



**Wood Buffalo Environmental Association**

# **DECEMBER 2017 MONTHLY REPORT**

CONTINUOUS MONITORING  
INTEGRATED MONITORING  
January 30, 2018

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



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January 30, 2017

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**RE: Monthly Ambient Air Quality Monitoring Report December 2017  
Wood Buffalo Environmental Association**

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Enclosed is the December 2017 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 - Horizon  
AMS 16 - Muskeg River  
AMS 17 - Wapasu  
AMS 18 - Stony Mountain  
AMS 19 - Firebag  
AMS 20 - MacKay River  
AMS 21 - Conklin  
AMS 22 - Janvier  
AMS 23 - Fort Hills  
AMS 24 - Surmont  
AMS 25 - Waskōw ohci Pimâtisiwin  
AMS 500 - Christina Lake  
AMS 501 - Leismer  
AMS 505 - Sawbones Bay

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



<b>Member</b>	<b>EPEA Approval No.</b>
Athabasca Oil Corporation	289664-00-00; 241311-00-00
Canadian Natural Resources Ltd.	149968-01-00
Canadian Natural Upgrading Ltd.	20809-02-00
Cenovus FCCL Ltd.	48522-01-00
Connacher Oil and Gas Ltd.	240008-00-00
ConocoPhillips Canada Resources Corp.	48263-01-00
Devon Canada Corporation	224816-00-00
Finning Canada Ltd.	Not Applicable
Fort Hills Energy Corporation	151469-01-00
Hammerstone Corporation	189942-00-00
Husky Oil Operations Ltd.	206355-01-00
Imperial Oil Resources Ltd.	00046586-00-00
Inter Pipeline Offgas Ltd.	73203-02-00
MEG Energy Corporation	00216466-01-00
Nexen Energy ULC.	137467-01-00; 236394-00-00
PetroChina Canada Ltd.	254465-00-00
Suncor Energy Inc.	094-02-00; 80105-01-00
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

#### **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

#### **Aboriginal Communities**

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

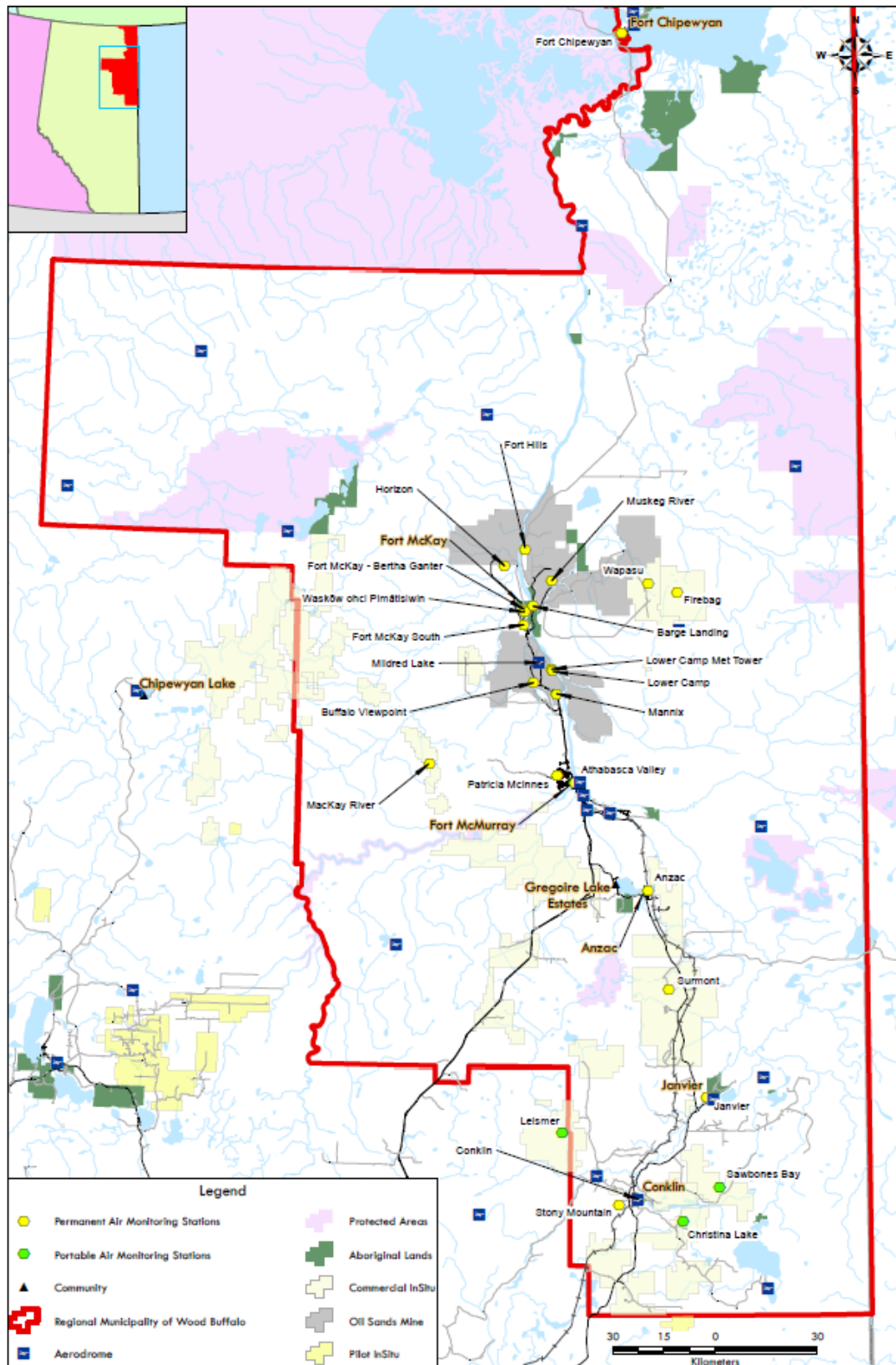


Figure 1: Map of WBEA Continuous Monitoring Network.



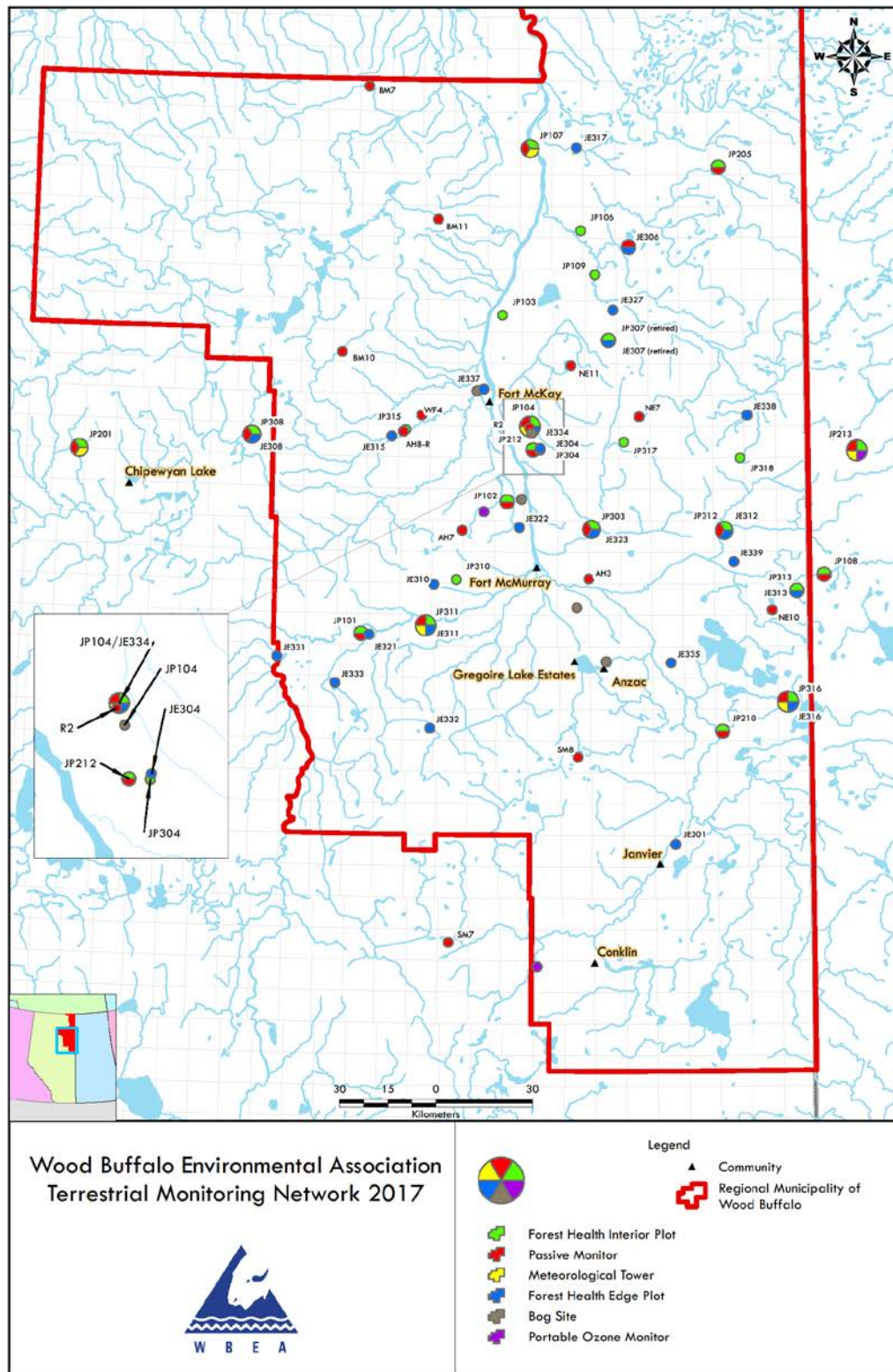


Figure 2: Map of WBEA Terrestrial Monitoring Network.

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 CO, NH<sub>3</sub>, NO<sub>2</sub>, O<sub>3</sub>, and SO<sub>2</sub>.

There were 6 H<sub>2</sub>S ambient ground level concentrations in excess of the 1-hour and 24-hour H<sub>2</sub>S 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 3 concentrations in excess of the 1-hour H<sub>2</sub>S air quality objective and 1 concentration in excess of the 24-hour H<sub>2</sub>S air quality objective.

There was 1 O<sub>3</sub> ambient ground level concentration in excess of the 1-hour air quality objective reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were no concentrations in excess of the 1-hour O<sub>3</sub> air quality objective

There were 4 ambient ground level concentrations in excess of the 24-hour PM<sub>2.5</sub> air quality objective reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were 4 concentrations in excess of the 24-hour PM<sub>2.5</sub> air quality objective.

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

<u>Site</u>	<u>Parameter</u>	<u>Date / Time</u>	<u>Reference</u>	<u>Period</u>	Concentration ppb or ug/m <sup>3</sup>		<u>Status</u>
					<u>Reported</u>	<u>Final</u>	
AMS 1 Fort McKay – Bertha Ganter	PM <sub>2.5</sub>	08Dec17, 24:00	332627	24hr	94	93.7	exc
AMS 1 Fort McKay – Bertha Ganter	PM <sub>2.5</sub>	09Dec17, 24:00	332648	24hr	55	55.1	exc
AMS 1 Fort McKay – Bertha Ganter	PM <sub>2.5</sub>	12Dec17, 24:00	332748	24hr	39	38.8	exc
AMS 1 Fort McKay – Bertha Ganter	PM <sub>2.5</sub>	29Dec17, 24:00	333228	24hr	35	34.8	exc
AMS 11 Lower Camp	H <sub>2</sub> S	02Dec17, 15:00	332401	1hr	10	10	nae
AMS 11 Lower Camp	H <sub>2</sub> S	02Dec17, 16:00	332401	1hr	12	12	exc
AMS 11 Lower Camp	H <sub>2</sub> S	02Dec17, 17:00	332401	1hr	10	10	nae
AMS 11 Lower Camp	H <sub>2</sub> S	02Dec17, 24:00	332406	24hr	4	4	exc
AMS 11 Lower Camp	H <sub>2</sub> S	24Dec17, 15:00	333113	1hr	17	17	exc
AMS 17 Wapasu	O <sub>3</sub>	29Dec17, 13:00	333208	1hr	479	-	ret
AMS 19 Firebag	H <sub>2</sub> S	30Dec17, 20:00	333246	1hr	13	13	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<sub>2.5</sub>, 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, NO<sub>2</sub> concentrations were re-calculated from baseline-corrected NO<sub>x</sub> and NO concentrations. Specifically, the NO concentration was subtracted from the NO<sub>x</sub> concentration to determine the NO<sub>2</sub> concentration. In cases where the NO<sub>x</sub> and/or NO values exceeded the operating range of the analyzer, values reported for NO<sub>2</sub> were determined as the largest of either the difference between baseline-corrected NO<sub>x</sub> and NO values, or the NO<sub>2</sub> value reported by the data acquisition system with baseline correction applied.

## 1.2 Revisions to AEP Airdata Warehouse

As a result of the Alberta Environment and Parks (AEP) audit, data for Surmont (AMS 24) from September to November 2017 was re-submitted to reflect the adjustment to NO, NO<sub>2</sub>, and NO<sub>x</sub> data.

## 2.0 Operational Status

### Continuous Monitoring

In December 2017, there were 2 instances of a compliance monitoring instrument operating less than 90% of the time.

1. The nitrogen dioxide (NO<sub>2</sub>) analyzer at Fort Chipewyan AMS operated less than 90% of the time in December 2017, which is a contravention of the Air Monitoring Directive (2016, as amended), Chapter 6, Clause DQ 4-C.

On December 2, the NO<sub>2</sub> analyzer did not meet operational criteria for daily zero/span response due to being greater than 10% below the span target concentration. Remote diagnostic investigation did not reveal the source of the issue. On-site investigation on December 7 revealed possible moisture contamination; on-site repairs were un-successful in returning the analyzer to operating conditions. The NO<sub>2</sub> analyzer was flagged for maintenance and a backup analyzer was installed on December 21, as the current analyzer will require in-shop repairs.

In December 2017, the NO<sub>2</sub> analyzer at Fort Chipewyan AMS operated for less than 90% of the reporting period. This incident was reported to Alberta Environment and Parks on December 14, 2017 (reference number 332827)

2. The total hydrocarbon (THC) analyzer at Surmont AMS operated less than 90% of the time in December 2017, which is a contravention of the Air Monitoring Directive (1989, as amended), Chapter 6, Clause DQ 4-C.

In December 2017, the Regional Municipality of Wood Buffalo (RMWB) experienced extreme cold conditions, with temperatures recorded as low as -43 degrees Celsius. During this time, HVAC (heating, ventilation, and air-conditioning) systems throughout the WBEA network operated at full capacity. Efforts were made throughout the network to address any HVAC shortfalls, in many cases by installing portable heaters in the air monitoring stations. Additional weather-proofing and HVAC maintenance is continually ongoing throughout the monitoring network, as required, to maintain stable shelter temperatures.

The HVAC unit in the Surmont Air Monitoring Station was unable to maintain a stable temperature during extreme ambient temperatures beginning on December 23 and was stabilized on January 1. Fluctuating internal station temperatures during this period affected the baseline response of the THC analyzer and resulted in 239 hours of invalid data.

In December 2017, the THC analyzer at Surmont AMS operated for 72% of the reporting period. This incident was reported to Alberta Environment and Parks on January 25, 2018 (reference number 334069).

In December 2017, there were 3 incidents of a monitoring instrument not required for air quality compliance operating less than 90% of the time:

1. The precipitation collector at Fort Chipewyan (AMS 8) had 180 hours of invalid data due to suspected sensor failure discovered during routine data validation. Maintenance to resolve the issue was completed on December 8.
2. The precipitation collector at Wapasu (AMS 17) had 133 hours of invalid data due to snow buildup on the sensor, resulting in false readings. Maintenance to clean out the bucket was completed on December 6.
3. The precipitation collector at MacKay River (AMS 20) had 183 hours of invalid data due to snow buildup on the sensor, resulting in false readings. Maintenance to clean out the bucket was completed on December 8.

### **Intermittent Monitoring**

Results for integrated monitoring of precipitation, passive, PAH, VOC, PM<sub>2.5</sub>, and PM<sub>10</sub> for November 2017 are included with this report.

### 3.0 Monitoring Notes

#### General Network Notes

The Ammonia (NH<sub>3</sub>) 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 NH<sub>3</sub> 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 NH<sub>3</sub> gas is an inherent behavior in the NH<sub>3</sub> analyzer operation resulting from the properties of the NH<sub>3</sub> gas. Data for 1 to 2 hours following the daily spans have been reported as invalid for a total of 54 hours this month.

Maintenance and cleaning of the sample manifold on December 7 interrupted the normal operations of the NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub>, THC, and TRS analyzers for 2 hours.

There were three issues associated with operation of the THC analyzer resulting in 18 hours of invalid data. Replacement of the carrier gas cylinder at the station on December 1 affected the normal operation of the THC analyzer for 1 hour. A single instance of intermittent unstable operation due excessive baseline drift on December 9 affected the normal operation of the THC analyzer for 11 hours. Maintenance to replace the actuator and a follow-up calibration on December 9 affected the operations of the THC analyzer for a further 6 hours.

A power spike at the station on December 5 affected the normal operations of the NO<sub>2</sub> analyzer for 1 hour.

Numerous instances of negative baseline drift throughout the month affected the normal operation of the PM<sub>2.5</sub> analyzer for 17 hours.

Flat-lines in the output signal of the wind sensor resulted in 35 hours of invalid data this reporting period.

The precipitation collector was found to be recording spurious values, beginning on November 28, 2017. Data was invalidated back to the last precipitation event, resulting in 71 hours of invalid data.

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***

Flat-lines in the output signal of the wind sensor resulted in 40 hours of invalid data this reporting period.

***Station 3, Lower Camp - Meteorology***

Flat lines in output signals of the sonic wind sensors at 20, 45, 100, and 167 m elevations resulted in 52, 52, 16, and 2 hours of downtime for each respective sensor.

***Station 4, Buffalo Viewpoint***

Flat-lines in the output signal of the wind sensor resulted in 39 hours of invalid data this reporting period.

***Station 5, Mannix***

Flat lines in output signals of the sonic wind sensors at 20, 45, 75, and 90 m elevations resulted in 78, 21, 5, and 20 hours of downtime for each respective sensor.

Flat lines in output signals of the ambient temperature and relative humidity sensors at the 20 m elevation resulted in 34 hours of downtime.

***Station 6, Patricia McInnes***

The NH<sub>3</sub> 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 NH<sub>3</sub> gas is an inherent behavior in the NH<sub>3</sub> analyzer operation resulting from the properties of the NH<sub>3</sub> gas. Data for 1 to 2 hours following each daily span has been reported as invalid for a total of 32 hours this month. Additional time to stabilize following the December calibration resulted in 7 hours of downtime.

A broken sample manifold prevented all air quality analyzers from sampling ambient air. Manifold pressure diagnostics and review of analyzer baseline responses indicated that the break occurred on December 4 2017; the manifold was repaired on December 5 2017, resulting in 34 hours of invalid data.

Replacement of the carrier gas cylinder at the station on December 15 affected the normal operation of the THC analyzer for 1 hour.

Station operator activities on December 18 affected the normal operation of the THC analyzer for 2 hours.

Flat-lines in the output signal of the wind sensor resulted in 19 hours of invalid data this reporting period.

### ***Station 7, Athabasca Valley***

Maintenance and cleaning of the sample manifold on December 5 interrupted the normal operations of the CO, O<sub>3</sub>, and TRS analyzers for 1 hour this reporting period.

Station temperature fluctuations from December 26 to December 29 interrupted the normal operation of the THC analyzer for 21 hours.

Station operator activities to investigate and verify analyzer response on December 11 interrupted the routine operations of the NO<sub>2</sub> analyzer for 2 hours. Maintenance to recalibrate the analyzer on December 21 interrupted the routine operations of the NO<sub>2</sub> analyzer for 5 hours. On December 28, the automated daily zero/span response did not meet operational criteria until the analyzer was recalibrated, on December 30, resulting in 60 hours of downtime.

Negative baseline drift throughout the month affected the normal operation of the PM<sub>2.5</sub> analyzer for 21 hours.

The data acquisition system failed to record data on December 12 resulting in the absence of barometric pressure data for one hour.

Flat-lines in the output signal of the wind sensor resulted in 36 hours of invalid data this reporting period.

### ***Station 8, Fort Chipewyan***

The NO<sub>2</sub> analyzer failed to meet the operational performance specifications for daily span response (+/- 10%) on December 2. Troubleshooting steps during an on-site visit on December 8 did not resolve the issue. An additional site visit was scheduled for December 21, during which time a replacement analyzer was installed and calibrated the following day. This resulted in 485 hours of invalid data.

A broken sample manifold prevented the SO<sub>2</sub> and O<sub>3</sub> analyzers from sampling ambient air. Manifold pressure diagnostics and review of analyzer baseline responses indicated that the break occurred on December 20 2017; the manifold was repaired on December 21 2017, resulting in 11 hours of invalid data.

Numerous instances of negative baseline drift throughout the month affected the normal operations of the PM<sub>2.5</sub> analyzer for 22 hours.

The precipitation collector was found to be unresponsive beginning on October 24, 2017. Data was invalidated back to the last precipitation event, resulting in 179 hours of invalid data. Maintenance and audit of the tipping bucket precipitation collector on December 21 resulted in 1 hour of invalid data.

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

***Station 9, Barge Landing***

The normal operations of the TRS analyzer was interrupted on December 28 for 4 hours due to a maintenance calibration to adjust the high point.

Station operator activities on December 8 affected the normal operations of the THC analyzer for 1 hour.

Flat-lines in the output signal of the wind speed and direction sensors resulted in 58 and 67 hours of invalid data this reporting period, respectively.

***Station 11, Lower Camp***

An internal audit on December 5 interrupted the routine operation of the H<sub>2</sub>S and SO<sub>2</sub> analyzers for 2 hours.

Station temperature fluctuations occurring December 25 affected the normal operation of the THC analyzer for 12 hours.

Flat-lines in the output signal of the wind sensor resulted in 15 hours of invalid data this reporting period.

***Station 13, Fort McKay South***

Two instances of negative baseline drift affected the normal operations of the PM<sub>2.5</sub> analyzer for 6 hours this reporting period.

Flat-lines in the output signal of the wind sensor resulted in 14 hours of invalid data this reporting period.

***Station 14, Anzac***

Hydrogen generator failures occurring on December 25 and 26, and December 28 and 29 interrupted the routine operations of the THC analyzer for 29 hours. Maintenance to restart the hydrogen generator on December 26 interrupted the normal operations of the THC analyzer for 1 hour. Maintenance to restart the hydrogen generator and verify analyzer response on December 29 interrupted the normal operations of the THC analyzer for 1 hour.

Flat-lines in the output signal of the wind sensor resulted in 4 hours of invalid data this reporting period.

***Station 15, Horizon***

Maintenance to verify the daily span response on December 30 interrupted the normal operation of the TRS analyzer for 1 hour.

Replacement of the fuel gas cylinder at the station on December 13 affected the normal operation of the THC analyzer for 2 hours.

Flat-lines in the output signal of the wind sensor resulted in 38 hours of invalid data this reporting period.



### ***Station 16, Muskeg River***

Power outages at the station on December 2 and 26 affected the normal operations of all analyzers for 12 to 13 hours. Following the power outage on December 26, the FID flame in the THC analyzer failed to relight, interrupting the normal operations of the analyzer for an additional 50 hours.

A power outage at the station on December 26 affected the normal operation of the temperature and relative humidity sensors for 9 hours.

The data acquisition system failed to record data on December 12 resulting in the absence of data for one hour for the barometric pressure sensor.

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

### ***Station 17, Wapasu***

Maintenance to verify the daily span response on December 1 interrupted the normal operation of the NO<sub>2</sub> analyzer for 1 hour.

A new calibrator was installed at the station on December 6. Maintenance to reinitiate span checks following the calibrator installation affected the normal operations of all air quality analyzers for 1 hour.

A single instance of intermittent unstable operation due to the output signal of the analyzer reporting spurious values on December 20 affected the normal operation of the NO<sub>2</sub> analyzer for 1 hour.

There were four issues associated with operation of the O<sub>3</sub> analyzer resulting in 42 hours of invalid data this month. Station operator activities on December 19 and 20 affected the normal operation of the O<sub>3</sub> analyzer for 2 hours. Unstable operation on December 20, 21, and 29 affected the normal operation of the analyzer for 31 hours. Maintenance to verify the daily span response due to a slightly elevated zero on December 23 resulted in 1 hour of invalid data. On December 29, it was determined that a replacement analyzer should be installed. Maintenance to remove the original analyzer and install a replacement resulted in 8 hours of invalid data.

Two instances of negative baseline drift affected the normal operation of the PM<sub>2.5</sub> analyzer for 9 hours this reporting period.

The precipitation collector was found to be recording spurious values beginning on November 28, 2017. Data was invalidated back to the last precipitation event, resulting in 133 hours of invalid data.

Flat-lines in the output signal of the wind sensor resulted in 43 hours of invalid data this reporting period.

### ***Station 18, Stony Mountain***

Replacement of the fuel gas cylinder at the station on December 18 affected the normal operation of the THC analyzer for 1 hour.

***Station 19, Firebag***

Station temperature fluctuations from December 24 to December 29 interrupted the normal operation of the THC analyzer for 10 hours.

Flat-lines in the output signal of the wind sensor resulted in 47 hours of invalid data this reporting period.

***Station 20, MacKay River***

Maintenance to verify the daily span response on December 31 interrupted the normal operation of the NO<sub>2</sub>, SO<sub>2</sub>, and THC for 1 hour.

A single instance of unstable operation due to baseline drift on December 30 and 31 affected the normal operation of the THC analyzer for a total of 31 hours this reporting period.

The precipitation collector was found to be recording spurious values, beginning on November 28, 2017. Data was invalidated back to the last precipitation event, resulting in 183 hours of invalid data.

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

***Station 21, Conklin***

A broken sample manifold prevented all air quality analyzers from sampling ambient air. Manifold pressure diagnostics and review of analyzer baseline responses indicated that the break occurred on December 19 2017; the manifold was repaired on December 21 2017, resulting in 51 hours of invalid data.

Three instances of negative baseline drift throughout the month affected the normal operation of the PM<sub>2.5</sub> analyzer for 9 hours this reporting period.

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

***Station 22, Janvier***

There were two issues associated with the operations of the THC analyzer resulting in 4 hours of invalid data this reporting period. Maintenance to install a hydrogen generator on December 4 interrupted the normal operations of the THC analyzer for 2 hours. Replacement of the carrier gas cylinder at the station on December 10 affected the normal operations of the THC analyzer for 2 hours.

There were three issues associated with operations of the PM<sub>2.5</sub> analyzer resulting in 73 hours of invalid data. Station operator activities on December 4 affected the normal operation of the PM<sub>2.5</sub> analyzer for 2 hours. Flat-line in the output signal on December 17 through 19 interrupted the normal operation of the PM<sub>2.5</sub> analyzer for 45 hours. Numerous instances of negative baseline drift throughout the month affected the normal operation of the analyzer for a further 26 hours.

***Station 23, Fort Hills***

Maintenance and cleaning of the sample manifold on December 5 interrupted the normal operations of the TRS analyzer for 1 hour this reporting period.

Flat-lines in the output signal of the wind sensor resulted in 9 hours of invalid data this reporting period.

***Station 24, Surmont***

Operational issues with the HVAC unit caused unstable station temperatures from December 23 to January 1 and interrupted the normal operation of the THC analyzer for 210 hours.

Numerous instances of unstable operation due to baseline drift throughout the month affected the normal operation of the H<sub>2</sub>S analyzer for 40 hours this reporting period.

***Station 25, Waskōw ohci Pimâtisiwin***

A single instance of intermittent unstable operation due baseline drift on December 21 affected the normal operation of the SO<sub>2</sub> analyzer for 12 hours.

Maintenance to verify the daily span response on December 22 interrupted the normal operation of the H<sub>2</sub>S and SO<sub>2</sub> analyzers for 1 to 2 hours, respectively.

Flat-lines in the output signal of the wind sensor resulted in 64 hour of invalid data this reporting period.

***Station 500, Christina Lake***

No operational issues to report this month.

***Station 501, Leismer***

A single instance of unstable operation due to baseline drift on December 26 affected the normal operation of the H<sub>2</sub>S analyzer for 2 hours.

Flat-lines in the output signal of the wind sensor resulted in 10 hours of invalid data this reporting period.

***Station 505, Sawbones Bay.***

A single instance of unstable operation due to baseline drift on December 24 affected the normal operation of the THC analyzer for 9 hours.

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 Lead

Kendra Thomas  
Data Technician

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

December 2017

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APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	12	2017					
241311-00-00	CONTINUOUS AMBIENT MONITORING						
20809-02-00							
149968-01-00							
48522-01-00							
240008-00-00			ONE-HOUR AVERAGE		24-HOUR AVERAGE		
48263-01-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
151469-01-00	SO2(ppm)	1	99.73	0.012	0	0.002	0
224816-00-00	SO2(ppm)	2	100.00	0.088	0	0.024	0
189942-00-00	SO2(ppm)	4	100.00	0.011	0	0.001	0
206355-00-00	SO2(ppm)	5	100.00	0.039	0	0.004	0
46586-00-00	SO2(ppm)	6	95.43	0.021	0	0.005	0
73203-02-00	SO2(ppm)	7	100.00	0.007	0	0.001	0
216466-01-00	SO2(ppm)	8	98.52	0.005	0	0.002	0
137467-01-00	SO2(ppm)	11	99.73	0.029	0	0.003	0
236394-00-00	SO2(ppm)	13	100.00	0.004	0	0.001	0
80105-01-00	SO2(ppm)	14	100.00	0.012	0	0.002	0
254465-00-00	SO2(ppm)	15	100.00	0.004	0	0.001	0
094-02-00	SO2(ppm)	16	98.25	0.020	0	0.008	0
305529-00-00	SO2(ppm)	17	99.87	0.043	0	0.015	0
026-02-00	SO2(ppm)	18	100.00	0.005	0	0.001	0
228044-00-00	SO2(ppm)	19	100.00	0.106	0	0.023	0
	SO2(ppm)	20	99.87	0.015	0	0.003	0
	SO2(ppm)	21	93.15	0.006	0	0.001	0
	SO2(ppm)	22	100.00	0.004	0	0.001	0
	SO2(ppm)	23	100.00	0.012	0	0.003	0
	SO2(ppm)	24	100.00	0.010	0	0.004	0
	SO2(ppm)	25	98.12	0.009	0	0.003	0
	SO2(ppm)	500	100.00	0.029	0	0.005	0
	SO2(ppm)	502	100.00	0.028	0	0.006	0
	SO2(ppm)	505	100.00	0.034	0	0.009	0
	H2S(ppm)	2	100.00	0.006	0	0.001	0
	H2S(ppm)	4	100.00	0.004	0	0.001	0
	H2S(ppm)	5	100.00	0.005	0	0.001	0
	H2S(ppm)	11	99.73	0.017	2	0.004	1
	H2S(ppm)	17	99.87	0.001	0	0.001	0
	H2S(ppm)	19	100.00	0.013	1	0.002	0
	H2S(ppm)	20	100.00	0.002	0	0.001	0
	H2S(ppm)	24	94.62	0.001	0	0.000	0
	H2S(ppm)	25	99.87	0.002	0	0.001	0
	H2S(ppm)	500	100.00	0.001	0	0.000	0
	H2S(ppm)	502	99.73	0.002	0	0.000	0
	H2S(ppm)	505	100.00	0.001	0	0.001	0
	TRS(ppm)	1	99.73	0.002	0	0.001	0
	TRS(ppm)	6	95.43	0.001	0	0.001	0
	TRS(ppm)	7	99.60	0.001	0	0.001	0
	TRS(ppm)	9	99.46	0.002	0	0.001	0
	TRS(ppm)	13	100.00	0.003	0	0.001	0
	TRS(ppm)	14	100.00	0.001	0	0.000	0
	TRS(ppm)	15	99.87	0.002	0	0.001	0
	TRS(ppm)	18	100.00	0.001	0	0.000	0
	TRS(ppm)	21	93.15	0.001	0	0.000	0
	TRS(ppm)	22	100.00	0.000	0	0.000	0
	TRS(ppm)	23	99.87	0.002	0	0.001	0
	THC(ppm)	1	97.31	3.2	-	2.7	-
	THC(ppm)	2	100.00	7.9	-	3.2	-
	THC(ppm)	4	100.00	3.9	-	2.8	-
	THC(ppm)	5	100.00	7.7	-	3.4	-
	THC(ppm)	6	95.30	2.4	-	2.1	-
	THC(ppm)	7	97.18	2.9	-	2.4	-
	THC(ppm)	9	99.87	4.0	-	3.0	-
	THC(ppm)	11	98.39	5.8	-	3.3	-
	THC(ppm)	13	100.00	6.0	-	3.0	-
	THC(ppm)	14	95.97	2.2	-	2.1	-
	THC(ppm)	15	99.73	9.3	-	3.0	-
	THC(ppm)	16	91.13	5.4	-	3.2	-
	THC(ppm)	17	99.87	2.7	-	2.4	-
	THC(ppm)	18	99.87	2.1	-	2.0	-
	THC(ppm)	19	98.66	2.9	-	2.5	-
	THC(ppm)	20	95.70	2.7	-	2.4	-
	THC(ppm)	21	93.55	2.2	-	2.1	-
	THC(ppm)	22	99.46	2.1	-	2.0	-

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

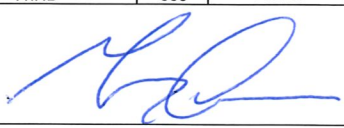
December 2017

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APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
	12	2017					
289664-00-00	CONTINUOUS AMBIENT MONITORING						
241311-00-00	CONTINUOUS AMBIENT MONITORING						
20809-02-00	CONTINUOUS AMBIENT MONITORING						
149968-01-00	CONTINUOUS AMBIENT MONITORING						
48522-01-00	CONTINUOUS AMBIENT MONITORING						
			ONE-HOUR AVERAGE		24-HOUR AVERAGE		
	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
240008-00-00	THC(ppm)	23	100.00	13.0	-	4.0	-
48263-01-00	THC(ppm)	24	71.77	3.0	-	2.0	-
151469-01-00	THC(ppm)	505	98.79	3.0	-	2.4	-
224816-00-00	O3(ppm)	1	99.73	0.038	0	0.030	-
189942-00-00	O3(ppm)	4	100.00	0.042	0	0.039	-
206355-00-00	O3(ppm)	6	95.43	0.044	0	0.040	-
46586-00-00	O3(ppm)	7	99.87	0.040	0	0.035	-
73203-02-00	O3(ppm)	8	98.52	0.041	0	0.036	-
216466-01-00	O3(ppm)	13	100.00	0.039	0	0.031	-
137467-01-00	O3(ppm)	14	100.00	0.044	0	0.042	-
236394-00-00	O3(ppm)	17	94.22	0.041	0	0.038	-
80105-01-00	O3(ppm)	18	100.00	0.046	0	0.043	-
254465-00-00	O3(ppm)	21	93.15	0.047	0	0.043	-
094-02-00	O3(ppm)	22	100.00	0.049	0	0.046	-
305529-00-00	NO2(ppm)	1	99.60	0.039	0	0.026	-
026-02-00	NO2(ppm)	4	100.00	0.045	0	0.026	-
228044-00-00	NO2(ppm)	6	95.43	0.045	0	0.021	-
	NO2(ppm)	7	90.99	0.040	0	0.025	-
	NO2(ppm)	8	34.81	0.027	0	0.011	-
	NO2(ppm)	13	100.00	0.040	0	0.026	-
	NO2(ppm)	14	100.00	0.025	0	0.009	-
	NO2(ppm)	15	100.00	0.045	0	0.020	-
	NO2(ppm)	16	98.25	0.053	0	0.027	-
	NO2(ppm)	17	99.46	0.030	0	0.015	-
	NO2(ppm)	18	100.00	0.008	0	0.002	-
	NO2(ppm)	19	100.00	0.031	0	0.015	-
	NO2(ppm)	20	99.87	0.028	0	0.008	-
	NO2(ppm)	21	93.15	0.013	0	0.005	-
	NO2(ppm)	22	100.00	0.022	0	0.009	-
	NO2(ppm)	23	100.00	0.065	0	0.033	-
	NO2(ppm)	24	100.00	0.017	0	0.007	-
	NO2(ppm)	500	100.00	0.019	0	0.007	-
	NO2(ppm)	501	100.00	0.040	0	0.010	-
	NO2(ppm)	505	100.00	0.029	0	0.011	-
	CO(ppm)	7	99.87	0.8	0	0.3	-
	NH3(ppm)	1	92.74	0.015	0	0.001	-
	NH3(ppm)	6	90.05	0.000	0	0.000	-
	PM2.5(ug/m3)	1	97.72	330.2	-	93.7	4
	PM2.5(ug/m3)	4	100.00	32.2	-	9.5	0
	PM2.5(ug/m3)	6	100.00	41.8	-	8.6	0
	PM2.5(ug/m3)	7	97.18	24.4	-	12.5	0
	PM2.5(ug/m3)	8	97.04	39.2	-	10.9	0
	PM2.5(ug/m3)	13	99.19	24.6	-	9.3	0
	PM2.5(ug/m3)	14	100.00	62.0	-	7.9	0
	PM2.5(ug/m3)	15	100.00	46.6	-	12.1	0
	PM2.5(ug/m3)	16	98.39	39.9	-	15.2	0
	PM2.5(ug/m3)	17	98.79	39.3	-	15.2	0
	PM2.5(ug/m3)	18	100.00	17.3	-	7.3	0
	PM2.5(ug/m3)	21	98.79	17.5	-	6.6	0
	PM2.5(ug/m3)	22	90.19	20.7	-	7.5	0
	PM2.5(ug/m3)	23	100.00	76.0	-	16.0	0
	PM2.5(ug/m3)	24	100.00	20.0	-	8.0	0
	WIND	1	95.30	-	-	-	-
	WIND	2	94.62	-	-	-	-
	WIND	4	94.76	-	-	-	-
	WIND	5	89.52	-	-	-	-
	WIND	6	97.45	-	-	-	-
	WIND	7	95.16	-	-	-	-
	WIND	8	99.87	-	-	-	-
	WIND	9	92.20	-	-	-	-
	WIND	11	97.98	-	-	-	-
	WIND	13	98.12	-	-	-	-
	WIND	14	99.46	-	-	-	-
	WIND	15	94.89	-	-	-	-
	WIND	16	99.19	-	-	-	-
	WIND	17	94.22	-	-	-	-

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

APPROVAL NUMBERS	page 3 of 3						
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	REPORT DATE						
	MONTH	YEAR					
289664-00-00	12	2017					
241311-00-00	CONTINUOUS AMBIENT MONITORING						
20809-02-00							
149968-01-00							
48522-01-00				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
240008-00-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
48263-01-00	WIND	18	100.00	-	-	-	-
151469-01-00	WIND	19	93.68	-	-	-	-
224816-00-00	WIND	20	98.92	-	-	-	-
189942-00-00	WIND	21	99.87	-	-	-	-
206355-00-00	WIND	22	100.00	-	-	-	-
46586-00-00	WIND	23	98.79	-	-	-	-
73203-02-00	WIND	24	100.00	-	-	-	-
216466-01-00	WIND	25	91.40	-	-	-	-
137467-01-00	WIND	500	100.00	-	-	-	-
236394-00-00	WIND	502	98.66	-	-	-	-
80105-01-00	WIND	505	100.00	-	-	-	-
254465-00-00							
094-02-00							
305529-00-00							
026-02-00							
228044-00-00							
SIGNATURE OF ASSOCIATION REPRESENTATIVE				FOR ALBERTA ENVIRONMENT USE ONLY			



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 1**  
**BERTHA GANTER FORT MCKAY**  
**DECEMBER 2017**

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

January 30, 2018



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY - BERTHA GANTER (AMS 1)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	707	35	37	99.73	12	0	2	0
TRS(ppb) Average	707	35	37	99.73	2	0	1	0
THC(ppm) Average	689	35	55	97.31	3.2	-	2.7	-
NMHC(ppm) Average	689	35	55	97.31	0.847	-	0.202	-
CH4(ppm) Average	689	35	55	97.31	2.9	-	2.5	-
O3 (ppb) Average	708	34	36	99.73	38	0	30	-
NO2 (ppb) Average	705	36	39	99.6	39	0	26	-
NO (ppb) Average	705	36	39	99.6	90	-	31	-
NOX (ppb) Average	705	36	39	99.6	118	-	53	-
NH3 (ppb) Average	646	44	98	92.74	15	0	1	-
PM2.5 (ug/m3) Average	723	4	21	97.72	330.2	-	93.7	4
Wind Speed 10 m (km/h) Average	709	0	35	95.3	26	-	12	-
Wind Direction 10 m (deg) Average	709	0	35	95.3	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100	4.3	-	1.6	-
Temperature 10 m (C) Average	744	0	0	100	4.6	-	2.4	-
Relative Humidity (%) Average	744	0	0	100	97	-	92	-
Precipitation (mm) Total	673	0	71	90.46	2.6	-	12.1	-
Leaf Wetness (% of range) Average	744	0	0	100	68	-	17	-
Global Solar Radiation (W/m2) Average	744	0	0	100	203	-	33	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER FORT McKAY (AMS 1)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	707	0.6	1	-	0	0	0	0	1	1	1	12
TRS (ppb) Average	707	0.7	0	-	0	0	0	0	1	1	1	2
THC (ppm) Average	689	2.24	0.3	-	1.9	1.9	2	2.2	2.4	2.6	2.6	3.2
NMHC(ppm) Average	689	0.078	0.094	-	0	0	0	0	0.1	0.2	0.2	0.847
CH4(ppm) Average	689	2.16	0.2	-	1.9	1.9	2	2.1	2.3	2.4	2.4	2.9
O3 (ppb) Average	708	13.6	11	-	0	1	3	11	23	30	30	38
NO2 (ppb) Average	705	15.9	10	-	0	1	6	17	25	29	29	39
NO (ppb) Average	705	6.5	12	-	0	0	0	1	7	18	18	90
NOX (ppb) Average	705	22.4	19	-	0	1	6	20	31	47	47	118
NH3 (ppb) Average	646	0	1	-	0	0	0	0	0	0	0	15
PM2.5 (ug/m3) Average	723	13.62	32.1	-	0.1	0.8	1.8	4	10.1	29.8	29.8	330.2
Wind Speed 10 m (km/h) Average	709	5.6	4	-	0	2	3	5	7	10	10	26
Wind Direction 10 m (deg) Average	709	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-14.59	12.2	-	-42.7	-32.1	-26.7	-10.7	-4.4	-0.2	-0.2	4.3
Temperature 10 m (C) Average	744	-13.86	12.2	-	-41.9	-31.3	-25.8	-10.3	-3.6	0.9	0.9	4.6
Relative Humidity (%) Average	744	79.6	9	-	60	67	71	81	88	92	92	97
Precipitation (mm) Total	673	-	-	25.65	-	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	744	2.3	7	-	0	0	0	1	2	3	3	68
Global Solar Radiation (W/m2) Average	744	15.5	34	-	0	0	0	0	9	63	63	203

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER Fort McKAY (AMS 1)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NOX,O3, SO2, THC, TRS	07 Dec 2017 11:00	07 Dec 2017 12:00	2	Maintenance - manifold cleaning
NMHC, CH4, THC	01 Dec 2017 11:00	01 Dec 2017 11:00	1	Maintenance - replaced carrier gas
NMHC, CH4, THC	09 Dec 2017 02:00	09 Dec 2017 12:00	11	Unstable operation - excessive baseline drift
NMHC, CH4, THC	09 Dec 2017 13:00	09 Dec 2017 18:00	6	Maintenance - actuator replacement and recalibration
NO2, NO, NOX	05 Dec 2017 12:00	05 Dec 2017 12:00	1	Power spike
PM2.5	14 Dec 2017 00:00	14 Dec 2017 00:00	1	Unstable operation - excessive baseline drift
PM2.5	15 Dec 2017 14:00	15 Dec 2017 15:00	2	Unstable operation - excessive baseline drift
PM2.5	15 Dec 2017 23:00	16 Dec 2017 00:00	2	Unstable operation - excessive baseline drift
PM2.5	17 Dec 2017 15:00	17 Dec 2017 21:00	7	Unstable operation - excessive baseline drift
PM2.5	17 Dec 2017 23:00	18 Dec 2017 03:00	5	Unstable operation - excessive baseline drift
NH3	01 Dec 2017 09:00	31 Dec 2017 10:00	54	Stabilization after daily span
Precipitation Collector	01 Dec 2017 01:00	03 Dec 2017 23:00	71	Analyzer Failure - inconsistent response
Wind Speed, Wind Direction	10 Dec 2017 10:00	10 Dec 2017 10:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	15 Dec 2017 08:00	15 Dec 2017 09:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	16 Dec 2017 03:00	17 Dec 2017 10:00	32	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 12 ppb on Dec 16 23:00	Maximum Daily Average: 2.0 ppb on Dec 20		Hours of Data:	707
Minimum Value: 0 ppb on Dec 18 20:00	Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Missing Data:	37
Maximum Diurnal Average: 1.0 ppb at hour 14	Minimum Diurnal Average: 0.4 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 0.6 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 4		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0.3	1
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0.4	1
3-Dec	Z	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Dec	0	Z	0	0	0	0	0	0	0	0	1	C	C	C	C	1	1	1	1	2	1	1	1	3	0.8	3
5-Dec	0	0	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
6-Dec	1	1	1	Z	3	3	2	2	2	3	2	2	2	1	1	1	1	1	1	1	0	0	0	0	1.4	3
7-Dec	0	0	1	1	Z	0	0	0	1	1	M	M	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
8-Dec	1	1	1	1	1	Z	1	1	1	1	2	1	2	2	2	2	1	1	1	1	1	0	1	1	1.1	2
9-Dec	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.4	1
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	2	2	3	1	1	1	1	1	1	0.7	3
12-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	0	0	0	0	Z	0	1	1	1	0	1	2	3	1	0	0	0	0	0	0	0	0	0	0.5	3
15-Dec	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	12	12	1.4	12
17-Dec	10	3	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	10
18-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	0.7	2
20-Dec	1	1	3	1	1	Z	4	3	2	2	5	5	4	5	3	1	1	1	1	1	1	1	1	1	2.0	5
21-Dec	Z	1	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.4	1
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	1	1	0.4	1
26-Dec	1	1	2	1	1	Z	1	1	1	1	1	1	2	2	2	2	1	1	1	0	0	0	0	0	1.1	2
27-Dec	Z	0	0	0	1	1	1	1	1	1	1	2	1	2	2	2	1	1	1	0	0	0	0	0	0.9	2
28-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
29-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	2	1	1	1	1	1	1	1	1	0.6	2
30-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	0	0	1	0.9	2
31-Dec	1	1	0	0	Z	0	0	0	1	1	4	2	1	5	3	3	2	1	1	1	2	1	1	1	1.4	5

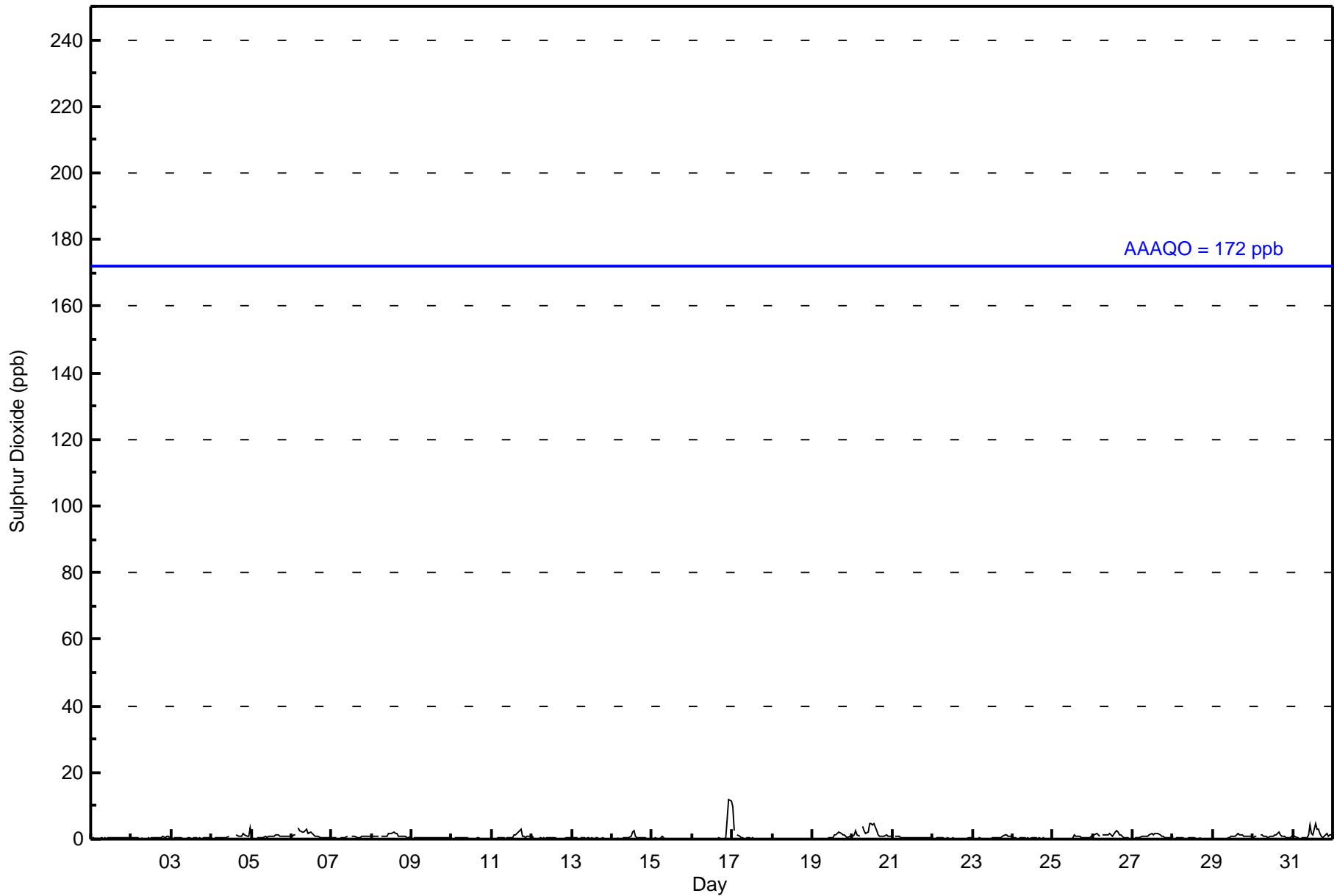
0.8	0.5	0.6	0.4	0.6	0.5	0.6	0.5	0.4	0.5	0.8	0.7	0.7	1.0	0.8	0.8	0.7	0.6	0.5	0.5	0.5	0.6	0.8	0.9	Diurnal Average
10	3	3	1	3	3	4	3	2	3	5	5	4	5	3	3	2	3	1	2	2	6	12	12	Diurnal Maximum

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 (SO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	705	99.72	99.72
11 - 20	2	0.28	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	48	26	5	6	3	6	9	40	263	58	33	29	39	56	30	22	673
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
<b>Totals</b>	48	26	5	6	3	6	9	40	263	58	33	29	39	56	30	22	673

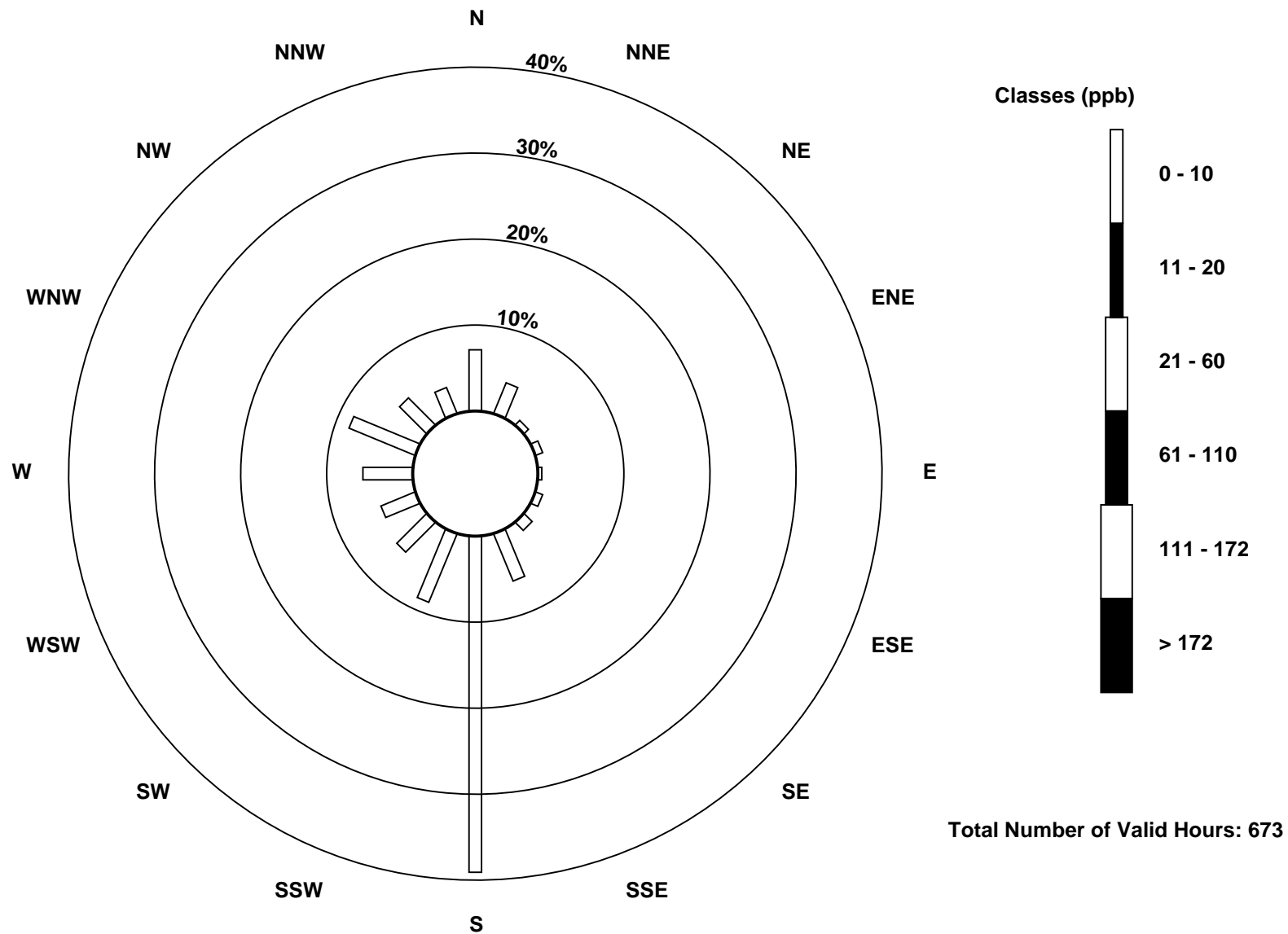
Total Number of Valid Hours: 673

Total Number of Hours: 744

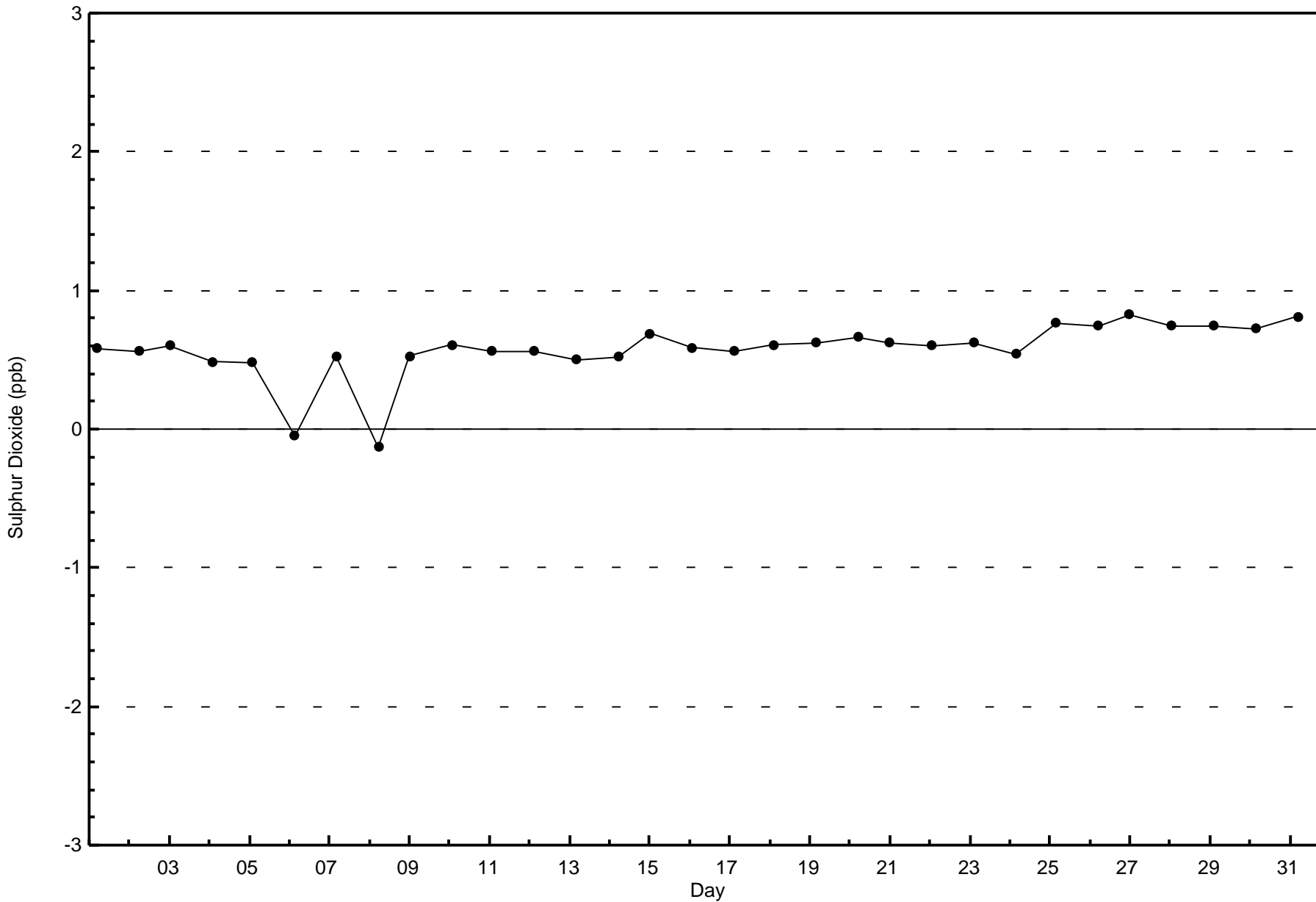


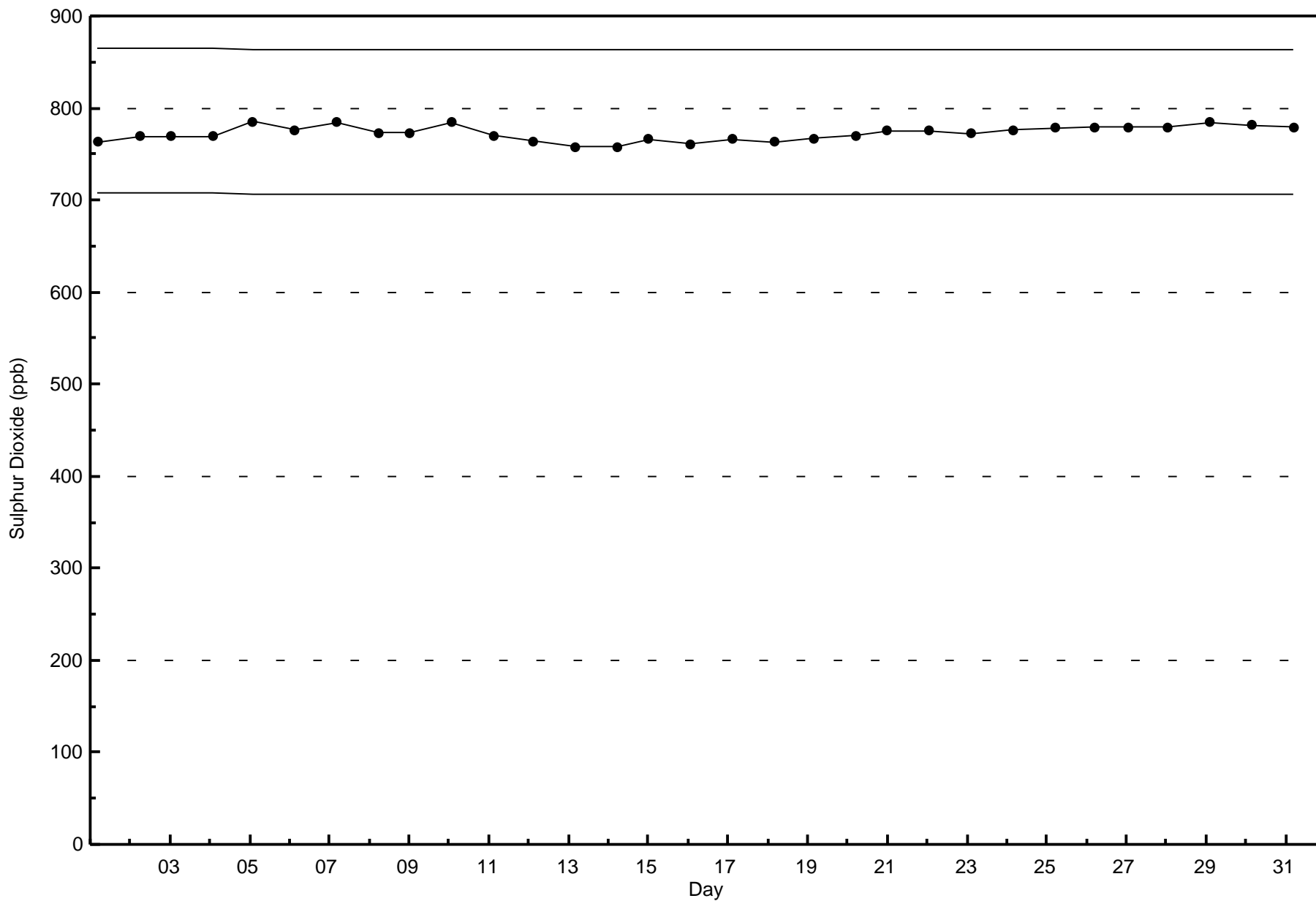
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)







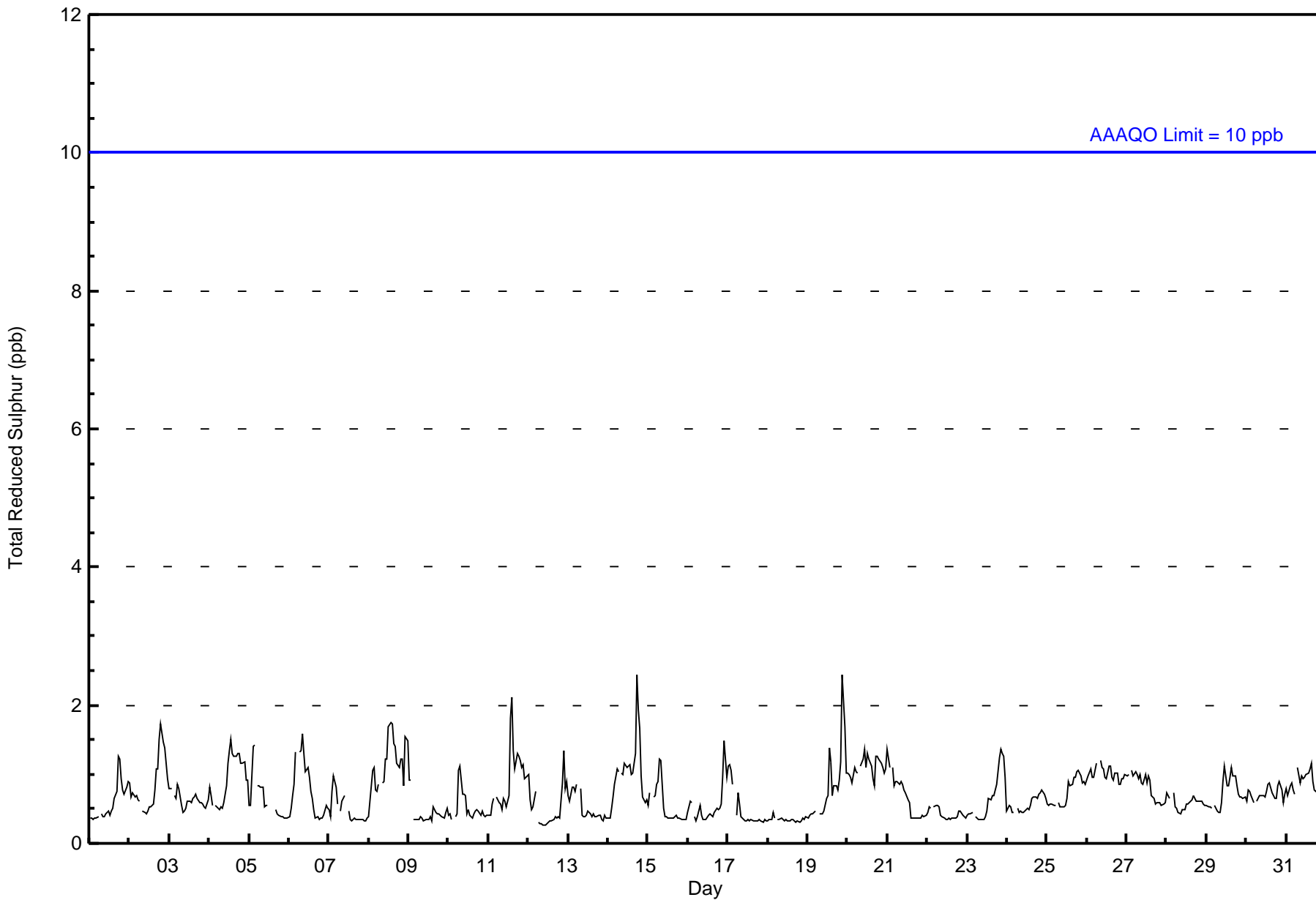






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Fort McKay - Bertha Ganter - December 2017**

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

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	48	25	5	6	3	6	9	43	266	57	31	31	38	54	32	20	674
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
<b>Totals</b>	48	25	5	6	3	6	9	43	266	57	31	31	38	54	32	20	674

