W4	AF	AF	AF	AF	AF	AF	M	M	M	SSW5	SSW5	SSW4	SSW6	S7	SSW7	SSW8	SW9	SW7	SSE6	SSE9	S10	----	S10
30-Nov	S10	S10	S11	S11	S10	SSE11	SSE11	SSE12	SSE14	SSE13	S11	S11	S13	S11	S9	S10	S11	S12	S12	S11	S12	S13	S13	S13	S11.2	SSE14	

SW2.2SSW2.3SSW2.6SSW2.9SSW2.9SSW2.9SSW3.1SSW2.7SSW3.6	S3.9	S4.8	S4.9	SSW4.8	S3.9	S3.3	SSW3.3	SW2.4	SW2.5	WSW2.1	WSW2.2	SW2.8	SW2.5	SSW2.6	SW2.7	Diurnal Average									
S12	S14	SSE16	SSE17	SSE15	SSE13	SSE16	SSE17	SSE17	SSE16	SSE17	SSE18	SSE17	SSE17	SSE16	SSE15	SSE12	NNE12	NNE12	SSW13	S14	WSW14	WSW15	WSW15	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
Fort McKay South - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 6 km/h on Nov 15 00:00	Hours of Data: 701
Minimum Value: 0 km/h on Nov 28 09:00	Hours of Missing Data: 19
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 5	Hours of Calibration: 0
	Percent Operational Time: 97.4

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-Nov	2	2	1	1	1	1	2	4	4	3	3	3	3	3	4	4	3	3	2	2	2	1	1	2	4
2-Nov	2	1	1	1	1	1	1	2	1	4	3	3	3	3	3	2	2	2	1	1	1	1	1	1	4
3-Nov	1	1	1	1	1	1	1	2	2	1	2	2	3	3	2	1	3	1	3	3	3	3	3	3	3
4-Nov	3	2	2	3	3	3	4	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	4
5-Nov	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	2	2	1	2	2	1	2	2	2
6-Nov	2	3	2	2	3	2	2	2	2	1	3	4	4	4	1	1	1	1	1	1	2	2	1	1	4
7-Nov	1	1	1	1	1	1	1	1	1	2	2	1	2	2	3	2	2	1	1	1	1	1	1	1	3
8-Nov	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	2	2	2
9-Nov	1	2	2	2	1	2	3	2	2	3	3	5	4	2	3	2	2	2	3	3	2	2	2	3	5
10-Nov	2	2	4	4	2	3	3	3	1	1	2	2	2	2	2	1	2	1	1	2	1	1	1	3	4
11-Nov	2	2	2	1	2	1	1	1	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2
12-Nov	2	2	1	2	3	1	2	2	2	2	1	2	2	1	2	3	2	1	1	2	1	1	1	4	4
13-Nov	4	1	1	1	1	1	2	1	2	2	1	2	2	2	2	2	1	1	1	1	1	1	1	4	4
14-Nov	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	4	4	3	3	4	5	5	5	6	6
15-Nov	5	4	4	5	4	4	4	3	4	4	4	5	4	3	4	3	1	2	2	2	3	2	2	1	5
16-Nov	2	1	1	1	1	1	1	1	1	1	1	1	3	3	2	3	3	3	3	3	3	2	4	4	4
17-Nov	3	3	2	2	3	2	2	1	2	1	1	3	3	3	4	4	4	4	3	2	2	1	1	1	4
18-Nov	2	3	1	1	1	1	1	1	1	1	1	2	3	3	2	2	1	1	1	1	1	2	1	2	3
19-Nov	1	2	2	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2
20-Nov	2	1	1	1	1	1	1	1	2	3	3	2	3	2	2	1	2	1	1	2	2	2	1	1	3
21-Nov	1	2	1	3	2	2	2	2	2	1	2	2	2	2	2	1	1	1	4	2	2	2	2	2	4
22-Nov	2	2	1	1	1	2	1	1	1	1	2	2	1	1	1	2	1	3	2	2	2	3	3	3	3
23-Nov	2	3	3	4	4	3	3	3	3	3	3	4	4	3	4	3	3	2	2	2	4	3	2	2	4
24-Nov	2	2	2	2	2	1	1	2	1	1	2	2	2	2	2	2	2	1	1	1	1	1	2	1	2
25-Nov	1	1	2	1	1	1	2	5	3	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	5
26-Nov	3	1	3	2	2	1	1	1	1	2	1	2	3	3	3	2	2	2	2	2	2	1	2	2	3
27-Nov	2	1	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2
28-Nov	1	1	1	1	1	1	AF	1	0	AF	AF	AF	AF	1	AF	AF	AF	1	AF	AF	2	1	1	1	2
29-Nov	1	AF	1	1	AF	AF	AF	AF	AF	M	M	M	1	1	2	1	2	2	2	2	2	2	2	3	3
30-Nov	2	2	2	2	2	2	2	2	3	2	3	2	2	3	2	3	3	2	3	2	3	3	2	2	3

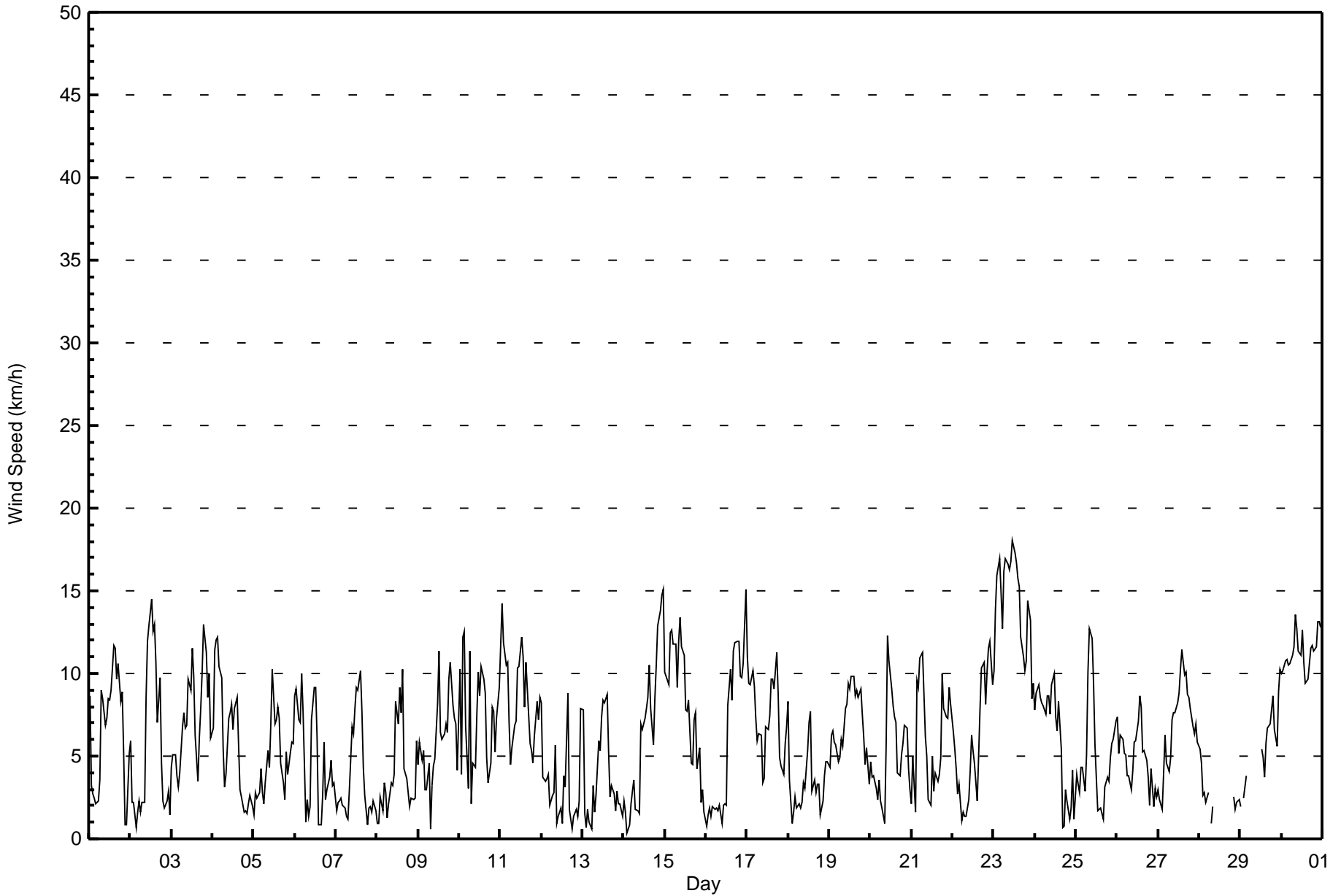
5	4	4	5	4	4	4	4	5	4	4	4	5	4	4	4	4	4	4	4	4	5	5	5	6	
Diurnal Maximum																									

M - Maintenance AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Fort McKay South - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay South - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	335	47.79	47.79
6 - 11	301	42.94	90.73
12 - 19	65	9.27	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: 701

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay South - 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	13	11	5	5	6	4	8	19	47	60	46	41	22	17	21	10	335
6 - 11	34	11	2	0	0	0	6	46	80	25	17	30	22	11	3	14	301
12 - 19	1	3	0	0	0	0	1	27	15	3	0	11	2	0	0	2	65
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	48	25	7	5	6	4	15	92	142	88	63	82	46	28	24	26	701

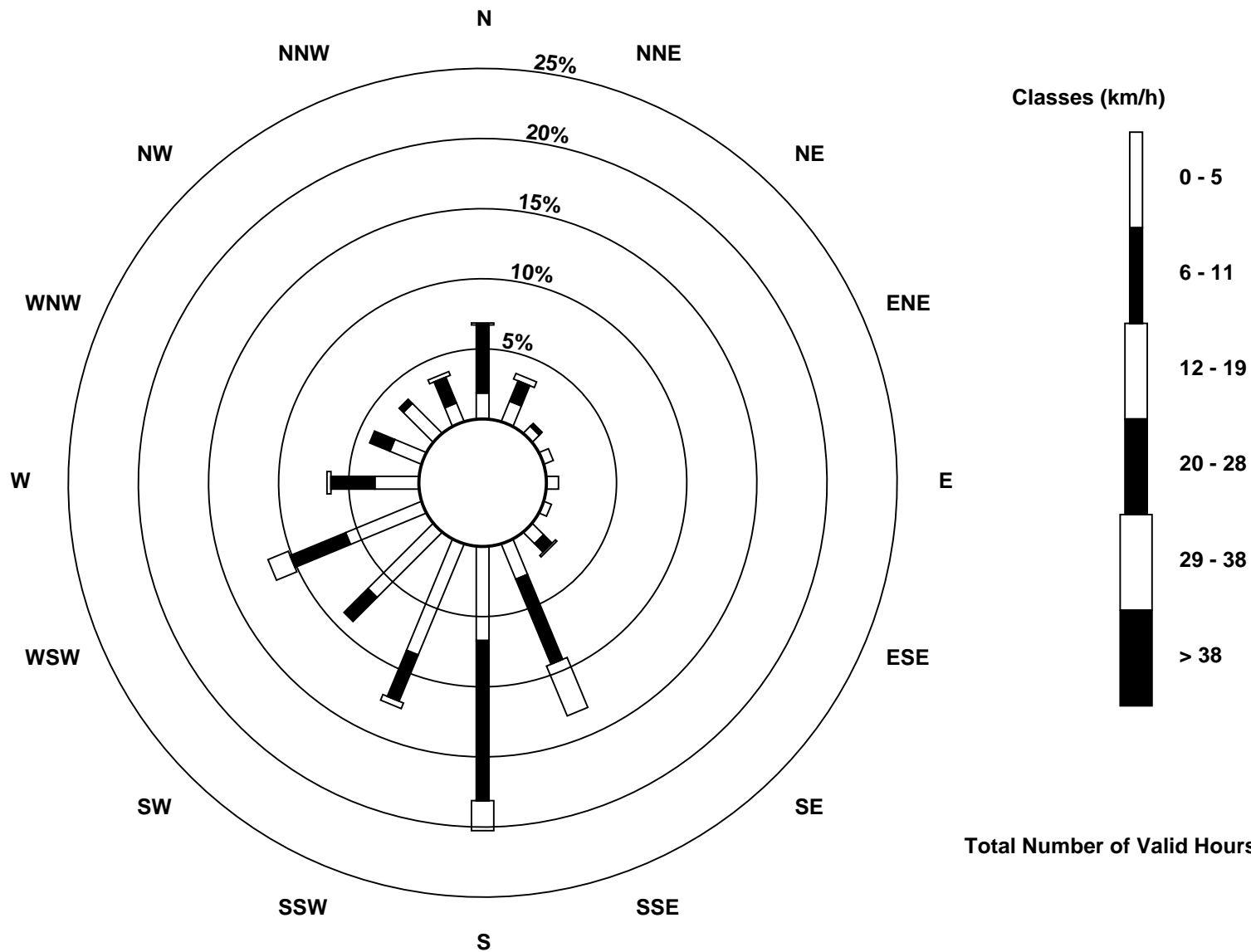
Total Number of Valid Hours: 701

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Fort McKay South (AMS 13)



Total Number of Valid Hours: 701



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort McKay South - November 2016

Direction of Maximum Speed: 164 deg on Nov 23 12:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 166.2 deg on Nov 23	Hours of Data: 701
Direction of Minimum Speed: 216 deg on Nov 14 03:00	Hours of Missing Data: 19
Direction of Minimum Daily Speed Average: 0.4 deg on Nov 21	Percent Operational Time: 97.4
Monthly Average Direction: 230.2 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-Nov	348	316	309	305	244	208	241	284	279	293	288	285	273	320	327	334	328	328	351	359	353	261	235	149	312.2
2-Nov	137	186	197	304	234	213	247	255	198	164	168	170	168	167	166	172	180	186	201	279	223	197	250	203	178.7
3-Nov	177	183	185	201	218	177	187	185	187	170	171	170	172	150	168	187	192	184	198	203	209	216	204	203	187.2
4-Nov	192	196	200	205	213	220	202	217	192	176	155	169	174	167	186	183	199	211	243	285	224	272	229	244	195.9
5-Nov	269	221	259	203	188	201	205	193	179	176	168	156	158	155	167	178	196	205	214	182	189	174	187	226	182.9
6-Nov	215	207	201	198	215	201	331	8	208	189	239	247	236	235	155	154	208	236	188	240	196	179	233	245	218.6
7-Nov	220	339	235	243	236	234	308	254	213	175	183	170	176	180	179	172	193	225	253	269	217	332	200	202	194.2
8-Nov	301	261	207	236	194	199	177	201	178	173	163	177	145	154	178	186	185	190	216	259	239	253	192	185	185.1
9-Nov	183	180	189	193	191	190	187	261	184	213	218	244	258	242	249	271	250	242	257	254	251	234	220	246	232.5
10-Nov	252	231	256	248	172	212	258	220	181	167	180	179	146	151	156	176	187	190	184	190	187	193	178	188	196.2
11-Nov	184	175	180	184	182	181	191	199	177	184	175	177	178	156	187	193	180	196	219	230	228	239	213	227	189.0
12-Nov	241	206	170	221	210	225	197	184	186	205	230	12	80	147	197	244	294	317	206	261	182	139	171	262	216.8
13-Nov	259	69	14	192	200	155	180	151	185	164	143	157	166	146	149	175	237	236	243	242	230	266	256	282	183.0
14-Nov	287	227	216	239	204	176	196	312	255	226	241	241	249	248	267	288	282	271	263	267	262	255	250	254	256.7
15-Nov	275	276	278	264	250	247	253	262	252	249	251	248	261	253	241	247	206	241	266	283	272	270	268	294	256.9
16-Nov	202	227	237	242	251	185	158	182	239	50	104	84	136	14	36	37	15	20	18	20	5	359	1	352	14.2
17-Nov	343	336	341	348	341	327	287	269	267	264	242	260	300	269	287	292	299	319	319	306	312	280	262	269	303.9
18-Nov	268	281	255	222	221	258	248	217	253	298	339	326	230	241	225	232	206	235	247	209	294	317	323	356	265.6
19-Nov	359	19	9	18	28	27	8	4	1	9	358	359	358	354	356	349	350	348	353	349	350	356	18	7	0.9
20-Nov	99	92	94	83	58	71	59	342	209	170	163	168	153	173	166	166	177	169	176	167	159	138	122	104	148.7
21-Nov	44	125	137	158	160	165	169	174	178	189	157	284	290	289	311	289	282	305	8	17	9	9	23	15	122.3
22-Nov	19	28	62	40	10	12	162	147	276	195	147	146	159	152	147	165	172	160	167	175	160	160	143	139	148.4
23-Nov	148	164	168	168	155	162	166	167	169	167	166	164	163	160	157	158	162	167	163	164	185	182	195	186	166.2
24-Nov	190	186	191	190	184	180	162	180	168	163	181	195	204	179	167	199	223	304	323	312	251	273	146	280	185.4
25-Nov	25	23	16	5	18	4	124	156	165	166	162	139	109	350	339	293	257	283	247	223	237	232	232	236	181.9
26-Nov	236	215	238	243	219	194	191	185	180	194	175	204	207	188	202	212	235	207	232	241	242	229	217	204	211.4
27-Nov	144	303	360	2	355	40	33	29	14	357	2	360	1	356	359	353	352	348	356	354	350	345	338	334	357.8
28-Nov	342	334	314	277	256	260	AF	162	165	AF	AF	AF	AF	45	AF	AF	AF	310	AF	AF	345	340	311	275	--
29-Nov	308	AF	252	274	AF	AF	AF	AF	AF	M	M	M	208	196	197	197	174	204	200	215	219	165	168	178	--
30-Nov	190	169	177	175	170	165	165	167	166	168	173	172	169	171	177	172	180	189	184	188	191	189	179	178	176.1

232.6 200.6 209.9 213.4 200.8 194.2 194.8 196.9 193.3 185.4 183.2 190.0 191.3 182.7 190.5 207.6 219.9 232.7 242.3 240.2 230.6 221.8 211.6 225.9

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
Fort McKay South - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 104 deg on Nov 12 20:00	Hours of Data: 701
Minimum Value: 7 deg on Nov 6 18:00	Hours of Missing Data: 19
Percentiles: P ₁ = 9 P ₁₀ = 12 Q ₁ = 14 Median = 21 Q ₃ = 36 P ₉₀ = 57 P ₉₉ = 86	Hours of Calibration: 0
	Percent Operational Time: 97.4

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-Nov	13	34	25	53	37	17	52	29	27	26	28	30	30	27	24	19	19	20	17	14	23	66	58	22	66
2-Nov	15	62	22	57	64	25	18	18	33	15	14	12	12	12	11	11	12	8	18	35	53	25	20	52	64
3-Nov	12	22	10	22	19	22	10	12	13	16	14	15	14	15	30	38	20	8	16	15	20	27	24	55	55
4-Nov	15	11	13	15	18	20	43	44	21	11	13	18	21	20	12	19	47	33	27	61	47	36	37	47	61
5-Nov	59	38	30	36	24	39	64	36	25	20	17	13	17	14	14	15	35	47	58	14	25	14	38	16	64
6-Nov	16	18	13	16	19	19	101	41	78	72	41	35	29	36	73	92	24	7	65	24	31	18	23	16	101
7-Nov	48	50	51	18	40	45	34	53	27	15	14	14	14	12	10	12	15	21	42	40	45	63	44	74	74
8-Nov	80	80	37	56	22	24	71	65	37	21	18	9	22	15	12	8	15	19	36	58	44	28	46	28	80
9-Nov	21	12	34	15	43	56	24	84	63	55	56	41	25	27	31	30	20	23	21	18	18	17	23	67	84
10-Nov	14	54	16	20	33	45	19	76	20	13	16	19	16	12	12	14	13	21	9	10	16	18	19	13	76
11-Nov	9	10	9	9	9	10	17	15	18	16	8	10	13	10	15	14	13	33	26	21	18	17	28	21	33
12-Nov	16	38	41	32	71	56	57	82	40	95	76	79	84	50	65	20	70	62	86	104	70	80	46	60	104
13-Nov	51	70	83	55	78	87	16	81	62	35	25	14	15	10	9	18	40	22	38	46	24	40	37	49	87
14-Nov	29	46	95	75	68	41	26	41	38	61	45	33	28	28	30	30	33	38	26	28	28	26	23	31	95
15-Nov	33	35	37	27	22	23	25	25	22	21	24	26	37	29	29	38	18	18	21	39	50	83	56	59	83
16-Nov	67	20	22	48	31	38	35	43	34	72	52	67	74	20	18	20	16	17	16	17	18	14	16	16	74
17-Nov	14	15	14	13	15	20	18	14	17	33	32	31	38	30	31	28	27	20	21	18	22	29	10	12	38
18-Nov	17	75	86	52	37	42	41	55	43	28	36	31	34	34	60	39	20	18	19	47	35	21	17	27	86
19-Nov	15	13	17	20	15	18	20	19	14	17	13	13	14	14	15	12	13	12	12	17	15	26	15	23	26
20-Nov	27	26	19	27	23	31	44	32	80	16	12	14	19	15	15	13	17	17	14	17	16	13	17	40	80
21-Nov	48	18	51	12	11	11	11	10	13	14	47	32	28	53	23	24	24	19	22	21	16	18	18	17	53
22-Nov	18	26	21	41	20	84	36	36	60	36	29	14	13	16	38	19	11	14	12	13	13	12	13	14	84
23-Nov	14	11	12	12	12	12	10	11	10	11	11	11	10	12	11	11	12	11	10	10	12	11	16	12	16
24-Nov	13	11	12	12	11	11	10	10	10	10	14	16	24	20	14	22	82	50	27	55	61	54	32	77	82
25-Nov	34	32	52	25	30	50	27	23	12	11	11	19	26	54	21	33	36	17	14	23	23	20	22	22	54
26-Nov	23	21	24	24	21	15	20	33	27	15	13	25	25	17	19	23	19	20	42	81	35	48	59	45	81
27-Nov	32	44	57	34	15	29	42	17	16	16	14	13	14	13	14	13	13	12	12	13	11	12	13	15	57
28-Nov	12	14	27	28	23	22	AF	65	38	AF	AF	AF	AF	20	AF	AF	AF	17	AF	AF	13	13	18	29	65
29-Nov	30	AF	14	22	AF	AF	AF	AF	AF	M	M	M	19	18	23	15	15	21	19	23	22	19	12	17	30
30-Nov	13	12	11	13	10	10	10	10	10	11	11	14	13	14	13	11	13	13	13	14	13	14	11	10	14

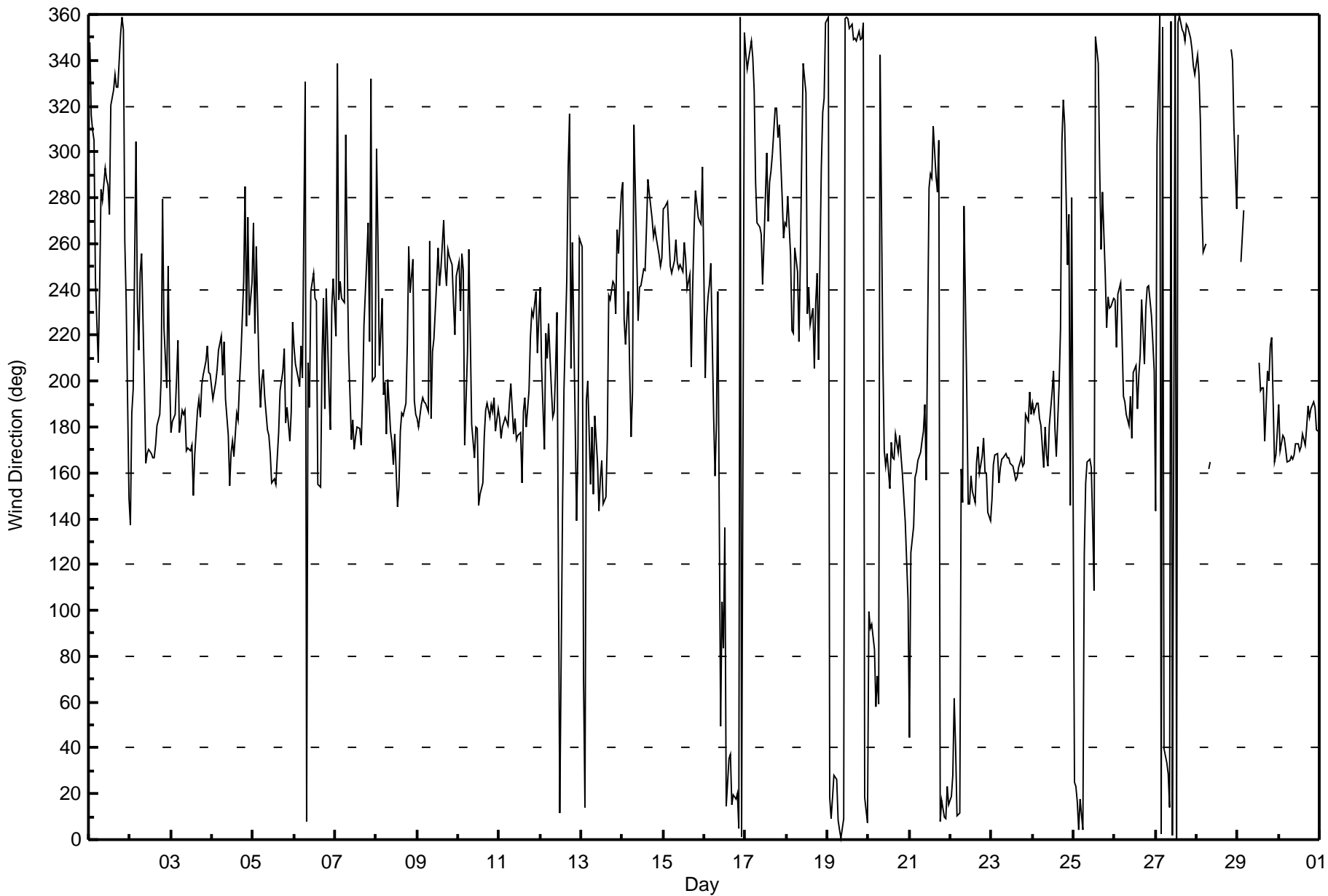
80	80	95	75	78	87	101	84	80	95	76	79	84	54	73	92	82	62	86	104	70	83	59	77	
Diurnal Maximum																								

M - Maintenance AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Fort McKay South - November 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 10, 2016	Last Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	12:12
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	3250	3250
Calculated slope	1.000264	0.999774	Box temp	32.5	32.5
Calculated intercept	2.404836	3.421881	Pressure	26.4	26.4
Analyzer Background	32.2	32.2	Flow	693	693
Analyzer Coefficient	1.026	1.026	Lamp Ratio	110	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	-0.1	----
as found span	5000	78.9	785.8	772.6	1.017
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	78.9	785.8	785.1	1.001
second point	5000	39.4	392.4	384.7	1.020
third point	5000	19.7	196.2	191.4	1.025
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	78.9	785.8	774.9	1.014
Average Correction Factor					1.015

Corrected As found 772.7 Previous response 783.2 % change 1.4%

Notes:

filter changed out, no maintenance or adjustments done

Calibration Performed By: Melissa Lemay



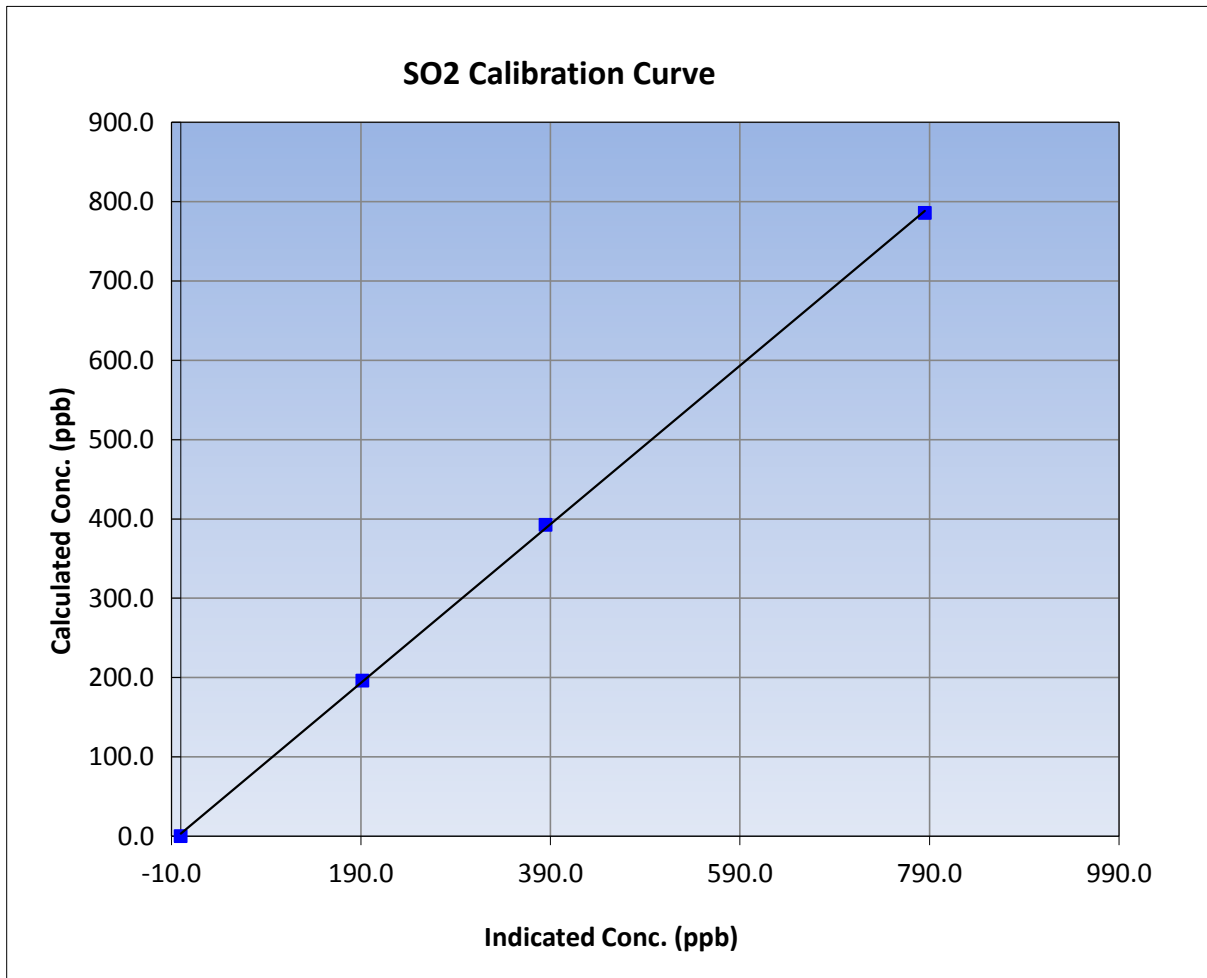
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:10	End Time (MST)	12:12
Analyzer make	API T100	Analyzer serial #	599

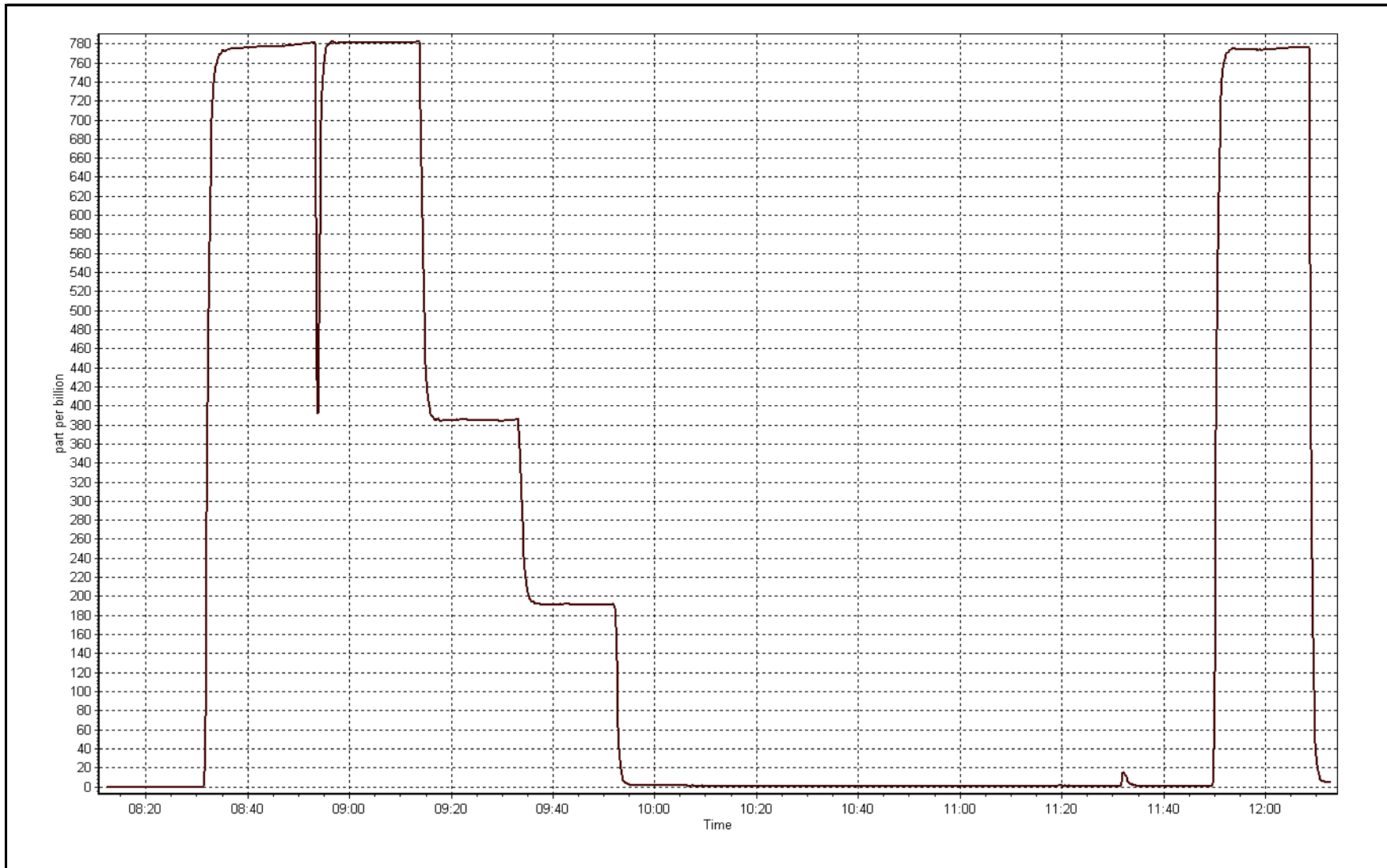
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999886
785.8	785.1	1.0009		
392.4	384.7	1.0201	Slope	0.999774
196.2	191.4	1.0251		
			Intercept	3.421881



SO2 Calibration Plot

Date: November 10, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 14, 2016	Last Calibration	October 27, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	10:55	End Time (MST)	13:28
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	1007	1007
Calculated slope	0.988603	0.986381	Chamber temp	45	45
Calculated intercept	0.357178	0.336372	Pressure	675.7	675.7
Analyzer Background	2.08	2.08	Flow	0.441	0.441
Analyzer Coefficient	1.016	1.016	Intensity	89	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	80.9	0.989
SO2 scrubber check	5000	17.6	175.3	0.1	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	78.9	80.0	80.9	0.989
second point	5000	39.4	40.0	40.0	0.999
third point	5000	19.7	20.0	19.7	1.014
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	78.9	80.0	81.1	0.986
Average Correction Factor					1.001

Corrected As found	81.0	Previous response	80.6	% change	-0.5%
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Notes:

Scrubber check done after as founds. Inlet filter changed. No adjustments or maintenance done.

Calibration Performed By:

_____ Melissa Lemay



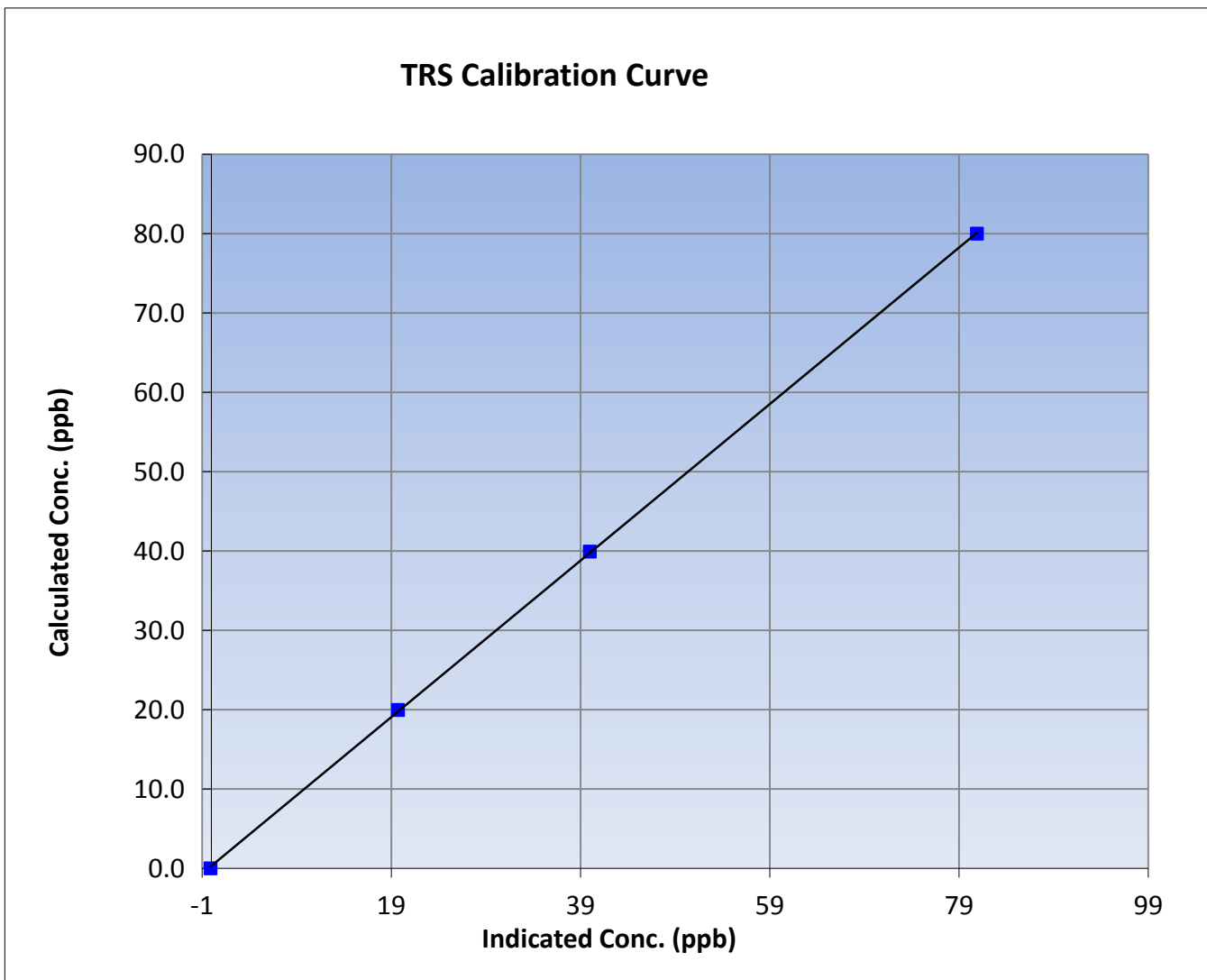
Wood Buffalo Environmental Association TRS Calibration Report

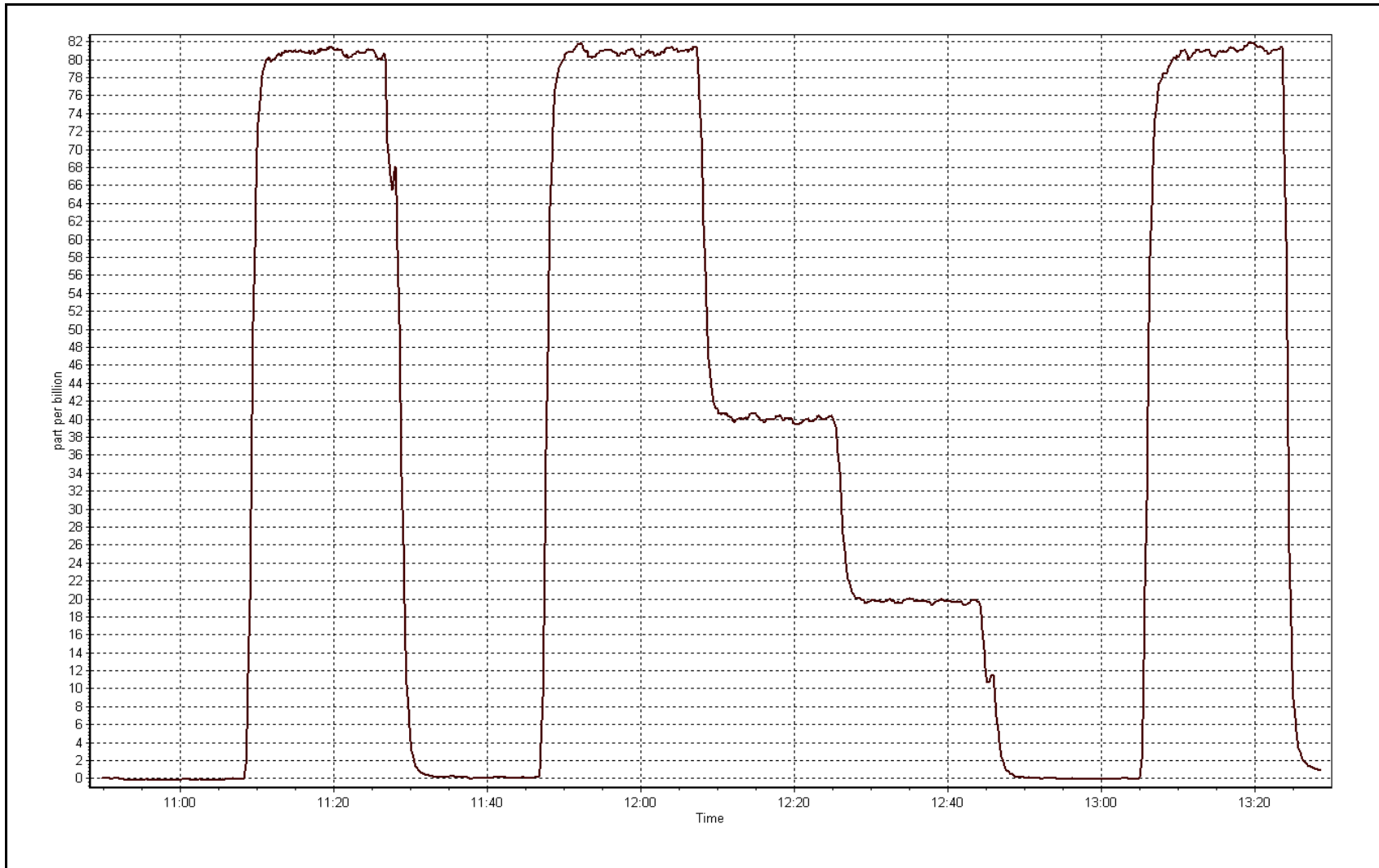
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 27, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	10:55	End Time (MST)	13:28
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	0.999959
80.0	80.9	0.9889		
40.0	40.0	0.9988	Slope	0.986381
20.0	19.7	1.0140		
			Intercept	0.336372







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 10, 2016	Last Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	12:11
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	0.997498	0.997295	Fuel Pressure	23.1	23.1
Calculated intercept	0.107645	0.081697	Analyzer Coeff	3.038	3.011
			Analyzer BKG	1.370	1.360

Analyzer make 51i-LT Analyzer serial # 1505164380

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	78.9	16.84	17.01	0.990
calibrator zero	5000	0.0	0.00	-0.03	----
high point	5000	78.9	16.84	16.85	0.999
second point	5000	39.4	8.41	8.25	1.019
third point	5000	19.6	4.18	4.11	1.018
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	78.9	16.84	16.96	0.993
Average Correction Factor					1.012

Corrected As found 17.04 Previous response 16.77 % change -1.6%

Notes:

no maintenance done, filter changed out, span adjusted

Calibration Performed By:

Melissa Lemay



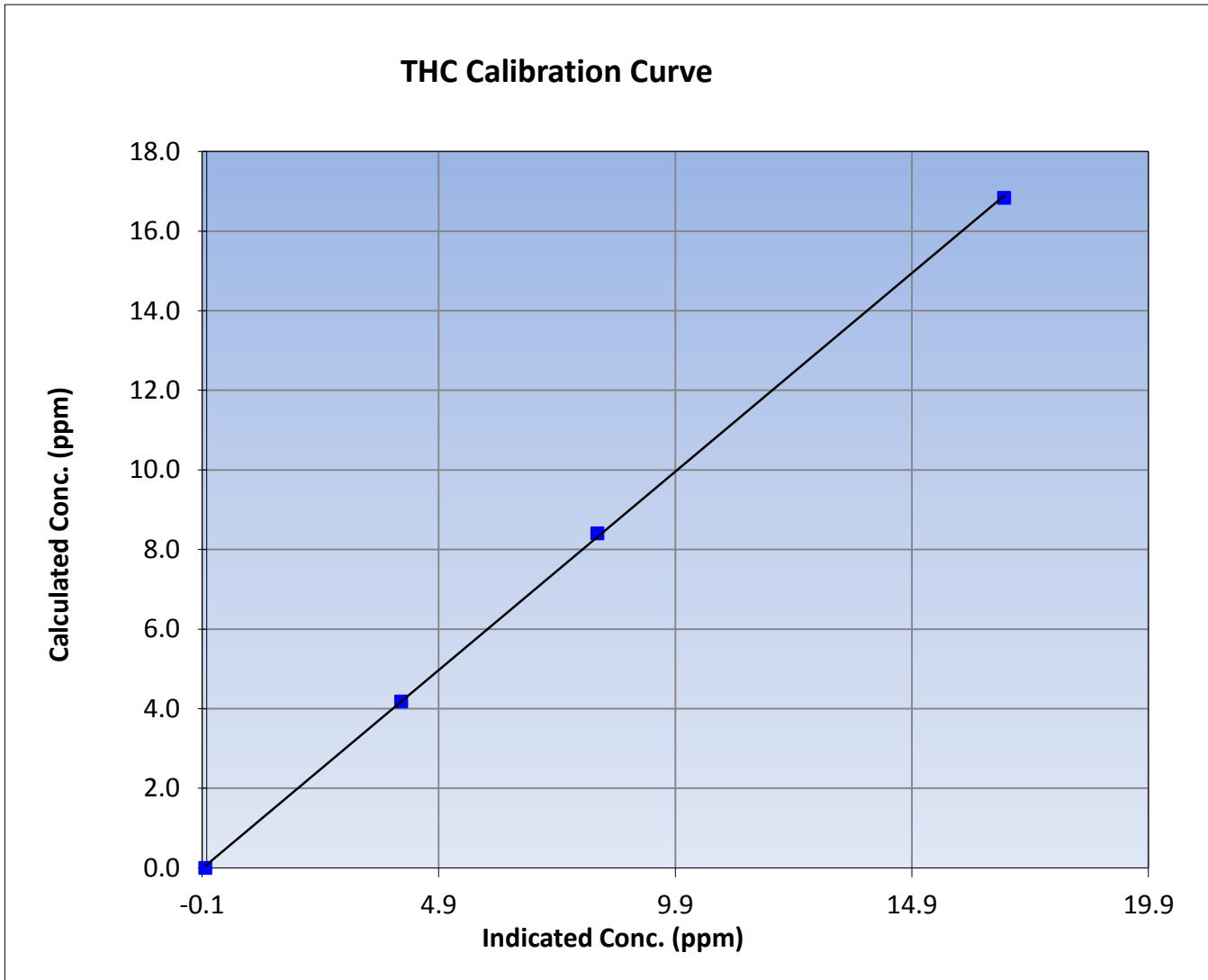
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:10	End Time (MST)	12:11
Analyzer make	51i-LT	Analyzer serial #	1505164380

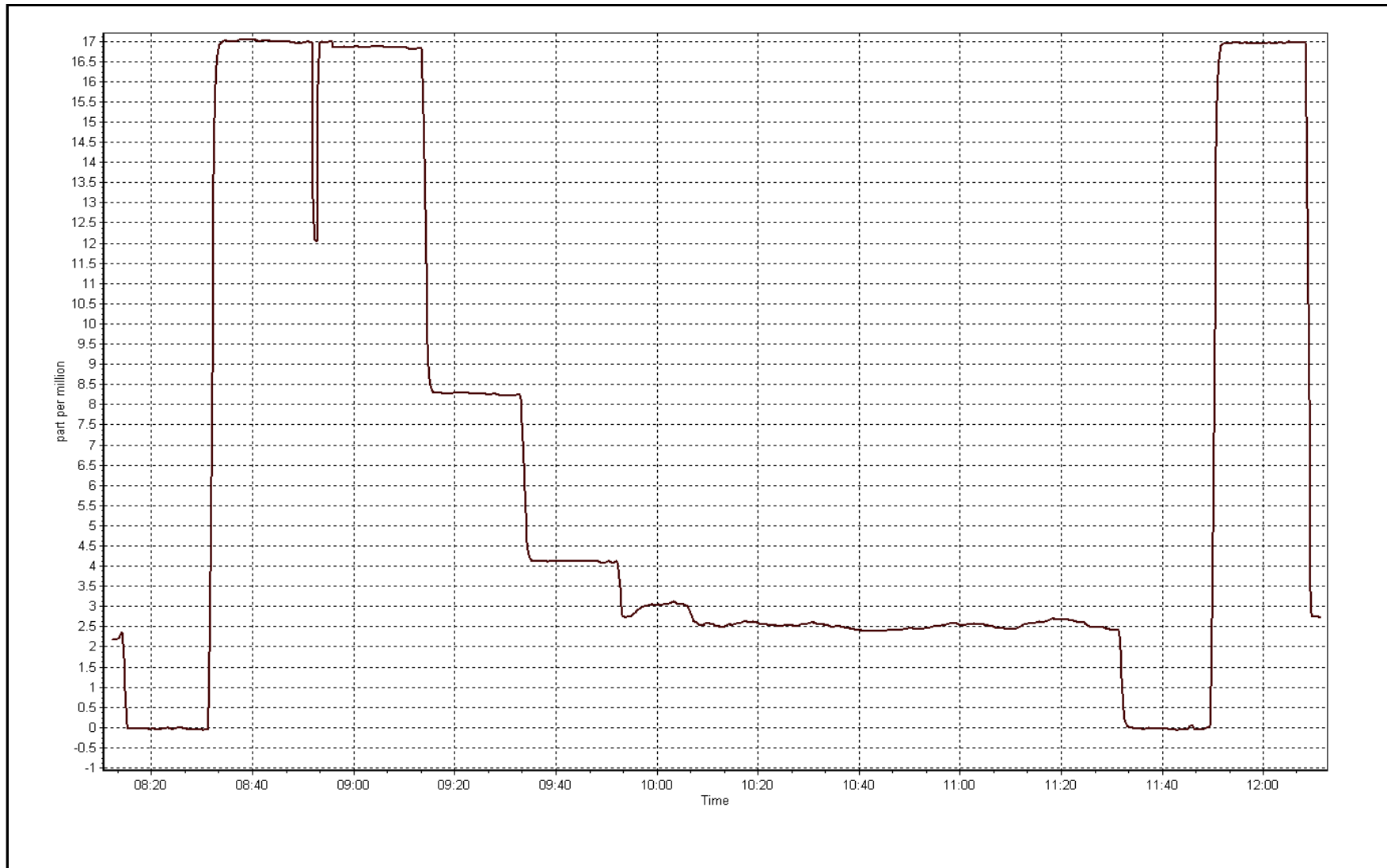
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.03	----	Correlation Coefficient	0.999905
16.84	16.85	0.9992		
8.41	8.25	1.0191	Slope	0.997295
4.18	4.11	1.0177		
			Intercept	0.081697



THC Calibration Plot

Date: November 10, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 27, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	12:08	End Time (MST)	14:30
NO2 GPT Ref date	November 10, 2016	Transfer Standard	Nox
Calibrator Make/Model	Sabio 4010	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	11041107
DACS make/model	Campbell Scientific CR3000	Serial Number	5613
		Serial Number	11038

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Box temp.	25.5	25.5
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	1.002768	1.007941	Pressure	26.7	26.7
Calculated intercept	0.007342	-0.227369	Flow	765.0	765.0
Analyzer Background	1.2	1.2	Intensity	4391.4	4391.4
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	0.2	----
as found span	5000	0.89	359.3	356.7	1.007
calibrator zero	5000	0.00	0.0	0.2	----
high point	5000	0.89	359.3	356.7	1.007
second point	5000	0.47	213.8	212.3	1.007
third point	5000	0.36	112.6	112.0	1.005
as left zero	5000	0.00	0.0	0.0	----
as left span	5000	0.89	359.3	364.2	0.987
Average Correction Factor					1.007

Corrected As found	356.5	Previous response	358.3	% change	0.5%
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Notes:

filter changed out, no adjustments or maintenance done

Calibration Performed By: Melissa Lemay



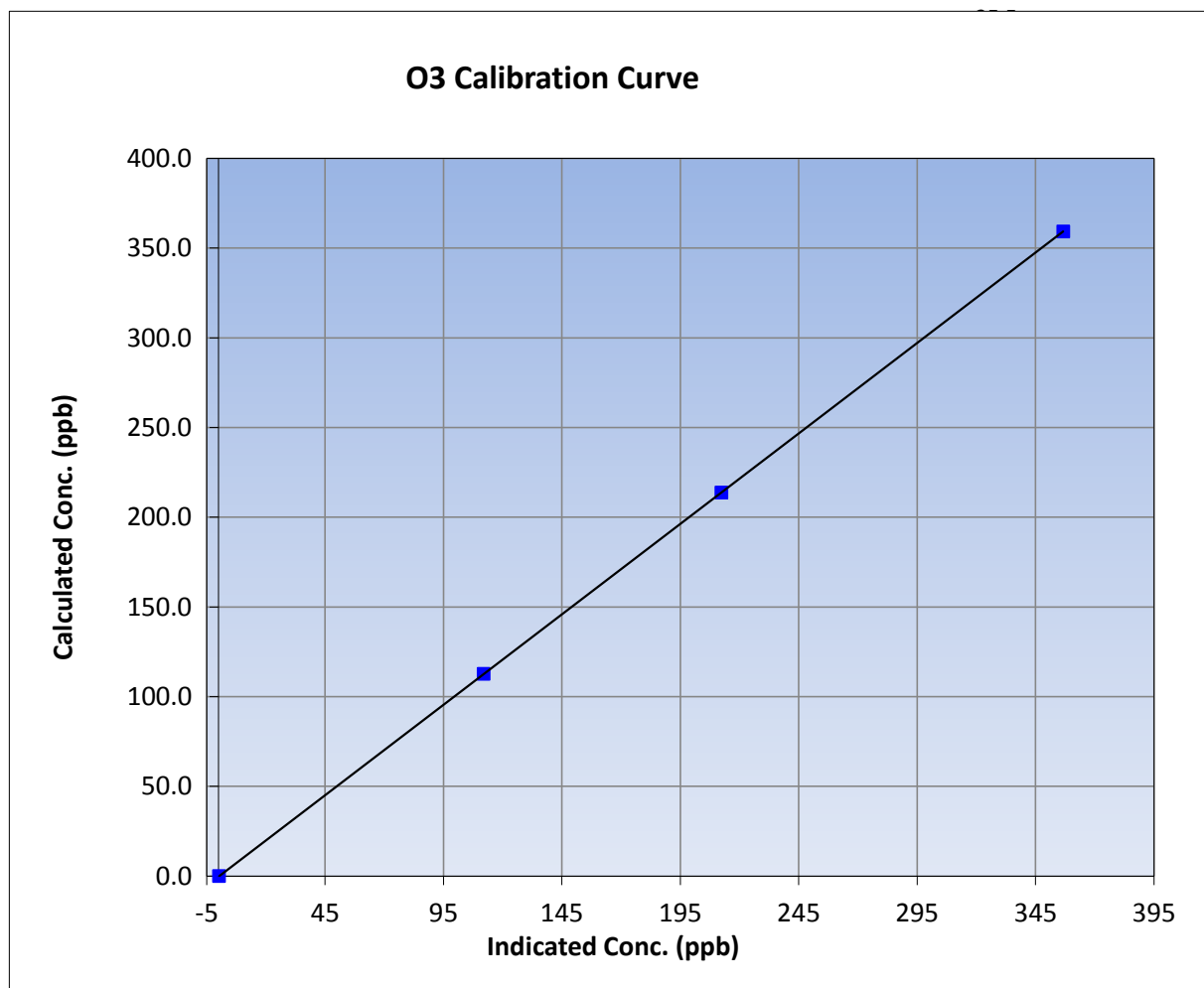
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	November-10-16	Previous Calibration	October 27, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	12:08	End Time (MST)	14:30
Analyzer make	API T400	Analyzer serial #	825

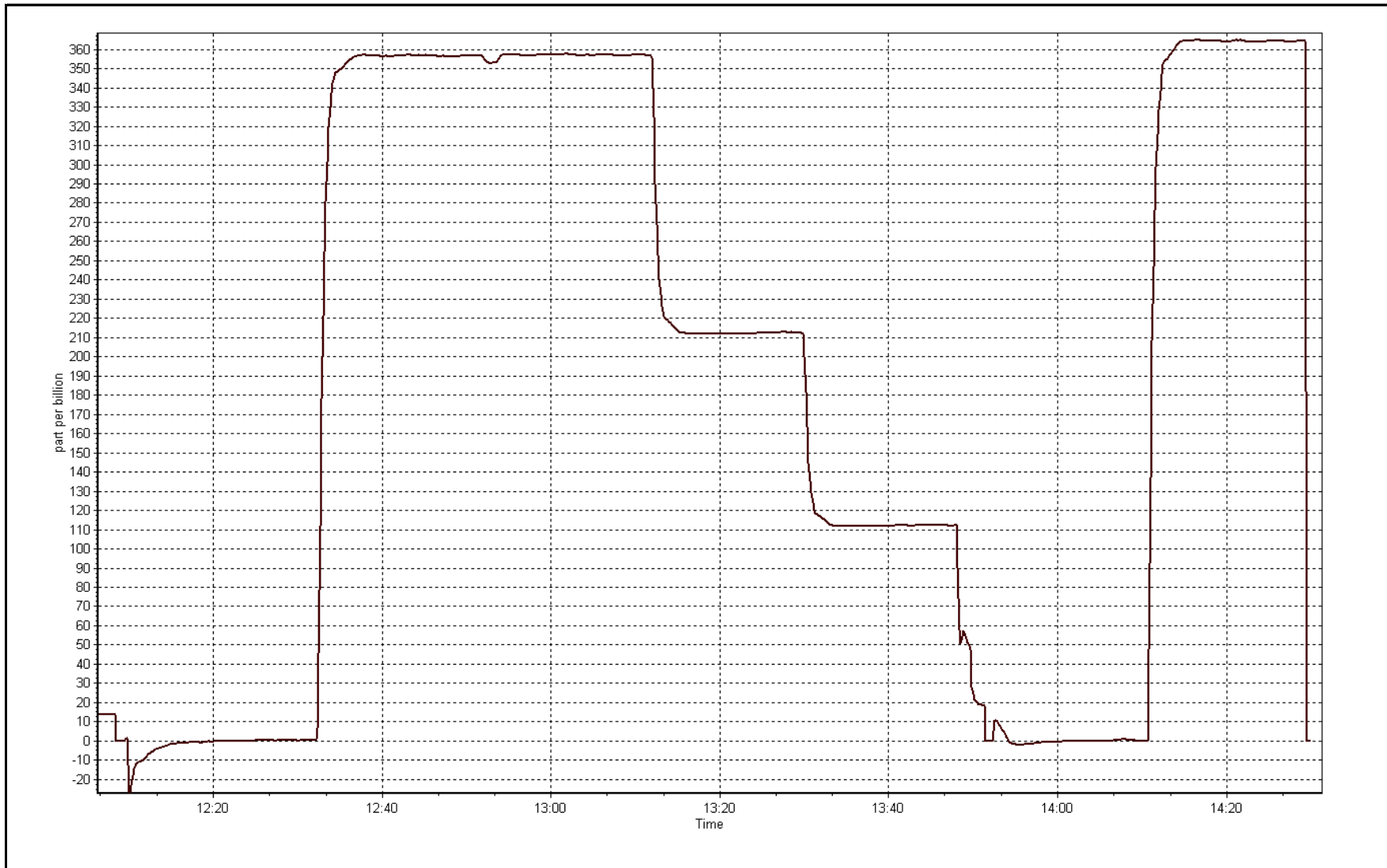
Calibration Data

Calculated concentration (ppb) (Cc)	11/10/16	Correction factor (Cc/lc)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	1.000000
359.3	356.7	1.0073		
213.8	212.3	1.0071	Slope	1.007941
112.6	112.0	1.0054		
			Intercept	-0.227369



O3 Calibration Plot

Date: November 10, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	12:12
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	0.997549	0.997342	1.006124
	Data Offset	2.491787	2.331134	1.103119
Current Calibration	Data Slope	0.995461	0.994868	1.008983
	Data Offset	2.325690	2.123525	0.650515

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	1.091		1.108	
NOx coefficient	1.002		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	8.1		8.3	
NOx bkgrnd	8.2		8.3	
Chamber Temp	50.5	Deg C	50.5	Deg C
Moly Temp	326.6	Deg C	326.6	Deg C
PMT voltage	-827.3	V	-827.3	V
PMT Temp	-2.8	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	203.1	mmHg	206.7	mmHg
R Cell Press Nox	203.1	mmHg	206.7	mmHg
NO sample flow	0.801	lpm	0.801	lpm
Nox sample Flow	0.803	lpm	0.803	lpm

Notes:

Span adjusted, filter changed out, no maintenance done



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 10, 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	0.0	0.0	0.0	----	----
as found span	5000	78.9	803.2	800.0	3.2	793.5	789.5	4.0	1.0122	1.0134
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	5000	78.9	803.2	800.0	3.2	806.3	803.7	2.6	0.9962	0.9955
second point	5000	39.4	401.1	399.5	1.6	397.5	396.5	1.0	1.0090	1.0076
third point	5000	19.7	200.5	199.8	0.8	198.1	197.8	0.4	1.0123	1.0099
as left zero	5000	0.0	0.0	0.0	0.0	0.4	0.1	0.4	----	----
as left span	5000	78.9	803.2	439.7	363.5	805.5	442.3	363.2	0.9971	0.9941
Average Correction Factor									1.0058	1.0043

Corrected As found NO_x= 793.5 NO= 789.5 Percent Change NO_x= 1.2% NO= 1.3%
 Previous Response NO_x= 802.7 NO= 799.8

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	800.8	799.0	0.0	1.0030	1.0013	----	----
1st NO2 (300)	439.7	362.5	799.0	439.7	359.2	1.0053	----	1.0091	99.1%
2nd NO2 (200)	585.2	217.0	798.8	585.2	213.6	1.0055	----	1.0157	98.5%
3rd NO2 (100)	686.4	115.8	800.0	686.4	113.6	1.0040	----	1.0190	98.1%
2nd NO ref point		3.2	800.9	799.1	1.8	1.0029	1.0012	----	----
Average Correction Factor						1.0044		1.0146	98.6%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

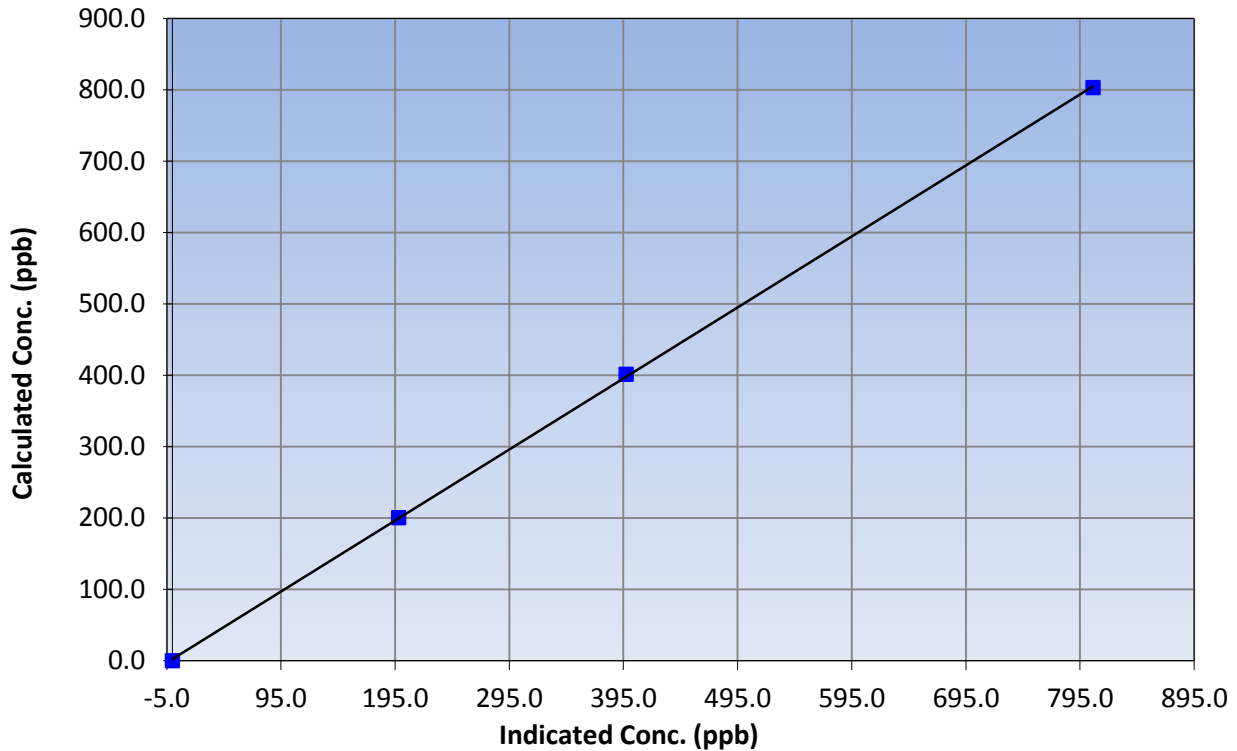
Station Information

Calibration Date	October 26, 2016	Previous Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:10	End Time (MST)	11:42
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	0.0	----	Correlation Coefficient	0.999946
803.2	806.3	0.9962		
401.1	397.5	1.0090	Slope	0.995461
200.5	198.1	1.0123		
			Intercept	2.325690

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

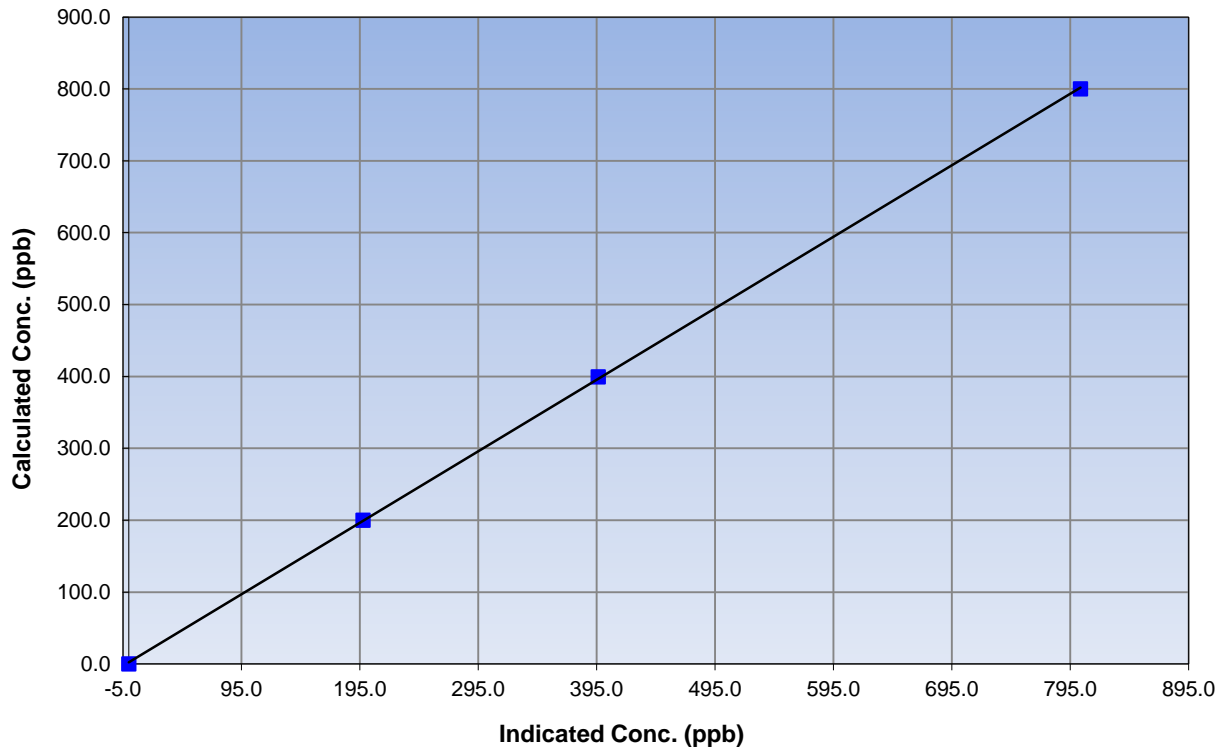
Station Information

Calibration Date	October 26, 2016	Previous Calibration	October 26, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:10	End Time (MST)	11:42
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	0.0	N/A	Correlation Coefficient	0.999953
800.0	803.7	0.9955		
399.5	396.5	1.0076	Slope	0.994868
199.8	197.8	1.0099		
			Intercept	2.123525

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

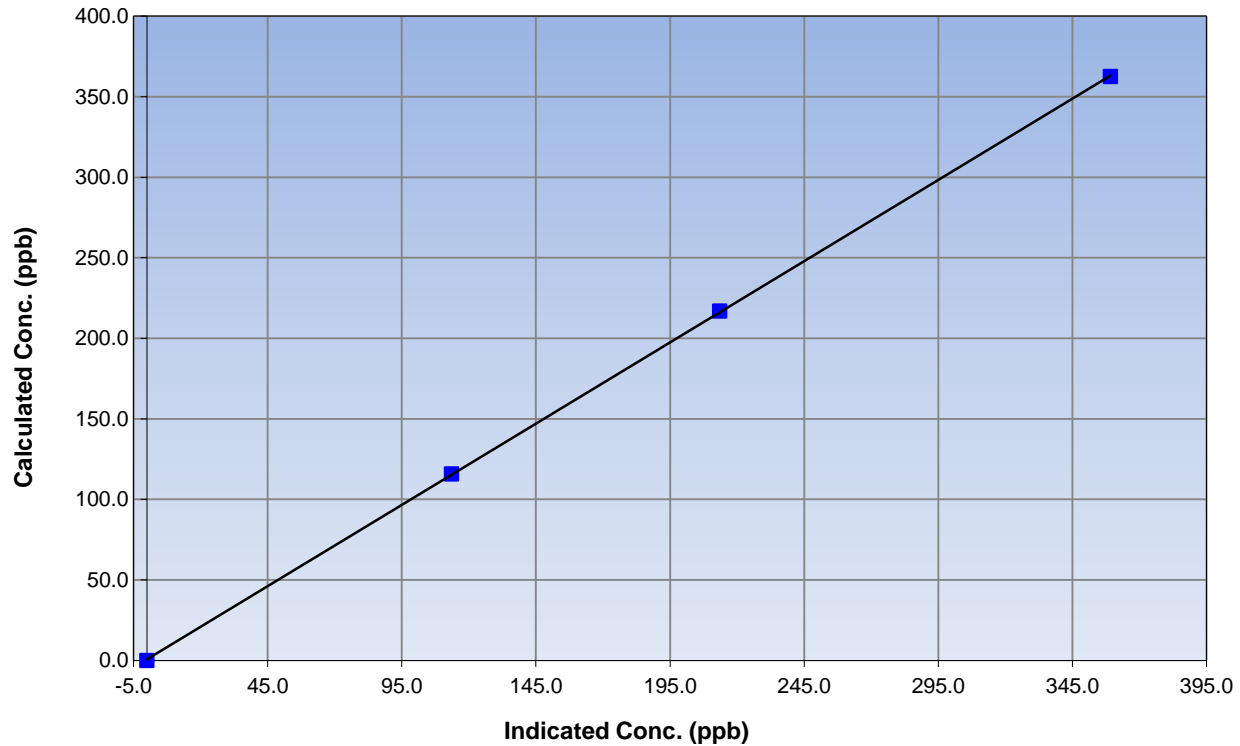
Station Information

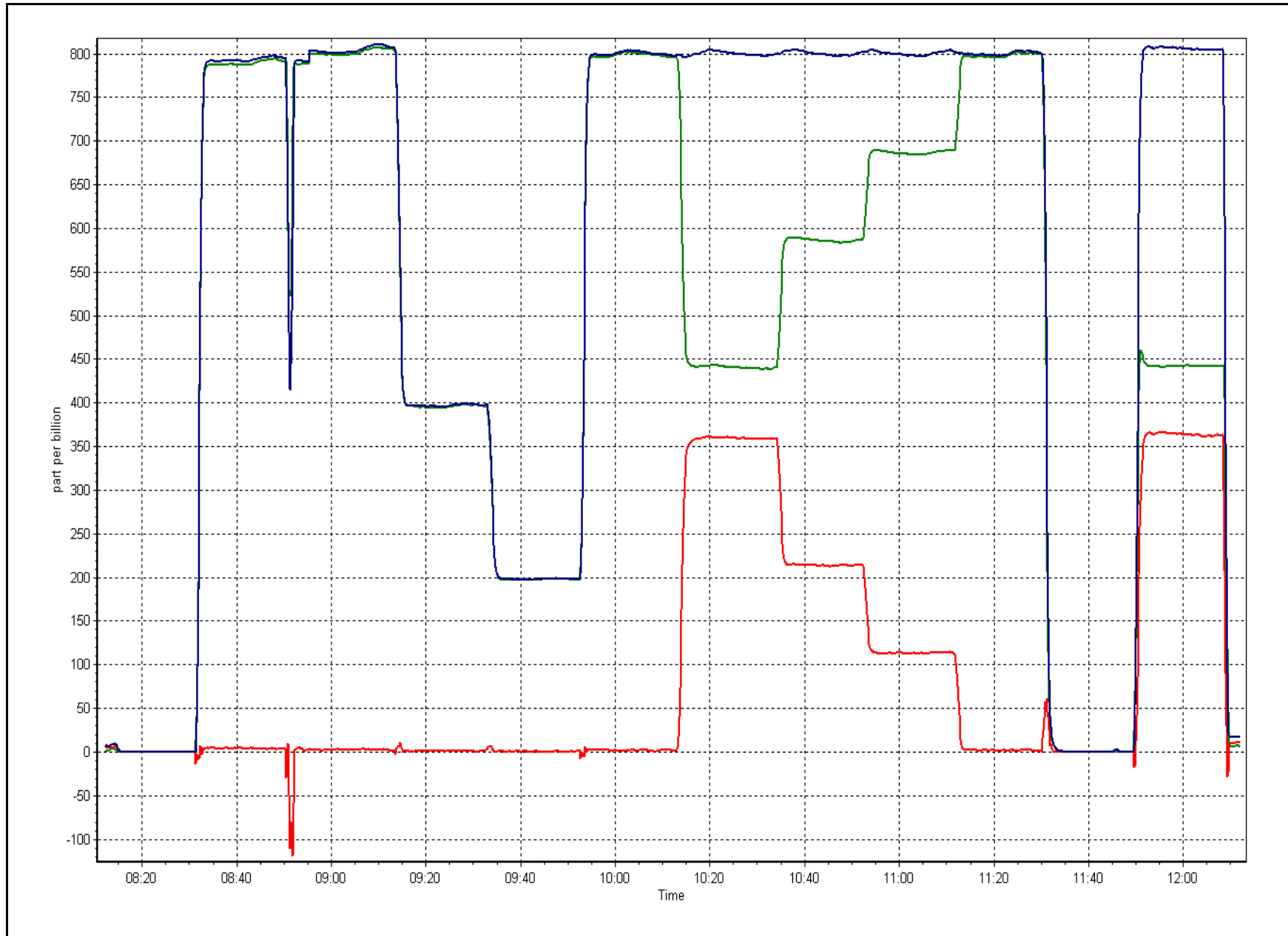
Calibration Date	October 26, 2016	Previous Calibration	October 26, 2016
Station Number	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:10	End Time (MST)	11:42
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999977
362.5	359.2	1.0091		
217.0	213.6	1.0157	Slope	1.008983
115.8	113.6	1.0190		
			Intercept	0.650515

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:	November 14, 2016	Last Cal Date:	October 27, 2016
Start time (MST):	11:09	End time (MST):	12:10
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)	6	6.9	6	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	961	961	961	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1000	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	1.8	-----	-0.3	<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

				Tolerance
Leak Test:	Date of check:	<u>October 27, 2016</u>	Last Cal Date:	<u>October 27, 2016</u>
	Flow w/o adaptor:	<u>16.55</u>	Flow w/ adaptor:	<u>16.45</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: Nephelometer adjusted, cyclone head cleaned

Calibration by: Melissa Lemay



Wood Buffalo Environmental Association

WS/WD Calibration Report

Station Information

Calibration Date	November 29, 2016	Previous Calibration	September 23, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	<input type="checkbox"/> Routine <input checked="" type="checkbox"/> Installation <input type="checkbox"/> Removal		
Start Time (MST)	9:11	End Time (MST)	12:15
Barometric Press	735	Station Temp	22 Deg C
WS Calibrator	MetOne 053-120	Serial Number	K13090

WIND SPEED

Sensor make/model	Met One 010C-1	Sensor serial #	U11127
DACS make	Campbel Scientific CR3000	DACS serial No.	11038
DACS voltage range	5000	DACS channel #	P2
	<u>Before</u>		<u>After</u>
Calculated slope		Calculated slope	0.998443
Calculated intercept		Calculated intercept	0.026636

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	20.1	1.0031
400	39.4	39.4	0.9990
600	58.6	58.7	0.9975
800	77.8	77.8	0.9994
Average Correction Factor			0.9997

WIND DIRECTION

Sensor make/model	Met One 020C-1	Sensor serial #	N13744
DACS make	Campbel Scientific CR3000	DACS serial No.	11038
DACS voltage range	5000	DACS channel #	SE 24
	<u>Before</u>		<u>After</u>
Calculated slope	1.005384	Calculated slope	#DIV/0!
Calculated intercept	-1.733214	Calculated intercept	#DIV/0!
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	NA	n/a
90	NA	#VALUE!
180	NA	#VALUE!
270	NA	#VALUE!
357	NA	#VALUE!
Average Correction Factor		#VALUE!

Notes:

Removed old wind speed sensor due to not working properly at low wind speeds, new wind speed sensor installed
 Wind direction sensor aligned with true north before and after tower take down

Calibration Performed By: Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 14 ANZAC NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
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	681	33	39	99.17	5	0	1	0
TRS(ppb) Average	687	33	33	100.00	1	0	0	0
THC(ppm) Average	672	35	48	98.19	2.3	-	2.1	-
NMHC(ppm) Average	672	35	48	98.19	0.141	-	0.042	-
CH4(ppm) Average	672	35	48	98.19	2.3	-	2.1	-
NO2(ppb) Average	685	35	35	100.00	19	0	6	-
NO(ppb) Average	685	35	35	100.00	20	-	3	-
NOX(ppb) Average	685	35	35	100.00	39	-	9	-
O3(ppb) Average	687	33	33	100.00	40	0	36	-
PM2.5(ug/m3) Average	718	1	2	99.86	32.7	-	8.1	0
AT 2m(C) Average	720	0	0	100.00	16.6	-	9	-
RH(%) Average	720	0	0	100.00	98	-	95	-
Leaf Wetness (% of range) Average	720	0	0	100.00	21	-	4	-
WS(km/h) Average	719	0	1	99.86	22	-	15	-
WD(deg) Average	719	0	1	99.86	-	-	-	-
PC(mm) Total	720	0	0	100.00	0.8	-	1.5	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
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	681	0.3	0	-	0	0	0	0	0	1	5
TRS(ppb) Average	687	0.2	0	-	0	0	0	0	0	0	1
THC(ppm) Average	672	1.99	0.1	-	1.9	1.9	1.9	2	2	2.1	2.3
NMHC (ppm) Average	672	0.006	0.016	-	0	0	0	0	0	0	0.141
CH4(ppm) Average	672	1.98	0.1	-	1.9	1.9	1.9	2	2	2.1	2.3
NO2(ppb) Average	685	2.3	2	-	0	1	1	2	3	4	19
NO(ppb) Average	685	0.4	1	-	0	0	0	0	0	1	20
NOX(ppb) Average	685	2.7	3	-	0	1	1	2	3	5	39
O3(ppb) Average	687	24.4	8	-	3	14	18	25	31	34	40
PM2.5(ug/m3) Average	718	2.97	2.8	-	0.1	0.8	1.2	2	3.8	6.3	32.7
Temperature 2 m (C) Average	720	-0.69	6.5	-	-13.2	-8.7	-5.8	-2.2	5.2	8	16.6
Relative Humidity (%) Average	720	76.8	14	-	29	57	68	79	88	93	98
Leaf Wetness (% of range) Average	720	1.2	2	-	0	0	0	1	1	3	21
Wind Speed 20 m (km/h) Average	719	8.9	4	-	1	4	6	9	11	14	22
Wind Direction 20 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	720	-	-	1.52	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	21 Nov 2016 08:00	21 Nov 2016 13:00	6	Unstable operation - excessive baseline drift
CH4, NMHC, THC	20 Nov 2016 10:00	20 Nov 2016 10:00	1	Unstable operation
CH4, NMHC, THC	21 Nov 2016 10:00	21 Nov 2016 14:00	5	Maintenance - flame optimization
CH4, NMHC, THC	22 Nov 2016 21:00	22 Nov 2016 21:00	1	Unstable operation
CH4, NMHC, THC	24 Nov 2016 21:00	24 Nov 2016 21:00	1	Unstable operation
CH4, NMHC, THC	26 Nov 2016 13:00	26 Nov 2016 13:00	1	Unstable operation
CH4, NMHC, THC	26 Nov 2016 22:00	26 Nov 2016 22:00	1	Unstable operation
CH4, NMHC, THC	29 Nov 2016 01:00	29 Nov 2016 01:00	1	Unstable operation
CH4, NMHC, THC	30 Nov 2016 13:00	30 Nov 2016 14:00	2	Unstable operation
PM2.5	09 Nov 2016 13:00	09 Nov 2016 13:00	1	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	22 Nov 2016 09:00	22 Nov 2016 09:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Anzac - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 5 ppb on Nov 16 15:00	Maximum Daily Average: 0.9 ppb on Nov 16		Hours of Data:	681
Minimum Value: 0 ppb on Nov 9 16:00	Minimum Daily Average: 0.1 ppb on Nov 9		Hours of Missing Data:	39
Maximum Diurnal Average: 0.5 ppb at hour 3	Minimum Diurnal Average: 0.3 ppb at hour 10		Hours of Calibration:	33
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		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-Nov	0	0	2	2	0	Z	1	1	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.4	2
2-Nov	Z	0	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
3-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	0.2	0
4-Nov	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0.6	2
5-Nov	1	2	1	Z	0	0	1	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0.6	2
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	0.2	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	1	1	0.3	1
8-Nov	Z	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.5	1
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	0.1	0
10-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	0.3	1
11-Nov	1	1	1	Z	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
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	0.2	0
14-Nov	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
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	0.1	0
16-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	2	4	5	2	1	3	1	0	0	0	0	0	0.9	5
17-Nov	0	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1
19-Nov	1	2	3	2	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3
20-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0.3	1
21-Nov	0	Z	0	0	0	0	0	UO	UO	UO	UO	UO	UO	0	0	0	0	0	0	0	0	1	0	0	--	1
22-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0.4	1
23-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	0.2	0
24-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0.3	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	0.2	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	0.1	0
27-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	0.4	1
28-Nov	1	1	Z	2	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.7	2
29-Nov	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
30-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.3	1

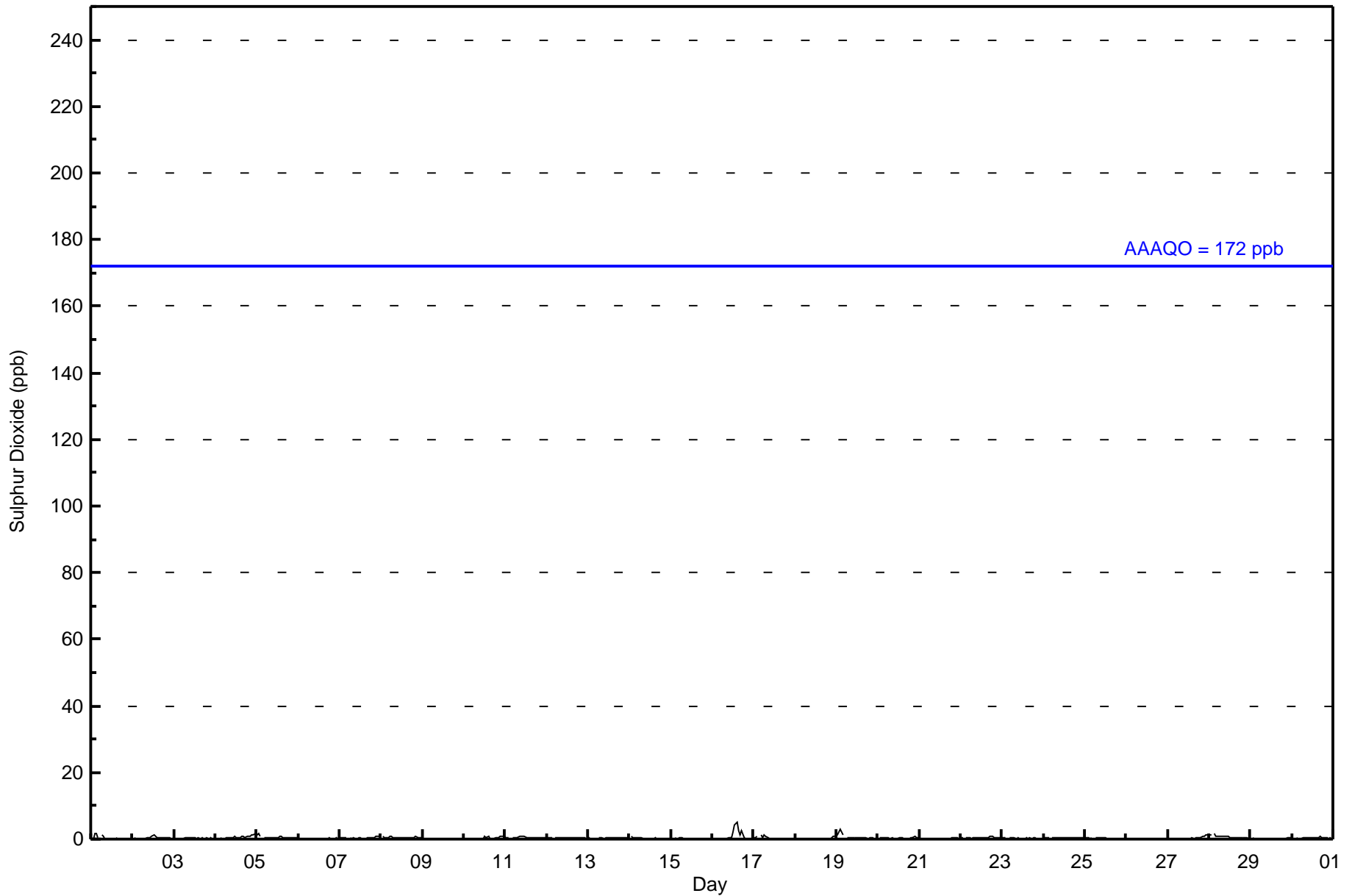
0.4	0.5	0.5	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	Diurnal Average
1	2	3	2	1	1	1	1	1	1	1	1	1	2	4	5	2	1	3	1	1	1	1	1	2	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Anzac - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	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: 681

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Anzac - 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	18	3	8	8	8	16	62	116	66	28	44	21	36	157	51	38	680
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	18	3	8	8	8	16	62	116	66	28	44	21	36	157	51	38	680

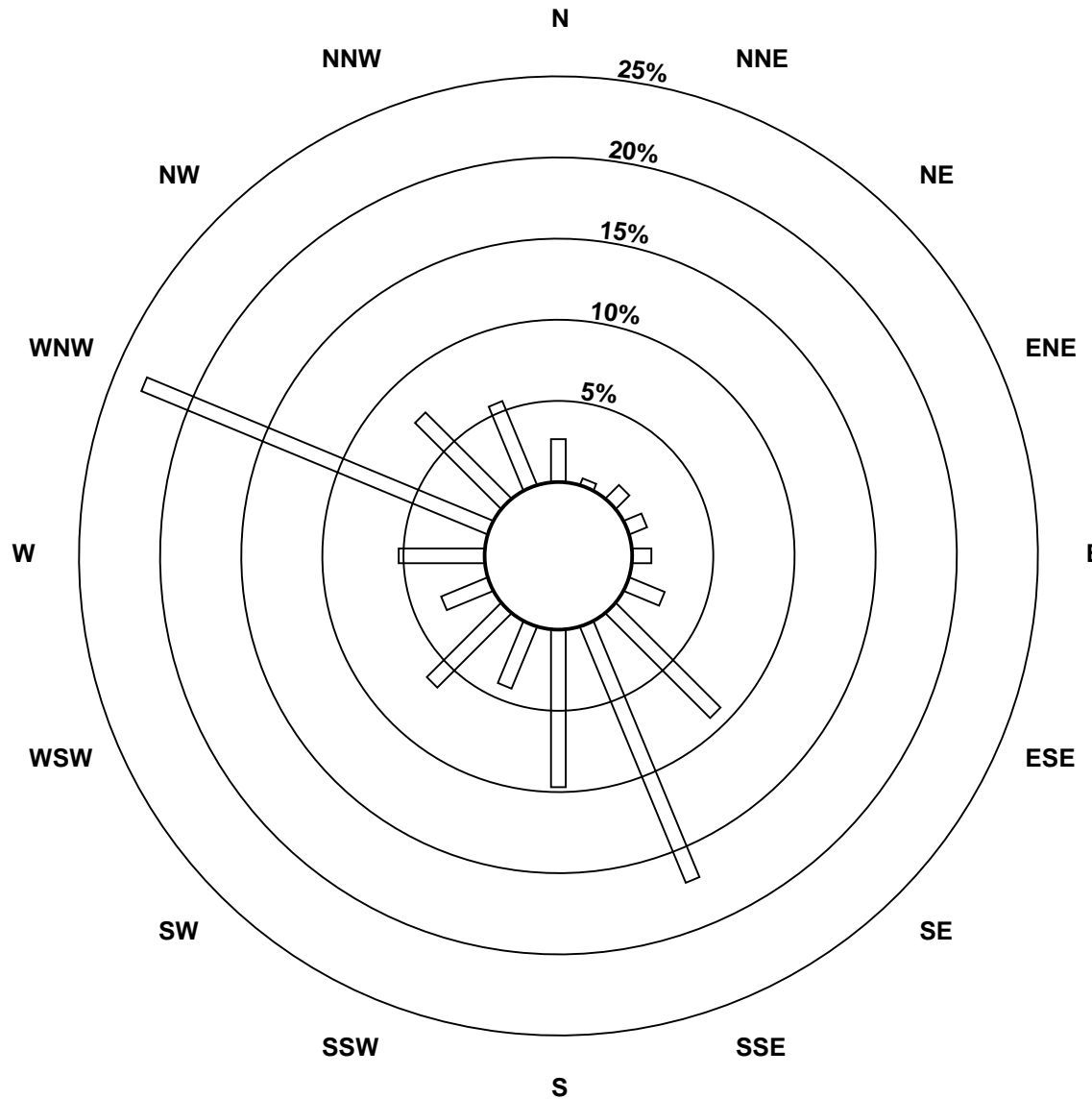
Total Number of Valid Hours: 680

Total Number of Hours: 720

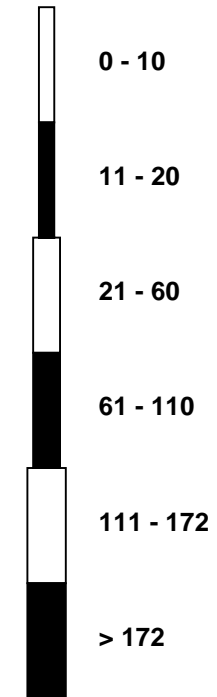


Wood Buffalo Environmental Association
Wind Rose Nov 2016

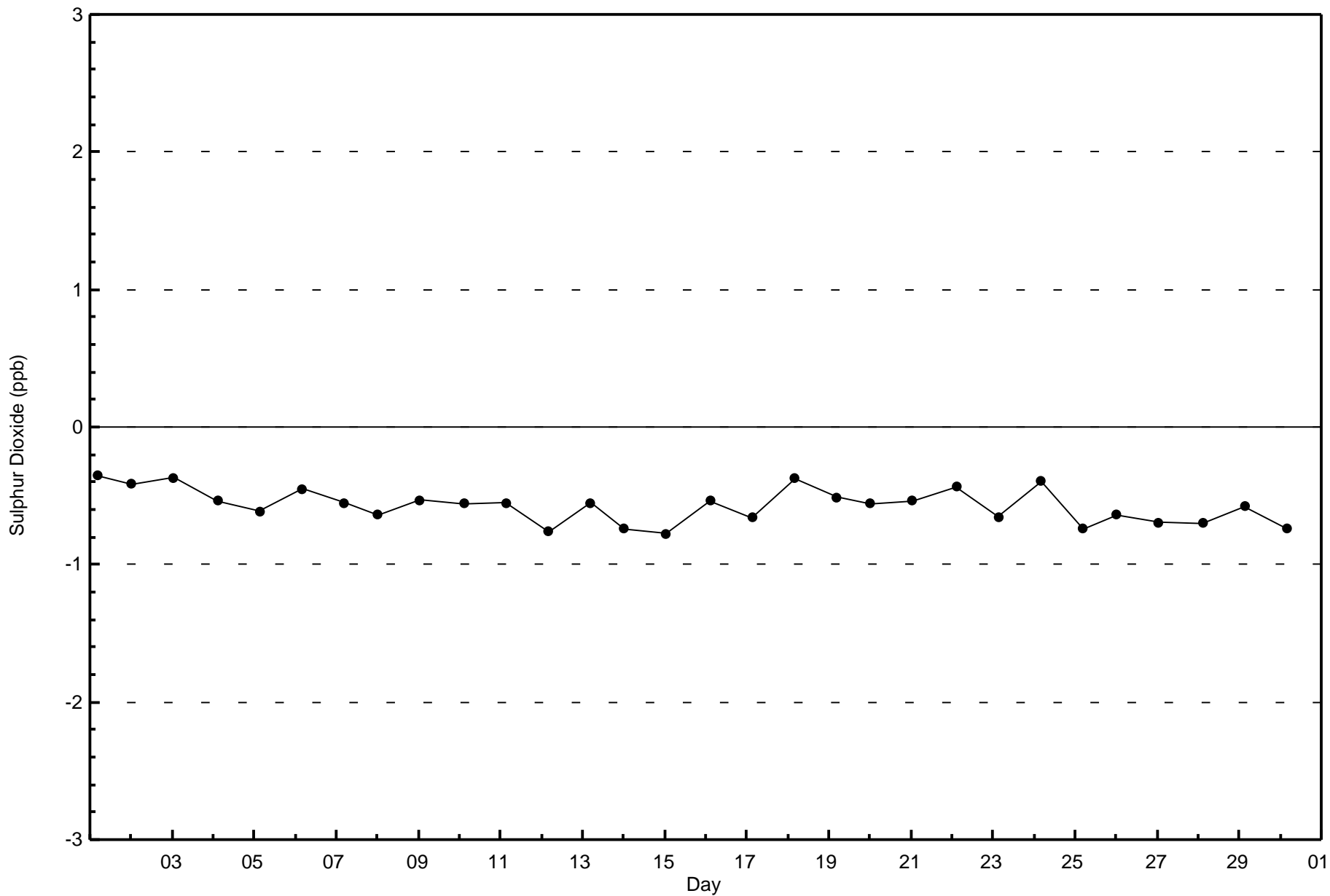
Sulphur Dioxide (SO₂) - ppb
Anzac (AMS 14)

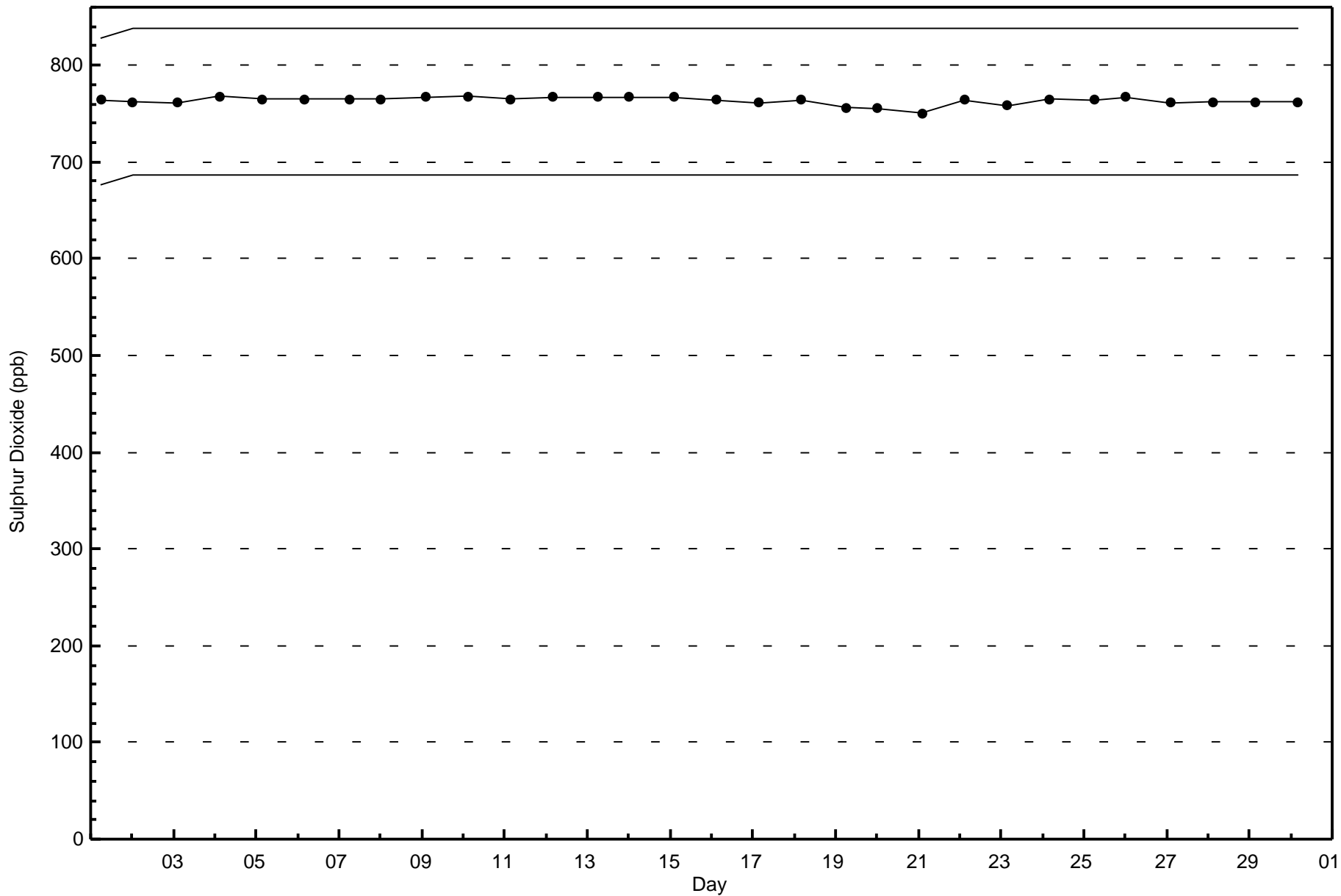


Classes (ppb)



Total Number of Valid Hours: 680

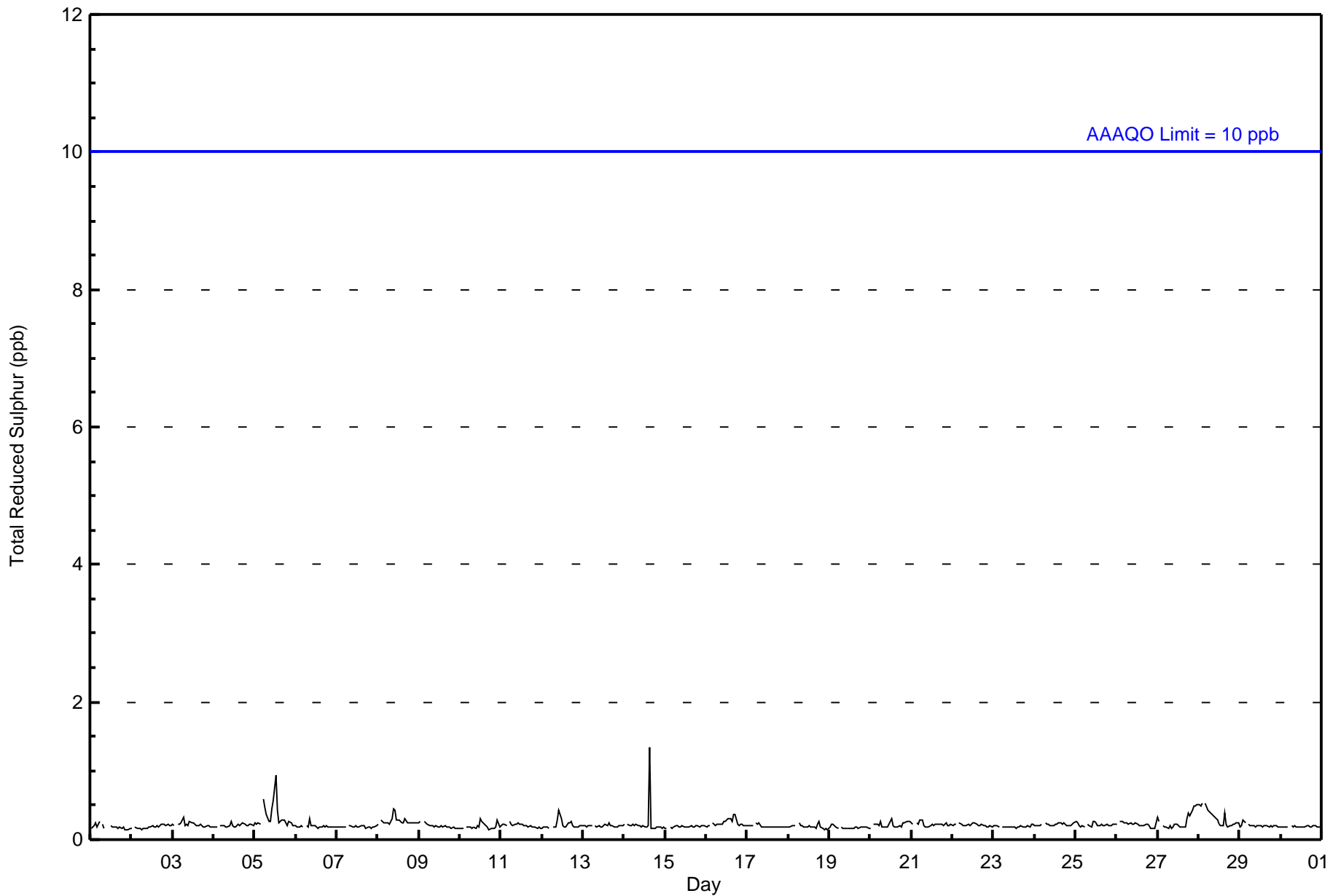






Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Anzac - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	687	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: 687

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Anzac - 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 - 2	18	3	8	8	8	18	60	120	66	29	43	22	38	157	49	39	686
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	18	3	8	8	8	18	60	120	66	29	43	22	38	157	49	39	686

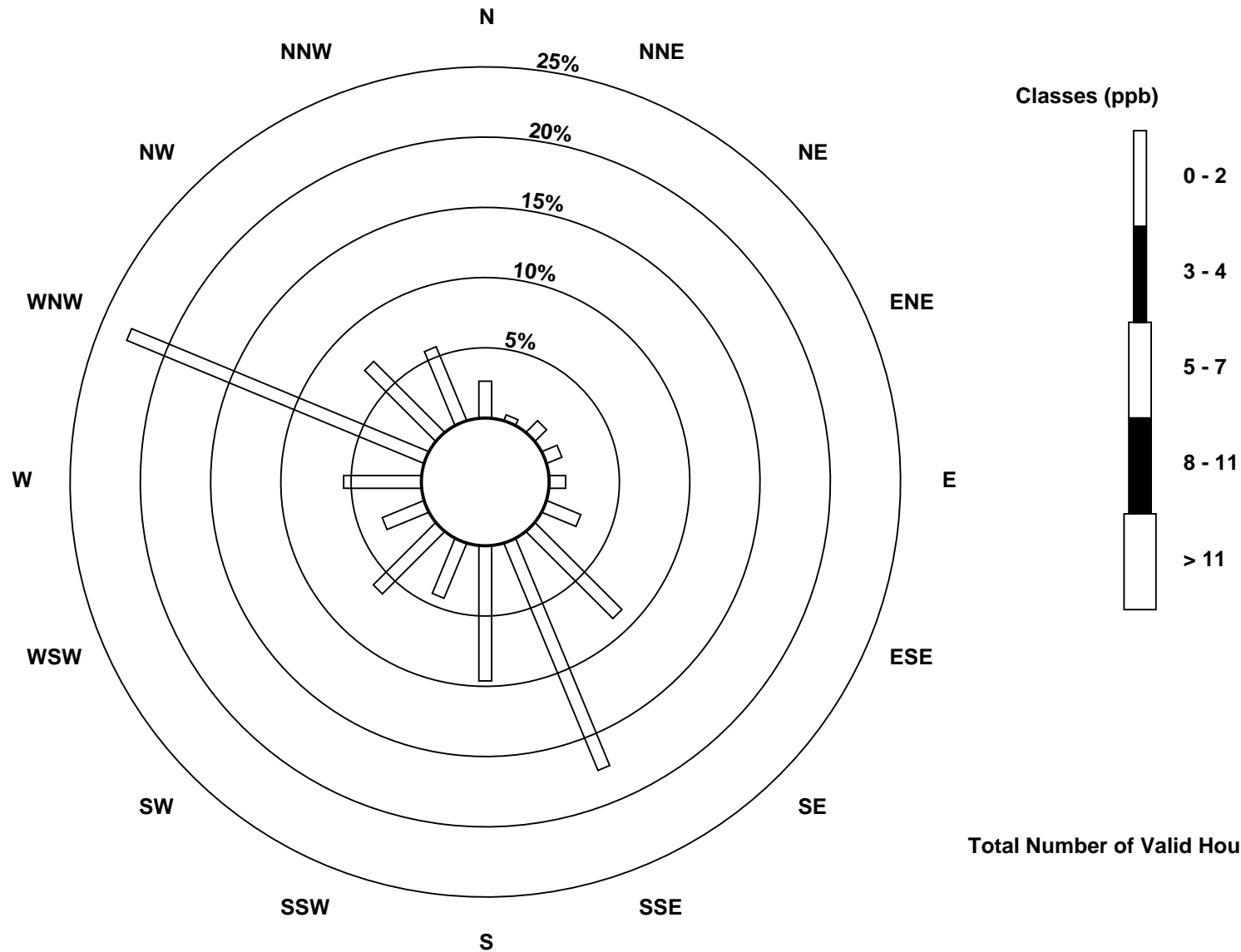
Total Number of Valid Hours: 686

Total Number of Hours: 720

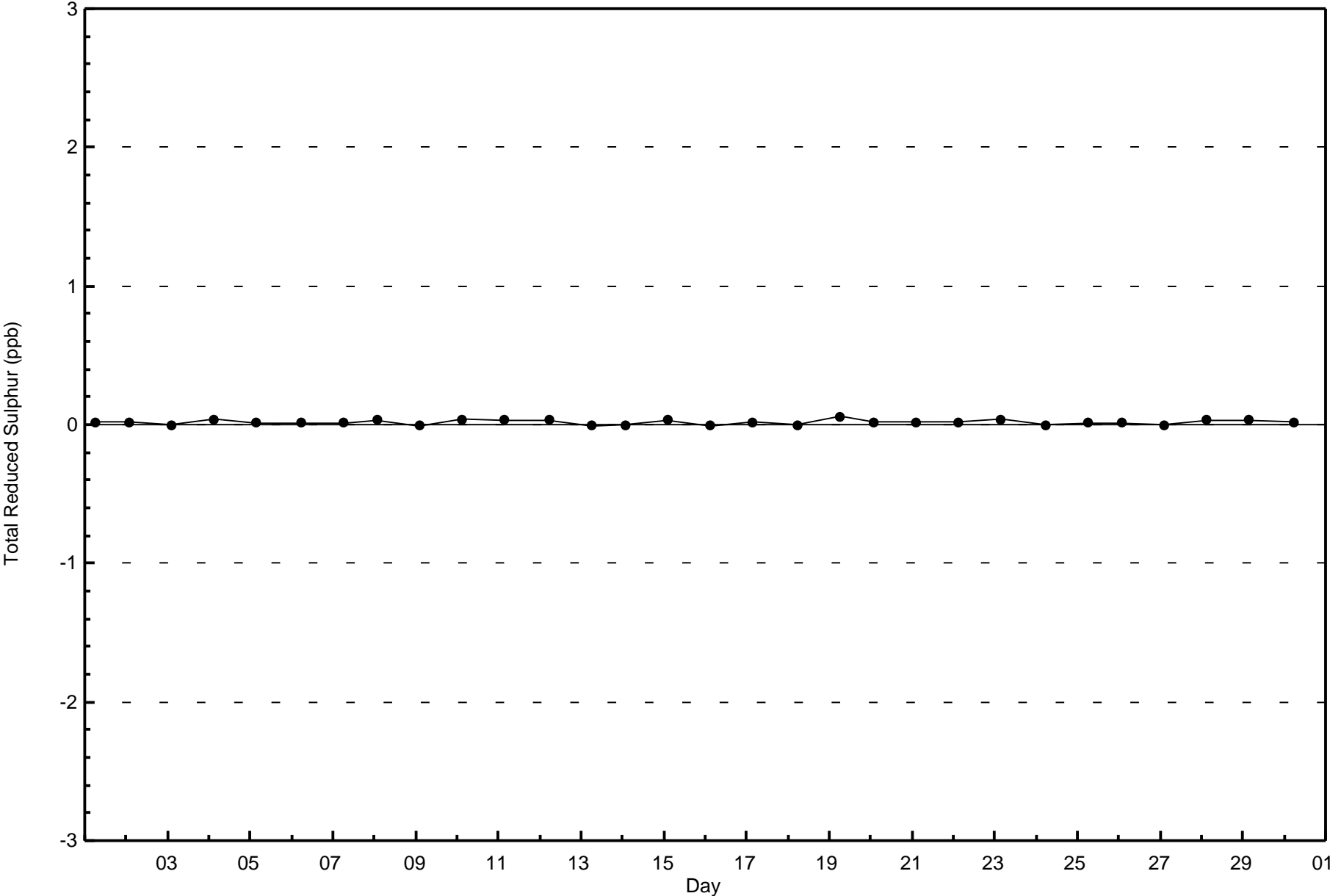


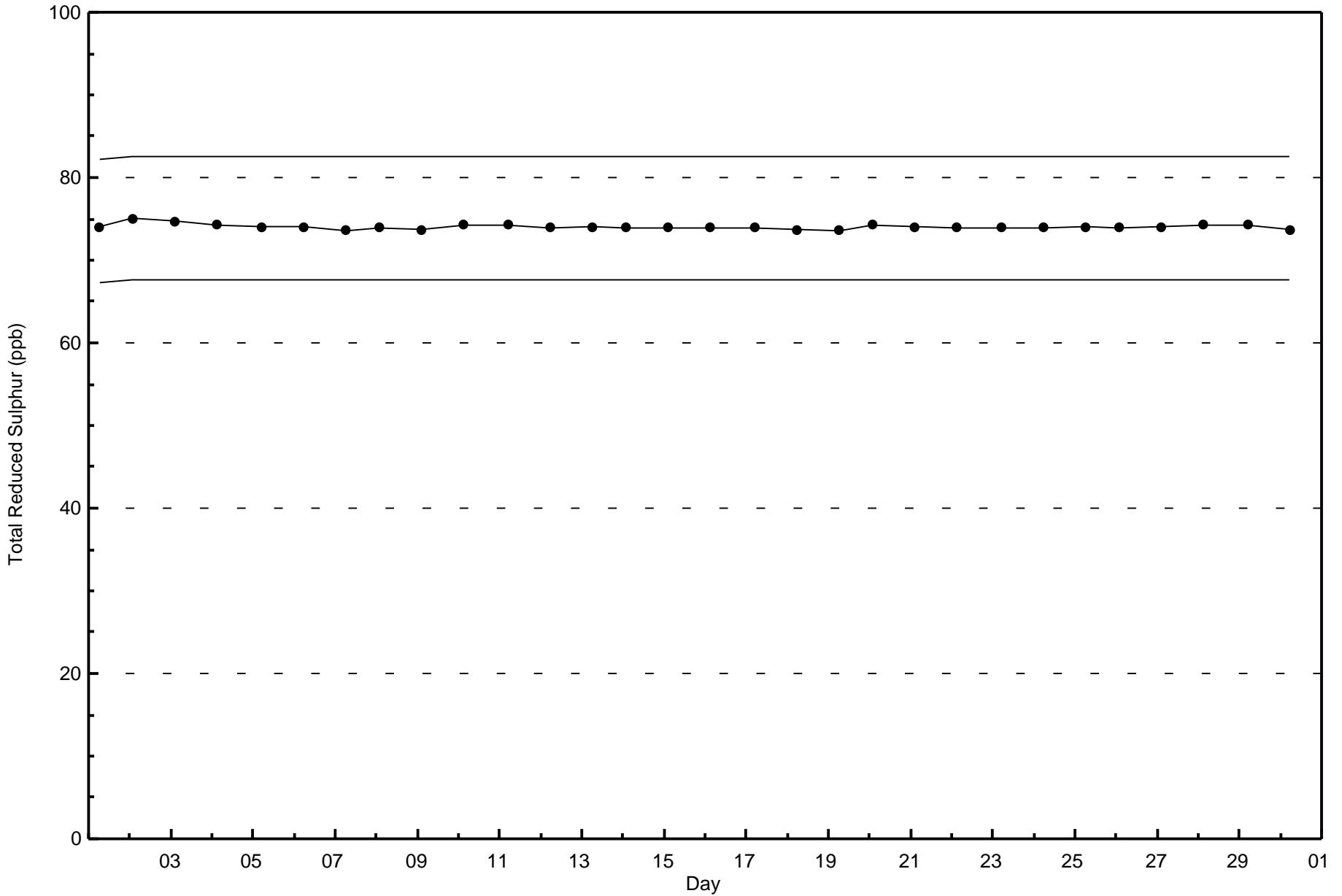
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Reduced Sulphur (TRS) - ppb
Anzac (AMS 14)



Total Number of Valid Hours: 686



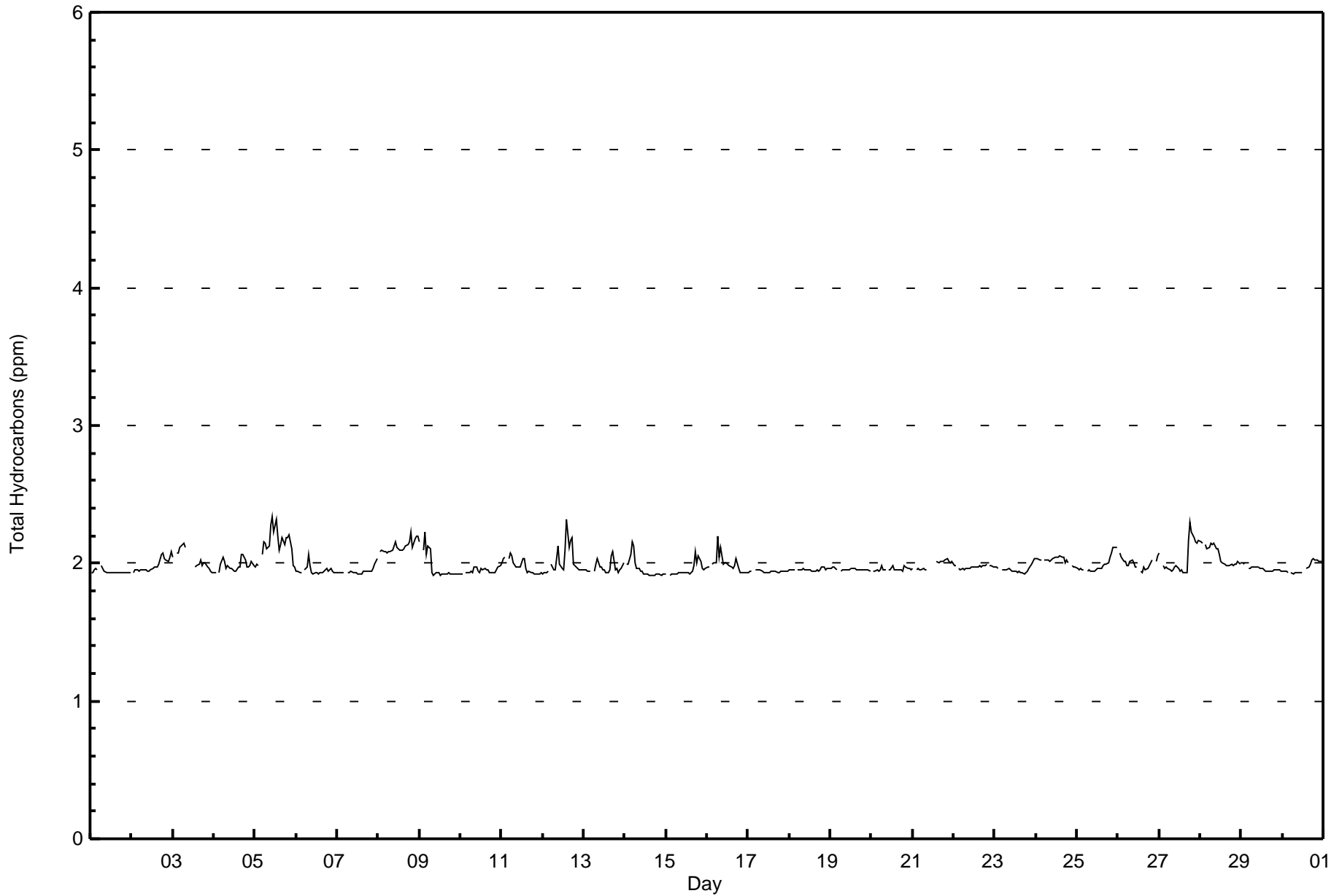




Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Anzac - November 2016

Maximum Value: 2.3 ppm on Nov 5 11:00 Maximum Daily Average: 2.1 ppm on Nov 5																				Hours in Service:	720							
Minimum Value: 1.9 ppm on Nov 9 09:00 Minimum Daily Average: 1.9 ppm on Nov 1																				Hours of Data:	672							
Maximum Diurnal Average: 2.0 ppm at hour 6 Minimum Diurnal Average: 2.0 ppm at hour 12																				Hours of Missing Data:	48							
Monthly Average: 1.99 ppm Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2																				Hours of Calibration:	35							
																				Percent Operational Time:	98.2							
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-Nov	1.9	1.9	2.0	2.0	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	2.0	2.1
2-Nov	Z	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1
3-Nov	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	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	2.1
4-Nov	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
5-Nov	2.0	2.0	2.0	Z	2.1	2.2	2.1	2.1	2.1	2.3	2.3	2.2	2.3	2.2	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.1	2.0	2.0	2.1	2.1	2.1	2.3
6-Nov	1.9	1.9	1.9	1.9	Z	1.9	2.0	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.1
7-Nov	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	2.0	2.0	2.0	1.9	1.9	1.9	2.0
8-Nov	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	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2
9-Nov	2.2	Z	2.1	2.2	2.1	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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
10-Nov	1.9	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0
11-Nov	2.0	2.0	2.0	Z	2.0	2.1	2.1	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1
12-Nov	1.9	1.9	1.9	1.9	Z	2.0	2.0	1.9	2.0	2.1	2.0	2.0	2.0	2.1	2.3	2.1	2.2	2.2	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.3
13-Nov	2.0	2.0	1.9	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.1	2.1	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1
14-Nov	Z	2.0	2.0	2.1	2.2	2.1	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	2.2
15-Nov	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	2.0	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
16-Nov	2.0	2.0	Z	2.0	2.0	2.0	2.2	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.2
17-Nov	1.9	1.9	1.9	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	2.0
18-Nov	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	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
19-Nov	2.0	2.0	2.0	2.0	2.0	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
20-Nov	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	UO	1.9	2.0	2.0	2.0	1.9	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
21-Nov	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	M	M	M	M	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
22-Nov	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	UO	2.0	2.0	2.0	2.0	2.0
23-Nov	2.0	2.0	2.0	Z	1.9	1.9	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0
24-Nov	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	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	UO	2.0	2.0	2.0	2.0	2.1
25-Nov	2.0	2.0	2.0	2.0	2.0	Z	1.9	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	2.1	2.1	2.1	2.1	2.0	2.1
26-Nov	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	UO	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	UO	2.0	2.1	2.0	2.1	2.0
27-Nov	2.1	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.2	2.3	2.2	2.2	2.2	2.2	2.1	2.2	2.0	2.3	
28-Nov	2.2	2.2	Z	2.1	2.1	2.1	2.1	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	2.0	2.0	2.0	2.1	2.2
29-Nov	UO	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0
30-Nov	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	UO	UO	2.0	2.0	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				
																								Diurnal Maximum				
Z - zerspan C - Calibration M - Maintenance UO - Unstable Operation																												





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	570	84.82	84.82
2.1 - 3.0	102	15.18	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 672

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - November 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	18	3	6	7	5	11	53	95	58	18	27	14	33	137	47	37	569
2.1 - 3.0	0	0	2	1	3	4	9	17	7	9	15	7	3	19	5	1	102
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	18	3	8	8	8	15	62	112	65	27	42	21	36	156	52	38	671

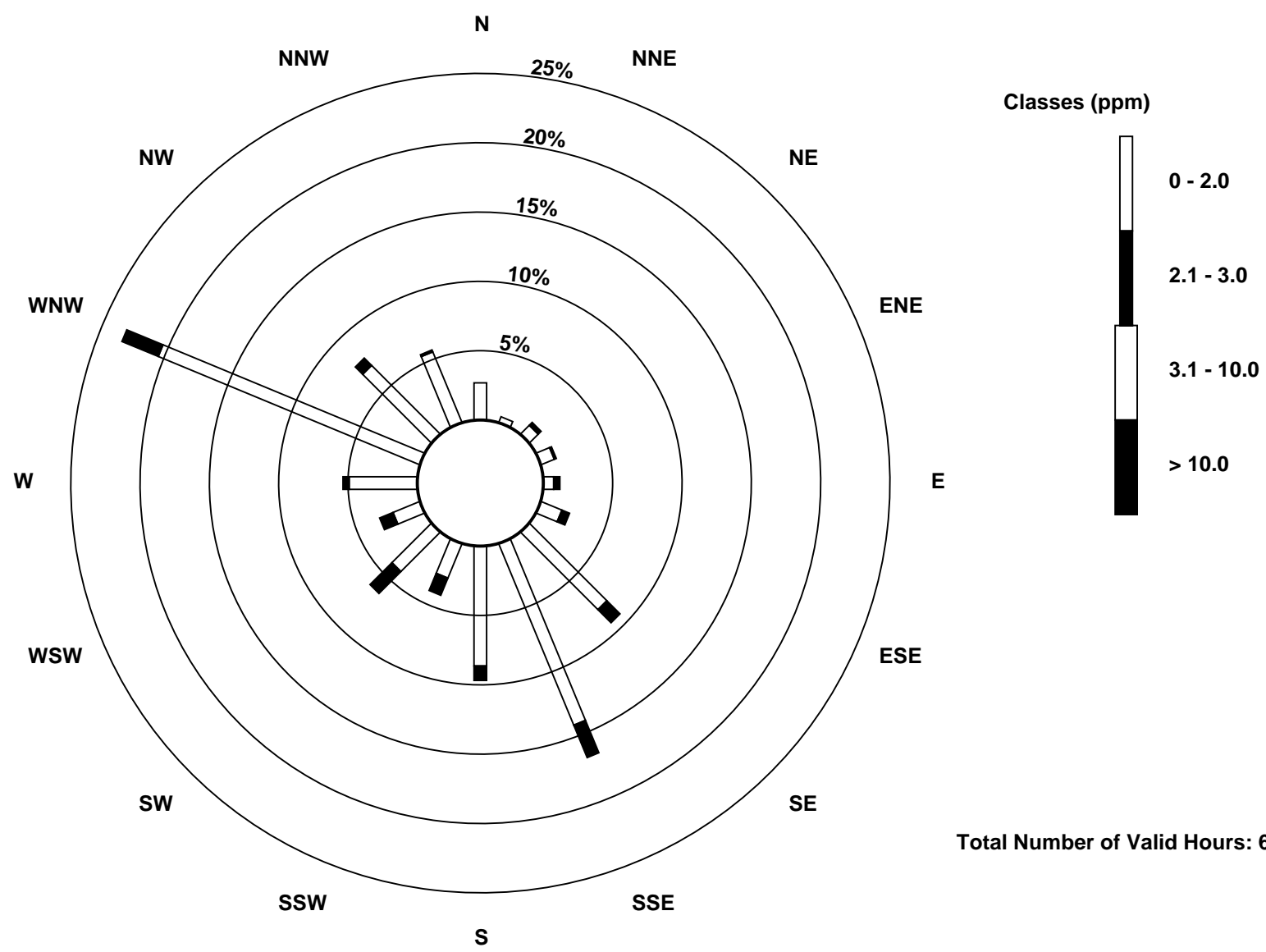
Total Number of Valid Hours: 671

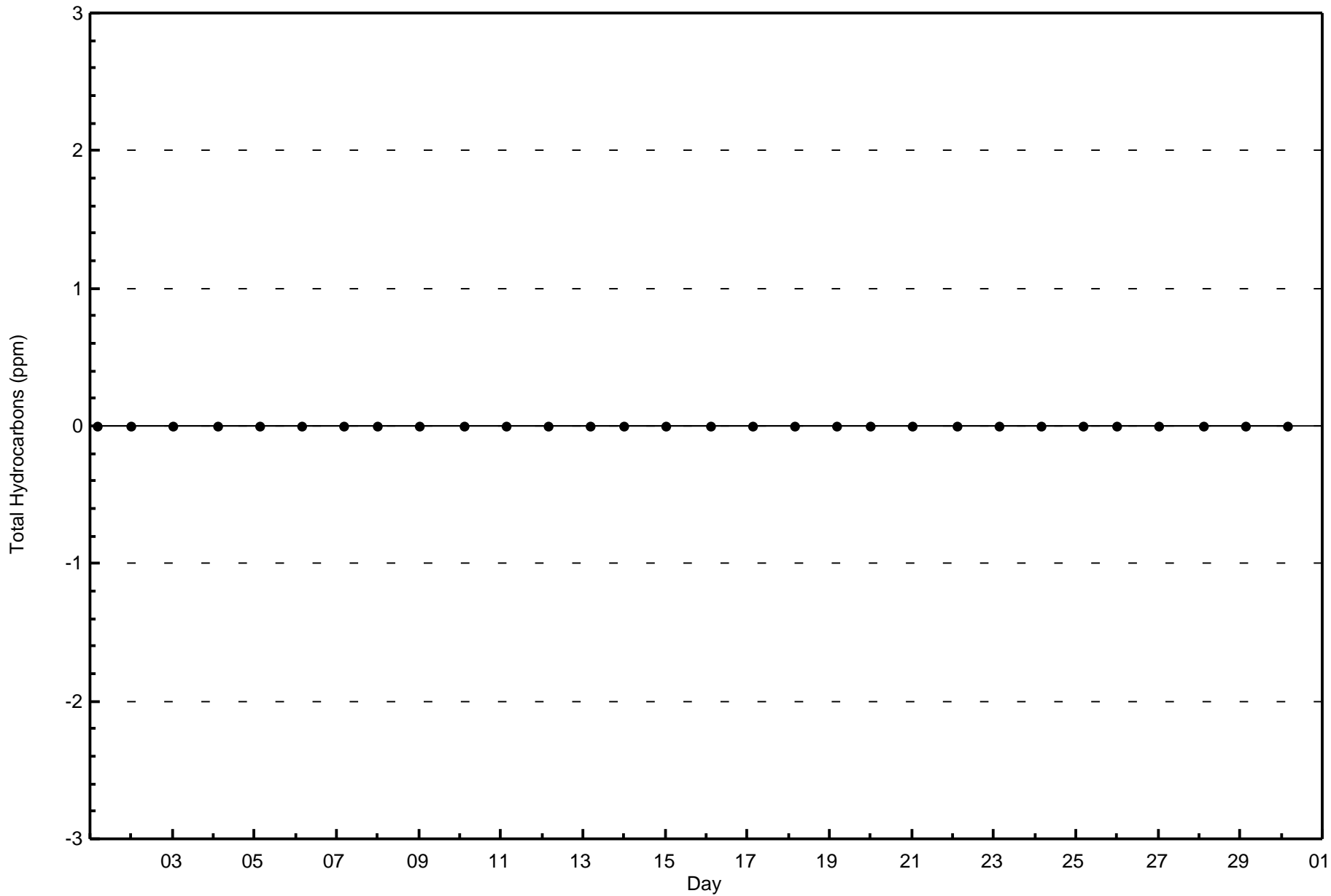
Total Number of Hours: 720

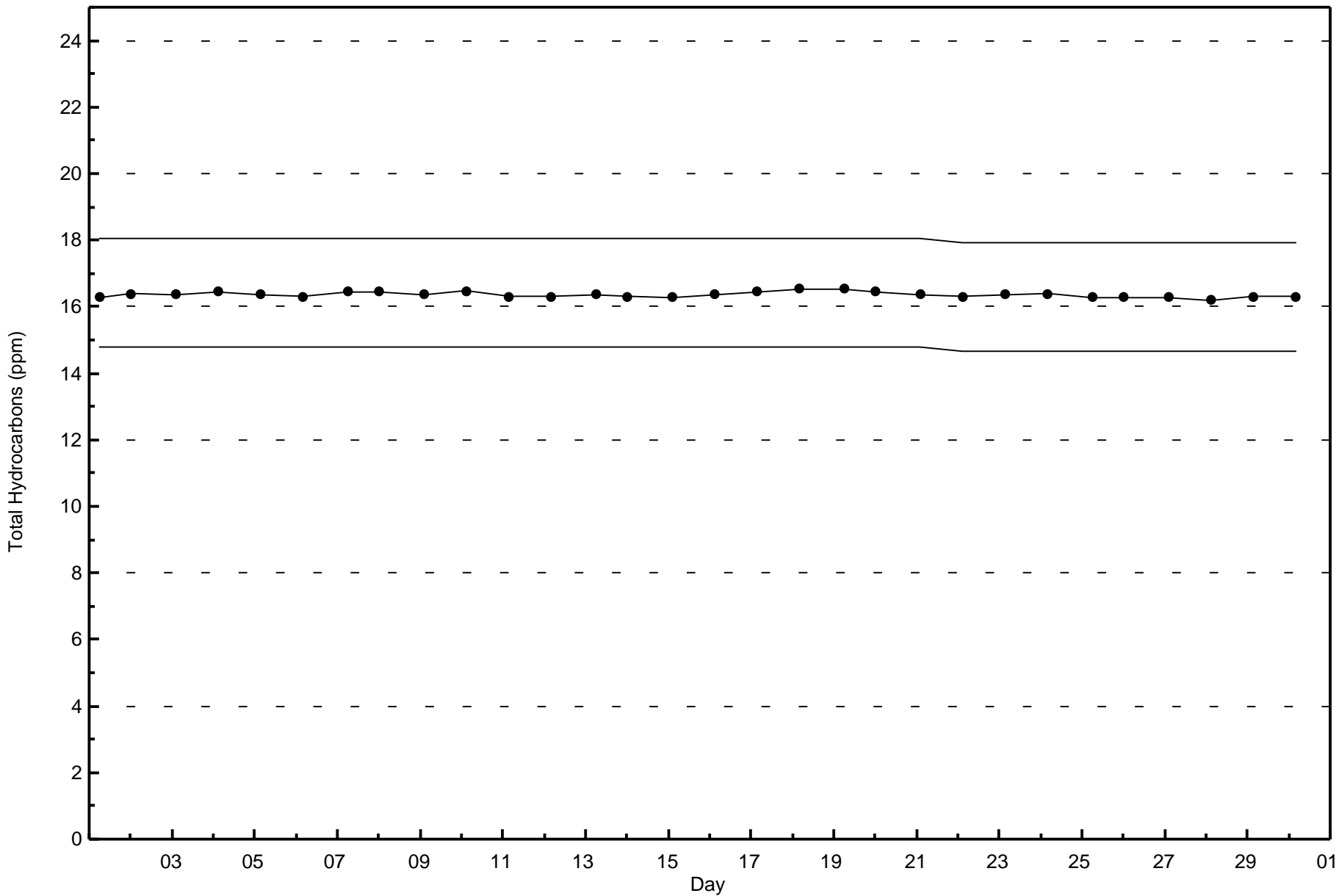


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Anzac (AMS 14)









Wood Buffalo Environmental Association

Summary of Hour Averages

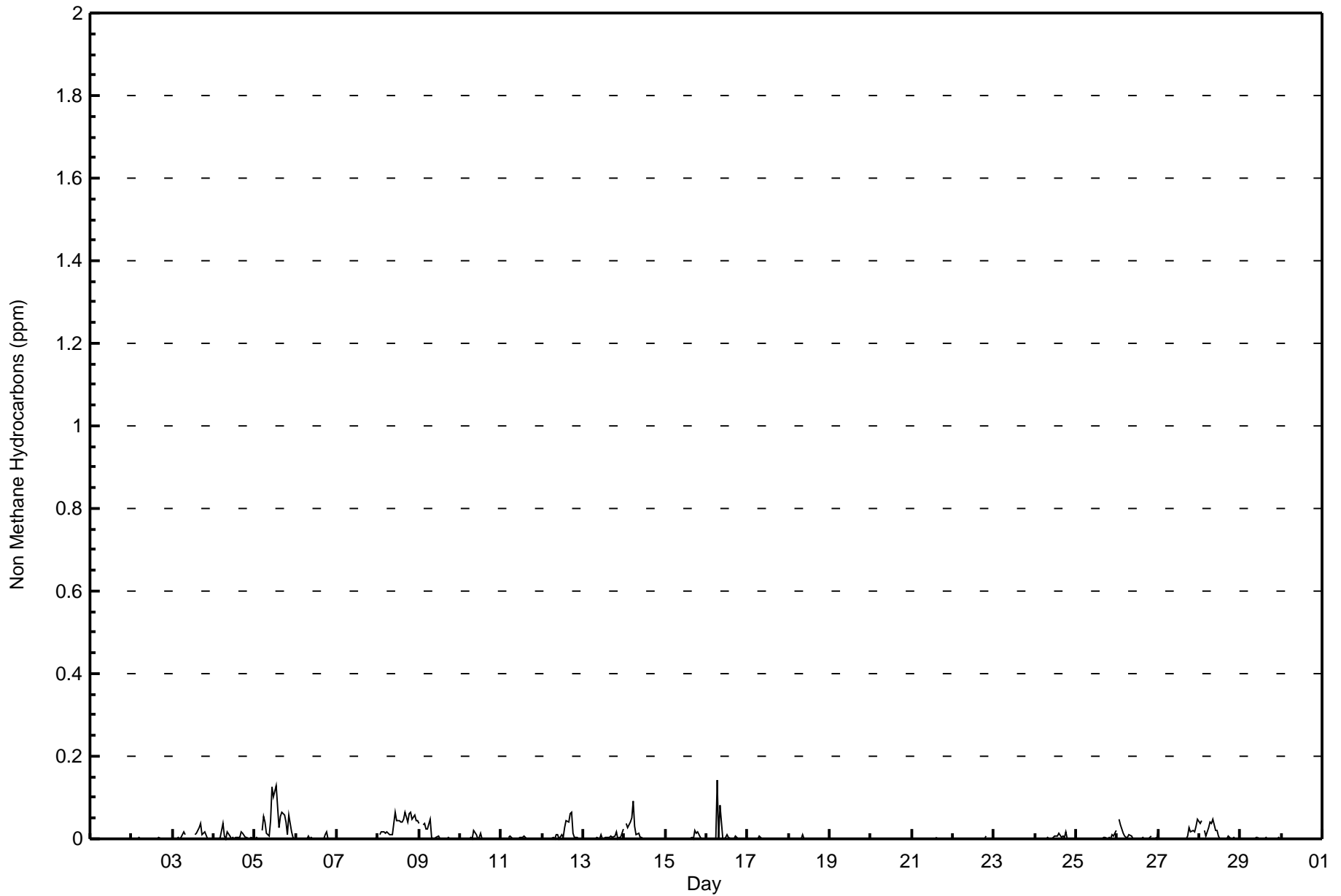
Non Methane Hydrocarbons (NMHC) - ppm

Anzac - November 2016

Maximum Value: 0.141 ppm on Nov 16 07:00	Maximum Daily Average: 0.042 ppm on Nov 5	Hours in Service: 720
Minimum Value: 0.000 ppm on Nov 1 01:00	Minimum Daily Average: 0.000 ppm on Nov 1	Hours of Data: 672
Maximum Diurnal Average: 0.012 ppm at hour 7	Minimum Diurnal Average: 0.003 ppm at hour 23	Hours of Missing Data: 48
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 = 0.1	Hours of Calibration: 35
		Percent Operational Time: 98.2

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-Nov	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	
2-Nov	Z	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	0.000	0.002	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	
3-Nov	0.000	Z	0.000	0.002	0.002	0.005	0.016	0.011	C	C	C	C	C	0.010	0.014	0.026	0.039	0.011	0.014	0.019	0.001	0.001	0.000	0.000	0.009	0.039	0.009	0.039	0.009	0.039	0.009	0.039		
4-Nov	0.000	0.000	Z	0.001	0.003	0.037	0.007	0.001	0.016	0.007	0.000	0.002	0.000	0.003	0.002	0.002	0.016	0.015	0.003	0.003	0.001	0.000	0.002	0.000	0.005	0.037	0.005	0.037	0.005	0.037	0.005	0.037		
5-Nov	0.002	0.002	0.001	Z	0.021	0.056	0.041	0.013	0.008	0.044	0.127	0.100	0.129	0.078	0.026	0.055	0.063	0.058	0.041	0.012	0.058	0.018	0.004	0.000	0.042	0.129	0.042	0.129	0.042	0.129	0.042	0.129		
6-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.001	0.006	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.018	0.002	0.001	0.001	0.000	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.018	
7-Nov	0.000	0.000	0.000	0.000	0.000	Z	0.001	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	0.000	0.000	0.003	0.003	0.003	
8-Nov	Z	0.012	0.016	0.016	0.014	0.016	0.013	0.011	0.012	0.039	0.064	0.043	0.045	0.041	0.040	0.049	0.064	0.042	0.060	0.065	0.046	0.059	0.044	0.044	0.037	0.065	0.037	0.065	0.037	0.065	0.037	0.065		
9-Nov	0.037	Z	0.036	0.038	0.025	0.022	0.047	0.002	0.000	0.001	0.002	0.006	0.000	0.000	0.000	0.000	0.000	0.003	0.001	0.000	0.000	0.000	0.000	0.010	0.047	0.010	0.047	0.010	0.047	0.010	0.047	0.010	0.047	
10-Nov	0.000	0.000	Z	0.000	0.000	0.000	0.003	0.000	0.021	0.011	0.000	0.003	0.012	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.021	0.002	0.021	0.002	0.021	0.002	0.021	0.002	0.021	
11-Nov	0.000	0.000	0.000	Z	0.004	0.006	0.004	0.001	0.001	0.000	0.000	0.002	0.002	0.007	0.003	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.007	
12-Nov	0.000	0.000	0.000	0.000	Z	0.001	0.003	0.000	0.011	0.010	0.001	0.010	0.004	0.026	0.043	0.042	0.062	0.063	0.013	0.003	0.003	0.000	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.063	
13-Nov	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.005	0.000	0.009	0.000	0.001	0.003	0.004	0.002	0.006	0.003	0.008	0.015	0.001	0.003	0.004	0.023	0.004	0.023	0.004	0.023	0.004	0.023	0.004	0.023	0.004	0.023
14-Nov	Z	0.038	0.028	0.041	0.051	0.091	0.030	0.009	0.014	0.004	0.002	0.002	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.014	0.038	0.014	0.038	0.014	0.038	0.014	0.038	0.014	0.038	
15-Nov	0.000	Z	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	0.003	0.000	0.021	0.013	0.017	0.004	0.000	0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.021	
16-Nov	0.000	0.000	Z	0.000	0.000	0.000	0.141	0.000	0.080	0.000	0.001	0.005	0.011	0.004	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.141	
17-Nov	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.008	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	0.000	0.000	0.000	0.008	
18-Nov	0.000	0.000	0.000	0.000	Z	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	
19-Nov	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	
20-Nov	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	UO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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-Nov	0.000	Z	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	M	M	M	M	M	0.003	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	0.003	
22-Nov	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	0.007	UO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	
23-Nov	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	0.000	
24-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.001	0.004	0.000	0.000	0.000	0.005	0.006	0.008	0.015	0.003	0.007	0.004	0.018	0.001	UO	0.000	0.000	0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
25-Nov	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	0.003	0.000	0.003	0.000	0.000	0.000	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
26-Nov	Z	0.046	0.035	0.013	0.008	0.003	0.010	0.006	0.000	0.000	0.000	0.000	UO	0.000	0.000	0.002	0.000	0.000	0.001	0.003	0.008	UO	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.046
27-Nov	0.021	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	0.006	0.028	0.017	0.019	0.018	UO	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.021	
28-Nov	0.039	0.045	Z	0.020	0.008	0.029	0.041	0.039	0.049	0.020	0.021	0.008	0.001	0.001	0.000	0.000	0.000	0.006	0.001	0.000	0.002	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.049	
29-Nov	UO	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.002	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	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
30-Nov	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	UO	UO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
																								Diurnal Average										
																								Diurnal Maximum										

Z - zerospan	C - Calibration	M - Maintenance	UO - Unstable Operation
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**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Anzac - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	537	79.91	79.91
0.006 - 0.05	116	17.26	97.17
0.06 - 0.1	19	2.83	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 672

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Non Methane Hydrocarbons (NMHC) - ppm
Anzac - November 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	16	3	6	7	5	12	52	91	53	16	22	12	29	131	45	36	536
0.006 - 0.05	2	0	2	1	2	3	8	17	10	9	17	8	7	24	4	2	116
0.06 - 0.1	0	0	0	0	1	0	2	4	2	2	3	1	0	1	3	0	19
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	18	3	8	8	8	15	62	112	65	27	42	21	36	156	52	38	671

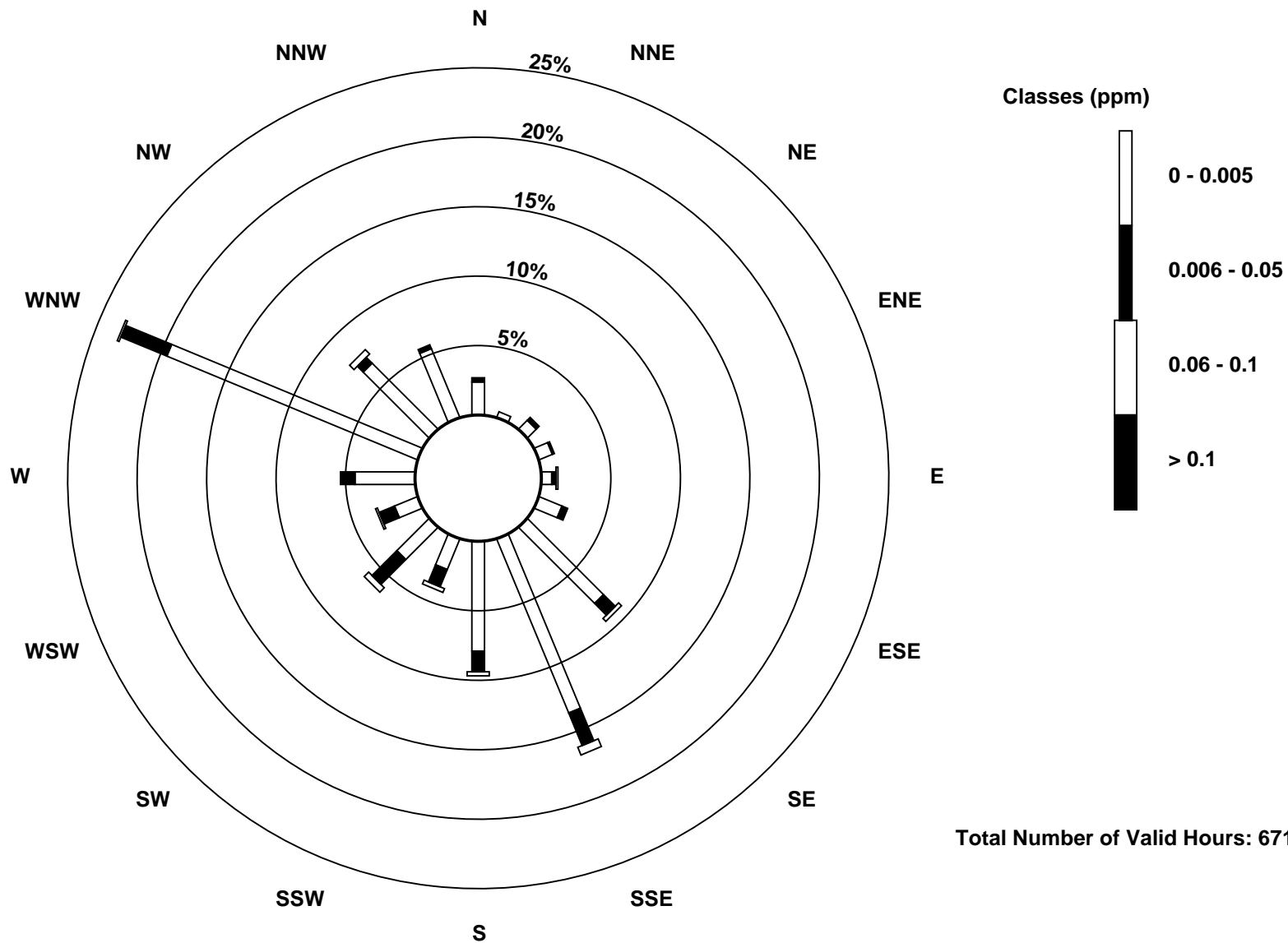
Total Number of Valid Hours: 671

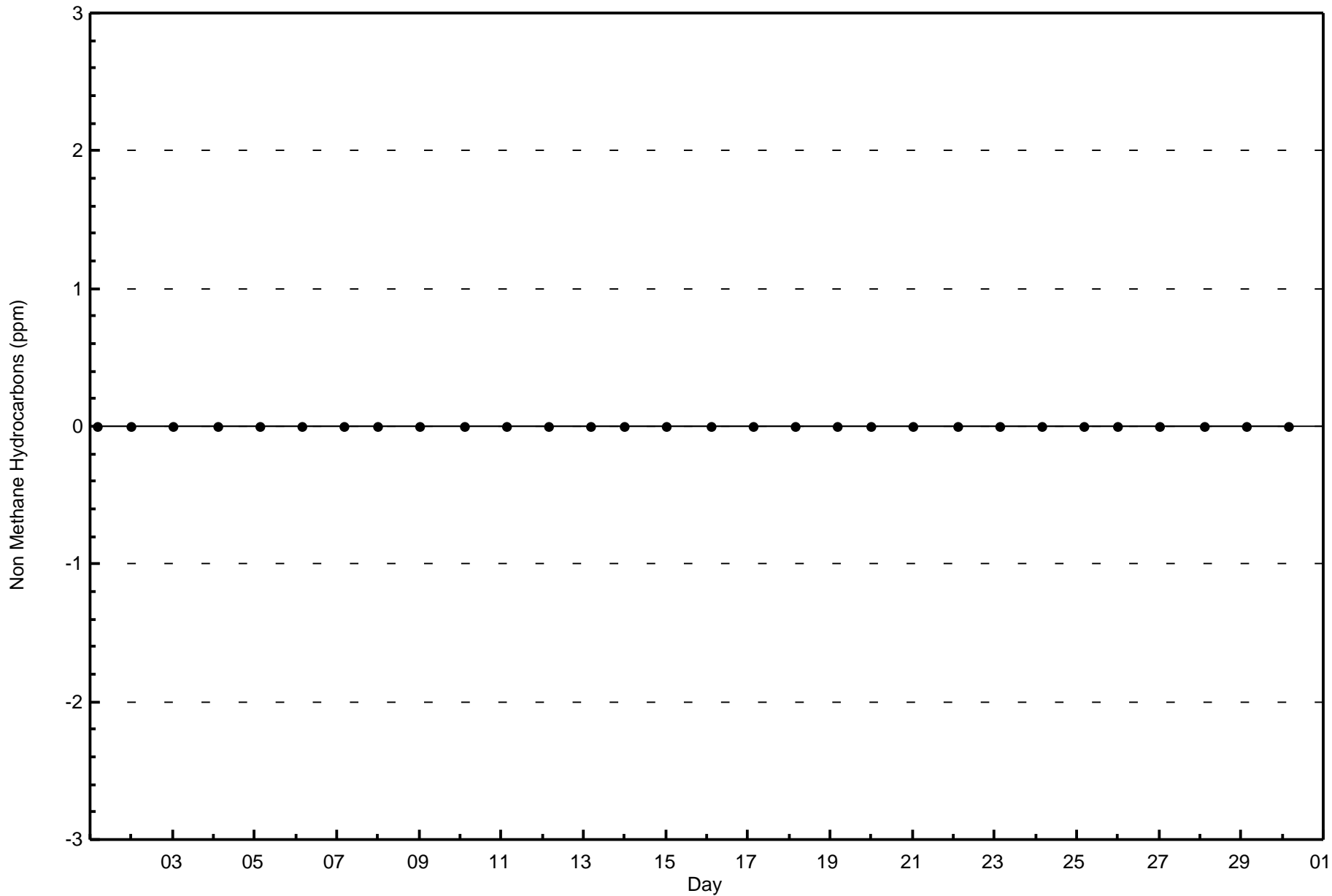
Total Number of Hours: 720

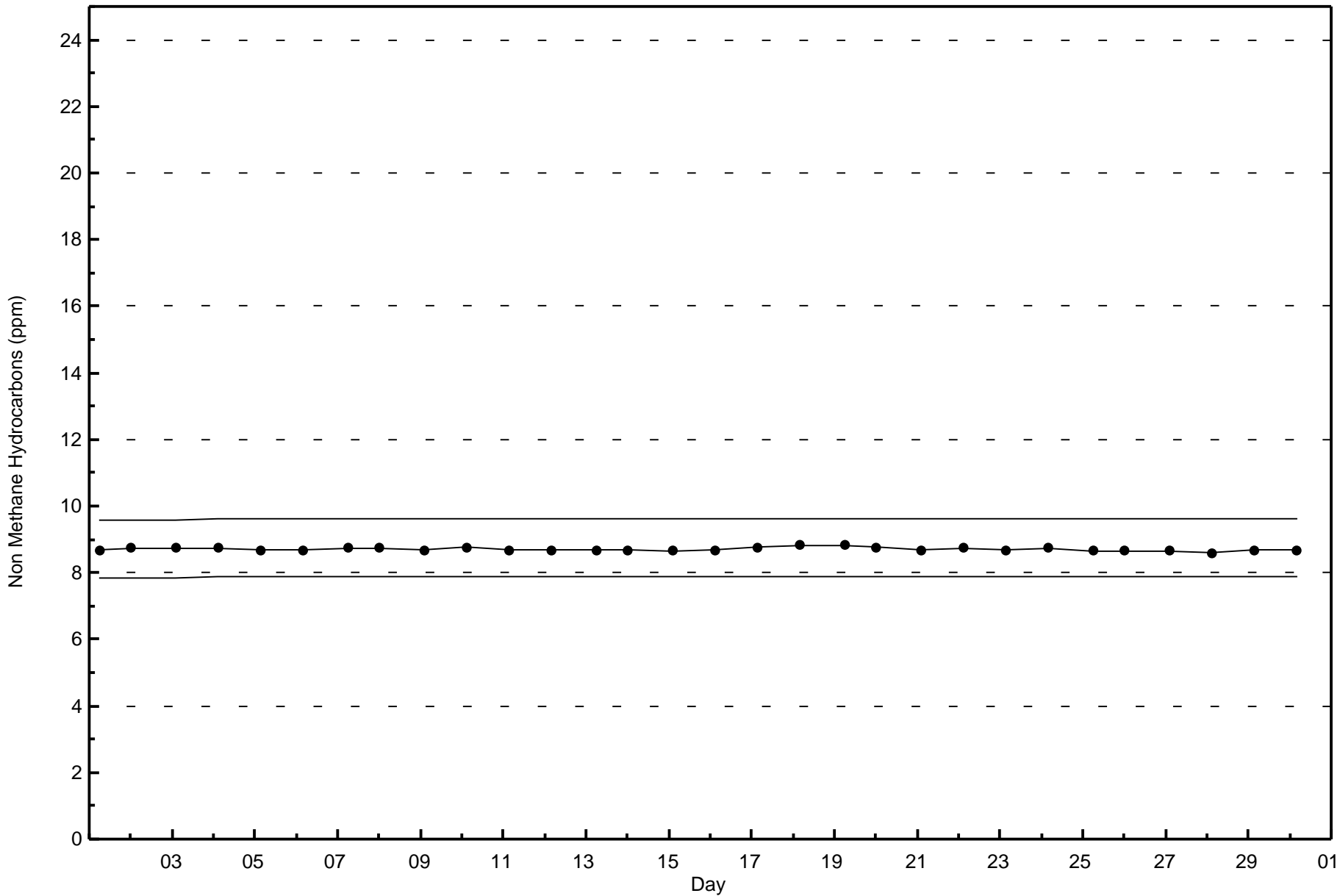


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Non Methane Hydrocarbons (NMHC) - ppm
Anzac (AMS 14)









Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

Anzac - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2.3 ppm on Nov 12 15:00	Maximum Daily Average: 2.1 ppm on Nov 5		Hours of Data:	672
Minimum Value: 1.9 ppm on Nov 9 09:00	Minimum Daily Average: 1.9 ppm on Nov 1		Hours of Missing Data:	48
Maximum Diurnal Average: 2.0 ppm at hour 6	Minimum Diurnal Average: 2.0 ppm at hour 12		Hours of Calibration:	35
Monthly Average: 1.98 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2		Percent Operational Time:	98.2

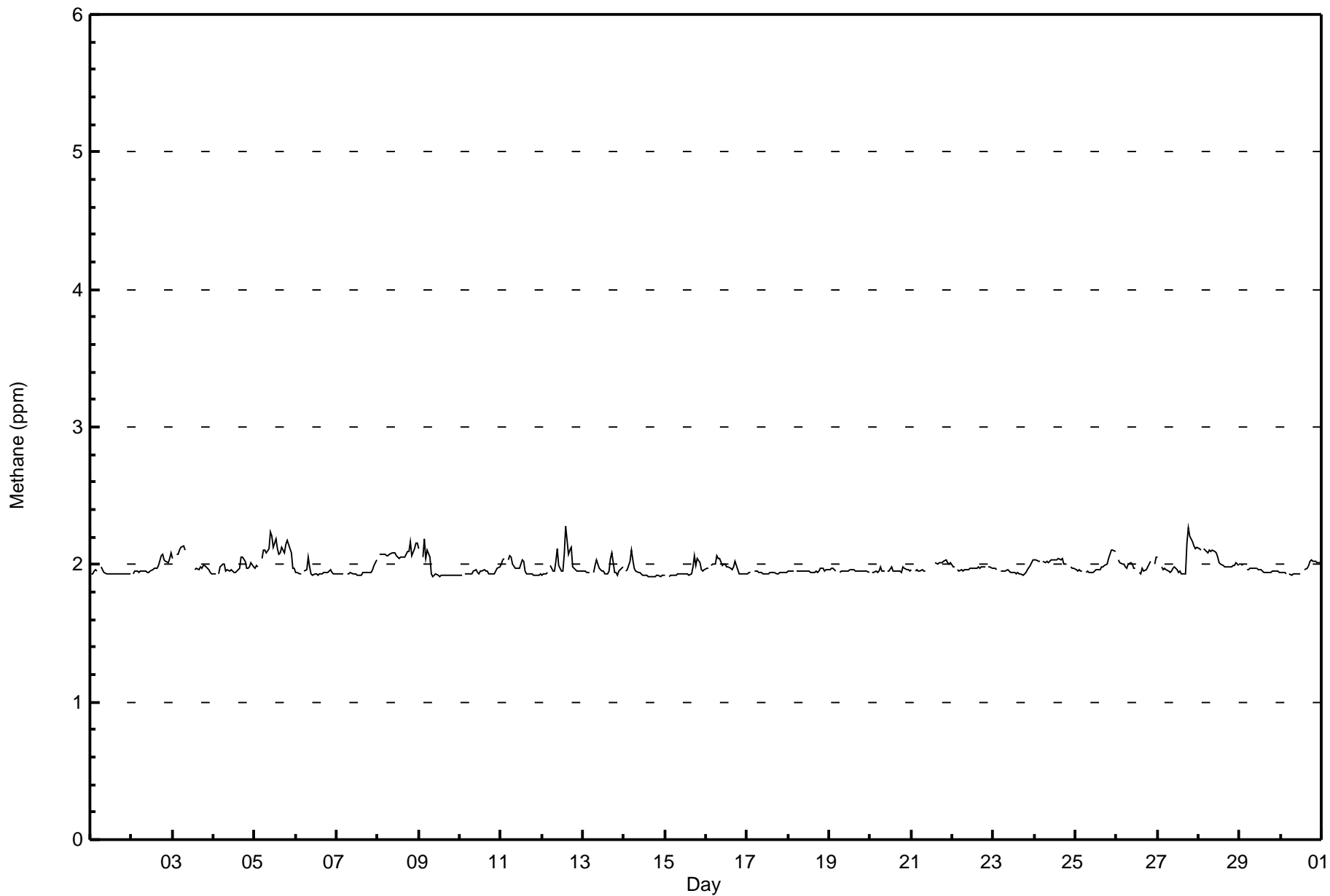
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Nov	1.9	1.9	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
2-Nov	Z	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.1	
3-Nov	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	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	2.1	2.1	
4-Nov	1.9	1.9	Z	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	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	
5-Nov	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.0	2.0	2.1	2.1	2.2	
6-Nov	1.9	1.9	1.9	1.9	Z	1.9	2.0	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	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1	
7-Nov	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
8-Nov	Z	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	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	
9-Nov	2.1	Z	2.1	2.2	2.0	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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	
10-Nov	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	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	1.9	2.0	2.0	
11-Nov	2.0	2.0	2.0	Z	2.0	2.1	2.1	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
12-Nov	1.9	1.9	1.9	1.9	Z	2.0	1.9	1.9	2.0	2.1	2.0	2.0	2.0	2.1	2.3	2.1	2.1	2.1	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.3	
13-Nov	2.0	2.0	1.9	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.1	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
14-Nov	Z	2.0	2.0	2.0	2.1	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	2.1	
15-Nov	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	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
16-Nov	2.0	2.0	Z	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	
17-Nov	1.9	1.9	1.9	Z	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	
18-Nov	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	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
19-Nov	2.0	2.0	2.0	2.0	2.0	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
20-Nov	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	UO	1.9	2.0	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
21-Nov	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	M	M	M	M	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
22-Nov	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	UO	2.0	2.0	2.0	2.0	2.0	
23-Nov	2.0	2.0	2.0	Z	1.9	1.9	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
24-Nov	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	UO	2.0	2.0	2.0	2.0	2.0	
25-Nov	2.0	2.0	2.0	2.0	2.0	Z	1.9	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	2.1	2.1	2.1	2.1	2.1	2.1	
26-Nov	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	UO	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	UO	2.0	2.1	2.0	2.1	2.1	
27-Nov	2.1	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.3	2.3	
28-Nov	2.1	2.1	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1
29-Nov	UO	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	
30-Nov	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	UO	UO	2.0	2.0	2.0	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					
2.1																								Diurnal Maximum					

Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation



Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Anzac - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Anzac - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	580	86.31	86.31
2.1 - 3.0	92	13.69	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 672

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Anzac - November 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	18	3	6	7	6	11	54	96	59	19	28	16	33	138	48	37	579
2.1 - 3.0	0	0	2	1	2	4	8	16	6	8	14	5	3	18	4	1	92
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	18	3	8	8	8	15	62	112	65	27	42	21	36	156	52	38	671

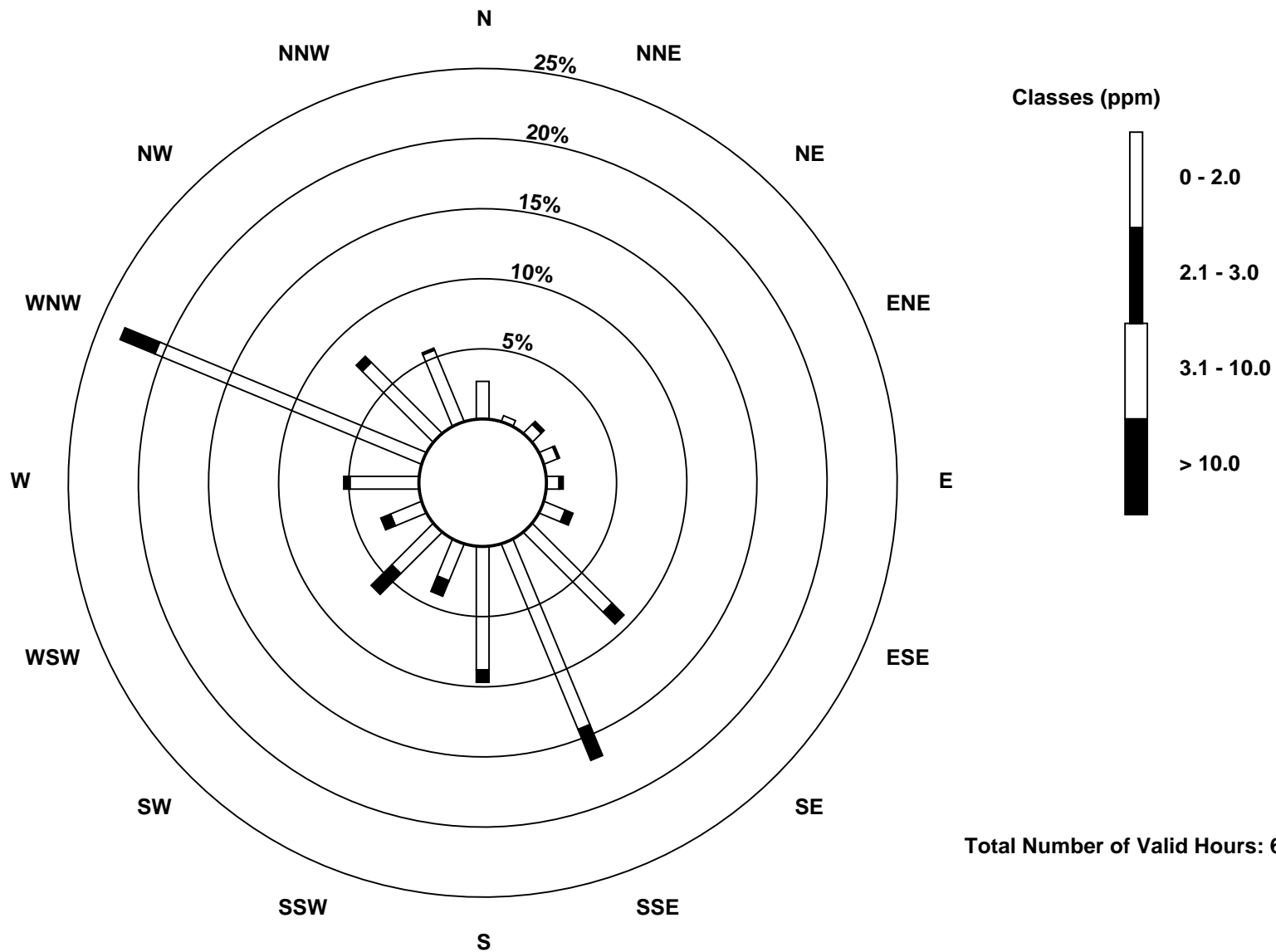
Total Number of Valid Hours: 671

Total Number of Hours: 720

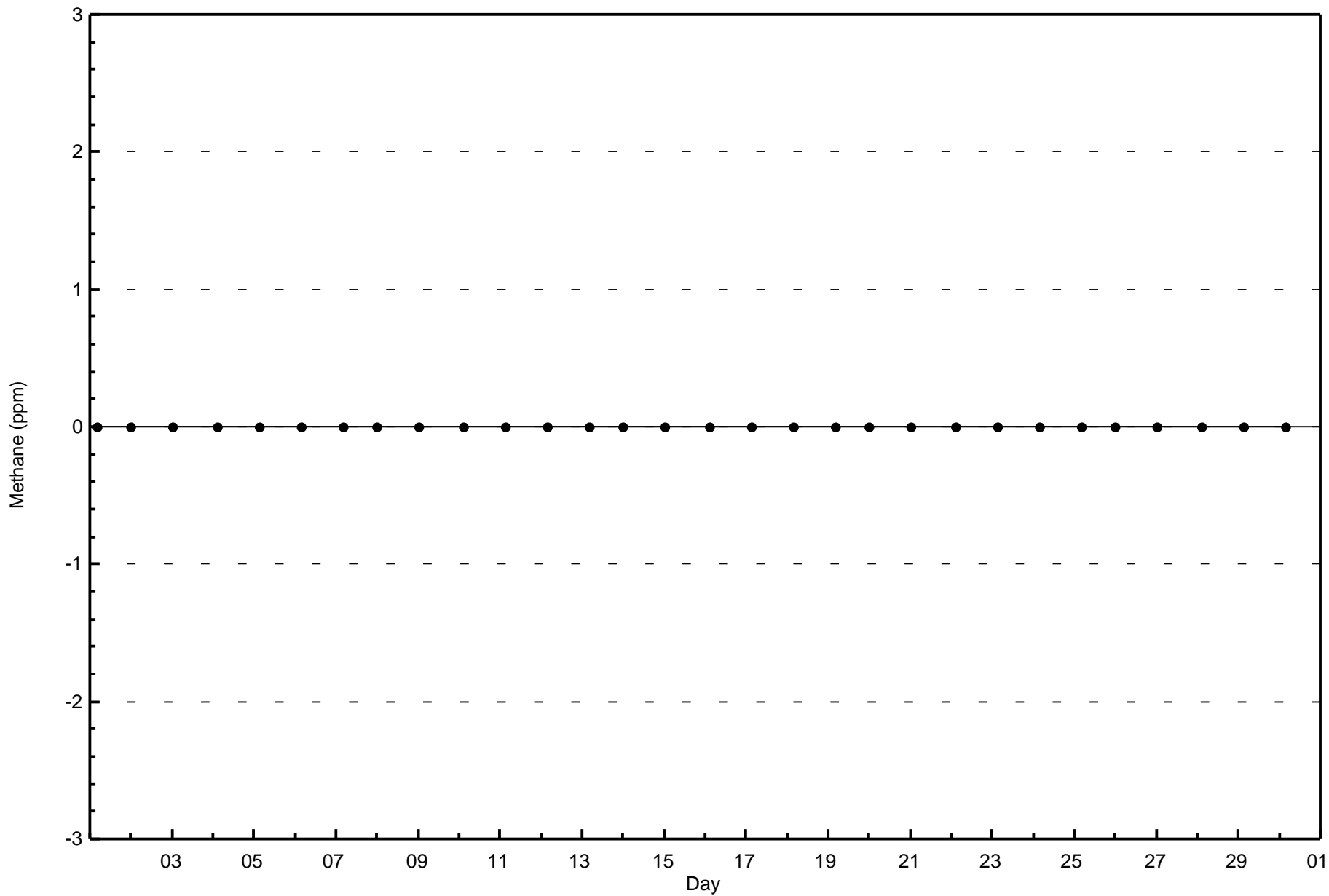


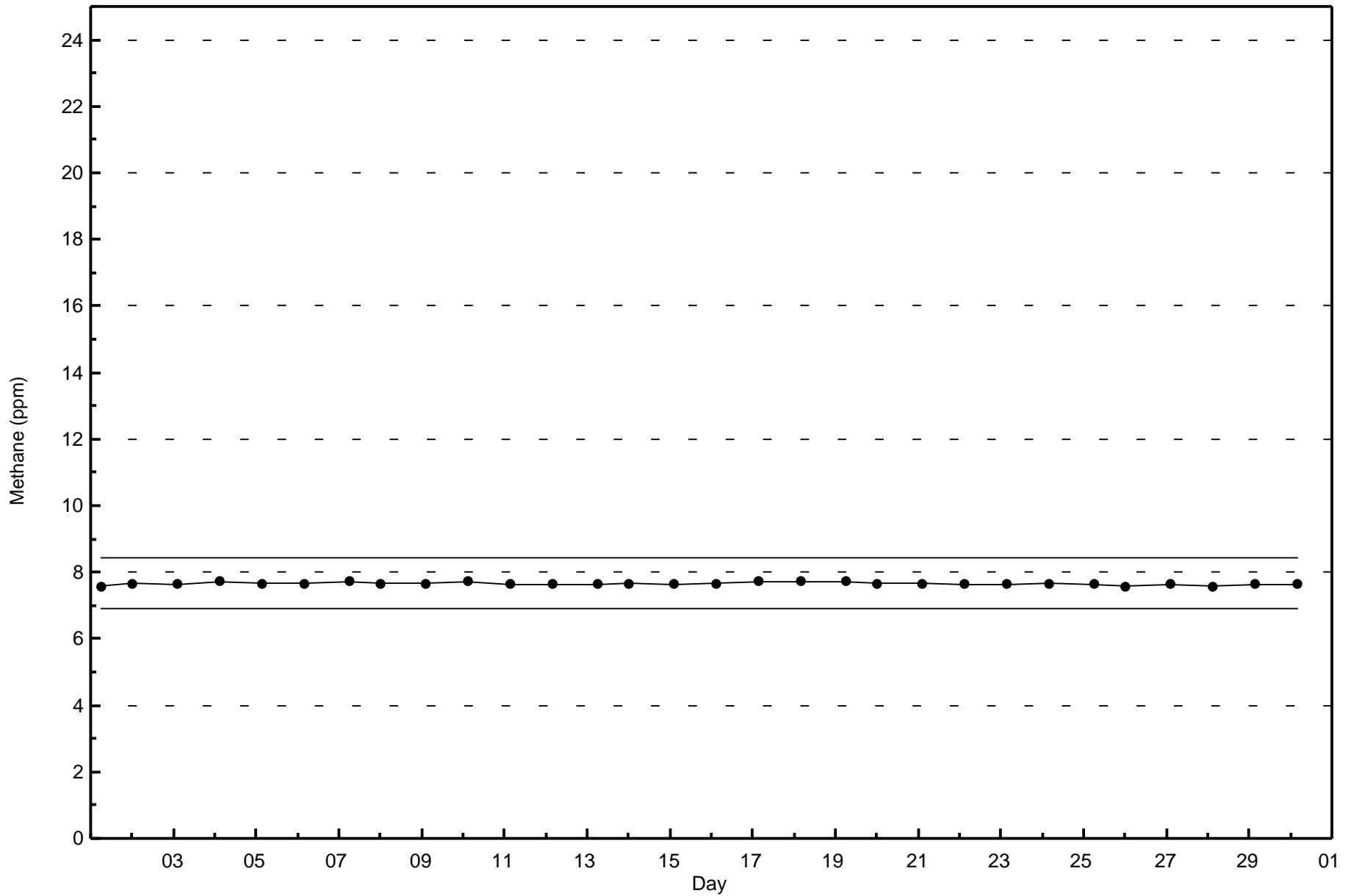
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Methane (CH₄) - ppm
Anzac (AMS 14)



Total Number of Valid Hours: 671







Wood Buffalo Environmental Association
Summary of Hour Averages

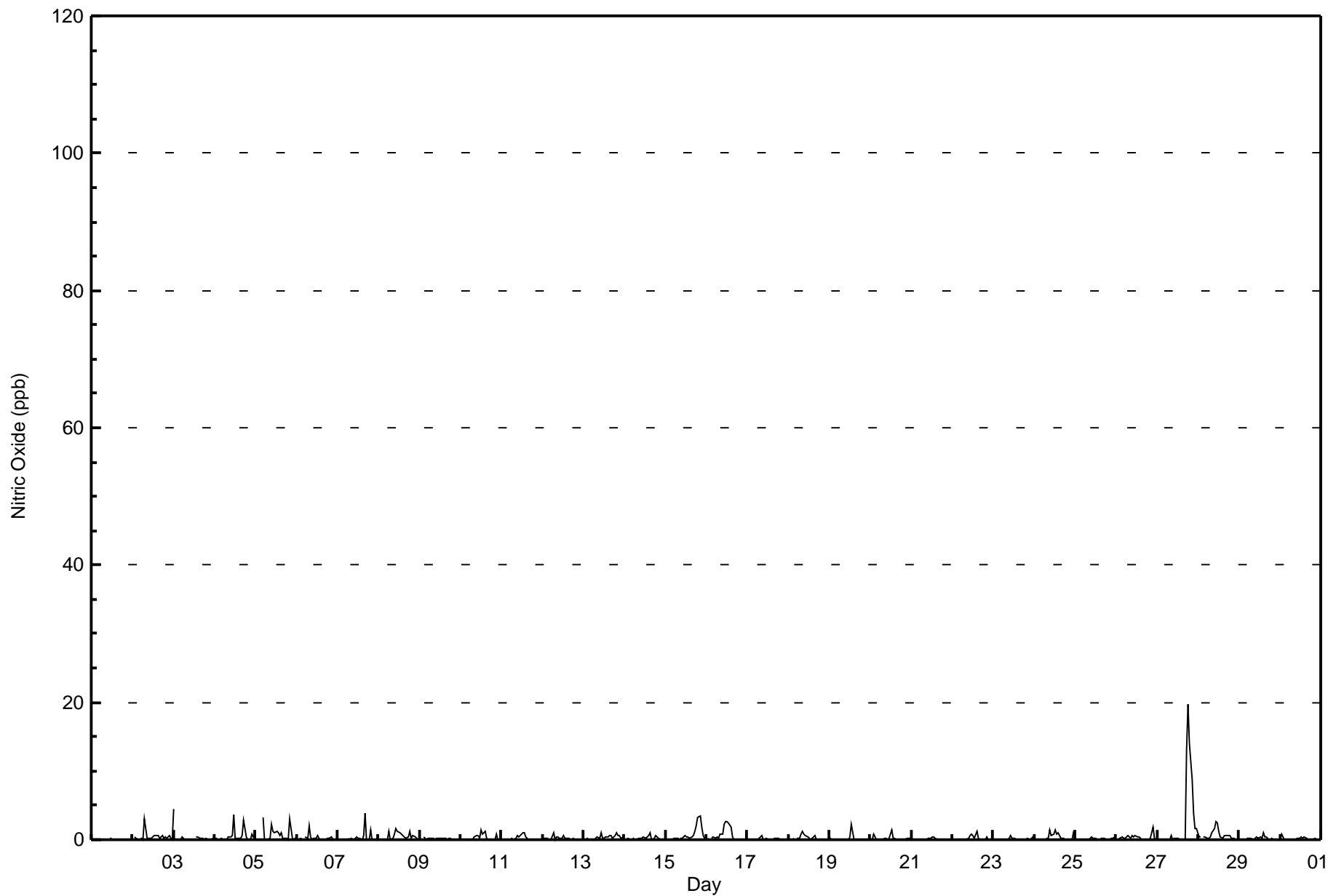
Nitric Oxide (NO) - ppb
Anzac - November 2016

Maximum Value: 20 ppb on Nov 27 19:00		Maximum Daily Average: 2.8 ppb on Nov 27		Hours in Service: 720																						
Minimum Value: 0 ppb on Nov 1 19:00		Minimum Daily Average: 0.0 ppb on Nov 1		Hours of Data: 685																						
Maximum Diurnal Average: 0.9 ppb at hour 19		Minimum Diurnal Average: 0.1 ppb at hour 4		Hours of Missing Data: 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 = 4		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	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	3	0	0	0	0	1	1	1	1	0	1	0	0	0	1	0	0	0.4	3
3-Nov	5	Z	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.4	5
4-Nov	0	0	Z	0	0	0	0	0	0	0	1	4	0	0	0	0	1	3	0	0	0	0	1	0	0.5	4
5-Nov	0	0	0	Z	3	0	0	0	0	2	1	1	1	1	1	1	0	0	0	0	3	0	0	0	0.7	3
6-Nov	0	0	0	0	Z	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	2
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	4	0	0	1	0	0	0	0	0	0.3	4
8-Nov	Z	0	0	0	0	0	1	0	0	1	2	1	1	1	1	0	0	0	1	0	1	0	0	0	0.5	2
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	0.1	0
10-Nov	0	0	Z	0	0	0	0	0	0	1	1	0	2	1	1	0	0	0	0	0	0	1	0	0	0.3	2
11-Nov	0	0	0	Z	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Nov	0	0	0	0	Z	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
13-Nov	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	1	1	0	1	1	1	1	0	0	0.3	1
14-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0.2	1
15-Nov	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	2	3	4	2	1	0	0.7	4
16-Nov	0	0	Z	0	0	0	0	0	1	1	2	3	3	2	2	0	0	0	0	0	0	0	0	0	0.7	3
17-Nov	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
18-Nov	0	0	0	0	Z	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1
19-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0.1	2
20-Nov	Z	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
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	0.1	0
22-Nov	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0.2	1
23-Nov	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
24-Nov	0	0	0	0	Z	0	0	0	0	2	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0.4	2
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	0.1	0
26-Nov	Z	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0.3	2
27-Nov	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	13	20	14	9	4	2	2	2.8	20
28-Nov	0	0	Z	0	0	0	0	0	1	2	3	2	1	0	0	1	1	1	1	0	0	0	0	0	0.7	3
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
30-Nov	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
																								Diurnal Average		
																								Diurnal Maximum		
																								Z - zerospan C - Calibration		



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Anzac - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Anzac - 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
Anzac - 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	18	3	8	8	8	15	62	119	66	28	42	21	37	157	53	39	684
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	18	3	8	8	8	15	62	119	66	28	42	21	37	157	53	39	684

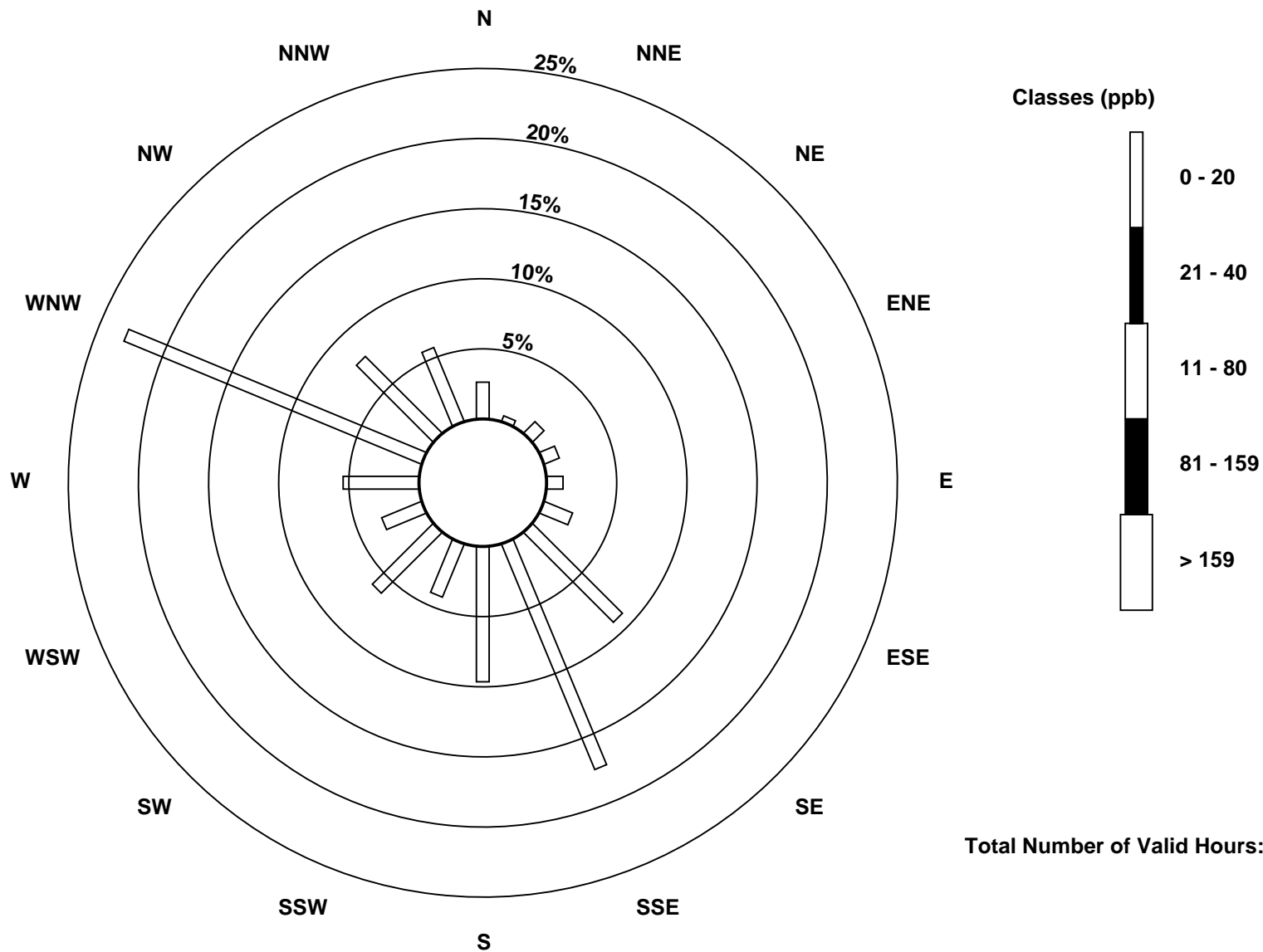
Total Number of Valid Hours: 684

Total Number of Hours: 720

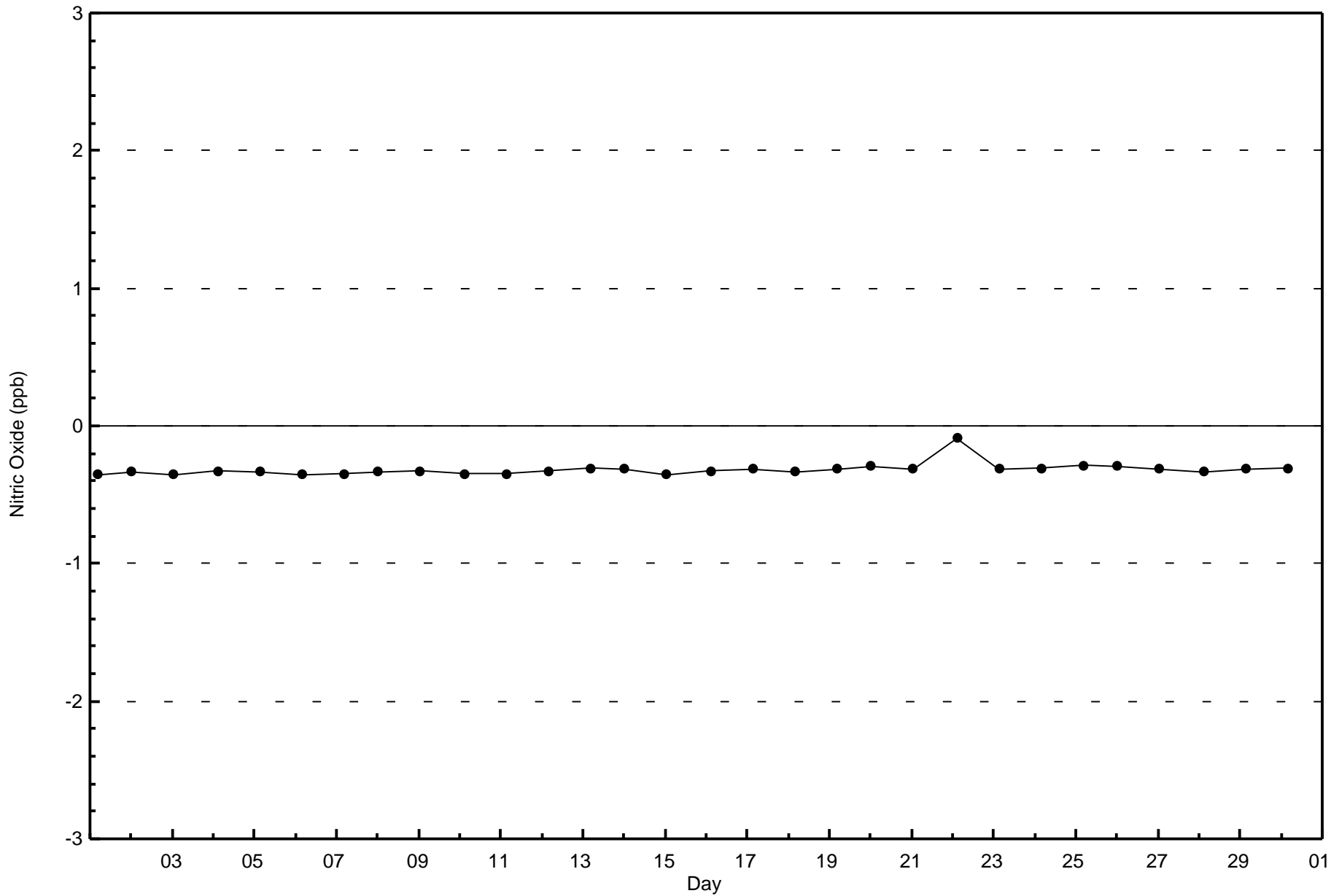


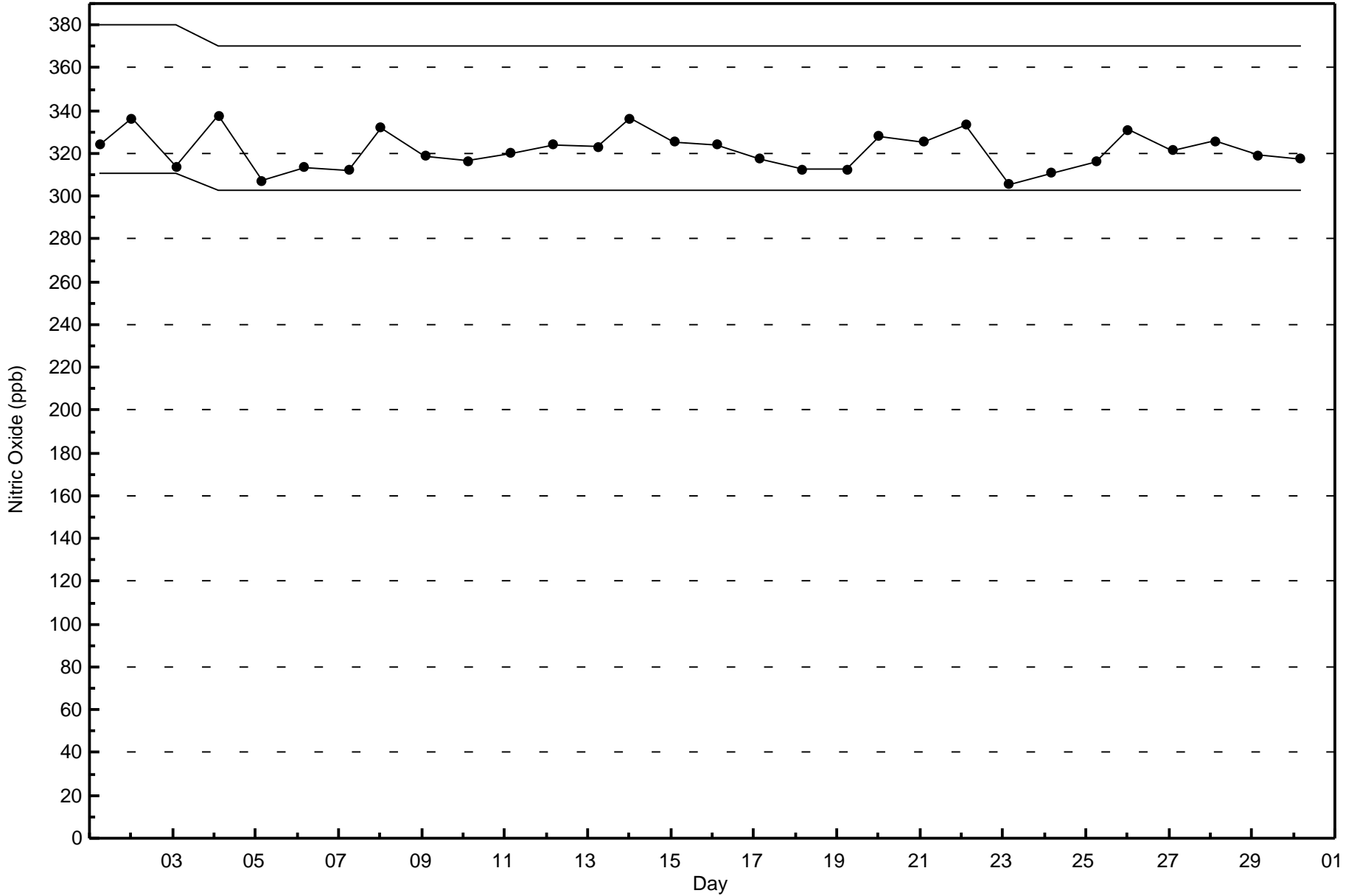
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Anzac (AMS 14)



Total Number of Valid Hours: 684







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Anzac - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 19 ppb on Nov 27 19:00	Maximum Daily Average: 6.1 ppb on Nov 28		Hours of Data:	685
Minimum Value: 0 ppb on Nov 1 19:00	Minimum Daily Average: 0.8 ppb on Nov 1		Hours of Missing Data:	35
Maximum Diurnal Average: 3.2 ppb at hour 18	Minimum Diurnal Average: 1.9 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 2.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 16		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	3	3	2	Z	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	5
2-Nov	Z	1	0	0	0	0	1	6	1	2	2	2	3	3	3	3	4	5	4	3	3	3	2	2	2.2	6
3-Nov	2	Z	2	2	2	2	2	2	C	C	C	C	C	2	2	2	2	2	2	2	2	1	1	1	1.6	2
4-Nov	1	1	Z	1	2	1	1	3	4	2	2	4	2	2	1	2	4	10	4	2	2	3	4	4	2.6	10
5-Nov	4	4	3	Z	4	4	4	3	3	3	3	5	5	5	5	7	4	4	3	6	3	2	2	3.8	7	
6-Nov	1	1	1	1	Z	3	2	6	4	1	1	1	2	1	1	1	1	1	1	2	3	1	1	1	1.5	6
7-Nov	1	1	1	1	1	Z	1	1	1	1	1	2	1	1	1	2	7	1	1	3	1	2	2	3	1.4	7
8-Nov	Z	4	3	3	3	3	4	3	3	4	5	3	3	2	2	3	4	5	6	5	6	6	4	3	3.8	6
9-Nov	3	Z	3	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1.3	3
10-Nov	1	1	Z	0	1	1	1	1	3	2	2	1	4	3	5	1	1	1	1	2	2	3	6	3	1.9	6
11-Nov	2	2	2	Z	2	3	2	2	2	2	3	4	4	4	4	2	1	1	1	1	1	1	1	1	2.0	4
12-Nov	1	1	1	1	Z	1	8	2	3	5	1	1	3	3	4	3	2	3	2	2	1	1	1	1	2.2	8
13-Nov	1	1	1	1	1	Z	1	2	2	2	3	2	2	2	1	2	2	2	2	2	2	2	1	2	1.5	3
14-Nov	Z	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1.1	3
15-Nov	1	Z	0	0	0	1	1	1	1	1	1	2	1	1	1	3	4	4	6	8	10	6	3	2	2.5	10
16-Nov	1	2	Z	2	3	2	2	2	3	4	8	7	8	9	9	7	6	14	5	1	1	1	2	1	4.3	14
17-Nov	1	3	4	Z	4	4	4	3	2	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	1.3	4
18-Nov	0	0	1	1	Z	1	1	2	3	2	1	1	1	1	2	1	0	0	0	0	0	1	1	1	0.9	3
19-Nov	2	4	3	2	1	Z	1	1	1	1	1	1	2	2	1	1	1	0	0	0	0	0	0	0	1.2	4
20-Nov	Z	2	3	3	1	1	2	2	3	1	0	2	5	2	1	1	1	1	1	4	5	7	3	3	2.3	7
21-Nov	2	Z	1	1	1	3	2	1	1	1	1	2	2	2	2	2	2	4	4	3	4	3	3	5	2.1	5
22-Nov	2	2	Z	2	2	1	1	1	2	2	3	3	2	2	3	3	3	3	4	3	2	3	3	3	2.2	4
23-Nov	3	2	2	Z	2	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	2	2	2	2	1.4	3
24-Nov	2	1	2	2	Z	2	2	3	4	3	2	3	4	3	4	4	5	4	3	2	1	1	3	4	2.8	5
25-Nov	4	2	1	1	1	Z	1	1	2	2	3	3	2	1	1	2	3	3	2	2	2	3	3	4	2.0	4
26-Nov	Z	3	3	3	2	2	2	3	3	3	2	2	2	2	1	1	5	5	6	2	2	3	2	2	2.5	6
27-Nov	2	Z	1	1	1	1	1	1	1	1	2	1	1	0	0	0	0	16	19	18	17	17	16	16	5.7	19
28-Nov	14	14	Z	14	12	10	10	10	10	9	6	5	4	3	2	2	3	2	3	2	2	2	5	5	6.1	14
29-Nov	5	6	6	Z	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	0	1	1	1	1.5	6
30-Nov	0	2	1	0	Z	1	1	1	1	1	1	1	2	1	2	2	3	3	2	2	2	1	1	1	1.4	3

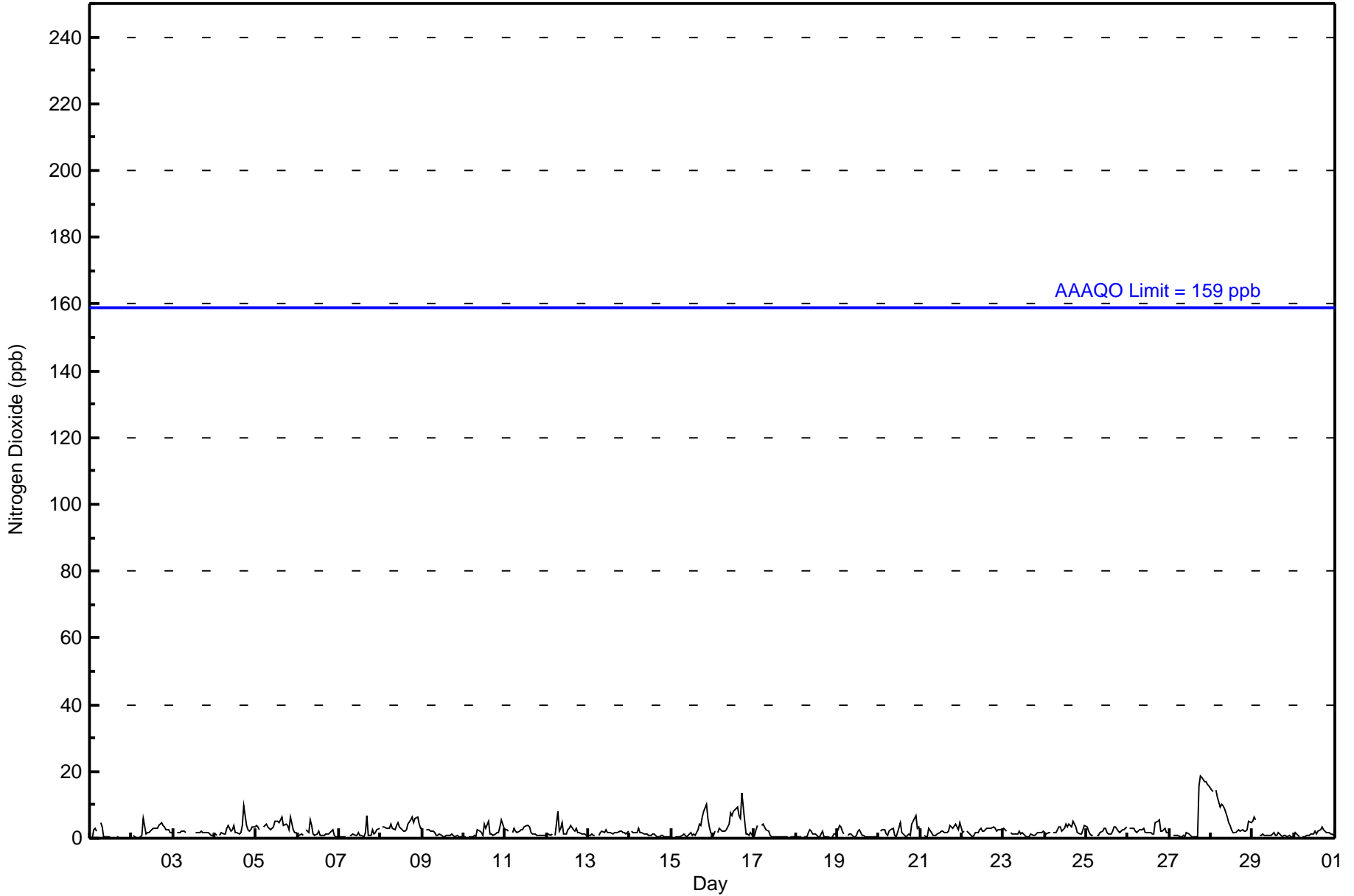
2.1	2.4	1.9	1.9	2.0	2.1	2.2	2.3	2.2	1.9	2.0	2.1	2.3	1.9	2.0	2.0	2.4	3.2	2.9	2.6	2.7	2.5	2.4	2.3	Diurnal Average		
14	14	6	14	12	10	10	10	10	9	6	8	7	8	9	9	7	7	16	19	18	17	17	16	16	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Anzac - 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
Anzac - 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	18	3	8	8	8	15	62	119	66	28	42	21	37	157	53	39	684
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	18	3	8	8	8	15	62	119	66	28	42	21	37	157	53	39	684

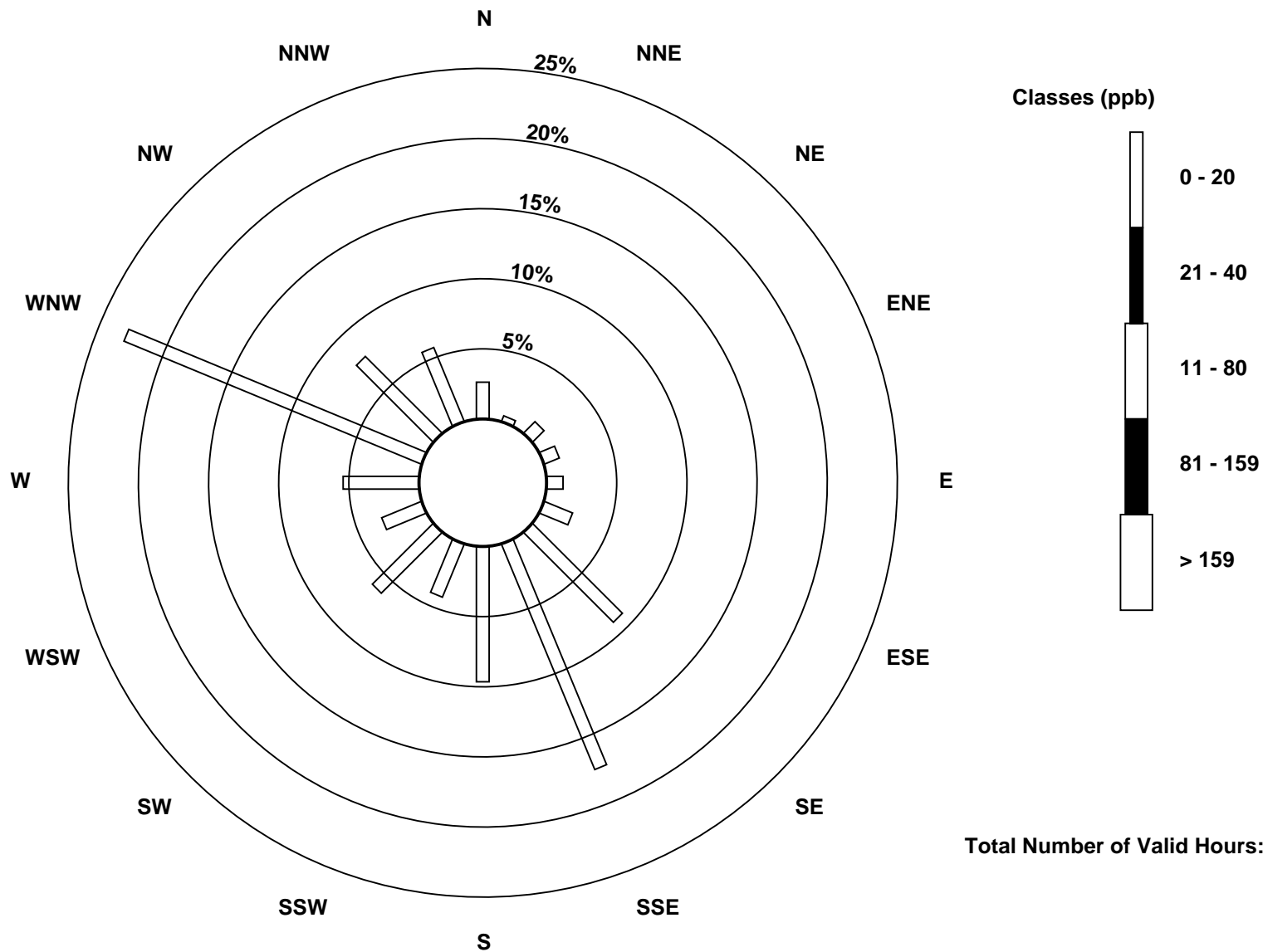
Total Number of Valid Hours: 684

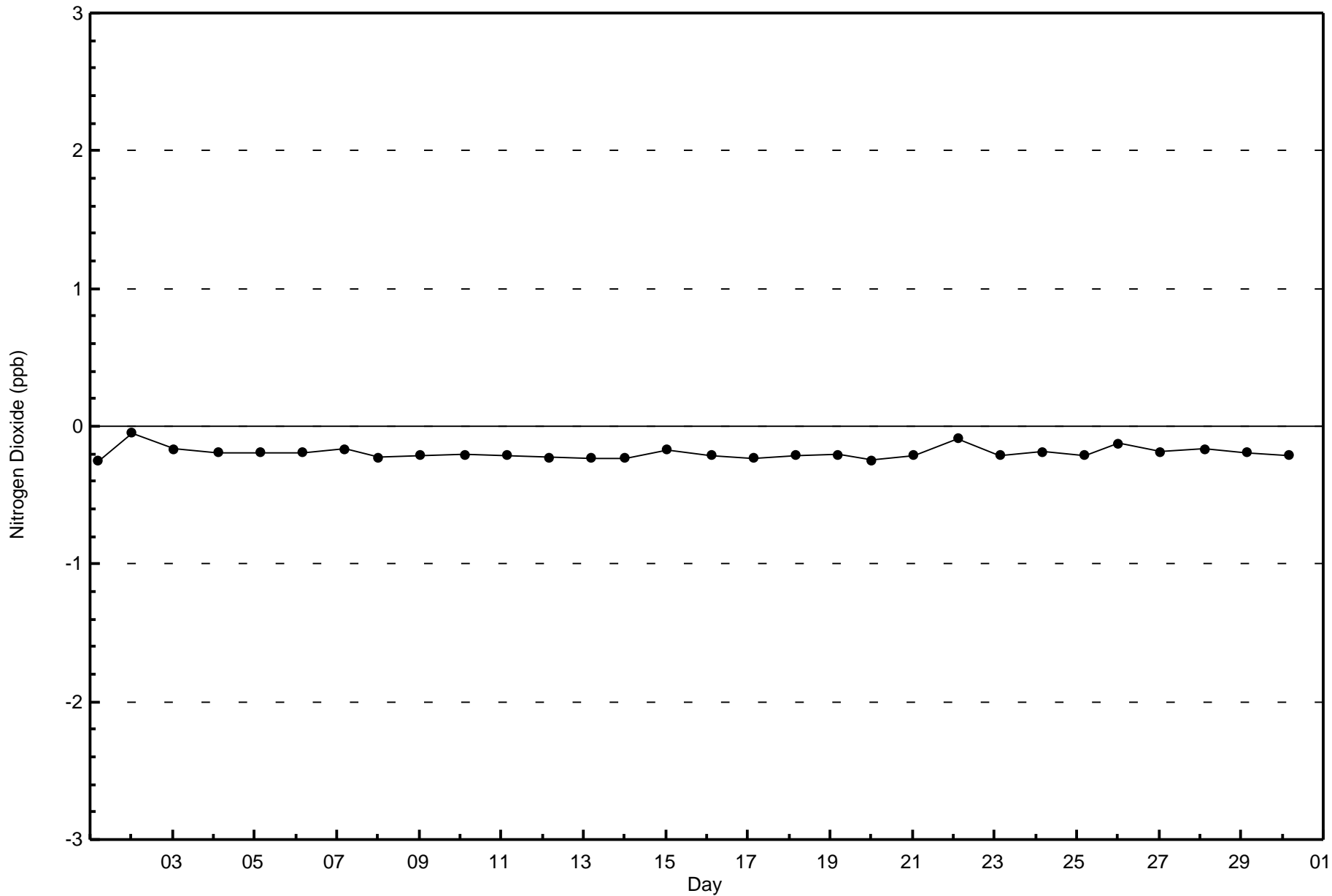
Total Number of Hours: 720

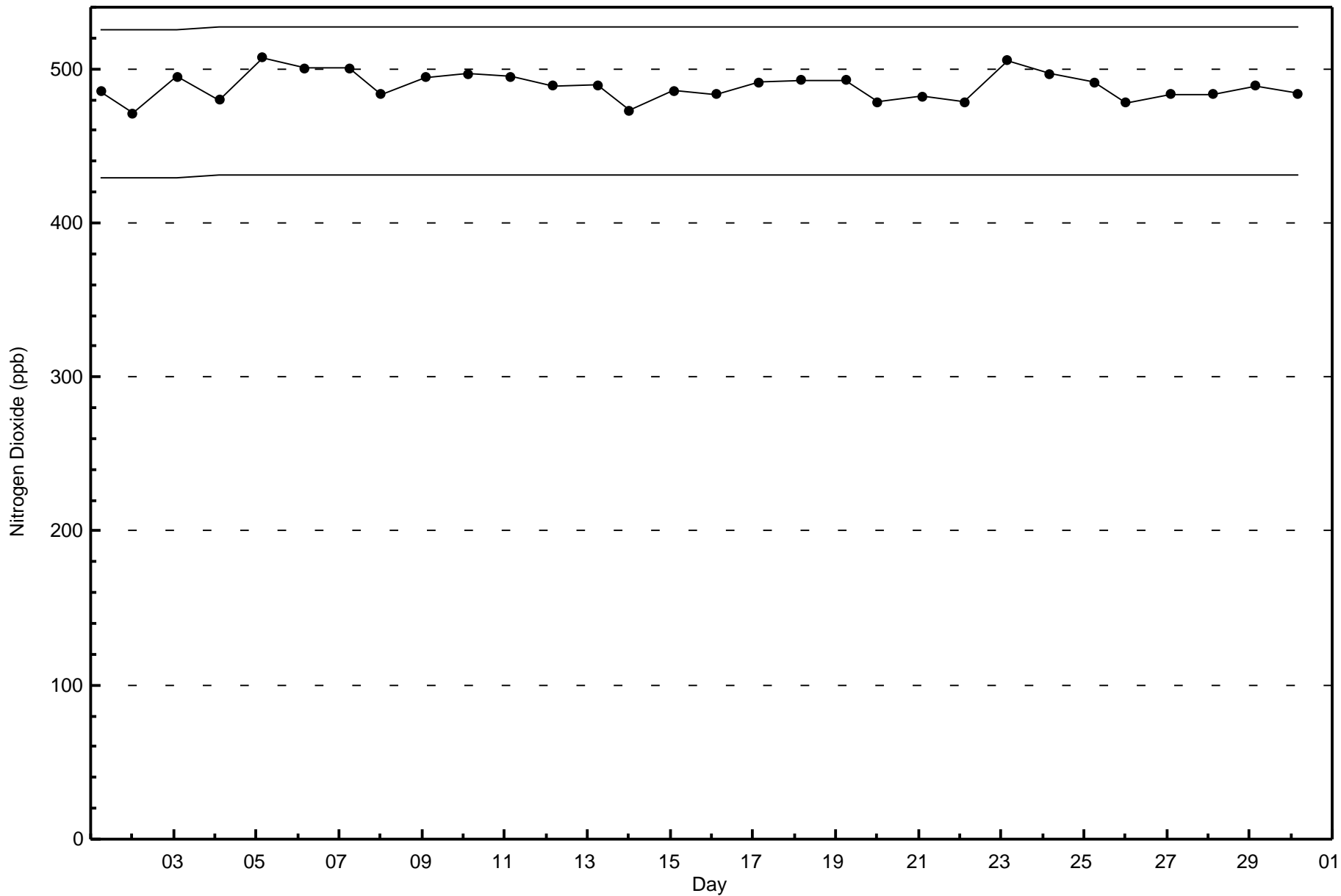


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Anzac (AMS 14)









Wood Buffalo Environmental Association
Summary of Hour Averages

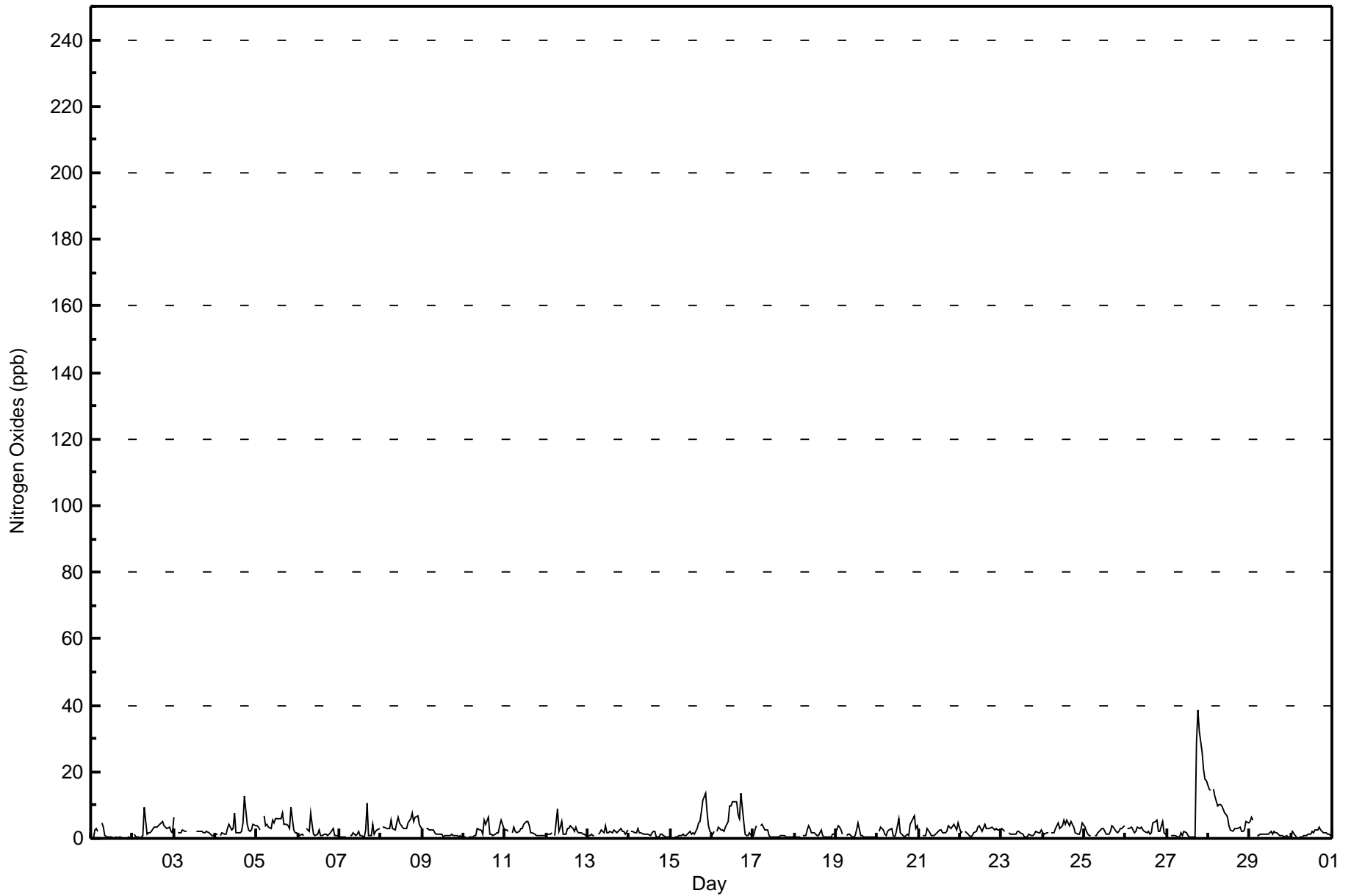
Nitrogen Oxides (NO_x) - ppb
Anzac - November 2016

Maximum Value: 39 ppb on Nov 27 19:00																		Maximum Daily Average: 8.5 ppb on Nov 27																		Hours in Service: 720	
Minimum Value: 0 ppb on Nov 1 20:00																		Minimum Daily Average: 0.9 ppb on Nov 1																		Hours of Data: 685	
Maximum Diurnal Average: 3.9 ppb at hour 18																		Minimum Diurnal Average: 2.0 ppb at hour 4																		Hours of Missing Data: 35	
Monthly Average: 2.7 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 5 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	3	3	2	Z	5	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.9	5											
2-Nov	Z	1	0	0	0	0	1	9	1	2	2	2	3	3	3	4	4	5	4	4	3	3	2	2	2.6	9											
3-Nov	6	Z	2	2	2	2	2	2	C	C	C	C	C	2	2	2	2	2	2	2	1	1	1	2.0	6												
4-Nov	1	1	Z	1	2	1	1	3	4	2	3	7	2	2	2	2	5	13	4	2	2	3	4	4	3.1	13											
5-Nov	4	4	3	Z	7	4	4	3	3	5	5	6	6	6	6	8	4	4	3	9	3	2	2	4.5	9												
6-Nov	1	1	1	1	Z	3	2	8	4	1	1	1	3	1	1	1	1	1	1	2	3	1	1	1	1.8	8											
7-Nov	1	1	1	1	0	Z	1	1	2	1	1	2	1	1	1	2	11	1	1	4	1	2	2	3	1.8	11											
8-Nov	Z	3	3	3	3	3	6	3	3	5	6	5	4	3	3	3	4	6	8	5	7	7	4	3	4.3	8											
9-Nov	3	Z	3	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	3											
10-Nov	1	1	Z	1	1	1	1	1	3	3	3	1	6	4	6	1	1	1	1	2	2	4	5	3	2.2	6											
11-Nov	2	2	2	Z	2	3	2	2	2	3	3	4	5	5	4	2	2	1	1	1	1	1	1	1	2.2	5											
12-Nov	1	1	1	1	Z	1	9	2	3	5	1	1	3	3	4	3	2	3	2	2	2	1	1	1	2.4	9											
13-Nov	1	1	1	1	1	Z	1	2	2	2	4	2	2	2	2	3	2	2	3	3	2	2	1	3	1.9	4											
14-Nov	Z	2	2	2	2	3	2	2	1	1	1	1	1	2	2	2	1	1	1	1	1	0	1	1	1.4	3											
15-Nov	1	Z	1	1	1	1	1	1	1	1	1	1	2	1	2	1	3	5	5	8	12	14	8	4	3.2	14											
16-Nov	1	2	Z	2	3	3	3	2	3	5	10	10	11	11	11	7	6	14	5	1	1	1	2	1	5.0	14											
17-Nov	1	3	4	Z	4	4	3	3	2	1	0	1	0	0	0	0	1	1	1	0	0	0	0	0	1.3	4											
18-Nov	1	1	1	1	Z	1	1	3	4	3	2	2	1	1	1	3	1	0	0	0	0	1	1	1	1.2	4											
19-Nov	3	4	3	2	1	Z	1	1	1	1	0	1	3	5	1	1	1	0	0	0	0	0	0	0	1.3	5											
20-Nov	Z	2	3	3	1	1	2	2	3	1	0	2	6	2	1	1	0	1	1	4	5	7	3	4	2.4	7											
21-Nov	1	Z	1	1	1	3	2	1	1	1	1	2	3	2	2	2	2	4	4	3	4	3	3	4	2.2	4											
22-Nov	1	2	Z	2	2	1	1	1	2	2	3	4	3	2	4	3	3	3	4	3	3	3	3	3	2.4	4											
23-Nov	3	2	2	Z	2	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	1	2	2	1.5	3											
24-Nov	2	1	2	2	Z	2	2	3	4	5	3	4	6	4	5	4	5	4	3	2	1	1	3	5	3.1	6											
25-Nov	4	2	1	1	1	Z	1	1	2	3	3	3	2	1	1	2	4	3	2	2	2	3	3	4	2.2	4											
26-Nov	Z	3	3	3	2	2	3	3	4	2	2	2	2	1	1	5	5	6	2	2	5	2	1	1	2.8	6											
27-Nov	2	Z	1	1	1	1	1	1	2	1	2	2	1	1	0	0	0	29	39	32	26	21	18	17	8.5	39											
28-Nov	15	14	Z	15	13	10	10	10	10	8	7	6	4	2	2	3	3	3	3	2	2	2	5	5	6.7	15											
29-Nov	5	6	6	Z	1	1	1	1	1	1	1	1	2	1	2	2	2	1	1	1	1	1	1	0	1.7	6											
30-Nov	0	2	1	0	Z	0	1	1	1	1	1	1	2	2	3	3	3	3	2	2	2	1	1	1	1.5	3											
																								Diurnal Average													
																								Diurnal Maximum													
Z - zerospan C - Calibration																																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Anzac - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	680	99.27	99.27
21 - 40	5	0.73	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
Anzac - 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	18	3	8	8	8	15	62	119	66	28	42	21	36	153	53	39	679
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	1	4	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	18	3	8	8	8	15	62	119	66	28	42	21	37	157	53	39	684

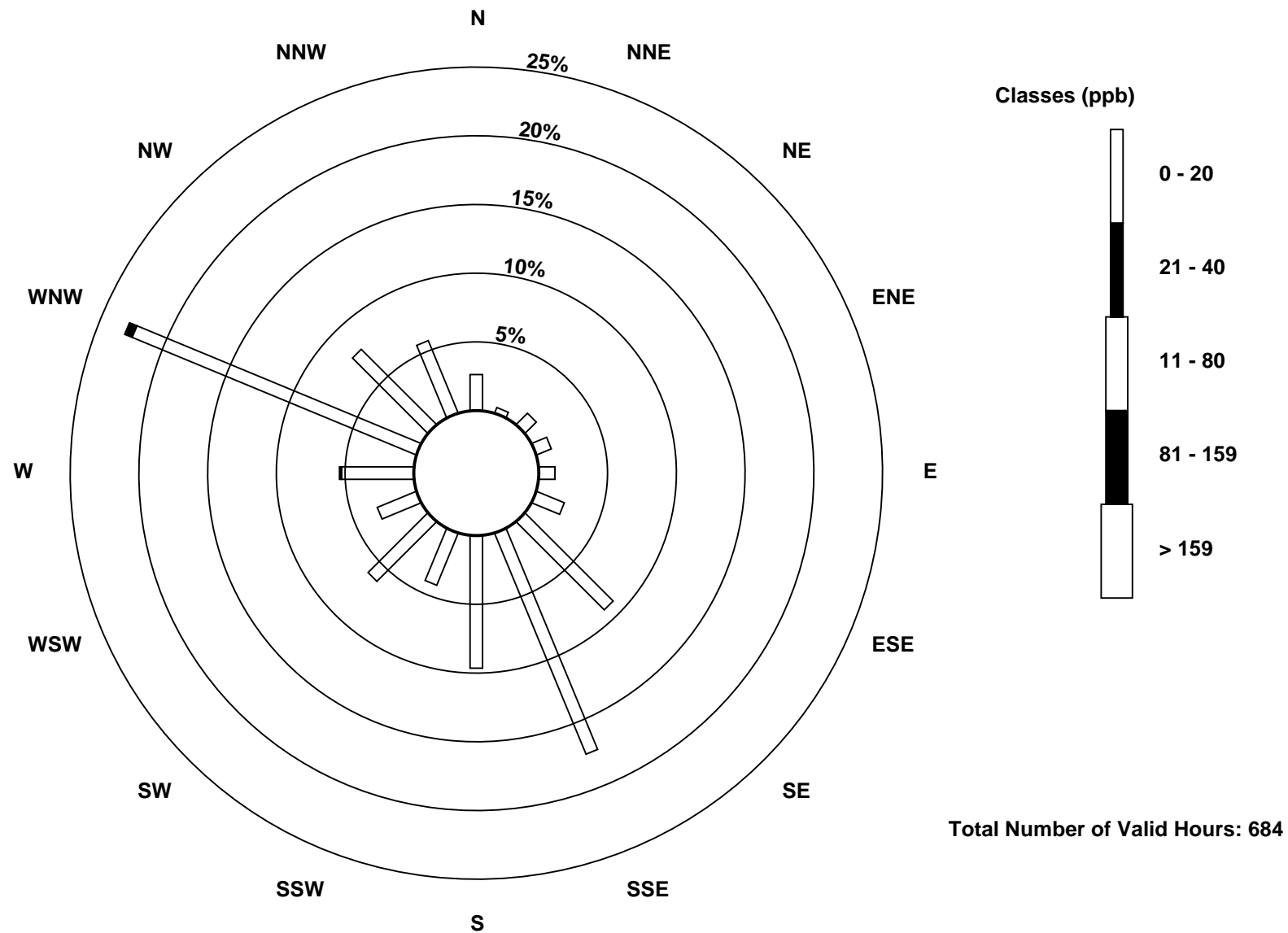
Total Number of Valid Hours: 684

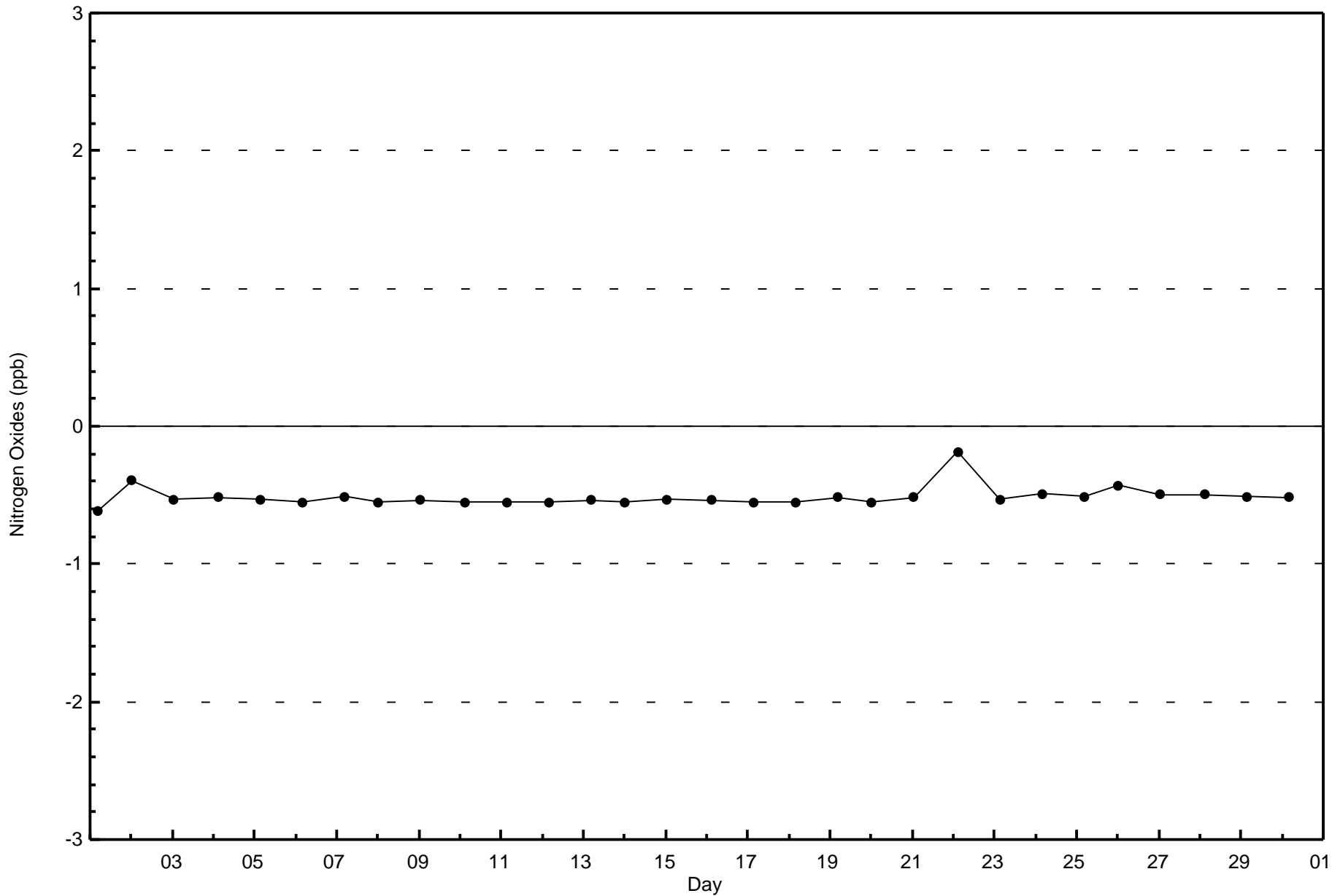
Total Number of Hours: 720

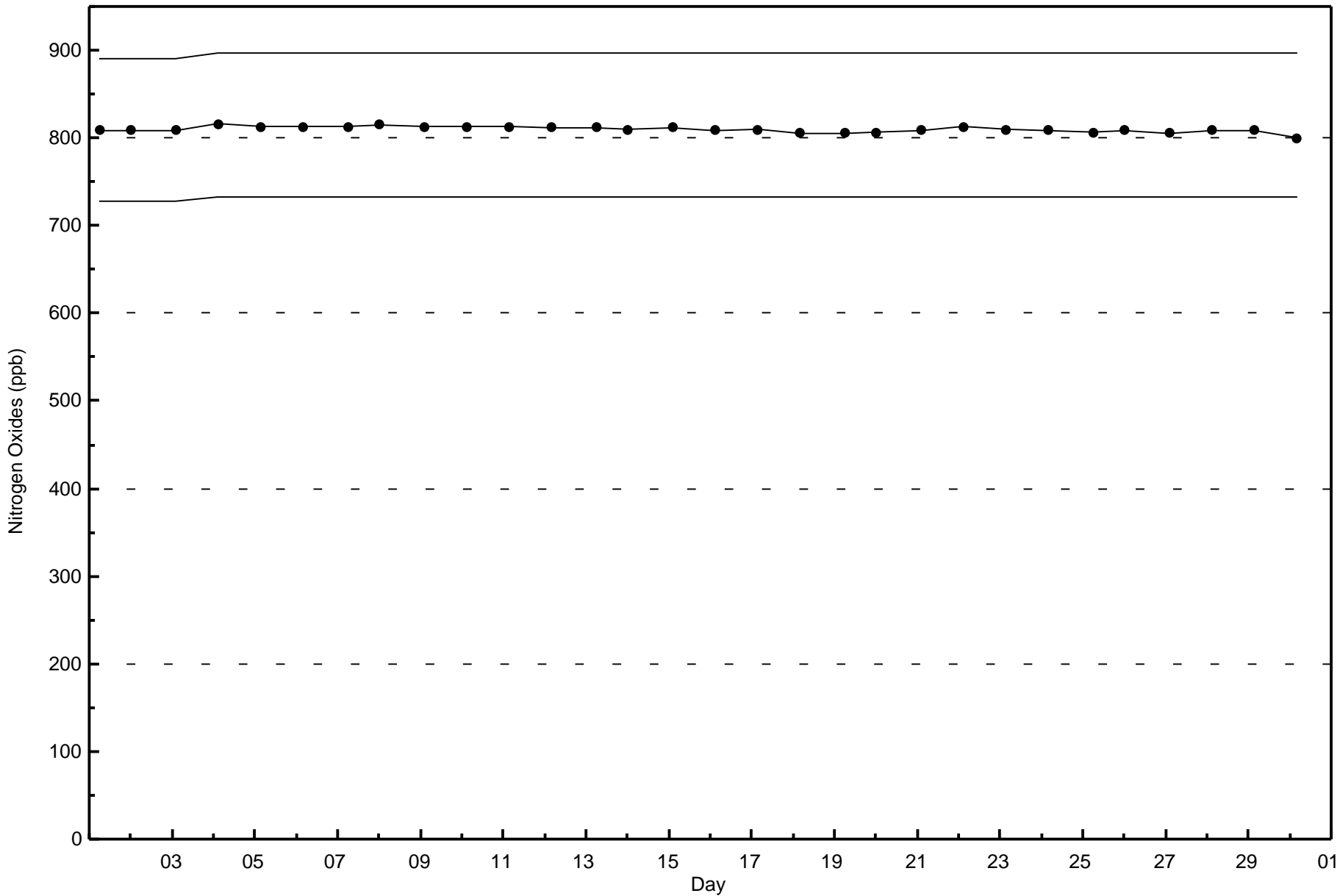


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Anzac (AMS 14)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Anzac - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 40 ppb on Nov 9 13:00	Maximum Daily Average: 35.7 ppb on Nov 6		Hours of Data:	687
Minimum Value: 3 ppb on Nov 27 22:00	Minimum Daily Average: 10.7 ppb on Nov 28		Hours of Missing Data:	33
Maximum Diurnal Average: 26.8 ppb at hour 15	Minimum Diurnal Average: 22.1 ppb at hour 8		Hours of Calibration:	33
Monthly Average: 24.4 ppb	Percentiles: P ₁ = 4 P ₁₀ = 14 O ₁ = 18 Median = 25 O ₃ = 31 P ₉₀ = 34 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-Nov	25	25	22	22	23	23	19	Z	28	29	32	33	32	32	32	32	31	31	31	32	33	33	32	32	29.0	33
2-Nov	32	31	Z	25	23	25	26	20	27	28	27	25	22	20	19	18	15	13	13	16	18	19	18	17	21.6	32
3-Nov	12	15	15	Z	16	16	16	16	15	14	10	14	21	C	C	C	25	28	26	26	30	32	37	39	21.1	39
4-Nov	39	39	39	35	Z	29	29	27	25	26	27	33	38	40	33	35	32	25	29	30	29	29	28	30	31.6	40
5-Nov	25	28	27	28	20	Z	17	12	13	12	17	19	19	22	24	17	20	18	19	26	16	22	30	32	21.0	32
6-Nov	38	40	40	38	32	32	Z	27	32	36	37	37	36	38	39	38	38	37	35	34	34	35	35	35	35.7	40
7-Nov	34	34	35	35	35	35	34	Z	34	34	33	33	36	37	38	35	26	34	33	30	30	29	26	23	32.7	38
8-Nov	20	18	Z	18	17	17	15	15	12	12	11	14	17	17	18	17	17	19	16	16	18	15	17	18	16.2	20
9-Nov	15	13	11	Z	17	15	19	29	33	31	28	31	40	38	37	36	35	33	33	34	34	34	33	34	28.8	40
10-Nov	33	33	33	32	Z	31	30	30	25	23	30	30	26	26	23	26	27	30	29	29	29	27	24	26	28.4	33
11-Nov	27	27	27	28	27	Z	24	24	24	23	23	22	19	20	28	33	33	33	33	34	34	34	34	34	28.0	34
12-Nov	35	35	35	32	32	32	Z	21	24	19	13	27	28	25	19	16	16	17	25	25	27	28	28	28	25.5	35
13-Nov	28	29	31	32	31	32	30	Z	22	26	26	27	25	29	28	26	23	22	23	25	29	29	28	26	27.3	32
14-Nov	27	23	Z	18	19	19	26	28	30	30	30	31	31	30	31	31	33	33	33	30	31	35	35	34	29.0	35
15-Nov	35	34	34	Z	34	33	32	32	32	32	34	32	33	35	37	34	31	26	26	20	22	26	27	23	30.5	37
16-Nov	19	22	17	13	Z	13	10	12	13	19	22	24	26	25	25	26	17	13	23	27	28	30	29	31	21.1	31
17-Nov	30	27	28	26	28	Z	30	32	33	34	36	34	33	33	33	33	33	34	36	36	34	32	31	31	32.1	36
18-Nov	32	32	31	30	30	31	Z	29	28	28	30	30	34	34	34	33	32	30	26	26	27	28	26	26	29.8	34
19-Nov	25	23	24	26	27	28	28	Z	28	28	28	28	27	27	29	30	31	31	31	31	31	30	30	30	28.3	31
20-Nov	29	28	Z	28	28	26	24	25	24	26	27	25	22	24	24	23	23	23	23	19	17	15	19	19	23.6	29
21-Nov	21	21	21	Z	19	17	18	19	19	18	17	16	15	16	19	18	17	14	13	13	11	12	12	12	16.5	21
22-Nov	18	17	18	19	Z	20	20	20	18	18	17	17	17	18	18	18	17	16	15	15	15	15	16	17	17.4	20
23-Nov	18	19	20	21	22	Z	23	22	23	22	25	25	25	25	25	25	25	25	25	24	22	22	22	20	22.8	25
24-Nov	20	19	18	17	16	15	Z	13	11	11	12	11	11	12	11	11	17	18	19	19	20	19	18	18	15.1	20
25-Nov	18	20	21	22	22	23	24	Z	24	23	22	22	23	23	22	21	18	18	17	15	14	13	14	15	19.7	24
26-Nov	14	17	Z	20	20	24	25	22	21	21	26	26	28	30	30	25	19	19	16	17	11	10	9	9	19.9	30
27-Nov	10	12	18	Z	18	19	21	23	20	18	17	19	21	22	26	26	25	6	3	3	3	3	3	4	14.8	26
28-Nov	4	4	5	4	Z	8	7	7	7	9	10	12	14	14	15	16	16	15	14	13	14	13	13	16	10.7	16
29-Nov	16	15	13	13	14	Z	15	15	15	16	16	19	20	24	29	31	30	30	29	28	28	28	28	29	21.9	31
30-Nov	30	30	30	31	32	32	Z	31	31	31	31	32	32	32	31	30	29	29	30	31	32	33	33	33	31.2	33

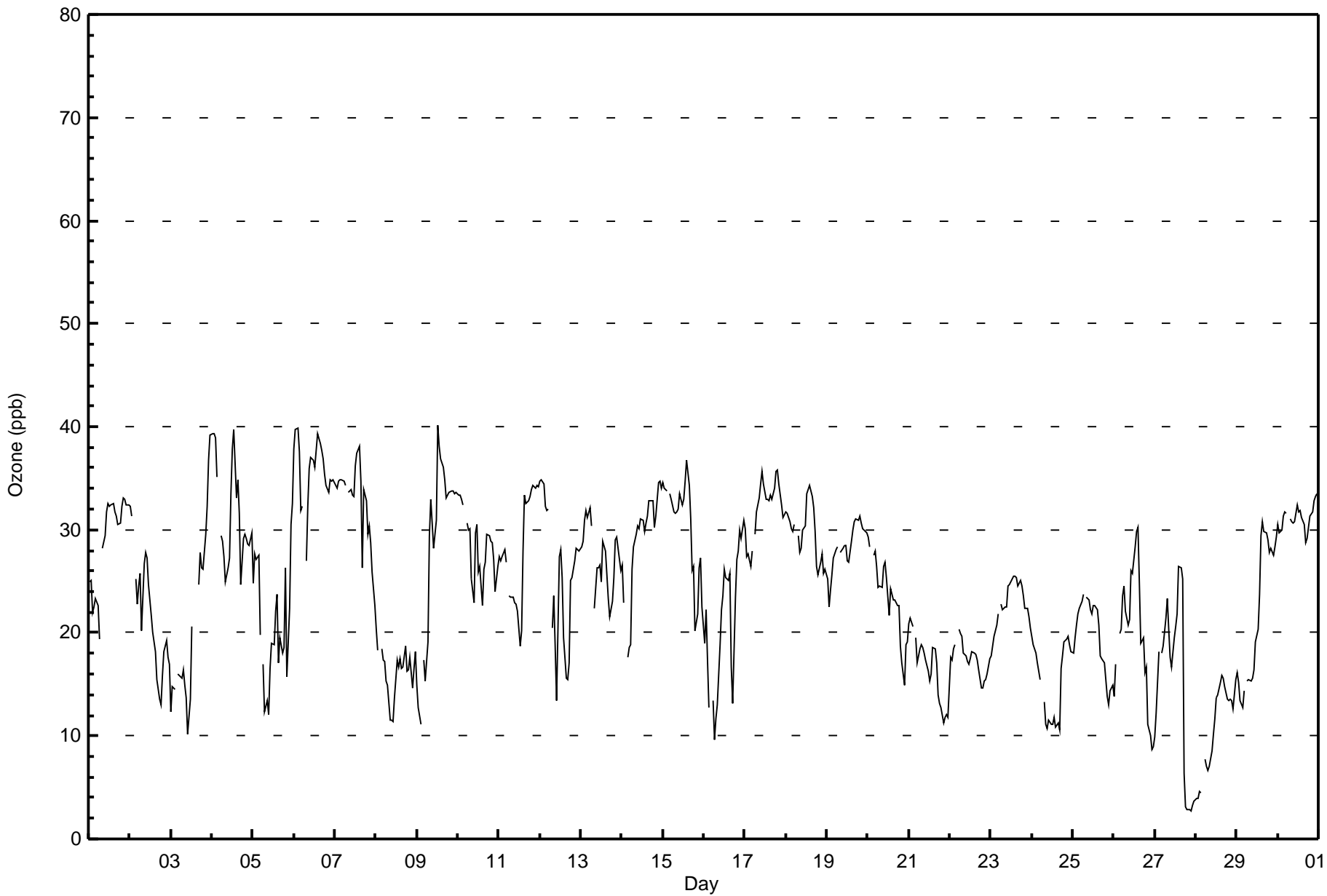
24.3	24.3	24.4	24.5	24.1	23.8	22.5	22.1	23.0	23.2	23.8	25.0	25.7	26.5	26.8	26.3	24.7	23.9	24.1	24.1	24.0	24.4	24.6	24.7	Diurnal Average	
39	40	40	38	35	35	34	32	34	36	37	37	40	40	39	38	38	37	36	36	34	35	37	39	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Anzac - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	236	34.35	34.35
21 - 50	451	65.65	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Anzac - 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	8	1	6	3	6	6	23	55	17	11	14	6	7	34	20	18	235
21 - 50	12	2	1	6	2	12	38	65	50	14	29	15	30	121	35	19	451
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	20	3	7	9	8	18	61	120	67	25	43	21	37	155	55	37	686

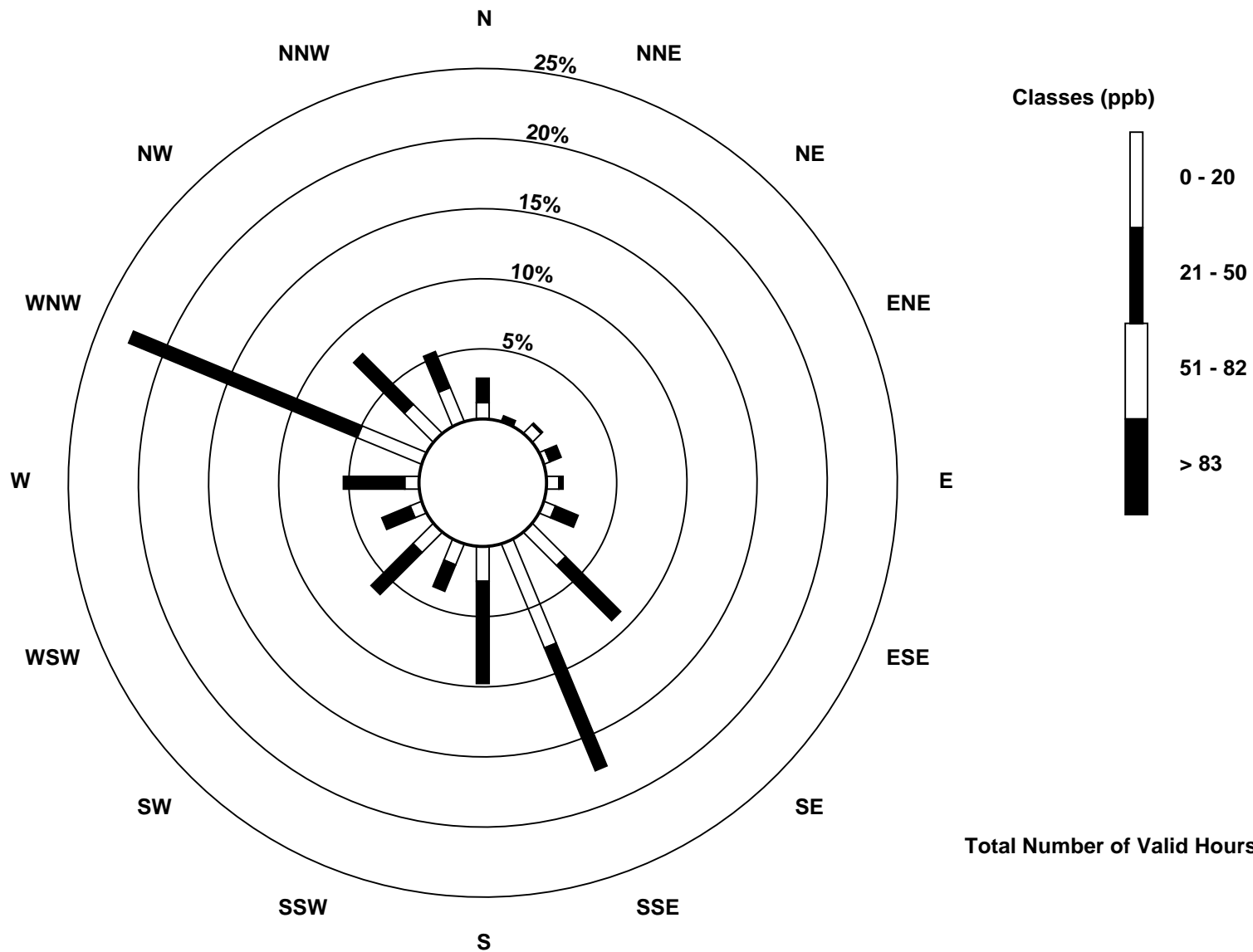
Total Number of Valid Hours: 686

Total Number of Hours: 720

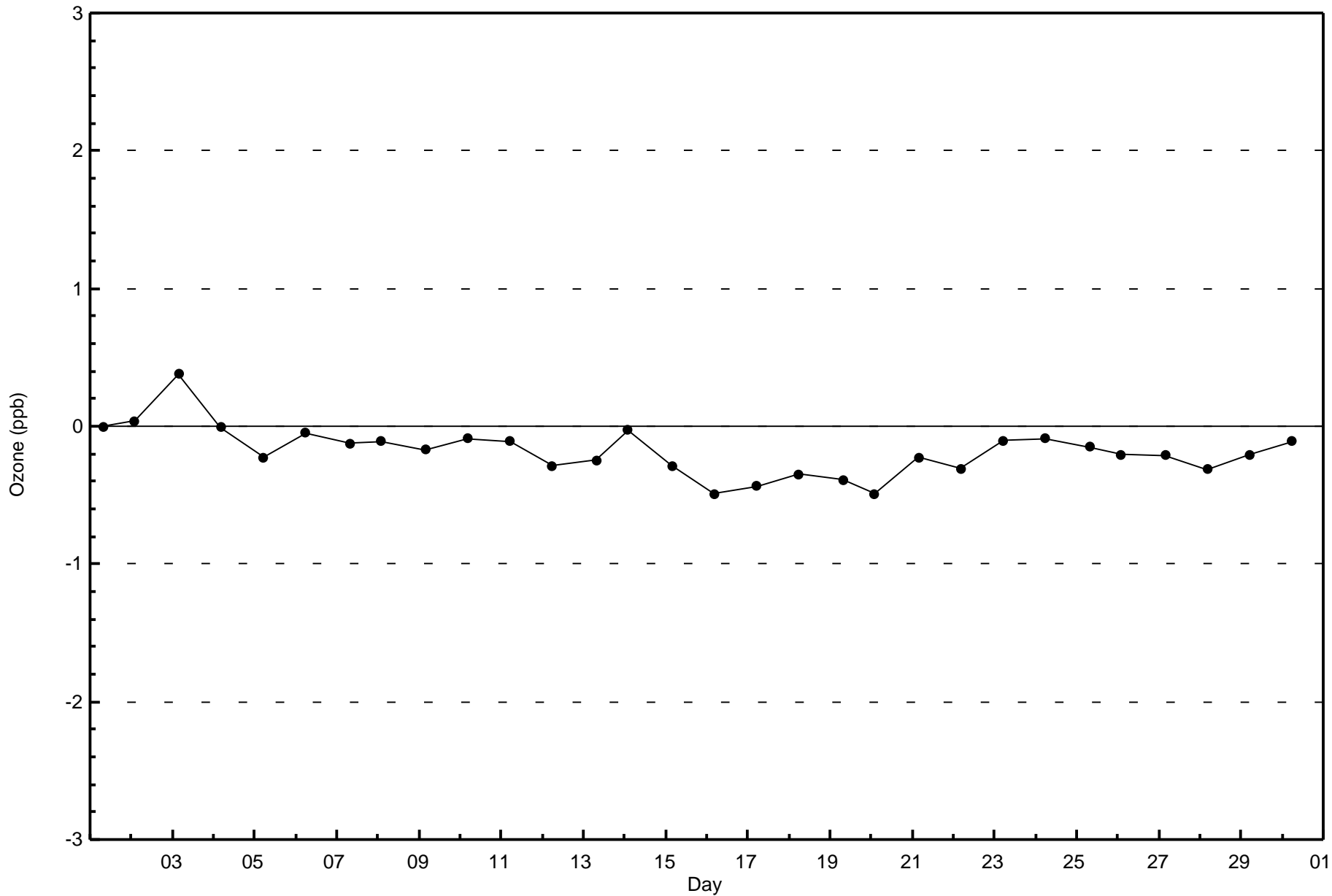


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Anzac (AMS 14)



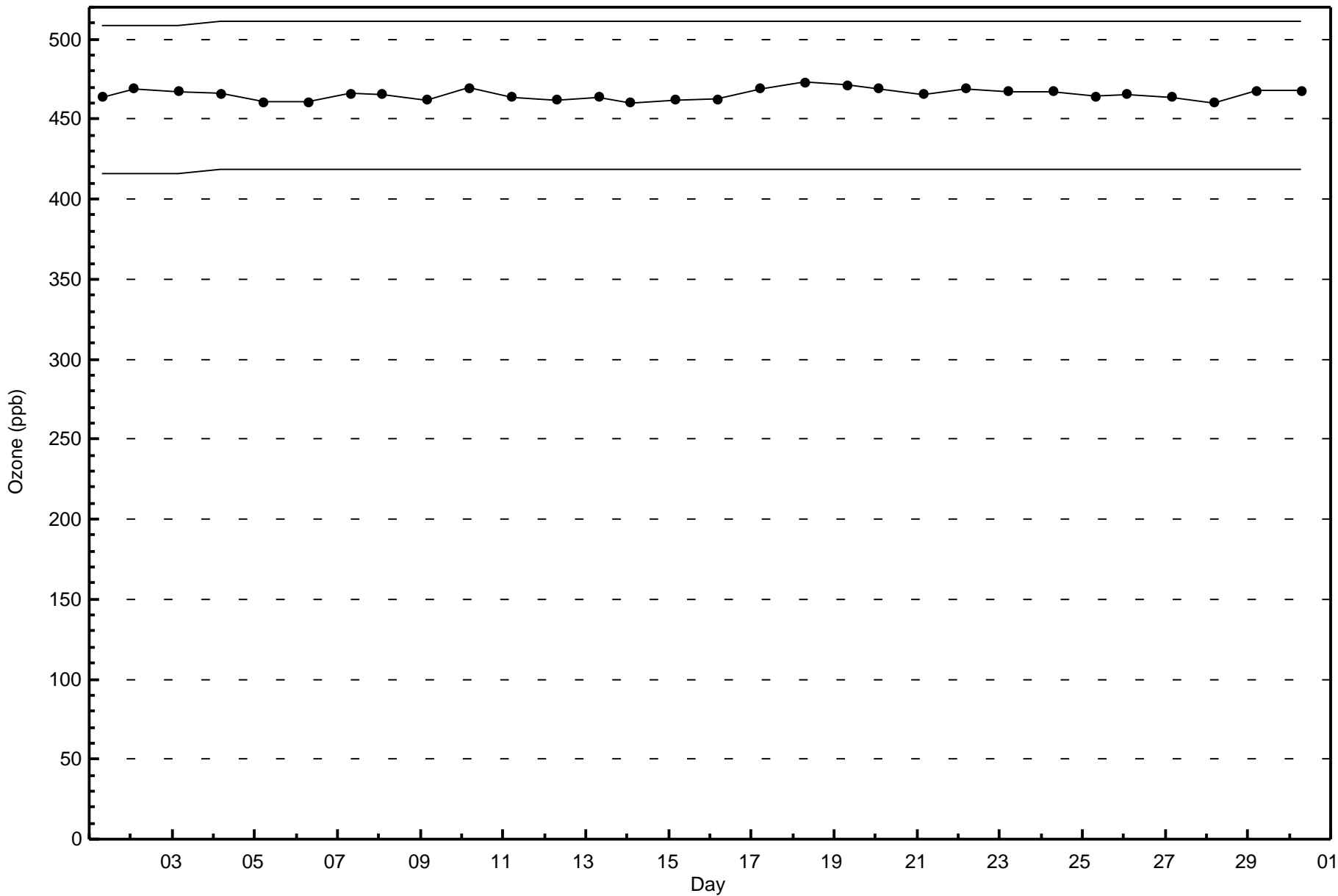
Total Number of Valid Hours: 686





Wood Buffalo Environmental Association
Span Responses

Ozone (O₃) - ppb
Anzac - November 2016





Number of Exceedences (AAAQO): 24-hr: 0	Hours in Service: 720
Maximum Value: 32.7 µg/m ³ on Nov 14 16:00	Maximum Daily Average: 8.1 µg/m ³ on Nov 28
Minimum Value: 0.1 µg/m ³ on Nov 9 14:00	Hours of Data: 718
Maximum Diurnal Average: 4.0 µg/m ³ at hour 18	Hours of Missing Data: 2
Monthly Average: 2.97 µg/m ³	Hours of Calibration: 1
Minimum Daily Average: 1.0 µg/m ³ on Nov 9	Percent Operational Time: 99.9
Minimum Diurnal Average: 2.3 µg/m ³ at hour 15	
Percentiles: P ₁ = 0.3 P ₁₀ = 0.8 Q ₁ = 1.2 Median = 2.0 Q ₃ = 3.8 P ₉₀ = 6.3 P ₉₉ = 11.5	

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-Nov	0.4	0.5	1.8	3.3	1.0	0.8	2.6	1.4	0.9	0.9	1.0	1.0	0.8	0.8	1.1	1.1	1.3	1.2	1.1	0.7	0.7	0.7	0.8	0.8	1.1	3.3
2-Nov	0.8	0.8	1.0	0.8	0.9	1.0	1.1	1.8	1.3	1.3	1.5	1.7	2.0	2.8	3.1	3.7	4.7	6.7	6.1	6.1	5.5	5.0	4.6	5.0	2.9	6.7
3-Nov	4.8	3.8	3.3	3.0	3.0	2.7	3.8	4.3	5.4	C	5.6	5.1	1.5	0.6	0.6	0.6	0.8	1.1	1.6	1.7	1.3	1.1	0.8	0.8	2.5	5.6
4-Nov	0.8	1.0	1.5	2.1	2.9	2.8	2.3	1.8	1.7	1.5	0.8	1.5	1.1	1.2	1.1	1.6	1.7	2.2	2.2	1.9	1.9	2.0	2.0	1.8	1.7	2.9
5-Nov	1.9	1.8	1.8	3.3	4.2	4.2	4.4	5.0	5.0	4.5	3.9	2.6	3.1	2.7	1.9	2.5	2.7	3.5	5.5	6.4	10.8	7.8	5.7	3.4	4.1	10.8
6-Nov	2.2	1.9	1.7	1.7	1.6	1.6	1.5	1.7	2.7	3.8	2.9	3.2	1.1	0.8	1.5	1.2	3.0	2.2	2.7	2.1	2.0	2.5	1.6	1.1	2.0	3.8
7-Nov	1.0	1.1	1.3	1.0	1.0	1.1	1.2	1.3	1.8	1.5	0.9	0.7	0.6	0.3	0.5	0.9	1.1	0.7	0.8	1.8	1.6	1.7	2.4	3.3	1.2	3.3
8-Nov	4.7	7.2	8.1	8.3	6.8	5.1	4.6	3.7	3.0	2.3	1.8	1.5	0.6	0.7	0.6	0.6	0.7	0.6	0.9	1.9	1.1	1.9	2.2	1.8	2.9	8.3
9-Nov	1.6	2.0	1.8	1.9	2.1	2.2	2.3	1.2	1.1	1.2	1.1	0.7	UO	0.1	0.3	0.6	0.3	0.3	0.1	0.2	0.4	0.4	0.8	0.7	1.0	2.3
10-Nov	0.7	0.9	1.0	1.2	1.3	1.4	1.7	1.9	2.1	2.2	4.0	1.0	1.1	0.9	1.0	1.1	1.3	1.5	2.3	2.2	2.2	2.3	2.3	2.1	1.7	4.0
11-Nov	1.7	1.5	1.4	1.5	1.6	1.8	2.0	2.0	2.7	2.2	2.4	2.2	2.2	2.5	2.4	1.1	0.8	0.8	0.8	0.6	0.7	0.6	1.2	1.5	1.6	2.7
12-Nov	1.5	1.6	1.5	1.6	1.4	1.4	2.1	1.5	1.4	3.6	1.5	1.6	1.9	3.3	3.7	2.7	4.4	4.0	2.6	2.4	1.9	1.8	4.2	1.9	2.3	4.4
13-Nov	1.6	1.5	1.2	1.1	1.2	1.1	1.8	1.6	1.7	1.5	1.5	1.6	1.7	1.5	0.7	0.6	0.5	2.1	1.8	1.5	1.4	1.5	2.0	5.2	1.6	5.2
14-Nov	2.9	3.2	3.5	5.6	4.4	4.2	2.3	1.7	1.4	1.2	0.9	1.5	0.7	0.7	0.6	32.7	0.5	0.6	1.1	0.6	0.8	0.7	0.7	1.1	3.1	32.7
15-Nov	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.1	1.2	1.0	0.9	0.9	0.8	0.3	0.2	0.6	2.3	12.0	18.4	4.7	3.1	1.8	2.2	2.8	2.6	18.4
16-Nov	2.4	3.1	2.5	1.7	2.0	1.7	1.9	1.9	1.7	1.8	2.0	2.2	3.0	4.1	5.3	4.9	6.1	10.0	2.7	1.0	0.9	0.8	0.7	0.6	2.7	10.0
17-Nov	0.9	1.3	1.4	1.7	1.2	1.3	1.7	1.5	0.7	0.9	0.9	0.9	1.1	1.5	2.0	1.2	1.1	0.9	0.8	0.8	0.9	1.2	0.9	1.3	1.2	2.0
18-Nov	0.8	0.9	0.7	1.3	1.1	0.8	0.9	1.3	1.3	1.7	1.0	0.9	2.2	0.9	1.0	1.2	1.4	0.8	1.0	0.9	0.7	0.9	1.5	1.7	1.1	2.2
19-Nov	1.9	1.8	2.1	1.7	1.4	1.2	1.3	1.6	1.4	1.1	1.0	0.9	1.2	1.4	1.2	1.0	0.9	0.9	0.9	0.9	1.0	1.3	1.3	1.4	1.3	2.1
20-Nov	1.3	1.3	1.5	1.5	1.7	1.7	1.7	1.8	2.0	2.2	2.3	2.3	2.5	3.0	3.1	3.1	2.3	2.3	2.5	2.9	3.6	4.3	4.7	5.7	2.5	5.7
21-Nov	6.5	7.4	6.7	5.8	5.4	5.6	5.2	5.5	5.9	7.0	7.2	6.5	7.2	6.6	4.6	4.6	5.2	6.2	6.0	5.9	6.7	6.3	5.3	3.9	6.0	7.4
22-Nov	3.0	3.0	2.5	2.3	2.2	1.9	1.9	2.1	2.2	2.0	2.1	2.4	2.3	2.6	2.8	2.4	2.9	3.9	5.2	5.4	4.8	4.0	3.5	4.1	3.0	5.4
23-Nov	4.9	5.4	5.3	4.9	4.2	3.1	3.1	3.9	5.1	4.8	3.6	3.3	3.4	3.0	2.5	2.3	2.0	2.1	2.2	2.4	2.5	2.2	2.6	2.4	3.4	5.4
24-Nov	2.4	2.9	3.4	3.1	3.2	3.1	3.1	3.5	3.4	4.1	6.5	8.5	9.4	9.6	7.7	8.7	12.3	9.5	9.9	6.4	3.8	3.0	2.9	2.6	5.5	12.3
25-Nov	2.6	3.2	2.9	2.4	2.1	2.4	3.7	4.4	4.1	3.9	4.4	5.8	6.2	5.6	5.5	5.5	5.6	8.0	8.0	8.7	6.9	7.8	8.4	9.1	5.3	9.1
26-Nov	11.4	10.6	10.4	10.9	12.5	10.1	6.2	5.3	5.6	5.0	4.4	3.9	2.4	2.1	2.2	2.9	3.3	3.5	3.4	3.2	3.0	3.1	2.9	3.0	5.5	12.5
27-Nov	3.7	4.0	5.2	4.5	6.0	8.0	6.1	5.1	6.9	8.6	7.9	6.2	4.8	3.4	1.7	1.8	1.8	21.5	7.8	6.3	5.9	5.3	6.5	7.0	6.1	21.5
28-Nov	7.4	6.0	6.9	9.2	7.4	7.7	14.7	14.5	12.7	10.6	9.6	7.5	6.6	6.9	6.9	16.7	6.5	5.7	5.2	5.3	6.2	5.4	4.9	3.2	8.1	16.7
29-Nov	2.6	3.1	5.4	5.6	4.9	7.1	7.9	5.4	4.9	3.6	3.1	2.9	2.3	1.7	1.4	1.6	1.3	1.3	1.7	1.5	1.5	1.6	2.1	2.0	3.2	7.9
30-Nov	1.5	1.4	1.4	1.4	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.5	1.5	1.6	1.7	2.3	2.6	2.4	2.6	2.6	2.4	2.2	2.4	2.2	1.8	2.6

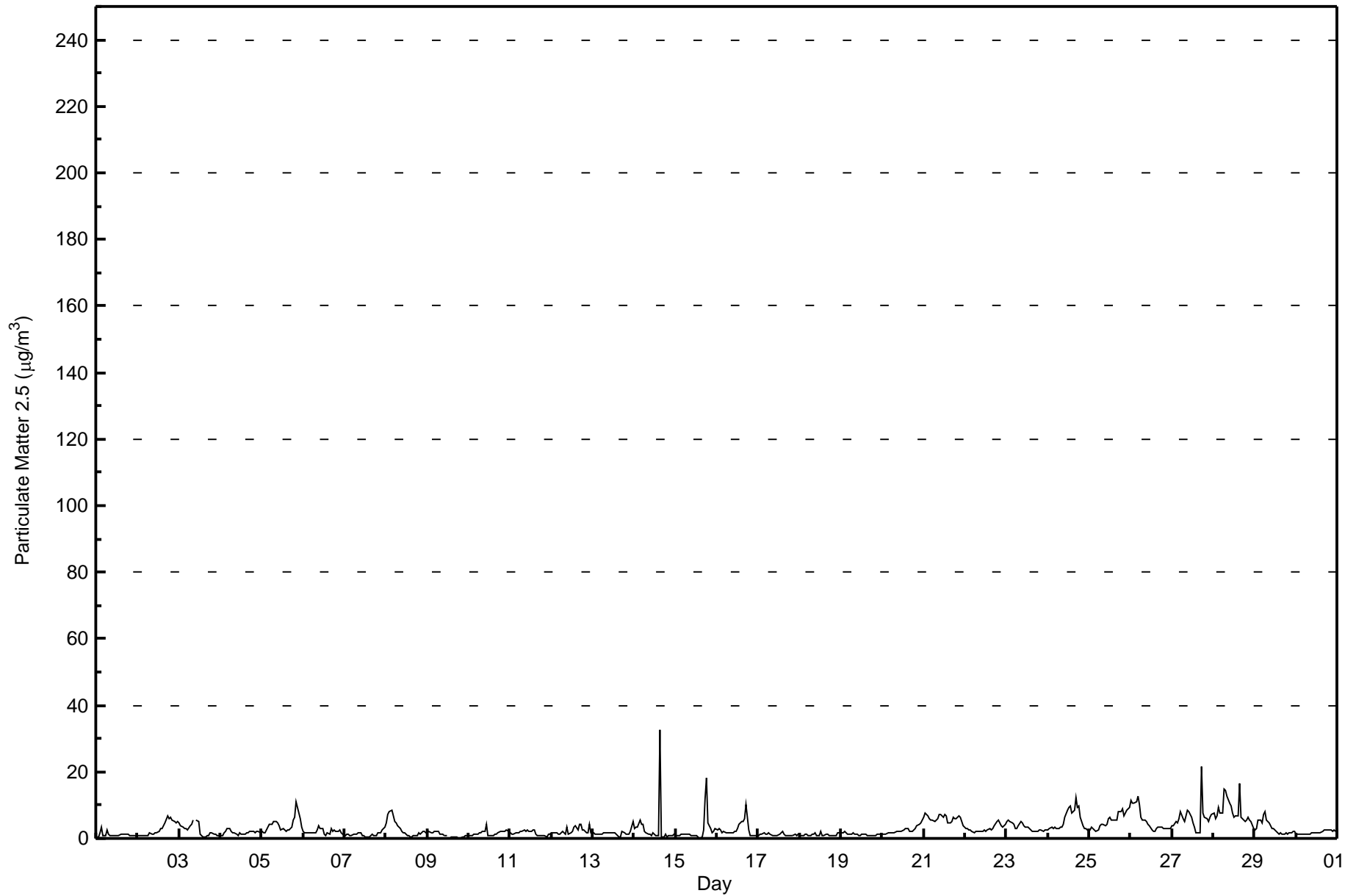
2.7	2.8	3.0	3.2	3.0	3.0	3.2	3.0	3.1	3.0	2.9	2.8	2.6	2.4	2.3	3.7	2.7	4.0	3.6	3.0	2.9	2.7	2.8	2.8	Diurnal Average	
11.4	10.6	10.4	10.9	12.5	10.1	14.7	14.5	12.7	10.6	9.6	8.5	9.4	9.6	7.7	32.7	12.3	21.5	18.4	8.7	10.8	7.8	8.4	9.1	Diurnal Maximum	

C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - November 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	494	68.80	68.80
6 - 15	97	13.51	82.31
16 - 25	3	0.42	82.73
26 - 80	1	0.14	82.87
> 81.0	0	0.00	82.87

Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Anzac - November 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	9	0	5	6	5	14	47	107	62	22	36	18	23	83	29	27	493
6 - 15	4	1	3	0	1	1	9	16	3	2	5	1	10	28	8	5	97
16 - 25	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	3
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	13	1	8	6	6	15	56	123	65	24	42	19	33	114	37	32	594

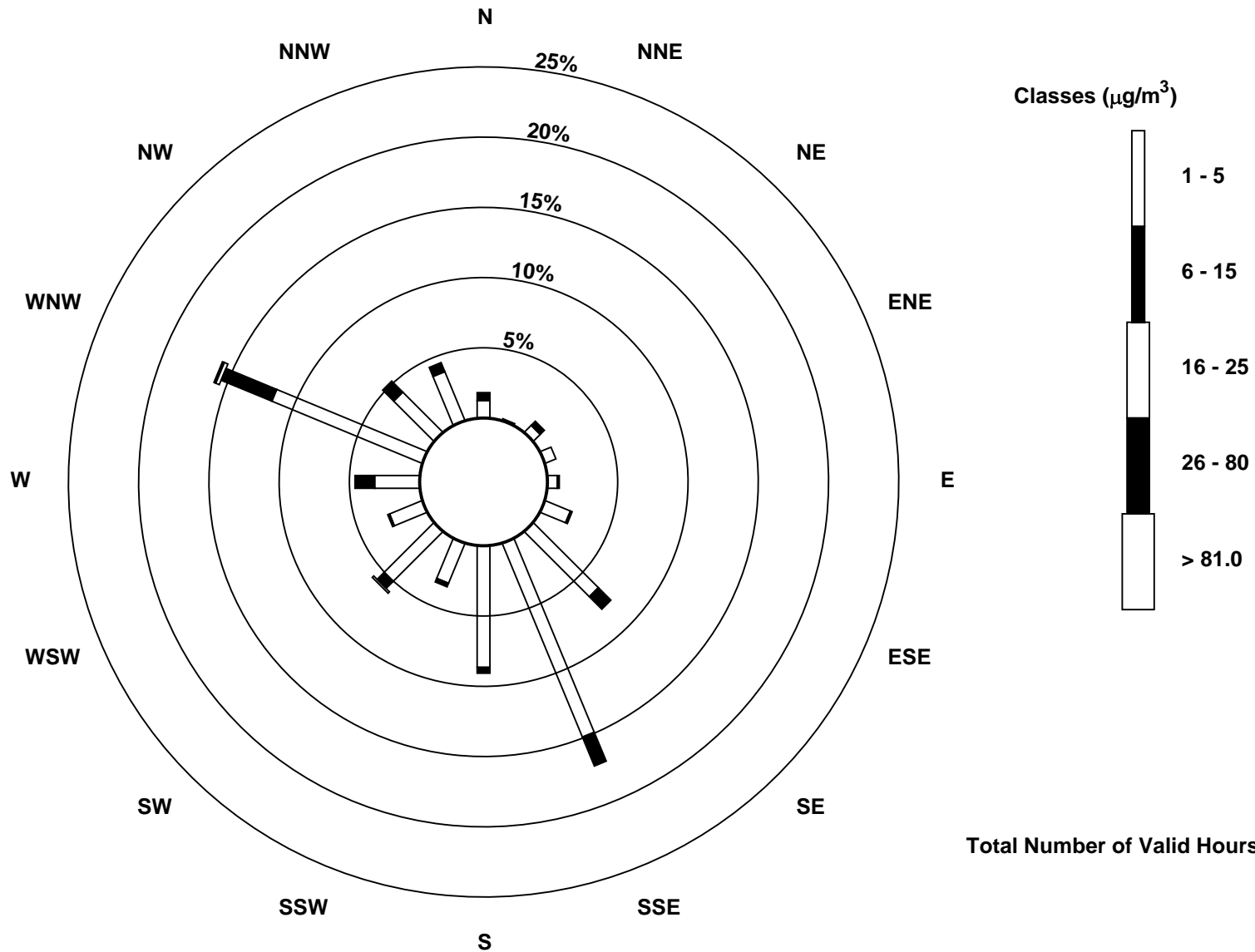
Total Number of Valid Hours: 717

Total Number of Hours: 720



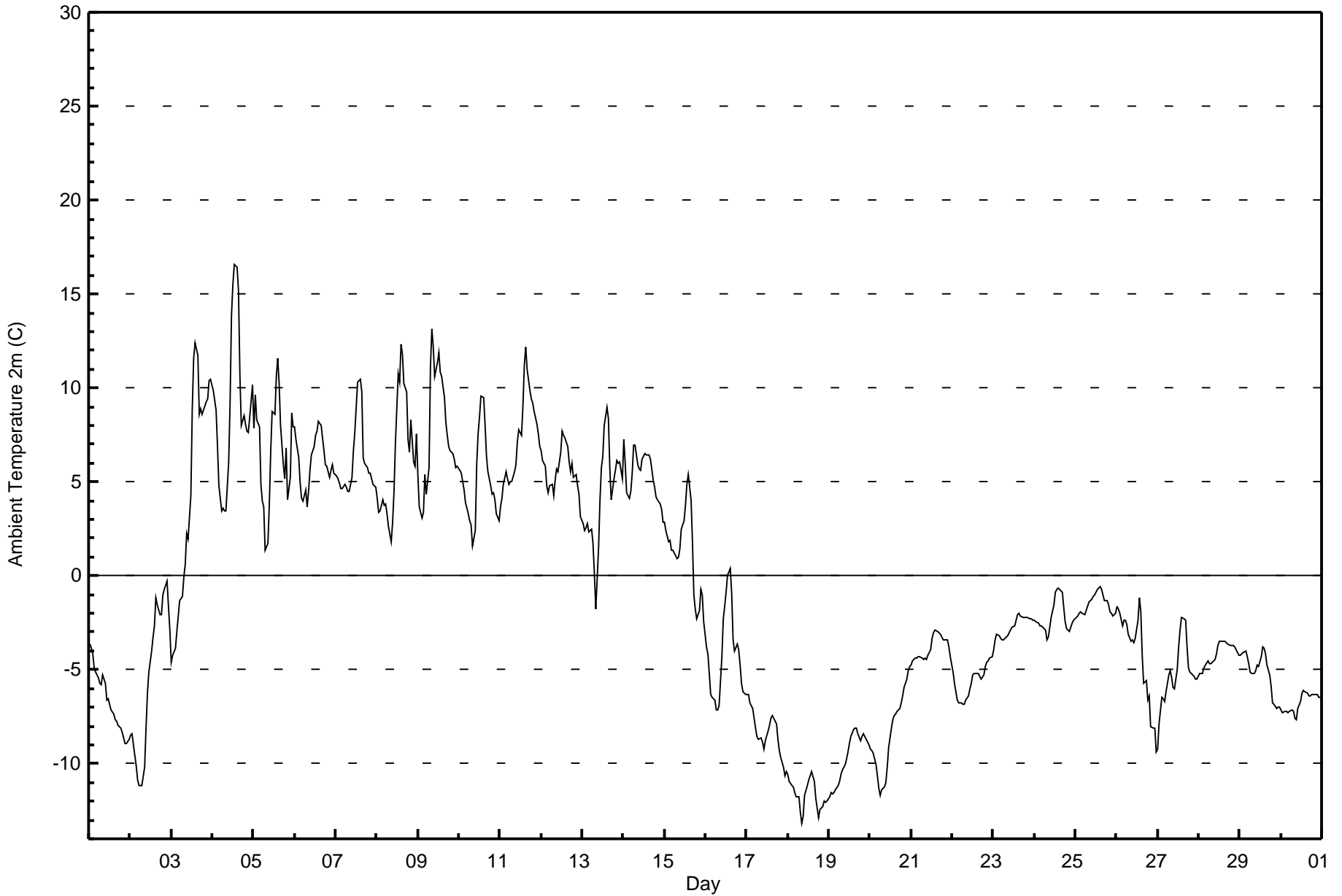
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac (AMS 14)





Maximum Value: 16.6 C on Nov 4 14:00 Maximum Daily Average: 9.0 C on Nov 4																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -13.2 C on Nov 18 09:00 Minimum Daily Average: -11.7 C on Nov 18 Maximum Diurnal Average: 1.9 C at hour 15 Minimum Diurnal Average: -2.2 C at hour 8 Monthly Average: -0.69 C Percentiles: P ₁ = -12.1 P ₁₀ = -8.7 Q ₁ = -5.8 Median = -2.2 Q ₃ = 5.2 P ₉₀ = 8.0 P ₉₉ = 11.8																										
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	-3.6	-3.9	-4.2	-4.9	-5.1	-5.4	-5.7	-5.8	-5.2	-5.7	-6.6	-6.6	-6.9	-7.1	-7.4	-7.7	-7.7	-7.9	-8.1	-8.4	-8.6	-8.9	-8.9	-8.7	-6.6	-3.6
2-Nov	-8.5	-8.4	-9.0	-10.2	-10.9	-11.1	-11.2	-11.2	-10.2	-8.1	-6.3	-5.2	-4.0	-3.3	-2.6	-1.2	-1.5	-2.1	-2.1	-1.0	-0.7	-0.3	-1.6	-2.9	-5.6	-0.3
3-Nov	-4.6	-4.2	-3.8	-3.0	-2.2	-1.3	-1.1	0.0	0.6	2.2	2.0	4.3	8.9	11.6	12.4	11.7	8.6	8.9	8.6	8.8	9.3	9.4	10.4	10.5	4.5	12.4
4-Nov	9.8	9.3	8.8	6.9	4.8	3.4	3.6	3.4	3.4	6.1	9.3	13.9	15.5	16.6	16.4	15.2	10.7	8.0	8.5	8.1	7.7	7.6	8.4	10.2	9.0	16.6
5-Nov	7.8	9.6	8.3	7.9	4.9	4.0	3.7	1.4	1.7	3.8	6.7	8.8	8.6	10.6	11.5	10.2	8.0	5.9	5.2	6.8	4.0	5.2	8.7	7.9	6.7	11.5
6-Nov	7.9	7.3	6.3	4.9	4.2	3.9	4.5	3.7	4.5	5.6	6.4	6.9	7.5	7.7	8.2	8.0	7.3	6.6	5.9	5.8	5.2	5.6	5.9	5.5	6.1	8.2
7-Nov	5.3	5.1	4.9	4.6	4.6	4.9	4.7	4.5	4.5	5.2	6.6	7.6	9.0	10.3	10.5	9.8	6.3	6.0	5.8	5.5	5.4	5.2	4.9	4.7	6.1	10.5
8-Nov	4.1	3.4	3.5	4.0	3.8	3.8	3.3	2.6	1.8	2.9	4.5	7.1	10.7	10.3	12.3	11.8	10.2	9.8	7.2	6.6	8.3	6.1	5.9	7.6	6.3	12.3
9-Nov	5.4	3.7	3.1	3.4	5.4	4.3	5.8	11.1	13.1	12.1	10.6	11.4	11.9	10.8	10.6	9.5	8.2	7.5	6.9	6.6	6.5	6.2	5.8	5.8	7.7	13.1
10-Nov	5.6	5.5	5.0	4.5	3.9	3.3	3.0	2.7	1.6	2.4	5.9	7.5	8.5	9.6	9.5	8.0	6.4	5.6	4.8	4.4	4.4	4.0	3.3	2.9	5.1	9.6
11-Nov	3.7	4.1	4.8	5.5	5.1	4.9	5.0	5.0	5.6	5.9	7.1	7.8	7.5	9.0	11.2	12.1	11.0	9.9	9.4	9.2	8.7	8.1	7.6	6.9	7.3	12.1
12-Nov	6.7	6.2	5.9	4.8	4.4	4.8	4.9	4.3	5.1	5.7	5.6	6.6	7.7	7.5	7.3	6.9	6.1	5.5	6.0	5.2	5.4	4.8	4.4	3.2	5.6	7.7
13-Nov	2.8	2.4	2.6	2.8	2.3	2.5	1.8	0.1	-1.8	1.5	4.0	5.8	6.4	8.0	9.0	8.4	5.8	4.1	5.1	5.6	6.1	6.0	6.0	5.2	4.3	9.0
14-Nov	7.3	6.0	4.5	4.2	4.5	5.5	7.0	6.9	5.9	5.7	5.6	6.2	6.5	6.4	6.4	6.4	6.2	5.1	4.7	4.2	4.0	3.9	3.5	2.8	5.4	7.3
15-Nov	2.9	2.4	1.8	1.9	1.4	1.3	1.1	0.9	1.0	1.4	2.5	2.9	3.8	4.9	5.4	4.1	1.8	-1.0	-1.8	-2.3	-1.8	-0.7	-1.0	-2.4	1.3	5.4
16-Nov	-3.8	-4.2	-5.2	-6.3	-6.5	-6.6	-7.2	-7.1	-6.9	-4.3	-2.3	-1.6	-0.9	0.0	0.4	-0.9	-3.4	-4.0	-3.6	-3.9	-4.7	-5.8	-6.1	-6.3	-4.2	0.4
17-Nov	-6.3	-6.3	-6.8	-7.1	-7.6	-8.1	-8.6	-8.7	-8.7	-8.8	-9.2	-8.8	-8.3	-7.9	-7.6	-7.4	-7.6	-7.9	-8.7	-9.3	-9.6	-10.2	-10.6	-10.4	-8.4	-6.3
18-Nov	-10.6	-10.9	-11.2	-11.3	-11.5	-11.8	-11.7	-12.6	-13.2	-12.8	-11.7	-11.2	-10.8	-10.6	-10.4	-11.0	-11.8	-12.4	-12.9	-12.4	-12.3	-12.0	-12.1	-12.0	-11.7	-10.4
19-Nov	-11.7	-11.5	-11.6	-11.5	-11.4	-11.2	-10.9	-10.6	-10.4	-10.0	-9.7	-9.4	-8.9	-8.6	-8.2	-8.1	-8.1	-8.4	-8.8	-8.6	-8.4	-8.5	-8.7	-9.0	-9.7	-8.1
20-Nov	-9.2	-9.3	-9.5	-10.0	-10.6	-11.3	-11.7	-11.4	-11.2	-11.0	-10.2	-9.1	-8.1	-7.6	-7.5	-7.3	-7.2	-7.1	-6.8	-6.4	-6.0	-5.5	-5.0	-4.8	-8.5	-4.8
21-Nov	-4.7	-4.5	-4.4	-4.4	-4.3	-4.3	-4.4	-4.4	-4.4	-4.4	-4.2	-3.9	-3.3	-3.1	-2.9	-3.0	-3.0	-3.1	-3.3	-3.4	-3.4	-3.4	-3.8	-4.3	-3.8	-2.9
22-Nov	-5.1	-5.7	-6.2	-6.6	-6.8	-6.8	-6.8	-6.9	-6.6	-6.4	-6.0	-5.7	-5.3	-5.2	-5.2	-5.2	-5.3	-5.5	-5.3	-4.8	-4.6	-4.5	-4.4	-4.3	-5.6	-4.3
23-Nov	-4.0	-3.4	-3.1	-3.2	-3.3	-3.4	-3.4	-3.3	-3.2	-3.0	-2.9	-2.7	-2.6	-2.3	-2.1	-2.0	-2.1	-2.2	-2.2	-2.2	-2.2	-2.3	-2.3	-2.3	-2.7	-2.0
24-Nov	-2.4	-2.5	-2.5	-2.7	-2.7	-2.7	-2.9	-3.4	-3.2	-2.8	-2.2	-1.6	-0.8	-0.7	-0.7	-0.8	-0.8	-1.7	-2.4	-2.8	-3.0	-2.8	-2.5	-2.4	-2.2	-0.7
25-Nov	-2.2	-2.2	-2.0	-1.9	-2.0	-2.1	-1.9	-1.6	-1.4	-1.2	-1.1	-1.0	-0.9	-0.7	-0.6	-0.7	-1.0	-1.3	-1.3	-1.6	-1.9	-2.0	-2.1	-2.0	-1.5	-0.6
26-Nov	-1.7	-1.8	-2.0	-2.6	-2.4	-2.4	-2.6	-3.1	-3.5	-3.4	-3.5	-3.3	-2.3	-1.1	-1.9	-4.2	-5.8	-5.6	-6.6	-6.4	-8.0	-8.1	-8.1	-9.4	-4.2	-1.1
27-Nov	-9.3	-7.9	-6.5	-6.5	-6.7	-6.2	-5.3	-5.1	-5.4	-5.9	-6.0	-5.0	-3.8	-2.9	-2.2	-2.3	-2.4	-3.8	-4.9	-5.2	-5.3	-5.3	-5.5	-5.5	-5.2	-2.2
28-Nov	-5.2	-5.2	-5.2	-4.9	-4.8	-4.5	-4.7	-4.7	-4.6	-4.5	-4.1	-3.7	-3.5	-3.5	-3.5	-3.5	-3.6	-3.7	-3.7	-3.7	-3.7	-3.8	-3.9	-4.3	-4.2	-3.5
29-Nov	-4.2	-4.2	-4.1	-4.0	-4.3	-4.7	-5.1	-5.2	-5.2	-5.1	-4.8	-4.8	-4.3	-3.8	-3.8	-4.2	-4.8	-5.3	-5.9	-6.8	-6.9	-7.1	-7.0	-7.0	-5.1	-3.8
30-Nov	-7.2	-7.3	-7.2	-7.2	-7.3	-7.2	-7.1	-7.2	-7.6	-7.6	-7.1	-6.7	-6.3	-6.1	-6.1	-6.3	-6.4	-6.4	-6.3	-6.3	-6.3	-6.3	-6.5	-6.5	-6.8	-6.1
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Anzac - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	423	58.75	58.75
0 - 10	264	36.67	95.42
10 - 20	33	4.58	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) - %

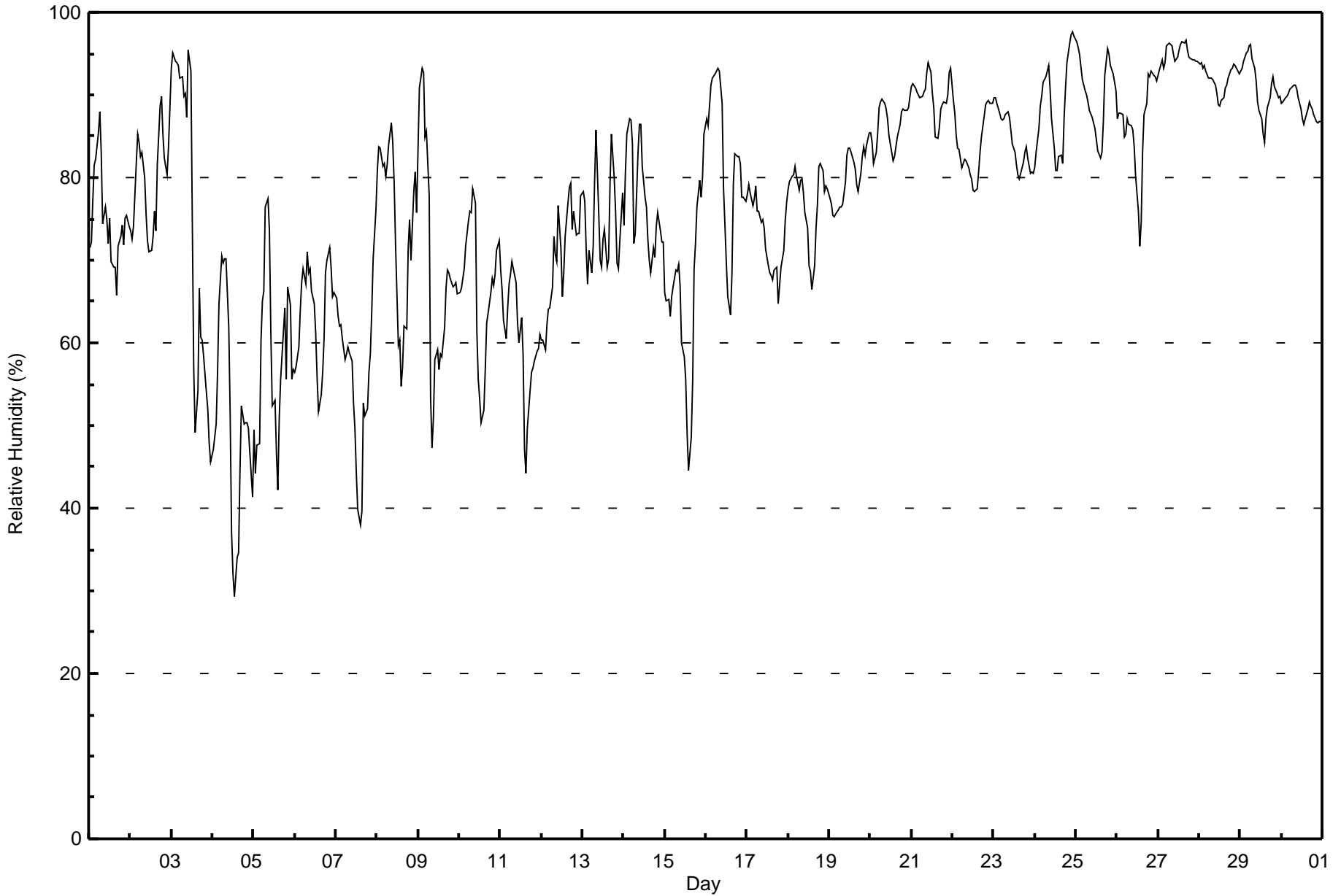
Anzac - November 2016

Maximum Value: 98 % on Nov 24 23:00 Maximum Daily Average: 94.8 % on Nov 27																		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 Nov 4 14:00 Minimum Daily Average: 50.6 % on Nov 4 Maximum Diurnal Average: 81.1 % at hour 6 Minimum Diurnal Average: 67.8 % at hour 15 Monthly Average: 76.8 % Percentiles: P ₁ = 39 P ₁₀ = 57 Q ₁ = 68 Median = 79 Q ₃ = 88 P ₉₀ = 93 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-Nov	72	72	77	82	82	85	88	83	74	76	75	72	75	70	69	69	66	72	73	74	72	75	75	74	75.1	88
2-Nov	73	73	74	82	85	84	83	83	80	76	72	71	71	73	76	74	81	89	90	85	82	80	84	89	79.6	90
3-Nov	93	95	94	94	94	92	92	90	90	87	95	93	74	57	49	54	67	61	60	59	54	52	48	46	74.6	95
4-Nov	47	49	50	57	65	71	70	70	70	62	51	37	32	29	34	35	45	52	50	50	50	50	47	41	50.6	71
5-Nov	49	44	48	48	60	65	66	76	77	74	61	52	53	47	42	51	56	61	64	56	67	65	56	57	58.1	77
6-Nov	56	57	59	64	67	69	67	71	68	69	66	65	61	56	52	54	56	60	69	70	72	69	66	66	63.7	72
7-Nov	65	63	62	62	60	58	59	59	59	58	53	50	44	40	38	40	53	51	52	56	59	64	70	76	56.3	76
8-Nov	81	84	83	81	82	80	82	84	87	84	79	72	60	60	55	57	62	62	71	75	70	78	81	76	74.4	87
9-Nov	83	91	93	93	85	86	78	53	47	51	58	59	57	59	58	62	67	69	69	68	67	67	67	66	68.8	93
10-Nov	66	67	68	69	72	75	76	76	79	77	61	56	53	50	52	57	62	64	66	68	67	68	71	72	66.3	79
11-Nov	69	66	63	61	64	67	68	70	68	67	63	60	63	58	47	44	50	54	56	57	58	59	59	61	60.6	70
12-Nov	60	60	59	62	64	64	67	73	71	70	77	71	66	68	73	77	79	79	74	76	73	73	73	78	70.3	79
13-Nov	78	77	71	67	71	68	72	79	86	75	70	69	72	74	69	70	79	85	80	76	70	69	72	78	74.2	86
14-Nov	74	81	85	87	87	84	72	73	83	86	86	81	78	77	72	70	68	72	70	74	76	74	72	72	77.3	87
15-Nov	66	65	65	63	66	67	69	69	69	67	60	58	56	49	45	49	56	69	72	77	80	78	80	85	65.7	85
16-Nov	87	86	89	91	92	92	93	93	93	89	79	74	70	66	63	68	79	83	82	82	82	78	78	77	81.9	93
17-Nov	78	79	78	77	77	79	76	76	75	75	74	71	69	68	68	68	69	69	65	67	69	71	75	77	72.9	79
18-Nov	78	80	80	80	81	80	78	80	80	78	76	74	69	69	66	69	74	77	81	82	81	78	79	79	77.1	82
19-Nov	78	77	75	75	76	76	76	76	77	80	83	84	84	83	82	81	79	78	81	83	84	83	84	85	79.9	85
20-Nov	85	84	82	83	85	89	89	90	89	88	87	85	83	82	82	84	85	86	88	88	88	88	89	90	86.2	90
21-Nov	91	91	91	90	90	90	90	90	91	93	94	93	90	88	85	85	86	88	89	89	89	90	93	93	90.0	94
22-Nov	89	88	85	83	83	81	82	82	82	81	80	80	78	78	79	81	83	85	87	89	89	89	89	89	83.9	89
23-Nov	90	90	89	88	87	87	87	88	88	87	86	84	83	81	80	80	81	82	83	84	82	80	81	81	84.5	90
24-Nov	81	83	86	89	90	92	92	93	94	91	87	84	81	81	83	83	82	87	91	94	96	97	98	97	88.7	98
25-Nov	96	96	95	93	92	91	90	89	88	87	87	86	85	83	82	83	87	92	96	95	94	93	93	90	90.1	96
26-Nov	87	88	88	88	85	85	87	87	86	86	84	80	76	72	75	83	88	89	93	92	93	92	92	92	86.1	93
27-Nov	92	93	94	93	94	96	96	96	96	95	94	95	95	96	96	96	97	95	95	94	94	94	94	94	94.8	97
28-Nov	94	94	93	94	93	92	92	92	92	91	90	89	89	89	90	91	91	92	93	93	94	94	93	92	91.9	94
29-Nov	93	93	94	95	95	96	96	94	93	92	89	88	87	85	84	87	88	90	91	92	91	90	90	90	91.1	96
30-Nov	89	89	90	90	90	91	91	91	91	91	90	88	87	86	87	88	89	88	88	88	87	87	87	87	88.8	91
	78.1	78.5	78.7	79.4	80.5	81.1	80.8	80.9	80.8	79.4	76.9	74.0	71.4	69.2	67.8	69.6	73.4	76.1	77.3	77.7	77.6	77.5	77.8	78.3	Diurnal Average	
	96	96	95	95	95	96	96	96	96	95	95	95	95	96	96	96	97	95	96	95	96	97	98	97	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Anzac - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	8	1.11	1.11
40 - 60	88	12.22	13.33
60 - 80	276	38.33	51.67
80 - 100	348	48.33	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (SW) - %

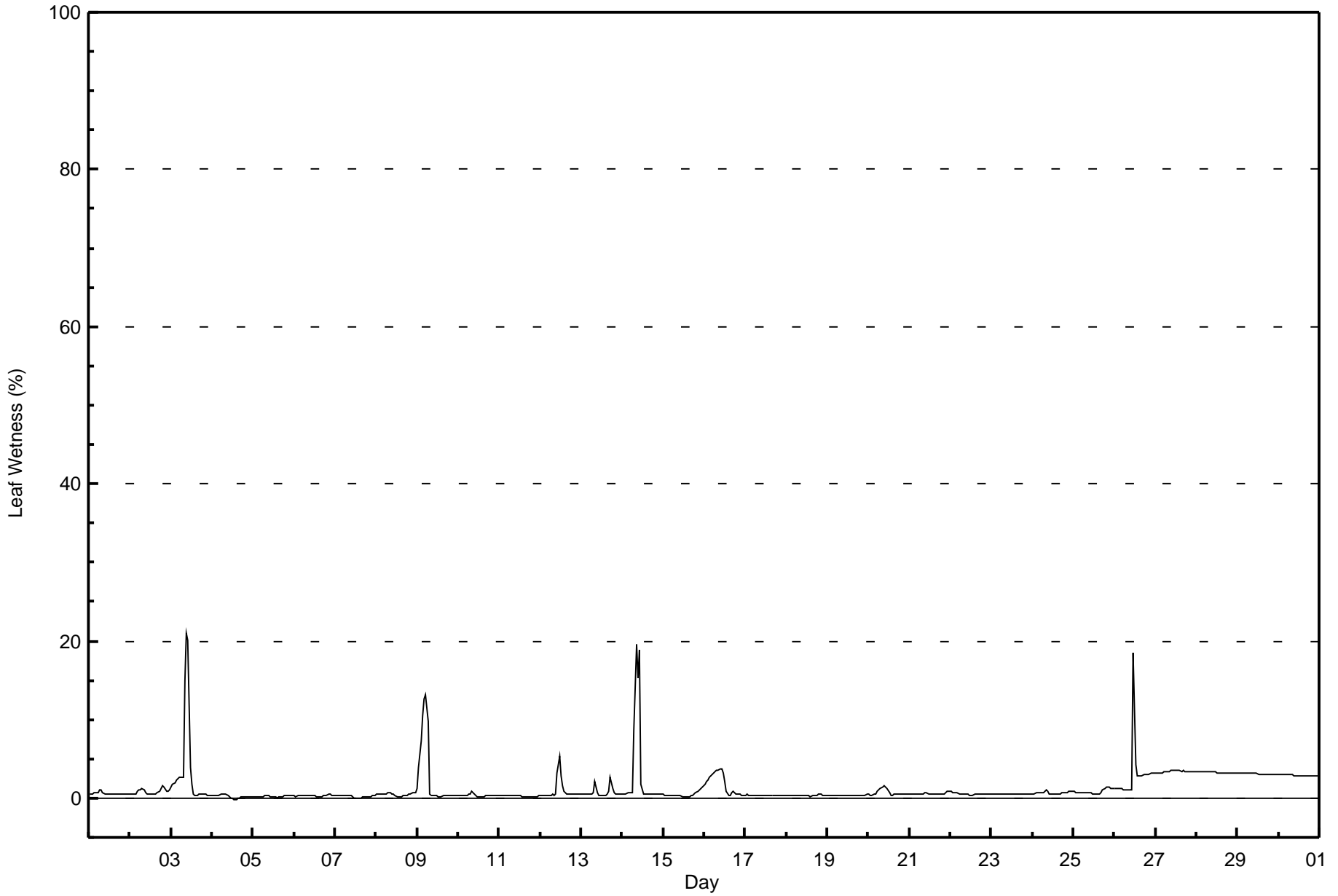
Anzac - November 2016

Maximum Value: 21 % on Nov 3 10:00 Maximum Daily Average: 3.5 % on Nov 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: 0 % on Nov 4 15:00 Minimum Daily Average: 0.2 % on Nov 4 Maximum Diurnal Average: 2.3 % at hour 11 Minimum Diurnal Average: 0.8 % at hour 15 Monthly Average: 1.2 % Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 3 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-Nov	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	0.6	1
2-Nov	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.8	1
3-Nov	1	2	2	2	3	3	3	3	15	21	20	4	2	0	0	0	1	0	0	0	0	0	0	0	3.5	21	
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	0.2	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	0.2	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	0.3	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	0.2	0	
8-Nov	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1	
9-Nov	1	4	7	11	13	13	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7	13	
10-Nov	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
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	0.3	0	
12-Nov	0	0	0	0	0	0	0	0	0	1	3	5	3	2	1	1	1	1	0	0	0	0	0	1	0.9	5	
13-Nov	1	1	0	0	0	0	0	1	2	1	0	0	0	0	0	0	1	3	1	1	1	1	1	1	0.7	3	
14-Nov	1	1	1	1	1	1	1	9	20	15	19	2	1	1	1	0	0	0	0	0	1	1	0	0	3.1	20	
15-Nov	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	
16-Nov	2	2	2	3	3	3	3	3	4	4	4	3	2	1	0	0	1	1	1	0	0	0	0	0	1.8	4	
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	0.3	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	0.3	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	0.4	0	
20-Nov	0	0	0	0	1	1	1	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0.7	2	
21-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	0.6	1	
22-Nov	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1	
23-Nov	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1	
24-Nov	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	
25-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	0.8	1	
26-Nov	1	1	1	1	1	1	1	1	1	1	1	18	4	3	3	3	3	3	3	3	3	3	3	3	2.8	18	
27-Nov	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3.4	3	
28-Nov	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3.3	3	
29-Nov	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	
30-Nov	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	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (SW) - %
Anzac - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Anzac - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	173	24.26	24.26
0.4 - 0.5	245	34.36	58.63
0.6 - 0.7	78	10.94	69.57
0.8 - 1.4	63	8.84	78.40
1.5 - 10	142	19.92	98.32
> 10	10	1.40	99.72

Total Number of Valid Hours: 713

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Anzac - November 2016

Maximum Speed: 22 km/h on Nov 23 14:00	Maximum Daily Speed Average: 13.8 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 22 11:00	Minimum Daily Speed Average: 0.9 km/h on Nov 21	Hours of Data: 719
Maximum Diurnal Speed Average: 4.2 km/h at hour 20	Minimum Diurnal Speed Average: 2.3 km/h at hour 12	Hours of Missing Data: 1
Monthly Average Velocity: 3.0 km/h 230.6 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 11 P ₉₀ = 14 P ₉₉ = 21	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-Nov	NW10	NW9	NNW9	NNW9	NNW6	N6	N6	NNW7	NW11	NW13	NW13	NW10	NW12	NW14	NW12	NW12	NW13	NNW11	NNW10	NNW10	NNW9	NNW6	N4	N3	NNW9.1	NW14
2-Nov	ENE2	SW5	SSW5	S3	SSE5	S8	S10	SSE11	SSE14	SSE12	SSE13	SSE12	SSE12	SSE13	SSE11	SSE10	S7	SSW7	SW7	SW11	WSW13	SW13	SSW9	SSW5	S7.7	SSE14
3-Nov	SSE3	SSE6	SSE7	SSE12	SSE11	SE11	SE10	SSE11	S7	SW5	ESE1	SSW7	SW10	W10	WSW7	S7	SSW10	SW20	SW22	SW21	WSW16	WSW19	WSW22	W20	SW8.5	SW22
4-Nov	W18	W15	W9	S5	SSW7	SSW8	S10	S9	S7	SSE7	S7	SW8	NNW6	W3	ESE1	SSW7	S5	S8	S9	S10	SSW8	S7	S7	S9	SSW5.8	W18
5-Nov	SSE9	S12	SSE10	SSE10	SE4	SE4	SE3	NE3	ESE3	SSE4	SSE4	SE3	S5	SSE3	S4	SSE5	SSE6	SSW5	SW6	SW7	NW1	NNW8	NNW12	NNW10	S3.4	S12
6-Nov	WNW12	WNW12	W8	W6	WSW5	W4	SW1	SW6	WNW6	WNW8	WNW10	WNW8	W7	WNW8	WNW7	WNW8	WNW7	WNW8	WNW9	WNW8	WNW7	WNW9	WNW9	WNW10	WNW7.3	WNW12
7-Nov	WNW12	WNW13	WNW12	WNW11	WNW13	W13	W13	W12	W8	WNW9	NW7	SSW1	WNW3	WNW5	WNW7	SSW2	SSE7	SSE9	SSE10	SSE11	SSE13	SSE13	S12	SSE11	WSW4.8	W13
8-Nov	SSE10	SSE11	SSE11	SSE14	SSE11	SSE10	SSE7	SE7	ESE3	ESE5	E6	SSE7	E3	E6	ENE7	SE5	S8	SSW8	SSW6	SW7	SW8	SW5	SW7	SW10	SSE5.7	SSE14
9-Nov	WSW4	SSE2	S5	SSW8	SSW7	SSW6	WSW6	WNW8	WNW15	WNW14	WNW13	WNW13	WNW19	WNW18	WNW16	WNW14	WNW10	WNW10	WNW12	WNW14	WNW16	WNW16	WNW16	WNW15	WNW10.0	WNW19
10-Nov	WNW14	WNW15	WNW14	WNW12	WNW12	WNW11	WNW10	WNW9	NW3	SW4	SW3	ESE5	SE8	SE9	SE11	SE11	SSE10	SSE12	SSE12	SSE11	SSE11	SSE13	SE15	SSE16	SSW3.7	SSE16
11-Nov	SSE16	SE12	SE11	S11	S11	SSW6	WSW7	SW11	SW11	SW10	WSW6	W3	S4	SW5	WSW10	W15	WNW14	WNW10	WNW12	WNW12	WNW11	WNW10	WNW10	WNW8	WSW5.9	SSE16
12-Nov	WNW9	W9	WSW12	SW9	SW9	SW5	SW5	S2	S6	WSW3	NE2	N5	WNW6	SW5	SW4	NE2	SW2	NW6	NW7	WNW8	WNW9	WNW8	WNW8	WNW8	W4.5	WSW12
13-Nov	WNW9	WNW9	WNW10	WNW12	WNW11	WNW10	WNW8	W5	SSW6	SSW8	SSW7	SSW6	SSW6	W8	W9	WSW6	SW7	SW10	SW11	SW14	SW13	SW10	SW10	SSW8	WSW7.1	SW14
14-Nov	S9	SSE9	S7	S6	SW8	WSW7	WNW10	WNW12	WNW11	WNW10	W13	W16	WNW18	WNW15	WNW16	WNW14	WNW17	WNW14	WNW13	W15	WNW15	WNW13	WNW16	WNW14	W10.4	WNW18
15-Nov	WNW16	WNW16	NW14	WNW16	WNW14	WNW15	WNW15	WNW13	WNW15	WNW15	WNW12	WNW11	W11	WNW10	W7	WSW5	WSW4	SW5	WSW4	WNW6	WNW7	WNW7	WNW7	WNW7	WNW10.6	WNW16
16-Nov	NW7	NW6	NW5	NW5	WNW5	NW5	WNW5	WNW6	NW6	NW6	NNW6	WNW7	WNW6	NW6	W5	NNW6	N4	N7	N10	N12	N11	NNE11	N7	N8	NNW5.8	N12
17-Nov	NNW6	NNW8	N10	N11	NNW9	NNW9	NNW9	NNW9	NNW9	NW10	NW10	NW10	NW10	NNW12	NW10	NW10	NNW10	NNW10	NNW13	NNW16	NW16	NW13	NW10	NW7	NNW10.1	NNW16
18-Nov	NW10	WNW10	WNW10	NW6	WNW6	WNW8	WNW8	W8	WSW7	W7	W7	WNW8	WNW7	NW7	NW6	WNW6	NNW4	N3	NE1	ENE1	SE2	SE3	SSE4	SSE4	WNW4.5	WNW10
19-Nov	SE5	SE7	SE9	ESE8	SE7	ESE8	SE9	SE9	SE10	ESE9	SE11	SE12	SE11	SE13	SE14	SE12	SE11	ESE11	SE9	SE10	ESE13	ESE14	ESE11	ESE11	SE10.0	SE14
20-Nov	SE9	SE11	SE12	SE8	SE8	SE7	SE7	SSE9	SSE8	SSE10	SSE10	SE9	SE10	SSE10	SSE10	SE10	SSE10	SSE10	SE9	SE7	SE9	SE10	SE14	SE15	SE9.4	SE15
21-Nov	SE16	SE13	SE10	SSE8	SE6	SE7	SE7	SSE7	SSE7	SSE6	S4	SSW4	W3	NW6	NNW8	NNW7	NNW6	NNW6	N4	NNW5	NNW7	NNW7	NNW8	N8	SE0.9	SE16
22-Nov	N8	NNW8	NNW7	NNW6	NNW5	NNW4	N4	NNW3	AF	E1	E1	ENE3	SE6	SE5	SSE9	S7	S10	S12	SSE13	SSE13	S15	SSE14	SSE13	SSE18	SSE3.9	SSE18
23-Nov	SSE19	SSE16	SSE16	SSE17	SSE18	SSE17	SSE16	SSE13	SSE15	SSE14	SSE18	SSE21	SSE22	SSE16	SSE13	SSE11	SSE10	SSE10	S9	SW11	SW9	SW11	SSW9	SSE13.8	SSE22	
24-Nov	S7	S7	S7	SSE8	SSE7	SSE8	SSE7	SSE6	SSE5	S5	S6	SSE5	SE7	SSE9	SSE10	SSE8	SSE10	SSE14	SSE14	SSE13	SSE14	SSE13	SE15	SE17	SSE9.0	SE17
25-Nov	SE16	SE16	SSE17	SSE18	SSE21	SSE22	SSE20	SSE17	SSE13	SSE11	SE12	SE10	SE12	SSE8	SSE7	SW4	WNW2	WNW4	WNW9	WNW10	WNW13	WNW13	WNW14	WNW12	SSE6.9	SSE22
26-Nov	W14	WNW14	W12	W11	W12	WNW12	W9	WSW9	W6	WSW6	WNW9	WNW7	WNW6	NW5	NW3	S2	SE6	SSE7	S5	S4	SSE5	SSE4	SSE2	ESE3	W4.8	WNW14
27-Nov	SE5	ESE4	ENE5	NE3	NE2	E2	SE3	ENE3	NE3	N3	NNE4	NE6	ENE5	ENE5	E6	E6	ENE4	WNW2	W3	WNW5	WNW3	WNW4	W4	W2	NE1.8	E6
28-Nov	NW2	NNW3	NW5	NW6	WNW8	WNW9	WNW9	WNW9	WNW9	WNW8	WNW9	WNW9	WNW9	WNW6	WNW7	WNW8	WNW9	WNW7	WNW6	WNW7	NW6	NW6	NW6	NNW7	WNW6.9	WNW9
29-Nov	NNW7	NNW6	NNW7	NW7	NW8	NW7	NW8	NW7	NW5	WNW7	NW7	WNW8	WNW4	WNW3	W3	W4	SW5	S6	S8	SSW7	SSW7	S7	S9	S7	W3.6	S9
30-Nov	S7	S8	S8	S9	S11	S12	S11	SSE12	S10	S12	S10	S12	SSE10	SSE11	S12	S13	S12	S13	S11	S9	S9	S10	S10	S9	S10.4	S13

WSW3.0	WSW3.0	SW2.5	SW2.9	SW3.2	SW2.9	SW3.1	SW3.2	SW3.3	SW3.1	WSW2.5	SW2.3	SW2.4	WSW2.4	WSW2.5	SW2.6	SW2.8	SW3.3	SW3.8	WSW4.2	WSW3.9	WSW3.7	WSW4.0	SW3.3	Diurnal Average
SSE19	SSE16	SSE17	SSE18	SSE21	SSE22	SSE20	SSE17	SSE15	WNW15	SSE18	SSE18	SSE21	SSE22	WNW16	W15	WNW17	SW20	SW22	SW21	WNW16	WSW19	WSW22	W20	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 - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 7 km/h on Nov 3 23:00	Hours of Data: 719
Minimum Value: 1 km/h on Nov 22 08:00	Hours of Missing Data: 1
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 6	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-Nov	4	4	3	2	2	2	2	3	5	5	4	4	4	4	5	5	4	4	3	3	3	2	1	1	5
2-Nov	1	3	2	1	1	2	2	3	4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	2	4
3-Nov	1	2	2	2	3	3	2	3	3	5	2	3	3	5	3	3	5	5	6	5	4	6	7	7	7
4-Nov	7	5	3	3	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	7
5-Nov	2	3	3	2	2	2	2	1	1	2	2	2	2	1	2	2	2	1	1	1	2	4	4	3	4
6-Nov	4	4	2	2	2	1	2	1	2	2	3	3	2	3	2	2	2	2	2	3	2	3	3	3	4
7-Nov	4	4	4	3	4	5	4	4	3	3	3	1	1	2	3	1	1	2	2	3	3	3	3	3	5
8-Nov	3	3	4	3	3	3	2	2	1	1	1	2	2	2	2	1	2	2	1	1	2	2	2	2	4
9-Nov	2	2	1	2	2	1	2	3	5	5	5	5	7	7	5	5	3	3	3	4	5	5	5	5	7
10-Nov	4	4	4	4	4	3	3	2	2	1	2	1	2	3	3	3	2	3	3	3	3	3	4	4	4
11-Nov	4	4	3	3	3	5	4	3	3	2	3	3	1	1	4	5	5	4	4	4	3	3	3	2	5
12-Nov	2	2	3	2	2	1	2	1	2	2	2	3	2	2	1	1	2	2	2	2	2	2	2	2	3
13-Nov	2	3	3	4	3	3	2	2	2	1	1	2	2	3	3	2	1	2	2	3	3	3	3	3	4
14-Nov	3	2	2	2	2	1	3	4	4	3	4	6	6	6	5	5	5	4	4	5	5	5	6	5	6
15-Nov	6	6	5	5	5	5	5	4	5	5	5	4	4	4	4	2	1	1	1	1	2	2	2	2	6
16-Nov	1	1	1	1	1	1	1	1	2	2	2	3	2	2	2	1	1	2	2	3	3	4	2	2	4
17-Nov	2	2	3	3	3	3	3	3	3	4	4	3	4	4	4	3	4	5	5	5	5	3	2	3	5
18-Nov	3	3	3	3	2	3	3	3	2	2	3	3	3	2	3	2	1	1	1	1	2	2	2	1	3
19-Nov	2	2	3	2	3	3	3	3	3	3	3	4	4	4	4	3	3	3	3	3	4	4	4	3	4
20-Nov	3	4	4	2	2	2	1	2	3	3	3	3	3	3	3	3	3	3	2	2	3	3	4	4	4
21-Nov	5	4	3	3	2	2	2	2	2	2	1	1	1	2	2	2	2	2	1	1	2	2	2	2	5
22-Nov	2	3	2	2	1	1	1	1	AF	1	1	1	2	2	2	2	3	4	4	4	4	4	5	6	6
23-Nov	6	6	5	5	5	6	5	4	4	4	5	5	6	6	6	4	3	3	3	2	4	3	4	3	6
24-Nov	2	2	2	2	2	2	2	1	2	1	2	1	2	3	2	2	3	4	5	4	4	4	5	5	5
25-Nov	4	5	5	5	5	6	6	6	4	4	3	3	3	2	2	2	1	2	4	3	4	5	4	4	6
26-Nov	4	5	4	3	4	5	3	3	2	2	3	2	2	2	2	2	1	2	2	2	2	2	1	1	5
27-Nov	1	1	1	1	2	1	2	1	1	1	1	2	1	1	2	2	1	1	1	1	1	2	1	1	2
28-Nov	2	1	1	2	2	3	3	3	3	3	3	3	3	2	2	2	3	2	2	2	2	2	2	2	3
29-Nov	2	2	2	2	3	2	2	2	2	2	2	2	2	1	2	2	2	2	3	3	2	3	3	3	3
30-Nov	2	2	3	3	3	4	3	3	3	3	4	3	3	3	4	4	4	5	4	3	3	3	3	3	5

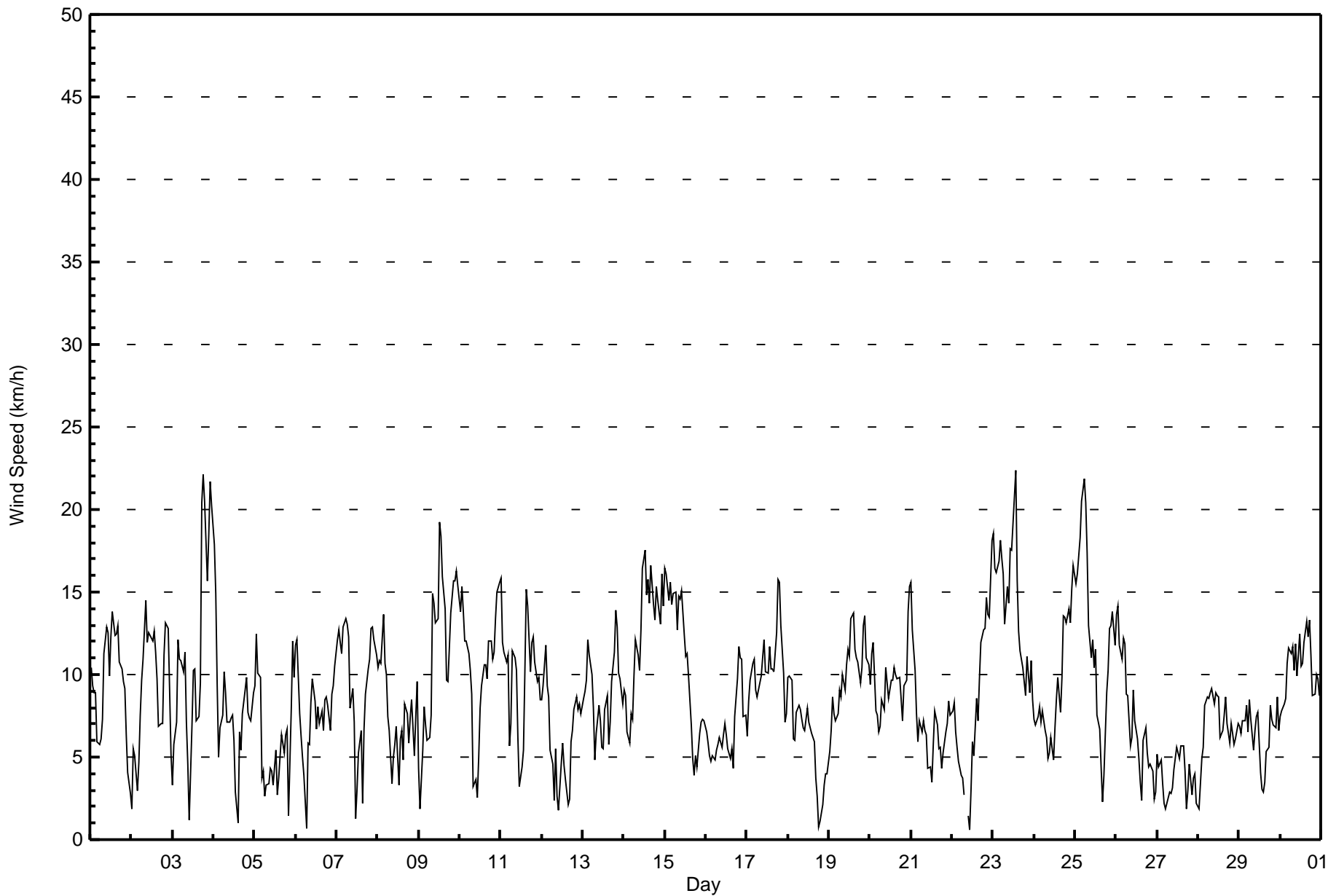
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Diurnal Maximum																									

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Anzac - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Anzac - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	140	19.47	19.47
6 - 11	402	55.91	75.38
12 - 19	167	23.23	98.61
20 - 28	10	1.39	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Anzac - 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	2	7	8	4	9	9	16	12	6	15	6	11	12	10	6	140
6 - 11	12	1	1	1	4	7	38	60	48	23	24	11	16	90	35	31	402
12 - 19	1	0	0	0	0	2	17	45	10	0	3	4	12	59	11	3	167
20 - 28	0	0	0	0	0	0	0	5	0	0	3	1	1	0	0	0	10
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	3	8	9	8	18	64	126	70	29	45	22	40	161	56	40	719

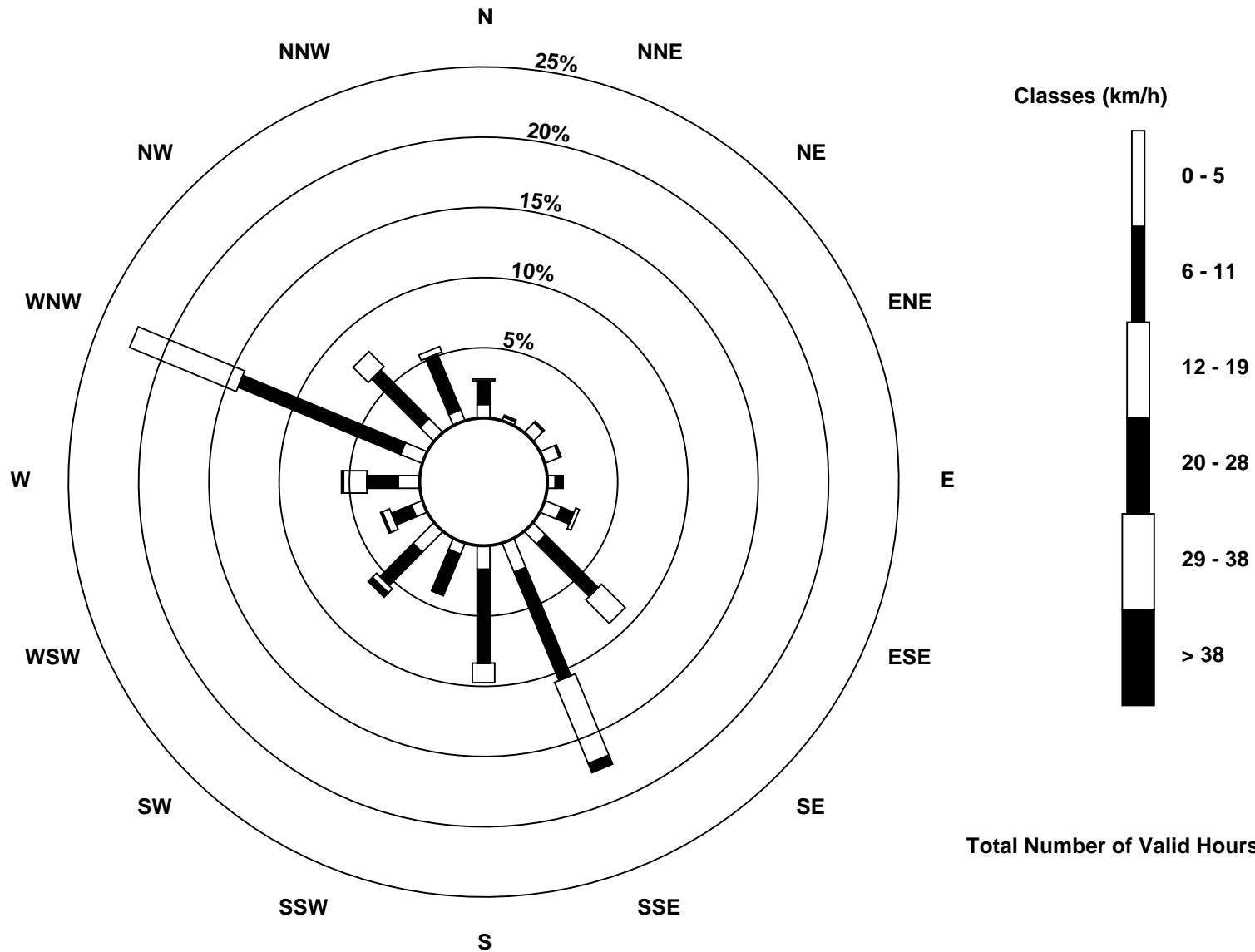
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Anzac (AMS 14)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Anzac - November 2016

Direction of Maximum Speed: 158 deg on Nov 23 14:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 166.8 deg on Nov 23	Hours of Data: 719
Direction of Minimum Speed: 101 deg on Nov 22 11:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 0.9 deg on Nov 21	Percent Operational Time: 99.9
Monthly Average Direction: 266.0 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-Nov	323	325	334	348	341	8	360	331	306	311	311	315	326	320	315	317	318	330	334	334	334	348	9	11	327.4
2-Nov	73	225	212	181	168	171	172	166	163	159	157	154	152	156	156	167	179	202	214	236	243	236	210	194	181.9
3-Nov	148	164	163	163	160	144	145	158	175	234	118	198	230	281	257	188	203	234	235	234	246	247	256	276	219.3
4-Nov	280	279	272	184	205	193	183	181	176	152	175	236	289	264	109	198	186	177	186	186	198	187	189	178	207.7
5-Nov	165	171	162	168	130	130	146	56	106	150	160	125	171	164	184	159	165	198	214	235	312	288	291	291	184.1
6-Nov	292	290	278	260	254	278	222	229	282	288	292	282	281	300	290	292	294	291	293	293	295	294	298	297	286.9
7-Nov	296	294	296	295	292	278	272	277	270	303	309	202	302	286	298	202	161	160	164	166	167	165	169	163	249.0
8-Nov	153	159	158	165	162	164	152	134	116	113	100	164	83	84	75	124	174	193	209	216	225	236	222	231	165.3
9-Nov	255	151	188	196	204	192	247	295	292	293	298	297	302	303	300	294	298	303	293	296	301	301	299	296	289.6
10-Nov	294	290	289	296	291	292	289	297	313	219	226	114	140	129	142	146	152	153	160	159	156	151	145	151	194.5
11-Nov	157	143	126	169	174	212	238	225	226	221	252	269	181	218	239	265	284	288	296	296	297	297	293	287	240.6
12-Nov	293	270	239	232	229	216	232	189	191	238	46	355	295	226	229	46	226	319	310	294	301	298	298	292	269.3
13-Nov	287	293	296	303	294	294	293	266	208	210	204	194	198	261	272	239	221	226	229	234	229	234	226	193	248.5
14-Nov	179	161	172	184	214	257	294	286	289	285	279	281	282	296	294	300	301	298	282	276	287	286	286	296	279.9
15-Nov	292	301	308	292	293	293	285	282	288	283	287	290	285	281	286	268	250	237	227	251	299	288	287	302	286.8
16-Nov	309	316	309	314	296	304	299	302	305	316	330	296	299	308	276	334	5	359	2	1	8	12	7	7	332.6
17-Nov	342	340	2	359	359	348	346	338	322	320	319	323	320	307	316	324	331	332	328	326	326	321	318	312	330.2
18-Nov	310	301	303	306	299	298	302	273	251	261	278	297	293	307	319	298	337	5	39	76	124	140	168	155	293.6
19-Nov	146	131	131	120	126	118	130	132	131	122	125	130	132	131	128	127	126	121	125	124	122	119	120	120	126.1
20-Nov	131	144	144	144	140	137	140	151	150	164	159	142	131	156	150	145	150	153	145	126	134	137	140	144	144.4
21-Nov	146	146	146	153	136	141	146	152	160	161	170	193	280	320	328	340	347	345	354	348	342	331	336	349	132.7
22-Nov	349	338	346	343	335	339	357	347	AF	79	101	74	136	130	159	178	173	172	168	164	169	166	164	163	161.3
23-Nov	167	168	164	163	166	162	160	162	155	152	154	154	156	158	165	165	160	167	166	171	216	215	225	208	166.8
24-Nov	186	178	170	168	167	168	168	164	156	169	178	167	142	152	152	155	155	151	152	156	154	147	141	145	157.2
25-Nov	143	144	149	149	150	153	154	157	150	152	142	140	142	160	162	225	282	286	302	298	295	297	290	282	167.0
26-Nov	279	283	272	276	278	283	262	255	266	258	288	295	299	310	325	181	144	163	171	176	161	165	148	104	263.4
27-Nov	139	110	58	54	53	91	126	60	55	10	33	48	57	74	89	79	70	290	280	289	292	294	278	274	54.5
28-Nov	309	328	320	311	298	299	302	292	296	300	295	301	297	301	303	291	283	297	301	301	310	314	323	336	302.5
29-Nov	329	328	329	323	304	307	304	308	307	300	304	299	285	294	261	269	221	180	185	192	193	191	181	190	272.5
30-Nov	185	186	176	173	171	172	179	164	175	177	175	171	166	167	170	176	176	174	176	184	189	184	180	181	175.7

239.1 238.3 223.5 214.0 219.4 218.2 222.3 222.9 225.4 233.1 242.1 234.2 235.4 244.6 236.4 227.1 214.2 219.3 228.7 239.5 243.4 241.4 237.8 230.2

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

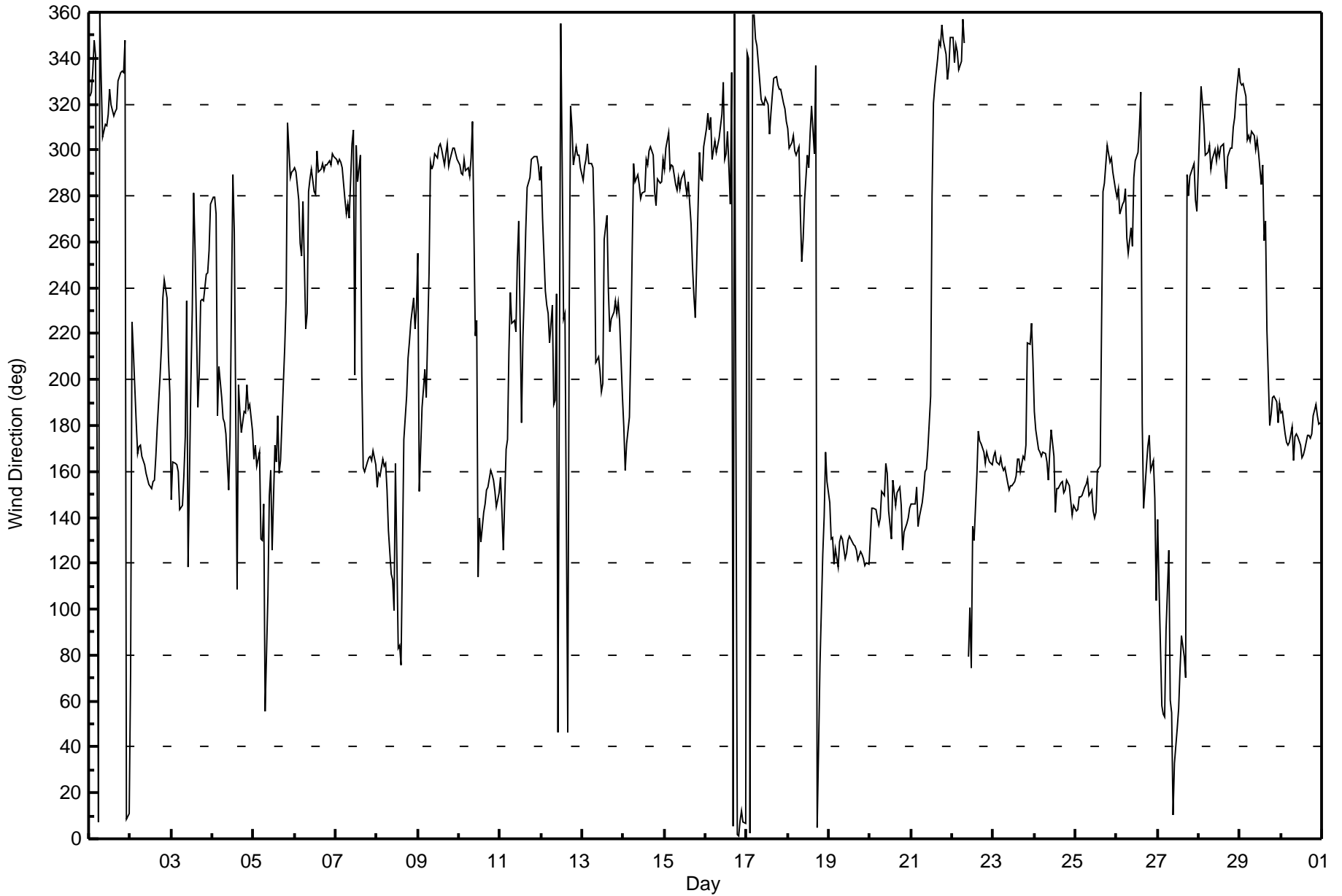
Wind Direction (WD) - deg
Anzac - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 93 deg on Nov 3 11:00	Hours of Data: 719
Minimum Value: 8 deg on Nov 15 19:00	Hours of Missing Data: 1
	Hours of Calibration: 0
	Percent Operational Time: 99.9
Percentiles: P ₁ = 11 P ₁₀ = 15 Q ₁ = 17 Median = 20 Q ₃ = 23 P ₉₀ = 32 P ₉₉ = 71	

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	18	23	23	16	20	16	16	21	23	23	24	23	18	19	22	22	19	19	17	16	17	17	15	30	30
2-Nov	45	37	18	20	11	13	17	17	15	18	18	16	18	17	16	18	19	22	19	14	16	16	20	18	45
3-Nov	18	15	15	13	17	16	18	18	34	83	93	38	20	28	31	24	30	16	16	15	20	20	21	23	93
4-Nov	24	24	27	55	20	17	12	16	18	19	22	35	31	61	83	20	17	13	16	15	18	22	20	20	83
5-Nov	13	15	16	16	52	43	74	26	29	32	26	45	32	54	32	19	16	13	15	12	72	34	21	18	74
6-Nov	19	20	22	22	23	33	90	19	17	18	19	24	26	21	25	21	19	18	18	20	18	22	23	19	90
7-Nov	22	23	23	21	23	25	23	25	25	20	25	75	59	30	25	73	14	13	14	15	13	13	15	15	75
8-Nov	19	17	17	14	16	17	20	18	31	22	21	35	66	24	18	28	19	15	17	20	16	21	14	12	66
9-Nov	32	59	18	16	14	16	35	31	25	23	23	24	21	21	21	22	23	19	21	21	20	20	20	20	59
10-Nov	21	18	19	21	19	19	17	16	32	28	63	33	17	20	20	18	17	17	17	20	21	18	17	19	63
11-Nov	19	20	26	19	21	90	41	20	16	15	42	69	22	21	18	29	25	27	25	24	22	22	20	21	90
12-Nov	19	20	13	13	13	20	31	54	12	70	44	63	33	31	17	45	55	32	26	17	18	16	16	18	70
13-Nov	18	21	20	19	19	21	18	46	11	15	18	24	28	32	24	30	11	11	13	13	15	16	25	27	46
14-Nov	27	13	25	23	25	19	19	23	25	26	24	24	23	23	22	21	21	22	24	23	22	25	23	23	27
15-Nov	23	25	24	22	23	23	22	24	21	22	22	23	23	23	26	24	18	19	8	25	14	15	14	14	26
16-Nov	13	13	12	14	14	15	14	14	14	15	15	21	24	29	33	21	11	12	14	16	18	17	17	17	33
17-Nov	16	17	17	15	15	17	15	16	18	18	22	21	20	22	23	19	15	15	17	17	16	16	16	19	23
18-Nov	19	19	18	21	20	22	23	25	16	19	31	23	27	33	38	26	18	17	24	70	36	40	20	36	70
19-Nov	20	20	17	19	25	19	19	17	19	19	18	20	19	17	16	16	19	18	17	18	20	19	17	18	25
20-Nov	19	19	21	18	15	14	14	19	19	18	18	19	20	18	17	18	19	18	18	20	20	21	20	19	21
21-Nov	19	20	21	19	20	20	19	17	17	18	27	24	41	19	18	16	18	15	16	15	14	16	14	17	41
22-Nov	16	16	17	13	14	25	22	23	AF	39	73	30	24	31	23	25	22	19	20	20	20	20	20	19	73
23-Nov	21	22	20	19	19	19	19	17	17	17	19	17	17	16	21	20	20	19	19	21	23	21	20	23	23
24-Nov	21	14	15	14	17	16	18	17	18	17	28	20	19	18	18	20	18	19	18	19	19	19	20	19	28
25-Nov	19	19	18	19	17	17	19	20	23	21	19	19	20	21	22	32	26	23	21	25	23	23	23	24	32
26-Nov	22	23	24	22	23	25	25	24	31	24	24	23	20	22	27	81	12	14	15	24	29	11	20	32	81
27-Nov	11	25	17	35	63	67	43	36	34	22	21	15	14	18	19	19	18	58	26	22	25	23	22	22	67
28-Nov	36	16	17	23	19	22	18	18	19	19	22	21	21	25	19	23	23	22	20	20	17	16	17	16	36
29-Nov	15	15	15	18	18	17	16	17	19	18	19	20	34	33	46	44	34	28	24	24	26	21	20	25	46
30-Nov	26	24	22	22	20	20	20	20	22	18	22	21	22	21	20	21	21	20	22	23	23	21	21	22	26

45	59	27	55	63	90	90	54	34	83	93	75	66	61	83	81	55	58	26	70	72	40	25	36	
Diurnal Maximum																								

AF - Analyzer Failure



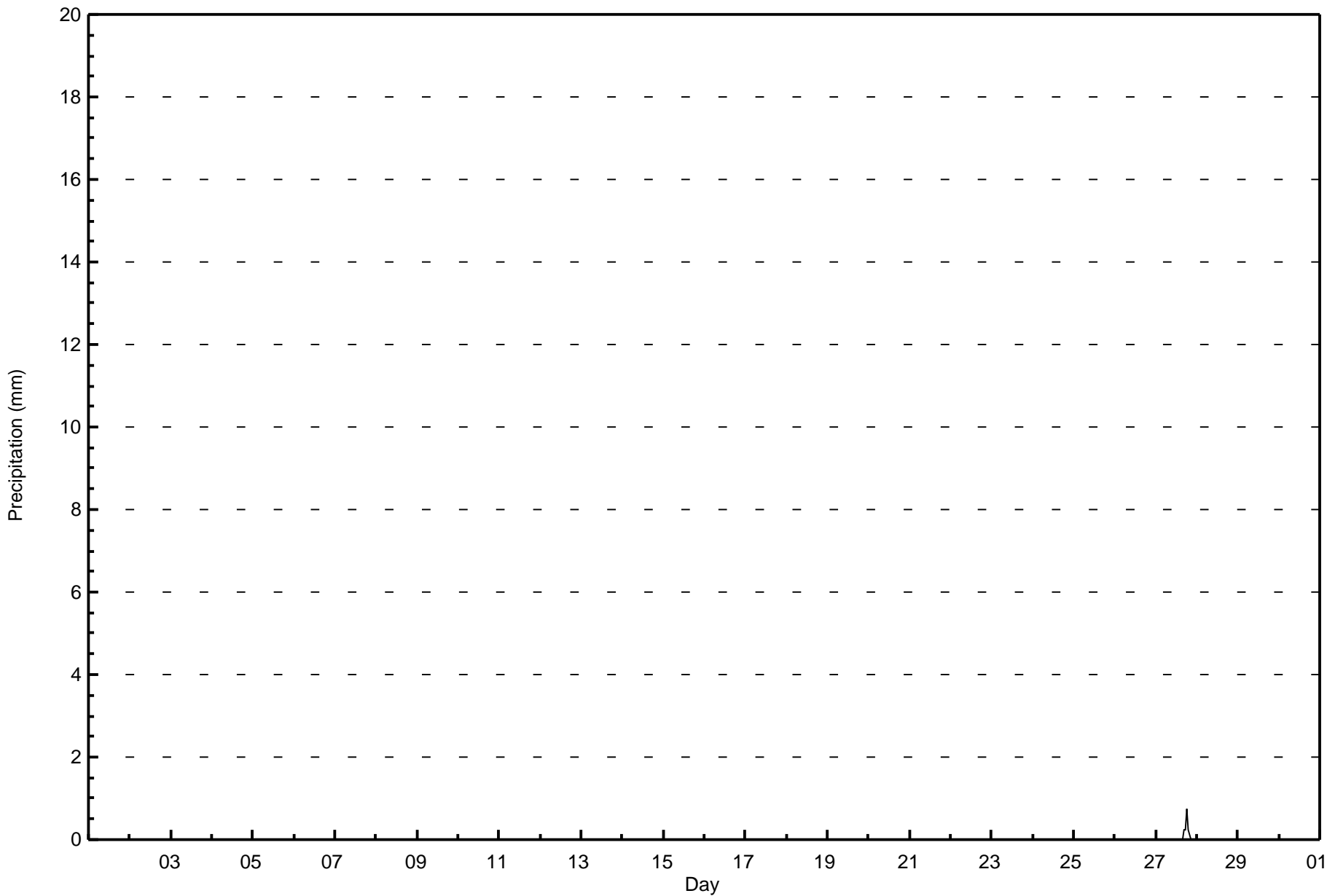


Maximum Value: 0.8 mm on Nov 27 19:00																			Maximum Daily Total: 1.5 mm on Nov 27							Hours in Service: 720																							
Minimum Value: 0.0 mm on Nov 1 01:00																			Minimum Daily Total: 0.0 mm on Nov 1							Hours of Data: 720																							
Maximum Diurnal Total: 0.8 mm at hour 19																			Minimum Diurnal Total: 0.0 mm at hour 1							Hours of Missing Data: 0																							
Monthly Total: 1.52 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: 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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	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	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	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	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	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	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	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	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	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	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	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	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	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	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	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	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	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	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	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	0.0	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-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	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	0.3	0.3	0.8	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	1.5	0.8														
28-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-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	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
30-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	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
																								0.0	0.0	0.0	0.0	0.0	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	0.8	0.3	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	0.0	0.0	0.0	0.3	0.3	0.8	0.3	0.0	0.0	0.0	0.0	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Anzac - November 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 14, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	11:16	End Time (MST)	13:50
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-638	-638
Analyzer IP address	192.168.1.43		Lamp voltage	791	791
Calculated slope	0.992563	0.992637	Chamber temp	45.2	45.2
Calculated intercept	0.636061	-1.139494	Pressure	692.9	695.7
Analyzer Background	14.5	14.5	Flow	0.428	0.429
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	-0.4	----
as found span	5000	79.8	799.6	805.3	0.993
calibrator zero	5000	0.0	0.0	-0.4	----
high point	5000	79.8	799.6	805.3	0.993
second point	5000	39.9	399.8	406.4	0.984
third point	5000	19.9	199.4	202.4	0.985
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	74.9	750.5	763.1	0.984
Average Correction Factor					0.987

Corrected As found 805.7 Previous response 805.0 % change -0.1%

Notes:

Sample inlet filter replaced after as founds. No adjustments.

Calibration Performed By:

Asad Hidayat



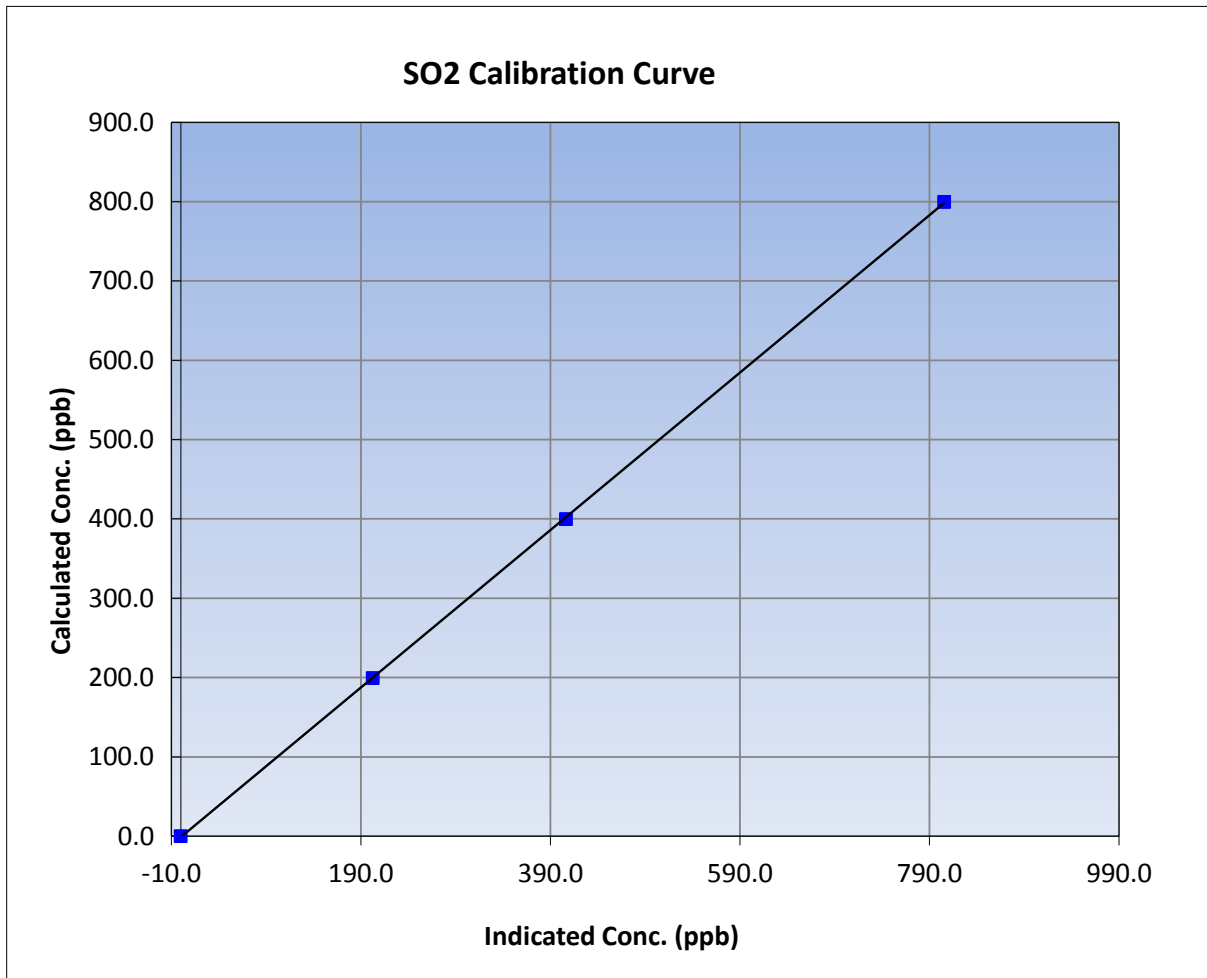
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:16	End Time (MST)	13:50
Analyzer make	Thermo 43i	Analyzer serial #	1152430005

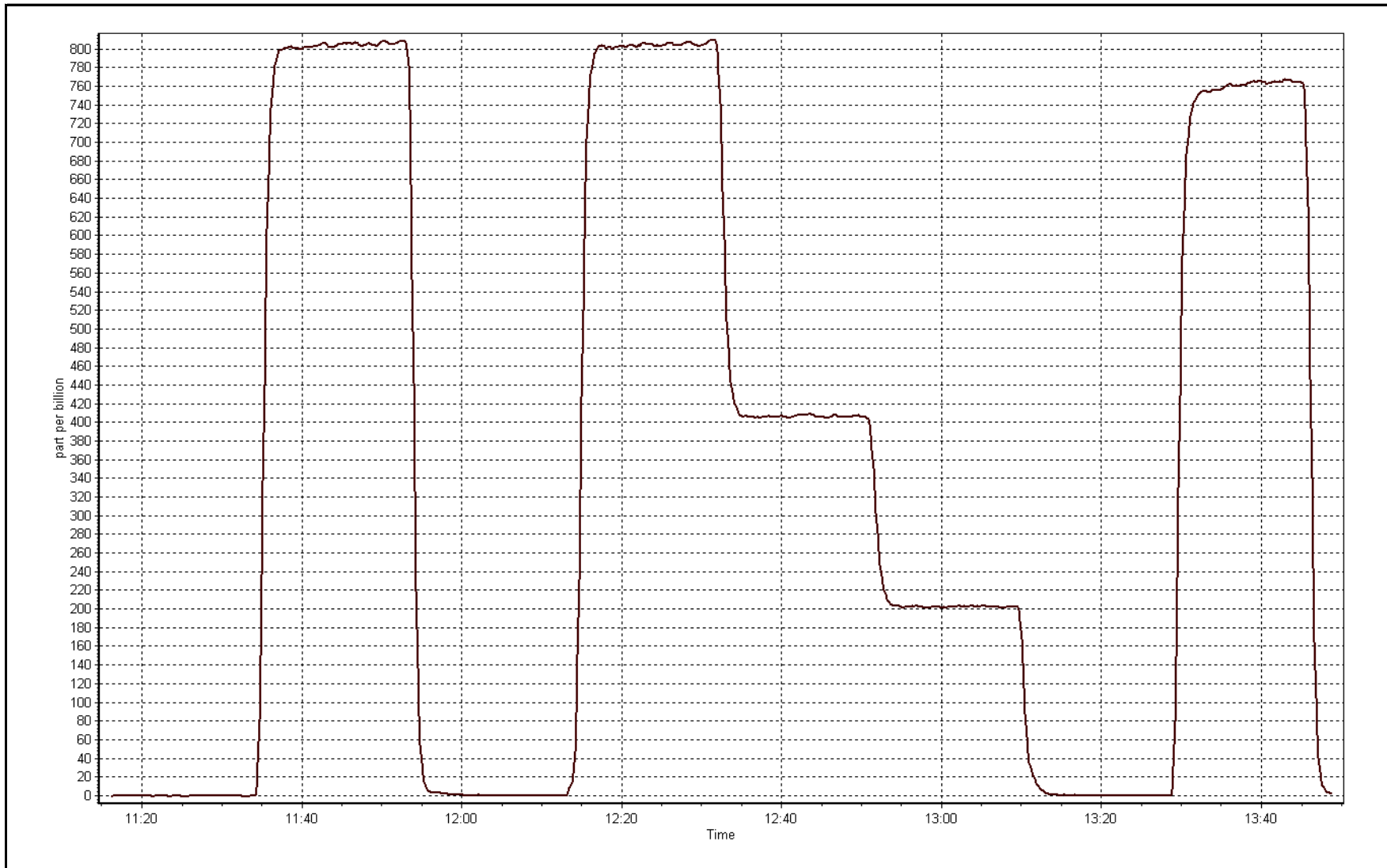
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999971
799.6	805.3	0.9929		
399.8	406.4	0.9839	Slope	0.992637
199.4	202.4	0.9851		
			Intercept	-1.139494



SO2 Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 13, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	11:20
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	-732	-731
Analyzer IP address	192.168.1.42		Lamp voltage	994	992
Calculated slope	0.998466	1.010248	Chamber temp	45	45
Calculated intercept	-0.133667	-0.260850	Pressure	679.5	672.5
Analyzer Background	1.7	1.71	Flow	0.419	0.414
Analyzer Coefficient	1.197	1.197	Intensity	98	96
			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	74.3	1.010
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	74.3	1.010
second point	5000	39.6	40.0	40.2	0.994
third point	5000	19.8	20.0	20.1	0.994
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	74.3	75.0	74.7	1.005
Average Correction Factor					0.999

Corrected As found	74.3	Previous response	75.3	% change	1.4%
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Notes:

Sample inlet filter replaced after as founds. No adjustments. Used SO2 gas cylinder to do scrubber test after 3rd point.