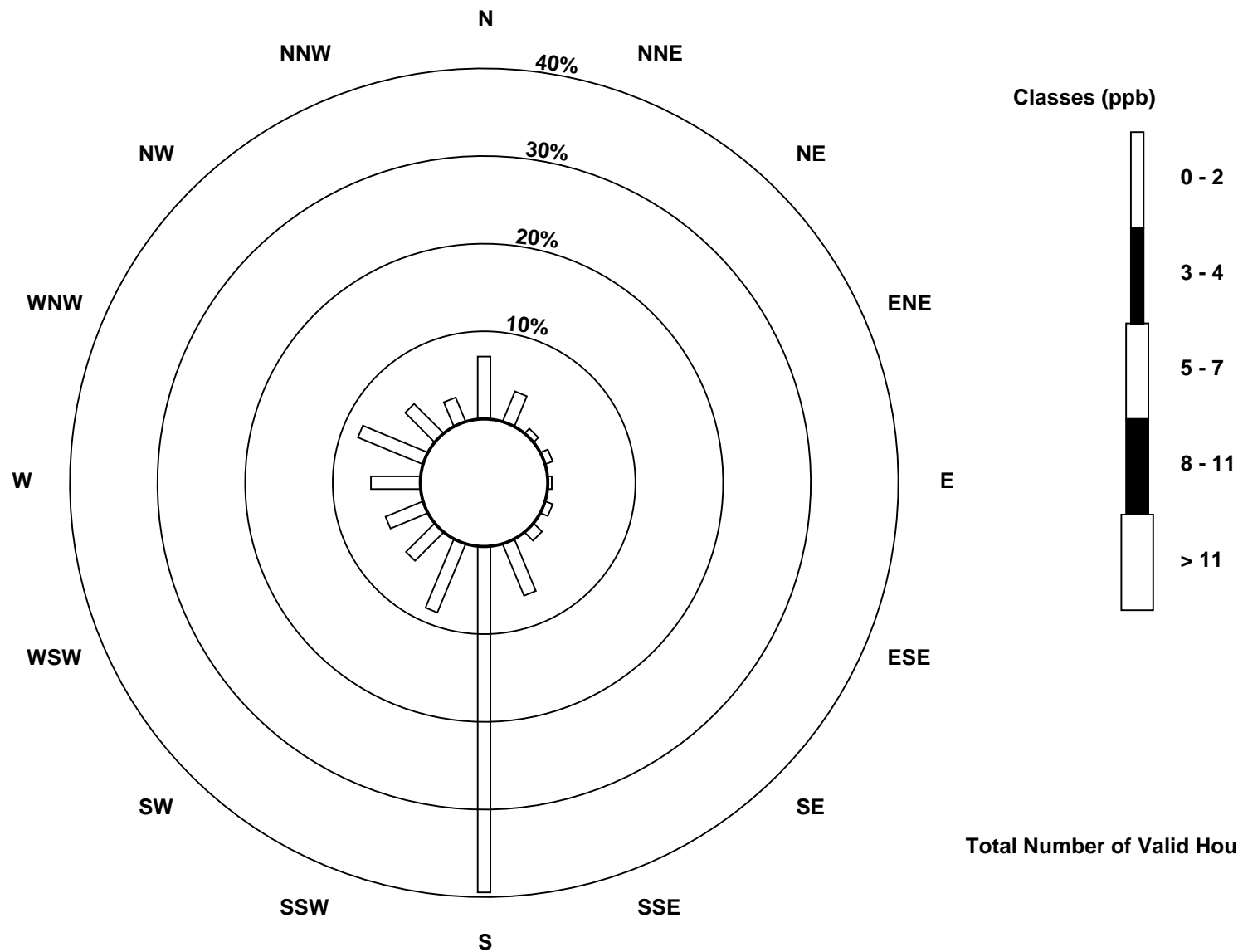
Total Number of Valid Hours: 674

Total Number of Hours: 744

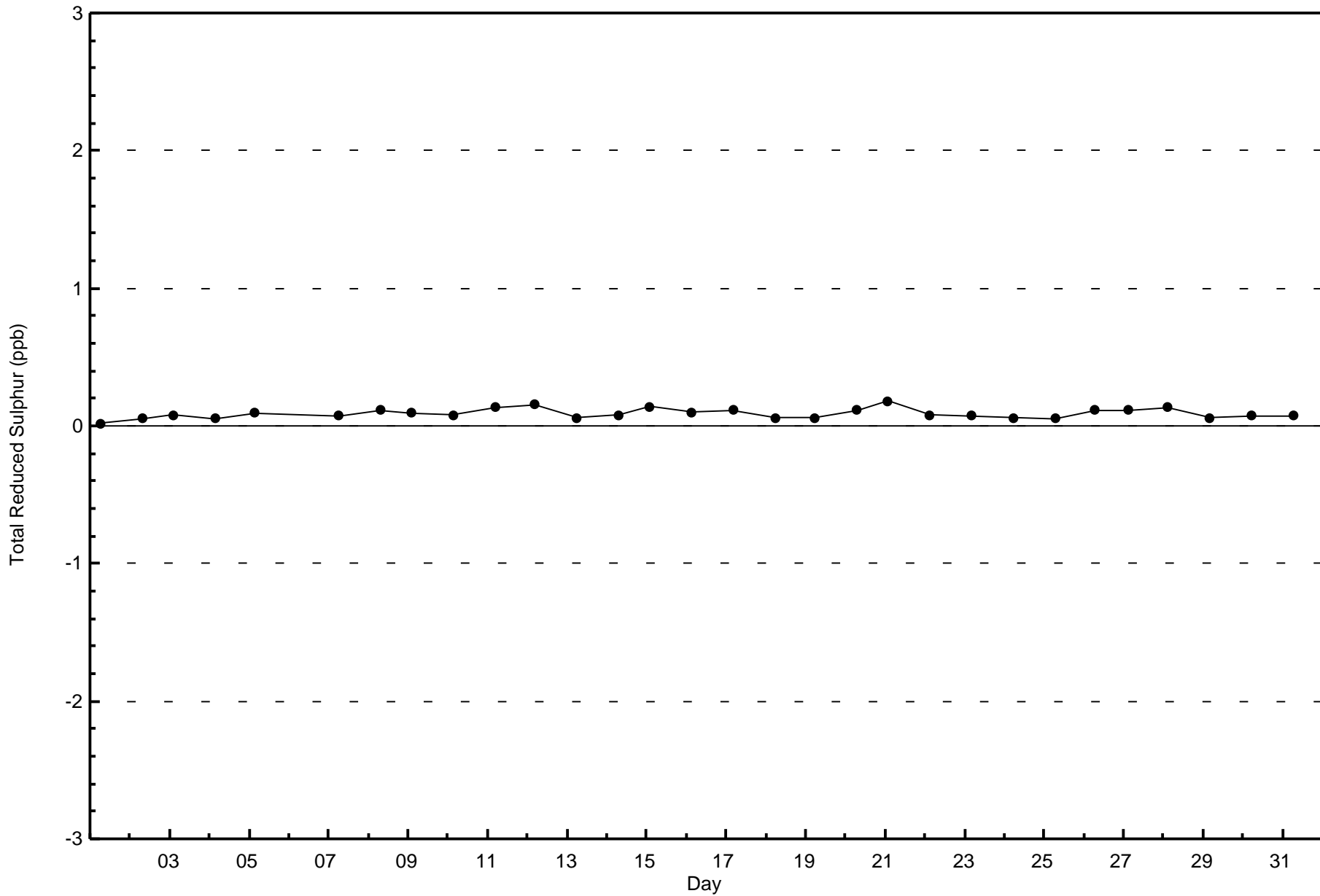


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

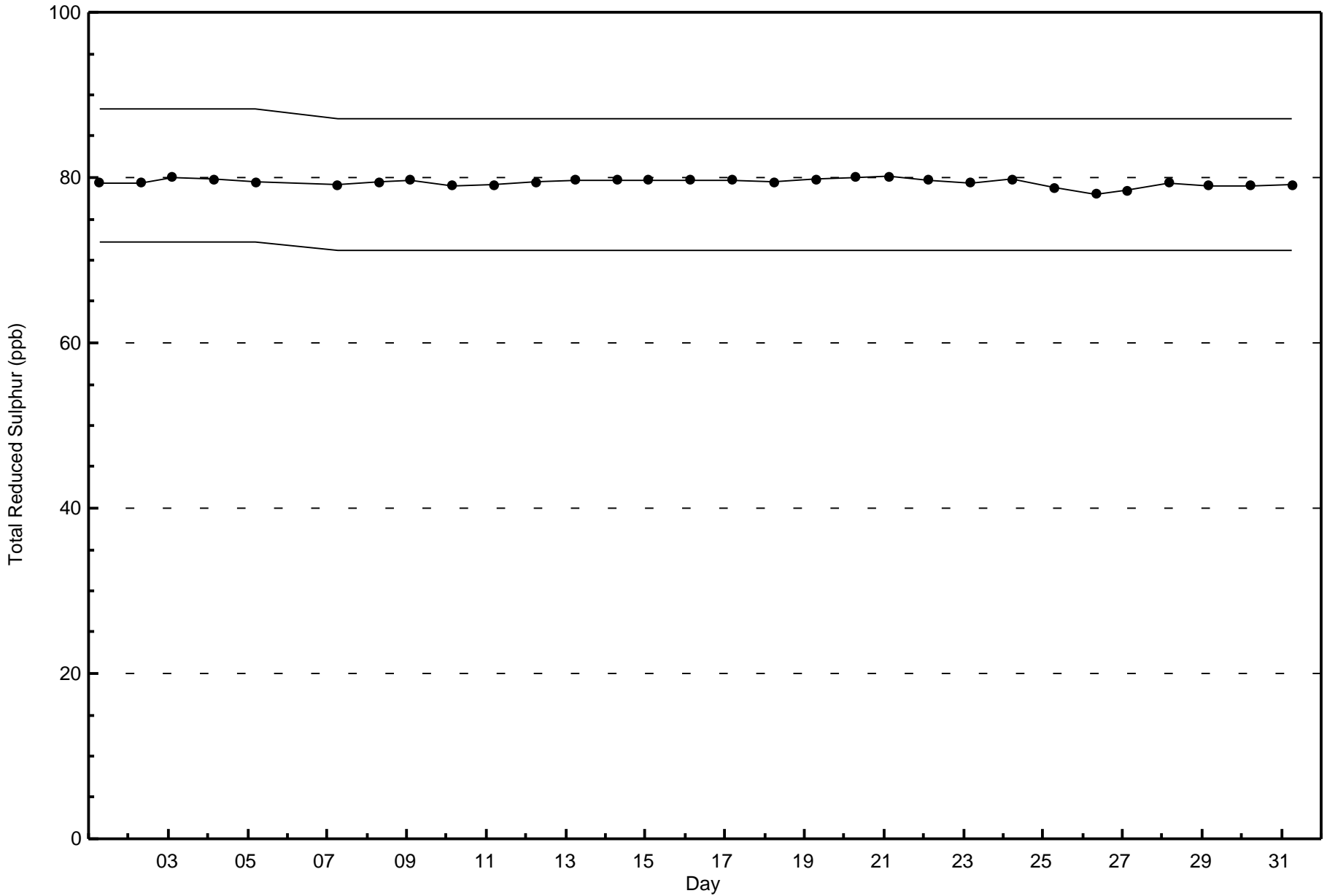
Total Reduced Sulphur (TRS) - ppb  
Fort McKay - Bertha Ganter (AMS 1)



Total Number of Valid Hours: 674







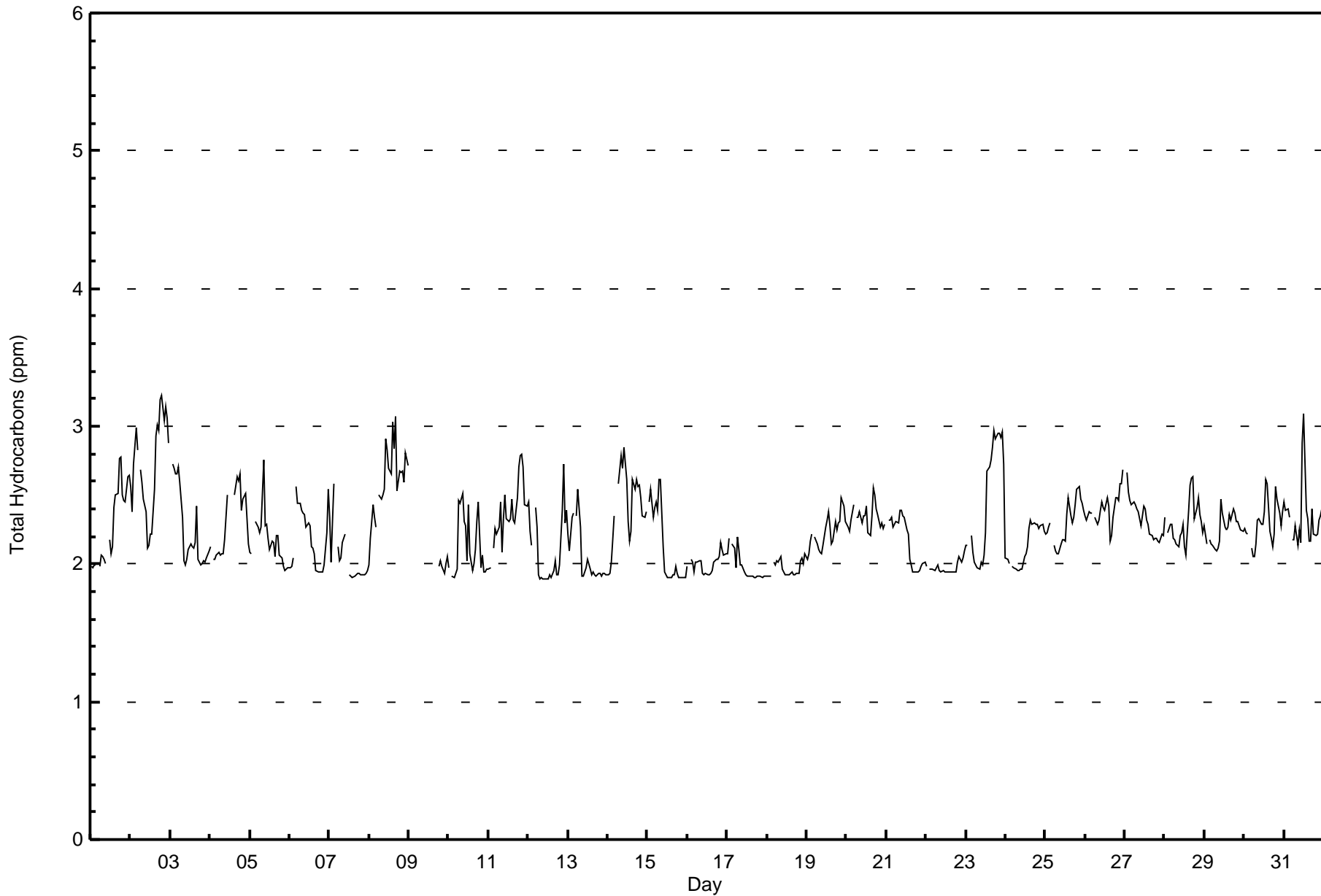


Maximum Value: 3.2 ppm on Dec 2 20:00																				Maximum Daily Average: 2.7 ppm on Dec 2					Hours in Service: 744				
Minimum Value: 1.9 ppm on Dec 12 11:00																				Minimum Daily Average: 2.0 ppm on Dec 18					Hours of Data: 689				
Maximum Diurnal Average: 2.3 ppm at hour 18																				Minimum Diurnal Average: 2.2 ppm at hour 1					Hours of Missing Data: 55				
Monthly Average: 2.24 ppm																				Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 2.0 Median = 2.2 Q <sub>3</sub> = 2.4 P <sub>90</sub> = 2.6 P <sub>99</sub> = 3.0					Hours of Calibration: 35				
																									Percent Operational Time: 97.3				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.0	2.0	M	2.2	2.1	2.1	2.4	2.5	2.5	2.8	2.8	2.5	2.5	2.5	2.6	2.6	2.3	2.8			
2-Dec	2.6	2.4	2.7	3.0	2.8	Z	2.7	2.6	2.5	2.4	2.1	2.1	2.2	2.2	2.5	2.9	3.0	3.0	3.2	3.2	3.0	3.1	3.1	2.9	2.7	3.2			
3-Dec	Z	2.7	2.7	2.7	2.7	2.7	2.6	2.3	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.4	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.7				
4-Dec	2.1	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.5	C	C	C	C	2.5	2.6	2.6	2.7	2.4	2.5	2.5	2.3	2.1	2.3	2.7			
5-Dec	2.1	2.1	Z	2.3	2.3	2.3	2.2	2.3	2.8	2.3	2.3	2.2	2.1	2.2	2.2	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.2	2.8				
6-Dec	2.0	2.0	2.0	Z	2.6	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.1	2.1	2.1	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.5	2.2	2.6			
7-Dec	2.3	2.0	2.3	2.6	Z	2.1	2.0	2.0	2.2	2.2	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	2.6				
8-Dec	2.0	2.2	2.4	2.3	2.3	Z	2.5	2.5	2.5	2.5	2.9	2.8	2.7	2.7	3.0	2.8	3.1	2.5	2.7	2.7	2.6	2.8	2.7	2.6	3.1				
9-Dec	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	M	M	2.0	2.0	2.0	1.9	2.0	2.1	--	2.1			
10-Dec	2.0	Z	1.9	1.9	1.9	2.0	2.5	2.4	2.5	2.3	2.3	2.0	2.4	2.1	1.9	2.0	2.1	2.3	2.5	2.0	2.1	1.9	1.9	2.0	2.1	2.5			
11-Dec	2.0	2.0	Z	2.1	2.3	2.2	2.3	2.5	2.1	2.3	2.5	2.3	2.3	2.3	2.5	2.3	2.3	2.5	2.7	2.8	2.7	2.4	2.4	2.4	2.8				
12-Dec	2.5	2.2	2.1	Z	2.4	2.3	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	2.0	2.4	2.7	2.3	2.4	2.1	2.7			
13-Dec	2.2	2.1	2.3	2.4	Z	2.4	2.5	2.3	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	2.1	2.5				
14-Dec	1.9	1.9	2.0	2.2	2.3	Z	2.6	2.7	2.8	2.7	2.8	2.6	2.3	2.2	2.2	2.6	2.5	2.6	2.6	2.6	2.5	2.3	2.3	2.4	2.4	2.8			
15-Dec	Z	2.4	2.5	2.3	2.4	2.5	2.4	2.6	2.6	2.1	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	2.1	2.6				
16-Dec	2.0	Z	2.0	2.0	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.2	2.1	2.1	2.1	2.0	2.2			
17-Dec	2.1	2.2	Z	2.1	2.1	2.0	2.2	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	2.0	2.2			
18-Dec	1.9	1.9	1.9	Z	2.0	2.0	2.0	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	2.0	2.0	2.0	2.1	2.0	2.1			
19-Dec	2.0	2.1	2.2	2.2	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.3	2.3	2.4	2.3	2.1	2.2	2.3	2.3	2.3	2.3	2.5	2.4	2.3	2.2	2.5			
20-Dec	2.3	2.3	2.2	2.3	2.4	Z	2.3	2.3	2.4	2.3	2.4	2.3	2.4	2.2	2.2	2.4	2.6	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.6			
21-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.2	2.2	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.2	2.4			
22-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.0	2.1	2.0	2.1			
23-Dec	2.1	2.1	Z	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.7	2.7	2.8	2.8	3.0	2.9	2.9	2.9	2.9	3.0	2.7	2.4	3.0			
24-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.3			
25-Dec	2.2	2.2	2.3	2.3	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.4	2.5	2.4	2.3	2.3	2.4	2.5	2.6	2.5	2.4	2.4	2.3	2.6			
26-Dec	2.3	2.3	2.4	2.4	2.4	Z	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.4	2.2	2.2	2.3	2.5	2.5	2.5	2.6	2.6	2.7	2.4	2.7			
27-Dec	Z	2.7	2.5	2.5	2.4	2.5	2.4	2.4	2.4	2.3	2.3	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.7			
28-Dec	2.3	Z	2.2	2.3	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.3	2.1	2.1	2.4	2.6	2.6	2.6	2.6	2.3	2.4	2.5	2.4	2.3	2.2	2.3	2.6		
29-Dec	2.3	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.5	2.4	2.3	2.2	2.3	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.3	2.5		
30-Dec	2.3	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.3	2.3	2.3	2.3	2.4	2.6	2.6	2.2	2.2	2.2	2.1	2.2	2.6	2.5	2.4	2.3	2.4	2.3	2.6		
31-Dec	2.5	2.4	2.4	2.3	Z	2.2	2.2	2.3	2.1	2.2	2.2	2.9	3.1	2.4	2.3	2.2	2.2	2.4	2.2	2.2	2.2	2.3	2.3	2.4	2.3	3.1			
																								Diurnal Average					
																								Diurnal Maximum					
Z - zerospan																								C - Calibration					
																								M - Maintenance					
																								UO - Unstable Operation					



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	218	31.64	31.64
2.1 - 3.0	465	67.49	99.13
3.1 - 10.0	6	0.87	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 689

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	17	8	2	1	3	4	5	7	18	12	10	18	16	47	23	7	198
2.1 - 3.0	31	18	3	5	0	2	4	33	241	45	19	10	12	7	7	14	451
3.1 - 10.0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	1	6
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	48	26	5	6	3	6	9	40	261	58	29	28	29	55	30	22	655

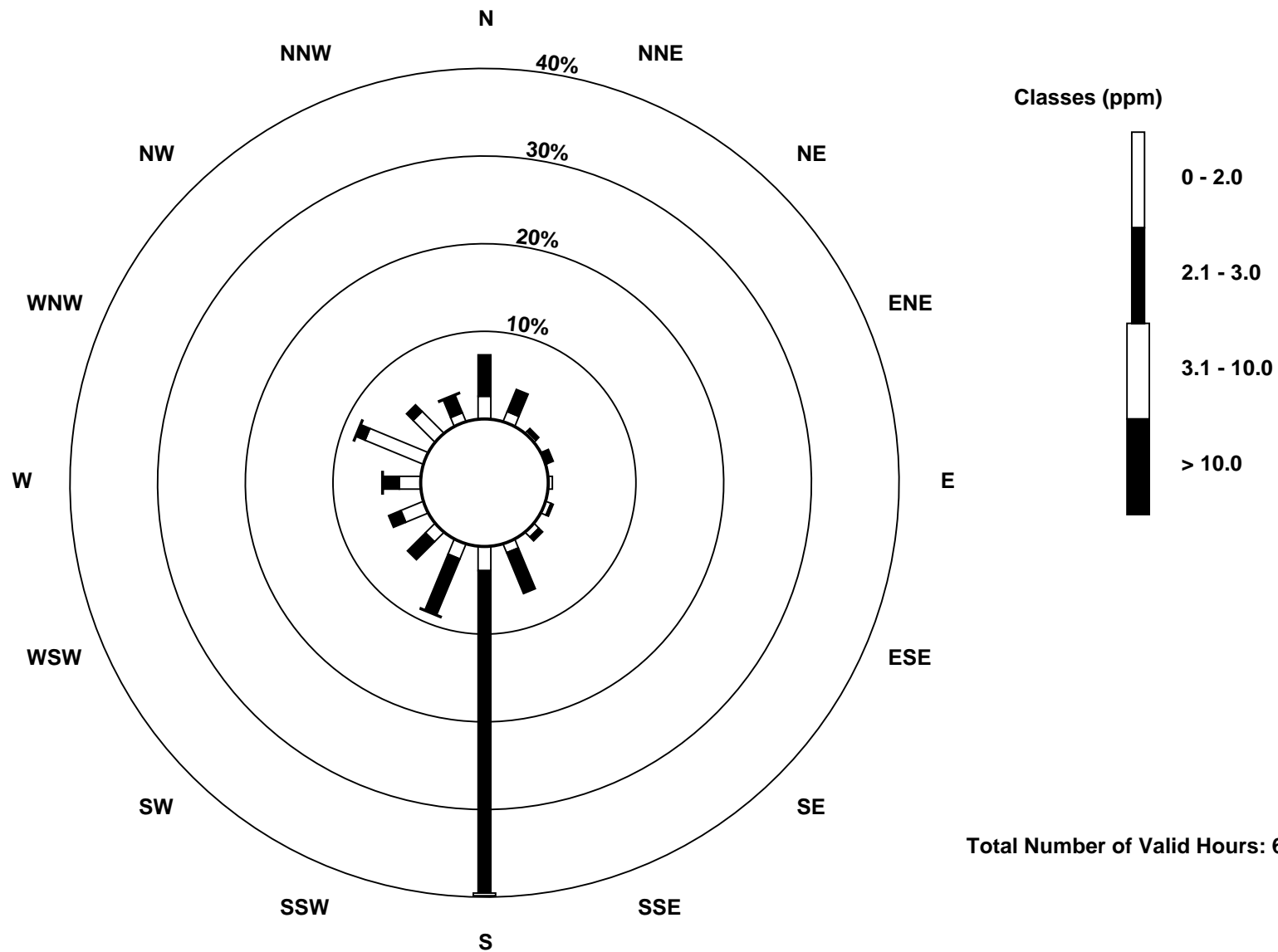
Total Number of Valid Hours: 655

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

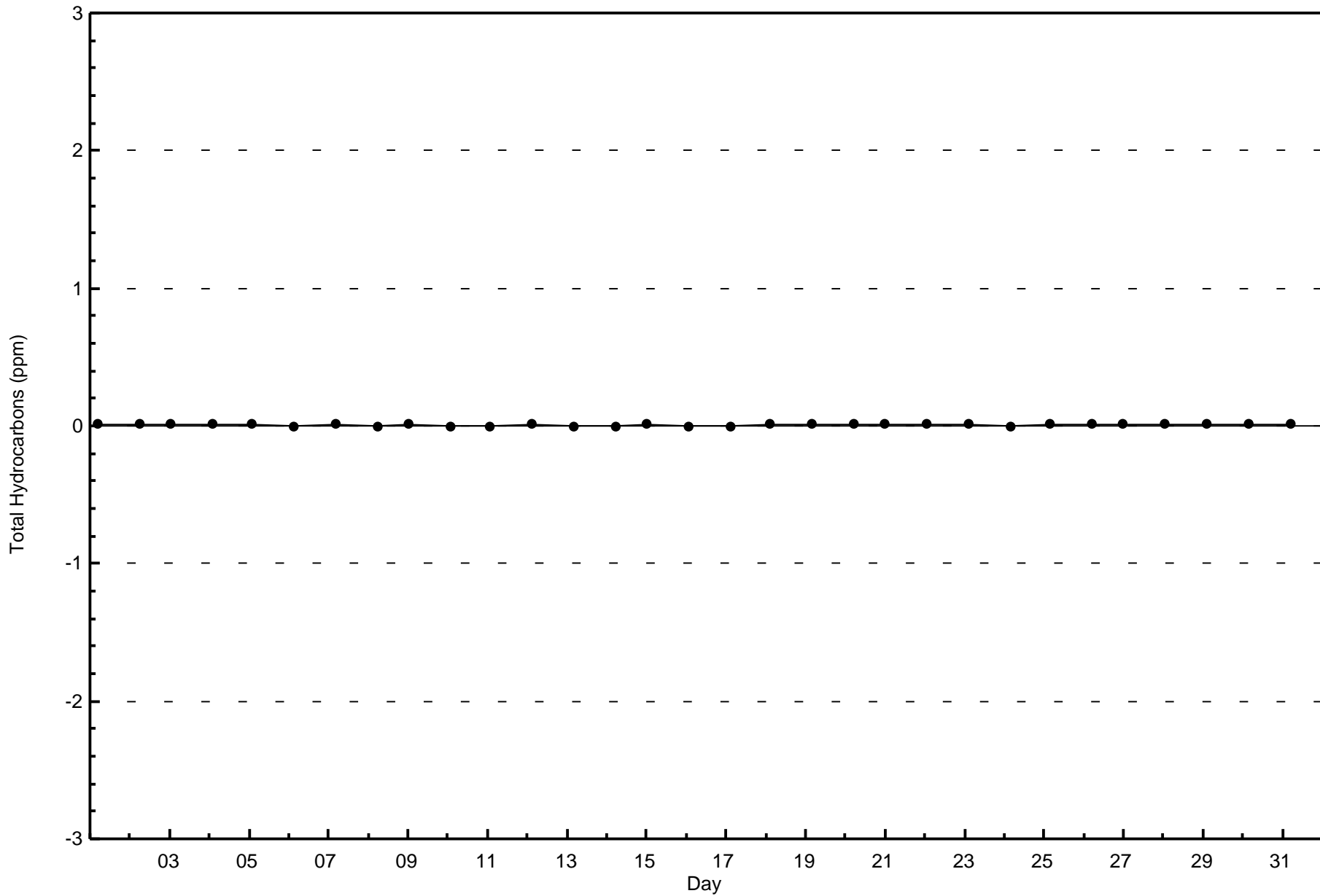
Total Hydrocarbons (THC) - ppm  
Fort McKay - Bertha Ganter (AMS 1)

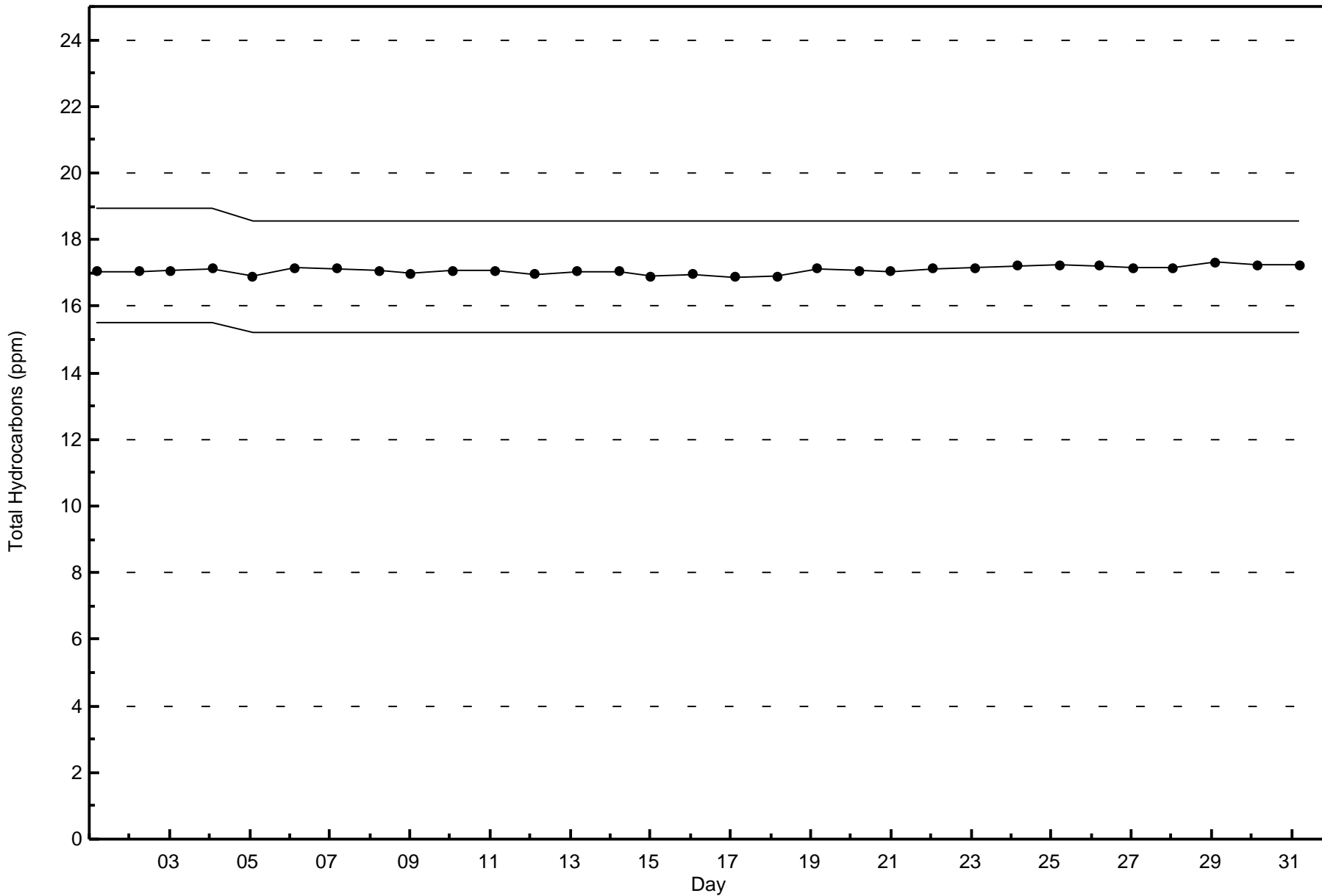




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Fort McKay - Bertha Ganter - December 2017









Wood Buffalo Environmental Association

Summary of Hour Averages

Non Methane Hydrocarbons (NMHC) - ppm

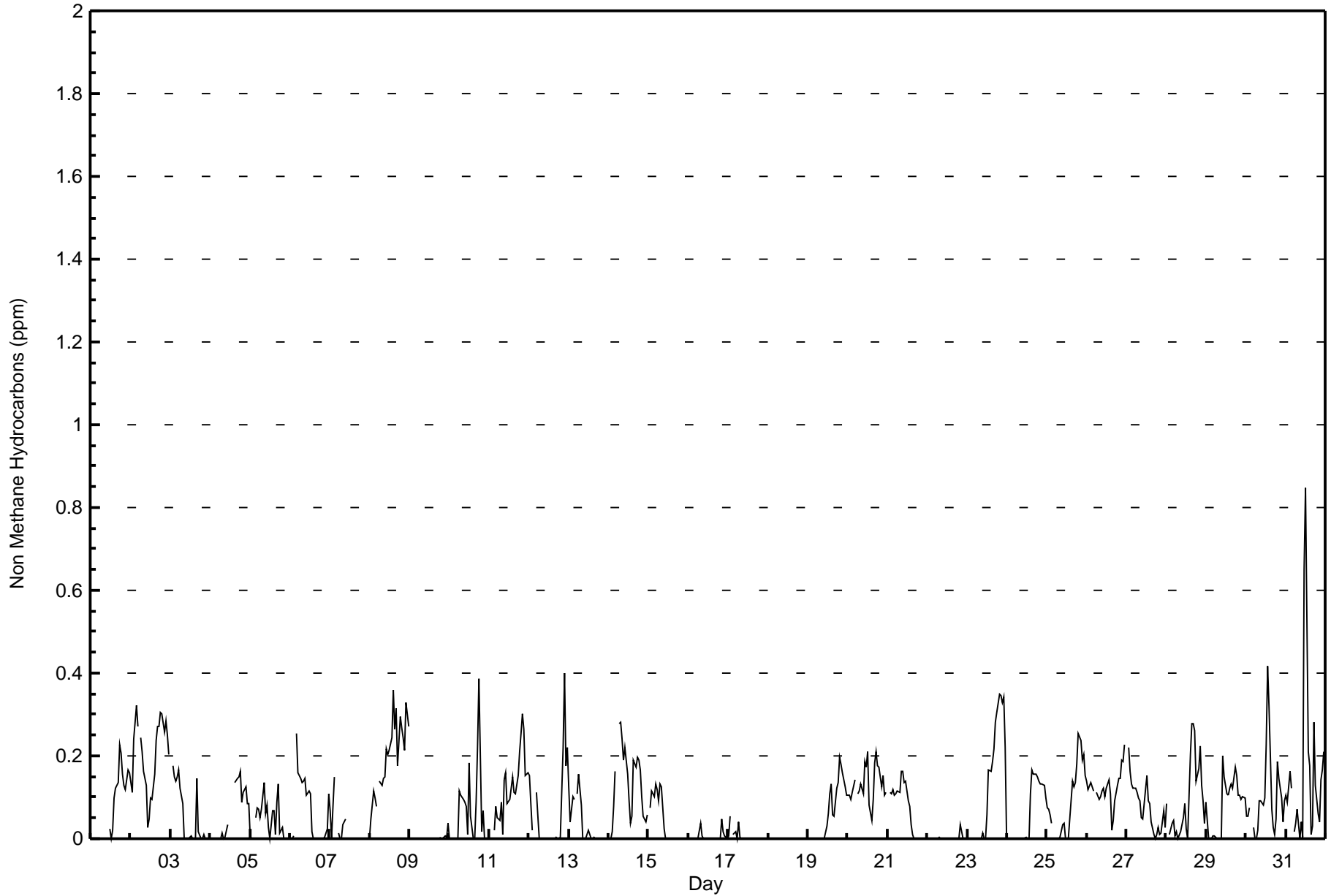
Fort McKay - Bertha Ganter - December 2017

Maximum Value: 0.847 ppm on Dec 31 13:00																								Hours in Service: 744			
Maximum Daily Average: 0.202 ppm on Dec 2																								Hours of Data: 689			
Minimum Value: 0.000 ppm on Dec 1 01:00																								Hours of Missing Data: 55			
Minimum Daily Average: 0.000 ppm on Dec 18																								Hours of Calibration: 35			
Maximum Diurnal Average: 0.109 ppm at hour 18																								Percent Operational Time: 97.3			
Minimum Diurnal Average: 0.040 ppm at hour 6																											
Monthly Average: 0.078 ppm																											
Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.1 P <sub>90</sub> = 0.2 P <sub>99</sub> = 0.3																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	M	0.023	0.000	0.019	0.098	0.123	0.136	0.226	0.207	0.156	0.128	0.120	0.165	0.158	0.071	0.226	
2-Dec	0.137	0.112	0.242	0.322	0.272	Z	0.245	0.209	0.164	0.129	0.028	0.047	0.097	0.095	0.154	0.237	0.272	0.270	0.306	0.303	0.259	0.285	0.250	0.204	0.202	0.322	
3-Dec	Z	0.175	0.150	0.139	0.148	0.167	0.123	0.085	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.146	0.016	0.000	0.000	0.010	0.000	0.000	0.000	0.051	0.175	
4-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.013	0.002	0.003	0.035	C	C	C	C	0.136	0.147	0.149	0.162	0.089	0.112	0.124	0.086	0.083	0.060	0.162	
5-Dec	0.008	0.001	Z	0.050	0.076	0.070	0.052	0.072	0.137	0.062	0.080	0.027	0.000	0.068	0.066	0.072	0.000	0.088	0.131	0.014	0.029	0.000	0.000	0.000	0.045	0.137	
6-Dec	0.000	0.000	0.007	Z	0.256	0.159	0.145	0.137	0.137	0.147	0.105	0.116	0.110	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.023	0.110	0.064	0.256	
7-Dec	0.067	0.000	0.077	0.150	Z	0.015	0.000	0.000	0.034	0.047	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.150	
8-Dec	0.000	0.048	0.115	0.098	0.077	Z	0.139	0.129	0.145	0.151	0.218	0.204	0.215	0.244	0.359	0.263	0.315	0.177	0.294	0.268	0.244	0.213	0.329	0.273	0.196	0.359	
9-Dec	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	M	M	0.005	0.002	0.000	0.006	0.004	0.038	--	0.038	
10-Dec	0.000	Z	0.000	0.000	0.000	0.001	0.116	0.103	0.096	0.089	0.080	0.012	0.184	0.054	0.000	0.001	0.087	0.220	0.386	0.016	0.069	0.000	0.000	0.000	0.066	0.386	
11-Dec	0.000	0.000	Z	0.022	0.078	0.052	0.043	0.087	0.009	0.143	0.161	0.085	0.094	0.123	0.149	0.111	0.109	0.154	0.211	0.253	0.301	0.266	0.151	0.158	0.120	0.301	
12-Dec	0.154	0.086	0.021	Z	0.112	0.056	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	0.004	0.220	0.398	0.178	0.222	0.063	0.398	
13-Dec	0.125	0.040	0.102	0.094	Z	0.107	0.155	0.080	0.000	0.000	0.000	0.011	0.021	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.032	0.155	
14-Dec	0.000	0.000	0.017	0.078	0.163	Z	0.279	0.282	0.239	0.190	0.220	0.156	0.091	0.036	0.054	0.189	0.172	0.196	0.189	0.167	0.103	0.054	0.041	0.057	0.129	0.282	
15-Dec	Z	0.074	0.114	0.101	0.133	0.117	0.093	0.131	0.124	0.024	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.133	
16-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.001	0.037	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.016	0.007	0.000	0.005	0.046	
17-Dec	0.006	0.054	Z	0.009	0.016	0.000	0.040	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	0.006	0.054	
18-Dec	0.002	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	0.002	0.002
19-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.063	0.107	0.133	0.057	0.056	0.123	0.136	0.195	0.179	0.159	0.125	0.106	0.064	0.195	
20-Dec	0.106	0.105	0.096	0.110	0.143	Z	0.109	0.114	0.133	0.108	0.186	0.174	0.209	0.080	0.045	0.096	0.183	0.210	0.176	0.172	0.125	0.153	0.105	0.112	0.133	0.210	
21-Dec	Z	0.112	0.109	0.119	0.106	0.109	0.115	0.111	0.162	0.164	0.137	0.141	0.093	0.077	0.033	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.069	0.164	
22-Dec	0.000	Z	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	0.034	0.000	0.000	0.000	0.002	0.034	
23-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000	0.058	0.166	0.164	0.186	0.217	0.283	0.306	0.348	0.344	0.328	0.341	0.221	0.129	0.348	
24-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.109	0.165	0.157	0.154	0.148	0.141	0.131	0.132	0.128	0.097	0.059	0.165	
25-Dec	0.074	0.073	0.056	0.037	Z	0.000	0.000	0.000	0.002	0.033	0.038	0.001	0.000	0.001	0.049	0.138	0.124	0.135	0.181	0.254	0.237	0.189	0.205	0.152	0.086	0.254	
26-Dec	0.139	0.118	0.136	0.126	0.116	Z	0.113	0.094	0.101	0.116	0.121	0.102	0.121	0.144	0.110	0.020	0.044	0.093	0.130	0.144	0.145	0.190	0.186	0.229	0.123	0.229	
27-Dec	Z	0.220	0.163	0.133	0.121	0.122	0.111	0.099	0.093	0.052	0.049	0.118	0.153	0.092	0.084	0.041	0.011	0.000	0.009	0.027	0.010	0.014	0.067	0.027	0.079	0.220	
28-Dec	0.085	Z	0.011	0.038	0.043	0.008	0.017	0.000	0.017	0.035	0.049	0.086	0.023	0.000	0.203	0.279	0.278	0.262	0.140	0.170	0.223	0.129	0.092	0.039	0.097	0.279	
29-Dec	0.087	0.000	Z	0.000	0.006	0.006	0.000	0.000	0.000	0.001	0.201	0.151	0.108	0.104	0.122	0.133	0.124	0.173	0.151	0.104	0.104	0.095	0.100	0.099	0.081	0.201	
30-Dec	0.055	0.053	0.076	Z	0.029	0.000	0.000	0.019	0.091	0.093	0.081	0.100	0.229	0.415	0.319	0.071	0.028	0.010	0.047	0.186	0.145	0.097	0.042	0.091	0.099	0.415	
31-Dec	0.104	0.089	0.163	0.123	Z	0.017	0.039	0.072	0.000	0.040	0.003	0.652	0.847	0.210	0.176	0.010	0.032	0.281	0.128	0.061	0.040	0.144	0.167	0.212	0.157	0.847	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan																											
C - Calibration																											
M - Maintenance																											
UO - Unstable Operation																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	264	38.32	38.32
0.006 - 0.05	98	14.22	52.54
0.06 - 0.1	195	28.30	80.84
> 0.1	132	19.16	100.00

Total Number of Valid Hours: 689

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	23	11	2	2	2	4	5	11	31	18	16	18	19	49	22	10	243
0.006 - 0.05	6	4	1	1	1	0	2	7	40	6	3	4	6	1	4	2	88
0.06 - 0.1	10	10	1	1	0	2	2	16	118	15	2	5	1	2	2	5	192
> 0.1	9	1	1	2	0	0	0	6	72	19	8	1	3	3	2	5	132
<b>Totals</b>	48	26	5	6	3	6	9	40	261	58	29	28	29	55	30	22	655

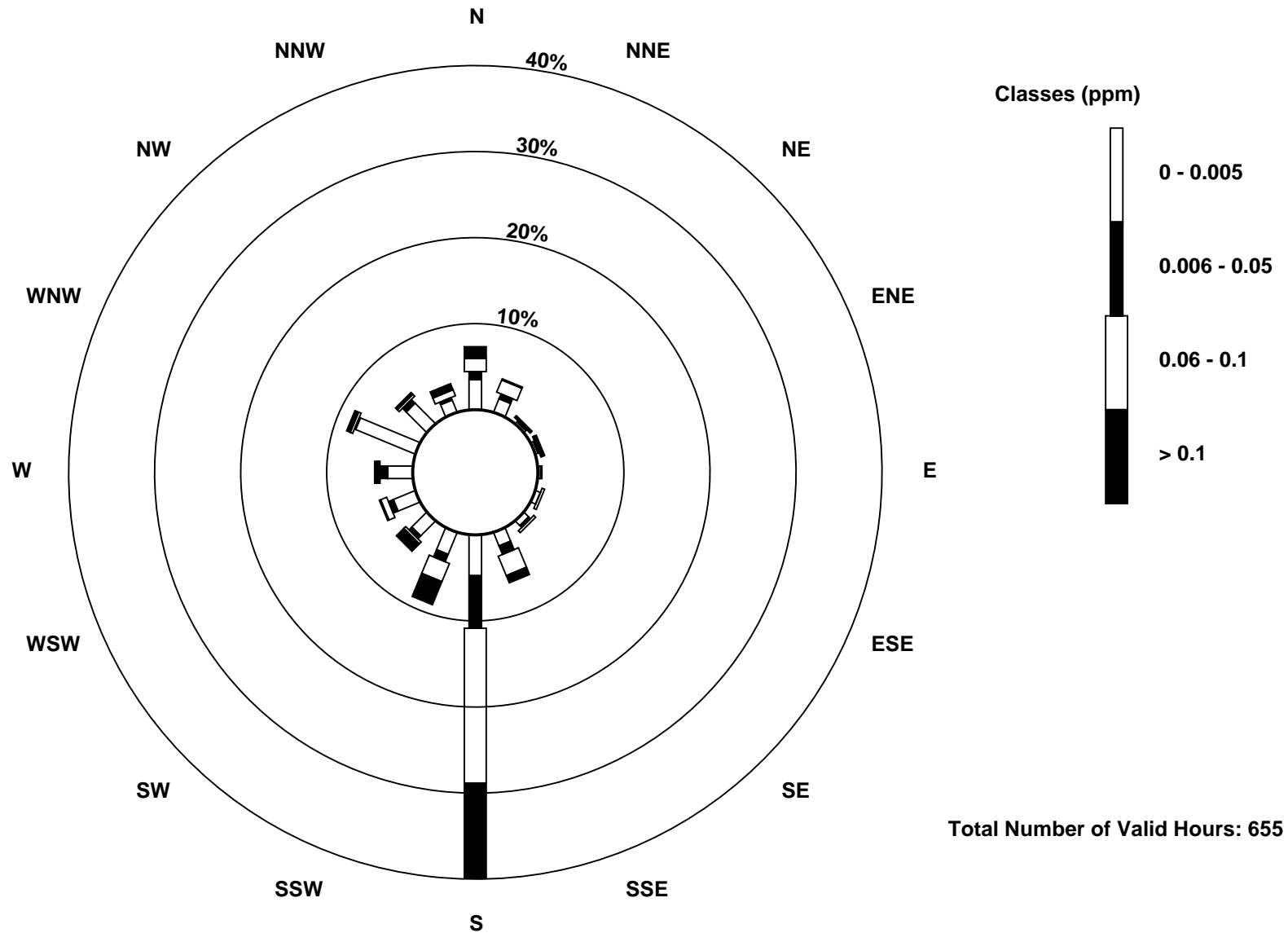
Total Number of Valid Hours: 655

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

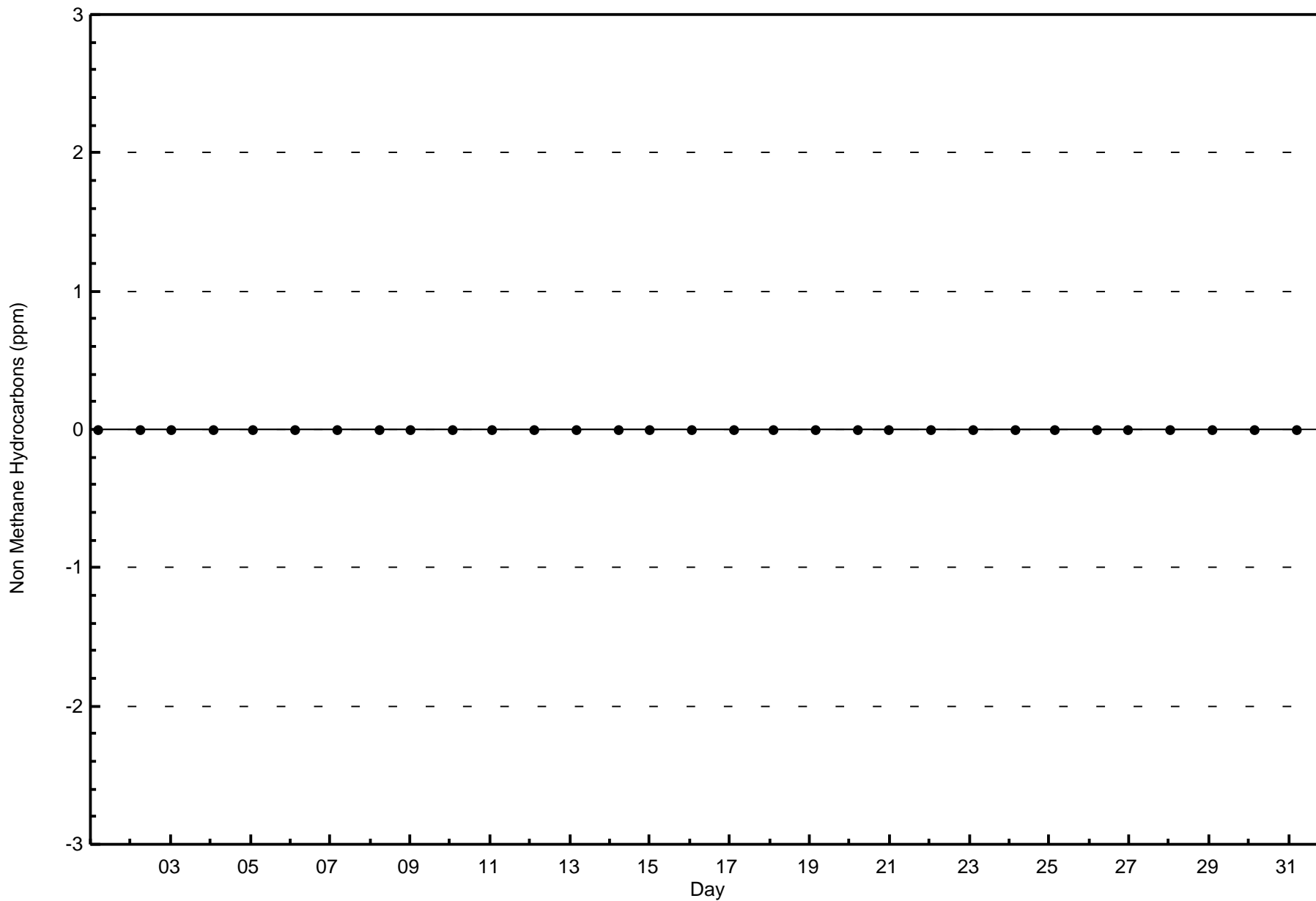
Non Methane Hydrocarbons (NMHC) - ppm  
Fort McKay - Bertha Ganter (AMS 1)

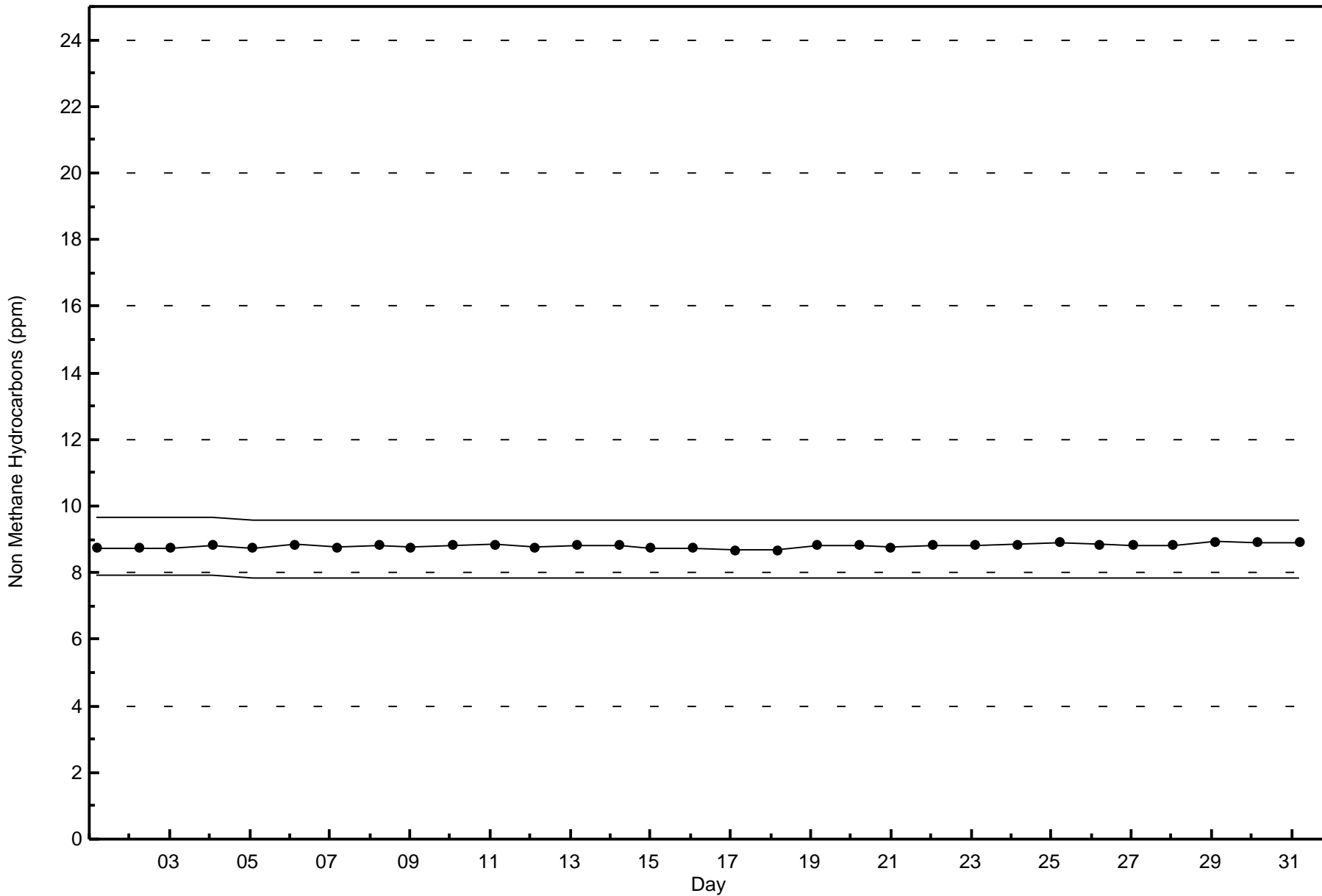




Wood Buffalo Environmental Association  
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm  
Fort McKay - Bertha Ganter - December 2017





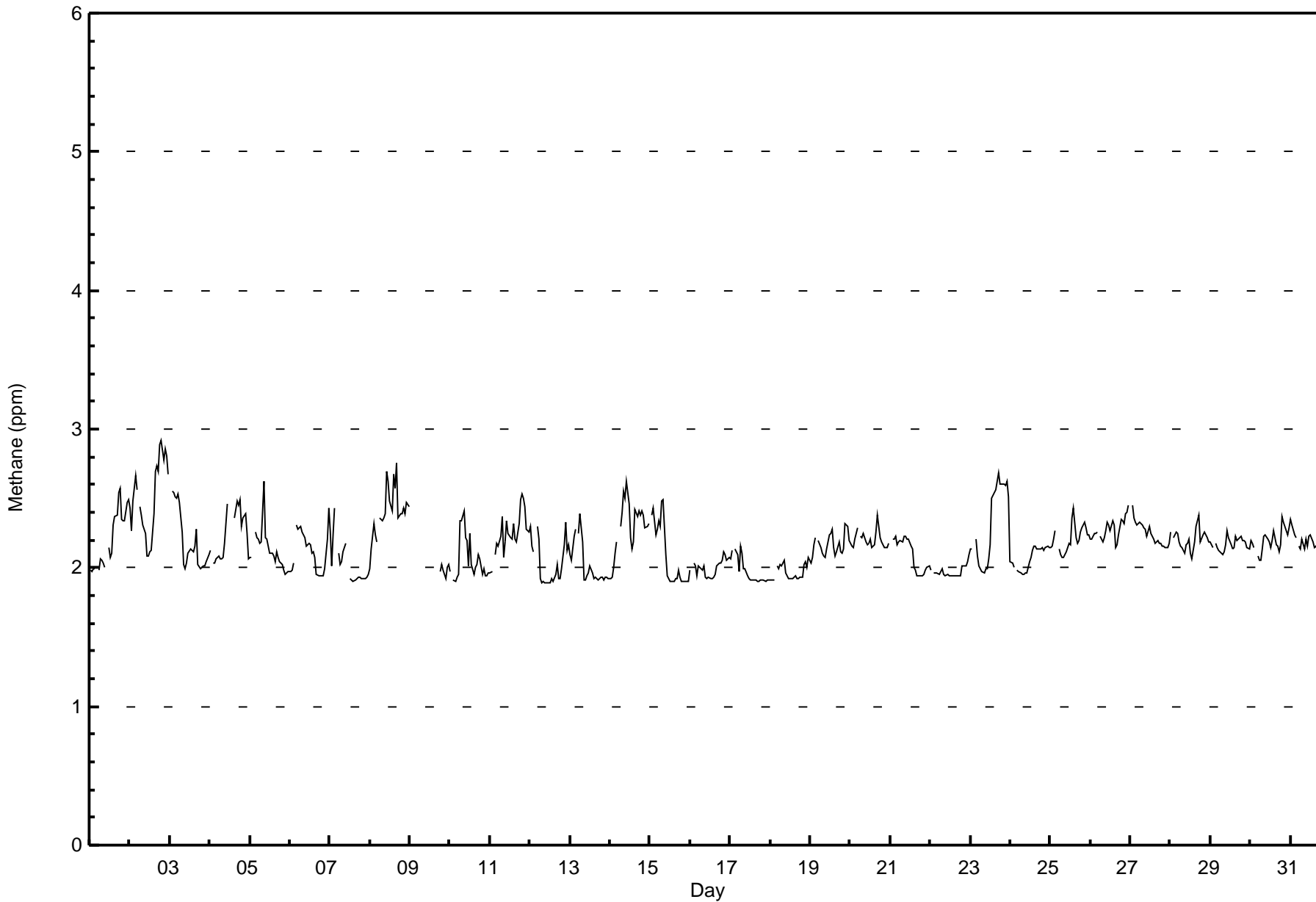


Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2017

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																		Daily Average	Daily Maximum			
Maximum Value: 2.9 ppm on Dec 2 20:00		Maximum Daily Average: 2.5 ppm on Dec 2																		Hours of Data: 689						
Minimum Value: 1.9 ppm on Dec 12 11:00		Minimum Daily Average: 2.0 ppm on Dec 18																		Hours of Missing Data: 55						
Maximum Diurnal Average: 2.2 ppm at hour 4		Minimum Diurnal Average: 2.1 ppm at hour 1																		Hours of Calibration: 35						
Monthly Average: 2.16 ppm		Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 2.0 Median = 2.1 Q <sub>3</sub> = 2.3 P <sub>90</sub> = 2.4 P <sub>99</sub> = 2.7																		Percent Operational Time: 97.3						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.0	2.0	M	2.1	2.1	2.1	2.3	2.4	2.4	2.5	2.6	2.3	2.3	2.3	2.5	2.5	2.2	2.6
2-Dec	2.4	2.3	2.5	2.7	Z	Z	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.4	2.7	2.7	2.7	2.9	2.9	2.8	2.9	2.8	2.7	2.5	2.9
3-Dec	Z	2.6	2.5	2.5	2.5	2.5	2.5	2.3	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.6
4-Dec	2.1	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.5	C	C	C	C	2.4	2.5	2.4	2.5	2.3	2.4	2.4	2.2	2.1	2.2	2.5
5-Dec	2.1	2.1	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.6	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.6
6-Dec	2.0	2.0	2.0	Z	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.4	2.1	2.4
7-Dec	2.3	2.0	2.2	2.4	Z	2.1	2.0	2.0	2.1	2.2	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	2.4
8-Dec	2.0	2.1	2.3	2.2	2.2	Z	2.4	2.3	2.4	2.4	2.7	2.6	2.5	2.4	2.7	2.6	2.8	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.8
9-Dec	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	M	M	2.0	2.0	2.0	1.9	2.0	2.0	--	2.0
10-Dec	2.0	Z	1.9	1.9	1.9	2.0	2.3	2.3	2.4	2.2	2.2	2.0	2.2	2.0	1.9	2.0	2.0	2.1	2.1	2.0	2.0	1.9	1.9	2.0	2.1	2.4
11-Dec	2.0	2.0	Z	2.1	2.2	2.2	2.2	2.4	2.1	2.2	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.5	2.5	2.5	2.4	2.3	2.3	2.3	2.5
12-Dec	2.3	2.2	2.1	Z	2.3	2.2	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	2.0	2.2	2.3	2.1	2.2	2.0	2.3
13-Dec	2.1	2.1	2.2	2.3	Z	2.2	2.4	2.2	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	2.4
14-Dec	1.9	1.9	2.0	2.1	2.2	Z	2.3	2.4	2.5	2.5	2.6	2.5	2.2	2.1	2.2	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.6
15-Dec	Z	2.4	2.4	2.2	2.3	2.3	2.3	2.5	2.5	2.1	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	2.1	2.5
16-Dec	2.0	Z	2.0	2.0	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.1
17-Dec	2.1	2.1	Z	2.1	2.1	2.0	2.2	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	2.0	2.2
18-Dec	1.9	1.9	1.9	Z	2.0	2.0	2.0	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	2.0	2.0	2.0	2.1	2.0	2.1
19-Dec	2.0	2.1	2.2	2.2	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.3	2.3	2.2	2.2	2.3
20-Dec	2.2	2.2	2.1	2.2	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.3	2.4	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.4
21-Dec	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.2
22-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.0	2.1
23-Dec	2.1	2.1	Z	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.5	2.5	2.6	2.6	2.7	2.6	2.6	2.6	2.6	2.6	2.5	2.3	2.7
24-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2
25-Dec	2.1	2.2	2.2	2.3	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.4	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.4
26-Dec	2.2	2.2	2.2	2.2	2.3	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.1	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.5	2.3	2.5
27-Dec	Z	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.4
28-Dec	2.3	Z	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.2	2.3	2.3	2.4	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.4
29-Dec	2.2	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.3
30-Dec	2.2	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.3	2.2	2.2	2.2	2.1	2.2	2.4	2.3	2.3	2.2	2.2	2.4
31-Dec	2.4	2.3	2.2	2.2	Z	2.2	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.4
2.1																								Diurnal Average		
2.4																								Diurnal Maximum		
Z - zerospan      C - Calibration      M - Maintenance      UO - Unstable Operation																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	226	32.80	32.80
2.1 - 3.0	463	67.20	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 689

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Fort McKay - Bertha Ganter - December 2017**

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	11	3	1	3	5	5	8	18	12	10	19	16	47	23	7	206
2.1 - 3.0	30	15	2	5	0	1	4	32	243	46	19	9	13	8	7	15	449
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
<b>Totals</b>	48	26	5	6	3	6	9	40	261	58	29	28	29	55	30	22	655

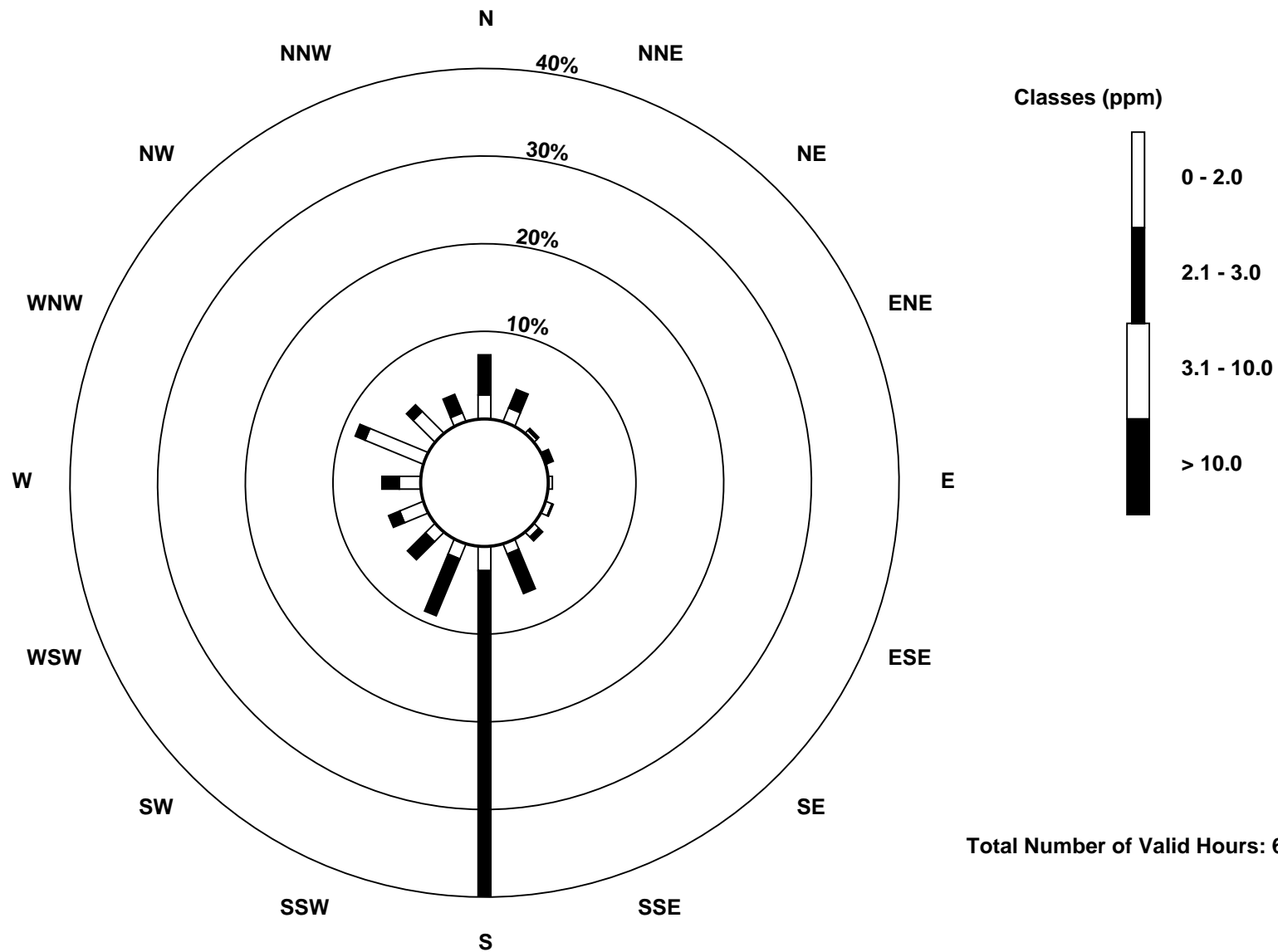
Total Number of Valid Hours: 655

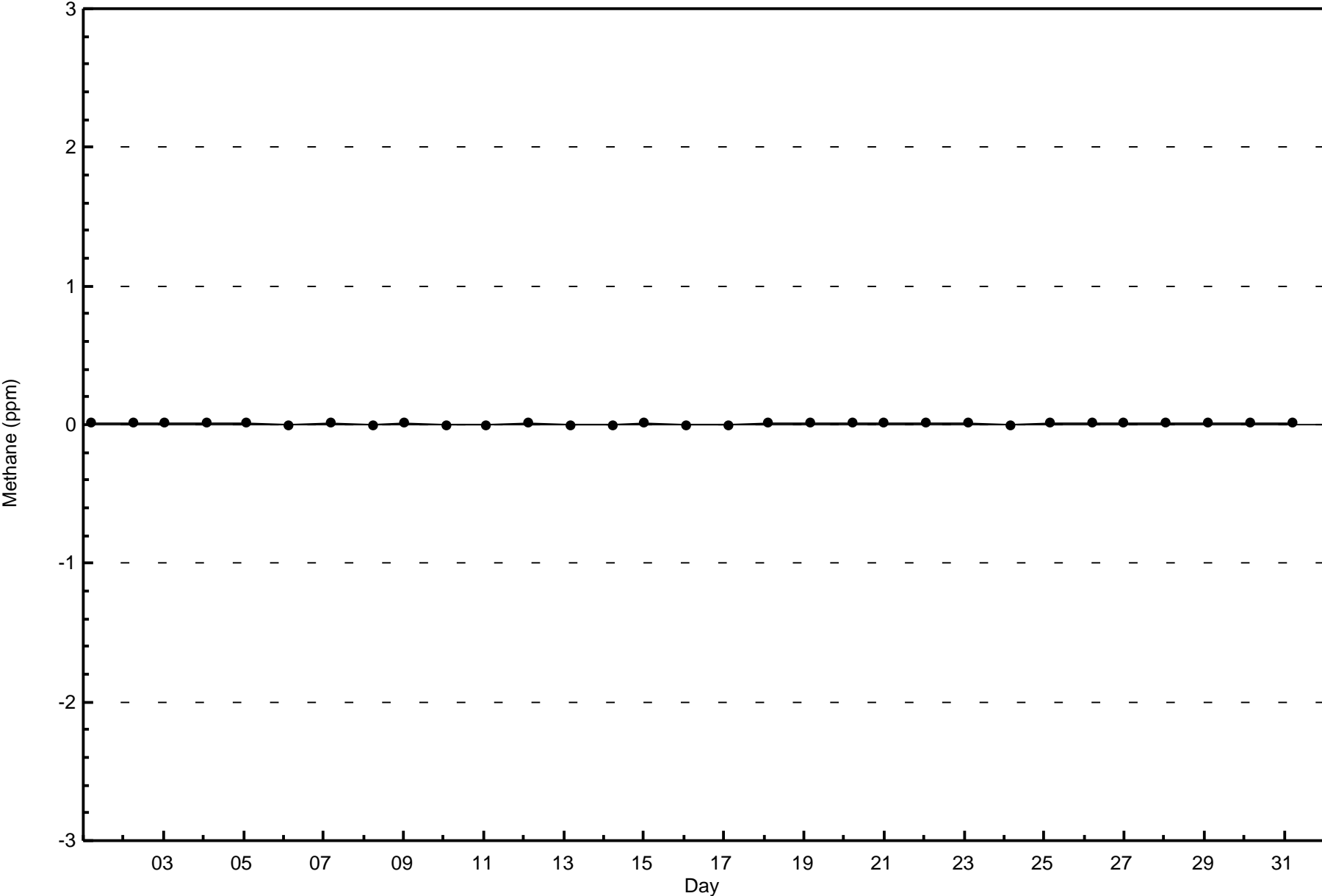
Total Number of Hours: 744

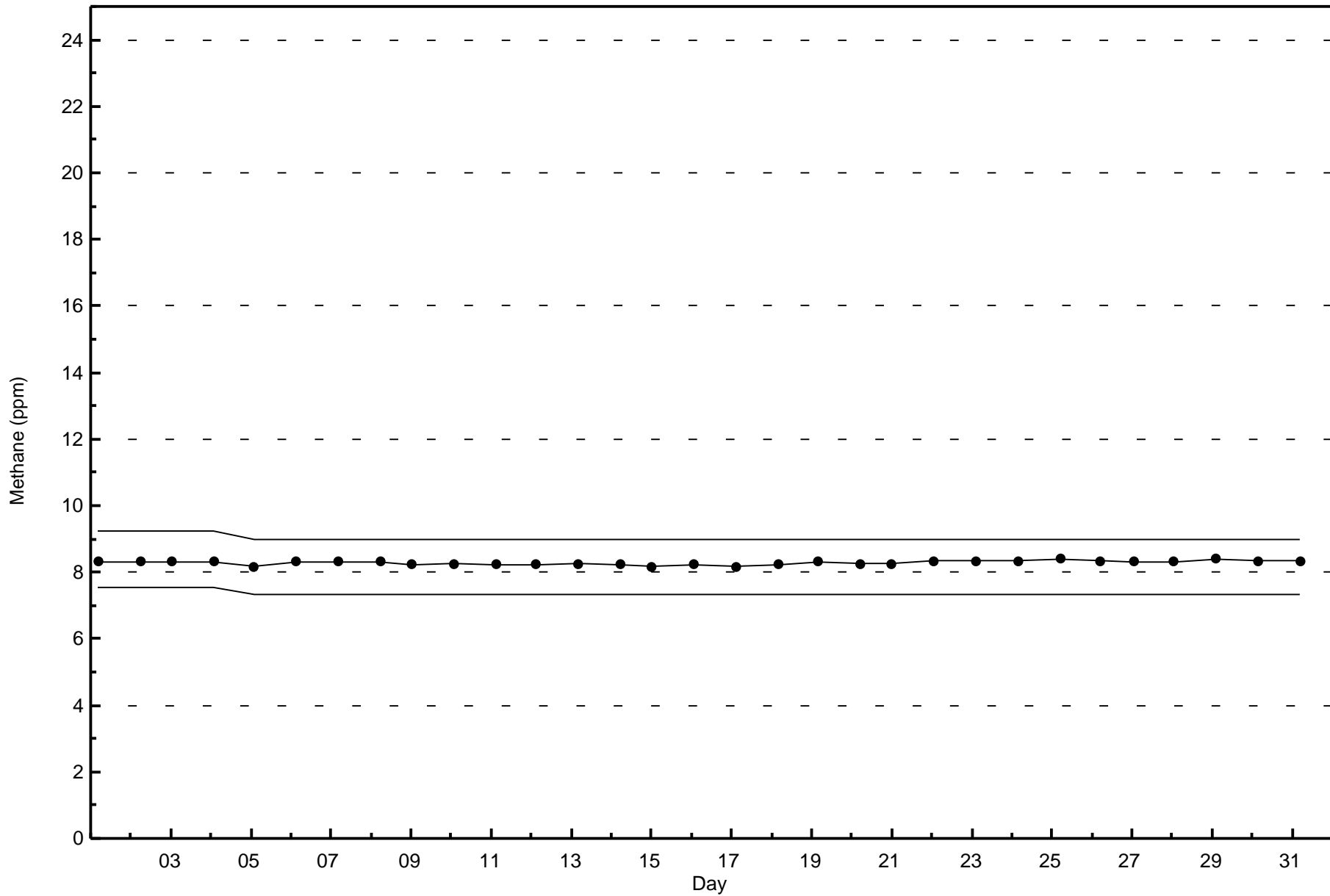


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Fort McKay - Bertha Ganter (AMS 1)





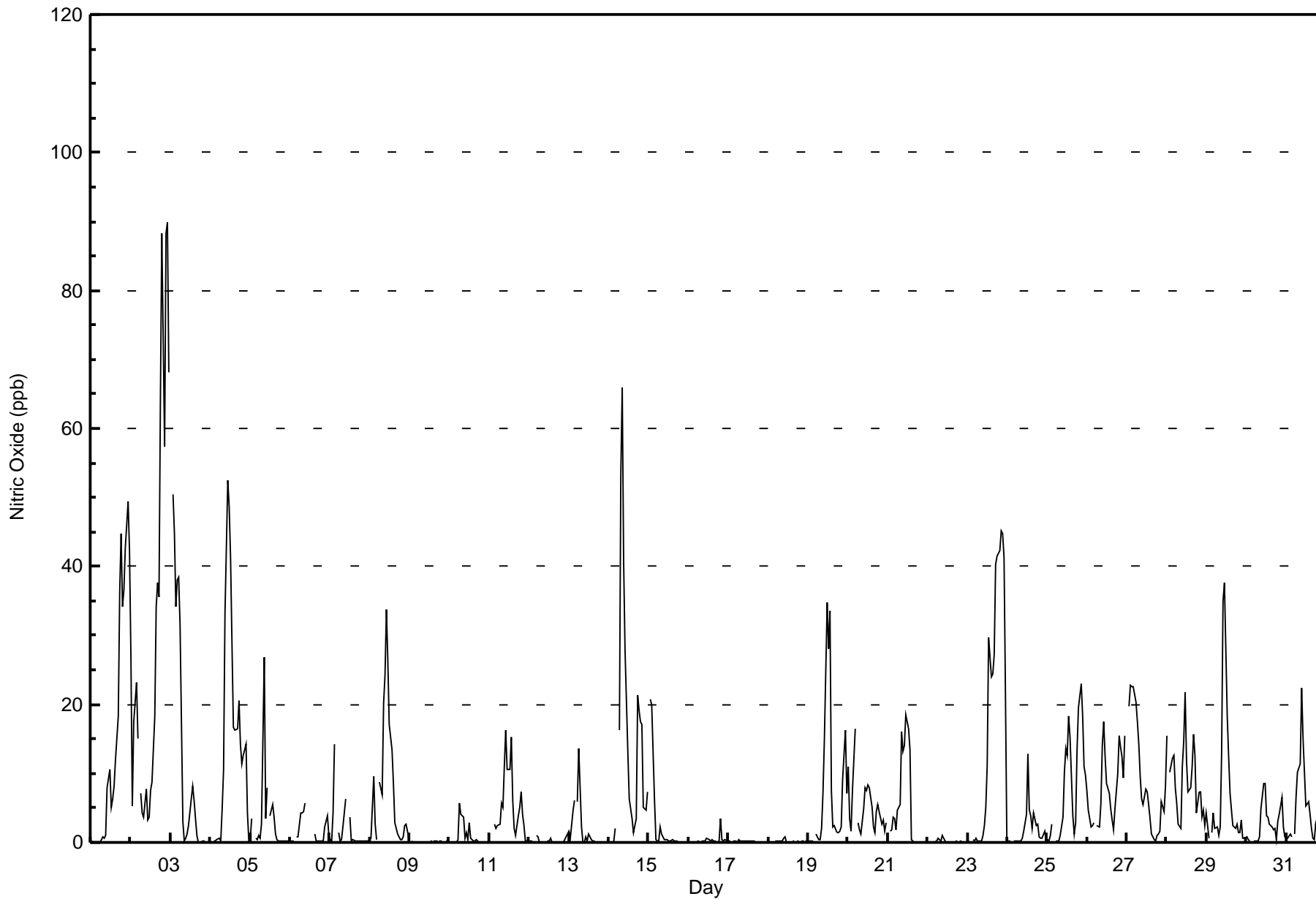




Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2017

Maximum Value: 90 ppb on Dec 2 23:00																		Maximum Daily Average: 31.1 ppb on Dec 2						Hours in Service: 744			
Minimum Value: 0 ppb on Dec 9 08:00																		Minimum Daily Average: 0.1 ppb on Dec 9						Hours of Data: 705			
Maximum Diurnal Average: 10.7 ppb at hour 12																		Minimum Diurnal Average: 2.7 ppb at hour 1						Hours of Missing Data: 39			
Monthly Average: 6.5 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 7 P <sub>90</sub> = 18 P <sub>99</sub> = 54						Hours of Calibration: 36			
																								Percent Operational Time: 99.6			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	Z	0	0	1	1	1	8	11	5	6	8	12	18	36	45	34	37	43	49	42	15.5	49	
2-Dec	27	5	17	23	15	Z	7	4	4	8	3	4	8	9	18	34	38	36	64	88	57	88	90	68	31.1	90	
3-Dec	Z	50	45	34	38	39	31	3	0	1	1	2	6	8	6	3	1	0	0	0	0	0	0	0	11.8	50	
4-Dec	0	Z	0	0	0	1	0	5	11	33	53	49	41	29	17	16	16	21	14	11	13	14	4	0	15.1	53	
5-Dec	0	4	Z	1	0	1	1	3	27	4	8	PF	4	5	4	1	0	0	0	0	0	0	0	0	2.9	27	
6-Dec	0	0	0	Z	1	1	4	4	5	6	C	C	C	C	C	1	0	0	0	0	0	2	4	1	1.7	6	
7-Dec	0	0	4	14	Z	1	0	0	2	6	M	M	4	0	0	0	0	0	0	0	0	0	0	0	1.7	14	
8-Dec	0	1	10	3	0	Z	9	7	20	24	34	26	17	13	8	3	2	1	0	0	1	2	3	1	8.1	34	
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
10-Dec	0	Z	0	0	0	0	6	4	4	1	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0.9	6	
11-Dec	0	0	Z	3	2	2	3	6	5	11	16	11	10	15	6	2	1	4	5	7	4	2	0	0	5.1	16	
12-Dec	0	0	0	Z	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0.3	1	
13-Dec	2	1	5	6	Z	6	14	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1.7	14	
14-Dec	0	0	0	0	2	Z	16	54	66	41	28	13	6	5	3	1	4	21	19	18	17	5	5	7	14.4	66	
15-Dec	Z	21	20	6	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.3	21	
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0.4	4	
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	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	
19-Dec	0	0	0	0	Z	1	0	0	2	7	15	35	28	34	8	2	2	2	1	2	2	9	16	7	7.6	35	
20-Dec	11	3	2	8	16	Z	3	2	1	5	8	8	8	8	5	2	1	4	5	5	3	3	2	3	5.1	16	
21-Dec	Z	2	2	4	3	2	5	5	16	13	14	18	16	14	0	0	0	0	0	0	0	0	0	0	5.0	18	
22-Dec	0	Z	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
23-Dec	0	0	Z	0	0	1	0	0	0	1	2	5	11	30	24	24	27	40	41	42	45	45	41	22	17.5	45	
24-Dec	0	0	0	Z	0	0	0	0	0	1	2	4	13	5	4	2	4	2	3	1	1	1	2	0	1.9	13	
25-Dec	0	0	1	3	Z	0	0	0	1	4	10	14	13	18	15	4	1	3	13	20	23	18	11	10	7.9	23	
26-Dec	7	5	2	2	3	Z	2	2	6	14	18	12	9	7	5	3	2	5	10	15	14	12	9	15	7.9	18	
27-Dec	Z	20	23	23	23	20	18	14	9	6	5	8	7	5	3	1	0	0	1	1	2	6	4	8	9.1	23	
28-Dec	15	Z	10	12	13	8	6	3	2	11	15	22	12	7	8	11	16	13	4	7	7	4	5	3	9.2	22	
29-Dec	4	1	Z	1	4	2	2	1	2	13	35	38	18	12	7	5	2	2	3	1	1	3	1	1	7.0	38	
30-Dec	1	0	0	Z	0	0	0	0	1	5	9	9	4	4	3	2	2	2	1	3	4	7	2	1	2.5	9	
31-Dec	1	1	1	1	Z	1	6	10	11	22	15	10	5	6	4	2	1	1	3	1	0	4	9	2	5.1	22	
																		Diurnal Average									
																		Diurnal Maximum									
Z - zerspan																		C - Calibration						M - Maintenance		PF - Power Failure	







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	643	91.21	91.21
21 - 40	39	5.53	96.74
41 - 80	20	2.84	99.57
81 - 159	3	0.43	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**

**Nitric Oxide (NO) - ppb  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	40	25	5	5	3	5	9	35	236	47	30	29	37	54	29	20	609
21 - 40	4	1	0	0	0	1	0	5	16	8	2	0	0	1	0	1	39
11 - 80	3	0	0	1	0	0	0	0	10	2	1	0	2	0	1	0	20
81 - 159	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	3
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>47</b>	<b>26</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>6</b>	<b>9</b>	<b>40</b>	<b>262</b>	<b>58</b>	<b>33</b>	<b>29</b>	<b>39</b>	<b>56</b>	<b>30</b>	<b>22</b>	<b>671</b>

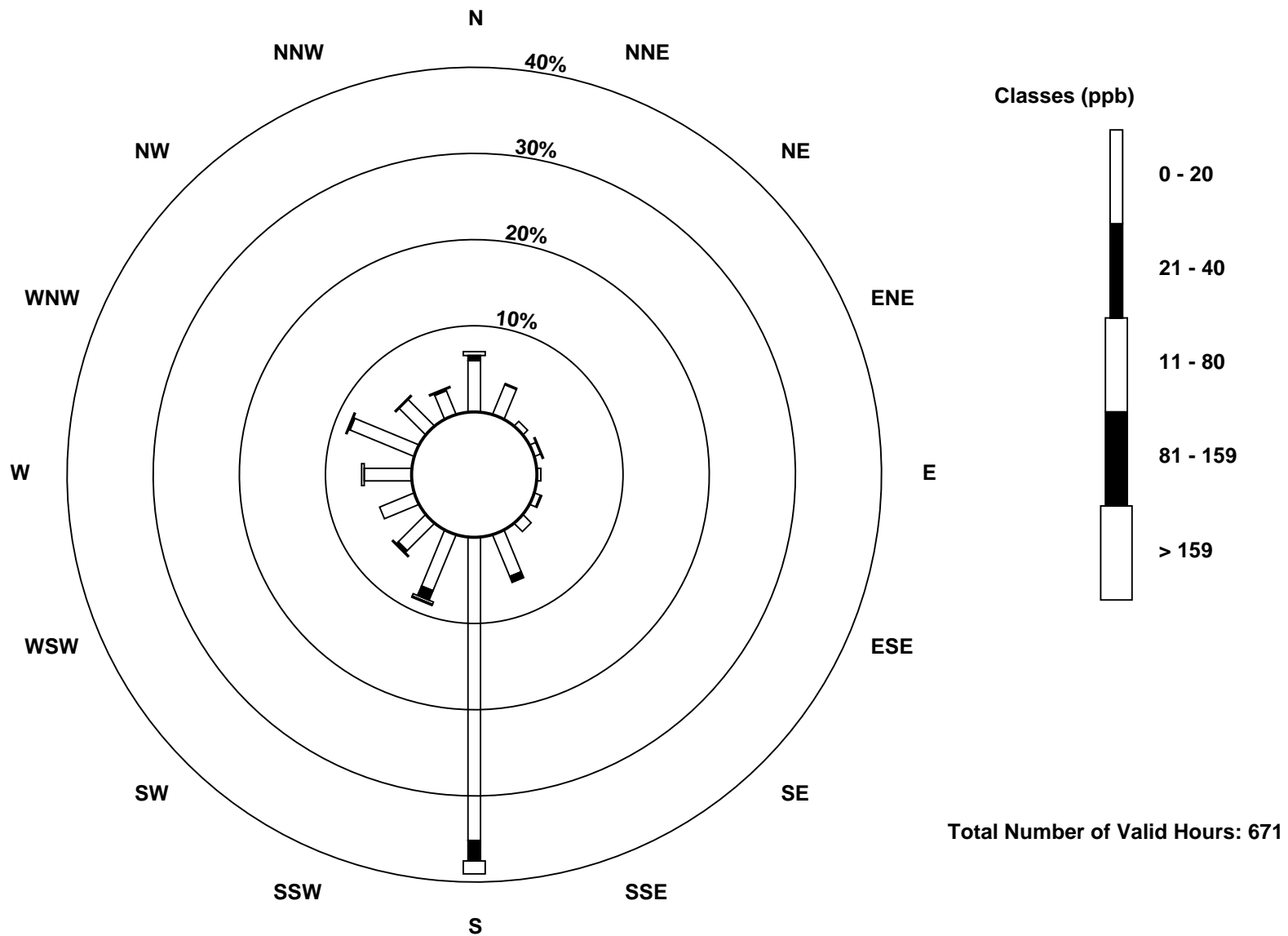
Total Number of Valid Hours: 671

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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



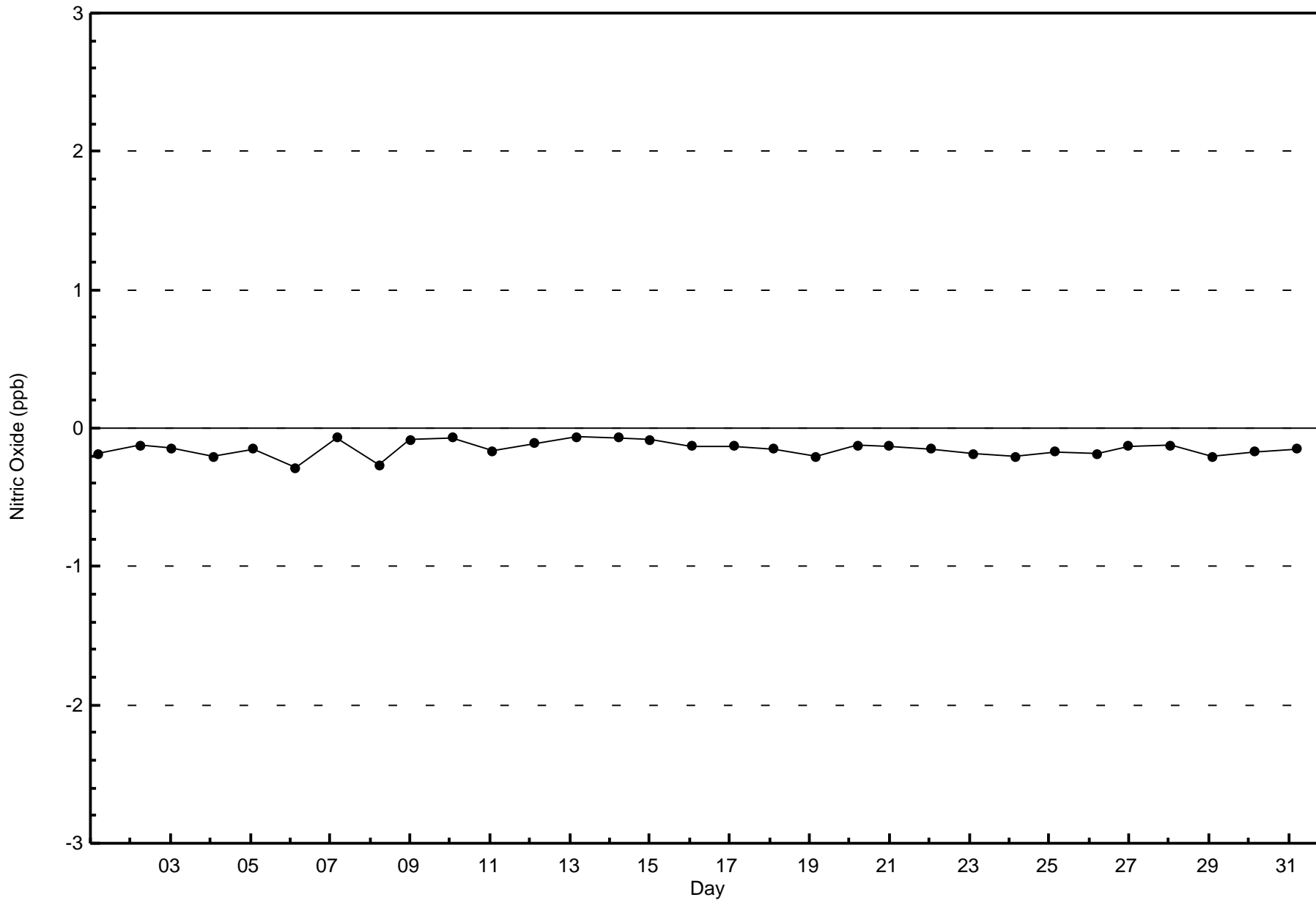


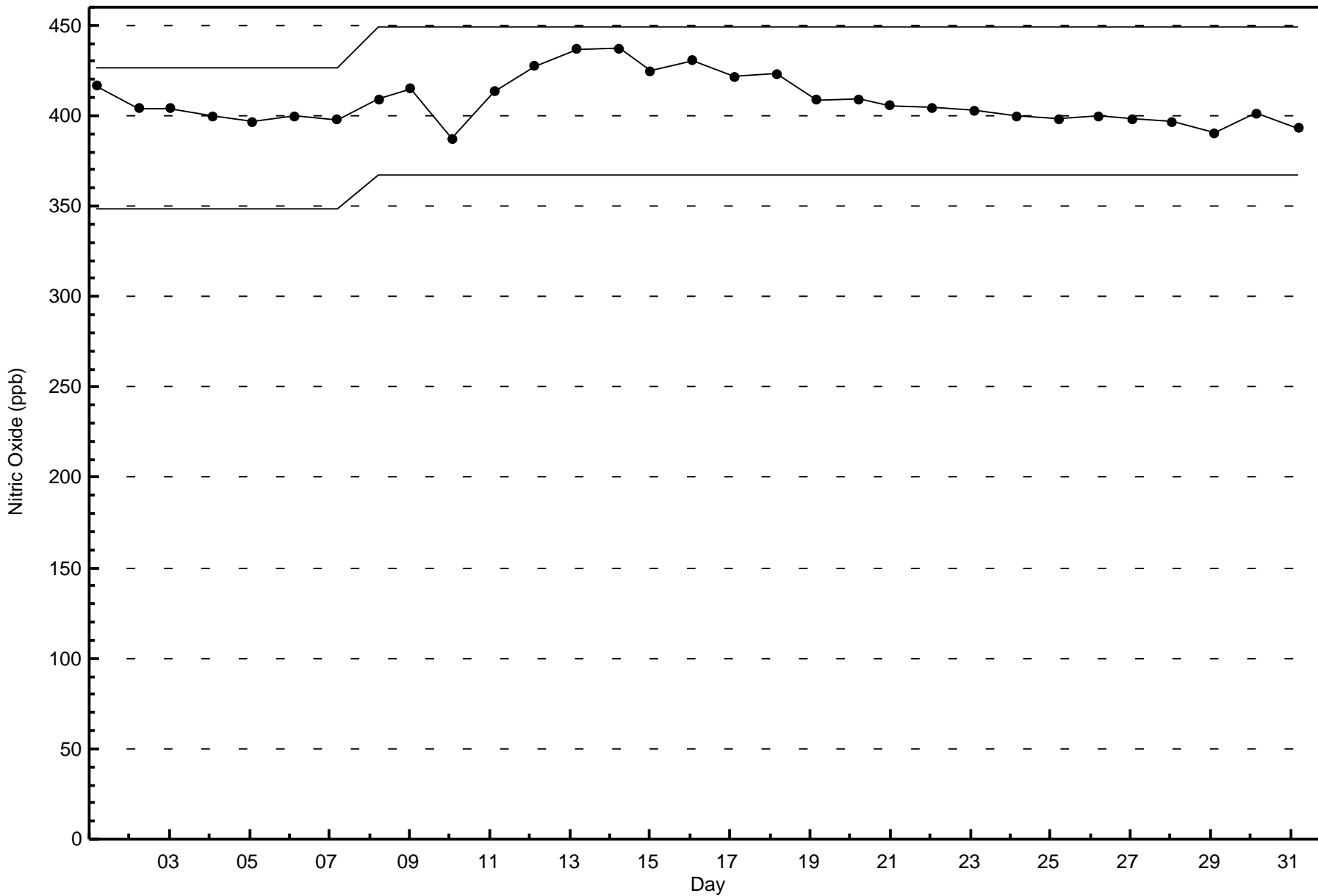
Wood Buffalo Environmental Association

Zero Responses

Nitric Oxide (NO) - ppb

Fort McKay - Bertha Ganter - December 2017







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 39 ppb on Dec 23 21:00	Maximum Daily Average: 25.7 ppb on Dec 26		Hours of Data:	705
Minimum Value: 0 ppb on Dec 15 22:00	Minimum Daily Average: 3.1 ppb on Dec 9		Hours of Missing Data:	39
Maximum Diurnal Average: 18.2 ppb at hour 23	Minimum Diurnal Average: 11.9 ppb at hour 13		Hours of Calibration:	36
Monthly Average: 15.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 6 Median = 17 Q <sub>3</sub> = 25 P <sub>90</sub> = 29 P <sub>99</sub> = 36		Percent Operational Time:	99.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	6	1	1	1	Z	1	16	20	15	6	15	17	11	15	21	29	32	35	33	30	27	29	27	26	18.0	35
2-Dec	25	24	25	24	22	Z	20	17	17	15	10	9	13	14	22	26	27	27	29	30	26	28	28	26	21.8	30
3-Dec	Z	24	24	25	21	24	23	21	9	6	6	6	12	14	15	19	17	6	7	10	12	10	9	12	14.4	25
4-Dec	15	Z	11	13	17	16	14	20	23	23	25	26	25	24	24	26	29	28	28	27	26	26	22	14	21.8	29
5-Dec	8	16	Z	18	16	19	17	20	29	18	19	PF	10	14	14	12	17	12	10	10	12	2	4	4	13.6	29
6-Dec	4	5	8	Z	20	20	24	25	25	22	C	C	C	C	C	13	2	1	1	1	2	12	30	25	13.4	30
7-Dec	19	6	24	31	Z	17	10	15	22	22	M	M	5	0	0	0	2	2	1	1	0	0	2	3	8.7	31
8-Dec	5	19	30	22	18	Z	27	28	28	26	28	26	25	26	28	25	32	27	23	25	25	26	24	21	24.5	32
9-Dec	Z	16	2	1	0	0	0	0	0	0	0	0	1	3	1	6	4	4	7	10	5	1	5	4	3.1	16
10-Dec	3	Z	1	1	2	5	29	24	25	15	12	4	15	7	3	6	8	10	9	4	4	1	2	3	8.3	29
11-Dec	3	4	Z	14	18	20	20	21	22	20	20	16	20	25	22	21	25	28	27	26	24	24	18	13	19.6	28
12-Dec	14	8	10	Z	18	14	2	0	1	0	0	0	1	3	0	1	3	1	1	2	6	11	10	10	5.1	18
13-Dec	9	17	23	23	Z	23	27	16	1	1	6	4	10	5	1	5	0	0	4	1	0	1	2	1	7.8	27
14-Dec	1	3	7	10	15	Z	18	23	25	25	24	21	15	15	19	20	21	27	25	24	23	19	19	18	18.1	27
15-Dec	Z	19	20	20	16	11	11	14	14	4	2	2	1	1	2	4	7	17	4	1	0	0	0	0	7.3	20
16-Dec	3	Z	9	5	2	8	18	14	19	3	3	6	3	3	4	8	13	15	15	18	17	15	18	21	10.3	21
17-Dec	19	14	Z	10	12	5	18	12	6	6	1	1	0	0	0	1	0	0	0	0	0	0	0	0	4.6	19
18-Dec	0	0	1	Z	10	9	8	9	4	6	4	0	0	0	0	1	0	0	0	0	7	9	5	13	3.7	13
19-Dec	11	11	16	21	Z	25	18	17	20	20	17	25	25	29	19	19	28	29	28	29	30	32	33	32	23.2	33
20-Dec	32	28	25	30	31	Z	26	24	24	21	18	14	15	16	16	18	24	30	29	28	27	27	26	26	24.0	32
21-Dec	Z	25	25	26	25	24	24	23	24	21	18	19	18	19	4	2	0	0	0	0	0	2	6	6	13.6	26
22-Dec	6	Z	8	7	6	6	13	12	3	6	3	0	0	0	0	0	0	0	0	5	8	5	7	8	4.4	13
23-Dec	11	13	Z	18	14	15	12	9	6	7	6	8	13	27	29	34	36	38	39	39	39	37	37	31	22.5	39
24-Dec	7	9	3	Z	4	4	4	5	6	6	6	7	16	12	15	19	25	27	27	24	22	19	25	21	13.6	27
25-Dec	21	20	24	26	Z	13	14	14	16	18	16	17	17	22	24	21	26	32	34	34	35	35	33	32	23.6	35
26-Dec	31	30	28	28	27	Z	27	28	30	28	23	17	13	14	15	19	27	30	30	31	30	29	28	28	25.7	31
27-Dec	Z	27	29	29	29	29	28	28	28	23	16	16	15	13	12	12	19	20	24	24	26	26	28	31	23.1	31
28-Dec	33	Z	30	30	29	27	25	19	18	18	16	17	14	13	18	28	35	33	31	31	30	27	26	24	24.8	35
29-Dec	23	17	Z	19	19	18	17	17	19	21	28	29	20	18	18	23	29	31	31	29	31	34	27	29	23.7	34
30-Dec	29	21	16	Z	9	7	10	19	24	25	20	18	13	13	13	19	30	32	22	28	32	33	31	27	21.2	33
31-Dec	26	26	29	25	Z	25	31	31	30	31	22	18	13	13	14	17	20	21	25	22	22	32	37	26	24.1	37

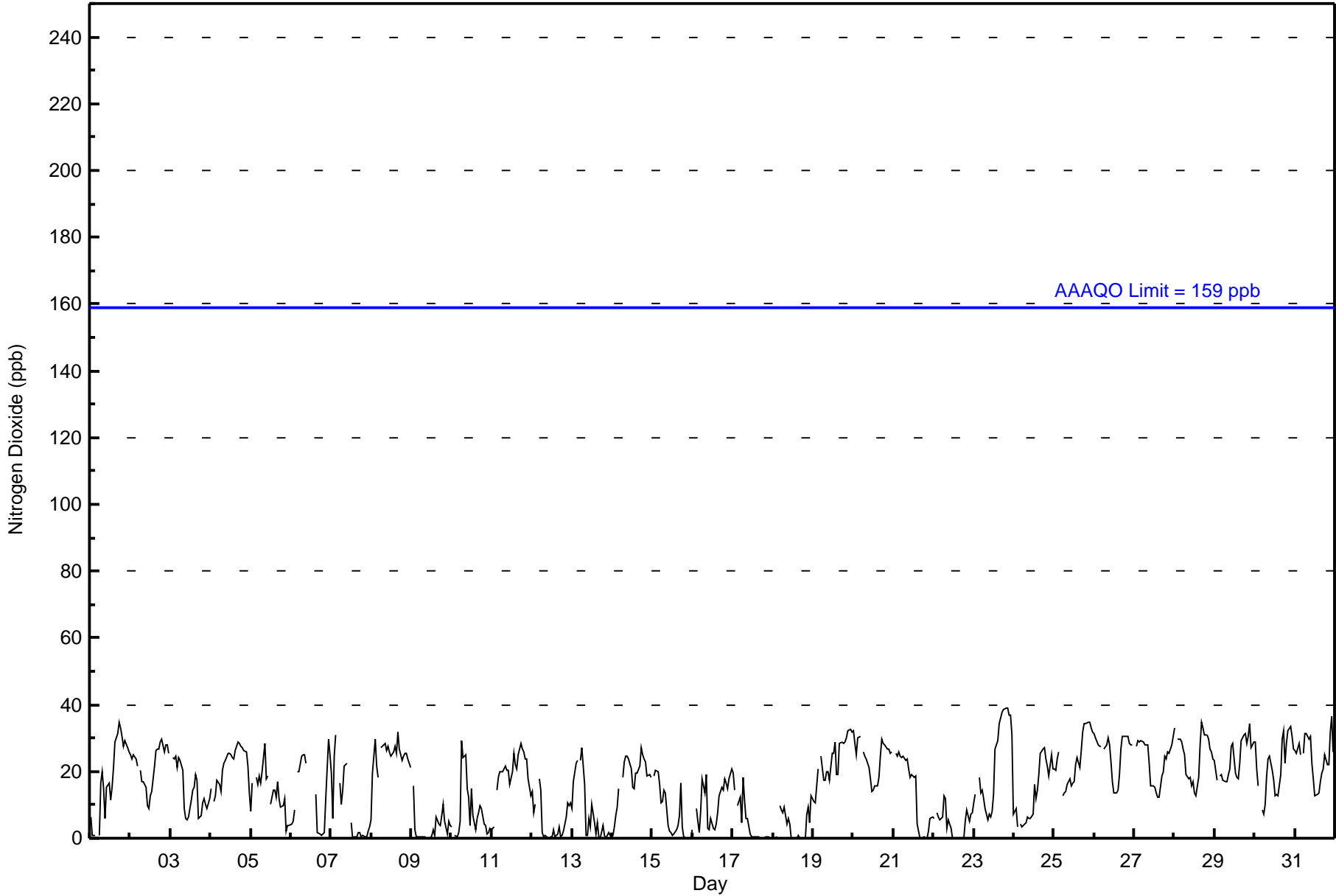
14.0	15.5	16.4	18.2	16.0	14.7	17.8	17.6	17.1	14.9	13.2	12.1	11.9	12.6	12.4	14.7	17.3	18.1	17.5	17.5	17.7	17.8	18.2	17.1	Diurnal Average	
33	30	30	31	31	29	31	31	30	31	28	29	25	29	29	34	36	38	39	39	39	39	37	37	32	Diurnal Maximum

Z - zerspan      C - Calibration      M - Maintenance      PF - Power Failure  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	437	61.99	61.99
21 - 40	268	38.01	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	23	5	5	3	5	8	24	96	29	25	25	30	53	26	12	404
21 - 40	12	3	0	1	0	1	1	16	166	29	8	4	9	3	4	10	267
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
<b>Totals</b>	47	26	5	6	3	6	9	40	262	58	33	29	39	56	30	22	671

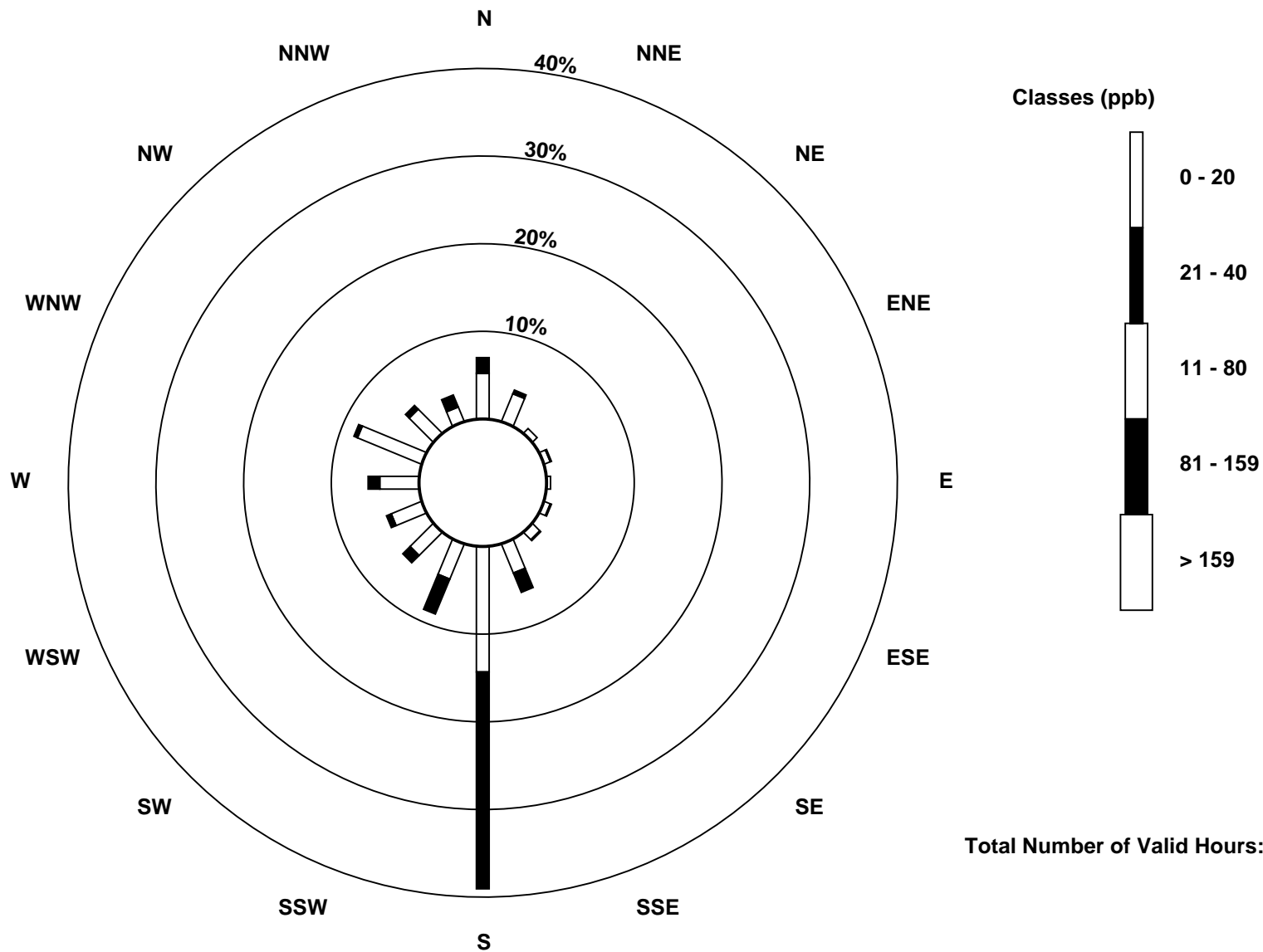
Total Number of Valid Hours: 671

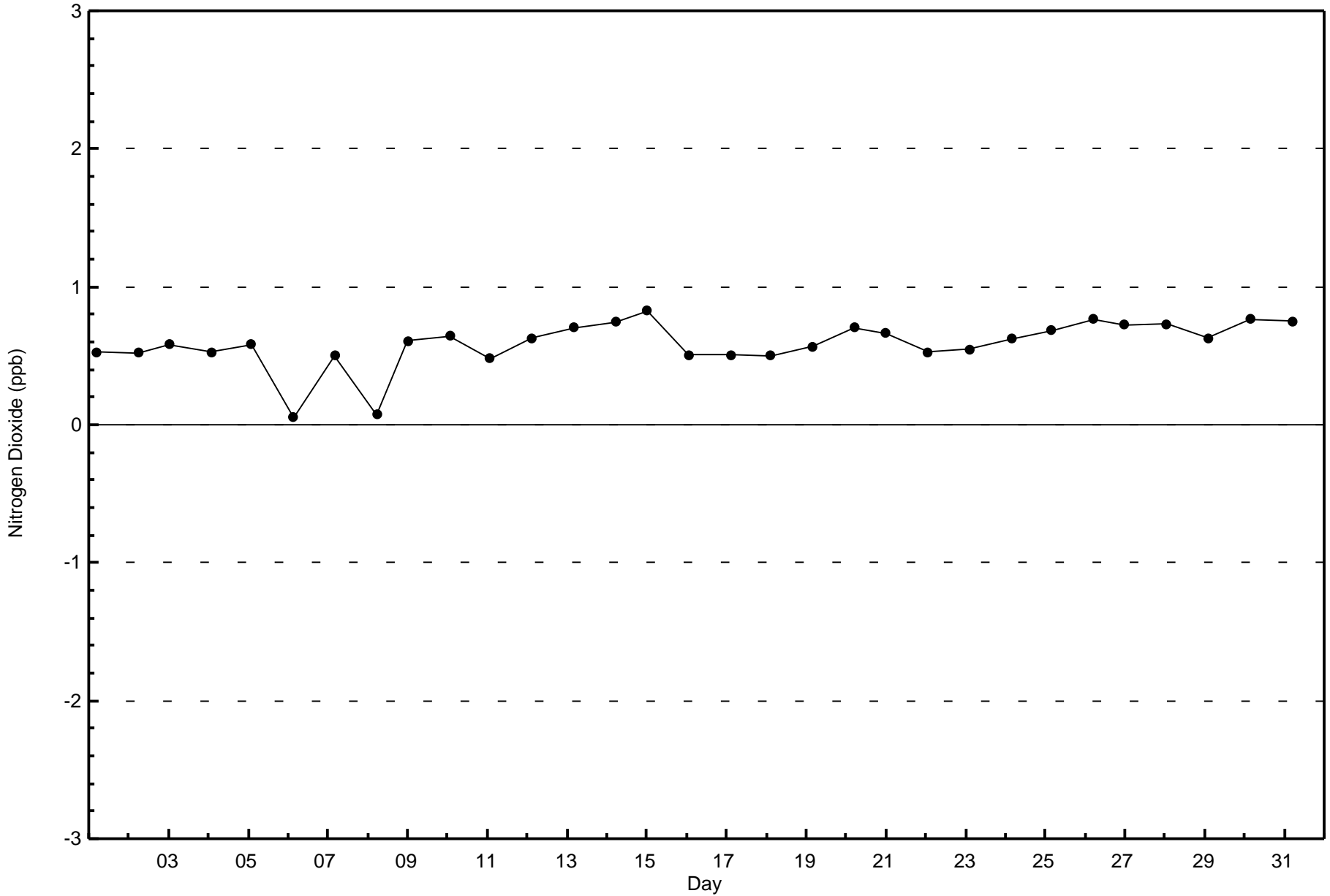
Total Number of Hours: 744

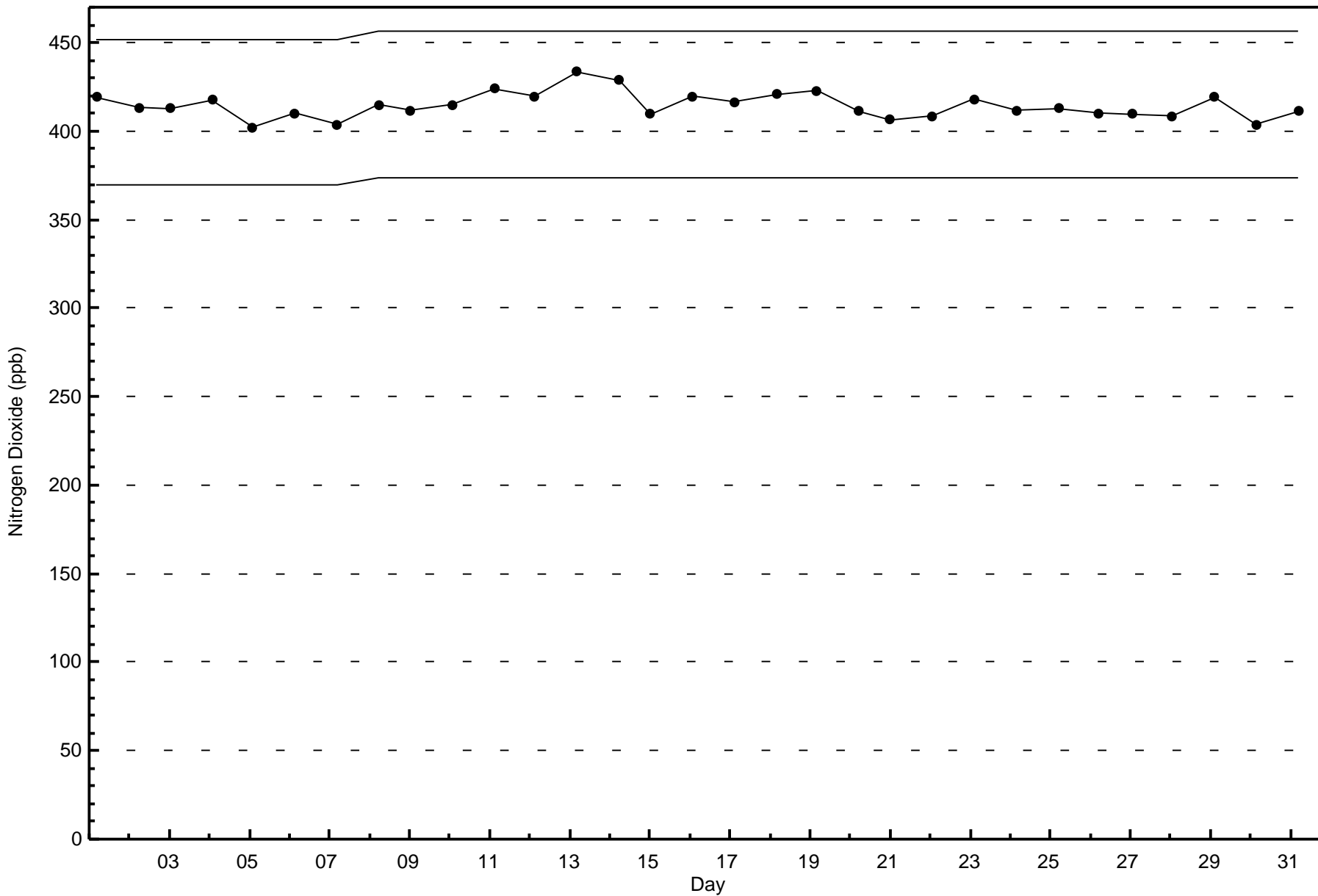


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)







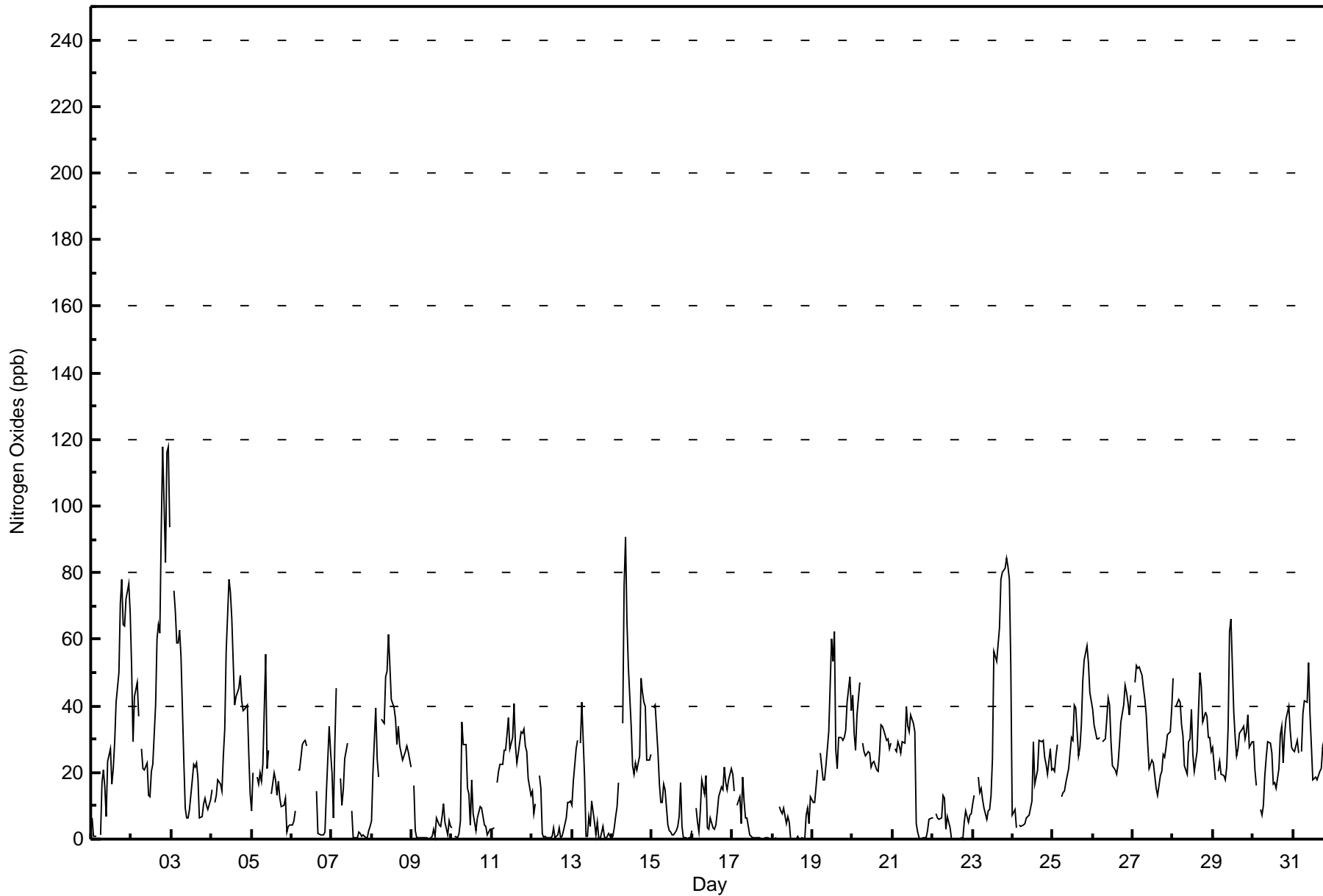


Maximum Value: 118 ppb on Dec 2 23:00		Maximum Daily Average: 52.9 ppb on Dec 2		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 13 18:00		Minimum Daily Average: 3.2 ppb on Dec 9		Hours of Data: 705																																													
Maximum Diurnal Average: 26.6 ppb at hour 23		Minimum Diurnal Average: 16.8 ppb at hour 1		Hours of Missing Data: 39																																													
Monthly Average: 22.4 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 6 Median = 20 Q <sub>3</sub> = 31 P <sub>90</sub> = 47 P <sub>99</sub> = 81		Hours of Calibration: 36																																													
				Percent Operational Time: 99.6																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	6	1	1	1	Z	1	17	21	16	7	23	27	17	21	29	41	50	71	78	64	64	72	77	68	33.5	78																							
2-Dec	52	29	43	47	37	Z	27	21	21	23	13	13	20	23	40	60	64	62	93	118	83	116	118	94	52.9	118																							
3-Dec	Z	75	68	59	59	63	55	23	9	6	7	9	18	22	21	23	18	6	7	11	12	10	9	12	26.2	75																							
4-Dec	15	Z	11	13	18	17	14	25	33	57	78	74	66	53	40	43	45	49	42	38	39	40	26	14	36.9	78																							
5-Dec	8	20	Z	19	17	20	17	23	55	21	27	PF	14	20	18	13	17	12	10	10	12	2	4	4	16.5	55																							
6-Dec	4	5	9	Z	21	21	29	29	30	28	C	C	C	C	C	15	2	1	1	1	2	14	34	26	15.1	34																							
7-Dec	20	6	29	45	Z	18	10	15	24	29	M	M	8	0	1	1	2	2	1	1	1	1	3	4	10.4	45																							
8-Dec	6	20	39	24	18	Z	36	35	49	50	61	52	42	39	36	28	34	28	24	25	26	28	26	22	32.5	61																							
9-Dec	Z	16	2	1	0	0	0	0	0	0	0	0	1	3	1	6	4	4	7	10	5	1	5	4	3.2	16																							
10-Dec	3	Z	1	1	2	6	35	28	28	15	14	4	18	7	3	6	8	10	9	4	4	1	2	3	9.3	35																							
11-Dec	3	4	Z	17	20	22	22	27	27	31	36	27	30	41	28	23	26	32	32	33	28	26	18	13	24.6	41																							
12-Dec	14	8	11	Z	19	15	2	0	1	0	0	0	1	3	0	1	3	1	1	2	7	11	11	12	5.4	19																							
13-Dec	10	18	27	30	Z	29	41	18	1	1	7	4	12	5	1	5	0	0	4	1	0	1	2	1	9.4	41																							
14-Dec	1	3	7	10	17	Z	35	76	90	65	52	34	22	20	23	21	25	48	44	41	40	24	24	25	32.5	90																							
15-Dec	Z	39	40	26	16	11	11	17	15	4	2	2	1	1	3	4	7	17	4	1	0	0	0	0	9.7	40																							
16-Dec	3	Z	9	5	2	8	18	14	19	3	3	6	3	3	4	8	13	15	15	21	17	15	18	21	10.6	21																							
17-Dec	20	15	Z	10	13	5	19	12	6	6	1	1	0	0	0	1	0	0	0	0	0	0	0	0	4.8	20																							
18-Dec	0	0	1	Z	10	9	8	9	5	7	5	0	0	0	0	1	0	0	0	0	7	9	5	13	3.9	13																							
19-Dec	11	11	16	21	Z	26	18	18	22	27	32	60	53	62	27	21	31	31	30	31	32	41	49	39	30.8	62																							
20-Dec	43	32	27	37	47	Z	29	26	25	26	26	22	23	23	21	20	26	34	34	33	29	30	27	29	29.1	47																							
21-Dec	Z	27	26	29	28	26	29	29	40	34	32	37	35	32	5	2	0	0	1	0	0	2	6	7	18.6	40																							
22-Dec	6	Z	8	7	6	6	13	12	3	7	3	0	0	0	0	0	0	0	0	5	8	5	7	8	4.6	13																							
23-Dec	11	13	Z	19	14	15	12	9	6	8	9	13	24	56	53	59	63	78	80	81	84	82	78	52	40.0	84																							
24-Dec	7	9	4	Z	4	4	4	5	6	7	7	12	29	17	19	21	30	29	30	24	22	19	27	21	15.5	30																							
25-Dec	21	20	25	28	Z	13	14	14	17	21	26	30	30	40	39	25	27	35	48	54	58	53	44	42	31.5	58																							
26-Dec	39	35	30	30	30	Z	29	30	36	42	40	29	22	21	20	22	28	35	40	46	44	41	37	43	33.5	46																							
27-Dec	Z	47	52	51	52	49	45	42	37	29	21	24	23	19	15	13	19	20	25	25	27	31	32	39	32.2	52																							
28-Dec	48	Z	40	42	41	34	31	22	20	29	30	39	26	20	26	39	50	46	35	38	37	30	31	26	34.0	50																							
29-Dec	27	18	Z	20	23	19	19	18	22	34	62	66	38	30	25	27	32	33	34	30	32	37	28	29	30.6	66																							
30-Dec	29	21	16	Z	9	7	10	19	24	29	29	26	17	17	15	21	31	34	23	31	36	40	33	28	23.8	40																							
31-Dec	27	26	30	26	Z	26	38	42	41	53	38	28	18	19	18	19	20	21	27	23	22	36	45	28	29.1	53																							
																								16.8	19.9	21.9	23.7	20.9	18.1	22.2	21.9	23.5	22.6	23.6	22.8	20.3	20.6	17.7	19.0	21.9	24.4	25.1	26.0	25.2	26.5	26.6	23.4	Diurnal Average	
																								52	75	68	59	59	63	55	76	90	65	78	74	66	62	53	60	64	78	93	118	84	116	118	94	Diurnal Maximum	
Z - zerspan																								C - Calibration				M - Maintenance				PF - Power Failure																	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	359	50.92	50.92
21 - 40	247	35.04	85.96
41 - 80	89	12.62	98.58
81 - 159	9	1.28	99.86
> 159	0	0.00	99.86

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	27	19	5	4	3	5	6	17	57	22	20	25	29	50	26	12	327
21 - 40	12	6	0	1	0	0	3	17	155	21	7	4	7	4	3	5	245
11 - 80	8	1	0	0	0	1	0	6	47	14	6	0	1	1	0	4	89
81 - 159	0	0	0	1	0	0	0	0	2	1	0	0	2	1	1	1	9
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	47	26	5	6	3	6	9	40	261	58	33	29	39	56	30	22	670

Total Number of Valid Hours: 671

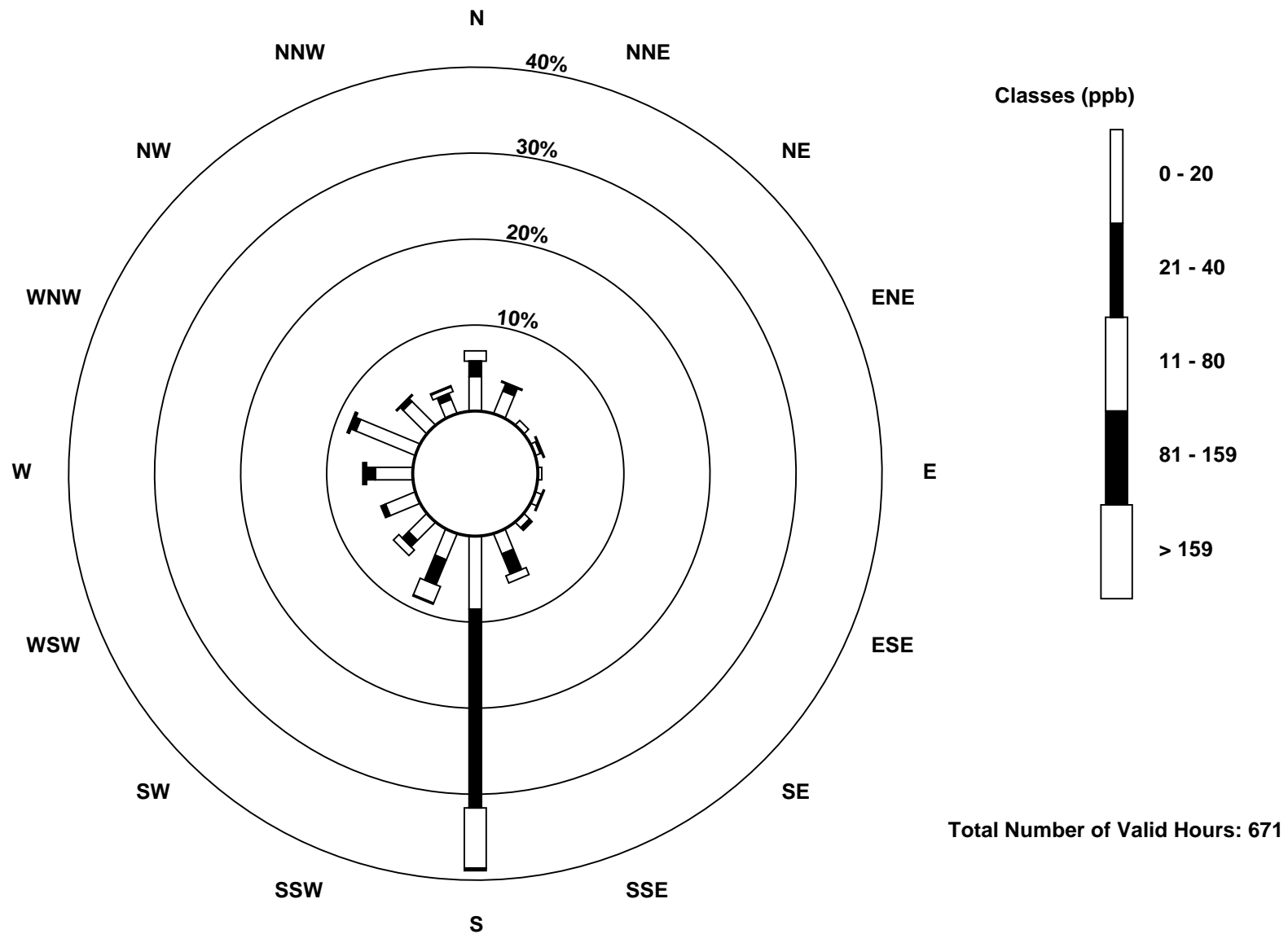
Total Number of Hours: 744

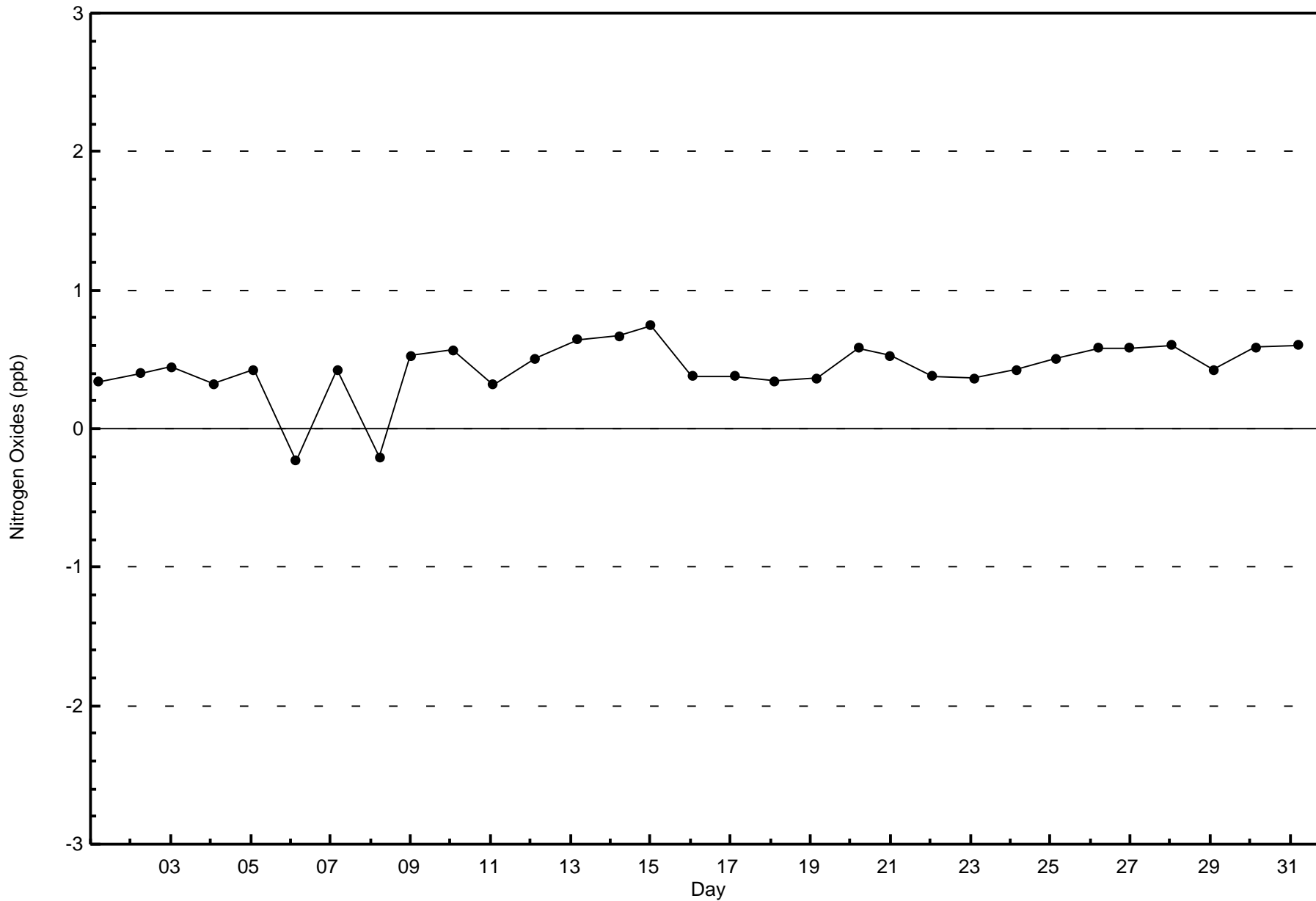


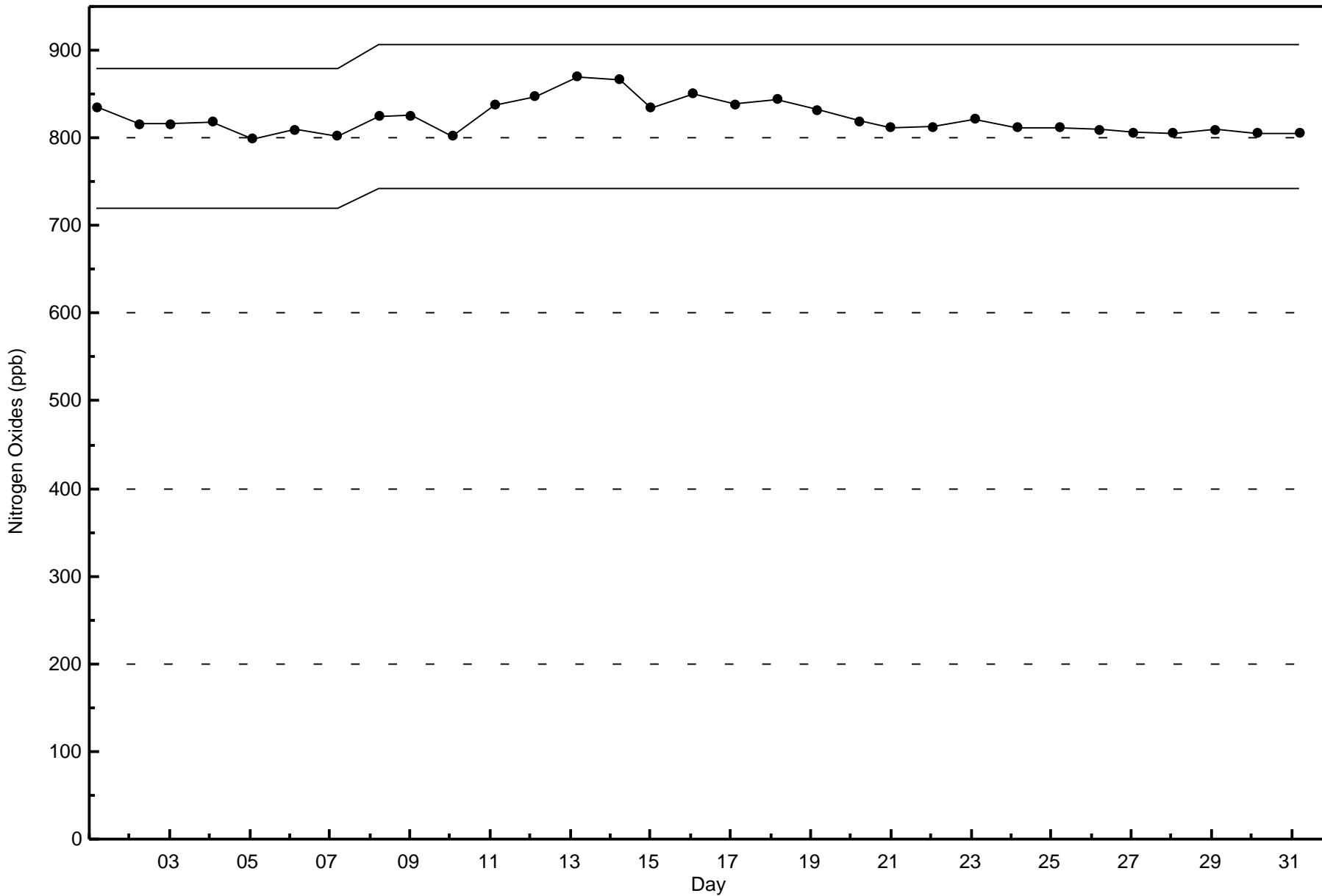


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

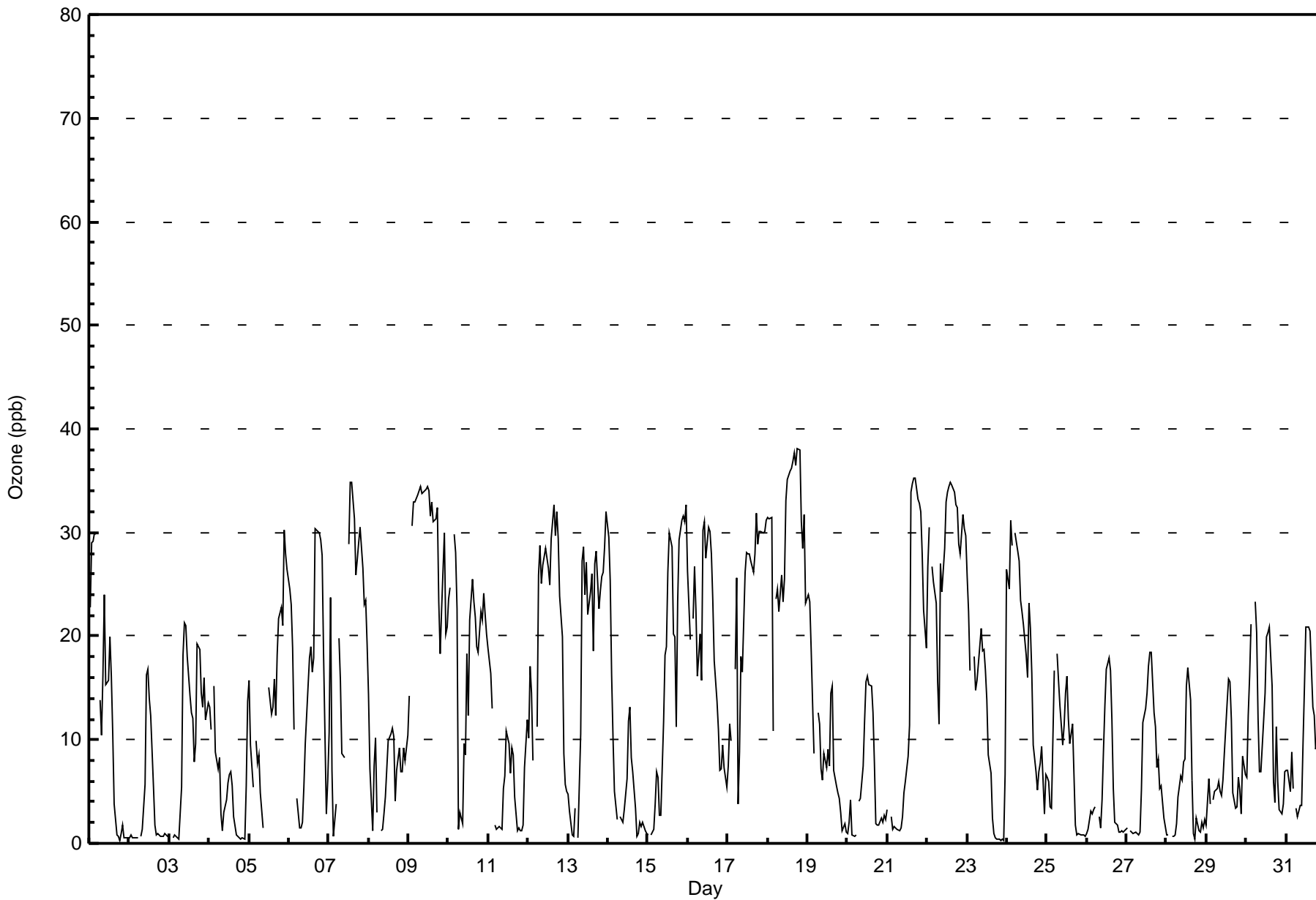
Fort McKay - Bertha Ganter - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 38 ppb on Dec 18 19:00 Maximum Daily Average: 30.1 ppb on Dec 18																		Hours in Service: 744 Hours of Data: 708 Hours of Missing Data: 36 Hours of Calibration: 34 Percent Operational Time: 99.7								
Minimum Value: 0 ppb on Dec 1 19:00 Minimum Daily Average: 3.6 ppb on Dec 2 Maximum Diurnal Average: 19.4 ppb at hour 15 Minimum Diurnal Average: 9.5 ppb at hour 8 Monthly Average: 13.6 ppb Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 3 Median = 11 Q <sub>3</sub> = 23 P <sub>90</sub> = 30 P <sub>99</sub> = 36																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	23	29	29	30	30	Z	14	10	16	24	15	16	20	16	11	4	1	1	0	1	2	1	0	1	12.7	30
2-Dec	1	1	0	1	1	0	Z	1	1	6	16	17	14	12	5	2	1	1	1	1	1	1	1	1	3.6	17
3-Dec	1	Z	1	1	1	1	0	5	18	21	21	18	14	13	12	8	10	19	19	15	13	16	12	14	10.9	21
4-Dec	13	11	Z	15	9	7	8	3	1	3	4	6	7	6	3	1	1	0	0	0	0	6	14	5.4	15	
5-Dec	16	9	5	Z	10	8	8	5	2	C	C	C	15	12	13	16	12	18	22	23	21	30	28	26	15.0	30
6-Dec	25	23	19	11	Z	4	2	2	2	5	10	15	18	19	17	18	30	30	30	29	28	18	3	6	15.8	30
7-Dec	11	24	7	1	4	Z	20	16	9	8	M	M	29	35	35	31	26	27	29	30	27	23	23	19	20.6	35
8-Dec	14	7	1	8	10	3	Z	1	1	3	5	7	10	11	11	10	4	7	9	7	7	9	8	10	7.2	14
9-Dec	14	Z	31	33	33	34	34	34	34	34	34	34	34	32	33	31	31	32	23	18	23	30	20	21	29.5	34
10-Dec	24	25	Z	30	28	23	1	3	2	10	8	18	12	22	25	23	22	19	18	22	22	24	22	20	18.4	30
11-Dec	19	16	13	Z	2	1	2	1	1	5	6	11	10	7	9	8	4	1	1	1	1	2	7	12	6.2	19
12-Dec	10	17	15	8	Z	11	26	29	25	27	28	28	27	25	29	33	30	32	29	24	20	9	6	5	21.4	33
13-Dec	5	3	1	1	3	Z	1	11	27	29	24	27	22	24	26	19	27	28	23	24	26	26	29	32	19.0	32
14-Dec	30	25	16	10	5	2	Z	3	2	2	3	6	12	13	8	7	3	1	1	2	2	2	1	1	6.9	30
15-Dec	1	Z	1	1	4	7	6	3	3	12	18	19	26	30	29	20	20	11	23	29	31	32	31	33	16.9	33
16-Dec	26	20	Z	22	27	22	16	20	16	30	31	28	30	30	28	23	18	14	11	7	7	10	7	5	19.5	31
17-Dec	8	11	10	Z	17	26	4	9	18	17	26	28	28	28	27	26	28	32	29	30	30	30	30	31	22.7	32
18-Dec	31	31	31	11	Z	24	25	22	26	23	25	33	35	36	36	37	38	36	38	38	31	28	32	23	30.1	38
19-Dec	24	23	19	14	9	Z	13	12	7	6	9	7	9	7	14	15	7	6	5	4	3	1	2	1	9.4	24
20-Dec	1	2	4	1	1	1	Z	4	4	7	12	16	16	15	15	13	8	2	2	2	2	2	3	2	5.9	16
21-Dec	3	Z	3	1	2	2	1	1	1	3	5	6	8	11	34	35	35	35	33	33	32	28	23	19	15.4	35
22-Dec	27	30	Z	27	25	23	16	12	27	24	28	33	34	34	35	35	34	33	32	29	28	32	30	30	28.6	35
23-Dec	26	22	17	Z	18	15	16	17	21	19	19	17	14	8	7	2	1	1	0	0	0	0	7	10.7	26	
24-Dec	26	25	31	29	Z	30	28	27	23	22	21	18	16	23	21	16	10	7	5	7	8	9	3	7	17.9	31
25-Dec	6	6	4	3	17	Z	18	16	13	9	11	14	16	12	10	12	7	2	1	1	1	1	1	1	7.9	18
26-Dec	1	1	3	3	3	4	Z	3	1	4	9	13	17	18	17	12	5	2	2	1	1	1	1	1	5.4	18
27-Dec	1	Z	1	1	1	1	1	1	1	5	12	13	15	17	18	18	13	11	7	8	5	6	2	2	7.0	18
28-Dec	1	1	Z	1	1	1	2	4	6	6	8	8	15	17	14	6	1	0	2	1	1	2	1	2	4.5	17
29-Dec	2	6	4	Z	4	5	5	6	5	5	6	9	14	16	16	12	5	3	3	6	5	3	8	7	6.7	16
30-Dec	6	12	16	21	Z	23	20	12	7	7	12	15	20	20	21	15	6	4	11	6	3	3	4	7	11.8	23
31-Dec	7	7	5	9	5	Z	3	3	4	4	10	15	21	21	21	17	13	12	9	11	11	4	2	9	9.6	21
13.0 15.0 11.0 11.2 10.3 11.1 11.2 9.5 10.5 12.7 15.1 17.1 18.6 19.1 19.4 17.0 14.5 13.8 13.6 13.3 12.6 12.4 11.2 11.9																								Diurnal Average		
31 31 31 33 33 34 34 34 34 34 34 34 34 35 36 36 37 38 36 38 38 32 32 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 (O<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	501	70.76	70.76
21 - 50	207	29.24	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	26	19	3	5	1	2	6	31	254	51	20	11	12	12	11	15	479
21 - 50	19	9	2	1	2	5	3	8	11	6	12	19	26	46	21	6	196
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
<b>Totals</b>	45	28	5	6	3	7	9	39	265	57	32	30	38	58	32	21	675