Calibration Performed By:

Asad Hidayat



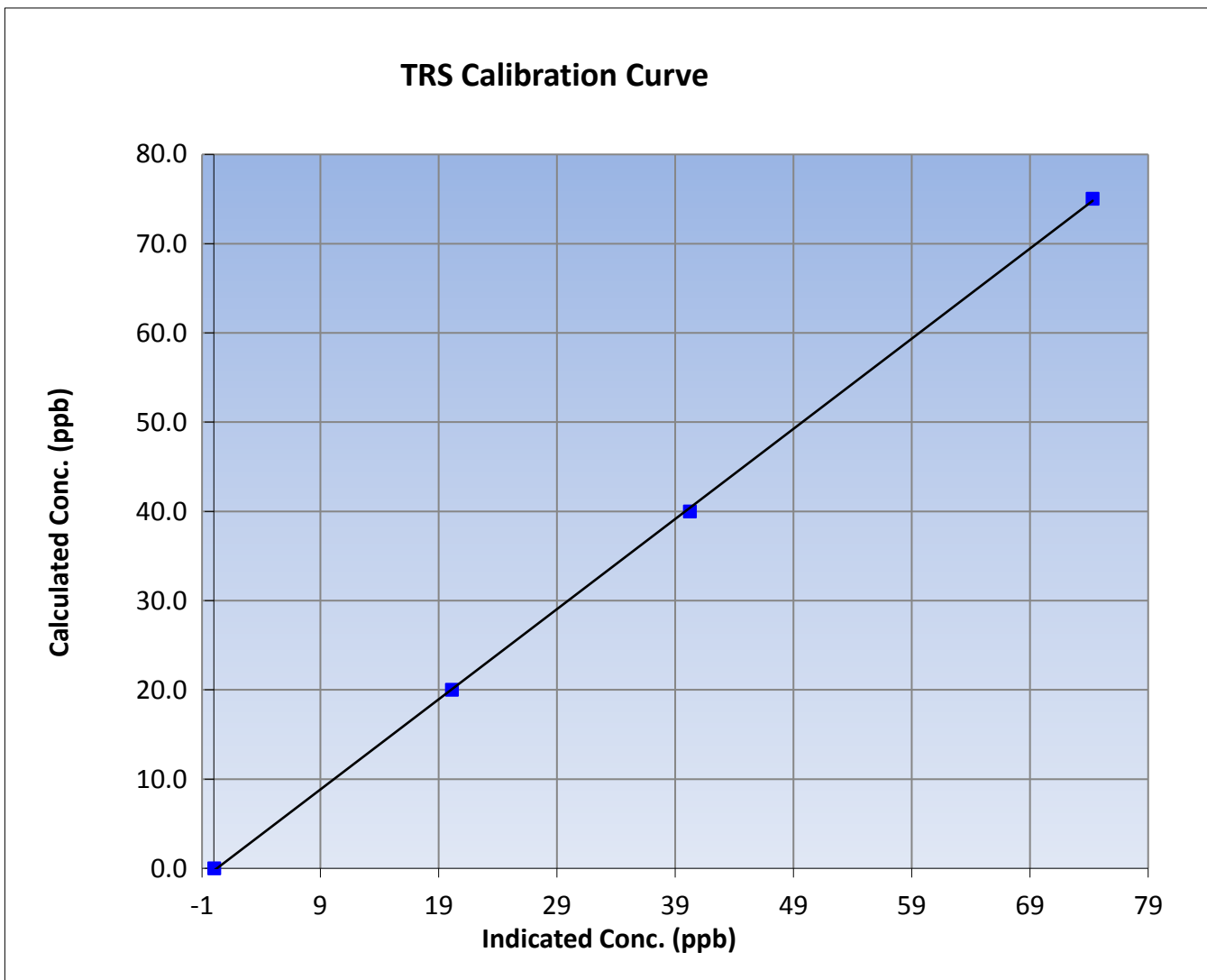
Wood Buffalo Environmental Association TRS Calibration Report

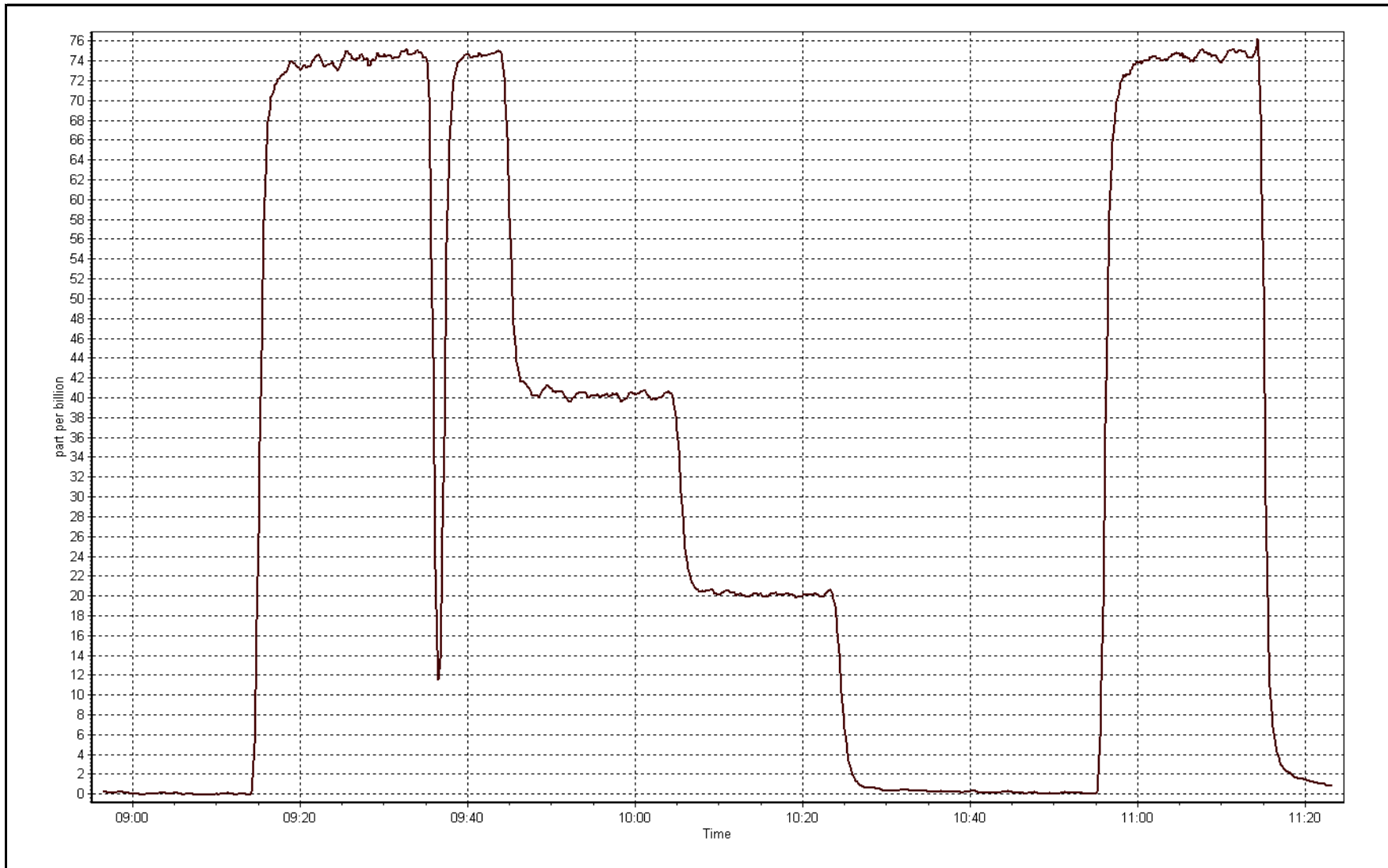
Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 13, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	8:55	End Time (MST)	11:20
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	0.999913
75.0	74.3	1.0099		
40.0	40.2	0.9939	Slope	1.010248
20.0	20.1	0.9939		
			Intercept	-0.260850







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 3, 2016	Last Calibration	October 22, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	8:41	End Time (MST)	13:05
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	75.0	75.1
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	0.998337	1.000009	Carrier Pressure	34.3	34.4
THC Calc intercept	0.013632	0.011671	Fuel Pressure	47.8	47.8
NMHC Calc slope	0.998804	0.999198	Air Pressure	36.6	36.6
NMHC Calc intercept	-0.002307	-0.006308			

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	16.32	1.003
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	16.36	16.35	1.001
second point	5000	37.4	8.17	8.17	1.000
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	16.37	1.000
Average Correction Factor					1.003

Corrected As found 16.32 Previous response 16.38 % change 0.3%

Notes:

Sample inlet filter replaced after as founds. Attached a ZAG sensor to ZAG unit and replaced Nitrogen cylinder after as founds.
Adjusted span.

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	8.70	0.999
second point	5000	37.4	4.34	4.36	0.995
third point	5000	18.7	2.17	2.18	0.995
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	8.69	8.70	0.999
Average Correction Factor					0.997

Corrected As found 8.70 Previous response 8.70 % 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	7.62	1.007
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	7.67	7.65	1.003
second point	5000	37.4	3.83	3.81	1.005
third point	5000	18.7	1.91	1.87	1.024
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					1.011

Corrected As found 7.62 Previous response 7.67 % change 0.7%



Wood Buffalo Environmental Association

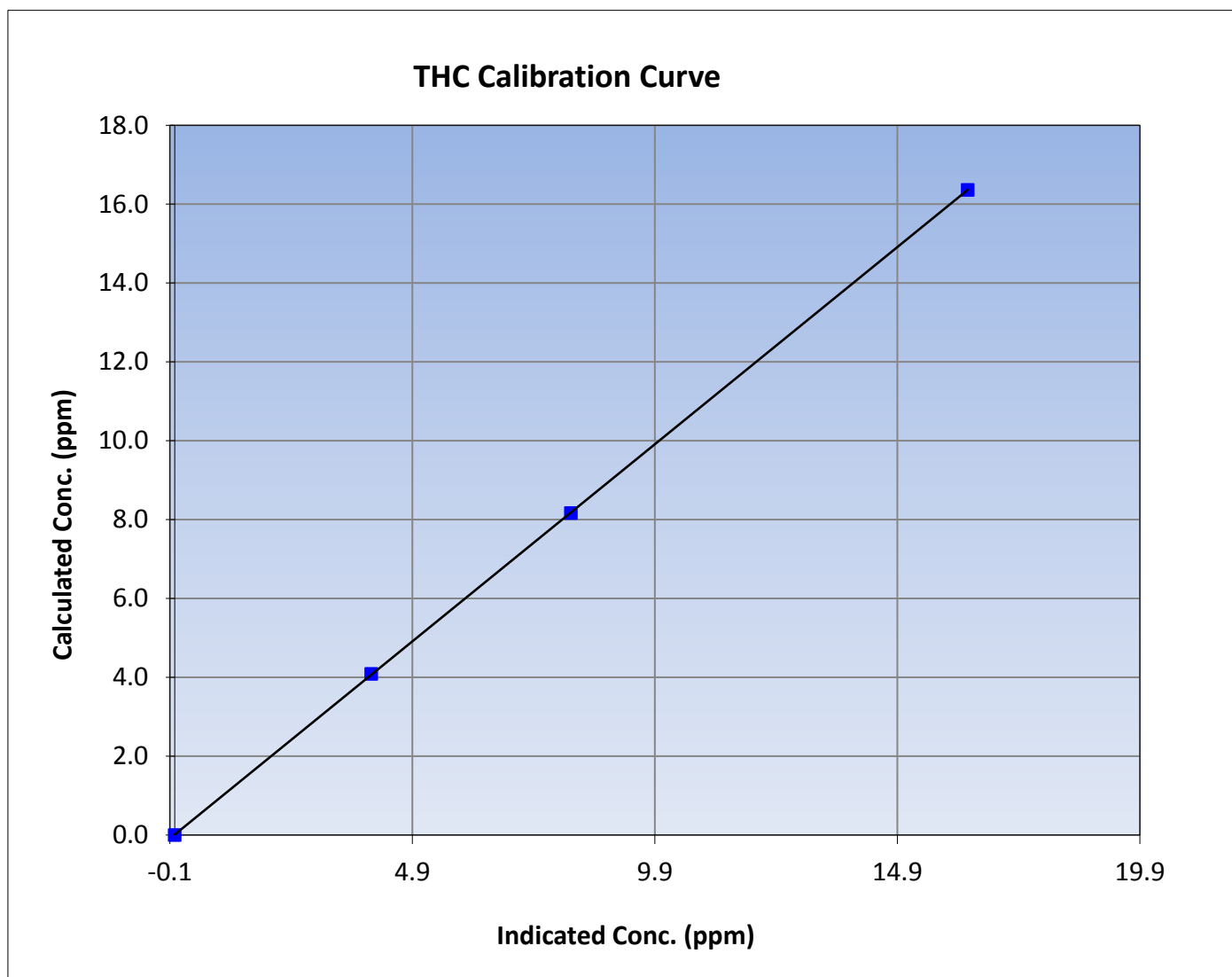
THC Calibration Summary

Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 22, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	8:41	End Time (MST)	13:05
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	0.999994
16.36	16.35	1.0007		
8.17	8.17	1.0000	Slope	1.000009
4.09	4.05	1.0086		
			Intercept	0.011671





Wood Buffalo Environmental Association

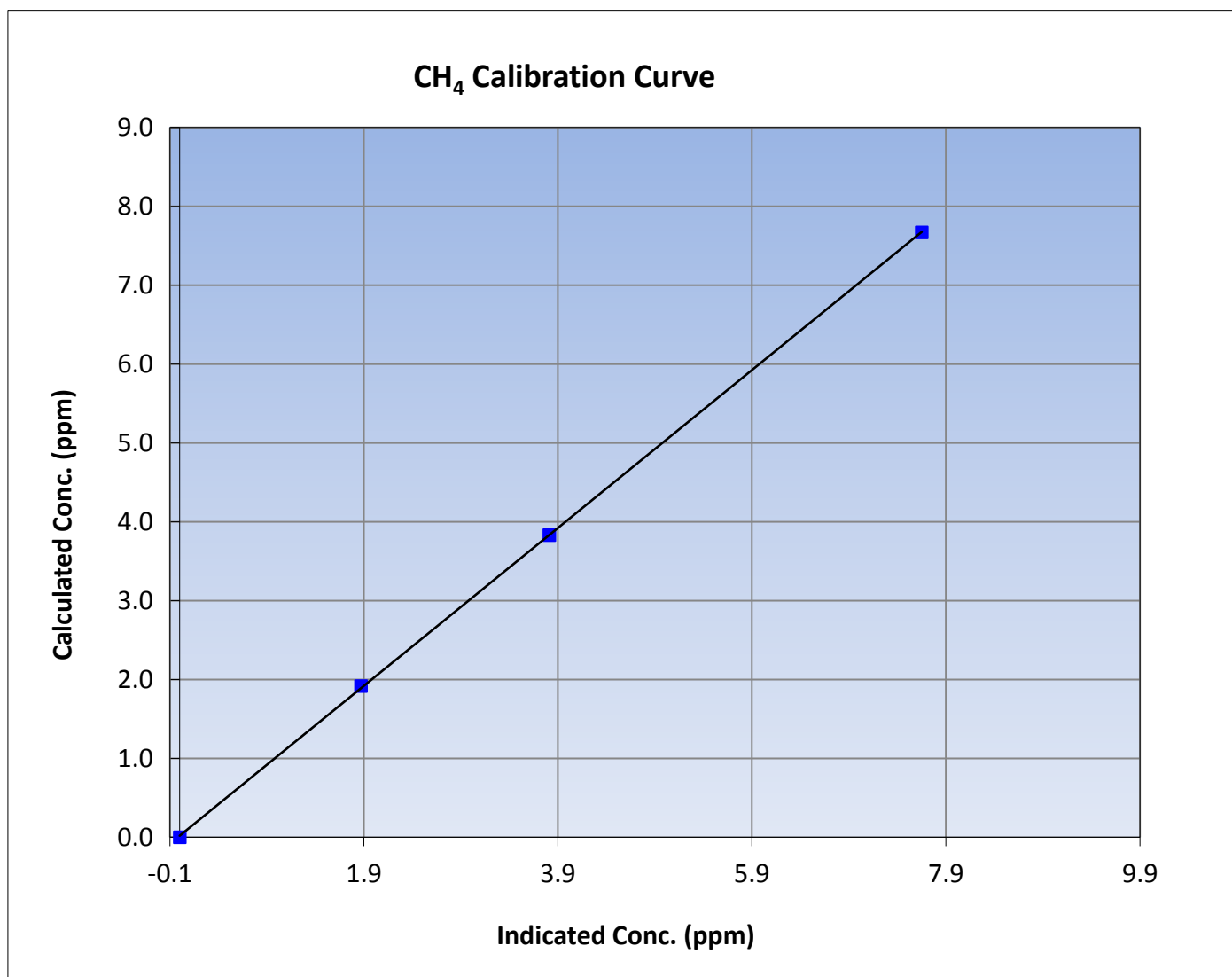
CH₄ Calibration Summary

Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 22, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	8:41	End Time (MST)	13:05
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	0.999969
7.67	7.65	1.0026		
3.83	3.81	1.0052	Slope	1.000907
1.91	1.87	1.0240		
			Intercept	0.018079





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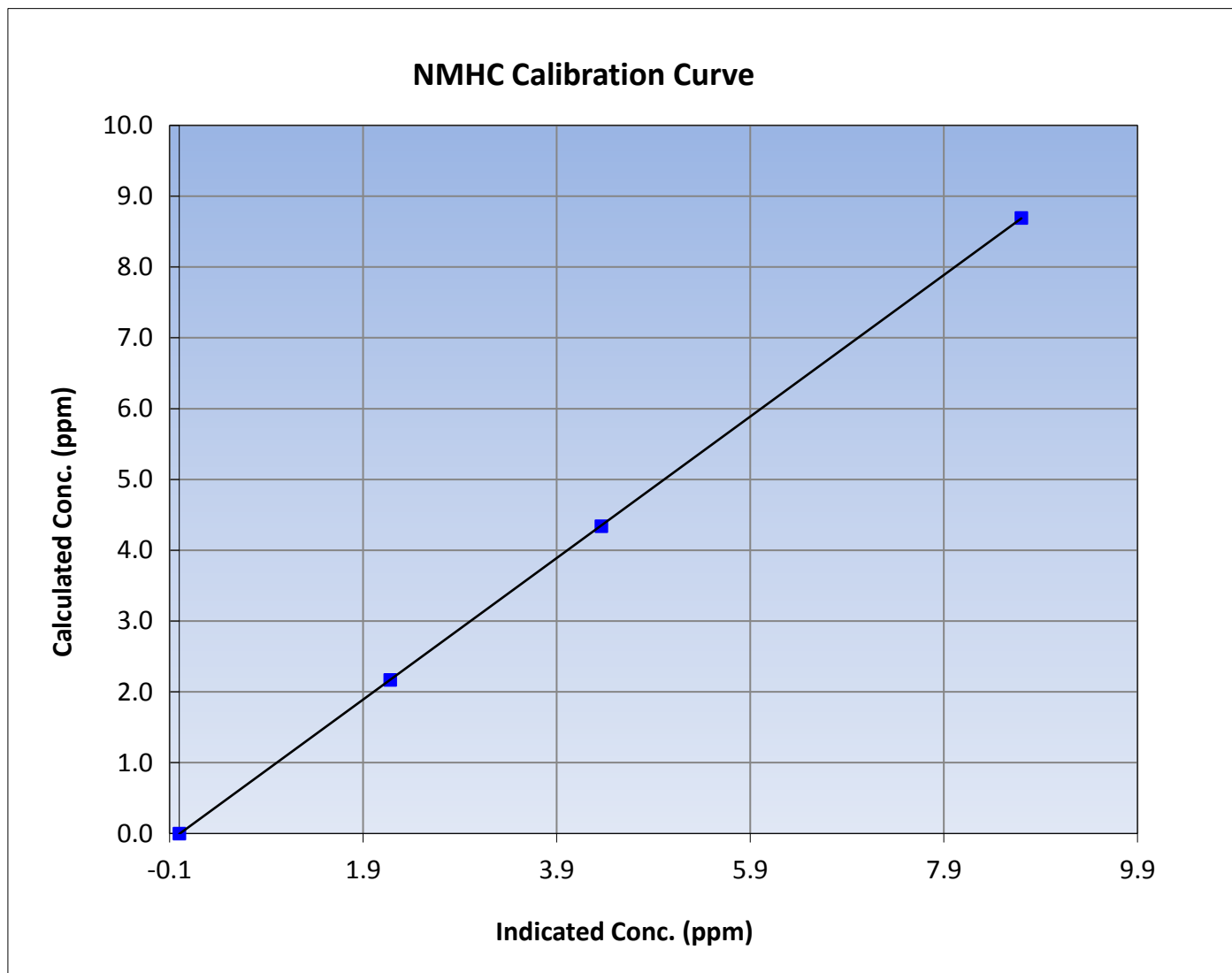
NMHC Calibration Summary

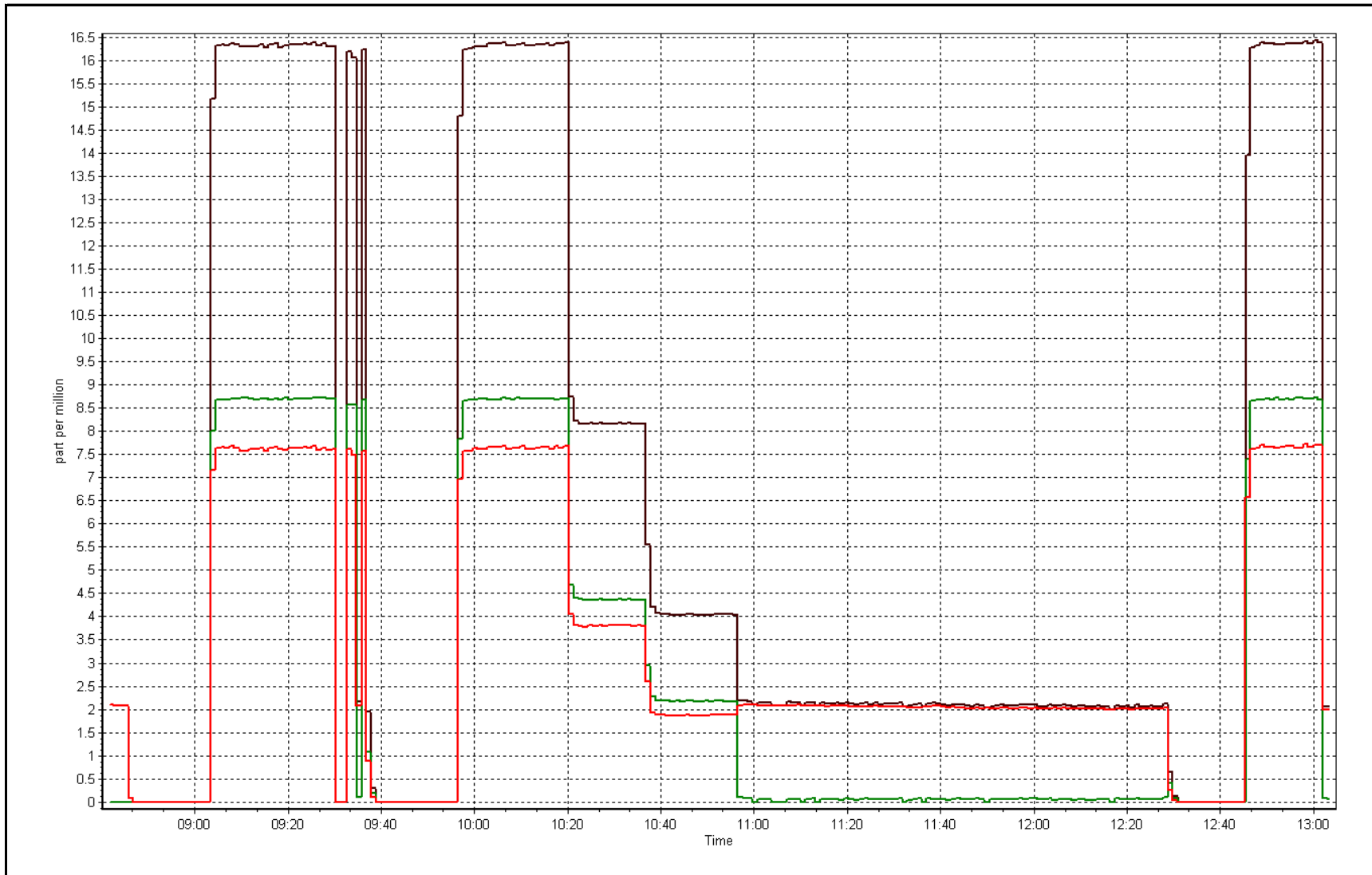
Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 22, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	8:41	End Time (MST)	13:05
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	0.999996
8.69	8.70	0.9991		
4.34	4.36	0.9955	Slope	0.999198
2.17	2.18	0.9955		
			Intercept	-0.006308







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 21, 2016	Last Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Other:	Repair	
Start Time (MST)	10:35	End Time (MST)	13:25
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	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.000009	1.003158	Carrier Pressure	34.4	36.3
THC Calc intercept	0.011671	0.021783	Fuel Pressure	47.8	47.8
NMHC Calc slope	0.999198	1.001165	Air Pressure	36.6	36.6
NMHC Calc intercept	-0.006308	-0.006292			

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	16.30	1.004
second point	5000	37.4	8.17	8.11	1.007
third point	5000	18.7	4.09	4.03	1.014
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	16.36	16.37	1.000
Average Correction Factor					1.008

Corrected As found 16.38 Previous response 16.35 % change -0.2%

Notes:

Instrument had issues with sudden CH4 baseline drops for past few days. Changed retention time from 12.4 secs to 12.0 secs by increasing carrier pressure from 34.5 PSI to 36.5 PSI. Span was adjusted after making these changes.

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	8.71	0.998
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	8.69	8.68	1.001
second point	5000	37.4	4.34	4.36	0.995
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	8.70	0.999
Average Correction Factor					0.999

Corrected As found 8.71 Previous response 8.71 % 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	7.62	1.007
second point	5000	37.4	3.83	3.76	1.019
third point	5000	18.7	1.91	1.86	1.030
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					1.018

Corrected As found 7.68 Previous response 7.64 % change -0.5%



Wood Buffalo Environmental Association

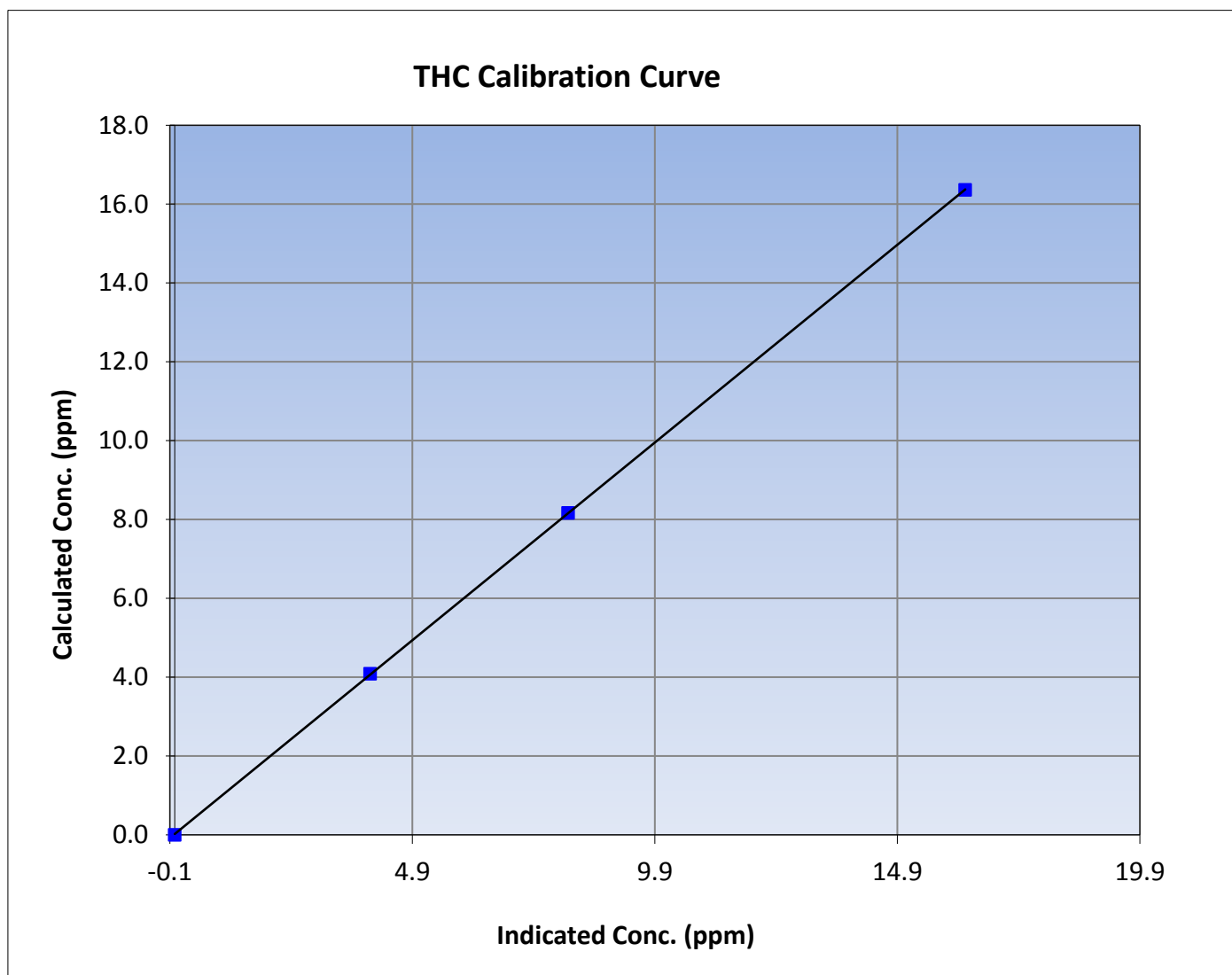
THC Calibration Summary

Station Information

Calibration Date	November 21, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:35	End Time (MST)	13:25
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	0.999992
16.36	16.30	1.0038		
8.17	8.11	1.0074	Slope	1.003158
4.09	4.03	1.0137		
			Intercept	0.021783





Wood Buffalo Environmental Association

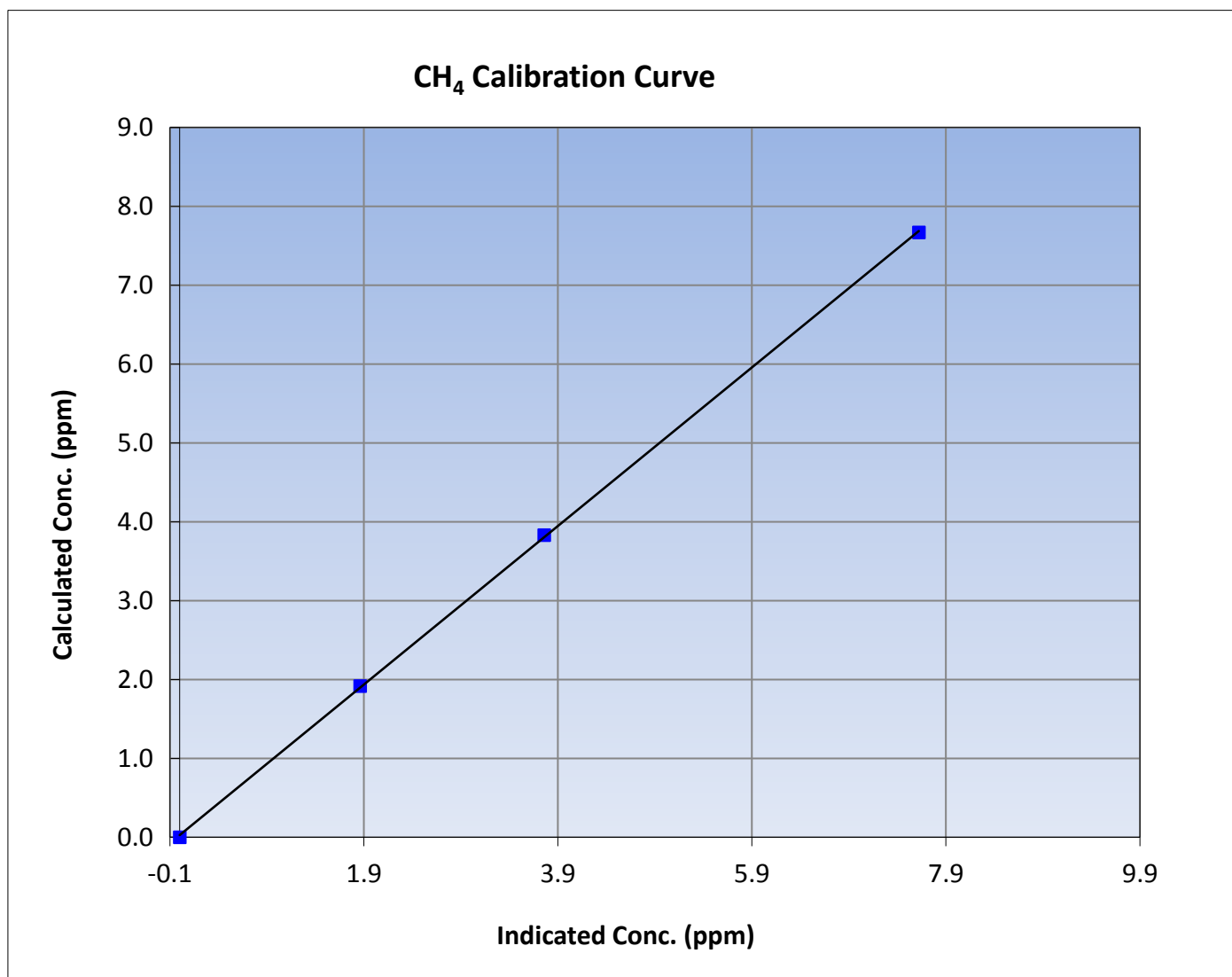
CH₄ Calibration Summary

Station Information

Calibration Date	November 21, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:35	End Time (MST)	13:25
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	0.999942
7.67	7.62	1.0065		
3.83	3.76	1.0186	Slope	1.005223
1.91	1.86	1.0295		
			Intercept	0.026312





Wood Buffalo Environmental Association

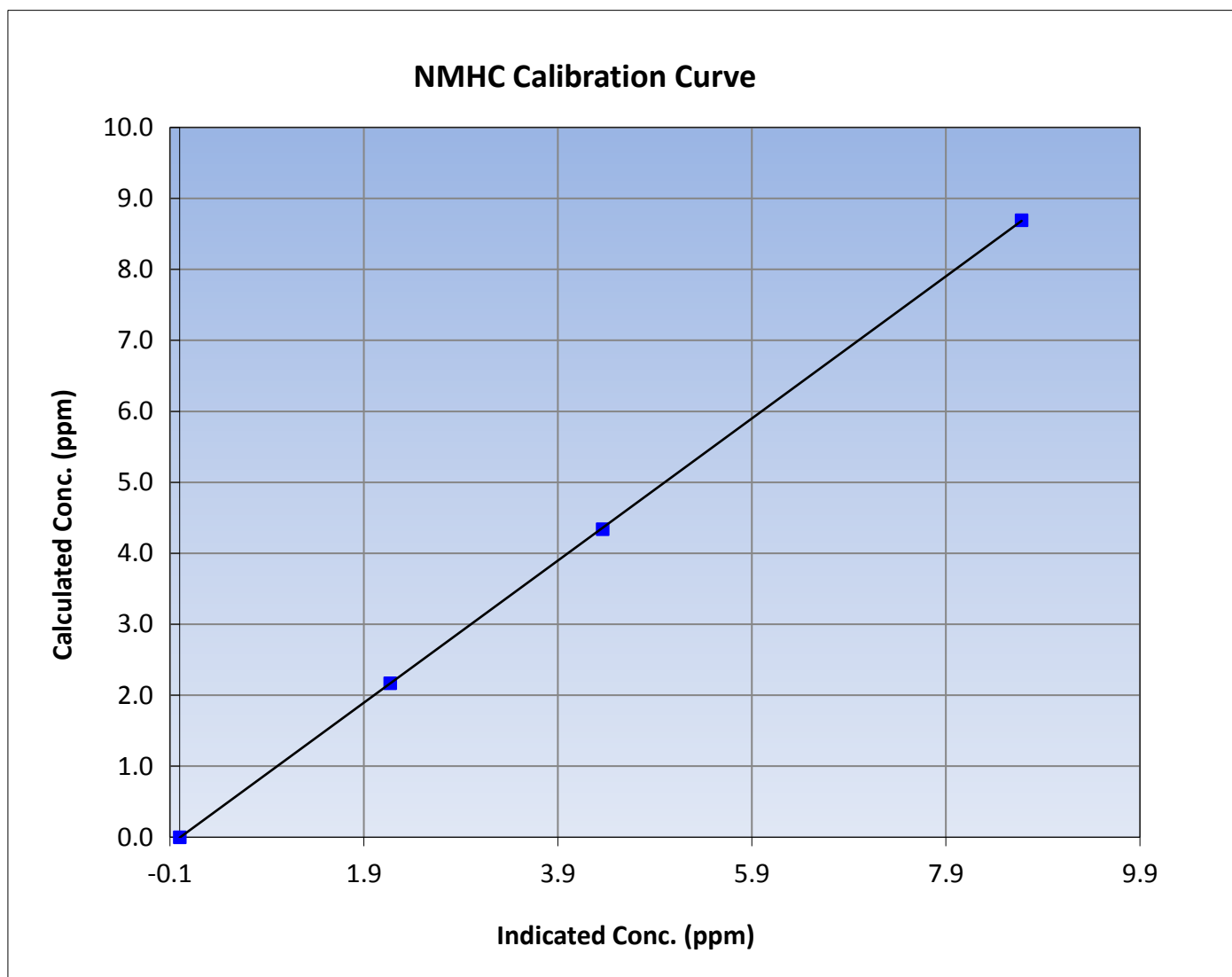
NMHC Calibration Summary

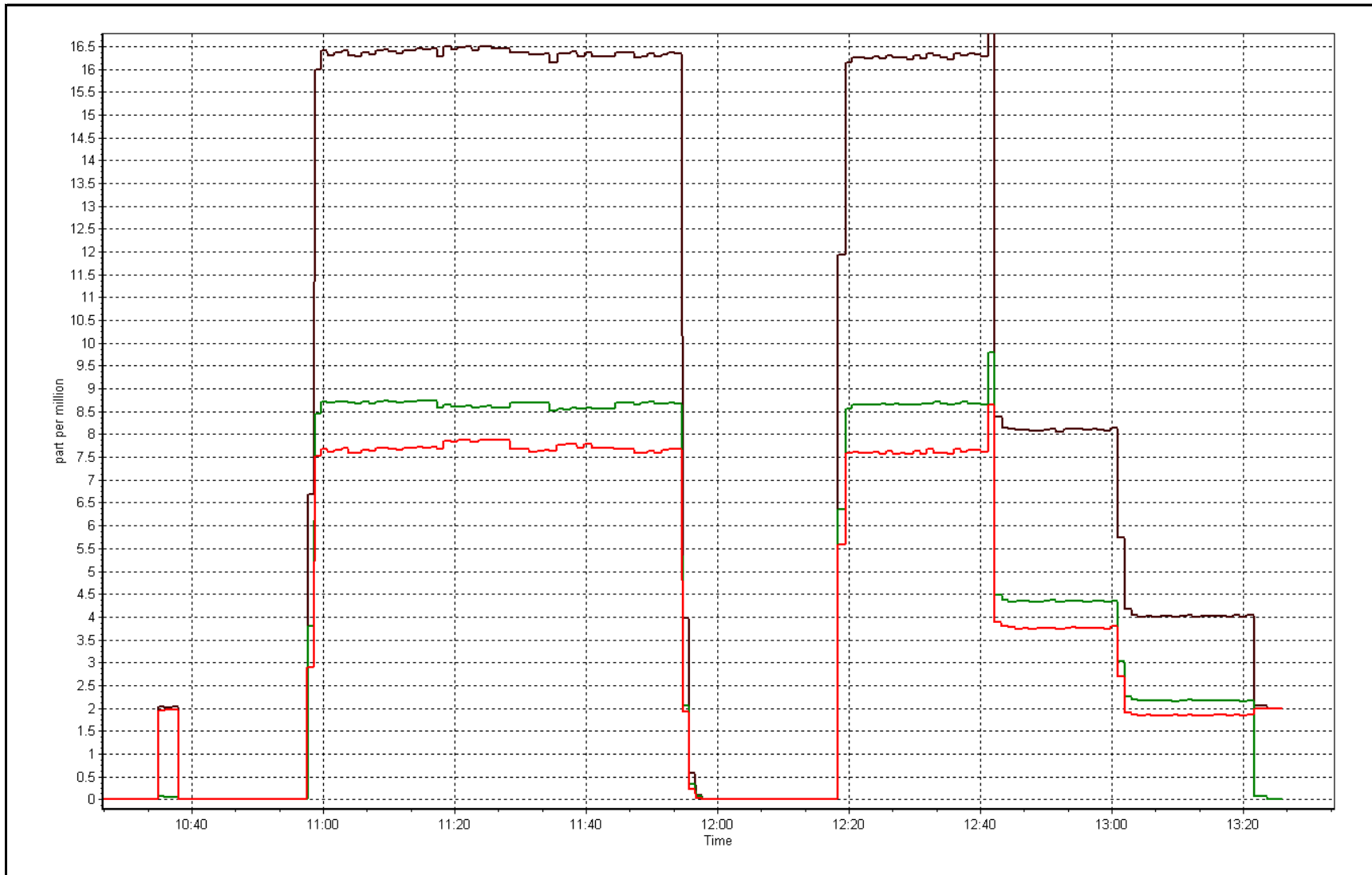
Station Information

Calibration Date	November 21, 2016	Previous Calibration	November 3, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:35	End Time (MST)	13:25
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	0.999989
8.69	8.68	1.0014		
4.34	4.36	0.9955	Slope	1.001165
2.17	2.17	1.0001		
			Intercept	-0.006292







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 20, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	13:00	End Time (MST)	15:55
NO2 GPT Ref date	November 3, 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.	27.1	27.2
Analyzer IP address	192.168.1.48		Lamp temp.	53.8	53.8
Calculated slope	0.999774	1.001346	Pressure	657.7	661.3
Calculated intercept	-1.211979	-0.700397	Flow cell A	0.708	0.711
Analyzer Background	2.4	-1.7	Flow cell B	0.719	0.720
Analyzer Coefficient	0.992	0.987	Cell A Intensity	96877	96533
			Cell B Intensity	108803	108696

Analyzer make	Thermo 49i	Analyzer serial #	1426262595
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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	1.19	460.4	461.4	0.998
calibrator zero	5000	0.00	0.0	0.5	----
high point	5000	1.19	460.4	460.3	1.000
second point	5000	0.85	313.4	313.9	0.998
third point	5000	0.51	161.6	162.2	0.996
as left zero	5000	0.00	0.0	1.9	----
as left span	5000	1.19	460.4	464.2	0.992
Average Correction Factor					0.998

Corrected As found	460.7	Previous response	461.7	% change	0.2%
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Notes:

Sample inlet filter replaced after as founds. Adjusted zero and span.

Calibration Performed By: Asad Hidayat



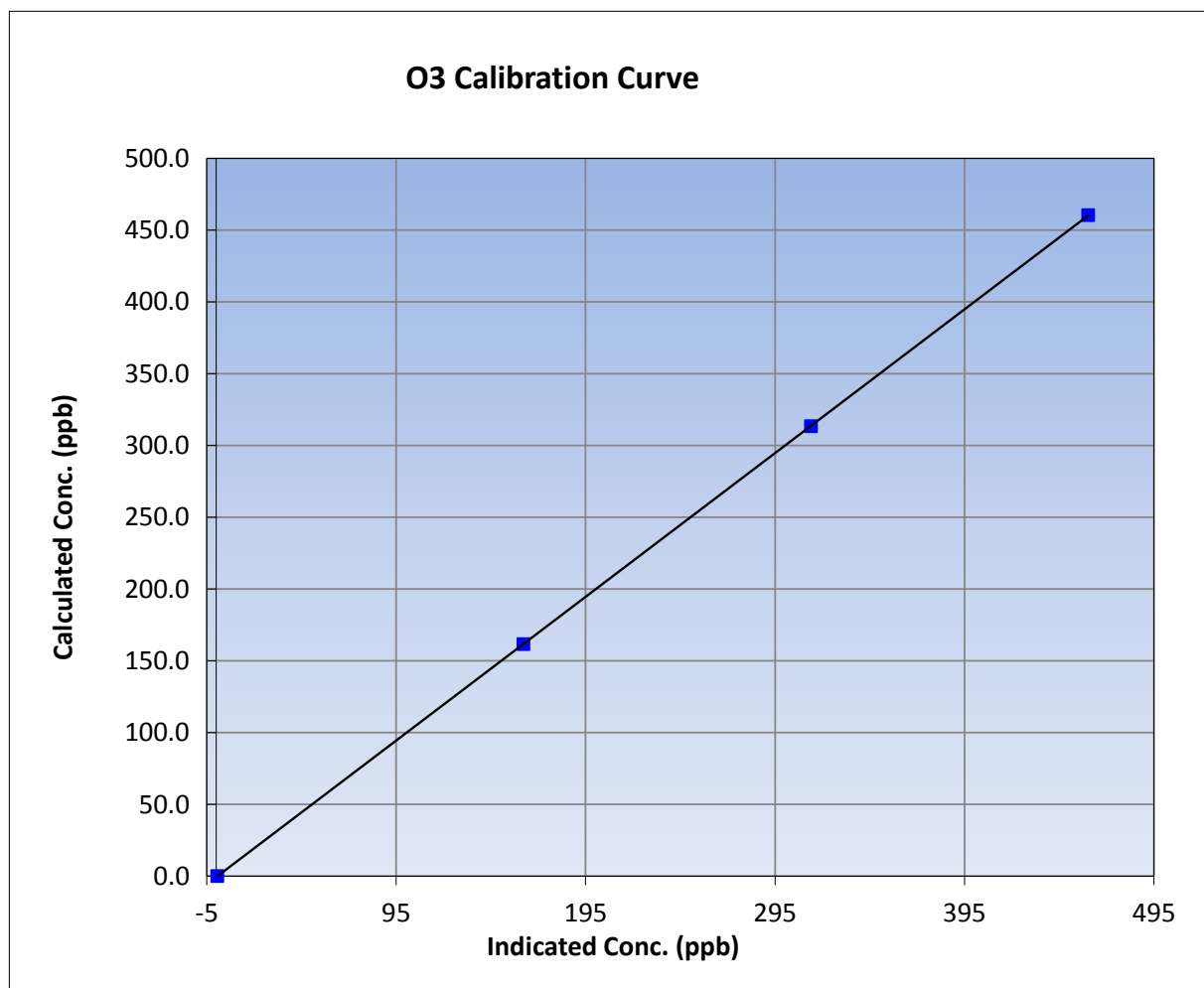
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 20, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	13:00	End Time (MST)	15:55
Analyzer make	Thermo 49i	Analyzer serial #	1426262595

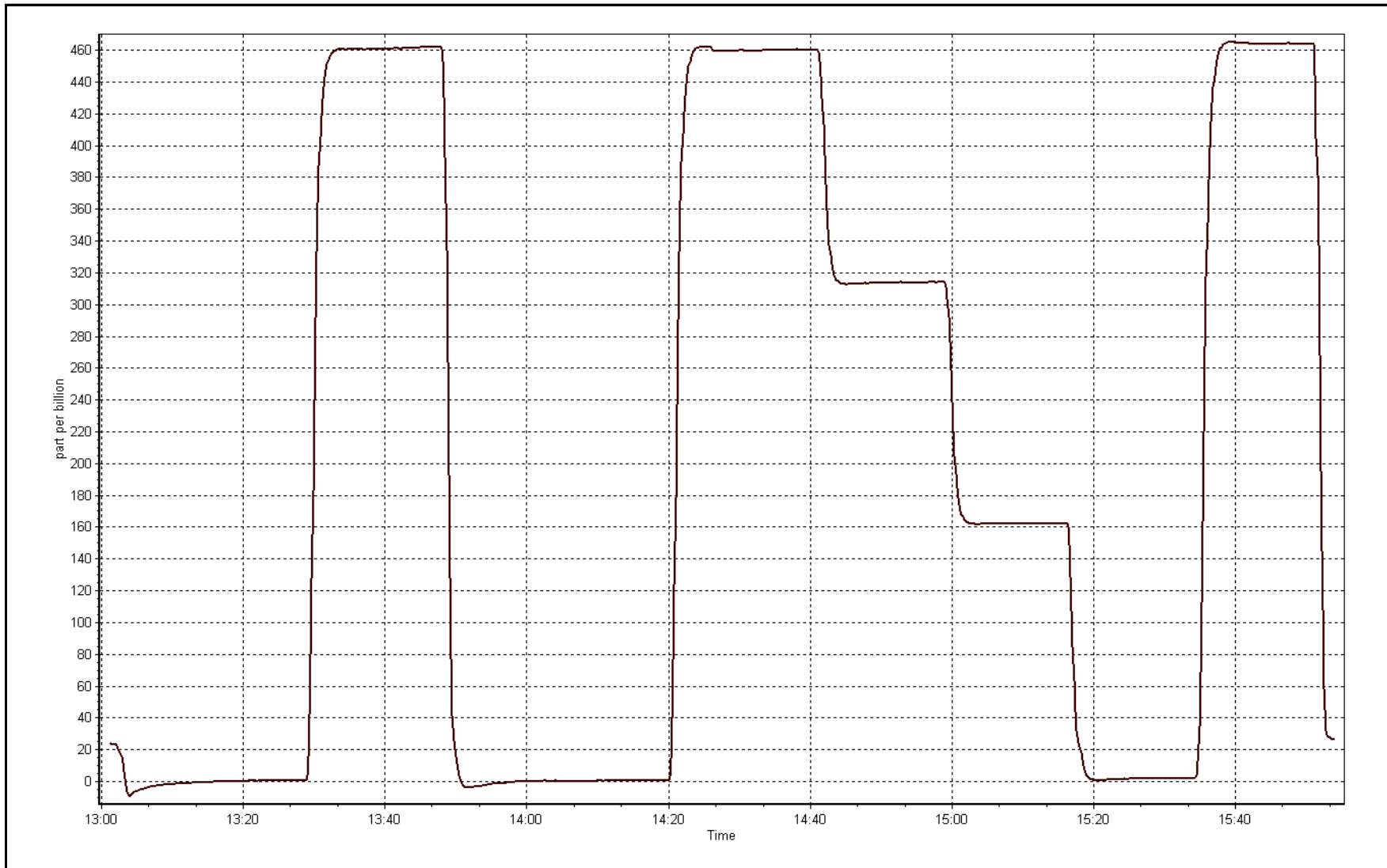
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999999
460.4	460.3	1.0003		
313.4	313.9	0.9982	Slope	1.001346
161.6	162.2	0.9962		
			Intercept	-0.700397



O3 Calibration Plot

Date: November 3, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 20, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	8:41	End Time (MST)	13:05
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	0.997927	0.998772	1.001092
	Data Offset	1.386312	1.215729	-0.129380
Current Calibration	Data Slope	0.995715	0.998270	0.996126
	Data Offset	1.335596	1.164231	-0.409015

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	1.064		1.068	
NOX coefficient	0.999		1.002	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.1		4.1	
NOX bkgrnd	4.4		4.4	
Chamber Temp	49.9	Deg C	49.9	Deg C
Moly Temp	324.5	Deg C	325.5	Deg C
PMT voltage	-808.1	V	-808.1	V
PMT Temp	-3	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	166.7	mmHg	173.1	mmHg
R Cell Press Nox	166.7	mmHg	172.5	mmHg
NO sample flow	0.741	lpm	0.781	lpm
Nox sample Flow	0.743	lpm	0.781	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

November 3, 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	-0.4	-0.1	----	----
as found span	5000	74.9	799.9	799.9	0.0	796.3	795.8	0.5	1.0046	1.0053
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
high point	5000	74.9	799.9	799.9	0.0	801.8	799.9	1.9	0.9976	1.0000
second point	5000	37.5	400.5	400.5	0.0	402.3	401.5	0.8	0.9955	0.9975
third point	5000	18.8	200.8	200.8	0.0	198.2	197.9	0.3	1.0130	1.0146
as left zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.2	----	----
as left span	5000	74.9	799.9	338.1	461.8	813.9	339.5	474.5	0.9828	0.9960
									1.0020	1.0040

Corrcted As found
Previous Response

NO_x= 796.8
NO_x= 800.2

NO= 796.1
NO= 799.7

Percent Change

NO_x= 0.4%

NO= 0.5%

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	800.3	798.5	-0.1	0.9996	1.0018	----	----
1st NO2 (300)	338.1	460.4	800.4	338.1	462.3	0.9994	----	0.9959	100.4%
2nd NO2 (200)	485.2	313.4	800.2	485.2	315.0	0.9997	----	0.9947	100.5%
3rd NO2 (100)	636.9	161.6	800.4	636.9	163.5	0.9995	----	0.9887	101.1%
2nd NO ref point		0.0	800.1	798.2	1.9	0.9998	1.0022	----	----
Average Correction Factor						0.9996		0.9931	100.7%

Calibration Performed By:

Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

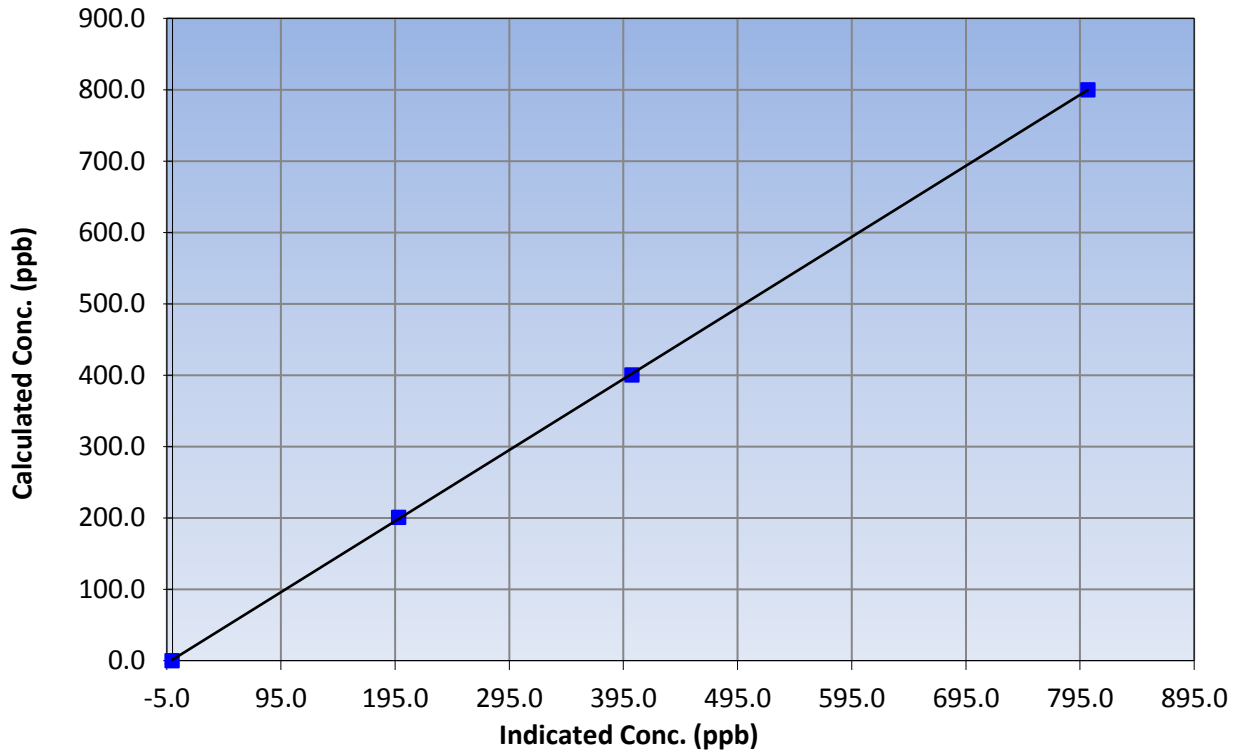
Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 20, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	8:41	End Time (MST)	13:05
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	-0.5	----	Correlation Coefficient	0.999979
799.9	801.8	0.9976		
400.5	402.3	0.9955	Slope	0.995715
200.8	198.2	1.0130		
			Intercept	1.335596

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

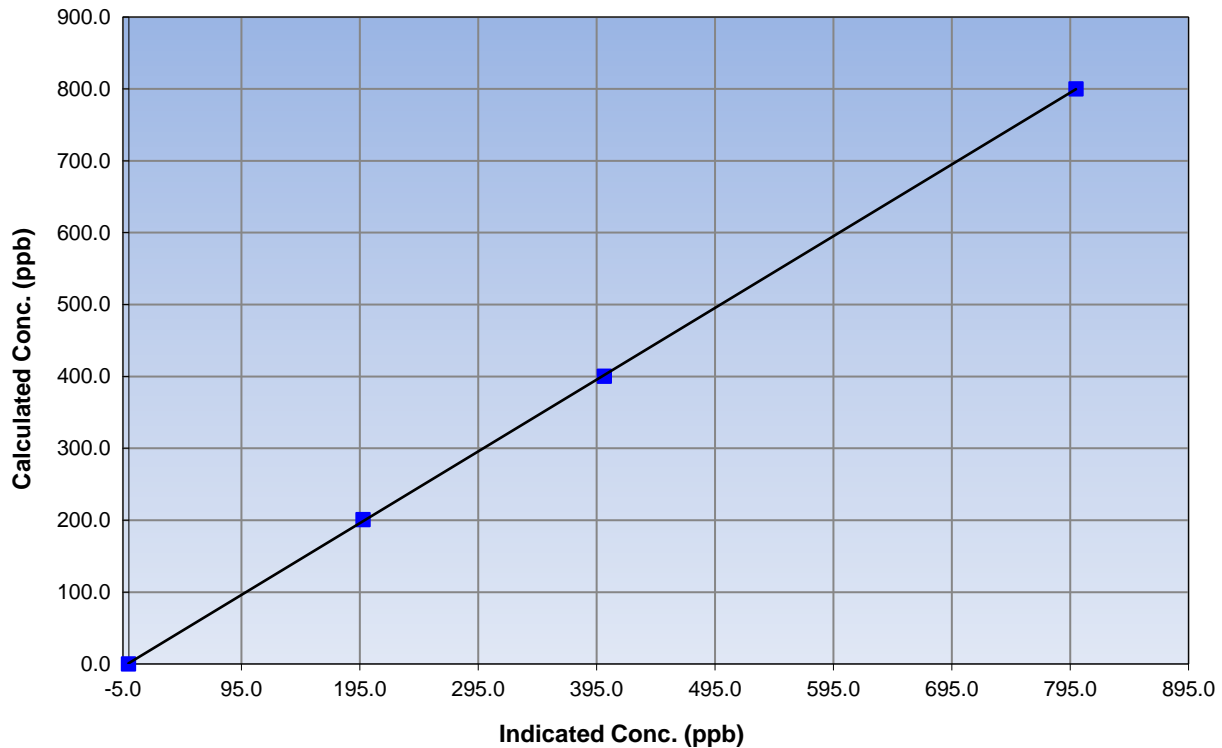
Station Information

Calibration Date	November 3, 2016	Previous Calibration	October 20, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	8:41	End Time (MST)	13:05
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	-0.4	N/A	Correlation Coefficient	0.999980
799.9	799.9	1.0000		
400.5	401.5	0.9975	Slope	0.998270
200.8	197.9	1.0146		
			Intercept	1.164231

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

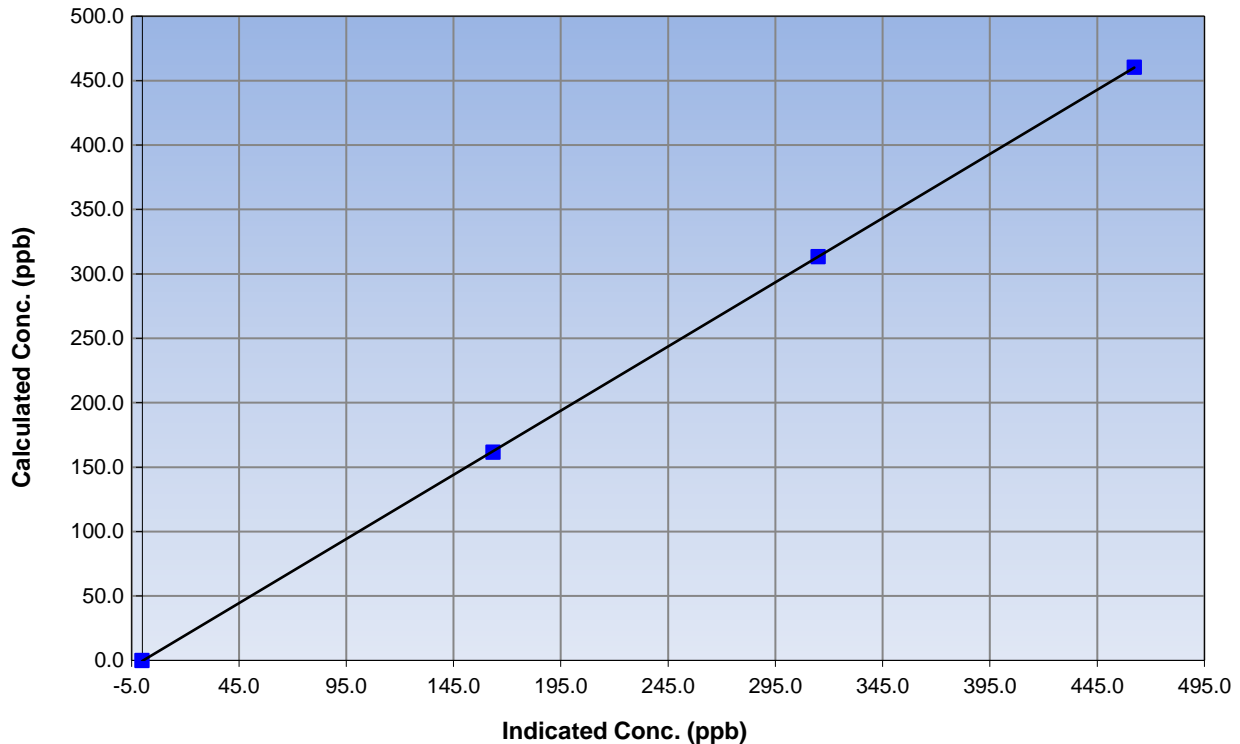
Station Information

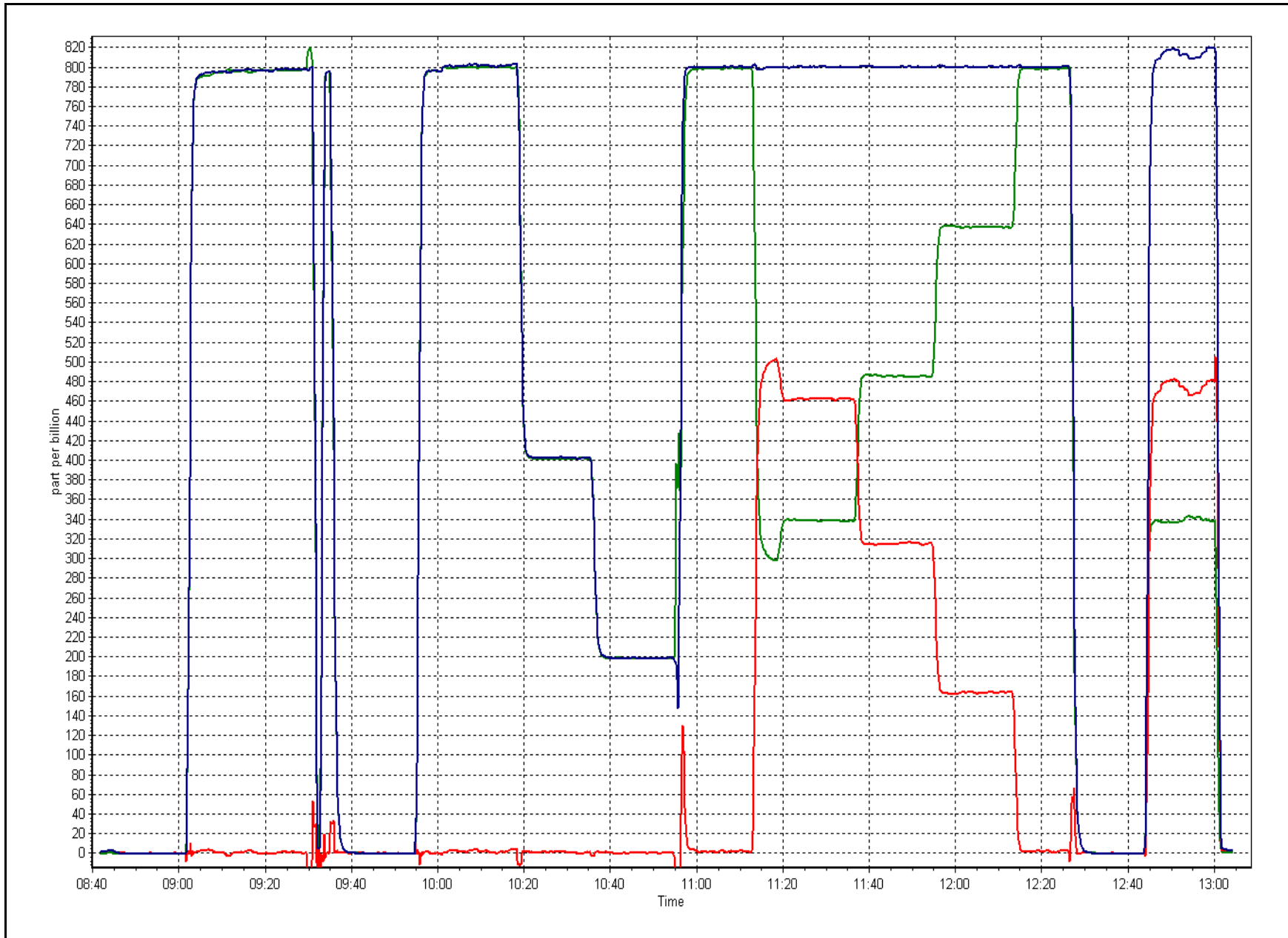
Calibration Date	November 3, 2016	Previous Calibration	October 20, 2016
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	8:41	End Time (MST)	13:05
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999991
460.4	462.3	0.9959		
313.4	315.0	0.9947	Slope	0.996126
161.6	163.5	0.9887		
			Intercept	-0.409015

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Anzac	Station number:	AMS 14
Calibration Date:	November 3, 2016	Last Cal Date:	October 20, 2016
Start time (MST):	9:01	End time (MST):	9:55
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)	3	2.9	3	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	949	948.5	949	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1002	1004	1002	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0	-----	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

				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)	19			<input type="checkbox"/>	+/- 2 °C
T3 (°C)	21			<input type="checkbox"/>	+/- 2 °C
T4 (°C)	20			<input type="checkbox"/>	+/- 2 °C
RH (%)	26			<input type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned. No adjustment made.

Calibration by: Asad Hidayat



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 15
CNRL HORIZON
NOVEMBER 2016**

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
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	678	35	42	99.03	51	0	3	0
TRS (ppb) Average	684	36	36	100.00	1	0	0	0
THC (ppm) Average	684	35	36	99.86	5.5	-	2.5	-
NO2 (ppb) Average	684	35	36	99.86	26	0	10	-
NO (ppb) Average	684	35	36	99.86	123	-	14	-
NOX (ppb) Average	684	35	36	99.86	147	-	19	-
PM2.5 (ug/m3) Average	702	2	18	97.78	29.5	-	10.7	0
Temperature 2 m (C) Average	720	0	0	100.00	11.7	-	5.2	-
Wind Speed 10 m (km/h) Average	700	0	20	97.22	22	-	12	-
Wind Direction 10 m (deg) Average	700	0	20	97.22	-	-	-	-
Precipitation (mm) Total	320	0	400	44.44	0.8	-	1	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	96	-
Global Solar Radiation (W/m2) Average	720	0	0	100.00	271	-	52	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
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	678	0.6	3	-	0	0	0	0	0	1	51
TRS (ppb) Average	684	0.2	0	-	0	0	0	0	0	0	1
THC (ppm) Average	684	2.22	0.3	-	2	2.1	2.1	2.1	2.2	2.4	5.5
NO2 (ppb) Average	684	4.4	5	-	0	0	1	2	6	12	26
NO (ppb) Average	684	2.1	10	-	0	0	0	0	1	2	123
NOX (ppb) Average	684	6.5	13	-	0	0	1	2	7	15	147
PM2.5 (ug/m3) Average	702	4.54	3.8	-	0	0.8	1.6	3.4	6.7	9.3	29.5
Temperature 2 m (C) Average	720	-2.13	5.2	-	-13.4	-9.2	-6	-2.3	1.7	4.9	11.7
Wind Speed 10 m (km/h) Average	700	8.6	4	-	0	3	6	8	11	14	22
Wind Direction 10 m (deg) Average	700	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	320	-	-	1.27	-	-	-	-	-	-	-
Relative Humidity (%) Average	720	82.1	11	-	42	65	75	84	91	95	98
Global Solar Radiation (W/m2) Average	720	22.3	48	-	0	0	0	0	17	86	271

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	07 Nov 2016 15:00	07 Nov 2016 15:00	1	Maintenance - cleaned glass manifold
SO2	26 Nov 2016 17:00	26 Nov 2016 22:00	6	Unstable operation - lamp voltage fluctuation
PM2.5	09 Nov 2016 20:00	10 Nov 2016 05:00	10	Unstable operation - excessive baseline drift
PM2.5	11 Nov 2016 15:00	11 Nov 2016 16:00	2	Unstable operation - excessive baseline drift
PM2.5	14 Nov 2016 22:00	14 Nov 2016 23:00	2	Unstable operation - excessive baseline drift
PM2.5	18 Nov 2016 11:00	18 Nov 2016 12:00	2	Maintenance - Flow and zero check
Wind Speed, Wind Direction	07 Nov 2016 19:00	07 Nov 2016 19:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	16 Nov 2016 02:00	16 Nov 2016 02:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	16 Nov 2016 08:00	16 Nov 2016 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	16 Nov 2016 10:00	16 Nov 2016 10:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	18 Nov 2016 18:00	18 Nov 2016 19:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	20 Nov 2016 16:00	20 Nov 2016 17:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	21 Nov 2016 05:00	21 Nov 2016 08:00	4	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	22 Nov 2016 05:00	22 Nov 2016 09:00	5	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	25 Nov 2016 13:00	25 Nov 2016 14:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Nov 2016 17:00	28 Nov 2016 17:00	1	Flat line in sensor output signal -sensor frozen
Precipitation Collector	14 Nov 2016 09:00	01 Dec 2016 00:00	400	Analyzer Failure - blocked with snow/ice



Number of Exceedences (AAAO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 51 ppb on Nov 29 15:00	Maximum Daily Average: 3.5 ppb on Nov 29		Hours of Data:	678
Minimum Value: 0 ppb on Nov 1 03:00	Minimum Daily Average: 0.0 ppb on Nov 3		Hours of Missing Data:	42
Maximum Diurnal Average: 2.5 ppb at hour 15	Minimum Diurnal Average: 0.1 ppb at hour 5		Hours of Calibration:	35
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 = 10		Percent Operational Time:	99.0

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	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-Nov	0	Z	0	0	0	0	0	0	0	0	0	18	16	0	2	0	0	0	0	0	0	0	0	0	0	1.7	18
3-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
4-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	3	1	1	0	0	0	0	0	0	0	0.3	3
5-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
6-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
7-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	1	1	1	0.2	1
8-Nov	1	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	1
9-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
10-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	4	8	4	2	1	1	1	1	1	1	1	1.0	8
11-Nov	6	12	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	12
12-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
13-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
14-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
15-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
16-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0.3	3
17-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
18-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
19-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
20-Nov	1	Z	0	0	0	0	0	0	0	0	1	4	7	6	7	10	9	7	5	3	2	2	1	1	1	2.9	10
21-Nov	1	1	Z	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
22-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	1	1	1	1	1	1	0.6	2
23-Nov	1	1	1	2	Z	2	2	3	4	7	6	9	3	3	2	2	4	2	3	2	0	0	0	0	0	2.6	9
24-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	0.2	0
25-Nov	Z	0	0	0	0	0	0	0	0	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UO	UO	UO	UO	UO	UO	0	0	--	0	
27-Nov	0	0	Z	0	0	1	0	0	2	2	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0.7	3
28-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
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	9	51	16	1	0	0	0	0	0	0	0	0	3.5	51
30-Nov	0	0	0	0	0	Z	0	0	0	1	2	0	1	11	0	0	5	0	0	0	0	0	0	0	0	1.0	11

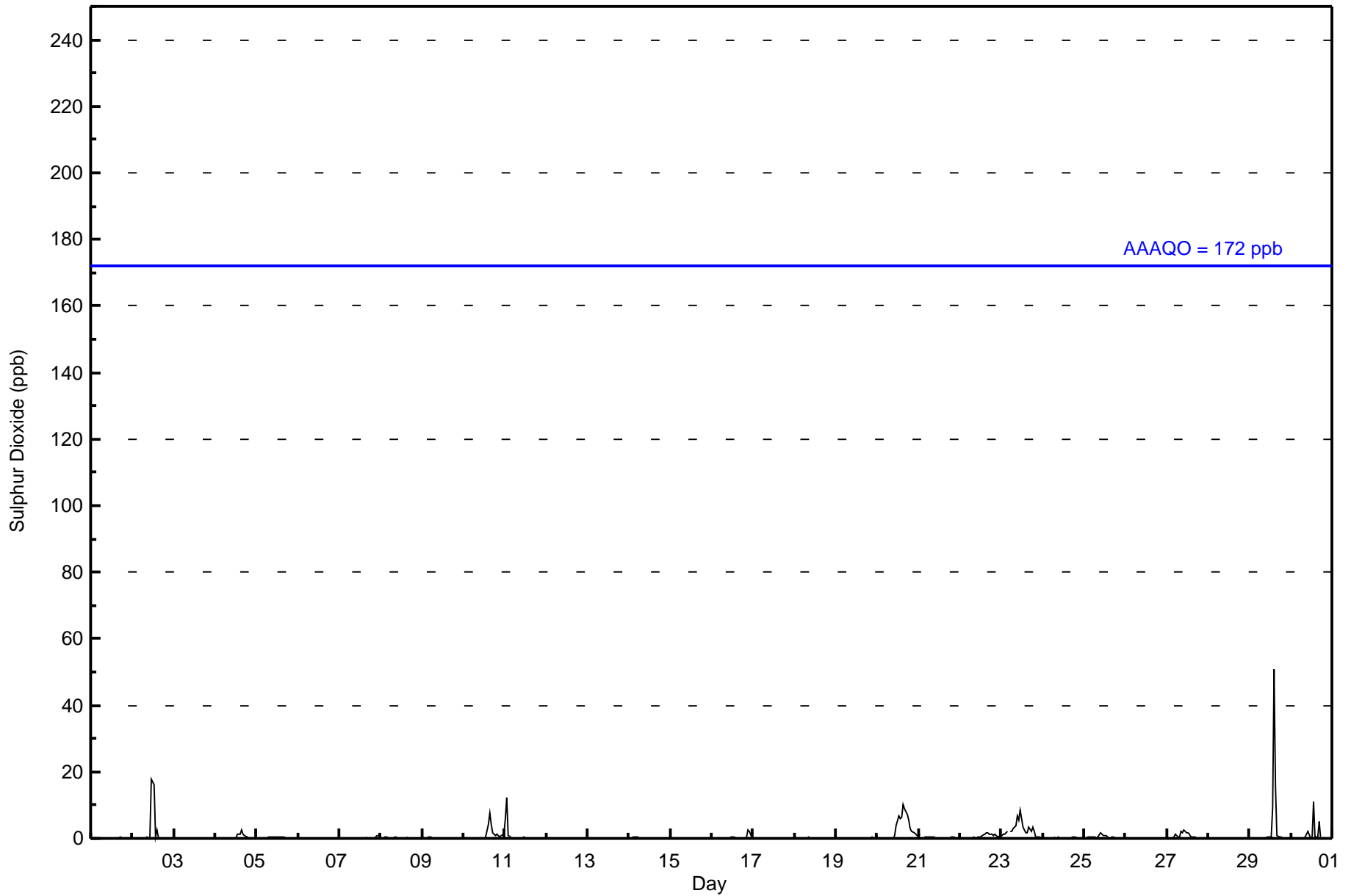
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6	12	1	2	1	2	2	3	4	7	6	18	16	11	51	16	9	7	5	3	2	3	2	1	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	672	99.12	99.12
11 - 20	5	0.74	99.85
21 - 60	1	0.15	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - 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	4	57	37	10	5	3	11	32	89	155	126	48	19	20	22	14	652
11 - 20	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	5
21 - 60	0	0	0	0	0	0	0	0	0	0	1	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	4	57	37	10	5	3	11	32	91	157	128	48	19	20	22	14	658

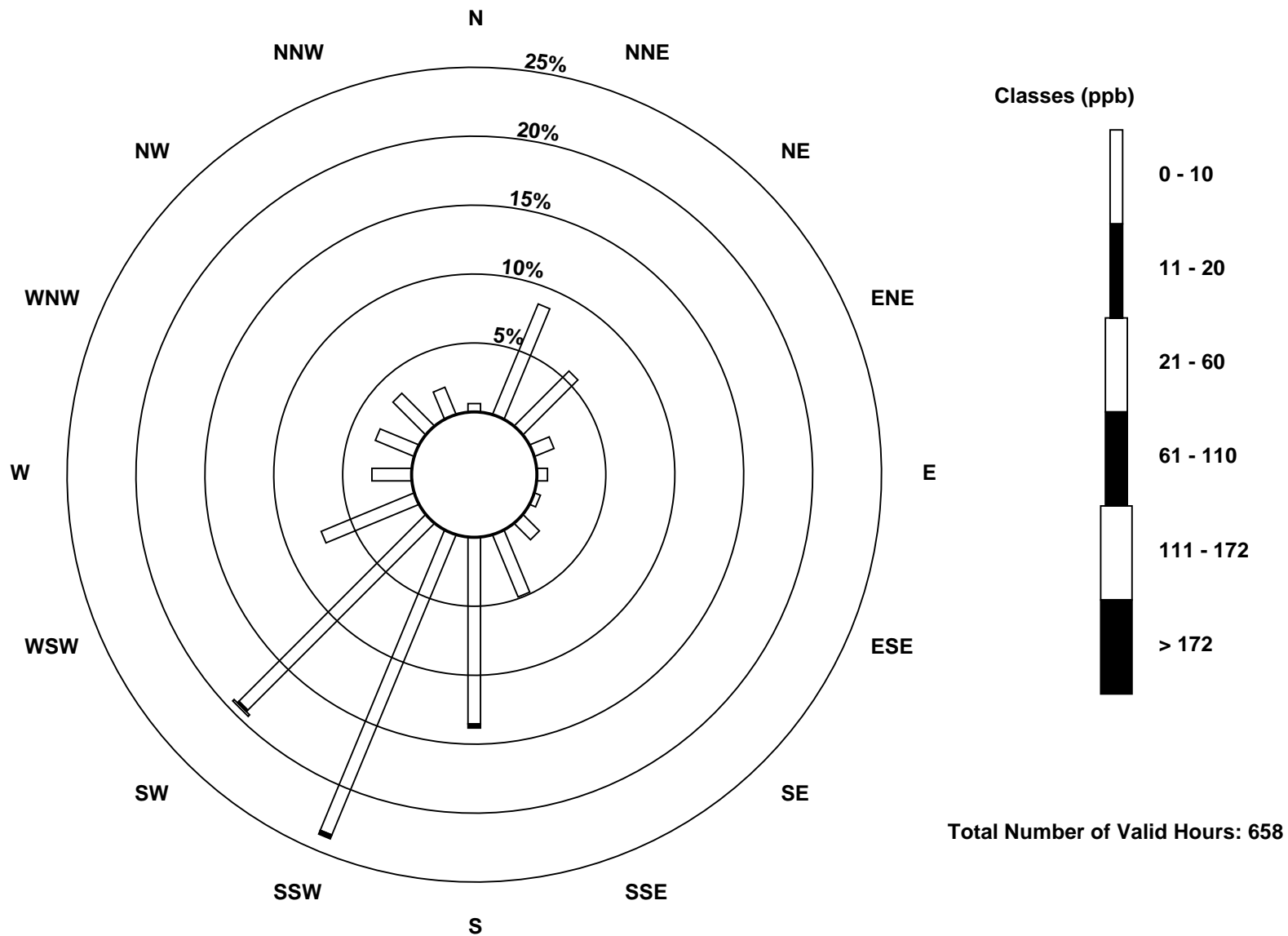
Total Number of Valid Hours: 658

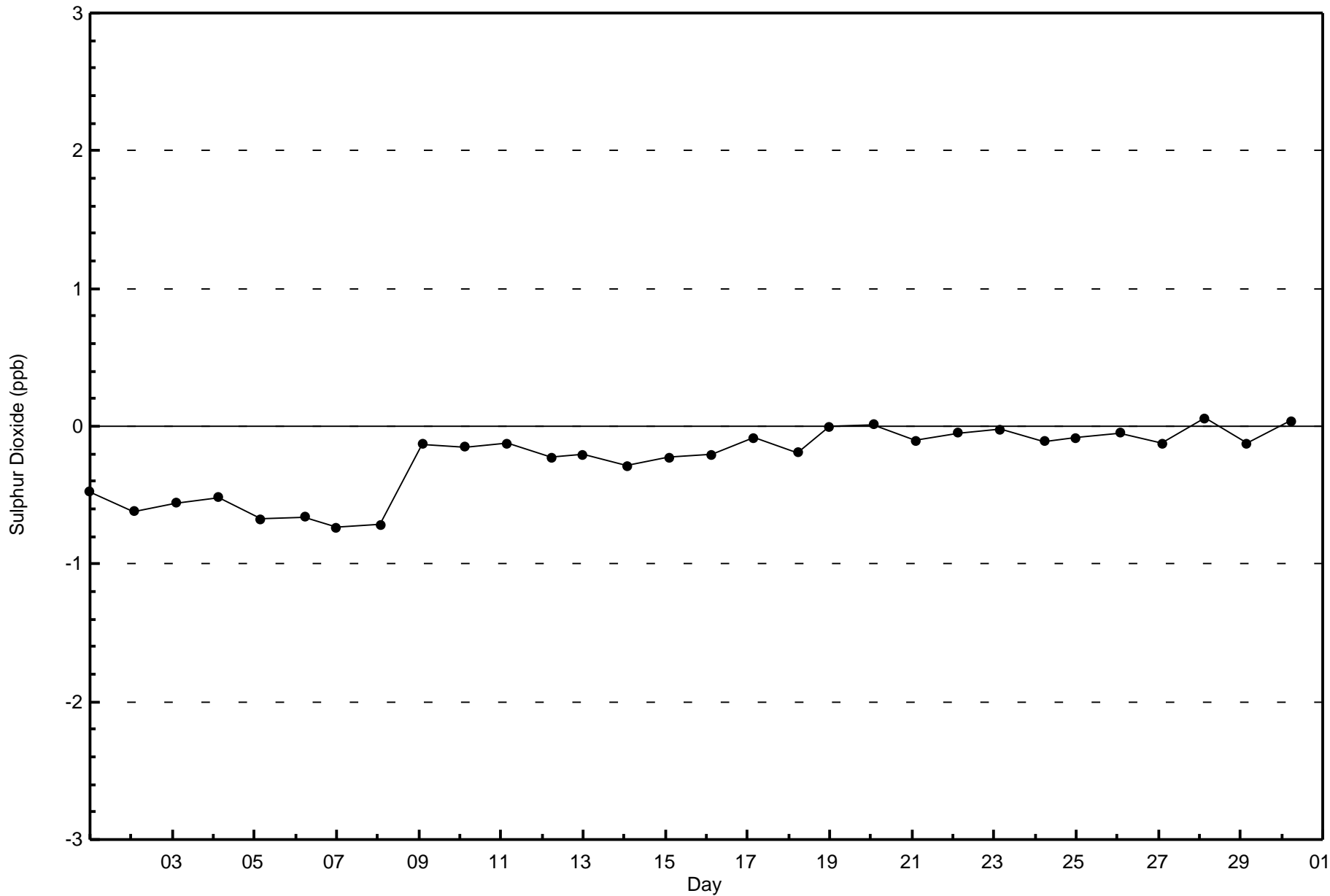
Total Number of Hours: 720

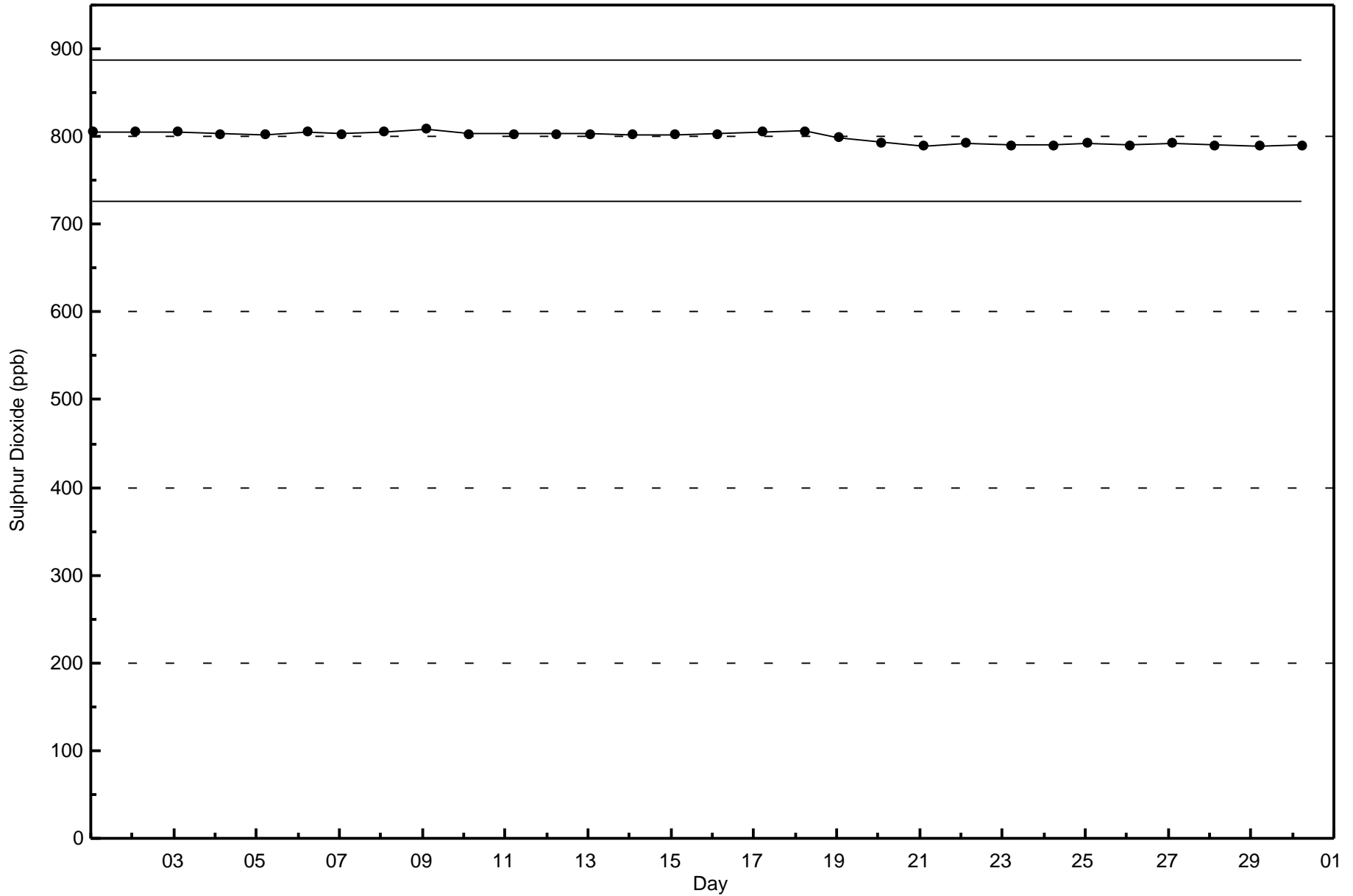


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

CNRL Horizon - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Nov 25 06:00	Maximum Daily Average: 0.3 ppb on Nov 20		Hours of Data:	684
Minimum Value: 0 ppb on Nov 14 09:00	Minimum Daily Average: 0.1 ppb on Nov 14		Hours of Missing Data:	36
Maximum Diurnal Average: 0.2 ppb at hour 6	Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration:	36
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-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
2-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	0.2	0
3-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	0.2	0
4-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.2	1
5-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	0.2	0
6-Nov	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	0.1	0
7-Nov	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	1
8-Nov	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	0.2	1
9-Nov	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	0.2	1
10-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	1	0	0	0.3	1
11-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	0.2	0
12-Nov	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	0.1	0
13-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
14-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
15-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	0.1	0
16-Nov	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	0.2	1
17-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	0.2	0
18-Nov	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
19-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	0.2	0
20-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0.3	1
21-Nov	0	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
22-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	0.2	0
23-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	0.3	0
24-Nov	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
25-Nov	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
26-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	0.2	0
27-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	0.3	0
28-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	0.2	0
29-Nov	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	0.2	1
30-Nov	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

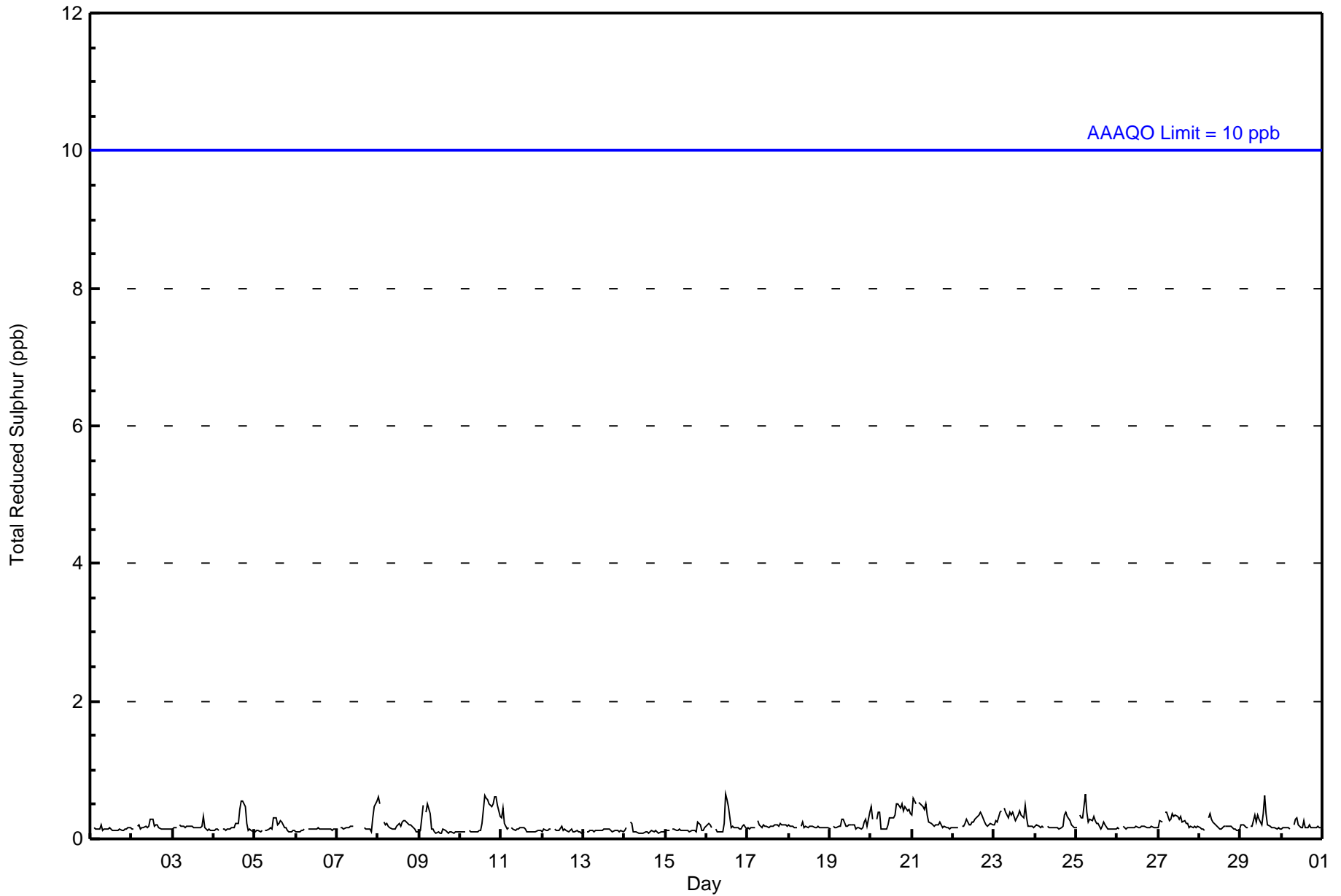
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
1	1	1	0	1	1	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	Diurnal Maximum

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
CNRL Horizon - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - 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 - 2	4	56	38	10	5	3	11	34	92	161	127	47	20	19	22	16	665
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	4	56	38	10	5	3	11	34	92	161	127	47	20	19	22	16	665

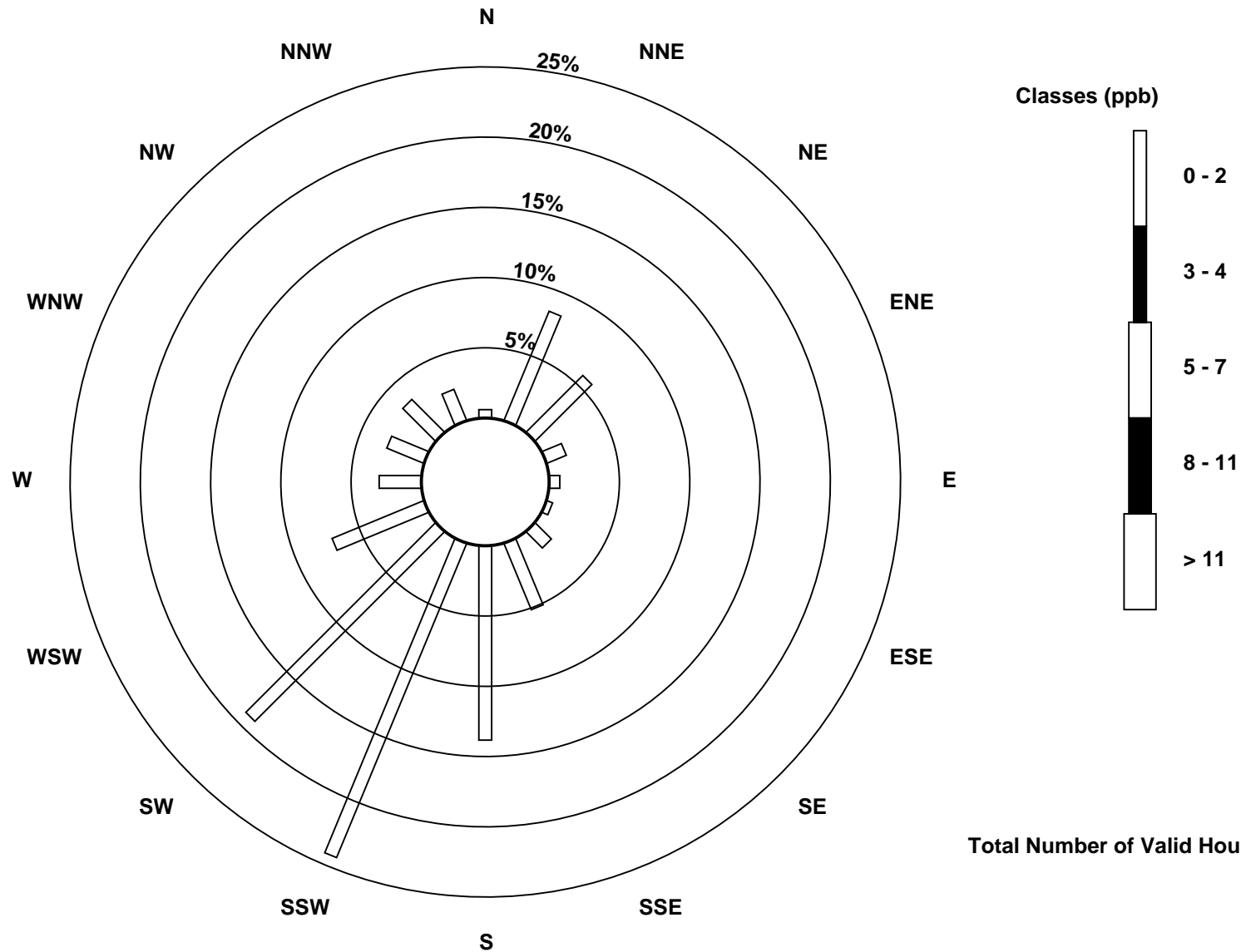
Total Number of Valid Hours: 665

Total Number of Hours: 720

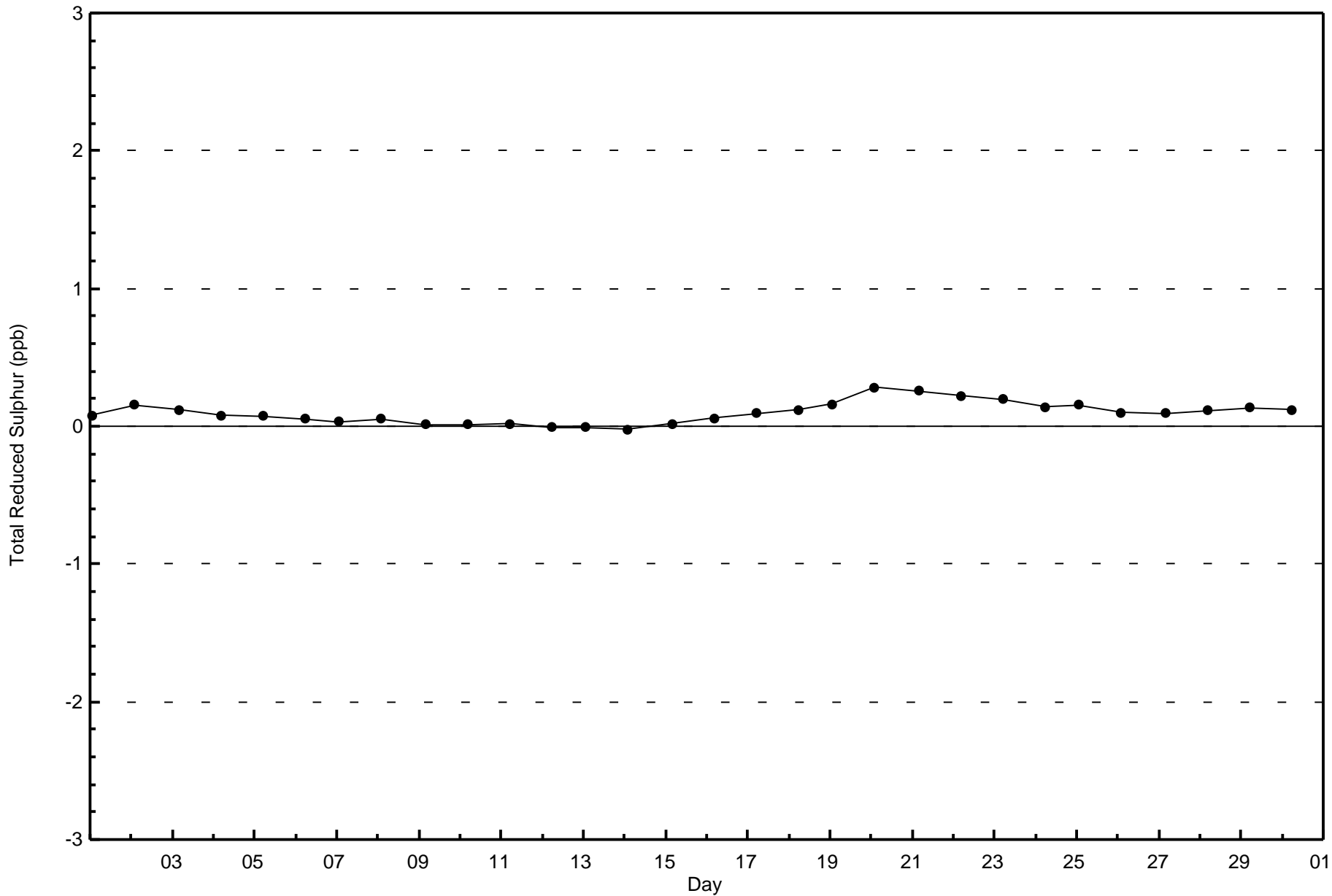


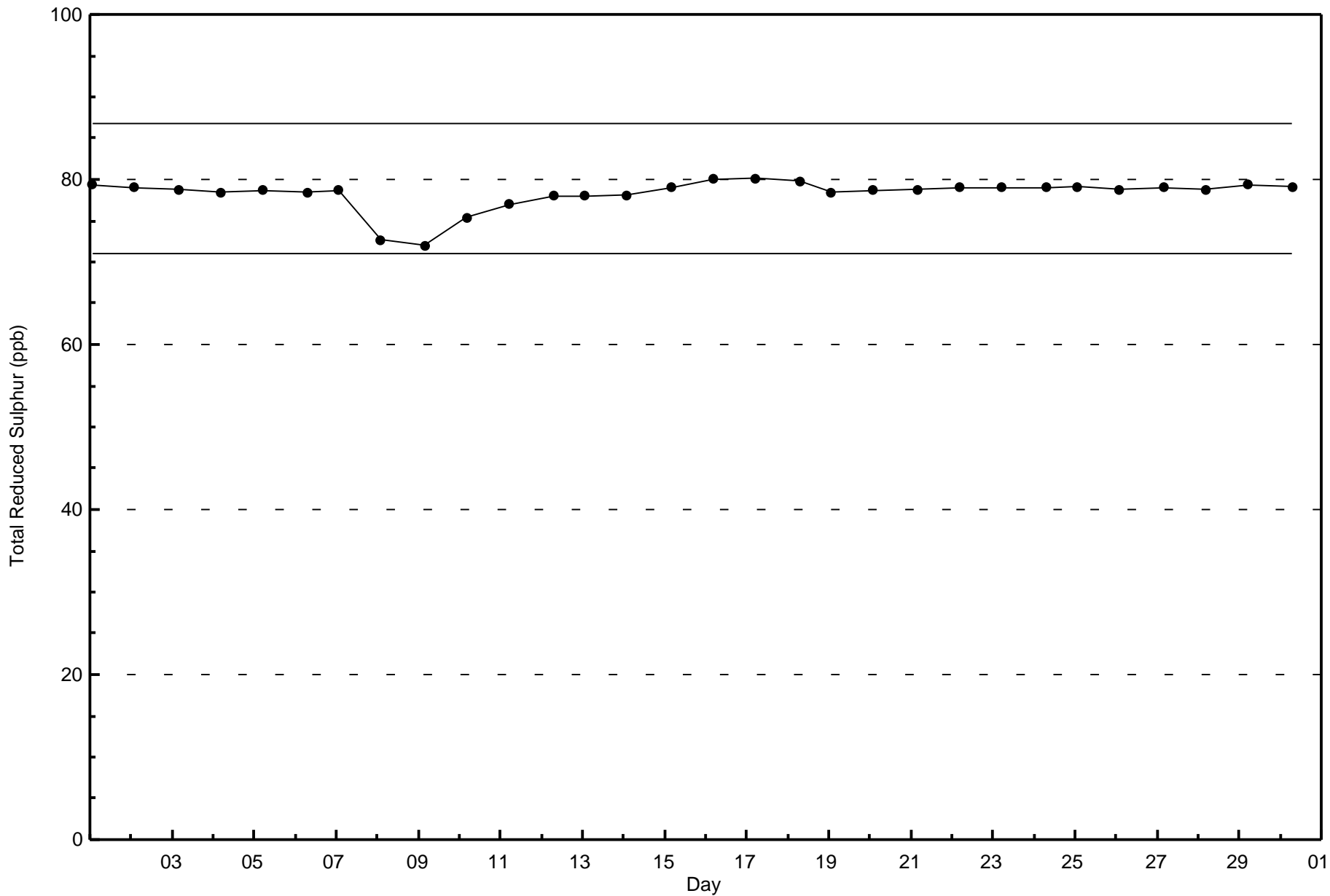
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon (AMS 15)



Total Number of Valid Hours: 665







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

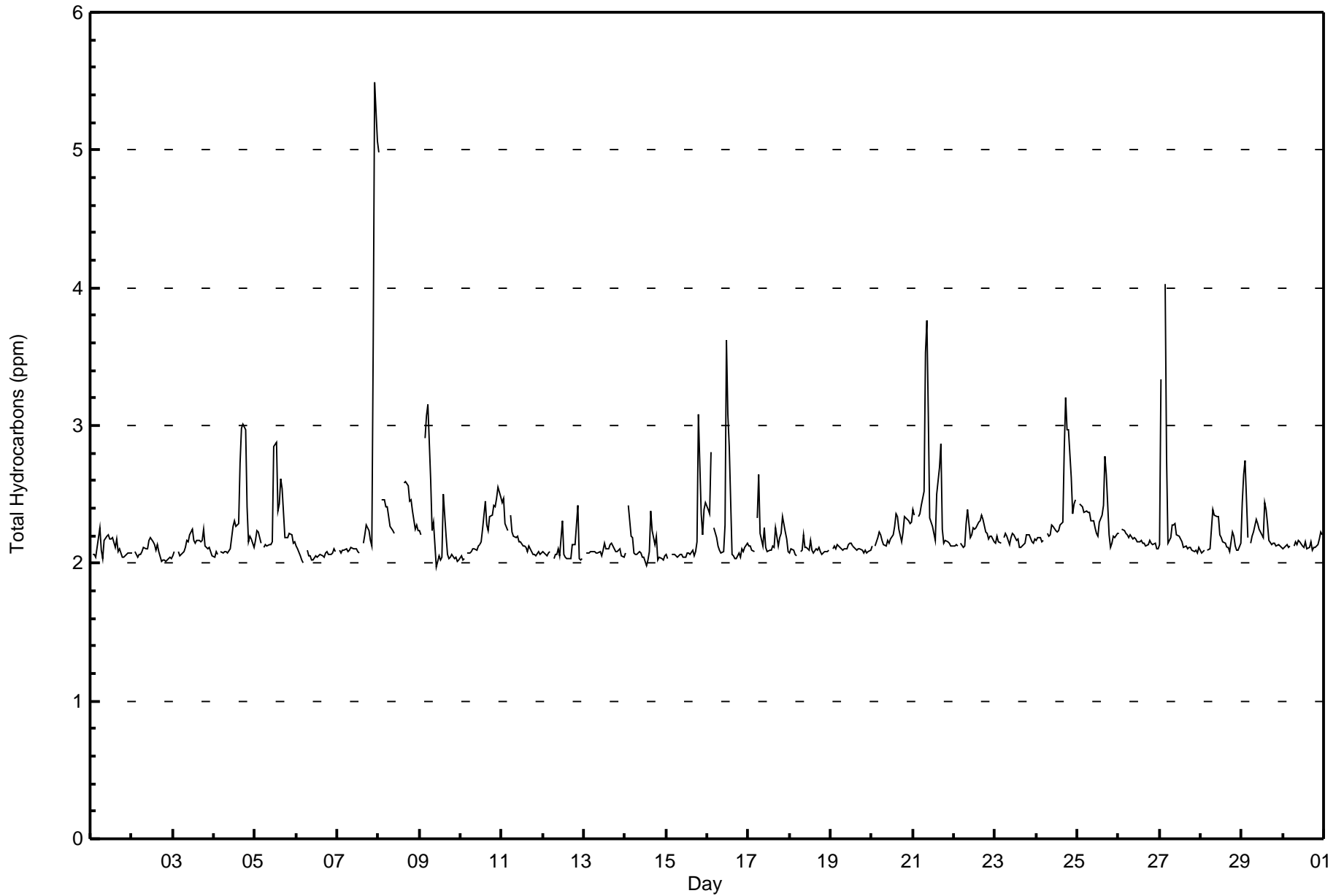
CNRL Horizon - November 2016

Maximum Value: 5.5 ppm on Nov 7 23:00 Maximum Daily Average: 2.5 ppm on Nov 8		Hours in Service: 720 Hours of Data: 684 Hours of Missing Data: 36 Hours of Calibration: 35 Percent Operational Time: 99.9																										
Minimum Value: 2.0 ppm on Nov 9 11:00 Maximum Diurnal Average: 2.3 ppm at hour 1 Monthly Average: 2.22 ppm		Minimum Daily Average: 2.1 ppm on Nov 6 Minimum Diurnal Average: 2.2 ppm at hour 11 Percentiles: $P_1 = 2.0$ $P_{10} = 2.1$ $Q_1 = 2.1$ Median = 2.1 $Q_3 = 2.2$ $P_{90} = 2.4$ $P_{99} = 3.6$																										
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-Nov	Z	2.1	2.1	2.0	2.1	2.3	2.1	2.0	2.2	2.2	2.2	2.2	2.2	2.1	2.2	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-Nov	2.1	Z	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	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	2.1	2.2
3-Nov	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3
4-Nov	2.0	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.3	2.7	3.0	3.0	3.0	2.4	2.2	2.2	2.2	2.1	2.1	2.3	3.0
5-Nov	2.2	2.2	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.9	2.9	2.4	2.4	2.6	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.9	
6-Nov	2.1	2.1	2.1	2.0	2.0	Z	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
7-Nov	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	Z	M	2.1	2.2	2.3	2.2	2.2	2.1	3.6	5.5	5.1	2.5	5.5	
8-Nov	5.0	Z	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	C	C	C	C	Z	C	2.6	2.6	2.6	2.5	2.5	2.4	2.3	2.3	2.2	2.5	5.0	
9-Nov	2.2	2.2	Z	2.9	3.1	3.2	2.6	2.2	2.3	2.1	2.0	2.0	2.0	2.0	2.5	2.2	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.3	3.2	
10-Nov	2.1	2.0	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.5	2.3	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.5	2.2	2.6	
11-Nov	2.4	2.5	2.3	2.2	Z	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.5
12-Nov	2.1	2.1	2.1	2.1	2.1	Z	2.0	2.1	2.1	2.1	2.1	2.3	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.4	2.0	2.0	2.0	2.1	2.1	2.4
13-Nov	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	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.2	
14-Nov	2.1	Z	2.4	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.4	2.2	2.1	2.2	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.4
15-Nov	2.1	2.0	Z	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	3.1	2.4	2.2	2.4	2.4	2.2	2.2	3.1
16-Nov	2.4	2.4	2.8	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.3	3.6	3.1	2.9	2.1	2.1	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.3	3.6
17-Nov	2.1	2.1	2.1	2.1	Z	2.3	2.6	2.2	2.1	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.1	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.2	2.6
18-Nov	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
19-Nov	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
20-Nov	2.1	Z	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.1	2.2	2.2	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.4
21-Nov	2.4	2.4	Z	2.3	2.4	2.4	2.5	3.5	3.8	3.1	2.3	2.3	2.2	2.2	2.5	2.7	2.9	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.5	3.8
22-Nov	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.3	2.4	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
23-Nov	2.1	2.2	2.2	2.1	Z	2.2	2.2	2.2	2.1	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	2.1	2.2	2.2	2.2	2.2	2.2
24-Nov	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.8	3.2	3.0	3.0	2.6	2.4	2.4	2.5	2.4	3.2
25-Nov	Z	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.4	2.8	2.6	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.8	
26-Nov	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	2.1	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	2.2
27-Nov	2.1	3.3	Z	4.0	2.8	2.1	2.2	2.3	2.3	2.3	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	2.3	4.0
28-Nov	2.1	2.1	2.1	Z	2.1	2.1	2.2	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.4
29-Nov	2.4	2.6	2.8	2.2	Z	2.1	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.8
30-Nov	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.2	2.1	2.2	2.2	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	2.1	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 2.2 2.2 2.2 2.2 2.3 2.2 2.2 2.2 2.2 2.2 2.2 2.3 2.3																								Diurnal Average				
5.0 3.3 2.8 4.0 3.1 3.2 2.6 3.5 3.8 3.1 2.3 3.6 3.1 2.9 2.5 2.7 3.0 3.2 3.0 3.1 2.6 3.6 5.5 5.1																								Diurnal Maximum				
Z - zerspan C - Calibration M - Maintenance																												



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
CNRL Horizon - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
CNRL Horizon - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	55	8.04	8.04
2.1 - 3.0	614	89.77	97.81
3.1 - 10.0	15	2.19	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
CNRL Horizon - November 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	6	0	0	0	0	1	4	14	13	16	1	0	0	0	55
2.1 - 3.0	4	56	31	10	5	2	10	29	86	147	116	32	16	18	19	14	595
3.1 - 10.0	0	1	0	0	0	1	1	2	1	1	0	0	2	2	3	0	14
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	4	57	37	10	5	3	11	32	91	162	129	48	19	20	22	14	664

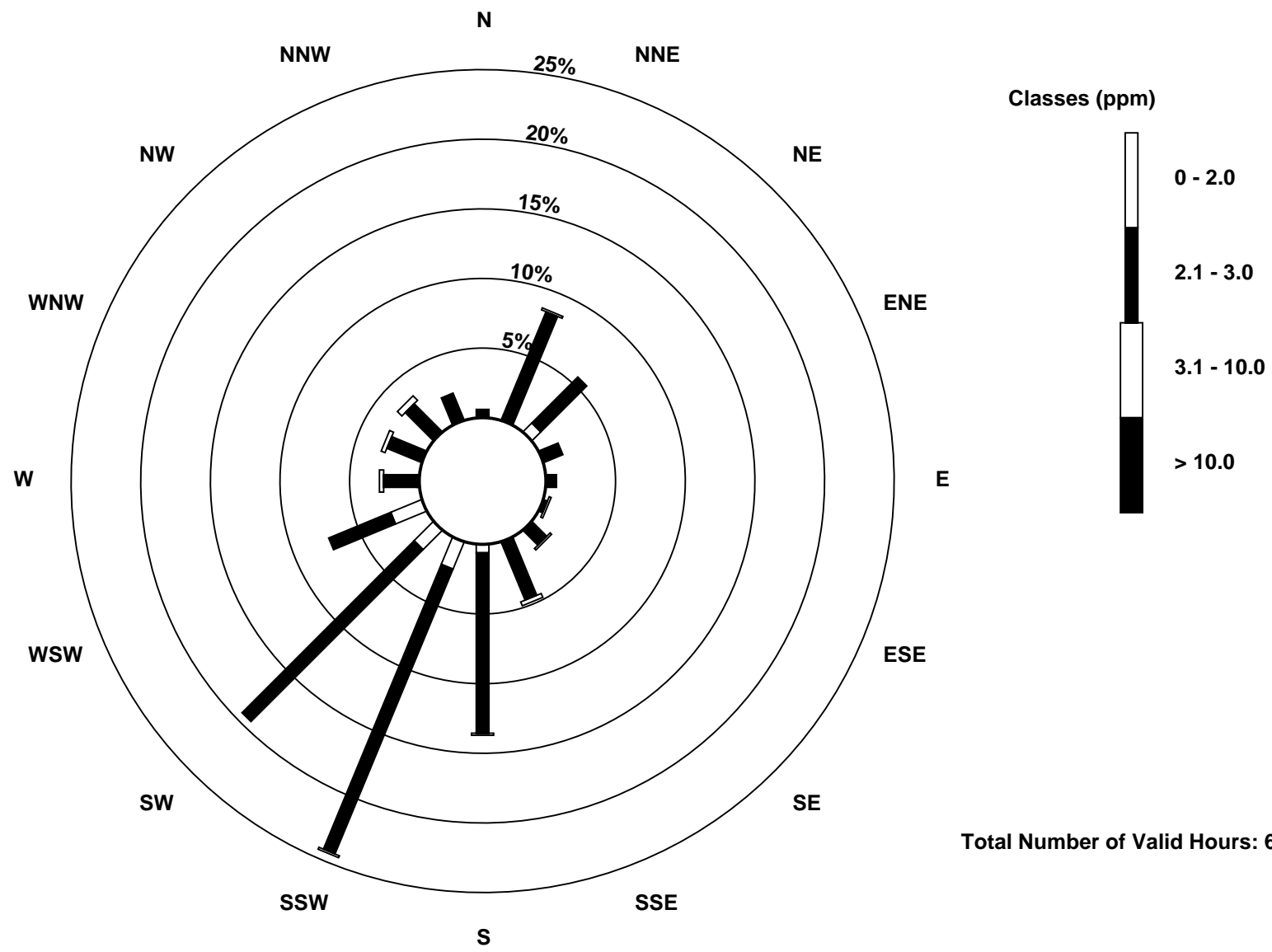
Total Number of Valid Hours: 664

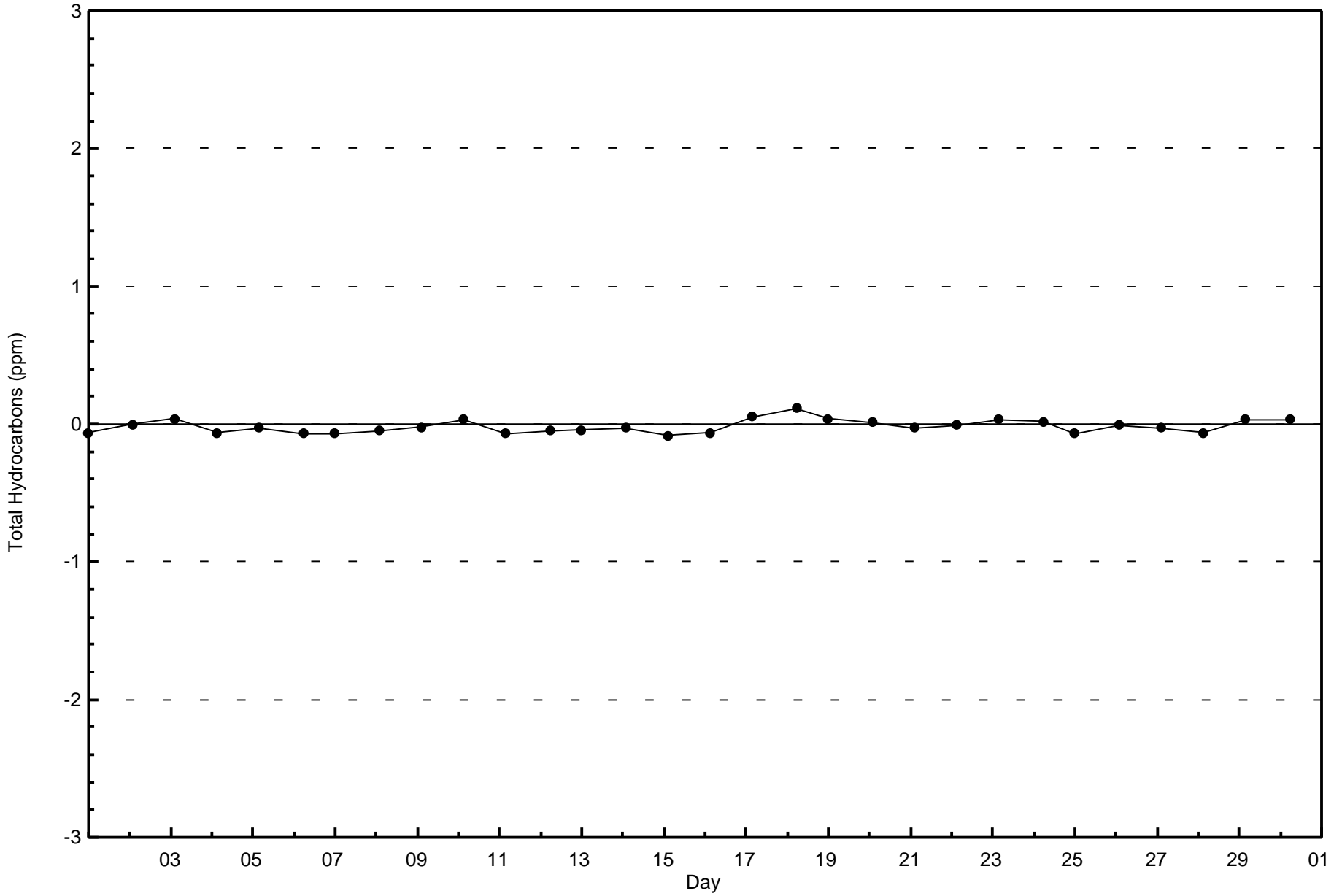
Total Number of Hours: 720

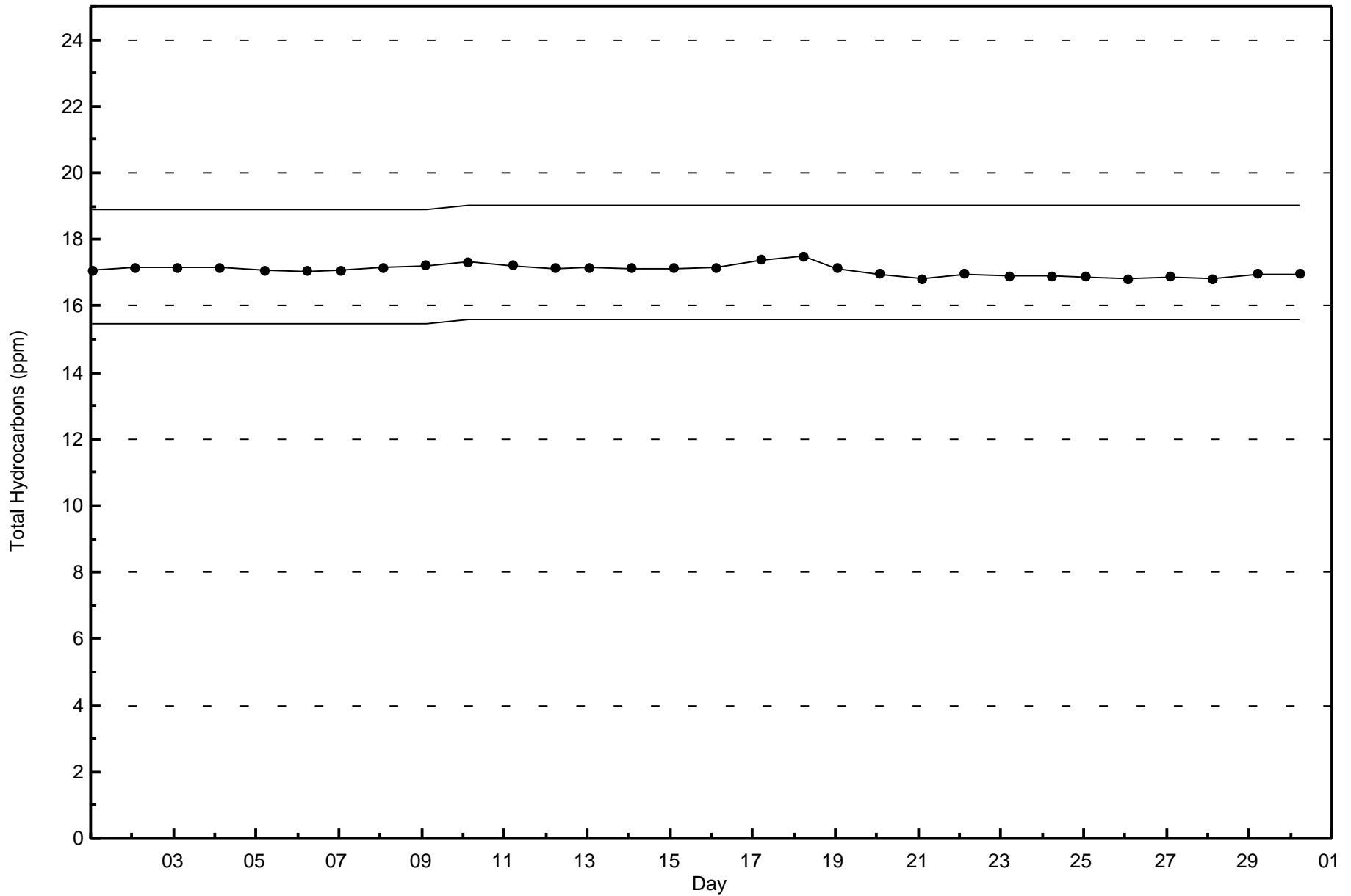


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
CNRL Horizon (AMS 15)

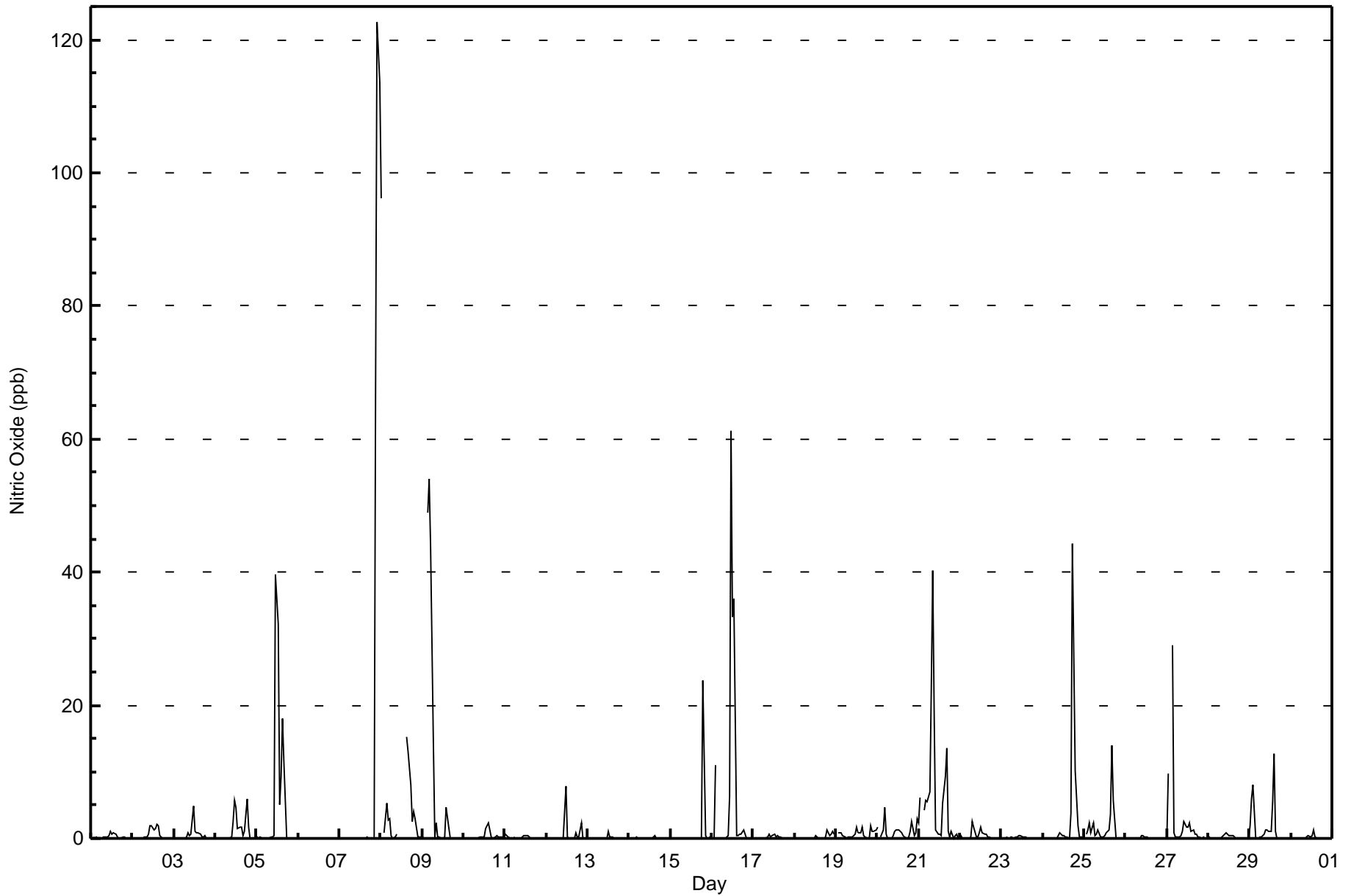








Maximum Value: 123 ppb on Nov 7 23:00		Maximum Daily Average: 13.8 ppb on Nov 7		Hours in Service: 720																																													
Minimum Value: 0 ppb on Nov 5 08:00		Minimum Daily Average: 0.0 ppb on Nov 6		Hours of Data: 684																																													
Maximum Diurnal Average: 4.5 ppb at hour 12		Minimum Diurnal Average: 0.5 ppb at hour 21		Hours of Missing Data: 36																																													
Monthly Average: 2.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 47		Hours of Calibration: 35																																													
				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-Nov	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1																							
2-Nov	0	Z	0	0	0	0	0	0	0	1	2	2	1	1	2	2	0	0	0	0	0	0	0	0	0.5	2																							
3-Nov	0	0	Z	0	0	0	0	0	1	0	1	5	1	1	1	1	0	0	0	0	0	0	0	0	0.5	5																							
4-Nov	0	0	0	Z	0	0	0	0	0	0	3	6	5	1	2	2	0	1	6	2	0	0	0	0	1.2	6																							
5-Nov	0	0	0	0	Z	0	0	0	0	0	0	40	32	5	9	18	11	0	0	0	0	0	0	0	5.1	40																							
6-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																							
7-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	67	123	114	13.8	123																							
8-Nov	96	Z	1	5	3	3	0	0	0	1	C	C	C	C	C	15	13	8	3	4	3	0	0	0	8.7	96																							
9-Nov	0	0	Z	49	54	44	14	0	2	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	7.5	54																							
10-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0.3	2																							
11-Nov	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
12-Nov	0	0	0	0	0	Z	0	0	0	0	0	8	0	0	0	0	0	1	0	0	2	0	0	0	0.5	8																							
13-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
14-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																							
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	1.1	24																							
16-Nov	0	0	11	Z	0	0	0	0	0	1	6	61	33	36	0	0	1	1	1	1	0	0	0	0	6.7	61																							
17-Nov	0	0	0	0	Z	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0.2	1																							
19-Nov	Z	1	1	1	0	0	0	0	0	0	1	2	1	1	2	0	0	0	0	0	2	1	1	1	0.7	2																							
20-Nov	2	Z	0	1	5	1	0	0	0	0	1	1	1	1	1	0	0	0	0	1	3	0	1	3	1.0	5																							
21-Nov	2	6	Z	4	6	6	7	23	40	19	1	1	1	0	5	9	14	1	0	1	0	0	1	0	6.4	40																							
22-Nov	1	0	0	Z	0	0	0	2	2	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0.5	2																							
23-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	0.1	0																							
24-Nov	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	4	44	28	10	2	0	0	0	0	3.9	44																							
25-Nov	Z	1	1	2	1	2	0	1	1	0	0	0	0	1	1	4	14	6	0	0	0	0	0	0	1.6	14																							
26-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	0.1	0																							
27-Nov	0	10	Z	29	1	0	0	0	1	1	2	2	2	2	1	1	1	1	1	0	0	0	0	0	2.4	29																							
28-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	0.2	1																							
29-Nov	2	6	8	0	Z	0	0	0	1	1	1	1	1	5	13	1	0	0	0	0	0	0	0	0	1.8	13																							
30-Nov	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																							
																								4.2	1.0	0.9	3.7	2.8	2.3	0.8	0.9	1.7	0.9	0.8	4.5	3.0	2.2	1.6	2.0	2.0	2.1	1.3	1.5	0.5	2.4	4.2	4.0	Diurnal Average	
																								96	10	11	49	54	44	14	23	40	19	6	61	33	36	13	18	14	44	28	24	3	67	123	114	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance																					





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
CNRL Horizon - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	666	97.37	97.37
21 - 40	9	1.32	98.68
41 - 80	6	0.88	99.56
81 - 159	3	0.44	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
CNRL Horizon - 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	4	55	36	10	5	2	10	30	89	159	129	48	18	18	20	14	647
21 - 40	0	1	1	0	0	1	0	0	1	1	0	0	1	1	1	0	8
11 - 80	0	1	0	0	0	0	0	2	1	1	0	0	0	0	1	0	6
81 - 159	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	3
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	4	57	37	10	5	3	11	32	91	162	129	48	19	20	22	14	664

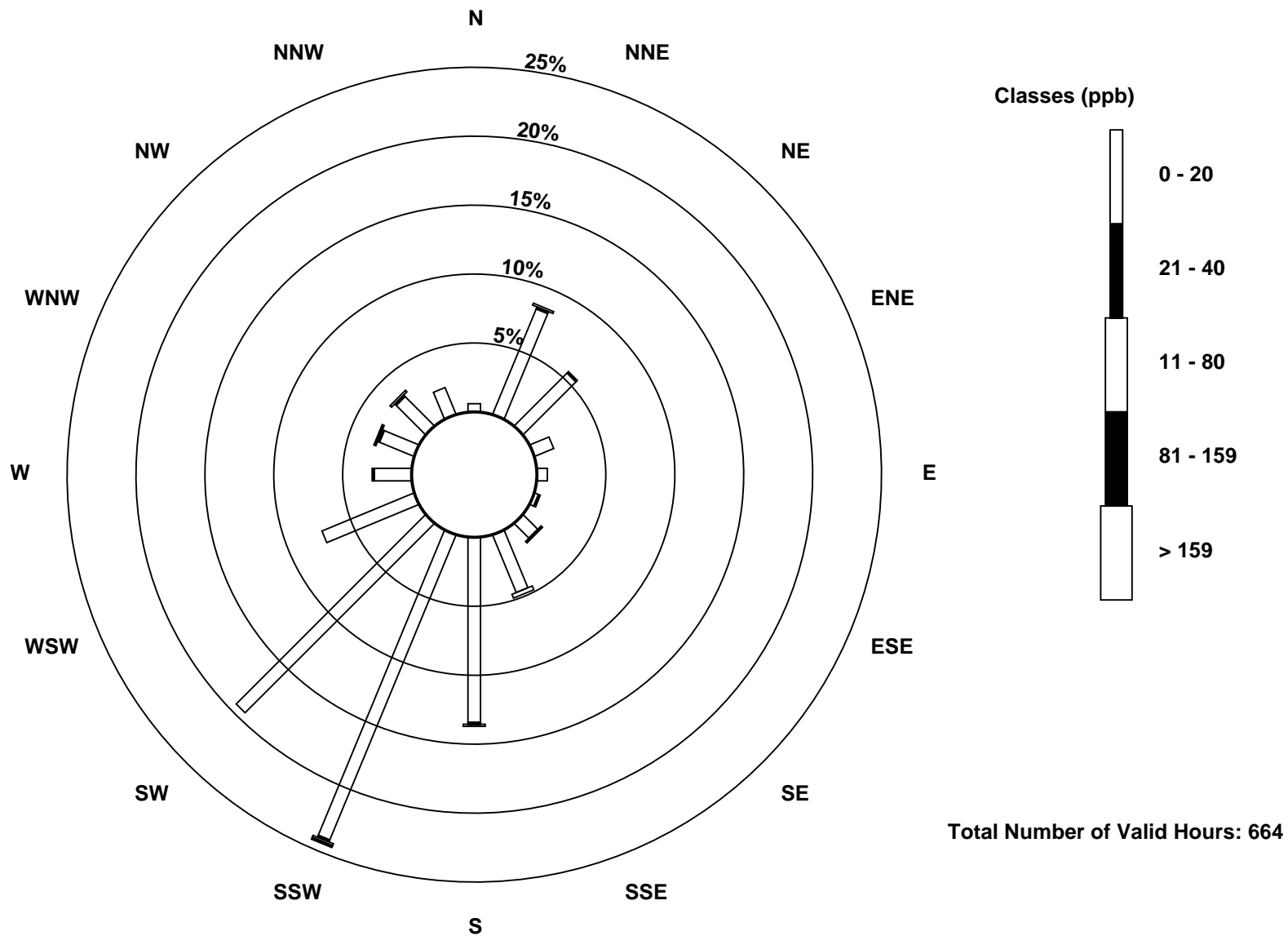
Total Number of Valid Hours: 664

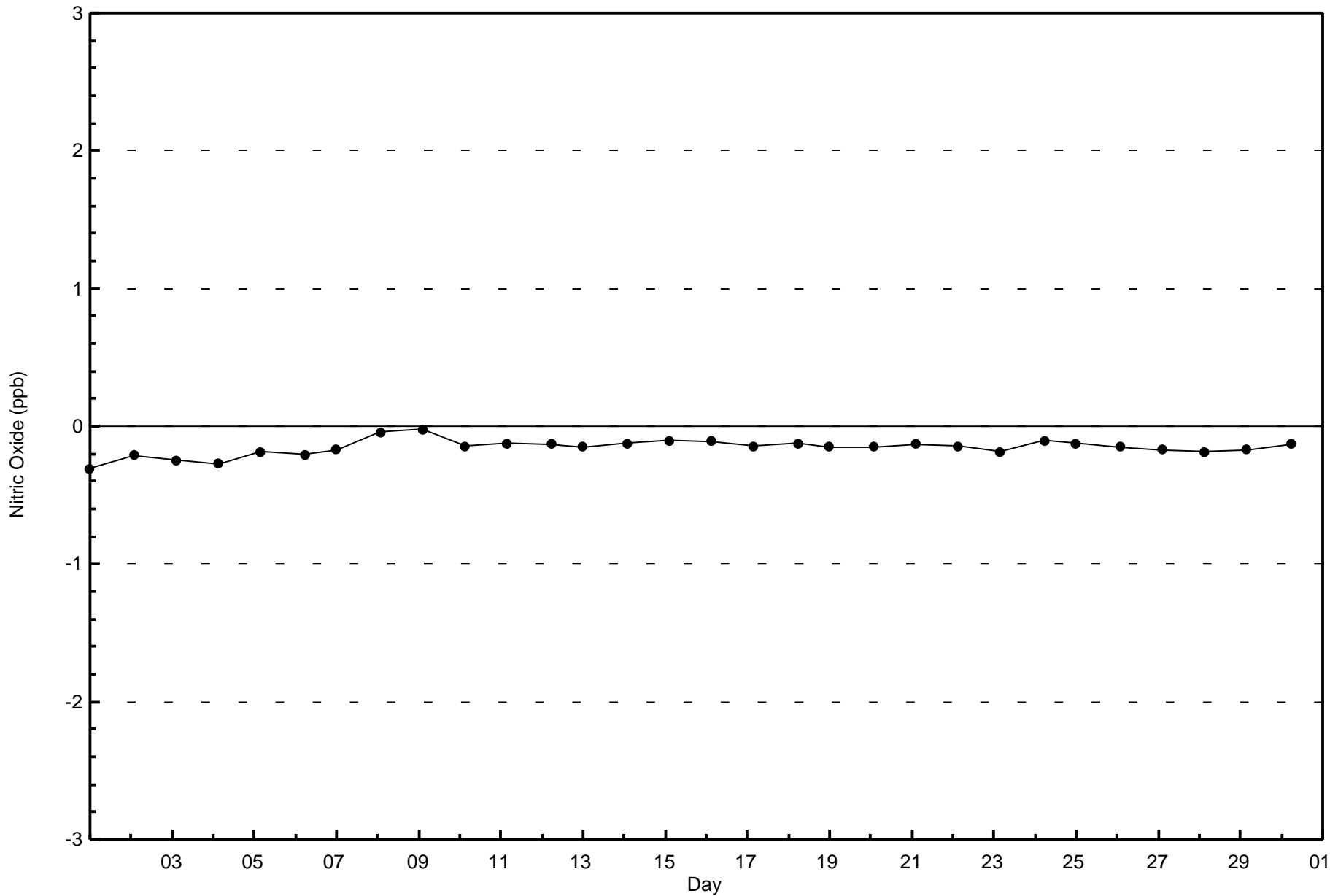
Total Number of Hours: 720

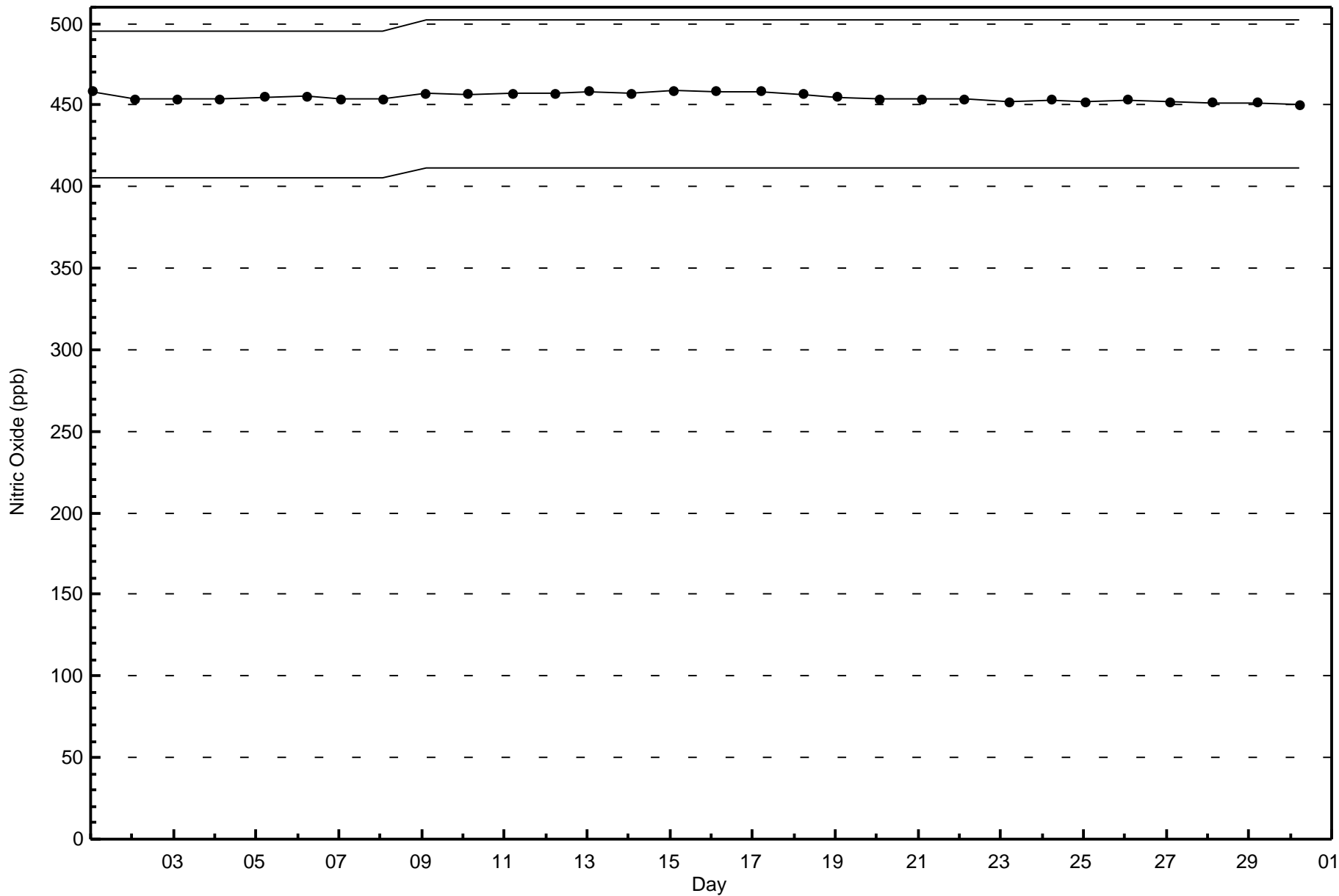


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 26 ppb on Nov 15 20:00	Maximum Daily Average: 10.2 ppb on Nov 8		Hours of Data:	684
Minimum Value: 0 ppb on Nov 9 21:00	Minimum Daily Average: 0.5 ppb on Nov 6		Hours of Missing Data:	36
Maximum Diurnal Average: 5.8 ppb at hour 17	Minimum Diurnal Average: 3.2 ppb at hour 22		Hours of Calibration:	35
Monthly Average: 4.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 6 P ₉₀ = 12 P ₉₉ = 22		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-Nov	Z	3	1	0	3	1	1	1	2	2	5	5	4	4	3	3	2	1	2	2	2	1	1	1	2.1	5
2-Nov	1	Z	2	2	3	2	3	4	2	3	8	7	7	8	8	10	4	1	1	1	1	1	1	1	3.4	10
3-Nov	1	1	Z	2	2	2	2	2	5	3	3	4	1	1	1	2	2	2	3	2	1	1	1	0	1.8	5
4-Nov	0	0	0	Z	0	0	0	0	0	1	6	10	10	5	7	11	14	22	24	11	2	4	5	1	6.0	24
5-Nov	5	10	12	5	Z	1	1	2	3	3	3	18	18	9	14	19	16	4	4	3	2	2	2	2	6.7	19
6-Nov	1	1	1	0	0	Z	1	0	0	0	1	1	1	1	1	0	0	1	1	0	0	1	1	1	0.5	1
7-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	M	0	8	13	11	6	1	16	24	24	4.8	24
8-Nov	21	Z	11	15	15	15	11	6	3	2	C	C	C	C	C	14	15	14	13	12	10	4	3	3	10.2	21
9-Nov	3	3	Z	15	15	13	9	3	5	1	1	1	0	1	16	9	0	0	0	0	0	0	0	0	4.1	16
10-Nov	0	0	0	Z	0	0	0	1	0	0	0	1	1	3	8	9	9	7	10	16	10	10	9	11	4.6	16
11-Nov	17	19	10	8	Z	11	3	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	0	0	3.7	19
12-Nov	0	0	0	0	0	Z	0	1	1	1	1	8	1	0	0	0	1	8	7	4	10	0	0	0	1.9	10
13-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	3	1	1	1	1	1	1	1	1	3	1	1	0.7	3
14-Nov	2	Z	5	2	6	1	1	1	1	1	1	1	1	0	2	9	5	2	4	0	0	0	0	0	2.0	9
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26	17	5	7	12	3.1	26
16-Nov	14	10	17	Z	6	2	1	0	1	1	8	24	24	17	1	2	2	1	3	2	1	3	2	1	6.2	24
17-Nov	2	2	1	1	Z	5	7	5	4	7	3	2	4	2	5	5	5	3	3	2	4	5	4	2	3.5	7
18-Nov	1	2	1	1	0	Z	1	1	4	1	1	1	3	2	0	1	2	2	3	6	4	4	4	4	2.1	6
19-Nov	Z	5	6	5	4	4	2	4	4	4	3	5	6	4	5	6	5	3	2	2	5	4	6	7	4.3	7
20-Nov	7	Z	3	12	16	12	4	3	4	4	6	5	5	5	6	9	11	12	14	18	18	14	14	13	9.4	18
21-Nov	13	16	Z	15	15	14	12	13	14	14	6	3	2	2	7	14	13	5	2	4	2	3	2	1	8.2	16
22-Nov	3	1	1	Z	1	1	3	15	14	3	3	6	8	5	7	8	11	11	7	5	3	3	2	5	5.4	15
23-Nov	4	6	8	7	Z	9	6	4	5	5	5	5	4	4	3	3	7	9	6	6	7	3	2	3	5.2	9
24-Nov	1	1	1	1	1	Z	6	3	2	5	4	2	3	3	3	3	11	17	17	14	9	5	9	8	5.6	17
25-Nov	Z	9	11	11	10	12	10	13	13	8	4	3	6	8	10	11	15	13	4	1	2	1	1	1	7.7	15
26-Nov	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.8	2
27-Nov	0	13	Z	20	11	5	4	6	14	11	9	8	7	7	5	8	6	6	2	2	2	2	2	2	6.5	20
28-Nov	2	1	2	Z	0	2	5	9	8	7	5	3	3	3	3	2	2	2	2	2	2	2	2	2	3.0	9
29-Nov	12	13	12	2	Z	2	8	9	13	9	5	4	4	13	20	10	2	2	2	1	1	1	1	1	6.3	20
30-Nov	1	1	2	1	2	Z	2	5	4	3	5	2	3	8	1	2	5	3	2	1	1	1	1	1	2.4	8

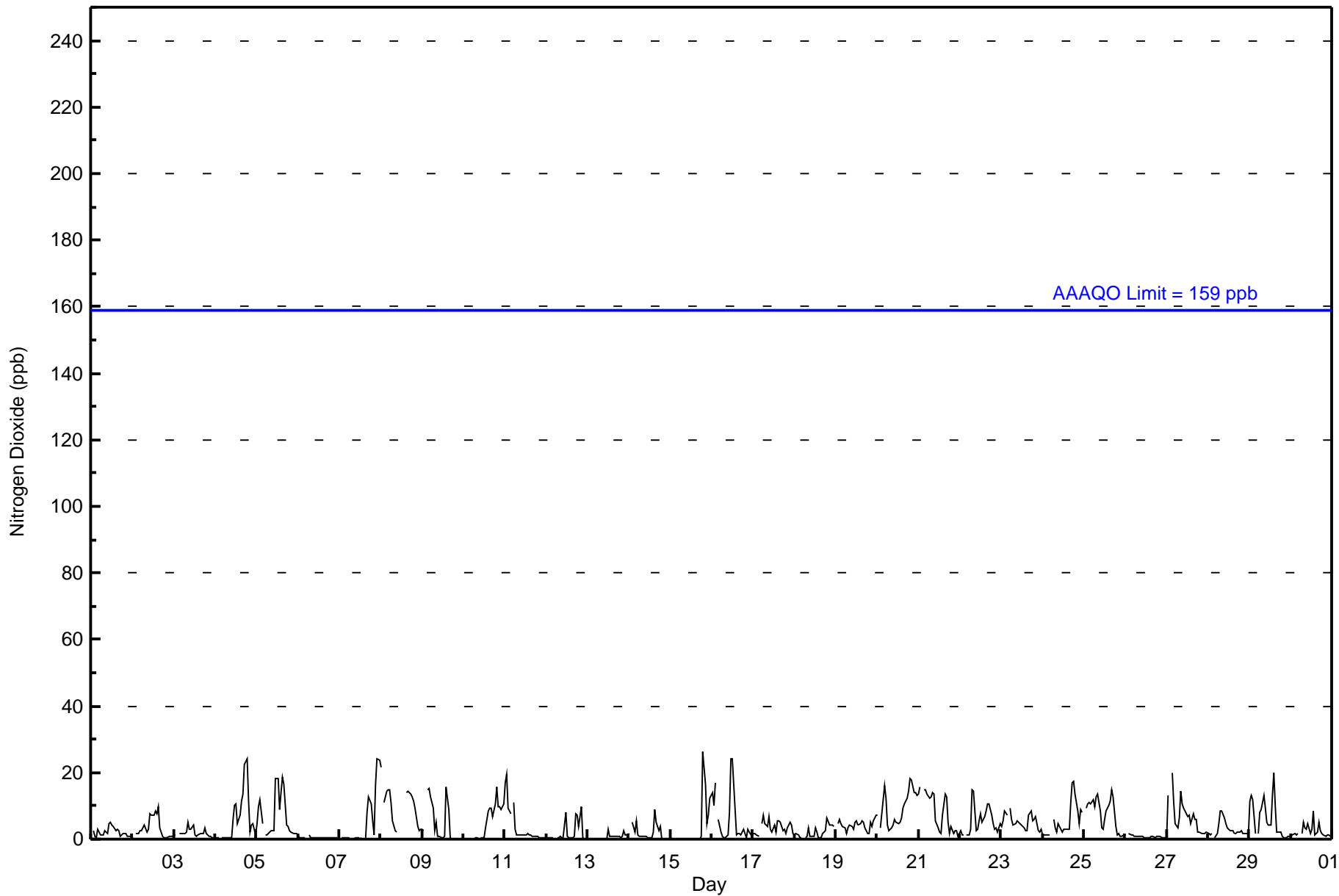
4.5	4.7	4.4	5.0	4.5	4.6	3.5	3.7	4.3	3.3	3.3	4.5	4.5	4.1	4.9	5.8	5.8	5.5	5.0	5.0	3.8	3.2	3.6	3.6	Diurnal Average	
21	19	17	20	16	15	12	15	14	14	9	24	24	17	20	19	16	22	24	26	18	16	24	24	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	676	98.83	98.83
21 - 40	8	1.17	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - 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	4	57	37	10	5	2	10	31	91	160	128	48	19	18	22	14	656
21 - 40	0	0	0	0	0	1	1	1	0	2	1	0	0	2	0	0	8
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	4	57	37	10	5	3	11	32	91	162	129	48	19	20	22	14	664

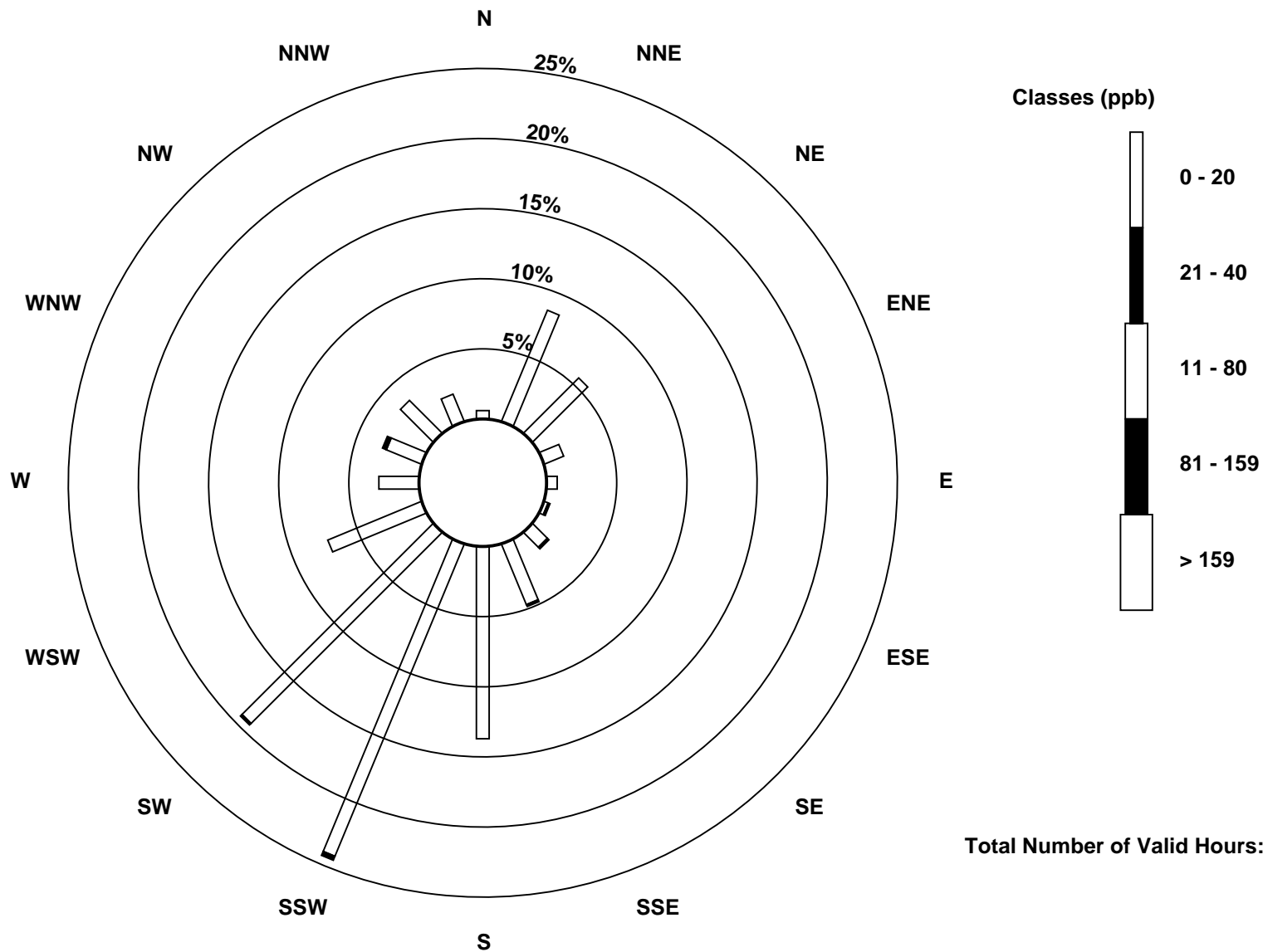
Total Number of Valid Hours: 664

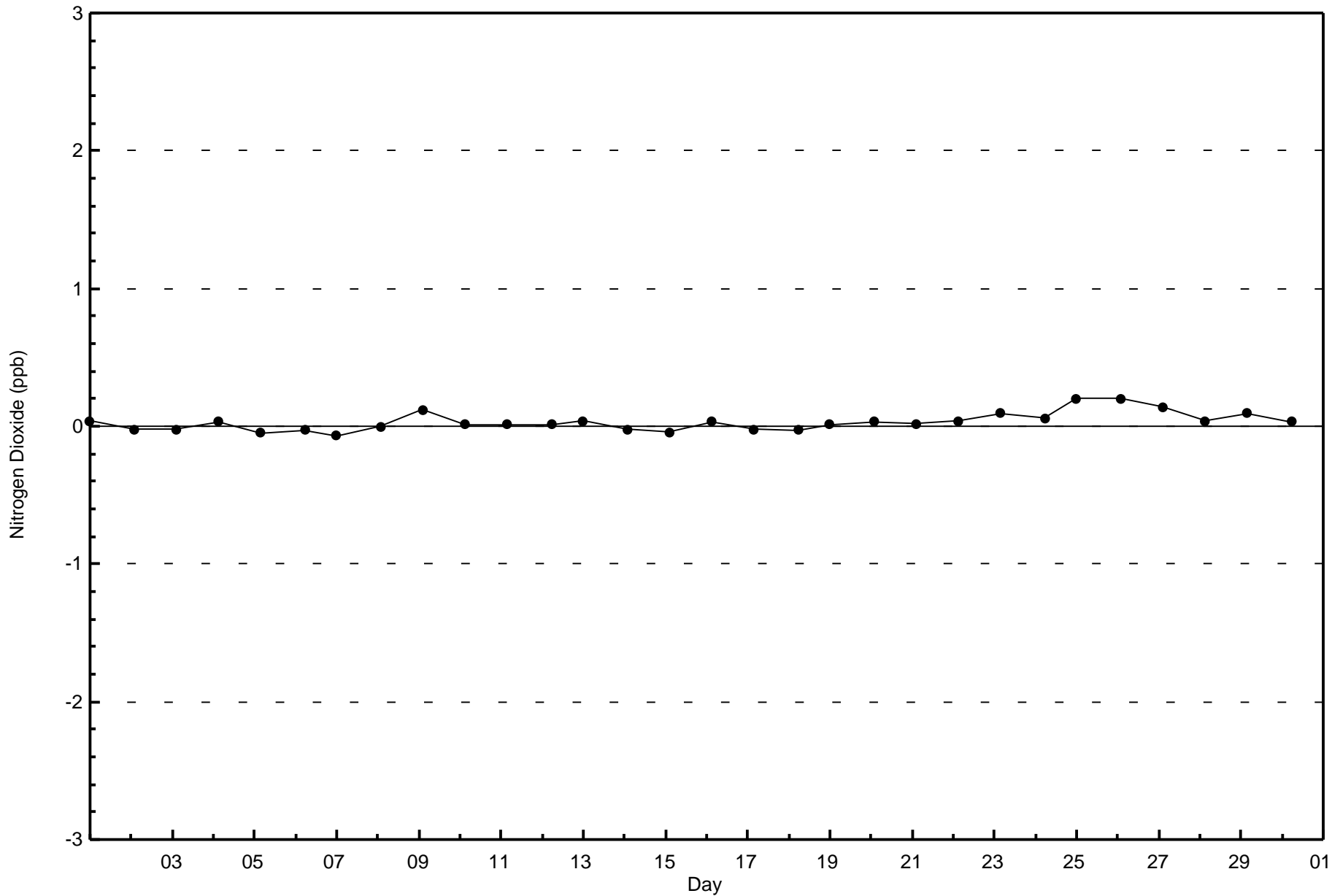
Total Number of Hours: 720

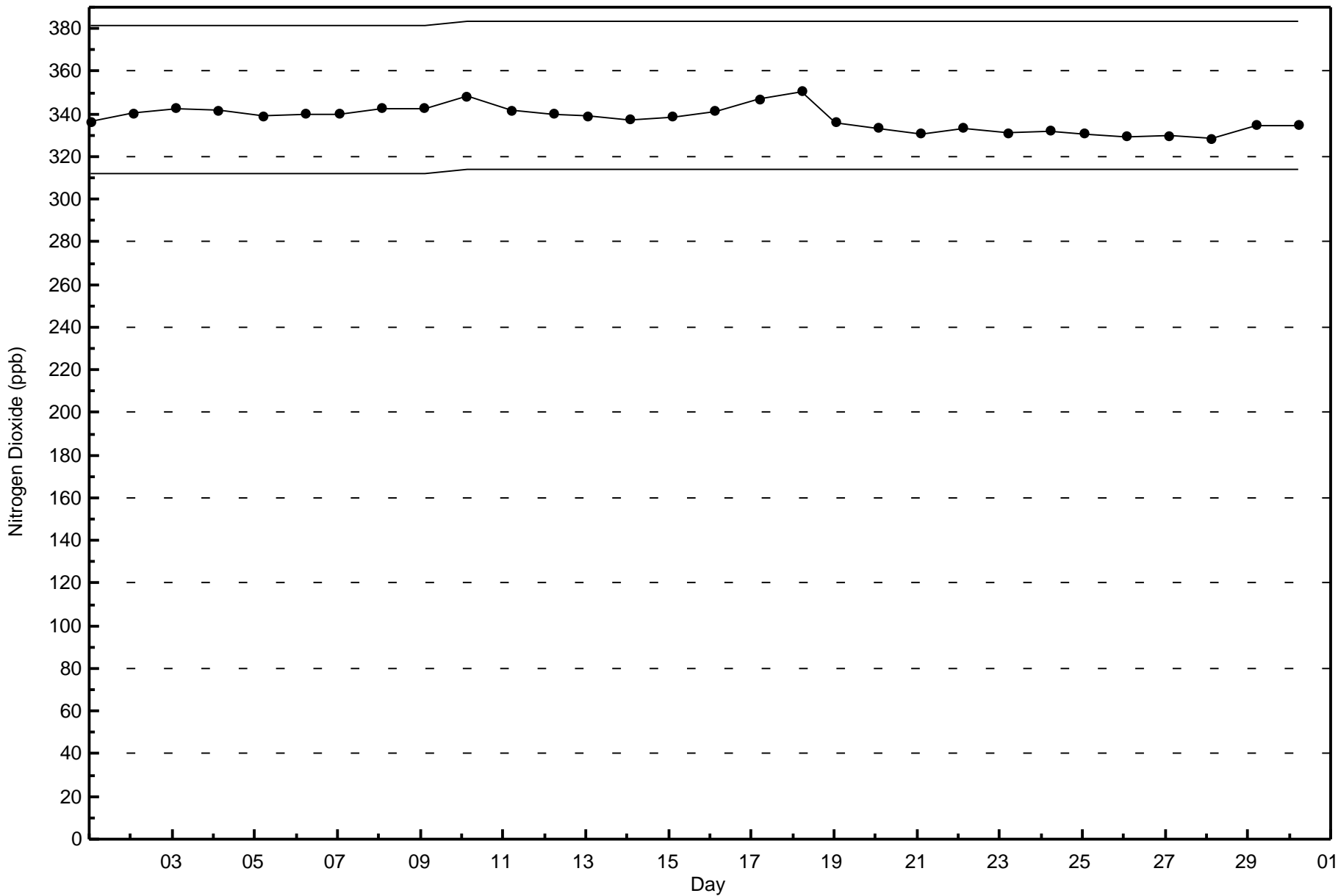


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association
Summary of Hour Averages

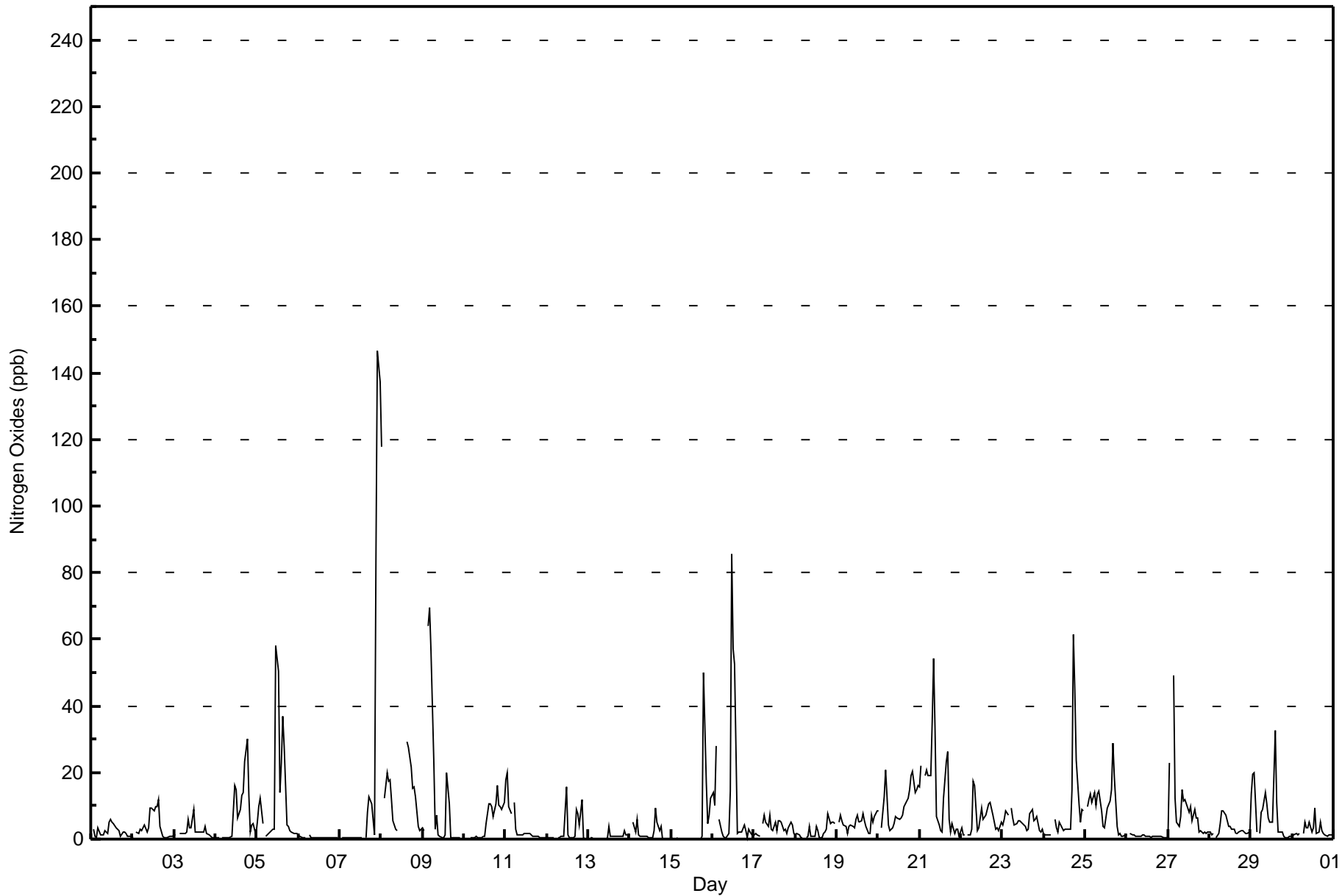
Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - November 2016

Maximum Value: 147 ppb on Nov 7 23:00		Maximum Daily Average: 18.8 ppb on Nov 8		Hours in Service: 720																																													
Minimum Value: 0 ppb on Nov 15 13:00		Minimum Daily Average: 0.5 ppb on Nov 6		Hours of Data: 684																																													
Maximum Diurnal Average: 9.1 ppb at hour 12		Minimum Diurnal Average: 4.0 ppb at hour 11		Hours of Missing Data: 36																																													
Monthly Average: 6.5 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 7 P ₉₀ = 15 P ₉₉ = 62		Hours of Calibration: 35																																													
				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-Nov	Z	3	1	0	3	1	1	1	3	2	5	6	5	5	3	3	3	1	2	2	2	1	1	1	2.4	6																							
2-Nov	1	Z	2	2	3	2	3	4	2	4	9	9	8	10	10	12	4	1	1	1	1	1	1	1	3.9	12																							
3-Nov	1	1	Z	2	2	2	2	2	6	3	4	9	2	2	2	2	2	2	4	2	1	1	1	0	2.4	9																							
4-Nov	0	0	0	Z	0	0	0	0	1	1	8	16	15	6	9	13	14	23	30	13	2	4	5	1	7.2	30																							
5-Nov	5	10	12	5	Z	1	1	2	3	3	3	58	50	14	23	37	28	4	4	3	2	2	2	2	11.8	58																							
6-Nov	1	1	0	0	0	Z	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0.5	1																							
7-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	M	0	8	13	11	6	1	83	147	137	18.6	147																							
8-Nov	118	Z	12	20	18	18	12	6	3	3	C	C	C	C	C	29	28	22	15	16	13	4	3	3	18.8	118																							
9-Nov	3	3	Z	64	69	56	23	3	7	1	1	1	0	1	20	11	0	0	0	0	0	0	0	0	11.6	69																							
10-Nov	0	0	0	Z	0	0	0	1	0	0	0	1	1	5	11	11	10	7	11	16	10	10	9	11	5.0	16																							
11-Nov	18	20	10	8	Z	11	3	1	1	1	1	2	2	2	2	1	1	1	1	1	1	0	0	0	3.8	20																							
12-Nov	0	0	0	0	0	Z	0	1	1	1	1	16	1	0	0	0	1	9	8	4	12	0	0	0	2.5	16																							
13-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	4	1	1	1	1	1	1	1	1	3	1	1	0.8	4																							
14-Nov	1	Z	5	2	6	1	1	1	1	1	1	1	0	0	2	9	5	2	4	0	0	0	0	0	2.0	9																							
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	50	17	5	7	12	4.1	50																							
16-Nov	14	10	28	Z	6	2	1	0	1	2	15	86	57	53	2	2	2	2	4	3	1	3	2	1	12.9	86																							
17-Nov	1	2	1	1	Z	5	7	5	4	7	3	3	5	2	6	5	5	3	3	2	4	5	4	2	3.7	7																							
18-Nov	1	2	1	0	0	Z	0	1	4	1	1	1	4	2	0	1	2	2	3	8	5	5	5	5	2.3	8																							
19-Nov	Z	5	7	6	4	4	2	4	4	4	3	6	7	5	6	7	6	4	2	2	7	5	7	9	5.0	9																							
20-Nov	9	Z	3	13	21	13	4	2	4	5	7	6	6	6	7	10	11	12	15	19	20	14	15	16	10.3	21																							
21-Nov	16	22	Z	19	21	19	19	35	54	33	7	4	3	2	12	23	26	6	2	5	2	3	3	1	14.7	54																							
22-Nov	3	1	1	Z	1	1	3	17	16	3	3	6	9	6	7	9	11	11	7	5	3	3	2	5	5.9	17																							
23-Nov	4	6	8	7	Z	9	6	4	5	6	5	5	4	4	3	3	7	9	6	6	7	3	2	3	5.3	9																							
24-Nov	1	1	1	1	1	Z	6	3	2	5	4	3	3	3	3	15	61	45	24	10	5	9	8	9.5	61																								
25-Nov	Z	10	12	14	11	14	10	13	15	9	4	3	6	9	11	15	29	19	4	1	2	1	1	1	9.3	29																							
26-Nov	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.9	2																							
27-Nov	0	23	Z	49	12	5	4	7	15	12	12	9	8	10	6	9	6	7	2	2	2	2	2	2	8.9	49																							
28-Nov	2	1	2	Z	1	2	5	9	9	7	6	4	4	3	3	2	2	2	2	2	2	2	2	2	3.2	9																							
29-Nov	14	19	20	2	Z	2	8	9	14	10	6	5	5	19	33	11	2	2	2	1	0	1	1	1	8.1	33																							
30-Nov	1	1	2	1	2	Z	2	5	4	3	5	2	3	10	2	2	5	3	2	1	1	1	1	1	2.6	10																							
																								8.7	5.7	5.3	8.7	7.3	6.8	4.3	4.6	5.9	4.2	4.0	9.1	7.4	6.3	6.6	7.8	7.8	7.6	6.3	6.5	4.3	5.6	7.8	7.6	Diurnal Average	
																								118	23	28	64	69	56	23	35	54	33	15	86	57	53	33	37	29	61	45	50	20	83	147	137	Diurnal Maximum	
Z - zerspan																								C - Calibration				M - Maintenance																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	646	94.44	94.44
21 - 40	21	3.07	97.51
41 - 80	12	1.75	99.27
81 - 159	5	0.73	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - 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	4	54	35	10	5	2	10	30	86	153	127	48	16	17	19	12	628
21 - 40	0	1	1	0	0	0	0	0	3	6	2	0	2	1	1	2	19
11 - 80	0	2	1	0	0	1	0	1	2	2	0	0	1	1	1	0	12
81 - 159	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	0	5
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	4	57	37	10	5	3	11	32	91	162	129	48	19	20	22	14	664

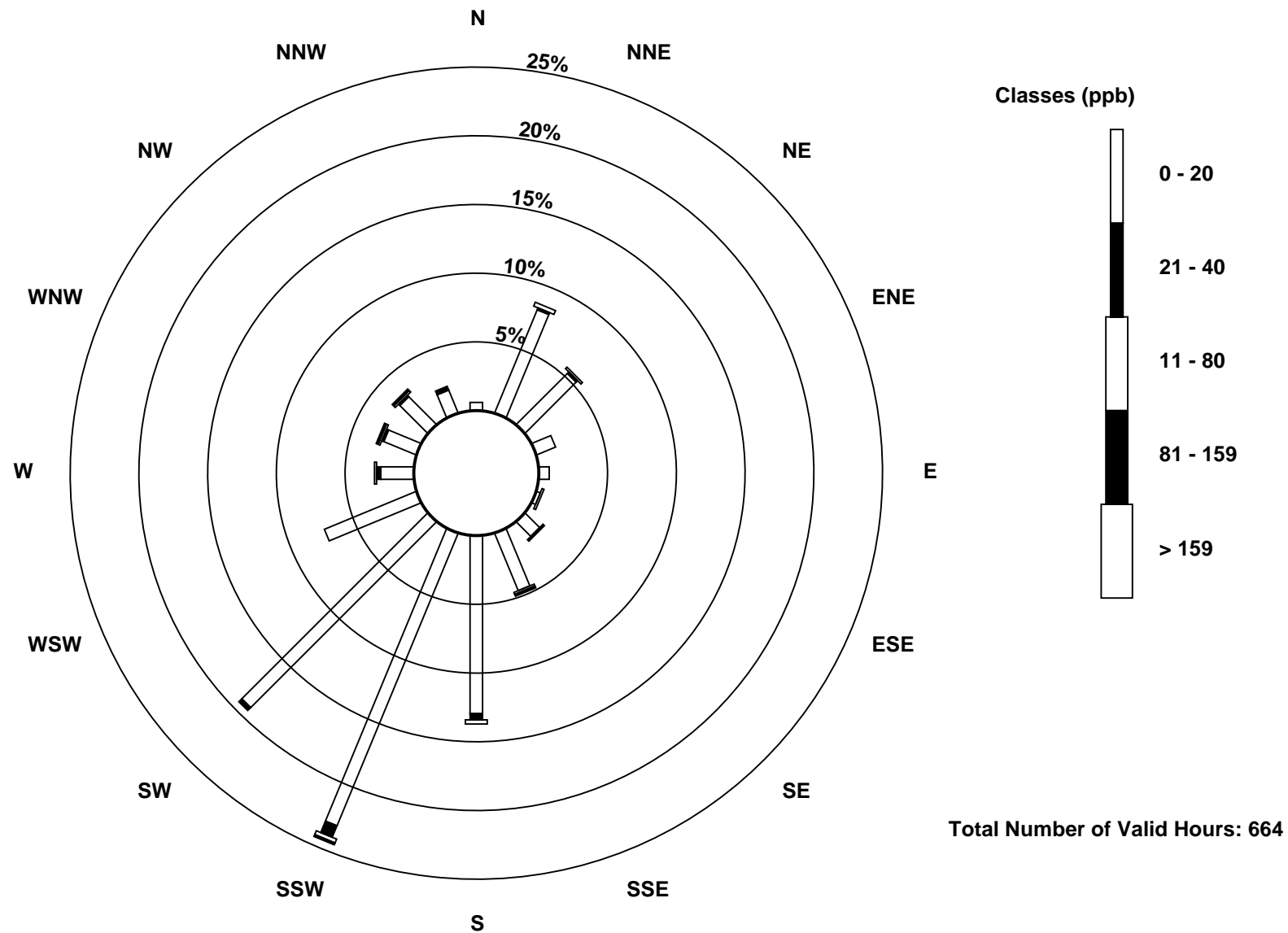
Total Number of Valid Hours: 664

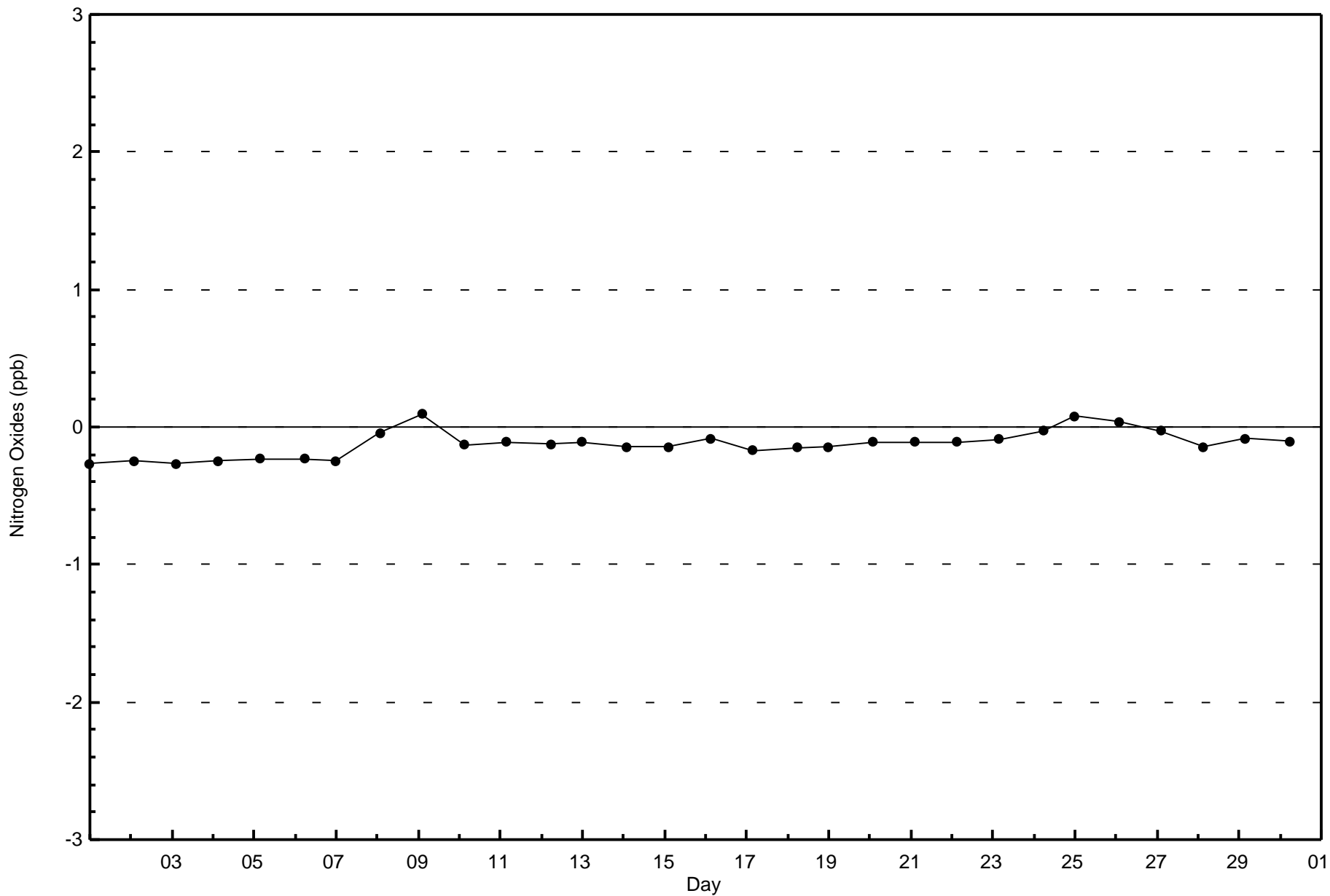
Total Number of Hours: 720

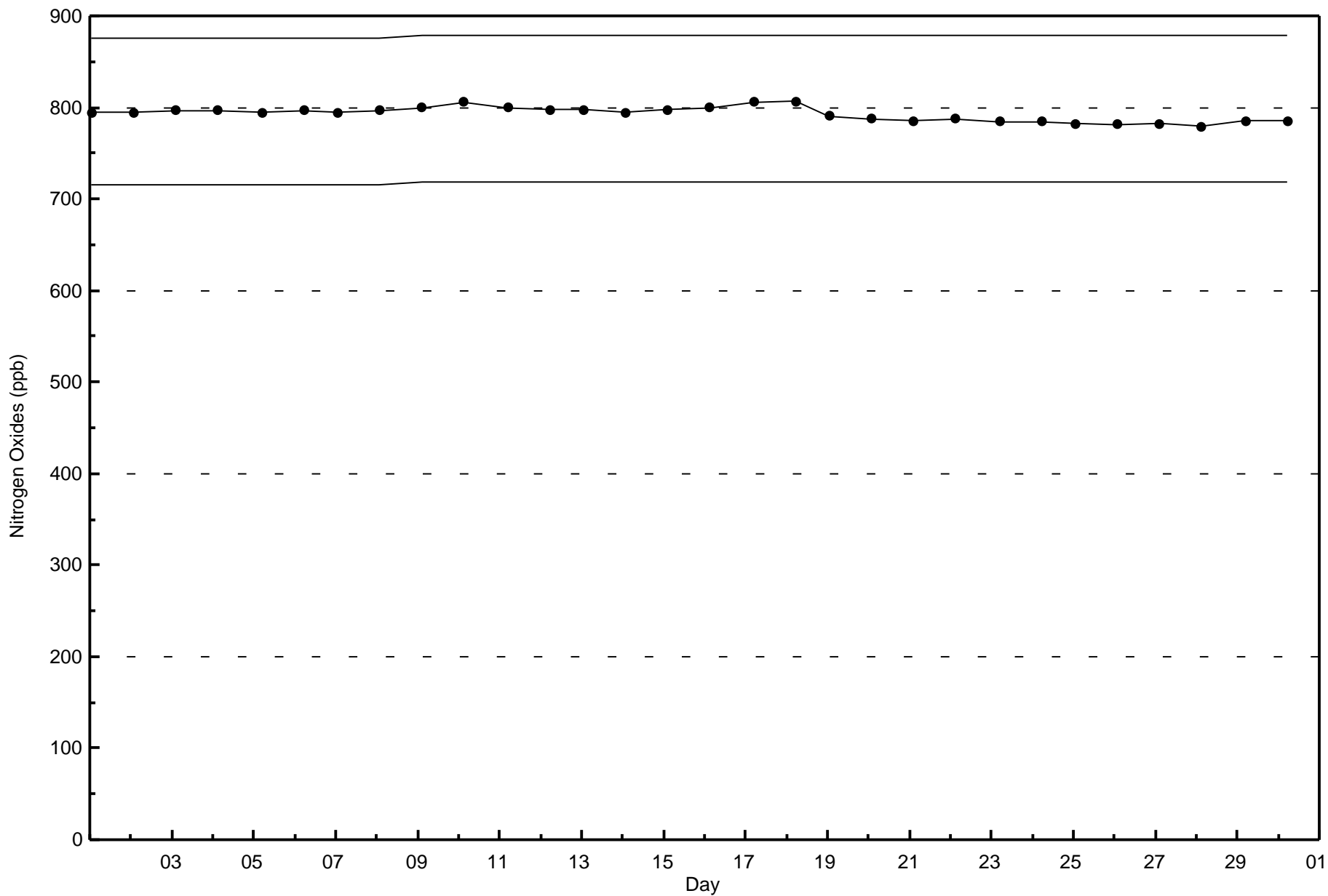


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

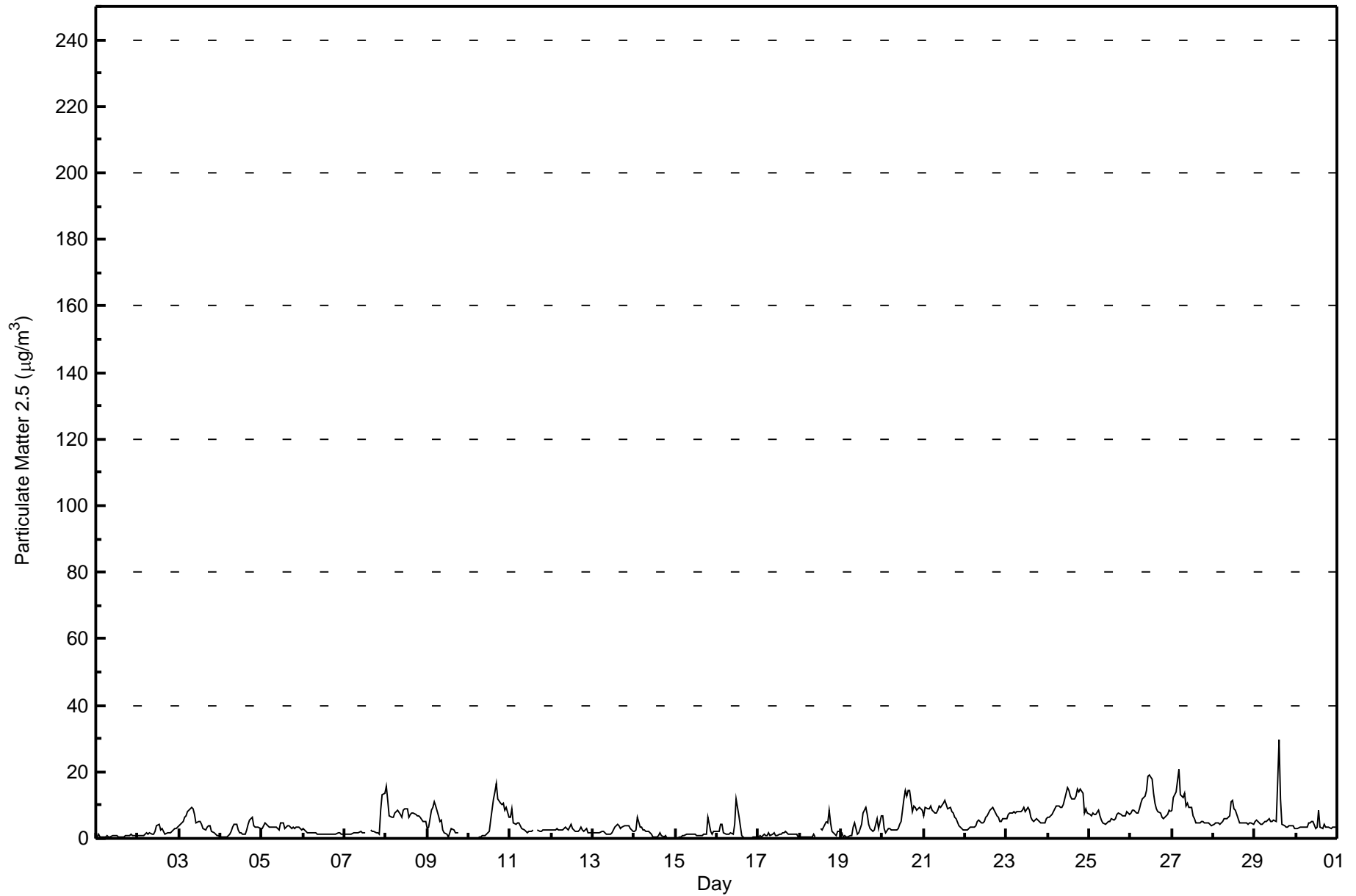
CNRL Horizon - November 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 29.5 µg/m ³ on Nov 29 15:00 Minimum Value: 0.0 µg/m ³ on Nov 15 01:00 Maximum Diurnal Average: 5.9 µg/m ³ at hour 15 Monthly Average: 4.54 µg/m ³		Maximum Daily Average: 10.7 µg/m ³ on Nov 24 Minimum Daily Average: 0.7 µg/m ³ on Nov 1 Minimum Diurnal Average: 3.9 µg/m ³ at hour 1 Percentiles: P ₁ = 0.1 P ₁₀ = 0.8 Q ₁ = 1.6 Median = 3.4 Q ₃ = 6.7 P ₉₀ = 9.3 P ₉₉ = 16.7		Hours in Service: 720 Hours of Data: 702 Hours of Missing Data: 18 Hours of Calibration: 2 Percent Operational Time: 97.8																						
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	0.6	1.4	0.4	0.4	0.4	0.5	0.7	0.5	0.6	0.9	1.0	1.0	0.7	0.6	0.6	0.6	0.6	0.7	0.7	0.9	1.2	1.0	0.9	0.8	0.7	1.4
2-Nov	0.8	1.0	1.0	1.0	1.4	1.5	1.5	1.6	1.4	1.4	2.3	3.7	4.2	2.3	2.8	2.2	1.5	1.7	1.8	1.8	2.0	2.8	2.9	3.5	2.0	4.2
3-Nov	3.7	4.1	5.0	6.2	6.8	8.2	8.8	9.3	9.1	7.2	4.8	5.0	5.3	4.1	3.0	2.7	3.4	3.8	3.8	2.2	1.5	1.3	1.0	0.7	4.6	9.3
4-Nov	0.5	0.5	0.5	0.5	0.6	1.1	2.3	3.2	4.2	4.4	2.6	1.8	1.5	1.4	1.3	2.4	4.3	5.6	6.2	4.0	3.2	3.4	3.2	2.9	2.6	6.2
5-Nov	2.9	3.7	4.6	3.9	3.3	3.2	3.4	3.4	3.3	3.0	2.8	4.6	4.5	2.8	3.5	4.0	3.8	3.1	3.3	3.1	3.3	3.3	3.1	2.7	3.4	4.6
6-Nov	2.8	2.6	1.9	1.7	1.5	1.5	1.6	1.5	1.4	1.3	1.3	1.2	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.6	2.8
7-Nov	1.4	1.4	1.4	1.4	1.5	1.7	1.7	1.6	1.9	2.0	1.7	1.7	1.7	C	C	2.5	2.2	2.0	1.8	1.5	1.4	8.4	13.0	13.7	3.1	13.7
8-Nov	15.8	11.5	6.9	6.2	6.5	7.5	8.0	8.6	7.4	6.5	8.7	8.8	8.8	6.4	7.3	7.7	7.7	7.0	6.7	6.8	6.4	5.2	5.0	5.2	7.6	15.8
9-Nov	3.2	3.2	8.6	9.4	10.9	9.7	6.9	5.3	5.4	2.4	1.8	1.3	0.6	1.8	2.9	2.4	1.6	1.5	1.6	UO	UO	UO	UO	UO	4.2	10.9
10-Nov	UO	UO	UO	UO	UO	0.1	0.3	0.6	0.9	1.0	1.3	1.7	2.3	5.5	11.7	14.0	16.5	12.0	10.6	10.0	10.7	8.6	9.5	6.2	6.5	16.5
11-Nov	6.5	8.8	4.6	4.4	4.7	4.8	3.7	2.9	2.6	2.1	1.9	2.0	2.3	2.6	UO	UO	2.4	2.3	2.2	2.3	2.4	2.5	2.5	2.4	3.3	8.8
12-Nov	2.5	2.6	2.6	2.8	2.7	2.7	2.6	2.9	3.2	3.1	2.5	4.0	2.9	2.5	2.3	2.3	2.4	3.5	2.7	2.3	2.9	1.8	1.6	1.5	2.6	4.0
13-Nov	1.7	1.8	1.8	1.7	1.8	2.0	2.0	1.7	1.5	1.4	1.4	1.8	2.7	3.6	4.4	3.8	3.1	3.4	3.6	3.7	3.8	3.7	2.9	2.3	2.6	4.4
14-Nov	2.0	2.7	6.2	3.2	3.2	2.6	2.5	2.2	2.0	1.5	1.1	0.5	0.3	0.3	0.7	1.6	0.8	0.5	0.7	0.0	0.1	UO	UO	0.1	1.6	6.2
15-Nov	0.0	0.1	0.3	0.4	0.7	1.0	1.1	1.2	1.3	1.3	1.3	1.1	1.0	0.9	0.7	1.0	1.1	1.2	1.2	6.4	2.3	1.3	2.0	2.3	1.3	6.4
16-Nov	2.3	2.2	4.2	4.0	1.8	1.3	1.3	1.2	1.5	1.5	4.3	12.0	9.3	6.9	1.0	0.3	0.2	0.1	0.2	0.1	0.2	0.2	0.4	0.5	2.4	12.0
17-Nov	0.6	0.7	0.5	1.1	0.6	1.0	1.8	0.9	1.2	1.7	0.7	0.9	1.4	1.1	1.6	1.8	2.0	1.4	1.2	1.2	1.5	1.4	1.4	0.5	1.2	2.0
18-Nov	0.2	0.4	0.3	0.3	0.4	0.4	0.3	0.4	1.1	0.2	M	M	2.8	2.4	3.6	5.0	4.8	8.5	4.6	2.2	1.4	0.8	1.9	2.2	2.0	8.5
19-Nov	1.8	0.5	0.7	0.5	0.4	0.7	0.8	3.5	4.7	1.3	1.9	2.8	4.1	7.4	9.3	7.3	4.2	3.1	2.1	2.4	4.4	6.1	2.8	6.8	3.3	9.3
20-Nov	6.8	2.9	1.9	2.9	2.9	2.7	2.3	2.5	2.7	2.9	4.1	5.1	11.7	14.5	12.7	14.6	14.3	8.1	9.8	9.3	8.3	9.4	8.9	8.6	7.1	14.6
21-Nov	6.8	9.3	9.0	8.7	9.9	8.6	7.4	7.8	8.5	9.6	9.5	10.6	11.3	10.1	9.1	9.3	8.2	7.8	6.2	5.8	3.9	3.5	3.1	2.7	7.8	11.3
22-Nov	2.6	2.5	2.8	3.4	3.3	3.5	4.0	5.1	5.5	4.5	4.6	5.1	6.2	7.0	8.4	8.8	9.4	8.4	6.9	6.5	5.1	5.0	5.8	5.8	5.4	9.4
23-Nov	6.1	7.0	7.5	7.8	8.0	7.6	8.2	8.1	8.2	8.3	9.4	7.9	9.2	8.6	6.2	5.4	4.9	5.8	5.4	5.1	4.8	4.5	4.6	5.9	6.9	9.4
24-Nov	6.3	6.5	7.2	7.9	9.0	9.6	9.6	9.3	9.4	10.3	11.7	15.1	14.5	12.6	11.7	11.8	12.9	14.8	13.8	14.8	13.6	7.6	8.8	7.7	10.7	15.1
25-Nov	7.0	6.8	7.7	7.4	7.2	8.3	6.7	5.4	4.5	4.3	4.8	5.0	5.2	5.8	5.6	6.0	7.0	7.8	7.1	6.9	6.8	6.6	7.9	7.4	6.5	8.3
26-Nov	7.5	8.7	8.5	7.5	7.6	9.0	10.4	12.0	12.7	14.6	18.6	18.9	17.7	13.7	10.8	8.9	8.2	7.8	6.2	6.0	6.2	7.4	8.3	7.9	10.2	18.9
27-Nov	8.4	12.3	13.9	17.4	20.9	13.3	12.1	13.4	9.8	10.4	9.3	9.2	7.0	6.1	4.6	4.7	4.5	5.0	5.1	4.6	4.5	4.6	4.1	3.9	8.7	20.9
28-Nov	4.3	4.6	4.5	4.5	4.4	4.9	5.9	6.1	6.1	6.9	10.9	11.5	8.9	8.5	5.9	4.7	4.6	4.6	4.8	4.7	4.4	4.5	4.5	4.4	5.8	11.5
29-Nov	4.9	5.4	5.0	4.4	4.4	4.6	4.9	5.0	5.8	5.2	5.3	5.5	4.9	16.9	29.5	11.7	4.3	3.8	3.6	3.3	3.6	3.9	3.9	2.9	6.4	29.5
30-Nov	2.9	3.0	3.3	3.4	3.6	3.4	3.4	4.7	4.8	4.9	5.1	3.0	3.4	8.4	3.2	3.0	4.2	3.2	3.2	3.2	3.1	3.2	3.5	3.5	3.8	8.4
																								Diurnal Average		
																								Diurnal Maximum		
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}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - November 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	399	56.84	56.84
6 - 15	207	29.49	86.32
16 - 25	8	1.14	87.46
26 - 80	1	0.14	87.61
> 81.0	0	0.00	87.61

Total Number of Valid Hours: 702

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
CNRL Horizon - November 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	3	30	14	6	4	1	5	14	57	112	81	29	8	10	8	5	387
6 - 15	0	22	17	2	1	2	6	20	29	44	31	8	6	4	4	3	199
16 - 25	0	0	0	0	0	0	0	0	1	2	2	1	0	0	1	1	8
26 - 80	0	0	0	0	0	0	0	0	0	0	1	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	3	52	31	8	5	3	11	34	87	158	115	38	14	14	13	9	595

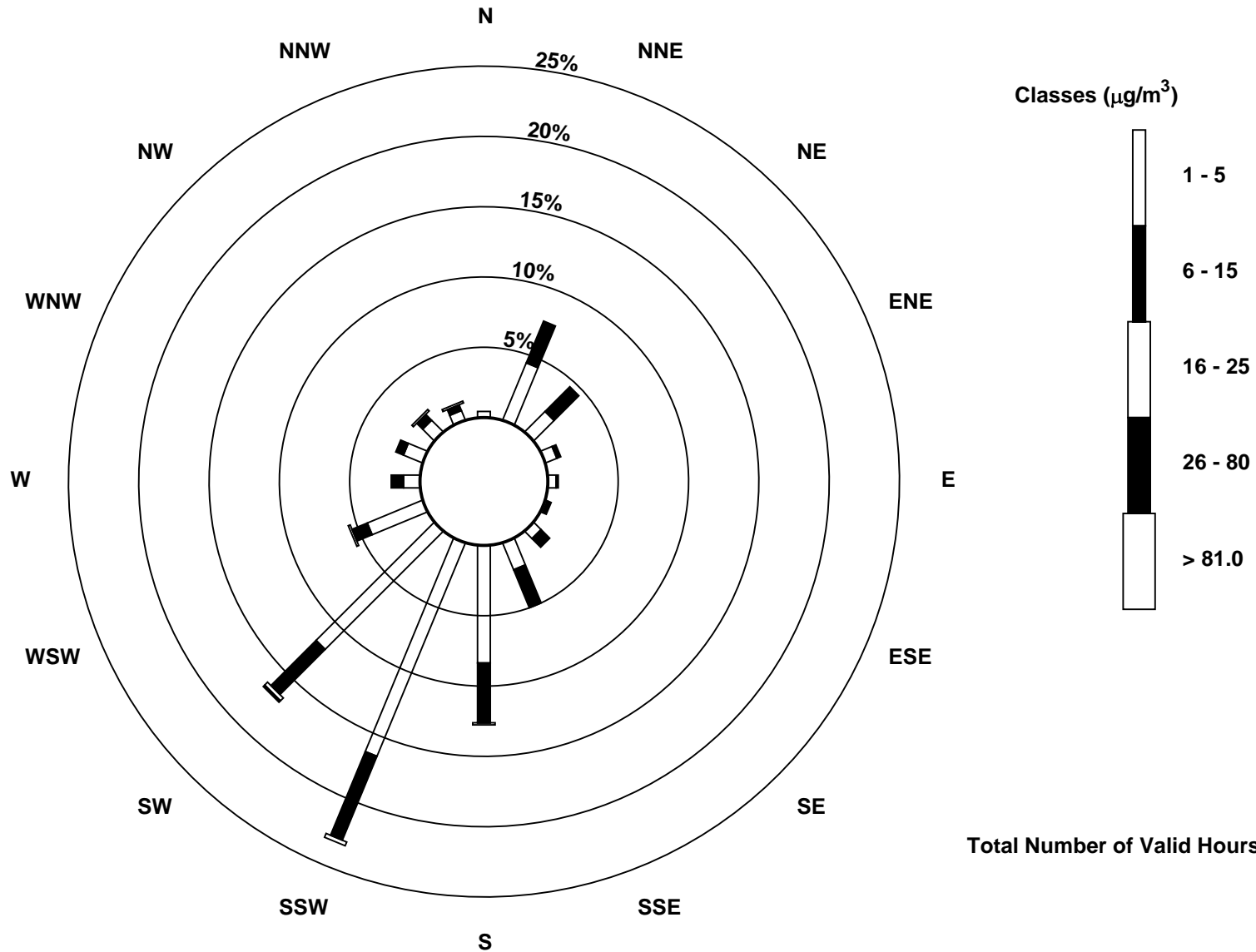
Total Number of Valid Hours: 682

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon (AMS 15)





Wood Buffalo Environmental Association
Summary of Hour Averages

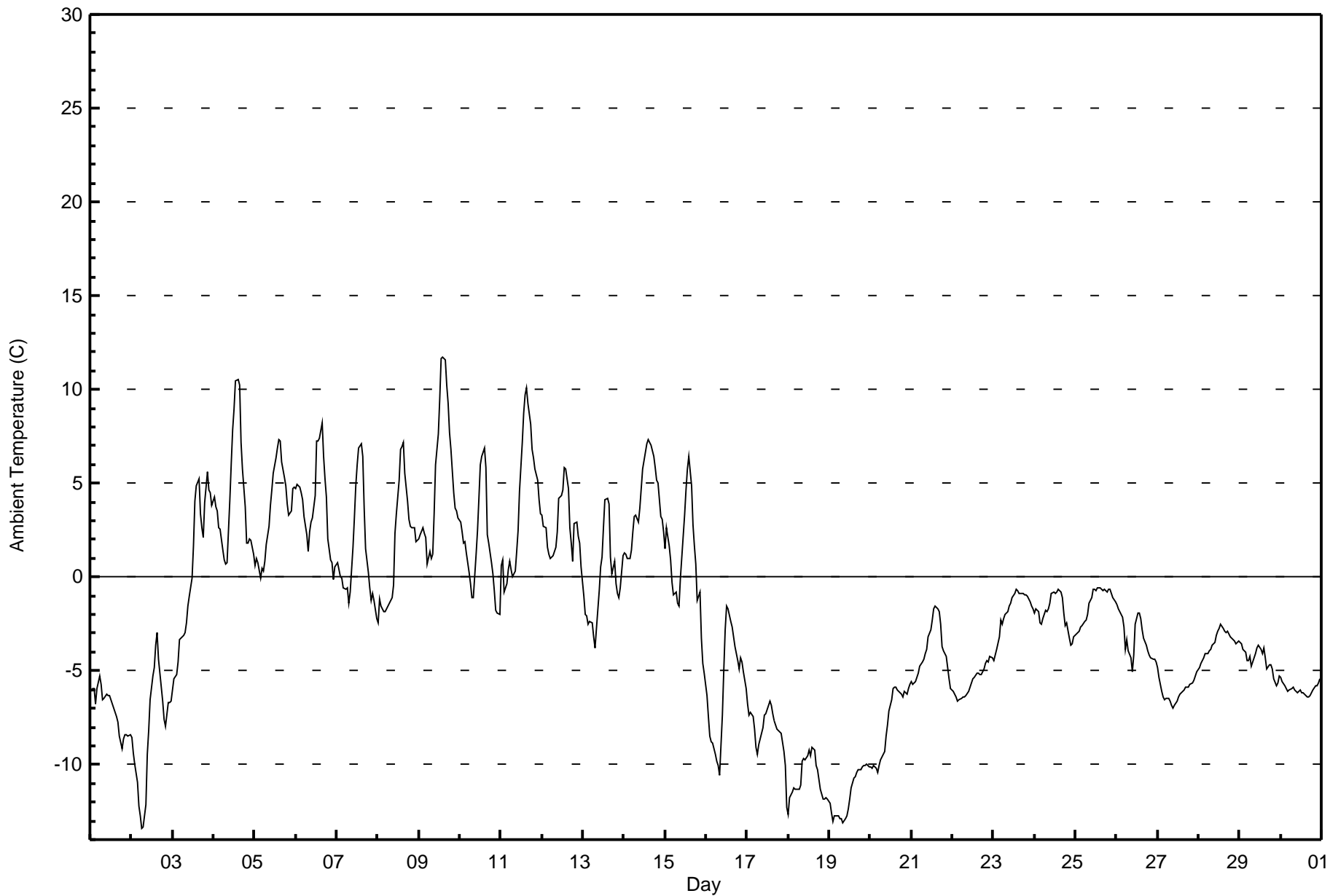
Ambient Temperature (AT) - C
CNRL Horizon - November 2016

Maximum Value: 11.7 C on Nov 9 15:00		Maximum Daily Average: 5.2 C on Nov 9		Hours in Service: 720																																												
Minimum Value: -13.4 C on Nov 2 07:00		Minimum Daily Average: -11.6 C on Nov 19		Hours of Data: 720																																												
Maximum Diurnal Average: 0.7 C at hour 15		Minimum Diurnal Average: -3.9 C at hour 8		Hours of Missing Data: 0																																												
Monthly Average: -2.13 C		Percentiles: P ₁ = -12.8 P ₁₀ = -9.2 Q ₁ = -6.0 Median = -2.3 Q ₃ = 1.7 P ₉₀ = 4.9 P ₉₉ = 10.2		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-Nov	-6.1	-5.9	-5.9	-6.8	-6.0	-5.3	-5.7	-6.5	-6.5	-6.2	-6.3	-6.3	-6.5	-6.8	-7.2	-7.4	-7.7	-8.4	-9.1	-8.7	-8.4	-8.4	-8.5	-8.4	-7.1	-5.3																						
2-Nov	-8.6	-9.4	-10.0	-11.0	-12.2	-12.7	-13.4	-13.3	-12.1	-9.4	-8.2	-6.6	-5.3	-4.8	-3.6	-3.0	-4.4	-5.9	-6.6	-7.6	-7.9	-6.7	-6.7	-6.6	-8.2	-3.0																						
3-Nov	-6.0	-5.4	-5.2	-4.5	-3.3	-3.3	-3.1	-2.9	-2.4	-1.6	-1.0	-0.1	1.6	4.1	4.8	5.2	3.4	2.7	2.1	4.0	5.6	4.7	4.5	3.8	0.3	5.6																						
4-Nov	4.3	3.7	3.5	2.6	2.5	1.4	0.9	0.7	0.8	4.2	6.0	7.8	8.9	10.5	10.5	10.2	7.2	5.8	3.8	1.8	1.8	2.1	2.0	1.2	4.3	10.5																						
5-Nov	0.6	1.0	0.7	0.0	0.5	0.4	0.9	1.7	2.7	3.8	4.6	5.5	6.4	6.9	7.4	7.3	6.2	5.3	4.9	3.9	3.3	3.5	4.7	4.8	3.6	7.4																						
6-Nov	4.7	4.9	4.8	4.5	4.1	3.2	2.2	1.3	2.4	3.0	3.1	4.4	7.3	7.3	7.4	8.2	6.4	5.3	4.3	2.0	0.9	0.8	-0.2	0.5	3.9	8.2																						
7-Nov	0.7	0.4	0.0	0.0	-0.6	-0.6	-0.6	-1.4	-0.8	1.6	3.1	4.9	6.0	6.9	7.1	6.4	3.7	1.5	0.3	-0.6	-1.2	-0.9	-1.2	-2.2	1.3	7.1																						
8-Nov	-2.5	-1.2	-1.6	-1.8	-1.8	-1.7	-1.6	-1.4	-1.1	-0.4	2.3	3.4	5.1	6.8	6.9	7.2	5.5	4.1	3.0	2.7	2.7	2.6	1.9	2.0	1.7	7.2																						
9-Nov	2.1	2.3	2.6	2.3	2.1	0.7	1.4	1.0	1.2	3.4	6.0	7.6	9.5	11.7	11.7	11.6	10.2	9.3	7.7	6.8	4.5	3.7	3.5	3.1	5.2	11.7																						
10-Nov	3.0	2.4	1.8	1.9	1.3	0.3	-0.4	-1.1	-1.1	1.2	2.5	4.2	6.0	6.5	6.9	5.9	2.3	1.8	0.7	0.1	-0.7	-1.8	-1.9	-2.0	1.7	6.9																						
11-Nov	0.6	0.9	-0.8	-0.3	0.4	0.8	0.4	0.0	0.3	1.4	2.5	4.5	7.2	8.7	9.7	10.1	9.3	8.1	6.8	6.3	5.8	5.2	4.1	3.4	4.0	10.1																						
12-Nov	3.3	2.7	2.6	1.6	1.3	1.0	1.1	1.4	1.6	2.4	4.2	4.3	4.6	5.9	5.8	4.7	2.6	1.8	0.8	2.8	2.9	2.2	1.8	0.6	2.7	5.9																						
13-Nov	-1.0	-2.0	-2.1	-2.5	-2.4	-2.4	-3.2	-3.8	-2.8	-0.7	0.5	1.1	2.7	4.1	4.2	3.9	1.1	0.2	0.9	-0.4	-0.8	-1.1	-0.6	1.1	-0.3	4.2																						
14-Nov	1.3	1.2	1.0	1.0	1.4	2.4	3.2	3.3	2.9	3.6	4.7	5.7	6.6	7.1	7.3	7.2	7.0	6.4	5.8	5.1	5.0	3.2	3.1	2.4	4.1	7.3																						
15-Nov	1.5	2.6	1.7	0.9	-0.2	-0.9	-0.8	-1.4	-1.5	0.0	1.1	3.3	4.7	5.8	6.4	4.9	2.7	1.6	0.7	-1.2	-0.8	-3.3	-4.6	-5.2	0.8	6.4																						
16-Nov	-6.3	-7.5	-8.5	-8.8	-8.9	-9.4	-9.8	-10.0	-10.6	-7.3	-5.0	-2.8	-1.5	-1.7	-2.3	-2.6	-3.2	-3.7	-4.5	-4.9	-4.3	-4.6	-5.0	-5.9	-5.8	-1.5																						
17-Nov	-6.8	-7.4	-7.2	-7.4	-8.1	-9.1	-9.5	-8.9	-8.3	-8.0	-7.4	-7.3	-6.9	-6.6	-6.9	-7.3	-7.7	-8.1	-8.2	-8.3	-8.4	-9.3	-10.0	-12.3	-8.1	-6.6																						
18-Nov	-12.6	-11.7	-11.4	-11.2	-11.3	-11.3	-11.3	-11.1	-9.8	-9.7	-9.8	-9.5	-9.2	-9.5	-9.1	-9.2	-10.1	-10.3	-10.8	-11.3	-11.8	-11.9	-11.7	-11.8	-10.7	-9.1																						
19-Nov	-12.0	-12.6	-13.0	-12.7	-12.7	-12.8	-12.9	-12.9	-13.1	-12.9	-12.7	-12.4	-11.9	-11.2	-10.7	-10.6	-10.4	-10.3	-10.3	-10.1	-10.0	-10.0	-10.0	-10.1	-11.6	-10.0																						
20-Nov	-10.1	-10.2	-10.1	-10.2	-10.4	-10.0	-9.7	-9.6	-9.3	-8.5	-7.9	-7.2	-6.5	-6.0	-5.8	-5.9	-6.0	-6.2	-6.3	-6.4	-6.1	-6.2	-6.0	-5.7	-7.8	-5.7																						
21-Nov	-5.6	-5.7	-5.6	-5.3	-5.2	-4.8	-4.6	-4.4	-4.1	-3.9	-3.2	-2.8	-2.3	-1.7	-1.5	-1.7	-1.8	-2.5	-3.7	-3.9	-4.2	-4.8	-5.4	-5.9	-3.9	-1.5																						
22-Nov	-6.1	-6.2	-6.4	-6.6	-6.6	-6.5	-6.4	-6.4	-6.3	-6.1	-5.9	-5.7	-5.4	-5.3	-5.1	-5.1	-5.2	-5.2	-4.9	-4.6	-4.5	-4.5	-4.3	-4.3	-5.6	-4.3																						
23-Nov	-4.5	-4.2	-3.8	-3.2	-2.3	-2.5	-2.2	-2.0	-1.9	-1.6	-1.4	-1.1	-0.9	-0.6	-0.7	-0.9	-0.9	-0.9	-0.9	-0.9	-1.0	-1.4	-1.6	-1.7	-1.8	-0.6																						
24-Nov	-1.9	-1.7	-1.9	-2.4	-2.5	-2.2	-1.7	-1.8	-1.7	-1.4	-0.9	-0.8	-0.9	-0.8	-0.6	-0.8	-1.1	-2.0	-2.6	-2.4	-3.3	-3.6	-3.5	-3.2	-1.9	-0.6																						
25-Nov	-3.0	-2.9	-2.9	-2.7	-2.6	-2.4	-2.3	-2.0	-1.4	-1.1	-0.6	-0.6	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.8	-0.7	-0.6	-0.9	-1.1	-1.3	-1.4	-0.6																						
26-Nov	-1.5	-1.7	-1.8	-2.1	-2.7	-3.9	-3.4	-4.0	-4.3	-5.0	-4.2	-2.5	-1.9	-1.9	-2.2	-2.8	-3.3	-3.6	-3.9	-4.2	-4.3	-4.4	-4.4	-4.5	-3.3	-1.5																						
27-Nov	-4.8	-5.4	-6.1	-6.4	-6.5	-6.5	-6.5	-6.6	-6.8	-7.0	-6.8	-6.6	-6.4	-6.2	-6.2	-6.0	-5.9	-5.9	-5.9	-5.8	-5.6	-5.5	-5.3	-5.0	-6.1	-4.8																						
28-Nov	-4.9	-4.6	-4.5	-4.3	-4.1	-4.1	-3.9	-3.8	-3.7	-3.5	-3.1	-2.9	-2.7	-2.5	-2.8	-2.9	-2.9	-2.9	-2.9	-3.2	-3.2	-3.3	-3.4	-3.5	-3.4	-3.5	-2.5																					
29-Nov	-3.5	-3.6	-3.9	-4.0	-4.4	-4.5	-4.2	-4.8	-4.3	-4.1	-3.8	-3.6	-3.9	-4.0	-3.8	-4.3	-4.9	-4.7	-4.7	-4.9	-5.4	-5.8	-5.7	-5.3	-4.4	-3.5																						
30-Nov	-5.4	-5.6	-5.8	-6.0	-6.1	-6.1	-6.0	-5.9	-6.0	-6.1	-6.1	-6.0	-6.1	-6.2	-6.3	-6.4	-6.4	-6.4	-6.2	-6.0	-5.8	-5.8	-5.6	-5.5	-6.0	-5.4																						
																								-3.0	-3.1	-3.3	-3.5	-3.6	-3.8	-3.8	-3.9	-3.6	-2.7	-1.8	-0.9	-0.1	0.5	0.7	0.5	-0.5	-1.1	-1.7	-2.0	-2.2	-2.5	-2.7	-2.9	Diurnal Average
																								4.7	4.9	4.8	4.5	4.1	3.2	3.2	3.3	2.9	4.2	6.0	7.8	9.5	11.7	11.7	11.6	10.2	9.3	7.7	6.8	5.8	5.2	4.7	4.8	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
CNRL Horizon - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
CNRL Horizon - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	478	66.39	66.39
0 - 10	234	32.50	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

Precipitation (PC) - mm

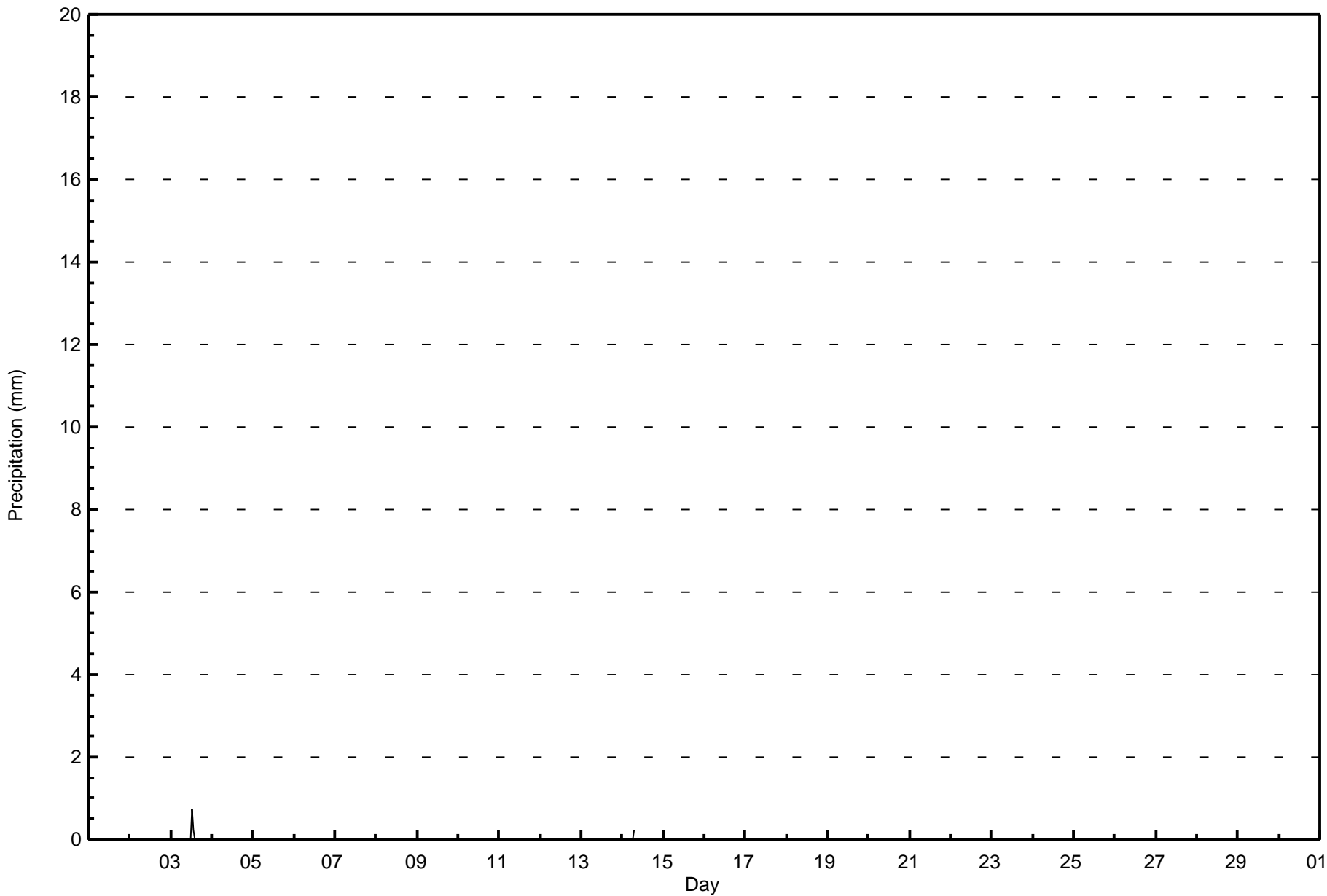
CNRL Horizon - November 2016

Maximum Value: 0.8 mm on Nov 3 13:00 Maximum Daily Total: 1.0 mm on Nov 3 Minimum Value: 0.0 mm on Nov 1 01:00 Minimum Daily Total: 0.0 mm on Nov 1 Maximum Diurnal Total: 0.8 mm at hour 13 Minimum Diurnal Total: 0.0 mm at hour 1 Monthly Total: 1.27 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 in Service: 720 Hours of Data: 320 Hours of Missing Data: 400 Hours of Calibration: 0 Percent Operational Time: 44.4																																	
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-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	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	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	0.0	0.0	0.0	0.8	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	1.0	0.8																					
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	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	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	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	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	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	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	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	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	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	0.3	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	0.3	0.3																					
15-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	AF	AF	AF	AF	AF	AF	AF																						
16-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	AF	AF	AF	AF	AF	AF	AF																						
17-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	AF	AF	AF	AF	AF	AF	AF																						
18-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	AF	AF	AF	AF	AF	AF	AF																						
19-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	AF	AF	AF	AF	AF	AF	AF																						
20-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	AF	AF	AF	AF	AF	AF	AF																						
21-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	AF	AF	AF	AF	AF	AF	AF																						
22-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	AF	AF	AF	AF	AF	AF	AF																						
23-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	AF	AF	AF	AF	AF	AF	AF																						
24-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	AF	AF	AF	AF	AF	AF	AF																						
25-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	AF	AF	AF	AF	AF	AF	AF																						
26-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	AF	AF	AF	AF	AF	AF	AF																						
27-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	AF	AF	AF	AF	AF	AF	AF																						
28-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	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	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	AF	AF	AF	AF	AF	AF	AF																						
																								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.8	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	Diurnal Average	
																								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.8	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	Diurnal Maximum
AF - Analyzer Failure																																																									



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
CNRL Horizon - November 2016



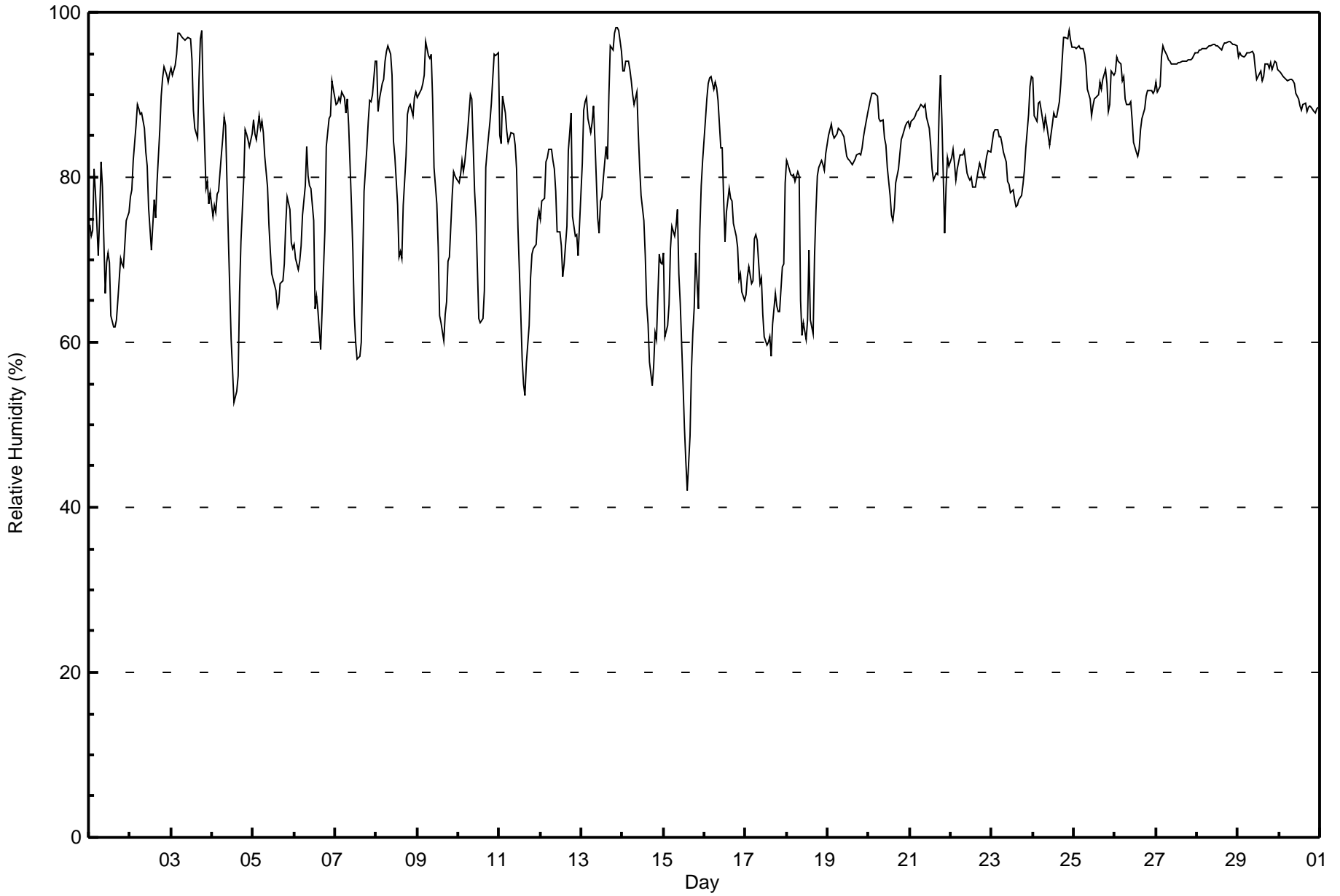


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
CNRL Horizon - November 2016**

Maximum Value: 98 % on Nov 13 22:00 Maximum Daily Average: 95.9 % on Nov 28																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 42 % on Nov 15 15:00 Minimum Daily Average: 64.7 % on Nov 15 Maximum Diurnal Average: 87.5 % at hour 8 Minimum Diurnal Average: 73.3 % at hour 15 Monthly Average: 82.1 % Percentiles: P ₁ = 55 P ₁₀ = 65 Q ₁ = 75 Median = 84 O ₃ = 91 P ₉₀ = 95 P ₉₉ = 97																										
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	74	73	74	81	78	70	75	82	79	66	70	71	70	63	62	62	63	65	70	69	69	72	75	76	71.2	82
2-Nov	78	78	82	86	89	88	88	88	86	83	81	76	71	74	77	75	79	86	90	92	93	92	91	93	84.1	93
3-Nov	93	92	94	95	97	97	97	97	97	97	97	97	94	88	86	85	92	97	98	90	79	79	77	78	91.3	98
4-Nov	75	77	76	78	78	83	85	87	86	73	66	60	57	53	54	56	66	72	80	86	85	85	84	85	74.4	87
5-Nov	87	85	85	87	86	87	85	83	79	74	71	68	67	66	64	65	67	68	70	74	78	76	72	71	75.6	87
6-Nov	72	70	69	70	72	75	79	84	80	79	79	75	64	66	64	59	64	69	74	84	87	87	92	91	75.1	92
7-Nov	89	89	90	89	90	90	88	89	86	77	71	63	60	58	58	60	69	78	84	87	89	89	90	94	80.3	94
8-Nov	94	88	89	91	92	94	95	96	95	92	84	83	77	70	71	70	77	83	88	88	89	88	90	90	86.4	96
9-Nov	90	90	91	91	92	97	95	94	95	89	81	77	72	63	62	60	63	65	70	70	78	81	80	80	80.3	97
10-Nov	79	80	82	81	82	85	88	90	90	78	75	69	63	62	63	66	81	83	87	89	92	95	95	95	81.3	95
11-Nov	85	84	90	88	86	84	85	85	85	84	81	74	64	58	55	54	57	62	68	71	71	72	75	76	74.7	90
12-Nov	75	77	78	82	82	83	83	82	81	78	73	73	72	68	70	74	83	85	88	75	73	73	70	74	77.3	88
13-Nov	82	88	89	90	87	85	87	89	85	75	73	77	78	80	84	82	90	96	95	97	98	98	98	95	87.4	98
14-Nov	93	93	94	94	93	92	90	89	90	85	81	78	75	70	65	62	58	55	57	61	60	71	70	70	76.9	94
15-Nov	71	61	62	65	71	74	73	74	76	68	65	55	50	46	42	49	57	61	64	71	64	74	79	82	64.7	82
16-Nov	87	89	91	92	92	91	91	91	89	84	84	77	72	76	79	78	77	74	73	72	68	68	66	65	80.2	92
17-Nov	66	68	69	67	67	72	73	72	67	68	63	61	60	60	61	58	62	66	64	64	64	69	69	79	66.3	79
18-Nov	82	81	80	80	80	79	81	80	65	61	62	60	63	71	63	61	70	76	80	81	82	82	81	83	74.4	83
19-Nov	85	86	86	85	85	85	86	86	86	85	84	83	82	82	82	82	82	83	83	83	83	85	86	88	84.2	88
20-Nov	89	90	90	90	90	90	87	87	87	85	84	81	78	75	75	76	79	81	83	85	85	86	87	87	84.4	90
21-Nov	86	87	87	87	88	88	89	89	88	89	87	86	84	81	80	81	80	88	92	87	73	79	82	81	85.0	92
22-Nov	82	83	82	80	81	83	83	83	83	81	80	80	80	79	79	80	81	82	81	80	81	83	83	83	81.3	83
23-Nov	84	85	86	86	85	85	84	83	82	80	79	78	78	77	76	77	77	78	79	81	84	88	91	92	82.3	92
24-Nov	92	88	87	89	89	88	86	87	86	85	84	86	88	87	87	89	91	94	97	97	97	98	97	96	90.2	98
25-Nov	96	96	96	96	96	96	95	94	91	90	87	89	89	90	92	91	92	93	91	88	89	93	92	92	92.0	96
26-Nov	93	95	94	94	92	92	89	89	89	89	87	84	83	83	83	86	87	88	90	91	91	91	90	91	89.1	95
27-Nov	92	90	91	95	96	95	95	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	95	95	93.9	96
28-Nov	95	95	95	96	96	96	96	96	96	96	96	96	96	96	95	96	96	96	96	96	96	96	96	96	95.9	96
29-Nov	95	95	95	95	95	95	95	95	95	95	93	92	93	93	92	92	94	94	93	94	93	94	94	93	93.8	95
30-Nov	93	93	92	92	92	92	92	92	92	91	90	90	89	88	89	89	88	88	89	88	88	88	88	88	90.0	93
																			85.1 84.9 85.5 86.4 86.6 87.1 87.1 87.5 86.0 82.3 80.1 77.8 75.3 73.9 73.3 73.6 77.2 80.0 82.3 83.0 82.4 84.0 84.5 85.3				Diurnal Average			
																			96 96 96 96 97 97 97 97 97 97 97 97 96 96 95 96 96 96 97 98 97 98 98 98 96				Diurnal Maximum			





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
CNRL Horizon - November 2016

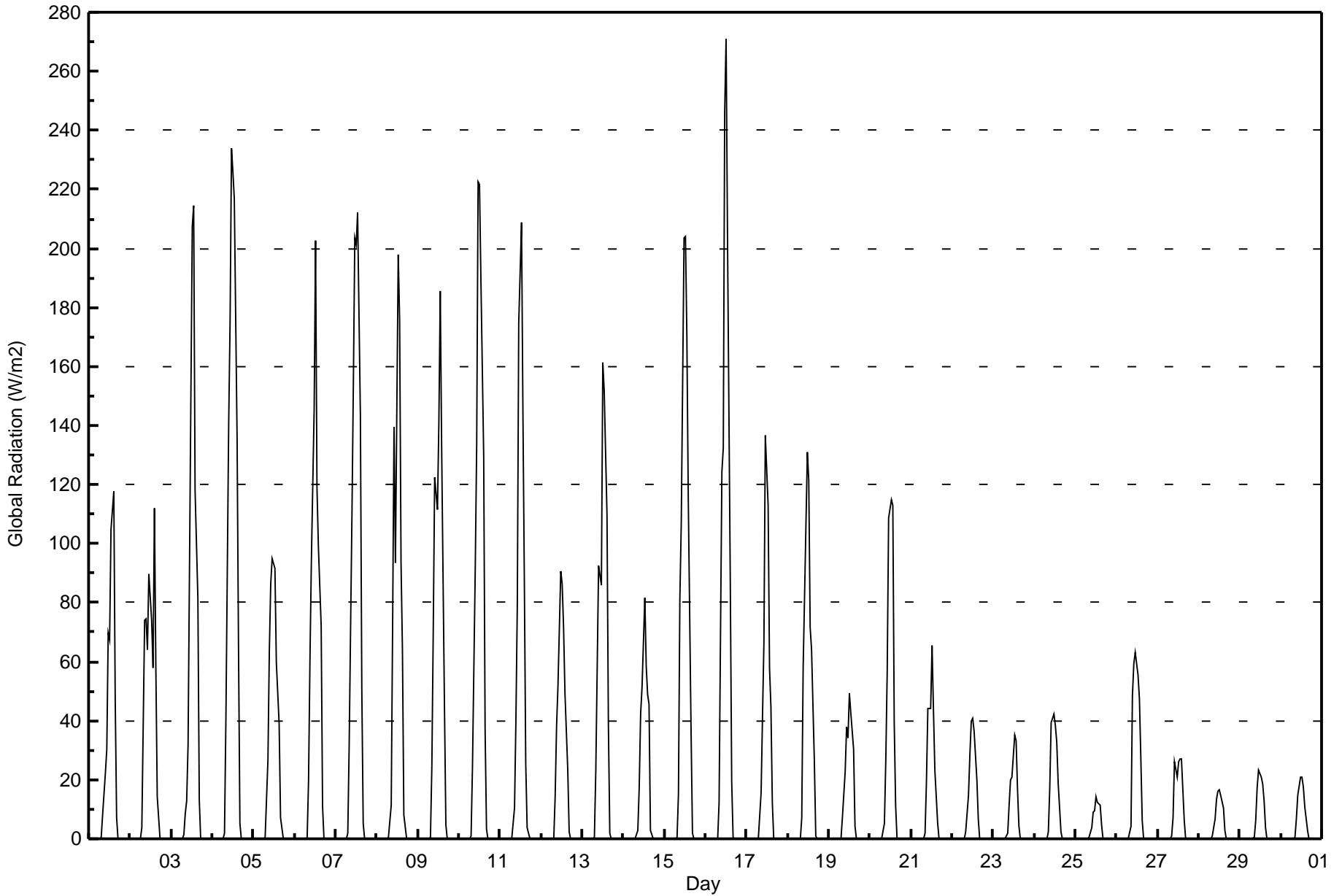
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	23	3.19	3.19
60 - 80	234	32.50	35.69
80 - 100	463	64.31	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 271 W/m2 on Nov 16 13:00																			Maximum Daily Average: 51.7 W/m2 on Nov 4						Hours in Service: 720	
Minimum Value: 0 W/m2 on Nov 1 01:00																			Minimum Daily Average: 2.7 W/m2 on Nov 25						Hours of Data: 720	
Maximum Diurnal Average: 112.6 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 3						Hours of Missing Data: 0	
Monthly Average: 22.3 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 17 P ₉₀ = 86 P ₉₉ = 214						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	0	8	22	30	70	68	105	118	47	7	0	0	0	0	0	0	0	19.8	118
2-Nov	0	0	0	0	0	0	0	4	74	75	64	90	74	58	112	58	14	0	0	0	0	0	0	0	26.0	112
3-Nov	0	0	0	0	0	0	0	1	9	13	32	149	208	214	118	82	13	0	0	0	0	0	0	0	34.9	214
4-Nov	0	0	0	0	0	0	0	2	40	141	176	234	226	217	135	65	5	0	0	0	0	0	0	0	51.7	234
5-Nov	0	0	0	0	0	0	0	1	27	64	86	95	92	60	49	39	7	0	0	0	0	0	0	0	21.6	95
6-Nov	0	0	0	0	0	0	0	1	20	61	94	146	203	119	99	72	11	0	0	0	0	0	0	0	34.4	203
7-Nov	0	0	0	0	0	0	0	2	32	111	155	204	201	212	143	51	5	0	0	0	0	0	0	0	46.5	212
8-Nov	0	0	0	0	0	0	0	1	12	73	140	94	198	176	94	64	8	0	0	0	0	0	0	0	35.7	198
9-Nov	0	0	0	0	0	0	0	1	25	71	122	112	141	186	132	45	5	0	0	0	0	0	0	0	34.9	186
10-Nov	0	0	0	0	0	0	0	1	25	93	134	222	222	190	130	37	3	0	0	0	0	0	0	0	44.0	222
11-Nov	0	0	0	0	0	0	0	0	10	41	80	175	209	144	88	26	4	0	0	0	0	0	0	0	32.3	209
12-Nov	0	0	0	0	0	0	0	0	14	38	52	91	87	72	49	23	2	0	0	0	0	0	0	0	17.8	91
13-Nov	0	0	0	0	0	0	0	0	23	92	89	86	161	152	110	38	2	0	0	0	0	0	0	0	31.4	161
14-Nov	0	0	0	0	0	0	0	0	3	18	42	51	81	58	49	45	3	0	0	0	0	0	0	0	14.6	81
15-Nov	0	0	0	0	0	0	0	0	15	81	107	204	204	171	116	37	2	0	0	0	0	0	0	0	39.0	204
16-Nov	0	0	0	0	0	0	0	0	13	124	132	246	271	204	87	19	1	0	0	0	0	0	0	0	45.7	271
17-Nov	0	0	0	0	0	0	0	0	15	42	66	137	113	58	45	12	0	0	0	0	0	0	0	0	20.3	137
18-Nov	0	0	0	0	0	0	0	0	7	58	82	131	122	72	64	26	1	0	0	0	0	0	0	0	23.4	131
19-Nov	0	0	0	0	0	0	0	0	7	23	38	34	49	43	31	4	0	0	0	0	0	0	0	0	9.5	49
20-Nov	0	0	0	0	0	0	0	0	5	27	57	109	115	113	39	11	0	0	0	0	0	0	0	0	19.9	115
21-Nov	0	0	0	0	0	0	0	0	2	19	44	44	66	43	23	5	0	0	0	0	0	0	0	0	10.3	66
22-Nov	0	0	0	0	0	0	0	0	3	15	28	40	41	36	20	6	0	0	0	0	0	0	0	0	7.9	41
23-Nov	0	0	0	0	0	0	0	0	2	11	20	21	35	33	17	4	0	0	0	0	0	0	0	0	6.0	35
24-Nov	0	0	0	0	0	0	0	0	2	17	39	42	38	33	19	2	0	0	0	0	0	0	0	0	8.1	42
25-Nov	0	0	0	0	0	0	0	0	0	4	9	10	14	12	11	5	0	0	0	0	0	0	0	0	2.7	14
26-Nov	0	0	0	0	0	0	0	0	4	48	59	63	56	48	28	6	0	0	0	0	0	0	0	0	13.0	63
27-Nov	0	0	0	0	0	0	0	0	1	7	26	21	26	27	27	6	0	0	0	0	0	0	0	0	5.9	27
28-Nov	0	0	0	0	0	0	0	0	1	7	13	16	17	15	10	3	0	0	0	0	0	0	0	0	3.4	17
29-Nov	0	0	0	0	0	0	0	0	0	6	17	23	21	18	13	4	0	0	0	0	0	0	0	0	4.3	23
30-Nov	0	0	0	0	0	0	0	0	1	7	15	21	21	18	11	3	0	0	0	0	0	0	0	0	4.0	21
0.0																			13.3						Diurnal Average	
0																			74						Diurnal Maximum	





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

CNRL Horizon - November 2016

Maximum Speed: 22 km/h on Nov 1 14:00	Maximum Daily Speed Average: 11.7 km/h on Nov 17	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 28 23:00	Minimum Daily Speed Average: 0.4 km/h on Nov 28	Hours of Data: 700
Maximum Diurnal Speed Average: 6.8 km/h at hour 13	Minimum Diurnal Speed Average: 2.3 km/h at hour 19	Hours of Missing Data: 20
Monthly Average Velocity: 4.7 km/h 218.4 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 6 Median = 8 Q ₃ = 11 P ₉₀ = 14 P ₉₉ = 18	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-Nov	N6	NNE6	ENE4	S2	NNW1	NW7	ENE3	NE7	NW9	NW15	NW13	WNW13	WNW22	WNW19	NW17	NW16	NNW11	NE6	NE6	ENE2	SSW4	SSW3	SSE3	NW6.1	WNW22		
2-Nov	S3	S7	S6	S5	S5	SSW7	SSW7	SSW7	SW7	SSW6	SSW6	S7	SSW11	SSW10	SSW10	SSW11	WSW8	WSW8	SW7	SSW8	SSW9	SSW12	SSW11	S10	SSW7.5	SSW12	
3-Nov	S12	S13	SSW14	SSW12	SW11	SSW8	SSW7	SW6	SW10	SSW11	SSW12	SW9	SSW10	SW12	SW9	SSW10	S8	S7	S4	SSW12	SW13	SW13	SW8	SSW12	SSW9.8	SSW14	
4-Nov	SSW13	S11	S11	SSW12	SW11	SW8	SW6	SSW6	SSW11	SSW9	S7	S8	S10	SSW11	SSW10	SSW10	SSW7	SSW6	SW7	SSW5	SSW7	SSW8	SSW8	SSW7	SSW8.5	SSW13	
5-Nov	SSW9	SSW9	SW9	SW9	SW8	SSW10	SSW11	SSW13	SSW14	S13	S12	S10	SSW8	S7	S7	S7	SSW12	S8	SSE8	SSW11	SSW9	SSW13	SSW11	SSW14	SSW9.9	SSW14	
6-Nov	SW14	SW14	SW16	SW15	SW11	W3	WSW7	SW10	WSW13	WSW12	WSW10	SW10	SSW10	SSW10	SW10	SW10	SSW9	SW10	WSW6	SSW6	S8	SSW10	SSW8	SW13	SW9.9	SW16	
7-Nov	SW15	SW14	SW15	SW14	SW12	SW13	SW16	SSW13	SW14	SSW13	SW14	SW13	SW10	SSW12	SSW12	SSW9	S8	SSW5	AF	SSE5	WNW2	NW3	WNW3	SE2	SW9.6	SW16	
8-Nov	SSW6	SSW8	SSW8	SW8	SSW8	SW9	SW9	SW9	SSW10	SSW9	SSW10	SSW9	SSW11	SSW16	SSW15	SSW10	SSW10	SSW9	S6	SSW8	SSW9	SSW9	SSW9	S10	SSW9.3	SSW16	
9-Nov	S11	SSW11	S12	SSW12	S7	SSE3	S10	SSE3	S8	SW10	SSW15	SW13	SW14	WSW14	WNW13	W12	WSW15	WSW15	WSW12	SW12	SSW12	SSW16	SSW16	SW17	SW10.2	SW17	
10-Nov	SW16	SW16	SW14	SW14	SW13	SW10	SW9	S6	SSW7	S6	S7	S7	SSW8	SE7	S9	S6	S5	SSE6	S7	SSW7	SSW5	SW5	SW6	SW8	SSW7.7	SW16	
11-Nov	S10	SW7	WSW7	SSW7	SW9	SW10	SSW10	SSW11	SSW11	SSW12	SSW13	SSW13	SSW17	SSW14	SSW12	SW16	SSW15	SSW11	SE6	SE5	SSW12	SW10	SW13	SW16	SSW10.8	SSW17	
12-Nov	SW15	SW14	SW14	SSW13	SSW14	SSW8	SSW11	SSW11	SW12	SW16	SW13	SW5	SW12	SSW9	SSW9	S1	SW1	SW3	SW5	WSW7	WSW7	WSW11	WSW11	SW11	SW9.3	SW16	
13-Nov	SW7	SW8	SW7	SW10	SW12	SW12	SW7	SSW8	SW13	SW10	S10	S9	S11	SSW16	SW14	SW8	SW7	SW9	SW9	SSW9	SSW9	S9	S9	SSE8	SSW9.1	SSW16	
14-Nov	S7	SSE6	SSW6	SSW8	SW10	SSW10	SSW10	SSW10	SSW10	SSW11	SW13	SW12	SW10	WSW10	W14	W11	W16	W15	W19	WSW16	WSW15	WSW16	WSW19	SW9	WSW10.3	W19	
15-Nov	SW11	W12	WSW11	WSW18	WSW14	WSW16	WSW12	WSW16	WSW15	WSW17	WSW16	WSW15	SW13	WSW13	SW13	SW11	SW13	W9	WNW6	WSW6	W5	WNW4	NNW3	WSW11.4	WSW18		
16-Nov	NW3	AF	SSW3	SW4	SSW6	SW4	SSW5	AF	SW3	AF	ENE2	SSE5	ESE4	NE10	NE10	NE10	NE9	NE10	NE9	NE9	NNW18	NNW14	N19	NW18	N4.3	N19	
17-Nov	NW15	NW14	NW13	NNW14	NNW14	WNW9	WNW9	W6	NW12	W6	WNW13	WNW14	WNW11	W10	WNW17	WNW18	NW20	NW17	NW16	NW16	NW11	NW7	NW8	WSW4	NW11.7	NW20	
18-Nov	SW4	SW1	SSW4	SSW6	SW5	SW4	SSW6	S2	NNW11	NW11	NW10	NNW8	WNW4	S4	WSW5	WSW7	ENE2	AF	AF	NNE9	NNE8	NNE8	NE8	NE8	NW2.0	NW11	
19-Nov	NNE6	NNE8	NNE6	NNE6	NNE7	NNE8	NNE8	NNE8	NNE8	NNE9	NNE10	NNE9	NNE9	NNE10	NNE11	NNE12	NNE11	NNE10	NNE11	NNE10	NNE9	NNE8	NNE7	NNE6	NNE8.6	NNE12	
20-Nov	NNE6	NE5	NE6	NNE5	NE6	NE5	E4	E4	ENE4	S1	S5	S6	S7	SSW5	SSE1	AF	AF	NE3	NE3	NE4	NNE4	NE3	NE3	NNE4	ENE2.2	S7	
21-Nov	NNE5	NNE5	NNE5	NNE3	AF	AF	AF	AF	W2	W4	SW3	WSW6	SW6	WSW5	W5	WNW3	NNW3	NE10	NE10	NE8	N11	NNE9	NE8	NE8	N3.0	N11	
22-Nov	NE6	NE5	ENE5	NE3	AF	AF	AF	AF	AF	E1	SE3	SE5	S7	S6	S5	SSE4	SSE4	SSE4	S5	S6	S5	SSE5	SSE6	SE8	SE3.6	SE8	
23-Nov	SE7	SSE7	SE8	SSE8	SSE10	SSE9	SSE10	SSE11	S12	S13	S14	S10	SSE10	SSE11	SSE11	SSE10	SSE8	SSE8	S8	SSW9	SSW7	S8	S8	SSE9.2	S14		
24-Nov	SSW7	S9	SSW9	S9	SSW8	S8	S8	SSW9	S8	S8	SSW9	SW10	SSW9	SW8	SW4	W4	WNW3	NNE3	NNE4	NNW4	ENE3	NE5	ESE5	WSW1	SSW4.3	SW10	
25-Nov	NNW2	NE5	NE5	NE7	NE6	NNE5	E5	SE5	SSE6	SSE5	SSE5	E2	AF	AF	NE3	NW3	W4	W5	SW6	WSW7	WSW6	SW8	SW10	SW10	SSW0.9	SW10	
26-Nov	SW9	SW8	SW8	SW8	SW8	SW8	SW8	WSW7	SSW5	SW7	WSW10	SW10	SW10	SSW9	S8	SW7	SSW9	SSW7	SSW7	SSW8	SSW5	WSW3	S3	SW7.1	SW10		
27-Nov	WSW3	NW5	NW7	NW7	NNW6	NE6	NNE6	NNE6	NE5	NNE5	NNE8	NNE7	NNE8	NNE9	NNE11	NNE9	NNE10	NNE10	NNE10	NNE10	NNE10	NNE10	NNE9	NNE6	NNE3	NNE6.6	NNE11
28-Nov	NE3	NNE4	NNE4	NE3	SSW2	SW4	SSW2	SSE3	SSW3	S3	SSW3	S3	SSW1	SSW1	ENE2	ENE1	AF	SW1	NNW1	NE1	SSE0	SW1	WSW0	W2	S0.4	NNE4	
29-Nov	N1	WSW1	SSW3	SSW4	SSE1	N1	ESE3	WSW1	SE1	SW2	SW5	SSW6	SSW7	SSW7	SW6	SSW8	SW7	SSW6	S7	S7	SSW13	SSW8	SSW6	SSW9	SSW4.5	SSW13	
30-Nov	SSW11	S10	S11	S10	S12	SSW11	SSW10	S11	S10	S9	S11	S10	S11	S12	S10	S10	SSW12	SSW11	SSW12	SSW12	SSW12	SSW13	S13	S12	SSW11	S11.0	SSW13

SW4.5SSW4.3 SW4.8 SW5.3 SW5.7 SW4.9SSW5.4SSW5.2 SW5.5 SW5.8 SW6.1 SW5.9SSW6.8SSW6.3 SW5.0 SW4.6WSW4.1 SW3.3 SW2.3 SW2.6 SW3.5 SW4.1 SW4.1SSW4.8	Diurnal Average
SW16 SW16 SW16WSW18WSW15WSW14 SW16 SSW13WSW16 SW16WSW17WSW16 SSW17WNW22WNW19WNW18 NW20 NW17 W19WSW16NNW18 WSW16WSW19 NW18	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 - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 6 km/h on Nov 14 18:00	Hours of Data: 700
Minimum Value: 0 km/h on Nov 16 01:00	Hours of Missing Data: 20
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 3 P ₉₉ = 5	Hours of Calibration: 0
	Percent Operational Time: 97.2

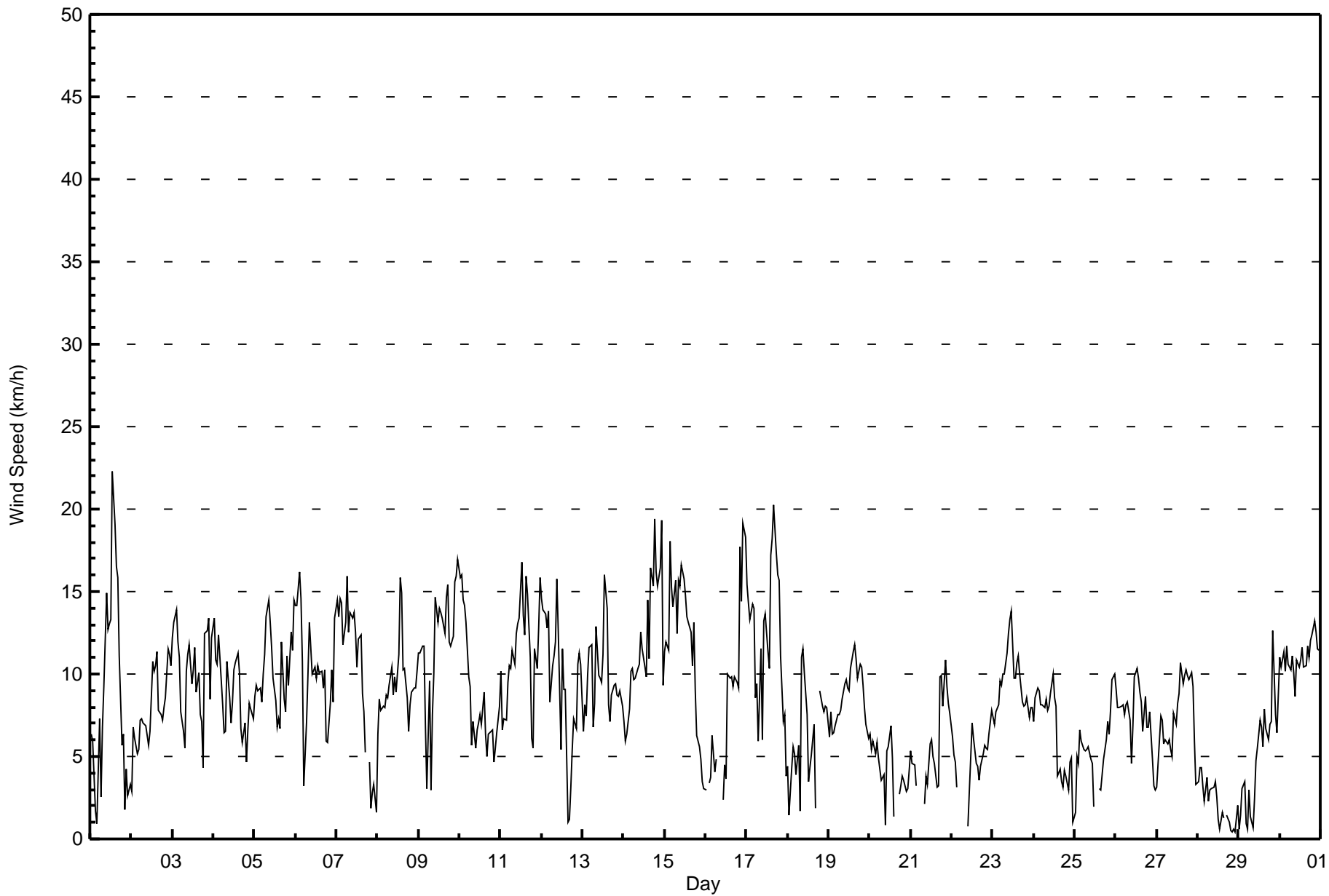
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	2	2	1	1	1	2	1	2	3	3	3	3	3	3	4	3	3	4	2	2	2	1	1	1	4
2-Nov	2	1	1	1	1	1	1	1	2	2	2	3	4	3	3	3	1	1	1	1	1	2	2	2	4
3-Nov	2	2	2	2	3	2	1	1	3	2	3	2	3	3	2	2	1	1	3	5	4	3	2	5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

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
CNRL Horizon - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
CNRL Horizon - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	161	23.00	23.00
6 - 11	386	55.14	78.14
12 - 19	151	21.57	99.71
20 - 28	2	0.29	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
CNRL Horizon - 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	2	14	17	10	5	3	6	15	17	21	17	9	9	6	3	7	161
6 - 11	2	44	23	0	0	0	5	20	65	113	73	19	5	4	9	4	386
12 - 19	1	1	0	0	0	0	0	0	12	40	46	21	6	9	10	5	151
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	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	5	59	40	10	5	3	11	35	94	174	136	49	20	20	23	16	700

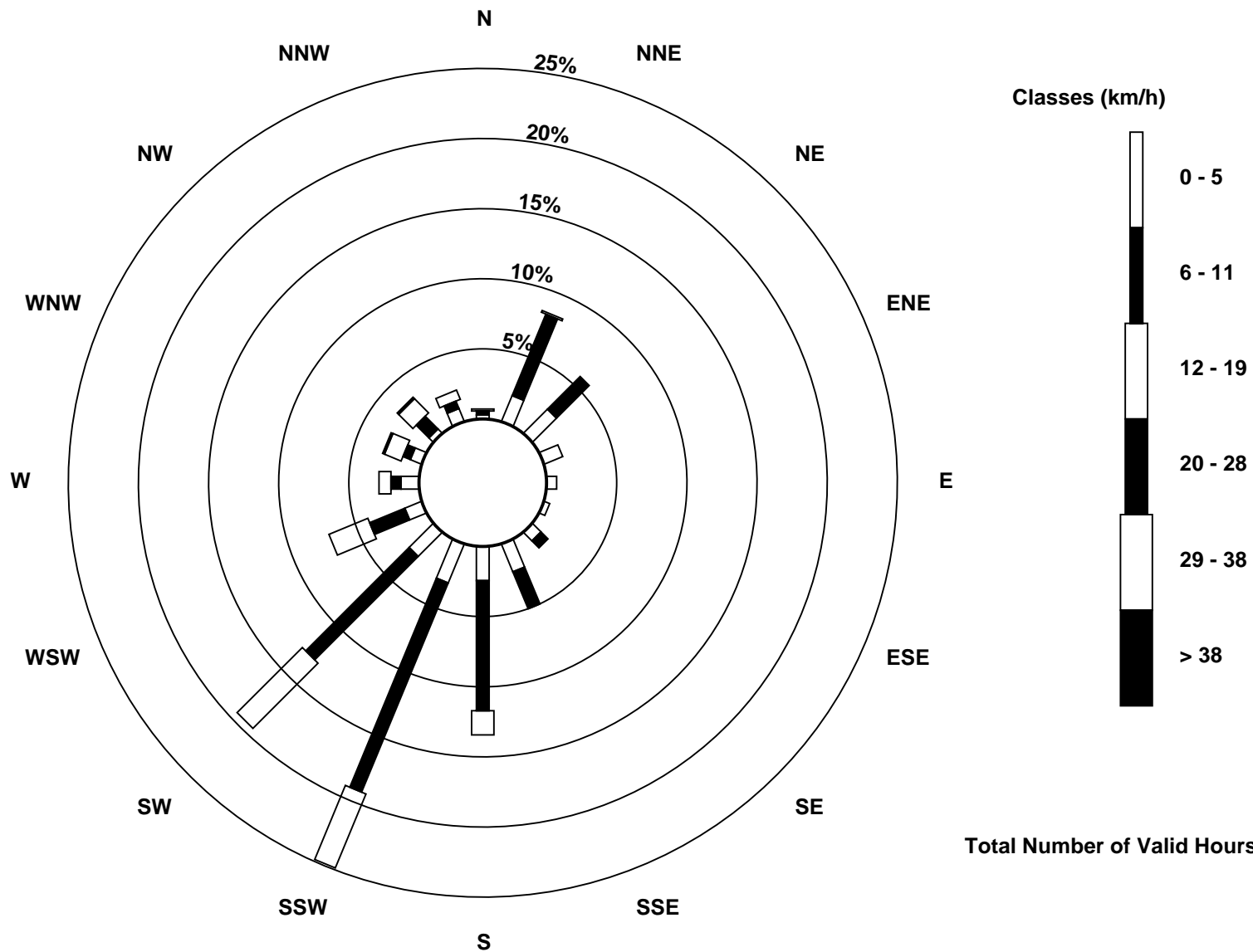
Total Number of Valid Hours: 700

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
CNRL Horizon (AMS 15)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
CNRL Horizon - November 2016

Direction of Maximum Speed: 302 deg on Nov 1 14:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 308.5 deg on Nov 17	Hours of Data: 700
Direction of Minimum Speed: 250 deg on Nov 28 23:00	Hours of Missing Data: 20
Direction of Minimum Daily Speed Average: 0.4 deg on Nov 28	Percent Operational Time: 97.2
Monthly Average Direction: 221.2 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-Nov	7	24	75	177	337	326	59	49	321	310	293	295	295	302	299	310	320	344	45	46	66	194	197	164	319.2
2-Nov	181	173	190	174	180	212	213	212	221	208	209	191	197	203	199	212	245	246	221	197	196	203	199	188	203.7
3-Nov	189	190	204	205	220	211	207	230	221	200	194	215	205	216	221	201	188	183	169	213	229	229	234	207	208.4
4-Nov	205	171	189	209	222	232	228	209	197	198	187	178	185	199	207	198	205	195	234	205	199	196	207	208	202.0
5-Nov	212	213	215	218	215	201	195	199	196	188	187	181	192	188	170	181	194	189	166	194	204	206	223	212	198.3
6-Nov	215	215	219	220	217	273	241	231	247	241	245	229	210	198	218	225	209	224	242	208	187	196	197	217	220.5
7-Nov	225	223	226	228	225	221	223	208	221	212	215	217	217	199	199	196	178	195	AF	166	289	314	288	138	215.8
8-Nov	204	203	205	224	206	219	219	222	211	212	208	200	196	193	194	195	192	203	191	197	203	212	199	180	202.8
9-Nov	187	192	186	192	181	161	190	166	183	221	210	232	228	238	296	269	257	256	244	225	197	209	213	216	219.9
10-Nov	221	219	221	228	233	220	228	170	196	177	191	174	192	142	169	183	186	166	180	195	195	223	224	232	204.8
11-Nov	191	221	239	207	220	217	210	213	206	195	196	213	204	205	200	214	210	202	145	142	206	219	215	215	206.6
12-Nov	225	223	223	207	212	210	200	210	219	220	225	234	220	211	207	186	229	214	234	254	256	248	240	228	222.3
13-Nov	228	219	217	216	227	228	223	213	232	224	184	180	188	206	224	232	230	226	219	207	192	184	187	165	211.0
14-Nov	171	167	205	202	214	213	204	198	195	213	222	223	220	244	273	278	275	270	273	254	254	240	248	233	237.0
15-Nov	230	264	251	245	243	240	245	243	242	245	243	244	238	234	242	234	235	235	266	294	249	278	295	344	245.7
16-Nov	326	AF	211	230	208	230	210	AF	218	AF	70	152	105	49	50	49	43	43	37	38	341	343	349	322	8.3
17-Nov	324	320	326	337	333	296	303	274	316	280	286	287	292	280	295	291	316	317	325	321	321	310	307	239	308.5
18-Nov	230	226	208	212	221	214	193	189	334	306	322	327	299	178	251	237	73	AF	AF	31	29	30	38	40	315.2
19-Nov	33	31	29	32	28	19	21	20	17	15	21	18	27	22	26	26	25	16	17	17	19	19	28	22	22.3
20-Nov	25	46	45	30	39	53	97	82	75	189	180	184	190	196	154	AF	AF	45	43	37	32	39	37	25	64.4
21-Nov	25	21	29	30	AF	AF	AF	AF	267	262	227	242	234	242	269	288	346	37	45	35	6	25	46	50	10.6
22-Nov	43	48	72	40	AF	AF	AF	AF	AF	91	129	143	178	171	176	147	156	152	169	173	174	147	161	145	144.5
23-Nov	144	149	144	157	166	153	160	164	162	171	174	176	173	166	158	154	158	161	162	170	192	201	182	187	166.1
24-Nov	193	189	194	191	194	186	190	196	189	190	199	219	211	214	236	278	303	18	29	345	62	41	112	240	198.7
25-Nov	334	45	48	39	48	33	79	134	154	148	158	88	AF	AF	54	317	277	274	230	237	248	218	233	226	205.9
26-Nov	225	215	219	220	214	215	227	223	251	198	219	237	236	224	209	178	217	204	192	206	206	200	248	190	216.6
27-Nov	250	326	319	313	336	38	25	18	44	32	20	27	30	22	26	24	25	26	26	31	25	25	24	13	17.4
28-Nov	36	22	27	43	203	215	193	167	199	191	199	181	202	195	59	68	AF	230	345	46	147	230	250	279	176.5
29-Nov	10	237	205	203	155	352	120	240	127	233	225	210	201	192	218	201	216	213	188	174	201	195	205	204	201.7
30-Nov	193	182	189	191	190	196	193	187	173	172	174	191	190	186	184	184	205	197	195	206	196	190	189	196	189.9

214.9 210.5 213.8 217.4 218.8 219.9 210.2 205.4 218.9 217.8 214.6 217.4 213.0 213.5 226.7 227.6 237.7 234.6 229.3 219.4 225.8 221.8 223.6 212.1

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

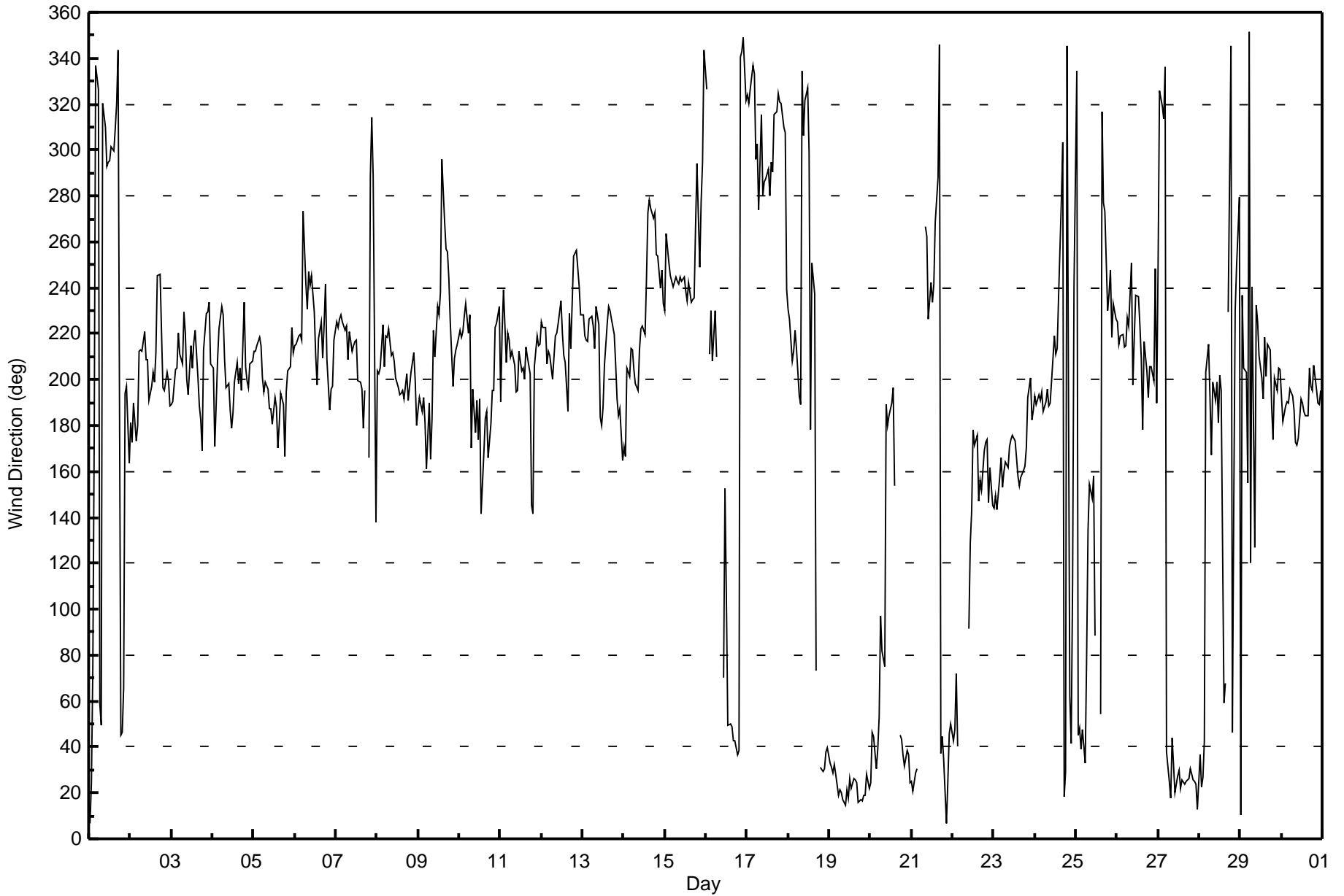
Wind Direction (WD) - deg
CNRL Horizon - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 98 deg on Nov 12 16:00	Hours of Data: 700
Minimum Value: 7 deg on Nov 2 06:00	Hours of Missing Data: 20
Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 13 Median = 17 Q ₃ = 20 P ₉₀ = 33 P ₉₉ = 83	Hours of Calibration: 0
	Percent Operational Time: 97.2

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-Nov	23	24	24	58	85	21	57	19	22	9	14	15	22	9	16	12	17	25	24	18	78	21	26	16	85
2-Nov	28	16	13	12	16	7	7	8	19	21	22	28	22	17	17	15	15	22	14	12	9	11	13	12	28
3-Nov	12	12	13	14	15	15	16	17	16	16	17	20	17	16	17	17	9	16	55	16	16	13	30	14	55
4-Nov	13	15	20	9	12	12	19	18	11	15	20	20	17	15	14	13	13	15	12	39	10	8	10	9	39
5-Nov	11	10	10	11	19	13	12	12	14	13	14	19	16	22	20	20	19	19	14	11	14	13	23	11	23
6-Nov	13	12	11	15	21	84	32	18	13	19	16	16	18	13	14	13	11	14	35	28	15	13	16	9	84
7-Nov	8	9	9	10	10	10	9	11	9	12	13	14	18	14	14	15	10	24	AF	10	80	32	37	58	80
8-Nov	10	16	13	11	10	10	14	13	11	12	14	13	14	15	15	15	12	14	14	11	11	12	11	15	16
9-Nov	11	12	11	14	27	74	19	81	25	24	13	16	13	31	13	14	12	13	10	17	12	11	9	11	81
10-Nov	10	10	11	10	19	14	31	41	30	19	22	21	26	26	22	14	18	10	14	18	15	27	18	11	41
11-Nov	15	22	11	13	10	10	12	12	14	14	14	16	16	16	17	13	13	16	25	34	12	9	9	10	34
12-Nov	10	10	12	13	10	12	12	11	17	12	13	64	14	18	19	98	64	54	38	52	45	9	9	9	98
13-Nov	62	12	16	13	10	10	20	21	10	15	18	17	19	14	14	10	11	10	9	12	11	10	18	16	62
14-Nov	14	14	13	12	13	22	15	14	13	19	13	13	13	20	15	26	16	20	17	16	17	13	14	33	33
15-Nov	16	27	27	12	12	12	19	14	12	14	14	14	15	14	14	12	10	13	28	31	48	27	54	39	54
16-Nov	16	AF	20	18	15	15	12	AF	41	AF	42	38	41	20	16	15	15	17	17	18	13	15	19	12	42
17-Nov	11	11	10	10	22	12	12	32	9	31	14	17	15	26	12	13	12	9	10	10	13	11	33	58	58
18-Nov	21	80	13	12	14	24	16	83	16	16	20	26	71	45	39	16	86	AF	AF	19	18	18	17	17	86
19-Nov	17	16	18	18	17	18	18	17	18	17	19	17	18	19	17	18	17	17	17	16	17	15	15	14	19
20-Nov	15	12	9	9	8	8	15	25	15	72	29	31	24	27	73	AF	AF	17	11	17	19	16	14	18	73
21-Nov	14	16	19	26	AF	AF	AF	AF	26	22	30	19	20	19	28	54	45	23	15	20	19	22	17	14	54
22-Nov	17	14	15	24	AF	AF	AF	AF	AF	73	30	27	19	19	21	20	19	20	16	19	20	23	20	18	73
23-Nov	18	19	21	20	23	18	19	17	18	17	17	18	17	19	19	18	19	18	17	18	15	15	14	14	23
24-Nov	13	14	13	13	13	13	14	13	14	15	17	16	19	20	21	29	29	39	41	41	34	16	25	91	91
25-Nov	75	16	17	19	16	21	30	20	20	19	30	46	AF	AF	20	17	14	15	14	13	14	11	13	13	75
26-Nov	13	13	13	13	13	18	25	17	30	30	16	16	17	17	19	16	20	18	20	19	18	20	48	56	56
27-Nov	31	72	7	10	22	23	26	23	18	30	21	21	18	19	17	17	18	17	17	18	17	18	14	13	72
28-Nov	16	19	17	27	45	16	13	36	18	19	14	22	13	69	46	30	AF	38	61	23	77	83	78	30	83
29-Nov	53	67	26	17	72	75	39	49	81	40	20	20	23	20	17	16	20	18	18	19	16	16	17	17	81
30-Nov	17	18	17	17	17	16	17	17	18	19	17	19	19	19	20	18	16	17	15	15	16	16	15	14	20

75	80	27	58	85	84	57	83	81	73	42	64	71	69	73	98	86	54	61	52	80	83	78	91	
Diurnal Maximum																								

AF - Analyzer Failure





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Last Calibration	October 18, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:53	End Time (MST)	14:35
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	-623	-622
Analyzer IP address	192.168.1.43		Lamp voltage	862	861
Calculated slope	0.997006	0.997668	Chamber temp	45.3	45.3
Calculated intercept	0.822187	0.895714	Pressure	706.9	706.0
Analyzer Background	19.2	18.8	Flow	0.429	0.426
Analyzer Coefficient	0.990	0.990	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	-0.5	----
as found span	5000	81.5	815.0	811.7	1.004
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	81.5	815.0	816.6	0.998
second point	5000	40.7	407.0	406.2	1.002
third point	5000	20.3	203.0	202.1	1.004
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	81.5	815.0	813.8	1.001
Average Correction Factor					1.002

Corrected As found 812.2 Previous response 816.6 % change 0.5%

Notes:

Sample inlet filter replaced after as founds. Adjusted zero and span.

Calibration Performed By: Jayne Marcoux



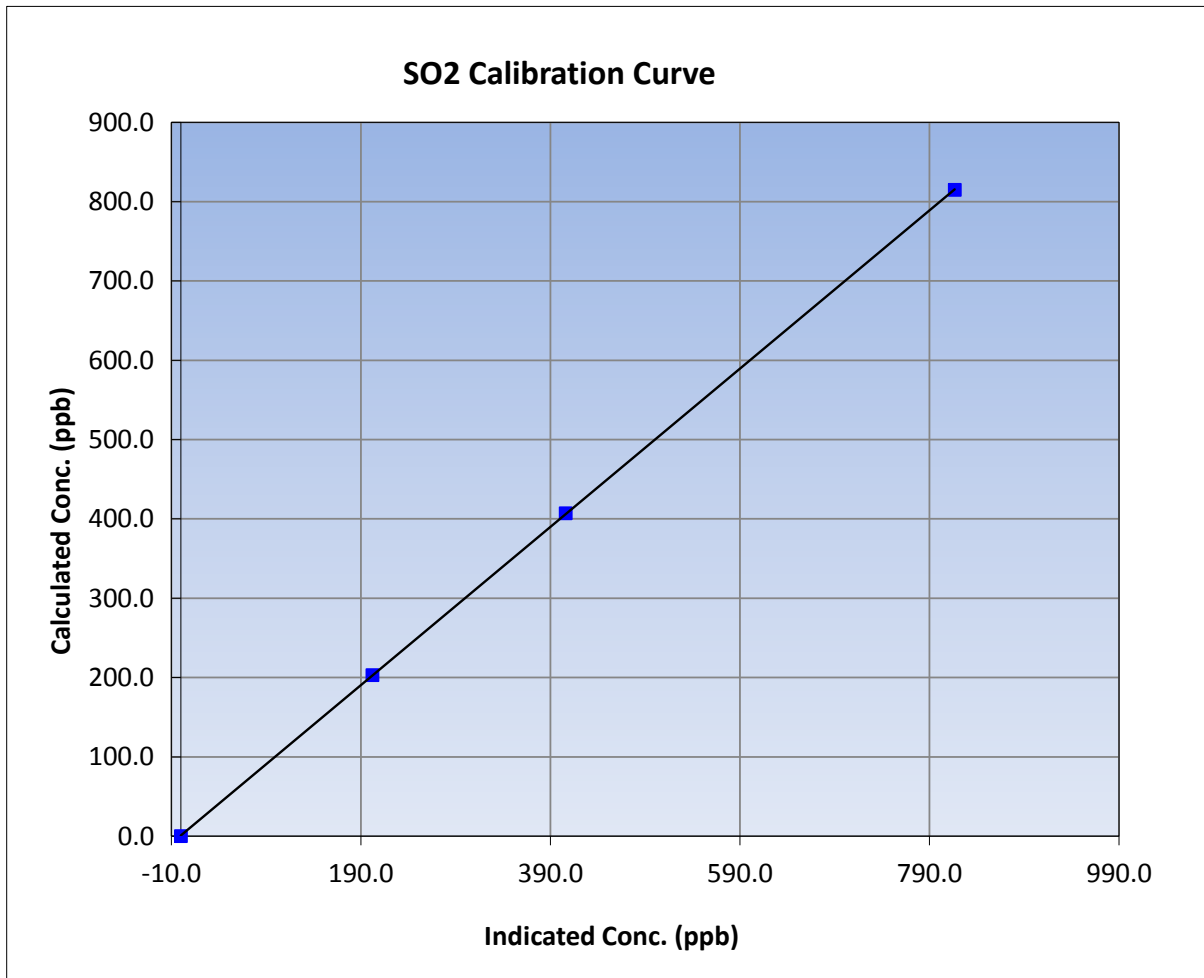
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 18, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:53	End Time (MST)	14:35
Analyzer make	Thermo 43i	Analyzer serial #	710321322

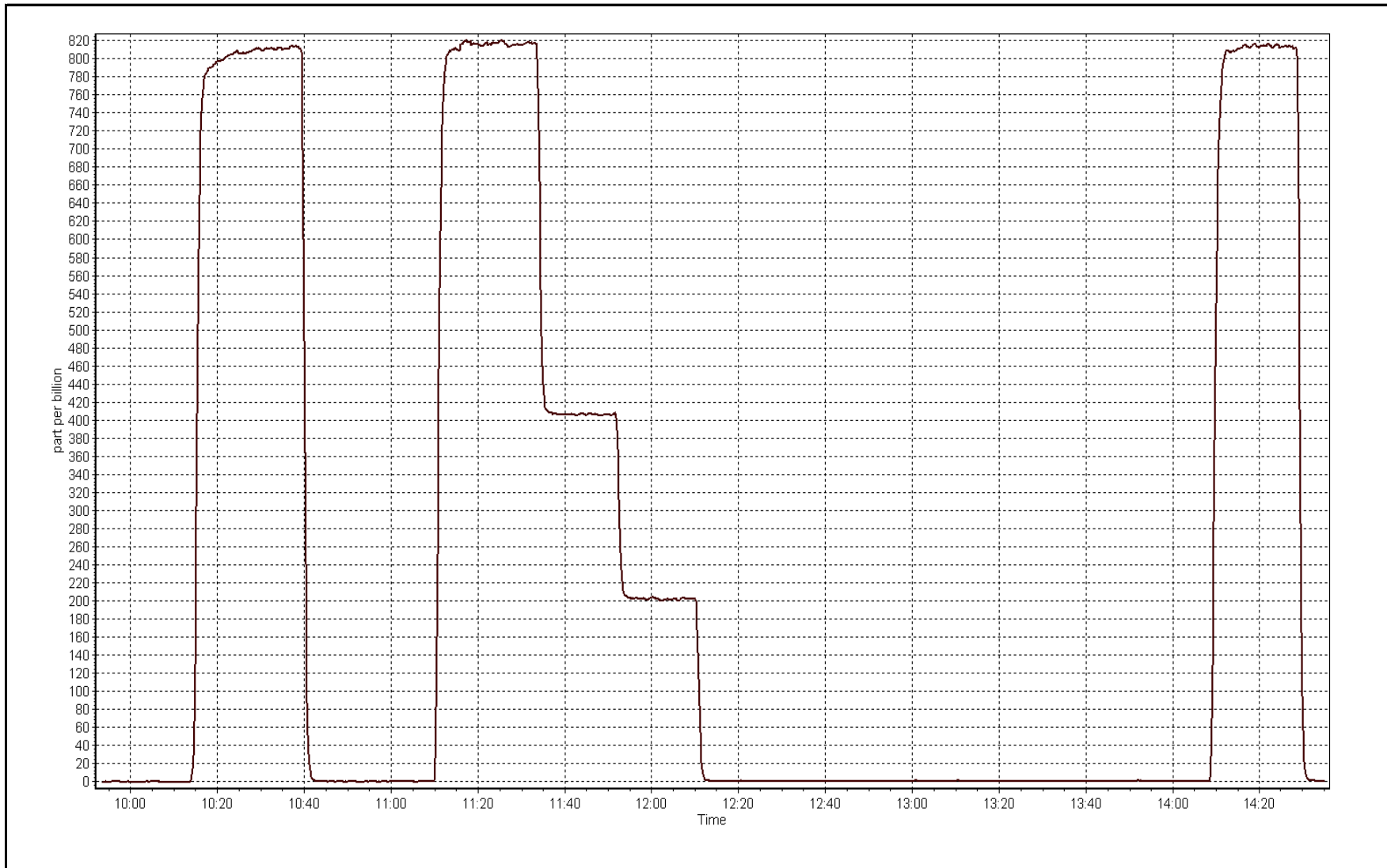
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999995
815.0	816.6	0.9981		
407.0	406.2	1.0021	Slope	0.997668
203.0	202.1	1.0045		
			Intercept	0.895714



SO2 Calibration Plot

Date: November 8, 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 21, 2016	Last Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Other: <input type="checkbox"/> Lamp Adjustment		
Start Time (MST)	10:13	End Time (MST)	12:17
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	-711	-710
Analyzer IP address	192.168.1.43		Lamp voltage	813	819
Calculated slope	0.997772	0.100749	Chamber temp	45.1	45.0
Calculated intercept	3.321681	0.037277	Pressure	709.6	701.8
Analyzer Background	9.0	9.0	Flow	0.542	0.447
Analyzer Coefficient	1.019	1.019	Intensity	108	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	83.6	807.6	801.2	1.008
calibrator zero	5000	0.0	0.0	-0.4	----
high point	5000	83.6	80.8	801.2	0.101
second point					
third point					
as left zero	5000	0.0	0.0	-0.3	----
as left span	5000	83.6	807.6	803.6	1.005
Average Correction Factor					0.101

Corrected As found 801.6 Previous response 806.1 % change 0.6%

Notes:

Logged in remotely. Adjusted Lamp volatage intensity to 91%.

Calibration Performed By: Jayne Marcoux



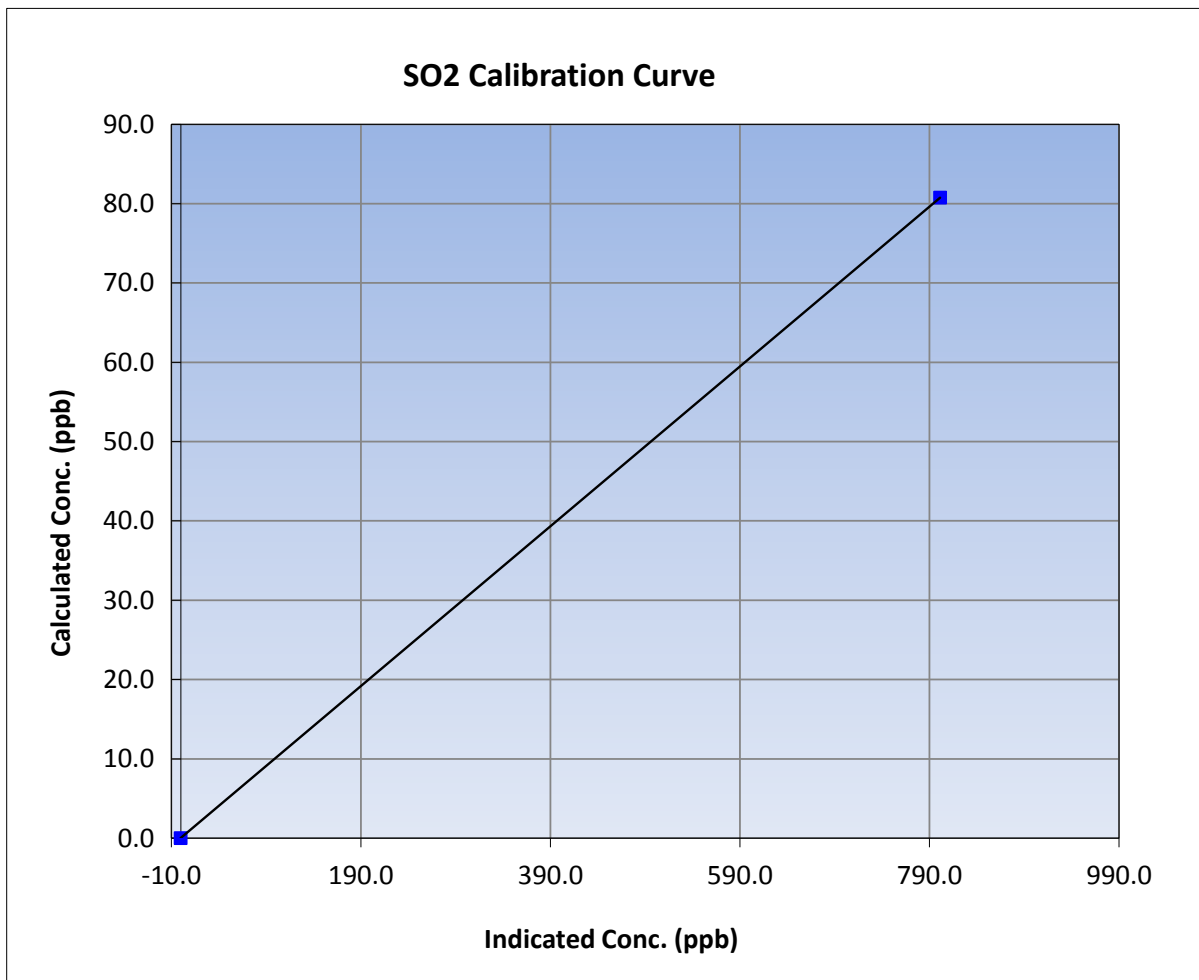
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 21, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	10:13	End Time (MST)	12:17
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

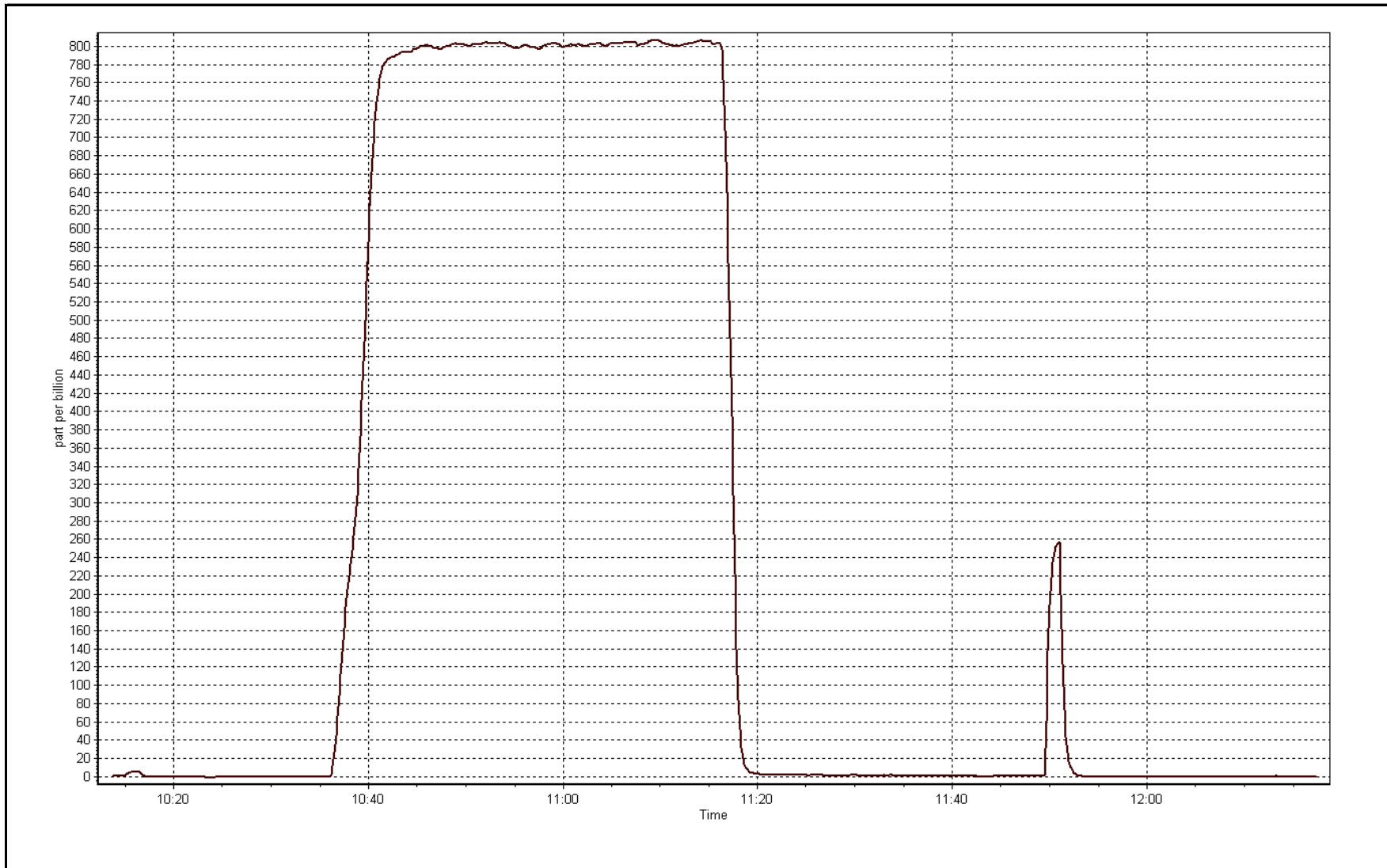
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	1.000000
80.8	801.2	0.1008		
			Slope	0.100749
			Intercept	0.037277



SO2 Calibration Plot

Date: November 21, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 7, 2016	Last Calibration	October 5, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Other: <input type="checkbox"/> Installing H2S cylinder		
Start Time (MST)	10:34	End Time (MST)	11:35
Gas Cert Reference	LL82745	Station temp.	22 Deg C
Cal Gas Concentration	9.6 ppm	Cal Gas Exp Date	February 22, 2016
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	985	983
Calculated slope	0.995800		Chamber temp	45	45
Calculated intercept	-0.261036		Pressure	636.5	638.7
Analyzer Background	2.05		Flow	0.401	0.403
Analyzer Coefficient	1.181		Intensity	90	91
			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	0.1	----
as found span	5000	41.4	79.5	79.8	0.996
SO2 scrubber check					
calibrator zero					
high point					
second point					
third point					
as left zero					
as left span					
Average Correction Factor					

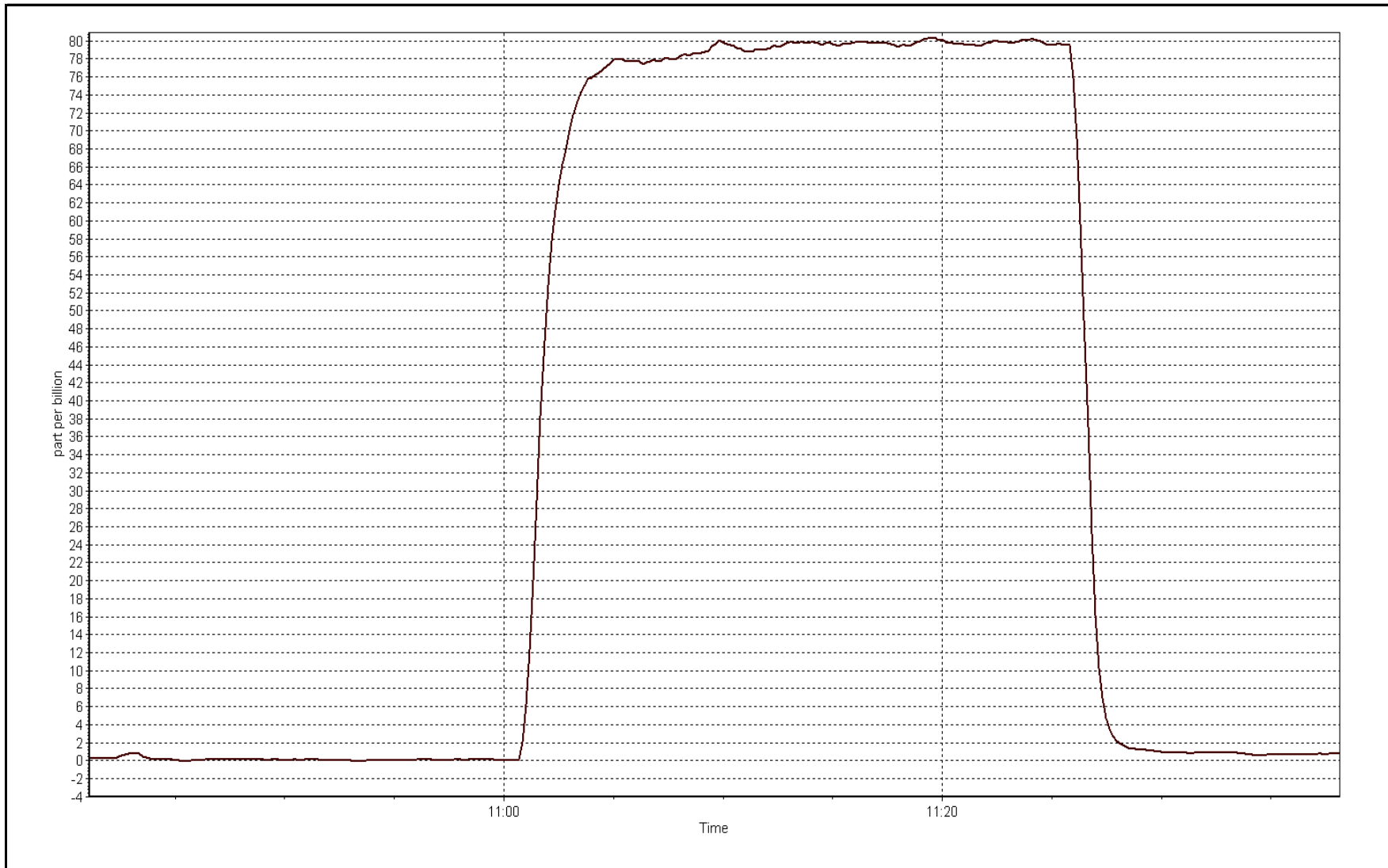
Corrected As found	79.8	Previous response	80.1	% change	0.4%
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Notes:

Changed H2S cylinder after as founds.

Calibration Performed By:

Jayme Marcoux





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 7, 2016	Last Calibration	October 5, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:34	End Time (MST)	15:16
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	985	982
Calculated slope	0.513459	0.992109	Chamber temp	45	45
Calculated intercept	-0.134597	-0.007285	Pressure	636.5	641.4
Analyzer Background	2.05	2.11	Flow	0.401	0.404
Analyzer Coefficient	1.181	1.153	Intensity	90	90
			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	5000	20.4	204.0	0.7	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	79.8	80.4	0.993
second point	5000	40.2	39.8	40.3	0.987
third point	5000	20.0	19.8	19.9	0.995
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	80.6	79.8	80.1	0.996
Average Correction Factor					0.992

Corrected As found NA Previous response NA % change NA

Notes:

H2S cylinder installed after asfinds. Adjusted zero and span. Scrubber check done after 3rd point.

Calibration Performed By: Jayme Marcoux



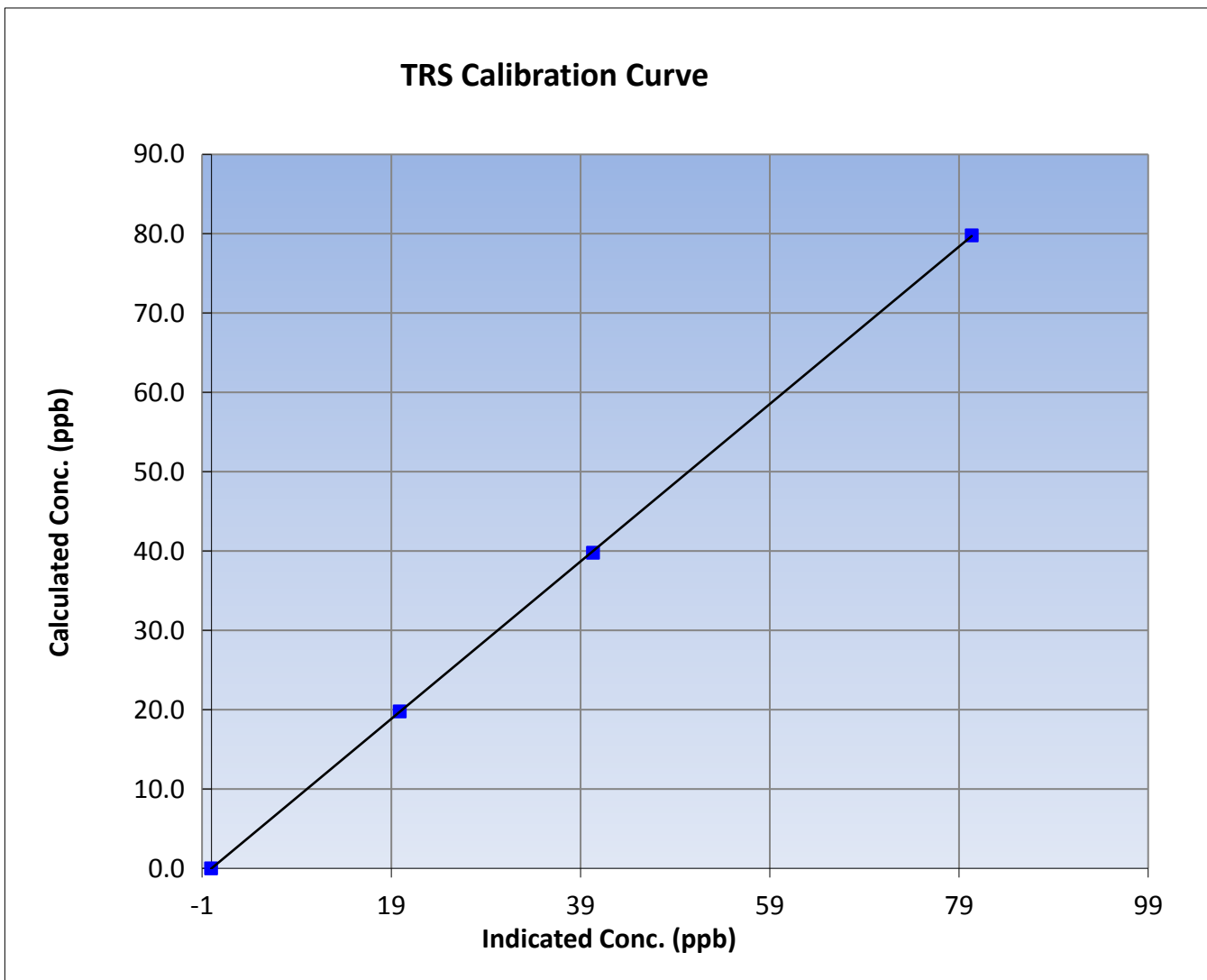
Wood Buffalo Environmental Association TRS Calibration Report

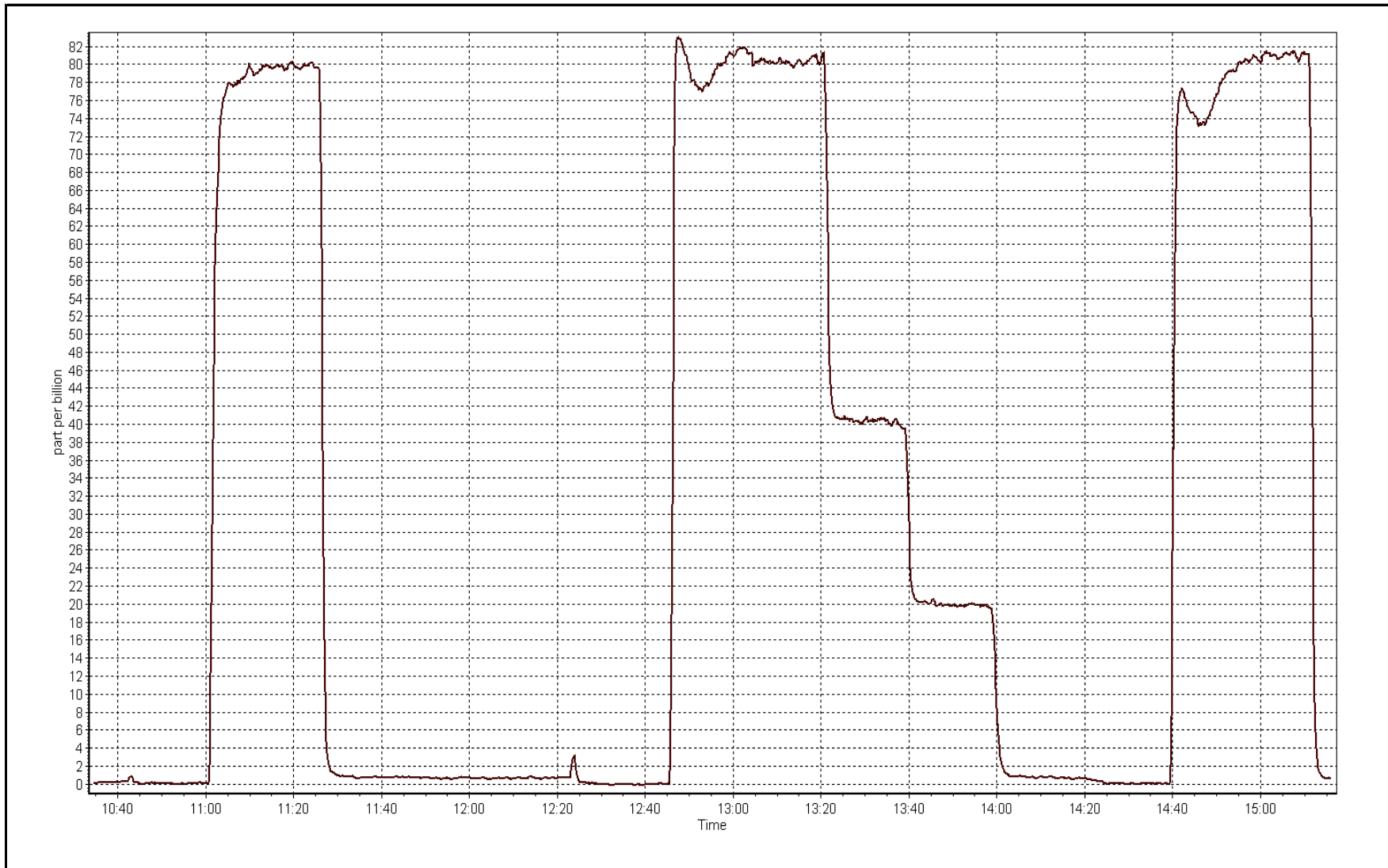
Station Information

Calibration Date	November 7, 2016	Previous Calibration	October 5, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:34	End Time (MST)	15:16
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	0.999983
79.8	80.4	0.9931		
39.8	40.3	0.9868	Slope	0.992109
19.8	19.9	0.9955		
			Intercept	-0.007285







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November-08-16	Last Calibration	October-18-16
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:53	End Time (MST)	14:31
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	8.8	8.7
Analyzer IP address	192.168.1.51		Air or Bypass Press	38.0	38.0
Calculated slope	0.997646	1.000531	Fuel Pressure	26.3	26.3
Calculated intercept	0.055559	0.021647	Analyzer Coeff	3.107	3.118
			Analyzer BKG	2.16	2.15

Analyzer make Thermo 51i-LT Analyzer serial # 1327059295

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	16.93	1.008
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	81.5	17.06	17.03	1.002
second point	5000	40.7	8.52	8.50	1.002
third point	5000	20.3	4.25	4.22	1.007
as left zero	5000	0.0	0.00	0.05	----
as left span	5000	81.5	17.06	17.09	0.998
Average Correction Factor					1.004

Corrected As found 16.97 Previous response 17.05 % change 0.5%

Notes:

Sample inlet filter replaced after as founds. Adjusted zero and span.

Calibration Performed By:

Jayne Marcoux



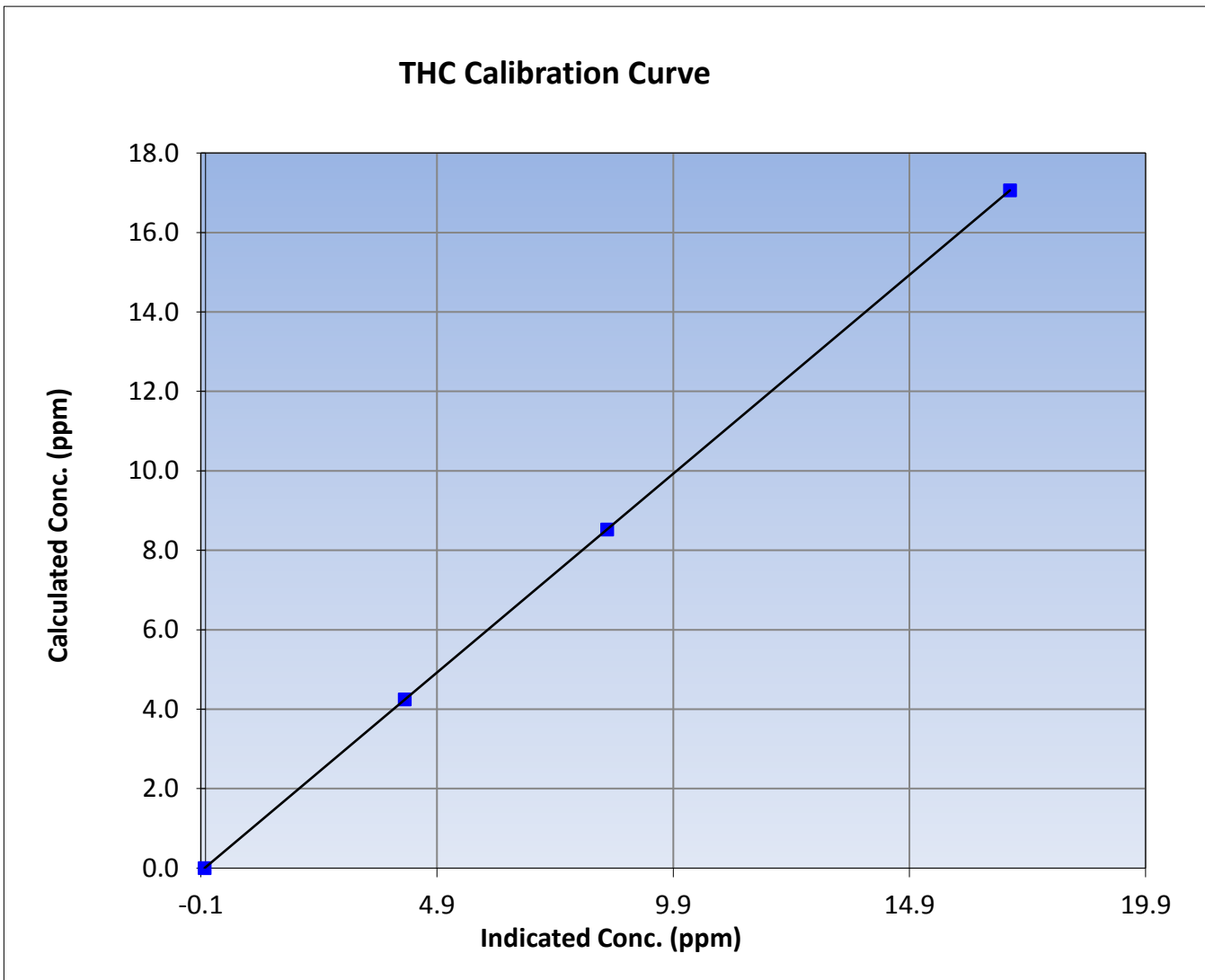
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 18, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:53	End Time (MST)	14:31
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295

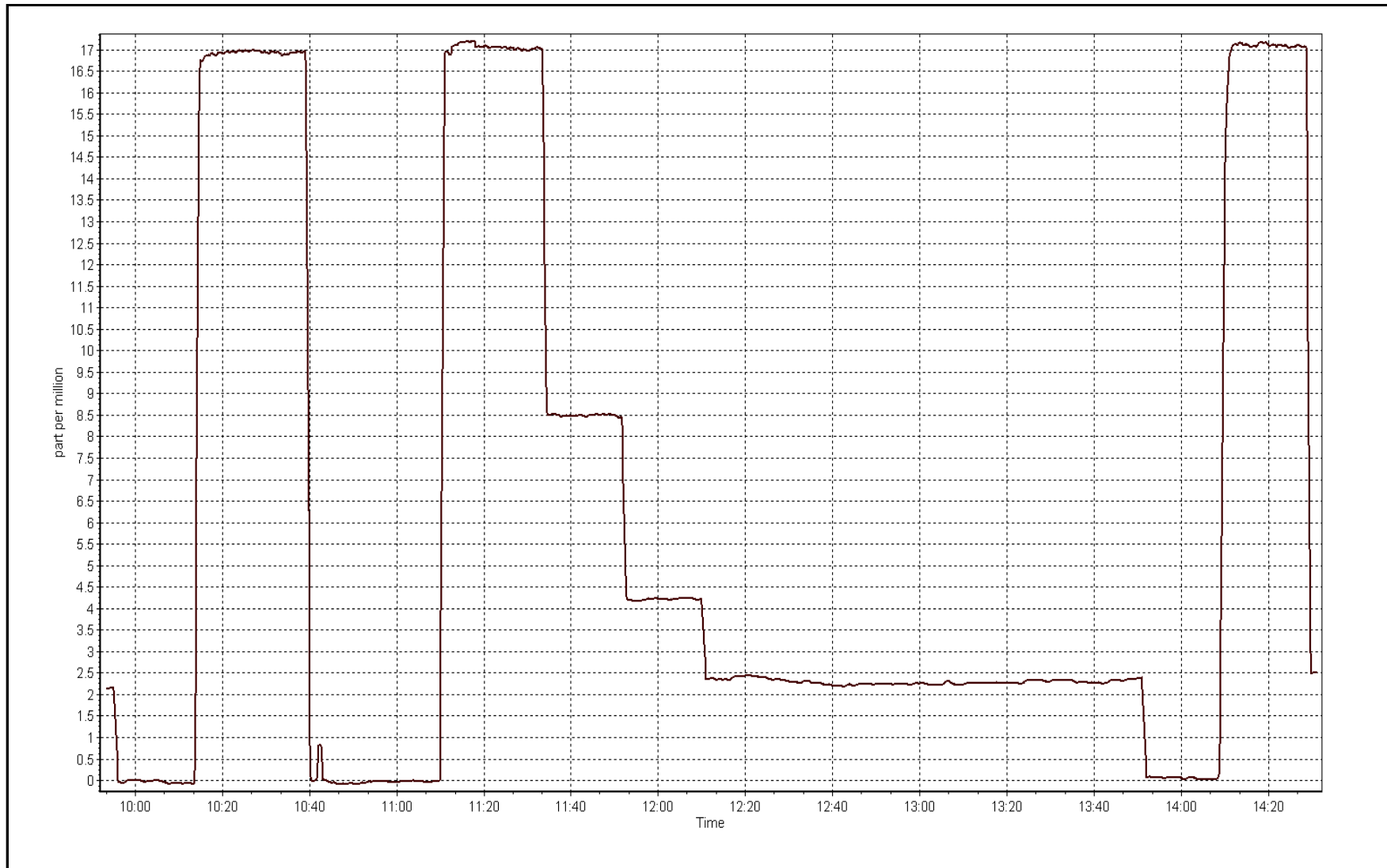
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	1.000000
17.06	17.03	1.0019		
8.52	8.50	1.0024	Slope	1.000531
4.25	4.22	1.0071		
			Intercept	0.021647



THC Calibration Plot

Date: November 8, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 18, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:53	End Time (MST)	14:32
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	0.999910	0.999911	0.994654
	Data Offset	0.168932	0.150892	-0.308123
Current Calibration	Data Slope	0.998691	0.998929	0.996508
	Data Offset	0.176520	0.240751	-0.030734

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	0.965		0.709	
NOx coefficient	1.000		1.000	
NO2 coefficient	1.000		1.000	
NO bkgnd	11.4		8.9	
NOx bkgnd	11.5		9.0	
Chamber Temp	49.8	Deg C	50	Deg C
Moly Temp	326.3	Deg C	323.9	Deg C
PMT voltage	-778.5	V	-779.9	V
PMT Temp	-3.1	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	174	mmHg	147.3	mmHg
R Cell Press Nox	174	mmHg	147.6	mmHg
NO sample flow	0.654	lpm	0.773	lpm
Nox sample Flow	0.657	lpm	0.774	lpm

Notes:

Changed inlet filter after as founds. Installed new pump after asfound. Adjusted span. During second GPT point, 200ppb of NO was generated instead of 800ppb of NO and 200ppb of O3. Adjusted values and continued on.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

November 8, 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	-0.1	-0.2	0.1	----	----
as found span	5000.00	81.5	797.1	797.1	0.0	797.9	797.2	0.6	0.9989	0.9999
calibrator zero	5000	0.0	0.0	0.0	0.0	0.1	0.0	0.1	----	----
high point	5000	81.5	797.1	797.1	0.0	798.0	797.7	0.3	0.9988	0.9992
second point	5000	40.7	398.0	398.0	0.0	398.5	398.5	-0.1	0.9989	0.9988
third point	5000	20.3	198.5	198.5	0.0	198.2	198.0	0.2	1.0015	1.0027
as left zero	5000	0.0	0.0	0.0	0.0	1.7	1.7	0.0	----	----
as left span	5000	81.5	797.1	459.3	337.8	789.9	458.8	331.1	1.0091	1.0011
Average Correction Factor									0.9998	1.0003

Corrected As found
Previous Response

NO_x= 798.0
NO_x= 797.0

NO= 797.4
NO= 797.0

Percent Change

NO_x= -0.1%

NO= 0.0%

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	793.6	791.2	0.1	1.0044	1.0074	----	----
1st NO2 (300)	459.3	332.0	792.6	459.3	333.3	1.0057	----	0.9961	100.4%
2nd NO2 (200)	564.1	227.2	791.9	564.1	227.8	1.0066	----	0.9972	100.3%
3rd NO2 (100)	672.1	119.1	791.7	672.1	119.6	1.0067	----	0.9958	100.4%
2nd NO ref point		0.0	791.0	789.3	1.7	1.0077	1.0099	----	----
Average Correction Factor						1.0067		0.9964	100.4%

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

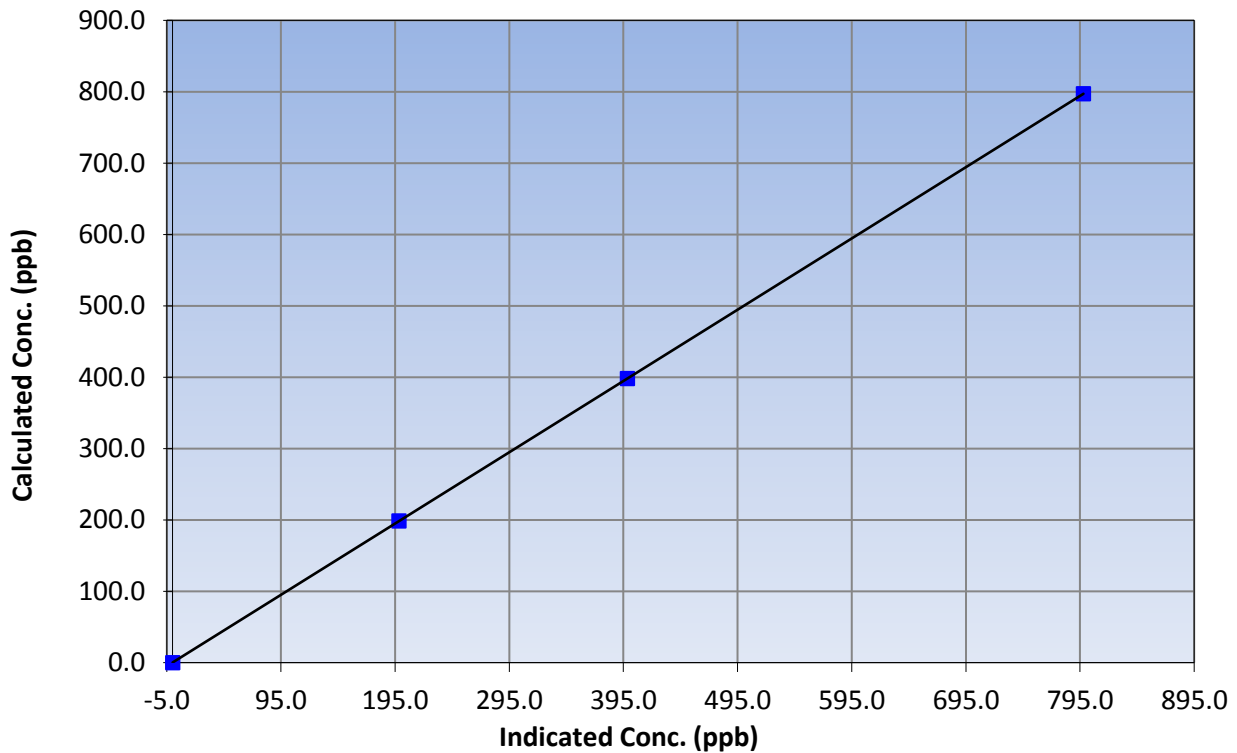
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 18, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:53	End Time (MST)	14:32
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	0.999999
797.1	798.0	0.9988		
398.0	398.5	0.9989	Slope	0.998691
198.5	198.2	1.0015		
			Intercept	0.176520

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

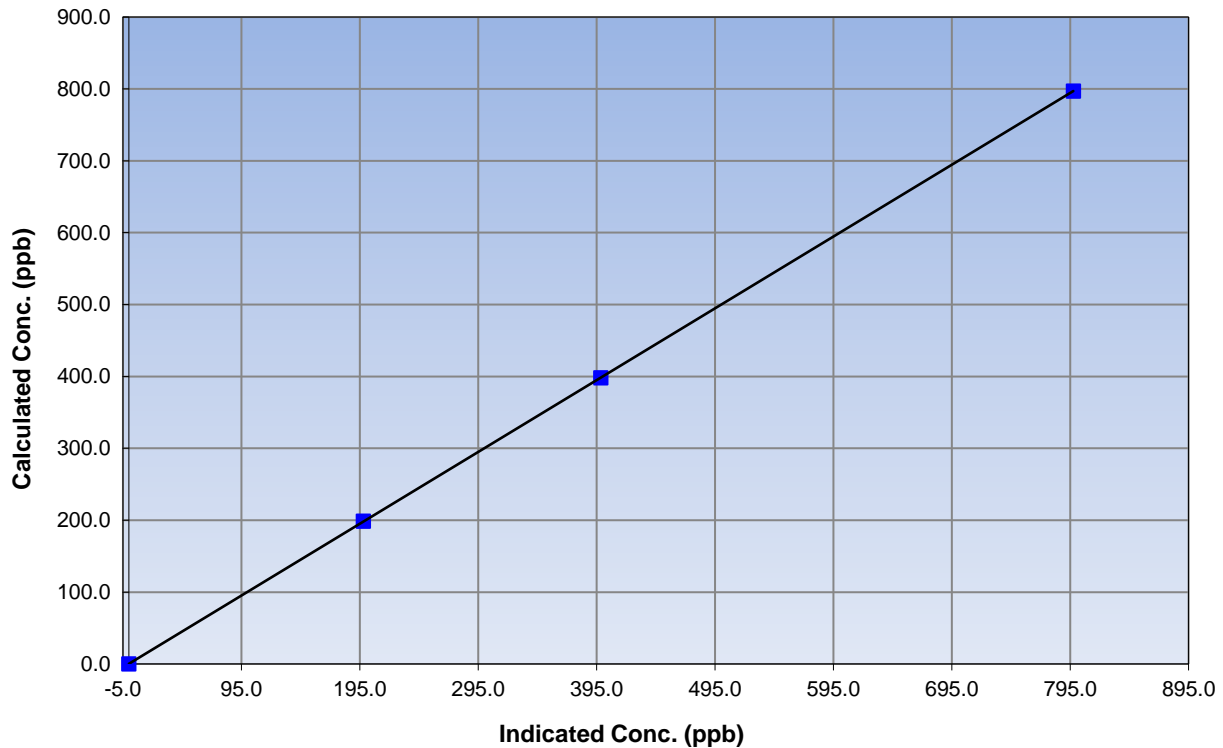
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 18, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:53	End Time (MST)	14:32
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	0.999999
797.1	797.7	0.9992		
398.0	398.5	0.9988	Slope	0.998929
198.5	198.0	1.0027		
			Intercept	0.240751

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

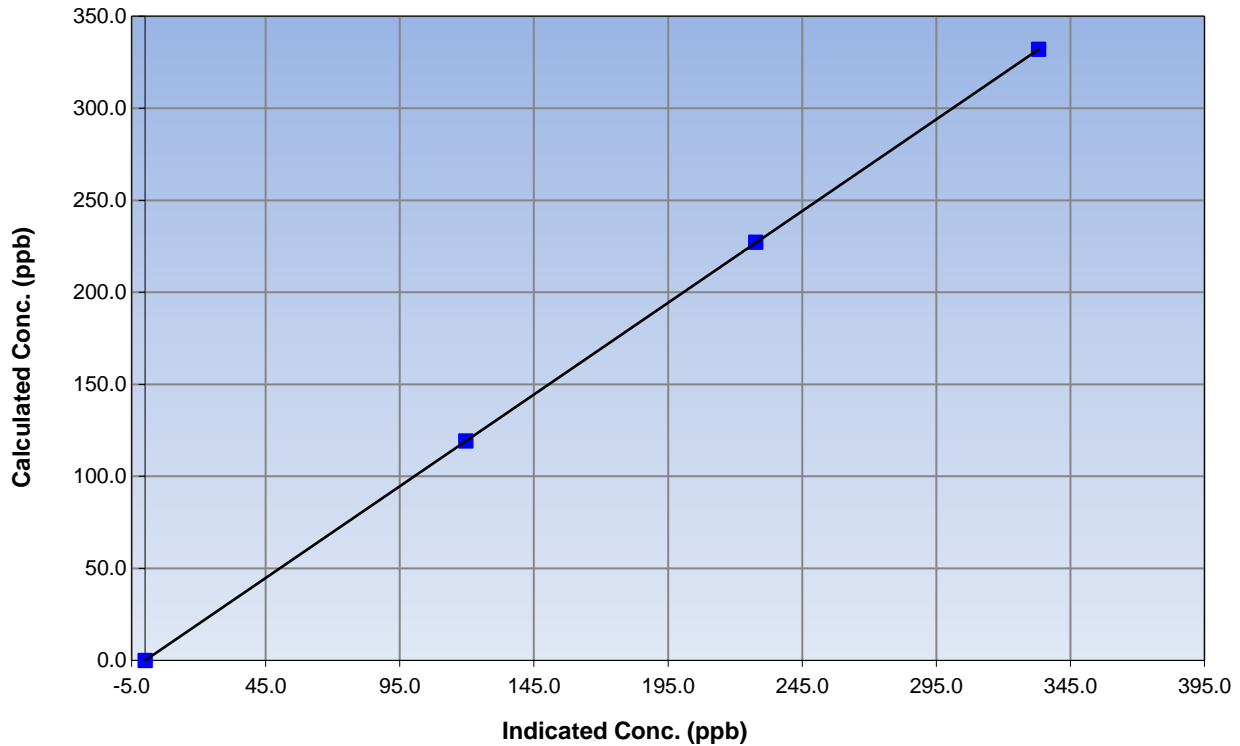
Station Information

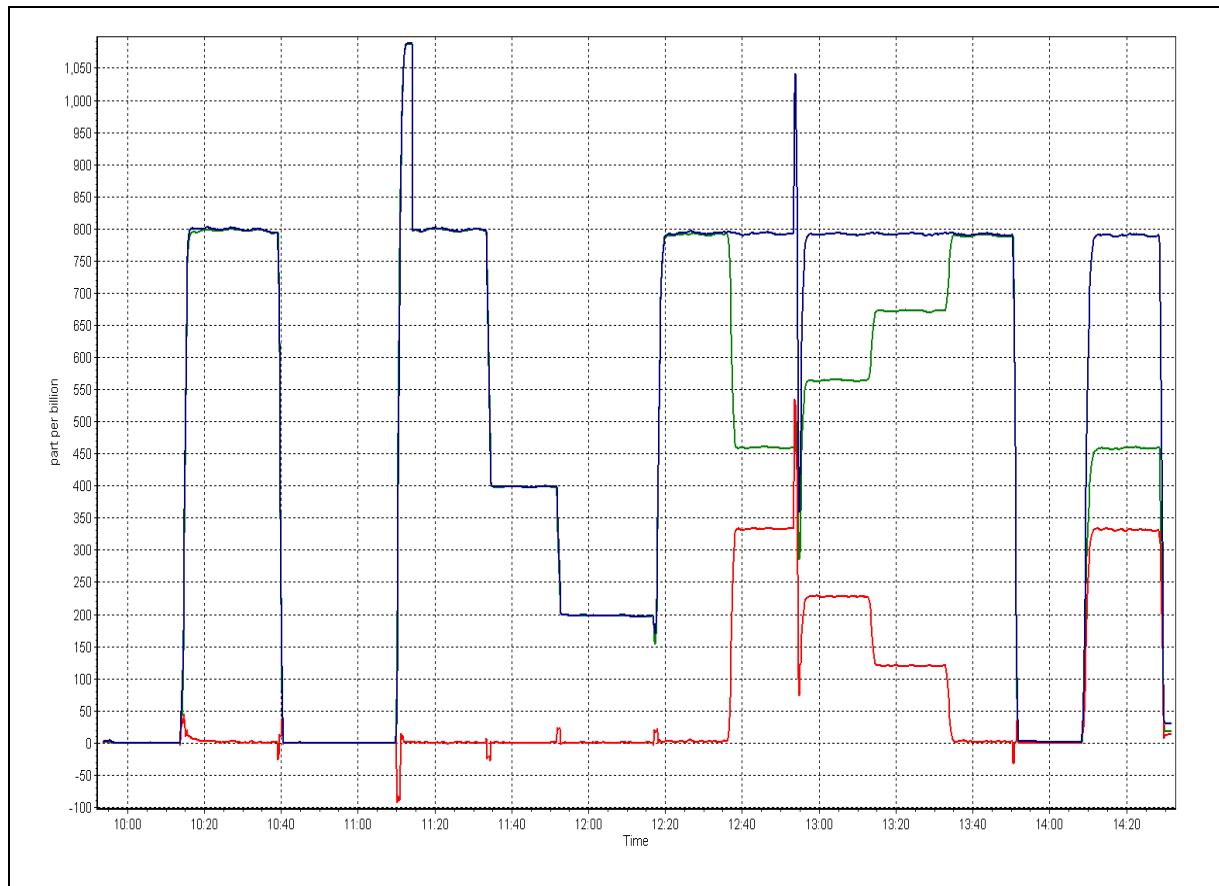
Calibration Date	November 8, 2016	Previous Calibration	October 18, 2016
Station Number	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:53	End Time (MST)	14:32
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999999
332.0	333.3	0.9961		
227.2	227.8	0.9972	Slope	0.996508
119.1	119.6	0.9958		
			Intercept	-0.030734

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:	November 7, 2016	Last Cal Date:	October 5, 2016
Start time (MST):	13:00	End time (MST):	14:16
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)	5.9	6.1	5.9	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	977	978.5	977	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	900.4	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.5	-----	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 checked="" type="checkbox"/>				

Quarterly Calibration Test

				Tolerance
Leak Test:	Date of check:	<u>November 7, 2016</u>	Last Cal Date:	<u>October 5, 2016</u>
	Flow w/o adaptor:	<u>16.7</u>	Flow w/ adaptor:	<u>16.76</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)	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. Installed new filter tape. Cyclone head cleaned. Nephelometer zeroed.

Calibration by: Jayne 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:	November 18, 2016	Last Cal Date:	November 7, 2016
Start time (MST):	10:32	End time (MST):	11:37
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)	-9	-9	-9	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	992	981	981	<input checked="" type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1031.4	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.7	-----	0.1	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified <input checked="" type="checkbox"/>				
Cyclone cleaning :	PM10 Cyclone <input type="checkbox"/>		PM2.5 Cyclone <input 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 P3, instrument flow and nephelometer. Replaces the HV battery buffer supply batteries. Zeroed nephelometer.

Calibration by: Jayne Marcoux



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 16
SHELL MUSKEG RIVER
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 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	682	38	38	100.00	27	0	6	0
THC (ppm) Average	674	35	46	98.47	4.2	-	2.8	-
NO2 (ppb) Average	685	35	35	100.00	28	0	19	-
NO (ppb) Average	685	35	35	100.00	76	-	16	-
NOX (ppb) Average	685	35	35	100.00	104	-	32	-
PM2.5 (ug/m3) Average	718	2	2	100.00	25.3	-	13	0
Temperature 2 m (C) Average	720	0	0	100.00	12.1	-	5.1	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	96	-
Barometric Pressure (inHg) Average	720	0	0	100.00	29.4	-	29.4	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	24	-	15	-
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 - SHELL MUSKEG RIVER (AMS 16)
 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	682	1.5	4	-	0	0	0	0	1	4	27
THC (ppm) Average	674	2.39	0.3	-	2	2.1	2.2	2.3	2.5	2.8	4.2
NO2 (ppb) Average	685	8.7	6	-	0	1	4	8	13	18	28
NO (ppb) Average	685	4.4	8	-	0	0	0	1	5	14	76
NOX (ppb) Average	685	13.1	13	-	0	2	4	10	19	29	104
PM2.5 (ug/m3) Average	718	5.09	3.8	-	0	1.5	2.6	4.1	6.7	9.9	25.3
Temperature 2 m (C) Average	720	-2.14	5.1	-	-13.6	-8.6	-5.8	-2.6	1.4	5.1	12.1
Relative Humidity (%) Average	720	82.8	11	-	47	68	76	84	92	96	99
Barometric Pressure (inHg) Average	720	28.79	0.2	-	28.3	28.5	28.6	28.8	28.9	29.1	29.4
Wind Speed 10 m (km/h) Average	720	9	4	-	0	4	6	8	12	15	24
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	11 Nov 2016 08:00	11 Nov 2016 18:00	11	Unstable Operation



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 27 ppb on Nov 4 14:00	Maximum Daily Average: 6.2 ppb on Nov 4		Hours of Data:	682
Minimum Value: 0 ppb on Nov 1 09:00	Minimum Daily Average: 0.0 ppb on Nov 18		Hours of Missing Data:	38
Maximum Diurnal Average: 4.3 ppb at hour 14	Minimum Diurnal Average: 0.4 ppb at hour 3		Hours of Calibration:	38
Monthly Average: 1.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 4 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-Nov	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	3	3	2	9	4	4	1	1	0	1	1	1.3	9
3-Nov	2	3	Z	3	3	2	3	0	2	2	2	5	5	3	10	8	3	2	2	2	1	0	0	0	2.8	10
4-Nov	0	0	1	Z	0	0	0	0	1	6	7	19	27	27	25	16	4	3	2	1	1	1	1	1	6.2	27
5-Nov	1	1	1	2	Z	4	4	2	3	5	5	19	14	22	17	8	6	5	2	2	2	2	1	1	5.7	22
6-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
7-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	5	0	2	3	1	0	0	0	0	0	0	0.6	5
8-Nov	0	Z	0	0	0	0	0	0	0	1	2	6	5	7	20	16	15	7	5	14	22	10	5	2	6.0	22
9-Nov	1	1	Z	4	5	4	4	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	5
10-Nov	0	0	0	Z	0	0	0	0	0	1	2	4	9	21	2	1	1	0	0	0	0	0	0	1	1.9	21
11-Nov	0	0	0	1	Z	3	5	4	3	5	4	3	3	7	3	2	1	1	0	0	0	0	0	0	2.0	7
12-Nov	0	0	0	0	0	Z	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
13-Nov	Z	0	0	0	0	0	0	0	0	0	1	4	4	6	5	3	3	2	1	1	1	1	1	0	1.5	6
14-Nov	0	Z	0	1	0	2	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
15-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
16-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	0.1	0
17-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
18-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
19-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
20-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	1	3	5	7	1	0	0	0	0	0	0	0	0.8	7
21-Nov	0	0	Z	0	0	0	0	0	0	1	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	1
22-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	2	2	3	4	1	1	0	0	0	0	0	0.7	4
23-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.2	1
24-Nov	0	1	1	1	1	Z	1	1	1	2	2	3	1	0	7	26	8	2	2	1	1	0	0	0	2.7	26
25-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
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	6	6	6	6	7	3	1	9	5	12	2.6	12
27-Nov	14	10	Z	4	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	14
28-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	0.1	0
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	8	15	14	4	4	5	7	3	1	1	2	2.8	15
30-Nov	2	4	6	3	2	Z	0	1	1	4	7	4	9	11	5	3	3	1	1	1	1	2	1	1	3.1	11

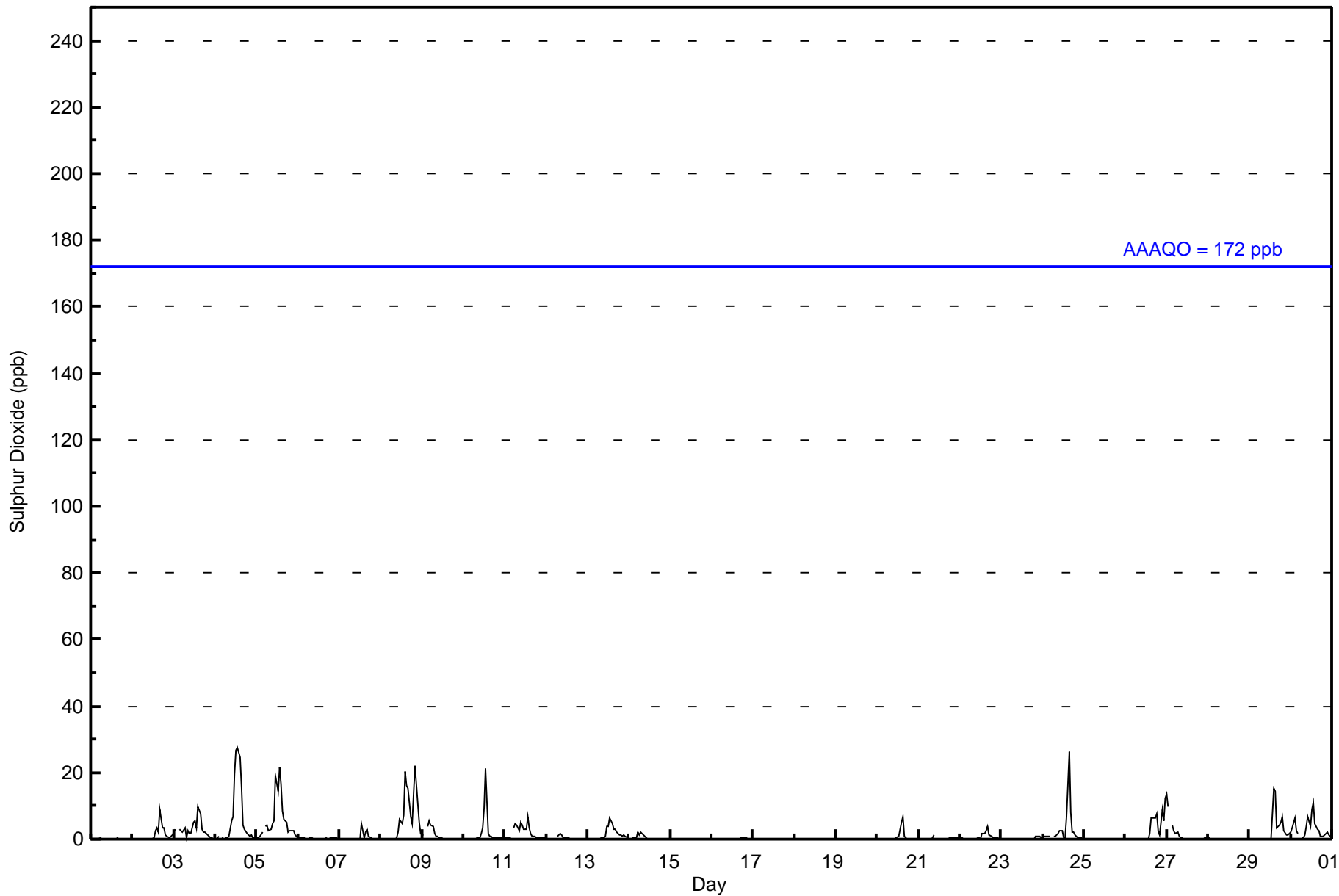
0.9	0.8	0.4	0.8	0.6	0.8	0.8	0.5	0.6	1.0	1.2	2.4	2.8	4.3	4.0	3.9	2.4	1.4	1.1	1.2	1.2	1.1	0.7	0.8	Diurnal Average	
14	10	6	4	5	4	5	4	3	6	7	19	27	27	25	26	15	7	7	14	22	10	5	12	Diurnal Maximum	

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
Shell Muskeg River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	661	96.92	96.92
11 - 20	14	2.05	98.97
21 - 60	7	1.03	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
Shell Muskeg River - 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	8	19	24	28	13	16	21	78	149	134	60	38	21	12	18	22	661
11 - 20	0	0	0	0	0	0	0	0	4	9	0	1	0	0	0	0	14
21 - 60	0	0	0	0	0	0	0	1	2	1	3	0	0	0	0	0	7
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	19	24	28	13	16	21	79	155	144	63	39	21	12	18	22	682

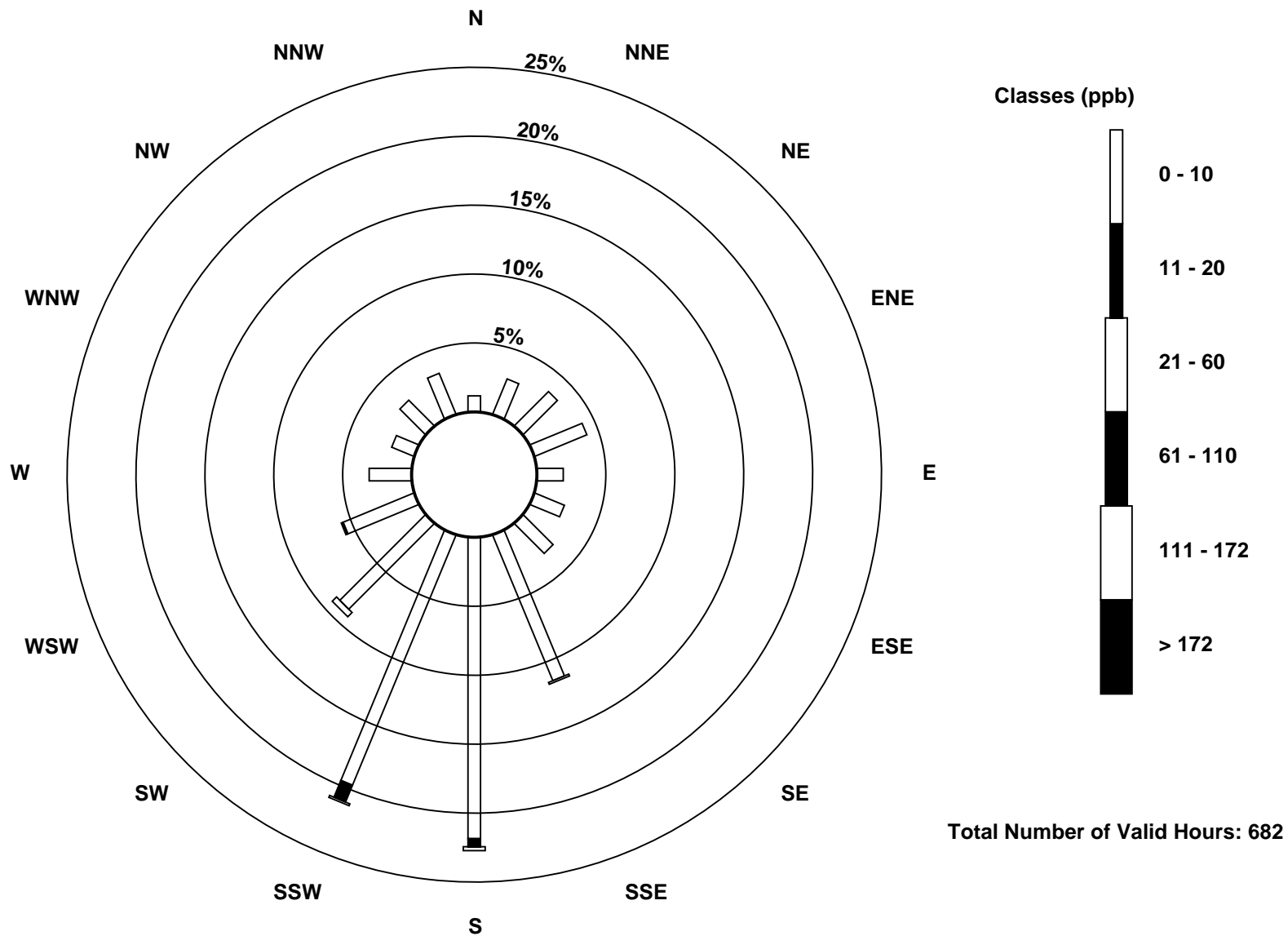
Total Number of Valid Hours: 682

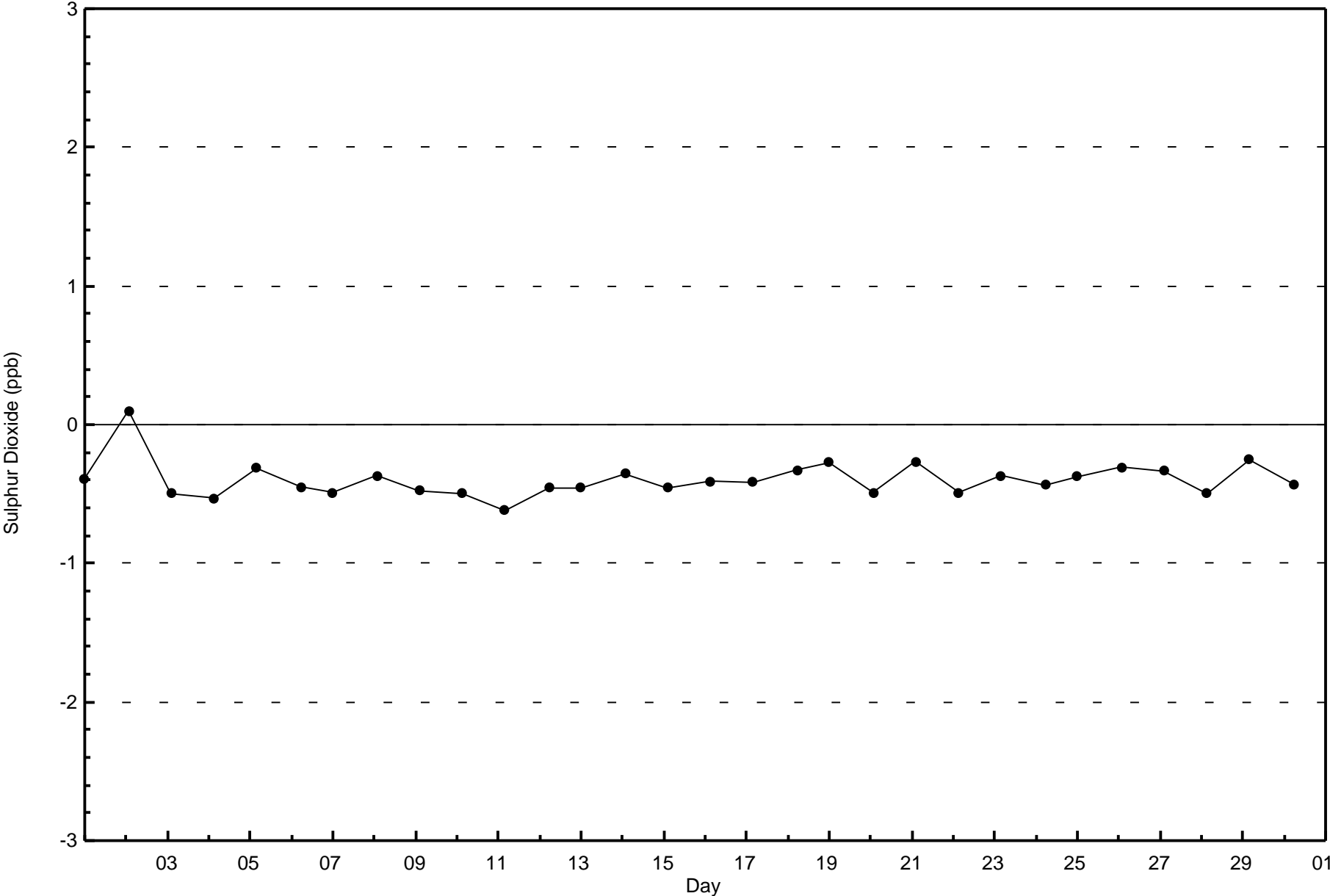
Total Number of Hours: 720

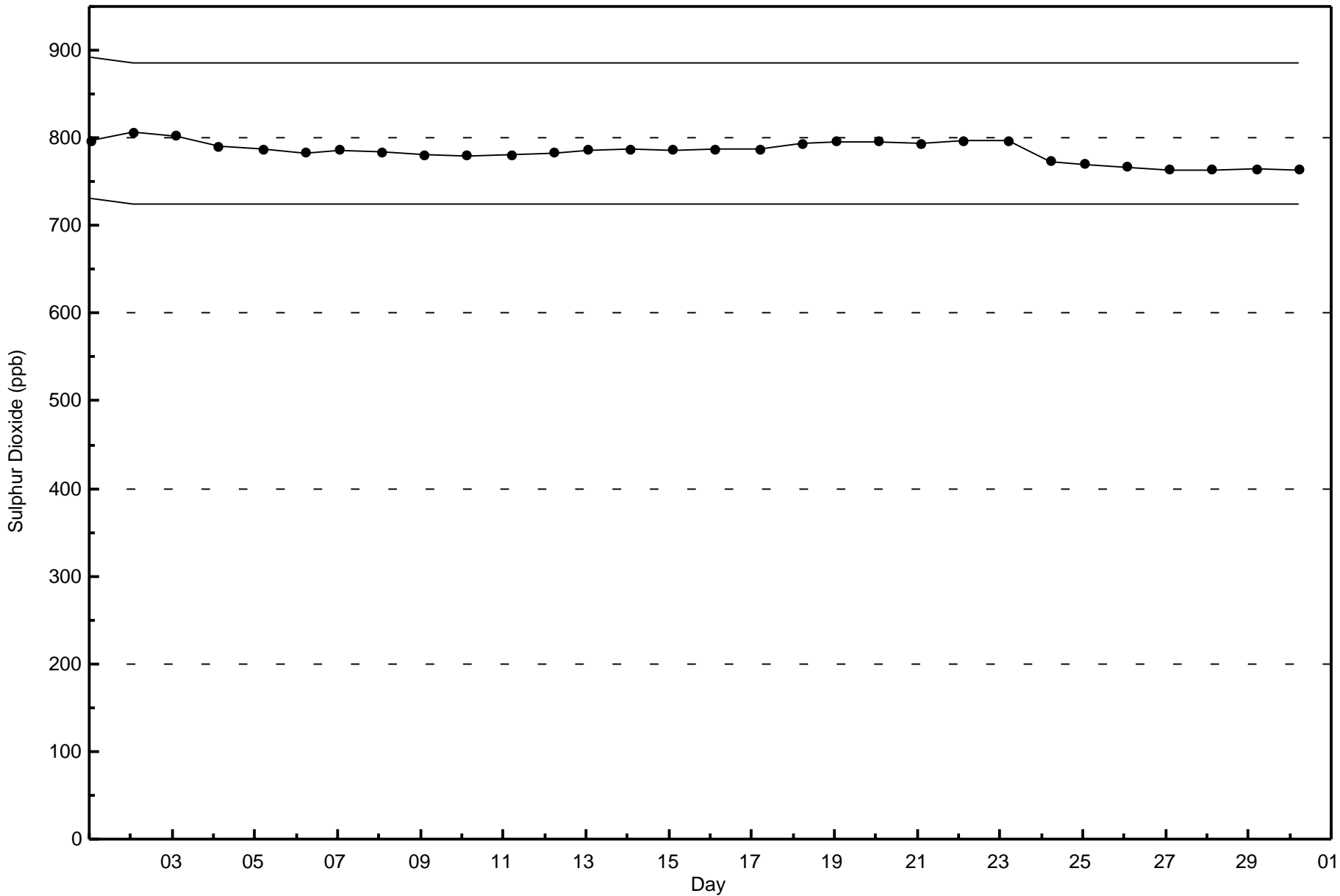


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

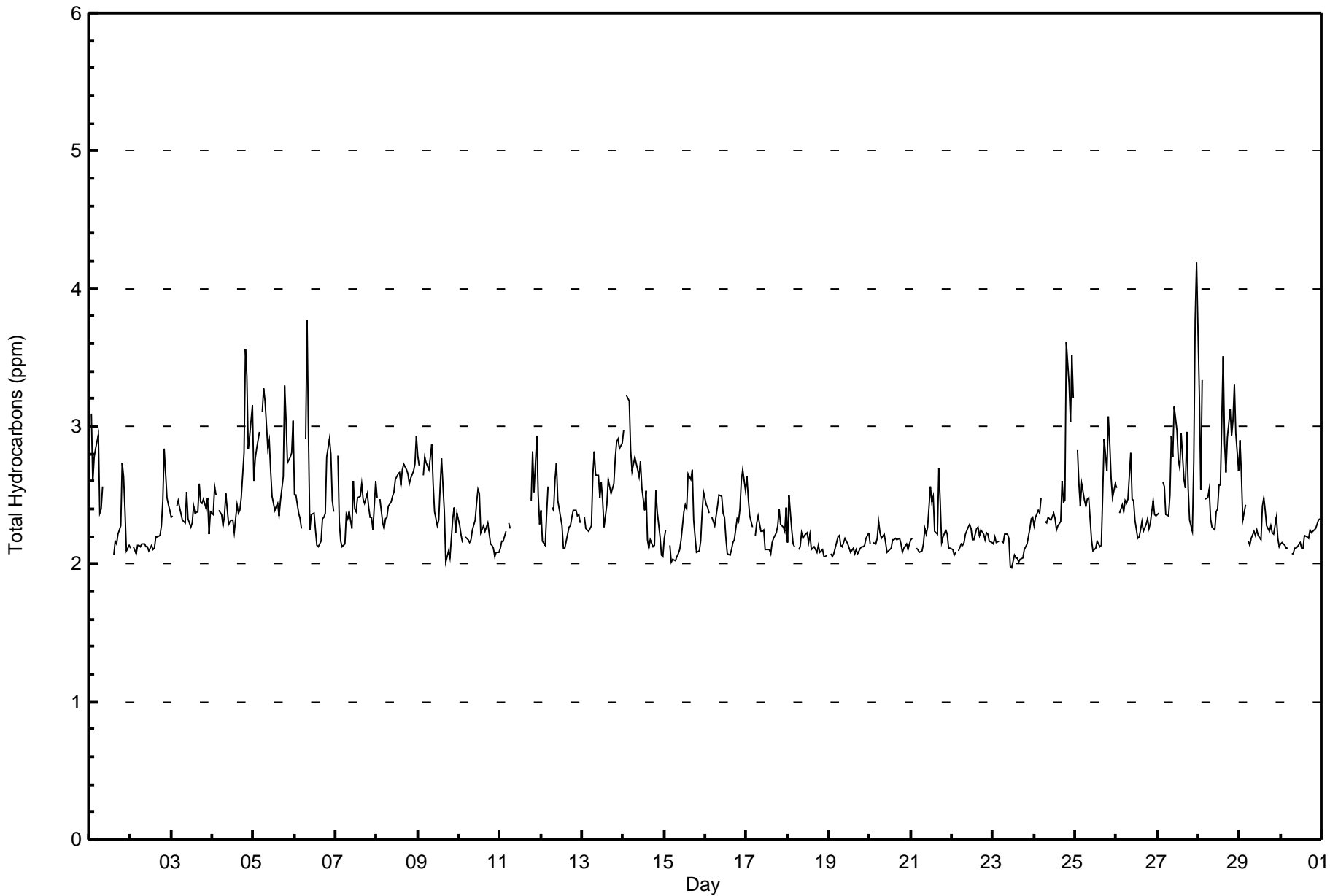
Total Hydrocarbons (THC) - ppm
Shell Muskeg River - November 2016

Maximum Value: 4.2 ppm on Nov 28 00:00																				Maximum Daily Average: 2.8 ppm on Nov 5					Hours in Service: 720	
Minimum Value: 2.0 ppm on Nov 23 12:00																				Minimum Daily Average: 2.1 ppm on Nov 19					Hours of Data: 674	
Maximum Diurnal Average: 2.5 ppm at hour 20																				Minimum Diurnal Average: 2.3 ppm at hour 14					Hours of Missing Data: 46	
Monthly Average: 2.39 ppm																				Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.5 P ₉₀ = 2.8 P ₉₉ = 3.5					Hours of Calibration: 35	
																									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-Nov	Z	3.1	2.6	2.8	2.8	2.9	2.4	2.4	2.6	C	C	C	C	C	2.1	2.2	2.1	2.2	2.3	2.7	2.6	2.4	2.1	2.1	2.5	3.1
2-Nov	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	2.2	2.2	2.2	2.3	2.5	2.8	2.5	2.4	2.4	2.2	2.8
3-Nov	2.3	2.3	Z	2.4	2.5	2.4	2.3	2.3	2.3	2.5	2.3	2.3	2.3	2.4	2.4	2.4	2.6	2.5	2.4	2.5	2.4	2.5	2.2	2.4	2.4	2.6
4-Nov	2.4	2.6	2.5	Z	2.4	2.4	2.3	2.3	2.5	2.3	2.3	2.3	2.3	2.2	2.4	2.4	2.4	2.5	2.8	3.6	3.4	2.8	2.9	3.2	2.6	3.6
5-Nov	2.6	2.8	2.8	3.0	Z	3.1	3.3	3.2	2.8	2.9	2.7	2.5	2.4	2.4	2.4	2.3	2.5	2.6	3.3	3.0	2.7	2.8	2.8	3.0	2.8	3.3
6-Nov	2.5	2.5	2.4	2.3	2.3	Z	2.9	3.8	2.9	2.3	2.4	2.4	2.3	2.1	2.1	2.2	2.3	2.3	2.4	2.8	2.9	2.8	2.5	2.4	2.5	3.8
7-Nov	Z	2.8	2.3	2.2	2.1	2.1	2.4	2.3	2.4	2.3	2.6	2.4	2.4	2.5	2.5	2.6	2.5	2.4	2.5	2.4	2.3	2.3	2.3	2.6	2.4	2.8
8-Nov	2.5	Z	2.5	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.7	2.7	2.6	2.7	2.7	2.7	2.7	2.6	2.6	2.7	2.7	2.9	2.6	2.9
9-Nov	2.8	2.7	Z	2.6	2.8	2.7	2.7	2.8	2.9	2.6	2.4	2.3	2.3	2.6	2.8	2.4	2.0	2.1	2.1	2.0	2.3	2.4	2.2	2.4	2.5	2.9
10-Nov	2.3	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.2	2.3	2.2	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.5
11-Nov	2.1	2.2	2.2	2.2	Z	2.3	2.3	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	2.5	2.8	2.5	2.9	2.5	2.3	--	2.9
12-Nov	2.4	2.2	2.1	2.4	2.6	Z	2.4	2.4	2.6	2.7	2.5	2.3	2.3	2.1	2.1	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.3	2.3	2.7
13-Nov	Z	2.3	2.3	2.2	2.2	2.3	2.6	2.8	2.6	2.6	2.5	2.6	2.5	2.3	2.4	2.6	2.6	2.5	2.6	2.8	2.9	2.9	2.8	2.9	2.6	2.9
14-Nov	3.0	Z	3.2	3.2	2.8	2.7	2.7	2.8	2.7	2.6	2.7	2.5	2.4	2.5	2.2	2.1	2.2	2.1	2.1	2.5	2.4	2.2	2.1	2.1	2.5	3.2
15-Nov	2.2	2.2	Z	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.4	2.4	2.4	2.7	2.6	2.7	2.3	2.2	2.1	2.1	2.2	2.4	2.5	2.3	2.7
16-Nov	2.4	2.4	2.4	Z	2.3	2.3	2.4	2.4	2.5	2.5	2.4	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.6	2.7	2.5	2.3	2.7
17-Nov	2.6	2.5	2.3	2.3	Z	2.2	2.3	2.4	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.3	2.3	2.2	2.4	2.3	2.6
18-Nov	2.2	2.5	2.3	2.2	2.1	Z	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	2.1	2.1	2.1	2.1	2.2	2.5
19-Nov	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2
20-Nov	2.1	Z	2.2	2.2	2.2	2.3	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	2.1	2.1	2.2	2.1	2.1	2.2	2.3
21-Nov	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.3	2.6	2.4	2.5	2.2	2.2	2.7	2.5	2.2	2.2	2.2	2.2	2.1	2.1	2.3	2.7
22-Nov	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.2	2.2	2.3	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	2.3
23-Nov	2.1	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.3	2.3	2.3	2.1	2.3
24-Nov	2.3	2.3	2.4	2.4	2.5	Z	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.2	2.3	2.3	2.6	2.5	2.5	3.6	3.3	3.0	3.5	3.2	2.6	3.6
25-Nov	Z	2.8	2.6	2.4	2.6	2.5	2.4	2.5	2.5	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.5	2.9	2.7	3.1	2.9	2.6	2.5	2.6	2.5	3.1
26-Nov	2.6	Z	2.4	2.4	2.4	2.5	2.4	2.5	2.8	2.5	2.5	2.3	2.2	2.2	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.5	2.4	2.4	2.4	2.8
27-Nov	2.4	2.4	Z	2.6	2.6	2.4	2.3	2.5	2.9	2.8	3.1	3.0	2.8	2.7	3.0	2.6	2.6	3.0	2.6	2.3	2.2	2.7	3.8	4.2	2.7	4.2
28-Nov	3.2	2.5	3.3	Z	2.5	2.5	2.5	2.3	2.3	2.2	2.4	2.4	2.6	2.6	3.5	2.9	2.7	2.9	3.1	2.9	3.0	3.3	3.0	2.7	2.8	3.5
29-Nov	2.9	2.7	2.3	2.4	Z	2.2	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.4	2.5	2.4	2.3	2.2	2.3	2.2	2.2	2.3	2.2	2.1	2.3	2.9
30-Nov	2.2	2.2	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.3
																				Diurnal Average						
																				Diurnal Maximum						
Z - zerspan																				C - Calibration					UO - Unstable Operation	



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Shell Muskeg River - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	12	1.78	1.78
2.1 - 3.0	638	94.66	96.44
3.1 - 10.0	24	3.56	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Shell Muskeg River - November 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	7	0	0	0	3	2	0	0	0	12
2.1 - 3.0	5	17	24	28	13	15	19	72	153	133	56	36	20	12	17	18	638
3.1 - 10.0	3	2	0	0	0	1	2	0	2	4	4	1	0	0	1	4	24
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	19	24	28	13	16	21	79	155	137	60	40	22	12	18	22	674

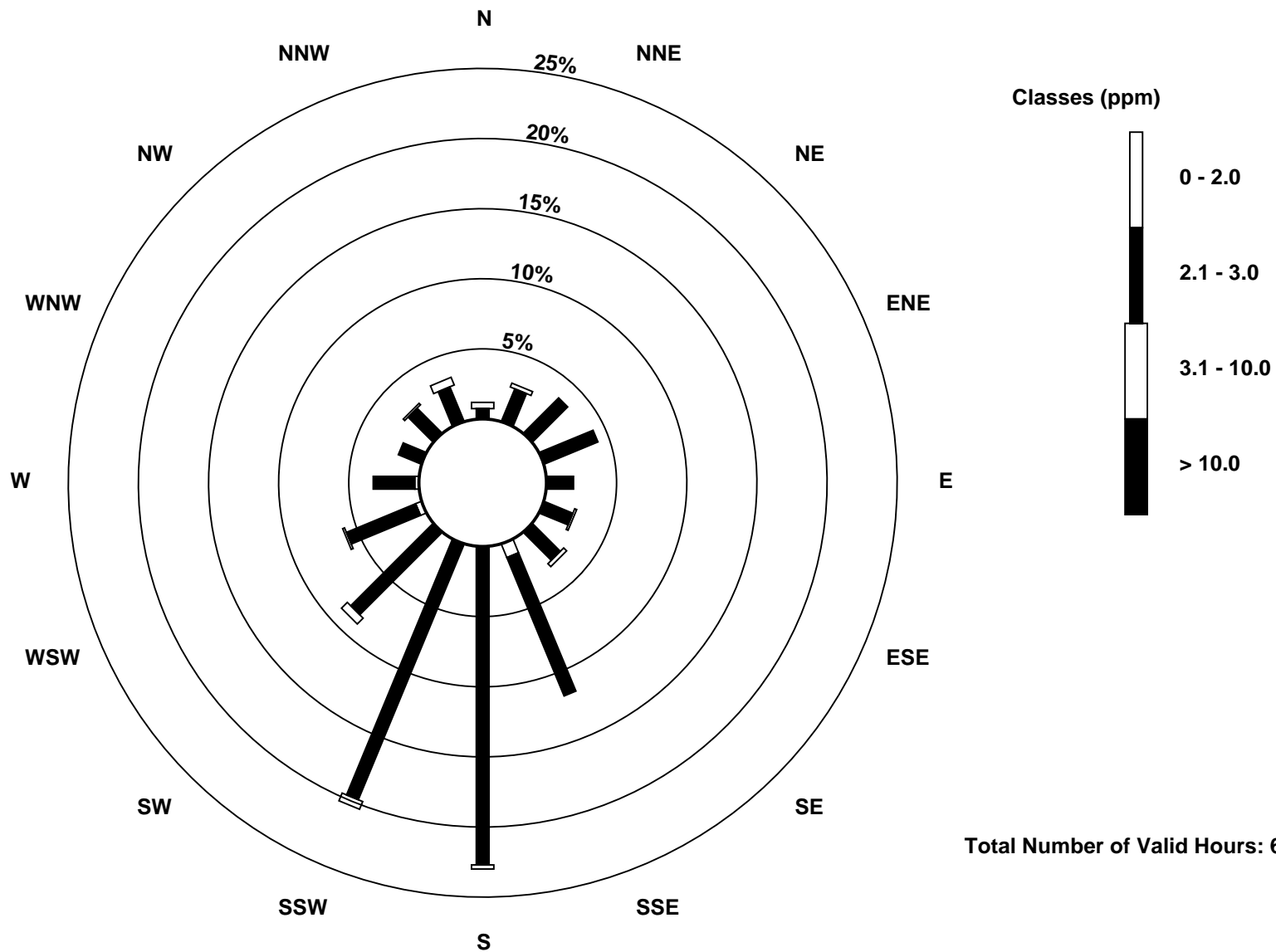
Total Number of Valid Hours: 674

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

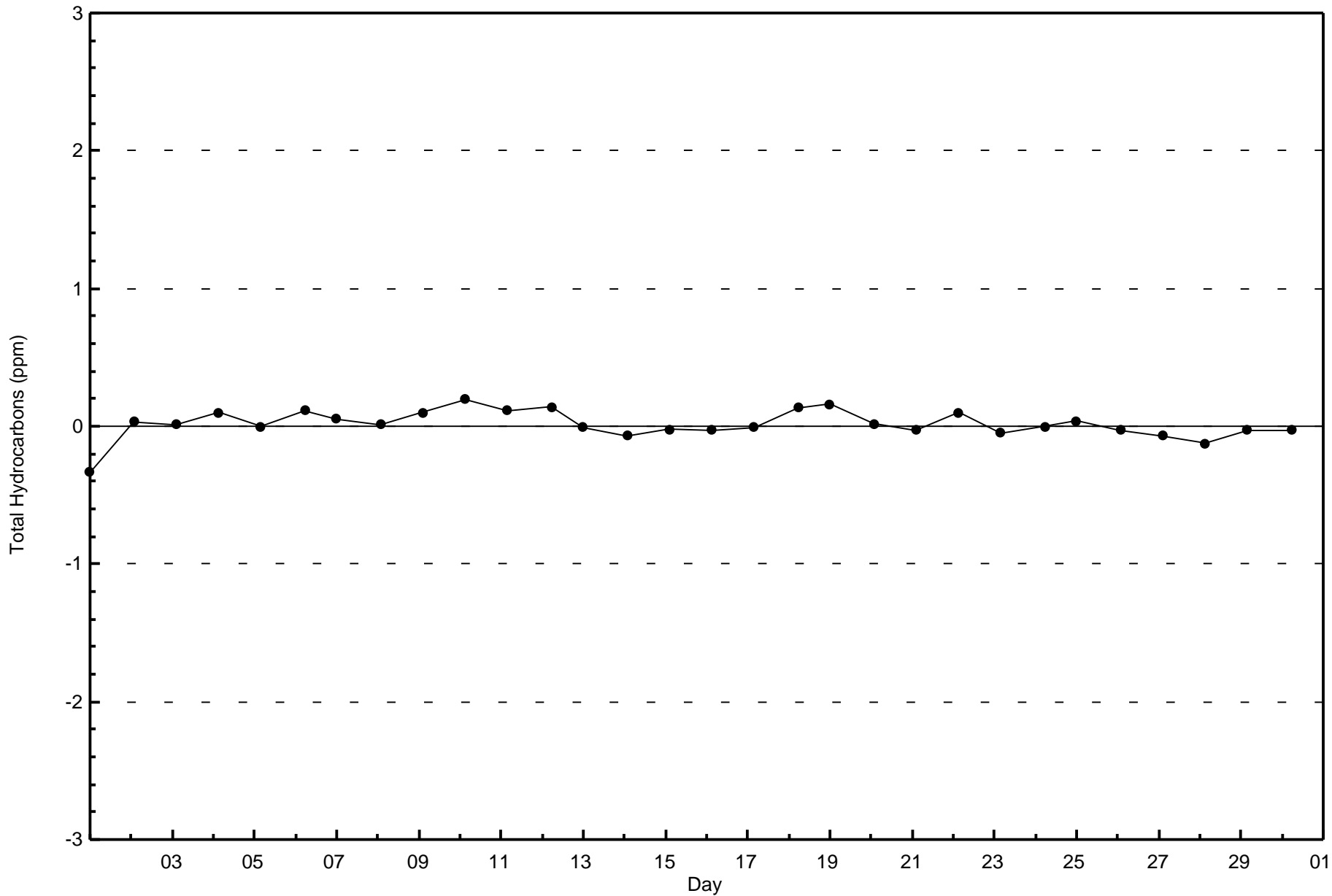
Total Hydrocarbons (THC) - ppm
Shell Muskeg River (AMS 16)

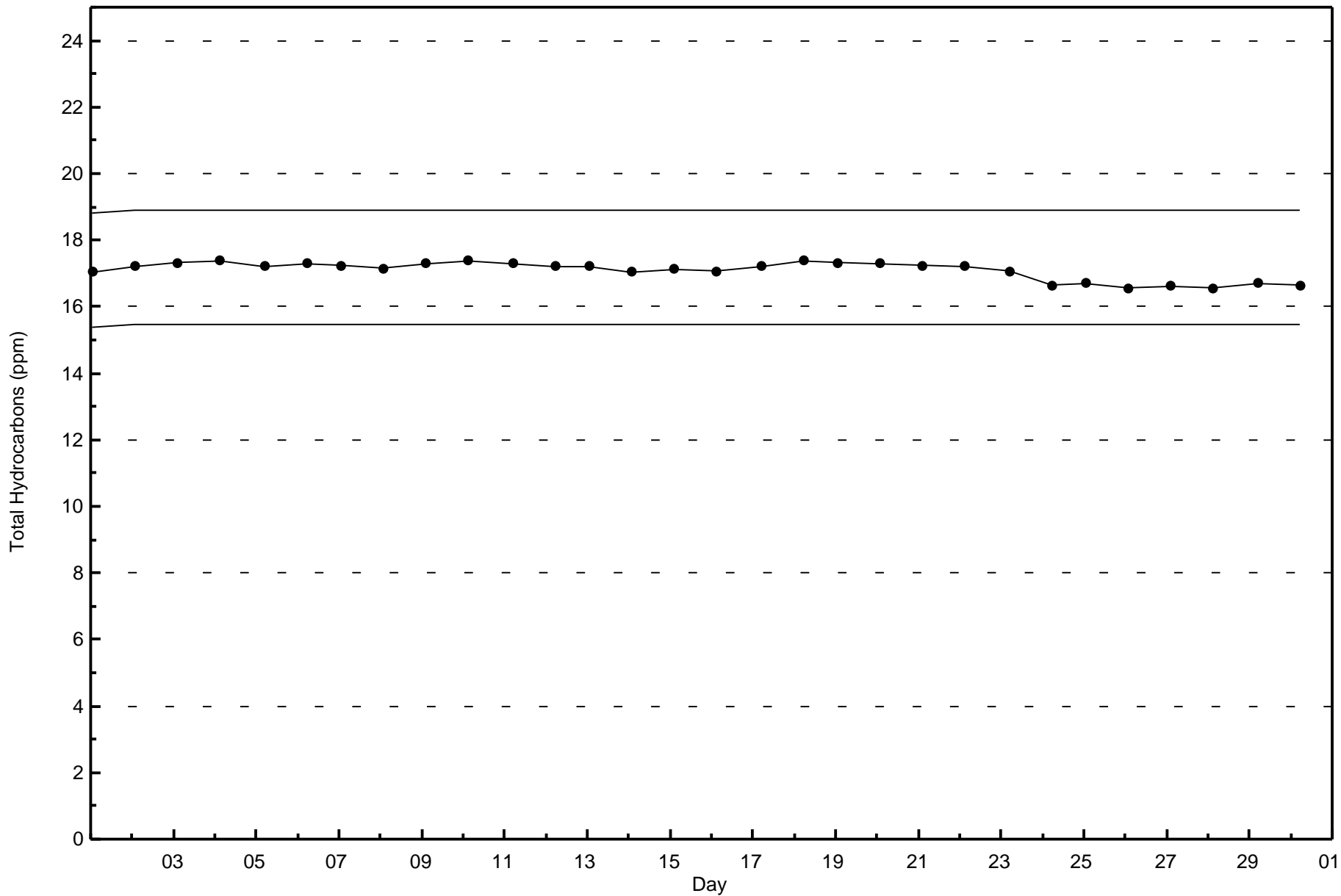




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - November 2016





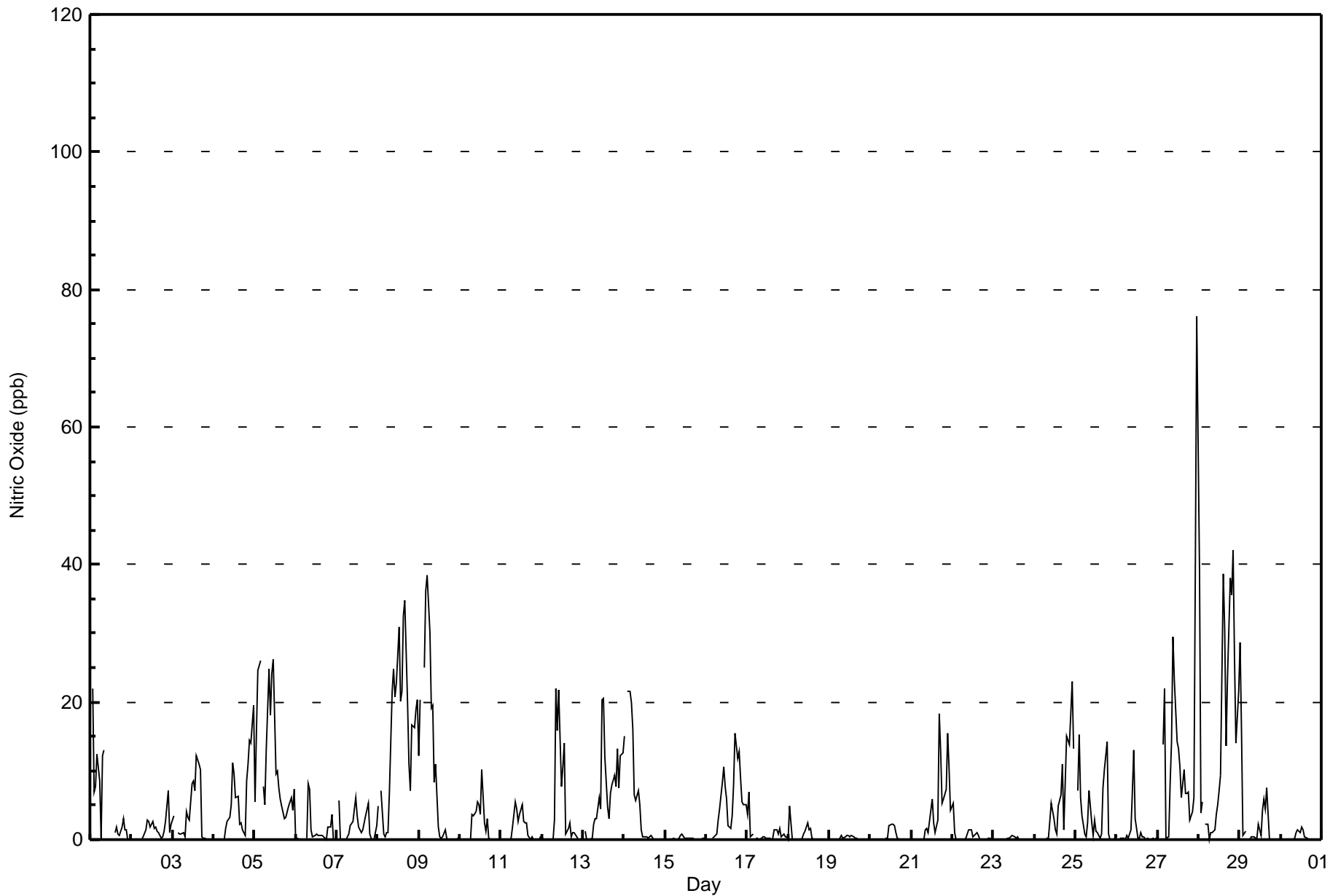


Maximum Value: 76 ppb on Nov 28 00:00																		Maximum Daily Average: 15.9 ppb on Nov 28						Hours in Service: 720		
Minimum Value: 0 ppb on Nov 1 23:00																		Minimum Daily Average: 0.1 ppb on Nov 23						Hours of Data: 685		
Maximum Diurnal Average: 6.2 ppb at hour 24																		Minimum Diurnal Average: 1.7 ppb at hour 7						Hours of Missing Data: 35		
Monthly Average: 4.4 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 5 P ₉₀ = 14 P ₉₉ = 38						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	Z	22	7	8	12	8	0	12	13	C	C	C	C	C	1	2	1	1	2	3	1	1	0	0	5.3	22
2-Nov	0	Z	0	0	0	0	0	0	1	3	3	2	3	2	2	1	1	0	0	1	3	7	1	2	1.4	7
3-Nov	3	3	Z	1	1	1	1	0	4	3	3	8	8	7	12	11	10	0	0	0	0	0	0	3.4	12	
4-Nov	0	0	0	Z	0	0	0	2	3	3	5	11	9	6	6	2	3	1	1	9	11	14	14	20	5.2	20
5-Nov	5	16	25	26	Z	8	5	13	25	18	24	26	10	10	7	6	5	3	3	4	5	6	4	7	11.4	26
6-Nov	0	0	0	0	0	Z	0	8	7	1	0	1	1	1	1	1	0	0	0	2	2	4	0	0	1.3	8
7-Nov	Z	6	0	0	0	0	0	1	2	3	5	6	4	2	1	1	2	3	5	1	0	0	0	2	1.9	6
8-Nov	5	Z	7	1	0	1	1	7	21	25	21	23	31	20	22	33	35	20	11	7	17	16	19	20	15.7	35
9-Nov	12	20	Z	25	36	38	30	19	19	8	11	2	0	0	0	1	0	0	0	0	0	0	0	0	9.8	38
10-Nov	0	0	0	Z	0	0	0	4	4	4	5	5	4	10	2	1	3	0	0	0	0	0	0	0	1.9	10
11-Nov	0	0	0	0	Z	0	0	2	6	4	3	4	5	3	3	3	1	0	0	0	0	0	0	0	1.4	6
12-Nov	0	0	0	0	0	Z	0	3	22	16	22	8	11	14	1	2	2	0	1	1	0	0	0	0	4.5	22
13-Nov	Z	1	0	0	0	0	2	3	3	6	4	20	21	12	5	3	7	8	9	8	13	8	12	13	6.9	21
14-Nov	15	Z	21	22	20	16	7	6	7	5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	5.3	22
15-Nov	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Nov	0	0	0	Z	0	1	1	3	4	8	11	8	6	2	2	3	8	15	12	13	9	6	5	5	5.3	15
17-Nov	4	7	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	1	0	0	0.9	7
18-Nov	0	5	0	0	0	Z	0	0	0	1	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0.6	5
19-Nov	Z	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1
20-Nov	0	Z	0	0	0	0	0	0	0	0	0	2	2	2	2	1	0	0	0	0	0	0	0	0	0.5	2
21-Nov	0	0	Z	0	0	0	0	0	1	2	1	4	6	2	1	3	18	13	5	6	7	15	10	4	4.4	18
22-Nov	5	1	0	Z	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0.6	5
23-Nov	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
24-Nov	0	0	0	0	0	Z	0	0	0	3	5	3	1	1	5	6	11	1	8	15	14	18	23	13	5.6	23
25-Nov	Z	7	15	6	4	1	0	2	7	2	1	3	1	1	0	1	7	10	14	1	0	0	0	0	3.7	15
26-Nov	1	Z	0	0	0	0	1	0	2	7	13	3	0	0	1	0	0	0	0	0	0	0	0	0	1.3	13
27-Nov	0	0	Z	14	22	0	0	8	14	30	23	14	13	11	6	10	7	7	7	3	4	6	39	76	13.7	76
28-Nov	39	4	6	Z	2	2	0	1	1	2	4	5	7	9	39	30	14	24	38	36	42	26	14	21	15.9	42
29-Nov	29	16	1	1	Z	0	0	0	0	0	0	2	1	4	6	4	8	0	0	0	0	0	0	0	3.2	29
30-Nov	0	0	0	0	0	Z	0	0	0	1	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0.3	2
																								Diurnal Average		
																								Diurnal Maximum		
4.8 4.3 3.3 4.2 3.9 3.1 1.7 3.2 5.6 5.5 5.9 5.7 5.1 4.3 4.2 4.3 4.9 3.6 4.0 3.7 4.3 4.3 4.8 6.2																										
39 22 25 26 36 38 30 19 25 30 24 26 31 20 39 33 35 24 38 36 42 26 39 76																										
Z - zerspan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Shell Muskeg River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Shell Muskeg River - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	646	94.31	94.31
21 - 40	37	5.40	99.71
41 - 80	2	0.29	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
Shell Muskeg River - 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	3	18	23	28	12	16	20	79	147	133	61	40	22	12	18	14	646
21 - 40	5	1	1	0	1	0	1	0	8	12	2	0	0	0	0	6	37
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	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	8	19	24	28	13	16	21	79	155	145	63	40	22	12	18	22	685

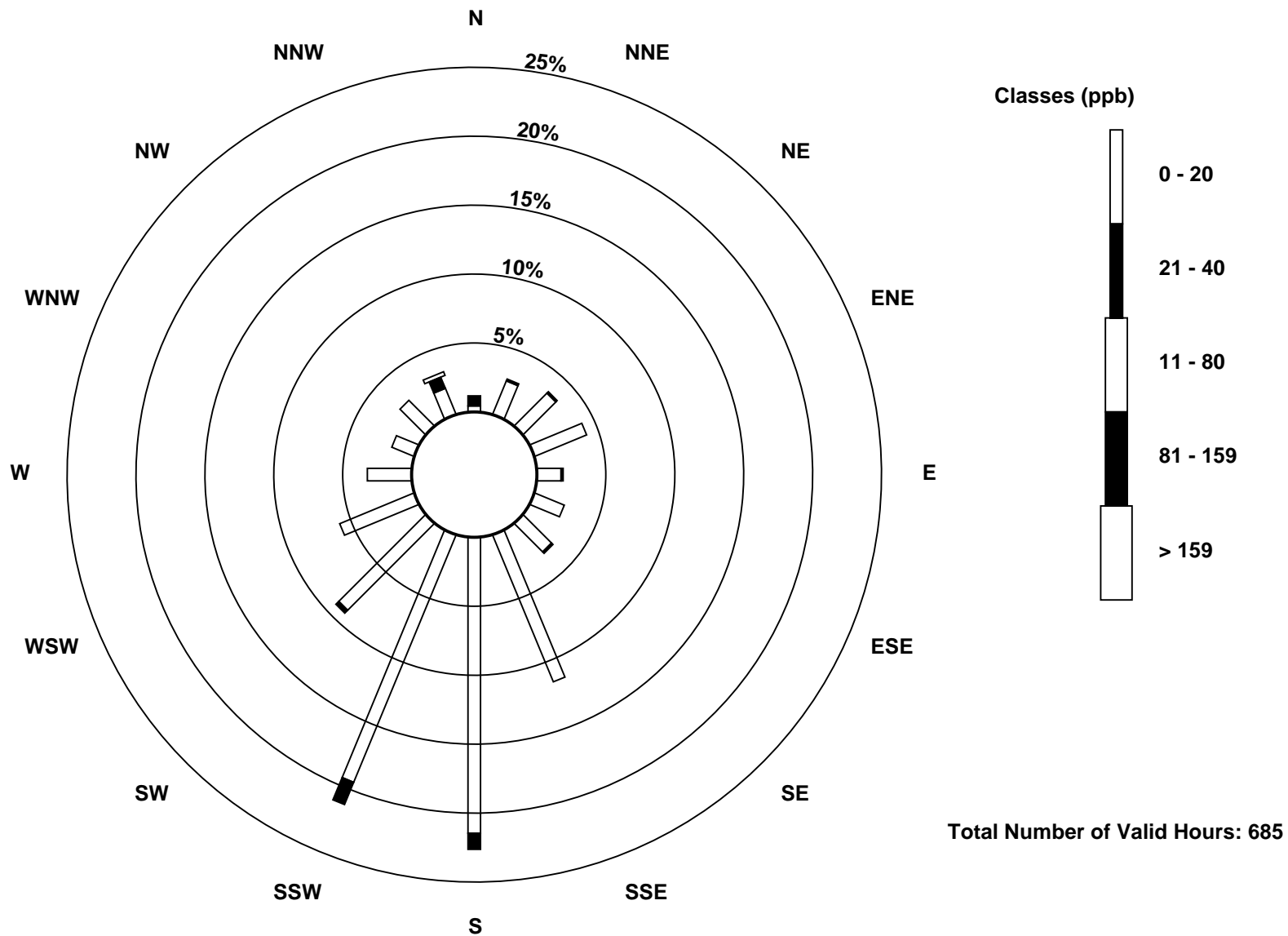
Total Number of Valid Hours: 685

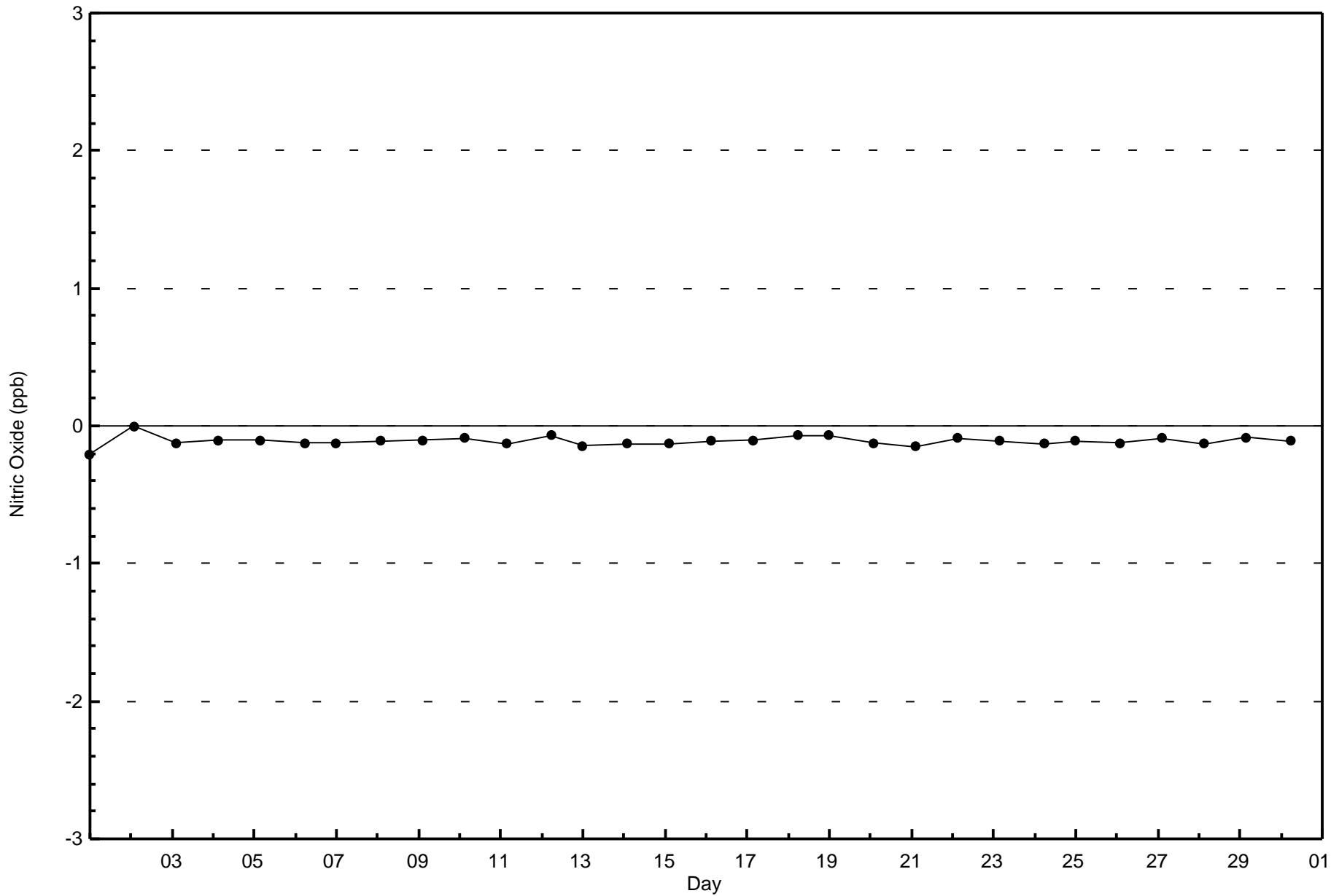
Total Number of Hours: 720

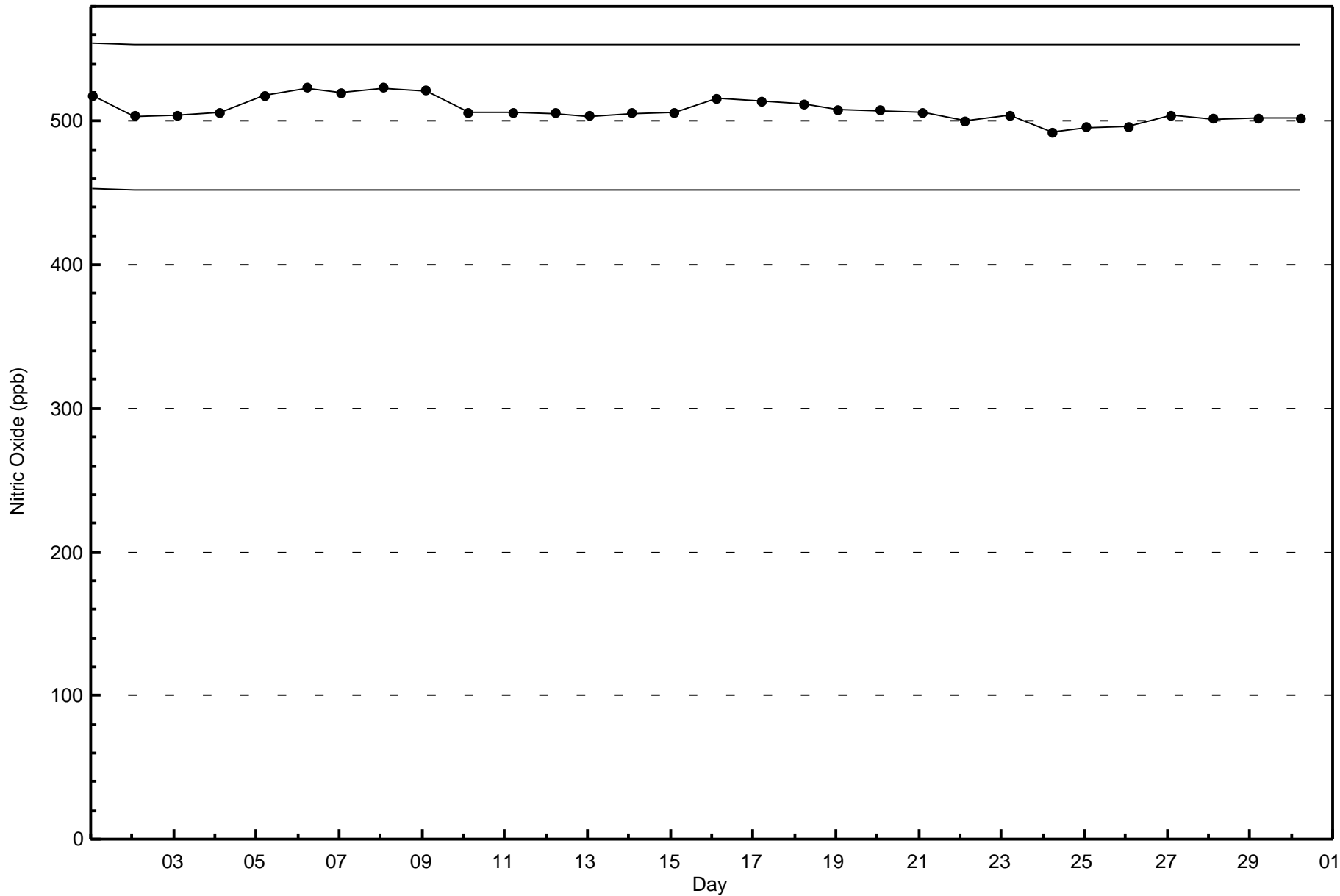


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Shell Muskeg River - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 28 ppb on Nov 28 00:00	Maximum Daily Average: 18.6 ppb on Nov 5		Hours of Data:	685
Minimum Value: 0 ppb on Nov 14 19:00	Minimum Daily Average: 2.3 ppb on Nov 15		Hours of Missing Data:	35
Maximum Diurnal Average: 10.3 ppb at hour 9	Minimum Diurnal Average: 7.1 ppb at hour 23		Hours of Calibration:	35
Monthly Average: 8.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 4 Median = 8 Q ₃ = 13 P ₉₀ = 18 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-Nov	Z	27	21	25	26	20	7	18	25	C	C	C	C	C	4	7	7	9	18	16	13	16	2	4	14.6	27
2-Nov	2	Z	0	1	3	4	3	3	5	7	9	7	11	9	7	8	12	12	13	13	13	15	13	14	8.1	15
3-Nov	13	12	Z	11	11	10	10	8	8	9	9	7	6	6	8	10	13	7	7	9	8	2	2	9	8.5	13
4-Nov	12	8	4	Z	9	13	16	19	11	10	11	17	17	15	17	13	15	19	18	22	20	24	15	18	14.8	24
5-Nov	20	18	20	18	Z	18	18	18	19	17	19	20	16	18	18	17	20	20	18	18	19	21	20	19	18.6	21
6-Nov	13	21	13	13	12	Z	17	17	14	7	3	2	3	3	4	6	10	10	15	22	22	18	8	5	11.0	22
7-Nov	Z	19	6	4	3	9	15	15	13	8	9	11	9	6	5	5	13	25	25	18	10	5	6	10	10.8	25
8-Nov	21	Z	18	14	13	14	14	15	16	14	12	13	14	13	16	17	17	16	15	14	14	13	11	9	14.5	21
9-Nov	11	12	Z	13	13	12	10	10	10	8	7	3	1	1	2	5	2	1	1	0	1	0	1	3	5.4	13
10-Nov	1	1	1	Z	7	6	4	8	9	6	8	8	7	14	8	9	15	6	1	0	1	0	1	1	5.2	15
11-Nov	3	5	7	9	Z	15	17	20	20	13	8	6	5	7	10	11	12	17	15	2	1	1	1	9	9.2	20
12-Nov	16	4	4	15	13	Z	14	20	24	23	23	10	9	9	4	5	9	12	11	12	10	8	7	4	11.5	24
13-Nov	Z	7	6	6	9	13	15	13	12	10	9	16	16	14	9	10	16	16	15	17	15	15	12	10	12.1	17
14-Nov	9	Z	10	9	10	13	13	13	13	10	6	2	1	2	2	2	5	1	0	2	1	0	1	0	5.4	13
15-Nov	3	1	Z	2	2	2	1	1	1	1	1	1	1	0	1	2	5	5	5	0	2	3	5	9	2.3	9
16-Nov	9	7	5	Z	5	9	10	12	8	8	10	10	9	2	1	4	8	11	10	13	12	21	16	23	9.5	23
17-Nov	20	25	9	11	Z	3	6	5	4	4	3	0	0	0	0	3	7	7	9	15	7	12	9	10	7.3	25
18-Nov	2	24	11	4	3	Z	3	7	4	7	6	9	6	8	1	1	1	1	3	2	2	0	0	2	4.7	24
19-Nov	Z	3	3	3	4	9	9	9	5	5	5	4	3	5	4	4	5	4	4	4	4	4	4	4	4.6	9
20-Nov	1	Z	0	0	0	1	1	2	2	2	2	7	7	8	11	13	9	4	1	1	1	1	1	1	3.4	13
21-Nov	0	1	Z	2	1	1	2	6	15	10	6	10	10	7	5	7	12	9	4	6	7	11	8	4	6.2	15
22-Nov	5	1	1	Z	1	4	4	3	6	11	9	7	3	5	8	9	9	6	4	4	5	4	3	2	4.9	11
23-Nov	2	2	2	2	Z	2	3	6	8	5	5	6	3	4	4	2	1	2	4	12	10	3	2	2	3.9	12
24-Nov	2	2	3	3	3	Z	6	7	6	7	8	7	7	7	10	18	17	13	15	14	12	12	10	9	8.5	18
25-Nov	Z	9	14	12	7	9	9	10	12	6	3	8	6	6	5	4	12	17	15	8	3	3	2	3	8.0	17
26-Nov	3	Z	3	3	3	2	4	3	6	9	10	7	2	2	7	9	9	11	17	10	5	12	9	15	7.0	17
27-Nov	16	13	Z	20	20	12	13	11	15	22	17	12	11	10	8	9	7	7	6	4	4	9	22	28	12.9	28
28-Nov	17	6	11	Z	14	15	9	10	10	10	12	11	13	16	24	20	14	20	25	24	26	23	19	23	16.1	26
29-Nov	24	22	6	11	Z	0	0	3	5	2	1	6	3	14	17	18	14	7	5	6	4	3	3	4	7.7	24
30-Nov	4	5	7	4	4	Z	5	4	5	8	9	5	9	10	6	4	4	4	3	3	3	3	3	2	4.9	10

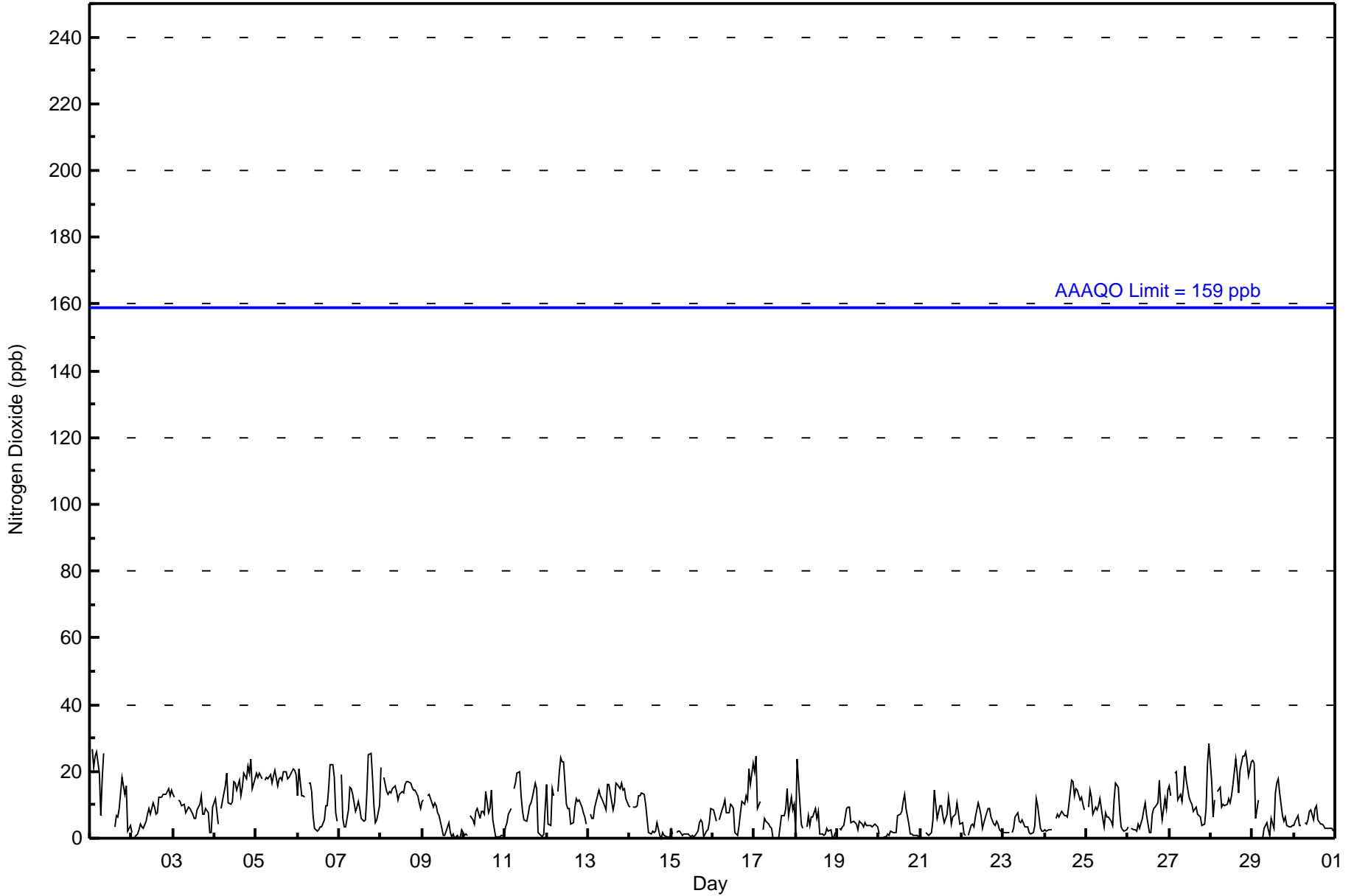
9.1	10.2	7.3	8.5	7.8	8.5	8.5	9.9	10.3	8.9	8.2	8.0	7.1	7.6	7.5	8.3	9.9	9.9	10.1	9.7	8.4	8.7	7.1	8.5	Diurnal Average	
24	27	21	25	26	20	18	20	25	23	23	20	17	18	24	20	20	25	25	24	26	24	22	28	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	653	95.33	95.33
21 - 40	32	4.67	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
Shell Muskeg River - 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	4	19	24	28	13	16	19	79	151	141	61	40	22	12	15	9	653
21 - 40	4	0	0	0	0	0	2	0	4	4	2	0	0	0	3	13	32
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	19	24	28	13	16	21	79	155	145	63	40	22	12	18	22	685

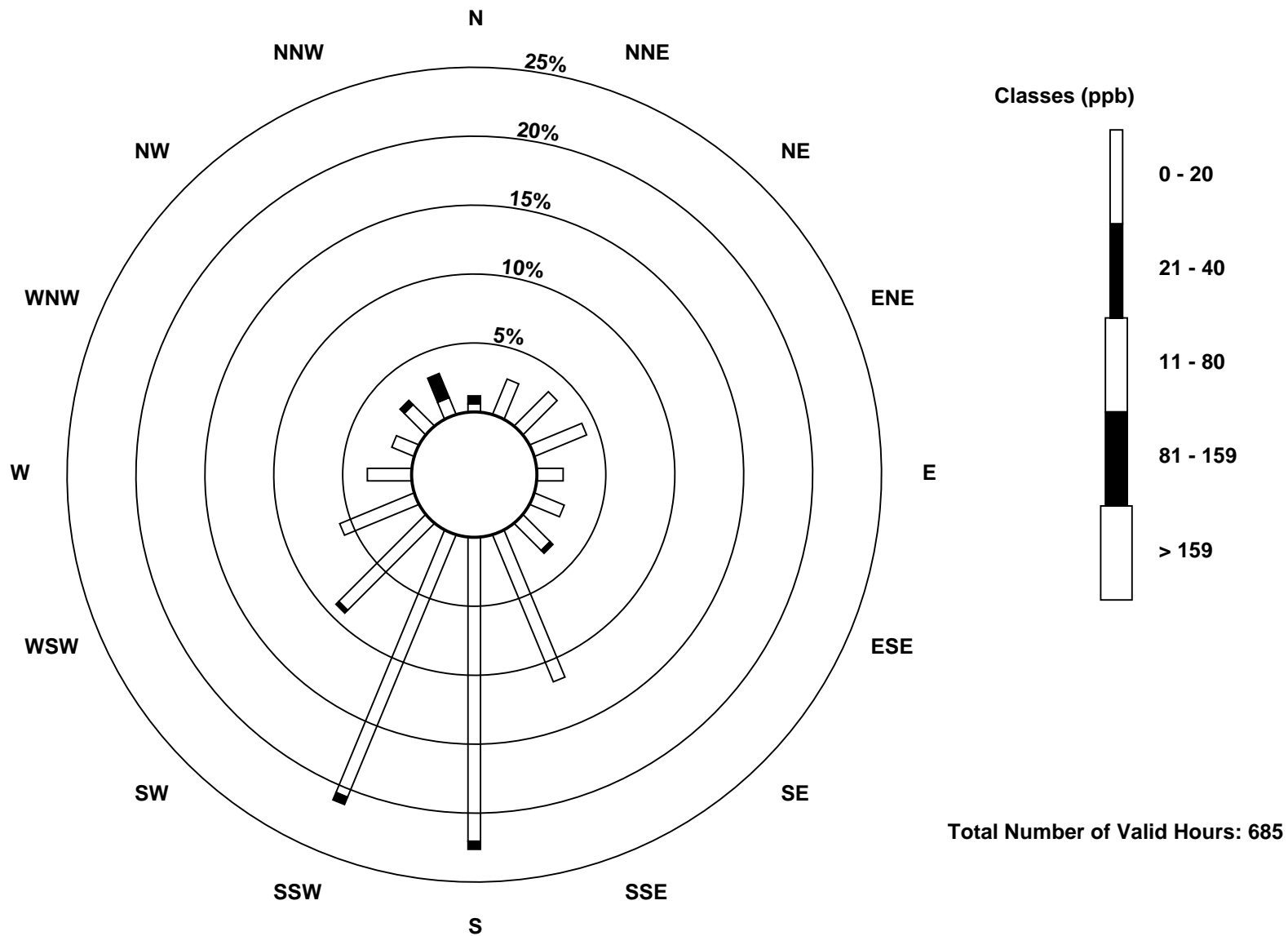
Total Number of Valid Hours: 685

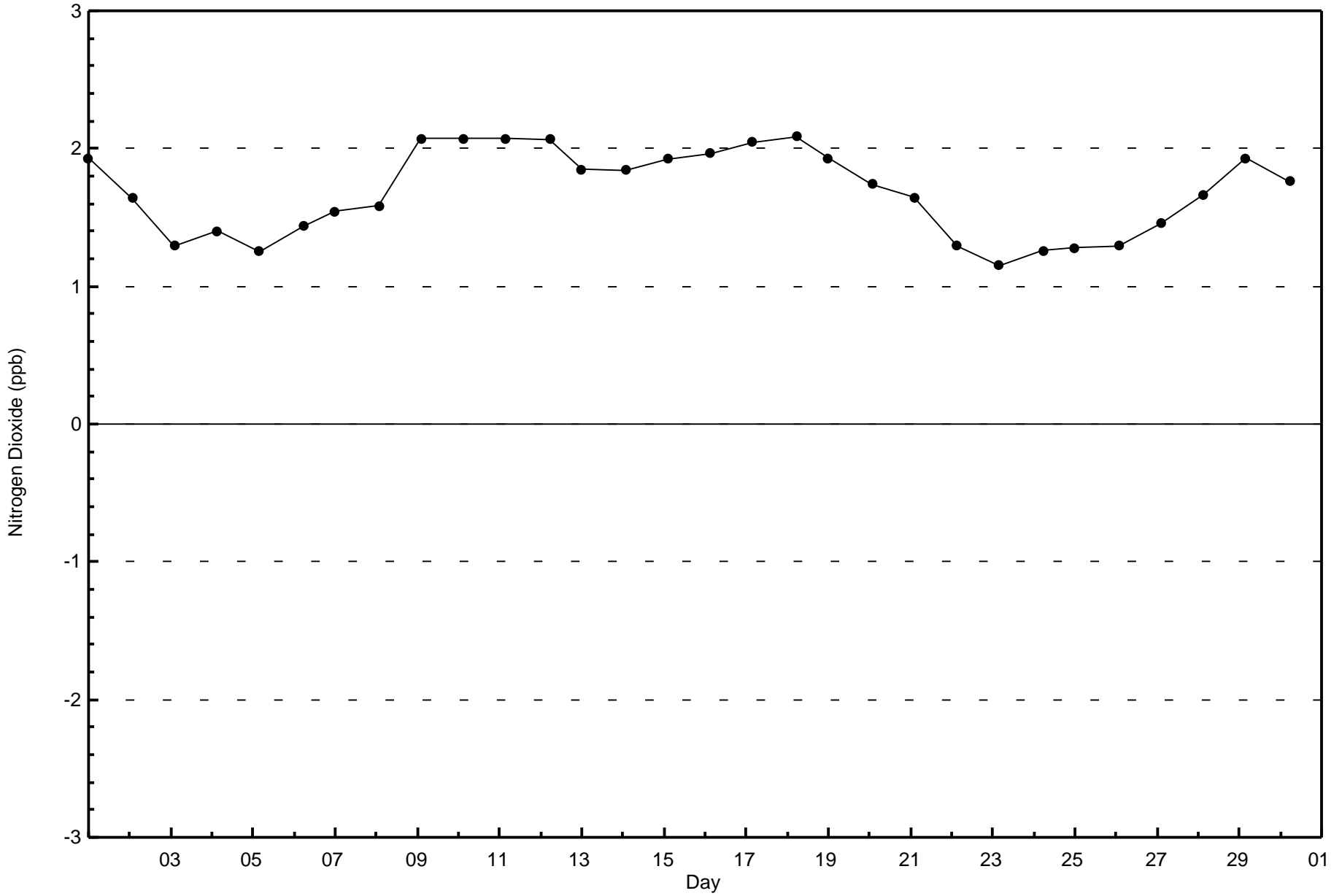
Total Number of Hours: 720

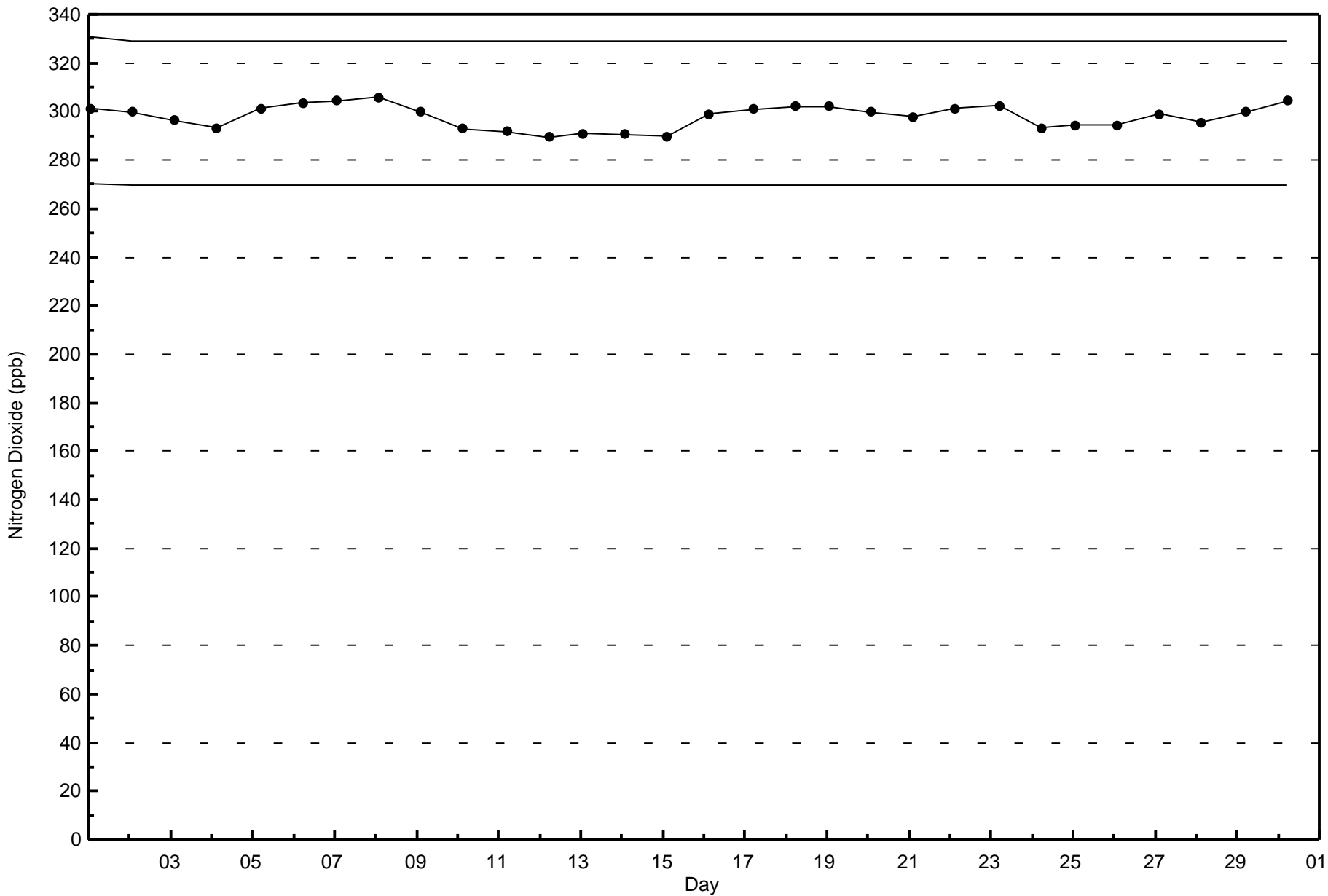


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

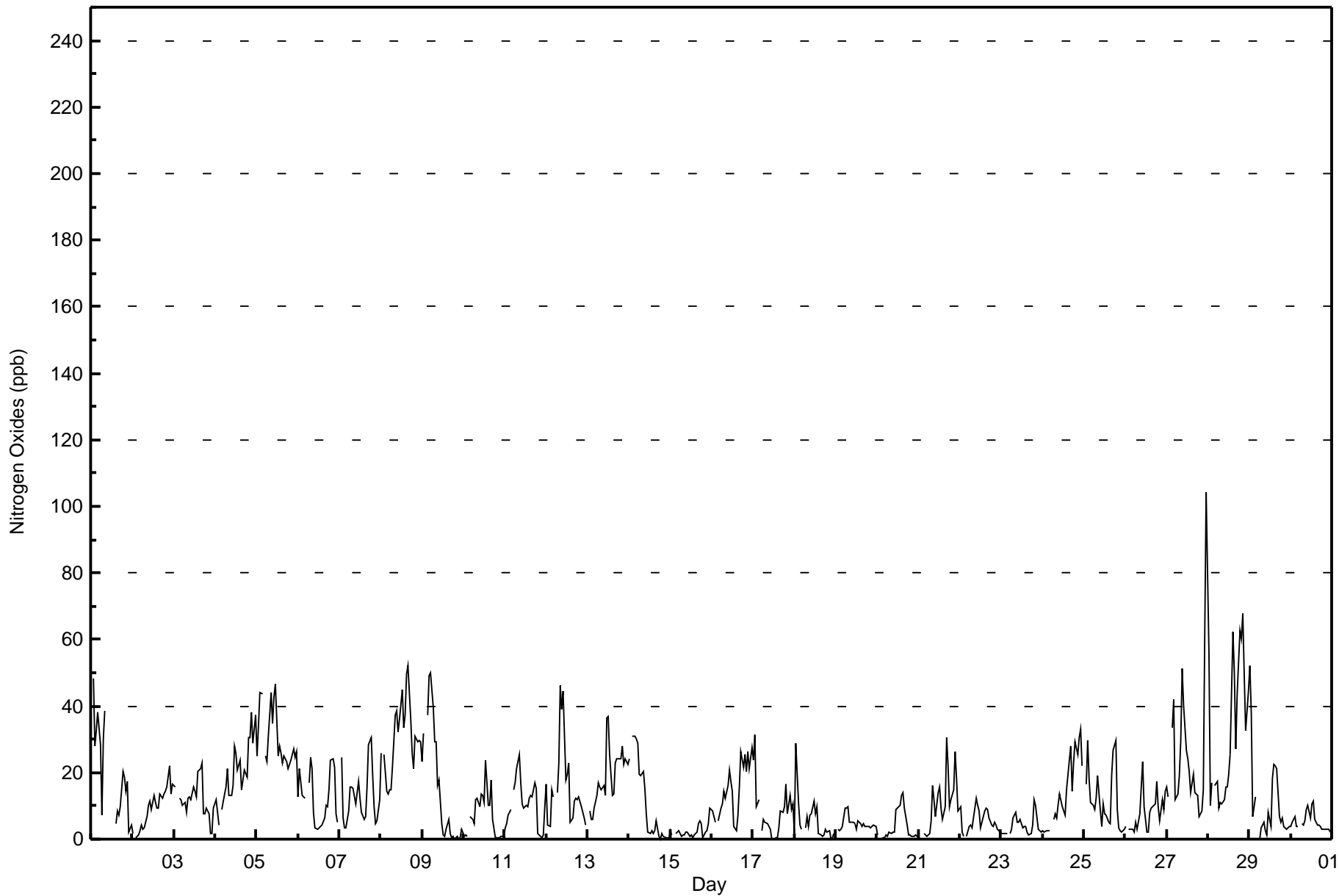
Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - November 2016

Maximum Value: 104 ppb on Nov 28 00:00		Maximum Daily Average: 32.0 ppb on Nov 28		Hours in Service: 720																						
Minimum Value: 0 ppb on Nov 15 00:00		Minimum Daily Average: 2.5 ppb on Nov 15		Hours of Data: 685																						
Maximum Diurnal Average: 16.0 ppb at hour 9		Minimum Diurnal Average: 10.2 ppb at hour 7		Hours of Missing Data: 35																						
Monthly Average: 13.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 4 Median = 10 Q ₃ = 19 P ₉₀ = 29 P ₉₉ = 55		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	Z	48	28	33	38	28	7	30	38	C	C	C	C	C	5	9	7	10	20	19	15	17	2	4	19.9	48
2-Nov	2	Z	0	1	3	4	3	3	7	10	11	9	13	11	9	9	13	12	14	14	16	22	14	17	9.5	22
3-Nov	16	16	Z	12	12	10	11	8	12	13	12	16	14	13	21	21	23	8	7	9	8	2	2	9	11.9	23
4-Nov	12	8	4	Z	9	13	16	21	13	13	16	28	26	21	24	15	18	21	19	30	31	38	29	37	20.0	38
5-Nov	25	34	44	44	Z	25	23	31	44	35	43	47	25	28	26	23	25	23	21	22	24	27	24	26	30.0	47
6-Nov	13	21	13	13	12	Z	17	25	21	8	3	3	3	4	4	6	10	10	15	24	24	22	8	5	12.3	25
7-Nov	Z	25	6	4	3	9	15	16	15	11	14	17	12	8	6	7	16	29	31	19	10	5	6	12	12.8	31
8-Nov	26	Z	25	15	13	15	15	21	37	38	32	36	45	34	37	50	52	36	26	21	31	29	30	29	30.2	52
9-Nov	23	32	Z	37	49	50	39	29	29	16	18	5	1	1	3	6	2	1	1	0	1	0	0	3	15.1	50
10-Nov	1	1	1	Z	7	6	5	12	12	10	13	13	11	24	10	10	18	6	1	0	1	0	1	1	7.1	24
11-Nov	3	5	7	9	Z	15	17	21	26	17	11	9	10	10	12	13	13	17	15	2	1	1	1	9	10.6	26
12-Nov	17	4	4	15	13	Z	14	23	46	39	44	18	20	23	5	6	12	12	12	13	10	8	7	4	15.9	46
13-Nov	Z	9	6	6	10	13	17	16	15	16	13	37	37	26	13	13	23	24	24	24	28	22	24	22	19.0	37
14-Nov	24	Z	31	31	30	29	19	19	20	15	8	2	2	3	2	3	5	1	0	2	1	0	0	0	10.8	31
15-Nov	3	1	Z	2	2	2	1	1	1	2	2	1	1	1	1	2	5	5	5	0	2	3	5	9	2.5	9
16-Nov	9	7	5	Z	5	9	11	14	12	16	21	18	14	4	3	7	16	26	22	25	20	26	21	28	14.7	28
17-Nov	24	32	10	12	Z	3	6	5	5	4	3	0	0	0	0	4	8	8	10	16	7	13	9	11	8.2	32
18-Nov	2	29	11	4	3	Z	3	7	4	7	8	11	8	10	2	1	1	1	3	2	2	0	0	2	5.2	29
19-Nov	Z	3	3	3	4	9	9	10	5	5	5	5	3	6	5	4	5	4	4	4	4	4	4	4	4.8	10
20-Nov	1	Z	0	0	0	1	1	2	2	2	2	9	10	10	13	14	9	4	1	1	1	1	1	1	3.8	14
21-Nov	0	0	Z	2	1	1	2	6	16	12	7	14	16	9	6	10	31	22	10	12	15	26	18	9	10.6	31
22-Nov	10	2	1	Z	1	4	4	3	6	12	10	8	3	5	8	9	9	6	4	4	5	4	3	2	5.5	12
23-Nov	2	2	2	2	Z	2	3	6	8	5	5	6	4	4	4	2	1	2	4	12	10	3	2	2	4.0	12
24-Nov	2	2	2	3	2	Z	6	8	7	10	13	10	8	7	15	24	28	14	23	29	25	31	33	22	14.1	33
25-Nov	Z	16	30	18	11	10	9	12	19	8	4	11	8	7	5	5	19	27	29	9	3	3	2	3	11.7	30
26-Nov	4	Z	3	3	3	2	5	3	8	16	23	10	2	2	8	10	10	11	17	10	5	12	9	15	8.3	23
27-Nov	16	13	Z	33	42	12	14	19	30	51	40	27	24	21	14	19	14	14	13	7	8	15	61	104	26.5	104
28-Nov	56	10	17	Z	16	17	9	11	11	12	16	16	20	26	62	50	27	44	63	60	68	49	33	44	32.0	68
29-Nov	52	38	7	13	Z	0	0	3	5	3	1	8	4	18	22	22	21	7	5	6	4	3	3	4	10.8	52
30-Nov	4	5	7	4	4	Z	5	4	6	9	10	6	11	11	6	4	4	4	3	3	3	3	3	2	5.2	11
																								Diurnal Average		
																								Diurnal Maximum		
13.8 14.5 10.6 12.7 11.7 11.6 10.2 13.0 16.0 14.3 14.1 13.7 12.2 11.8 11.7 12.6 14.8 13.6 14.0 13.4 12.7 13.0 11.8 14.7																										
56 48 44 44 49 50 39 31 46 51 44 47 45 34 62 50 52 44 63 60 68 49 61 104																										
Z - zerospan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	528	77.08	77.08
21 - 40	130	18.98	96.06
41 - 80	26	3.80	99.85
81 - 159	1	0.15	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
Shell Muskeg River - 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	1	9	22	26	11	14	17	74	120	98	46	40	21	11	12	6	528
21 - 40	3	9	1	2	1	2	4	5	30	40	17	0	1	1	6	8	130
11 - 80	4	1	1	0	1	0	0	0	5	7	0	0	0	0	0	7	26
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	19	24	28	13	16	21	79	155	145	63	40	22	12	18	22	685

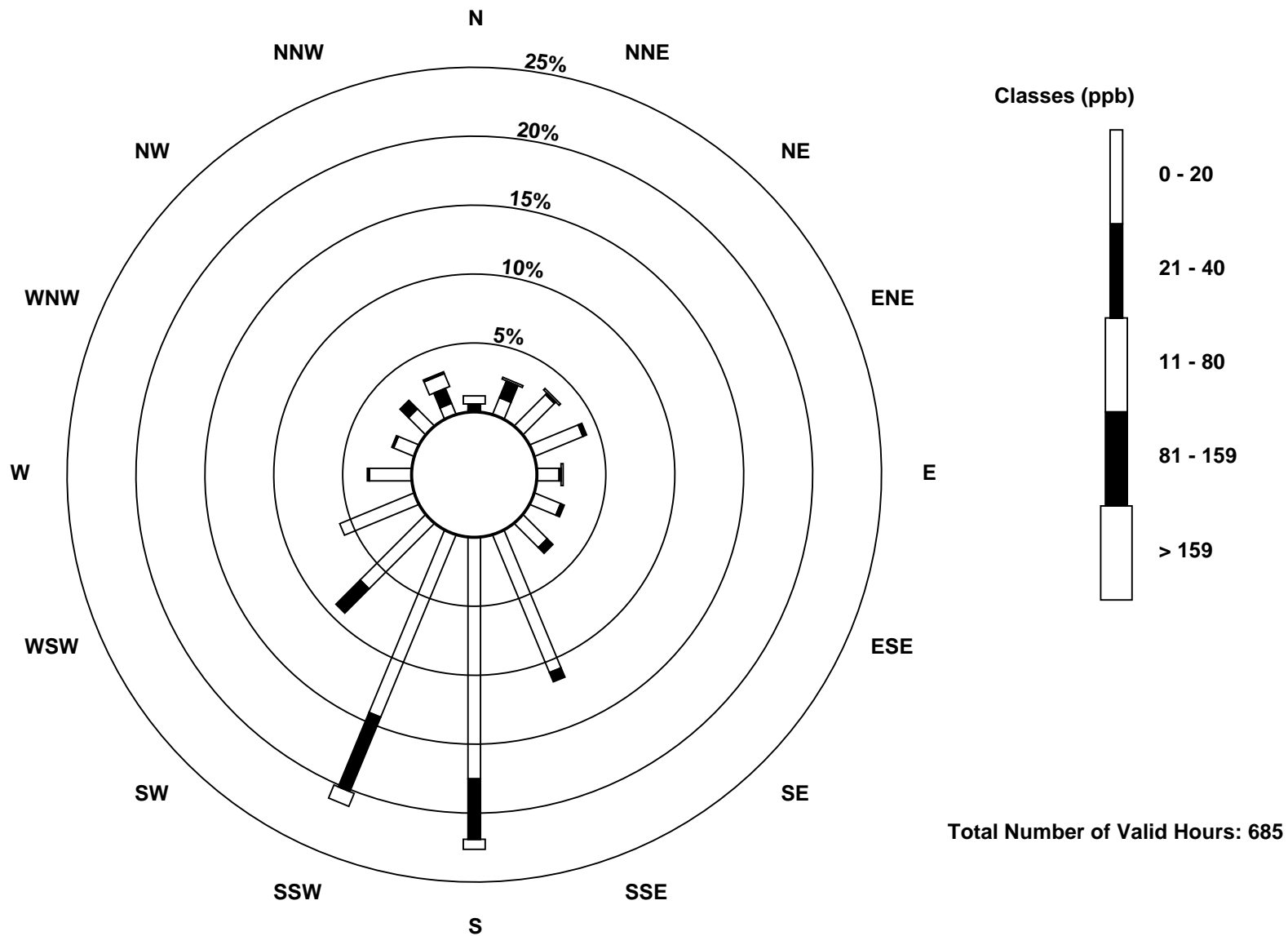
Total Number of Valid Hours: 685

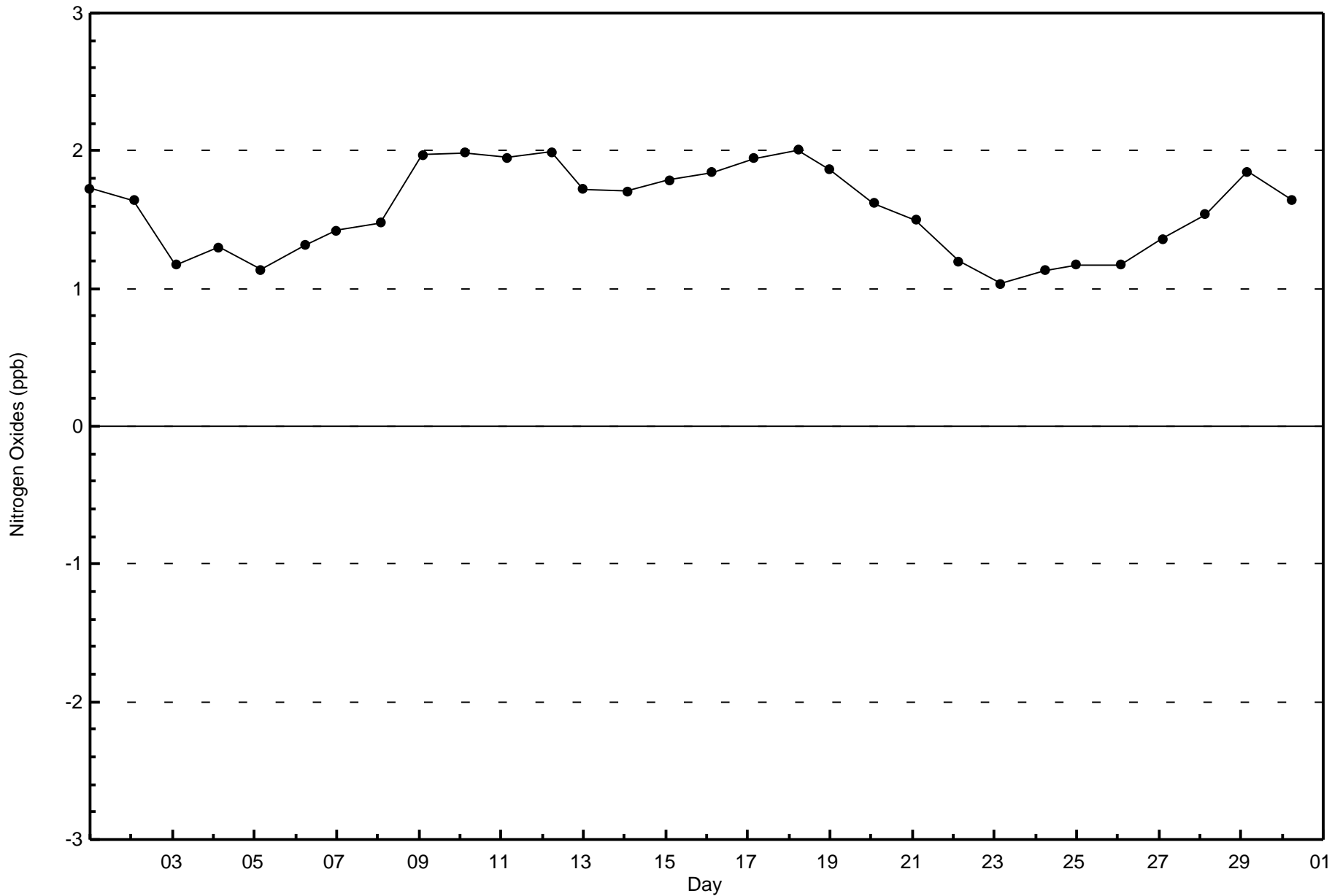
Total Number of Hours: 720

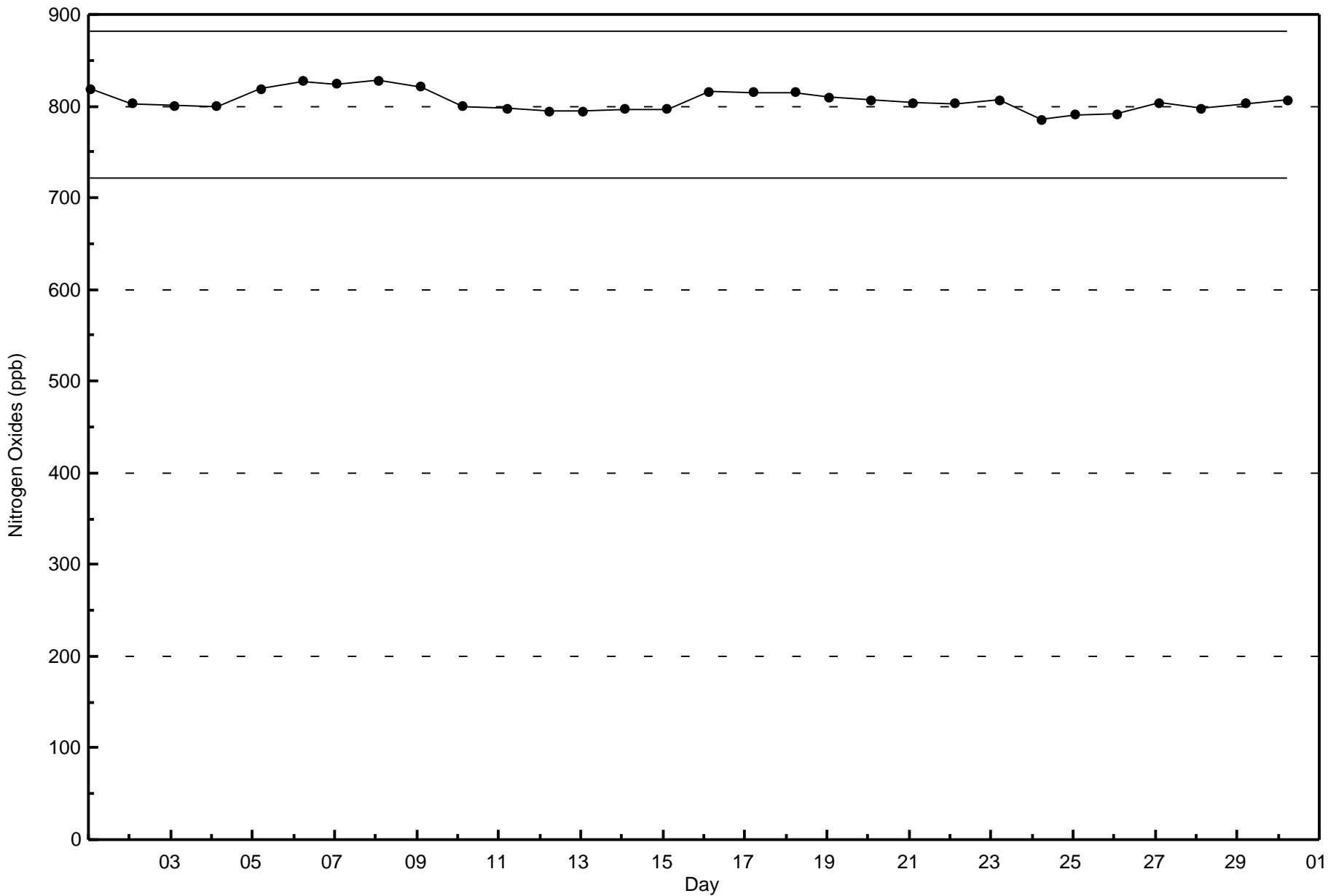


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
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 - November 2016

Number of Exceedences (AAAQO):		24-hr: 0		Hours in Service:		720																																										
Maximum Value: 25.3 µg/m ³ on Nov 26 10:00		Maximum Daily Average: 13.0 µg/m ³ on Nov 26		Hours of Data:		718																																										
Minimum Value: 0.0 µg/m ³ on Nov 14 19:00		Minimum Daily Average: 0.8 µg/m ³ on Nov 15		Hours of Missing Data:		2																																										
Maximum Diurnal Average: 7.0 µg/m ³ at hour 9		Minimum Diurnal Average: 4.0 µg/m ³ at hour 13		Hours of Calibration:		2																																										
Monthly Average: 5.09 µg/m ³		Percentiles: P ₁ = 0.1 P ₁₀ = 1.5 Q ₁ = 2.6 Median = 4.1 Q ₃ = 6.7 P ₉₀ = 9.9 P ₉₉ = 19.6		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	2.5	2.0	1.5	2.3	2.9	2.7	1.4	1.6	1.7	0.9	C	C	3.3	2.1	2.3	2.7	3.5	4.5	6.8	5.3	3.6	3.3	1.7	1.9	2.7	6.8																						
2-Nov	1.8	1.5	1.6	1.9	2.1	2.6	3.4	5.7	11.2	4.0	2.5	2.0	3.6	3.7	3.9	3.8	3.8	5.6	6.5	6.4	6.9	8.2	7.7	8.7	4.5	11.2																						
3-Nov	10.9	11.6	11.2	12.7	12.6	10.6	7.7	5.7	6.1	7.9	7.1	7.6	5.8	2.6	2.6	3.7	5.2	6.5	7.0	8.8	6.2	1.4	1.5	2.2	6.9	12.7																						
4-Nov	2.5	3.3	3.7	2.5	3.0	5.6	7.3	7.3	10.5	4.3	2.8	5.4	4.3	5.0	4.2	3.9	6.0	7.5	7.5	7.9	8.5	9.5	8.3	8.6	5.8	10.5																						
5-Nov	6.5	8.8	11.2	11.8	13.4	14.7	15.8	12.1	9.9	9.2	6.6	6.9	4.3	5.6	7.9	5.6	5.7	7.5	10.2	9.6	8.8	9.1	6.6	6.9	8.9	15.8																						
6-Nov	3.7	3.7	2.7	2.5	2.2	2.2	2.8	5.3	7.7	2.2	1.4	1.2	0.9	1.0	1.5	2.0	2.7	5.2	6.3	8.3	9.9	7.8	5.3	3.4	3.8	9.9																						
7-Nov	5.3	4.8	2.5	1.9	1.9	2.7	3.4	3.1	2.9	1.9	1.9	1.7	1.6	5.7	1.4	4.0	9.0	5.6	6.6	4.2	3.7	3.7	3.1	4.2	3.6	9.0																						
8-Nov	5.7	6.1	6.7	6.0	6.0	6.7	7.0	6.6	8.0	7.7	5.3	4.0	4.2	3.6	2.8	4.1	5.9	10.9	6.6	6.3	8.5	7.5	7.7	7.8	6.3	10.9																						
9-Nov	8.6	9.5	11.3	9.2	9.4	10.6	10.9	11.1	12.3	8.6	3.8	2.6	1.6	1.2	1.1	0.9	0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.6	4.9	12.3																						
10-Nov	0.4	0.4	0.4	0.7	0.9	0.9	0.9	1.3	4.0	3.6	3.8	3.9	6.6	8.1	1.3	1.8	3.2	2.8	2.0	2.2	2.8	2.5	2.6	2.7	2.5	8.1																						
11-Nov	3.3	3.4	3.5	4.0	3.5	4.1	4.5	5.6	7.8	13.7	7.4	6.1	3.8	5.1	3.1	2.9	2.7	4.9	6.3	2.4	2.3	2.3	2.5	3.0	4.5	13.7																						
12-Nov	3.5	3.1	3.3	4.0	5.6	4.4	6.3	6.2	8.3	8.0	6.0	3.2	2.8	2.1	2.2	2.2	3.4	4.5	8.4	4.7	4.1	3.7	3.9	4.1	4.5	8.4																						
13-Nov	4.0	4.1	3.5	3.5	4.7	4.1	4.2	6.2	7.0	5.1	4.3	4.5	4.3	3.2	3.8	4.9	6.6	6.5	7.3	7.7	7.9	8.2	7.2	6.3	5.4	8.2																						
14-Nov	6.8	6.9	7.2	6.7	6.1	5.9	7.2	8.8	8.0	6.9	2.8	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	3.1	8.8																						
15-Nov	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.8	0.9	0.8	0.6	0.4	0.3	0.2	0.7	0.8	1.3	1.7	1.0	1.2	1.4	1.9	3.1	0.8	3.1																						
16-Nov	3.4	3.9	4.1	4.3	4.2	4.6	4.9	9.1	13.4	9.4	5.6	2.6	1.5	1.2	1.4	1.6	1.9	2.2	2.2	2.3	2.2	3.1	3.0	3.4	4.0	13.4																						
17-Nov	3.6	4.4	2.5	4.0	4.5	3.6	5.4	3.7	6.9	4.9	2.2	1.4	1.4	1.2	1.2	3.1	9.2	5.4	3.6	4.2	2.8	2.3	2.2	2.7	3.6	9.2																						
18-Nov	2.3	6.7	2.3	2.2	2.0	2.4	2.0	2.7	2.1	2.6	2.3	3.0	2.9	2.6	1.8	1.6	3.4	3.0	3.2	3.0	2.4	1.0	1.2	1.9	2.5	6.7																						
19-Nov	2.8	3.1	4.1	3.7	2.1	2.8	3.2	3.0	2.3	2.6	1.8	1.6	1.9	3.5	2.8	2.4	3.0	2.9	2.4	2.2	2.1	2.0	2.0	1.9	2.6	4.1																						
20-Nov	2.0	2.3	2.3	2.2	2.3	2.9	3.2	2.6	3.6	2.2	2.2	3.3	3.5	3.8	4.5	4.4	5.0	4.0	2.8	3.9	4.2	3.8	3.2	3.4	3.2	5.0																						
21-Nov	3.7	4.0	3.7	4.5	5.3	5.3	5.8	6.8	7.8	7.3	7.9	7.9	7.1	7.2	7.7	8.3	9.9	8.0	5.7	5.8	5.1	3.2	2.3	2.2	5.9	9.9																						
22-Nov	2.2	2.1	2.5	3.1	3.5	4.2	4.6	4.4	4.3	4.9	5.0	4.7	4.3	6.7	6.7	6.9	5.4	4.5	3.6	3.7	4.2	4.4	4.7	4.8	4.4	6.9																						
23-Nov	5.0	5.5	5.5	5.7	5.3	4.8	4.7	4.3	4.1	4.1	4.4	4.6	3.7	3.2	3.9	2.9	2.9	2.6	2.3	3.4	3.7	4.6	5.8	5.7	4.3	5.8																						
24-Nov	7.6	10.8	10.8	11.0	11.1	11.8	8.2	8.3	10.1	9.5	10.7	13.7	12.8	9.7	14.1	22.0	13.5	13.1	14.3	15.0	13.0	13.0	13.7	8.8	12.0	22.0																						
25-Nov	7.1	5.8	4.1	4.0	4.2	4.2	4.1	4.9	4.4	3.8	3.7	3.7	3.2	3.5	3.5	3.5	4.4	5.3	6.0	7.2	6.8	7.1	8.2	7.1	5.0	8.2																						
26-Nov	7.1	8.6	8.5	6.8	6.9	10.8	15.8	18.3	22.8	25.3	21.3	15.8	9.2	7.3	11.1	12.5	12.4	16.8	13.7	6.6	6.1	11.4	11.5	25.2	13.0	25.3																						
27-Nov	24.6	20.1	20.1	14.7	13.3	13.3	8.6	4.5	5.3	6.4	6.4	5.2	4.6	4.9	4.1	3.3	3.1	3.3	3.3	3.3	3.0	3.3	4.6	6.1	7.9	24.6																						
28-Nov	5.2	4.4	4.9	4.4	5.0	5.0	5.4	8.3	10.8	12.5	12.2	10.4	8.2	7.3	6.2	5.1	3.8	4.5	4.9	4.4	4.3	4.2	4.1	4.6	6.2	12.5																						
29-Nov	5.8	6.7	5.7	6.0	5.2	5.0	4.3	3.9	4.3	3.3	2.7	3.1	4.0	20.3	15.8	13.9	7.4	7.1	7.2	8.8	4.7	3.8	3.2	2.6	6.4	20.3																						
30-Nov	2.8	3.5	2.9	2.8	2.5	2.4	2.4	2.3	2.1	2.4	2.9	2.8	3.3	3.7	3.1	3.3	3.3	3.3	3.6	3.8	3.5	3.2	3.4	3.2	3.0	3.8																						
																								5.0	5.4	5.1	5.0	5.1	5.4	5.5	5.8	7.0	6.2	5.1	4.6	4.0	4.5	4.2	4.6	4.9	5.3	5.4	5.1	4.8	4.7	4.5	4.9	Diurnal Average
																								24.6	20.1	20.1	14.7	13.4	14.7	15.8	18.3	22.8	25.3	21.3	15.8	12.8	20.3	15.8	22.0	13.5	16.8	14.3	15.0	13.0	13.0	13.7	25.2	Diurnal Maximum

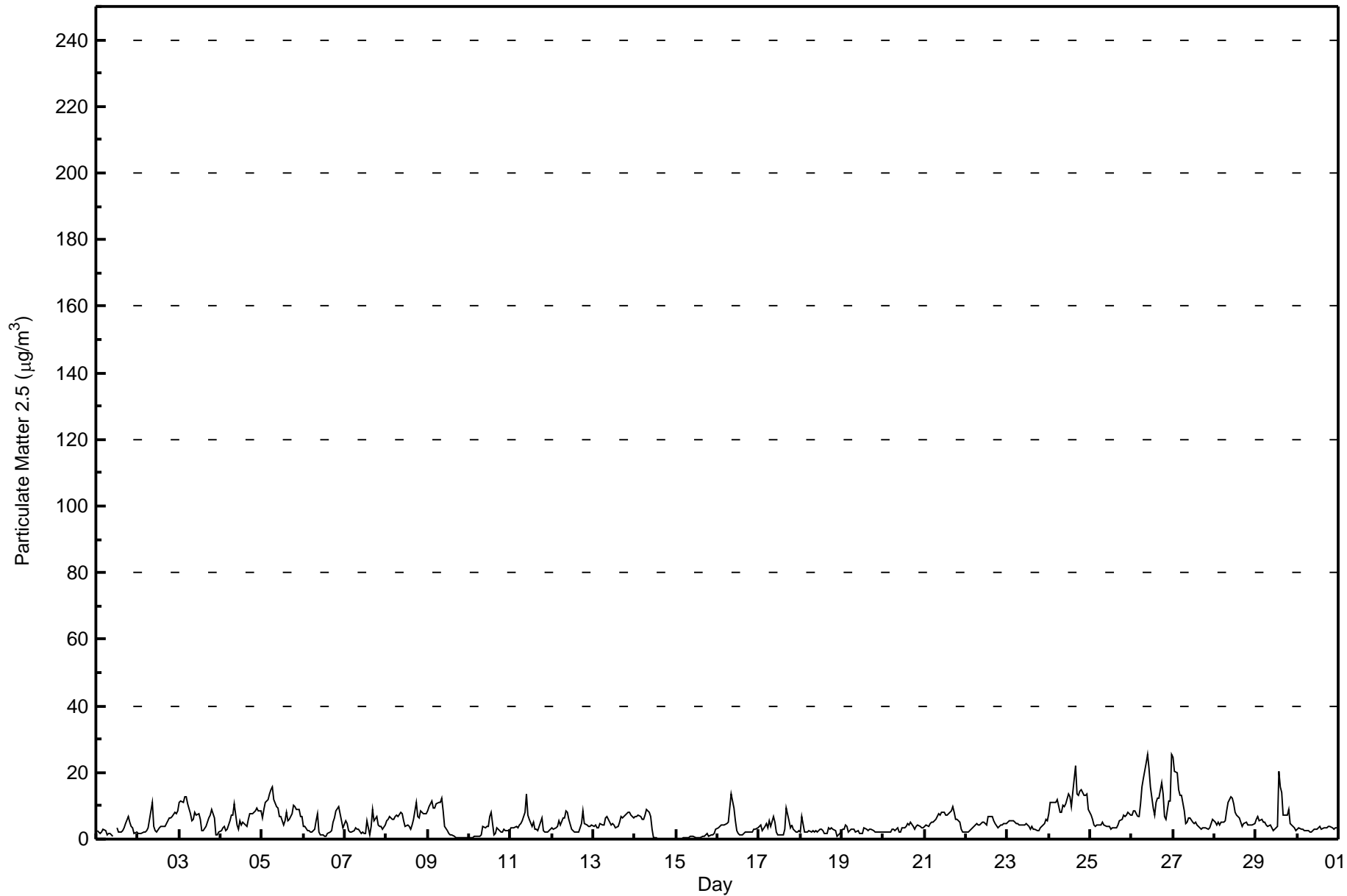
C - Calibration

Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - November 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	423	58.91	58.91
6 - 15	232	32.31	91.23
16 - 25	15	2.09	93.31
26 - 80	0	0.00	93.31
> 81.0	0	0.00	93.31

Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - 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	4	18	20	27	11	15	16	66	85	70	24	9	10	13	14	21	423
6 - 15	4	1	4	3	2	3	6	17	71	75	22	10	5	2	4	3	232
16 - 25	0	0	0	0	0	0	1	0	3	3	6	2	0	0	0	0	15
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	8	19	24	30	13	18	23	83	159	148	52	21	15	15	18	24	670

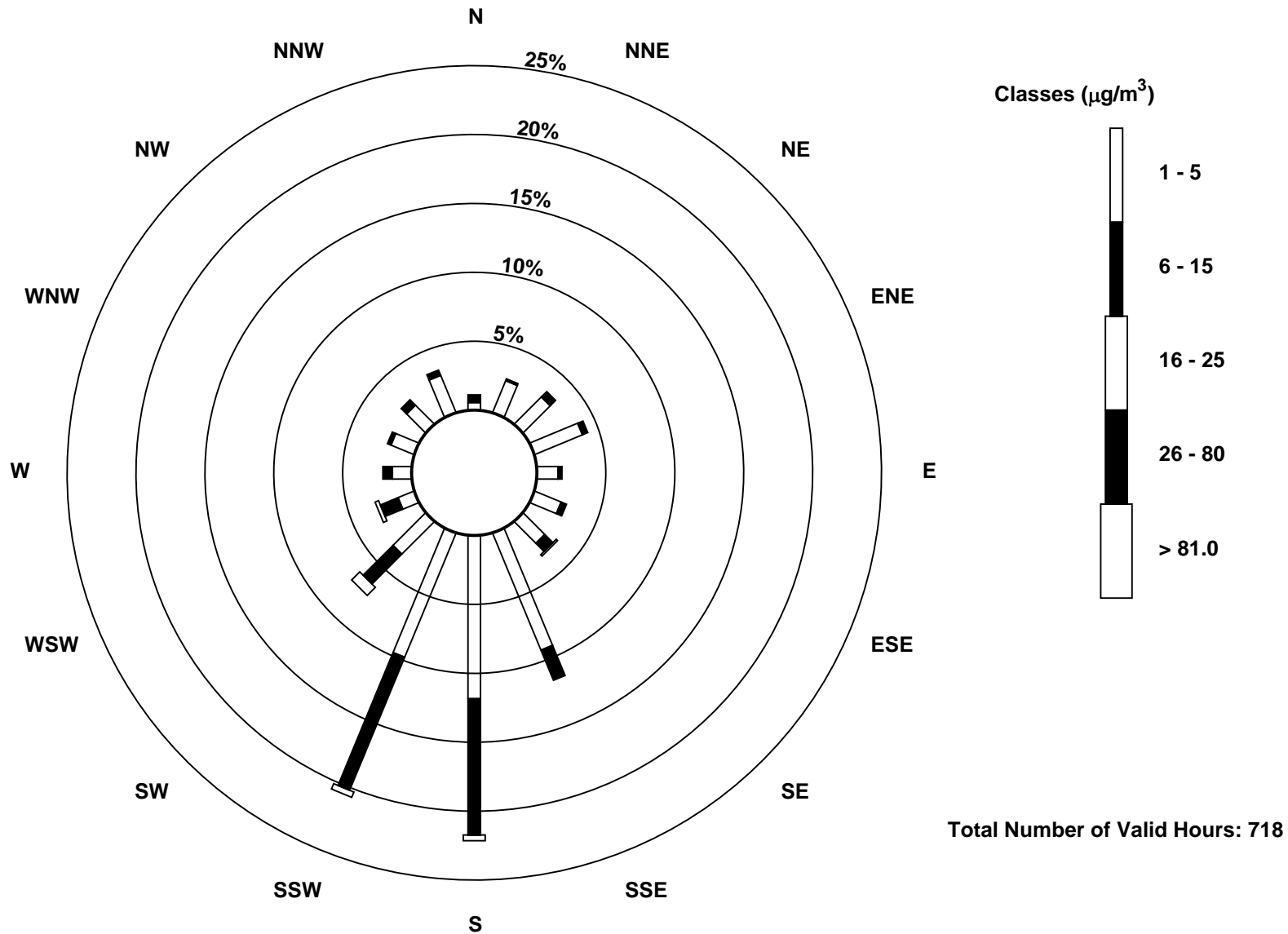
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River (AMS 16)





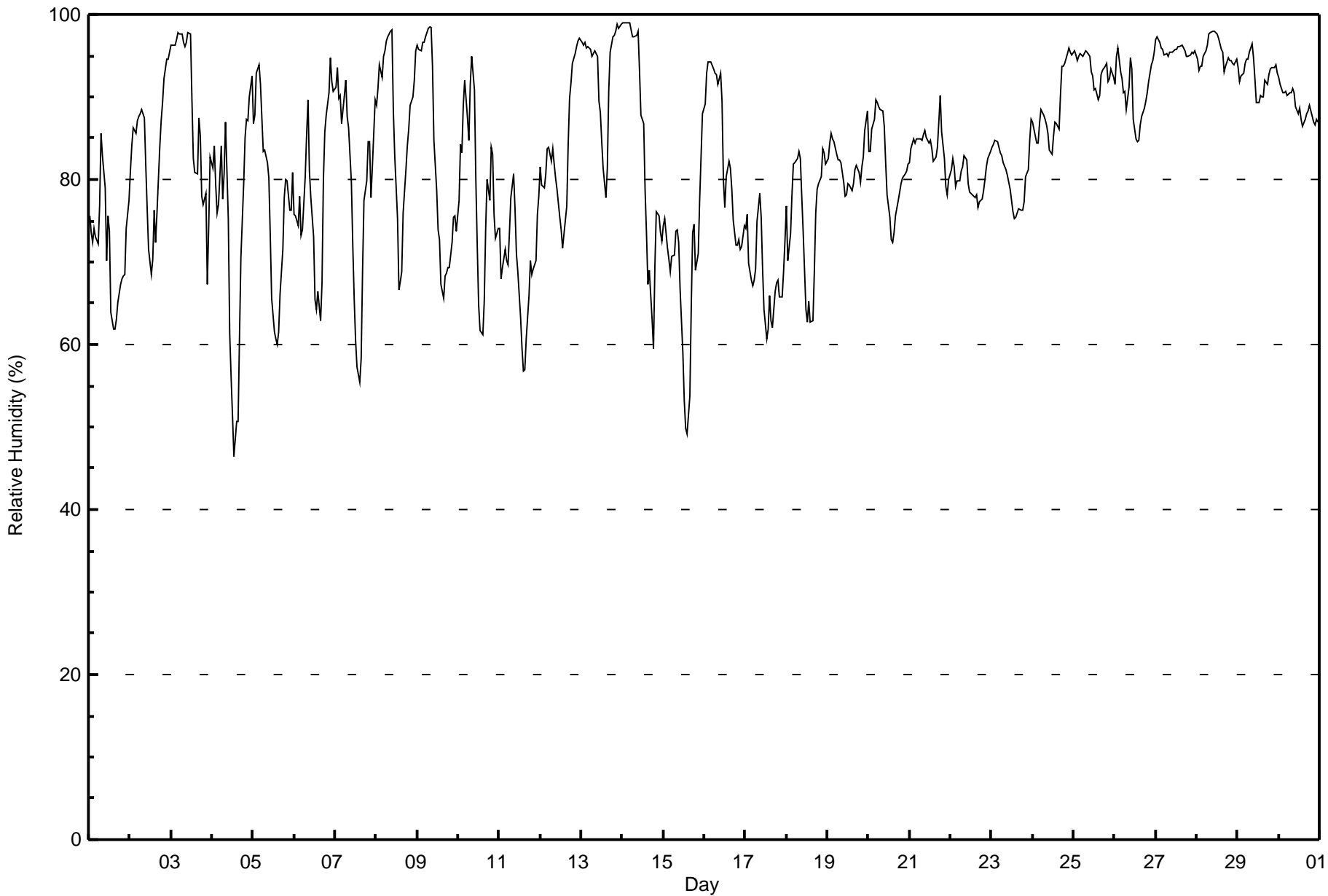
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Shell Muskeg River - November 2016

Maximum Value: 99 % on Nov 14 03:00 Maximum Daily Average: 95.7 % on Nov 27																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 47 % on Nov 4 14:00 Minimum Daily Average: 68.4 % on Nov 17 Maximum Diurnal Average: 88.6 % at hour 9 Minimum Diurnal Average: 73.5 % at hour 15 Monthly Average: 82.8 % Percentiles: P ₁ = 53 P ₁₀ = 68 Q ₁ = 76 Median = 84 O ₃ = 92 P ₉₀ = 96 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-Nov	76	74	72	74	73	72	77	86	83	79	70	76	74	64	62	62	63	65	67	68	68	68	74	78	71.8	86
2-Nov	81	84	86	86	87	88	88	88	87	82	76	71	69	70	76	72	76	84	87	89	92	95	95	95	83.6	95
3-Nov	96	96	96	97	98	98	98	97	96	97	98	98	90	83	81	81	88	85	78	77	78	67	74	83	88.7	98
4-Nov	81	84	79	76	77	84	78	81	87	75	61	56	51	47	51	51	61	70	80	85	87	87	90	92	73.8	92
5-Nov	87	88	93	94	92	88	83	84	82	80	73	66	61	61	60	62	66	71	78	80	80	76	76	81	77.5	94
6-Nov	76	76	74	78	73	74	80	85	90	81	78	73	65	64	67	63	67	80	86	88	90	95	92	91	78.6	95
7-Nov	91	94	90	90	87	90	92	88	86	80	72	66	61	57	55	58	69	78	80	85	85	78	81	90	79.2	94
8-Nov	89	91	94	92	95	96	97	97	98	98	88	83	75	67	68	69	76	81	84	86	89	90	92	96	87.1	98
9-Nov	96	96	96	97	97	97	98	98	98	94	85	79	74	73	67	66	68	69	69	69	72	75	76	74	82.6	98
10-Nov	77	84	83	89	92	88	85	92	95	91	80	72	65	62	61	65	74	80	77	84	83	76	73	74	79.2	95
11-Nov	74	68	69	72	70	70	74	78	81	77	71	69	63	60	57	57	61	66	70	68	69	70	76	78	69.4	81
12-Nov	82	79	79	81	84	84	82	84	82	80	79	75	74	72	73	77	84	90	92	94	95	96	97	97	83.8	97
13-Nov	97	96	97	96	96	96	95	95	96	95	90	88	85	81	78	81	91	95	97	97	98	99	98	99	93.1	99
14-Nov	99	99	99	99	99	98	97	97	97	98	93	88	87	79	73	67	69	63	59	69	76	76	74	73	84.5	99
15-Nov	74	75	72	70	69	71	71	74	74	72	67	59	53	50	49	54	65	74	75	69	71	77	83	88	69.0	88
16-Nov	89	93	94	94	94	93	93	93	92	93	90	80	77	80	82	81	79	75	72	72	73	72	72	74	83.6	94
17-Nov	74	76	70	68	67	68	69	75	78	75	69	64	61	62	66	63	62	66	67	68	66	66	69	73	68.4	78
18-Nov	77	70	73	78	82	82	83	83	83	78	74	64	63	65	63	63	69	76	79	79	80	84	83	82	75.5	84
19-Nov	83	84	86	85	85	83	82	82	82	80	78	78	79	79	79	80	81	82	81	80	82	83	86	88	81.9	88
20-Nov	83	83	86	87	90	89	89	88	88	87	82	78	75	73	72	74	76	78	78	79	80	81	81	82	81.7	90
21-Nov	82	84	85	84	85	85	85	85	85	86	85	84	85	84	82	83	84	87	90	86	82	79	78	80	84.0	90
22-Nov	81	83	82	79	80	80	81	81	83	82	79	79	78	78	78	77	77	78	79	80	82	82	83	83	80.0	83
23-Nov	84	84	85	85	84	83	83	82	81	80	80	79	76	75	75	76	76	76	76	77	80	81	85	87	80.5	87
24-Nov	87	86	84	84	87	89	88	87	87	86	84	83	85	87	87	86	90	94	94	94	95	96	95	95	88.7	96
25-Nov	96	95	94	95	95	95	95	96	95	95	93	93	91	91	90	93	93	94	94	94	92	92	93	92	93.4	96
26-Nov	92	95	96	93	92	91	91	89	91	95	93	87	85	85	85	87	88	89	90	90	92	94	94	95	90.7	96
27-Nov	97	97	97	96	96	95	95	95	95	95	95	96	96	96	96	96	96	96	95	95	95	95	95	96	95.7	97
28-Nov	95	93	94	94	95	96	96	98	98	98	98	98	98	98	97	96	95	93	94	95	94	94	94	95	95.4	98
29-Nov	94	92	93	93	94	95	95	95	96	95	92	89	89	90	90	90	92	92	93	93	94	94	94	93	92.7	96
30-Nov	92	92	91	91	91	90	90	91	91	90	89	88	89	87	86	87	88	88	89	88	87	87	87	87	89.0	92
86.0 86.4 86.3 86.5 86.8 86.8 87.0 88.1 88.6 86.4 82.1 78.6 75.8 73.9 73.5 73.8 77.3 80.4 81.7 82.6 83.6 83.5 84.7 86.3																								Diurnal Average		
99 99 99 99 99 98 98 98 98 98 98 98 98 97 96 96 96 96 97 97 98 99 98 99																								Diurnal Maximum		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Shell Muskeg River - 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	256	35.56	37.92
80 - 100	447	62.08	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

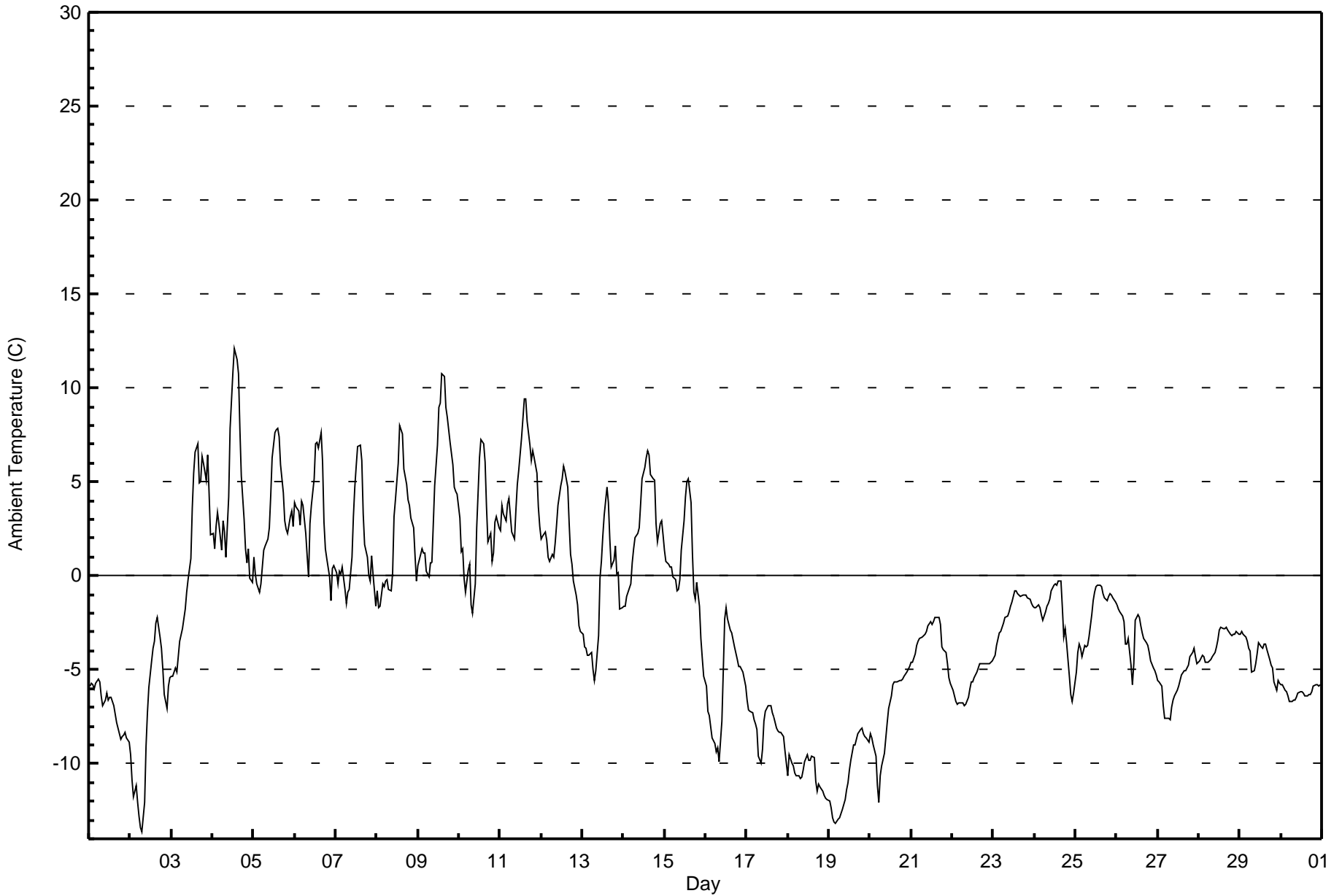


Maximum Value: 12.1 C on Nov 4 14:00		Maximum Daily Average: 5.1 C on Nov 11		Hours in Service: 720																						
Minimum Value: -13.6 C on Nov 2 08:00		Minimum Daily Average: -10.6 C on Nov 19		Hours of Data: 720																						
Maximum Diurnal Average: 0.7 C at hour 15		Minimum Diurnal Average: -3.9 C at hour 8		Hours of Missing Data: 0																						
Monthly Average: -2.14 C		Percentiles: P ₁ = -12.8 P ₁₀ = -8.6 Q ₁ = -5.8 Median = -2.6 Q ₃ = 1.4 P ₉₀ = 5.1 P ₉₉ = 8.6		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-Nov	-5.8	-5.7	-5.8	-6.0	-5.7	-5.5	-5.7	-6.4	-6.9	-6.6	-6.2	-6.6	-6.5	-6.5	-6.9	-7.4	-7.8	-8.1	-8.7	-8.6	-8.5	-8.3	-8.6	-8.9	-7.0	-5.5
2-Nov	-9.6	-10.8	-11.8	-11.1	-12.0	-12.8	-13.4	-13.6	-12.0	-9.1	-7.3	-6.0	-4.6	-3.9	-3.5	-2.5	-2.2	-3.2	-3.9	-5.0	-6.3	-7.1	-5.9	-5.4	-7.6	-2.2
3-Nov	-5.3	-5.3	-4.9	-5.1	-4.3	-3.5	-2.8	-2.3	-1.7	-0.9	-0.2	0.9	3.6	5.4	6.6	7.0	4.9	5.0	6.4	6.0	5.1	6.5	4.4	2.2	1.2	7.0
4-Nov	2.2	1.5	2.6	3.4	2.8	1.4	2.9	2.3	1.0	4.2	7.8	9.3	10.9	12.1	11.5	10.8	7.8	5.3	3.0	1.4	0.7	1.5	-0.2	-0.4	4.4	12.1
5-Nov	1.0	0.1	-0.5	-0.9	-0.4	0.5	1.4	1.6	2.0	2.6	4.3	6.3	7.6	7.8	7.8	7.4	5.9	4.4	2.9	2.5	2.3	3.2	3.5	2.6	3.2	7.8
6-Nov	3.9	3.7	3.4	2.7	3.9	3.7	2.3	1.1	0.0	2.8	3.8	5.2	7.0	7.1	6.8	7.6	6.0	2.9	1.5	0.9	0.0	-1.4	0.4	0.5	3.2	7.6
7-Nov	0.1	-0.4	0.3	0.1	0.5	-0.7	-1.5	-0.8	-0.7	1.0	3.1	4.7	5.9	6.9	7.0	6.1	3.3	1.7	1.0	0.0	-0.3	1.0	0.1	-1.6	1.5	7.0
8-Nov	-0.8	-1.7	-1.6	-0.4	-0.6	-0.3	-0.2	-0.7	-0.8	0.2	3.1	4.0	6.0	8.0	7.7	7.5	5.7	4.8	4.1	3.7	3.1	2.6	1.1	-0.3	2.3	8.0
9-Nov	0.6	0.9	1.4	1.2	1.2	0.3	0.0	0.7	0.7	2.7	4.8	7.0	8.9	9.2	10.8	10.6	9.0	8.4	7.8	7.1	5.9	4.7	4.5	4.4	4.7	10.8
10-Nov	3.0	1.3	1.5	-0.1	-0.8	0.3	0.6	-1.6	-2.0	-0.4	2.6	4.4	6.3	7.2	7.0	6.1	3.7	1.8	2.3	0.7	1.2	2.8	3.2	2.6	2.2	7.2
11-Nov	2.4	3.7	3.3	2.9	3.8	4.2	3.2	2.4	2.0	3.5	4.9	5.6	7.3	8.3	9.4	9.4	8.2	6.9	6.1	6.7	6.3	5.4	3.7	2.6	5.1	9.4
12-Nov	2.0	2.1	2.3	1.9	1.0	0.8	1.2	1.0	1.7	2.7	3.7	4.8	5.1	5.9	5.5	4.7	2.8	1.2	0.6	-0.3	-1.1	-1.5	-2.6	-3.0	1.8	5.9
13-Nov	-3.1	-3.8	-3.8	-4.2	-4.2	-4.1	-5.0	-5.6	-5.0	-3.2	-0.2	0.7	2.1	3.2	4.7	3.9	1.9	0.4	0.8	1.6	0.1	0.2	-1.8	-1.7	-1.1	4.7
14-Nov	-1.6	-1.6	-1.1	-0.7	-0.4	0.7	1.4	2.1	2.3	2.5	3.8	5.1	5.7	6.3	6.6	6.4	5.4	5.1	2.8	1.8	2.8	2.9	2.2	2.2	2.7	6.6
15-Nov	1.4	0.7	0.6	0.5	0.5	-0.1	-0.2	-0.8	-0.7	-0.2	1.3	2.9	4.2	5.0	5.2	3.9	1.1	-0.9	-1.3	-0.3	-1.6	-3.4	-4.4	-5.3	0.3	5.2
16-Nov	-5.9	-7.2	-7.5	-8.1	-8.7	-9.0	-9.4	-9.2	-9.9	-7.8	-5.1	-2.3	-1.7	-2.3	-2.9	-3.0	-3.4	-3.8	-4.4	-4.8	-4.8	-5.0	-5.2	-5.9	-5.7	-1.7
17-Nov	-6.6	-7.1	-7.2	-7.3	-7.6	-7.9	-8.1	-9.6	-10.0	-9.2	-7.7	-7.2	-6.9	-6.9	-6.9	-7.3	-7.5	-8.1	-8.3	-8.4	-8.4	-8.6	-9.3	-10.0	-8.0	-6.6
18-Nov	-10.6	-9.5	-9.9	-10.1	-10.5	-10.7	-10.7	-10.8	-10.8	-10.4	-9.9	-9.5	-9.9	-9.8	-9.6	-9.7	-10.9	-11.5	-11.1	-11.3	-11.4	-11.7	-11.9	-11.9	-10.6	-9.5
19-Nov	-12.0	-12.4	-12.9	-13.1	-13.2	-13.0	-12.9	-12.6	-12.5	-11.9	-11.4	-11.0	-10.3	-9.8	-9.0	-9.0	-8.7	-8.4	-8.2	-8.1	-8.4	-8.5	-8.6	-8.8	-10.6	-8.1
20-Nov	-8.4	-8.6	-9.0	-9.6	-11.1	-12.1	-10.6	-10.1	-9.4	-8.6	-7.8	-7.1	-6.4	-5.8	-5.6	-5.6	-5.6	-5.6	-5.6	-5.5	-5.3	-5.2	-5.0	-4.8	-7.4	-4.8
21-Nov	-4.6	-4.6	-4.2	-3.7	-3.5	-3.4	-3.3	-3.2	-3.1	-3.0	-2.6	-2.5	-2.6	-2.4	-2.2	-2.2	-2.2	-2.6	-3.8	-4.0	-4.1	-4.7	-5.4	-5.8	-3.5	-2.2
22-Nov	-6.1	-6.4	-6.7	-6.9	-6.8	-6.8	-6.8	-6.9	-6.9	-6.5	-6.0	-5.7	-5.7	-5.4	-5.1	-4.9	-4.7	-4.7	-4.6	-4.7	-4.7	-4.7	-4.7	-4.6	-5.7	-4.6
23-Nov	-4.4	-4.2	-3.7	-3.1	-3.0	-2.8	-2.5	-2.2	-2.1	-1.9	-1.7	-1.4	-0.8	-0.8	-1.0	-1.0	-1.1	-1.0	-1.0	-1.0	-1.2	-1.2	-1.5	-1.6	-1.9	-0.8
24-Nov	-1.7	-1.7	-1.6	-1.7	-2.1	-2.4	-1.9	-1.7	-1.5	-1.3	-0.8	-0.5	-0.5	-0.5	-0.3	-0.3	-1.7	-3.3	-2.8	-3.6	-5.4	-6.3	-6.7	-6.2	-2.3	-0.3
25-Nov	-5.1	-4.1	-3.6	-3.9	-4.3	-3.7	-3.8	-3.7	-3.3	-2.0	-1.3	-0.9	-0.6	-0.5	-0.5	-0.6	-0.9	-1.1	-1.3	-1.1	-0.9	-1.0	-1.2	-1.4	-2.1	-0.5
26-Nov	-1.5	-1.8	-1.9	-2.1	-2.4	-3.6	-3.7	-3.4	-4.7	-5.8	-4.7	-2.4	-2.1	-2.2	-2.7	-3.1	-3.4	-3.6	-3.7	-4.1	-4.5	-4.9	-5.0	-5.3	-3.4	-1.5
27-Nov	-5.6	-5.7	-5.8	-6.9	-7.6	-7.6	-7.6	-7.7	-7.0	-6.6	-6.4	-6.1	-5.9	-5.6	-5.3	-5.1	-5.0	-4.9	-4.7	-4.3	-4.1	-3.9	-4.3	-4.7	-5.8	-3.9
28-Nov	-4.5	-4.4	-4.2	-4.3	-4.6	-4.6	-4.5	-4.5	-4.3	-4.1	-3.7	-3.4	-2.9	-2.8	-2.8	-2.8	-2.7	-2.9	-3.1	-3.2	-3.1	-3.1	-3.0	-3.1	-3.6	-2.7
29-Nov	-3.1	-3.0	-3.1	-3.2	-3.5	-3.8	-4.0	-5.1	-5.1	-4.7	-4.2	-3.5	-3.8	-3.8	-3.6	-3.7	-3.9	-4.5	-4.8	-4.9	-5.6	-6.1	-5.6	-5.7	-4.3	-3.0
30-Nov	-5.8	-5.8	-6.1	-6.2	-6.4	-6.7	-6.7	-6.6	-6.6	-6.4	-6.2	-6.2	-6.2	-6.2	-6.4	-6.4	-6.3	-6.3	-6.1	-5.9	-5.8	-5.8	-5.9	-5.8	-6.2	-5.8
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Shell Muskeg River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Shell Muskeg River - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	485	67.36	67.36
0 - 10	229	31.81	99.17
10 - 20	6	0.83	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

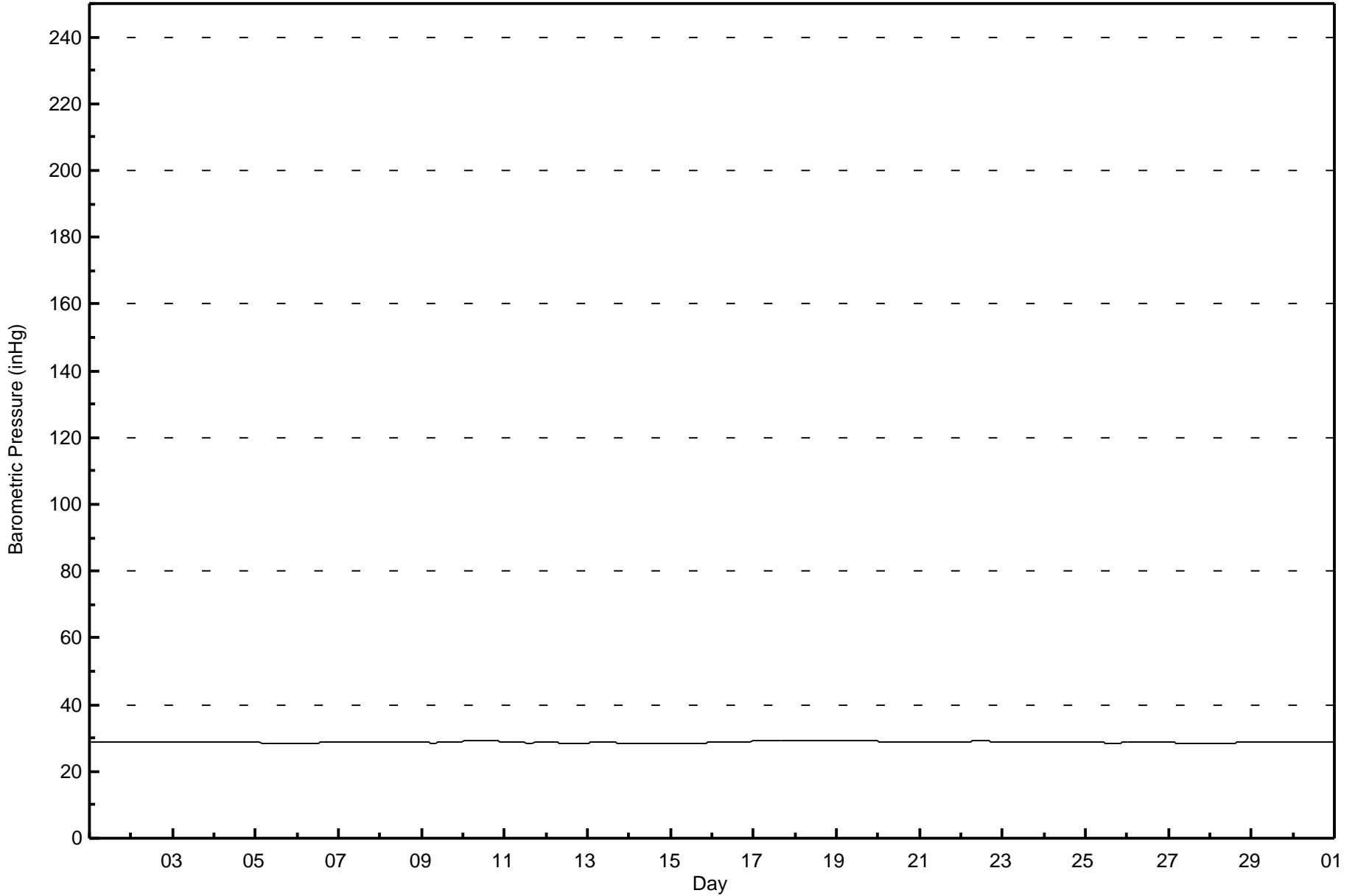
**Barometric Pressure (BP) - inHg
Shell Muskeg River - November 2016**

Maximum Value: 29.4 inHg on Nov 18 11:00 Maximum Daily Average: 29.4 inHg on Nov 18																						Hours in Service: 720					
Minimum Value: 28.3 inHg on Nov 14 12:00 Minimum Daily Average: 28.4 inHg on Nov 14																						Hours of Data: 720					
Maximum Diurnal Average: 28.8 inHg at hour 24 Minimum Diurnal Average: 28.8 inHg at hour 15																						Hours of Missing Data: 0					
Monthly Average: 28.79 inHg Percentiles: $P_1 = 28.4$ $P_{10} = 28.5$ $Q_1 = 28.6$ Median = 28.8 $Q_3 = 28.9$ $P_{90} = 29.1$ $P_{99} = 29.4$																						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-Nov	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	28.8	29.0	
2-Nov	28.9	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	28.8	28.8	28.8	28.9	29.0
3-Nov	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.8	28.8	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	28.7	28.7	28.7	28.8
4-Nov	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8
5-Nov	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	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.6
6-Nov	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	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.7	28.7
7-Nov	28.8	28.8	28.8	28.8	28.8	28.8	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	28.9	28.9	28.9	28.9	28.9	29.0
8-Nov	28.9	28.8	28.8	28.8	28.8	28.8	28.7	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	28.7	28.9
9-Nov	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	28.7	28.7	28.7	28.8	28.8	28.8	28.9	28.9	28.9	29.0	29.0	29.0	28.7	29.0
10-Nov	29.0	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	29.2	29.1	29.1	29.1	29.1	29.0	29.0	28.9	28.9	29.1	29.2	29.2
11-Nov	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	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.8
12-Nov	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	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6
13-Nov	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	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.6	28.7
14-Nov	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.4	28.5
15-Nov	28.5	28.5	28.5	28.5	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	28.6	28.6	28.6	28.6	28.6	28.6	28.6
16-Nov	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	28.8	29.0	29.0
17-Nov	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	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.3	29.3
18-Nov	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	29.4
19-Nov	29.4	29.4	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.4	29.4
20-Nov	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	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.9	29.0
21-Nov	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	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.8	28.9	28.9
22-Nov	28.9	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	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	29.0	29.1
23-Nov	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	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9
24-Nov	28.8	28.8	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	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9
25-Nov	28.8	28.8	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	28.6	28.6	28.8
26-Nov	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	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.7	28.8
27-Nov	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	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	28.6
28-Nov	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	28.5	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
29-Nov	28.8	28.8	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	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
30-Nov	29.0	29.0	29.0	28.9	28.9	28.9	28.9	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
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - inHg
Shell Muskeg River - November 2016





Maximum Speed: 24 km/h on Nov 15 05:00	Maximum Daily Speed Average: 15.3 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 25 07:00	Minimum Daily Speed Average: 0.8 km/h on Nov 18	Hours of Data: 720
Maximum Diurnal Speed Average: 6.4 km/h at hour 13	Minimum Diurnal Speed Average: 2.1 km/h at hour 18	Hours of Missing Data: 0
Monthly Average Velocity: 4.4 km/h 199.7 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 8 Q ₃ = 12 P ₉₀ = 15 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-Nov	NNW9	NNW12	NNW10	NW6	NNW6	NW6	WNW4	NNW5	NW10	WNW8	NW10	WNW9	WNW13	WNW16	WNW18	NW14	NW13	NW12	NNW11	N13	NNW8	NNW5	SSE5	SSE5	NW8.1	WNW18
2-Nov	SE6	S7	S7	S5	S6	SSE7	S6	S7	S8	SSE11	S12	S13	S13	S11	S11	SSW9	SSW10	S9	SW7	WSW7	S5	SSW8	SSW9	SSW7	S7.7	S13
3-Nov	SSW7	S9	SSW9	SSW7	SW7	SSW6	S8	S8	SSW9	S10	S12	S10	SSW11	SSW9	S6	S7	SSW9	SSW14	SSW14	S15	SSW12	WSW20	WSW8	SSW10	SSW9.4	WSW20
4-Nov	SSW9	SSW12	SSW12	SSW13	SSW8	SE7	S8	SSE5	SSE7	S7	S8	SSW7	SSW8	S9	SW12	SSW8	SSW5	SSW4	SW2	SW4	SSW7	SSW7	SSW6	S6	SSW7.2	SSW13
5-Nov	SSW5	SSW7	SSW5	SSW10	S9	SSW9	SSW9	SSW10	S10	S10	S11	S12	SSW9	S7	S10	S9	SSW9	SSW6	S8	S6	S6	S8	SW7	SSW10	SSW8.1	S12
6-Nov	SW17	SW14	SSW9	S8	SSW10	SSW6	WSW7	SW6	SSW10	SSW8	SW7	SW7	SSW8	SSW8	S5	SSW8	SSW8	SW8	SSE7	SE7	SE6	S8	SSW9	SW9	SSW7.7	SW17
7-Nov	SSW7	SW12	SW9	SW12	SW14	S7	SSW9	SSW12	SSW11	SSW12	SSW8	SSW10	SSW9	SSW9	SSW10	S9	SSE8	S6	SSW5	S3	S4	SSW7	SSW6	SSE5	SSW8.1	SW14
8-Nov	S3	SSW8	S7	SSW9	SSW7	SSW9	SSW7	SW10	SSW7	SSW6	SW6	SSW8	SSW8	SSW8	SSW11	SSW8	SSW9	SSW8	SW8	SSW8	SW9	SW8	S7	S10	SSW7.7	SSW11
9-Nov	S9	S9	S7	S7	S7	SSW5	S9	SSW6	S7	SSW9	S9	SW13	WSW17	WSW17	WSW12	W12	W13	W16	W20	W22	WSW18	SW16	WSW20	WSW20	SW10.8	W22
10-Nov	SW8	S8	S9	S8	SSW10	SW17	SSW4	S7	SSE7	S6	S8	S10	SSW8	SSE10	S12	S10	S9	SSE9	S10	S10	SSE13	SSE14	S15	S12	S9.0	SW17
11-Nov	S11	S12	S9	S9	S10	S11	SSW10	SSW10	SSW8	SSW10	SSW11	SSW11	SSW13	SSW13	SW13	SW15	SSW11	SW12	SW15	SW16	SW18	WSW15	S4	SSE7	SSW10.7	SW18
12-Nov	SE6	S8	S8	SSE9	S8	SSE7	S8	S7	SSW10	SSW11	S8	S2	SSW7	S7	SSW8	SSW3	S4	SSW5	SSW5	SSW5	SSW5	S6	S7	S7	S6.4	SSW11
13-Nov	S6	SSW7	SSW6	SSW7	SSW6	S6	SSE7	SSE8	SSE7	S8	S9	SSE8	S8	S10	SSW8	SSW7	SSW5	SSW7	SSW9	SW7	SSW7	SW6	SSW7	S4	S6.7	S10
14-Nov	SW2	W2	SW6	SSW5	SSW9	S10	S9	SSW6	SSW6	SSW7	SW13	SW14	SW14	WSW17	WSW16	W17	WSW12	W15	W16	WSW13	WSW15	WSW19	WSW20	W15	WSW10.4	WSW20
15-Nov	WSW14	SW14	WSW14	WSW20	WSW24	WSW24	WSW22	WSW20	WSW22	SW8	SSW8	SW12	WSW15	SW13	SW15	SW15	SW13	SSW4	W4	WNW13	W6	WNW4	E2	ESE3	WSW11.9	WSW24
16-Nov	SSE1	S3	S3	SSW3	SSW4	S4	S5	SSE4	SSE4	S2	SSE3	SSE4	ENE7	NE19	NE17	NE16	NE18	NNE21	NNE22	NNE19	NNE15	NNW15	N16	NNW11	NNE6.3	NNE22
17-Nov	NNW11	NNW10	NW12	NNW14	NNW13	WNW12	WNW12	W8	W10	W10	W9	W13	W13	W12	W15	WNW19	NW18	NW18	NW12	NNW10	NNW11	NNW10	NW7	WNW8	WNW10.9	WNW19
18-Nov	WNW10	NW5	S3	SSE5	S5	SSW5	S4	SSW5	SW5	W7	NW8	NW9	NW7	WNW4	W4	SSW4	SSW3	SSE5	SSE5	SSE4	ENE7	ENE10	ENE10	ENE9	SW0.8	ENE10
19-Nov	ENE8	ENE13	ENE13	ENE10	ENE7	ENE5	ENE6	ENE7	ENE8	ENE7	ENE6	ENE7	NE10	NE12	NE14	ENE14	ENE14	NE14	ENE13	ENE12	ENE9	ENE8	E5	ESE4	ENE9.3	ENE14
20-Nov	SE8	ESE6	ESE6	SE5	E5	E6	ESE5	E5	ESE5	S4	SSE12	S12	SSE9	SSW6	WSW3	SE1	S4	SE5	SSE6	SSE8	SSE7	SSE7	SE7	SE4	SE5.3	S12
21-Nov	ESE3	ESE5	SE6	SSE7	SSE8	S9	S8	S8	S8	S6	SSW4	WSW6	W6	SW5	W5	WNW5	NW7	NNE15	NE17	NE17	NE15	NE18	NNE20	NE13	ENE2.5	NNE20
22-Nov	NE14	ENE10	E8	ENE6	ESE5	E5	ESE4	E3	ESE2	SSW1	E2	SE5	SSE8	SSE6	SSE2	S6	S11	SSE10	SSE10	SSE10	SSE10	SE10	SE13	SSE13	SE5.7	NE14
23-Nov	SSE15	SSE14	SSE16	SSE18	SSE18	SSE16	SSE17	S17	SSE17	SSE18	SSE20	SSE19	SSE19	SSE17	SSE17	SSE17	SSE14	SSE15	SSE13	SSE14	S11	S11	SSW9	SSW8	SSE15.3	SSE20
24-Nov	S8	S8	S9	S9	S9	S7	S10	S9	S11	S10	S10	S9	SSW11	SSW9	SSW8	SW8	SW5	ESE5	ENE8	NW3	ESE4	E3	SE4	SE3	S6.1	S11
25-Nov	WNW2	ENE8	ENE6	NE4	ENE6	NE7	ESE0	ESE3	SE5	SSE8	SSE7	SSE5	SSE11	SSW2	ESE3	SE3	SW3	WNW7	W7	WSW9	WSW10	WSW10	WSW13	WSW14	SSW2.1	WSW14
26-Nov	WSW13	SW13	SW16	WSW13	SW13	SW12	SW12	SW13	SW10	S5	SSW8	SW13	SW14	SW12	SSW10	S6	SSW7	SSW7	SSW6	S7	WSW6	SW7	SSE5	S6	SW9.1	SW16
27-Nov	WSW3	SW3	SE3	ESE4	E5	SE2	NE10	NE12	NNE8	N5	N7	NNE9	NNE11	NNE11	NNE12	NNE13	NNE17	NNE16	NNE17	NE14	NE13	NE11	N7	NNW4	NNE7.7	NNE17
28-Nov	NNE8	NNE8	NNE6	SSE1	SSW4	S4	SSW3	S4	S4	SSW4	SSW4	S4	SSE3	SSE2	N2	NE3	NNE7	N5	NNW6	NNW9	NNW9	NNW11	NNW11	NNW10	N2.3	NNW11
29-Nov	NNW9	N6	ENE2	NE1	ESE3	NE3	SE2	SSE3	E4	E4	SE4	SSE4	SSE10	S8	SSW6	SSW6	S8	S10	SSW8	S10	SW13	SW9	S11	SSE13	S4.1	SSE13
30-Nov	S13	S13	S15	S14	S13	SSE14	SSE15	SSE13	S9	S12	S11	S11	S14	S12	SSW9	S9	SSW7	SSW7	S8	SSW10	S12	S14	S12	S13	S11.4	SSE15

SSW3.2	S3.9	S4.3	SSW5.0	SSW5.4	S5.4	SSW5.3	SSW5.2	SSW5.3	SSW5.7	S5.9	SSW6.3	SSW6.4	SSW5.6	SSW4.9	SW3.9	SW3.3	SSW2.1	SW2.2	SW2.6	SSW3.3	SW3.6	SSW3.5	SSW4.3	Diurnal Average
SSW17	SSE14	SSE16	WSW20	WSW24	WSW24	WSW22	WSW20	WSW22	SSE18	SSE20	SSE19	SSE19	NE19	WNW18	WNW19	NE18	NNE21	NNE22	W22	SW18	WSW20	WSW20	WSW20	Diurnal Maximum

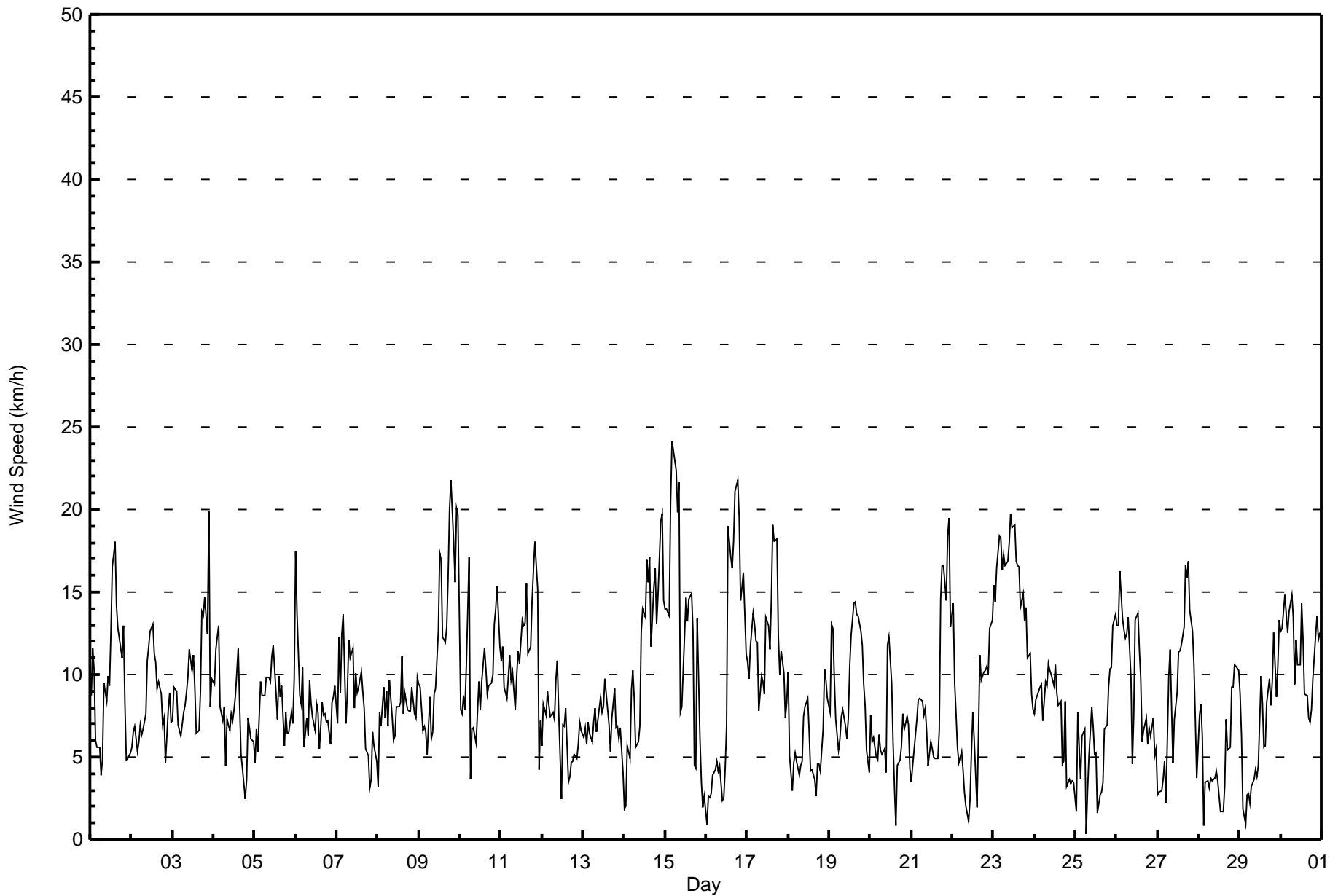
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Shell Muskeg River - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Nov 7 04:00 Minimum Value: 0 km/h on Nov 16 08:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 5																	Hours in Service: 720 Hours of Data: 720 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-Nov	3	5	4	2	2	2	2	4	3	2	3	3	4	4	5	4	4	4	4	3	4	3	1	2	5
2-Nov	2	1	1	1	1	2	1	1	2	2	3	3	3	3	3	3	2	2	2	1	1	2	1	1	3
3-Nov	2	2	2	1	1	2	2	2	2	3	3	3	4	3	2	2	2	3	4	4	4	4	3	2	4
4-Nov	2	2	2	3	3	1	1	2	2	1	2	3	3	2	2	2	2	2	1	1	1	1	1	2	3
5-Nov	2	1	2	1	1	2	2	2	2	2	3	3	2	2	2	2	2	2	2	1	2	2	2	4	4
6-Nov	3	3	2	3	3	2	2	2	2	2	2	2	3	3	2	2	3	2	1	1	1	1	2	4	4
7-Nov	2	3	4	7	5	2	3	3	3	4	3	4	3	3	3	2	2	1	1	1	2	2	1	2	7
8-Nov	2	1	1	2	1	1	2	3	1	2	2	2	2	3	2	2	2	2	2	2	2	2	1	2	3
9-Nov	2	2	2	1	3	2	2	2	2	3	3	6	2	3	2	3	3	5	3	3	3	2	4	4	6
10-Nov	4	2	2	2	3	5	4	2	2	2	2	3	3	2	2	2	1	2	2	2	2	2	3	3	5
11-Nov	2	2	3	1	2	2	2	2	2	3	3	3	4	4	4	4	3	2	3	1	2	3	3	2	4
12-Nov	2	2	2	2	1	2	3	2	2	2	2	3	3	2	2	3	1	2	2	1	2	1	2	1	3
13-Nov	1	1	1	1	1	2	1	1	1	2	2	1	2	3	2	2	1	2	2	1	2	1	1	2	3
14-Nov	1	2	2	1	2	2	3	2	2	2	2	2	4	2	3	4	4	4	4	2	1	4	5	3	5
15-Nov	2	3	4	6	4	3	4	3	4	5	2	3	3	3	2	2	2	2	4	2	2	2	1	1	6
16-Nov	1	1	1	1	1	1	1	0	1	1	1	1	3	2	2	2	3	4	5	5	4	4	4	4	5
17-Nov	3	3	4	4	4	3	3	1	2	1	2	3	3	3	4	4	5	5	5	4	4	3	2	2	5
18-Nov	1	2	1	1	1	1	1	2	1	1	2	3	3	2	1	1	1	1	1	1	3	3	2	2	3
19-Nov	2	2	2	2	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	1	1	2	1	1	2
20-Nov	2	2	2	1	1	1	1	1	1	1	3	3	3	2	2	1	1	1	1	2	1	2	2	1	3
21-Nov	1	1	1	2	2	2	3	2	2	2	1	2	1	1	1	2	2	5	3	3	2	3	3	4	5
22-Nov	4	4	2	2	1	1	1	1	1	1	1	2	2	1	1	4	3	2	2	2	2	3	3	3	4
23-Nov	3	3	4	4	4	3	4	4	4	4	5	4	5	4	4	4	3	3	3	3	3	3	2	5	
24-Nov	2	2	2	2	3	2	2	2	3	3	3	3	3	3	3	3	3	2	1	2	1	2	1	2	3
25-Nov	3	2	2	2	2	3	1	1	2	2	2	1	1	2	1	0	1	1	1	1	1	2	2	2	3
26-Nov	2	2	2	2	2	3	3	2	3	1	3	4	3	3	3	2	2	2	2	1	2	3	2	2	4
27-Nov	2	1	2	2	2	1	5	3	2	2	3	2	2	2	3	3	2	3	2	2	2	1	3	2	5
28-Nov	4	2	2	2	1	1	1	1	1	1	1	1	1	1	2	4	3	2	2	2	2	2	3	3	4
29-Nov	3	2	2	2	2	2	1	1	2	3	1	2	2	3	2	2	2	3	2	3	3	3	3	2	3
30-Nov	3	4	4	4	3	2	2	3	3	4	4	4	4	4	3	2	2	2	2	3	4	4	3	3	4
Diurnal Maximum																									
4 5 4 7 5 5 5 4 4 5 5 6 5 4 5 4 5 5 5 5 4 4 5 4																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Shell Muskeg River - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	148	20.56	20.56
6 - 11	382	53.06	73.61
12 - 19	174	24.17	97.78
20 - 28	16	2.22	100.00
29 - 38	0	0.00	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
Shell Muskeg River - 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	3	0	4	2	11	16	13	22	25	28	8	3	3	5	2	3	148
6 - 11	3	8	4	22	2	2	9	33	114	114	22	9	8	5	10	17	382
12 - 19	2	8	16	6	0	0	1	27	23	10	34	19	10	7	7	4	174
20 - 28	0	3	0	0	0	0	0	1	0	0	0	10	2	0	0	0	16
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	8	19	24	30	13	18	23	83	162	152	64	41	23	17	19	24	720

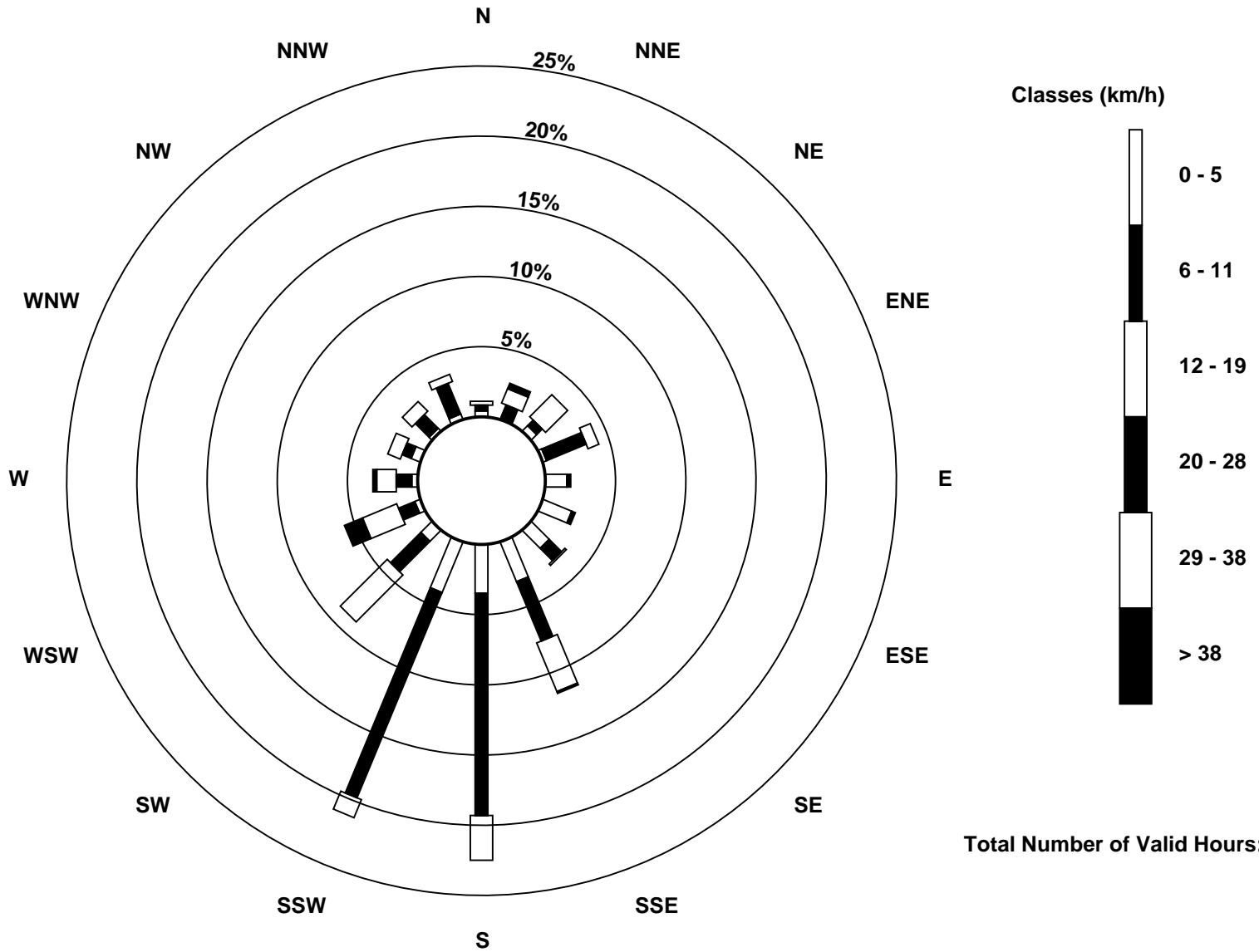
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Shell Muskeg River (AMS 16)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Shell Muskeg River - November 2016

Direction of Maximum Speed: 256 deg on Nov 15 05:00 Direction of Maximum Daily Speed Average: 164.7 deg on Nov 23	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 115 deg on Nov 25 07:00 Direction of Minimum Daily Speed Average: 0.8 deg on Nov 18	Percent Operational Time: 100.0
Monthly Average Direction: 207.9 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-Nov	338	345	342	320	333	307	282	345	326	296	321	303	297	293	303	315	318	325	338	350	338	348	150	153	320.2
2-Nov	145	176	179	174	170	161	177	174	170	168	173	176	179	181	180	206	193	186	230	256	176	203	210	192	184.2
3-Nov	192	191	203	207	218	192	176	187	205	190	181	181	200	207	189	190	206	192	194	187	213	237	238	201	200.0
4-Nov	199	207	210	211	195	144	189	164	158	171	183	196	196	191	219	201	199	207	215	214	208	211	193	189	196.2
5-Nov	198	209	203	203	181	201	214	211	190	190	185	175	209	186	172	179	210	202	190	176	179	182	214	206	193.9
6-Nov	224	217	203	188	207	193	243	220	210	203	229	214	193	203	173	204	207	216	160	145	133	186	201	217	203.2
7-Nov	194	223	214	217	223	180	194	202	209	212	200	210	207	192	196	180	166	189	199	183	174	203	210	163	201.3
8-Nov	187	198	184	205	193	208	202	214	192	200	214	208	208	204	201	211	207	206	226	212	222	215	191	172	203.9
9-Nov	180	182	188	178	189	194	186	199	177	201	182	217	244	242	246	259	265	269	259	266	244	233	238	239	231.7
10-Nov	235	190	190	175	205	230	208	169	156	181	177	185	196	163	173	174	173	156	176	174	161	165	169	177	180.8
11-Nov	179	179	183	181	190	187	192	193	198	198	196	196	196	205	217	215	211	217	226	235	236	240	180	161	204.7
12-Nov	145	170	175	163	182	166	190	190	194	196	171	187	201	177	203	203	180	198	205	208	195	184	189	189	185.2
13-Nov	169	197	194	198	200	175	148	162	168	170	178	164	177	183	198	194	195	194	204	216	207	223	209	190	187.6
14-Nov	226	267	230	209	204	188	182	205	194	212	234	229	228	238	254	278	258	272	268	242	242	251	251	259	241.2
15-Nov	251	236	250	254	256	249	256	254	252	219	193	223	237	229	233	236	236	203	259	287	259	288	89	112	245.1
16-Nov	152	173	181	206	208	186	180	151	167	174	154	165	58	43	44	45	36	29	21	21	18	343	357	344	30.5
17-Nov	341	334	323	333	331	299	291	271	263	274	266	278	276	275	276	292	309	313	323	327	321	328	313	293	302.7
18-Nov	285	311	184	167	177	196	188	201	219	279	309	317	305	293	259	213	208	150	153	155	75	67	72	72	232.6
19-Nov	68	68	69	69	72	65	65	57	60	60	72	61	51	46	43	58	57	51	62	66	67	70	79	103	61.7
20-Nov	133	122	104	125	98	101	112	101	113	173	166	172	164	199	251	137	176	146	151	152	157	150	136	127	144.6
21-Nov	107	120	144	147	155	171	176	187	182	189	207	245	259	236	267	295	309	32	41	38	36	35	29	48	64.6
22-Nov	45	66	84	78	107	93	107	82	121	207	95	130	148	152	163	171	177	156	157	150	151	144	144	152	131.1
23-Nov	159	154	153	159	162	164	164	169	167	163	167	167	168	168	163	155	153	155	168	167	172	184	193	193	164.7
24-Nov	184	181	184	183	178	181	179	186	183	180	187	191	204	207	197	215	227	104	70	311	105	95	143	129	181.2
25-Nov	284	78	70	47	68	55	115	116	129	160	149	149	147	202	122	135	236	287	270	239	243	240	245	241	201.7
26-Nov	238	233	230	241	232	226	234	231	236	171	207	224	228	222	200	191	199	199	196	171	243	230	166	187	220.7
27-Nov	243	219	133	103	100	146	55	38	23	358	8	21	24	25	22	26	28	23	28	46	49	35	350	332	30.8
28-Nov	21	22	15	162	193	183	201	177	182	198	197	191	153	157	352	45	29	358	336	338	335	344	343	338	350.0
29-Nov	335	353	74	53	116	56	131	165	98	96	125	163	162	178	197	193	177	187	194	190	215	230	169	166	177.1
30-Nov	174	178	181	176	169	159	161	166	182	175	190	184	176	183	196	186	199	198	186	197	185	179	176	185	179.3

200.4 190.2 187.6 192.3 193.6 190.7 191.8 191.4 192.2 191.7 190.6 199.0 203.8 205.8 213.6 214.6 215.4 212.1 217.3 219.0 209.7 218.9 201.3 194.8

Diurnal Average

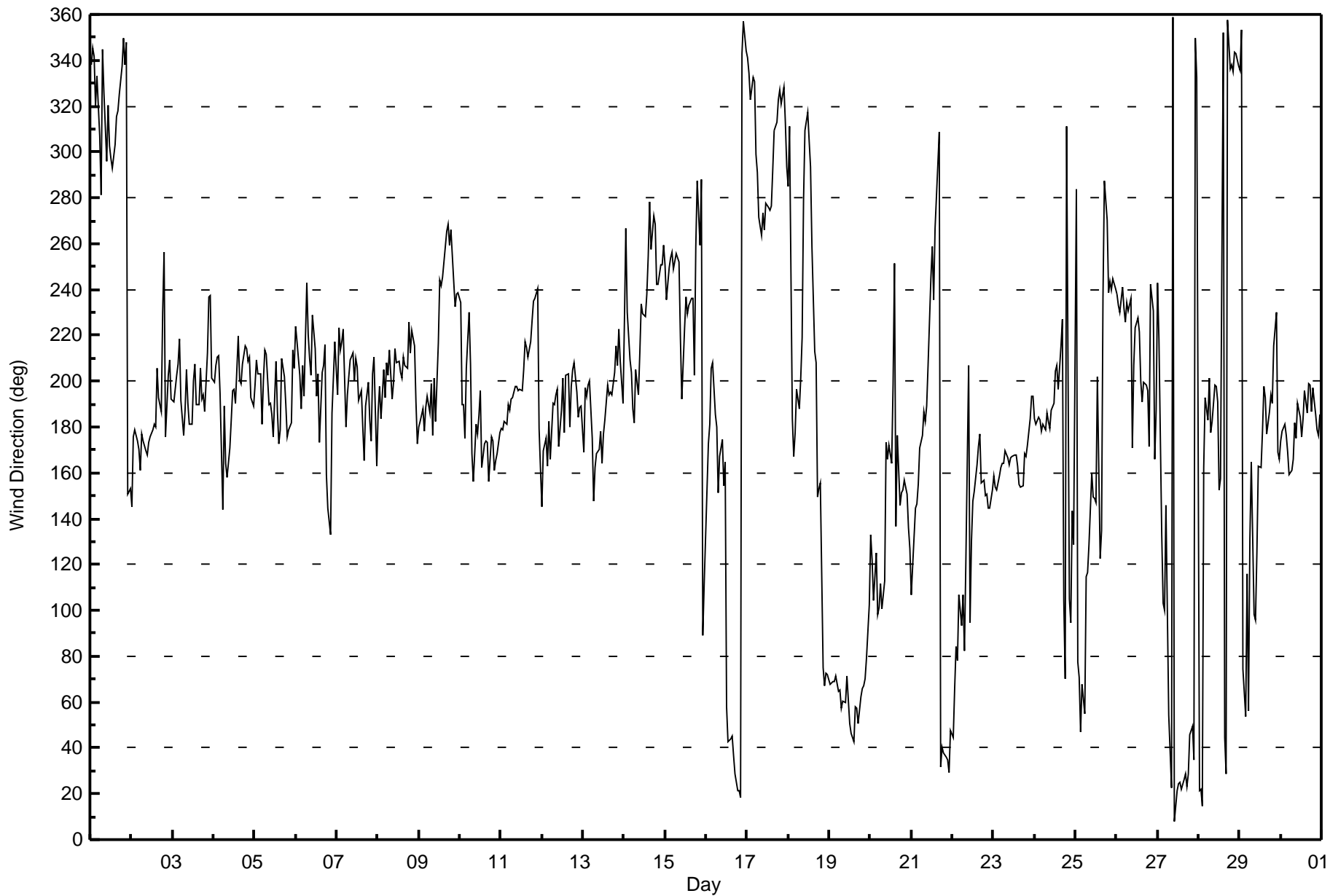
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Shell Muskeg River - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Nov 16 01:00 Minimum Value: 5 deg on Nov 19 20:00 Percentiles: P ₁ = 7 P ₁₀ = 10 Q ₁ = 13 Median = 17 Q ₃ = 22 P ₉₀ = 35 P ₉₉ = 80																		Hours in Service: 720 Hours of Data: 720 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-Nov	23	22	18	25	25	26	38	72	21	18	23	20	21	17	21	19	18	21	19	17	32	54	21	27	72
2-Nov	27	16	11	13	11	10	15	13	19	15	18	16	16	17	20	17	17	16	29	19	19	15	11	15	29
3-Nov	16	15	14	12	9	21	16	15	18	17	16	20	21	20	24	18	15	16	18	16	19	10	35	15	35
4-Nov	16	15	14	16	22	21	15	41	14	12	17	23	24	23	14	19	37	38	43	41	19	11	20	24	43
5-Nov	33	17	13	18	14	15	13	15	17	15	16	16	18	23	15	17	17	47	34	20	22	15	39	26	47
6-Nov	10	13	21	43	22	22	23	18	13	18	20	30	32	26	31	21	23	18	17	19	14	13	16	30	43
7-Nov	30	12	42	33	12	26	23	16	16	23	29	24	21	21	20	14	15	15	16	31	36	15	19	28	42
8-Nov	58	27	21	14	17	12	17	17	13	20	17	18	20	20	16	17	15	16	18	13	13	15	18	11	58
9-Nov	12	13	19	18	26	36	15	25	31	24	24	37	9	7	10	15	12	12	8	10	11	8	8	7	37
10-Nov	70	19	25	17	18	11	81	31	18	20	23	21	24	19	15	13	10	11	13	12	9	13	11	14	81
11-Nov	13	14	15	15	14	16	15	15	14	16	18	20	22	19	15	14	14	10	9	6	7	6	66	29	66
12-Nov	41	23	29	19	18	12	19	20	15	16	20	92	33	27	24	63	34	17	35	20	33	17	14	14	92
13-Nov	20	13	12	13	13	19	14	14	16	10	17	17	18	17	22	18	17	16	14	13	14	17	12	31	31
14-Nov	40	80	21	17	14	19	20	20	16	18	8	8	11	8	13	12	17	13	10	8	7	9	13	10	80
15-Nov	8	14	19	12	9	8	10	9	9	56	25	15	11	11	8	9	12	43	60	9	41	69	60	50	69
16-Nov	98	18	18	11	9	12	10	8	18	46	44	22	52	8	7	13	13	11	16	14	21	16	21	18	98
17-Nov	22	22	22	19	20	17	13	10	7	11	16	15	18	16	14	14	21	16	23	23	20	21	18	19	23
18-Nov	10	50	36	17	14	16	18	17	33	13	26	27	26	41	33	23	32	12	20	8	32	16	14	13	50
19-Nov	15	12	9	9	11	13	10	14	13	11	24	16	12	11	7	13	12	12	10	5	7	12	9	23	24
20-Nov	15	16	13	16	12	11	12	15	14	28	13	16	21	28	39	70	14	14	10	12	14	14	19	17	70
21-Nov	15	14	13	13	12	14	17	18	14	17	23	23	17	22	18	19	14	33	11	13	18	12	11	22	33
22-Nov	20	22	16	23	23	13	19	36	39	69	65	20	16	15	43	21	15	16	12	11	12	15	12	12	69
23-Nov	12	11	11	12	14	13	11	14	13	11	12	12	14	14	12	12	11	12	13	12	13	17	19	18	19
24-Nov	16	14	14	16	16	15	16	16	16	16	17	20	21	23	23	58	25	13	61	23	48	44	44	43	61
25-Nov	72	11	22	33	10	46	97	29	19	10	13	14	14	62	17	31	13	15	16	7	8	9	9	8	97
26-Nov	8	9	8	9	13	12	14	8	12	25	20	14	12	23	22	23	21	21	21	14	31	26	18	32	32
27-Nov	73	28	48	27	29	59	41	15	18	44	34	15	11	11	14	10	8	12	8	10	7	12	27	44	73
28-Nov	30	22	22	92	18	21	24	12	13	18	19	16	26	39	75	87	30	31	28	14	14	13	17	16	92
29-Nov	16	31	80	94	58	83	67	26	21	72	20	34	17	19	24	21	15	18	21	20	19	15	19	11	94
30-Nov	17	16	15	15	14	11	10	12	17	16	21	20	16	23	21	18	19	18	16	18	18	16	14	17	23
																		98 80 80 94 58 83 97 72 39 72 65 92 52 62 75 87 58 47 60 61 41 69 66 50							
Diurnal Maximum																									





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Last Calibration	October 11, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	8:46	End Time (MST)	13:50
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	813	814
Calculated slope	0.995827	0.997772	Chamber temp	44.9	45.2
Calculated intercept	3.263935	3.321681	Pressure	709.3	709.6
Analyzer Background	9.1	9.0	Flow	0.542	0.452
Analyzer Coefficient	1.026	1.019	Intensity	108	108
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	83.6	807.6	809.1	0.998
calibrator zero	5000	0.0	0.0	-0.4	----
high point	5000	83.6	807.6	807.8	1.000
second point	5000	42.0	405.7	401.1	1.012
third point	5000	21.1	203.8	198.5	1.027
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	83.6	807.6	807.8	1.000
Average Correction Factor					1.013

Corrected As found 809.5 Previous response 807.7 % change -0.2%

Notes:

Inlet filter changed after as founds. Adjusted span. Door was opened multiple times during second point decreasing the temperature in the station slightly.

Calibration Performed By:

Jayme Marcoux



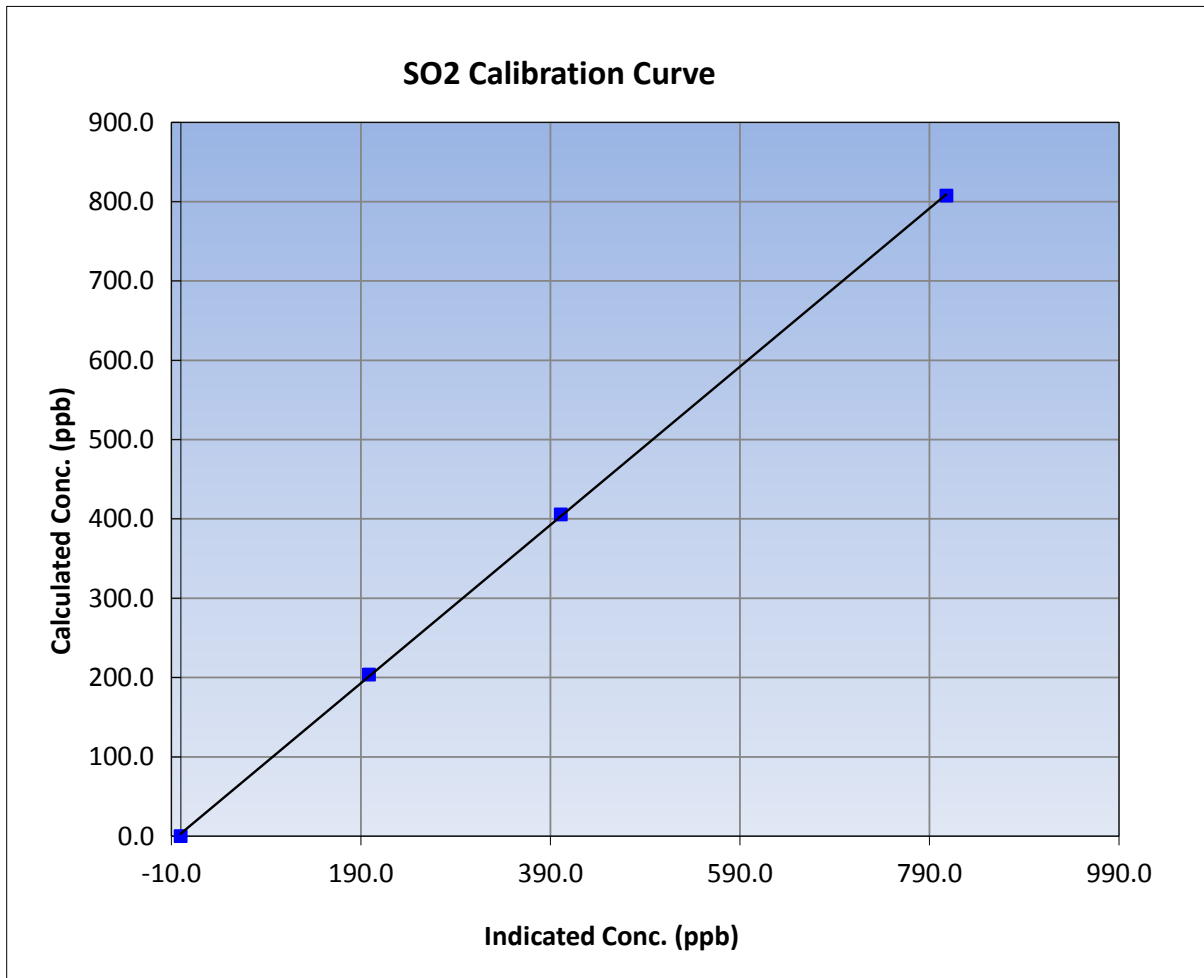
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 11, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	8:46	End Time (MST)	13:50
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

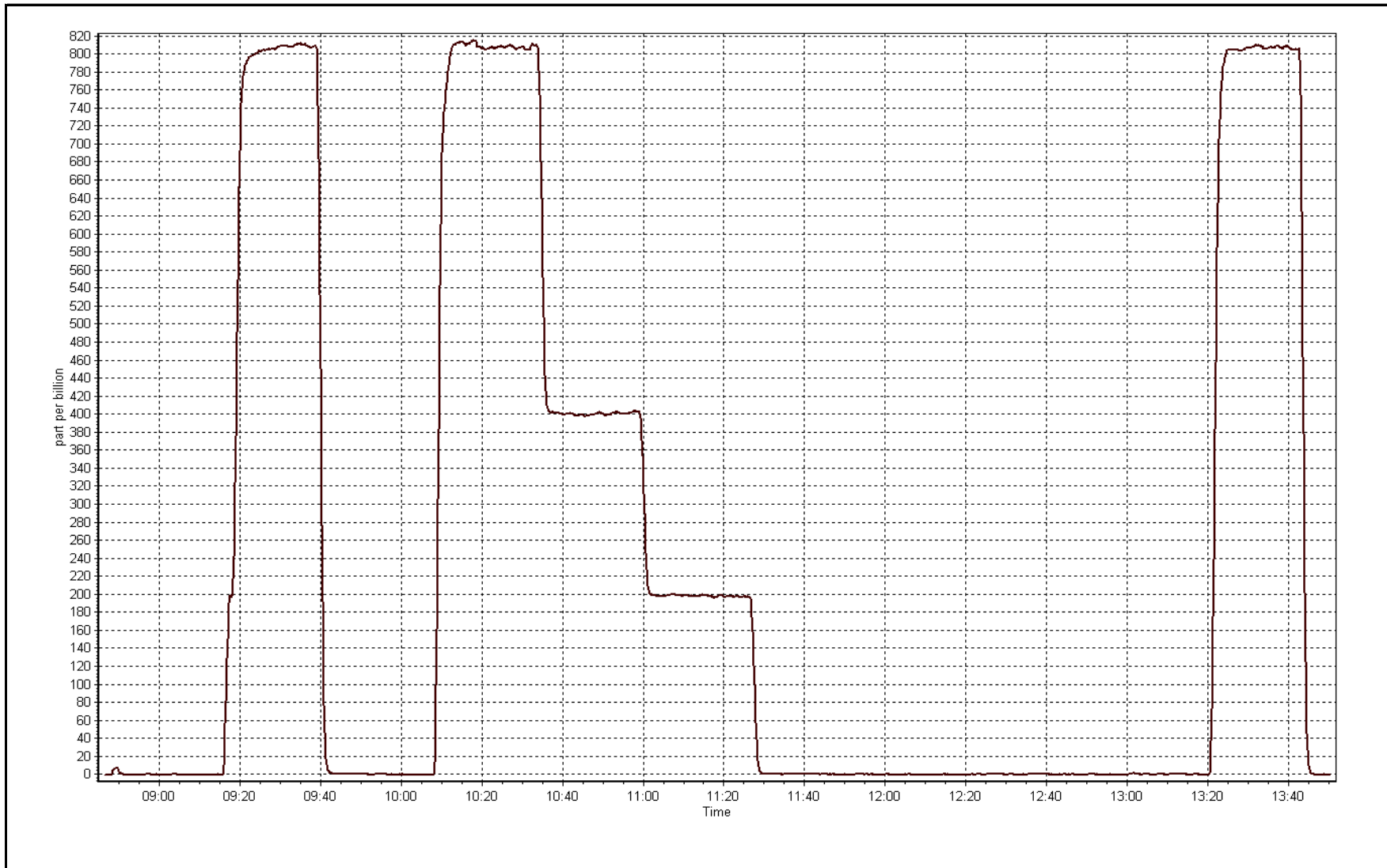
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999937
807.6	807.8	0.9998		
405.7	401.1	1.0116	Slope	0.997772
203.8	198.5	1.0266		
			Intercept	3.321681



SO2 Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 21, 2016	Last Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Other: <input type="checkbox"/> Lamp Adjustment		
Start Time (MST)	10:13	End Time (MST)	12:17
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	-711	-710
Analyzer IP address	192.168.1.43		Lamp voltage	813	819
Calculated slope	0.997772	0.100749	Chamber temp	45.1	45.0
Calculated intercept	3.321681	0.037277	Pressure	709.6	701.8
Analyzer Background	9.0	9.0	Flow	0.542	0.447
Analyzer Coefficient	1.019	1.019	Intensity	108	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	83.6	807.6	801.2	1.008
calibrator zero	5000	0.0	0.0	-0.4	----
high point	5000	83.6	807.6	801.2	1.008
second point					
third point					
as left zero	5000	0.0	0.0	-0.3	----
as left span	5000	83.6	807.6	803.6	1.005
Average Correction Factor					0.101

Corrected As found 801.6 Previous response 806.1 % change 0.6%

Notes:

Logged in remotely. Adjusted Lamp volatage intensity to 91%.

Calibration Performed By: Jayne Marcoux



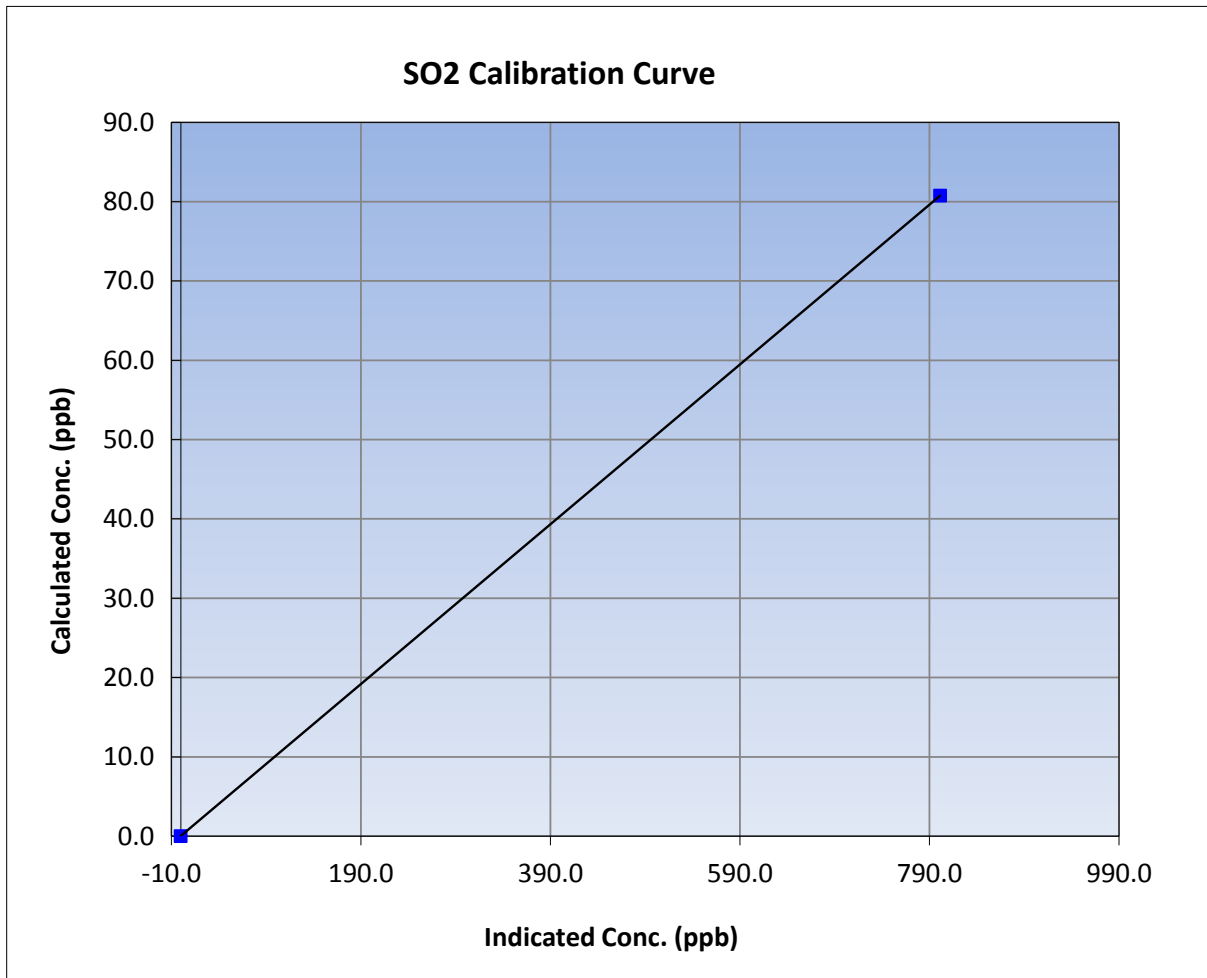
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 21, 2016	Previous Calibration	November 1, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	10:13	End Time (MST)	12:17
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

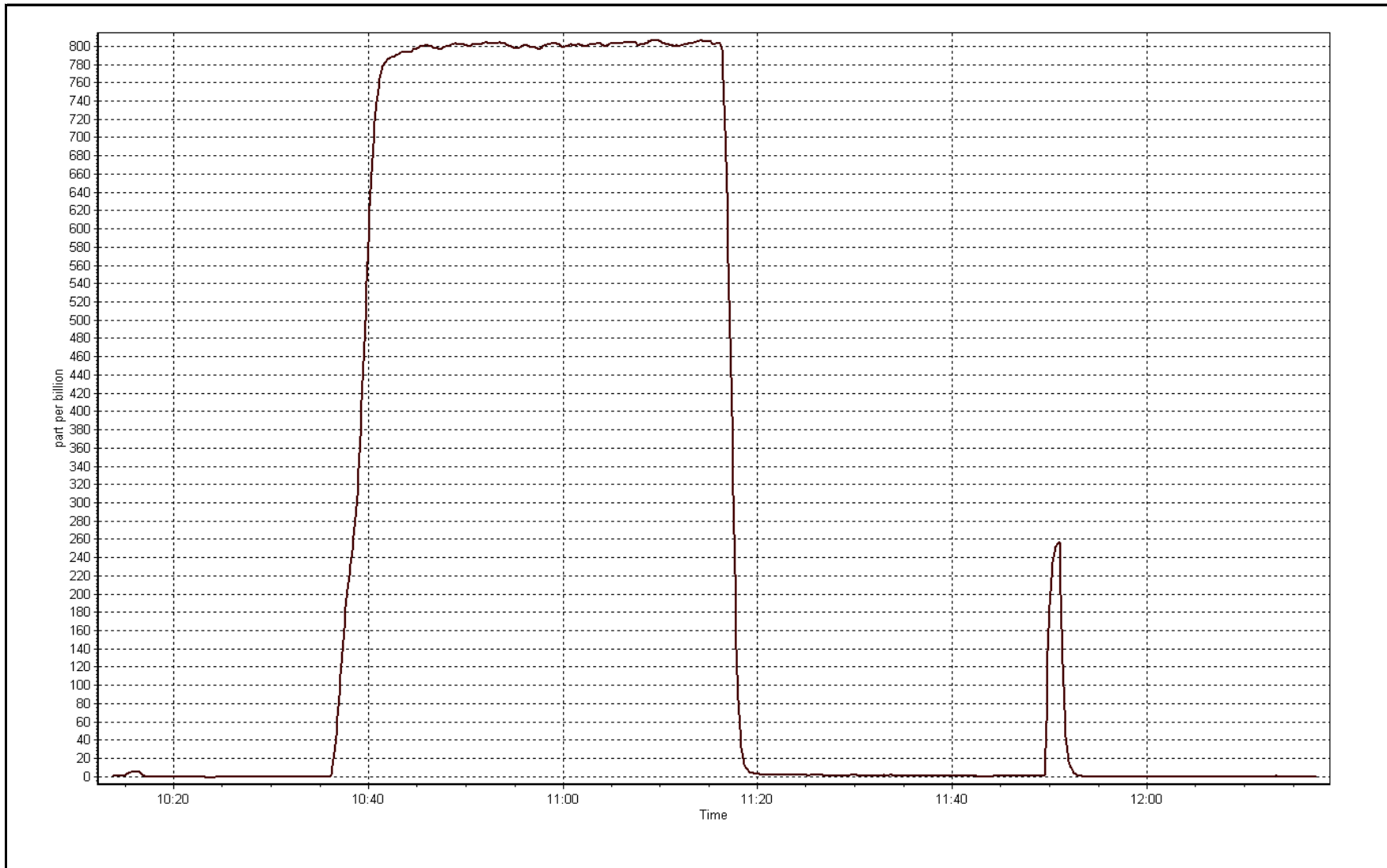
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	1.000000
80.8	801.2	0.1008		
			Slope	0.100749
			Intercept	0.037277



SO2 Calibration Plot

Date: November 21, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November-01-16	Last Calibration	October-11-16
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	8:46	End Time (MST)	13:47
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

	<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	0.993680	0.996278	Fuel Pressure	24.2	24.2
Calculated intercept	0.022533	0.112665	Analyzer Coeff	4.466	4.435
			Analyzer BKG	2.37	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	-0.19	----
as found span	5000	83.6	17.02	17.03	0.999
calibrator zero	5000	0.0	0.00	-0.04	----
high point	5000	83.6	17.02	17.02	1.000
second point	5000	42.0	8.55	8.38	1.020
third point	5000	21.1	4.29	4.16	1.032
as left zero	5000	0.0	0.00	-0.07	----
as left span	5000	83.6	17.02	17.05	0.998
Average Correction Factor					1.017

Corrected As found	17.22	Previous response	17.10	% change	-0.7%
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Notes:

Inlet filter changed after as founds. Adjusted zero and span. Door was opened multiple times during second point decreasing the temperature in the station slightly.

Calibration Performed By:

Jayme Marcoux



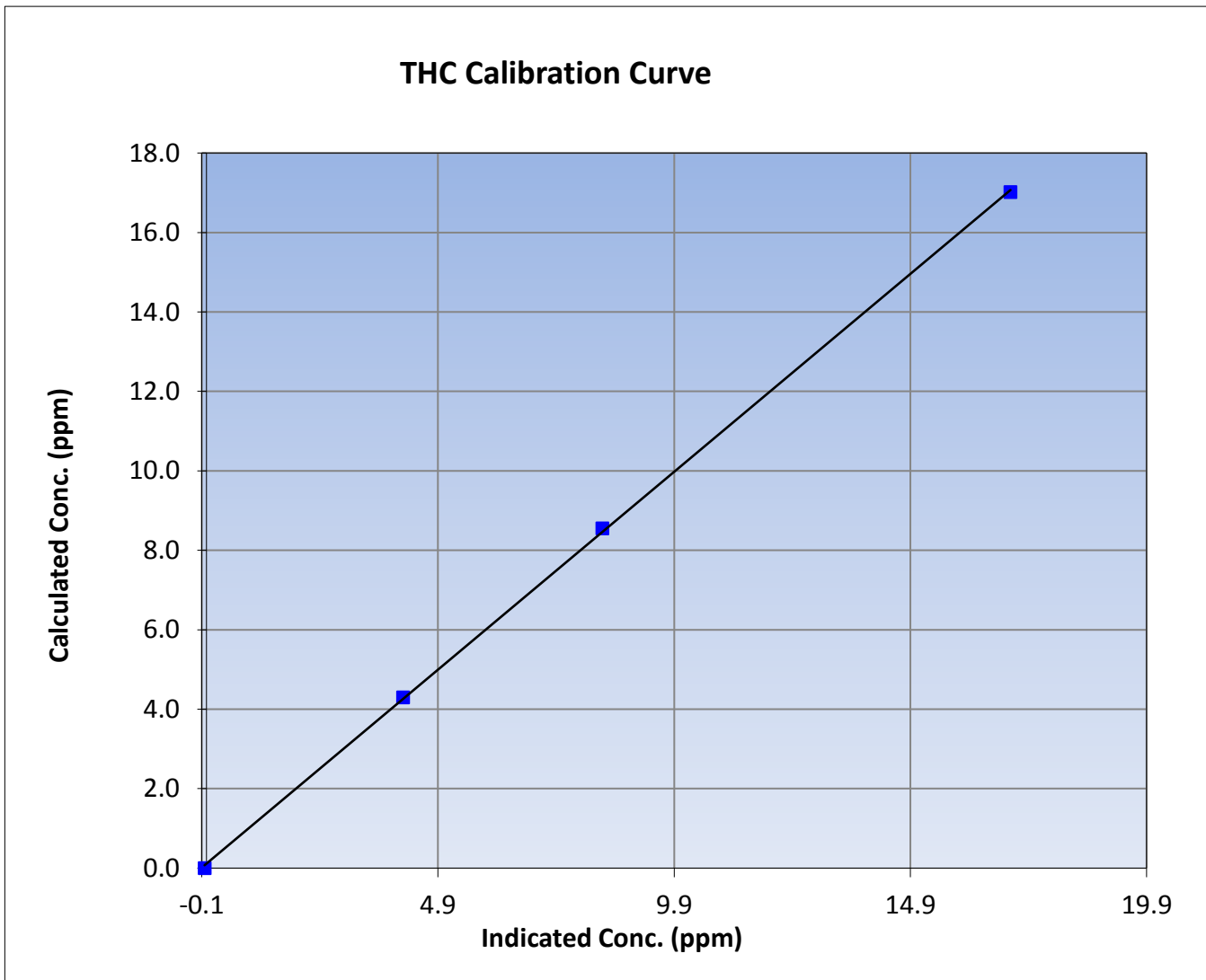
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 11, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	8:46	End Time (MST)	
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

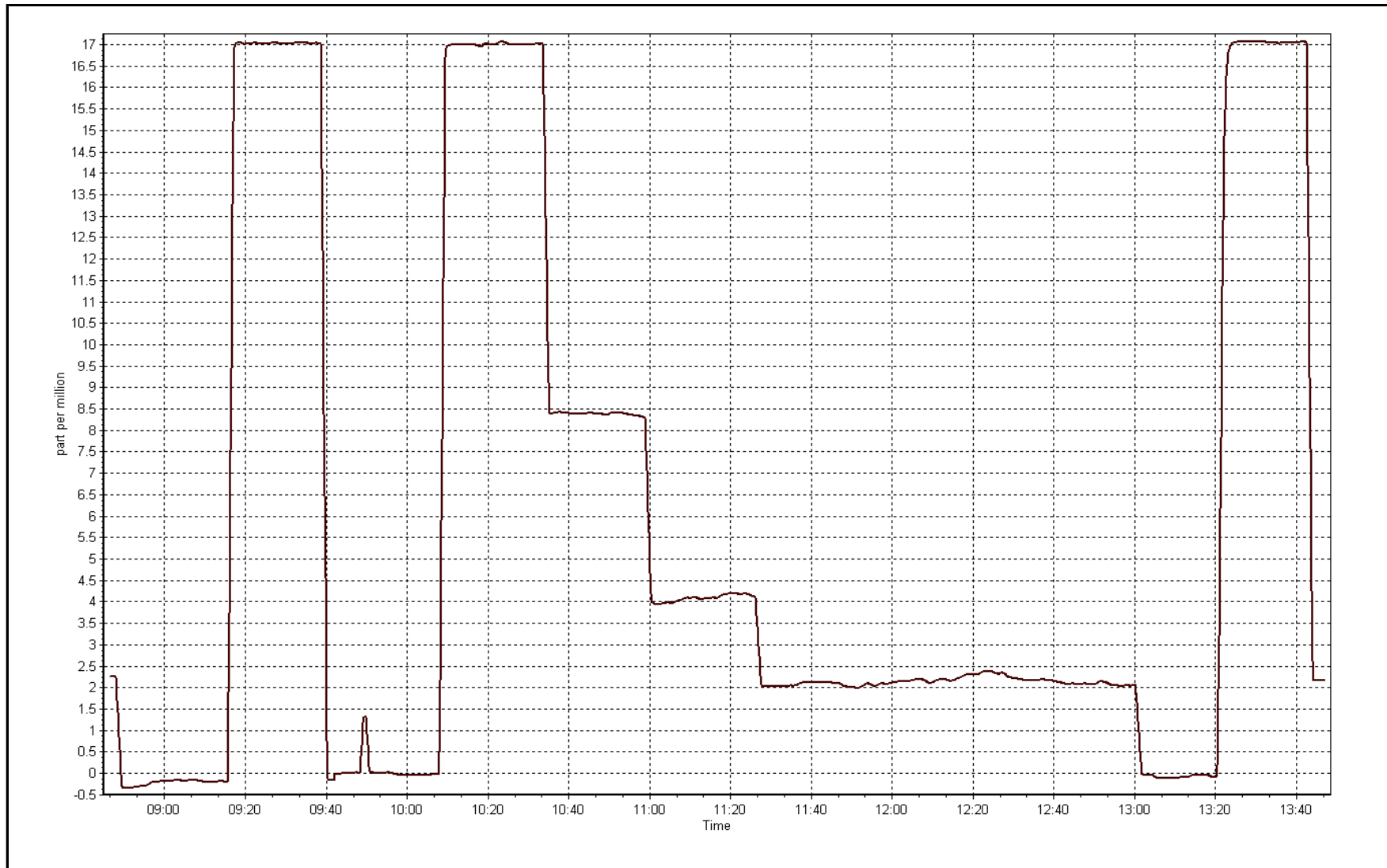
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.04	----	Correlation Coefficient	0.999892
17.02	17.02	0.9998		
8.55	8.38	1.0202	Slope	0.996278
4.29	4.16	1.0324		
			Intercept	0.112665



THC Calibration Plot

Date: November 1, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 11, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	8:46	End Time (MST)	13:48
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	0.996077	0.997953	0.994081
	Data Offset	2.890094	3.330435	-0.657846
Current Calibration	Data Slope	0.999474	0.999342	0.994758
	Data Offset	2.146791	2.560071	0.494924

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	1.015		1.012	
NOx coefficient	1.000		1.000	
NO2 coefficient	1.000		0.998	
NO bkgnd	8.5		8.3	
NOx bkgnd	8.8		8.5	
Chamber Temp	50.4	Deg C	50.5	Deg C
Moly Temp	325	Deg C	325	Deg C
PMT voltage	-744	V	-744.8	V
PMT Temp	-3	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	164	mmHg	164.6	mmHg
R Cell Press Nox	163.7	mmHg	164.6	mmHg
NO sample flow	0.914	lpm	0.923	lpm
Nox sample Flow	0.916	lpm	0.921	lpm

Notes:

Inlet filter changed out after as founds. Adjusted zero and span. During 2nd GPT point, purge was pressed and then generated 300ppb of ozone instead of 200ppb. Adjusted to 200ppb and continued.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 1, 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	-0.2	-0.1	----	----
as found span	5000	83.6	802.6	802.6	0.0	811.2	808.1	3.0	0.9894	0.9932
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	5000	83.6	802.6	802.6	0.0	802.1	801.9	0.1	1.0006	1.0008
second point	5000	42.0	403.2	403.2	0.0	399.7	399.2	0.5	1.0087	1.0100
third point	5000	21.1	202.6	202.6	0.0	198.7	197.8	0.8	1.0195	1.0239
as left zero	6000	0.0	0.0	0.0	0.0	1.6	0.0	1.6	----	----
as left span	5000	83.6	802.6	508.0	294.6	802.2	505.8	296.4	1.0005	1.0043
Average Correction Factor									1.0096	1.0115

Corrcctd As found NO_x= 811.5 NO= 808.3 Percent Change NO_x= -1.1% NO= -0.9%
 Previous Response NO_x= 802.8 NO= 800.9

GPT Calibration Data

Dilution Flow 5000 ccm Source Gas Flow 83.60 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			0.0			N/A	
1st NO2 (300)	----	508.0	290.3	799.9	508.0	292.0	0.9868	1.0000	0.9943	100.6%
2nd NO2 (200)	----	598.5	199.8	798.1	598.5	199.6	0.9891	1.0000	1.0009	99.9%
3rd NO2 (100)	----	694.4	103.9	797.9	694.4	103.5	0.9893	1.0000	1.0034	99.7%
4th NO2 (0)	798.3	----	1.7	800.0	798.3	1.7	0.9868	1.0000	N/A	----
Average Correction Factor							0.9880	1.0000	0.9995	100.1%

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

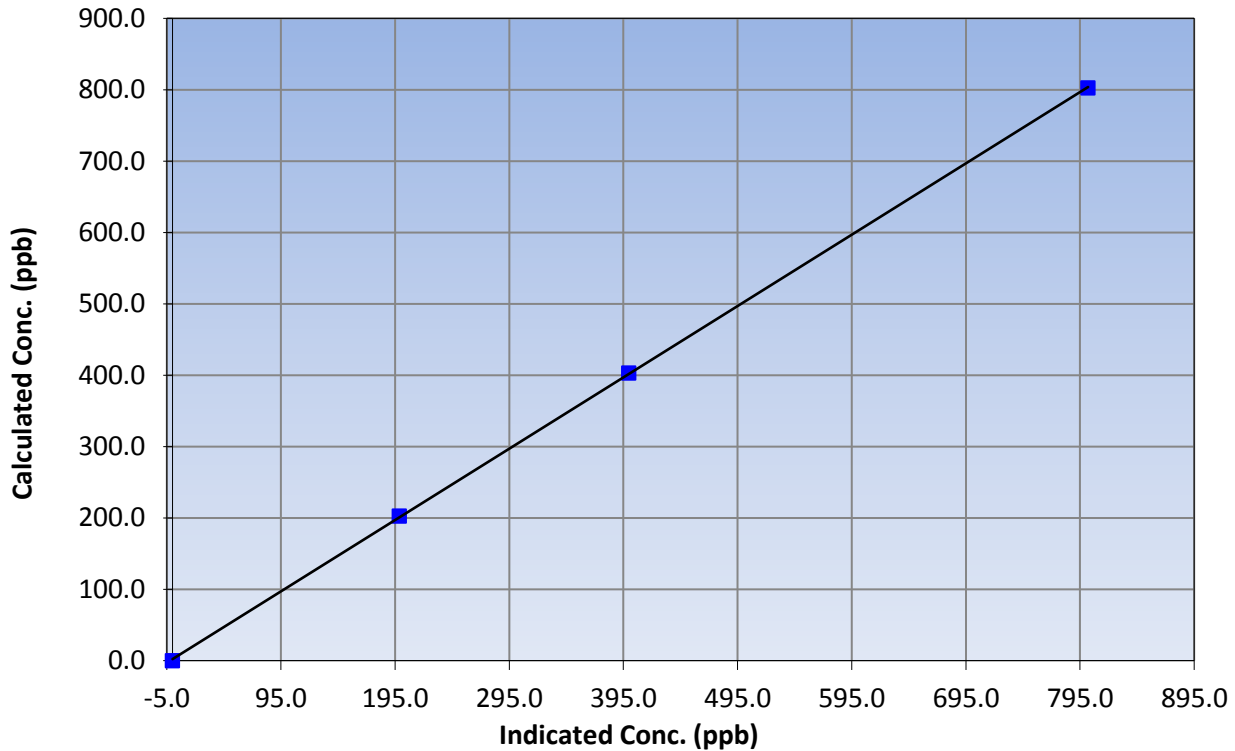
Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 11, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	8:46	End Time (MST)	13:48
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	0.0	----	Correlation Coefficient	0.999967
802.6	802.1	1.0006		
403.2	399.7	1.0087	Slope	0.999474
202.6	198.7	1.0195		
			Intercept	2.146791

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

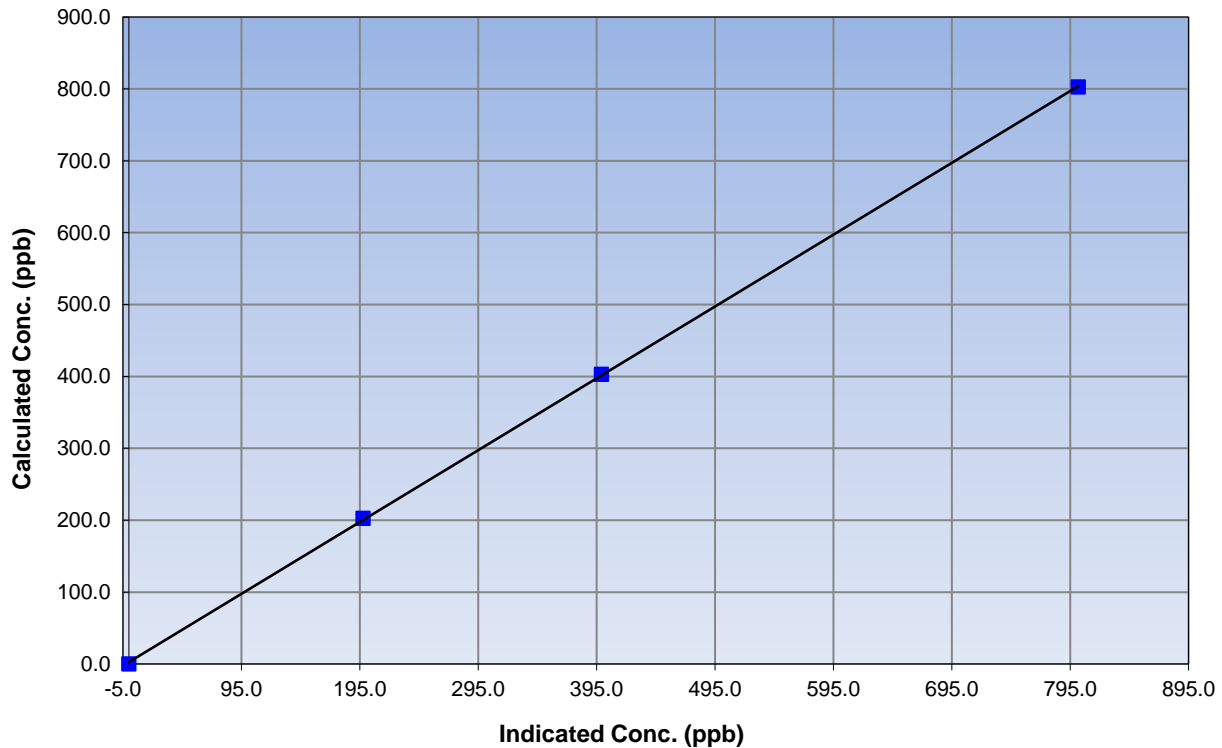
Station Information

Calibration Date	November 1, 2016	Previous Calibration	October 11, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	8:46	End Time (MST)	13:48
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	0.0	N/A	Correlation Coefficient	0.999953
802.6	801.9	1.0008		
403.2	399.2	1.0100	Slope	0.999342
202.6	197.8	1.0239		
			Intercept	2.560071

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

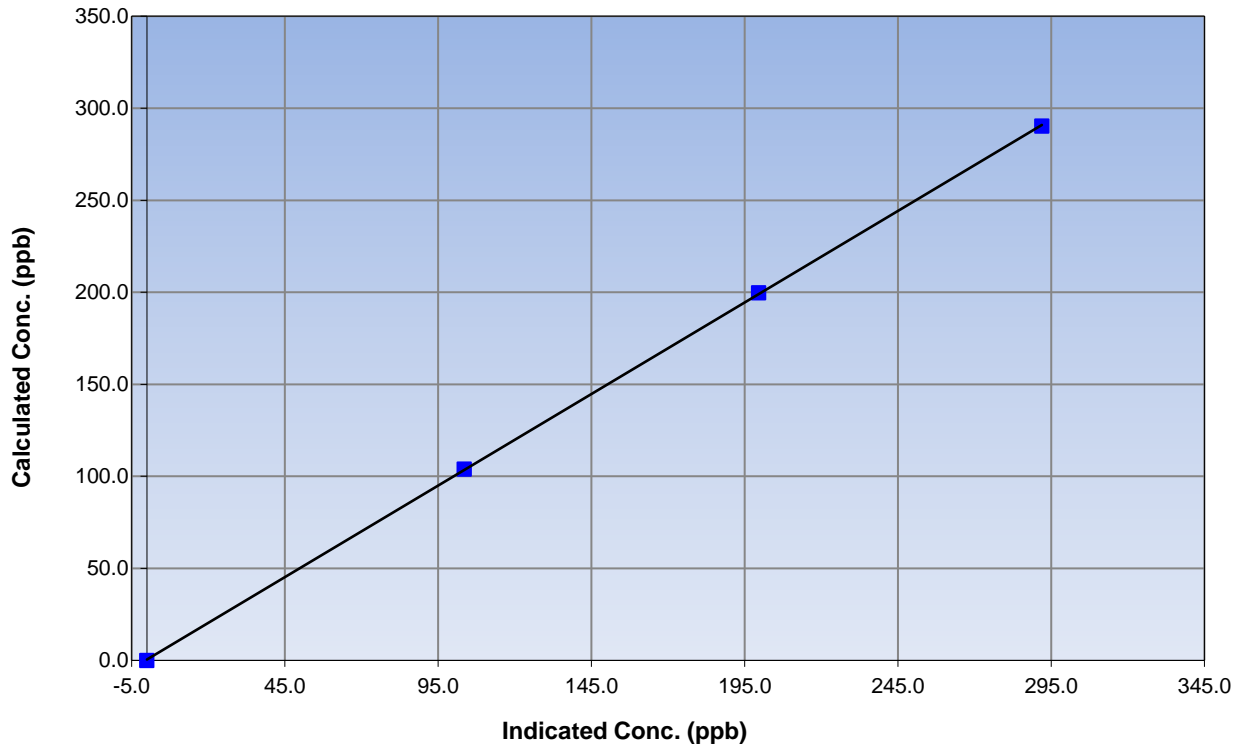
Station Information

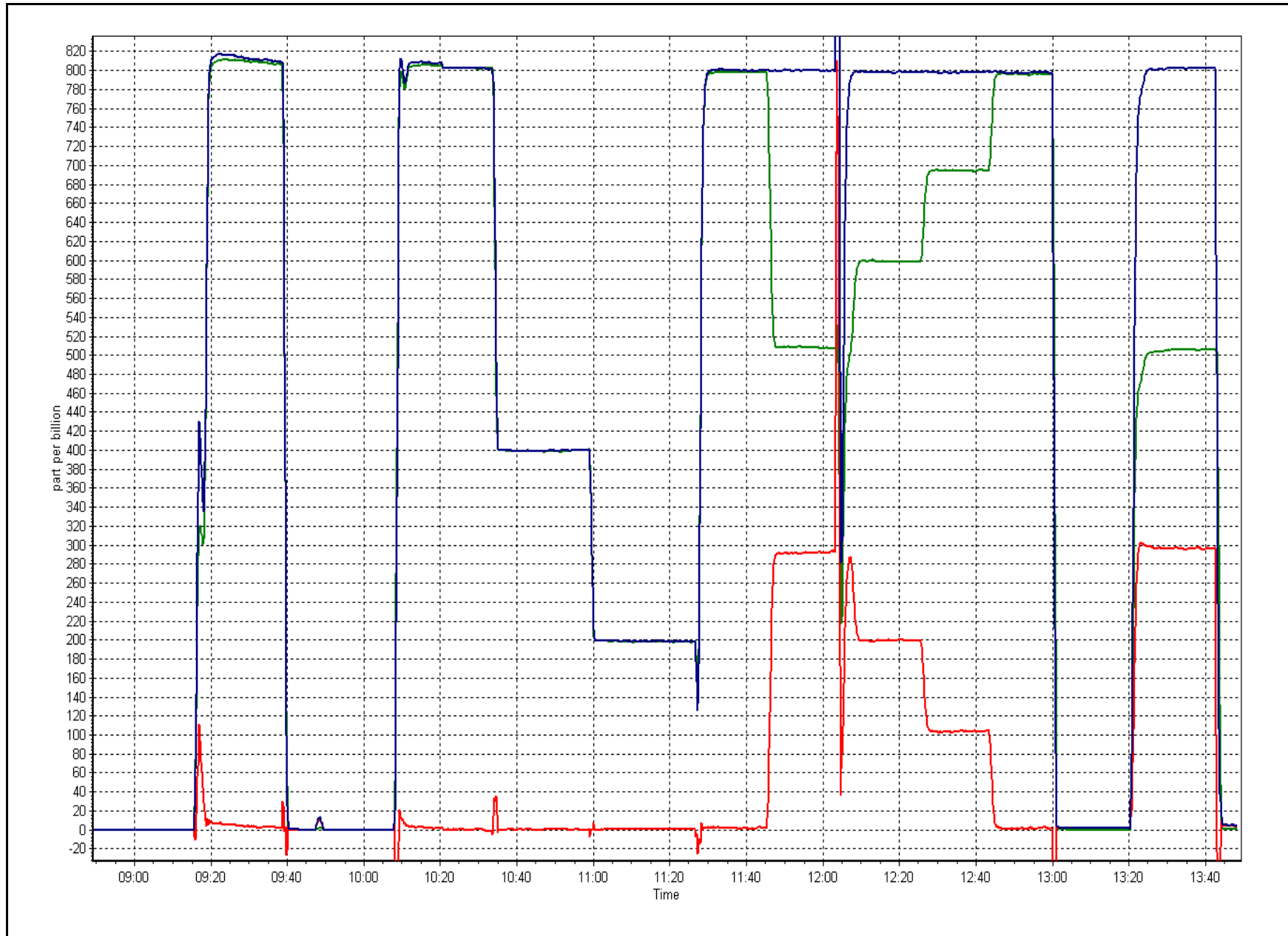
Calibration Date	November 1, 2016	Previous Calibration	October 11, 2016
Station Number	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	8:46	End Time (MST)	13:48
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999972
290.3	292.0	0.9943		
199.8	199.6	1.0009	Slope	0.994758
103.9	103.5	1.0034		
			Intercept	0.494924

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:	November 1, 2016	Last Cal Date:	October 11, 2016
Start time (MST):	9:55	End time (MST):	10:40
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)	-4.4	-4.9	-4.4	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	974	972.5	974	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1007	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.5	-----	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>NA</u>	Last Cal Date:	<u>June 24, 2016</u>
	Flow w/o adaptor:	<u>NA</u>	Flow w/ adaptor:	<u>NA</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: Clean cyclone head. Adjusted nephelometer.

Calibration by: Jayme Marcoux



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 17
WAPASU
NOVEMBER 2016**

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
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	26	0	7	0
H2S (ppb) Average	684	36	36	100.00	4	0	1	0
THC (ppm) Average	685	35	35	100.00	2.7	-	2.3	-
O3 (ppb) Average	687	33	33	100.00	37	0	31	-
NO2 (ppb) Average	685	35	35	100.00	17	0	8	-
NO (ppb) Average	685	35	35	100.00	7	-	1	-
NOX (ppb) Average	685	35	35	100.00	22	-	9	-
PM2.5 (ug/m3) Average	708	2	12	98.61	25.5	-	10	0
Temperature 2 m (C) Average	720	0	0	100.00	13.6	-	8.4	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	96	-
Precipitation (mm) Total	351	0	369	48.75	1.9	-	2.3	-
Wind Speed 10 m (km/h) Average	718	0	2	99.72	22	-	15	-
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 - WAPASU (AMS 17)
 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	1.6	3	-	0	0	0	0	1	5	26
H2S (ppb) Average	684	0.2	0	-	0	0	0	0	0	0	4
THC (ppm) Average	685	2.21	0.1	-	2.1	2.1	2.2	2.2	2.2	2.3	2.7
O3 (ppb) Average	687	22.5	7	-	1	13	18	23	28	31	37
NO2 (ppb) Average	685	2.9	3	-	0	0	1	2	4	8	17
NO (ppb) Average	685	0.5	1	-	0	0	0	0	1	1	7
NOX (ppb) Average	685	3.4	4	-	0	0	1	2	4	9	22
PM2.5 (ug/m3) Average	708	4.05	3.5	-	0.1	0.6	1.8	3.2	5.1	8.4	25.5
Temperature 2 m (C) Average	720	-1.96	6.6	-	-15.6	-10.2	-7.1	-2.9	4.3	7.3	13.6
Relative Humidity (%) Average	720	81.4	13	-	40	61	74	86	92	95	98
Precipitation (mm) Total	351	-	-	3.95	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	718	8.7	4	-	0	4	6	8	11	14	22
Wind Direction 10 m (deg) Average	718	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
PM2.5	16 Nov 2016 20:00	16 Nov 2016 21:00	2	Unstable operation - excessive baseline drift
PM2.5	17 Nov 2016 01:00	17 Nov 2016 01:00	1	Unstable operation - excessive baseline drift
PM2.5	17 Nov 2016 03:00	17 Nov 2016 05:00	3	Unstable operation - excessive baseline drift
PM2.5	17 Nov 2016 10:00	17 Nov 2016 13:00	4	Maintenance - baseline adjustment
Precipitation Collector	15 Nov 2016 16:00	01 Dec 2016 00:00	369	Data not recorded
Wind Speed, Wind Direction	18 Nov 2016 16:00	18 Nov 2016 17:00	2	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Wapasu - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 26 ppb on Nov 7 15:00	Maximum Daily Average: 7.4 ppb on Nov 7		Hours of Data:	685
Minimum Value: 0 ppb on Nov 15 15:00	Minimum Daily Average: 0.1 ppb on Nov 16		Hours of Missing Data:	35
Maximum Diurnal Average: 3.0 ppb at hour 14	Minimum Diurnal Average: 0.6 ppb at hour 20		Hours of Calibration:	35
Monthly Average: 1.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 5 P ₉₉ = 17		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	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
3-Nov	1	Z	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	1	4	4	3	7	1.1	7	
4-Nov	9	6	Z	9	13	11	6	4	4	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	3.1	13
5-Nov	1	1	1	Z	1	1	1	1	1	2	4	6	3	1	1	3	2	1	2	4	5	9	5	10	2.8	10
6-Nov	3	5	8	9	Z	1	7	6	3	2	2	2	1	2	3	6	4	2	2	2	2	3	5	8	3.9	9
7-Nov	6	8	5	4	5	Z	7	5	6	8	11	16	14	21	26	19	6	1	1	0	0	0	1	1	7.4	26
8-Nov	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.8	1
9-Nov	4	Z	3	1	1	1	1	4	16	17	10	2	1	1	0	1	1	0	0	0	0	0	0	1	2.8	17
10-Nov	2	2	Z	2	2	4	3	4	4	11	10	12	16	12	5	3	1	1	1	1	1	1	1	1	4.3	16
11-Nov	1	1	1	Z	1	0	0	1	1	1	2	5	7	10	9	9	7	7	4	2	1	1	3	6	3.4	10
12-Nov	5	2	4	7	Z	6	7	10	12	17	20	8	4	6	3	3	2	1	1	1	0	1	0	0	5.3	20
13-Nov	0	0	0	0	0	Z	1	2	12	15	11	3	3	1	3	1	0	0	0	0	0	0	0	0	2.5	15
14-Nov	Z	0	1	1	1	1	3	7	8	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	1.4	8
15-Nov	0	Z	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	1	1	0	0	0	0	0	0.3	1
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	0.1	0
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
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	0.3	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	0.3	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	0.3	0
21-Nov	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0.5	1
22-Nov	1	0	Z	0	0	0	0	0	0	1	1	1	15	24	2	2	4	2	1	1	1	1	0	0	2.5	24
23-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	0.2	0
24-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	0.2	0
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	0.2	0
26-Nov	Z	0	0	0	0	0	0	0	0	0	0	6	12	6	1	0	0	0	0	0	0	0	0	0	1.4	12
27-Nov	0	Z	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
28-Nov	0	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
29-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	3	2	1	0	0	0	0	0	0.6	3
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	0.3	0

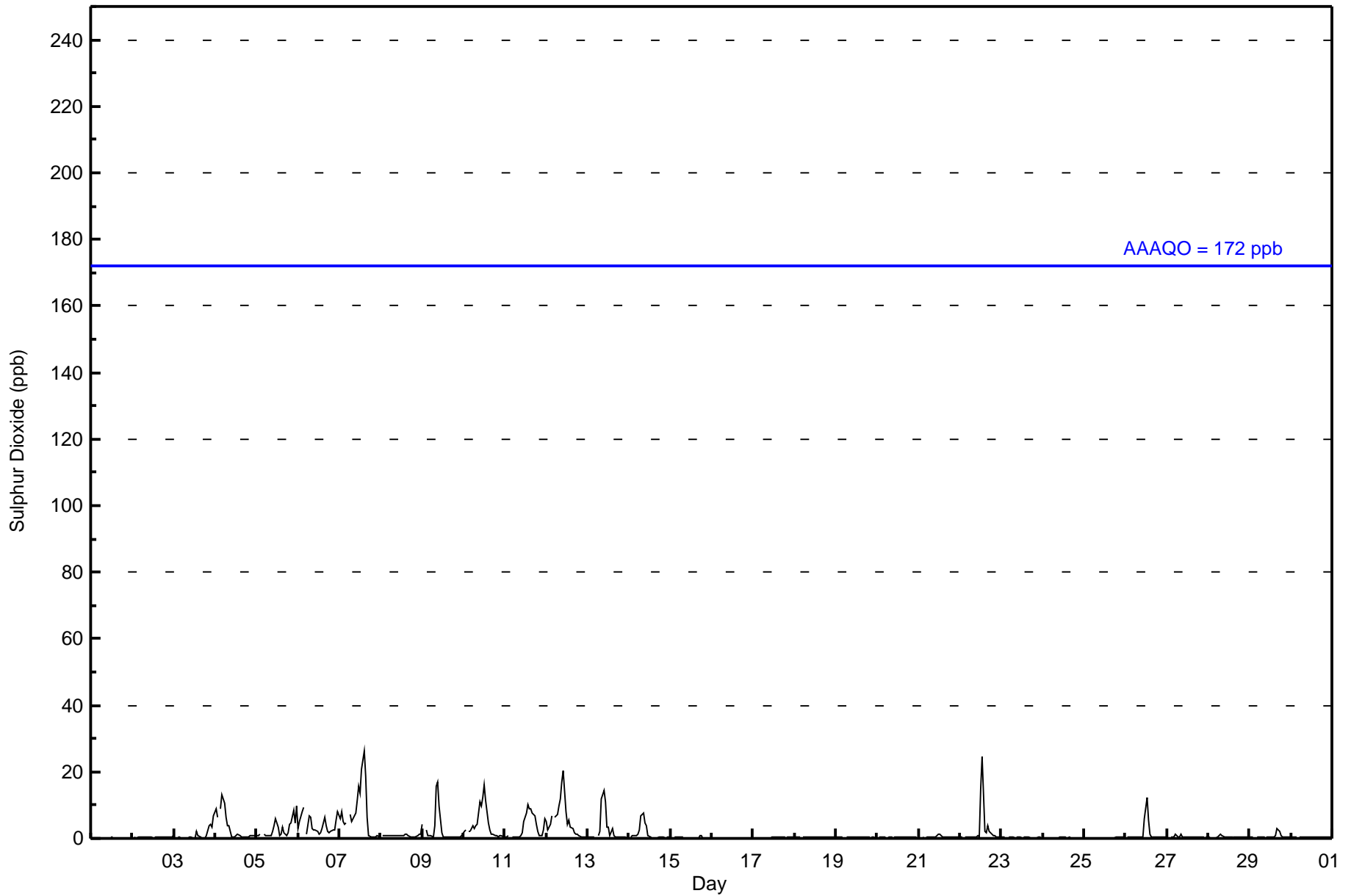
1.4	1.3	1.1	1.5	1.1	1.3	1.4	1.7	2.5	2.9	2.8	2.3	2.9	3.0	2.0	1.8	1.2	0.8	0.6	0.6	0.7	0.9	0.9	1.3	Diurnal Average	
9	8	8	9	13	11	7	10	16	17	20	16	16	24	26	19	7	7	4	4	5	9	5	10	Diurnal Maximum	

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
Wapasu - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Wapasu - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	662	96.64	96.64
11 - 20	20	2.92	99.56
21 - 60	3	0.44	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
Wapasu - 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	27	10	24	9	7	11	41	140	157	48	63	47	15	9	26	26	660
11 - 20	0	0	0	0	0	0	0	4	6	6	4	0	0	0	0	0	20
21 - 60	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683

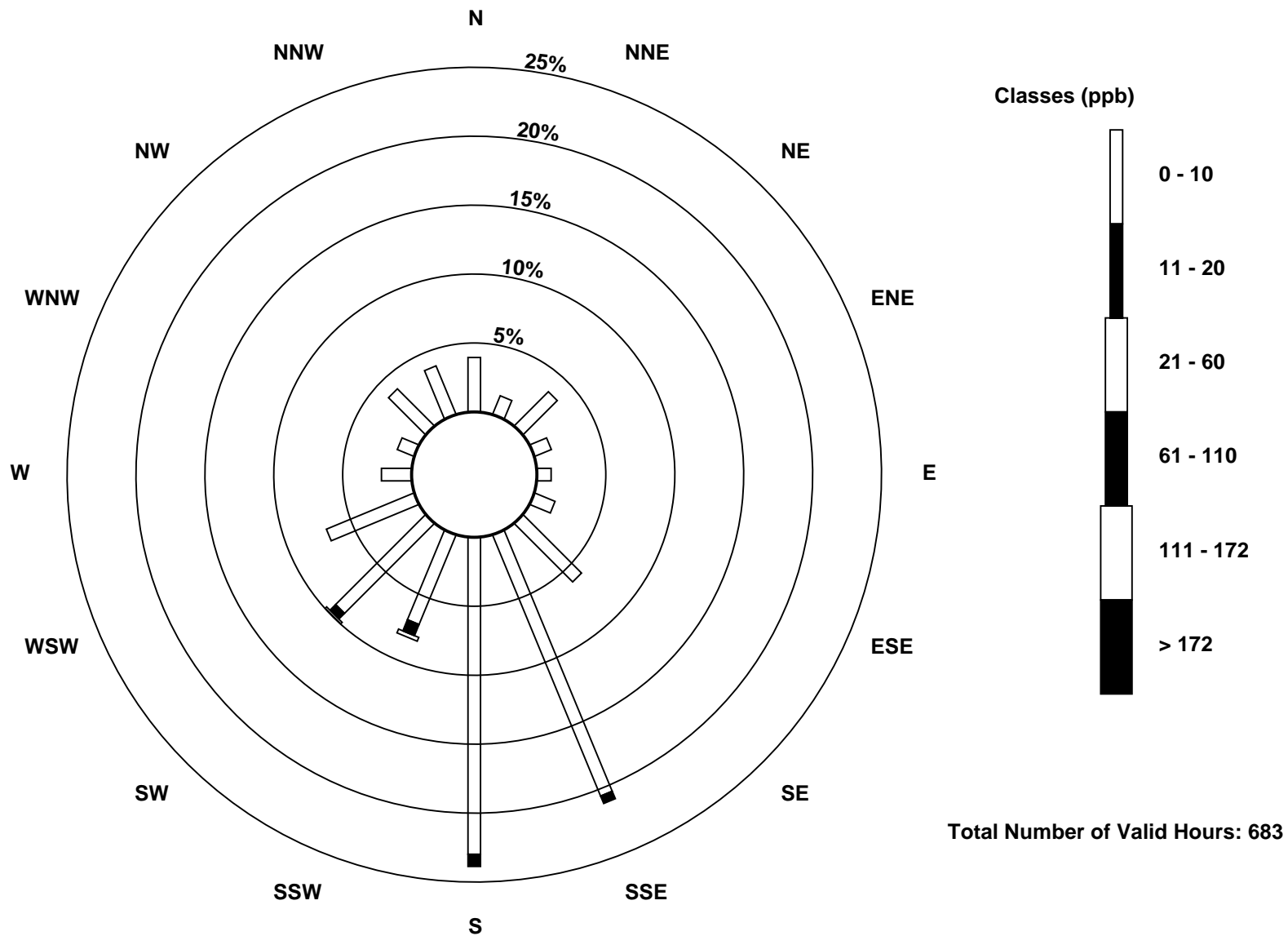
Total Number of Valid Hours: 683

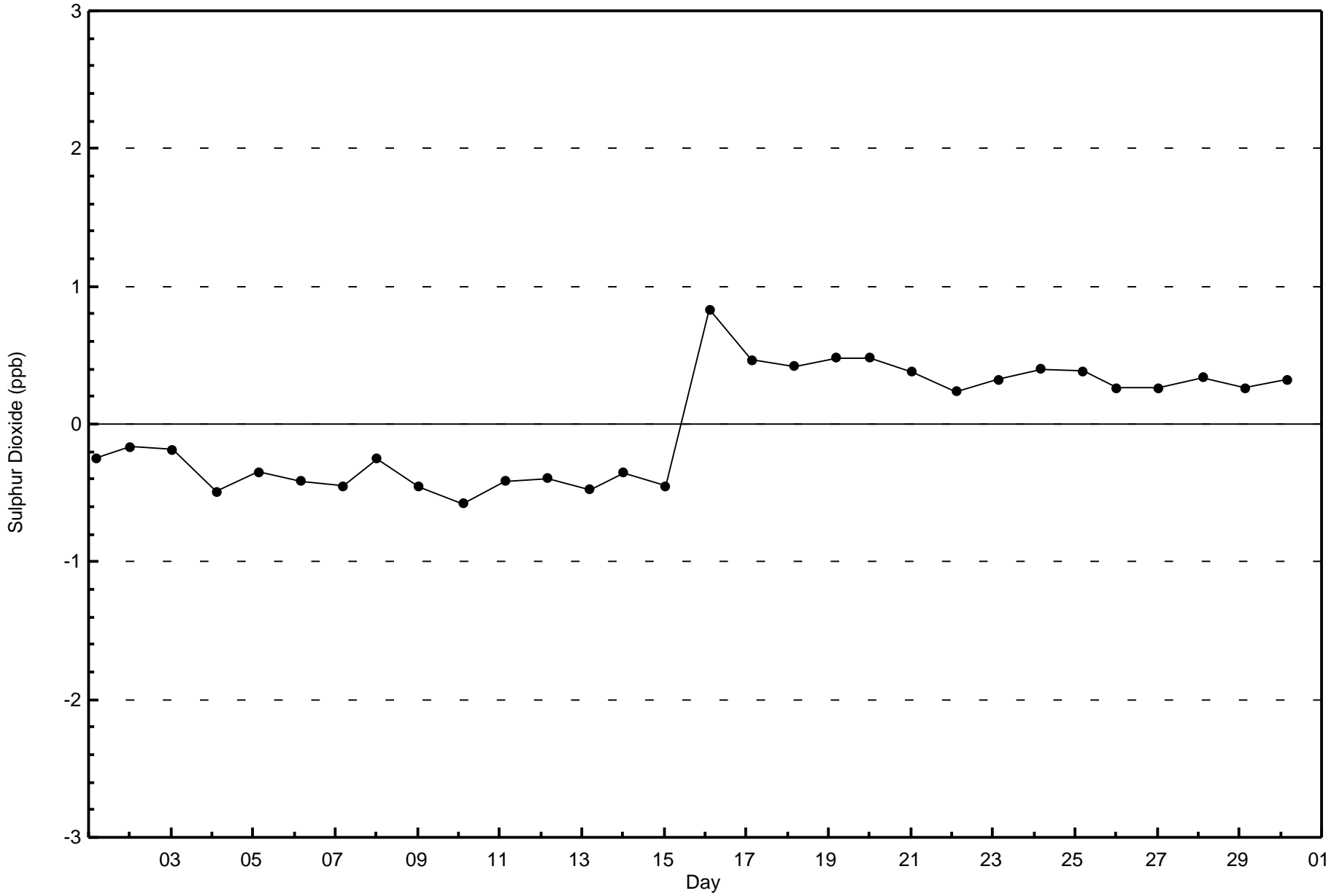
Total Number of Hours: 720

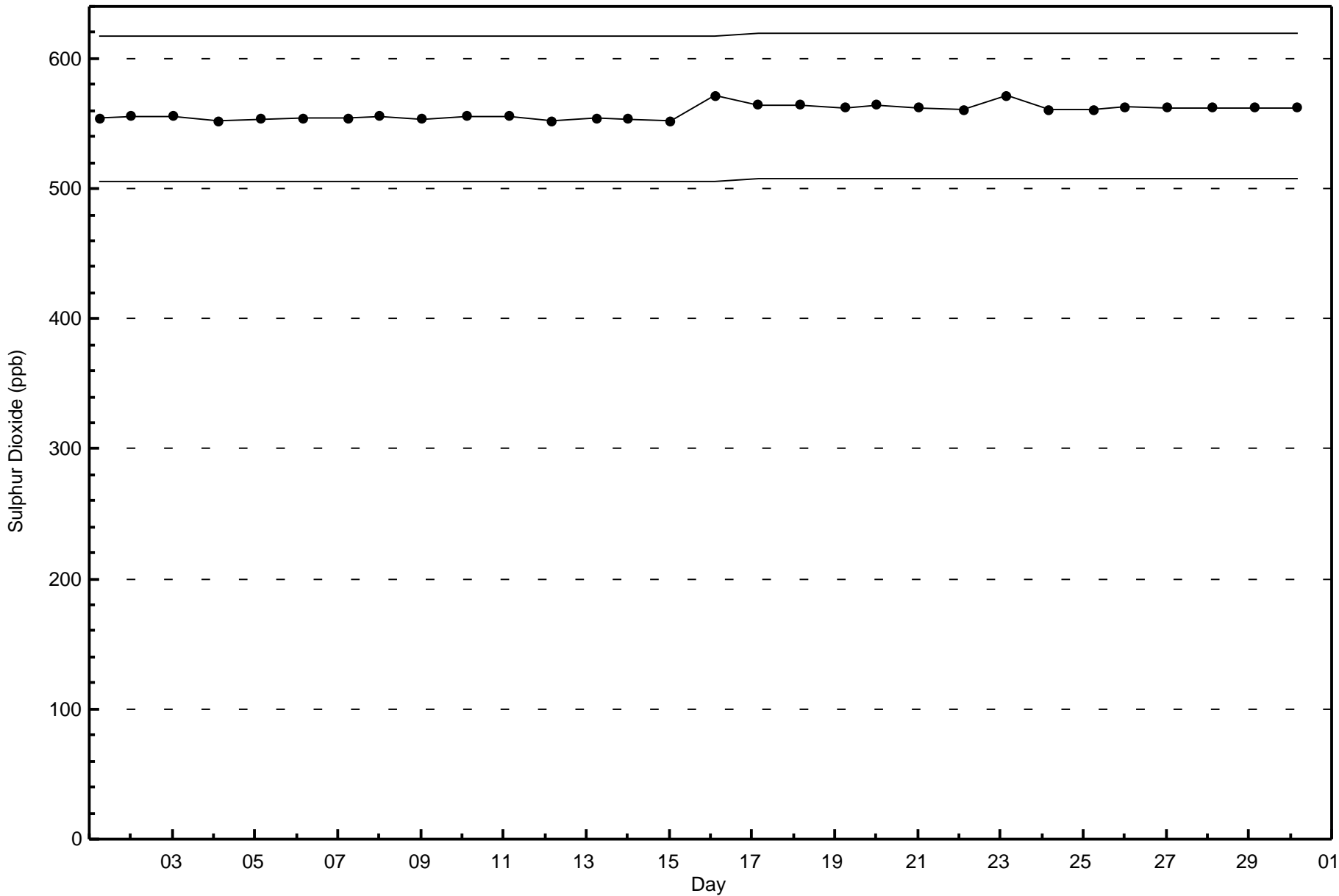


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Wapasu (AMS 17)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 4 ppb on Nov 12 11:00	Maximum Daily Average: 1.3 ppb on Nov 12		Hours of Data:	684
Minimum Value: 0 ppb on Nov 1 01:00	Minimum Daily Average: 0.0 ppb on Nov 1		Hours of Missing Data:	36
Maximum Diurnal Average: 0.4 ppb at hour 10	Minimum Diurnal Average: 0.1 ppb at hour 20		Hours of Calibration:	36
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 = 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-Nov	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	0
2-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
3-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
4-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	0.1	0
5-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
6-Nov	0	0	0	1	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Nov	0	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
8-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
9-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
10-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	0.2	0
11-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	1	2	0.6	2
12-Nov	2	1	1	2	1	Z	1	1	2	3	4	2	2	2	1	1	1	1	1	1	1	0	0	0	0	1.3	4
13-Nov	0	0	0	0	0	0	Z	1	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4
14-Nov	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
15-Nov	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
16-Nov	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	--	0
17-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
18-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
19-Nov	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	0.1	0
20-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
21-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
22-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
23-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
24-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
25-Nov	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	0
26-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
27-Nov	0	0	Z	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
28-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	0.1	0
29-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
30-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

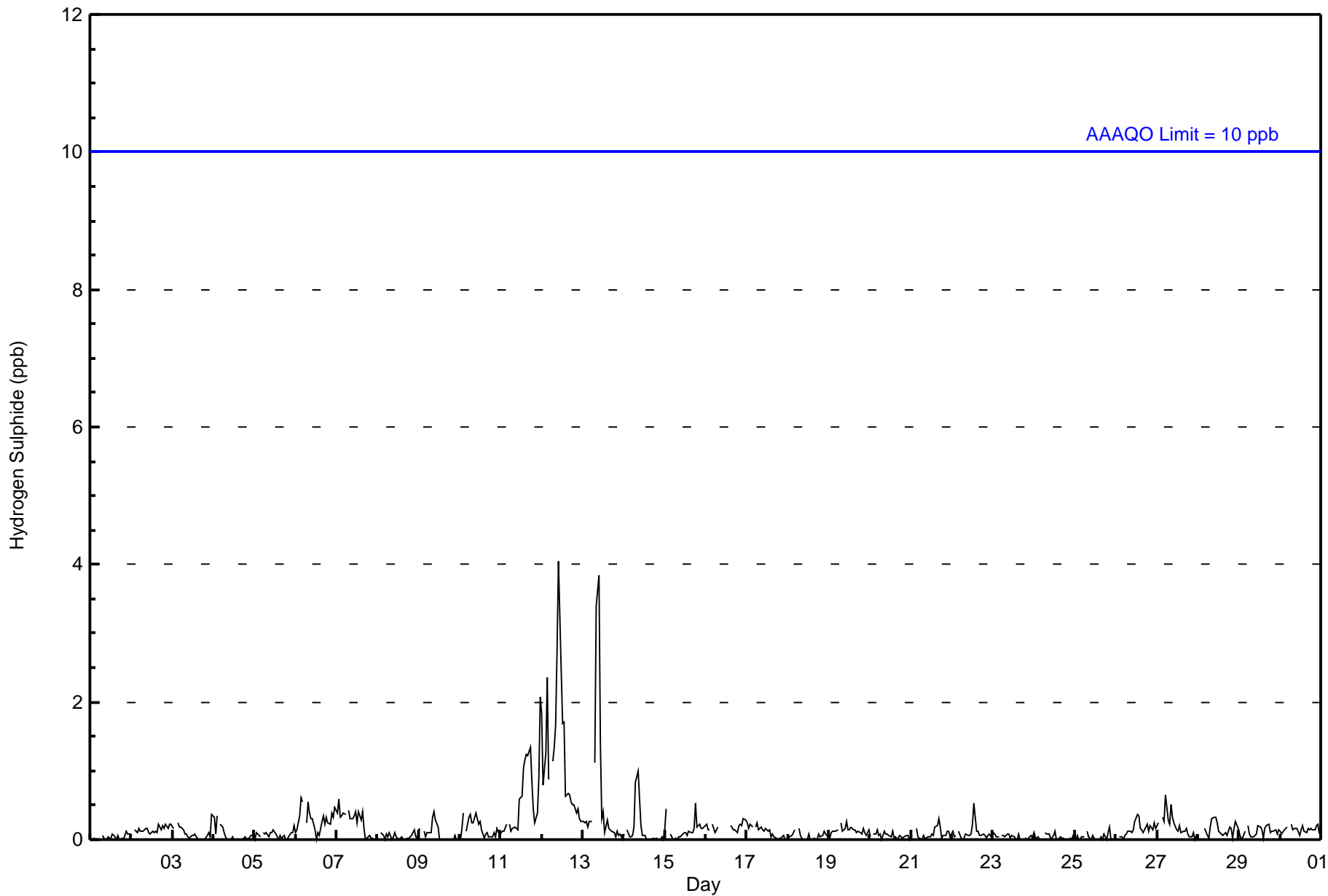
0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.4	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	Diurnal Average	
2	1	1	2	1	1	1	1	3	4	4	2	2	2	1	1	1	1	1	1	1	1	0	0	1	2	Diurnal Maximum	

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
Wapasu - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Wapasu - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	680	99.42	99.42
3 - 4	4	0.58	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Wapasu - 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 - 2	24	11	22	8	7	11	44	142	159	55	70	50	14	9	26	26	678
3 - 4	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	4
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	24	11	22	8	7	11	44	143	160	56	71	50	14	9	26	26	682

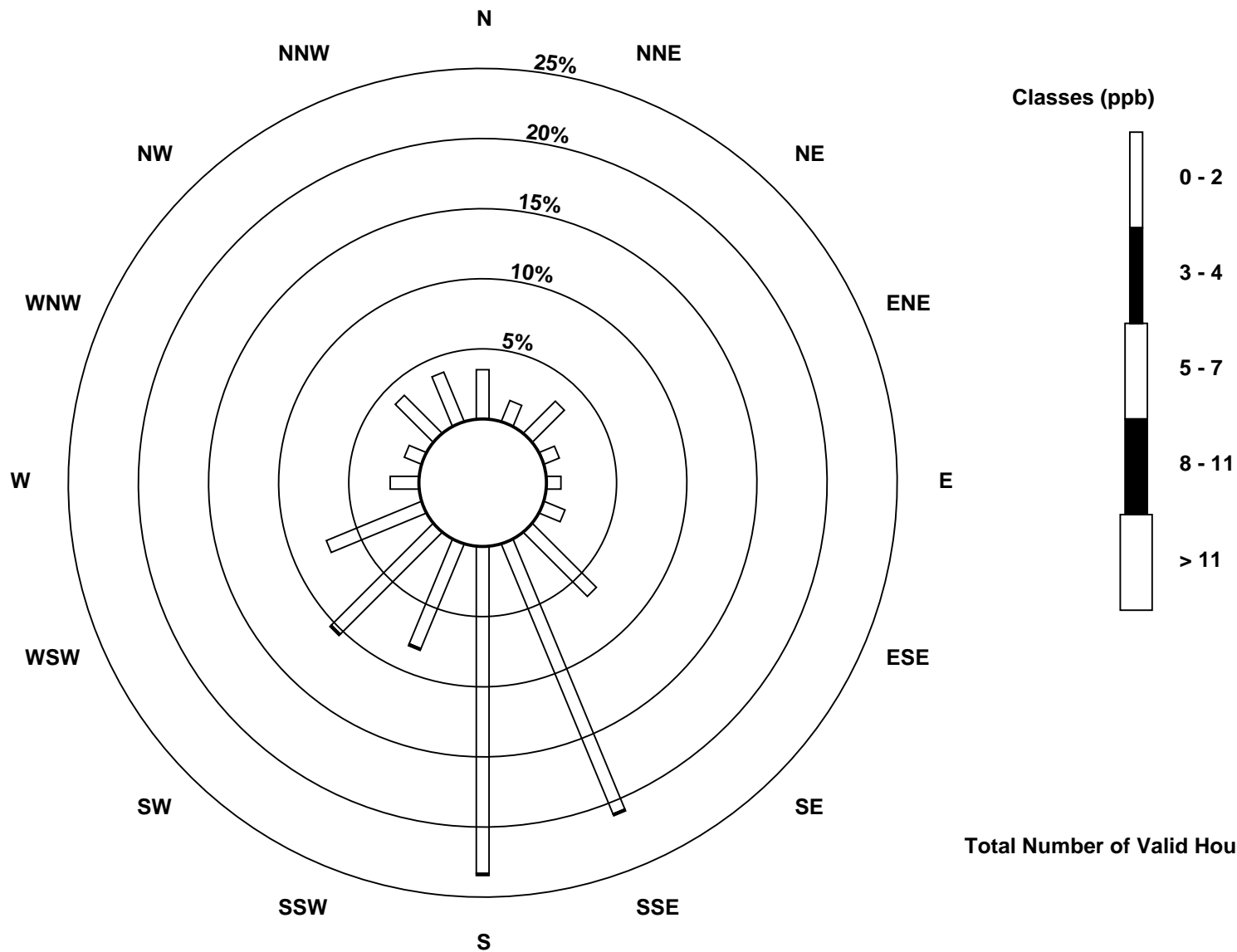
Total Number of Valid Hours: 682

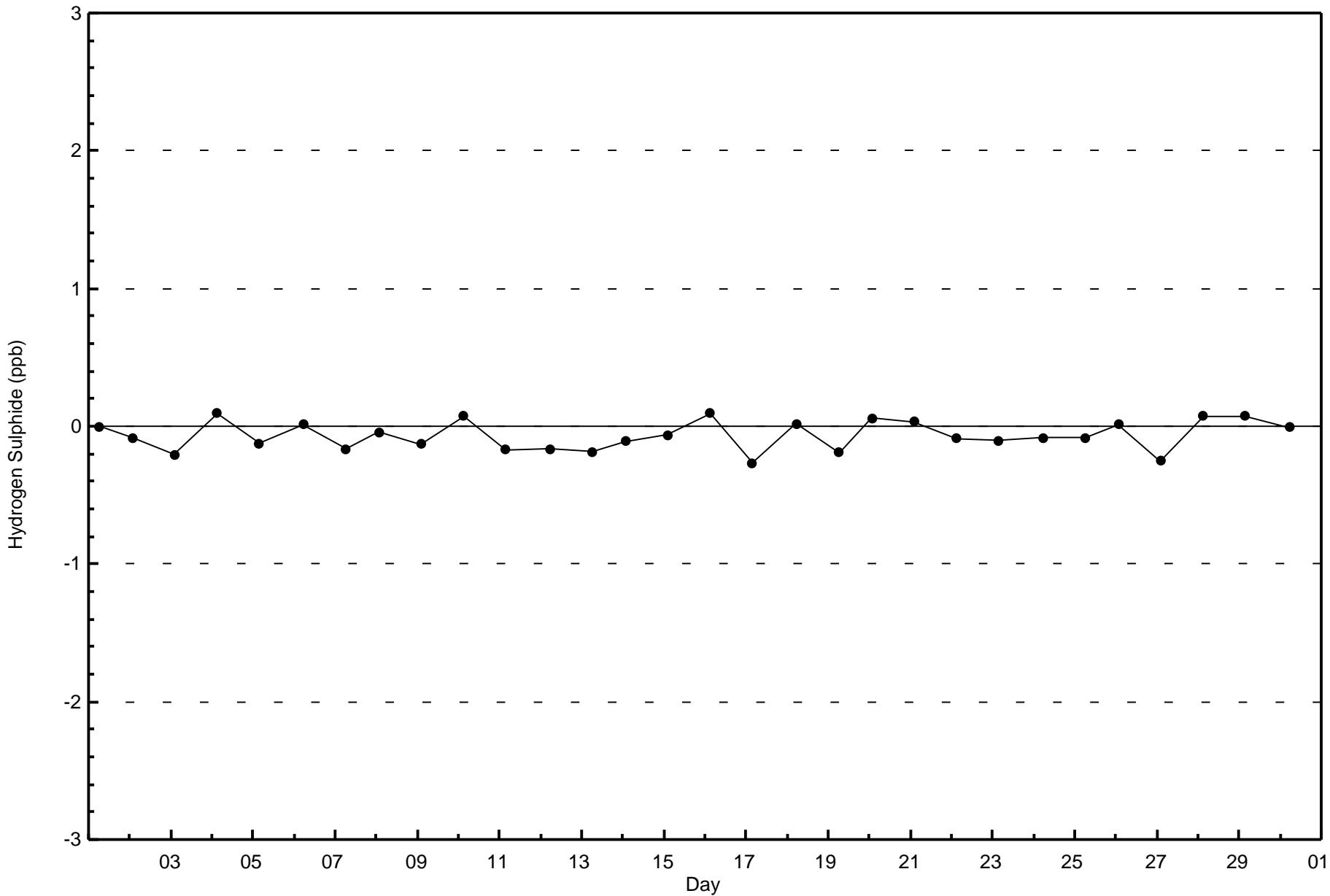
Total Number of Hours: 720

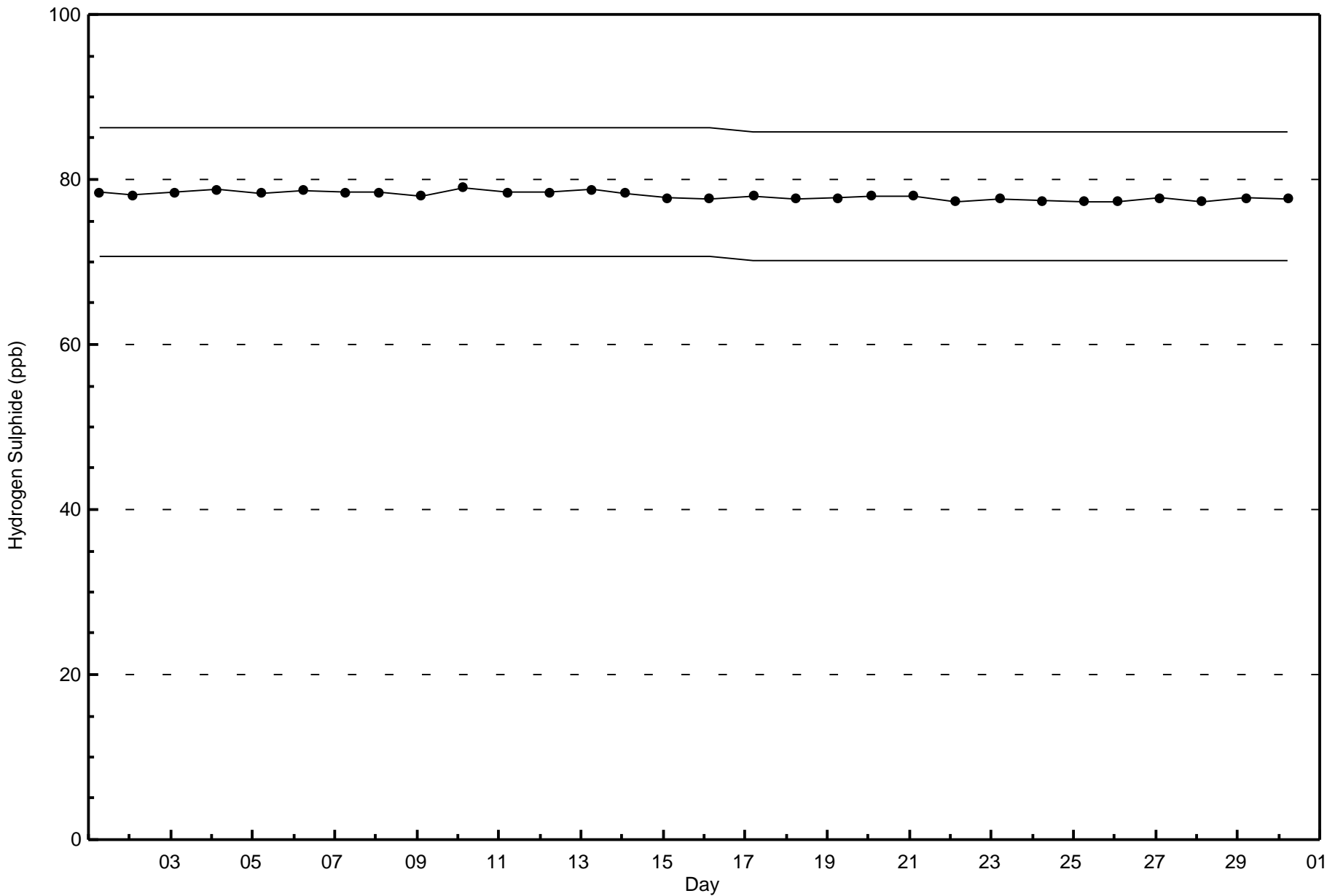


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Hydrogen Sulphide (H₂S) - ppb
Wapasu (AMS 17)









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

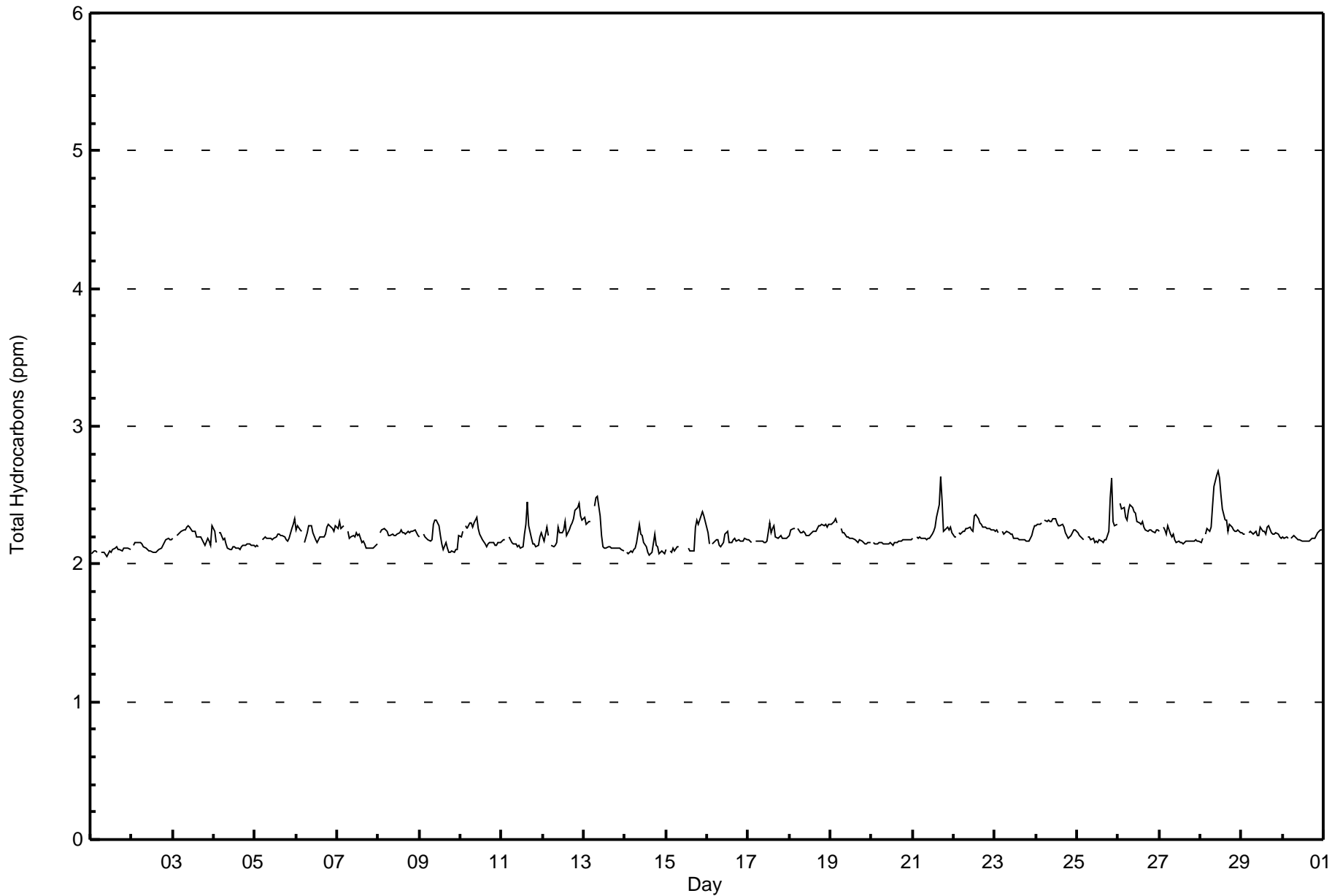
Wapasu - November 2016

Maximum Value: 2.7 ppm on Nov 28 11:00 Maximum Daily Average: 2.3 ppm on Nov 28														Hours in Service: 720 Hours of Data: 685 Hours of Missing Data: 35 Hours of Calibration: 35 Percent Operational Time: 100.0													
Minimum Value: 2.1 ppm on Nov 1 10:00 Minimum Daily Average: 2.1 ppm on Nov 1 Maximum Diurnal Average: 2.2 ppm at hour 9 Minimum Diurnal Average: 2.2 ppm at hour 15 Monthly Average: 2.21 ppm Percentiles: P ₁ = 2.1 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.2 Q ₃ = 2.2 P ₉₀ = 2.3 P ₉₉ = 2.5																											
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-Nov	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
2-Nov	Z	2.1	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	2.2	2.2	2.2	2.2	2.2	2.1	2.2	
3-Nov	2.2	Z	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	2.1	2.2	2.1	2.1	2.3	2.2	2.3	
4-Nov	2.2	2.2	Z	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	2.1	2.1	2.1	2.2	
5-Nov	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	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.3	
6-Nov	2.2	2.3	2.2	2.2	Z	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	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.3	
7-Nov	2.3	2.3	2.3	2.3	2.3	Z	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	2.1	2.1	2.1	2.1	2.2	2.2	2.3	
8-Nov	Z	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	2.2	2.2	2.2	2.2	2.2	2.2	2.3	
9-Nov	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	
10-Nov	2.2	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	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.3	
11-Nov	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.5	2.3	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.5	
12-Nov	2.2	2.2	2.3	2.2	Z	2.1	2.1	2.1	2.2	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.3	2.4	
13-Nov	2.3	2.3	2.3	2.3	2.3	Z	2.4	2.5	2.5	2.4	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	
14-Nov	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	
15-Nov	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.2	2.4
16-Nov	2.2	2.1	Z	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	
17-Nov	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	
18-Nov	2.2	2.2	2.3	2.3	Z	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	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	
19-Nov	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.3	
20-Nov	Z	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.2	2.1	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	2.2	
21-Nov	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	2.4	2.6	2.5	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.6	
22-Nov	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	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	2.4	
23-Nov	2.2	2.3	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	2.3	2.3	2.2	2.3	
24-Nov	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	
25-Nov	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	2.2	2.5	2.6	2.3	2.3	2.3	2.2	2.6
26-Nov	Z	2.4	2.4	2.4	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	
27-Nov	2.2	Z	2.3	2.2	2.2	2.3	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	2.2	2.2	2.2	2.3	
28-Nov	2.2	2.2	Z	2.2	2.3	2.2	2.3	2.4	2.6	2.6	2.7	2.6	2.5	2.4	2.3	2.3	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.2	2.3	2.7	
29-Nov	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	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	2.3	
30-Nov	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	
2.2 2.2																								Diurnal Average			
2.3 2.4 2.4 2.4 2.3 2.3 2.4 2.5 2.6 2.6 2.7 2.6 2.5 2.4 2.3 2.5 2.6 2.5 2.3 2.5 2.6 2.4 2.3 2.3																								Diurnal Maximum			
Z - zerospan C - Calibration																											



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Wapasu - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	685	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: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - November 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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683
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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683

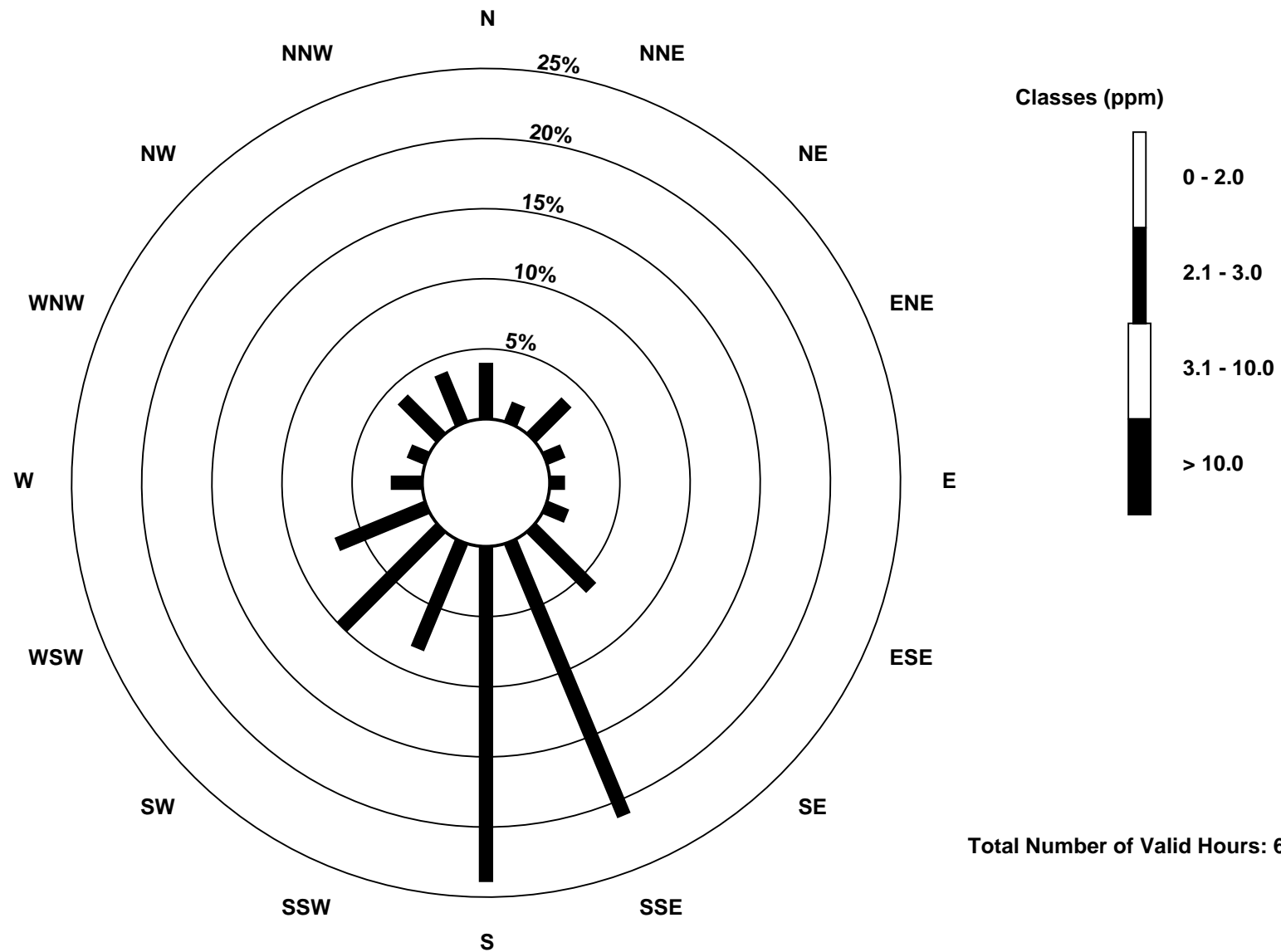
Total Number of Valid Hours: 683

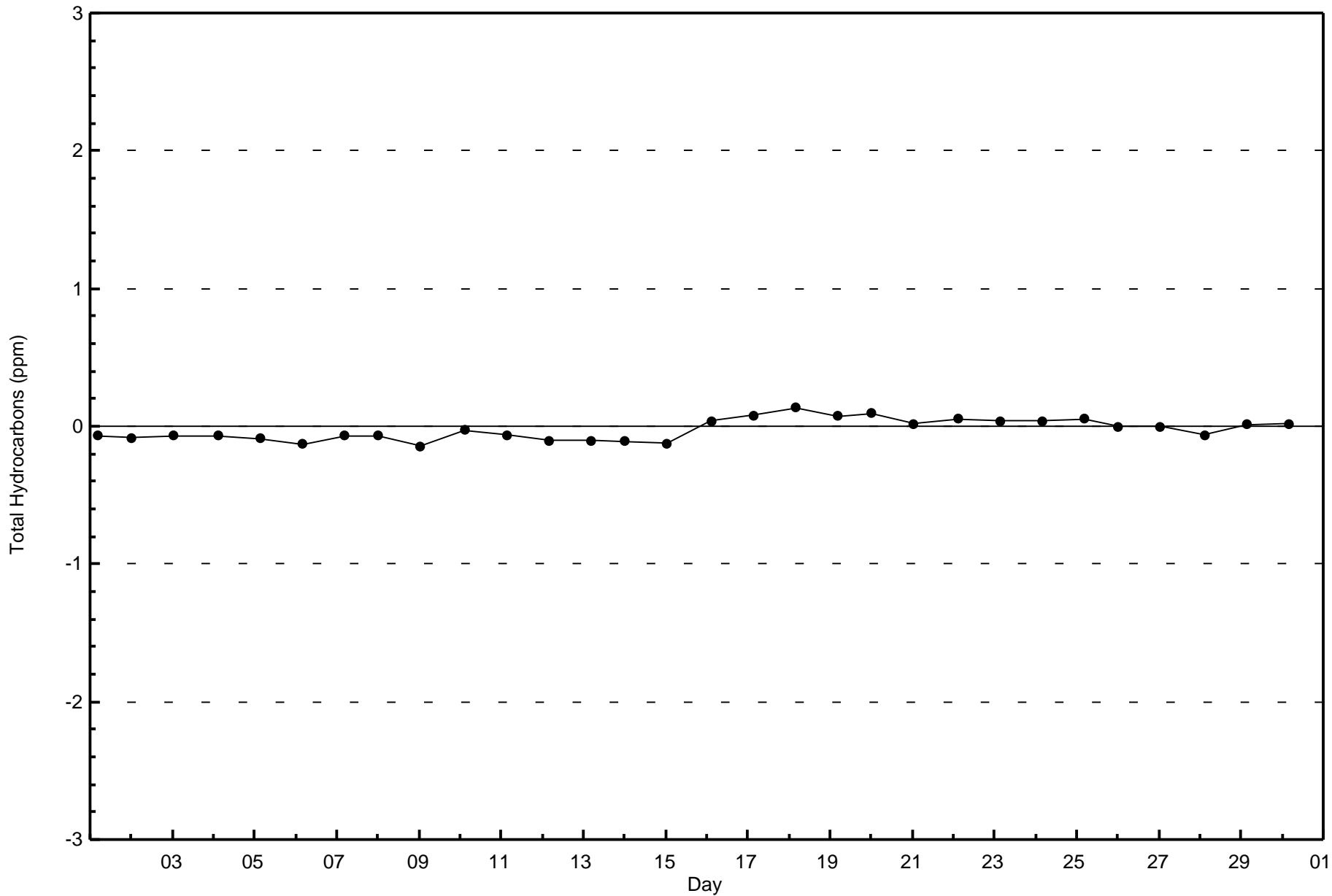
Total Number of Hours: 720

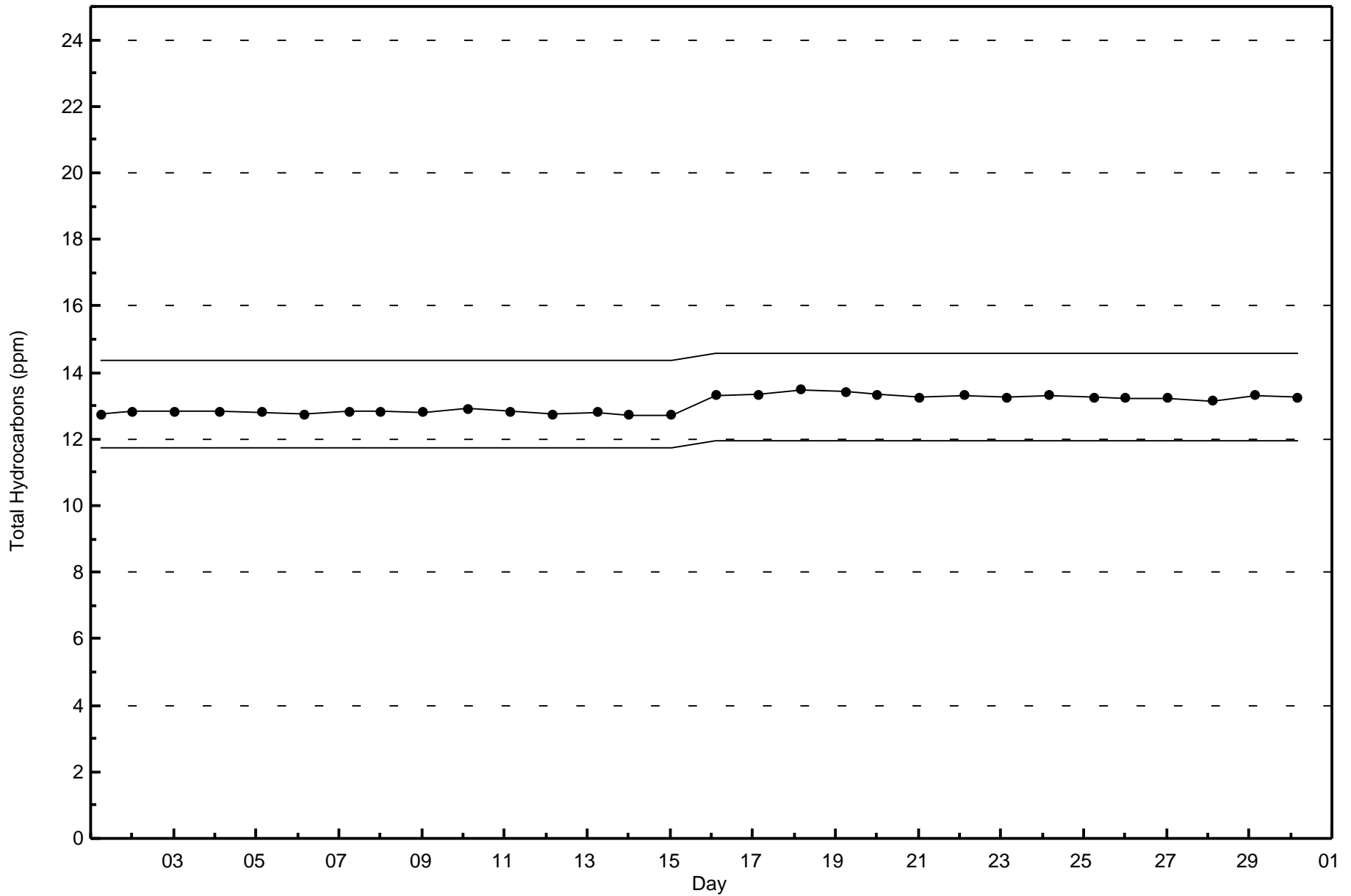


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Wapasu (AMS 17)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Wapasu - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 37 ppb on Nov 17 06:00	Maximum Daily Average: 31.2 ppb on Nov 30		Hours of Data:	687
Minimum Value: 1 ppb on Nov 21 17:00	Minimum Daily Average: 11.5 ppb on Nov 28		Hours of Missing Data:	33
Maximum Diurnal Average: 24.1 ppb at hour 15	Minimum Diurnal Average: 20.0 ppb at hour 7		Hours of Calibration:	33
Monthly Average: 22.5 ppb	Percentiles: P ₁ = 6 P ₁₀ = 13 Q ₁ = 18 Median = 23 Q ₃ = 28 P ₉₀ = 31 P ₉₉ = 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	25	24	23	25	26	26	25	26	Z	29	31	30	29	28	31	32	32	32	32	32	30	30	31	31	28.7	32
2-Nov	28	24	23	Z	24	25	26	28	28	29	28	28	27	26	24	22	19	18	16	14	14	13	13	15	22.3	29
3-Nov	14	14	14	16	Z	17	18	20	18	15	13	13	12	14	16	17	19	19	21	23	20	26	31	19	17.8	31
4-Nov	17	28	21	21	21	Z	22	24	26	30	32	34	35	35	32	30	30	31	33	32	31	31	31	31	28.8	35
5-Nov	33	31	31	30	29	28	Z	26	25	24	23	23	24	24	24	23	25	25	25	24	23	18	19	21	25.2	33
6-Nov	29	29	28	25	27	26	23	Z	25	28	29	30	30	31	30	27	27	25	22	17	16	21	20	13	25.1	31
7-Nov	14	11	16	15	14	14	12	14	Z	19	22	19	20	18	19	20	24	29	30	32	33	32	32	30	21.3	33
8-Nov	27	24	22	Z	20	20	19	19	18	19	21	22	22	22	21	21	20	21	21	20	19	18	19	18	20.5	27
9-Nov	17	12	18	17	Z	16	16	14	6	8	12	18	20	24	29	26	28	30	31	29	29	30	30	25	21.2	31
10-Nov	26	23	20	21	18	Z	16	13	12	12	16	20	22	25	27	27	28	28	29	29	29	30	31	31	23.2	31
11-Nov	31	30	29	28	28	27	Z	25	24	23	21	19	20	20	20	14	19	24	28	29	29	29	27	25	24.9	31
12-Nov	28	28	24	23	20	22	23	Z	18	17	20	26	27	23	26	22	13	11	9	6	5	6	10	10	18.1	28
13-Nov	7	13	9	5	7	9	11	10	Z	13	19	26	27	23	19	18	18	19	20	19	18	19	22	22	16.3	27
14-Nov	24	25	25	Z	22	20	17	13	10	12	17	22	24	24	24	25	29	21	30	32	33	30	28	29	23.3	33
15-Nov	30	31	32	32	Z	31	28	29	29	28	29	32	34	35	35	34	32	27	25	20	12	6	7	12	26.6	35
16-Nov	19	29	30	28	18	Z	20	28	19	C	C	C	24	29	28	28	29	28	28	30	33	31	29	29	26.8	33
17-Nov	29	31	31	33	34	37	Z	34	35	34	33	34	29	28	27	25	29	30	29	27	29	30	28	28	30.6	37
18-Nov	30	23	19	19	18	19	20	Z	24	29	33	34	32	31	31	26	18	16	14	17	18	21	23	23	23.5	34
19-Nov	23	22	19	19	21	24	26	27	Z	30	30	30	30	30	29	29	28	28	29	29	30	30	30	31	27.2	31
20-Nov	30	30	30	Z	30	29	29	29	29	29	29	28	27	27	26	26	26	25	25	24	24	23	22	24	27.0	30
21-Nov	26	25	23	22	Z	21	20	19	19	18	17	14	13	11	10	5	1	7	17	18	18	20	18	20	16.6	26
22-Nov	21	22	22	21	21	Z	20	20	21	21	19	19	14	9	15	18	18	18	18	19	18	17	17	18	18.4	22
23-Nov	18	19	20	21	21	Z	22	22	23	23	24	24	25	25	25	25	26	26	26	26	25	24	22	21	23.0	26
24-Nov	21	19	18	18	18	17	16	Z	15	14	13	13	14	19	20	19	20	21	24	27	24	21	20	20	18.7	27
25-Nov	21	21	22	21	23	24	24	Z	25	25	25	25	25	24	24	23	21	20	14	8	5	13	14	13	19.9	25
26-Nov	8	8	8	Z	9	10	7	9	9	12	17	19	17	20	19	21	24	24	23	22	23	22	17	15	15.7	24
27-Nov	21	22	21	16	Z	18	21	20	14	18	18	18	17	18	18	17	19	19	20	19	18	15	12	12	18.0	22
28-Nov	11	9	10	16	10	Z	9	5	5	6	6	8	11	12	13	12	17	15	12	13	18	16	13	18	11.5	18
29-Nov	20	20	20	19	21	23	Z	22	22	26	26	21	22	24	26	23	21	26	26	25	26	28	32	30	23.9	32
30-Nov	30	30	29	29	30	31	31	Z	31	31	31	31	32	32	33	33	33	33	32	31	30	30	31	31	31.2	33

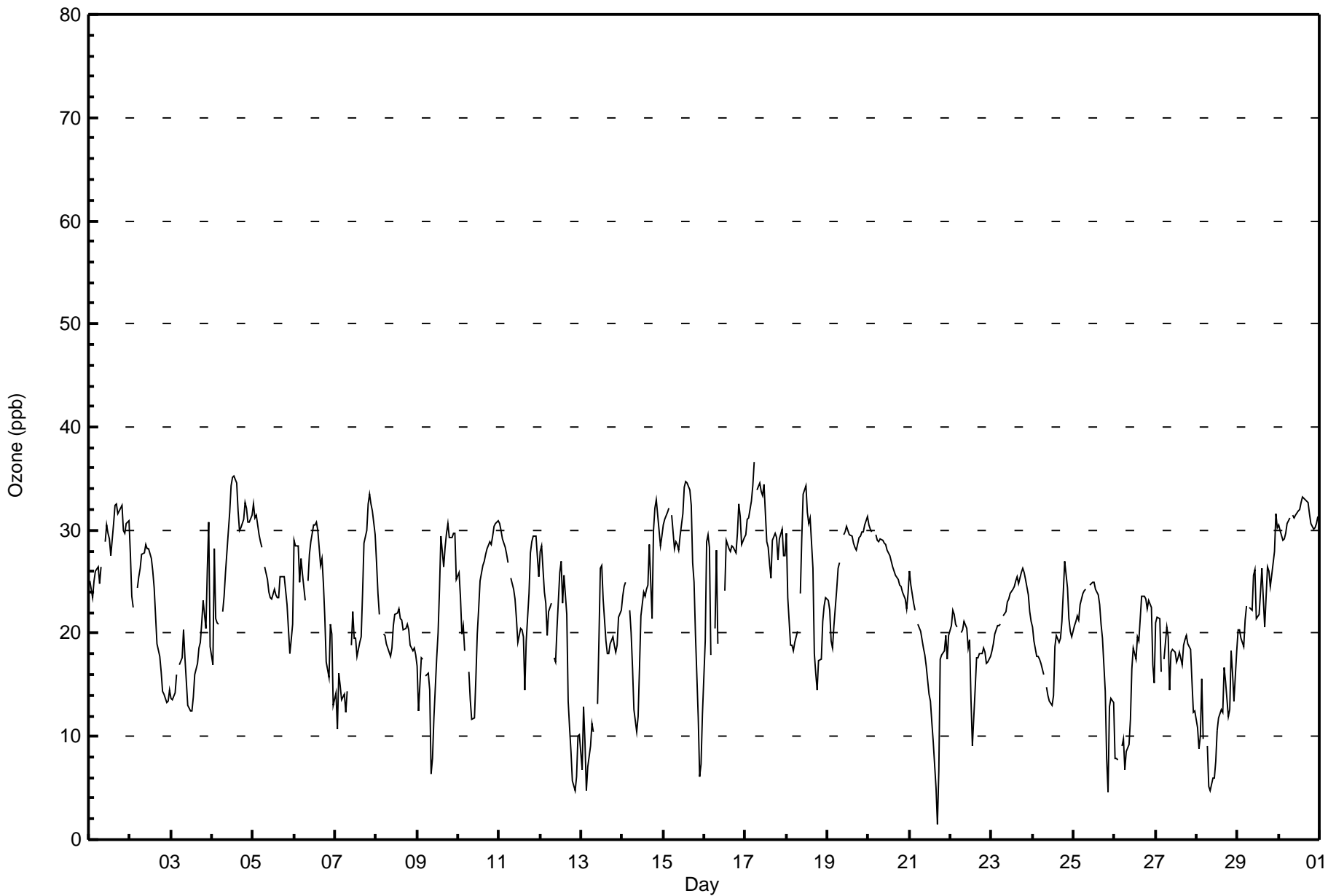
22.6	22.6	21.9	21.6	21.1	22.2	20.0	20.9	20.1	21.4	22.6	23.5	23.5	23.7	24.1	23.1	23.0	23.2	23.6	23.2	22.8	22.8	22.6	22.2	Diurnal Average	
33	31	32	33	34	37	31	34	35	34	33	34	35	35	35	34	33	33	32	33	33	32	31	Diurnal Maximum		

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



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Wapasu - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Wapasu - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	266	38.72	38.72
21 - 50	421	61.28	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Wapasu - 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	12	6	14	7	5	3	10	45	65	34	25	18	7	2	4	8	265
21 - 50	14	5	9	0	2	9	34	99	95	22	46	30	8	7	21	19	420
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	26	11	23	7	7	12	44	144	160	56	71	48	15	9	25	27	685

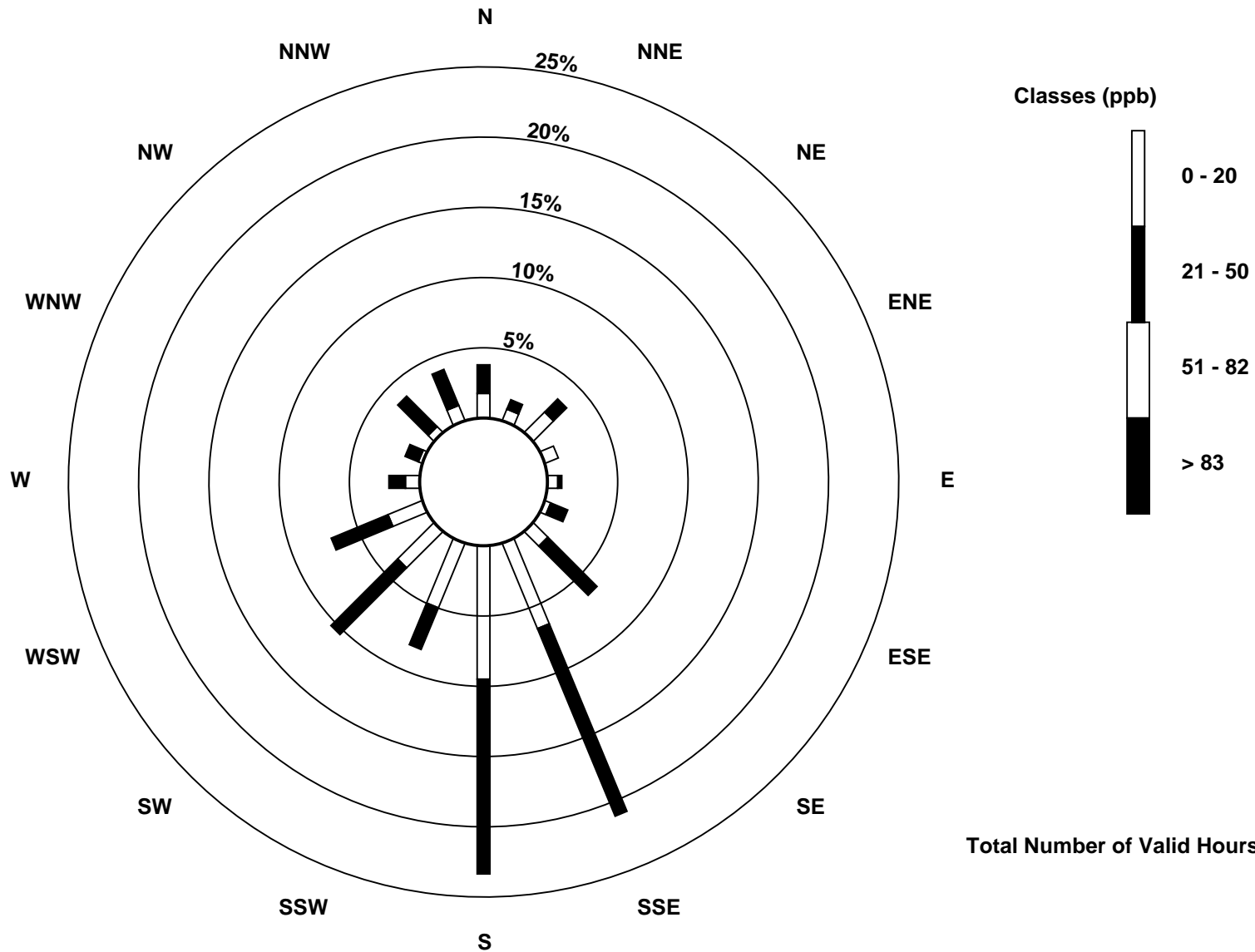
Total Number of Valid Hours: 685

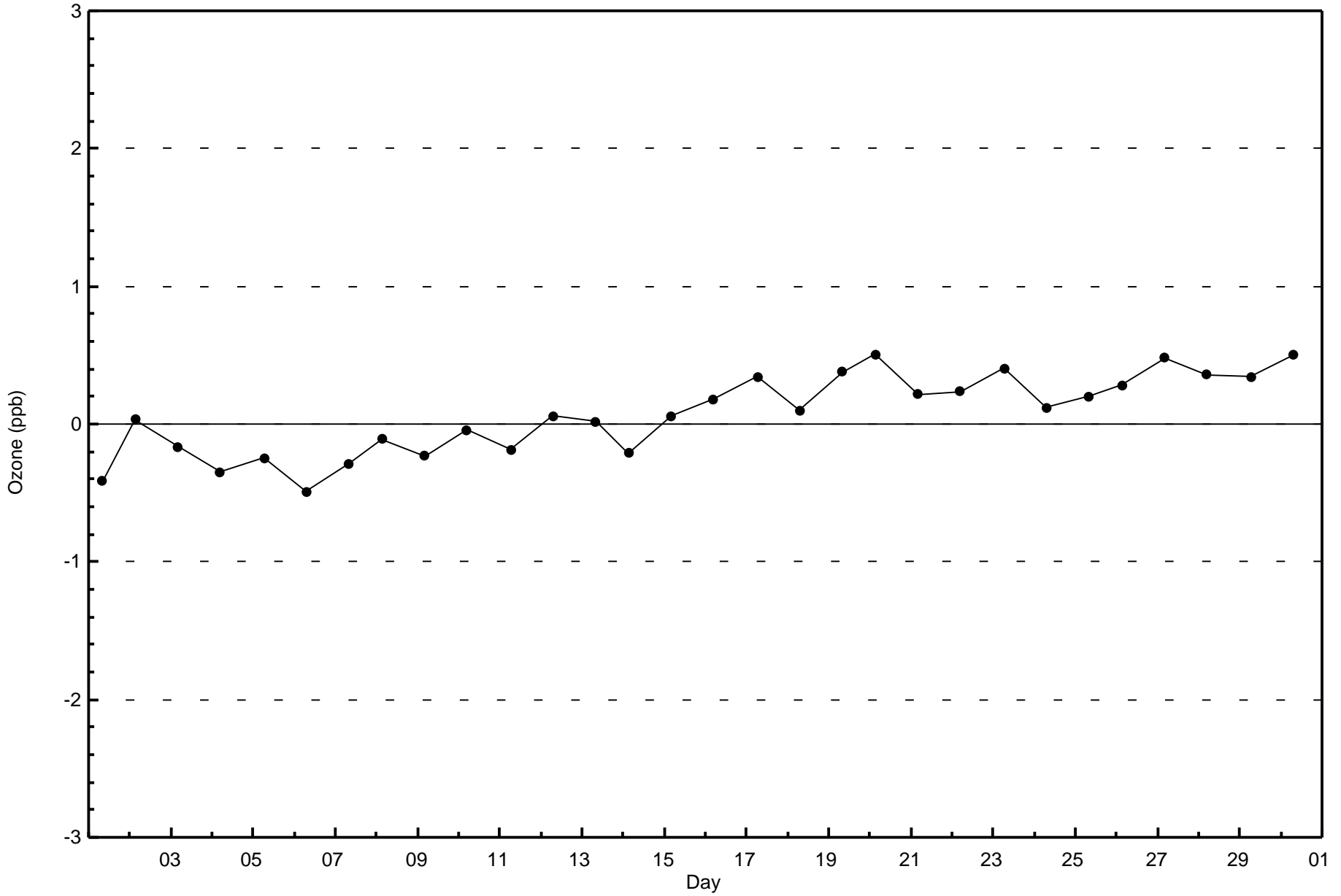
Total Number of Hours: 720

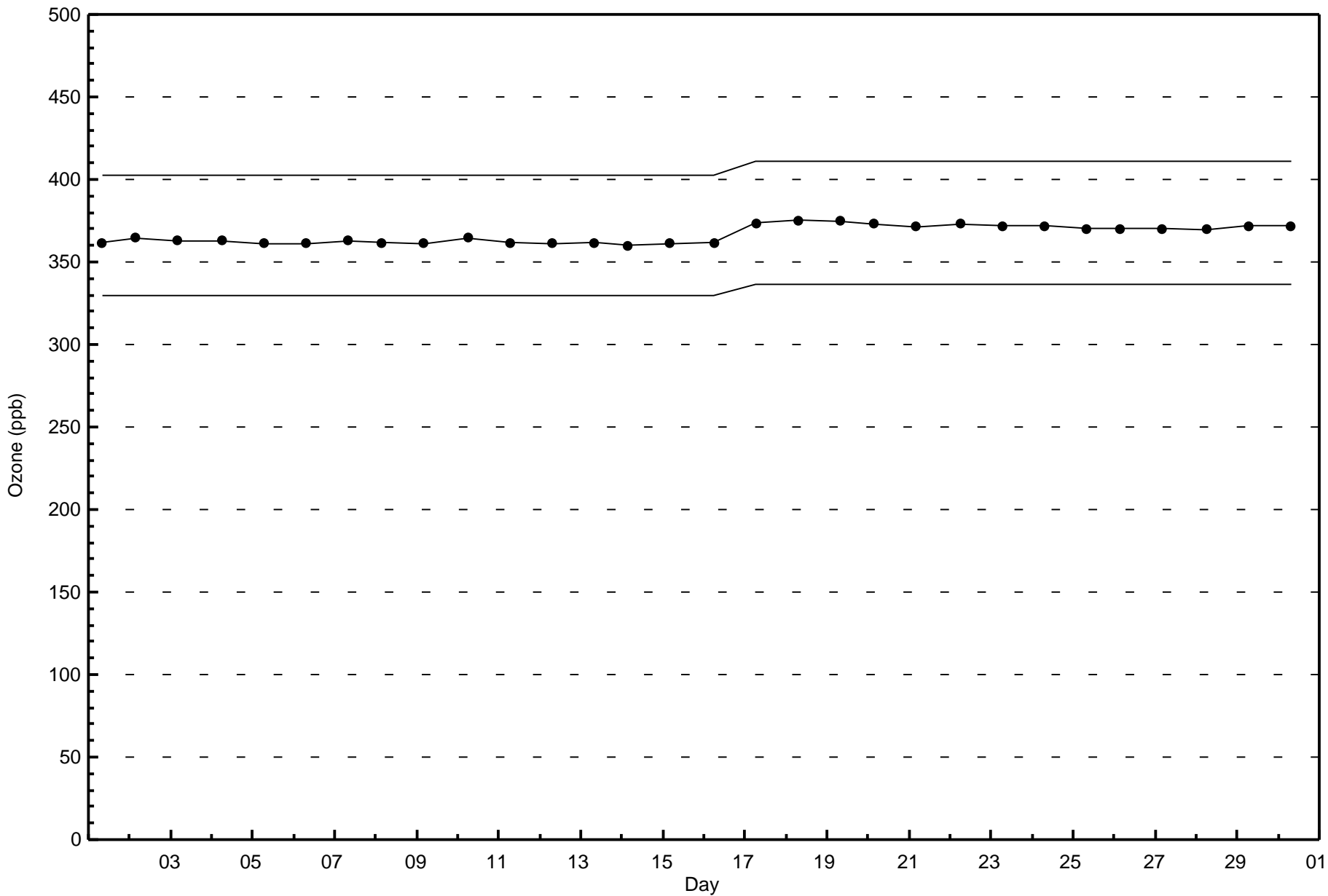


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Wapasu (AMS 17)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitric Oxide (NO) - ppb

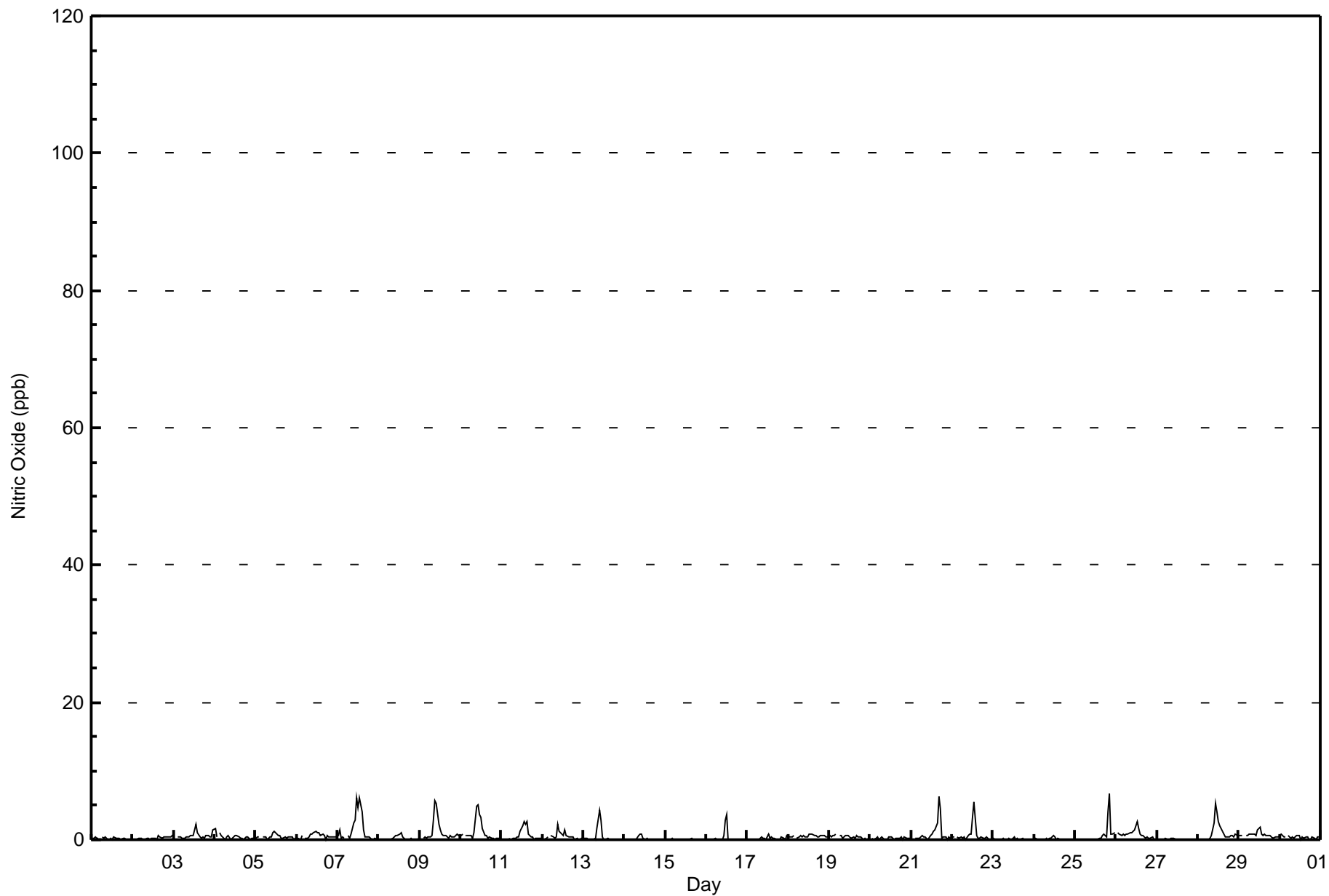
Wapasu - November 2016

Maximum Value: 7 ppb on Nov 25 21:00																	Maximum Daily Average: 1.5 ppb on Nov 7																	Hours in Service: 720	
Minimum Value: 0 ppb on Nov 1 11:00																	Minimum Daily Average: 0.0 ppb on Nov 15																	Hours of Data: 685	
Maximum Diurnal Average: 1.2 ppb at hour 13																	Minimum Diurnal Average: 0.2 ppb at hour 3																	Hours of Missing Data: 35	
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 = 5																	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	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	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1									
3-Nov	0	Z	0	0	0	0	0	0	0	0	1	1	1	2	1	0	0	0	0	1	1	0	0	0.6	2										
4-Nov	2	0	Z	1	1	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2										
5-Nov	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1										
6-Nov	0	0	0	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0.5	1										
7-Nov	1	2	0	0	0	Z	1	0	1	2	3	6	5	6	4	2	0	0	0	0	0	0	0	1.5	6										
8-Nov	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1										
9-Nov	0	Z	0	0	0	0	0	1	3	6	5	2	1	1	1	1	0	0	1	0	0	1	1	1.1	6										
10-Nov	1	1	Z	1	1	1	1	0	1	5	5	4	3	2	1	1	0	0	0	0	0	0	0	1.1	5										
11-Nov	0	0	0	Z	0	0	0	0	0	0	0	1	2	3	2	3	1	0	0	0	0	0	0	0.6	3										
12-Nov	0	0	0	0	Z	1	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	2										
13-Nov	0	0	0	0	0	Z	0	0	0	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0.4	4										
14-Nov	Z	0	0	0	0	0	0	0	1	1	1	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	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0.0	0										
16-Nov	0	0	Z	0	0	0	0	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0	0.3	4										
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1										
18-Nov	1	0	0	1	Z	0	0	1	0	1	0	0	1	1	1	1	1	0	0	1	1	1	0	0.5	1										
19-Nov	1	0	1	1	1	Z	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0.4	1										
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	0.2	0										
21-Nov	0	Z	0	0	0	0	1	0	0	0	0	1	1	1	1	2	6	4	0	0	0	0	0	0.9	6										
22-Nov	0	0	Z	0	0	0	0	0	0	1	1	1	3	5	1	0	0	1	0	0	0	0	0	0.7	5										
23-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
24-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1										
25-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	4	7	1	1	0.7	7										
26-Nov	Z	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	0	0	0	0	0	0	0.8	3										
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										
28-Nov	0	0	Z	0	0	0	0	0	1	2	5	4	3	2	1	1	0	0	0	1	1	0	1	1.0	5										
29-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	0	0	0	0	0.7	2										
30-Nov	1	1	0	0	Z	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1										
																								Diurnal Average											
																								Diurnal Maximum											
																								Z - zerospan C - Calibration											



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Wapasu - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Wapasu - 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
Wapasu - 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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683
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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683

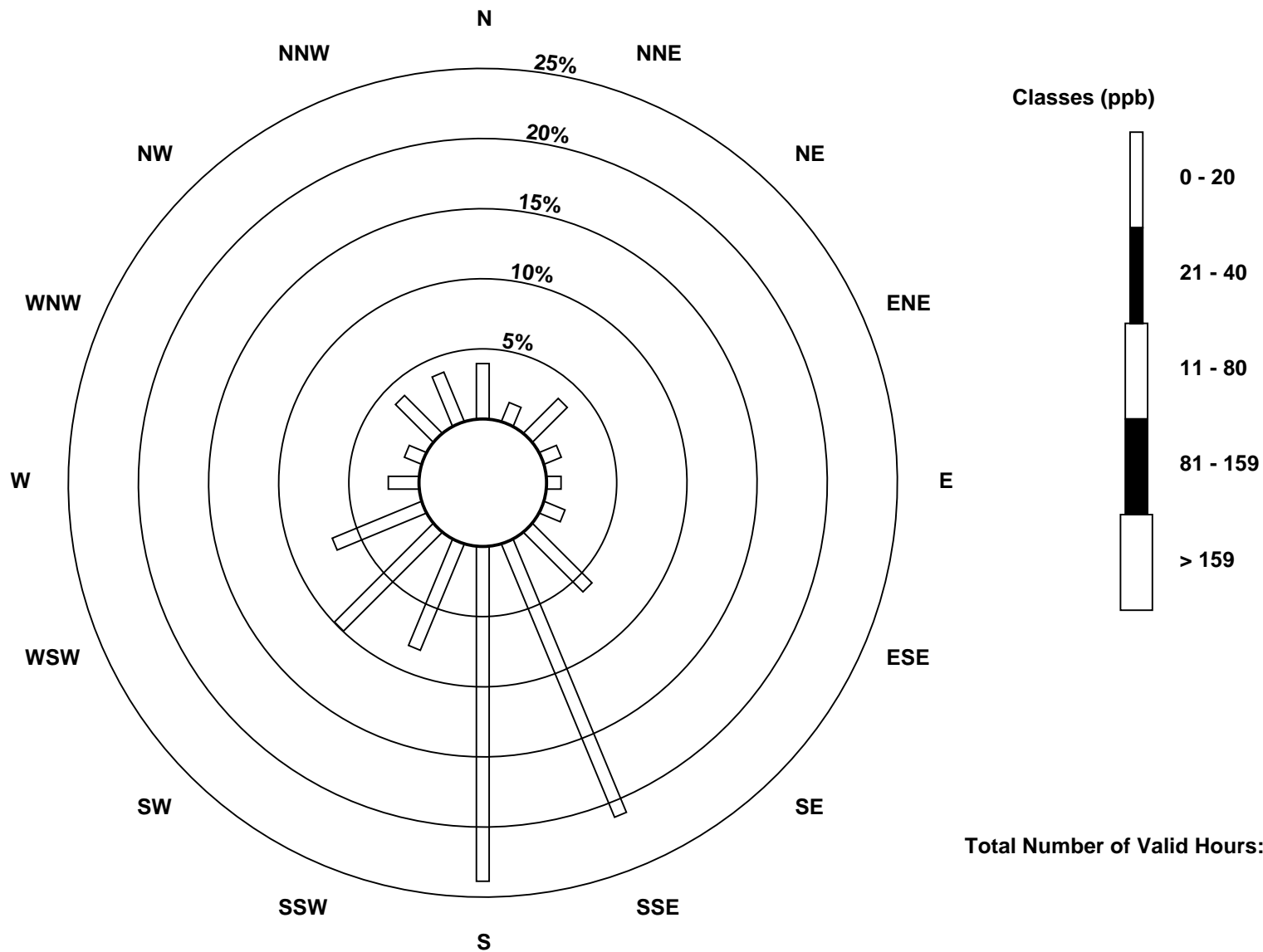
Total Number of Valid Hours: 683

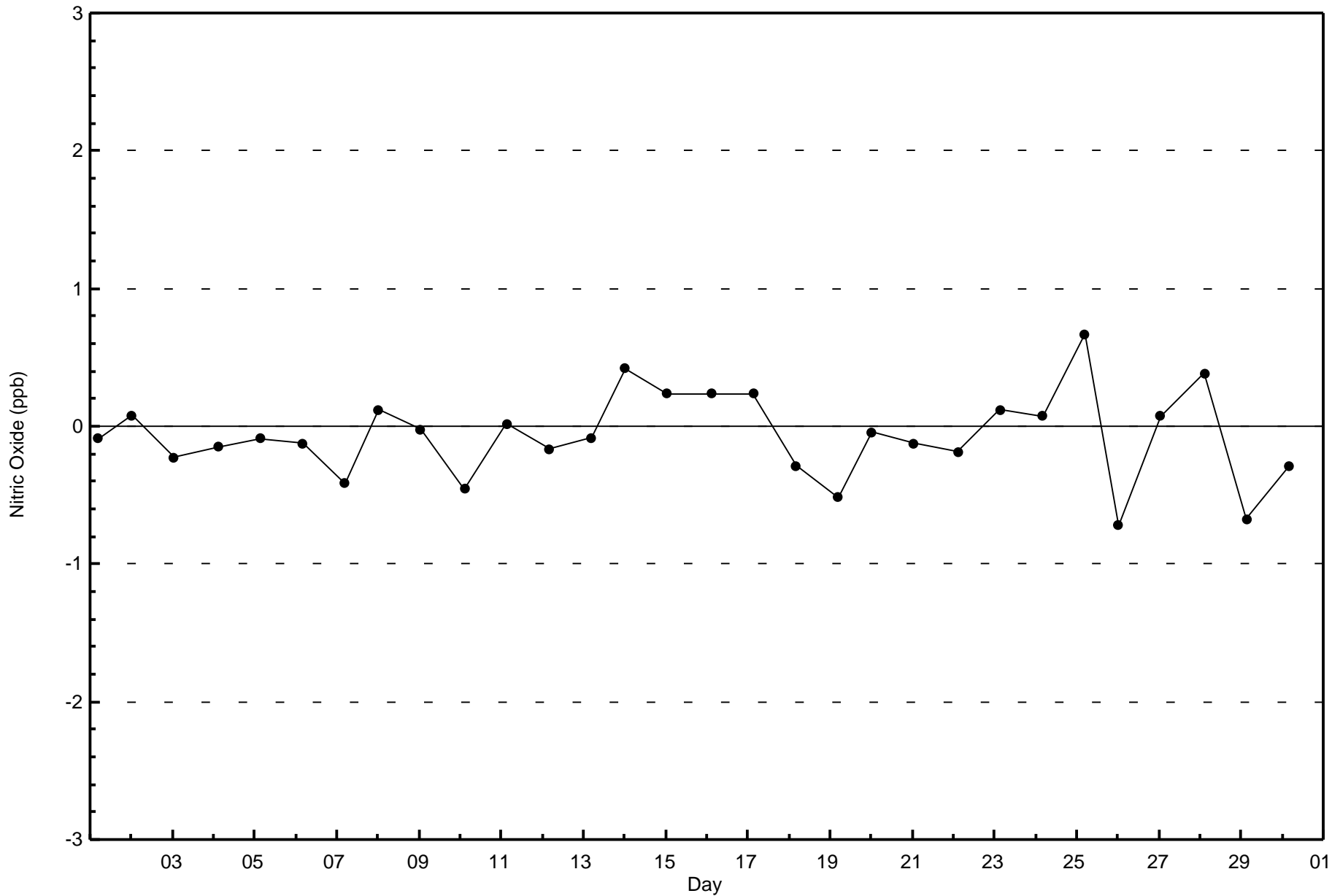
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Wapasu (AMS 17)

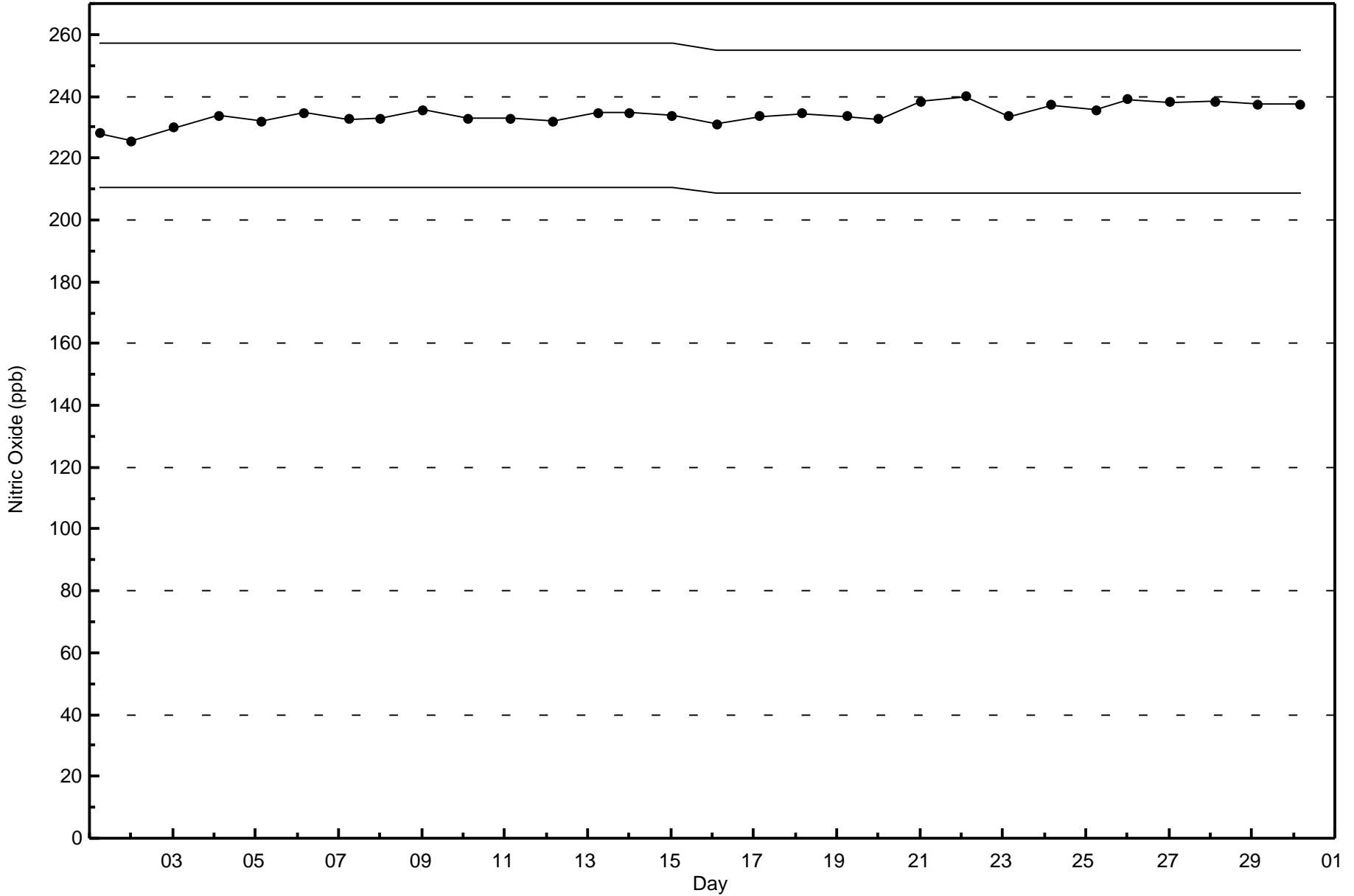






Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Wapasu - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Wapasu - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 17 ppb on Nov 4 01:00	Maximum Daily Average: 8.0 ppb on Nov 6		Hours of Data:	685
Minimum Value: 0 ppb on Nov 1 02:00	Minimum Daily Average: 0.1 ppb on Nov 20		Hours of Missing Data:	35
Maximum Diurnal Average: 4.3 ppb at hour 9	Minimum Diurnal Average: 2.0 ppb at hour 19		Hours of Calibration:	35
Monthly Average: 2.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 O ₃ = 4 P ₉₀ = 8 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-Nov	0	0	0	1	0	Z	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2	2	0	0	0.4	2
2-Nov	Z	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	2	2	2	2	2	3	2	1.1	3	
3-Nov	3	Z	2	1	1	1	1	1	1	1	1	1	3	2	1	2	2	2	2	6	6	4	15	2.5	15	
4-Nov	17	7	Z	14	13	9	6	5	3	1	0	0	1	1	1	0	0	1	0	1	1	1	1	3.6	17	
5-Nov	1	1	1	Z	2	1	1	1	2	3	3	4	3	2	2	3	2	2	2	3	4	8	7	10	3.0	10
6-Nov	7	7	8	14	Z	7	11	10	10	8	7	5	4	4	5	8	6	8	9	11	10	8	8	14	8.0	14
7-Nov	12	17	11	9	10	Z	13	9	8	8	7	11	12	14	12	12	6	1	1	1	1	0	1	1	7.5	17
8-Nov	Z	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2.2	3
9-Nov	4	Z	3	2	2	2	2	3	11	11	8	5	4	2	1	4	2	1	1	1	1	1	0	4	3.2	11
10-Nov	3	6	Z	6	6	7	7	7	10	12	10	7	7	4	2	0	0	0	0	0	0	1	1	1	4.2	12
11-Nov	1	1	1	Z	1	1	1	1	1	1	3	5	5	9	10	15	10	6	3	2	2	2	3	6	3.8	15
12-Nov	3	3	6	5	Z	7	6	8	11	13	12	6	5	8	7	9	8	6	5	3	3	3	5	4	6.3	13
13-Nov	3	4	3	2	3	Z	9	12	15	15	9	3	2	1	3	2	1	1	1	1	1	1	0	3.9	15	
14-Nov	Z	1	1	1	1	2	4	7	13	9	7	4	2	2	0	1	1	8	2	2	0	0	0	0	3.0	13
15-Nov	0	Z	0	0	1	0	2	1	C	C	C	C	C	0	0	1	2	5	5	7	7	4	6	4	2.5	7
16-Nov	2	0	Z	0	0	0	0	0	0	0	3	8	9	0	0	1	0	0	1	1	0	1	4	3	1.5	9
17-Nov	3	1	1	Z	1	0	1	1	1	2	3	2	6	5	5	6	3	0	1	4	1	0	0	1	2.1	6
18-Nov	3	2	9	14	Z	10	7	4	5	2	1	0	2	3	3	3	2	2	1	3	3	2	2	2	3.6	14
19-Nov	2	2	2	3	2	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3
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	0.1	0
21-Nov	0	Z	0	0	0	0	0	0	0	0	1	3	4	5	7	11	15	11	2	1	1	2	4	2	3.1	15
22-Nov	1	0	Z	0	0	0	1	1	1	2	4	2	8	13	6	3	3	3	1	1	1	1	1	1	2.3	13
23-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	2	1	0.8	2
24-Nov	1	2	2	2	Z	1	1	2	2	2	2	3	3	3	3	3	2	1	1	1	1	1	1	1	1.9	3
25-Nov	1	1	1	1	1	Z	1	0	1	0	1	1	0	0	0	1	1	1	6	11	15	4	2	1	2.1	15
26-Nov	Z	5	4	4	2	1	4	4	4	3	3	4	9	7	7	4	2	1	1	1	1	1	1	1	3.2	9
27-Nov	1	Z	1	1	1	3	1	1	6	3	1	1	1	1	1	1	1	0	1	1	1	3	4	1	1.4	6
28-Nov	0	1	Z	1	4	4	6	10	14	14	15	13	11	9	9	8	3	4	9	9	2	5	8	4	7.0	15
29-Nov	2	2	2	Z	3	3	0	1	2	1	1	4	4	2	1	6	9	4	1	1	1	0	1	1	2.3	9
30-Nov	1	1	0	1	Z	0	1	1	1	1	1	0	1	0	0	0	0	0	1	1	1	1	1	1	0.8	1

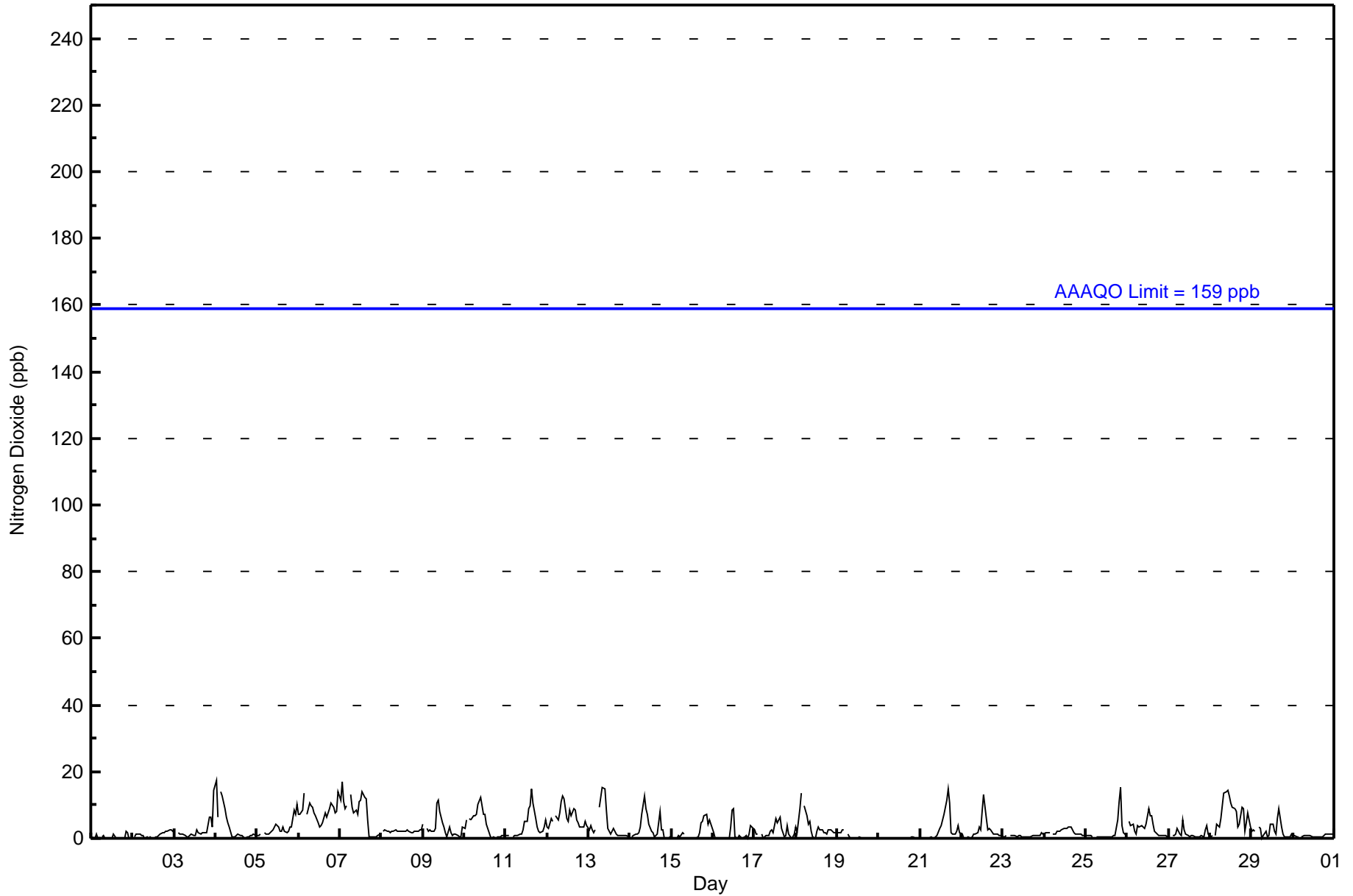
2.9	2.6	2.5	3.4	2.3	2.5	3.0	3.2	4.3	4.0	3.6	3.3	3.6	3.5	3.0	3.6	2.9	2.3	2.0	2.4	2.3	2.2	2.3	2.8	Diurnal Average	
17	17	11	14	13	10	13	12	15	15	15	13	12	14	12	15	15	11	9	11	15	8	8	15	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Wapasu - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Wapasu - 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
Wapasu - 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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683
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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683

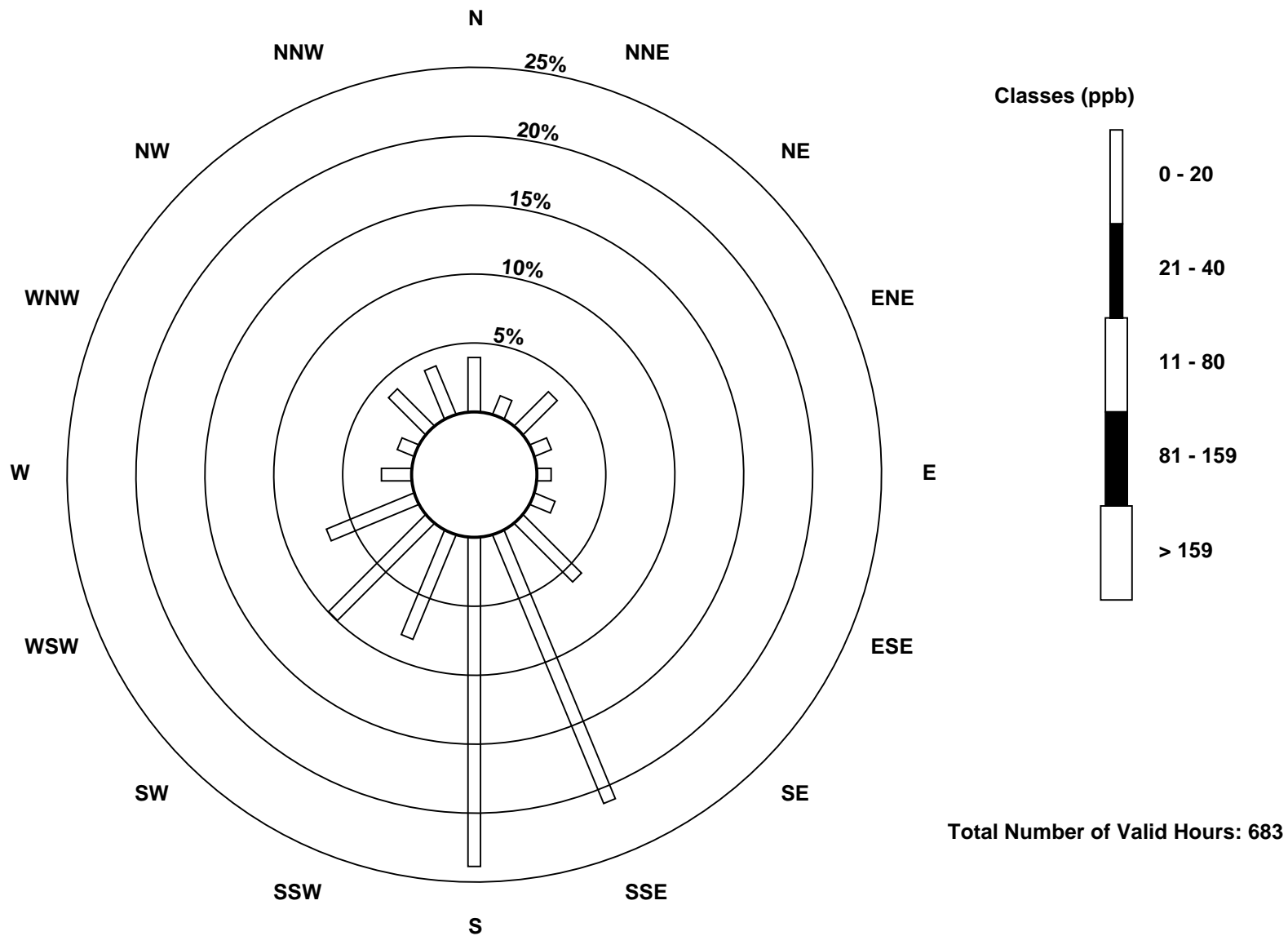
Total Number of Valid Hours: 683

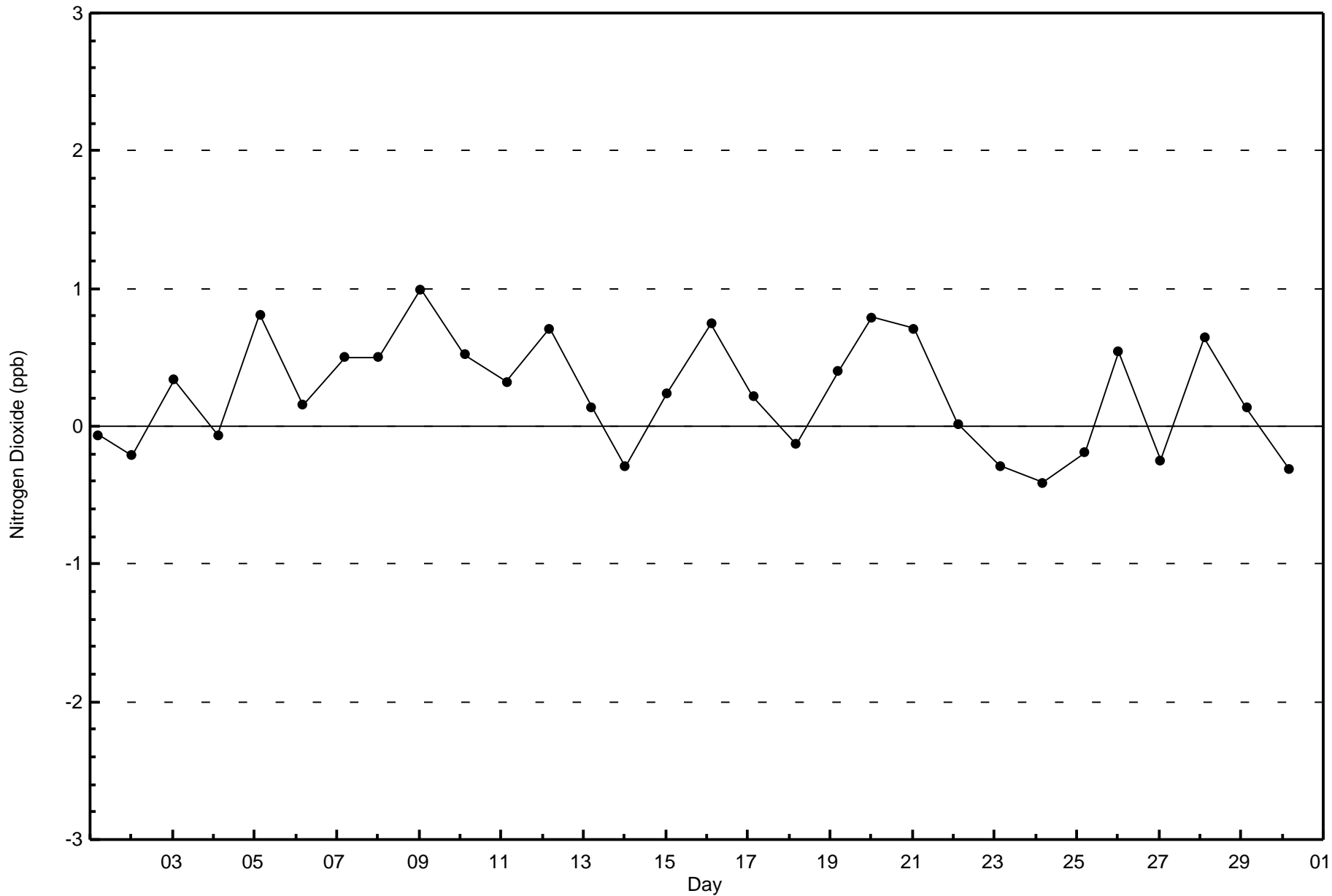
Total Number of Hours: 720

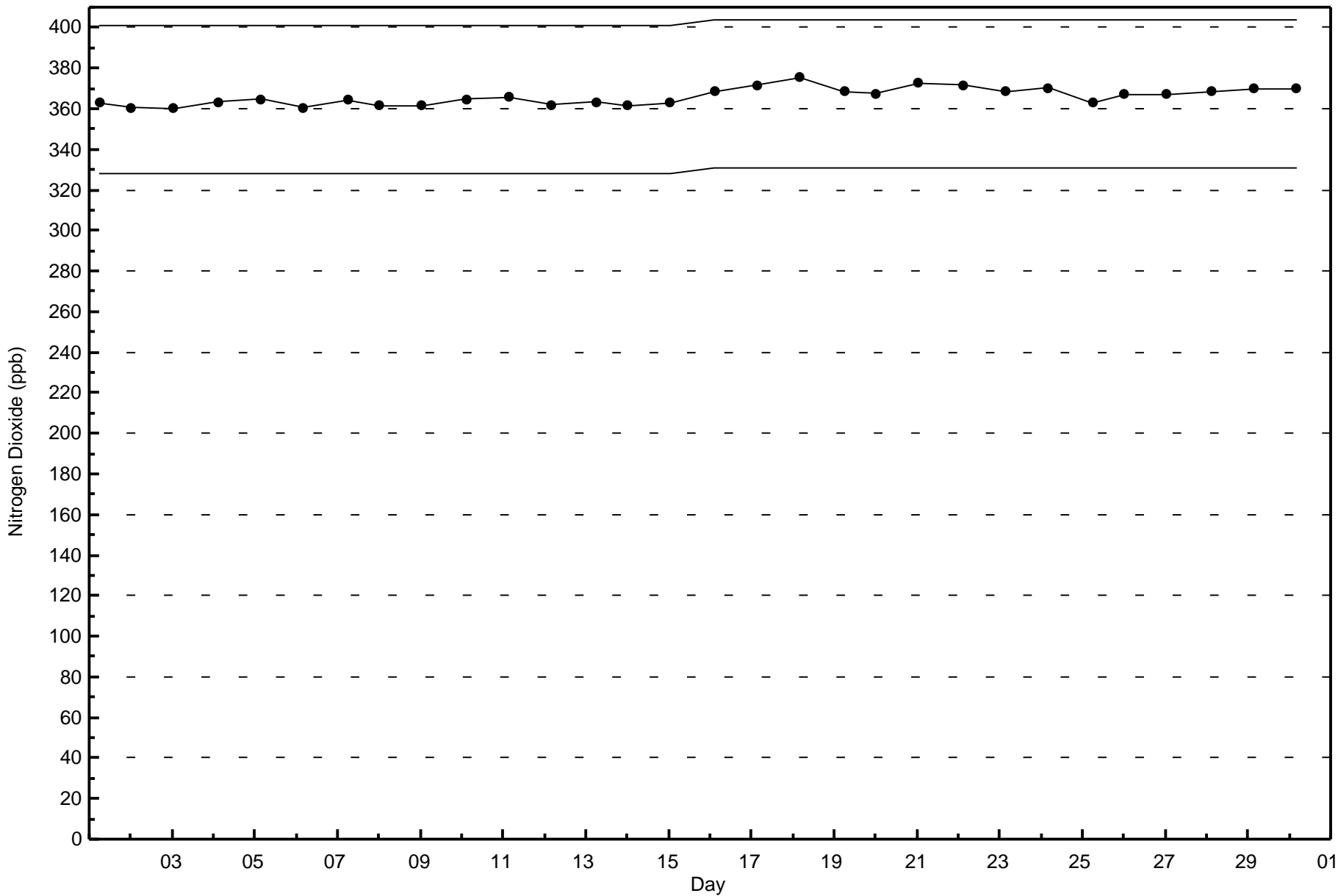


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Wapasu (AMS 17)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

Wapasu - November 2016

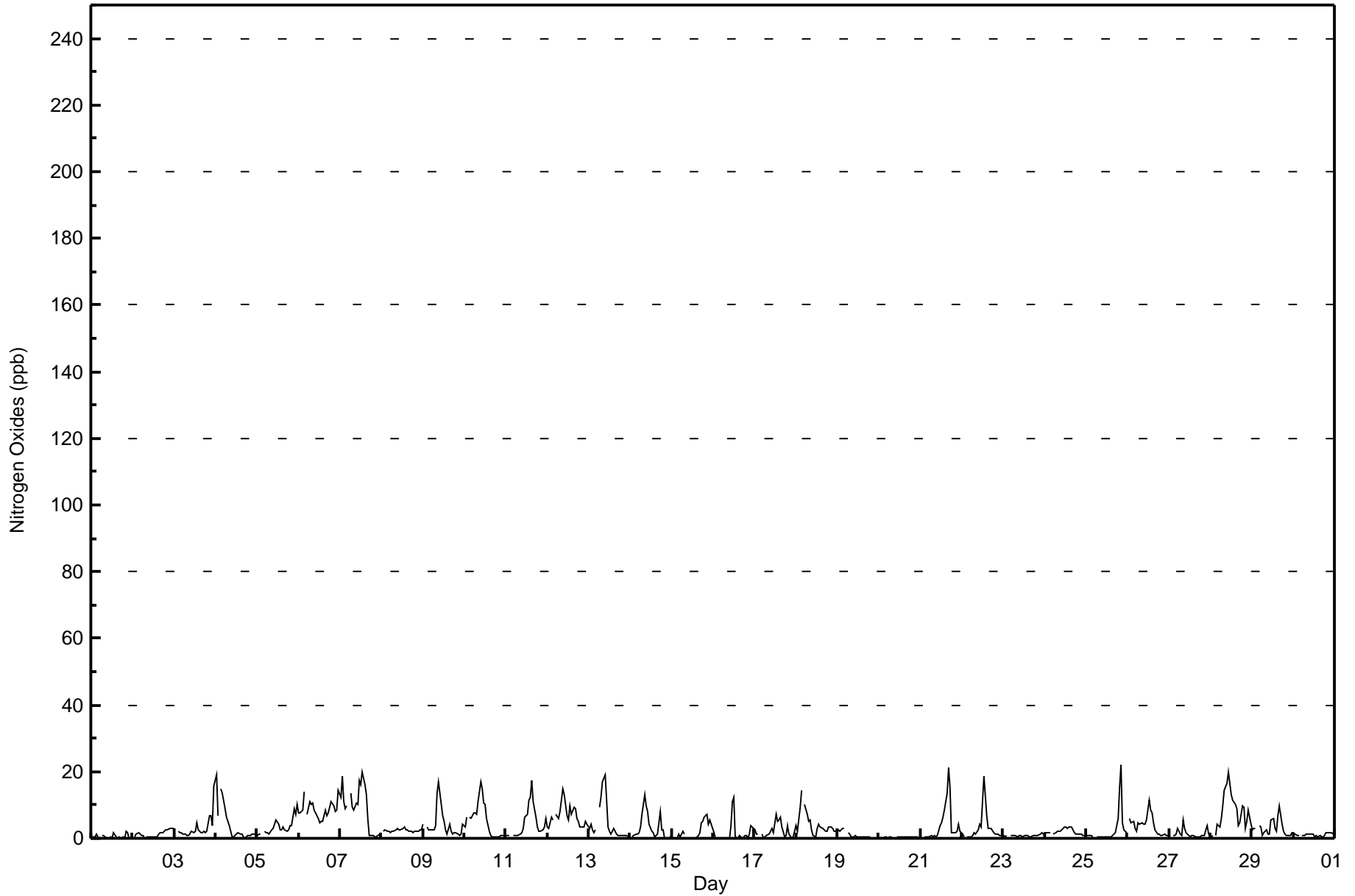
Maximum Value: 22 ppb on Nov 25 21:00																		Maximum Daily Average: 9.0 ppb on Nov 7						Hours in Service: 720		
Minimum Value: 0 ppb on Nov 15 14:00																		Minimum Daily Average: 0.3 ppb on Nov 20						Hours of Data: 685		
Maximum Diurnal Average: 5.0 ppb at hour 10																		Minimum Diurnal Average: 2.3 ppb at hour 19						Hours of Missing Data: 35		
Monthly Average: 3.4 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 9 P ₉₉ = 18						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	1	0	Z	1	1	0	0	0	0	2	0	0	0	0	0	0	2	2	0	0	0.5	2	
2-Nov	Z	1	1	2	1	1	1	0	0	0	0	0	0	1	1	2	2	2	3	3	3	3	3	1.3	3	
3-Nov	3	Z	2	2	2	1	1	1	1	2	2	2	5	2	2	2	2	2	7	7	4	16	3.0	16		
4-Nov	19	7	Z	15	13	9	6	5	4	1	0	1	1	2	1	1	1	0	1	1	1	1	1	4.0	19	
5-Nov	1	1	1	Z	2	2	2	1	2	3	4	5	4	3	3	3	3	2	3	4	4	9	7	10	3.5	10
6-Nov	8	8	8	14	Z	7	11	10	10	9	8	6	5	5	8	7	8	9	11	10	8	8	14	8.6	14	
7-Nov	12	18	11	9	10	Z	14	9	8	11	10	17	16	20	16	13	6	1	1	1	0	1	1	9.0	20	
8-Nov	Z	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3	2.4	3	
9-Nov	4	Z	3	3	2	3	2	4	14	17	13	7	5	3	1	4	2	1	2	2	1	1	1	4.3	17	
10-Nov	4	6	Z	7	6	7	7	7	11	17	15	11	10	6	2	1	0	1	0	0	0	1	1	5.3	17	
11-Nov	1	1	1	Z	1	1	1	1	1	2	3	6	7	11	12	18	11	6	4	2	2	2	3	6	4.5	18
12-Nov	3	3	6	5	Z	7	6	8	12	15	13	7	5	10	7	9	9	6	5	3	4	3	5	4	6.8	15
13-Nov	3	4	3	2	3	Z	9	12	17	19	11	3	2	1	3	2	1	1	1	1	1	1	0	4.4	19	
14-Nov	Z	1	1	1	1	2	3	7	13	10	8	4	2	2	0	1	1	8	2	2	0	0	0	3.1	13	
15-Nov	0	Z	0	0	1	0	2	1	C	C	C	C	C	0	0	1	2	5	5	7	7	4	6	4	2.5	7
16-Nov	2	0	Z	0	0	0	0	0	0	0	4	11	12	0	0	1	0	0	1	1	0	1	4	3	1.8	12
17-Nov	3	1	1	Z	1	0	0	1	1	2	3	2	7	5	6	6	3	0	1	4	1	0	0	2	2.3	7
18-Nov	4	2	9	14	Z	10	7	5	5	2	1	1	3	4	3	3	2	2	2	3	3	3	2	2	4.1	14
19-Nov	2	2	2	3	3	Z	2	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1.0	3
20-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0.3	1
21-Nov	0	Z	0	0	0	0	1	1	1	1	1	4	5	6	8	14	21	15	2	2	2	2	4	2	4.0	21
22-Nov	1	1	Z	1	1	1	1	1	1	2	4	3	11	19	7	3	3	3	2	1	1	1	1	1	3.0	19
23-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	2	1	0.8	2	
24-Nov	2	2	2	2	Z	1	2	2	2	2	3	3	4	3	4	3	2	2	1	1	1	1	1	1	2.0	4
25-Nov	1	1	1	1	1	Z	1	0	0	0	1	1	0	0	1	1	1	2	6	15	22	5	2	2	2.8	22
26-Nov	Z	6	5	5	3	2	5	4	5	4	4	6	11	8	8	5	3	1	1	1	1	1	1	3.9	11	
27-Nov	1	Z	1	1	1	3	1	1	6	3	2	1	1	1	1	1	1	0	1	1	1	3	4	1	1.4	6
28-Nov	0	1	Z	1	4	4	6	10	14	17	20	17	13	11	10	9	4	5	10	9	3	5	8	4	8.0	20
29-Nov	3	3	3	Z	4	4	1	2	3	1	1	6	6	3	2	7	10	4	2	1	1	1	1	2	3.0	10
30-Nov	2	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	1	2	2	2	2	1	1.1	2
																		Diurnal Average		Diurnal Maximum						
																		3.2		19						
																		2.9		18						
																		2.7		11						
																		3.6		15						
																		2.6		13						
																		2.7		10						
																		3.3		14						
																		3.4		12						
																		4.7		17						
																		5.0		19						
																		4.7		20						
																		4.4		17						
																		4.8		16						
																		4.5		20						
																		3.6		16						
																		4.1		18						
																		3.3		21						
																		2.7		15						
																		2.3		10						
																		2.8		15						
																		2.8		22						
																		2.4		9						
																		2.6		8						
																		3.1		16						

Z - zerospan C - Calibration



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Wapasu - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Wapasu - 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
Wapasu - 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	27	10	24	9	7	11	41	144	163	56	68	47	14	9	25	26	681
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	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	27	10	24	9	7	11	41	144	163	56	68	47	15	9	26	26	683

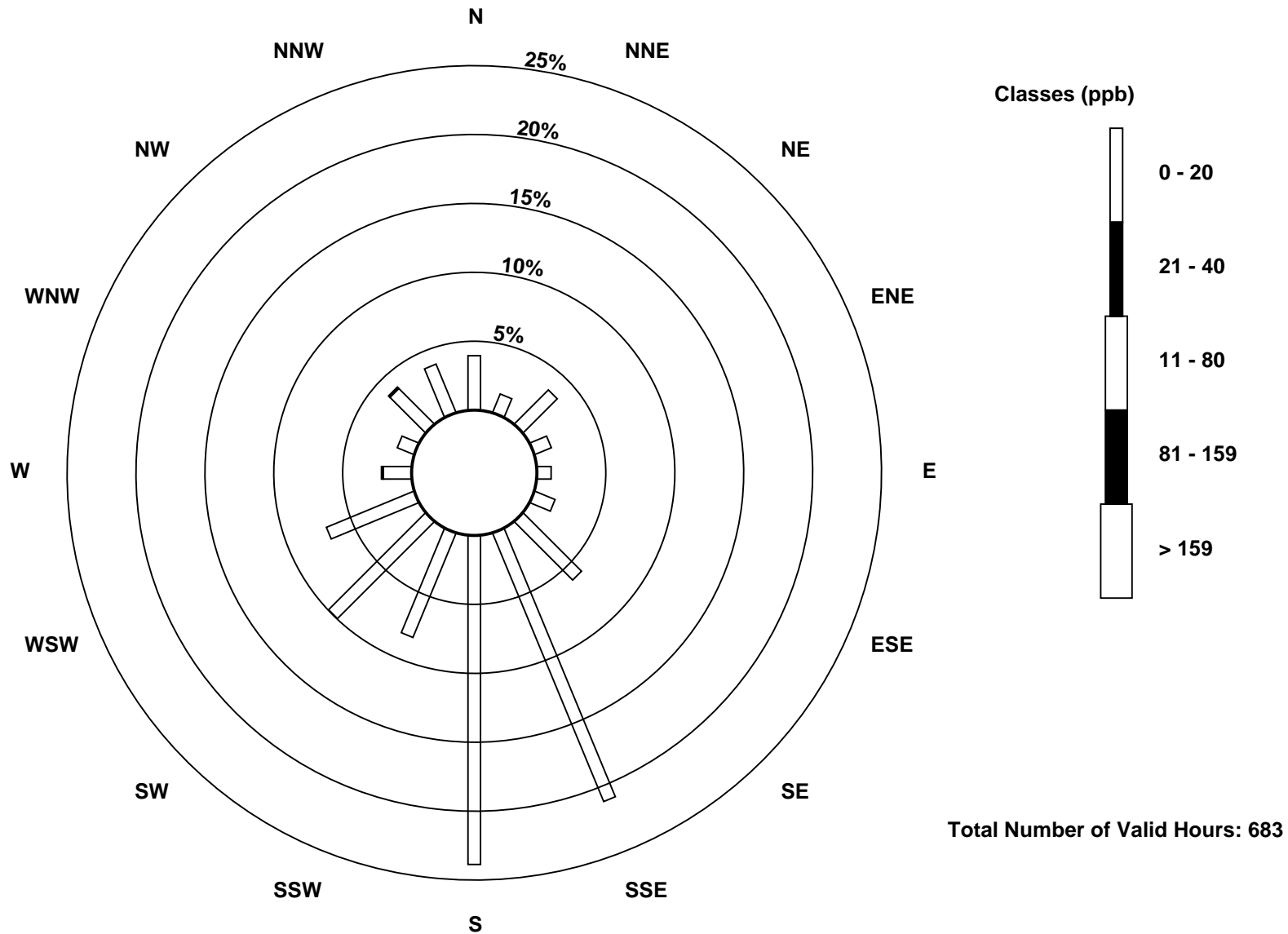
Total Number of Valid Hours: 683

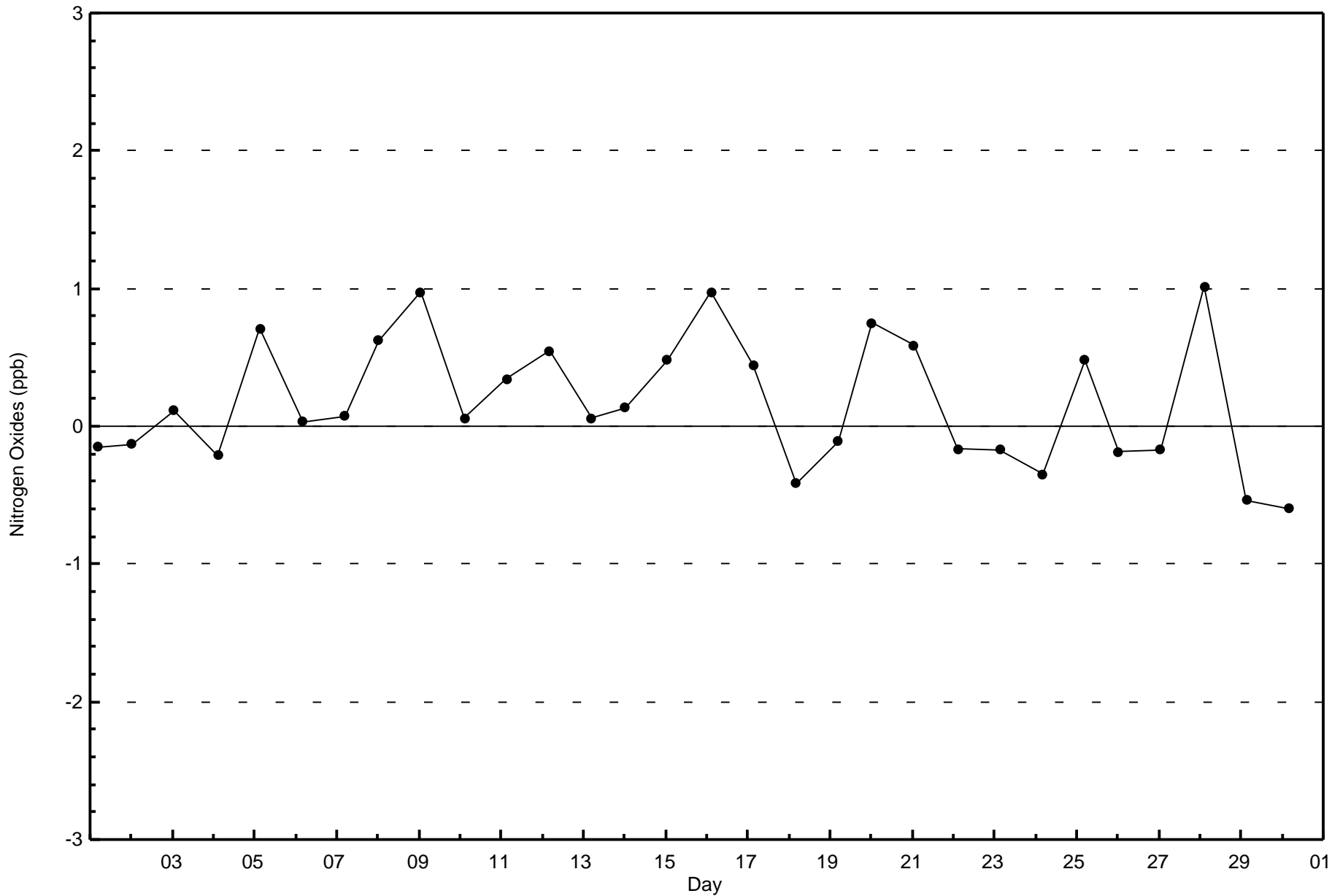
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Wapasu (AMS 17)

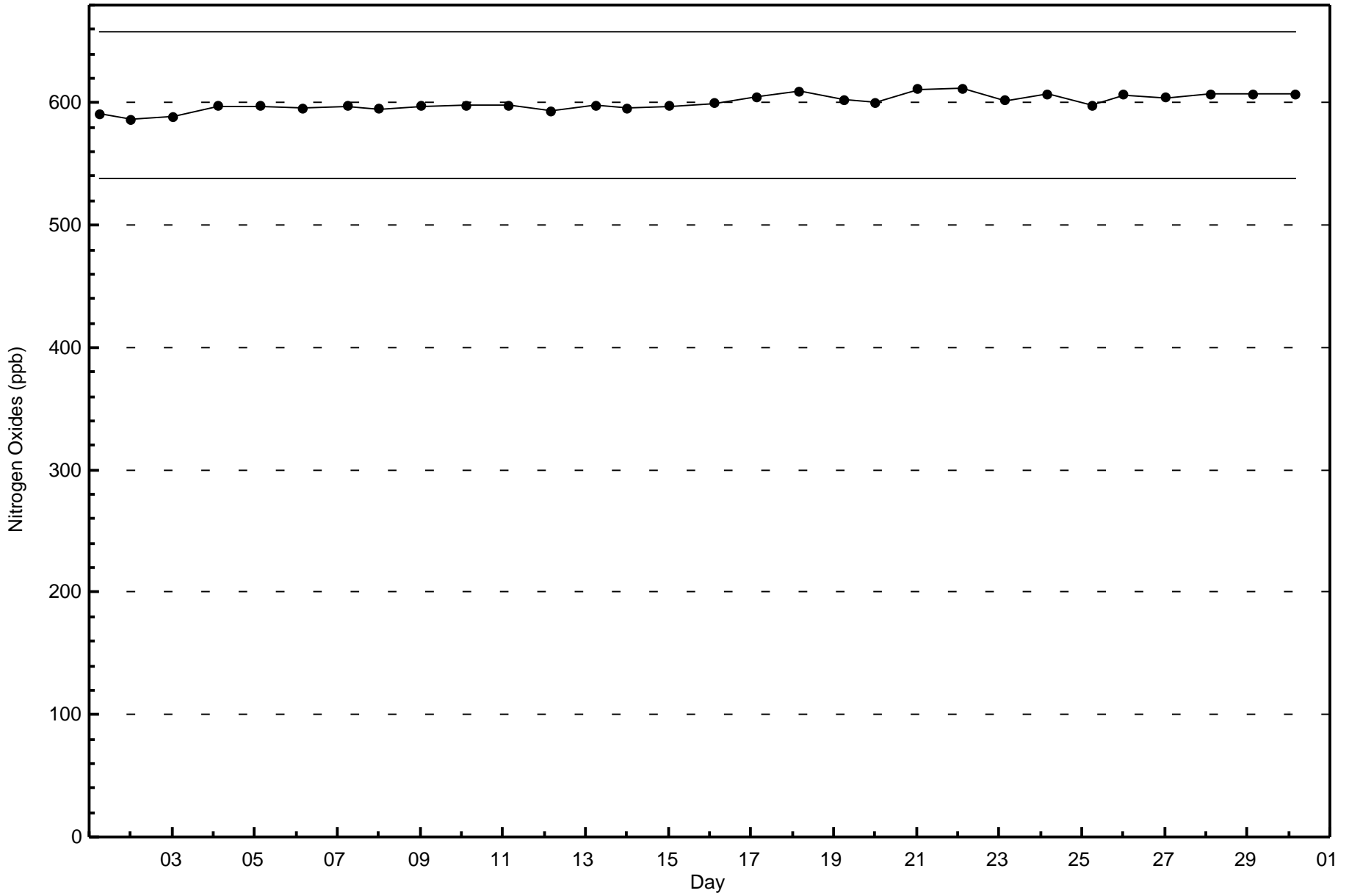






Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
Wapasu - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Wapasu - November 2016

Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 25.5 µg/m ³ on Nov 13 09:00	Maximum Daily Average: 10.0 µg/m ³ on Nov 26	Hours of Data:	708
Minimum Value: 0.1 µg/m ³ on Nov 17 02:00	Minimum Daily Average: 0.5 µg/m ³ on Nov 1	Hours of Missing Data:	12
Maximum Diurnal Average: 6.2 µg/m ³ at hour 9	Minimum Diurnal Average: 3.3 µg/m ³ at hour 23	Hours of Calibration:	2
Monthly Average: 4.05 µg/m ³	Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.8 Median = 3.2 Q ₃ = 5.1 P ₉₀ = 8.4 P ₉₉ = 17.7	Percent Operational Time:	98.6

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-Nov	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.4	0.3	0.4	0.5	0.6	0.7	0.9	0.5	0.5	0.4	0.6	0.6	0.5	0.8	0.7	0.6	0.6	0.5	0.9
2-Nov	0.5	0.6	0.7	0.7	0.6	0.7	0.6	0.5	0.6	0.8	0.7	0.9	1.0	1.2	1.7	2.1	2.7	3.1	3.8	5.0	6.2	6.5	7.0	8.1	2.3	8.1
3-Nov	7.9	8.0	7.6	6.3	5.2	5.1	4.1	2.6	3.7	6.2	7.6	7.8	6.7	5.1	3.5	2.7	2.6	2.9	3.1	3.2	3.9	6.3	5.9	5.3	5.1	8.0
4-Nov	5.6	4.8	3.2	3.1	3.6	4.9	5.5	5.0	3.7	2.2	1.7	1.7	1.8	1.9	1.8	1.9	1.9	1.9	2.1	2.2	2.4	2.7	2.8	2.8	3.0	5.6
5-Nov	2.5	2.6	2.6	2.7	2.6	2.7	3.4	3.5	3.7	4.9	5.7	6.6	4.2	4.1	4.9	5.3	4.6	5.1	6.0	7.8	8.1	11.5	8.4	13.3	5.3	13.3
6-Nov	3.9	14.4	10.0	10.8	8.0	2.4	2.4	6.4	4.3	5.8	5.9	4.8	2.8	3.3	5.4	9.9	5.3	3.9	3.5	3.7	4.1	4.8	5.1	4.6	5.6	14.4
7-Nov	8.7	11.7	7.5	9.0	11.4	13.5	7.0	5.9	8.5	11.2	8.0	4.9	5.5	4.4	3.9	3.3	2.6	2.1	2.0	1.9	1.9	1.7	1.8	2.1	5.9	13.5
8-Nov	2.6	3.1	3.9	5.2	5.4	5.2	4.5	3.7	3.4	2.9	2.4	2.2	2.2	2.4	2.4	2.3	2.3	2.2	2.2	2.3	2.4	2.6	2.9	3.3	3.1	5.4
9-Nov	9.8	15.7	3.3	2.8	3.4	3.1	3.0	3.5	14.0	8.7	7.3	3.3	1.8	1.6	1.4	1.4	1.5	1.4	1.3	1.3	1.2	1.4	1.4	1.8	4.0	15.7
10-Nov	3.7	2.7	3.9	4.3	4.2	8.0	8.5	11.3	10.7	9.3	5.0	4.2	6.6	7.2	4.4	3.7	3.2	2.6	2.7	3.0	3.1	3.2	3.0	3.3	5.1	11.3
11-Nov	2.6	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.5	3.2	5.4	5.7	5.5	6.2	6.6	8.9	9.8	8.0	5.2	3.8	4.0	6.9	11.1	4.7	11.1
12-Nov	8.7	4.9	7.0	11.0	4.3	4.7	6.2	6.9	4.7	13.5	20.1	8.7	6.9	8.8	4.9	6.0	6.2	5.6	5.2	4.5	3.9	3.8	3.6	3.5	6.8	20.1
13-Nov	3.3	3.1	2.6	2.3	2.7	3.0	5.5	13.3	25.5	17.4	6.2	2.1	2.7	2.5	4.4	3.1	3.2	3.4	3.1	2.8	2.5	2.3	2.1	2.2	5.0	25.5
14-Nov	2.3	2.6	2.7	2.6	3.0	3.7	4.7	7.7	9.0	5.9	6.7	3.0	1.8	1.4	1.3	1.5	1.6	1.8	1.0	0.5	0.4	0.4	0.4	0.4	2.8	9.0
15-Nov	0.3	0.4	0.5	0.5	0.7	0.8	1.1	1.2	1.3	1.3	1.6	1.8	1.5	1.5	1.5	1.5	1.7	2.3	2.4	1.8	1.6	1.4	1.4	1.4	1.3	2.4
16-Nov	1.1	1.0	0.8	0.7	0.6	0.5	0.6	0.6	C	C	1.7	3.1	2.7	1.2	1.0	1.1	1.0	0.9	1.1	UO	UO	0.8	0.4	0.3	1.1	3.1
17-Nov	UO	0.1	UO	UO	UO	0.6	1.4	3.4	5.0	M	M	M	M	2.8	2.2	1.9	0.9	0.6	0.5	0.6	0.5	0.4	0.5	0.5	--	5.0
18-Nov	0.6	0.5	1.0	1.4	1.4	1.2	0.8	0.7	0.8	0.5	0.3	0.3	0.6	0.7	0.6	0.6	0.4	0.5	0.5	0.6	0.6	0.7	0.8	1.0	0.7	1.4
19-Nov	0.9	0.8	0.8	0.7	0.7	0.8	0.8	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.7	0.8	0.9	0.9	0.8	0.9	1.0	0.9	0.8	0.7	1.0
20-Nov	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.3	1.4	1.4	1.4	2.0	2.3	2.5	2.5	2.4	2.8	3.4	4.5	5.4	5.0	4.8	4.0	2.3	5.4
21-Nov	3.6	3.9	4.5	5.0	5.8	6.1	7.4	8.1	8.1	10.5	11.4	11.1	10.0	10.0	10.4	9.9	9.4	8.7	5.5	5.2	4.4	3.3	2.5	2.1	7.0	11.4
22-Nov	2.0	2.2	2.9	4.1	4.3	4.2	4.4	4.9	4.2	4.0	4.1	4.5	12.5	8.2	6.3	6.1	6.9	5.0	4.7	3.9	3.8	4.7	4.8	4.8	4.9	12.5
23-Nov	4.3	3.8	4.1	4.2	4.2	4.1	4.0	3.9	3.5	3.3	3.3	3.0	2.9	3.1	3.1	3.2	3.3	3.0	2.7	2.7	2.8	3.2	3.7	3.8	3.5	4.3
24-Nov	4.0	4.7	5.0	5.1	4.6	4.5	4.2	6.9	6.0	6.3	6.0	8.5	9.7	8.2	8.4	11.1	13.4	8.3	6.2	5.0	4.1	2.9	2.5	2.3	6.2	13.4
25-Nov	2.0	1.8	1.9	2.0	2.5	3.0	3.2	3.2	3.8	4.6	5.2	5.0	4.8	4.9	6.0	6.0	6.1	5.6	6.8	8.5	9.3	7.3	8.2	8.2	5.0	9.3
26-Nov	9.0	9.1	8.8	8.4	7.3	8.6	15.2	18.4	22.3	24.1	22.9	18.0	11.3	8.5	7.7	6.3	5.7	5.1	5.1	4.7	4.1	3.6	3.0	2.9	10.0	24.1
27-Nov	2.7	2.5	2.3	2.3	2.2	2.9	2.1	2.1	2.7	2.2	2.3	2.9	4.3	4.9	4.9	3.7	3.5	3.7	4.0	3.8	3.4	3.5	3.3	3.1	3.1	4.9
28-Nov	3.0	3.1	2.8	2.8	4.3	6.5	9.1	18.6	20.2	13.9	14.9	12.5	8.9	6.6	6.0	5.5	4.0	4.1	3.6	3.7	3.7	4.1	4.4	4.7	7.1	20.2
29-Nov	5.1	4.6	4.6	4.4	4.0	3.8	3.3	3.4	3.4	3.1	3.5	4.9	4.4	3.6	3.4	5.0	6.7	4.4	3.3	3.1	2.9	2.5	2.3	2.3	3.8	6.7
30-Nov	2.6	2.7	2.9	3.1	3.1	3.0	3.0	3.1	2.9	2.8	3.0	2.7	2.7	2.7	2.6	2.6	3.1	3.4	3.2	3.2	2.9	2.8	2.9	3.0	2.9	3.4

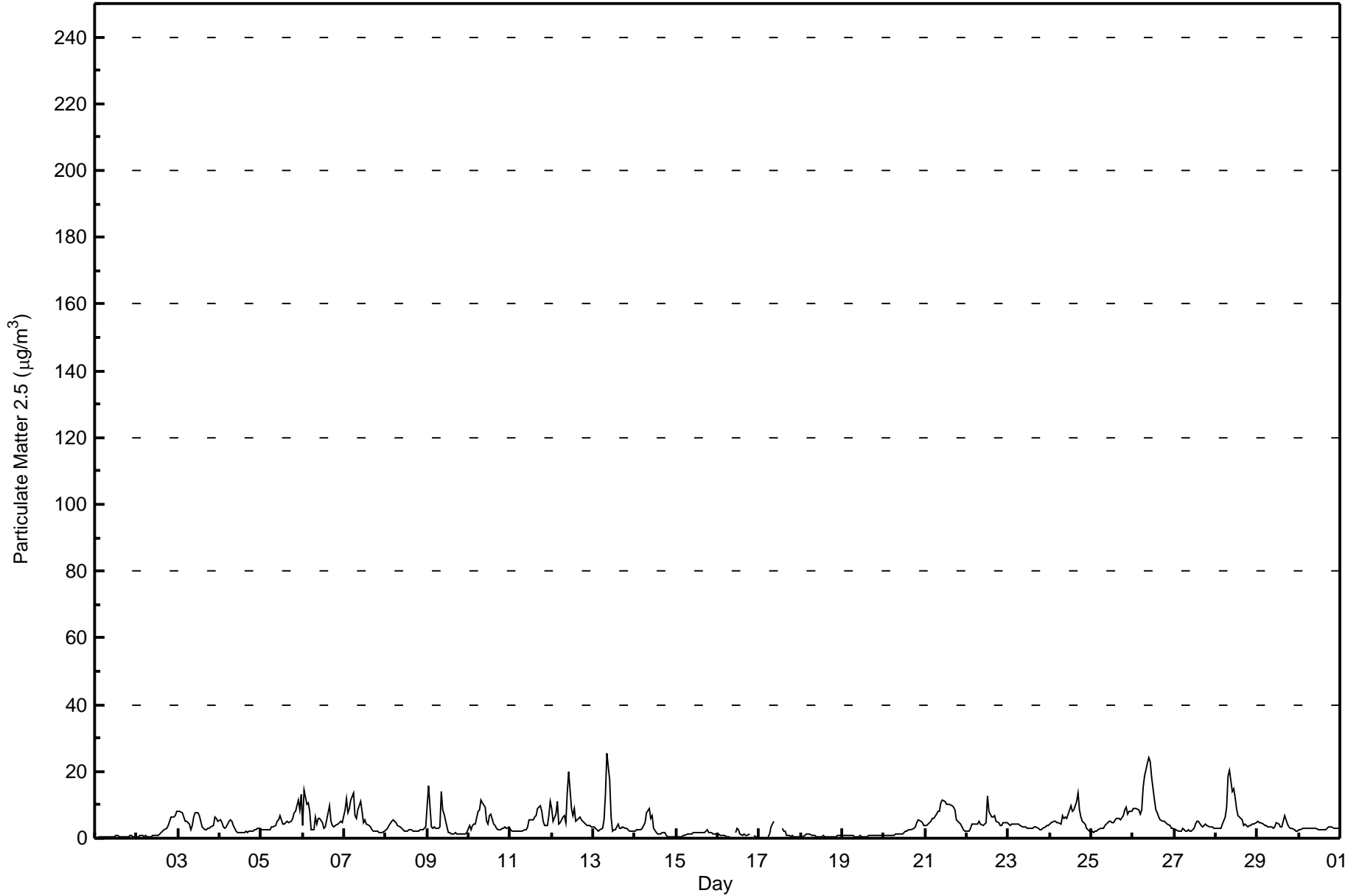
3.6	4.0	3.5	3.7	3.6	3.7	4.0	5.1	6.2	6.1	5.6	4.7	4.5	4.0	3.8	3.9	3.9	3.5	3.3	3.3	3.3	3.3	3.3	3.3	3.6	Diurnal Average	
9.8	15.7	10.0	11.0	11.4	13.5	15.2	18.6	25.5	24.1	22.9	18.0	12.5	10.0	10.4	11.1	13.4	9.8	8.0	8.5	9.3	11.5	8.4	13.3	Diurnal Maximum		

C - Calibration M - Maintenance UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu - November 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	435	61.44	61.44
6 - 15	143	20.20	81.64
16 - 25	11	1.55	83.19
26 - 80	0	0.00	83.19
> 81.0	0	0.00	83.19

Total Number of Valid Hours: 708

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Wapasu - November 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	20	9	21	6	3	3	23	117	125	31	30	23	9	3	3	9	435
6 - 15	1	1	0	0	0	0	1	17	42	26	30	17	5	0	3	0	143
16 - 25	0	0	0	0	0	0	0	2	1	1	4	3	0	0	0	0	11
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	21	10	21	6	3	3	24	136	168	58	64	43	14	3	6	9	589