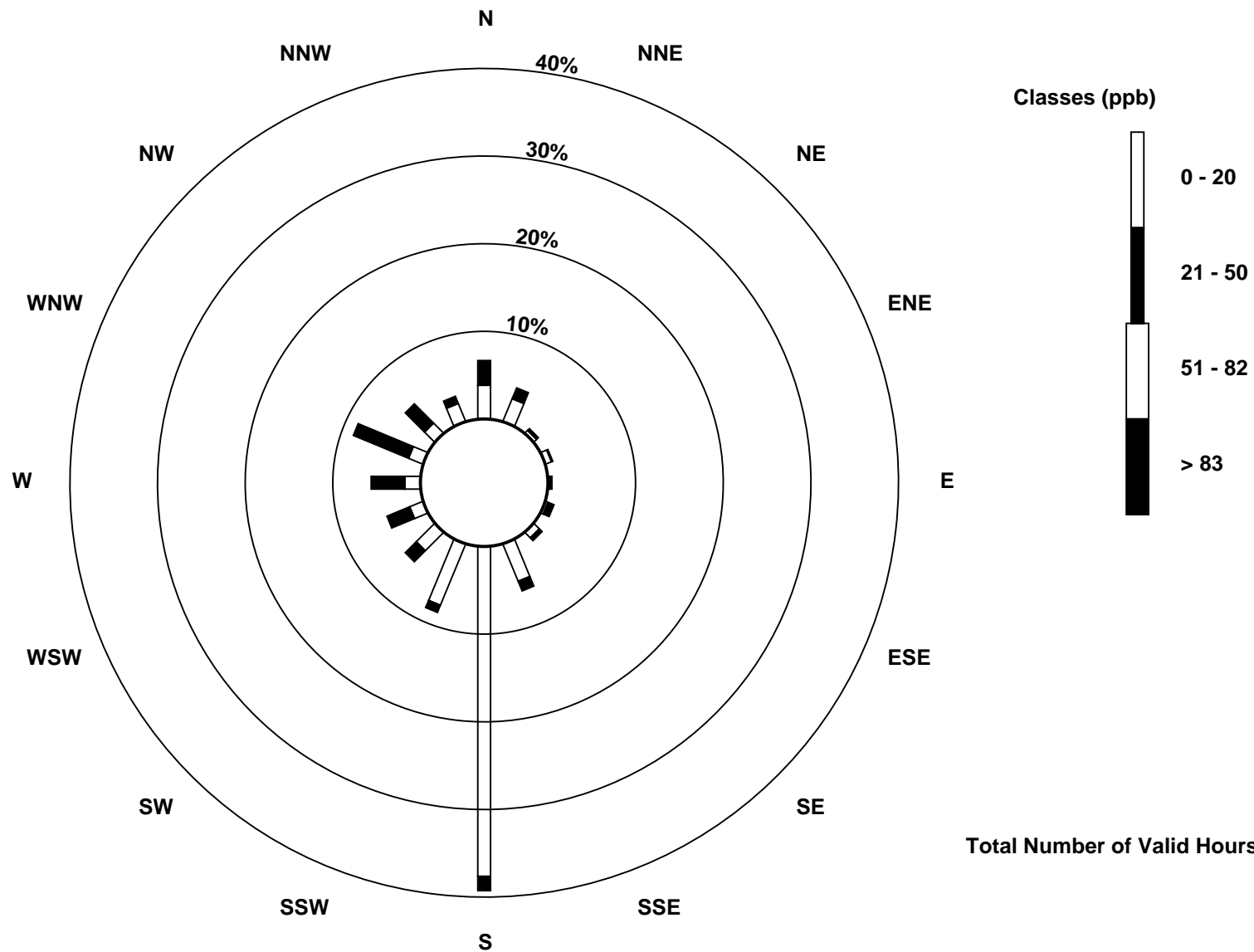
Total Number of Valid Hours: 675

Total Number of Hours: 744

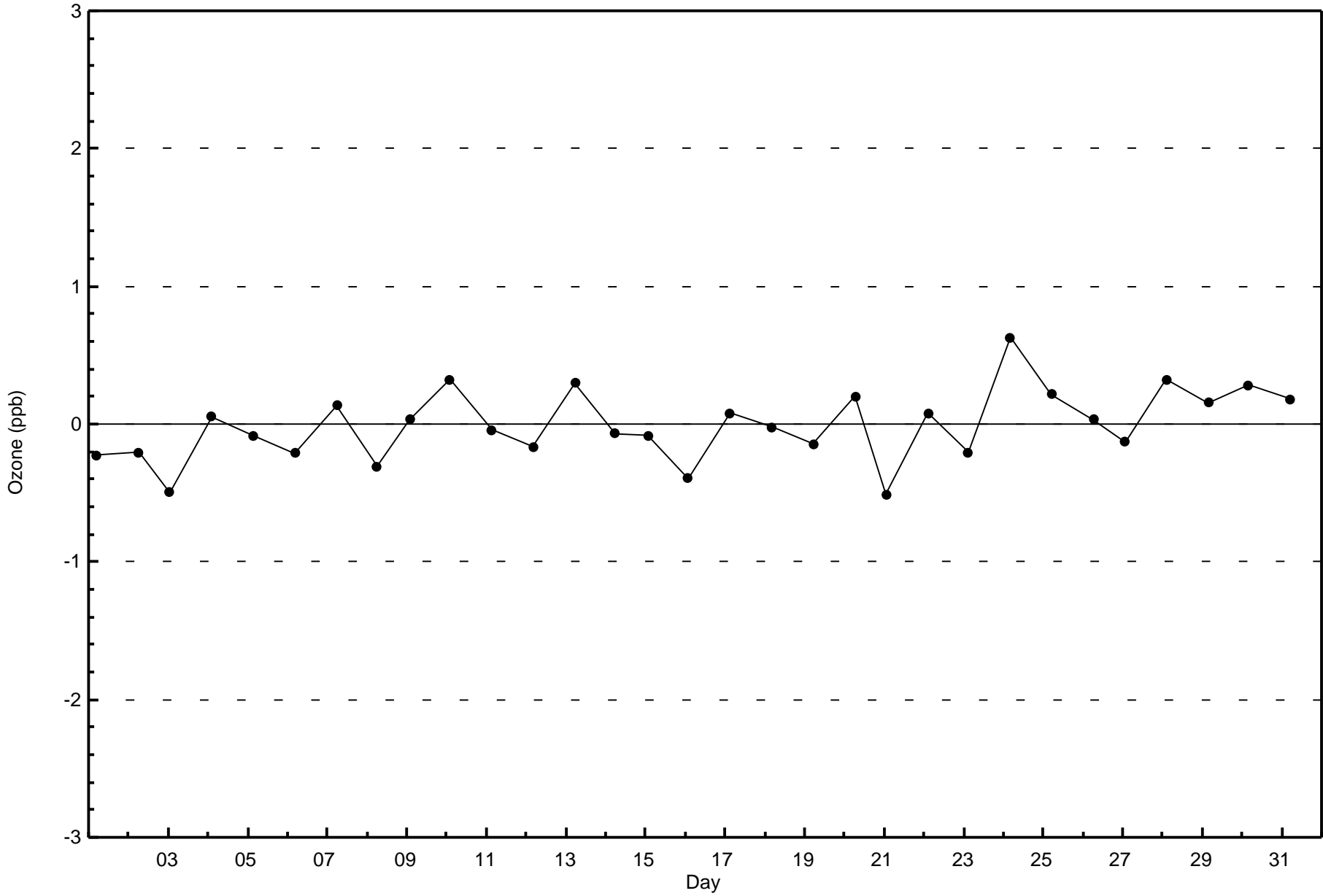


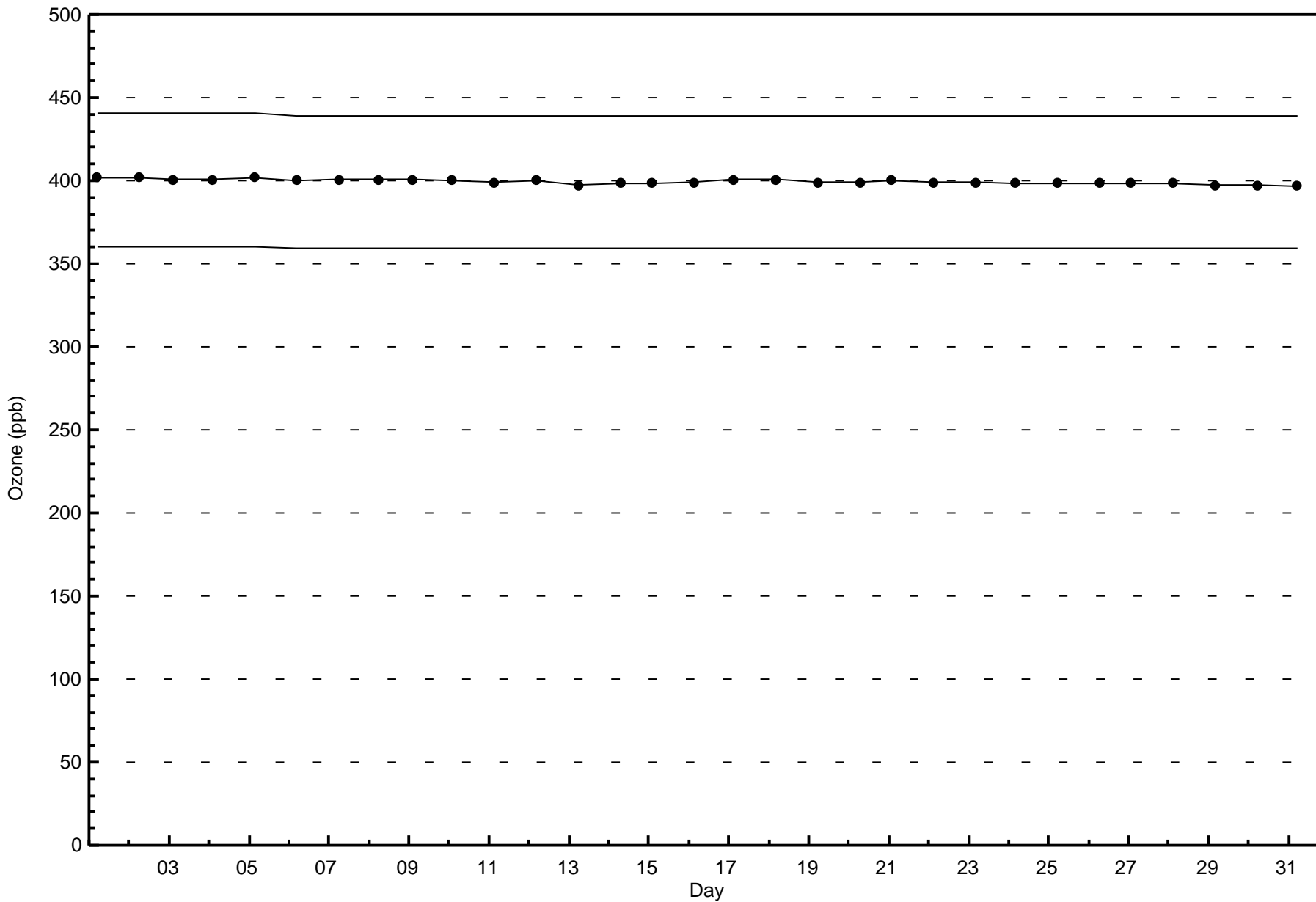
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)











Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) - µg/m<sup>3</sup>

Fort McKay - Bertha Ganter - December 2017

Number of Exceedences (AAAQO): 24-hr: 4		Hours in Service: 744																								
Maximum Value: 330.2 µg/m <sup>3</sup> on Dec 9 16:00		Maximum Daily Average: 93.7 µg/m <sup>3</sup> on Dec 8																								
Minimum Value: 0.1 µg/m <sup>3</sup> on Dec 18 12:00		Hours of Data: 723																								
Maximum Diurnal Average: 27.1 µg/m <sup>3</sup> at hour 22		Hours of Missing Data: 21																								
Monthly Average: 13.62 µg/m <sup>3</sup>		Hours of Calibration: 4																								
Minimum Daily Average: 0.4 µg/m <sup>3</sup> on Dec 18		Percent Operational Time: 97.7																								
Minimum Diurnal Average: 8.1 µg/m <sup>3</sup> at hour 2		Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.8 Q <sub>1</sub> = 1.8 Median = 4.0 Q <sub>3</sub> = 10.1 P <sub>90</sub> = 29.8 P <sub>99</sub> = 134.8																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.4	0.8	1.0	1.1	1.1	1.2	2.0	1.9	1.5	1.2	1.6	1.3	0.9	1.1	1.4	2.4	3.4	6.2	6.6	8.8	4.2	3.9	4.4	4.4	2.7	8.8
2-Dec	3.4	2.5	3.2	3.4	3.5	3.6	4.0	3.9	4.4	5.1	6.6	8.5	9.3	7.9	9.2	12.1	13.1	16.5	13.2	12.8	11.2	13.8	10.0	7.5	7.9	16.5
3-Dec	5.4	5.0	4.5	5.0	6.2	4.8	3.6	2.5	2.0	1.6	2.1	3.1	2.8	2.3	1.9	1.9	2.2	1.6	1.6	2.1	2.5	2.0	1.7	1.6	2.9	6.2
4-Dec	2.1	1.6	1.6	1.8	1.9	3.0	5.9	6.6	4.4	3.4	4.1	5.4	5.3	5.4	3.8	5.5	7.3	9.2	6.8	6.2	5.5	5.5	3.7	4.4	4.6	9.2
5-Dec	1.4	1.7	2.7	2.8	2.3	3.4	2.4	3.1	3.8	1.8	1.8	1.9	3.7	6.5	12.2	21.6	20.7	10.8	6.0	9.6	19.8	4.6	5.3	9.3	6.6	21.6
6-Dec	7.6	7.7	9.8	13.2	12.9	10.4	9.3	8.4	8.0	6.8	5.1	4.8	4.6	4.0	1.9	2.1	2.3	1.9	2.6	2.6	2.3	3.8	3.7	3.9	5.8	13.2
7-Dec	3.2	2.6	3.4	5.1	4.1	2.8	2.0	2.2	3.2	4.2	4.5	C	C	C	C	0.9	0.9	1.3	1.2	2.9	5.5	4.8	10.1	136.7	10.1	136.7
8-Dec	108.1	37.3	51.3	46.1	45.6	64.4	105.4	119.9	203.2	161.8	102.9	59.5	61.3	68.4	76.5	67.3	67.0	51.3	153.8	88.0	154.6	295.9	44.2	14.6	93.7	295.9
9-Dec	8.1	11.6	6.6	2.5	2.2	2.0	2.1	2.1	2.2	2.5	2.9	4.7	17.9	102.0	57.2	330.2	129.2	105.9	97.8	83.4	75.4	51.5	89.5	131.8	55.1	330.2
10-Dec	54.0	51.9	22.5	16.8	24.3	18.6	14.3	12.8	10.7	13.0	13.8	8.5	5.7	7.9	6.3	3.2	2.3	2.6	3.1	2.4	2.2	2.0	2.0	2.8	12.7	54.0
11-Dec	2.6	3.5	22.2	8.2	2.3	0.7	0.8	2.4	1.8	8.5	9.1	2.6	1.2	1.1	1.1	1.0	1.1	1.5	2.1	4.9	4.6	3.4	3.2	4.7	3.9	22.2
12-Dec	7.0	42.0	9.3	9.7	8.3	8.7	4.4	3.4	3.9	3.8	3.8	4.5	5.5	16.4	7.5	7.8	8.4	6.9	6.7	6.9	236.7	299.5	90.1	129.2	38.8	299.5
13-Dec	54.2	9.5	5.6	4.0	5.0	8.5	13.0	15.4	7.3	5.0	6.1	4.4	4.0	4.9	5.1	7.3	3.2	2.9	18.4	11.5	1.4	1.1	0.6	UO	8.6	54.2
14-Dec	0.5	1.9	36.0	57.0	37.0	36.7	30.5	23.0	17.1	7.7	6.1	3.7	2.4	2.4	2.8	10.3	8.4	8.0	9.6	32.1	30.1	10.8	8.6	12.0	16.4	57.0
15-Dec	10.7	18.7	13.9	4.1	3.9	4.1	5.0	5.8	6.3	4.3	3.2	2.7	0.6	UO	UO	1.6	2.1	3.7	4.3	1.8	0.2	2.1	UO	UO	5.0	18.7
16-Dec	0.1	0.2	0.3	0.4	0.3	0.4	0.5	0.4	0.6	0.3	0.3	0.4	0.4	0.4	0.5	0.9	1.3	1.5	1.8	2.1	6.3	2.3	1.6	1.8	1.0	6.3
17-Dec	1.3	1.6	2.1	1.7	1.2	0.9	1.4	1.2	1.6	1.5	0.8	0.2	0.3	0.2	UO	UO	UO	UO	UO	UO	UO	1.9	UO	UO	--	2.1
18-Dec	UO	UO	UO	0.5	0.3	0.3	0.4	0.4	0.3	0.7	0.7	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.6	0.6	0.9	0.4	0.9
19-Dec	1.1	1.1	8.3	24.4	5.5	4.7	2.5	3.6	3.4	7.2	17.5	13.0	6.0	10.7	6.5	3.0	11.2	19.6	22.2	28.4	36.2	43.8	46.3	24.3	14.6	46.3
20-Dec	20.1	11.3	11.0	12.1	8.4	6.4	6.8	8.6	10.0	11.2	14.8	27.8	54.2	42.6	29.8	25.7	32.7	35.9	31.8	31.6	24.0	26.6	15.6	15.0	21.4	54.2
21-Dec	11.8	3.8	9.1	15.3	12.0	15.8	18.4	14.7	31.4	16.0	13.1	19.5	16.3	7.0	0.3	0.2	0.2	0.1	0.8	0.1	0.1	0.2	0.9	1.1	8.7	31.4
22-Dec	0.3	0.2	0.3	0.3	1.0	2.0	2.1	3.0	1.2	0.4	0.3	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.8	0.8	0.6	3.0
23-Dec	0.8	0.9	1.0	1.5	1.4	1.1	0.9	0.9	1.1	1.6	1.3	1.4	1.6	2.8	3.5	6.0	15.6	10.5	7.8	8.0	8.4	12.2	13.1	4.6	4.5	15.6
24-Dec	1.2	0.7	0.9	1.0	0.9	1.3	0.8	0.9	1.0	0.9	1.6	4.4	1.8	1.2	2.0	12.9	5.1	4.6	5.6	4.5	2.8	2.8	5.4	2.5	2.8	12.9
25-Dec	1.3	0.9	0.9	0.9	0.7	0.8	0.7	0.7	1.1	3.4	3.3	4.1	9.4	15.4	15.7	17.5	20.8	19.0	23.0	27.0	14.9	12.4	10.7	5.2	8.7	27.0
26-Dec	9.1	10.4	9.5	8.7	8.6	8.4	6.0	6.7	7.1	4.1	2.4	1.8	1.5	8.4	18.0	8.8	4.7	4.2	4.6	3.1	3.6	3.5	2.4	3.5	6.2	18.0
27-Dec	8.2	5.5	3.9	2.9	2.6	2.5	5.3	4.7	1.5	1.3	4.1	10.6	11.7	15.8	14.0	12.2	4.0	2.7	2.2	2.5	5.7	4.1	5.3	3.5	5.7	15.8
28-Dec	2.9	4.2	3.7	2.9	2.4	2.4	2.8	3.0	3.7	4.6	3.8	8.7	52.0	32.6	23.2	25.3	69.6	36.0	16.2	5.7	5.7	2.3	1.7	1.6	13.2	69.6
29-Dec	2.1	1.4	1.8	19.7	111.5	66.4	86.2	116.0	103.6	198.7	107.4	2.7	1.9	1.9	1.7	1.8	1.8	1.9	1.6	1.3	1.3	1.3	1.3	1.2	34.8	198.7
30-Dec	1.1	1.1	1.1	1.0	0.9	0.8	0.8	8.9	14.0	15.0	15.5	27.4	40.5	42.1	11.7	2.6	3.5	2.7	2.5	3.9	2.9	2.7	2.2	2.8	8.7	42.1
31-Dec	3.1	2.7	3.5	3.0	3.2	2.9	3.0	2.9	4.0	4.2	2.8	10.0	10.0	3.8	8.9	9.9	10.6	12.6	8.3	6.7	7.5	18.0	9.2	5.4	6.5	18.0
																								Diurnal Average		
																								Diurnal Maximum		
11.1 8.1 8.4 8.9 10.4 9.3 11.1 12.6 15.0 16.2 11.7 8.3 11.1 14.3 11.5 20.1 15.1 12.7 15.4 13.4 22.5 27.1 13.6 19.2																										
108.1 51.9 51.3 57.0 111.5 66.4 105.4 119.9 203.2 198.7 107.4 59.5 61.3 102.0 76.5 330.2 129.2 105.9 153.8 88.0 236.7 299.5 90.1 136.7																										
C - Calibration UO - Unstable Operation																										
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																										

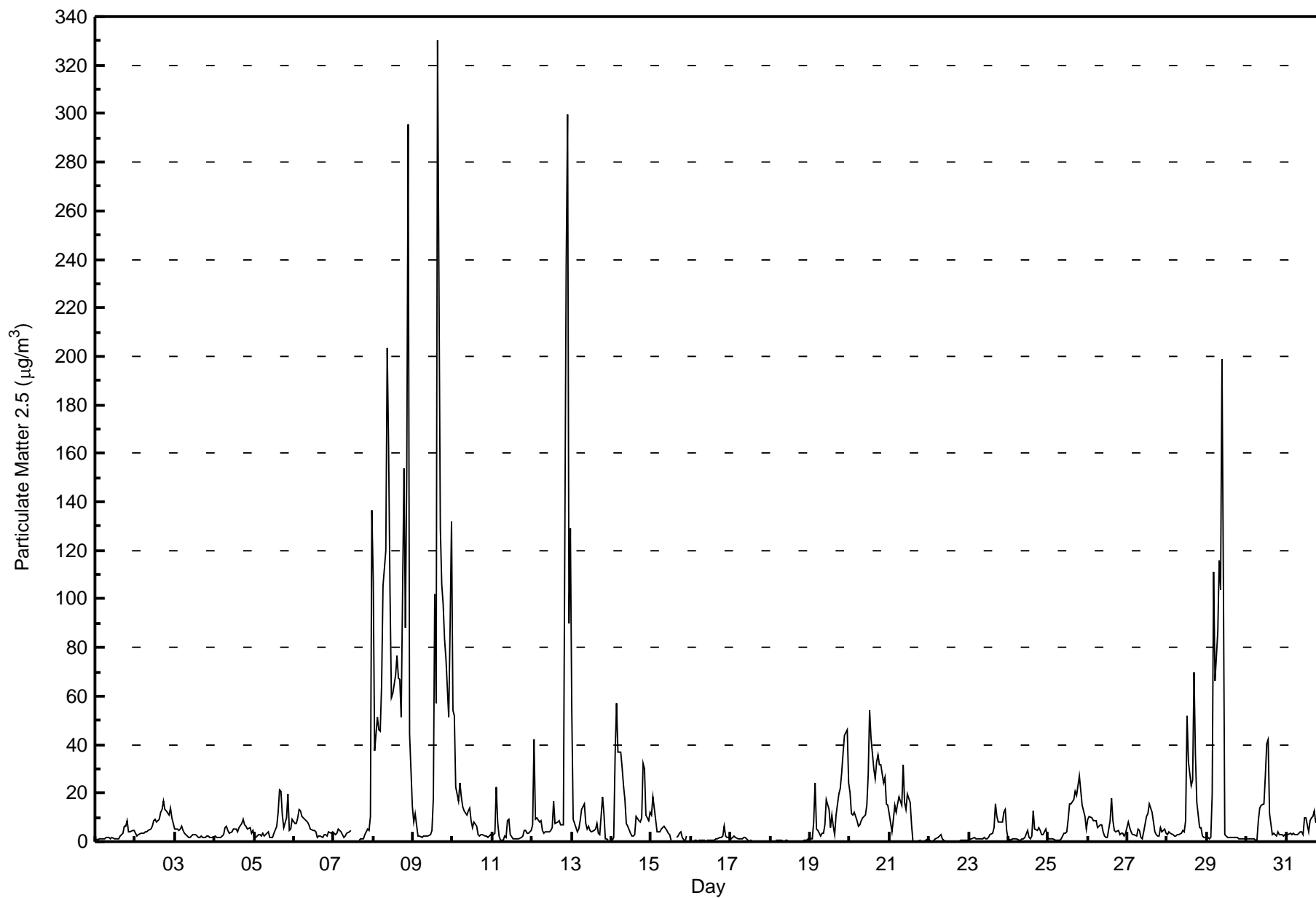


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Fort McKay - Bertha Ganter - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	333	46.06	46.06
6 - 15	166	22.96	69.02
16 - 25	42	5.81	74.83
26 - 80	51	7.05	81.88
> 81.0	29	4.01	85.89

Total Number of Valid Hours: 723

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Fort McKay - Bertha Ganter - December 2017**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	26	13	4	0	2	3	5	26	116	26	15	18	23	16	11	13	317
6 - 15	5	6	0	3	0	1	1	10	92	11	7	1	3	10	8	4	162
16 - 25	0	2	0	2	0	0	1	1	20	6	5	2	0	0	0	3	42
26 - 80	1	0	1	1	0	0	0	4	31	7	2	3	1	0	0	0	51
> 81.0	0	0	0	0	0	0	0	3	13	7	4	2	0	0	0	0	29
<b>Totals</b>	<b>32</b>	<b>21</b>	<b>5</b>	<b>6</b>	<b>2</b>	<b>4</b>	<b>7</b>	<b>44</b>	<b>272</b>	<b>57</b>	<b>33</b>	<b>26</b>	<b>27</b>	<b>26</b>	<b>19</b>	<b>20</b>	<b>601</b>

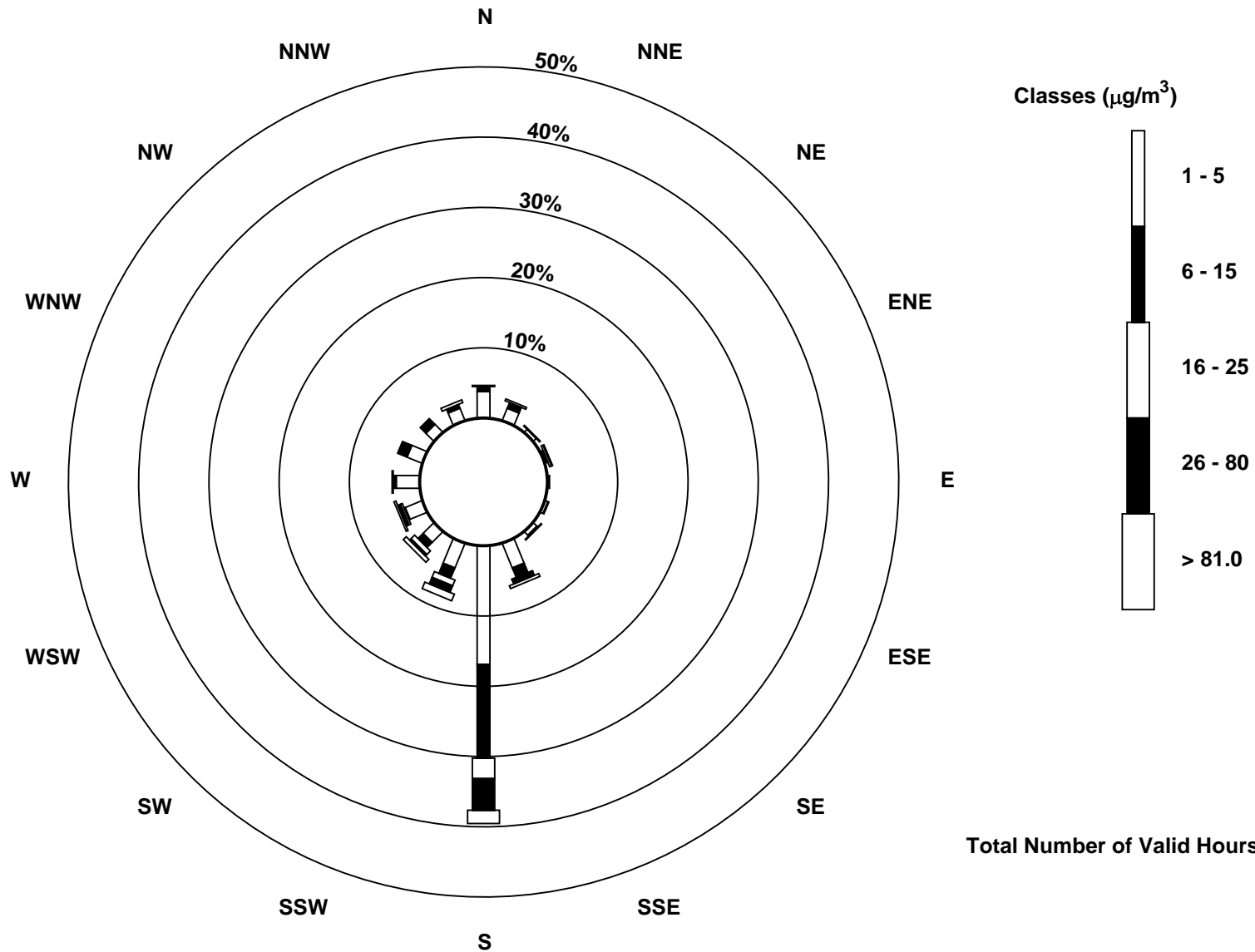
Total Number of Valid Hours: 688

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





Number of Exceedences (AAAQO): 1-hr: 0	Hours in Service: 744
Maximum Value: 15 ppb on Dec 12 22:00	Maximum Daily Average: 0.7 ppb on Dec 12
Minimum Value: 0 ppb on Dec 1 01:00	Hours of Data: 646
Maximum Diurnal Average: 0.6 ppb at hour 9	Hours of Missing Data: 98
Monthly Average: 0.0 ppb	Hours of Calibration: 44
Minimum Daily Average: 0.0 ppb on Dec 1	Percent Operational Time: 92.7
Minimum Diurnal Average: 0.0 ppb at hour 1	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	0	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3-Dec	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Dec	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Dec	0	0	0	0	0	Z	RE	RE	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	10
6-Dec	0	0	0	0	0	0	Z	RE	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
7-Dec	0	0	0	0	0	0	0	Z	RE	RE	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
8-Dec	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
9-Dec	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
10-Dec	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
11-Dec	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0.7	15
13-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	0	0	0	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	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
16-Dec	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
17-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	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
19-Dec	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
20-Dec	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
21-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	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
23-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	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
25-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Dec	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
27-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	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

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	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	0	15	0	0

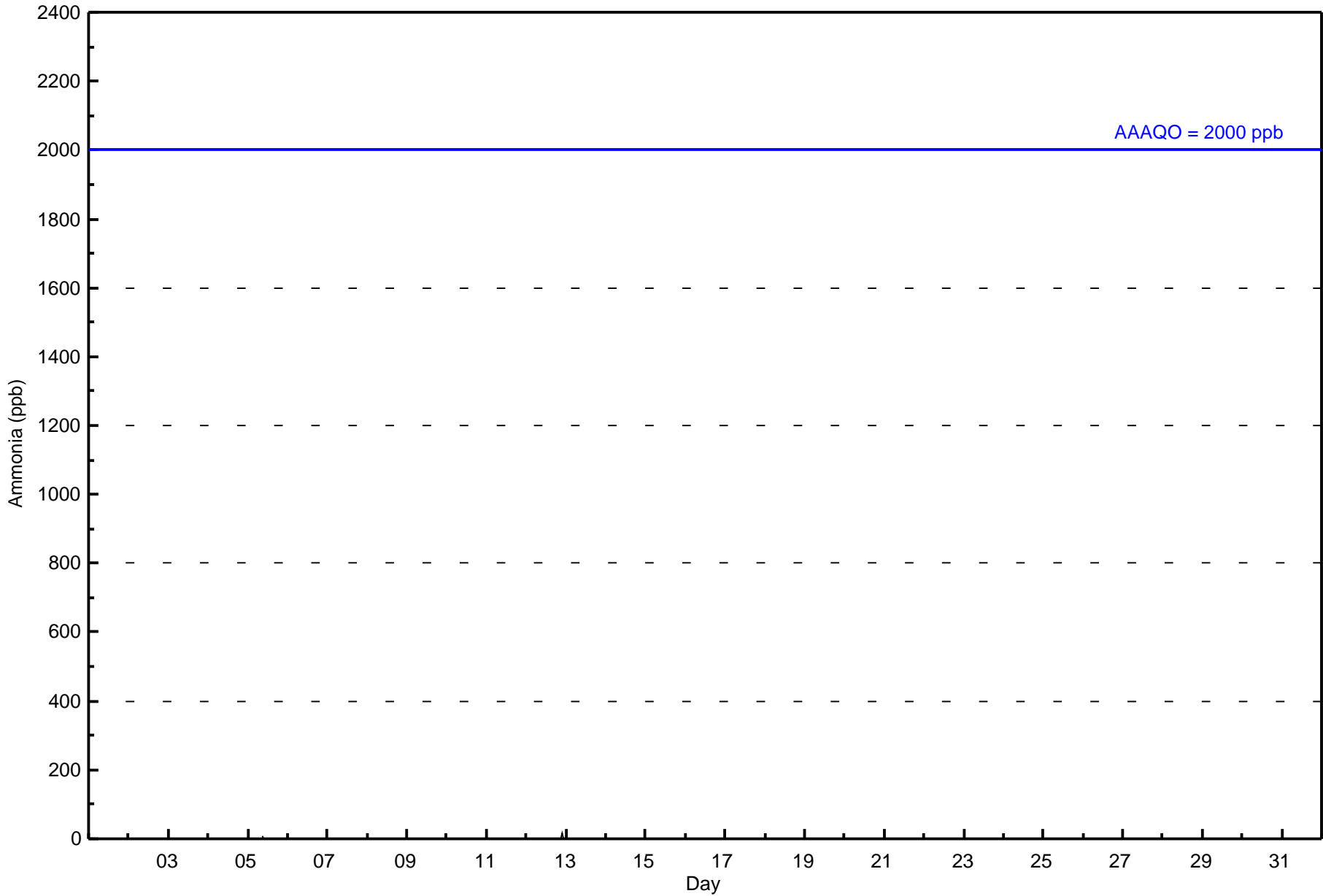
Z - zerospan      C - Calibration      RE - Recovery  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Ammonia (NH<sub>3</sub>) - ppb  
Fort McKay - Bertha Ganter - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	644	99.69	99.69
6 - 10	1	0.15	99.85
11 - 15	1	0.15	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: 646

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	44	27	5	6	3	7	7	37	242	49	28	31	29	47	30	22	614
6 - 10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11 - 15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
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
<b>Totals</b>	45	27	5	6	3	7	7	37	243	49	28	31	29	47	30	22	616

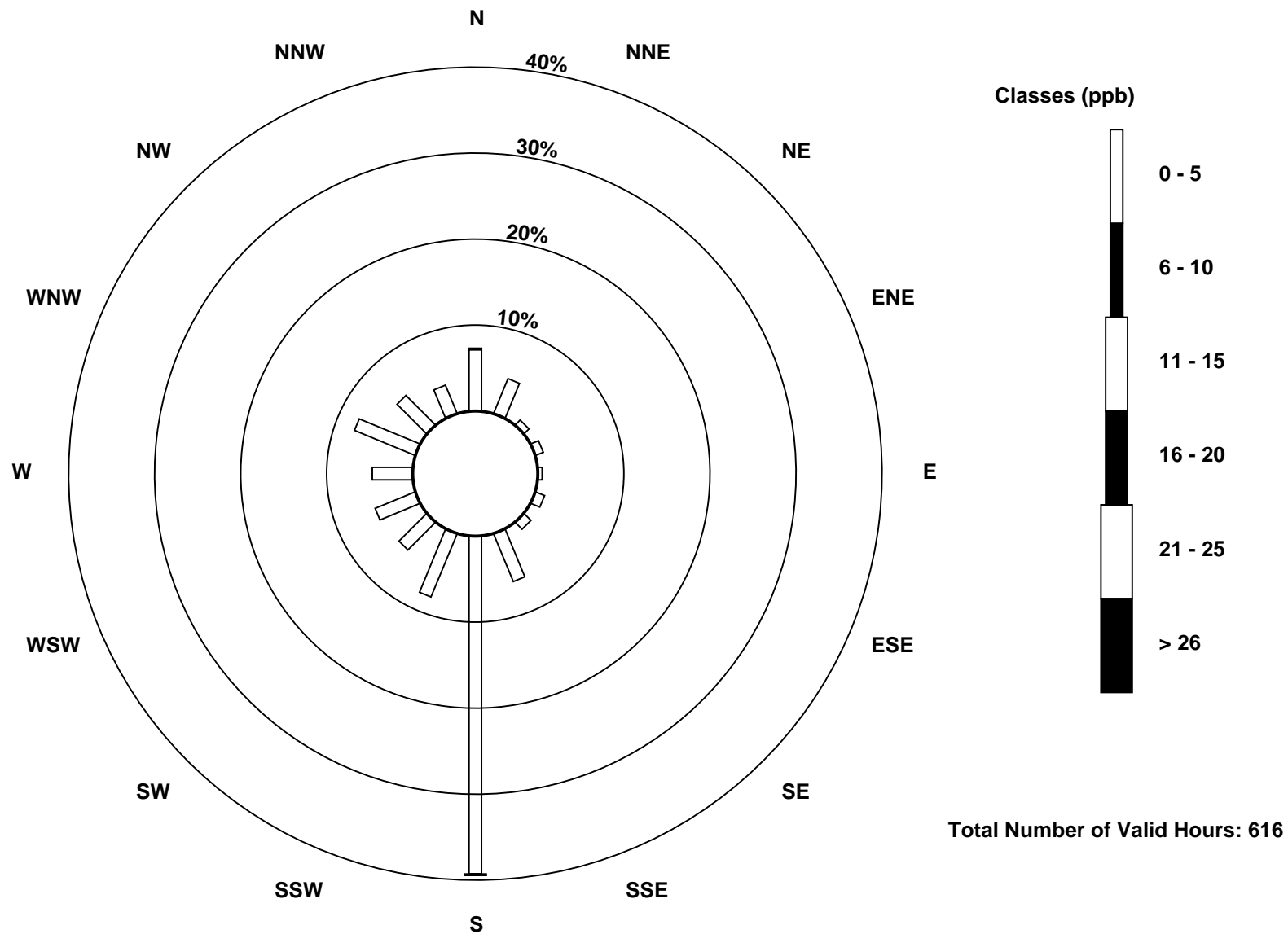
Total Number of Valid Hours: 616

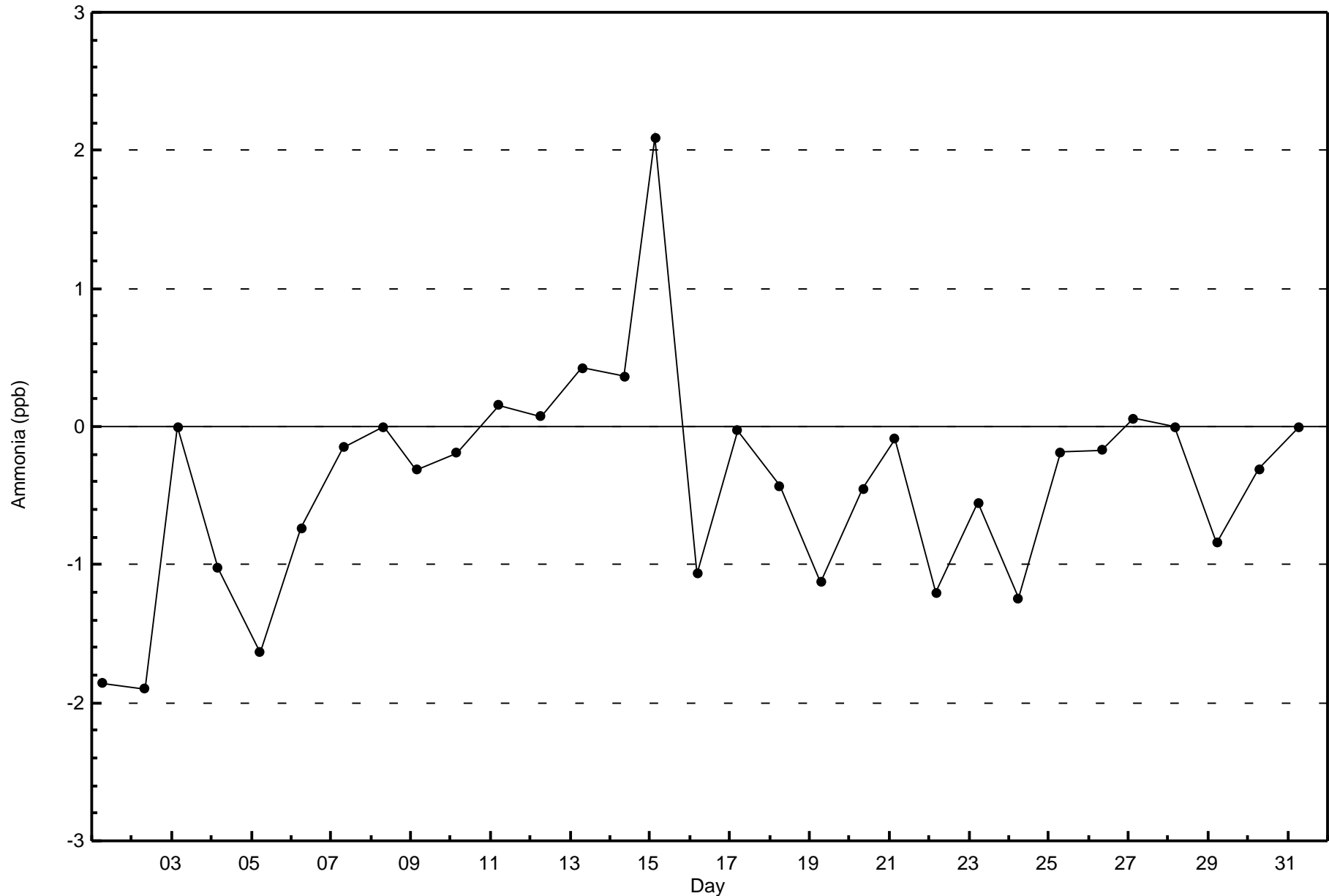
Total Number of Hours: 744

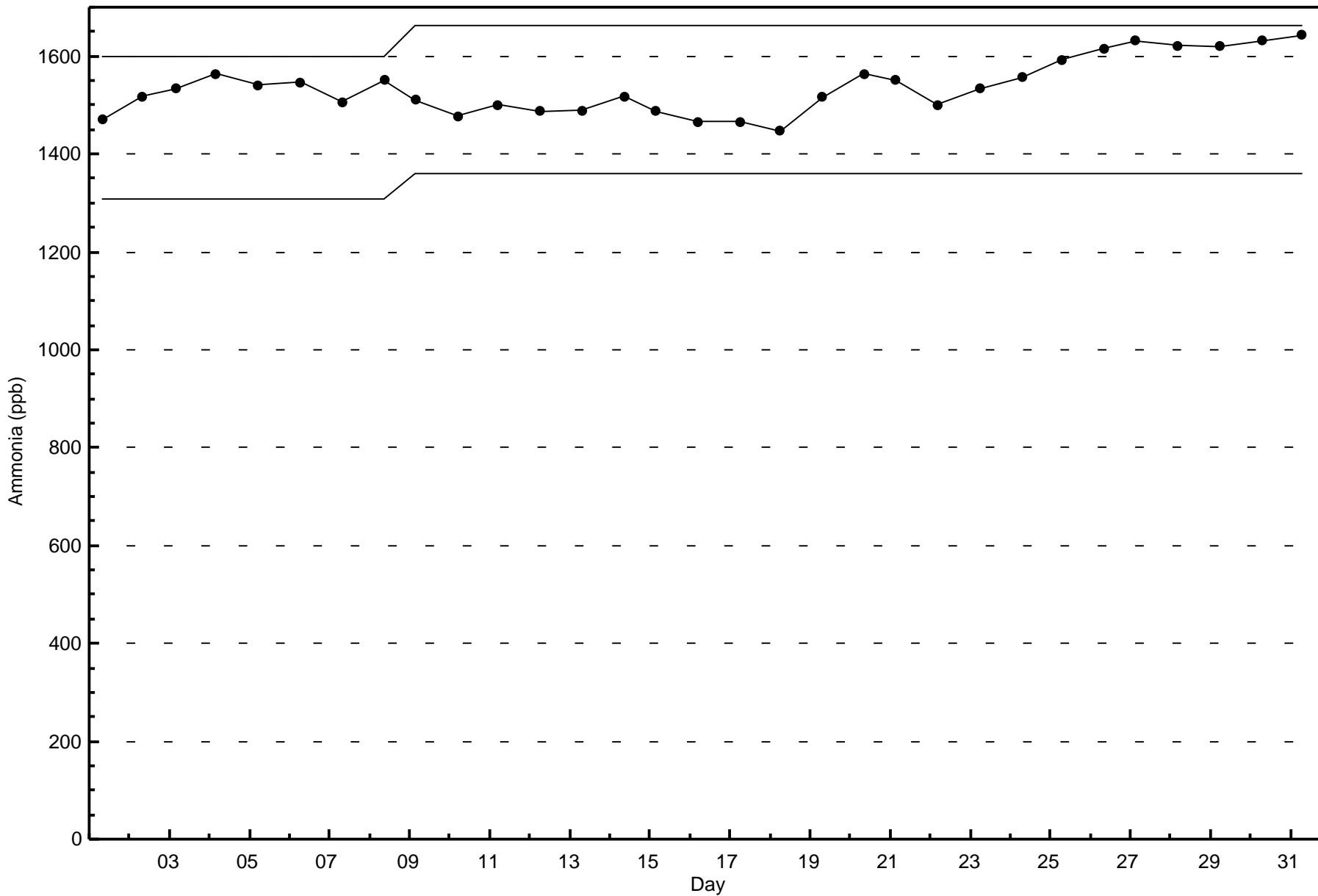


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ammonia (NH<sub>3</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)









**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature 10 m (AT 10m) - C**

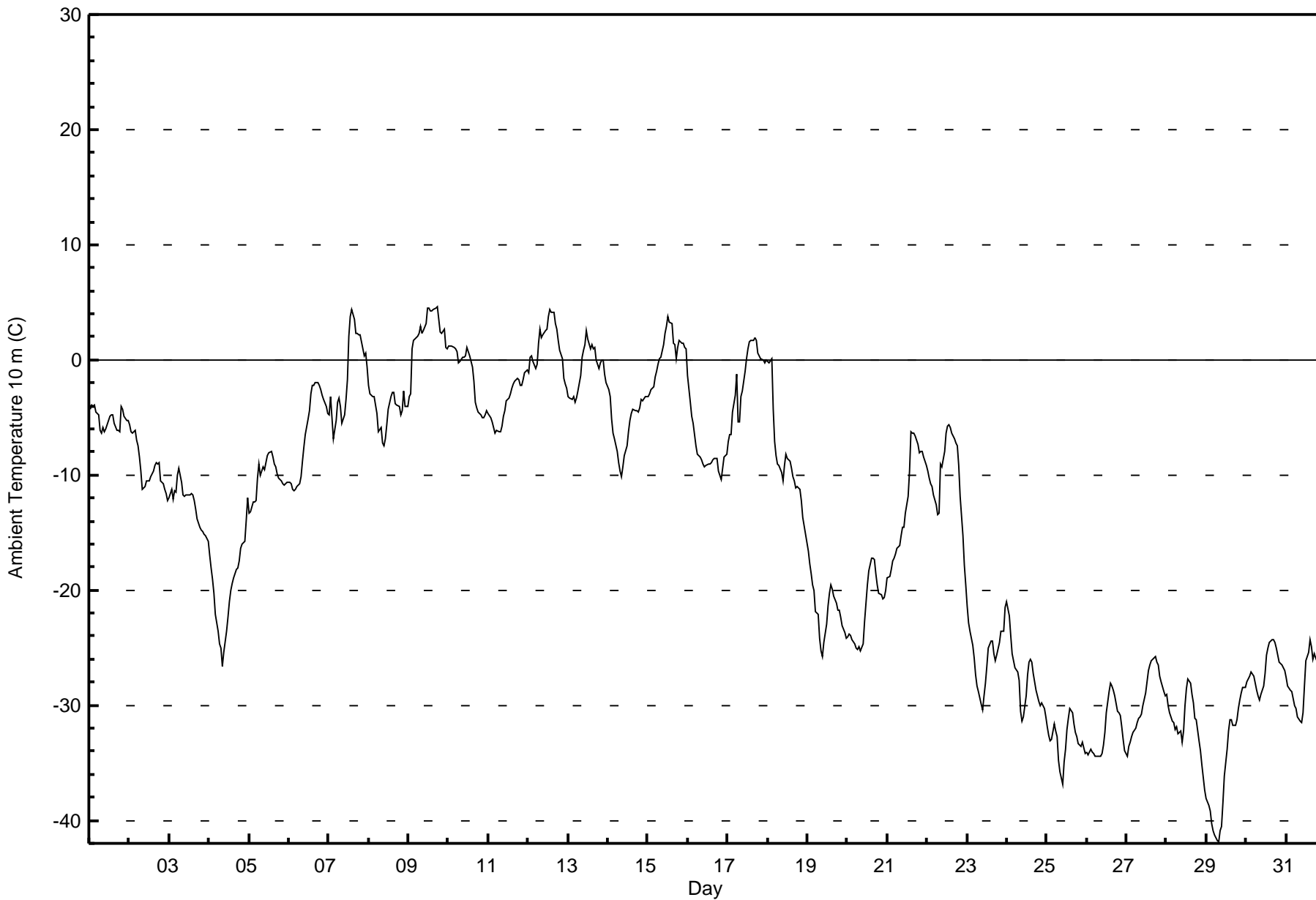
**Fort McKay - Bertha Ganter - December 2017**

Maximum Value: 4.6 C on Dec 9 18:00		Maximum Daily Average: 2.4 C on Dec 9		Hours in Service: 744																						
Minimum Value: -41.9 C on Dec 29 08:00		Minimum Daily Average: -35.3 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -11.6 C at hour 15		Minimum Diurnal Average: -15.8 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -13.86 C		Percentiles: P <sub>1</sub> = -39.2 P <sub>10</sub> = -31.3 Q <sub>1</sub> = -25.8 Median = -10.3 Q <sub>3</sub> = -3.6 P <sub>90</sub> = 0.9 P <sub>99</sub> = 4.4		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.2	-3.9	-4.1	-3.9	-4.5	-4.8	-6.1	-6.3	-5.9	-6.3	-6.0	-5.2	-4.8	-4.8	-4.8	-5.5	-6.2	-6.1	-6.3	-4.1	-4.3	-4.8	-5.2	-5.3	-5.2	-3.9
2-Dec	-5.7	-6.2	-6.4	-6.1	-7.0	-7.5	-8.4	-9.7	-11.3	-11.0	-10.5	-10.5	-10.5	-10.2	-9.7	-9.2	-8.9	-9.1	-9.0	-10.5	-10.8	-11.3	-11.6	-12.3	-9.3	-5.7
3-Dec	-12.0	-11.3	-12.1	-11.4	-11.5	-10.0	-9.5	-10.6	-11.8	-11.8	-11.7	-11.8	-11.7	-11.6	-11.7	-12.2	-12.9	-13.8	-14.5	-14.8	-15.0	-15.1	-15.3	-15.8	-12.5	-9.5
4-Dec	-17.0	-18.1	-19.0	-20.3	-22.1	-23.5	-24.7	-25.0	-26.6	-25.4	-23.6	-22.3	-21.0	-20.1	-19.4	-18.9	-18.2	-18.1	-17.4	-16.4	-16.0	-15.7	-13.9	-12.0	-19.8	-12.0
5-Dec	-13.3	-13.2	-12.3	-12.4	-12.2	-10.3	-9.0	-10.1	-9.3	-9.5	-9.0	-8.3	-8.0	-7.9	-8.4	-9.0	-9.4	-9.9	-10.3	-10.6	-10.7	-10.9	-10.8	-10.6	-10.2	-7.9
6-Dec	-10.6	-10.8	-11.2	-11.3	-11.3	-11.1	-10.8	-10.1	-8.8	-7.6	-6.5	-5.2	-4.5	-2.9	-2.2	-2.2	-1.9	-2.0	-2.2	-2.6	-3.1	-3.5	-4.1	-4.7	-6.3	-1.9
7-Dec	-4.8	-3.2	-5.0	-6.9	-5.2	-3.7	-3.3	-4.0	-5.5	-4.8	-3.4	-1.8	2.1	3.8	4.4	3.5	2.3	2.3	2.2	2.1	0.9	0.3	0.6	-0.6	-1.2	4.4
8-Dec	-2.2	-2.9	-3.1	-3.3	-3.9	-4.7	-6.2	-5.9	-7.2	-7.5	-6.8	-5.7	-4.3	-3.2	-2.8	-2.9	-3.8	-3.9	-4.1	-4.8	-4.4	-2.8	-4.0	-4.1	-4.3	-2.2
9-Dec	-3.2	-3.0	0.9	1.7	1.9	2.1	2.3	2.9	2.2	2.5	3.2	4.4	4.5	4.2	4.3	4.4	4.5	4.6	3.5	2.4	2.3	2.7	1.1	1.0	2.4	4.6
10-Dec	1.2	1.2	1.2	1.1	1.0	0.8	-0.2	-0.1	0.2	0.2	0.4	1.1	0.7	0.4	-0.6	-1.9	-3.7	-4.2	-4.6	-4.8	-5.0	-5.0	-4.8	-4.5	-1.3	1.2
11-Dec	-4.6	-5.0	-5.4	-5.9	-6.3	-6.1	-6.2	-6.2	-5.8	-4.8	-4.4	-3.6	-3.4	-3.0	-2.5	-2.1	-1.8	-1.6	-1.7	-2.3	-2.2	-1.7	-1.1	-0.9	-3.7	-0.9
12-Dec	-1.1	0.2	0.4	-0.1	-0.8	-0.4	1.5	2.7	1.9	2.2	2.6	2.6	3.8	4.4	4.2	4.1	3.2	2.6	1.7	0.8	0.1	-1.6	-2.1	-2.5	1.3	4.4
13-Dec	-3.2	-3.3	-3.4	-3.2	-3.7	-3.4	-2.7	-1.4	0.3	0.9	1.3	2.6	1.8	0.9	1.4	1.0	1.0	0.0	-0.8	-0.2	-0.1	0.0	-1.2	-2.0	-0.7	2.6
14-Dec	-2.5	-3.2	-5.2	-6.4	-6.8	-8.0	-9.0	-9.6	-10.1	-9.3	-8.4	-7.4	-6.3	-5.2	-4.6	-4.2	-4.4	-4.4	-4.5	-4.1	-3.4	-3.6	-3.2	-3.2	-5.7	-2.5
15-Dec	-3.2	-2.9	-2.6	-2.3	-1.5	-1.0	-0.4	0.0	0.3	1.3	2.4	2.9	3.7	3.3	3.1	1.4	1.3	0.1	1.0	1.6	1.5	1.4	1.1	0.9	0.6	3.7
16-Dec	-1.4	-3.6	-5.0	-5.6	-6.5	-7.4	-8.2	-8.5	-8.7	-9.0	-9.2	-9.1	-9.1	-9.1	-8.9	-8.7	-8.5	-8.6	-9.7	-10.0	-10.4	-9.4	-8.5	-8.2	-8.0	-1.4
17-Dec	-7.1	-6.5	-6.5	-4.6	-3.1	-1.2	-5.4	-5.4	-3.2	-2.7	-1.0	0.1	1.0	1.5	1.6	1.7	1.9	1.6	0.6	0.3	0.1	0.0	-0.2	-0.1	-1.5	1.9
18-Dec	-0.1	-0.3	0.1	-4.3	-7.1	-8.4	-9.0	-9.2	-9.8	-10.5	-9.2	-8.2	-8.5	-8.8	-9.4	-10.2	-10.6	-11.1	-11.0	-11.3	-12.3	-13.7	-14.4	-15.2	-8.9	0.1
19-Dec	-16.6	-17.8	-18.6	-19.5	-20.1	-21.9	-22.2	-24.2	-25.3	-25.8	-24.6	-22.9	-21.4	-20.3	-19.6	-19.9	-20.6	-21.1	-21.8	-21.8	-22.4	-23.1	-23.7	-24.2	-21.6	-16.6
20-Dec	-24.1	-23.9	-23.9	-24.3	-24.7	-25.1	-25.1	-25.0	-25.2	-24.7	-22.7	-21.1	-19.6	-18.3	-17.2	-17.2	-17.4	-18.6	-19.6	-20.3	-20.4	-20.8	-20.6	-20.0	-21.7	-17.2
21-Dec	-19.0	-18.8	-18.2	-17.5	-17.2	-16.8	-16.3	-16.1	-15.2	-14.6	-14.5	-13.3	-11.9	-9.7	-6.3	-6.4	-6.4	-6.6	-7.4	-8.0	-7.9	-8.0	-8.5	-9.2	-12.2	-6.3
22-Dec	-9.7	-10.2	-10.7	-10.9	-11.8	-12.6	-13.4	-13.3	-9.1	-9.3	-8.0	-6.3	-5.8	-5.6	-5.8	-6.4	-6.9	-7.2	-7.5	-9.2	-11.8	-15.2	-17.8	-19.6	-10.2	-5.6
23-Dec	-21.4	-22.8	-23.6	-24.8	-25.9	-27.4	-28.3	-28.8	-29.9	-30.4	-29.2	-28.1	-26.6	-25.0	-24.5	-24.4	-25.6	-26.2	-25.6	-24.6	-23.6	-23.6	-23.6	-21.5	-25.6	-21.4
24-Dec	-21.0	-22.2	-24.0	-25.5	-26.2	-26.8	-27.2	-27.9	-30.6	-31.3	-31.1	-29.2	-27.3	-26.3	-26.0	-26.3	-27.2	-28.7	-29.2	-29.7	-30.0	-29.8	-30.3	-31.0	-27.7	-21.0
25-Dec	-31.9	-32.6	-33.1	-33.0	-31.6	-32.3	-32.7	-34.8	-35.8	-36.9	-34.9	-33.8	-32.2	-31.2	-30.3	-30.6	-31.7	-32.4	-32.7	-33.3	-33.6	-33.2	-33.7	-34.2	-33.0	-30.3
26-Dec	-34.1	-34.3	-33.8	-34.1	-34.2	-34.5	-34.4	-34.5	-34.4	-34.2	-33.4	-32.4	-30.6	-28.9	-28.1	-28.3	-28.7	-29.2	-30.5	-30.6	-30.9	-31.8	-33.0	-34.0	-32.2	-28.1
27-Dec	-34.4	-33.6	-33.2	-32.7	-32.4	-32.0	-31.5	-31.2	-31.0	-30.7	-30.0	-29.0	-28.0	-27.0	-26.5	-26.1	-25.9	-25.8	-26.2	-26.6	-27.5	-28.0	-28.8	-29.2	-29.5	-25.8
28-Dec	-29.1	-30.1	-30.6	-31.4	-31.5	-32.1	-31.9	-32.4	-32.2	-33.2	-32.3	-30.0	-28.6	-27.7	-28.1	-29.1	-29.8	-31.1	-31.3	-33.1	-34.0	-35.2	-36.3	-37.3	-31.6	-27.7
29-Dec	-38.1	-38.7	-39.2	-40.3	-41.0	-41.3	-41.8	-41.9	-40.9	-40.6	-38.5	-36.2	-33.8	-32.3	-31.3	-31.2	-31.8	-31.7	-31.2	-30.3	-29.5	-28.9	-28.5	-28.4	-35.3	-28.4
30-Dec	-28.0	-27.7	-27.4	-27.1	-27.5	-28.1	-28.7	-29.2	-29.5	-29.1	-28.3	-27.3	-25.7	-25.0	-24.5	-24.4	-24.3	-24.6	-25.0	-25.7	-26.3	-26.5	-26.8	-27.0	-26.8	-24.3
31-Dec	-27.6	-28.3	-28.7	-28.8	-29.4	-30.0	-30.3	-31.0	-31.4	-31.6	-30.7	-28.3	-26.2	-25.3	-24.2	-25.0	-26.0	-25.6	-25.9	-26.5	-26.7	-26.8	-27.8	-27.5	-27.9	-24.2
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 10 m (AT 10m) - C**  
**Fort McKay - Bertha Ganter - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 10 m (AT 10m) - C  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	262	35.22	35.22
-20 - 0	383	51.48	86.69
0 - 10	99	13.31	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