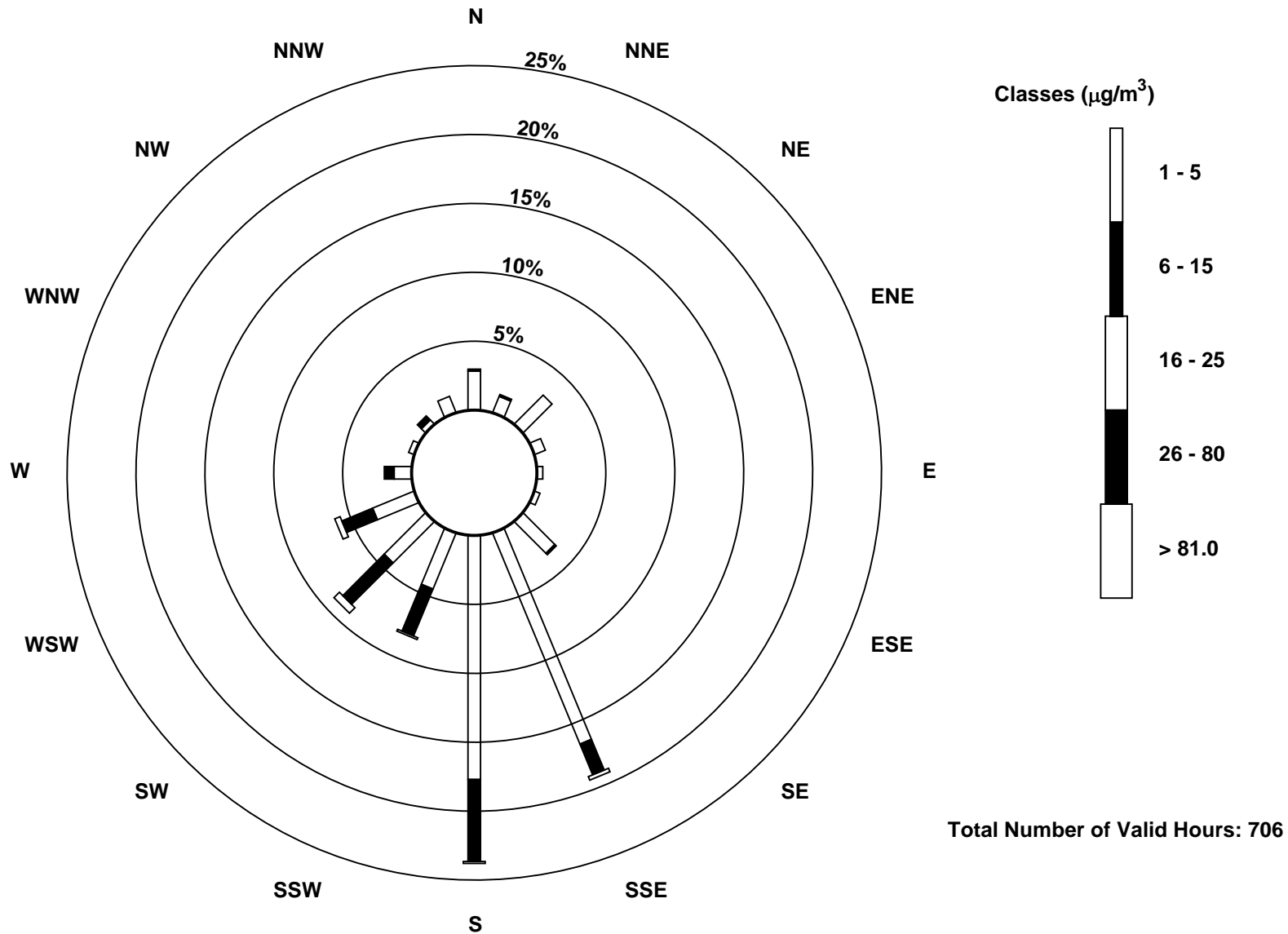
Total Number of Valid Hours: 706

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu (AMS 17)





Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

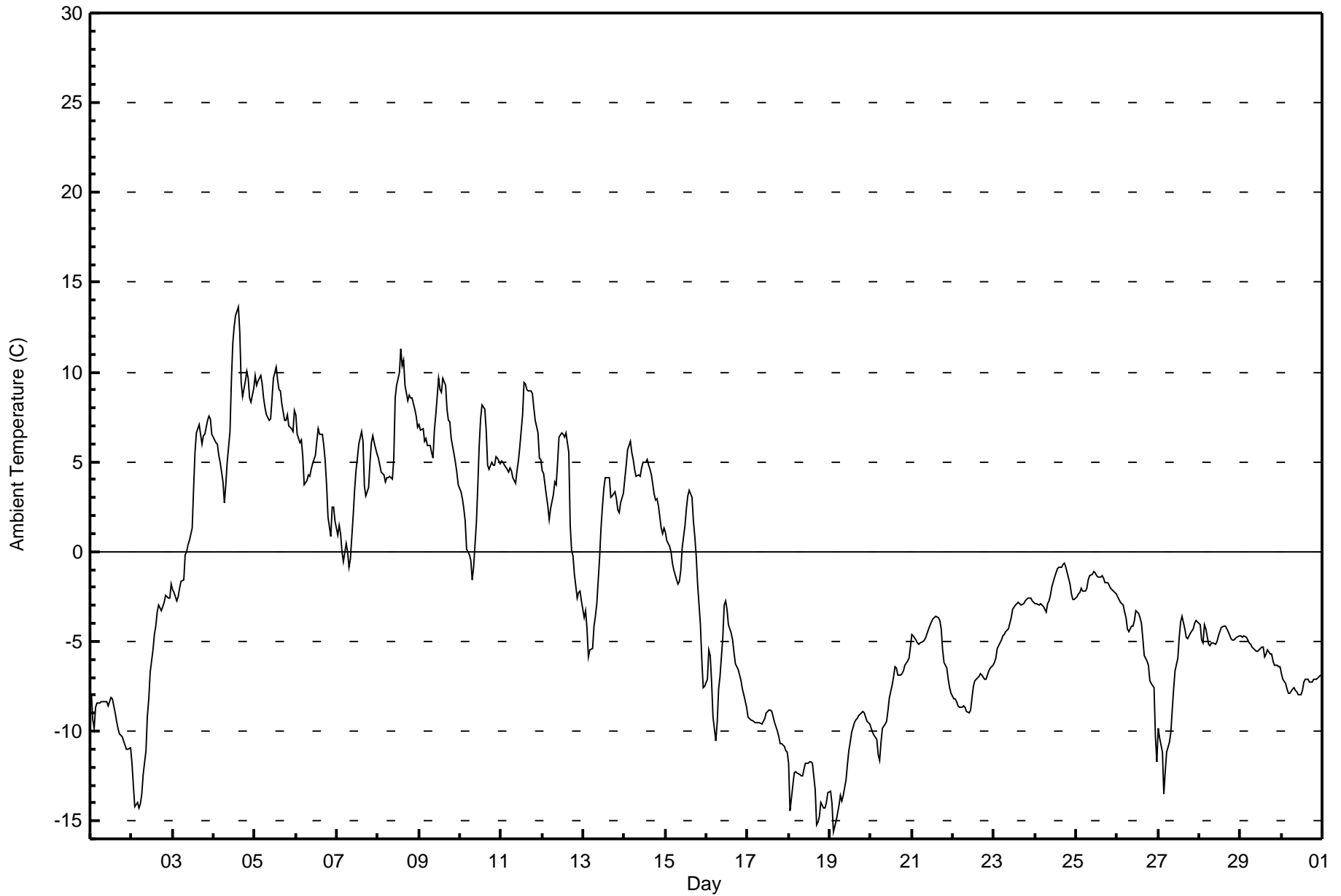
Wapasu - November 2016

Maximum Value: 13.6 C on Nov 4 15:00 Maximum Daily Average: 8.4 C on Nov 5																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -15.6 C on Nov 19 03:00 Minimum Daily Average: -13.0 C on Nov 18 Maximum Diurnal Average: 0.1 C at hour 15 Minimum Diurnal Average: -3.6 C at hour 6 Monthly Average: -1.96 C Percentiles: P ₁ = -14.3 P ₁₀ = -10.2 Q ₁ = -7.1 Median = -2.9 Q ₃ = 4.3 P ₉₀ = 7.3 P ₉₉ = 10.2																										
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-Nov	-7.9	-9.3	-9.8	-8.7	-8.4	-8.4	-8.4	-8.3	-8.4	-8.4	-8.6	-8.4	-8.1	-8.2	-9.0	-9.5	-9.8	-10.1	-10.3	-10.5	-10.8	-11.0	-11.0	-10.9	-9.3	-7.9
2-Nov	-11.8	-13.0	-14.2	-14.0	-14.3	-14.1	-13.5	-12.4	-11.1	-9.1	-8.2	-6.7	-5.5	-4.6	-4.2	-3.4	-3.0	-3.3	-3.1	-2.8	-2.4	-2.6	-2.6	-1.8	-7.6	-1.8
3-Nov	-2.1	-2.3	-2.8	-2.5	-2.1	-1.7	-1.6	-0.2	0.0	0.4	0.6	1.3	3.5	5.5	6.6	7.1	6.6	6.0	6.4	6.5	7.3	7.5	7.4	6.5	2.7	7.5
4-Nov	6.2	6.1	6.0	5.3	5.0	3.9	2.7	3.8	4.9	6.7	9.5	11.6	12.5	13.2	13.6	12.2	9.4	8.6	9.5	10.1	9.7	8.6	8.3	9.1	8.2	13.6
5-Nov	9.8	9.3	9.5	9.8	9.4	8.6	8.0	7.6	7.3	7.4	8.5	9.6	10.3	9.6	9.0	8.9	8.3	7.3	7.3	7.6	7.0	6.8	6.7	7.9	8.4	10.3
6-Nov	7.6	6.5	6.1	6.2	5.3	3.8	4.0	4.3	4.2	4.6	4.9	5.4	6.2	6.9	6.6	6.5	5.9	5.1	3.7	2.0	0.8	2.5	2.5	1.7	4.7	7.6
7-Nov	0.9	1.5	1.0	0.0	-0.5	0.4	0.0	-0.9	-0.4	2.0	3.4	4.5	5.2	6.0	6.7	6.2	3.7	3.1	3.5	5.0	6.0	6.4	6.1	5.5	3.1	6.7
8-Nov	5.2	4.9	4.4	4.3	3.9	4.1	4.2	4.2	4.0	5.2	8.6	9.3	10.0	11.3	10.4	10.7	9.2	8.4	8.7	8.6	8.6	8.0	7.5	6.9	7.1	11.3
9-Nov	7.1	6.8	6.8	6.1	6.3	5.9	5.9	5.5	5.2	6.8	7.6	9.6	9.1	8.9	9.6	9.3	8.0	7.3	7.2	6.3	5.4	5.0	4.4	3.7	6.8	9.6
10-Nov	3.3	2.9	2.4	1.7	0.1	-0.2	-0.5	-1.6	-0.9	1.6	3.6	5.9	7.4	8.2	7.9	6.8	4.8	4.6	5.0	4.8	4.8	5.3	5.2	4.9	3.7	8.2
11-Nov	5.0	5.0	4.8	4.6	4.5	4.6	4.5	4.1	3.8	4.5	5.1	5.8	7.7	9.4	9.4	9.0	8.9	8.9	8.8	8.0	7.3	6.6	5.2	5.1	6.3	9.4
12-Nov	4.5	4.4	3.1	2.5	1.8	2.4	3.2	3.9	3.7	5.0	6.4	6.6	6.5	6.4	6.6	5.5	1.4	0.1	-0.3	-1.3	-2.6	-2.3	-2.2	-2.7	2.6	6.6
13-Nov	-3.7	-3.3	-4.3	-5.8	-5.5	-5.4	-4.1	-3.6	-2.9	-0.3	1.3	2.5	3.5	4.1	4.1	4.1	3.0	3.1	3.3	2.9	2.3	2.1	2.7	3.2	0.1	4.1
14-Nov	4.0	4.8	5.6	6.2	5.5	5.1	4.6	4.2	4.3	4.2	4.7	5.0	4.9	5.1	4.8	4.6	4.3	3.2	2.8	3.0	2.6	1.3	1.0	1.3	4.0	6.2
15-Nov	1.1	0.6	0.3	0.0	-0.7	-1.1	-1.6	-1.8	-1.6	-1.1	0.2	1.4	2.4	3.1	3.4	3.0	1.7	0.8	-0.3	-1.8	-4.1	-6.0	-7.6	-7.5	-0.7	3.4
16-Nov	-7.1	-5.5	-5.8	-7.3	-9.2	-10.5	-9.5	-7.6	-6.9	-4.8	-3.0	-2.7	-3.2	-4.1	-4.5	-5.0	-5.6	-6.3	-6.6	-6.9	-7.2	-7.6	-8.0	-8.7	-6.4	-2.7
17-Nov	-9.2	-9.3	-9.3	-9.5	-9.5	-9.5	-9.6	-9.5	-9.6	-9.4	-9.3	-9.0	-8.9	-8.8	-8.9	-9.2	-9.6	-10.0	-10.3	-10.7	-10.7	-10.9	-11.1	-11.2	-9.7	-8.8
18-Nov	-11.8	-14.5	-13.1	-12.3	-12.2	-12.3	-12.4	-12.5	-12.5	-12.1	-11.8	-11.8	-11.7	-11.7	-11.8	-13.3	-15.2	-15.1	-14.8	-13.9	-14.3	-14.3	-14.0	-13.5	-13.0	-11.7
19-Nov	-13.4	-14.1	-15.6	-15.3	-15.0	-14.2	-13.6	-13.9	-13.6	-12.8	-11.9	-11.1	-10.6	-10.1	-9.5	-9.4	-9.3	-9.2	-9.0	-8.9	-9.0	-9.2	-9.5	-9.6	-11.6	-8.9
20-Nov	-9.8	-10.1	-10.3	-10.5	-11.4	-11.6	-10.6	-9.9	-9.6	-9.5	-8.8	-8.2	-7.4	-7.0	-6.4	-6.5	-6.9	-6.9	-6.8	-6.6	-6.3	-6.1	-6.0	-5.3	-8.3	-5.3
21-Nov	-4.7	-4.7	-4.9	-5.0	-5.2	-5.1	-5.0	-4.9	-4.7	-4.6	-4.3	-3.9	-3.7	-3.7	-3.6	-3.7	-3.9	-4.3	-5.4	-6.2	-6.5	-7.1	-7.5	-7.9	-5.0	-3.6
22-Nov	-8.2	-8.2	-8.4	-8.6	-8.7	-8.6	-8.6	-8.7	-8.9	-9.0	-8.8	-8.1	-7.5	-7.2	-7.0	-7.0	-6.8	-6.9	-7.1	-7.1	-6.9	-6.7	-6.5	-6.3	-7.7	-6.3
23-Nov	-6.2	-5.9	-5.4	-5.1	-4.9	-4.7	-4.6	-4.5	-4.3	-4.0	-3.7	-3.2	-3.0	-2.9	-2.8	-2.9	-3.0	-2.9	-2.7	-2.6	-2.6	-2.6	-2.7	-2.8	-3.7	-2.6
24-Nov	-2.9	-2.9	-3.0	-2.9	-3.0	-3.1	-3.3	-2.9	-2.8	-2.5	-2.0	-1.4	-1.2	-1.2	-0.9	-0.9	-0.9	-0.7	-0.9	-1.2	-1.8	-2.4	-2.7	-2.7	-2.1	-0.7
25-Nov	-2.5	-2.4	-2.2	-2.1	-2.2	-2.2	-2.1	-1.6	-1.3	-1.2	-1.1	-1.2	-1.4	-1.4	-1.4	-1.4	-1.5	-1.7	-1.7	-1.9	-2.0	-2.1	-2.2	-2.3	-1.8	-1.1
26-Nov	-2.5	-2.7	-2.8	-3.0	-3.4	-3.7	-4.3	-4.5	-4.1	-4.1	-3.8	-3.3	-3.4	-3.7	-4.0	-4.8	-5.8	-6.1	-6.3	-7.2	-7.4	-7.6	-10.3	-11.7	-5.0	-2.5
27-Nov	-9.9	-10.4	-11.2	-13.5	-12.2	-11.2	-10.6	-10.1	-8.8	-7.7	-6.7	-5.9	-4.8	-4.0	-3.6	-4.3	-4.8	-4.9	-4.7	-4.6	-4.3	-4.0	-3.9	-3.9	-7.1	-3.6
28-Nov	-4.1	-5.0	-5.1	-4.0	-4.3	-5.2	-5.3	-5.1	-5.1	-5.2	-5.0	-4.7	-4.5	-4.2	-4.1	-4.1	-4.3	-4.5	-4.8	-4.9	-4.9	-4.8	-4.8	-4.7	-4.7	-4.0
29-Nov	-4.7	-4.8	-4.7	-4.8	-4.9	-5.1	-5.2	-5.3	-5.4	-5.6	-5.6	-5.5	-5.3	-5.3	-5.9	-5.7	-5.5	-5.7	-5.7	-6.1	-6.3	-6.4	-6.4	-6.4	-5.5	-4.7
30-Nov	-6.8	-7.1	-7.4	-7.6	-7.9	-7.9	-7.7	-7.6	-7.7	-7.8	-8.0	-8.0	-7.8	-7.3	-7.1	-7.1	-7.2	-7.3	-7.2	-7.1	-7.1	-7.0	-7.0	-6.9	-7.4	-6.8
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Wapasu - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Wapasu - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	454	63.06	63.06
0 - 10	256	35.56	98.61
10 - 20	10	1.39	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) - %

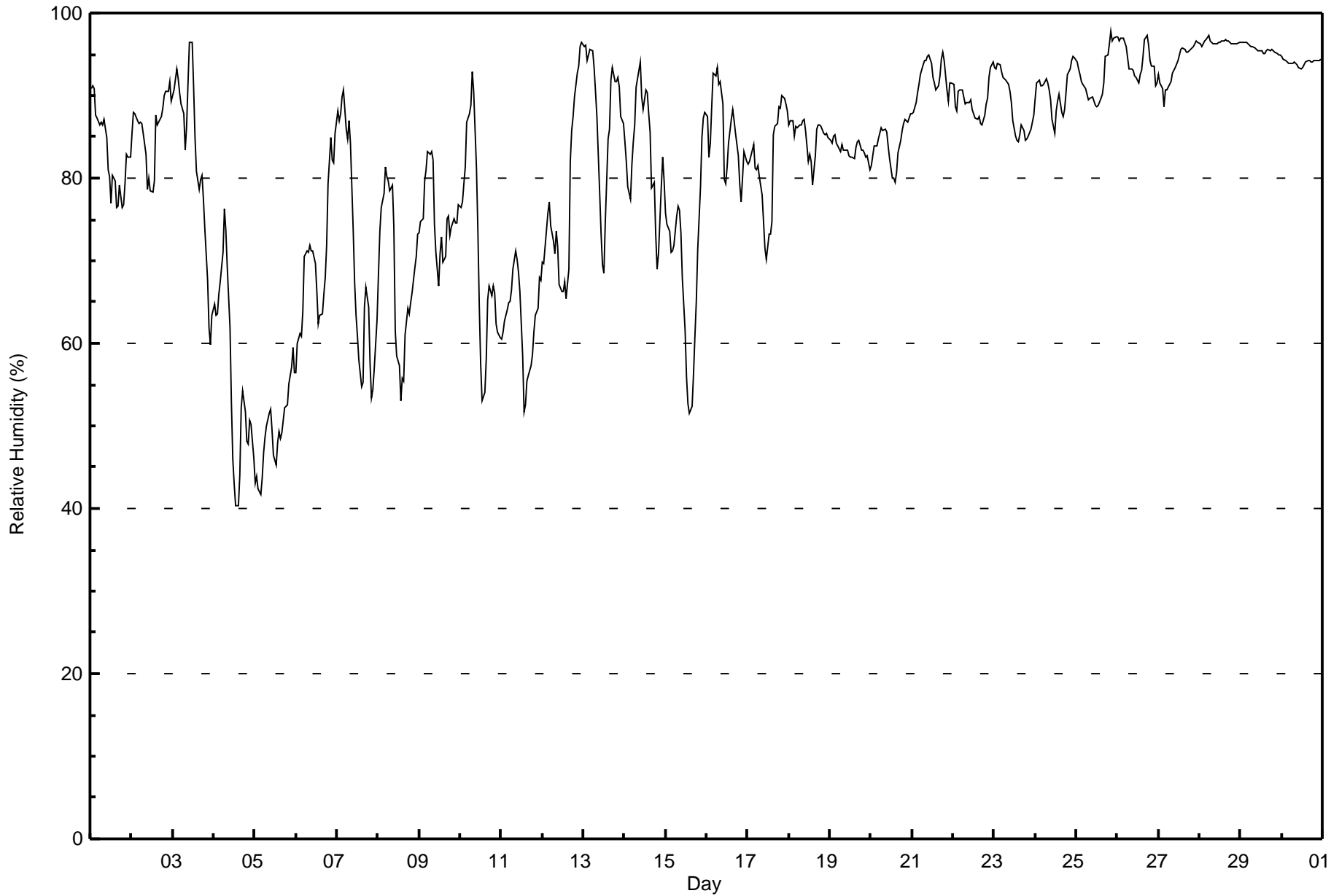
Wapasu - November 2016

Maximum Value: 98 % on Nov 25 21:00														Maximum Daily Average: 96.5 % on Nov 28														Hours in Service: 720																					
Minimum Value: 40 % on Nov 4 14:00														Minimum Daily Average: 49.4 % on Nov 5														Hours of Data: 720																					
Maximum Diurnal Average: 85.0 % at hour 7														Minimum Diurnal Average: 76.2 % at hour 14														Hours of Missing Data: 0																					
Monthly Average: 81.4 %														Percentiles: P ₁ = 44 P ₁₀ = 61 Q ₁ = 74 Median = 86 O ₃ = 92 P ₉₀ = 95 P ₉₉ = 97														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	91	91	91	88	87	86	87	86	87	85	81	80	77	80	80	76	77	79	76	77	79	83	83	83	82.9	91																							
2-Nov	85	88	88	87	87	87	87	85	83	79	80	78	78	80	88	86	87	88	89	90	91	91	92	89	85.8	92																							
3-Nov	90	91	93	92	90	89	88	83	86	92	97	96	91	85	81	79	80	80	77	74	68	62	60	63	82.8	97																							
4-Nov	65	63	64	66	67	71	76	74	69	62	53	46	43	40	40	44	52	54	52	48	48	51	50	46	56.0	76																							
5-Nov	43	44	42	42	44	47	49	50	51	52	50	46	45	48	49	49	49	52	52	53	55	57	59	56	49.4	59																							
6-Nov	56	60	61	61	64	71	71	71	72	71	71	70	66	62	63	63	66	68	72	79	85	82	82	85	69.8	85																							
7-Nov	88	87	88	90	91	86	85	87	84	74	67	63	61	58	55	55	64	67	64	58	53	54	57	63	70.8	91																							
8-Nov	68	74	76	78	81	80	80	78	79	74	61	59	57	53	56	55	61	64	64	65	66	69	71	73	68.5	81																							
9-Nov	73	75	75	80	81	83	83	83	82	74	71	67	71	73	70	70	75	75	73	74	75	75	75	77	75.4	83																							
10-Nov	76	77	79	81	87	88	89	93	91	81	74	65	57	53	54	58	65	67	66	67	66	62	61	61	71.6	93																							
11-Nov	61	61	63	64	65	65	67	69	71	70	69	66	58	52	53	55	56	57	59	61	63	64	68	68	62.7	71																							
12-Nov	70	70	74	76	77	74	72	71	74	72	67	66	66	68	65	69	82	86	88	90	93	93	96	96	77.3	96																							
13-Nov	96	96	94	95	96	95	93	91	87	78	73	70	69	75	85	86	92	93	92	92	91	87	87	87	87.7	96																							
14-Nov	84	82	79	77	82	84	86	91	93	94	90	88	91	90	88	86	79	80	73	69	71	79	83	80	83.3	94																							
15-Nov	76	74	73	71	71	72	75	77	76	73	68	62	56	53	52	52	56	61	65	71	79	85	87	88	69.7	88																							
16-Nov	88	83	84	89	93	92	93	91	92	89	80	79	81	84	87	88	87	85	83	79	77	80	83	82	85.4	93																							
17-Nov	82	82	83	84	81	81	82	80	78	75	71	70	73	73	75	85	86	87	89	88	90	90	89	88	81.8	90																							
18-Nov	86	87	87	85	86	86	86	86	87	87	86	82	83	82	79	83	86	86	86	86	85	85	85	85	85.2	87																							
19-Nov	85	84	85	85	84	84	83	84	83	83	83	83	83	83	82	84	84	85	83	83	83	83	83	81	83.5	85																							
20-Nov	82	83	84	84	85	85	86	86	86	86	84	82	80	80	80	81	83	85	86	87	87	87	87	88	84.2	88																							
21-Nov	88	88	89	90	91	93	94	94	94	95	95	94	92	91	91	91	92	94	95	94	91	89	92	91	92.1	95																							
22-Nov	91	89	88	90	91	91	90	89	89	89	89	88	88	87	87	87	87	86	88	89	90	92	93	94	89.3	94																							
23-Nov	93	93	94	94	93	92	92	92	91	91	89	87	85	85	84	85	86	86	85	85	85	86	87	88	88.7	94																							
24-Nov	90	91	92	91	91	91	92	91	91	90	87	85	88	89	90	88	88	88	90	93	93	94	95	95	90.6	95																							
25-Nov	94	93	92	92	91	91	90	89	90	90	89	89	89	89	90	90	92	95	95	96	98	97	97	97	92.3	98																							
26-Nov	97	97	97	97	96	96	95	93	93	93	92	92	91	93	93	95	97	97	96	94	94	94	91	91	94.4	97																							
27-Nov	92	91	91	89	91	91	91	92	93	93	93	94	95	96	96	96	95	95	95	96	96	96	97	96	93.7	97																							
28-Nov	96	96	96	97	97	97	97	96	96	96	96	96	96	96	97	97	97	97	96	96	96	96	96	96	96.5	97																							
29-Nov	97	96	96	96	96	96	96	96	96	96	95	95	95	95	95	95	96	95	96	95	95	95	95	95	95.6	97																							
30-Nov	95	94	94	94	94	94	94	94	94	94	93	93	93	94	94	94	94	94	94	94	94	94	94	94	94.0	95																							
																								82.6	82.7	83.1	83.5	84.3	84.6	85.0	84.8	84.6	82.5	79.9	77.8	76.7	76.2	76.6	77.5	79.7	80.9	80.6	80.8	81.3	81.9	82.5	82.6	Diurnal Average	
																								97	97	97	97	97	97	97	96	96	96	97	96	96	96	97	97	97	97	96	96	98	97	97	97	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Wapasu - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Wapasu - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	69	9.58	9.58
60 - 80	182	25.28	34.86
80 - 100	469	65.14	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

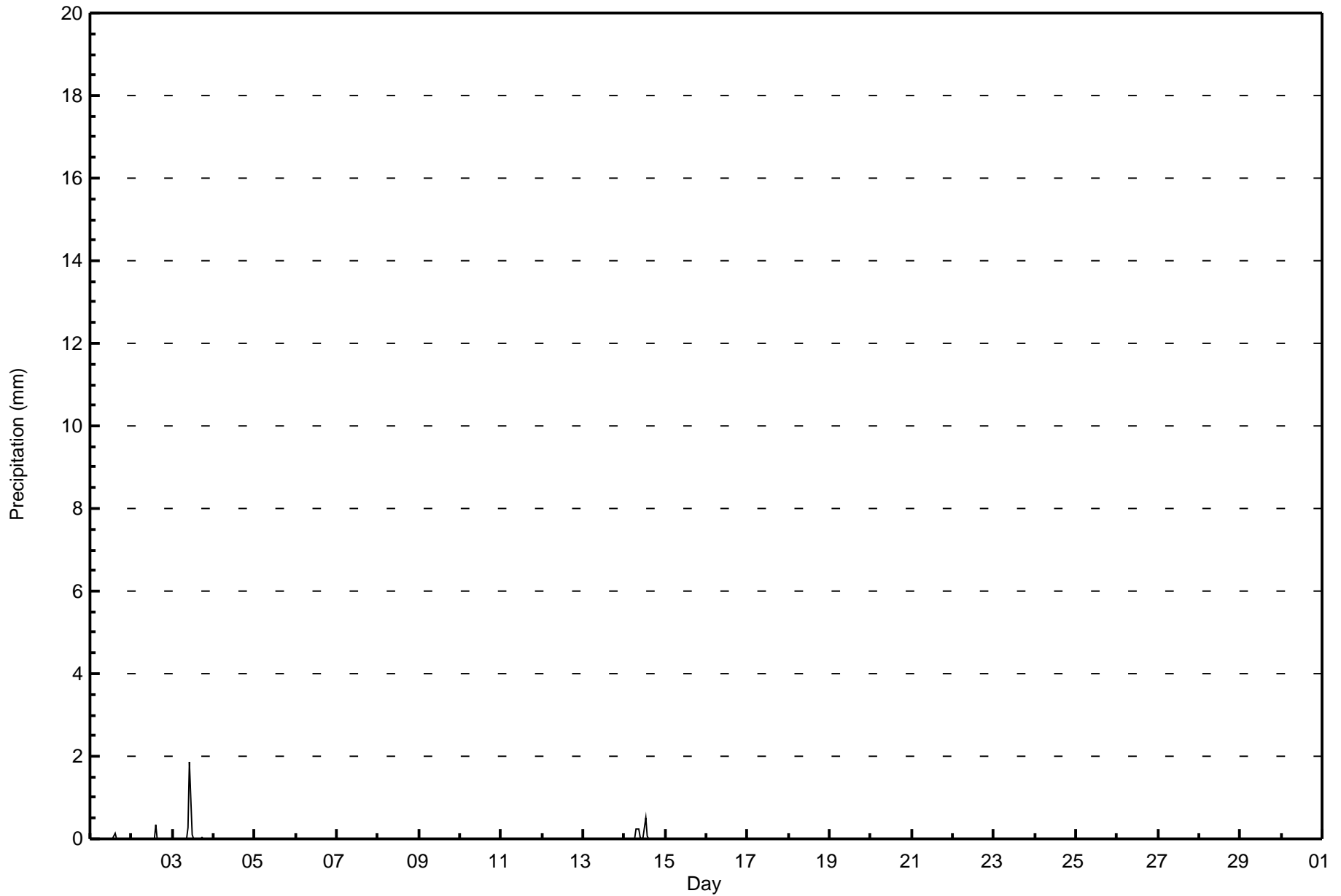
Wapasu - November 2016

Maximum Value: 1.9 mm on Nov 3 11:00														Maximum Daily Total: 2.3 mm on Nov 3														Hours in Service: 720	
Minimum Value: 0.0 mm on Nov 1 01:00														Minimum Daily Total: 0.0 mm on Nov 4														Hours of Data: 351	
Maximum Diurnal Total: 1.9 mm at hour 11														Minimum Diurnal Total: 0.0 mm at hour 1														Hours of Missing Data: 369	
Monthly Total: 3.95 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: 48.8	
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	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2			
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	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3		
3-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.9	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	1.9		
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		
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		
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		
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		
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		
9-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		
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		
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		
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		
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		
14-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.0	0.1	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.5		
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	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	--	0.0		
16-Nov	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	--	--		
17-Nov	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	--	--		
18-Nov	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	--	--		
19-Nov	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	--	--		
20-Nov	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	--	--		
21-Nov	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	--	--		
22-Nov	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	--	--		
23-Nov	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	--	--		
24-Nov	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	--	--		
25-Nov	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	--	--		
26-Nov	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	--	--		
27-Nov	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	--	--		
28-Nov	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	--	--		
29-Nov	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	--	--		
30-Nov	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	--	--		
														Diurnal Average															
														Diurnal Maximum															
DF - DAS Failure																													



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Wapasu - November 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

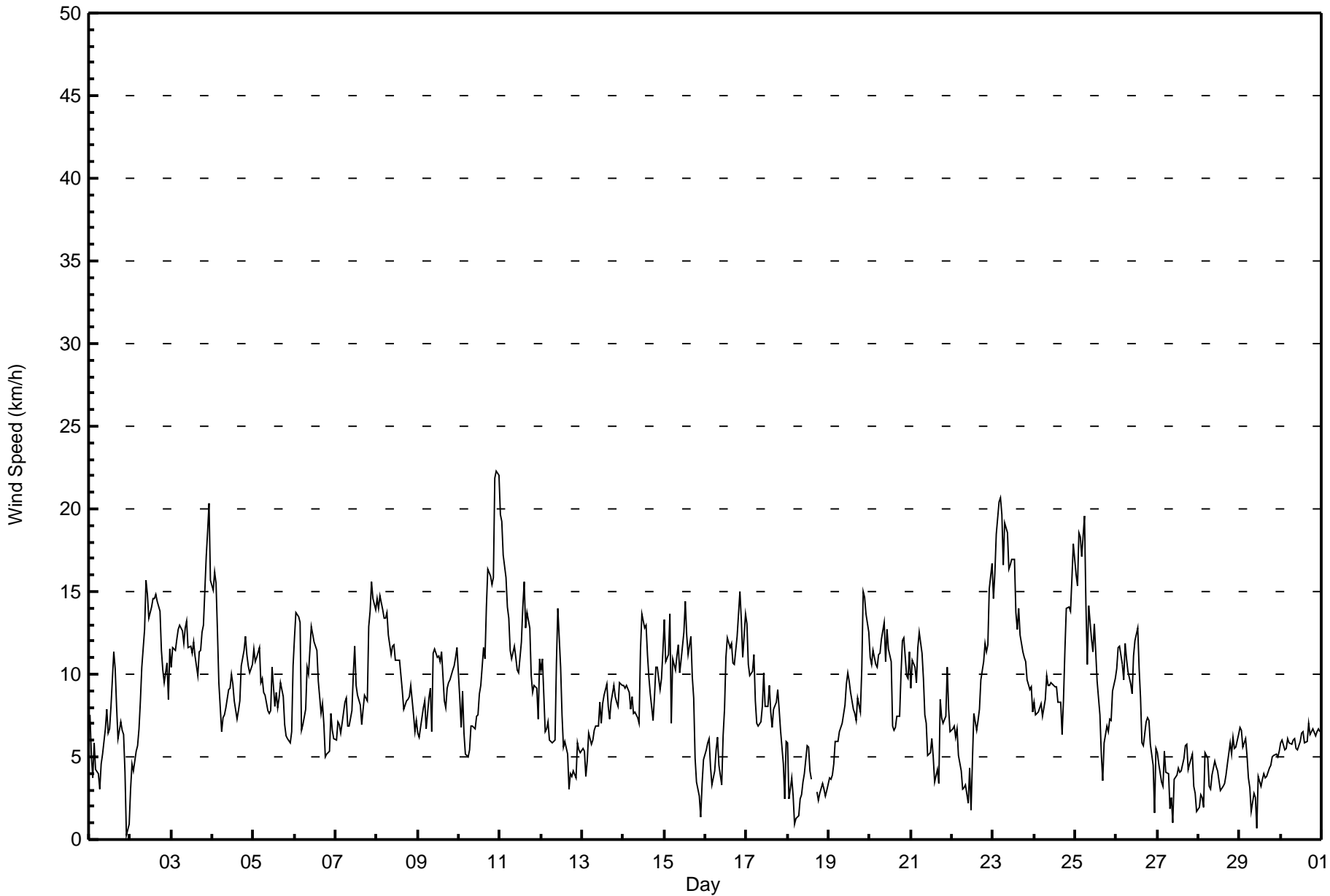
Wind Speed (WS) - km/h
Wapasu - November 2016

Maximum Speed: 22 km/h on Nov 10 23:00	Maximum Daily Speed Average: 14.6 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 1 23:00	Minimum Daily Speed Average: 0.6 km/h on Nov 29	Hours of Data: 718
Maximum Diurnal Speed Average: 6.4 km/h at hour 10	Minimum Diurnal Speed Average: 4.2 km/h at hour 19	Hours of Missing Data: 2
Monthly Average Velocity: 5.3 km/h 186.6 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 8 Q ₃ = 11 P ₉₀ = 14 P ₉₉ = 19	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-Nov	NW8	NW5	WNW4	NW6	NW4	NW4	NW3	NW5	NW5	NW7	NNW8	NW6	NW7	WNW8	NNW11	NW10	NW8	NNW6	NNW7	NNW7	NNW6	NNW4	WNW0	SW1	NW5.7	NNW11
2-Nov	SE3	SSE5	SSE4	SSE5	SSE6	SSE7	SSE8	SSE10	SSE13	S16	SSE15	SSE13	SSE14	S15	SSE15	S15	S14	S14	S11	S10	S9	S11	S8	S12	S10.3	SSE16
3-Nov	S10	S12	S11	S12	S13	S13	SSE13	SSE12	S13	SSW13	SSW12	S12	SSW11	SSW12	SSW11	S10	SSW11	S11	SSW13	SSW13	SW17	SW19	SW20	SW16	SSW12.3	SW20
4-Nov	SW15	SW16	SW16	SW13	SSW10	S7	S7	S8	S8	S9	S9	SSW10	SSW9	S8	S7	SSW8	S8	SSE10	SSE11	SSE12	SSE11	S11	S10	SSE11	S9.4	SW16
5-Nov	S12	SSE11	SSE12	S9	S10	S9	S9	S9	S8	S8	S8	S10	S8	S9	SSE8	SSE9	SSE9	S9	S7	S6	S6	S6	S7	SW10	S8.4	SSE12
6-Nov	WSW12	SW14	SW13	SW13	SSW7	S7	SSW8	SW10	SW10	SW11	SW13	SW12	SW12	SW11	SW10	SW8	SW8	SW7	SSW5	S5	S5	SSW8	SSW7	S6	SW8.9	SW14
7-Nov	SSW6	SSW7	SSW7	S6	S7	SSW8	SSW9	S7	S7	SSW8	SSW10	SW12	SSW9	SW9	SSW8	S7	S8	S9	SSE8	SSE13	SSE14	SSE16	SSE15	SSE14	S8.5	SSE16
8-Nov	SSE15	SSE14	SSE15	SSE14	SSE13	SSE13	S14	S12	S11	S12	S12	S11	SSW11	SSW11	S10	S9	S8	SSE8	S9	S9	S9	S8	SSE7	S7	S10.6	SSE15
9-Nov	SSE6	SSE6	SSE7	SSE8	SSE8	SSE7	S9	S9	S7	SW11	SW12	SW11	W11	WSW11	W11	W8	WSW8	WSW9	WSW9	WSW10	WSW10	SW10	SW11	SW12	SW7.4	SW12
10-Nov	SW9	SSW7	SW9	SSW6	S5	S5	S5	SSE7	SSE7	SSE7	SSE7	SSE8	S9	S9	SSE12	SSE11	SSE14	SSE16	SSE16	SSE15	SSE16	SSE22	SSE22	SSE22	SSE10.5	SSE22
11-Nov	SSE20	S19	S17	S16	S14	S13	SSW11	S11	SSW12	SSW11	SSW10	SSW10	SSW12	SW14	SW16	SW13	SW14	WSW13	WSW10	WSW9	WSW9	WSW9	SW7	SW11	SSW11.3	SSE20
12-Nov	SW10	SW11	S7	S7	S7	S6	SSE6	SSW6	S6	SSW11	SW14	SW10	SW8	SSW6	SW6	SW5	SSE3	SSE4	SE4	SE4	SE4	SSE6	SSE5	SSE5	SSW5.6	SW14
13-Nov	SSE6	SSE5	SE4	SE5	SSE6	SSE6	SSE6	SSE7	SSE7	S7	SSE8	S7	S8	S9	SSW9	S8	S7	S8	SSE9	SSE9	SSE8	SSE8	S9	S9	SSE7.2	S9
14-Nov	SSE9	SSE9	SSE9	S9	S8	SSW9	S8	SSW8	SSW7	SSW7	SW11	WSW14	WSW13	WSW13	WSW11	W10	W9	WSW7	WSW9	WSW10	WSW10	SW9	SW10	WSW11	SW8.1	WSW14
15-Nov	WSW13	SW11	SW11	WSW14	SW7	SW11	SW10	SW11	WSW12	SW10	SW11	WSW13	WSW14	WSW12	SW11	SW12	WSW10	SW9	WSW5	WNW4	WNW3	SE1	E3	NE5	WSW8.4	WSW14
16-Nov	NE5	NE6	NE6	NE4	E3	ENE4	ENE5	NE6	ENE5	NE3	N6	NNW8	N11	N12	N12	N11	N11	N12	N14	N15	NNW13	NNW11	NNW14	N7.9	N15	
17-Nov	NNW13	NNW11	NNW10	NNW10	NNW11	NNW8	NNW7	WNW7	WNW7	WNW8	NNW10	WNW8	W8	W9	W8	W7	WNW8	NNW8	N9	NNW8	NNW7	NW5	NW2	NNW6	NW7.4	NNW13
18-Nov	N6	NNE2	N4	NNW3	NNW1	W1	WSW1	WSW2	SW3	SW3	WNW4	NW6	N6	NNW4	NW4	AF	AF	SE3	SE2	SSE3	E3	E3	E3	SE3	NNW0.9	N6
19-Nov	SSE4	ESE4	ESE4	ESE5	ESE6	ESE6	SE7	ESE7	SE7	SE8	SE9	SE10	SE10	ESE9	SE8	ESE8	ESE7	SE9	SSE8	SE10	SE15	SE15	SE14	SE13	SE8.2	SE15
20-Nov	SE11	SE11	SE11	SE11	SE10	SE11	SE11	SSE12	SE13	SSE11	SSE13	SSE12	SSE11	SSE7	SSE7	SSE7	SSE7	SSE7	SSE10	SSE12	SSE12	SSE10	SSE10	SE11	SSE10.2	SE13
21-Nov	SSE9	SSE11	SSE10	SSE9	SSE12	SSE13	SSE11	SSE10	S8	S7	S5	SW5	WSW6	W5	W4	NW4	NW3	N8	NNE7	NNE7	N7	N10	N8	N7	S2.0	SSE13
22-Nov	N7	NNE7	NNE6	NE7	NE5	NE4	NE3	NE3	NE3	SE2	SSE4	SSW2	SSW5	SSW8	SSW7	S7	S8	S10	S11	S12	SSE11	SSE12	SSE15	SSE17	SSE4.0	SSE17
23-Nov	S15	SSE16	SSE18	SSE20	SSE21	SSE20	SSE17	SSE19	SSE19	S16	SSE17	S17	SSE17	S14	S13	SSE14	SSE12	S11	S11	SSE11	S10	S9	S9	S8	SSE14.6	SSE21
24-Nov	S8	S8	S8	S8	S8	S7	S8	S10	S9	S9	S10	SSW9	S9	SSW9	SSW8	SSW8	S6	SSE8	SE11	SSE14	SE14	SE14	SE16	SE18	S9.1	SE18
25-Nov	SE16	SE15	SE19	SE18	SE17	SE20	SSE14	SSE11	SSE14	SSE12	SSE11	SSE13	SSE11	SSE10	SSE8	SSE5	S4	SW6	WSW7	W7	W7	WSW7	WSW9	WSW10	SSE8.7	SE20
26-Nov	WSW10	WSW12	WSW12	WSW11	WSW10	WSW12	WSW11	WSW10	WSW9	SW9	SW11	WSW12	SW13	SW10	SSW9	S6	S6	S7	SSE7	SSE7	SSE6	SSE5	ESE2	SE6	SW7.1	SW13
27-Nov	SE5	SE5	ESE3	NE3	ENE5	E4	ESE4	E2	NNE3	NNE1	NE4	NE4	NNE4	NE4	NNE4	NE5	NE6	NE6	NE4	NE5	ENE5	ENE3	ENE3	ENE2	ENE3.2	NE6
28-Nov	NE2	ENE3	SE3	S2	WSW5	WSW5	SW3	SSW3	SW4	SW5	SW4	WSW4	WSW4	W3	NW3	NW3	NNW4	N5	N6	NNW5	NNW6	N6	N6	NNW6	WNW1.9	NNW6
29-Nov	NNW7	NNW7	N6	N6	N5	NNE4	N3	NE2	NE3	NNE3	S1	SW4	S3	S4	SSE4	S4	S4	S4	SSW5	S5	S5	S5	S5	S5	SSW0.6	NNW7
30-Nov	S6	S6	S5	S5	S6	S6	S6	S6	S6	S6	S5	S6	SSE6	S7	S6	S6	S7	S6	S7	S7	S6	S7	S7	S6	S6.1	S7

S4.8	S5.2	S5.4	S5.3	S5.4	S5.7	S5.9	S5.9	S5.9	S5.9	S6.4	SSW6.4	SSW6.4	SSW6.1	SSW6.1	SSW5.3	SSW4.8	S4.4	S4.5	S4.2	S4.5	S4.4	S4.9	S5.3	S5.3	Diurnal Average
SSE20	S19	SE19	SSE20	SSE21	SSE20	SSE17	SSE19	SSE19	S16	SSE17	SSE17	SSE17	S15	SW16	S15	S14	SSE16	SSE16	SSE15	SW17	SSE22	SSE22	SSE22	SSE22	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
Wapasu - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	152	21.17	21.17
6 - 11	412	57.38	78.55
12 - 19	145	20.19	98.75
20 - 28	9	1.25	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 718

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Wapasu - 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	4	7	19	9	7	6	12	16	22	5	10	7	4	5	13	6	152
6 - 11	18	4	6	0	0	6	19	75	122	46	39	29	11	4	14	19	412
12 - 19	6	0	0	0	0	0	14	53	24	7	23	15	0	0	0	3	145
20 - 28	0	0	0	0	0	0	1	7	0	0	1	0	0	0	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	28	11	25	9	7	12	46	151	168	58	73	51	15	9	27	28	718

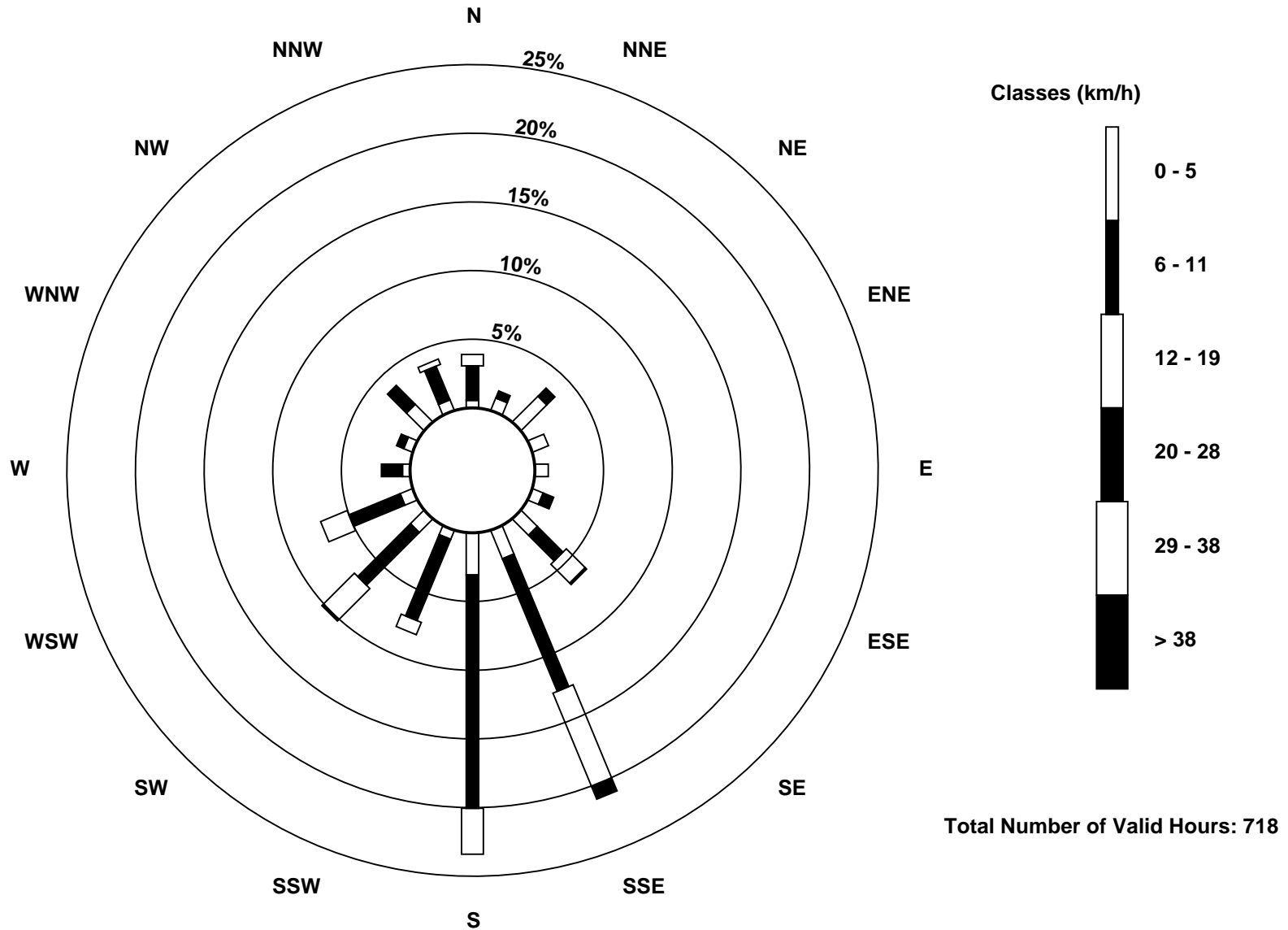
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Wapasu (AMS 17)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Wapasu - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 6 km/h on Nov 23 05:00	Hours of Data: 718
Minimum Value: 0 km/h on Nov 13 06:00	Hours of Missing Data: 2
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6	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-Nov	2	2	1	2	1	1	1	1	1	2	2	2	3	3	3	2	2	2	2	2	2	1	1	1	3	
2-Nov	1	1	1	1	1	1	2	3	4	5	4	4	4	4	5	5	5	5	3	4	3	3	3	3	5	
3-Nov	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	3	4	4	5	4	5	4	5	
4-Nov	4	3	4	4	3	2	2	2	2	3	3	3	3	3	2	3	2	3	3	3	3	3	3	3	4	
5-Nov	3	3	3	3	3	3	2	3	2	2	3	4	3	3	2	2	2	2	3	2	2	1	2	2	4	
6-Nov	3	3	3	3	2	2	3	3	3	3	3	3	3	3	2	2	2	2	1	1	1	3	2	2	3	
7-Nov	1	2	2	2	2	2	2	2	2	3	3	4	3	3	3	2	2	2	2	3	3	4	4	4	4	
8-Nov	4	4	4	4	3	4	4	4	4	3	4	3	4	3	3	3	2	2	2	2	3	2	1	2	4	
9-Nov	2	1	2	1	2	2	2	3	2	4	4	4	3	3	3	3	2	2	2	2	2	3	2	2	4	
10-Nov	2	2	2	2	1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	5	6	6	6	
11-Nov	6	6	6	5	5	4	4	3	4	3	3	3	4	5	4	4	4	3	2	2	2	2	2	2	6	
12-Nov	3	2	2	2	2	2	1	2	2	5	3	3	3	2	2	1	1	1	1	1	1	1	1	1	5	
13-Nov	1	1	1	1	1	0	1	1	1	2	2	2	3	3	3	2	2	2	3	2	2	2	3	2	3	
14-Nov	2	2	2	3	2	3	2	2	2	2	3	3	3	3	3	3	4	2	2	3	3	2	3	3	4	
15-Nov	3	3	3	3	2	3	2	3	3	3	3	3	4	3	3	3	2	3	1	1	1	2	1	1	4	
16-Nov	1	1	1	1	1	1	1	1	1	1	2	2	3	4	4	3	3	3	4	4	4	5	4	3	4	5
17-Nov	3	3	3	3	3	3	2	2	2	3	3	2	2	3	3	2	3	3	3	3	2	2	1	2	3	
18-Nov	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	AF	AF	1	1	1	1	1	1	1	2	
19-Nov	1	1	1	1	1	1	2	2	2	2	3	3	3	2	2	2	2	2	3	4	4	4	4	3	4	
20-Nov	3	3	3	3	2	3	3	3	4	3	4	4	3	2	2	2	2	2	3	3	3	3	3	3	4	
21-Nov	4	4	4	3	3	4	3	3	2	3	2	2	1	1	1	1	1	3	3	2	2	3	2	2	4	
22-Nov	2	2	2	2	2	1	2	2	1	1	2	1	2	3	2	3	3	3	3	4	4	4	5	6	6	
23-Nov	5	6	6	6	6	6	5	6	6	6	6	6	5	5	4	4	4	3	3	4	3	3	3	2	6	
24-Nov	3	2	2	3	3	2	3	3	3	3	3	3	3	3	3	3	2	2	3	4	4	3	4	5	5	
25-Nov	5	5	5	5	5	6	6	4	5	4	4	4	4	3	3	2	1	2	1	2	2	2	2	2	6	
26-Nov	3	3	3	3	3	3	2	2	3	2	3	3	3	4	3	2	2	2	2	1	1	1	1	1	4	
27-Nov	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	
28-Nov	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	2	2	
29-Nov	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	
30-Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	3	
	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5	4	4	5	6	6	6		

Diurnal Maximum

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Wapasu - November 2016

Direction of Maximum Speed: 159 deg on Nov 10 23:00		Hours in Service: 720
Direction of Maximum Daily Speed Average: 167.8 deg on Nov 23		Hours of Data: 718
Direction of Minimum Speed: 285 deg on Nov 1 23:00	Direction of Minimum Daily Speed Average: 0.6 deg on Nov 29	Hours of Missing Data: 2
Monthly Average Direction: 204.6 deg		Percent Operational Time: 99.7

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	324	325	294	311	321	323	315	317	317	314	330	319	311	300	327	325	326	329	329	335	342	328	285	219	321.4
2-Nov	129	154	150	159	151	152	159	163	164	169	163	161	167	169	167	182	182	184	179	183	183	182	186	185	170.8
3-Nov	187	188	185	182	180	178	167	167	179	201	193	187	193	208	193	183	192	191	198	203	220	227	227	223	196.1
4-Nov	226	229	226	215	205	186	172	175	172	172	178	194	198	186	184	194	169	162	161	161	168	174	173	166	187.8
5-Nov	169	164	159	160	174	177	175	183	188	178	176	175	190	175	167	162	157	178	170	173	178	190	177	235	175.3
6-Nov	238	228	229	225	195	182	210	222	219	225	228	231	235	226	229	223	226	224	206	173	174	204	192	189	218.9
7-Nov	195	210	199	188	190	202	197	182	182	193	205	223	211	216	202	189	171	169	159	157	153	153	155	163	182.5
8-Nov	155	156	158	163	159	163	173	169	169	174	183	190	198	206	187	187	175	164	171	176	181	175	166	169	172.5
9-Nov	165	166	163	152	154	155	172	181	189	216	230	234	264	256	261	259	249	246	245	242	243	236	234	233	221.7
10-Nov	225	203	219	210	187	188	183	155	156	158	165	165	181	178	156	156	153	153	160	163	166	156	159	160	167.6
11-Nov	166	173	179	174	179	188	196	191	194	195	194	199	205	219	224	218	228	240	247	253	247	242	221	225	203.9
12-Nov	224	228	190	179	184	180	168	195	191	212	230	236	233	211	223	219	148	148	140	146	129	153	148	150	197.2
13-Nov	151	153	132	143	150	149	164	152	160	176	168	169	176	189	192	175	172	173	167	159	156	165	169	169	166.0
14-Nov	167	167	166	172	181	192	186	199	203	205	233	246	244	244	250	268	278	247	251	253	246	230	235	241	225.0
15-Nov	244	234	233	240	225	231	236	235	241	232	233	242	242	238	229	236	238	232	251	291	291	166	83	37	237.7
16-Nov	43	37	41	43	85	73	58	55	61	42	354	334	357	1	3	360	2	2	355	351	350	348	346	344	5.9
17-Nov	340	340	338	338	338	327	304	308	291	293	305	285	271	277	278	278	310	315	350	345	318	315	324	338	315.5
18-Nov	351	24	357	346	341	281	240	240	228	229	299	326	353	334	322	AF	AF	138	140	150	87	98	96	130	343.8
19-Nov	152	123	120	117	112	113	125	123	125	140	134	137	130	123	124	119	120	125	148	144	136	128	132	132	129.5
20-Nov	141	136	127	138	134	136	143	147	145	151	162	161	151	160	166	163	162	164	153	151	150	154	150	144	148.6
21-Nov	162	163	159	166	156	160	162	162	169	173	189	216	251	267	265	308	320	350	20	25	3	349	2	3	169.3
22-Nov	6	12	25	39	39	48	39	53	48	130	168	198	194	193	202	179	174	174	177	170	168	164	163	163	156.4
23-Nov	170	167	162	162	160	163	165	164	164	169	166	169	165	172	174	158	155	177	172	168	183	186	189	191	167.8
24-Nov	188	191	186	188	179	187	184	190	189	190	182	200	184	192	200	194	180	149	136	147	144	136	138	133	169.5
25-Nov	138	139	135	135	142	136	152	164	160	160	160	154	158	166	162	168	179	234	243	262	264	255	247	249	163.3
26-Nov	247	244	251	254	257	247	240	244	251	235	234	237	231	216	199	171	174	179	154	149	156	164	102	143	223.3
27-Nov	137	128	123	37	68	93	113	85	29	19	43	47	29	34	21	35	37	45	44	51	59	59	59	60	59.8
28-Nov	48	68	142	171	242	240	219	201	221	232	231	240	248	276	310	322	343	351	351	341	343	349	354	346	300.1
29-Nov	347	346	349	350	359	17	10	38	39	27	178	228	182	169	167	184	175	179	195	184	186	188	186	188	201.0
30-Nov	175	189	182	182	178	183	178	169	171	172	176	173	168	184	182	179	172	175	177	179	183	176	186	185	178.1

185.8 183.6 178.3 177.3 170.0 173.0 176.7 178.7 181.3 190.3 196.8 203.7 205.3 208.2 205.0 198.4 189.5 186.9 181.1 177.8 181.6 180.9 177.3 181.3

Diurnal Average

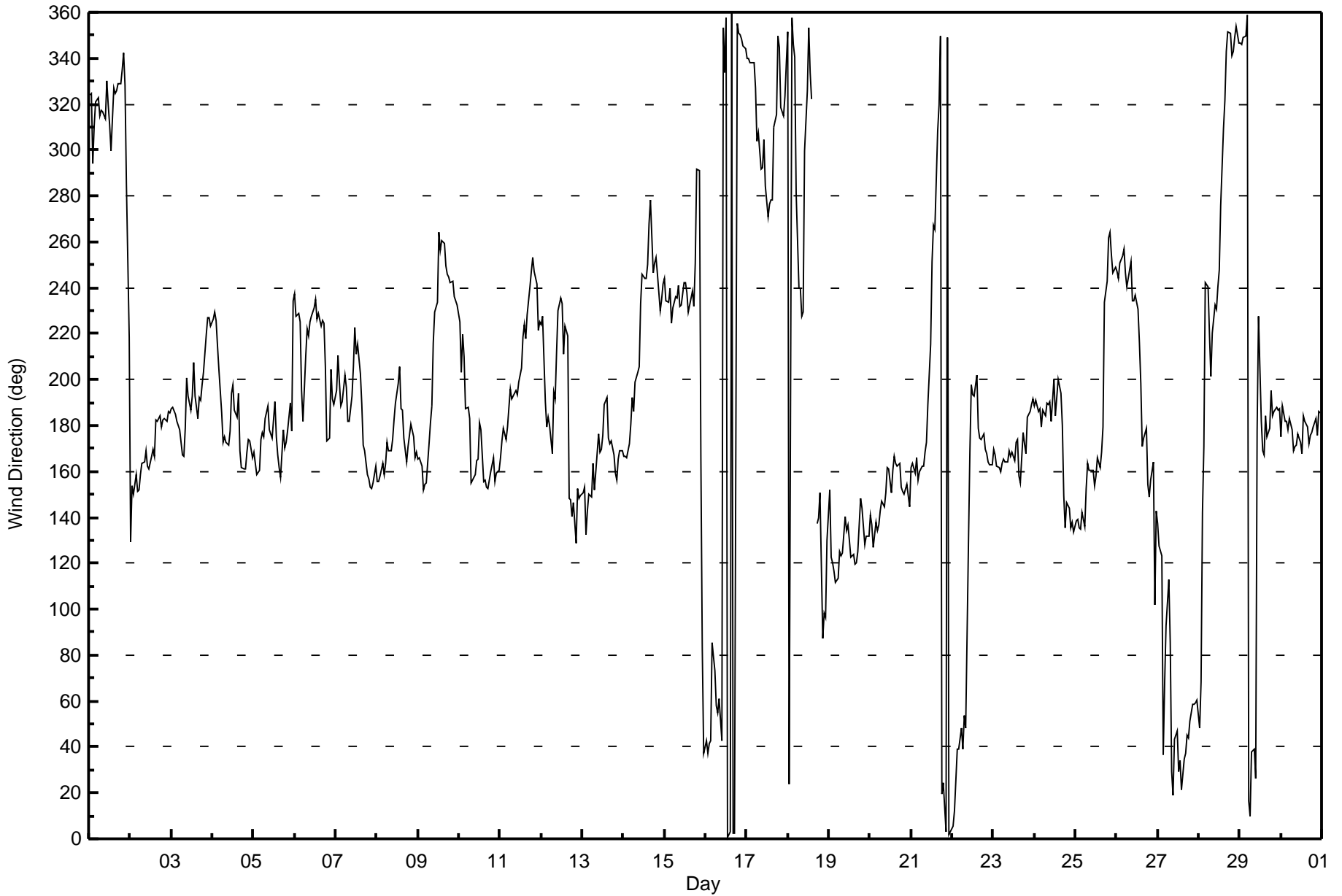
AF - Analyzer Failure

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Wapasu - November 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Wapasu - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 96 deg on Nov 1 23:00	Hours of Data: 718
Minimum Value: 6 deg on Nov 13 05:00	Hours of Missing Data: 2
Percentiles: P ₁ = 10 P ₁₀ = 17 Q ₁ = 19 Median = 24 O ₃ = 28 P ₉₀ = 31 P ₉₉ = 58	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-Nov	19	21	30	27	22	24	33	23	26	24	21	25	24	30	20	21	19	19	24	23	17	40	96	90	96
2-Nov	34	14	22	15	15	15	18	21	22	27	22	24	25	26	23	31	30	33	30	29	28	29	30	28	34
3-Nov	29	31	30	28	27	27	23	26	29	29	29	32	29	28	31	28	29	30	28	28	22	16	16	18	32
4-Nov	16	14	18	25	29	25	19	23	23	25	27	30	30	28	27	29	21	21	21	25	25	23	23	30	
5-Nov	25	21	19	21	26	27	25	28	26	27	25	30	29	26	25	20	19	28	20	18	21	22	23	26	30
6-Nov	17	14	16	17	30	27	24	18	20	16	16	17	19	16	17	19	14	19	21	22	13	20	25	22	30
7-Nov	23	21	24	22	24	26	27	26	25	28	24	21	23	24	27	26	21	21	18	18	17	18	20	22	28
8-Nov	19	21	19	23	20	24	24	26	26	28	30	28	31	27	29	28	25	20	24	24	28	24	17	22	31
9-Nov	18	21	21	13	17	22	23	32	28	23	16	20	28	23	25	24	19	18	19	21	18	15	16	15	32
10-Nov	18	23	15	23	32	26	23	12	16	23	21	28	31	28	20	19	17	18	21	23	25	20	22	23	32
11-Nov	25	27	28	28	28	29	28	28	29	28	29	28	27	22	18	23	18	15	20	23	18	17	17	15	29
12-Nov	18	15	24	24	28	23	23	26	26	28	16	19	27	25	22	18	23	13	25	13	18	9	10	8	28
13-Nov	7	13	27	7	6	7	10	12	11	24	26	24	27	27	28	25	25	24	24	24	20	20	24	21	28
14-Nov	22	23	25	27	28	28	30	27	27	25	18	19	18	19	20	26	28	20	25	24	21	14	17	18	30
15-Nov	17	17	18	16	23	17	15	16	17	20	20	19	19	20	17	16	16	20	28	38	32	69	25	16	69
16-Nov	15	17	16	16	19	22	22	12	16	25	29	23	23	25	26	24	25	26	22	20	20	20	19	17	29
17-Nov	17	17	17	18	19	19	26	25	27	29	27	29	28	29	30	29	24	24	23	19	22	22	22	18	30
18-Nov	24	22	29	28	48	52	50	28	19	17	40	22	26	36	34	AF	AF	23	16	18	21	28	31	36	52
19-Nov	26	17	14	19	16	19	19	18	20	19	19	20	21	20	21	20	23	22	29	26	19	19	19	19	29
20-Nov	19	18	20	20	17	17	17	18	20	22	22	24	21	29	28	28	23	26	22	19	19	19	20	22	29
21-Nov	29	25	23	24	22	22	22	22	25	27	28	26	22	29	41	28	54	24	30	29	27	19	25	29	54
22-Nov	25	31	28	25	26	27	36	38	42	52	36	63	31	30	30	28	29	29	29	26	28	25	24	26	63
23-Nov	29	26	24	23	22	24	27	23	23	27	24	26	24	29	30	23	23	28	28	27	31	31	30	31	31
24-Nov	28	31	28	28	30	27	28	28	29	29	29	30	30	29	28	27	17	19	19	18	18	19	20	31	31
25-Nov	21	21	19	19	22	20	27	28	24	24	25	21	24	24	26	24	25	19	19	25	27	23	18	21	28
26-Nov	19	17	20	23	24	18	17	18	22	16	15	16	18	27	31	30	31	27	19	16	15	16	59	9	59
27-Nov	12	13	27	30	13	35	19	60	46	76	33	29	26	29	30	26	26	25	27	23	21	20	17	23	76
28-Nov	21	14	54	43	18	15	23	26	23	14	16	17	28	37	29	25	19	23	19	18	16	21	21	19	54
29-Nov	17	17	19	19	27	34	28	37	33	35	51	20	33	27	29	31	26	29	29	30	31	31	32	32	51
30-Nov	31	31	31	32	32	32	31	30	27	29	32	31	29	32	32	32	30	30	30	30	30	31	32	33	33

34	31	54	43	48	52	50	60	46	76	51	63	33	37	41	32	54	33	30	38	32	69	96	90	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 15, 2016	Last Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	12:24
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-654	-654
Analyzer IP address	192.168.1.43		Lamp voltage	982	982
Calculated slope	0.998183	0.994649	Chamber temp	45.1	45.1
Calculated intercept	1.494126	1.255921	Pressure	680.8	680.8
Analyzer Background	9.2	8.8	Flow	0.447	0.447
Analyzer Coefficient	1.027	1.047	Intensity	91	91

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	-0.4	----
as found span	5000	60.5	578.4	565.1	1.024
calibrator zero	5000	0.0	0.0	0.6	----
high point	5000	60.5	578.4	581.1	0.995
second point	5000	30.2	288.7	288.2	1.002
third point	5000	15.2	145.3	142.9	1.017
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	60.5	578.4	580.1	0.997
Average Correction Factor					1.005

Corrected As found 565.5 Previous response 577.9 % change 2.2%

Notes:

Inlet filter changed after as founds. Adjusted zero and span. No maintenance done

Calibration Performed By: Melissa Lemay



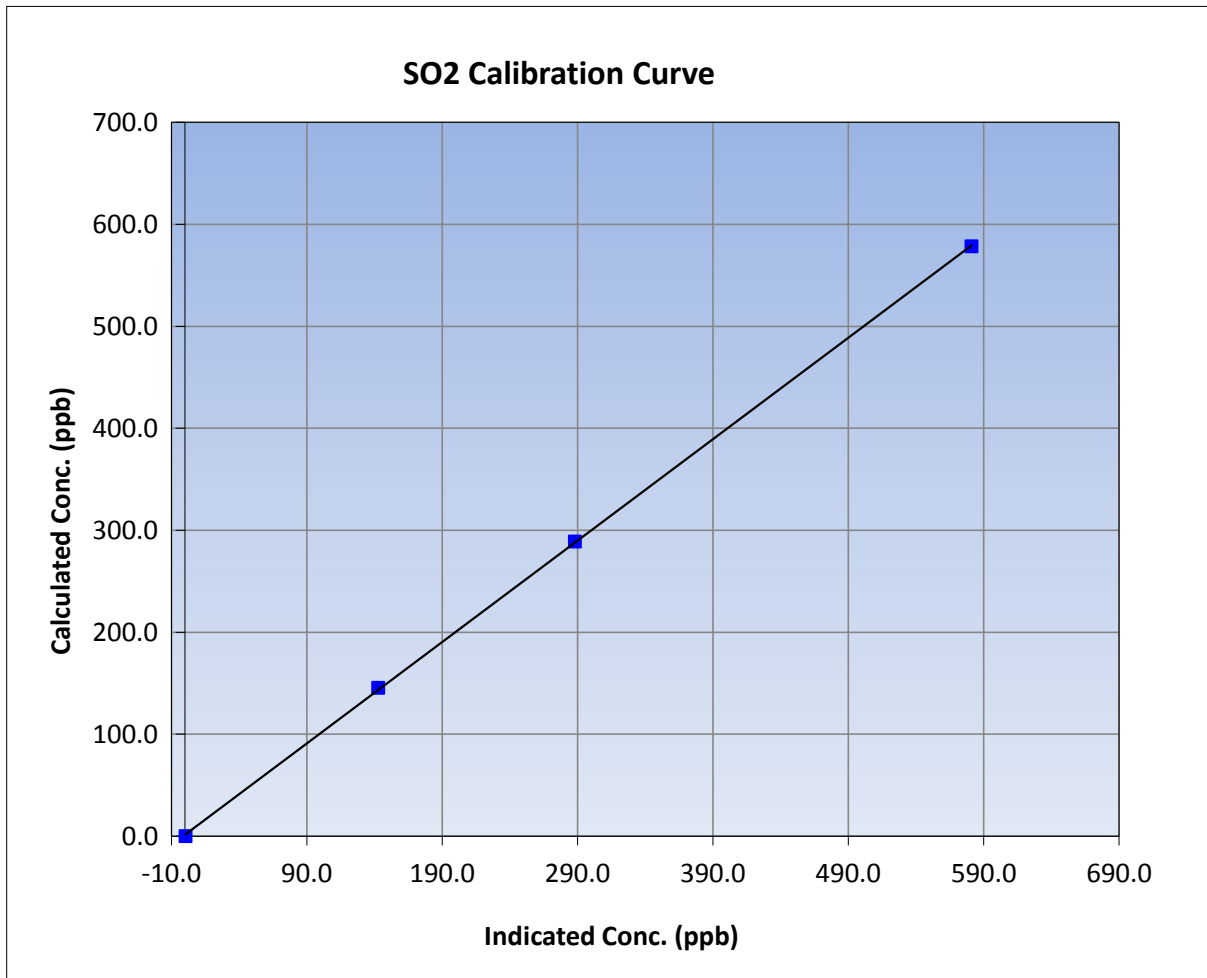
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:10	End Time (MST)	12:24
Analyzer make	Thermo 43i	Analyzer serial #	1218153459

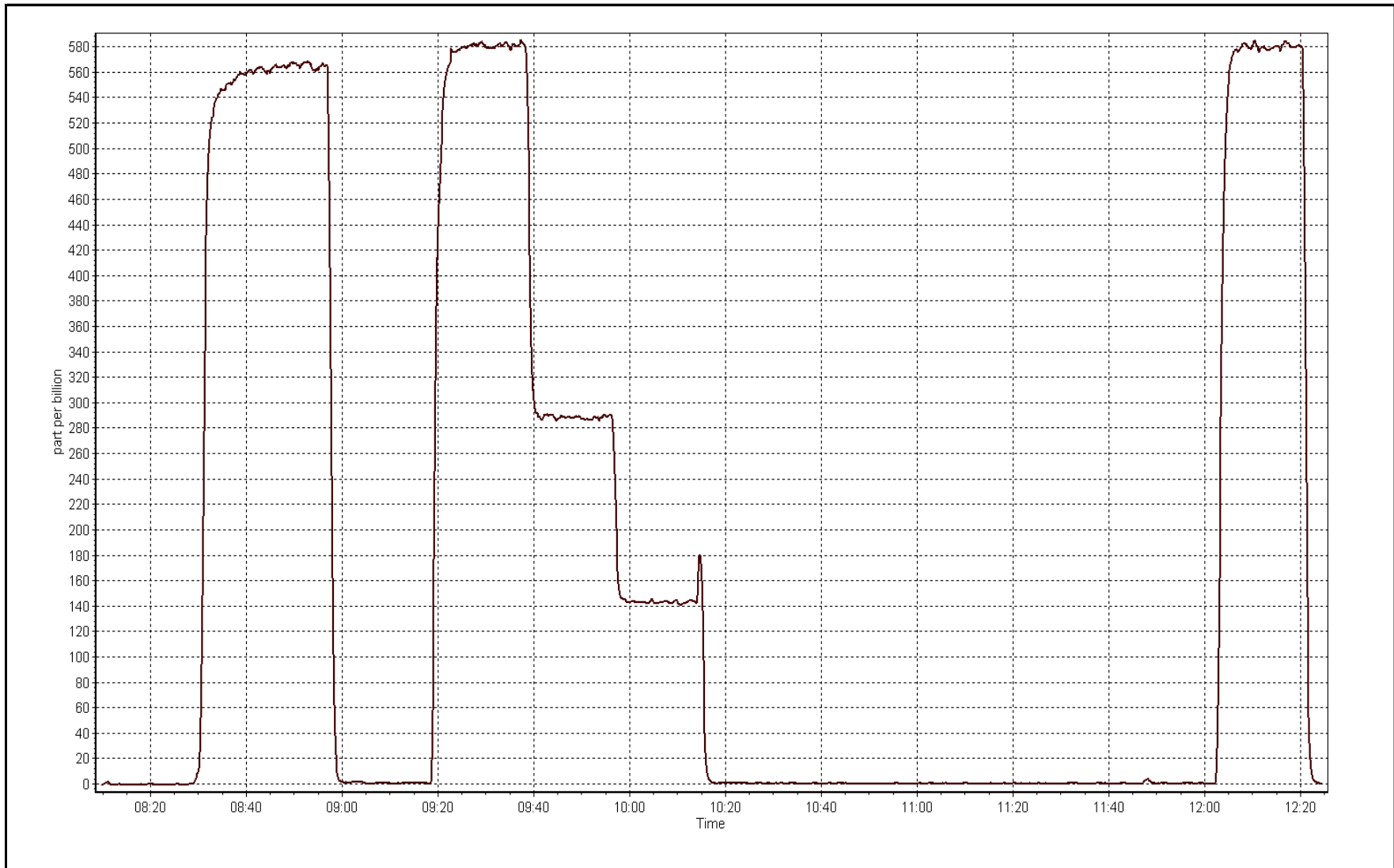
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999953
578.4	581.1	0.9953		
288.7	288.2	1.0018	Slope	0.994649
145.3	142.9	1.0169		
			Intercept	1.255921



SO2 Calibration Plot

Date: November 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 16, 2016	Last Calibration	October 26, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	7:54	End Time (MST)	13:31
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	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-651	-675
Analyzer IP address	192.168.1.45		Lamp voltage	787	758
Calculated slope	0.995120	0.994828	Chamber temp	45	45
Calculated intercept	0.089024	-0.454104	Pressure	553.1	553.1
Analyzer Background	14.4	13.9	Flow	0.933	0.933
Analyzer Coefficient	1.225	1.028	Intensity	113	100
			Converter temp.	340	340

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	-0.1	----
as found span	5000	78.3	79.9	78.5	1.017
SO2 scrubber check	5000	19.9	190.2	1.4	----
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	78.3	79.9	80.6	0.991
second point	5000	39.3	40.1	41.0	0.978
third point	5000	19.7	20.1	20.7	0.971
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	78.3	79.9	77.9	1.025
Average Correction Factor					0.980

Corrected As found	78.6	Previous response	80.2	% change	2.0%
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Notes:

filter changed out, lamp voltage adjusted, Lamp intensity adjusted, PMT adjusted, zero and span adjusted, calibration continued at 11:15MST scrubber checked before calibrator zero

Calibration Performed By: Melissa Lemay



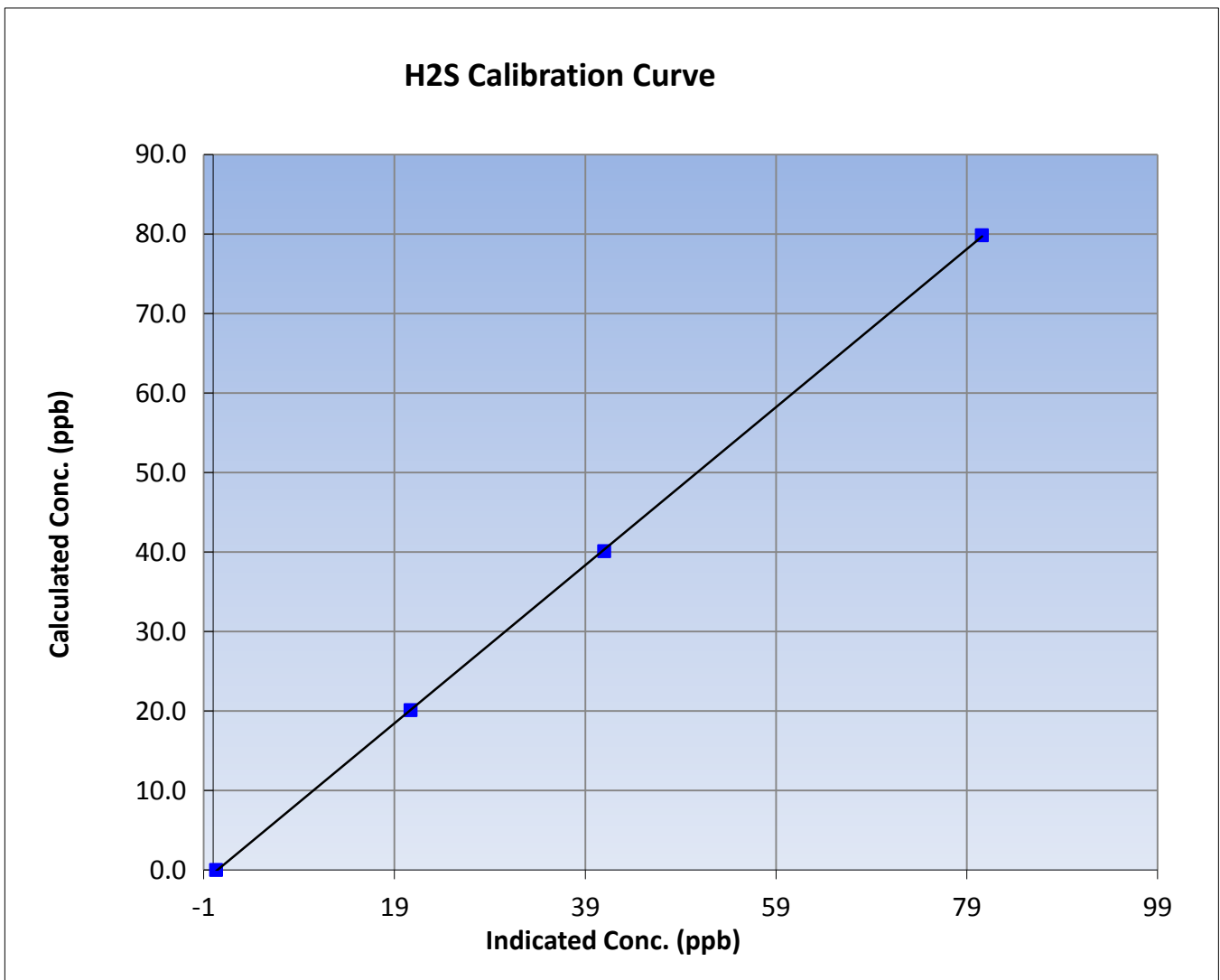
Wood Buffalo Environmental Association H2S Calibration Report

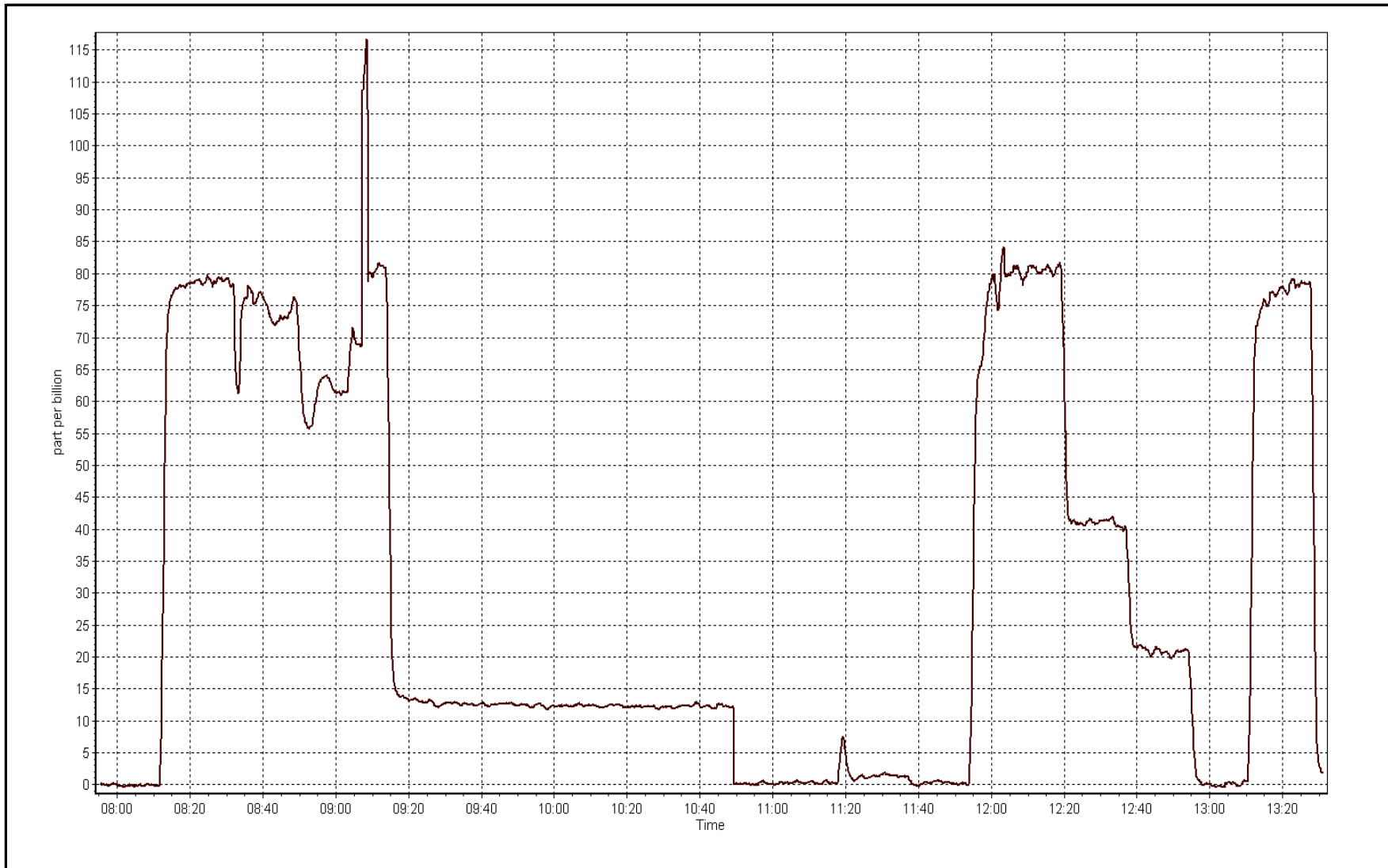
Station Information

Calibration Date	November 16, 2016	Previous Calibration	October 26, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	7:54	End Time (MST)	13:31
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	0.3	----	Correlation Coefficient	0.999969
79.9	80.6	0.9909		
40.1	41.0	0.9777	Slope	0.994828
20.1	20.7	0.9707		
			Intercept	-0.454104







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 15, 2016	Last Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	12:23
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

	<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	41.0	41.0
Calculated slope	1.000876	1.003832	Fuel Pressure	24.8	24.8
Calculated intercept	-0.001598	-0.023705	Analyzer Coeff	4.328	4.462
			Analyzer BKG	2.960	2.910

Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352
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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	-0.18	----
as found span	5000	60.5	13.22	12.68	1.042
calibrator zero	5000	0.0	0.00	0.01	----
high point	5000	60.5	13.22	13.18	1.003
second point	5000	30.2	6.60	6.61	0.998
third point	5000	15.2	3.32	3.34	0.994
as left zero	5000	0.0	0.00	0.04	----
as left span	5000	60.5	13.22	13.25	0.997
Average Correction Factor					0.998

Corrected As found	12.86	Previous response	13.21	% change	2.7%
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Notes:

Inlet filter changed after as founds. Adjusted zero and span. No maintenance done

Calibration Performed By:

Melissa Lemay



Wood Buffalo Environmental Association THC Calibration Report

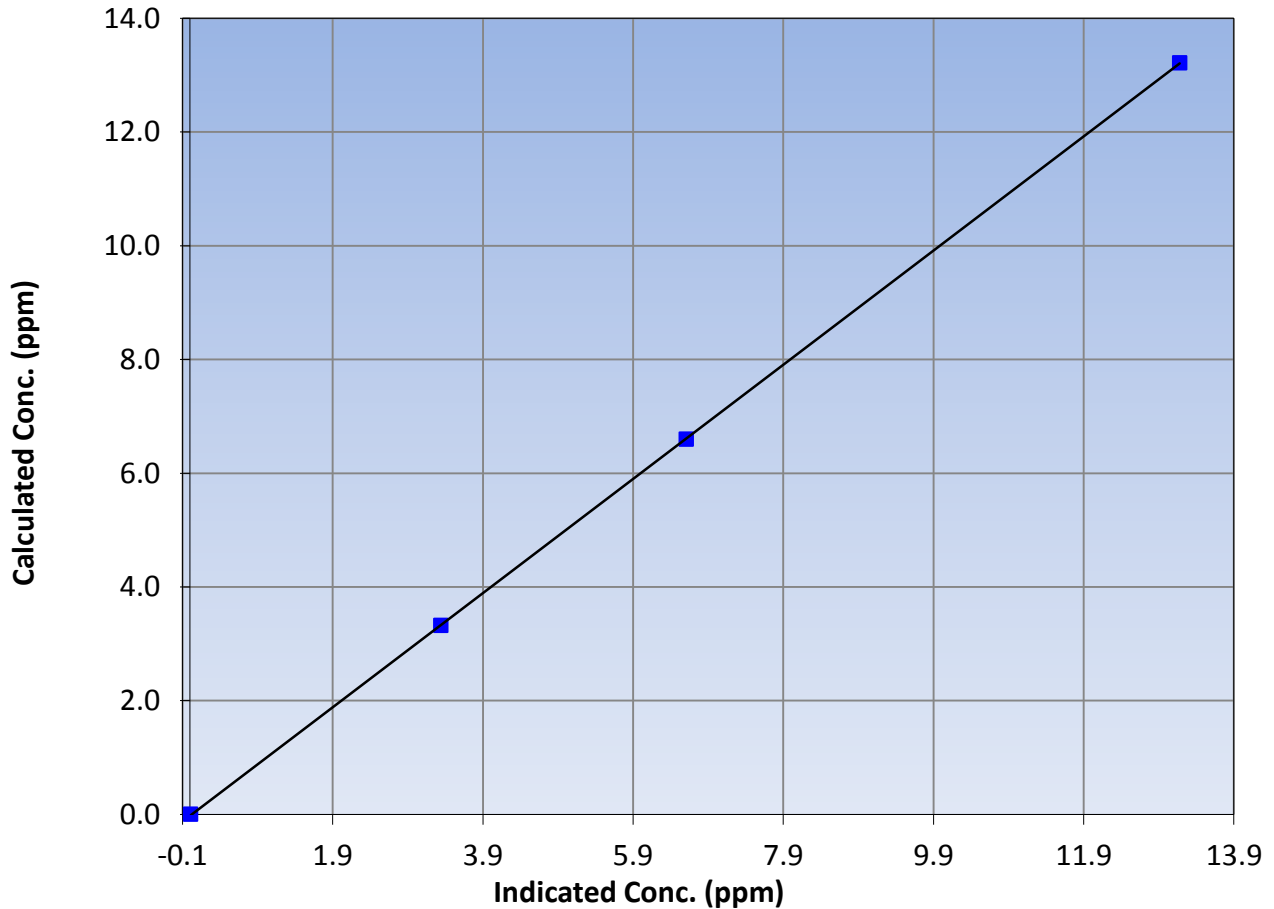
Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:10	End Time (MST)	12:23
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352

Calibration Data

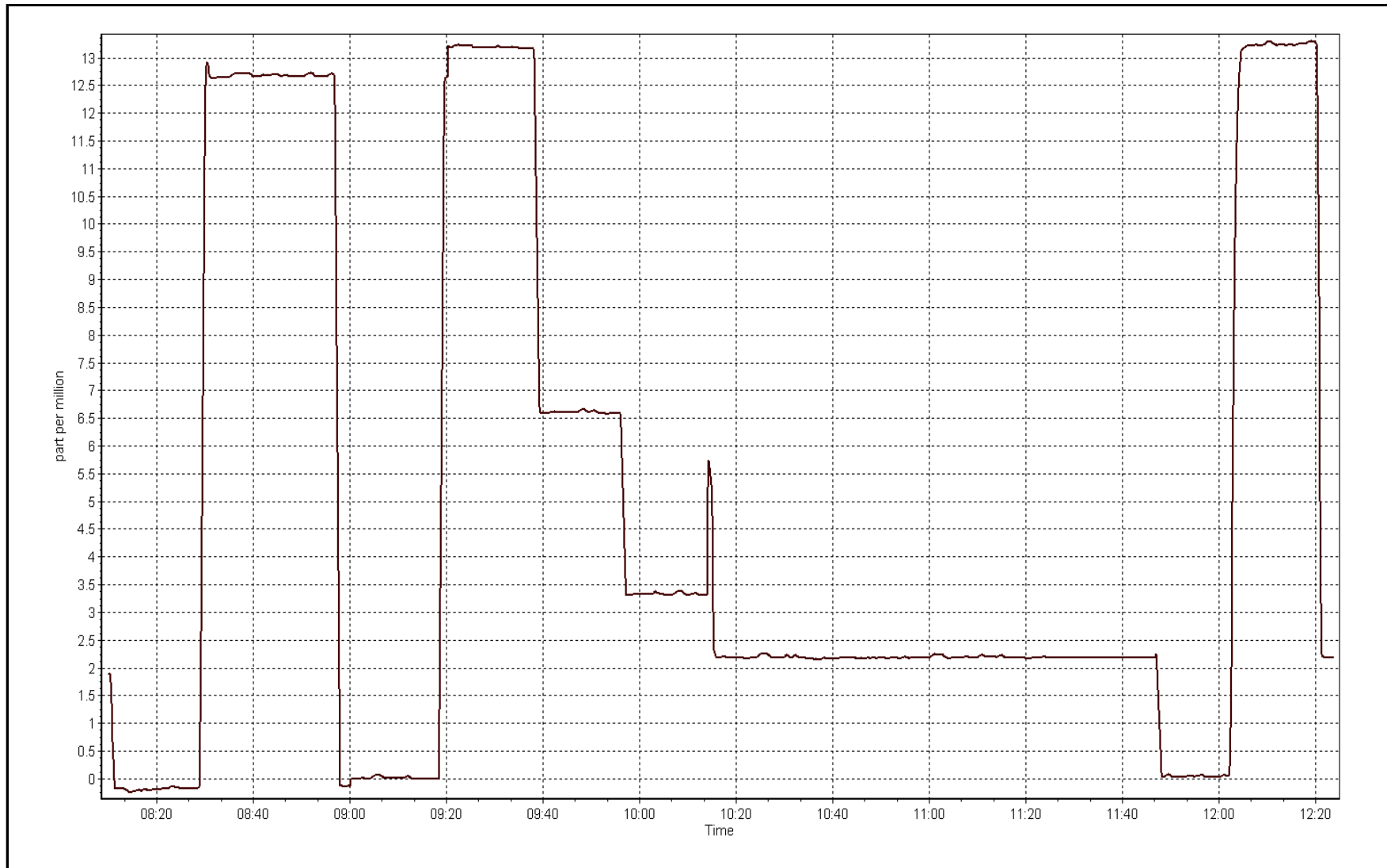
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.01	----	Correlation Coefficient	0.999994
13.22	13.18	1.0027		
6.60	6.61	0.9981	Slope	1.003832
3.32	3.34	0.9941		
			Intercept	-0.023705

THC Calibration Curve



THC Calibration Plot

Date: November 15, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 16, 2016	Previous Calibration	October 26, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:16	End Time (MST)	11:18
NO2 GPT Ref date	November 15, 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.	27.2	27.2
Analyzer IP address	192.168.1.72		Lamp temp.	58.0	58.0
Calculated slope	0.999975	1.001062	Pressure	26.0	26.0
Calculated intercept	-0.407893	0.202125	Flow cell A	696	696
Analyzer Background	5.240	5.369	Flow cell B	710	710
Analyzer Coefficient	0.981	1.006	O3 measure	4671.5	4671.5
			O3 reference	4671.7	4671.7

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	0.5	----
as found span	5000	713.2/1079.8	367.8	359.1	1.024
calibrator zero	5000	197.7/800	0.0	0.5	----
high point	5000	713.2/1079.8	367.8	367.9	1.000
second point	5000	494.7/971.3	249.9	248.8	1.004
third point	5000	260.9/844.3	129.2	128.1	1.009
as left zero	5000	197.7/800	0.0	-0.1	----
as left span	5000	713.2/1079.8	367.8	371.1	0.991
Average Correction Factor					1.004

Corrected As found	358.6	Previous response	368.2	% change	2.7%
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Notes:

Inlet filter changed after as founds. Adjusted span. No maintenance done

Calibration Performed By:

Melissa Lemay



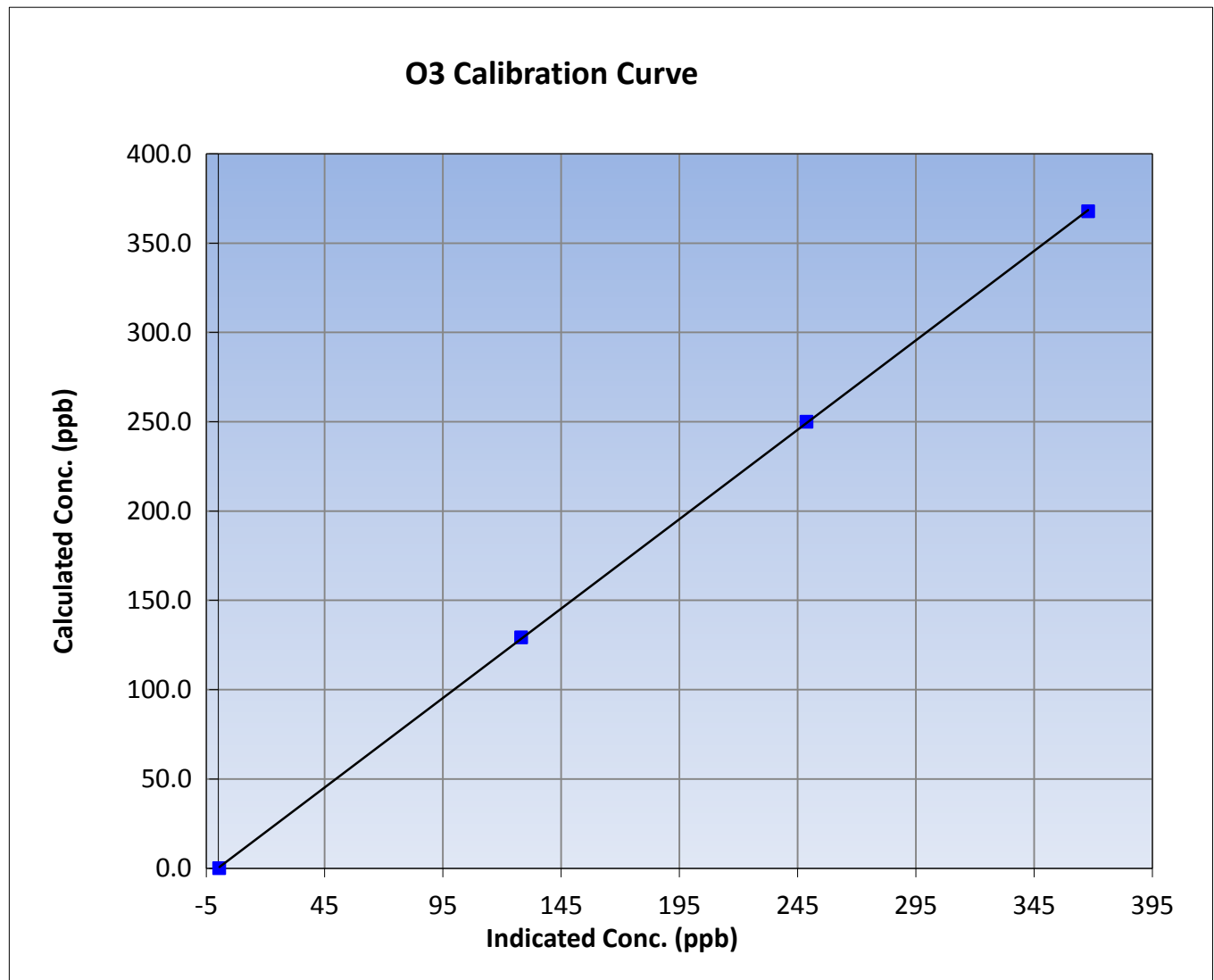
Wood Buffalo Environmental Association O3 Calibration Report

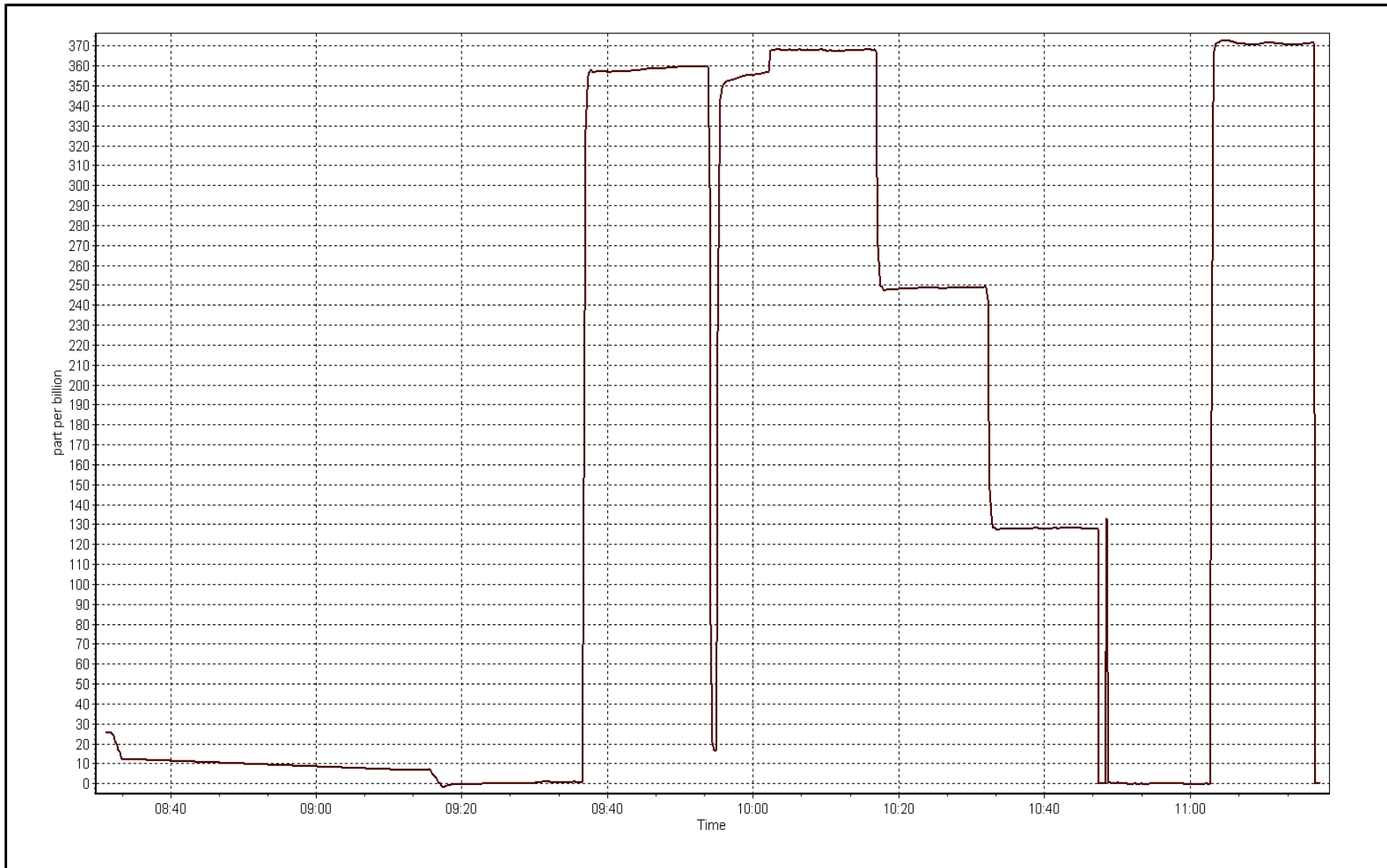
Station Information

Calibration Date	November 16, 2016	Previous Calibration	October 26, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:16	End Time (MST)	11:18
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	0.5	----	Correlation Coefficient	0.999974
367.8	367.9	0.9997		
249.9	248.8	1.0044	Slope	1.001062
129.2	128.1	1.0086		
			Intercept	0.202125







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:10	End Time (MST)	12:23
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	0.999844	0.997076	1.008261
	Data Offset	1.577206	1.212253	0.642639
Current Calibration	Data Slope	0.999230	0.996015	1.016157
	Data Offset	0.566429	1.160724	0.082303

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	1.075		1.096	
NOx coefficient	1.072		1.097	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.3		0.0	
NOx bkgrnd	0.0		0.1	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	315.7	Deg C	315.7	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	7.6	mmHg	7.6	mmHg
R Cell Press Nox	7.6	mmHg	7.6	mmHg
NO sample flow	435	lpm	435	lpm
Nox sample Flow	435	lpm	435	lpm

Notes:

Inlet filter changed after as founds. Adjusted span. No maintenance done



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 15, 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	0.1	-0.3	0.4	----	----
as found span	5000.00	60.5	601.4	601.4	0.0	589.8	591.0	-1.2	1.0196	1.018
calibrator zero	5000	0.0	0.0	0.0	0.0	0.1	-0.3	0.4	----	----
high point	5000	60.5	601.4	601.4	0.0	601.4	603.1	-1.7	1.0000	0.997
second point	5000	30.2	300.2	300.2	0.0	300.1	299.6	0.5	1.0003	1.002
third point	5000	15.0	149.1	149.1	0.0	147.6	147.8	-0.2	1.0102	1.009
as left zero	5000	0.0	0.0	0.0	0.0	0.2	0.1	0.1	----	----
as left span	5000	60.5	601.4	235.4	366.0	598.4	233.9	364.5	1.0050	1.006
Average Correction Factor									1.0035	1.0026

Corrcted As found NO_x= 589.7 NO= 591.3 Percent Change NO_x= 1.7% NO= 1.8%
 Previous Response NO_x= 599.9 NO= 601.9

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.50 ccm NOx ref calc conc = 601.4 ppb NO ref calc conc = 601.4 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	601.6	603.2	0.4	0.9996	0.9970	----	----
1st NO2 (300)	235.4	367.8	597.5	235.4	362.1	1.0065	----	1.0157	98.5%
2nd NO2 (200)	353.3	249.9	599.2	353.3	245.9	1.0036	----	1.0163	98.4%
3rd NO2 (100)	474.0	129.2	600.3	474.0	126.3	1.0018	----	1.0230	97.8%
2nd NO ref point	----	0.0	600.9	601.9	-1.0	1.0008	0.9991	----	----
Average Correction Factor						1.0032		1.0183	98.2%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

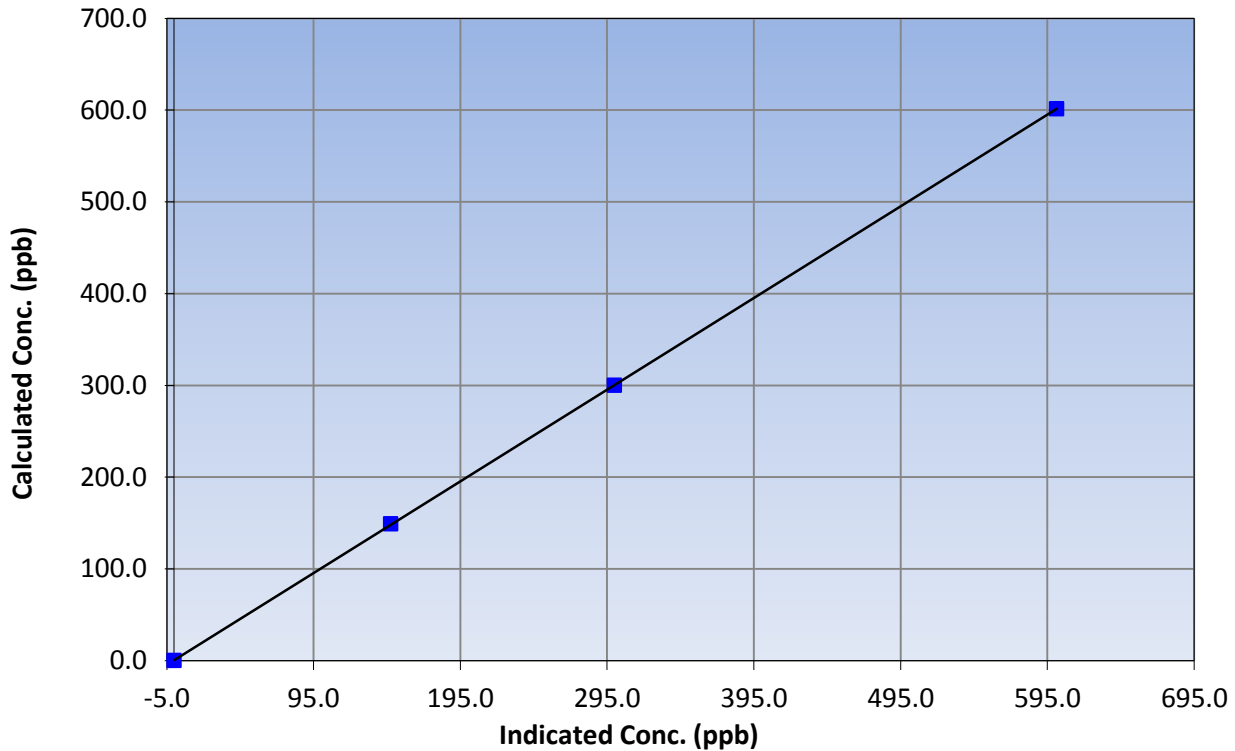
Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:10	End Time (MST)	12:23
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	0.1	----	Correlation Coefficient	0.999992
601.4	601.4	1.0000		
300.2	300.1	1.0003	Slope	0.999230
149.1	147.6	1.0102		
			Intercept	0.566429

NO_x Calibration Curve





Wood Buffalo Environmental Association

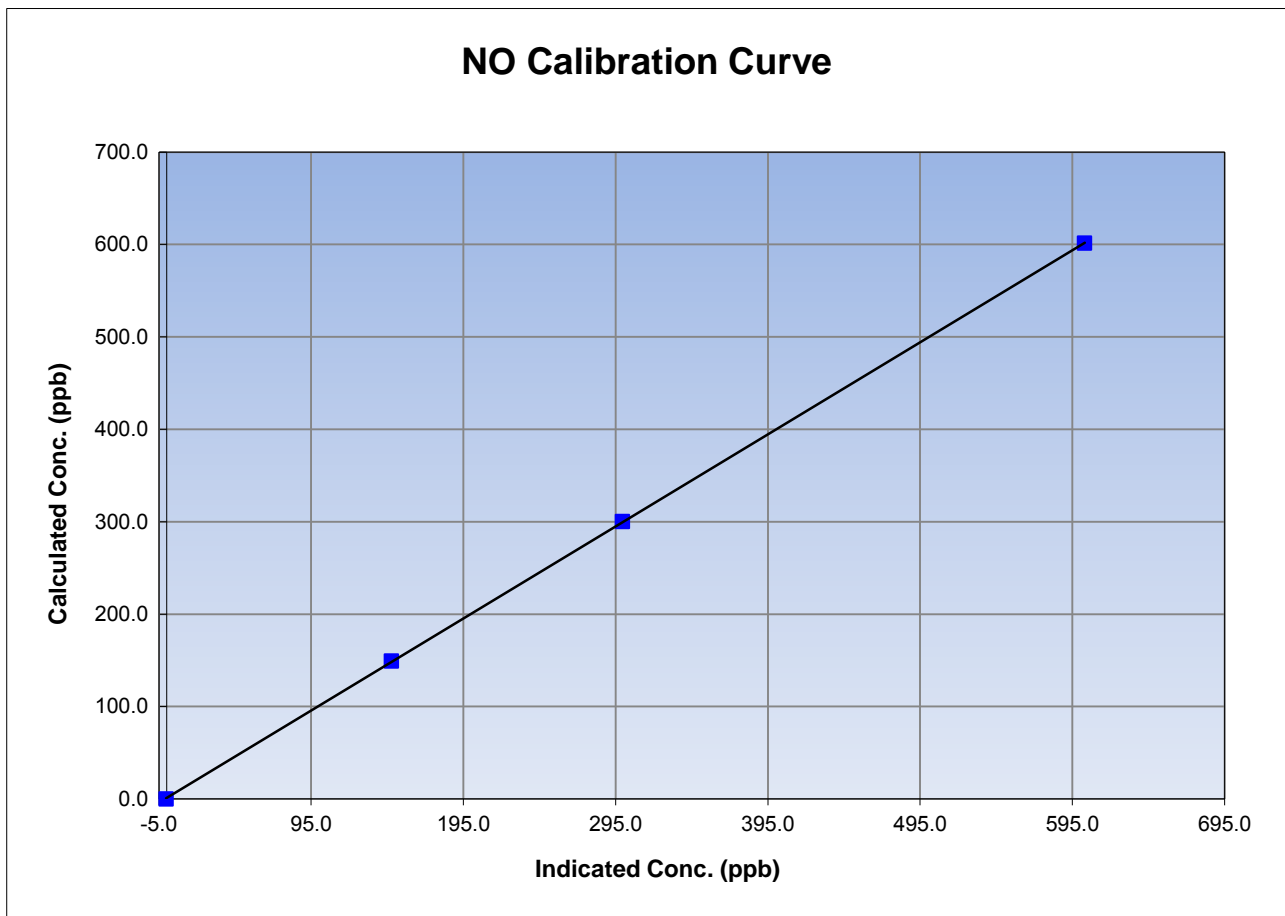
NO Calibration Summary

Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 25, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:10	End Time (MST)	12:23
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	-0.3	N/A	Correlation Coefficient	0.999990
601.4	603.1	0.9971		
300.2	299.6	1.0020	Slope	0.996015
149.1	147.8	1.0088		
			Intercept	1.160724





Wood Buffalo Environmental Association

NO₂ Calibration Summary

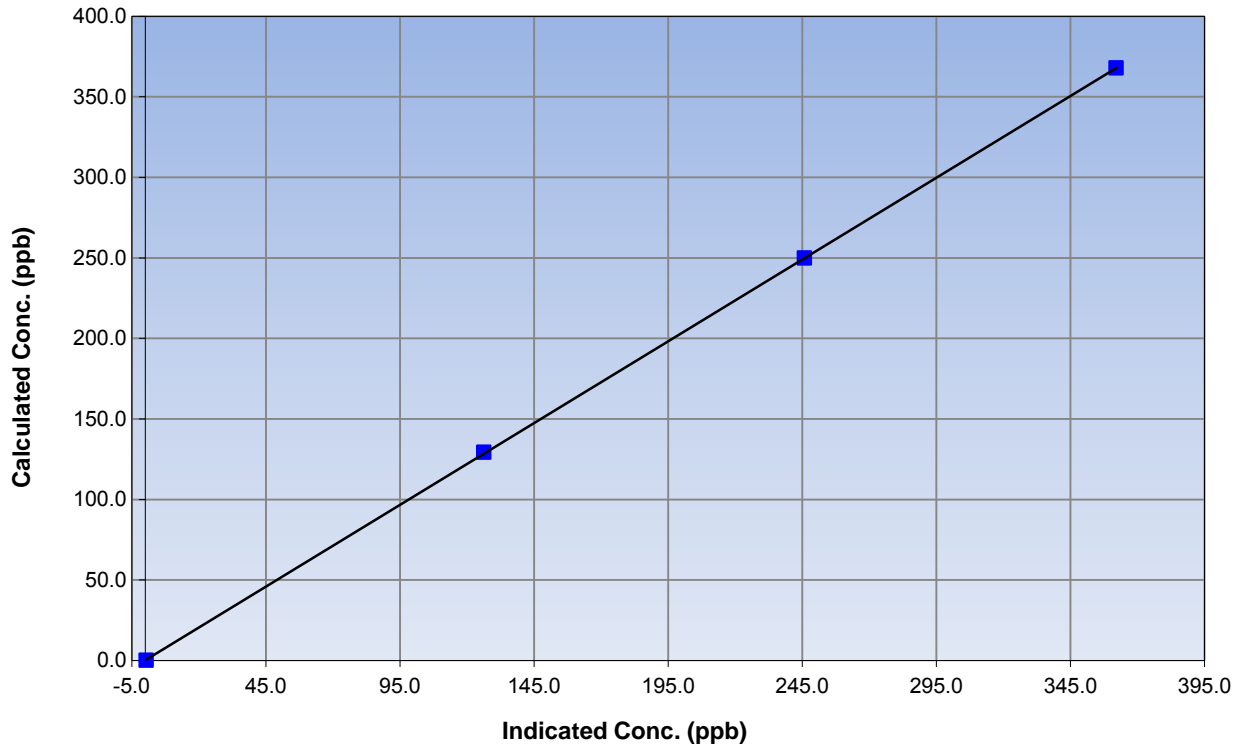
Station Information

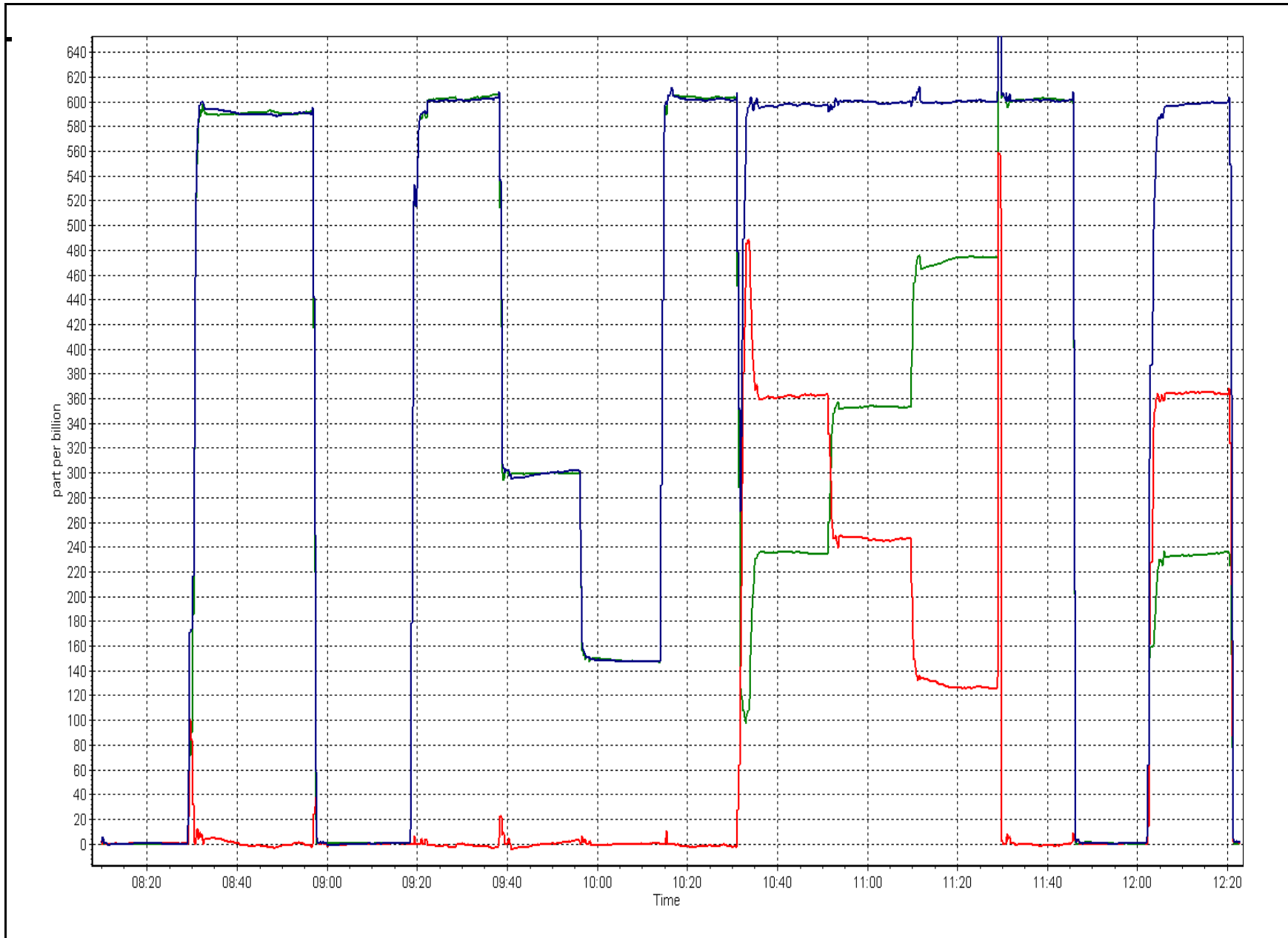
Calibration Date	November 15, 2016	Previous Calibration	October 25, 2016
Station Number	Wapasu	Station Number	AMS 17
Start Time (MST)	8:10	End Time (MST)	12:23
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	N/A	Correlation Coefficient	0.999988
367.8	362.1	1.0157		
249.9	245.9	1.0163	Slope	1.016157
129.2	126.3	1.0230		
			Intercept	0.082303

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:	November 16, 2016	Last Cal Date:	October 28, 2016
Start time (MST):	8:08	End time (MST):	9:35
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)	-7	-7.2	-7	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	945	947	945	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1030	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.9	-----	-0.1	<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

				Tolerance
Leak Test:	Date of check:	<u>October 28, 2016</u>	Last Cal Date:	<u>October 26, 2016</u>
	Flow w/o adaptor:	<u>17.35</u>	Flow w/ adaptor:	<u>17.05</u> 0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	<u>1326</u>	S/N:	<u>2519</u>
	Date of check:	<u>October 28, 2016</u>	Last Cal Date:	<u>NA</u>
	New Correction Factor:	<u>7090</u>	Previous Correction Factor:	<u>7212</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: Flow and 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:	Wapasu	Station number:	AMS 17
Calibration Date:	November 17, 2016	Last Cal Date:	November 16, 2016
Start time (MST):	9:22	End time (MST):	12:21
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)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	NA	NA	NA	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	NA	NA	NA	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-1.3	-----	0.0	<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

				Tolerance
Leak Test:	Date of check:	<u>October 28, 2016</u>	Last Cal Date:	<u>October 26, 2016</u>
	Flow w/o adaptor:	<u>17.35</u>	Flow w/ adaptor:	<u>17.05</u> 0.4 LPM

Annual Calibration Test

Foil Calibration	Foil Mass:	<u>1326</u>	S/N:	<u>2519</u>
	Date of check:	<u>October 28, 2016</u>	Last Cal Date:	<u>NA</u>
	New Correction Factor:	<u>7090</u>	Previous Correction Factor:	<u>7212</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: After nephelometer as founds Replaced Batteries, Restarted sharp, FC+Z done. Nephelometer was zeroed. Nephelometer was around 0ug/m3. Let nephelometer go for 2 hrs, still around 0.0ug/m3

Calibration by: Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 18
STONY MOUNTAIN
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
 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	681	34	39	99.31	2	0	1	0
TRS(ppb) Average	681	34	39	99.31	0	0	0	0
THC(ppm) Average	681	34	39	99.31	2.3	-	2.1	-
NMHC(ppm) Average	681	34	39	99.31	0.104	-	0.029	-
CH4(ppm) Average	681	34	39	99.31	2.2	-	2.1	-
O3 (ppb) Average	685	34	35	99.86	46	0	42	-
NO2 (ppb) Average	681	34	39	99.31	6	0	3	-
NO (ppb) Average	681	34	39	99.31	1	-	0	-
NOX (ppb) Average	681	34	39	99.31	6	-	4	-
PM2.5 (ug/m3) Average	690	1	30	95.97	16.9	-	7.3	0
Wind Speed 10 m (km/h) Average	720	0	0	100.00	22	-	16	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	15.2	-	9.4	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	97.0	-
Precipitation (mm) Total	720	0	0	100.00	0.7	-	2.7	-
Leaf Wetness (% of range) Average	720	0	0	100.00	18	-	6.0	-
Global Solar Radiation (W/m2) Average	720	0	0	100.00	360	-	75.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
 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	681	0.3	0	-	0	0	0	0	0	1	2
TRS (ppb) Average	681	0.3	0	-	0	0	0	0	0	0	0
THC (ppm) Average	681	1.95	0.1	-	1.9	1.9	1.9	1.9	2	2	2.3
NMHC(ppm) Average	681	0.005	0.012	-	0	0	0	0	0	0	0.104
CH4(ppm) Average	681	1.94	0.1	-	1.9	1.9	1.9	1.9	2	2	2.2
O3 (ppb) Average	685	29.4	7	-	14	19	24	30	35	38	46
NO2 (ppb) Average	681	1.6	1	-	0	0	1	1	2	3	6
NO (ppb) Average	681	0.1	0	-	0	0	0	0	0	0	1
NOX (ppb) Average	681	1.6	1	-	0	0	1	1	2	3	6
PM2.5 (ug/m3) Average	690	3.21	2.6	-	0	0.8	1.6	2.5	3.7	6.5	16.9
Wind Speed 10 m (km/h) Average	720	9.1	4	-	0	4	6	9	12	15	22
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	-0.71	6.7	-	-14.7	-8.1	-5.3	-3	5.3	8.2	15.2
Relative Humidity (%) Average	720	79	16	-	29	56	66	84	94	96	99
Precipitation (mm) Total	720	-	-	5.89	-	-	-	-	-	-	-
Surface Wetness (% of range) Average	720	2.5	1	-	1	1	2	2	3	4	18
Global Solar Radiation (W/m2) Average	720	31.3	68	-	0	0	0	0	25	101	360

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	28 Nov 2016 14:00	28 Nov 2016 17:00	4	Maintenance - manifold cleaning
AIR QUALITY ANALYZERS	29 Nov 2016 13:00	29 Nov 2016 13:00	1	Maintenance - manifold supports
PM2.5	01 Nov 2016 12:00	01 Nov 2016 14:00	3	Unstable operation - excessive baseline drift
PM2.5	01 Nov 2016 22:00	02 Nov 2016 06:00	9	Unstable operation - excessive baseline drift
PM2.5	17 Nov 2016 22:00	18 Nov 2016 14:00	17	Unstable operation - excessive baseline drift



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Nov 16 09:00	Maximum Daily Average: 0.9 ppb on Nov 16		Hours of Data:	681
Minimum Value: 0 ppb on Nov 3 04:00	Minimum Daily Average: 0.1 ppb on Nov 3		Hours of Missing Data:	39
Maximum Diurnal Average: 0.4 ppb at hour 11	Minimum Diurnal Average: 0.2 ppb at hour 5		Hours of Calibration:	34
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		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-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	0.2	0
2-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	0.2	0
3-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
4-Nov	0	0	0	Z	0	0	0	0	1	1	0	C	C	C	C	1	1	1	0	0	0	0	0	0	0	0.4	1
5-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.4	1
6-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
7-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0.2	1
8-Nov	0	Z	0	0	0	0	0	0	0	1	2	2	2	2	1	2	1	2	1	1	1	1	1	1	1	0.9	2
9-Nov	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
10-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0.4	1
11-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
12-Nov	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	0.4	1
13-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	0.3	0
14-Nov	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	0.3	1
15-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	0.2	0
16-Nov	0	0	0	Z	0	1	1	2	2	2	2	2	1	1	1	0	0	0	0	0	1	0	1	1	0	0.9	2
17-Nov	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	0.3	1
18-Nov	1	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
19-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	0.3	0
20-Nov	0	Z	0	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
21-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	0.2	0
22-Nov	0	0	0	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0.5	1
23-Nov	1	1	0	0	Z	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1
24-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	2	1	1	1	0	1	1	0	0	0.4	2
25-Nov	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	0.3	1
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.3	1
27-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
28-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	M	M	M	M	0	0	0	0	0	0	0	0	0.1	0
29-Nov	0	0	1	1	Z	1	1	0	1	1	1	1	M	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
30-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	0.2	0

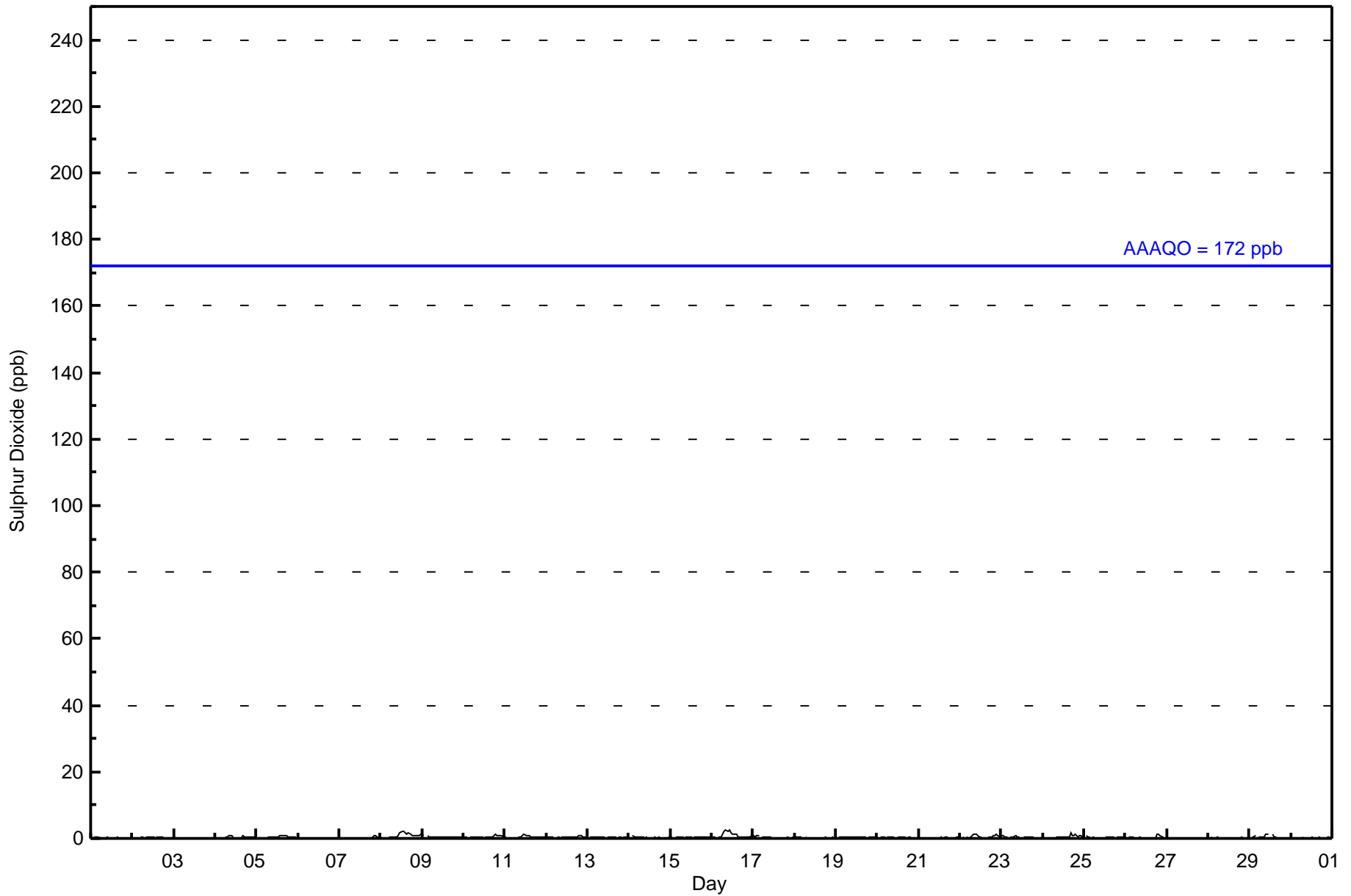
0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.3	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.3	Diurnal Average
1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	Diurnal Maximum

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
Stony Mountain - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Stony Mountain - 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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681
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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

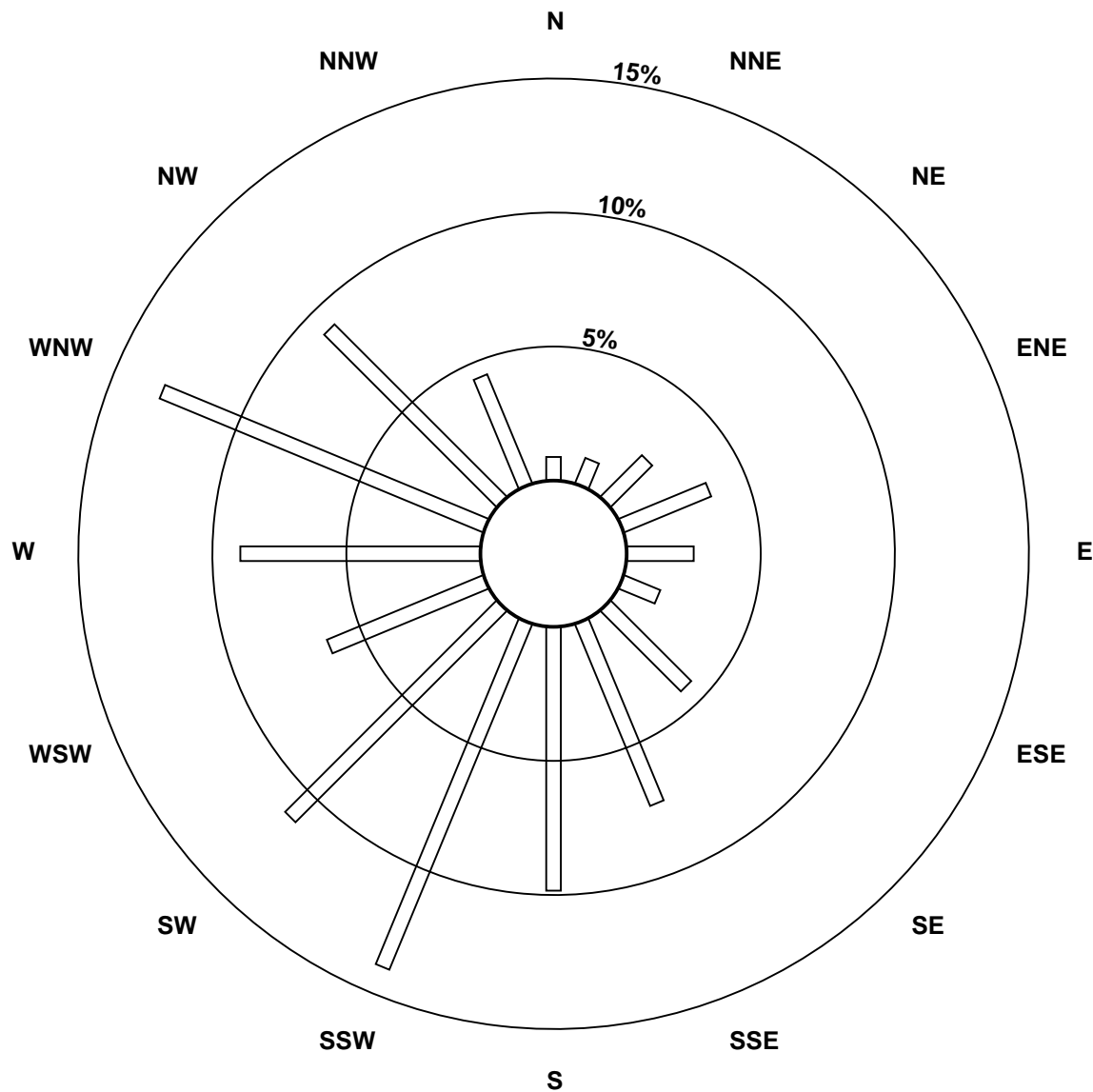
Total Number of Valid Hours: 681

Total Number of Hours: 720

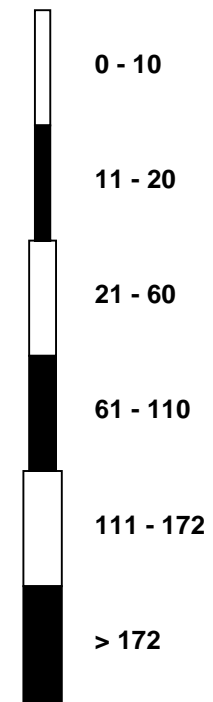


Wood Buffalo Environmental Association
Wind Rose Nov 2016

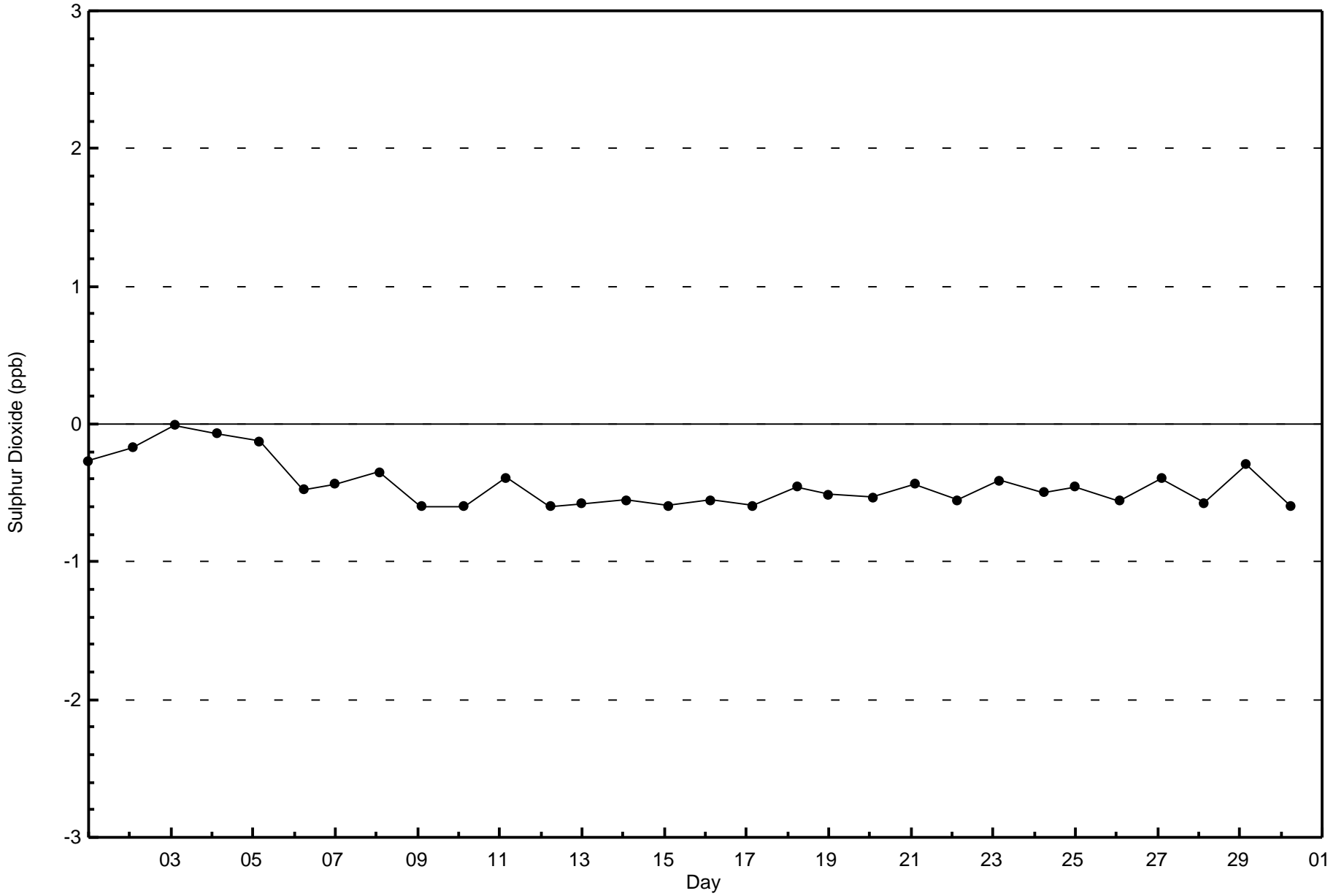
Sulphur Dioxide (SO₂) - ppb
Stony Mountain (AMS 18)

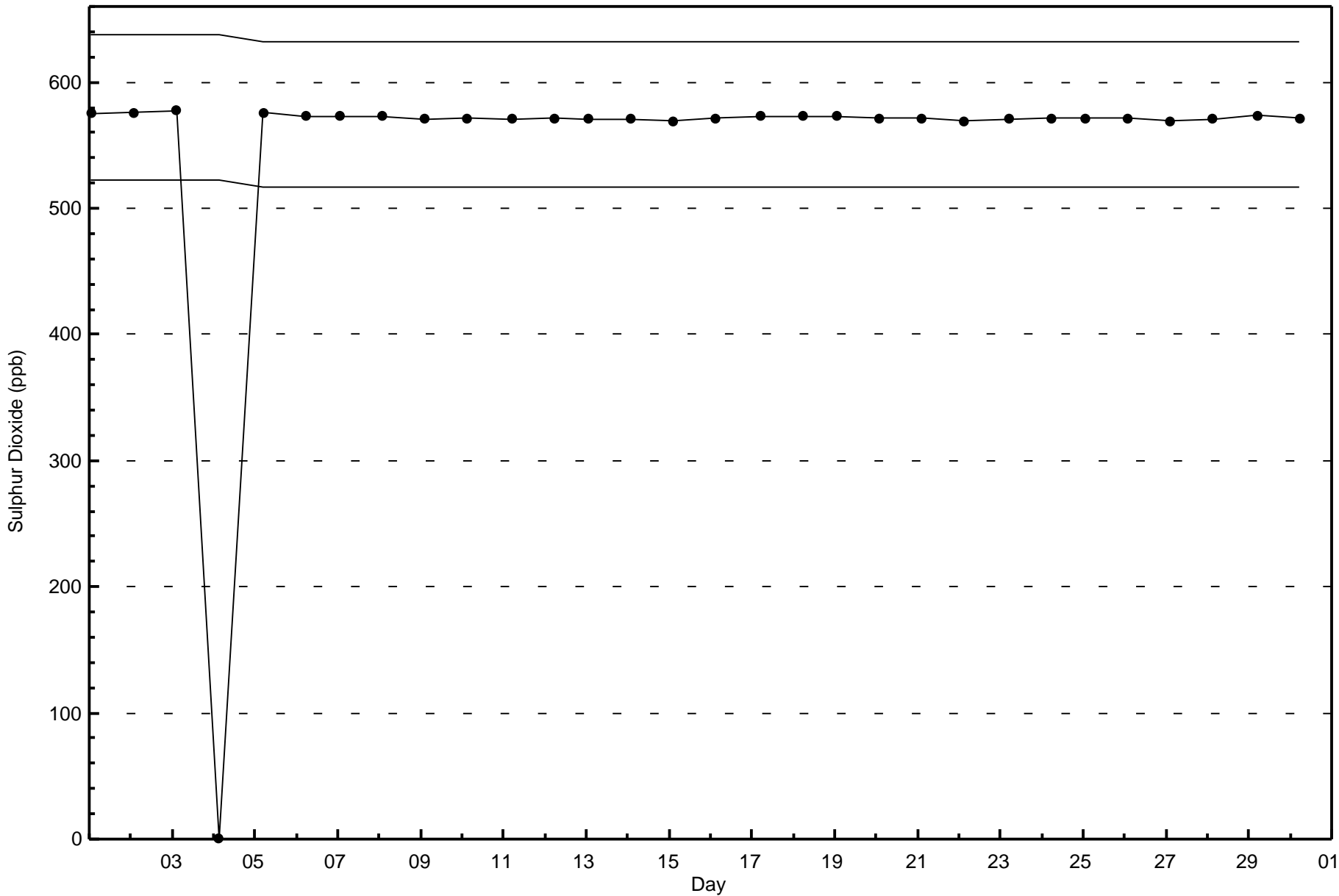


Classes (ppb)



Total Number of Valid Hours: 681







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Stony Mountain - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 0 ppb on Nov 11 14:00	Maximum Daily Average: 0.4 ppb on Nov 11		Hours of Data:	681
Minimum Value: 0 ppb on Nov 17 17:00	Minimum Daily Average: 0.2 ppb on Nov 27		Hours of Missing Data:	39
Maximum Diurnal Average: 0.3 ppb at hour 5	Minimum Diurnal Average: 0.3 ppb at hour 6		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 = 0		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-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	0.2	0
2-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	0.3	0
3-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	0.3	0
4-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	0.3	0
5-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	0.3	0
6-Nov	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-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	0.3	0
8-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	0.3	0
9-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	0.3	0
10-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	0.3	0
11-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	0.4	0
12-Nov	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-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	0.3	0
14-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	0.3	0
15-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	0.3	0
16-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	0.3	0
17-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
18-Nov	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
19-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	0.3	0
20-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	0.3	0
21-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	0.3	0
22-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	0.3	0
23-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	0.3	0
24-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0.3	0
26-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	0.3	0
27-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	0.2	0
28-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	M	M	M	M	0	0	0	0	0	0	0	0.3	0
29-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.3	0
30-Nov	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

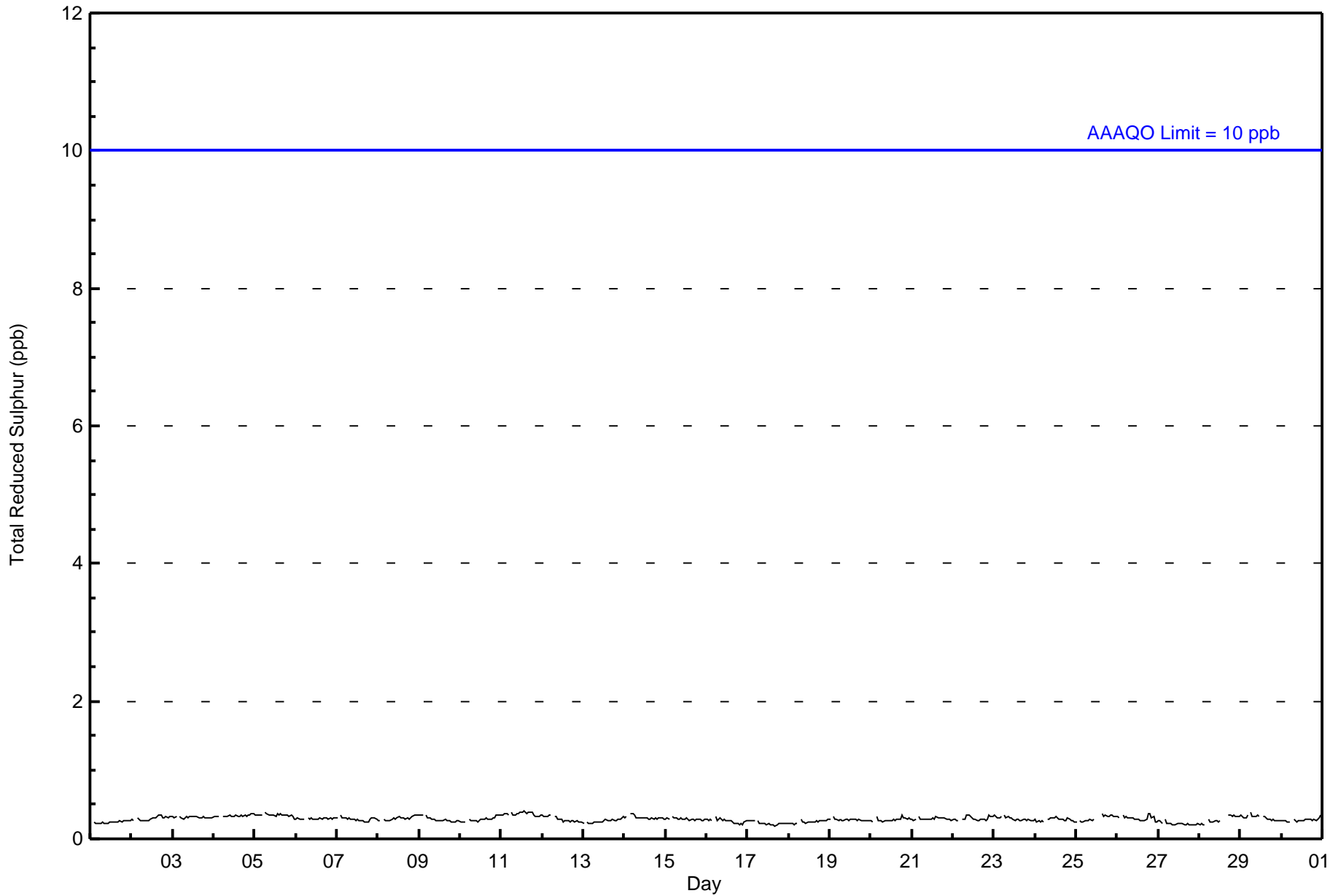
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance
 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 - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	681	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: 681

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - 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 - 2	6	6	15	24	18	10	27	48	67	99	76	43	60	90	61	31	681
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	6	15	24	18	10	27	48	67	99	76	43	60	90	61	31	681

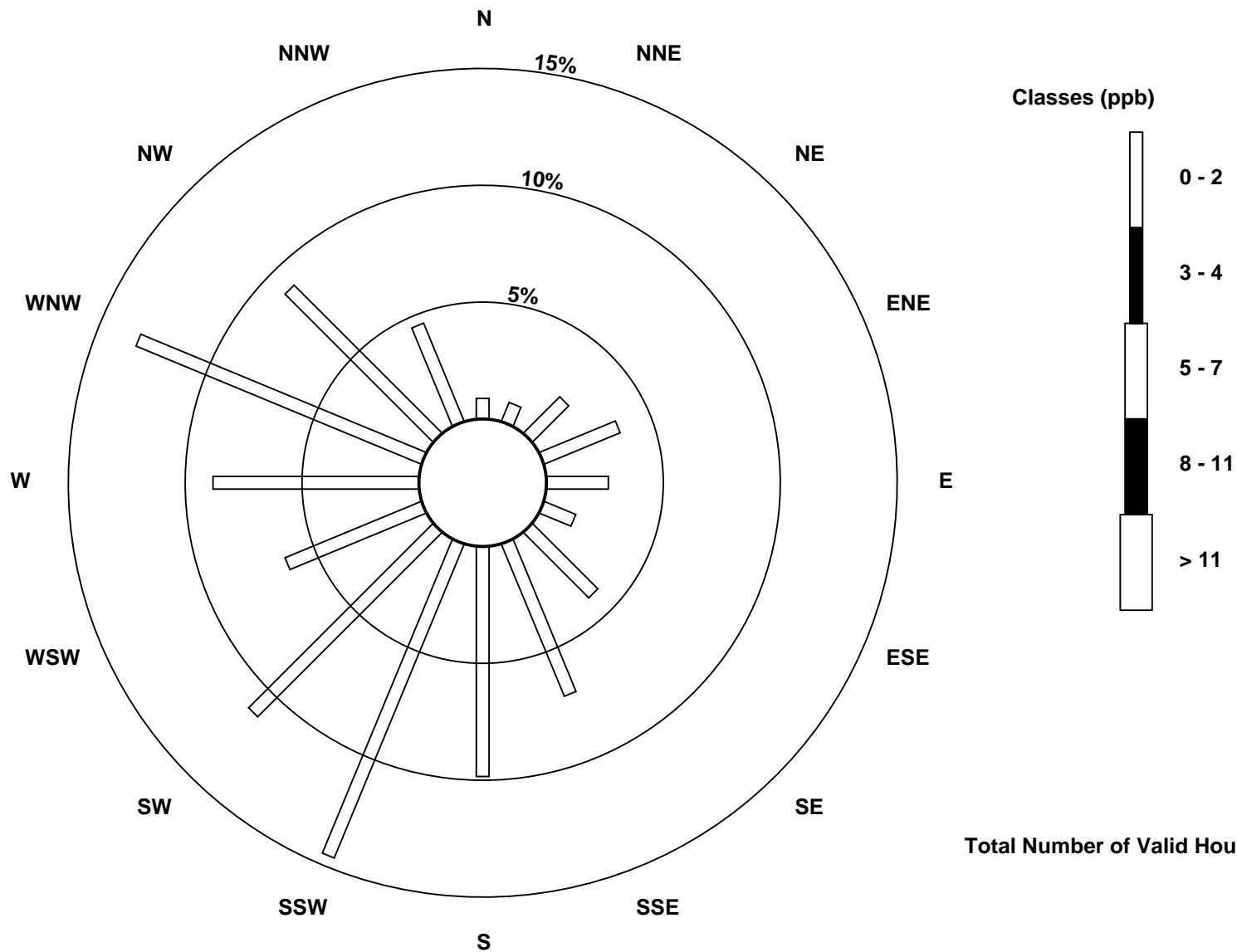
Total Number of Valid Hours: 681

Total Number of Hours: 720

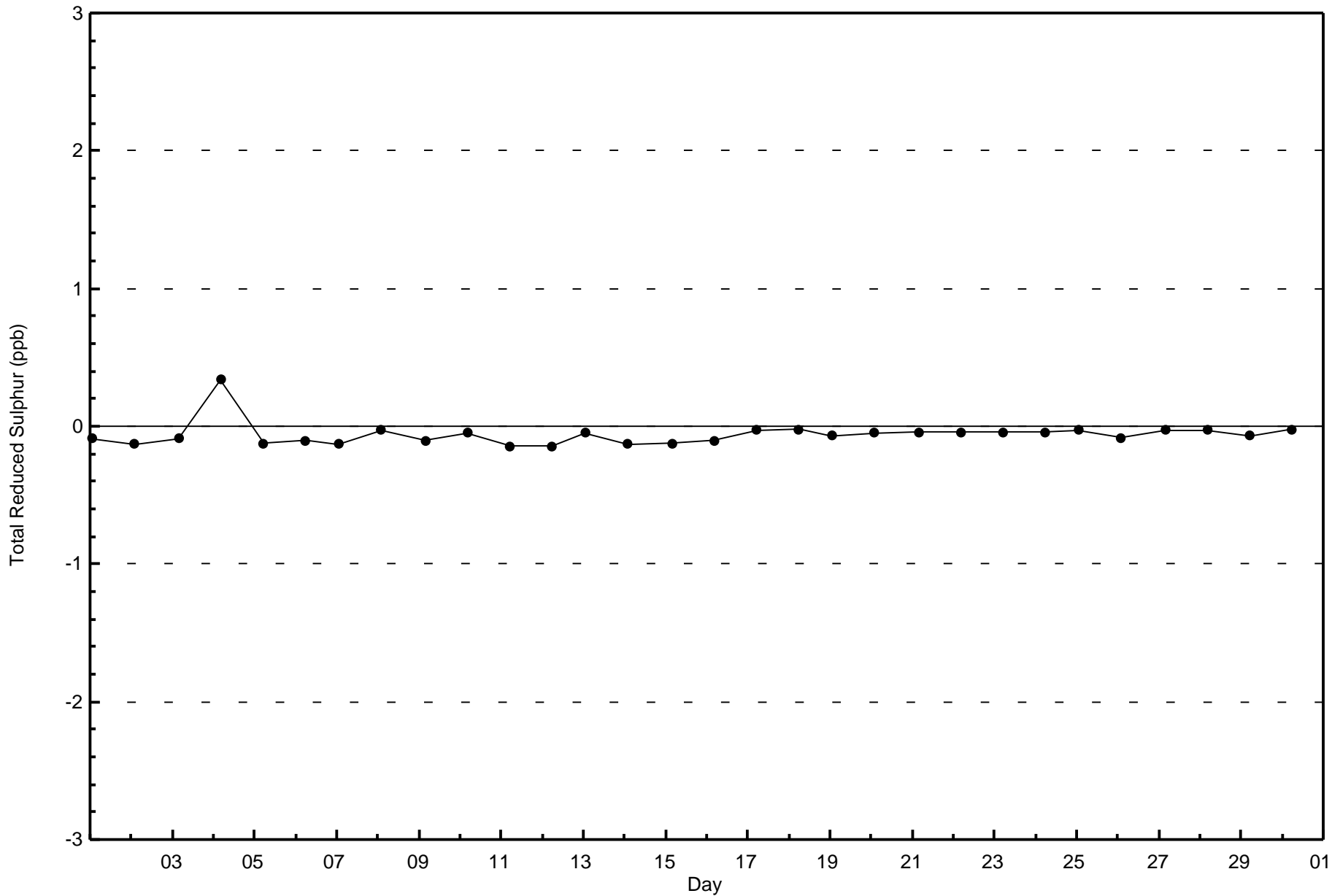


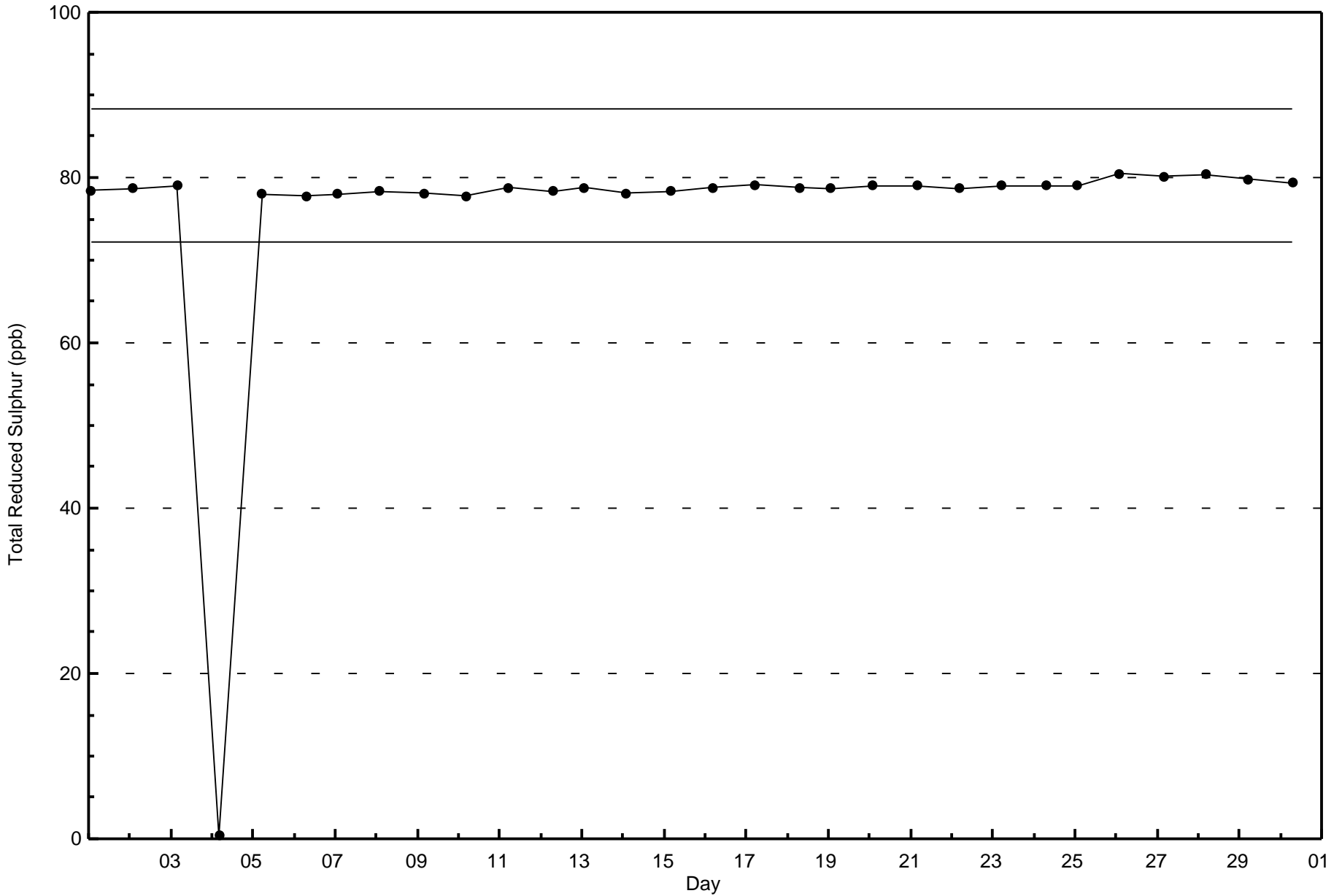
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Reduced Sulphur (TRS) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 681







Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Stony Mountain - November 2016

Maximum Value: 2.3 ppm on Nov 3 02:00	Maximum Daily Average: 2.1 ppm on Nov 3	Hours in Service: 720
Minimum Value: 1.9 ppm on Nov 30 02:00	Minimum Daily Average: 1.9 ppm on Nov 15	Hours of Data: 681
Maximum Diurnal Average: 2.0 ppm at hour 6	Minimum Diurnal Average: 1.9 ppm at hour 16	Hours of Missing Data: 39
Monthly Average: 1.95 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.0 P ₉₉ = 2.2	Hours of Calibration: 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-Nov	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	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-Nov	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	2.1	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
3-Nov	2.3	2.3	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.3
4-Nov	1.9	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	1.9	1.9	C	C	C	C	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
5-Nov	2.0	2.0	2.0	2.0	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	2.1	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.1
6-Nov	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	1.9	1.9	1.9	1.9
7-Nov	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
8-Nov	2.1	Z	2.1	2.0	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	2.0	2.0	2.0	2.0	2.0	2.1
9-Nov	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	1.9	1.9	1.9	2.0
10-Nov	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	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0
11-Nov	2.0	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	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	2.0
12-Nov	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	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	2.0	2.0	2.0
13-Nov	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	1.9	1.9	1.9	2.0	2.0	2.0
14-Nov	2.0	Z	2.1	2.1	2.1	2.1	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	2.1
15-Nov	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	1.9	1.9	1.9	1.9
16-Nov	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	1.9	1.9	1.9	1.9	1.9
17-Nov	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	1.9	1.9	1.9	1.9
18-Nov	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	1.9	1.9	1.9	1.9
19-Nov	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	1.9	1.9	1.9	1.9	1.9
20-Nov	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	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
21-Nov	1.9	1.9	Z	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	2.0	2.0	2.0	2.0	2.0	2.0
22-Nov	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	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
23-Nov	1.9	1.9	1.9	1.9	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	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0
24-Nov	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	2.0	2.0	2.0	2.0	2.0
25-Nov	Z	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	2.1	2.1	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.1	
26-Nov	1.9	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	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
27-Nov	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	1.9	1.9	1.9	1.9
28-Nov	1.9	1.9	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	M	M	M	M	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-Nov	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	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
30-Nov	1.9	1.9	1.9	1.9	1.9	Z	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0

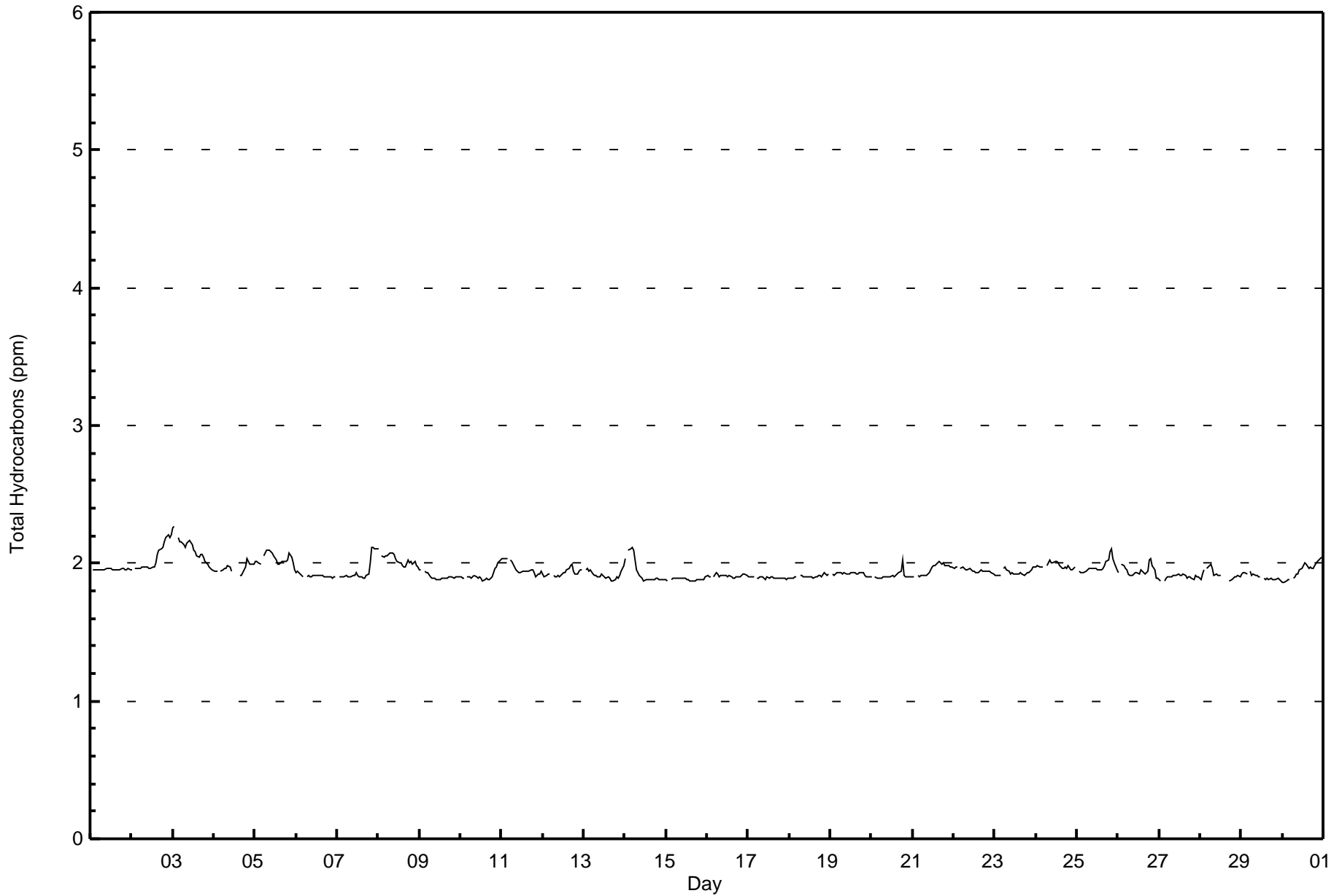
2.0	1.9	1.9	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Diurnal Average	
2.3	2.3	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	Diurnal Maximum

Z - zerspan C - Calibration M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Stony Mountain - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Stony Mountain - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	630	92.51	92.51
2.1 - 3.0	51	7.49	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Stony Mountain - November 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	7	15	24	17	10	29	50	58	65	66	43	61	87	62	30	630
2.1 - 3.0	0	0	0	0	0	0	0	0	9	30	10	0	0	2	0	0	51
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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

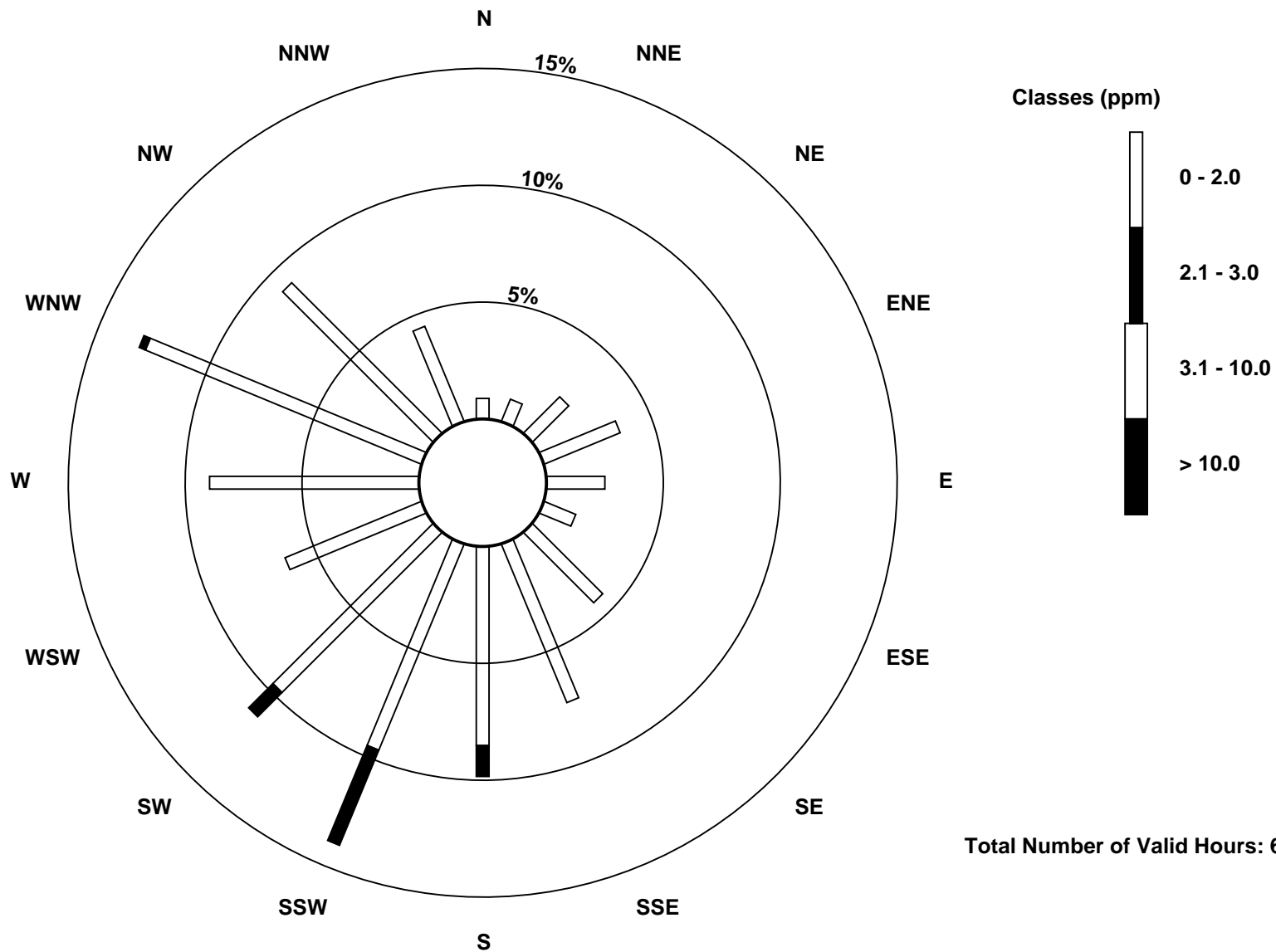
Total Number of Valid Hours: 681

Total Number of Hours: 720

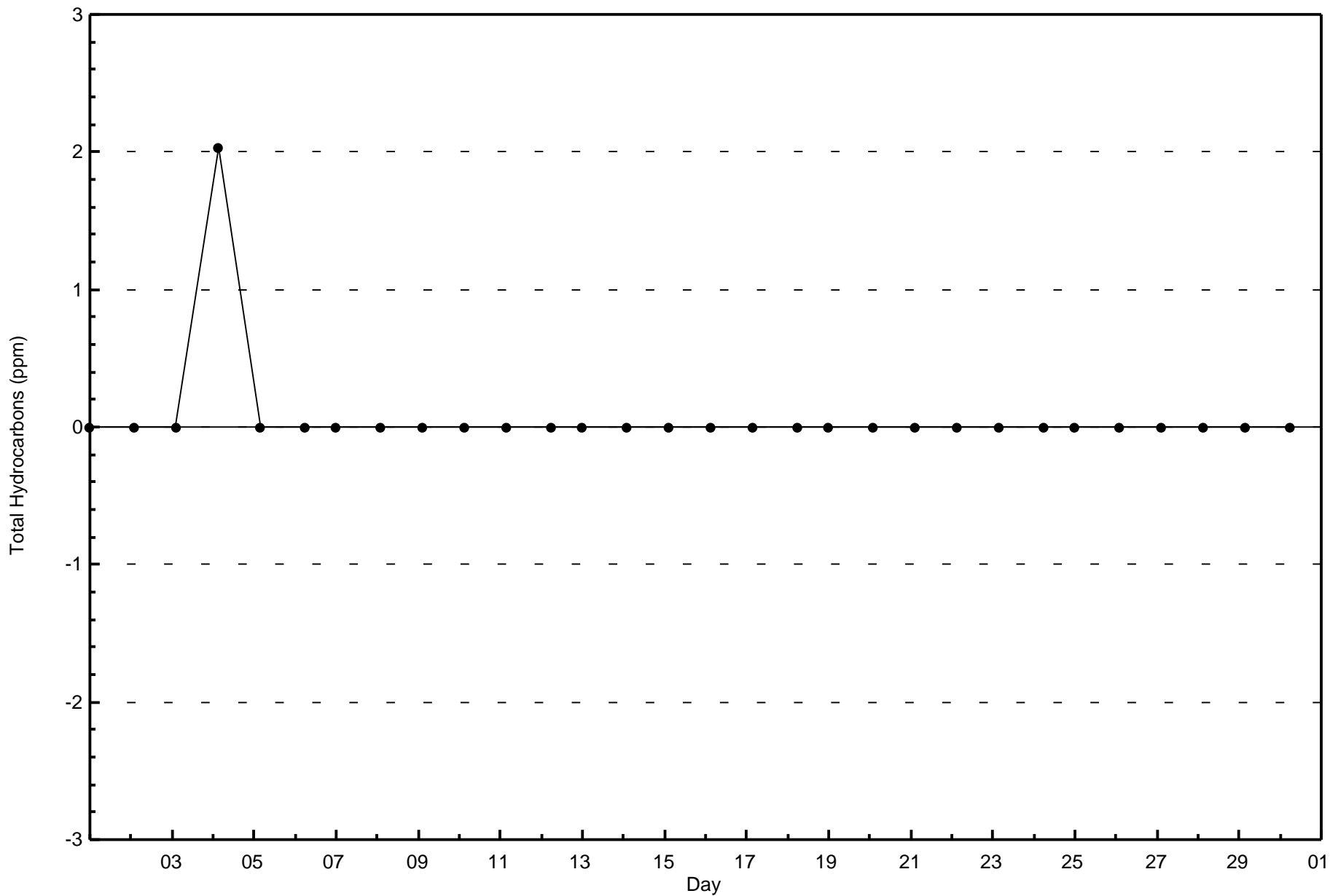


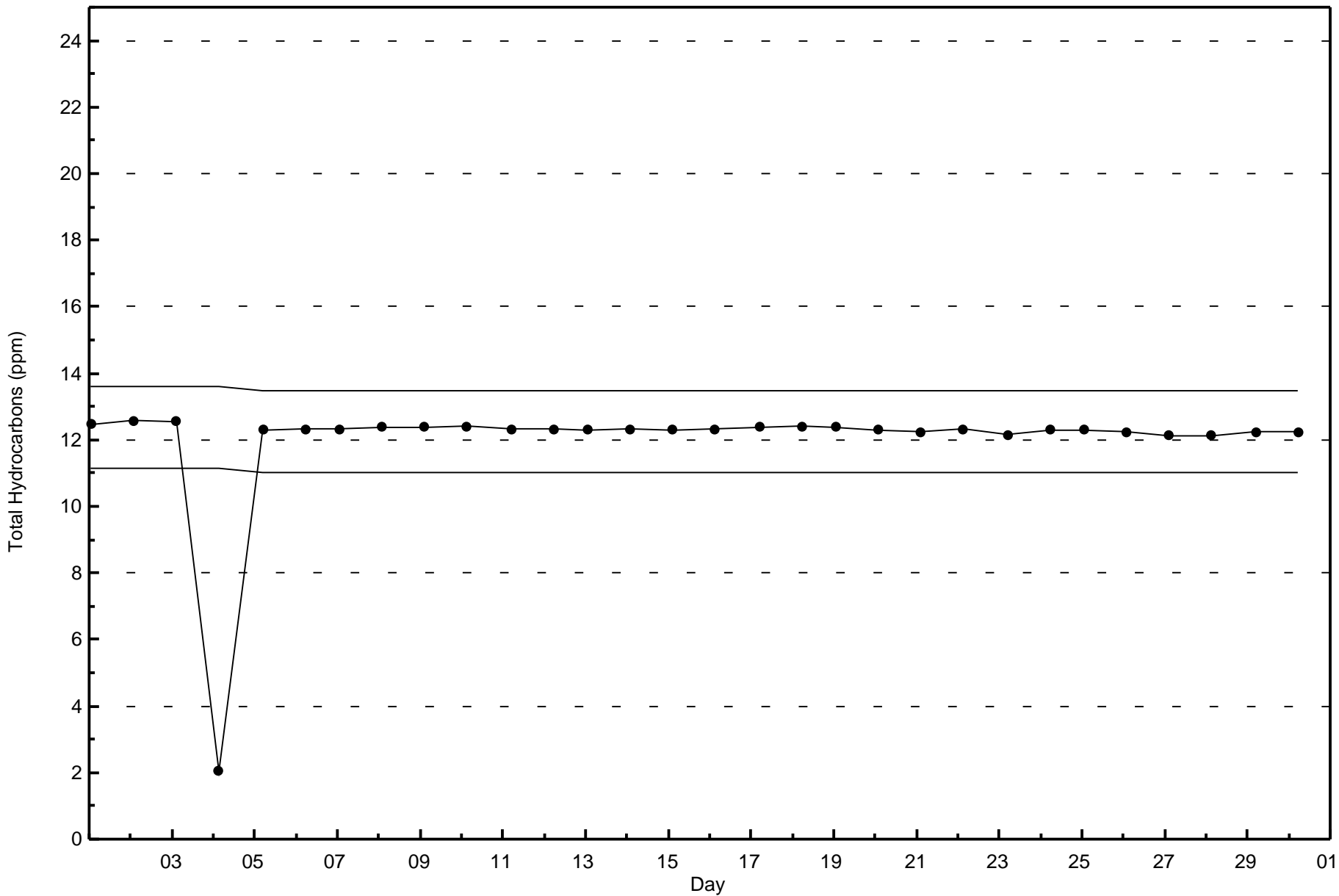
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Stony Mountain (AMS 18)



Total Number of Valid Hours: 681



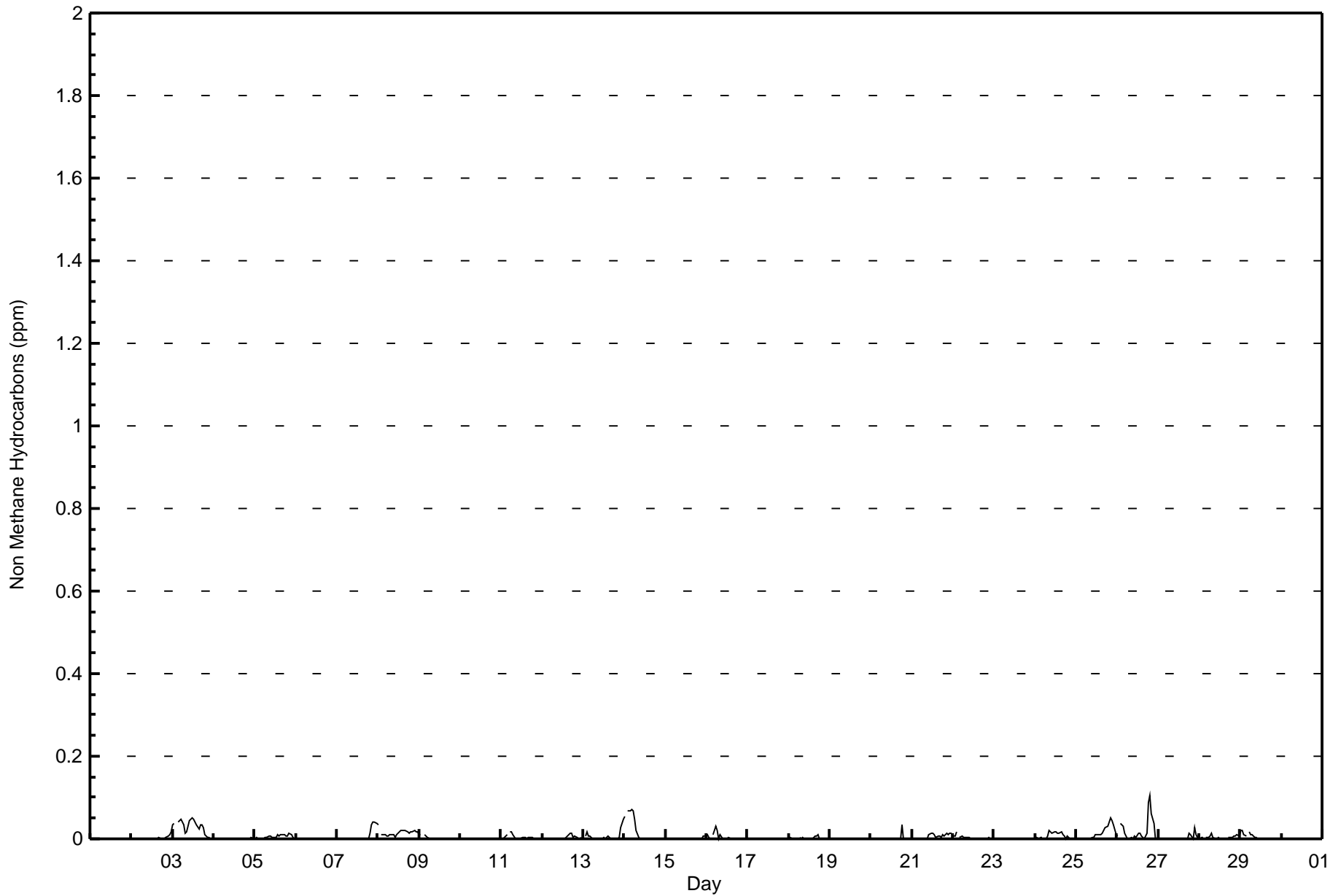




Summary of Hour Averages

Stony Mountain - November 2016

Maximum Value: 0.104 ppm on Nov 26 20:00																					Maximum Daily Average: 0.029 ppm on Nov 3					Hours in Service:	720																			
Minimum Value: 0.000 ppm on Nov 1 02:00																					Minimum Daily Average: 0.000 ppm on Nov 17					Hours of Data:	681																			
Maximum Diurnal Average: 0.009 ppm at hour 6																					Minimum Diurnal Average: 0.003 ppm at hour 10					Hours of Missing Data:	39																			
Monthly Average: 0.005 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:	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-Nov	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																			
2-Nov	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	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.006	0.010	0.016	0.002	0.016																				
3-Nov	0.034	0.038	Z	0.042	0.044	0.048	0.033	0.012	0.018	0.032	0.046	0.049	0.047	0.042	0.033	0.025	0.034	0.034	0.026	0.012	0.005	0.004	0.000	0.001	0.029	0.049																				
4-Nov	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.001	0.001	0.000	C	C	C	C	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.001	0.000	0.002																				
5-Nov	0.001	0.002	0.000	0.000	Z	0.001	0.003	0.004	0.006	0.006	0.003	0.002	0.009	0.006	0.011	0.010	0.009	0.006	0.007	0.013	0.011	0.005	0.001	0.005	0.013																					
6-Nov	0.001	0.001	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																					
7-Nov	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	0.012	0.035	0.040	0.039	0.036	0.007	0.040																				
8-Nov	0.034	Z	0.009	0.009	0.010	0.007	0.008	0.009	0.012	0.009	0.004	0.009	0.016	0.019	0.021	0.022	0.020	0.017	0.015	0.018	0.019	0.019	0.017	0.015	0.015	0.034																				
9-Nov	0.011	0.011	Z	0.009	0.006	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	0.002	0.011																					
10-Nov	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	0.001																					
11-Nov	0.000	0.001	0.005	0.010	Z	0.018	0.018	0.012	0.002	0.000	0.001	0.002	0.002	0.003	0.003	0.001	0.002	0.002	0.002	0.001	0.000	0.000	0.001	0.001	0.004	0.018																				
12-Nov	0.000	0.000	0.000	0.000	0.001	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.009	0.014	0.014	0.003	0.006	0.002	0.000	0.001	0.004	0.003	0.014																				
13-Nov	Z	0.005	0.018	0.006	0.008	0.002	0.001	0.001	0.000	0.000	0.000	0.001	0.002	0.001	0.007	0.003	0.000	0.000	0.000	0.001	0.004	0.026	0.046	0.006	0.046																					
14-Nov	0.055	Z	0.067	0.069	0.071	0.067	0.049	0.022	0.004	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.071																					
15-Nov	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	0.005	0.008	0.001	0.008																				
16-Nov	0.009	0.002	0.002	Z	0.011	0.031	0.021	0.001	0.010	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.004	0.031																				
17-Nov	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																					
18-Nov	0.004	0.004	0.000	0.000	0.000	Z	0.003	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.007	0.009	0.000	0.000	0.000	0.000	0.000	0.002	0.009																					
19-Nov	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																					
20-Nov	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	0.034	0.001	0.000	0.000	0.001	0.000	0.002	0.034																				
21-Nov	0.000	0.000	Z	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.010	0.015	0.013	0.009	0.005	0.008	0.007	0.005	0.009	0.006	0.012	0.009	0.015	0.012	0.006	0.015																				
22-Nov	0.008	0.008	0.016	Z	0.003	0.008	0.004	0.002	0.004	0.005	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.002	0.001	0.000	0.003	0.016																				
23-Nov	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	0.001	0.001	0.000	0.001																				
24-Nov	0.000	0.002	0.001	0.002	0.002	Z	0.000	0.008	0.019	0.016	0.015	0.017	0.018	0.013	0.013	0.016	0.012	0.006	0.001	0.007	0.001	0.000	0.001	0.001	0.007	0.019																				
25-Nov	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.005	0.009	0.009	0.010	0.013	0.021	0.028	0.031	0.041	0.052	0.044	0.035	0.011	0.014	0.052																					
26-Nov	0.007	Z	0.036	0.029	0.014	0.007	0.001	0.000	0.002	0.001	0.008	0.005	0.013	0.012	0.007	0.003	0.001	0.014	0.089	0.104	0.062	0.038	0.002	0.000	0.020	0.104																				
27-Nov	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	0.013	0.009	0.000	0.026	0.011	0.003	0.003	0.026																				
28-Nov	0.001	0.003	0.004	Z	0.003	0.005	0.008	0.012	0.004	0.000	0.001	0.002	0.000	M	M	M	M	0.004	0.004	0.004	0.007	0.006	0.010	0.008	0.005	0.012																				
29-Nov	0.022	0.020	0.009	0.008	Z	0.017	0.011	0.009	0.003	0.003	0.001	0.001	M	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.022																				
30-Nov	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																				
																					0.007	0.004	0.007	0.007	0.007	0.009	0.005	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.008	0.008	0.007	0.007	0.006	0.006	Diurnal Average	
																					0.055	0.038	0.067	0.069	0.071	0.067	0.049	0.022	0.019	0.032	0.046	0.049	0.047	0.042	0.033	0.025	0.034	0.034	0.089	0.104	0.062	0.044	0.039	0.046	Diurnal Maximum	
Z - zerospan																					C - Calibration					M - Maintenance																				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	514	75.48	75.48
0.006 - 0.05	160	23.49	98.97
0.06 - 0.1	7	1.03	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - November 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	3	7	12	24	16	9	21	46	50	52	49	37	55	74	44	15	514
0.006 - 0.05	3	0	3	0	1	0	6	4	17	41	25	6	6	15	18	15	160
0.06 - 0.1	0	0	0	0	0	1	2	0	0	2	2	0	0	0	0	0	7
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

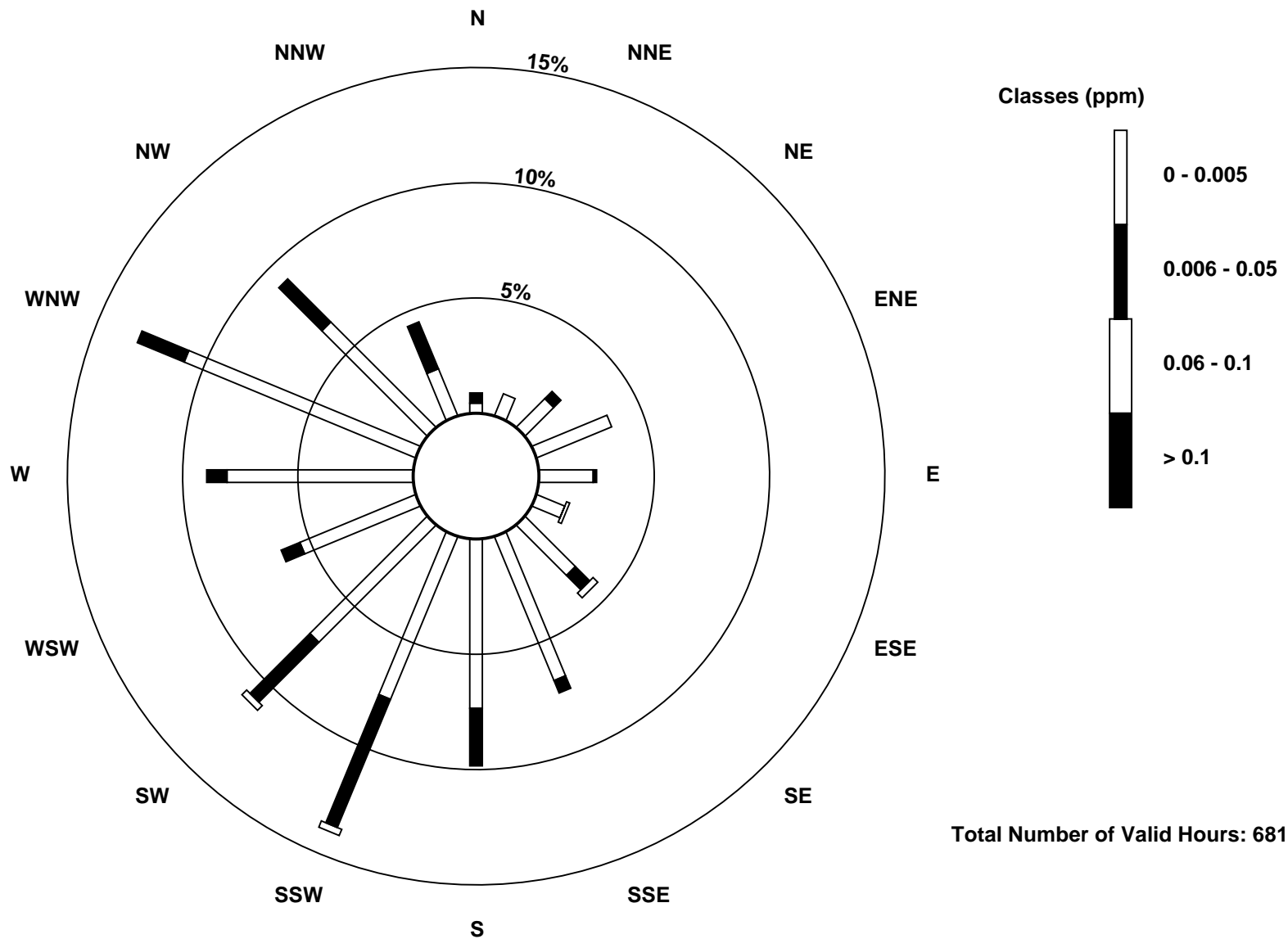
Total Number of Valid Hours: 681

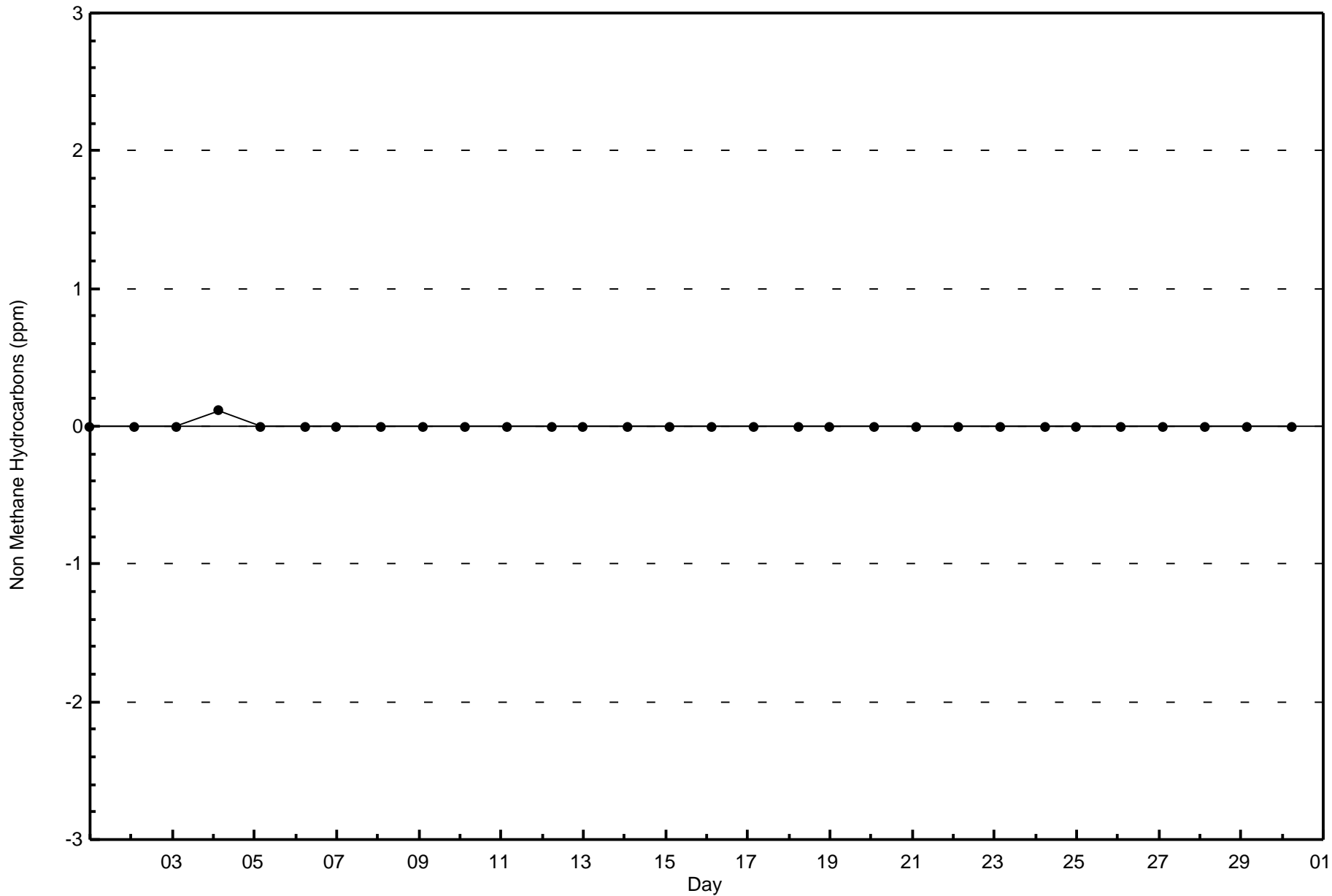
Total Number of Hours: 720

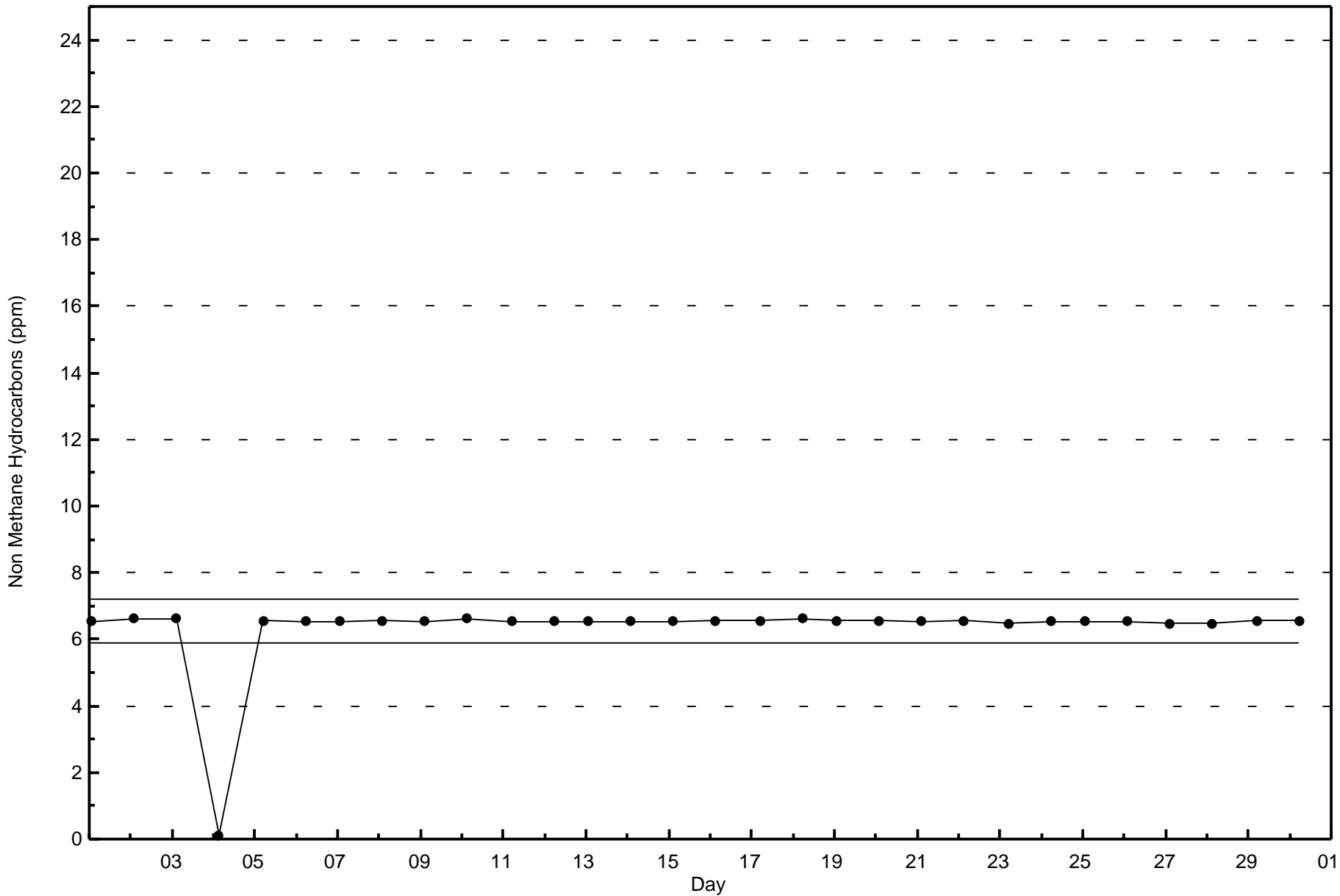


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain (AMS 18)









Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

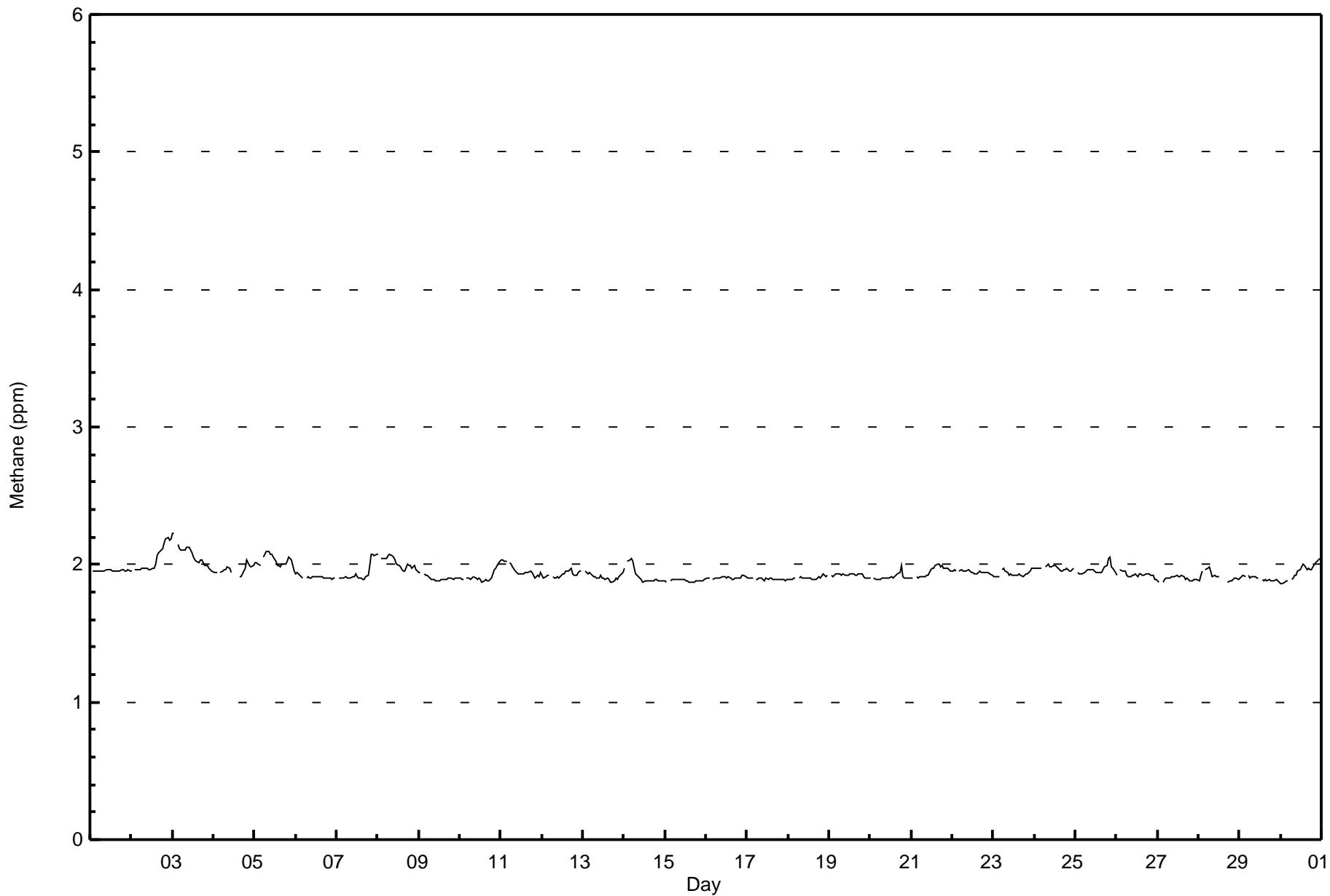
Stony Mountain - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2.2 ppm on Nov 3 01:00 Maximum Daily Average: 2.1 ppm on Nov 3		Hours in Service: 720 Hours of Data: 681 Hours of Missing Data: 39 Hours of Calibration: 34 Percent Operational Time: 99.3																															
Minimum Value: 1.9 ppm on Nov 30 02:00 Maximum Diurnal Average: 2.0 ppm at hour 6 Monthly Average: 1.94 ppm		Minimum Daily Average: 1.9 ppm on Nov 15 Minimum Diurnal Average: 1.9 ppm at hour 16 Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.0 P ₉₉ = 2.1																															
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-Nov	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	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-Nov	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	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.0	2.2			
3-Nov	2.2	2.2	Z	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.1	2.2		
4-Nov	1.9	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	2.0	1.9	C	C	C	C	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		
5-Nov	2.0	2.0	2.0	2.0	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	2.1	2.0	2.0	1.9	2.0	2.1	2.1	2.0	2.1			
6-Nov	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	1.9	1.9	1.9		
7-Nov	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	2.1	2.1	2.1	2.1	2.1	2.1	1.9	2.1	1.9	2.1		
8-Nov	2.1	Z	2.0	2.0	2.0	2.0	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	2.0	2.0	2.1	2.0	2.1		
9-Nov	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	1.9	1.9	1.9		
10-Nov	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	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2.0		
11-Nov	2.0	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0		
12-Nov	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	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	2.0	1.9	2.0		
13-Nov	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0		
14-Nov	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	1.9	1.9	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		
15-Nov	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	1.9	1.9	1.9		
16-Nov	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	1.9	1.9	1.9	1.9		
17-Nov	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	1.9	1.9	1.9		
18-Nov	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	1.9	1.9	1.9		
19-Nov	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	1.9	1.9	1.9	1.9		
20-Nov	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0		
21-Nov	1.9	1.9	Z	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	2.0	2.0	2.0	1.9	2.0		
22-Nov	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	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	2.0		
23-Nov	1.9	1.9	1.9	1.9	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	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2.0		
24-Nov	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	2.0	2.0	2.0	2.0		
25-Nov	Z	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	2.0	2.0	2.1	2.0	2.0	1.9	2.0	2.1	2.0	2.1	2.0	2.1			
26-Nov	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	2.0		
27-Nov	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	1.9	1.9	1.9		
28-Nov	1.9	1.9	2.0	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	M	M	M	M	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-Nov	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		
30-Nov	1.9	1.9	1.9	1.9	1.9	Z	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	2.0	2.0	2.0	2.0	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	1.9	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				
	2.2	2.2	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	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	2.2	Diurnal Maximum			
Z - zerospan		C - Calibration				M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Stony Mountain - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Stony Mountain - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	642	94.27	94.27
2.1 - 3.0	39	5.73	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 681

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Methane (CH₄) - ppm
Stony Mountain - November 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	7	15	24	17	10	29	50	58	73	69	43	61	88	62	30	642
2.1 - 3.0	0	0	0	0	0	0	0	0	9	22	7	0	0	1	0	0	39
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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

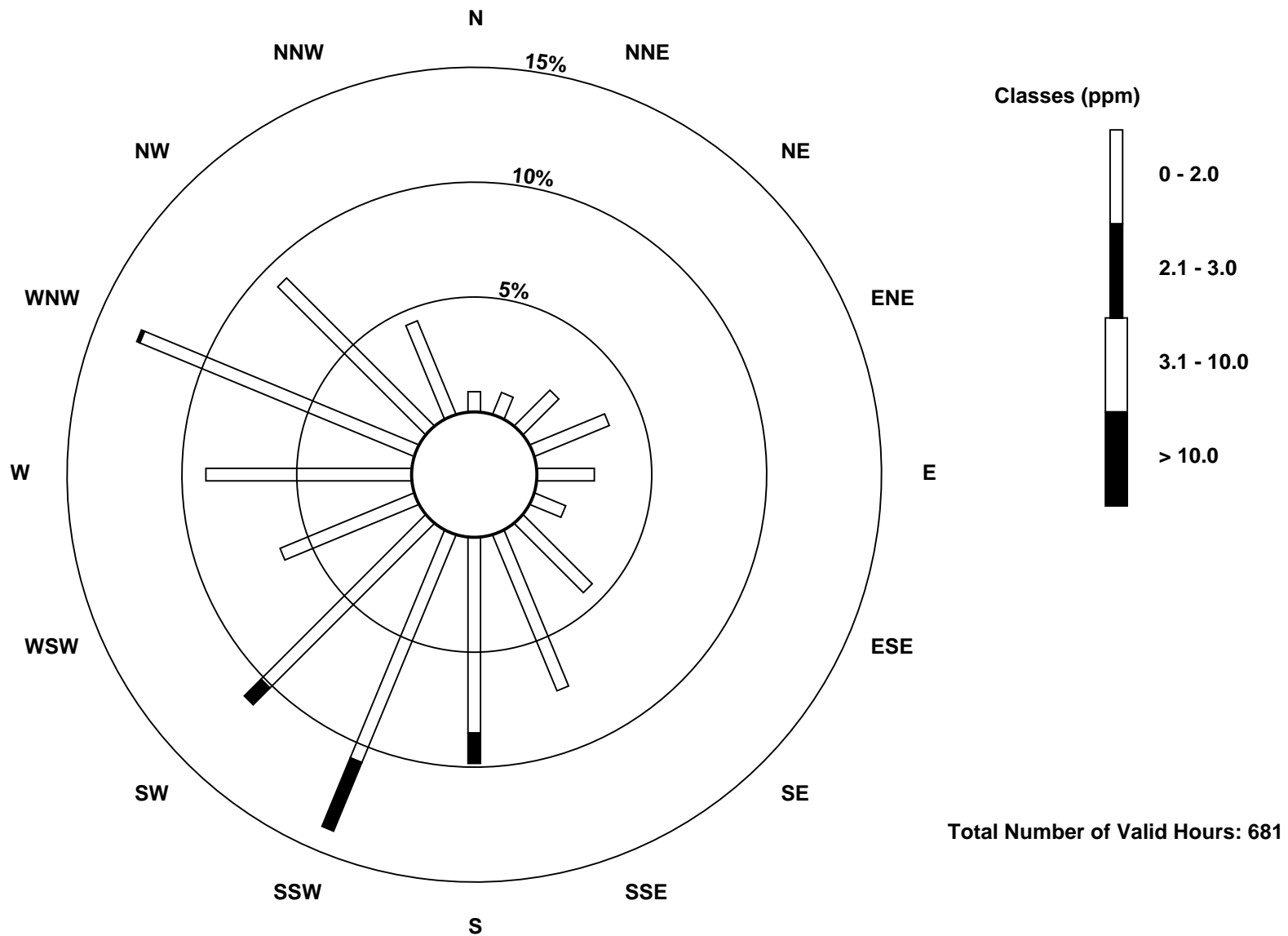
Total Number of Valid Hours: 681

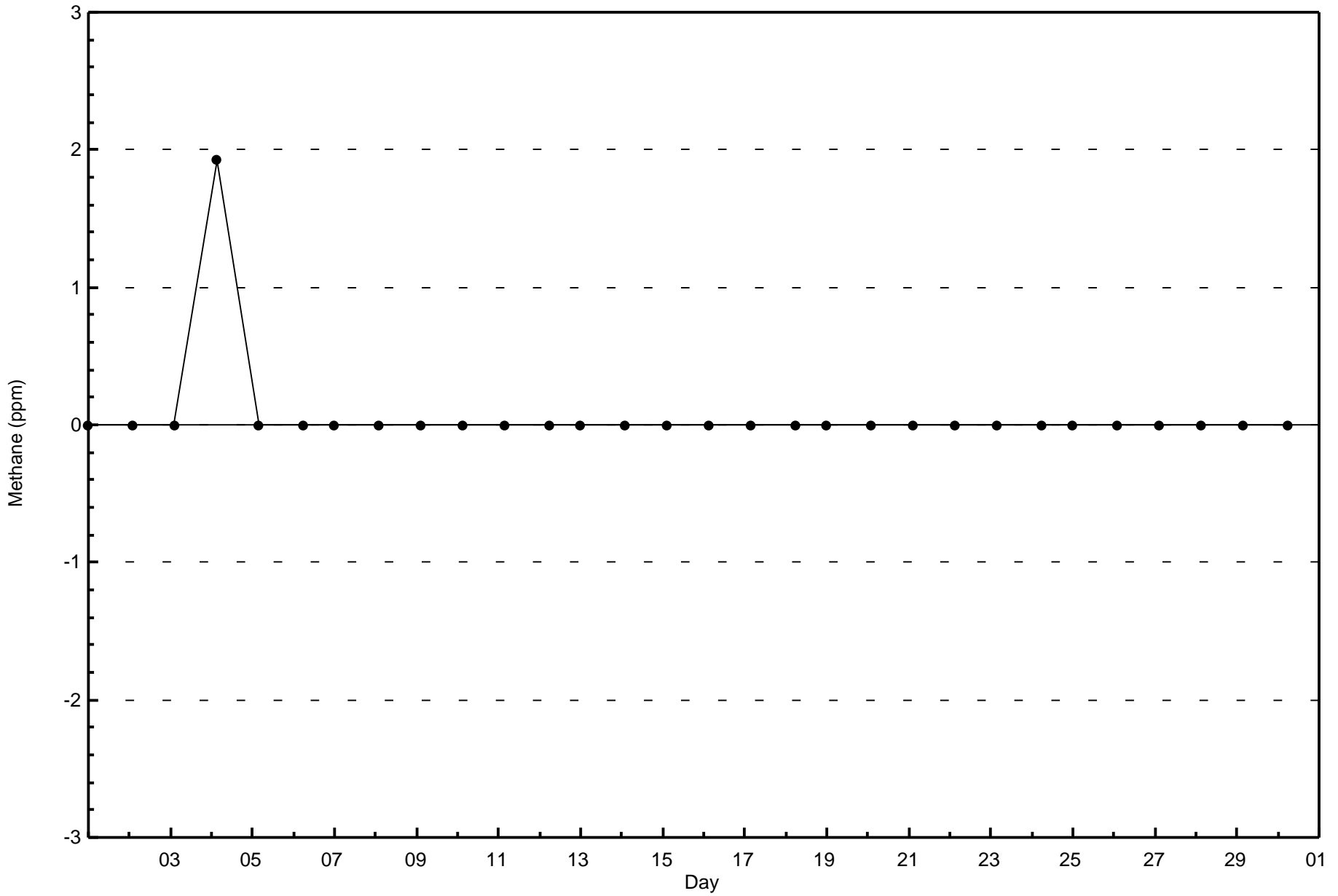
Total Number of Hours: 720

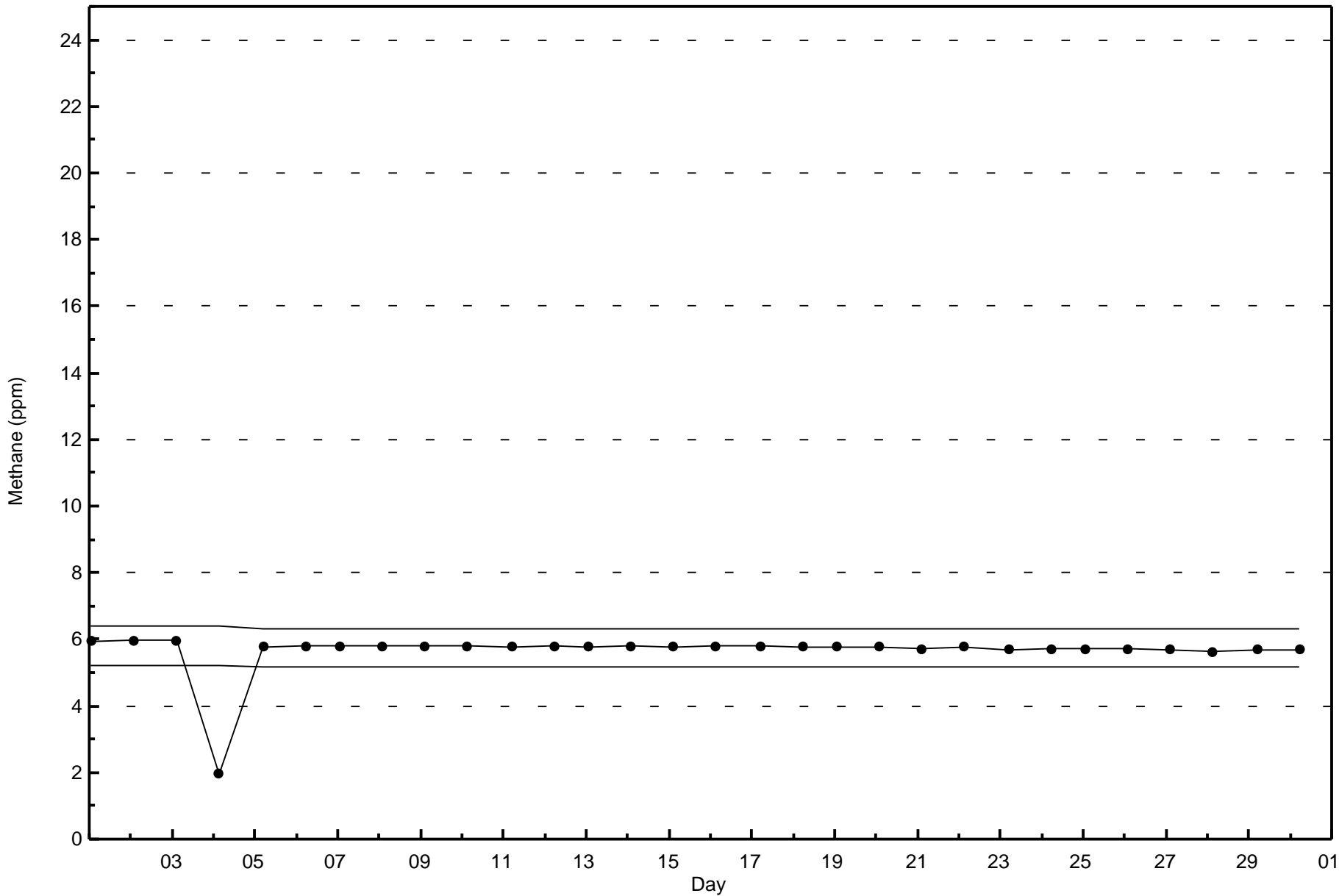


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Methane (CH₄) - ppm
Stony Mountain (AMS 18)







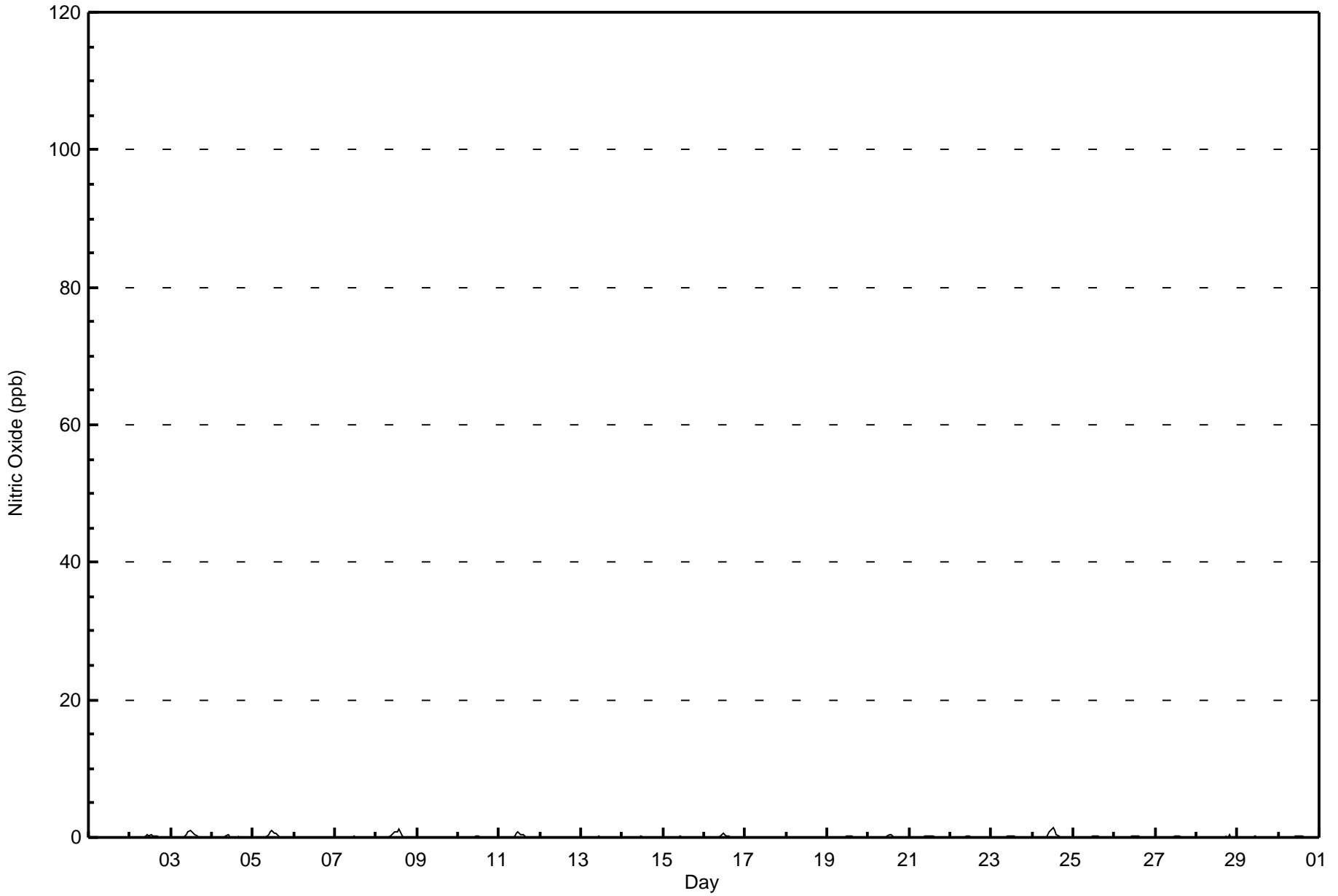


Maximum Value: 1 ppb on Nov 24 13:00		Maximum Daily Average: 0.3 ppb on Nov 24		Hours in Service: 720																																																	
Minimum Value: 0 ppb on Nov 1 02:00		Minimum Daily Average: 0.0 ppb on Nov 1		Hours of Data: 681																																																	
Maximum Diurnal Average: 0.3 ppb at hour 12		Minimum Diurnal Average: 0.0 ppb at hour 2		Hours of Missing Data: 39																																																	
Monthly Average: 0.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		Hours of Calibration: 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-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																										
2-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																										
3-Nov	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	0.2	1																										
4-Nov	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0																										
5-Nov	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	0.2	1																										
6-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																										
7-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																										
8-Nov	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																										
9-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																										
10-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																										
11-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																										
12-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																										
13-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																										
14-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																										
15-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																										
16-Nov	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	0.1	1																										
17-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																										
18-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																										
19-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																										
20-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																										
21-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																										
22-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																										
23-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																										
24-Nov	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1																										
25-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																										
26-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																										
27-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																										
28-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	M	M	M	M	0	0	0	0	0	0	0	0	0.0	0																										
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																										
30-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																										
																								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.2	0.2	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	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum
Z - zerospan																								C - Calibration				M - Maintenance																									



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Stony Mountain - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Stony Mountain - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



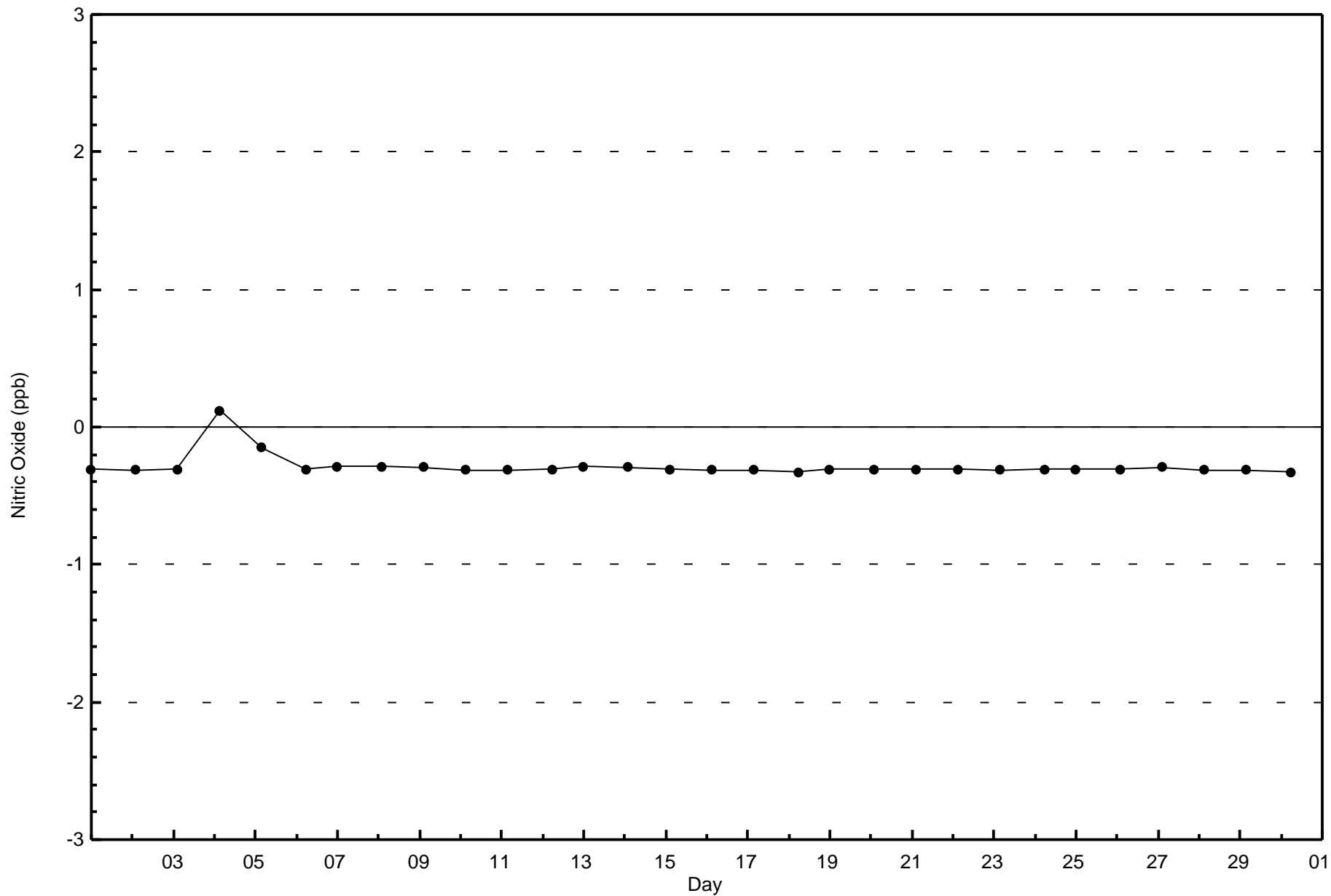
**Wood Buffalo Environmental Association
Frequency Distribution**

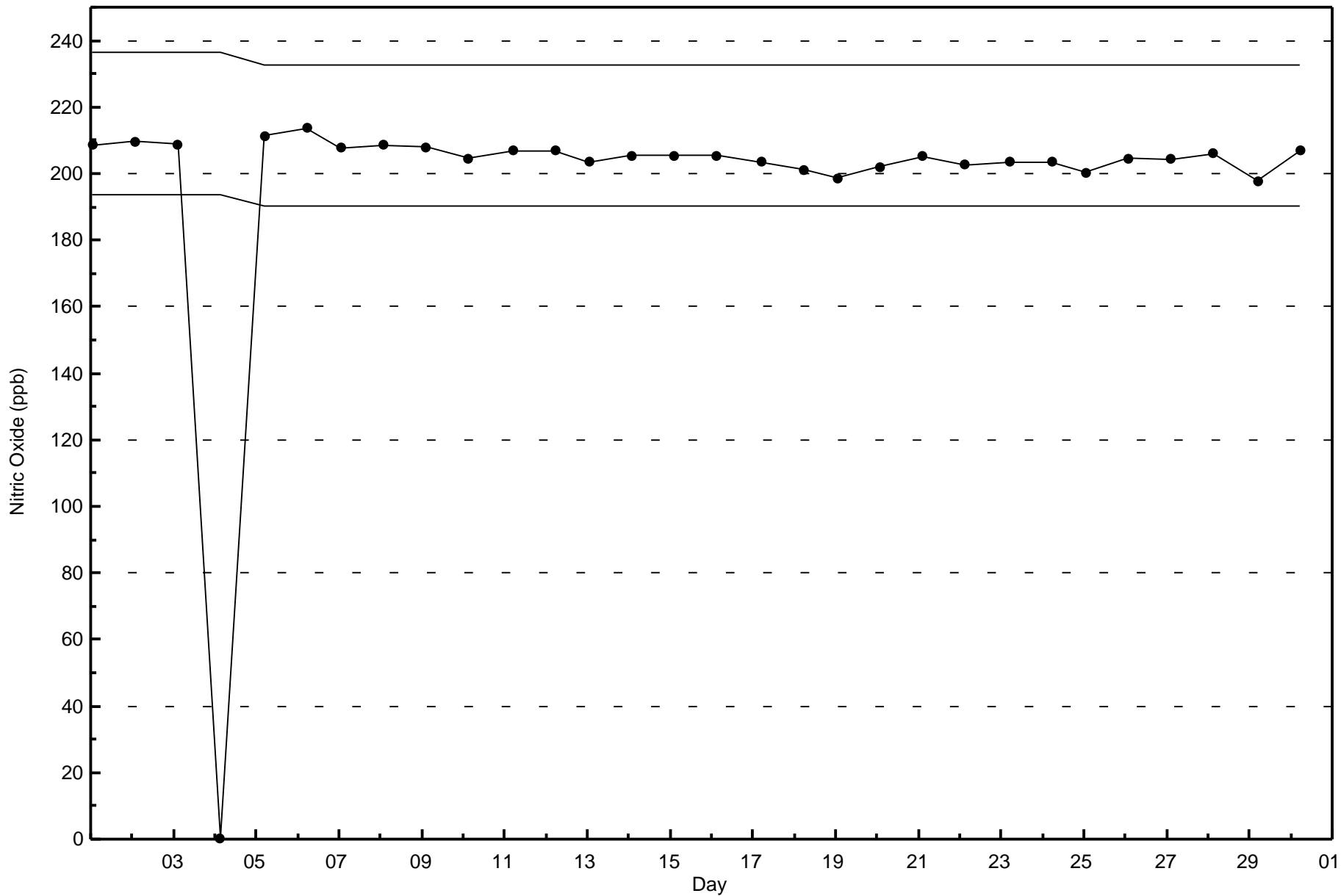
**Nitric Oxide (NO) - ppb
Stony Mountain - November 2016**

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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681
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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

Total Number of Valid Hours: 681

Total Number of Hours: 720







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Stony Mountain - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 6 ppb on Nov 22 22:00	Maximum Daily Average: 3.5 ppb on Nov 5		Hours of Data:	681
Minimum Value: 0 ppb on Nov 1 07:00	Minimum Daily Average: 0.2 ppb on Nov 1		Hours of Missing Data:	39
Maximum Diurnal Average: 2.0 ppb at hour 21	Minimum Diurnal Average: 1.3 ppb at hour 5		Hours of Calibration:	34
Monthly Average: 1.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 O ₃ = 2 P ₉₀ = 3 P ₉₉ = 4		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-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
2-Nov	1	Z	0	0	0	1	1	1	1	2	2	1	2	2	2	2	4	3	3	3	3	3	2	2	1.8	4
3-Nov	3	2	Z	2	2	2	2	3	3	3	3	2	2	2	2	2	3	3	3	2	2	2	1	1	2.2	3
4-Nov	1	1	1	Z	1	1	1	2	3	2	1	C	C	C	C	2	2	3	4	4	4	4	3	3	2.3	4
5-Nov	3	3	3	3	Z	3	3	4	4	4	3	C	C	C	4	4	4	4	4	4	4	3	2	3.5	4	
6-Nov	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	0.9	2	
7-Nov	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	5	5	4	3	1.4	5
8-Nov	3	Z	3	2	3	2	3	3	3	2	2	3	4	4	4	4	4	4	3	3	3	3	3	3	3.1	4
9-Nov	3	4	Z	3	3	2	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1.1	4
10-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	0	1	1	1	1	1	2	3	4	3	2	2	1.1	4
11-Nov	2	2	2	2	Z	2	2	2	2	1	2	2	3	3	3	2	3	3	3	2	1	2	2	2	2.0	3
12-Nov	1	1	1	2	1	Z	1	1	1	1	1	1	2	2	2	2	3	2	2	2	2	2	1	1	1.6	3
13-Nov	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	1.0	3
14-Nov	3	Z	4	4	4	4	3	2	1	1	1	1	1	1	0	1	0	1	1	1	0	0	1	1	1.5	4
15-Nov	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0.7	1
16-Nov	1	1	1	Z	1	1	1	2	2	2	2	2	1	1	1	0	1	1	1	1	1	2	4	4	1.4	4
17-Nov	2	2	2	2	Z	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
18-Nov	1	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	1	2	1	2	1	1	1	0.7	2
19-Nov	Z	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2
20-Nov	0	Z	1	1	1	1	1	2	1	1	1	1	2	2	2	2	2	3	3	2	2	1	2	1	1.5	3
21-Nov	1	1	Z	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1.5	2
22-Nov	1	1	1	Z	1	1	1	2	3	3	2	1	1	1	1	1	1	1	2	2	4	6	4	3	1.8	6
23-Nov	3	3	2	2	Z	2	3	2	3	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2.1	3
24-Nov	2	1	1	1	1	Z	1	2	2	3	3	4	4	4	4	6	3	3	6	4	3	4	3	3	3.1	6
25-Nov	Z	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	3	2	2.4	4
26-Nov	2	Z	2	2	2	2	2	1	2	1	2	2	1	2	2	2	2	3	4	4	4	4	3	2	2.1	4
27-Nov	2	1	Z	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1.1	2
28-Nov	1	2	1	Z	2	2	2	1	1	1	1	1	1	M	M	M	M	1	1	1	1	1	1	1	1.0	2
29-Nov	1	1	1	2	Z	2	1	1	1	1	1	1	M	1	1	1	1	1	1	0	1	1	1	0	0.9	2
30-Nov	0	0	1	0	1	Z	1	1	1	1	2	2	2	2	2	2	1	2	1	2	2	2	2	2	1.3	2

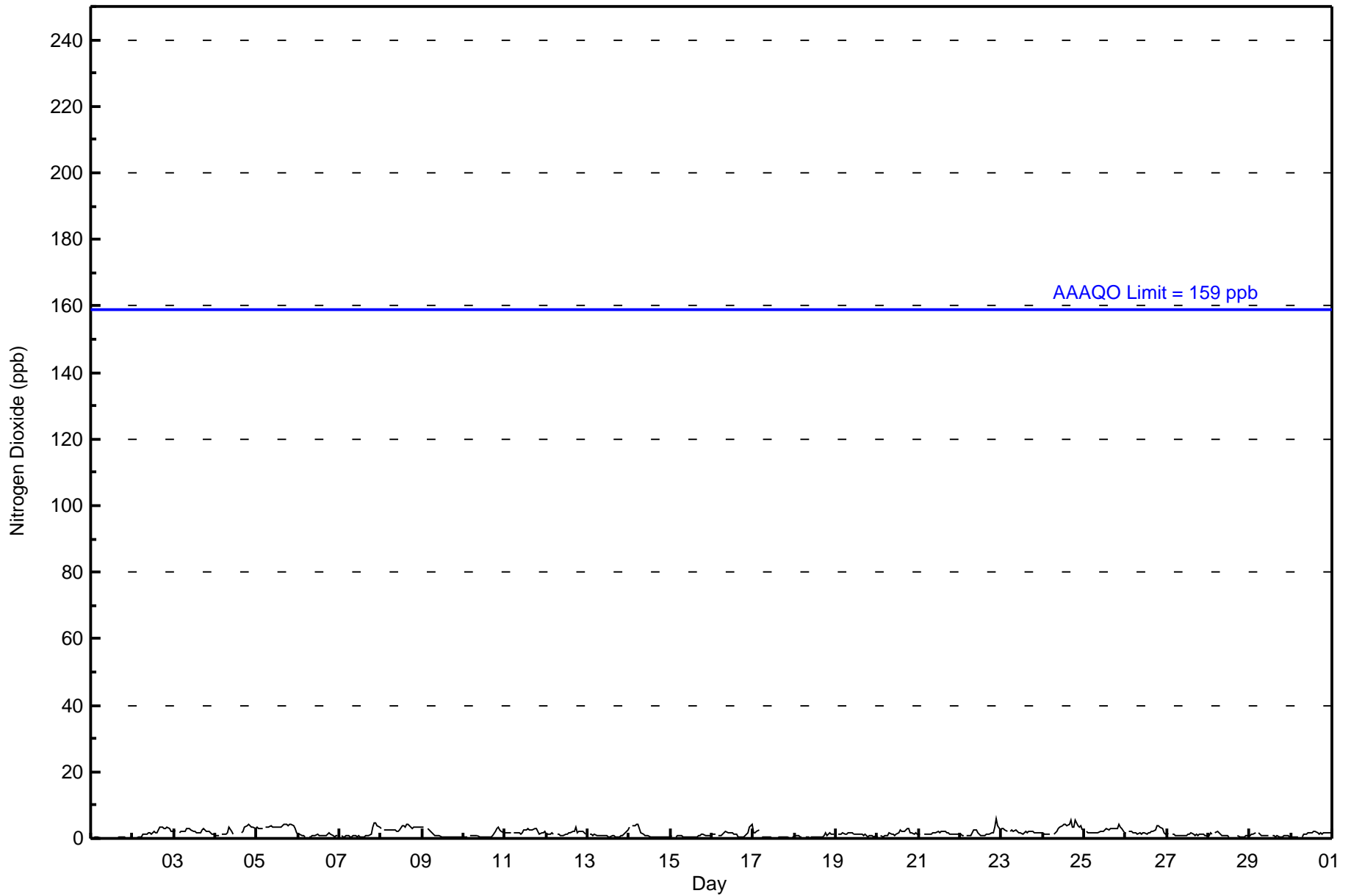
1.5	1.4	1.4	1.5	1.3	1.5	1.3	1.4	1.5	1.4	1.3	1.4	1.5	1.5	1.5	1.6	1.7	1.8	1.8	1.9	2.0	1.9	1.8	1.6	Diurnal Average
3	4	4	4	4	4	3	4	4	4	4	3	4	4	4	4	6	4	4	6	5	6	4	4	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - 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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681
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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

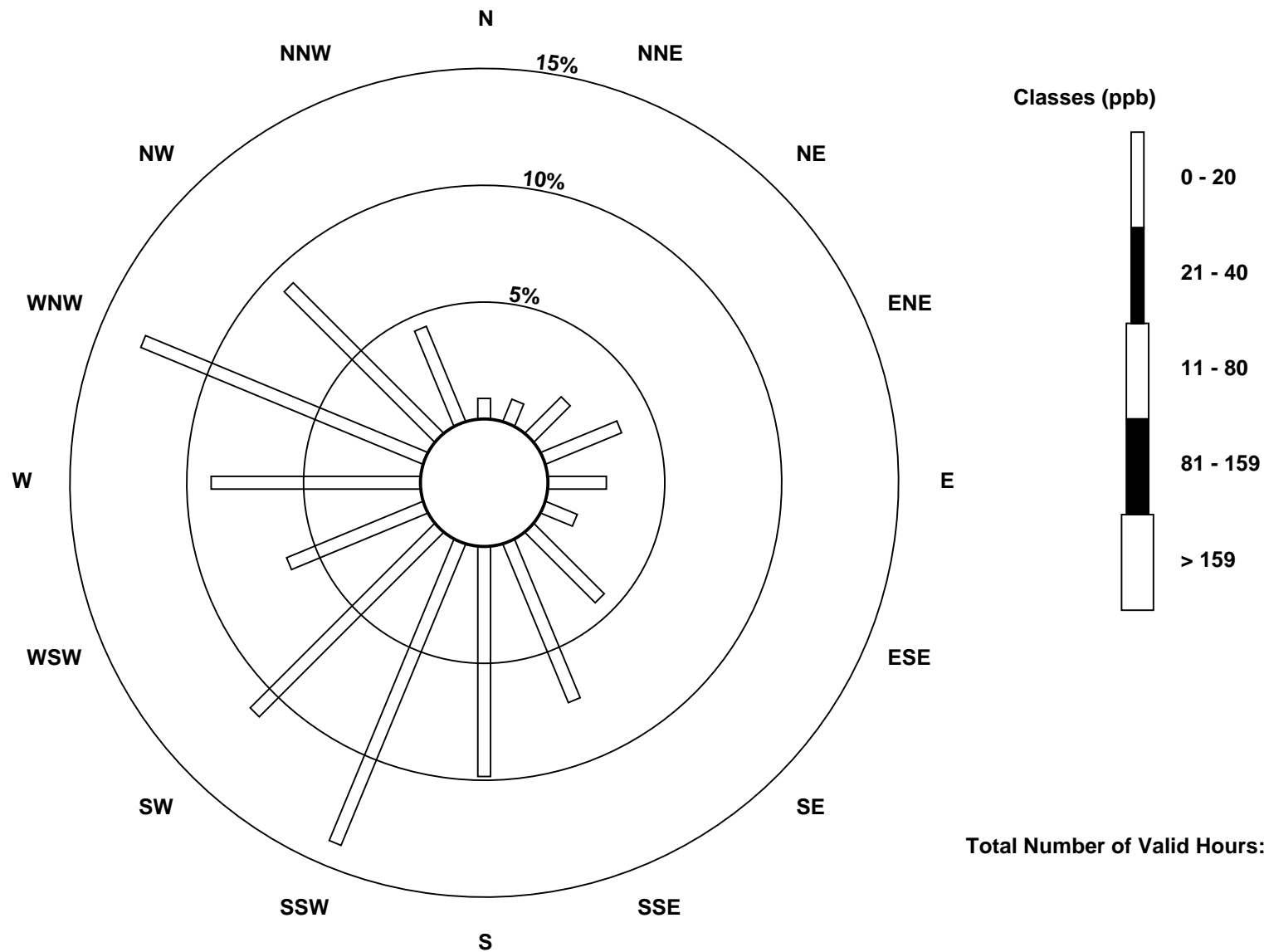
Total Number of Valid Hours: 681

Total Number of Hours: 720

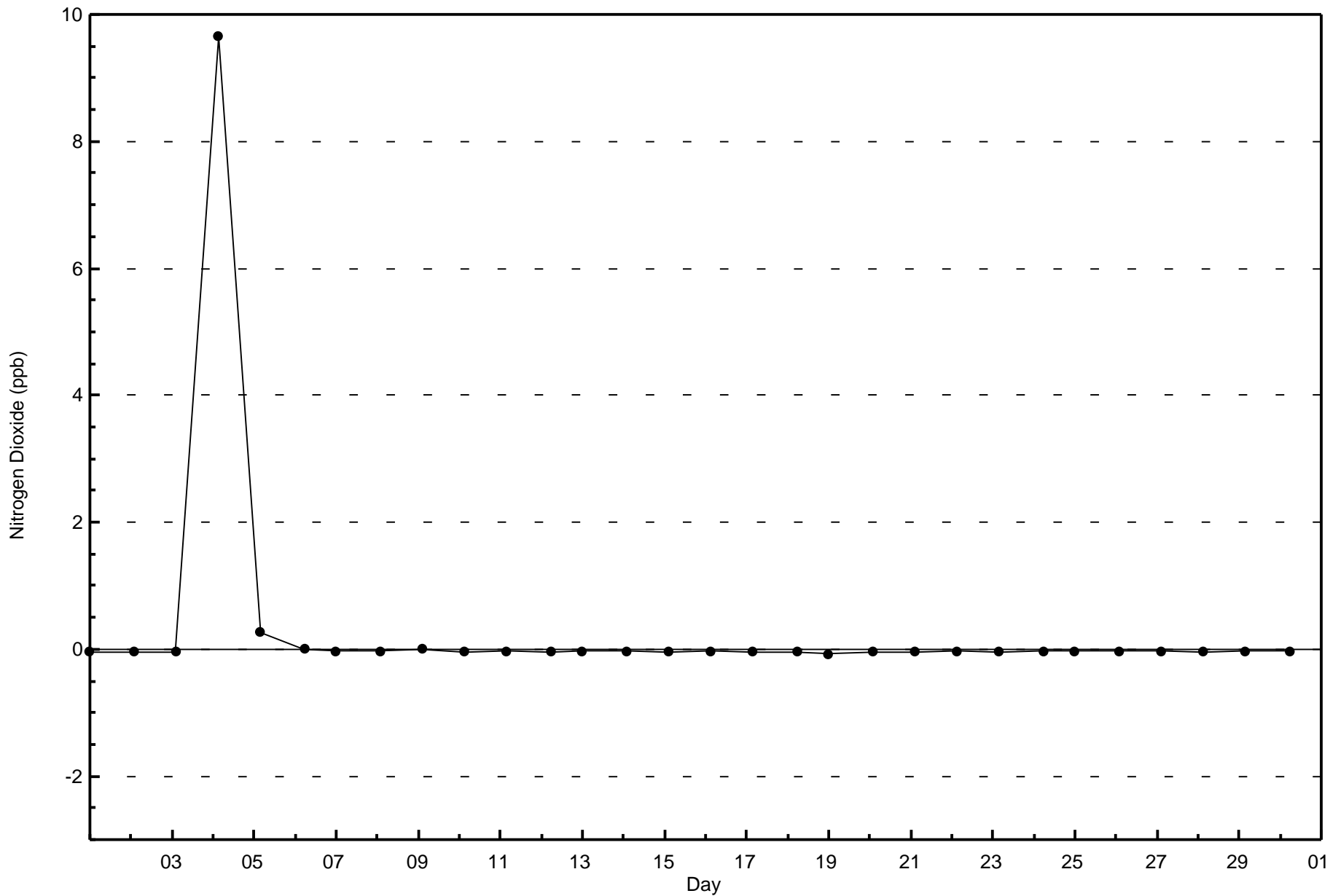


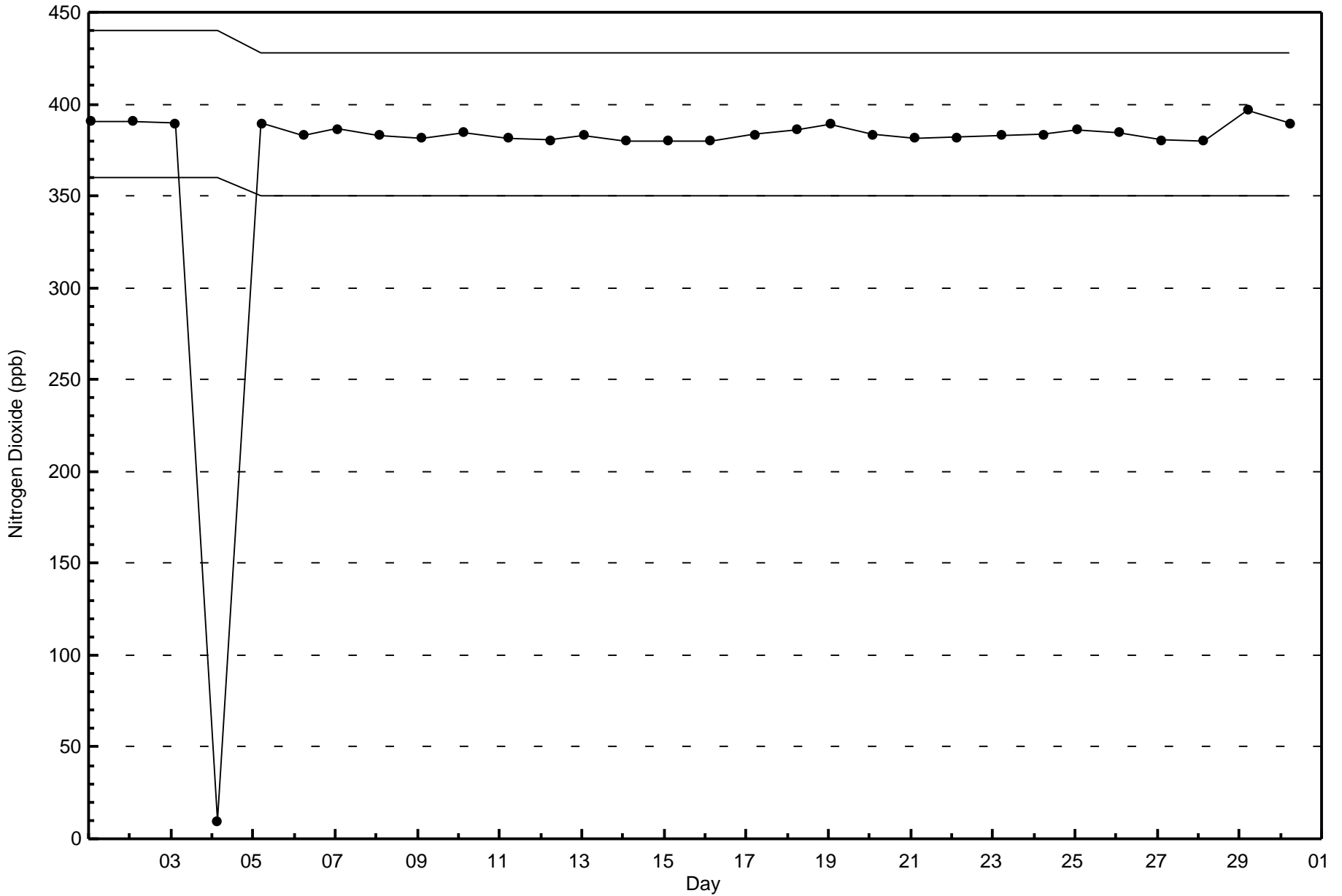
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 681







Wood Buffalo Environmental Association
Summary of Hour Averages

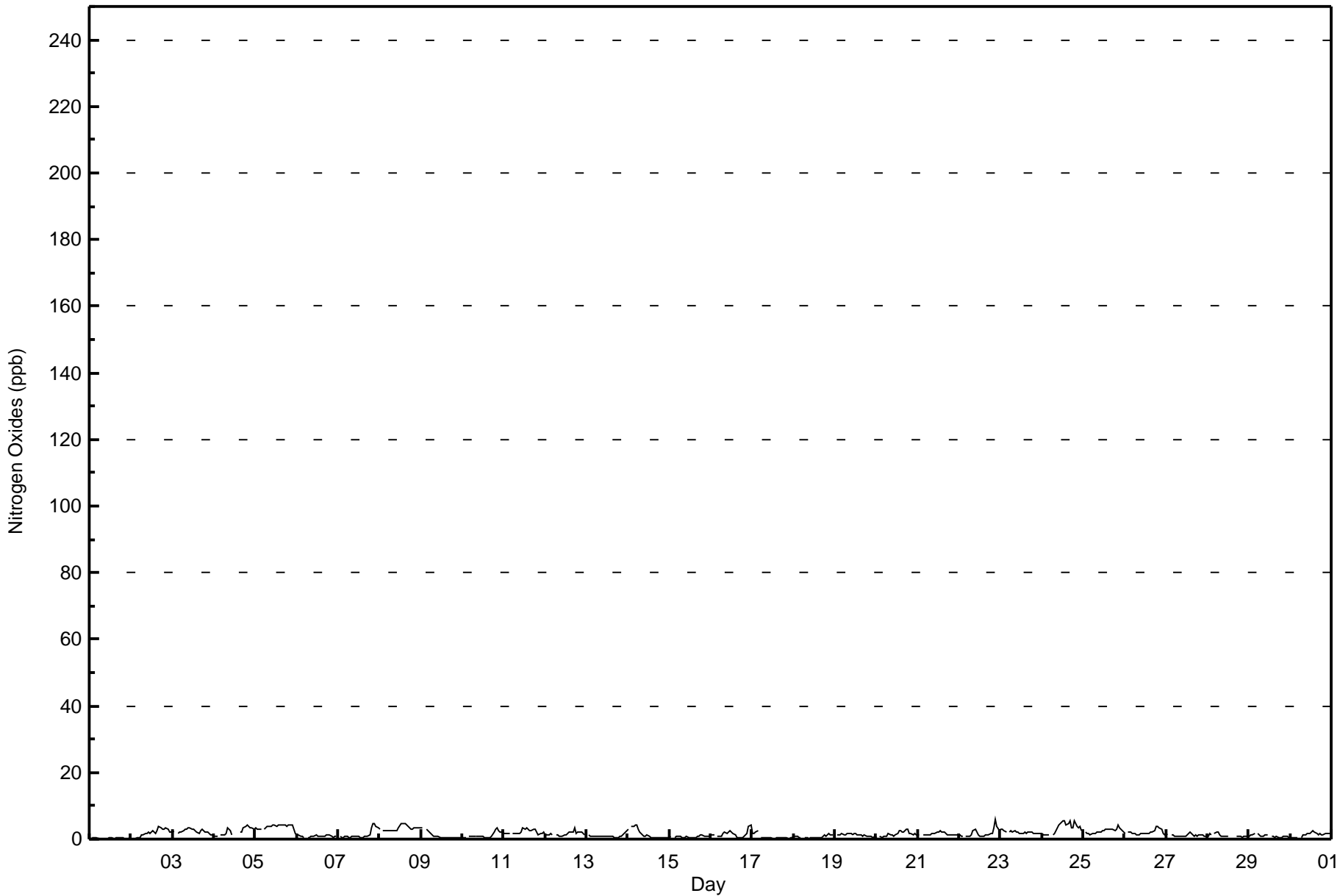
Nitrogen Oxides (NO_x) - ppb
Stony Mountain - November 2016

Maximum Value: 6 ppb on Nov 22 22:00																	Maximum Daily Average: 3.7 ppb on Nov 5																	Hours in Service: 720														
Minimum Value: 0 ppb on Nov 1 08:00																	Minimum Daily Average: 0.2 ppb on Nov 1																	Hours of Data: 681														
Maximum Diurnal Average: 2.0 ppb at hour 21																	Minimum Diurnal Average: 1.3 ppb at hour 5																	Hours of Missing Data: 39														
Monthly Average: 1.6 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 O ₃ = 2 P ₉₀ = 3 P ₉₉ = 5																	Hours of Calibration: 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-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																						
2-Nov	0	Z	0	0	0	1	1	1	1	2	2	2	2	2	2	3	4	3	3	3	3	3	2	2	1.9	4																						
3-Nov	3	2	Z	2	2	2	2	3	3	3	4	3	3	2	2	2	3	3	3	2	2	2	1	1	2.3	4																						
4-Nov	1	1	1	Z	1	1	1	2	3	3	1	C	C	C	C	2	2	3	4	4	4	4	3	3	2.4	4																						
5-Nov	3	3	3	3	Z	3	3	4	4	4	4	C	C	C	4	4	4	4	4	4	4	3	2	3.7	4																							
6-Nov	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																							
7-Nov	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	5	5	4	3	1.4	5																						
8-Nov	3	Z	3	2	3	2	3	3	3	2	3	3	5	5	4	5	4	4	3	3	3	3	3	3	3.3	5																						
9-Nov	3	4	Z	3	3	2	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	1	1.1	4																						
10-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	1	1	1	2	3	4	2	2	2	1.2	4																						
11-Nov	2	2	2	2	Z	2	2	2	2	2	2	3	3	3	3	3	3	3	3	2	1	2	2	2	2.2	3																						
12-Nov	1	1	1	2	1	Z	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	2	2	1	1.6	3																						
13-Nov	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	2	2	1.0	2																						
14-Nov	3	Z	4	4	4	4	3	2	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	1.5	4																						
15-Nov	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0.7	1																						
16-Nov	1	1	1	Z	1	1	1	2	2	2	2	2	2	2	1	1	0	0	1	1	1	2	4	4	1.5	4																						
17-Nov	2	2	2	2	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2																						
18-Nov	1	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	1	0.7	2																						
19-Nov	Z	1	1	1	2	1	1	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2																						
20-Nov	0	Z	1	1	1	1	1	2	1	1	1	1	2	3	2	2	2	3	3	2	2	1	2	1	1.5	3																						
21-Nov	1	1	Z	1	1	1	1	1	2	2	2	2	2	3	2	2	2	1	1	1	1	1	1	1	1.5	3																						
22-Nov	1	1	1	Z	1	1	1	1	3	3	2	1	1	1	1	1	1	1	2	2	4	6	4	3	1.8	6																						
23-Nov	3	3	2	2	Z	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	3																						
24-Nov	2	1	1	1	1	Z	1	2	2	3	4	5	6	5	4	5	6	3	3	5	4	3	4	3	3.3	6																						
25-Nov	Z	2	2	2	1	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	3	2	2.5	4																						
26-Nov	2	Z	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	3	4	4	3	3	2	1	2.1	4																						
27-Nov	2	1	Z	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1.2	2																						
28-Nov	1	2	1	Z	2	2	2	1	1	1	1	1	1	M	M	M	M	1	1	1	1	1	1	1	1.1	2																						
29-Nov	1	1	1	2	Z	2	1	1	1	1	1	1	M	1	1	1	1	1	0	0	1	1	1	0	0.9	2																						
30-Nov	0	0	0	0	0	Z	1	1	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	2	1.3	2																						
																								1.6	1.4	1.4	1.5	1.3	1.5	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.6	1.7	1.7	1.8	1.8	1.9	2.0	1.9	1.8	1.6	Diurnal Average
																								3	4	4	4	4	4	3	4	4	4	4	5	6	5	4	5	6	4	4	5	5	6	4	4	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Stony Mountain - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - 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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681
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	7	15	24	17	10	29	50	67	95	76	43	61	89	62	30	681

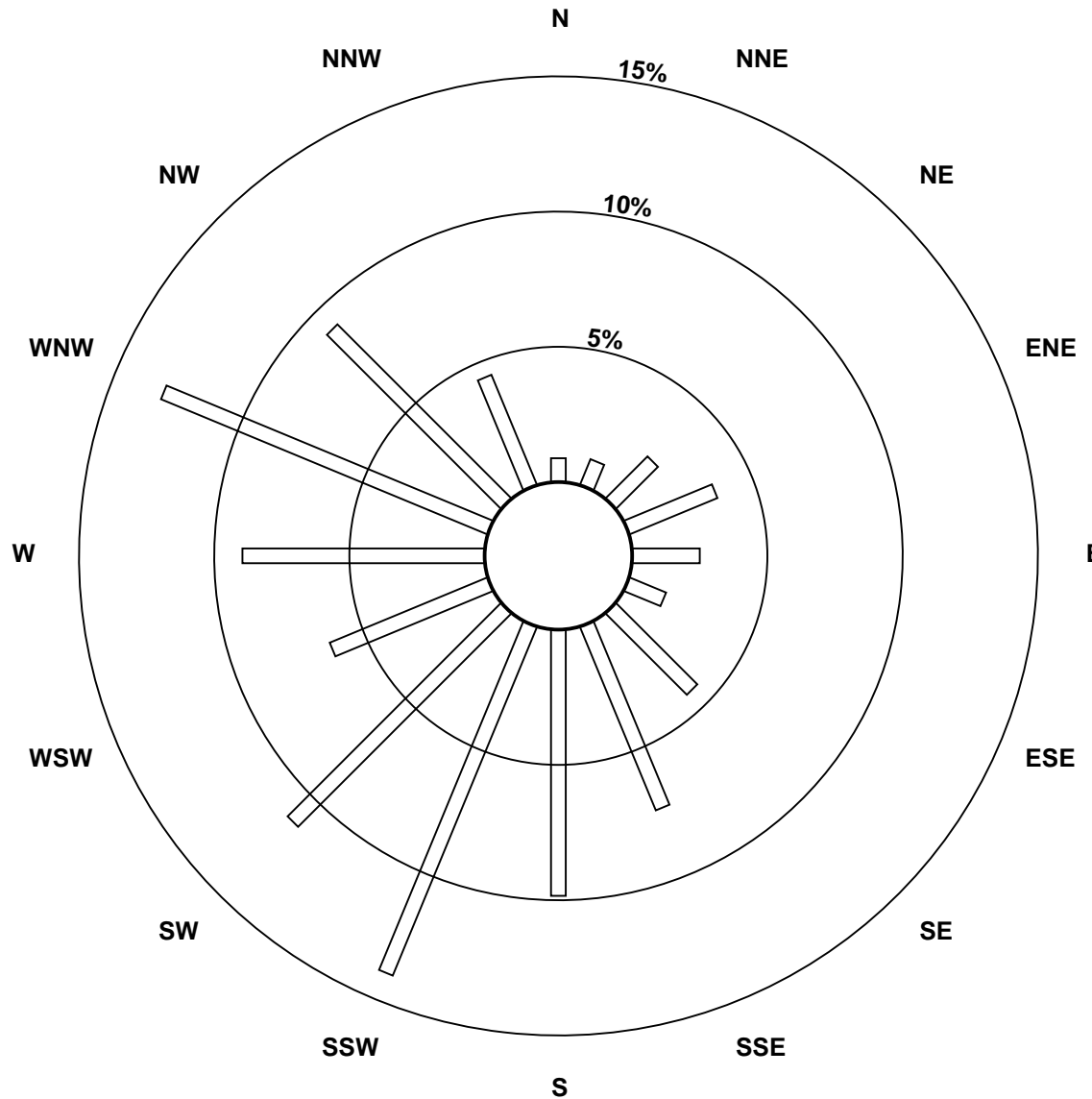
Total Number of Valid Hours: 681

Total Number of Hours: 720

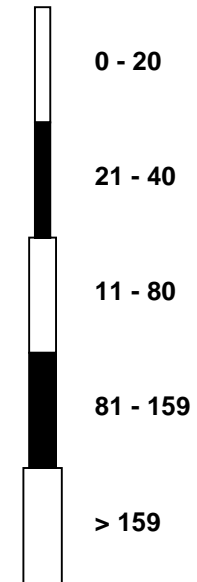


Wood Buffalo Environmental Association
Wind Rose Nov 2016

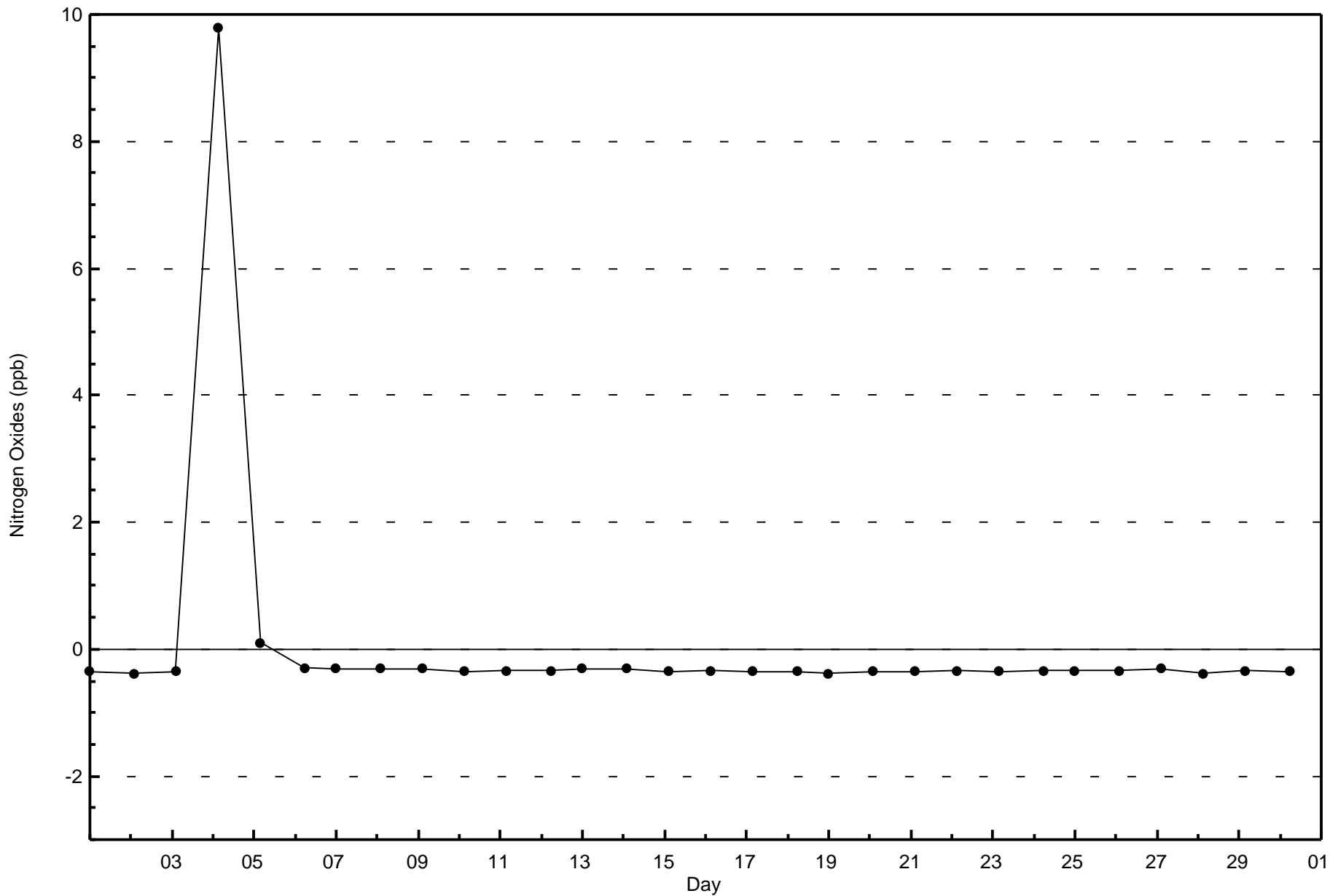
Nitrogen Oxides (NO_x) - ppb
Stony Mountain (AMS 18)

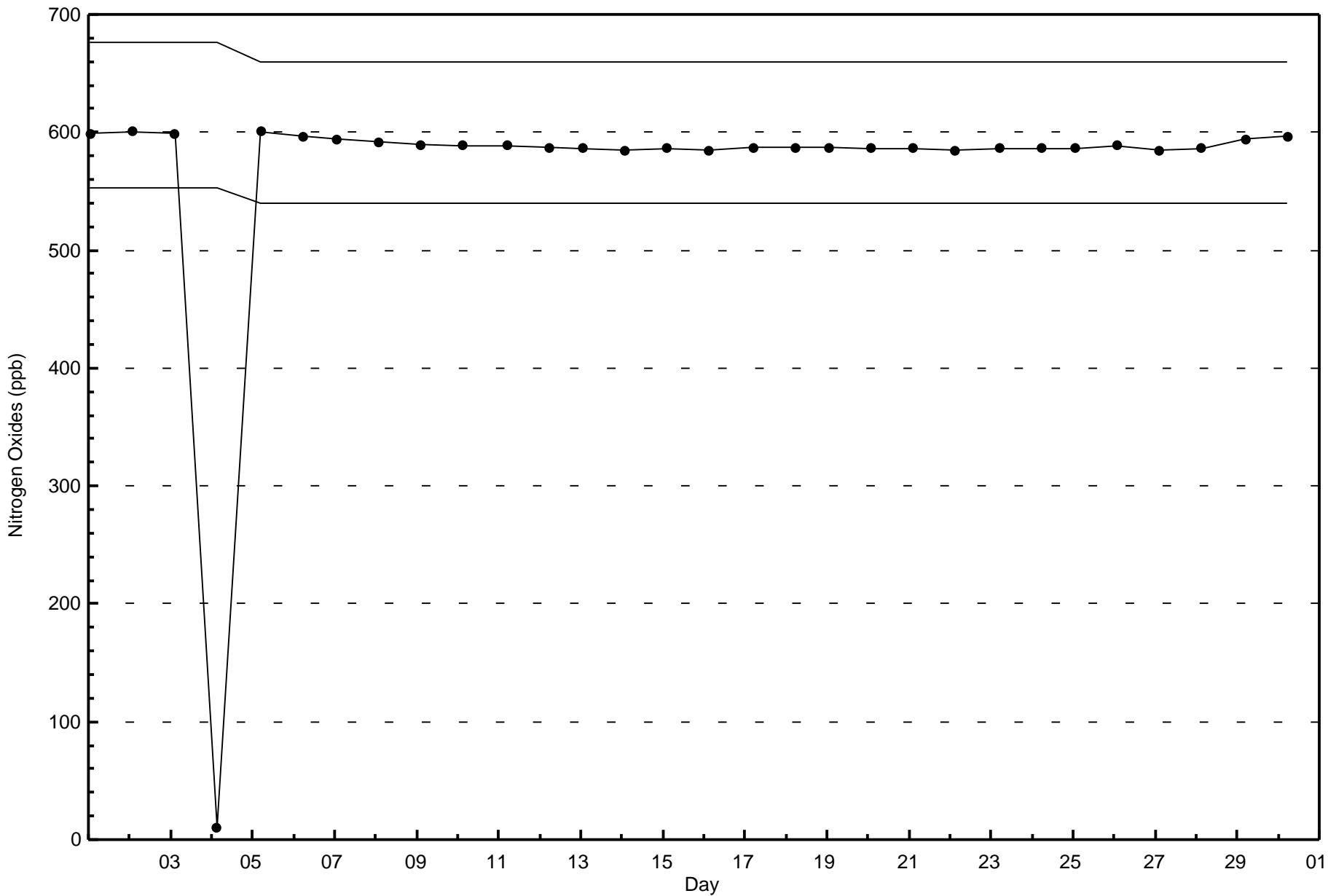


Classes (ppb)



Total Number of Valid Hours: 681







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Stony Mountain - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 46 ppb on Nov 9 14:00	Maximum Daily Average: 42.5 ppb on Nov 6		Hours of Data:	685
Minimum Value: 14 ppb on Nov 24 12:00	Minimum Daily Average: 16.7 ppb on Nov 24		Hours of Missing Data:	35
Maximum Diurnal Average: 31.3 ppb at hour 15	Minimum Diurnal Average: 27.4 ppb at hour 8		Hours of Calibration:	34
Monthly Average: 29.4 ppb	Percentiles: P ₁ = 15 P ₁₀ = 19 Q ₁ = 24 Median = 30 Q ₃ = 35 P ₉₀ = 38 P ₉₉ = 44		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-Nov	24	26	Z	24	25	27	29	29	29	29	29	30	31	35	36	35	35	35	34	34	35	35	34	33	31.0	36
2-Nov	31	30	32	Z	32	31	28	27	26	24	24	25	24	24	23	20	19	19	19	19	19	20	20	21	24.2	32
3-Nov	20	20	21	21	Z	18	18	18	17	16	16	17	20	24	27	28	25	25	28	31	33	38	39	39	24.3	39
4-Nov	40	39	40	37	37	Z	35	34	34	38	41	42	42	42	43	42	40	37	35	32	32	33	32	31	37.3	43
5-Nov	29	29	31	34	30	28	Z	26	26	27	28	29	32	33	33	31	30	30	29	29	27	28	31	36	29.8	36
6-Nov	39	40	43	44	45	45	45	Z	45	44	44	42	42	42	42	42	43	43	42	42	42	42	39	39	42.5	45
7-Nov	39	39	Z	40	37	35	37	37	37	34	33	28	33	38	42	40	40	37	35	29	23	23	23	22	34.0	42
8-Nov	22	22	22	Z	20	21	19	19	19	20	23	26	25	27	28	29	28	25	25	25	25	24	26	26	23.8	29
9-Nov	26	25	26	26	Z	29	33	38	37	36	36	40	45	46	44	43	42	41	41	40	39	38	38	37	36.8	46
10-Nov	37	37	36	36	36	Z	36	34	31	30	30	29	33	37	38	38	37	35	33	31	31	34	34	33	34.2	38
11-Nov	33	33	32	30	29	28	Z	27	26	26	25	25	23	23	29	29	25	22	21	28	36	33	32	27	28.0	36
12-Nov	34	38	34	30	32	34	39	Z	41	39	40	38	38	38	37	36	31	31	35	35	34	32	32	32	35.2	41
13-Nov	30	31	Z	31	29	30	33	30	31	30	25	27	28	30	29	31	33	35	33	32	32	31	28	24	30.2	35
14-Nov	23	22	20	Z	18	18	24	30	34	35	35	36	37	37	38	38	37	37	36	36	38	39	38	38	32.4	39
15-Nov	38	37	36	35	Z	35	35	35	34	35	34	36	39	41	41	36	35	35	36	38	38	37	37	36	36.5	41
16-Nov	33	33	32	32	33	Z	34	34	34	33	32	32	36	37	38	39	40	38	36	33	30	28	25	25	33.3	40
17-Nov	33	35	31	31	33	36	Z	35	34	35	37	36	37	37	37	37	38	38	37	36	39	40	39	38	36.1	40
18-Nov	36	35	35	34	33	32	32	Z	34	35	35	35	36	36	38	36	35	34	34	35	32	31	29	30	34.1	38
19-Nov	29	28	Z	28	26	25	24	23	23	25	26	26	26	27	30	31	31	30	31	31	31	31	30	30	27.8	31
20-Nov	30	30	30	Z	29	28	27	25	25	24	24	23	23	22	22	21	20	19	19	24	24	25	23	23	24.3	30
21-Nov	22	22	22	21	Z	20	19	18	17	16	17	18	19	17	18	19	20	21	21	22	21	21	21	22	19.8	22
22-Nov	22	21	21	20	18	Z	17	17	16	17	19	20	20	19	18	17	18	19	18	19	18	16	21	23	18.8	23
23-Nov	23	22	23	24	24	Z	25	24	25	26	26	26	26	25	25	24	24	25	24	24	23	22	21	20	24.0	26
24-Nov	19	18	17	16	16	15	15	Z	15	15	14	14	14	15	17	16	15	17	18	17	19	19	19	20	16.7	20
25-Nov	20	22	Z	24	25	24	25	25	24	24	23	23	22	21	20	19	20	20	19	18	24	27	29	29	22.8	29
26-Nov	27	24	24	Z	26	25	27	28	30	31	28	29	31	23	26	27	30	25	27	29	31	31	32	33	28.0	33
27-Nov	32	32	35	37	Z	29	27	27	25	25	26	25	25	23	23	24	25	24	24	22	21	22	22	25	26.2	37
28-Nov	24	22	20	19	20	Z	20	25	30	29	28	30	31	C	C	C	C	34	32	31	30	28	27	25	26.5	34
29-Nov	22	20	18	17	17	17	Z	20	22	24	28	29	M	32	32	32	32	32	33	33	32	32	34	35	27.0	35
30-Nov	34	34	34	35	34	34	36	Z	35	35	35	34	33	33	34	37	37	37	38	38	37	37	37	35	35.4	38

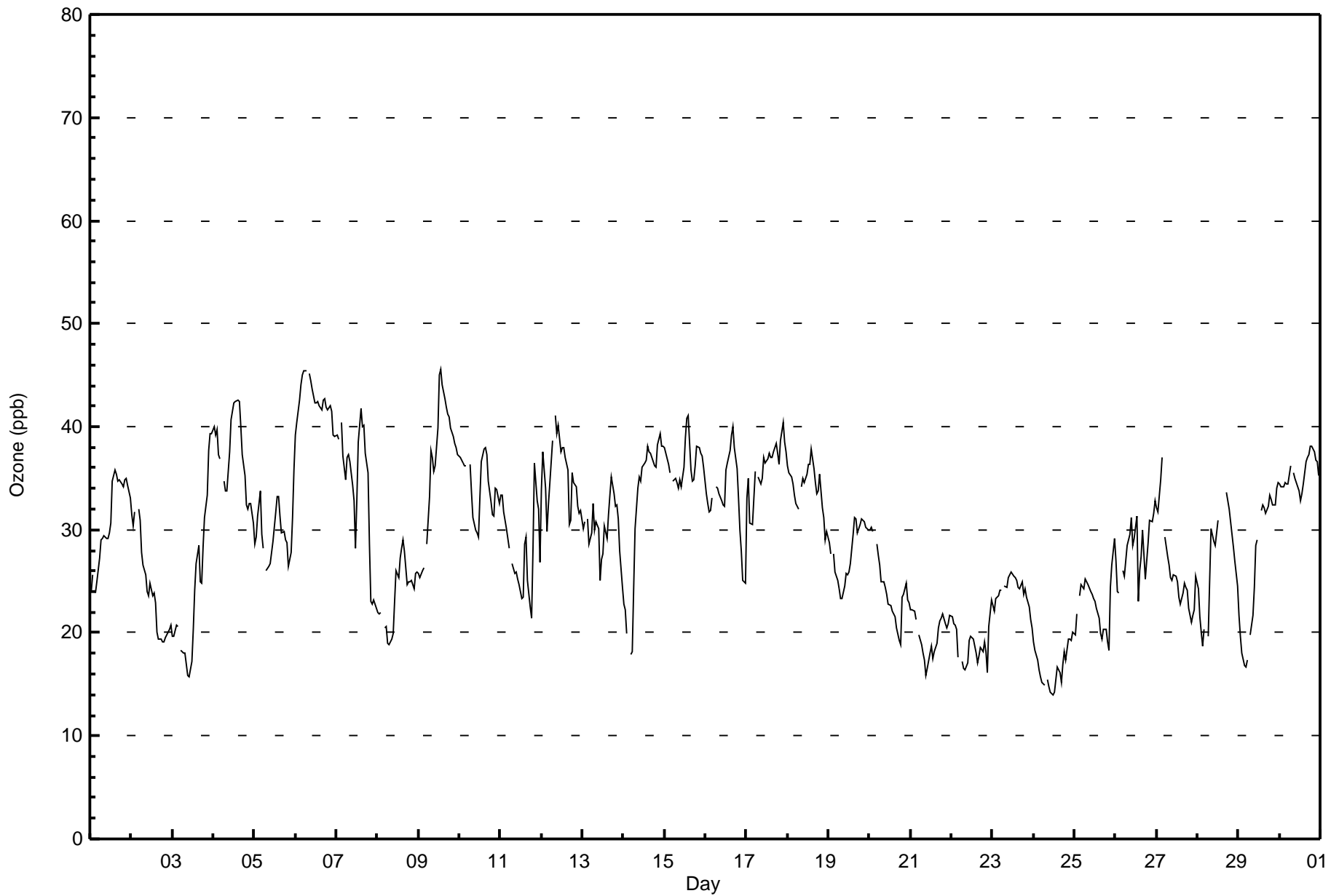
29.1	28.9	28.6	29.0	28.2	27.6	28.6	27.4	28.6	28.5	28.7	29.0	30.0	30.7	31.3	31.0	30.5	30.0	29.9	29.8	29.8	29.8	29.7	29.5	Diurnal Average		
40	40	43	44	45	45	45	45	38	45	44	44	42	45	46	44	43	43	43	42	42	42	42	39	39	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Stony Mountain - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Stony Mountain - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	100	14.60	14.60
21 - 50	585	85.40	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Stony Mountain - 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	1	0	2	1	1	3	13	14	10	21	9	1	1	9	8	6	100
21 - 50	5	7	11	24	17	7	15	37	57	79	66	43	57	82	52	26	585
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	7	13	25	18	10	28	51	67	100	75	44	58	91	60	32	685

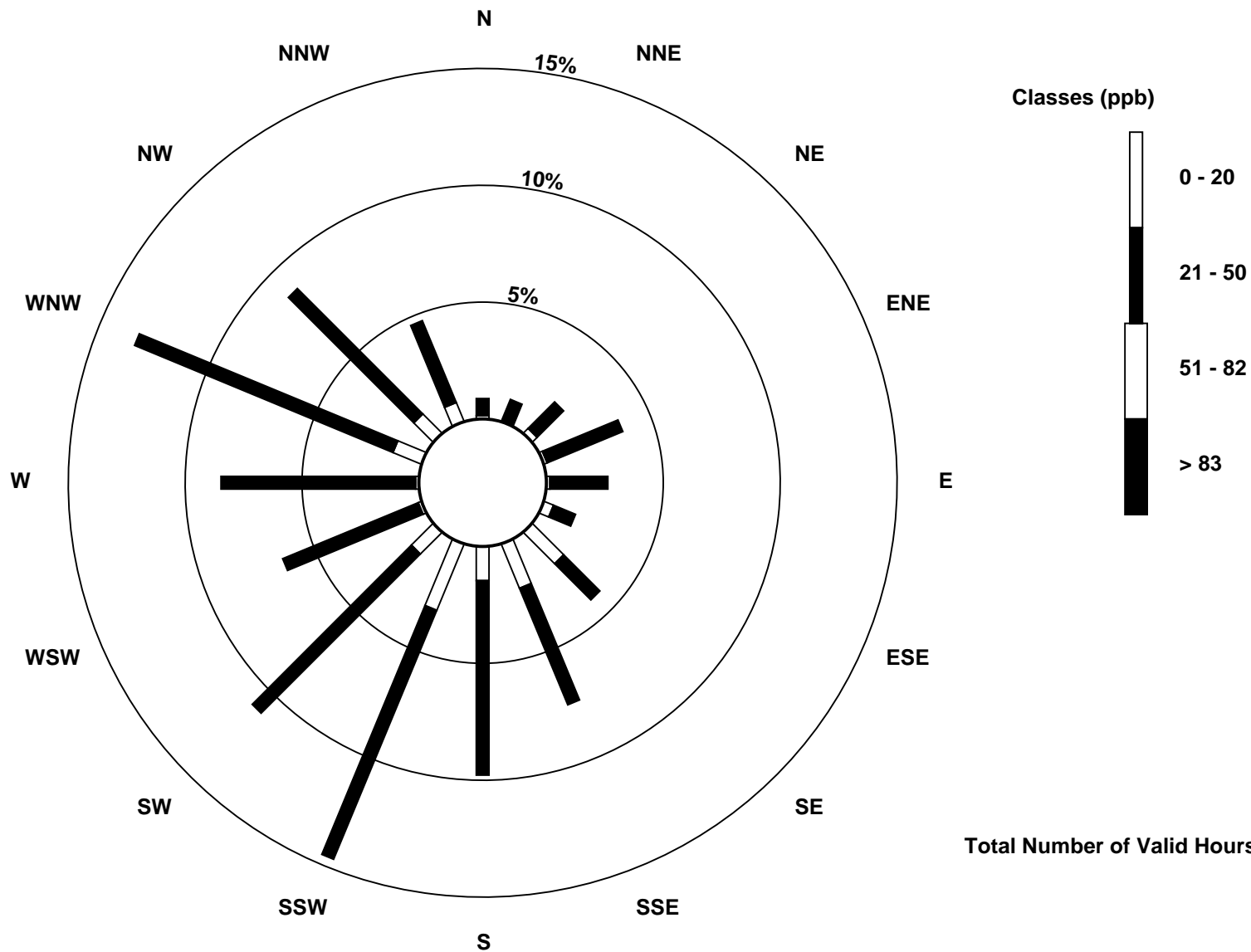
Total Number of Valid Hours: 685

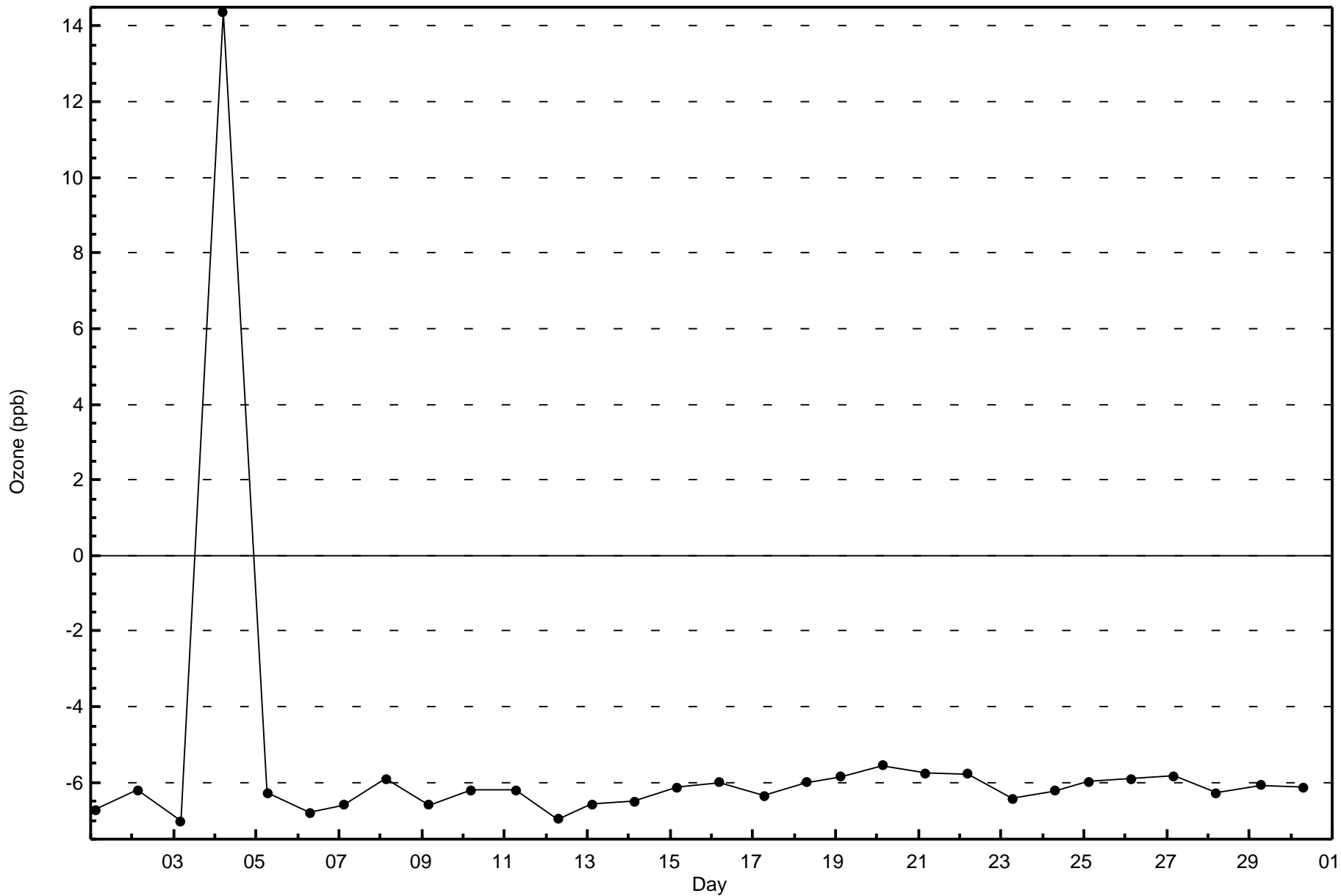
Total Number of Hours: 720

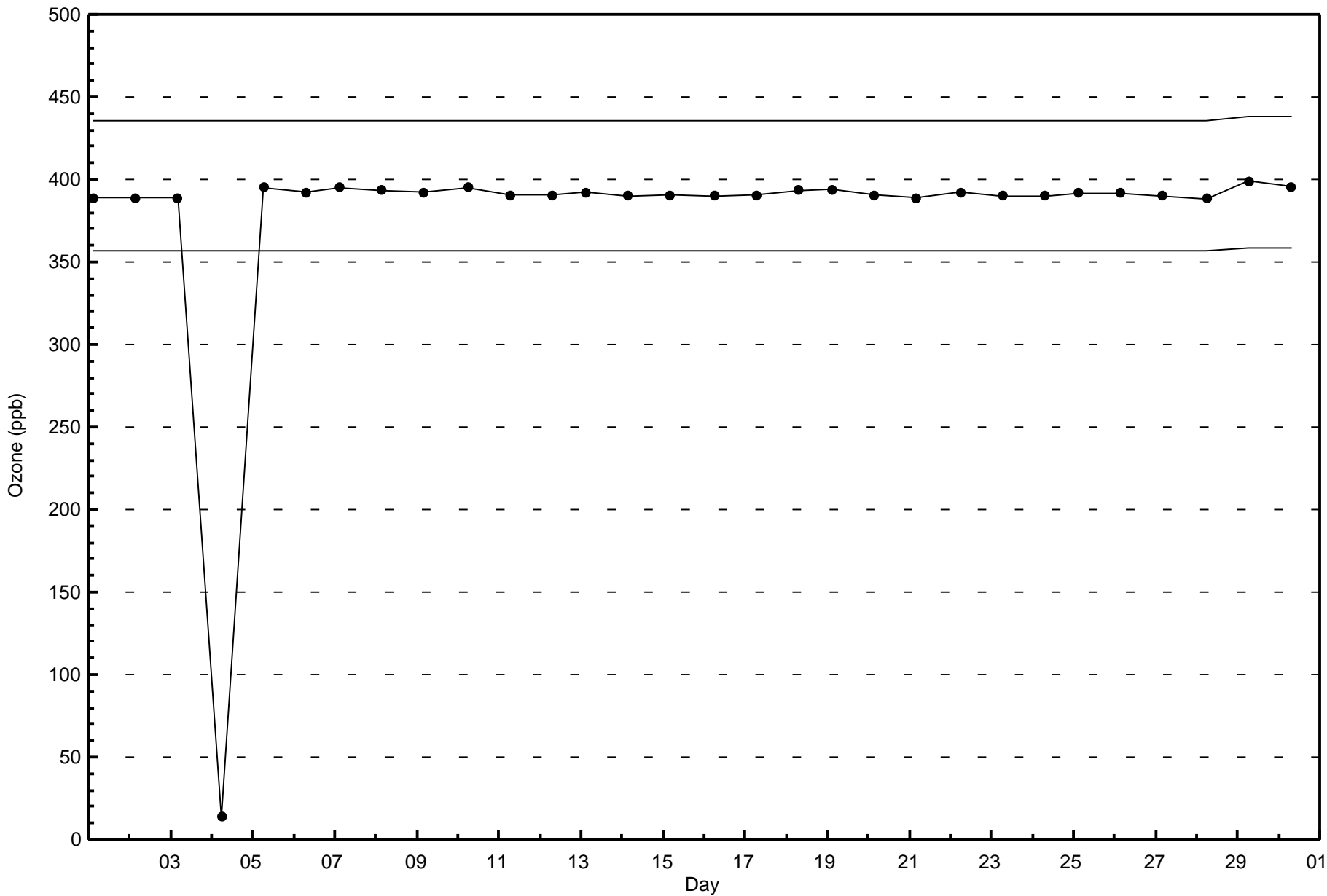


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Stony Mountain (AMS 18)







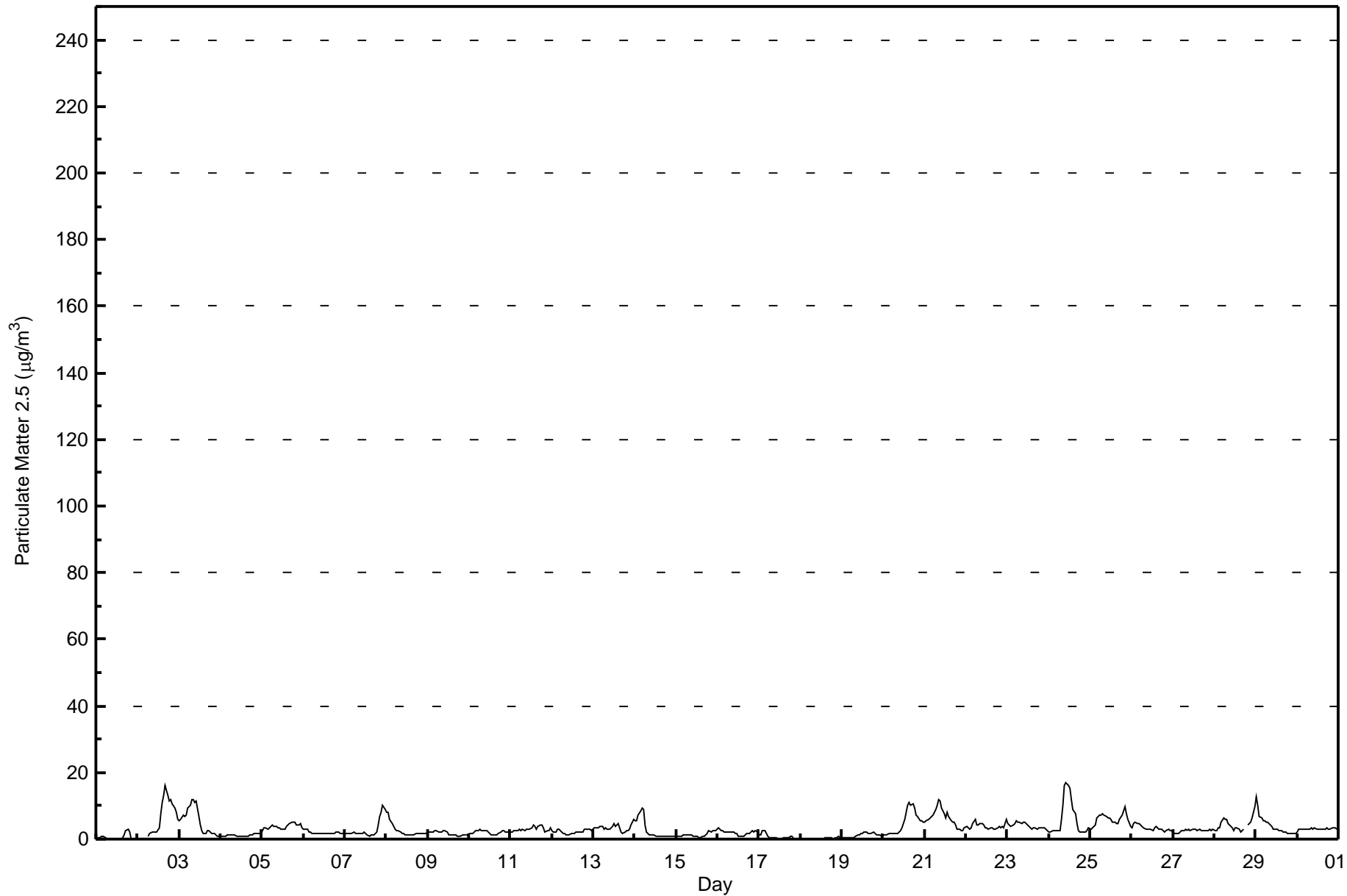


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 16.9 µg/m ³ on Nov 24 11:00 Maximum Daily Average: 7.3 µg/m ³ on Nov 2		Hours in Service: 720 Hours of Data: 690 Hours of Missing Data: 30 Hours of Calibration: 1 Percent Operational Time: 96.0																																														
Minimum Value: 0.0 µg/m ³ on Nov 1 09:00 Maximum Diurnal Average: 3.6 µg/m ³ at hour 6 Monthly Average: 3.21 µg/m ³		Minimum Daily Average: 0.7 µg/m ³ on Nov 1 Minimum Diurnal Average: 3.0 µg/m ³ at hour 19 Percentiles: P ₁ = 0.2 P ₁₀ = 0.8 Q ₁ = 1.6 Median = 2.5 Q ₃ = 3.7 P ₉₀ = 6.5 P ₉₉ = 13.1																																														
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-Nov	0.4	0.6	0.6	0.7	0.7	0.4	0.1	0.0	0.0	0.0	0.0	UO	UO	UO	0.2	0.6	1.2	2.7	3.1	2.1	0.2	UO	UO	UO	0.7	3.1																						
2-Nov	UO	UO	UO	UO	UO	UO	0.9	1.5	2.3	2.2	2.0	2.0	3.2	7.4	10.9	13.1	15.9	13.1	11.4	12.1	10.5	9.2	8.2	6.1	7.3	15.9																						
3-Nov	5.5	6.0	7.1	7.0	7.3	9.5	10.4	12.0	11.7	11.2	11.3	6.8	4.2	2.4	1.9	1.9	2.4	2.5	2.2	1.9	1.6	1.1	1.0	1.0	5.4	12.0																						
4-Nov	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.3	1.0	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.5	1.7	1.7	1.7	1.8	1.2	1.8																						
5-Nov	2.4	3.3	3.3	3.0	3.6	3.9	4.1	4.0	3.9	3.6	3.6	3.1	3.0	3.0	3.6	4.1	4.7	5.1	5.1	5.0	4.4	4.2	4.5	3.5	3.8	5.1																						
6-Nov	3.0	3.1	2.8	2.3	2.0	1.7	1.7	1.7	1.6	1.7	1.6	1.7	1.6	1.6	1.8	1.8	1.8	1.8	1.9	2.0	2.0	1.8	1.9	1.7	1.9	3.1																						
7-Nov	1.5	1.6	1.7	1.6	1.8	2.0	1.8	1.8	1.8	1.7	1.6	2.0	1.7	1.1	0.9	1.1	1.2	1.5	2.0	4.3	6.7	8.1	10.0	8.9	2.8	10.0																						
8-Nov	8.2	8.2	5.8	4.6	4.0	3.0	2.6	2.3	1.9	1.6	1.5	1.5	1.5	1.4	1.3	1.3	1.5	1.6	1.6	1.8	1.8	1.8	1.7	1.7	2.7	8.2																						
9-Nov	2.0	2.1	2.2	2.3	2.5	2.4	2.2	2.0	2.2	2.5	2.5	2.0	1.5	1.2	1.1	1.1	1.1	1.0	0.9	1.0	1.1	1.2	1.2	1.3	1.7	2.5																						
10-Nov	1.5	1.6	1.7	2.0	2.6	2.7	2.9	2.5	2.4	2.4	2.5	2.3	1.6	1.3	1.2	1.2	1.3	1.6	2.0	2.4	2.5	2.1	1.9	2.0	2.0	2.9																						
11-Nov	2.0	2.1	2.4	2.6	2.7	2.8	2.7	2.8	2.7	2.8	3.2	3.0	3.5	4.3	3.6	2.8	3.7	4.3	4.2	3.2	2.2	2.4	2.5	3.4	3.0	4.3																						
12-Nov	2.5	2.0	2.3	3.1	3.1	2.5	1.7	1.6	1.3	1.4	1.3	1.6	1.6	1.7	2.0	2.0	2.2	2.1	2.1	3.2	2.9	2.9	3.0	2.6	2.2	3.2																						
13-Nov	3.2	3.5	3.3	3.3	3.8	3.6	3.1	3.5	3.1	2.8	3.3	3.8	4.5	3.9	4.6	3.4	2.2	1.9	2.1	2.4	2.6	3.0	4.2	5.7	3.4	5.7																						
14-Nov	5.4	5.5	7.3	8.5	9.5	8.8	4.2	2.0	1.4	1.2	1.3	1.1	0.9	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	2.7	9.5																						
15-Nov	0.8	0.8	0.8	0.8	1.3	1.2	1.1	1.4	1.4	1.3	0.9	0.9	0.7	0.5	0.5	0.9	1.1	1.1	1.8	2.5	2.3	2.6	2.4	2.5	1.3	2.6																						
16-Nov	3.2	2.9	2.7	2.4	2.1	2.0	2.0	2.1	2.3	1.9	1.9	1.7	0.9	0.8	0.8	0.7	1.2	1.6	1.7	2.1	2.4	2.3	2.4	2.1	1.9	3.2																						
17-Nov	1.2	1.4	2.6	2.4	1.6	1.0	0.5	0.5	0.6	0.4	0.2	0.2	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.8	0.4	UO	UO	UO	0.8	2.6																						
18-Nov	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	0.2	0.4	0.4	0.4	0.2	0.0	0.3	0.5	0.7	0.3	--	0.7																						
19-Nov	0.3	0.3	0.4	0.3	0.4	0.4	0.5	0.6	0.8	1.2	1.5	1.7	1.9	2.0	2.0	1.8	1.8	1.8	1.9	1.5	1.2	1.1	1.2	1.0	1.2	2.0																						
20-Nov	1.2	1.2	1.4	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.5	3.2	5.7	8.0	10.0	10.9	10.2	10.6	9.2	7.0	6.9	5.5	5.3	5.3	4.9	10.9																						
21-Nov	5.1	5.5	5.9	6.5	6.6	7.3	9.0	10.3	12.1	11.4	9.3	7.4	6.5	8.0	6.9	5.6	5.1	5.0	4.3	2.9	2.8	2.8	2.7	3.2	6.3	12.1																						
22-Nov	3.7	3.3	3.1	3.5	4.8	5.8	4.0	4.4	4.9	4.5	4.2	3.5	3.4	3.1	3.4	3.6	3.2	2.9	3.3	3.6	3.5	3.6	3.5	6.1	3.9	6.1																						
23-Nov	4.7	4.3	3.9	4.0	4.6	5.7	5.2	5.2	4.8	5.2	5.2	4.7	3.8	3.3	3.1	3.2	3.4	2.9	3.4	3.5	3.5	3.5	3.0	2.6	4.0	5.7																						
24-Nov	2.2	2.2	2.4	2.7	2.7	2.5	2.5	5.9	10.1	16.3	16.9	15.9	15.1	11.7	9.0	7.5	4.7	2.3	1.9	2.1	2.3	2.3	2.4	3.2	6.1	16.9																						
25-Nov	2.9	3.3	3.8	4.3	6.3	7.3	7.3	7.6	7.4	6.9	6.6	6.2	5.8	5.1	4.9	4.7	4.7	5.9	7.1	8.3	9.9	7.5	5.7	3.6	6.0	9.9																						
26-Nov	3.6	4.8	5.0	4.7	4.6	4.4	3.8	3.3	3.1	3.0	3.2	2.8	2.3	3.4	3.7	3.3	3.0	3.2	2.5	2.2	2.3	3.0	2.6	2.4	3.3	5.0																						
27-Nov	2.0	1.8	1.8	1.9	2.1	2.6	2.7	2.8	2.8	2.9	2.7	2.9	2.9	2.8	2.7	2.9	2.6	2.7	2.6	2.4	2.8	3.0	2.6	2.9	2.6	3.0																						
28-Nov	2.6	2.6	3.2	3.3	4.9	6.5	5.8	5.8	4.6	3.8	3.2	2.7	3.2	3.3	2.8	2.2	2.5	3.0	C	4.2	4.7	5.2	6.2	9.9	4.2	9.9																						
29-Nov	12.5	10.1	6.9	6.4	5.6	5.5	5.1	4.9	4.3	3.7	3.0	3.1	3.0	2.6	2.4	2.5	2.1	2.0	1.7	1.8	1.9	1.8	1.7	1.7	4.0	12.5																						
30-Nov	2.1	2.9	2.9	2.9	3.0	3.0	2.8	3.2	3.3	3.1	3.2	3.2	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.2	3.5	3.5	3.3	3.1	3.1	3.5																						
																								3.1	3.2	3.2	3.2	3.5	3.6	3.2	3.4	3.5	3.6	3.5	3.3	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.2	3.2	3.2	Diurnal Average
																								12.5	10.1	7.3	8.5	9.5	9.5	10.4	12.0	12.1	16.3	16.9	15.9	15.1	11.7	10.9	13.1	15.9	13.1	11.4	12.1	10.5	9.2	10.0	9.9	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}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - November 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	504	73.04	73.04
6 - 15	93	13.48	86.52
16 - 25	4	0.58	87.10
26 - 80	0	0.00	87.10
> 81.0	0	0.00	87.10

Total Number of Valid Hours: 690

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Stony Mountain - November 2016

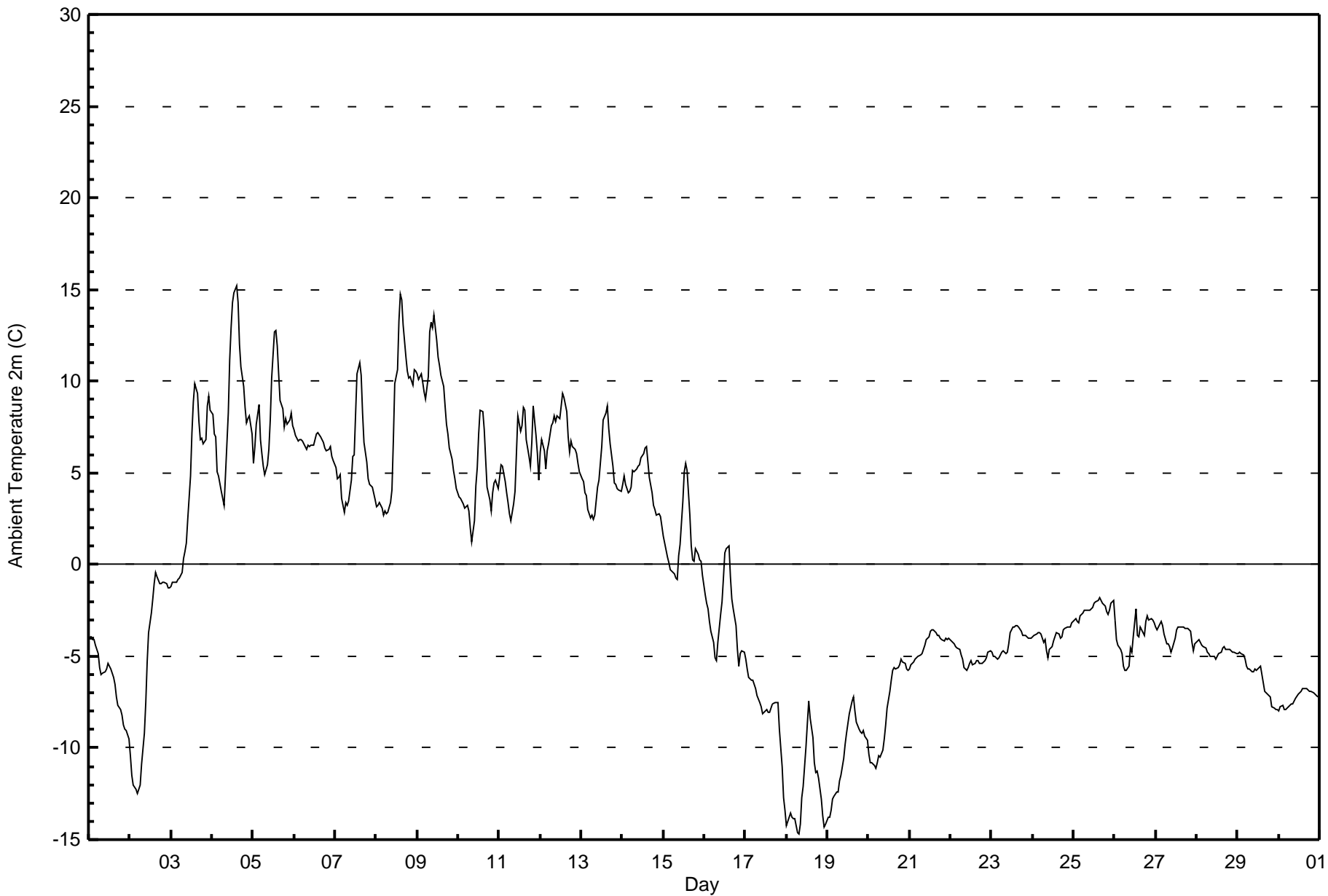
Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	6	3	10	18	16	4	19	39	53	75	68	39	45	64	26	19	504
6 - 15	0	0	0	0	2	6	11	11	14	19	7	0	2	8	8	5	93
16 - 25	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	4
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	3	10	18	18	10	30	50	68	96	76	39	47	72	34	24	601

Total Number of Valid Hours: 690

Total Number of Hours: 720



Maximum Value: 15.2 C on Nov 4 15:00 Maximum Daily Average: 9.4 C on Nov 9																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																												
Minimum Value: -14.7 C on Nov 18 08:00 Minimum Daily Average: -12.3 C on Nov 18 Maximum Diurnal Average: 1.6 C at hour 15 Minimum Diurnal Average: -2.1 C at hour 7 Monthly Average: -0.71 C Percentiles: P ₁ = -13.9 P ₁₀ = -8.1 Q ₁ = -5.3 Median = -3.0 Q ₃ = 5.3 P ₉₀ = 8.2 P ₉₉ = 13.2																																																
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-Nov	-4.0	-4.0	-4.1	-4.1	-4.4	-4.9	-5.6	-6.0	-5.9	-5.9	-5.7	-5.4	-5.5	-5.7	-6.1	-6.5	-7.2	-7.7	-7.9	-8.2	-8.7	-8.9	-9.0	-9.5	-6.3	-4.0																						
2-Nov	-10.4	-11.5	-12.0	-12.3	-12.4	-12.2	-12.0	-10.9	-9.2	-7.5	-5.3	-3.7	-2.7	-1.9	-1.1	-0.4	-0.6	-1.0	-1.1	-1.0	-1.0	-1.1	-1.3	-1.3	-5.6	-0.4																						
3-Nov	-1.2	-1.0	-1.0	-1.0	-0.8	-0.7	-0.5	0.3	0.7	1.2	2.5	4.8	7.2	8.8	9.9	9.4	7.8	6.8	6.9	6.6	6.8	8.7	9.1	8.4	4.2	9.9																						
4-Nov	8.2	7.1	7.0	5.0	4.8	4.0	3.6	3.2	4.9	8.3	11.2	12.9	14.3	14.9	15.2	14.3	12.0	10.8	9.7	8.6	7.7	8.0	8.1	7.1	8.8	15.2																						
5-Nov	5.5	6.4	7.6	8.7	6.8	6.1	5.4	4.9	5.4	6.3	7.9	10.1	12.7	12.7	11.9	10.4	9.0	8.5	7.5	8.0	7.7	7.9	8.2	7.5	8.1	12.7																						
6-Nov	7.3	7.0	6.8	6.8	6.8	6.8	6.4	6.2	6.5	6.4	6.5	6.5	6.8	7.1	7.2	7.0	6.8	6.6	6.4	6.2	6.3	6.5	5.9	5.7	6.6	7.3																						
7-Nov	5.3	4.7	4.7	4.9	3.6	2.9	3.4	3.2	3.5	4.6	5.9	6.0	8.2	10.4	11.0	10.4	8.2	6.6	5.6	4.7	4.3	4.3	4.2	3.5	5.6	11.0																						
8-Nov	3.2	3.3	3.4	3.1	2.7	2.9	2.8	2.9	3.4	4.0	6.7	9.8	10.6	13.3	14.7	14.4	13.1	11.4	10.6	10.1	10.2	9.8	10.6	10.6	7.8	14.7																						
9-Nov	10.4	10.1	10.4	10.0	9.4	9.0	10.3	12.7	13.3	12.9	13.6	12.2	11.3	10.8	10.4	9.7	8.7	7.7	7.1	6.4	5.7	5.1	4.7	4.1	9.4	13.6																						
10-Nov	3.7	3.6	3.4	3.3	3.1	3.2	2.9	2.0	1.3	2.4	4.3	5.3	7.1	8.4	8.3	7.4	5.7	4.3	3.5	2.9	3.9	4.4	4.6	4.2	4.3	8.4																						
11-Nov	4.8	5.4	5.3	4.6	3.9	3.3	2.7	2.4	3.3	4.0	6.0	8.1	7.3	7.6	8.6	8.4	6.8	5.9	5.4	6.7	8.6	7.0	6.1	4.6	5.7	8.6																						
12-Nov	6.1	6.8	6.2	5.2	6.2	6.6	7.6	7.8	8.1	7.8	8.1	7.9	8.7	9.3	9.1	8.4	7.0	6.1	6.8	6.4	6.3	6.0	5.5	5.1	7.0	9.3																						
13-Nov	4.7	4.5	4.0	3.7	3.0	2.5	2.7	2.5	2.7	4.2	4.6	5.5	6.4	7.9	8.3	8.7	7.4	6.6	5.3	4.5	4.4	4.2	4.1	4.0	4.8	8.7																						
14-Nov	4.4	4.8	4.4	3.9	4.0	4.3	5.2	5.1	5.2	5.4	5.5	5.8	6.1	6.4	6.5	5.6	4.7	3.9	3.2	3.0	2.7	2.8	2.6	2.1	4.5	6.5																						
15-Nov	1.6	1.2	0.4	0.1	-0.3	-0.4	-0.5	-0.8	-0.8	0.5	1.1	3.4	5.1	5.5	5.1	2.7	1.0	0.3	0.2	0.8	0.6	0.2	0.2	-0.6	1.1	5.5																						
16-Nov	-1.7	-2.1	-2.4	-3.1	-3.7	-4.3	-5.1	-5.3	-4.2	-2.7	-2.0	-0.7	0.6	0.9	1.0	-0.7	-1.9	-2.4	-3.3	-4.6	-5.5	-4.9	-4.7	-4.7	-2.8	1.0																						
17-Nov	-5.2	-5.7	-6.2	-6.3	-6.3	-6.5	-6.8	-7.2	-7.5	-7.8	-8.1	-8.1	-7.9	-8.0	-8.0	-7.8	-7.6	-7.5	-7.5	-7.6	-8.9	-11.0	-12.7	-13.4	-7.9	-5.2																						
18-Nov	-14.2	-14.0	-13.5	-13.8	-13.9	-13.9	-14.6	-14.7	-14.2	-12.7	-12.1	-9.9	-8.6	-7.4	-8.3	-9.4	-10.8	-11.3	-11.2	-11.6	-12.8	-13.7	-14.3	-14.1	-12.3	-7.4																						
19-Nov	-13.8	-13.7	-13.4	-12.8	-12.6	-12.4	-12.4	-11.8	-11.5	-10.6	-9.8	-9.2	-8.7	-8.1	-7.5	-7.3	-8.0	-8.6	-9.0	-9.1	-9.2	-9.0	-9.4	-9.6	-10.3	-7.3																						
20-Nov	-10.4	-10.8	-10.8	-10.9	-11.1	-10.8	-10.5	-10.5	-10.1	-9.5	-8.7	-7.8	-6.9	-6.3	-5.7	-5.6	-5.7	-5.6	-5.4	-5.2	-5.3	-5.4	-5.7	-5.8	-7.9	-5.2																						
21-Nov	-5.7	-5.5	-5.3	-5.2	-5.1	-5.0	-4.9	-4.8	-4.7	-4.4	-4.1	-3.9	-3.6	-3.6	-3.6	-3.7	-3.9	-3.9	-4.0	-4.1	-4.1	-4.0	-4.1	-4.1	-4.4	-3.6																						
22-Nov	-4.2	-4.3	-4.3	-4.5	-4.5	-4.6	-4.9	-5.2	-5.6	-5.7	-5.6	-5.4	-5.3	-5.4	-5.4	-5.2	-5.2	-5.4	-5.4	-5.3	-5.3	-5.1	-4.8	-4.7	-5.1	-4.2																						
23-Nov	-4.8	-5.0	-5.0	-5.2	-5.1	-5.0	-4.8	-4.7	-4.9	-4.8	-4.3	-3.7	-3.4	-3.4	-3.3	-3.3	-3.4	-3.6	-3.9	-3.9	-3.9	-4.0	-4.1	-4.0	-4.2	-3.3																						
24-Nov	-3.9	-3.8	-3.8	-3.7	-3.7	-3.8	-4.3	-4.1	-4.7	-5.1	-4.6	-4.5	-4.2	-3.9	-3.7	-3.8	-4.0	-3.9	-3.6	-3.5	-3.4	-3.4	-3.4	-3.2	-3.9	-3.2																						
25-Nov	-3.0	-3.0	-3.1	-3.2	-2.8	-2.6	-2.5	-2.5	-2.5	-2.4	-2.4	-2.1	-2.0	-2.0	-1.8	-1.9	-2.1	-2.3	-2.6	-2.7	-2.5	-2.1	-2.0	-2.4	-1.8	-1.8																						
26-Nov	-3.0	-4.1	-4.4	-4.6	-4.9	-5.5	-5.8	-5.8	-5.5	-4.6	-4.8	-3.9	-2.4	-3.8	-3.9	-3.4	-3.6	-3.8	-3.1	-2.8	-3.0	-3.0	-3.1	-3.2	-4.0	-2.4																						
27-Nov	-3.4	-3.6	-3.3	-3.1	-3.4	-3.8	-4.3	-4.4	-4.5	-4.8	-4.6	-4.1	-3.6	-3.4	-3.4	-3.4	-3.4	-3.5	-3.5	-3.5	-3.6	-4.2	-4.7	-4.3	-3.8	-3.1																						
28-Nov	-4.2	-4.1	-4.3	-4.4	-4.5	-4.6	-4.8	-4.9	-5.0	-5.0	-5.0	-5.2	-5.0	-4.8	-4.8	-4.6	-4.5	-4.6	-4.6	-4.6	-4.7	-4.8	-4.8	-4.9	-4.7	-4.1																						
29-Nov	-4.9	-4.8	-4.8	-4.9	-5.2	-5.5	-5.7	-5.7	-5.9	-5.8	-5.7	-5.7	-5.6	-5.5	-6.0	-6.5	-6.9	-7.0	-7.1	-7.2	-7.7	-7.8	-7.9	-7.9	-6.2	-4.8																						
30-Nov	-8.0	-7.7	-7.6	-7.9	-7.9	-7.8	-7.6	-7.6	-7.6	-7.5	-7.3	-7.1	-7.0	-6.9	-6.8	-6.8	-6.8	-6.9	-6.9	-6.9	-7.0	-7.1	-7.2	-7.2	-7.3	-6.8																						
																								-1.4	-1.5	-1.5	-1.7	-1.9	-2.1	-2.1	-2.1	-1.9	-1.3	-0.5	0.3	1.0	1.5	1.6	1.2	0.4	-0.1	-0.4	-0.6	-0.7	-0.8	-1.0	-1.3	Diurnal Average
																								10.4	10.1	10.4	10.0	9.4	9.0	10.3	12.7	13.3	12.9	13.6	12.9	14.3	14.9	15.2	14.4	13.1	11.4	10.6	10.1	10.2	9.8	10.6	10.6	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Stony Mountain - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	418	58.06	58.06
0 - 10	263	36.53	94.58
10 - 20	39	5.42	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



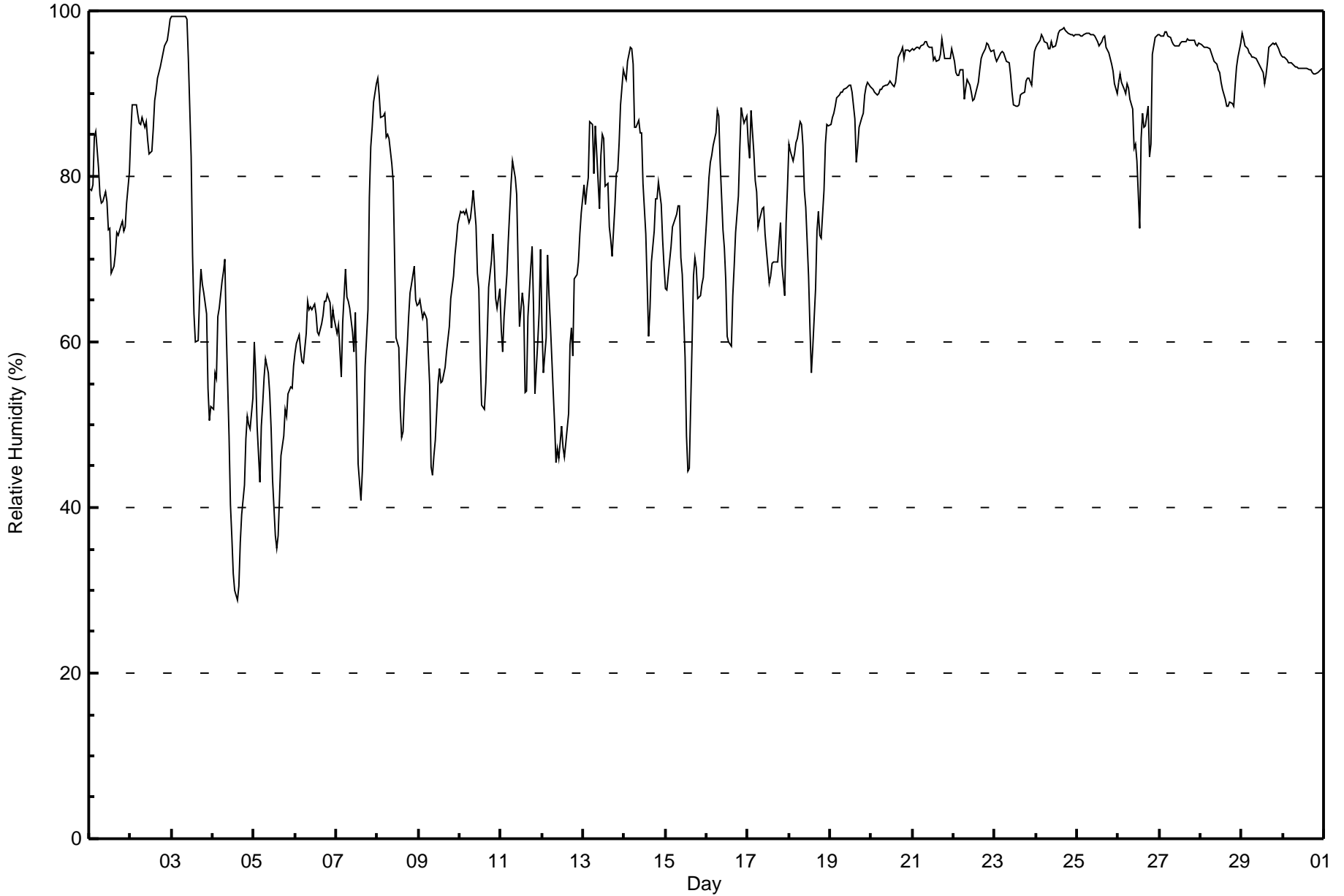
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Stony Mountain - November 2016

Maximum Value: 99 % on Nov 3 08:00 Maximum Daily Average: 96.7 % on Nov 24																		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 Nov 4 15:00 Minimum Daily Average: 48.9 % on Nov 4 Maximum Diurnal Average: 83.5 % at hour 6 Minimum Diurnal Average: 70.7 % at hour 15 Monthly Average: 79.0 % Percentiles: P ₁ = 37 P ₁₀ = 56 Q ₁ = 66 Median = 84 Q ₃ = 94 P ₉₀ = 96 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-Nov	78	78	79	85	85	81	78	77	77	78	77	73	74	68	69	71	73	73	74	75	73	74	77	80	76.2	85
2-Nov	85	89	89	89	87	86	86	87	86	87	84	83	83	86	89	90	92	93	94	95	96	96	98	99	89.6	99
3-Nov	99	99	99	99	99	99	99	99	99	99	94	82	70	63	60	60	65	69	67	66	63	54	51	52	79.6	99
4-Nov	52	56	56	63	64	67	68	70	61	49	40	36	32	30	29	30	36	39	43	48	51	50	49	53	48.9	70
5-Nov	60	56	50	43	50	53	56	58	56	54	50	43	37	35	37	41	46	49	52	51	54	55	54	57	49.8	60
6-Nov	59	60	61	59	58	57	61	65	64	64	64	65	63	61	61	62	63	65	65	66	65	62	64	63	62.3	66
7-Nov	61	62	59	56	62	69	65	65	64	61	59	64	56	45	41	44	50	57	64	78	84	86	89	91	63.8	91
8-Nov	92	90	87	87	88	85	85	85	81	79	70	60	59	52	49	49	53	59	63	66	67	69	65	64	71.1	92
9-Nov	65	65	63	64	63	63	55	45	44	46	48	55	57	55	55	57	59	60	62	65	68	71	72	74	59.6	74
10-Nov	76	76	76	75	76	74	75	77	78	74	68	66	58	52	52	55	61	67	70	73	70	65	64	66	68.5	78
11-Nov	62	59	63	68	72	76	79	82	80	78	69	62	66	64	54	54	63	69	71	64	54	60	64	71	66.8	82
12-Nov	62	56	61	71	66	62	54	50	45	47	46	50	47	46	48	51	60	62	58	68	68	70	73	76	58.2	76
13-Nov	79	77	78	80	87	86	80	86	83	76	83	85	85	79	79	74	72	70	76	80	81	84	89	93	80.9	93
14-Nov	92	92	94	96	95	94	86	86	87	85	85	79	73	67	61	64	70	73	77	77	79	77	72	69	80.4	96
15-Nov	66	66	70	72	74	74	75	76	76	70	68	58	49	44	45	60	68	70	69	65	66	67	68	71	66.2	76
16-Nov	77	80	82	82	84	85	88	87	82	74	71	67	61	60	59	66	69	73	78	83	88	87	86	87	77.4	88
17-Nov	84	82	88	83	79	78	74	75	76	76	73	71	67	68	70	70	70	70	72	74	69	66	74	79	74.5	88
18-Nov	84	83	82	83	84	85	87	86	84	78	76	68	62	56	59	66	73	76	73	72	78	84	86	86	77.2	87
19-Nov	86	87	88	88	90	90	90	90	90	91	91	91	91	90	87	82	84	86	87	88	90	91	91	91	88.7	91
20-Nov	91	91	90	90	90	91	91	91	91	91	91	91	91	91	91	93	94	95	96	94	95	95	95	95	92.3	96
21-Nov	95	95	96	96	95	96	96	96	96	96	96	96	94	94	94	94	95	97	95	94	94	94	94	95	95.2	97
22-Nov	94	93	92	92	93	93	89	91	92	91	90	89	89	90	91	93	94	95	95	96	96	96	95	95	92.7	96
23-Nov	94	94	94	95	95	95	94	94	94	92	90	89	89	88	89	90	90	91	92	92	91	93	95	95	92.1	95
24-Nov	96	96	96	97	97	96	96	95	95	96	96	96	96	97	98	98	98	98	97	97	97	97	97	97	96.7	98
25-Nov	97	97	97	97	97	97	97	97	97	97	97	97	96	96	96	97	97	96	95	94	94	93	91	90	95.8	97
26-Nov	91	92	91	91	90	91	91	89	88	83	84	82	74	85	88	86	86	88	82	84	95	97	97	97	88.4	97
27-Nov	97	97	97	97	97	97	97	96	96	96	96	96	96	96	96	96	97	97	97	96	96	96	96	96	96.4	97
28-Nov	96	96	96	96	96	95	95	94	94	94	93	93	91	90	89	88	88	89	89	88	91	93	94	96	92.7	96
29-Nov	97	97	96	95	95	95	94	94	94	94	94	93	93	91	92	94	96	96	96	96	96	95	95	95	94.7	97
30-Nov	94	94	94	94	94	94	93	93	93	93	93	93	93	93	93	93	93	93	92	92	92	93	93	93	93.2	94
	82.1	81.8	82.1	82.7	83.4	83.5	82.5	82.6	81.5	79.6	77.9	75.8	73.0	71.2	70.7	72.3	75.2	77.1	78.0	79.3	80.1	80.2	80.9	82.3	Diurnal Average	
	99	99	99	99	99	99	99	99	99	99	97	97	96	97	98	98	98	98	97	97	97	97	98	99	Diurnal Maximum	



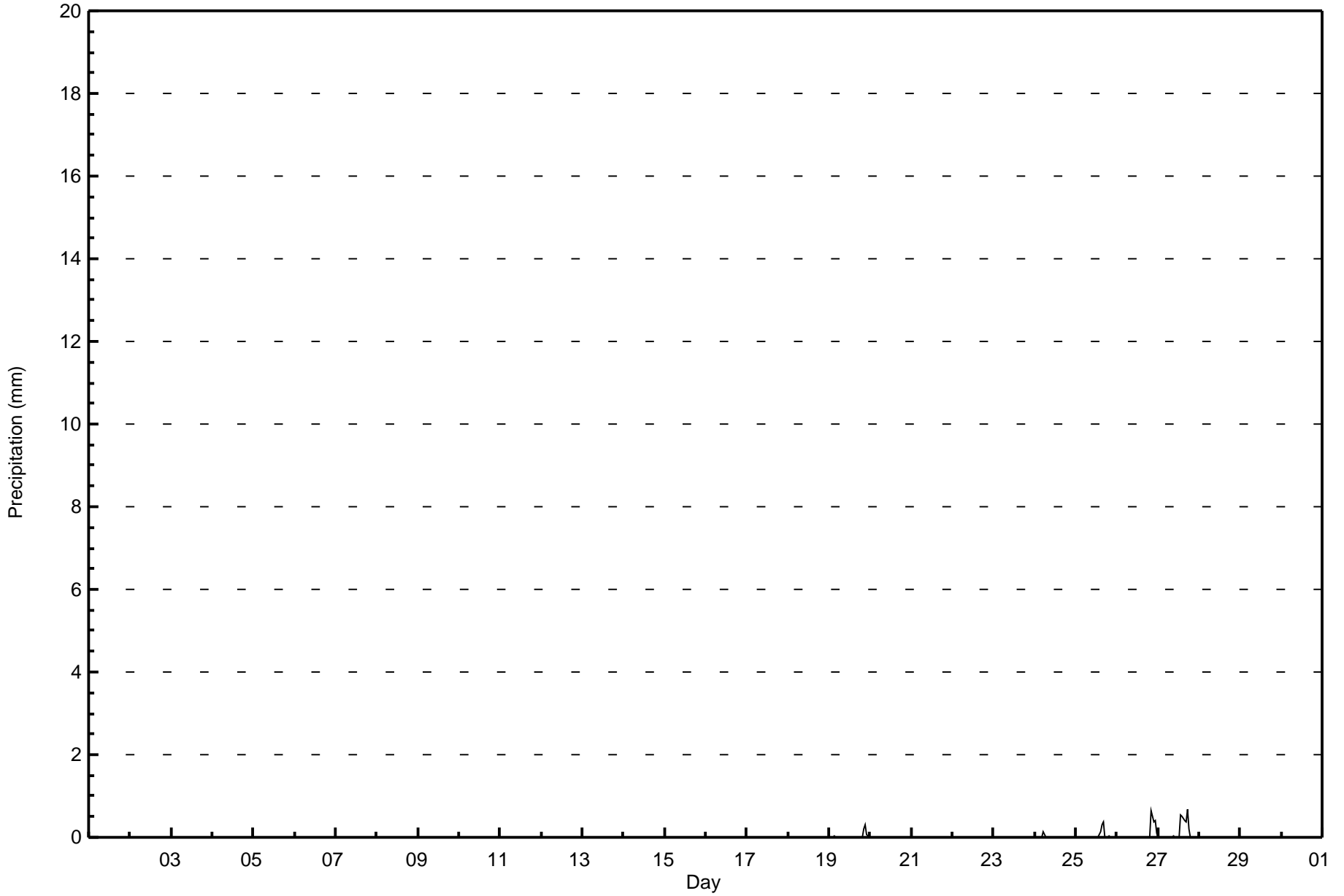


Maximum Value: 0.7 mm on Nov 27 18:00 Maximum Daily Total: 2.7 mm on Nov 27		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																										
Minimum Value: 0.0 mm on Nov 1 01:00 Maximum Diurnal Total: 0.9 mm at hour 21 Monthly Total: 5.89 mm		Minimum Daily Total: 0.0 mm on Nov 1 Minimum Diurnal Total: 0.0 mm at hour 1 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 = 0.4																										
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-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	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.1	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	0.2	0.3	0.1	0.0	0.0	0.6	0.3	
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.1	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	0.1	0.1	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	0.1	0.3	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.4	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	0.7	0.4	0.4	0.1	0.0	1.5	0.7	0.0	
27-Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.5	0.5	0.4	0.4	0.7	0.2	0.0	0.0	0.0	0.0	0.0	2.7	0.7	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	0.0	0.0	0.0	0.0	0.0	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-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
30-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
																								Diurnal Average				
																								Diurnal Maximum				



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Stony Mountain - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Precipitation (PC) - mm
Stony Mountain - November 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	711	98.75	98.75
0.4 - 0.5	7	0.97	99.72
0.6 - 0.7	2	0.28	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: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (LW) - %

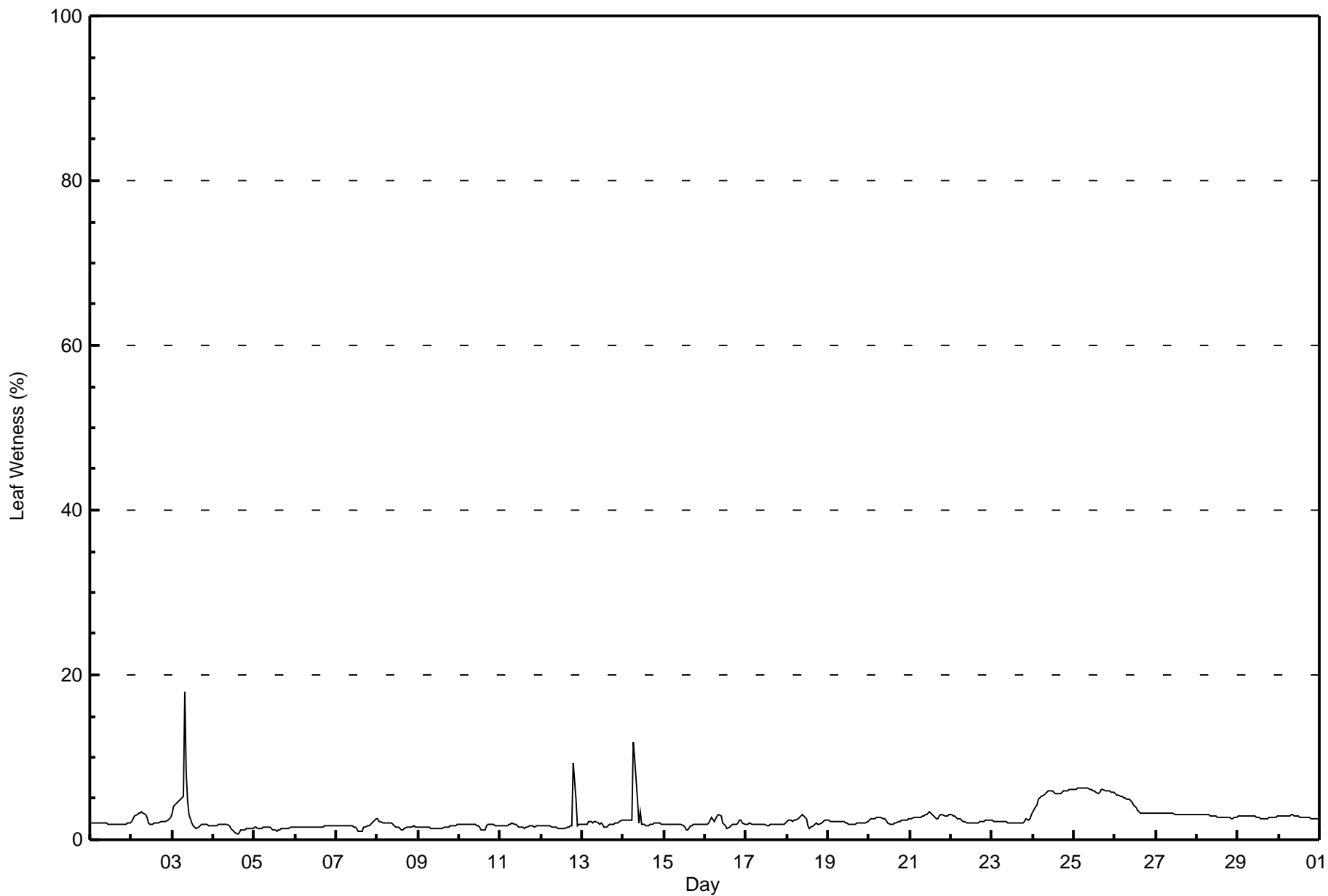
Stony Mountain - November 2016

Maximum Value: 18 % on Nov 3 08:00																	Maximum Daily Average: 6.0 % on Nov 25																	Hours in Service: 720	
Minimum Value: 1 % on Nov 4 15:00																	Minimum Daily Average: 1.4 % on Nov 5																	Hours of Data: 720	
Maximum Diurnal Average: 3.4 % at hour 8																	Minimum Diurnal Average: 2.1 % at hour 15																	Hours of Missing Data: 0	
Monthly Average: 2.5 %																	Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 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-Nov	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	2.0	2								
2-Nov	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3								
3-Nov	3	4	4	5	5	5	5	18	8	5	3	2	2	1	1	2	2	2	2	2	2	2	2	2	2	3.6	18								
4-Nov	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	1.4	2								
5-Nov	2	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	2								
6-Nov	1	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.6	2								
7-Nov	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	3	1.6	3								
8-Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	1.8	2								
9-Nov	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1.5	2								
10-Nov	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	1.7	2								
11-Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	1.7	2								
12-Nov	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	9	5	2	2	2	2	2.0	9								
13-Nov	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	2.0	2								
14-Nov	2	2	2	2	2	2	12	10	5	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3.0	12								
15-Nov	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	1.8	2								
16-Nov	2	2	2	2	3	2	3	3	3	3	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2.1	3								
17-Nov	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	1.9	2								
18-Nov	2	2	2	2	2	2	3	3	3	3	3	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2.2	3								
19-Nov	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								
20-Nov	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	3								
21-Nov	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	2.9	3								
22-Nov	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	3								
23-Nov	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	2.2	3								
24-Nov	3	4	4	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5.5	6								
25-Nov	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6.0	6								
26-Nov	6	5	5	5	5	5	5	5	5	5	5	4	4	4	3	3	3	3	3	3	3	3	3	3	3	4.2	6								
27-Nov	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	3.1	3								
28-Nov	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	2.8	3								
29-Nov	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	2.8	3								
30-Nov	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	2.8	3								
2.5																	2.5																	Diurnal Average	
6																	6																	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (LW) - %
Stony Mountain - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (LW) - %
Stony Mountain - November 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	1	0.14	0.14
0.8 - 1.4	62	8.61	8.75
1.5 - 10	639	88.75	97.50
> 10	2	0.28	97.78

Total Number of Valid Hours: 720

Total Number of Hours: 720

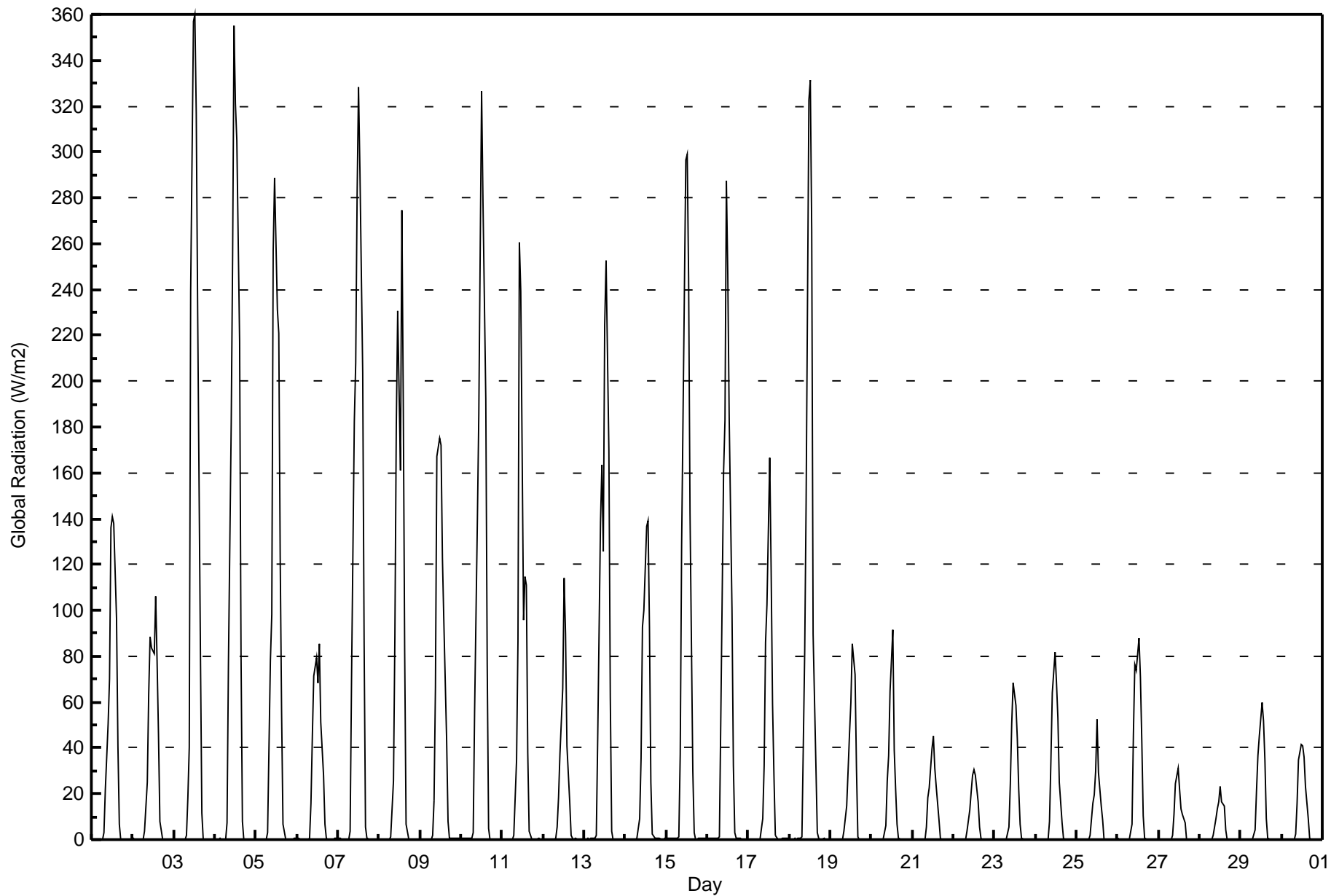


Maximum Value: 360 W/m2 on Nov 3 13:00																			Maximum Daily Average: 75.3 W/m2 on Nov 4						Hours in Service: 720	
Minimum Value: 0 W/m2 on Nov 1 03:00																			Minimum Daily Average: 4.2 W/m2 on Nov 28						Hours of Data: 720	
Maximum Diurnal Average: 148.2 W/m2 at hour 13																			Minimum Diurnal Average: 0.1 W/m2 at hour 19						Hours of Missing Data: 0	
Monthly Average: 31.3 W/m2																			Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 25 P ₉₀ = 101 P ₉₉ = 321						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	3	22	51	70	136	141	138	96	41	7	0	0	0	0	0	0	0	29.4	141
2-Nov	0	0	0	0	0	0	0	4	25	63	88	84	81	106	78	46	8	0	0	0	0	0	0	0	24.3	106
3-Nov	0	0	0	0	0	0	0	2	18	40	239	357	360	317	231	81	11	0	0	0	0	0	0	0	69.0	360
4-Nov	0	0	0	0	0	0	0	7	76	182	255	355	321	305	217	81	8	0	0	0	0	0	0	0	75.3	355
5-Nov	0	0	0	0	0	0	0	3	78	98	257	289	231	221	124	56	7	0	0	0	0	0	0	0	56.9	289
6-Nov	0	0	0	0	0	0	0	1	16	45	71	79	68	85	51	28	7	0	0	0	0	0	0	0	19.0	85
7-Nov	0	0	0	0	0	0	0	4	69	183	208	281	328	292	204	86	6	0	0	0	0	0	0	0	69.3	328
8-Nov	0	0	0	0	0	0	0	1	26	88	180	231	161	274	191	82	7	0	0	0	0	0	0	0	51.7	274
9-Nov	0	0	0	0	0	0	0	2	17	66	167	175	172	123	95	43	8	0	0	0	0	0	0	0	36.3	175
10-Nov	0	1	0	0	1	1	1	3	56	140	186	257	326	277	192	77	5	0	0	0	0	0	0	0	63.5	326
11-Nov	0	0	0	0	0	0	0	2	35	87	261	239	96	115	111	38	4	0	0	0	0	0	0	0	41.1	261
12-Nov	0	0	0	0	0	0	0	0	6	19	37	66	114	90	41	17	2	0	0	0	0	0	0	0	16.3	114
13-Nov	0	0	0	0	1	1	0	2	44	139	164	126	225	253	170	62	3	0	0	0	0	0	0	0	49.5	253
14-Nov	0	0	0	0	0	0	0	0	9	35	93	100	136	139	93	25	3	1	1	0	0	0	0	1	26.5	139
15-Nov	1	1	0	0	1	1	0	1	37	128	184	297	299	244	143	30	3	0	0	1	1	1	1	1	57.2	299
16-Nov	1	0	0	1	1	1	1	1	52	160	183	287	246	184	100	32	3	1	1	1	0	0	0	0	52.4	287
17-Nov	0	0	0	0	0	0	0	0	9	32	86	103	167	117	59	28	2	0	0	0	0	0	0	0	25.2	167
18-Nov	0	0	0	0	0	0	1	1	41	82	147	323	332	266	90	33	3	0	0	0	0	0	0	0	55.0	332
19-Nov	0	0	0	0	0	0	0	0	4	15	30	46	60	86	72	31	1	0	0	0	0	0	0	0	14.3	86
20-Nov	0	0	0	0	0	0	0	0	6	26	37	65	91	39	22	7	1	0	0	0	0	0	0	0	12.2	91
21-Nov	0	0	0	0	0	0	0	0	6	18	23	40	45	31	23	8	1	0	0	0	0	0	0	0	8.1	45
22-Nov	0	0	0	0	0	0	0	0	3	13	21	28	31	28	16	6	0	0	0	0	0	0	0	0	6.1	31
23-Nov	0	0	0	0	0	0	0	0	6	24	51	69	58	44	22	7	0	0	0	0	0	0	0	0	11.7	69
24-Nov	0	0	0	0	0	0	0	0	8	34	64	82	69	53	25	7	0	0	0	0	0	0	0	0	14.3	82
25-Nov	0	0	0	0	0	0	0	0	2	16	20	30	53	29	14	9	0	0	0	0	0	0	0	0	7.2	53
26-Nov	1	0	0	0	0	0	0	0	6	46	76	74	88	71	43	11	1	0	0	0	0	0	0	0	17.4	88
27-Nov	0	0	0	0	0	0	0	0	2	11	24	31	22	14	11	7	0	0	0	0	0	0	0	0	5.1	31
28-Nov	0	0	0	0	0	0	0	0	2	9	14	17	23	17	15	5	0	0	0	0	0	0	0	0	4.2	23
29-Nov	0	0	0	0	0	0	0	0	4	22	37	45	60	52	35	9	0	0	0	0	0	0	0	0	11.0	60
30-Nov	0	0	0	0	0	0	0	0	3	16	35	41	41	36	23	9	1	0	0	0	0	0	0	0	8.5	41
																			0.1 0.1 0.1 0.1 0.1 0.1 0.1 1.2 22.9 63.0 110.2 145.1 148.2 134.8 86.8 33.4 3.4 0.1 0.1 0.1 0.1 0.1 0.1 0.1						Diurnal Average	
																			1 1 0 1 1 1 1 7 78 183 261 357 360 317 231 86 11 1 1 1 1 1 1 1						Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Global Radiation (GR) - W/m²
Stony Mountain - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Stony Mountain - November 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	527	73.19	73.19
21 - 100	121	16.81	90.00
101 - 300	62	8.61	98.61
301 - 600	10	1.39	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

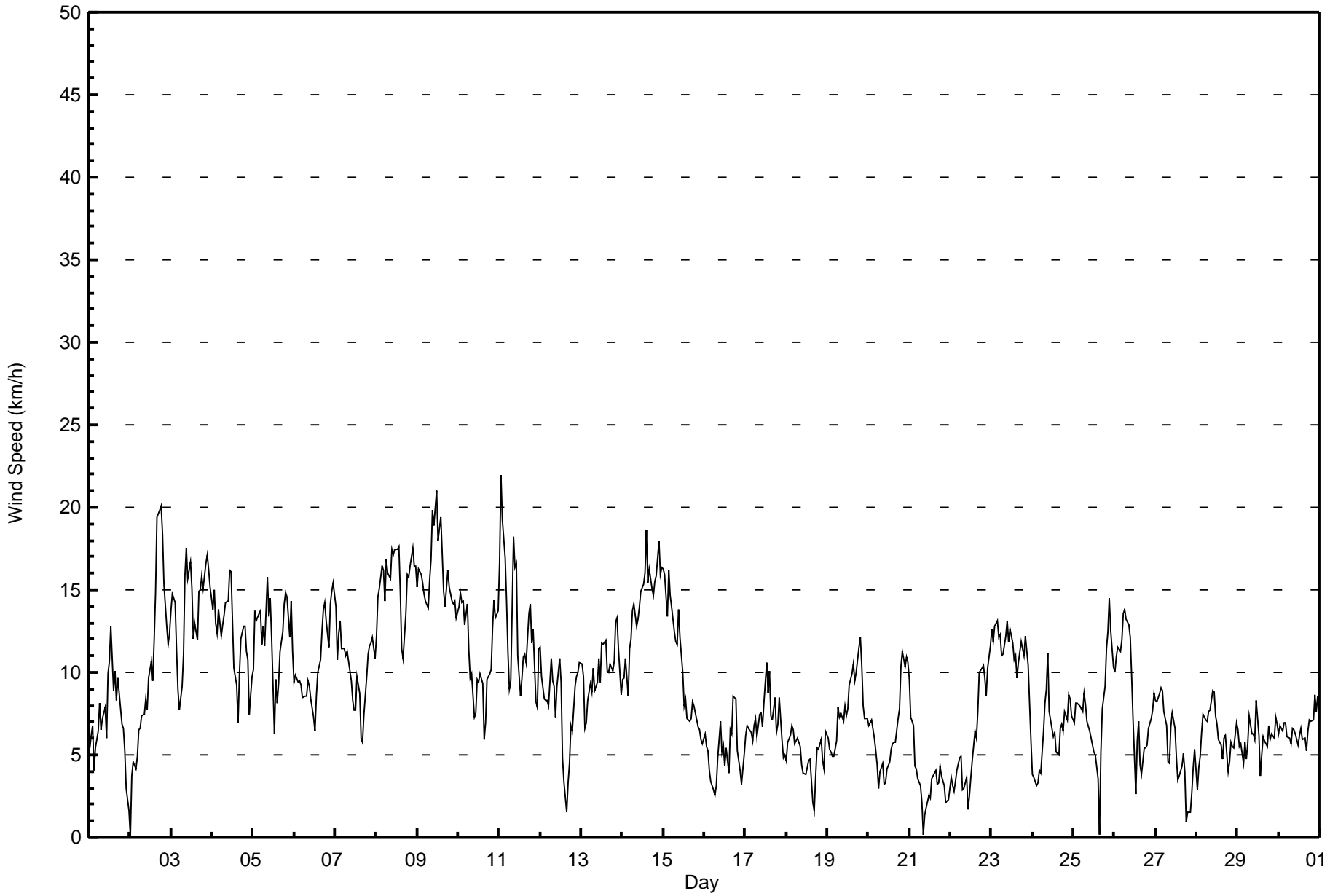


Maximum Speed: 22 km/h on Nov 11 02:00	Maximum Daily Speed Average: 15.4 km/h on Nov 8	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 2 01:00	Minimum Daily Speed Average: 0.5 km/h on Nov 21	Hours of Data: 720
Maximum Diurnal Speed Average: 6.0 km/h at hour 10	Minimum Diurnal Speed Average: 4.2 km/h at hour 1	Hours of Missing Data: 0
Monthly Average Velocity: 5.0 km/h 230.8 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 12 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-Nov	NW5	NW6	NW7	NNW4	NNW5	NNW6	NW8	NW7	NW7	NW8	NW6	NNW10	NNW11	NNW13	NW9	NW10	NW8	NNW10	NW8	NW7	NW7	NW5	NNW3	NNE2	NW7.0	NNW13	
2-Nov	SW0	SSW4	SSW5	S4	SSE5	SSE7	S7	S7	SSE7	S8	S8	S10	S11	S9	SSW12	SW15	SW19	SSW20	SSW20	SSW18	SSW15	SSW13	SSW12	SSW12	SSW9.9	SSW20	
3-Nov	SSW14	SSW15	SSW14	S11	S9	S8	S9	SSW11	SSW16	SW18	SW16	SW17	SW15	SW12	SSW13	SSW12	SSW15	SSW15	SW16	SW15	SW17	SW17	WSW16	WSW15	SSW13.3	SW18	
4-Nov	WSW14	WSW15	SW13	SW12	SW14	SW12	SW13	SSW13	SSW14	SSW14	SSW16	SSW16	SSW13	SSW10	SSW9	SW7	SSW10	SSW12	SSW13	SSW13	SSW11	SSW11	SSW7	S10	SSW11.9	SSW16	
5-Nov	S10	SSW14	SSW13	SSW14	SSW14	SSW12	SSW13	SSW16	SSW13	SSW14	SSW12	WSW6	SW10	SW8	SSW9	SW11	SW12	SW14	SW15	SW15	WSW12	NNW14	NNW11	SSW11.1	SSW16		
6-Nov	NNW9	NNW10	NNW9	NNW9	NNW9	NNW8	W9	W9	NNW10	NNW9	NNW8	NNW7	W6	W9	W10	NNW11	NNW12	NNW14	NNW14	W13	W12	W14	W15	W15	NNW10.3	W15	
7-Nov	W14	WSW11	W12	W13	WSW11	WSW11	WSW11	WSW11	WSW11	SW9	SW8	SSW8	SSW8	SW10	SSW9	S6	SSE6	S7	S10	SSW11	S12	S12	S12	S11	SSW8.6	W14	
8-Nov	S12	SSW15	SSW15	SSW16	SSW16	SSW14	SSW17	SSW16	SSW16	SSW17	SSW17	SSW17	SSW17	SW18	SSW15	SSW11	SSW11	SSW14	SSW16	SSW16	SSW16	SSW16	SSW18	SW16	SW16	SSW15.4	SW18
9-Nov	SW15	SW16	SW16	SW15	SW15	SW14	WSW14	WSW16	W17	W20	NNW19	NNW21	W18	NNW19	NNW19	NNW15	W14	NNW15	NNW16	NNW15	NNW14	NNW14	NNW14	NNW13	W14.3	NNW21	
10-Nov	NNW14	NNW15	NNW14	NNW14	NNW13	W14	W11	WSW10	WSW10	SSW7	SW8	SW10	SW9	SSW10	S9	S6	SSE7	SSE10	S10	S10	S13	S14	S13	S14	SSW7.7	NNW15	
11-Nov	S17	S22	SSW19	S17	S14	S11	SSW9	SSW10	SSW18	SW16	SW17	WSW11	WSW9	WSW10	W11	SW11	SW11	SW14	SW14	WSW12	W13	WSW8	WSW8	SW11	SSW11.7	S22	
12-Nov	SW12	WSW10	SW8	SW8	SW8	SW8	SW11	SW10	SW9	SW7	SSW9	SSW11	SW9	WSW5	NNW3	NNW2	NNW3	NNW4	NNW7	NNW6	NNW9	NNW10	NNW10	NNW11	WSW6.5	SW12	
13-Nov	NNW10	NNW10	NW7	W7	W8	W9	W9	WSW10	WSW9	SW9	SW11	SW9	SW12	SW12	SW12	SW10	SW10	SW11	SW10	SSW11	SW13	SSW13	SSW11	S9	SSW8.7	SSW13	
14-Nov	S10	SSW10	SSW11	SSW9	SW11	SW12	W14	NNW14	W13	W13	W14	W15	W15	W16	W19	NNW15	NNW16	W15	W15	W16	W16	NNW18	W16	W16	W12.7	W19	
15-Nov	W16	W16	W13	W16	W15	W14	W12	WSW12	WSW12	W14	W12	NNW10	W8	WSW8	WSW7	SW7	SW7	SW8	WSW8	W8	W7	NNW7	NNW6	NNW6	W9.9	W16	
16-Nov	NW6	NW6	NW5	NNW4	NNW3	NW3	NNW3	NW3	NNW5	NNW7	NW5	NW6	NW4	NW5	NNW4	W7	W6	NNW9	NW8	NW5	NNW5	NNW4	NNW3	N5	NNW4.7	NNW9	
17-Nov	NNW6	N7	N7	N6	NNW6	NW7	NW7	NW6	NW7	NW8	NNW7	NNW8	NNW11	NNW9	NNW10	NW7	NW7	NNW8	W6	NNW7	NNW9	NNW6	NW5	NW5	NNW6.7	NNW11	
18-Nov	NW5	NW6	NNW6	NNW7	NNW7	NW6	NW6	NNW6	NNW6	W4	NNW4	NNW4	NW4	NNW5	NNW5	NW2	NNW2	NE4	ENE5	ENE5	NE6	ENE5	NNE4	NNE6	NNW3.0	NNW7	
19-Nov	ENE6	NNE5	NE5	ENE5	NE5	ENE6	NE8	ENE7	ENE8	ENE7	ENE8	ENE7	ENE8	E9	E10	E11	E9	E10	E12	E12	ESE10	E8	E7	E7	E7.5	E12	
20-Nov	E7	ENE7	ENE7	ENE6	ENE5	E4	NE3	ESE4	SE5	SSE3	SE3	E4	E5	ESE5	ESE6	ESE6	ESE6	ESE6	ESE7	SE8	SE10	SE11	SSE10	SSE11	SSE11	ESE5.6	SE11
21-Nov	SSE10	SSE7	SSE7	SSE4	SE4	SE4	ESE3	SE2	SE0	E1	NW2	NNW3	NNW2	NNW4	NNW4	NNW4	N3	NNW3	N4	NNW4	NNW3	NNW2	NNW2	NNW2	ENE0.5	SSE10	
22-Nov	NNW4	NNW3	NW3	NNW3	NNW4	NW5	NW5	NNW3	NE3	ENE4	SE2	SW3	SSW4	SE5	SSE6	SSE6	SSE8	SSE10	SSE10	SSE10	SSE10	SSE9	S10	SSE12	S3.0	SSE12	
23-Nov	SSE13	SSE12	SSE13	SSE13	SSE12	SSE12	SSE11	SSE11	SSE12	SSE13	SSE12	SSE13	SE12	SSE11	SSE11	SSE10	S11	S12	S11	S11	S12	SSW10	SSE8	SSE6	SSE11.1	SSE13	
24-Nov	SSE4	S4	SSE3	S3	S4	S4	SSW6	SSW8	SSW9	SSW11	SSW8	S7	S6	S6	S5	SSE5	SSE7	SE7	SE6	SE8	SSE7	SE9	SE8	SE7	S5.5	SSW11	
25-Nov	SE7	SE8	SE8	SE8	SE8	SE8	SSE9	SSE8	SSE7	SE6	SE6	SSE6	SE5	SSE5	SE4	NE0	WSW5	W8	NNW9	NNW11	NNW12	NNW14	W13	W10	SSW2.9	NNW14	
26-Nov	WSW10	WSW11	WSW12	WSW11	WSW12	SW14	SW14	SW13	WSW13	WSW12	SW10	WSW7	NW3	SSW6	SSW7	SSW4	ESE4	SE5	SE5	SE6	ESE7	E7	E8	ENE9	SSW5.4	SW14	
27-Nov	ENE8	ENE8	E9	ENE9	NE9	ENE8	NE7	ENE5	NNE4	NE7	NE8	NE7	ENE5	NNE3	NNE4	NE4	ENE5	ENE4	NE1	N2	NNW2	NNW3	NNW4	NNW5	NE4.4	ENE9	
28-Nov	W3	W4	NNW5	NNW6	NNW7	NNW7	NNW7	NNW8	NNW8	NNW9	NNW9	W7	WSW7	W6	NNW6	NNW5	NW6	NW6	NW4	NNW5	NW6	NW5	NW5	NNW7	NNW6.0	NNW9	
29-Nov	NW6	NW6	NW6	NW4	NW6	NW5	NNW6	NW7	NW6	NNW6	NNW6	W8	W6	W4	SW5	WSW6	WSW6	SSW6	SSW7	SSW6	SSW6	S6	SSW7	SSW7	W3.9	W8	
30-Nov	SSW6	SSW7	SSW6	S7	S7	S6	S6	S6	S7	S7	S6	S6	S6	S7	SSE6	S6	S5	S6	S7	S7	S7	SSW9	S8	SSW9	S6.5	SSW9	

SW4.2	SW4.9	SW4.7	SW4.6	SW4.7	SW4.6	SW5.0	SW5.4	SW6.0	SW6.0	SW5.5	SW5.5	SW5.1	SW5.2	SW4.9	SW4.3	SW4.4	SW5.1	SW5.4	SW5.4	SW5.4	SW5.3	SW4.7	SW4.4	Diurnal Average
S17	S22	SSW19	S17	SSW16	SW14	SSW17	SSW16	SSW18	W20	NNW19	NNW21	W18	NNW19	NNW19	NNW15	SW19	SSW20	SSW20	SSW18	SW17	NNW18	SW16	SW16	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 - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	142	19.72	19.72
6 - 11	371	51.53	71.25
12 - 19	202	28.06	99.31
20 - 28	5	0.69	100.00
29 - 38	0	0.00	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
Stony Mountain - 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	3	6	8	10	4	4	12	7	7	4	3	2	4	18	24	26	142
6 - 11	3	1	7	16	12	6	17	34	49	43	35	27	23	50	42	6	371
12 - 19	0	0	0	0	2	0	1	11	13	55	41	16	36	27	0	0	202
20 - 28	0	0	0	0	0	0	0	0	1	2	0	0	1	1	0	0	5
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	7	15	26	18	10	30	52	70	104	79	45	64	96	66	32	720

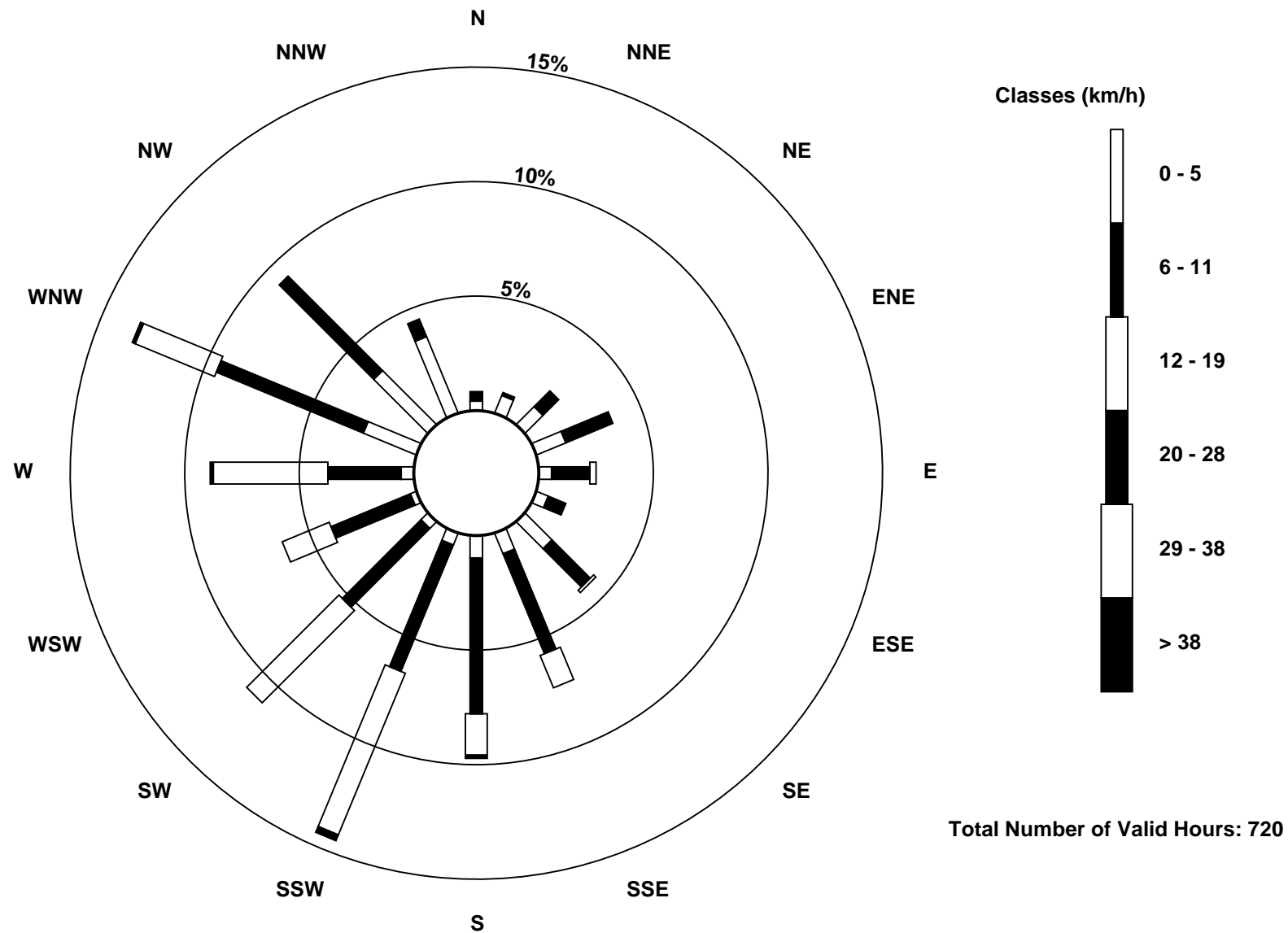
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Stony Mountain (AMS 18)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Stony Mountain - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 9 12:00 Minimum Value: 0 km/h on Nov 16 07:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6														Hours in Service: 720 Hours of Data: 720 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-Nov	2	2	2	2	2	2	3	2	2	3	2	3	3	4	3	3	3	4	3	3	2	2	1	1	4
2-Nov	1	1	1	1	1	1	2	2	2	3	2	3	4	3	4	4	5	6	6	5	4	4	4	4	6
3-Nov	4	4	4	4	3	2	3	4	5	6	5	4	4	3	3	3	4	4	4	4	4	5	4	4	6
4-Nov	4	4	4	3	3	3	3	3	3	4	5	4	4	3	3	2	2	3	3	3	2	3	2	3	5
5-Nov	3	3	3	3	3	3	3	4	4	4	4	4	2	3	2	3	3	3	3	4	3	3	4	3	4
6-Nov	3	3	3	3	3	2	2	2	3	3	2	2	2	3	3	3	3	4	4	3	3	5	4	5	5
7-Nov	4	3	4	4	3	3	3	3	3	3	2	2	2	3	3	2	1	2	3	3	3	3	4	3	4
8-Nov	3	4	4	4	4	4	4	4	4	4	4	5	5	5	4	3	3	3	4	4	4	4	4	4	5
9-Nov	3	4	4	4	4	3	3	4	5	6	6	8	6	7	6	5	4	4	5	5	4	4	4	4	8
10-Nov	5	4	4	4	3	4	4	3	2	3	2	2	3	3	3	2	2	2	3	3	4	5	4	5	5
11-Nov	6	7	6	5	4	4	3	4	5	5	4	4	2	3	4	3	2	4	3	3	4	3	3	3	7
12-Nov	3	2	2	2	2	2	3	2	2	2	3	3	4	2	1	1	1	1	1	1	2	3	3	3	4
13-Nov	3	3	2	2	2	3	2	3	2	2	3	3	3	3	4	3	3	3	2	3	3	3	3	2	4
14-Nov	2	3	3	2	3	3	4	4	4	4	5	5	5	6	6	5	6	5	5	5	6	5	5	5	6
15-Nov	5	5	4	5	4	4	4	4	4	4	4	3	3	2	2	2	2	2	2	2	1	1	1	1	5
16-Nov	1	1	1	1	1	0	0	1	1	2	1	1	1	2	1	2	2	2	2	2	1	2	1	2	2
17-Nov	3	3	2	3	2	3	3	2	2	3	3	3	4	3	4	3	3	3	2	3	4	3	2	1	4
18-Nov	1	1	1	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	2	1	1	2	2
19-Nov	2	2	1	1	2	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	2	3
20-Nov	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	3	4	3	3	3	4
21-Nov	3	2	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	1	1	1	3
22-Nov	1	1	1	1	1	1	2	1	1	1	1	2	2	2	2	2	3	3	3	4	3	3	4	4	4
23-Nov	4	3	4	4	4	4	4	3	4	4	4	4	4	4	3	3	3	4	4	4	4	4	3	2	4
24-Nov	1	1	1	1	1	1	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	3
25-Nov	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	1	1	2	3	3	4	5	4	3	5
26-Nov	3	3	3	3	3	3	3	3	3	3	2	3	2	3	2	1	1	1	2	2	1	2	2	2	3
27-Nov	2	2	2	3	2	2	2	1	1	1	2	2	1	1	1	1	1	2	1	1	1	1	2	2	3
28-Nov	1	1	1	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
29-Nov	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3
30-Nov	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	3
Diurnal Maximum																									



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Stony Mountain - November 2016

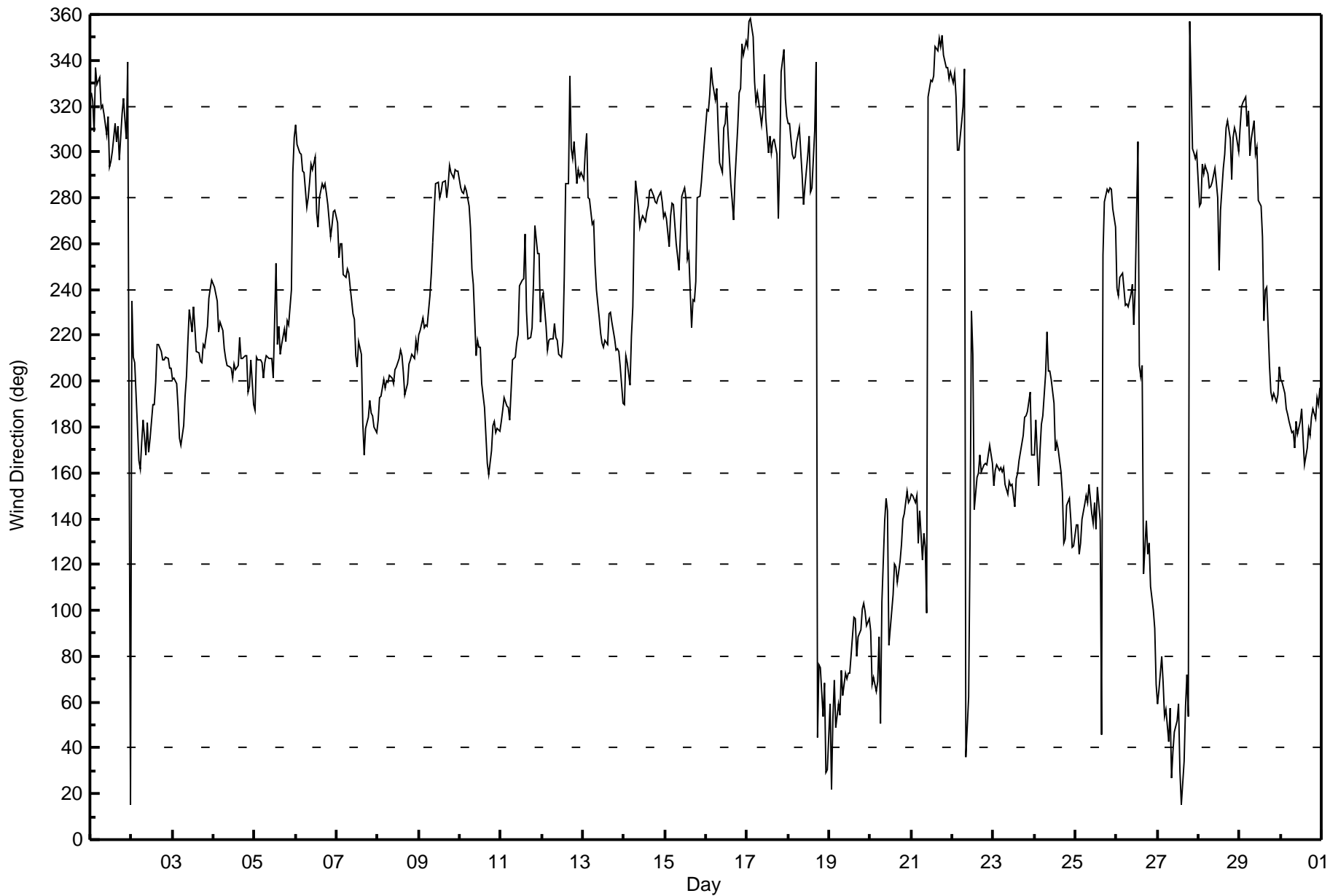
Direction of Maximum Speed: 187 deg on Nov 11 02:00		Hours in Service:	720
Direction of Maximum Daily Speed Average: 204.0 deg on Nov 8		Hours of Data:	720
Direction of Minimum Speed: 235 deg on Nov 2 01:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 0.5 deg on Nov 21		Percent Operational Time:	100.0
Monthly Average Direction: 255.6 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-Nov	326	322	308	337	329	332	319	320	317	308	315	294	296	300	313	305	311	297	317	323	314	306	339	15	312.6
2-Nov	235	211	208	179	166	162	174	183	168	182	169	175	190	190	199	216	216	213	209	209	210	210	205	206	199.2
3-Nov	201	202	199	188	175	172	181	193	202	217	231	222	232	223	213	209	208	216	215	224	236	240	244	213.6	
4-Nov	241	238	235	221	226	222	214	210	207	206	205	202	208	205	207	219	210	210	211	211	195	197	209	190	212.9
5-Nov	187	210	209	210	208	201	208	211	210	210	202	202	251	216	224	212	216	223	217	226	225	240	291	307	219.5
6-Nov	312	303	300	299	291	291	276	280	287	294	292	298	273	267	280	286	284	286	282	277	263	268	274	274	283.8
7-Nov	269	254	260	260	246	245	249	247	241	230	227	211	206	218	211	182	168	179	184	192	186	185	180	177	220.6
8-Nov	183	193	194	201	197	200	199	202	201	199	205	206	210	214	211	204	194	199	208	209	212	210	218	214	204.0
9-Nov	220	222	227	223	225	224	237	247	260	274	286	287	280	283	287	287	280	286	294	291	289	292	292	292	267.6
10-Nov	284	282	282	285	283	276	267	249	242	211	218	215	215	199	188	177	164	159	169	180	182	178	180	178	223.8
11-Nov	182	187	193	189	188	183	196	209	210	216	221	242	244	245	264	230	219	219	223	243	268	256	256	226	216.5
12-Nov	236	239	224	214	218	218	218	225	219	218	212	210	217	245	286	286	333	301	297	305	286	292	289	291	245.1
13-Nov	288	300	308	280	280	269	270	250	240	228	221	217	215	218	216	230	230	226	218	213	214	213	206	190	234.5
14-Nov	189	211	208	198	220	232	270	287	276	267	270	272	270	274	277	283	284	281	278	277	280	283	278	272	266.4
15-Nov	273	271	259	272	278	277	260	254	248	264	281	284	279	253	256	223	236	235	244	280	280	287	295	303	266.7
16-Nov	319	318	325	337	330	323	328	310	295	291	311	312	322	309	286	279	270	288	311	326	328	347	342	349	311.6
17-Nov	346	357	358	350	331	321	326	322	312	318	334	315	299	307	300	304	306	299	271	297	335	344	323	315	318.8
18-Nov	312	312	299	297	297	304	311	300	290	277	285	298	307	282	284	309	339	45	76	75	54	69	29	30	323.4
19-Nov	59	22	53	70	49	59	55	74	63	72	70	73	73	80	97	97	80	89	92	100	103	100	93	96	79.8
20-Nov	91	68	71	65	69	89	50	103	139	149	143	85	100	107	120	119	112	122	129	140	142	152	147	148	117.2
21-Nov	151	150	147	150	130	143	122	133	128	99	324	331	331	333	346	344	350	346	351	342	337	337	332	335	59.7
22-Nov	330	334	324	301	301	313	319	336	36	62	130	230	212	144	158	160	168	161	164	164	164	168	172	164	171.6
23-Nov	155	161	163	161	162	161	162	155	151	156	154	155	145	157	160	165	169	176	184	185	187	196	168	168	164.4
24-Nov	168	183	155	170	181	185	203	222	204	205	201	190	170	174	170	160	152	129	131	146	149	139	128	128	168.9
25-Nov	137	137	124	129	140	146	150	147	155	142	138	147	136	154	139	46	255	278	284	282	284	284	275	267	195.1
26-Nov	241	238	246	247	240	233	234	232	238	242	224	240	304	207	202	207	116	139	124	129	110	100	92	67	218.9
27-Nov	59	65	80	68	53	57	42	57	27	38	47	52	59	30	15	34	58	72	54	357	301	300	297	299	46.1
28-Nov	277	278	295	290	294	291	284	285	287	293	287	280	248	275	293	299	311	314	306	288	306	311	308	300	291.2
29-Nov	310	320	321	324	311	318	298	306	314	299	302	279	277	263	226	240	241	207	195	192	195	191	194	206	264.5
30-Nov	201	200	194	188	186	182	178	178	171	183	177	182	188	175	163	171	179	176	184	188	184	193	190	197	184.2

231.7 233.4 229.5 228.3 231.3 230.9 235.1 233.9 230.2 231.9 232.8 234.7 235.7 232.9 233.2 231.6 227.3 224.2 223.1 224.8 226.8 229.4 234.3 232.0

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
Stony Mountain - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 96 deg on Nov 2 01:00 Minimum Value: 9 deg on Nov 16 07:00 Percentiles: P ₁ = 12 P ₁₀ = 16 Q ₁ = 18 Median = 22 Q ₃ = 25 P ₉₀ = 30 P ₉₉ = 66																	Hours in Service: 720 Hours of Data: 720 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-Nov	33	28	25	34	33	32	27	28	25	29	33	28	26	24	26	26	24	26	25	31	27	25	41	66	66	
2-Nov	96	19	11	15	16	13	17	17	19	23	23	24	23	26	25	21	20	20	19	18	21	21	22	23	96	
3-Nov	22	19	20	22	23	21	22	22	21	24	23	20	21	22	19	19	17	18	18	18	19	22	21	22	24	
4-Nov	23	20	20	16	16	16	17	17	17	18	19	20	21	25	23	22	16	16	16	17	16	15	31	20	31	
5-Nov	22	18	17	17	18	18	17	27	18	22	18	20	34	23	22	20	18	18	16	18	16	23	21	20	34	
6-Nov	18	19	21	21	23	22	21	19	20	21	21	20	29	23	19	19	18	21	19	20	25	25	22	22	29	
7-Nov	24	25	25	25	23	22	22	20	21	19	21	22	24	21	24	22	16	18	22	17	19	20	22	19	25	
8-Nov	18	17	17	17	16	18	18	18	17	17	17	20	20	20	21	20	18	18	18	16	17	17	17	18	21	
9-Nov	17	17	18	18	16	17	18	21	24	23	23	23	24	23	22	22	21	21	21	22	22	20	22	19	24	
10-Nov	20	19	19	20	18	19	24	25	20	31	24	19	23	21	24	24	17	16	21	21	23	23	24	25	31	
11-Nov	25	22	20	20	21	22	24	27	19	19	20	29	25	23	27	20	17	16	17	25	25	31	32	17	32	
12-Nov	18	17	21	15	15	16	17	19	17	18	18	18	32	30	35	80	14	15	16	16	19	21	19	20	80	
13-Nov	20	19	19	22	20	22	20	21	18	20	18	19	21	21	20	21	19	19	18	17	16	16	18	16	22	
14-Nov	17	19	17	20	18	19	26	19	23	24	25	23	24	24	24	24	23	23	22	22	22	21	24	26		
15-Nov	23	22	24	22	22	24	25	23	25	25	21	22	25	25	24	19	19	16	18	17	15	14	15	14	25	
16-Nov	14	12	12	11	12	9	9	13	10	17	19	19	27	25	28	18	21	20	18	18	15	31	29	30	31	
17-Nov	28	30	27	30	33	28	27	30	23	29	30	28	25	32	24	28	22	23	26	35	32	28	21	15	35	
18-Nov	14	15	17	16	15	15	15	16	15	22	33	53	51	44	36	36	35	17	17	16	16	28	24	23	53	
19-Nov	30	18	23	21	24	21	15	16	17	19	16	17	18	19	19	18	17	18	16	18	16	18	16	17	30	
20-Nov	17	14	16	15	17	18	39	37	22	38	34	28	21	18	20	18	17	18	20	21	24	23	23	25	39	
21-Nov	21	23	21	23	19	22	20	23	77	51	55	31	41	33	32	35	27	31	30	33	34	27	28	30	77	
22-Nov	30	26	22	20	20	21	25	40	47	18	70	61	51	46	25	30	27	24	25	23	25	25	25	23	70	
23-Nov	23	22	21	20	22	22	24	22	22	21	26	22	23	26	24	23	23	26	27	25	25	26	23	26	27	
24-Nov	25	26	23	20	21	19	23	24	18	17	23	26	28	26	30	30	22	23	21	23	23	20	19	20	30	
25-Nov	22	20	18	21	22	22	22	22	24	23	25	25	25	26	37	87	25	25	26	22	23	24	24	26	87	
26-Nov	22	20	23	22	21	18	18	19	20	20	18	26	63	19	15	18	19	17	30	21	19	16	17	18	63	
27-Nov	16	16	17	19	18	19	17	17	21	18	16	19	26	28	23	22	21	23	66	23	48	15	17	25	66	
28-Nov	31	26	19	19	21	22	22	23	20	22	25	33	25	29	25	24	24	25	34	28	24	20	20	21	34	
29-Nov	22	24	23	23	21	24	21	21	20	23	24	21	24	42	41	32	31	29	24	26	28	28	26	26	42	
30-Nov	27	23	27	27	29	29	30	30	29	29	30	31	30	33	29	29	30	29	30	27	28	27	26	24	33	
																	96 30 27 34 33 32 39 40 77 51 70 61 63 46 41 87 35 31 66 35 48 31 41 66									
Diurnal Maximum																										



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	11:00	End Time (MST)	15:40
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-600	-600
Analyzer IP address	192.168.1.43		Lamp voltage	894	894
Calculated slope	0.995249	0.998873	Chamber temp	44.0	44.0
Calculated intercept	1.117220	1.098186	Pressure	660.0	660.0
Analyzer Background	21.0	21.3	Flow	0.380	0.380
Analyzer Coefficient	0.897	0.890	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	0.1	----
as found span	5000	58.9	581.9	584.5	0.996
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	58.9	581.9	582.2	1.000
second point	5000	29.5	291.5	289.5	1.007
third point	5000	14.7	145.2	143.9	1.009
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	58.9	581.9	580.3	1.003
Average Correction Factor					1.005

Corrected As found 584.4 Previous response 583.6 % change -0.1%

Notes:

No issues with calibration, slight zero and span adjustment after inlet filter change.