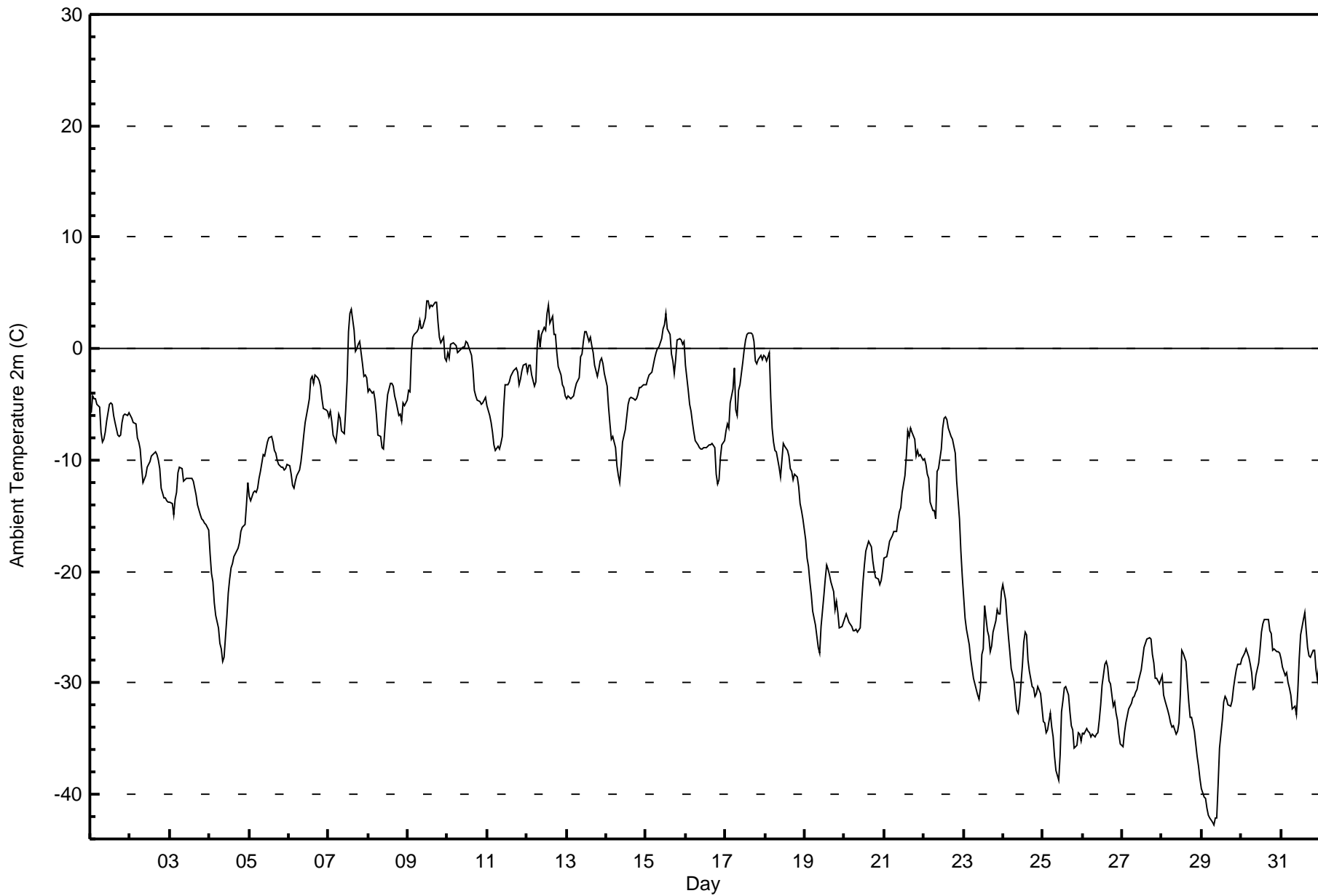


Maximum Value: 4.3 C on Dec 9 13:00		Maximum Daily Average: 1.6 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -42.7 C on Dec 29 08:00		Minimum Daily Average: -35.8 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -11.8 C at hour 14		Minimum Diurnal Average: -16.8 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -14.59 C		Percentiles: P <sub>1</sub> = -40.4 P <sub>10</sub> = -32.1 Q <sub>1</sub> = -26.7 Median = -10.7 Q <sub>3</sub> = -4.4 P <sub>90</sub> = -0.2 P <sub>99</sub> = 3.6		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-5.7	-4.3	-4.4	-4.4	-5.0	-5.3	-7.5	-8.3	-8.1	-7.5	-6.5	-5.0	-4.9	-5.0	-5.9	-6.7	-7.7	-7.9	-7.8	-6.7	-6.0	-5.9	-5.9	-5.8	-6.2	-4.3																						
2-Dec	-6.0	-6.3	-6.6	-6.8	-8.0	-8.3	-9.0	-10.6	-12.0	-11.3	-10.6	-10.4	-10.2	-9.6	-9.4	-9.3	-9.5	-10.0	-10.8	-12.6	-13.4	-13.4	-13.6	-13.8	-10.1	-6.0																						
3-Dec	-13.8	-13.9	-14.9	-13.6	-12.9	-11.2	-10.7	-10.8	-11.8	-11.8	-11.7	-11.7	-11.7	-11.7	-11.8	-12.5	-13.2	-14.0	-14.9	-15.3	-15.5	-15.7	-15.8	-16.3	-13.2	-10.7																						
4-Dec	-18.4	-20.1	-20.9	-22.8	-23.9	-25.1	-26.4	-26.9	-28.1	-27.7	-24.1	-21.9	-20.6	-19.7	-19.3	-18.7	-18.2	-17.9	-17.4	-16.4	-16.0	-15.8	-14.0	-12.1	-20.5	-12.1																						
5-Dec	-13.3	-13.7	-12.9	-12.7	-12.9	-12.5	-11.7	-11.0	-9.5	-9.6	-9.0	-8.4	-8.1	-7.9	-8.4	-9.1	-9.4	-10.0	-10.4	-10.6	-10.7	-10.9	-10.7	-10.4	-10.6	-7.9																						
6-Dec	-10.5	-11.3	-12.2	-12.5	-11.9	-11.4	-10.9	-10.2	-9.0	-7.7	-6.6	-5.3	-4.5	-2.8	-2.5	-3.1	-2.3	-2.6	-2.9	-3.4	-4.5	-5.4	-5.4	-5.7	-6.9	-2.3																						
7-Dec	-6.1	-5.7	-6.5	-7.7	-8.3	-7.3	-5.9	-6.2	-7.3	-7.7	-5.5	-2.9	1.5	3.2	3.5	1.6	-0.2	0.0	0.4	0.7	-1.4	-2.5	-2.4	-2.6	-3.1	3.5																						
8-Dec	-3.9	-3.6	-4.0	-3.9	-4.6	-6.0	-7.8	-7.9	-8.9	-9.0	-7.2	-5.5	-4.1	-3.1	-3.1	-3.3	-4.3	-4.7	-6.0	-5.9	-6.4	-4.9	-5.1	-4.6	-5.3	-3.1																						
9-Dec	-3.8	-3.9	-0.2	1.0	1.3	1.6	1.8	2.6	1.8	1.9	2.8	4.3	4.3	3.7	3.9	3.7	4.2	4.2	2.4	1.0	0.5	1.0	-0.9	-1.1	1.6	4.3																						
10-Dec	-0.3	-0.9	0.4	0.6	0.4	0.3	-0.3	-0.2	0.0	0.2	0.2	0.7	0.5	0.2	-0.6	-1.9	-3.7	-4.2	-4.6	-4.7	-5.0	-4.9	-4.6	-4.3	-1.5	0.7																						
11-Dec	-5.2	-6.1	-6.6	-7.5	-8.6	-9.1	-8.8	-8.9	-8.6	-7.9	-5.2	-3.3	-3.3	-3.0	-2.5	-2.2	-1.9	-1.8	-2.1	-3.2	-2.8	-2.0	-1.5	-1.4	-4.7	-1.4																						
12-Dec	-2.1	-1.5	-1.5	-2.4	-3.3	-3.0	0.3	1.6	0.2	1.2	1.8	1.7	3.1	4.0	2.3	2.9	1.3	1.3	-0.4	-1.6	-2.4	-3.2	-3.4	-4.3	-0.3	4.0																						
13-Dec	-4.5	-4.3	-4.5	-4.3	-4.3	-3.6	-3.1	-2.6	-0.7	-0.5	0.6	1.6	1.5	0.7	1.0	0.2	-0.3	-1.5	-2.5	-1.8	-1.1	-0.9	-1.3	-2.2	-1.6	1.6																						
14-Dec	-3.4	-5.2	-6.7	-8.1	-7.9	-8.9	-10.5	-11.4	-12.1	-10.4	-8.4	-7.2	-6.1	-5.0	-4.5	-4.4	-4.5	-4.6	-4.5	-4.2	-3.4	-3.5	-3.2	-3.2	-6.3	-3.2																						
15-Dec	-3.2	-2.8	-2.4	-2.2	-1.4	-0.9	-0.4	0.1	0.2	0.8	1.8	2.1	3.1	1.8	1.2	-0.5	-1.1	-2.3	-0.9	0.8	0.8	0.8	0.5	0.7	-0.1	3.1																						
16-Dec	-1.5	-3.7	-5.0	-5.7	-6.7	-7.5	-8.3	-8.6	-8.8	-9.0	-9.0	-8.9	-8.8	-8.7	-8.6	-8.7	-8.5	-8.8	-11.3	-12.2	-11.7	-9.8	-8.7	-8.3	-8.2	-1.5																						
17-Dec	-7.3	-6.7	-7.1	-4.9	-3.6	-1.7	-5.6	-6.0	-3.8	-3.2	-1.2	-0.1	0.8	1.3	1.4	1.4	1.3	0.7	-1.1	-1.3	-1.0	-0.6	-1.0	-0.6	-2.1	1.4																						
18-Dec	-0.8	-1.2	-0.3	-4.4	-7.1	-8.4	-9.1	-9.3	-10.6	-11.5	-10.0	-8.5	-8.8	-9.1	-9.7	-10.7	-11.0	-11.7	-11.3	-11.5	-12.4	-13.8	-14.5	-15.3	-9.2	-0.3																						
19-Dec	-17.2	-18.7	-19.6	-21.0	-22.1	-23.5	-24.8	-25.9	-26.9	-27.3	-25.0	-22.1	-20.7	-19.4	-19.7	-20.3	-21.0	-21.9	-23.4	-22.7	-23.7	-25.0	-25.0	-24.5	-22.6	-17.2																						
20-Dec	-24.1	-23.9	-24.2	-24.6	-25.0	-25.3	-25.4	-25.2	-25.5	-25.0	-22.9	-21.0	-19.4	-18.1	-17.3	-17.6	-17.8	-19.0	-19.9	-20.5	-20.7	-21.1	-20.8	-19.9	-21.8	-17.3																						
21-Dec	-18.8	-18.6	-18.1	-17.3	-17.0	-16.8	-16.4	-16.4	-15.4	-14.7	-14.3	-12.9	-11.4	-9.6	-7.4	-7.8	-7.1	-7.5	-8.2	-9.6	-9.2	-9.6	-9.5	-10.0	-12.7	-7.1																						
22-Dec	-9.8	-10.4	-11.3	-11.6	-13.8	-14.5	-14.6	-15.2	-11.0	-10.7	-9.0	-7.2	-6.3	-6.1	-6.3	-7.1	-7.8	-8.2	-8.7	-9.4	-11.9	-15.3	-18.2	-20.5	-11.0	-6.1																						
23-Dec	-22.3	-24.2	-25.2	-26.6	-27.9	-28.7	-29.5	-30.0	-31.1	-31.5	-30.4	-27.4	-26.9	-23.1	-25.3	-25.8	-27.2	-26.7	-25.5	-24.5	-23.5	-23.8	-23.7	-21.8	-26.4	-21.8																						
24-Dec	-21.1	-22.5	-24.3	-25.9	-27.2	-28.7	-29.9	-31.3	-32.4	-32.8	-31.7	-28.4	-26.3	-25.4	-25.7	-28.0	-29.0	-30.4	-30.5	-31.2	-31.0	-30.3	-30.9	-32.3	-28.6	-21.1																						
25-Dec	-33.5	-33.6	-34.4	-34.2	-32.7	-34.0	-34.8	-36.6	-37.8	-38.7	-36.5	-32.6	-31.5	-30.5	-30.3	-31.0	-32.6	-33.9	-34.2	-35.8	-35.6	-34.4	-34.6	-35.2	-34.1	-30.3																						
26-Dec	-34.5	-34.6	-34.1	-34.4	-34.4	-34.8	-34.6	-34.8	-34.6	-34.4	-33.3	-32.0	-30.2	-28.3	-28.1	-28.6	-29.8	-30.1	-32.1	-31.7	-32.7	-33.3	-34.6	-35.5	-32.7	-28.1																						
27-Dec	-35.7	-34.5	-33.6	-33.0	-32.3	-31.8	-31.4	-31.2	-30.9	-30.5	-29.8	-28.8	-27.8	-26.8	-26.1	-25.9	-26.1	-27.4	-28.3	-29.6	-29.6	-30.1	-29.7	-29.9	-29.9	-25.9																						
28-Dec	-29.4	-31.1	-31.6	-32.5	-32.9	-33.6	-34.0	-33.8	-34.6	-34.4	-33.6	-30.9	-27.1	-27.4	-28.0	-29.9	-31.7	-33.1	-33.1	-34.4	-35.4	-36.6	-37.5	-38.6	-32.7	-27.1																						
29-Dec	-39.5	-40.2	-40.4	-41.2	-41.8	-42.2	-42.5	-42.7	-42.1	-42.1	-39.0	-35.8	-33.3	-31.8	-31.2	-31.4	-32.0	-32.1	-31.6	-30.4	-29.5	-28.8	-28.4	-28.3	-35.8	-28.3																						
30-Dec	-27.9	-27.5	-27.3	-26.9	-27.7	-28.3	-29.0	-30.6	-30.5	-29.4	-28.2	-26.9	-25.4	-24.7	-24.3	-24.3	-24.3	-25.3	-25.6	-27.0	-27.0	-27.1	-27.2	-27.3	-27.1	-24.3																						
31-Dec	-27.9	-28.5	-29.4	-29.1	-29.9	-30.5	-31.0	-32.4	-32.1	-32.9	-30.7	-27.8	-25.7	-24.3	-23.7	-25.3	-26.8	-27.6	-27.7	-27.1	-27.1	-28.8	-29.7	-28.4	-28.5	-23.7																						
																								-14.6	-15.0	-15.2	-15.5	-15.9	-16.2	-16.5	-16.8	-16.8	-16.6	-15.2	-13.6	-12.5	-11.8	-11.8	-12.4	-13.0	-13.5	-14.0	-14.2	-14.5	-14.7	-14.9	-14.9	Diurnal Average
																								-0.3	-0.9	0.4	1.0	1.3	1.6	1.8	2.6	1.8	1.9	2.8	4.3	4.3	4.0	3.9	3.7	4.2	4.2	2.4	1.0	0.8	1.0	0.5	0.7	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 2m (AT 2m) - C**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	264	35.48	35.48
-20 - 0	407	54.70	90.19
0 - 10	73	9.81	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



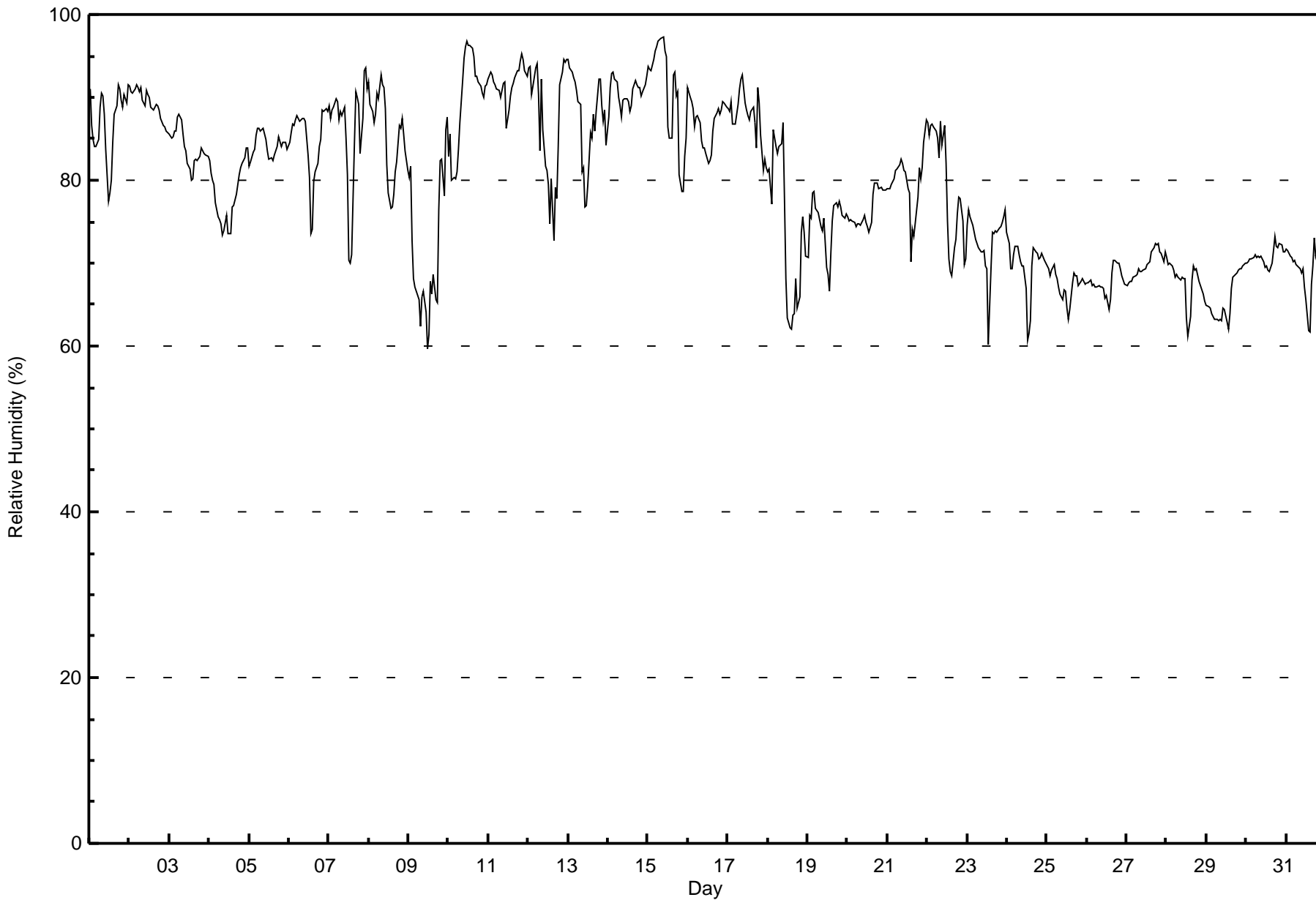
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

**Fort McKay - Bertha Ganter - December 2017**

Maximum Value: 97 % on Dec 15 10:00																		Maximum Daily Average: 91.8 % on Dec 11																		Hours in Service: 744													
Minimum Value: 60 % on Dec 9 12:00																		Minimum Daily Average: 65.6 % on Dec 29																		Hours of Data: 744													
Maximum Diurnal Average: 81.5 % at hour 1																		Minimum Diurnal Average: 74.5 % at hour 14																		Hours of Missing Data: 0													
Monthly Average: 79.6 %																		Percentiles: P <sub>1</sub> = 62 P <sub>10</sub> = 67 Q <sub>1</sub> = 71 Median = 81 O <sub>3</sub> = 88 P <sub>90</sub> = 92 P <sub>99</sub> = 96																		Hours of Calibration: 0													
																																				Percent Operational Time: 100.0													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	91	87	85	84	84	85	89	90	90	88	84	77	79	80	85	88	89	92	91	90	89	90	89	92	86.9	92																							
2-Dec	91	91	90	91	92	91	91	91	90	89	91	90	90	89	89	89	89	89	88	87	87	87	86	86	89.3	92																							
3-Dec	86	85	85	86	86	88	88	87	86	84	84	82	81	80	80	82	83	82	83	84	84	83	83	83	83.9	88																							
4-Dec	82	81	80	79	77	76	75	75	73	74	74	74	77	77	78	80	81	82	82	83	84	84	84	84	78.2	84																							
5-Dec	82	82	83	84	85	86	86	86	86	86	85	84	83	83	82	83	84	84	85	84	85	85	85	84	84.2	86																							
6-Dec	85	86	87	87	87	88	87	87	87	87	87	83	80	74	74	80	81	82	84	85	88	88	89	88	84.7	89																							
7-Dec	89	87	89	89	90	90	87	88	88	89	85	81	70	70	71	85	91	90	89	83	87	93	94	91	86.1	94																							
8-Dec	92	89	88	87	88	91	90	93	92	91	89	82	78	77	77	78	81	82	87	86	87	86	84	81	85.6	93																							
9-Dec	80	82	73	68	67	66	66	62	66	67	64	60	61	68	66	69	66	65	76	82	83	78	86	88	71.2	88																							
10-Dec	83	86	80	80	80	81	84	87	92	95	96	97	96	96	96	95	92	92	92	91	91	90	91	92	89.8	97																							
11-Dec	92	93	93	92	92	91	91	90	91	92	92	86	88	90	91	92	92	93	93	94	95	95	93	93	91.8	95																							
12-Dec	94	94	90	91	93	94	90	84	92	86	82	81	80	75	80	73	79	78	84	92	93	95	94	95	87.0	95																							
13-Dec	95	94	93	92	92	91	90	89	81	81	77	77	79	86	85	88	86	88	92	92	89	87	89	84	87.4	95																							
14-Dec	88	91	93	93	92	92	90	89	88	90	90	90	89	88	89	91	92	92	91	91	90	91	92	93	90.6	93																							
15-Dec	94	93	93	95	96	96	97	97	97	97	96	95	86	85	85	93	93	90	91	81	79	79	83	85	90.6	97																							
16-Dec	91	90	89	89	87	88	88	87	85	84	84	83	82	82	83	86	87	88	89	88	88	90	89	89	86.9	91																							
17-Dec	89	88	90	87	87	88	89	91	92	93	89	89	88	87	88	89	87	84	91	89	85	81	83	81	87.7	93																							
18-Dec	81	81	77	86	85	84	83	84	84	87	78	68	63	62	62	64	64	68	65	66	74	76	74	71	74.5	87																							
19-Dec	71	76	75	79	79	77	76	75	74	74	75	69	69	67	71	75	77	77	77	77	77	76	75	76	74.8	79																							
20-Dec	76	75	75	75	75	74	75	75	75	75	76	75	74	74	75	78	80	80	80	79	79	79	79	79	76.5	80																							
21-Dec	79	79	80	80	80	81	81	82	83	82	81	81	79	78	70	74	73	75	78	82	80	81	85	87	79.6	87																							
22-Dec	87	85	87	87	86	86	85	83	87	84	87	82	75	70	69	68	72	73	76	78	78	75	70	70	79.2	87																							
23-Dec	75	76	76	75	74	73	72	72	71	71	72	70	69	60	69	74	74	74	74	74	74	75	76	76	72.7	76																							
24-Dec	74	72	69	69	71	72	72	71	70	70	70	67	61	62	63	70	72	71	71	71	71	70	70	70	69.6	74																							
25-Dec	70	69	68	69	70	69	68	67	66	66	67	67	64	63	64	68	69	68	69	67	68	68	67	67	67.5	70																							
26-Dec	68	68	68	67	68	67	67	67	67	67	67	66	66	64	66	69	70	70	70	70	69	68	68	67	67.7	70																							
27-Dec	67	68	68	68	68	68	69	69	69	69	69	69	70	70	70	71	72	72	72	72	71	71	70	71	69.8	72																							
28-Dec	71	70	70	70	69	68	69	68	68	68	68	68	68	63	61	64	68	70	69	69	68	67	67	66	65	67.7	71																						
29-Dec	65	65	65	64	64	63	63	63	63	63	65	64	63	62	64	67	68	69	69	69	69	69	70	70	65.6	70																							
30-Dec	70	70	70	70	71	71	71	71	71	71	70	70	70	69	69	70	71	73	72	72	72	72	71	71	70.8	73																							
31-Dec	72	71	71	71	70	70	70	70	69	69	69	67	66	62	62	68	70	73	71	72	72	71	71	72	69.5	73																							
																								81.5	81.4	80.7	80.7	80.8	80.8	80.6	80.4	80.5	80.3	79.4	77.2	75.4	74.5	75.4	78.1	79.1	79.5	80.6	80.6	80.8	80.6	80.8	80.7	Diurnal Average	
																								95	94	93	95	96	96	97	97	97	97	96	97	96	96	96	95	93	93	93	94	95	95	94	95	Diurnal Maximum	



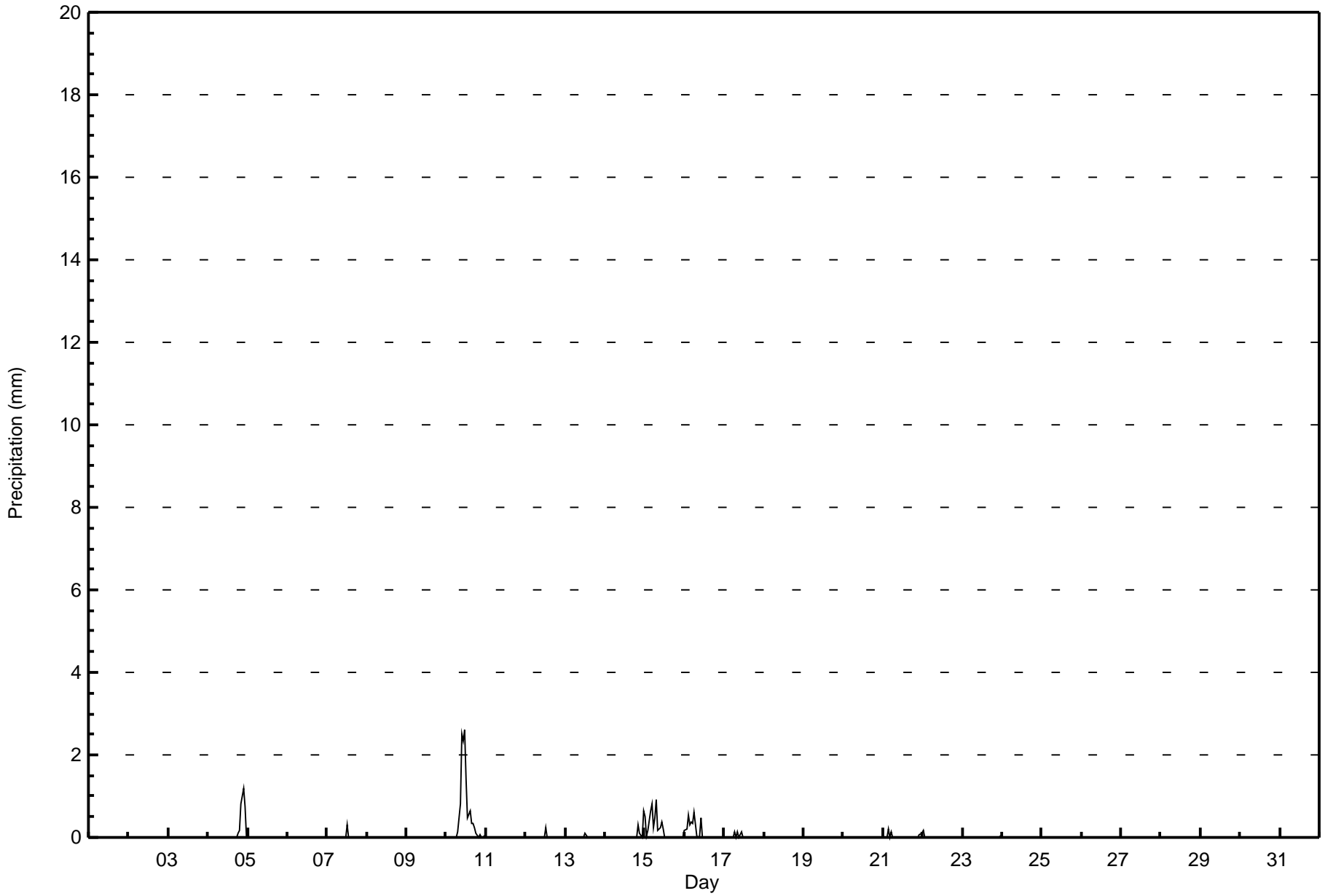


Maximum Value: 2.6 mm on Dec 10 12:00																				Maximum Daily Total: 12.1 mm on Dec 10					Hours in Service: 744			
Minimum Value: 0.0 mm on Dec 4 00:00																				Minimum Daily Total: 0.0 mm on Dec 5					Hours of Data: 673			
Maximum Diurnal Total: 3.3 mm at hour 11																				Minimum Diurnal Total: 0.2 mm at hour 20					Hours of Missing Data: 71			
Monthly Total: 25.65 mm																				Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.8					Hours of Calibration: 0			
																									Percent Operational Time: 90.5			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.0	0.0		
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.8	1.2	0.7	0.0	3.0	1.2	
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	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
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	2.5	2.3	2.6	1.4	0.5	0.7	0.3	0.4	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	12.1	2.6	
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.6	1.0	0.6	
15-Dec	0.5	0.1	0.2	0.6	0.8	0.2	0.5	0.9	0.2	0.2	0.4	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	4.8	0.9	
16-Dec	0.2	0.2	0.5	0.3	0.4	0.3	0.6	0.0	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.6	
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1	
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.2	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	0.1	0.1	0.5	0.2	
22-Dec	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	0.0	0.0	0.0	0.2	0.2	
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
																								Diurnal Average				
																								Diurnal Maximum				
0.9 0.3 0.7 1.1 1.2 0.7 1.2 1.1 1.1 2.8 3.3 2.8 2.0 0.5 0.7 0.3 0.4 0.2 0.2 0.2 1.2 1.3 0.8 0.8																												
0.5 0.2 0.5 0.6 0.8 0.3 0.6 0.9 0.8 2.5 2.3 2.6 1.4 0.5 0.7 0.3 0.4 0.2 0.1 0.2 0.8 1.2 0.7 0.6																												
AF - Analyzer Failure																												



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Fort McKay - Bertha Ganter - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	652	96.88	96.88
0.4 - 0.5	7	1.04	97.92
0.6 - 0.7	5	0.74	98.66
0.8 - 1.4	6	0.89	99.55
1.5 - 10	3	0.45	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 673

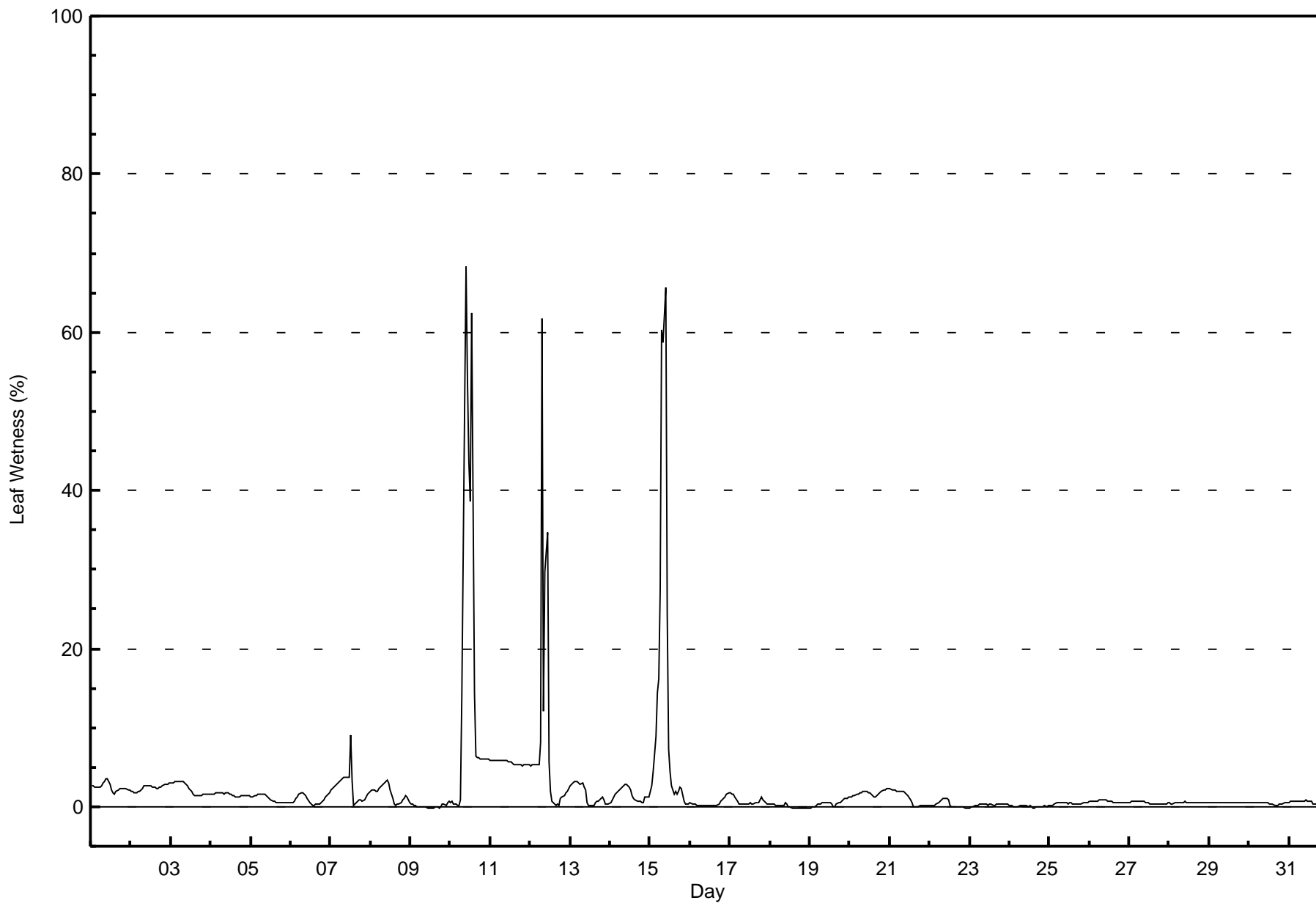
Total Number of Hours: 744



Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2017

Maximum Value: 68 % on Dec 10 10:00																	Maximum Daily Average: 16.8 % on Dec 10																	Hours in Service: 744	
Minimum Value: 0 % on Dec 9 12:00																	Minimum Daily Average: 0.0 % on Dec 24																	Hours of Data: 744	
Maximum Diurnal Average: 6.7 % at hour 10																	Minimum Diurnal Average: 0.9 % at hour 16																	Hours of Missing Data: 0	
Monthly Average: 2.3 %																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 50																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	3	3	3	2	2	3	3	3	3	4	4	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2.5	4								
2-Dec	2	2	2	2	2	2	2	2	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3	3	2.4	3									
3-Dec	3	3	3	3	3	3	3	3	3	3	3	2	2	2	1	1	1	1	1	2	2	2	2	2	2.3	3									
4-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.5	2									
5-Dec	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1.0	2									
6-Dec	0	1	1	1	1	2	2	2	2	1	1	1	0	0	0	0	0	0	1	1	1	1	2	2	0.9	2									
7-Dec	2	2	3	3	3	3	3	4	4	4	4	4	9	3	0	0	1	1	1	1	1	1	2	2	2.5	9									
8-Dec	2	2	2	2	2	2	2	3	3	3	3	3	2	1	0	0	0	0	1	1	1	1	1	1	1.7	3									
9-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1	1								
10-Dec	0	1	0	0	0	0	1	14	51	68	54	44	39	63	14	6	6	6	6	6	6	6	6	6	16.8	68									
11-Dec	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5	5.6	6									
12-Dec	5	5	5	5	5	5	8	62	12	30	35	6	2	1	0	0	0	0	1	1	1	2	2	2	8.2	62									
13-Dec	3	3	3	3	3	3	3	3	3	2	1	0	0	0	1	1	1	1	1	1	1	0	0	0	1.5	3									
14-Dec	1	1	1	2	2	2	2	3	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1.5	3									
15-Dec	2	3	4	9	14	16	27	60	59	66	24	7	4	3	2	2	2	2	2	2	1	0	0	0	13.0	66									
16-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	0.5	2									
17-Dec	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.7	2									
18-Dec	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1									
19-Dec	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0.4	1									
20-Dec	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	1.7	2									
21-Dec	2	2	2	2	2	2	2	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1.1	2									
22-Dec	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1									
23-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
24-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0									
25-Dec	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0.4	1									
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1									
27-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1									
28-Dec	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0.5	1									
29-Dec	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	0.5	1									
30-Dec	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1									
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0.6	1									
1.3 1.4 1.5 1.6 1.8 1.9 2.5 5.7 5.3 6.7 5.0 3.0 2.6 3.0 1.1 0.9 0.9 1.0 1.1 1.2 1.1 1.2 1.2 1.2																	Diurnal Average																		
6 6 6 9 14 16 27 62 59 68 54 44 39 63 14 6 6 6 6 6 6 6 6 6 6																	Diurnal Maximum																		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (LW) - %**  
**Fort McKay - Bertha Ganter - December 2017**

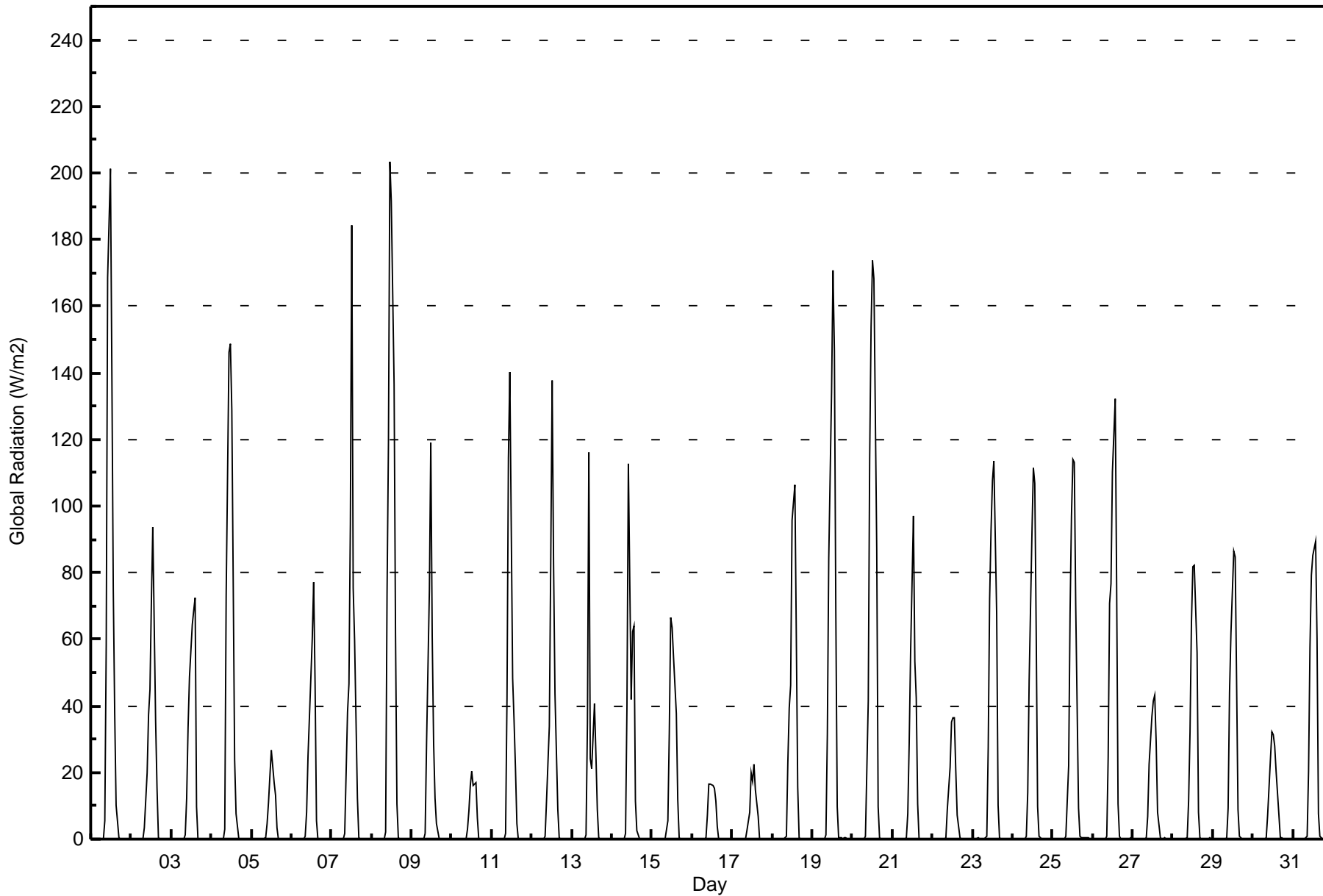
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	144	20.48	20.48
0.4 - 0.5	140	19.91	40.40
0.6 - 0.7	72	10.24	50.64
0.8 - 1.4	91	12.94	63.58
1.5 - 10	230	32.72	96.30
> 10	19	2.70	99.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



Maximum Value: 203 W/m2 on Dec 8 12:00																		Maximum Daily Average: 33.3 W/m2 on Dec 8																		Hours in Service: 744	
Minimum Value: 0 W/m2 on Dec 1 01:00																		Minimum Daily Average: 3.6 W/m2 on Dec 16																		Hours of Data: 744	
Maximum Diurnal Average: 85.8 W/m2 at hour 13																		Minimum Diurnal Average: 0.0 W/m2 at hour 1																		Hours of Missing Data: 0	
Monthly Average: 15.5 W/m2																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 9 P <sub>90</sub> = 63 P <sub>99</sub> = 167																		Hours of Calibration: 0	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	0	0	0	0	0	0	0	0	5	58	169	201	140	75	38	10	0	0	0	0	0	0	0	0	0	29.1	201										
2-Dec	0	0	0	0	0	0	0	0	4	20	37	45	71	94	36	15	0	0	0	0	0	0	0	0	0	13.4	94										
3-Dec	0	0	0	0	0	0	0	0	1	12	33	49	64	69	72	10	0	0	0	0	0	0	0	0	0	12.9	72										
4-Dec	0	0	0	0	0	0	0	0	3	73	146	149	129	77	24	8	0	0	0	0	0	0	0	0	0	25.4	149										
5-Dec	0	0	0	0	0	0	0	0	0	5	11	19	27	17	13	3	0	0	0	0	0	0	0	0	0	4.0	27										
6-Dec	0	0	0	0	0	0	0	0	1	8	25	48	60	77	47	6	0	0	0	0	0	0	0	0	0	11.3	77										
7-Dec	0	0	0	0	0	0	0	0	2	38	47	95	184	76	60	12	0	0	0	0	0	0	0	0	0	21.4	184										
8-Dec	0	0	0	0	0	0	0	0	2	74	119	203	192	136	62	11	0	0	0	0	0	0	0	0	0	33.3	203										
9-Dec	0	0	0	0	0	0	0	0	2	29	75	119	61	29	12	5	0	0	0	0	0	0	0	0	0	13.8	119										
10-Dec	0	0	0	0	0	0	0	0	0	3	9	16	20	16	17	6	0	0	0	0	0	0	0	0	0	3.6	20										
11-Dec	0	0	0	0	0	0	0	0	2	43	114	140	48	36	21	4	0	0	0	0	0	0	0	0	0	17.0	140										
12-Dec	0	0	0	0	0	0	0	0	1	11	34	83	138	83	44	9	0	0	0	0	0	0	0	0	0	16.8	138										
13-Dec	0	0	0	0	0	0	0	0	1	35	116	24	21	41	25	9	0	0	0	0	0	0	0	0	0	11.4	116										
14-Dec	0	0	0	0	0	0	0	0	2	40	113	42	62	64	11	2	0	0	0	0	0	0	0	0	0	14.0	113										
15-Dec	0	0	0	0	0	0	0	0	0	6	32	67	64	55	38	12	0	0	0	0	0	0	0	0	0	11.4	67										
16-Dec	0	0	0	0	0	0	0	0	0	7	17	16	16	15	11	4	0	0	0	0	0	0	0	0	0	3.6	17										
17-Dec	0	0	0	0	0	0	0	0	0	2	8	20	17	22	15	7	0	0	0	0	0	0	0	0	0	3.8	22										
18-Dec	0	0	0	0	0	0	0	0	1	23	39	46	96	106	62	16	0	0	0	0	0	0	0	0	0	16.2	106										
19-Dec	0	0	0	0	0	0	0	0	1	31	84	134	171	147	68	10	0	0	0	0	0	0	0	0	0	27.0	171										
20-Dec	0	0	0	0	0	0	0	0	1	42	114	154	174	168	87	10	0	0	0	0	0	0	0	0	0	31.2	174										
21-Dec	0	0	0	0	0	0	0	0	0	8	29	56	97	53	42	10	0	0	0	0	0	0	0	0	0	12.3	97										
22-Dec	0	0	0	0	0	0	0	0	0	9	22	35	37	36	21	7	0	0	0	0	0	0	0	0	0	7.0	37										
23-Dec	0	0	0	0	0	0	0	0	1	28	72	93	108	114	67	10	1	0	0	0	0	0	0	0	0	20.6	114										
24-Dec	0	0	0	0	0	0	0	0	1	14	48	92	112	107	62	10	1	0	0	0	0	0	0	0	0	18.6	112										
25-Dec	0	0	0	0	0	0	0	0	1	22	68	97	114	113	70	9	1	0	0	0	0	0	0	0	0	20.8	114										
26-Dec	0	0	0	0	0	0	0	0	1	25	71	77	110	132	76	10	1	0	0	0	0	0	0	0	0	21.0	132										
27-Dec	0	0	0	0	0	0	0	0	0	7	22	37	42	43	29	8	0	0	0	0	0	0	0	0	0	7.9	43										
28-Dec	0	0	0	0	0	0	0	0	1	12	32	65	82	82	56	8	0	0	0	0	0	0	0	0	0	14.1	82										
29-Dec	0	0	0	0	0	0	0	0	1	9	44	62	86	85	48	9	1	0	0	0	0	0	0	0	0	14.4	86										
30-Dec	0	0	0	0	0	0	0	0	0	7	24	32	31	28	20	7	0	0	0	0	0	0	0	0	0	6.3	32										
31-Dec	0	0	0	0	0	0	0	0	1	20	58	79	85	89	60	8	1	0	0	0	0	0	0	0	0	16.7	89										
0.0																		0.0																		Diurnal Average	
0																		0																		Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2**  
**Fort McKay - Bertha Ganter - December 2017**

<b>Concentration Ranges (W/m2)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	596	80.11	80.11
21 - 100	115	15.46	95.56
101 - 300	33	4.44	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: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Fort McKay - Bertha Ganter - December 2017

Maximum Speed: 26 km/h on Dec 18 13:00	Maximum Daily Speed Average: 10.5 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 23 22:00	Minimum Daily Speed Average: 0.6 km/h on Dec 28	Hours of Data: 709
Maximum Diurnal Speed Average: 2.9 km/h at hour 13	Minimum Diurnal Speed Average: 1.6 km/h at hour 1	Hours of Missing Data: 35
Monthly Average Velocity: 2.2 km/h 212.0 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 5 Q <sub>3</sub> = 7 P <sub>90</sub> = 10 P <sub>99</sub> = 17	Percent Operational Time: 95.3

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW4	WSW6	WSW8	W7	WSW6	SW6	S3	S5	SSW7	S6	S7	S8	S8	S5	S5	S6	S4	S3	SSW2	SSW4	SSW4	S6	S2	N1	SSW4.6	S8
2-Dec	N3	NNE2	NNW2	NW3	N4	N3	N4	N5	N4	N2	N1	ENE2	SSE3	SSE4	S4	SSW3	SSW2	SW1	W1	NNW2	W2	SSW1	WNW1	NW1	NNW0.8	N5
3-Dec	NW1	SSW3	N1	SSW1	SSW1	SSW3	NNE2	NNW11	N8	N7	N7	NNE7	N6	NNE4	NNE3	N5	NNE4	NE2	E2	SW1	SE2	WNW1	NNE2	NE1	N2.4	NNW11
4-Dec	N1	NNE2	SSE2	WNW1	SW1	SSW2	WNW1	SW1	SSW3	S3	S5	S8	S7	SSE7	S7	S3	S2	ESE1	NNW1	SSW2	NNE1	SSE1	S6	SSW6	S2.5	S8
5-Dec	WSW6	SW7	SSW9	S7	S6	WSW3	NW2	N3	N8	N6	N5	N7	N8	NNE5	NNE7	NNE6	NNE6	NNE6	NNE4	NNE5	ENE2	SE2	SSE4	SSE6	N1.4	SSW9
6-Dec	S6	S6	S5	S6	S8	S9	S9	S10	S10	S9	S9	S11	S10	SSE8	S8	S8	SW7	SW7	WSW5	WSW4	SW4	S5	S8	S8	S7.1	S11
7-Dec	SSW7	SSW6	S8	S6	SSE6	SSE4	ESE4	SSE5	SSE6	SSE4	S4	S6	W8WNW11	WNW7	WNW7	WNW3	WSW2	W6	WSW2	NW3	NW3	SW3	SSW4	SW2.9	WNW11	
8-Dec	S6	S8	S6	S8	S7	S6	SSE3	SSW3	S3	S6	S7	S9	S11	S10	S10	S12	S9	S9	S6	S8	S8	SSW7	S11	S13	S7.6	S13
9-Dec	S11	S7WNW11	W11	W12	W16	W14	W9	W9	W14	W12	W5	SW3	SW4	W6	WSW6	SW4	SW5	SSE3	SSE5	NE3	WSW3	S5	WSW2	WSW5.7	W16	
10-Dec	S6	WSW5	WSW4	WSW5	SSW4	S5	S6	SSE6	S4	AF	ENE1	NW8	NNW14	N10	N10	NNE7	NE6	NE4	NNE4	E3	ESE3	ESE2	SE3	S3	N0.6	NNW14
11-Dec	NNW2	SSW2	S5	S3	NNW1	W1	SE3	S4	S3	S4	S5	S6	S8	S9	S10	S9	S8	S7	S5	SSE3	S5	S8	S8	S9	S4.9	S10
12-Dec	S7	SSW8	S10	S7	S7	S3	W10	WNW5	WNW2WNW11WNW10	NNW6	W5	SW4	WNW8	NW21	NW16	NW17	NW11	NNW5	SW3	S3	S4	S4	S2	W4.7	NW21	
13-Dec	S6	S6	S5	S6	S6	S7	S8	SW6	WNW7WNW13	WNW3	NW12	NNW10	NNW6	WSW2	WNW8	NW4	SW3	WNW5	WNW6	NW7	E4	ESE4	W2.6	WNW13		
14-Dec	SE2	SSW4	S3	S2	SSW2	SSE1	SSW1	SW2	S1	S6	S7	SSE5	S8	S7	SSW3	WNW2	NW3	WNW4	S3	SW4	WSW2	S5	SSW2	NNE2	S2.6	S8
15-Dec	NW1	S4	SSE4	S5	S3	SSE5	SSW6	AF	AF	WSW6	S6	WSW4	WSW3	WNW3	S5	S6	S7	SSE5	SSW6	WSW6	WNW8	WNW6	W5	W7	SW3.7	WNW8
16-Dec	N12	NNE8	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	N12
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	WSW7	WSW7	WSW7	WSW8	W6	W5WNW10WNW11	WNW7WNW10	W5	W6	NW2	WNW8	----	WNW11	
18-Dec	WNW8	W7	WNW9	NNE13	N14	NNE10	NNE8	N8	N6	W3WNW10	NW17	NW26	NW24	NW23	NW16	NW14	WNW9	NW19	NW14	N12	N10	N8	NNE9	NW10.5	NW26	
19-Dec	N7	NNW4	N5	NNW3	WNW3	W2	W3	SW1	SW1	SW1	S3	S5	SSE7	SSE7	S9	S8	S7	S6	S5	S6	SSW6	S5	S6	S8	S3.0	S9
20-Dec	S7	S6	S8	S7	S7	S8	S9	S10	S8	S9	S11	S13	S14	S14	S14	S10	S8	S9	S9	S8	S7	SSW7	S8	S6	S9.0	S14
21-Dec	S6	SSE2	S3	S3	SE2	NNW1	SSW1	SW1	SSW2	S2	SSE2	SE2	S5	WNW3	NW13WNW11WNW11WNW10	WNW8WNW10	WNW6	WNW3	SSW1	SE2	W2.7	NW13	W2.7	NW13		
22-Dec	ESE4	ESE3	NNE2	SSW3	W3	S0	S4	SSW3	WSW4	S1	W4WNW10WNW12WNW11WNW15WNW13	WNW9	WNW6	NW7	N15	NNE13	NNE15	N13	N10	NW4.8	WNW15	NW4.8	WNW15			
23-Dec	N8	NNW5	WNW1	WSW2	SW1	SSW2	SSW1	NW2	NW1	NNW3	NNW1	SE2	NNE2	SSE3	N4	SW4	SSW2	S4	S4	S5	S3	ENE0	N4	N10	NW0.6	N10
24-Dec	NNE14	N14	N17	N11	N7	WNW3	WNW3	WNW3	WNW2	W2	SW2	SSE2	SSE4	SSE7	SSE4	S2	SSW3	SSW1	SSW2	WSW1	NW2	WSW2	N0	NW4	NNW1.9	N17
25-Dec	NNW4	N3	N2	N6	N6	NNW3	WNW5	NW3	W2	SW3	SSW2	SSE4	S6	S7	S7	S6	S5	S4	S5	S5	S7	S7	S7	S2.2	S7	
26-Dec	S7	S7	S8	S7	S7	S7	S7	S6	S6	S5	S6	S8	S7	S9	S9	S6	S4	S5	S3	SSW4	SSW3	SSW2	WSW1	SW1	S5.5	S9
27-Dec	SSW3	S3	S5	S6	SSE5	S6	SSE3	S4	S5	S7	S8	S9	S9	SSE9	S8	S7	S7	S6	S6	S5	S4	S4	S5	S6	S5.7	S9
28-Dec	S5	S2	SSE1	NNW3	W2	W1	W2	WNW2	W1	SW2	SSW2	S1	SSE3	ENE2	ENE3	SSW0	SW1	N2	NNW2	SW1	W1	WNW2	WSW1	W1	WSW0.6	S5
29-Dec	W1	NW2	WSW1	SSW1	SSW2	SSW2	SSW2	SSW2	SSW3	S4	S6	S7	S8	S9	S8	S8	S7	S7	S7	S8	S8	S6	S7	S6	S4.8	S9
30-Dec	S6	S7	S7	SSE6	S6	S7	S5	S4	S3	S3	S5	SSE5	S7	SSE8	SSE7	S7	SSE5	S5	S6	S5	S8	S8	S9	S8	S6.0	S9
31-Dec	S9	S8	S6	S7	S5	S7	S5	SSW5	S4	S6	S6	S5	S7	SSE6	S6	S7	S5	SSW4	S6	S9	S10	SSW4	S6	S10	S6.3	S10

SSW1.6SSW2.2SSW2.4SSW2.0SSW2.0SSW2.5SSW2.2	SW1.9	SW1.8	SW2.7SSW2.9SSW2.6SSW2.9SSW2.9	SW2.5	SW2.9	SSW2.5	SW2.4	SW2.2	SW2.2	SW1.6SSW1.7	S2.4	S2.2	Diurnal Average											
NNE14	N14	N17	NNE13	N14	W16	W14	NNW11	S10	W14	W12	NW17	NW26	NW24	NW23	NW21	NW16	NW17	NW19	N15	NNE13	NNE15	N13	S13	Diurnal Maximum

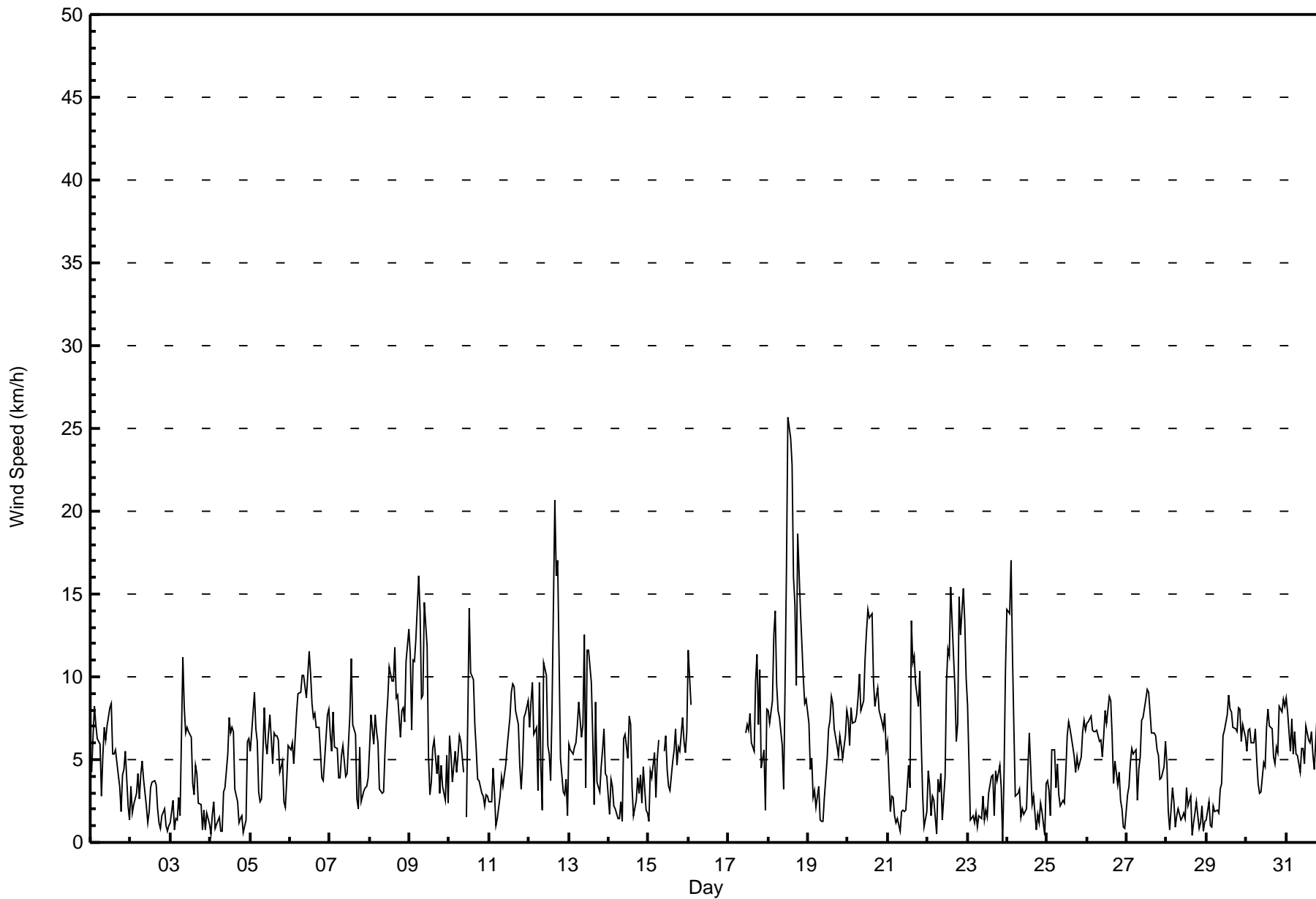
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Fort McKay - Bertha Ganter - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort McKay - Bertha Ganter - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	361	50.92	50.92
6 - 11	307	43.30	94.22
12 - 19	37	5.22	99.44
20 - 28	4	0.56	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort McKay - Bertha Ganter - December 2017**

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	21	15	4	6	3	7	9	30	91	49	28	21	22	23	15	17	361
6 - 11	22	10	1	0	0	0	0	14	182	11	5	11	12	31	4	4	307
12 - 19	8	4	0	0	0	0	0	0	6	0	0	0	5	4	9	1	37
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
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
<b>Totals</b>	51	29	5	6	3	7	9	44	279	60	33	32	39	58	32	22	709

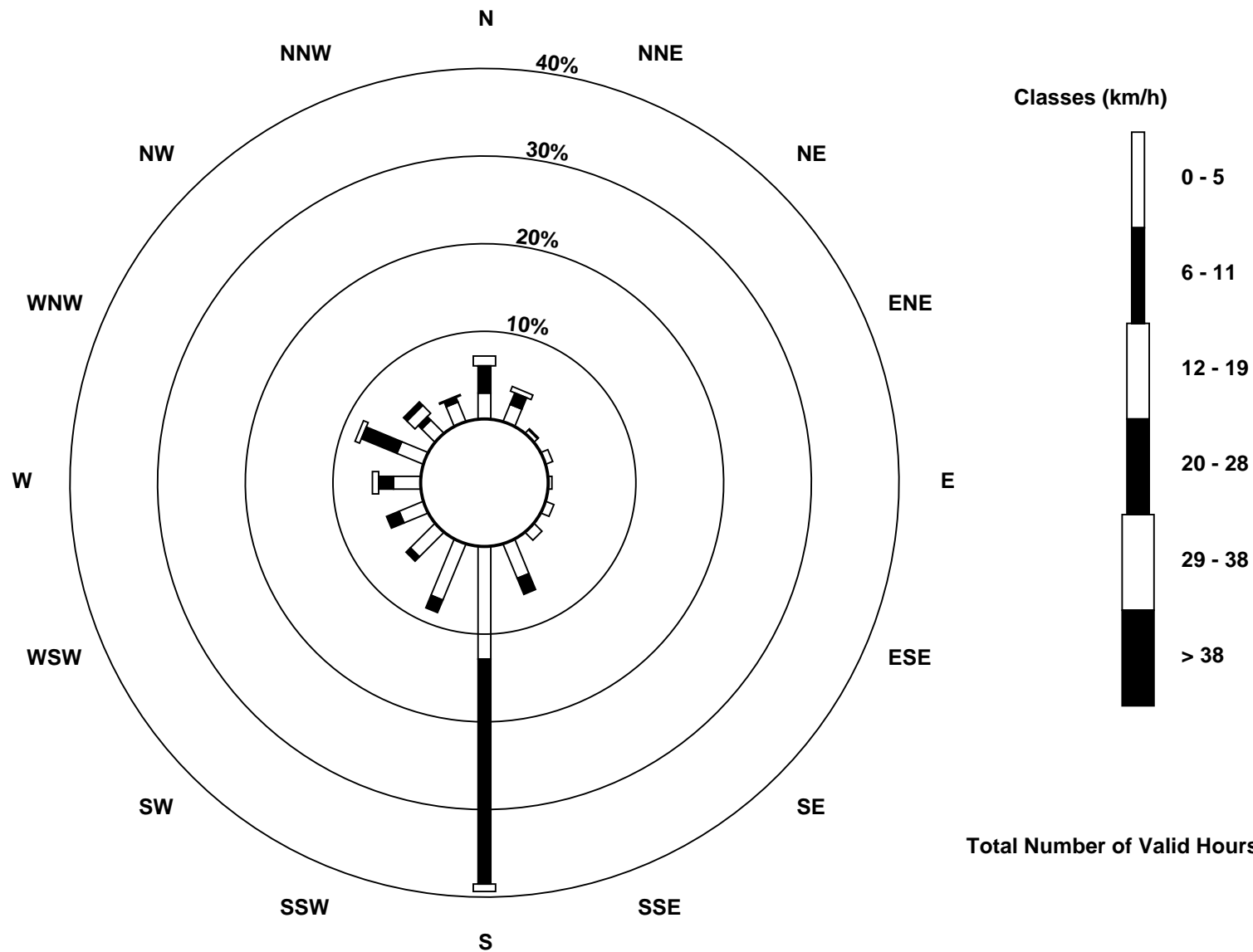
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**

**Fort McKay - Bertha Ganter - December 2017**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 6 km/h on Dec 18 11:00			Hours of Data:	709
Minimum Value: 1 km/h on Dec 29 05:00			Hours of Missing Data:	35
			Hours of Calibration:	0
			Percent Operational Time:	95.3
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5				

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

AF - Analyzer Failure



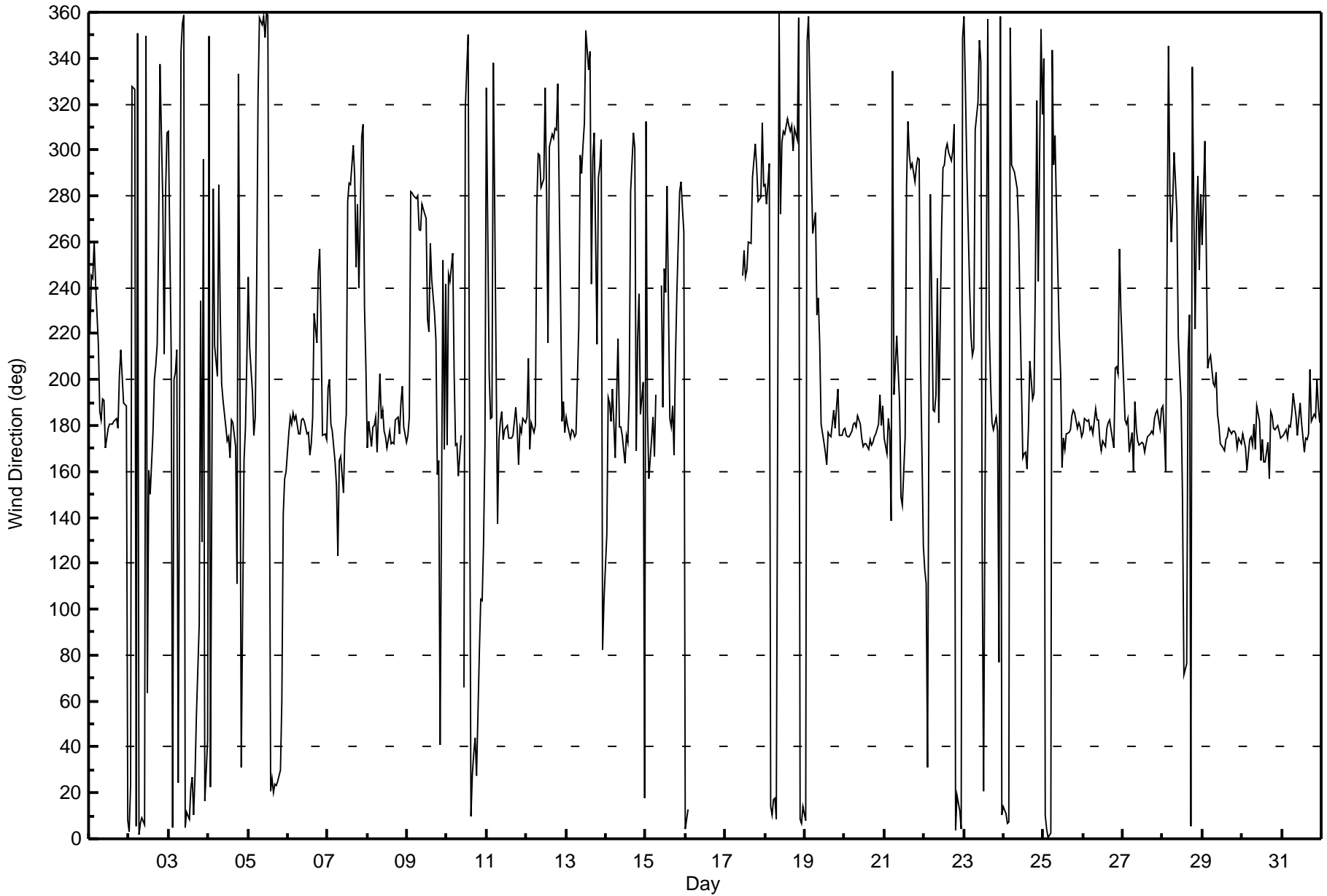
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

**Fort McKay - Bertha Ganter - December 2017**

Direction of Maximum Speed: 307 deg on Dec 18 13:00																				Hours in Service: 744							
Direction of Maximum Daily Speed Average: 325.1 deg on Dec 18																				Hours of Data: 709							
Direction of Minimum Speed: 77 deg on Dec 23 22:00										Direction of Minimum Daily Speed Average: 0.6 deg on Dec 28										Hours of Missing Data: 35							
Monthly Average Direction: 224.8 deg																								Percent Operational Time: 95.3			
Day	Hourly Period Ending At (MST)																								Daily Average		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	221	245	244	260	242	215	186	183	192	191	170	179	180	181	181	182	183	179	201	213	201	190	188	8	201.3		
2-Dec	3	23	327	326	5	351	2	7	9	6	349	64	160	150	177	200	207	216	262	338	277	211	282	307	347.2		
3-Dec	308	211	5	200	203	213	25	343	355	359	5	12	9	22	27	11	28	54	93	234	130	296	16	43	5.6		
4-Dec	350	23	155	283	215	201	285	229	198	191	179	173	175	166	182	181	171	111	333	213	31	165	179	209	182.4		
5-Dec	245	214	195	176	183	240	323	358	354	358	349	359	359	21	26	20	24	23	25	30	61	142	157	160	9.7		
6-Dec	177	184	181	186	182	184	176	176	183	183	182	176	177	167	172	184	229	216	247	257	222	176	176	174	185.8		
7-Dec	196	200	180	177	164	154	123	165	167	151	175	185	278	285	285	302	289	249	276	240	305	311	232	205	220.0		
8-Dec	170	182	171	180	180	184	168	203	183	187	177	175	170	178	172	173	172	182	184	176	190	197	179	173	178.3		
9-Dec	176	184	282	281	280	279	280	266	265	277	272	270	226	221	259	243	229	217	159	165	41	252	170	242	255.9		
10-Dec	172	246	243	255	203	171	172	158	176	AF	66	318	335	350	10	28	37	44	27	81	104	104	129	171	7.8		
11-Dec	327	203	183	183	338	272	138	174	182	186	174	178	180	174	174	174	176	188	179	163	179	177	183	181	179.4		
12-Dec	184	210	169	181	177	180	275	298	297	284	288	327	281	216	301	307	305	309	309	329	235	182	191	177	275.2		
13-Dec	184	180	174	178	178	175	176	223	298	290	302	312	352	335	343	242	296	307	215	288	293	304	83	104	273.6		
14-Dec	133	192	190	182	196	166	193	218	179	180	176	163	176	173	194	282	307	301	169	218	237	185	199	17	189.9		
15-Dec	313	185	157	175	184	166	194	AF	AF	241	188	248	238	284	183	180	188	167	209	237	282	286	274	265	216.8		
16-Dec	4	13	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--		
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	245	256	245	248	260	259	288	295	303	292	278	279	312	284	--	
18-Dec	285	276	294	14	11	17	18	9	359	272	303	308	307	313	311	308	311	300	309	305	357	8	7	14	325.1		
19-Dec	8	347	358	327	292	264	273	228	235	215	180	172	168	163	177	176	175	187	179	188	196	176	176	178	187.2		
20-Dec	179	176	175	175	178	180	182	180	184	181	175	171	172	172	170	174	172	173	175	176	180	194	180	189	176.6		
21-Dec	174	168	183	178	139	334	194	219	205	190	149	145	175	284	313	298	292	294	286	293	296	296	207	127	273.9		
22-Dec	117	111	31	194	281	187	186	193	244	181	265	292	293	300	303	299	296	299	311	4	19	12	4	349	322.3		
23-Dec	358	328	293	240	219	211	213	309	321	348	339	126	21	147	357	224	198	181	178	184	178	77	358	10	319.8		
24-Dec	14	11	6	7	353	293	290	287	283	266	230	166	168	168	161	179	208	192	194	245	321	243	352	316	348.5		
25-Dec	340	10	4	1	2	344	294	306	275	220	203	162	174	170	176	177	178	184	187	186	179	181	179	175	189.8		
26-Dec	177	183	182	182	178	180	176	187	183	182	173	169	173	171	179	181	182	178	170	205	206	203	257	231	180.5		
27-Dec	198	182	181	183	168	177	160	190	179	173	171	173	172	168	172	175	176	178	176	183	186	187	179	187	177.0		
28-Dec	189	178	160	345	281	260	277	299	273	218	204	191	149	71	76	212	228	5	336	222	271	289	248	280	246.5		
29-Dec	259	304	256	205	209	211	198	197	203	185	180	172	170	169	174	175	179	176	177	177	177	170	175	172	179.8		
30-Dec	176	173	170	161	174	175	172	181	169	189	182	165	174	164	164	173	157	186	184	179	178	180	178	175	173.7		
31-Dec	175	176	178	174	180	179	185	194	184	176	183	189	181	168	175	174	176	204	182	185	184	200	188	181	181.3		
192.5	204.1	201.8	202.9	205.1	202.0	207.5	216.0	219.0	223.4	206.9	208.4	211.3	202.1	220.2	225.7	236.7	231.8	233.2	229.9	217.6	211.1	181.1	190.3				
Diurnal Average																											
AF - Analyzer Failure																											
All monthly, daily, and diurnal averages have been calculated using vector methods																											





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Fort McKay - Bertha Ganter - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 95 deg on Dec 24 23:00 Minimum Value: 6 deg on Dec 12 18:00 Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 11 Q <sub>1</sub> = 13 Median = 21 Q <sub>3</sub> = 43 P <sub>90</sub> = 65 P <sub>99</sub> = 88																			Hours in Service: 744 Hours of Data: 709 Hours of Missing Data: 35 Hours of Calibration: 0 Percent Operational Time: 95.3							
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-Dec	39	48	48	44	49	37	75	39	16	15	12	11	10	15	11	10	28	19	30	35	22	19	75	62	75	
2-Dec	51	49	47	20	24	41	17	10	15	41	65	60	29	13	14	32	55	50	48	63	41	45	78	50	78	
3-Dec	67	41	89	61	61	49	73	12	15	16	17	16	16	38	25	16	27	66	53	89	36	86	54	64	89	
4-Dec	88	57	31	73	54	56	71	70	16	22	12	11	13	15	14	29	54	70	61	73	79	80	19	23	88	
5-Dec	42	22	18	20	23	53	73	89	14	23	18	19	15	33	31	23	22	25	46	36	66	47	33	13	89	
6-Dec	22	10	15	14	12	11	12	11	13	12	11	11	13	11	13	20	54	28	41	59	40	29	13	10	59	
7-Dec	24	25	13	18	18	49	48	23	14	45	40	23	47	20	24	16	62	72	24	73	55	48	35	36	73	
8-Dec	17	9	11	13	10	22	61	30	40	16	12	12	10	12	11	11	10	13	18	11	18	23	13	11	61	
9-Dec	12	14	27	23	24	25	26	54	43	27	53	60	65	58	61	42	75	52	48	27	78	69	32	71	78	
10-Dec	22	40	70	56	53	34	18	20	20	AF	73	38	17	15	17	35	42	42	36	34	63	23	23	53	73	
11-Dec	33	78	12	42	85	83	34	12	27	26	11	14	14	12	12	11	13	13	25	25	19	18	20	17	85	
12-Dec	18	19	20	26	19	72	42	53	74	21	23	71	56	58	21	7	10	6	14	22	74	70	38	82	82	
13-Dec	17	14	17	22	35	33	12	39	43	22	84	18	22	17	48	53	15	48	32	19	24	37	42	21	84	
14-Dec	61	31	24	81	55	46	54	68	61	10	11	15	12	15	33	83	71	35	26	32	46	32	45	65	83	
15-Dec	67	24	22	17	67	28	15	AF	AF	39	22	41	49	46	50	11	10	34	25	35	27	20	33	43	67	
16-Dec	42	15	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	42	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	53	52	44	44	39	34	26	18	15	12	53	24	63	21	63
18-Dec	17	24	29	19	16	19	20	19	23	35	41	12	11	10	10	11	12	14	10	13	25	15	15	19	41	
19-Dec	16	19	12	28	17	45	21	43	39	38	16	11	12	10	12	12	11	12	13	14	20	31	12	9	45	
20-Dec	12	11	12	13	12	10	11	10	11	11	12	11	11	11	10	11	8	11	12	13	13	15	15	28	28	
21-Dec	18	71	25	21	47	80	71	75	50	54	56	61	15	68	10	11	15	12	14	9	19	68	94	82	94	
22-Dec	31	51	66	53	31	84	11	42	38	80	52	13	14	12	11	12	12	16	10	19	21	18	19	15	84	
23-Dec	17	19	75	57	42	31	65	36	52	56	74	41	81	32	41	11	74	14	25	20	29	85	38	17	85	
24-Dec	16	15	16	14	15	34	10	25	56	30	37	38	15	11	13	28	16	73	53	74	52	47	95	17	95	
25-Dec	19	37	36	15	13	22	22	48	54	49	32	11	11	11	12	9	8	9	9	13	8	9	9	13	54	
26-Dec	10	11	11	11	15	10	13	13	10	12	11	12	12	12	13	15	11	21	38	17	26	42	43	19	43	
27-Dec	20	13	13	13	23	13	46	20	13	12	12	13	12	12	11	11	10	8	8	11	24	18	12	12	46	
28-Dec	14	64	60	18	29	68	56	23	40	65	46	46	18	43	27	90	70	45	27	61	51	27	55	47	90	
29-Dec	81	16	40	48	21	31	28	29	17	16	9	14	12	11	12	12	12	15	14	12	12	13	13	12	81	
30-Dec	12	15	17	14	12	10	11	8	21	18	16	20	14	10	12	13	18	13	10	10	9	9	11	10	21	
31-Dec	11	11	14	12	13	9	11	14	26	10	14	19	15	13	12	9	24	28	15	13	12	34	15	10	34	
88 78 89 81 85 84 75 89 74 80 84 71 81 68 61 90 75 73 61 89 79 86 95 82																										
Diurnal Maximum																										
AF - Analyzer Failure																										







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

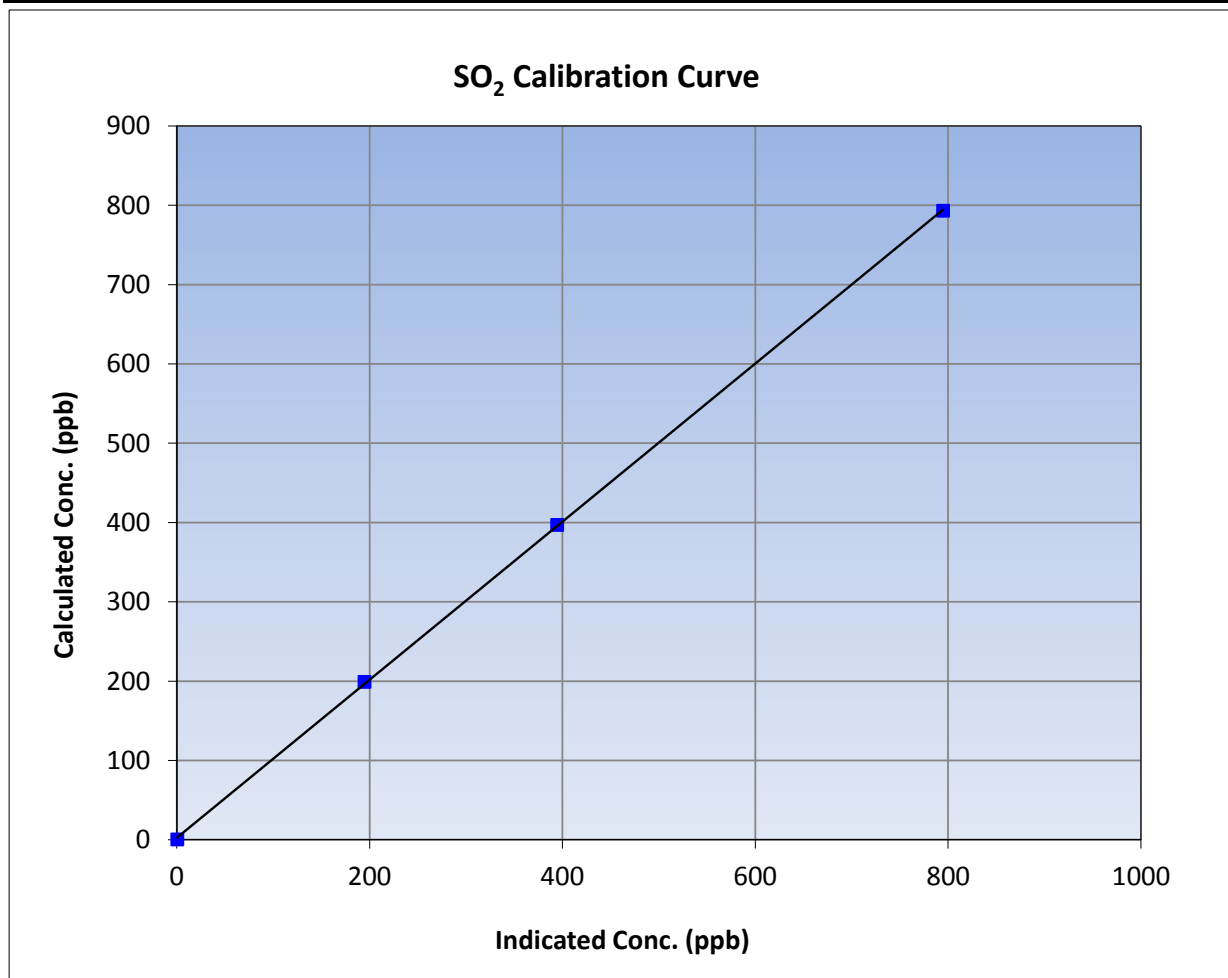
Version-03-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 3, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:00	End Time (MST)	14:30
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

### Calibration Data

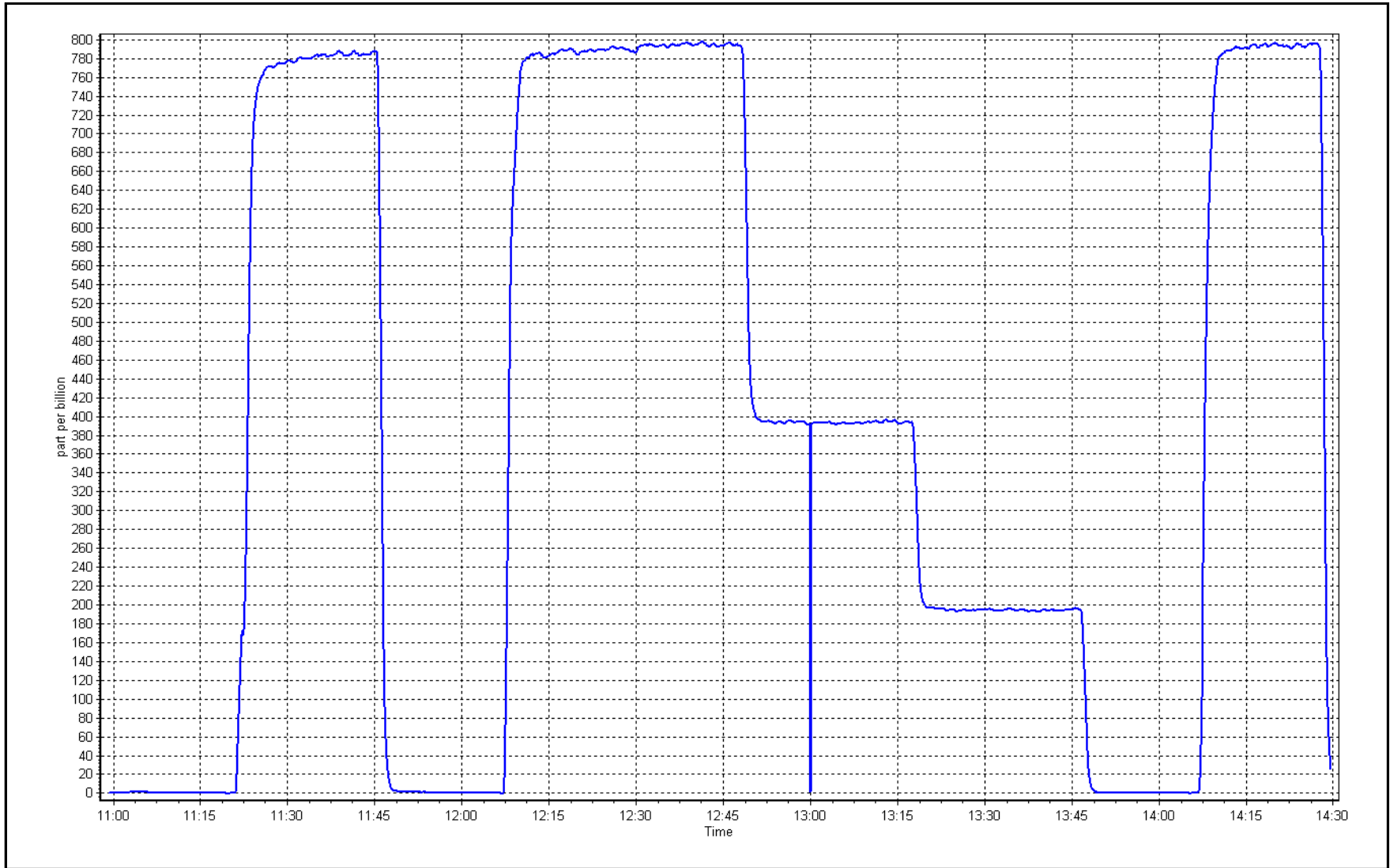
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.3	----	Correlation Coefficient	≥0.995
792.9	794.4	0.9981		
396.5	394.2	1.0057	Slope	0.90 - 1.10
198.8	194.3	1.0230		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 4, 2017

Location: Fort McKay - Bertha Ganter







# Wood Buffalo Environmental Association

## TRS Calibration Summary

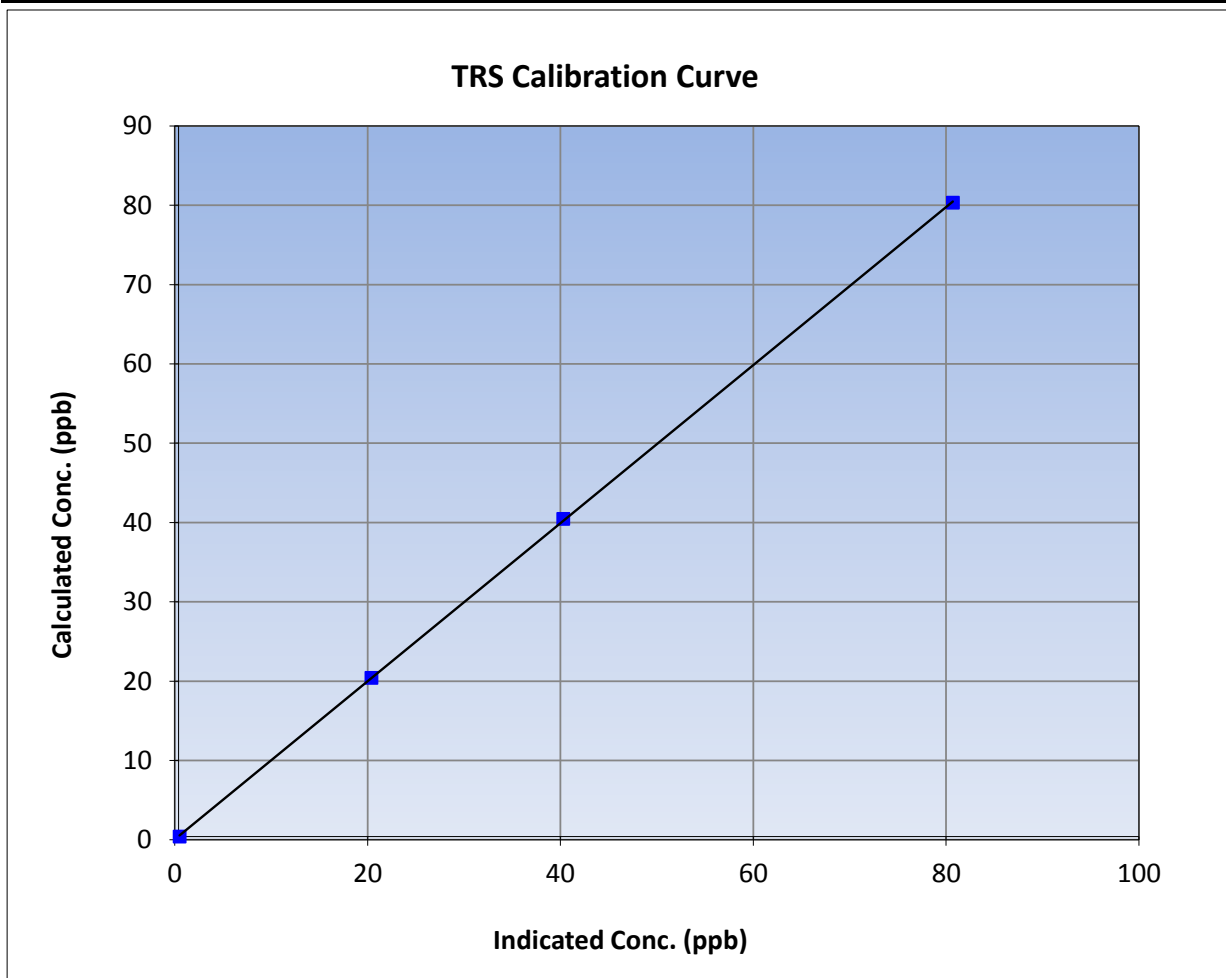
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	12:00	End Time (MST)	15:20
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153461

### Calibration Data

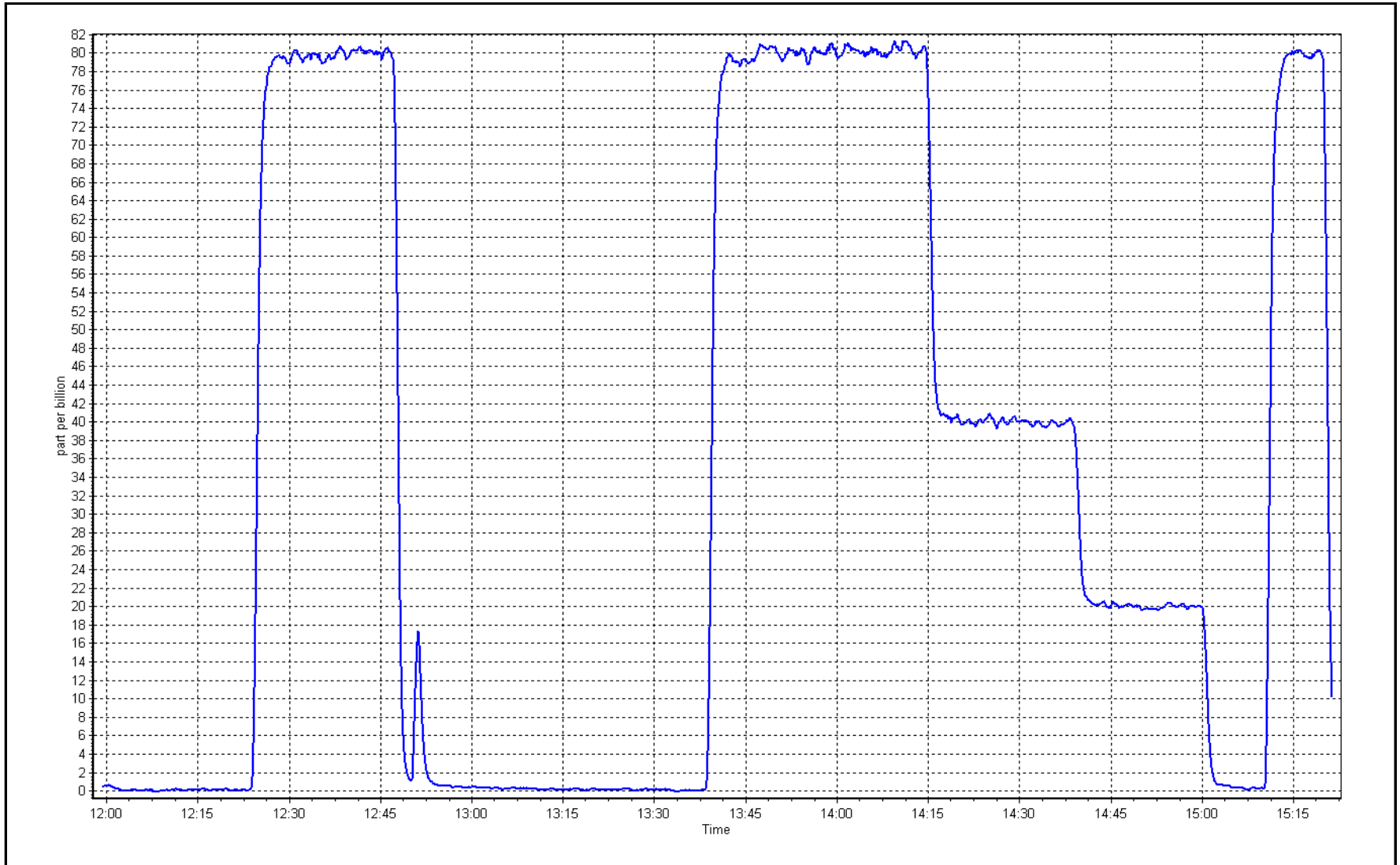
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999972	≥0.995
79.9	80.3	0.9956			
40.1	39.9	1.0038	Slope	0.996630	0.90 - 1.10
20.0	20.0	1.0008			
			Intercept	0.047290	+/-3



TRS Calibration Plot

Date: December 5, 2017

Location: Fort McKay - Bertha Ganter





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay - Bertha Ganter	Station number:	AMS 01
Calibration Date:	December 4, 2017	Last Cal Date:	December 1, 2017
Start time (MST):	11:00	End time (MST):	14:30
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000683	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>515.0</u> ppm	CH4 Equiv Conc.	1062.3 ppm
C3H8 Cal Gas Conc.	<u>199.0</u> ppm	Station temp.	21 Deg C
Calibrator Model	API T700	Serial Number	2464
ZAG make/model	API T701	Serial Number	262

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1152430012

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.5	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
CH4 SP Ratio	1.72E-04	1.71E-04	Flame Temp	405.0	405.0
CH4 Retention time	12.2	12.0	Carrier Pressure	36.7	36.7
NMHC SP Ratio	3.97E-05	3.96E-05	Fuel Pressure	47.7	47.7
NMHC Peak Area	221562	222133	Air Pressure	39.0	39.0

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	1.010579	0.998242
THC Cal Offset	0.000000	0.071298
CH4 Cal Slope	1.010811	0.996074
CH4 Cal Offset	0.000000	0.042242
NMHC Cal Slope	1.010245	1.000121
NMHC Cal Offset	0.000000	0.029670

Notes:

Span adjusted.

Calibration Performed By:

Devin Russell



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5998	0.0	0.00	0.00	----
as found span	4931	80.6	17.08	17.17	0.995
calibrator zero	5998	0.0	0.00	0.00	----
high point	4931	80.6	17.08	17.08	1.000
second point	4971	40.3	8.54	8.43	1.013
third point	4990	20.2	4.28	4.16	1.030
as left zero	5998	0.0	0.00	0.00	----
as left span	4931	80.6	17.08	17.03	1.003
Average Correction Factor					1.014
Corrected As found	17.17	Prev response	16.91	*% change	-1.5%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5998	0	0.00	0.00	----
as found span	4931	80.6	8.80	8.83	0.997
calibrator zero	5998	0	0.00	0.00	----
high point	4931	80.6	8.80	8.79	1.002
second point	4971	40.3	4.40	4.35	1.011
third point	4990	20.2	2.21	2.15	1.027
as left zero	5998	0	0.00	0.00	----
as left span	4931	80.6	8.80	8.78	1.002
Average Correction Factor					1.013
Corrected As found	8.83	Prev response	8.71	*% change	-1.3%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5998	0.0	0.00	0.00	----
as found span	4931	80.6	8.28	8.34	0.993
calibrator zero	5998	0.0	0.00	0.00	----
high point	4931	80.6	8.28	8.30	0.998
second point	4971	40.3	4.14	4.08	1.016
third point	4990	20.2	2.08	2.01	1.033
as left zero	5998	0.0	0.00	0.00	----
as left span	4931	80.6	8.28	8.25	1.004
Average Correction Factor					1.016
Corrected As found	8.34	Prev response	8.19	*% change	-1.7%

\* = > +/-5% change initiates investigation





# Wood Buffalo Environmental Association

## THC Calibration Summary

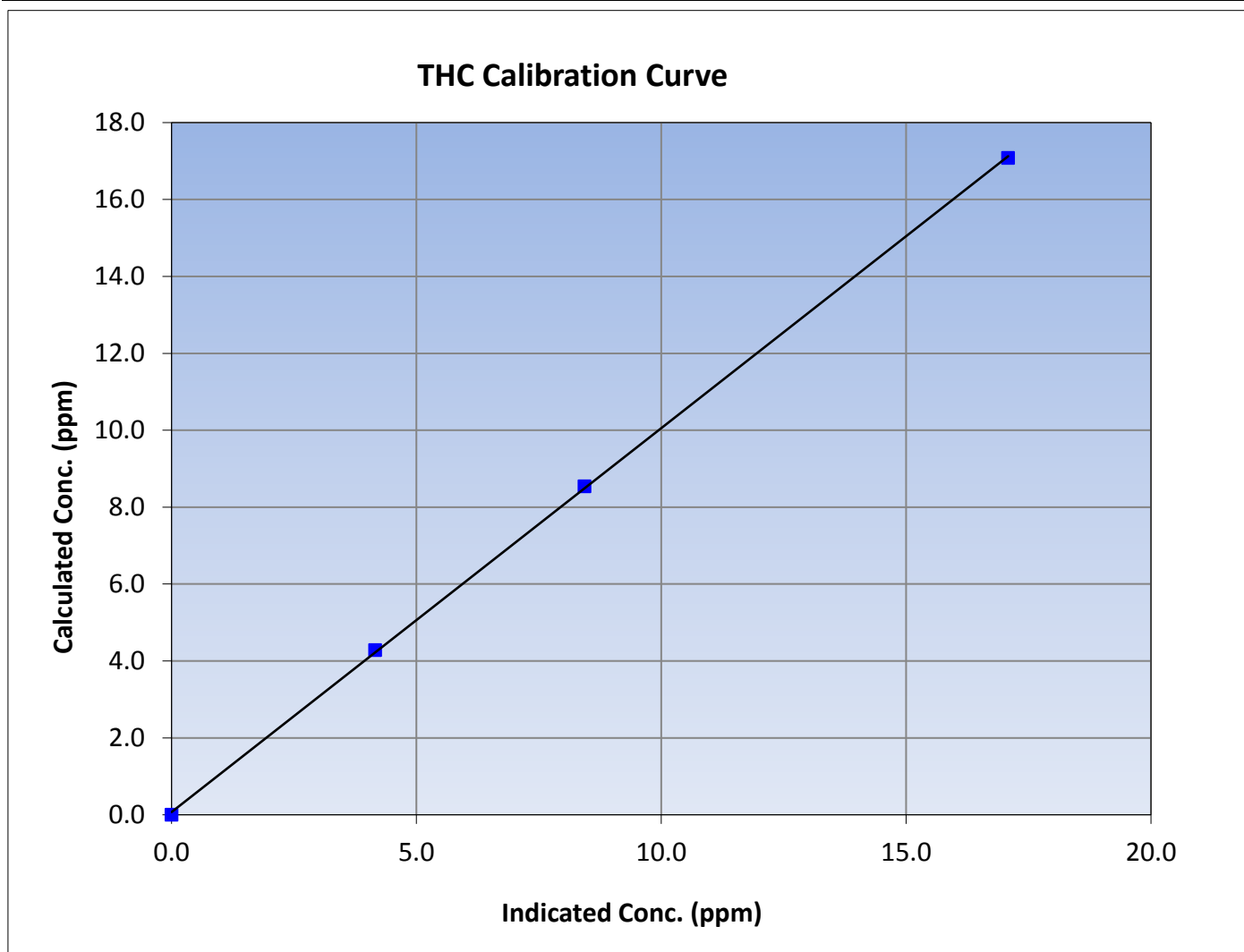
Version-02-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	December 1, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:00	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999916	$\geq 0.995$			
17.08	17.08	1.0000						
8.54	8.43	1.0132				Slope	0.998242	0.90 - 1.10
4.28	4.16	1.0295						
			Intercept	0.071298	$\pm 0.5$			





# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

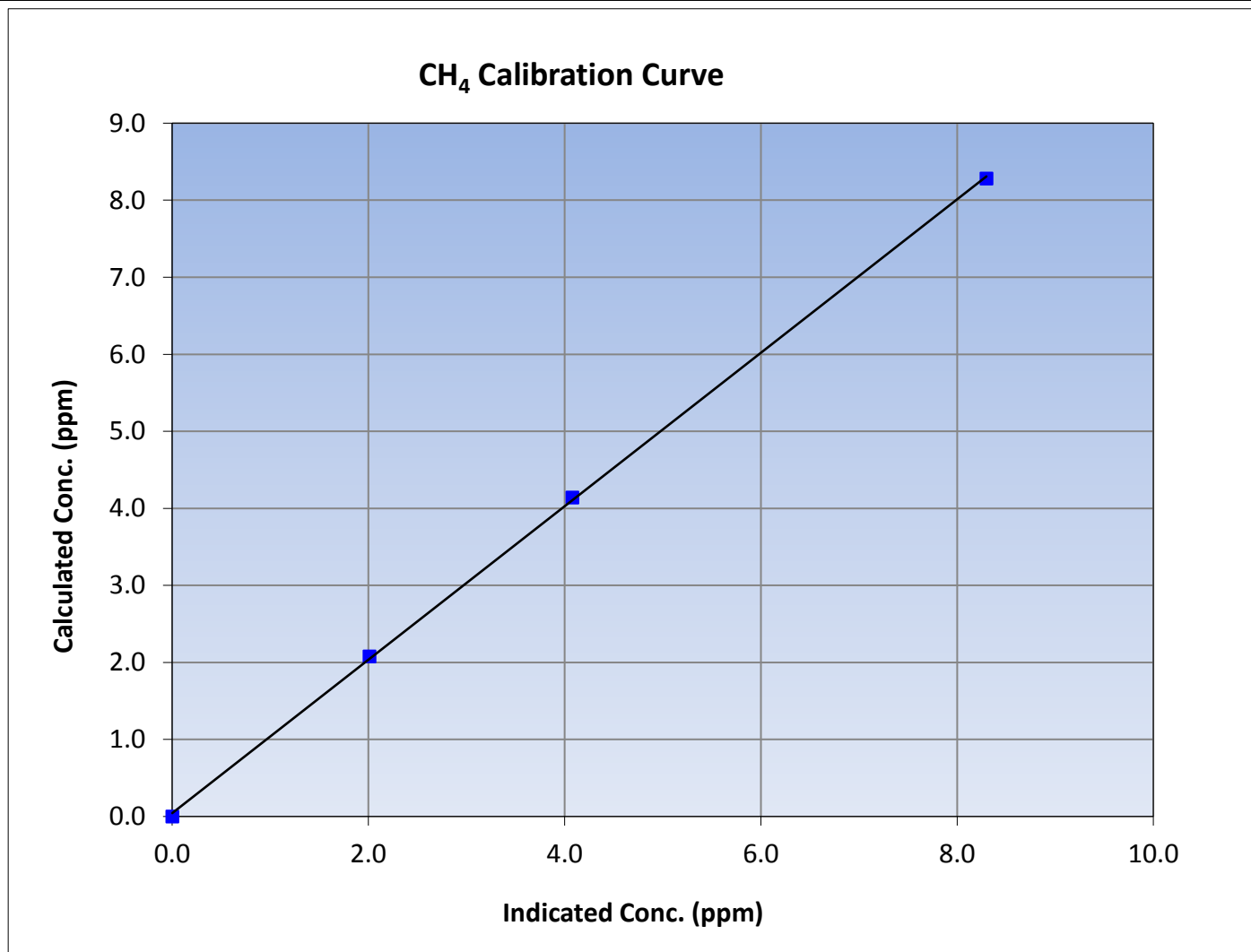
Version-02-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	December 1, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:00	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999868	$\geq 0.995$			
8.28	8.30	0.9980						
4.14	4.08	1.0156				Slope	0.996074	0.90 - 1.10
2.08	2.01	1.0330						
			Intercept	0.042242	$\pm 0.5$			





# Wood Buffalo Environmental Association

## NMHC Calibration Summary

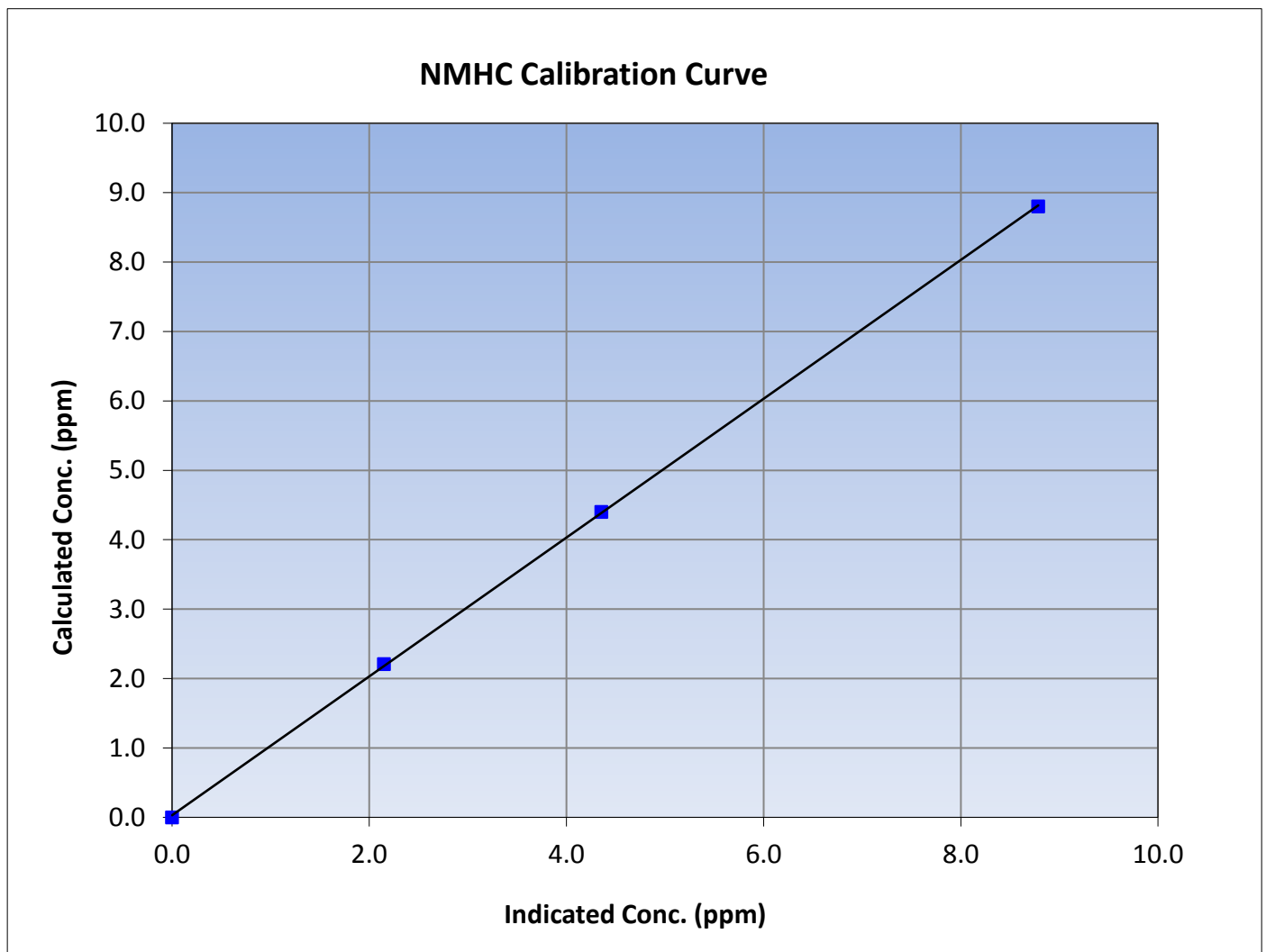
Version-02-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	December 1, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:00	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

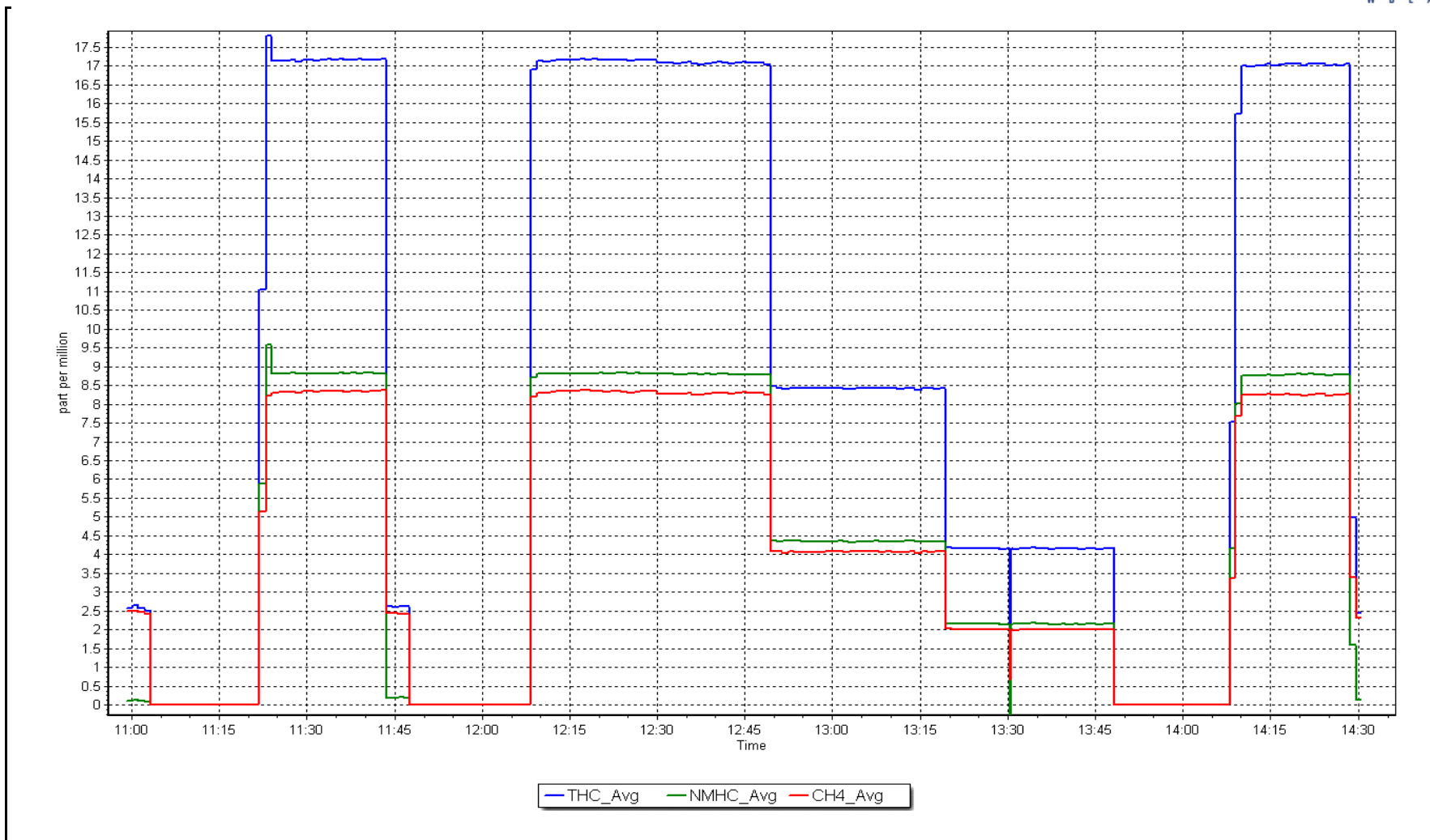
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999948	$\geq 0.995$			
8.80	8.79	1.0017						
4.40	4.35	1.0110				Slope	1.000121	0.90 - 1.10
2.21	2.15	1.0267						
			Intercept	0.029670	$\pm 0.5$			



NMHC Calibration Plot

Date: December 4, 2017

Location: Fort McKay - Bertha Ganter





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay - Bertha Ganter	Station number:	AMS 01
Calibration Date:	December 9, 2017	Last Cal Date:	December 4, 2017
Start time (MST):	11:59	End time (MST):	17:24
Reason:	Maintenance		

### Calibration Standards

Gas Cert Reference	EY0000683	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>515.0</u> ppm	CH4 Equiv Conc.	1062.3 ppm
C3H8 Cal Gas Conc.	<u>199.0</u> ppm	Station temp.	21 Deg C
Calibrator Model	API T700	Serial Number	2464
ZAG make/model	API T701	Serial Number	262

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1152430012

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.2
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.1
CH4 SP Ratio	1.71E-04	1.71E-04	Flame Temp	405.0	405.0
CH4 Retention time	12.0	12.0	Carrier Pressure	36.7	36.7
NMHC SP Ratio	3.96E-05	3.96E-05	Fuel Pressure	47.7	47.7
NMHC Peak Area	222133	222133	Air Pressure	39.0	39.0

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	0.998242	1.000028
THC Cal Offset	0.071298	0.058046
CH4 Cal Slope	0.996074	1.001856
CH4 Cal Offset	0.042242	0.040232
NMHC Cal Slope	1.000121	0.998295
NMHC Cal Offset	0.029670	0.017932

Notes: Actuator changed. CH4 had a lot of negative spiking since last nights span. Very short As Lefts just to get chromatagram

Calibration Performed By:

Ryan Power



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5998	0.0	0.00	0.00	----
as found span	4931	80.6	17.08	17.02	1.004
calibrator zero	5998	0.0	0.00	0.00	----
high point	4931	80.6	17.08	17.06	1.001
second point	4971	40.3	8.54	8.43	1.014
third point	4990	20.2	4.28	4.19	1.023
as left zero					
as left span					
Average Correction Factor					1.013
Corrected As found	17.02	Prev response	17.04	*% change	0.1%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5998	0	0.00	0.00	----
as found span	4931	80.6	8.80	8.73	1.008
calibrator zero	5998	0	0.00	0.00	----
high point	4931	80.6	8.80	8.81	0.999
second point	4971	40.3	4.40	4.37	1.006
third point	4990	20.2	2.21	2.18	1.012
as left zero					
as left span					
Average Correction Factor					1.006
Corrected As found	8.73	Prev response	8.77	*% change	0.5%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5998	0.0	0.00	0.00	----
as found span	4931	80.6	8.28	8.29	0.999
calibrator zero	5998	0.0	0.00	0.00	----
high point	4931	80.6	8.28	8.25	1.004
second point	4971	40.3	4.14	4.05	1.022
third point	4990	20.2	2.08	2.01	1.035
as left zero					
as left span					
Average Correction Factor					1.020
Corrected As found	8.29	Prev response	8.27	*% change	-0.2%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## THC Calibration Summary

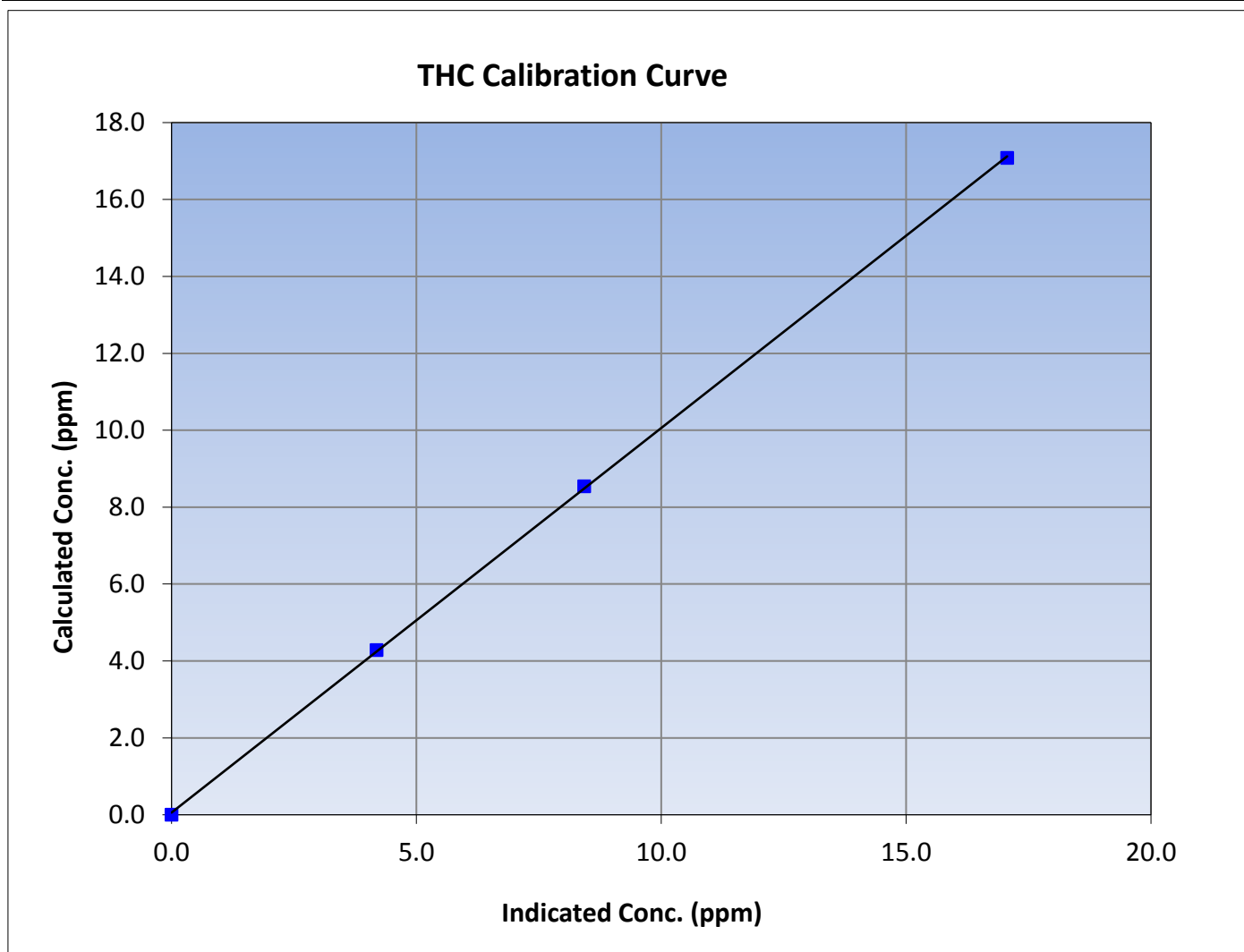
Version-02-2017

### Station Information

Calibration Date	December 9, 2017	Previous Calibration	December 4, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:59	End Time (MST)	17:24
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999940	$\geq 0.995$			
17.08	17.06	1.0012						
8.54	8.43	1.0137				Slope	1.000028	0.90 - 1.10
4.28	4.19	1.0231						
			Intercept	0.058046	$\pm 0.5$			





# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

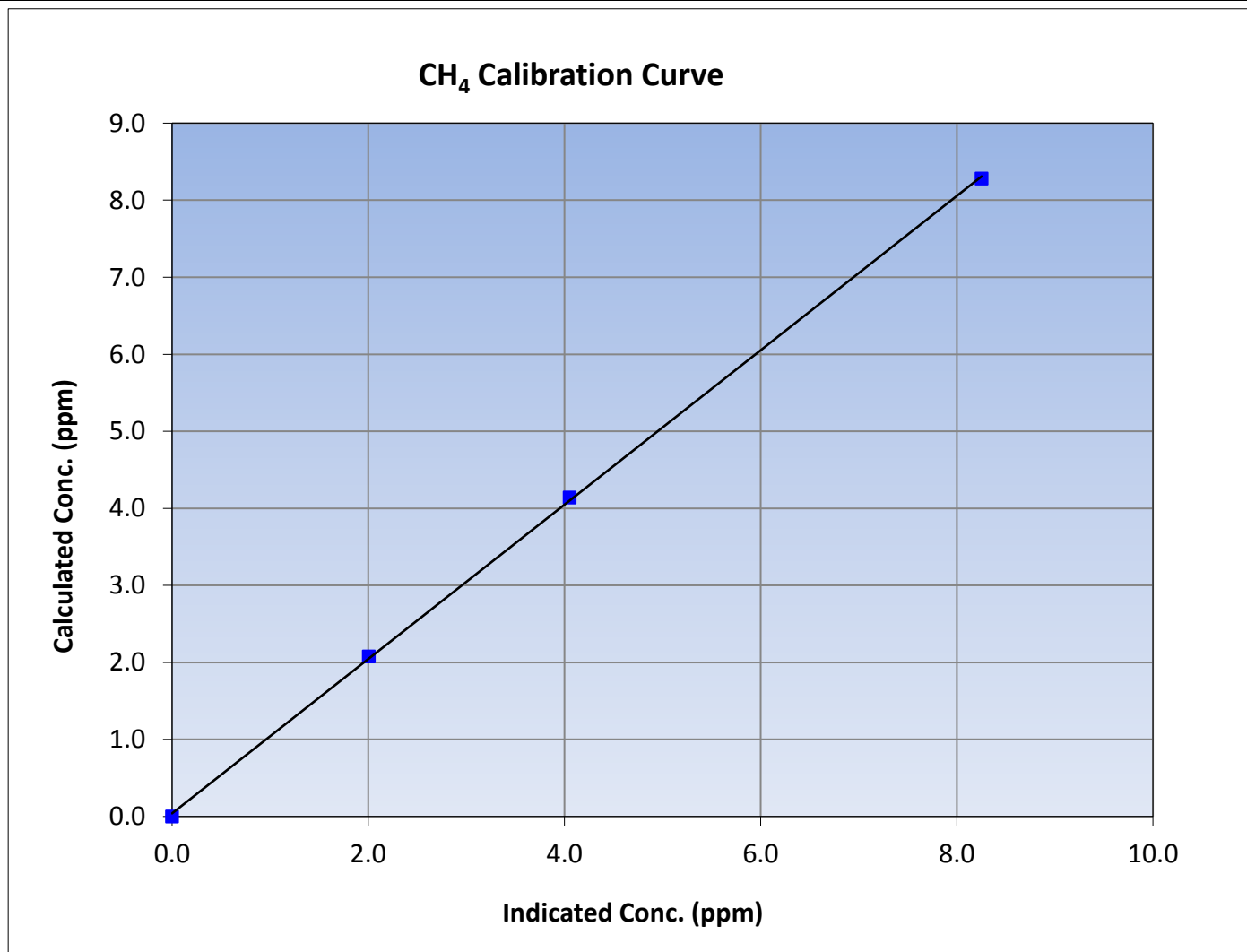
Version-02-2017

### Station Information

Calibration Date	December 9, 2017	Previous Calibration	December 4, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:59	End Time (MST)	17:24
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>
0.00	0.00	----	Correlation Coefficient	0.999878	$\geq 0.995$
8.28	8.25	1.0036			
4.14	4.05	1.0216			
2.08	2.01	1.0351			
			Slope	1.001856	0.90 - 1.10
			Intercept	0.040232	+/-0.5







# Wood Buffalo Environmental Association

## NMHC Calibration Summary

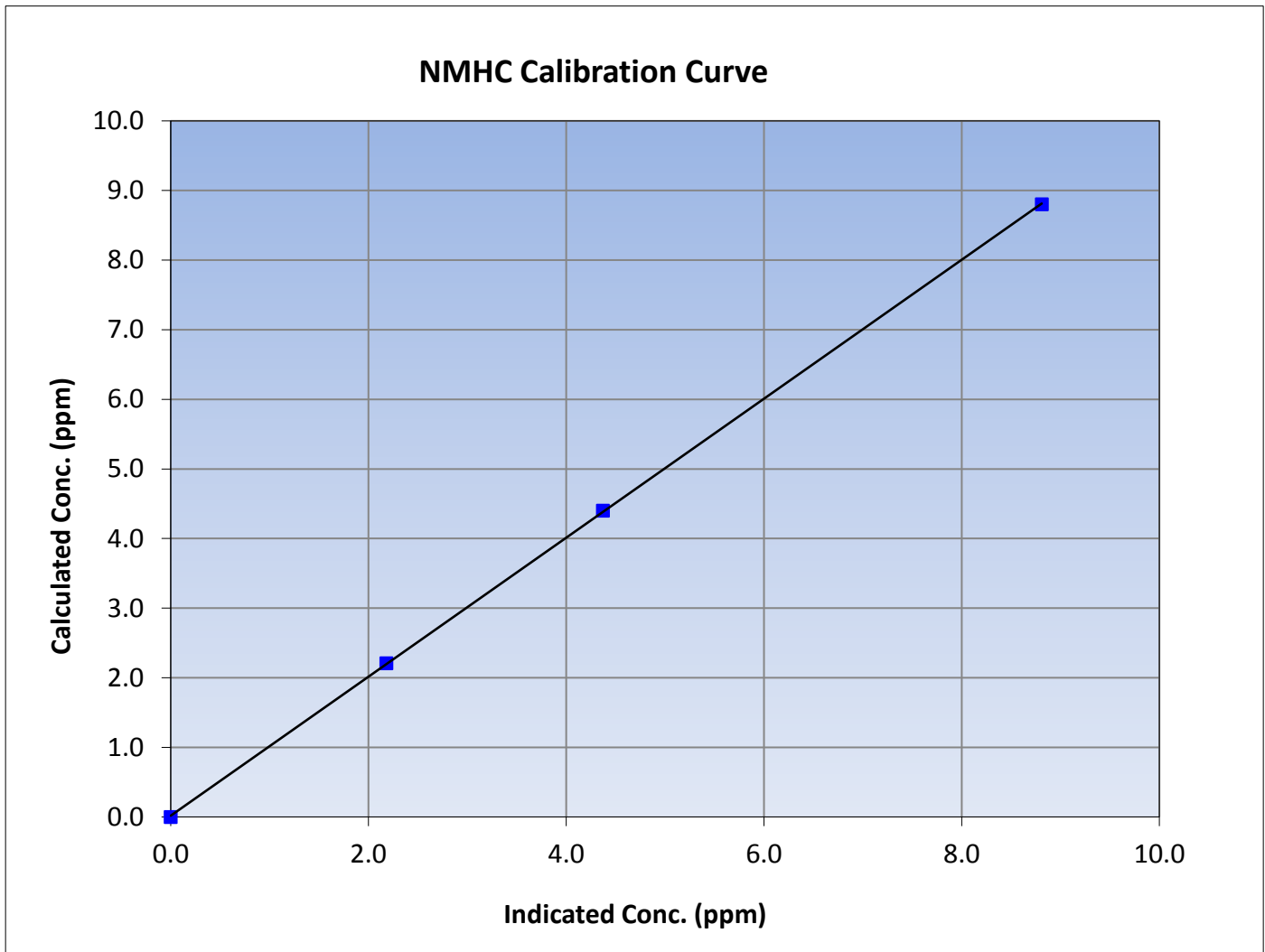
Version-02-2017

### Station Information

Calibration Date	December 9, 2017	Previous Calibration	December 4, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	11:59	End Time (MST)	17:24
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

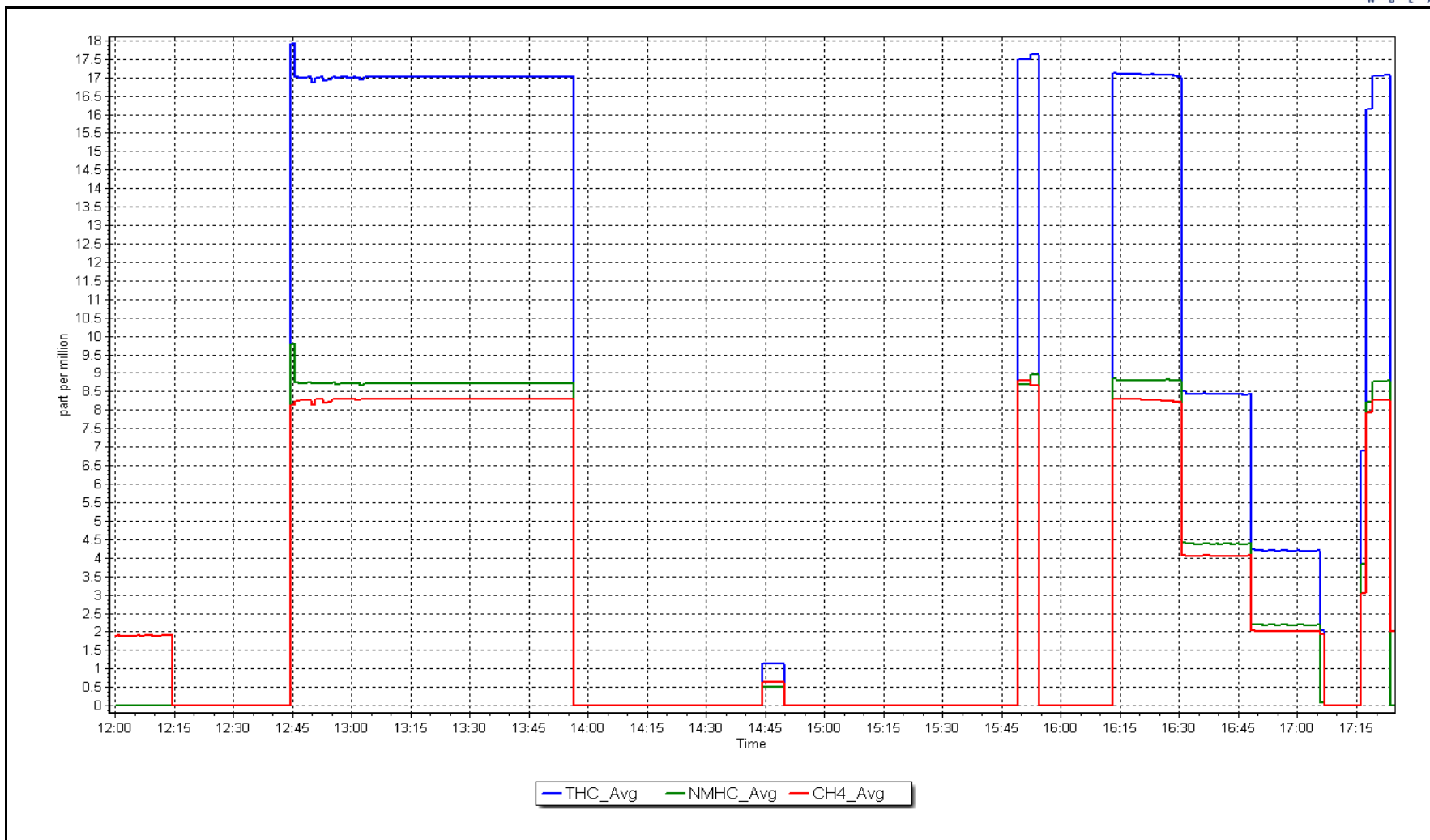
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999979	$\geq 0.995$			
8.80	8.81	0.9990						
4.40	4.37	1.0064				Slope	0.998295	0.90 - 1.10
2.21	2.18	1.0121						
			Intercept	0.017932	$\pm 0.5$			



NMHC Calibration Plot

Date: December 9, 2017

Location: Fort McKay - Bertha Ganter





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

Version-03-2017

### Station Information

Station Name: Fort McKay - Bertha Ganter      Station number: AMS 01  
 Calibration Date: December 5, 2017      Last Cal Date: November 1, 2017  
 Start time (MST): 9:30      End time (MST): 12:10  
 Reason: Routine

### Calibration Standards

O<sub>3</sub> generation mode: Photometer      O<sub>3</sub> reference Date: Photometer  
 Calibrator Make/Model: API T700      Serial Number: 2464  
 ZAG Make/Model: API 701H      Serial Number: 262

### Analyzer Information

Analyzer make: API T400      Analyzer serial #: 1107

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 500 ppb		Pressure	26.9	26.9
Calculated slope	0.998202	0.999086	Flow cell A	782.0	782.0
Calculated intercept	0.040095	0.159907	Flow cell B	786.0	784.0
Analyzer Background	0.4	0.4	O <sub>3</sub> Measurement	3682.1	3682.1
Analyzer Coefficient	1.012	1.012	O <sub>3</sub> Reference	3682.7	3682.7

### O<sub>3</sub> Calibration Data

Set Point	Total air flow rate (sccm)	Calibrator Lamp Voltage Drive	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	800.0	0.0	-0.2	----
as found span	4893	948.0	400.0	399.0	1.003
calibrator zero	5996	800.0	0.0	-0.1	----
high point	5000	948.0	400.0	400.2	1.000
second point	5001	783.1	200.0	200.1	1.000
third point	4999	673.9	100.0	99.8	1.002
as left zero	5996	800.0	0.0	-0.3	----
as left span	5000	948.0	400.0	401.5	0.996
Average Correction Factor					1.000

Corrected As found      399.20      Previous response      400.68      \*% change      0.4%

\* = > +/--8% change initiates investigation

Notes:      No adjustments made.

Calibration Performed By:      Devin Russell



# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

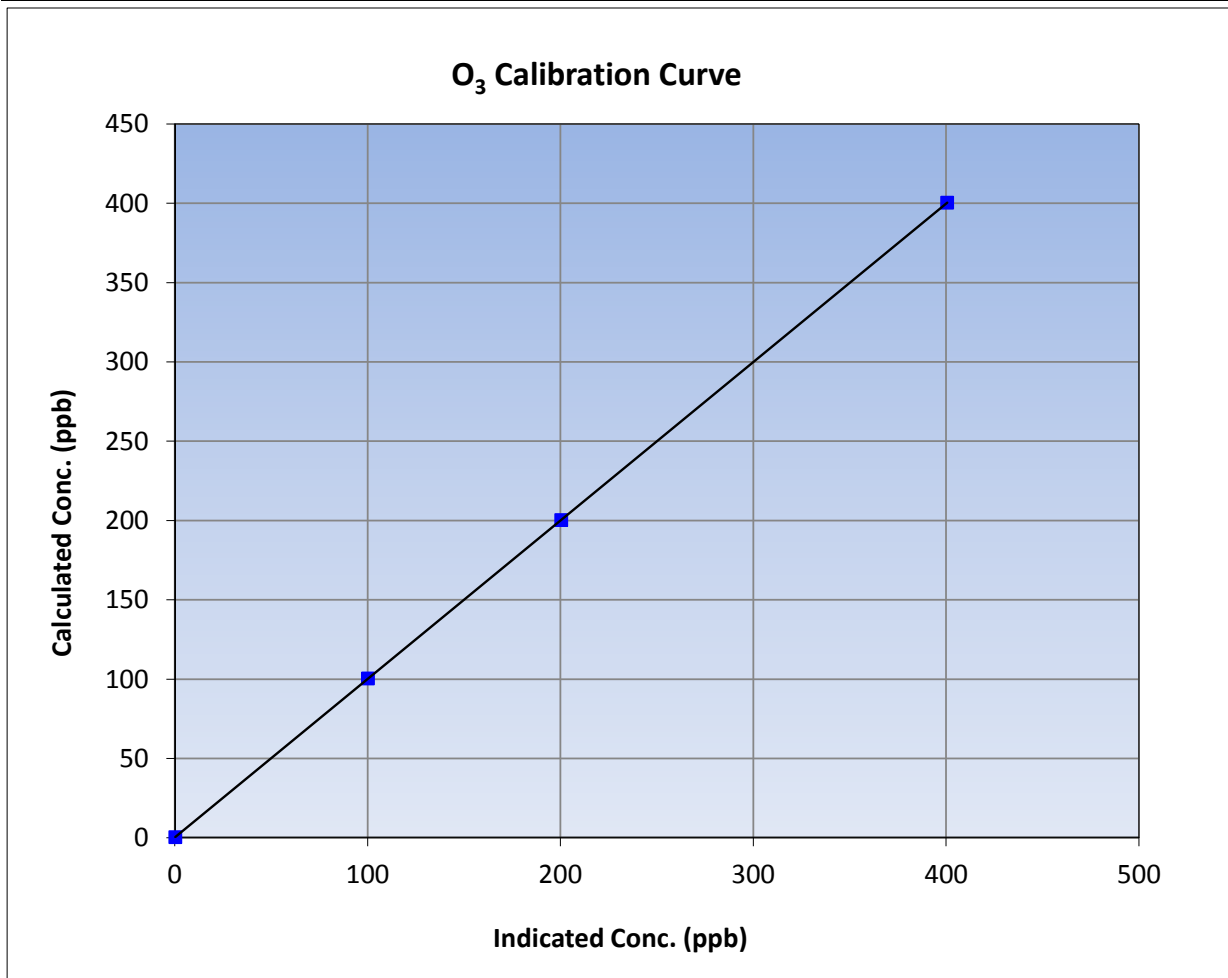
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	9:30	End Time (MST)	12:10
Analyzer make	API T400	Analyzer serial #	1107

### Calibration Data

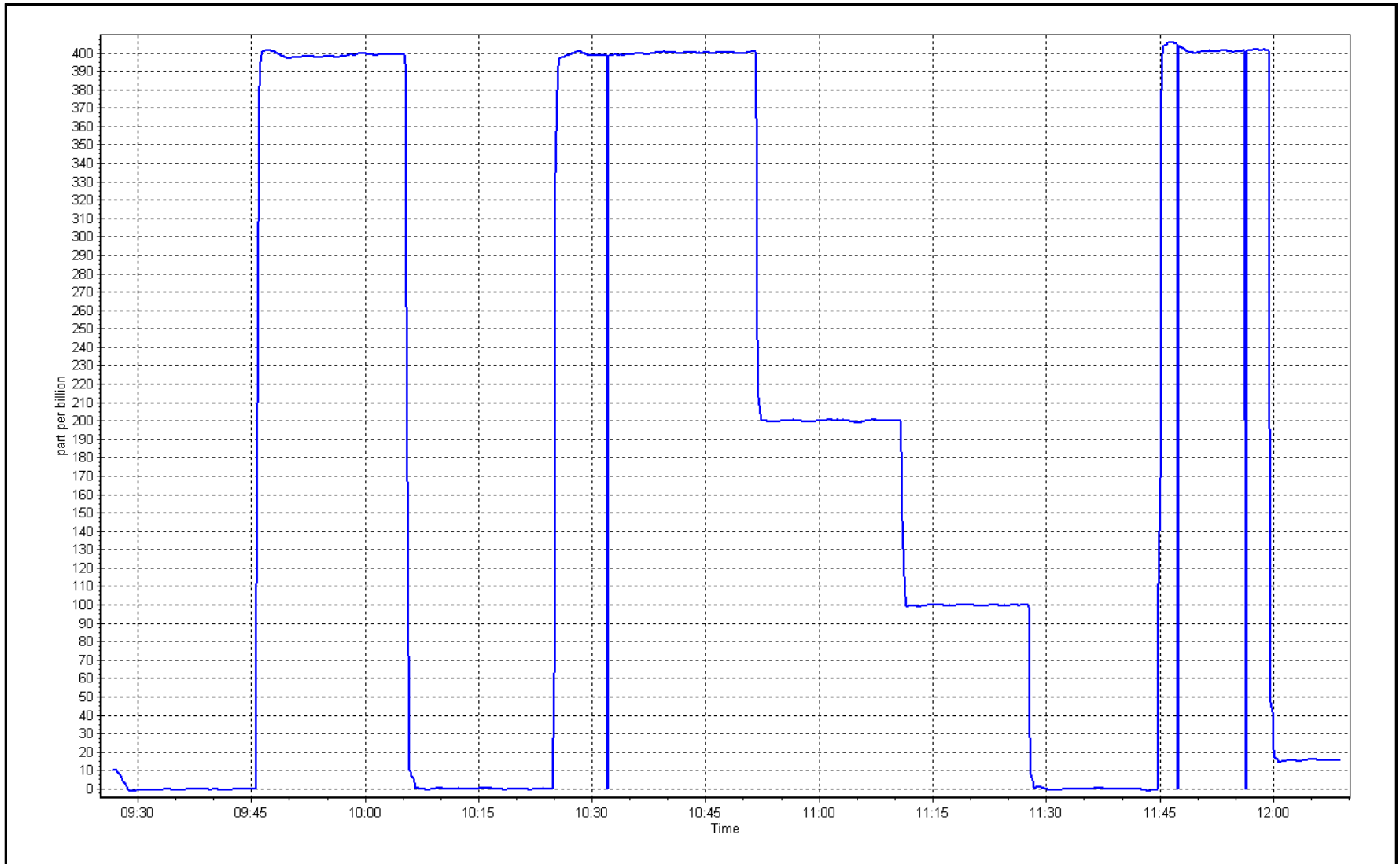
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.1	----	Correlation Coefficient	1.000000	≥0.995
400.0	400.2	0.9995			
200.0	200.1	0.9995	Slope	0.999086	0.90 - 1.10
100.0	99.8	1.0020			
			Intercept	0.159907	+/- 10



# O<sub>3</sub> Calibration Plot

Date: December 5, 2017

Location: Fort McKay - Bertha Ganter





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay - Bertha Ganter	Station number:	AMS 01
Calibration Date:	December 6, 2017	Last Cal Date:	November 2, 2017
Start time (MST):	10:00	End time (MST):	15:10
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000683	Cal Gas Expiry Date	November 4, 2019
NOX Cal Gas Conc.	<u>49.7</u> ppm	NO Cal Gas Conc.	<u>49.7</u> ppb
Calibrator Model	API T700	Serial Number	2464
ZAG make/model	API T701	Serial Number	262

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 1218153357		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.170	1.173	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	0.998	0.998	PMT Temperature	-2.9	-3.1
NO2 coefficient	1.000	1.000	Reaction cell Press	175.0	174.4
NO bkgrnd	5.8	5.9	Sample Flow	0.593	0.598
NOX bkgrnd	6.0	6.0	PMT Voltage	-791.8	-791.8

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.999107	0.998768
NO <sub>x</sub> Cal Offset	2.265241	1.983456
NO Cal Slope	0.998279	0.997754
NO Cal Offset	2.403213	2.361336
NO <sub>2</sub> Cal Slope	0.999530	1.002324
NO <sub>2</sub> Cal Offset	0.259091	-0.461615



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	0.0	0.0	0.2	-0.1	0.3	----	----
as found span	4930	80.6	799.5	799.5	0.0	799.9	799.0	0.9	0.9995	1.0006
calibrator zero	5000	0.0	0.0	0.0	0.0	0.1	-0.2	0.3	----	----
high point	4930	80.6	799.5	799.5	0.0	799.6	800.1	-0.4	0.9998	0.9992
second point	4970	40.3	399.8	399.8	0.0	396.9	396.8	0.0	1.0072	1.0075
third point	4990	20.1	199.4	199.4	0.0	195.8	195.6	0.2	1.0183	1.0194
as left zero	5997	0.0	0.0	0.0	0.0	0.2	-0.2	0.4	----	----
as left span	4930	80.6	799.5	394.3	405.2	796.3	394.9	401.3	1.0040	0.9985
<b>Average Correction Factor</b>									<b>1.0085</b>	<b>1.0087</b>

Corrected As found	NO <sub>x</sub> = 799.7 ppb	NO = 799.1 ppb		*Percent Change	NO <sub>x</sub> = -0.2%
Previous Response	NO <sub>x</sub> = 797.9 ppb	NO = 798.4 ppb		*Percent Change	NO = -0.1%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	797.2	796.2	1.0	1.0028	1.0041	----	----
1st NO2 (400 ppb O3)	394.3	401.9	795.5	394.3	401.2	1.0050	----	1.0017	99.8%
2nd NO2 (200 ppb O3)	592.6	203.6	796.7	592.6	204.1	1.0035	----	0.9976	100.2%
3rd NO2 (100 ppb O3)	693.4	102.8	796.3	693.4	102.9	1.0040	----	0.9990	100.1%
2nd NO ref point	----	0.0	795.4	794.3	1.1	1.0051	1.0065	----	----
<b>Average Correction Factor</b>						<b>1.0044</b>	<b>1.0053</b>	<b>0.9994</b>	<b>100.1%</b>

Notes:

Span adjusted.