Calibration Performed By:

Zack Eastman



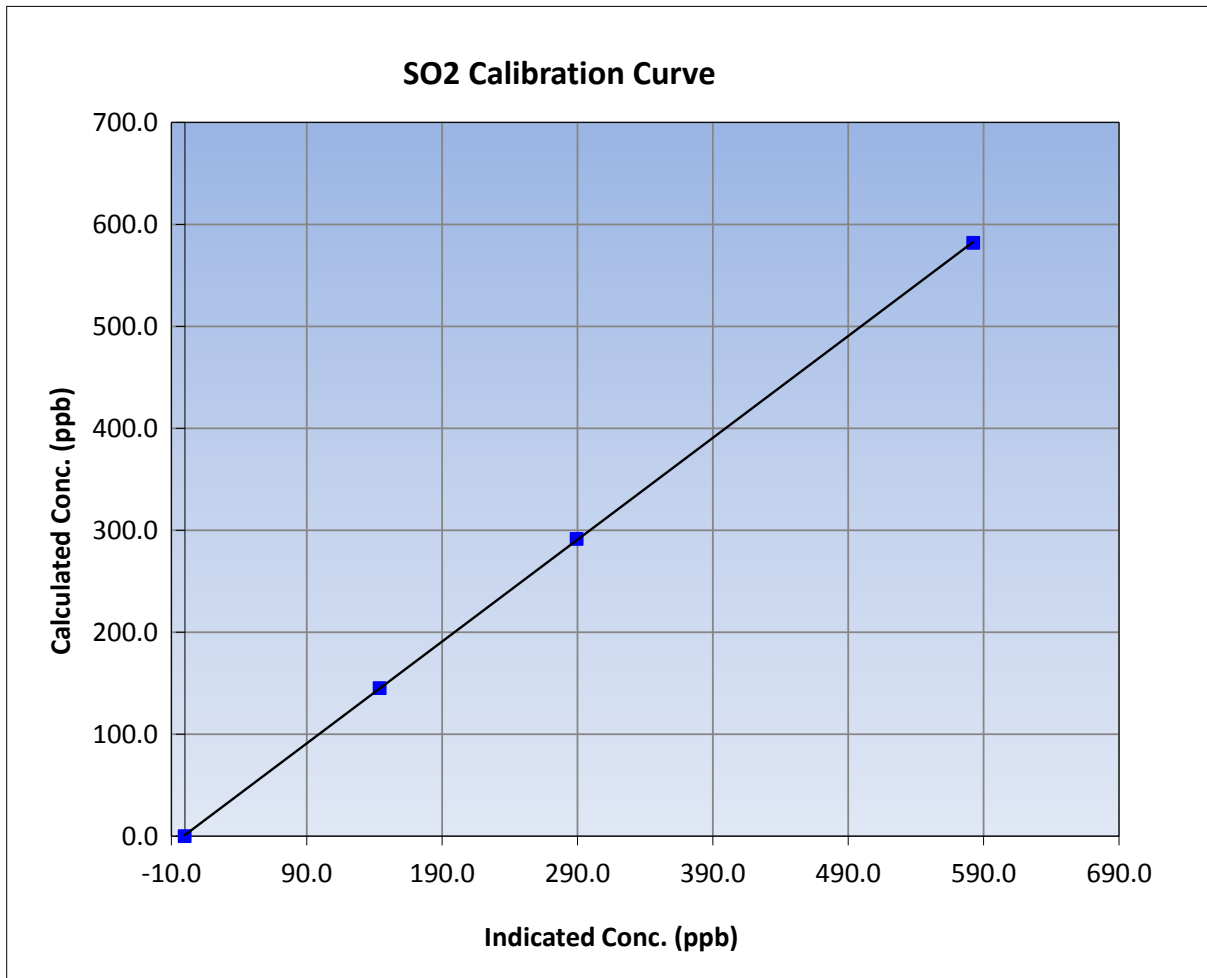
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301453

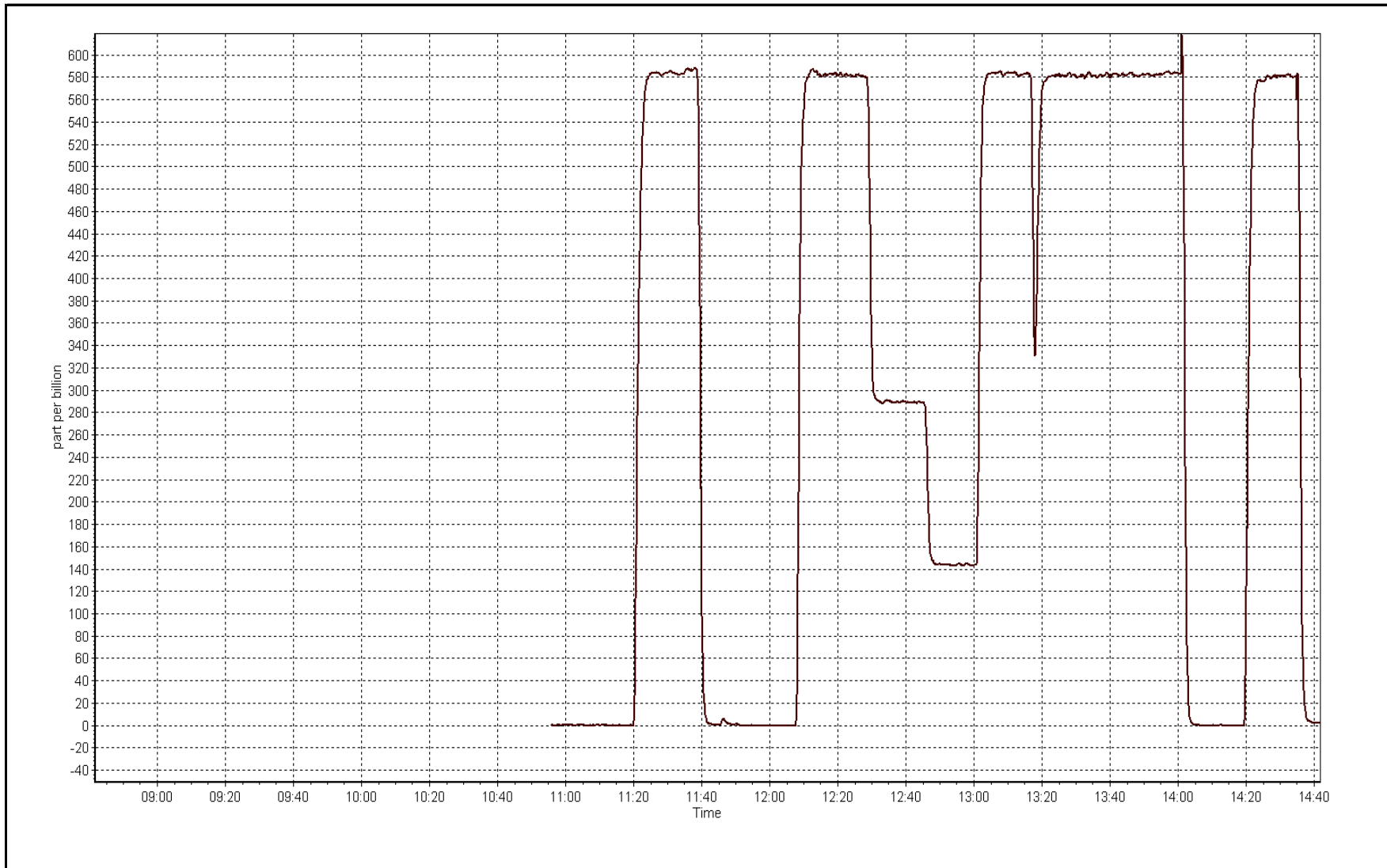
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999984
581.9	582.2	0.9995		
291.5	289.5	1.0069	Slope	0.998873
145.2	143.9	1.0091		
			Intercept	1.098186



SO2 Calibration Plot

Date: November 4, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 25, 2016	Last Calibration	October 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	11:26	End Time (MST)	14:16
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	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1014	1014
Calculated slope	1.002842	1.010886	Chamber temp	45	45
Calculated intercept	-0.257311	-0.191852	Pressure	623.0	623.0
Analyzer Background	2.78	2.78	Flow	0.404	0.404
Analyzer Coefficient	1.065	1.065	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	-0.1	----
as found span	5000	82.0	80.0	79.4	1.008
SO2 scrubber check	5000	10.0	98.8	0.3	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	82.0	80.0	79.3	1.009
second point	5000	41.1	40.1	39.9	1.006
third point	5000	20.6	20.1	20.2	0.996
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	82.0	80.0	79.6	1.006
Average Correction Factor					1.004

Corrected As found	79.5	Previous response	80.1	% change	0.7%
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Notes:

Inlet filter changed after as founds. No adjustments required.

Calibration Performed By:

Zach Eastman



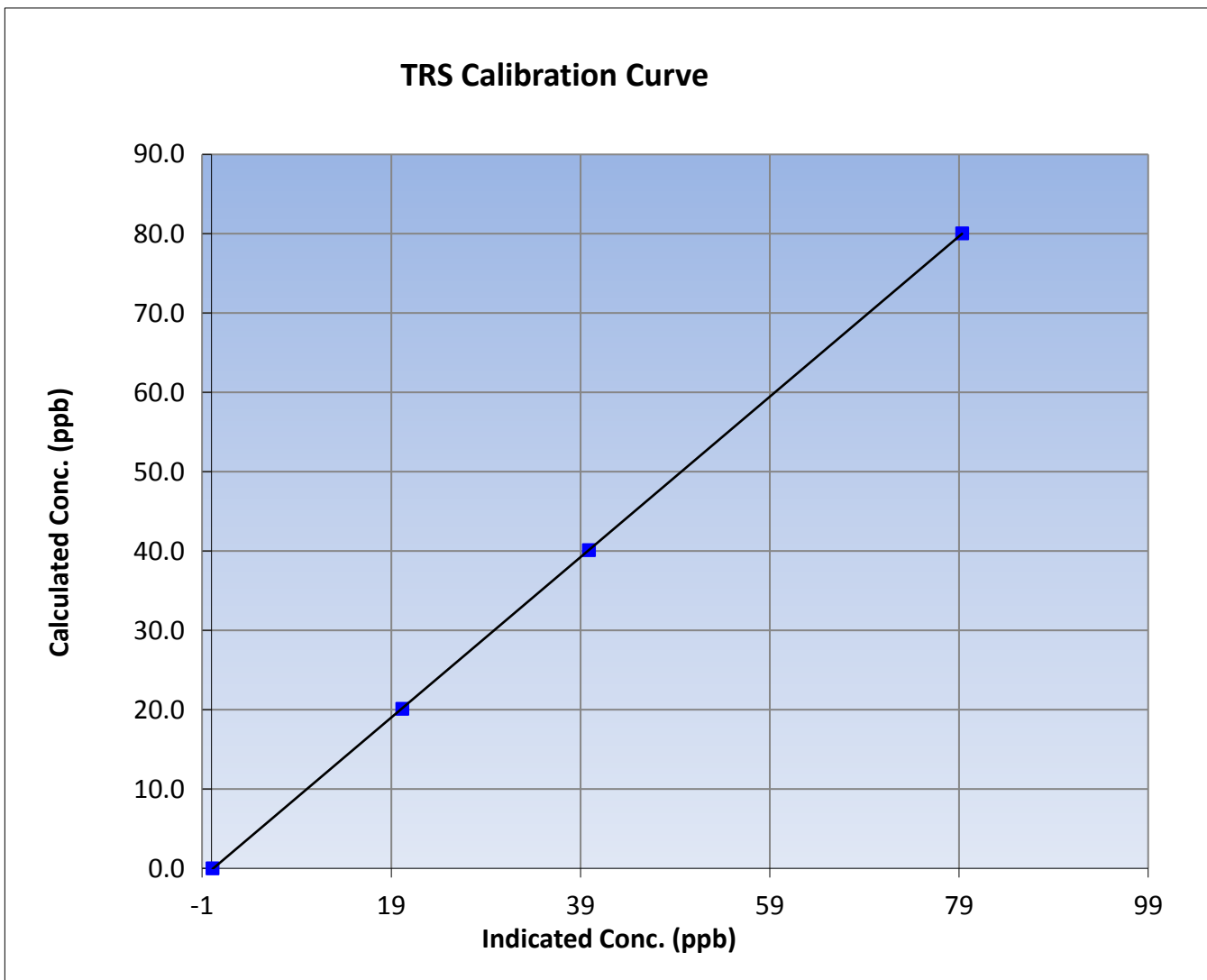
Wood Buffalo Environmental Association TRS Calibration Report

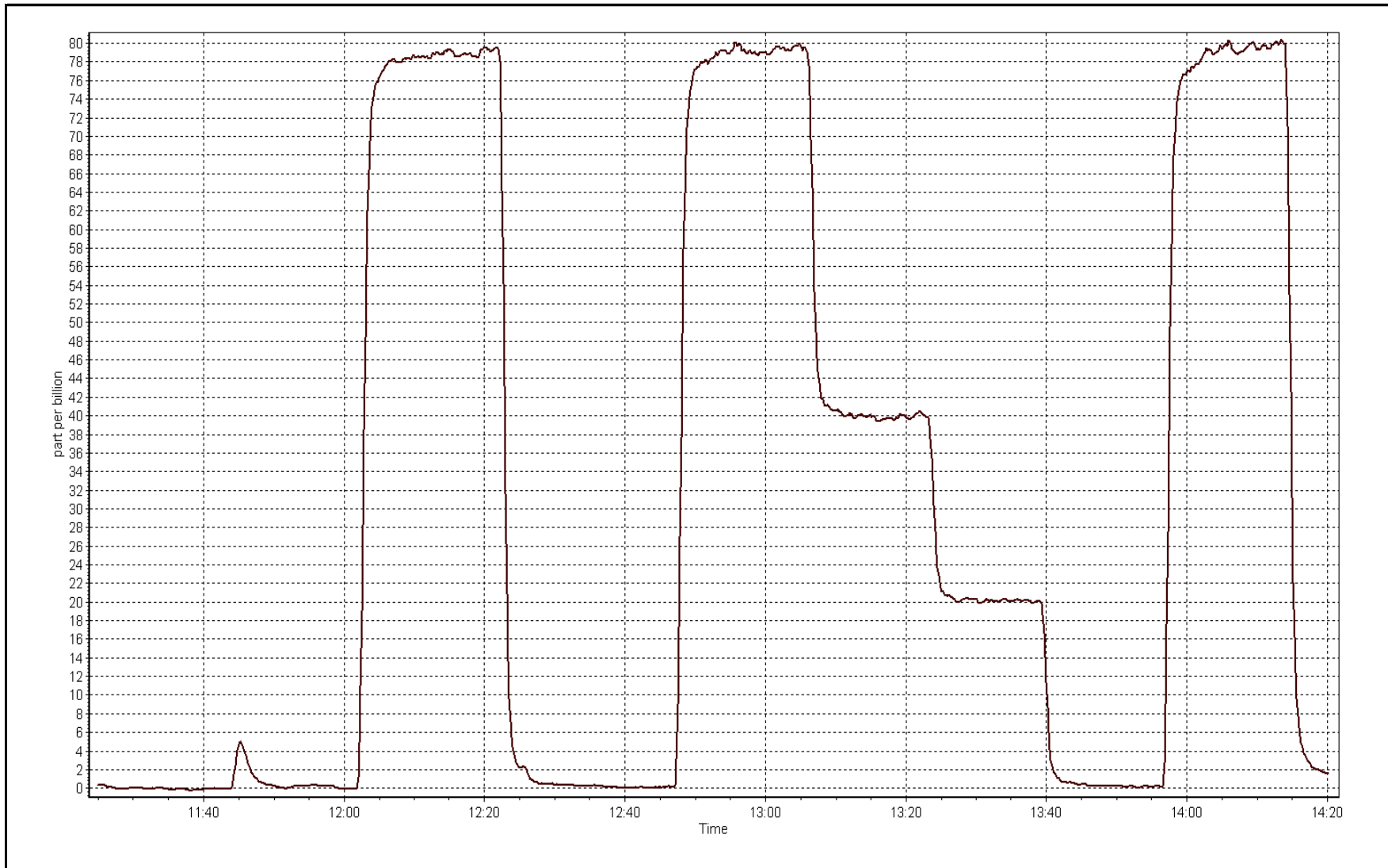
Station Information

Calibration Date	November 25, 2016	Previous Calibration	October 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:26	End Time (MST)	14:16
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	0.1	----	Correlation Coefficient	0.999995
80.0	79.3	1.0088		
40.1	39.9	1.0059	Slope	1.010886
20.1	20.2	0.9963		
			Intercept	-0.191852







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	11:00	End Time (MST)	15:40
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	0.999019	0.999861	Carrier Pressure	30.9	30.9
THC Calc intercept	0.024099	0.022097	Fuel Pressure	44.3	44.3
NMHC Calc slope	0.996391	0.997609	Air Pressure	34.5	34.5
NMHC Calc intercept	0.007991	0.012016			

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	12.44	0.986
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.9	12.26	12.26	1.000
second point	5000	29.5	6.14	6.09	1.009
third point	5000	14.7	3.06	3.03	1.010
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.9	12.26	12.27	0.999
Average Correction Factor					1.006

Corrected As found 12.44 Previous response 12.25 % change -1.5%

Notes:

No issues to note, slight span adjustment after inlet filter change and H2 change.

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	3.23	1.005
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	6.51	0.995
Average Correction Factor					1.005

Corrected As found 6.56 Previous response 6.49 % 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	5000	0	0.00	0.00	----
as found span	5000	58.9	5.78	5.88	0.984
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.9	5.78	5.77	1.002
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	5.76	1.004
Average Correction Factor					1.011

Corrected As found 5.88 Previous response 5.76 % change -2.1%



Wood Buffalo Environmental Association

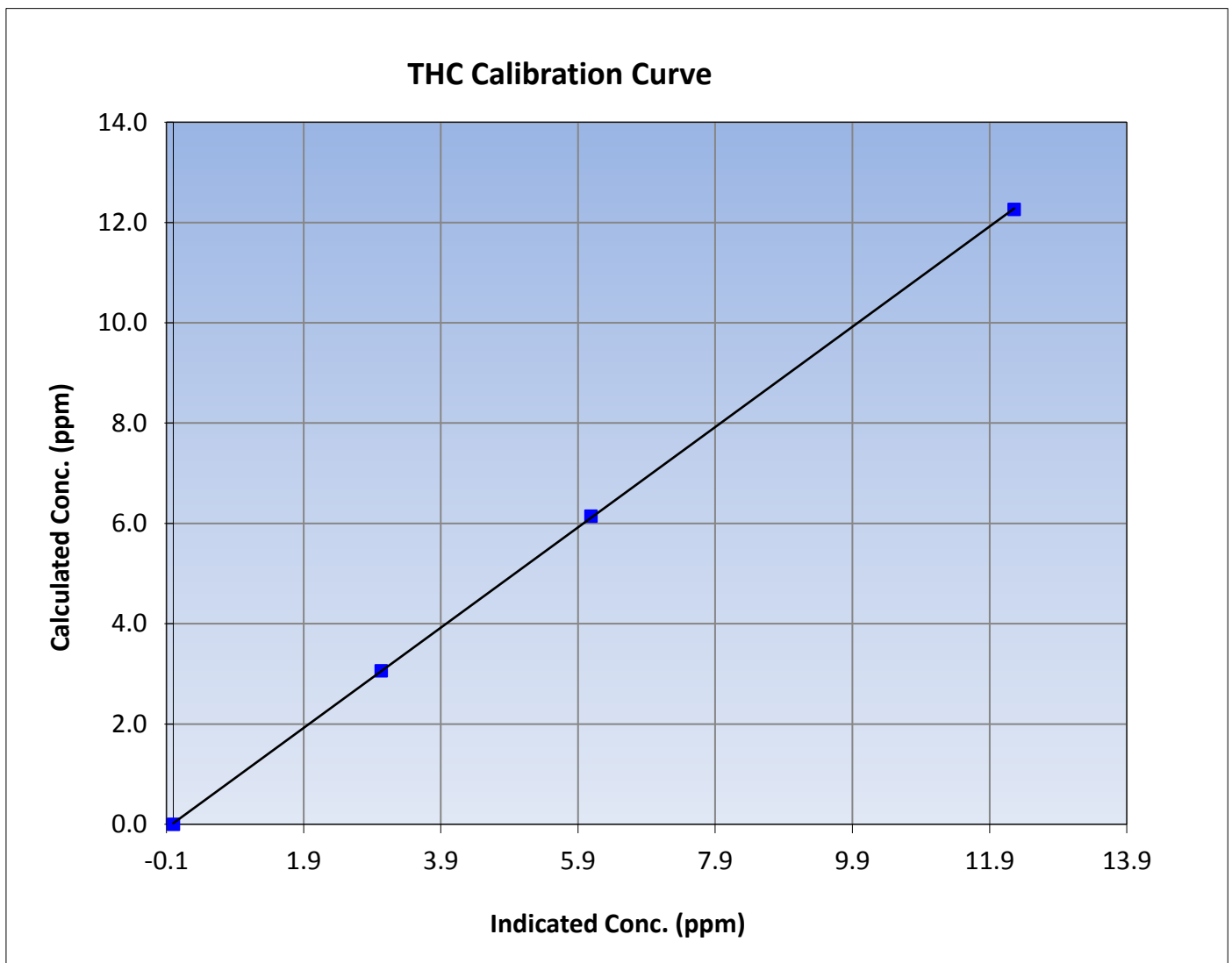
THC Calibration Summary

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
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	0.999978
12.26	12.26	1.0002		
6.14	6.09	1.0085	Slope	0.999861
3.06	3.03	1.0101		
			Intercept	0.022097





Wood Buffalo Environmental Association

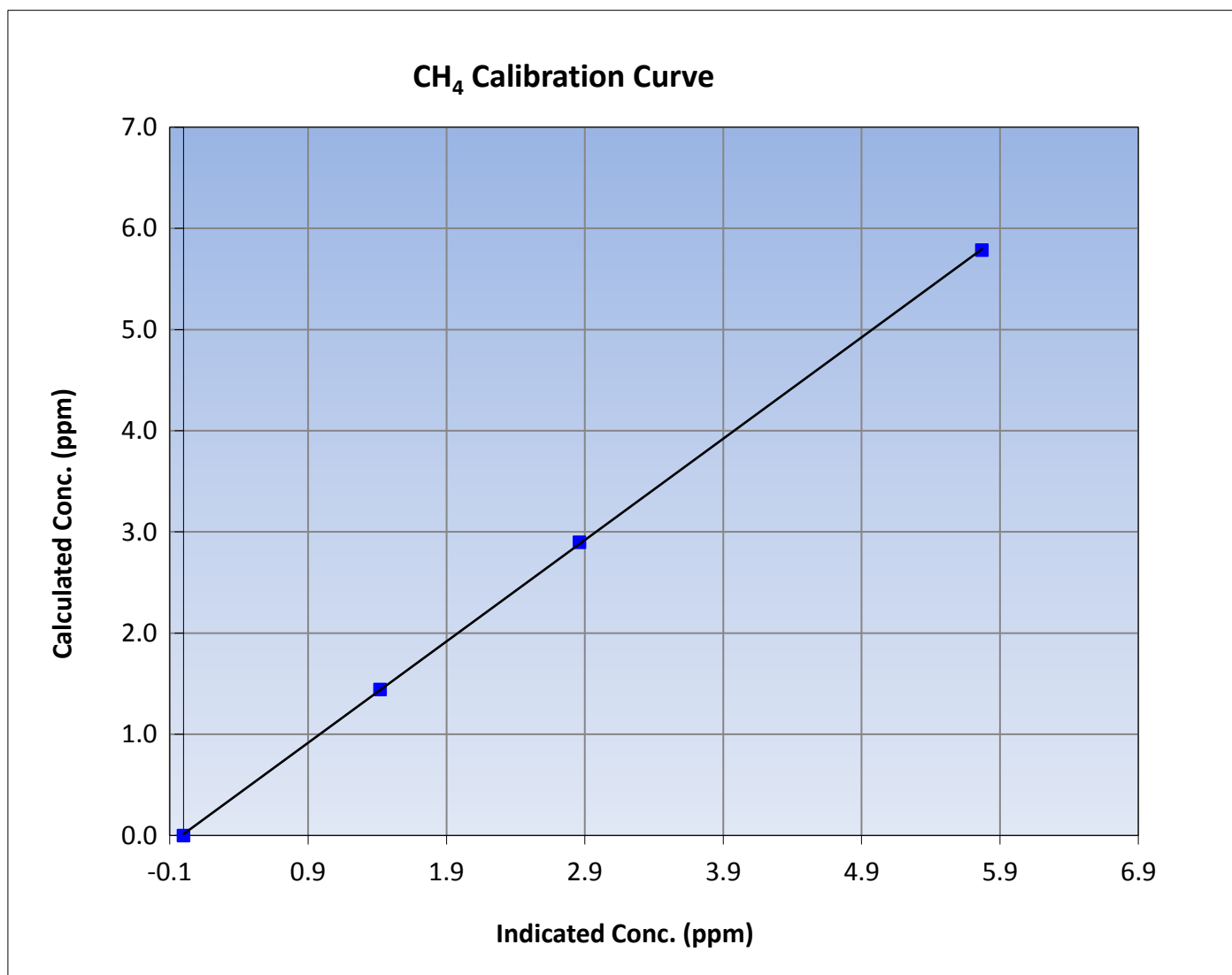
CH₄ Calibration Summary

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
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	0.999963
5.78	5.77	1.0024		
2.90	2.86	1.0129	Slope	1.001790
1.44	1.42	1.0166		
			Intercept	0.014108





Wood Buffalo Environmental Association

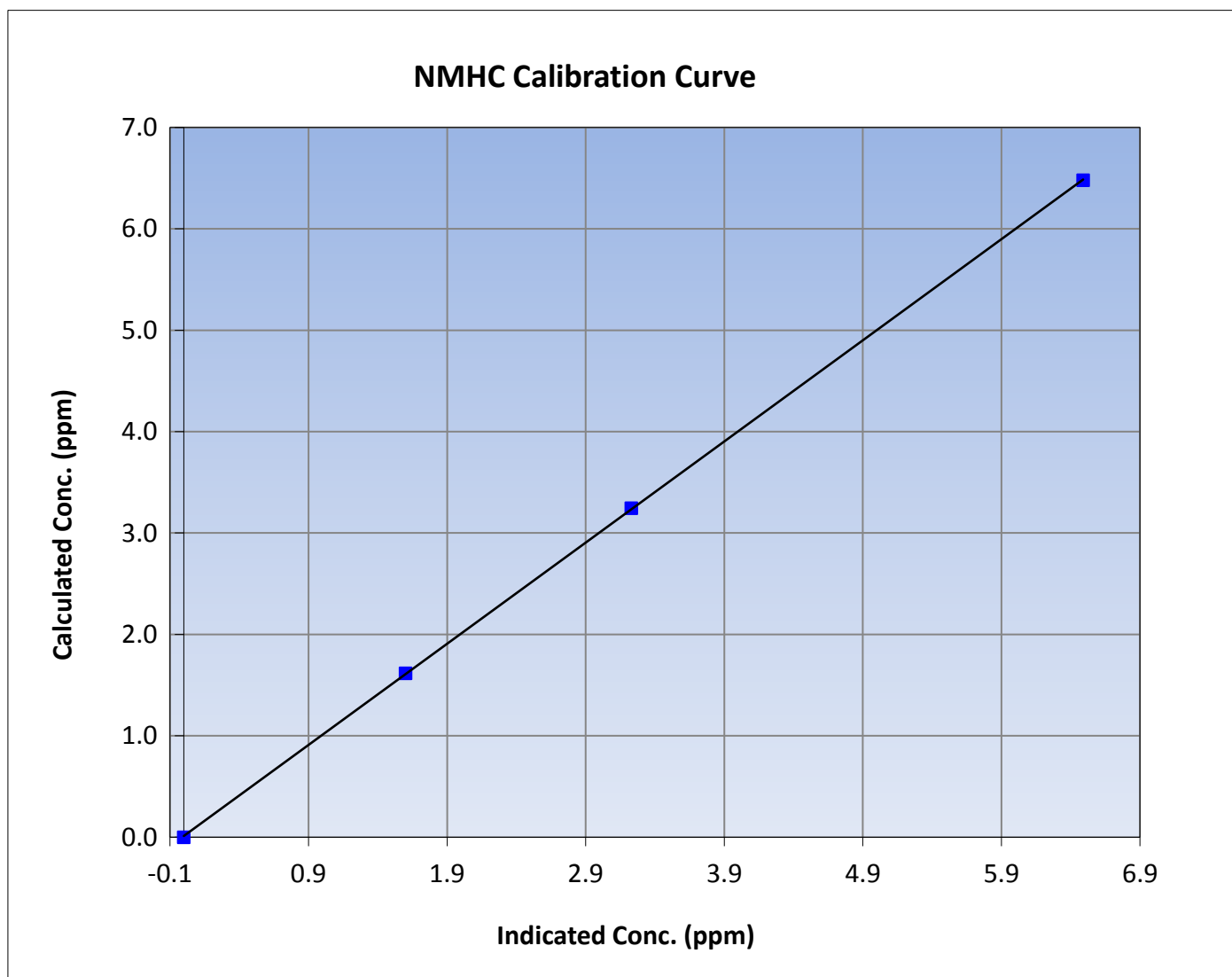
NMHC Calibration Summary

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
Analyzer make	Thermo 55i	Analyzer serial #	1505164831

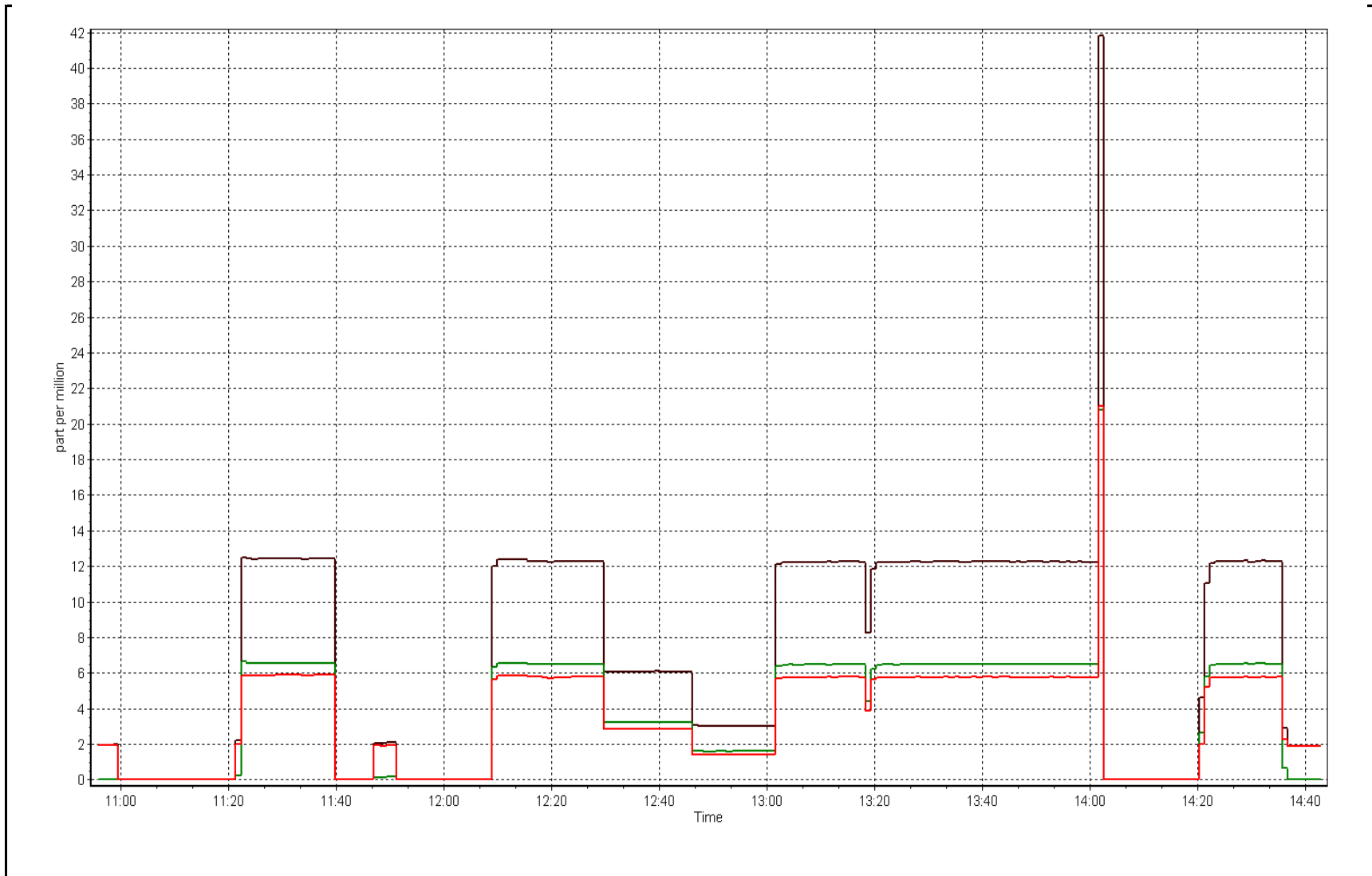
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999983
6.48	6.49	0.9983		
3.25	3.23	1.0046	Slope	0.997609
1.62	1.60	1.0106		
			Intercept	0.012016



THC Calibration Plot

Date: November 4, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 28, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	13:08	End Time (MST)	17:11
NO2 GPT Ref date	November 4, 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	1.003069	0.993185	Pressure	609.0	609.0
Calculated intercept	0.333125	-0.783730	Flow cell A	0.683	0.683
Analyzer Background	-1.6	-2.3	Flow cell B	0.687	0.687
Analyzer Coefficient	1.403	1.403	Cell A Intensity	54xxx	64xxx
			Cell B Intensity	53xxx	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	0.0	----
as found span	5000	1084	392.4	387.9	1.011
calibrator zero	5000	0.00	0.0	-0.1	----
high point	5000	1085	392.4	395.0	0.993
second point	5000	975	265.1	268.5	0.987
third point	5000	844	135.8	138.5	0.981
as left zero	5000	0.00	0.0	-0.5	----
as left span	5000	1085	392.4	401.0	0.979
Average Correction Factor					0.987

Corrected As found	388.0	Previous response	390.9	% change	0.7%
--------------------	-------	-------------------	-------	----------	------

Notes:

Cell intensities a little low, optical tubes cleaned and lamp position adjusted after as founds for preventative maintenance purposes. Inlet filter also changed after as founds. Optical tubes clean. Lamp adjustment resulted in slight increase in intensities. Zero and span adjusted. Calibration meets cal criteria.

Calibration Performed By: Zach Eastman



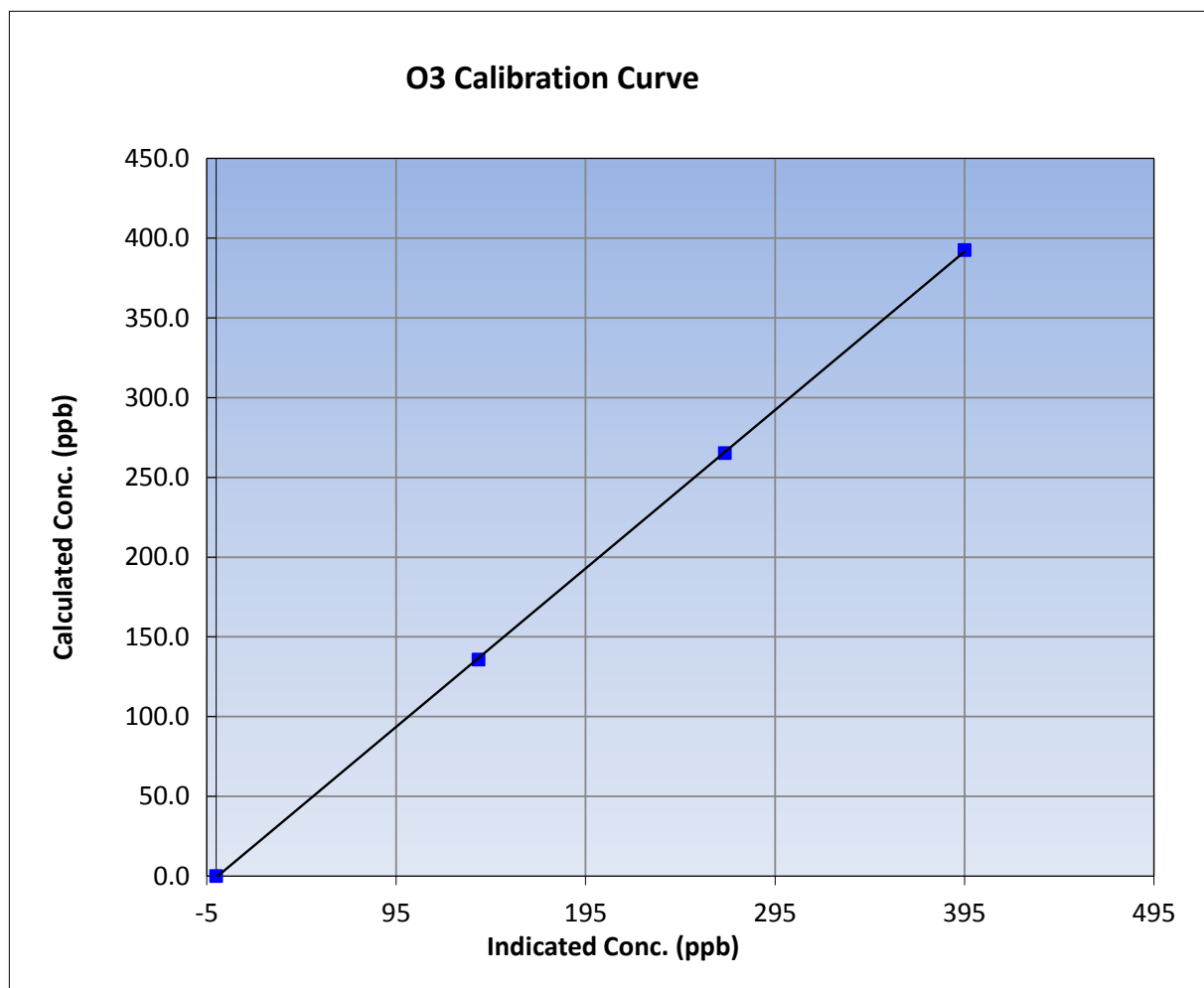
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	Monday, November 28, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	13:08	End Time (MST)	17:11
Analyzer make	Thermo 49i	Analyzer serial #	1501663733

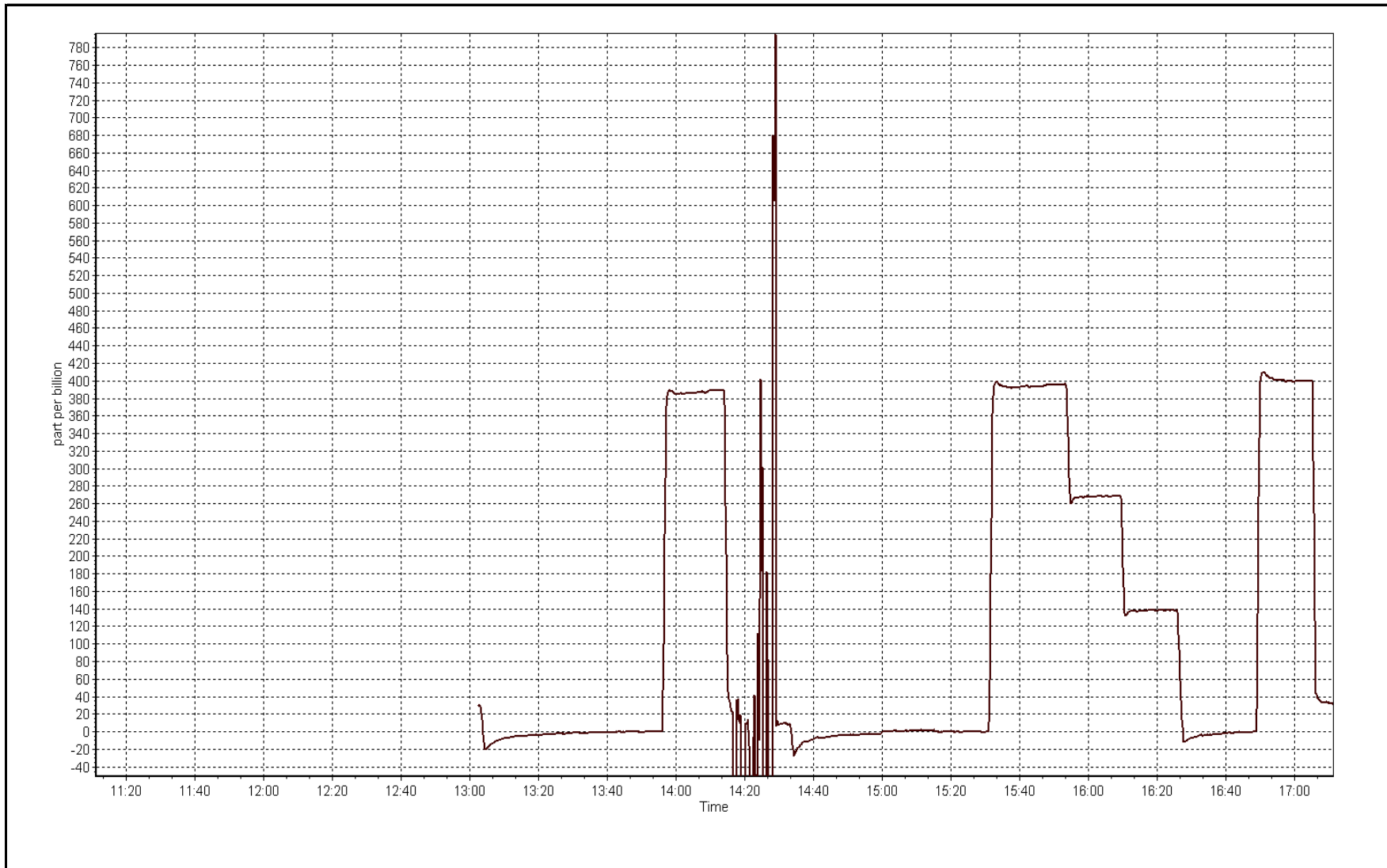
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999964
392.4	395.0	0.9934		
265.1	268.5	0.9873	Slope	0.993185
135.8	138.5	0.9805		
			Intercept	-0.783730



O3 Calibration Plot

Date: November 28, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	11:00	End Time (MST)	15:40
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	0.997912	0.997464	1.017460
	Data Offset	0.891555	1.290958	-0.343448
Current Calibration	Data Slope	0.999993	1.000654	0.997310
	Data Offset	0.853757	1.176194	-0.977375

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		0.996	
NOx coefficient	0.998		1.000	
NO2 coefficient	0.999		0.999	
NO bkgnd	1.8		1.8	
NOx bkgnd	1.9		1.9	
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	150.9	mmHg
R Cell Press Nox	150.9	mmHg	150.9	mmHg
NO sample flow	0.951	lpm	0.951	lpm
Nox sample Flow	0.953	lpm	0.953	lpm

Notes:

No issues with calibration, slight span adjustment after inlet filter change. Nothing else to note.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

November 4, 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	-0.1	-0.2	0.0	----	----
as found span	5000	58.9	599.6	599.6	0.0	612.8	612.8	0.1	0.9785	0.9785
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	----	----
high point	5000	58.9	599.6	599.6	0.0	599.3	598.7	0.6	1.0005	1.0015
second point	5000	29.5	300.3	300.3	0.0	298.5	297.9	0.5	1.0062	1.0080
third point	5000	14.7	149.6	149.6	0.0	148.6	147.7	0.9	1.0072	1.0131
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	----	----
as left span	5000	58.9	599.6	208.5	391.1	602.9	205.3	397.6	0.9945	1.0159
Average Correction Factor									1.0046	1.0075

Corrected As found

NO_x= 612.9

NO= 613.0

Percent Change

NO_x= -2.1%

NO= -2.1%

Previous Response

NO_x= 600.0

NO= 599.8

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	601.3	600.9	0.0	0.9972	0.9979	----	----
1st NO2 (300)	208.5	392.4	602.1	208.5	393.4	0.9959	----	0.9973	100.3%
2nd NO2 (200)	335.8	265.1	603.5	335.8	267.6	0.9936	----	0.9904	101.0%
3rd NO2 (100)	465.1	135.8	603.3	465.1	138.2	0.9939	----	0.9826	101.8%
2nd NO ref point		0.0							
Average Correction Factor						0.9945		0.9901	101.0%

Calibration Performed By:

Zach Eastman



Wood Buffalo Environmental Association

NO_x Calibration Summary

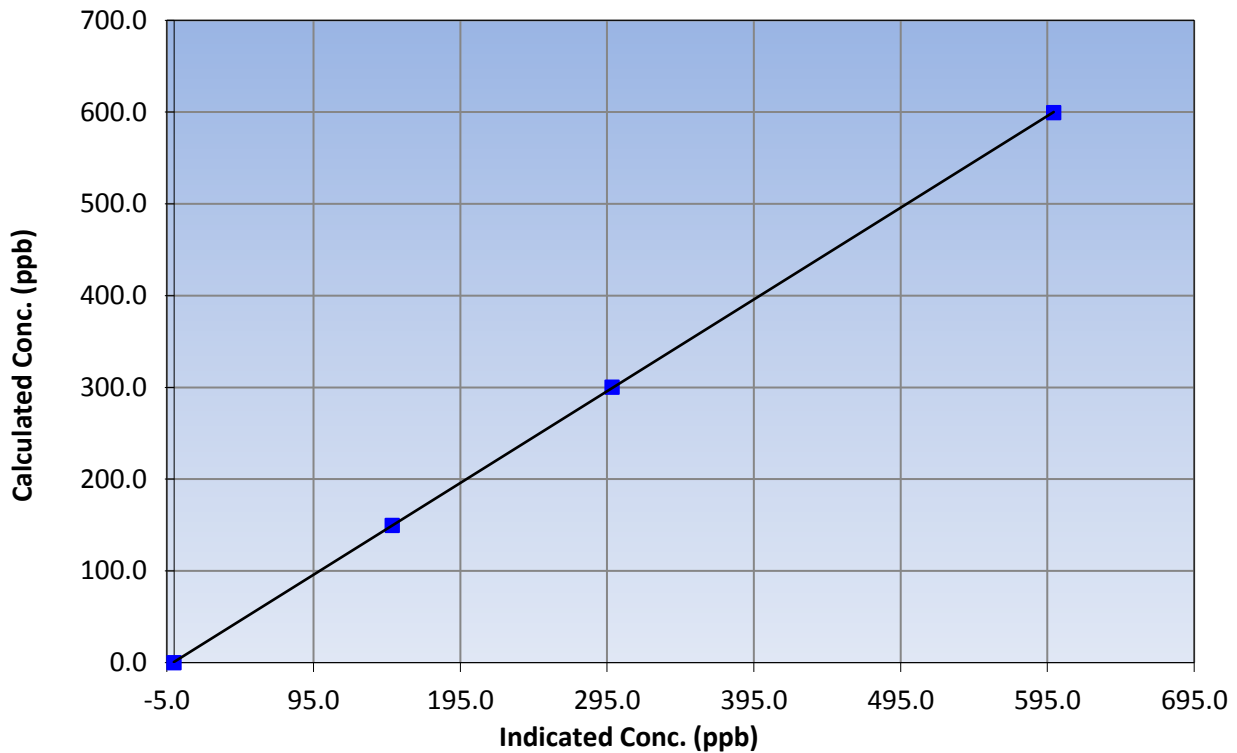
Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
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	----	Correlation Coefficient	0.999991
599.6	599.3	1.0005		
300.3	298.5	1.0062	Slope	0.999993
149.6	148.6	1.0072		
			Intercept	0.853757

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

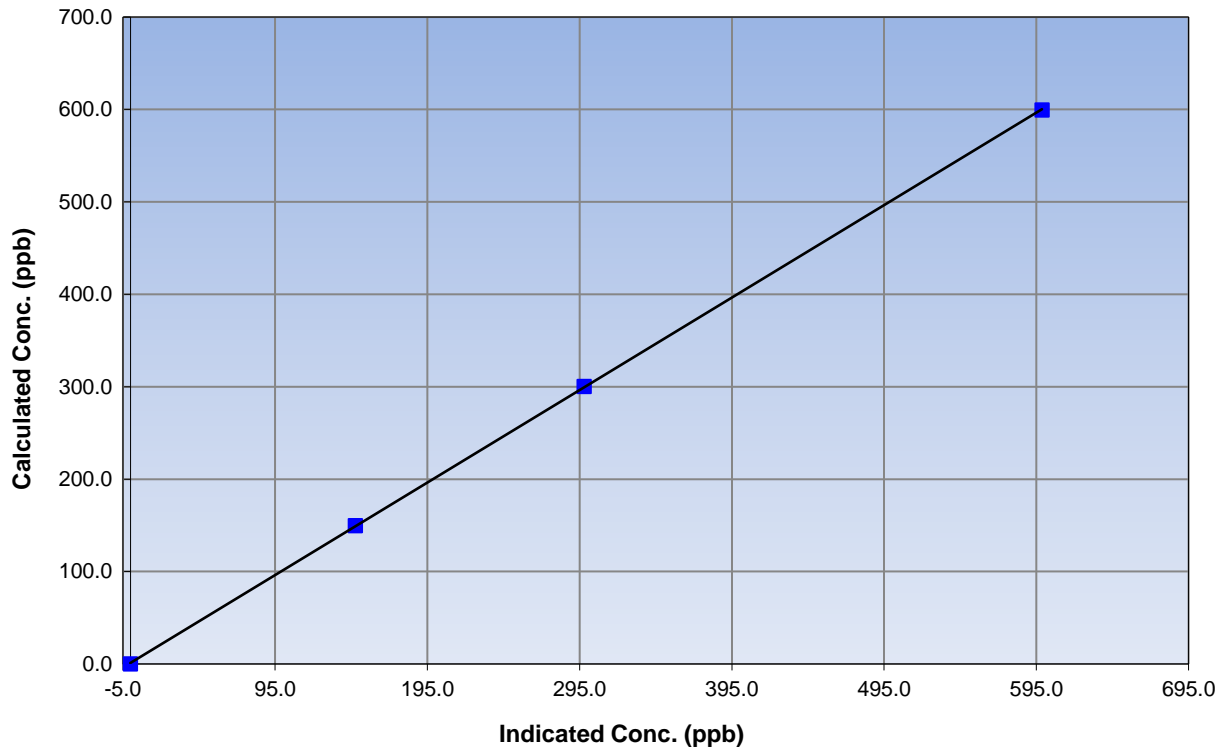
Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
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	0.999985
599.6	598.7	1.0015		
300.3	297.9	1.0080	Slope	1.000654
149.6	147.7	1.0131		
			Intercept	1.176194

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

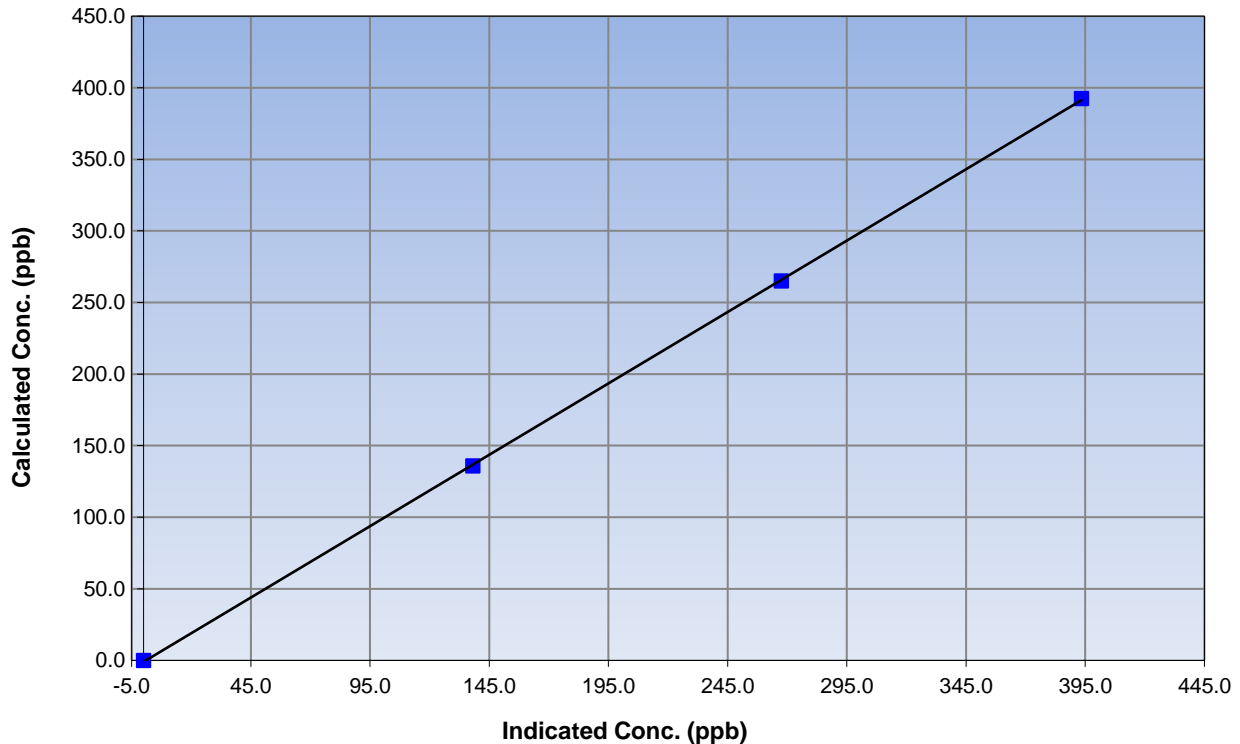
Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Number	Stony Mountain	Station Number	AMS 18
Start Time (MST)	11:00	End Time (MST)	15:40
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

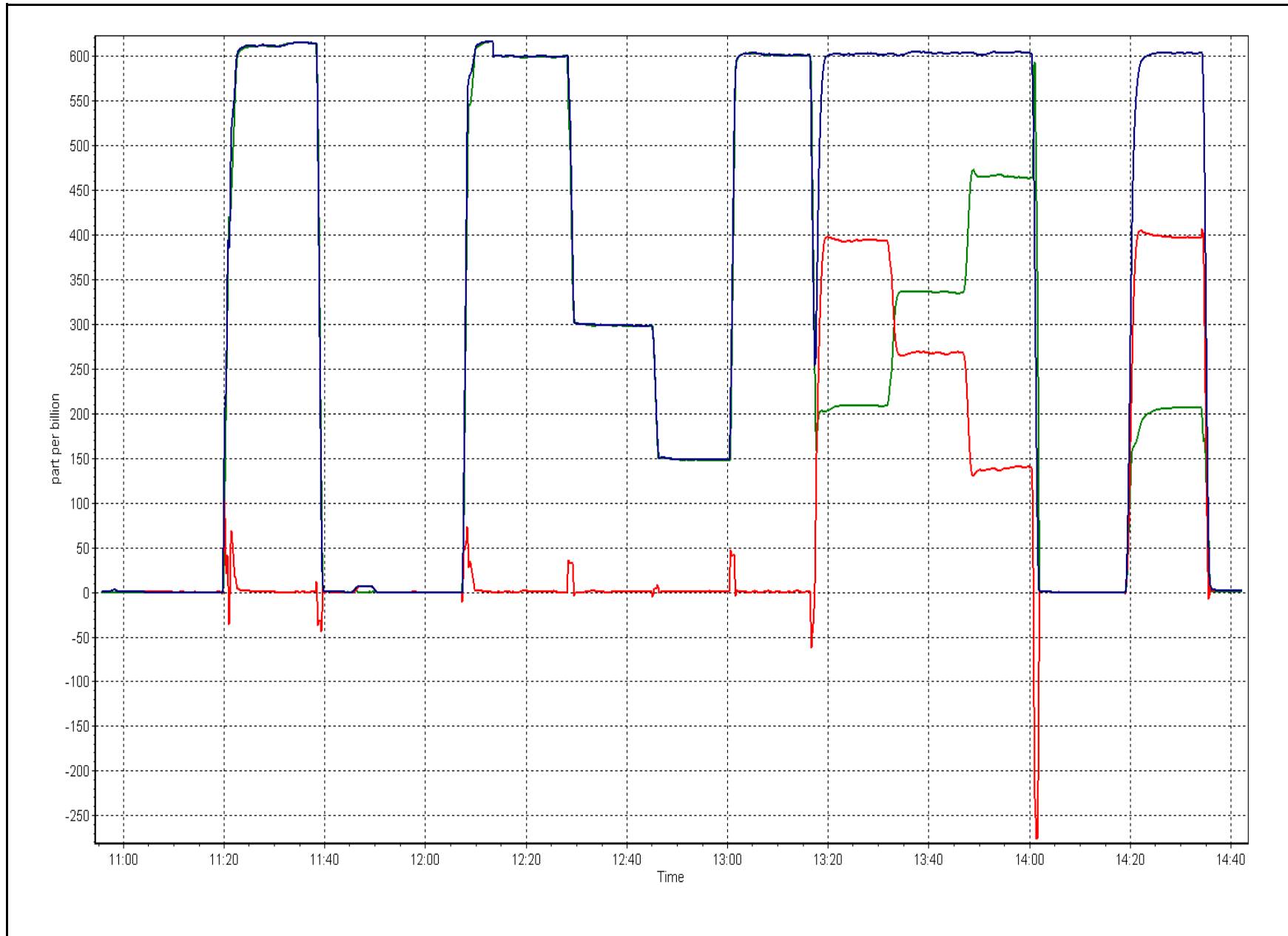
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999957
392.4	393.4	0.9973		
265.1	267.6	0.9904	Slope	0.997310
135.8	138.2	0.9826		
			Intercept	-0.977375

NO₂ Calibration Curve



NOX Calibration Plot

Date: November 4, 2016





Wood Buffalo Environmental Association

SHARP PM_{2.5} CALIBRATION

Version-08-2016

Station Information

Station Name:	Stony Mountain	Station number:	AMS 18
Calibration Date:	November 28, 2016	Last Cal Date:	October 18, 2016
Start time (MST):	18:00	End time (MST):	18:38
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

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T1 (°C)	-4	-2	-2	<input checked="" type="checkbox"/>	+/- 2 °C
P3 (hPa)	923	923	923	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1001	999	1001	<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

		<u>Date of check:</u>	<u>Last Cal Date:</u>	<u>Tolerance</u>
Leak Test:		Oct 18 2016	June 22 2016	
	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>

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<u>Tolerance</u>
T2 (°C)	20	NA	20	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	23	NA	23	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	18	NA	18	<input type="checkbox"/>	+/- 2 °C
RH (%)	19	NA	19	<input type="checkbox"/>	+/- 10%

Notes: Slight temp adjustmen on T1 required, no other adjustments made.

Calibration by: Zach Eastman



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 19 FIREBAG NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
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	683	34	37	99.58	28	0	8	0
H2S (ppb) Average	685	34	35	99.86	7	0	2	0
THC (ppm) Average	683	35	37	99.72	2.9	-	2.4	-
NO2 (ppb) Average	683	35	37	99.72	18	0	8	-
NO (ppb) Average	683	35	37	99.72	6	-	2	-
NOX (ppb) Average	683	35	37	99.72	22	-	8	-
Temperature 2 m (C) Average	719	0	1	99.86	11.4	-	7.7	-
Relative Humidity (%) Average	719	0	1	99.86	98	-	96	-
Wind Speed 10 m (km/h) Average	10	0	710	1.39	20	-	-	-
Wind Direction 10 m (deg) Average	10	0	710	1.39	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
 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	683	1.7	4	-	0	0	0	0	1	5	28
H2S (ppb) Average	685	0.2	0	-	0	0	0	0	0	0	7
THC (ppm) Average	683	2.25	0.1	-	2.1	2.2	2.2	2.2	2.3	2.3	2.9
NO2 (ppb) Average	683	3.3	3	-	0	1	1	2	4	8	18
NO (ppb) Average	683	0.5	1	-	0	0	0	0	1	1	6
NOX (ppb) Average	683	3.8	4	-	0	1	1	3	5	8	22
Temperature 2 m (C) Average	719	-2.45	6.5	-	-15.9	-10.7	-7.7	-3.2	3.5	6.5	11.4
Relative Humidity (%) Average	719	82.7	13	-	47	62	76	86	93	96	98
Wind Speed 10 m (km/h) Average	10	18.4	1	-	16	17	18	19	19	20	20
Wind Direction 10 m (deg) Average	10	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	09 Nov 2016 11:00	09 Nov 2016 11:00	1	DAS collection error - data not recorded
ALL PARAMETERS	09 Nov 2016 20:00	09 Nov 2016 20:00	1	DAS collection error - data not recorded
SO2, THC, NO2	10 Nov 2016 14:00	10 Nov 2016 14:00	1	DAS collection error - data not recorded
Wind Speed, Wind Direction	01 Nov 2016 01:00	30 Nov 2016 14:00	710	Sensor incorrectly oriented



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Firebag - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 28 ppb on Nov 13 10:00	Maximum Daily Average: 7.7 ppb on Nov 12		Hours of Data:	683
Minimum Value: 0 ppb on Nov 25 15:00	Minimum Daily Average: 0.1 ppb on Nov 1		Hours of Missing Data:	37
Maximum Diurnal Average: 3.0 ppb at hour 10	Minimum Diurnal Average: 0.6 ppb at hour 20		Hours of Calibration:	34
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 = 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-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	0.1	0
2-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	0.3	0
3-Nov	1	1	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	4	3	4	0.8	4
4-Nov	6	7	9	Z	2	1	2	2	2	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1.6	9
5-Nov	1	1	1	2	Z	1	1	1	1	2	4	6	4	1	1	1	2	1	1	2	4	10	5	7	2.6	10
6-Nov	4	5	9	11	5	Z	1	8	9	10	7	5	3	3	5	7	7	3	2	3	4	4	8	9	5.8	11
7-Nov	Z	11	9	7	8	10	7	6	7	7	10	22	22	14	11	15	2	0	0	0	0	0	0	1	7.4	22
8-Nov	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0.6	1
9-Nov	1	5	Z	1	1	1	0	1	15	17	DF	C	C	C	C	1	0	0	0	DF	0	0	0	1	--	17
10-Nov	3	2	2	Z	2	4	6	8	7	6	11	5	2	DF	6	3	1	1	1	1	0	0	1	0	3.4	11
11-Nov	0	0	0	0	Z	0	0	1	1	1	1	2	2	5	4	3	4	7	4	2	1	2	3	7	2.3	7
12-Nov	10	6	7	8	2	Z	9	8	3	9	17	18	24	17	13	7	5	4	4	2	1	1	1	1	7.7	24
13-Nov	Z	1	1	1	1	0	1	5	18	28	18	2	1	1	1	0	0	0	0	0	0	0	0	0	3.4	28
14-Nov	0	Z	0	1	1	1	1	4	7	4	4	1	1	0	0	0	0	0	0	0	0	0	0	0	1.2	7
15-Nov	0	0	Z	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	3	4	1	0	0	0	0.6	4
16-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	0.1	0
17-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	0.2	0
18-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	0.3	0
19-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	0.3	0
20-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	0.2	0
21-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0.4	2
22-Nov	0	0	0	Z	0	0	0	0	0	0	0	1	11	22	5	2	2	2	1	1	0	0	0	0	2.2	22
23-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	0.1	0
24-Nov	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
25-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
26-Nov	0	Z	0	0	0	0	0	0	0	0	0	8	5	2	0	0	0	0	0	0	0	0	0	0	0.8	8
27-Nov	0	0	Z	0	0	1	1	1	3	0	0	8	4	0	0	0	0	0	0	0	0	0	2	23	1.9	23
28-Nov	2	0	0	Z	0	0	13	11	7	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1.7	13
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	3	4	2	0	0	0	0	0	0.5	4
30-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	0.3	0

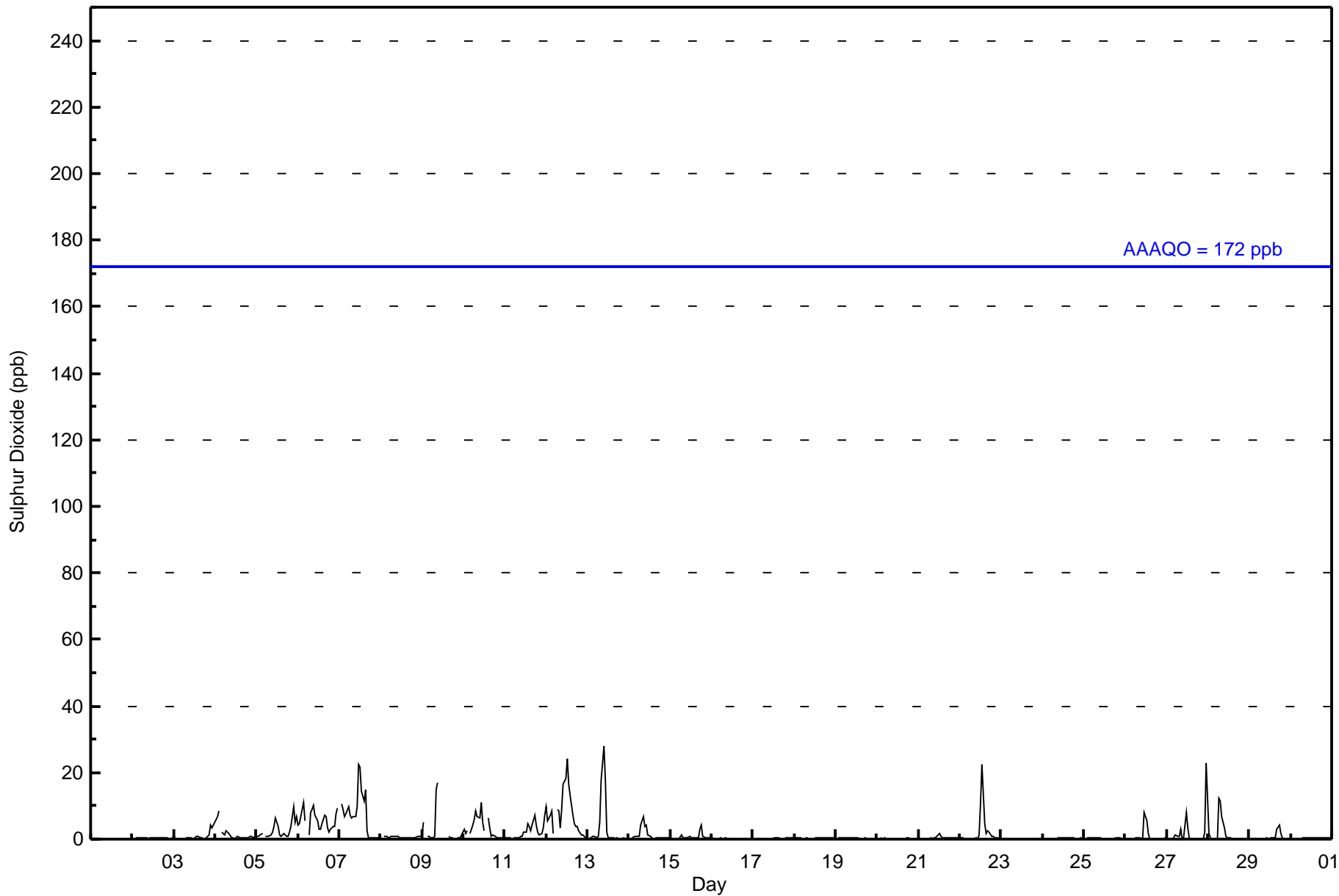
1.2	1.6	1.7	1.4	1.0	0.9	1.6	2.1	2.7	3.0	2.7	3.0	2.9	2.6	1.7	1.5	1.0	1.0	0.8	0.6	0.6	0.9	1.0	2.0	Diurnal Average	
10	11	9	11	8	10	13	11	18	28	18	22	24	22	13	15	7	7	4	3	4	10	8	23	Diurnal Maximum	

Z - zerospan C - Calibration DF - DAS 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
Firebag - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	660	96.63	96.63
11 - 20	17	2.49	99.12
21 - 60	6	0.88	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Firebag - 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	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10
11 - 20	0	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	0
61 - 110	0	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	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10

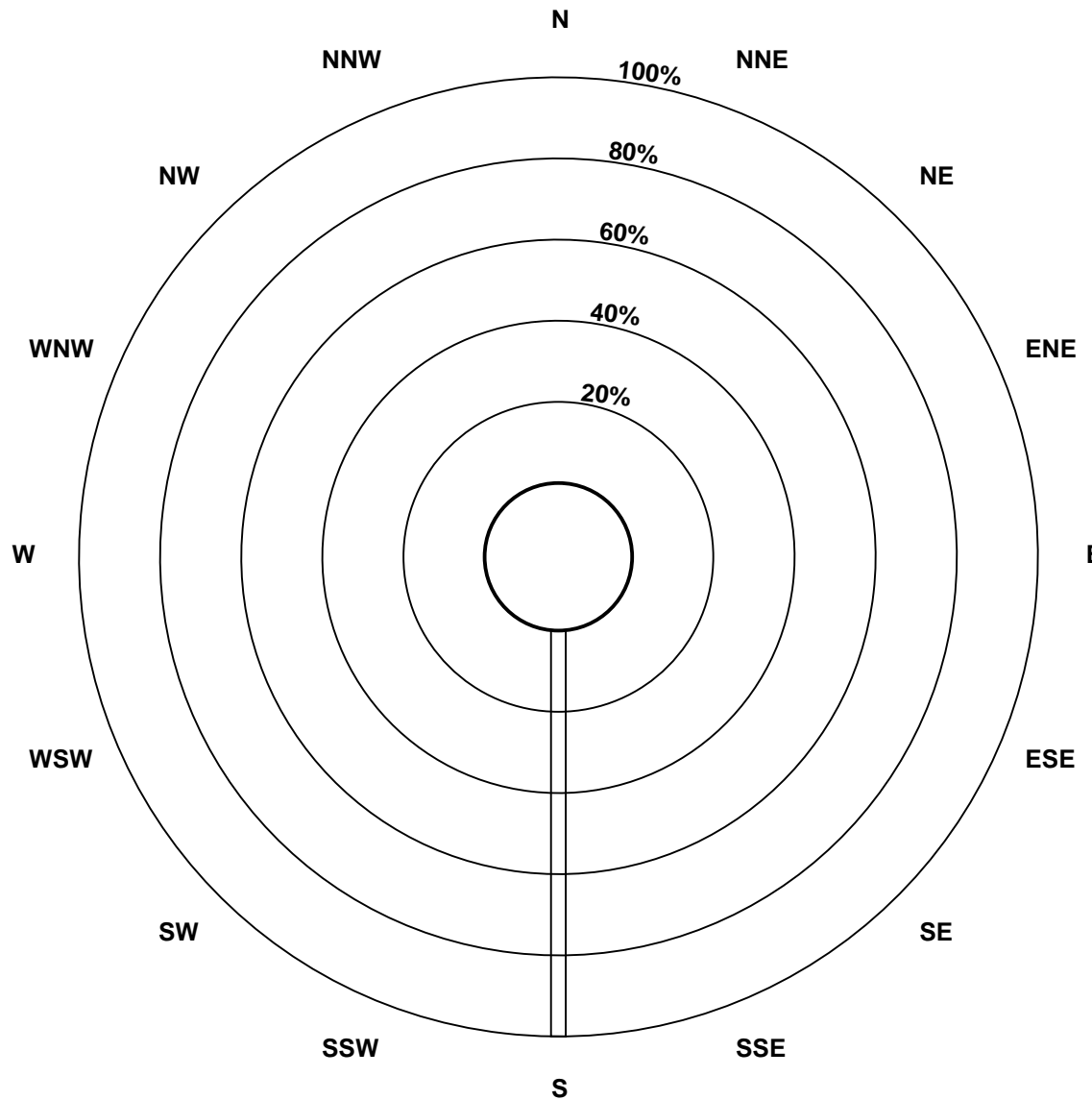
Total Number of Valid Hours: 10

Total Number of Hours: 720

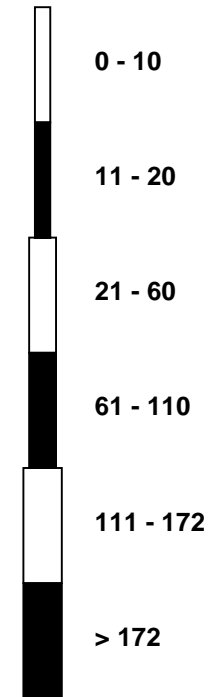


Wood Buffalo Environmental Association
Wind Rose Nov 2016

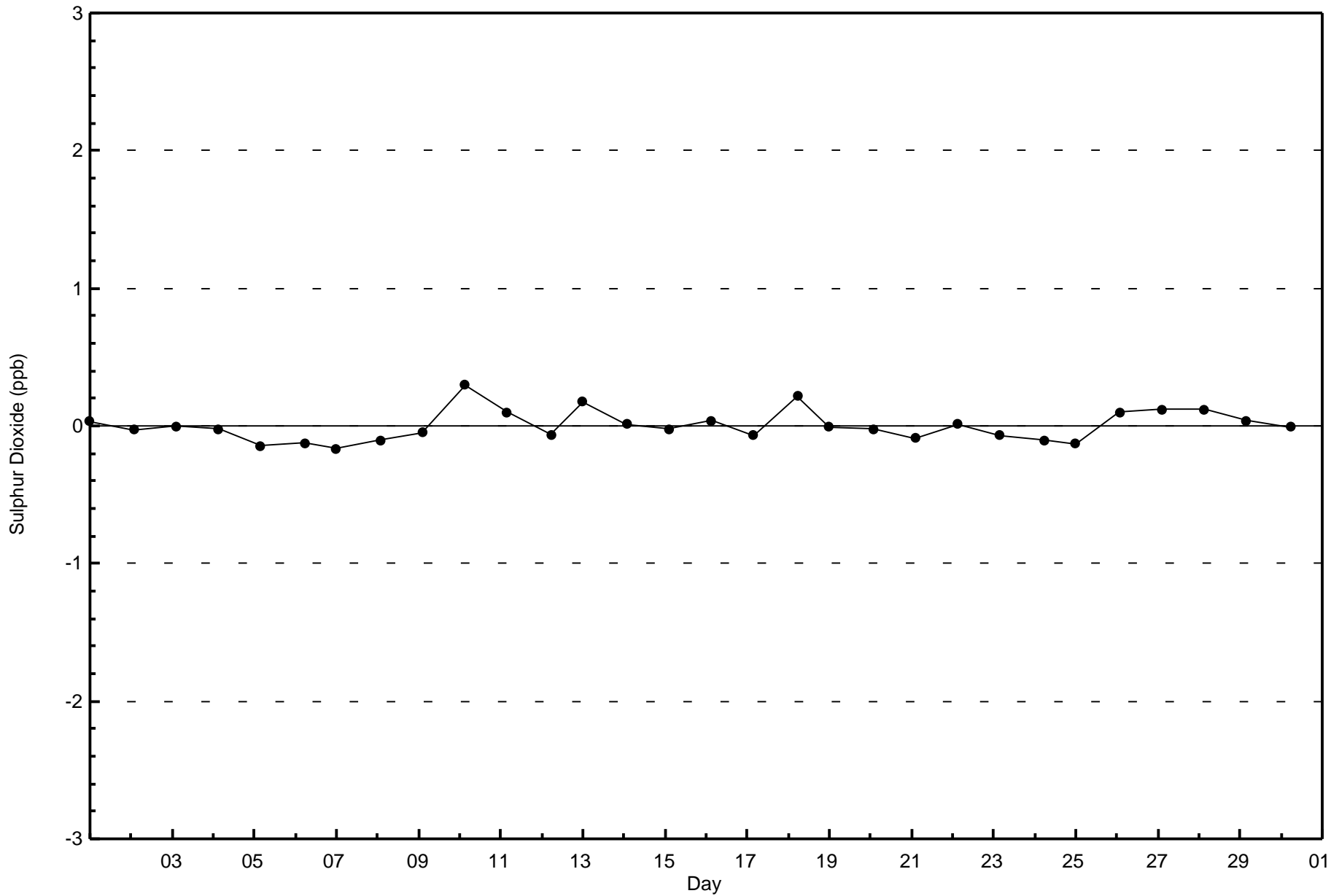
Sulphur Dioxide (SO₂) - ppb
Firebag (AMS 19)

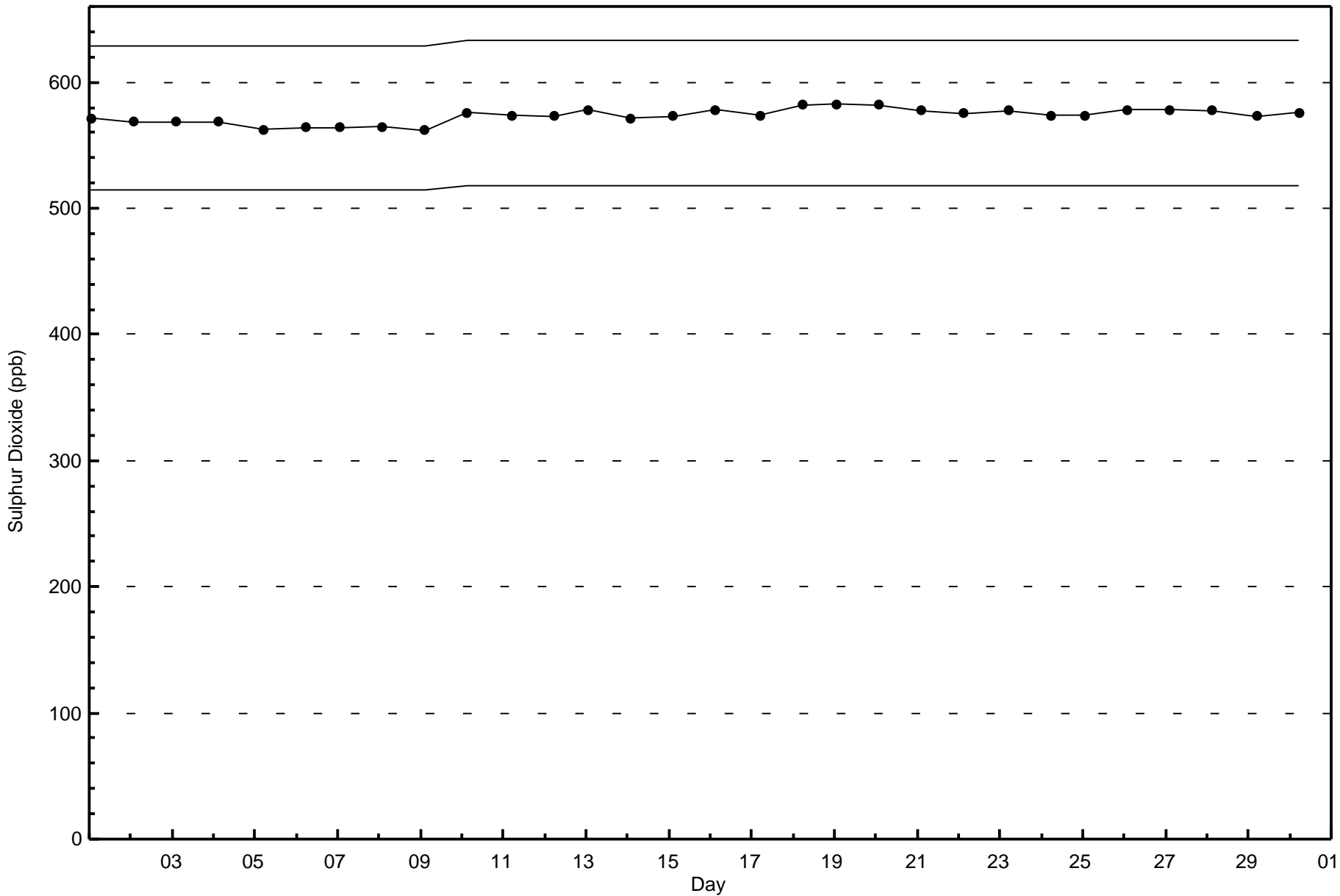


Classes (ppb)



Total Number of Valid Hours: 10





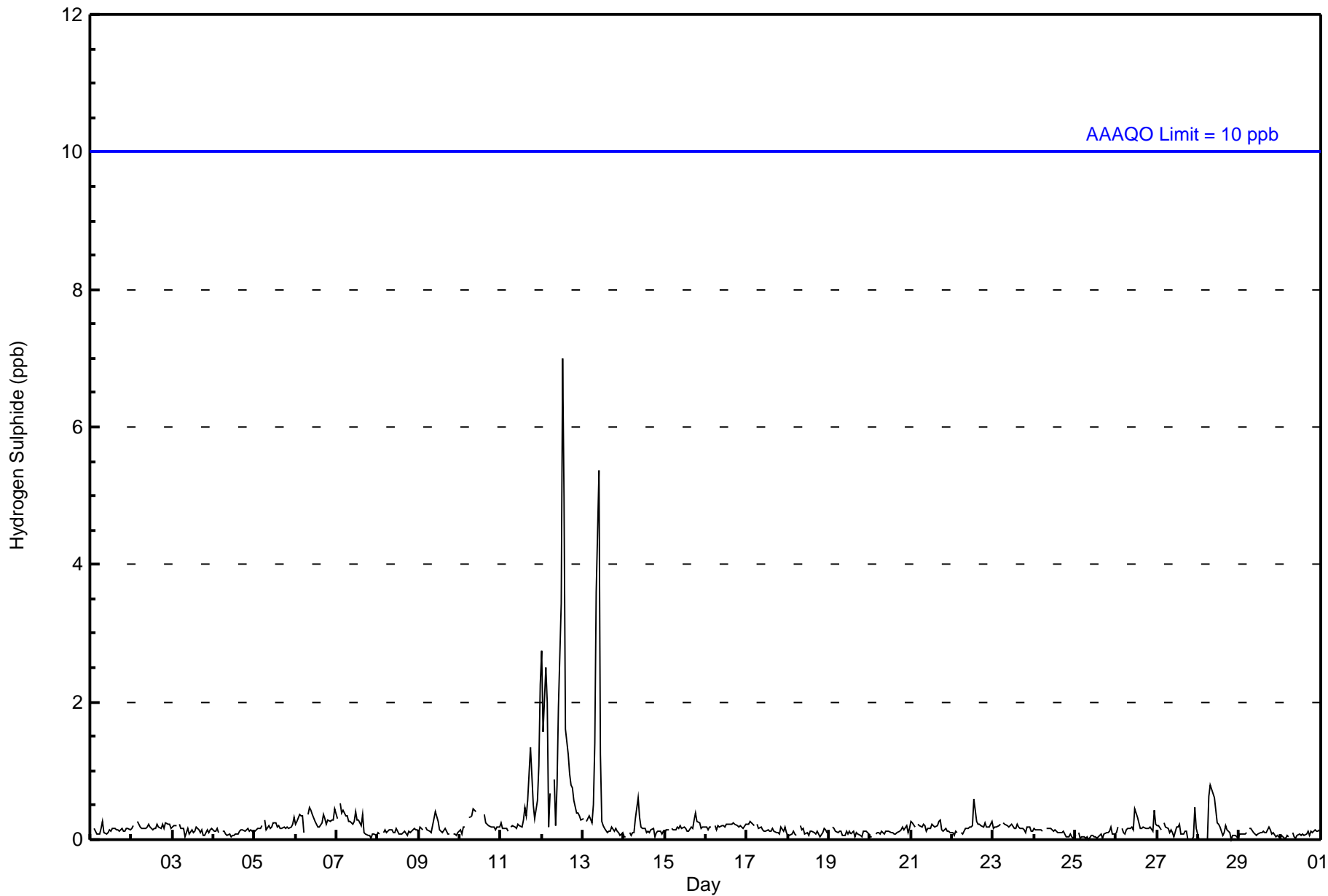


Number of Exceedences (AAAO): 1-hr: 0 24-hr: 0										Hours in Service: 720										Daily Average		Daily Maximum																												
Maximum Value: 7 ppb on Nov 12 13:00										Maximum Daily Average: 1.6 ppb on Nov 12										Hours of Data: 685																														
Minimum Value: 0 ppb on Nov 25 09:00										Minimum Daily Average: 0.1 ppb on Nov 25										Hours of Missing Data: 35																														
Maximum Diurnal Average: 0.4 ppb at hour 13										Minimum Diurnal Average: 0.2 ppb at hour 20										Hours of Calibration: 34																														
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 = 2										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-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	0.1	0																								
2-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	0.2	0																								
3-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	0.1	0																								
4-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	0.1	0																								
5-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																								
6-Nov	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-Nov	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																								
8-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	0.1	0																								
9-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DF	0	0	0	0.1	0																								
10-Nov	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0.2	0																									
11-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	2	0.5	2																								
12-Nov	3	2	2	2	0	1	Z	1	0	1	2	3	7	5	2	1	1	1	1	1	1	0	0	0	1.6	7																								
13-Nov	0	Z	0	0	0	0	1	1	4	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	5																								
14-Nov	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
15-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	0.2	0																								
16-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	0.2	0																								
17-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																								
18-Nov	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																								
19-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	0.1	0																								
20-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	0.1	0																								
21-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	0.2	0																								
22-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
23-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																								
24-Nov	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																								
25-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	0.1	0																								
26-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	0.2	0																								
27-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	0.1	0																								
28-Nov	0	0	0	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
29-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	0.1	0																								
30-Nov	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																								
																								0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average		
																								3	2	2	2	0	1	1	1	4	5	2	3	7	5	2	1	1	1	1	1	1	0	1	1	2	Diurnal Maximum	
Z - zerospan C - Calibration DF - DAS Failure																																																		
Alberta Ambient Air Quality Objectives (AAAO): 1-hr 10 ppb 24-hr 3 ppb																																																		



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Firebag - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Firebag - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	679	99.12	99.12
3 - 4	3	0.44	99.56
5 - 7	3	0.44	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Firebag - 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 - 2	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10
3 - 4	0	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	0
8 - 11	0	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	0
Totals	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10

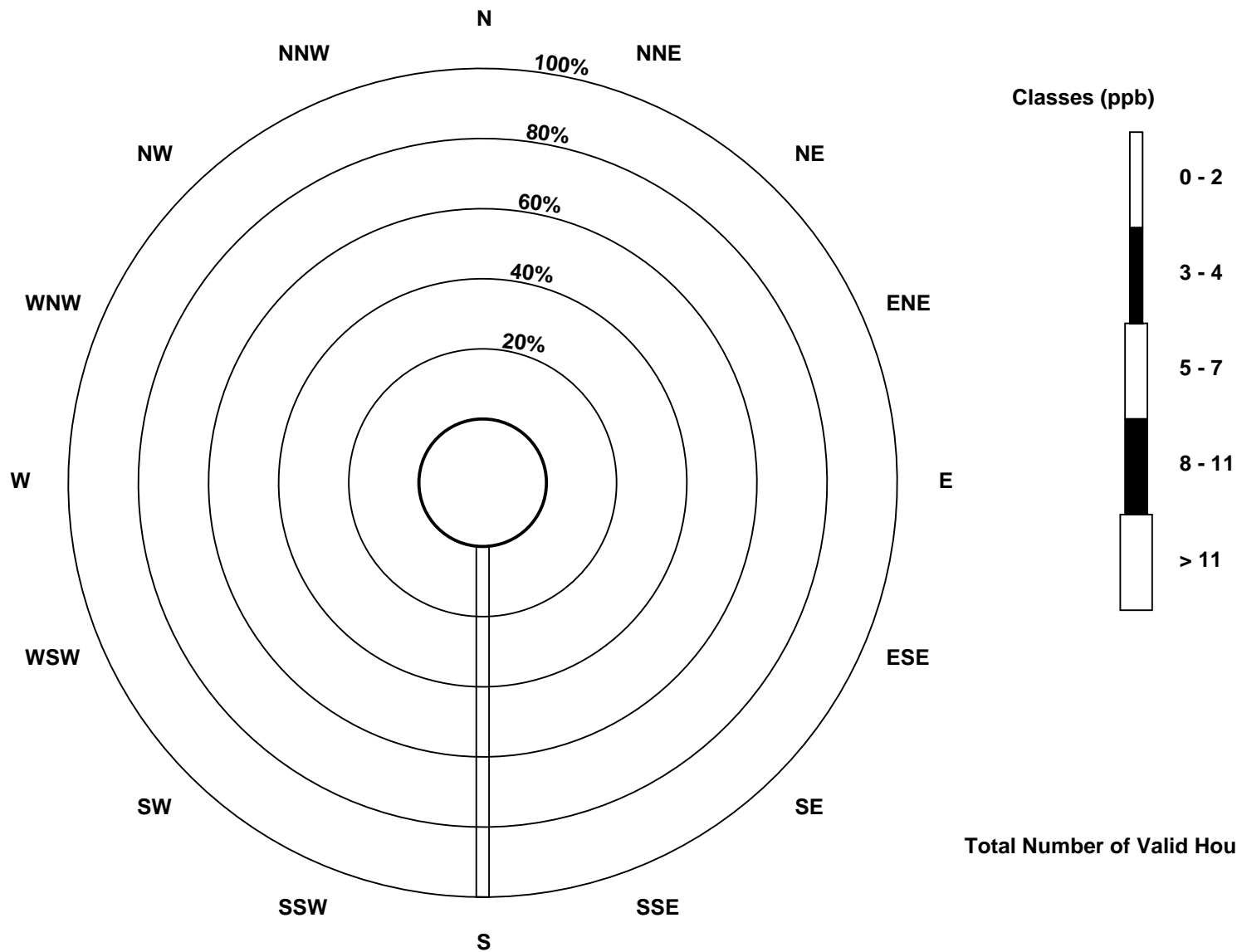
Total Number of Valid Hours: 10

Total Number of Hours: 720

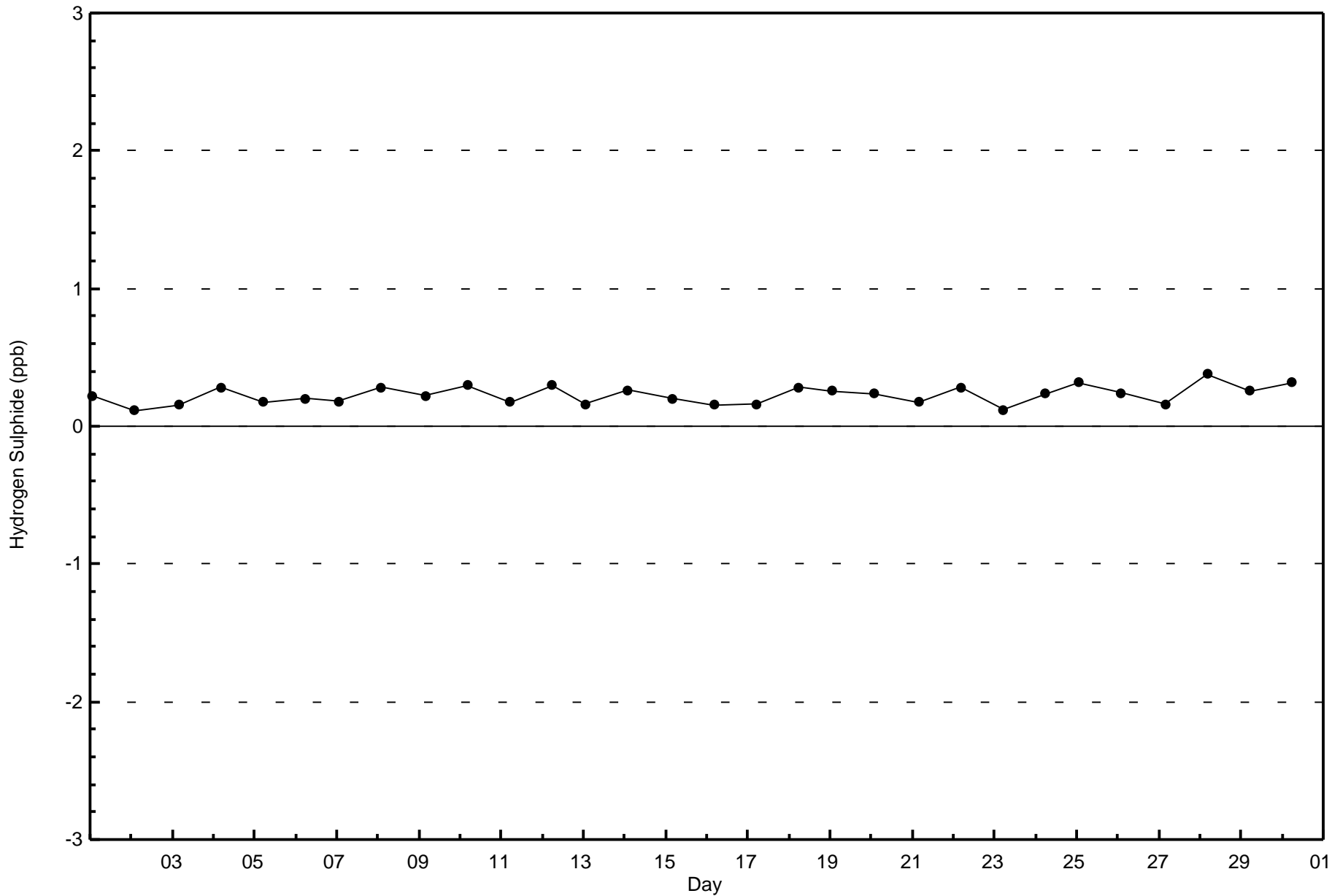


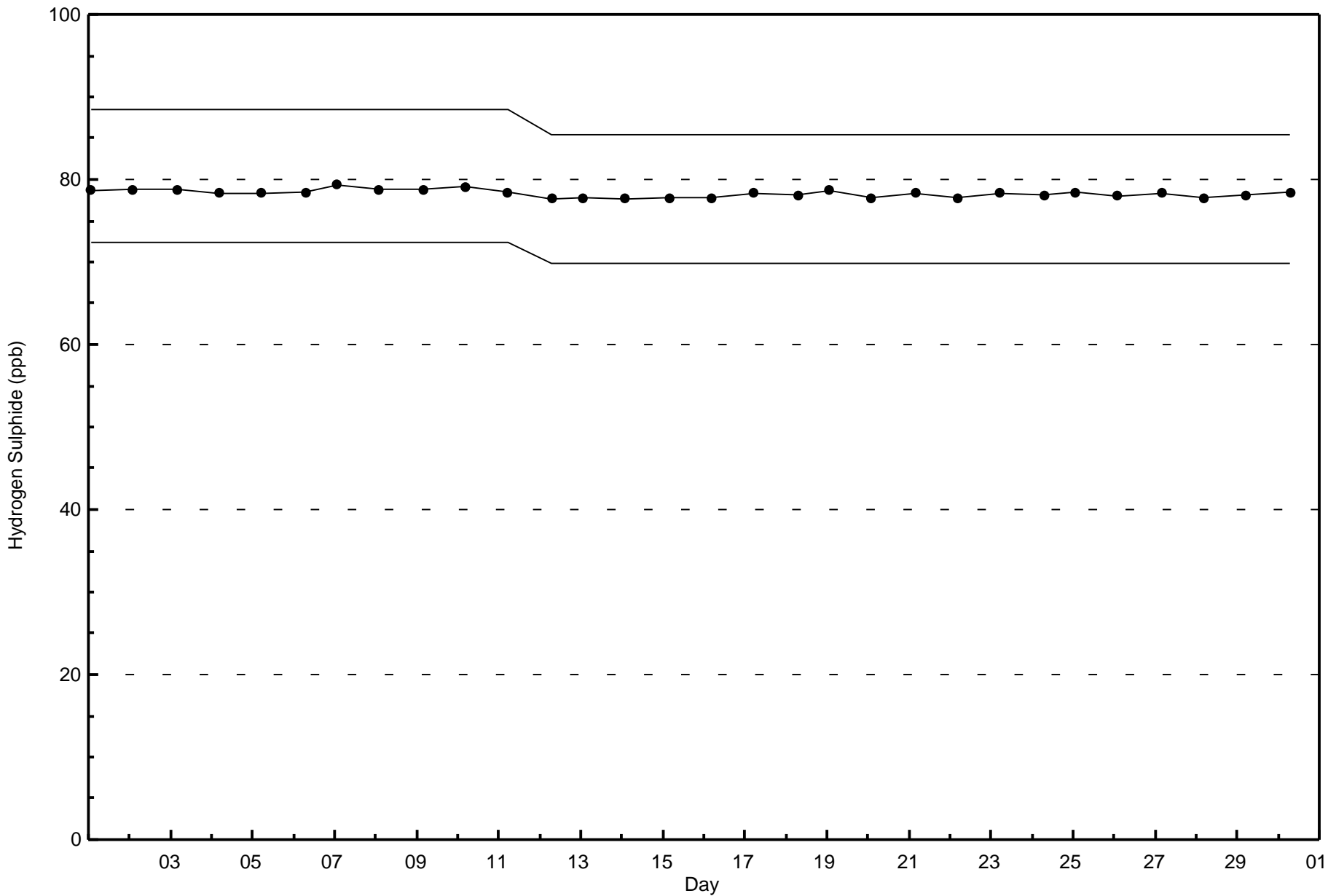
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Hydrogen Sulphide (H₂S) - ppb
Firebag (AMS 19)



Total Number of Valid Hours: 10

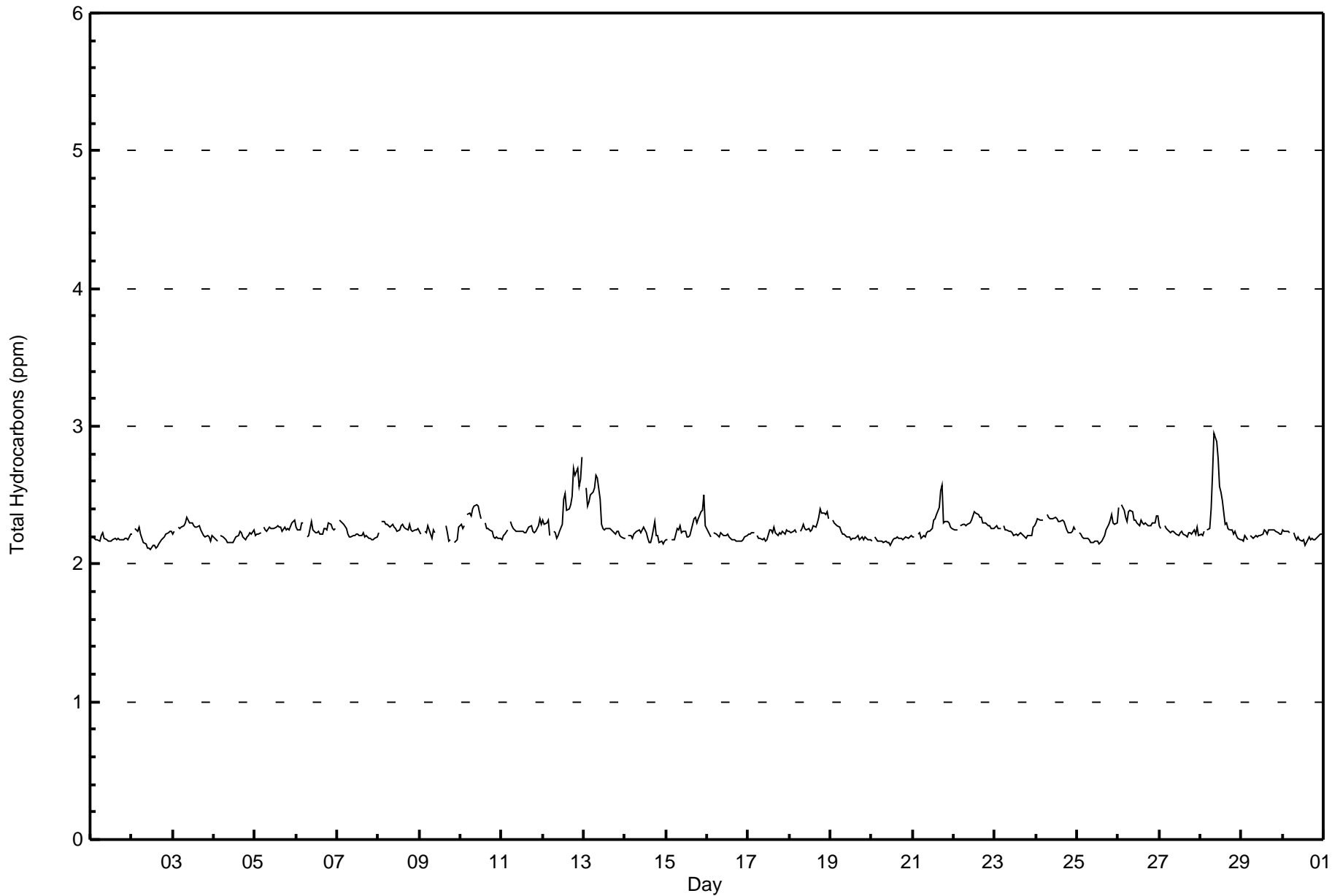






Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Firebag - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Firebag - November 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	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0

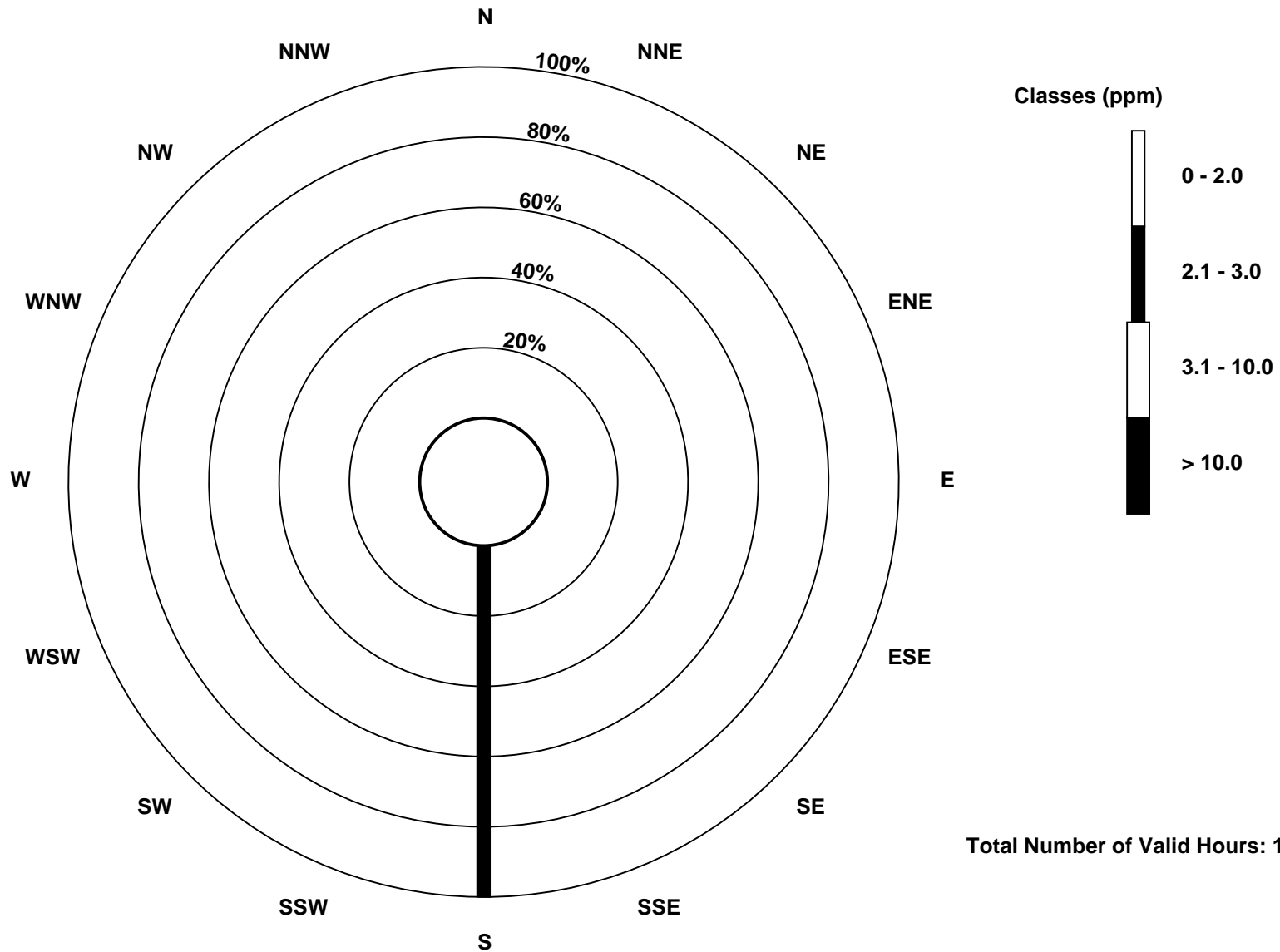
Total Number of Valid Hours: 10

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

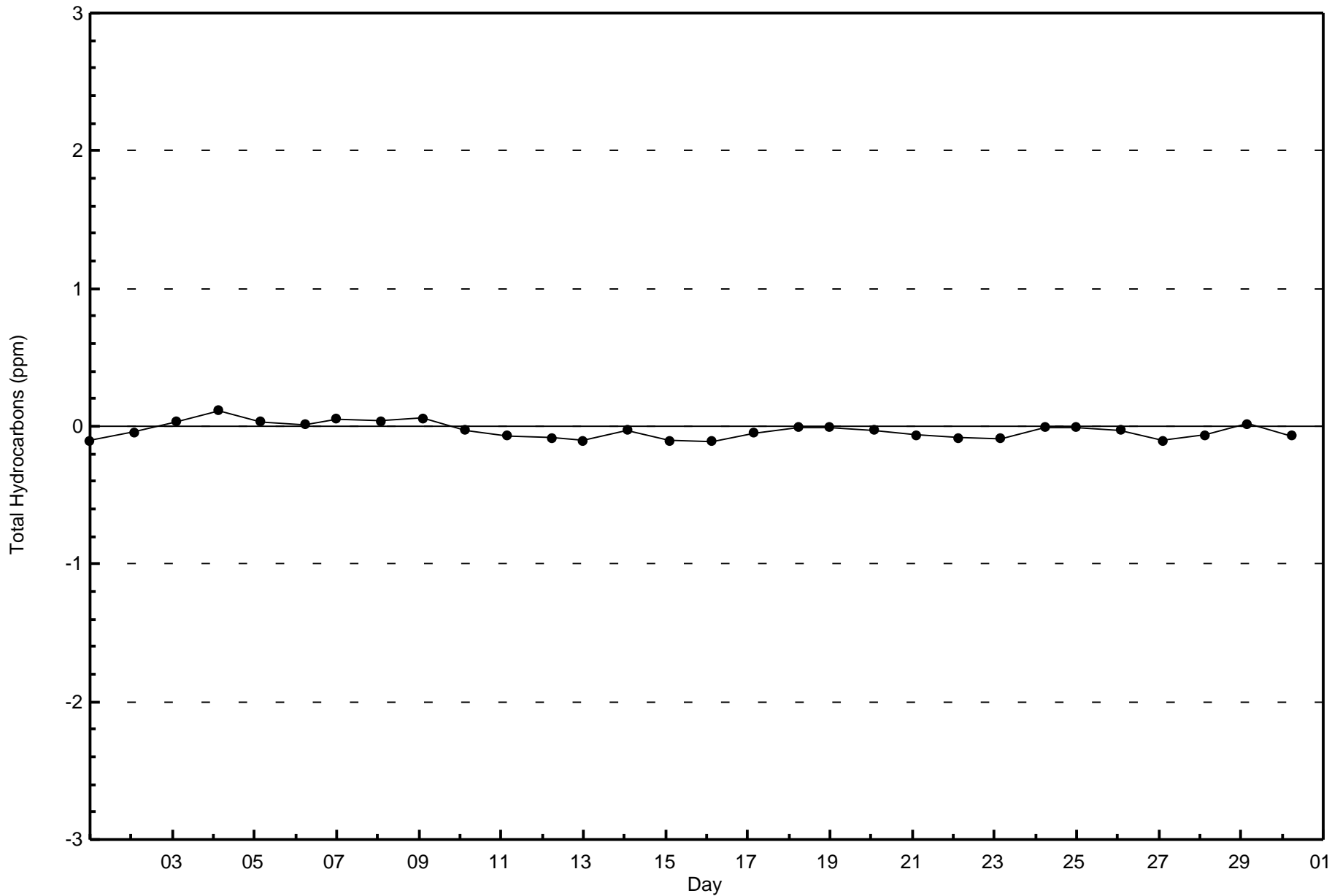
Total Hydrocarbons (THC) - ppm
Firebag (AMS 19)

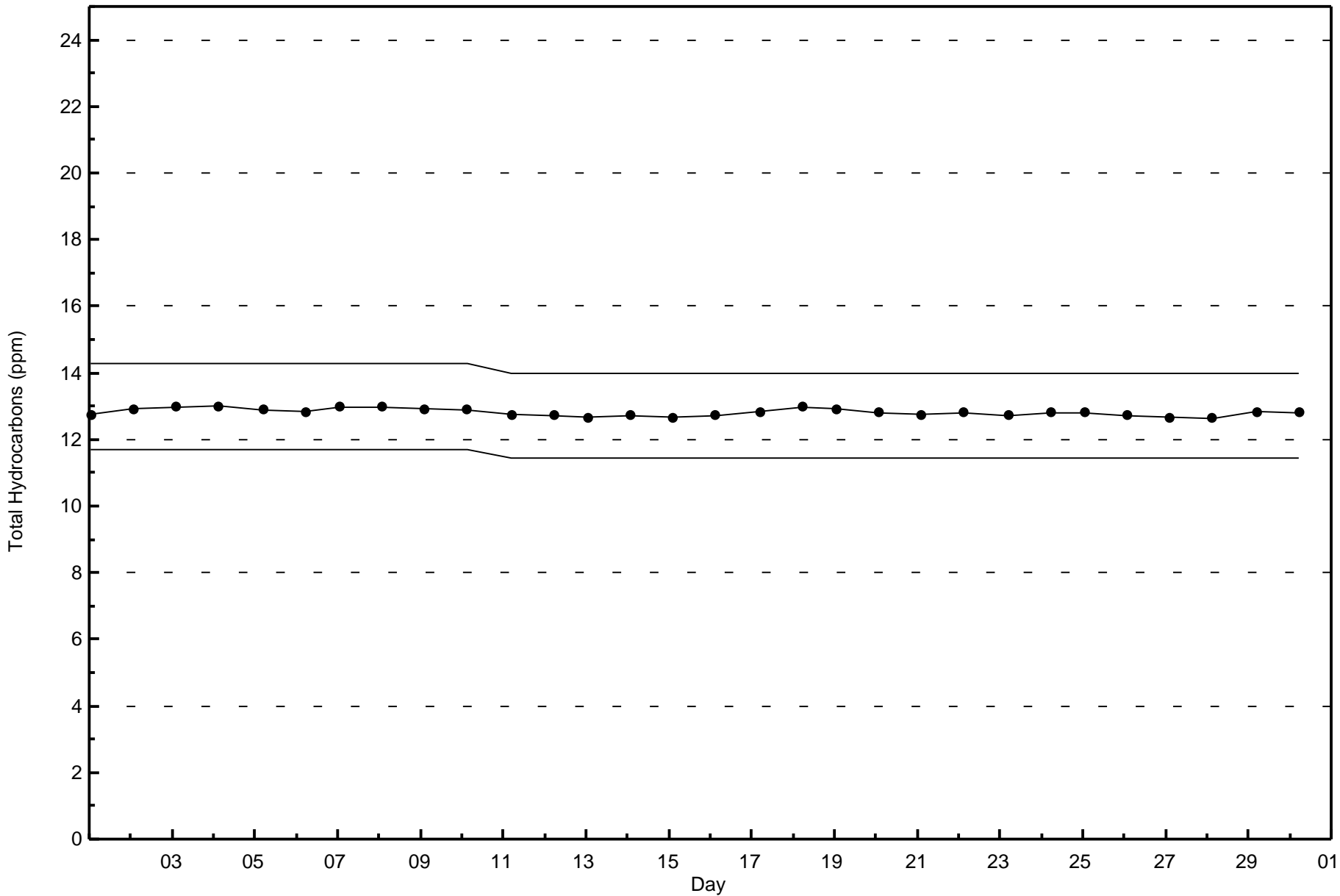




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Firebag - November 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

Firebag - November 2016

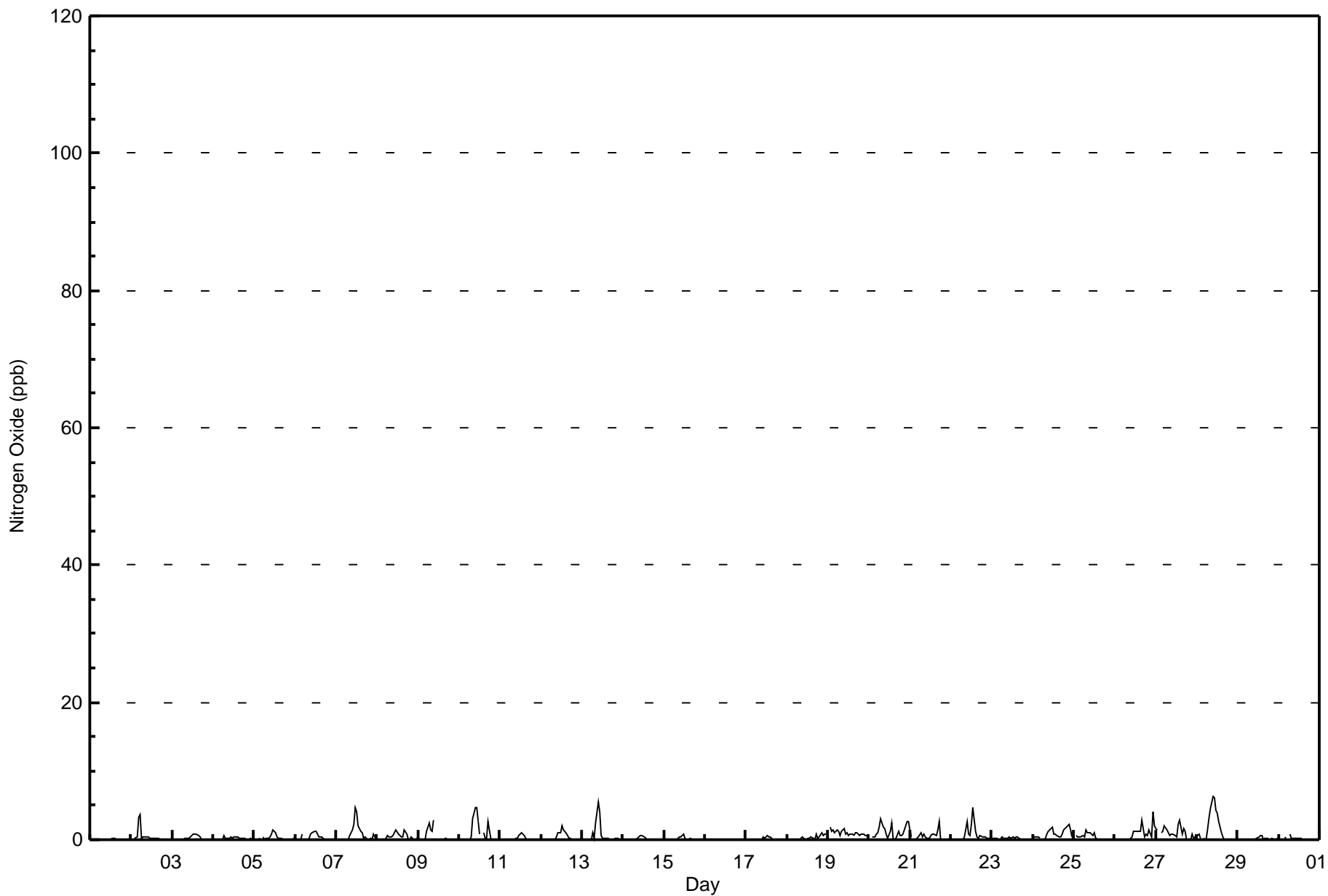
Maximum Value: 6 ppb on Nov 28 10:00																		Maximum Daily Average: 1.5 ppb on Nov 28						Hours in Service: 720			
Minimum Value: 0 ppb on Nov 16 01:00																		Minimum Daily Average: 0.0 ppb on Nov 16						Hours of Data: 683			
Maximum Diurnal Average: 1.2 ppb at hour 10																		Minimum Diurnal Average: 0.1 ppb at hour 3						Hours of Missing Data: 37			
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 = 5						Hours of Calibration: 35			
																		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-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
2-Nov	0	Z	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4
3-Nov	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	0.2	1
4-Nov	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
5-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Nov	0	0	0	0	1	Z	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Nov	Z	0	0	0	0	0	0	0	1	1	2	5	4	2	1	1	0	1	0	0	0	0	1	0	0	0.8	5
8-Nov	0	Z	0	0	0	0	1	0	0	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0.4	1
9-Nov	0	0	Z	0	0	1	2	1	1	3	C	C	C	C	C	0	0	0	0	DF	0	0	0	0	0	--	3
10-Nov	0	0	0	Z	0	0	0	0	3	5	5	3	1	DF	1	0	0	3	0	0	0	0	0	0	0	0.9	5
11-Nov	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	0.2	1
12-Nov	0	0	0	0	0	Z	0	0	0	1	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2
13-Nov	Z	0	0	0	0	0	1	0	2	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	5
14-Nov	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	0.1	1
15-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-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
17-Nov	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	0.1	1
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0.3	1
19-Nov	Z	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
20-Nov	0	Z	0	1	1	1	2	3	2	2	1	0	1	2	0	0	0	1	1	1	1	2	3	3	3	1.2	3
21-Nov	1	0	Z	0	0	1	1	0	1	0	0	0	1	1	1	1	1	3	0	0	0	0	0	0	0	0.5	3
22-Nov	0	0	0	Z	0	0	0	0	0	3	1	1	2	5	1	0	0	1	0	0	0	0	0	0	0	0.7	5
23-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	0.2	0
24-Nov	0	0	0	0	0	Z	0	0	1	1	1	2	1	1	1	0	0	1	1	2	2	2	1	1	1	0.9	2
25-Nov	Z	1	0	0	0	1	0	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
26-Nov	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	3	0	1	1	1	1	0	4	2	0.8	4	
27-Nov	2	1	Z	1	1	2	1	1	1	1	1	1	0	2	3	1	2	1	0	0	0	1	0	0	1.0	3	
28-Nov	1	1	0	Z	0	0	2	3	5	6	6	4	4	3	1	0	0	0	0	0	0	0	0	0	0	1.5	6
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.1	1
30-Nov	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	0.1	1
																		Diurnal Average		Diurnal Maximum							
																		0.2		2							
																		0.3		2							
																		0.1		1							
																		0.2		1							
																		0.4		3							
																		0.5		4							
																		0.5		2							
																		0.4		3							
																		0.7		5							
																		1.2		6							
																		1.0		6							
																		0.9		5							
																		0.9		4							
																		0.9		5							
																		0.6		3							
																		0.3		1							
																		0.4		3							
																		0.4		3							
																		0.2		1							
																		0.2		2							
																		0.3		2							
																		0.3		2							
																		0.4		4							
																		0.3		3							

Z - zerospan C - Calibration DF - DAS Failure



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Firebag - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - 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	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10
21 - 40	0	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	0
81 - 159	0	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	0
Totals	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10

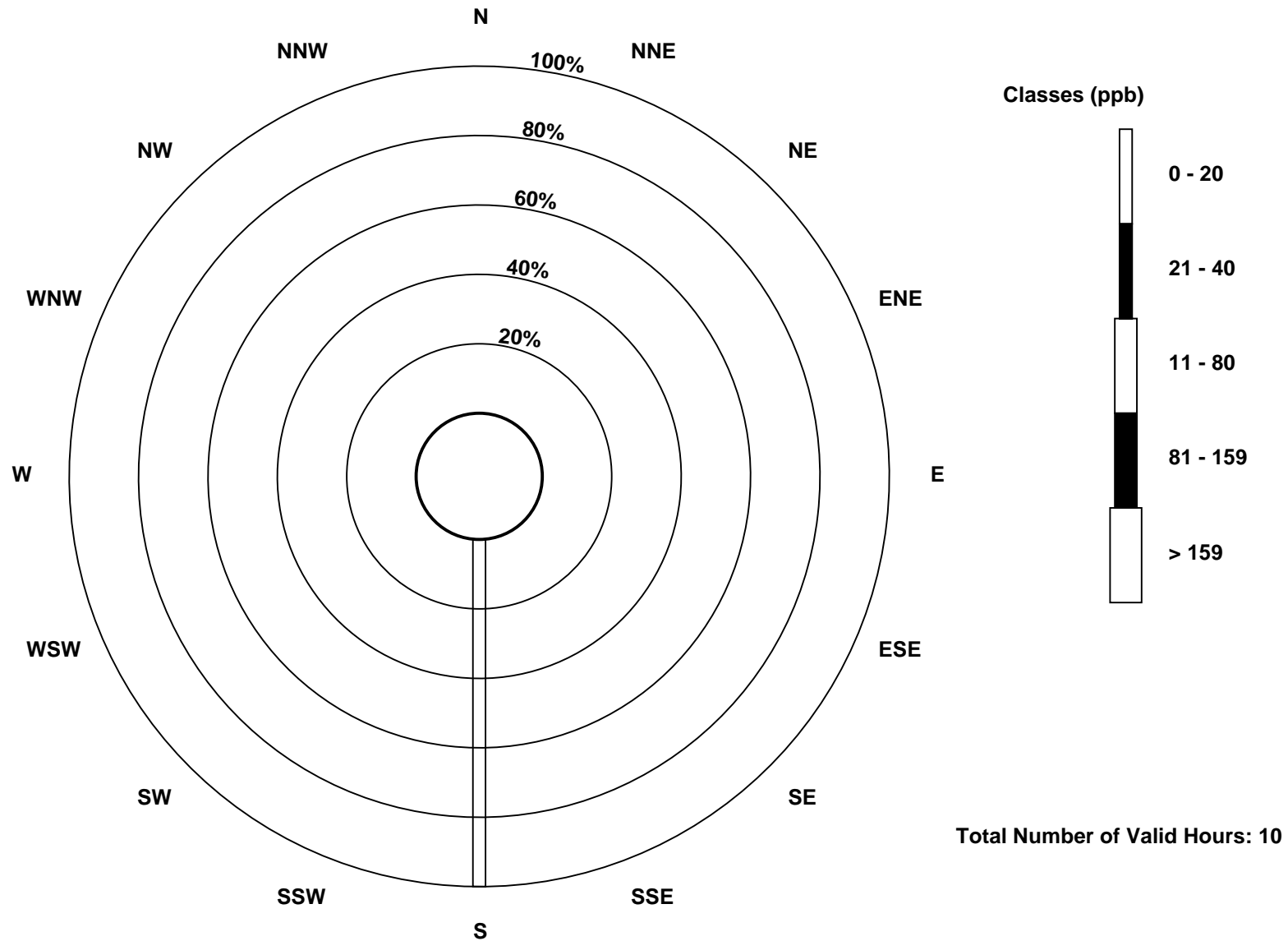
Total Number of Valid Hours: 10

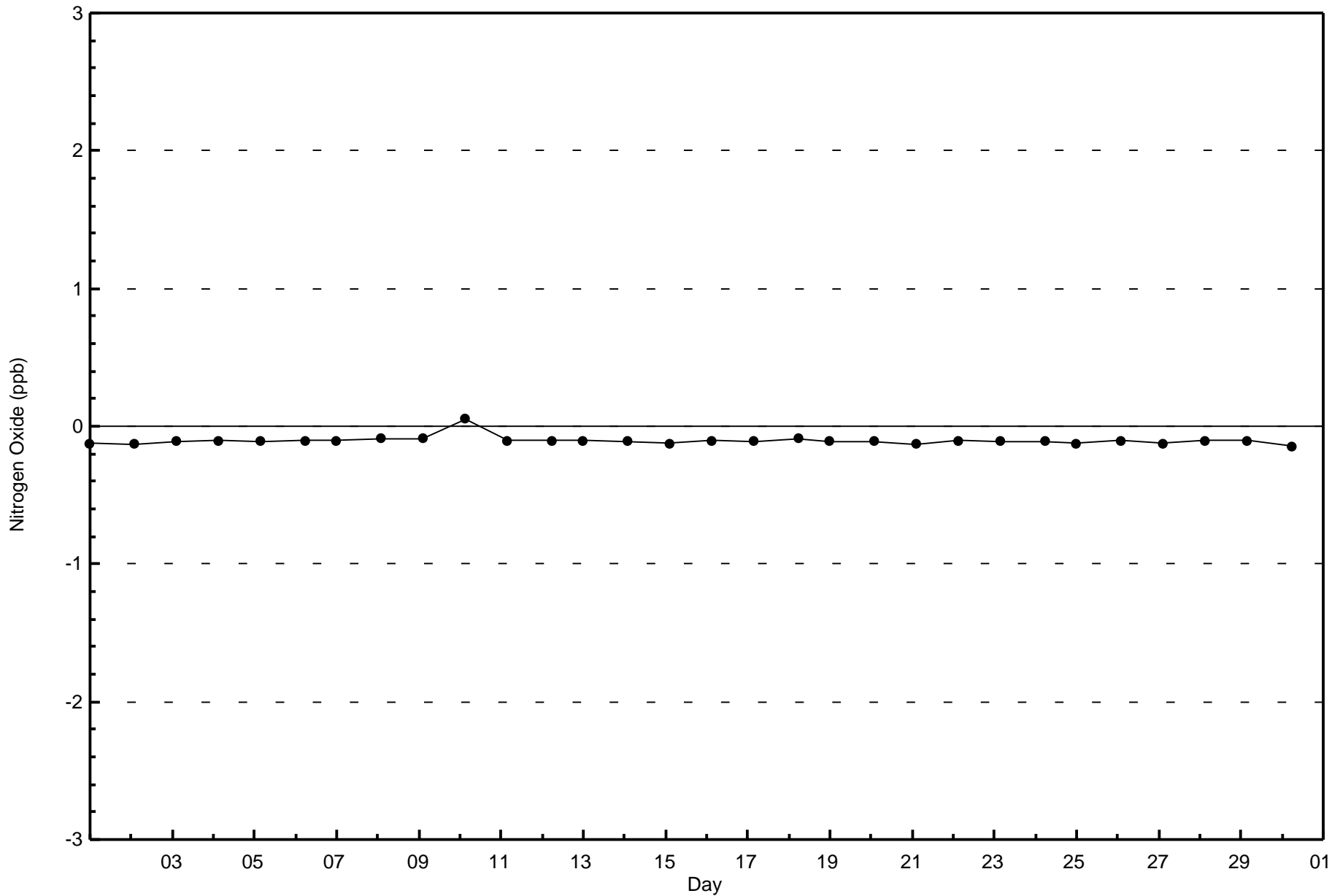
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxide (NO) - ppb
Firebag (AMS 19)

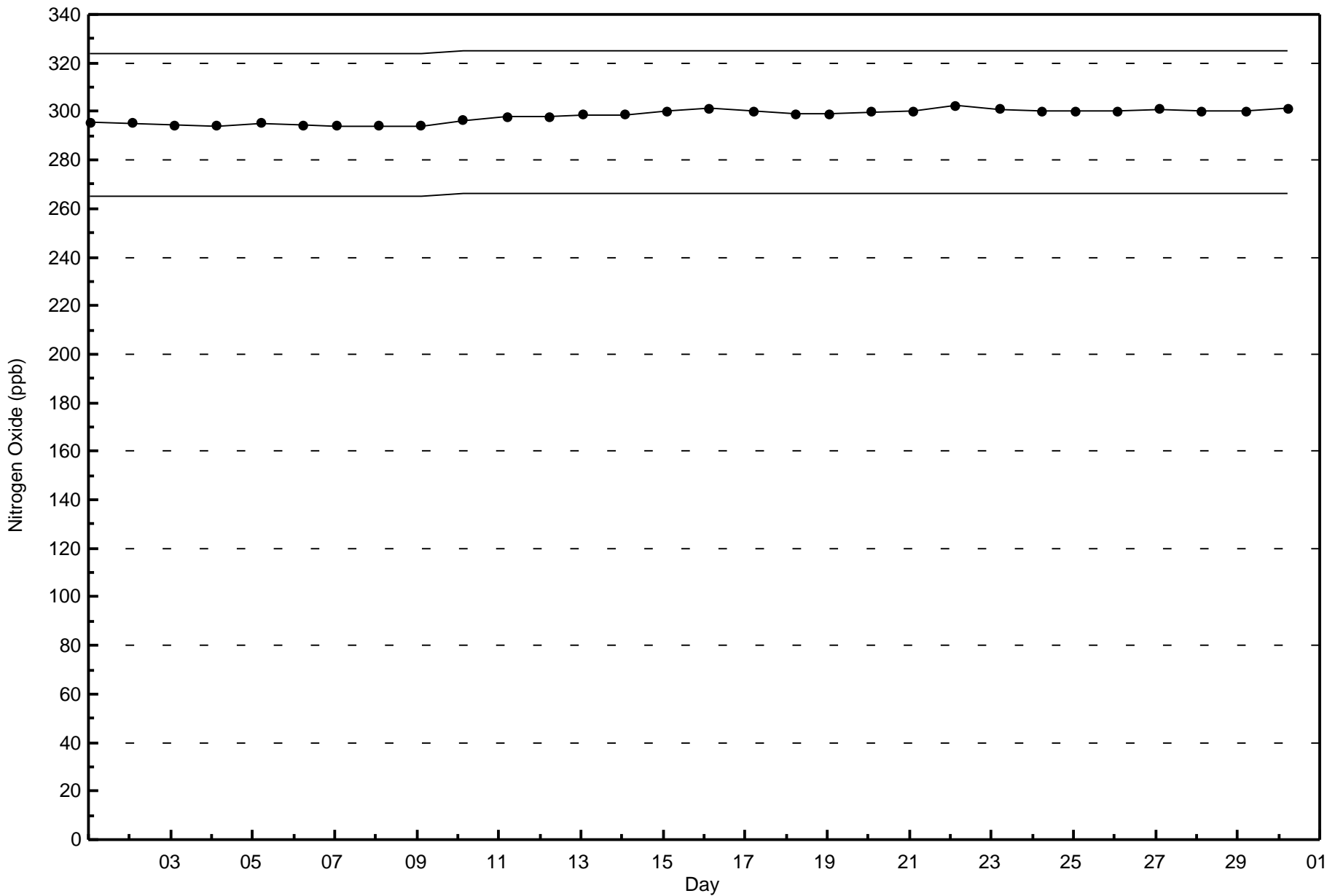






Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxide (NO) - ppb
Firebag - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Firebag - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 18 ppb on Nov 13 09:00	Maximum Daily Average: 8.0 ppb on Nov 6		Hours of Data:	683
Minimum Value: 0 ppb on Nov 1 03:00	Minimum Daily Average: 0.4 ppb on Nov 16		Hours of Missing Data:	37
Maximum Diurnal Average: 4.4 ppb at hour 9	Minimum Diurnal Average: 2.3 ppb at hour 1		Hours of Calibration:	35
Monthly Average: 3.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 8 P ₉₉ = 15		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-Nov	Z	0	0	0	0	0	5	6	1	0	0	0	0	1	1	0	0	1	2	1	0	1	1	0	0.9	6	
2-Nov	0	Z	3	3	9	6	1	1	1	1	1	1	1	1	1	2	2	3	3	3	3	3	3	3	2.2	9	
3-Nov	3	3	Z	2	2	2	2	1	1	1	2	2	1	2	2	2	2	2	2	1	2	4	3	5	2.1	5	
4-Nov	6	6	7	Z	4	3	5	4	2	1	1	1	2	2	2	2	2	1	2	2	3	4	2	2.7	7		
5-Nov	2	2	3	4	Z	4	2	3	3	4	4	5	5	3	3	4	3	2	3	4	7	6	8	3.7	8		
6-Nov	7	6	8	11	12	Z	4	7	8	8	7	6	5	5	5	6	7	7	7	12	12	9	11	14	8.0	14	
7-Nov	Z	13	13	12	12	12	11	7	7	6	6	9	10	7	5	8	2	3	1	1	1	1	2	2	6.4	13	
8-Nov	2	Z	3	3	3	3	3	3	3	3	3	4	2	2	2	5	5	3	3	3	3	3	3	3	3.0	5	
9-Nov	4	6	Z	4	4	8	6	4	9	8	C	C	C	C	C	4	3	2	2	DF	1	1	1	3	--	9	
10-Nov	3	3	4	Z	4	6	8	13	16	12	10	6	3	DF	3	2	1	5	1	1	1	2	2	4.8	16		
11-Nov	1	1	2	2	Z	2	2	2	2	2	2	3	3	4	4	5	7	6	4	3	2	3	4	4	3.0	7	
12-Nov	5	4	5	10	5	Z	6	6	3	7	9	8	11	10	11	9	9	10	8	9	7	10	8	6	7.7	11	
13-Nov	Z	4	4	5	8	8	12	15	18	17	10	3	2	1	2	1	1	1	1	2	2	2	1	1	5.2	18	
14-Nov	1	Z	1	2	2	2	3	5	7	5	5	4	3	2	1	1	2	5	2	2	1	0	0	0	2.4	7	
15-Nov	0	0	Z	0	0	1	4	3	4	3	2	3	1	1	1	3	5	4	4	7	10	9	7	4	3.2	10	
16-Nov	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.4	2	
17-Nov	1	2	4	4	Z	2	1	1	1	1	3	1	4	4	3	5	3	1	0	0	2	3	4	3	2.3	5	
18-Nov	0	0	1	3	0	Z	2	5	7	4	1	1	1	1	4	4	4	8	8	9	8	7	7	6	3.9	9	
19-Nov	Z	7	7	6	6	6	4	3	3	4	2	2	2	2	2	2	2	2	2	1	2	2	2	1	1	3.0	7
20-Nov	1	Z	1	2	2	3	4	5	3	3	1	0	2	3	1	1	1	2	2	1	1	3	4	3	2.1	5	
21-Nov	2	1	Z	1	1	1	2	1	2	2	1	2	3	5	6	7	13	12	2	2	2	1	1	1	2.9	13	
22-Nov	0	0	0	Z	1	1	1	1	4	10	3	2	6	11	5	3	3	3	2	2	2	1	1	1	2.7	11	
23-Nov	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	
24-Nov	1	2	2	2	2	Z	2	2	3	3	3	3	3	3	3	3	3	3	4	3	3	4	2	2	2.6	4	
25-Nov	Z	1	1	1	1	1	1	2	2	2	1	2	1	1	1	1	1	1	6	8	8	5	3	3	2.4	8	
26-Nov	6	Z	6	5	4	2	4	3	3	2	2	7	6	6	5	5	8	2	4	3	4	3	8	6	4.4	8	
27-Nov	4	3	Z	4	3	4	3	3	2	2	2	2	2	5	4	3	3	2	0	0	0	2	2	3	2.7	5	
28-Nov	3	4	1	Z	1	2	12	16	17	15	14	10	9	8	6	7	9	8	5	1	3	1	0	0	6.6	17	
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	2	2	2	1	6	6	2	1	1	1	1	2	1.3	6	
30-Nov	1	1	1	1	1	Z	3	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.2	3	

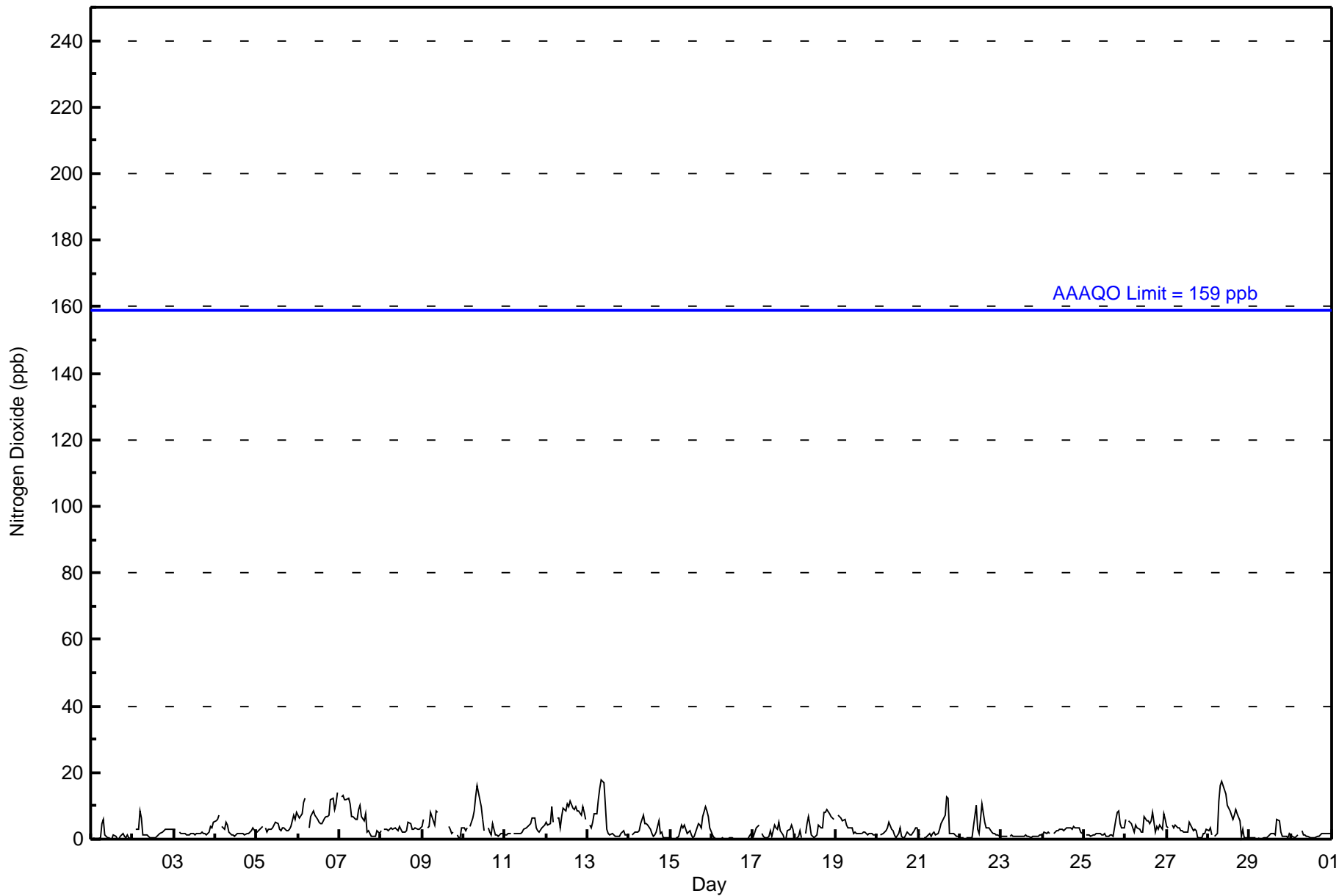
2.3	2.9	3.0	3.4	3.4	3.1	3.7	4.1	4.4	4.3	3.4	3.0	3.1	3.2	3.0	3.1	3.6	3.6	2.7	2.8	3.0	3.0	3.1	3.2	Diurnal Average	
7	13	13	12	12	12	12	16	18	17	14	10	11	11	11	9	13	12	8	12	12	10	11	14	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Firebag - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Firebag - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Firebag - 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	0	0	0	0	0	10	0	0	0	0	0	0	0	10
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	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10

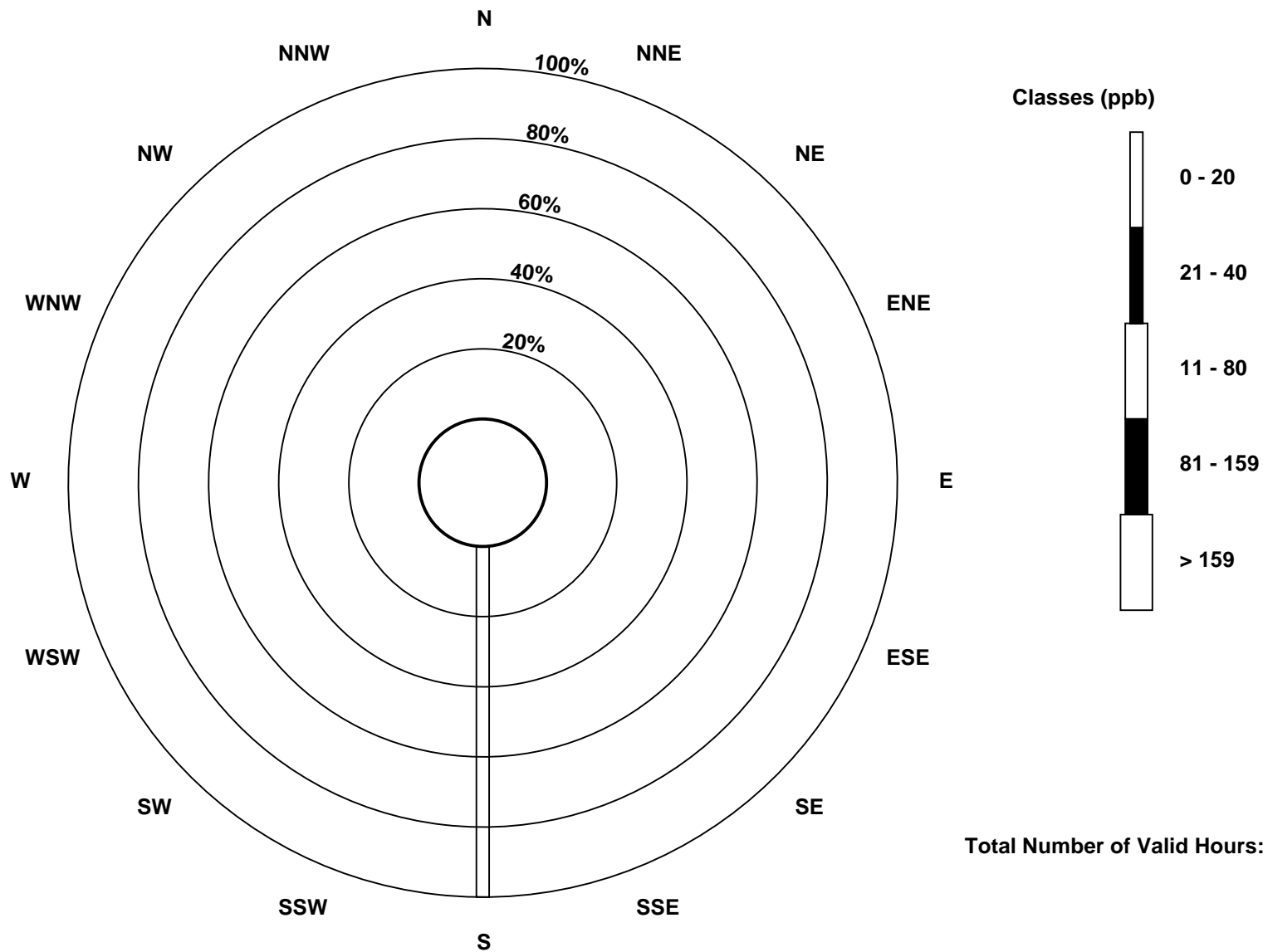
Total Number of Valid Hours: 10

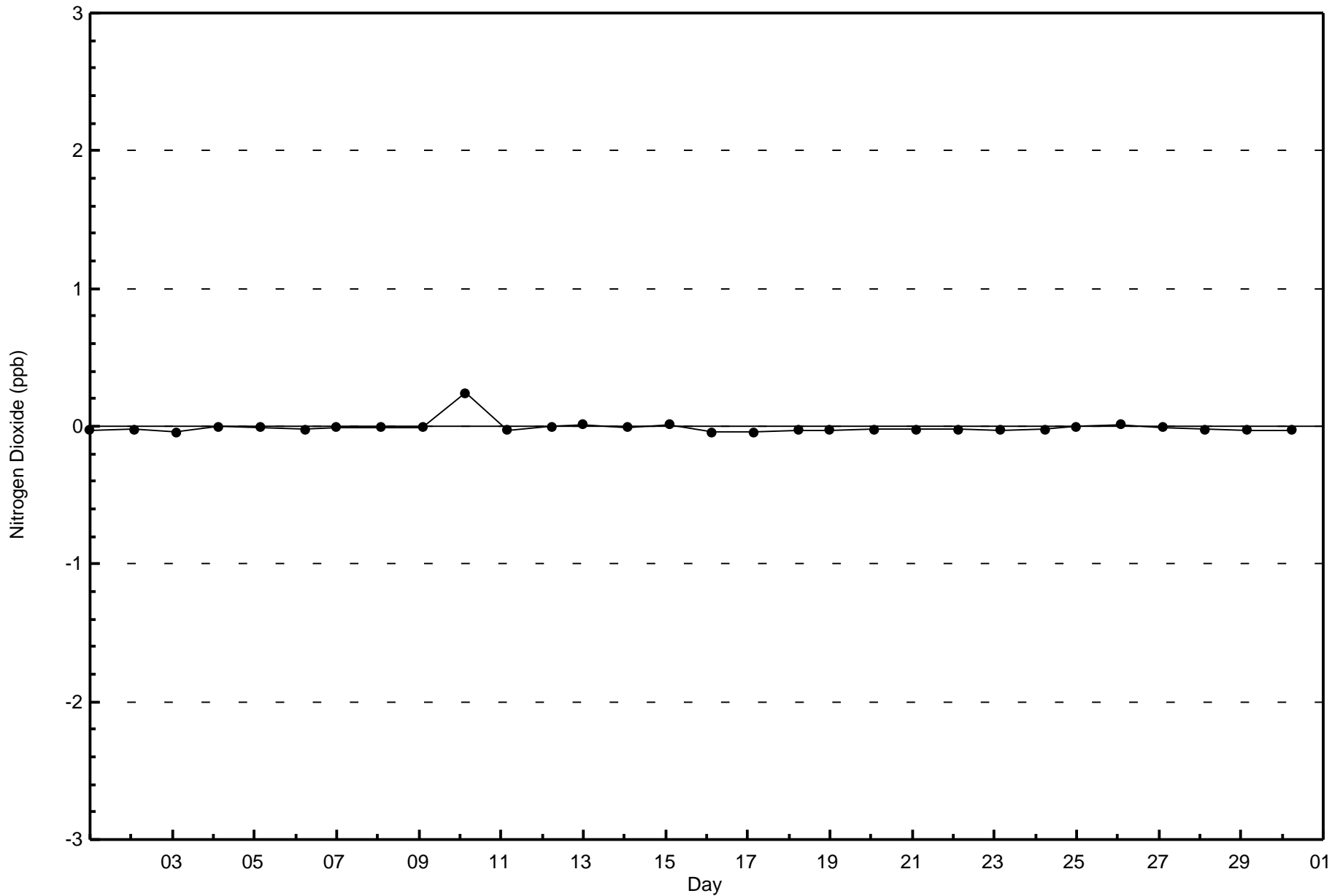
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Firebag (AMS 19)

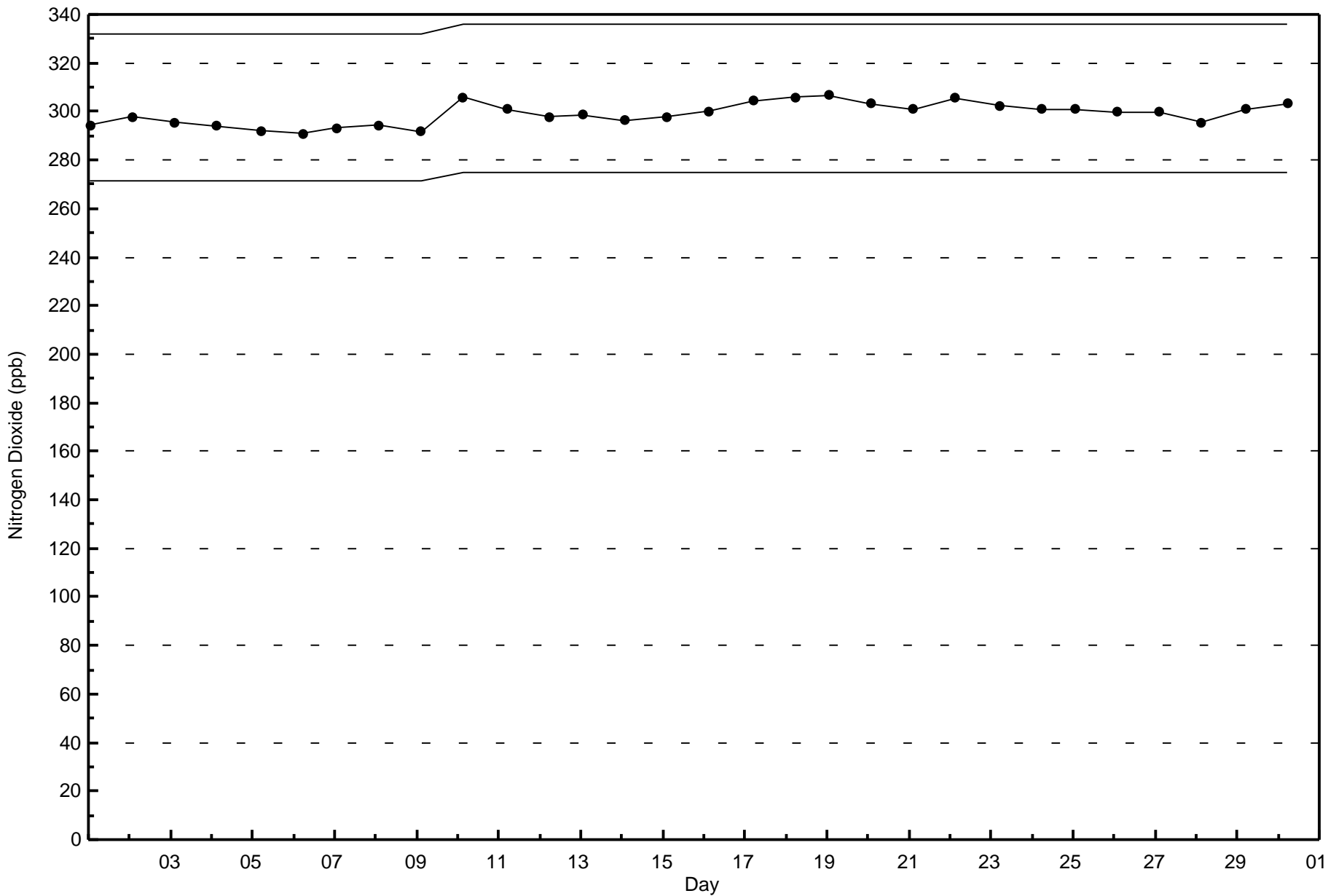






Wood Buffalo Environmental Association
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Firebag - November 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

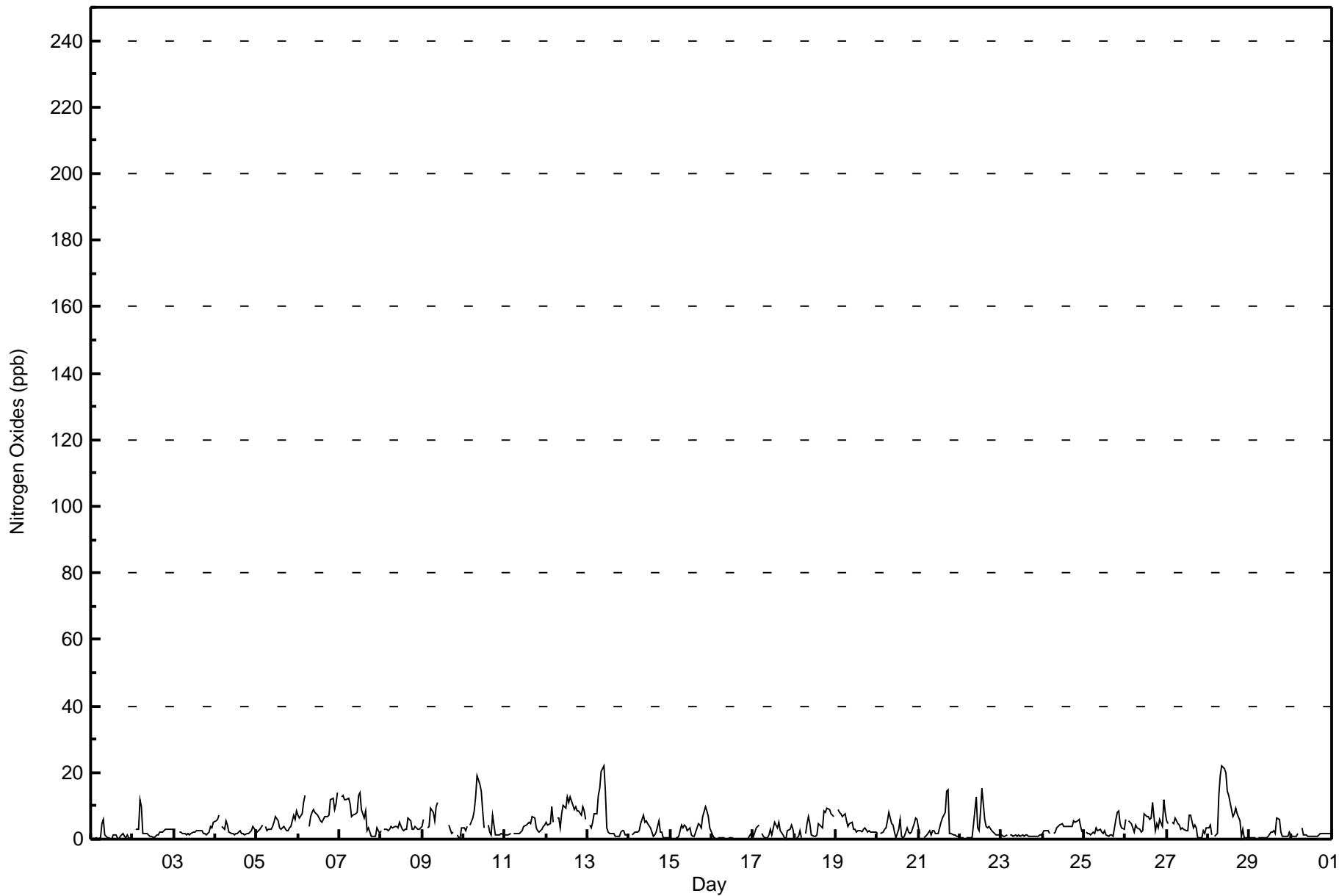
Nitrogen Oxides (NO_x) - ppb
Firebag - November 2016

Maximum Value: 22 ppb on Nov 13 10:00		Maximum Daily Average: 8.3 ppb on Nov 6		Hours in Service: 720																						
Minimum Value: 0 ppb on Nov 16 18:00		Minimum Daily Average: 0.4 ppb on Nov 16		Hours of Data: 683																						
Maximum Diurnal Average: 5.4 ppb at hour 10		Minimum Diurnal Average: 2.5 ppb at hour 1		Hours of Missing Data: 37																						
Monthly Average: 3.8 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 3 Q ₃ = 5 P ₉₀ = 8 P ₉₉ = 19		Hours of Calibration: 35																						
				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-Nov	Z	0	0	0	0	0	5	6	1	0	0	0	0	1	1	0	0	1	2	1	0	1	1	0	1.0	6
2-Nov	0	Z	3	3	12	10	2	2	2	1	1	1	1	1	1	2	2	3	3	3	3	3	3	3	2.7	12
3-Nov	3	3	Z	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	1	2	4	3	5	2.3	5
4-Nov	5	6	7	Z	4	3	5	4	2	2	2	2	2	2	2	2	2	1	2	2	2	3	4	2	2.9	7
5-Nov	2	2	3	4	Z	4	2	3	3	4	5	7	6	3	3	4	4	3	2	3	4	7	6	8	4.0	8
6-Nov	7	6	8	11	13	Z	4	7	8	9	8	7	6	6	5	7	7	7	7	12	12	9	11	14	8.3	14
7-Nov	Z	13	13	12	12	12	11	7	7	7	8	13	14	9	6	9	2	3	1	1	1	1	3	2	7.3	14
8-Nov	2	Z	3	3	3	3	4	3	4	4	4	5	3	3	3	3	6	5	3	3	4	3	3	3	3.5	6
9-Nov	4	6	Z	4	4	9	8	6	10	11	C	C	C	C	C	4	3	2	2	DF	1	1	1	3	--	11
10-Nov	3	3	4	Z	4	6	8	13	19	16	14	9	3	DF	4	2	1	7	1	1	1	2	1	5.7	19	
11-Nov	1	1	1	2	Z	2	2	2	2	2	3	4	4	5	5	5	7	6	3	3	2	3	4	4	3.2	7
12-Nov	5	4	5	10	5	Z	6	6	3	7	10	9	13	11	13	10	9	10	8	8	7	10	8	6	8.1	13
13-Nov	Z	4	3	5	8	8	13	15	20	22	14	3	2	2	2	2	1	1	1	2	2	3	1	1	5.9	22
14-Nov	1	Z	1	2	2	2	3	5	7	5	5	5	3	2	1	1	2	5	2	2	1	0	0	0	2.6	7
15-Nov	0	0	Z	0	0	1	4	3	4	4	2	3	1	1	1	3	4	4	4	7	10	9	7	3	3.3	10
16-Nov	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.4	2
17-Nov	1	2	3	4	Z	2	1	0	1	1	3	1	5	4	3	5	3	1	0	0	2	3	4	3	2.4	5
18-Nov	0	0	1	2	0	Z	2	5	7	5	1	1	1	5	4	3	9	8	9	9	7	7	7	7	4.1	9
19-Nov	Z	9	8	8	7	8	6	4	5	5	3	3	2	2	2	2	3	3	2	3	2	2	2	2	4.0	9
20-Nov	1	Z	2	2	3	3	5	8	5	4	2	0	3	6	1	1	1	3	2	2	2	5	6	6	3.2	8
21-Nov	3	2	Z	1	1	1	3	1	2	3	2	2	3	5	7	8	14	15	2	2	1	1	1	1	3.4	15
22-Nov	0	0	0	Z	0	0	1	1	4	13	4	2	8	15	6	4	3	4	3	2	2	1	1	1	3.3	15
23-Nov	1	1	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
24-Nov	2	3	2	2	2	Z	2	2	3	4	4	5	4	4	4	4	4	4	5	5	5	6	4	2	3.5	6
25-Nov	Z	2	2	2	1	2	2	3	3	3	2	2	3	1	1	1	1	1	1	6	8	8	5	3	2.8	8
26-Nov	6	Z	6	4	4	2	4	3	3	2	2	8	7	7	6	6	11	2	5	3	6	4	12	8	5.3	12
27-Nov	5	5	Z	5	5	6	5	4	3	3	3	3	3	7	7	3	4	4	0	0	1	3	2	3	3.7	7
28-Nov	3	4	1	Z	1	1	13	19	22	21	20	14	13	11	7	8	9	8	5	1	3	1	0	0	8.1	22
29-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	2	2	3	2	6	6	2	1	1	1	1	2	1.4	6
30-Nov	1	1	1	1	2	Z	3	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.3	3
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerspan C - Calibration DF - DAS Failure																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Firebag - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Firebag - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	680	99.56	99.56
21 - 40	3	0.44	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Firebag - 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	0	0	0	0	0	10	0	0	0	0	0	0	0	10
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	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10

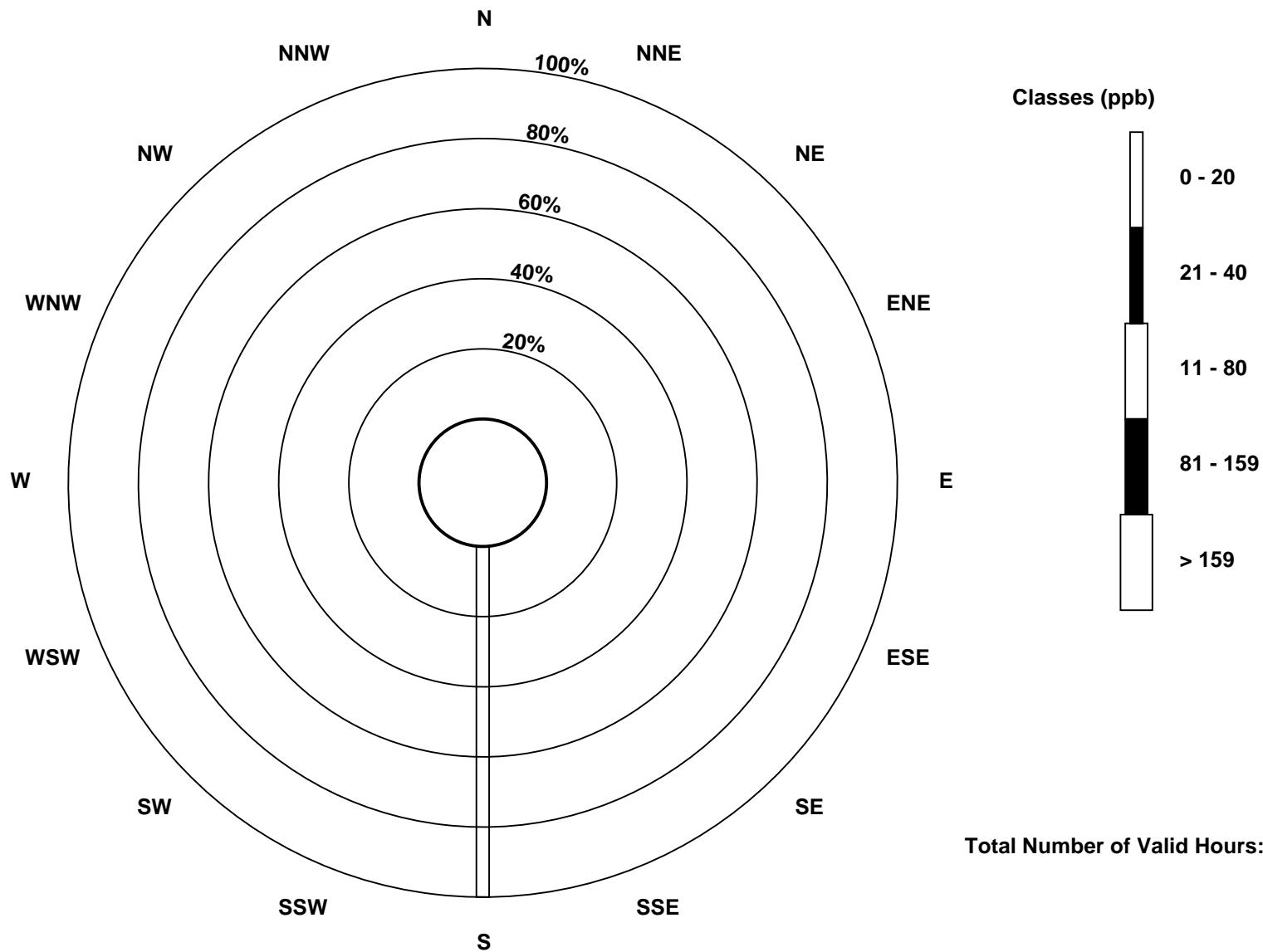
Total Number of Valid Hours: 10

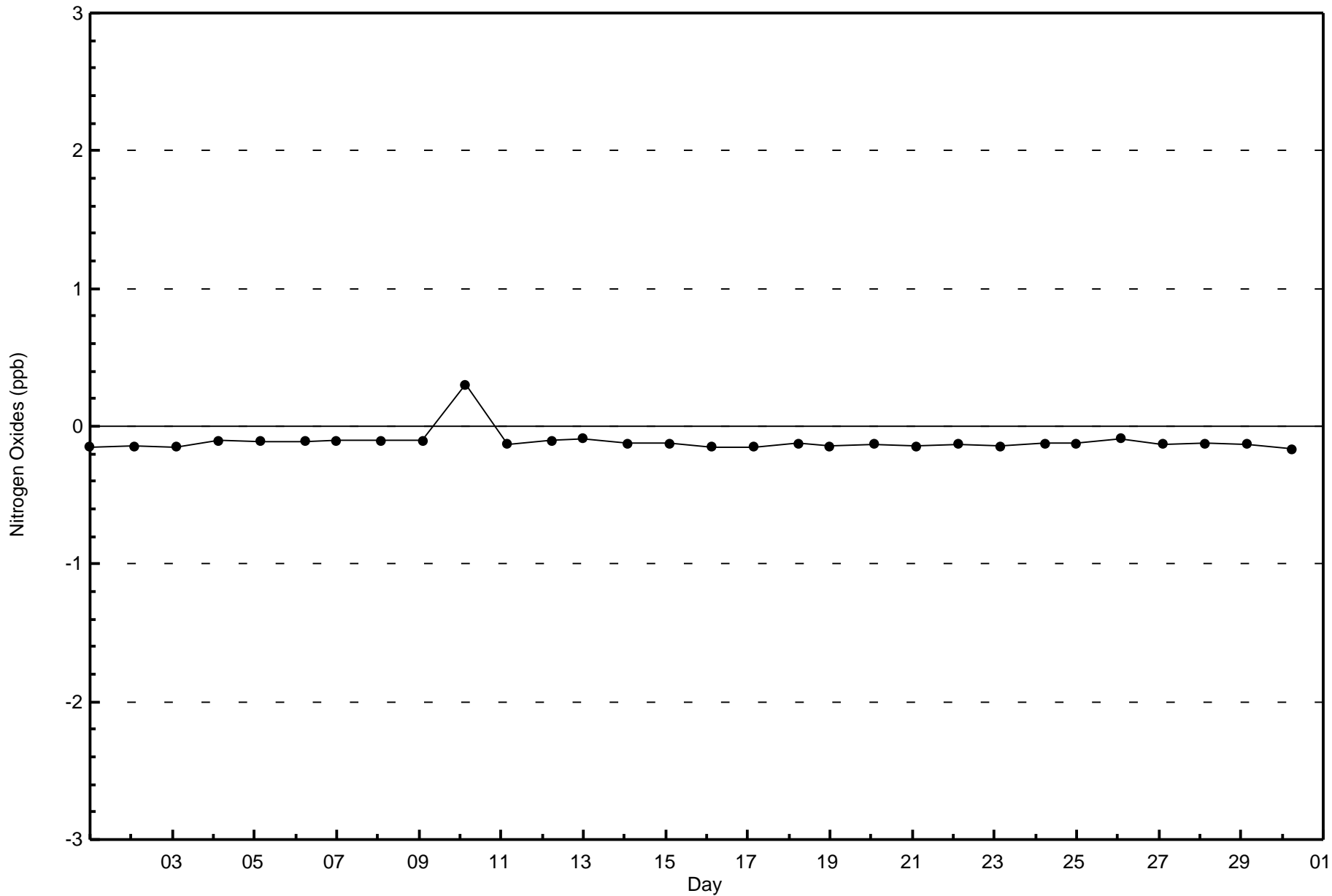
Total Number of Hours: 720

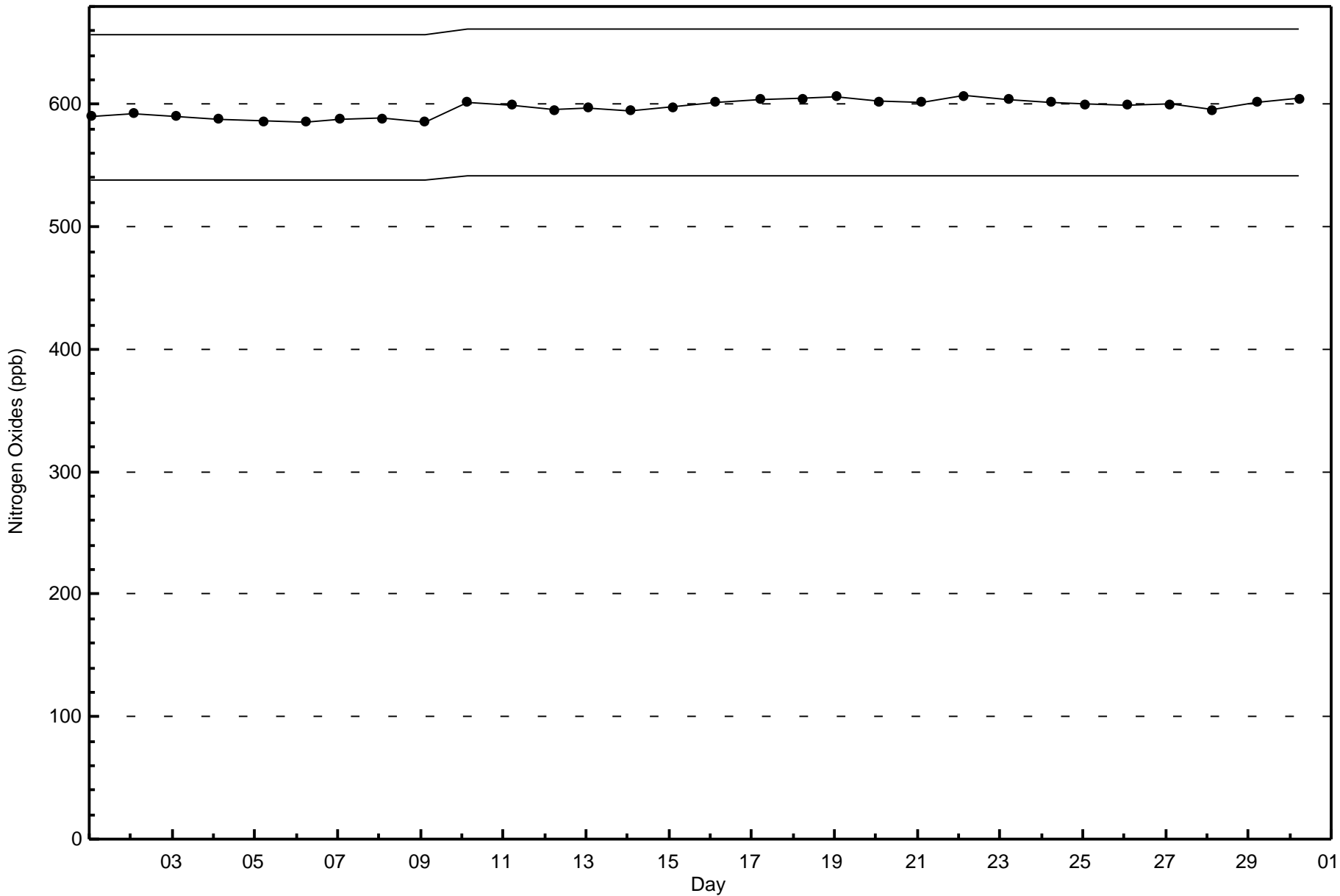


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Firebag (AMS 19)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

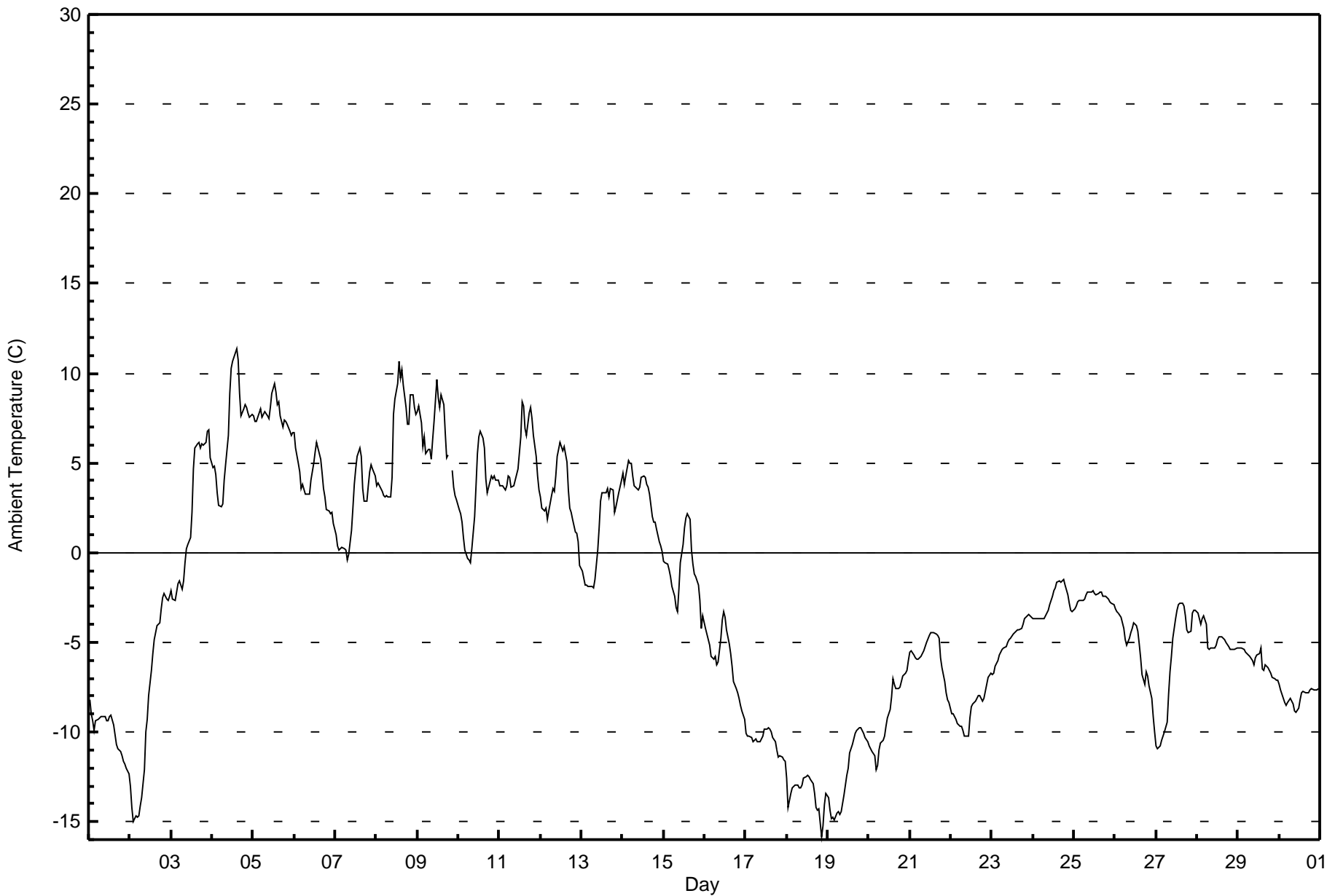
Firebag - November 2016

Maximum Value: 11.4 C on Nov 4 15:00		Maximum Daily Average: 7.7 C on Nov 5		Hours in Service: 720																						
Minimum Value: -15.9 C on Nov 18 21:00		Minimum Daily Average: -13.4 C on Nov 18		Hours of Data: 719																						
Maximum Diurnal Average: -0.7 C at hour 14		Minimum Diurnal Average: -3.7 C at hour 6		Hours of Missing Data: 1																						
Monthly Average: -2.45 C		Percentiles: P ₁ = -14.7 P ₁₀ = -10.7 O ₁ = -7.7 Median = -3.2 O ₃ = 3.5 P ₉₀ = 6.5 P ₉₉ = 10.1		Hours of Calibration: 0																						
				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-Nov	-8.2	-9.0	-9.4	-9.9	-9.4	-9.3	-9.2	-9.2	-9.1	-9.1	-9.4	-9.3	-9.1	-9.1	-9.6	-10.2	-10.7	-10.9	-11.1	-11.3	-11.6	-11.8	-12.0	-12.3	-10.0	-8.2
2-Nov	-13.1	-14.2	-15.0	-14.6	-14.7	-14.7	-14.2	-13.7	-12.1	-10.0	-9.3	-7.9	-6.5	-5.6	-4.8	-4.4	-4.1	-3.9	-3.2	-2.5	-2.3	-2.6	-2.6	-2.4	-8.3	-2.3
3-Nov	-2.1	-2.6	-2.6	-2.2	-1.7	-1.5	-2.0	-1.6	-0.6	0.2	0.4	0.9	2.3	4.7	5.8	6.0	6.1	5.8	6.0	6.1	6.7	6.8	5.3	2.2	6.8	
4-Nov	4.7	4.8	4.3	3.3	2.6	2.6	2.7	4.0	4.9	6.5	8.8	10.3	10.7	10.9	11.4	10.8	8.9	7.6	8.0	8.3	8.1	7.8	7.5	7.7	7.0	11.4
5-Nov	7.6	7.3	7.3	7.7	8.0	7.5	7.7	7.8	7.6	7.5	8.1	8.9	9.4	9.0	8.2	8.4	7.7	7.0	7.4	7.3	7.1	6.8	6.5	6.7	7.7	9.4
6-Nov	6.7	5.8	5.0	4.5	3.6	3.8	3.3	3.3	3.3	3.3	4.0	5.0	5.6	6.1	5.8	5.2	4.4	3.5	3.1	2.4	2.3	2.1	2.3	1.6	4.0	6.7
7-Nov	1.0	0.3	0.2	0.2	0.3	0.2	0.1	-0.4	-0.1	1.2	2.4	3.8	4.6	5.4	5.8	5.4	3.6	2.8	2.9	3.7	4.5	4.9	4.6	4.3	2.6	5.8
8-Nov	3.7	3.9	3.7	3.4	3.2	3.1	3.2	3.1	3.1	4.2	7.7	8.6	9.4	10.6	9.7	10.2	9.4	8.1	7.1	7.2	8.8	8.8	8.1	7.7	6.5	10.6
9-Nov	7.9	8.2	7.2	5.9	6.5	5.5	5.8	5.7	5.2	6.3	7.3	9.6	8.6	8.1	8.8	8.3	6.7	5.3	5.4	DF	4.6	3.6	3.2	2.9	6.4	9.6
10-Nov	2.4	2.2	1.7	0.8	0.2	-0.3	-0.4	-0.5	0.2	2.0	3.7	5.6	6.5	6.8	6.4	5.8	4.1	3.3	4.0	4.3	4.1	4.2	4.0	4.0	3.1	6.8
11-Nov	3.8	3.7	3.7	3.5	3.7	4.2	4.2	3.7	3.7	4.1	4.4	4.6	6.5	8.4	8.2	6.9	6.6	7.8	8.1	7.5	6.5	5.3	4.3	3.5	5.3	8.4
12-Nov	3.1	2.5	2.3	2.5	1.8	2.4	3.2	3.6	3.4	4.3	5.4	6.2	5.9	5.7	5.9	5.1	3.5	2.5	2.2	1.9	1.2	1.1	0.6	-0.7	3.1	6.2
13-Nov	-1.1	-1.5	-1.8	-1.8	-1.9	-1.9	-1.9	-2.0	-1.5	0.1	1.4	2.8	3.4	3.4	3.3	3.5	3.1	3.6	3.5	2.3	2.6	2.9	3.4	4.1	1.2	4.1
14-Nov	4.4	3.8	4.3	5.1	5.0	5.0	4.3	3.7	3.6	3.5	3.7	4.2	4.3	4.2	3.8	3.6	3.3	2.0	1.7	1.7	1.3	0.6	0.4	0.1	3.2	5.1
15-Nov	-0.5	-0.6	-0.6	-1.0	-1.4	-1.9	-2.5	-3.1	-3.3	-2.1	-0.6	0.4	1.4	1.9	2.1	1.9	0.1	-0.7	-1.1	-1.3	-1.8	-2.7	-4.3	-3.5	-1.0	2.1
16-Nov	-4.2	-4.5	-4.9	-5.2	-5.8	-5.9	-5.8	-6.2	-6.1	-4.8	-3.7	-3.3	-3.6	-4.3	-5.1	-5.6	-6.4	-7.2	-7.5	-7.8	-8.1	-8.5	-8.9	-9.3	-5.9	-3.3
17-Nov	-10.0	-10.2	-10.3	-10.3	-10.5	-10.5	-10.4	-10.5	-10.6	-10.4	-10.2	-9.8	-9.8	-9.8	-9.8	-10.0	-10.3	-10.5	-11.0	-11.4	-11.3	-11.4	-11.6	-11.6	-10.5	-9.8
18-Nov	-12.6	-14.2	-13.4	-13.1	-13.0	-13.0	-13.0	-13.1	-13.1	-12.9	-12.5	-12.5	-12.4	-12.5	-12.7	-12.9	-13.4	-14.2	-14.4	-14.3	-15.9	-15.2	-14.0	-13.5	-13.4	-12.4
19-Nov	-13.7	-14.4	-14.8	-14.8	-14.9	-14.6	-14.4	-14.6	-14.4	-13.5	-12.9	-12.4	-12.0	-11.2	-10.7	-10.4	-10.1	-9.9	-9.7	-9.8	-9.9	-10.1	-10.3	-10.5	-12.3	-9.7
20-Nov	-10.8	-10.9	-11.1	-11.3	-12.1	-11.9	-11.0	-10.7	-10.4	-10.3	-9.7	-9.2	-8.7	-8.0	-7.1	-7.4	-7.6	-7.6	-7.5	-7.2	-6.9	-6.7	-6.6	-6.1	-9.0	-6.1
21-Nov	-5.5	-5.5	-5.7	-5.8	-6.0	-5.9	-5.8	-5.6	-5.5	-5.3	-5.0	-4.6	-4.5	-4.4	-4.5	-4.5	-4.6	-4.8	-5.9	-6.4	-7.2	-7.8	-8.2	-8.4	-5.7	-4.4
22-Nov	-9.0	-9.0	-9.2	-9.3	-9.5	-9.7	-9.7	-9.9	-10.2	-10.3	-10.2	-9.2	-8.6	-8.4	-8.3	-8.1	-8.0	-8.0	-8.3	-8.1	-7.8	-7.3	-7.0	-6.7	-8.7	-6.7
23-Nov	-6.8	-6.7	-6.3	-6.0	-5.7	-5.5	-5.4	-5.3	-5.2	-5.0	-4.9	-4.7	-4.6	-4.5	-4.4	-4.3	-4.2	-4.0	-3.7	-3.6	-3.5	-3.5	-3.6	-4.8	-3.5	
24-Nov	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.5	-3.4	-3.2	-2.9	-2.4	-2.1	-2.0	-1.7	-1.6	-1.7	-1.6	-1.5	-1.8	-2.3	-2.8	-3.2	-3.3	-2.8	-1.5
25-Nov	-3.1	-3.0	-2.8	-2.7	-2.7	-2.7	-2.6	-2.4	-2.2	-2.2	-2.2	-2.1	-2.3	-2.3	-2.2	-2.2	-2.2	-2.4	-2.5	-2.5	-2.6	-2.7	-2.8	-2.9	-2.5	-2.1
26-Nov	-3.2	-3.3	-3.4	-3.6	-3.9	-4.3	-4.8	-5.2	-4.7	-4.5	-4.2	-3.9	-4.0	-4.4	-5.1	-5.8	-6.8	-7.4	-6.6	-6.9	-7.4	-8.1	-9.2	-10.0	-5.4	-3.2
27-Nov	-10.8	-11.0	-10.8	-10.5	-10.2	-10.0	-9.5	-7.9	-6.6	-5.8	-4.8	-3.7	-3.2	-2.9	-2.8	-2.8	-3.0	-3.5	-4.3	-4.5	-4.3	-3.4	-3.2	-3.2	-5.9	-2.8
28-Nov	-3.4	-3.7	-4.0	-3.7	-3.5	-4.0	-5.3	-5.4	-5.3	-5.3	-5.3	-5.2	-4.9	-4.7	-4.7	-4.8	-4.8	-5.0	-5.2	-5.4	-5.4	-5.4	-5.4	-5.4	-4.8	-3.4
29-Nov	-5.3	-5.3	-5.3	-5.4	-5.6	-5.7	-5.7	-5.8	-6.0	-6.3	-5.9	-5.7	-5.6	-5.3	-6.5	-6.6	-6.2	-6.4	-6.5	-6.7	-6.9	-7.0	-7.1	-7.1	-6.1	-5.3
30-Nov	-7.3	-7.7	-8.1	-8.4	-8.5	-8.3	-8.1	-8.3	-8.5	-8.8	-8.9	-8.6	-8.2	-7.8	-7.7	-7.8	-7.8	-7.8	-7.7	-7.6	-7.6	-7.7	-7.6	-7.6	-8.0	-7.3
																								Diurnal Average		
																								Diurnal Maximum		
																								7.9 8.2 7.3 7.7 8.0 7.5 7.7 7.8 7.6 7.5 8.8 10.3 10.7 10.9 11.4 10.8 9.4 8.1 8.1 8.3 8.8 8.8 8.1 7.7		
DF - DAS Failure																										



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Firebag - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Firebag - November 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	450	62.59	62.59
0 - 10	262	36.44	99.03
10 - 20	7	0.97	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

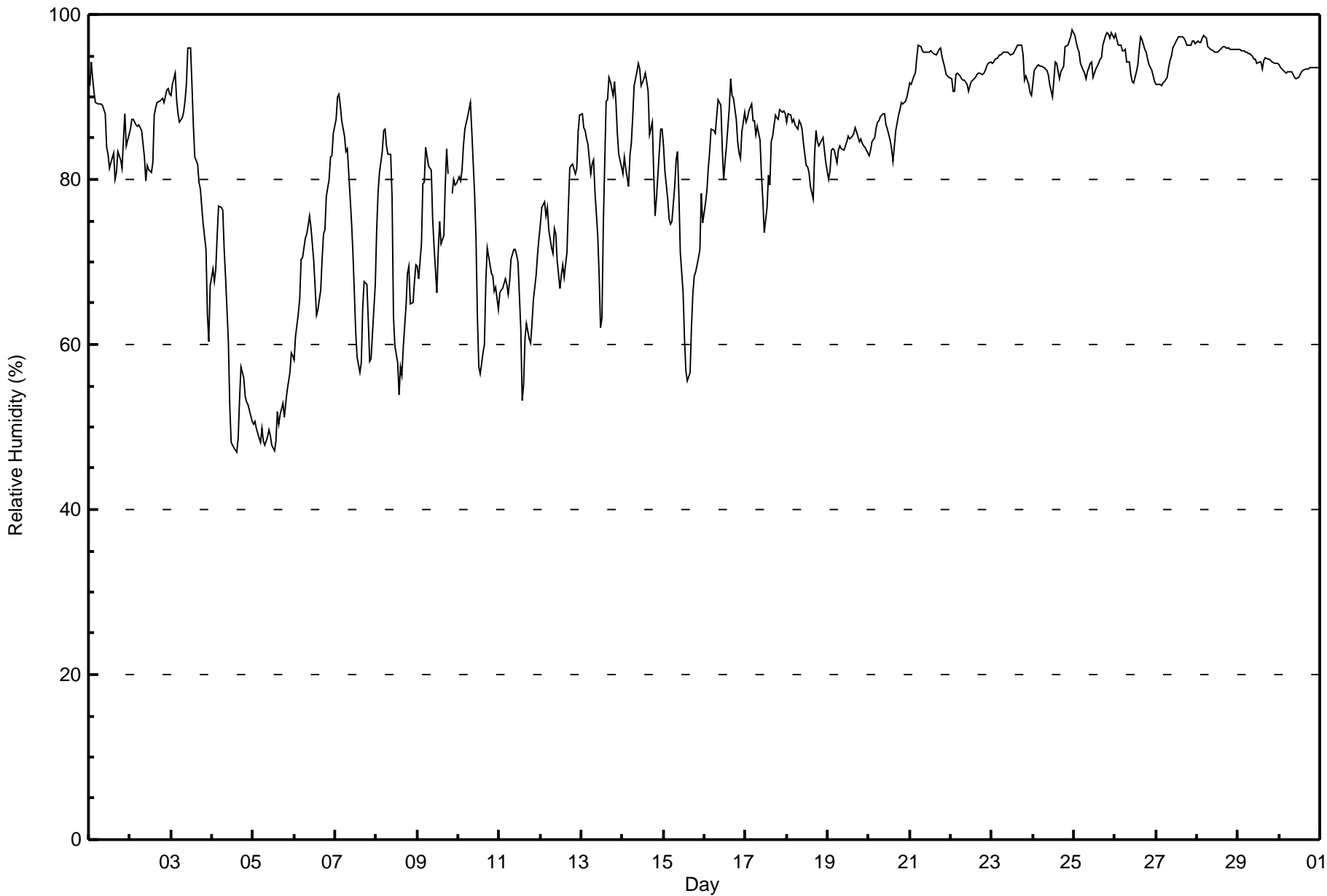
Firebag - November 2016

Maximum Value: 98 % on Nov 25 00:00														Maximum Daily Average: 96.1 % on Nov 28														Hours in Service: 720			
Minimum Value: 47 % on Nov 4 15:00														Minimum Daily Average: 51.0 % on Nov 5														Hours of Data: 719			
Maximum Diurnal Average: 85.5 % at hour 8														Minimum Diurnal Average: 78.7 % at hour 13														Hours of Missing Data: 1			
Monthly Average: 82.7 %														Percentiles: P ₁ = 48 P ₁₀ = 62 Q ₁ = 76 Median = 86 Q ₃ = 93 P ₉₀ = 96 P ₉₉ = 98														Hours of Calibration: 0			
																												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-Nov	91	94	92	91	89	89	89	89	89	88	84	83	81	82	83	80	81	83	82	81	85	88	84	85	86.1	94					
2-Nov	86	87	87	87	86	87	86	86	86	83	80	82	81	81	82	88	89	89	90	90	90	89	91	91	90	86.6	91				
3-Nov	90	91	93	90	88	87	87	88	90	92	96	96	91	86	83	82	80	79	77	75	72	64	60	67	83.4	96					
4-Nov	69	68	69	73	77	77	76	72	68	60	52	48	48	47	47	49	53	57	56	54	53	53	52	51	59.6	77					
5-Nov	50	51	50	49	48	50	48	48	49	50	49	48	47	48	52	50	51	53	51	53	54	57	59	59	51.0	59					
6-Nov	58	61	64	66	70	71	73	73	74	76	74	70	67	64	64	67	70	73	74	78	80	83	83	86	71.6	86					
7-Nov	87	90	90	89	87	85	83	84	81	75	71	66	61	59	57	58	64	68	67	63	58	58	61	67	72.1	90					
8-Nov	74	79	81	83	86	86	84	83	83	78	63	60	58	54	57	56	60	65	69	69	65	65	68	70	70.6	86					
9-Nov	69	68	72	80	80	84	82	81	81	75	72	66	71	75	72	73	79	84	81	DF	78	80	79	79	76.6	84					
10-Nov	80	80	81	84	86	88	88	89	86	78	73	63	57	57	59	60	68	72	70	69	68	67	67	64	73.0	89					
11-Nov	66	67	67	68	67	66	68	70	72	71	71	70	62	53	55	61	63	61	60	63	65	69	71	73	65.7	73					
12-Nov	75	77	77	76	77	74	72	71	74	73	70	67	69	70	68	71	77	81	82	82	81	81	86	88	75.7	88					
13-Nov	88	86	86	85	84	81	82	82	79	73	68	62	63	75	90	90	92	92	90	92	89	86	83	82	82.5	92					
14-Nov	81	83	81	79	83	84	88	91	93	94	93	91	92	93	92	91	85	87	81	76	78	83	86	86	86.3	94					
15-Nov	84	81	78	75	75	75	79	82	83	78	71	66	61	57	56	57	62	66	68	69	71	72	78	75	71.6	84					
16-Nov	77	79	81	83	86	86	86	88	90	89	84	80	82	84	89	92	90	90	87	85	83	83	86	88	85.3	92					
17-Nov	87	87	88	89	87	87	85	87	85	81	77	73	77	80	79	85	85	88	87	87	88	88	88	88	84.8	89					
18-Nov	87	88	88	87	87	87	86	87	87	86	84	82	81	81	79	78	83	86	85	84	85	85	84	82	84.5	88					
19-Nov	80	81	84	84	84	82	84	84	84	84	84	85	85	85	85	86	86	86	85	85	84	84	84	83	84.0	86					
20-Nov	83	84	85	85	86	87	87	88	88	88	87	86	85	84	82	84	86	88	89	89	89	89	90	91	86.6	91					
21-Nov	92	92	93	93	95	96	96	96	95	95	95	95	96	95	95	95	95	96	96	95	94	93	93	92	94.5	96					
22-Nov	92	91	91	93	93	93	92	92	92	92	91	91	92	92	92	93	93	93	93	93	93	94	94	94	92.4	94					
23-Nov	94	94	95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	95	92	93	91	90	90	94.5	96					
24-Nov	92	93	94	94	94	94	94	93	93	93	91	90	92	94	94	92	93	93	94	96	96	97	97	98	93.8	98					
25-Nov	98	97	96	95	94	93	93	92	93	94	94	92	93	93	94	95	95	96	98	98	98	97	98	97	95.1	98					
26-Nov	98	97	96	96	96	96	96	94	94	93	92	92	93	94	96	97	97	96	96	95	94	93	93	92	94.7	98					
27-Nov	92	92	91	91	92	92	92	94	94	95	96	97	97	97	97	97	97	97	96	96	96	97	97	97	94.9	97					
28-Nov	97	97	97	97	97	97	96	96	96	96	95	95	95	96	96	96	96	96	96	96	96	96	96	96	96.1	97					
29-Nov	96	96	96	96	95	95	95	95	95	95	95	94	94	94	93	94	95	95	95	94	94	94	94	94	94.7	96					
30-Nov	94	94	93	93	93	93	93	93	93	92	92	92	93	93	93	93	93	93	94	94	94	94	94	94	93.2	94					
83.6 84.0 84.5 84.8 85.2 85.2 85.2 85.5 85.3 83.6 81.5 79.3 78.7 78.7 79.5 80.2 81.9 83.3 82.7 82.4 82.1 82.3 82.9 83.3																								Diurnal Average							
98 97 97 97 97 97 96 96 96 96 96 96 97 97 97 97 97 97 98 98 98 97 98 98																								Diurnal Maximum							
DF - DAS Failure																															



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Firebag - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Firebag - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	59	8.21	8.21
60 - 80	161	22.39	30.60
80 - 100	499	69.40	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Firebag - November 2016

Maximum Speed: 20 km/h on Nov 30 23:00	Maximum Daily Speed Average: 0.0 km/h on Jan 1	Hours in Service: 720
Minimum Speed Value: 16 km/h on Nov 30 16:00	Minimum Daily Speed Average: 0.0 km/h on Jan 1	Hours of Data: 10
Maximum Diurnal Speed Average: 20.2 km/h at hour 23	Minimum Diurnal Speed Average: 16.4 km/h at hour 16	Hours of Missing Data: 710
Monthly Average Velocity: 18.4 km/h 179.8 deg	Percentiles: P ₁ = 16 P ₁₀ = 17 Q ₁ = 18 Median = 19 Q ₃ = 19 P ₉₀ = 20 P ₉₉ = 20	Percent Operational Time: 1.4

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-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	AF	AF	AF	AF	AF	AF	AF	AF	----	----	
3-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	----	----	
4-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	----	----	
5-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	----	----	
6-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	----	----	
7-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	----	----	
8-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	----	----	
9-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	----	----	
10-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	----	----	
11-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	----	----	
12-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	----	----	
13-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	----	----	
14-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	----	----	
15-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	----	----	
16-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	----	----	
17-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	----	----	
18-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	----	----	
19-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	----	----	
20-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	----	----	
21-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	----	----	
22-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	----	----	
23-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	----	----	
24-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	----	----	
25-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	----	----	
26-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	----	----	
27-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	----	----	
28-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	----	----	
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	----	----	
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	S18	S16	S18	S18	S19	S18	S19	S19	S19	S20	S19	----	S20

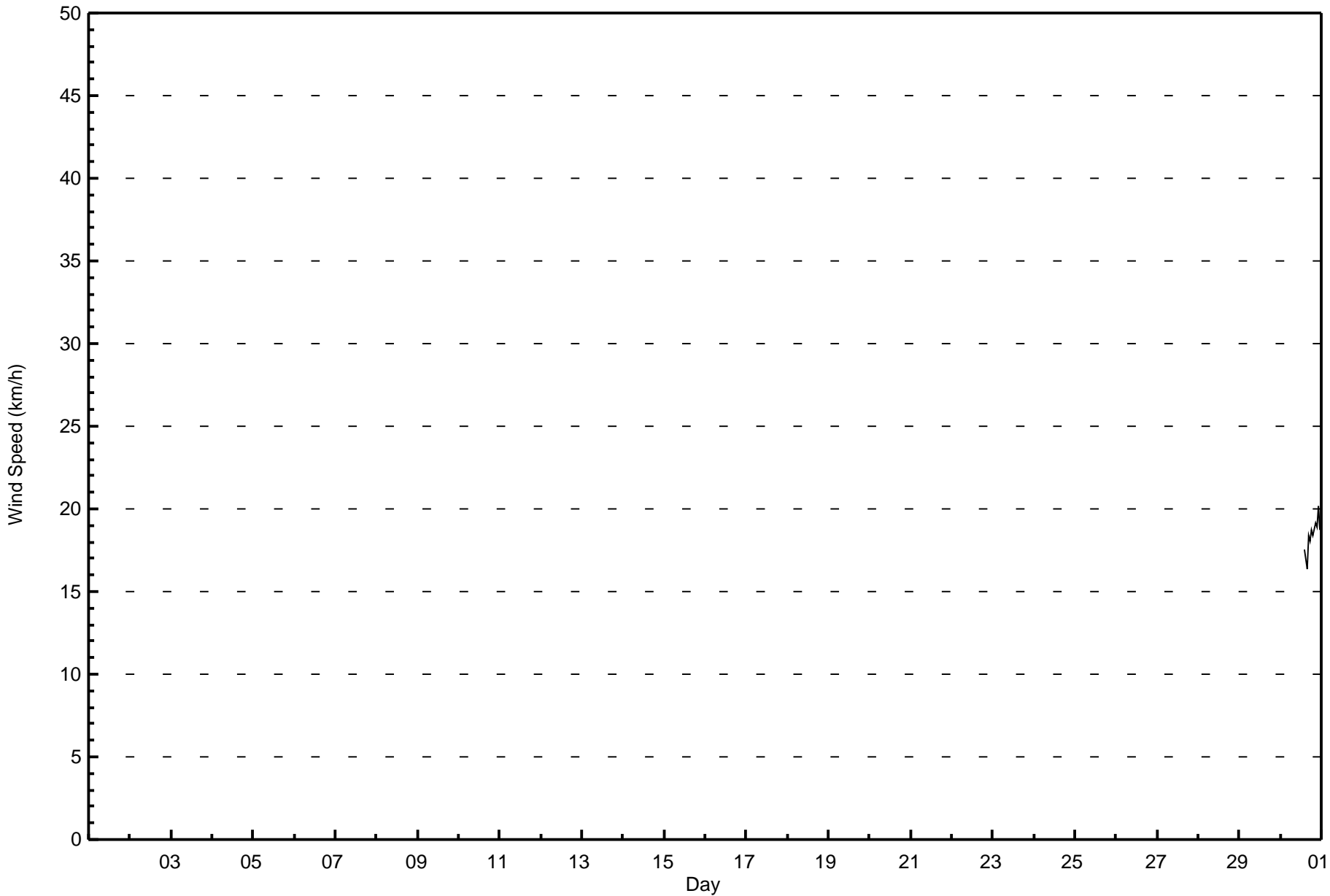
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AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Firebag - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	0	0.00	0.00
6 - 11	0	0.00	0.00
12 - 19	9	90.00	90.00
20 - 28	1	10.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 10

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - 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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 - 19	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	9
20 - 28	0	0	0	0	0	0	0	0	1	0	0	0	0	0	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	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10

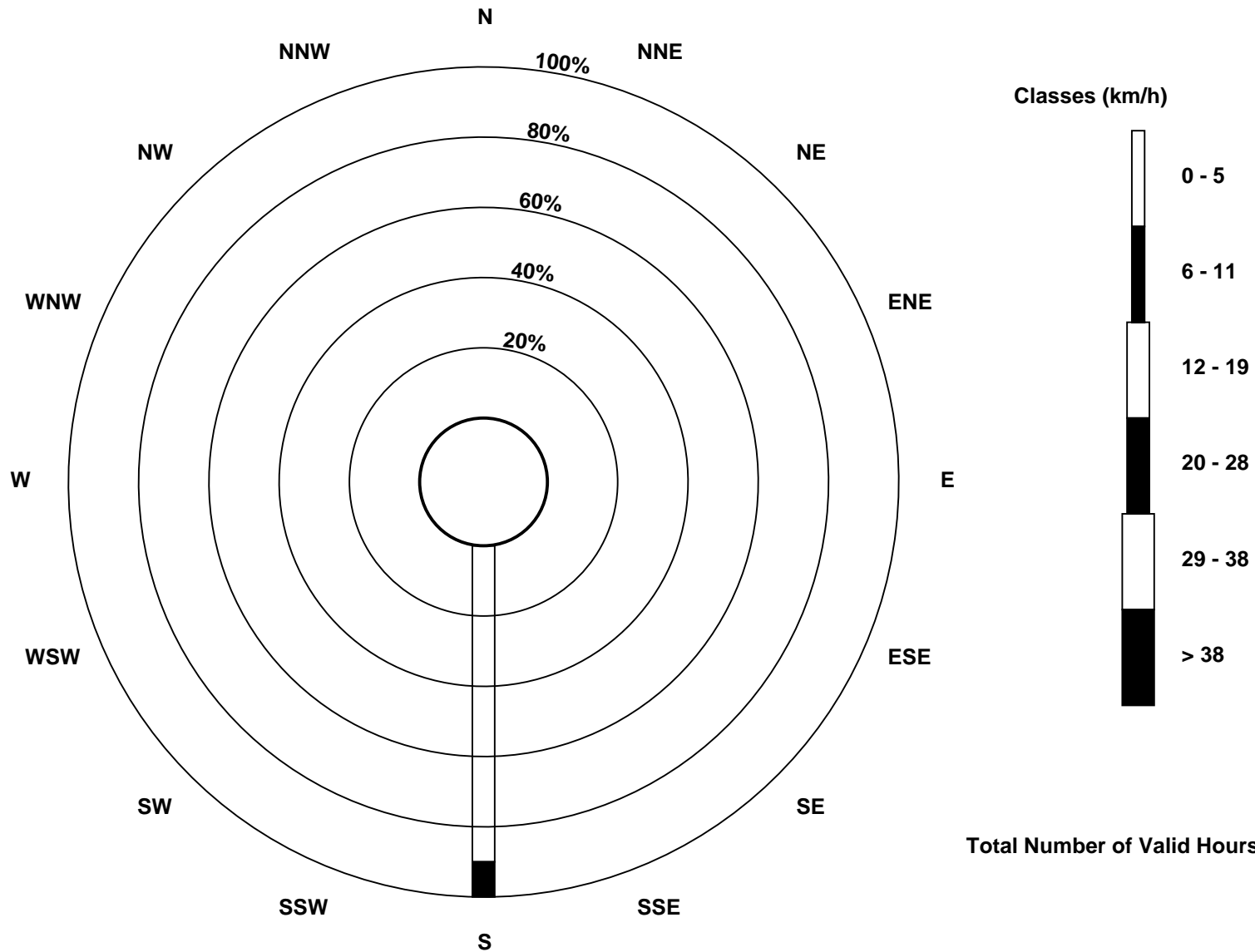
Total Number of Valid Hours: 10

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Firebag (AMS 19)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Firebag - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4 km/h on Nov 30 17:00 Minimum Value: 2 km/h on Nov 30 16:00 Percentiles: P ₁ = 2 P ₁₀ = 2 Q ₁ = 3 Median = 3 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 4	Hours in Service: 720 Hours of Data: 10 Hours of Missing Data: 710 Hours of Calibration: 0 Percent Operational Time: 1.4
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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	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	--	
2-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	--
3-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	--
4-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	--
5-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	--
6-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	--
7-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	--
8-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	--
9-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	--
10-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	--
11-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	--
12-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	--
13-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	--
14-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	--
15-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	--
16-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	--
17-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	--
18-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	--
19-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	--
20-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	--
21-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	--
22-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	--
23-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	--
24-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	--
25-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	--
26-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	--
27-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	--
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	3	2	4	3	3	4	3	3	3	3	3	3	4

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Diurnal Maximum																											

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Firebag - November 2016

Direction of Maximum Speed: 181 deg on Nov 30 23:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 0.0 deg on Jan 1	Hours of Data: 10
Direction of Minimum Speed: 182 deg on Nov 30 16:00	Hours of Missing Data: 710
Direction of Minimum Daily Speed Average: 0.0 deg on Jan 1	Percent Operational Time: 1.4
Monthly Average Direction: 179.8 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-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	AF	AF	AF	AF	AF	AF	AF	AF	--
3-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	--
4-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	--
5-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	--
6-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	--
7-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	--
8-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	--
9-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	--
10-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	--
11-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	--
12-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	--
13-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	--
14-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	--
15-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	--
16-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	--
17-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	--
18-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	--
19-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	--
20-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	--
21-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	--
22-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	--
23-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	--
24-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	--
25-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	--
26-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	--
27-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	--
28-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	--
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	--
30-Nov	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	181	182	174	178	178	179	181	181	181	183	--
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	181.1	181.8	174.4	177.6	177.5	178.8	181.3	181.1	181.4	182.6	

Diurnal Average

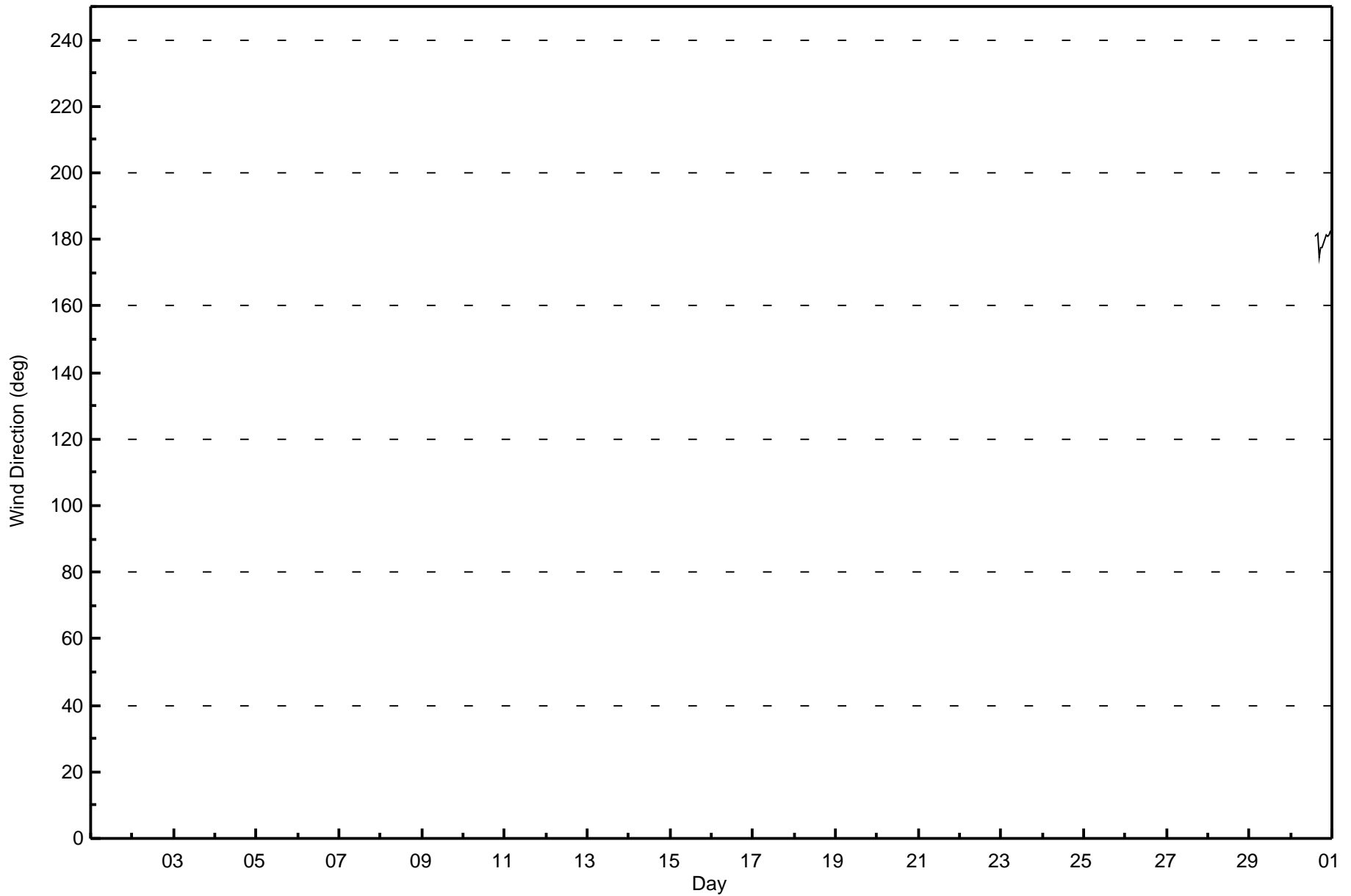
AF - Analyzer Failure

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Firebag - November 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Firebag - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 12 deg on Nov 30 16:00	Hours of Data: 10
Minimum Value: 9 deg on Nov 30 19:00	Hours of Missing Data: 710
Percentiles: P ₁ = 9 P ₁₀ = 9 Q ₁ = 9 Median = 9 Q ₃ = 10 P ₉₀ = 12 P ₉₉ = 12	Hours of Calibration: 0
	Percent Operational Time: 1.4

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-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	--	
2-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	--
3-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	--
4-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	--
5-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	--
6-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	--
7-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	--
8-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	--
9-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	--
10-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	--
11-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	--
12-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	--
13-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	--
14-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	--
15-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	--
16-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	--
17-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	--
18-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	--
19-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	--
20-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	--
21-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	--
22-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	--
23-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	--
24-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	--
25-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	--
26-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	--
27-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	--
28-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	--
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	--
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	--
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11	12	10	9	9	9	9	9	9	9	9	12

Diurnal Maximum

AF - Analyzer Failure



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 9, 2016	Last Calibration	October 6, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	14:58
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	-605
Analyzer IP address	192.168.1.43		Lamp voltage	796	796
Calculated slope	1.003217	0.995654	Chamber temp	45.2	45.0
Calculated intercept	-0.974629	1.219879	Pressure	679.2	679.8
Analyzer Background	8.1	8.2	Flow	0.444	0.444
Analyzer Coefficient	0.891	0.995	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	-0.2	----
as found span	5000	58.3	574.8	566.5	1.015
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	58.3	574.8	577.0	0.996
second point	5000	29.3	288.9	287.5	1.005
third point	5000	14.7	144.9	143.5	1.010
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	58.3	574.8	578.8	0.993
Average Correction Factor					1.004

Corrected As found 566.6 Previous response 574.0 % change 1.3%

Notes:

Inlet filter changed after as founds. Adjusted zero and span.

Calibration Performed By:

Jayne Marcoux



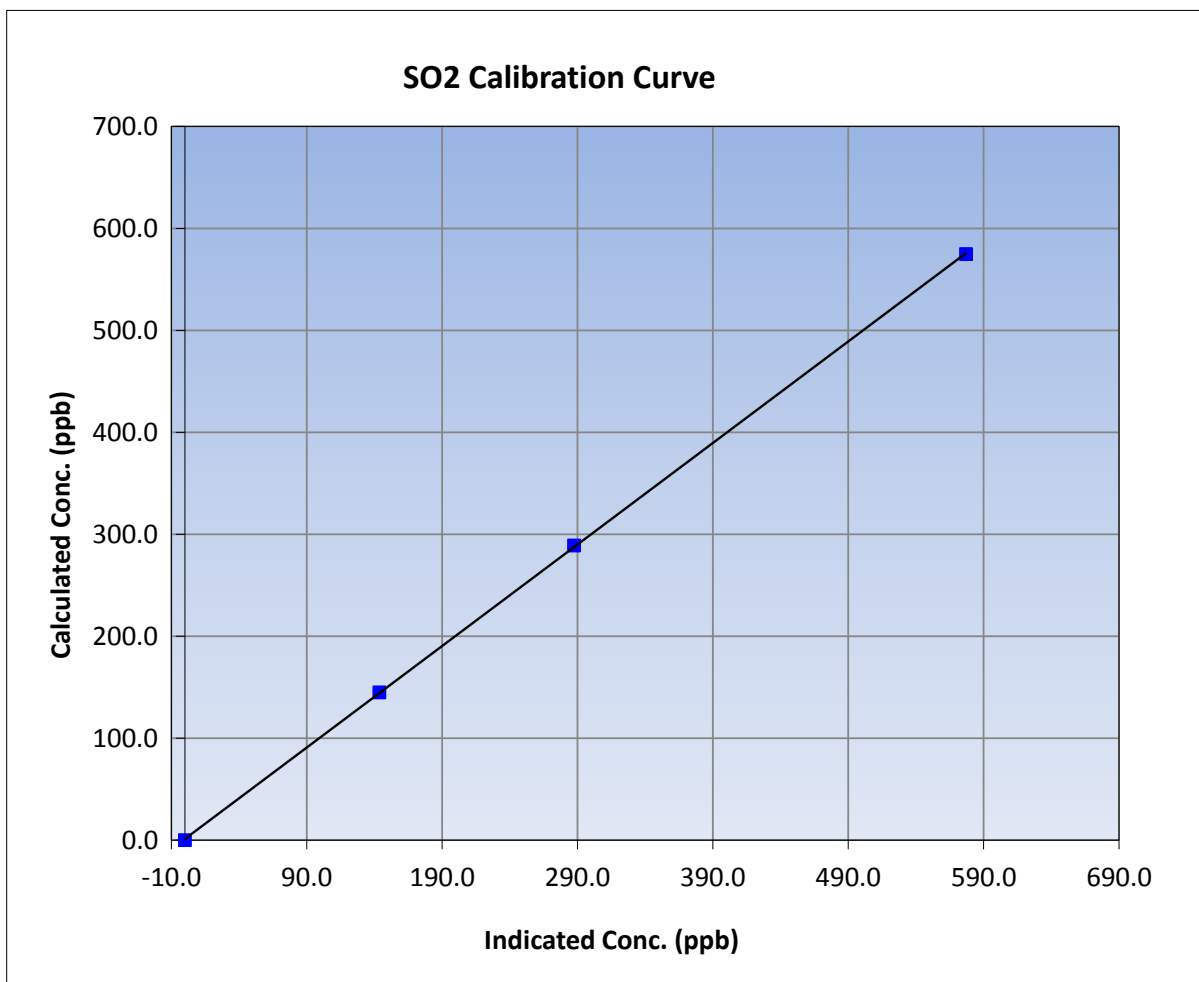
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 6, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:20	End Time (MST)	14:58
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

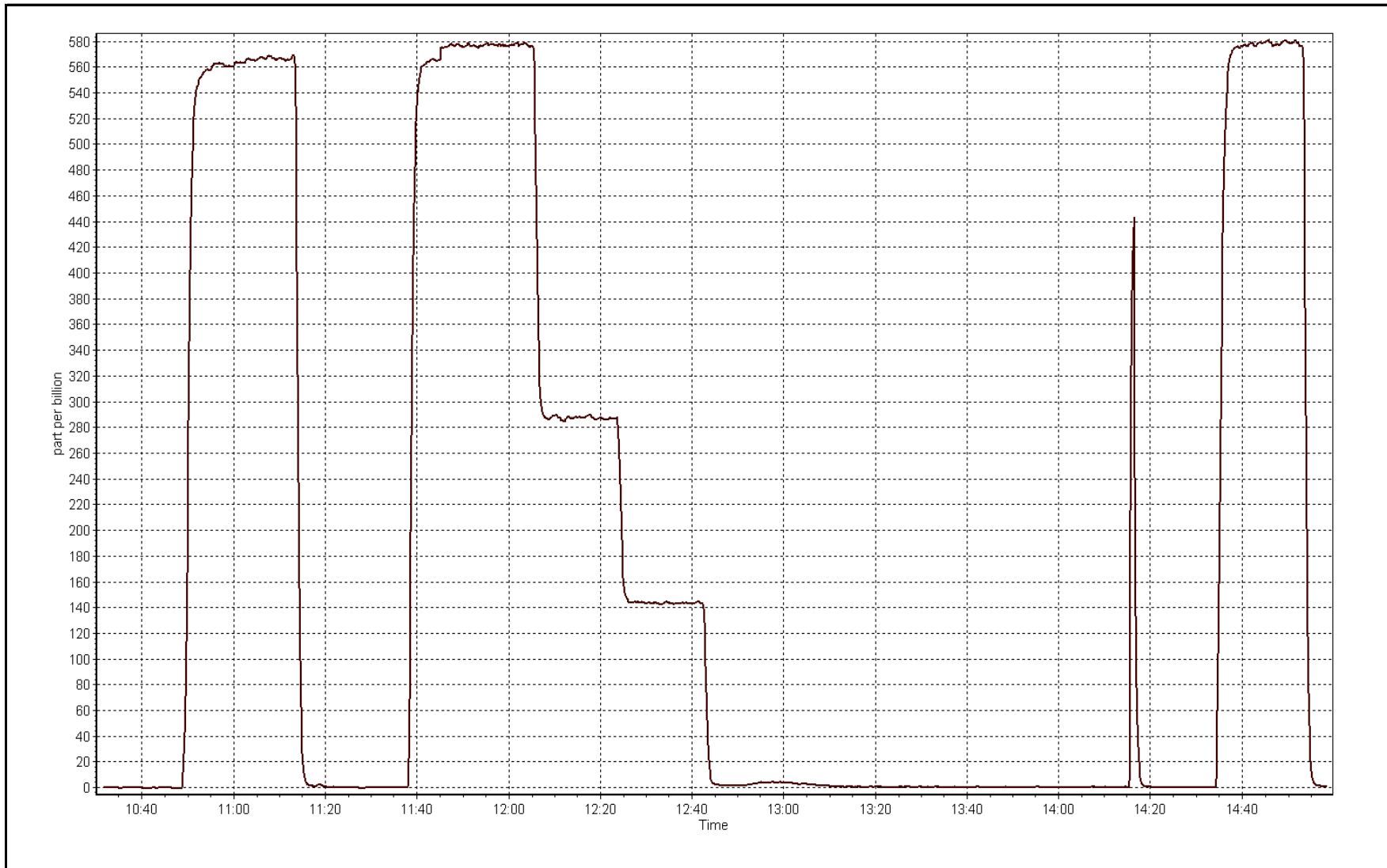
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999971
574.8	577.0	0.9962		
288.9	287.5	1.0048	Slope	0.995654
144.9	143.5	1.0098		
			Intercept	1.219879



SO2 Calibration Plot

Date: November 9, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 10, 2016	Last Calibration	October 20, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:12	End Time (MST)	13:28
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	-574	-574
Analyzer IP address	192.168.1.45		Lamp voltage	932	935
Calculated slope	1.003972	0.996727	Chamber temp	45	45
Calculated intercept	0.014752	-0.078521	Pressure	542.2	542.2
Analyzer Background	13.7	13.3	Flow	0.958	0.954
Analyzer Coefficient	1.188	1.162	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	0.2	----
as found span	5000	75.6	80.1	81.8	0.980
SO2 scrubber check	5000	15.2	149.9	1.3	----
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	75.6	80.1	80.6	0.994
second point	5000	37.8	40.1	40.1	0.999
third point	5000	19.0	20.1	20.2	0.997
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	75.6	80.1	80.1	1.000
Average Correction Factor					0.997

Corrected As found	81.6	Previous response	79.8	% change	-2.2%
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Notes:

Changed inlet filter after as founds. During high point, the internet connection was lost and the modem was reset. Causing the -10ppb dip. Adjusted zero and span.

Calibration Performed By: Jayme Marcoux



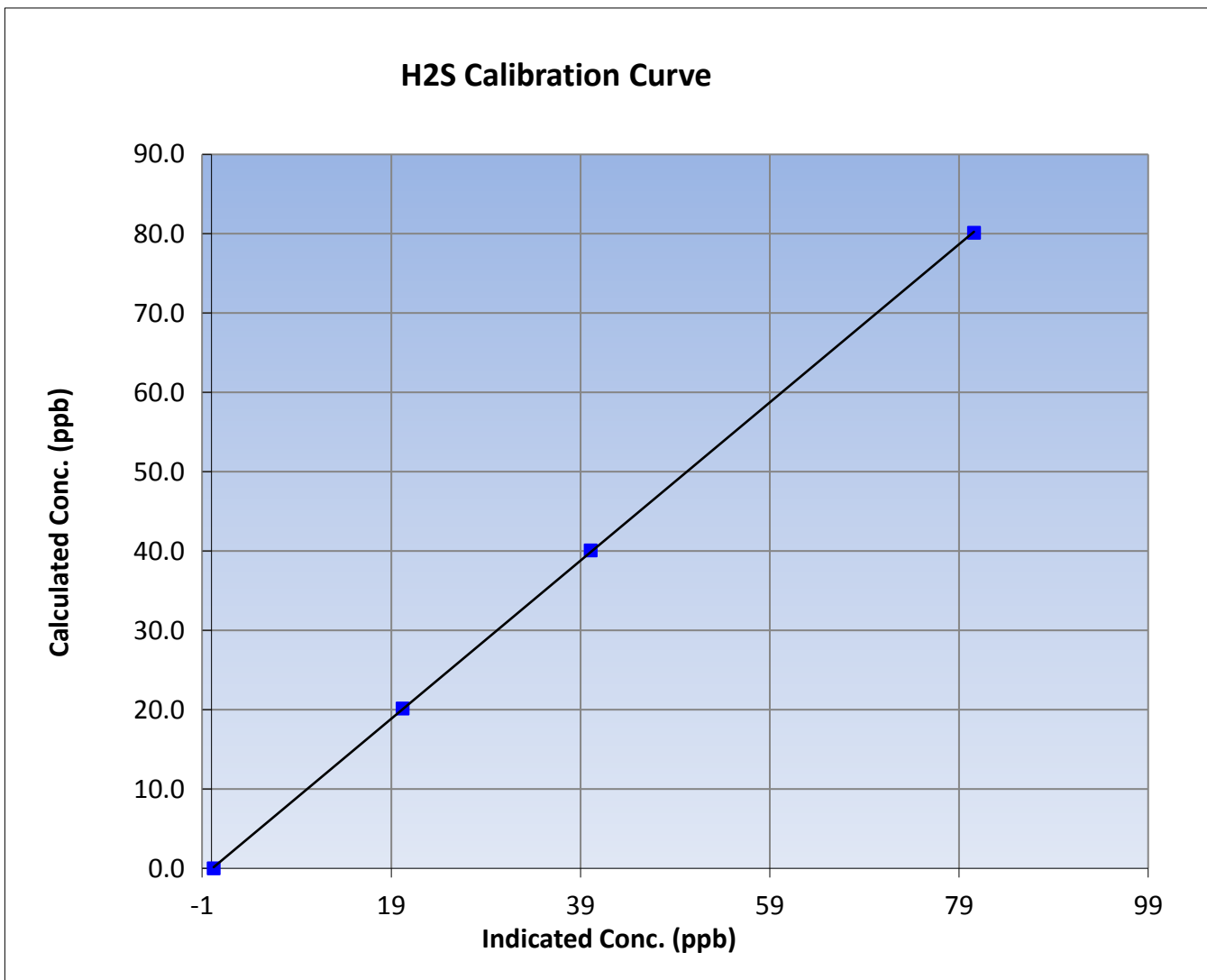
Wood Buffalo Environmental Association H2S Calibration Report

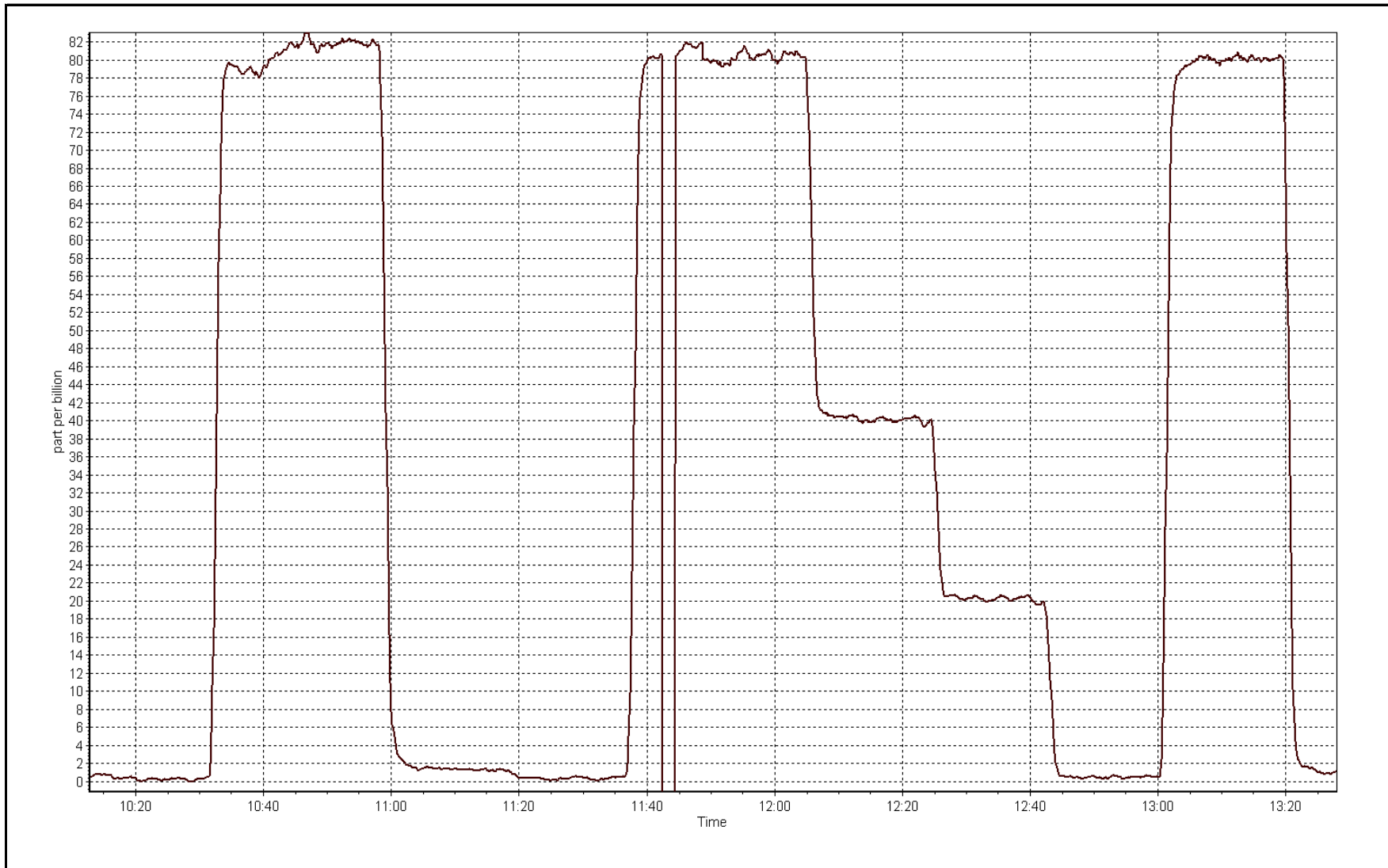
Station Information

Calibration Date	November 10, 2016	Previous Calibration	October 20, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:12	End Time (MST)	13:28
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	0.999978
80.1	80.6	0.9944		
40.1	40.1	0.9995	Slope	0.996727
20.1	20.2	0.9965		
			Intercept	-0.078521







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 9, 2016	Last Calibration	October 21, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	14:56
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

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	35.0	29.5
Calculated slope	1.000477	0.997218	Fuel Pressure	23.0	23.0
Calculated intercept	-0.048328	0.019887	Analyzer Coeff	3.622	3.604
			Analyzer BKG	4.82	4.90

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	0.07	----
as found span	5000	58.3	12.74	12.75	0.999
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	58.3	12.74	12.79	0.996
second point	5000	29.3	6.40	6.32	1.013
third point	5000	14.7	3.21	3.20	1.004
as left zero	5000	0.0	0.00	0.06	----
as left span	5000	58.3	12.74	12.85	0.991
Average Correction Factor					1.004

Corrected As found 12.68 Previous response 12.78 % change 0.8%

Notes:

Inlet filter changed after as founds. Adjusted zero and span.

Calibration Performed By:

Jayne Marcoux



Wood Buffalo Environmental Association THC Calibration Report

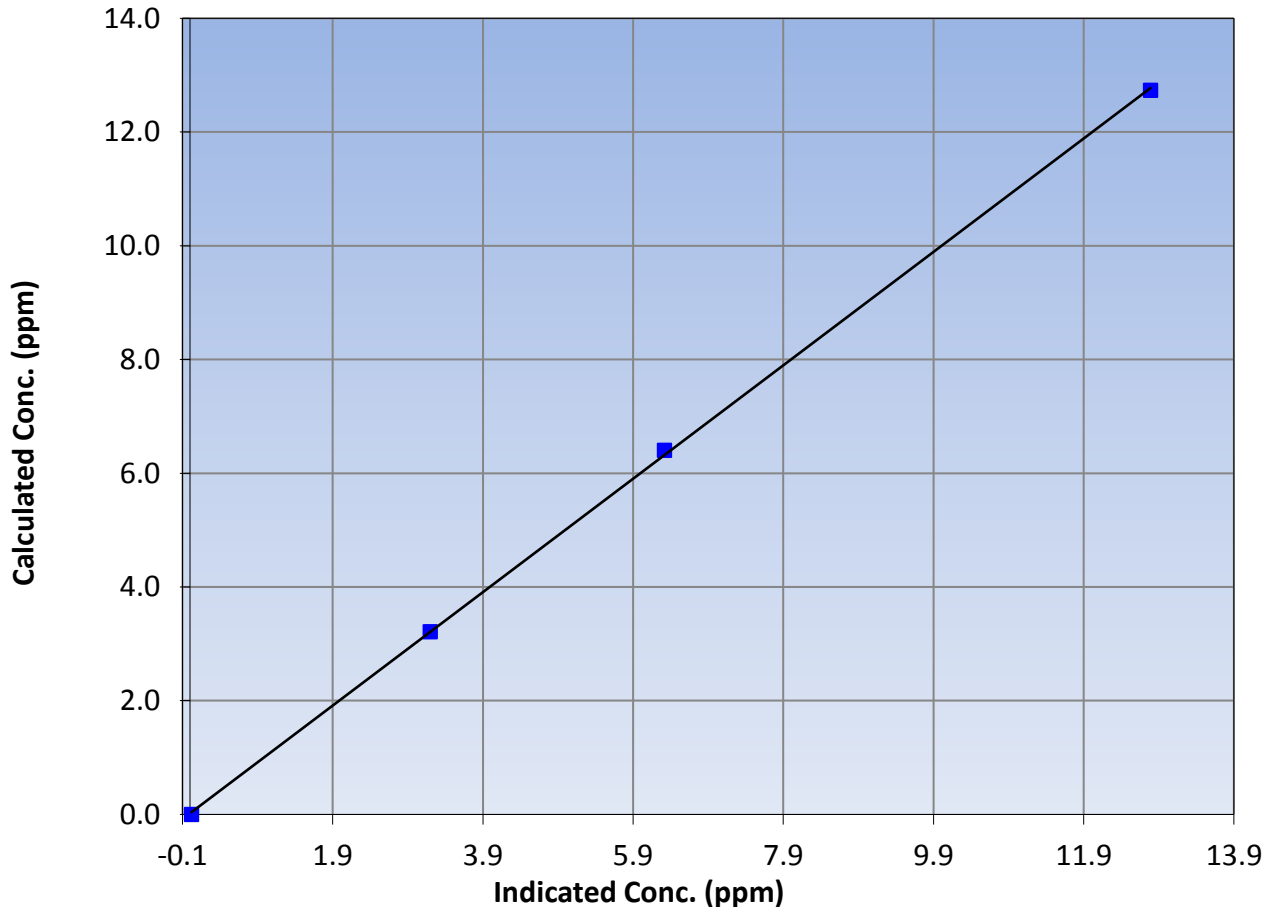
Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 21, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:20	End Time (MST)	14:56
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

Calibration Data

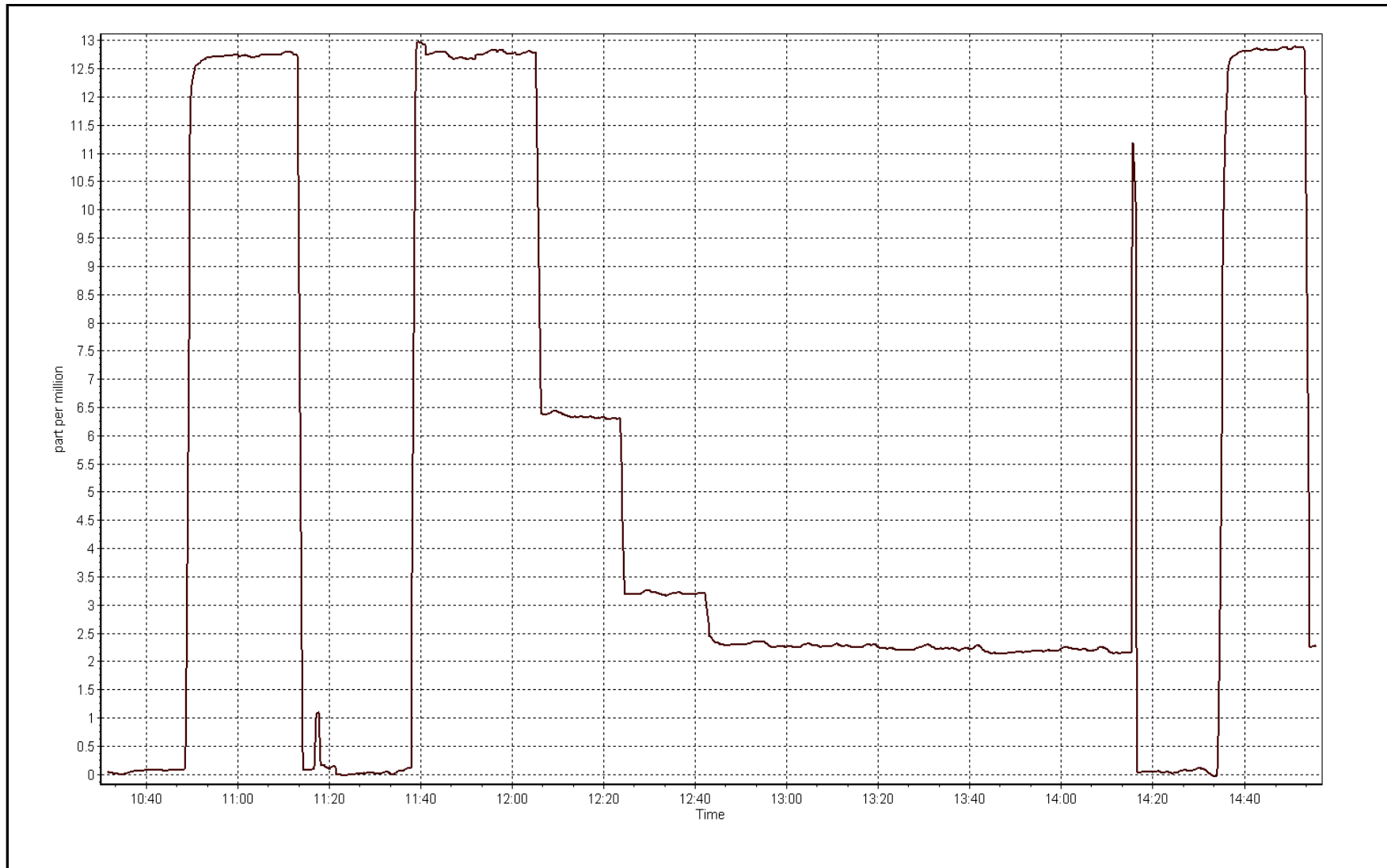
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999896
12.74	12.79	0.9957		
6.40	6.32	1.0128	Slope	0.997218
3.21	3.20	1.0035		
			Intercept	0.019887

THC Calibration Curve



THC Calibration Plot

Date: November 9, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 6, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	14:56
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	0.998027	0.998807	0.997056
	Data Offset	-0.538164	-0.412316	-0.094469
Current Calibration	Data Slope	0.998626	0.998350	0.997926
	Data Offset	1.565260	1.717473	-0.644007

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	0.866		0.883	
NOX coefficient	1.001		1.000	
NO2 coefficient	1.000		1.000	
NO bkgrnd	3.8		3.9	
NOX bkgrnd	3.8		3.9	
Chamber Temp	50.5	Deg C	50.4	Deg C
Moly Temp	325	Deg C	325	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-2.7	Deg C	-2.6	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	158.3	mmHg	157.4	mmHg
R Cell Press Nox	158.3	mmHg	157.7	mmHg
NO sample flow	0.645	lpm	0.638	lpm
Nox sample Flow	0.644	lpm	0.640	lpm

Notes:

Inlet filter changed after as founds. Adjusted the span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 9, 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	588.3	586.9	1.4	1.0208	1.0232
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	600.8	600.9	0.2	0.9995	0.9994
second point	5000	29.3	301.8	301.8	0.0	298.9	298.9	0.0	1.0097	1.0097
third point	5000	14.7	151.4	151.4	0.0	149.3	148.9	0.3	1.0144	1.0167
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.0	0.0	----	----
as left span	5000	58.3	600.5	304.2	296.3	598.8	300.0	299.8	1.0028	1.0140
Average Correction Factor									1.0078	1.0086

Corrected As found NO_x= 588.4 NO= 587.0 Percent Change NO_x= 2.4% NO= 2.5%
 Previous Response NO_x= 602.2 NO= 601.6

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	600.8	599.5	0.0	0.9995	1.0016	----	----
1st NO2 (300)	304.2	295.4	600.4	304.2	296.2	1.0002	----	0.9971	100.3%
2nd NO2 (200)	400.2	199.4	600.7	400.2	200.6	0.9997	----	0.9941	100.6%
3rd NO2 (100)	498.3	101.2	601.3	498.3	103.0	0.9986	----	0.9828	101.7%
2nd NO ref point	----	0.0	600.8	599.6	1.2	0.9995	1.0015	----	----
Average Correction Factor						0.9995		0.9913	100.9%

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

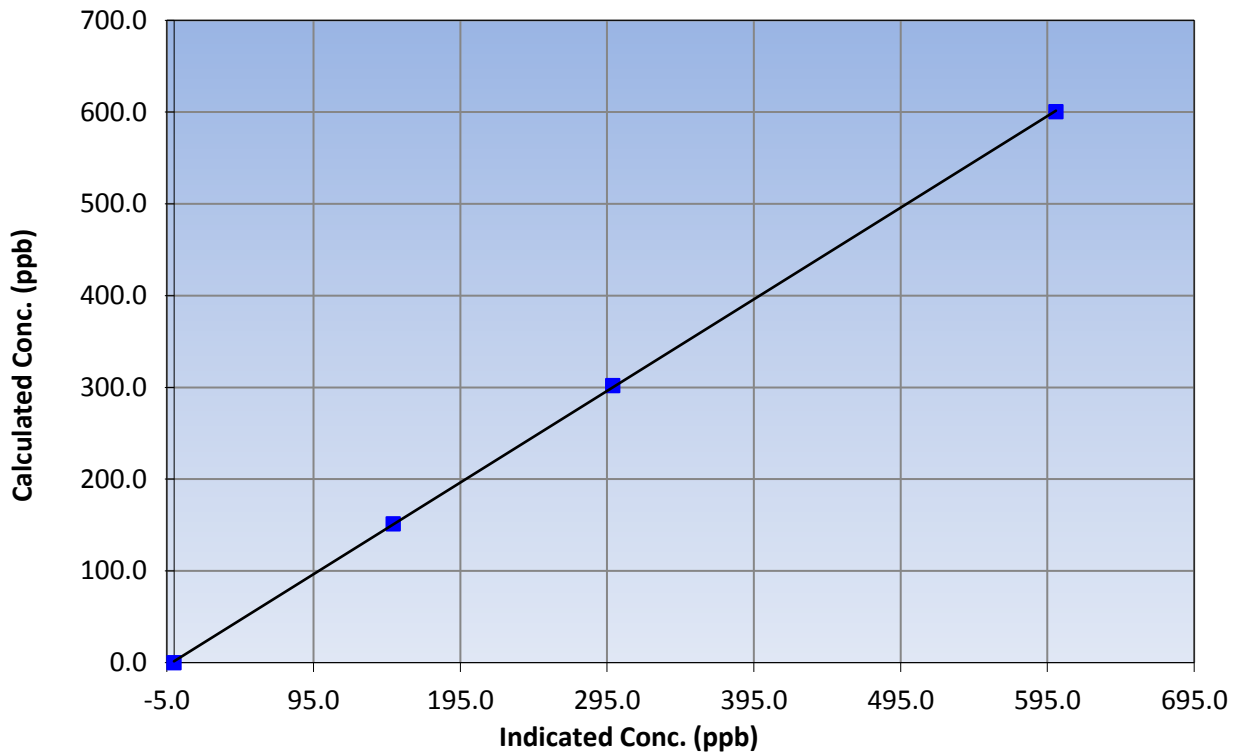
Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 6, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:20	End Time (MST)	14:56
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	0.999965
600.5	600.8	0.9995		
301.8	298.9	1.0097	Slope	0.998626
151.4	149.3	1.0144		
			Intercept	1.565260

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

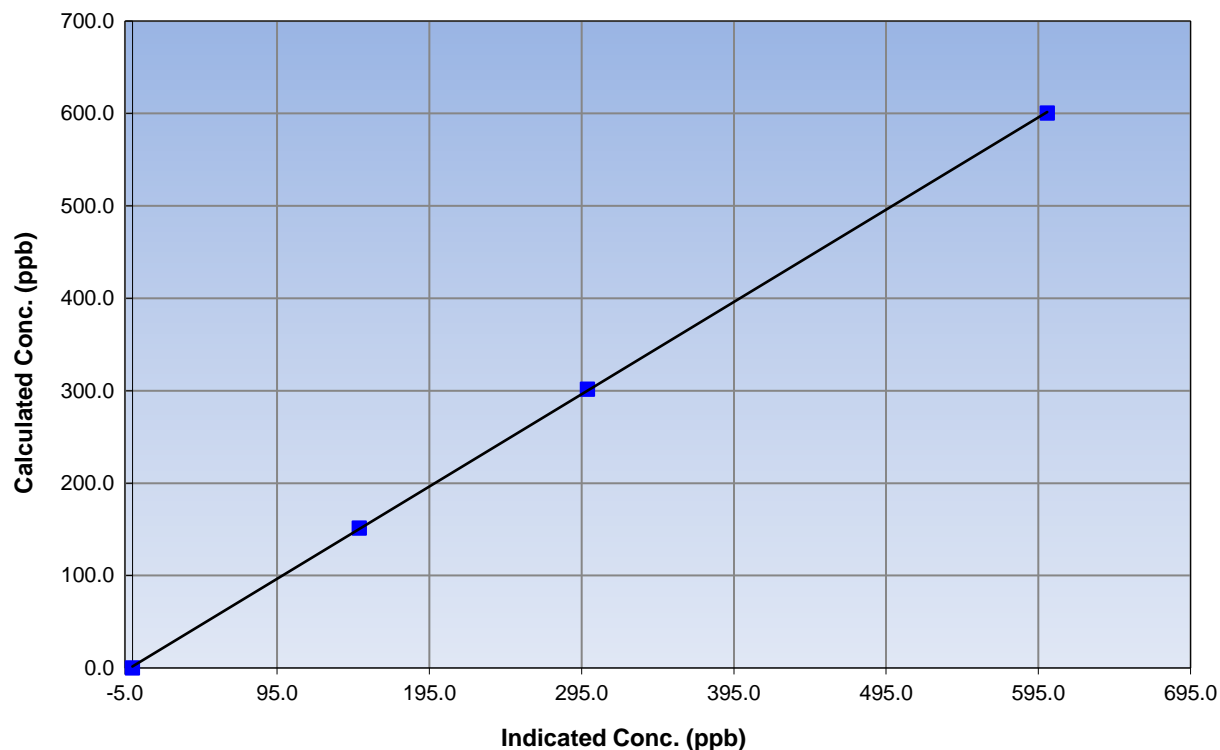
Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 6, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:20	End Time (MST)	14:56
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	600.9	0.9994		
301.8	298.9	1.0097	Slope	0.998350
151.4	148.9	1.0167		
			Intercept	1.717473

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

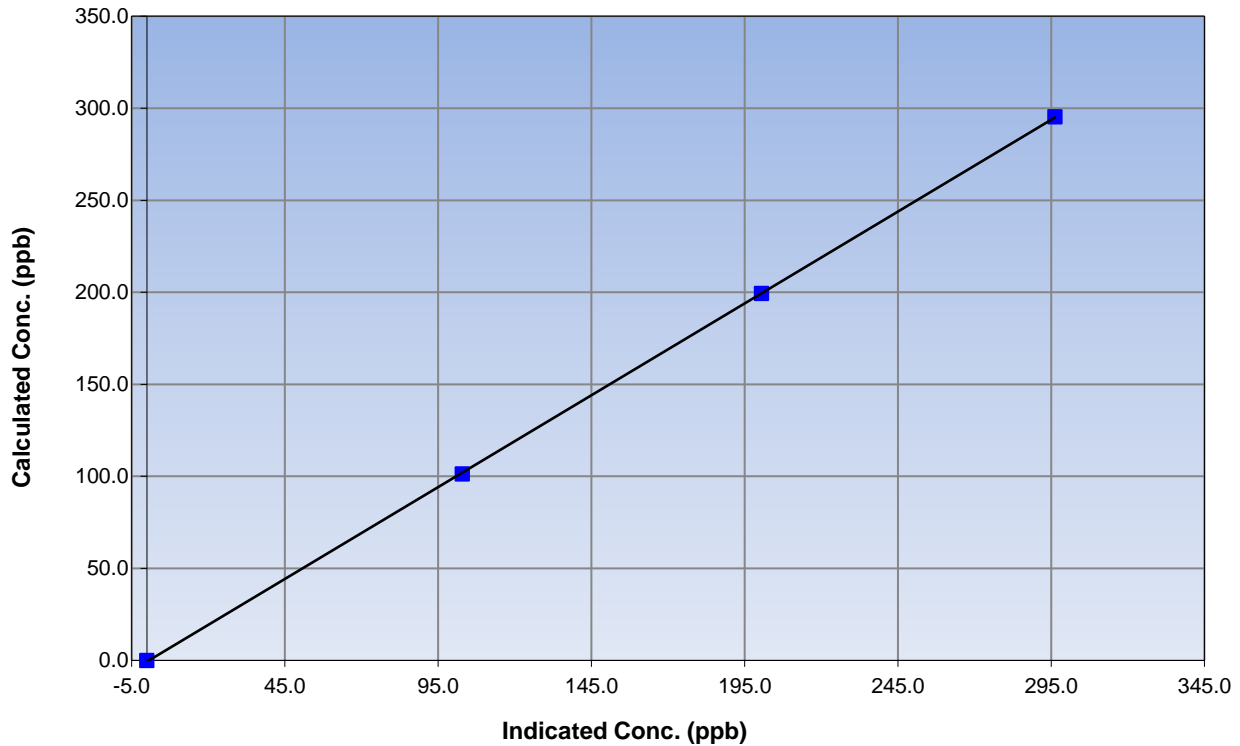
Station Information

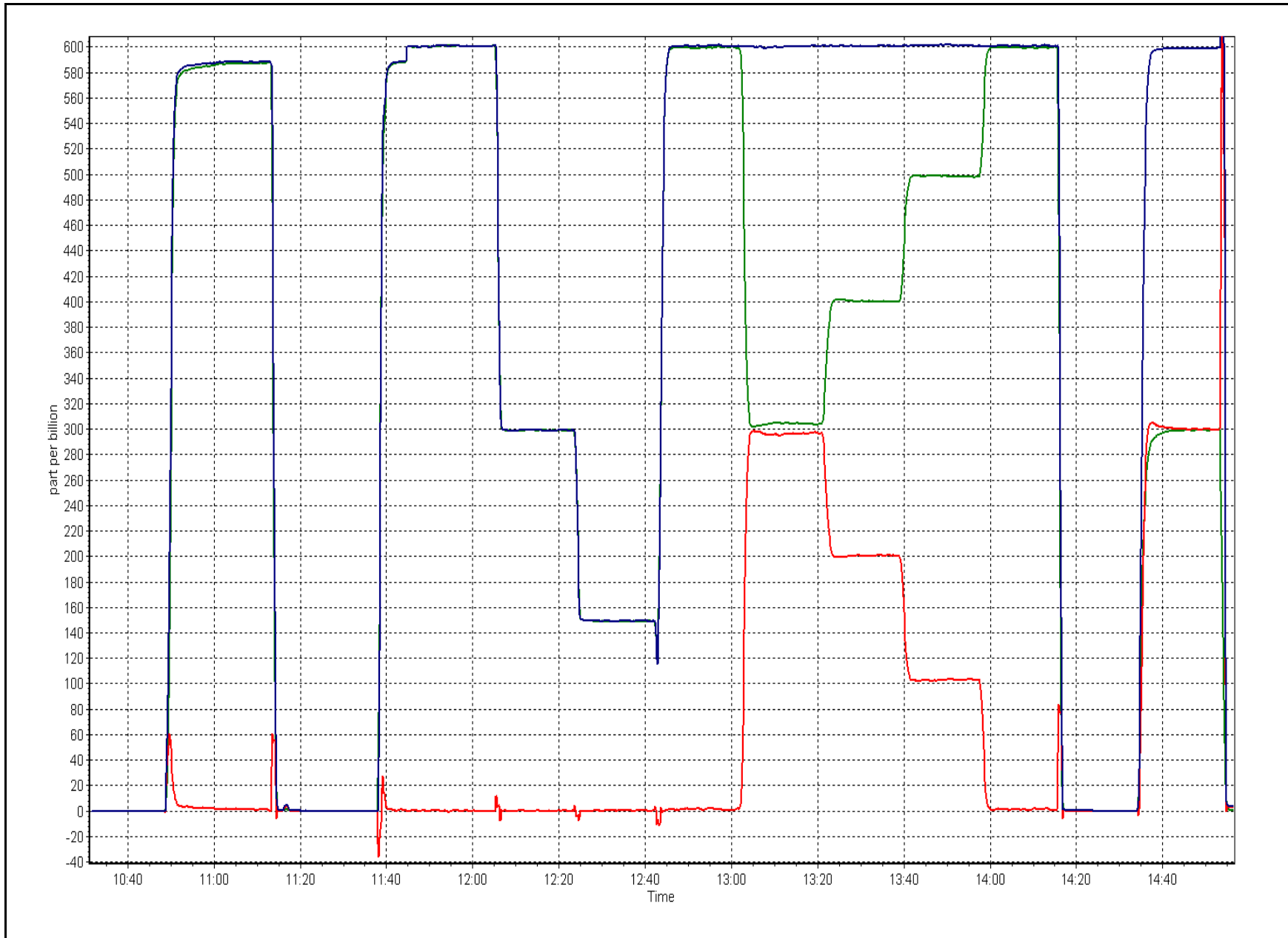
Calibration Date	November 9, 2016	Previous Calibration	October 6, 2016
Station Number	Firebag	Station Number	AMS 19
Start Time (MST)	10:20	End Time (MST)	14:56
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999971
295.4	296.2	0.9971		
199.4	200.6	0.9941	Slope	0.997926
101.2	103.0	0.9828		
			Intercept	-0.644007

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 20
BRION MACKAY RIVER
NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
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	21	0	6	0
H2S (ppb) Average	682	34	38	99.44	2	0	1	0
THC (ppm) Average	685	35	35	100.00	2.9	-	2.5	-
NO2 (ppb) Average	685	35	35	100.00	24	0	12	-
NO (ppb) Average	685	35	35	100.00	30	-	6	-
NOX (ppb) Average	685	35	35	100.00	54	-	19	-
Temperature 2 m (C) Average	720	0	0	100.00	12.7	-	6.6	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	95	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	15	-	10	-
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 - BRION MACKAY RIVER (AMS 20)
 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	2	-	0	0	0	0	0	0	0	21
H2S (ppb) Average	682	0.2	0	-	0	0	0	0	0	0	0	2
THC (ppm) Average	685	2.21	0.1	-	2	2.1	2.2	2.2	2.2	2.3	2.3	2.9
NO2 (ppb) Average	685	1.7	3	-	0	0	1	1	2	3	3	24
NO (ppb) Average	685	0.3	2	-	0	0	0	0	0	0	0	30
NOX (ppb) Average	685	2	5	-	0	0	0	1	2	4	4	54
Temperature 2 m (C) Average	720	-1.91	6.3	-	-18	-9.7	-6.5	-2.7	3.8	6.6	6.6	12.7
Relative Humidity (%) Average	720	80.7	12	-	42	63	73	84	91	94	94	98
Wind Speed 10 m (km/h) Average	720	6.4	3	-	1	3	4	6	8	10	10	15
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	01 Nov 2016 23:00	01 Nov 2016 23:00	1	Intermittent unstable operation - excessive baseline drift
H2S	10 Nov 2016 13:00	10 Nov 2016 13:00	1	Intermittent unstable operation - excessive baseline drift
H2S	23 Nov 2016 09:00	23 Nov 2016 09:00	1	Intermittent unstable operation - excessive baseline drift
H2S	25 Nov 2016 12:00	25 Nov 2016 12:00	1	Intermittent unstable operation - excessive baseline drift



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Brion MacKay River - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 21 ppb on Nov 27 08:00	Maximum Daily Average: 6.3 ppb on Nov 27		Hours of Data:	685
Minimum Value: 0 ppb on Nov 1 12:00	Minimum Daily Average: 0.0 ppb on Nov 30		Hours of Missing Data:	35
Maximum Diurnal Average: 1.0 ppb at hour 8	Minimum Diurnal Average: 0.1 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 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 9		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	0.1	0
2-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	1
3-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
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	1	0.2	1
5-Nov	1	1	1	Z	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
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	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Nov	0	0	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	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	0.1	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	0.1	0
14-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	0.2	0
15-Nov	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	0.1	0
16-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0.2	2
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	0.1	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	0.0	0
19-Nov	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	0.3	1
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	0.2	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	0	0.1	0
22-Nov	0	0	Z	2	2	5	4	4	2	3	9	4	2	1	1	0	0	0	0	0	0	0	0	0	0	1.8	9
23-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	0.1	0
24-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
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	0.1	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	0.1	0
27-Nov	0	Z	0	0	0	8	15	21	16	11	7	7	9	14	8	6	3	1	2	6	7	3	1	0	6.3	21	
28-Nov	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	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	0.0	0

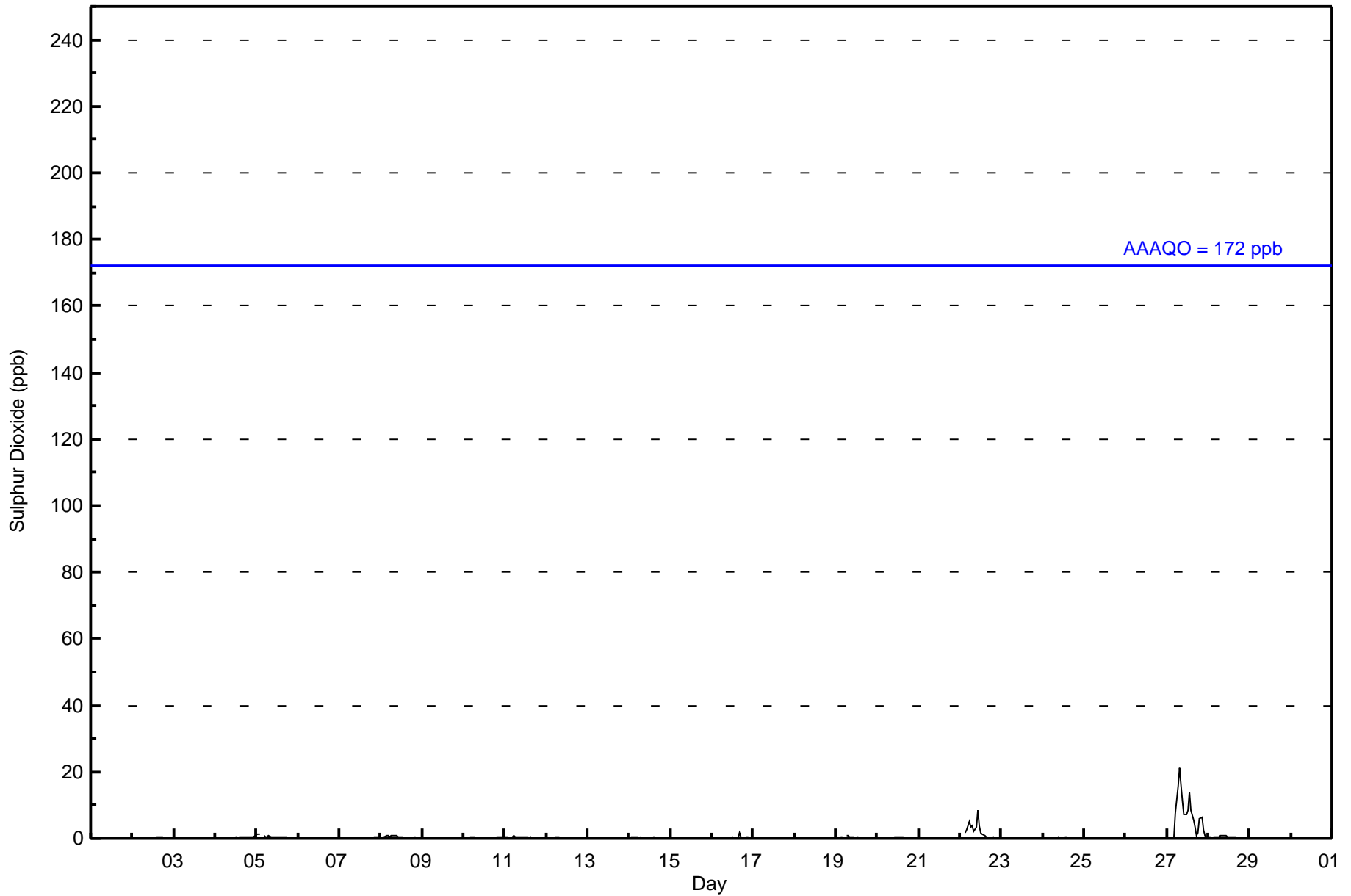
0.1	0.2	0.2	0.2	0.3	0.7	0.8	1.0	0.8	0.7	0.7	0.5	0.5	0.6	0.4	0.3	0.3	0.1	0.1	0.3	0.3	0.2	0.1	0.1	Diurnal Average
1	1	1	2	2	8	15	21	16	11	9	7	9	14	8	6	3	1	2	6	7	3	1	1	Diurnal Maximum

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
Brion MacKay River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	680	99.27	99.27
11 - 20	4	0.58	99.85
21 - 60	1	0.15	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
Brion MacKay River - 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	5	14	13	15	10	46	40	66	119	102	43	81	50	35	29	12	680
11 - 20	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4
21 - 60	0	1	0	0	0	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	5	17	15	15	10	46	40	66	119	102	43	81	50	35	29	12	685

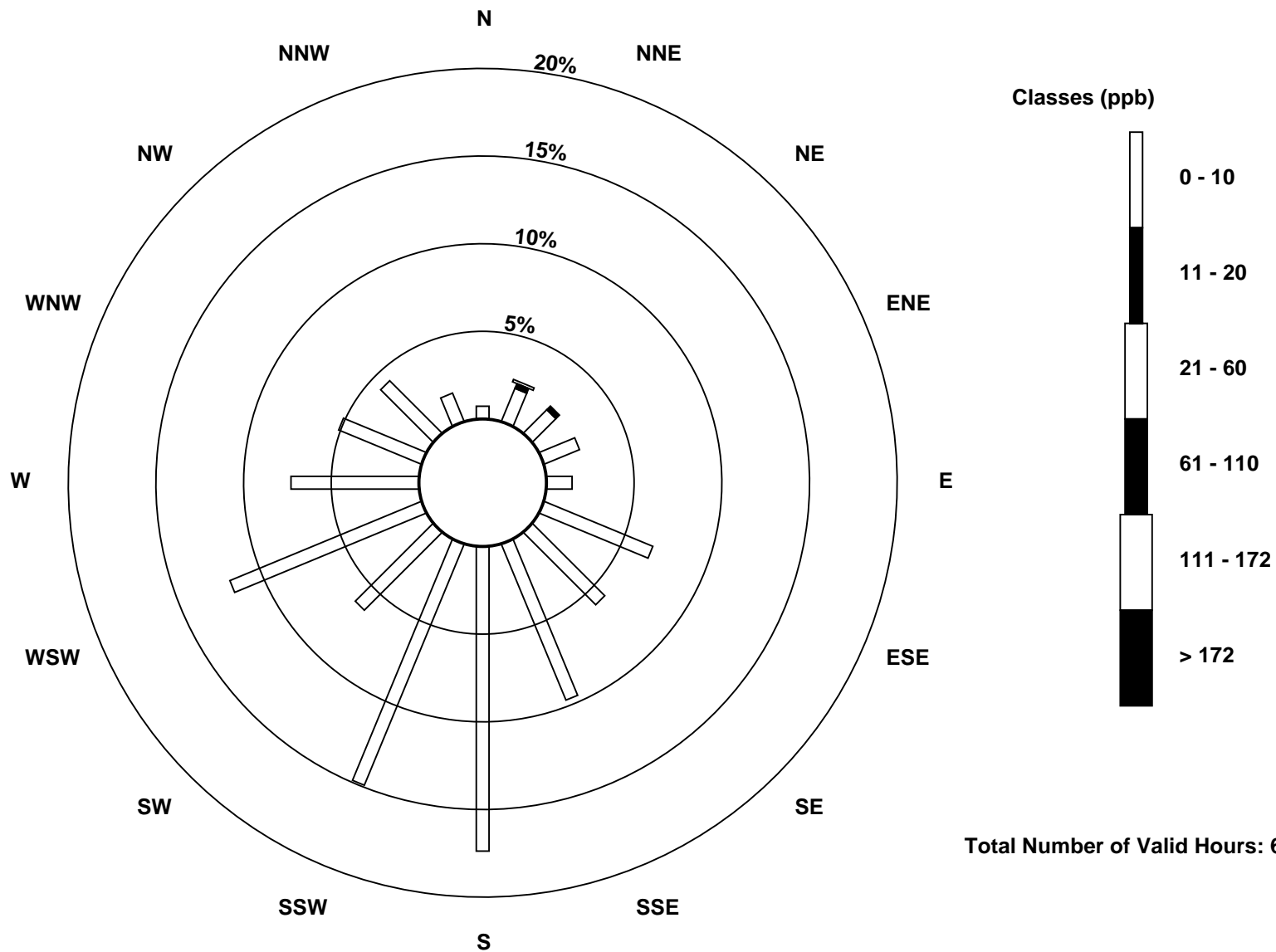
Total Number of Valid Hours: 685

Total Number of Hours: 720

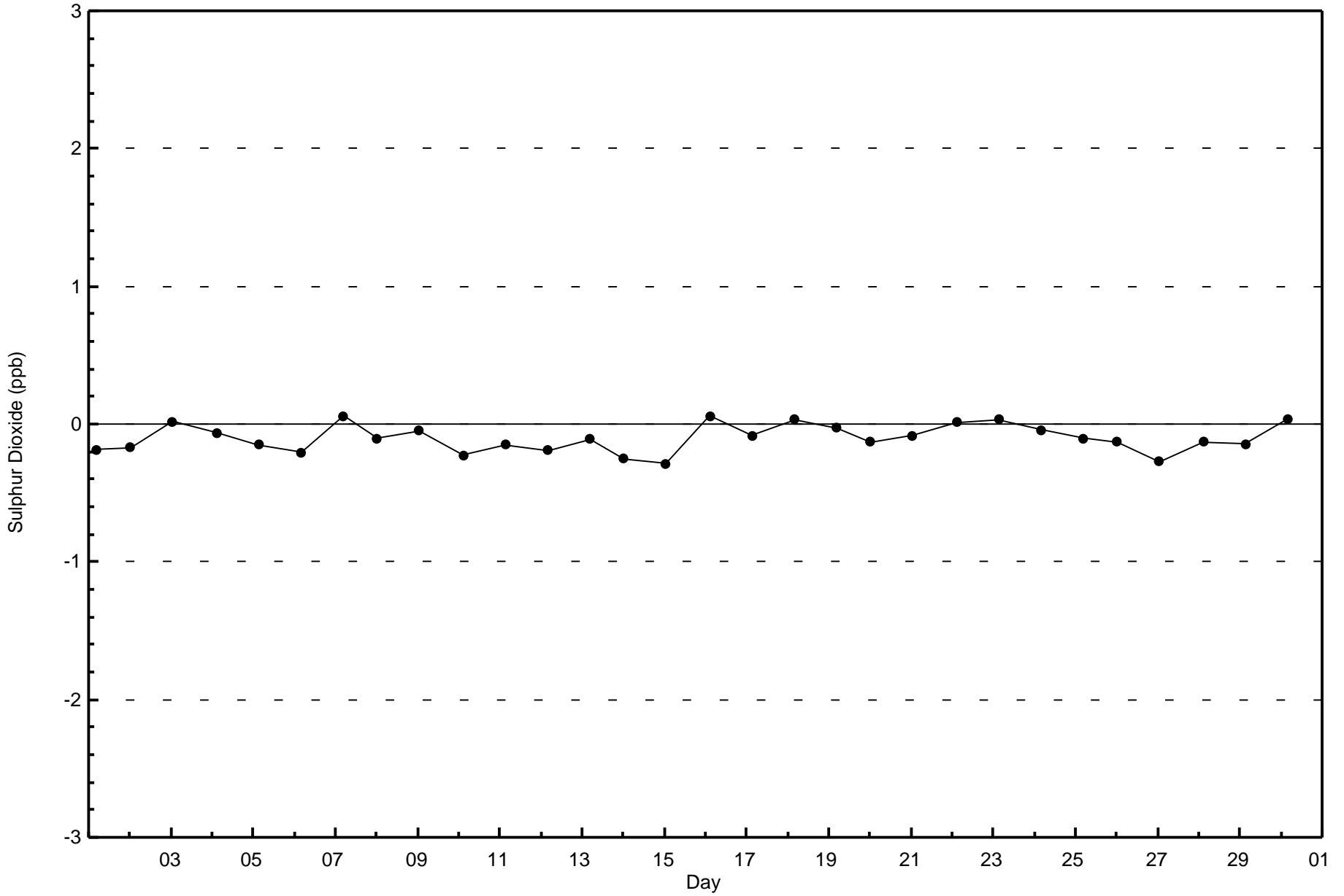


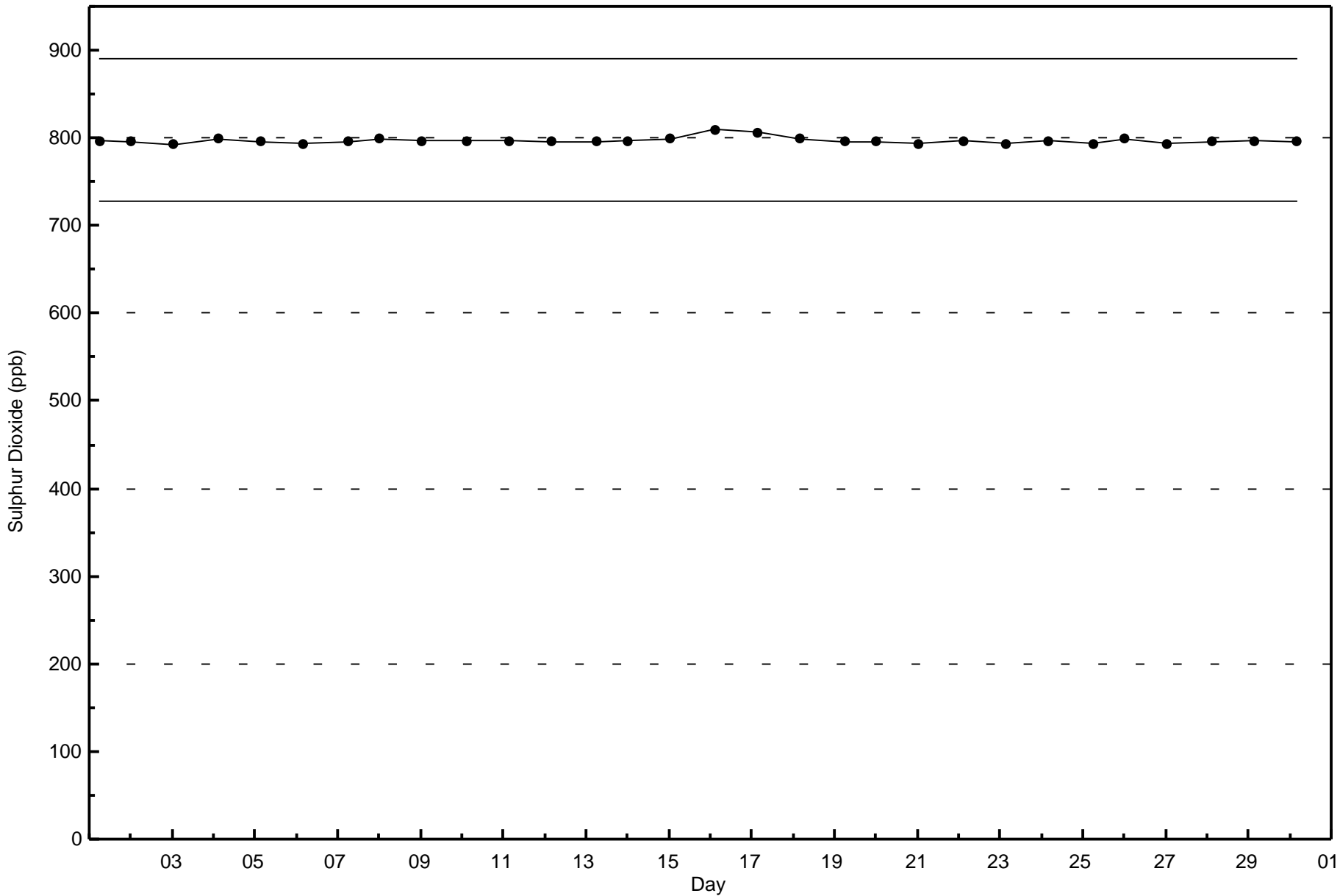
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River (AMS 20)



Total Number of Valid Hours: 685







Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

Brion MacKay River - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Nov 27 08:00	Maximum Daily Average: 0.6 ppb on Nov 27		Hours of Data:	682
Minimum Value: 0 ppb on Nov 18 09:00	Minimum Daily Average: 0.1 ppb on Nov 18		Hours of Missing Data:	38
Maximum Diurnal Average: 0.3 ppb at hour 8	Minimum Diurnal Average: 0.2 ppb at hour 2		Hours of Calibration:	34
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:	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-Nov	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UO	0	0.2	0
2-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	0.2	0
3-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	0.2	0
4-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	0.2	0
5-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	0.3	0
6-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
7-Nov	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
8-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	0.2	0
9-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	0.2	0
10-Nov	0	0	0	Z	0	0	0	0	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-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	0.3	0
12-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	0.3	0
13-Nov	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
14-Nov	0	Z	0	0	0	0	0	1	1	1	1	0	C	C	C	C	0	0	0	0	0	0	0	0	0.4	1
15-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	0.2	0
16-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.2	1
17-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	0.1	0
18-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	0.1	0
19-Nov	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-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	0.2	0
21-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	0.3	0
22-Nov	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
23-Nov	0	0	0	0	Z	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-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	0.1	0
25-Nov	0	0	0	0	0	0	Z	0	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-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	0.2	0
27-Nov	0	0	Z	0	0	1	1	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	2
28-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	0.3	0
29-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	0.2	0
30-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	0.1	0

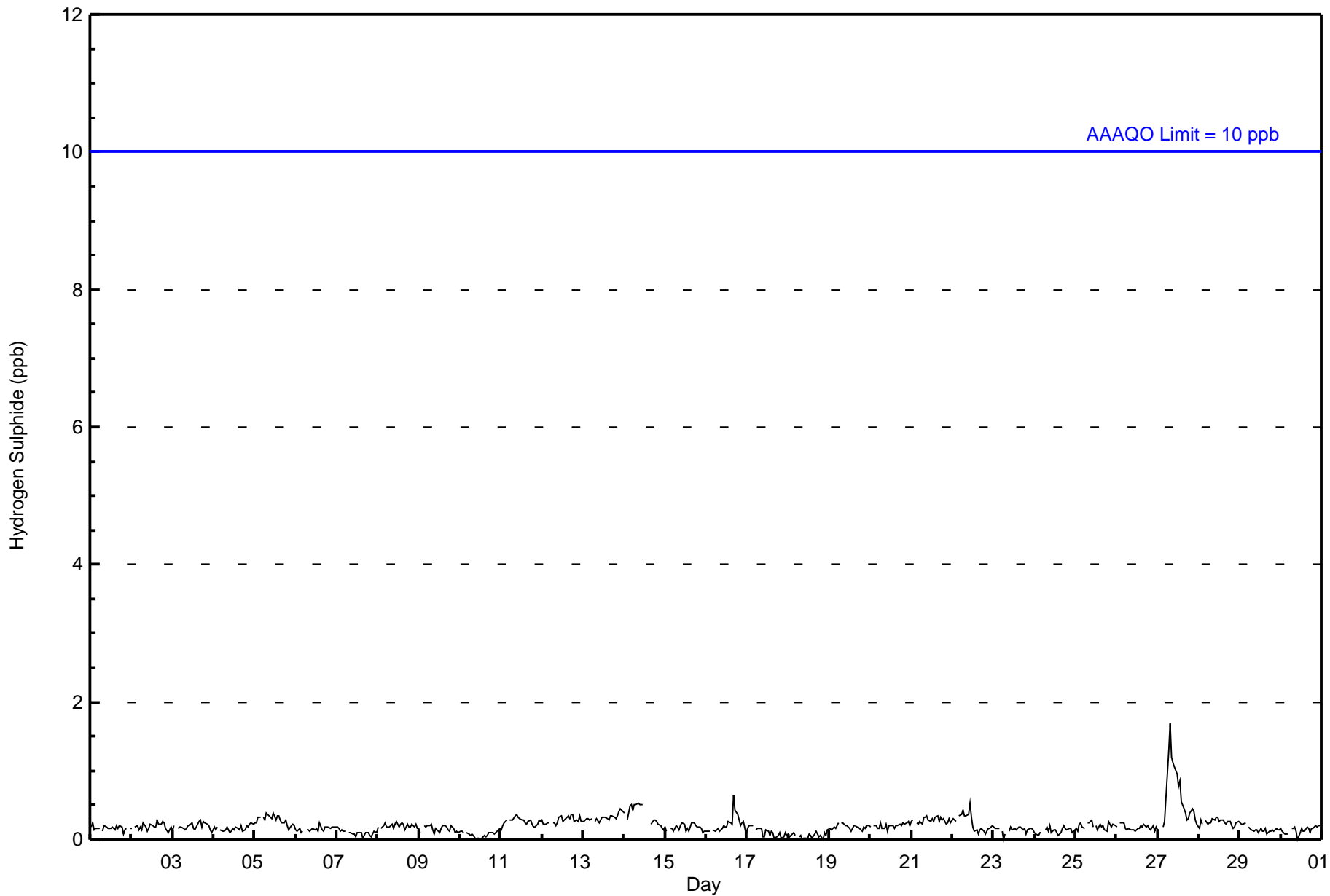
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
0	0	0	0	0	0	1	1	2	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - November 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: 720



Wood Buffalo Environmental Association
Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - 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 - 2	5	18	13	17	10	44	42	64	116	102	43	83	50	34	29	12	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	5	18	13	17	10	44	42	64	116	102	43	83	50	34	29	12	682

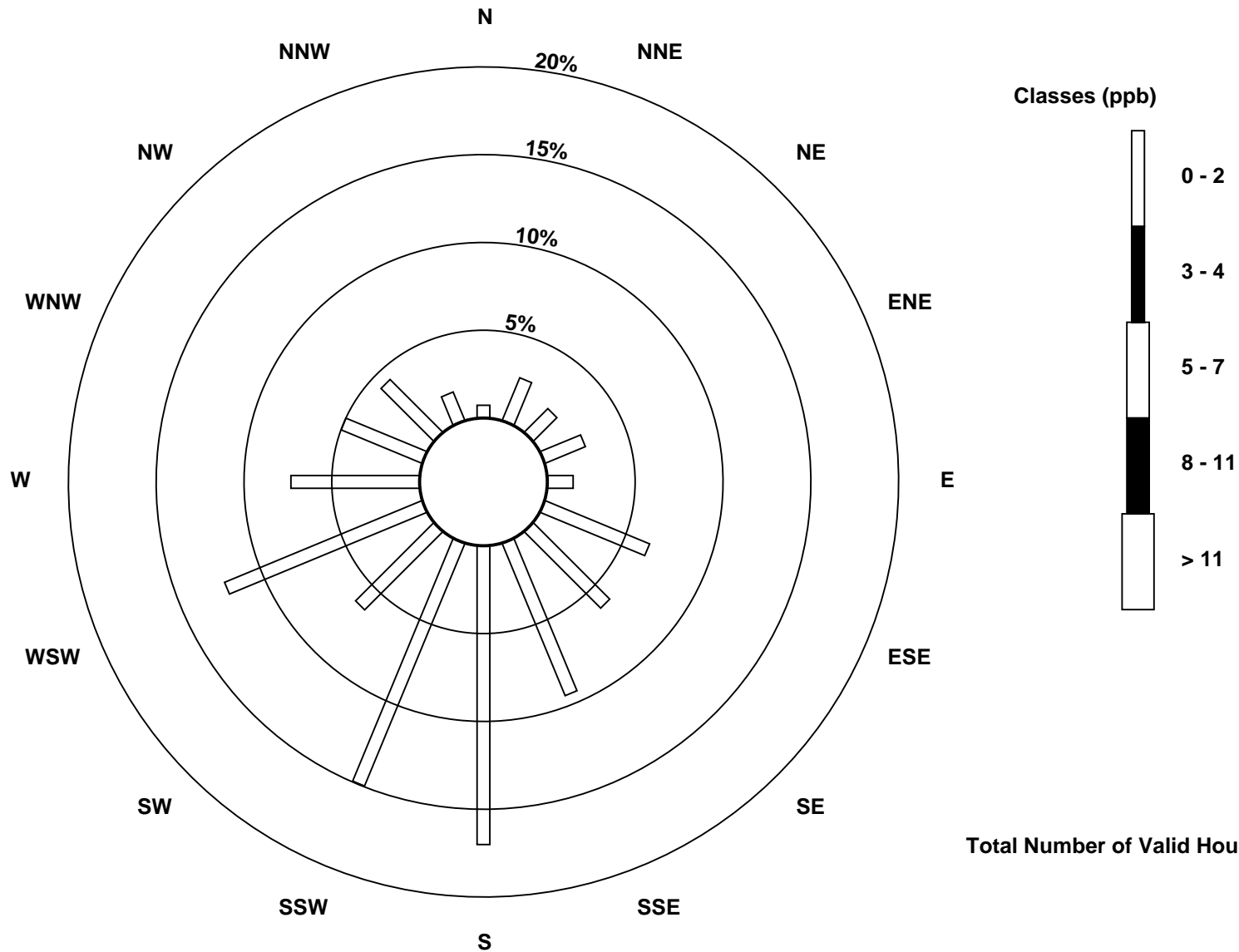
Total Number of Valid Hours: 682

Total Number of Hours: 720

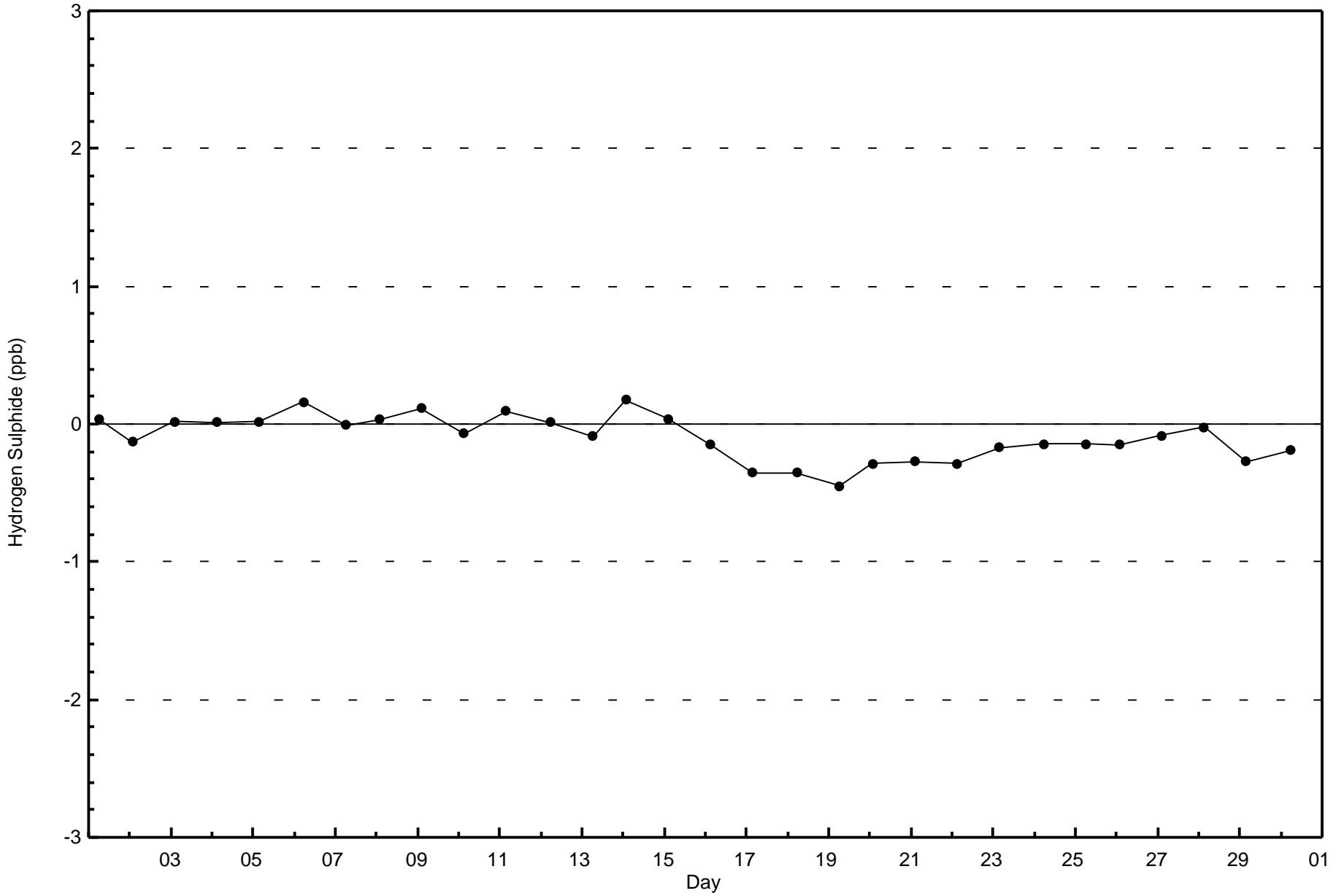


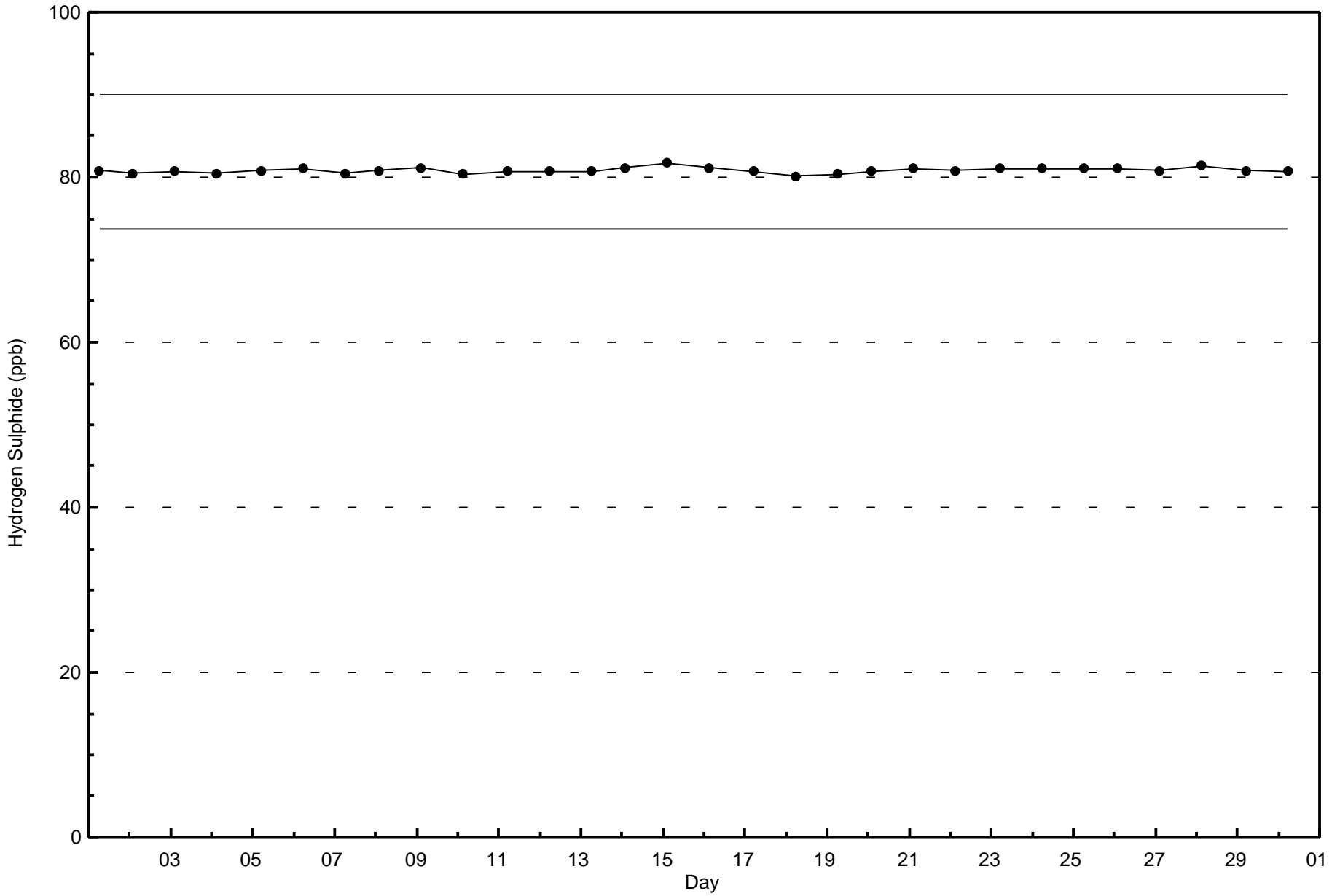
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River (AMS 20)



Total Number of Valid Hours: 682







Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Brion MacKay River - November 2016

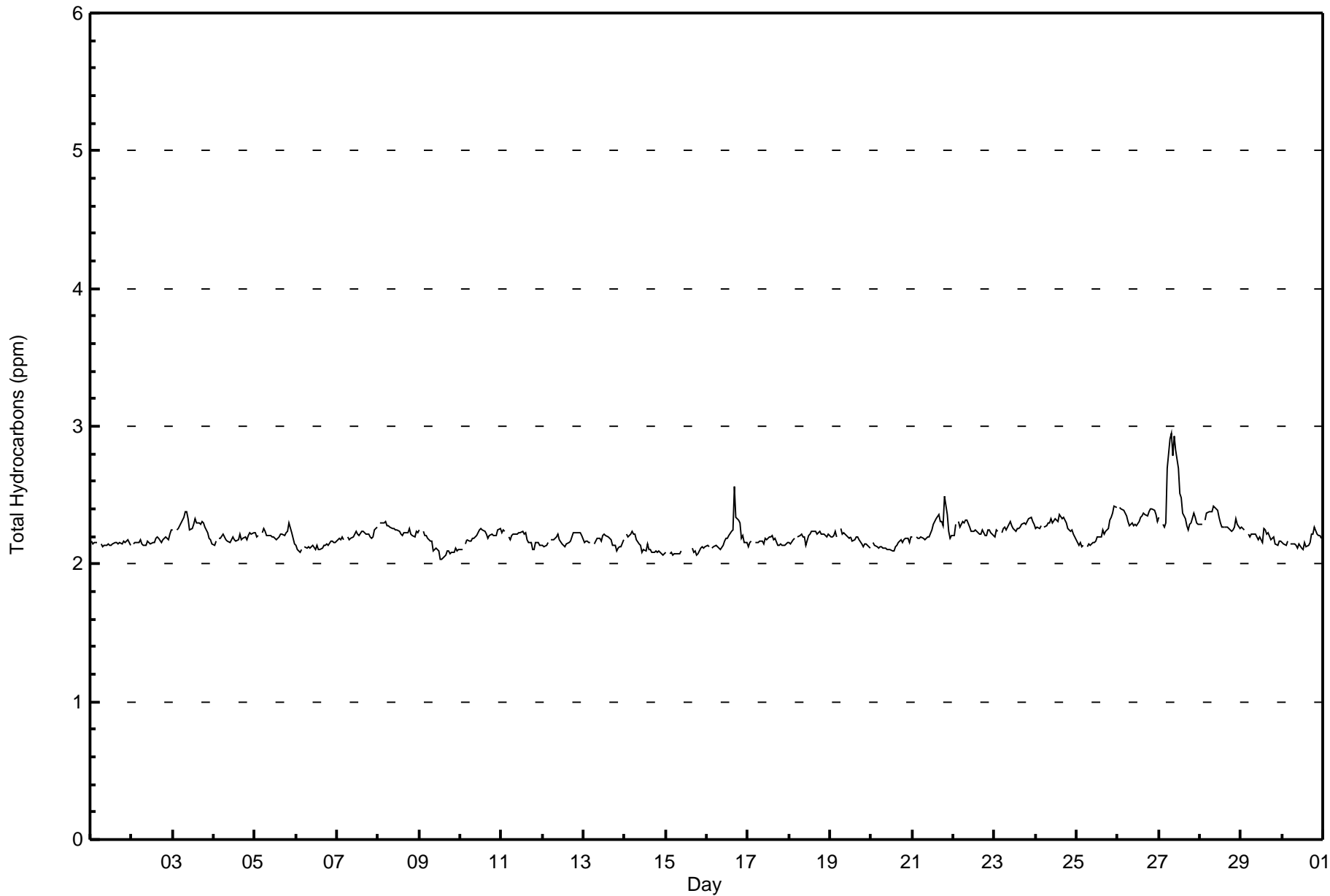
Maximum Value: 2.9 ppm on Nov 27 08:00		Maximum Daily Average: 2.5 ppm on Nov 27		Hours in Service: 720																						
Minimum Value: 2.0 ppm on Nov 9 13:00		Minimum Daily Average: 2.1 ppm on Nov 15		Hours of Data: 685																						
Maximum Diurnal Average: 2.2 ppm at hour 6		Minimum Diurnal Average: 2.2 ppm at hour 1		Hours of Missing Data: 35																						
Monthly Average: 2.21 ppm		Percentiles: P ₁ = 2.1 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.2 Q ₃ = 2.2 P ₉₀ = 2.3 P ₉₉ = 2.7		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	2.2	2.1	2.2	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1
2-Nov	Z	2.1	2.2	2.2	2.2	2.2	2.1	2.1	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	2.2	2.2
3-Nov	2.3	Z	2.2	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	2.2	2.2	2.2	2.2	2.1	2.3
4-Nov	2.1	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
5-Nov	2.2	2.2	2.2	Z	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	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.2
6-Nov	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	2.2	2.2	2.2	2.2	2.2	2.1
7-Nov	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	2.2	2.2	2.2	2.2	2.2	2.3	2.2
8-Nov	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	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2
9-Nov	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.0	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
10-Nov	2.1	2.1	Z	2.1	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	2.3	2.2	2.3
11-Nov	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	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2
12-Nov	2.1	2.1	2.1	2.2	Z	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2
13-Nov	2.2	2.2	2.2	2.2	2.2	Z	2.1	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	2.1	2.1	2.1	2.2	2.2	2.2
14-Nov	Z	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
15-Nov	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
16-Nov	2.1	2.1	Z	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	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2
17-Nov	2.1	2.2	2.2	Z	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	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2
18-Nov	2.2	2.1	2.2	2.2	Z	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2
19-Nov	2.2	2.2	2.2	2.2	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	2.2	2.1	2.1	2.1	2.1	2.1	2.2
20-Nov	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1
21-Nov	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	2.4	2.3	2.3	2.3	2.3	2.5	2.4	2.2	2.2	2.2	2.3
22-Nov	2.2	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	2.3
23-Nov	2.2	2.2	2.2	Z	2.2	2.3	2.3	2.2	2.3	2.3	2.3	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	2.3	2.3
24-Nov	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	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3
25-Nov	2.2	2.1	2.2	2.1	2.1	Z	2.1	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	2.3	2.4	2.4	2.4	2.2
26-Nov	Z	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	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3
27-Nov	2.3	Z	2.3	2.3	2.3	2.7	2.9	2.9	2.8	2.9	2.8	2.7	2.5	2.5	2.4	2.3	2.3	2.2	2.3	2.3	2.4	2.3	2.3	2.3	2.5	2.9
28-Nov	2.3	2.3	Z	2.3	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	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3
29-Nov	2.3	2.3	2.3	Z	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	2.2	2.1	2.2	2.2	2.2	2.2
30-Nov	2.2	2.1	2.1	2.2	Z	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2
																								Diurnal Average		
																								Diurnal Maximum		
																								2.2		
																								2.3		

Z - zerospan C - Calibration



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Brion MacKay River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Brion MacKay River - November 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	3	0.44	0.44
2.1 - 3.0	682	99.56	100.00
3.1 - 10.0	0	0.00	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
Brion MacKay River - November 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	2	1	0	0	3
2.1 - 3.0	5	17	15	15	10	46	40	66	119	102	43	81	48	34	29	12	682
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	5	17	15	15	10	46	40	66	119	102	43	81	50	35	29	12	685

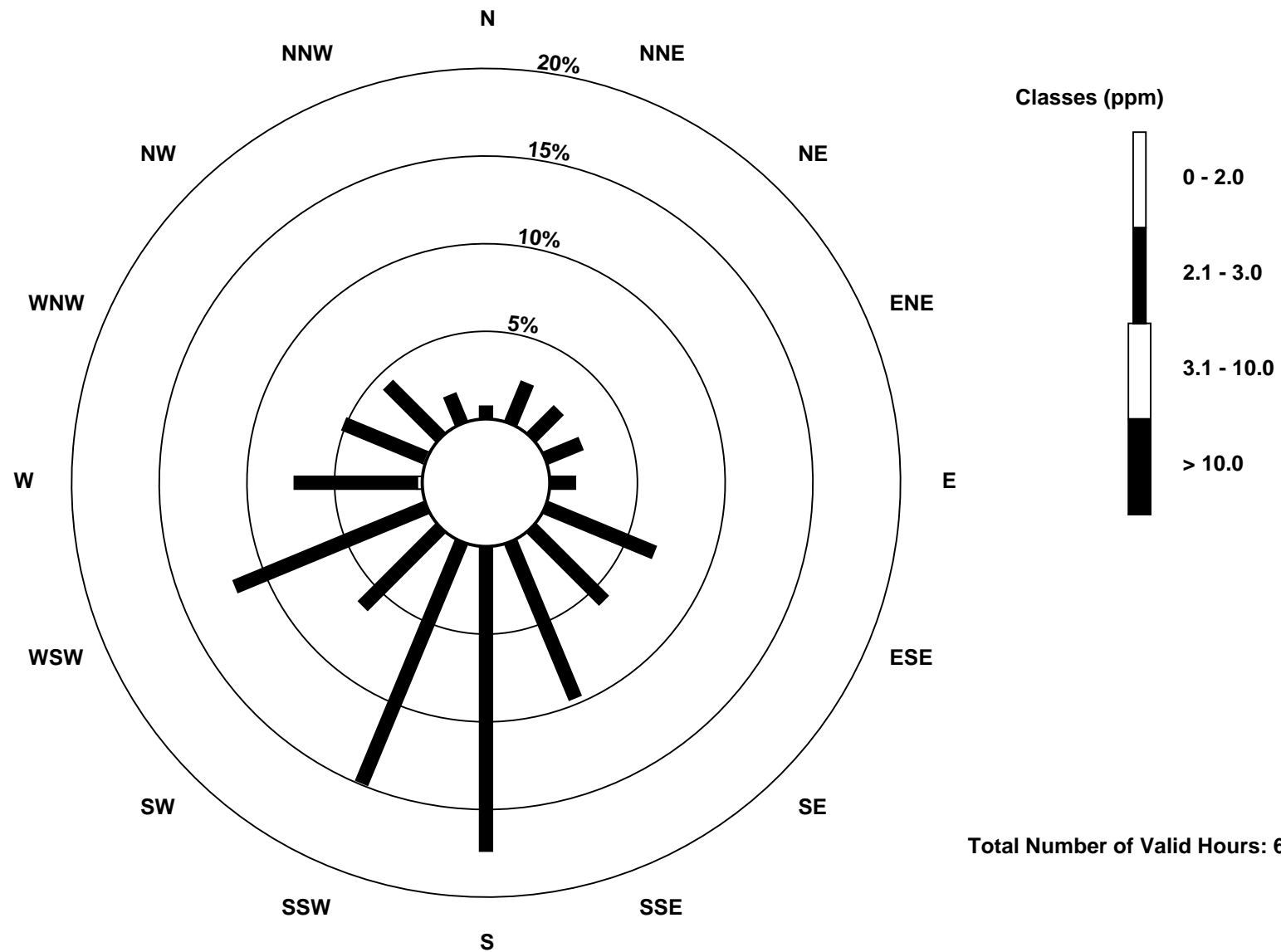
Total Number of Valid Hours: 685

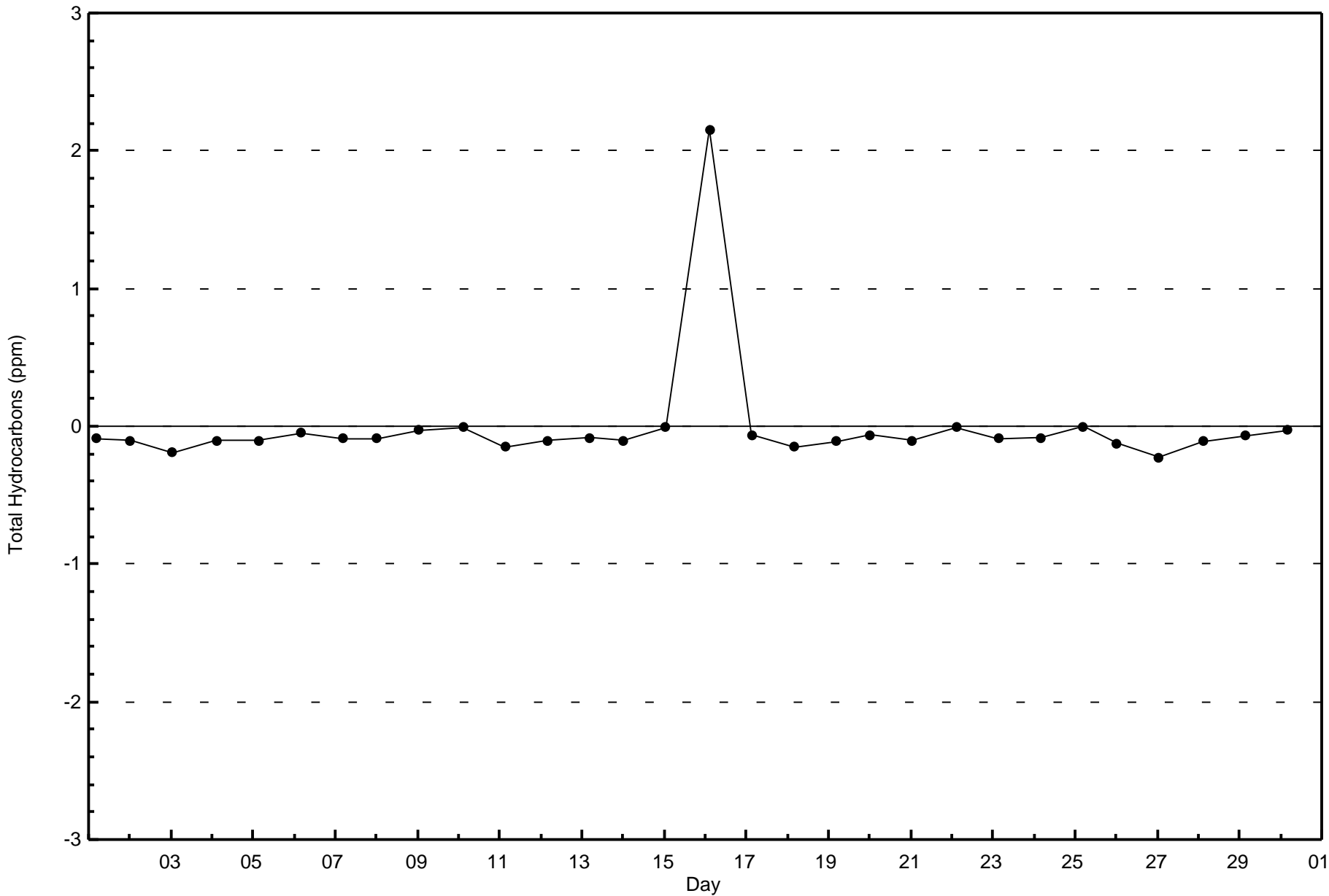
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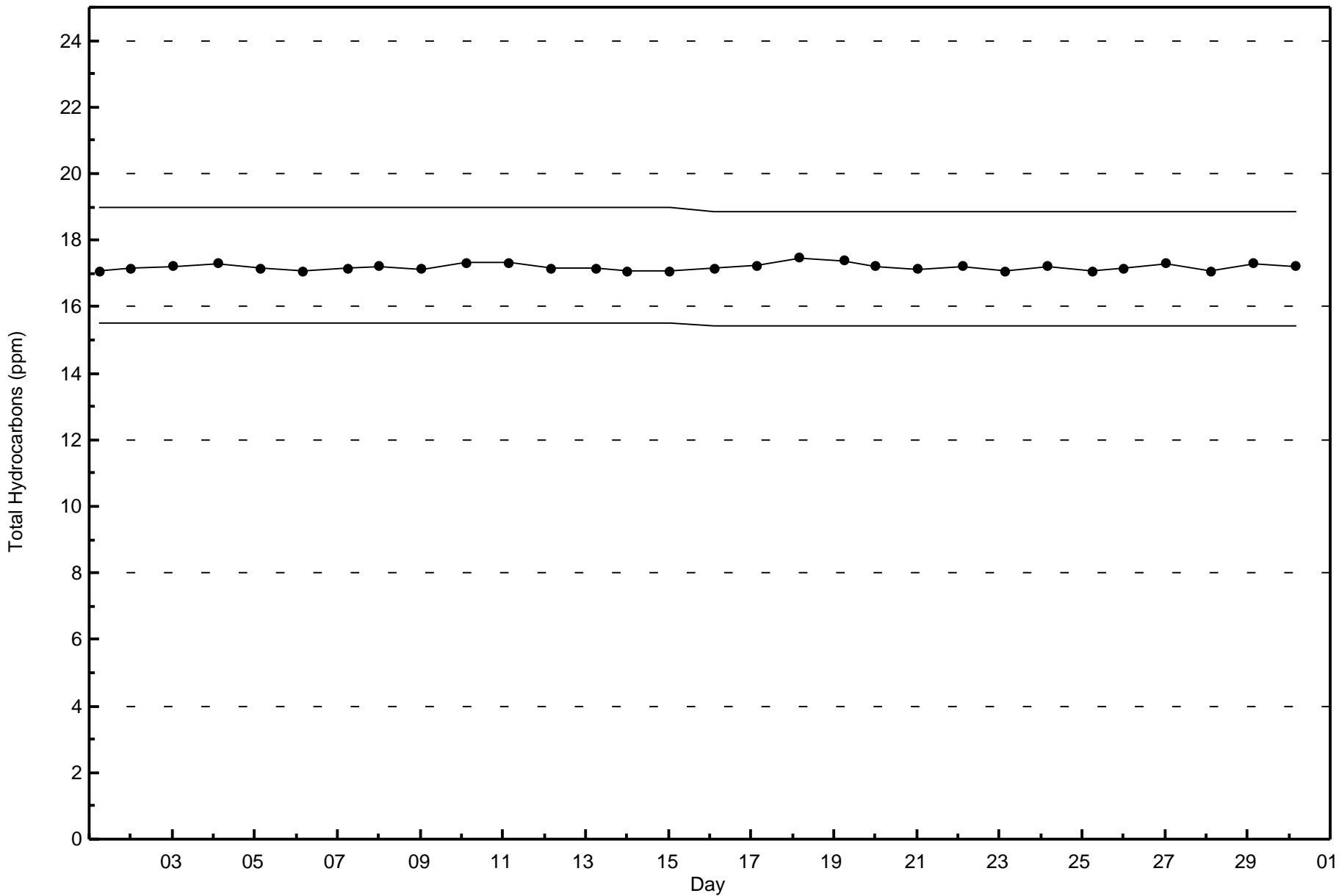


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Brion MacKay River (AMS 20)

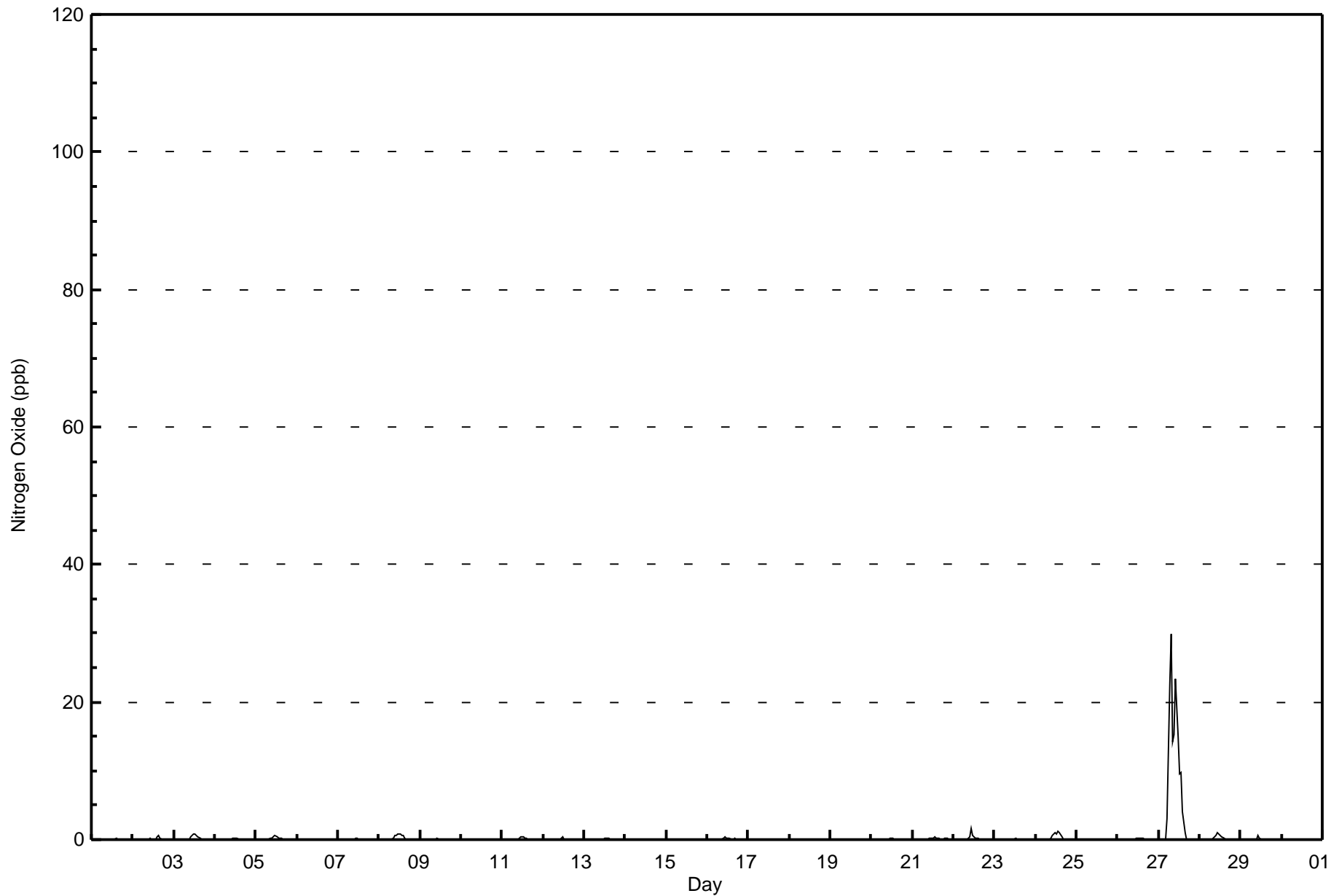








Maximum Value: 30 ppb on Nov 27 08:00																	Maximum Daily Average: 6.4 ppb on Nov 27																	Hours in Service: 720	
Minimum Value: 0 ppb on Nov 1 01:00																	Minimum Daily Average: 0.0 ppb on Nov 15																	Hours of Data: 685	
Maximum Diurnal Average: 1.1 ppb at hour 11																	Minimum Diurnal Average: 0.0 ppb at hour 1																	Hours of Missing Data: 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 = 8																	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	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	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1	1									
3-Nov	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.1	1									
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	0									
5-Nov	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1									
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									
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	0									
8-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1									
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	0									
10-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									
11-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	0.1	0									
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									
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									
14-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									
15-Nov	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0.0	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	0.1	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									
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	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									
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									
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	0.1	0									
22-Nov	0	0	Z	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2									
23-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									
24-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	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									
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	0.1	0									
27-Nov	0	Z	0	0	0	3	23	30	14	15	23	15	10	10	4	1	0	0	0	0	0	0	0	0	6.4	30									
28-Nov	0	0	Z	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
29-Nov	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									
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	0									
																	0.0 0.0 0.0 0.0 0.0 0.1 0.8 1.0 0.5 0.6 1.1 0.8 0.5 0.5 0.3 0.1 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 3 23 30 14 15 23 15 10 10 4 1 0 0 0 0 0 0 0 0 0																	Diurnal Maximum	
Z - zerospan		C - Calibration																																	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Brion MacKay River - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	682	99.56	99.56
21 - 40	3	0.44	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 Oxide (NO) - ppb
Brion MacKay River - 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	5	15	14	15	10	46	40	66	119	102	43	81	50	35	29	12	682
21 - 40	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3
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	5	17	15	15	10	46	40	66	119	102	43	81	50	35	29	12	685

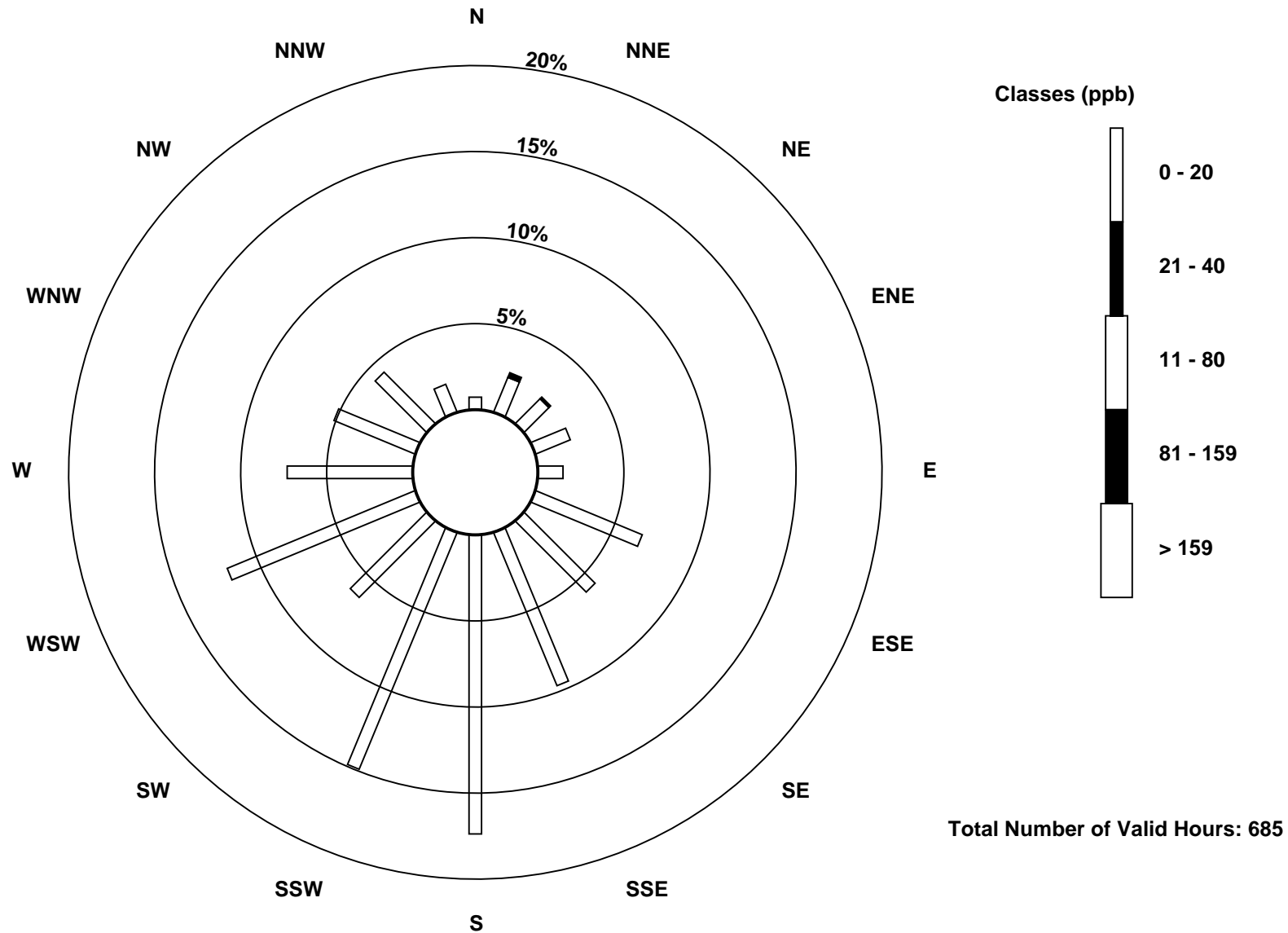
Total Number of Valid Hours: 685

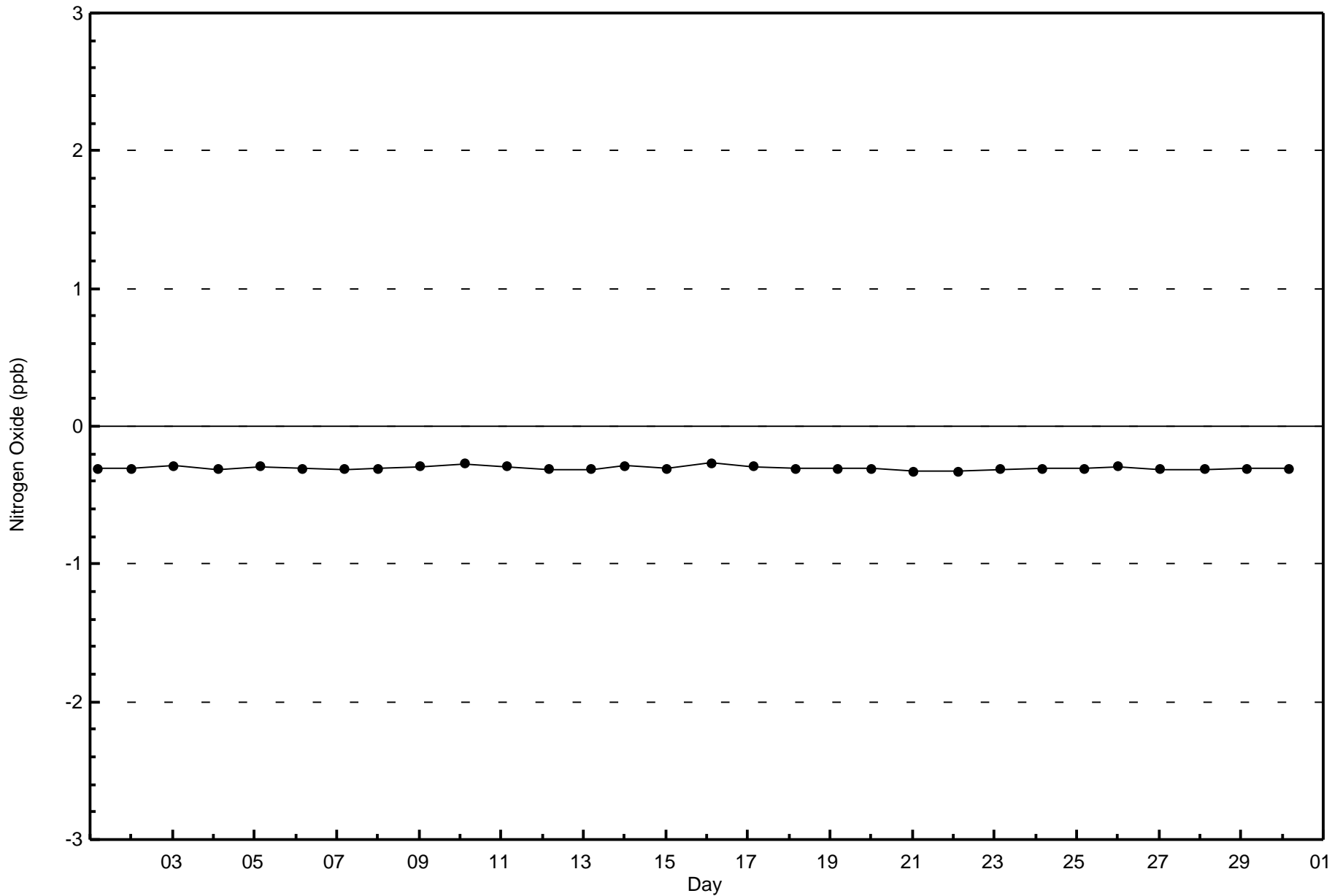
Total Number of Hours: 720

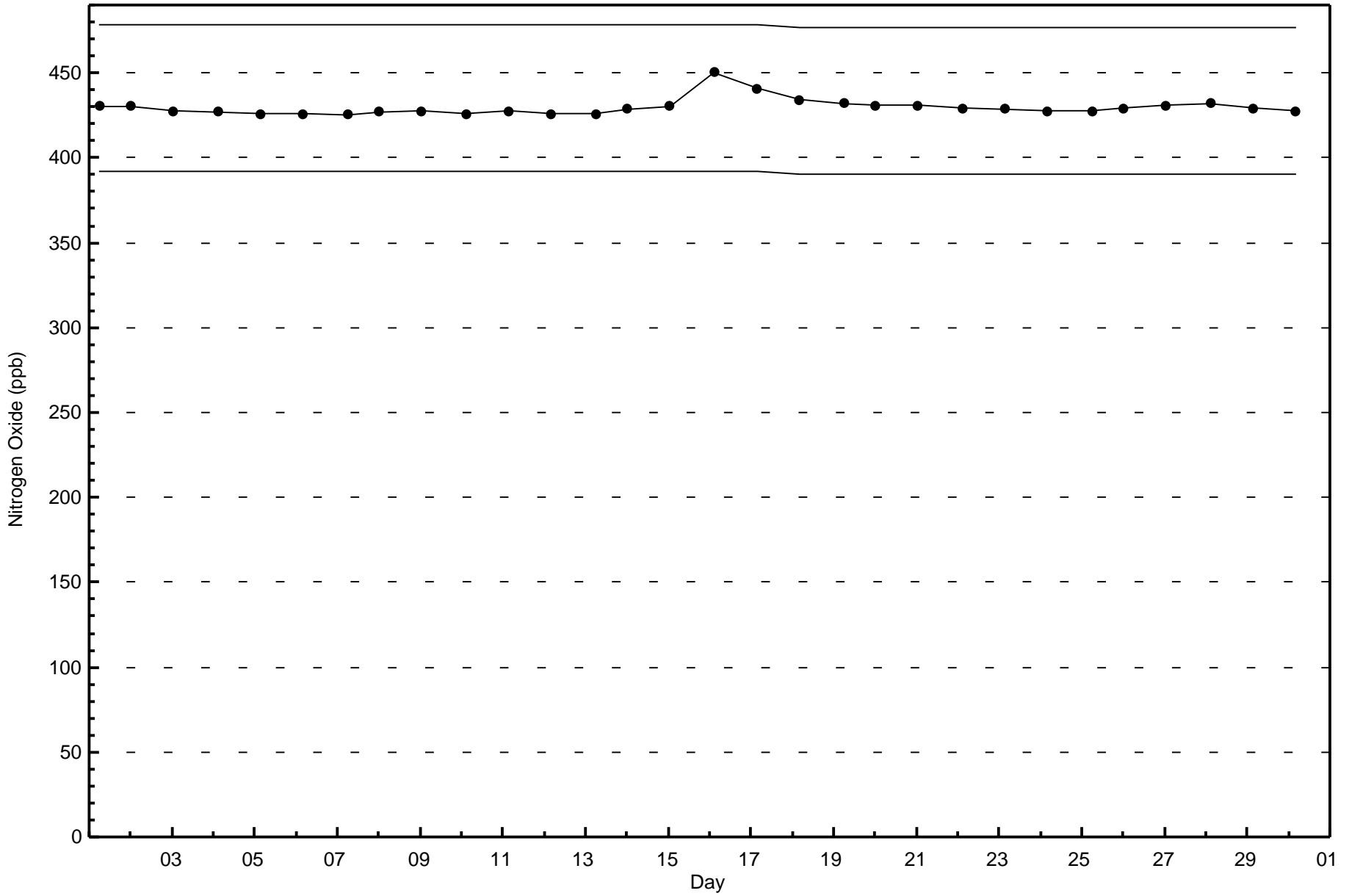


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxide (NO) - ppb
Brion MacKay River (AMS 20)









Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 24 ppb on Nov 27 08:00	Maximum Daily Average: 12.2 ppb on Nov 27
Minimum Value: 0 ppb on Nov 1 03:00	Hours of Data: 685
Maximum Diurnal Average: 2.3 ppb at hour 11	Hours of Missing Data: 35
Monthly Average: 1.7 ppb	Hours of Calibration: 35
Minimum Daily Average: 0.2 ppb on Nov 18	Percent Operational Time: 100.0
Minimum Diurnal Average: 1.2 ppb at hour 1	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 18	