Calibration Performed By:

Devin Russell



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

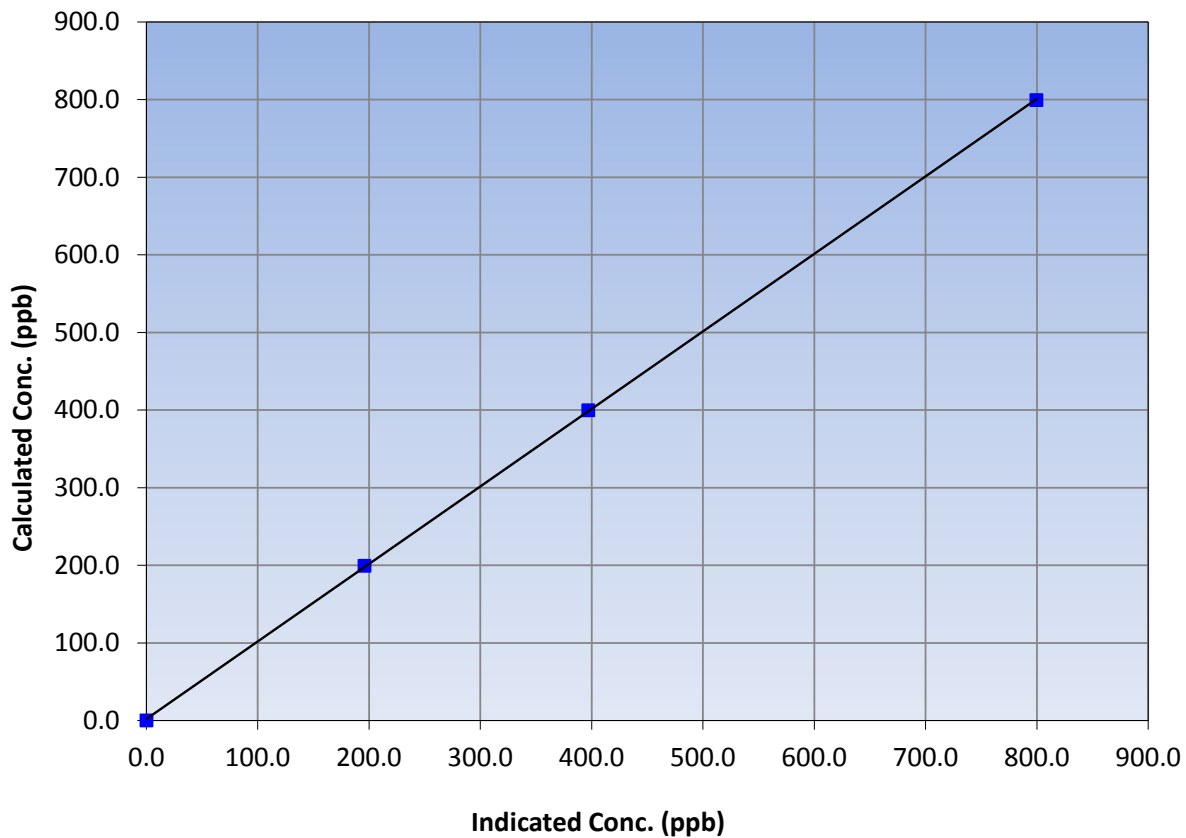
### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 2, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	10:00	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.1	----	Correlation Coefficient	≥0.995	
799.5	799.6	0.9998			
399.8	396.9	1.0072			
199.4	195.8	1.0183			
			Slope	0.998768	0.90 - 1.10
			Intercept	1.983456	+/-20

NO<sub>x</sub> Calibration Curve







# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

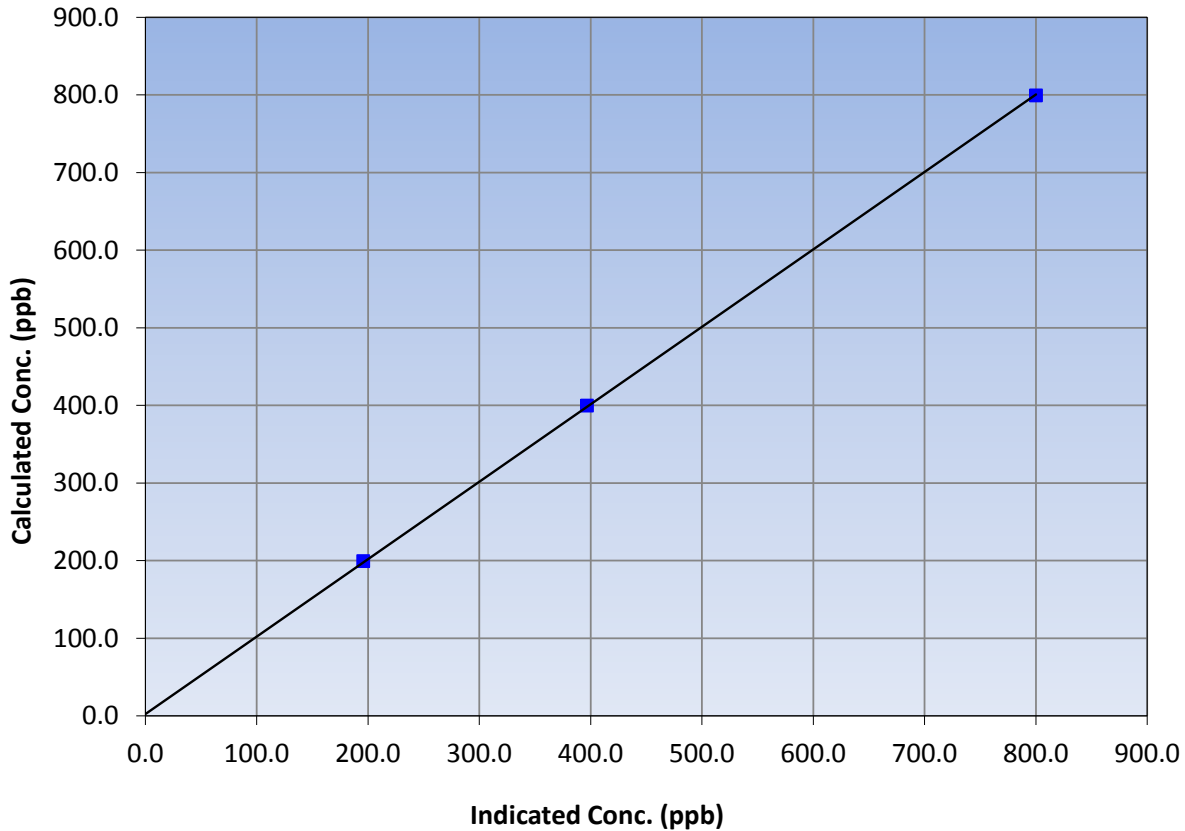
### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 2, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	10:00	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.2	----	Correlation Coefficient	≥0.995	
799.5	800.1	0.9992			
399.8	396.8	1.0075			
199.4	195.6	1.0194			
			Slope	0.997754	0.90 - 1.10
			Intercept	2.361336	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

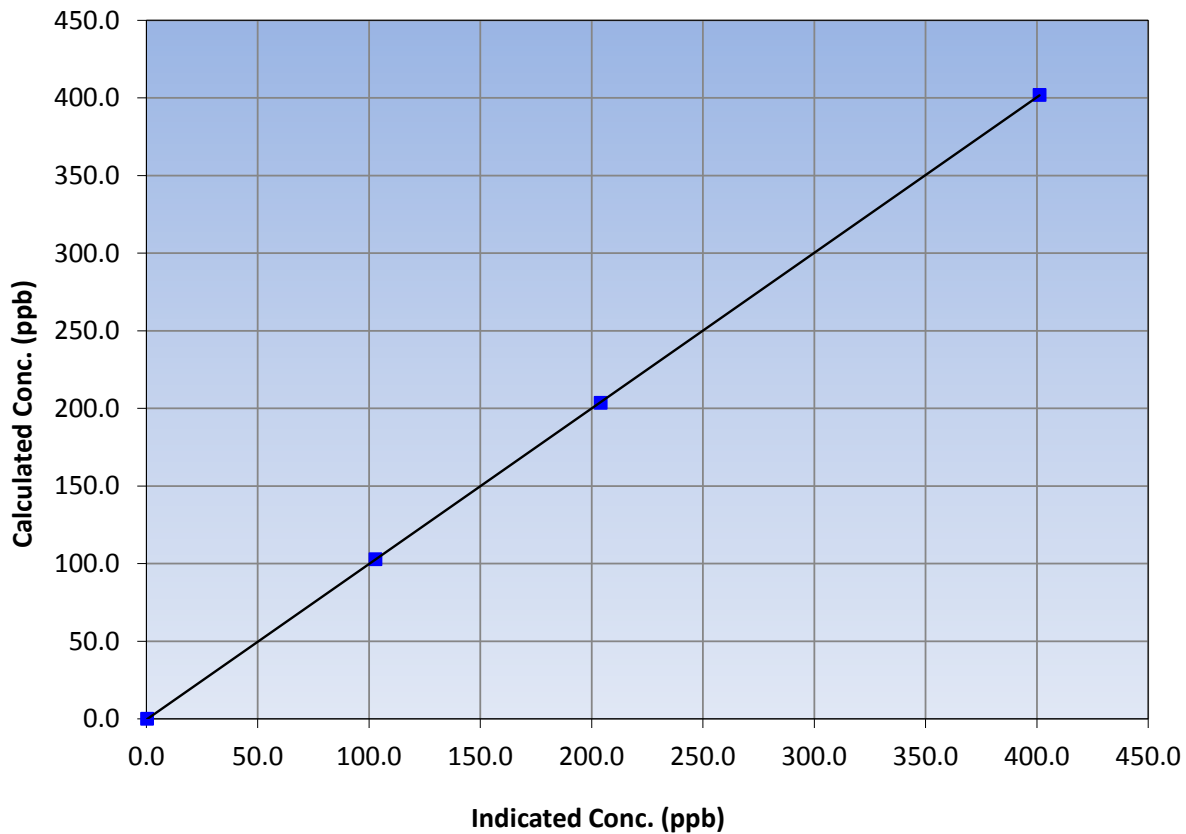
### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 2, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	10:00	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.3	----	Correlation Coefficient	≥0.995	
401.9	401.2	1.0017			
203.6	204.1	0.9976			
102.8	102.9	0.9990			
			Slope	1.002324	0.90 - 1.10
			Intercept	-0.461615	+/-20

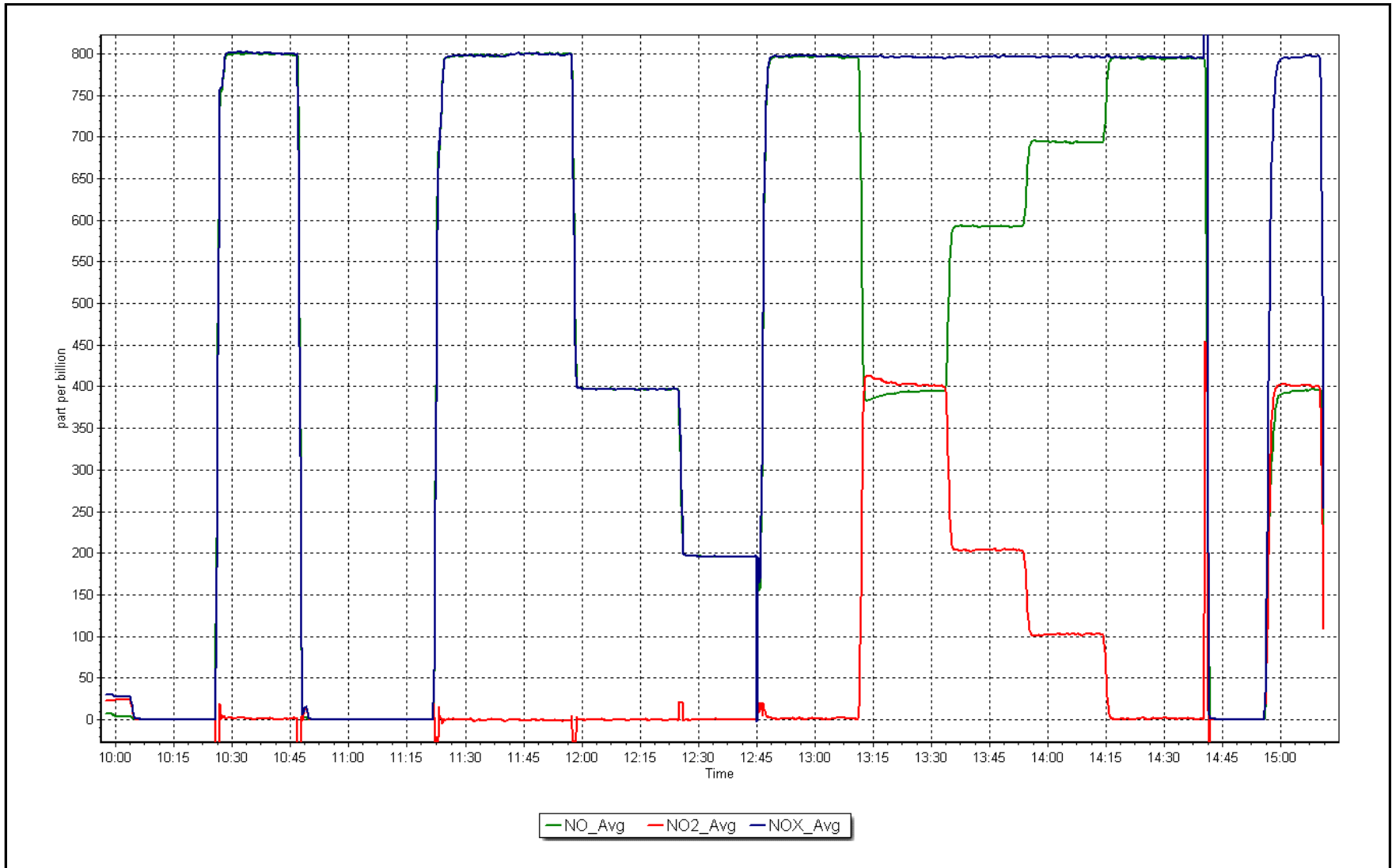
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: December 6, 2017

Location: Fort McKay - Bertha Ganter





# Wood Buffalo Environmental Association

## TN - NO<sub>x</sub> - NH<sub>3</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay - Bertha Ganter	Station number:	AMS 01
NOX Cal Date:	December 6, 2017	Last Cal Date:	November 2, 2017
Start time (MST):	10:00	End time (MST):	14:50
NH3 Cal Date:	December 7, 2017	Last Cal Date:	November 3, 2017
Start time (MST):	9:55	End time (MST):	14:10
Reason:	Routine		

### Calibration Standards

NOX Cal Gas Conc.	<u>49.7</u>	ppm	NO Gas Cylinder #	EY0000683
NO Cal Gas Conc.	<u>49.7</u>	ppm	NO Cal Gas Expiry	November-04-19
NH3 Cal Gas Conc.	<u>95.5</u>	ppm	NH3 Gas Cylinder #	LL23123
			NH3 Cal Gas Expiry	May-24-17
Calibrator Model	API T700		Serial Number	2464
ZAG make/model	API 701H		Serial Number	587

### Analyzer Information

Analyzer make:	API T201	Analyzer serial #:	152		
	<u>Start</u>	<u>Finish</u>			
NO coefficient	1.065	1.066	NH3 Range (ppb)	<u>Start</u>	<u>Finish</u>
NOX coefficient	1.208	1.214	NOX Range (ppb)	0 - 1000 ppb	
NO2 coefficient	1.000	1.000	PMT Temperature	7.0	7.0
NH3 coefficient	0.896	0.904	Reaction cell Press	9.7	9.8
TN coefficient	1.214	1.212	Sample Flow	0.529	0.528
NO bkgrnd	0.0	-0.1	PMT Voltage	645.0	645.0
NOX bkgrnd	-0.1	-0.1	Moly Temperature	315.4	316.3
TN bkgrnd	0.2	0.1	NH3 Conv Temp	825	825

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.996690	0.993321
NO <sub>x</sub> Cal Offset	4.102209	2.911031
NO Cal Slope	0.998097	0.999781
NO Cal Offset	4.687384	2.930645
NO <sub>2</sub> Cal Slope	0.996677	0.987514
NO <sub>2</sub> Cal Offset	-1.672021	-1.380034
NH3 Cal Slope	1.003323	0.996764
NH3 Cal Offset	2.557655	1.786574
TN Cal Slope	0.987217	0.979205
TN Cal Offset	1.587837	1.376969



# Wood Buffalo Environmental Association

## TN - NOX - NH<sub>3</sub> Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated TN concentration (ppb) (Cc)	Calculated NOX concentration (ppb) (Cc)	Calculated NH3 concentration (ppb) (Cc)	Indicated TN concentration (ppb) (Ic)	Indicated NOX concentration (ppb) (Ic)	Indicated NH3 concentration (ppb) (Ic)	TN Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NH3 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	0.0	0.0	-2.5	-3.6	1.1	----	----
as found NO	4930	80.6	799.5	799.5	----	789.0	792.2	-3.1	1.013	----
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.9	-0.4	-0.5	----	----
high NO point	4930	80.6	799.5	799.5	----	800.8	803.4	-2.5	0.998	----
NO/O3 point	4930	80.6	799.5	799.5	----	799.1	799.1	0.0	1.000	----
as found NH3	4916	94.3	1797.4	NA	1797.4	1828.8	----	1798.5	0.983	0.999
first NH3	4916	94.3	1797.4	NA	1797.4	1833.7	----	1801.4	0.980	0.998
second NH3	4948	52.4	1000.8	NA	1000.8	1022.4	----	1003.7	0.979	0.997
third NH3	4932	26.3	506.6	NA	506.6	514.1	----	503.7	0.985	1.006
<b>Average Correction Factor</b>									<b>0.9994</b>	<b>1.0002</b>

Corrected As found      TN = 791.5 ppb      NO<sub>x</sub> = 795.8 ppb      NH<sub>3</sub> = 1797.4 ppb

Previous Response      TN = 808.2 ppb      NO<sub>x</sub> = 798.0 ppb      NH<sub>3</sub> = 1788.9 ppb

NH3 Previous Converter Efficiency =    89.6 %

NH3 Current Converter Efficiency =    90.4 %

\*Percent Change      TN =    2.1%

\*Percent Change      NO<sub>x</sub> =    0.3%

\*Percent Change      NH<sub>3</sub> = -0.5%

*\* = > +/-5% change initiates investigation*



# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NO <sub>x</sub> concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated TN concentration (ppb) (Cc)	Indicated NO <sub>x</sub> concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated TN concentration (ppb) (Ic)	NO <sub>x</sub> Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.7	-2.2	----	----
as found span	4930	80.6	799.5	799.5	799.5	797.3	801.0	797.7	1.0027	0.9981
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.4	-0.9	----	----
high point	4930	80.6	799.5	799.5	799.5	803.4	798.0	800.8	0.9951	1.0018
second point	4970	40.3	399.8	399.8	399.8	397.5	395.5	397.2	1.0057	1.0108
third point	4990	20.1	199.4	199.4	199.4	195.8	194.1	193.3	1.0183	1.0273
<b>Average Correction Factor</b>									<b>1.0064</b>	<b>1.0133</b>

Corrected As found    TN = 799.9 ppb    NO<sub>x</sub> = 797.7 ppb    NO = 801.7 ppb  
 Previous Response    TN = 808.2 ppb    NO<sub>x</sub> = 798.0 ppb    NO = 796.3 ppb

\*Percent Change    TN = 1.0%  
 \*Percent Change    NO<sub>x</sub> = 0.0%  
 \*Percent Change    NO = -0.7%  
 \* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO <sub>2</sub> concentration (ppb) (Cc)	Indicated NO <sub>x</sub> concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO <sub>2</sub> concentration (ppb) (Ic)	NO <sub>x</sub> Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO <sub>2</sub> Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point	----	0.0	799.1	793.2	5.9	1.0005	1.0079	----	----
1st NO <sub>2</sub> (400 ppb O <sub>3</sub> )	394.2	399.0	798.2	394.2	403.9	1.0016	----	0.9879	101.2%
2nd NO <sub>2</sub> (200 ppb O <sub>3</sub> )	592.2	201.0	799.2	592.2	207.0	1.0003	----	0.9710	103.0%
3rd NO <sub>2</sub> (100 ppb O <sub>3</sub> )	688.5	104.7	797.6	688.5	109.2	1.0023	----	0.9588	<b>104.3%</b>
2nd NO ref point	----	0.0	805.0	791.7	13.3	0.9931	1.0098	----	----
<b>Average Correction Factor</b>						<b>0.9993</b>	<b>1.0089</b>	<b>0.9726</b>	<b>102.8%</b>

**Notes:**

Adjusted span and zero for Nt and NO<sub>x</sub> channels. 3rd GPT point showing 104.3% converter efficiency due to high imbalance between NO and NO<sub>x</sub> during NO ref point. NH<sub>3</sub> span adjusted.

Calibration Performed By:                      Devin Russell



# Wood Buffalo Environmental Association

## TN Calibration Summary

Version-03-2017

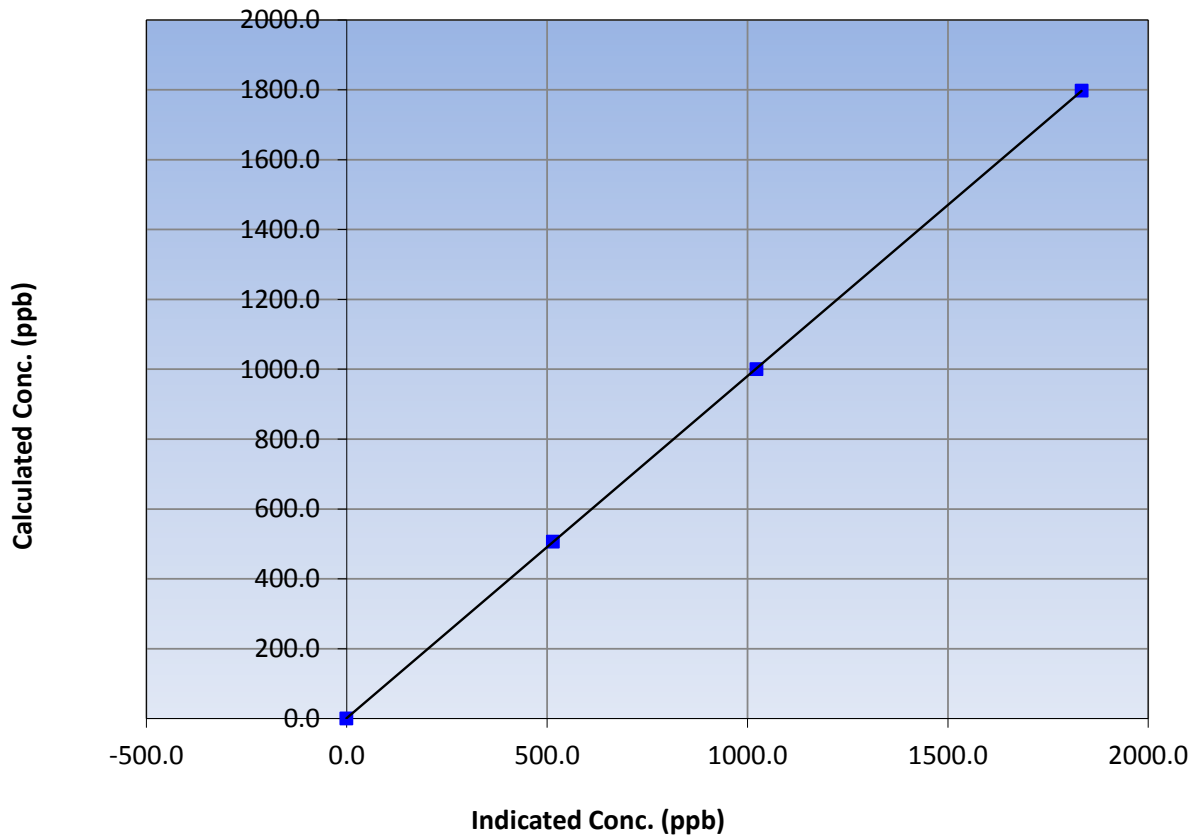
### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 3, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	9:55	End Time (MST)	14:10
Analyzer make	API T201	Analyzer serial #	152

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.9	----	Correlation Coefficient	≥0.995	
1797.4	1833.7	0.9802			
1000.8	1022.4	0.9788			
506.6	514.1	0.9853			
			Slope	0.979205	0.90 - 1.10
			Intercept	1.376969	+/-20

TN Calibration Curve





# Wood Buffalo Environmental Association

## NH<sub>3</sub> Calibration Summary

Version-03-2017

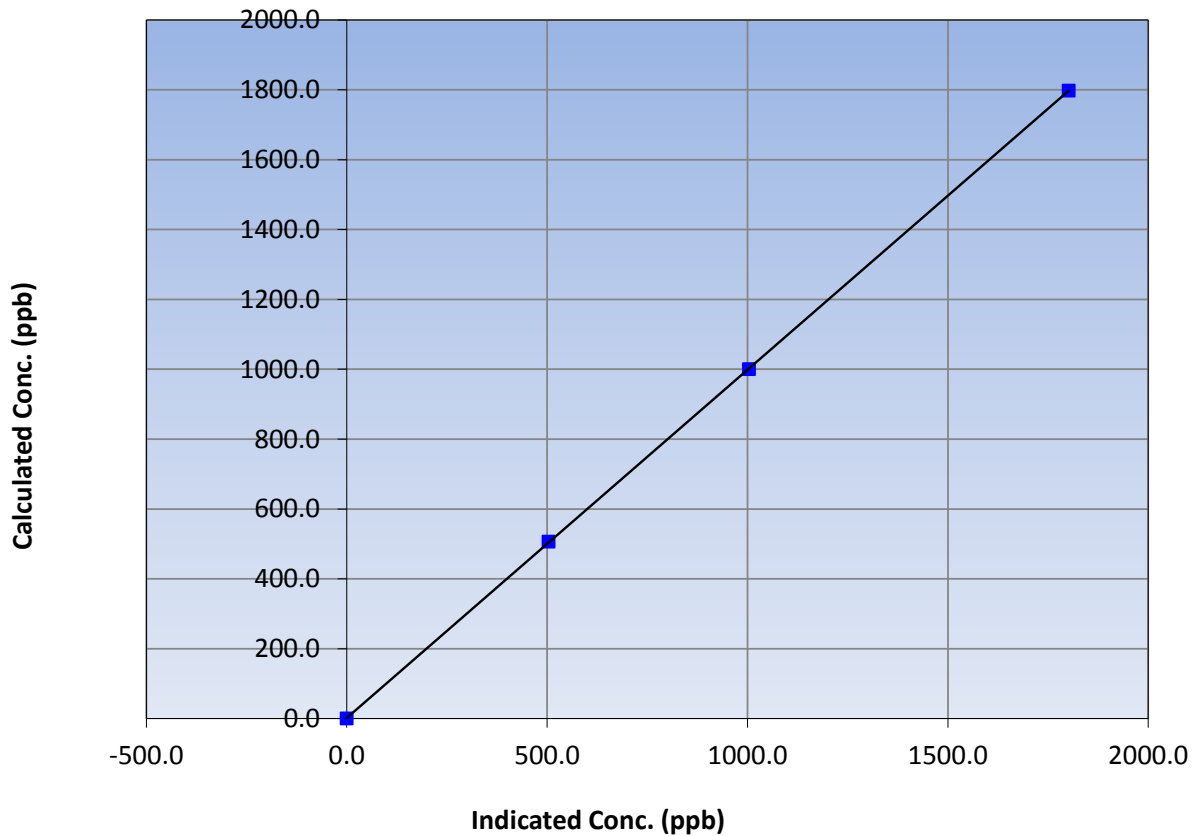
### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 3, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	9:55	End Time (MST)	14:10
Analyzer make	API T201	Analyzer serial #	152

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.5	----	Correlation Coefficient	≥0.995	
1797.4	1801.4	0.9978			
1000.8	1003.7	0.9971			
506.6	503.7	1.0057			
			Slope	0.996764	0.90 - 1.10
			Intercept	1.786574	+/-20

NH<sub>3</sub> Calibration Curve







# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

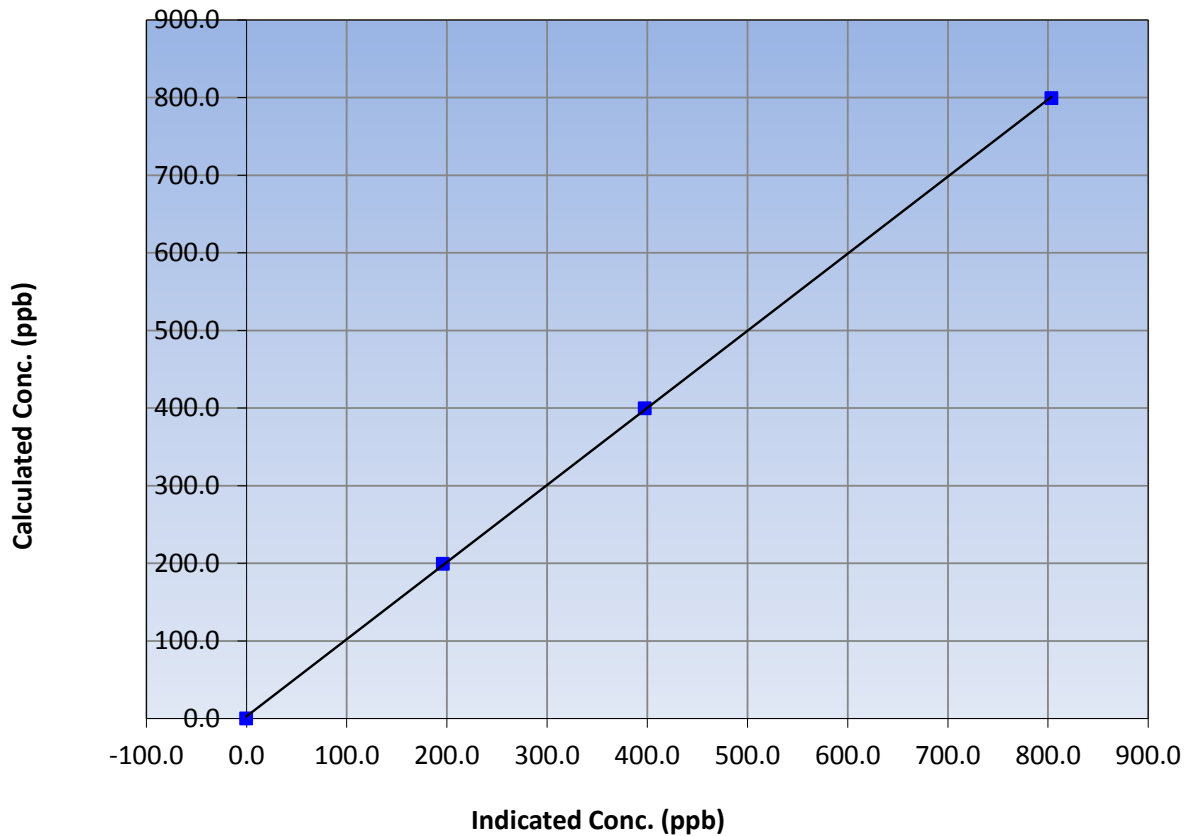
### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 2, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	10:00	End Time (MST)	14:50
Analyzer make	API T201	Analyzer serial #	152

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.4	----	Correlation Coefficient	≥0.995	
799.5	803.4	0.9951			
399.8	397.5	1.0057			
199.4	195.8	1.0183			
			Slope	0.993321	0.90 - 1.10
			Intercept	2.911031	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

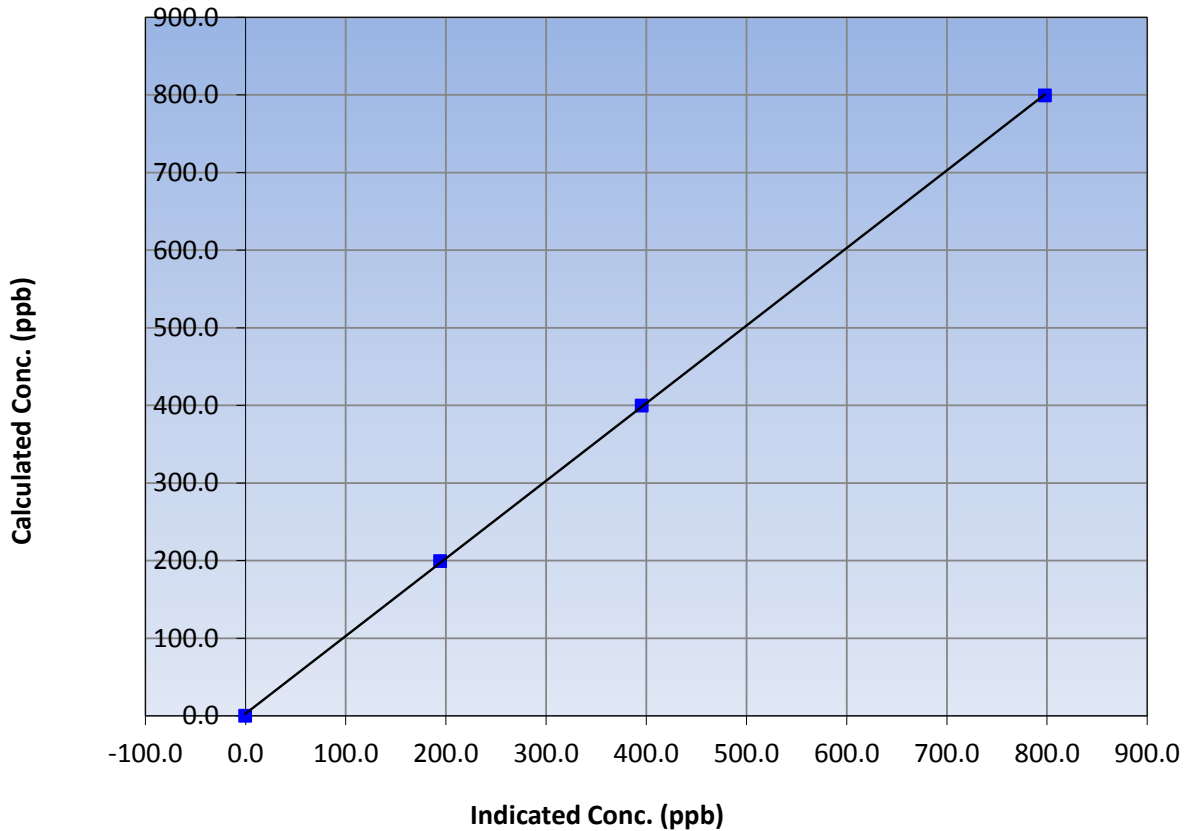
### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 2, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	10:00	End Time (MST)	14:50
Analyzer make	API T201	Analyzer serial #	152

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.4	----	Correlation Coefficient	$\geq 0.995$	
799.5	798.0	1.0018			
399.8	395.5	1.0108			
199.4	194.1	1.0273			
			Slope	0.999781	0.90 - 1.10
			Intercept	2.930645	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

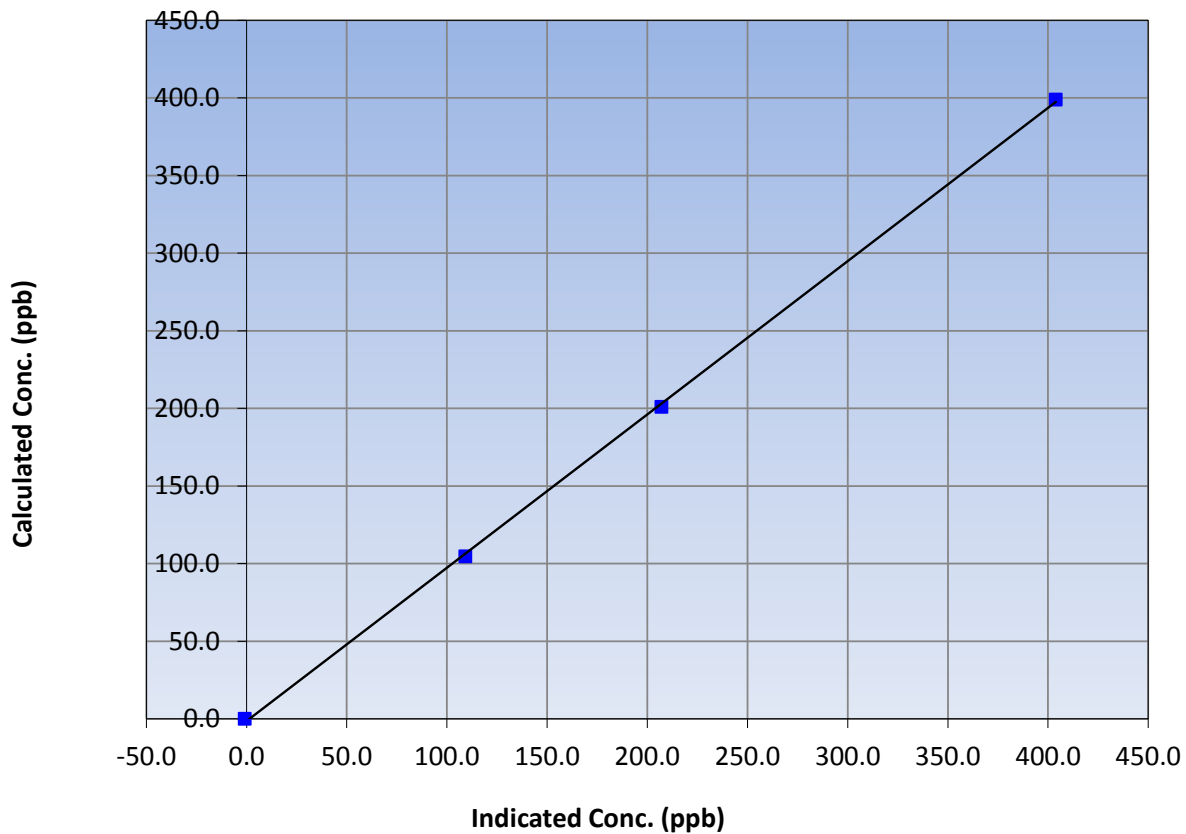
### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 2, 2017
Station Name	Fort McKay - Bertha Ganter	Station Number	AMS 01
Start Time (MST)	10:00	End Time (MST)	14:50
Analyzer make	API T201	Analyzer serial #	152

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.9	----	Correlation Coefficient	≥0.995	
399.0	403.9	0.9879			
201.0	207.0	0.9710			
104.7	109.2	0.9588			
			Slope	0.987514	0.90 - 1.10
			Intercept	-1.380034	+/-20

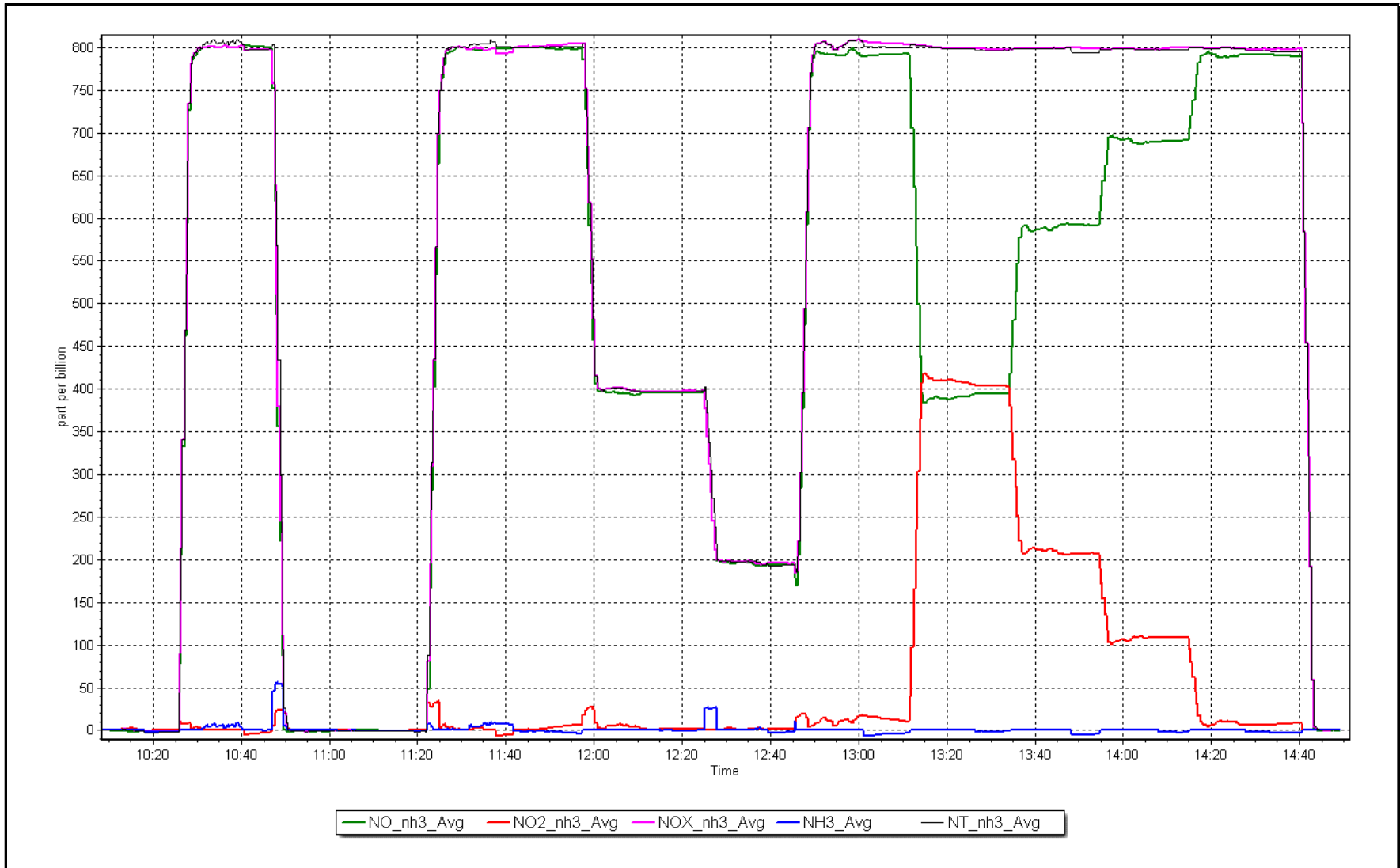
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 6, 2017

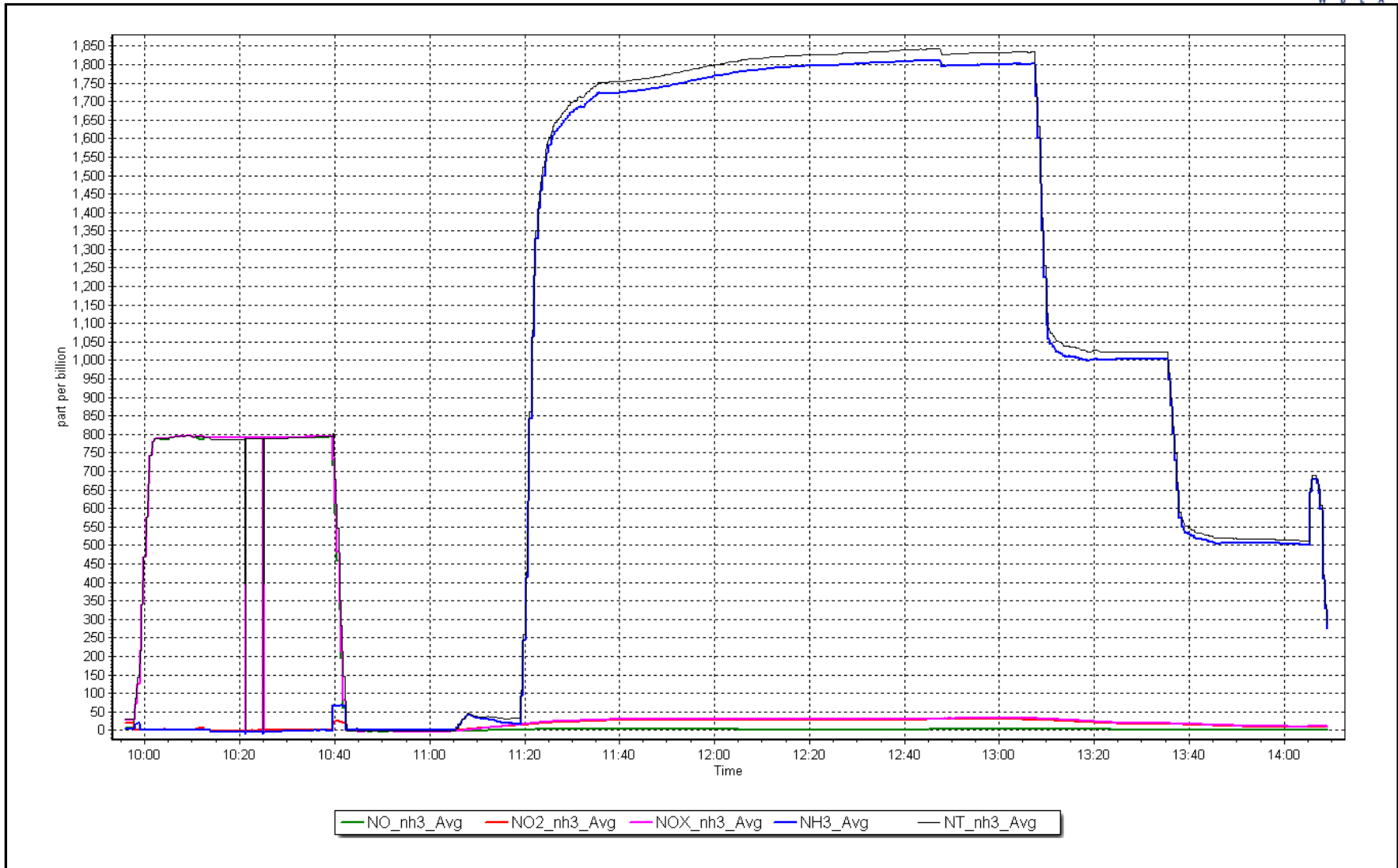
Location: Fort McKay - Bertha Ganter



# NH<sub>3</sub> Calibration Plot

Date: December 7, 2017

Location: Fort McKay - Bertha Ganter





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Fort McKay - Bertha Ganter	Station number:	AMS 01
Calibration Date:	December 7, 2017	Last Cal Date:	November 3, 2017
Start time (MST):	11:00	End time (MST):	14:15
Sharp Model:	Thermo 5030 SHARP	S/N:	E-1486
Particulate Fraction:	PM2.5	C14 Source S/N:	5691
Flow Meter Make/Model:	Delta-Cal	S/N:	1019
Temp/RH standard:	Delta-Cal	S/N:	1019

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	-2	-1.8	-2	<input type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	984	985.7	984	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	1020	1002	<input checked="" type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	-0.2	-----	-0.2	<input type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Concentration zero	-0.1	-----	-0.1	<input type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test: \_\_\_\_\_ Date of check: \_\_\_\_\_ Last Cal Date: September 13, 2017  
 Flow w/o adaptor: \_\_\_\_\_ Flow w/ adaptor: \_\_\_\_\_

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>2582</u>	
Foil Mass: _____	Foil Mass: <u>1186</u>	
Calibration Date: _____	Calibration Date: <u>September 13, 2017</u>	
Correction Factor: _____	Correction Factor: _____	---

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)				<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes:

Cyclone head replaced with clean head. Flow adjusted.

Calibration by: Devin Russell



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 2  
MILDRED LAKE  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100	88	0	24	0
H2S (ppb) Average	708	36	36	100	6	0	1	0
THC (ppm) Average	709	35	35	100	7.9	-	3.2	-
Temperature (C) Average	744	0	0	100	5.3	-	2.7	-
Relative Humidity (%) Average	744	0	0	100	99	-	93	-
Wind Speed 10 m (km/h) Average	701	3	43	94.62	25	-	15	-
Wind Direction 10 m (deg) Average	701	3	43	94.62	-	-	-	-

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



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1.9	7	-	0	0	0	0	1	3	88
H2S (ppb) Average	708	0.6	1	-	0	0	0	0	1	1	6
THC (ppm) Average	709	2.6	0.6	-	2	2.1	2.2	2.4	2.8	3.3	7.9
Temperature 2 m (C) Average	744	-13.11	12.1	-	-38.5	-30.2	-25.5	-9.3	-2.8	0.9	5.3
Relative Humidity (%) Average	744	80.9	8	-	55	72	75	80	87	93	99
Wind Speed 10 m (km/h) Average	701	7.4	4	-	0	3	4	7	9	13	25
Wind Direction 10 m (deg) Average	701	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	04 Dec 2017 06:00	04 Dec 2017 06:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	11 Dec 2017 02:00	11 Dec 2017 13:00	12	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	16 Dec 2017 02:00	17 Dec 2017 04:00	27	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

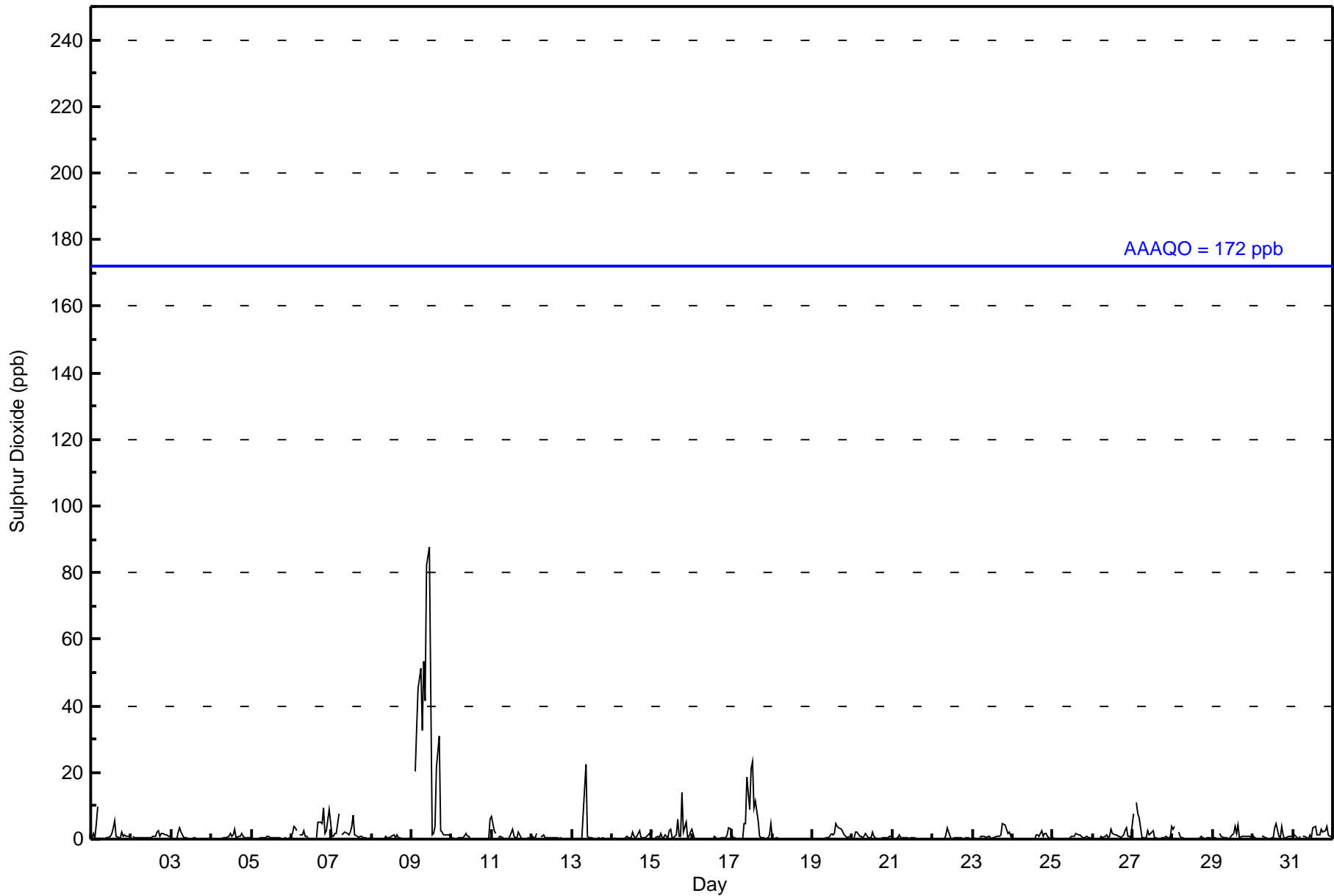
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mildred Lake - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 88 ppb on Dec 9 11:00										Maximum Daily Average: 24.4 ppb on Dec 9										Hours of Data: 709							
Minimum Value: 0 ppb on Dec 3 20:00										Minimum Daily Average: 0.1 ppb on Dec 18										Hours of Missing Data: 35							
Maximum Diurnal Average: 3.8 ppb at hour 10										Minimum Diurnal Average: 0.6 ppb at hour 22										Hours of Calibration: 35							
Monthly Average: 1.9 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 40										Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	2	1	5	10	Z	0	0	0	0	1	1	2	3	6	1	1	0	2	1	1	1	1	1	1.7	10	
2-Dec	Z	1	0	0	0	0	0	0	0	0	0	1	0	1	1	2	2	1	2	2	1	1	1	1	0.9	2	
3-Dec	1	Z	0	0	2	3	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.5	3	
4-Dec	0	0	Z	0	0	0	0	0	0	0	1	2	1	1	3	1	1	1	2	1	1	0	0	1	0.7	3	
5-Dec	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1	
6-Dec	2	4	3	3	Z	1	1	2	1	1	0	C	C	C	C	0	5	5	5	9	2	3	9	5	3.2	9	
7-Dec	1	1	2	2	8	Z	1	2	2	2	1	2	4	7	1	1	1	1	1	1	0	0	0	0	1.7	8	
8-Dec	Z	0	0	0	0	0	0	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0.4	1	
9-Dec	0	Z	20	33	45	51	33	54	41	82	88	43	1	2	4	22	31	2	2	1	1	1	1	1	24.4	88	
10-Dec	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	6	0.5	6	
11-Dec	7	2	2	Z	0	1	0	0	0	0	0	1	3	1	1	0	2	0	0	0	0	0	0	0	1.0	7	
12-Dec	1	1	0	2	Z	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
13-Dec	0	0	0	0	0	Z	0	15	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	22	
14-Dec	Z	0	0	0	0	0	0	0	0	1	0	0	2	1	0	1	2	0	0	1	0	1	2	0	0.6	2	
15-Dec	3	Z	0	1	0	2	1	0	1	1	3	3	0	0	1	6	1	1	14	2	5	1	1	2	2.1	14	
16-Dec	3	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	4	3	0.6	4	
17-Dec	1	0	0	Z	0	0	0	4	5	19	9	21	23	9	11	6	1	0	0	0	0	0	1	5	5.1	23	
18-Dec	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
19-Dec	0	0	0	0	0	Z	0	0	0	1	0	2	1	2	4	4	3	3	2	1	1	1	1	1	1.2	4	
20-Dec	Z	0	2	2	1	1	1	1	2	1	1	1	2	1	0	0	0	0	0	0	0	0	1	1	0.8	2	
21-Dec	0	Z	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-Dec	0	0	Z	0	0	0	0	0	1	3	1	0	0	0	1	1	1	0	0	0	1	1	0	0	0.4	3	
23-Dec	0	0	0	Z	0	1	1	1	1	1	1	0	0	0	1	1	1	1	5	4	3	2	2	1	1.1	5	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	2	1	2	2	1	0	0	0.6	2	
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	2	1	1	1	1	0	1	0	1	0	0.5	2	
26-Dec	Z	0	0	0	0	1	0	1	1	0	1	3	2	1	1	1	1	0	1	2	3	1	1	1	1.0	3	
27-Dec	8	Z	11	8	6	0	1	0	0	2	1	2	3	0	0	0	0	1	1	1	1	1	1	4	2.2	11	
28-Dec	3	4	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.7	4	
29-Dec	1	0	0	Z	2	1	0	0	0	0	0	1	1	4	2	4	0	1	1	1	1	1	1	0	1.0	4	
30-Dec	1	0	0	0	Z	1	1	1	1	0	0	1	4	5	1	1	4	1	0	0	1	1	1	1	1.0	5	
31-Dec	1	1	1	0	1	Z	1	1	0	0	1	0	3	4	1	1	1	3	2	3	4	1	1	1	1.4	4	
1.3 0.7 1.8 2.3 3.0 2.6 1.5 2.8 2.7 3.8 3.7 2.9 1.8 1.6 1.6 1.8 1.8 1.0 1.5 1.1 1.0 0.6 0.9 1.1										Diurnal Average																	
8 4 20 33 45 51 33 54 41 82 88 43 23 9 11 22 31 5 14 9 5 3 9 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 (SO<sub>2</sub>) - ppb  
Mildred Lake - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mildred Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	689	97.18	97.18
11 - 20	6	0.85	98.03
21 - 60	12	1.69	99.72
61 - 110	2	0.28	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mildred Lake - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	52	27	15	9	8	25	97	107	60	43	24	28	66	24	23	41	649
11 - 20	0	0	0	0	0	0	0	1	0	0	3	2	0	0	0	0	6
21 - 60	0	0	0	0	0	0	0	0	0	0	0	11	1	0	0	0	12
61 - 110	0	0	0	0	0	0	0	0	0	0	0	2	0	0	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
<b>Totals</b>	52	27	15	9	8	25	97	108	60	43	27	43	67	24	23	41	669

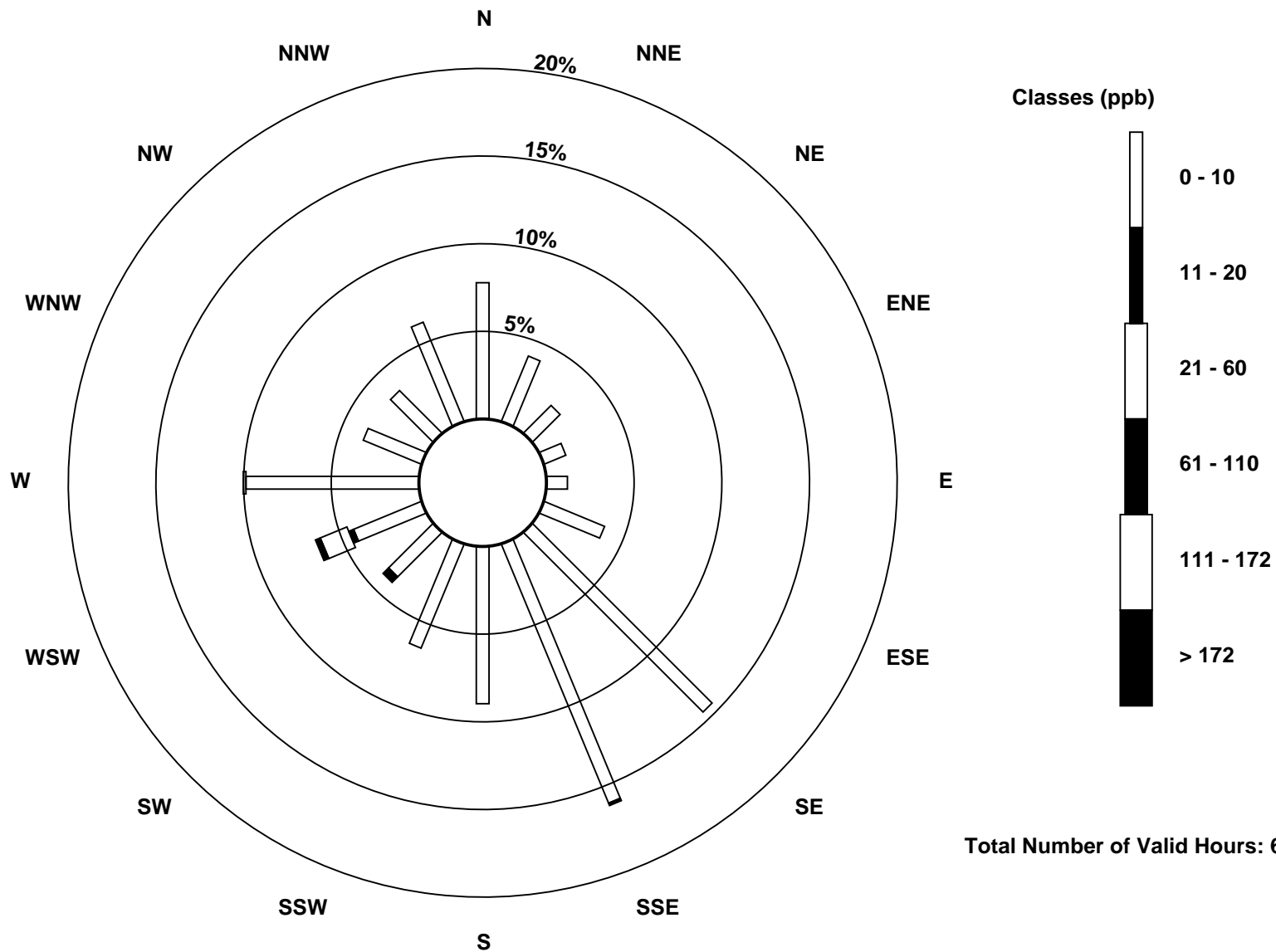
Total Number of Valid Hours: 669

Total Number of Hours: 744

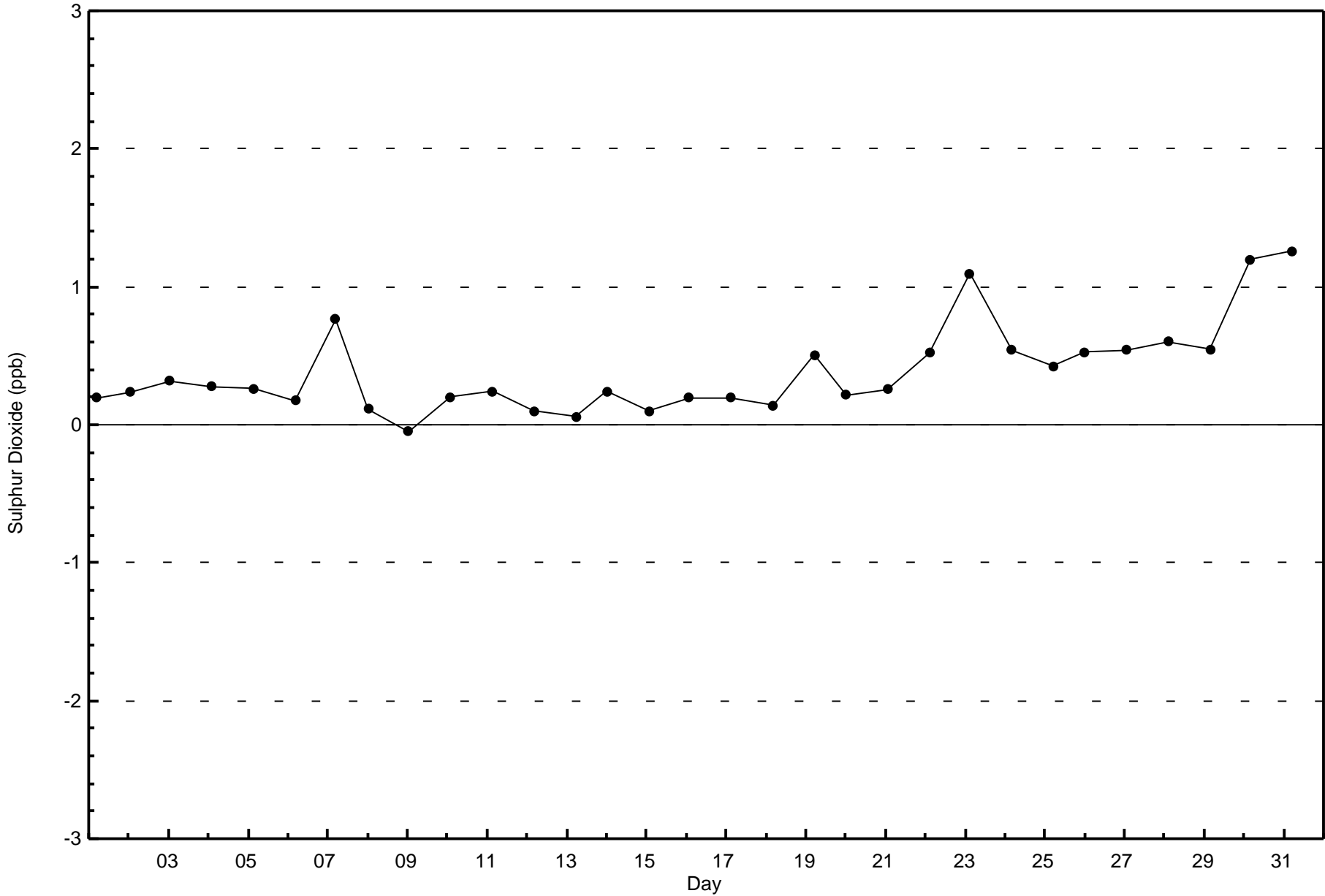


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

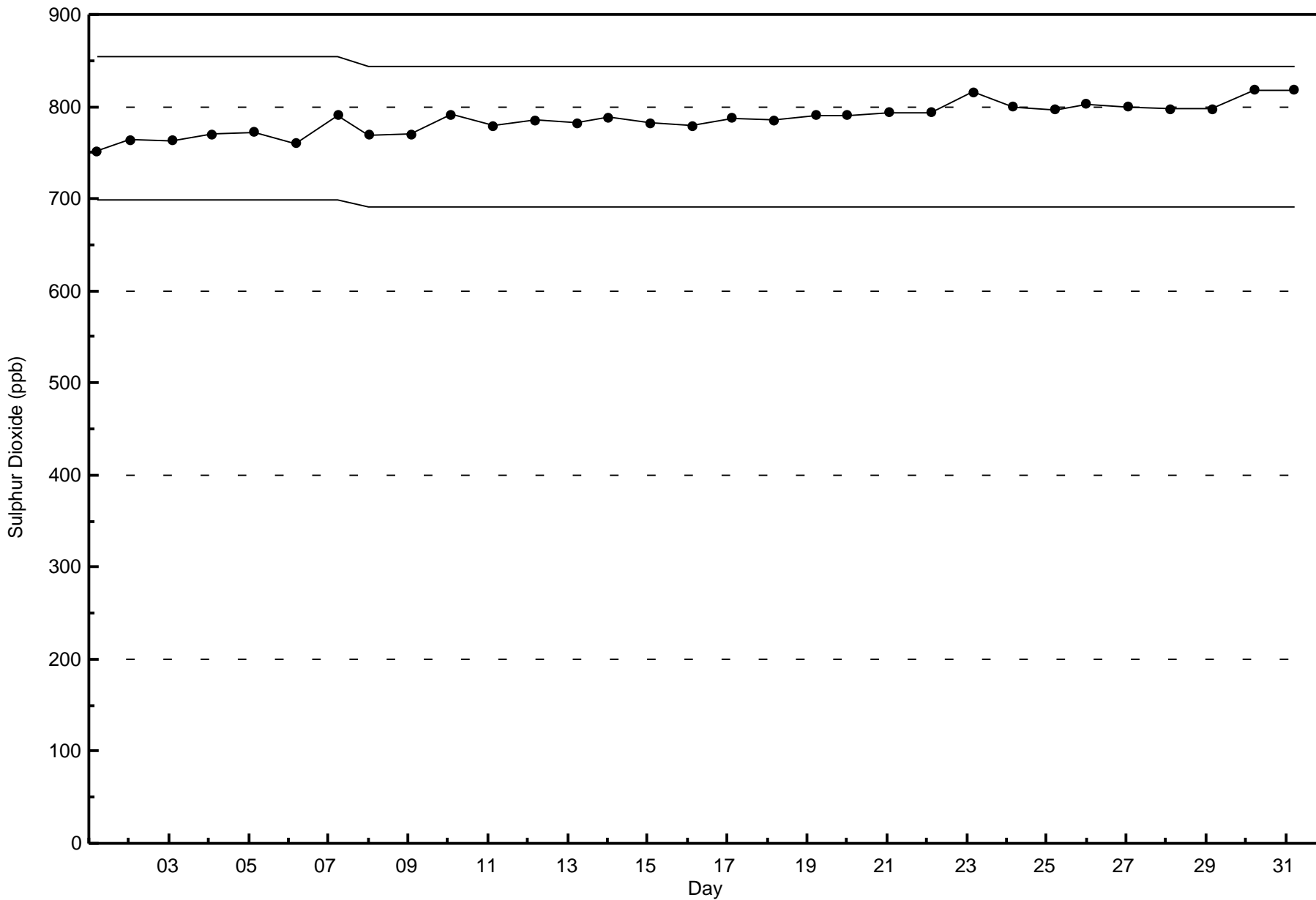
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mildred Lake (AMS 2)