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	0	0	0	0	Z	0	0	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0.4	1	
2-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	3	3	3	3	2	2	3	3	1.2	3	
3-Nov	4	Z	4	3	3	2	1	2	1	2	2	1	1	2	2	2	2	2	2	2	1	1	1	1	1.8	4	
4-Nov	1	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	4	1.1	4
5-Nov	4	4	4	Z	3	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	1	2.3	4	
6-Nov	1	1	1	1	Z	0	0	0	0	1	1	1	1	0	1	1	1	0	0	1	1	0	0	1	0.6	1	
7-Nov	1	1	1	0	0	Z	1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	2	0.7	2	
8-Nov	Z	3	3	3	3	3	3	4	4	4	3	3	2	2	2	2	2	2	2	2	3	2	2	1	2.6	4	
9-Nov	1	Z	2	3	2	2	2	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1.0	3	
10-Nov	0	0	Z	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0.6	1	
11-Nov	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	1	1	1	1	1	1.4	2	
12-Nov	1	1	1	1	Z	1	1	1	0	1	2	3	1	2	1	2	1	3	1	1	1	1	0	0	1.0	3	
13-Nov	0	0	0	1	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0.5	1	
14-Nov	Z	2	2	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.9	2	
15-Nov	1	Z	1	1	1	1	1	1	1	1	C	C	C	C	C	1	1	0	0	0	0	0	0	0	0.6	1	
16-Nov	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	2	18	15	12	11	4	4	0	1	3.3	18	
17-Nov	1	0	0	Z	0	2	1	0	1	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0.5	2	
18-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	0.2	1	
19-Nov	0	1	1	1	2	Z	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1.1	4	
20-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	0.9	2	
21-Nov	1	Z	1	1	1	1	1	1	1	1	1	2	2	2	3	2	2	2	2	3	2	1	1	1	1.4	3	
22-Nov	2	7	Z	4	4	5	5	5	5	5	9	5	3	2	2	1	1	1	1	1	1	1	1	1	3.0	9	
23-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1.4	2	
24-Nov	2	2	2	2	Z	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	4	3	2	2.9	4	
25-Nov	1	2	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	4	1.3	4	
26-Nov	Z	4	4	3	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1.6	4	
27-Nov	1	Z	1	1	1	16	24	24	23	22	21	18	16	17	15	12	9	7	7	10	12	10	7	6	12.2	24	
28-Nov	6	5	Z	4	5	5	5	5	6	6	5	3	2	2	1	1	2	1	1	1	1	1	1	0	3.0	6	
29-Nov	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0.4	1	
30-Nov	1	1	1	1	Z	1	1	1	0	0	1	1	1	1	0	1	1	1	2	2	2	1	1	1	0.9	2	

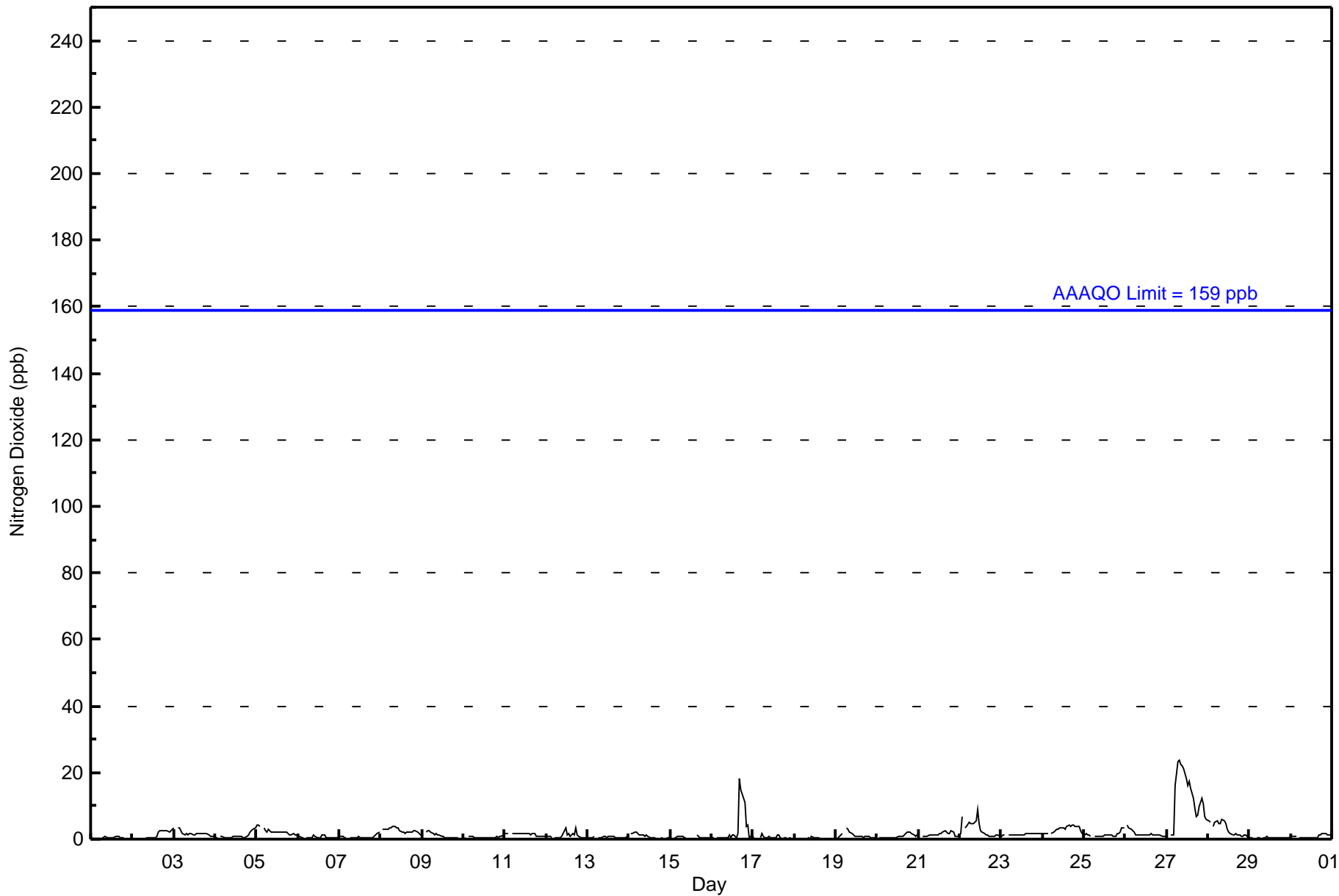
1.2	1.5	1.2	1.3	1.5	2.1	2.1	2.0	2.1	2.1	2.1	2.3	1.9	1.6	1.6	1.6	1.6	2.0	1.9	1.7	1.8	1.6	1.5	1.2	1.2	Diurnal Average	
6	7	4	4	5	16	24	24	23	22	21	21	18	16	17	15	12	18	15	12	11	12	10	7	6	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	680	99.27	99.27
21 - 40	5	0.73	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
Brion MacKay River - 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	5	14	13	15	10	46	40	66	119	102	43	81	50	35	29	12	680
21 - 40	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5
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	5	17	15	15	10	46	40	66	119	102	43	81	50	35	29	12	685

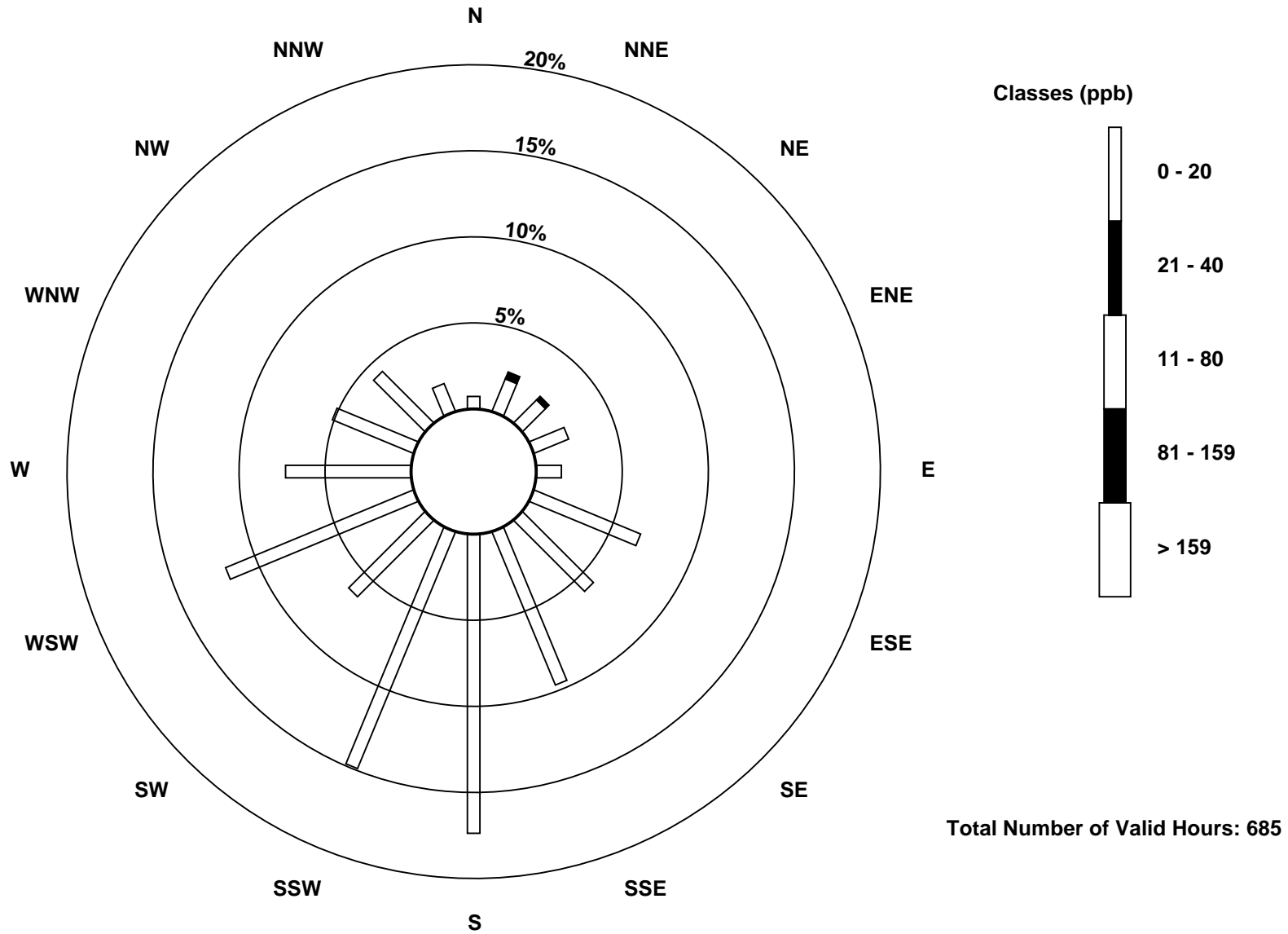
Total Number of Valid Hours: 685

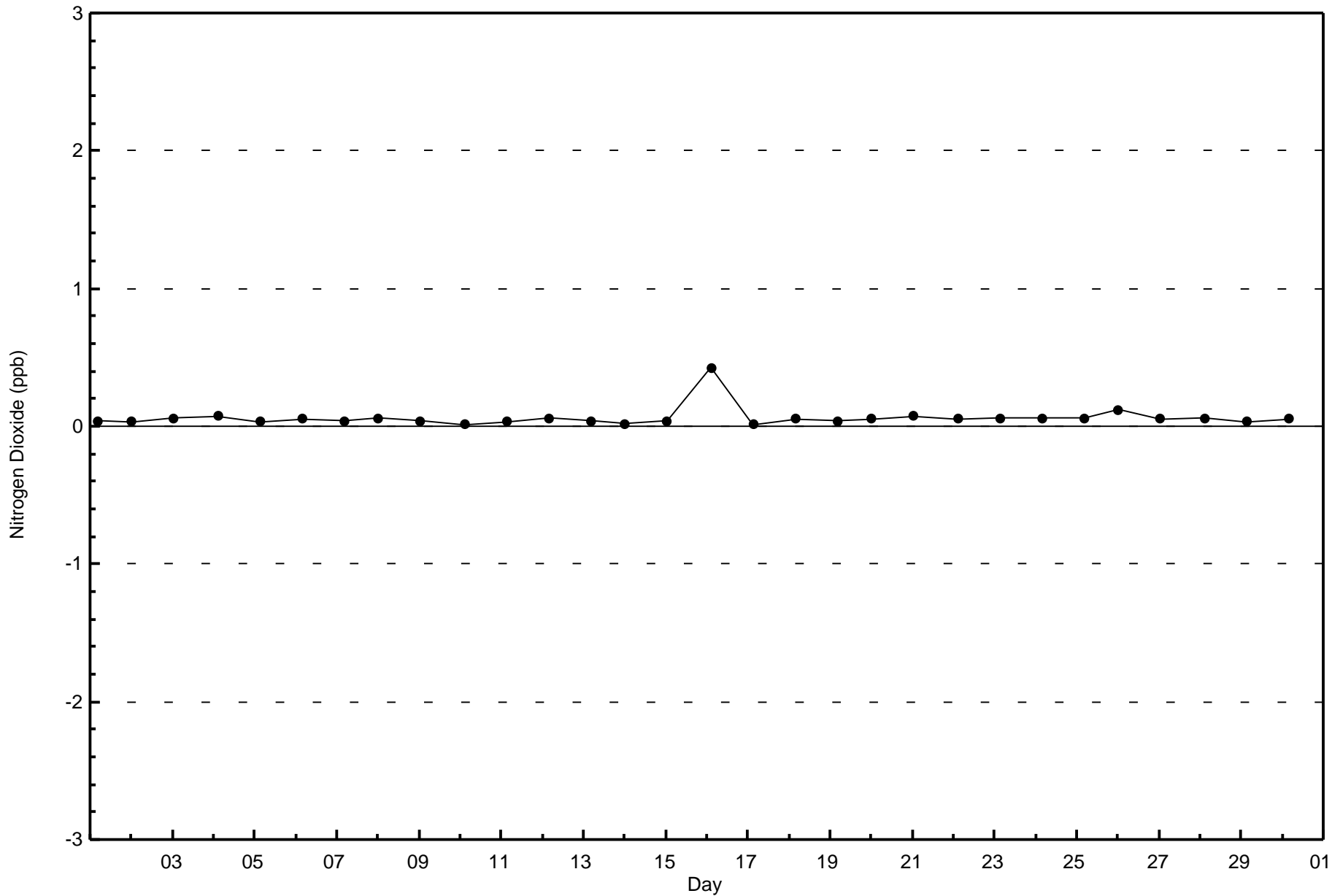
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River (AMS 20)

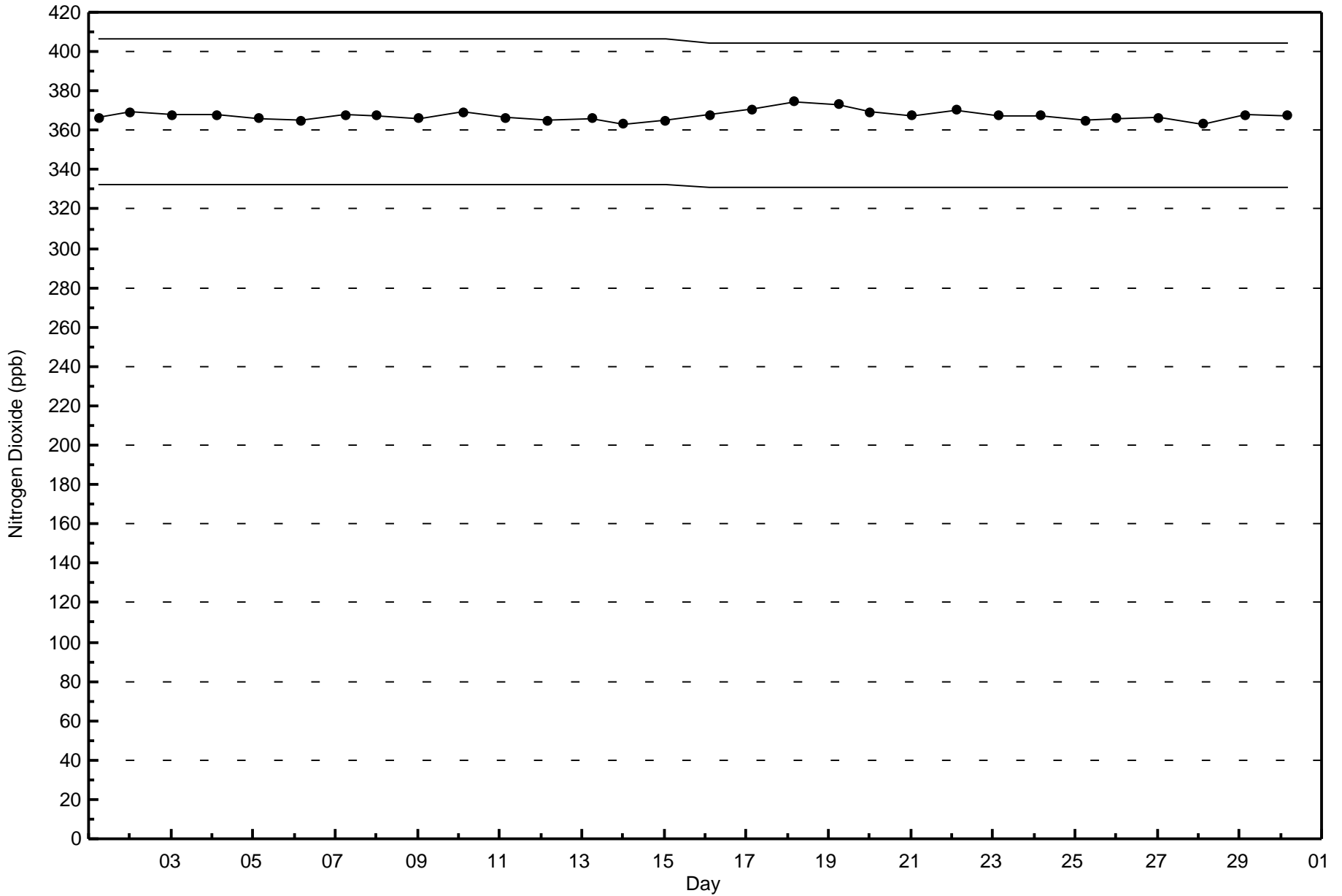






Wood Buffalo Environmental Association
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - November 2016





Maximum Value: 54 ppb on Nov 27 08:00	Maximum Daily Average: 18.7 ppb on Nov 27	Hours in Service: 720
Minimum Value: 0 ppb on Nov 2 06:00	Minimum Daily Average: 0.2 ppb on Nov 18	Hours of Data: 685
Maximum Diurnal Average: 3.3 ppb at hour 11	Minimum Diurnal Average: 1.2 ppb at hour 1	Hours of Missing Data: 35
Monthly Average: 2.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 4 P ₉₉ = 25	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	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0.4	1
2-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	3	3	3	3	3	2	2	3	3	1.3	3
3-Nov	4	Z	4	3	3	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1.9	4
4-Nov	1	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	4	1.1	4
5-Nov	4	4	4	Z	3	3	2	3	2	2	3	3	3	2	2	2	2	2	2	1	1	2	1	1	2.4	4
6-Nov	1	1	1	0	Z	0	0	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0.6	1
7-Nov	1	1	1	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	2	2	0.7	2
8-Nov	Z	3	3	3	3	3	3	4	4	4	4	4	3	3	3	2	2	2	2	2	3	2	2	1	2.8	4
9-Nov	1	Z	2	3	2	2	1	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1.0	3
10-Nov	0	0	Z	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1	1	1	1	1	0.6	1
11-Nov	2	2	2	Z	1	2	2	2	2	2	2	2	2	2	2	1	2	2	1	1	1	1	1	1	1.5	2
12-Nov	1	1	1	1	Z	1	1	1	0	1	2	4	1	2	1	2	1	3	1	1	1	0	0	0	1.1	4
13-Nov	0	0	0	0	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0.6	1
14-Nov	Z	2	2	2	2	2	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0.9	2
15-Nov	0	Z	1	1	1	1	1	1	1	1	C	C	C	C	C	1	1	0	0	0	0	0	0	0	0.6	1
16-Nov	0	0	Z	0	0	0	0	1	1	1	2	1	2	1	1	2	19	15	12	11	4	4	0	1	3.4	19
17-Nov	1	0	0	Z	0	2	1	0	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0.5	2
18-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	0.2	1
19-Nov	0	0	1	1	2	Z	4	3	2	2	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1.1	4
20-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	0.9	2
21-Nov	1	Z	1	1	1	1	1	1	1	1	1	2	2	2	3	3	2	2	2	2	3	3	1	1	1.5	3
22-Nov	2	7	Z	4	4	5	5	5	5	6	11	5	3	2	2	1	1	1	1	1	1	1	1	1	3.2	11
23-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	2	2	1.4	2
24-Nov	2	2	2	1	Z	2	2	2	3	3	4	4	4	4	5	5	4	4	4	4	4	4	3	2	3.2	5
25-Nov	1	2	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	1.3	4
26-Nov	Z	4	3	3	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1.7	4
27-Nov	1	Z	1	1	1	19	46	54	37	37	44	33	26	27	19	13	9	7	7	10	12	10	7	6	18.7	54
28-Nov	6	5	Z	4	5	5	5	5	6	6	6	4	3	2	2	1	1	1	1	1	1	1	0	0	3.1	6
29-Nov	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	1	0.4	1
30-Nov	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	1	1	0.8	2

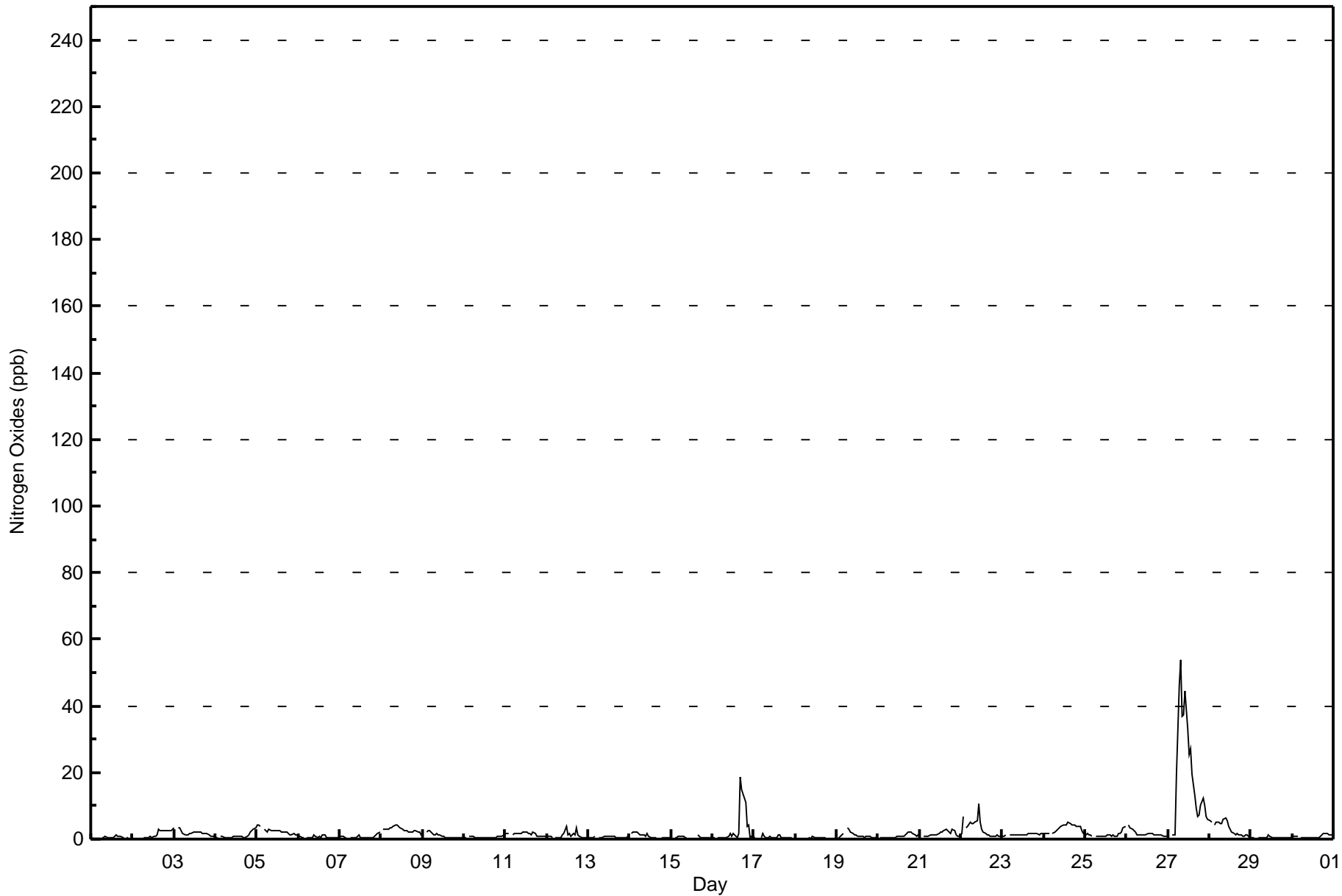
1.2	1.5	1.2	1.3	1.5	2.2	2.8	3.0	2.6	2.7	3.3	2.6	2.2	2.2	1.9	1.7	2.1	1.9	1.7	1.8	1.6	1.5	1.3	1.2	Diurnal Average	
6	7	4	4	5	19	46	54	37	37	44	33	26	27	19	13	19	15	12	11	12	10	7	6	Diurnal Maximum	

Z - zerospan C - Calibration



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	677	98.83	98.83
21 - 40	5	0.73	99.56
41 - 80	3	0.44	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
Brion MacKay River - 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	5	11	13	15	10	46	40	66	119	102	43	81	50	35	29	12	677
21 - 40	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
11 - 80	0	2	1	0	0	0	0	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	5	17	15	15	10	46	40	66	119	102	43	81	50	35	29	12	685

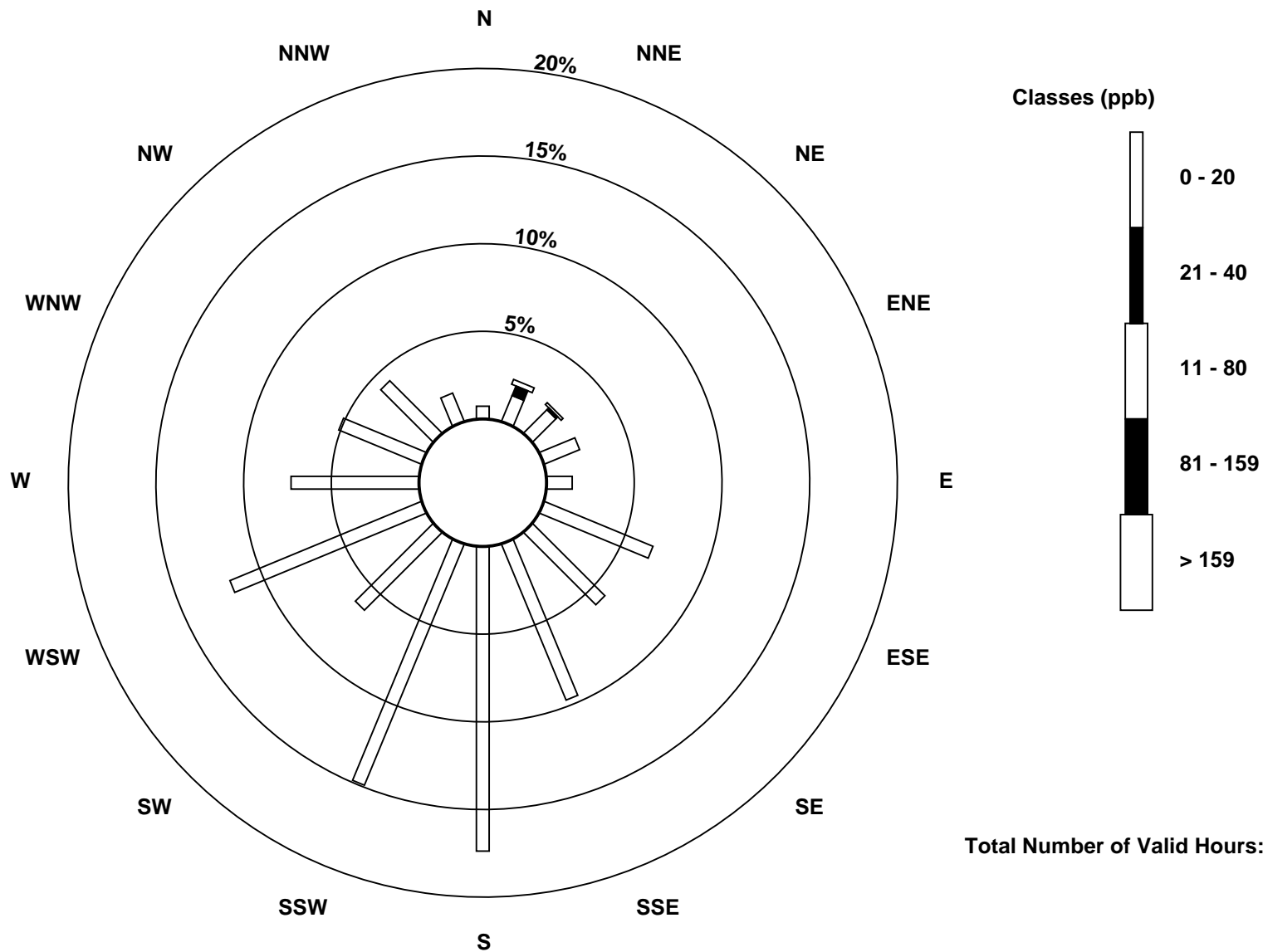
Total Number of Valid Hours: 685

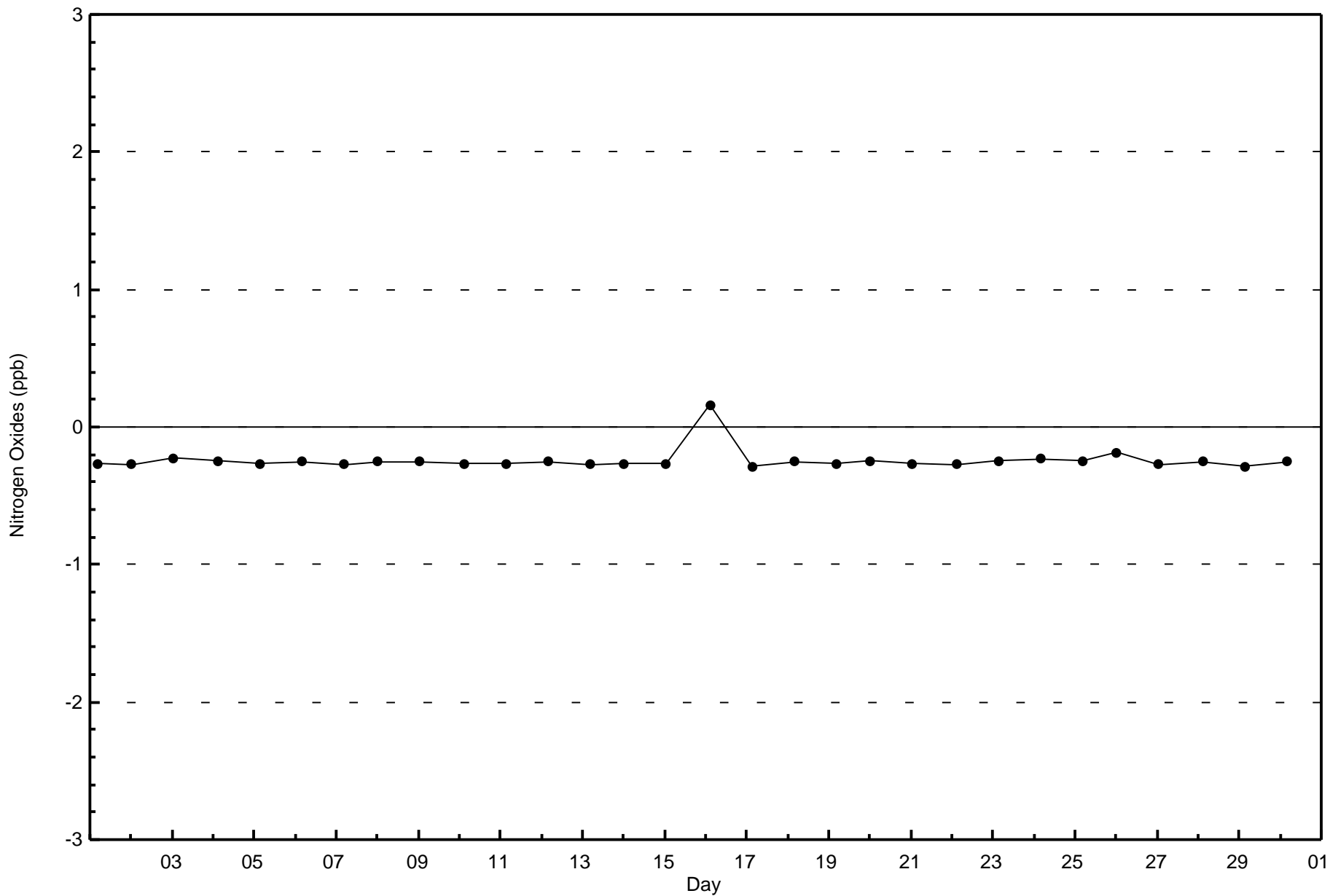
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River (AMS 20)

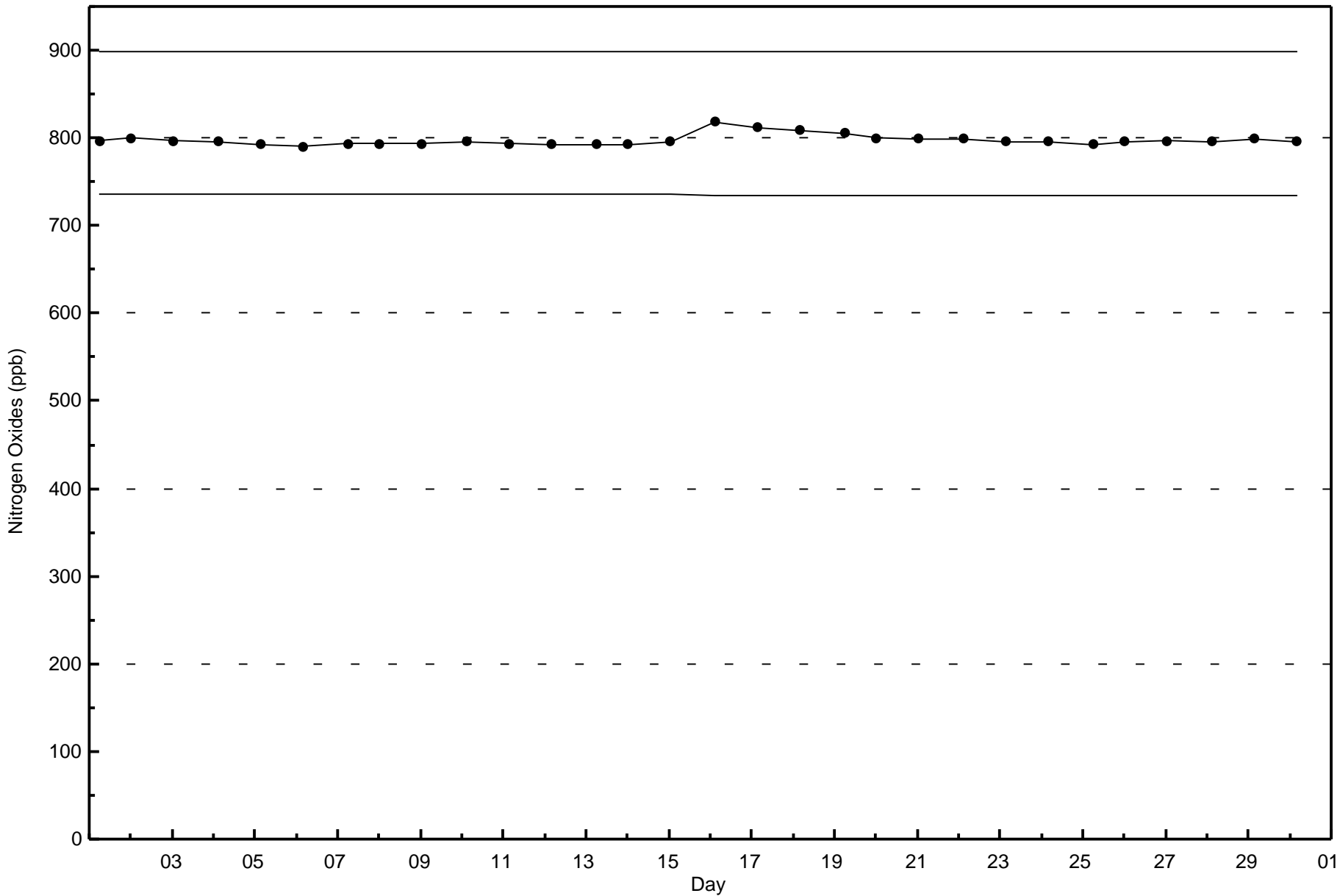






Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

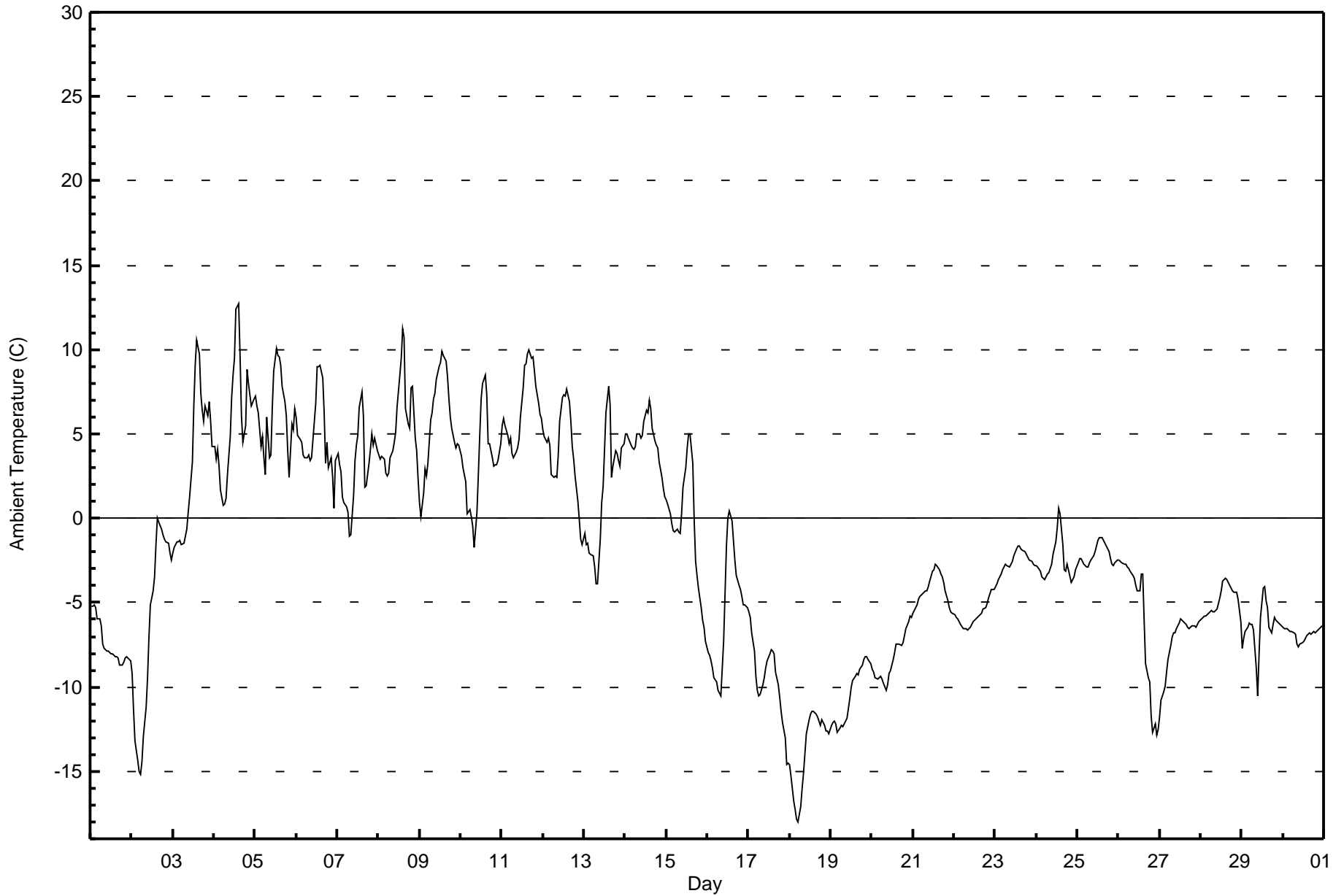
Brion MacKay River - November 2016

Maximum Value: 12.7 C on Nov 4 15:00		Maximum Daily Average: 6.6 C on Nov 11		Hours in Service: 720																							
Minimum Value: -18.0 C on Nov 18 06:00		Minimum Daily Average: -13.8 C on Nov 18		Hours of Data: 720																							
Maximum Diurnal Average: 1.1 C at hour 15		Minimum Diurnal Average: -3.6 C at hour 6		Hours of Missing Data: 0																							
Monthly Average: -1.91 C		Percentiles: P ₁ = -15.2 P ₁₀ = -9.7 Q ₁ = -6.5 Median = -2.7 Q ₃ = 3.8 P ₉₀ = 6.6 P ₉₉ = 9.9		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-Nov	-5.2	-5.2	-5.1	-5.3	-6.0	-6.0	-6.4	-7.4	-7.7	-7.9	-7.9	-8.0	-8.0	-8.0	-8.2	-8.2	-8.3	-8.7	-8.7	-8.5	-8.3	-8.2	-8.3	-8.5	-7.4	-5.1	
2-Nov	-9.2	-11.3	-13.2	-14.3	-15.0	-15.2	-14.4	-13.0	-11.2	-9.4	-7.0	-5.2	-4.3	-3.5	-1.6	0.1	-0.2	-0.6	-0.9	-1.2	-1.4	-1.5	-2.1	-2.5	-6.6	0.1	
3-Nov	-2.0	-1.8	-1.4	-1.4	-1.3	-1.5	-1.5	-1.0	-0.7	0.4	1.3	3.4	6.7	9.1	10.6	9.8	7.4	6.4	5.7	6.7	6.1	6.9	5.7	4.3	3.2	10.6	
4-Nov	4.3	3.5	4.1	3.1	1.7	0.8	0.8	1.2	2.6	4.9	7.2	8.5	9.5	12.4	12.7	9.6	6.1	4.5	5.5	8.8	8.0	7.3	6.6	7.1	5.9	12.7	
5-Nov	7.2	6.7	6.2	4.2	4.8	3.5	2.6	6.0	3.6	3.8	6.6	8.7	10.1	9.7	9.6	9.1	7.8	6.9	6.1	4.0	2.5	5.6	5.2	6.5	6.1	10.1	
6-Nov	6.0	4.9	4.6	4.5	3.7	3.6	3.6	3.7	3.4	3.6	4.7	6.8	9.0	9.0	9.0	8.3	6.2	3.2	4.5	3.0	3.6	2.5	0.6	3.4	4.8	9.0	
7-Nov	3.8	3.2	2.7	1.3	0.9	0.7	0.3	-1.1	-1.0	1.4	3.4	4.3	4.9	6.6	7.5	6.1	1.8	1.9	3.3	4.0	5.0	4.3	4.7	4.0	3.1	7.5	
8-Nov	3.8	3.5	3.7	3.5	2.7	2.5	2.7	3.6	4.0	4.5	5.1	6.6	8.5	9.5	11.2	10.7	6.5	5.6	5.3	7.7	7.8	4.8	4.0	2.4	5.4	11.2	
9-Nov	0.9	0.1	1.5	3.0	2.5	3.3	5.8	6.2	7.1	7.4	8.2	9.0	9.2	9.9	9.6	9.3	8.4	7.1	6.0	5.4	4.5	4.1	4.4	4.4	5.7	9.9	
10-Nov	3.7	3.0	2.6	2.2	0.2	0.5	0.1	-0.5	-1.8	0.4	2.6	4.9	7.1	8.0	8.4	7.3	4.4	4.4	3.6	3.1	3.1	3.2	3.5	4.4	3.3	8.4	
11-Nov	5.5	5.9	5.5	5.0	4.5	4.8	3.8	3.6	3.9	4.1	4.6	6.0	7.8	9.1	9.2	9.8	10.0	9.5	9.6	8.7	7.8	6.8	6.2	5.9	6.6	10.0	
12-Nov	5.2	4.9	4.5	4.8	4.3	2.6	2.4	2.5	2.4	3.8	5.8	7.2	7.4	7.2	7.6	6.9	5.7	4.2	3.5	2.5	1.1	-0.1	-1.2	-1.6	3.9	7.6	
13-Nov	-0.9	-1.6	-1.5	-2.1	-2.1	-2.3	-2.9	-3.9	-3.9	-1.2	1.0	1.8	4.0	6.3	7.9	6.7	2.4	3.1	4.0	3.9	3.4	3.1	4.2	4.4	1.4	7.9	
14-Nov	5.0	5.0	4.8	4.3	4.1	4.1	4.3	5.0	5.0	4.8	5.0	5.8	6.4	6.2	7.0	6.5	5.4	4.6	4.3	4.1	3.3	2.5	1.8	1.3	4.6	7.0	
15-Nov	1.1	0.8	0.3	-0.3	-0.7	-0.8	-0.6	-0.8	-0.9	0.2	1.9	3.0	4.2	5.0	5.0	3.2	-0.1	-2.6	-3.4	-4.1	-5.3	-6.0	-6.5	-7.3	-0.6	5.0	
16-Nov	-8.0	-8.1	-8.4	-8.9	-9.4	-9.7	-10.2	-10.4	-10.5	-7.3	-4.5	-1.6	0.0	0.4	-0.2	-1.3	-2.5	-3.4	-4.0	-4.2	-4.6	-5.1	-5.2	-5.3	-5.5	0.4	
17-Nov	-5.5	-5.8	-6.8	-7.9	-9.4	-10.2	-10.6	-10.5	-9.9	-9.4	-8.8	-8.5	-8.0	-7.8	-7.9	-8.0	-9.1	-9.8	-10.6	-11.4	-12.1	-13.0	-14.6	-14.5	-9.6	-5.5	
18-Nov	-14.6	-15.3	-16.8	-17.2	-17.8	-18.0	-17.1	-16.0	-15.1	-13.9	-12.7	-11.9	-11.6	-11.5	-11.4	-11.6	-11.7	-12.0	-12.3	-12.0	-12.3	-12.6	-12.6	-12.8	-13.8	-11.4	
19-Nov	-12.3	-12.1	-12.0	-12.2	-12.7	-12.4	-12.3	-12.3	-12.2	-11.9	-11.3	-10.7	-10.0	-9.6	-9.4	-9.2	-9.3	-8.9	-8.7	-8.4	-8.2	-8.2	-8.4	-8.6	-10.5	-8.2	
20-Nov	-9.0	-9.1	-9.5	-9.5	-9.4	-9.4	-9.6	-9.7	-10.2	-9.8	-9.2	-9.0	-8.4	-7.9	-7.5	-7.5	-7.5	-7.6	-7.3	-7.0	-6.5	-6.1	-5.8	-5.9	-8.3	-5.8	
21-Nov	-5.7	-5.4	-5.1	-4.8	-4.7	-4.5	-4.4	-4.3	-4.3	-4.1	-3.7	-3.1	-3.0	-2.7	-2.8	-3.1	-3.3	-3.5	-3.8	-4.3	-4.9	-5.3	-5.5	-5.6	-4.2	-2.7	
22-Nov	-5.7	-5.9	-6.0	-6.1	-6.3	-6.6	-6.6	-6.5	-6.6	-6.5	-6.3	-6.2	-6.0	-5.9	-5.8	-5.7	-5.6	-5.4	-5.3	-5.1	-4.7	-4.5	-4.3	-4.2	-5.7	-4.2	
23-Nov	-4.1	-3.9	-3.6	-3.3	-3.1	-2.9	-2.7	-2.8	-2.9	-2.7	-2.5	-2.2	-1.8	-1.7	-1.6	-1.8	-1.9	-2.0	-2.2	-2.3	-2.5	-2.5	-2.7	-2.8	-2.6	-1.6	
24-Nov	-2.8	-2.9	-3.1	-3.5	-3.5	-3.6	-3.3	-3.2	-3.0	-2.8	-2.1	-1.4	-0.6	0.6	0.3	-1.5	-3.1	-3.2	-2.8	-3.1	-3.8	-3.7	-3.4	-3.0	-2.6	0.6	
25-Nov	-2.6	-2.4	-2.4	-2.5	-2.7	-2.9	-2.9	-2.6	-2.5	-2.2	-2.0	-1.7	-1.3	-1.1	-1.1	-1.3	-1.5	-1.7	-2.0	-2.4	-2.8	-2.8	-2.6	-2.5	-2.2	-1.1	
26-Nov	-2.5	-2.5	-2.6	-2.7	-2.8	-2.8	-3.0	-3.1	-3.4	-3.6	-4.0	-4.3	-4.3	-3.3	-3.3	-6.1	-8.7	-9.5	-9.7	-11.7	-12.7	-12.2	-12.8	-12.5	-6.0	-2.5	
27-Nov	-11.7	-10.8	-10.3	-9.9	-9.1	-8.4	-7.5	-7.1	-6.8	-6.8	-6.6	-6.2	-6.0	-6.1	-6.1	-6.3	-6.4	-6.5	-6.5	-6.4	-6.4	-6.5	-6.3	-6.1	-7.4	-6.0	
28-Nov	-6.0	-5.9	-5.8	-5.8	-5.7	-5.6	-5.5	-5.6	-5.6	-5.4	-5.1	-4.7	-4.3	-3.7	-3.5	-3.7	-3.8	-3.9	-4.3	-4.4	-4.4	-4.4	-4.8	-6.1	-4.9	-3.5	
29-Nov	-7.7	-7.1	-6.7	-6.4	-6.2	-6.3	-6.3	-6.6	-8.8	-10.5	-8.1	-5.9	-4.1	-4.1	-4.9	-5.3	-6.5	-6.8	-6.3	-5.9	-6.0	-6.2	-6.3	-6.4	-6.5	-4.1	
30-Nov	-6.5	-6.5	-6.5	-6.6	-6.7	-6.7	-6.8	-6.9	-7.5	-7.6	-7.5	-7.4	-7.3	-7.1	-7.0	-6.8	-6.9	-6.8	-6.7	-6.8	-6.7	-6.5	-6.4	-6.3	-6.9	-6.3	
		-2.5	-2.7	-2.9	-3.2	-3.5	-3.6	-3.6	-3.5	-3.5	-2.8	-1.7	-0.7	0.2	0.8	1.1	0.5	-0.8	-1.4	-1.5	-1.6	-1.9	-2.1	-2.4	-2.5	Diurnal Average	
		7.2	6.7	6.2	5.0	4.8	4.8	5.8	6.2	7.1	7.4	8.2	9.0	10.1	12.4	12.7	10.7	10.0	9.5	9.6	8.8	8.0	7.3	6.6	7.1	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Brion MacKay River - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Brion MacKay River - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	443	61.53	61.53
0 - 10	271	37.64	99.17
10 - 20	6	0.83	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) - %

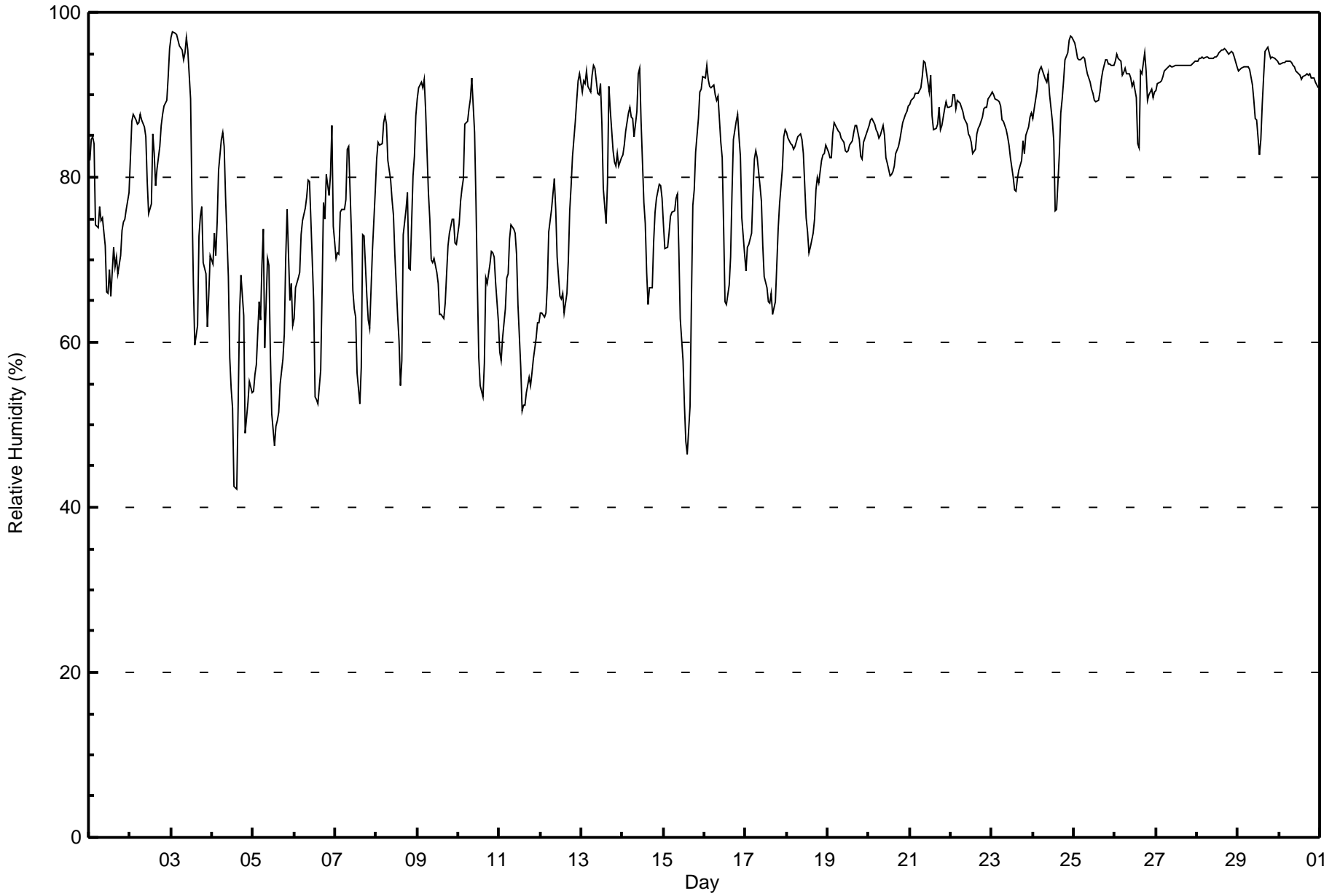
Brion MacKay River - November 2016

Maximum Value: 98 % on Nov 3 02:00 Maximum Daily Average: 94.7 % on Nov 28																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 42 % on Nov 4 15:00 Minimum Daily Average: 60.9 % on Nov 5 Maximum Diurnal Average: 86.0 % at hour 7 Minimum Diurnal Average: 70.8 % at hour 15 Monthly Average: 80.7 % Percentiles: P ₁ = 50 P ₁₀ = 63 Q ₁ = 73 Median = 84 Q ₃ = 91 P ₉₀ = 94 P ₉₉ = 97																										
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	82	85	85	84	74	74	76	75	75	72	66	66	69	66	71	69	70	68	70	74	75	75	76	78	74.0	85
2-Nov	82	87	88	87	86	87	88	87	86	85	80	76	77	85	83	79	81	84	86	88	89	89	92	96	85.2	96
3-Nov	97	98	97	97	97	96	95	94	95	97	95	89	77	67	60	62	73	75	76	70	68	62	66	70	82.3	98
4-Nov	69	73	70	75	81	85	85	84	78	68	58	54	52	43	42	52	64	68	63	49	51	53	55	54	63.6	85
5-Nov	54	56	57	65	63	69	74	59	70	69	59	51	48	50	51	51	55	58	61	70	76	65	67	62	60.9	76
6-Nov	63	67	68	69	73	75	76	78	80	79	75	65	53	53	53	57	66	77	75	80	78	80	86	74	70.8	86
7-Nov	70	71	71	76	76	76	77	83	84	73	66	64	63	56	52	57	73	73	66	63	62	66	71	78	69.5	84
8-Nov	82	84	84	84	87	87	87	82	80	77	75	71	63	60	55	58	73	76	78	69	69	80	83	87	76.3	87
9-Nov	90	91	92	91	92	88	78	75	70	70	70	68	67	63	63	63	65	68	72	73	75	75	72	72	75.1	92
10-Nov	74	77	79	80	86	87	88	89	92	85	77	67	58	55	53	57	68	67	70	71	71	70	67	63	73.0	92
11-Nov	59	58	61	64	68	68	73	74	74	73	71	65	57	52	52	52	54	56	55	56	58	60	62	62	61.8	74
12-Nov	64	64	63	64	67	73	76	78	80	76	70	66	65	66	64	66	70	76	79	82	87	89	92	93	73.7	93
13-Nov	90	92	91	93	91	90	92	93	93	90	90	91	86	79	74	79	91	88	83	82	81	83	81	82	87.0	93
14-Nov	83	84	86	88	88	87	87	85	88	93	93	87	77	74	69	65	67	67	72	76	78	79	79	77	80.3	93
15-Nov	74	71	71	73	75	76	76	78	78	71	63	58	52	48	46	52	65	77	78	83	87	90	91	92	72.0	92
16-Nov	92	94	92	91	91	91	90	89	90	84	82	74	65	65	67	70	78	84	87	88	85	82	75	71	82.4	94
17-Nov	69	72	72	73	78	82	83	82	79	77	72	68	67	65	65	66	63	65	69	74	77	81	85	86	73.7	86
18-Nov	85	85	84	84	83	84	85	85	85	85	83	75	73	71	72	73	75	78	80	79	82	83	83	84	80.7	85
19-Nov	83	82	82	85	87	86	86	85	85	84	83	83	83	84	84	85	86	86	84	82	82	84	85	86	84.4	87
20-Nov	86	87	87	86	86	86	85	85	86	85	82	82	80	80	81	81	83	84	85	86	87	88	88	89	84.7	89
21-Nov	89	89	90	90	90	90	91	92	94	94	93	90	92	88	86	86	86	88	86	86	88	89	88	88	89.4	94
22-Nov	89	90	90	88	89	89	88	88	87	86	85	85	84	83	83	85	86	86	87	88	88	88	89	90	87.3	90
23-Nov	90	90	89	89	89	89	87	87	86	85	84	82	80	78	78	80	81	82	84	83	85	86	87	88	85.0	90
24-Nov	87	88	91	92	93	93	92	92	92	93	90	87	84	76	76	83	88	89	92	94	95	97	97	97	89.9	97
25-Nov	96	95	94	94	94	95	94	93	93	92	91	90	89	89	89	90	92	93	94	94	94	94	94	94	92.8	96
26-Nov	94	95	94	94	92	93	93	93	93	92	91	91	90	84	84	93	92	95	93	89	90	91	90	90	91.5	95
27-Nov	91	91	91	92	92	93	93	93	93	93	93	93	94	94	94	94	94	93	94	94	94	94	94	94	93.1	94
28-Nov	94	94	94	94	94	95	95	94	94	94	94	95	95	95	95	95	96	95	95	95	95	95	95	93	94.7	96
29-Nov	93	93	93	93	93	93	93	93	91	89	87	87	83	85	89	92	95	96	95	94	95	94	94	94	91.9	96
30-Nov	94	94	94	94	94	94	94	94	94	93	93	93	92	92	92	92	93	92	92	92	92	92	91	91	92.8	94
82.2 83.2 83.4 84.3 85.0 85.7 86.0 85.4 85.4 83.5 80.4 77.1 73.9 71.5 70.8 72.9 77.4 79.6 80.1 80.2 81.1 81.9 82.5 82.5																		Diurnal Average								
97 98 97 97 97 96 95 94 95 97 95 95 95 95 95 95 96 96 95 95 95 97 97 97																		Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Brion MacKay River - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Brion MacKay River - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	53	7.36	7.36
60 - 80	236	32.78	40.14
80 - 100	431	59.86	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

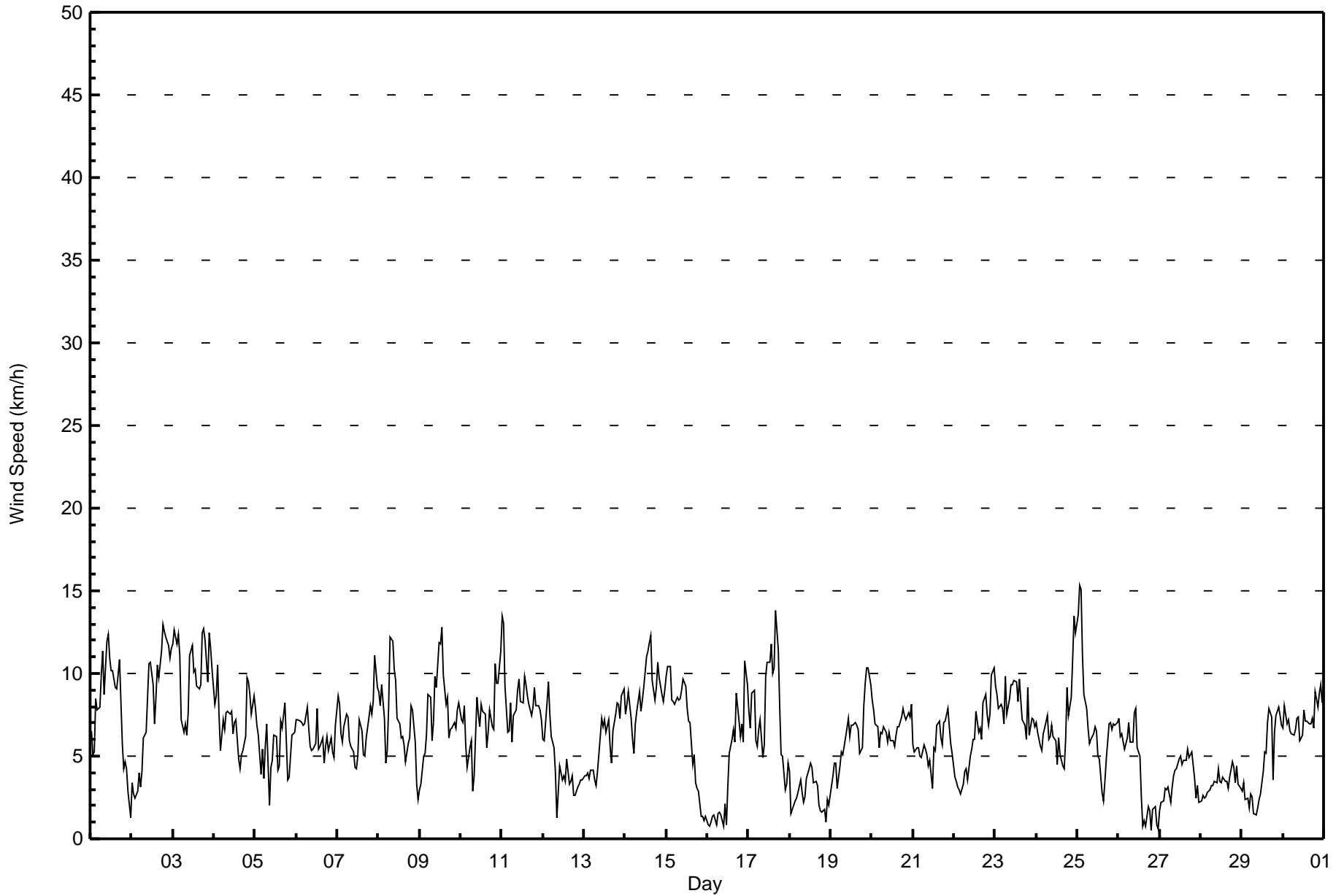


Maximum Speed: 15 km/h on Nov 25 02:00	Maximum Daily Speed Average: 10.1 km/h on Nov 3	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 26 20:00	Minimum Daily Speed Average: 1.2 km/h on Nov 21	Hours of Data: 720
Maximum Diurnal Speed Average: 4.0 km/h at hour 11	Minimum Diurnal Speed Average: 2.3 km/h at hour 17	Hours of Missing Data: 0
Monthly Average Velocity: 3.3 km/h 200.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 4 Median = 6 Q ₃ = 8 P ₉₀ = 10 P ₉₉ = 13	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	NW6	NW5	WNW5	NW9	WNW8	WNW8	WNW10	WNW11	WNW9	NW12	NW12	WNW11	WNW10	NW10	NW9	NW9	NW10	NW11	NW6	WNW4	WNW5	WNW4	WNW3	E1	NW7.7	NW12
2-Nov	SE3	SSE3	SE2	SSE3	SSE4	SSE3	SE4	SSE6	SSE6	SSE9	SSE11	SSE11	S9	S7	S9	SSW11	SSW10	SSW11	SSW13	SSW13	SSW12	SSW12	SSW11	SSW12	S7.6	SSW13
3-Nov	SSW12	SSW13	SSW12	S12	S11	S7	S6	SSW7	SSW6	SSW8	SSW11	SSW12	SSW10	SSW10	SSW9	SSW9	S9	SSW12	SSW13	SSW12	SSW10	SW12	SSW12	SSW10	SSW10.1	SSW13
4-Nov	SSW8	SSW9	SSW11	S7	SSE5	S7	S7	S8	S8	S8	S8	S6	S7	S7	SSE5	S4	S5	SSE5	S6	S10	S9	S9	S8	S9	S7.2	SSW11
5-Nov	SSE8	SSE7	S6	SSW4	SSW5	SW4	S6	SSW7	S2	S4	S5	S6	SSW6	SW4	SSE4	S7	S7	SSW8	SSW6	SSW4	WSW4	WSW6	SW6	WSW6	SSW5.1	SSW8
6-Nov	SW7	SSW7	SSW7	SSW7	S7	S7	SSW8	SW7	SW6	SW5	WSW5	WSW6	WSW8	WSW5	WSW6	SW6	SW5	SSW6	SW6	SW5	SW6	SSW5	SSW5	SW7	SW5.9	SSW8
7-Nov	WSW9	WSW8	SW6	SSW6	SSW7	SW8	SSW7	SSW6	SSW6	SW5	SW4	SSW4	S5	SSW7	S7	SSE5	SE5	SE6	SE7	SE8	SE8	SSE8	S11	SSE9	S5.6	S11
8-Nov	SSE9	SSE8	S9	S7	SSE5	S5	S8	S12	S12	SSW10	SSW10	SSW7	SSW7	SSW6	S6	S6	S5	SSE6	S6	S8	S8	S6	S3	SSE2	S7.0	S12
9-Nov	SSE3	SSE3	SSW5	SSW5	SSW6	SSW9	SSW9	SW6	WSW7	W10	W9	W12	W12	WNW13	W10	W8	WNW9	W6	WSW7	W7	W7	W7	WSW8	WSW8	WSW6.4	WNW13
10-Nov	WSW7	WSW7	WSW8	SW6	SW4	WSW5	W6	SW3	S4	SSW9	SSW8	SSW7	S8	S8	S8	SSE5	SE6	SE8	SE7	SE7	SE11	SE9	SSE9	SSE11	S5.4	SSE11
11-Nov	S13	S13	S9	S6	SSW7	SSW8	SSW6	SSW7	SSW8	SSW9	SSW10	SSW8	SSW8	SSW10	SSW9	SSW9	WSW8	WSW7	WSW8	WSW9	WSW8	SW8	WSW8	WSW7	SSW7.8	S13
12-Nov	WSW6	WSW6	SSW8	SSW9	SSW8	S6	S5	SSE4	SSW1	W3	WSW4	WSW4	SW4	SW3	SW5	WSW3	WNW4	NW4	WNW3	WSW3	WSW3	WSW3	WSW4	WSW4	SSW3.7	SSW9
13-Nov	WSW4	WSW4	WSW4	SW4	SW4	SSW4	S4	S3	SSE4	S6	S7	S7	SSW7	S6	SSW7	SSW6	SSW5	SSW7	SSW8	S8	SSW8	S7	S9	S9	SSW5.5	S9
14-Nov	S8	S8	S9	S7	SSW6	SSW5	SSW7	SW8	WSW9	SW8	WSW8	WSW9	W11	W11	WNW12	WNW12	W10	W8	W9	W11	W10	WSW9	WSW8	W9	WSW7.4	WNW12
15-Nov	WSW10	WSW10	WSW10	WSW8	WSW8	WSW9	WSW8	WSW8	WSW9	W10	W9	W8	WSW7	WSW7	SW5	SSW5	WSW3	WSW3	SW3	SSE1	SSW1	SSE1	SE1	SE1	WSW6.2	WSW10
16-Nov	SSW1	W1	SSE1	SSE1	SSW1	SSE1	SE2	SSE2	SSE1	W1	W2	SSE1	SW3	W5	NW6	NNW7	NE6	NNE9	NNE7	NNE6	NNE7	N6	NNW11	NW9	NNW2.2	NNW11
17-Nov	NNW8	NNW7	N9	NNW9	NNW6	NW6	WNW7	WNW7	WNW5	WNW6	NW10	WNW11	WNW11	NW12	NW10	NW10	WNW14	WNW11	WNW8	W5	WNW5	W3	W3	W5	NW7.3	WNW14
18-Nov	W4	WSW2	WSW2	WSW2	WSW2	WSW3	WSW4	WSW3	WSW2	WSW3	WNW4	NW4	WNW5	W4	WNW3	SW3	S3	SSE2	SE2	E2	E2	E1	ESE2	E2	WSW1.5	WNW5
19-Nov	E3	ENE4	ENE5	NE5	ENE3	ENE4	NE5	ENE5	NE6	ENE7	ENE7	ENE6	ENE7	ENE7	ENE7	ENE7	ENE7	ENE5	E6	E8	ESE9	ESE10	ESE10	ESE9	E5.9	ESE10
20-Nov	ESE8	ESE8	ESE7	ESE7	ESE6	ESE6	SE6	ESE7	SE6	SE6	SE6	SE6	SE6	SE6	ESE6	ESE6	ESE7	ESE7	ESE7	ESE8	ESE7	ESE7	ESE8	ESE7	ESE8	ESE8
21-Nov	ESE6	ESE5	ESE6	SE6	SE5	SSE5	S6	S5	S5	S4	S5	WSW3	WNW6	NNW5	NW7	NW7	NW6	NW6	NNW7	NW7	NW8	NNW7	NNW6	NNW5	NW1.2	NW8
22-Nov	N4	NE3	ENE3	ESE3	E3	E3	ESE4	SE4	SE4	SE5	SSE5	S6	S6	SSE8	S6	SSE7	SSE6	SSE8	SSE9	SE8	SE7	SE8	SE10	SE10	SE4.9	SE10
23-Nov	SE9	SE9	SSE8	SE8	SSE8	SSE7	S10	SSE8	SSE8	SSE9	SSE9	SSE10	SSE9	S8	S10	SSE8	SSE7	S7	S6	SSW9	SSW6	SSW7	SSW7	SSW7	SSE7.7	S10
24-Nov	SSW7	S6	S6	S5	S6	S7	S7	SSW6	S6	SSW7	SSW6	S6	S4	SE6	SSE5	SE4	ESE4	ESE6	SE9	ESE7	SE9	ESE11	ESE13	ESE12	SSE5.9	ESE13
25-Nov	ESE14	ESE15	ESE15	ESE11	ESE9	ESE8	ESE7	SE6	ESE6	ESE6	ESE7	ESE7	ESE5	ESE5	SE3	SW2	WSW3	W5	W7	W7	W7	WSW7	WSW7	WSW7	SE3.8	ESE15
26-Nov	WSW7	WSW6	WSW6	WSW5	WSW6	WSW6	SW7	SW6	SW6	SSW8	SW8	SW6	WSW5	WSW3	W1	NNW1	SE1	N2	NE2	E1	NNE2	ENE2	ENE1	NE1	SW3.1	SW8
27-Nov	NE2	NNE2	NE2	NNE3	NNE3	NE3	NE2	NNE3	NE4	NNE4	NNE4	NNE5	NNE5	NNE4	NE5	NNE5	NNE5	NNE5	NE5	NE5	NNE4	N2	NNW3	NW2	NNE3.5	NNE5
28-Nov	W2	WNW3	WNW2	WSW3	W3	W3	W3	WSW3	WSW3	SW3	SW4	SW3	WSW3	W4	W3	W3	WSW3	W4	WNW5	NW4	WNW3	NW4	WNW3	W3	W3.1	WNW5
29-Nov	W3	W3	W2	WNW2	W2	W3	W3	WSW2	S1	SW2	SW2	SSW3	S4	S5	S5	S7	S8	SSW7	S4	S6	S7	S8	SSW7	S7	SSW3.7	S8
30-Nov	S7	SSE8	S7	SSE7	S7	S6	S6	SSE7	SSE7	SSE7	SSE6	SSE6	S8	S7	S7	SSE7	SSE7	S7	S7	S9	S8	S9	S9	S8	S7.2	S9

SSW3.4	S3.5	S3.7	S3.3	SSW3.3	SSW3.3	SSW3.3	SSW3.8	SSW3.7	SSW3.4	SSW3.8	SSW4.0	SSW3.7	SW3.9	SW3.4	SW3.1	SSW2.7	SSW2.3	SSW2.4	SSW2.7	SSW3.3	SSW3.0	SSW3.4	SSW3.6	SSW3.6	Diurnal Average	
ESE14	ESE15	ESE15	S12	S11	SSW9	WNW10	S12	S12	NW12	NW12	W12	W12	WNW13	WNW12	WNW12	WNW14	SSW12	SSW13	SSW13	SSW12	SW12	ESE13	ESE12	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
Brion MacKay River - November 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	256	35.56	35.56
6 - 11	431	59.86	95.42
12 - 19	33	4.58	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: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed (WS) - km/h
Brion MacKay River - 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	3	14	13	9	8	8	14	29	24	16	23	39	28	18	6	4	256
6 - 11	2	4	2	8	2	36	28	40	95	78	20	48	23	16	20	9	431
12 - 19	0	0	0	0	0	5	0	0	5	13	1	0	2	4	3	0	33
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	5	18	15	17	10	49	42	69	124	107	44	87	53	38	29	13	720

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Brion MacKay River - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Nov 9 12:00 Minimum Value: 0 km/h on Nov 16 08:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 3 P ₉₉ = 5																	Hours in Service: 720 Hours of Data: 720 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-Nov	2	2	2	3	3	3	3	4	3	4	4	4	4	4	3	3	3	4	2	1	2	2	1	1	4
2-Nov	1	1	1	1	1	1	1	2	2	2	3	4	3	2	3	3	3	3	3	4	3	3	2	3	4
3-Nov	3	3	3	4	4	3	2	2	2	3	3	4	3	3	3	3	3	3	3	4	3	4	3	2	4
4-Nov	3	2	3	2	2	2	1	2	2	2	2	2	3	2	1	1	1	1	2	3	3	3	2	2	3
5-Nov	2	2	2	2	2	1	3	2	1	2	2	2	2	1	1	2	3	2	2	1	2	2	2	2	3
6-Nov	2	2	2	2	2	2	2	2	1	2	2	3	3	2	2	2	1	2	2	1	2	1	2	3	3
7-Nov	3	3	2	1	2	2	2	2	2	1	1	1	2	2	2	2	1	1	2	2	2	3	4	3	4
8-Nov	2	2	3	2	1	2	4	3	3	3	3	3	2	2	2	1	1	1	1	2	2	2	2	1	4
9-Nov	1	2	2	3	2	3	2	2	3	4	4	5	5	5	4	3	3	2	3	3	3	3	3	3	5
10-Nov	3	3	3	2	1	2	2	3	2	2	2	2	2	2	3	1	2	2	2	2	3	3	3	4	4
11-Nov	4	4	3	2	2	2	2	2	2	3	3	3	2	3	3	3	3	3	3	4	3	3	3	3	4
12-Nov	2	2	2	3	2	2	2	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	3
13-Nov	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	3	3
14-Nov	2	2	2	2	2	1	2	3	4	3	3	4	5	5	5	5	4	3	4	4	4	4	4	3	5
15-Nov	4	5	4	4	3	3	3	4	3	4	4	4	3	3	3	2	1	1	1	1	0	1	1	1	5
16-Nov	1	1	1	1	1	1	1	0	1	1	1	1	1	2	2	2	2	3	2	2	2	3	3	3	3
17-Nov	2	2	3	3	2	2	2	2	2	2	3	3	4	4	3	5	5	4	3	2	2	1	1	2	5
18-Nov	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	2
19-Nov	1	1	1	2	1	2	2	2	2	2	2	2	2	3	3	2	2	2	2	3	3	3	3	3	3
20-Nov	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
21-Nov	2	1	1	1	1	1	2	1	1	1	1	1	2	2	2	2	2	1	2	2	2	2	2	1	2
22-Nov	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	2	2	3	3	2	2	2	3	3	3
23-Nov	3	3	3	2	2	2	3	2	3	3	3	3	3	3	3	3	2	2	2	3	2	3	2	2	3
24-Nov	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2	1	1	3	3	2	2	3	4	3	4
25-Nov	4	4	4	4	3	2	2	1	2	2	2	2	2	2	1	1	1	2	3	3	3	3	3	3	4
26-Nov	3	2	3	2	3	2	3	2	2	2	3	3	2	1	1	2	1	1	1	1	1	1	1	1	3
27-Nov	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	2	2	2	1	1	1	1	1	2
28-Nov	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2
29-Nov	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	2	2	2	2	3	3
30-Nov	2	3	2	2	2	2	2	2	2	2	2	2	3	2	2	3	2	2	2	3	3	3	3	3	3
Diurnal Maximum																									



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Brion MacKay River - November 2016

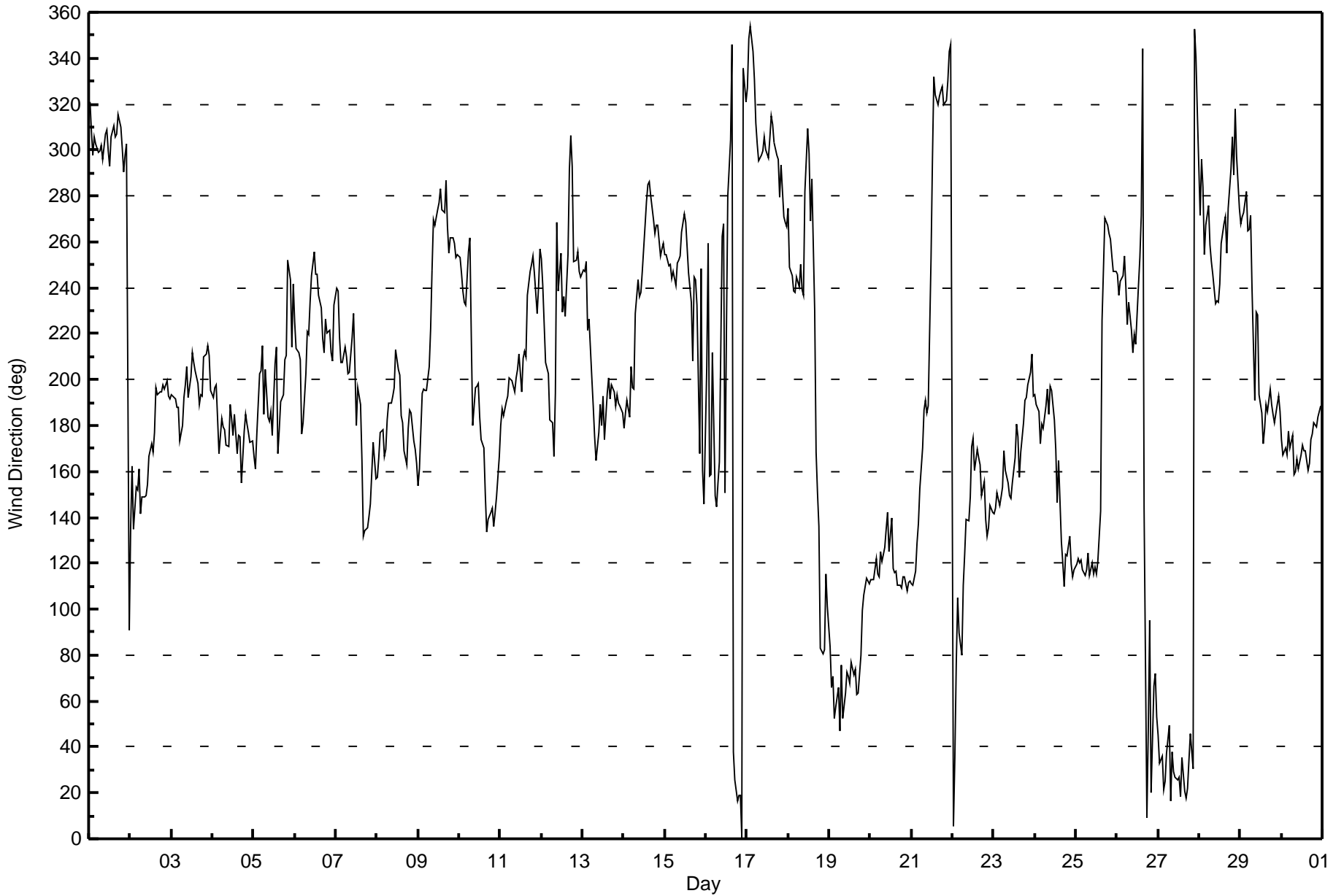
Direction of Maximum Speed: 122 deg on Nov 25 02:00		Hours in Service:	720
Direction of Maximum Daily Speed Average: 197.8 deg on Nov 3		Hours of Data:	720
Direction of Minimum Speed: 95 deg on Nov 26 20:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 1.2 deg on Nov 21		Percent Operational Time:	100.0
Monthly Average Direction: 222.0 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-Nov	321	308	298	306	303	299	300	302	296	307	309	300	293	306	311	306	307	315	310	301	290	298	303	91	304.4
2-Nov	136	162	135	153	152	161	142	149	149	149	154	167	172	169	177	197	193	194	195	197	196	199	193	192	178.3
3-Nov	194	193	192	188	188	173	180	192	198	206	192	201	212	207	204	198	189	193	193	210	211	215	210	195	197.8
4-Nov	193	197	198	183	168	183	179	178	171	171	189	183	176	185	168	176	175	155	178	185	181	177	172	173	180.1
5-Nov	167	161	176	203	204	215	185	204	184	182	186	176	207	214	168	178	190	193	209	210	252	243	214	242	196.7
6-Nov	225	213	212	209	176	181	202	221	220	234	245	256	246	246	237	231	218	212	226	221	221	212	208	233	220.5
7-Nov	240	239	219	208	208	214	210	203	203	219	229	205	180	197	189	165	132	134	135	140	146	160	173	157	186.8
8-Nov	157	166	177	178	167	170	183	190	190	193	197	213	205	202	184	181	169	163	179	187	186	173	170	163	182.8
9-Nov	154	161	194	196	195	196	206	222	248	269	267	274	277	283	274	273	287	267	255	262	262	259	253	255	252.5
10-Nov	253	246	238	234	233	255	262	219	180	196	197	198	183	174	170	150	133	139	142	144	136	142	149	167	182.2
11-Nov	180	187	184	190	193	201	200	200	194	201	204	211	195	209	212	210	237	247	250	254	246	229	240	257	211.9
12-Nov	253	241	208	205	203	183	181	167	194	268	239	255	230	236	227	255	291	307	293	251	252	256	247	244	229.9
13-Nov	248	247	252	222	226	201	188	175	165	177	189	180	193	174	194	201	192	198	195	188	194	190	189	186	194.7
14-Nov	179	186	191	184	205	196	196	229	244	236	238	247	267	278	285	286	280	270	263	267	267	254	257	260	247.1
15-Nov	254	254	250	250	244	247	241	251	252	254	264	272	268	258	246	233	208	245	243	233	168	248	160	146	249.5
16-Nov	206	259	158	159	212	150	145	155	164	262	268	151	219	280	304	346	38	26	16	19	19	1	336	321	347.9
17-Nov	327	348	354	343	331	312	303	295	298	300	306	300	296	305	315	311	303	298	296	280	294	271	269	267	307.6
18-Nov	274	249	245	239	238	245	241	250	239	237	282	310	298	269	288	230	169	150	136	83	80	82	115	101	249.4
19-Nov	84	66	71	52	57	66	47	76	53	63	73	71	68	77	71	74	63	64	80	99	106	110	114	111	79.9
20-Nov	113	113	113	122	115	114	125	121	127	135	142	125	139	118	116	117	110	110	109	114	114	108	112	112	117.8
21-Nov	111	110	116	129	137	153	170	187	191	186	189	253	295	332	324	320	323	326	327	320	321	330	343	346	308.7
22-Nov	6	36	76	105	90	80	110	124	139	139	149	171	174	160	170	166	163	149	155	139	132	136	145	142	141.4
23-Nov	142	144	150	145	149	153	169	161	155	150	148	155	166	181	175	157	168	182	191	192	198	203	211	193	166.6
24-Nov	194	189	186	172	181	179	189	196	185	197	195	183	170	146	165	129	120	110	124	123	132	120	114	117	154.3
25-Nov	120	122	120	122	117	114	117	124	114	120	115	119	115	121	143	226	248	271	268	263	261	254	247	247	142.0
26-Nov	246	237	243	245	254	240	224	234	221	212	220	215	241	253	272	344	144	9	48	95	20	67	72	53	234.9
27-Nov	45	33	36	21	25	37	49	17	38	29	27	26	27	18	36	21	18	22	34	46	31	353	340	316	25.2
28-Nov	272	296	284	255	267	276	259	252	246	233	234	233	242	259	268	271	255	275	292	305	289	318	297	274	269.4
29-Nov	268	271	273	282	265	265	271	240	191	230	228	193	186	172	179	189	186	196	189	185	181	189	193	186	201.1
30-Nov	174	167	170	167	178	170	176	159	160	166	161	167	172	169	169	160	164	174	176	182	180	184	186	188	172.2

193.6 190.1 189.5 189.7 191.9 192.0 195.7 198.5 194.3 201.4 207.4 212.3 216.7 219.0 215.2 213.5 207.6 204.0 201.8 199.5 196.4 195.2 193.0 192.7

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 (WD) - deg
Brion MacKay River - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 86 deg on Nov 2 00:00 Minimum Value: 13 deg on Nov 4 07:00 Percentiles: P ₁ = 14 P ₁₀ = 19 Q ₁ = 22 Median = 26 Q ₃ = 35 P ₉₀ = 46 P ₉₉ = 75																		Hours in Service: 720 Hours of Data: 720 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-Nov	21	31	41	24	28	25	26	25	32	24	25	30	34	31	28	26	25	21	20	32	38	36	46	86	
2-Nov	29	17	22	14	17	19	24	24	28	24	25	26	27	27	26	20	20	22	19	20	18	18	17	19	29
3-Nov	19	20	21	21	21	27	29	21	25	27	22	25	24	23	21	20	18	19	19	24	28	25	22	17	29
4-Nov	25	21	18	18	20	18	13	15	19	20	23	29	27	26	24	27	22	16	20	20	21	23	23	23	29
5-Nov	26	24	26	37	26	29	23	21	46	20	24	32	31	28	23	21	17	15	21	37	26	33	26	35	46
6-Nov	25	21	22	23	20	19	24	23	21	32	43	50	42	45	42	28	20	16	26	19	22	19	28	33	50
7-Nov	33	32	27	18	19	19	19	16	19	24	28	38	28	26	22	22	14	14	17	20	22	27	25	24	38
8-Nov	26	26	24	26	27	27	27	19	20	20	21	36	24	24	21	16	14	16	17	15	15	22	56	40	56
9-Nov	41	53	54	33	24	17	19	28	45	47	46	42	44	41	43	47	30	43	44	50	45	41	44	48	54
10-Nov	48	45	30	34	27	41	47	78	28	20	22	26	25	27	26	22	15	18	22	26	17	23	23	28	78
11-Nov	25	24	24	27	18	22	22	21	21	21	21	26	21	24	23	24	35	45	45	46	45	31	40	46	46
12-Nov	45	38	24	20	23	14	19	23	47	29	31	42	39	33	27	33	45	28	28	44	33	28	36	35	47
13-Nov	49	48	46	28	32	31	35	25	35	23	21	21	23	23	22	19	16	19	16	15	19	15	17	21	49
14-Nov	22	22	17	19	24	18	18	32	42	34	32	41	49	40	36	33	39	44	45	48	45	47	51	43	51
15-Nov	45	48	43	51	44	46	39	49	43	48	44	46	47	51	43	34	14	25	21	16	42	77	71	40	77
16-Nov	71	76	13	16	42	60	20	17	22	80	61	79	46	45	37	23	28	22	25	23	22	29	20	23	80
17-Nov	20	23	24	22	20	19	22	22	26	26	25	25	30	26	23	23	25	26	28	36	28	56	28	50	56
18-Nov	43	73	29	48	32	33	42	58	54	53	40	49	50	52	56	40	26	34	57	60	51	70	32	37	73
19-Nov	35	33	24	28	30	30	24	32	25	29	31	34	33	32	32	32	28	28	30	29	24	22	20	20	35
20-Nov	19	20	19	20	20	20	22	19	21	25	27	19	28	24	20	19	18	18	18	19	19	21	20	20	28
21-Nov	20	20	16	21	22	24	25	21	19	20	20	39	30	25	20	21	21	20	18	21	20	21	24	22	39
22-Nov	27	29	41	23	35	28	22	18	33	21	24	27	29	29	30	28	26	25	27	25	22	24	26	24	41
23-Nov	24	26	27	24	24	26	27	26	25	25	25	25	28	24	27	27	26	25	23	22	20	24	26	22	28
24-Nov	21	20	20	24	21	23	22	22	19	24	24	30	27	30	16	16	22	18	18	18	20	17	19	19	30
25-Nov	19	19	20	22	21	19	20	21	20	21	23	23	26	26	34	20	34	44	42	48	48	44	42	44	48
26-Nov	44	37	45	44	45	38	30	32	31	23	30	40	46	52	82	65	74	45	24	71	36	28	59	62	82
27-Nov	38	30	26	24	26	32	37	24	23	25	23	25	25	23	23	22	23	24	24	26	23	23	22	22	38
28-Nov	35	31	38	47	54	52	44	48	46	38	31	48	42	47	49	47	47	45	28	24	28	21	35	41	54
29-Nov	39	44	41	48	54	48	50	56	46	33	34	38	23	26	24	25	25	23	26	25	25	23	25	27	56
30-Nov	26	27	28	27	28	25	25	27	28	28	27	29	29	28	26	28	29	28	26	24	26	24	23	24	29
																		71 76 54 51 54 60 50 78 54 80 61 79 50 52 82 65 74 45 57 71 51 77 71 86							
Diurnal Maximum																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 15, 2016	Last Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:30	End Time (MST)	14:50
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	-634	-633
Analyzer IP address	192.168.1.43		Lamp voltage	836	835
Calculated slope	0.993422	0.993277	Chamber temp	45	45.0
Calculated intercept	1.604369	1.474897	Pressure	673.0	661.8
Analyzer Background	12.6	12.8	Flow	0.486	0.479
Analyzer Coefficient	0.927	0.930	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	-0.1	----
as found span	5000	79.9	810.2	806.3	1.005
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	79.9	810.2	815.1	0.994
second point	5000	40.1	406.6	406.5	1.000
third point	5000	20.1	203.8	202.8	1.005
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	79.9	810.2	818.4	0.990
Average Correction Factor					1.000

Corrected As found 806.4 Previous response 813.9 % change 0.9%

Notes:

Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By: Asad Hidayat



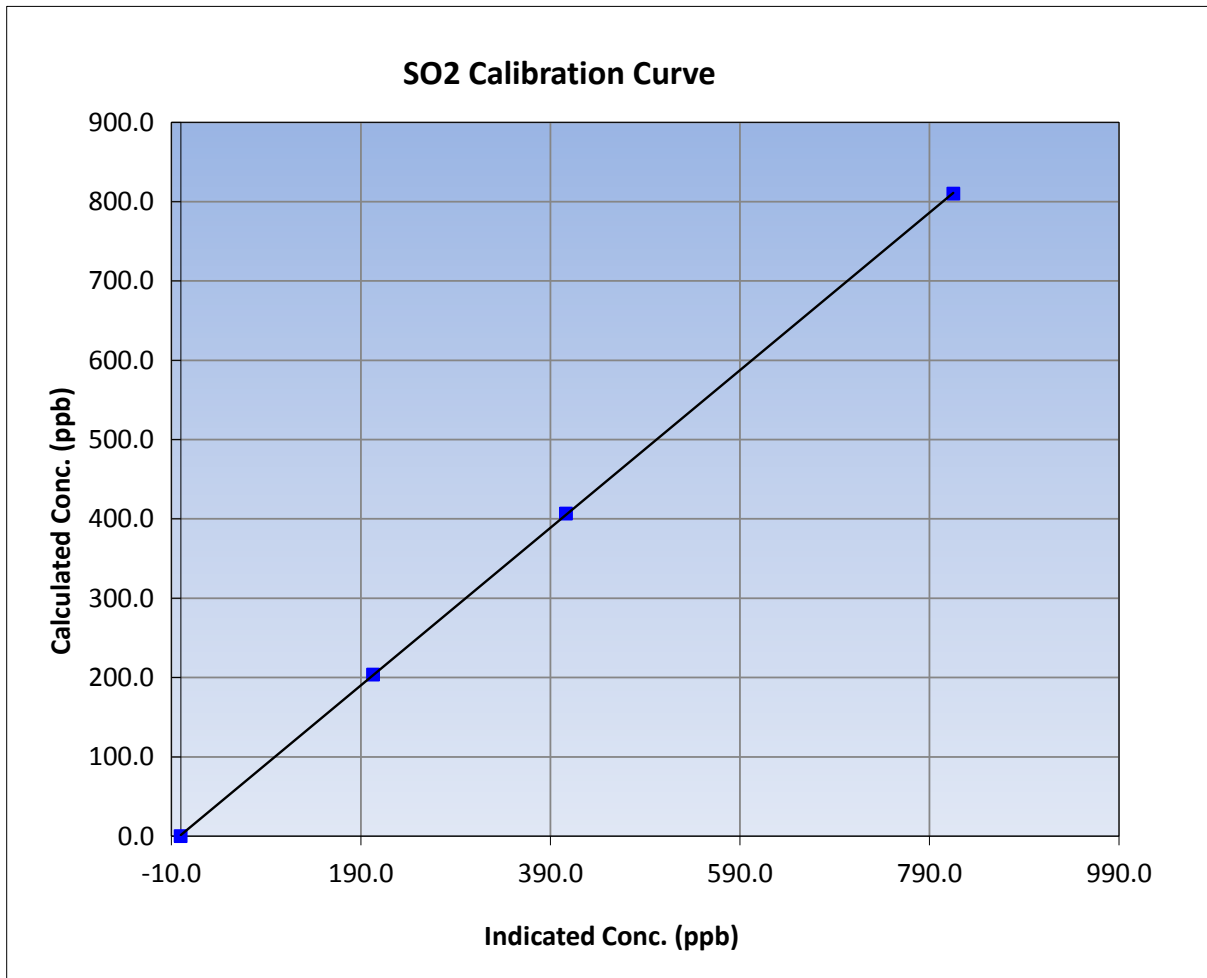
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:30	End Time (MST)	14:50
Analyzer make	Thermo 43i	Analyzer serial #	1501301450

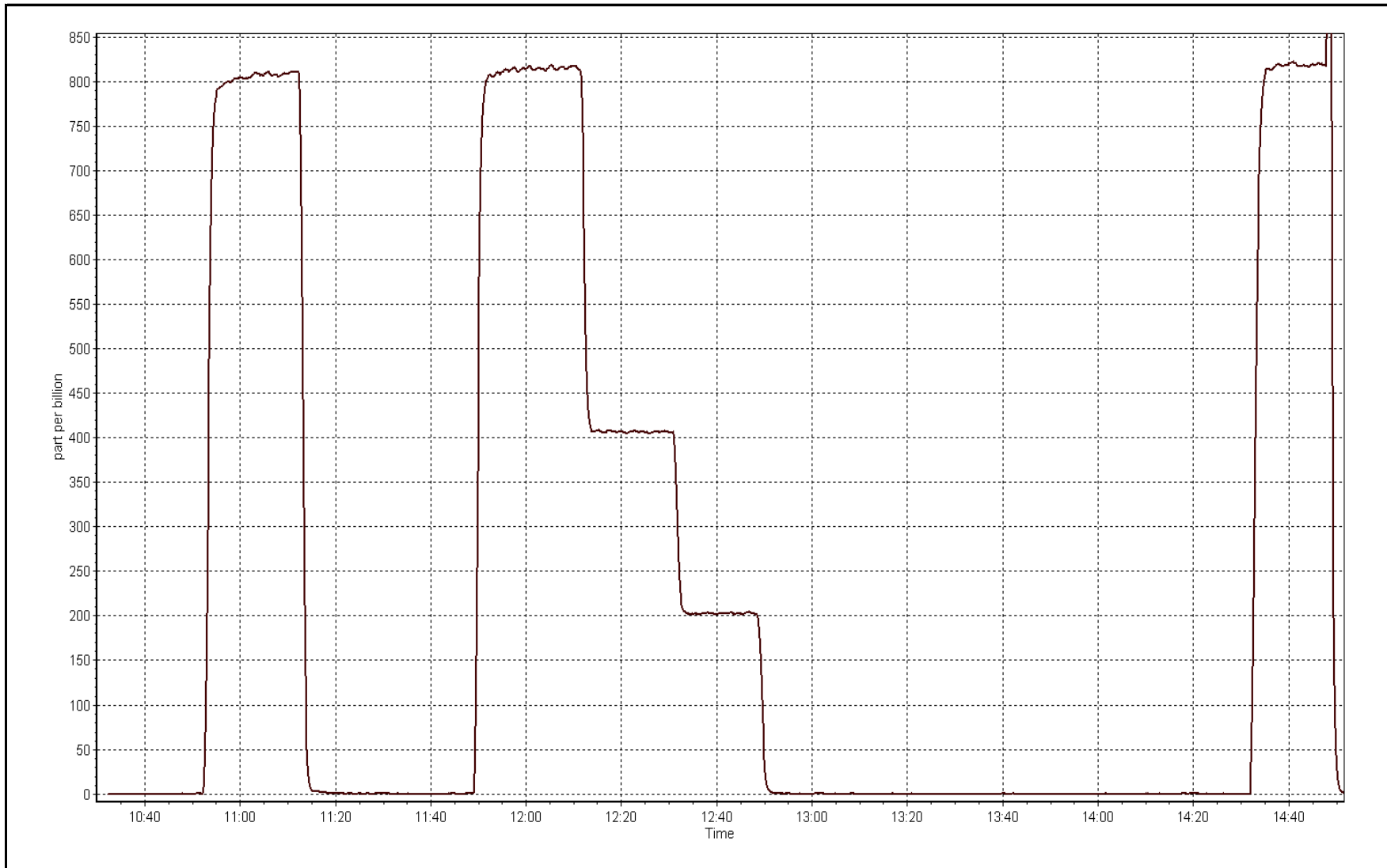
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999985
810.2	815.1	0.9940		
406.6	406.5	1.0004	Slope	0.993277
203.8	202.8	1.0049		
			Intercept	1.474897



SO2 Calibration Plot

Date: November 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 14, 2016	Last Calibration	October 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	12:28	End Time (MST)	15:25
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	2636	2608
Calculated slope	0.999476	0.996849	Chamber temp	50	50
Calculated intercept	0.196203	0.022050	Pressure	23.6	22.8
Analyzer Background	24.8	25.2	Flow	0.633	0.607
Analyzer Coefficient	0.996	0.999	Intensity	65	64
			Converter temp.	316	317

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	81.6	0.991
SO2 scrubber check	5000	19.8	200.8	3.6	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	75.6	80.9	81.2	0.997
second point	5000	37.8	40.4	40.5	0.999
third point	5000	18.9	20.2	20.2	1.000
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	75.6	80.9	81.4	0.994
Average Correction Factor					0.998

Corrected As found	81.2	Previous response	80.7	% change	-0.6%
--------------------	------	-------------------	------	----------	-------

Notes:

Sample inlet filter replaced and scrubber check completed after as founds. Slightly adjusted zero. Did not adjust span but took new 15 min average for the "high point" after adjusting baseline.

Calibration Performed By: Asad Hidayat



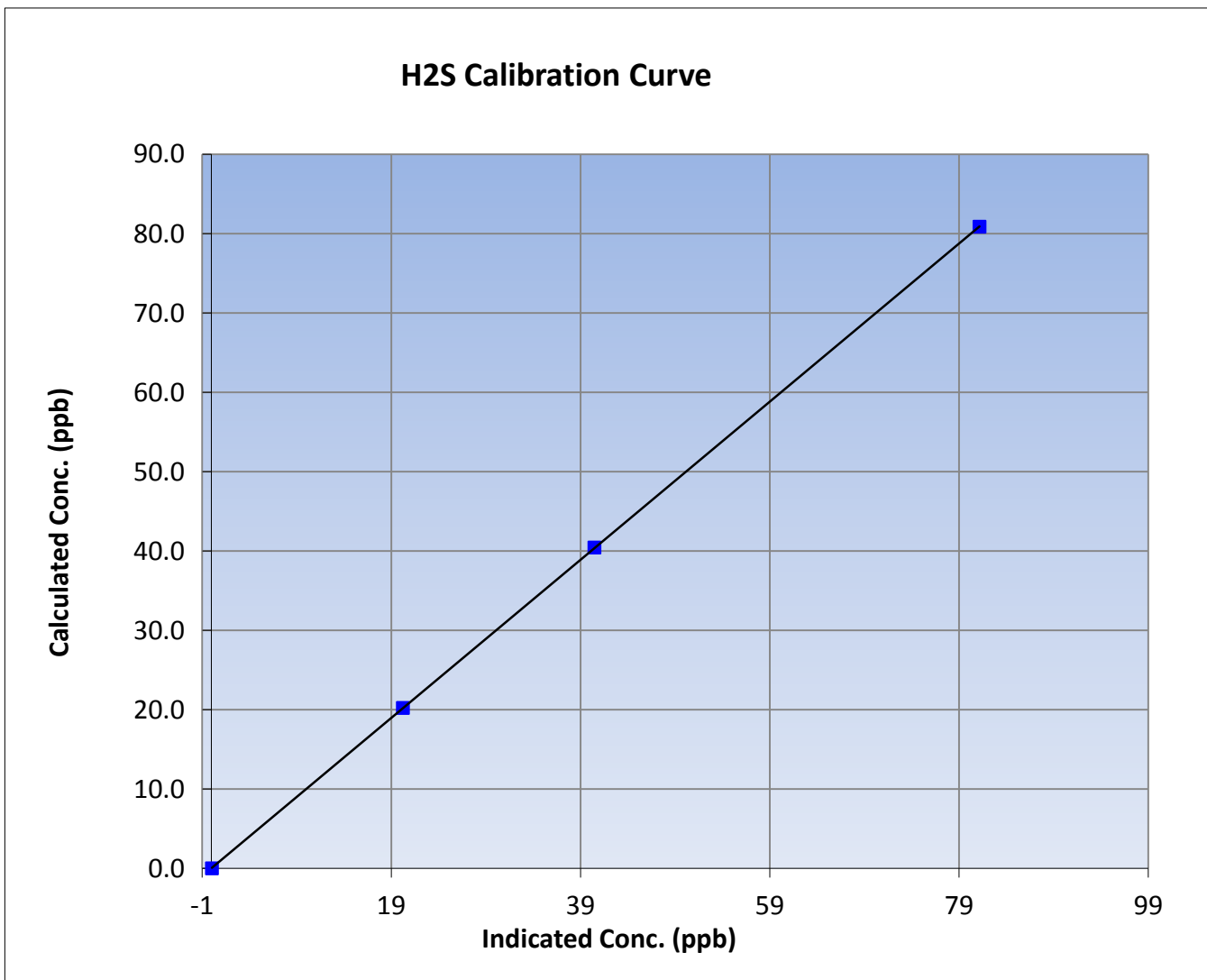
Wood Buffalo Environmental Association H2S Calibration Report

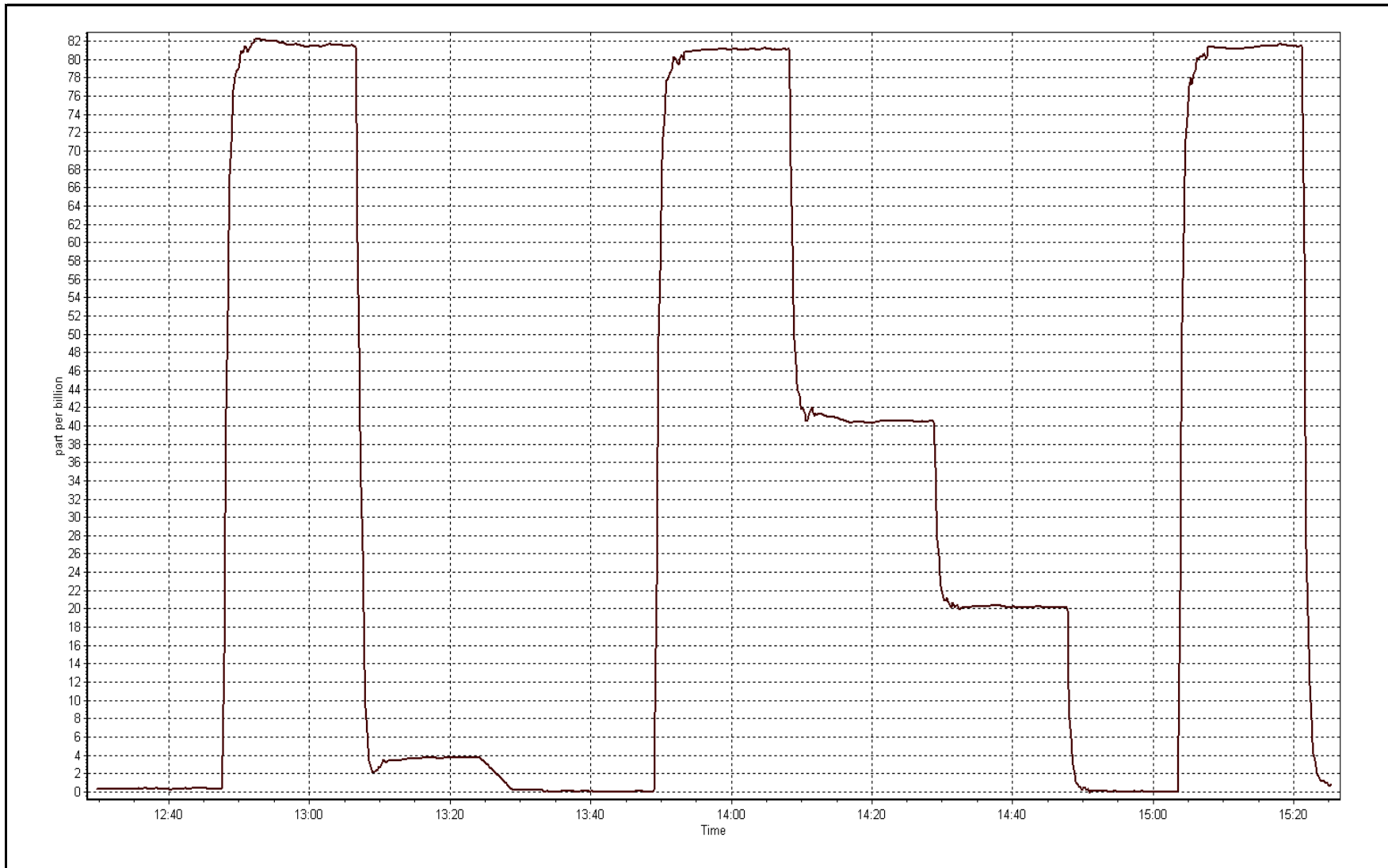
Station Information

Calibration Date	November 14, 2016	Previous Calibration	October 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	12:28	End Time (MST)	15:25
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	0.999997
80.9	81.2	0.9966		
40.4	40.5	0.9992	Slope	0.996849
20.2	20.2	0.9997		
			Intercept	0.022050







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 15, 2016	Last Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:30	End Time (MST)	14:50
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

	Before	After		Before	After
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	0.998895	0.996951	Fuel Pressure	23.9	23.9
Calculated intercept	0.011164	0.073118	Analyzer Coeff	4.4	4.5
			Analyzer BKG	2.220	2.230

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	-0.03	----
as found span	5000	79.9	17.14	17.01	1.008
calibrator zero	5000	0.0	0.00	-0.03	----
high point	5000	79.9	17.14	17.14	1.000
second point	5000	40.1	8.60	8.53	1.008
third point	5000	20.1	4.31	4.21	1.024
as left zero	5000	0.0	0.00	-0.01	----
as left span	5000	79.9	17.14	17.15	0.999
Average Correction Factor					1.011

Corrected As found	17.04	Previous response	17.15	% change	0.6%
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Notes:

Sample inlet filter replaced after as founds. Installed pressure sensor on ZAG after as founds; flame went out for couple mins. Adjusted span only.

Calibration Performed By:

Asad Hidayat



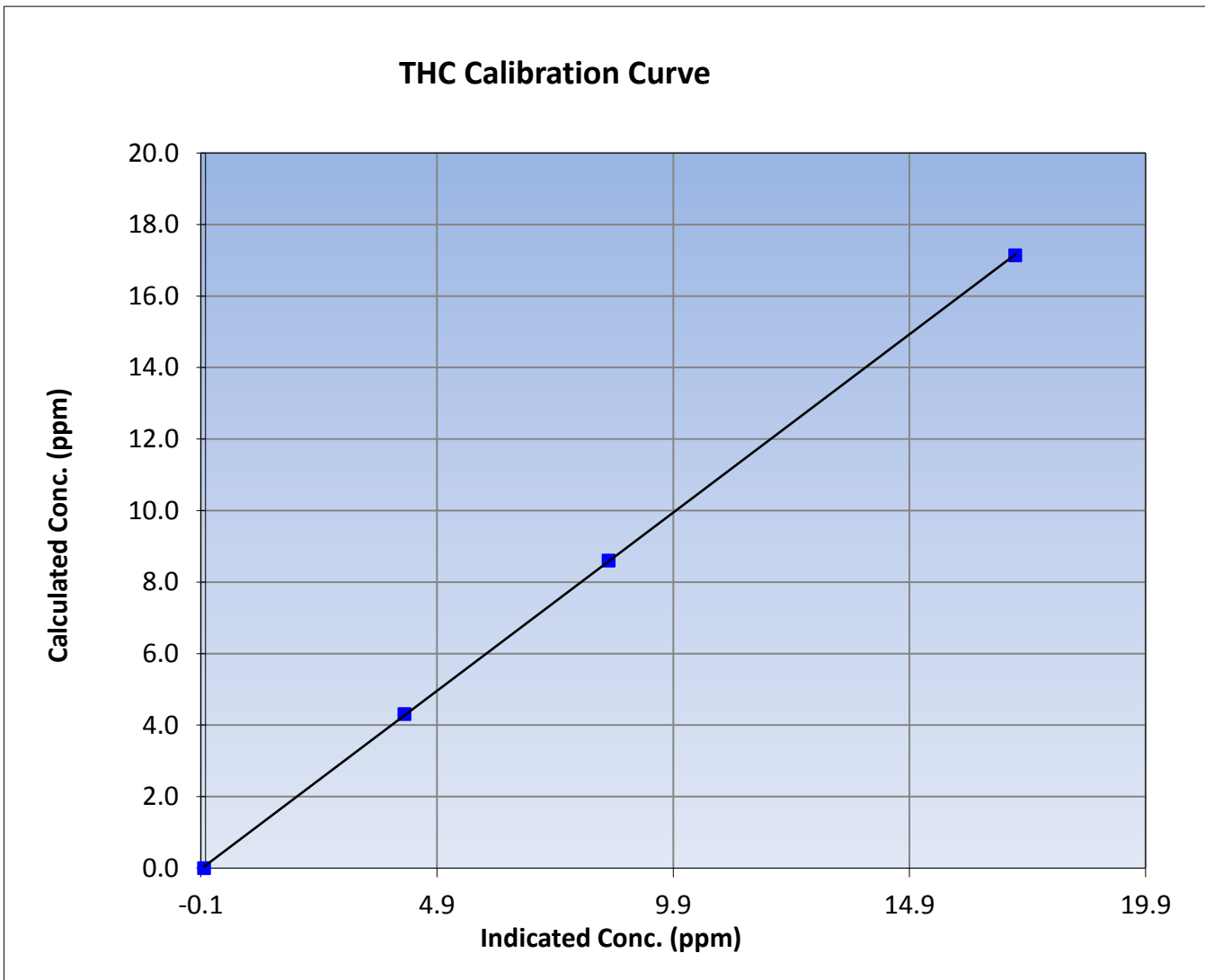
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:30	End Time (MST)	14:50
Analyzer make	51i-LT	Analyzer serial #	1501663727

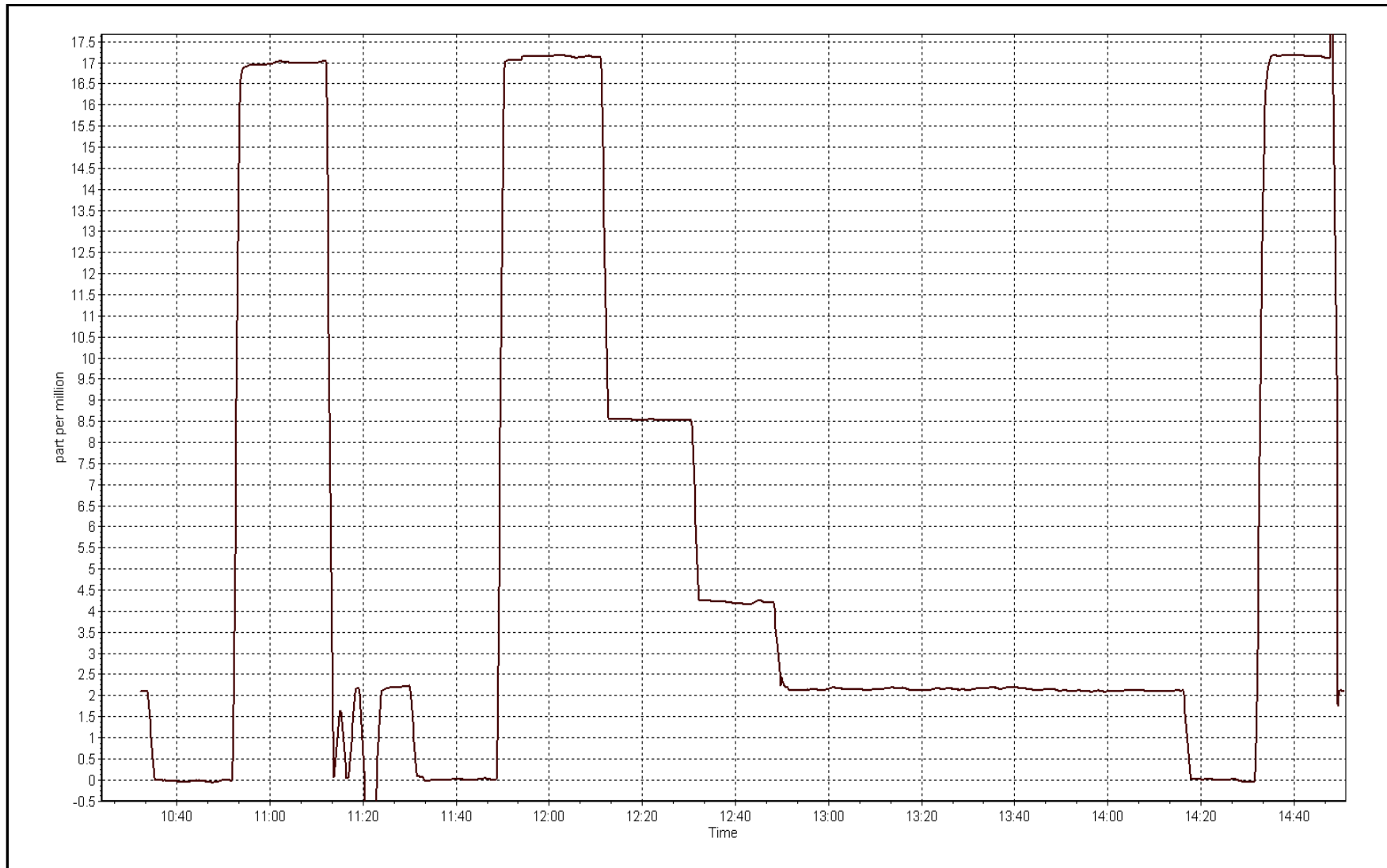
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.03	----	Correlation Coefficient	0.999971
17.14	17.14	0.9999		
8.60	8.53	1.0084	Slope	0.996951
4.31	4.21	1.0241		
			Intercept	0.073118



THC Calibration Plot

Date: November 15, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:30	End Time (MST)	14:50
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	0.998340	0.996481	0.990690
	Data Offset	-0.622429	-0.211931	-0.278061
Current Calibration	Data Slope	0.995863	0.994252	0.992823
	Data Offset	0.352225	0.697999	-0.157233

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1505164379
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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	1.097		1.099	
NOX coefficient	1.003		1.003	
NO2 coefficient	0.995		0.995	
NO bkgrnd	3.3		3.3	
NOX bkgrnd	3.3		3.3	
Chamber Temp	50.4	Deg C	50.2	Deg C
Moly Temp	324.2	Deg C	326.6	Deg C
PMT voltage	-767.4	V	-767	V
PMT Temp	-2.7	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	172.3	mmHg	169.9	mmHg
R Cell Press Nox	172.3	mmHg	169.9	mmHg
NO sample flow	0.811	lpm	0.796	lpm
Nox sample Flow	0.811	lpm	0.796	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted span. Nox drifted during GPT; used second high NO point for GPT reference.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 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	-0.3	-0.3	0.0	----	----
as found span	5000	79.9	805.4	800.6	4.8	800.8	796.2	4.6	1.0058	1.0055
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.2	0.1	----	----
high point	5000	79.9	805.4	800.6	4.8	808.4	804.7	3.8	0.9963	0.9949
second point	5000	40.1	404.2	401.8	2.4	405.7	403.4	2.3	0.9964	0.9962
third point	5000	20.1	202.6	201.4	1.2	202.7	201.2	1.5	0.9994	1.0009
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	456.0	349.4	823.1	457.4	365.8	0.9784	0.9970
Average Correction Factor									0.9974	0.9973

Corrected As found NO_x= 801.0 NO= 796.5 Percent Change NO_x= 0.8% NO= 0.9%
 Previous Response NO_x= 807.4 NO= 803.6

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	818.2	812.9	0.1	0.9844	0.9848	----	----
1st NO2 (300)	456.0	361.7	820.1	456.0	364.1	0.9820	----	0.9934	100.7%
2nd NO2 (200)	570.2	247.5	820.3	570.2	250.1	0.9819	----	0.9898	101.0%
3rd NO2 (100)	689.0	128.7	818.7	689.0	129.7	0.9838	----	0.9926	100.8%
2nd NO ref point		4.8	818.2	812.9	5.3	0.9844	0.9848	----	----
Average Correction Factor						0.9830		0.9919	100.8%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

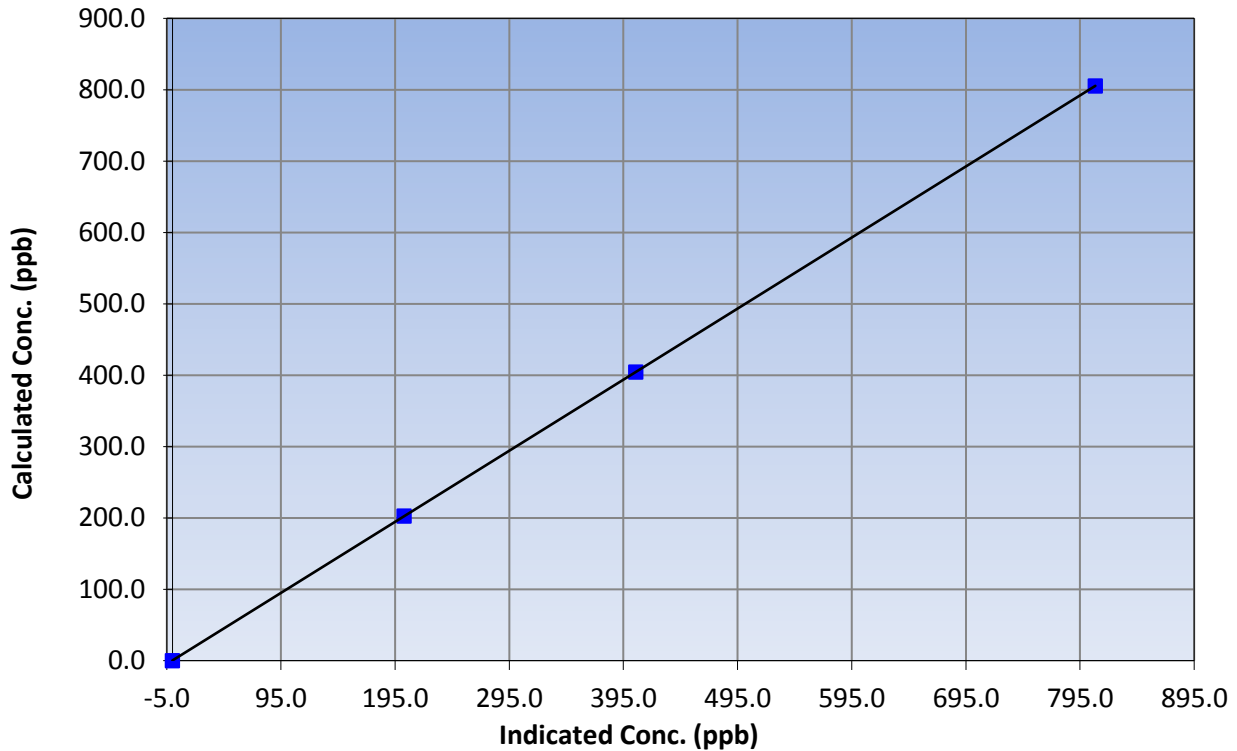
Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:30	End Time (MST)	14:50
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	----	Correlation Coefficient	0.999999
805.4	808.4	0.9963		
404.2	405.7	0.9964	Slope	0.995863
202.6	202.7	0.9994		
			Intercept	0.352225

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

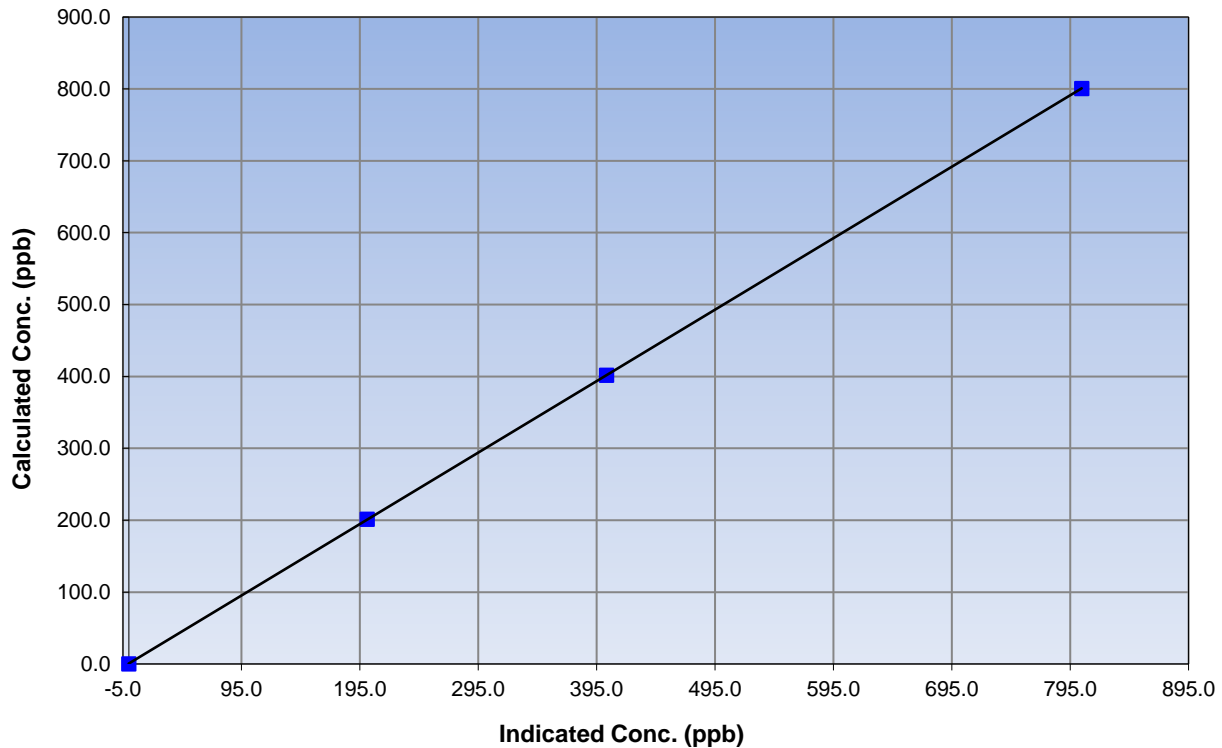
Station Information

Calibration Date	November 15, 2016	Previous Calibration	October 28, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:30	End Time (MST)	14:50
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	N/A	Correlation Coefficient	0.999998
800.6	804.7	0.9949		
401.8	403.4	0.9962	Slope	0.994252
201.4	201.2	1.0009		
			Intercept	0.697999

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

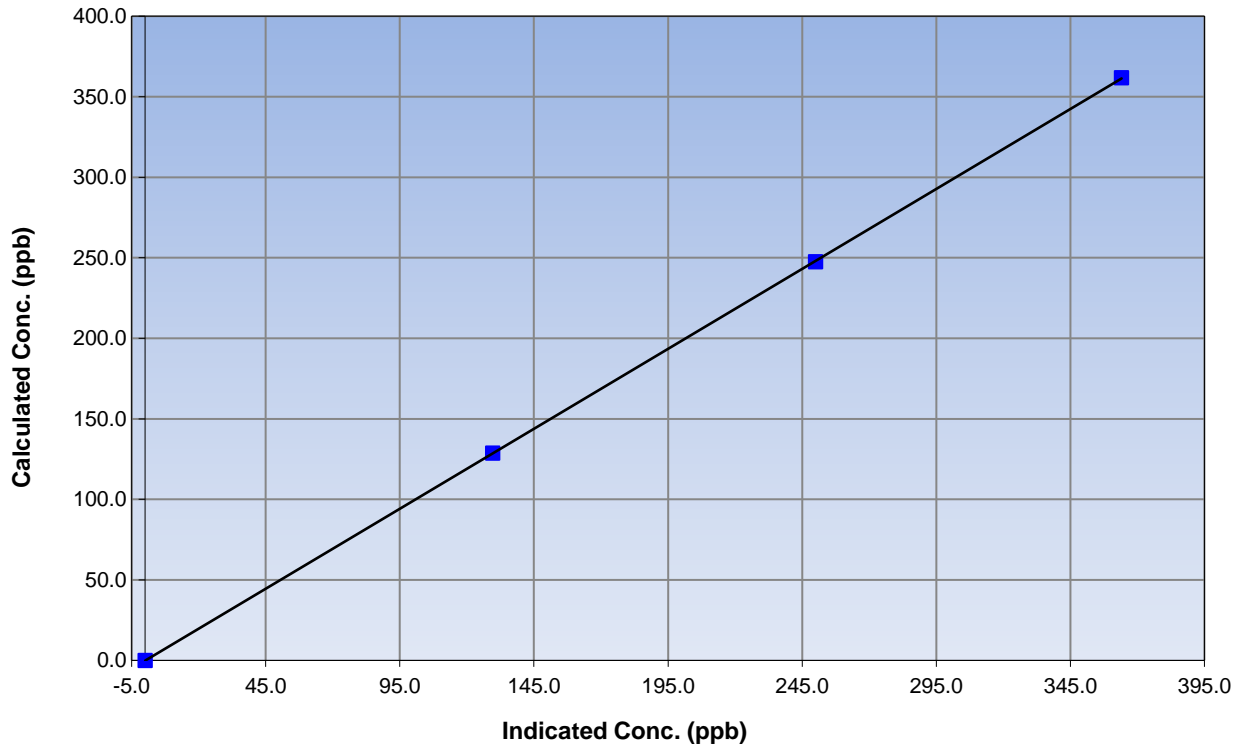
Station Information

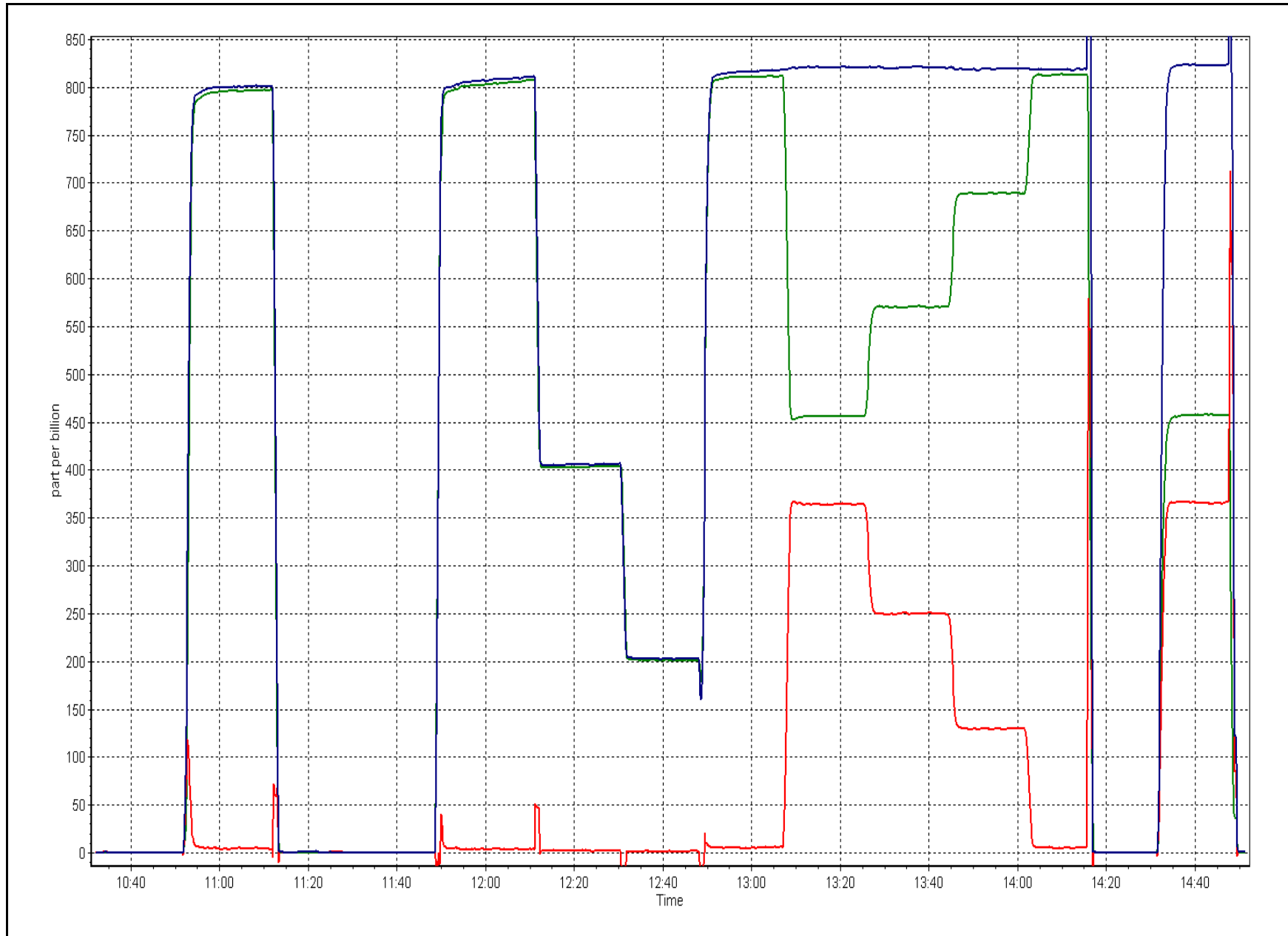
Calibration Date	November 15, 2016	Previous Calibration	October 28, 2016
Station Number	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:30	End Time (MST)	14:50
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999993
361.7	364.1	0.9934		
247.5	250.1	0.9898	Slope	0.992823
128.7	129.7	0.9926		
			Intercept	-0.157233

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 21 CONKLIN COMMUNITY NOVEMBER 2016

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
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	684	35	36	99.86	2	0	1	0
TRS(ppb) Average	686	34	34	100.00	0	0	0	0
THC(ppm) Average	682	35	38	99.58	2.2	-	2.1	-
NMHC(ppm) Average	682	35	38	99.58	0.017	-	0.001	-
CH4(ppm) Average	682	35	38	99.58	2.2	-	2.1	-
O3 (ppb) Average	687	33	33	100.00	43	0	36	-
NO2 (ppb) Average	681	35	39	99.44	14	0	5	-
NO (ppb) Average	681	35	39	99.44	18	-	2	-
NOX (ppb) Average	681	35	39	99.44	32	-	7	-
PM2.5 (ug/m3) Average	707	3	13	98.61	37.9	-	6.5	0
Wind Speed 10 m (km/h) Average	718	0	2	99.72	18	-	11	-
Wind Direction 10 m (deg) Average	718	0	2	99.72	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	16	-	9.1	-
Relative Humidity (%) Average	720	0	0	100.00	97	-	95.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 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	684	0.3	0	-	0	0	0	0	0	1	2
TRS (ppb) Average	686	0.3	0	-	0	0	0	0	0	0	0
THC (ppm) Average	682	1.95	0.1	-	1.9	1.9	1.9	1.9	2	2	2.2
NMHC(ppm) Average	682	0	0.001	-	0	0	0	0	0	0	0.017
CH4(ppm) Average	682	1.95	0.1	-	1.9	1.9	1.9	1.9	2	2	2.2
O3 (ppb) Average	687	25.1	8	-	5	16	20	25	32	36	43
NO2 (ppb) Average	681	2.5	2	-	0	1	1	2	3	5	14
NO (ppb) Average	681	0.7	1	-	0	0	0	0	1	2	18
NOX (ppb) Average	681	3.2	3	-	0	1	1	2	4	7	32
PM2.5 (ug/m3) Average	707	3.51	3.1	-	0	1	1.6	2.7	4.3	6.9	37.9
Wind Speed 10 m (km/h) Average	718	6.7	4	-	0	2	4	6	9	12	18
Wind Direction 10 m (deg) Average	718	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	-1.06	6.1	-	-16.2	-7.9	-4.8	-2.6	3.8	7.4	16
Relative Humidity (%) Average	720	80.1	13	-	28	62	71	85	89	94	97

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	08 Nov 2016 16:00	08 Nov 2016 16:00	1	Maintenance - replaced manifold
THC	22 Nov 2016 12:00	22 Nov 2016 13:00	2	Maintenance - replaced carrier gas
NO2, NO, NOX	08 Nov 2016 12:00	08 Nov 2016 14:00	3	Maintenance - confirmed calibration points for Ozone
PM2.5	01 Nov 2016 01:00	01 Nov 2016 02:00	2	Unstable operation - excessive baseline drift
PM2.5	01 Nov 2016 06:00	01 Nov 2016 08:00	3	Unstable operation - excessive baseline drift
PM2.5	01 Nov 2016 11:00	01 Nov 2016 13:00	3	Unstable operation - excessive baseline drift
PM2.5	06 Nov 2016 15:00	06 Nov 2016 15:00	1	Unstable operation - excessive baseline drift
PM2.5	07 Nov 2016 15:00	07 Nov 2016 15:00	1	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	16 Nov 2016 03:00	16 Nov 2016 04:00	2	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Nov 8 14:00	Maximum Daily Average: 0.7 ppb on Nov 8		Hours of Data:	684
Minimum Value: 0 ppb on Nov 1 02:00	Minimum Daily Average: 0.0 ppb on Nov 27		Hours of Missing Data:	36
Maximum Diurnal Average: 0.4 ppb at hour 15	Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration:	35
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		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-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	1	1	C	C	C	C	C	0	1	0	0	0	0	0	0	0	0	0.4	1
3-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	0.2	0
4-Nov	0	0	Z	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
5-Nov	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0.5	1
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	0.2	0
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.2	1
8-Nov	Z	1	0	0	0	0	0	0	0	0	1	2	2	2	2	M	1	0	0	0	0	0	1	1	1	0.7	2
9-Nov	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	0.2	1
10-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.3	1
11-Nov	1	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	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	0.2	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	0.2	0
14-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	0.2	0
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	0.2	0
16-Nov	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	0.4	1
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	0.1	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	0.2	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	0.2	0
20-Nov	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	0.3	1
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	0	0.2	0
22-Nov	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	1	1	1	0.6	1
23-Nov	1	1	1	Z	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1
24-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	0	1	1	1	1	1	1	0	1	1	1	0.4	2
25-Nov	0	1	1	1	1	Z	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
29-Nov	0	0	0	Z	1	1	1	1	1	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.6	2
30-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1

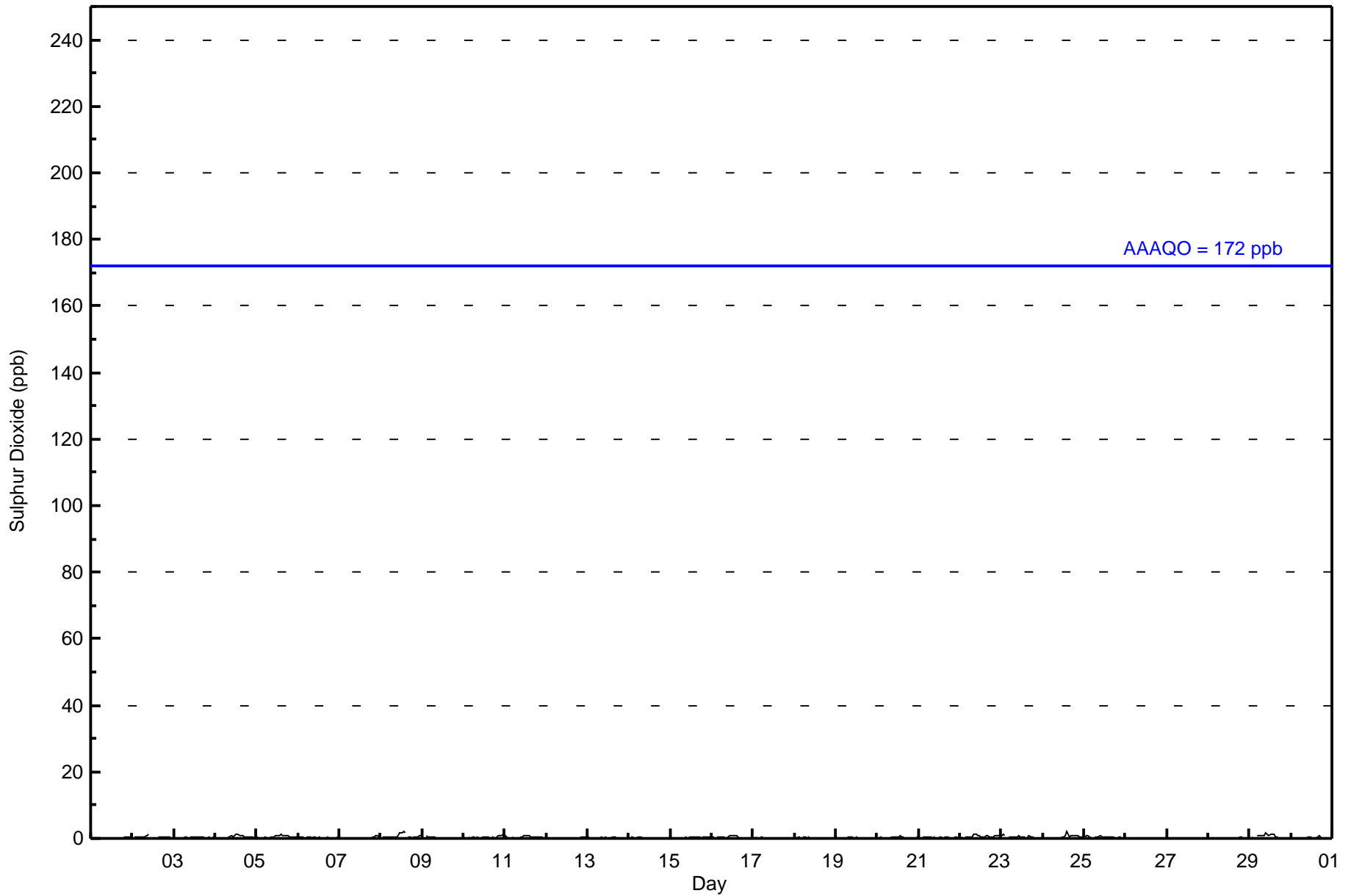
0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	Diurnal Average
1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum

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
Conklin Community - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Conklin Community - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Conklin Community - 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	31	9	14	14	7	18	47	75	76	72	70	28	49	51	67	55	683
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	31	9	14	14	7	18	47	75	76	72	70	28	49	51	67	55	683

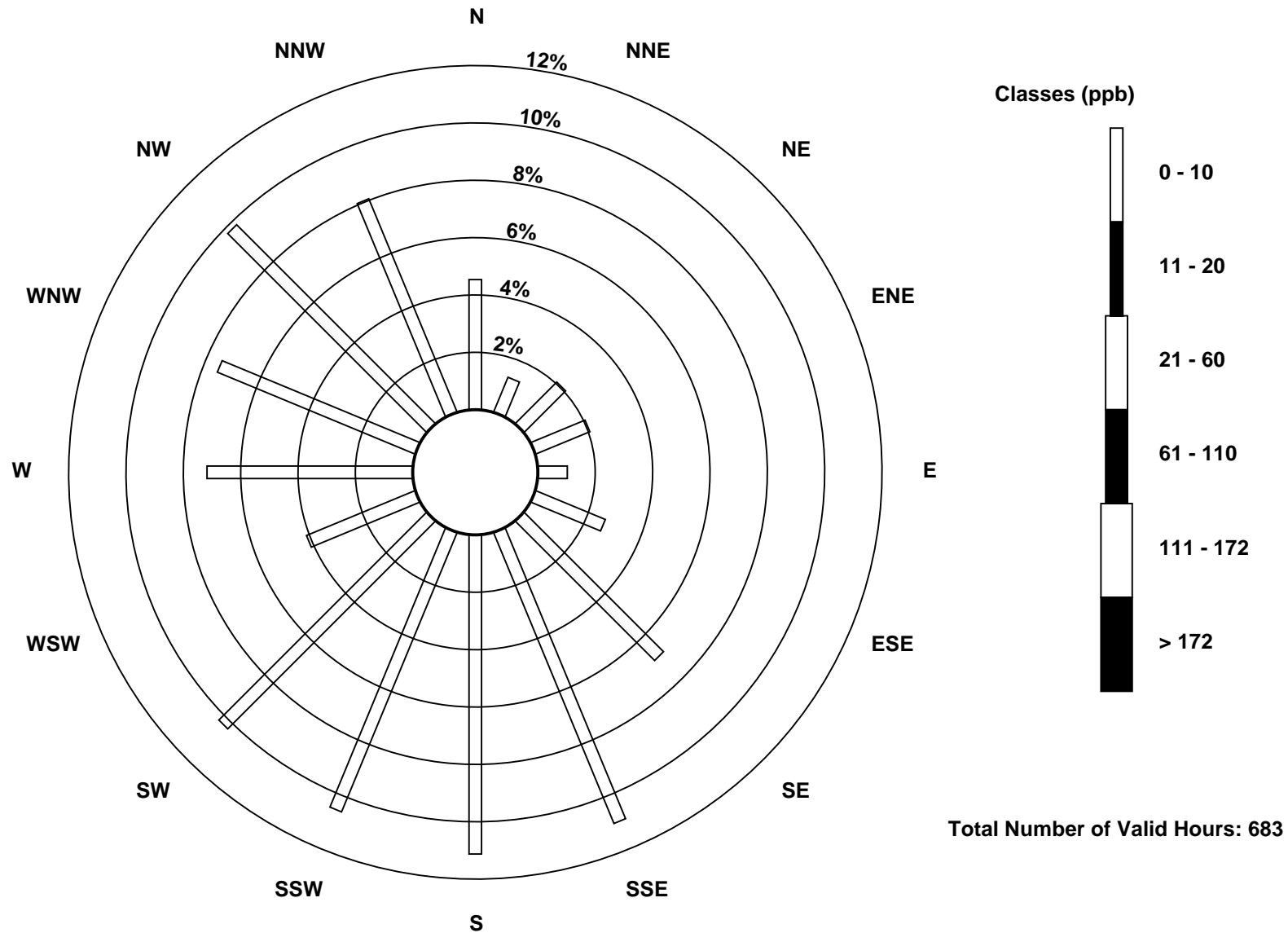
Total Number of Valid Hours: 683

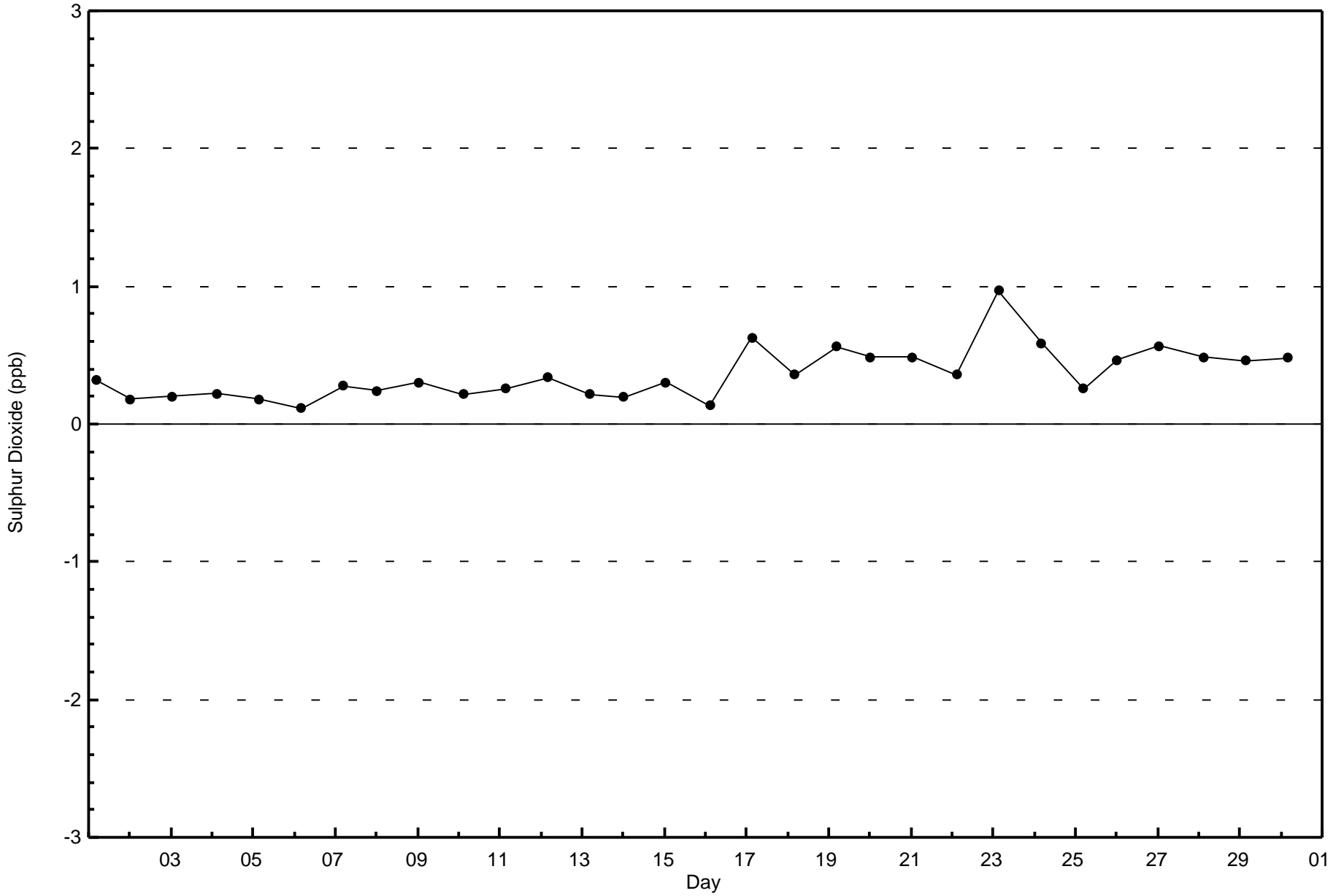
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Conklin Community (AMS 21)

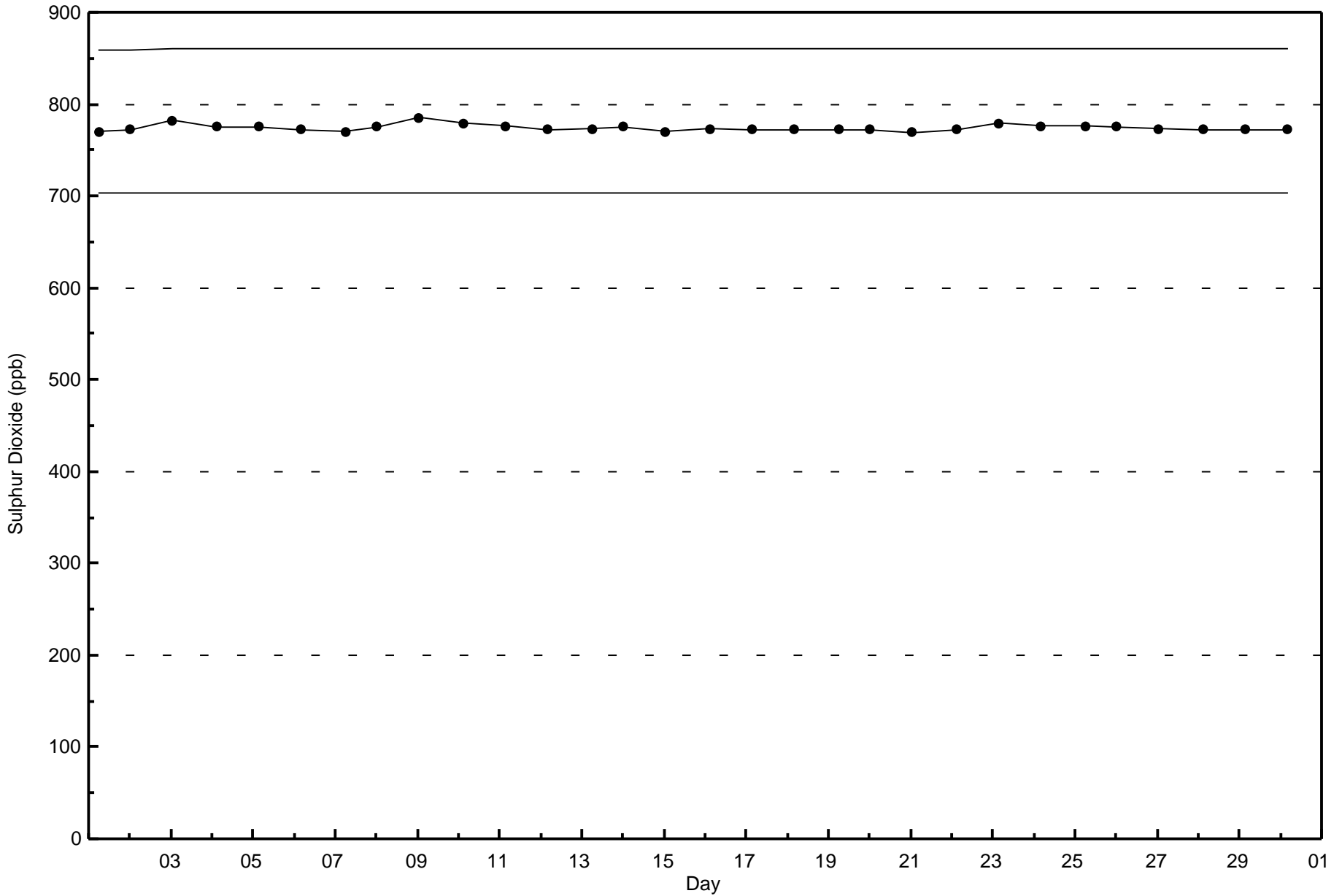






Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Conklin Community - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

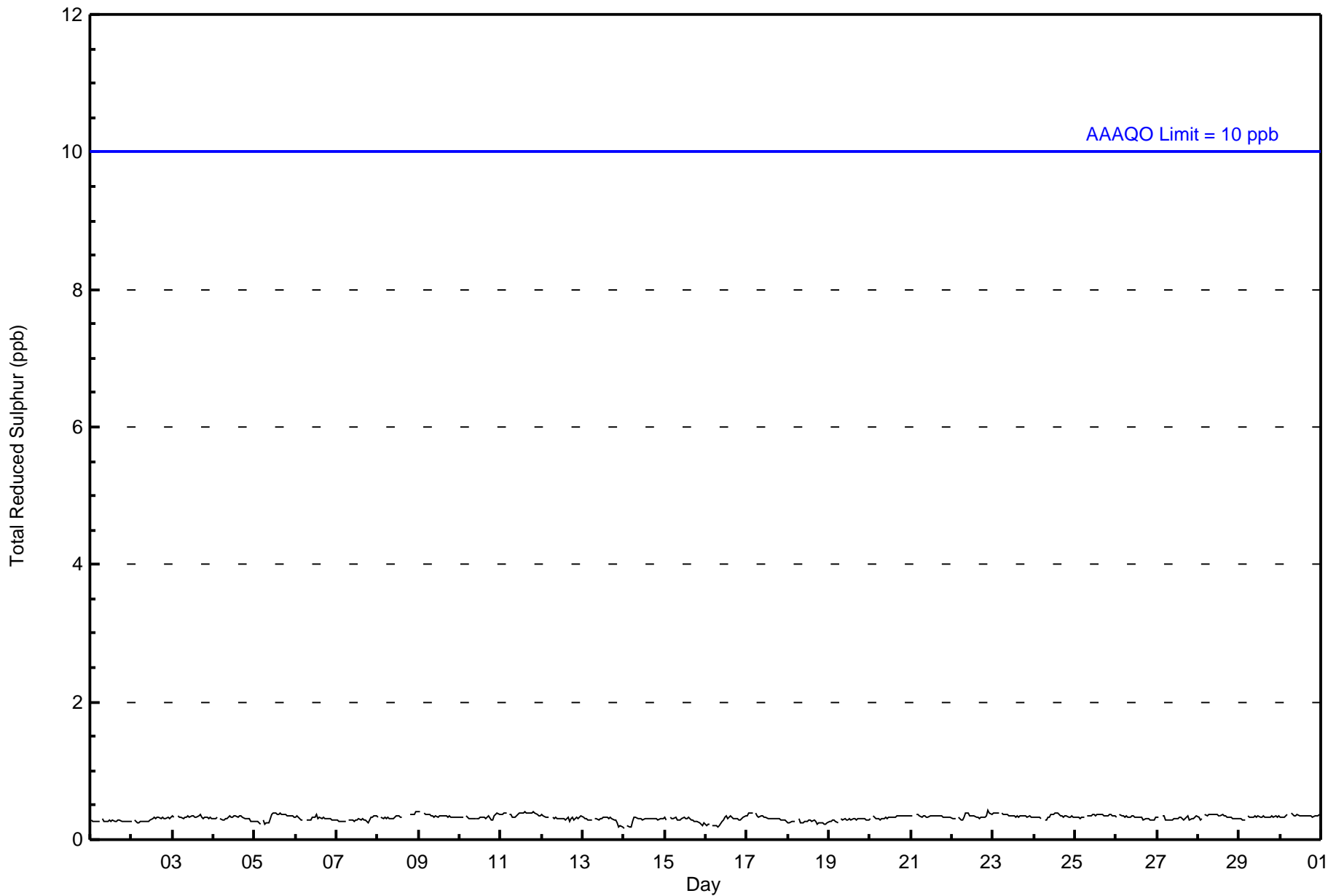
Conklin Community - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 720													
Maximum Value: 0 ppb on Nov 22 22:00														Maximum Daily Average: 0.4 ppb on Nov 11													
Minimum Value: 0 ppb on Nov 14 01:00														Minimum Daily Average: 0.3 ppb on Nov 18													
Maximum Diurnal Average: 0.3 ppb at hour 13														Minimum Diurnal Average: 0.3 ppb at hour 5													
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													
														Hours of Data: 686													
														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-Nov	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-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	0.3	0
3-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	0.3	0
4-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	0.3	0
5-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	0.3	0
6-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	0.3	0
7-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0.3	0
9-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0.3	0
10-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	0.3	0
11-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	0.4	0
12-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	0.3	0
13-Nov	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-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	0.3	0
15-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	0.3	0
16-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	0.3	0
17-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	0.3	0
18-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	0.3	0
19-Nov	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-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	0.3	0
21-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	0.3	0
22-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	0.3	0
23-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	0.4	0
24-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	0.3	0
25-Nov	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-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	0.3	0
27-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	0.3	0
28-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	0.3	0
29-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	0.3	0
30-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	0.3	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
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	686	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: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - 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 - 2	31	9	14	15	7	18	47	72	80	72	70	29	50	52	67	52	685
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	9	14	15	7	18	47	72	80	72	70	29	50	52	67	52	685

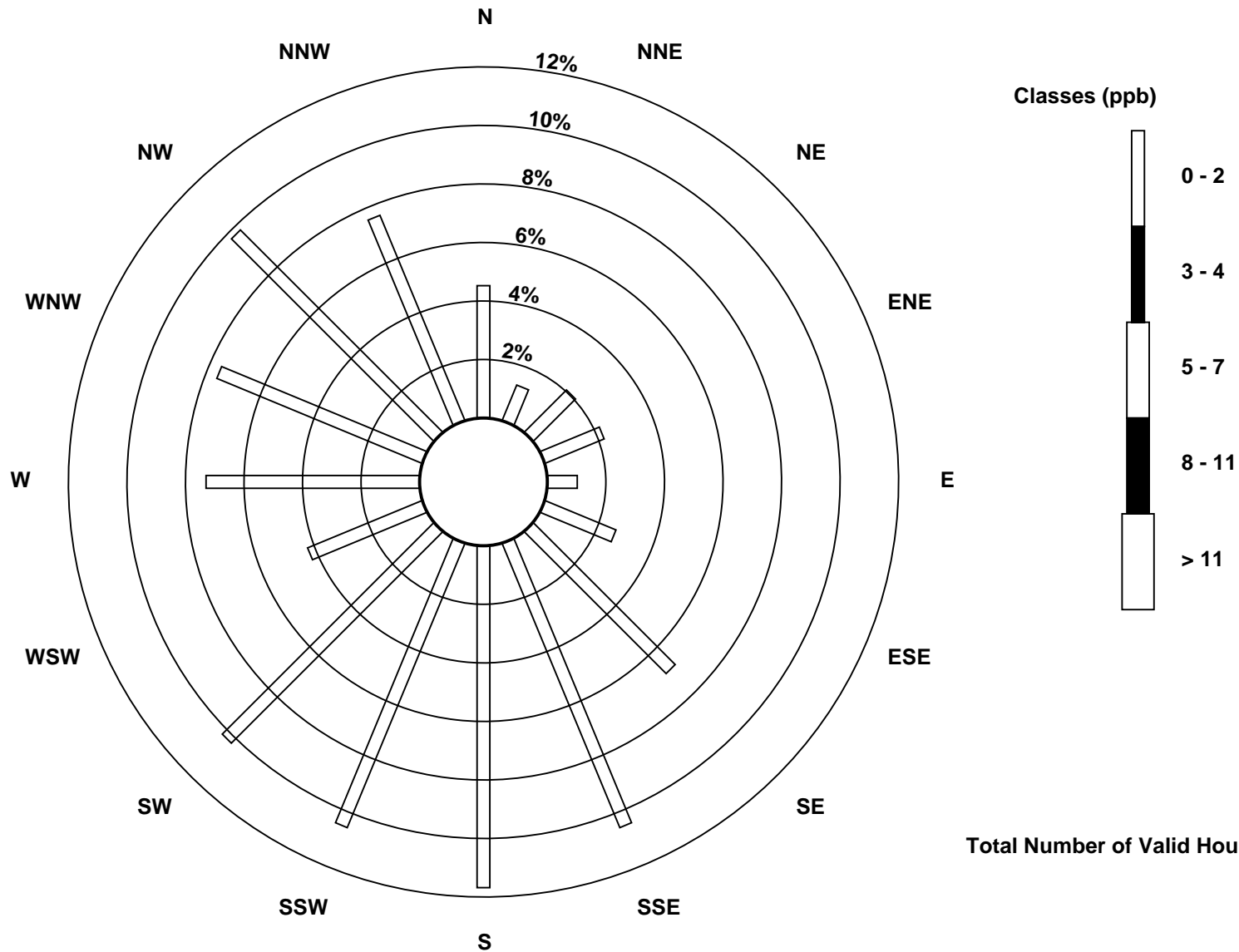
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

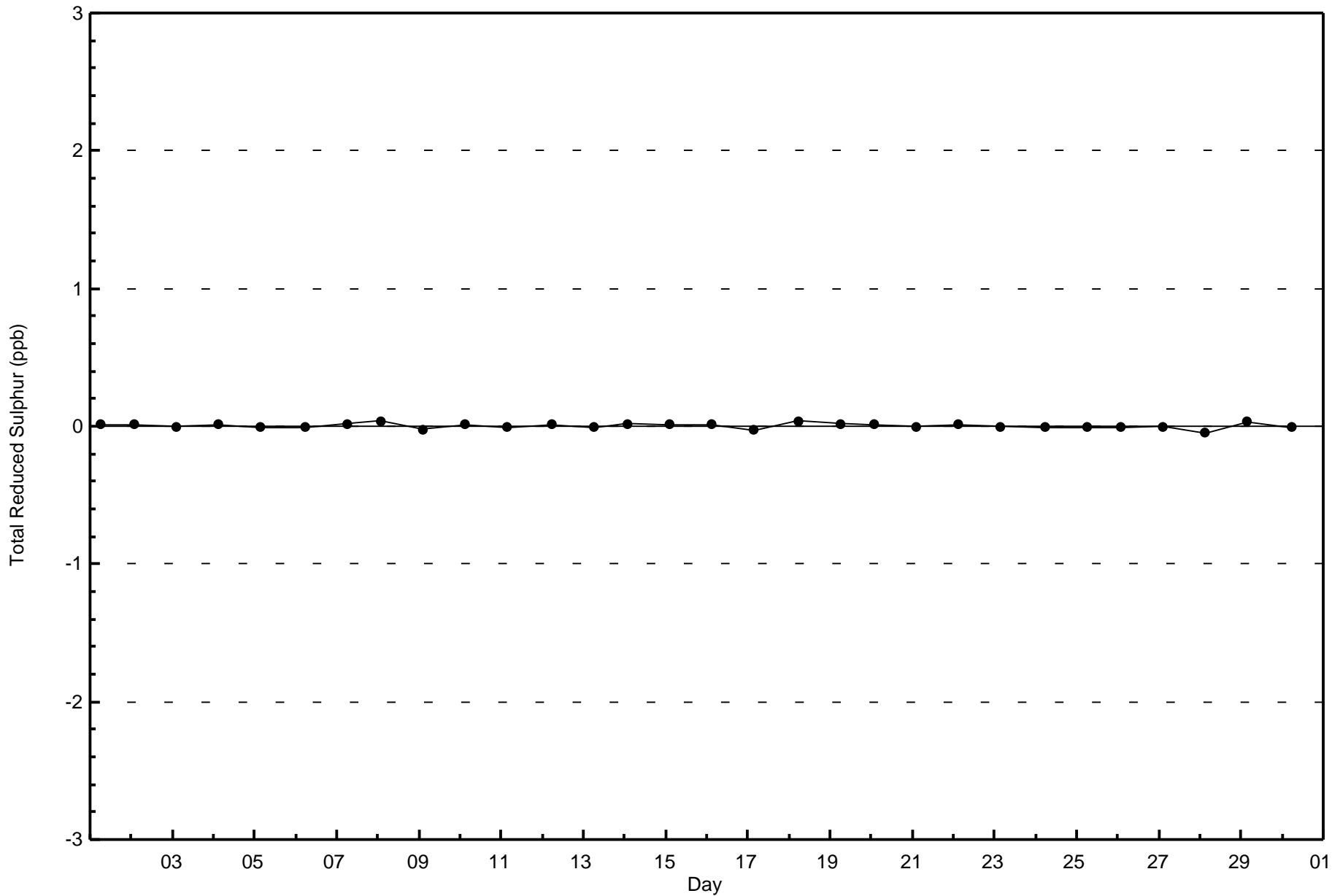
Total Reduced Sulphur (TRS) - ppb
Conklin Community (AMS 21)

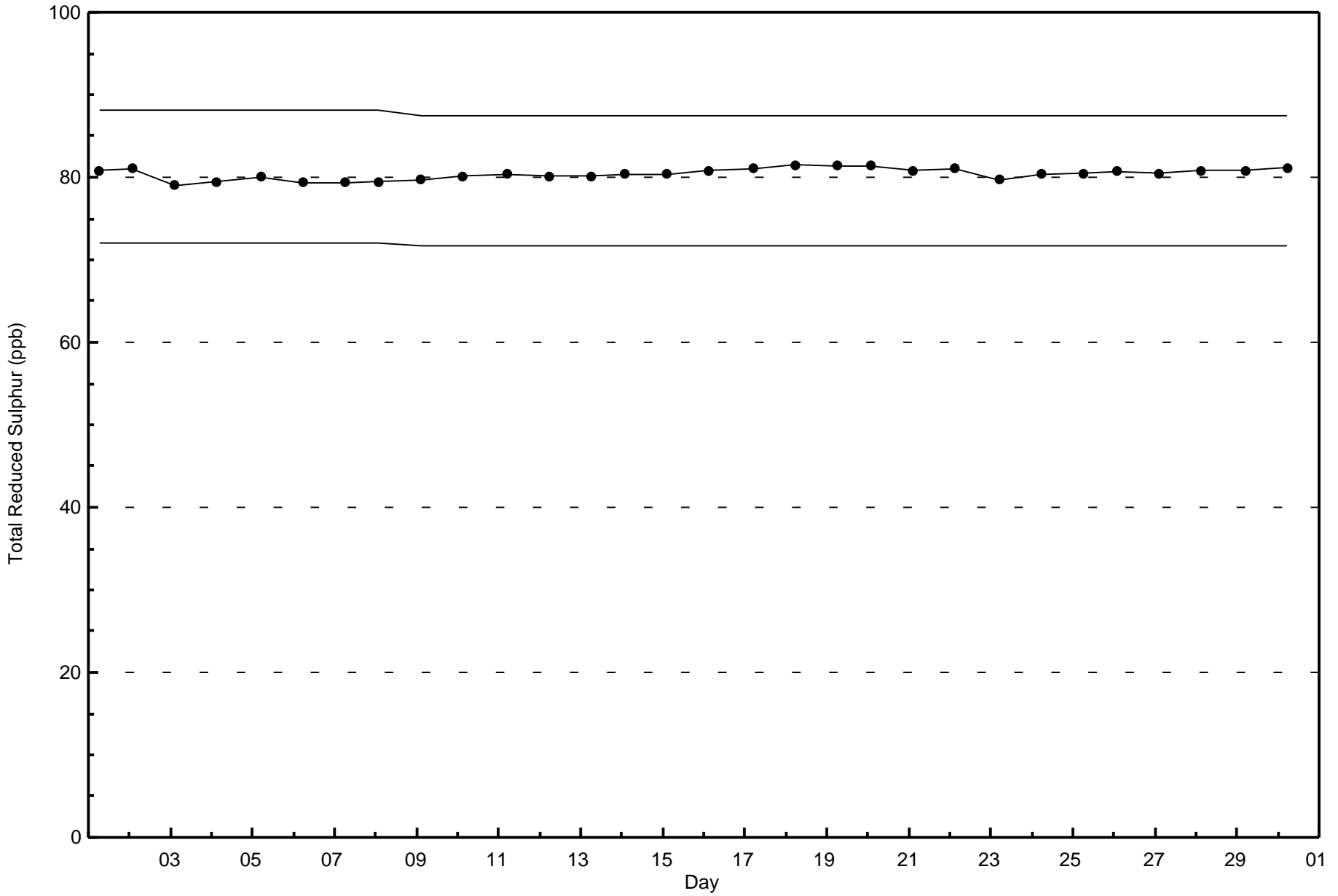




Wood Buffalo Environmental Association
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Conklin Community - November 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Conklin Community - November 2016

Maximum Value: 2.2 ppm on Nov 12 20:00	Maximum Daily Average: 2.1 ppm on Nov 5	Hours in Service: 720
Minimum Value: 1.9 ppm on Nov 9 10:00	Minimum Daily Average: 1.9 ppm on Nov 1	Hours of Data: 682
Maximum Diurnal Average: 2.0 ppm at hour 19	Minimum Diurnal Average: 1.9 ppm at hour 15	Hours of Missing Data: 38
Monthly Average: 1.95 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.0 P ₉₉ = 2.1	Hours of Calibration: 35
		Percent Operational Time: 99.6

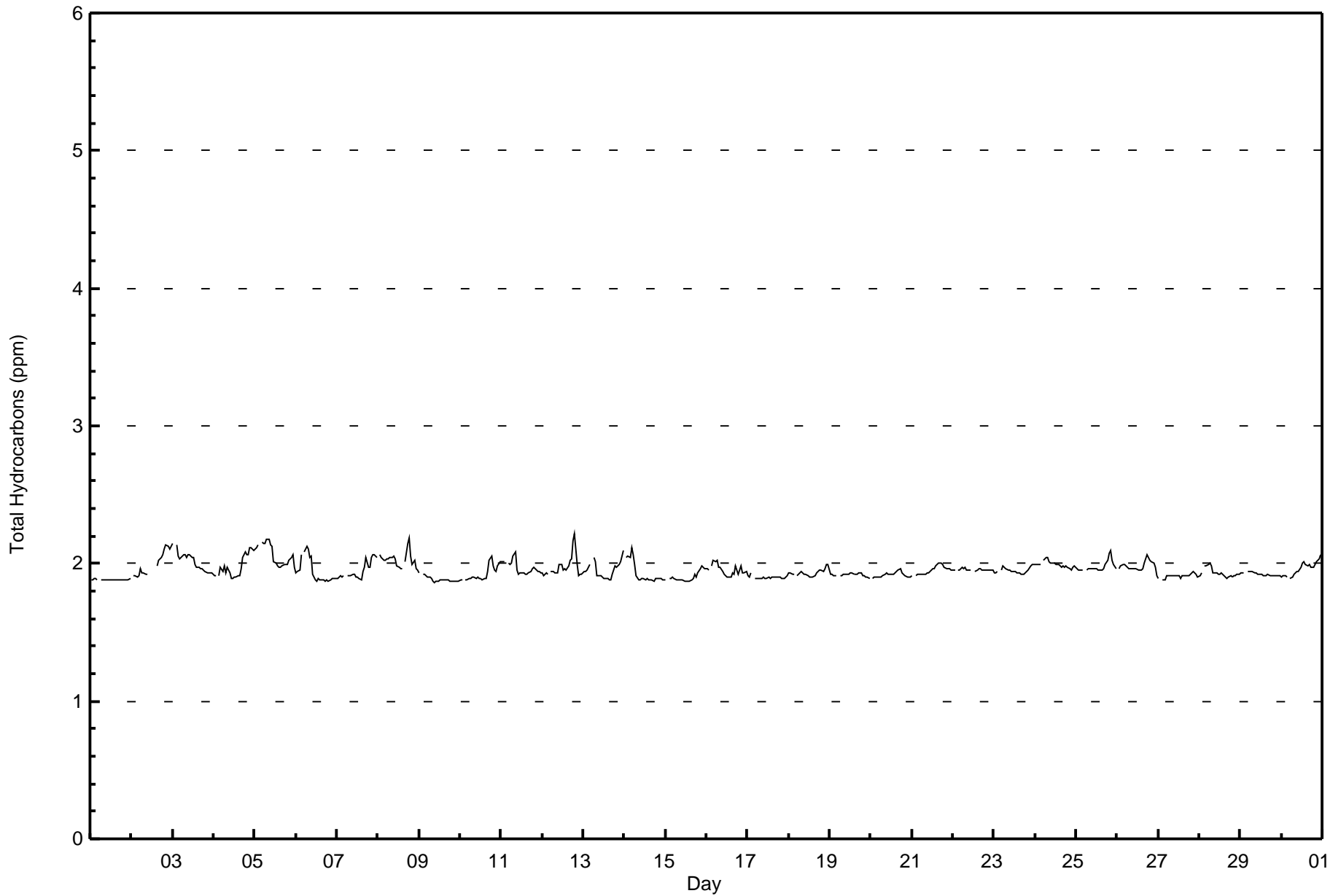
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																											
1-Nov	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																									
2-Nov	Z	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	C	C	C	C	C	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1																								
3-Nov	2.2	Z	2.1	2.1	2.0	2.0	2.1	2.1	2.0	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	1.9	1.9	1.9	2.0	2.2																								
4-Nov	1.9	1.9	Z	1.9	2.0	1.9	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1																								
5-Nov	2.1	2.1	2.1	Z	2.2	2.1	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	2.1	2.1	2.0	2.1	2.2																								
6-Nov	1.9	1.9	2.0	2.1	Z	2.1	2.1	2.1	2.0	2.1	1.9	1.9	1.9	1.9	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																								
7-Nov	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	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	1.9	2.1																									
8-Nov	Z	2.1	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	M	2.0	2.1	2.2	2.1	2.0	2.0	2.0	1.9	2.0	2.2																									
9-Nov	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																								
10-Nov	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	2.0	2.1	2.0	2.0	1.9	2.0	2.0	1.9	2.1																									
11-Nov	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.1																									
12-Nov	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	1.9	2.0	2.0	2.0	2.2	2.2	2.0	1.9	1.9	1.9	2.0	2.2																									
13-Nov	1.9	1.9	1.9	2.0	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	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1																									
14-Nov	Z	2.0	2.1	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1																								
15-Nov	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	2.0	2.0	2.0	1.9	2.0																								
16-Nov	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	2.0	1.9	1.9	2.0	1.9	1.9	1.9	2.0	2.0																								
17-Nov	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																								
18-Nov	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	2.0	1.9	2.0	2.0	2.0	1.9	2.0	2.0																								
19-Nov	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																								
20-Nov	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
21-Nov	1.9	Z	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																								
22-Nov	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	M	M	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	1.9	2.0	2.0																									
23-Nov	1.9	1.9	1.9	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	2.0	2.0	2.0	2.0	2.0	2.0																								
24-Nov	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-Nov	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	2.0	2.1																								
26-Nov	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	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.1																								
27-Nov	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																								
28-Nov	1.9	1.9	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
29-Nov	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																								
30-Nov	1.9	1.9	1.9	1.9	Z	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	2.1	2.1																								
																								1.9	1.9	2.0	1.9	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Diurnal Average	
																								2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	627	91.94	91.94
2.1 - 3.0	55	8.06	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - November 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	30	8	14	13	5	16	43	61	65	64	66	27	46	50	66	52	626
2.1 - 3.0	1	0	0	1	1	2	4	14	11	8	4	1	3	1	1	3	55
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	31	8	14	14	6	18	47	75	76	72	70	28	49	51	67	55	681

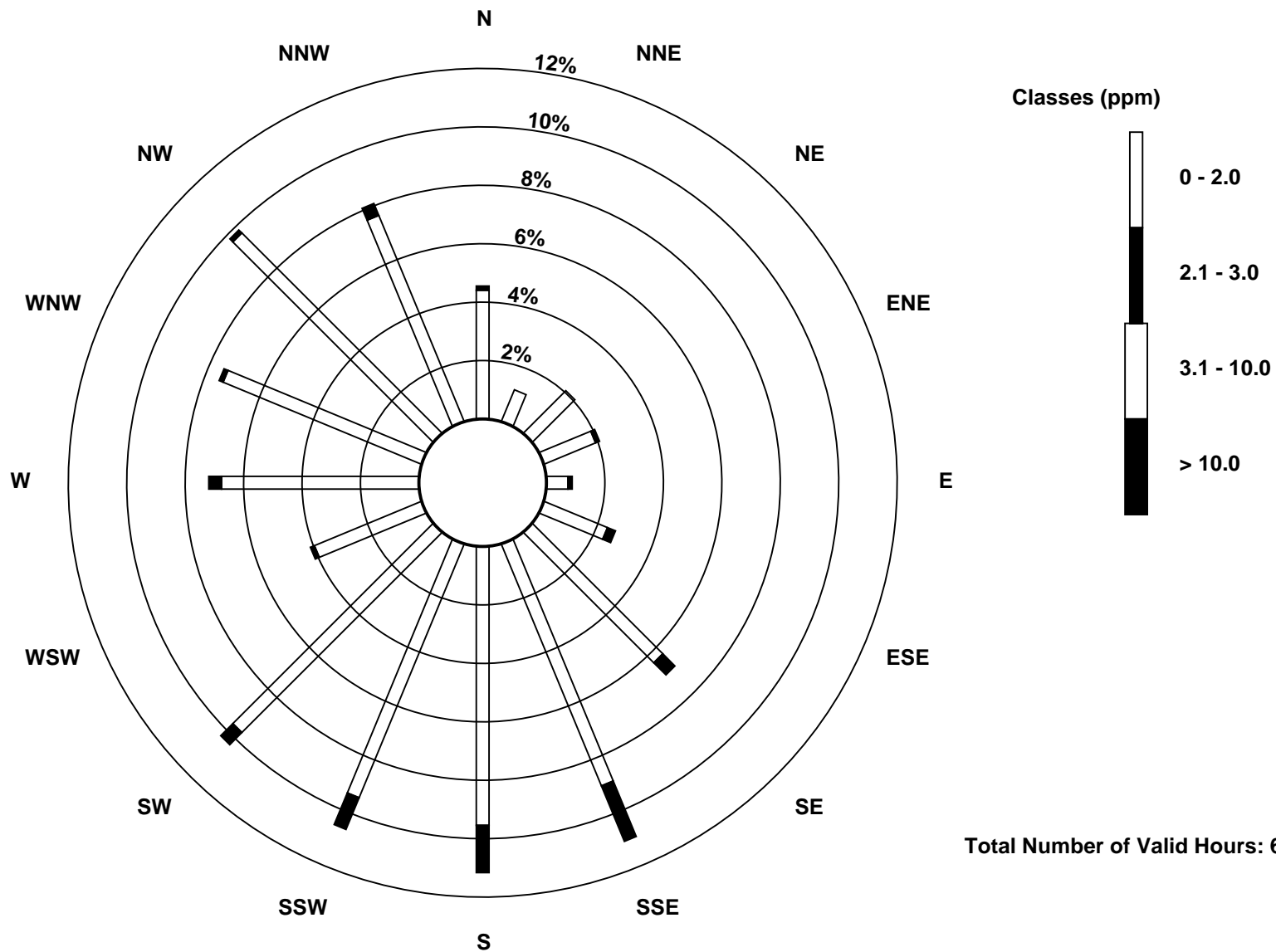
Total Number of Valid Hours: 681

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Total Hydrocarbons (THC) - ppm
Conklin Community (AMS 21)

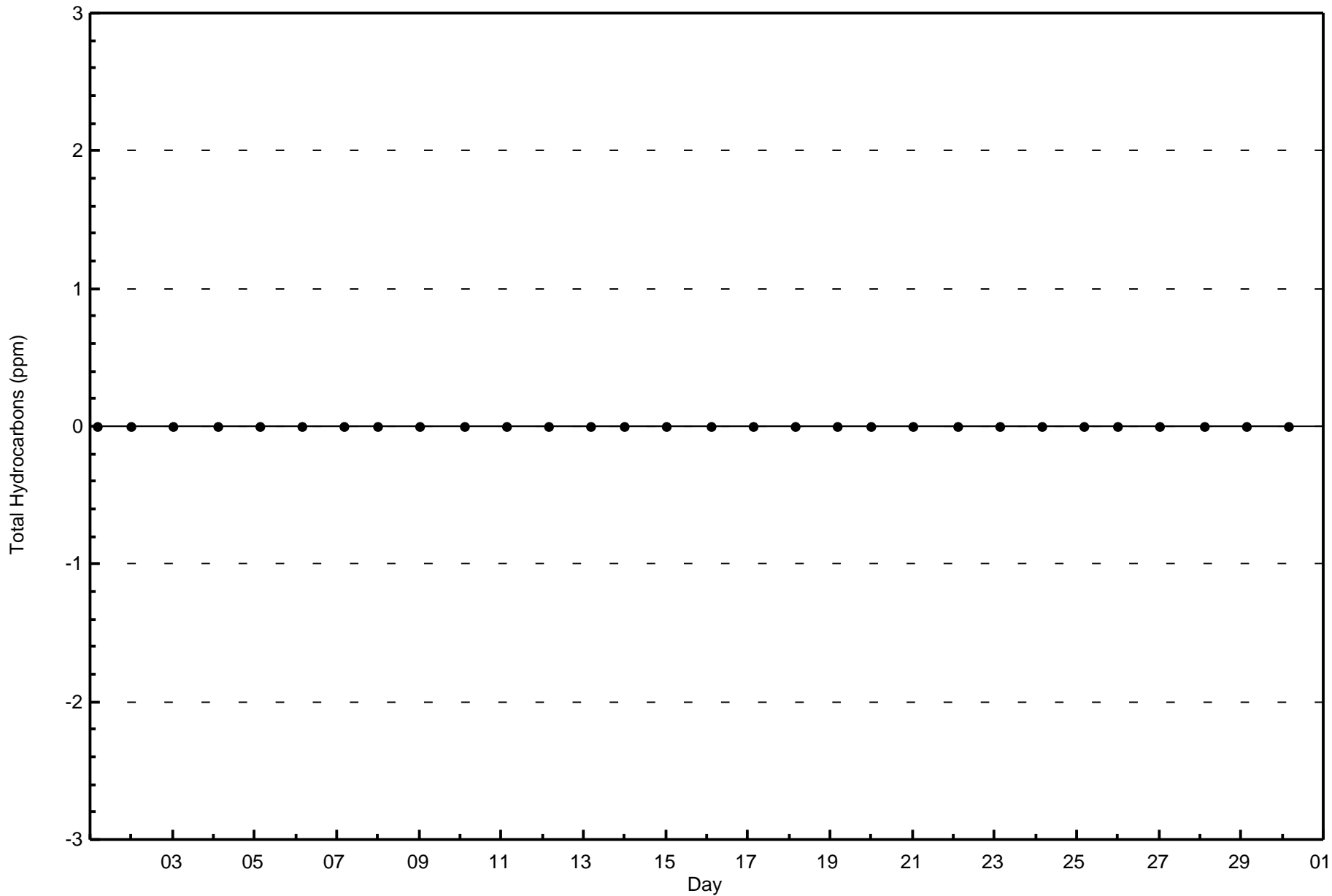


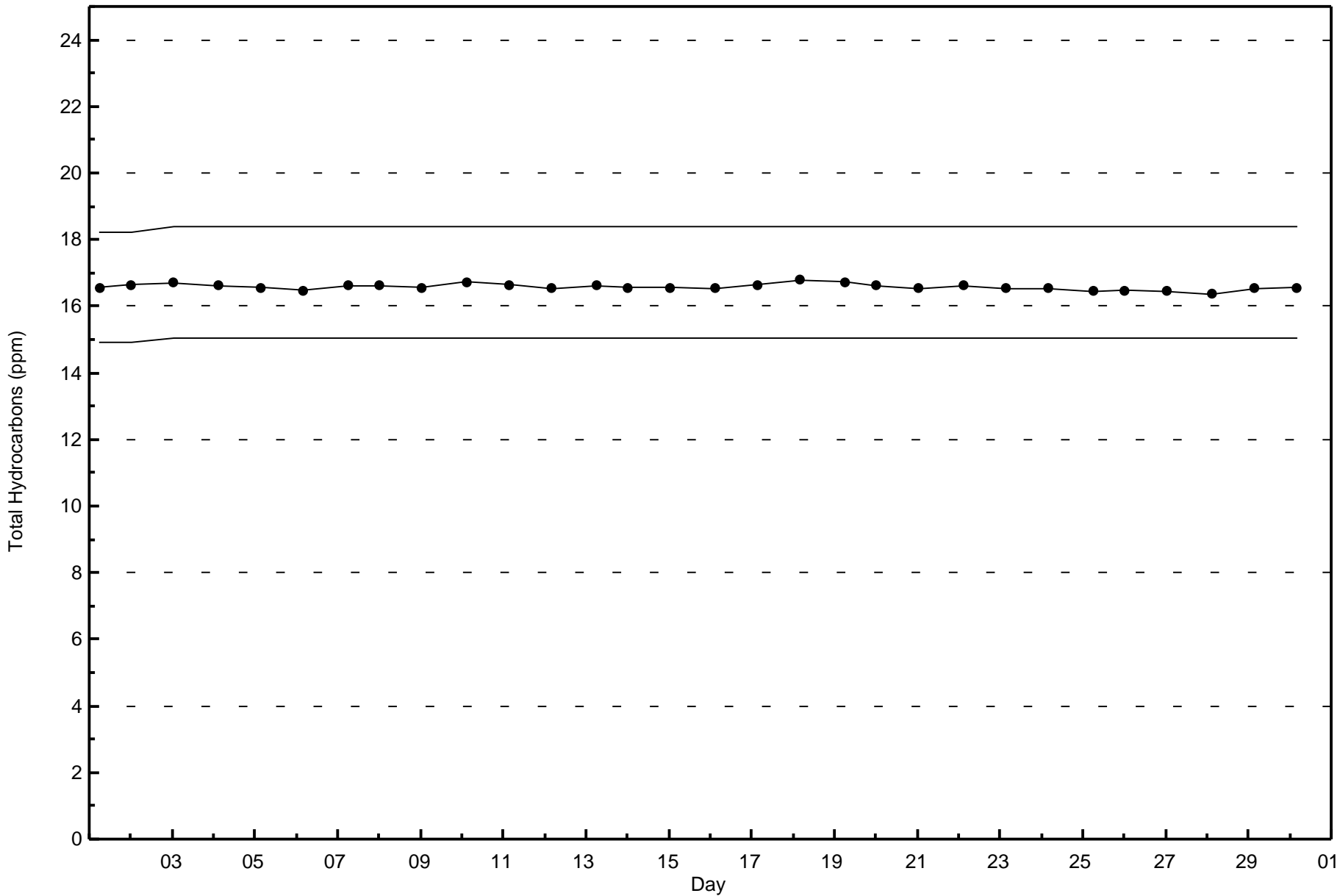
Total Number of Valid Hours: 681



Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Conklin Community - November 2016

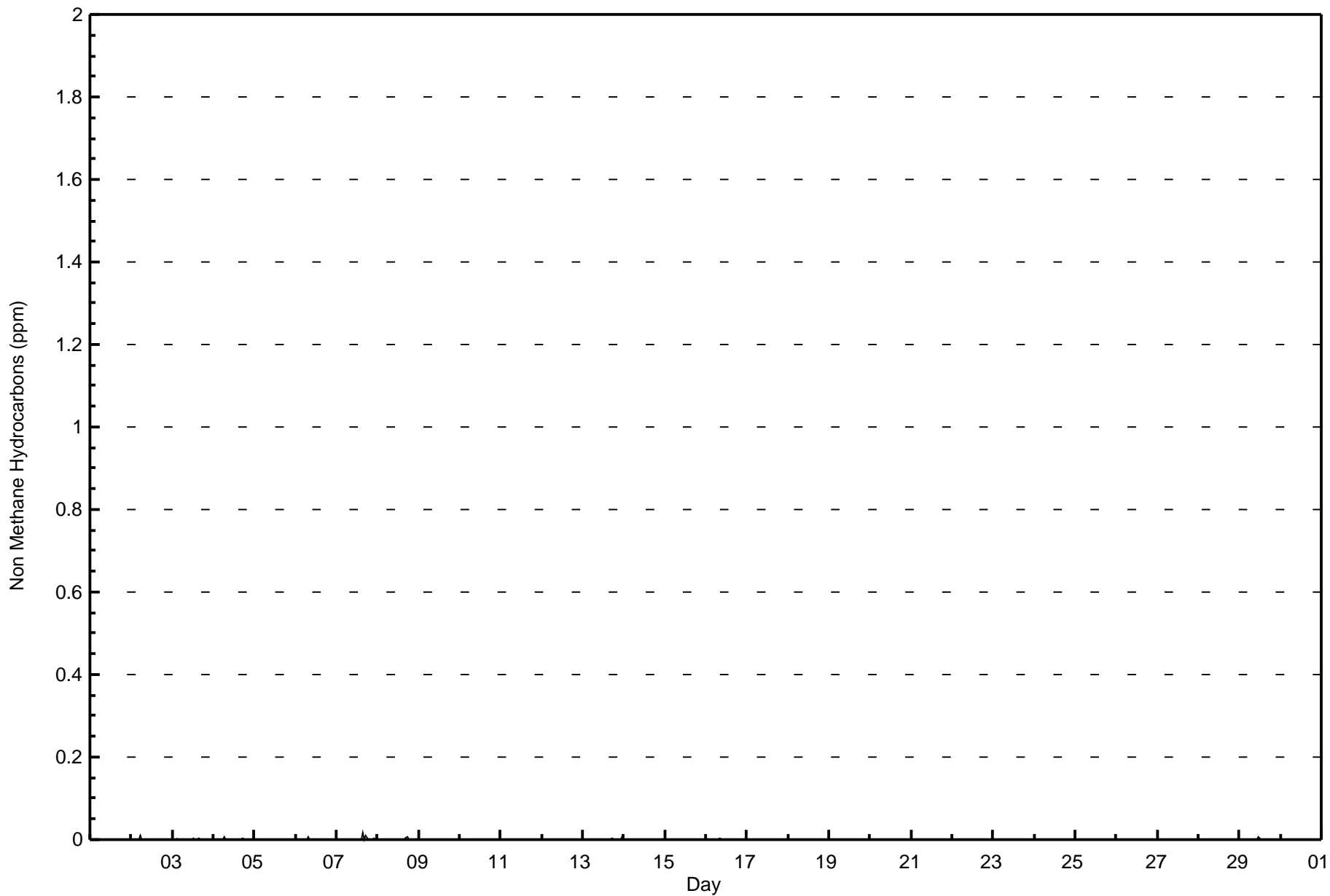






Wood Buffalo Environmental Association
Hourly Averages

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	674	98.83	98.83
0.006 - 0.05	8	1.17	100.00
0.06 - 0.1	0	0.00	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - November 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	31	8	14	14	6	18	47	74	73	70	70	28	48	50	67	55	673
0.006 - 0.05	0	0	0	0	0	0	0	1	3	2	0	0	1	1	0	0	8
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	0	0	0	0	0	0	0	0	0
Totals	31	8	14	14	6	18	47	75	76	72	70	28	49	51	67	55	681

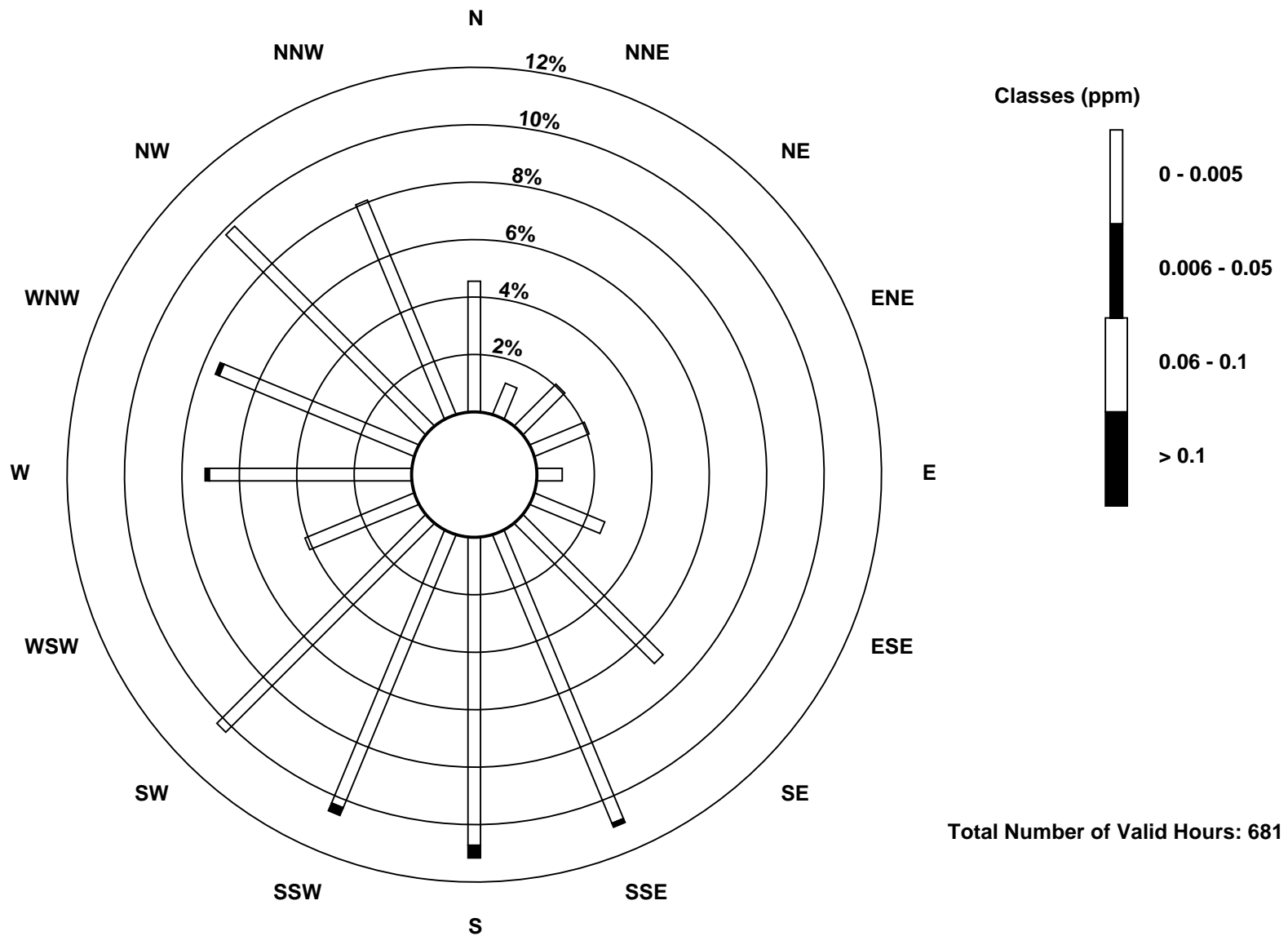
Total Number of Valid Hours: 681

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

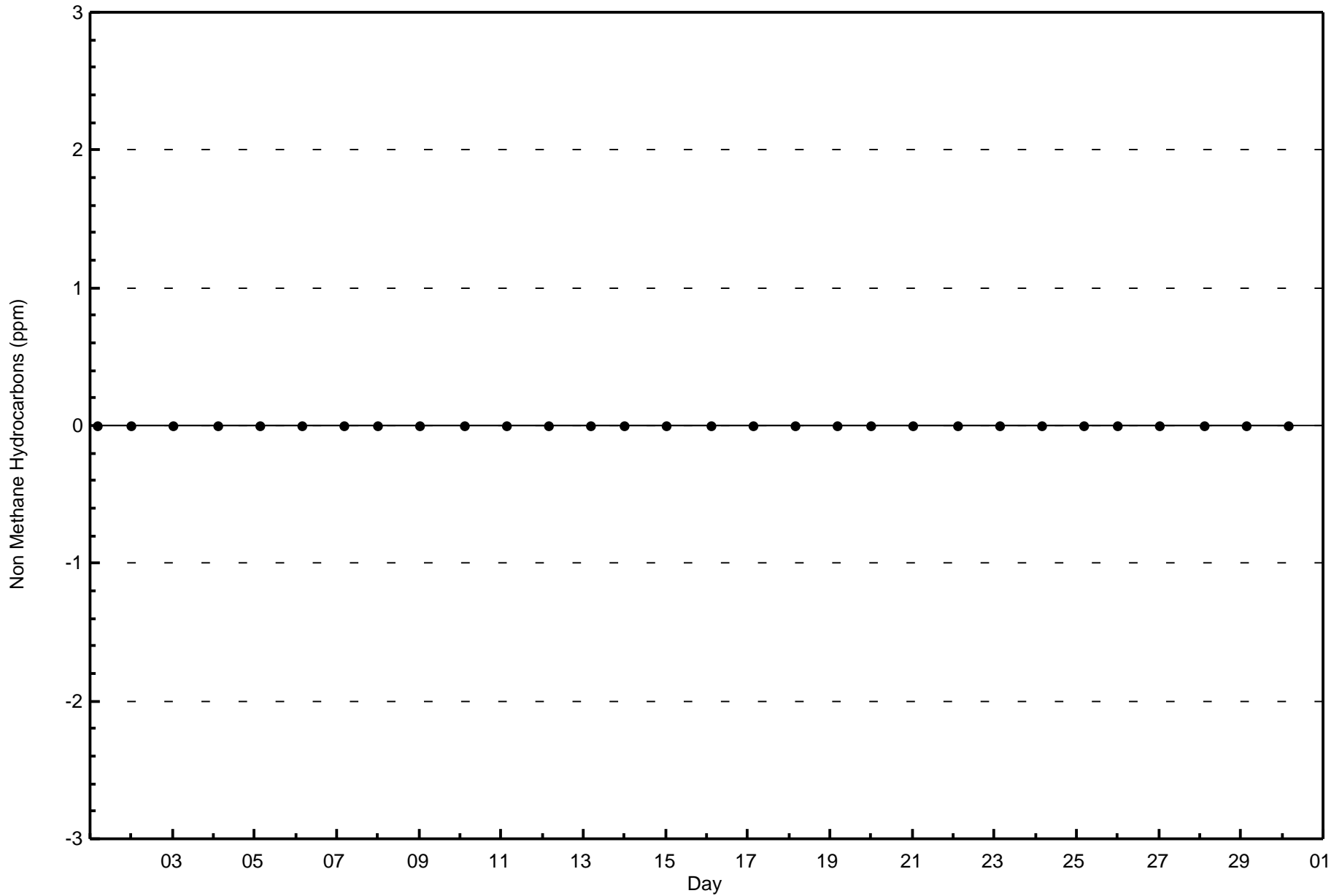
Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community (AMS 21)

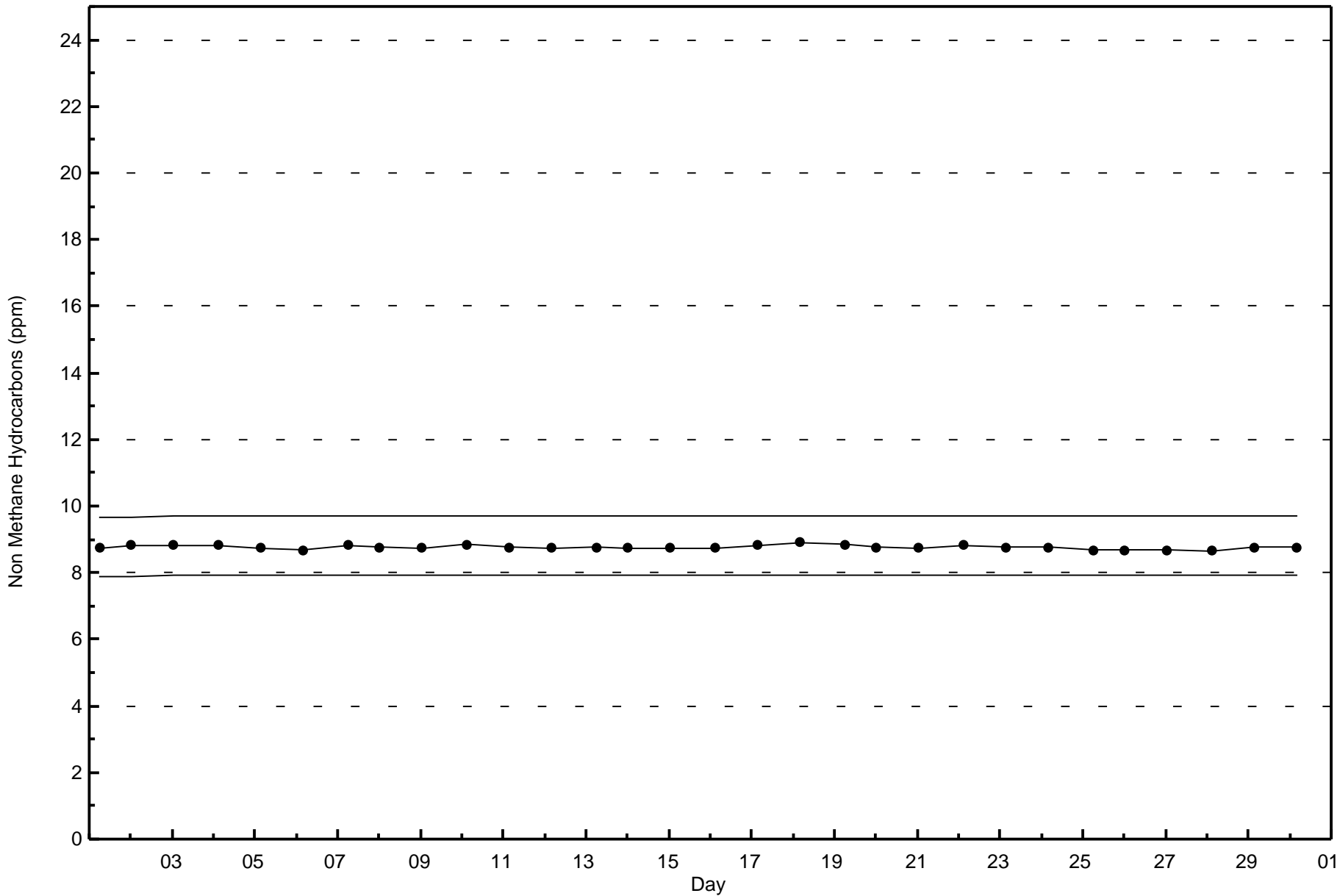




Wood Buffalo Environmental Association
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - November 2016

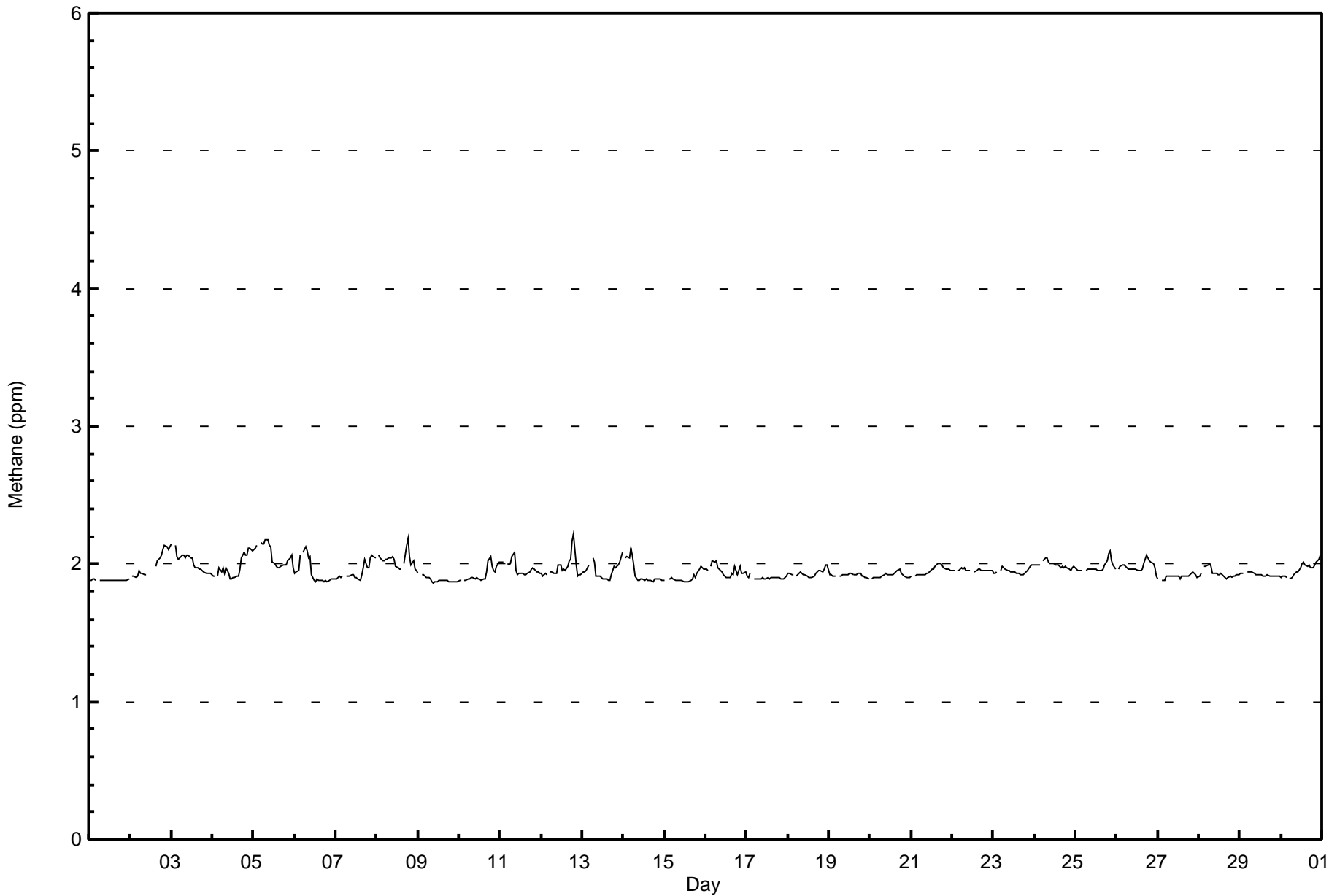






Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - November 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	627	91.94	91.94
2.1 - 3.0	55	8.06	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - November 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	30	8	14	13	5	16	43	61	65	64	66	27	46	50	66	52	626
2.1 - 3.0	1	0	0	1	1	2	4	14	11	8	4	1	3	1	1	3	55
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	31	8	14	14	6	18	47	75	76	72	70	28	49	51	67	55	681

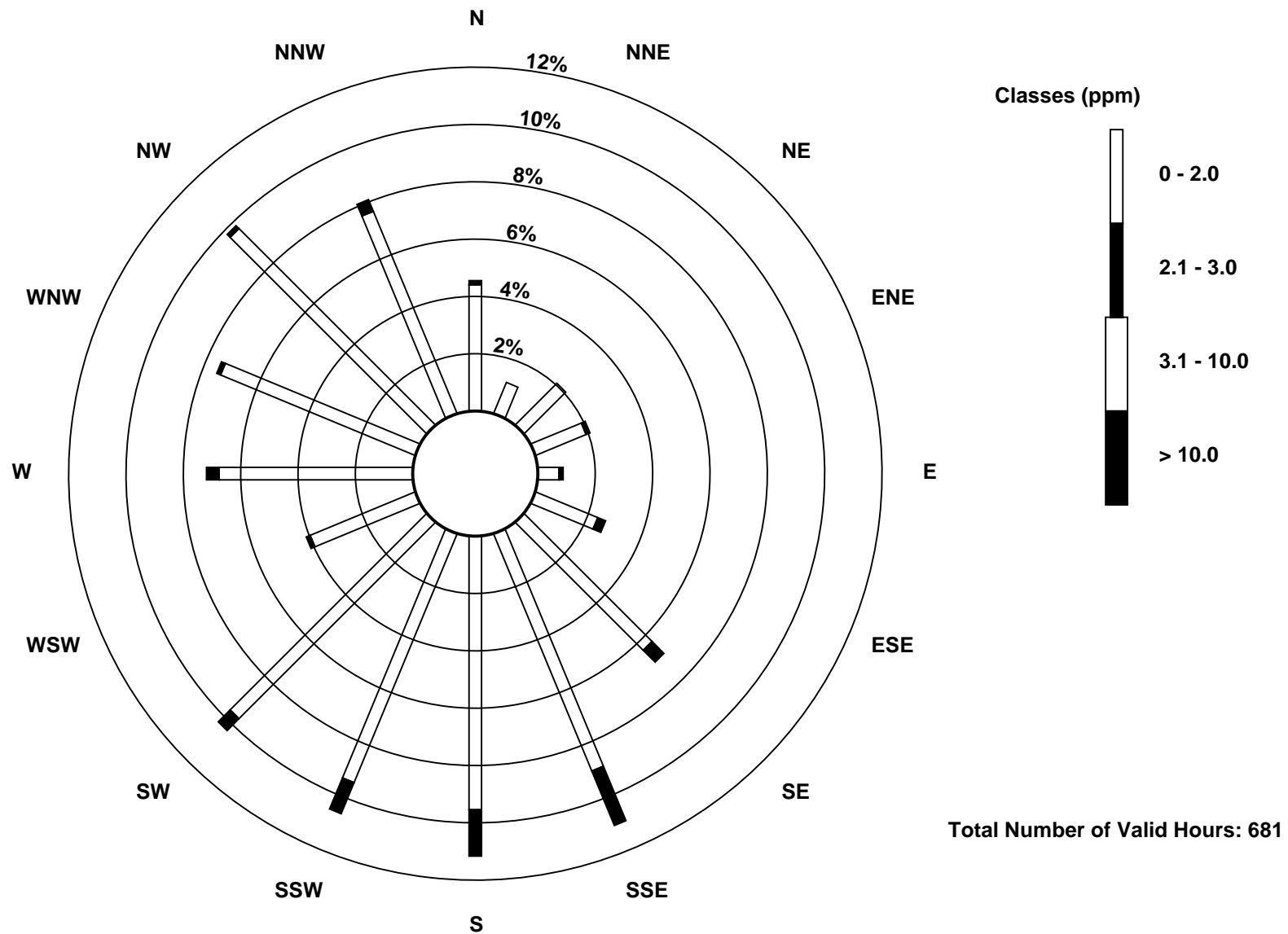
Total Number of Valid Hours: 681

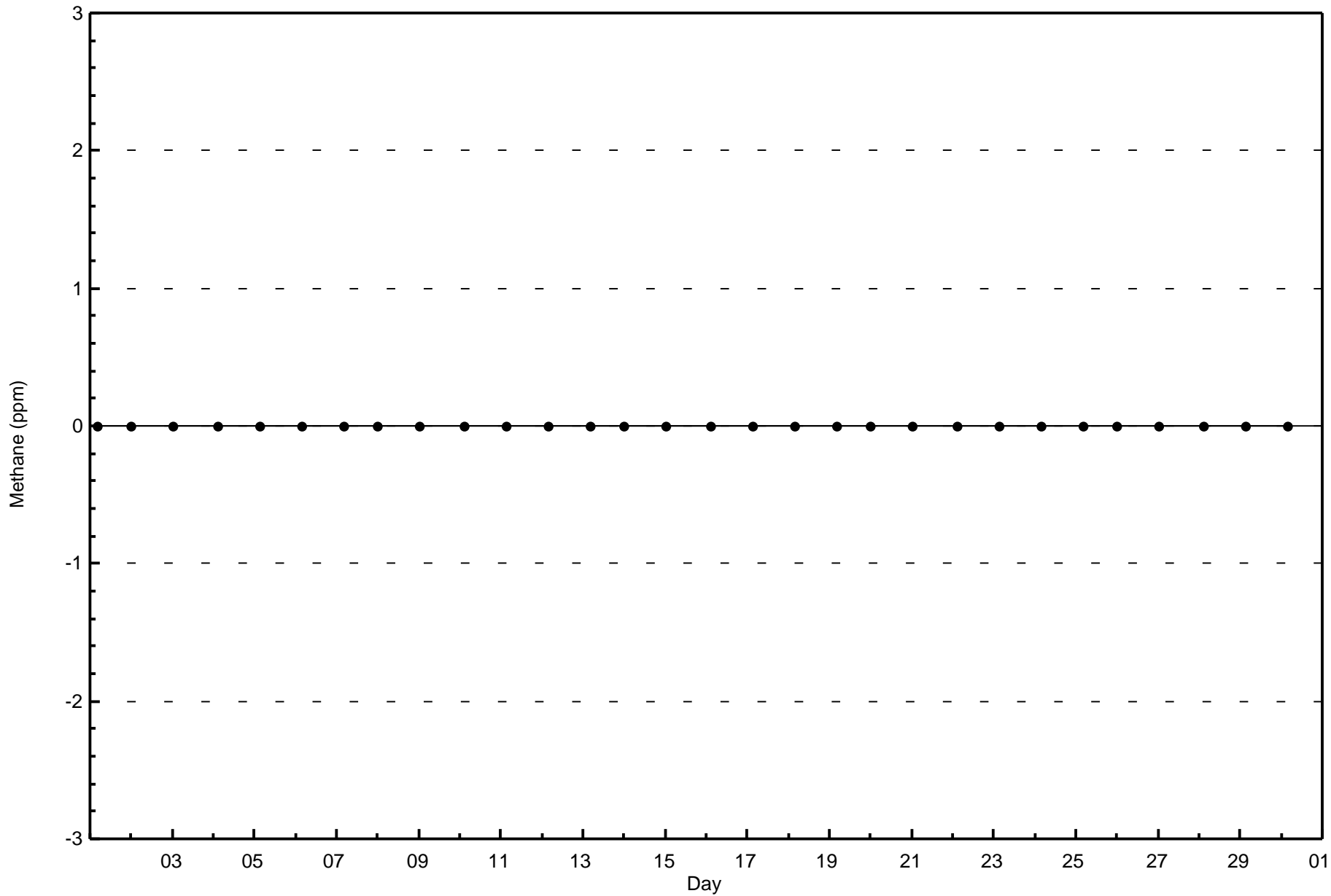
Total Number of Hours: 720

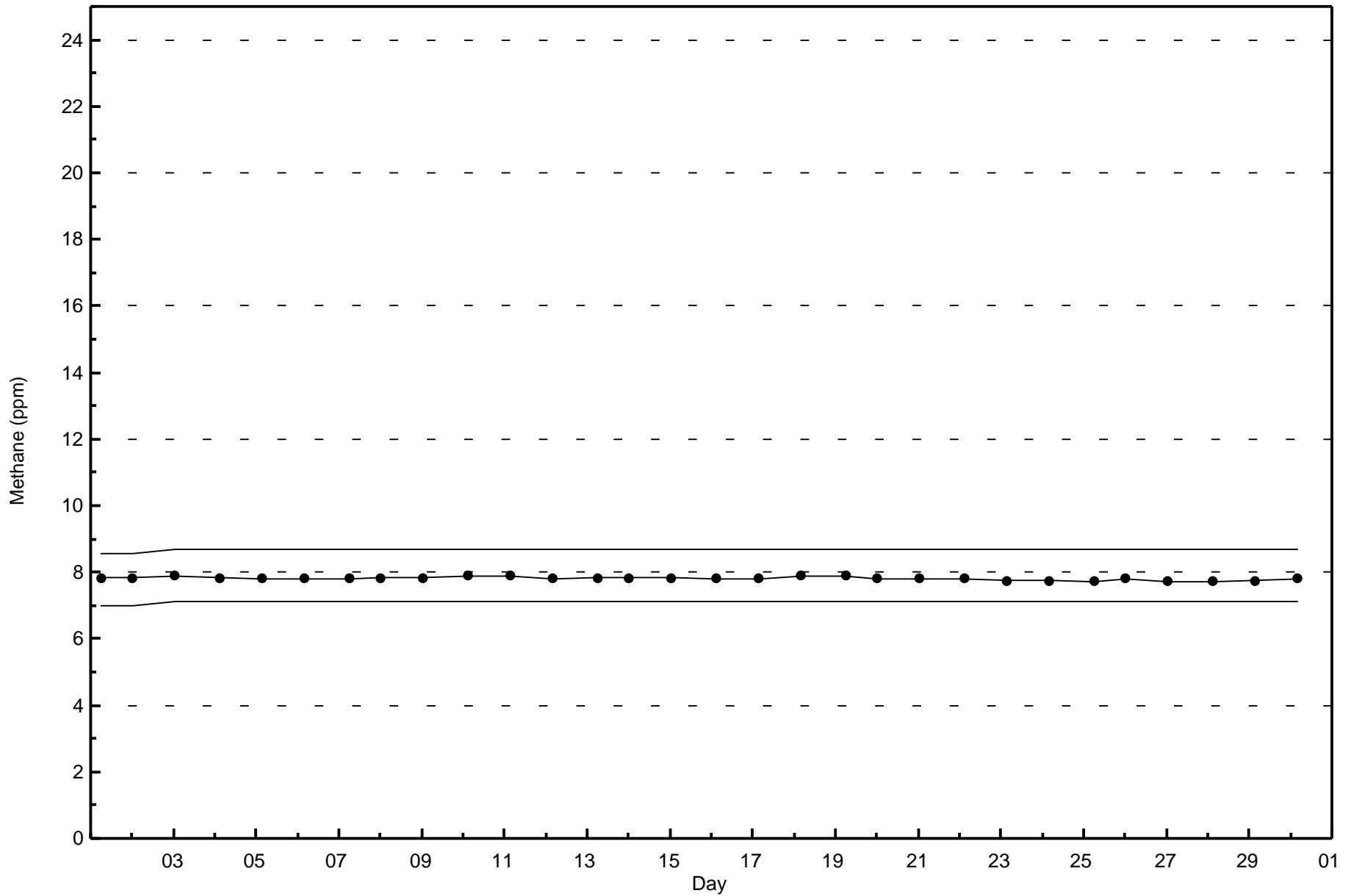


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Methane (CH₄) - ppm
Conklin Community (AMS 21)







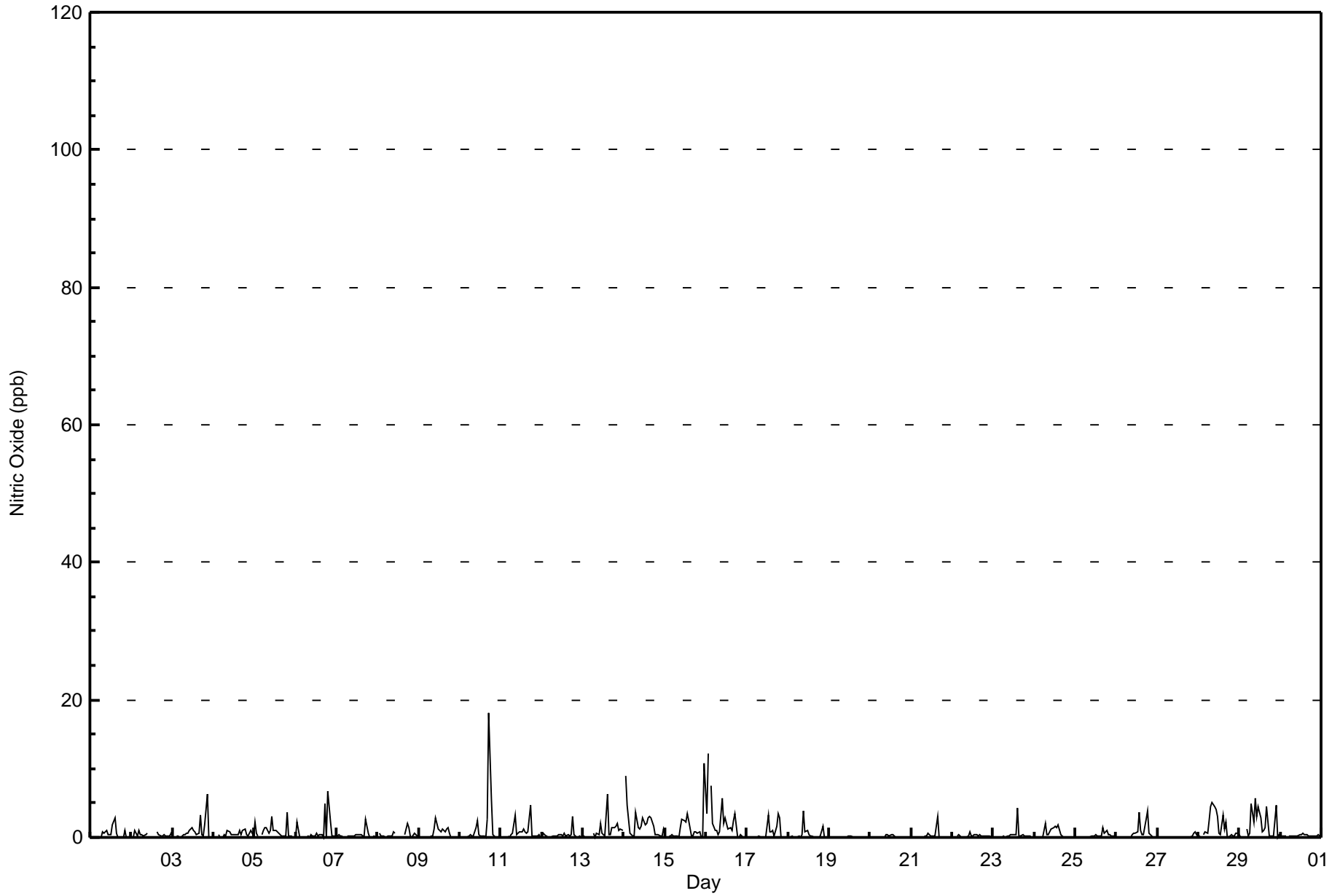


Maximum Value: 18 ppb on Nov 10 18:00																		Maximum Daily Average: 2.2 ppb on Nov 16						Hours in Service: 720		
Minimum Value: 0 ppb on Nov 1 18:00																		Minimum Daily Average: 0.0 ppb on Nov 19						Hours of Data: 681		
Maximum Diurnal Average: 1.6 ppb at hour 18																		Minimum Diurnal Average: 0.2 ppb at hour 6						Hours of Missing Data: 39		
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 = 6						Hours of Calibration: 35		
																								Percent Operational Time: 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-Nov	0	0	0	0	0	Z	0	1	1	1	0	0	0	2	3	1	0	0	0	0	1	0	0	0	0.4	3
2-Nov	Z	0	1	0	1	0	0	0	0	1	C	C	C	C	C	1	0	0	0	0	0	0	0	1	0.4	1
3-Nov	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	0	1	3	0	0	2	6	0	0	0	0.9	6
4-Nov	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	1	1	0	0.5	1
5-Nov	2	1	0	Z	1	1	1	1	1	1	3	1	1	1	1	0	0	0	0	4	0	0	0	0	0.9	4
6-Nov	0	2	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	5	0	7	2	0	0	0	0.8	7
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0.3	3
8-Nov	Z	1	0	0	0	0	0	0	0	1	1	M	M	M	1	M	0	2	1	0	0	1	0	0	0.5	2
9-Nov	0	Z	0	0	0	0	0	0	0	1	3	1	1	1	1	1	1	1	1	0	0	0	0	0	0.6	3
10-Nov	0	0	Z	0	0	0	0	0	0	1	2	0	0	0	0	0	3	18	6	0	0	0	0	0	1.4	18
11-Nov	0	0	0	Z	0	0	0	1	3	0	1	1	1	1	1	1	1	5	0	0	0	0	0	0	0.7	5
12-Nov	0	1	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	1	3	0	0	0	0	0	0.4	3
13-Nov	0	0	0	0	0	Z	1	0	1	0	2	1	0	0	6	0	0	1	1	2	2	1	1	1	1.0	6
14-Nov	Z	9	5	1	0	0	0	4	1	1	2	3	2	2	3	3	3	2	0	0	0	0	0	1	1.9	9
15-Nov	0	Z	0	0	0	0	0	0	0	1	3	2	2	3	2	0	0	1	1	1	1	0	0	11	1.3	11
16-Nov	3	12	Z	8	2	1	1	0	1	6	2	3	2	1	1	1	2	3	0	0	0	0	0	0	2.2	12
17-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	3	1	1	1	0	2	3	3	0	0	0	0	0.6	3
18-Nov	0	0	0	0	Z	0	0	0	0	4	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0.4	4
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
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	0.1	0
21-Nov	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
22-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	0.2	1
23-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0.4	4
24-Nov	0	0	0	0	Z	0	2	0	0	1	1	1	2	1	2	0	0	0	0	0	0	0	0	0	0.5	2
25-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.3	1
26-Nov	Z	0	0	0	0	0	0	0	0	0	1	1	1	4	1	0	0	3	4	1	0	0	0	0	0.7	4
27-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.1	1
28-Nov	0	0	Z	0	1	1	2	5	5	5	4	3	1	0	3	1	2	0	0	1	0	0	1	1	1.6	5
29-Nov	0	0	0	Z	1	0	1	5	2	6	3	4	3	1	1	1	4	0	0	0	0	5	0	0	1.7	6
30-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
																		Diurnal Average						Diurnal Maximum		
																		0.3						3		
																		1.1						12		
																		0.3						5		
																		0.4						8		
																		0.3						2		
																		0.2						1		
																		0.4						2		
																		0.6						5		
																		0.6						5		
																		1.1						6		
																		1.1						4		
																		1.0						4		
																		0.9						3		
																		0.8						4		
																		1.2						6		
																		0.7						3		
																		0.8						4		
																		1.6						18		
																		0.8						6		
																		0.8						7		
																		0.6						6		
																		0.3						5		
																		0.2						1		
																		0.6						11		
Z - zerspan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Conklin Community - 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	31	9	14	14	7	18	47	75	75	71	69	28	49	51	67	55	680
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	31	9	14	14	7	18	47	75	75	71	69	28	49	51	67	55	680

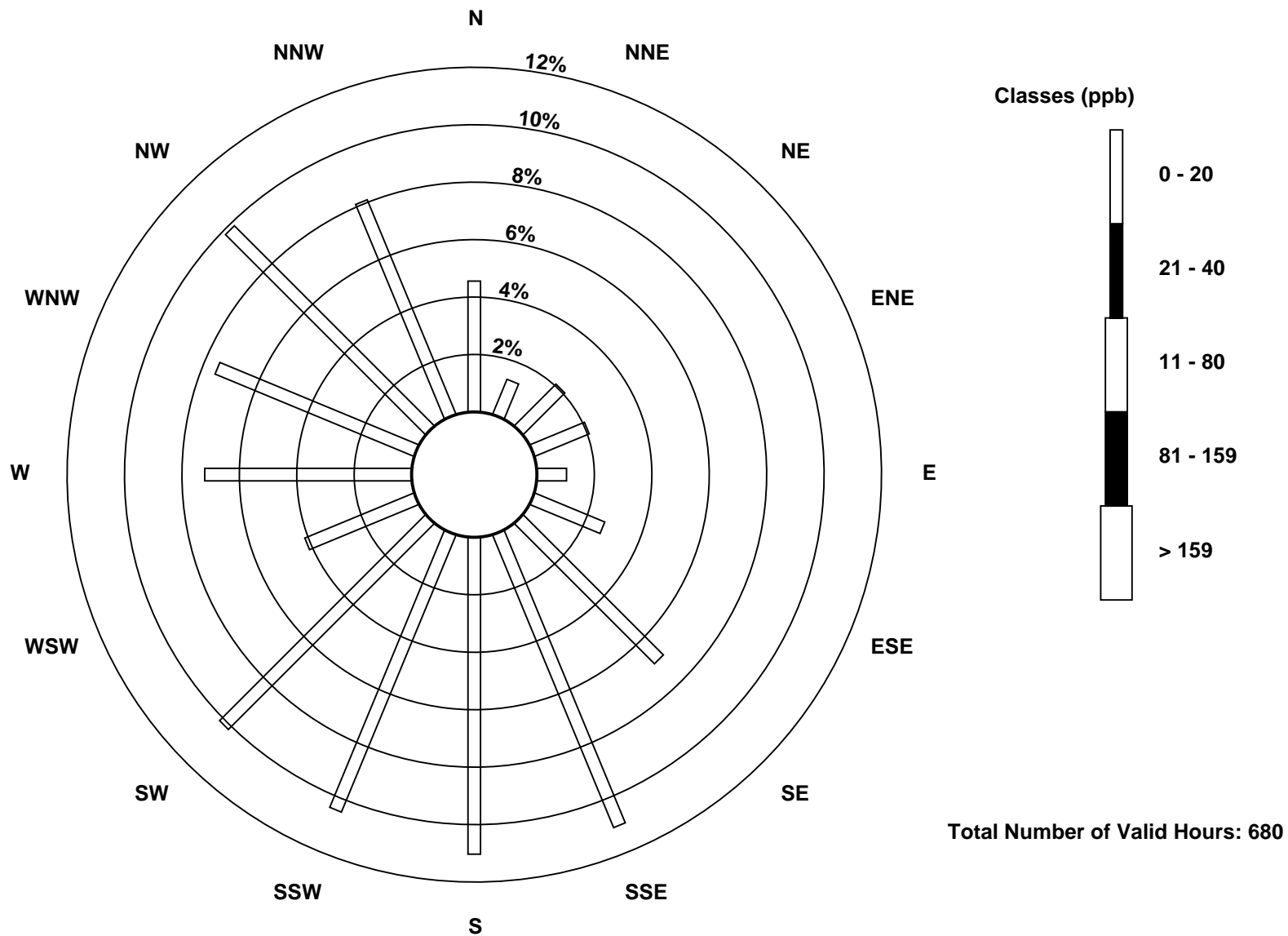
Total Number of Valid Hours: 680

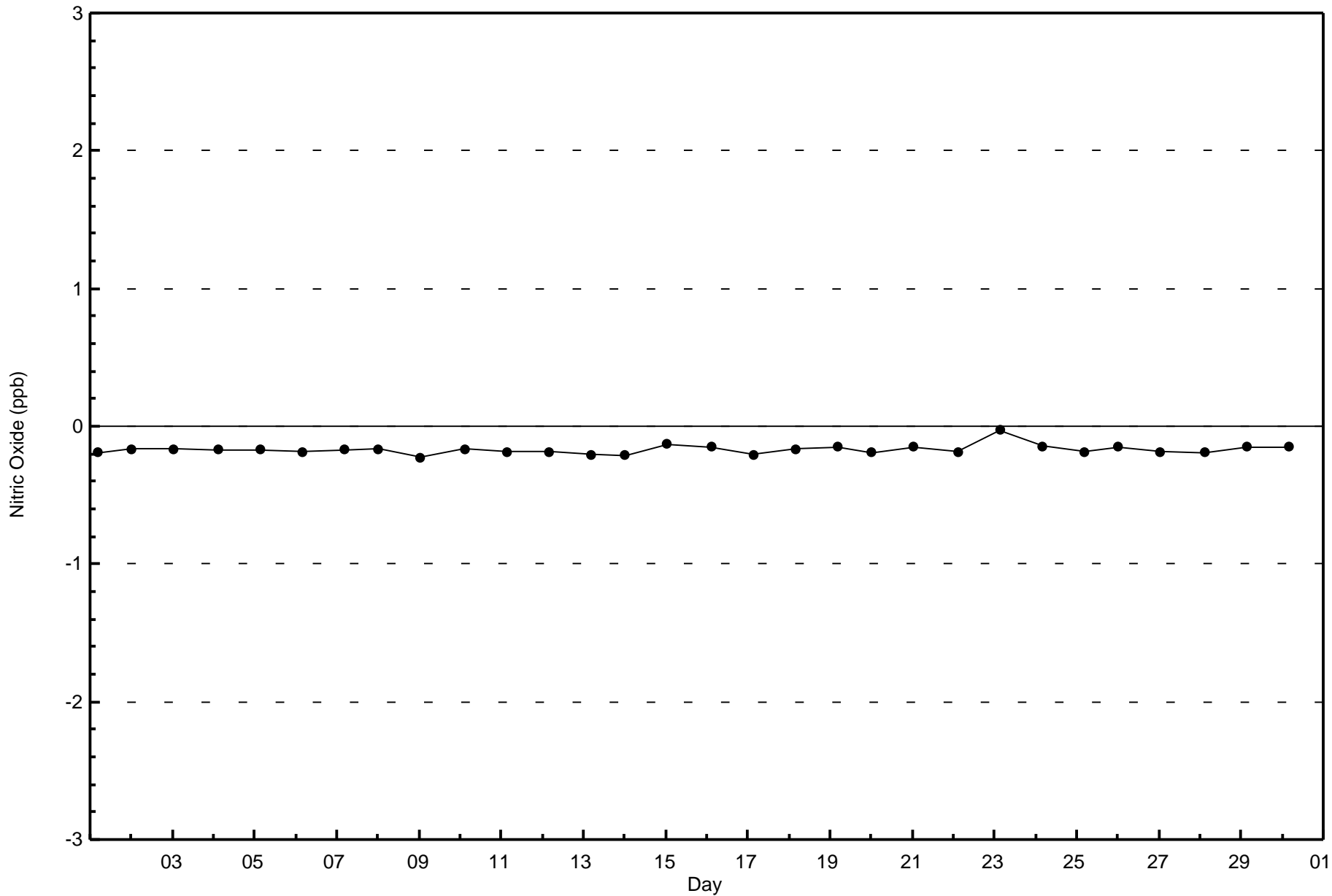
Total Number of Hours: 720

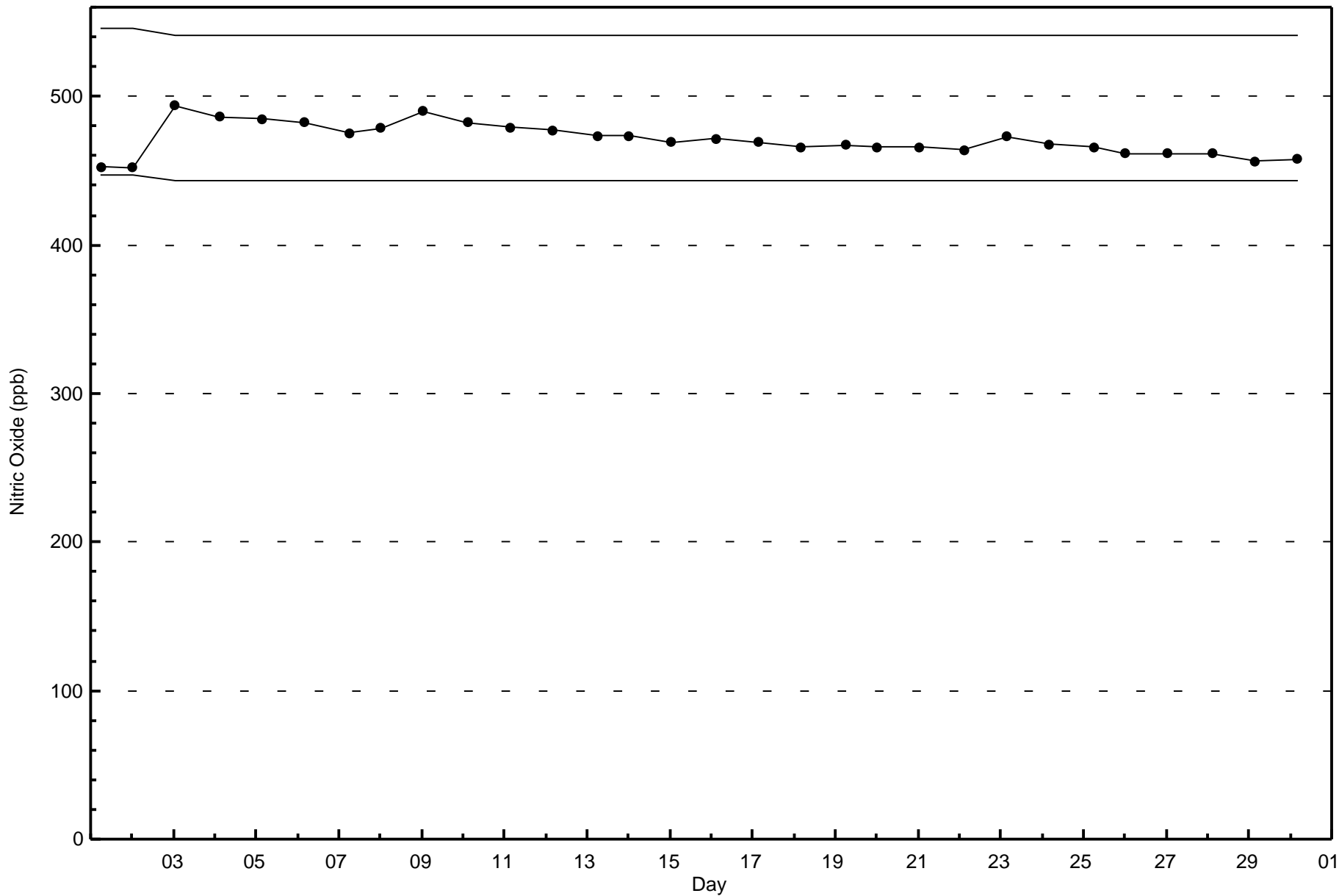


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitric Oxide (NO) - ppb
Conklin Community (AMS 21)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Conklin Community - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 14 ppb on Nov 10 18:00	Maximum Daily Average: 4.5 ppb on Nov 28
Minimum Value: 0 ppb on Nov 1 04:00	Hours of Data: 681
Maximum Diurnal Average: 4.0 ppb at hour 18	Hours of Missing Data: 39
Monthly Average: 2.5 ppb	Hours of Calibration: 35
Minimum Daily Average: 0.8 ppb on Nov 19	Percent Operational Time: 99.4
Minimum Diurnal Average: 1.7 ppb at hour 6	
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 5 P 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-Nov	0	1	0	0	0	Z	1	2	1	2	1	1	1	2	4	1	1	1	1	0	1	1	0	0	0.9	4
2-Nov	Z	1	3	4	3	1	2	2	2	3	C	C	C	C	C	2	3	3	3	3	3	3	2	3	2.5	4
3-Nov	2	Z	2	2	2	2	3	3	3	3	3	2	2	2	2	3	4	3	3	3	8	3	2	2	2.6	8
4-Nov	1	1	Z	2	1	1	2	2	3	3	2	1	2	2	2	4	6	6	5	3	3	4	3	2	2.6	6
5-Nov	3	4	3	Z	2	3	2	3	1	3	5	3	4	2	4	4	5	4	4	6	7	6	5	2	3.7	7
6-Nov	2	7	8	5	Z	2	1	2	2	2	3	3	4	2	3	3	2	5	2	1	9	3	1	1	3.1	9
7-Nov	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	2	4	9	5	3	5	5	4	3	2.3	9
8-Nov	Z	3	2	2	2	2	3	3	3	3	2	M	M	M	3	M	5	6	4	3	4	3	3	3	3.1	6
9-Nov	3	Z	3	3	3	3	2	2	2	3	4	2	2	2	4	3	5	5	3	1	1	1	1	1	2.5	5
10-Nov	1	1	Z	1	1	1	2	1	1	2	2	1	1	1	1	1	7	14	11	6	3	2	2	3	2.8	14
11-Nov	2	2	2	Z	2	2	3	3	6	2	2	2	3	4	3	4	4	4	6	3	3	3	3	2	3.0	6
12-Nov	2	3	4	2	Z	1	2	3	2	2	2	2	2	4	3	4	6	9	8	5	3	2	3	2	3.2	9
13-Nov	2	2	2	1	1	Z	2	1	2	1	2	1	1	1	2	2	2	4	3	3	2	1	2	2	1.8	4
14-Nov	Z	4	3	3	2	3	3	7	4	3	3	5	3	4	5	5	6	4	2	2	1	1	1	2	3.2	7
15-Nov	2	Z	1	1	2	1	1	1	1	2	4	4	4	6	6	1	1	3	3	4	3	2	2	6	2.6	6
16-Nov	7	8	Z	6	5	3	3	2	2	5	3	5	4	4	5	6	11	8	1	1	2	3	2	3	4.3	11
17-Nov	2	1	3	Z	1	1	0	0	1	1	0	0	4	2	3	2	4	7	4	0	0	0	1	1	1.7	7
18-Nov	1	1	1	1	Z	1	1	1	2	3	2	2	1	1	1	1	1	1	2	4	7	5	3	2	1.9	7
19-Nov	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0.8	1
20-Nov	Z	1	1	1	1	1	1	1	1	2	2	1	2	3	2	2	2	3	2	2	1	1	2	2	1.4	3
21-Nov	2	Z	2	2	2	2	2	2	2	2	4	2	2	2	2	4	2	2	2	2	1	2	2	1	2.0	4
22-Nov	1	1	Z	2	2	1	1	2	2	2	2	2	2	1	2	2	2	1	1	1	3	5	4	3	1.9	5
23-Nov	3	3	3	Z	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2.1	3
24-Nov	2	2	2	2	Z	2	3	2	2	2	3	3	4	5	7	4	3	3	4	4	3	2	3	2	2.9	7
25-Nov	2	2	2	1	1	Z	2	2	2	3	2	2	3	3	3	3	5	4	4	3	4	4	3	3	2.6	5
26-Nov	Z	2	2	2	2	2	2	2	2	2	2	2	7	5	5	5	7	8	8	8	8	5	2	1	3.6	8
27-Nov	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	5	3	1.4	5
28-Nov	2	1	Z	2	3	3	6	8	11	8	7	6	1	2	10	8	12	1	3	3	2	2	3	2	4.5	12
29-Nov	2	1	1	Z	4	2	3	7	5	9	6	8	6	3	3	5	7	1	1	1	1	3	1	1	3.5	9
30-Nov	1	1	1	1	Z	1	1	1	1	1	1	2	2	2	2	3	3	2	2	2	2	2	2	2	1.6	3

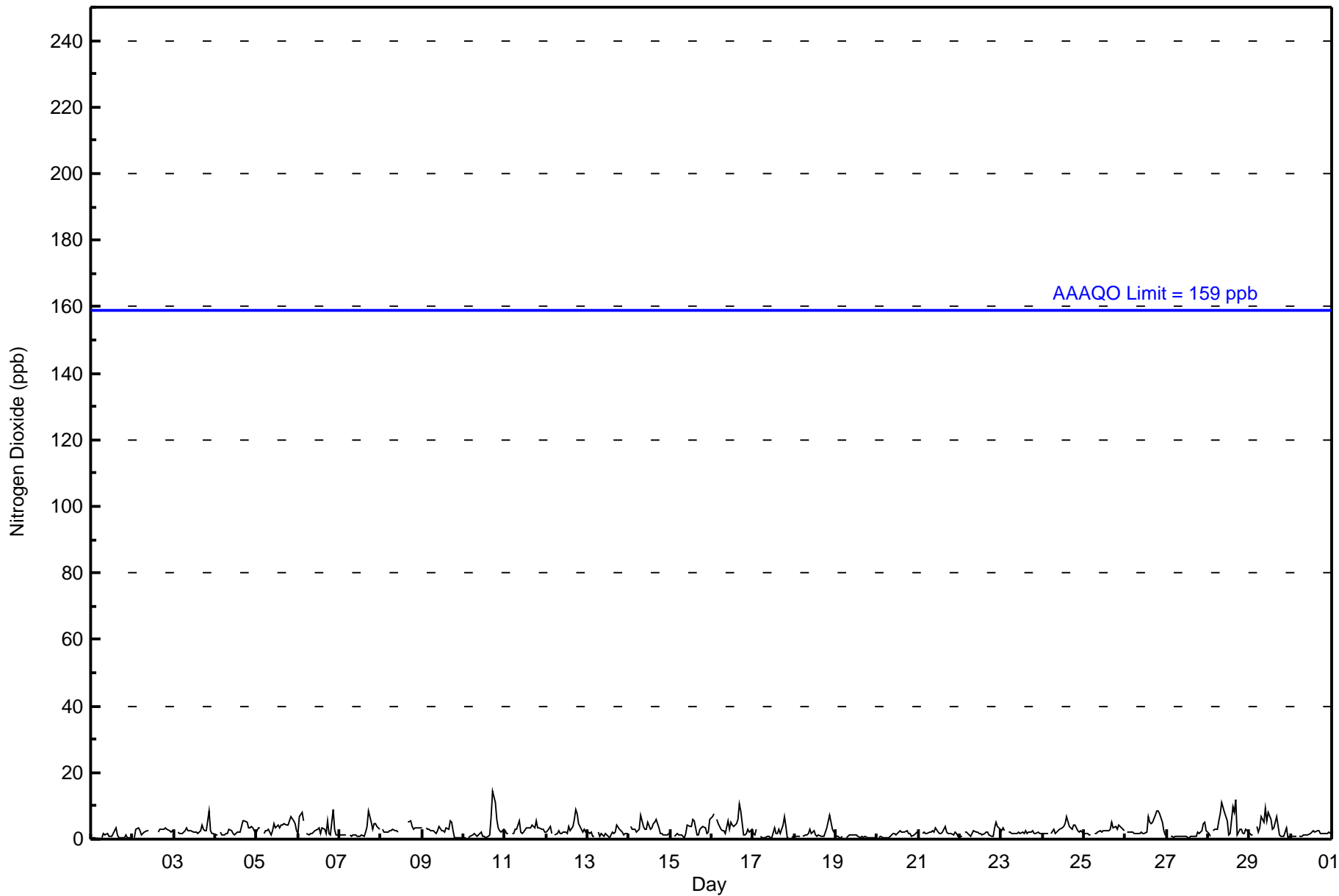
1.8	2.0	2.1	1.9	1.8	1.7	1.9	2.3	2.3	2.6	2.4	2.5	2.3	2.4	3.1	3.0	3.9	4.0	3.4	2.7	3.1	2.7	2.2	2.0	Diurnal Average	
7	8	8	6	5	3	6	8	11	9	7	8	6	7	10	8	12	14	11	8	9	6	5	6	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681
Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - 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	31	9	14	14	7	18	47	75	75	71	69	28	49	51	67	55	680
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	31	9	14	14	7	18	47	75	75	71	69	28	49	51	67	55	680

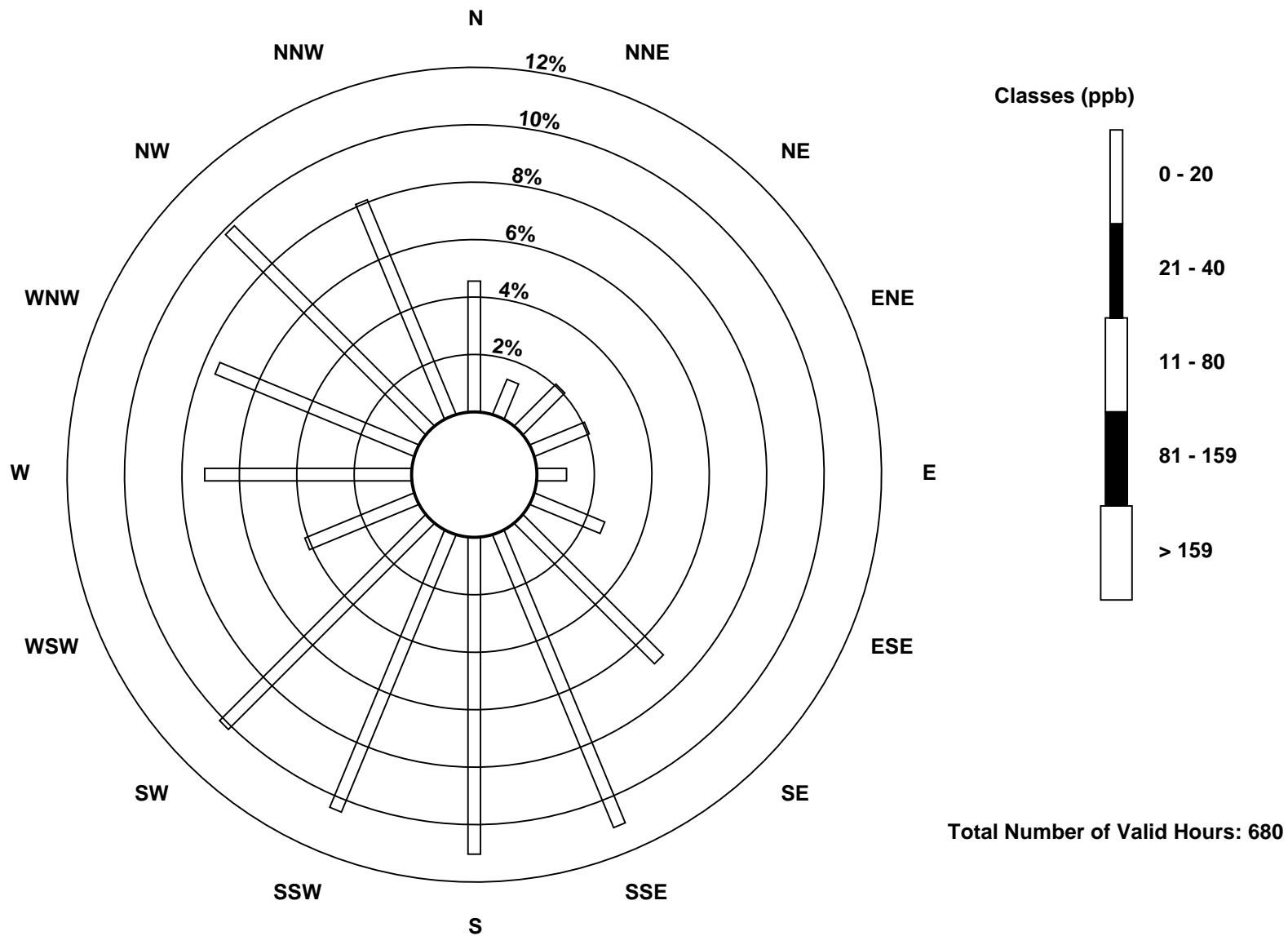
Total Number of Valid Hours: 680

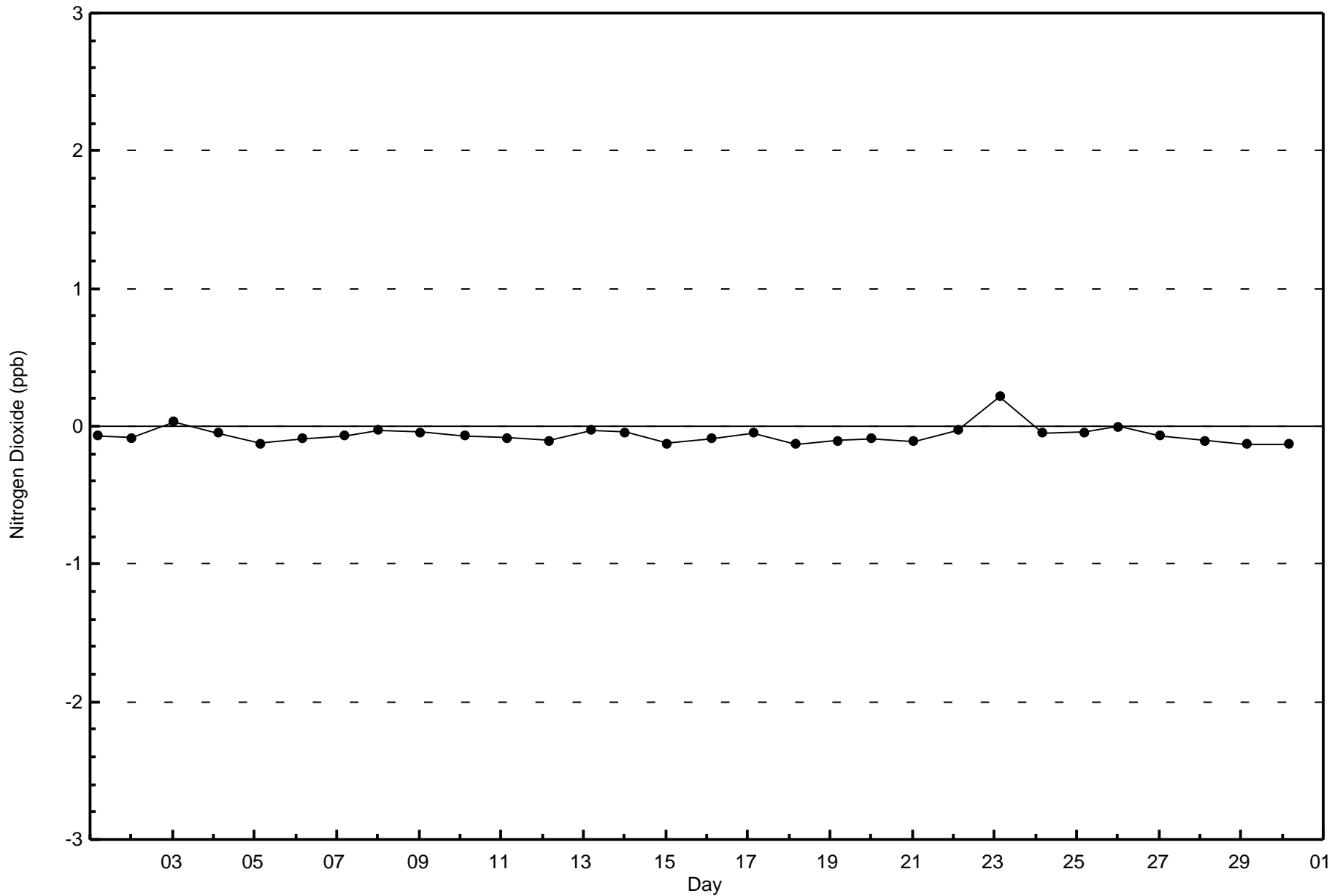
Total Number of Hours: 720

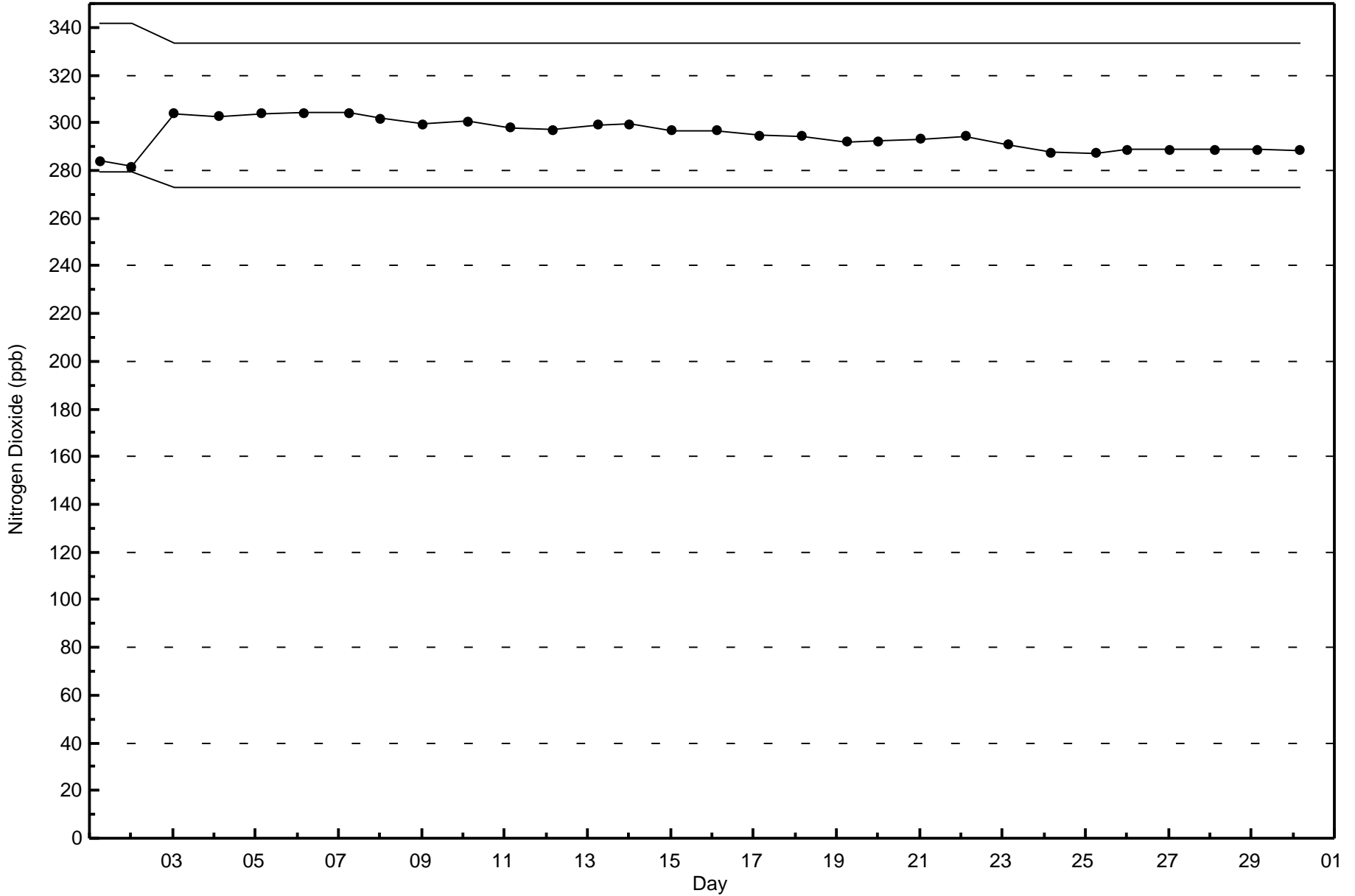


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Conklin Community (AMS 21)









Wood Buffalo Environmental Association
Summary of Hour Averages

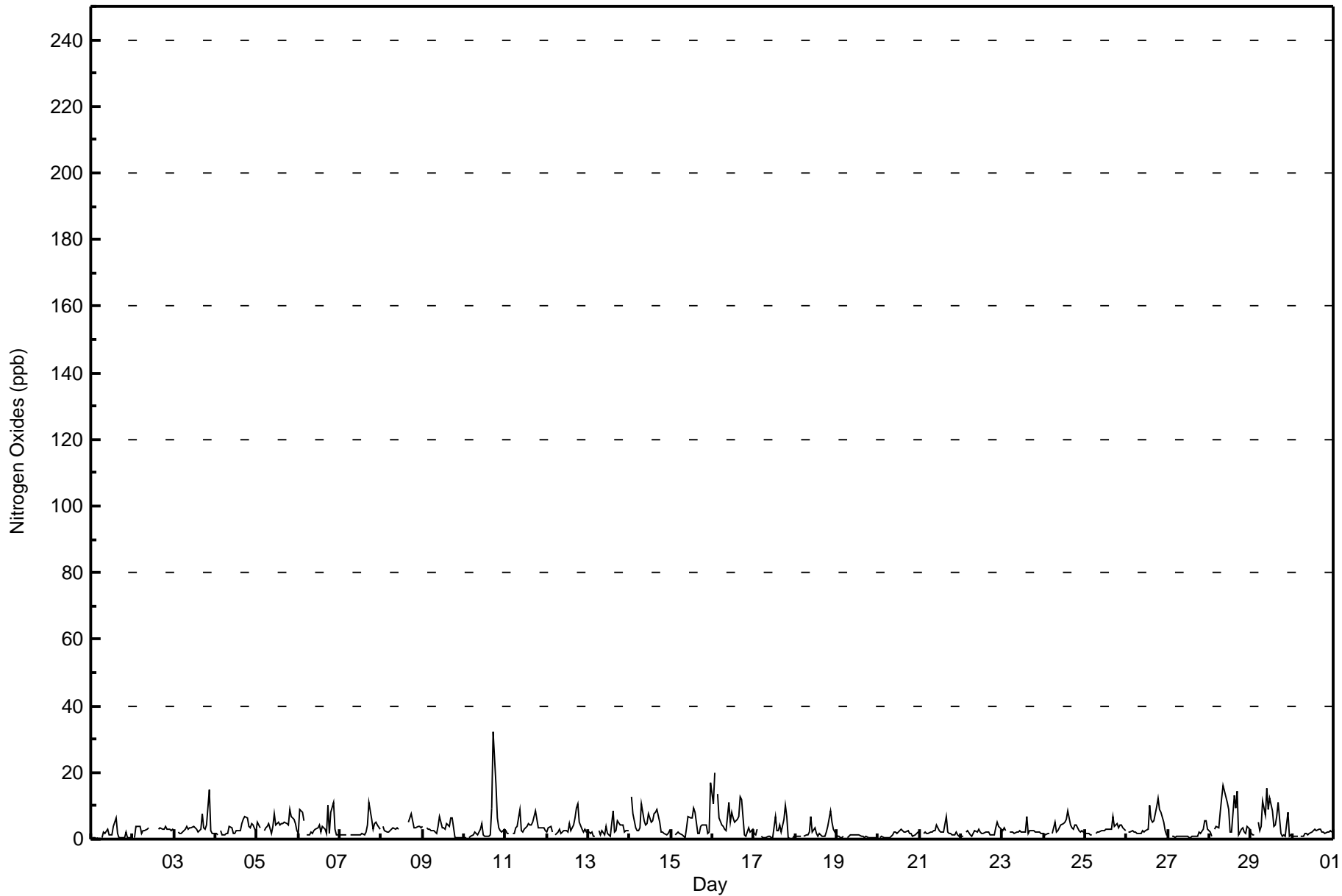
Nitrogen Oxides (NO_x) - ppb
Conklin Community - November 2016

Maximum Value: 32 ppb on Nov 10 18:00		Maximum Daily Average: 6.5 ppb on Nov 16		Hours in Service: 720																						
Minimum Value: 0 ppb on Nov 17 22:00		Minimum Daily Average: 0.8 ppb on Nov 19		Hours of Data: 681																						
Maximum Diurnal Average: 5.6 ppb at hour 18		Minimum Diurnal Average: 1.9 ppb at hour 6		Hours of Missing Data: 39																						
Monthly Average: 3.2 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 7 P ₉₉ = 15		Hours of Calibration: 35																						
				Percent Operational Time: 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-Nov	0	1	0	0	0	Z	1	2	2	3	1	1	1	4	7	2	1	1	1	0	2	0	0	0	1.3	7
2-Nov	Z	1	4	4	4	2	2	2	3	3	C	C	C	C	C	3	3	3	3	4	3	3	2	3	2.9	4
3-Nov	2	Z	2	2	2	2	3	4	3	3	4	4	3	3	2	3	8	3	3	4	15	3	2	2	3.5	15
4-Nov	2	1	Z	3	1	1	2	2	4	3	2	2	2	2	3	5	6	7	6	4	3	5	4	2	3.1	7
5-Nov	5	4	4	Z	2	4	4	5	2	4	8	4	5	4	5	5	5	5	4	9	7	6	5	2	4.6	9
6-Nov	2	9	8	5	Z	1	1	2	2	3	3	3	4	2	4	3	2	10	2	8	11	3	1	1	3.9	11
7-Nov	1	1	1	1	1	Z	1	1	1	1	1	1	1	2	1	2	4	11	6	3	5	5	4	3	2.7	11
8-Nov	Z	4	2	2	2	2	3	3	3	3	3	M	M	M	4	M	5	8	5	3	3	4	4	4	3.6	8
9-Nov	4	Z	3	3	3	3	2	2	2	4	7	4	3	3	5	4	7	6	3	1	0	0	0	0	3.0	7
10-Nov	1	1	Z	1	1	1	2	1	1	3	5	1	1	1	1	1	10	32	17	6	3	2	2	3	4.2	32
11-Nov	2	2	2	Z	2	2	4	4	9	2	2	3	4	5	4	4	5	8	6	3	3	3	3	2	3.7	9
12-Nov	2	3	4	2	Z	1	2	3	2	2	2	2	2	5	3	4	6	9	11	5	3	2	3	2	3.5	11
13-Nov	2	2	2	1	1	Z	2	1	3	1	4	2	1	1	9	2	3	6	4	4	4	2	3	3	2.7	9
14-Nov	Z	13	8	3	2	3	3	11	5	4	5	8	5	6	7	8	9	5	2	2	2	1	2	3	5.0	13
15-Nov	2	Z	1	2	2	2	1	1	1	3	7	6	6	9	8	2	2	4	4	4	4	2	2	17	4.0	17
16-Nov	10	20	Z	13	6	4	4	3	3	11	5	8	6	5	6	7	13	12	1	1	2	3	2	3	6.5	20
17-Nov	2	1	3	Z	1	1	0	1	1	1	0	0	7	3	2	4	2	6	10	7	0	0	0	1	2.3	10
18-Nov	1	1	1	1	Z	1	1	1	2	7	2	4	2	1	2	1	1	1	2	4	9	5	3	2	2.3	9
19-Nov	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	0.8	1
20-Nov	Z	1	1	0	1	1	1	1	1	2	2	2	2	3	2	2	2	3	2	2	1	1	1	2	1.5	3
21-Nov	2	Z	2	2	2	2	2	2	3	2	4	2	2	2	2	7	2	2	2	1	1	2	1	1	2.2	7
22-Nov	1	1	Z	2	2	1	1	2	2	2	3	2	2	2	2	2	2	1	1	1	3	5	4	3	2.1	5
23-Nov	3	3	3	Z	2	2	2	2	2	2	2	2	2	2	7	2	2	3	3	2	2	2	2	2	2.4	7
24-Nov	2	1	2	2	Z	2	5	2	3	3	4	5	5	6	8	4	3	3	4	4	2	2	2	2	3.4	8
25-Nov	2	2	1	1	1	Z	2	2	2	3	3	3	3	3	3	3	7	4	5	3	4	4	3	3	2.9	7
26-Nov	Z	2	2	2	2	2	2	2	2	3	2	3	3	10	6	5	5	10	12	9	8	5	2	1	4.4	12
27-Nov	1	Z	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	6	3	1.5	6
28-Nov	2	1	Z	3	4	4	8	12	16	13	11	9	2	2	13	10	14	1	3	3	2	2	4	3	6.1	16
29-Nov	2	1	1	Z	5	2	4	11	7	15	9	12	9	4	4	7	11	2	1	1	1	8	1	1	5.2	15
30-Nov	1	1	1	1	Z	1	1	2	2	1	2	2	2	3	2	3	3	2	2	2	2	2	2	2	1.8	3
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerspan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	680	99.85	99.85
21 - 40	1	0.15	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - 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	31	9	14	14	7	18	47	75	74	71	69	28	49	51	67	55	679
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	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	31	9	14	14	7	18	47	75	75	71	69	28	49	51	67	55	680

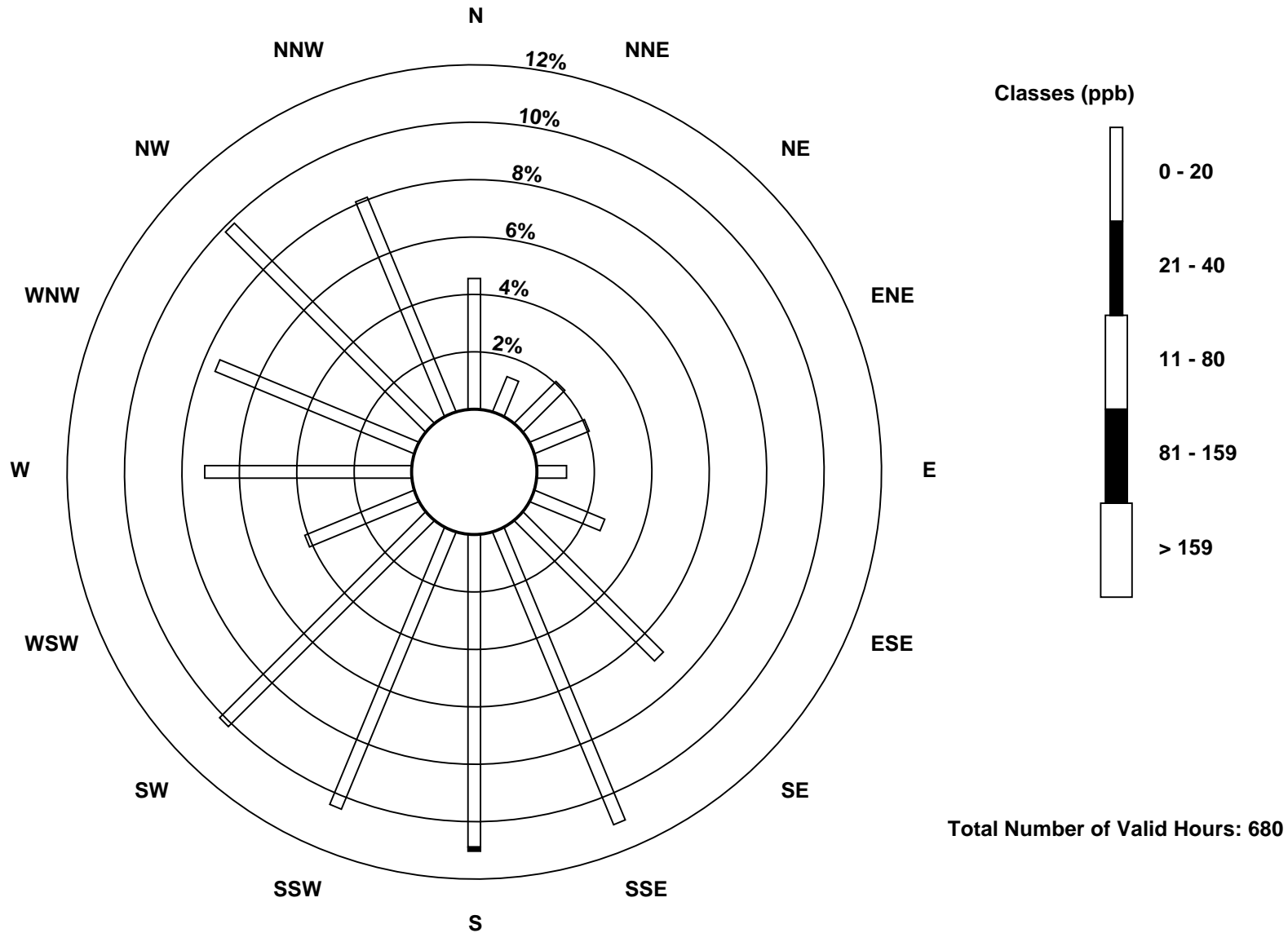
Total Number of Valid Hours: 680

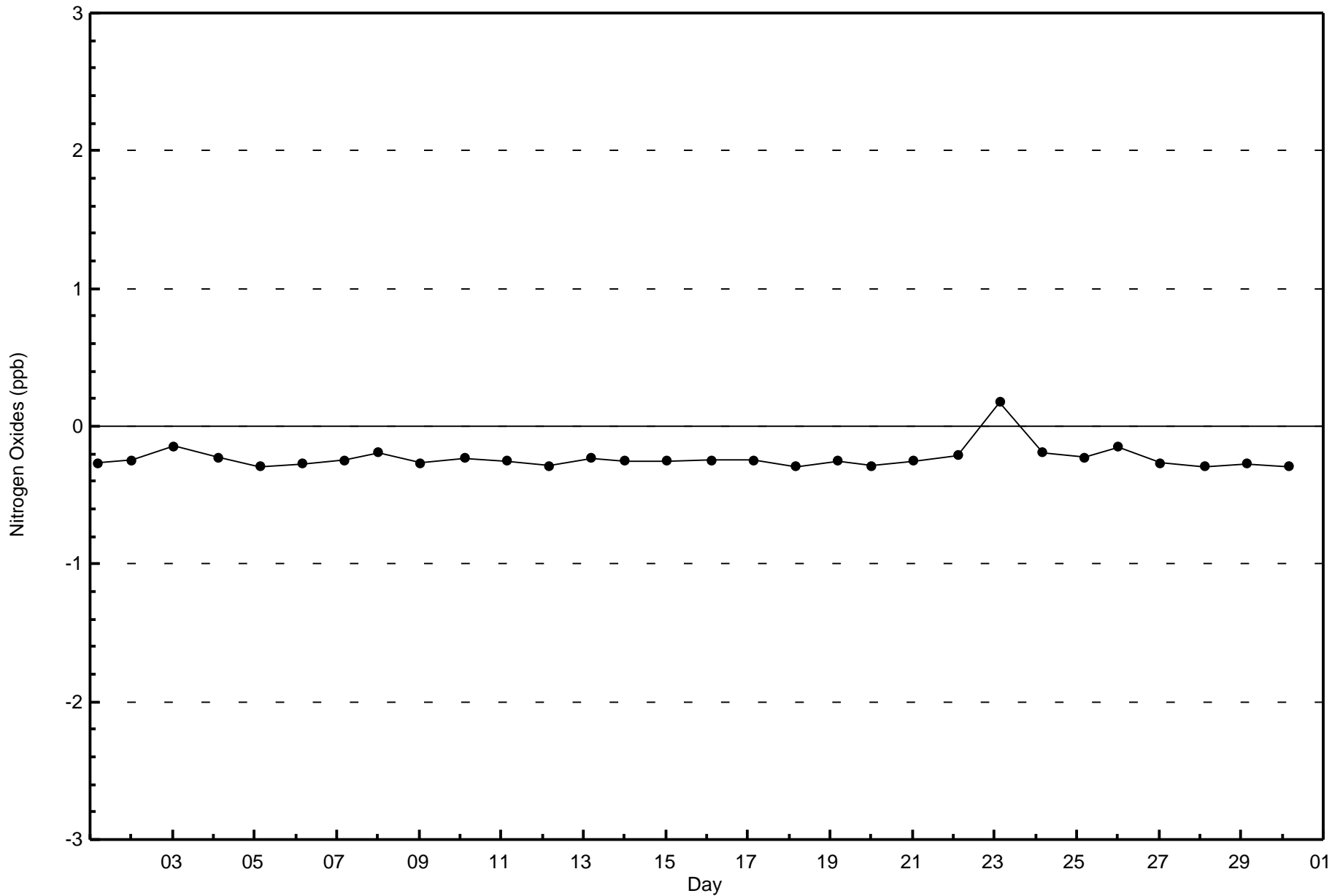
Total Number of Hours: 720

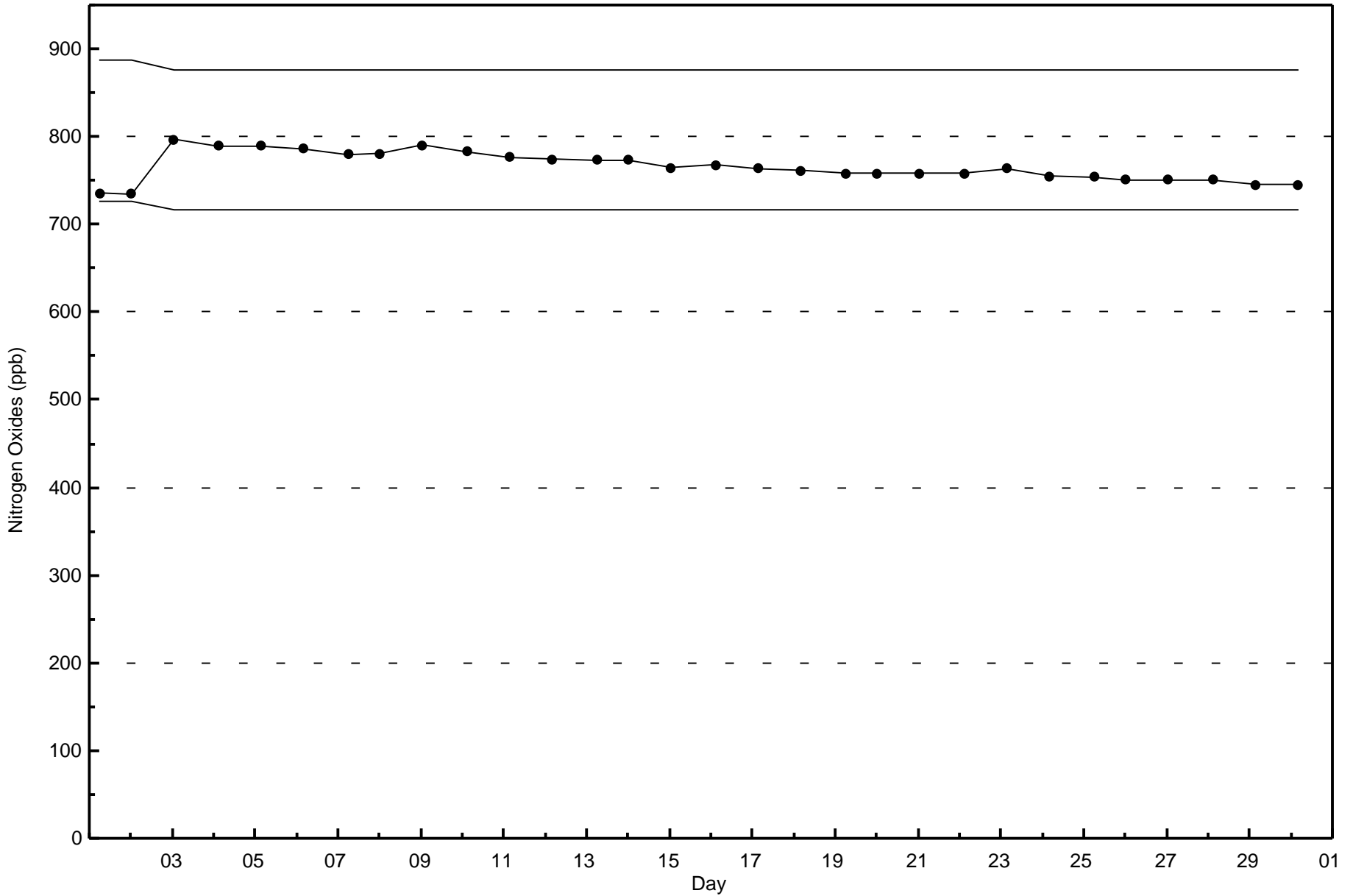


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Conklin Community (AMS 21)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Conklin Community - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 43 ppb on Nov 9 14:00	Maximum Daily Average: 36.1 ppb on Nov 30		Hours of Data:	687
Minimum Value: 5 ppb on Nov 16 03:00	Minimum Daily Average: 17.0 ppb on Nov 24		Hours of Missing Data:	33
Maximum Diurnal Average: 29.8 ppb at hour 14	Minimum Diurnal Average: 21.5 ppb at hour 7		Hours of Calibration:	33
Monthly Average: 25.1 ppb	Percentiles: P ₁ = 7 P ₁₀ = 16 Q ₁ = 20 Median = 25 Q ₃ = 32 P ₉₀ = 36 P ₉₉ = 41		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	23	24	24	24	25	27	28	Z	29	28	29	29	30	33	34	35	35	34	34	35	34	35	35	34	30.3	35
2-Nov	30	25	Z	18	17	18	18	20	22	22	23	24	24	23	22	20	19	19	19	19	19	20	20	20	21.0	30
3-Nov	20	20	19	Z	19	18	14	13	16	15	15	17	17	23	25	25	23	25	28	29	24	32	34	34	22.0	34
4-Nov	34	34	34	26	Z	20	20	27	23	30	39	41	41	43	42	39	29	18	13	18	21	18	12	12	27.5	43
5-Nov	11	9	7	7	8	Z	7	7	9	14	17	29	29	32	32	31	29	28	26	23	19	21	19	29	19.2	32
6-Nov	31	27	19	15	16	18	Z	25	27	23	34	38	38	38	37	38	39	39	38	39	29	32	33	34	30.8	39
7-Nov	33	27	25	26	25	24	24	Z	25	26	27	29	32	36	40	39	22	13	17	25	22	20	25	24	26.4	40
8-Nov	23	21	Z	20	21	20	19	19	18	18	21	25	26	C	C	C	19	12	10	19	20	18	23	24	19.8	26
9-Nov	24	23	23	Z	24	25	26	27	30	35	33	37	42	43	40	40	37	36	38	39	38	37	37	36	33.5	43
10-Nov	36	35	35	35	Z	34	30	27	26	27	28	30	33	36	38	38	21	7	7	17	31	35	34	33	29.3	38
11-Nov	33	34	32	31	30	Z	22	17	11	24	25	25	24	22	24	25	23	21	18	19	19	21	21	24	23.7	34
12-Nov	25	27	24	27	26	24	Z	24	26	24	22	22	27	28	26	23	16	10	8	10	24	30	29	30	23.1	30
13-Nov	29	28	28	23	21	20	14	Z	23	23	23	26	28	31	29	29	30	24	19	15	11	9	8	8	21.7	31
14-Nov	7	5	Z	7	6	13	19	24	31	34	33	33	35	34	34	33	34	35	35	37	38	37	37	37	27.6	38
15-Nov	37	37	36	Z	34	34	33	32	30	31	32	33	36	37	37	33	31	24	25	18	14	12	12	7	28.5	37
16-Nov	6	5	5	5	Z	7	8	8	9	13	25	28	33	33	32	26	23	16	31	25	19	24	25	24	18.6	33
17-Nov	32	36	31	31	35	Z	36	35	34	35	38	37	34	36	36	35	35	35	33	33	39	42	38	33	35.2	42
18-Nov	26	25	26	27	28	30	Z	21	21	24	28	33	36	36	35	32	26	21	17	13	17	14	15	21	24.9	36
19-Nov	28	28	28	27	27	25	25	Z	26	26	27	27	27	28	31	33	32	30	31	32	32	32	32	31	29.0	33
20-Nov	31	31	Z	30	28	27	27	27	27	26	24	24	24	23	23	23	22	21	22	24	25	25	24	23	25.2	31
21-Nov	23	22	22	Z	20	20	19	19	18	18	16	18	19	19	19	18	20	20	21	24	23	22	22	24	20.3	24
22-Nov	22	21	20	18	Z	15	16	16	18	20	20	20	20	20	19	18	17	19	20	21	19	18	21	23	19.2	23
23-Nov	23	22	23	24	25	Z	25	26	26	26	26	26	25	26	26	26	25	25	25	25	24	23	22	21	24.7	26
24-Nov	19	18	16	16	14	11	Z	12	15	15	16	15	16	16	15	18	18	19	19	19	21	21	21	21	17.0	21
25-Nov	21	22	24	25	25	25	25	Z	24	24	24	23	23	23	21	21	18	19	19	19	18	23	26	29	22.6	29
26-Nov	28	24	Z	22	22	24	25	26	27	27	26	26	26	21	21	19	13	8	7	8	8	11	19	31	20.4	31
27-Nov	32	33	34	Z	38	27	25	24	24	24	24	25	26	29	26	23	23	24	24	19	17	15	17	24	25.1	38
28-Nov	25	22	19	18	Z	19	17	17	22	25	25	27	30	31	28	29	25	32	30	28	28	27	25	24	24.9	32
29-Nov	22	20	19	18	15	Z	17	17	19	18	24	25	26	31	32	30	28	32	34	34	33	32	35	35	25.9	35
30-Nov	35	35	35	35	35	36	Z	37	36	36	35	35	34	35	36	36	37	38	38	39	38	38	37	36	36.1	39

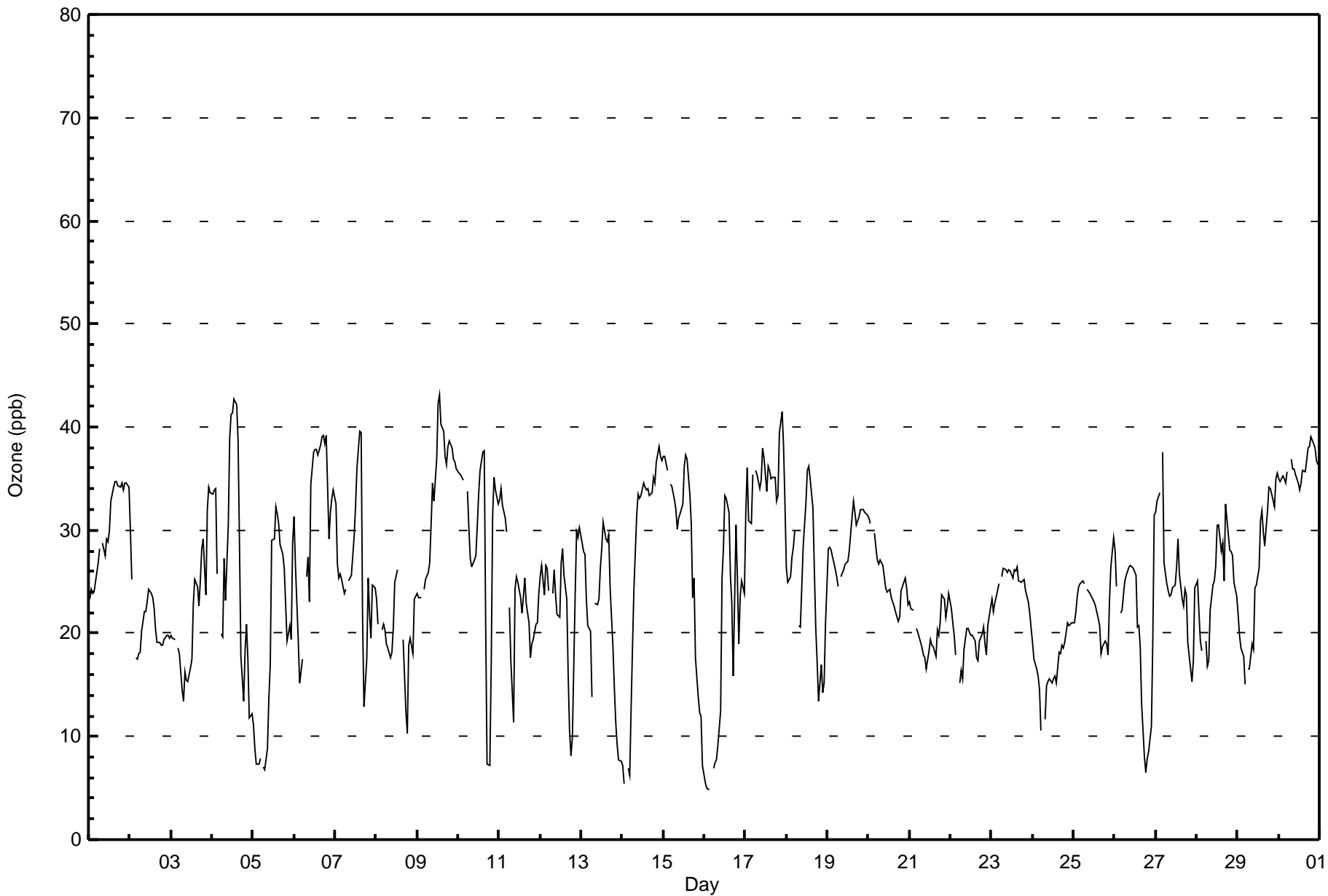
25.7	24.7	24.3	22.2	23.5	22.4	21.5	21.9	23.1	24.3	26.1	27.5	28.8	29.8	29.6	28.8	25.6	23.5	23.6	24.1	24.1	24.8	25.3	26.2	Diurnal Average	
37	37	36	35	38	36	36	37	36	36	39	41	42	43	42	40	39	39	38	39	39	42	38	37	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Conklin Community - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	193	28.09	28.09
21 - 50	494	71.91	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Conklin Community - 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	1	0	4	4	8	16	35	23	16	11	9	8	10	16	24	191
21 - 50	26	7	14	11	2	11	33	40	52	55	57	20	41	42	52	31	494
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	32	8	14	15	6	19	49	75	75	71	68	29	49	52	68	55	685

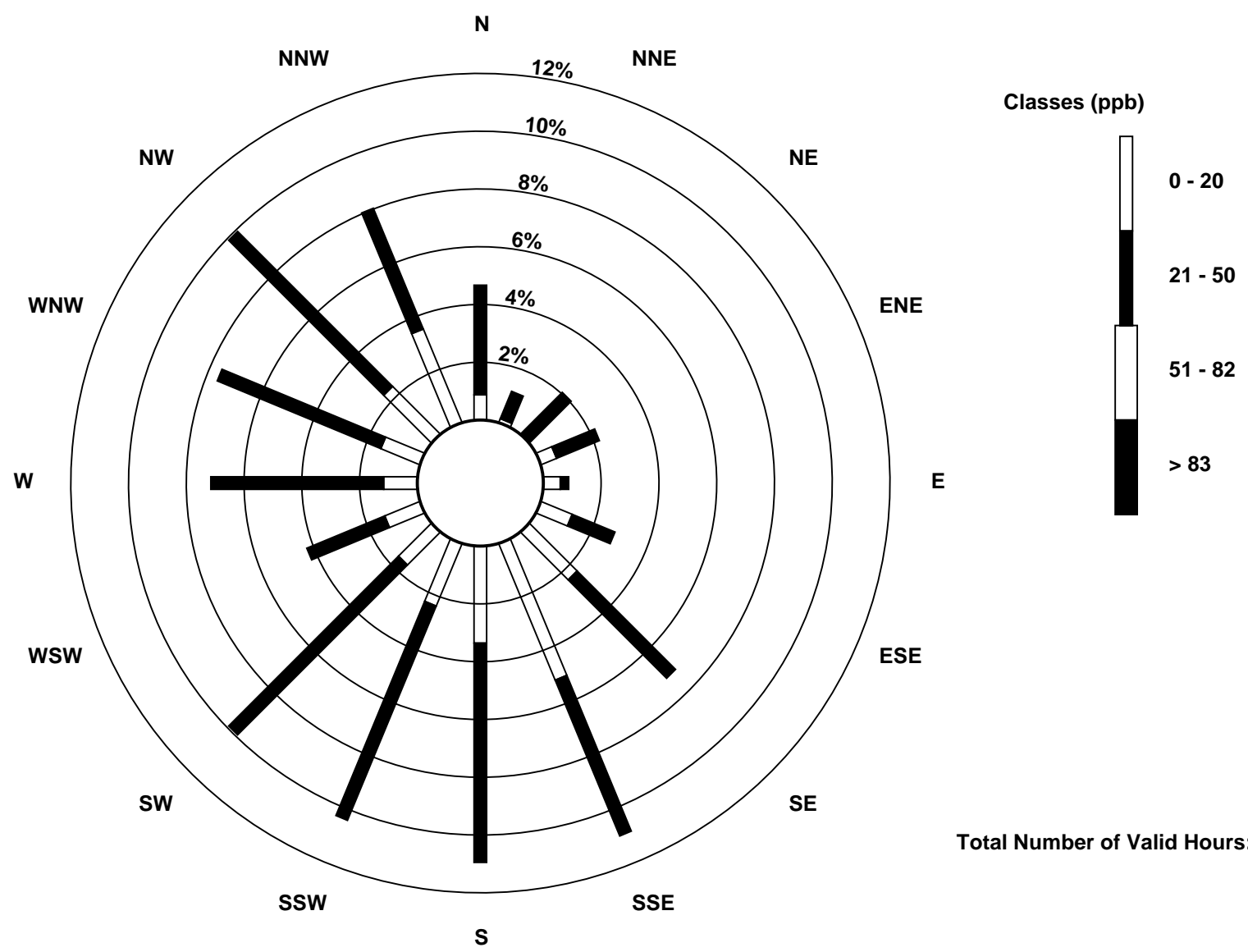
Total Number of Valid Hours: 685

Total Number of Hours: 720

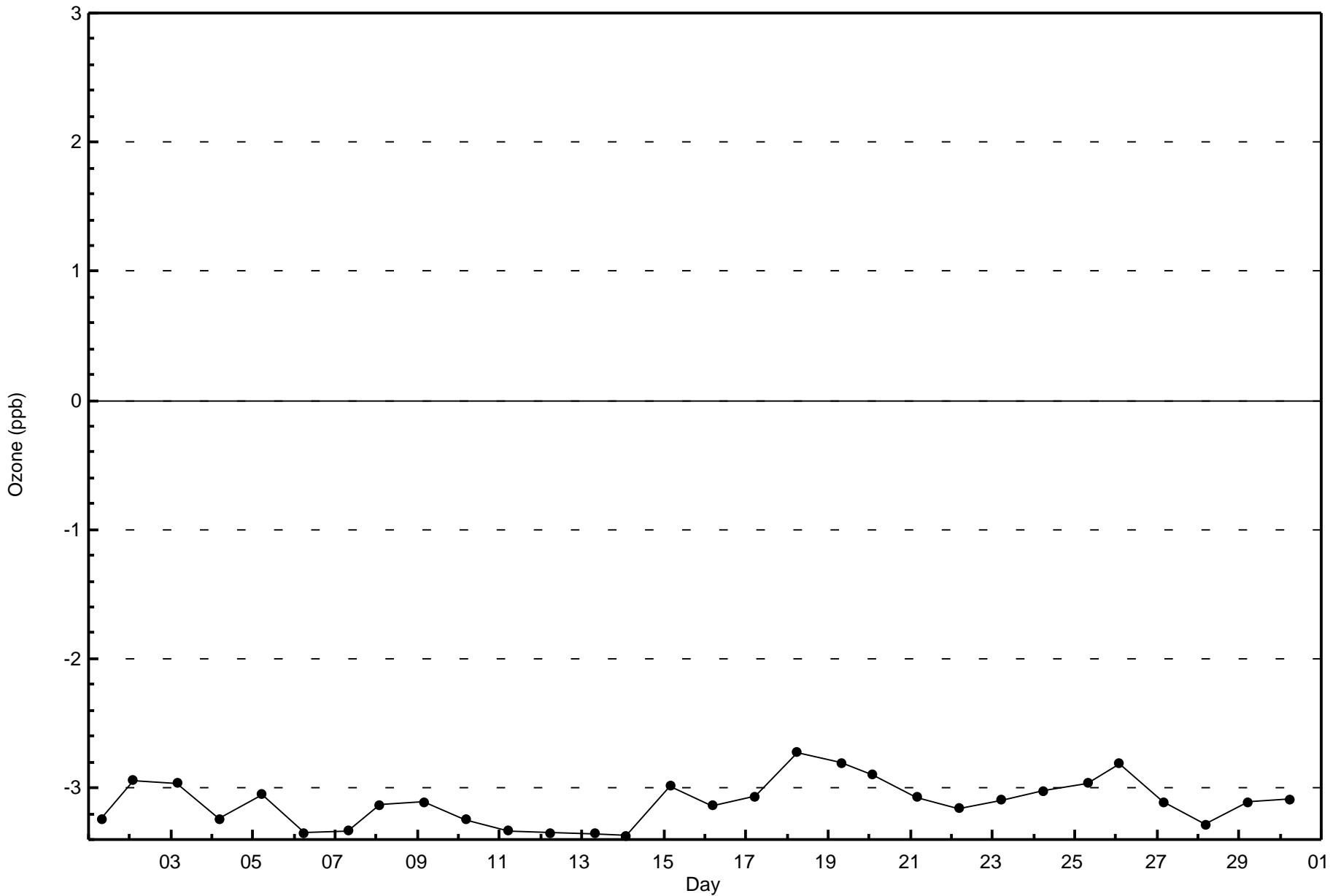


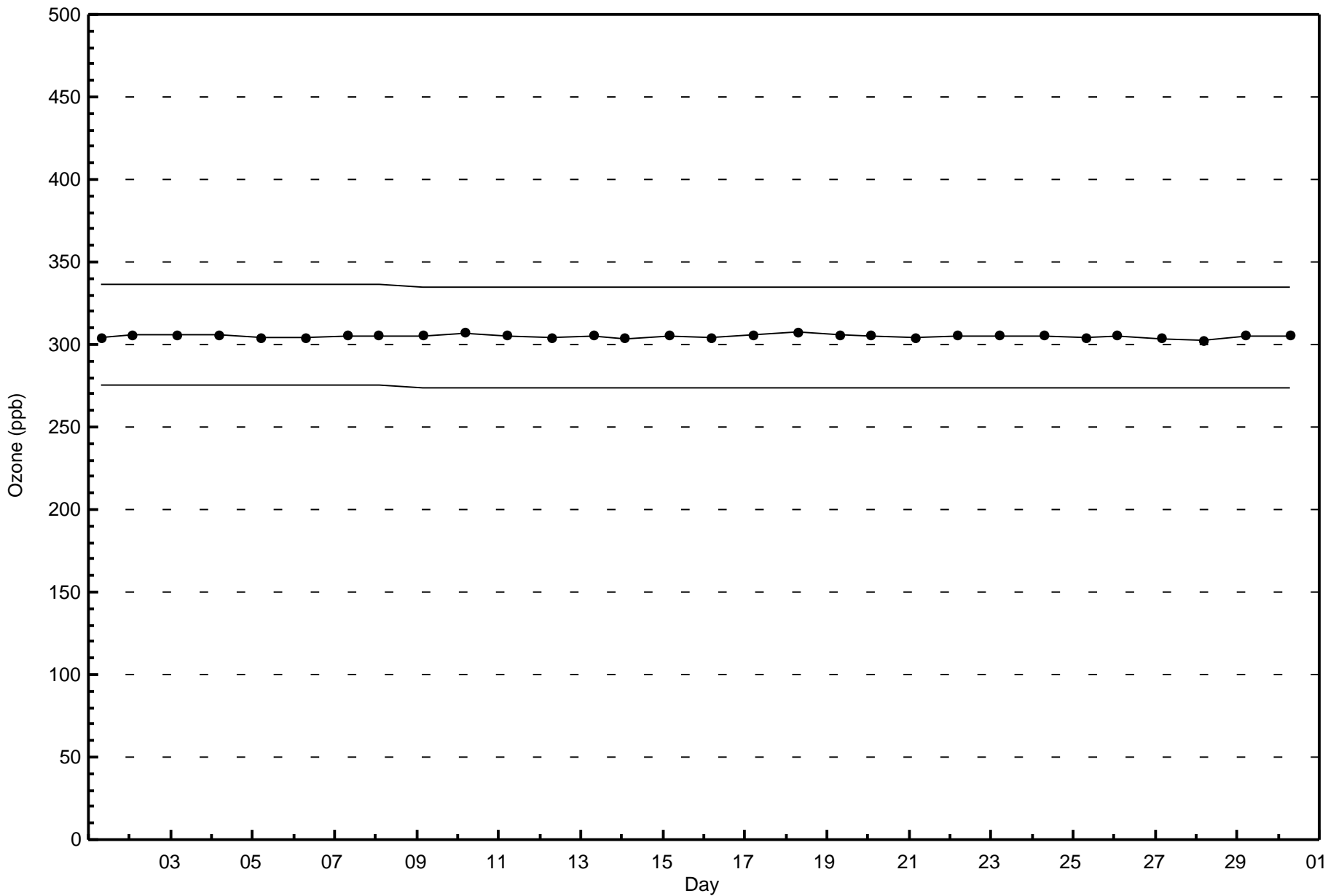
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Ozone (O₃) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 685







Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

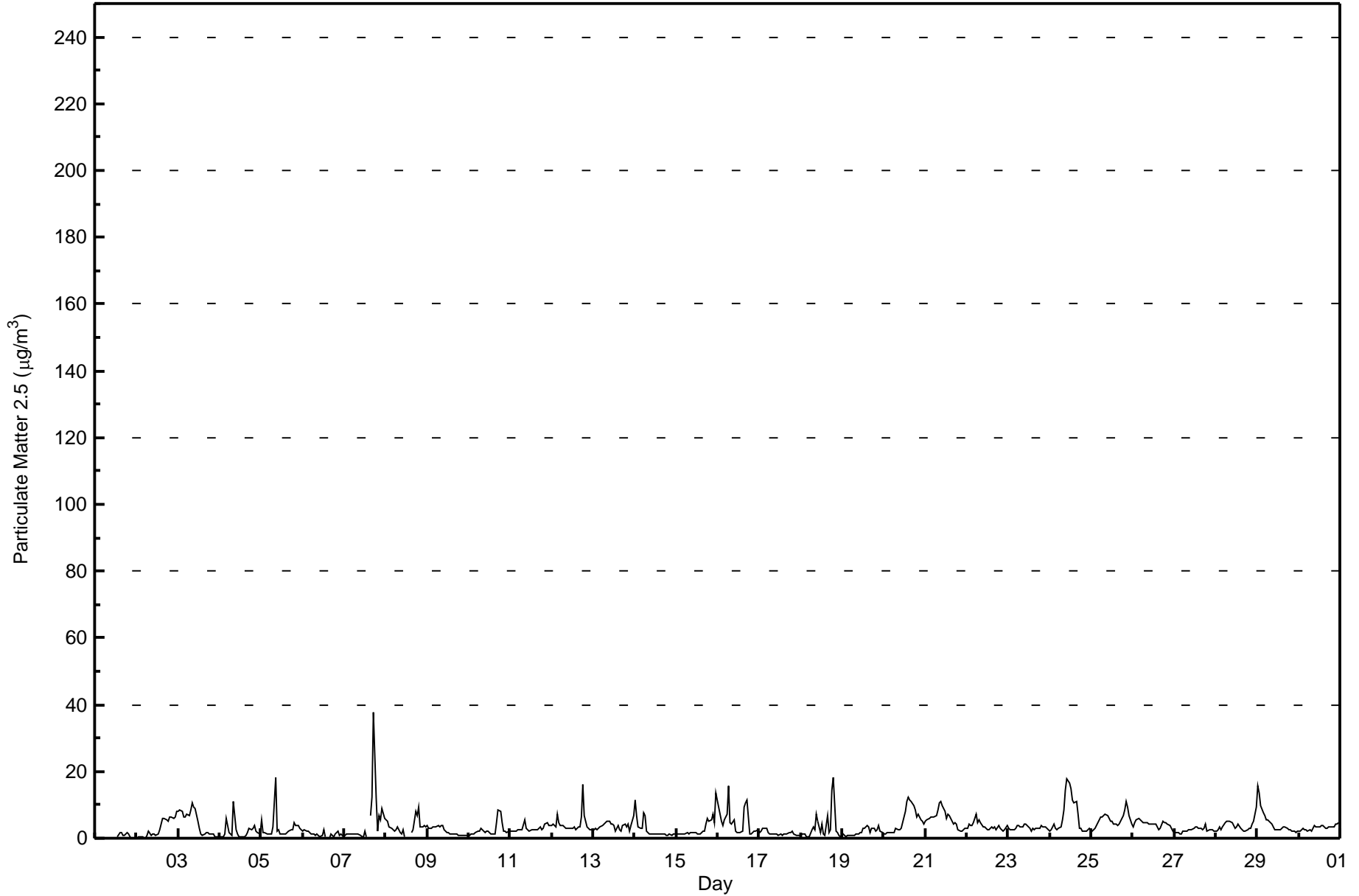
Conklin Community - November 2016

Number of Exceedences (AAAQO):		24-hr: 0		Hours in Service:		720																					
Maximum Value: 37.9 µg/m ³ on Nov 7 18:00		Maximum Daily Average: 6.5 µg/m ³ on Nov 24		Hours of Data:		707																					
Minimum Value: 0.0 µg/m ³ on Nov 1 09:00		Minimum Daily Average: 1.3 µg/m ³ on Nov 6		Hours of Missing Data:		13																					
Maximum Diurnal Average: 5.1 µg/m ³ at hour 18		Minimum Diurnal Average: 2.9 µg/m ³ at hour 14		Hours of Calibration:		3																					
Monthly Average: 3.51 µg/m ³		Percentiles: P ₁ = 0.1 P ₁₀ = 1.0 Q ₁ = 1.6 Median = 2.7 Q ₃ = 4.3 P ₉₀ = 6.9 P ₉₉ = 15.5		Percent Operational Time:		98.6																					
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-Nov	UO	UO	0.1	0.1	0.1	UO	UO	UO	0.0	0.2	UO	UO	UO	0.2	1.7	1.6	0.7	1.0	1.6	1.1	0.3	0.0	0.0	0.0	--	1.7	
2-Nov	0.2	0.4	0.4	0.4	0.0	0.0	0.8	2.0	0.9	1.4	1.1	1.0	1.3	2.4	4.0	6.0	6.1	5.4	5.0	6.2	6.4	6.1	6.4	7.9	3.0	7.9	
3-Nov	8.0	8.3	8.0	6.2	6.5	7.1	6.9	8.7	10.5	9.2	8.8	5.1	2.8	1.3	1.0	1.1	1.6	1.9	1.2	1.2	1.2	0.5	0.4	0.3	4.5	10.5	
4-Nov	0.3	0.3	0.2	1.4	6.1	1.6	1.1	0.9	10.9	2.4	1.2	0.3	0.5	0.5	0.6	1.1	1.8	3.1	2.7	2.8	3.7	2.0	1.7	1.4	2.0	10.9	
5-Nov	5.4	1.9	1.6	1.3	1.3	1.4	1.4	3.3	18.2	2.1	2.6	1.3	1.2	1.1	1.2	1.7	2.2	2.6	2.4	4.5	3.9	3.7	3.1	2.6	3.0	18.2	
6-Nov	1.9	2.7	2.3	2.2	1.7	1.2	1.1	0.8	1.2	1.0	0.6	0.9	2.3	0.4	UO	0.2	1.4	0.7	0.4	1.2	2.1	0.9	1.1	0.7	1.3	2.7	
7-Nov	0.7	1.1	1.1	1.4	1.3	1.3	1.4	1.4	1.1	1.0	0.6	0.5	2.1	0.3	UO	6.9	12.1	37.9	12.0	2.0	6.7	5.7	8.8	6.1	4.9	37.9	
8-Nov	5.4	5.1	3.5	3.1	2.5	2.0	2.6	3.3	1.7	1.3	2.5	0.6	C	C	C	1.8	2.7	8.1	6.6	9.3	3.2	3.3	3.9	3.5	3.6	9.3	
9-Nov	3.7	3.0	3.0	3.2	3.3	3.6	3.6	3.4	3.8	3.7	2.7	1.9	1.5	1.3	1.4	1.2	1.1	1.2	0.9	0.8	0.9	0.8	0.9	1.0	2.2	3.8	
10-Nov	1.1	1.1	1.2	1.3	1.6	2.0	2.3	3.1	2.6	1.9	2.2	2.0	1.5	1.3	1.3	1.2	4.8	8.7	7.9	4.6	2.3	2.2	1.9	2.0	2.6	8.7	
11-Nov	2.1	2.3	2.2	2.3	2.4	2.4	2.6	2.7	5.4	3.1	2.4	2.2	2.3	2.5	2.6	2.4	2.7	3.2	2.7	2.8	4.2	4.5	3.7	3.7	2.9	5.4	
12-Nov	3.7	4.1	3.5	7.2	4.7	3.7	3.7	3.5	3.1	2.9	2.9	3.0	2.8	3.4	2.6	3.2	3.3	6.2	16.1	6.8	3.2	2.9	2.7	2.4	4.2	16.1	
13-Nov	2.7	2.8	2.7	2.8	3.3	3.7	4.3	4.6	4.9	4.9	4.2	4.2	3.7	2.3	3.8	2.4	2.1	3.7	4.1	3.4	4.3	1.9	3.9	6.9	3.7	6.9	
14-Nov	11.6	6.7	3.5	3.1	3.0	7.8	6.8	2.1	1.3	1.1	1.1	1.2	1.1	1.2	1.2	1.3	1.2	1.2	1.0	1.1	1.1	1.0	1.1	1.2	2.6	11.6	
15-Nov	1.1	1.3	1.3	1.3	1.4	1.4	1.6	1.5	1.7	1.8	1.5	1.6	1.4	1.3	1.5	2.1	2.2	4.3	5.9	5.0	5.4	7.0	4.5	13.4	3.0	13.4	
16-Nov	9.3	7.0	5.2	3.9	5.3	7.2	15.5	4.6	4.4	5.5	2.0	1.8	1.9	1.5	2.3	9.3	10.8	11.5	1.4	1.4	1.7	2.2	2.3	2.4	5.0	15.5	
17-Nov	1.6	2.3	3.1	3.1	2.8	1.9	1.5	1.1	1.2	1.2	1.3	1.0	1.3	1.0	1.2	1.2	1.2	1.6	1.7	2.1	1.1	0.8	0.7	0.7	1.5	3.1	
18-Nov	0.9	1.5	1.2	0.6	0.6	0.6	2.6	3.5	2.7	7.2	5.2	1.8	4.0	1.2	0.9	6.9	1.5	2.4	14.5	18.0	2.3	1.5	0.9	0.6	3.5	18.0	
19-Nov	1.2	0.6	0.6	0.7	0.7	0.7	0.8	1.0	1.3	1.5	1.6	1.8	2.8	2.8	3.9	3.3	1.8	2.8	2.9	2.1	2.5	3.7	1.9	1.7	1.9	3.9	
20-Nov	1.3	1.5	1.7	1.8	1.7	1.7	1.8	2.8	2.5	2.3	2.9	4.7	8.2	11.2	12.2	11.6	11.0	9.6	8.3	6.4	7.3	5.6	5.0	4.4	5.3	12.2	
21-Nov	5.1	5.6	5.9	6.4	6.3	6.3	6.8	8.4	10.6	11.0	9.9	8.2	6.0	7.3	6.8	5.3	4.4	4.8	4.4	2.6	2.1	2.2	2.5	2.8	5.9	11.0	
22-Nov	3.1	4.1	3.9	3.7	4.6	7.1	4.9	5.6	4.5	3.6	3.4	3.1	2.7	2.6	3.2	3.0	3.5	2.7	3.9	2.8	2.4	2.3	2.6	4.0	3.6	7.1	
23-Nov	2.8	2.4	2.4	2.5	3.1	4.0	3.7	3.5	3.6	4.0	4.4	3.6	2.9	2.3	2.8	2.4	3.1	3.1	2.9	3.8	3.3	3.5	2.8	2.5	3.1	4.4	
24-Nov	2.3	2.4	4.4	3.1	2.7	3.1	3.5	5.6	8.4	14.2	18.0	16.4	14.9	11.3	10.7	10.9	7.2	2.9	3.1	2.1	2.0	2.0	2.4	2.9	6.5	18.0	
25-Nov	2.3	2.4	3.2	3.6	4.7	6.3	6.2	6.8	7.2	6.6	5.8	5.2	4.9	4.2	4.1	4.0	4.1	5.1	6.9	8.4	11.1	9.3	6.8	4.1	5.5	11.1	
26-Nov	3.6	4.7	5.4	5.8	5.6	5.1	4.6	4.5	4.6	4.3	4.1	4.1	4.4	4.2	3.4	2.7	2.9	5.0	4.7	4.8	4.3	3.9	3.0	2.0	4.2	5.8	
27-Nov	1.7	1.6	1.8	1.4	1.3	2.0	2.2	2.3	2.4	2.6	2.7	3.1	3.6	3.5	3.0	2.9	2.5	2.9	4.4	2.3	2.4	2.5	2.5	2.0	2.5	4.4	
28-Nov	2.1	2.5	3.4	2.6	3.3	4.7	5.0	4.9	4.9	4.9	3.7	3.1	3.2	4.1	2.8	2.4	2.2	2.2	2.6	2.9	3.0	4.1	5.0	9.2	3.7	9.2	
29-Nov	15.7	13.5	9.7	7.8	6.7	5.5	5.6	4.9	4.1	3.5	2.5	2.6	2.6	2.5	3.0	3.2	3.4	2.8	2.3	2.6	2.0	2.0	1.9	2.2	4.7	15.7	
30-Nov	2.0	2.3	2.9	2.7	2.4	2.3	2.4	2.2	2.8	3.9	3.4	3.3	3.3	3.7	3.9	3.0	3.1	3.3	3.4	3.3	3.5	4.0	4.2	4.7	3.2	4.7	
		3.6	3.3	3.0	2.9	3.0	3.4	3.7	3.6	4.4	3.8	3.6	3.1	3.3	2.9	3.2	3.5	3.6	5.1	4.6	3.9	3.3	3.1	3.0	3.3	Diurnal Average	
		15.7	13.5	9.7	7.8	6.7	7.8	15.5	8.7	18.2	14.2	18.0	16.4	14.9	11.3	12.2	11.6	12.1	37.9	16.1	18.0	11.1	9.3	8.8	13.4	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 - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - November 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	522	73.83	73.83
6 - 15	106	14.99	88.83
16 - 25	7	0.99	89.82
26 - 80	1	0.14	89.96
> 81.0	0	0.00	89.96

Total Number of Valid Hours: 707

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Conklin Community - November 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	23	8	16	15	6	10	33	62	64	52	51	23	41	37	44	35	520
6 - 15	2	1	0	0	1	8	18	11	15	9	9	5	8	5	7	7	106
16 - 25	0	0	0	0	0	1	0	1	1	1	0	0	0	0	2	1	7
26 - 80	0	0	0	0	0	0	0	0	0	1	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	25	9	16	15	7	19	51	74	80	63	60	28	49	42	53	43	634

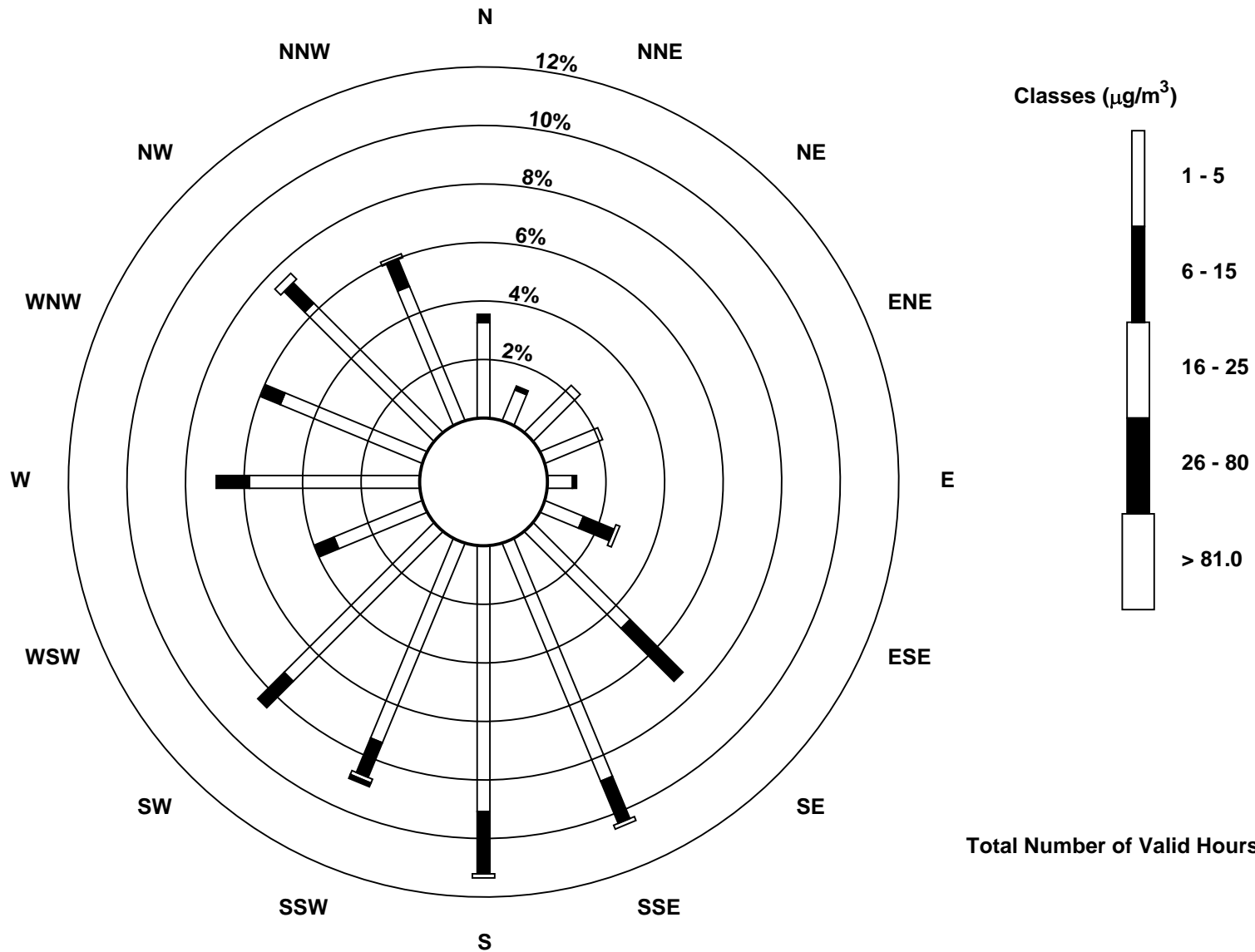
Total Number of Valid Hours: 705

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community (AMS 21)

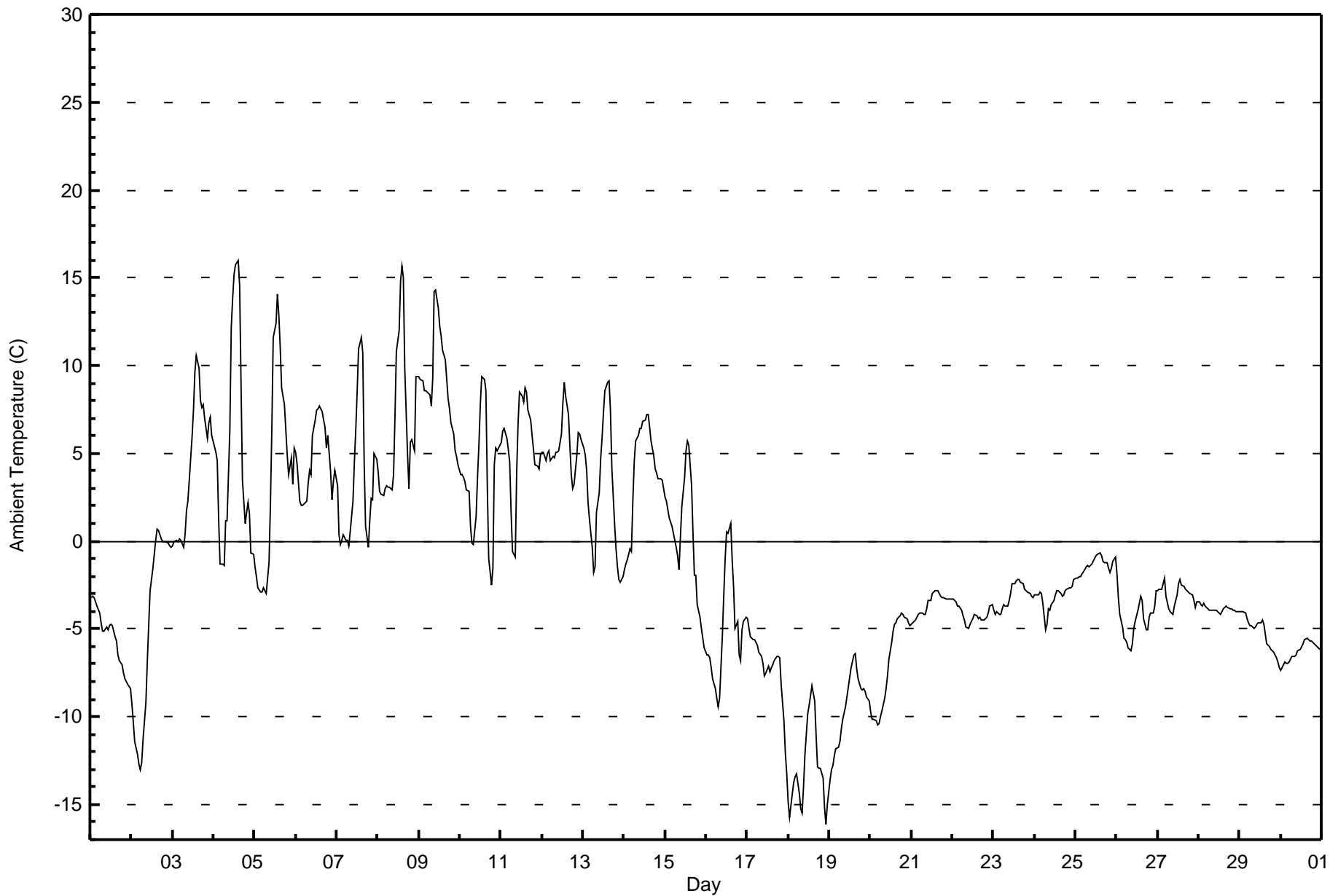




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Conklin Community - November 2016

Maximum Value: 16.0 C on Nov 4 15:00 Minimum Value: -16.2 C on Nov 18 23:00 Maximum Diurnal Average: 2.3 C at hour 15 Monthly Average: -1.06 C		Maximum Daily Average: 9.1 C on Nov 9 Minimum Daily Average: -13.0 C on Nov 18 Minimum Diurnal Average: -3.1 C at hour 7 Percentiles: P ₁ = -14.4 P ₁₀ = -7.9 Q ₁ = -4.8 Median = -2.6 Q ₃ = 3.8 P ₉₀ = 7.4 P ₉₉ = 14.3		Hours in Service: 720 Hours of Data: 720 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-Nov	-3.2	-3.2	-3.2	-3.5	-3.7	-4.1	-4.7	-5.1	-5.1	-4.9	-5.1	-4.8	-4.8	-4.8	-5.5	-5.7	-6.5	-6.8	-7.1	-7.5	-7.9	-8.0	-8.2	-8.4	-5.5	-3.2
2-Nov	-9.3	-10.3	-11.4	-12.2	-12.7	-13.0	-12.6	-11.3	-9.2	-6.9	-4.8	-2.8	-1.6	-0.8	0.0	0.7	0.6	0.1	-0.1	0.0	-0.1	-0.1	-0.3	-0.4	-4.9	0.7
3-Nov	-0.3	-0.1	0.0	0.0	0.1	0.1	-0.4	0.4	1.7	2.3	3.5	6.0	7.4	9.6	10.6	9.8	8.0	7.6	7.8	7.0	5.9	6.7	7.0	6.1	4.5	10.6
4-Nov	5.4	5.1	4.6	1.2	-1.3	-1.3	-1.4	1.2	1.2	6.3	12.1	13.8	15.2	15.7	16.0	14.5	8.9	3.5	1.0	1.7	2.2	1.6	-0.7	-0.7	5.2	16.0
5-Nov	-1.5	-2.0	-2.6	-2.9	-2.9	-2.7	-2.8	-3.0	-1.2	2.1	6.3	11.6	12.4	14.1	12.9	11.0	8.7	7.8	6.3	4.9	3.8	4.8	3.2	5.3	3.9	14.1
6-Nov	5.0	4.4	2.3	2.1	2.1	2.1	2.3	3.3	4.0	3.8	6.0	6.9	7.5	7.6	7.7	7.4	6.9	6.5	5.3	6.1	4.0	2.4	3.4	4.1	4.7	7.7
7-Nov	3.2	0.3	-0.2	0.0	0.3	0.1	0.0	-0.2	0.5	2.3	4.5	6.3	8.6	10.9	11.6	10.8	4.4	0.8	-0.3	1.1	2.5	2.3	5.0	4.7	3.3	11.6
8-Nov	4.0	2.9	2.7	2.6	3.0	3.1	3.0	3.1	2.9	3.8	7.0	10.8	12.0	14.8	15.6	15.0	9.8	4.9	3.0	5.6	5.7	5.2	9.3	9.3	6.6	15.6
9-Nov	9.4	9.2	9.2	8.5	8.6	8.5	8.3	7.7	9.3	14.3	14.3	13.3	12.3	11.7	10.9	10.3	9.2	8.1	7.5	6.7	6.1	5.2	4.8	4.3	9.1	14.3
10-Nov	3.8	3.8	3.6	3.4	2.9	2.9	0.8	-0.2	-0.2	1.4	3.6	5.5	7.8	9.4	9.2	8.5	3.2	-1.0	-2.5	-1.5	4.3	5.3	5.2	5.5	3.5	9.4
11-Nov	5.6	6.2	6.5	5.9	5.2	4.5	1.7	-0.6	-0.9	3.9	6.7	8.5	8.3	7.9	8.8	8.5	7.5	6.9	6.0	5.2	4.3	4.3	4.1	4.9	5.4	8.8
12-Nov	5.1	5.1	4.6	5.0	5.2	4.6	4.8	4.8	5.1	5.0	5.1	6.1	7.9	9.0	8.3	7.2	5.4	3.8	3.0	3.3	4.9	6.2	6.1	5.8	5.5	9.0
13-Nov	5.3	4.9	4.1	2.2	1.2	-0.3	-1.8	-1.4	1.6	2.8	4.7	5.9	7.3	8.6	9.0	9.1	7.4	4.2	0.9	-0.5	-1.4	-2.1	-2.3	-2.0	2.8	9.1
14-Nov	-1.6	-1.3	-1.1	-0.4	-0.6	2.3	4.5	5.7	6.0	6.4	6.4	6.8	6.9	7.3	7.2	6.5	5.7	4.8	4.1	3.8	3.5	3.5	3.5	3.0	3.9	7.3
15-Nov	2.6	2.2	1.3	1.0	0.8	0.4	-0.4	-0.8	-1.6	0.2	2.0	3.6	5.2	5.7	5.5	3.1	0.5	-2.0	-2.0	-3.6	-4.4	-5.0	-5.6	-6.1	0.1	5.7
16-Nov	-6.4	-6.5	-6.6	-7.2	-7.8	-8.4	-8.9	-9.5	-9.0	-5.4	-3.0	-1.0	0.6	0.5	1.0	-1.1	-2.6	-5.0	-4.5	-6.5	-6.8	-5.0	-4.6	-4.4	-4.9	1.0
17-Nov	-4.4	-4.9	-5.4	-5.6	-5.6	-5.8	-6.0	-6.3	-6.6	-7.0	-7.7	-7.5	-7.1	-7.4	-7.2	-7.0	-6.8	-6.5	-6.5	-6.6	-8.2	-10.3	-12.1	-13.2	-7.2	-4.4
18-Nov	-14.9	-15.7	-14.4	-13.7	-13.4	-13.2	-14.3	-15.3	-15.5	-14.0	-12.1	-9.9	-9.3	-8.8	-8.3	-9.1	-11.1	-12.8	-12.9	-12.9	-13.5	-15.2	-16.2	-15.0	-13.0	-8.3
19-Nov	-13.6	-13.0	-12.8	-12.2	-11.9	-11.7	-11.4	-10.7	-10.2	-9.5	-8.9	-8.3	-7.8	-7.2	-6.5	-6.4	-7.3	-7.8	-8.4	-8.5	-8.4	-8.6	-8.9	-9.1	-9.5	-6.4
20-Nov	-9.7	-10.1	-10.1	-10.2	-10.5	-10.4	-10.0	-9.7	-8.9	-8.4	-7.7	-6.7	-5.7	-5.1	-4.7	-4.6	-4.4	-4.3	-4.1	-4.2	-4.4	-4.4	-4.6	-4.8	-7.0	-4.1
21-Nov	-4.8	-4.6	-4.5	-4.3	-4.2	-4.1	-4.1	-4.2	-4.2	-3.8	-3.4	-3.4	-3.0	-2.9	-2.8	-2.8	-3.0	-3.2	-3.2	-3.2	-3.3	-3.3	-3.3	-3.3	-3.6	-2.8
22-Nov	-3.3	-3.4	-3.5	-3.7	-3.7	-3.9	-4.3	-4.5	-4.9	-5.0	-4.8	-4.6	-4.4	-4.2	-4.3	-4.4	-4.3	-4.5	-4.5	-4.4	-4.3	-4.1	-3.7	-3.6	-4.2	-3.3
23-Nov	-3.9	-4.2	-4.0	-4.2	-4.1	-3.8	-3.6	-3.7	-3.7	-3.4	-3.0	-2.4	-2.4	-2.2	-2.2	-2.2	-2.3	-2.4	-2.7	-2.8	-2.9	-3.0	-3.2	-3.2	-3.1	-2.2
24-Nov	-3.1	-3.0	-3.0	-2.9	-2.9	-3.5	-5.0	-4.7	-3.8	-3.9	-3.6	-3.4	-3.1	-2.8	-2.8	-3.0	-3.1	-3.0	-2.8	-2.8	-2.7	-2.7	-2.5	-2.2	-3.2	-2.2
25-Nov	-2.1	-2.1	-2.0	-2.0	-1.9	-1.6	-1.5	-1.4	-1.4	-1.3	-1.2	-1.0	-0.8	-0.7	-0.7	-0.8	-1.2	-1.3	-1.2	-1.5	-1.8	-1.5	-1.2	-0.9	-1.4	-0.7
26-Nov	-1.8	-3.2	-4.2	-4.9	-5.5	-5.6	-5.8	-6.1	-6.3	-5.8	-4.9	-4.5	-3.9	-3.5	-3.1	-3.4	-4.4	-5.1	-5.0	-4.3	-4.1	-4.1	-3.7	-2.8	-4.4	-1.8
27-Nov	-2.8	-2.8	-2.8	-2.5	-2.1	-3.1	-3.9	-4.0	-4.1	-4.2	-3.7	-3.1	-2.5	-2.2	-2.5	-2.6	-2.7	-2.8	-2.9	-3.0	-3.1	-3.4	-3.8	-3.5	-3.1	-2.1
28-Nov	-3.4	-3.6	-3.7	-3.6	-3.7	-3.8	-3.9	-4.0	-4.0	-3.9	-3.9	-4.0	-4.1	-4.1	-3.8	-3.8	-3.7	-3.8	-3.8	-3.8	-4.0	-3.9	-4.0	-4.0	-3.8	-3.4
29-Nov	-4.0	-4.0	-4.0	-4.1	-4.4	-4.7	-4.8	-4.8	-5.0	-4.9	-4.7	-4.6	-4.6	-4.5	-4.8	-5.3	-5.8	-6.0	-6.2	-6.3	-6.3	-6.7	-6.9	-7.2	-5.2	-4.0
30-Nov	-7.3	-7.2	-6.9	-7.0	-7.0	-6.9	-6.6	-6.6	-6.6	-6.5	-6.2	-6.1	-6.0	-5.8	-5.6	-5.5	-5.6	-5.7	-5.7	-5.7	-5.9	-6.0	-6.1	-6.2	-6.3	-5.5
	-1.7	-2.0	-2.3	-2.5	-2.7	-2.8	-3.1	-3.1	-2.7	-1.5	-0.2	0.9	1.6	2.2	2.3	1.8	0.4	-0.8	-1.4	-1.5	-1.5	-1.7	-1.7	-1.6	Diurnal Average	
	9.4	9.2	9.2	8.5	8.6	8.5	8.3	7.7	9.3	14.3	14.3	13.8	15.2	15.7	16.0	15.0	9.8	8.1	7.8	7.0	6.1	6.7	9.3	9.3	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Conklin Community - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	452	62.78	62.78
0 - 10	241	33.47	96.25
10 - 20	27	3.75	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) - %

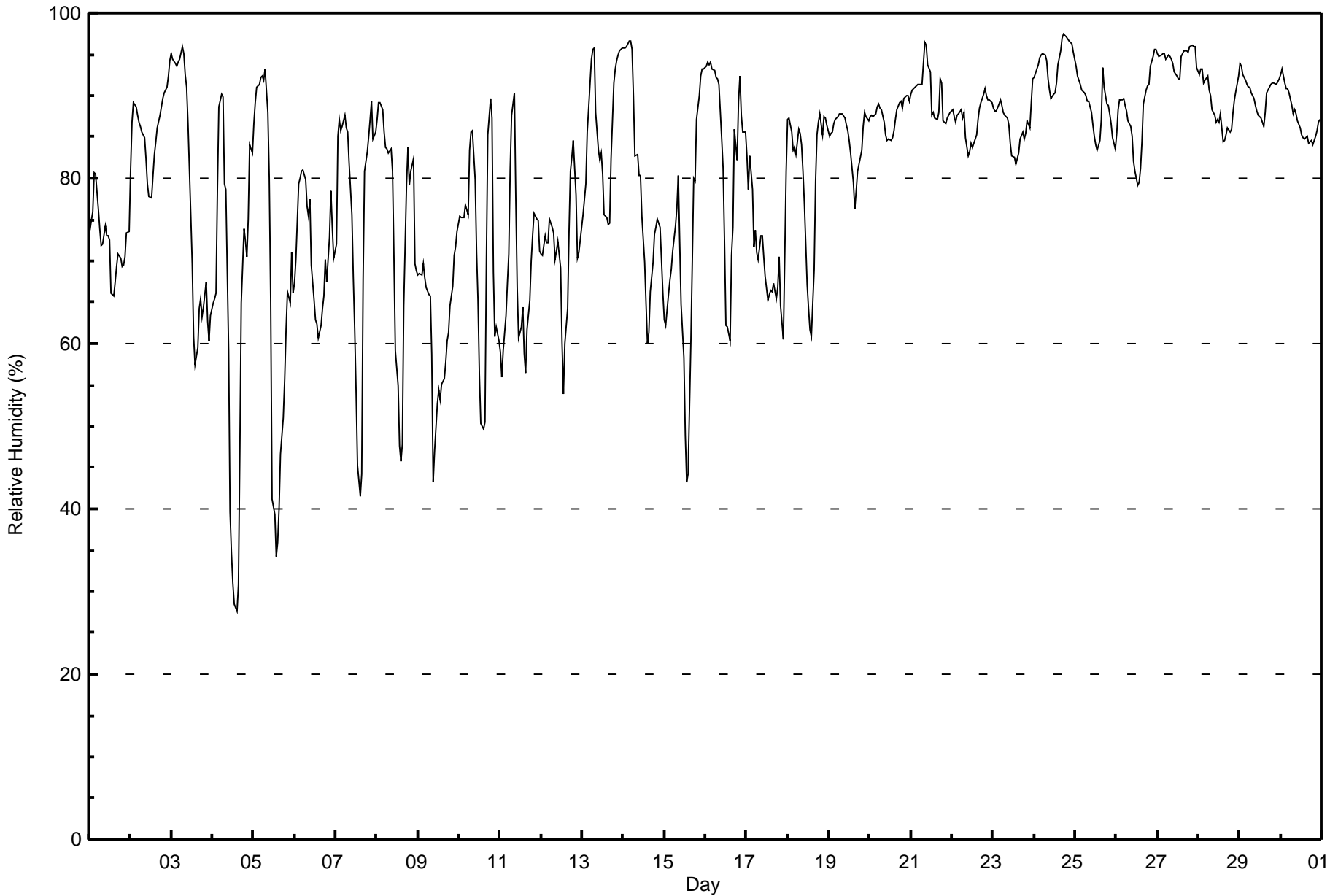
Conklin Community - November 2016

Maximum Value: 97 % on Nov 24 18:00 Maximum Daily Average: 94.6 % on Nov 27																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 28 % on Nov 4 15:00 Minimum Daily Average: 62.0 % on Nov 9 Maximum Diurnal Average: 86.1 % at hour 7 Minimum Diurnal Average: 67.9 % at hour 15 Monthly Average: 80.1 % Percentiles: P ₁ = 39 P ₁₀ = 62 Q ₁ = 71 Median = 85 Q ₃ = 89 P ₉₀ = 94 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-Nov	74	75	76	81	81	76	74	72	72	74	73	73	73	66	66	68	69	71	70	69	69	71	73	74	72.5	81
2-Nov	81	87	89	89	88	87	86	86	85	82	79	78	78	80	83	84	86	88	89	90	90	91	92	94	85.9	94
3-Nov	95	94	94	94	94	94	96	95	93	91	87	75	70	61	57	59	64	65	63	64	68	63	60	63	77.5	96
4-Nov	65	65	66	79	89	90	90	79	79	59	40	35	31	29	28	31	47	65	74	72	71	75	84	83	63.5	90
5-Nov	87	89	91	91	92	92	92	93	88	80	65	41	39	34	36	40	47	51	56	62	66	65	71	66	68.1	93
6-Nov	67	70	79	80	81	81	80	77	75	77	70	65	63	62	61	62	64	66	70	67	73	78	74	70	71.4	81
7-Nov	72	85	87	86	86	88	86	86	82	76	68	62	54	45	41	44	68	81	83	85	87	89	85	86	75.5	89
8-Nov	87	89	89	88	86	84	84	83	84	81	71	59	55	48	46	48	65	79	84	79	81	82	70	69	74.5	89
9-Nov	68	68	68	70	68	67	66	66	59	43	47	53	54	53	55	56	58	60	61	65	67	71	72	74	62.0	74
10-Nov	76	75	75	75	77	76	83	86	86	80	71	65	56	50	50	50	70	85	90	87	69	61	62	60	71.5	90
11-Nov	59	56	59	63	67	71	81	88	90	78	67	61	62	64	59	57	62	65	70	73	76	75	75	71	68.7	90
12-Nov	71	71	73	72	72	75	74	73	70	71	72	69	60	54	60	64	73	81	83	85	78	70	71	72	71.5	85
13-Nov	76	77	79	86	88	94	96	96	88	83	82	83	81	76	75	74	75	82	92	93	94	95	95	96	85.7	96
14-Nov	96	96	96	97	97	96	90	83	83	80	80	75	70	65	60	61	66	70	73	74	75	74	70	66	78.8	97
15-Nov	63	62	66	68	69	71	74	76	80	72	65	58	49	43	44	60	70	80	80	87	90	92	93	93	71.1	93
16-Nov	94	94	94	94	93	93	92	92	91	85	81	72	62	62	60	71	74	86	82	89	92	88	86	86	83.9	94
17-Nov	83	79	83	79	72	74	71	70	73	73	70	68	65	66	66	66	67	65	67	70	65	60	71	81	71.0	83
18-Nov	87	87	86	83	84	83	86	85	84	81	77	67	64	62	61	69	80	85	87	88	85	87	86	86	80.5	88
19-Nov	85	85	86	87	87	88	88	88	88	87	86	86	85	83	80	76	78	81	83	83	86	88	88	87	84.9	88
20-Nov	87	88	88	88	89	89	89	88	87	85	85	85	85	85	86	87	88	89	89	88	90	90	90	89	87.6	90
21-Nov	90	91	91	91	91	91	91	94	97	96	94	93	88	88	87	87	88	92	92	87	87	87	88	88	90.4	97
22-Nov	88	87	87	88	88	88	87	88	85	83	83	84	84	84	85	87	88	89	90	91	90	89	90	89	87.3	91
23-Nov	89	88	88	89	89	89	88	88	87	86	84	83	83	82	82	83	85	86	85	85	87	86	89	92	86.4	92
24-Nov	92	93	94	95	95	95	94	92	91	90	90	90	91	94	95	97	97	97	97	97	97	96	96	95	94.1	97
25-Nov	94	92	92	91	91	90	90	89	89	88	86	85	84	83	85	87	93	91	89	89	88	87	85	84	88.4	94
26-Nov	85	88	89	90	90	89	88	87	86	85	82	81	79	80	81	84	89	91	91	91	94	95	96	96	87.8	96
27-Nov	95	95	95	95	95	94	95	95	94	94	93	92	92	92	95	95	95	95	95	96	96	96	96	93	94.6	96
28-Nov	92	93	93	92	92	92	91	90	88	88	87	87	87	88	84	85	85	86	86	86	88	90	90	92	88.8	93
29-Nov	94	94	93	92	91	91	91	90	90	89	88	88	87	87	86	88	90	91	91	92	92	91	92	92	90.4	94
30-Nov	93	93	92	91	91	90	89	88	88	88	87	86	85	85	85	85	84	84	85	84	85	86	87	87	87.4	93
82.8 83.6 84.5 85.3 85.7 86.0 86.1 85.5 84.5 80.9 77.0 73.3 70.5 68.3 67.9 70.2 75.6 80.0 81.5 82.3 82.5 82.3 82.6 82.5																								Diurnal Average		
96 96 96 97 97 96 96 96 96 97 96 94 93 92 92 95 95 97 97 97 97 97 96 96 96																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Conklin Community - November 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Conklin Community - November 2016

Maximum Speed: 18 km/h on Nov 11 02:00	Maximum Daily Speed Average: 10.8 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 26 17:00	Minimum Daily Speed Average: 1.3 km/h on Nov 18	Hours of Data: 718
Maximum Diurnal Speed Average: 3.9 km/h at hour 14	Minimum Diurnal Speed Average: 1.9 km/h at hour 5	Hours of Missing Data: 2
Monthly Average Velocity: 2.8 km/h 220.0 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 6 Q ₃ = 9 P ₉₀ = 12 P ₉₉ = 15	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-Nov	NNW7	NW6	NW6	NNW7	NNW8	NW9	NW9	NW8	NW9	NW7	NW8	NW8	NW9	NNW11	NW11	NW10	NW10	NW9	NW9	NW10	NNW8	NNW6	NNW6	N3	NW7.9	NW11
2-Nov	WNW1	SSW2	S3	SSE3	SSE4	S4	S4	SSE4	SSE4	SSE5	SE6	SSE9	S9	S8	S10	SSW10	SW13	SSW14	SSW15	SSW13	SW12	SSW8	SSW8	SSW10	SSW6.9	SSW15
3-Nov	SSW9	SSW11	S10	S9	SSE7	SE6	SE5	SSE3	SSW8	SW11	WSW13	SW10	SW11	SW10	SSW10	SSW9	SSW10	SSW11	SSW13	SSW12	SW11	SW14	SW12	SW10	SSW8.9	SW14
4-Nov	SW10	SW10	SW8	ESE1	E3	ENE2	S4	S6	S5	S5	SSW10	SSW15	SSW9	SSW10	SSW8	SW5	SSE4	SSE5	SSE5	SSE6	S6	S4	SSE2	SE5	SSW5.3	SSW15
5-Nov	SSE3	SSE2	SSE2	SE4	SE2	S1	SSE2	S2	ESE2	ESE2	ENE0	SSW7	WSW4	SW8	WSW7	SSW4	SW5	SSW6	S7	W2	SE1	SSW4	SE1	NW7	SSW2.4	SW8
6-Nov	NW4	NW3	NW1	WNW1	ENE1	NNW2	S1	W2	NW2	NNW1	NW3	NW2	W4	SW5	W4	WNW4	WNW5	WNW4	WNW4	WNW6	SW8	SW7	SW10	WSW8	W2.9	SW10
7-Nov	SW9	SSW6	SSW8	SSW9	SW11	SW10	SSW10	SW11	SW10	SW8	SSW6	WSW5	WSW7	SSW7	S5	SSE2	SSW2	W3	WSW4	SW4	S4	S7	SSE6	SSW6.4	SW11	
8-Nov	SSE6	SSE7	S7	S8	S10	SSE7	S11	S6	SSE4	SSE5	SE3	S7	SSW6	SW10	SW12	S7	SSE3	SSE5	SSE4	SSE6	ESE4	S5	SSW11	SSW10	S6.3	SSW12
9-Nov	SSW6	SSW8	SSW10	S7	SSW10	SSW9	SW10	SSW6	SW9	W18	WNW13	WNW15	W13	WNW14	WNW11	WNW10	W9	WNW9	WNW9	WNW8	WNW7	WNW7	NW7	NW7	W7.7	W18
10-Nov	WNW6	WNW8	NW8	NW6	W5	WSW5	SSW6	SSW7	SSW8	SW10	SW7	SW8	SSW7	S7	SSW8	SSE6	SSE2	S1	N1	SSE5	SSE10	SSE13	SSE12	S15	SSW4.6	S15
11-Nov	SSE15	SSE18	S16	S15	S11	S8	N1	NNW2	E1	SW4	SW10	WSW10	WSW9	WSW8	SW5	SW7	SW10	SW12	SW15	SW10	SSW8	SSW7	SSW6	SW11	SSW7.8	SSE18
12-Nov	SW9	SSW7	S4	S5	S4	SSE4	S3	SSE3	SSE6	SE4	SSE4	SE2	N4	N1	NE1	ESE1	NNW2	WNW1	NW0	SW1	NW4	NW7	WNW5	WNW4	SSW1.5	SW9
13-Nov	W6	NW4	WNW2	NW1	SW3	WSW2	SE2	SW3	SW6	S7	SW11	SW9	SW11	SW12	SW11	SW7	SW5	SSW5	S5	S5	SSE5	SSE5	SE1	S2	SW4.4	SW12
14-Nov	S2	NNW1	SSE3	SSE1	SSW1	SW8	WSW10	WNW9	W11	W13	W14	W15	W16	W15	W14	WNW14	WNW12	W12	W12	W13	W12	WNW12	W12	W15	W9.6	W16
15-Nov	W15	W15	WSW12	W13	W12	W10	WSW10	WSW11	SW11	WSW11	WNW9	W8	W8	W8	W7	SSW6	SSW4	SSW5	S5	S1	S2	WNW1	WSW1	WSW1	WSW7.0	W15
16-Nov	NNW1	W1	AF	AF	S1	WNW1	SSE1	WSW1	SW1	SW0	NNW5	NW4	WNW3	NW4	SW2	WSW3	WSW4	WNW2	NW5	NNW4	NNW4	NNW5	NW4	NNW5	NW2.2	NNW5
17-Nov	N10	NNW12	N12	NNW9	NNW11	NNW7	NNW10	NNW9	NNW8	NNW10	NNW11	NNW10	WNW8	NNW9	NNW9	NW7	NW5	WNW7	W6	WNW8	NNW15	NNW11	NW5	NNW3	NW8.4	NNW15
18-Nov	WNW1	N1	SSW3	SW3	WNW1	NW2	SW2	SSW4	SSW3	SSW4	SSW4	WNW3	NW5	NNW5	NNW3	NNE2	NNW1	NNW2	NW1	NNW1	NNW4	NNW3	NNW2	NNW5	WNW1.3	NNW5
19-Nov	NNE3	N6	N4	N4	N4	N5	N5	NNE5	NE6	NE5	NE5	ENE6	ENE6	ENE7	E8	E8	ENE7	ENE7	ENE7	ENE8	ENE6	ENE6	ENE6	NE6	NE5.1	E8
20-Nov	NE5	NE5	NE5	NNE4	NNE3	N3	N4	NE3	SE3	SE3	ESE1	NE3	ESE5	ESE6	ESE8	SE7	ESE6	SE9	SE9	SE12	SE13	SE11	SE12	SE11	ESE4.7	SE13
21-Nov	SE11	SE9	SE8	SE6	ESE5	SE6	ESE6	ESE5	SSE3	ESE2	NW1	NNW5	N4	NNW7	NNW8	NNW7	NNW6	NNW5	N7	NNW7	NNW7	NNW4	NNW3	NW4	NNE1.4	SE11
22-Nov	NW5	NW5	NW4	WNW2	WNW3	NNW5	NNW6	NNW5	N6	N5	WNW1	E1	NNE2	SSE5	S7	SE8	SSE8	SSE12	SSE11	SSE11	SSE13	SSE11	SSE10	SSE12	SSE2.5	SSE13
23-Nov	SSE13	SSE11	SSE11	SSE12	SSE11	SSE12	SSE11	SSE13	SSE11	SSE10	SSE12	SE12	SSE12	SSE12	SSE12	SSE12	SSE12	S9	S12	S10	S9	S10	SSE7	SE7	SSE10.8	SSE13
24-Nov	SE5	E1	ENE2	E2	ESE2	NNW1	WSW1	W3	S4	S7	SSW5	S7	S7	SSE8	S7	SSE6	SSE7	SE10	SE10	SE10	SE8	SE10	SE11	SE9	SSE5.1	SE11
25-Nov	SE9	SE12	ESE10	SE10	SE9	SE11	SE10	SE10	SE8	SE10	SE9	SE7	ESE7	SE7	ESE3	N1	WSW5	WSW7	W9	W9	W11	W10	W12	W11	SSE4.0	W12
26-Nov	WSW10	SW11	SW9	SW9	SW9	SW12	SW12	SW12	SW13	SW10	SW10	SW7	SSW3	SSW3	S2	SE2	N0	SSW1	WSW1	NNW2	NNW2	NNW3	N3	NNE5	SW5.1	WSW13
27-Nov	NNE5	NE4	NE4	NE6	NE7	N5	N7	N6	N5	N6	N6	NNE5	NE5	NE4	N4	N3	N2	ENE2	NW1	NNW2	NNW2	NNW1	NW2	W4	N3.7	NE7
28-Nov	W4	SW3	W2	W4	NW5	NW5	WNW5	WNW5	WNW6	W7	W8	W7	SW8	SW7	WNW5	WNW4	NW4	NW6	WNW3	WNW3	NW5	NW6	WNW5	WNW6	WNW4.5	W8
29-Nov	NW6	NW5	NW5	NW5	NW5	NW6	NW5	NW8	NW6	WNW5	NW6	WNW6	W5	NW4	WSW4	W5	W5	S6	SSW7	S7	SSW6	SSW7	SSW8	S9	W3.5	SSW9
30-Nov	S8	S6	S8	S8	S8	S9	SSE8	S10	SSE10	S9	S9	S10	S10	S10	SSE8	S7	S9	S8	S7	S10	S9	S9	S8	S10	S8.6	S10

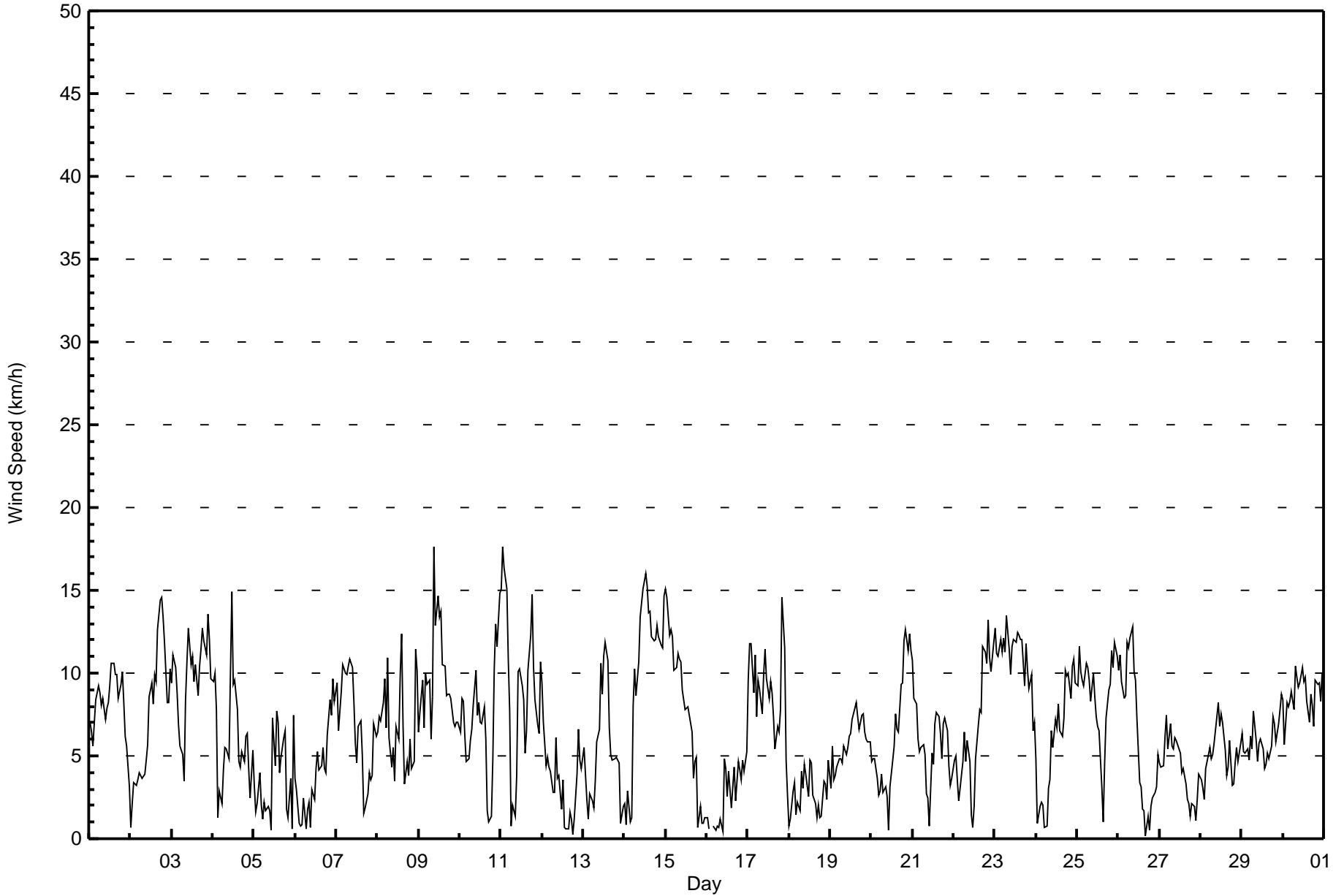
SW2.5 SW2.2SSW2.5SSW2.1SSW1.9 SW1.9 SW2.3 SW2.4 SW2.9 SW3.4WSW3.5 SW3.5WSW3.6 SW3.9 SW3.7 SW2.6 SW2.3SSW2.9 SW3.1 SW2.9SSW2.6 SW2.7SSW2.9 SW3.0	Diurnal Average
SSE15 SSE18 S16 S15 W12 SSE12 SW12 SSE13WSW13 W18 W14 W15 W16 W15 W14WNW14 SW13 SSW14 SW15 SSW13NNW15 SW14 SE12 S15	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Conklin Community - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - November 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	301	41.92	41.92
6 - 11	343	47.77	89.69
12 - 19	74	10.31	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: 718

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - 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	23	9	12	5	5	13	14	32	28	18	15	14	15	28	38	32	301
6 - 11	8	0	4	10	2	6	32	29	52	49	48	12	17	19	33	22	343
12 - 19	1	0	0	0	0	0	5	17	4	7	9	4	19	6	0	2	74
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	32	9	16	15	7	19	51	78	84	74	72	30	51	53	71	56	718

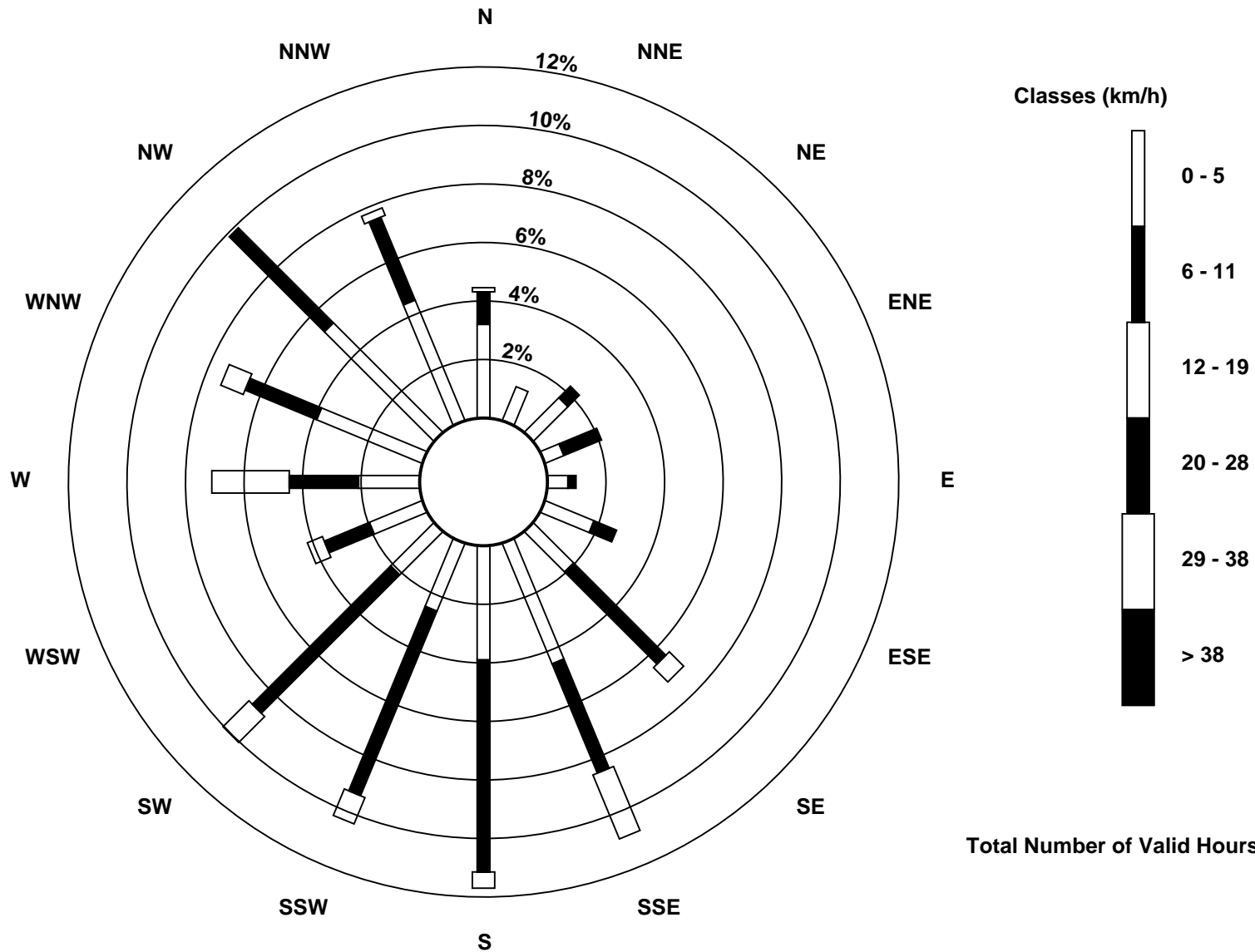
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Conklin Community (AMS 21)



Total Number of Valid Hours: 718



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Conklin Community - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 7 km/h on Nov 9 10:00	Hours of Data: 718
Minimum Value: 0 km/h on Nov 27 20:00	Hours of Missing Data: 2
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6	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-Nov	2	2	2	2	3	3	3	3	3	2	3	2	3	4	3	3	3	3	3	3	2	2	1	1	4
2-Nov	2	1	1	1	1	1	1	1	1	2	2	3	2	2	3	3	5	5	5	6	4	4	3	4	6
3-Nov	4	3	3	2	2	1	1	3	3	4	4	4	4	3	3	3	2	3	3	3	3	4	3	2	4
4-Nov	3	2	3	2	1	1	2	2	1	1	5	5	3	3	2	3	1	1	1	1	1	1	1	1	5
5-Nov	1	2	1	1	2	1	1	2	2	2	1	4	2	4	3	2	2	3	2	2	1	2	2	3	4
6-Nov	2	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	3	2	3	2	2	3	3	3
7-Nov	3	2	2	3	3	2	2	2	2	2	2	2	2	3	2	1	1	1	1	1	1	2	2	2	3
8-Nov	2	1	2	2	2	2	4	3	2	1	2	3	2	3	4	2	1	1	2	2	1	3	3	3	4
9-Nov	2	3	3	2	3	3	3	2	3	7	5	6	6	6	5	4	4	4	3	3	3	2	2	3	7
10-Nov	3	3	3	2	3	3	2	2	2	3	3	3	2	3	3	2	1	1	1	2	3	4	3	5	5
11-Nov	4	5	5	4	4	3	2	1	1	2	4	4	2	2	1	4	3	4	4	3	2	2	2	3	5
12-Nov	3	2	1	1	2	1	2	2	1	2	1	1	2	2	1	2	1	1	1	1	2	2	2	2	3
13-Nov	2	2	1	1	2	2	1	4	2	2	4	2	3	3	4	2	2	1	1	1	1	0	2	1	4
14-Nov	1	1	2	2	1	4	4	4	3	4	4	5	6	6	6	6	5	5	4	5	4	5	5	5	6
15-Nov	4	4	4	5	5	4	3	3	3	4	4	3	2	3	2	2	1	2	1	1	1	1	1	1	5
16-Nov	1	1	AF	AF	1	1	1	1	1	1	2	1	1	1	1	2	2	2	1	1	1	1	1	2	2
17-Nov	2	3	3	3	3	2	2	3	2	3	3	3	3	3	3	3	2	2	2	4	4	5	1	1	5
18-Nov	1	1	2	2	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2
19-Nov	2	2	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3	3	2	2	2	2	3
20-Nov	1	1	2	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3
21-Nov	3	2	2	2	1	2	1	1	1	1	1	1	1	2	2	2	2	1	2	2	2	1	1	1	3
22-Nov	1	1	1	1	1	1	2	1	1	1	1	1	1	2	2	2	2	3	3	3	4	3	3	3	4
23-Nov	4	3	4	3	3	3	4	4	4	4	4	3	4	3	4	3	3	3	3	3	4	2	2	4	4
24-Nov	1	1	1	1	1	1	1	3	1	3	2	2	2	2	2	2	2	2	3	3	2	3	3	2	3
25-Nov	3	3	3	3	3	3	3	3	2	3	2	2	2	1	2	2	1	2	3	3	3	4	4	4	4
26-Nov	3	3	2	2	2	3	4	3	3	3	3	3	2	2	1	1	1	1	2	1	2	1	1	1	4
27-Nov	1	1	1	2	2	1	2	1	1	2	1	1	2	1	1	1	1	1	1	0	1	1	2	2	2
28-Nov	1	1	1	1	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	1	1	2	2	2	3
29-Nov	2	1	1	1	2	2	2	2	2	2	2	3	2	1	2	2	2	2	2	2	2	2	3	2	3
30-Nov	2	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3	3	3	3

4	5	5	5	5	4	4	4	4	4	7	5	6	6	6	6	6	5	5	5	6	4	5	5	5	
Diurnal Maximum																									

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Conklin Community - November 2016

Direction of Maximum Speed: 167 deg on Nov 11 02:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 159.7 deg on Nov 23	Hours of Data: 718
Direction of Minimum Speed: 5 deg on Nov 26 17:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 1.3 deg on Nov 18	Percent Operational Time: 99.7
Monthly Average Direction: 257.9 deg	

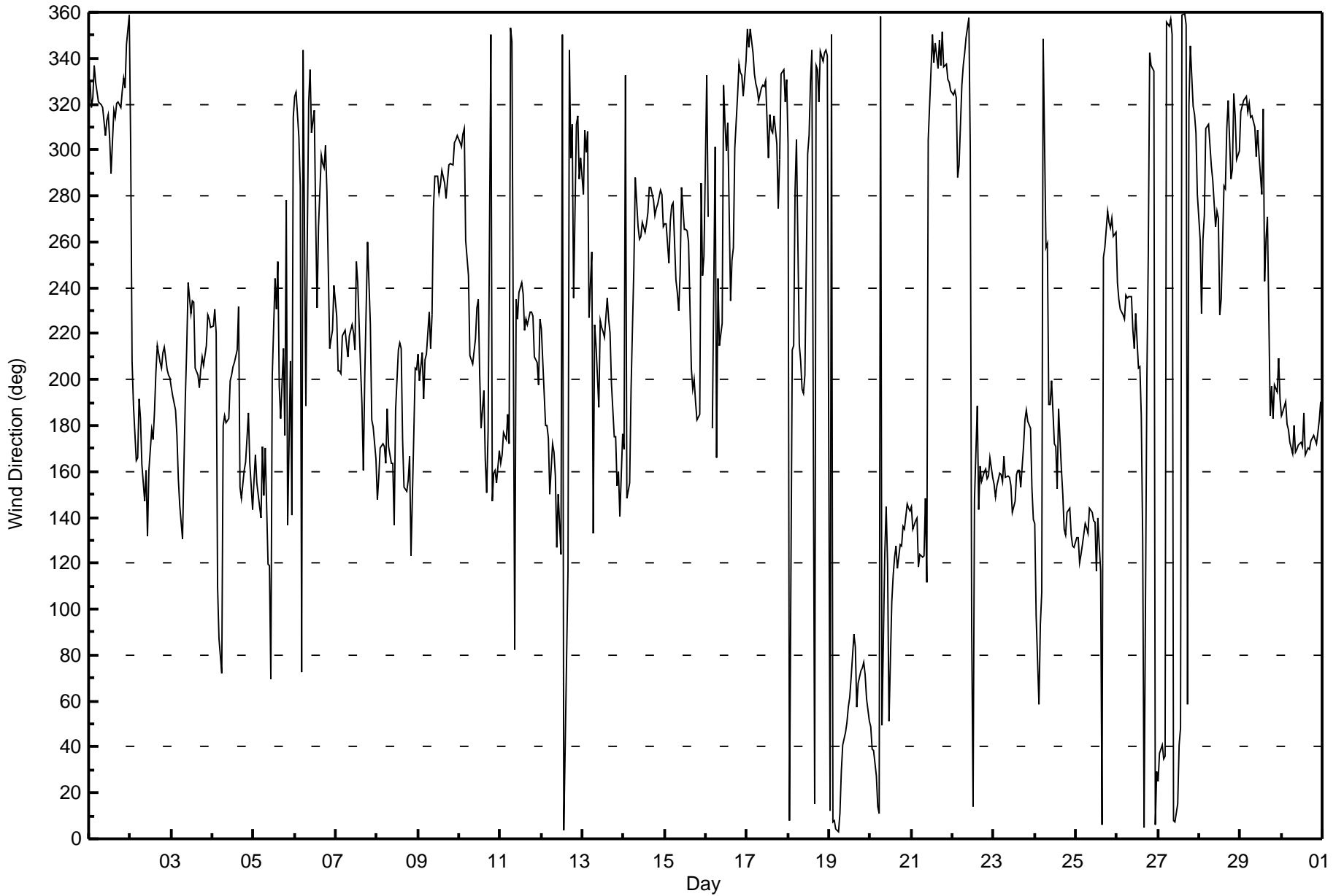
Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Nov	330	318	323	337	330	321	320	320	319	306	313	315	305	290	317	314	320	321	318	326	331	327	346	359	320.0
2-Nov	302	208	189	165	166	191	183	163	147	160	132	161	178	174	186	203	215	208	205	211	214	205	202	200	192.9
3-Nov	196	193	186	176	157	145	130	162	192	214	242	229	235	234	205	202	197	204	210	206	215	228	226	222	206.8
4-Nov	223	231	220	110	87	72	180	184	182	183	200	202	206	207	213	232	153	148	161	164	174	186	163	144	192.4
5-Nov	156	167	155	145	140	171	149	170	120	119	69	201	244	231	251	197	183	213	176	279	136	208	141	314	200.5
6-Nov	323	325	306	284	73	344	189	261	321	335	307	317	270	231	267	298	294	293	302	282	214	218	222	241	266.2
7-Nov	227	204	204	202	219	221	215	210	219	224	220	213	251	242	206	189	161	201	260	242	224	182	180	165	213.2
8-Nov	148	157	170	172	171	164	188	171	164	164	137	187	213	216	214	174	153	152	156	166	123	176	205	204	179.2
9-Nov	211	200	212	191	209	211	229	213	228	275	289	289	281	285	291	285	279	286	293	294	294	303	305	306	266.1
10-Nov	303	301	307	310	261	245	210	209	207	218	231	235	202	179	195	165	151	177	350	147	159	161	155	169	204.5
11-Nov	163	167	177	174	185	172	354	347	82	235	227	238	242	237	222	227	224	229	229	228	210	208	197	226	206.1
12-Nov	222	208	180	180	175	150	172	168	158	127	150	124	350	4	40	117	343	296	311	236	311	315	287	297	206.7
13-Nov	280	309	299	308	227	256	133	224	215	188	226	223	221	218	236	227	220	199	175	175	154	160	140	177	216.7
14-Nov	170	332	148	155	196	223	249	288	267	261	262	268	264	268	273	284	284	278	272	275	276	282	281	267	268.8
15-Nov	268	268	251	269	276	277	244	238	230	247	283	266	265	265	260	205	196	200	190	182	185	286	245	254	253.6
16-Nov	332	271	AF	AF	179	302	166	244	215	225	329	312	299	312	235	252	257	301	324	337	334	332	324	339	309.5
17-Nov	353	345	353	343	333	329	327	321	327	328	327	330	297	316	309	308	315	303	275	296	333	335	321	331	325.6
18-Nov	303	8	213	215	283	305	215	208	196	194	202	299	306	330	344	16	337	335	321	343	339	342	343	341	294.5
19-Nov	12	350	7	8	4	3	11	29	41	46	51	58	61	70	89	83	58	68	73	75	77	72	61	51	52.4
20-Nov	49	39	39	27	14	11	358	50	124	145	120	51	103	115	123	127	118	128	128	136	135	146	144	143	115.9
21-Nov	144	135	139	140	118	124	123	123	148	112	304	335	350	338	347	335	348	337	351	336	338	330	329	326	29.9
22-Nov	324	326	323	288	293	328	337	342	349	357	300	92	14	148	189	143	162	156	160	161	157	158	166	157	164.5
23-Nov	154	149	154	159	158	156	167	158	158	154	142	147	159	160	161	153	171	182	187	182	179	152	139	159.7	
24-Nov	137	97	58	93	107	348	258	259	189	189	200	172	171	153	187	161	150	135	132	142	144	132	127	127	149.4
25-Nov	131	131	120	124	128	138	136	133	144	142	139	138	117	139	117	6	253	257	274	269	266	270	262	264	166.8
26-Nov	242	235	231	228	226	236	236	236	236	222	214	229	205	205	184	130	5	201	254	342	337	334	6	29	233.8
27-Nov	25	37	41	35	36	356	354	357	350	8	7	15	41	48	359	359	355	58	319	345	319	315	307	281	9.4
28-Nov	261	229	261	271	309	311	302	293	287	267	273	270	228	235	284	283	309	322	287	292	325	315	296	300	283.4
29-Nov	317	319	321	323	317	320	314	315	310	297	309	298	281	318	243	261	271	185	197	183	198	195	209	191	270.6
30-Nov	184	186	190	180	178	173	168	180	168	169	171	173	171	185	167	170	170	173	175	176	172	177	183	190	176.2

215.4 216.2 202.2 193.9 204.9 222.2 222.2 221.9 214.6 223.1 239.1 235.3 236.6 230.2 228.0 220.1 222.1 212.0 215.5 217.5 213.2 215.5 210.8 214.6

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 (WD) - deg
Conklin Community - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 103 deg on Nov 16 05:00	Hours of Data: 718
Minimum Value: 10 deg on Nov 26 22:00	Hours of Missing Data: 2
Percentiles: P ₁ = 13 P ₁₀ = 17 Q ₁ = 19 Median = 24 Q ₃ = 34 P ₉₀ = 65 P ₉₉ = 96	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-Nov	19	21	22	18	19	19	22	21	20	28	25	25	30	32	24	23	22	18	20	18	18	22	22	34	34
2-Nov	76	62	35	29	28	28	33	49	41	32	27	19	21	21	22	29	24	22	23	33	24	28	29	24	76
3-Nov	29	22	20	20	15	14	18	78	25	30	26	29	24	26	23	23	17	17	18	17	18	20	20	20	78
4-Nov	19	19	25	76	46	50	60	21	19	26	29	18	28	22	27	50	25	19	19	15	17	25	63	11	76
5-Nov	66	88	68	46	82	96	74	88	66	90	92	45	41	34	30	42	39	41	24	95	86	76	99	32	99
6-Nov	24	34	36	76	89	43	86	73	42	87	28	24	35	19	31	31	31	36	42	38	24	20	22	31	89
7-Nov	30	28	22	24	19	18	18	15	17	18	21	25	47	25	27	22	78	64	43	26	37	52	21	23	78
8-Nov	18	14	13	14	13	26	20	34	42	27	65	40	34	27	21	23	40	22	45	23	39	65	18	23	65
9-Nov	34	33	24	41	27	27	23	40	24	25	31	31	30	30	32	31	27	30	31	30	31	29	29	28	41
10-Nov	30	30	24	33	46	51	28	20	23	21	28	24	29	40	21	18	79	82	50	34	15	17	14	17	82
11-Nov	17	20	19	18	21	46	81	70	88	79	31	23	21	19	25	38	19	19	19	20	15	22	30	20	88
12-Nov	21	21	25	22	25	25	80	85	21	49	21	83	34	84	79	83	71	39	67	68	26	21	31	32	85
13-Nov	30	26	28	30	33	45	60	91	27	26	25	22	21	21	20	21	24	27	21	17	18	13	93	71	93
14-Nov	68	66	78	98	82	31	28	29	22	17	18	22	23	25	29	31	30	28	22	24	25	31	30	20	98
15-Nov	20	21	20	27	25	31	18	19	18	28	31	28	24	27	25	18	48	28	12	103	70	45	66	63	103
16-Nov	40	67	AF	AF	103	63	84	67	64	80	18	28	63	27	64	46	36	46	14	13	16	14	16	20	103
17-Nov	19	18	18	19	19	17	18	18	18	18	19	21	29	27	27	28	24	30	26	35	18	17	17	19	35
18-Nov	65	24	61	37	54	46	77	16	27	22	28	78	36	31	41	41	17	49	62	53	19	11	16	17	78
19-Nov	51	17	22	25	26	19	24	23	29	30	31	32	32	36	34	33	30	34	35	34	36	34	32	29	51
20-Nov	30	28	28	29	31	22	18	48	58	54	97	52	27	22	19	17	19	16	16	16	17	17	17	16	97
21-Nov	15	15	16	18	17	19	16	19	34	41	69	18	23	20	20	18	20	16	20	18	20	15	23	13	69
22-Nov	14	15	13	28	30	17	17	18	20	22	67	96	56	41	23	19	21	19	19	18	17	17	17	17	96
23-Nov	18	16	19	17	17	18	21	16	19	19	18	18	19	19	18	19	17	22	20	21	19	21	21	14	22
24-Nov	15	74	47	38	46	39	67	68	40	29	29	24	26	22	34	31	25	18	18	17	20	17	19	19	74
25-Nov	21	17	19	21	19	16	18	20	20	17	22	20	22	22	52	66	21	17	24	22	19	28	21	23	66
26-Nov	17	17	19	20	22	19	20	18	17	20	19	28	70	61	71	64	68	79	94	54	13	10	28	24	94
27-Nov	20	25	28	27	25	20	16	18	16	18	19	22	28	34	23	20	34	50	58	13	21	24	25	30	58
28-Nov	23	23	24	20	30	23	29	30	31	26	27	33	22	19	30	30	26	16	39	37	20	19	28	29	39
29-Nov	19	17	16	17	22	19	19	17	24	31	23	29	28	28	46	42	37	27	28	22	30	25	21	21	46
30-Nov	24	28	22	22	21	19	17	19	17	20	23	25	21	23	22	17	18	20	21	18	17	19	21	23	28

76	88	78	98	103	96	86	91	88	90	97	96	70	84	79	83	79	82	94	103	86	76	99	71	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:35	End Time (MST)	14:40
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	846
Calculated slope	0.998300	1.006434	Chamber temp	45.1	45.0
Calculated intercept	0.108966	-0.739315	Pressure	658.7	659.3
Analyzer Background	21.3	21.2	Flow	0.485	0.486
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	0.3	----
as found span	5000	76.5	786.4	781.1	1.007
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	76.5	786.4	781.1	1.007
second point	5000	38.2	392.7	393.5	0.998
third point	5000	19.2	197.4	195.8	1.008
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	76.5	786.4	798.4	0.985
Average Correction Factor					1.004

Corrected As found 780.8 Previous response 787.7 % change 0.9%

Notes:

Sample inlet filter replaced after as founds. No adjustments. As lefts began at 14:06 MST.

Calibration Performed By: Asad Hidayat



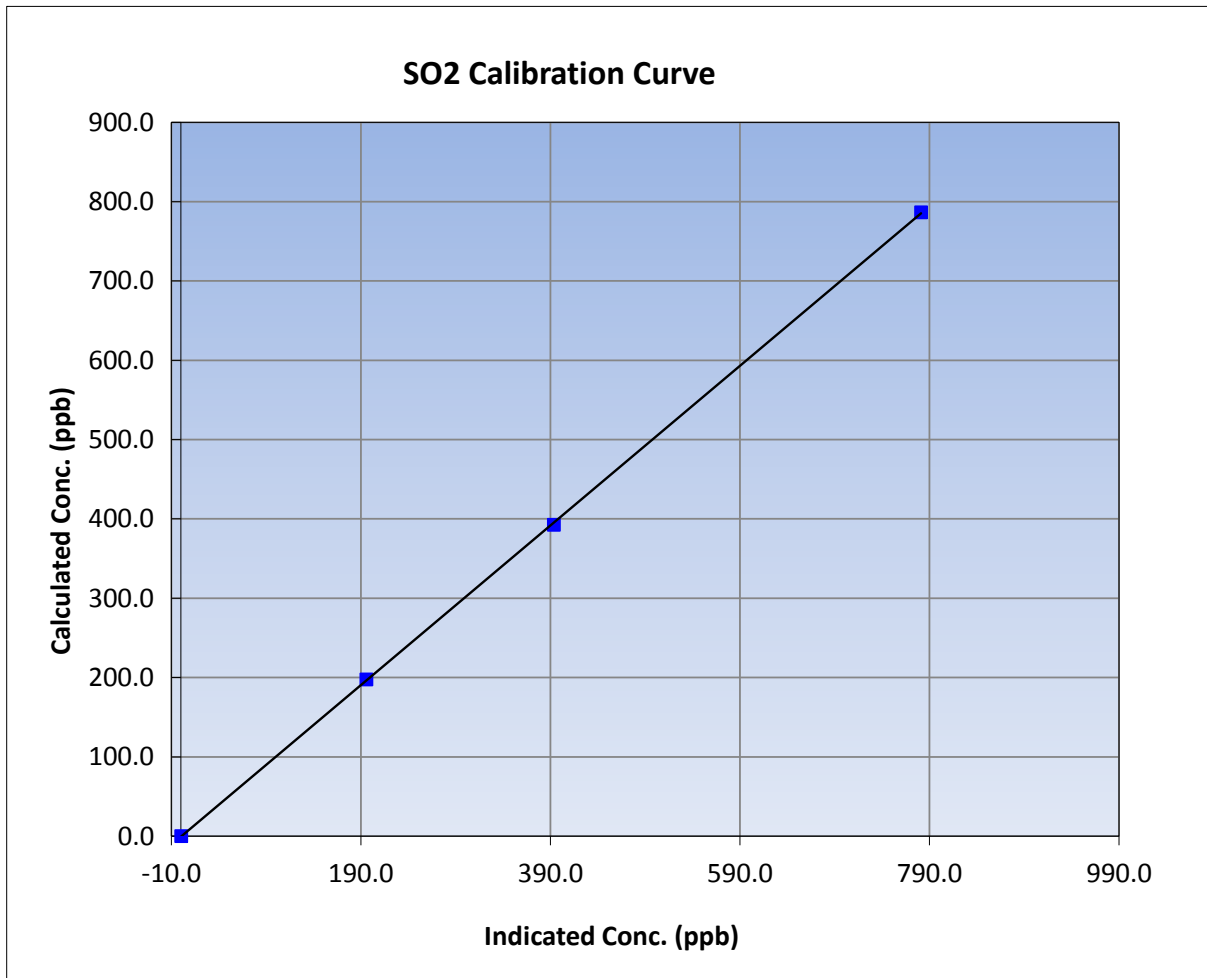
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
Analyzer make	Thermo 43i	Analyzer serial #	JC1428701363

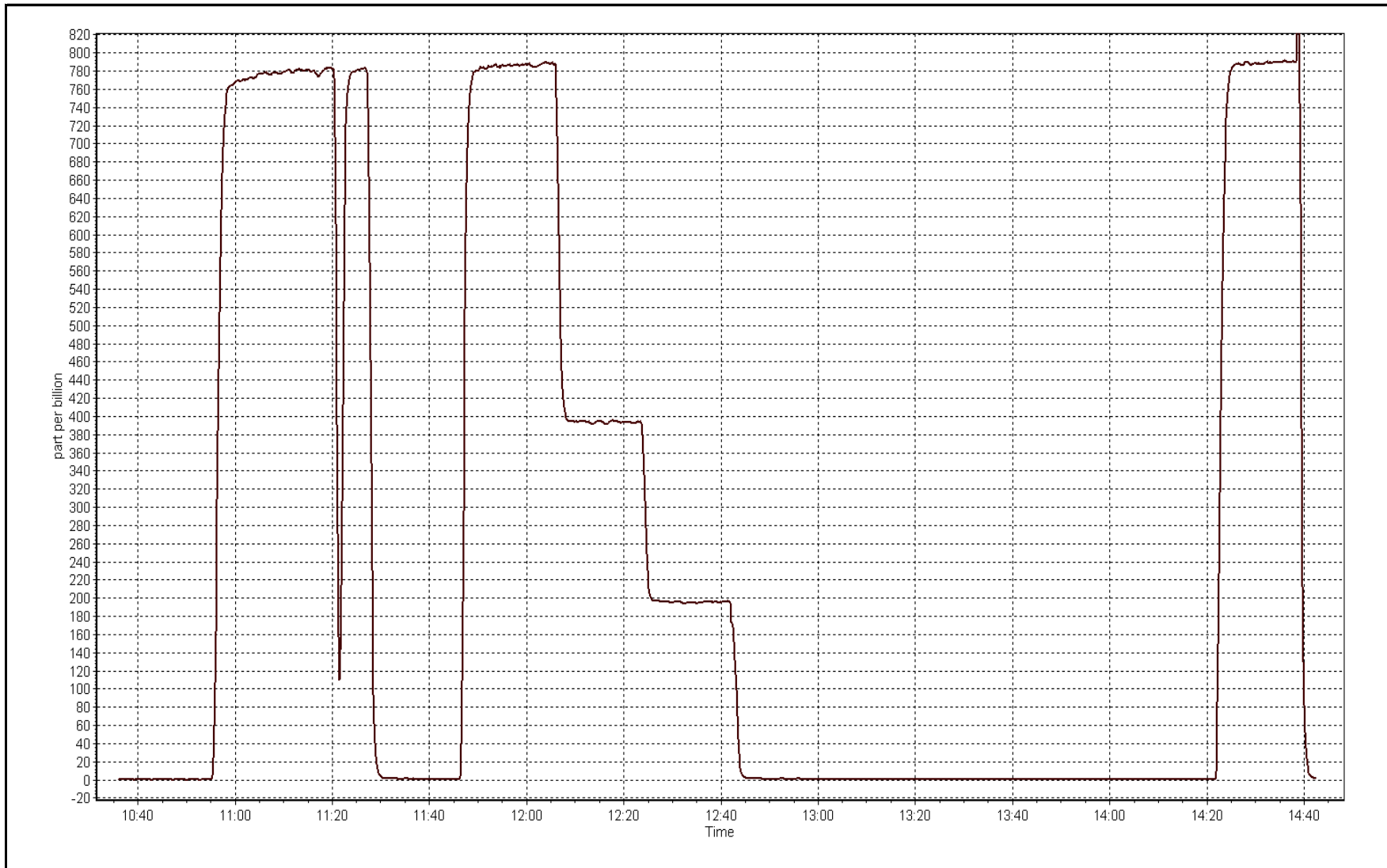
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999973
786.4	781.1	1.0068		
392.7	393.5	0.9980	Slope	1.006434
197.4	195.8	1.0083		
			Intercept	-0.739315



SO2 Calibration Plot

Date: November 2, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	November 8, 2016	Last Calibration	October 11, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	15:45	End Time (MST)	18:05
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	1021	1023
Calculated slope	0.999682	1.000321	Chamber temp	45	45
Calculated intercept	-0.005632	0.101957	Pressure	666.6	662.4
Analyzer Background	1.48	1.49	Flow	0.430	0.427
Analyzer Coefficient	1.007	1.007	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	80.0	1.001
SO2 scrubber check	5000	19.5	200.5	0.6	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	80.1	80.0	1.001
second point	5000	40.4	40.2	40.1	1.002
third point	5000	20.2	20.1	19.9	1.012
as left zero	6000	0.0	0.0	0.0	----
as left span	5000	80.6	80.1	80.2	0.999
Average Correction Factor					1.005

Corrected As found	80.0	Previous response	80.1	% change	0.1%
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Notes:

Sample inlet filter replaced after as founds. No adjustments. Scrubber check completed after 3rd point.

Calibration Performed By:

Asad Hidayat



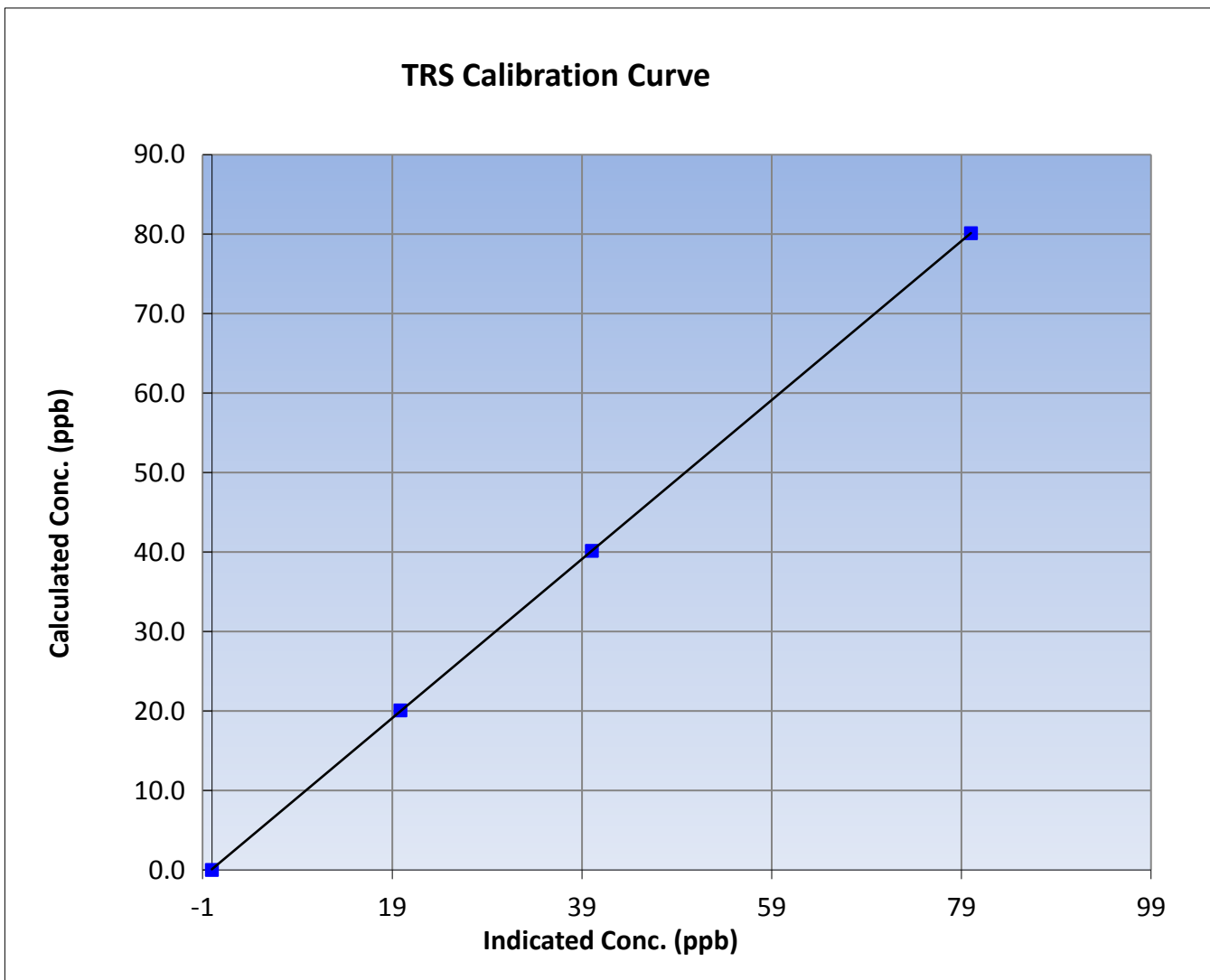
Wood Buffalo Environmental Association TRS Calibration Report

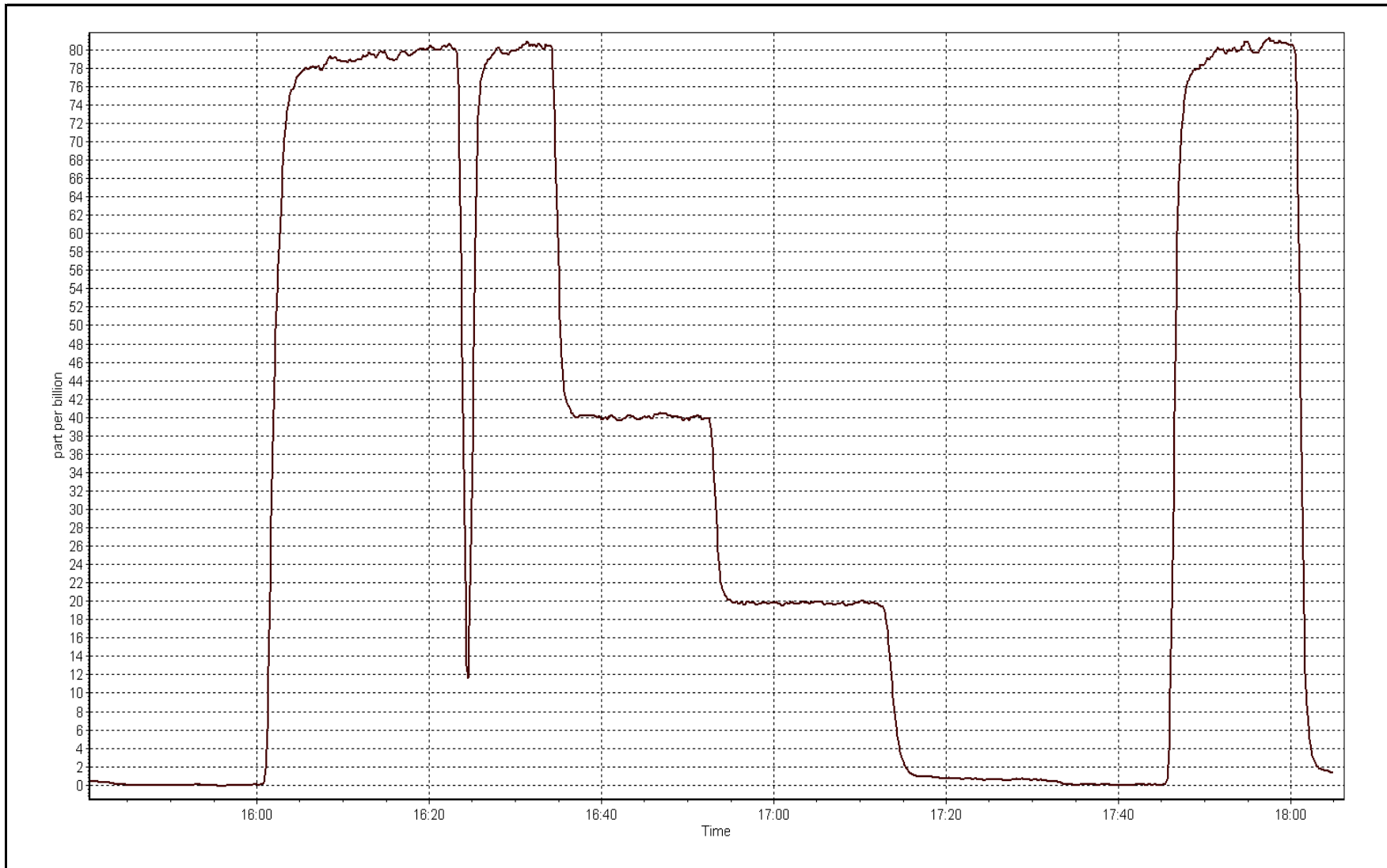
Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 11, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	15:45	End Time (MST)	18:05
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	0.999994
80.1	80.0	1.0013		
40.2	40.1	1.0024	Slope	1.000321
20.1	19.9	1.0115		
			Intercept	0.101957







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	November 2, 2016	Last Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:35	End Time (MST)	14:40
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	0.997011	0.995984	Carrier Pressure	37.0	37.0
THC Calc intercept	0.066005	0.065937	Fuel Pressure	49.7	49.6
NMHC Calc slope	0.995621	0.994449	Air Pressure	34.2	34.2
NMHC Calc intercept	0.035854	0.037831			

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	16.62	0.998
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	16.59	16.62	0.998
second point	5000	38.2	8.28	8.21	1.009
third point	5000	19.1	4.14	4.03	1.028
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	16.59	16.59	1.000
Average Correction Factor					1.011

Corrected As found 16.62 Previous response 16.57 % change -0.3%

Notes:

Sample inlet filter 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	8.78	0.997
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	8.75	8.78	0.997
second point	5000	38.2	4.37	4.34	1.007
third point	5000	19.1	2.19	2.12	1.031
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	8.75	8.76	0.999
Average Correction Factor					1.011

Corrected As found 8.78 Previous response 8.75 % change -0.3%

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	7.84	0.999
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	7.83	7.84	0.999
second point	5000	38.2	3.91	3.87	1.011
third point	5000	19.1	1.96	1.91	1.024
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	7.83	7.83	1.000
Average Correction Factor					1.011

Corrected As found 7.84 Previous response 7.81 % change -0.3%



Wood Buffalo Environmental Association

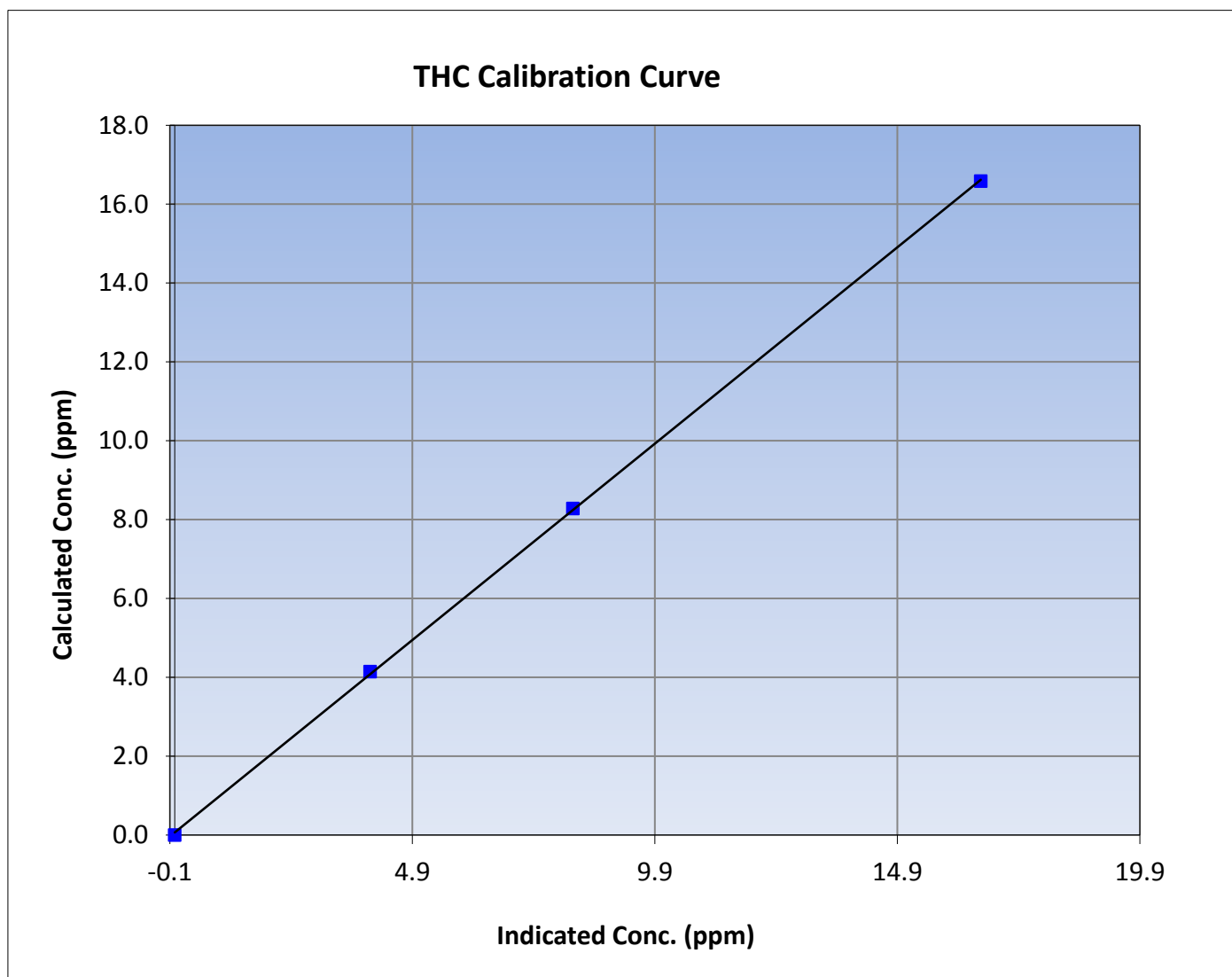
THC Calibration Summary

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
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	0.999929
16.59	16.62	0.9979		
8.28	8.21	1.0087	Slope	0.995984
4.14	4.03	1.0275		
			Intercept	0.065937





Wood Buffalo Environmental Association

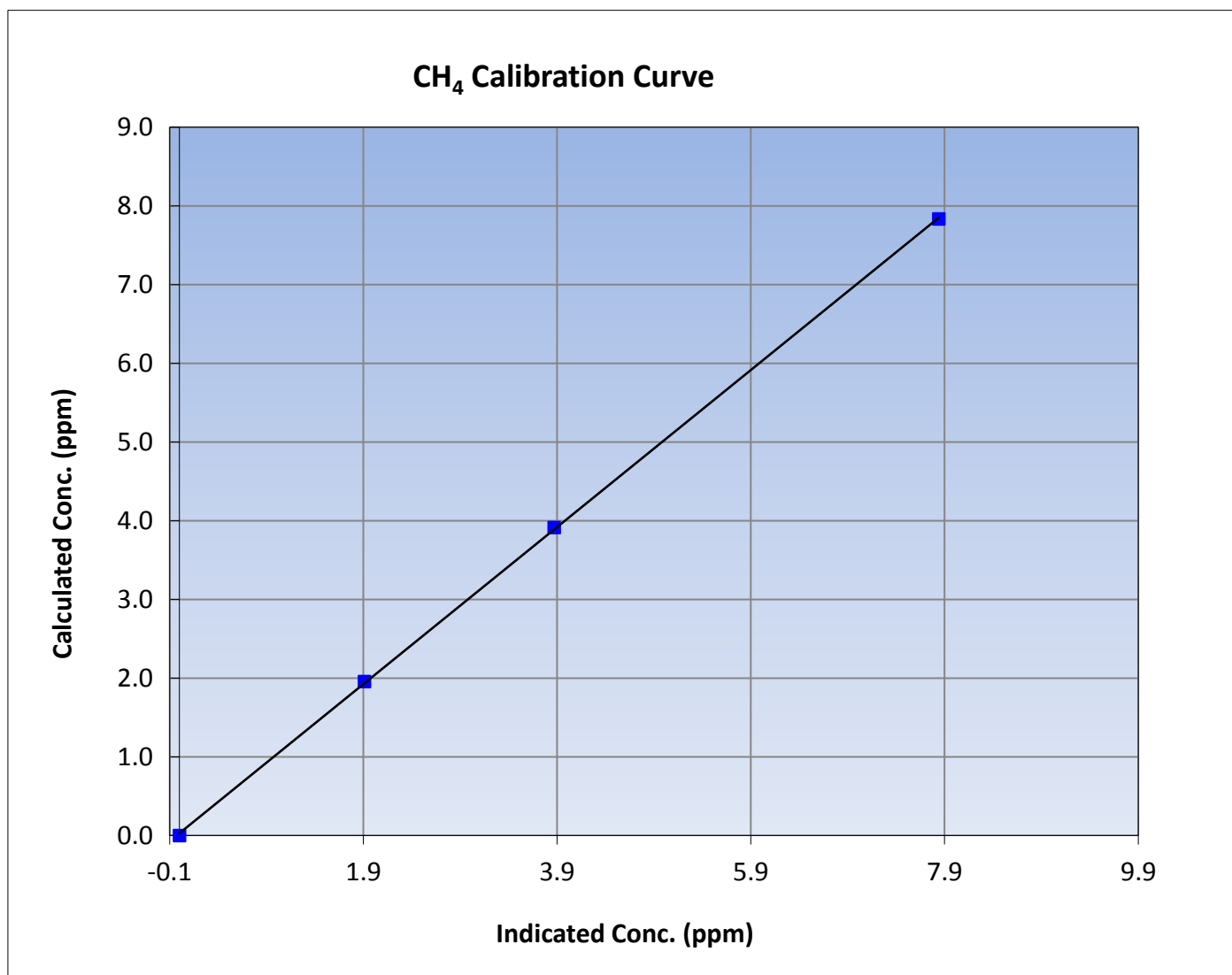
CH₄ Calibration Summary

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
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	0.999939
7.83	7.84	0.9992		
3.91	3.87	1.0108	Slope	0.997700
1.96	1.91	1.0240		
			Intercept	0.028111





Wood Buffalo Environmental Association

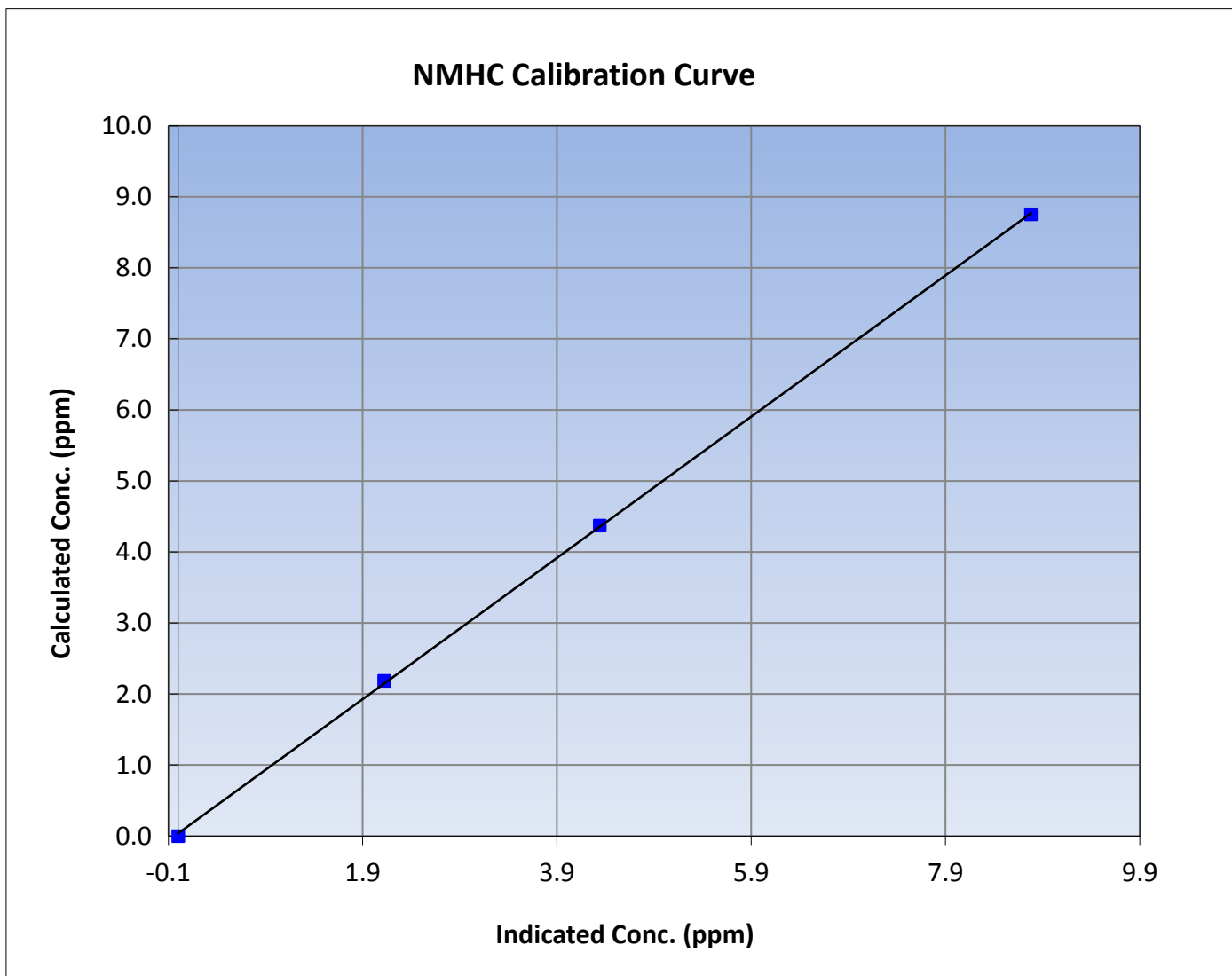
NMHC Calibration Summary

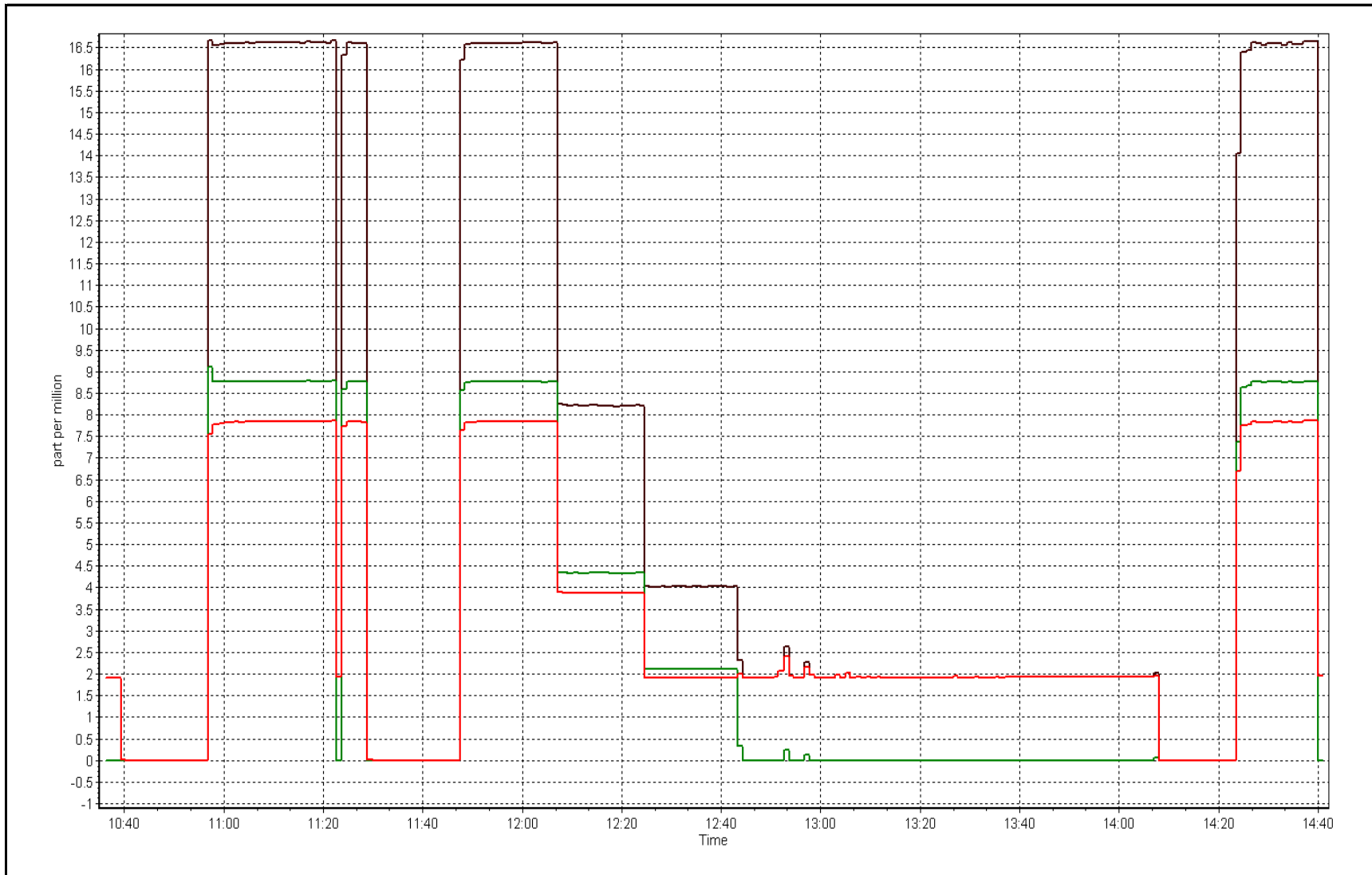
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
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	0.999916
8.75	8.78	0.9968		
4.37	4.34	1.0069	Slope	0.994449
2.19	2.12	1.0307		
			Intercept	0.037831







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	November 8, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	13:15	End Time (MST)	15:40
NO2 GPT Ref date	Wednesday, November 02, 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.	25.7	27.8
Analyzer IP address	192.168.1.49		Lamp temp.	53.4	53.4
Calculated slope	0.995380	0.994138	Pressure	653.1	640.7
Calculated intercept	-0.267188	-0.204911	Flow cell A	0.741	0.730
Analyzer Background	-1.3	-1.4	Flow cell B	0.730	0.721
Analyzer Coefficient	1.036	1.036	Cell A Intensity	71592	71398
			Cell B Intensity	70357	69780

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	-0.4	----
as found span	5000	567.8/1001.8	302.1	303.4	0.996
calibrator zero	5000	185.2/800	0.0	-0.4	----
high point	5000	567.8/1001.8	302.1	303.7	0.995
second point	5000	383.6/913.1	200.4	202.0	0.992
third point	5000	191.5/802.7	100.5	102.0	0.985
as left zero	6000	186.2/800	0.0	-0.2	----
as left span	5000	567.8/1001.8	302.1	306.7	0.985
Average Correction Factor					0.991

Corrected As found	303.8	Previous response	303.8	% change	0.0%
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Notes:

Sample inlet filter replaced after as founds. Slightly adjusted span. Used GPT reference from November 2 Nox cal; NO response had slightly dropped since. However; NO2 values measured today during GPT were within 3% of the values measured on Nov 2nds GPT cal.

Calibration Performed By: Asad Hidayat



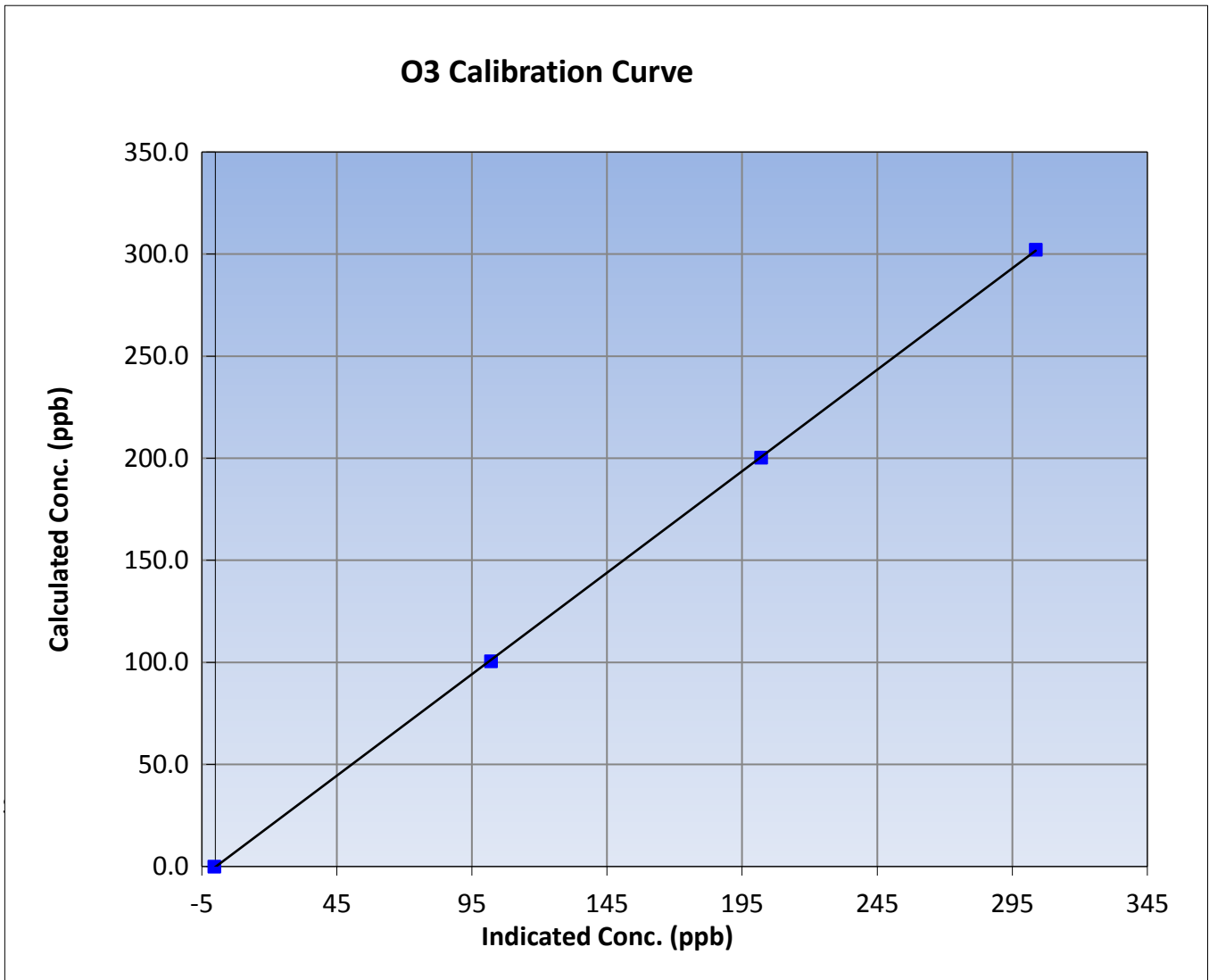
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	Tuesday, November 08, 2016	Previous Calibration	Wednesday, October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	13:15	End Time (MST)	15:40
Analyzer make	Thermo 49i	Analyzer serial #	1501663734

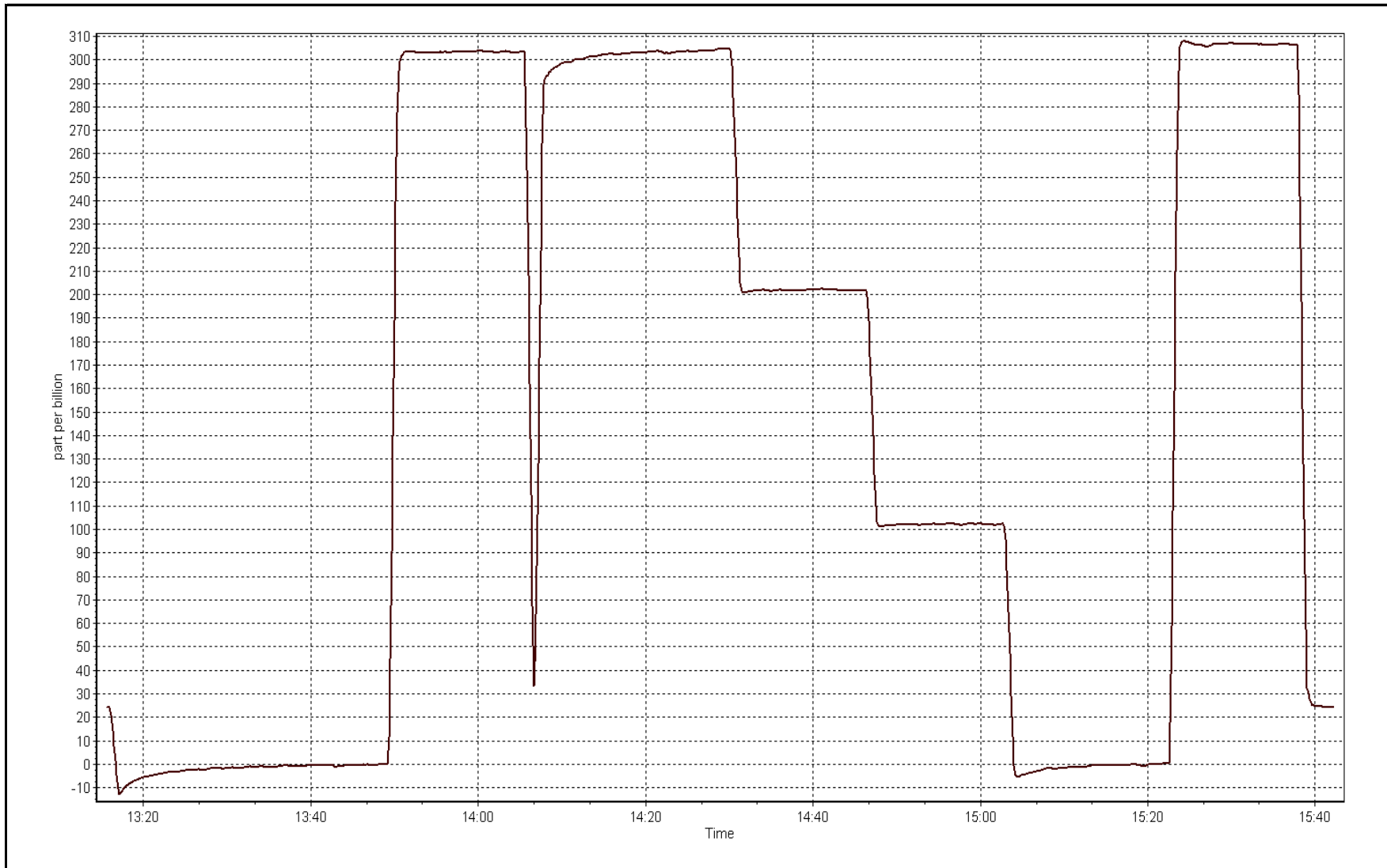
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999980
302.1	303.7	0.9948		
200.4	202.0	0.9918	Slope	0.994138
100.5	102.0	0.9853		
			Intercept	-0.204911



O3 Calibration Plot

Date: November 8, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:35	End Time (MST)	14:40
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	0.997424	0.997077	0.995933
	Data Offset	-0.225378	0.228269	-0.500714
Current Calibration	Data Slope	0.996143	0.995256	0.995795
	Data Offset	-0.118163	0.206558	-0.483831

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	192.168.1.43		192.168.1.43	
NO coefficient	1.107		1.251	
NOx coefficient	0.998		0.998	
NO2 coefficient	1.000		1.000	
NO bkgrnd	7.2		8.1	
NOx bkgrnd	7.3		8.2	
Chamber Temp	50.1	Deg C	50.2	Deg C
Moly Temp	322.9	Deg C	326.6	Deg C
PMT voltage	-840	V	-840.6	V
PMT Temp	-2.8	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	138.4	mmHg	162.6	mmHg
R Cell Press Nox	138.4	mmHg	162.9	mmHg
NO sample flow	0.842	lpm	0.711	lpm
Nox sample Flow	0.842	lpm	0.710	lpm

Notes:

Inlet filter changed after as founds. Changed sample pump after as founds because of ongoing daily span drift issues. Adjusted high point only. Rechecked zero; response remained about the same as "as founds".



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 2, 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	-0.2	-0.1	----	----
as found span	5000	76.5	801.7	801.7	0.0	736.9	736.6	0.3	1.0880	1.0884
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	----	----
high point	5000	76.5	801.7	801.7	0.0	804.3	804.8	-0.6	0.9968	0.9961
second point	5000	38.2	400.3	400.3	0.0	403.8	403.7	0.1	0.9914	0.9917
third point	5000	19.2	201.2	201.2	0.0	201.2	200.6	0.6	1.0003	1.0031
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as left span	5000	76.5	801.7	501.4	300.3	805.9	500.8	305.1	0.9948	1.0012
Average Correction Factor									0.9962	0.9970

Corrected As found NO_x= 737.1 NO= 736.8 Percent Change NO_x= 9.1% NO= 9.1%
 Previous Response NO_x= 804.0 NO= 803.8

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	804.8	803.5	-0.1	0.9962	0.9978	----	----
1st NO2 (300)	501.4	302.1	805.0	501.4	303.6	0.9959	----	0.9951	100.5%
2nd NO2 (200)	603.2	200.4	804.8	603.2	201.7	0.9962	----	0.9936	100.6%
3rd NO2 (100)	703.0	100.5	805.2	703.0	102.3	0.9956	----	0.9829	101.7%
2nd NO ref point		0.0	804.1	803.1	1.0	0.9971	0.9983	----	----
Average Correction Factor						0.9962		0.9905	101.0%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

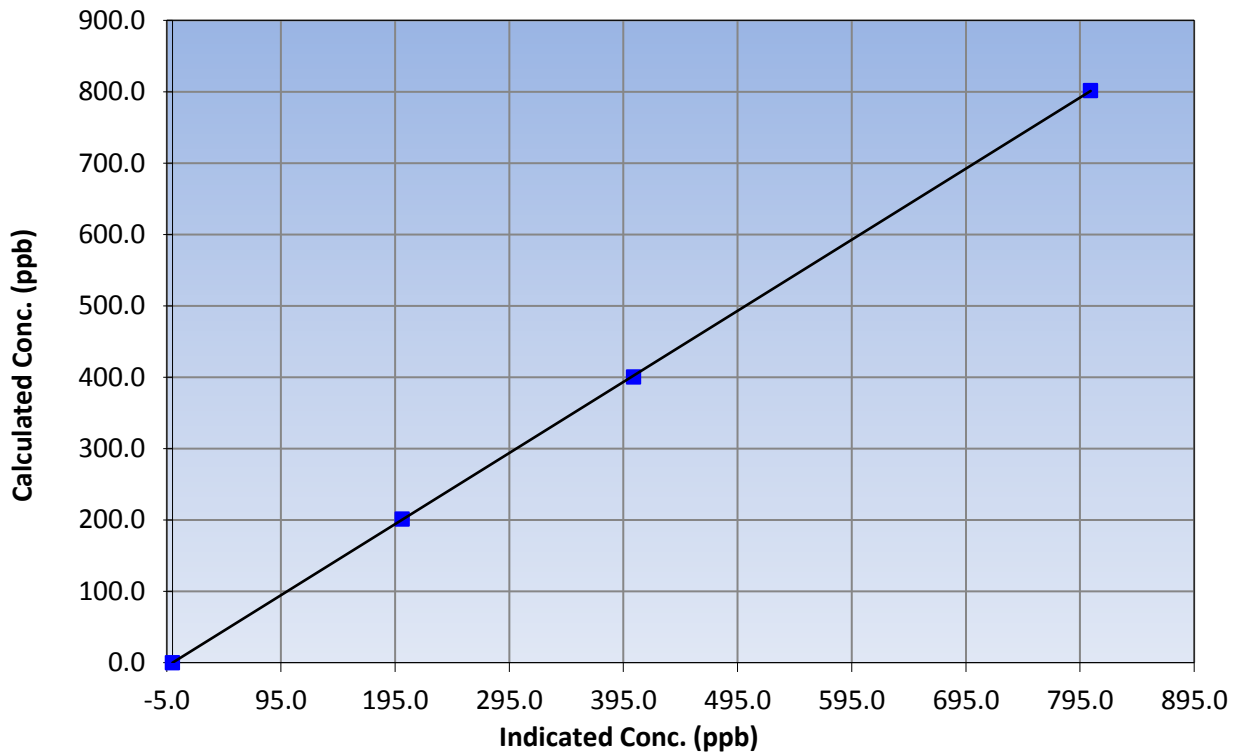
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
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	----	Correlation Coefficient	0.999987
801.7	804.3	0.9968		
400.3	403.8	0.9914	Slope	0.996143
201.2	201.2	1.0003		
			Intercept	-0.118163

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

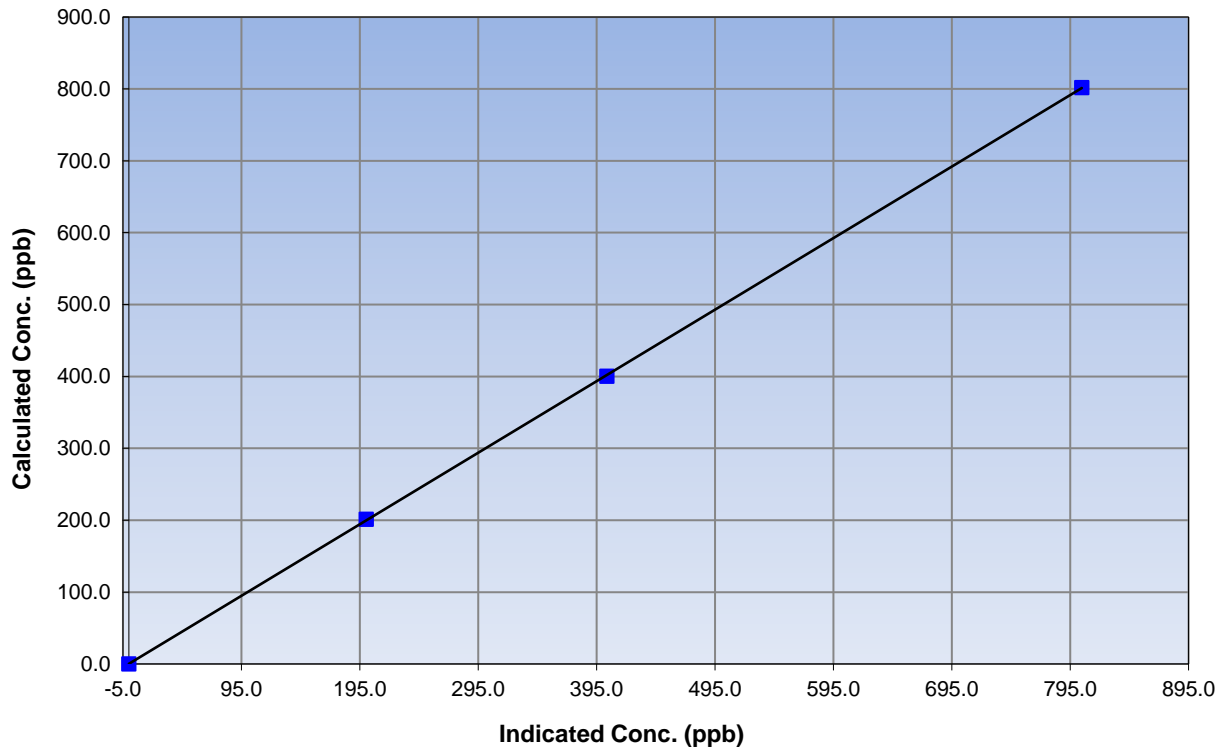
Station Information

Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
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	0.0	N/A	Correlation Coefficient	0.999986
801.7	804.8	0.9961		
400.3	403.7	0.9917	Slope	0.995256
201.2	200.6	1.0031		
			Intercept	0.206558

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

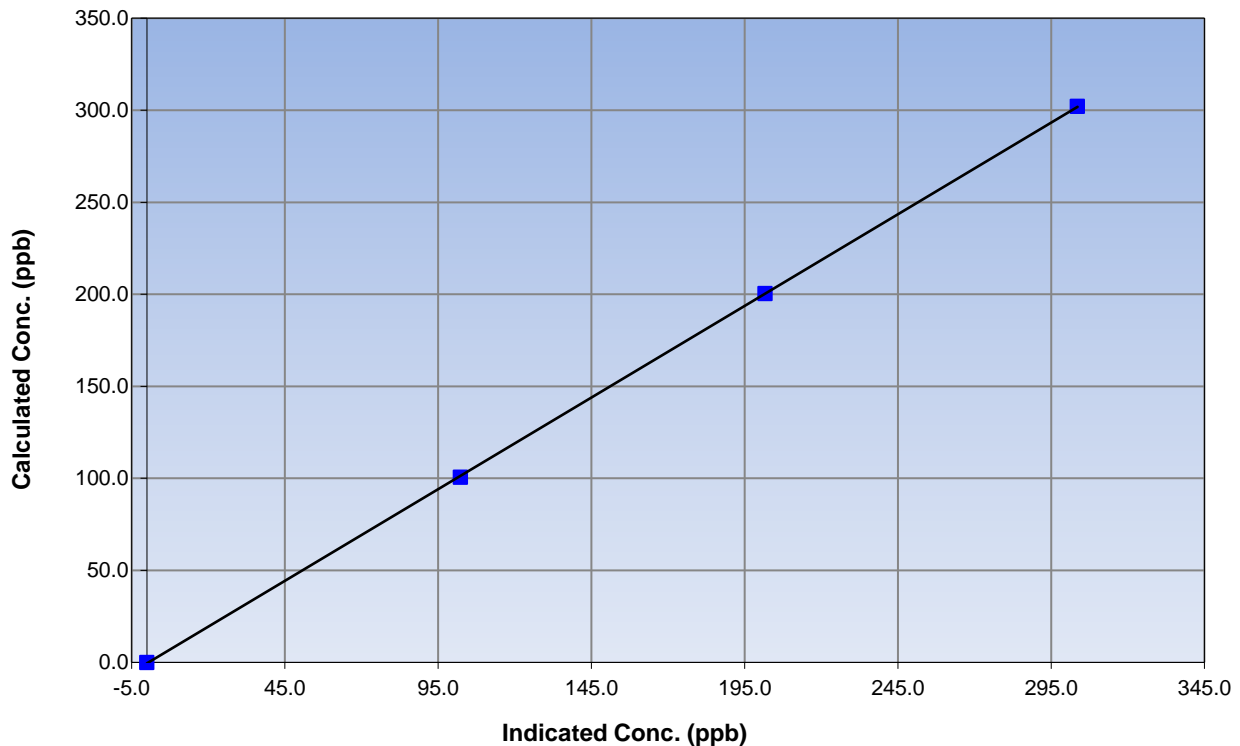
Station Information

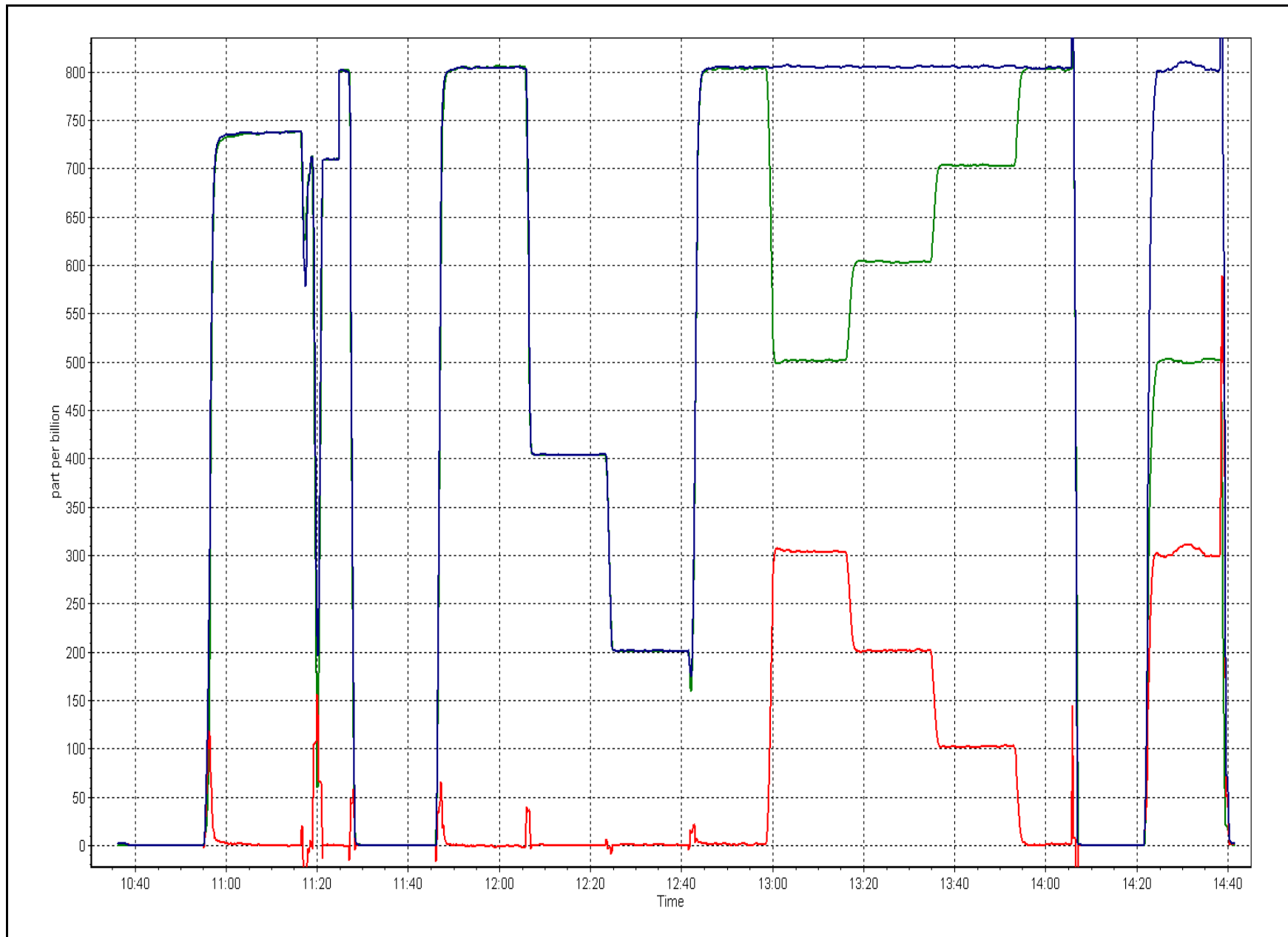
Calibration Date	November 2, 2016	Previous Calibration	October 12, 2016
Station Number	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:35	End Time (MST)	14:40
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999979
302.1	303.6	0.9951		
200.4	201.7	0.9936	Slope	0.995795
100.5	102.3	0.9829		
			Intercept	-0.483831

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:	November 8, 2016	Last Cal Date:	October 12, 2016
Start time (MST):	12:10	End time (MST):	14:45
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

Parameter	As found	Measured	As left	Adjusted	Tolerance
T1 (°C)	12	12.1	12	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	942	940.6	942	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1001	1012	1001	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	-0.7	-----	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>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>

Parameter	As found	Measured	As left	Adjusted	Tolerance
T2 (°C)	21		21	<input type="checkbox"/>	+/- 2 °C
T3 (°C)	22		22	<input type="checkbox"/>	+/- 2 °C
T4 (°C)	24		24	<input type="checkbox"/>	+/- 2 °C
RH (%)	54		54	<input type="checkbox"/>	+/- 10%

Notes: Cyclone head cleaned. Adjusted nephelometer zero multiple times (see docit note).

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
NOVEMBER 2016**

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 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	7	0	2	0
H2S (ppb) Average	687	33	33	100	3	0	0	0
NO2 (ppb) Average	685	35	35	100	18	0	8	-
NO (ppb) Average	685	35	35	100	13	-	3	-
NOX (ppb) Average	685	35	35	100	25	-	9	-
Temperature 2 m (C) Average	720	0	0	100	17.4	-	10.5	-
Relative Humidity (%) Average	720	0	0	100	97	-	94	-
Wind Speed 10 m (km/h) Average	720	0	0	100	25	-	15	-
Wind Direction 10 m (deg) Average	720	0	0	100	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 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	1	1	7
H2S (ppb) Average	687	0.1	0	-	0	0	0	0	0	0	3
NO2 (ppb) Average	685	2.9	2	-	0	1	1	2	4	6	18
NO (ppb) Average	685	0.9	1	-	0	0	0	1	1	2	13
NOX (ppb) Average	685	3.8	3	-	0	1	2	3	5	8	25
Temperature 2 m (C) Average	720	-0.1	6.4	-	-14.2	-7.3	-4.4	-2.3	5.3	8.4	17.4
Relative Humidity (%) Average	720	76.8	14	-	28	57	67	81	88	92	97
Wind Speed 10 m (km/h) Average	720	9.4	4	-	0	4	6	9	12	15	25
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
NOVEMBER 2016

OPERATIONAL NOTES

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



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 7 ppb on Nov 16 20:00	Maximum Daily Average: 1.6 ppb on Nov 29
Minimum Value: 0 ppb on Nov 3 01:00	Hours of Data: 685
Maximum Diurnal Average: 0.7 ppb at hour 20	Hours of Missing Data: 35
Monthly Average: 0.4 ppb	Hours of Calibration: 35
Minimum Daily Average: 0.0 ppb on Nov 25	Percent Operational Time: 100.0
Minimum Diurnal Average: 0.2 ppb at hour 6	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 1 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	Z	0	0	0	0	0	0	1	1	1	1	0	1	1	1	1	0	0	1	1	0	0	0	0.5	1
2-Nov	0	0	Z	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1
3-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	0.1	0
4-Nov	0	0	0	0	Z	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	2	1	0	0.4	2
5-Nov	3	2	1	0	0	Z	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.6	3	
6-Nov	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
7-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	0.5	2	
8-Nov	2	2	Z	1	1	1	1	2	1	2	1	1	1	1	1	1	1	2	1	1	0	0	1	1.0	2	
9-Nov	1	1	0	Z	0	0	0	0	0	C	C	C	C	C	1	1	0	1	1	1	1	1	1	0.7	1	
10-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	0.4	1	
11-Nov	1	2	2	1	1	Z	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0.6	2	
12-Nov	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	3	0.5	3	
13-Nov	0	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
14-Nov	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.4	1	
15-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	2	7	1	1	1	0.7	7	
17-Nov	0	0	0	1	1	Z	1	1	1	1	1	2	1	2	3	3	2	1	1	1	1	1	1	1.1	3	
18-Nov	Z	0	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
19-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
20-Nov	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
21-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
22-Nov	1	0	0	0	Z	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0.3	1	
23-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	
24-Nov	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
25-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	
26-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
27-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
28-Nov	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	1	1	1	0.5	2	
29-Nov	1	0	0	1	3	Z	7	5	5	2	1	1	1	1	2	1	1	1	1	1	1	1	0	1.6	7	
30-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	0	0	0.5	1	

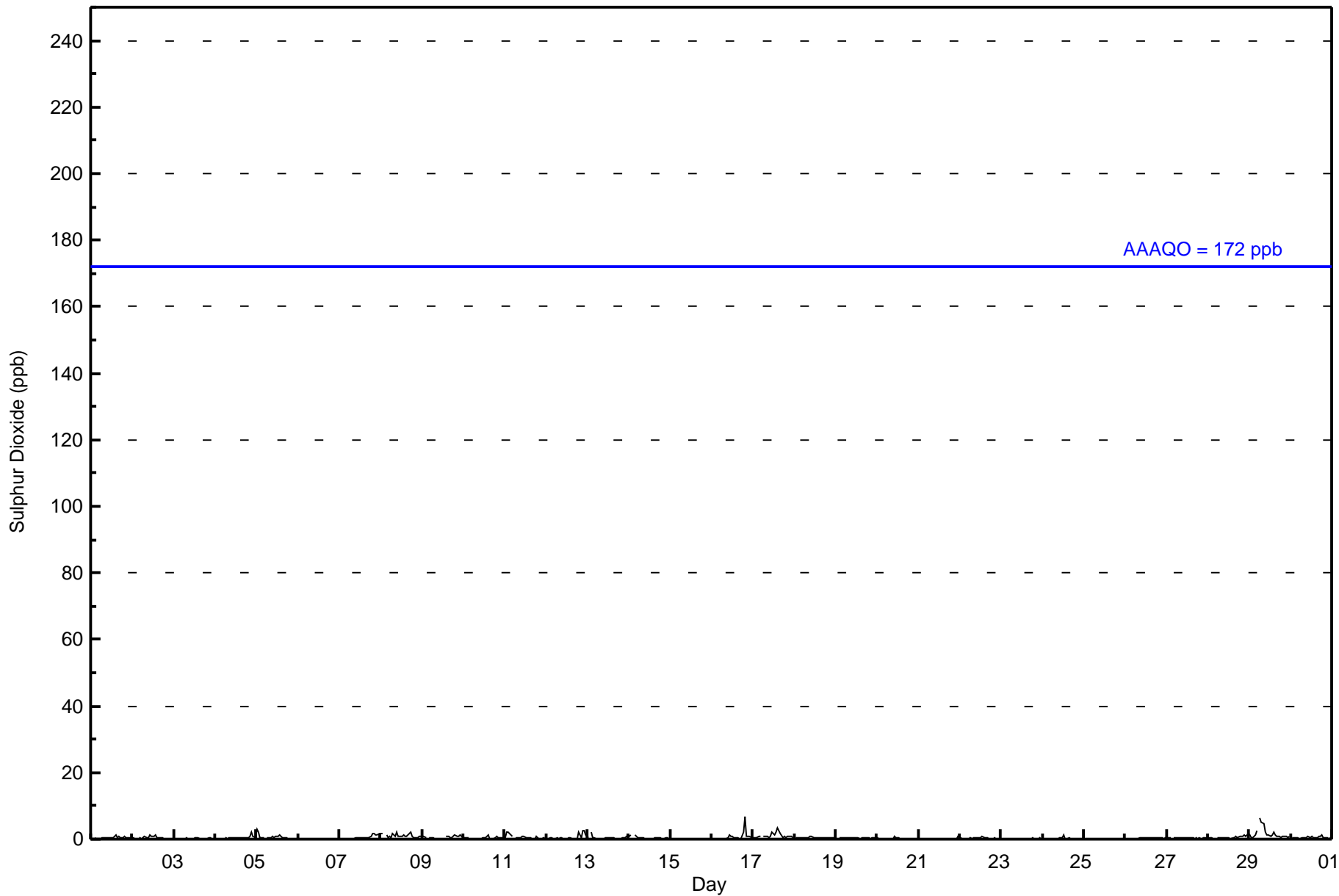
0.5	0.5	0.4	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.3	0.4	0.7	0.4	0.5	0.4	0.5	Diurnal Average
3	2	2	1	3	1	7	5	5	2	1	2	1	2	3	3	2	2	2	2	7	2	3	3	2	Diurnal Maximum

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
Cenovus - Christina Lake - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	685	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: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - 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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	685
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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	685

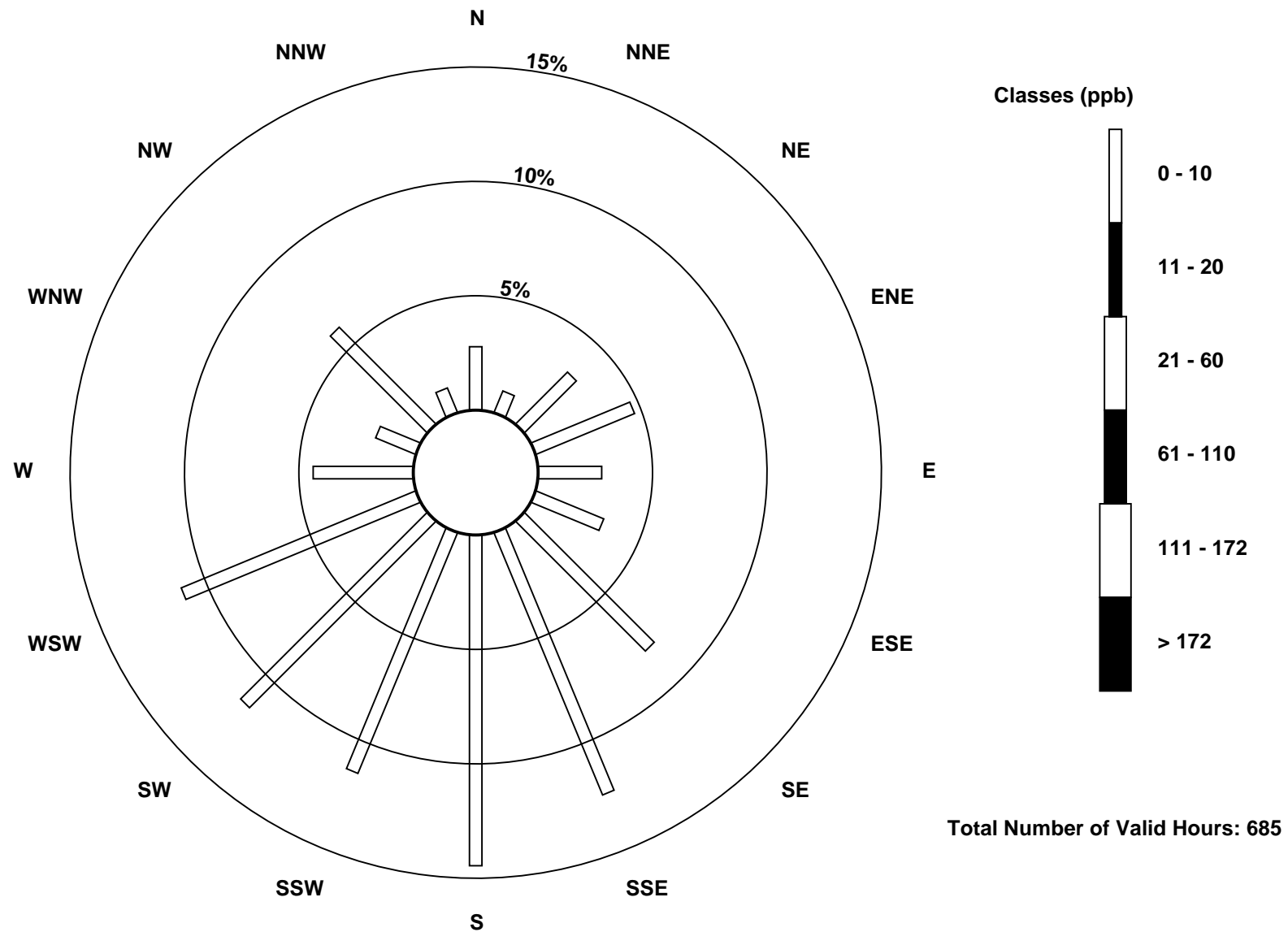
Total Number of Valid Hours: 685

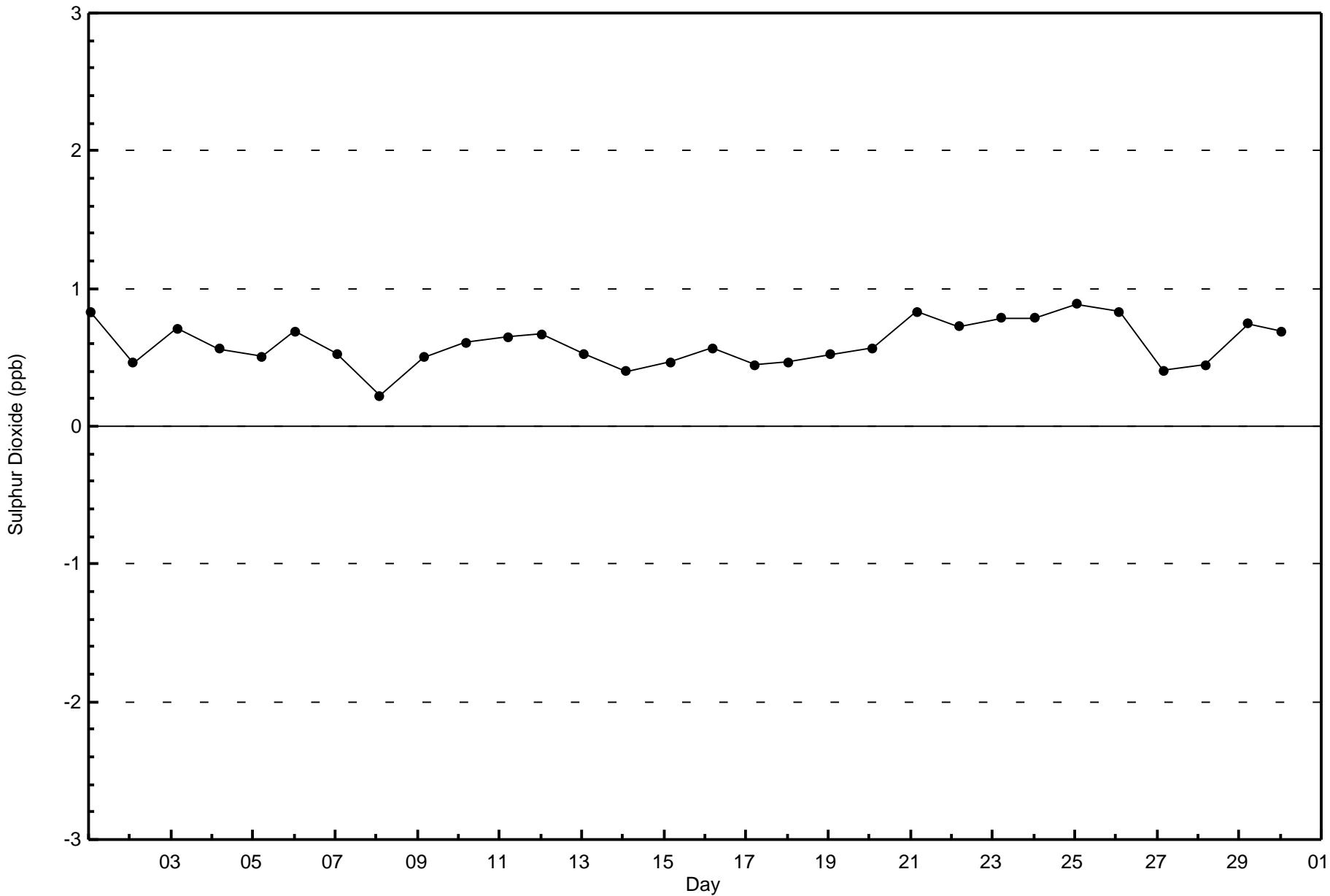
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake (AMS500)

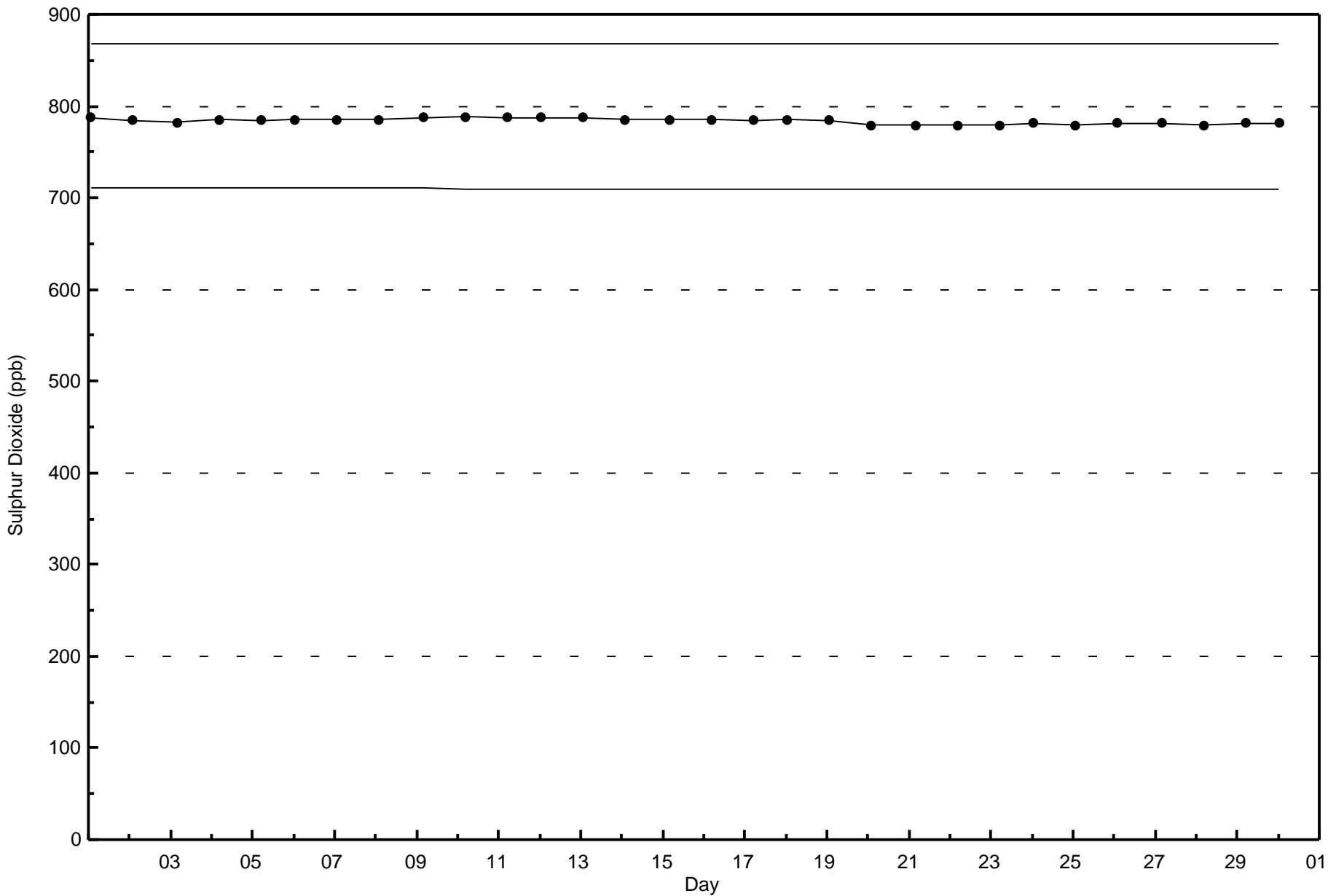






Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - November 2016



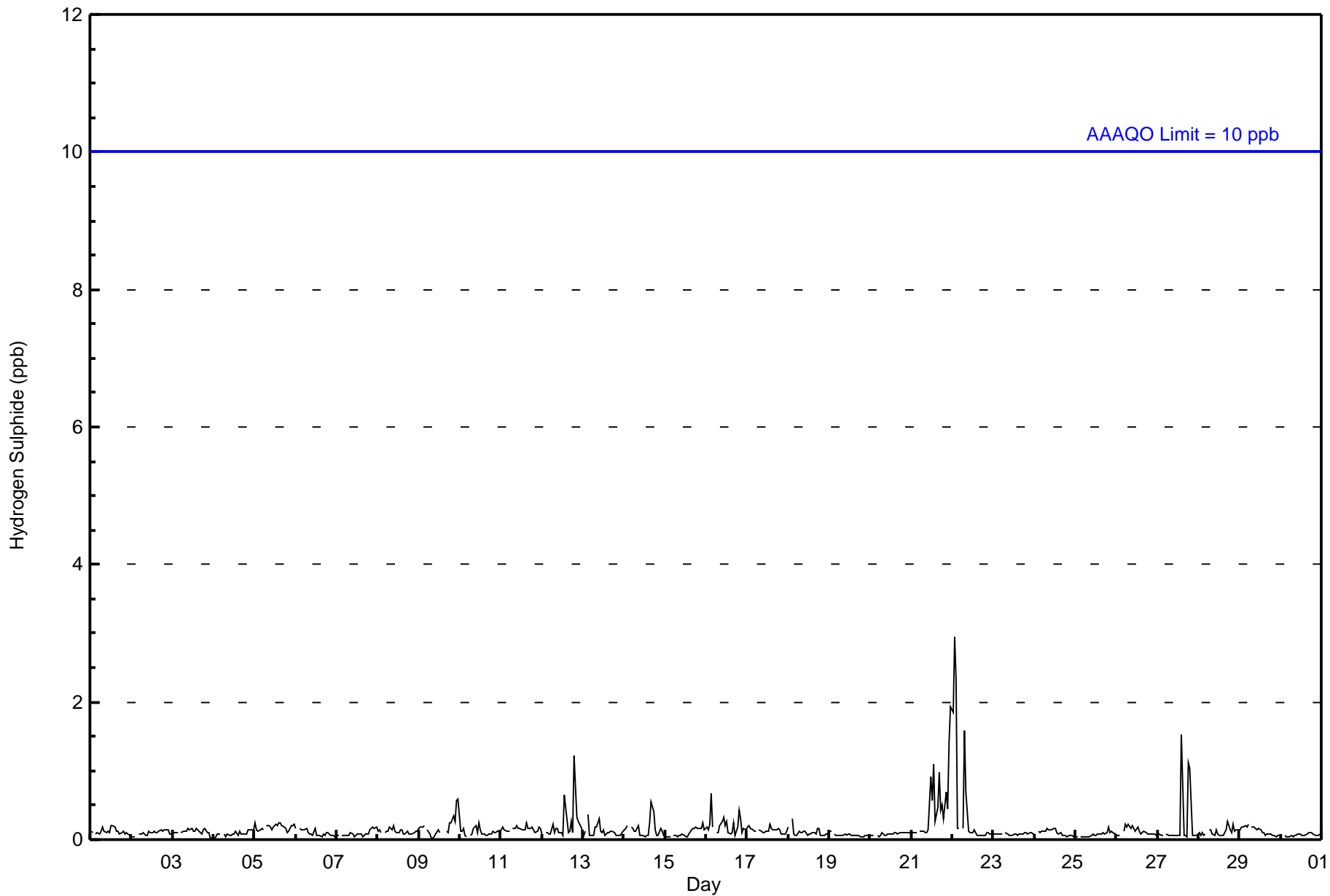


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 3 ppb on Nov 22 02:00	Maximum Daily Average: 0.5 ppb on Nov 22		Hours of Data:	687
Minimum Value: 0 ppb on Nov 9 09:00	Minimum Daily Average: 0.1 ppb on Nov 30		Hours of Missing Data:	33
Maximum Diurnal Average: 0.2 ppb at hour 2	Minimum Diurnal Average: 0.1 ppb at hour 5		Hours of Calibration:	33
Monthly Average: 0.1 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-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	0.1	0
2-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	0.1	0
3-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	0.1	0
4-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	0.1	0
5-Nov	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
6-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	0.1	0
7-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	0.1	0
8-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	0.1	0
9-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	1	1	0.2	1
10-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	0.1	0
11-Nov	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
12-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0.2	1
13-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	0.1	0
14-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1	1
15-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	0.1	0
16-Nov	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Nov	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-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	0.1	0
19-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	0.1	0
20-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	0.1	0
21-Nov	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	0	1	2	0.5	2	
22-Nov	2	3	2	0	0	Z	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3	
23-Nov	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	
24-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	
25-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	
26-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
27-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0.2	2	
28-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	
29-Nov	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	
30-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	

0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2	Diurnal Average
2	3	2	1	0	0	0	2	1	0	0	1	1	1	2	0	1	0	1	1	1	1	0	1	2	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**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	686	99.85	99.85
3 - 4	1	0.15	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: 687

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - 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 - 2	18	7	22	32	19	22	56	82	98	80	79	79	30	14	40	8	686
3 - 4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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	19	7	22	32	19	22	56	82	98	80	79	79	30	14	40	8	687

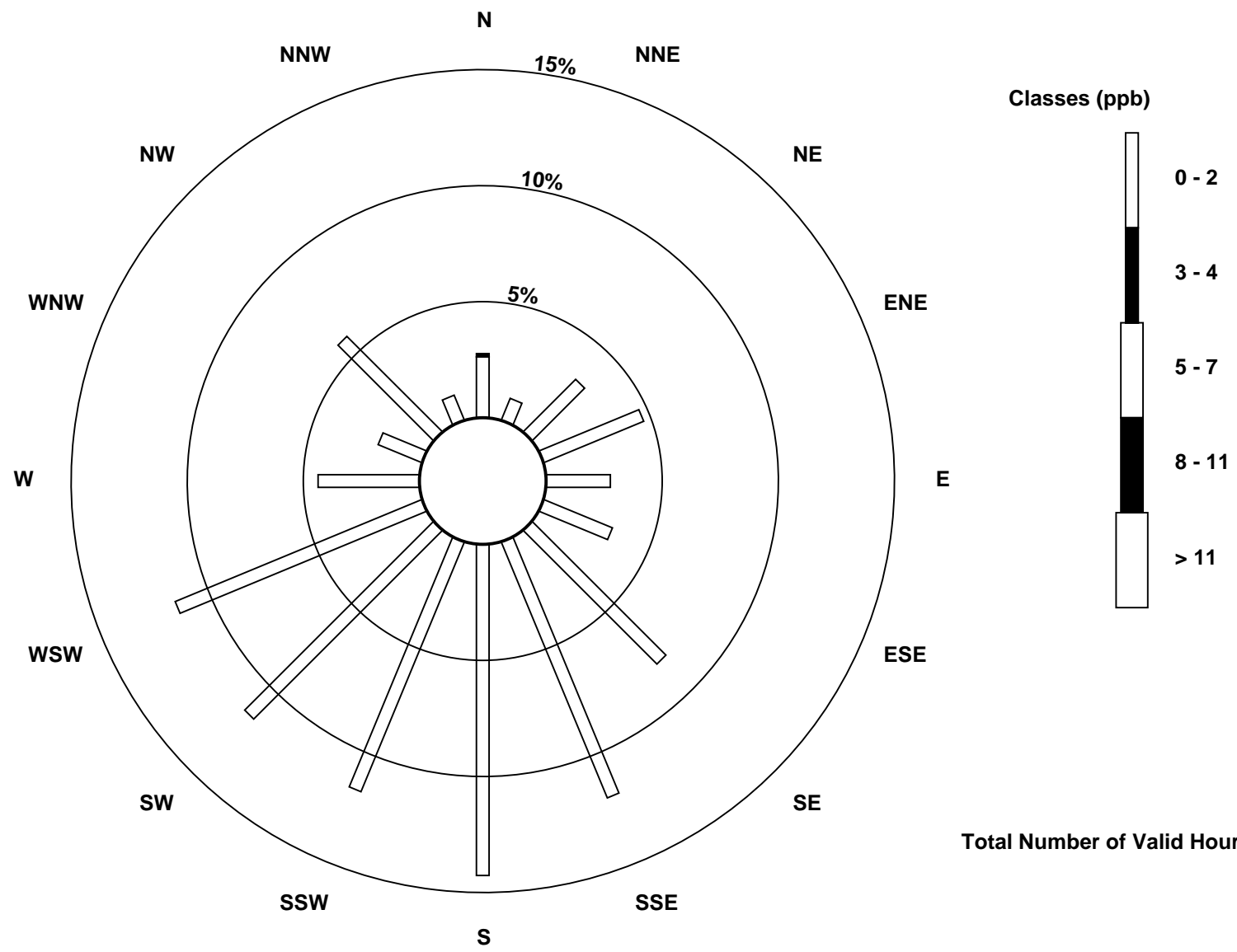
Total Number of Valid Hours: 687

Total Number of Hours: 720

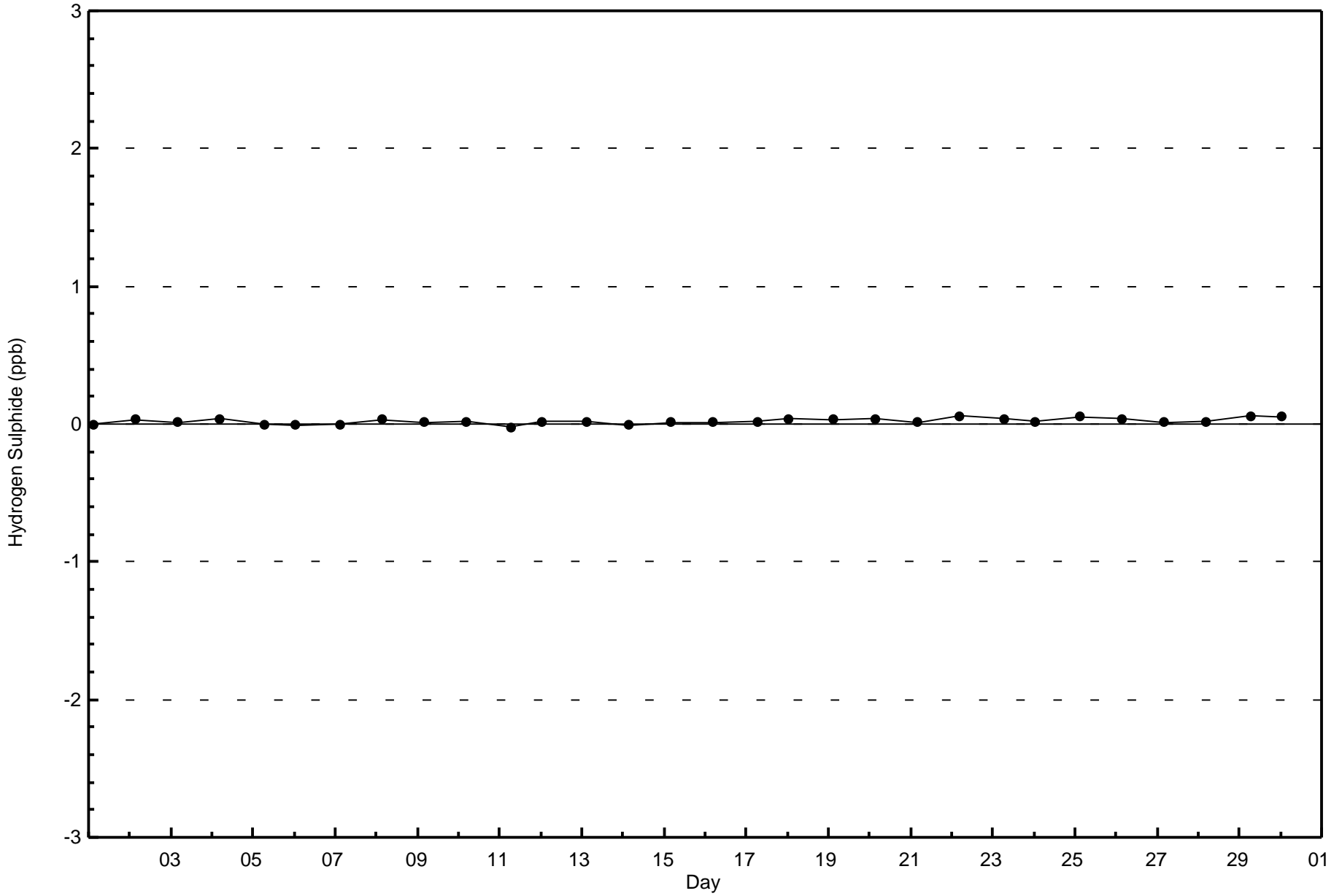


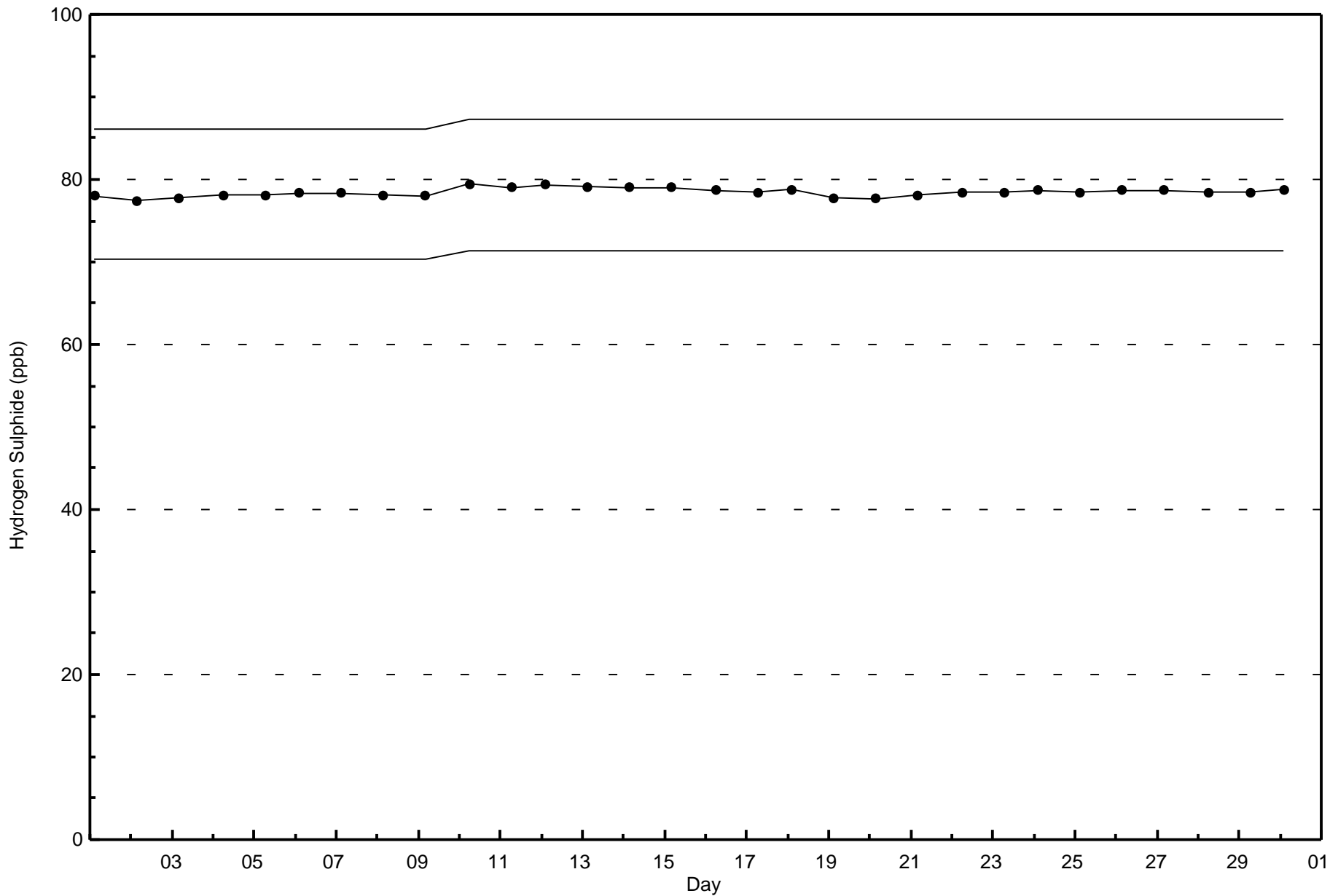
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake (AMS500)



Total Number of Valid Hours: 687







Maximum Value: 13 ppb on Nov 15 23:00	Maximum Daily Average: 3.3 ppb on Nov 17	Hours in Service: 720
Minimum Value: 0 ppb on Nov 2 01:00	Minimum Daily Average: 0.2 ppb on Nov 11	Hours of Data: 685
Maximum Diurnal Average: 1.4 ppb at hour 7	Minimum Diurnal Average: 0.3 ppb at hour 2	Hours of Missing Data: 35
Monthly Average: 0.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 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-Nov	3	Z	1	3	2	2	2	2	1	2	2	2	2	2	5	2	2	2	1	2	1	1	0	0	1.9	5
2-Nov	0	0	Z	0	0	1	3	1	1	1	2	2	1	2	1	1	1	0	0	0	0	0	0	0	0.8	3
3-Nov	0	0	0	Z	0	0	1	1	1	1	2	3	2	2	2	2	1	0	0	0	0	0	1	1	0.9	3
4-Nov	1	1	1	1	Z	1	2	1	3	1	3	2	1	1	1	2	1	0	0	0	0	1	0	0	1.0	3
5-Nov	1	0	1	0	1	Z	6	3	4	2	2	2	2	3	1	1	1	0	0	0	0	1	1	1	1.6	6
6-Nov	Z	1	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Nov	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	0	1	1	0.4	1
8-Nov	1	1	Z	1	0	1	0	2	1	3	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1.2	3
9-Nov	1	1	1	Z	1	1	1	0	1	C	C	C	C	C	1	1	0	0	1	2	1	1	2	1	0.9	2
10-Nov	0	0	0	0	Z	0	0	0	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
11-Nov	0	0	0	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Nov	Z	0	0	0	0	0	2	0	1	2	2	0	0	1	1	2	4	5	0	1	0	2	2	0	1.1	5
13-Nov	0	Z	2	0	0	0	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
14-Nov	1	1	Z	1	0	0	0	1	0	0	0	0	0	1	1	0	2	2	0	0	0	0	0	0	0.4	2
15-Nov	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	13	0.8	13
16-Nov	1	0	0	0	Z	1	1	1	4	5	2	2	1	1	1	2	0	0	2	7	1	1	0	0	1.4	7
17-Nov	0	0	0	1	2	Z	2	2	1	2	2	4	4	11	4	3	3	7	9	13	4	2	1	0	3.3	13
18-Nov	Z	1	1	1	0	2	3	1	1	1	1	0	0	1	0	1	1	5	2	0	0	1	1	0	1.0	5
19-Nov	0	Z	0	0	0	0	0	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0.5	2
20-Nov	0	0	Z	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0.4	1
21-Nov	0	0	0	Z	0	0	1	1	0	1	1	1	2	1	2	1	1	1	0	1	1	2	0	0	0.7	2
22-Nov	0	0	1	3	Z	1	4	1	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.9	4
23-Nov	0	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0.5	1
24-Nov	Z	1	1	1	0	0	1	1	1	2	2	2	2	1	1	1	0	1	0	0	0	0	1	0	0.8	2
25-Nov	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0.5	1
26-Nov	0	1	Z	0	0	0	1	1	1	1	1	3	3	2	1	3	2	2	1	1	0	1	0	0	1.0	3
27-Nov	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	1	1	0.4	1
28-Nov	1	1	1	1	Z	1	1	1	1	0	2	1	0	1	0	0	1	1	1	0	1	1	1	2	0.8	2
29-Nov	1	1	0	2	2	Z	7	5	3	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1.3	7
30-Nov	Z	1	0	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0.5	1

0.5	0.3	0.5	0.6	0.5	0.5	1.4	1.0	1.1	1.2	1.2	1.3	1.2	1.3	1.0	1.0	0.9	1.1	0.8	1.1	0.5	0.6	0.9	0.4	Diurnal Average	
3	1	2	3	2	2	7	5	4	5	3	4	4	11	5	3	4	7	9	13	4	2	13	2	Diurnal Maximum	

Z - zerospan C - Calibration

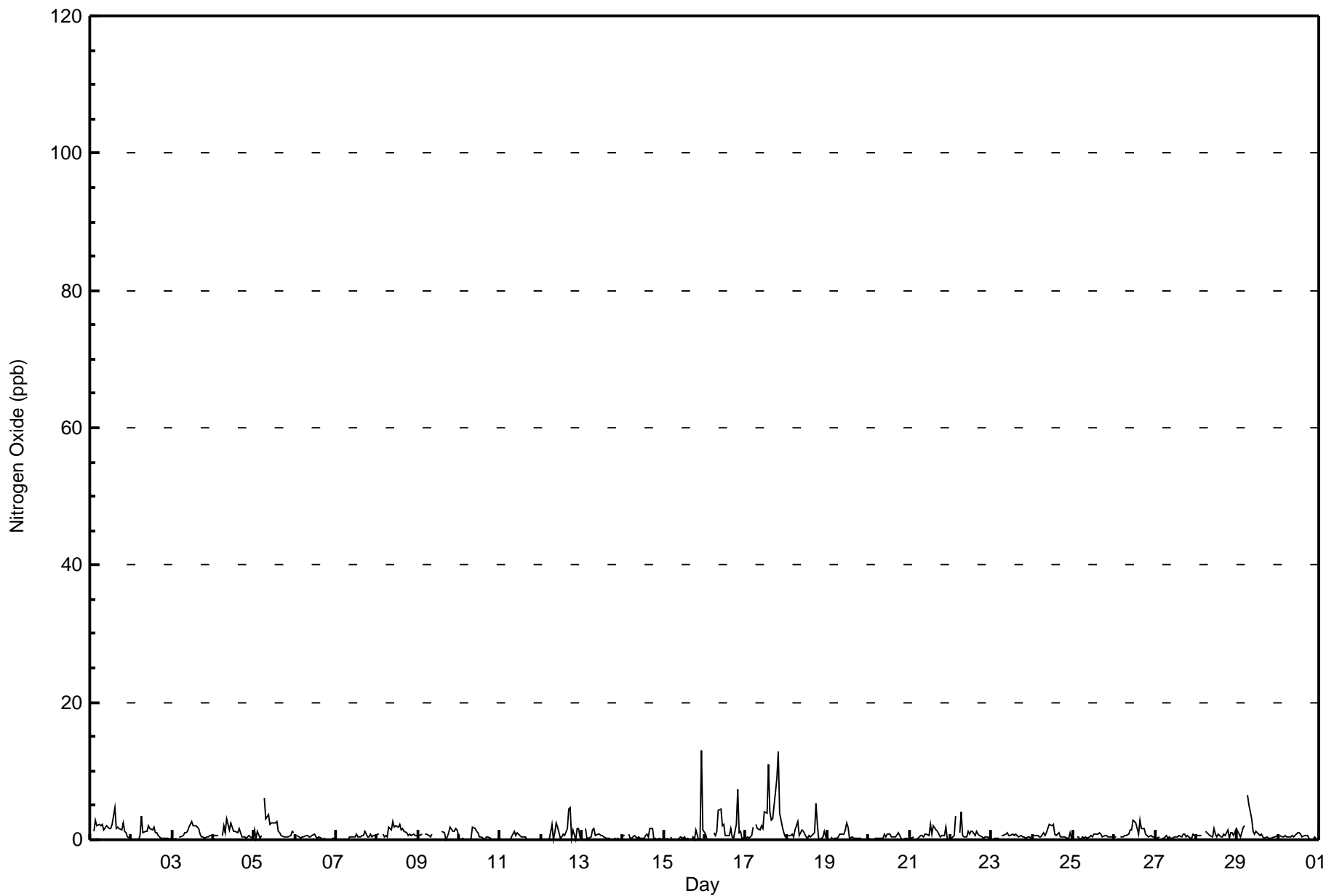


Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Oxide (NO) - ppb

Cenovus - Christina Lake - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - 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 Oxide (NO) - ppb
Cenovus - Christina Lake - 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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	685

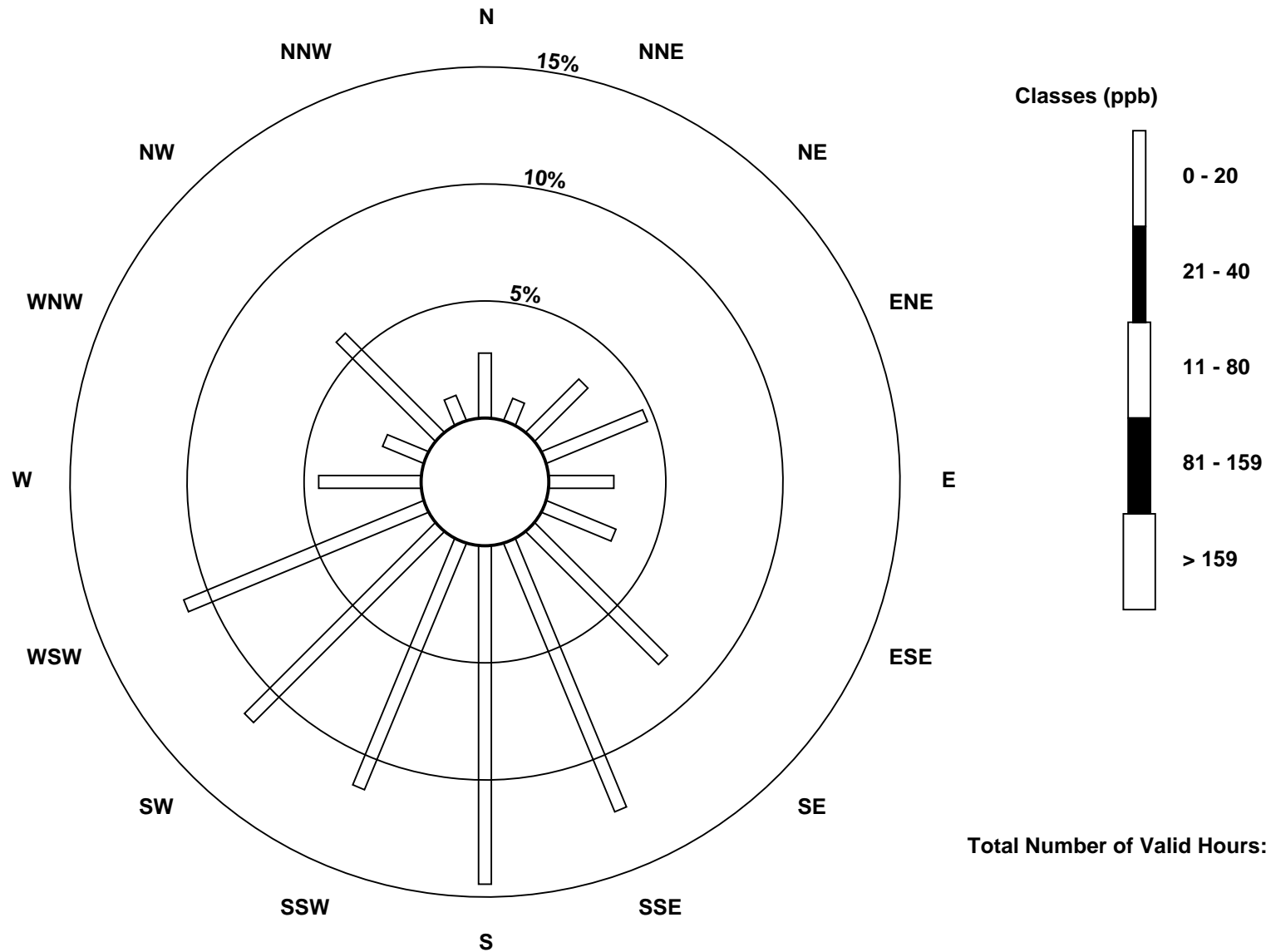
Total Number of Valid Hours: 685

Total Number of Hours: 720

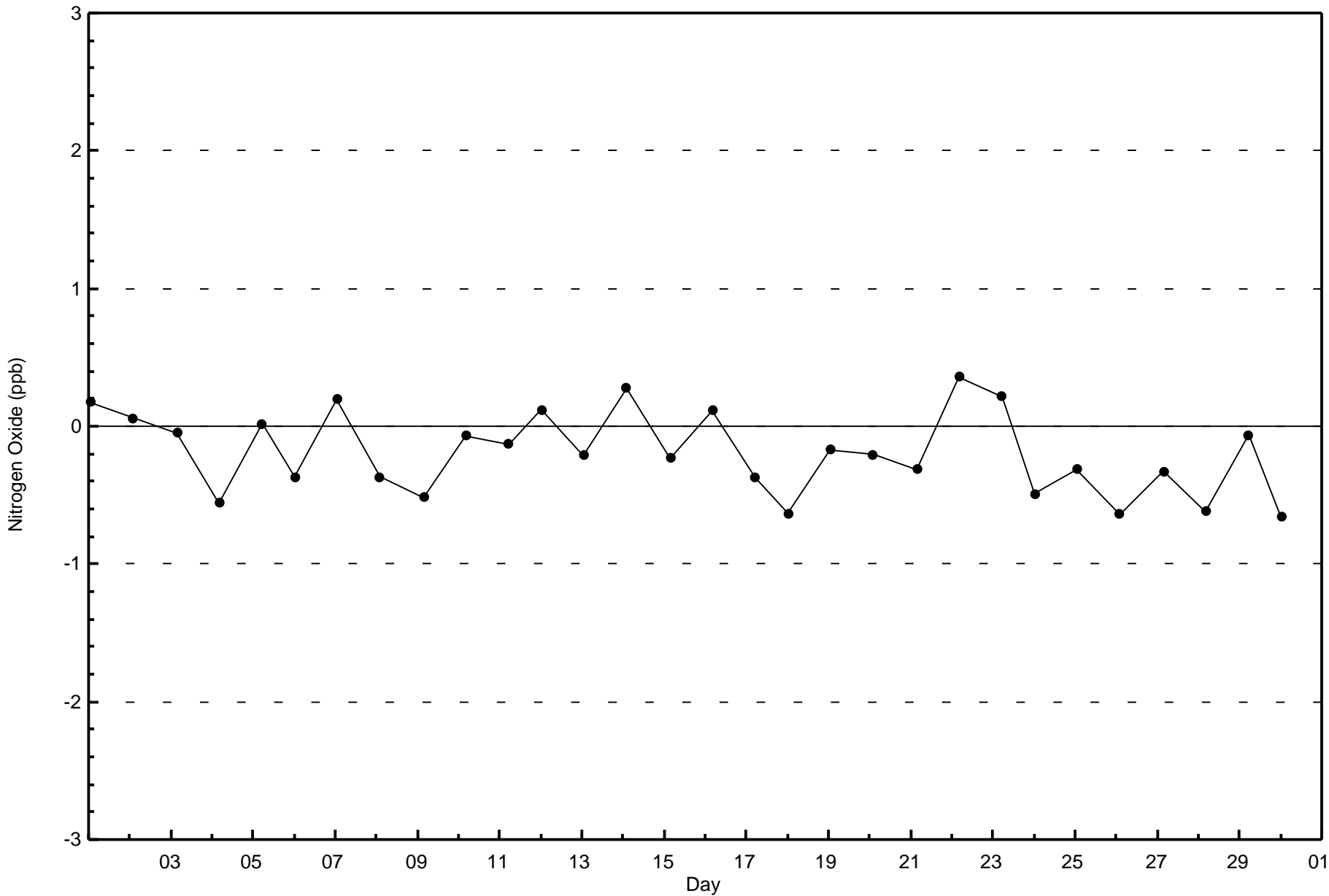


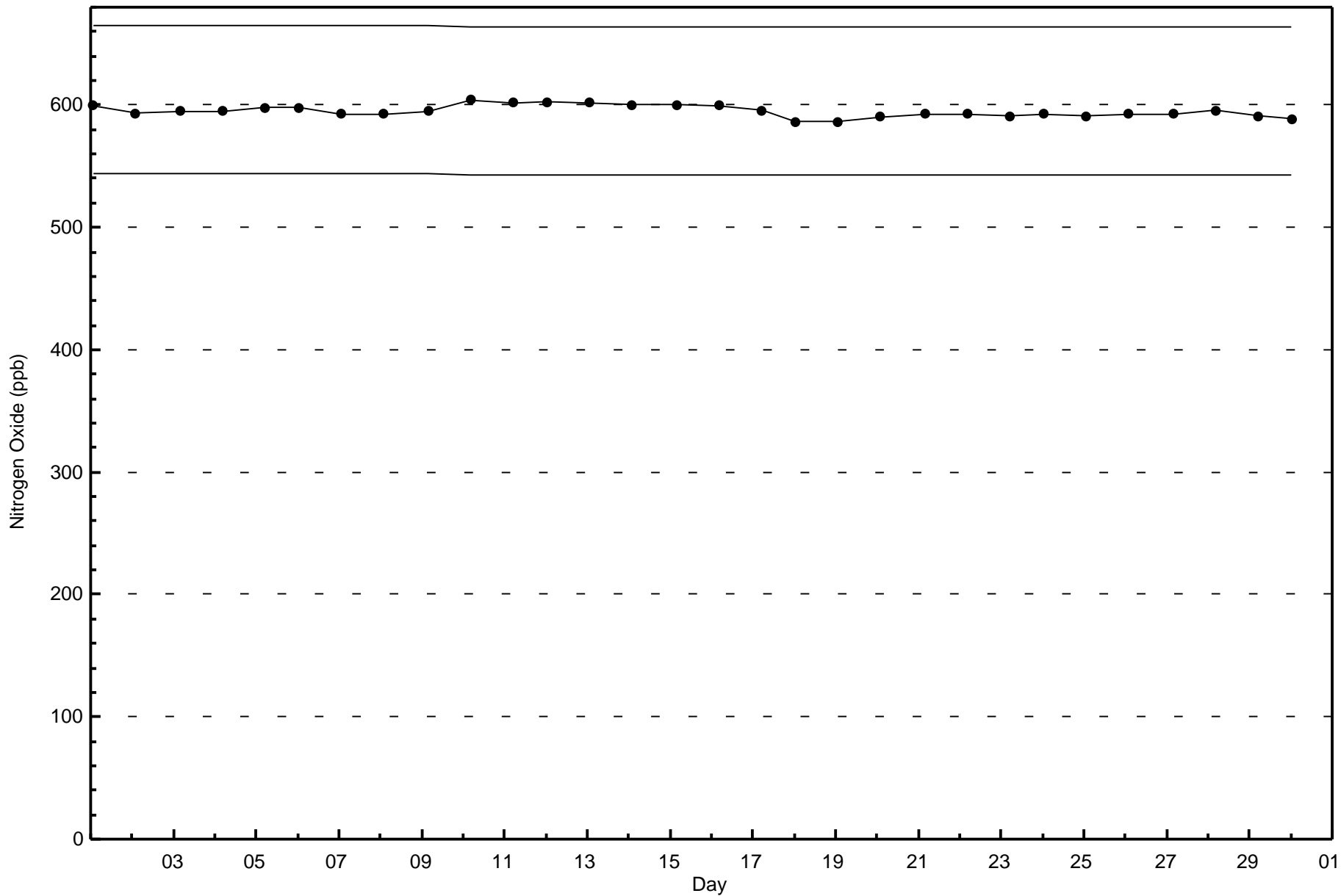
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake (AMS500)



Total Number of Valid Hours: 685







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Cenovus - Christina Lake - November 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 18 ppb on Nov 5 01:00	Maximum Daily Average: 7.7 ppb on Nov 5		Hours of Data:	685
Minimum Value: 0 ppb on Nov 10 16:00	Minimum Daily Average: 0.5 ppb on Nov 27		Hours of Missing Data:	35
Maximum Diurnal Average: 4.2 ppb at hour 18	Minimum Diurnal Average: 1.8 ppb at hour 3		Hours of Calibration:	35
Monthly Average: 2.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 O ₃ = 4 P ₉₀ = 6 P ₉₉ = 11		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	5	Z	3	5	4	4	4	5	4	4	5	4	4	4	7	5	5	5	5	5	4	4	2	2	4.3	7	
2-Nov	2	2	Z	3	4	5	10	6	4	5	6	5	5	6	4	4	4	4	4	4	5	4	3	2	4.3	10	
3-Nov	3	3	2	Z	3	3	4	5	3	3	3	3	3	3	4	6	4	3	3	3	2	3	1	1	3.1	6	
4-Nov	1	1	1	4	Z	2	5	3	9	4	3	3	4	4	4	8	6	6	5	5	9	11	6	6	4.7	11	
5-Nov	18	8	7	7	8	Z	15	11	11	7	6	5	7	6	5	7	6	4	4	4	6	10	8	7	7.7	18	
6-Nov	Z	2	2	2	2	2	5	6	3	4	5	7	2	3	4	4	4	4	4	3	4	2	1	3	3	3.2	7
7-Nov	2	Z	1	1	1	2	3	5	5	3	2	2	2	2	1	2	3	3	6	10	12	9	9	10	4.0	12	
8-Nov	8	9	Z	5	3	3	3	9	5	8	3	3	5	5	4	5	7	8	4	2	2	3	4	3	4.7	9	
9-Nov	4	4	2	Z	2	1	1	1	2	C	C	C	C	C	4	4	1	3	3	6	4	5	6	5	3.2	6	
10-Nov	2	2	2	3	Z	2	1	3	5	5	3	3	1	1	1	0	1	4	4	4	3	1	1	1	2.3	5	
11-Nov	1	3	3	1	1	Z	1	3	4	2	2	2	2	2	2	5	5	4	3	2	2	1	1	1	2.3	5	
12-Nov	Z	0	1	1	2	0	5	3	6	8	7	2	3	4	5	8	12	14	6	6	3	6	6	3	4.8	14	
13-Nov	0	Z	4	2	3	3	6	5	4	2	1	1	1	1	0	1	1	1	1	0	0	1	0	4	1.8	6	
14-Nov	6	8	Z	7	4	3	3	2	2	1	1	0	0	1	1	0	3	3	0	1	0	0	0	0	1.9	8	
15-Nov	1	0	0	Z	1	1	1	1	1	0	1	1	1	0	1	2	3	3	2	6	2	4	9	4	1.9	9	
16-Nov	4	3	3	4	Z	3	3	3	9	8	5	4	3	3	3	6	6	4	5	9	3	4	4	2	4.3	9	
17-Nov	1	1	1	2	5	Z	4	3	3	4	3	5	5	11	6	4	6	8	10	12	5	3	2	0	4.4	12	
18-Nov	Z	0	1	1	1	3	7	5	3	4	2	1	0	1	0	3	5	15	10	1	1	3	6	3	3.3	15	
19-Nov	2	Z	2	3	3	2	1	3	3	3	4	5	4	1	1	0	1	1	1	0	0	0	0	0	1.7	5	
20-Nov	0	1	Z	1	1	1	1	1	1	1	3	3	3	2	2	3	3	2	4	2	1	1	1	1	1	1.7	4
21-Nov	1	1	2	Z	2	2	3	3	2	2	3	2	3	2	2	2	2	2	2	1	1	1	3	1	1	1.9	3
22-Nov	1	0	1	4	Z	1	3	1	2	2	3	3	3	3	2	2	1	1	1	1	3	2	2	1	1.8	4	
23-Nov	1	1	1	1	1	Z	2	2	2	2	2	2	1	1	2	2	3	2	2	2	2	1	2	1	1.7	3	
24-Nov	Z	2	2	2	2	2	4	3	3	4	3	4	2	2	2	4	2	3	2	2	1	1	3	2	2.5	4	
25-Nov	1	Z	1	1	0	1	1	1	1	1	1	1	2	2	1	3	4	2	2	1	2	2	2	1	1.5	4	
26-Nov	1	1	Z	1	2	1	3	3	4	3	3	5	4	3	2	7	4	7	5	2	4	4	2	1	3.0	7	
27-Nov	1	0	1	Z	0	0	1	0	0	1	0	0	0	1	1	0	1	1	1	0	0	1	1	0	0.5	1	
28-Nov	0	1	1	1	Z	2	2	2	2	1	2	1	0	2	1	1	3	3	3	2	2	2	2	3	1.6	3	
29-Nov	2	2	1	3	3	Z	6	6	5	3	3	3	2	2	4	2	1	3	2	1	2	1	1	2	2.4	6	
30-Nov	Z	1	1	0	0	0	1	1	2	2	2	2	3	2	2	2	4	3	3	1	1	2	1	2	1.7	4	

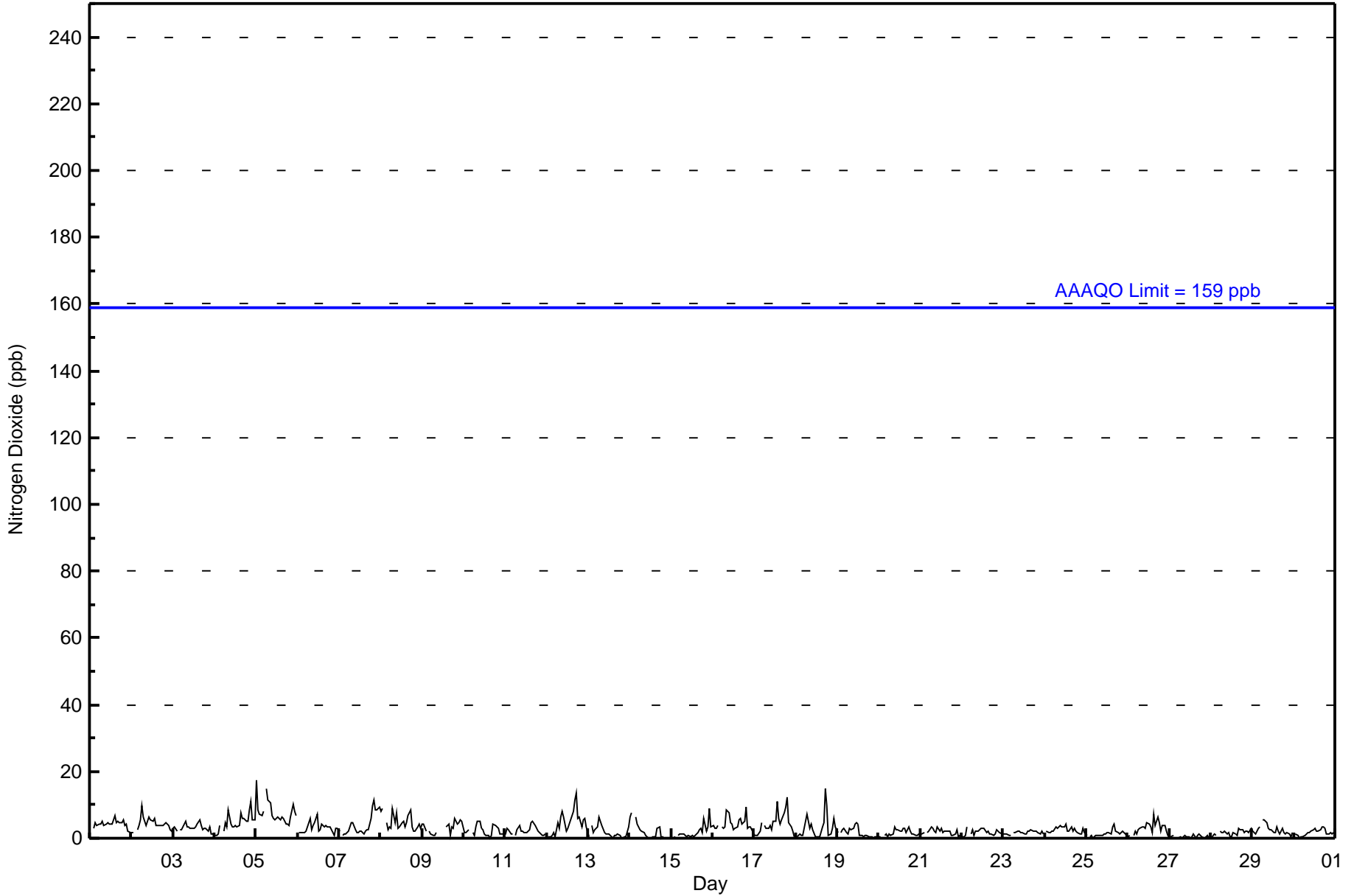
2.6	2.3	1.8	2.4	2.3	2.1	3.5	3.5	3.6	3.4	3.0	2.8	2.6	2.7	2.6	3.4	3.6	4.2	3.3	3.3	2.7	3.1	2.9	2.4	Diurnal Average	
18	9	7	7	8	5	15	11	11	8	7	7	7	11	7	8	12	15	10	12	12	11	9	10	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - 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
Cenovus - Christina Lake - 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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	685

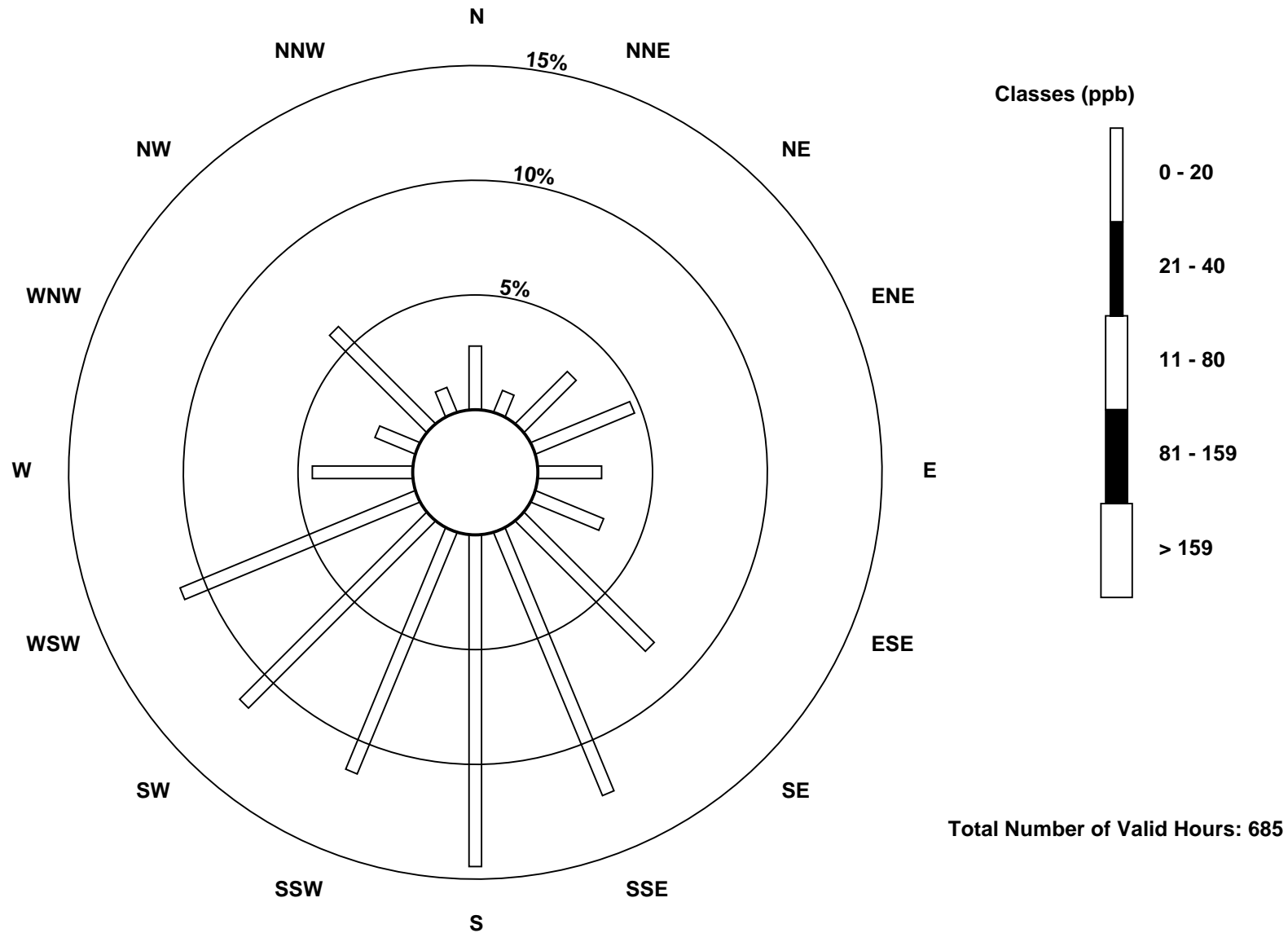
Total Number of Valid Hours: 685

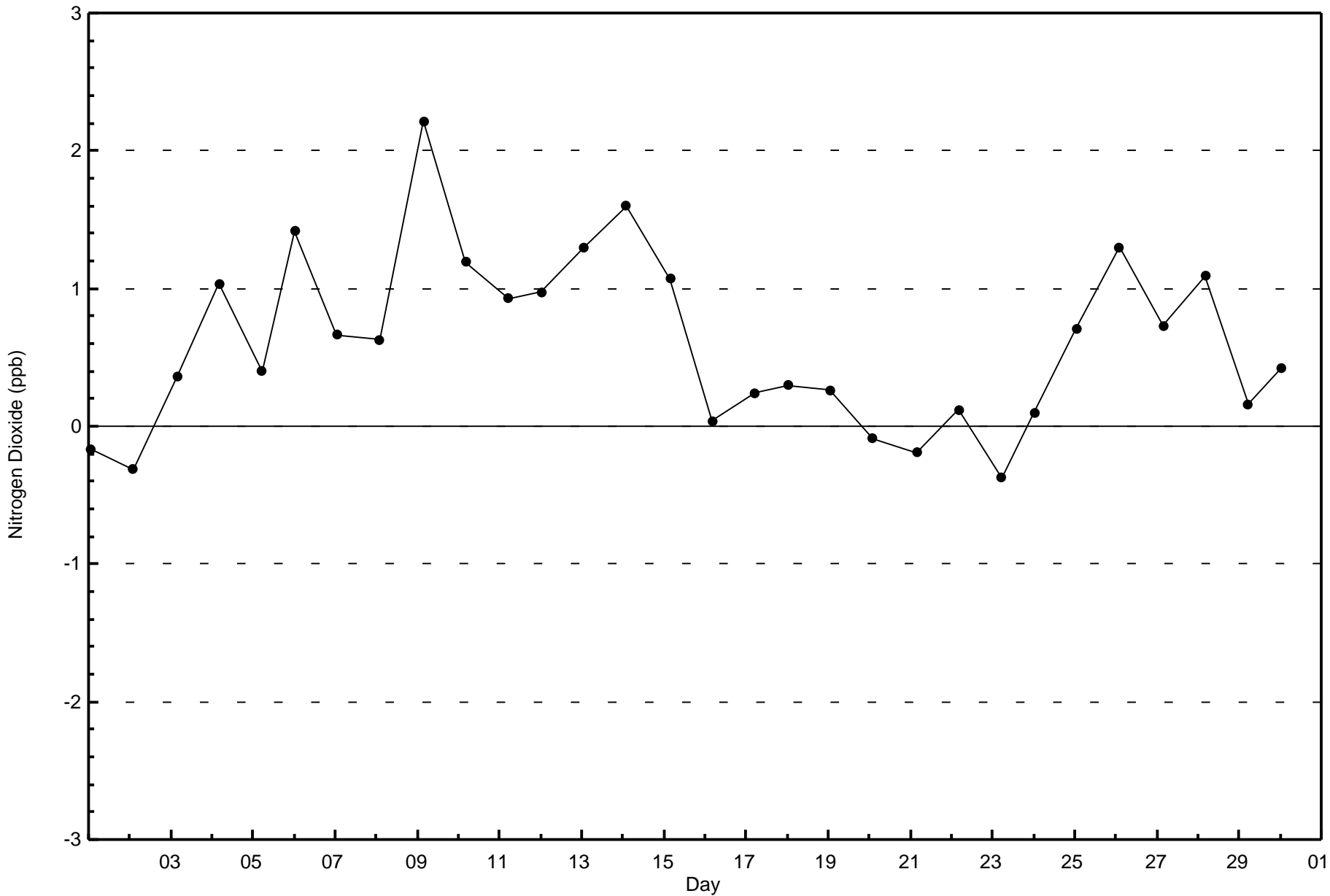
Total Number of Hours: 720

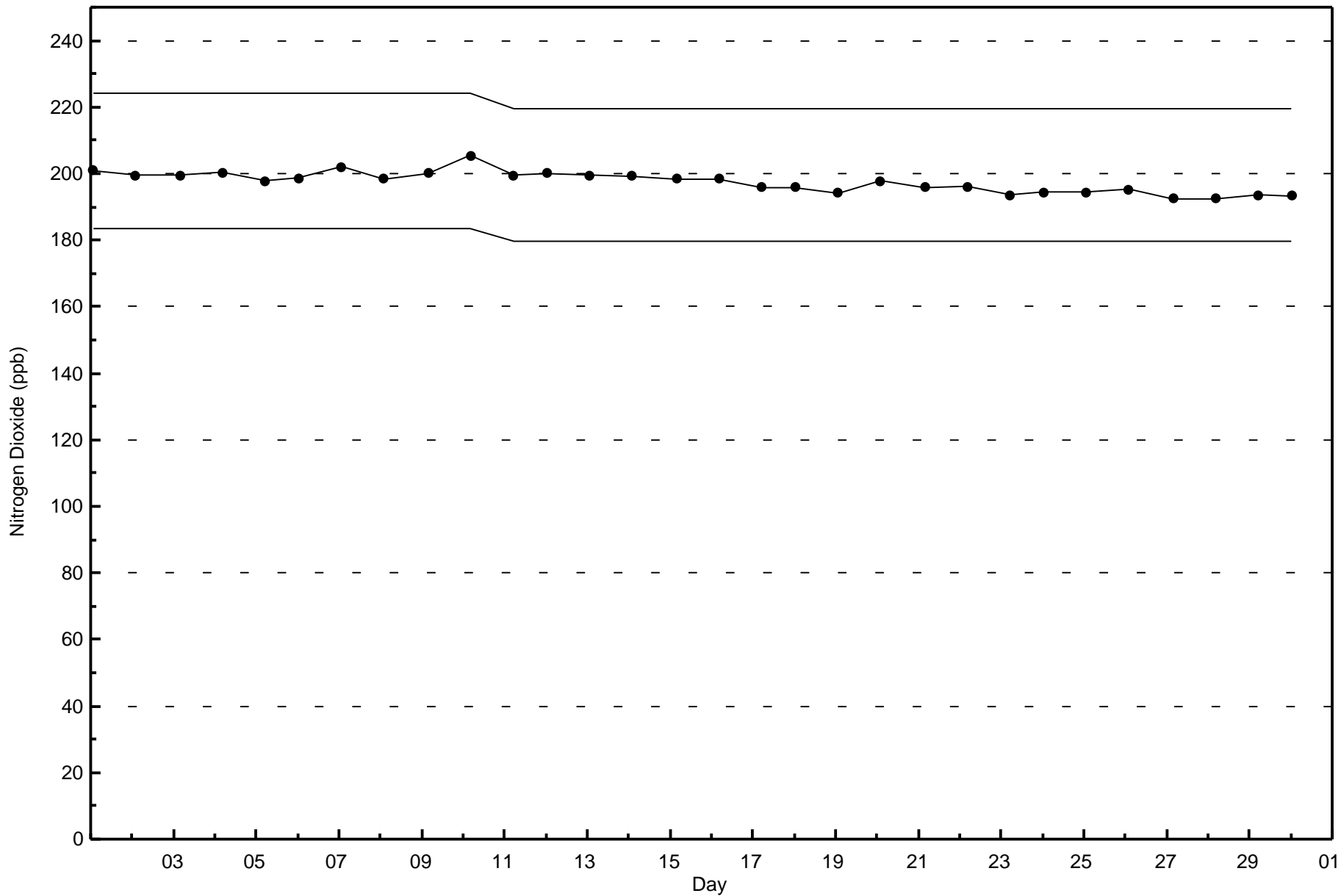


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake (AMS500)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

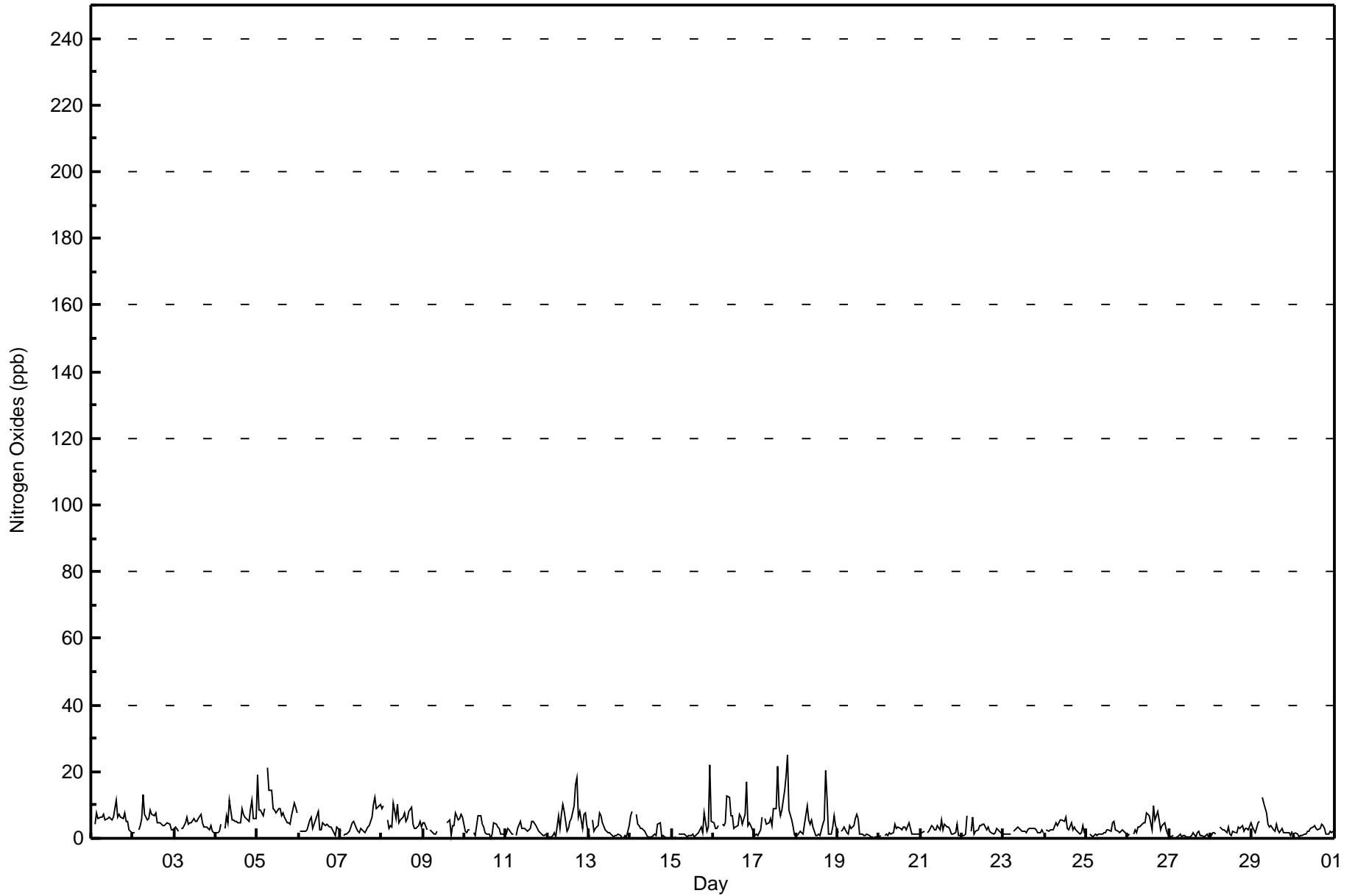
Cenovus - Christina Lake - November 2016

Maximum Value: 25 ppb on Nov 17 20:00																		Maximum Daily Average: 9.3 ppb on Nov 5						Hours in Service: 720																									
Minimum Value: 0 ppb on Nov 15 00:00																		Minimum Daily Average: 0.8 ppb on Nov 27						Hours of Data: 685																									
Maximum Diurnal Average: 5.3 ppb at hour 18																		Minimum Diurnal Average: 2.3 ppb at hour 3						Hours of Missing Data: 35																									
Monthly Average: 3.8 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 8 P ₉₉ = 18						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	8	Z	4	8	6	6	6	7	5	6	7	6	6	6	11	6	7	6	6	8	5	5	3	2	6.2	11																							
2-Nov	2	2	Z	3	4	6	13	7	5	6	8	7	7	8	5	5	5	4	4	4	5	4	3	2	5.1	13																							
3-Nov	3	3	2	Z	3	3	5	6	4	5	5	6	5	5	6	7	5	3	3	3	3	4	2	2	4.0	7																							
4-Nov	2	2	2	4	Z	3	7	5	12	6	6	5	5	5	5	9	7	6	5	5	9	12	6	6	5.7	12																							
5-Nov	19	9	8	7	9	Z	21	14	14	9	8	8	9	9	7	8	6	5	5	4	7	11	9	8	9.3	21																							
6-Nov	Z	2	2	2	2	2	5	7	3	4	5	8	2	3	5	4	4	4	3	4	2	1	3	3	3.5	8																							
7-Nov	2	Z	1	1	1	2	3	4	5	3	2	2	3	2	2	3	3	4	6	10	12	9	9	10	4.4	12																							
8-Nov	9	10	Z	5	3	4	3	11	6	10	5	5	6	7	5	6	8	9	4	3	3	4	5	4	5.9	11																							
9-Nov	5	5	3	Z	3	2	1	1	2	C	C	C	C	C	5	5	1	4	4	8	5	6	7	6	4.1	8																							
10-Nov	2	2	2	3	Z	2	1	4	7	7	4	3	2	1	1	0	1	5	4	4	3	1	1	1	2.6	7																							
11-Nov	1	3	3	1	1	Z	1	3	5	3	3	3	2	3	3	5	5	4	3	2	2	1	1	1	2.6	5																							
12-Nov	Z	0	0	1	2	0	7	3	7	10	8	2	3	5	6	10	16	18	6	8	3	7	8	4	5.9	18																							
13-Nov	0	Z	6	2	3	4	8	7	5	2	2	2	2	1	0	1	1	1	1	0	0	1	0	4	2.3	8																							
14-Nov	7	8	Z	7	4	4	3	3	2	1	1	0	0	1	1	1	4	5	0	1	0	0	0	0	2.4	8																							
15-Nov	1	0	1	Z	1	1	1	1	1	0	1	1	1	0	1	2	3	3	2	7	2	4	22	5	2.7	22																							
16-Nov	5	3	3	4	Z	4	4	5	13	12	7	7	3	3	4	7	6	4	7	17	4	5	4	2	5.7	17																							
17-Nov	1	1	1	3	6	Z	6	4	5	6	4	9	9	22	10	7	9	15	18	25	9	5	3	1	7.7	25																							
18-Nov	Z	1	2	2	1	4	10	6	4	6	4	1	1	1	1	4	6	20	12	1	1	3	7	4	4.4	20																							
19-Nov	2	Z	2	3	3	2	1	4	3	4	6	7	6	1	1	1	1	1	1	0	0	0	0	0	2.2	7																							
20-Nov	0	1	Z	1	1	1	2	1	2	4	3	3	3	3	3	4	2	5	3	1	1	1	1	1	2.1	5																							
21-Nov	1	2	2	Z	2	2	4	3	3	3	4	3	5	2	4	4	3	3	1	1	2	4	1	1	2.6	5																							
22-Nov	1	1	1	7	Z	2	7	1	2	3	4	4	4	4	2	3	2	2	1	2	3	2	2	1	2.7	7																							
23-Nov	1	1	1	1	1	Z	2	3	3	3	2	2	2	2	3	3	3	3	3	2	2	2	3	2	2.2	3																							
24-Nov	Z	3	2	2	2	3	5	4	5	6	6	5	6	3	3	5	2	3	3	2	1	2	4	2	3.4	6																							
25-Nov	1	Z	1	1	0	1	1	1	1	1	2	2	3	2	2	4	5	3	2	2	2	3	2	1	2.0	5																							
26-Nov	1	1	Z	1	2	2	3	3	4	5	4	7	7	5	2	10	6	8	5	3	4	5	2	1	4.1	10																							
27-Nov	1	1	1	Z	0	0	1	0	1	1	1	1	0	1	2	0	2	2	1	1	0	1	1	1	0.8	2																							
28-Nov	1	2	2	1	Z	3	3	3	3	1	3	1	1	2	2	1	4	3	4	2	3	3	2	4	2.4	4																							
29-Nov	3	2	2	5	5	Z	12	11	8	4	3	4	3	2	4	3	2	3	2	2	2	2	1	2	3.7	12																							
30-Nov	Z	2	1	1	1	1	1	1	2	2	3	3	4	3	3	3	4	4	3	1	1	2	2	2	2.2	4																							
																								3.1	2.6	2.3	3.0	2.7	2.6	4.9	4.4	4.7	4.6	4.2	4.0	3.8	4.0	3.6	4.3	4.5	5.3	4.1	4.5	3.2	3.6	3.8	2.8	Diurnal Average	
																								19	10	8	8	9	6	21	14	14	12	8	9	9	22	11	10	16	20	18	25	12	12	22	10	Diurnal Maximum	
Z - zerospan																								C - Calibration																									



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	99.42	99.42
21 - 40	4	0.58	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
Cenovus - Christina Lake - 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	19	7	22	32	19	21	54	85	99	78	79	75	29	13	41	8	681
21 - 40	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	4
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	19	7	22	32	19	22	55	85	99	78	79	76	30	13	41	8	685

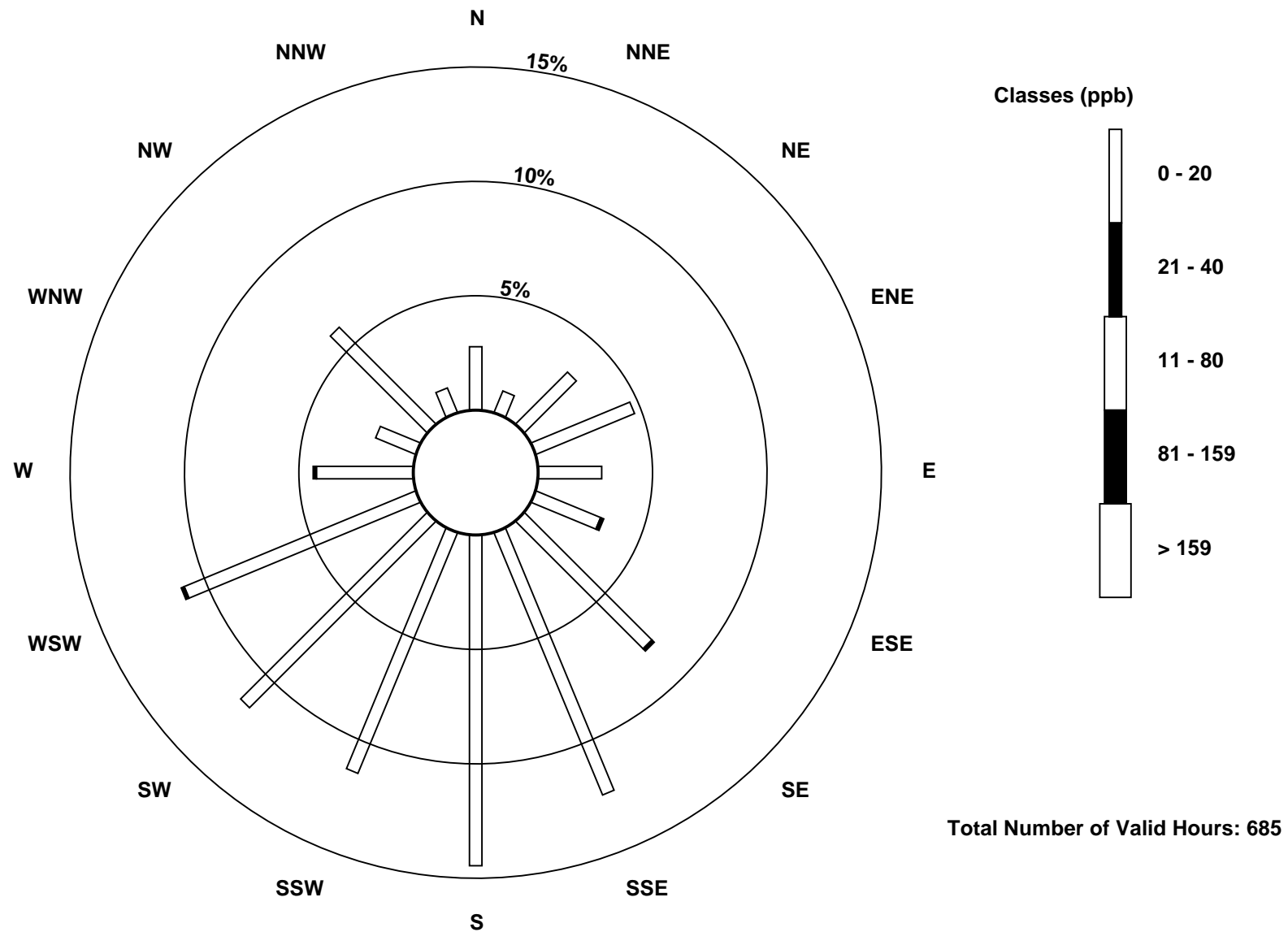
Total Number of Valid Hours: 685

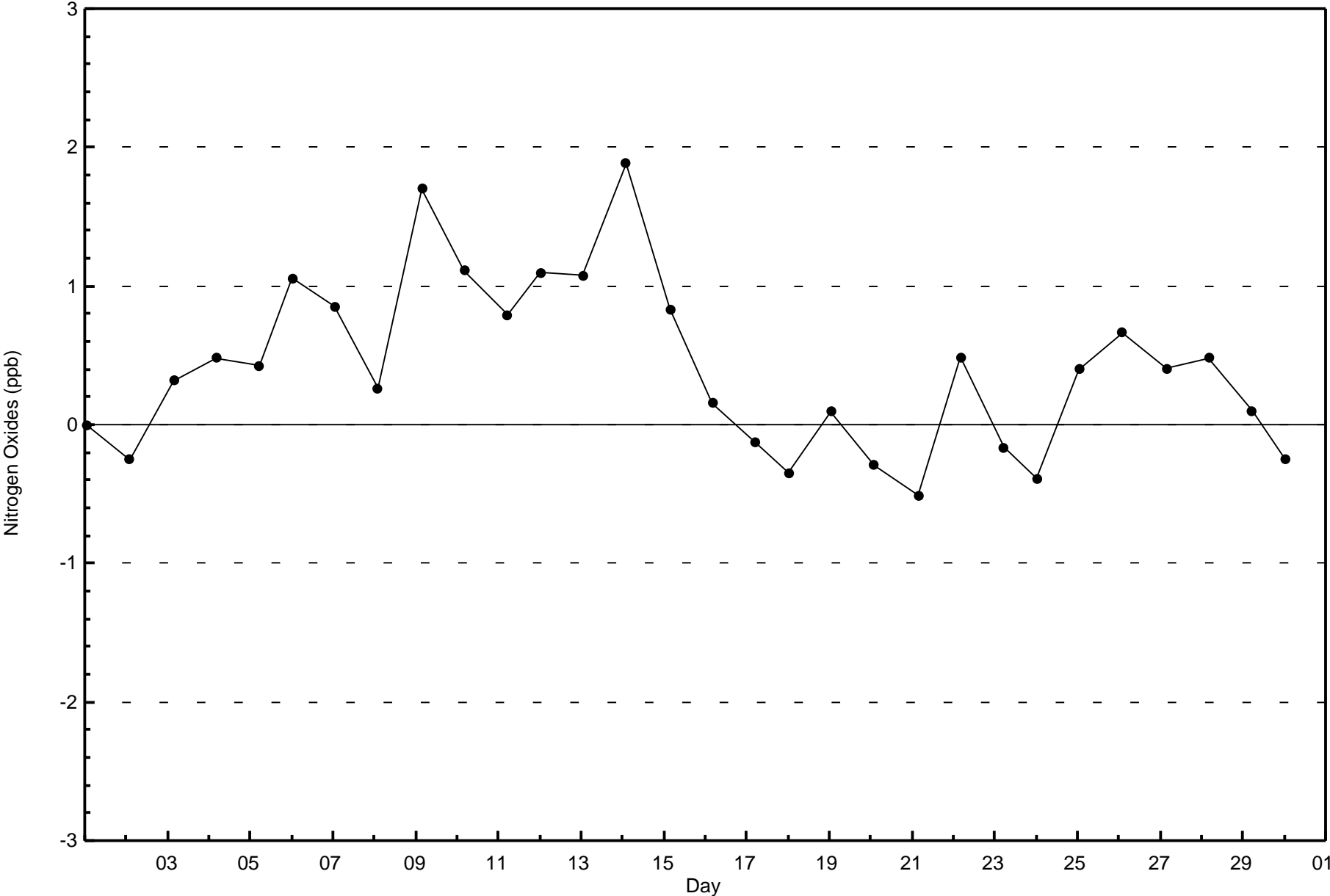
Total Number of Hours: 720

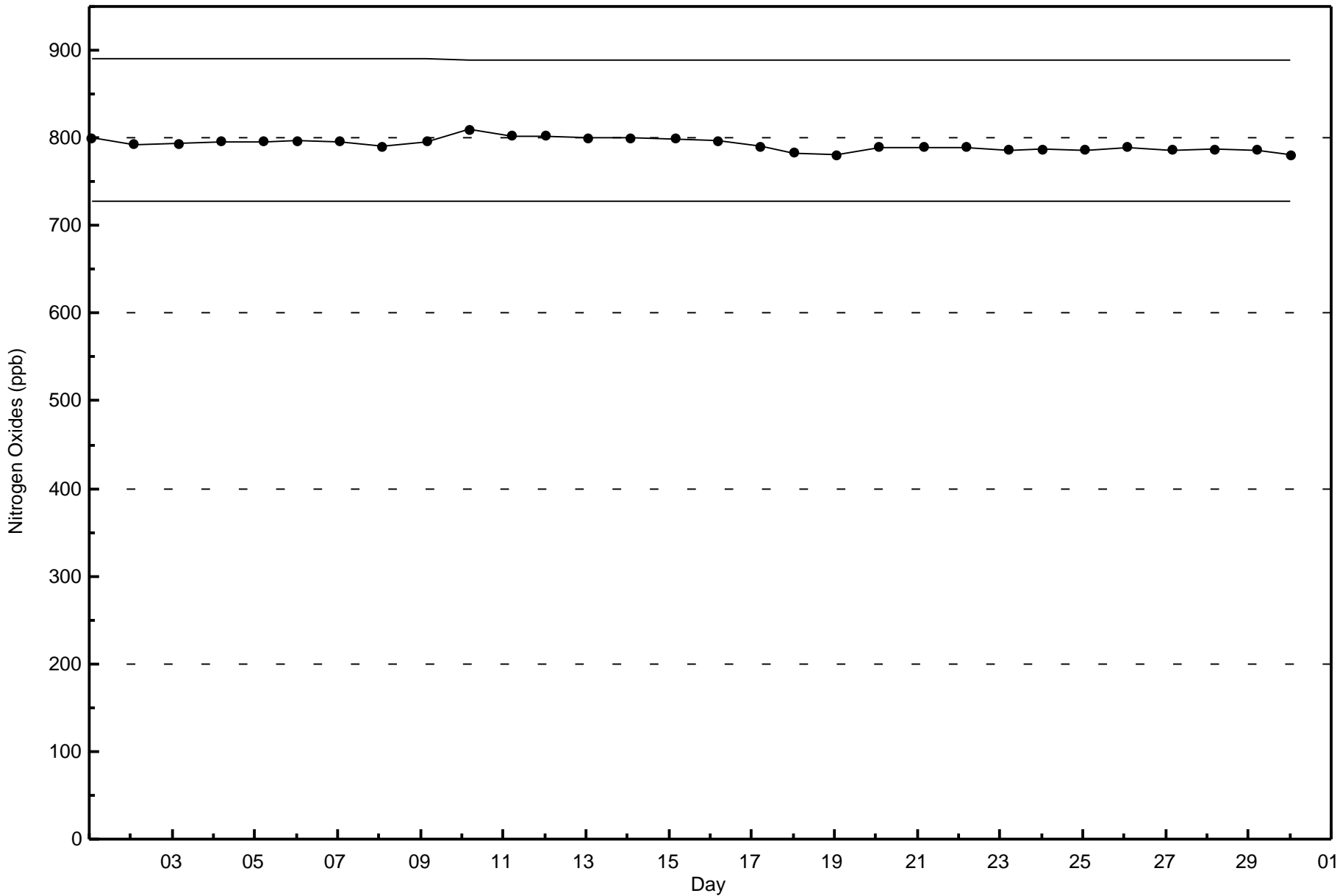


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake (AMS500)







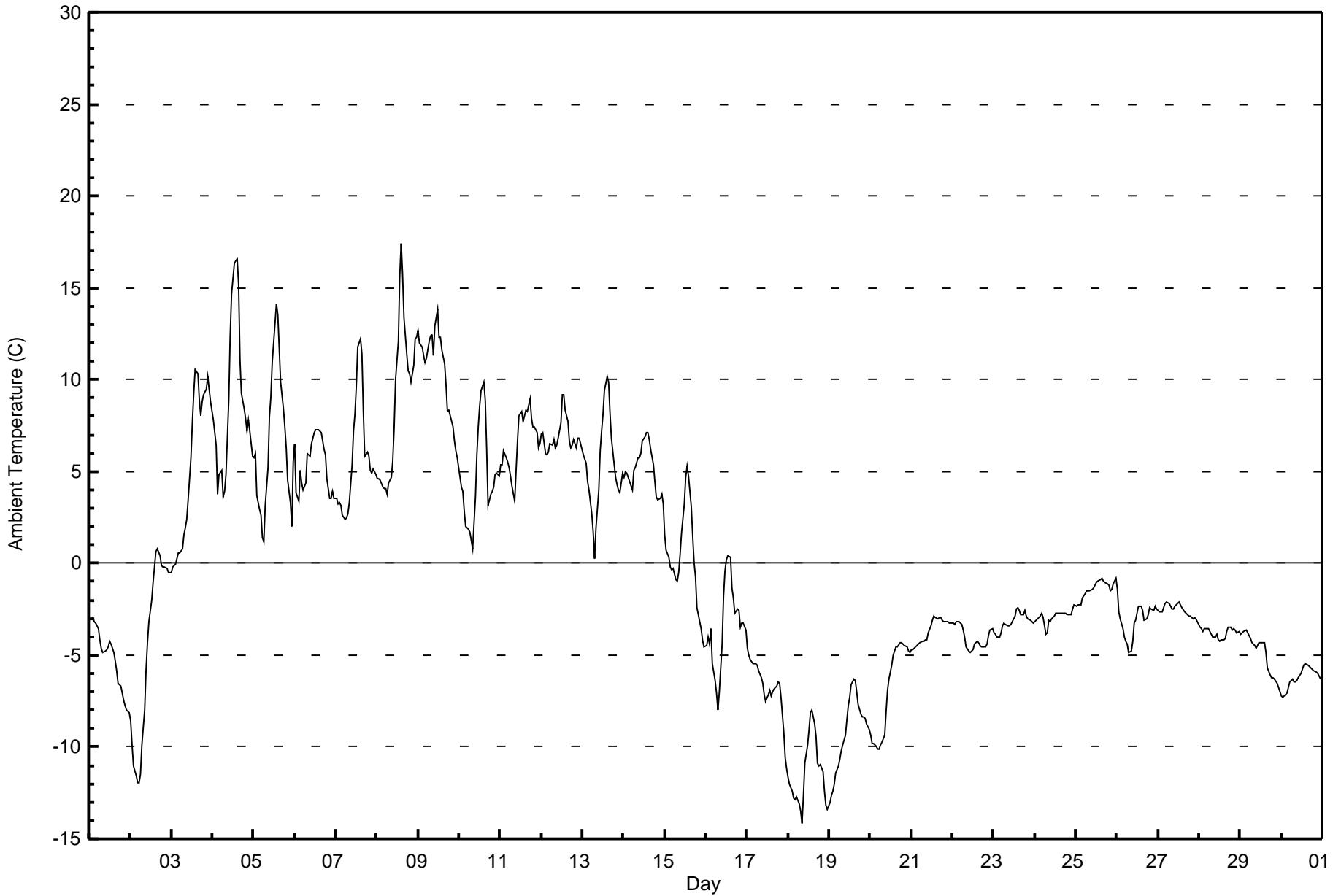


Maximum Value: 17.4 C on Nov 8 15:00 Maximum Daily Average: 10.5 C on Nov 9																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -14.2 C on Nov 18 09:00 Minimum Daily Average: -11.5 C on Nov 18 Maximum Diurnal Average: 2.5 C at hour 15 Minimum Diurnal Average: -1.7 C at hour 7 Monthly Average: -0.10 C Percentiles: P ₁ = -12.8 P ₁₀ = -7.3 Q ₁ = -4.4 Median = -2.3 Q ₃ = 5.3 P ₉₀ = 8.4 P ₉₉ = 15.0																										
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	-3.0	-3.0	-3.0	-3.2	-3.3	-3.6	-4.1	-4.6	-4.8	-4.8	-4.7	-4.6	-4.3	-4.4	-4.9	-5.3	-5.9	-6.5	-6.7	-7.0	-7.5	-7.7	-8.0	-8.2	-5.1	-3.0
2-Nov	-8.6	-9.9	-11.0	-11.6	-11.9	-11.9	-11.5	-9.9	-8.0	-5.8	-4.4	-3.2	-2.0	-1.1	-0.2	0.7	0.8	0.4	-0.2	-0.2	-0.2	-0.3	-0.5	-0.5	-4.6	0.8
3-Nov	-0.5	-0.2	0.0	0.3	0.5	0.6	0.8	1.5	1.9	2.4	3.5	5.8	7.7	9.2	10.6	10.3	8.9	8.0	8.8	9.2	9.5	10.2	9.5	8.8	5.3	10.6
4-Nov	7.8	7.1	6.4	3.8	4.8	5.1	3.6	3.9	4.8	8.9	12.4	14.7	15.5	16.3	16.6	15.2	11.1	9.3	8.4	7.9	7.2	7.8	7.2	5.8	8.8	16.6
5-Nov	5.8	6.0	3.7	2.9	2.6	1.4	1.2	3.2	5.2	8.0	9.0	11.0	13.1	14.1	13.5	11.7	9.9	8.4	7.4	6.3	4.5	3.3	2.0	5.5	6.6	14.1
6-Nov	6.5	3.8	3.4	5.1	4.4	4.0	4.4	6.0	5.9	5.8	6.5	7.1	7.2	7.3	7.3	7.1	6.7	6.2	5.9	4.6	3.6	3.5	3.9	3.5	5.4	7.3
7-Nov	3.5	3.2	3.3	3.2	2.6	2.4	2.5	2.7	3.3	5.4	7.2	8.1	9.6	11.8	12.2	11.4	8.2	5.9	6.0	5.8	5.1	4.9	5.1	4.9	5.8	12.2
8-Nov	4.6	4.6	4.5	4.1	4.0	4.1	3.8	4.4	4.7	5.6	7.4	10.0	12.1	15.7	17.4	15.7	13.4	11.4	10.5	10.3	9.8	10.8	12.3	12.3	8.9	17.4
9-Nov	12.7	12.0	11.8	11.3	10.9	11.2	12.1	12.4	12.5	11.3	12.9	13.8	12.3	12.3	11.6	10.9	9.7	8.3	8.3	8.1	7.4	6.7	6.1	5.7	10.5	13.8
10-Nov	4.7	4.1	3.9	2.8	2.0	1.8	1.7	1.3	0.8	3.6	5.9	7.4	8.6	9.4	9.9	8.9	6.2	3.2	3.8	3.9	4.1	4.8	4.9	4.7	4.7	9.9
11-Nov	5.4	5.4	6.1	5.8	5.5	5.2	4.7	4.2	3.4	5.0	6.7	8.0	8.3	7.7	8.0	8.3	8.3	9.0	7.9	7.4	7.4	7.1	6.3	6.5	6.6	9.0
12-Nov	7.0	7.1	6.0	5.9	6.0	6.5	6.4	6.7	6.2	6.5	6.8	7.7	9.2	9.1	8.3	7.8	6.7	6.3	6.5	6.7	6.3	6.8	6.8	6.5	6.9	9.2
13-Nov	5.9	5.7	5.5	4.5	4.0	2.7	1.7	0.3	2.0	4.0	6.1	7.2	8.1	9.4	10.1	9.8	8.2	6.8	5.3	4.7	4.3	4.0	3.8	4.9	5.4	10.1
14-Nov	4.7	5.0	4.9	4.4	4.2	4.0	5.1	5.2	5.8	5.8	6.0	6.7	6.9	7.1	7.2	6.7	6.2	5.3	4.4	3.6	3.5	3.5	3.8	3.2	5.1	7.2
15-Nov	1.6	0.7	0.3	-0.2	-0.4	-0.3	-0.9	-0.9	-0.5	0.5	1.6	3.2	4.7	5.3	4.8	3.1	1.5	0.0	-0.7	-2.4	-3.2	-3.5	-4.2	-4.6	0.2	5.3
16-Nov	-4.4	-4.0	-4.4	-3.6	-5.5	-6.4	-7.1	-8.0	-7.0	-4.4	-1.8	-0.5	0.2	0.4	0.3	-1.3	-1.9	-2.7	-2.5	-2.6	-3.5	-3.2	-3.3	-3.6	-3.4	0.4
17-Nov	-4.7	-5.0	-5.2	-5.5	-5.4	-5.5	-5.5	-5.9	-6.2	-6.5	-7.1	-7.5	-7.2	-6.9	-7.2	-7.0	-6.8	-6.7	-6.5	-6.5	-7.3	-9.2	-10.6	-11.2	-6.8	-4.7
18-Nov	-11.7	-12.0	-12.4	-12.8	-12.8	-12.7	-13.1	-13.5	-14.2	-12.6	-10.9	-9.9	-9.0	-8.1	-8.0	-8.8	-9.4	-10.9	-11.0	-11.0	-11.3	-12.4	-13.2	-13.4	-11.5	-8.0
19-Nov	-13.0	-12.6	-12.4	-12.1	-11.4	-11.0	-10.7	-10.2	-9.9	-9.3	-8.5	-7.7	-7.3	-6.6	-6.3	-6.4	-7.0	-7.7	-8.2	-8.4	-8.4	-8.4	-8.8	-9.0	-9.2	-6.3
20-Nov	-9.4	-9.8	-9.8	-10.0	-10.1	-10.1	-9.9	-9.8	-9.4	-8.0	-6.9	-6.3	-5.5	-5.0	-4.7	-4.6	-4.5	-4.3	-4.3	-4.4	-4.4	-4.5	-4.7	-4.9	-6.9	-4.3
21-Nov	-4.7	-4.7	-4.6	-4.4	-4.4	-4.3	-4.2	-4.3	-4.2	-4.1	-3.8	-3.4	-3.1	-2.9	-3.0	-3.0	-2.9	-2.9	-3.1	-3.2	-3.2	-3.1	-3.2	-3.2	-3.7	-2.9
22-Nov	-3.3	-3.3	-3.2	-3.2	-3.2	-3.3	-3.6	-4.0	-4.5	-4.8	-4.8	-4.8	-4.7	-4.4	-4.2	-4.3	-4.5	-4.6	-4.6	-4.6	-4.4	-3.9	-3.6	-3.6	-4.1	-3.2
23-Nov	-3.8	-3.8	-4.0	-4.0	-3.8	-3.4	-3.2	-3.3	-3.4	-3.4	-3.3	-3.2	-2.8	-2.5	-2.4	-2.6	-2.8	-2.8	-2.6	-2.9	-3.0	-3.1	-3.2	-3.3	-3.2	-2.4
24-Nov	-3.2	-3.1	-2.9	-2.9	-2.7	-3.0	-3.9	-3.8	-3.1	-3.1	-3.0	-2.9	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.8	-2.8	-2.8	-2.5	-2.3	-2.9	-2.3
25-Nov	-2.3	-2.3	-2.2	-2.2	-1.9	-1.7	-1.5	-1.5	-1.5	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.8	-0.9	-1.0	-1.2	-1.2	-1.5	-1.4	-1.1	-0.8	-1.4	-0.8
26-Nov	-1.4	-2.7	-3.1	-3.6	-4.0	-4.2	-4.4	-4.8	-4.8	-4.3	-3.2	-3.1	-2.4	-2.3	-2.3	-2.5	-3.1	-3.0	-2.8	-2.4	-2.5	-2.6	-2.4	-2.5	-3.1	-1.4
27-Nov	-2.6	-2.6	-2.6	-2.4	-2.2	-2.1	-2.2	-2.3	-2.5	-2.5	-2.4	-2.2	-2.1	-2.2	-2.4	-2.6	-2.7	-2.8	-2.9	-2.9	-3.0	-3.0	-3.0	-3.2	-2.6	-2.1
28-Nov	-3.5	-3.6	-3.7	-3.6	-3.6	-3.5	-3.7	-3.9	-4.0	-4.1	-3.8	-4.1	-4.3	-4.2	-4.1	-4.1	-3.7	-3.5	-3.5	-3.7	-3.6	-3.7	-3.8	-3.7	-3.8	-3.5
29-Nov	-3.9	-3.8	-3.7	-3.7	-3.8	-3.9	-4.1	-4.3	-4.5	-4.6	-4.5	-4.3	-4.3	-4.3	-4.3	-4.8	-5.7	-6.1	-6.2	-6.2	-6.3	-6.5	-6.8	-7.0	-4.9	-3.7
30-Nov	-7.2	-7.3	-7.2	-7.1	-6.8	-6.4	-6.3	-6.5	-6.5	-6.4	-6.2	-6.0	-5.7	-5.6	-5.5	-5.6	-5.6	-5.7	-5.8	-5.9	-5.9	-6.0	-6.2	-6.3	-6.2	-5.5
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Cenovus - Christina Lake - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Cenovus - Christina Lake - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	417	57.92	57.92
0 - 10	256	35.56	93.47
10 - 20	47	6.53	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) - %

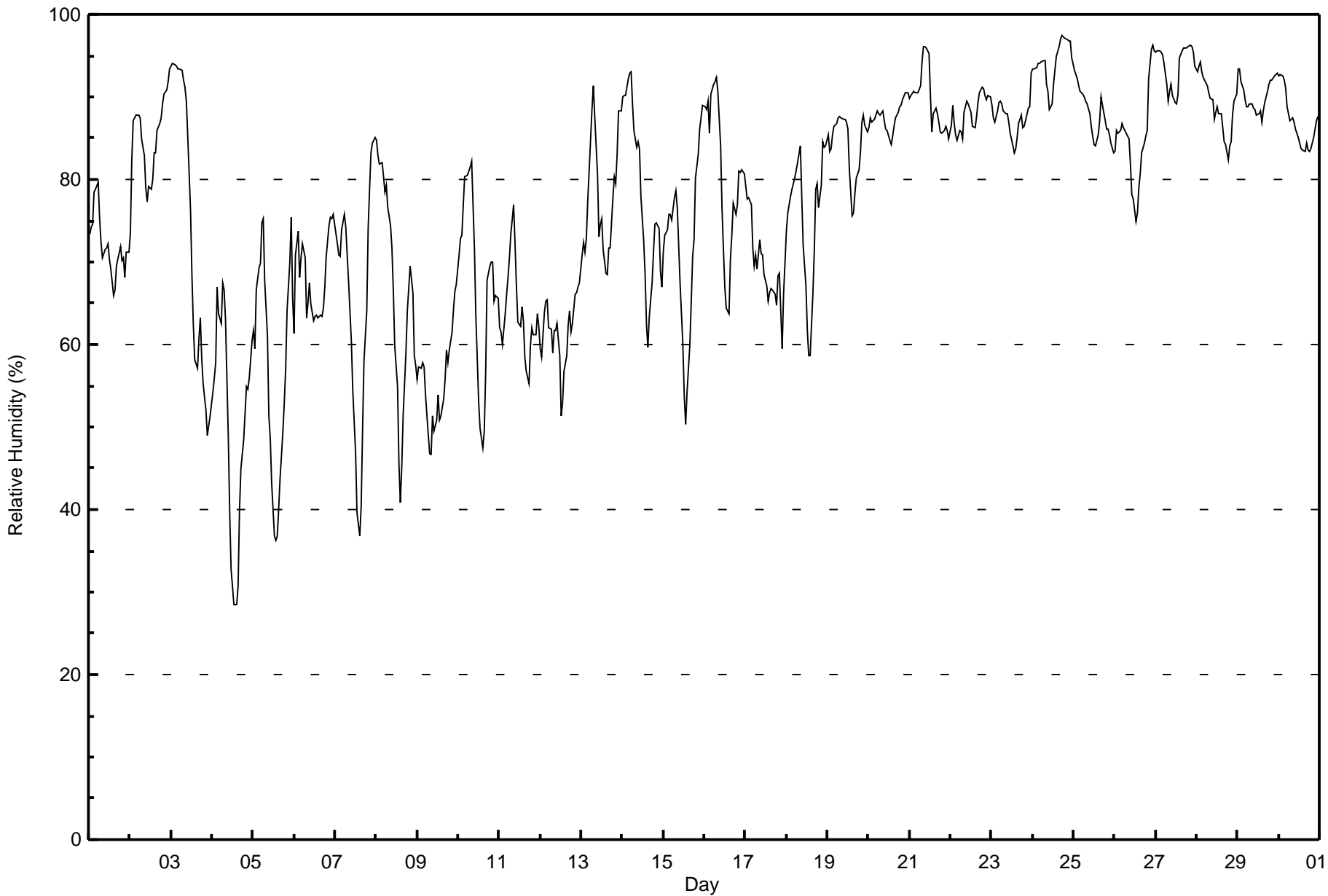
Cenovus - Christina Lake - November 2016

Maximum Value: 97 % on Nov 24 18:00 Maximum Daily Average: 94.2 % on Nov 24																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 28 % on Nov 4 15:00 Minimum Daily Average: 50.3 % on Nov 4 Maximum Diurnal Average: 81.9 % at hour 6 Minimum Diurnal Average: 67.9 % at hour 15 Monthly Average: 76.8 % Percentiles: P ₁ = 37 P ₁₀ = 57 Q ₁ = 67 Median = 81 O ₃ = 88 P ₉₀ = 92 P ₉₉ = 97																										
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	73	74	75	78	79	80	75	72	70	72	72	72	70	69	66	67	70	70	72	70	71	68	71	71	72.0	80
2-Nov	74	82	87	88	88	88	87	85	83	79	77	79	79	80	83	83	86	87	88	89	90	91	92	93	84.9	93
3-Nov	94	94	94	94	93	93	93	92	91	89	85	76	68	62	58	57	61	63	58	55	52	49	50	51	74.0	94
4-Nov	54	56	58	67	64	63	68	67	63	49	40	33	31	28	28	31	40	45	48	52	55	55	56	61	50.3	68
5-Nov	62	59	67	69	70	75	75	68	61	51	49	43	37	36	37	40	44	49	53	57	64	70	75	66	57.4	75
6-Nov	61	71	74	68	71	72	71	63	65	67	65	63	63	64	63	64	63	64	67	71	74	75	75	76	67.9	76
7-Nov	73	72	71	71	74	76	74	71	68	60	54	51	47	40	37	40	50	58	64	74	79	83	84	85	64.8	85
8-Nov	85	83	82	82	80	79	79	77	74	72	67	60	55	46	41	45	51	59	64	67	70	66	59	58	66.6	85
9-Nov	56	57	57	58	57	54	49	47	47	51	49	51	54	51	51	53	56	59	58	59	62	64	66	67	55.6	67
10-Nov	71	73	73	77	80	81	81	82	82	72	63	58	53	50	47	50	56	68	69	70	70	65	66	66	67.6	82
11-Nov	62	62	60	64	66	68	71	73	77	72	67	63	62	65	63	59	57	55	60	62	61	61	64	62	63.9	77
12-Nov	60	58	64	65	65	62	62	59	62	62	62	59	51	53	57	59	62	64	62	63	66	66	67	67	61.5	67
13-Nov	71	72	71	73	77	85	88	91	88	81	73	75	75	71	69	68	72	72	78	80	79	83	88	88	77.9	91
14-Nov	90	90	90	92	93	93	89	86	84	85	84	78	73	69	62	60	63	67	71	75	75	74	69	67	78.3	93
15-Nov	71	73	74	76	76	75	78	79	77	72	67	60	54	50	54	60	65	71	73	80	83	86	87	89	72.1	89
16-Nov	89	88	90	86	90	92	92	92	91	84	76	72	67	64	64	70	73	77	76	77	81	81	81	81	80.6	92
17-Nov	79	78	78	77	72	70	71	69	73	71	71	68	67	65	66	67	67	66	65	68	69	60	66	70	69.6	79
18-Nov	74	76	78	79	79	80	82	83	84	78	72	67	62	59	59	66	72	79	80	77	79	85	84	84	75.7	85
19-Nov	85	83	84	85	86	87	88	88	88	87	87	87	86	81	76	76	78	80	81	83	87	88	87	86	84.4	88
20-Nov	86	87	87	87	88	88	88	88	88	87	86	86	85	84	85	86	87	88	89	89	90	91	90	90	87.6	91
21-Nov	90	90	91	91	91	91	91	94	96	96	96	95	90	86	88	89	88	87	86	86	86	86	86	85	89.7	96
22-Nov	87	89	87	85	85	86	86	85	88	89	89	89	88	87	86	88	89	90	91	91	90	90	90	90	88.1	91
23-Nov	89	88	87	88	89	89	89	88	88	88	87	86	84	83	84	85	87	88	86	86	87	89	89	93	87.4	93
24-Nov	93	93	94	94	94	94	94	94	91	91	89	89	92	93	95	96	97	97	97	97	97	97	97	95	94.2	97
25-Nov	93	93	92	91	91	90	90	89	89	88	86	85	84	84	85	87	90	89	87	86	86	85	84	83	88.0	93
26-Nov	83	86	86	86	87	86	86	86	85	82	78	78	75	76	79	81	83	84	85	86	92	96	96	96	84.9	96
27-Nov	95	96	96	95	95	94	92	90	91	91	90	89	89	90	95	96	96	96	96	96	96	96	95	94	93.7	96
28-Nov	93	94	94	93	92	92	91	90	90	90	87	88	89	88	88	86	85	84	82	84	85	88	90	90	88.9	94
29-Nov	93	93	92	91	90	89	89	89	89	89	89	89	88	88	88	87	88	89	91	92	92	92	93	93	90.2	93
30-Nov	93	93	93	92	91	89	87	87	87	87	86	85	84	84	83	83	84	84	83	84	85	86	87	88	86.9	93
79.3 80.2 80.7 81.4 81.8 81.9 81.9 80.8 80.3 77.7 74.8 72.4 70.1 68.2 67.9 69.3 72.1 74.4 75.4 76.9 78.4 78.9 79.5 79.5																								Diurnal Average		
95 96 96 95 95 94 94 94 96 96 96 95 92 93 95 96 97 97 97 97 97 97 97 96																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Cenovus - Christina Lake - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Cenovus - Christina Lake - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	13	1.81	1.81
40 - 60	87	12.08	13.89
60 - 80	251	34.86	48.75
80 - 100	369	51.25	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 25 km/h on Nov 9 12:00	Maximum Daily Speed Average: 14.5 km/h on Nov 23	Hours in Service: 720
Minimum Speed Value: 0 km/h on Nov 27 19:00	Minimum Daily Speed Average: 1.7 km/h on Nov 18	Hours of Data: 720
Maximum Diurnal Speed Average: 4.9 km/h at hour 15	Minimum Diurnal Speed Average: 2.7 km/h at hour 2	Hours of Missing Data: 0
Monthly Average Velocity: 3.9 km/h 206.8 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 12 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-Nov	NW13	NW11	NW12	NNW11	NW12	NW13	NW15	NNW14	NNW13	NW14	W13	NNW10	W11	W15	NW19	NW16	NW17	NW16	NW14	NW17	NW14	NW10	N11	N9	NW12.6	NW19
2-Nov	NNE4	SSE4	SSE4	SSE4	S4	SSE4	SE4	SE5	SE8	SSE9	SSE9	SSE8	S12	S10	S10	SSW11	SSW10	SSW13	SSW14	SSW10	SSW9	SSW10	S10	S11	S7.4	SSW14
3-Nov	S11	SSW11	S10	S10	SSE10	SSE8	SSE8	S11	S9	SSW9	SW10	SW11	SW12	SW9	SSW10	SSW9	SSW11	SSW13	SSW13	SSW14	SW16	SW17	SW16	SW14	SSW10.5	SW17
4-Nov	SW13	SW11	S6	SSE5	SSW9	SSW7	S6	SSW6	SE3	S11	S11	SSW16	SSW13	SSW9	S8	SSW6	SSE6	S6	SSE4	S6	ESE5	SSE8	SSW3	SSW3	S7.1	SSW16
5-Nov	SSE8	ESE4	E4	ENE1	SE5	ESE4	ESE5	S5	SSE4	SSE6	S6	SSW7	SSW4	SSW7	SW7	SSW6	S6	SSW8	S8	SE2	SE6	SE4	SSE2	WSW5	S4.1	S8
6-Nov	SW3	SSE2	S1	SE3	SSE2	SE2	SW6	WSW10	SW8	S2	SW6	WSW5	SW7	WSW8	WSW9	WSW8	WSW10	SW9	SW8	SW6	SW7	SW7	WSW10	WSW9	SW5.6	WSW10
7-Nov	WSW10	SW8	SW6	SW7	SW10	SW10	SW10	SW11	SW12	SW9	WSW9	SW6	S4	SW7	SSW8	S7	SSE7	SSE8	S12	S15	SSE12	SSE11	S14	S14	SSW8.3	S15
8-Nov	S13	SSE11	S16	S12	S13	S12	S10	S12	S10	SSE10	S9	S10	SSE7	SSW8	SSW11	S9	SSE7	SSE7	S7	S7	S6	SSW7	SSW9	SSW12	S9.4	S16
9-Nov	SSW11	SSW9	SSW9	SSW7	SW8	SW7	SW11	SW11	WSW14	WSW13	WSW14	W25	W19	W21	W20	W16	WSW13	WSW12	W17	W17	W16	W15	W14	W14	WSW12.9	W25
10-Nov	WSW12	WSW12	WSW12	WSW10	SW9	SW9	SW7	SSW4	SSW8	SSW4	SSW4	SSW7	SSW7	S8	S9	SSE9	SSE7	SE7	SE12	SSE15	SSE15	SSE21	SSE19	SSE19	S8.1	SSE21
11-Nov	SSE23	SSE19	S18	S15	S16	S17	S9	S7	S5	SSW8	SSW11	SW14	WSW10	WSW10	SW8	SW7	SW6	SW9	SW12	SW11	SW8	SW8	SSW7	SW10	SSW9.9	SSE23
12-Nov	SW10	SSW7	SSE6	SSE6	S5	S6	S6	S5	S3	SE3	S5	SSE4	S2	N5	ENE3	SE3	SSE2	SW5	SW5	W4	SW4	W10	W9	W7	SSW3.3	W10
13-Nov	SW9	W8	W9	WSW9	WSW10	WSW9	SW6	SSW5	SSW5	SSW7	SSW7	SSW7	SSW10	SW11	SW12	SW10	SW9	SSW7	SSW7	S8	S7	S8	SSE8	SSE7	SSW7.3	SW12
14-Nov	ESE3	WSW1	SE6	SSE5	S5	SSW8	WSW13	WSW12	WSW12	WSW12	WSW15	WSW15	WSW15	WSW17	WSW19	W20	W21	W18	WSW15	WSW12	WSW14	WSW17	W18	WSW14	WSW11.7	W21
15-Nov	WSW12	WSW11	WSW12	WSW12	WSW10	WSW10	SW8	WSW10	SW11	WSW13	WSW12	WSW12	WSW10	SW11	SW10	SSW8	SSW7	SSW8	SSW5	SSE3	SSW4	SW3	SE3	S4	SW8.0	WSW13
16-Nov	SSE2	SW2	SW2	NNW3	SSW2	S2	SSW3	SSW4	SSW5	SW3	NW3	NW4	NNE5	SE2	E3	S6	SSW8	SW9	NNW12	NNW16	NW11	NNW12	N12	N15	WNW2.8	WNW16
17-Nov	NNE15	N14	N14	N13	NW14	NW14	NW16	NW17	NNW15	NNW15	NW16	NW15	NNW13	W13	NNW17	NW14	W10	WSW11	WSW11	WSW9	NNW20	NW19	NW12	NW13	NW12.3	NW20
18-Nov	WNW11	WNW13	W7	SW6	SSW5	WSW4	SW4	S5	S5	SSW5	WSW4	SW7	SW7	SW4	W4	ENE3	E3	ESE4	ESE4	E5	E4	E2	NE5	ENE4	SW1.7	WNW13
19-Nov	ENE6	NE5	NE7	ENE6	ENE6	NE6	NE9	ENE10	NE9	NE8	ENE8	NE9	NE9	ENE12	E14	E13	ENE12	ENE12	ENE13	E12	E10	ENE11	ENE9	E10	ENE9.2	E14
20-Nov	ENE9	NE7	NE8	NE7	ENE6	ENE6	NE5	NE6	E5	ESE5	SSE5	ESE7	SE7	SE8	SE8	ESE7	E7	ESE9	ESE11	SE13	SE13	SE16	SE14	SE12	ESE6.9	SE16
21-Nov	SE12	SE13	SE10	SE9	SE6	SE6	SE6	SE6	SE4	E6	ESE4	NNE4	NNW10	N10	NNW12	NNW11	N9	N12	N13	N13	N10	NNW11	N8	N9	NNE3.5	SE13
22-Nov	NNE9	N10	N9	NW9	WNW8	NW11	NNW12	N10	NNE10	NE8	ENE6	E5	ENE6	SE3	SSE6	SSE8	S11	SSE13	SSE13	SSE15	SSE15	SSE14	SSE12	SSE15	ESE2.5	SSE15
23-Nov	SSE16	SSE14	SSE16	SSE16	SSE16	SSE17	SSE17	SSE17	SSE15	SE14	SE15	SE18	SE16	SSE16	SSE16	SSE14	SSE15	SSE13	S17	S14	S13	S11	SSE10	SE8	SSE14.5	SE18
24-Nov	SE7	SE7	SSE7	SSE6	S6	SSE6	SSE5	SSW7	SSW7	SSW6	SSW8	S6	SSE8	SE9	SSE9	S6	SE9	ESE11	SE11	SE14	SE11	SE11	ESE13	ESE13	SSE7.6	SE14
25-Nov	ESE12	ESE13	ESE13	ESE11	SE12	SE10	SE13	SE12	SE12	SE12	SE11	SE9	ESE7	SE7	SE6	E4	WSW6	WSW10	WSW11	WSW14	WSW12	W17	WSW15	WSW12	SSE5.5	W17
26-Nov	SW11	SW10	WSW11	SW8	SW8	SSW8	SW9	SSW7	SW8	SSW9	SSW9	S7	SSE4	S7	SSE5	ESE4	E4	ESE3	ESE3	E3	ENE5	ENE6	ENE7	NE10	SSW3.6	SW11
27-Nov	NE10	NE9	NE8	NE10	NE11	ENE11	E10	ENE8	ENE10	ENE11	ENE12	ENE10	NE8	NNE6	NE7	NE5	ENE5	ENE0	NE1	SE2	SW5	WSW7	WSW8	ENE5.8	ENE12	
28-Nov	WSW10	S4	SSE4	SW6	WSW10	WSW10	WSW10	WSW10	WSW10	WSW9	W13	WSW10	SW9	SW9	WSW10	WSW9	W7	NW9	NW11	W7	NW14	NW15	W11	NW15	W8.2	NW15
29-Nov	NW16	NW14	NW13	NW13	NNW16	NW15	NW15	NW17	NW14	W8	W7	NNW10	WSW9	WSW7	WSW5	SW9	WSW7	SSW6	S7	S7	S7	S9	SSW8	SSE9	W7.0	NW17
30-Nov	SSW8	S5	S9	S11	S10	S9	S11	S12	S12	S13	S13	SSE11	S12	S11	S11	SSE13	S9	S10	S10	S11	S11	S12	S11	S12	S10.6	S13

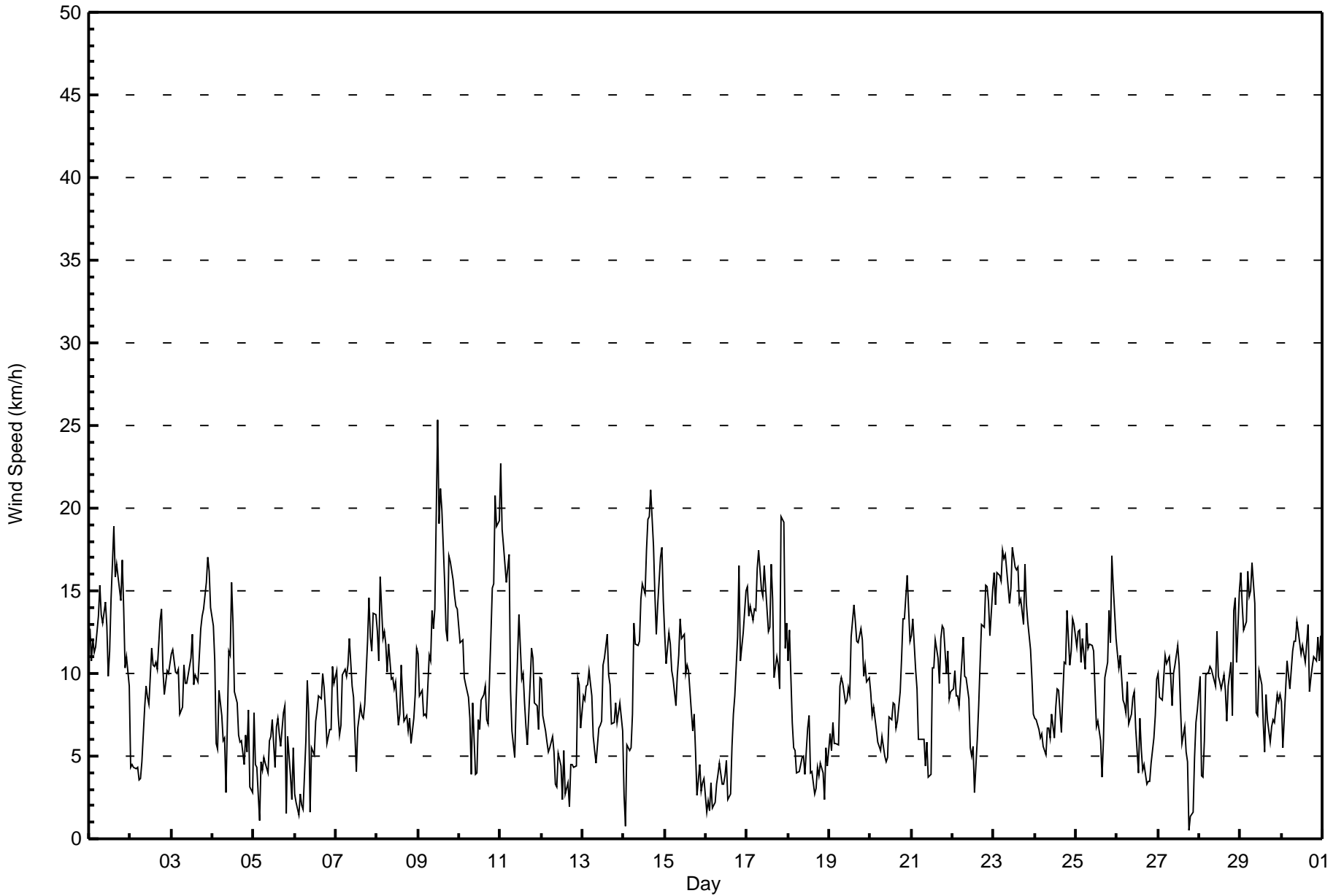
SSW3.4	SSW2.7	SSW3.0	SSW2.9	SSW3.9	SSW3.4	SSW3.4	SSW3.9	SSW3.7	SSW3.7	SSW4.5	SW4.6	SW4.5	SW4.9	SW4.9	SSW4.0	SSW3.9	SSW4.3	SSW4.7	SSW4.7	SSW3.9	SW4.4	SSW4.0	SSW3.7	Diurnal Average
SSE23	SSE19	S18	SSE16	S16	SSE17	SSE17	NW17	SSE15	NNW15	NW16	W25	W19	W21	W20	W20	W21	W18	W17	NW17	NW20	SSE21	SSE19	SSE19	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Cenovus - Christina Lake - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Cenovus - Christina Lake - November 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	130	18.06	18.06
6 - 11	377	52.36	70.42
12 - 19	205	28.47	98.89
20 - 28	8	1.11	100.00
29 - 38	0	0.00	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
Cenovus - Christina Lake - 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	1	3	4	8	11	12	15	20	18	16	10	7	2	1	2	0	130
6 - 11	10	3	21	19	5	7	26	35	60	58	63	42	13	4	7	4	377
12 - 19	8	1	0	5	3	5	17	30	24	8	10	32	14	10	34	4	205
20 - 28	0	0	0	0	0	0	0	2	0	0	0	0	5	0	1	0	8
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	19	7	25	32	19	24	58	87	102	82	83	81	34	15	44	8	720

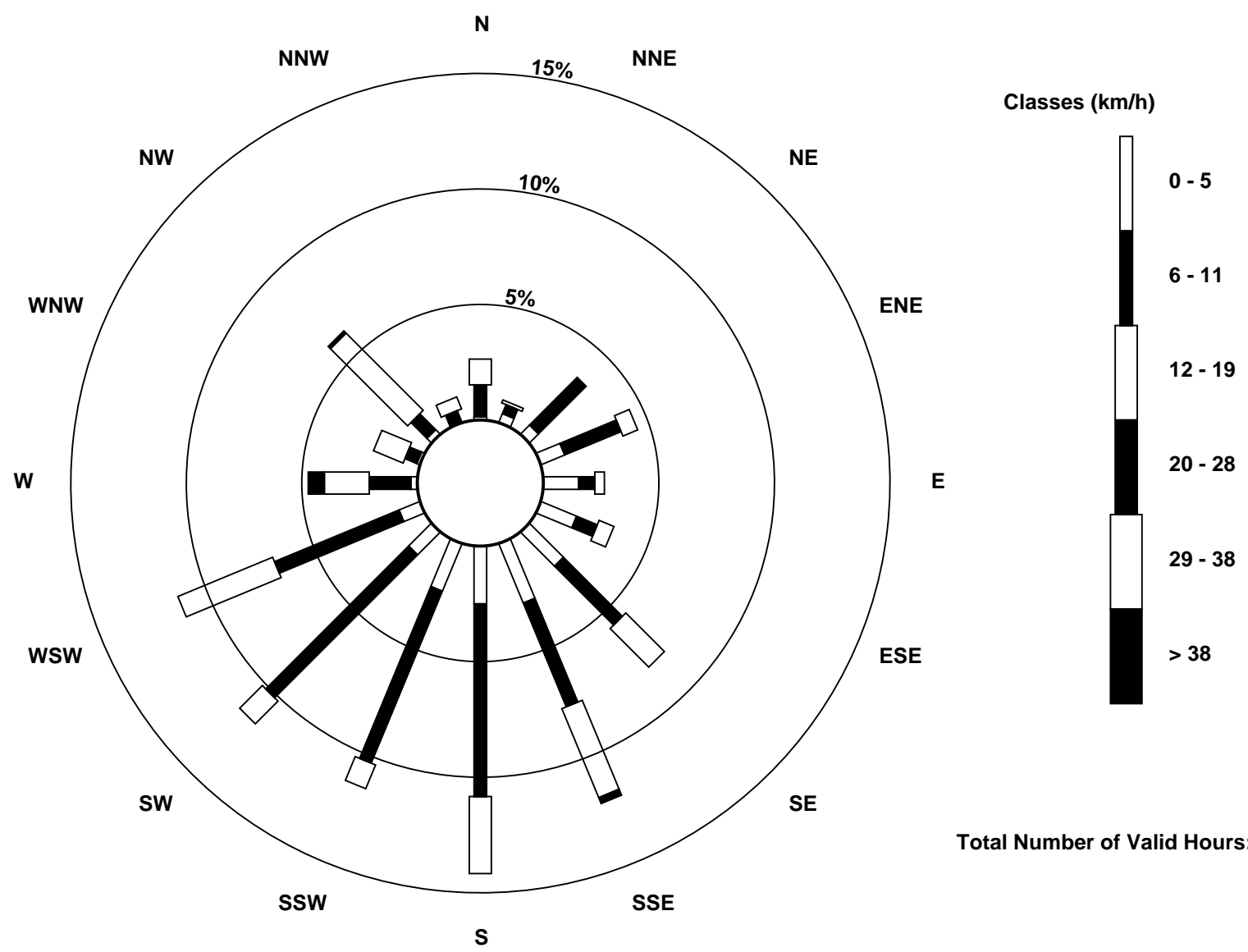
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
Cenovus - Christina Lake (AMS500)





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Cenovus - Christina Lake - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Nov 16 19:00																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Nov 24 07:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 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-Nov	3	3	2	2	3	3	3	4	3	3	4	3	4	4	5	4	3	3	4	4	4	4	2	2	5
2-Nov	2	1	1	1	1	1	1	2	2	4	3	3	3	3	3	3	3	5	5	3	3	4	3	3	5
3-Nov	3	3	3	3	3	2	3	3	3	3	3	4	3	3	2	2	3	4	4	4	4	5	4	4	5
4-Nov	4	3	2	2	2	2	2	3	1	3	3	4	4	3	3	1	1	2	2	2	1	3	2	1	4
5-Nov	3	2	1	1	1	3	2	2	2	2	2	4	1	2	2	2	2	1	2	2	2	2	2	2	3
6-Nov	2	2	1	1	1	1	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	3	2	3
7-Nov	3	2	2	2	2	3	2	2	3	2	2	2	2	3	3	2	1	1	2	3	3	3	3	3	3
8-Nov	4	3	4	3	4	3	3	3	3	2	2	4	2	2	3	2	2	2	2	2	2	2	2	3	4
9-Nov	3	2	2	2	2	4	3	3	4	3	6	7	6	6	6	4	4	4	4	4	4	4	3	4	7
10-Nov	3	3	3	2	2	2	3	1	2	1	2	3	2	2	3	2	1	2	3	3	4	5	4	4	5
11-Nov	5	4	5	4	4	4	3	3	2	2	3	4	3	3	2	2	2	3	4	4	2	2	1	2	5
12-Nov	2	2	1	2	2	1	2	2	1	1	1	1	1	4	2	1	2	2	1	3	3	3	3	3	4
13-Nov	2	3	3	3	2	2	2	2	1	1	3	2	3	4	4	3	2	2	2	2	2	2	2	2	4
14-Nov	1	3	2	2	1	3	4	3	3	4	4	5	5	5	6	6	6	5	4	3	4	4	5	4	6
15-Nov	3	3	4	3	2	2	3	3	3	3	4	3	3	3	3	1	1	1	1	1	1	1	1	1	4
16-Nov	1	1	1	2	1	1	1	1	1	1	1	3	2	1	2	1	1	2	7	4	2	2	3	3	7
17-Nov	3	3	3	3	4	3	4	4	3	3	4	4	3	4	4	4	3	3	3	3	5	5	3	2	5
18-Nov	2	2	3	2	2	1	1	1	1	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	3
19-Nov	2	1	1	1	1	2	1	2	3	1	2	2	2	2	3	2	2	2	2	3	2	2	2	2	3
20-Nov	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	2	3	3	3	3	4	3	4
21-Nov	3	3	2	2	1	1	2	1	1	1	1	2	3	2	2	2	2	3	3	3	2	3	2	2	3
22-Nov	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2	3	3	3	4	4	3	3	3	4
23-Nov	4	4	4	4	3	4	3	4	5	4	4	4	5	4	4	3	3	4	4	4	3	4	3	1	5
24-Nov	1	1	1	1	1	1	0	2	2	2	2	3	2	2	2	2	2	3	3	3	3	3	3	3	3
25-Nov	4	3	3	3	3	3	3	3	3	3	3	2	2	2	3	1	2	3	3	4	3	5	5	4	5
26-Nov	3	3	3	2	2	2	2	2	3	2	2	1	2	3	2	1	1	1	2	1	1	1	1	2	3
27-Nov	2	2	1	2	2	2	3	2	1	2	2	2	2	2	1	2	2	1	1	1	1	1	1	2	3
28-Nov	2	2	1	3	2	3	2	2	2	2	3	3	2	2	2	3	2	3	3	3	4	3	3	3	4
29-Nov	3	4	2	4	3	3	3	3	4	3	3	3	3	2	2	3	2	2	2	2	2	2	2	2	4
30-Nov	2	2	3	3	3	3	3	3	3	4	3	3	3	4	3	3	2	3	3	3	3	3	3	3	4
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Cenovus - Christina Lake - November 2016

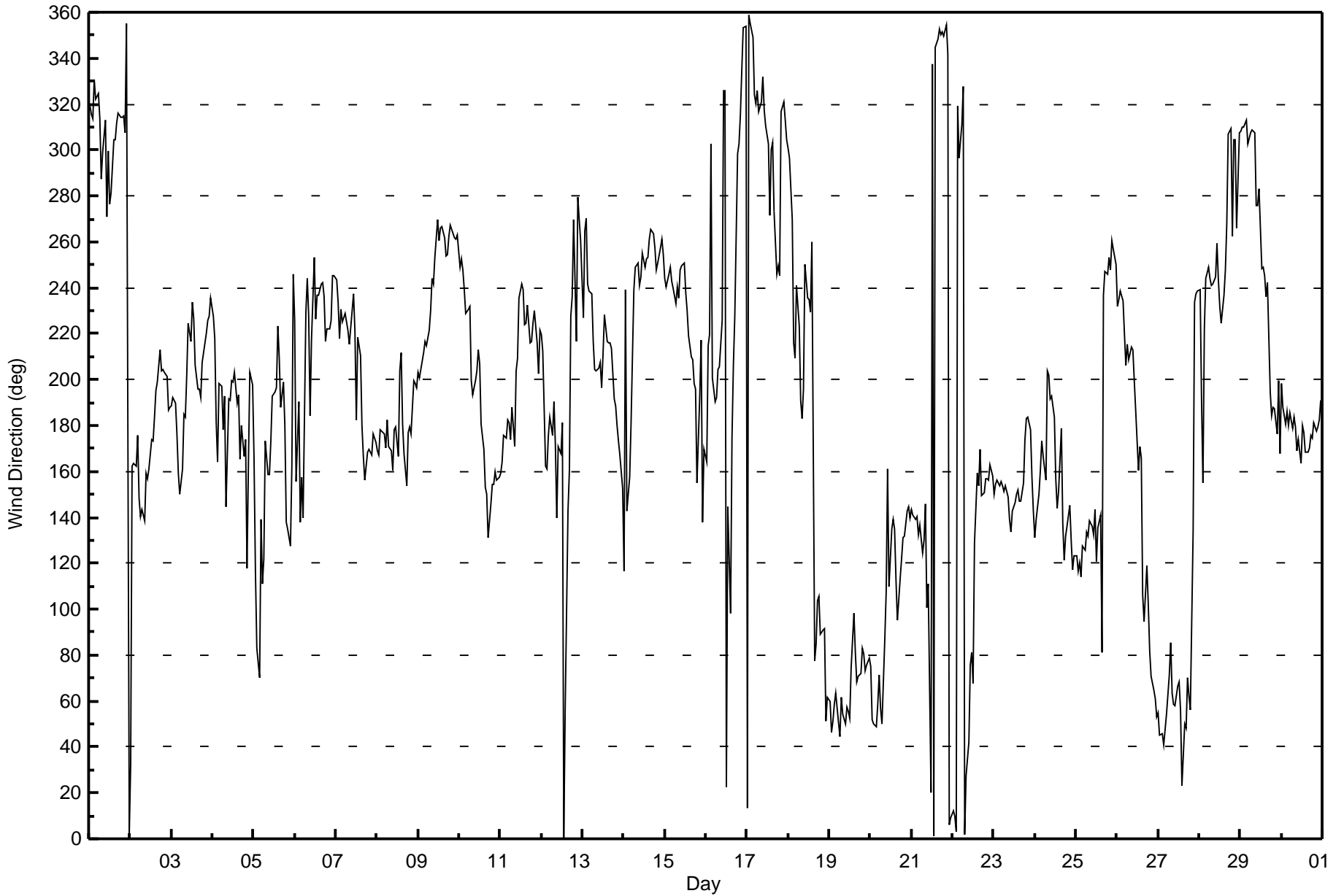
Direction of Maximum Speed: 270 deg on Nov 9 12:00 Direction of Maximum Daily Speed Average: 154.1 deg on Nov 23	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 62 deg on Nov 27 19:00 Direction of Minimum Daily Speed Average: 1.7 deg on Nov 18	Percent Operational Time: 100.0
Monthly Average Direction: 218.5 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-Nov	319	316	314	330	322	325	314	287	299	313	271	299	277	281	304	304	312	316	314	314	315	308	355	2	310.3
2-Nov	32	162	164	162	176	148	140	144	139	159	157	161	174	173	183	195	199	213	204	204	203	201	187	188	181.0
3-Nov	189	192	189	176	160	150	161	185	183	202	225	217	234	226	206	196	196	192	207	212	220	225	228	235	203.8
4-Nov	228	218	182	164	198	197	178	193	145	191	191	199	199	203	190	194	165	180	167	174	118	163	203	198	190.7
5-Nov	166	117	83	70	139	111	122	173	159	159	173	193	195	197	223	209	188	199	180	138	135	128	162	246	171.1
6-Nov	226	156	191	138	158	140	229	244	228	184	217	253	227	237	237	241	242	236	217	222	222	226	245	245	229.7
7-Nov	244	234	218	231	225	229	225	222	215	230	237	221	182	219	211	180	166	156	169	170	168	167	176	173	200.4
8-Nov	169	167	178	177	176	170	182	171	169	160	178	179	167	204	212	181	168	154	177	180	176	199	198	196	178.5
9-Nov	203	201	208	212	217	215	222	230	244	242	253	270	260	266	267	262	254	254	262	268	264	262	261	263	250.8
10-Nov	249	253	248	239	229	231	232	200	193	199	204	213	207	180	169	153	150	131	146	154	154	160	156	157	185.1
11-Nov	160	164	176	174	182	181	174	188	171	204	209	236	242	239	224	225	232	216	217	225	230	216	203	221	198.7
12-Nov	220	212	162	161	176	184	176	190	171	140	171	168	181	0	57	143	160	228	236	270	217	279	270	261	207.5
13-Nov	227	265	270	241	239	237	217	205	204	205	207	197	211	228	216	216	213	192	188	180	174	167	152	213.7	
14-Nov	117	239	143	158	181	211	239	249	251	241	245	255	249	253	253	261	265	264	257	248	251	258	261	255	249.3
15-Nov	244	240	246	249	243	240	233	240	235	248	249	251	238	230	219	210	209	198	196	155	193	217	138	169	232.0
16-Nov	164	215	220	303	200	190	192	204	205	226	326	326	22	144	98	175	206	227	298	303	315	335	353	354	296.4
17-Nov	13	359	355	349	324	320	326	316	321	332	317	310	303	271	300	304	273	246	250	245	317	321	313	305	314.5
18-Nov	301	297	270	216	209	241	223	191	183	196	250	235	235	230	260	77	85	103	106	89	91	92	52	62	231.5
19-Nov	60	46	52	59	64	51	45	62	54	50	58	55	52	75	99	81	68	71	72	83	80	73	76	79	67.7
20-Nov	75	52	50	49	58	71	56	50	87	107	161	110	135	139	135	113	95	114	122	131	132	143	145	140	111.4
21-Nov	143	141	139	140	132	136	124	130	146	101	111	20	337	1	345	348	353	350	352	350	354	342	6	9	29.0
22-Nov	12	10	3	319	297	311	328	2	27	42	75	81	68	129	159	154	170	150	151	157	157	156	163	158	120.3
23-Nov	150	154	156	154	155	154	151	154	149	139	133	143	146	150	152	147	147	155	174	183	184	178	158	143	154.1
24-Nov	131	139	150	160	173	167	156	204	202	192	193	184	157	144	151	179	137	121	132	136	145	130	117	123	149.1
25-Nov	123	117	120	114	128	126	133	132	139	136	133	143	121	135	141	81	237	247	246	253	248	261	257	250	164.9
26-Nov	232	235	239	234	220	207	215	209	214	213	200	187	161	171	166	106	95	119	102	82	71	65	61	53	191.7
27-Nov	55	45	46	41	48	54	71	85	63	59	58	67	68	56	23	50	48	70	62	56	134	234	238	239	57.7
28-Nov	239	191	155	222	244	249	244	241	242	244	259	244	232	225	237	248	268	307	309	262	304	304	266	307	259.6
29-Nov	308	310	310	313	302	305	307	309	308	276	276	283	248	249	245	236	242	194	184	188	187	176	199	168	275.9
30-Nov	198	188	180	186	180	186	179	183	179	169	174	164	180	177	169	168	170	176	174	181	178	179	182	191	178.3

200.8 202.2 192.5 196.4 202.2 204.5 207.5 209.4 204.1 198.7 210.5 218.1 214.1 214.1 215.8 206.7 206.5 201.4 203.5 203.8 206.6 213.9 206.8 206.6

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
Cenovus - Christina Lake - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 90 deg on Nov 14 02:00 Minimum Value: 6 deg on Nov 7 18:00 Percentiles: P ₁ = 9 P ₁₀ = 12 Q ₁ = 14 Median = 17 Q ₃ = 22 P ₉₀ = 38 P ₉₉ = 80																	Hours in Service: 720 Hours of Data: 720 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-Nov	17	17	13	12	20	16	14	24	22	17	24	28	25	27	20	21	14	12	13	16	19	34	17	18	34
2-Nov	68	29	17	17	17	33	20	24	14	16	24	21	19	16	19	19	19	19	22	22	22	20	14	18	68
3-Nov	15	16	17	17	12	15	17	18	19	29	26	21	21	23	19	17	14	14	18	17	18	17	17	18	29
4-Nov	17	17	23	33	14	14	21	47	54	15	16	17	19	22	19	17	19	27	38	19	30	30	71	45	71
5-Nov	23	47	38	83	31	55	22	41	43	27	18	32	32	32	19	19	22	16	15	81	31	54	85	50	85
6-Nov	74	81	78	58	64	69	49	14	53	90	52	51	26	17	14	14	13	13	11	12	12	15	16	17	90
7-Nov	17	17	21	18	16	16	17	15	15	19	20	26	37	30	24	14	11	6	10	11	15	13	12	13	37
8-Nov	14	18	14	18	15	17	20	14	20	15	18	22	33	23	19	21	19	18	17	14	19	19	19	15	33
9-Nov	16	17	16	22	20	25	18	19	20	17	21	16	18	16	17	18	17	18	16	16	16	17	16	17	25
10-Nov	15	16	15	13	15	15	22	42	18	37	42	22	22	23	18	11	8	10	14	11	12	11	11	10	42
11-Nov	12	12	14	14	14	14	19	22	38	21	21	20	21	21	19	22	26	16	18	22	22	15	11	14	38
12-Nov	14	14	8	14	34	19	10	40	32	28	11	22	70	52	60	47	68	34	25	56	74	30	29	32	74
13-Nov	16	33	26	19	12	13	22	43	20	16	28	20	19	20	19	18	15	17	12	12	14	16	12	22	43
14-Nov	31	90	42	33	16	21	21	16	16	18	18	19	18	19	18	17	16	16	17	16	17	16	15	18	90
15-Nov	18	17	18	17	16	18	21	22	20	19	19	17	21	20	17	14	11	10	15	43	59	43	22	27	59
16-Nov	66	66	56	73	63	66	17	10	15	40	37	71	40	62	64	16	10	11	46	9	13	21	16	15	73
17-Nov	14	17	18	18	15	14	13	15	14	15	18	22	31	25	19	18	34	18	21	19	25	13	16	10	34
18-Nov	11	9	43	32	30	29	30	34	18	32	47	26	24	54	60	58	43	16	26	19	20	40	18	28	60
19-Nov	36	28	12	20	17	23	10	12	13	12	12	11	13	13	15	12	10	11	10	12	11	10	11	11	36
20-Nov	10	11	11	12	16	14	13	28	13	24	20	18	22	17	14	18	12	12	14	14	14	14	15	14	28
21-Nov	13	13	13	14	16	14	13	18	16	21	21	42	21	19	21	19	21	16	17	16	20	24	16	16	42
22-Nov	16	16	24	17	25	15	14	16	15	11	17	20	24	61	29	18	19	13	18	15	14	14	14	13	61
23-Nov	13	14	13	13	12	12	12	13	13	15	15	13	16	17	14	13	14	15	13	16	17	18	16	14	18
24-Nov	11	11	12	13	11	14	21	18	22	16	16	30	19	21	17	30	16	18	18	17	19	15	15	16	30
25-Nov	15	12	13	18	14	19	13	16	15	16	16	18	22	26	26	40	20	19	16	16	17	17	18	18	40
26-Nov	18	20	19	20	17	18	16	18	21	16	16	17	49	21	29	22	20	37	51	28	16	9	11	11	51
27-Nov	10	9	11	10	12	10	13	14	14	10	12	11	11	11	14	14	12	18	73	80	56	18	16	19	80
28-Nov	18	50	37	45	16	19	17	15	14	17	20	18	16	17	16	27	39	22	20	39	28	18	28	11	50
29-Nov	9	12	12	14	9	9	10	11	14	30	31	23	22	27	42	20	25	32	24	19	17	20	18	16	42
30-Nov	21	24	16	17	16	17	14	15	15	15	15	14	18	16	17	15	13	15	14	15	14	15	15	18	24
																	Diurnal Maximum								
																	74 90 78 83 64 69 49 47 54 90 52 71 70 62 64 58 68 37 73 81 74 54 85 50								



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 9, 2016	Last Calibration	October 26, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	9:35	End Time (MST)	13:25
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	839	840
Calculated slope	0.997230	0.998721	Chamber temp	44.9	45.0
Calculated intercept	0.218387	0.516256	Pressure	680.2	677.3
Analyzer Background	12.5	12.5	Flow	0.592	0.591
Analyzer Coefficient	1.028	1.028	Intensity	90	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	0.5	----
as found span	5000	79.3	793.0	794.2	0.998
calibrator zero	5000	0.0	0.0	0.5	----
high point	5000	79.3	793.0	794.2	0.998
second point	5000	39.7	397.0	395.9	1.003
third point	5000	19.8	198.0	197.1	1.005
as left zero	5000	0.0	0.0	0.7	----
as left span	5000	79.3	793.0	796.8	0.995
Average Correction Factor					1.002

Corrected As found 793.7 Previous response 795.0 % change 0.2%

Notes:

Changed inlet filter after as founds. No adjustments. As lefts began around 12:48 MST.

Calibration Performed By: Asad Hidayat



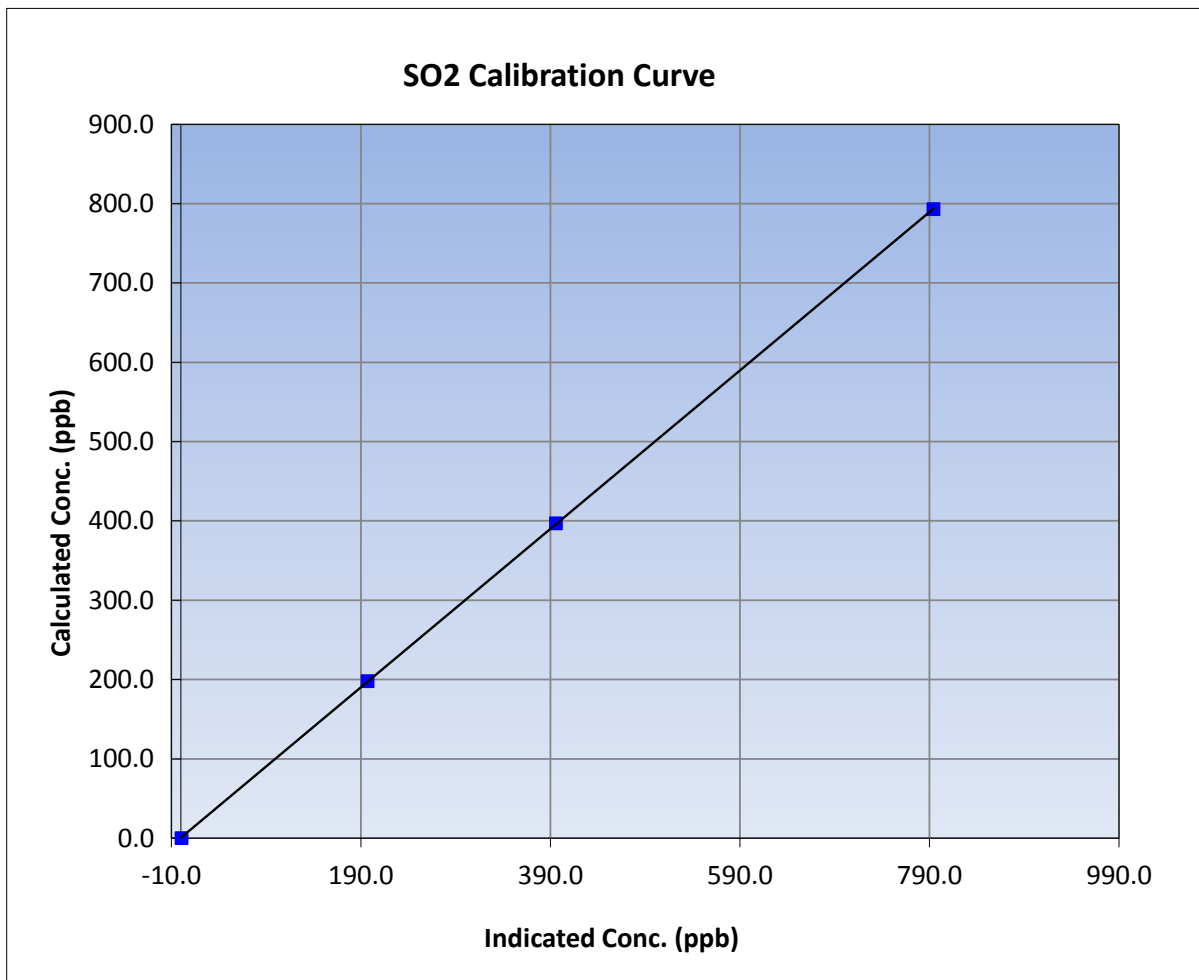
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 26, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Start Time (MST)	9:35	End Time (MST)	13:25
Analyzer make	Thermo 43i	Analyzer serial #	1118148497

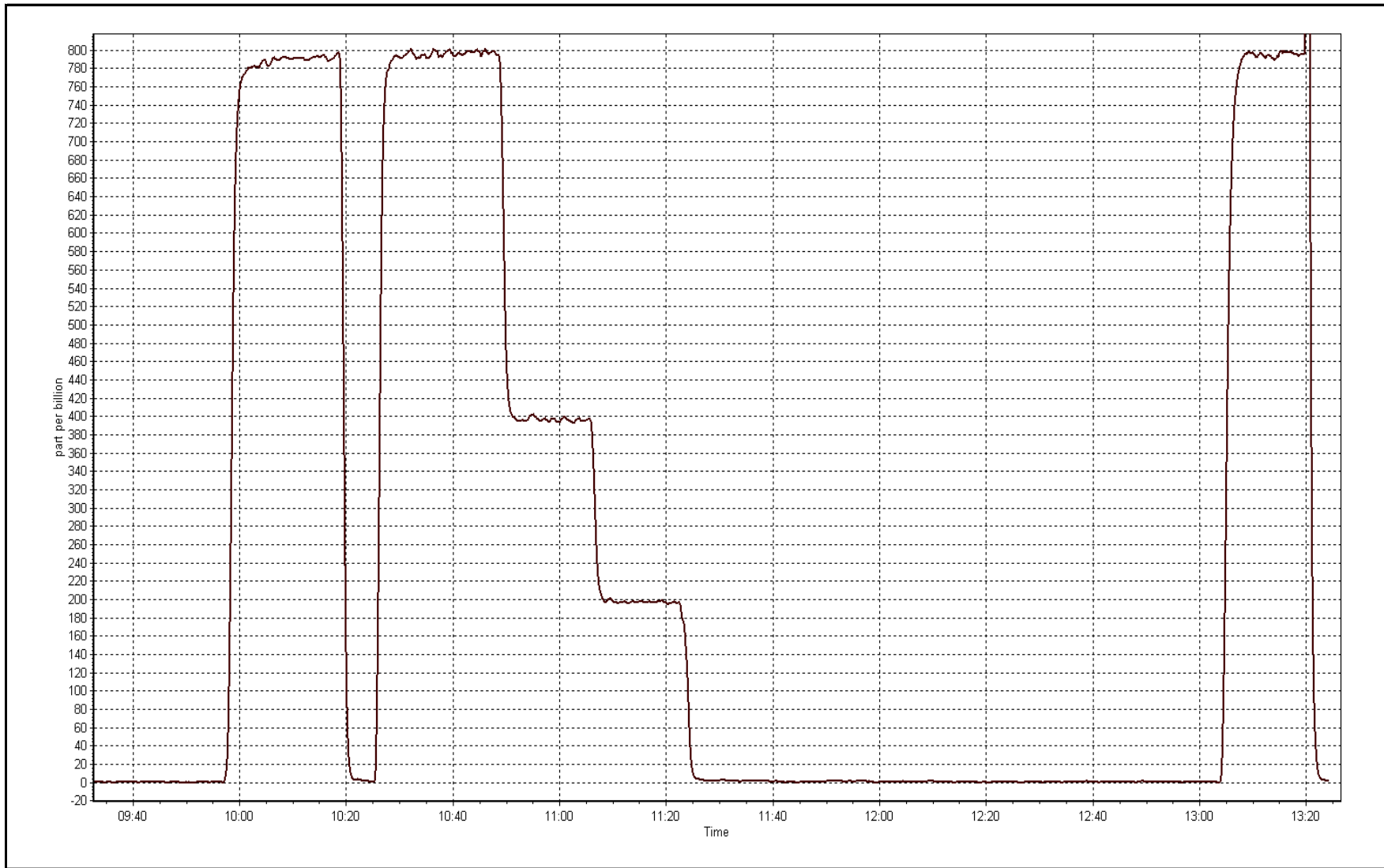
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999990
793.0	794.2	0.9985		
397.0	395.9	1.0029	Slope	0.998721
198.0	197.1	1.0046		
			Intercept	0.516256



SO2 Calibration Plot

Date: November 9, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 9, 2016	Last Calibration	October 25, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	13:20	End Time (MST)	15:50
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	-681
Analyzer IP address	192.168.1.35		Lamp voltage	975	971
Calculated slope	0.993598	0.992900	Chamber temp	45	45
Calculated intercept	0.089685	0.049692	Pressure	660.5	659.0
Analyzer Background	1.5	1.51	Flow	0.441	0.439
Analyzer Coefficient	0.844	0.849	Intensity	91	91
			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	0.0	----
as found span	5000	78.5	80.1	78.9	1.015
SO2 scrubber check	5000	19.8	198.0	1.4	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	78.5	80.1	80.6	0.993
second point	5000	39.3	40.1	40.2	0.996
third point	5000	19.6	20.0	20.1	0.995
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	78.5	80.1	80.5	0.994
Average Correction Factor					0.995

Corrected As found	78.9	Previous response	80.5	% change	2.0%
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Notes:

Inlet filter changed after as founds. Slightly adjusted span. Sox scrubber test completed after 3rd point.

Calibration Performed By: Asad Hidayat



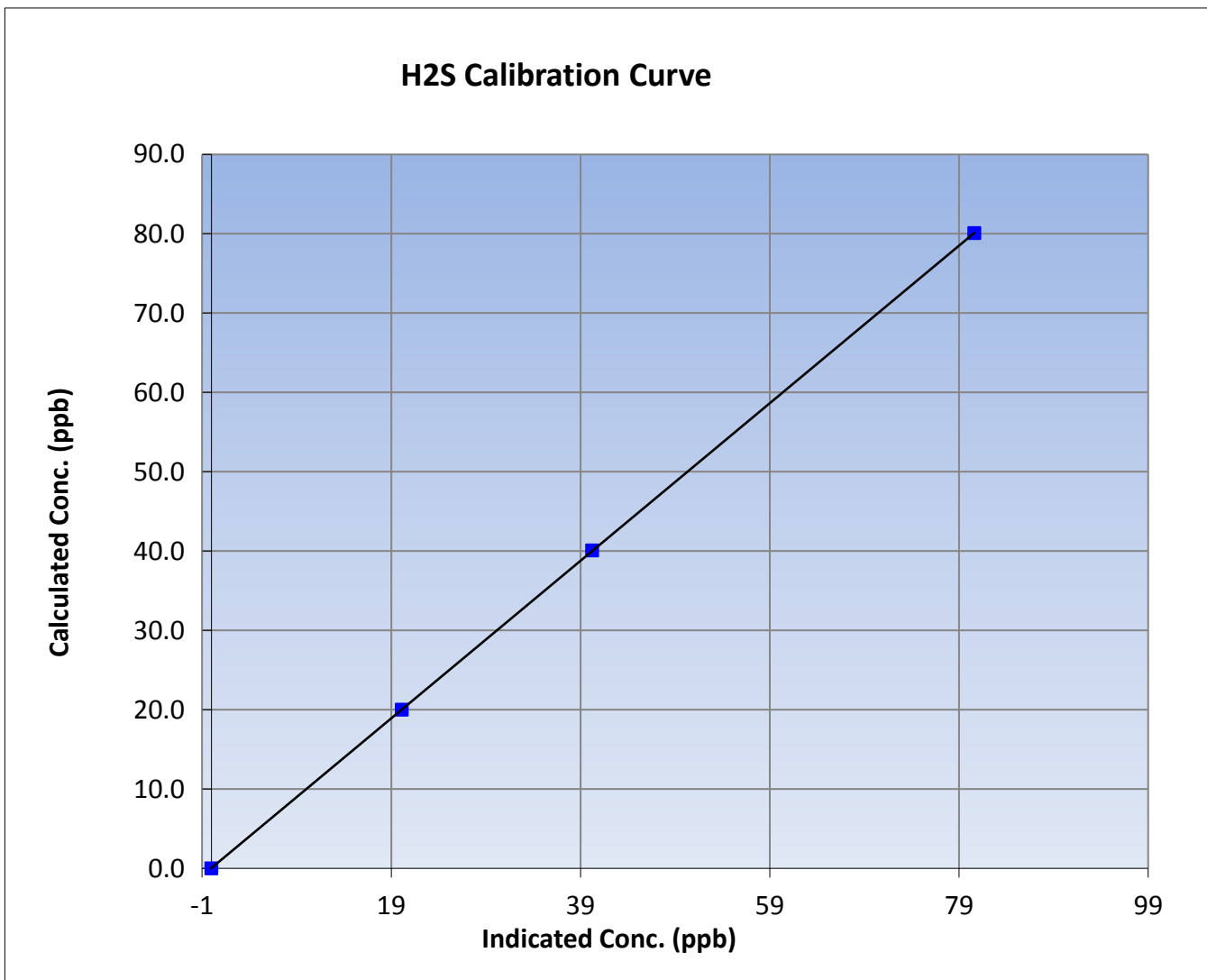
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 25, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	13:20	End Time (MST)	15:50
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1008841400

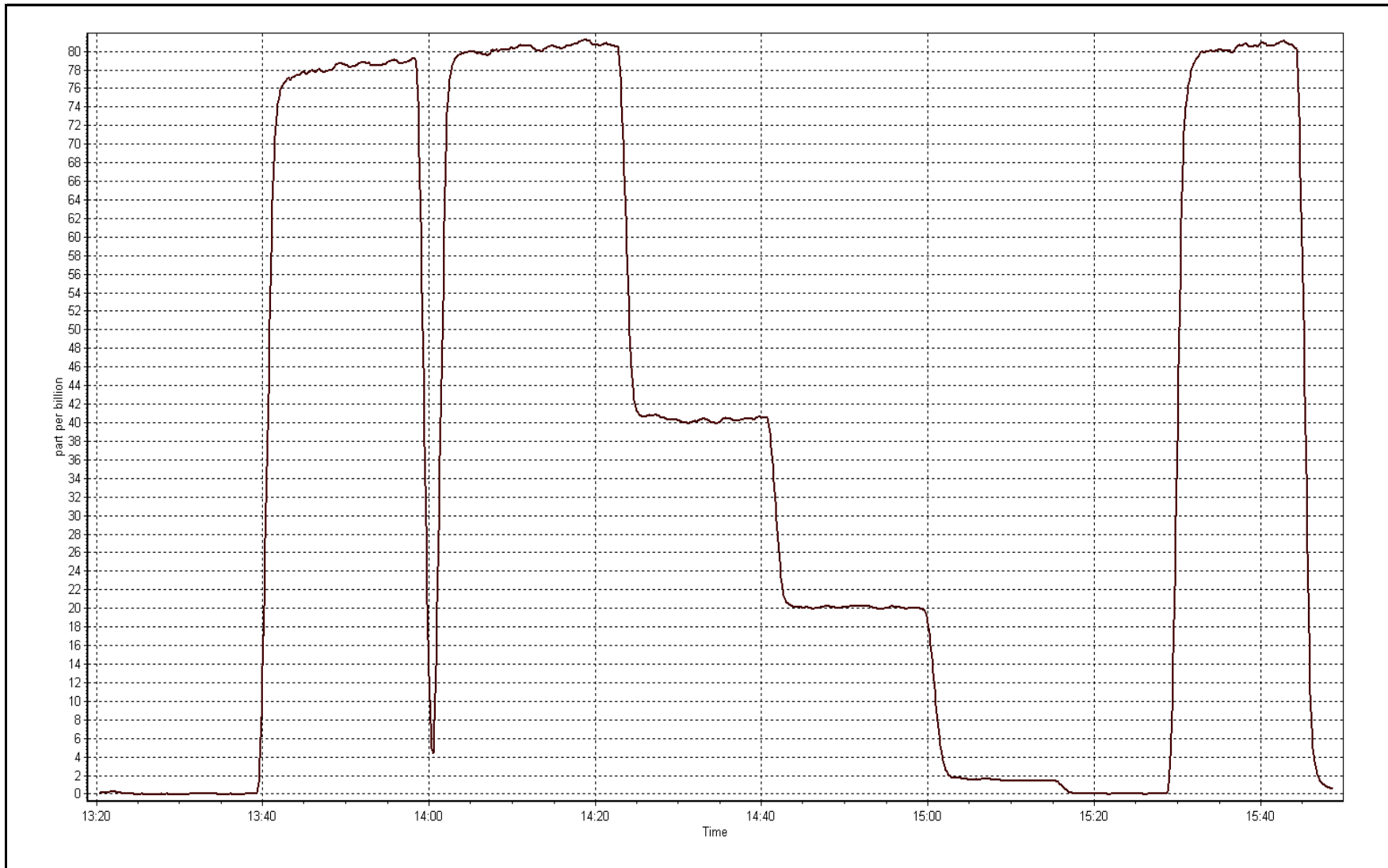
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
80.1	80.6	0.9931		
40.1	40.2	0.9962	Slope	0.992900
20.0	20.1	0.9946		
			Intercept	0.049692



H2S Calibration Plot

Date: November 9, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	9:35	End Time (MST)	13:25
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	0.999838	1.000675	0.996209
	Data Offset	1.909886	1.872599	-0.171822
Current Calibration	Data Slope	0.994696	0.993451	1.010949
	Data Offset	1.503710	1.280374	-0.158167

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	0.982		0.999	
NOx coefficient	0.987		1.002	
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	314.6	Deg C	315.4	Deg C
PMT voltage	826	V	826	V
PMT Temp	6.9	Deg C	6.9	Deg C
O3 flow	85	ccm	85	ccm
R Cell press NO	4.9	mmHg	5.1	mmHg
R Cell Press Nox	4.9	mmHg	4.9	mmHg
NO sample flow	0.491	lpm	0.489	lpm
Nox sample Flow	0.485	lpm	0.484	lpm

Notes:

Inlet filter changed after as founds. Adjusted span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: November 9, 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	0.2	-0.2	0.3	----	----
as found span	5000	79.3	805.7	800.9	4.8	796.1	789.7	6.4	1.0121	1.0142
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	-0.2	0.3	----	----
high point	5000	79.3	805.7	800.9	4.8	809.3	805.3	4.0	0.9956	0.9946
second point	5000	39.6	402.3	400.0	2.4	402.3	401.4	0.9	1.0001	0.9964
third point	5000	19.8	201.2	200.0	1.2	198.9	198.5	0.5	1.0113	1.0077
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.4	-0.4	----	----
as left span	5000	79.3	805.7	610.9	194.8	806.9	610.7	196.2	0.9985	1.0004
Average Correction Factor									1.0023	0.9996

Corrcted As found NO_x= 795.9 NO= 789.9 Percent Change NO_x= 1.0% NO= 1.1%
 Previous Response NO_x= 803.9 NO= 798.5

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	807.4	803.9	0.3	0.9979	0.9963	----	----
1st NO2 (600)	610.9	197.8	806.7	610.9	195.8	0.9988	----	1.0099	99.0%
2nd NO2 (400)	675.6	133.1	807.5	675.6	131.9	0.9978	----	1.0089	99.1%
3rd NO2 (200)	736.0	72.6	807.7	736.0	71.7	0.9975	----	1.0132	98.7%
2nd NO ref point		4.8	806.3	803.0	3.3	0.9992	0.9974	----	----
Average Correction Factor						0.9983		1.0107	98.9%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

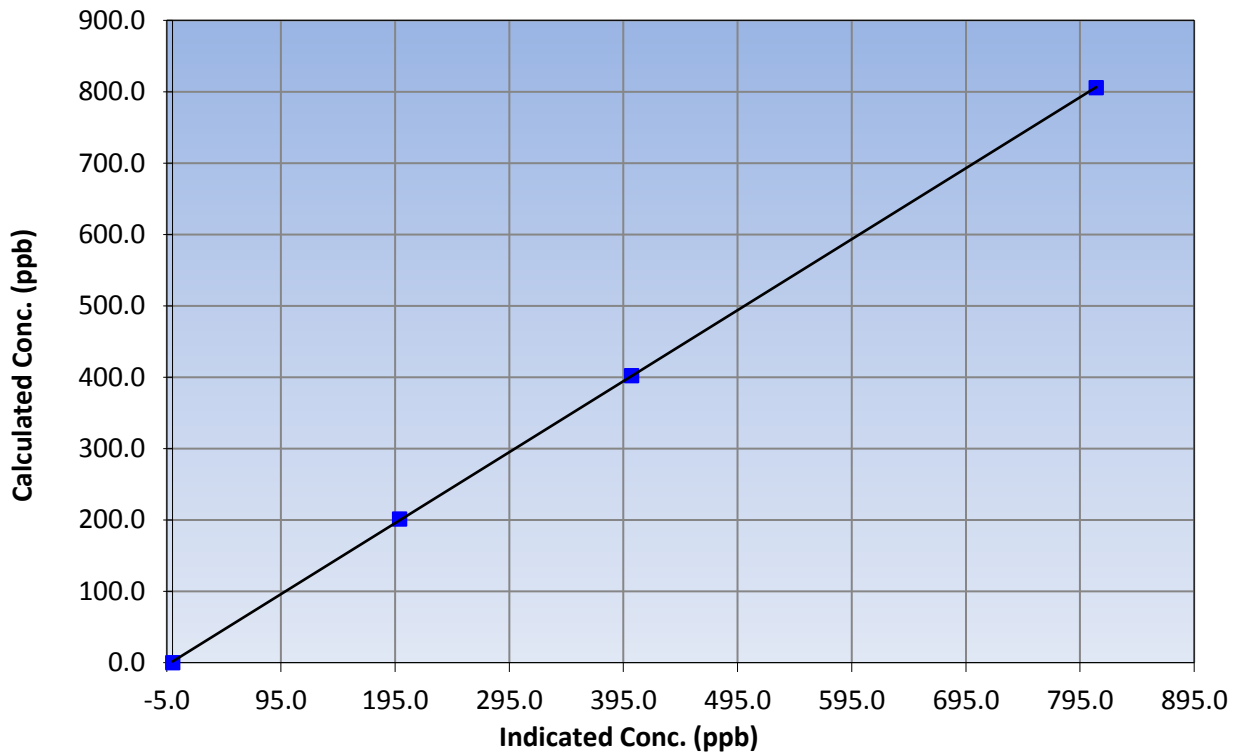
Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	9:35	End Time (MST)	13:25
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	0.2	----	Correlation Coefficient	0.999980
805.7	809.3	0.9956		
402.3	402.3	1.0001	Slope	0.994696
201.2	198.9	1.0113		
			Intercept	1.503710

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

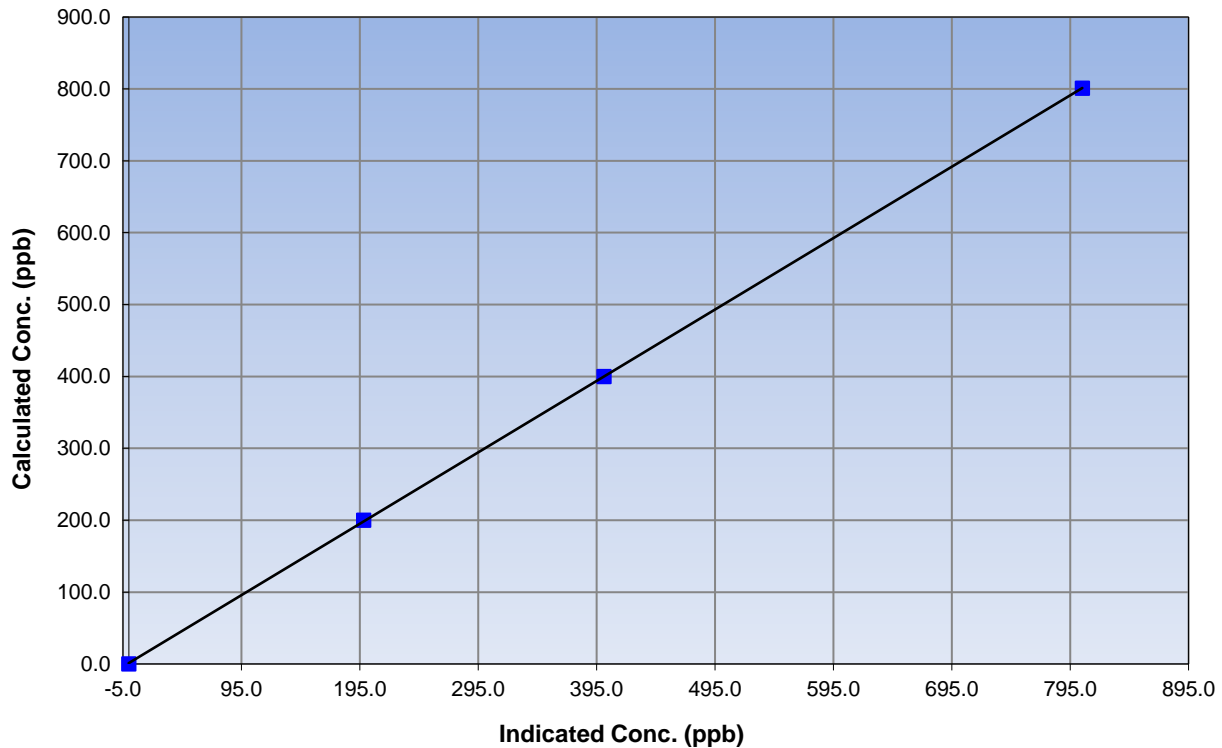
Station Information

Calibration Date	November 9, 2016	Previous Calibration	October 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	9:35	End Time (MST)	13:25
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	-0.2	N/A	Correlation Coefficient	0.999989
800.9	805.3	0.9946		
400.0	401.4	0.9964	Slope	0.993451
200.0	198.5	1.0077		
			Intercept	1.280374

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

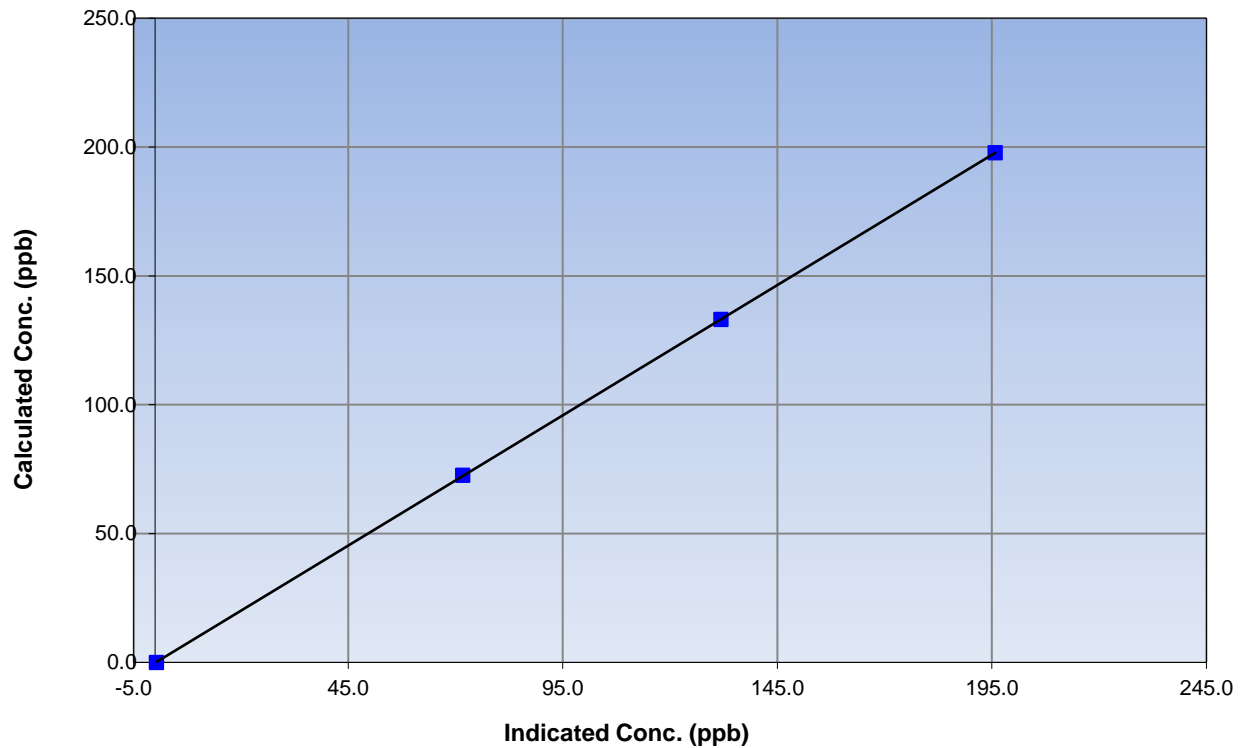
Station Information

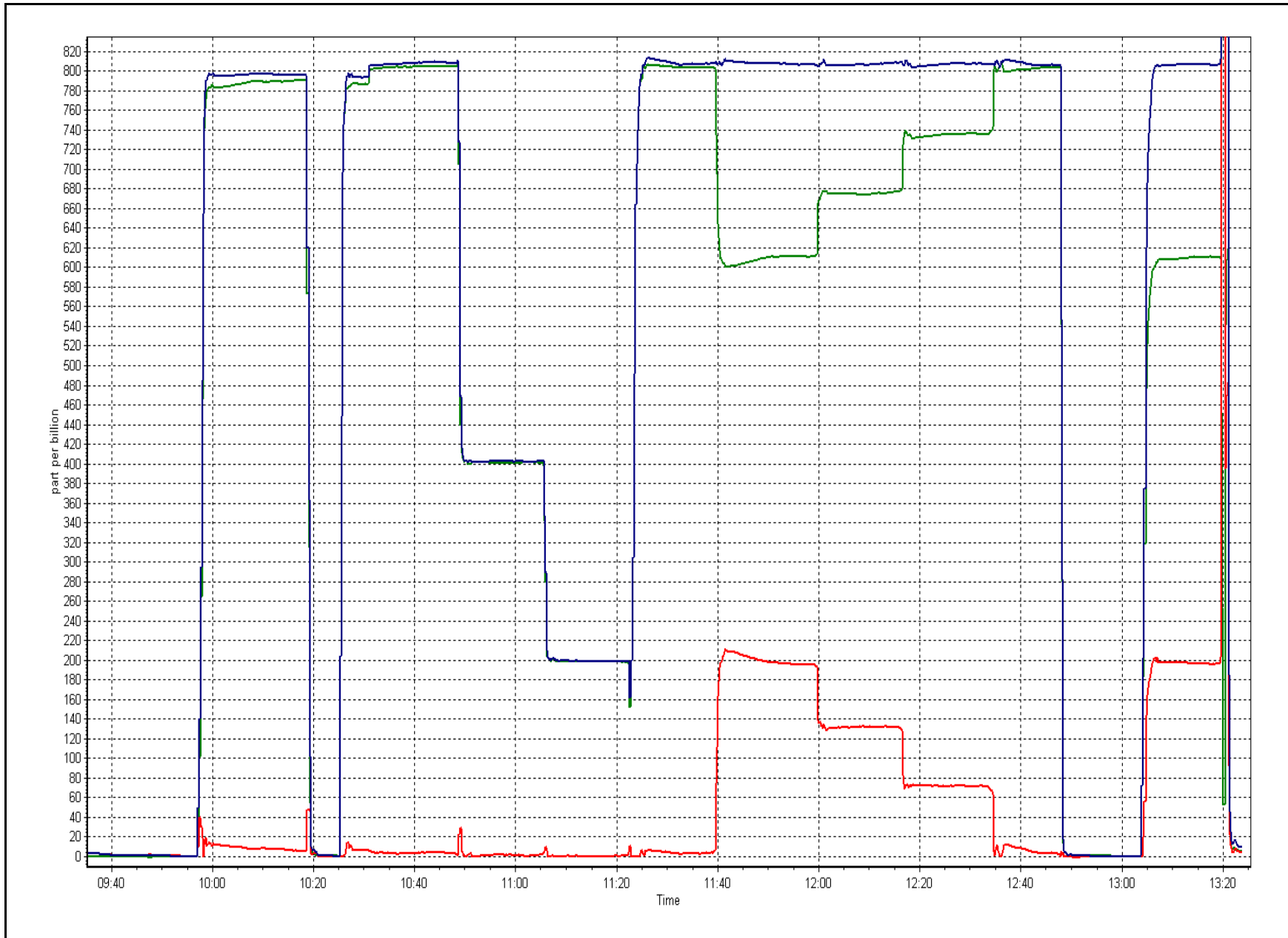
Calibration Date	November 9, 2016	Previous Calibration	October 26, 2016
Station Number	Cenovus	Station Number	AMS 500
Start Time (MST)	9:35	End Time (MST)	13:25
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999993
197.8	195.8	1.0099		
133.1	131.9	1.0089	Slope	1.010949
72.6	71.7	1.0132		
			Intercept	-0.158167

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 502
CONOCOPHILLIPS
SURMONT
NOVEMBER 2016**

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

December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
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	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)
 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	684	0.9	1	-	0	0	0	1	1	2	10
H2S (ppb) Average	680	0.3	0	-	0	0	0	0	0	0	3
NO2 (ppb) Average	685	2.3	2	-	0	1	1	2	3	5	12
NO (ppb) Average	685	0.9	1	-	0	0	0	1	1	2	7
NOX (ppb) Average	685	3.2	2	-	0	1	1	2	4	6	15
Temperature 2 m (C) Average	720	-0.54	7.2	-	-15.3	-9.8	-5.6	-2.7	6.1	9.6	15.4
Relative Humidity (%) Average	720	77.2	17	-	29	54	65	80	93	96	99
Wind Speed 10 m (km/h) Average	720	13.9	6	-	1	6	9	13	18	23	32
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
NOVEMBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	18 Nov 2016 09:00	18 Nov 2016 09:00	1	Unstable operation - excessive baseline drift
H2S	02 Nov 2016 08:00	02 Nov 2016 08:00	1	Unstable operation - excessive baseline drift
H2S	07 Nov 2016 13:00	07 Nov 2016 13:00	1	Maintenance - sample manifold cleaned
H2S	20 Nov 2016 06:00	20 Nov 2016 07:00	2	Unstable operation - excessive baseline drift
H2S	26 Nov 2016 11:00	26 Nov 2016 11:00	1	Unstable operation - excessive baseline drift
H2S	29 Nov 2016 17:00	29 Nov 2016 18:00	2	Unstable operation - excessive baseline drift



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

ConocoPhillips - Surmont - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 10 ppb on Nov 17 20:00	Maximum Daily Average: 4.1 ppb on Nov 17
Minimum Value: 0 ppb on Nov 2 08:00	Hours of Data: 684
Maximum Diurnal Average: 1.2 ppb at hour 2	Hours of Missing Data: 36
Monthly Average: 0.9 ppb	Hours of Calibration: 35
Minimum Daily Average: 0.3 ppb on Nov 3	Percent Operational Time: 99.9
Minimum Diurnal Average: 0.7 ppb at hour 22	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P 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-Nov	0	1	1	2	2	Z	1	2	1	1	1	1	1	1	1	1	0	0	1	1	2	1	1	1	1.0	2
2-Nov	Z	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0.7	2
3-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	0.3	0
4-Nov	0	0	Z	0	0	0	0	0	0	1	1	2	1	1	1	1	1	1	1	1	1	2	2	3	1.1	3
5-Nov	1	1	1	Z	1	1	2	2	2	1	1	1	1	2	2	1	1	1	1	1	1	1	3	2	1.3	3
6-Nov	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0.5	1
7-Nov	1	0	0	0	0	Z	1	1	1	1	0	C	C	C	C	C	1	1	1	1	1	1	1	1	0.7	1
8-Nov	Z	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	2	1	2	2	2	1	1	1.3	2
9-Nov	1	Z	1	1	1	1	0	1	1	1	1	1	1	2	1	1	1	0	0	0	0	0	0	0	0.7	2
10-Nov	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	1	1	1	3	4	0.9	4
11-Nov	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.7	1
12-Nov	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0.6	1
13-Nov	1	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1
14-Nov	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
15-Nov	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	1	0	0	0.5	1
16-Nov	2	5	Z	5	2	2	2	2	1	1	0	2	5	7	8	9	6	3	3	1	0	0	0	0	3.0	9
17-Nov	1	6	3	Z	6	6	3	6	7	8	6	7	1	1	2	3	3	3	6	10	4	2	1	0	4.1	10
18-Nov	0	0	0	1	Z	0	0	0	0	UO	0	1	1	1	1	1	1	1	1	0	0	0	1	2	0.6	2
19-Nov	4	4	3	1	1	Z	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	4
20-Nov	Z	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
21-Nov	1	Z	1	1	1	1	1	1	1	1	0	0	1	2	1	1	1	1	2	1	1	1	1	1	0.9	2
22-Nov	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.7	1
23-Nov	2	1	2	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.6	2
24-Nov	0	0	1	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	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	0.3	0
26-Nov	Z	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0.5	1
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	0.4	0
28-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	4	0.6	4
29-Nov	6	4	3	Z	2	3	3	4	3	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1.5	6
30-Nov	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0.4	1

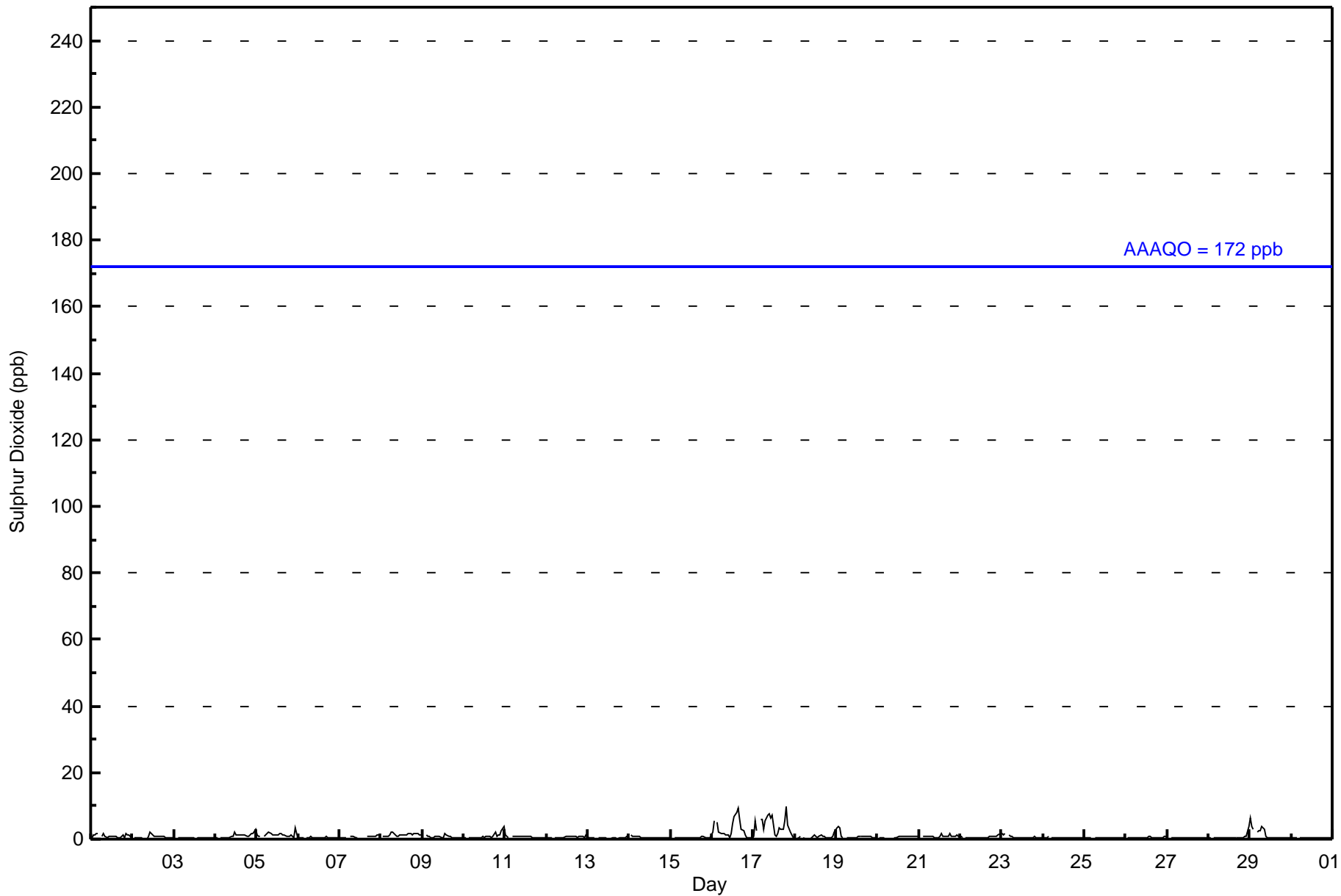
1.0	1.2	0.9	0.7	0.9	0.9	0.8	0.9	0.9	0.8	0.8	1.0	0.8	0.9	1.0	1.0	0.9	0.8	1.0	0.9	0.8	0.7	0.8	1.0	Diurnal Average
6	6	3	5	6	6	3	6	7	8	6	7	5	7	8	9	6	3	6	10	4	2	3	4	Diurnal Maximum

Z - zerspan C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surtmont - November 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - 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	18	6	3	3	13	28	61	34	74	53	55	91	128	68	20	29	684
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	18	6	3	3	13	28	61	34	74	53	55	91	128	68	20	29	684

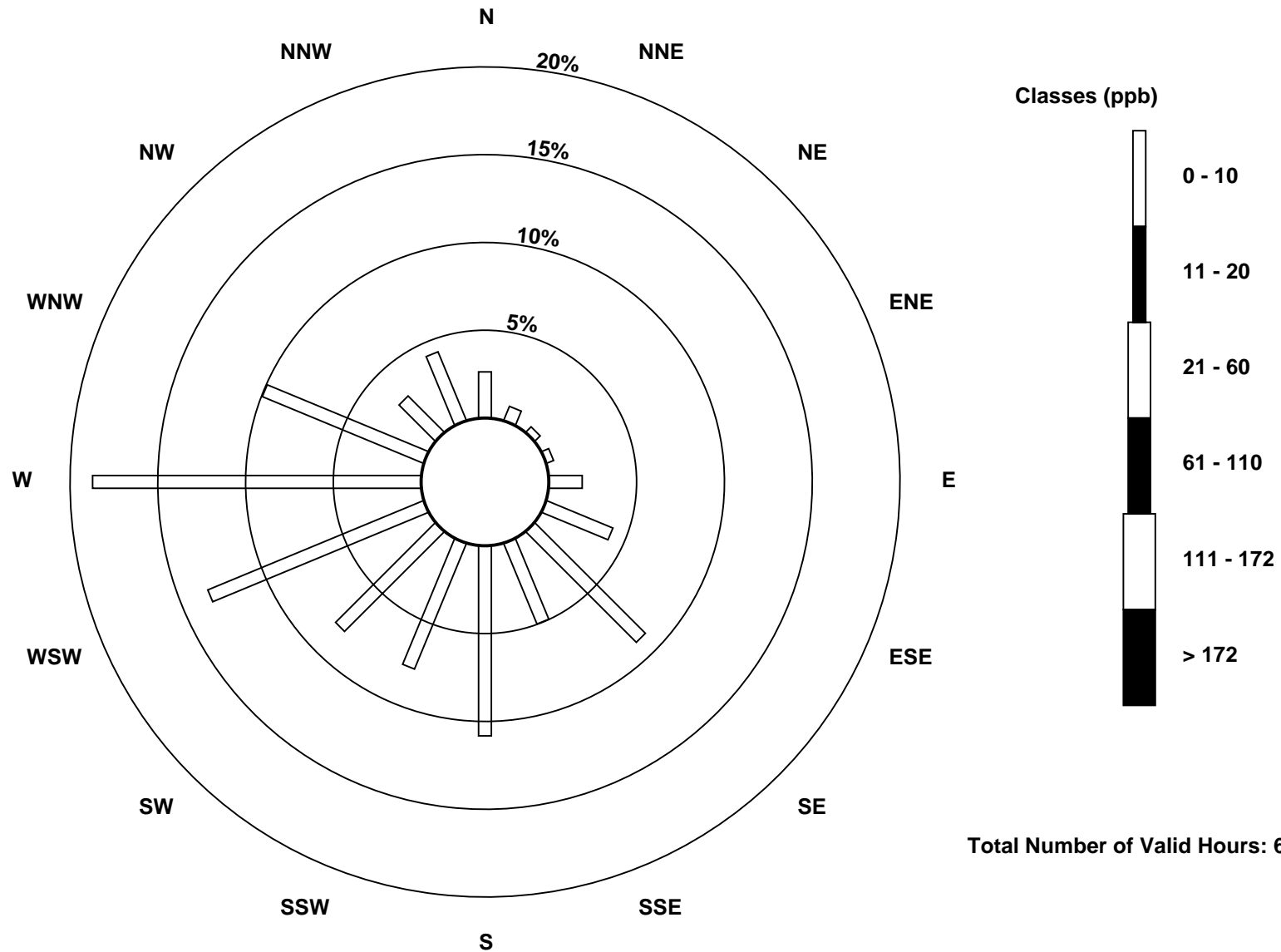
Total Number of Valid Hours: 684

Total Number of Hours: 720

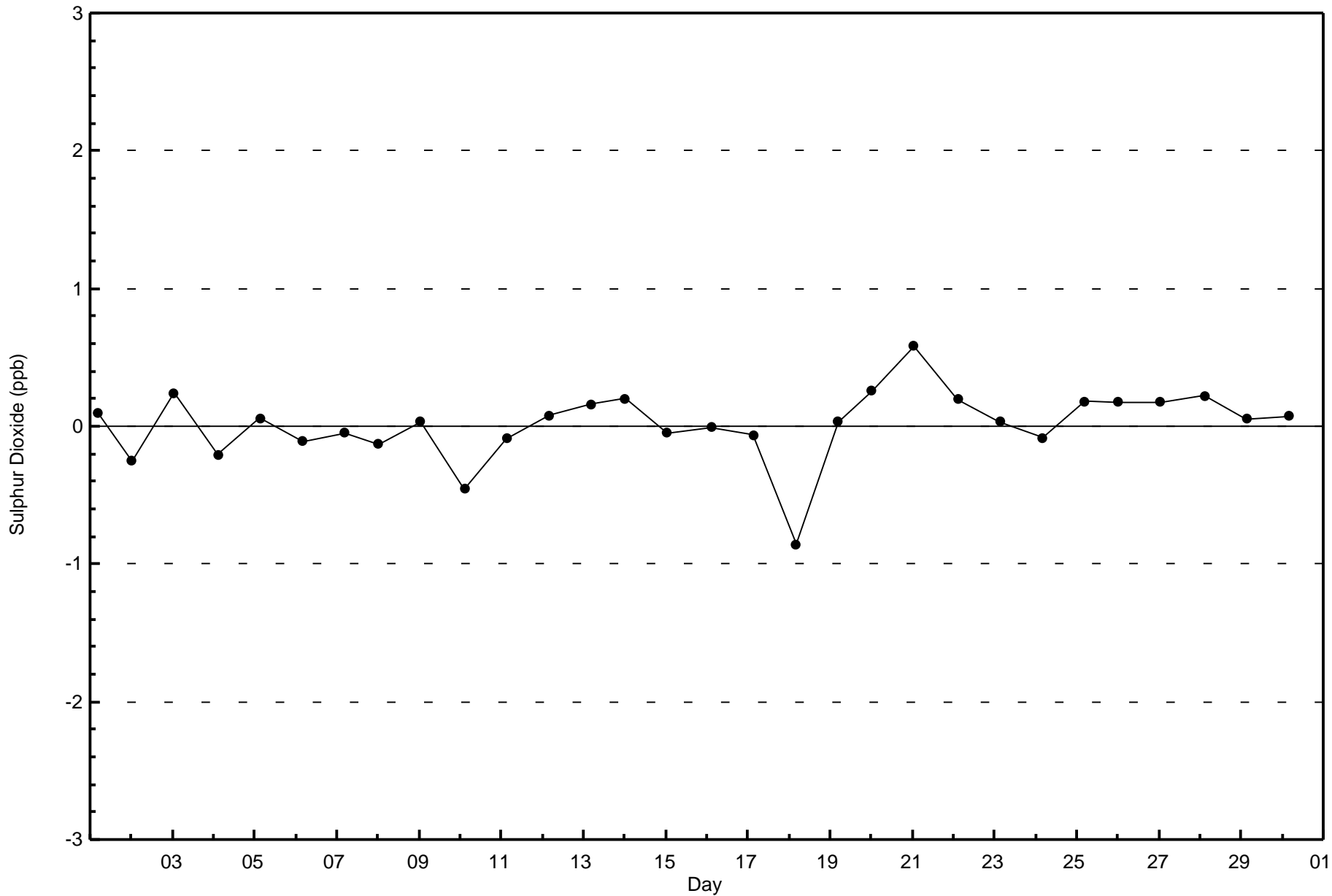


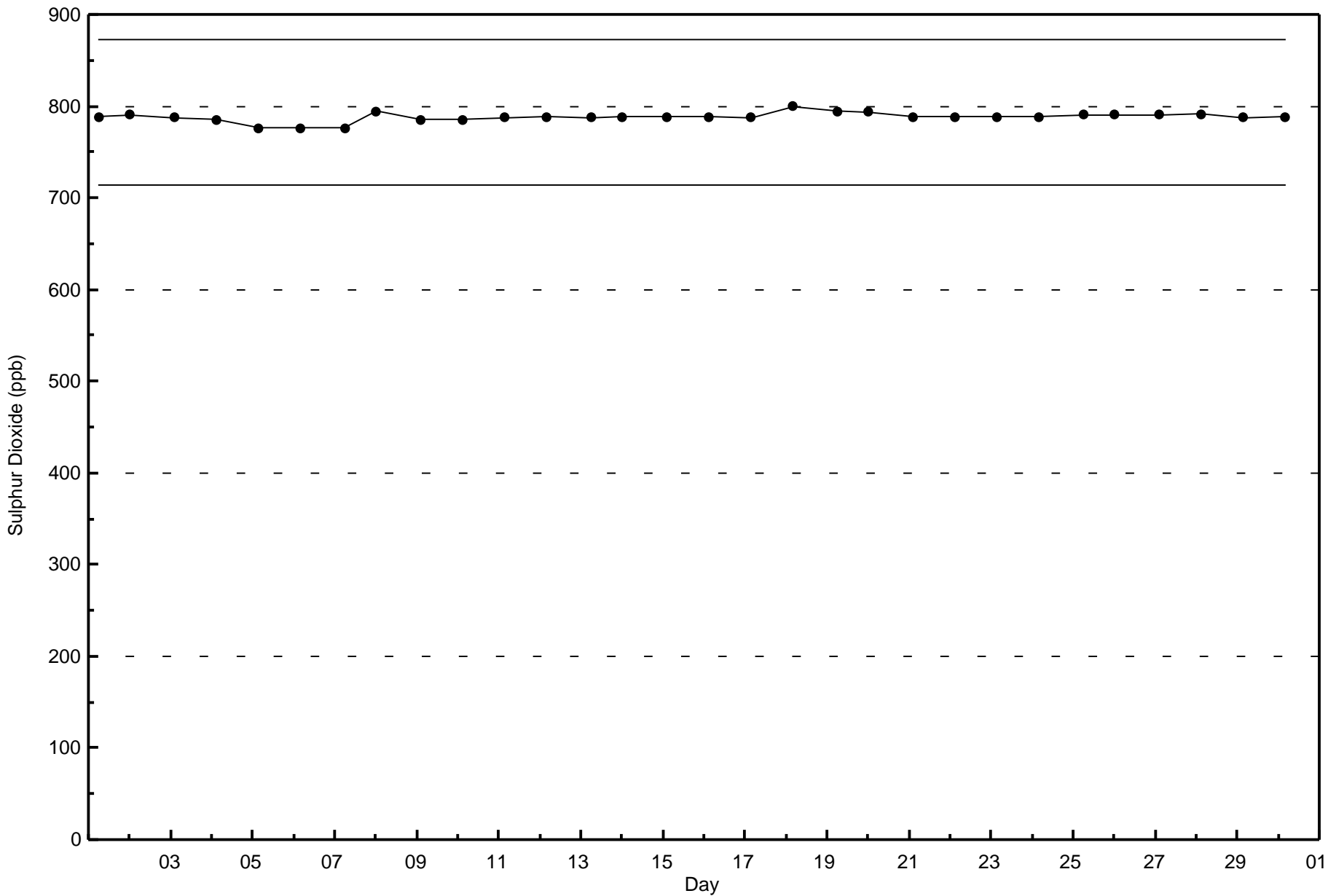
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont (AMS502)



Total Number of Valid Hours: 684







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 3 ppb on Nov 16 19:00	Maximum Daily Average: 0.7 ppb on Nov 16
Minimum Value: 0 ppb on Nov 17 21:00	Hours of Data: 680
Maximum Diurnal Average: 0.4 ppb at hour 19	Hours of Missing Data: 40
Monthly Average: 0.3 ppb	Hours of Calibration: 33
Minimum Daily Average: 0.1 ppb on Nov 13	Percent Operational Time: 99.0
Minimum Diurnal Average: 0.2 ppb at hour 12	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q 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-Nov	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-Nov	0	Z	0	1	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
3-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	0.2	0
4-Nov	0	0	0	Z	0	0	0	0	0	1	0	C	C	C	0	0	1	0	0	0	0	0	1	1	0.4	1	
5-Nov	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1	
6-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	
7-Nov	0	0	0	0	0	0	Z	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
8-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	0.3	0	
9-Nov	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
10-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	0.2	0	
11-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	0.3	0	
12-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.3	1	
13-Nov	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-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	0.3	0	
15-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	0.2	0	
16-Nov	0	0	0	Z	0	0	0	0	0	1	1	0	1	1	0	0	0	2	3	2	1	1	0	1	0.7	3	
17-Nov	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
18-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.2	1	
19-Nov	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	
20-Nov	0	Z	0	0	0	UO	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
21-Nov	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
22-Nov	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
23-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	0.2	0	
24-Nov	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
25-Nov	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-Nov	0	Z	0	0	0	0	0	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
27-Nov	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
28-Nov	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	1	
29-Nov	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	UO	UO	0	0	0	0	0	0	0.3	1	
30-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	

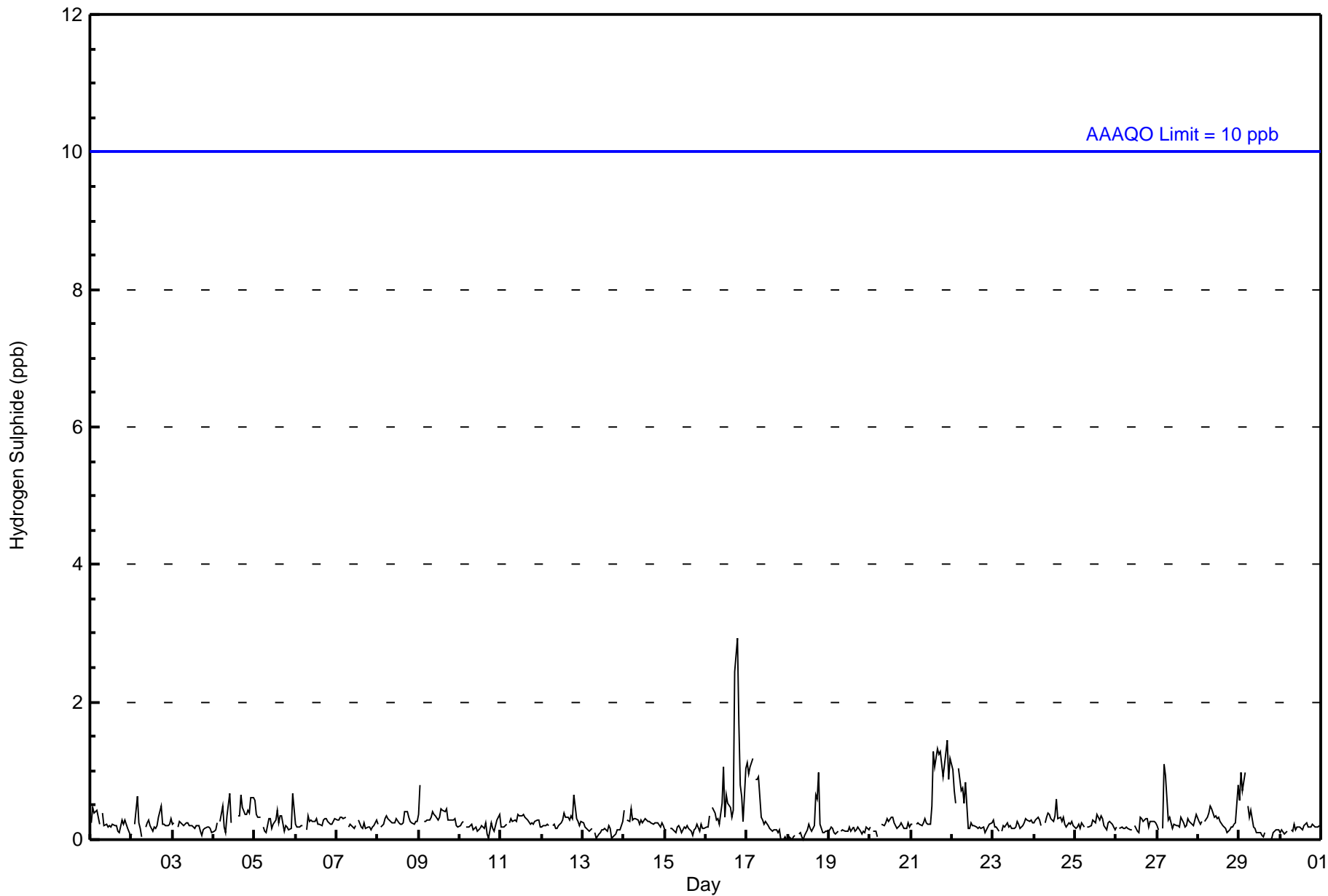
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	Diurnal Average
1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	2	3	2	1	1	1	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surrmont - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - November 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	679	99.85	99.85
3 - 4	1	0.15	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: 680

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - 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 - 2	18	6	3	3	13	27	61	33	74	50	55	92	128	68	19	29	679
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
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	18	6	3	3	13	27	61	33	74	50	55	92	128	68	19	30	680

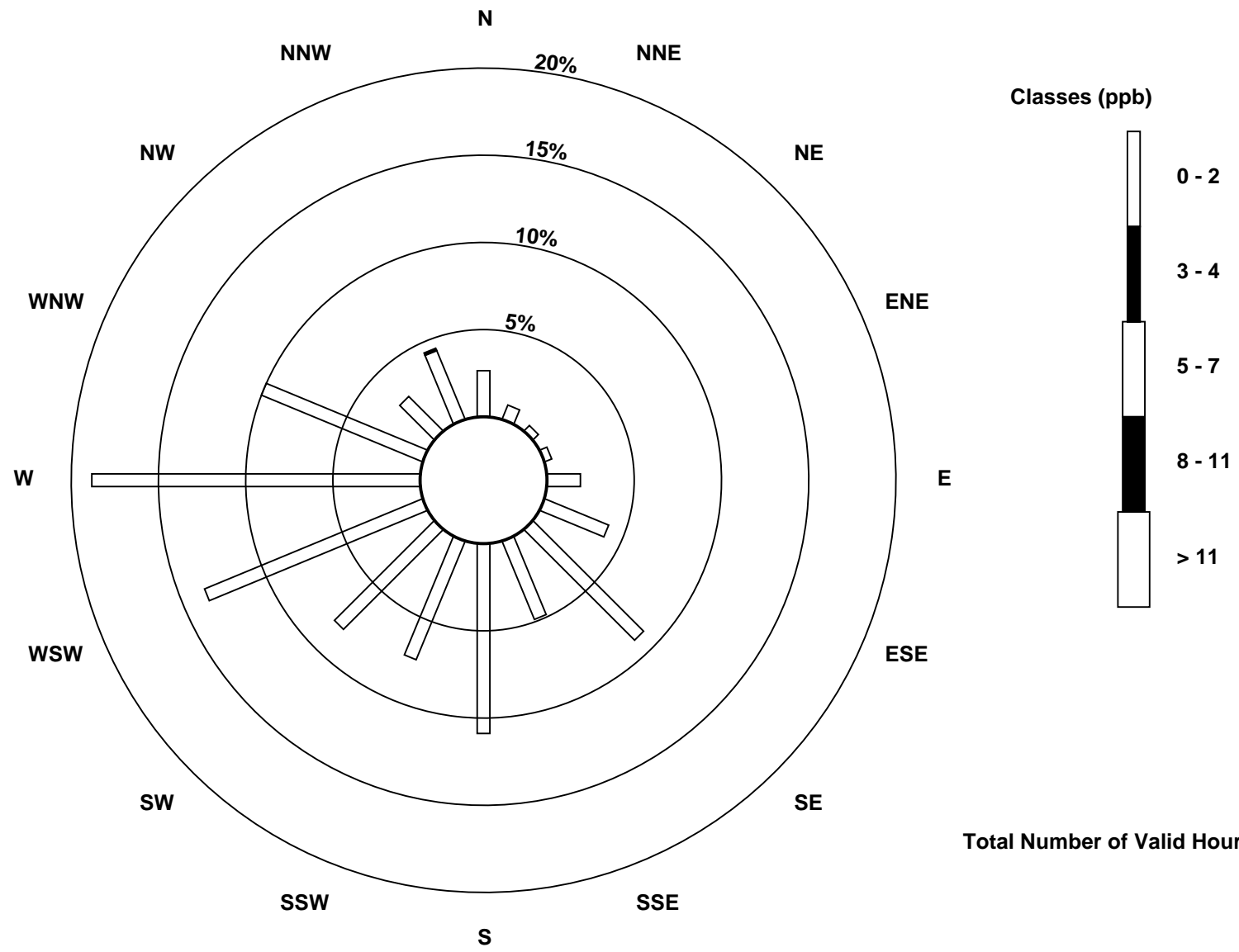
Total Number of Valid Hours: 680

Total Number of Hours: 720

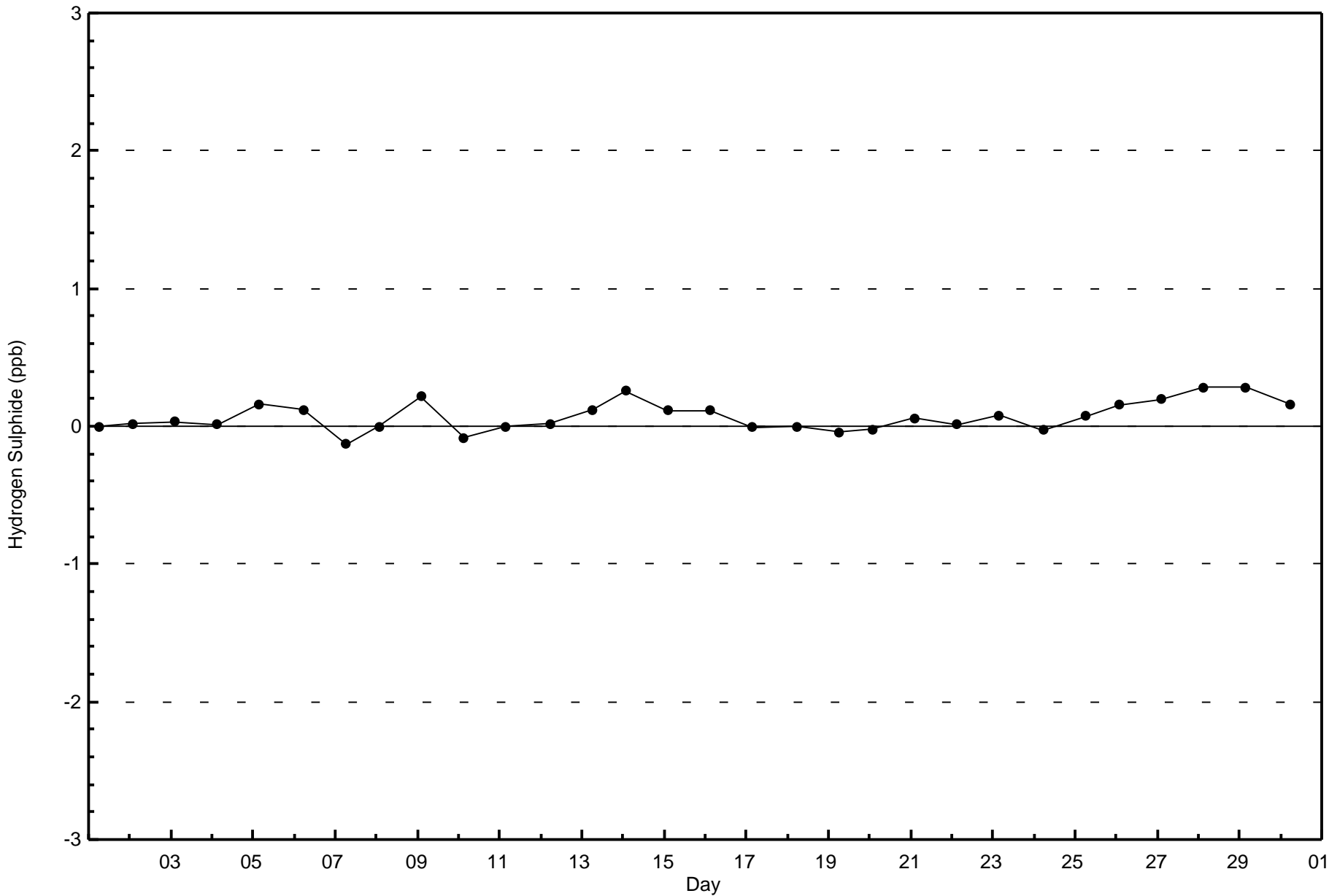


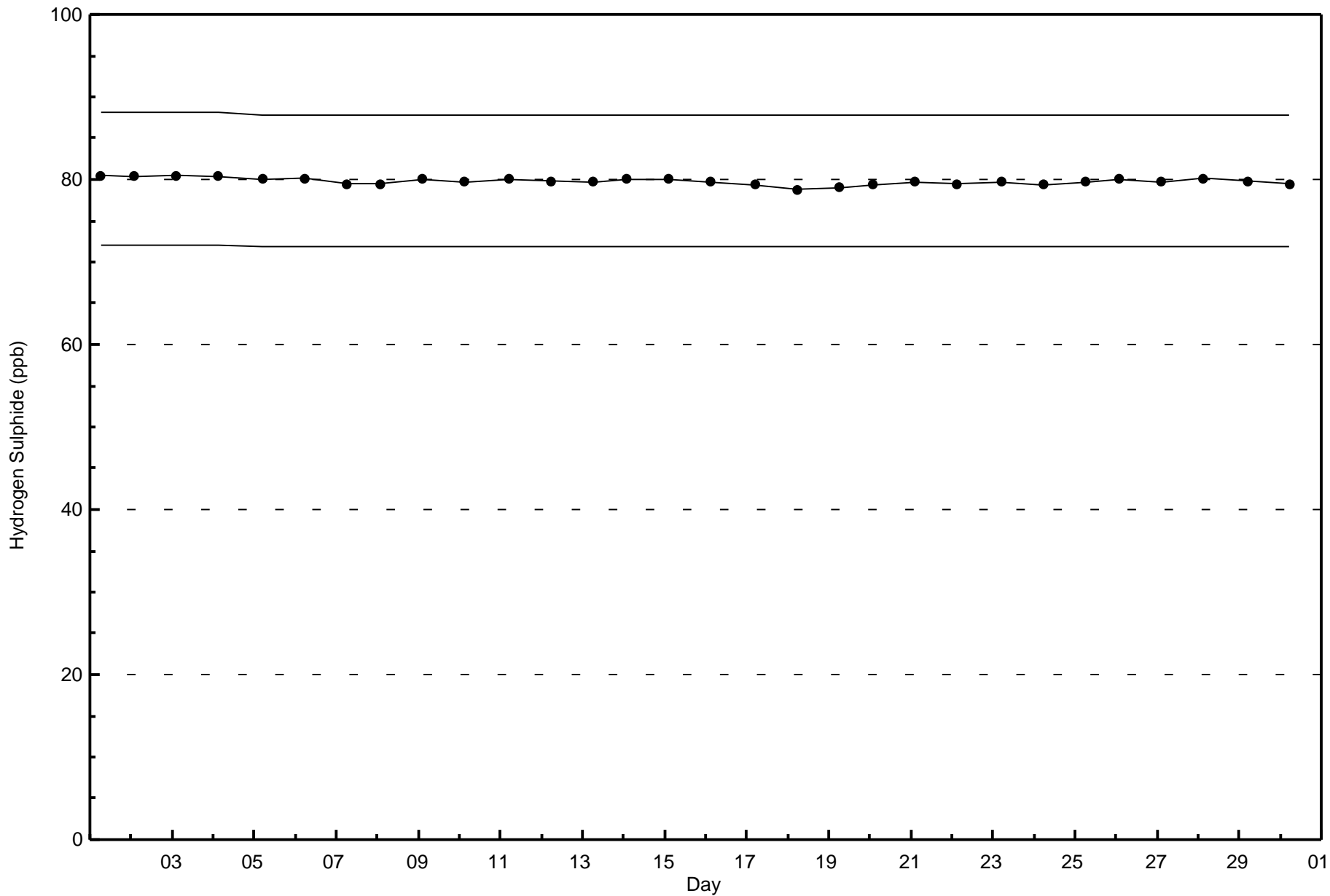
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont (AMS502)



Total Number of Valid Hours: 680







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

ConocoPhillips - Surmont - November 2016

Maximum Value: 7 ppb on Nov 29 01:00																	Maximum Daily Average: 2.0 ppb on Nov 17																	Hours in Service: 720	
Minimum Value: 0 ppb on Nov 2 02:00																	Minimum Daily Average: 0.1 ppb on Nov 6																	Hours of Data: 685	
Maximum Diurnal Average: 1.4 ppb at hour 14																	Minimum Diurnal Average: 0.6 ppb at hour 4																	Hours of Missing Data: 35	
Monthly Average: 0.9 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 5																	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	2	3	4	4	Z	2	4	1	1	1	1	1	2	1	0	0	0	3	0	3	2	2	0	1.7	4									
2-Nov	Z	0	0	1	1	1	0	1	1	2	3	4	1	1	1	2	1	1	0	1	1	0	1	1	1.0	4									
3-Nov	1	Z	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
4-Nov	0	0	Z	0	0	2	0	0	0	2	2	1	0	1	1	1	0	0	0	0	1	1	1	1	0.6	2									
5-Nov	1	1	1	Z	0	0	1	1	1	1	1	2	1	1	1	3	1	1	0	0	0	1	4	1	1.1	4									
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	0.1	0									
7-Nov	0	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	C	0	1	1	0	0	1	0	0	0.2	1									
8-Nov	Z	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0.7	1									
9-Nov	0	Z	1	0	0	0	0	0	0	0	0	1	1	2	1	1	0	0	1	0	0	0	0	0	0.4	2									
10-Nov	0	0	Z	0	0	0	0	0	0	0	1	0	1	3	2	4	0	3	5	0	0	1	3	5	1.3	5									
11-Nov	0	0	0	Z	0	1	1	1	1	2	2	2	2	1	1	0	0	0	1	0	0	0	0	1	0.8	2									
12-Nov	1	0	0	0	Z	1	1	1	1	1	1	1	1	1	2	2	1	0	1	1	0	1	0	1	0.8	2									
13-Nov	0	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	2	0	0	0	0	0	1	1	0	0.4	2									
14-Nov	Z	0	0	0	1	0	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	0.5	1									
15-Nov	0	Z	0	0	0	0	1	0	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0.3	1									
16-Nov	1	1	Z	2	1	2	1	2	1	1	1	1	2	2	3	1	1	0	0	0	0	0	0	0	1.1	3									
17-Nov	0	3	1	Z	0	0	0	2	4	6	4	6	0	1	1	2	1	1	4	7	3	1	0	0	2.0	7									
18-Nov	0	0	0	0	Z	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0.3	3									
19-Nov	0	0	1	0	0	Z	1	0	1	1	1	1	1	1	2	1	0	2	0	0	1	1	1	2	0.9	2									
20-Nov	Z	0	0	0	0	0	1	1	3	2	1	1	5	7	3	2	2	4	1	0	1	1	0	0	1.6	7									
21-Nov	2	Z	0	1	0	1	2	1	2	3	1	0	1	2	0	0	0	0	0	0	0	1	1	1	0.9	3									
22-Nov	0	1	Z	1	1	0	0	0	0	0	0	3	2	1	1	1	2	2	2	2	4	3	4	4	1.5	4									
23-Nov	4	4	4	Z	4	2	2	1	3	1	1	1	2	0	2	1	1	1	2	1	1	0	0	0	1.7	4									
24-Nov	1	1	1	2	Z	1	2	0	2	2	2	2	4	5	3	2	3	3	2	1	1	1	2	1	1.8	5									
25-Nov	0	1	0	1	1	Z	1	2	2	1	2	4	2	2	2	0	0	1	1	0	0	0	0	0	1.0	4									
26-Nov	Z	0	0	0	0	0	0	0	0	1	1	1	0	1	1	3	1	2	0	1	0	0	0	1	0.7	3									
27-Nov	1	Z	0	0	0	0	1	1	2	1	2	1	1	1	2	1	1	1	4	1	2	0	0	0	1.1	4									
28-Nov	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	5	0.7	5									
29-Nov	7	4	2	Z	2	2	1	1	0	0	0	1	0	0	0	1	0	0	0	1	1	1	1	0	1.1	7									
30-Nov	0	1	0	0	Z	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0	0	0	0	1	0.5	1									
																	Diurnal Average		Diurnal Maximum																
																	0.8		7																
																	0.9		4																
																	0.7		4																
																	0.6		4																
																	0.7		4																
																	0.7		2																
																	0.7		2																
																	0.7		4																
																	1.0		4																
																	1.1		6																
																	1.1		4																
																	1.4		6																
																	1.1		5																
																	1.4		7																
																	1.2		3																
																	1.2		4																
																	0.7		3																
																	0.9		4																
																	1.0		5																
																	0.7		7																
																	0.8		4																
																	0.6		3																
																	0.8		4																
																	0.9		5																

Z - zerospan C - Calibration

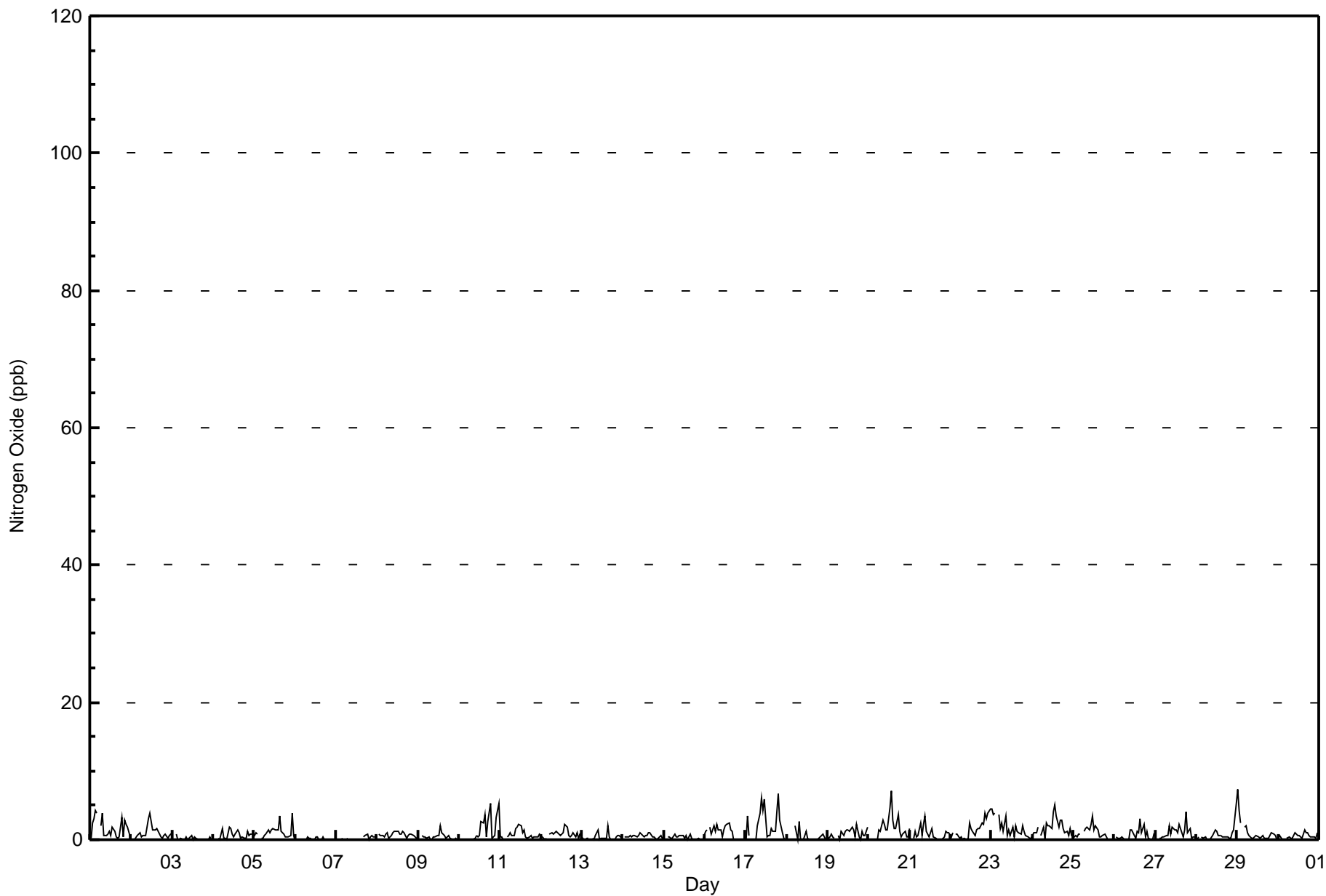


Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Oxide (NO) - ppb

ConocoPhillips - Surmont - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - 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 Oxide (NO) - ppb
ConocoPhillips - Surmont - 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	18	6	3	3	13	28	61	34	74	53	55	92	128	68	20	29	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	18	6	3	3	13	28	61	34	74	53	55	92	128	68	20	29	685

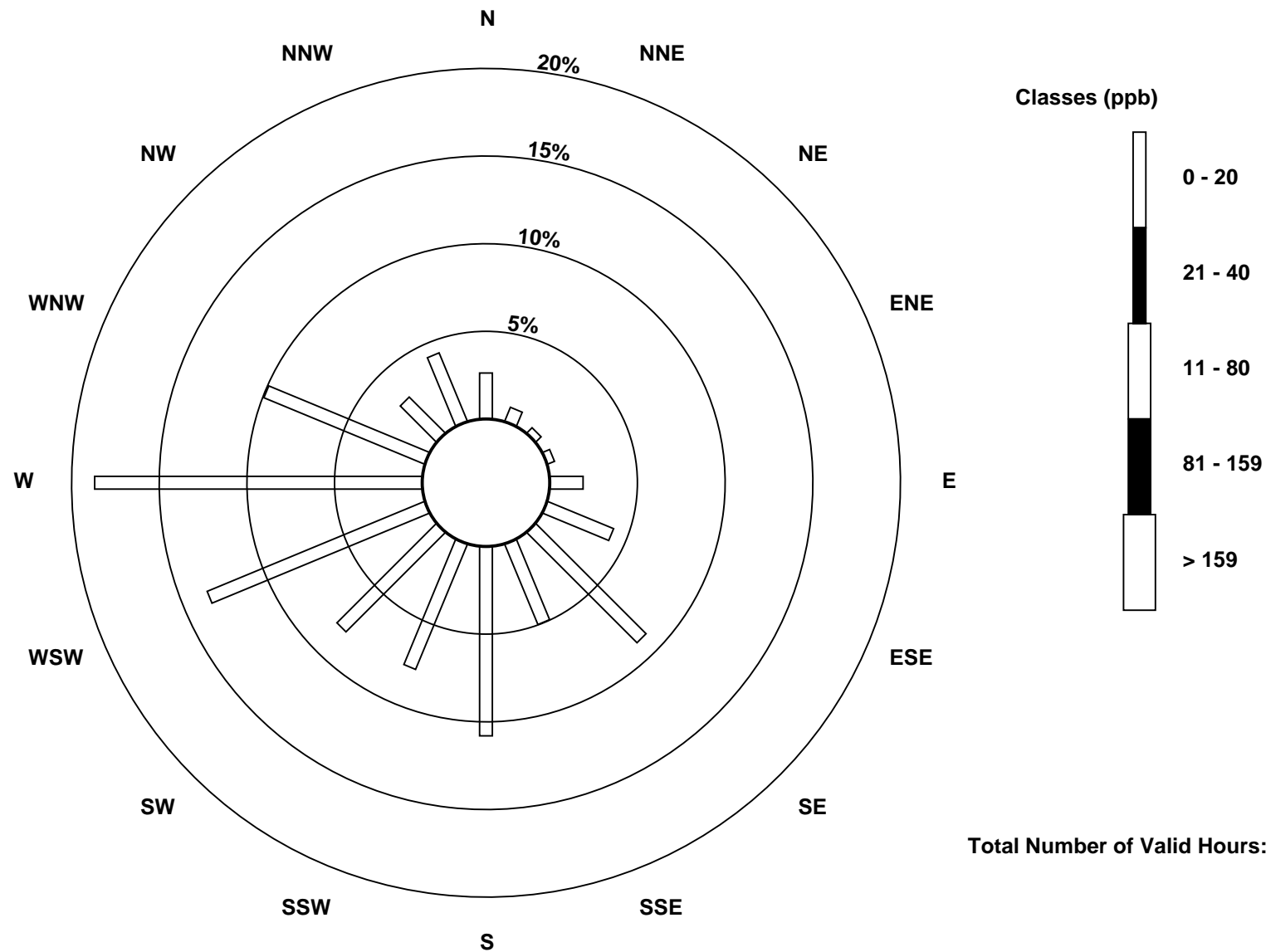
Total Number of Valid Hours: 685

Total Number of Hours: 720

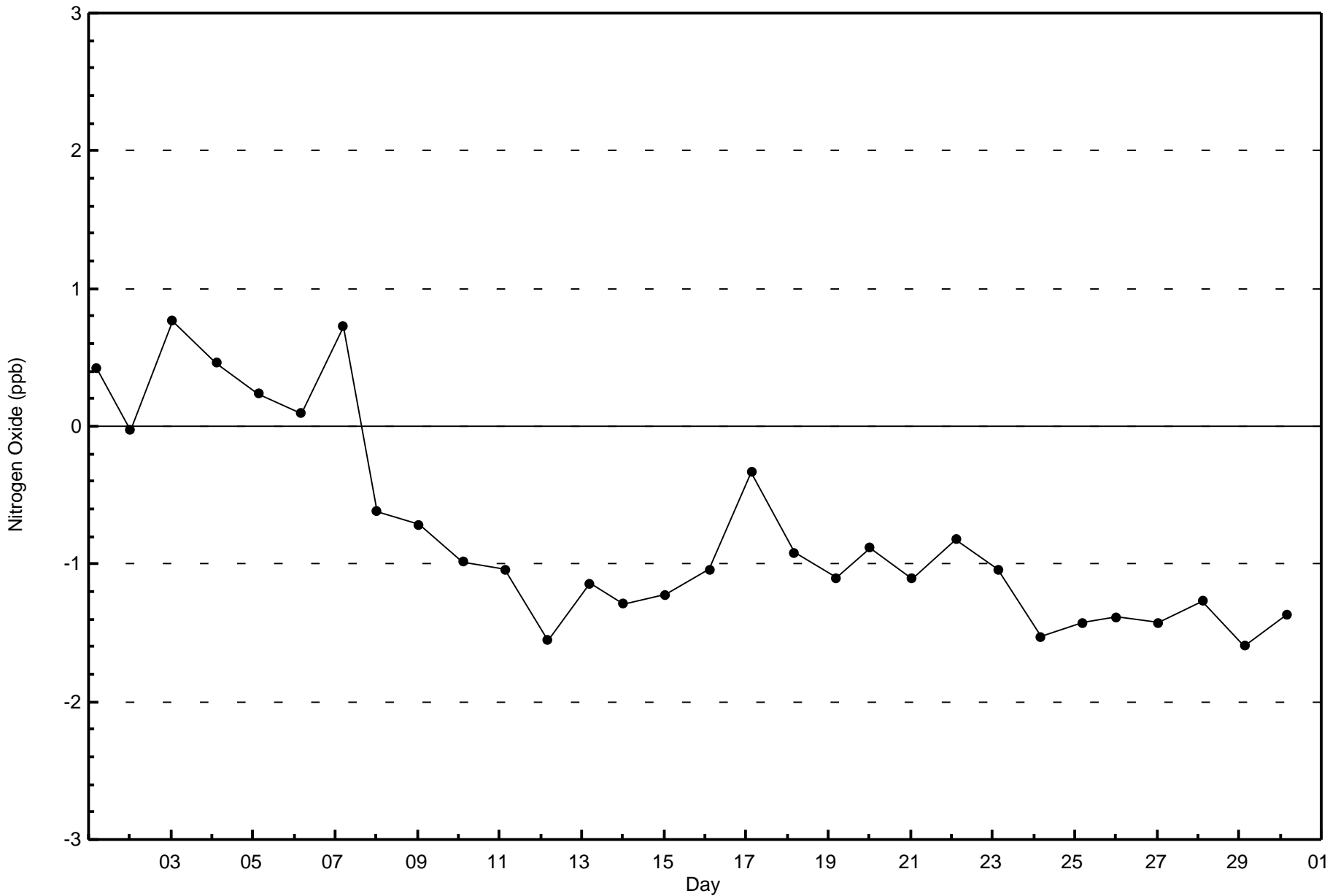


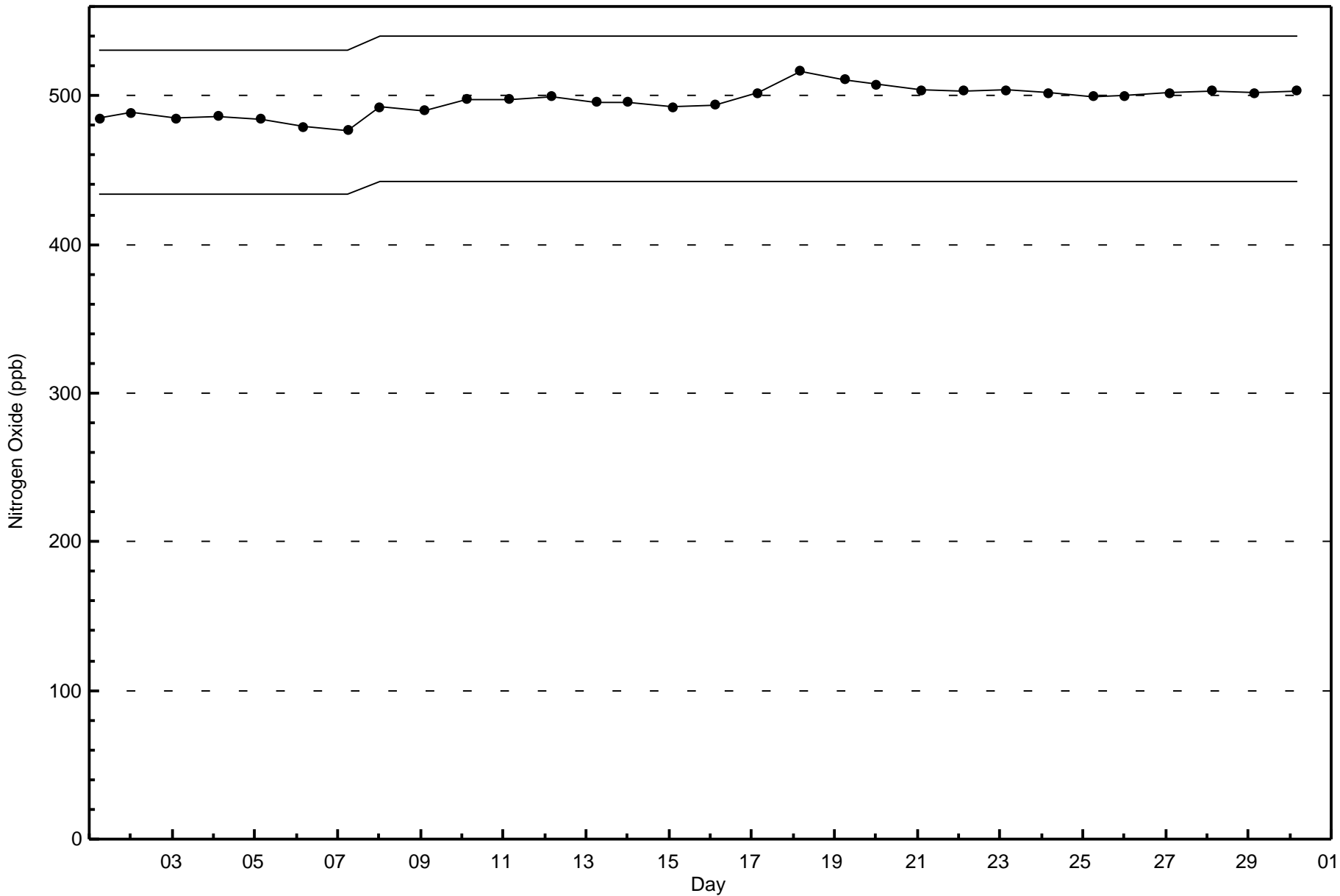
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont (AMS502)



Total Number of Valid Hours: 685







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

ConocoPhillips - Surmont - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 12 ppb on Nov 16 16:00	Maximum Daily Average: 5.6 ppb on Nov 16
Minimum Value: 0 ppb on Nov 18 09:00	Hours of Data: 685
Maximum Diurnal Average: 2.8 ppb at hour 16	Hours of Missing Data: 35
Monthly Average: 2.3 ppb	Hours of Calibration: 35
Minimum Daily Average: 0.5 ppb on Nov 15	Percent Operational Time: 100.0
Minimum Diurnal Average: 1.8 ppb at hour 13	
Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 5 P 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-Nov	1	2	2	3	2	Z	1	3	1	1	1	1	2	1	1	1	1	1	3	1	3	3	2	1	1.5	3
2-Nov	Z	0	0	3	3	1	2	2	2	3	5	5	3	4	4	3	4	4	4	4	4	3	3	4	3.0	5
3-Nov	3	Z	3	1	1	2	2	3	2	2	2	2	1	2	1	1	1	1	1	2	1	2	1	1	1.7	3
4-Nov	1	1	Z	2	3	7	1	1	2	6	4	3	2	3	3	5	4	2	3	3	5	5	7	8	3.5	8
5-Nov	5	6	5	Z	2	2	3	4	6	5	4	4	3	5	4	6	6	2	2	2	2	4	2	3.7	6	
6-Nov	1	1	1	1	Z	1	1	3	1	1	1	1	0	1	0	1	1	1	0	0	0	1	0	0	0.6	3
7-Nov	0	0	0	0	1	Z	1	0	1	0	0	C	C	C	C	C	3	3	4	3	3	4	4	5	1.8	5
8-Nov	Z	4	4	4	3	4	5	4	3	2	2	3	2	2	2	4	4	4	4	4	4	4	3	3	3.4	5
9-Nov	3	Z	3	2	2	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1.2	3
10-Nov	0	0	Z	0	0	1	1	1	0	1	1	1	2	3	3	3	2	4	7	4	4	4	7	9	2.6	9
11-Nov	4	3	3	Z	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	1	1	1	1	1	2.1	4
12-Nov	1	1	1	1	Z	1	1	1	1	1	2	2	2	4	8	6	4	3	2	4	2	1	1	2	2.1	8
13-Nov	1	1	1	1	1	Z	1	0	1	2	1	1	1	1	1	1	2	1	1	1	1	1	2	4	1.1	4
14-Nov	Z	3	2	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1.1	3
15-Nov	0	Z	1	1	0	1	1	1	1	1	1	0	0	0	1	1	0	0	1	0	1	1	1	1	0.5	1
16-Nov	2	3	Z	7	7	9	6	6	4	4	2	4	6	7	9	12	11	9	9	8	2	0	2	0	5.6	12
17-Nov	1	4	3	Z	5	6	5	6	5	5	4	5	1	1	1	2	2	2	3	5	3	1	1	1	3.0	6
18-Nov	1	0	1	1	Z	2	0	2	0	0	1	1	1	0	0	1	2	2	1	2	4	1	3	4	1.2	4
19-Nov	6	5	4	2	1	Z	3	2	1	1	1	1	1	1	2	0	1	1	2	0	1	1	1	2	1.7	6
20-Nov	Z	1	0	0	0	1	3	2	3	4	2	1	1	0	2	2	2	2	2	1	1	1	1	1	1.4	4
21-Nov	1	Z	1	1	1	1	1	2	2	2	1	1	2	2	2	2	1	2	2	3	3	4	3	3	1.9	4
22-Nov	2	4	Z	5	4	4	3	2	2	2	2	4	3	3	3	5	3	5	5	3	4	4	5	6	3.6	6
23-Nov	5	4	5	Z	4	3	3	3	2	2	1	1	1	2	2	1	2	4	4	2	2	2	2	2	2.5	5
24-Nov	2	3	3	3	Z	2	3	2	2	2	4	3	4	5	5	5	6	4	2	2	2	2	1	1	3.2	6
25-Nov	1	1	1	1	1	Z	1	2	2	2	3	4	3	2	2	2	1	2	2	2	2	3	3	3	2.0	4
26-Nov	Z	2	2	2	2	2	2	2	2	3	2	2	1	2	4	6	6	7	4	3	3	2	4	6	2.9	7
27-Nov	2	Z	2	2	2	2	2	2	4	2	3	3	2	1	2	3	2	2	4	1	1	1	1	2	2.0	4
28-Nov	1	1	Z	3	4	5	5	6	5	3	2	2	2	1	1	1	1	2	1	2	2	2	2	6	2.6	6
29-Nov	7	6	7	Z	5	4	4	5	4	2	1	1	1	1	1	1	1	1	1	3	1	2	2	1	2.6	7
30-Nov	1	1	1	2	Z	2	1	1	3	2	2	2	3	3	3	4	3	4	3	3	2	2	2	2	2.1	4

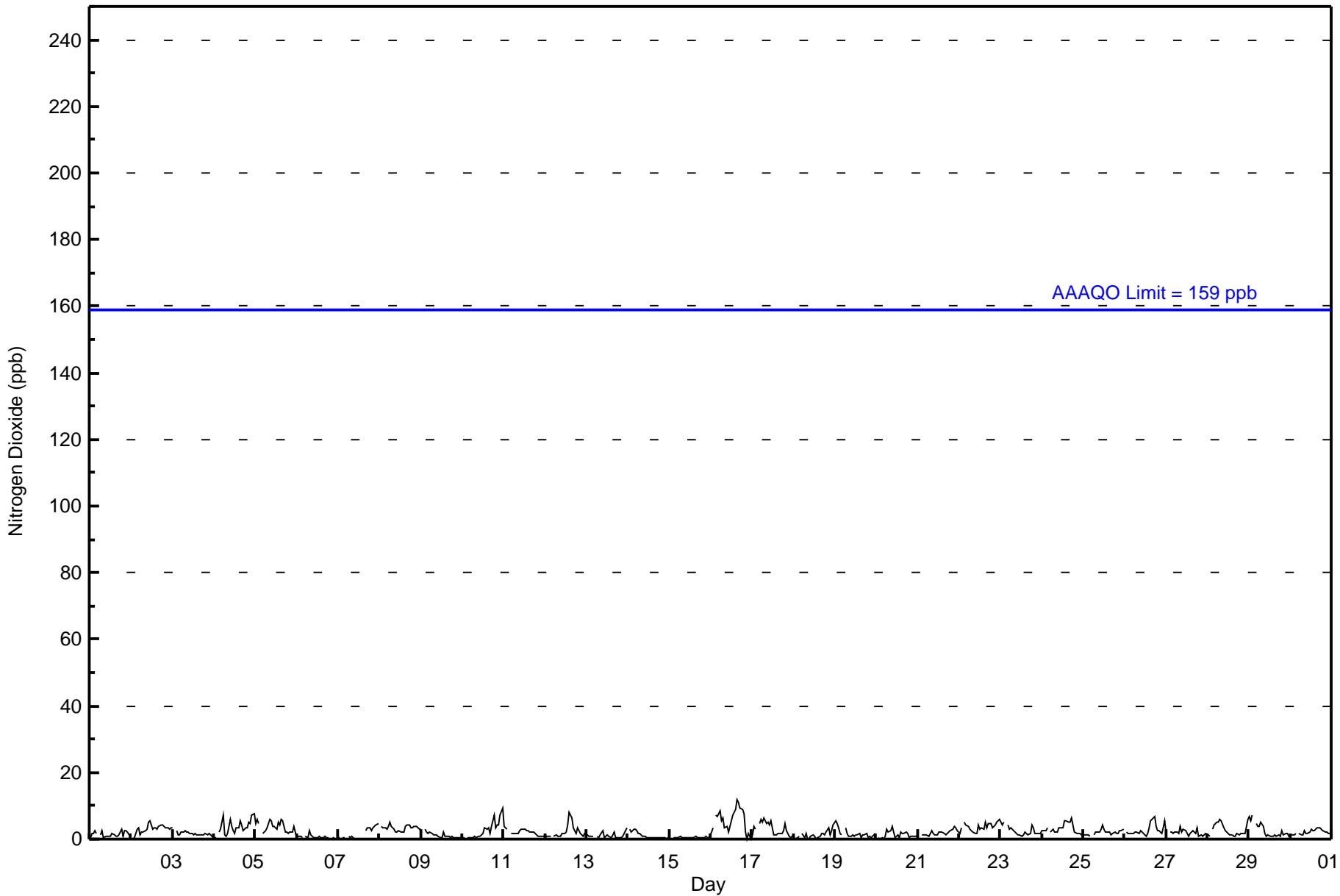
2.1	2.2	2.1	2.0	2.3	2.7	2.3	2.3	2.2	2.2	1.9	2.1	1.8	2.2	2.5	2.8	2.6	2.6	2.7	2.2	2.1	1.9	2.3	2.6	Diurnal Average
7	6	7	7	7	9	6	6	6	6	5	5	6	7	9	12	11	9	9	8	5	5	7	9	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - 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
ConocoPhillips - Surmont - 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	18	6	3	3	13	28	61	34	74	53	55	92	128	68	20	29	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	18	6	3	3	13	28	61	34	74	53	55	92	128	68	20	29	685

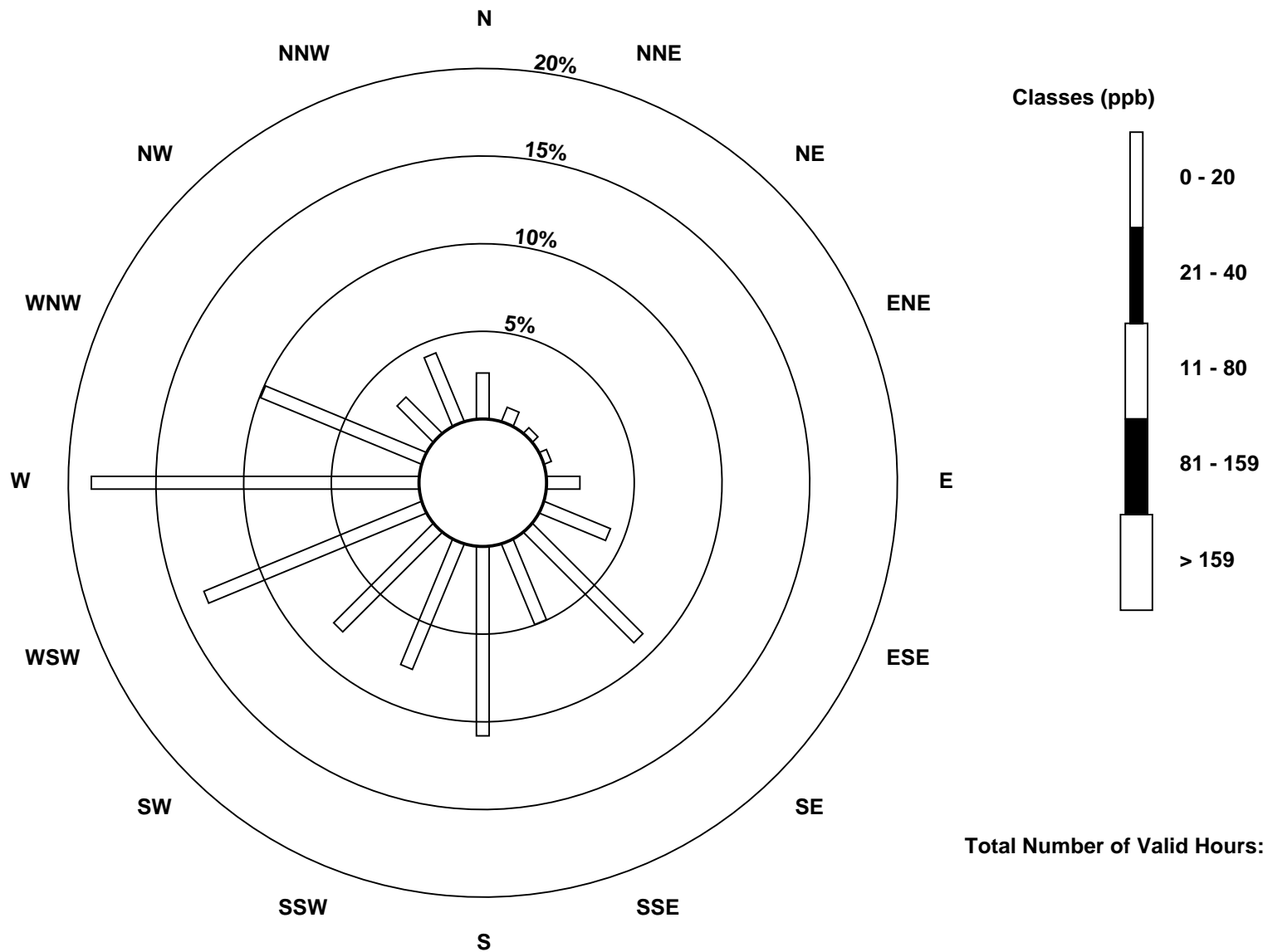
Total Number of Valid Hours: 685

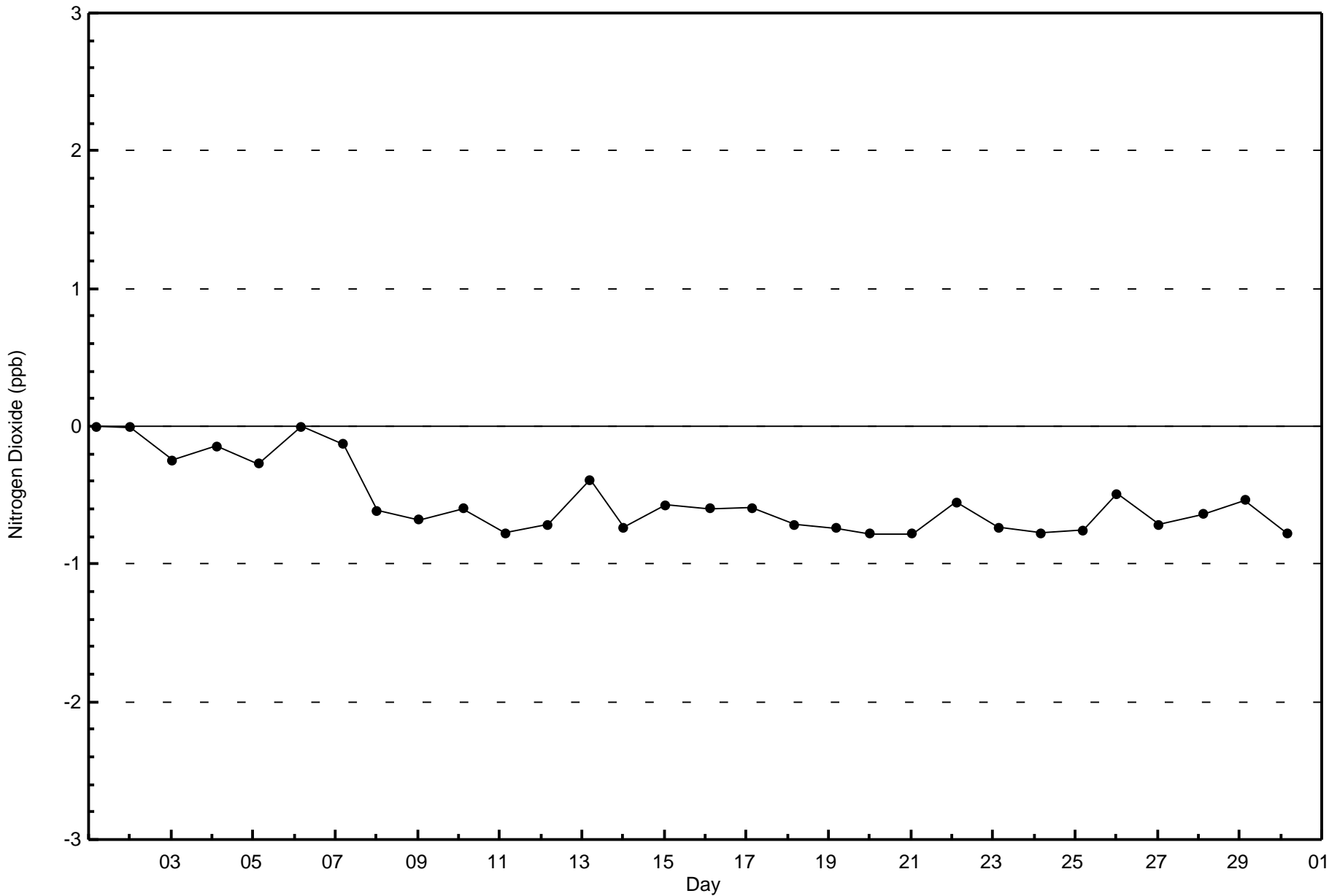
Total Number of Hours: 720

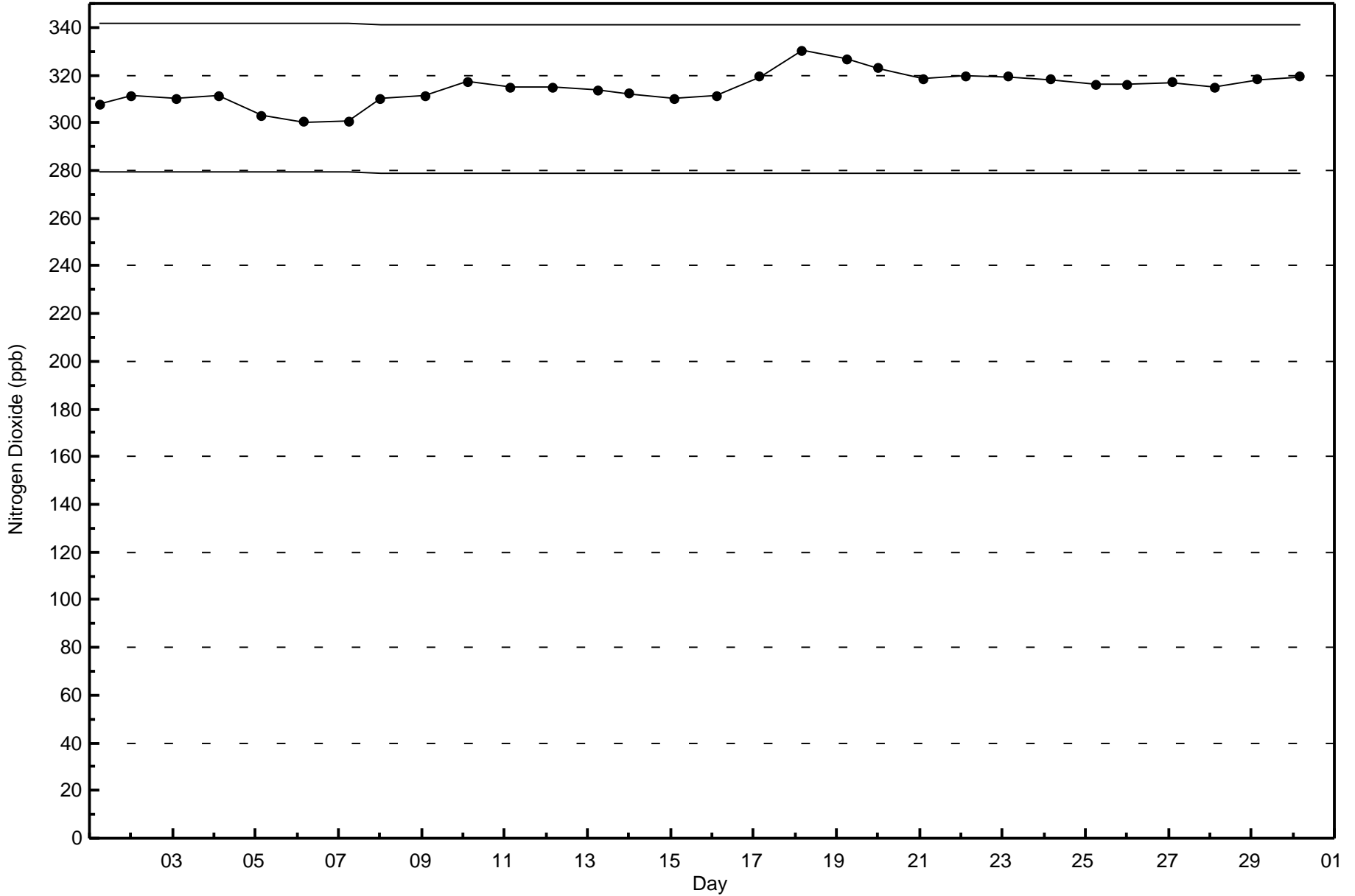


Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont (AMS502)









Wood Buffalo Environmental Association
Summary of Hour Averages

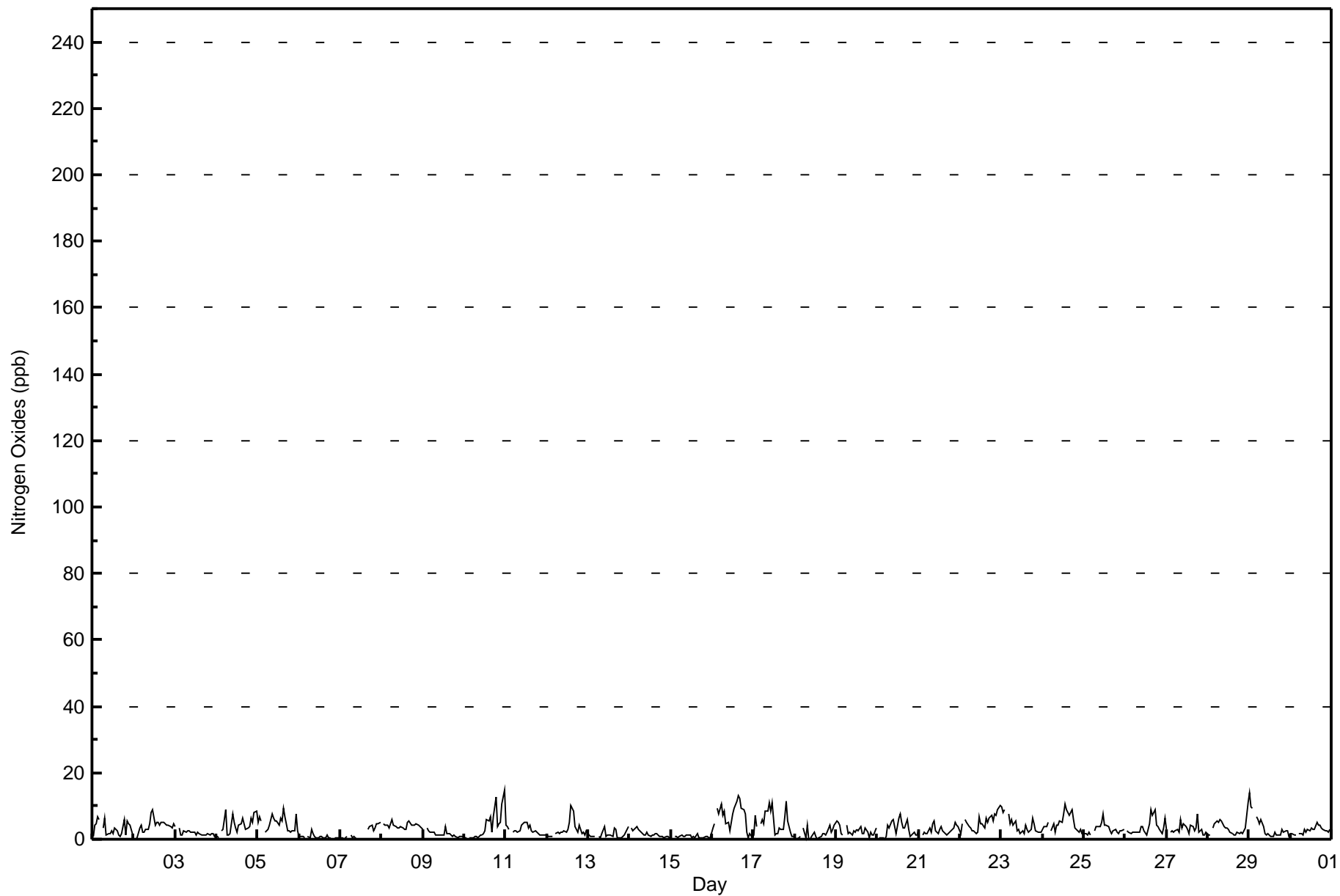
Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - November 2016

Maximum Value: 15 ppb on Nov 11 00:00																		Maximum Daily Average: 6.7 ppb on Nov 16						Hours in Service: 720		
Minimum Value: 0 ppb on Nov 18 09:00																		Minimum Daily Average: 0.7 ppb on Nov 6						Hours of Data: 685		
Maximum Diurnal Average: 4.1 ppb at hour 16																		Minimum Diurnal Average: 2.5 ppb at hour 22						Hours of Missing Data: 35		
Monthly Average: 3.2 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 6 P ₉₉ = 11						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	1	4	5	7	6	Z	3	6	1	2	2	2	3	2	1	1	2	6	1	5	5	4	1	3.2	7	
2-Nov	Z	0	0	3	4	2	2	3	3	5	8	9	4	5	5	4	5	5	4	4	4	4	5	4.1	9	
3-Nov	4	Z	3	1	1	3	2	2	2	2	2	1	2	2	1	1	1	1	2	1	1	2	1	1.9	4	
4-Nov	1	1	Z	2	3	9	1	1	2	8	5	3	2	4	5	6	5	3	3	4	6	5	8	9	4.2	9
5-Nov	5	7	5	Z	2	2	3	4	8	6	5	6	4	6	6	9	7	3	2	2	3	3	8	3	4.8	9
6-Nov	1	1	1	1	Z	1	1	3	2	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0.7	3	
7-Nov	0	0	0	0	1	Z	1	0	1	0	0	C	C	C	C	C	3	4	4	3	4	5	5	5	2.0	5
8-Nov	Z	5	4	4	3	5	6	4	4	3	3	4	3	3	3	5	5	4	4	4	5	4	4	3	4.1	6
9-Nov	3	Z	3	3	2	2	2	1	1	1	1	1	1	4	2	2	1	1	1	1	1	1	1	1	1.6	4
10-Nov	0	0	Z	0	0	0	1	1	0	1	1	2	3	6	5	7	2	7	13	4	5	5	10	15	3.8	15
11-Nov	4	4	3	Z	2	2	3	2	2	4	5	5	5	4	4	3	2	2	2	2	1	1	1	1	2.9	5
12-Nov	1	1	1	1	Z	2	2	2	2	2	3	2	3	5	10	8	4	3	2	4	2	2	1	2	2.9	10
13-Nov	1	1	1	1	1	Z	1	0	2	4	1	1	1	1	1	3	3	1	1	1	1	1	2	4	1.4	4
14-Nov	Z	3	3	3	4	3	2	2	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1.7	4
15-Nov	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	2	0	0	1	0	1	1	1	1	0.8	2
16-Nov	3	5	Z	9	8	11	7	9	5	5	3	5	8	9	11	13	12	9	9	8	2	0	2	0	6.7	13
17-Nov	1	7	4	Z	4	6	5	8	9	11	8	11	1	2	2	3	3	3	7	12	5	2	1	1	5.1	12
18-Nov	1	0	1	1	Z	4	0	4	0	0	1	2	1	0	0	1	2	2	1	2	4	2	3	4	1.6	4
19-Nov	6	5	4	2	1	Z	4	2	2	1	2	2	3	2	4	2	2	4	2	0	2	1	1	3	2.5	6
20-Nov	Z	0	0	0	0	1	4	3	5	6	4	2	6	7	5	3	3	6	3	1	1	2	1	1	3.0	7
21-Nov	3	Z	1	2	2	2	4	2	5	5	2	2	3	4	2	2	1	2	2	3	3	5	4	4	2.8	5
22-Nov	2	5	Z	6	5	4	4	2	3	2	2	7	5	5	3	6	5	7	7	6	8	7	9	10	5.2	10
23-Nov	10	8	9	Z	8	5	6	4	6	2	3	2	2	2	4	3	2	3	6	5	3	2	2	2	4.2	10
24-Nov	3	4	4	5	Z	3	5	2	4	4	5	5	8	11	9	7	8	9	6	3	3	2	3	2	5.0	11
25-Nov	2	2	1	2	1	Z	2	4	4	4	5	8	4	4	4	2	2	2	3	2	2	2	3	3	3.0	8
26-Nov	Z	2	2	2	2	2	2	2	2	4	4	3	1	3	4	9	7	9	4	4	3	2	4	6	3.6	9
27-Nov	3	Z	2	2	2	2	3	2	6	3	5	4	3	2	4	4	3	3	8	2	3	1	1	2	3.1	8
28-Nov	1	1	Z	4	4	5	5	6	6	4	4	3	3	2	2	1	1	2	2	2	2	2	3	11	3.3	11
29-Nov	14	10	10	Z	7	6	5	6	4	2	1	2	1	1	1	2	1	1	1	3	2	3	2	1	3.7	14
30-Nov	2	2	1	1	Z	2	2	1	3	2	3	3	3	3	3	5	4	4	4	3	3	2	2	3	2.6	5
																								Diurnal Average		
																								Diurnal Maximum		
2.9 3.1 2.8 2.6 3.0 3.3 3.0 3.1 3.1 3.3 3.1 3.5 3.0 3.6 3.7 4.1 3.3 3.4 3.7 2.9 2.8 2.5 3.1 3.5																										
14 10 10 9 8 11 7 9 9 11 8 11 8 11 11 13 12 9 13 12 8 7 10 15																										
Z - zerospan C - Calibration																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - November 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - 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 Oxides (NO_x) - ppb
ConocoPhillips - Surmont - 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	18	6	3	3	13	28	61	34	74	53	55	92	128	68	20	29	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	18	6	3	3	13	28	61	34	74	53	55	92	128	68	20	29	685

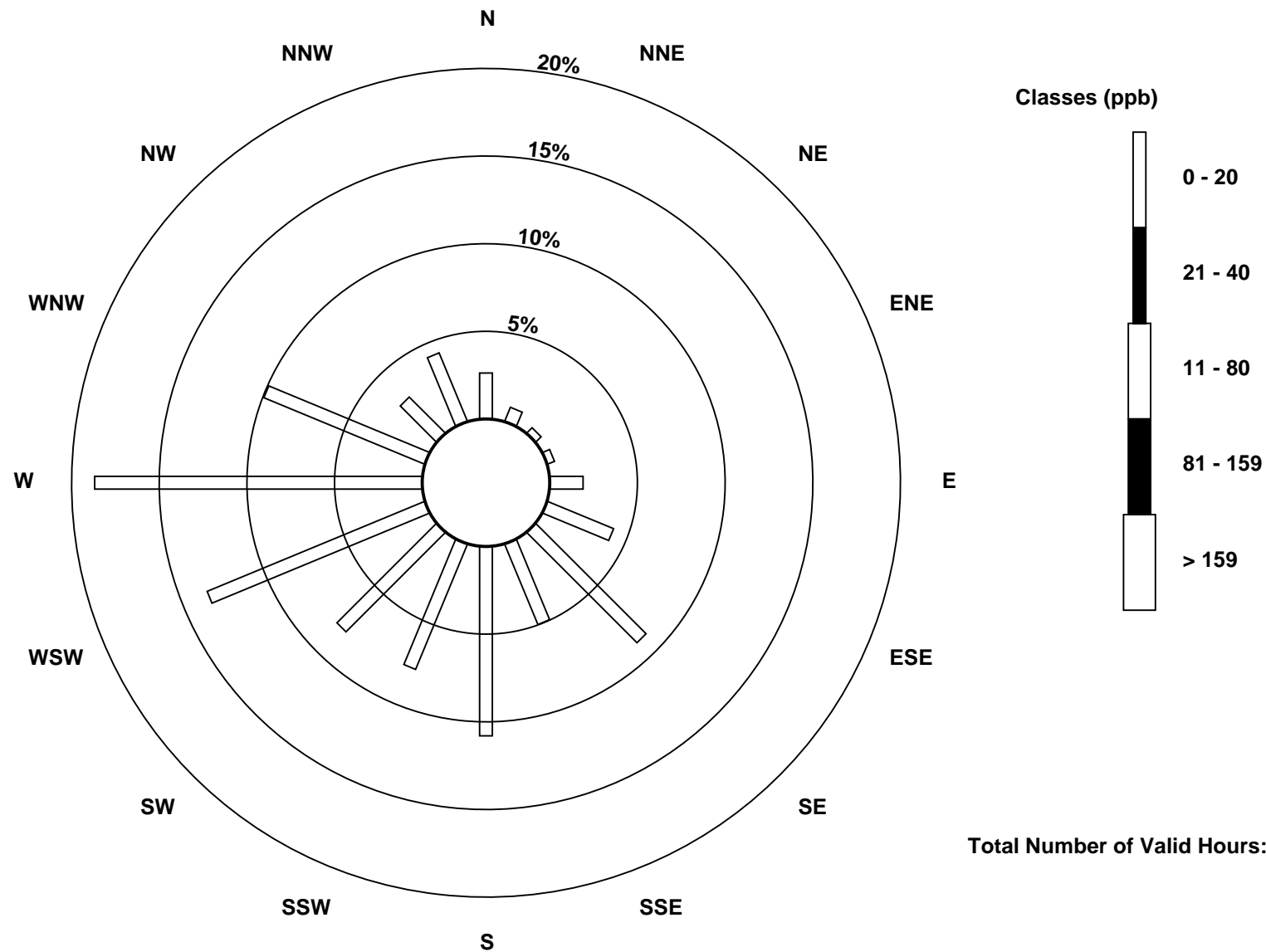
Total Number of Valid Hours: 685

Total Number of Hours: 720

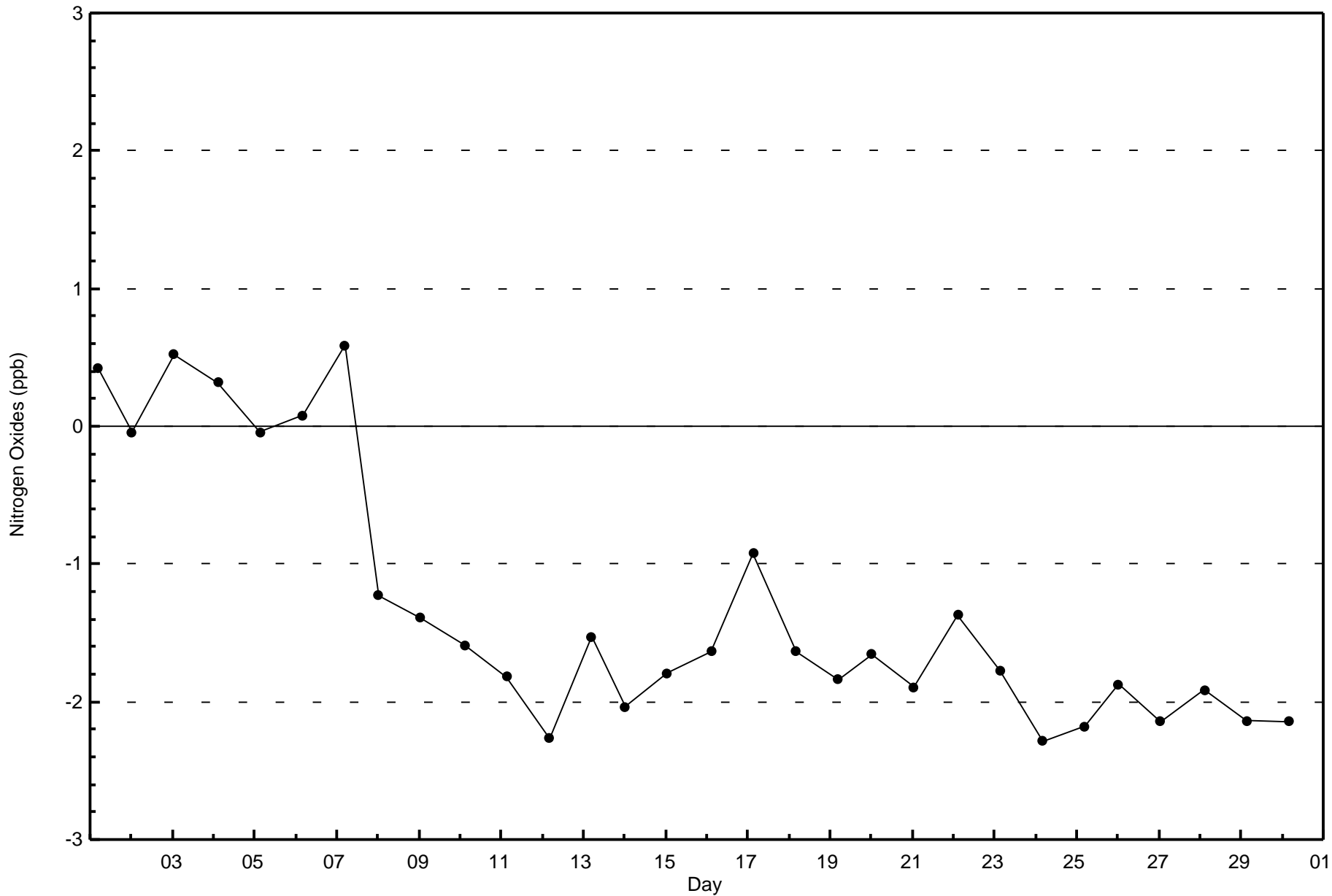


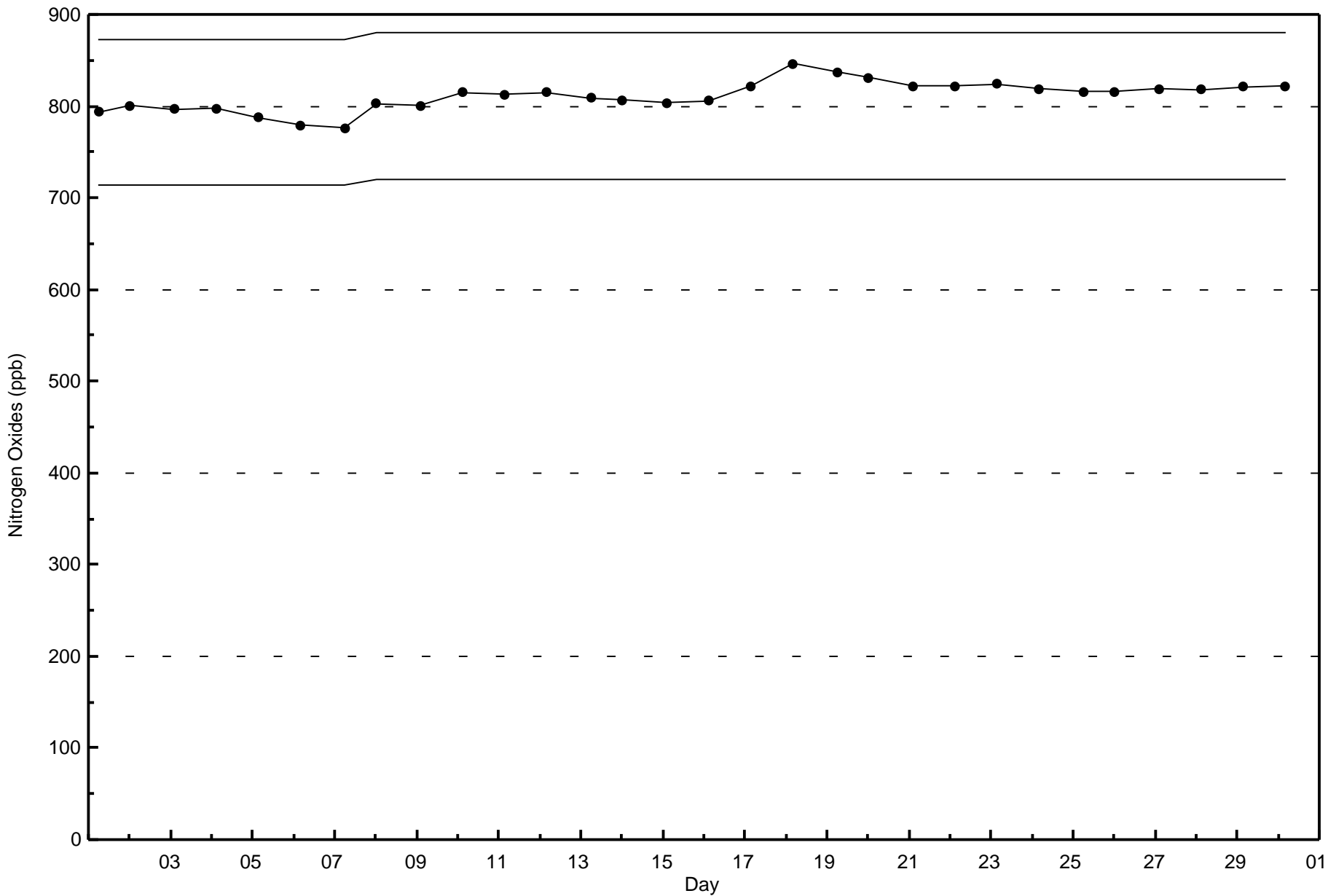
Wood Buffalo Environmental Association
Wind Rose Nov 2016

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont (AMS502)



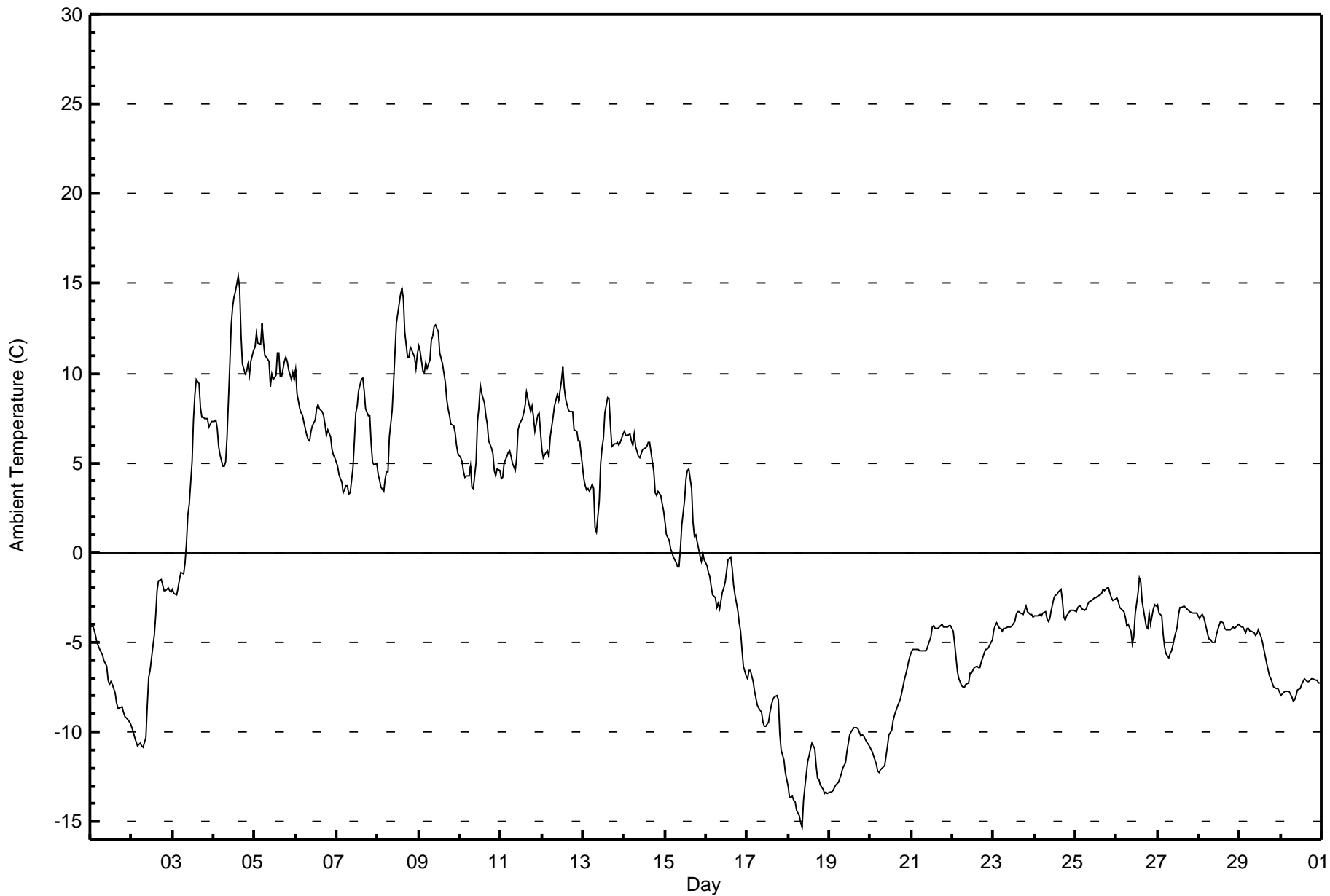
Total Number of Valid Hours: 685







Maximum Value: 15.4 C on Nov 4 15:00		Maximum Daily Average: 10.7 C on Nov 5		Hours in Service: 720																						
Minimum Value: -15.3 C on Nov 18 09:00		Minimum Daily Average: -13.0 C on Nov 18		Hours of Data: 720																						
Maximum Diurnal Average: 1.1 C at hour 15		Minimum Diurnal Average: -1.7 C at hour 8		Hours of Missing Data: 0																						
Monthly Average: -0.54 C		Percentiles: P ₁ = -13.7 P ₁₀ = -9.8 Q ₁ = -5.6 Median = -2.7 Q ₃ = 6.1 P ₉₀ = 9.6 P ₉₉ = 14.1		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-Nov	-4.1	-4.1	-4.3	-4.6	-5.0	-5.4	-5.6	-5.7	-6.0	-6.4	-7.1	-7.3	-7.2	-7.3	-7.8	-8.3	-8.7	-8.6	-8.6	-8.9	-9.1	-9.2	-9.3	-9.6	-7.0	-4.1
2-Nov	-9.8	-10.0	-10.3	-10.8	-10.7	-10.6	-10.7	-10.9	-10.3	-8.5	-6.9	-6.5	-5.2	-4.6	-3.5	-2.1	-1.6	-1.5	-1.8	-2.2	-2.1	-1.9	-2.1	-2.2	-6.1	-1.5
3-Nov	-2.0	-2.3	-2.4	-2.0	-1.5	-1.1	-1.2	-0.5	0.5	2.1	2.7	5.0	7.4	8.8	9.6	9.4	8.1	7.5	7.6	7.5	7.5	7.0	7.1	7.3	3.8	9.6
4-Nov	7.3	7.4	6.9	5.9	5.4	4.8	4.8	5.1	6.5	10.5	12.7	13.7	14.3	14.6	15.4	14.7	12.2	10.5	10.0	10.1	10.5	9.9	10.6	11.3	9.8	15.4
5-Nov	11.5	12.2	11.7	11.6	12.8	11.7	10.9	10.9	10.7	9.3	10.0	9.7	9.9	11.1	11.1	9.8	9.8	10.6	10.9	10.6	10.2	9.7	10.0	9.7	10.7	12.8
6-Nov	10.2	8.9	8.0	7.8	7.6	7.2	6.5	6.3	6.2	6.8	7.1	7.4	8.0	8.3	8.0	7.9	7.6	7.2	6.5	6.8	6.5	5.7	5.5	5.3	7.2	10.2
7-Nov	4.8	4.3	4.1	3.9	3.4	3.7	3.7	3.3	3.4	4.7	6.3	7.8	8.2	9.0	9.6	9.7	9.1	8.0	7.6	7.6	6.1	5.0	4.9	4.9	6.0	9.7
8-Nov	4.4	4.0	3.6	3.4	4.1	4.5	4.5	6.5	7.9	9.5	11.2	12.8	13.8	14.4	14.7	14.1	12.3	10.9	10.9	11.5	11.3	10.9	10.3	11.1	9.3	14.7
9-Nov	11.5	11.2	10.1	10.0	10.6	10.3	10.7	11.9	12.1	12.6	12.7	12.3	11.1	10.9	10.5	9.5	8.6	8.0	7.6	7.1	7.1	6.7	6.0	5.5	9.8	12.7
10-Nov	5.3	5.1	4.5	4.2	4.3	4.3	4.9	3.6	3.5	5.1	7.3	8.1	9.3	8.9	8.4	7.7	7.2	6.3	5.9	5.6	4.6	4.3	4.7	4.6	5.7	9.3
11-Nov	4.1	4.2	5.0	5.4	5.6	5.7	5.4	5.0	4.6	5.3	6.8	7.1	7.5	7.8	8.2	8.9	8.6	7.9	8.1	7.6	6.8	7.6	7.8	6.7	6.6	8.9
12-Nov	5.7	5.3	5.6	5.6	5.4	6.5	7.6	8.1	8.5	8.8	8.5	9.6	10.3	9.1	8.5	7.9	7.8	7.9	7.9	6.8	6.8	6.2	6.2	5.5	7.3	10.3
13-Nov	4.1	3.7	3.5	3.6	3.4	3.8	3.6	1.4	1.1	2.9	5.0	5.8	6.3	7.8	8.6	8.6	7.1	5.9	6.1	6.1	6.1	6.0	6.1	6.6	5.1	8.6
14-Nov	6.7	6.5	6.6	6.6	6.2	6.0	6.6	5.9	5.3	5.3	5.5	5.7	5.8	5.9	6.1	6.1	5.6	4.5	3.3	3.2	3.4	3.2	2.7	2.3	5.2	6.7
15-Nov	1.7	1.0	0.7	0.2	0.0	-0.3	-0.6	-0.8	-0.8	0.2	1.6	2.9	4.1	4.6	4.6	3.5	1.7	0.9	1.0	0.6	-0.2	-0.5	0.0	-0.4	1.1	4.6
16-Nov	-0.7	-1.1	-1.3	-1.9	-2.3	-2.5	-3.0	-2.8	-3.2	-2.2	-2.0	-1.7	-1.0	-0.4	-0.3	-0.9	-1.8	-2.3	-3.2	-3.9	-4.4	-5.4	-6.4	-6.8	-2.6	-0.3
17-Nov	-7.1	-6.6	-6.6	-7.2	-7.7	-8.1	-8.5	-8.7	-8.9	-9.4	-9.7	-9.7	-9.4	-8.9	-8.5	-8.2	-8.0	-8.0	-8.2	-10.0	-11.0	-11.6	-12.3	-12.6	-9.0	-6.6
18-Nov	-13.1	-13.6	-13.6	-13.8	-13.9	-14.3	-14.6	-15.0	-15.3	-13.8	-13.0	-11.6	-11.4	-10.9	-10.7	-10.9	-11.9	-12.6	-12.7	-12.9	-13.2	-13.4	-13.3	-13.4	-13.0	-10.7
19-Nov	-13.3	-13.3	-13.3	-13.1	-13.0	-12.8	-12.6	-12.3	-12.1	-11.7	-11.1	-10.6	-10.2	-10.0	-9.8	-9.7	-9.7	-9.9	-10.2	-10.1	-10.2	-10.4	-10.6	-10.8	-11.3	-9.7
20-Nov	-11.0	-11.1	-11.3	-11.8	-12.2	-12.3	-12.1	-12.1	-11.9	-11.3	-10.7	-10.2	-9.9	-9.4	-9.0	-8.8	-8.6	-8.2	-7.9	-7.5	-7.1	-6.5	-6.1	-5.8	-9.7	-5.8
21-Nov	-5.6	-5.4	-5.4	-5.4	-5.4	-5.5	-5.5	-5.5	-5.5	-5.4	-5.1	-4.7	-4.1	-4.1	-4.2	-4.2	-4.1	-4.0	-4.0	-4.1	-4.2	-4.1	-4.1	-4.1	-4.7	-4.0
22-Nov	-4.4	-5.0	-5.9	-6.7	-7.1	-7.4	-7.5	-7.5	-7.4	-7.2	-6.7	-6.7	-6.6	-6.4	-6.3	-6.4	-6.4	-6.1	-5.6	-5.4	-5.4	-5.3	-5.2	-4.8	-6.2	-4.4
23-Nov	-4.3	-4.1	-3.9	-4.3	-4.2	-4.4	-4.2	-4.2	-4.2	-4.2	-4.2	-4.1	-3.9	-3.4	-3.3	-3.3	-3.4	-3.5	-3.2	-3.0	-3.3	-3.4	-3.5	-3.6	-3.8	-3.0
24-Nov	-3.5	-3.5	-3.5	-3.5	-3.6	-3.3	-3.3	-3.7	-3.9	-3.7	-3.2	-2.5	-2.4	-2.4	-2.2	-2.0	-2.7	-3.6	-3.7	-3.5	-3.3	-3.2	-3.2	-3.2	-3.2	-2.0
25-Nov	-3.3	-3.1	-3.0	-3.0	-3.1	-3.2	-3.1	-2.9	-2.8	-2.7	-2.6	-2.5	-2.5	-2.4	-2.3	-2.3	-2.1	-2.1	-2.0	-2.0	-2.3	-2.5	-2.7	-2.6	-2.6	-2.0
26-Nov	-2.5	-2.8	-3.1	-3.2	-3.3	-3.6	-4.0	-4.0	-4.4	-5.1	-4.7	-3.4	-2.3	-1.4	-1.7	-2.8	-3.2	-4.1	-4.2	-3.4	-4.0	-3.1	-2.9	-3.0	-3.3	-1.4
27-Nov	-2.9	-3.4	-3.5	-4.5	-5.3	-5.6	-5.8	-5.6	-5.5	-5.2	-4.8	-4.1	-3.4	-3.1	-3.0	-3.0	-3.1	-3.1	-3.2	-3.3	-3.3	-3.4	-3.4	-3.4	-4.0	-2.9
28-Nov	-3.7	-3.5	-3.4	-3.6	-3.9	-4.6	-4.8	-4.9	-5.0	-5.0	-4.6	-4.3	-4.1	-3.9	-4.0	-4.2	-4.3	-4.3	-4.3	-4.2	-4.2	-4.2	-4.1	-4.0	-4.2	-3.4
29-Nov	-4.0	-4.1	-4.2	-4.5	-4.2	-4.2	-4.3	-4.4	-4.5	-4.6	-4.5	-4.3	-4.7	-5.0	-5.4	-5.8	-6.2	-6.8	-7.0	-7.3	-7.5	-7.6	-7.5	-7.7	-5.4	-4.0
30-Nov	-8.0	-7.9	-7.8	-7.8	-7.7	-7.7	-8.0	-8.3	-8.2	-8.0	-7.7	-7.5	-7.3	-7.2	-7.0	-7.2	-7.2	-7.1	-7.0	-7.1	-7.1	-7.1	-7.3	-7.3	-7.5	-7.0
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
ConocoPhillips - Surmont - November 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	425	59.03	59.03
0 - 10	235	32.64	91.67
10 - 20	60	8.33	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) - %

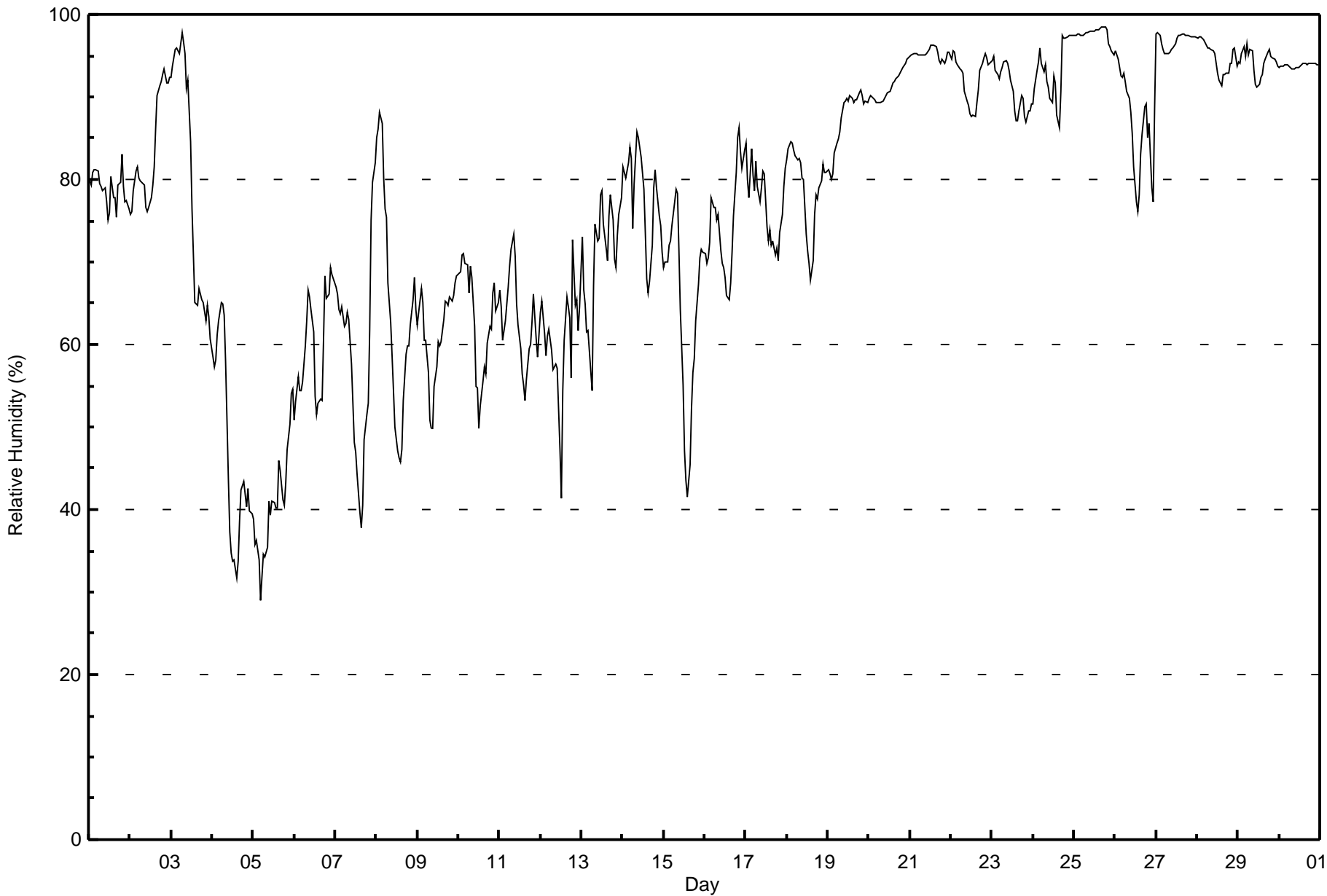
ConocoPhillips - Surmont - November 2016

Maximum Value: 99 % on Nov 25 19:00 Maximum Daily Average: 97.6 % on Nov 25																		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 Nov 5 05:00 Minimum Daily Average: 40.6 % on Nov 5 Maximum Diurnal Average: 79.7 % at hour 4 Minimum Diurnal Average: 71.5 % at hour 15 Monthly Average: 77.2 % Percentiles: P ₁ = 34 P ₁₀ = 54 Q ₁ = 65 Median = 80 O ₃ = 93 P ₉₀ = 96 P ₉₉ = 98																										
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	80	79	81	81	81	81	79	79	79	79	77	75	76	80	78	78	75	79	80	83	79	77	78	76	78.8	83
2-Nov	76	76	79	81	82	80	80	80	79	77	76	77	78	79	81	86	90	91	92	93	93	92	92	92	83.4	93
3-Nov	92	94	96	96	96	95	98	97	95	91	92	85	76	71	65	65	67	66	65	65	63	65	63	61	79.9	98
4-Nov	59	57	58	61	63	65	65	64	58	44	37	35	34	34	32	34	39	42	43	42	40	43	40	39	47.0	65
5-Nov	39	36	36	34	29	32	35	34	35	41	39	41	41	40	40	46	45	41	41	43	47	50	54	55	40.6	55
6-Nov	51	53	56	54	54	55	60	63	67	66	64	62	54	52	53	53	53	61	68	66	66	69	69	68	59.8	69
7-Nov	67	66	64	64	65	62	63	64	63	58	53	48	47	44	40	38	40	48	52	53	62	75	80	82	58.2	82
8-Nov	85	86	88	87	80	76	75	67	63	59	54	50	47	46	46	47	53	59	60	60	62	65	68	64	64.6	88
9-Nov	62	64	67	65	60	60	57	51	50	50	55	57	60	60	60	63	65	65	65	66	65	66	68	68	61.2	68
10-Nov	69	69	71	71	70	70	66	70	68	62	55	55	50	53	56	57	56	60	62	62	66	68	64	65	63.1	71
11-Nov	67	65	60	63	65	67	69	71	73	71	65	62	60	56	55	53	56	60	60	63	66	61	58	61	62.8	73
12-Nov	64	65	61	59	61	62	59	57	57	58	57	47	41	54	60	66	65	63	56	73	65	65	62	65	60.1	73
13-Nov	73	67	65	61	62	57	54	67	75	72	73	78	79	75	72	70	76	78	75	70	69	73	76	78	70.6	79
14-Nov	82	81	80	82	84	83	74	80	86	85	84	83	79	74	68	66	68	72	79	81	79	76	74	71	77.9	86
15-Nov	69	70	70	72	73	74	77	79	78	72	64	55	47	44	41	45	52	57	58	63	67	70	71	71	64.2	79
16-Nov	71	70	71	72	78	77	77	75	76	71	70	69	68	66	65	68	71	76	81	85	86	83	81	84	74.6	86
17-Nov	84	80	78	84	80	79	82	79	77	79	81	81	74	73	74	72	73	71	72	70	74	76	79	81	77.2	84
18-Nov	82	84	85	84	84	83	82	82	82	80	80	73	71	70	68	70	76	78	78	79	80	82	81	81	79.0	85
19-Nov	81	81	80	81	83	84	85	86	87	89	90	90	90	90	90	89	90	90	91	91	90	89	89	89	87.3	91
20-Nov	90	90	90	90	89	89	89	89	89	90	90	91	91	91	92	92	92	93	93	93	94	94	94	95	91.3	95
21-Nov	95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	95	94	94	95	94	95	95	95	95.2	96
22-Nov	95	96	95	94	94	93	93	93	91	89	89	88	88	88	88	89	91	93	94	95	95	95	94	94	92.2	96
23-Nov	94	95	93	93	92	93	94	94	94	94	93	92	91	88	87	87	88	90	90	88	87	88	88	89	91.0	95
24-Nov	89	91	93	94	96	94	93	94	92	91	90	89	92	92	88	86	91	97	97	97	97	97	97	97	93.2	97
25-Nov	97	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	99	98	96	96	96	95	97.6	99
26-Nov	96	95	95	92	92	93	92	91	90	88	86	82	77	76	78	83	86	89	89	85	87	79	77	89	86.9	96
27-Nov	98	98	97	96	96	95	95	95	96	96	96	96	97	97	98	98	98	98	98	97	97	97	97	97	96.8	98
28-Nov	97	97	97	97	97	96	96	96	96	96	95	94	93	92	91	93	93	93	93	94	94	96	96	94	94.8	97
29-Nov	94	94	95	96	95	96	95	96	96	93	91	91	91	92	93	94	95	95	96	95	95	95	94	94	94.2	96
30-Nov	94	94	94	94	94	94	94	93	93	93	93	94	94	94	94	94	94	94	94	94	94	94	94	94	93.8	94
	79.7	79.5	79.6	79.7	79.6	79.3	79.1	79.3	79.3	77.5	76.1	74.5	72.6	72.2	71.5	72.6	74.3	76.4	77.1	77.9	78.4	79.0	79.0	79.5	Diurnal Average	
	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	99	98	97	97	97	97	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
ConocoPhillips - Surmont - November 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
ConocoPhillips - Surmont - November 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	21	2.92	2.92
40 - 60	97	13.47	16.39
60 - 80	245	34.03	50.42
80 - 100	357	49.58	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

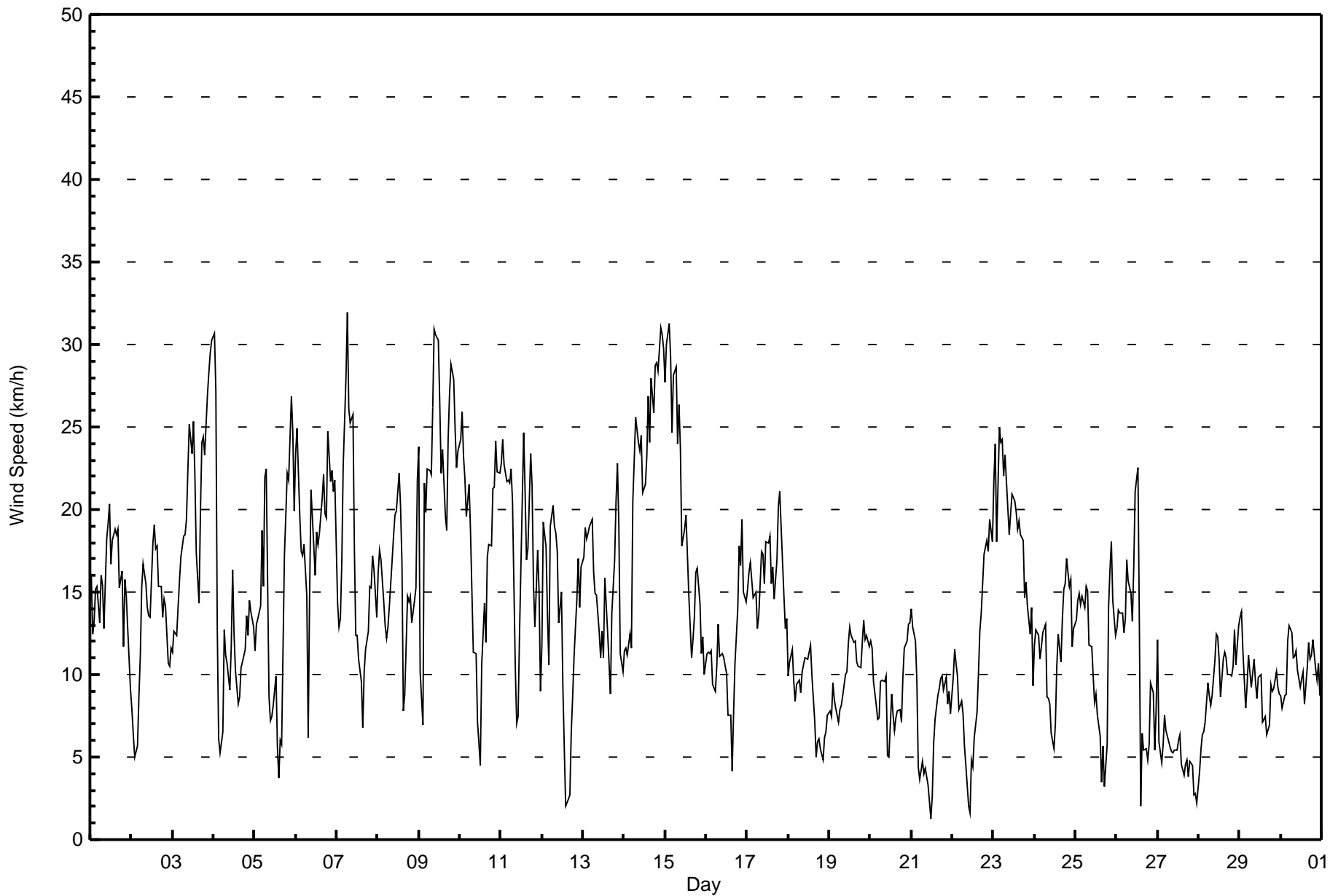


Maximum Speed: 32 km/h on Nov 7 07:00	Maximum Daily Speed Average: 22.3 km/h on Nov 9	Hours in Service: 720
Minimum Speed Value: 1 km/h on Nov 21 12:00	Minimum Daily Speed Average: 1.6 km/h on Nov 21	Hours of Data: 720
Maximum Diurnal Speed Average: 9.5 km/h at hour 7	Minimum Diurnal Speed Average: 6.1 km/h at hour 16	Hours of Missing Data: 0
Monthly Average Velocity: 7.9 km/h 239.4 deg	Percentiles: P ₁ = 3 P ₁₀ = 6 Q ₁ = 9 Median = 13 Q ₃ = 18 P ₉₀ = 23 P ₉₉ = 31	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	WNNW16	NW12	NW13	NW15	WNNW15	WNNW13	WNNW16	NW15	WNNW13	WNNW18	WNNW19	WNNW20	WNNW17	WNNW18	WNNW19	WNNW15	WNNW16	WNNW12	WNNW16	WNNW15	WNNW13	W9	WNNW15.4	WNNW20		
2-Nov	WSW8	WSW6	SW5	SSW6	SSW9	S11	S15	S17	S16	S14	S14	SSE13	S18	S19	S18	SSW18	SSW15	SSW15	SSW13	SSW15	SSW14	SSW11	SSW10	SSW12	S12.4	S19
3-Nov	S11	S13	SSW12	S14	S16	S17	S18	S18	SSW19	SW22	WSW25	WSW23	WSW25	WSW22	SW17	SW14	WSW20	WSW24	WSW24	WSW23	WSW27	WSW28	WSW29	WSW30	SW18.9	WSW30
4-Nov	WSW31	WSW27	SW13	SSW6	SSW5	SSW7	WSW13	SW11	SW11	SSW9	SSW12	SW16	SW12	SW10	SW8	SSW9	SW10	SW11	SW12	SW14	SW12	SW14	SW14	SSW13	SW12.0	WSW31
5-Nov	SW11	SSW13	SSW13	SW14	SW19	SW15	WSW22	WSW22	WSW9	SSW7	WSW7	SW8	WSW10	WSW6	SSW4	S6	SSW6	WSW17	WSW20	WSW22	WSW22	W27	WNNW25	WNNW20	WSW13.0	W27
6-Nov	W23	W25	W20	W17	W17	W18	W15	WNNW6	W15	W21	W20	W16	W19	W18	W19	W21	W22	W20	W19	W25	W22	W22	W21	W22	W19.1	W25
7-Nov	W14	W13	W13	W17	WSW23	W28	WSW32	WSW26	WSW25	WSW26	WSW18	W12	WSW12	WSW11	SW10	SW7	S10	S12	S13	S15	S15	S17	S16	S14	SW13.7	WSW32
8-Nov	S16	S18	S17	S14	S13	S12	SSW13	SW14	SW17	SW18	SW20	SW20	SW22	SW20	SW17	SW8	SW9	SW15	SW14	SW15	SW13	SW15	SW15	WSW22	SW14.6	SW22
9-Nov	WSW24	WSW10	WSW7	WSW22	WSW20	WSW22	WSW22	WSW22	WSW26	W31	W31	W30	W26	WNNW22	WNNW24	WNNW20	W19	W24	W27	W29	W28	WNNW25	W23	W24	W22.3	W31
10-Nov	W24	W26	W23	W22	W20	W21	W19	W15	WSW11	WSW11	SW7	SW6	SSE4	SE11	SE14	SSE12	S17	SSE18	SSE18	S21	S21	S24	S22	S22	SW10.8	W26
11-Nov	S23	S24	S23	S22	SSW22	SSW22	SW22	SW20	SW10	SW7	SSW7	W12	WSW21	WSW25	WSW21	WSW17	WSW18	WSW23	WSW21	W15	WSW13	W18	W15	WSW9	SW15.2	WSW25
12-Nov	WSW12	WSW19	WSW18	WSW14	SW11	WSW19	WSW20	WSW19	WSW19	WSW17	WSW13	W15	WSW9	N6	SE2	S2	W3	WNNW7	WNNW9	NW11	WNNW15	WNNW17	WNNW14	WNNW17	WSW11.4	WSW20
13-Nov	WNNW17	WNNW19	WNNW18	W19	W19	W19	W16	WSW15	SW15	SW13	SW11	WSW13	SW11	WSW16	SW13	SW11	SSW9	SW14	SW17	WSW21	WSW23	WSW19	SW11	SSW10	WSW13.9	WSW23
14-Nov	SSW11	S12	SSW11	SW12	SW12	WSW21	W23	W26	W24	W24	W24	W21	W21	W23	W27	W24	W28	W26	W29	W29	W28	W31	W31	W30	W21.6	W31
15-Nov	W28	WSW30	W31	W29	W25	WSW28	WSW29	WSW24	WSW26	WSW24	W18	W19	W20	W17	W15	WSW11	WSW12	WSW14	WSW16	WSW16	WSW14	W11	W12	WNNW10	W19.8	W31
16-Nov	WNNW11	WNNW11	NW11	NW11	NW9	NW9	NW10	NW13	NW11	NW11	N11	N10	N10	N8	NNE8	NE4	N8	NW11	NW14	NW18	NW17	NW19	N15	NW14	NNW10.7	NNW19
17-Nov	NNW15	NNW16	NNW17	NNW15	NNW15	NNW15	NNW13	NNW14	NNW17	NN17	NN15	NW18	WNNW18	WNNW18	WNNW16	WNNW17	WNNW15	WNNW17	WNNW20	WNNW21	WNNW19	WNNW15	WNNW13	WNNW13	NNW15.0	WNNW21
18-Nov	W10	W11	W12	W10	W8	W9	WSW10	WSW9	WSW10	W11	WNNW11	WNNW11	W11	W12	W10	WNNW7	NNW5	N6	N6	N5	NE5	ESE6	ESE7	ESE8	W5.8	W12
19-Nov	ESE8	ESE7	SE10	ESE8	ESE8	E7	E8	E8	E9	ESE10	ESE10	ESE12	ESE13	ESE12	ESE12	E12	E11	E11	ESE10	ESE12	ESE13	ESE12	ESE12	ESE12	ESE10.2	ESE13
20-Nov	ESE12	ESE12	ESE10	ESE8	ESE7	SE7	SE10	SE10	SE10	SE10	SE5	ESE5	SE9	SE8	SSE7	SE7	SE8	SE8	SE7	SE10	SE12	SE12	SE13	SE13	SE9.0	SE13
21-Nov	SE14	SE13	SE12	SE10	SSE4	SSE4	SE5	SSE4	SE4	SE4	ESE3	SSW1	WNNW3	N6	NNW7	NNW9	NNW9	NNW10	N10	N9	N10	NNW8	NNW9	NNW8	NE1.6	SE14
22-Nov	NNW10	N12	N11	N10	NNW8	N8	N8	NNW6	NNW4	WSW2	W2	E5	ESE4	SSE6	SSE8	SSE10	S13	SSE14	SSE17	S18	SSE18	SSE17	SSE19	SSE18	SSE3.6	SSE19
23-Nov	SSE22	SSE24	SSE18	SE25	SSE24	SE24	SSE22	SE23	SE20	SE18	SE20	SE21	SE21	SE20	SE19	SE19	SE18	SE18	SSE15	S16	SSW14	SSW12	SSW14	SSW9	SSE18.2	SE25
24-Nov	S12	SSE13	S12	S11	S12	S13	S13	SSW9	SSW9	S8	SSW6	S5	SE7	SSE10	SE12	SSE11	SSE13	SE15	SE15	SE17	SE15	SE16	SE12	SE13	SSE11.1	SE17
25-Nov	SE13	SE14	SE15	SE14	SE15	SE14	SE15	SE15	SE12	SE12	SE10	SE8	SE9	SE8	SSE6	SW3	WNNW6	W3	W6	WNNW14	WNNW16	W18	W15	W12	SSE5.3	W18
26-Nov	W13	W14	W14	W14	W13	WSW13	W17	W16	W15	W13	W17	WSW21	WSW23	W13	W2	SSE6	S5	SSE6	SSW5	S6	SSW10	SSW9	S5	SSE8	WSW9.6	WSW23
27-Nov	SSE12	SE6	ESE5	NNE6	NNW8	N7	NNE6	N6	NNE5	N5	NNE5	NE5	ENE6	E6	E5	ENE4	E5	E5	E4	E5	E4	ENE3	SW3	WNNW2	ENE3.1	SSE12
28-Nov	WSW4	W5	W6	W6	W7	W9	W9	W8	W9	W11	W12	W12	W11	W9	W11	W11	W11	W10	W10	WNNW10	WNNW11	WNNW13	WNNW11	NW13	W9.3	NW13
29-Nov	NW13	NNW14	NW11	NNW8	NW9	WNNW11	NW10	WNNW9	WNNW11	WNNW10	WNNW9	WNNW10	W10	W7	WSW7	SW7	SW6	SSW7	SSW9	S9	S9	S10	S9	SSW9	W6.0	NNW14
30-Nov	SSW9	SSW8	SSW9	S9	S12	S13	S13	S11	S11	S11	S10	SSW9	S10	S10	S8	S10	S12	S11	S11	S12	S10	S10	S11	SSW9	S10.3	S13

WSW7.8WSW7.9WSW7.0WSW6.8WSW7.3WSW8.6WSW9.5WSW8.9WSW9.1WSW9.1WSW8.2WSW8.3WSW8.4WSW7.3	SW6.4	SW6.1	SW6.7	SW7.2	WSW7.8WSW8.8WSW9.0WSW9.2WSW8.1WSW7.7	Diurnal Average																	
WSW31WSW30	W31	W29	W25	WSW28	WSW32	WSW26	WSW26	W31	W31	W30	W26	WSW25	W27	W24	W28	W26	W29	W29	W28	W31	W31	WSW30	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
ConocoPhillips - Surmont - November 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	51	7.08	7.08
6 - 11	239	33.19	40.28
12 - 19	288	40.00	80.28
20 - 28	125	17.36	97.64
29 - 38	17	2.36	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
ConocoPhillips - Surmont - 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	1	3	3	2	7	4	5	4	4	4	3	2	5	2	0	2	51
6 - 11	16	3	0	1	7	13	21	10	25	30	22	18	28	19	11	15	239
12 - 19	2	0	0	0	0	12	31	16	41	18	28	28	49	39	10	14	288
20 - 28	0	0	0	0	0	0	8	4	9	2	7	43	43	9	0	0	125
29 - 38	0	0	0	0	0	0	0	0	0	0	0	6	11	0	0	0	17
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	19	6	3	3	14	29	65	34	79	54	60	97	136	69	21	31	720

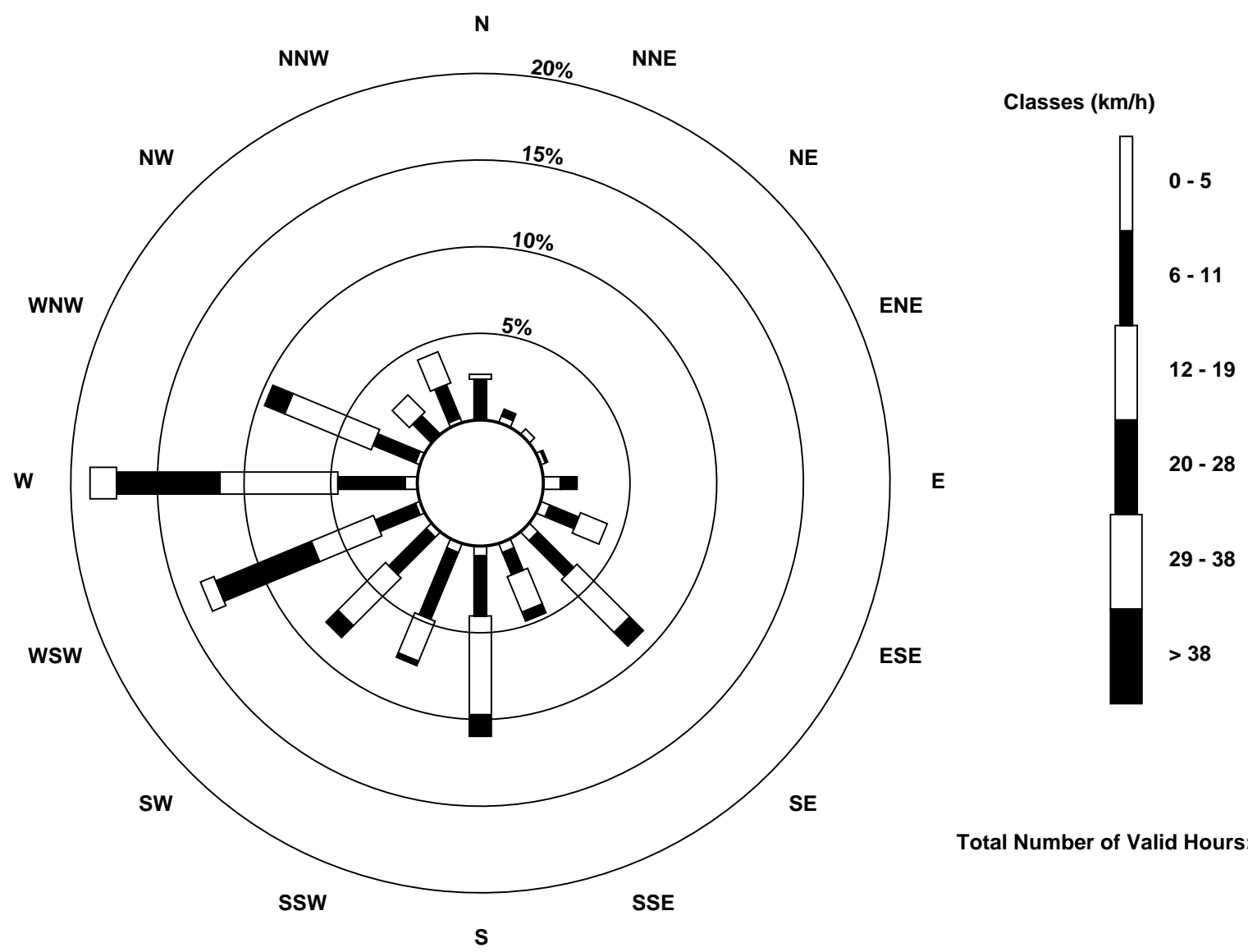
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Nov 2016

Wind Speed (WS) - km/h
ConocoPhillips - Surmont (AMS502)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Nov 9 12:00 Minimum Value: 0 km/h on Nov 28 01:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 6																	Hours in Service: 720 Hours of Data: 720 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-Nov	3	3	3	3	3	3	4	4	3	4	4	4	4	4	4	4	4	3	4	2	4	3	3	2	4
2-Nov	2	3	1	1	2	3	4	4	3	3	3	3	4	4	4	4	4	4	3	3	3	3	3	3	4
3-Nov	2	2	3	3	4	3	4	4	5	6	7	4	5	5	5	3	4	4	4	4	4	4	4	5	7
4-Nov	5	5	5	3	2	1	3	2	2	2	3	4	4	3	2	2	2	2	3	2	2	3	3	3	5
5-Nov	2	3	3	4	4	3	4	4	6	2	3	3	3	2	2	2	2	2	3	3	3	4	4	4	6
6-Nov	4	5	3	3	3	3	3	2	6	3	3	3	3	3	3	4	4	4	4	4	4	5	3	4	6
7-Nov	4	4	5	3	6	4	5	5	4	4	4	3	2	3	4	2	3	2	3	3	3	4	4	3	6
8-Nov	3	3	3	3	3	3	3	3	4	4	4	5	5	5	5	3	3	2	3	3	3	4	3	4	5
9-Nov	4	6	2	4	2	4	4	4	5	5	7	8	7	6	5	5	4	4	5	5	5	4	4	3	8
10-Nov	4	4	4	4	3	3	3	3	3	1	2	3	2	3	3	3	4	4	5	5	5	5	5	5	5
11-Nov	5	5	5	5	5	5	5	5	5	3	3	3	6	4	4	4	4	4	4	3	3	4	2	2	6
12-Nov	2	4	2	2	2	3	3	3	3	3	3	3	1	4	1	2	3	1	2	2	2	3	2	3	4
13-Nov	3	3	3	3	3	3	3	2	2	3	4	4	3	4	3	3	2	4	3	4	3	4	3	2	4
14-Nov	2	2	3	3	3	4	5	4	4	4	4	4	5	5	6	6	5	5	5	5	6	5	5	5	6
15-Nov	5	5	5	5	4	4	4	4	4	4	4	3	3	3	3	2	1	2	2	2	2	3	2	2	5
16-Nov	2	2	2	2	3	2	2	2	2	2	2	2	2	2	1	2	1	2	3	3	4	4	3	3	4
17-Nov	3	4	4	3	3	3	3	3	4	4	3	3	3	3	3	4	4	4	4	4	4	3	2	2	4
18-Nov	2	2	1	1	2	1	1	1	2	2	2	2	2	2	2	1	2	1	1	1	1	1	2	1	2
19-Nov	1	1	2	2	1	1	1	1	2	2	2	2	3	2	2	2	2	2	2	2	3	3	2	2	3
20-Nov	2	2	1	1	1	1	1	1	2	2	2	1	2	2	1	1	1	1	1	2	2	2	2	3	3
21-Nov	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
22-Nov	2	2	2	1	2	1	2	1	2	1	1	1	2	2	3	3	3	4	4	5	5	5	5	5	5
23-Nov	5	6	5	5	5	5	5	4	4	3	4	4	4	4	3	4	3	3	4	4	4	3	4	3	6
24-Nov	2	2	2	2	2	2	4	2	2	2	2	1	2	2	3	2	3	3	3	4	3	3	2	3	4
25-Nov	2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	3	1	1	2	3	3	4	4	4	4
26-Nov	3	4	3	3	2	4	5	4	4	3	3	3	3	5	4	2	2	2	1	3	2	2	2	3	5
27-Nov	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
28-Nov	0	1	1	1	1	2	2	2	2	2	2	3	4	2	2	2	2	2	2	2	2	2	2	3	4
29-Nov	3	3	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2	2	3	3	3	3	3	3
30-Nov	3	2	2	3	3	3	4	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3	3	2	4
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
ConocoPhillips - Surmont - November 2016

Direction of Maximum Speed: 255 deg on Nov 7 07:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 266.9 deg on Nov 9	Hours of Data: 720
Direction of Minimum Speed: 197 deg on Nov 21 12:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.6 deg on Nov 21	Percent Operational Time: 100.0
Monthly Average Direction: 251.3 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-Nov	286	321	309	308	303	289	294	308	285	288	289	288	284	289	289	283	284	288	294	286	294	298	293	276	292.4
2-Nov	255	246	220	207	196	187	184	180	183	180	172	163	173	175	180	196	204	208	194	196	197	194	194	194	190.2
3-Nov	182	191	194	188	187	180	182	185	201	228	239	245	242	241	236	226	238	238	238	238	245	244	247	250	226.4
4-Nov	251	250	223	198	198	200	237	230	215	208	196	236	232	214	218	198	214	216	214	218	215	216	215	212	223.1
5-Nov	214	200	207	224	234	226	239	248	239	212	243	236	238	255	197	179	202	245	251	251	246	259	290	292	242.5
6-Nov	280	279	281	275	277	263	262	292	272	275	276	272	267	267	265	266	263	272	280	272	264	263	263	264	270.8
7-Nov	265	265	260	259	256	259	255	255	253	251	257	265	257	237	236	214	178	177	181	180	178	177	180	183	235.5
8-Nov	177	176	177	183	188	181	195	214	214	217	230	233	234	234	231	216	214	221	225	220	224	231	226	239	214.5
9-Nov	240	256	251	243	246	239	244	244	252	263	275	274	279	289	285	283	280	275	276	271	275	283	279	274	266.9
10-Nov	272	274	272	270	274	271	278	266	249	245	235	230	161	143	136	151	185	156	167	181	179	178	176	171	218.2
11-Nov	178	177	177	186	195	201	214	217	216	227	206	262	255	249	244	239	239	249	257	263	255	270	281	256	227.1
12-Nov	243	239	242	245	236	243	242	242	244	250	247	259	252	6	136	184	281	286	282	308	283	291	287	294	258.4
13-Nov	289	285	284	278	277	278	271	242	235	233	239	224	238	227	233	213	229	234	237	240	237	217	193	248.4	
14-Nov	192	190	208	225	227	254	268	262	266	265	269	267	266	269	275	272	273	270	269	266	270	268	263	266	262.1
15-Nov	261	257	259	259	259	254	255	256	254	256	266	272	270	271	274	254	247	248	255	252	248	262	278	282	259.6
16-Nov	300	301	315	319	318	315	308	313	305	322	352	6	357	357	16	36	2	344	342	341	345	345	358	344	335.8
17-Nov	343	329	336	345	347	345	347	332	301	310	306	308	284	282	286	292	289	293	301	302	293	290	286	288	308.5
18-Nov	279	276	277	275	261	261	246	247	245	268	284	284	277	280	272	290	329	357	357	2	42	105	107	108	278.8
19-Nov	116	118	134	109	104	98	91	94	99	102	106	113	119	111	108	101	94	95	102	105	108	110	109	111	106.8
20-Nov	114	116	117	121	119	124	131	134	137	138	137	117	133	144	151	139	130	129	127	129	135	136	137	136	130.5
21-Nov	139	138	139	141	157	151	137	156	138	134	118	197	290	349	348	343	346	346	349	350	349	341	338	339	34.2
22-Nov	341	352	351	355	337	351	355	333	333	257	264	94	108	160	162	164	172	147	153	172	165	165	164	165	156.6
23-Nov	149	150	163	146	148	145	156	144	141	141	142	141	141	144	141	140	141	141	153	176	195	199	197	200	151.9
24-Nov	175	168	169	174	174	170	173	194	194	185	192	183	145	152	145	161	148	145	140	143	140	141	135	135	158.2
25-Nov	139	142	142	138	140	139	142	140	134	135	127	127	127	128	149	215	282	264	263	283	283	273	280	276	165.7
26-Nov	273	262	271	272	263	258	261	275	266	266	260	251	251	274	280	160	184	163	202	178	207	211	177	164	249.9
27-Nov	147	138	122	17	347	355	16	10	22	11	28	46	70	87	89	78	91	93	99	100	100	71	235	282	64.0
28-Nov	256	265	280	281	277	275	274	276	270	274	271	274	281	270	266	266	265	270	274	285	284	290	294	321	277.6
29-Nov	315	327	315	337	322	300	307	294	291	287	288	284	269	267	243	225	233	202	192	187	188	190	185	194	268.6
30-Nov	203	196	193	190	179	182	183	185	180	183	186	194	178	181	183	180	177	180	178	179	181	182	187	195	184.2

237.1 236.8 236.4 238.2 238.4 237.8 239.1 239.1 238.4 243.9 248.7 252.3 244.2 242.2 235.8 227.8 230.7 233.2 239.5 238.9 238.6 241.3 240.3 239.8

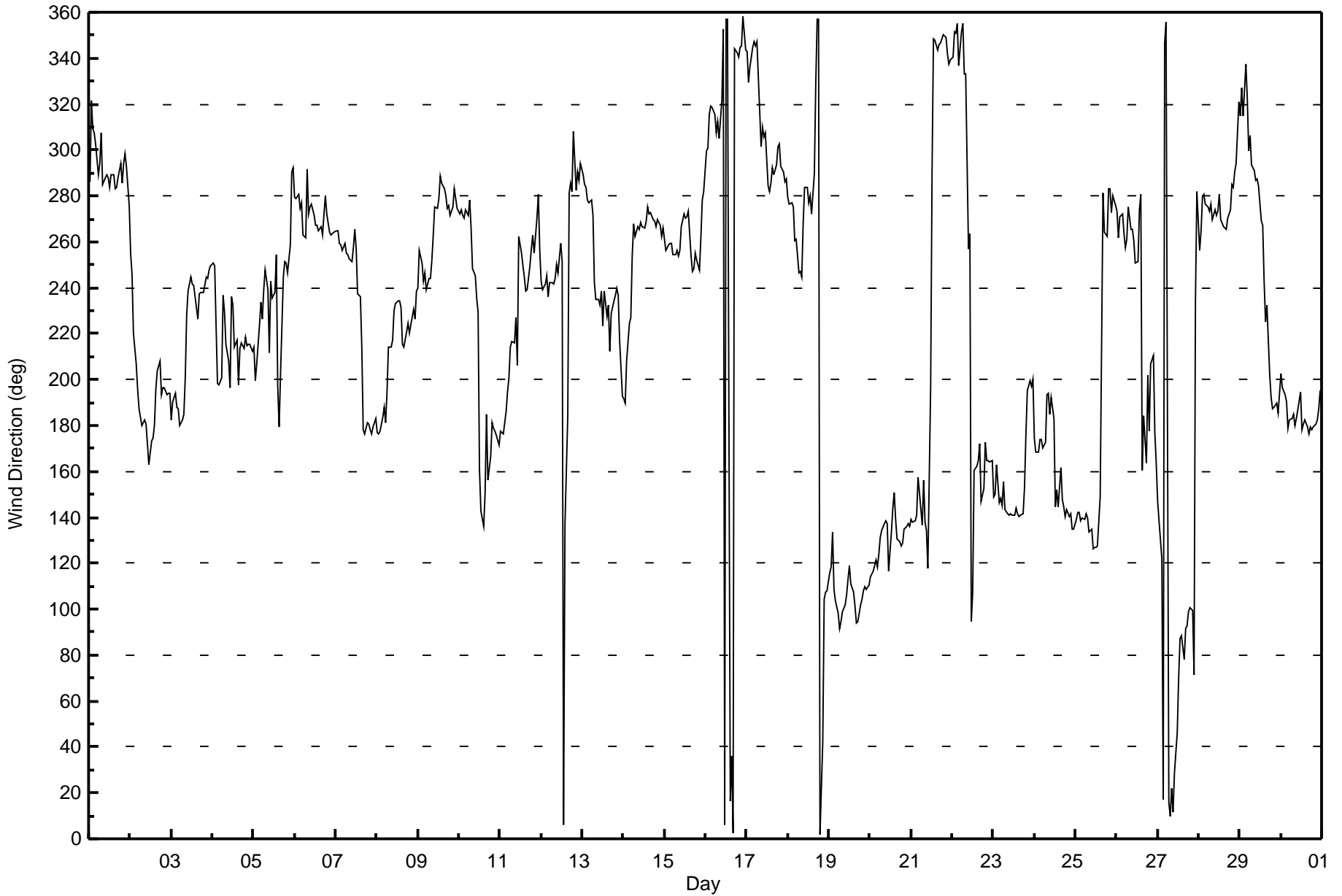
Diurnal Average

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
ConocoPhillips - Surrmont - November 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
ConocoPhillips - Surmont - November 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Nov 26 15:00																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 5 deg on Nov 28 01:00																									
Percentiles: P ₁ = 7 P ₁₀ = 9 Q ₁ = 11 Median = 13 Q ₃ = 17 P ₉₀ = 22 P ₉₉ = 64																									
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	10	18	19	16	18	14	17	20	13	12	12	13	14	15	12	14	11	11	14	13	14	15	13	14	20
2-Nov	14	19	17	15	15	17	17	14	15	16	16	19	13	13	15	16	18	16	14	15	15	19	17	17	19
3-Nov	16	14	15	15	15	14	14	15	17	15	12	9	10	11	14	14	10	10	9	10	8	8	8	9	17
4-Nov	8	9	22	35	26	15	12	13	13	17	16	15	15	19	16	15	10	12	15	12	14	12	12	13	35
5-Nov	14	15	14	15	12	14	9	10	52	34	26	26	17	39	52	30	28	9	8	7	7	12	12	9	52
6-Nov	8	9	9	8	9	9	12	45	18	9	9	10	9	9	9	9	8	9	11	9	9	11	9	9	45
7-Nov	10	13	17	11	11	9	8	9	9	8	12	16	12	16	17	14	16	17	17	14	13	13	14	14	17
8-Nov	13	13	13	15	15	15	20	13	13	14	14	13	12	12	14	29	30	12	12	12	13	13	14	9	30
9-Nov	8	46	23	8	7	8	9	9	10	10	12	12	13	15	12	16	12	9	9	9	9	10	9	9	46
10-Nov	8	8	8	8	9	9	9	10	11	6	21	44	64	20	11	21	15	25	19	14	14	13	14	14	64
11-Nov	13	14	13	16	16	16	15	16	37	29	34	18	13	9	8	14	12	11	11	11	14	8	9	15	37
12-Nov	10	9	8	7	14	8	8	8	8	11	14	8	9	60	67	67	90	25	30	21	10	10	9	9	90
13-Nov	10	8	8	10	9	8	11	9	10	10	15	17	19	12	16	13	13	15	11	10	8	11	22	16	22
14-Nov	13	15	18	17	17	12	10	9	9	9	10	11	12	11	12	11	10	10	9	10	10	9	8	8	18
15-Nov	9	9	9	9	10	8	8	9	9	9	13	11	11	12	12	10	7	9	7	6	8	23	7	8	23
16-Nov	10	13	14	17	20	13	12	12	13	18	14	16	19	18	24	21	14	10	8	9	14	14	17	12	24
17-Nov	13	17	14	15	16	13	15	20	15	17	15	15	13	14	13	11	13	12	16	15	9	9	9	8	20
18-Nov	11	10	8	8	17	8	8	8	9	11	12	13	14	12	15	28	44	18	16	16	26	17	30	19	44
19-Nov	14	19	12	19	17	17	14	13	14	12	12	14	12	13	13	13	11	11	11	12	12	11	12	10	19
20-Nov	10	11	10	11	9	11	10	10	11	16	22	19	16	17	16	13	11	12	12	11	11	11	11	11	22
21-Nov	11	10	10	13	24	27	20	21	17	14	18	65	52	20	16	13	13	14	15	15	13	20	23	24	65
22-Nov	18	16	15	15	20	16	18	36	33	58	77	15	45	30	28	24	21	17	19	18	22	21	19	19	77
23-Nov	14	15	19	11	12	11	19	10	11	11	10	11	11	11	10	10	11	11	20	19	19	19	19	22	22
24-Nov	15	12	13	16	12	13	18	17	20	18	21	23	19	16	14	23	17	12	11	10	11	11	14	14	23
25-Nov	13	11	11	12	12	12	11	11	12	13	13	14	12	13	18	54	7	16	20	11	12	11	12	13	54
26-Nov	14	15	11	11	11	15	13	12	14	13	11	8	8	20	100	31	28	31	21	45	12	14	33	18	100
27-Nov	12	9	41	12	18	18	17	20	13	15	16	14	19	13	14	15	12	9	11	11	13	30	23	59	59
28-Nov	5	13	10	10	11	12	13	13	13	11	10	11	16	13	10	9	9	11	10	9	8	10	13	18	18
29-Nov	15	14	17	26	22	16	23	16	10	8	10	11	12	23	13	21	29	26	23	26	22	22	23	23	29
30-Nov	20	23	23	22	17	18	19	20	18	19	20	22	19	19	22	20	18	19	18	18	21	20	21	19	23
																	20 46 41 35 26 27 23 45 52 58 77 65 64 60 100 67 90 31 30 45 26 30 33 59								
Diurnal Maximum																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	November 7, 2016	Last Calibration	October 17, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	11:15	End Time (MST)	15:45
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	1627	1598
Calculated slope	0.995222	0.997462	Chamber temp	50.0	50.0
Calculated intercept	0.571912	1.649369	Pressure	21.1	21.5
Analyzer Background	24.2	24.2	Flow	0.520	0.526
Analyzer Coefficient	1.016	1.031	Intensity	40	39
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	0.0	----
as found span	5000	83.2	803.7	790.7	1.016
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	83.2	803.7	805.4	0.998
second point	5000	41.6	401.9	399.0	1.007
third point	5000	20.8	200.9	199.1	1.009
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	83.2	803.7	796.0	1.010
Average Correction Factor					1.005

Corrected As found 790.7 Previous response 807.0 % change 2.1%

Notes:

Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By:

Asad Hidayat



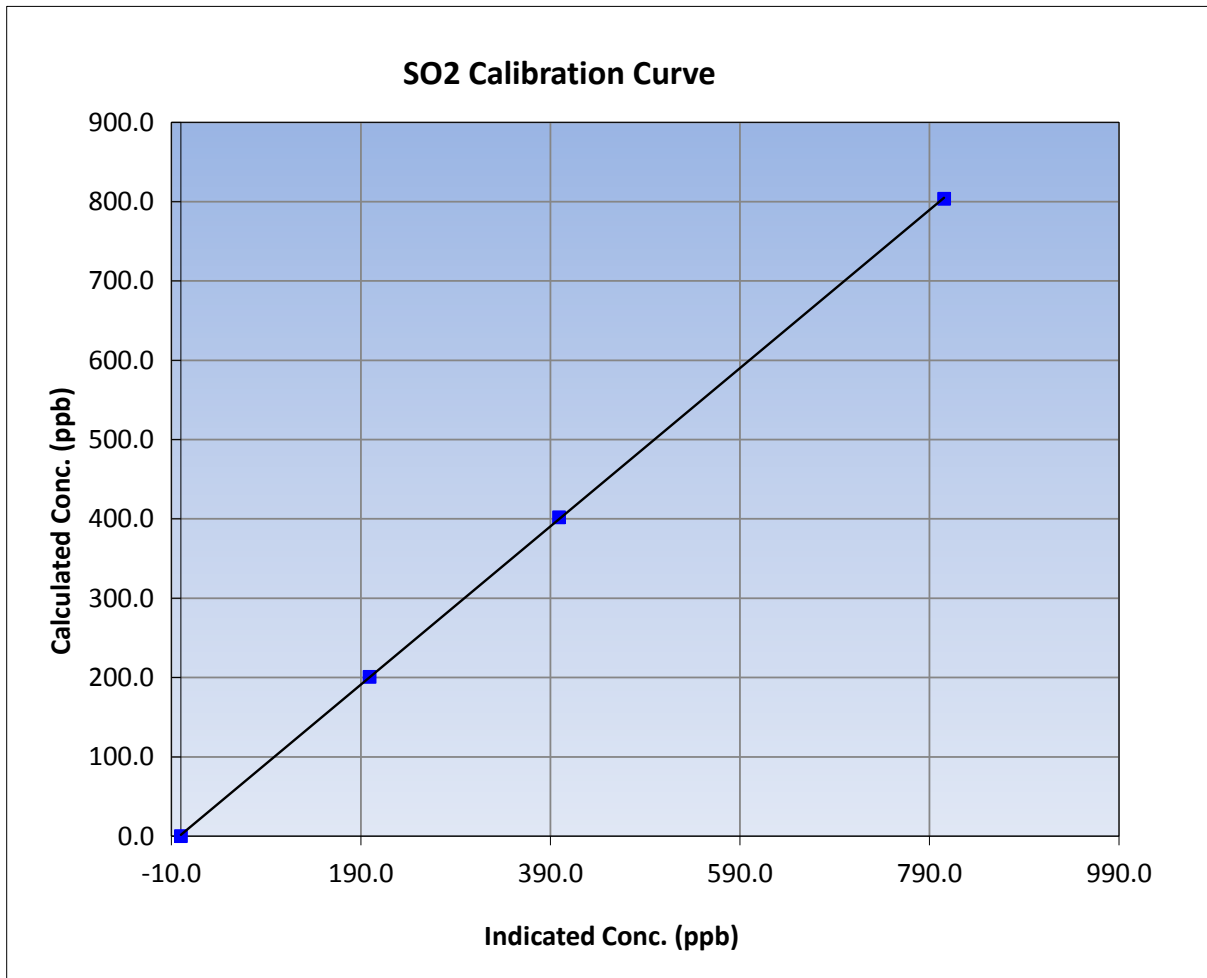
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	November 7, 2016	Previous Calibration	October 17, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Start Time (MST)	11:15	End Time (MST)	15:45
Analyzer make	API T100	Analyzer serial #	598

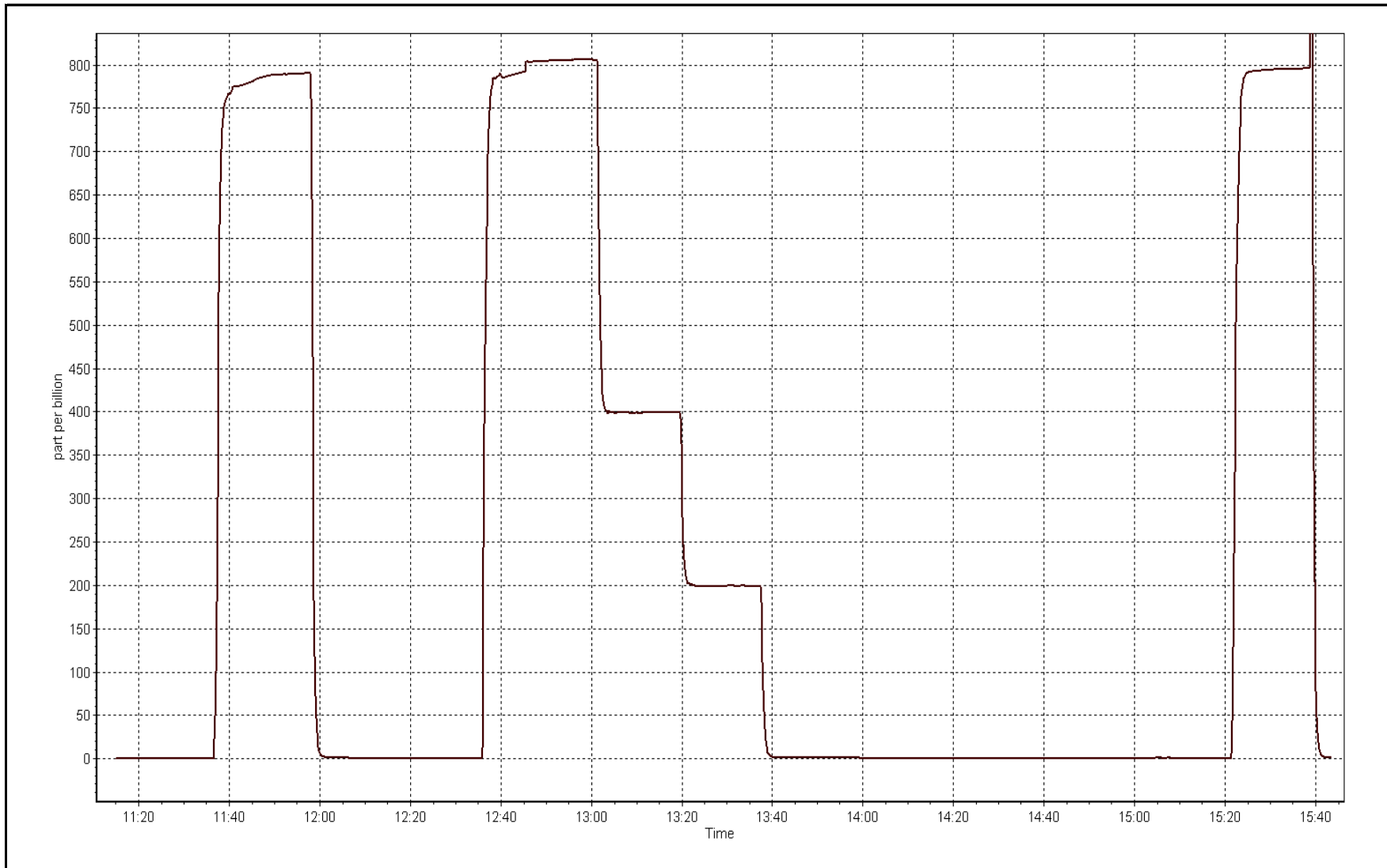
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999973
803.7	805.4	0.9979		
401.9	399.0	1.0072	Slope	0.997462
200.9	199.1	1.0091		
			Intercept	1.649369



SO2 Calibration Plot

Date: November 7, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 4, 2016	Last Calibration	October 17, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	11:00	End Time (MST)	13:50
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	2356	2342
Calculated slope	0.987998	0.999993	Chamber temp	50.0	50.0
Calculated intercept	-0.007869	0.058751	Pressure	22.8	23.3
Analyzer Background	20.6	20.6	Flow (SLPM)	0.584	0.594
Analyzer Coefficient	0.972	0.978	Intensity	52	52
			Converter temp.	314	317

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	0.0	----
as found span	5000	38.5	80.1	79.5	1.007
SO2 scrubber check	5000	20.7	200.0	3.5	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	38.5	80.1	80.1	1.000
second point	5000	19.3	40.1	40.0	1.003
third point	5000	12.0	25.0	24.9	1.002
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	38.5	80.1	79.6	1.007
Average Correction Factor					1.002

Corrected As found	79.5	Previous response	81.1	% change	1.9%
--------------------	------	-------------------	------	----------	------

Notes:

Sample inlet filter replaced after as founds. Sample pump replaced after as founds for preventative maintenance. Scrubber check done after 3rd point. Slightly adjusted span.

Calibration Performed By: Asad Hidayat



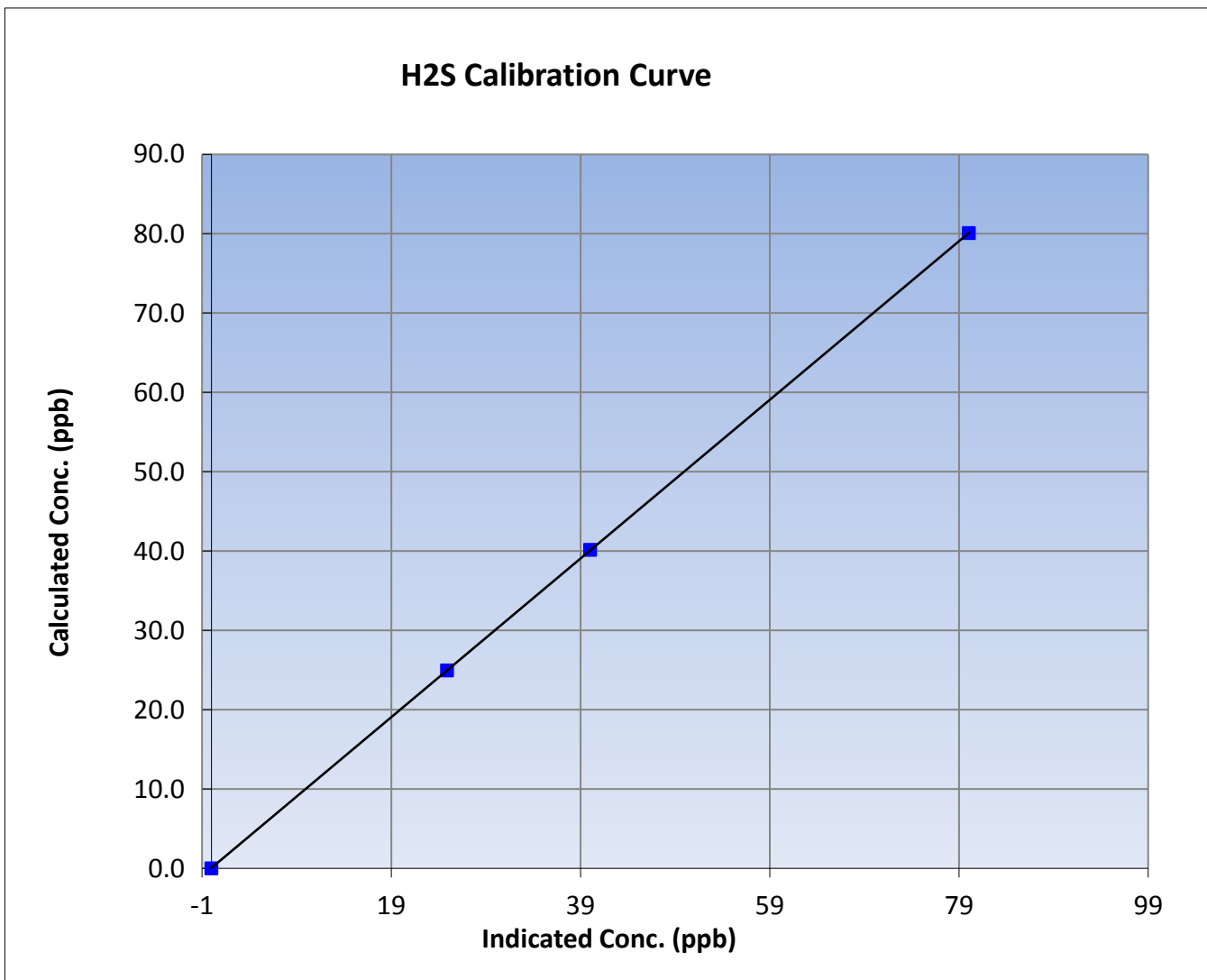
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	November 4, 2016	Previous Calibration	October 17, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	11:00	End Time (MST)	13:50
Analyzer make	API T101	Analyzer serial #	197

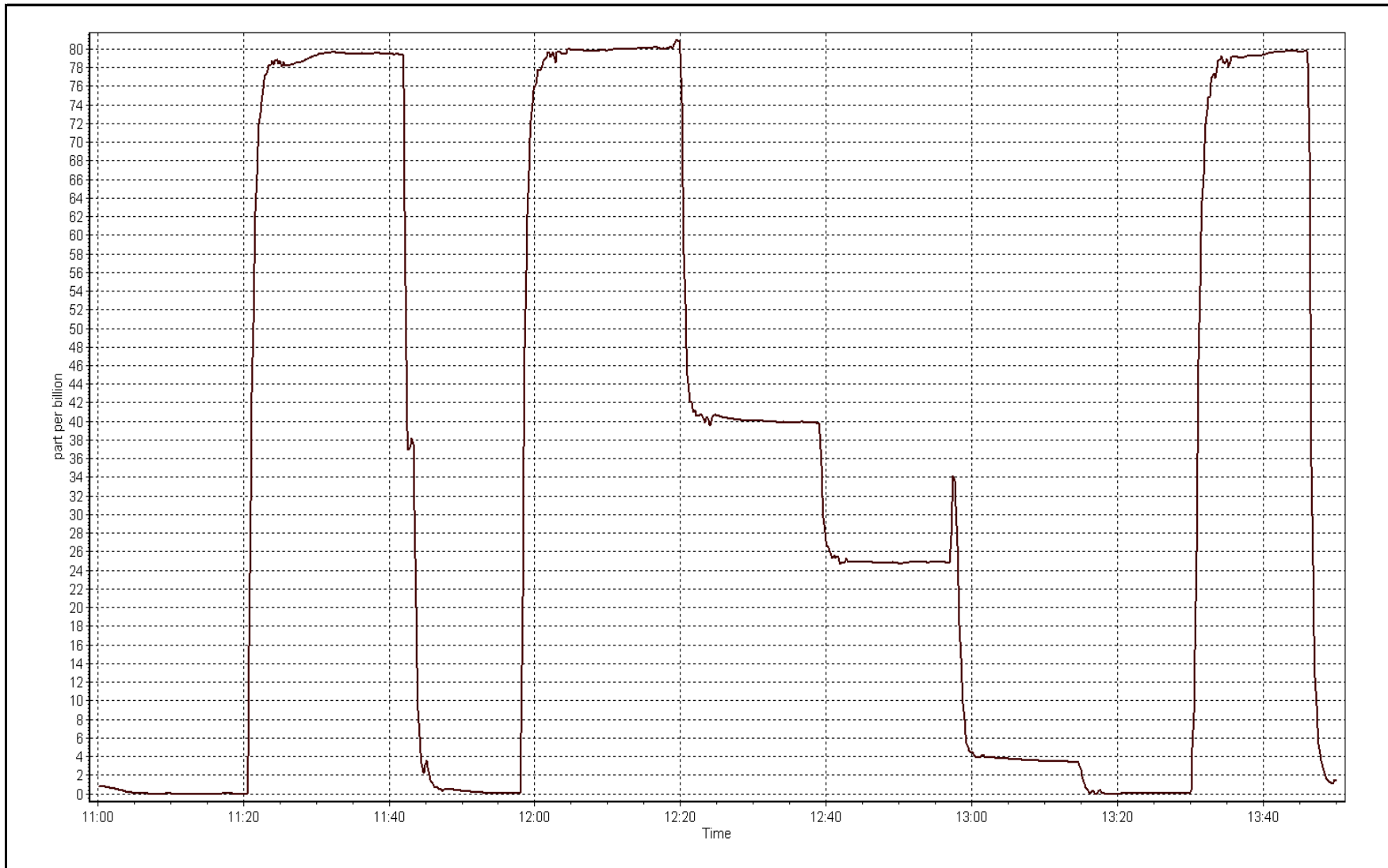
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
80.1	80.1	1.0002		
40.1	40.0	1.0033	Slope	0.999993
25.0	24.9	1.0024		
			Intercept	0.058751



H2S Calibration Plot

Date: November 4, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	November 7, 2016	Previous Calibration	October 6, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	11:15	End Time (MST)	15:45
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	1.001676	0.999998	1.001084
	Data Offset	2.000482	2.288857	-0.494581
Current Calibration	Data Slope	1.000214	1.000691	0.999153
	Data Offset	2.806152	2.395474	-0.126861

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153356
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.955		0.984	
NOX coefficient	1.000		1.000	
NO2 coefficient	1.000		1.001	
NO bkgrnd	5.2		6.5	
NOX bkgrnd	5.6		7.3	
Chamber Temp	50.4	Deg C	50.3	Deg C
Moly Temp	322.4	Deg C	322.4	Deg C
PMT voltage	-866.9	V	-866.9	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	161.5	mmHg	160.6	mmHg
R Cell Press Nox	161.2	mmHg	160.3	mmHg
NO sample flow	0.694	lpm	0.687	lpm
Nox sample Flow	0.695	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: November 7, 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	0.7	0.1	0.6	----	----
as found span	5000	83.2	800.4	800.4	0.0	779.0	778.4	0.6	1.0275	1.0283
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.7	-0.5	-0.1	----	----
high point	5000	83.2	800.4	800.4	0.0	798.9	798.8	0.0	1.0019	1.0020
second point	5000	41.6	400.2	400.2	0.0	395.0	395.3	-0.3	1.0131	1.0124
third point	5000	20.8	200.1	200.1	0.0	196.0	196.5	-0.5	1.0211	1.0184
as left zero	5000	0.0	0.0	0.0	0.0	-0.9	-0.4	-0.5	----	----
as left span	5000	83.2	800.4	488.2	312.2	799.7	490.9	308.8	1.0009	0.9946
Average Correction Factor									1.0120	1.0109

Corrected As found NO_x= 778.3 NO= 778.3 Percent Change NO_x= 2.4% NO= 2.5%
 Previous Response NO_x= 797.0 NO= 798.1

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	795.6	794.0	-0.1	1.0061	1.0081	----	----
1st NO2 (300)	488.2	305.7	794.4	488.2	306.2	1.0075	----	0.9984	100.2%
2nd NO2 (200)	583.0	211.0	793.8	583.0	210.8	1.0083	----	1.0008	99.9%
3rd NO2 (100)	682.7	111.3	794.8	682.7	112.1	1.0070	----	0.9925	100.8%
2nd NO ref point		0.0	796.0	794.1	1.5	1.0055	1.0079	----	----
Average Correction Factor						1.0071		0.9972	100.3%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

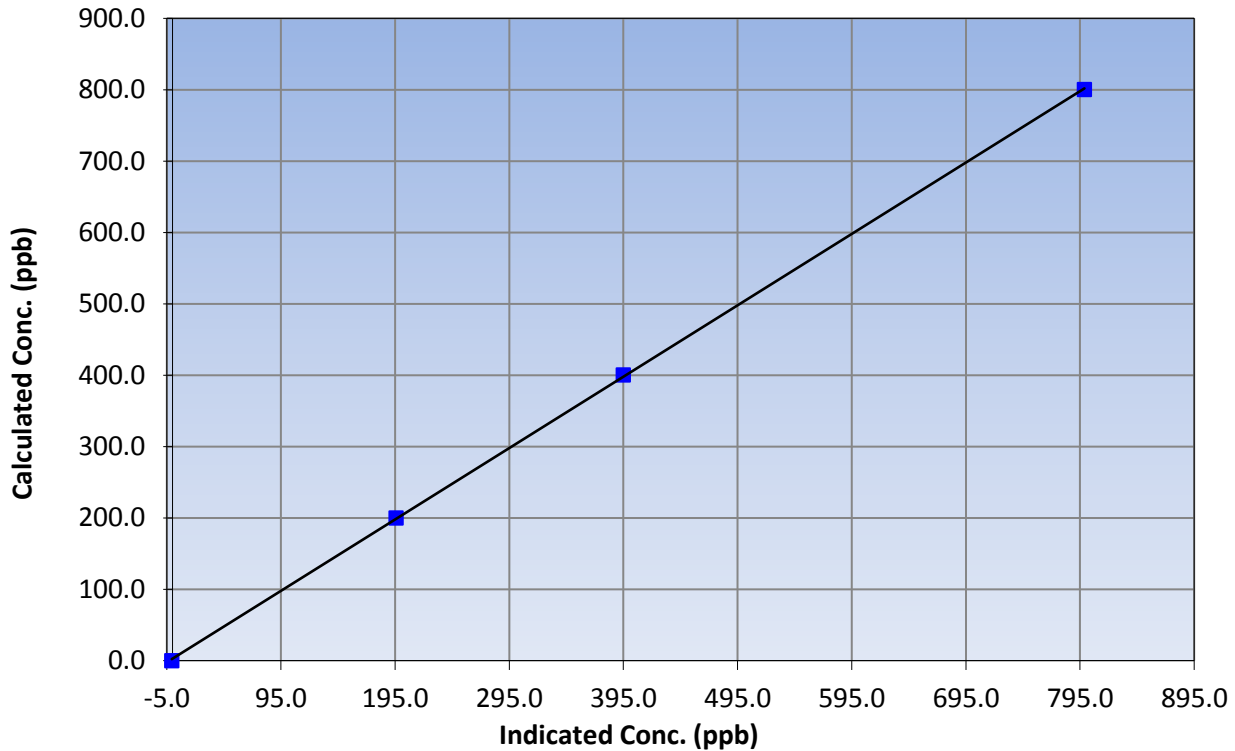
Station Information

Calibration Date	November 7, 2016	Previous Calibration	October 6, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	11:15	End Time (MST)	15:45
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	-0.7	----	Correlation Coefficient	0.999961
800.4	798.9	1.0019		
400.2	395.0	1.0131	Slope	1.000214
200.1	196.0	1.0211		
			Intercept	2.806152

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

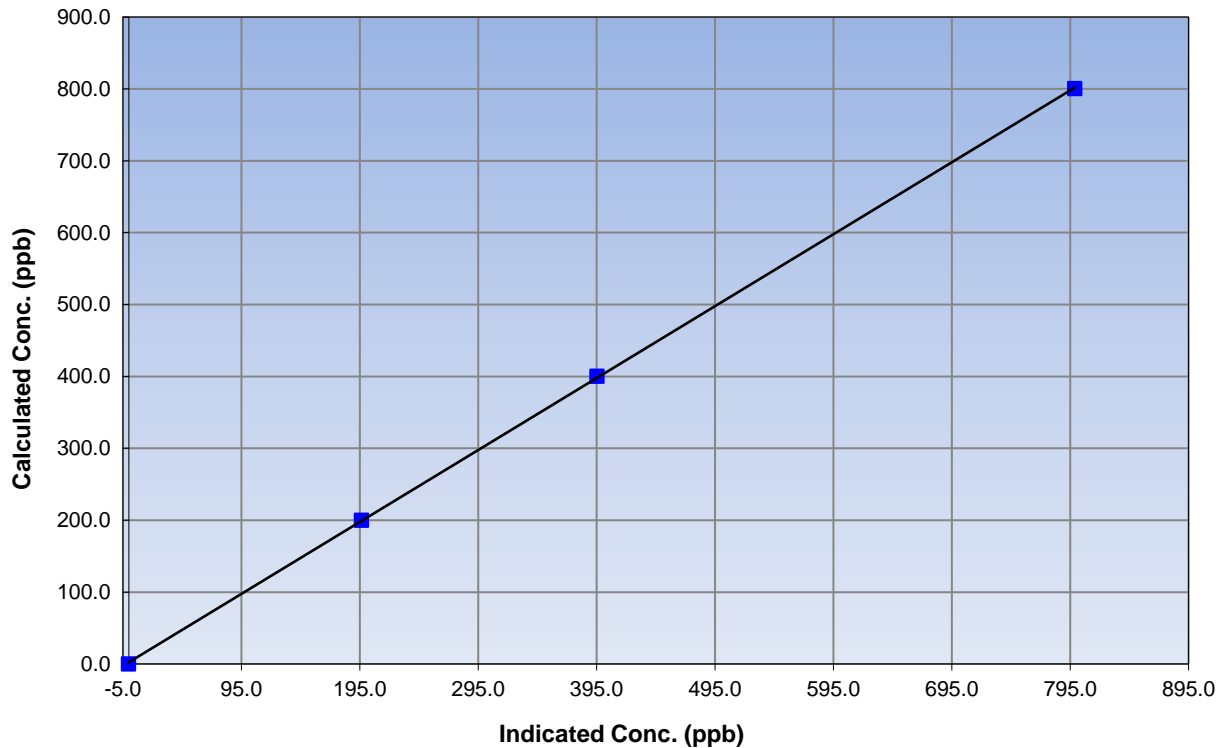
Station Information

Calibration Date	November 7, 2016	Previous Calibration	October 6, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	11:15	End Time (MST)	15:45
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	0.999966
800.4	798.8	1.0020		
400.2	395.3	1.0124	Slope	1.000691
200.1	196.5	1.0184		
			Intercept	2.395474

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

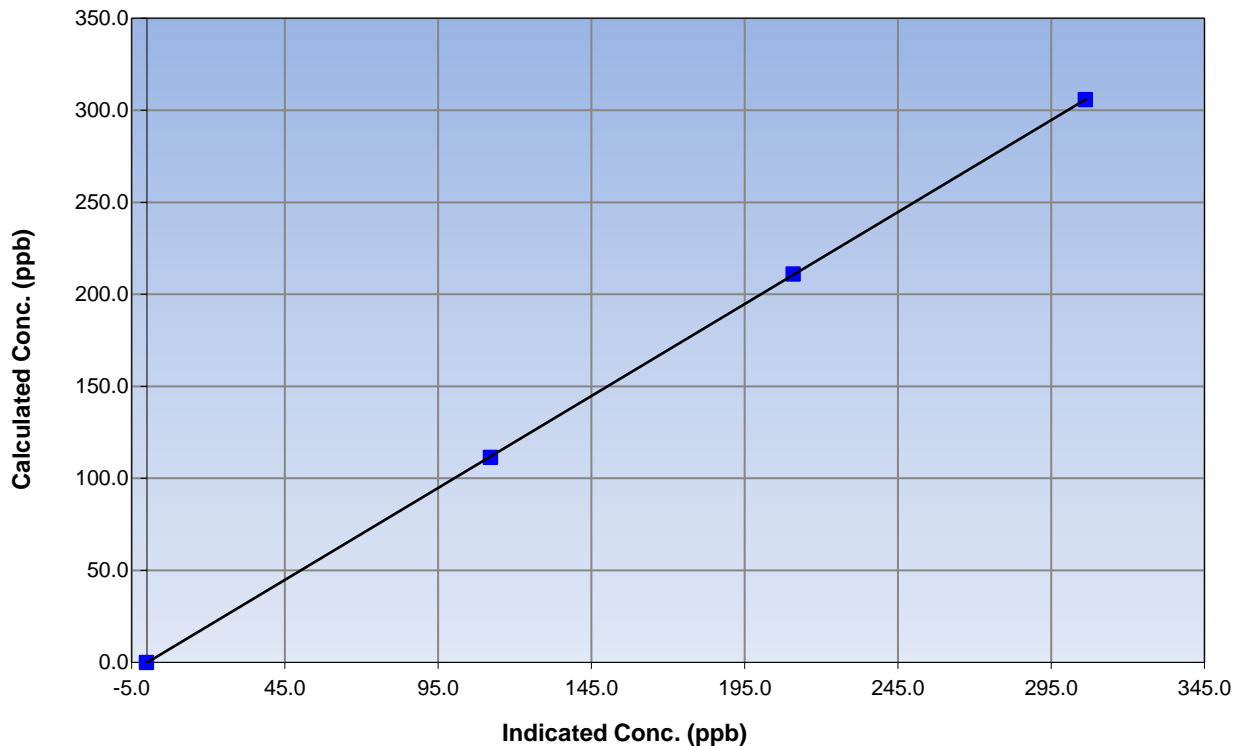
Station Information

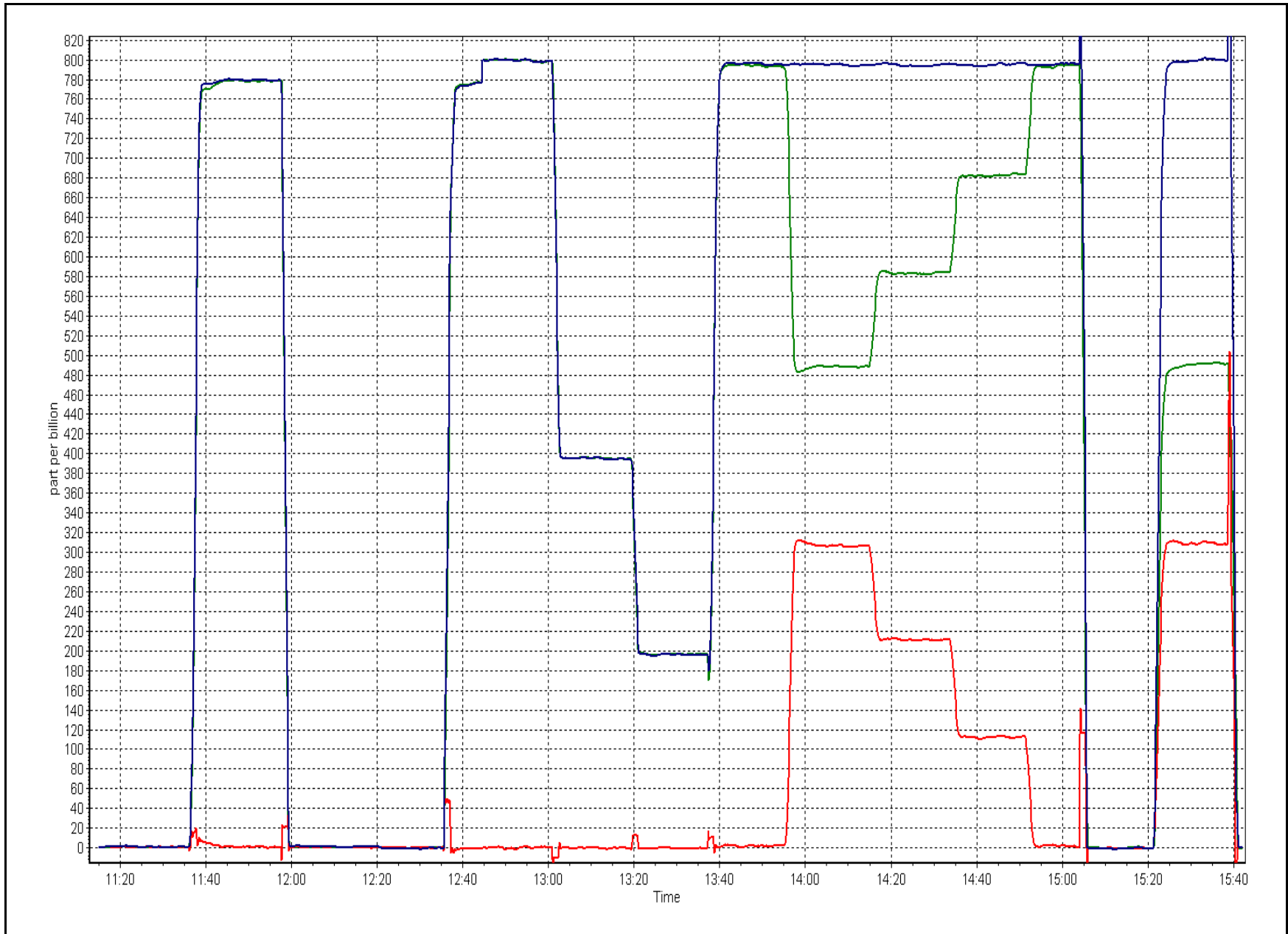
Calibration Date	November 7, 2016	Previous Calibration	October 6, 2016
Station Number	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	11:15	End Time (MST)	15:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999987
305.7	306.2	0.9984		
211.0	210.8	1.0008	Slope	0.999153
111.3	112.1	0.9925		
			Intercept	-0.126861

NO₂ Calibration Curve







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

OCTOBER 2016

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Prepared: Dec 20 2016 15:45

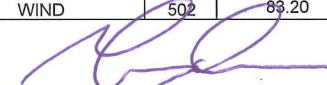
APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	10	2016	CONTINUOUS AMBIENT MONITORING				
254465-00-00			ONE-HOUR AVERAGE			24-HOUR AVERAGE	
149968-00-01	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
48522-01-00							
240008-00-03	SO2(ppm)	1	100.00	0.021	0	0.005	0
48263-00-00	SO2(ppm)	2	99.60	0.029	0	0.009	0
224816-00-03	SO2(ppm)	4	100.00	0.016	0	0.002	0
189942-00-02	SO2(ppm)	5	100.00	0.185	1	0.042	0
206355-00-00	SO2(ppm)	6	99.87	0.017	0	0.004	0
46586-00-00	SO2(ppm)	7	99.60	0.012	0	0.004	0
216466-00-04	SO2(ppm)	8	99.87	0.005	0	0.001	0
137467-00-00	SO2(ppm)	11	100.00	0.143	0	0.019	0
20809-01-00	SO2(ppm)	13	99.73	0.020	0	0.004	0
241311-00-00	SO2(ppm)	14	99.60	0.012	0	0.004	0
094-02-00	SO2(ppm)	15	100.00	0.031	0	0.009	0
305529-00-00	SO2(ppm)	16	100.00	0.014	0	0.004	0
026-02-00	SO2(ppm)	17	100.00	0.041	0	0.007	0
228044-00-00	SO2(ppm)	18	100.00	0.004	0	0.001	0
73203-01-00	SO2(ppm)	19	99.73	0.047	0	0.008	0
236394-00-00	SO2(ppm)	20	100.00	0.008	0	0.002	0
	SO2(ppm)	21	99.87	0.003	0	0.001	0
	SO2(ppm)	500	99.87	0.002	0	0.001	0
	SO2(ppm)	502	100.00	0.005	0	0.002	0
	H2S(ppm)	2	99.87	0.003	0	0.001	0
	H2S(ppm)	4	99.33	0.005	0	0.001	0
	H2S(ppm)	5	100.00	0.006	0	0.002	0
	H2S(ppm)	11	100.00	0.024	6	0.003	0
	H2S(ppm)	17	100.00	0.001	0	0.000	0
	H2S(ppm)	19	99.46	0.002	0	0.000	0
	H2S(ppm)	20	98.52	0.001	0	0.000	0
	H2S(ppm)	500	99.73	0.004	0	0.001	0
	H2S(ppm)	502	99.06	0.002	0	0.001	0
	TRS(ppm)	1	100.00	0.011	1	0.002	0
	TRS(ppm)	6	99.87	0.002	0	0.000	0
	TRS(ppm)	7	99.60	0.001	0	0.001	0
	TRS(ppm)	9	100.00	0.001	0	0.001	0
	TRS(ppm)	13	99.73	0.012	1	0.002	0
	TRS(ppm)	14	100.00	0.001	0	0.000	0
	TRS(ppm)	15	99.87	0.001	0	0.000	0
	TRS(ppm)	18	100.00	0.000	0	0.000	0
	TRS(ppm)	21	99.46	0.001	0	0.000	0
	THC(ppm)	1	100.00	3.5	-	2.7	-
	THC(ppm)	2	100.00	7.2	-	3.2	-
	THC(ppm)	4	100.00	3.8	-	2.7	-
	THC(ppm)	5	100.00	5.6	-	2.7	-
	THC(ppm)	6	95.56	3.0	-	2.3	-
	THC(ppm)	7	87.23	2.6	-	2.1	-
	THC(ppm)	9	100.00	3.6	-	2.9	-
	THC(ppm)	11	92.74	4.6	-	2.8	-
	THC(ppm)	13	99.73	3.8	-	3.1	-
	THC(ppm)	14	93.82	2.4	-	2.2	-
	THC(ppm)	15	100.00	4.9	-	2.5	-
	THC(ppm)	16	99.33	6.4	-	3.2	-
	THC(ppm)	17	100.00	2.7	-	2.4	-
	THC(ppm)	18	100.00	2.3	-	2.1	-
	THC(ppm)	19	99.73	2.7	-	2.5	-
	THC(ppm)	20	100.00	2.9	-	2.3	-
	THC(ppm)	21	99.87	2.4	-	2.1	-
	O3(ppm)	1	100.00	0.036	0	0.028	-
	O3(ppm)	6	100.00	0.035	0	0.032	-
	O3(ppm)	7	99.60	0.037	0	0.032	-

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

OCTOBER 2016

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Prepared: Dec 20 2016 15:45

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	10	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01							
48522-01-00							
240008-00-03							
48263-00-00			ONE-HOUR AVERAGE		24-HOUR AVERAGE		
224816-00-03	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
189942-00-02	O3(ppm)	8	56.85	0.036	0	0.033	-
206355-00-00	O3(ppm)	13	99.19	0.035	0	0.026	-
46586-00-00	O3(ppm)	14	100.00	0.034	0	0.029	-
216466-00-04	O3(ppm)	17	100.00	0.035	0	0.030	-
137467-00-00	O3(ppm)	18	100.00	0.039	0	0.035	-
20809-01-00	O3(ppm)	21	100.00	0.040	0	0.033	-
241311-00-02	NO2(ppm)	1	98.92	0.022	0	0.012	-
094-02-00	NO2(ppm)	6	99.87	0.026	0	0.015	-
305529-00-00	NO2(ppm)	7	99.60	0.021	0	0.014	-
026-02-00	NO2(ppm)	8	99.87	0.009	0	0.005	-
228044-00-00	NO2(ppm)	13	99.73	0.017	0	0.008	-
73203-01-00	NO2(ppm)	14	100.00	0.018	0	0.010	-
236394-00-00	NO2(ppm)	15	100.00	0.028	0	0.008	-
	NO2(ppm)	16	100.00	0.035	0	0.018	-
	NO2(ppm)	17	100.00	0.016	0	0.005	-
	NO2(ppm)	18	100.00	0.006	0	0.003	-
	NO2(ppm)	19	99.73	0.022	0	0.006	-
	NO2(ppm)	20	100.00	0.019	0	0.006	-
	NO2(ppm)	21	99.87	0.010	0	0.004	-
	NO2(ppm)	500	99.87	0.012	0	0.005	-
	NO2(ppm)	502	100.00	0.015	0	0.006	-
	CO(ppm)	7	99.60	0.3	0	0.2	-
	NH3(ppm)	1	93.15	0.000	0	0.000	-
	NH3(ppm)	6	95.70	0.000	0	0.000	-
	PM2.5(ug/m3)	1	100.00	18.1	-	10.6	0
	PM2.5(ug/m3)	6	97.72	29.6	-	15.5	0
	PM2.5(ug/m3)	7	99.06	28.2	-	15.7	0
	PM2.5(ug/m3)	8	99.87	14.3	-	7.8	0
	PM2.5(ug/m3)	13	97.45	15.1	-	9.0	0
	PM2.5(ug/m3)	14	99.60	13.9	-	8.6	0
	PM2.5(ug/m3)	15	99.46	16.3	-	9.4	0
	PM2.5(ug/m3)	16	100.00	19.5	-	10.1	0
	PM2.5(ug/m3)	17	97.18	27.6	-	7.4	0
	PM2.5(ug/m3)	18	98.52	13.4	-	7.1	0
	PM2.5(ug/m3)	21	98.25	72.4	-	7.6	0
	WIND	1	99.73	-	-	-	-
	WIND	2	98.25	-	-	-	-
	WIND	4	98.79	-	-	-	-
	WIND	5	99.33	-	-	-	-
	WIND	6	99.87	-	-	-	-
	WIND	7	99.46	-	-	-	-
	WIND	8	95.83	-	-	-	-
	WIND	9	98.25	-	-	-	-
	WIND	11	99.46	-	-	-	-
	WIND	13	99.19	-	-	-	-
	WIND	14	99.73	-	-	-	-
	WIND	15	97.04	-	-	-	-
	WIND	16	100.00	-	-	-	-
	WIND	17	95.70	-	-	-	-
	WIND	18	86.29	-	-	-	-
	WIND	19	81.18	-	-	-	-
	WIND	20	95.97	-	-	-	-
	WIND	21	95.83	-	-	-	-
	WIND	500	93.15	-	-	-	-
	WIND	502	83.20	-	-	-	-
							
SIGNATURE OF ASSOCIATION REPRESENTATIVE				FOR ALBERTA ENVIRONMENT USE ONLY			



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 19
FIREBAG
OCTOBER 2016**

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

Revision 1 – December 22, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
OCTOBER 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	705	37	39	99.73	47	0	8	0
H2S (ppb) Average	704	36	40	99.46	2	0	0	0
THC (ppm) Average	708	34	36	99.73	2.7	-	2.5	-
NO2 (ppb) Average	705	37	39	99.73	22	0	6	-
NO (ppb) Average	705	37	39	99.73	33	-	4	-
NOX (ppb) Average	705	37	39	99.73	42	-	9	-
Temperature 2 m (C) Average	744	0	0	100.00	7.1	-	3.9	-
Relative Humidity (%) Average	744	0	0	100.00	100	-	100	-
Wind Speed 10 m (km/h) Average	604	0	140	81.18	27	-	21	-
Wind Direction 10 m (deg) Average	604	0	140	81.18	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
OCTOBER 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	705	1.2	4	-	0	0	0	0	1	3	47
H2S (ppb) Average	704	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	708	2.23	0.1	-	2.1	2.1	2.2	2.2	2.3	2.3	2.7
NO2 (ppb) Average	705	2.2	3	-	0	0	0	1	3	5	22
NO (ppb) Average	705	0.7	2	-	0	0	0	0	1	1	33
NOX (ppb) Average	705	3	4	-	0	0	0	2	4	7	42
Temperature 2 m (C) Average	744	-0.97	2.5	-	-7.9	-3.9	-2.8	-1.1	0.2	2.4	7.1
Relative Humidity (%) Average	744	90.7	11	-	55	74	86	95	99	100	100
Wind Speed 10 m (km/h) Average	604	12.7	5	-	1	6	9	12	16	20	27
Wind Direction 10 m (deg) Average	604	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
OCTOBER 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	12 Oct 2016 08:00	12 Oct 2016 09:00	2	DAS collection error - data not recorded
H2S	24 Oct 2016 11:00	24 Oct 2016 12:00	2	Maintenance - purged calibration cylinder
Wind Speed, Wind Direction	23 Oct 2016 20:00	24 Oct 2016 10:00	15	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	24 Oct 2016 11:00	24 Oct 2016 11:00	1	Maintenance - ice removal
Wind Speed, Wind Direction	26 Oct 2016 21:00	01 Nov 2016 00:00	124	Sensor incorrectly oriented



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

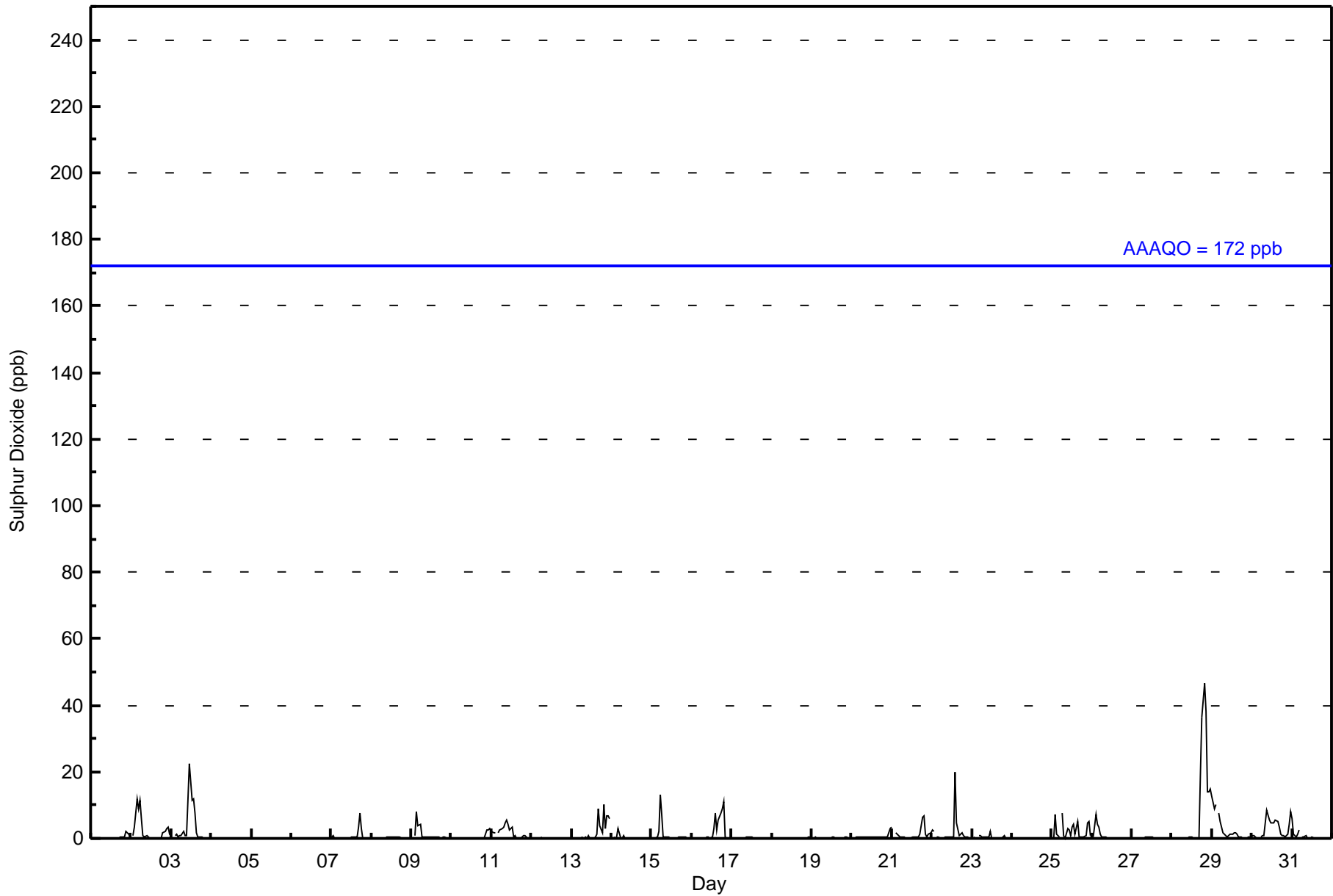
Firebag - October 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 47 ppb on Oct 28 20:00										Maximum Daily Average: 8.1 ppb on Oct 28										Hours of Data: 705						
Minimum Value: 0 ppb on Oct 4 00:00										Minimum Daily Average: 0.0 ppb on Oct 4										Hours of Missing Data: 39						
Maximum Diurnal Average: 2.7 ppb at hour 20										Minimum Diurnal Average: 0.5 ppb at hour 8										Hours of Calibration: 37						
Monthly Average: 1.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 3 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-Oct	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0.3	2
2-Oct	Z	1	3	12	9	12	6	1	0	1	1	0	0	0	0	0	0	0	0	2	2	3	3	1	2.5	12
3-Oct	1	Z	1	1	1	1	1	2	1	1	11	23	12	12	8	2	0	0	0	0	0	0	0	0	3.3	23
4-Oct	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
5-Oct	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-Oct	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
7-Oct	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	4	8	3	0	0	0	0	0	0.8	8
8-Oct	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-Oct	0	Z	1	8	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	8
10-Oct	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	3	0.5	3
11-Oct	2	2	2	Z	2	3	3	3	5	6	4	3	3	1	1	0	0	0	0	1	1	0	0	0	1.8	6
12-Oct	0	0	0	0	Z	0	0	DF	DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Oct	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	1	9	4	2	10	3	7	7	6	2.2	10
14-Oct	Z	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	3
15-Oct	0	Z	0	0	2	13	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	13
16-Oct	0	0	Z	0	0	0	0	0	0	1	1	0	0	3	8	2	5	8	9	11	0	0	0	0	2.1	11
17-Oct	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-Oct	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-Oct	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-Oct	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.5	3
21-Oct	4	Z	2	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	6	7	1	1	1	1	1.3	7
22-Oct	3	2	Z	0	0	0	0	0	0	0	0	0	0	0	20	5	1	1	2	1	1	0	0	0	1.6	20
23-Oct	0	0	0	Z	1	1	1	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0.4	2
24-Oct	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
25-Oct	0	0	7	1	0	Z	8	1	0	3	3	1	3	4	1	5	0	0	0	0	1	5	5	1	2.2	8
26-Oct	Z	0	7	4	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	7
27-Oct	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-Oct	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	36	47	38	14	14	15	8.1	47
29-Oct	13	9	10	Z	8	5	2	1	1	1	1	1	1	2	2	1	0	0	0	0	0	0	0	1	2.5	13
30-Oct	1	1	0	0	Z	0	1	1	5	8	5	5	5	5	6	5	3	1	1	1	1	1	4	8	2.9	8
31-Oct	6	1	0	1	3	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	6
1.2 0.7 1.4 1.2 1.4 1.7 1.0 0.5 0.5 0.8 1.0 1.3 1.0 1.0 1.6 0.8 0.8 1.5 2.0 2.7 1.7 1.2 1.4 1.3																								Diurnal Average		
13 9 10 12 9 13 8 3 5 8 11 23 12 12 20 5 9 19 36 47 38 14 14 15																								Diurnal Maximum		
Z - zerospan C - Calibration DF - DAS 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
Firebag - October 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - October 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	688	97.59	97.59
11 - 20	13	1.84	99.43
21 - 60	4	0.57	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: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - October 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	30	75	42	35	26	59	39	33	52	28	21	47	22	14	13	26	562
11 - 20	0	0	0	0	0	4	1	0	0	0	1	1	1	0	0	0	8
21 - 60	0	0	0	0	0	0	0	0	0	0	1	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	30	75	42	35	26	63	40	33	52	28	23	48	23	14	13	26	571

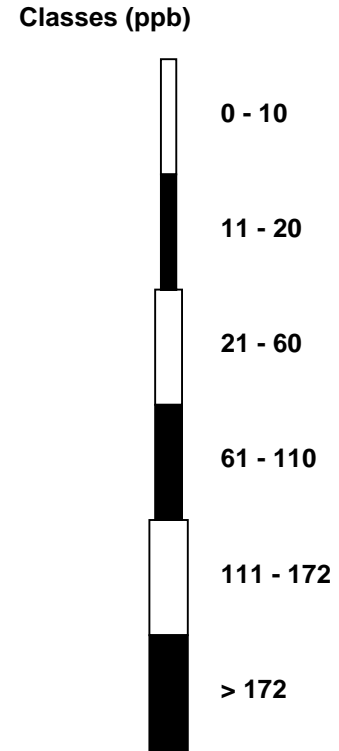
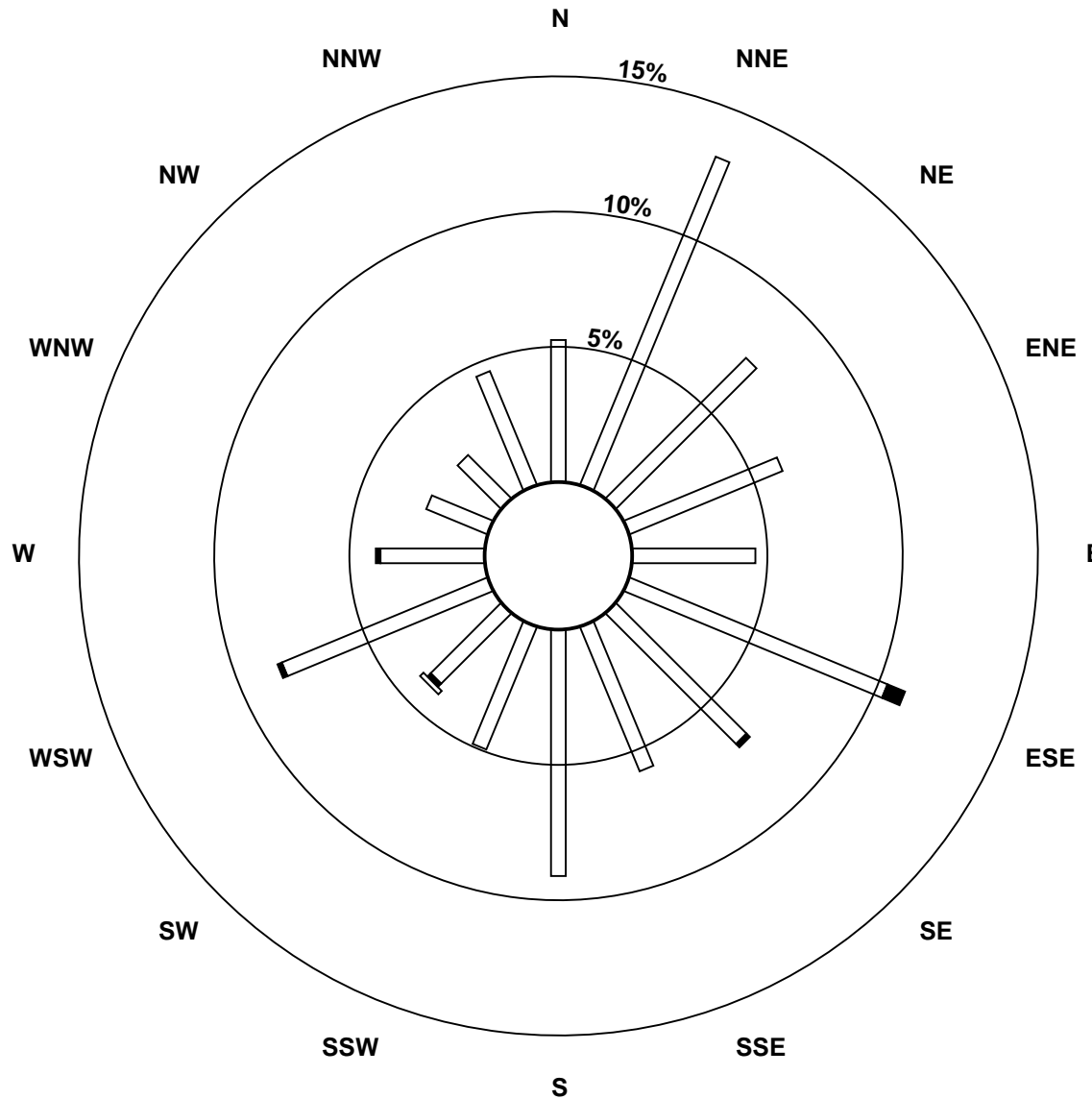
Total Number of Valid Hours: 571

Total Number of Hours: 744

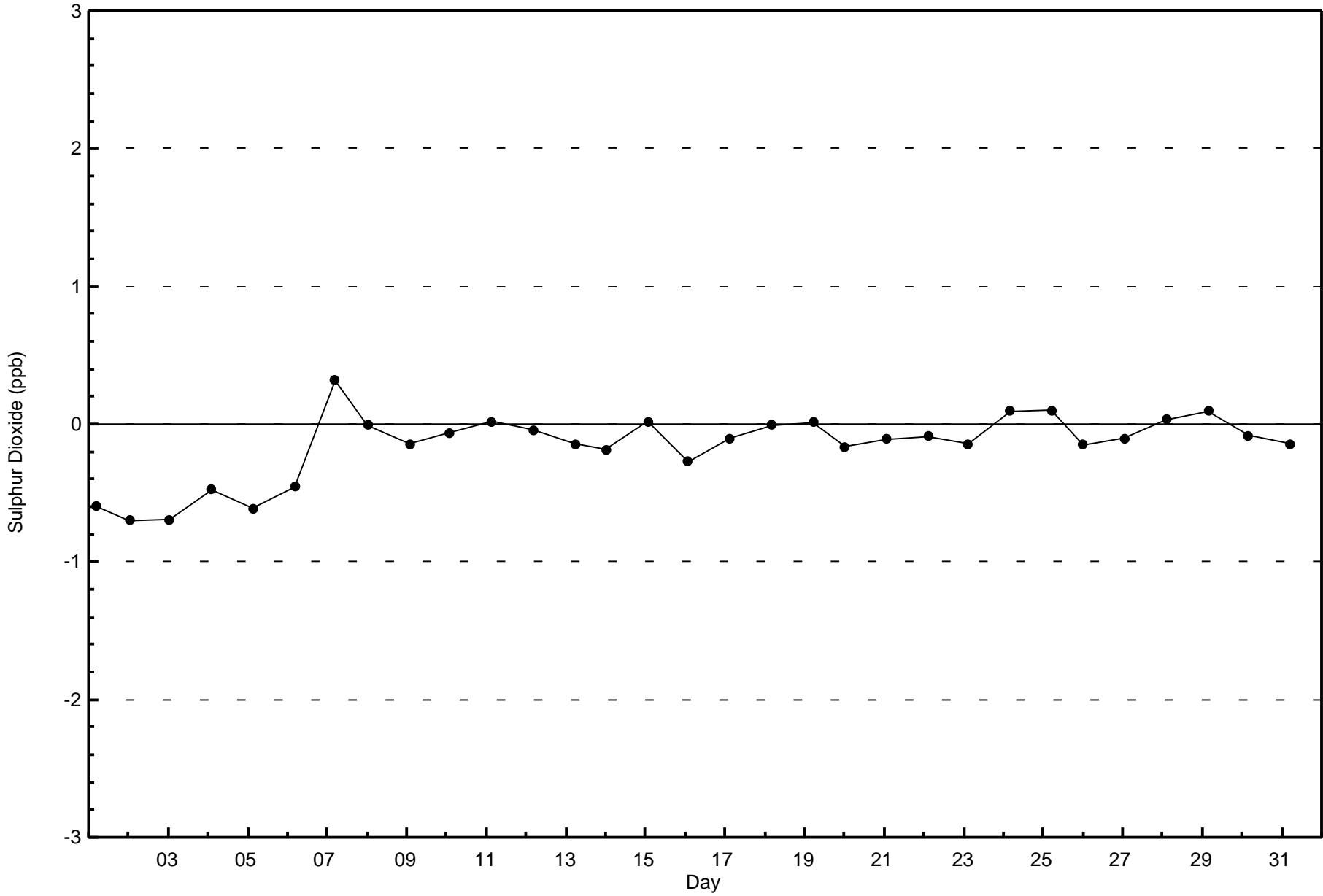


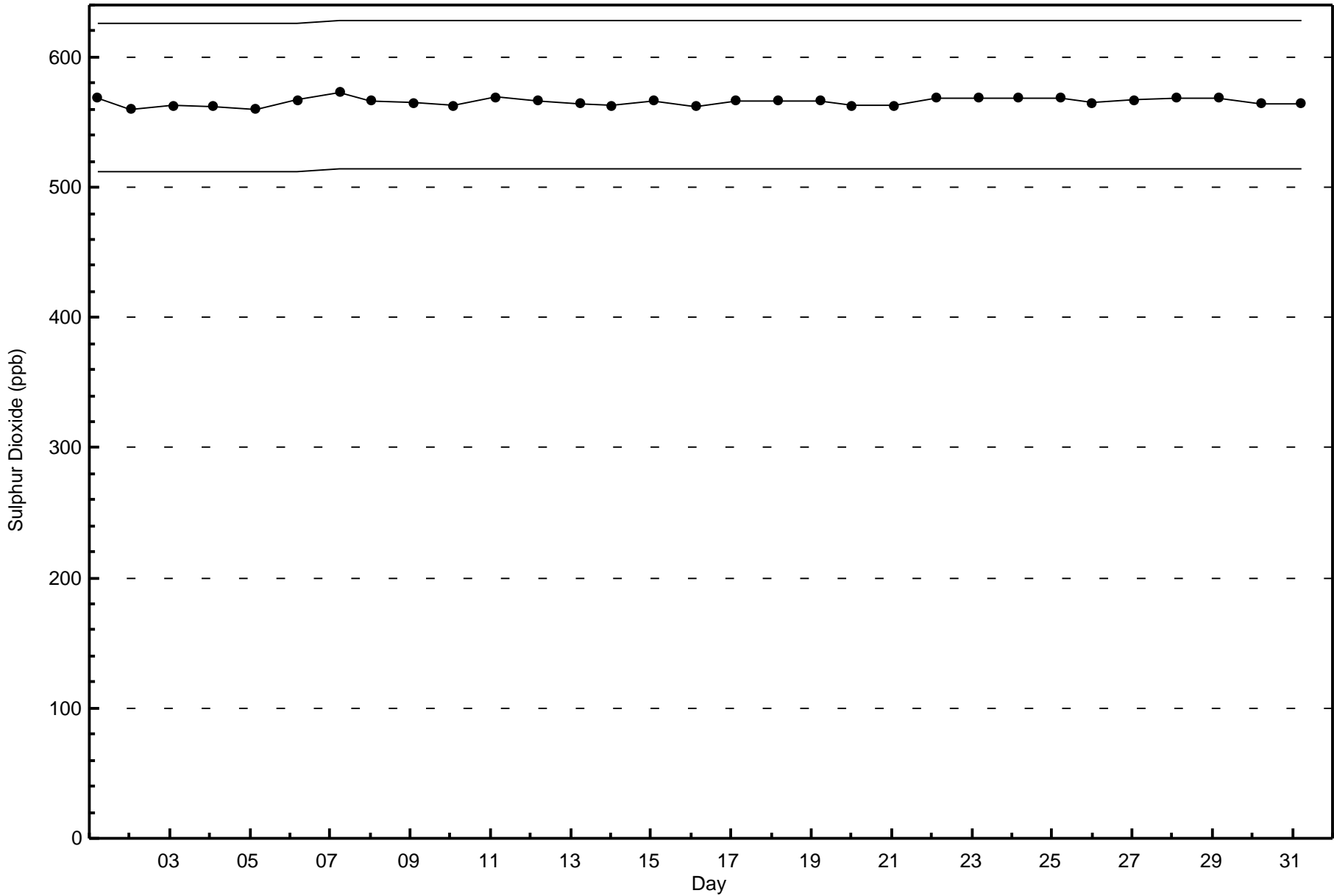
Wood Buffalo Environmental Association
Wind Rose Oct 2016

Sulphur Dioxide (SO₂) - ppb
Firebag (AMS 19)



Total Number of Valid Hours: 571







Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb

Firebag - October 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2 ppb on Oct 23 20:00	Maximum Daily Average: 0.4 ppb on Oct 26		Hours of Data:	704
Minimum Value: 0 ppb on Oct 8 00:00	Minimum Daily Average: 0.0 ppb on Oct 8		Hours of Missing Data:	40
Maximum Diurnal Average: 0.2 ppb at hour 20	Minimum Diurnal Average: 0.1 ppb at hour 16		Hours of Calibration:	36
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:	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-Oct	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-Oct	0	Z	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
3-Oct	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
4-Oct	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-Oct	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-Oct	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-Oct	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
8-Oct	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
9-Oct	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
10-Oct	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
11-Oct	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-Oct	0	0	0	0	0	Z	0	DF	DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Oct	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
14-Oct	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-Oct	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Oct	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-Oct	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-Oct	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
19-Oct	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-Oct	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
21-Oct	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-Oct	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0.2	1
23-Oct	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0.3	2
24-Oct	0	0	0	0	0	Z	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Oct	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1
26-Oct	1	Z	2	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
27-Oct	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-Oct	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
29-Oct	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-Oct	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
31-Oct	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

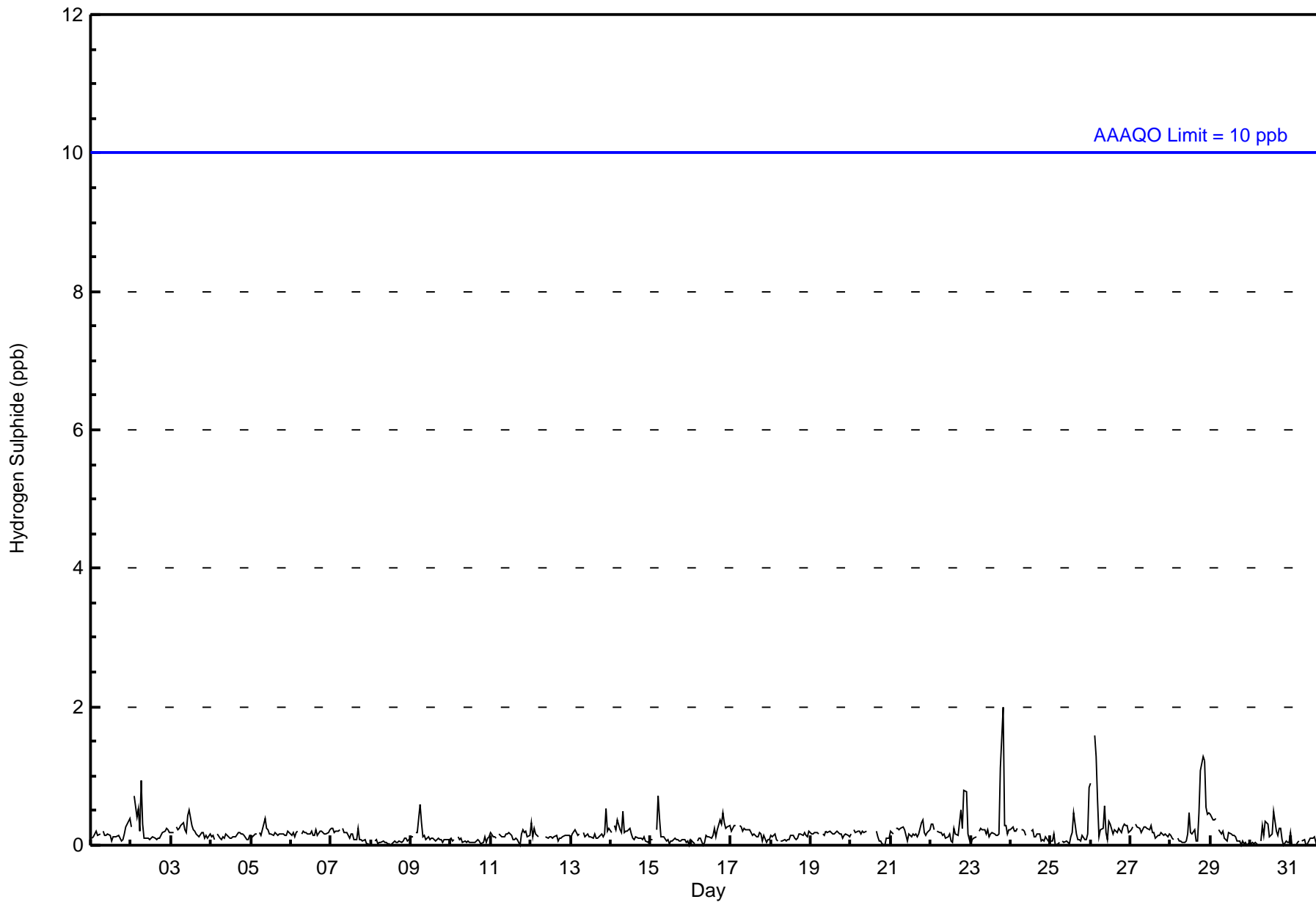
0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	Diurnal Average		
1	0	2	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1	2	1	1	0	1	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Firebag - October 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Firebag - October 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	704	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Firebag - October 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	30	77	46	35	26	62	40	27	54	27	22	48	23	15	13	26	571
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	30	77	46	35	26	62	40	27	54	27	22	48	23	15	13	26	571

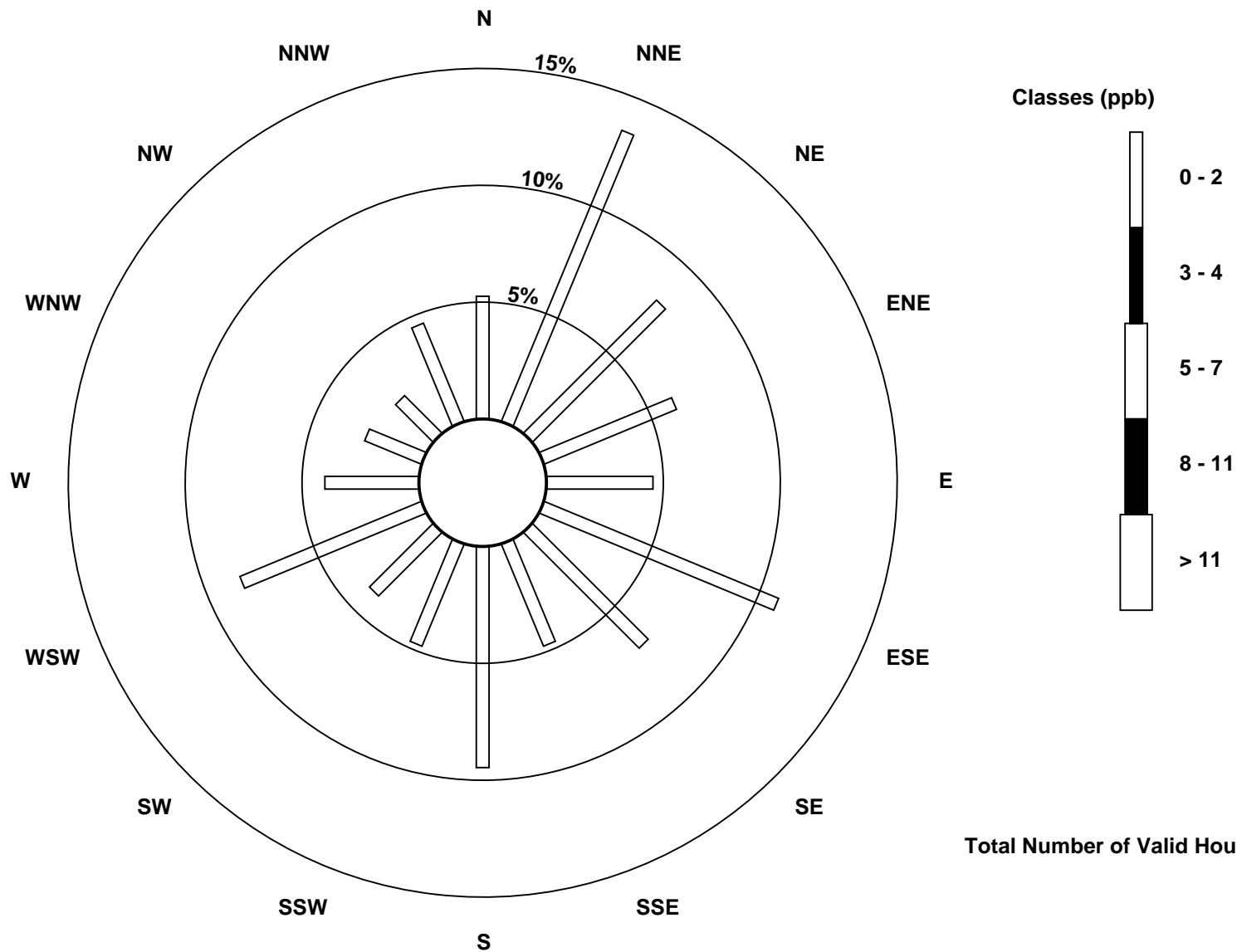
Total Number of Valid Hours: 571

Total Number of Hours: 744

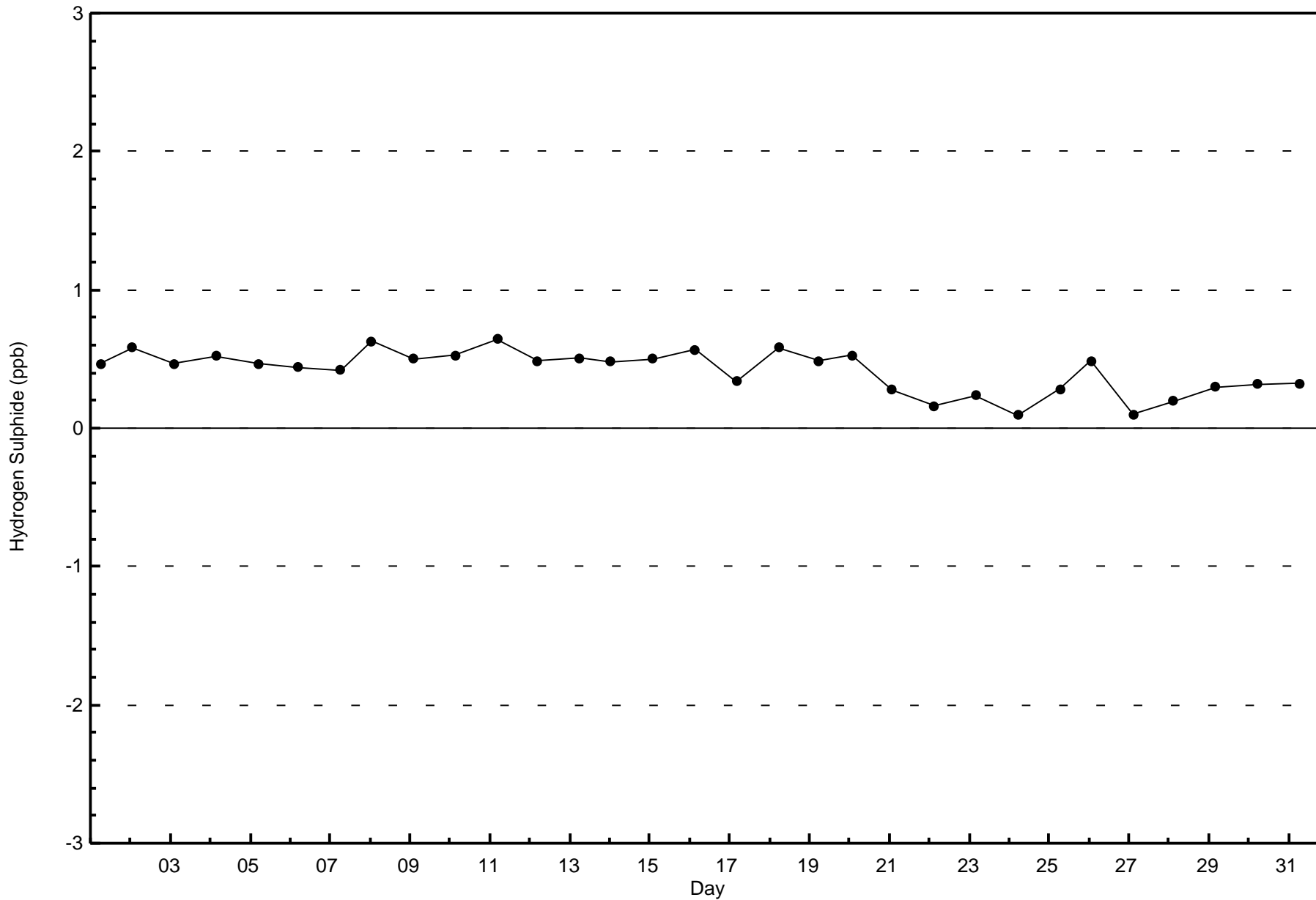


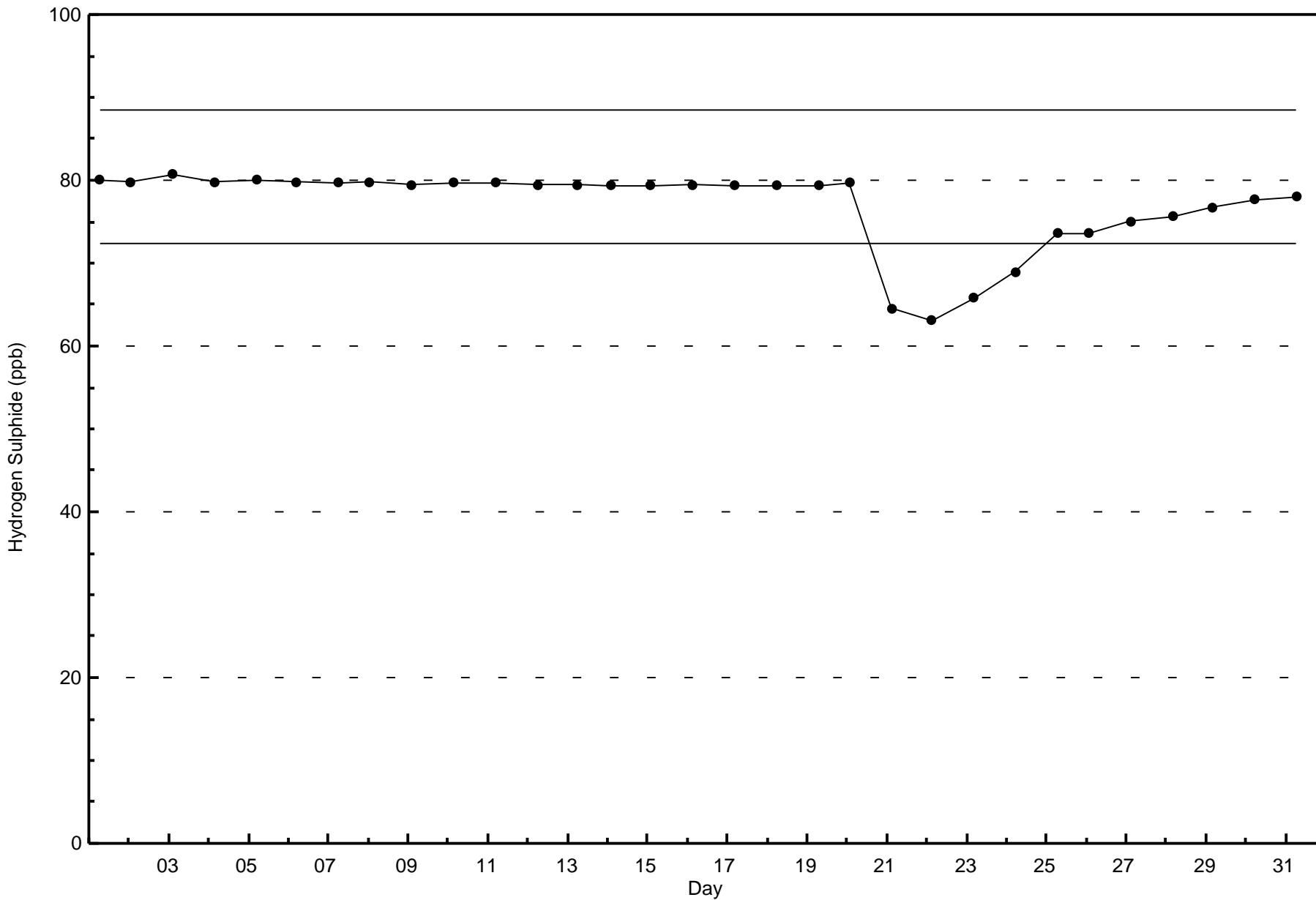
Wood Buffalo Environmental Association
Wind Rose Oct 2016

Hydrogen Sulphide (H₂S) - ppb
Firebag (AMS 19)



Total Number of Valid Hours: 571

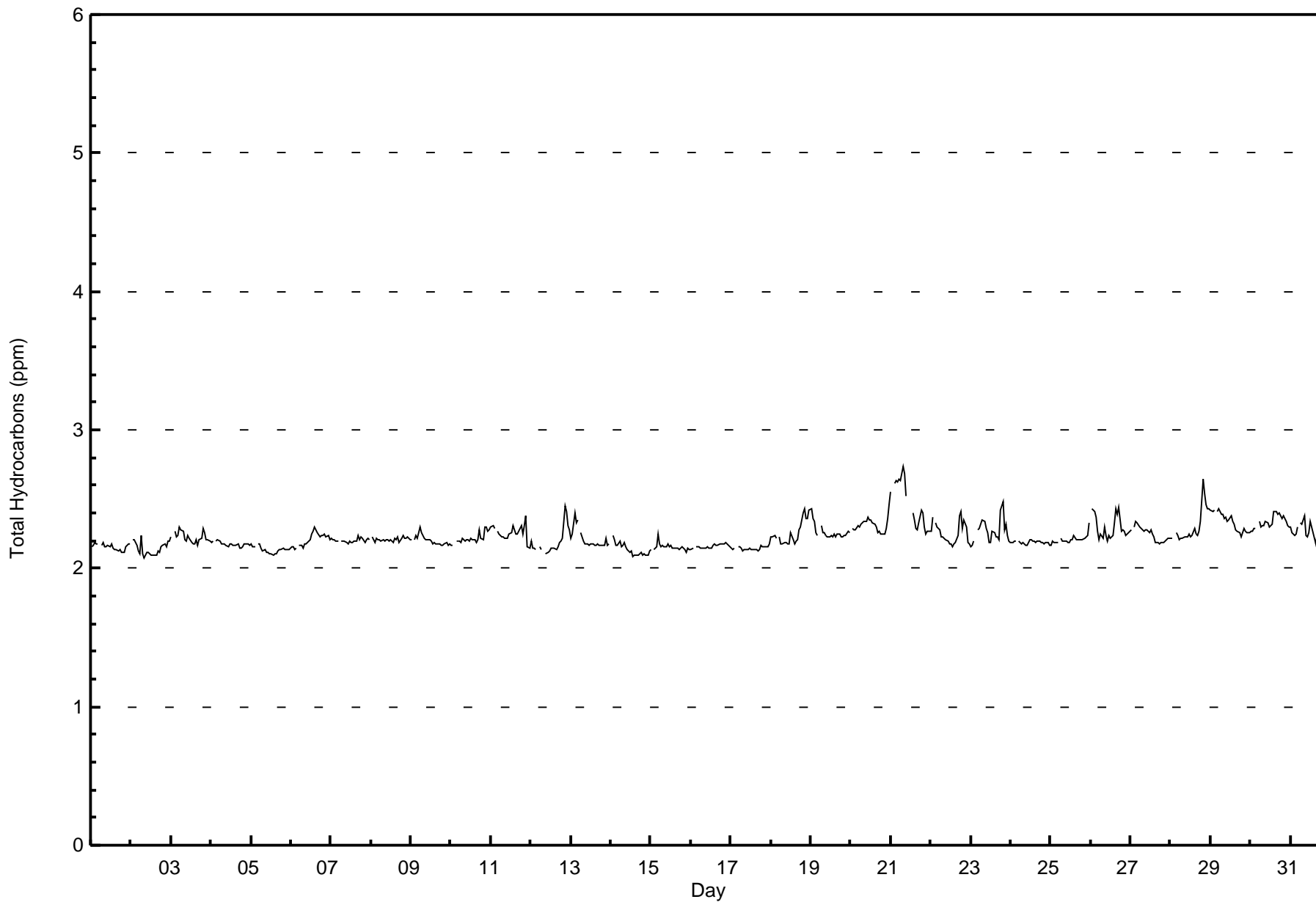






Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Firebag - October 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - October 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



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - October 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	30	78	45	35	26	63	40	33	52	28	23	48	23	11	13	26	574
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	30	78	45	35	26	63	40	33	52	28	23	48	23	11	13	26	574

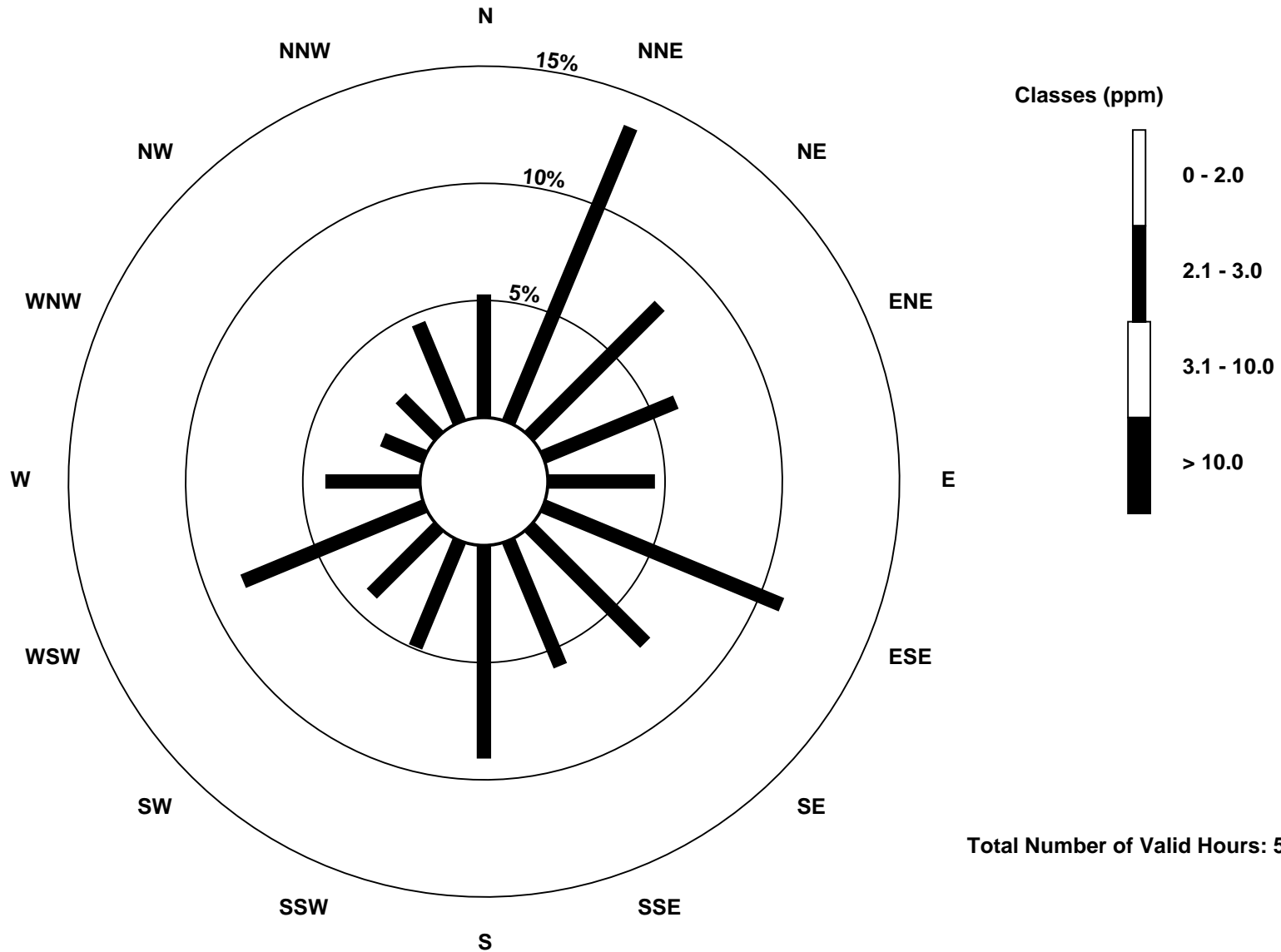
Total Number of Valid Hours: 574

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Oct 2016

Total Hydrocarbons (THC) - ppm
Firebag (AMS 19)



Total Number of Valid Hours: 574

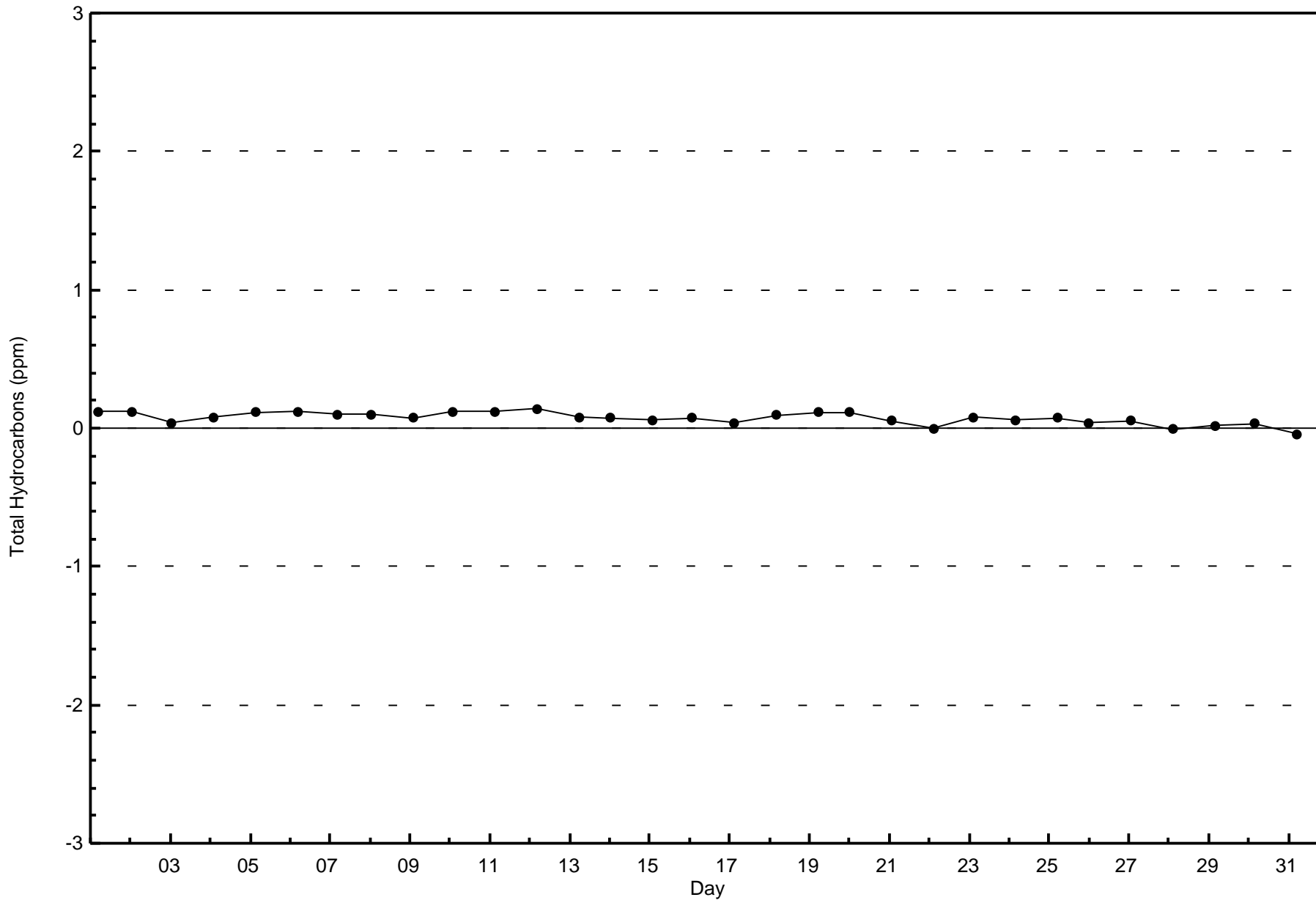


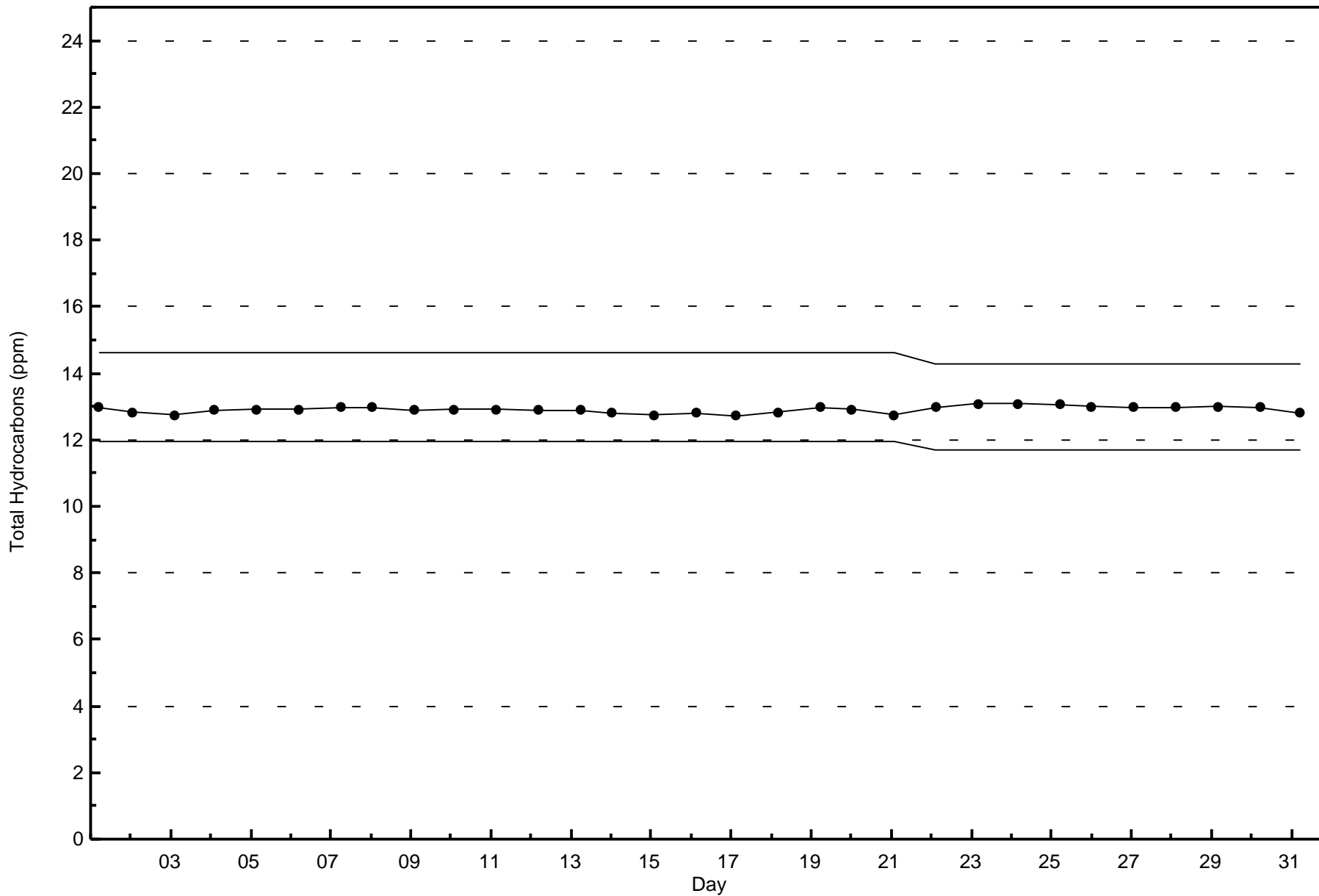
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

Firebag - October 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

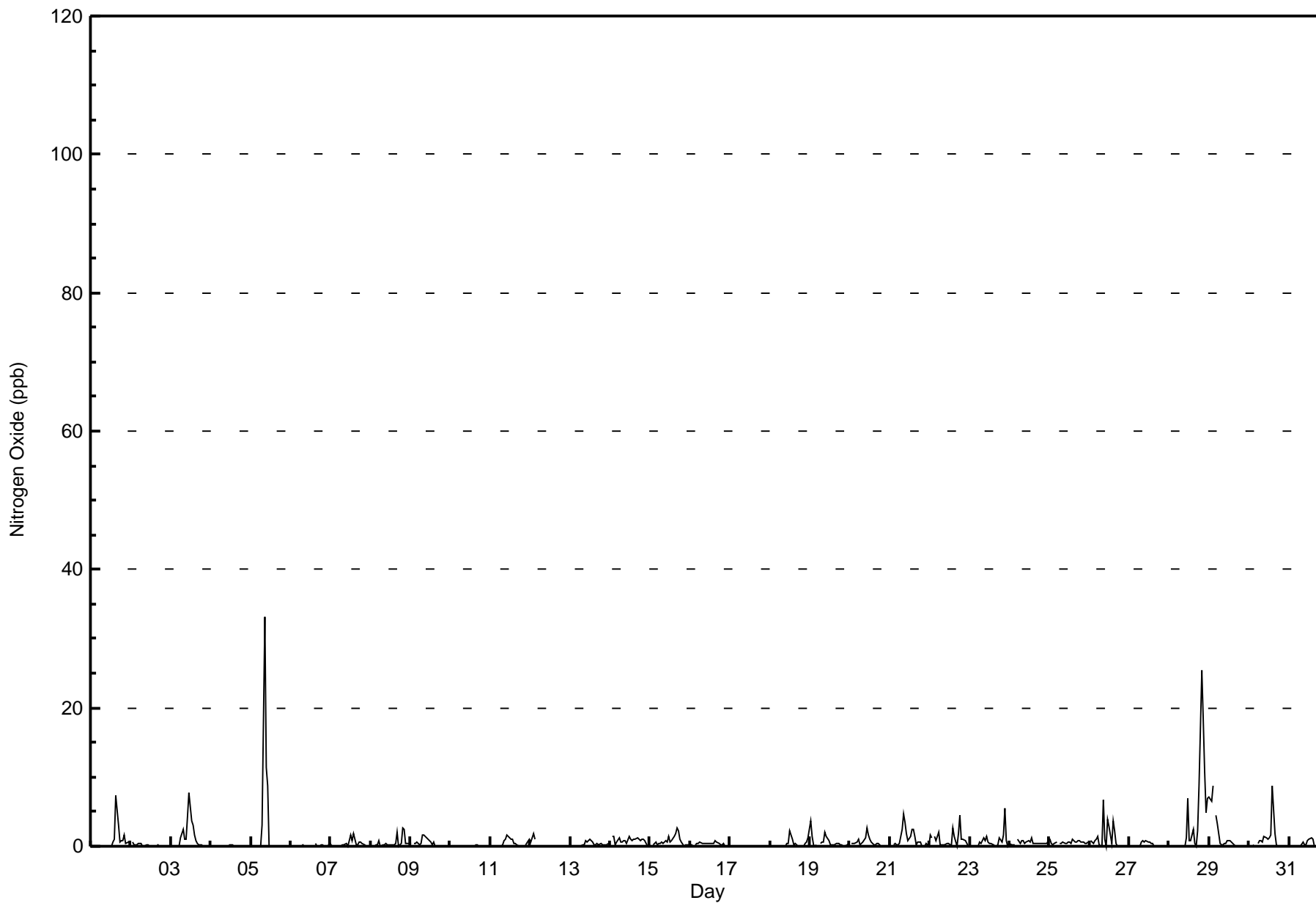
Firebag - October 2016

Maximum Value: 33 ppb on Oct 5 09:00		Maximum Daily Average: 3.9 ppb on Oct 28		Hours in Service: 744																							
Minimum Value: 0 ppb on Oct 12 10:00		Minimum Daily Average: 0.0 ppb on Oct 17		Hours of Data: 705																							
Maximum Diurnal Average: 1.9 ppb at hour 9		Minimum Diurnal Average: 0.3 ppb at hour 7		Hours of Missing Data: 39																							
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 = 9		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-Oct	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	7	3	1	1	1	2	1	1	0	0.8	7	
2-Oct	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
3-Oct	0	Z	0	0	0	0	1	2	1	1	4	8	4	3	2	1	0	0	0	0	0	0	0	0	1.2	8	
4-Oct	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-Oct	0	0	0	Z	0	0	0	3	33	11	9	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	33	
6-Oct	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	1	--	1	
7-Oct	0	0	0	0	0	Z	0	0	0	0	0	1	2	1	2	0	0	1	1	0	0	0	0	0	0.4	2	
8-Oct	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	3	2	0	0	0	0.5	3	
9-Oct	0	Z	0	0	1	0	0	2	2	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0.5	2	
10-Oct	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	
11-Oct	0	0	0	Z	0	0	0	0	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	1	0.4	2	
12-Oct	1	1	2	1	Z	0	0	DF	DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
13-Oct	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1	
14-Oct	Z	2	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.9	2	
15-Oct	0	Z	0	1	0	0	0	1	0	1	1	1	1	1	1	2	3	2	1	1	0	0	0	0	0.8	3	
16-Oct	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1	
17-Oct	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	
18-Oct	0	0	0	0	Z	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	1	1	0.3	2	
19-Oct	4	1	0	0	0	Z	0	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4	
20-Oct	Z	0	0	0	1	1	0	0	1	1	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0.5	3	
21-Oct	0	Z	0	0	0	0	0	2	5	4	2	1	1	3	2	1	0	1	1	0	0	0	0	0	1.1	5	
22-Oct	2	1	Z	1	1	2	0	0	0	0	0	0	0	0	3	1	0	2	5	1	1	1	0	0	1.0	5	
23-Oct	0	0	0	Z	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	2	6	1	0	0.7	6	
24-Oct	0	0	0	0	Z	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0.5	1	
25-Oct	1	0	0	0	1	Z	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0.5	1	
26-Oct	Z	1	0	1	1	1	0	0	7	1	0	4	3	0	4	2	0	0	0	0	0	0	0	0	1.1	7	
27-Oct	0	Z	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
28-Oct	0	0	Z	0	0	0	0	0	0	0	1	7	1	1	2	0	0	2	9	25	18	11	5	7	3.9	25	
29-Oct	7	7	9	Z	4	3	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1.5	9	
30-Oct	0	0	0	0	Z	0	1	1	1	1	1	1	1	2	9	2	0	0	0	0	0	0	0	0	0.9	9	
31-Oct	0	0	0	0	0	Z	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1	
		0.6	0.6	0.6	0.3	0.4	0.5	0.3	0.6	1.9	1.0	1.0	1.2	0.8	0.7	1.1	0.7	0.5	0.4	0.7	1.1	0.9	0.7	0.3	0.4	Diurnal Average	
		7	7	9	1	4	3	1	3	33	11	9	8	4	3	9	7	3	2	9	25	18	11	5	7	Diurnal Maximum	
Z - zerospan		C - Calibration				DF - DAS Failure																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Firebag - October 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - October 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	99.72	99.72
21 - 40	2	0.28	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - October 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	30	74	42	35	26	63	40	33	52	28	23	48	23	14	13	26	570
21 - 40	0	1	0	0	0	0	0	0	0	0	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	30	75	42	35	26	63	40	33	52	28	23	48	23	14	13	26	571

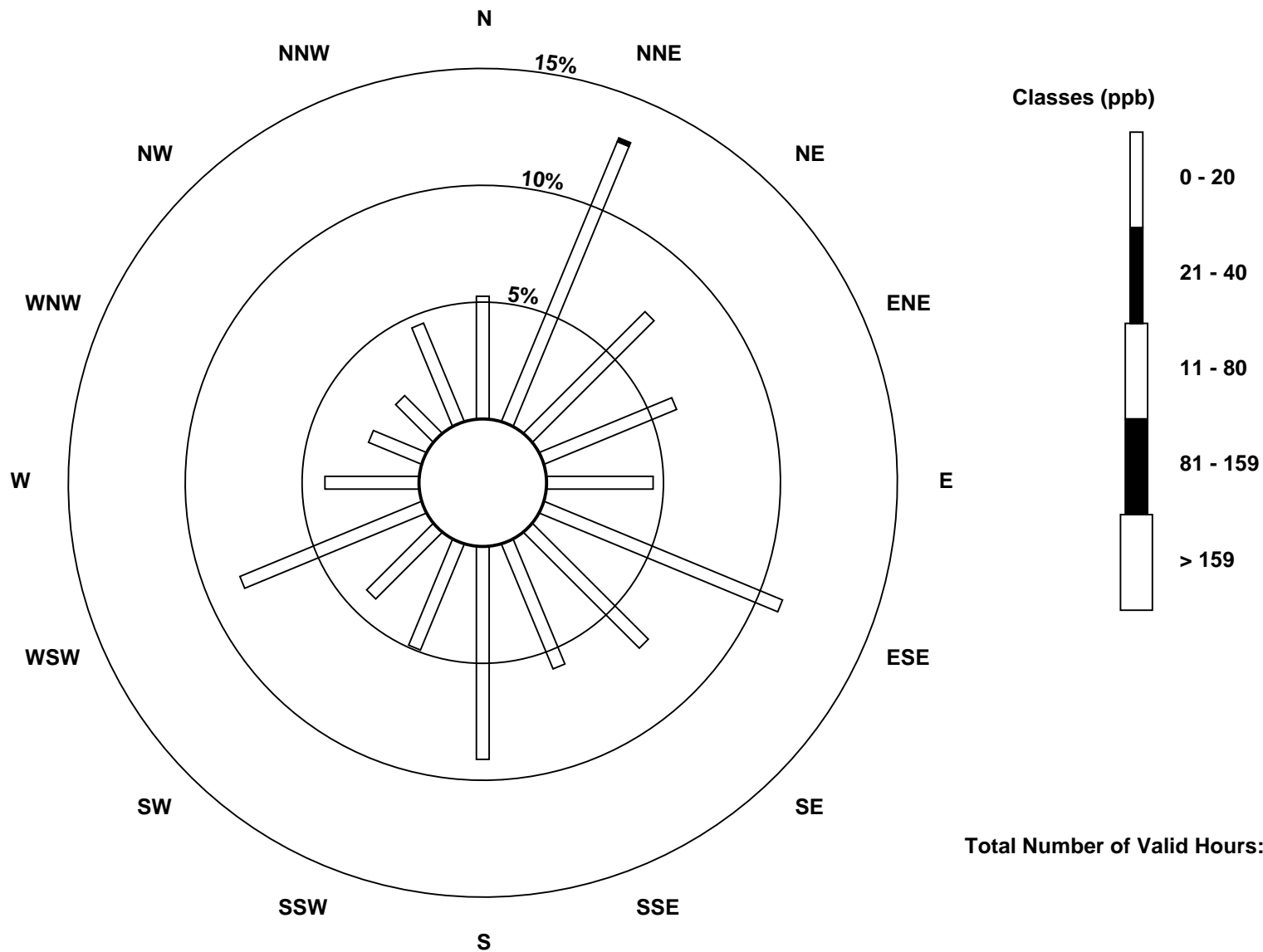
Total Number of Valid Hours: 571

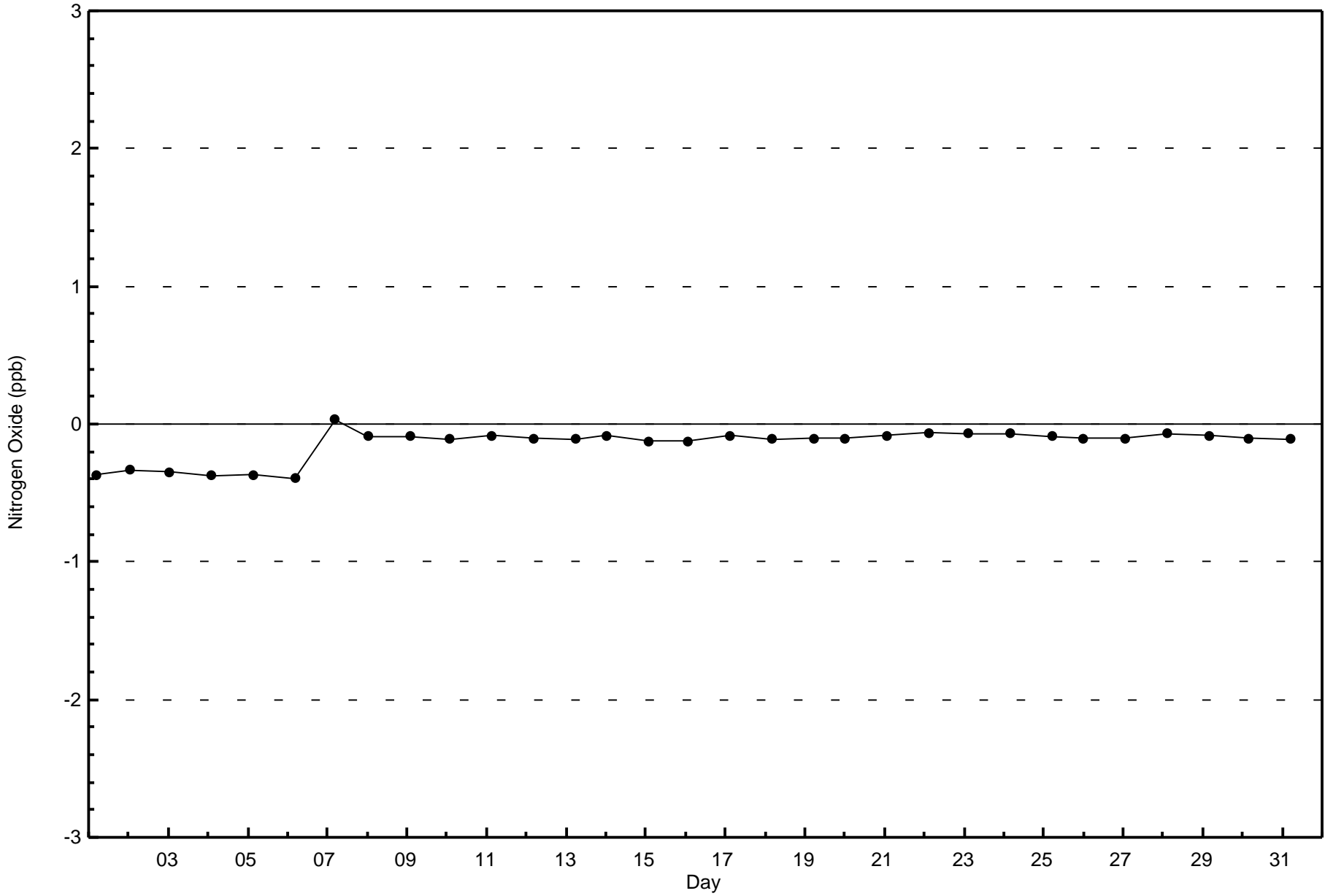
Total Number of Hours: 744

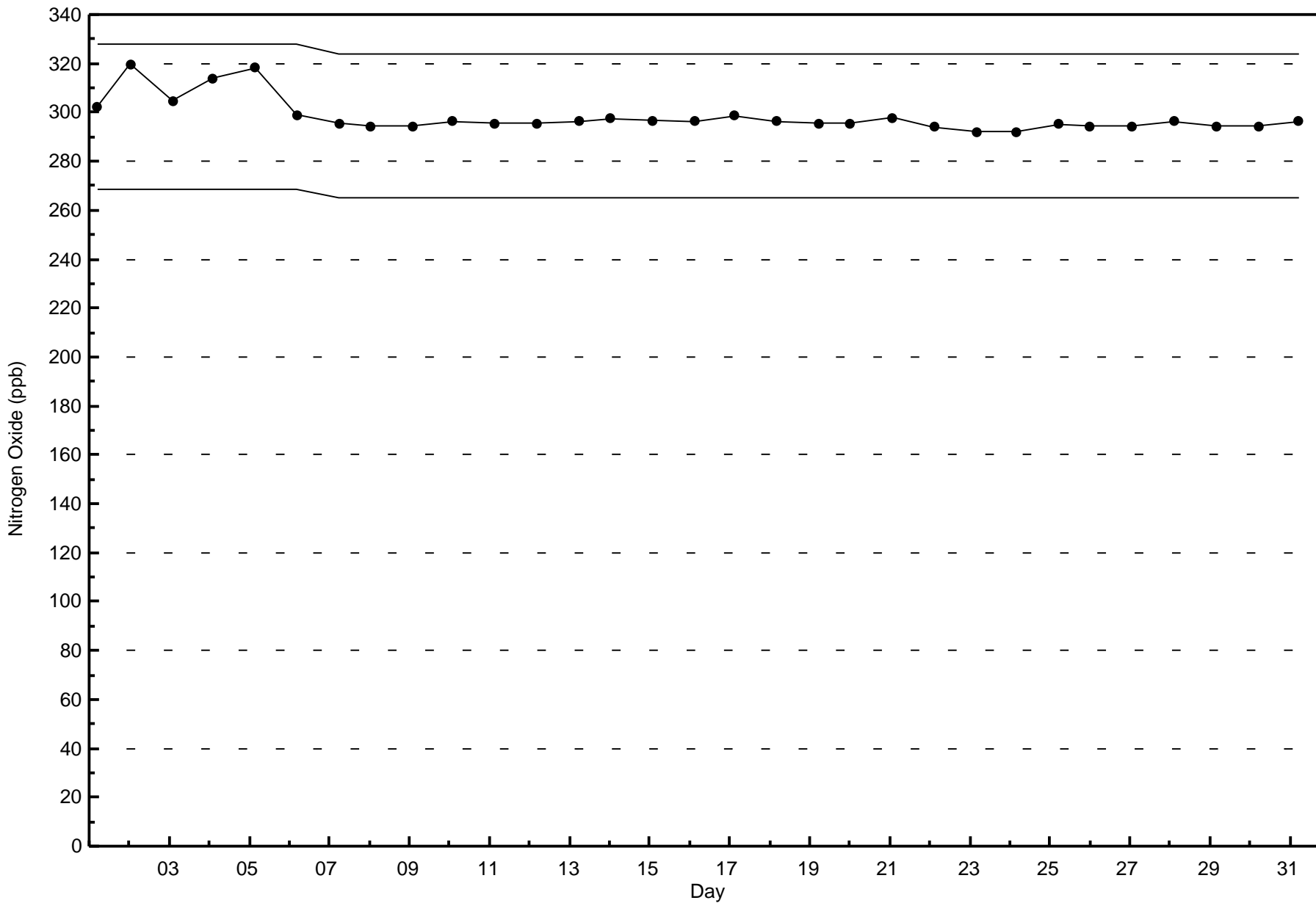


Wood Buffalo Environmental Association
Wind Rose Oct 2016

Nitrogen Oxide (NO) - ppb
Firebag (AMS 19)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Firebag - October 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 22 ppb on Oct 22 19:00	Maximum Daily Average: 6.1 ppb on Oct 21		Hours of Data:	705
Minimum Value: 0 ppb on Oct 1 04:00	Minimum Daily Average: 0.1 ppb on Oct 4		Hours of Missing Data:	39
Maximum Diurnal Average: 3.3 ppb at hour 19	Minimum Diurnal Average: 1.5 ppb at hour 14		Hours of Calibration:	37
Monthly Average: 2.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 12		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-Oct	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	2	2	1	1	1	4	3	4	2	1.0	4	
2-Oct	Z	4	3	2	2	2	3	1	1	1	2	0	0	0	0	1	1	0	1	2	2	3	3	2	1.6	4	
3-Oct	3	Z	5	3	3	4	4	5	2	2	5	6	4	4	2	2	2	2	3	4	2	0	0	0	2.9	6	
4-Oct	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-Oct	0	0	0	Z	0	0	0	4	8	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	8	
6-Oct	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	1	0	0	0	0	0	0	0	2	--	2	
7-Oct	2	2	0	0	0	Z	1	1	0	1	0	1	2	1	1	1	1	3	3	2	1	1	1	0	1.0	3	
8-Oct	Z	0	0	1	1	2	1	1	1	1	1	0	0	1	1	4	0	1	6	5	2	1	1	1	1.4	6	
9-Oct	1	Z	1	1	2	2	2	3	2	2	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0.9	3	
10-Oct	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	10	12	10	8	2.0	12	
11-Oct	6	6	7	Z	5	7	7	6	5	5	5	5	4	4	2	2	3	4	4	2	3	5	1	2	4.3	7	
12-Oct	2	3	5	2	Z	0	0	DF	DF	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.8	5	
13-Oct	1	6	11	6	4	Z	3	2	1	3	1	2	2	1	1	1	2	2	3	2	1	3	1	2	2.7	11	
14-Oct	Z	4	4	1	2	4	2	3	3	2	1	2	2	1	1	1	1	2	1	1	1	1	0	0	1.9	4	
15-Oct	1	Z	0	2	3	2	2	1	1	2	1	2	1	1	2	3	5	4	2	1	0	0	0	0	1.6	5	
16-Oct	0	0	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	0	0	0	0.9	2	
17-Oct	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-Oct	6	5	4	2	Z	2	1	0	0	0	1	1	4	2	1	1	2	8	9	8	8	6	5	8	3.5	9	
19-Oct	10	6	3	2	2	Z	2	2	1	1	1	1	0	0	1	1	1	1	1	1	1	2	2	3	1.9	10	
20-Oct	Z	2	2	2	3	3	3	3	3	3	3	2	2	1	1	1	1	2	1	1	1	1	4	7	2.3	7	
21-Oct	9	Z	9	9	9	8	10	8	5	5	3	3	3	5	5	5	3	7	12	9	5	3	3	3	6.1	12	
22-Oct	9	8	Z	5	3	4	2	1	1	1	1	1	1	1	9	7	3	13	22	10	5	4	2	1	5.0	22	
23-Oct	1	1	2	Z	3	3	4	4	3	2	2	1	1	1	1	1	1	1	4	3	5	7	2	0	2.2	7	
24-Oct	2	1	1	1	Z	3	1	2	2	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1.5	3
25-Oct	2	1	1	1	1	Z	1	1	1	1	1	1	1	1	3	1	1	2	2	1	1	1	1	1	1	1.2	3
26-Oct	Z	2	2	2	3	5	3	2	7	2	0	4	4	1	4	7	6	5	2	3	3	2	3	3	3.2	7	
27-Oct	3	Z	3	5	4	3	3	4	2	2	2	2	2	1	1	1	0	0	0	0	0	0	0	0	1.7	5	
28-Oct	0	0	Z	0	0	0	0	0	0	0	2	6	1	2	4	1	1	9	15	16	14	12	12	11	4.6	16	
29-Oct	9	7	6	Z	6	7	6	5	4	3	3	4	4	5	4	2	2	1	1	1	1	1	1	1	3.6	9	
30-Oct	1	3	4	4	Z	3	4	4	5	5	4	4	3	5	14	10	7	11	8	4	4	4	5	8	5.2	14	
31-Oct	6	3	2	3	5	Z	3	4	6	2	1	4	4	4	3	0	2	5	0	0	0	1	2	3	2.6	6	

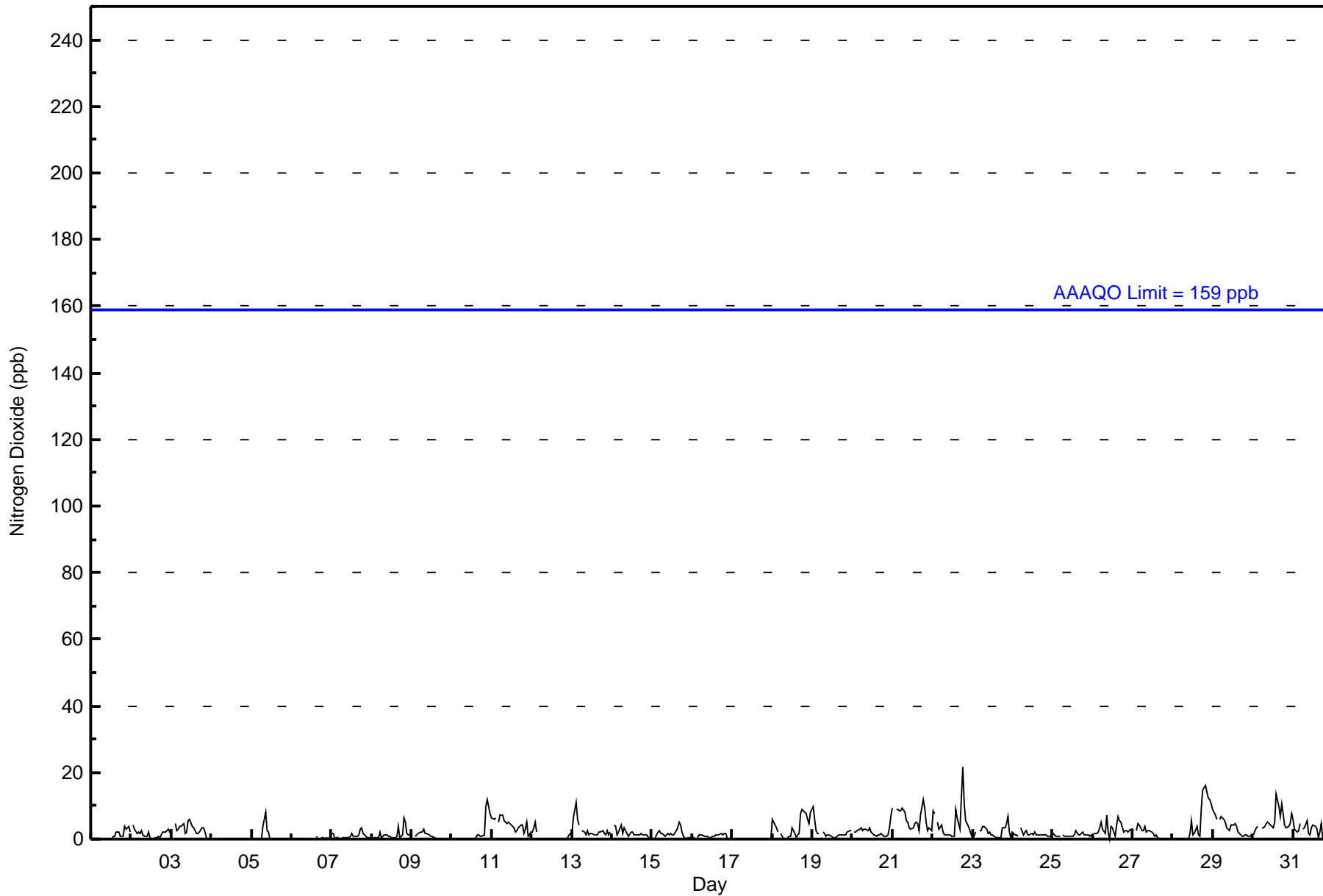
2.9	2.5	2.8	2.1	2.4	2.6	2.1	2.3	2.2	1.7	1.6	1.8	1.6	1.5	2.2	1.8	1.8	2.8	3.3	2.8	2.6	2.4	2.1	2.3	Diurnal Average	
10	8	11	9	9	8	10	8	8	5	5	6	4	5	14	10	7	13	22	16	14	12	12	11	Diurnal Maximum	

Z - zeronpan C - Calibration DF - DAS Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Firebag - October 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Firebag - October 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Firebag - October 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	30	75	42	35	26	63	40	32	52	28	23	48	23	14	13	26	570
21 - 40	0	0	0	0	0	0	0	1	0	0	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	30	75	42	35	26	63	40	33	52	28	23	48	23	14	13	26	571

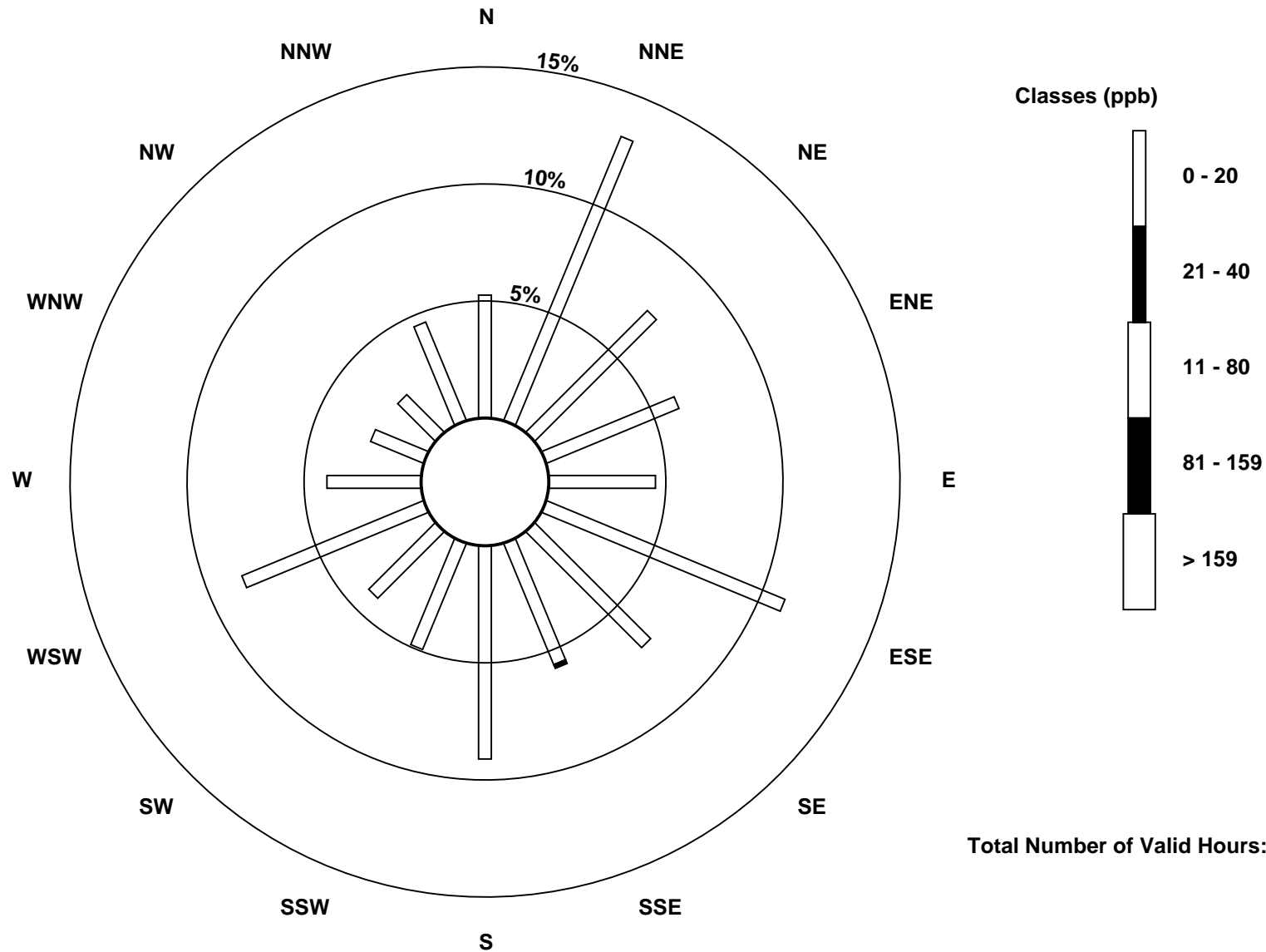
Total Number of Valid Hours: 571

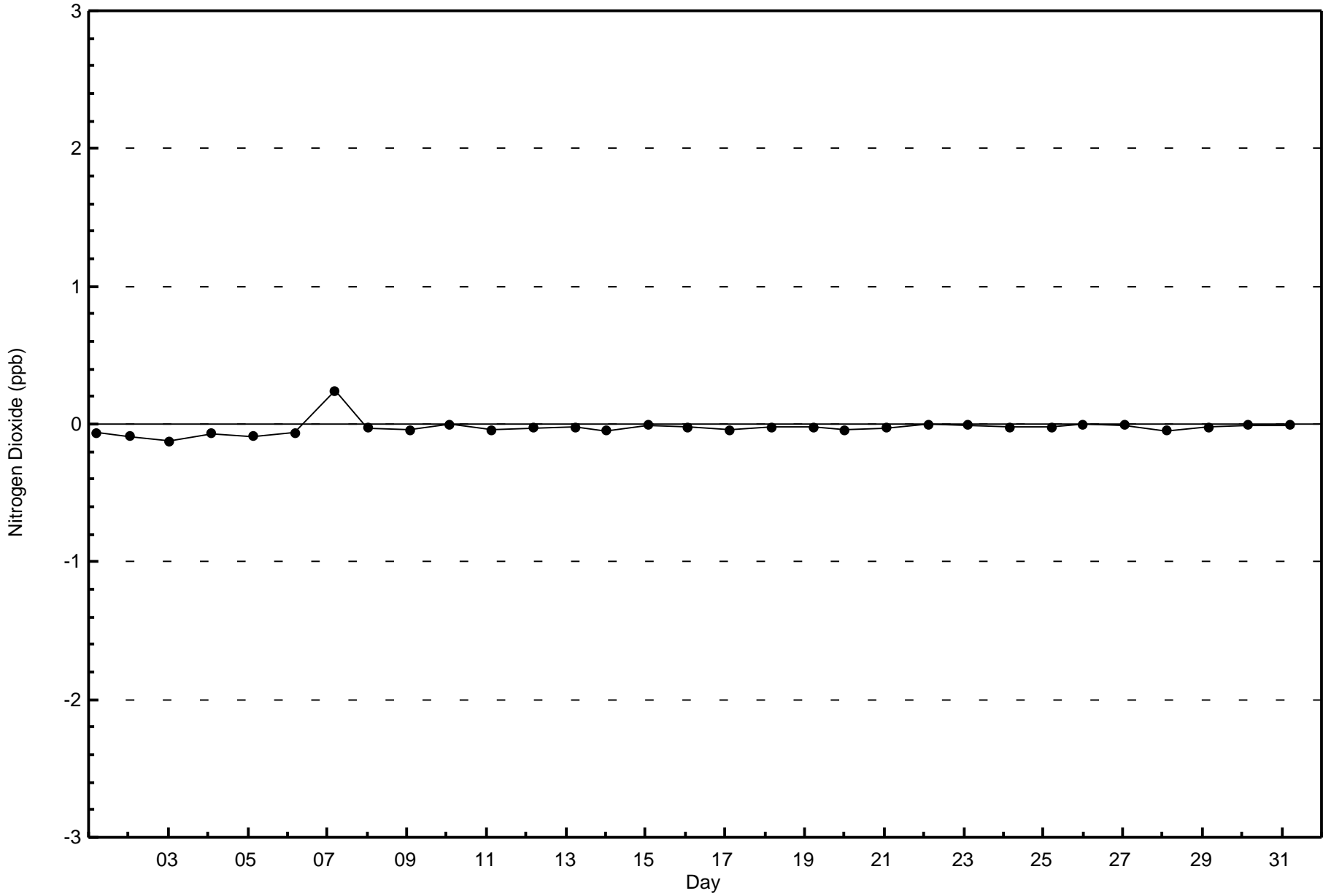
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Oct 2016

Nitrogen Dioxide (NO₂) - ppb
Firebag (AMS 19)

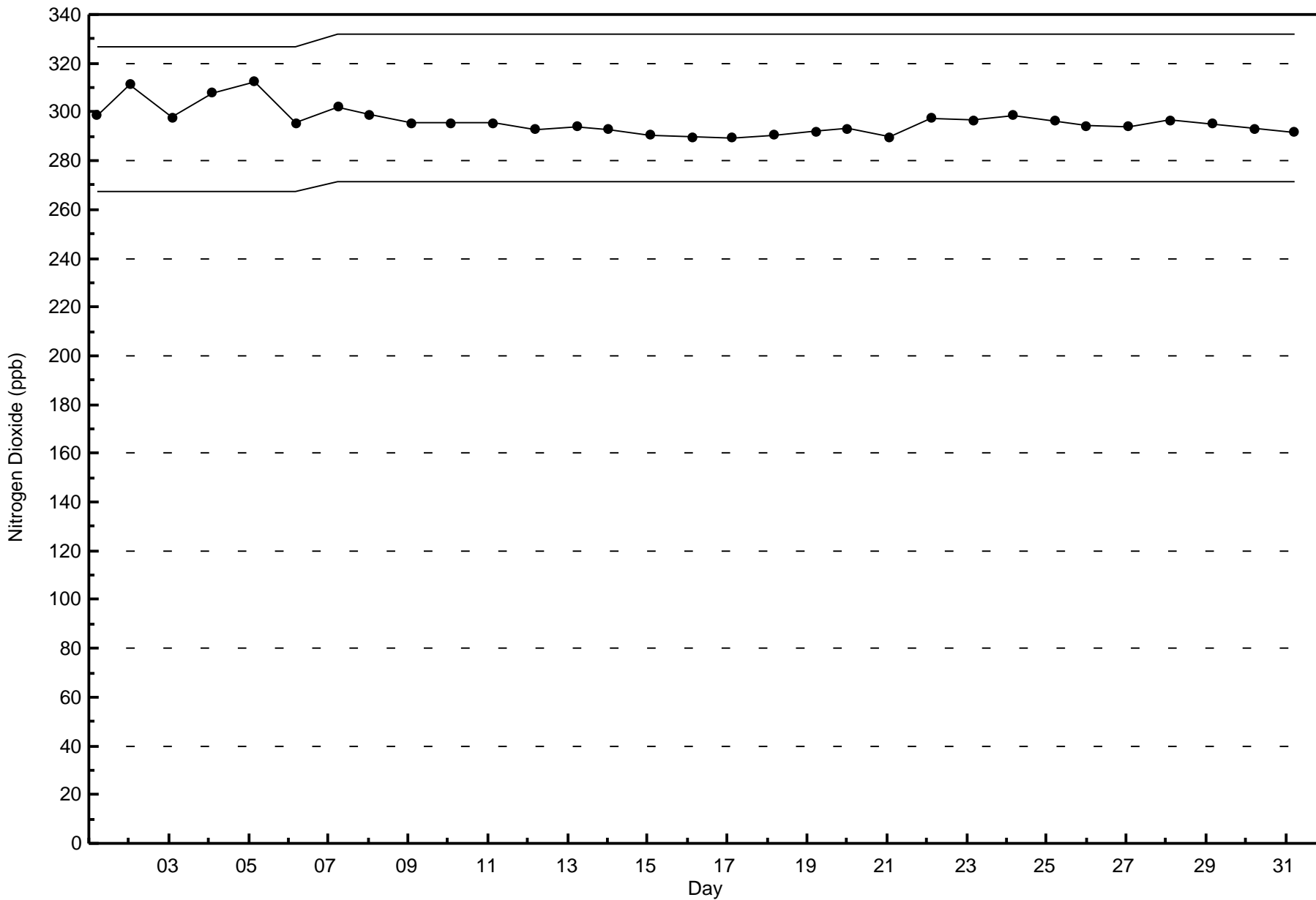






Wood Buffalo Environmental Association
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Firebag - October 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

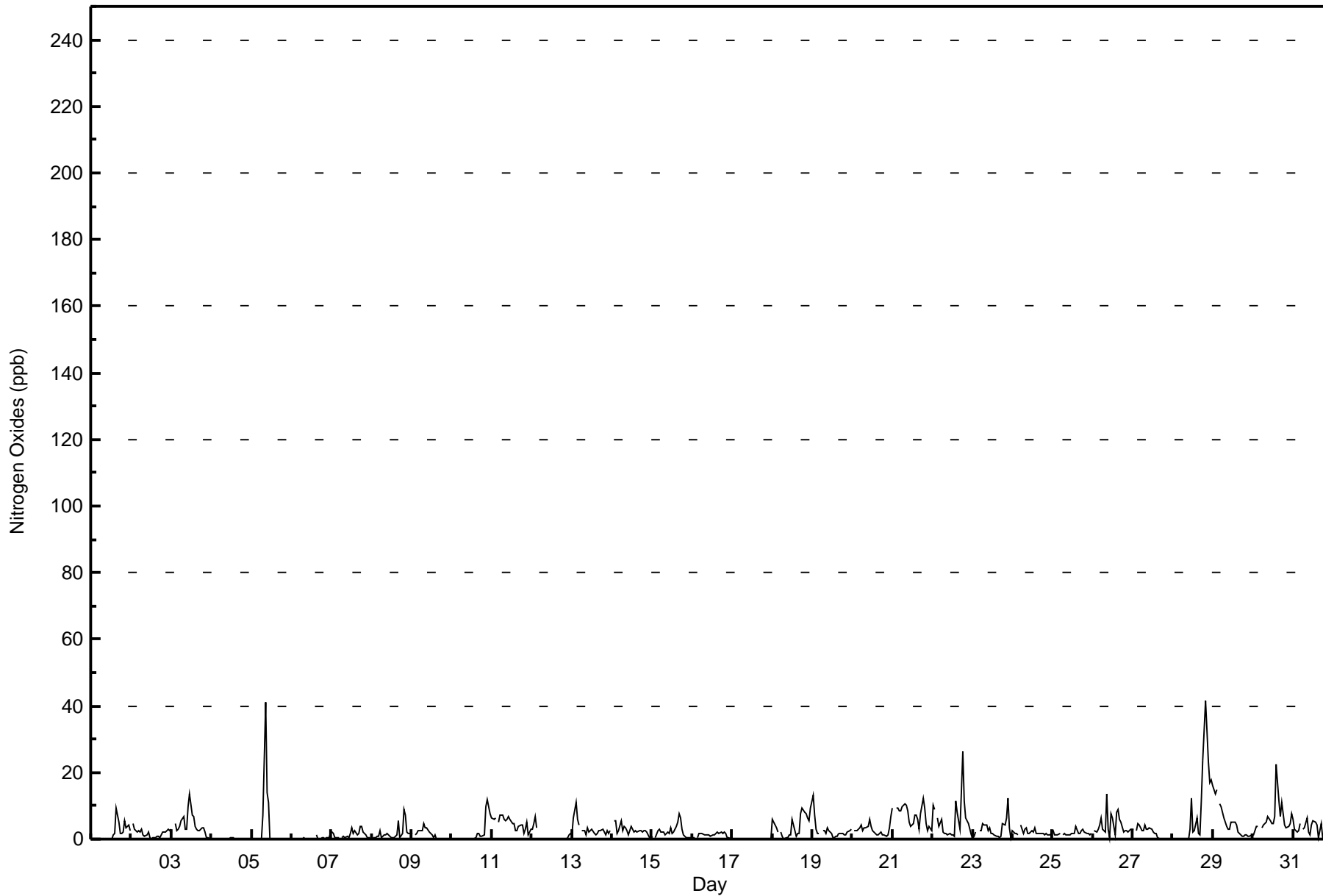
Firebag - October 2016

Maximum Value: 42 ppb on Oct 28 20:00		Maximum Daily Average: 8.5 ppb on Oct 28		Hours in Service: 744																									
Minimum Value: 0 ppb on Oct 28 07:00		Minimum Daily Average: 0.1 ppb on Oct 17		Hours of Data: 705																									
Maximum Diurnal Average: 4.1 ppb at hour 9		Minimum Diurnal Average: 2.2 ppb at hour 14		Hours of Missing Data: 39																									
Monthly Average: 3.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 2 Q ₃ = 4 P ₉₀ = 7 P ₉₉ = 22		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-Oct	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	9	5	2	2	2	6	4	4	3	1.8	9			
2-Oct	Z	5	3	2	2	2	3	1	1	1	2	0	0	0	0	1	1	0	1	2	2	3	3	2	1.8	5			
3-Oct	3	Z	5	3	3	4	5	7	3	3	10	14	7	7	4	3	2	2	4	4	2	1	0	0	4.1	14			
4-Oct	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-Oct	0	0	0	Z	0	0	0	7	41	14	11	0	0	0	0	0	0	0	0	0	0	0	0	0	3.3	41			
6-Oct	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	1	0	0	1	1	0	0	0	2	--	2			
7-Oct	2	2	0	0	0	Z	0	1	1	1	0	2	3	2	3	1	2	4	4	2	1	1	1	0	1.4	4			
8-Oct	Z	0	0	1	1	3	1	1	1	2	1	1	1	1	1	1	6	0	2	9	7	2	2	2	1.9	9			
9-Oct	2	Z	1	2	2	2	2	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0	1.4	5			
10-Oct	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	10	12	10	8	2.0	12			
11-Oct	6	6	6	Z	5	7	7	6	6	6	7	6	5	5	3	3	4	4	4	2	3	5	1	3	4.8	7			
12-Oct	3	5	7	3	Z	0	0	DF	DF	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1.1	7			
13-Oct	1	6	11	6	4	Z	3	3	1	3	2	2	3	2	1	2	3	2	3	2	1	3	2	2	3.0	11			
14-Oct	Z	6	6	1	3	5	2	4	3	3	1	4	3	2	3	2	3	3	2	2	2	0	0	0	2.7	6			
15-Oct	1	Z	1	3	3	2	2	2	1	2	2	3	2	2	4	5	8	7	3	1	0	0	0	0	2.4	8			
16-Oct	0	0	Z	1	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0	1.3	2			
17-Oct	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-Oct	6	5	4	2	Z	2	1	0	0	0	1	1	6	3	1	2	2	8	9	8	8	6	6	9	3.9	9			
19-Oct	13	7	3	2	2	Z	3	2	1	3	2	1	1	1	1	1	2	2	2	1	1	2	3	3	2.5	13			
20-Oct	Z	3	3	3	3	4	3	3	3	4	6	4	3	2	1	1	2	2	1	1	1	1	3	7	2.8	7			
21-Oct	9	Z	9	9	9	9	10	11	10	8	5	4	5	7	7	6	3	8	12	9	5	3	4	3	7.1	12			
22-Oct	10	9	Z	7	4	6	2	2	2	1	2	1	1	1	11	8	3	14	26	12	6	5	3	1	6.0	26			
23-Oct	1	1	2	Z	3	3	5	4	4	3	3	2	2	1	1	1	1	1	5	4	6	12	3	0	2.9	12			
24-Oct	2	2	1	1	Z	4	2	3	3	2	2	2	2	4	2	2	2	2	2	1	1	1	1	2	2.0	4			
25-Oct	3	1	1	1	2	Z	1	2	1	1	1	1	2	2	4	2	2	3	3	2	2	1	2	2	1.8	4			
26-Oct	Z	2	2	3	4	7	3	2	14	3	0	8	6	1	8	9	6	5	2	3	3	2	3	3	4.3	14			
27-Oct	3	Z	3	4	4	3	3	4	3	3	3	3	2	2	2	1	0	0	0	0	0	0	0	0	1.9	4			
28-Oct	0	0	Z	0	0	0	0	0	0	0	3	12	2	2	6	2	1	11	24	42	33	23	17	18	8.5	42			
29-Oct	16	14	15	Z	10	10	6	5	4	3	3	5	5	5	4	2	2	1	1	1	1	1	1	1	5.1	16			
30-Oct	1	2	4	4	Z	4	4	4	4	5	7	6	5	5	7	22	12	7	11	8	4	4	4	5	6.1	22			
31-Oct	6	3	2	2	5	Z	3	4	6	2	1	4	6	5	4	1	2	5	0	0	0	1	1	3	2.9	6			
		3.4	3.1	3.4	2.3	2.8	3.2	2.4	2.8	4.1	2.7	2.6	3.0	2.4	2.2	3.3	2.6	2.2	3.2	4.0	3.9	3.5	3.1	2.5	2.7	Diurnal Average			
		16	14	15	9	10	10	10	11	41	14	11	14	7	7	22	12	8	14	26	42	33	23	17	18	Diurnal Maximum			
Z - zerospan		C - Calibration				DF - DAS Failure																							



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Firebag - October 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Firebag - October 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	698	99.01	99.01
21 - 40	5	0.71	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Firebag - October 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	30	74	42	35	26	63	40	32	52	28	23	48	23	14	13	26	569
21 - 40	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
11 - 80	0	1	0	0	0	0	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	30	75	42	35	26	63	40	33	52	28	23	48	23	14	13	26	571

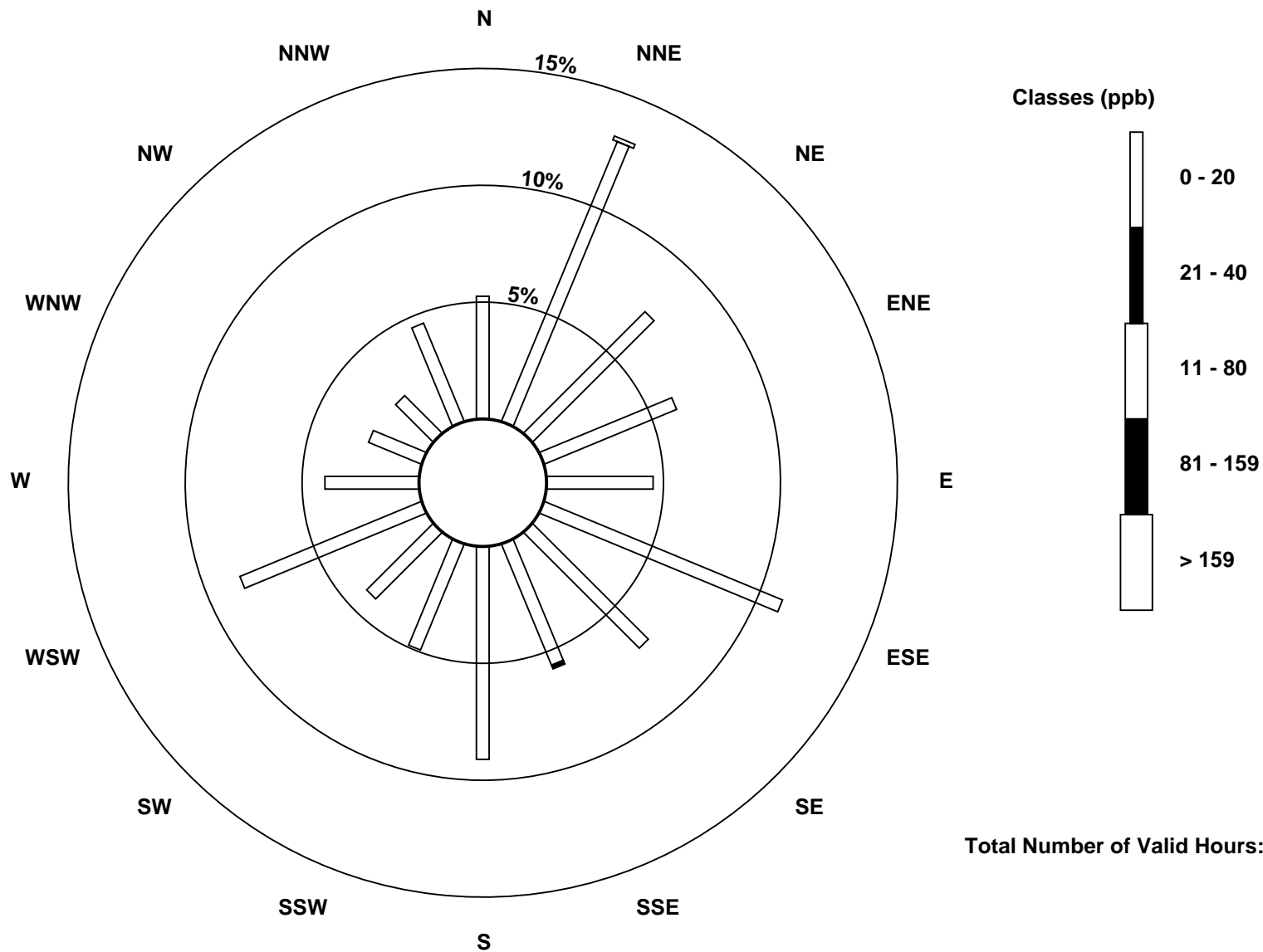
Total Number of Valid Hours: 571

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Oct 2016

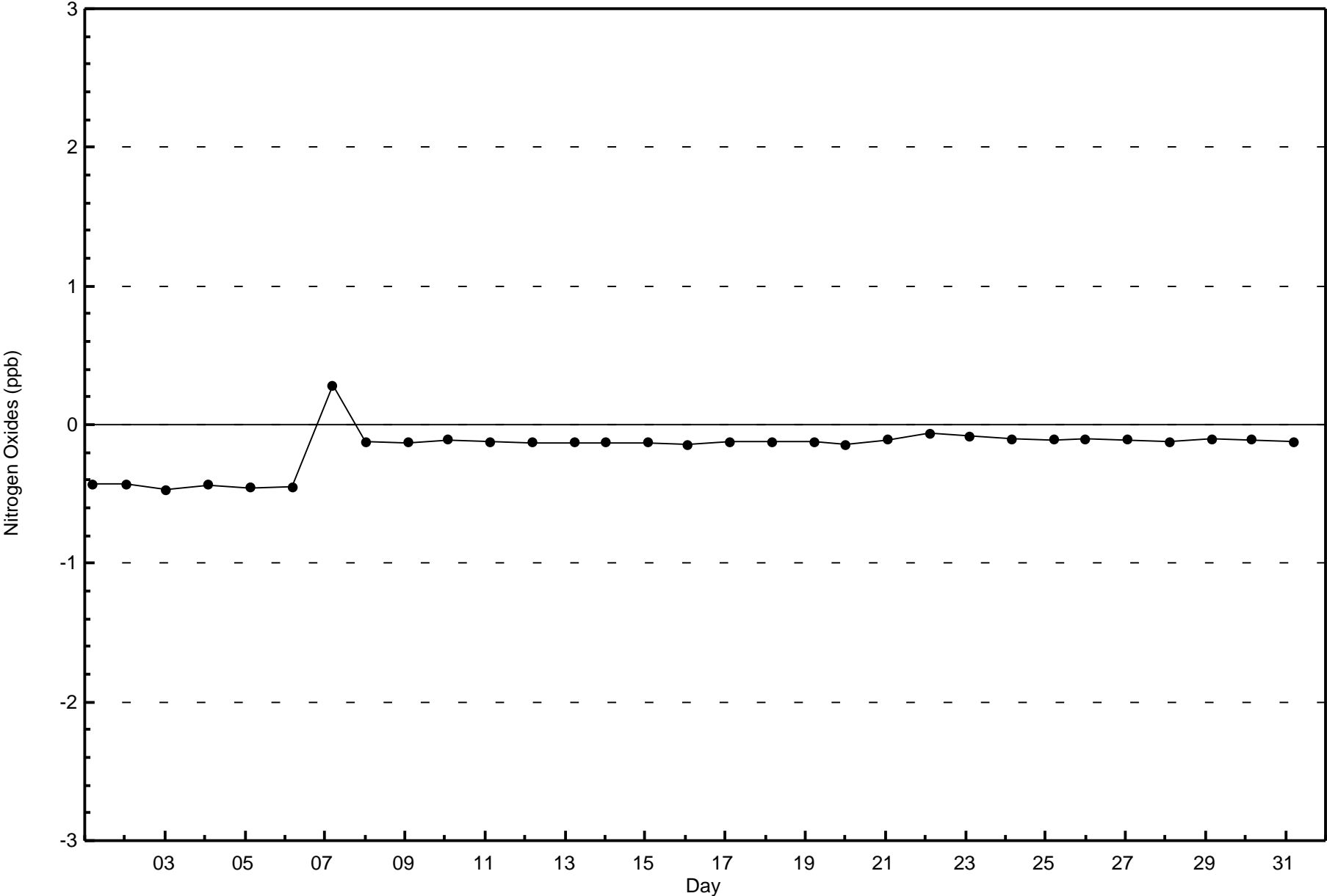
Nitrogen Oxides (NO_x) - ppb
Firebag (AMS 19)

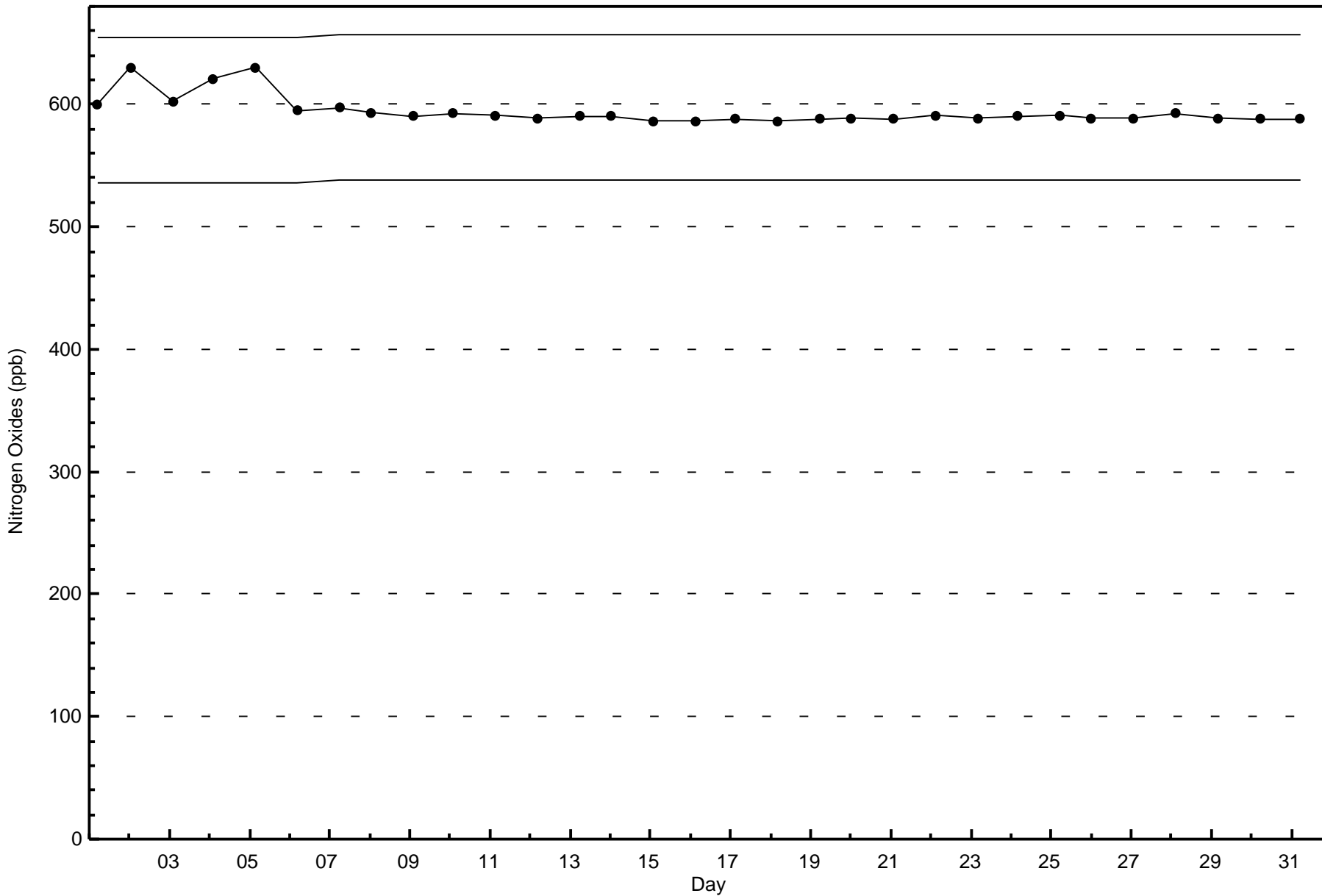




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Firebag - October 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

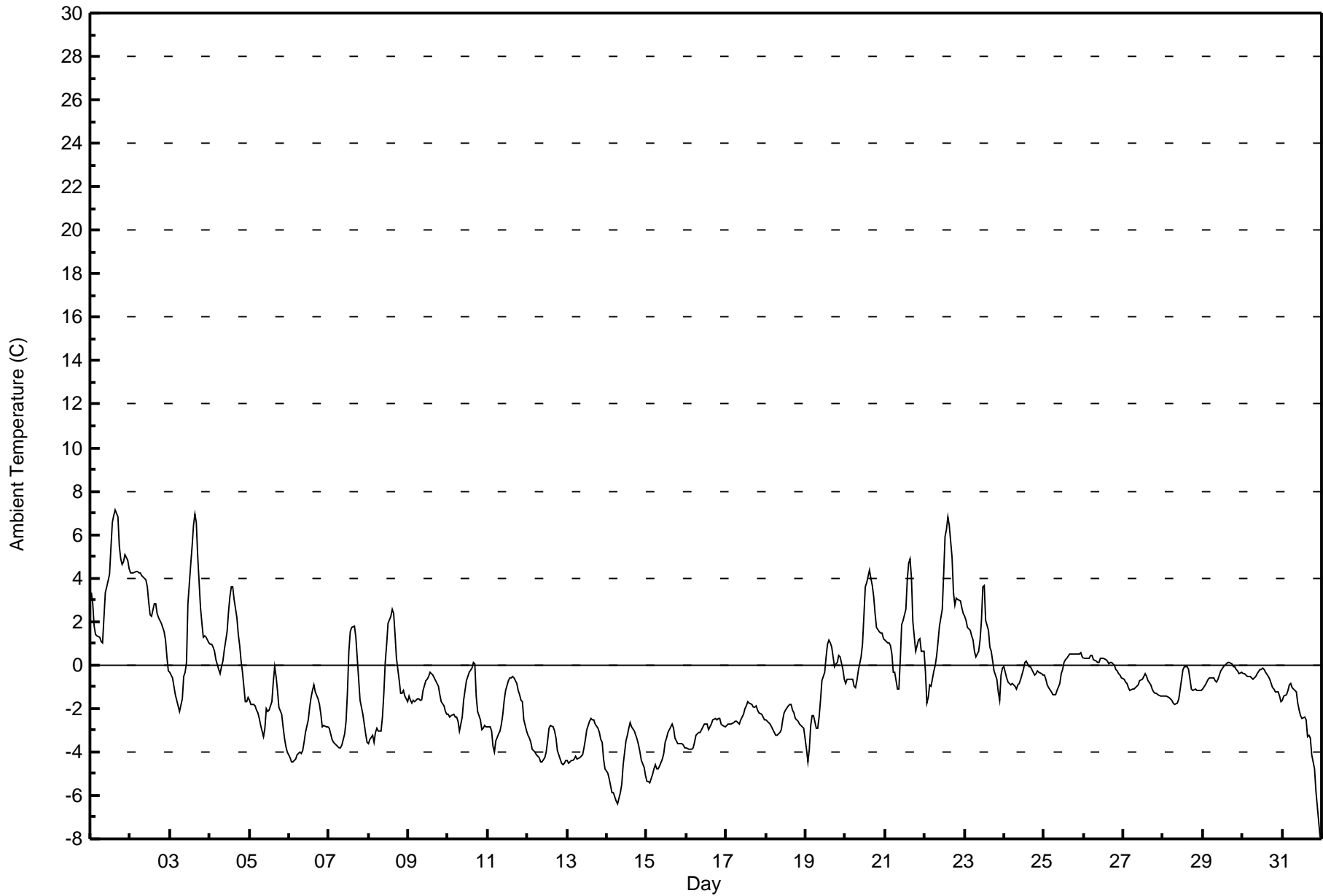
Firebag - October 2016

Maximum Value: 7.1 C on Oct 1 16:00		Maximum Daily Average: 3.9 C on Oct 1		Hours in Service: 744																						
Minimum Value: -7.9 C on Nov 1 00:00		Minimum Daily Average: -4.5 C on Oct 14		Hours of Data: 744																						
Maximum Diurnal Average: 0.6 C at hour 15		Minimum Diurnal Average: -1.9 C at hour 8		Hours of Missing Data: 0																						
Monthly Average: -0.97 C		Percentiles: P ₁ = -5.9 P ₁₀ = -3.9 Q ₁ = -2.8 Median = -1.1 Q ₃ = 0.2 P ₉₀ = 2.4 P ₉₉ = 6.5		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-Oct	3.3	2.8	1.8	1.4	1.3	1.3	1.1	1.0	2.1	3.3	3.6	4.2	5.4	6.5	6.9	7.1	6.8	5.5	4.9	4.6	4.8	5.1	4.8	4.4	3.9	7.1
2-Oct	4.2	4.2	4.3	4.3	4.3	4.3	4.2	4.1	4.0	3.9	3.6	2.9	2.3	2.2	2.8	2.8	2.4	2.2	2.0	1.9	1.6	1.2	0.4	-0.3	2.9	4.3
3-Oct	-0.3	-0.6	-1.0	-1.3	-1.6	-1.9	-2.1	-1.6	-0.5	-0.3	0.1	2.8	4.6	5.5	6.4	6.9	6.5	5.0	2.6	1.9	1.3	1.3	1.3	1.0	1.5	6.9
4-Oct	1.0	0.9	0.8	0.6	0.3	-0.2	-0.4	-0.1	0.2	0.7	1.5	2.5	3.1	3.6	3.6	3.0	2.2	1.4	0.9	0.2	-0.3	-1.7	-1.7	-1.5	0.9	3.6
5-Oct	-1.6	-1.8	-1.8	-1.9	-2.1	-2.2	-2.4	-2.8	-3.3	-2.9	-2.0	-2.1	-2.1	-1.7	-0.8	-0.1	-0.5	-1.2	-1.9	-2.3	-2.8	-3.4	-3.8	-4.0	-2.1	-0.1
6-Oct	-4.3	-4.5	-4.5	-4.4	-4.3	-4.2	-4.0	-4.1	-3.9	-3.6	-3.1	-2.5	-1.9	-1.5	-1.2	-0.9	-1.2	-1.5	-1.8	-2.2	-2.8	-2.8	-2.9	-2.8	-3.0	-0.9
7-Oct	-2.9	-3.2	-3.4	-3.6	-3.7	-3.8	-3.8	-3.8	-3.7	-3.1	-2.6	-1.2	0.6	1.5	1.7	1.8	1.3	0.3	-0.6	-1.6	-2.3	-2.7	-3.2	-3.5	-1.9	1.8
8-Oct	-3.6	-3.4	-3.2	-3.5	-3.1	-2.9	-3.0	-3.1	-2.4	-1.3	0.1	0.9	1.9	2.2	2.6	2.4	1.4	0.3	-0.7	-1.3	-1.3	-1.2	-1.5	-1.7	-1.1	2.6
9-Oct	-1.5	-1.6	-1.8	-1.6	-1.7	-1.6	-1.6	-1.6	-1.6	-1.2	-0.7	-0.7	-0.6	-0.3	-0.4	-0.5	-0.7	-0.9	-1.0	-1.3	-1.7	-1.9	-2.1	-2.2	-1.3	-0.3
10-Oct	-2.2	-2.4	-2.4	-2.3	-2.4	-2.4	-2.6	-3.0	-2.4	-1.6	-1.1	-0.7	-0.5	-0.4	-0.1	0.1	0.0	-1.4	-2.1	-2.5	-3.0	-2.9	-2.8	-2.8	-1.8	0.1
11-Oct	-2.8	-2.8	-3.1	-3.7	-4.0	-3.5	-3.2	-3.1	-2.7	-2.2	-1.6	-1.2	-0.7	-0.6	-0.6	-0.5	-0.6	-0.9	-1.2	-1.4	-1.6	-1.7	-2.5	-3.1	-2.1	-0.5
12-Oct	-3.3	-3.3	-3.5	-3.9	-4.0	-4.1	-4.2	-4.3	-4.4	-4.4	-4.3	-4.0	-3.5	-2.9	-2.8	-2.9	-3.1	-3.4	-3.9	-4.1	-4.5	-4.6	-4.5	-4.4	-3.8	-2.8
13-Oct	-4.4	-4.5	-4.4	-4.4	-4.4	-4.2	-4.4	-4.3	-4.2	-4.1	-3.8	-3.4	-3.0	-2.6	-2.4	-2.5	-2.5	-2.7	-2.9	-3.1	-3.4	-3.5	-4.3	-4.8	-3.7	-2.4
14-Oct	-5.0	-5.2	-5.6	-5.9	-5.9	-6.2	-6.4	-6.2	-5.9	-5.5	-4.6	-3.5	-3.3	-2.9	-2.7	-2.8	-3.0	-3.3	-3.4	-3.7	-4.0	-4.4	-4.7	-5.1	-4.5	-2.7
15-Oct	-5.3	-5.3	-5.5	-5.0	-4.8	-4.6	-4.8	-4.8	-4.6	-4.4	-4.1	-3.6	-3.4	-3.1	-2.8	-2.7	-2.9	-3.4	-3.5	-3.6	-3.6	-3.6	-3.7	-3.8	-4.0	-2.7
16-Oct	-3.8	-3.9	-3.9	-3.9	-3.8	-3.6	-3.2	-3.1	-3.1	-3.0	-2.8	-2.7	-2.7	-3.0	-2.8	-2.7	-2.5	-2.5	-2.5	-2.4	-2.5	-2.7	-2.8	-2.8	-3.0	-2.4
17-Oct	-2.8	-2.7	-2.7	-2.7	-2.6	-2.6	-2.6	-2.7	-2.7	-2.5	-2.3	-2.0	-1.9	-1.7	-1.7	-1.8	-2.0	-2.0	-1.9	-2.1	-2.2	-2.3	-2.4	-2.5	-2.3	-1.7
18-Oct	-2.5	-2.6	-2.7	-2.8	-3.0	-3.1	-3.2	-3.3	-3.1	-2.9	-2.5	-2.2	-2.0	-1.9	-1.8	-1.8	-2.0	-2.2	-2.5	-2.6	-2.7	-2.8	-2.8	-2.9	-2.6	-1.8
19-Oct	-3.9	-4.5	-3.9	-2.8	-2.3	-2.3	-2.9	-2.9	-2.4	-1.6	-0.7	-0.3	0.4	0.9	1.2	1.0	0.9	-0.1	0.1	0.1	0.4	0.4	-0.2	-0.7	-1.1	1.2
20-Oct	-0.8	-0.7	-0.6	-0.7	-0.7	-1.0	-1.0	-0.7	-0.2	0.4	0.9	2.2	3.6	3.8	4.4	4.0	3.7	3.2	2.4	1.7	1.5	1.5	1.4	1.2	1.2	4.4
21-Oct	1.2	1.0	1.0	0.9	0.5	-0.4	-0.3	-1.1	-1.1	0.3	1.8	2.0	2.6	3.9	4.7	4.9	4.0	2.0	0.7	0.9	1.1	1.2	0.6	0.6	1.4	4.9
22-Oct	-0.3	-1.8	-1.5	-0.9	-1.0	-0.3	0.0	0.4	1.1	1.8	2.6	4.2	5.9	6.2	6.8	6.4	4.9	3.3	2.8	3.1	3.0	2.9	2.6	2.4	2.3	6.8
23-Oct	2.3	2.1	1.7	1.6	1.3	1.1	0.6	0.4	0.6	1.1	2.1	3.6	3.7	2.1	1.6	0.8	0.7	0.2	-0.2	-0.7	-1.2	-1.6	-0.5	-0.1	1.0	3.7
24-Oct	-0.1	-0.6	-0.8	-0.9	-0.9	-0.9	-1.0	-1.1	-0.9	-0.9	-0.7	-0.2	0.1	0.2	0.1	0.0	-0.1	-0.3	-0.4	-0.4	-0.3	-0.3	-0.4	-0.5	-0.5	0.2
25-Oct	-0.5	-0.7	-0.9	-1.0	-1.2	-1.4	-1.4	-1.4	-1.2	-0.8	-0.4	-0.2	0.1	0.2	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.4	-0.2	0.6
26-Oct	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.2	0.1	0.1	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.0	-0.2	-0.3	-0.4	-0.5	-0.6	0.1	0.4
27-Oct	-0.7	-0.8	-0.9	-1.0	-1.1	-1.1	-1.1	-1.1	-1.0	-0.9	-0.7	-0.6	-0.5	-0.4	-0.5	-0.7	-0.9	-1.1	-1.3	-1.3	-1.3	-1.4	-1.4	-1.4	-1.0	-0.4
28-Oct	-1.4	-1.4	-1.4	-1.5	-1.5	-1.7	-1.7	-1.8	-1.8	-1.6	-1.1	-0.6	-0.2	-0.1	-0.1	-0.2	-0.6	-1.1	-1.2	-1.1	-1.2	-1.1	-1.2	-1.2	-1.1	-0.1
29-Oct	-1.1	-0.9	-0.8	-0.7	-0.6	-0.6	-0.6	-0.7	-0.8	-0.7	-0.5	-0.2	-0.1	0.0	0.1	0.1	0.1	0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-0.3	-0.4	0.1
30-Oct	-0.4	-0.4	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6	-0.5	-0.4	-0.2	-0.2	-0.1	-0.2	-0.3	-0.5	-0.7	-0.8	-1.0	-1.1	-1.2	-1.2	-1.4	-1.7	-0.7	-0.1
31-Oct	-1.6	-1.4	-1.3	-1.2	-0.9	-0.9	-1.0	-1.1	-1.2	-1.8	-2.1	-2.3	-2.5	-2.4	-2.6	-3.3	-3.3	-3.4	-4.1	-4.8	-5.8	-6.5	-7.3	-7.9	-2.9	-0.9
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Firebag - October 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Firebag - October 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	533	71.64	71.64
0 - 10	211	28.36	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

Relative Humidity (RH) - %

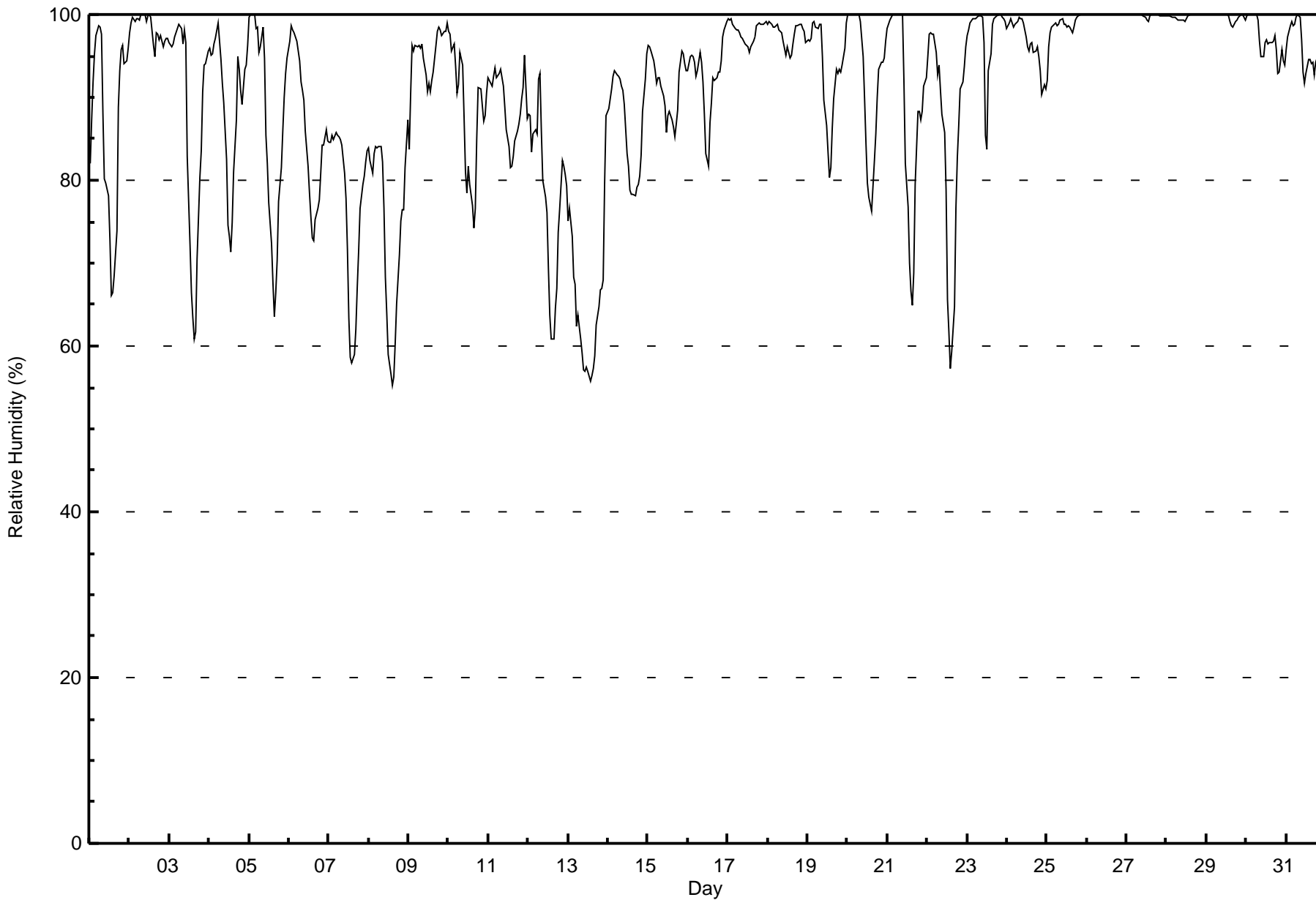
Firebag - October 2016

Maximum Value: 100 % on Oct 2 08:00																		Maximum Daily Average: 100.0 % on Oct 26																		Hours in Service: 744	
Minimum Value: 55 % on Oct 8 15:00																		Minimum Daily Average: 65.0 % on Oct 13																		Hours of Data: 744	
Maximum Diurnal Average: 95.6 % at hour 5																		Minimum Diurnal Average: 81.6 % at hour 15																		Hours of Missing Data: 0	
Monthly Average: 90.7 %																		Percentiles: P ₁ = 57 P ₁₀ = 74 Q ₁ = 86 Median = 95 Q ₃ = 99 P ₉₀ = 100 P ₉₉ = 100																		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-Oct	82	87	92	95	98	99	99	98	88	80	80	78	73	66	66	68	74	89	93	96	96	94	94	96	86.7	99											
2-Oct	98	99	100	99	99	100	99	100	100	100	99	100	100	100	96	95	98	98	97	98	96	97	97	97	98.4	100											
3-Oct	97	96	96	97	98	98	99	98	96	98	97	83	72	67	63	61	62	70	80	84	91	94	94	96	87.0	99											
4-Oct	96	95	95	96	97	99	97	95	92	89	83	75	73	71	75	81	87	95	93	91	89	93	94	96	89.5	99											
5-Oct	100	100	100	100	98	98	95	96	98	95	85	82	77	72	68	64	66	70	77	81	86	90	93	95	87.0	100											
6-Oct	97	99	98	98	97	97	94	92	91	90	86	82	78	76	73	73	75	77	78	81	84	84	86	85	86.2	99											
7-Oct	85	85	85	85	86	85	85	85	84	81	78	72	63	59	58	59	62	67	72	77	80	81	82	84	76.6	86											
8-Oct	84	82	81	83	84	84	84	84	82	77	68	64	59	57	55	56	60	65	71	75	76	76	81	87	74.1	87											
9-Oct	84	90	96	96	96	96	96	96	96	95	93	91	92	91	92	93	96	98	98	98	97	98	98	99	94.8	99											
10-Oct	98	98	96	96	94	91	91	95	94	88	81	79	82	79	77	74	77	85	91	91	89	87	88	91	87.9	98											
11-Oct	92	92	91	92	94	92	93	93	92	91	89	86	84	82	82	83	85	86	87	88	90	91	95	87	89.1	95											
12-Oct	88	88	83	86	86	86	92	93	86	80	78	76	70	64	61	61	65	67	74	76	82	82	81	79	78.4	93											
13-Oct	75	77	73	68	67	62	64	61	59	57	57	57	57	56	56	57	59	63	65	67	67	68	80	88	65.0	88											
14-Oct	89	90	91	93	93	93	93	92	91	91	89	83	82	79	78	78	79	80	83	83	88	92	95	95	86.7	95											
15-Oct	96	96	96	94	93	92	92	92	91	90	89	86	88	88	87	86	85	87	89	93	96	95	94	93	91.2	96											
16-Oct	93	95	95	95	94	93	93	95	94	92	88	83	82	87	89	92	92	92	93	93	94	97	98	99	92.5	99											
17-Oct	99	99	99	99	98	98	98	98	97	97	97	96	96	95	96	97	97	99	99	99	99	99	99	99	97.9	99											
18-Oct	99	99	99	98	98	99	99	98	98	97	96	95	96	95	95	97	98	99	99	99	99	98	98	97	97.6	99											
19-Oct	97	97	97	99	99	99	98	99	99	95	90	87	83	80	81	86	90	93	93	93	93	94	96	99	93.2	99											
20-Oct	100	100	100	100	100	100	100	100	99	95	90	84	80	78	76	79	82	86	90	93	94	94	95	97	92.2	100											
21-Oct	98	99	100	100	100	100	100	100	100	100	92	82	77	70	67	65	69	80	88	88	87	88	91	92	88.9	100											
22-Oct	95	98	98	98	98	95	93	94	91	88	86	79	66	62	57	59	65	77	83	87	91	92	94	96	84.9	98											
23-Oct	97	98	99	99	100	100	100	100	100	100	97	85	84	93	95	99	99	100	100	100	100	99	99	99	97.6	100											
24-Oct	98	99	99	99	98	99	99	100	100	99	99	97	96	96	96	97	95	96	96	95	93	90	91	91	96.7	100											
25-Oct	92	96	98	98	99	99	99	99	99	99	99	99	98	99	99	98	99	99	100	100	100	100	100	100	98.6	100											
26-Oct	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100.0	100											
27-Oct	100	100	100	100	100	100	100	100	100	100	100	100	99	99	100	100	100	100	100	100	100	100	100	100	99.9	100											
28-Oct	100	100	100	100	100	100	100	99	99	99	99	99	99	99	100	100	100	100	100	100	100	100	100	100	99.7	100											
29-Oct	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	99	99	99	99	99	100	100	100	99	99.7	100											
30-Oct	100	100	100	100	100	100	100	99	97	95	95	97	97	97	97	97	97	97	96	93	93	96	94	94	97.0	100											
31-Oct	96	97	99	99	99	99	100	100	100	97	93	92	93	95	95	94	94	93	94	95	95	95	93	93	95.8	100											
																		94.3 95.2 95.4 95.6 95.6 95.2 95.2 95.2 95.2 94.0 92.1 89.4 86.1 83.7 82.3 81.6 82.2 84.0 87.2 89.5 90.7 91.7 92.3 93.5 94.3																		Diurnal Average	
																		100 100																		Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Firebag - October 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %
Firebag - October 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	18	2.42	2.42
60 - 80	100	13.44	15.86
80 - 100	532	71.51	87.37

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 - October 2016

Maximum Speed: 27 km/h on Oct 20 14:00	Maximum Daily Speed Average: 20.1 km/h on Oct 20	Hours in Service: 744
Minimum Speed Value: 1 km/h on Oct 7 01:00	Minimum Daily Speed Average: 2.8 km/h on Oct 26	Hours of Data: 604
Maximum Diurnal Speed Average: 3.9 km/h at hour 23	Minimum Diurnal Speed Average: 2.3 km/h at hour 16	Hours of Missing Data: 140
Monthly Average Velocity: 3.0 km/h 101.4 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 12 Q ₃ = 16 P ₉₀ = 20 P ₉₉ = 25	Percent Operational Time: 81.2

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-Oct	NNE16	NNE19	NNE19	NNE18	NNE19	NNE19	NE20	NE18	NE18	NE17	NNE17	NE17	NE18	ENE19	ENE23	ENE21	ENE22	ENE19	ENE23	ENE26	E26	ESE24	E23	E23	NE18.3	E26		
2-Oct	E21	E18	ESE17	ESE17	ESE13	ESE14	E9	NW4	WNW7	W11	W18	WSW24	W25	W25	W24	W22	WSW21	WSW18	WSW17	WSW20	WSW20	WSW16	WSW17	WSW17	WSW8.6	W25		
3-Oct	WSW17	WSW18	WSW17	WSW13	WSW11	WSW9	SW8	WSW9	WSW10	SW12	SW12	SW13	W12	WSW10	W11	W9	WNW6	NNE6	NE7	NE8	NNE9	NNE11	NE13	NNE12	W6.1	WSW18		
4-Oct	NE14	NE14	NE13	NE12	NNE11	NE12	NE16	NE14	NE18	NE16	NE18	NE15	NNE15	NE14	N15	N15	N19	NNE17	NNE17	NNE16	NNE14	NNE9	NNE10	NNE11	NNE14.1	N19		
5-Oct	NNE13	NNE12	NNE10	NE10	NNE9	NNE13	NNE15	NNE17	NNE16	NNE18	NNE21	NNE20	NNE20	NNE20	NNE20	NNE20	NNE18	NNE13	N14	NNE16	NNE15	NNE15	NNE14	NNE14	NNE15.4	NNE21		
6-Oct	NNE15	NNE15	NNE15	NNE14	NNE14	NNE15	NNE14	NE15	NE14	NE14	NNE14	NNE12	NNE11	NE10	NE9	NE8	NNE8	NNE9	NE9	NE7	NNE6	NE5	NE4	ENE4	NNE10.7	NNE15		
7-Oct	ESE1	SSW7	SSW5	SSW7	SSW8	S8	SSW6	SSW8	SSW8	SW6	SSW7	SSE3	S4	SSE4	ESE7	SE8	ESE10	ESE10	ESE10	SE10	SE12	SSE13	S11	S10	SSE6.3	SSE13		
8-Oct	SSE11	SSE11	S12	SSE9	S11	S14	S12	S12	S12	S15	S12	SSW12	S11	S12	SSE11	S15	SSE12	S13	SSE11	SE10	SE12	SE11	ESE10	ESE11	SSE11.0	S15		
9-Oct	SE12	SE14	ESE14	ESE15	ESE12	E11	E11	ENE11	ENE9	E10	ENE12	ENE14	ENE12	NE15	ENE14	NE13	NNE15	NNE13	NNE15	NNE14	NNE13	NNE12	NNE13	NNE13	ENE10.3	NE15		
10-Oct	NNE14	NNE10	NNE8	N11	N9	N10	N8	NNW5	NNW5	N9	NNE9	NNE11	N10	NNW10	NW6	WNW5	WSW7	WSW8	SW9	SW10	SW11	SW12	SW12	WSW12	NW4.0	NNE14		
11-Oct	WSW13	WSW13	WSW15	SW12	SW11	SW14	SW14	SW15	SW17	SW17	WSW16	WSW17	WSW15	WSW18	WSW15	WSW12	WSW11	WSW11	WSW11	WSW9	W7	NW3	NE12	ENE10	WSW10.7	WSW18		
12-Oct	ENE8	ENE8	ENE11	ENE10	NE8	NNE9	N10	NNE18	NNE18	NNE17	NNE15	NNE12	NNE14	N14	N16	N14	N10	N7	NNW4	WNW2	NW4	W6	WSW5	WSW6	NNE8.2	NNE18		
13-Oct	WSW6	W4	WSW4	W5	WNW3	WNW3	SW4	SSW8	S11	SE10	SSE10	SSE13	SE12	SE12	SE10	ESE10	ESE13	ESE11	ESE10	ESE12	ESE15	ESE16	ESE17	ESE15	SE7.1	ESE17		
14-Oct	E15	E15	E16	E19	E18	E16	E20	E18	E19	E20	E20	E19	ENE17	ENE17	ENE19	ENE21	ENE19	ENE17	ENE16	ENE18	ENE17	ENE16	NE12	NE11	E16.9	ENE21		
15-Oct	ENE9	ENE10	ENE11	E12	E10	ESE14	ESE14	ESE12	ESE12	SE13	ESE13	SE14	ESE12	ESE12	SE12	SE14	ESE17	ESE18	SE17	SSE18	SSE17	SSE18	S18	SSE18	SE17	SSE16	SE12.1	S18
16-Oct	SSE17	SSE15	SE15	SE16	SE14	SE16	SE18	SE18	SE20	ESE22	ESE22	ESE23	ESE21	ESE18	ESE18	ESE17	ESE19	ESE17	ESE16	ESE16	ENE8	NE7	NE10	NE12	ESE14.9	ESE23		
17-Oct	NE11	NNE11	N11	N11	NNE11	NNE10	N12	N13	N13	N13	N13	N14	NNW15	NNW17	NNW16	N17	N16	NNW13	NNW16	NNW14	NNW13	NNW14	NNW13	NNW13	N12.9	N17		
18-Oct	NNW12	NNW12	NNW12	NNW13	NNW11	NNW12	NNW13	NNW12	NNW9	N10	NNW10	NNW9	NW9	NW8	NW8	NW7	NW6	WNW5	WNW4	W3	WSW3	SW4	SSW4	S3	NNW7.0	NNW13		
19-Oct	S4	S5	S7	SSW8	SSW7	S8	S8	SSW11	SSW13	SSW12	SSW12	S14	S14	S16	S16	S15	S17	S18	S22	S22	SSW23	SSW21	S21	S23	S14.0	S23		
20-Oct	S23	S23	S23	S23	S20	S17	SSE20	SSE23	SSE24	SSE25	SSE24	SSE24	SSE26	SSE27	SSE25	S21	S22	S21	S21	S19	SSW17	SW16	SW11	SW11	S20.1	SSE27		
21-Oct	WSW11	WSW12	WSW11	WSW8	WSW10	W8	W7	W5	W5	W7	WNW9	NNW10	NNW8	WNW7	WNW7	W8	W6	SSW6	SSW9	SSW10	SSW11	SW11	SSW11	SSW11	WSW7.2	WSW12		
22-Oct	SSW6	S7	S9	SSE8	S9	S11	S11	S11	S12	S11	S9	S9	SW7	SSW4	SE2	ESE3	W1	WNW4	S2	SSE5	E8	ENE8	ENE8	NE8	SSE5.0	S12		
23-Oct	NE9	NNE7	N9	N6	N6	N7	NNE6	N3	NE4	NE6	ENE7	SE9	SE10	N7	NNE9	NNE5	NE8	NE9	E6	AF	AF	AF	AF	AF	NE5.3	SE10		
24-Oct	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	---	SE23		
25-Oct	SE19	SE13	ESE15	ESE15	ESE15	ESE16	ESE17	ESE14	ESE15	ESE16	ESE15	ESE17	ESE17	E16	ESE17	ESE14	SE11	SE9	ESE9	ESE10	ESE11	ESE12	E10	ESE13.9	SE19			
26-Oct	E11	E9	ESE7	E6	ESE5	SE2	NW5	NW6	NNW6	NNW7	NNW8	NW7	WNW6	W8	WSW12	WSW12	WSW8	WSW10	WSW11	WSW12	AF	AF	AF	AF	W2.8	WSW12		
27-Oct	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-Oct	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-Oct	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-Oct	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-Oct	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	---	---		

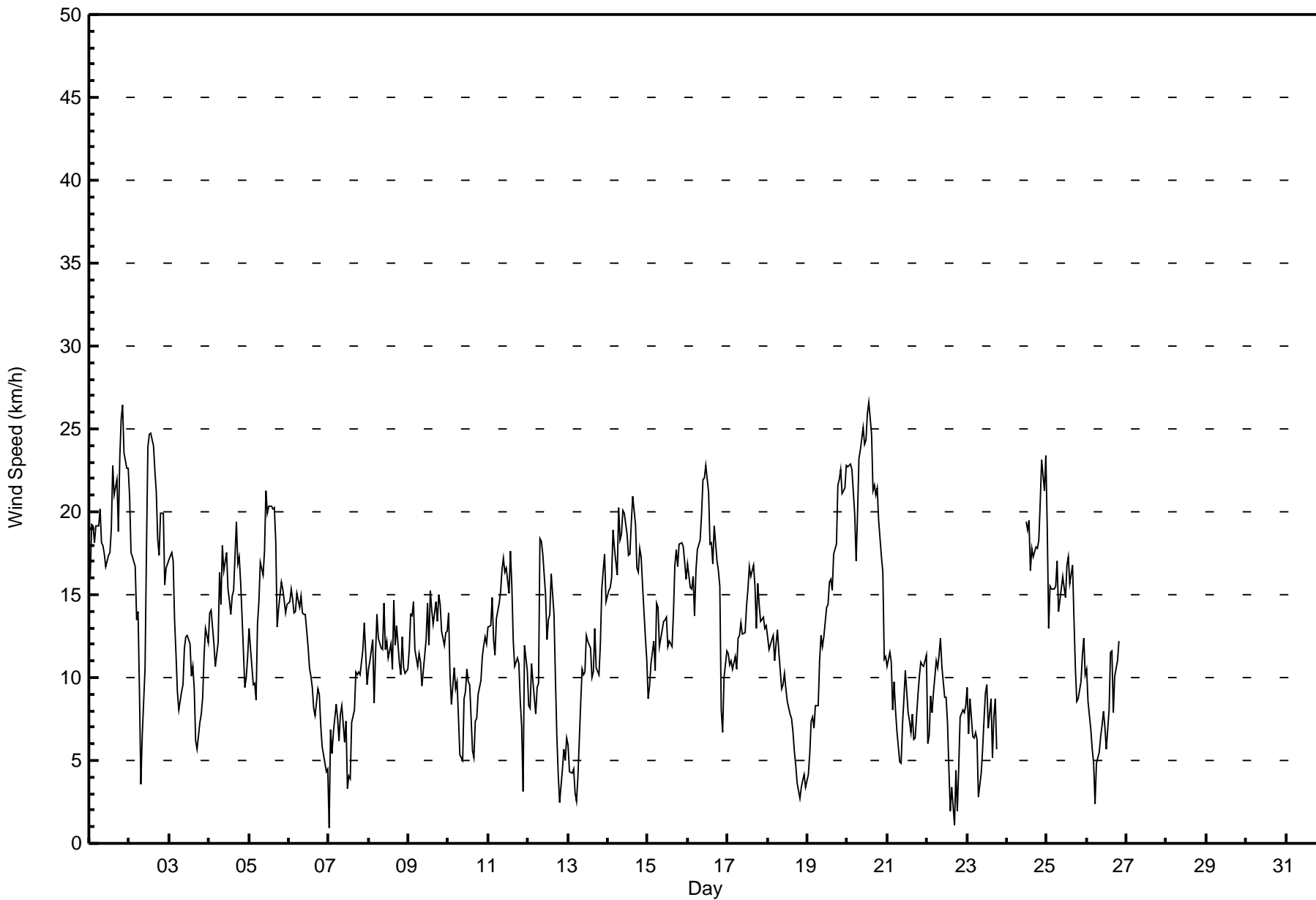
E3.4	E3.0	E2.9	E3.4	E3.0	E3.4	E3.8	E2.9	E3.0	E3.3	E3.2	ESE3.2	ESE2.5	E2.3	ENE2.6	E2.3	E2.9	ESE2.7	ESE3.2	SE3.5	ESE3.9	SE3.8	ESE3.9	ESE3.5	Diurnal Average	
S23	S23	S23	S23	S20	NNE19	E20	SSE23	SSE24	SSE25	SSE24	SSE24	SSE26	SSE27	SSE25	W22	ENE22	S21	ENE23	ENE26	E26	ESE24	E23	SE23	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Firebag - October 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - October 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	47	7.78	7.78
6 - 11	215	35.60	43.38
12 - 19	279	46.19	89.57
20 - 28	63	10.43	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 604

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - October 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	1	1	3	1	0	3	2	4	4	3	2	3	6	7	4	3	47
6 - 11	16	25	18	14	11	13	10	7	18	18	10	20	11	8	8	8	215
12 - 19	15	51	26	15	11	43	25	13	21	5	12	23	2	0	1	16	279
20 - 28	0	6	1	6	7	5	5	10	13	2	0	4	4	0	0	0	63
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	83	48	36	29	64	42	34	56	28	24	50	23	15	13	27	604

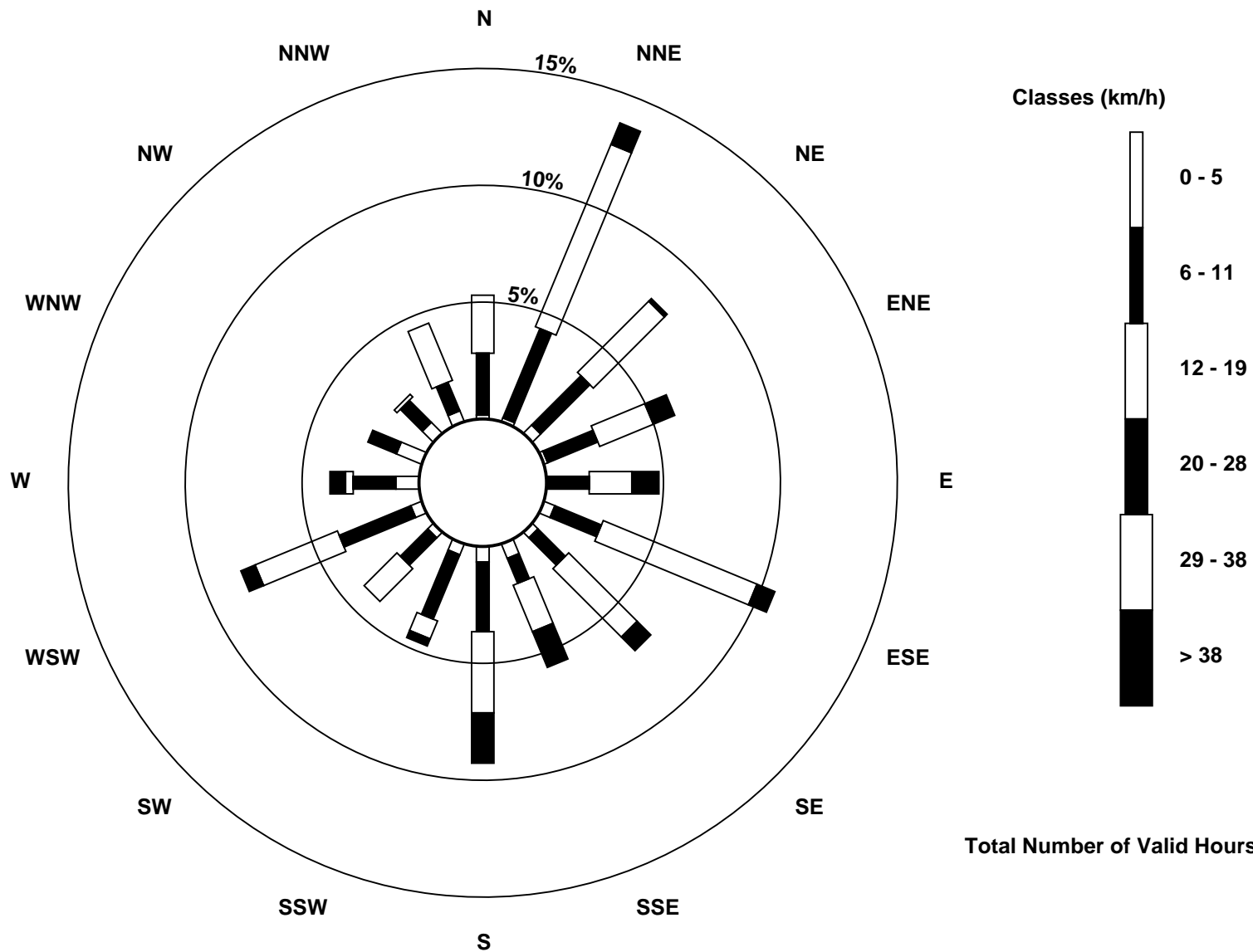
Total Number of Valid Hours: 604

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Oct 2016

Wind Speed (WS) - km/h
Firebag (AMS 19)





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Firebag - October 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 6 km/h on Oct 1 21:00	Hours of Data: 604
Minimum Value: 0 km/h on Oct 12 19:00	Hours of Missing Data: 140
Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 5	Hours of Calibration: 0
	Percent Operational Time: 81.2

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-Oct	3	3	4	3	4	4	4	4	4	3	3	3	3	4	5	4	5	4	5	5	6	5	5	4	6
2-Oct	4	3	3	3	3	3	3	2	1	5	5	5	5	5	5	5	4	4	3	4	3	4	3	3	5
3-Oct	3	3	3	2	2	2	1	2	2	2	2	3	3	3	3	3	3	1	1	1	1	2	2	2	3
4-Oct	2	2	3	2	2	3	4	3	4	4	4	3	4	4	4	3	4	3	3	3	3	1	2	2	4
5-Oct	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4	2	2	3	3	2	3	2	4
6-Oct	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	1	1	1	1	1	3
7-Oct	1	2	2	2	2	2	3	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	3
8-Oct	1	1	2	2	2	2	2	2	2	3	2	3	4	4	3	3	2	3	2	2	2	2	2	2	4
9-Oct	2	3	2	2	2	2	2	3	2	2	3	3	2	3	3	2	3	3	3	3	3	3	3	3	3
10-Oct	3	2	2	2	2	2	2	1	1	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	3
11-Oct	2	2	2	2	1	2	2	2	2	2	3	3	3	3	3	2	2	1	2	1	1	3	2	2	3
12-Oct	2	2	2	1	1	2	2	4	4	3	3	3	3	3	4	4	2	2	0	1	1	1	1	3	4
13-Oct	2	1	1	2	1	1	2	2	2	3	4	3	3	3	2	2	2	3	2	2	3	4	3	3	4
14-Oct	4	3	3	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	3	3	3	2	1	4
15-Oct	2	2	2	2	2	2	2	2	2	3	3	3	2	2	3	3	4	3	3	3	3	3	3	2	4
16-Oct	3	3	3	3	3	4	4	4	4	5	5	5	4	3	3	3	3	4	3	4	3	1	2	2	5
17-Oct	2	2	2	2	2	2	2	2	3	2	2	3	3	3	3	3	3	2	3	3	3	2	3	2	3
18-Oct	2	2	2	2	2	2	2	2	2	2	1	2	2	1	1	1	1	1	1	0	1	1	1	1	2
19-Oct	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
20-Oct	3	3	3	3	3	2	4	3	3	4	4	4	4	4	4	4	3	3	3	3	2	3	3	2	4
21-Oct	2	2	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	2	1	1	1	1	1	1	3
22-Oct	3	1	0	1	1	1	1	2	1	2	1	1	1	2	1	1	1	2	3	1	1	2	3	3	3
23-Oct	1	1	1	1	2	2	1	2	1	2	2	2	2	3	2	1	2	2	2	AF	AF	AF	AF	AF	3
24-Oct	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	4	4	4	3	4	4	4	4	4	5	5	5	5	5
25-Oct	5	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	5
26-Oct	2	1	2	1	1	1	1	1	1	1	1	2	1	1	3	2	2	2	2	4	AF	AF	AF	AF	4
27-Oct	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-Oct	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-Oct	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-Oct	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-Oct	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	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	4	5	5	6	5	5	5	

Diurnal Maximum

M - Maintenance AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Firebag - October 2016

Direction of Maximum Speed: 160 deg on Oct 20 14:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 175.5 deg on Oct 20	Hours of Data: 604
Direction of Minimum Speed: 110 deg on Oct 7 01:00	Hours of Missing Data: 140
Direction of Minimum Daily Speed Average: 2.8 deg on Oct 26	Percent Operational Time: 81.2
Monthly Average Direction: 226.8 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-Oct	26	25	21	24	33	31	37	39	35	40	30	38	44	61	66	69	71	63	66	70	82	106	98	95	55.1
2-Oct	93	98	107	111	110	111	98	322	296	273	271	258	260	259	260	261	254	252	247	243	241	247	241	247	241.7
3-Oct	251	248	244	246	248	250	232	242	248	229	230	236	267	258	276	275	283	24	45	37	21	29	34	31	265.5
4-Oct	36	34	39	38	30	34	40	37	39	34	37	47	22	34	7	360	10	17	17	24	30	26	14	13	27.4
5-Oct	22	24	26	42	26	23	25	26	28	27	33	33	24	26	21	17	14	12	7	12	20	22	16	16	22.6
6-Oct	15	15	18	23	20	22	33	42	34	34	29	26	33	42	42	35	17	21	44	45	30	36	44	70	29.5
7-Oct	110	193	213	194	196	184	199	206	197	225	203	161	175	153	110	128	106	114	121	133	140	163	169	170	163.1
8-Oct	162	167	169	167	174	175	177	186	186	189	188	193	179	169	164	171	157	173	167	146	144	131	117	122	167.0
9-Oct	125	127	118	115	118	101	92	70	72	79	66	64	61	50	59	41	26	21	23	26	31	26	22	20	62.4
10-Oct	21	21	13	6	9	10	358	348	345	0	15	23	355	342	312	298	243	246	227	221	223	223	232	237	324.4
11-Oct	249	241	237	236	228	227	226	223	229	232	241	242	247	250	251	254	239	238	240	248	261	326	47	65	240.4
12-Oct	72	72	76	66	49	25	6	12	17	24	26	13	12	358	7	356	11	354	333	302	313	279	254	239	15.6
13-Oct	246	277	250	276	294	301	229	201	178	144	154	149	140	137	125	118	117	117	119	111	113	108	116	106	134.8
14-Oct	82	84	85	96	92	90	93	98	92	93	94	87	78	68	67	68	71	68	66	67	67	66	56	55	79.5
15-Oct	57	65	60	90	98	113	115	122	118	126	123	136	122	122	137	148	148	150	159	162	169	162	158	156	132.6
16-Oct	160	157	146	145	136	136	131	131	130	122	122	122	122	115	113	117	114	113	114	111	76	40	53	36	121.5
17-Oct	40	30	11	8	13	13	7	8	3	1	354	350	343	343	346	350	355	345	347	344	344	341	340	337	355.4
18-Oct	326	335	334	341	339	344	348	347	346	349	344	339	313	322	313	312	305	302	285	267	257	220	200	169	328.6
19-Oct	178	179	184	210	198	190	177	193	203	202	195	189	185	183	188	185	183	180	187	191	197	192	188	184	189.2
20-Oct	179	182	184	185	181	176	166	162	166	161	156	158	159	160	166	171	177	181	173	189	200	215	229	230	175.5
21-Oct	240	248	250	248	250	262	279	264	269	279	297	304	296	288	289	273	262	206	203	207	211	214	207	208	248.7
22-Oct	199	185	184	166	175	182	179	178	169	171	177	189	216	196	135	109	279	293	169	150	95	67	72	43	166.8
23-Oct	49	29	10	1	355	9	30	356	47	44	68	139	130	350	27	30	35	50	86	AF	AF	AF	AF	AF	40.4
24-Oct	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	141	138	147	134	131	132	131	131	135	138	140	138	145	--
25-Oct	142	128	110	114	116	113	115	119	119	115	114	119	115	114	101	115	120	130	131	117	115	113	112	96	116.8
26-Oct	96	93	104	95	116	125	309	326	339	346	340	316	288	267	255	254	256	257	253	249	AF	AF	AF	AF	279.4
27-Oct	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-Oct	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-Oct	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-Oct	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-Oct	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--

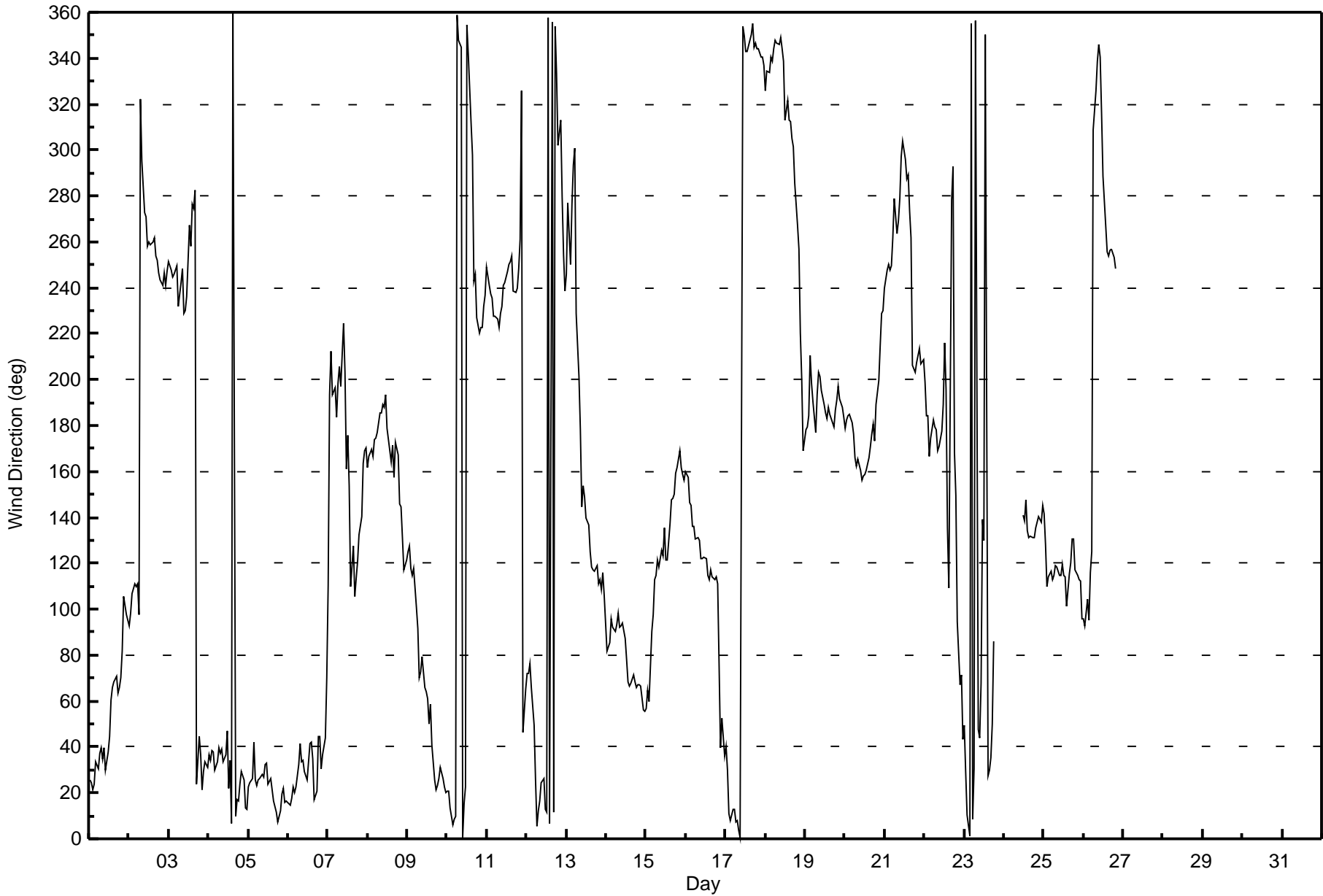
90.5	93.4	96.8	97.7	99.0	91.6	87.6	91.5	93.0	91.7	83.1	109.5	101.7	92.7	77.7	89.9	97.4	111.4	120.5	127.0	123.4	125.7	113.3	110.1
Diurnal Average																							

M - Maintenance 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
Firebag - October 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Firebag - October 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 92 deg on Oct 22 19:00	Hours of Data: 604
Minimum Value: 4 deg on Oct 22 03:00	Hours of Missing Data: 140
Percentiles: P ₁ = 6 P ₁₀ = 9 Q ₁ = 10 Median = 11 Q ₃ = 14 P ₉₀ = 21 P ₉₉ = 64	Hours of Calibration: 0
	Percent Operational Time: 81.2

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-Oct	10	9	11	10	11	11	10	11	12	12	12	11	12	13	12	12	12	10	11	11	13	14	13	11	14																						
2-Oct	11	10	10	10	11	11	21	34	15	15	12	12	11	11	12	12	11	10	10	9	10	11	9	10	34																						
3-Oct	9	9	9	9	9	11	12	16	13	13	13	19	21	27	27	24	23	34	8	12	11	10	10	9	34																						
4-Oct	10	10	10	11	10	14	13	12	12	14	14	17	24	23	16	14	12	11	11	11	9	8	11	11	24																						
5-Oct	10	10	12	12	13	14	11	11	16	14	15	17	15	15	17	14	11	13	12	10	11	11	11	10	17																						
6-Oct	10	11	12	12	11	11	15	15	12	15	17	22	27	27	31	30	21	14	19	19	14	17	16	19	31																						
7-Oct	85	18	35	25	19	21	23	23	31	30	17	65	62	68	23	19	13	12	12	11	11	10	8	9	85																						
8-Oct	11	11	8	13	9	8	11	8	8	9	14	17	28	21	25	15	11	9	10	11	10	14	11	13	28																						
9-Oct	12	11	11	10	11	13	12	13	15	14	14	12	12	12	12	10	11	11	11	11	10	12	11	12	15																						
10-Oct	11	12	15	13	12	13	11	11	13	13	15	17	14	17	33	33	8	8	13	8	7	7	8	9	33																						
11-Oct	9	8	8	8	8	8	8	9	10	8	12	11	10	11	11	10	9	9	9	10	12	51	20	14	51																						
12-Oct	20	14	11	11	12	10	13	14	12	13	18	20	15	16	17	14	12	14	9	33	16	14	18	17	33																						
13-Oct	21	23	28	35	45	60	84	19	10	27	29	24	20	25	21	16	11	12	12	11	10	11	10	16	84																						
14-Oct	13	11	11	10	14	12	10	12	11	11	11	14	15	12	12	12	11	11	11	11	10	10	9	9	15																						
15-Oct	10	11	11	14	12	10	10	12	11	12	12	14	12	12	14	15	10	10	10	11	10	9	10	10	15																						
16-Oct	10	11	11	11	12	12	12	11	12	12	12	12	12	12	10	11	10	11	10	12	30	13	9	10	30																						
17-Oct	9	9	11	11	11	11	12	11	12	13	11	10	10	10	11	11	13	11	10	10	10	10	10	10	13																						
18-Oct	11	11	11	9	10	10	10	9	11	11	12	12	14	13	12	12	15	15	13	13	21	16	19	20	21																						
19-Oct	21	13	13	10	13	14	11	7	8	8	7	6	9	9	10	8	9	8	6	8	6	7	8	7	21																						
20-Oct	7	8	7	7	9	8	8	8	7	9	9	10	9	9	9	8	8	8	9	11	8	12	10	9	12																						
21-Oct	9	8	8	9	8	12	11	11	15	11	18	21	33	33	31	21	11	10	7	4	7	7	5	5	33																						
22-Oct	14	9	4	12	8	9	9	9	6	10	6	13	12	29	41	26	85	38	92	37	11	17	18	13	92																						
23-Oct	10	14	11	14	11	10	28	49	37	15	27	19	48	17	15	12	16	14	AF	AF	AF	AF	AF	AF	49																						
24-Oct	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	12	13	12	14	13	12	13	13	13	12	12	12	12	14																						
25-Oct	13	15	10	11	11	11	11	12	11	11	11	13	10	11	13	11	12	13	16	11	10	9	9	10	16																						
26-Oct	9	10	13	12	19	25	12	11	12	11	11	18	20	11	9	10	11	10	11	9	AF	AF	AF	AF	25																						
27-Oct	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-Oct	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-Oct	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-Oct	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-Oct	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 Maximum																								85	23	35	35	45	60	84	49	37	30	29	65	62	68	41	33	85	38	92	37	30	51	20	20

M - Maintenance AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	October 6, 2016	Last Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Other: <input type="checkbox"/> Pump replacement		
Start Time (MST)	9:33	End Time (MST)	11:07
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	796	796
Calculated slope	0.999679	0.996134	Chamber temp	45.0	45.0
Calculated intercept	0.040504	-0.021647	Pressure	714.1	714.1
Analyzer Background	8.7	8.7	Flow	0.156	0.156
Analyzer Coefficient	0.979	0.979	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	-0.7	----
as found span	5000	58.3	574.8	576.9	0.996
calibrator zero	5000	0.0	0.0	-0.7	----
high point	5000	58.3	574.8	576.9	0.996
second point	5000	29.3	288.9	289.8	0.997
third point	5000	14.7	144.9	146.7	0.988
as left zero					
as left span					
Average Correction Factor					0.994

Corrected As found 577.7 Previous response 575.0 % change -0.5%

Notes:

Changed out SO2 pump.

Calibration Performed By: Jayne Marcoux



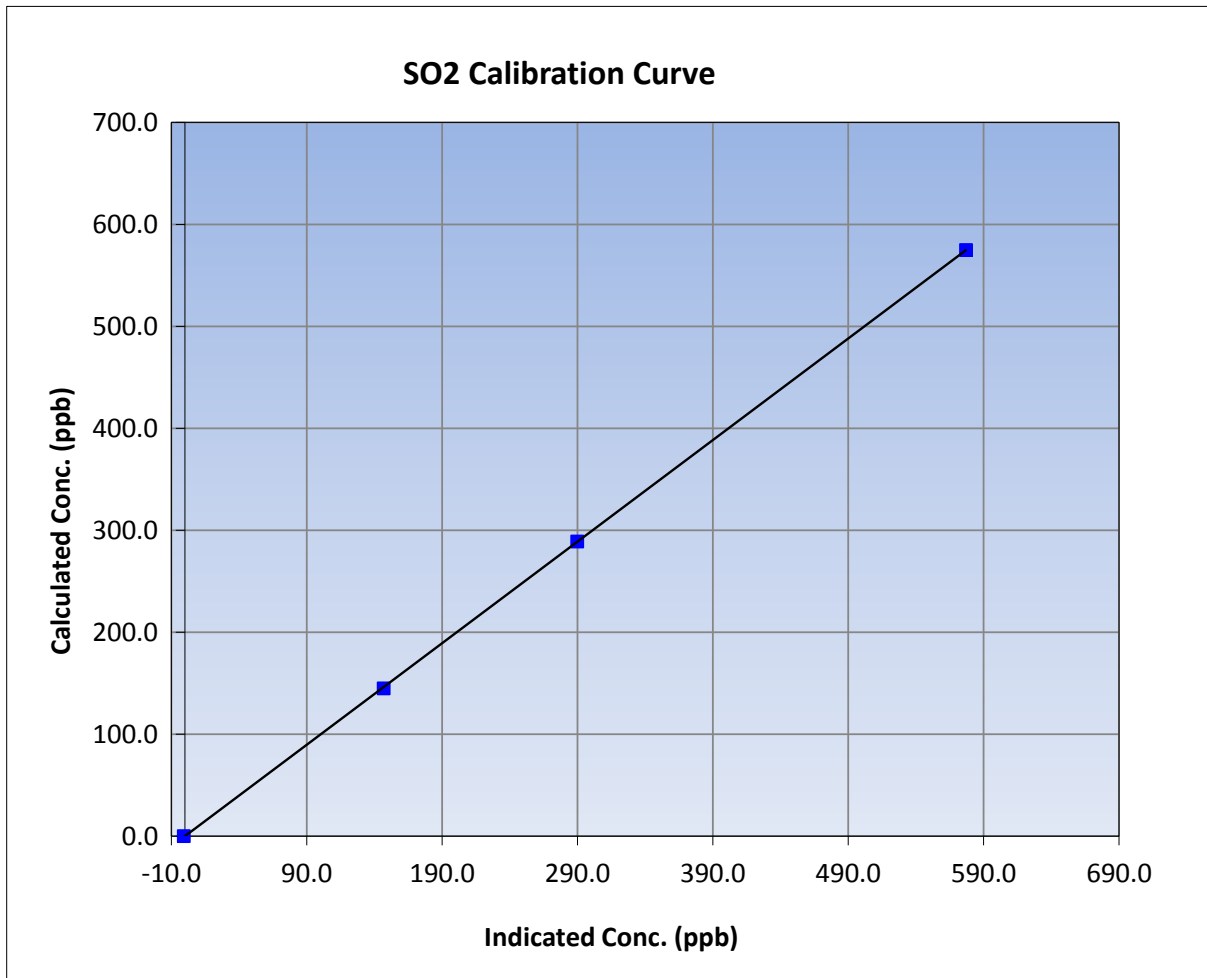
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:33	End Time (MST)	11:07
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

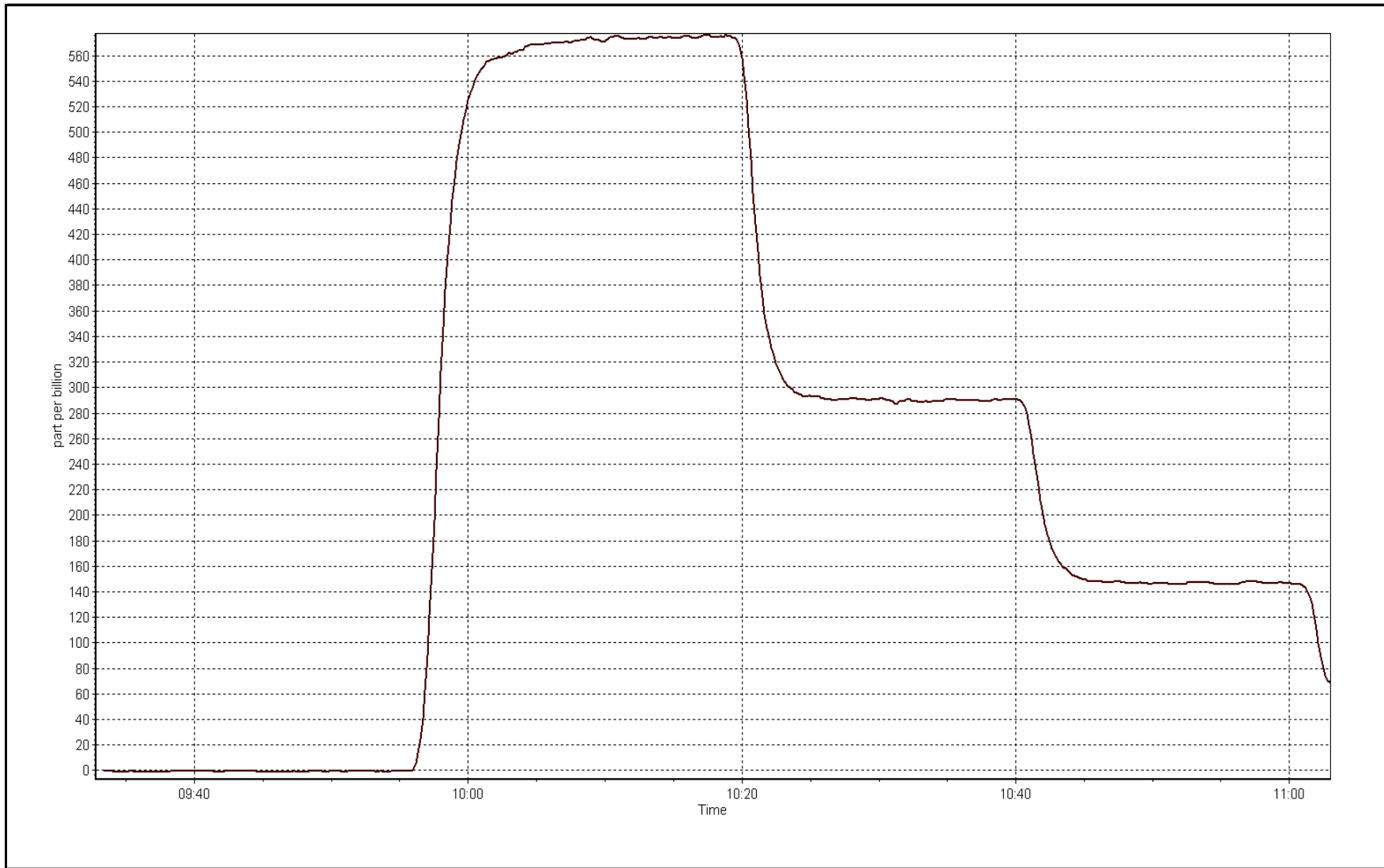
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.7	----	Correlation Coefficient	0.999989
574.8	576.9	0.9964		
288.9	289.8	0.9969	Slope	0.996134
144.9	146.7	0.9879		
			Intercept	-0.021647



SO2 Calibration Plot

Date: October 6, 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	October 6, 2016	Last Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	11:00	End Time (MST)	14:59
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-606	-606
Analyzer IP address	192.168.1.43		Lamp voltage	796	797
Calculated slope	0.999679	1.003217	Chamber temp	45.0	45.2
Calculated intercept	0.040504	-0.974629	Pressure	714.1	696.8
Analyzer Background	8.7	8.1	Flow	0.156	0.454
Analyzer Coefficient	0.979	0.891	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					
as found span					
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	58.3	574.8	573.4	1.003
second point	5000	29.3	288.9	289.8	0.997
third point	5000	14.7	144.9	146.1	0.992
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	58.3	574.8	572.9	1.003
Average Correction Factor					0.997

Corrected As found NA Previous response NA % change NA

Notes:

SO2 pump changed out. Adjusted zero and span.

Calibration Performed By: Jayne Marcoux



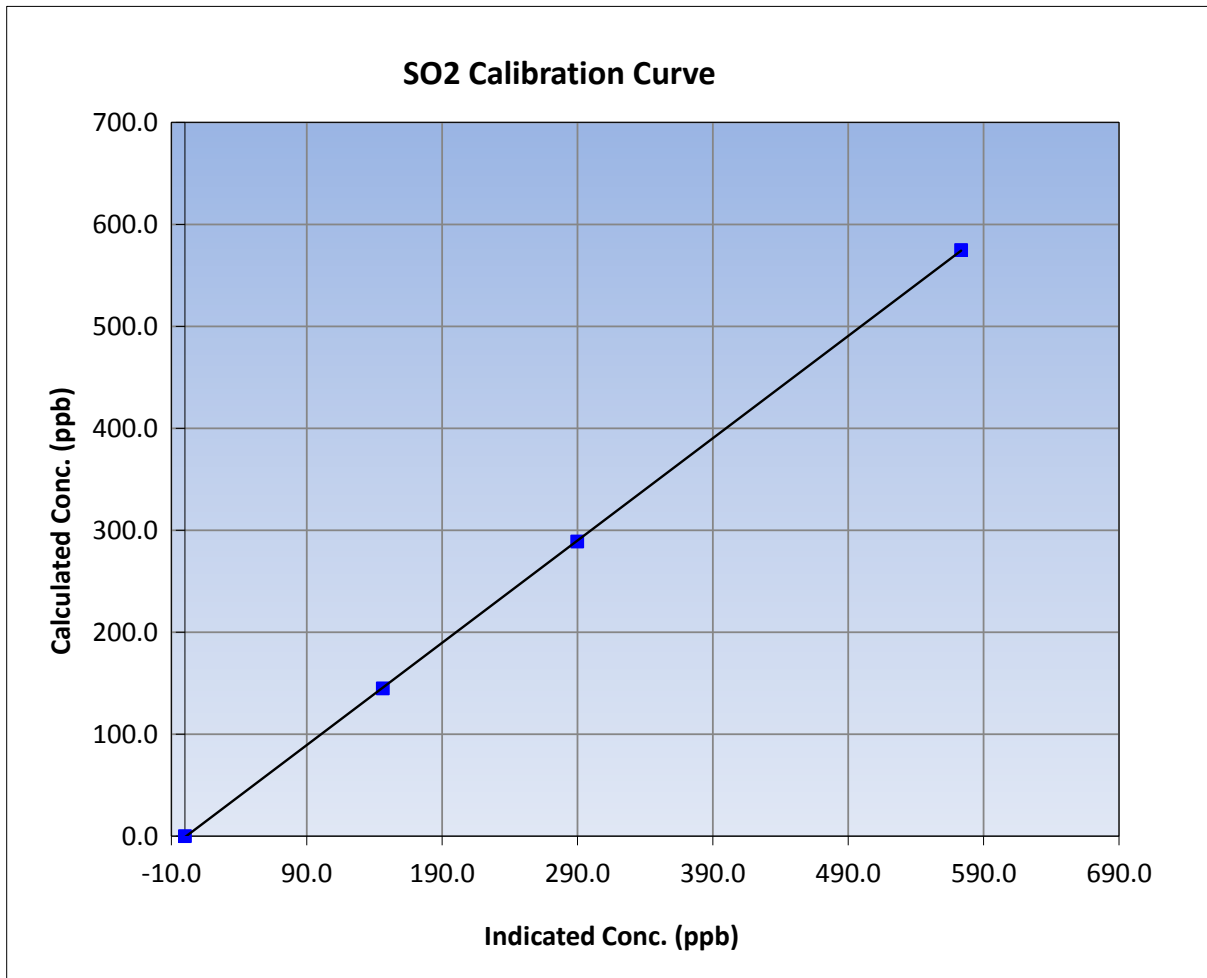
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	11:00	End Time (MST)	14:59
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

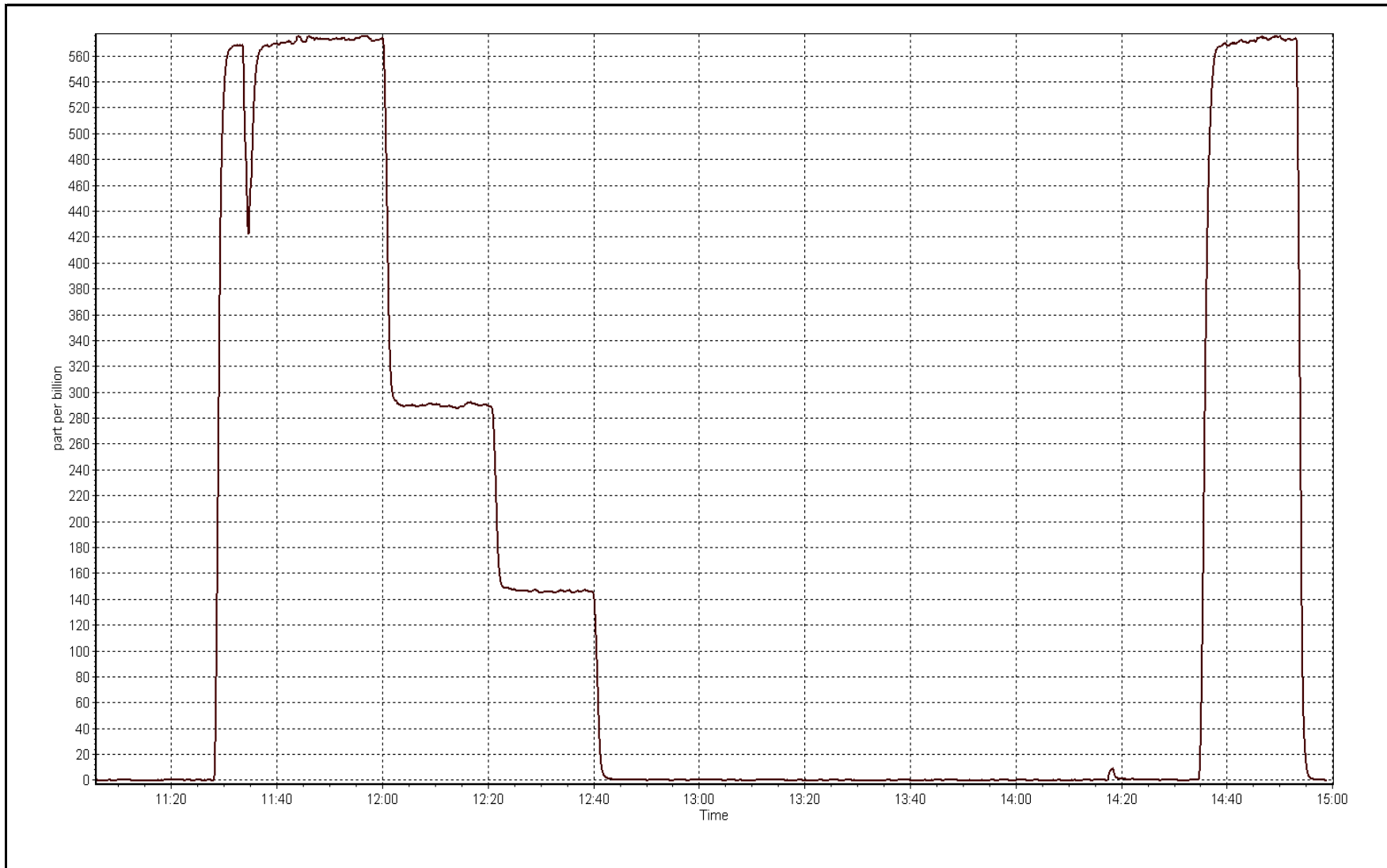
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999987
574.8	573.4	1.0026		
288.9	289.8	0.9968	Slope	1.003217
144.9	146.1	0.9921		
			Intercept	-0.974629



SO2 Calibration Plot

Date: October 6, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	October 20, 2016	Last Calibration	September 19, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:10	End Time (MST)	11:05
Gas Cert Reference	ALM066720	Station temp.	22 Deg C
Cal Gas Concentration	4.85 ppm	Cal Gas Exp Date	June 10, 2014
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 12-Dec-16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-573	
Analyzer IP address	192.168.1.45		Lamp voltage	933	
Calculated slope	1.002364		Chamber temp	45	
Calculated intercept	-0.623268		Pressure	532.5	
Analyzer Background	13.1		Flow	0.945	
Analyzer Coefficient	1.149		Intensity	85	
			Converter temp.	337	

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	0.5	----
as found span	5000	83.3	80.8	80.2	1.007
SO2 scrubber check					
calibrator zero					
high point					
second point					
third point					
as left zero					
as left span					
Average Correction Factor					

Corrected As found	79.7	Previous response	81.2	% change	1.9%
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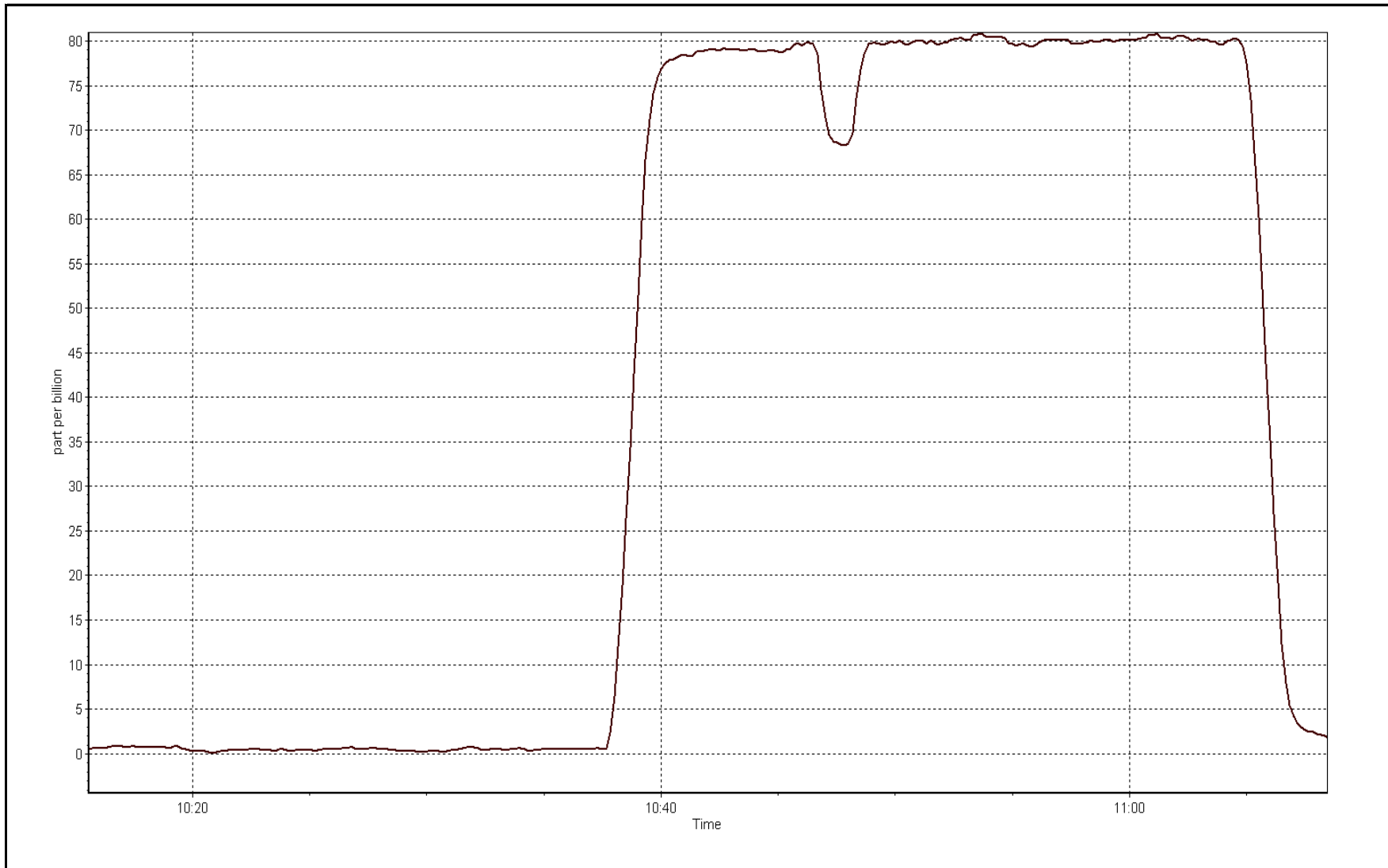
Notes:

Changing out H2S cylinder. Set calibrator to standby during as found span. Corrected and continued.

Calibration Performed By: Jayme Marcoux

H2S Calibration Plot

Date: October 20, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	October 20, 2016	Last Calibration	September 19, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	<input type="checkbox"/> Routine <input checked="" type="checkbox"/> H2S Cylinder Install		
Start Time (MST)	11:25	End Time (MST)	15:00
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 12-Dec-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	933	930
Calculated slope	1.002364	1.003972	Chamber temp	45	45
Calculated intercept	-0.623268	0.014752	Pressure	532.5	539.5
Analyzer Background	13.1	13.7	Flow	0.945	0.953
Analyzer Coefficient	1.149	1.188	Intensity	85	85
			Converter temp.	337	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					
as found span					
SO2 scrubber check	5000	15.2	149.9	1.4	----
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	75.6	80.1	80.0	1.002
second point	5000	37.8	40.1	39.6	1.012
third point	5000	19.0	20.1	19.8	1.016
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	75.6	80.1	80.1	1.001
Average Correction Factor					1.010

Corrected As found	NA	Previous response	NA	% change	NA
--------------------	----	-------------------	----	----------	----

Notes:

Installed new H2S cylinder. Adjusted zero and span. Scrubber check done before as lefts.

Calibration Performed By: Jayme Marcoux



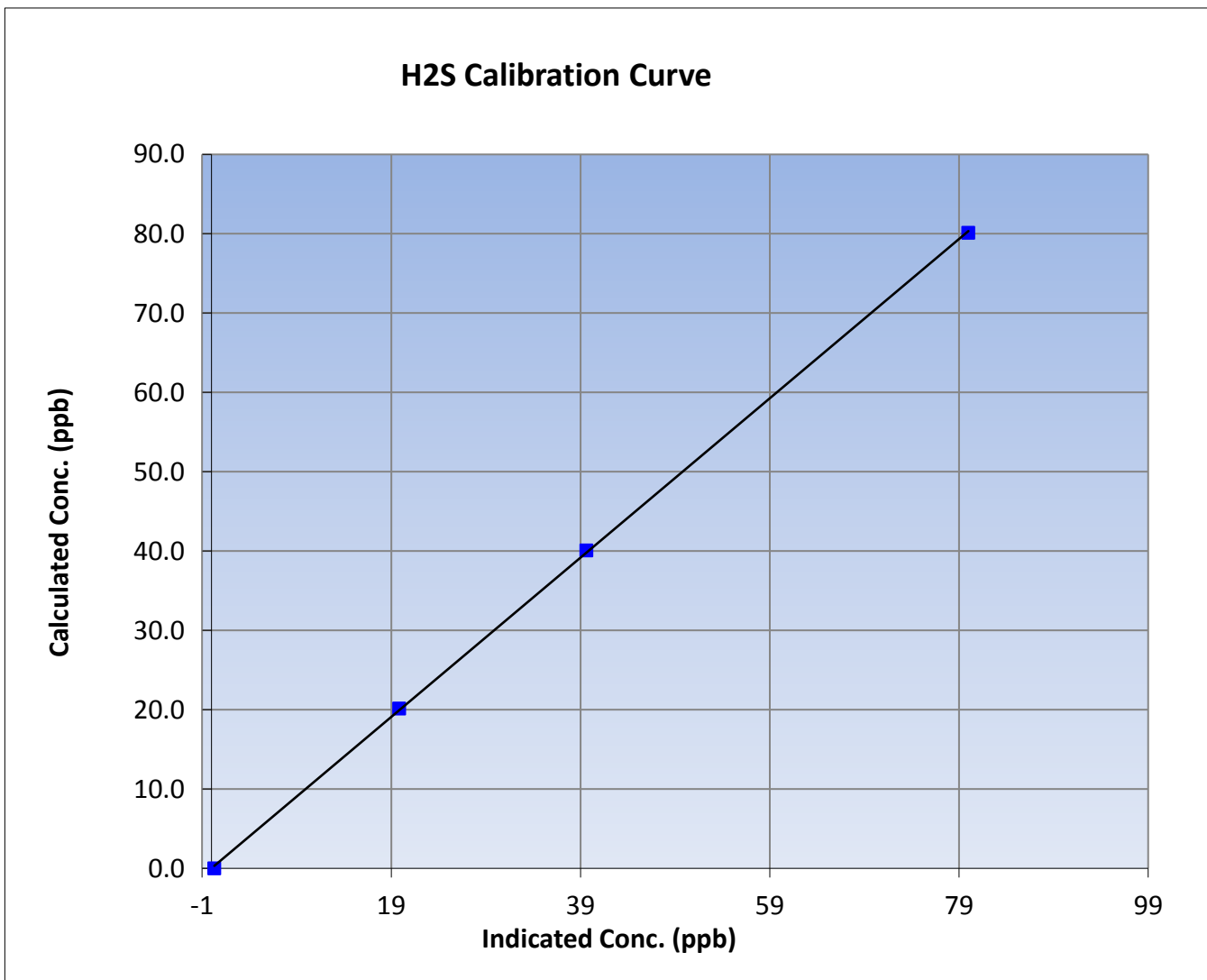
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	October 20, 2016	Previous Calibration	September 19, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	11:25	End Time (MST)	15:00
Analyzer make	Thermo 450i	Analyzer serial #	815129098

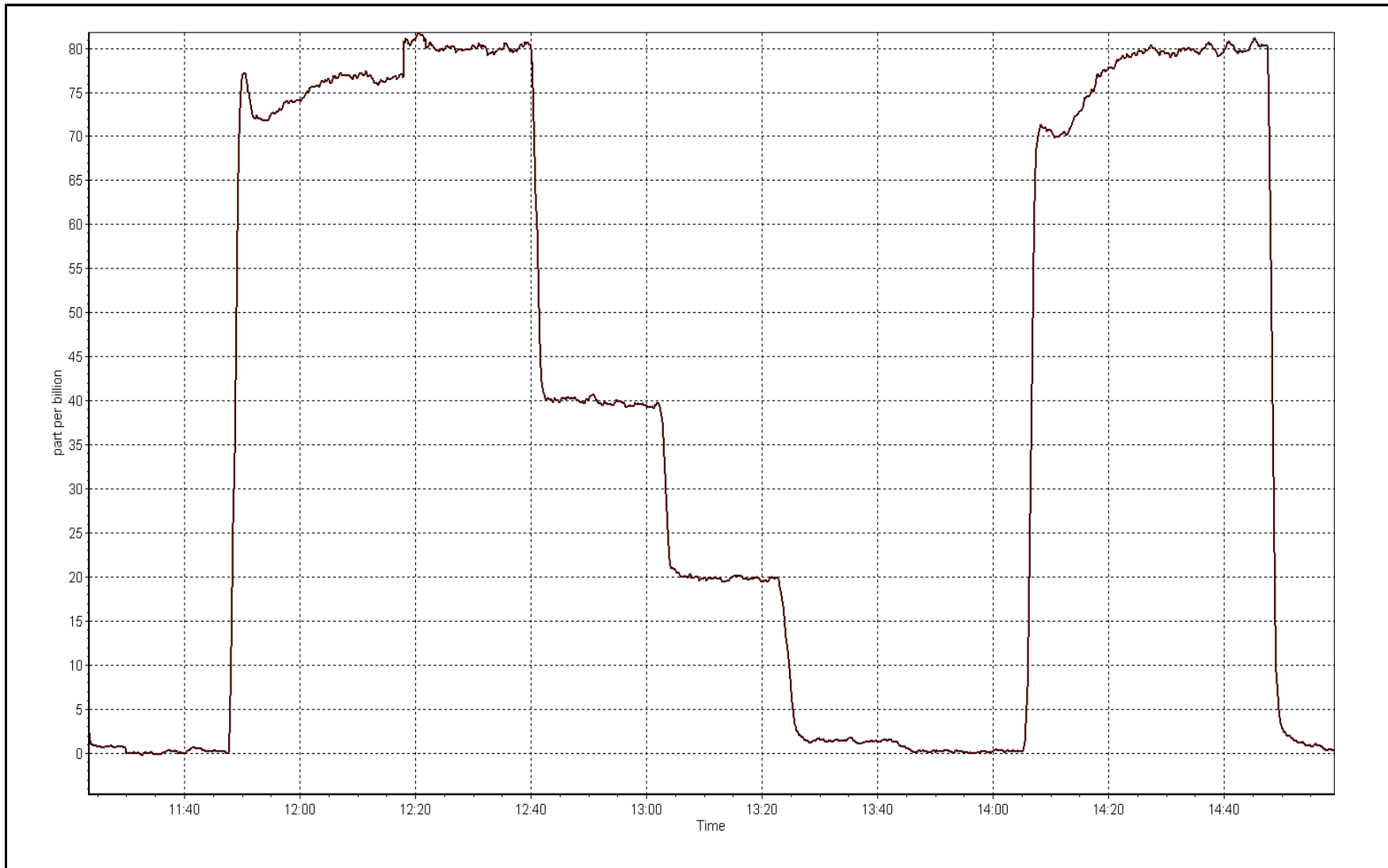
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999923
80.1	80.0	1.0017		
40.1	39.6	1.0116	Slope	1.003972
20.1	19.8	1.0161		
			Intercept	0.014752



H2S Calibration Plot

Date: October 20, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	October 21, 2016	Last Calibration	September 21, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:03	End Time (MST)	12:49
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	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	35.0	29.5
Calculated slope	0.999672	1.000477	Fuel Pressure	23.0	23.0
Calculated intercept	-0.026298	-0.048328	Analyzer Coeff	3.582	3.622
			Analyzer BKG	4.720	4.820

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 (ppm) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.05	----
as found span	5000	58.3	12.74	12.72	1.001
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	58.3	12.74	12.77	0.997
second point	5000	29.3	6.40	6.44	0.994
third point	5000	14.7	3.21	3.30	0.973
as left zero	5000	0.0	0.00	0.09	----
as left span	5000	58.3	12.74	12.95	0.983
Average Correction Factor					0.988

Corrected As found: 12.67 Previous response: 12.77 % change: 0.8%

Notes:

Generated concentration of 3.2ppm for span instead of concentration of 12.74ppm. Corrected and continued. Adjusted zero and span.

Calibration Performed By:

Jayne Marcoux



Wood Buffalo Environmental Association THC Calibration Report

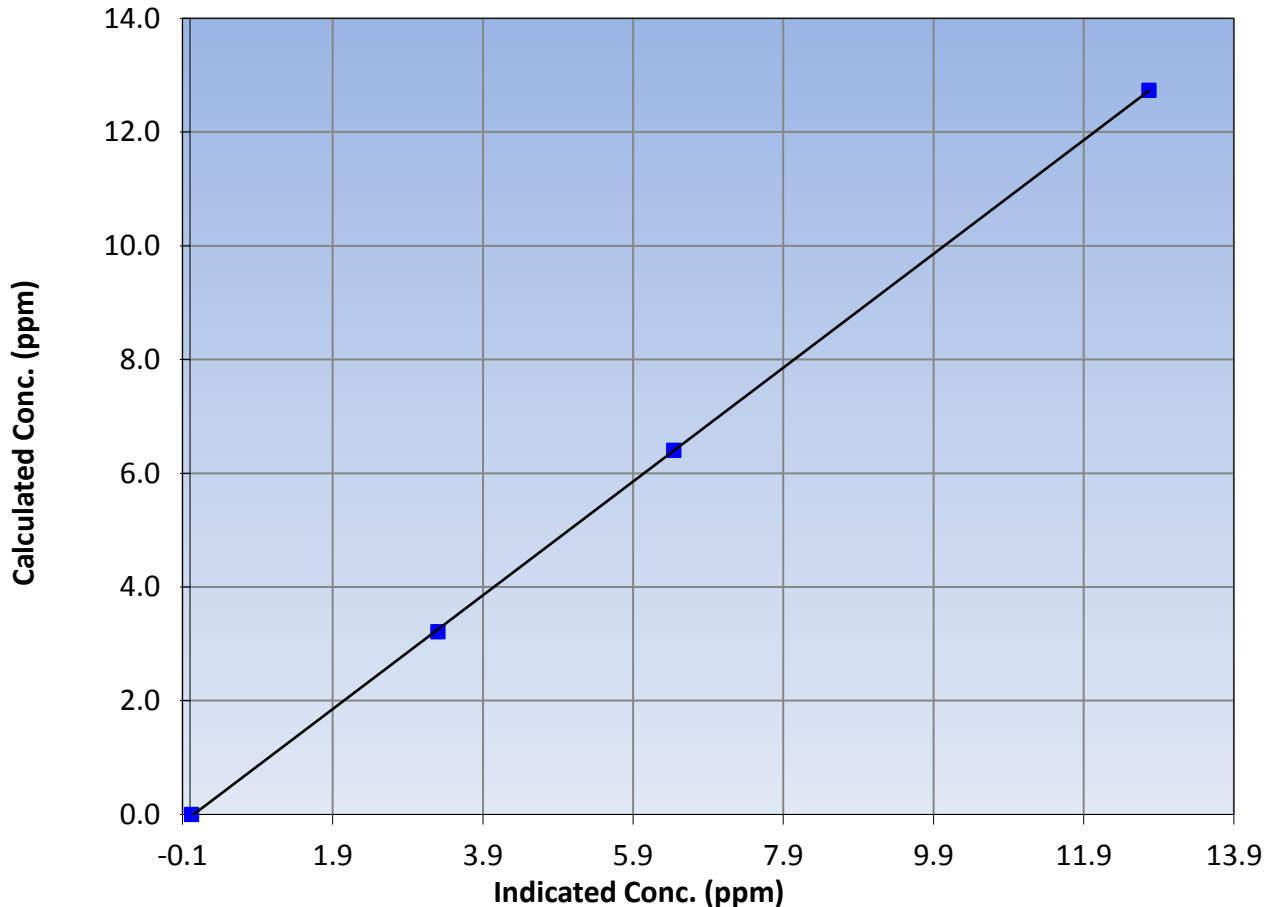
Station Information

Calibration Date	October 21, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:03	End Time (MST)	12:49
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

Calibration Data

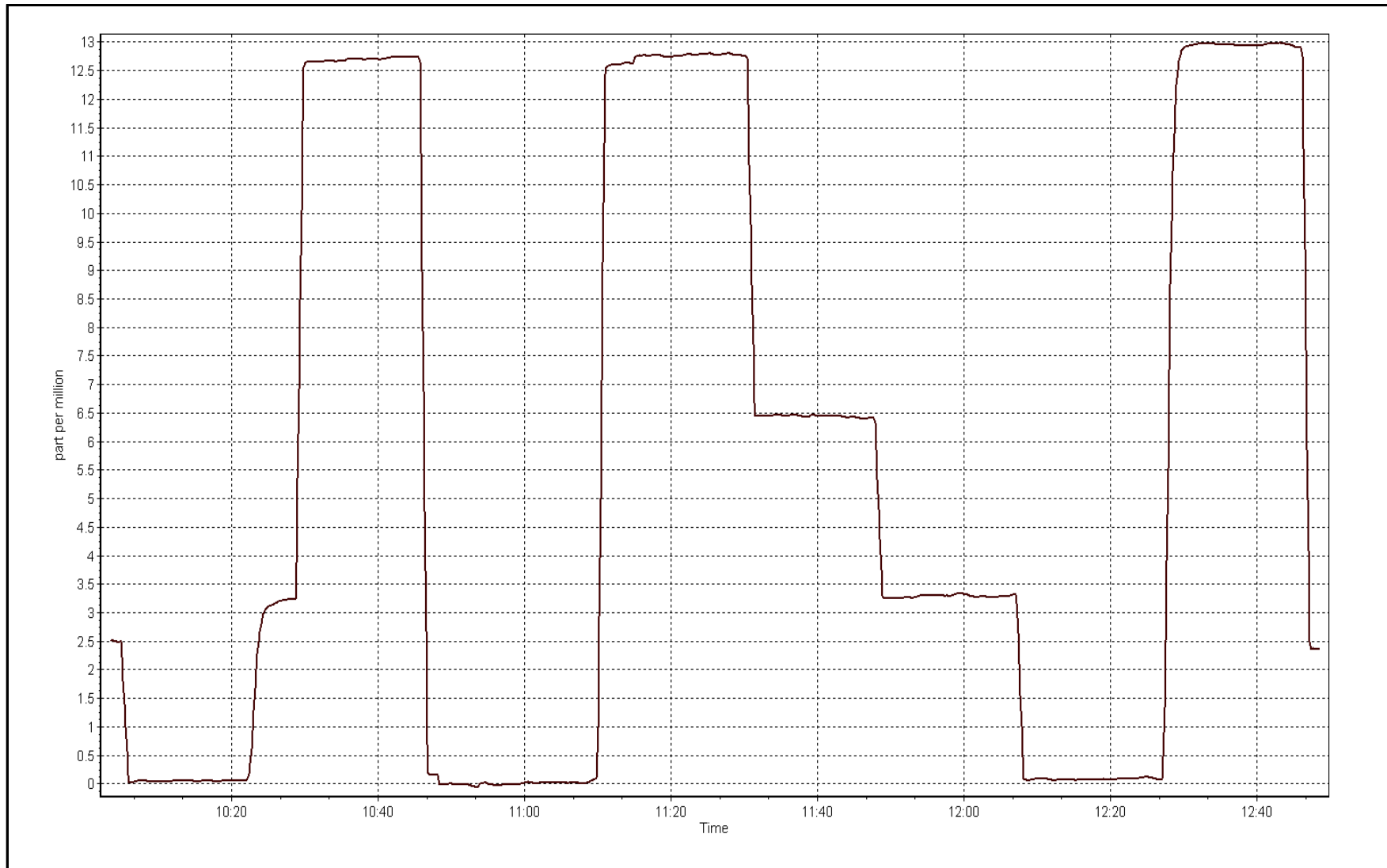
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999970
12.74	12.77	0.9973		
6.40	6.44	0.9939	Slope	1.000477
3.21	3.30	0.9731		
			Intercept	-0.048328

THC Calibration Curve



THC Calibration Plot

Date: October 21, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Other: Pump Replacement		
Start Time (MST)	9:33	End Time (MST)	11:07
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	0.999208	0.998603	0.995433
	Data Offset	-1.077960	-0.955208	-1.779824
Current Calibration	Data Slope	0.990763	0.990883	
	Data Offset	-0.197214	-0.125009	

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	192.168.1.43		192.168.1.43	
NO coefficient	1.168		1.168	
NOX coefficient	1.000		1.000	
NO2 coefficient	1.000		1.000	
NO bkgrnd	5.3		5.3	
NOX bkgrnd	5.4		5.4	
Chamber Temp	50.5	Deg C	50.5	Deg C
Moly Temp	326	Deg C	326	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-2.8	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	197.6	mmHg	197.6	mmHg
R Cell Press Nox	197.3	mmHg	197.3	mmHg
NO sample flow	0.51	lpm	0.51	lpm
Nox sample Flow	0.511	lpm	0.511	lpm

Notes:

Changed out NOx Pump.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: October 6, 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	-0.5	-0.4	-0.1	----	----
as found span	5000	58.3	600.5	600.5	0.0	606.1	606.1	0.0	0.9907	0.9908
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
high point	5000	58.3	600.5	600.5	0.0	606.1	606.1	0.0	0.9907	0.9908
second point	5000	29.3	301.8	301.8	0.0	304.7	304.4	0.3	0.9905	0.9913
third point	5000	14.7	151.4	151.4	0.0	154.0	153.8	0.2	0.9833	0.9847
as left zero										
as left span										
Average Correction Factor									0.9882	0.9889

Corrccted As found NO_x= 606.6 NO= 606.4 Percent Change NO_x= -0.7% NO= -0.7%
 Previous Response NO_x= 602.0 NO= 602.3

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			-0.1			----	
1st NO2 (300)									
2nd NO2 (200)									
3rd NO2 (100)									
2nd NO ref point		0.0							
Average Correction Factor									

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

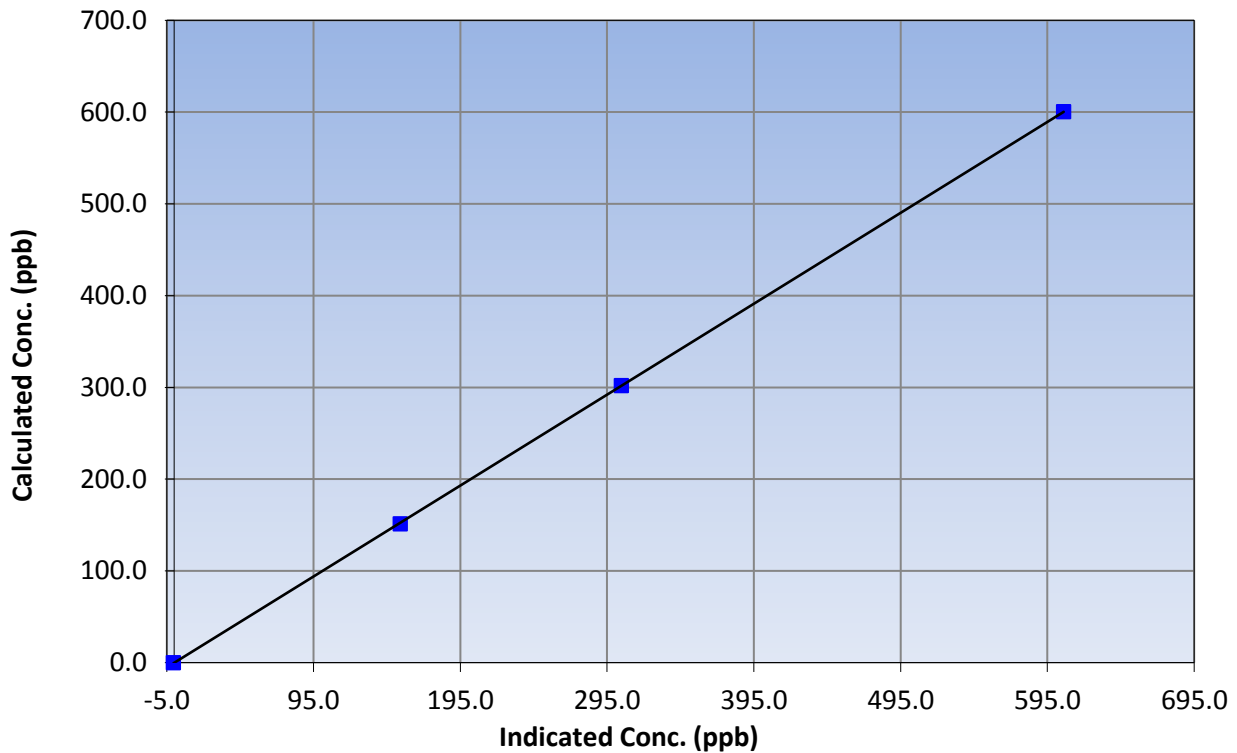
Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:33	End Time (MST)	11:07
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	-0.5	----	Correlation Coefficient	0.999993
600.5	606.1	0.9907		
301.8	304.7	0.9905	Slope	0.990763
151.4	154.0	0.9833		
			Intercept	-0.197214

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

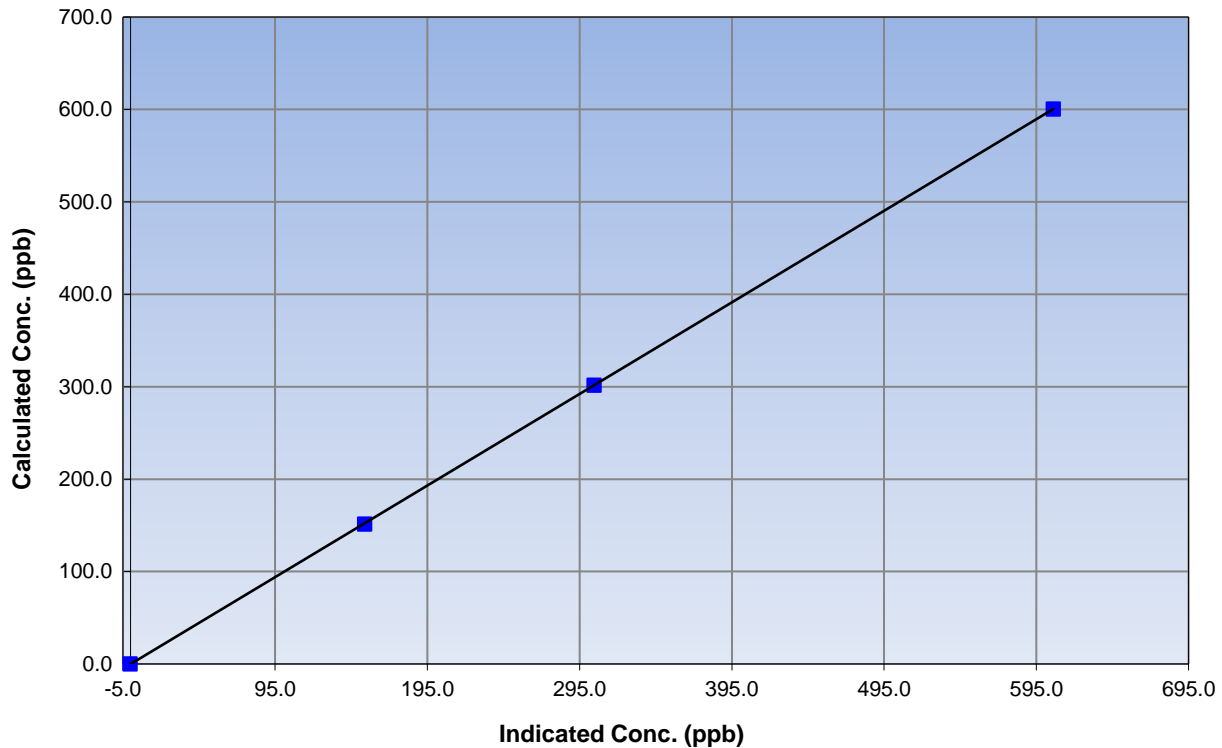
Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:33	End Time (MST)	11:07
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

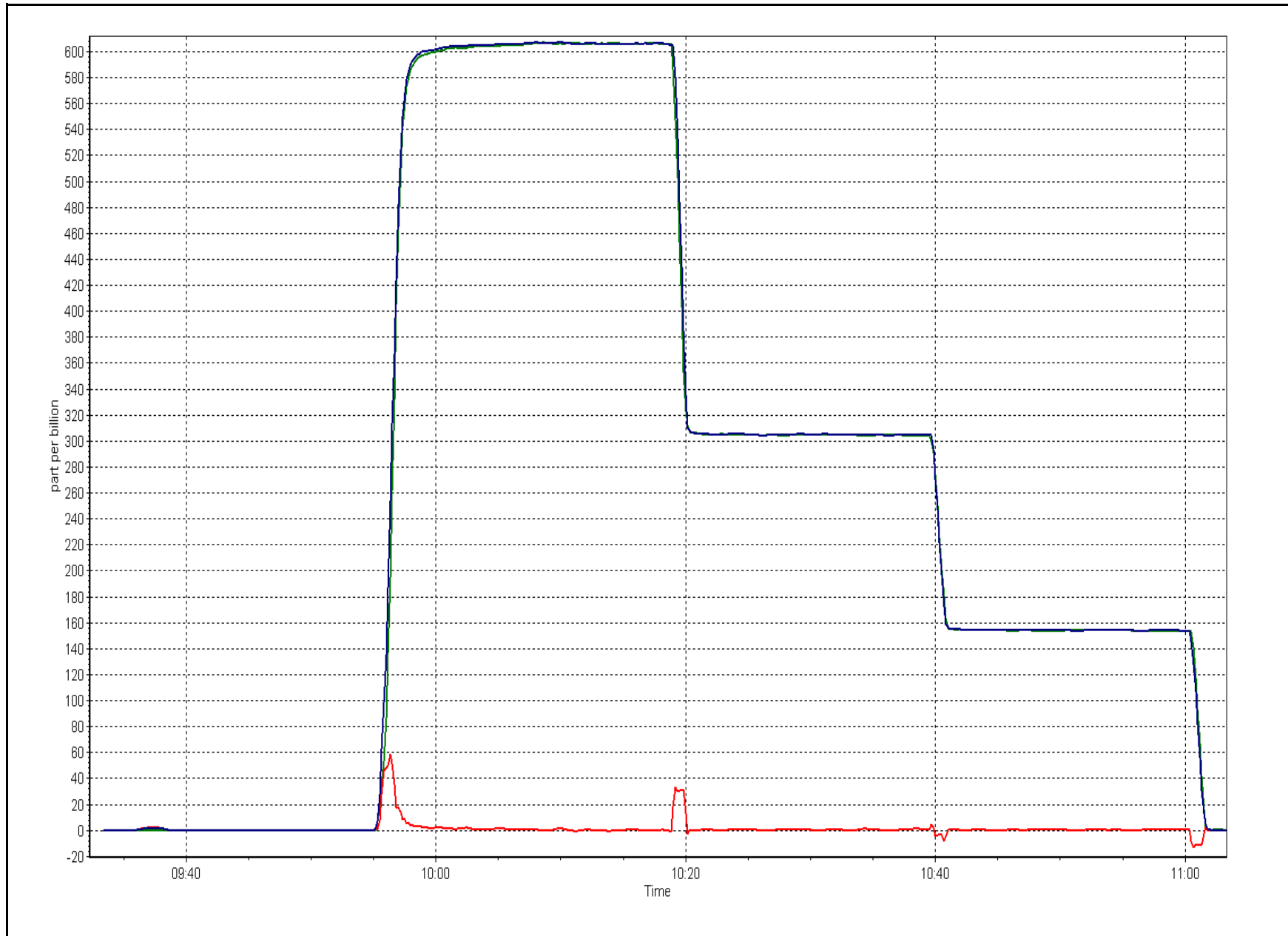
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	N/A	Correlation Coefficient	0.999995
600.5	606.1	0.9908		
301.8	304.4	0.9913	Slope	0.990883
151.4	153.8	0.9847		
			Intercept	-0.125009

NO Calibration Curve



NOX Calibration Plot

Date: October 6, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	11:00	End Time (MST)	14:56
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	0.999208	0.998603	0.995433
	Data Offset	-1.077960	-0.955208	-1.779824
Current Calibration	Data Slope	0.998027	0.998807	0.997056
	Data Offset	-0.538164	-0.412316	-0.094469

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	192.168.1.43		192.168.1.43	
NO coefficient	1.168		0.866	
NOX coefficient	1.000		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	5.3		3.8	
NOX bkgrnd	5.4		3.8	
Chamber Temp	50.5	Deg C	50.7	Deg C
Moly Temp	326	Deg C	327.4	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-2.8	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	197.6	mmHg	159.9	mmHg
R Cell Press Nox	197.3	mmHg	160.2	mmHg
NO sample flow	0.511	lpm	0.666	lpm
Nox sample Flow	0.511	lpm	0.665	lpm

Notes:

Nox pump Changed out. Adjusted zero. Span was high after the pump change out. Adjusted span



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: October 6, 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										
as found span										
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	602.1	601.6	0.1	0.9973	0.9982
second point	5000	29.3	301.8	301.8	0.0	302.7	302.2	0.4	0.9971	0.9985
third point	5000	14.7	151.4	151.4	0.0	153.3	152.9	0.4	0.9880	0.9905
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.1	0.0	----	----
as left span	5000	58.3	600.5	301.3	299.2	597.2	297.2	300.0	1.0055	1.0138
Average Correction Factor									0.9941	0.9958

Corrcted 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 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	597.8	595.8	0.0	1.0045	1.0078	----	----
1st NO2 (300)	301.3	294.5	596.7	301.3	295.4	1.0063	----	0.9970	100.3%
2nd NO2 (200)	396.5	199.4	596.5	396.5	200.1	1.0066	----	0.9965	100.4%
3rd NO2 (100)	493.4	102.5	596.4	493.4	103.0	1.0069	----	0.9947	100.5%
2nd NO ref point	----	0.0	596.1	594.4	1.8	1.0073	1.0103	----	----
Average Correction Factor						1.0068		0.9960	100.4%

Calibration Performed By: Jayne Marcoux



Wood Buffalo Environmental Association

NO_x Calibration Summary

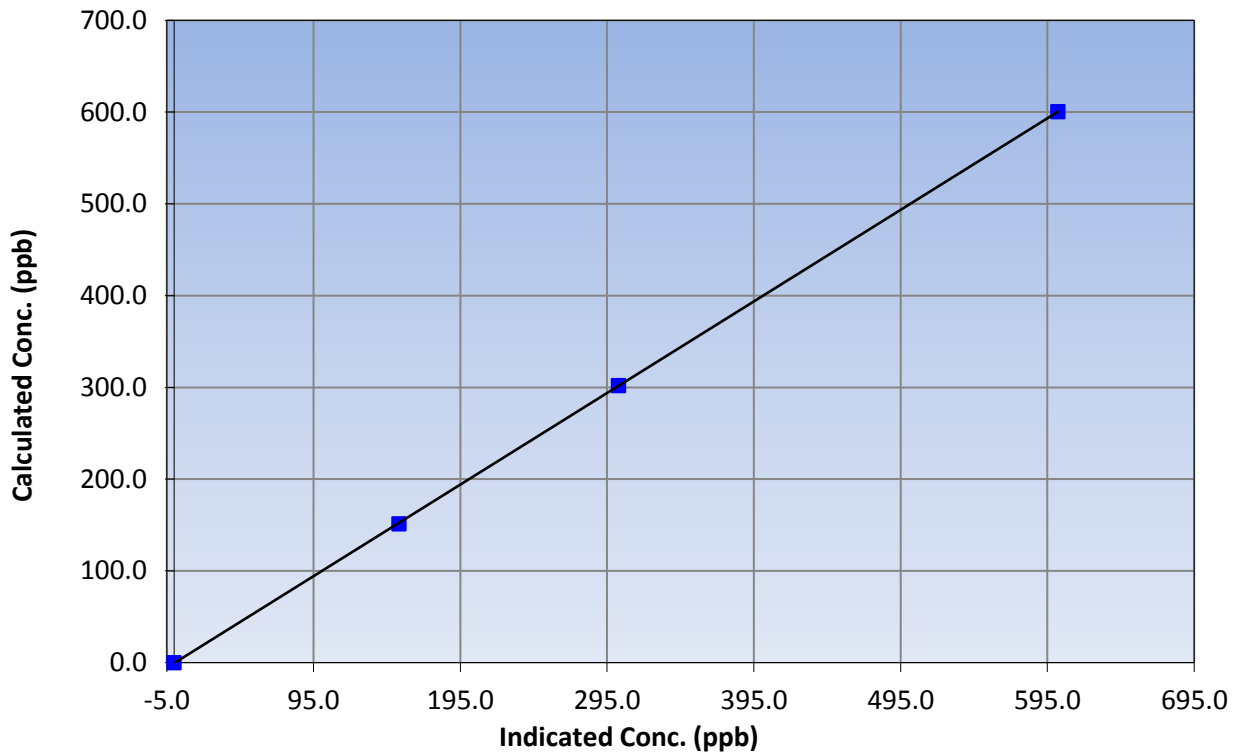
Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	11:00	End Time (MST)	14:56
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	0.999993
600.5	602.1	0.9973		
301.8	302.7	0.9971	Slope	0.998027
151.4	153.3	0.9880		
			Intercept	-0.538164

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

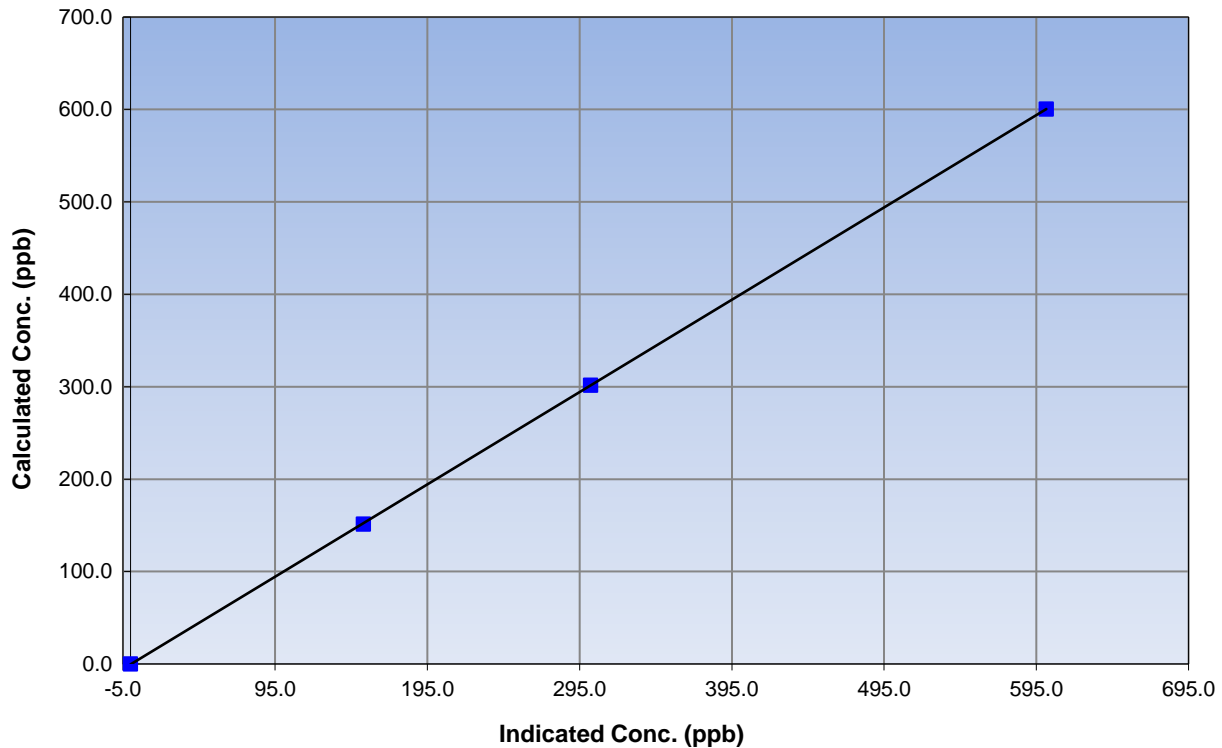
Station Information

Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	11:00	End Time (MST)	14:56
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	0.999995
600.5	601.6	0.9982		
301.8	302.2	0.9985	Slope	0.998807
151.4	152.9	0.9905		
			Intercept	-0.412316

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

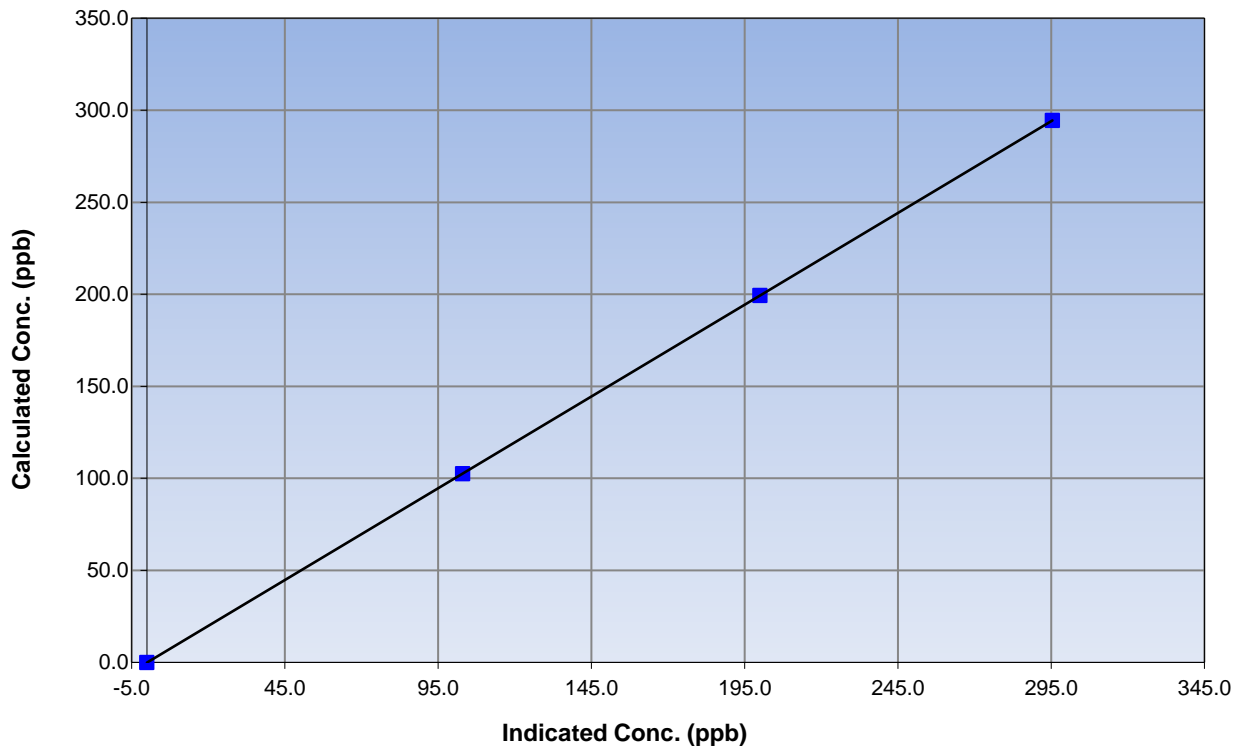
Station Information

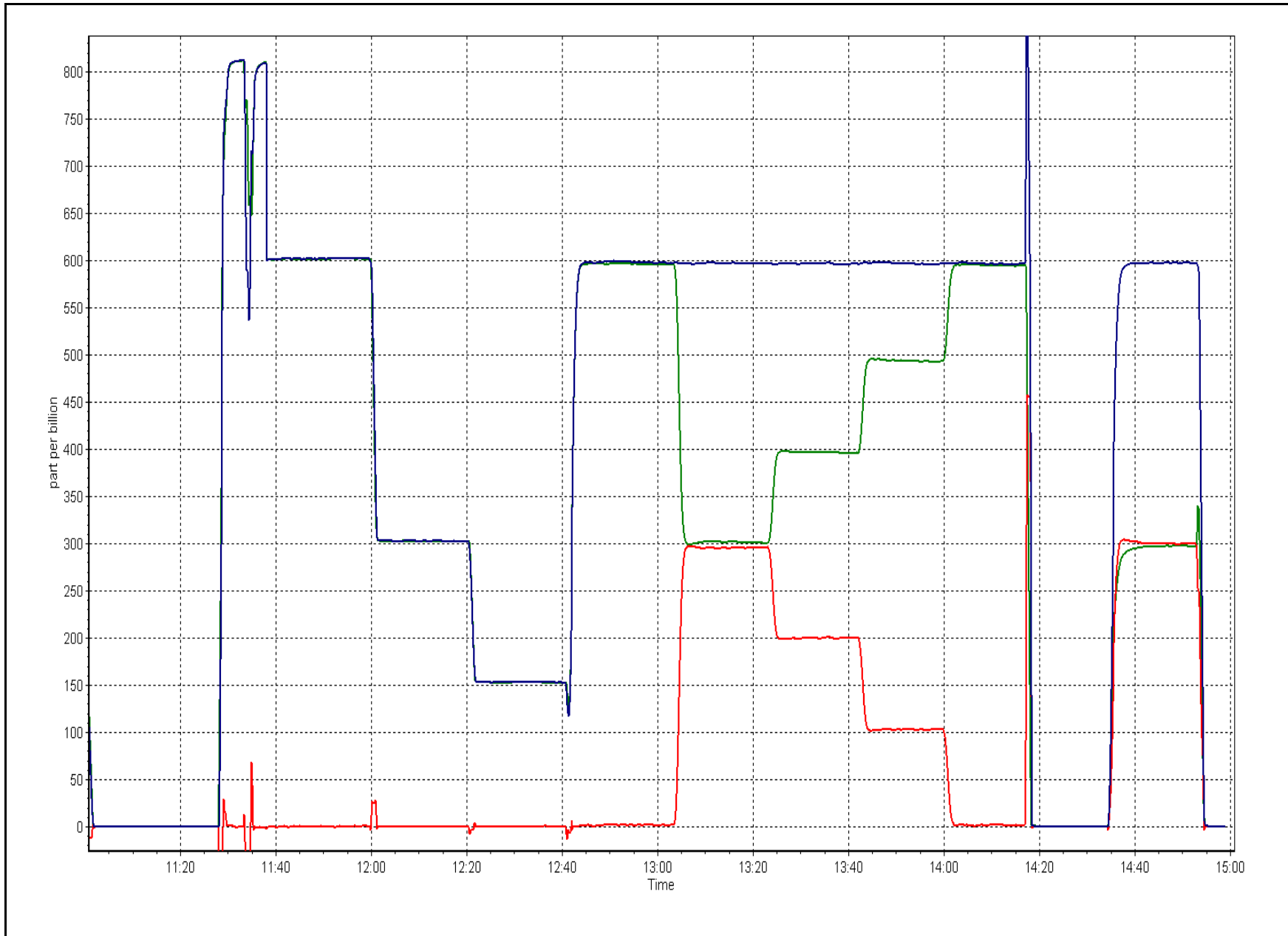
Calibration Date	October 6, 2016	Previous Calibration	September 15, 2016
Station Number	Firebag	Station Number	AMS 19
Start Time (MST)	11:00	End Time (MST)	14:56
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999999
294.5	295.4	0.9970		
199.4	200.1	0.9965	Slope	0.997056
102.5	103.0	0.9947		
			Intercept	-0.094469

NO₂ Calibration Curve







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