Total Number of Valid Hours: 669









Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb

Mildred Lake - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 6 ppb on Dec 11 06:00	Maximum Daily Average: 1.4 ppb on Dec 11		Hours of Data:	708
Minimum Value: 0 ppb on Dec 30 02:00	Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Missing Data:	36
Maximum Diurnal Average: 0.7 ppb at hour 6	Minimum Diurnal Average: 0.4 ppb at hour 22		Hours of Calibration:	36
Monthly Average: 0.6 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2		Percent Operational Time:	100.0

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

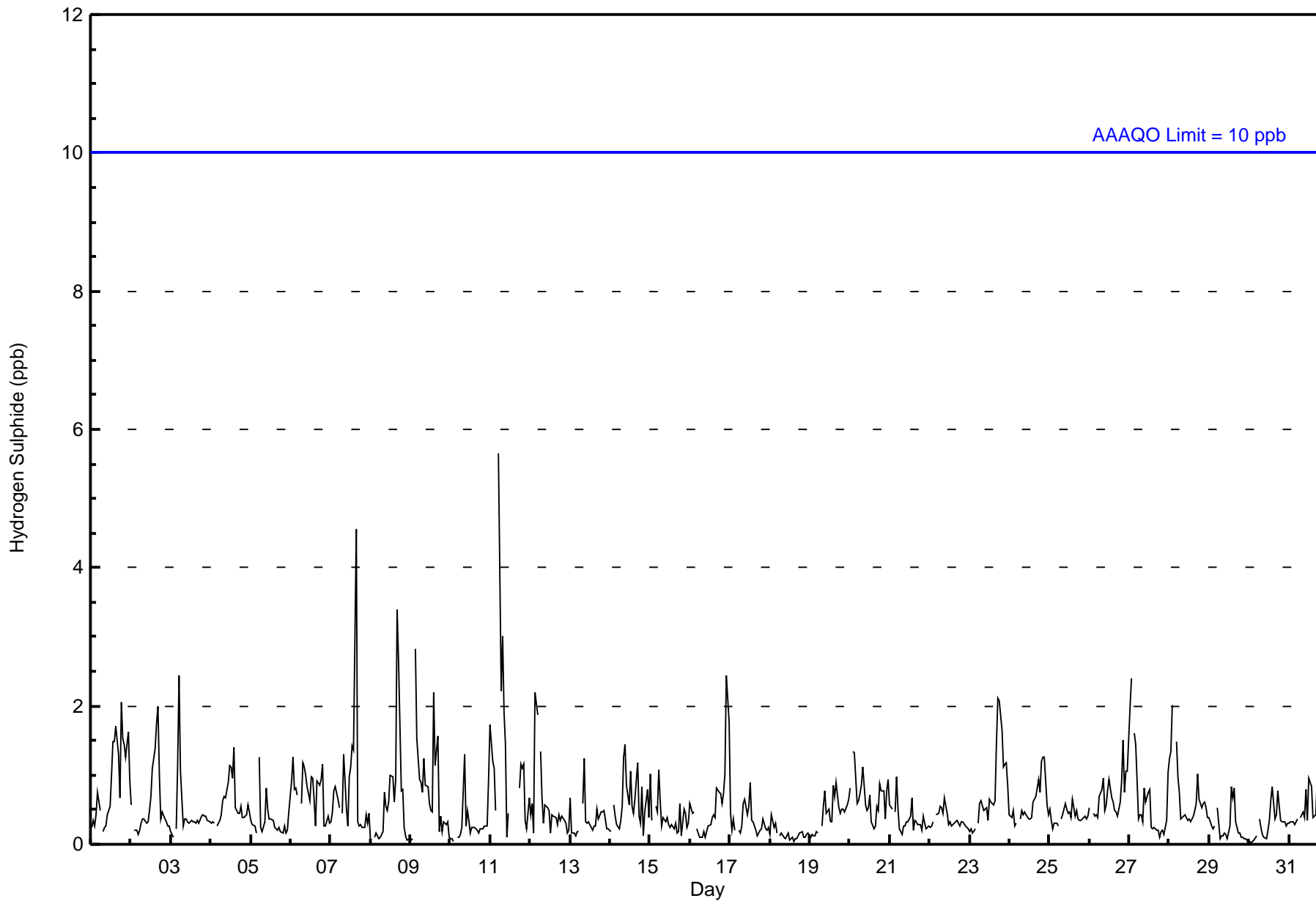
0.5	0.5	0.4	0.6	0.6	0.7	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.5	0.4	0.5	0.5	Diurnal Average	
2	2	2	3	2	6	2	3	2	1	1	1	1	1	1	2	5	3	3	2	2	2	2	1	2	2	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Mildred Lake - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Mildred Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	702	99.15	99.15
3 - 4	4	0.56	99.72
5 - 7	2	0.28	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mildred Lake - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	51	25	17	9	8	23	92	108	65	42	26	43	68	24	24	39	664
3 - 4	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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
<b>Totals</b>	51	25	17	9	8	23	94	108	65	42	26	44	68	24	24	40	668

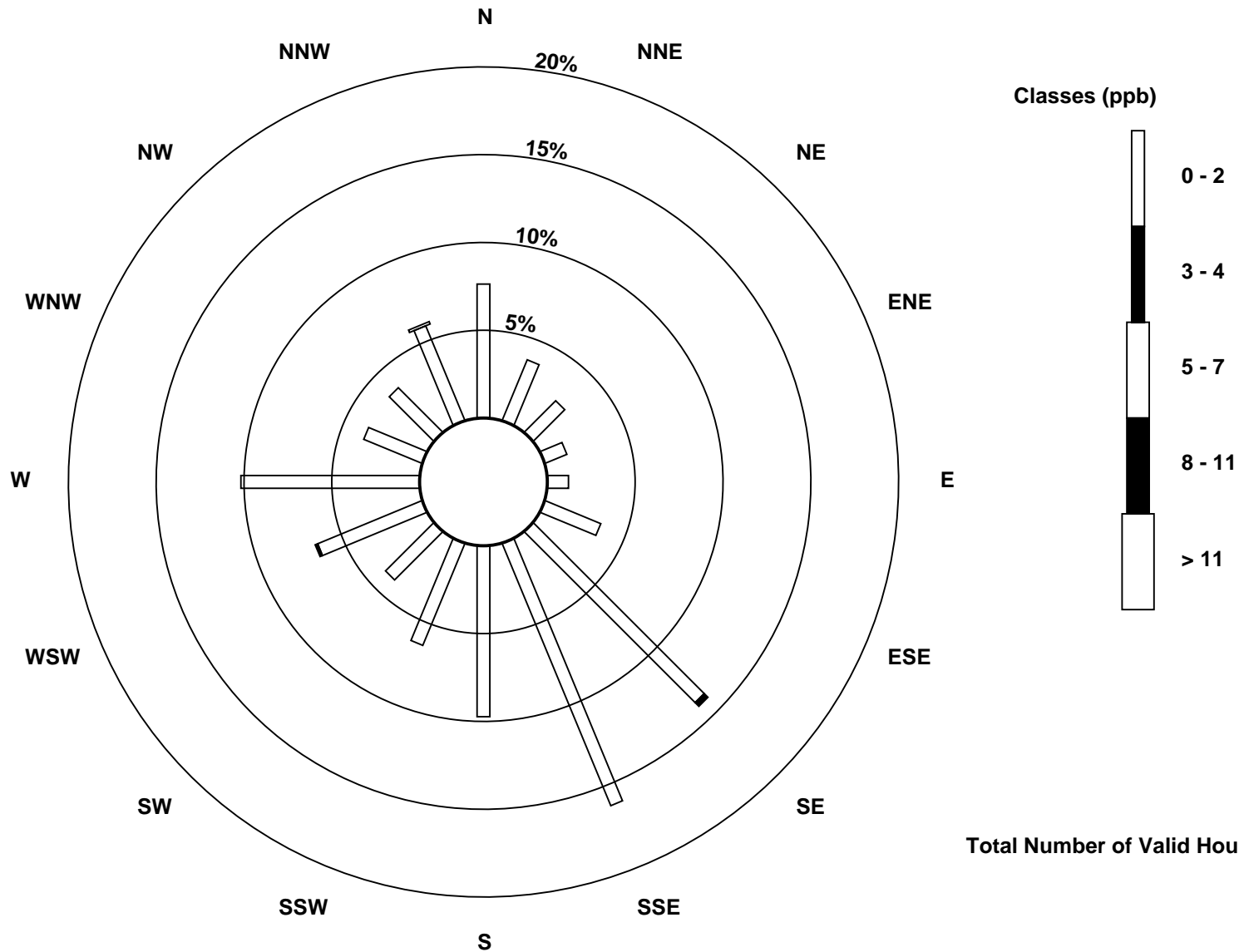
Total Number of Valid Hours: 668

Total Number of Hours: 744

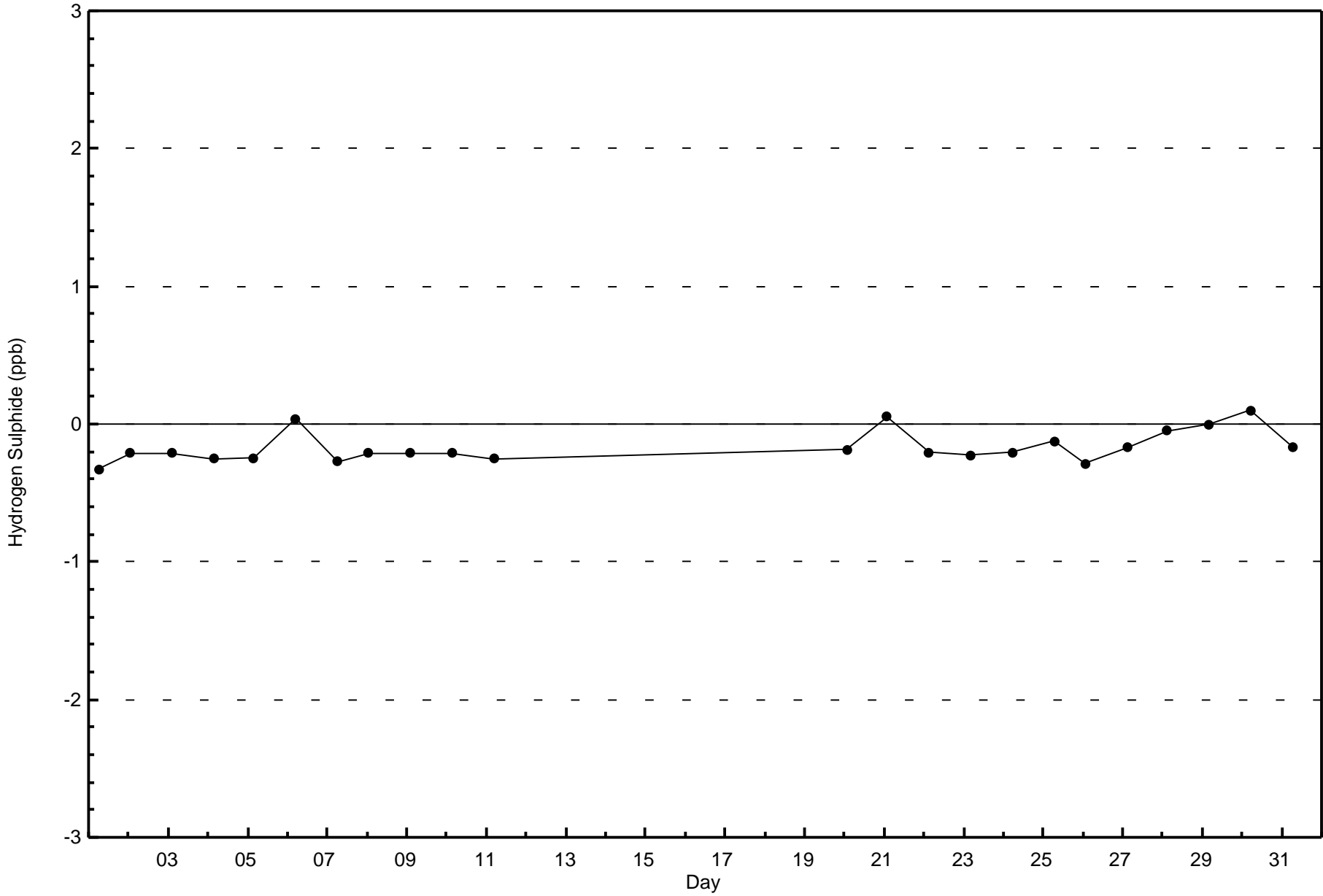


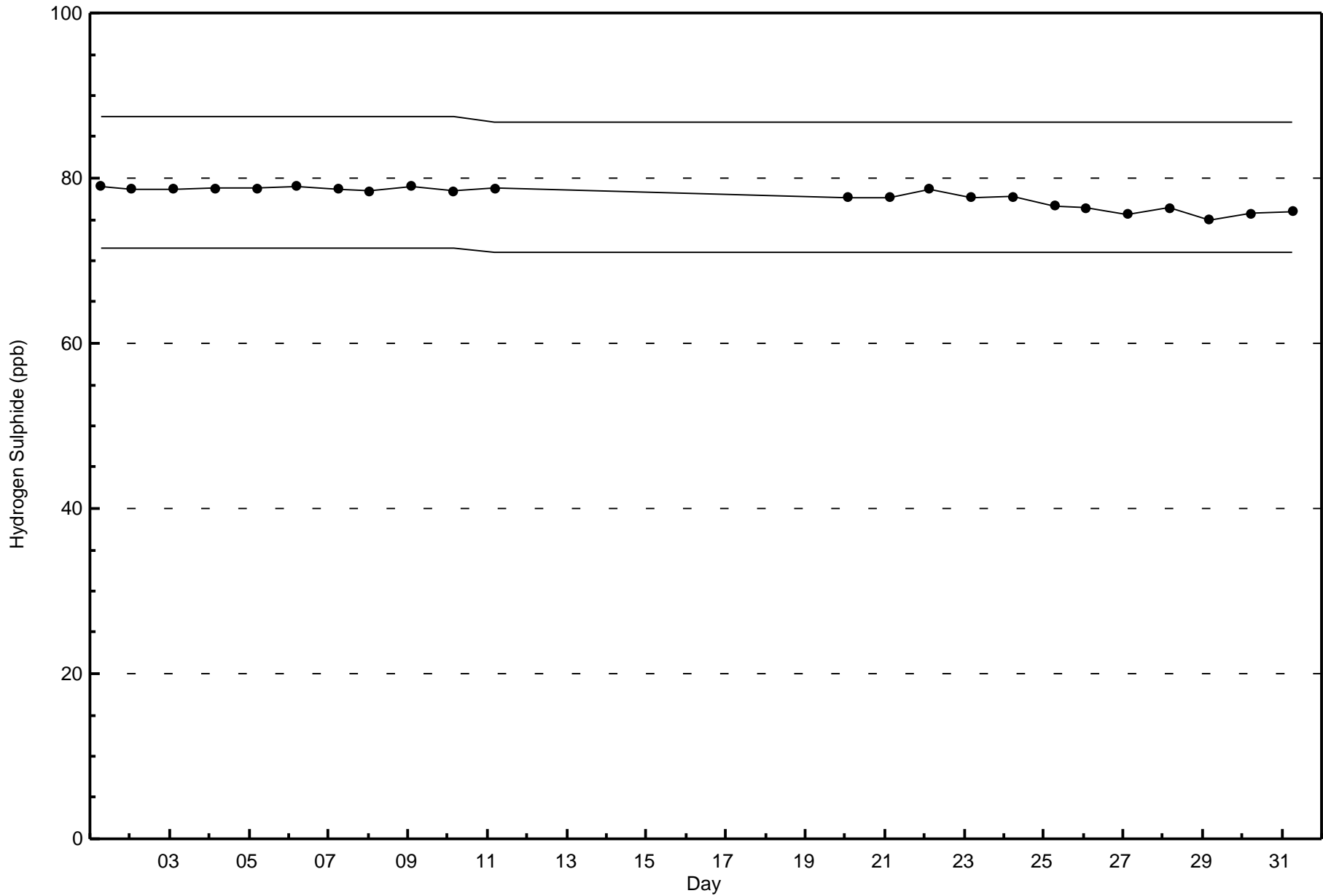
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mildred Lake (AMS 2)



Total Number of Valid Hours: 668









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

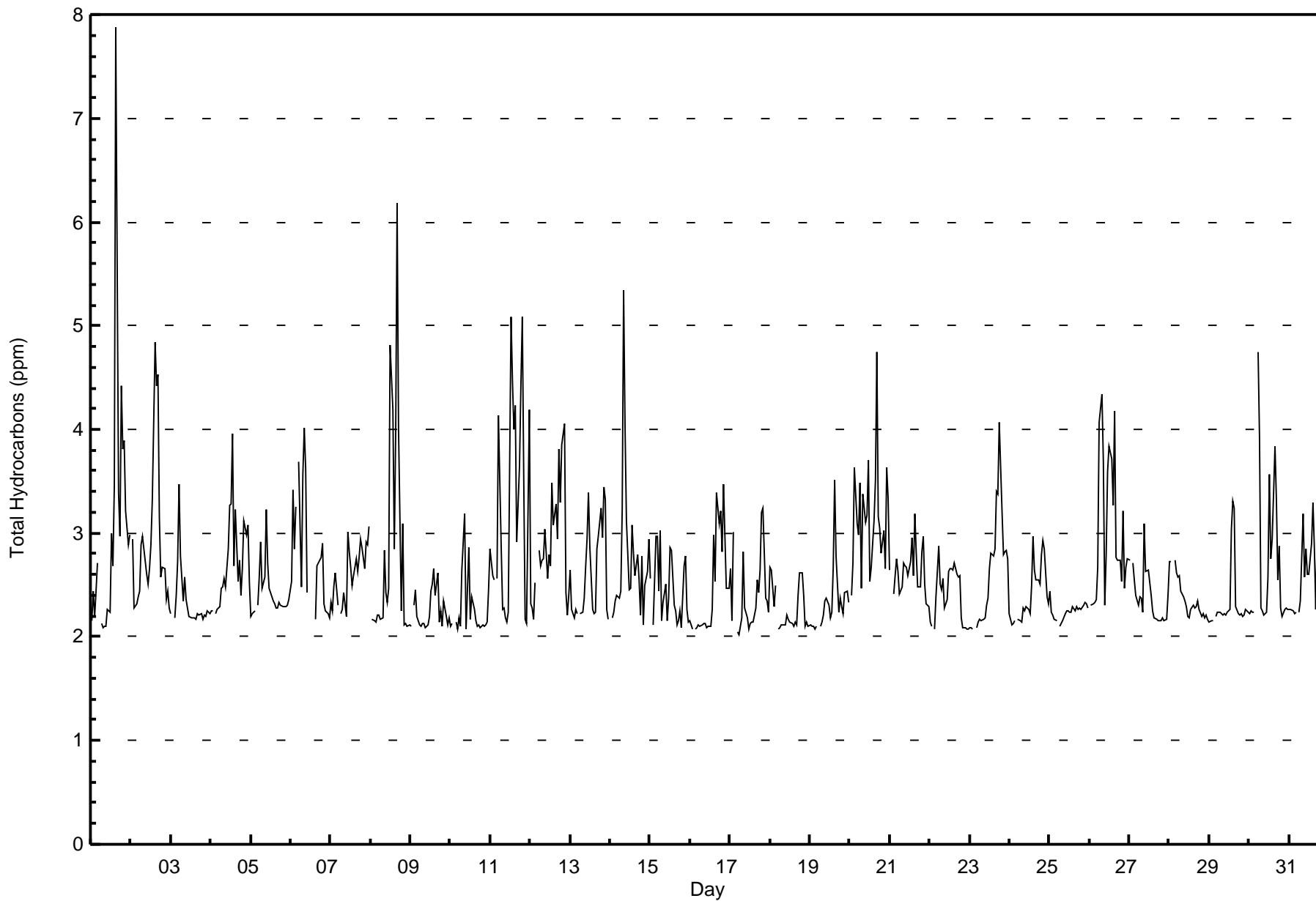
Mildred Lake - December 2017

Maximum Value: 7.9 ppm on Dec 1 16:00		Maximum Daily Average: 3.2 ppm on Dec 11		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Dec 17 06:00		Minimum Daily Average: 2.2 ppm on Dec 25		Hours of Data: 709																						
Maximum Diurnal Average: 3.0 ppm at hour 16		Minimum Diurnal Average: 2.3 ppm at hour 3		Hours of Missing Data: 35																						
Monthly Average: 2.60 ppm		Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.2 Median = 2.4 Q <sub>3</sub> = 2.8 P <sub>90</sub> = 3.3 P <sub>99</sub> = 4.8		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-Dec	2.1	2.4	2.2	2.4	2.7	Z	2.1	2.1	2.1	2.1	2.3	2.2	3.0	2.7	3.5	7.9	3.4	3.0	4.4	3.8	3.9	3.2	2.9	3.0	3.0	7.9
2-Dec	Z	2.9	2.3	2.3	2.4	2.4	2.9	3.0	2.8	2.6	2.5	2.7	2.9	3.3	4.8	4.4	4.5	3.2	2.6	2.7	2.7	2.4	2.4	2.3	2.9	4.8
3-Dec	2.2	Z	2.2	2.4	2.7	3.5	2.8	2.3	2.6	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	2.3	2.2	2.3	3.5
4-Dec	2.3	2.2	Z	2.2	2.3	2.3	2.5	2.5	2.6	2.5	2.8	3.3	3.3	4.0	2.7	3.2	2.5	2.7	2.4	2.7	3.1	3.0	3.1	2.5	2.7	4.0
5-Dec	2.2	2.2	2.3	Z	2.3	2.6	2.9	2.5	2.6	3.2	2.7	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	3.2
6-Dec	2.5	3.4	2.8	3.3	Z	3.7	2.5	3.6	4.0	3.6	2.4	C	C	C	C	2.2	2.7	2.7	2.8	2.9	2.3	2.3	2.2	2.2	2.8	4.0
7-Dec	2.3	2.2	2.5	2.6	2.3	Z	2.2	2.3	2.4	2.2	3.0	2.8	2.7	2.5	2.6	2.8	2.6	2.8	2.9	2.9	2.7	2.9	2.9	3.1	2.6	3.1
8-Dec	Z	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.8	2.4	2.3	2.5	4.8	4.2	2.8	4.0	6.2	4.0	2.3	3.1	2.1	2.1	2.1	2.1	2.8	6.2
9-Dec	2.1	Z	2.3	2.5	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4	2.5	2.7	2.4	2.6	2.1	2.2	2.1	2.3	2.2	2.1	2.2	2.3	2.7
10-Dec	2.1	2.1	Z	2.1	2.1	2.2	2.1	2.7	3.2	2.1	2.5	2.9	2.2	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.5	2.3	3.2
11-Dec	2.8	2.6	2.6	Z	2.6	4.1	2.9	2.3	2.3	2.2	2.1	2.2	5.1	4.5	4.0	4.2	2.9	3.6	4.4	5.1	3.5	2.2	2.1	4.2	3.2	5.1
12-Dec	2.3	2.3	2.2	2.5	Z	2.8	2.7	2.7	2.8	3.0	2.6	2.8	2.7	3.5	3.1	3.3	2.9	3.8	3.3	3.9	4.0	2.4	2.2	2.4	2.9	4.0
13-Dec	2.6	2.3	2.2	2.3	2.2	Z	2.2	2.2	2.4	2.7	2.9	3.4	2.9	2.3	2.2	2.2	2.9	3.0	3.2	3.0	3.4	3.3	2.3	2.2	2.6	3.4
14-Dec	Z	2.2	2.2	2.4	2.4	2.4	2.4	3.2	5.3	4.0	3.1	2.5	2.5	3.1	2.8	2.6	2.8	2.6	2.2	2.8	2.1	2.5	2.6	2.9	2.8	5.3
15-Dec	2.6	Z	2.1	3.0	3.0	2.4	3.0	2.2	2.3	2.5	2.2	2.4	2.9	2.8	2.3	2.3	2.1	2.2	2.3	2.1	2.7	2.8	2.3	2.1	2.4	3.0
16-Dec	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	3.0	2.5	3.4	3.1	3.2	2.8	3.5	3.0	2.5	2.5	2.5	3.5
17-Dec	2.7	2.1	3.0	Z	2.0	2.0	2.1	2.2	2.8	2.3	2.2	2.1	2.1	2.1	2.1	2.3	2.6	2.4	2.6	3.2	3.2	2.4	2.3	2.2	2.4	3.2
18-Dec	2.7	2.6	2.3	2.5	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.4	2.6	2.6	2.4	2.1	2.1	2.1	2.3	2.7
19-Dec	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.2	2.3	2.4	2.3	2.2	2.2	2.7	3.5	2.8	2.2	2.4	2.3	2.2	2.4	2.4	2.3	2.3	3.5
20-Dec	Z	2.4	2.7	3.6	3.1	3.0	3.5	2.5	3.4	3.1	3.2	3.7	2.5	2.7	3.1	3.5	4.7	3.2	3.0	2.8	3.0	2.7	3.6	3.3	3.1	4.7
21-Dec	2.6	Z	2.4	2.6	2.8	2.6	2.4	2.5	2.7	2.7	2.7	2.6	2.7	3.0	2.6	3.2	2.8	2.5	2.5	2.8	3.0	2.5	2.3	2.3	2.6	3.2
22-Dec	2.1	2.1	Z	2.1	2.4	2.9	2.5	2.5	2.6	2.3	2.4	2.6	2.7	2.7	2.6	2.7	2.6	2.6	2.6	2.2	2.1	2.1	2.1	2.1	2.4	2.9
23-Dec	2.1	2.1	2.1	Z	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.4	2.7	2.8	2.8	2.8	3.4	3.4	4.1	3.2	2.8	2.8	2.8	2.8	2.6	4.1
24-Dec	2.2	2.1	2.1	2.2	Z	2.2	2.2	2.1	2.3	2.2	2.3	2.3	2.2	2.5	3.0	2.6	2.6	2.5	2.5	2.8	2.9	2.8	2.4	2.3	2.4	3.0
25-Dec	2.4	2.2	2.2	2.2	2.2	Z	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.4
26-Dec	Z	2.3	2.3	2.3	2.4	2.7	4.1	4.3	3.7	2.3	2.8	3.6	3.8	3.7	3.3	4.2	2.8	2.7	2.7	2.5	3.2	2.5	2.7	2.8	3.0	4.3
27-Dec	2.7	Z	2.7	2.5	2.4	2.3	2.4	2.4	2.2	3.1	2.6	2.6	2.5	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.4	2.4	3.1
28-Dec	2.7	2.7	Z	2.7	2.6	2.6	2.6	2.4	2.4	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.4	2.7
29-Dec	2.1	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	3.0	3.3	3.2	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.3	3.3
30-Dec	2.2	2.2	2.2	2.2	Z	4.7	3.9	2.3	2.2	2.2	2.2	2.6	3.6	2.7	2.9	3.8	3.3	2.6	2.9	2.3	2.2	2.3	2.3	2.3	2.7	4.7
31-Dec	2.3	2.3	2.2	2.2	2.2	Z	2.2	2.3	3.2	2.6	2.8	2.6	2.6	2.9	3.3	2.8	2.3	3.0	2.6	3.3	2.7	2.2	2.2	2.2	2.6	3.3
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Mildred Lake - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mildred Lake - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	2	0.28	0.28
2.1 - 3.0	602	84.91	85.19
3.1 - 10.0	105	14.81	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Mildred Lake - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	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	1	1	0	0	0	0	0	0	0	2
2.1 - 3.0	52	25	15	9	6	19	56	93	47	40	25	41	55	23	23	41	570
3.1 - 10.0	0	2	0	0	2	6	41	14	12	3	2	2	12	1	0	0	97
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	52	27	15	9	8	25	97	108	60	43	27	43	67	24	23	41	669

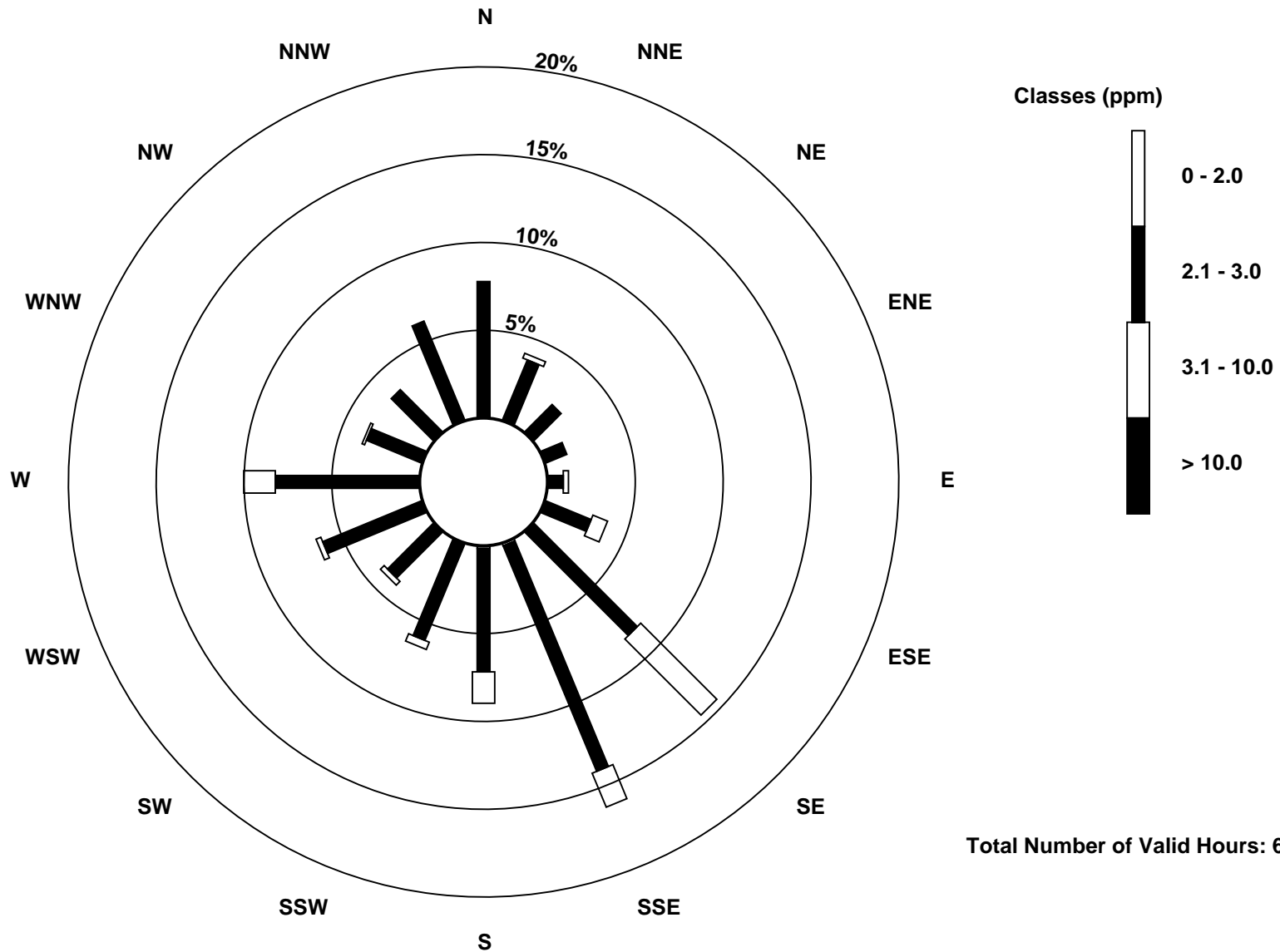
Total Number of Valid Hours: 669

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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

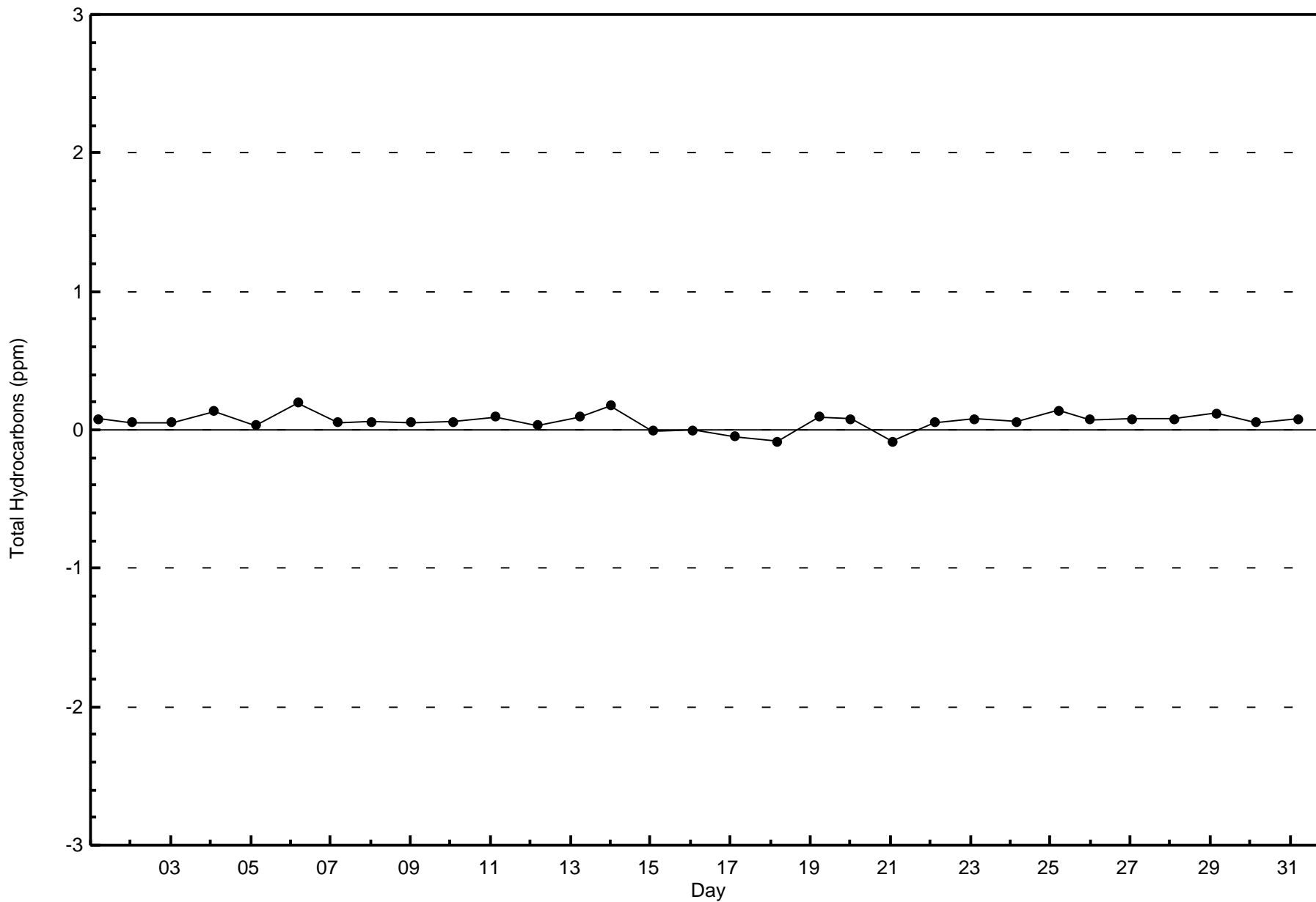


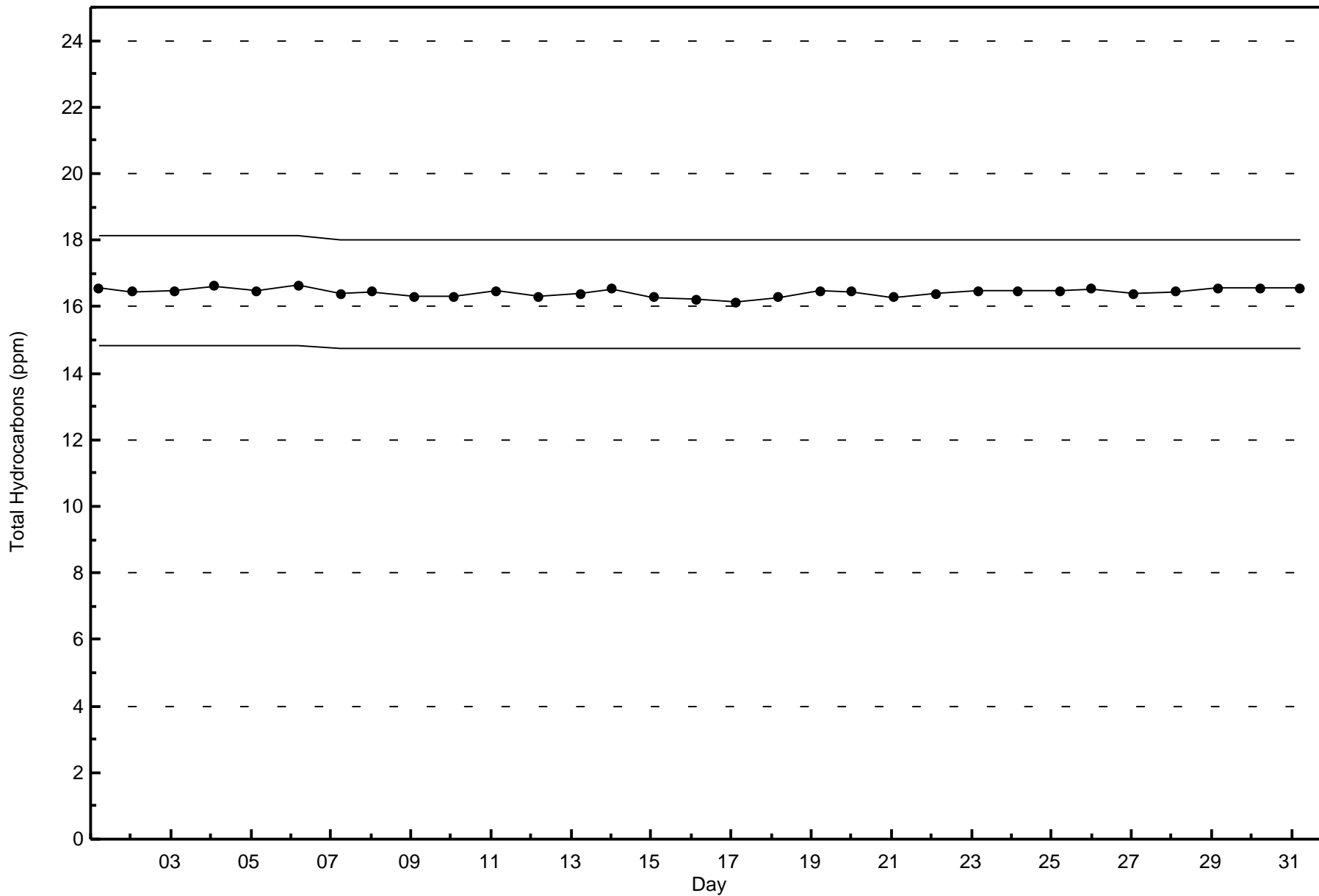
Total Number of Valid Hours: 669



Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Mildred Lake - December 2017





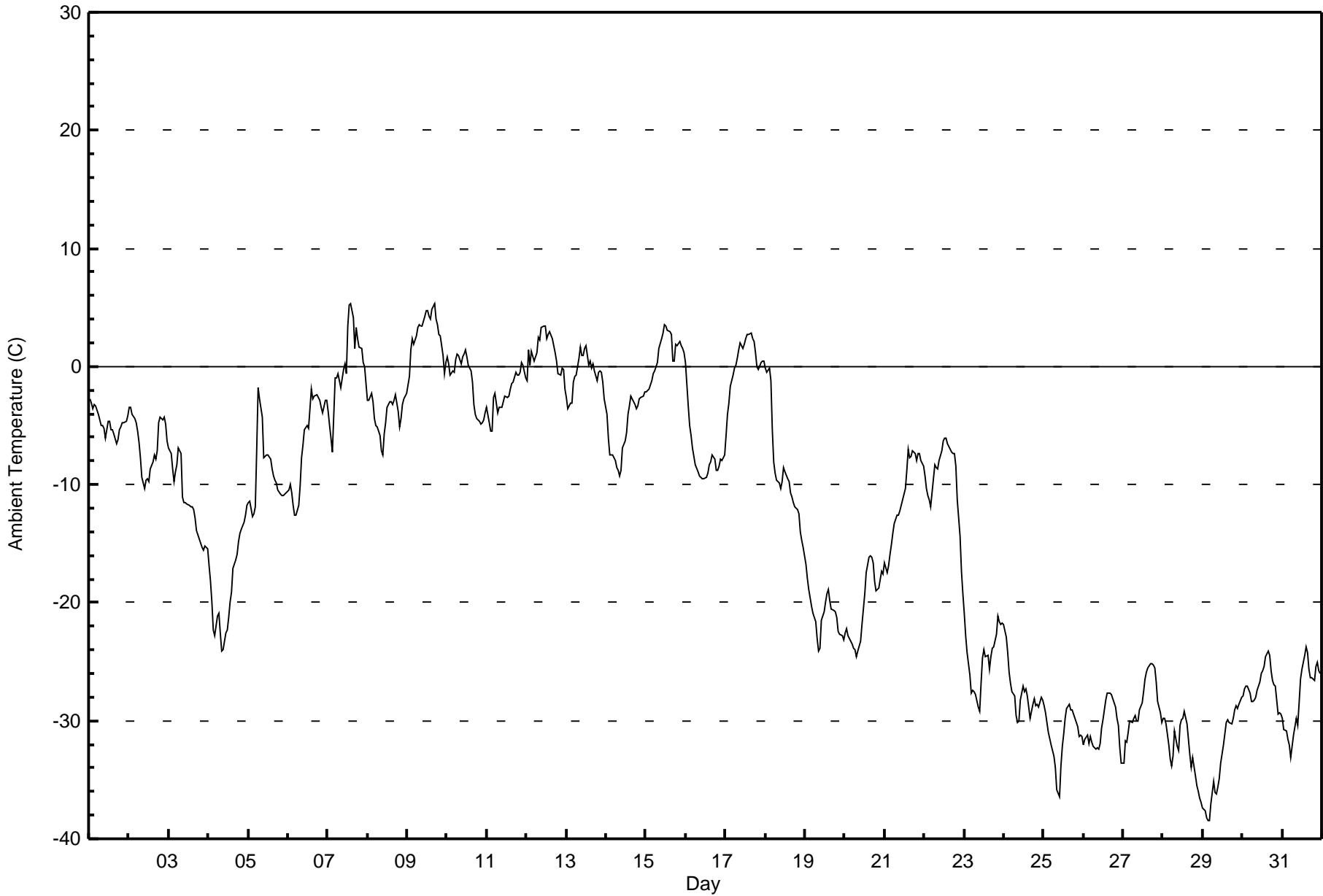


**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Ambient Temperature (AT) - C**  
**Mildred Lake - December 2017**

Maximum Value: 5.3 C on Dec 7 15:00      Maximum Daily Average: 2.7 C on Dec 9		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -38.5 C on Dec 29 04:00      Minimum Daily Average: -33.2 C on Dec 29 Maximum Diurnal Average: -11.5 C at hour 15      Minimum Diurnal Average: -14.3 C at hour 9 Monthly Average: -13.11 C      Percentiles: P <sub>1</sub> = -36.5 P <sub>10</sub> = -30.2 Q <sub>1</sub> = -25.5 Median = -9.3 Q <sub>3</sub> = -2.8 P <sub>90</sub> = 0.9 P <sub>99</sub> = 3.8																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-2.7	-3.1	-3.6	-3.3	-3.3	-4.0	-4.6	-5.0	-4.9	-5.3	-6.0	-4.6	-4.6	-5.3	-5.3	-5.8	-6.5	-6.1	-5.3	-5.1	-4.7	-4.8	-4.7	-4.2	-4.7	-2.7
2-Dec	-3.5	-3.5	-4.0	-4.4	-4.8	-5.5	-6.4	-7.7	-9.4	-10.3	-9.6	-9.5	-9.8	-8.6	-8.1	-7.5	-7.9	-7.1	-4.7	-4.3	-4.5	-4.2	-4.9	-6.3	-6.5	-3.5
3-Dec	-6.9	-7.4	-8.7	-9.7	-8.9	-8.3	-6.9	-7.3	-11.1	-11.5	-11.5	-11.7	-11.8	-11.9	-11.9	-12.2	-12.8	-13.9	-14.6	-14.9	-15.3	-15.5	-15.3	-15.5	-11.5	-6.9
4-Dec	-16.8	-18.2	-20.0	-22.4	-22.8	-21.1	-20.9	-22.6	-24.1	-24.0	-22.5	-22.4	-21.3	-20.0	-19.1	-17.1	-16.4	-16.0	-14.8	-14.2	-13.8	-13.1	-12.6	-11.8	-18.7	-11.8
5-Dec	-11.5	-11.4	-12.7	-12.5	-11.8	-7.1	-1.8	-2.8	-4.3	-7.8	-7.7	-7.5	-7.5	-7.8	-8.7	-9.3	-9.6	-9.9	-10.5	-10.8	-10.9	-10.9	-10.8	-10.7	-9.0	-1.8
6-Dec	-10.5	-10.0	-10.7	-11.7	-12.6	-12.6	-11.8	-10.1	-7.7	-6.7	-5.4	-5.1	-5.2	-3.6	-1.9	-2.7	-2.5	-2.4	-2.7	-2.9	-3.5	-3.9	-2.8	-2.8	-6.3	-1.9
7-Dec	-3.9	-5.0	-6.0	-7.2	-1.0	-0.9	-0.6	-1.2	-1.8	-0.2	0.2	-0.6	3.5	5.2	5.3	4.1	1.5	3.3	2.4	1.7	1.5	0.3	0.0	-1.4	0.0	5.3
8-Dec	-2.9	-2.8	-2.3	-3.0	-4.4	-5.0	-5.1	-5.8	-7.1	-7.5	-5.7	-4.7	-3.5	-3.0	-3.0	-3.2	-2.9	-2.4	-3.8	-5.1	-4.4	-3.2	-2.8	-2.2	-4.0	-2.2
9-Dec	-1.5	-0.8	1.4	2.4	1.9	2.6	3.4	3.6	3.4	3.4	4.2	4.8	4.7	4.3	4.0	4.9	5.3	4.0	3.6	2.7	2.6	0.9	-0.7	0.4	2.7	5.3
10-Dec	0.9	0.2	-0.7	-0.4	-0.4	0.6	1.1	1.0	0.3	0.8	1.1	1.4	0.8	0.1	-0.4	-1.4	-3.3	-4.1	-4.4	-4.7	-4.9	-4.7	-4.6	-3.9	-1.2	1.4
11-Dec	-3.5	-4.8	-5.5	-5.5	-2.6	-2.3	-4.0	-3.5	-3.4	-3.5	-3.0	-2.5	-2.6	-2.5	-1.9	-1.5	-1.3	-0.5	-0.7	-0.8	-0.5	0.4	0.1	-1.0	-2.4	0.4
12-Dec	-1.2	1.4	0.2	1.3	0.4	0.8	1.2	2.5	2.2	3.3	3.4	3.4	2.3	2.7	3.0	2.4	1.8	1.2	0.5	-0.6	-0.7	-0.1	-0.3	-1.9	1.2	3.4
13-Dec	-2.7	-3.6	-3.1	-3.0	-1.3	-0.9	-0.7	0.6	1.7	1.0	0.9	1.5	1.8	0.0	0.4	-0.1	0.2	-0.4	-1.2	-0.5	-0.3	-0.5	-1.3	-2.8	-0.6	1.8
14-Dec	-4.1	-6.0	-7.5	-7.5	-7.5	-7.9	-8.6	-8.7	-9.3	-8.8	-6.9	-6.3	-5.6	-4.0	-3.4	-2.5	-3.0	-3.2	-3.5	-3.3	-3.2	-2.7	-2.5	-2.1	-5.3	-2.1
15-Dec	-2.2	-2.0	-1.9	-1.2	-0.6	-0.4	0.0	0.4	1.5	2.3	2.8	3.5	3.4	3.1	2.9	2.7	0.4	0.5	1.9	1.8	2.1	1.8	1.5	1.2	1.1	3.5
16-Dec	0.3	-3.3	-4.9	-5.9	-7.0	-7.6	-8.3	-8.9	-9.2	-9.4	-9.6	-9.5	-9.4	-9.0	-8.4	-8.0	-7.5	-7.8	-8.8	-8.8	-8.5	-7.8	-7.9	-7.5	-7.6	0.3
17-Dec	-5.8	-4.1	-3.1	-1.7	-0.7	-0.1	0.2	0.7	1.4	2.0	1.6	1.9	2.4	2.7	2.8	2.8	2.3	2.1	1.1	0.0	-0.2	0.3	0.5	0.5	0.4	2.8
18-Dec	-0.2	-0.5	-0.1	-1.1	-5.3	-8.0	-9.0	-9.6	-9.9	-10.3	-9.7	-8.6	-8.9	-9.5	-9.8	-10.7	-11.0	-11.5	-11.9	-12.1	-12.5	-14.0	-14.8	-15.4	-8.9	-0.1
19-Dec	-16.7	-18.0	-18.9	-19.6	-20.3	-20.9	-21.6	-23.0	-24.0	-23.9	-21.5	-20.8	-19.9	-19.3	-18.9	-19.9	-20.5	-20.6	-20.8	-21.3	-22.4	-22.7	-22.7	-23.1	-20.9	-16.7
20-Dec	-22.6	-22.2	-22.8	-23.1	-23.5	-23.8	-24.0	-24.6	-24.1	-23.2	-21.9	-20.5	-19.2	-17.4	-16.1	-16.0	-16.1	-16.6	-18.2	-19.0	-18.8	-18.1	-17.4	-17.5	-20.3	-16.0
21-Dec	-16.6	-17.5	-16.8	-16.0	-15.1	-14.2	-13.3	-12.6	-12.6	-12.2	-11.7	-11.2	-10.4	-8.8	-7.1	-7.7	-7.6	-7.2	-7.3	-7.9	-7.4	-7.3	-8.0	-8.4	-11.0	-7.1
22-Dec	-9.3	-10.3	-10.9	-11.3	-11.8	-9.5	-8.3	-8.5	-8.6	-7.9	-7.1	-6.4	-6.1	-6.1	-6.5	-6.8	-7.2	-7.3	-7.3	-8.4	-11.3	-14.4	-17.4	-19.2	-9.5	-6.1
23-Dec	-20.8	-22.8	-24.2	-26.1	-27.7	-27.5	-27.6	-27.8	-28.8	-29.2	-26.8	-24.7	-24.0	-24.5	-24.5	-25.7	-24.6	-23.9	-23.7	-22.7	-21.1	-21.6	-21.9	-21.7	-24.7	-20.8
24-Dec	-21.8	-22.9	-24.3	-25.9	-26.9	-27.5	-27.9	-29.6	-30.1	-30.0	-28.3	-27.1	-27.6	-27.3	-27.9	-28.9	-29.8	-28.6	-28.2	-28.7	-28.6	-28.9	-28.1	-28.3	-27.6	-21.8
25-Dec	-28.8	-29.4	-30.2	-31.0	-32.1	-32.5	-33.0	-34.0	-35.9	-36.4	-33.8	-32.1	-31.1	-29.8	-29.0	-28.6	-29.1	-29.1	-29.5	-29.7	-30.5	-31.4	-31.2	-31.4	-31.2	-28.6
26-Dec	-32.1	-31.6	-31.2	-31.9	-31.3	-31.8	-32.2	-32.4	-32.2	-32.4	-32.0	-30.6	-29.9	-28.3	-27.6	-27.6	-27.6	-27.8	-28.5	-28.8	-29.8	-30.4	-32.3	-33.6	-30.6	-27.6
27-Dec	-33.5	-31.7	-31.8	-31.0	-30.1	-30.2	-29.8	-29.6	-30.1	-30.0	-29.0	-28.5	-27.5	-26.5	-25.9	-25.5	-25.1	-25.2	-25.3	-25.5	-26.7	-28.4	-29.3	-30.1	-28.6	-25.1
28-Dec	-29.9	-29.8	-30.2	-32.0	-33.2	-33.8	-33.0	-30.9	-32.1	-32.6	-30.4	-29.9	-29.8	-29.2	-30.2	-31.5	-32.9	-33.9	-33.1	-34.7	-35.5	-35.9	-36.5	-36.9	-32.4	-29.2
29-Dec	-37.4	-37.7	-38.3	-38.5	-38.4	-37.0	-35.2	-36.1	-36.2	-35.6	-34.9	-33.6	-32.1	-31.1	-30.2	-29.9	-30.2	-30.2	-29.7	-29.1	-28.7	-29.0	-28.6	-28.1	-33.2	-28.1
30-Dec	-28.0	-27.3	-27.0	-27.1	-27.7	-28.4	-28.3	-28.2	-28.0	-27.5	-26.7	-26.0	-25.8	-25.5	-24.5	-24.1	-24.5	-25.7	-26.5	-26.9	-27.0	-29.5	-29.3	-29.4	-27.0	-24.1
31-Dec	-29.8	-30.7	-30.8	-31.6	-32.1	-33.1	-32.1	-31.3	-29.8	-30.4	-28.5	-26.5	-25.6	-24.5	-23.8	-24.3	-25.7	-26.3	-26.4	-26.6	-25.5	-25.0	-25.8	-25.9	-28.0	-23.8
	-13.1	-13.4	-13.9	-14.3	-14.3	-14.1	-13.8	-14.0	-14.3	-14.3	-13.4	-12.7	-12.3	-11.8	-11.5	-11.7	-12.1	-12.2	-12.3	-12.6	-12.7	-13.0	-13.3	-13.6	Diurnal Average	
	0.9	1.4	1.4	2.4	1.9	2.6	3.4	3.6	3.4	3.4	4.2	4.8	4.7	5.2	5.3	4.9	5.3	4.0	3.6	2.7	2.6	1.8	1.5	1.2	Diurnal Maximum	







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Mildred Lake - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	254	34.14	34.14
-20 - 0	383	51.48	85.62
0 - 10	107	14.38	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

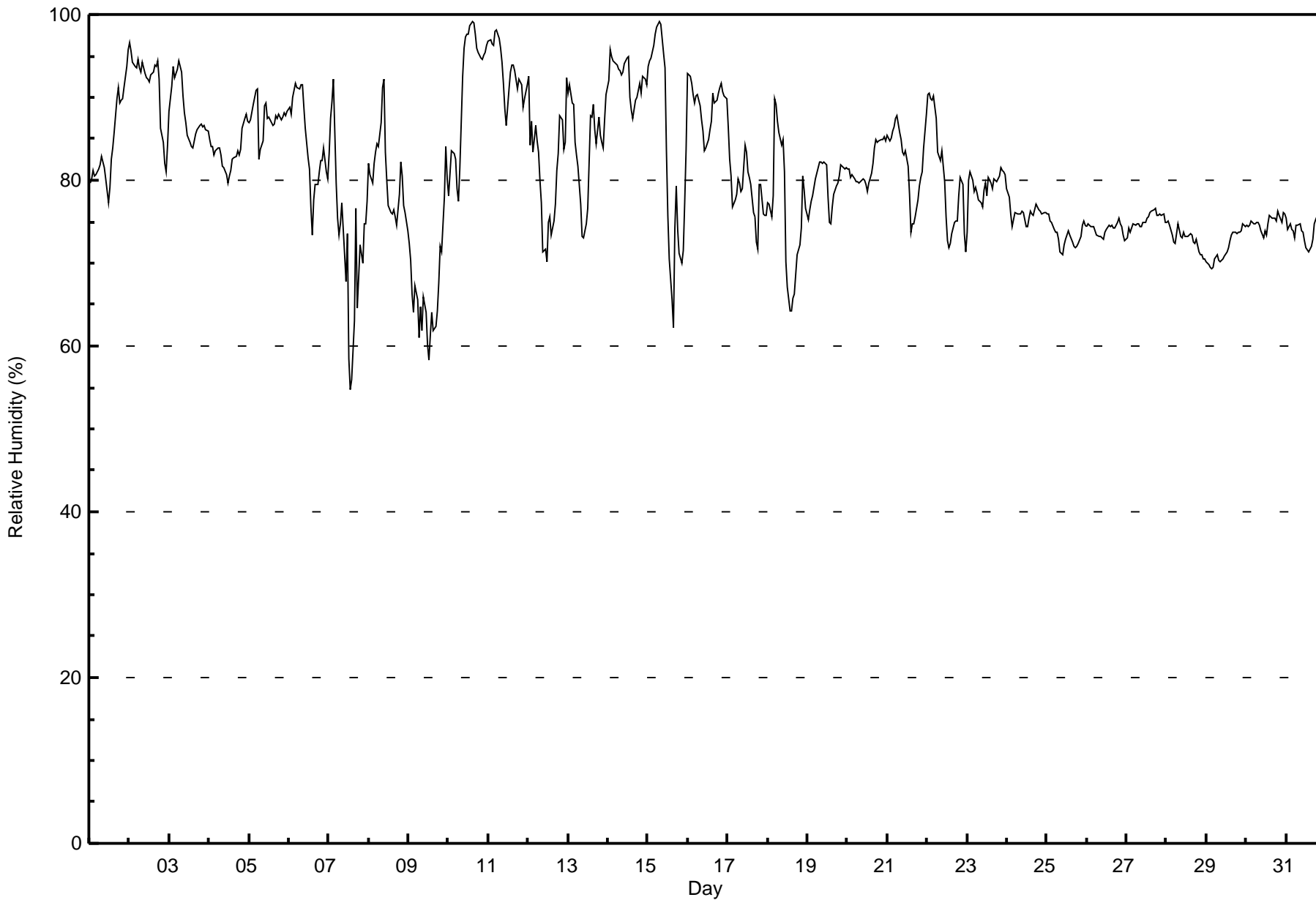
**Relative Humidity (RH) - %  
Mildred Lake - December 2017**

Maximum Value: 99 % on Dec 15 08:00																			Maximum Daily Average: 93.3 % on Dec 11						Hours in Service: 744																			
Minimum Value: 55 % on Dec 7 14:00																			Minimum Daily Average: 67.1 % on Dec 9						Hours of Data: 744																			
Maximum Diurnal Average: 82.9 % at hour 2																			Minimum Diurnal Average: 77.9 % at hour 15						Hours of Missing Data: 0																			
Monthly Average: 80.9 %																			Percentiles: P <sub>1</sub> = 62 P <sub>10</sub> = 72 Q <sub>1</sub> = 75 Median = 80 O <sub>3</sub> = 87 P <sub>90</sub> = 93 P <sub>99</sub> = 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-Dec	80	80	81	81	81	81	82	83	82	81	80	77	79	83	84	86	90	91	89	90	90	91	94	96	84.6	96																		
2-Dec	97	96	94	94	94	95	94	93	94	93	92	92	92	93	93	94	94	94	92	86	85	82	81	84	91.5	97																		
3-Dec	88	91	94	92	93	93	94	93	90	88	87	85	85	84	84	85	86	86	87	87	86	87	86	86	88.2	94																		
4-Dec	85	84	84	83	84	84	84	83	82	82	81	80	80	81	83	83	83	83	83	84	86	87	88	87	83.5	88																		
5-Dec	87	87	89	90	91	91	83	84	85	89	89	88	88	87	87	87	88	87	88	87	88	88	88	88	87.6	91																		
6-Dec	89	88	90	91	92	91	91	92	91	89	86	83	81	77	73	78	80	80	81	82	82	84	81	80	84.7	92																		
7-Dec	83	88	89	92	80	75	73	75	77	71	68	74	58	55	56	63	77	65	68	72	70	75	75	77	73.2	92																		
8-Dec	82	81	80	82	83	84	84	87	91	92	83	80	77	76	76	76	76	75	78	82	80	77	76	74	80.6	92																		
9-Dec	72	70	66	64	67	66	61	65	62	66	64	60	58	61	64	62	62	64	68	72	71	78	84	80	67.1	84																		
10-Dec	78	81	84	83	83	79	77	81	92	96	97	98	98	99	99	99	98	96	95	95	95	95	96	96	91.2	99																		
11-Dec	97	97	96	96	98	98	97	96	94	92	89	87	91	93	94	94	93	91	92	92	91	89	90	92	93.3	98																		
12-Dec	93	84	87	83	87	85	83	80	77	71	72	70	75	76	73	75	77	81	83	88	87	84	85	92	81.2	93																		
13-Dec	91	91	89	89	85	83	82	77	73	73	74	75	77	88	88	89	86	84	88	85	85	84	87	90	83.9	91																		
14-Dec	92	96	95	94	94	94	93	93	93	93	94	95	90	88	87	90	90	91	92	91	92	92	92	92	92.3	96																		
15-Dec	94	94	95	96	98	98	99	99	99	95	94	84	76	71	66	62	74	79	74	71	70	72	77	84	84.2	99																		
16-Dec	93	93	92	90	89	90	90	89	87	86	84	84	85	86	87	90	89	90	90	91	92	91	90	90	89.1	93																		
17-Dec	86	83	80	77	78	78	80	80	79	79	84	83	81	80	80	76	76	72	72	80	80	76	76	76	78.8	86																		
18-Dec	77	77	76	78	90	89	87	86	84	85	81	70	67	64	64	66	66	69	71	72	74	80	79	77	76.2	90																		
19-Dec	75	76	78	78	79	80	81	82	82	82	82	82	78	75	75	77	78	79	80	81	82	82	81	82	79.5	82																		
20-Dec	81	81	80	81	80	80	80	80	80	80	80	79	79	80	81	82	84	85	85	85	85	85	85	85	81.8	85																		
21-Dec	85	85	85	86	86	87	88	86	85	83	83	84	82	78	74	75	75	76	78	79	80	81	84	88	82.2	88																		
22-Dec	90	91	90	90	90	88	83	83	82	84	80	76	73	72	72	74	75	75	75	78	80	80	74	71	80.2	91																		
23-Dec	74	80	81	80	79	79	79	78	77	77	79	80	78	80	80	79	80	80	80	81	82	81	81	81	79.3	82																		
24-Dec	79	78	76	74	75	76	76	76	76	76	74	74	75	76	76	76	77	77	76	76	76	76	76	76	76.1	79																		
25-Dec	76	76	75	75	74	74	74	73	71	71	72	73	73	74	73	73	72	72	72	72	73	75	75	75	73.4	76																		
26-Dec	74	75	74	74	74	74	73	73	73	73	73	74	74	74	74	75	74	74	75	75	75	74	73	73	74.1	75																		
27-Dec	73	74	74	74	75	75	75	75	74	74	74	75	75	75	76	76	76	76	77	76	76	76	76	75	75.1	77																		
28-Dec	75	75	75	73	73	72	74	75	73	73	74	73	73	73	74	73	73	72	73	71	71	71	71	71	72.9	75																		
29-Dec	70	70	70	69	69	71	71	70	70	70	70	71	71	72	73	73	74	74	74	74	74	74	75	74	71.8	75																		
30-Dec	75	74	75	75	75	75	75	75	75	74	73	74	73	75	76	75	75	75	75	76	76	75	76	76	74.9	76																		
31-Dec	76	74	75	74	74	73	75	74	75	74	74	73	72	71	72	72	73	75	75	76	77	76	76	76	74.2	77																		
																			82.8	82.9	82.8	82.6	82.8	82.6	81.9	81.8	81.6	81.1	80.3	79.0	78.0	78.0	77.9	78.4	79.6	79.7	80.1	80.9	81.0	81.2	81.5	82.0	Diurnal Average	
																			97	97	96	96	98	98	99	99	99	96	97	98	98	99	99	99	98	96	95	95	95	95	96	96	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Mildred Lake - December 2017**





Maximum Speed: 25 km/h on Dec 9 09:00	Maximum Daily Speed Average: 13.1 km/h on Dec 17	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 28 23:00	Minimum Daily Speed Average: 0.3 km/h on Dec 25	Hours of Data: 701
Maximum Diurnal Speed Average: 3.0 km/h at hour 11	Minimum Diurnal Speed Average: 1.1 km/h at hour 23	Hours of Missing Data: 43
Monthly Average Velocity: 2.0 km/h 230.1 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 4 Median = 7 Q <sub>3</sub> = 9 P <sub>90</sub> = 13 P <sub>99</sub> = 20	Percent Operational Time: 94.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	WSW14	WSW13	WSW12	WSW13	WSW9	WSW10	SW9	SSW8	SW10	SW8	SW9	SSW7	S6	SSE4	SSE6	S5	SSW3	SSE6	SSE3	SW1	NNE5	E2	SSE2	SW3	SW5.3	WSW14
2-Dec	W3	NNW9	N7	NNE5	NNE2	N1	N6	N8	N6	NNE4	ENE1	SSW2	SSW1	S2	S3	SE4	SSW2	SW4	W7	W7	WSW5	W6	WSW5	SW4	WNW1.9	NNW9
3-Dec	SSW4	SW4	S6	SSW3	SE5	SSE3	WSW6	NW8	N15	N11	NNE8	NE7	NE8	NNE7	NNE7	NNE7	NE6	NE6	NE4	NE4	NE4	N3	N4	NNE5	NNE3.5	N15
4-Dec	NE6	NE7	ENE4	N1	SW0	AF	SSW4	SSW5	SSW5	SSW5	S5	S6	S4	SSE5	SSE6	S9	SSW9	S7	SSE12	SSE12	S9	S10	S13	S12	S5.3	S13
5-Dec	SSW12	SSW9	S8	S8	S5	NW7	NW14	NNW12	N12	NNE11	NNE8	N7	N8	NE9	NNE10	NNE9	NE7	NE8	NE8	NNE8	N5	NNW3	NNW1	SSE4	N3.5	NW14
6-Dec	SSE7	S8	S8	S9	S8	SSW7	SSW9	SSE8	S8	S10	S8	S8	S9	S9	SW8	SW8	WSW7	WSW10	WSW10	W10	W11	W8	WSW8	SSW8	SSW6.8	W11
7-Dec	SW7	S4	SSE6	SSW2	WNN9	NW12	NW14	NNW10	W6	NW12	NNW7	NE4	NW13	WNN16	WNN12	NNW9	N6	NNW10	NNW8	NNW5	NNW10	NW10	NW8	WSW4	NW6.8	WNN16
8-Dec	SSW6	SW7	SW7	SSW7	SSW7	SSW7	SSW7	S4	SSW6	S5	SSW7	C	C	C	SE7	SE8	SE10	SE11	SSE7	SSE9	SSW10	S10	S9	S9	S6.5	SE11
9-Dec	S11	S10	SW12	WSW13	WSW13	WSW19	WSW24	WSW17	WSW25	WSW19	WSW17	W9	W7	W6	S2	WSW13	WSW11	SSW9	SSW6	S6	NNW1	ENE5	SSE4	SSW7	SW9.5	WSW25
10-Dec	SSW9	SSW7	S6	SSW8	SW9	SW9	SSW8	SSE7	SSE7	SSW7	WSW9	W13	WNN18	NW14	NNW11	N10	N11	N9	N5	NNW5	NE3	ENE2	ENE5	ESE4	W2.5	WNN18
11-Dec	SSE4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SE6	ESE7	SE8	ESE9	SE9	SE8	SE9	SSE7	SSE10	SSE9	SE8	----	SSE10
12-Dec	S7	SSW9	S8	SSW9	SSW5	SSW8	SSW8	W12	W11	WSW14	W14	WNN11	W10	WSW11	W14	W12	WNN14	W12	W9	W8	WNN9	NW9	NW4	SW4	WSW8.0	W14
13-Dec	S5	S7	S8	SSW6	SSW8	S9	SSE9	SW14	WSW12	W9	W10	W9	WNN10	NNW9	NNW9	WNN4	W9	W10	W9	W11	W11	W10	N7	NNE6	W5.7	SW14
14-Dec	NNE4	SSE3	SE3	SSE6	S6	S5	SSE5	SE6	SE5	SE5	SE10	SE6	ESE7	SE10	SE8	SE8	ESE5	S3	SE5	SSE5	SE5	ESE4	SE7	SE5	SE5.1	SE10
15-Dec	SE4	SSE7	SSE8	SE8	SE10	ESE8	SSE8	SE7	SW6	SW6	SW8	W14	W13	W12	W11	WSW10	S4	SSW7	SW11	SW10	W11	W13	W15	WSW17	SW6.2	WSW17
16-Dec	W11	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	W11
17-Dec	AF	AF	AF	AF	S14	SSE8	S6	SW10	SW10	WSW15	WSW19	WSW17	WSW17	WSW22	WSW21	W18	W16	W18	W18	W12	W7	W14	WSW16	WSW17	WSW13.1	WSW22
18-Dec	W12	W12	WSW14	WNN10	N16	N16	N11	N11	N8	NNW5	WNN9	WNN19	WNN24	WNN24	WNN24	WNN19	WNN16	W14	W13	W12	WNN11	N11	N10	N10	NW11.6	WNN24
19-Dec	N10	N10	N9	N8	N6	NNW7	NNW6	NW2	S3	S4	S5	SSE6	SSE8	SE7	ESE9	SE10	SE7	SE7	SE6	SE7	SSE6	SE3	SSE5	SSE7	ESE2.1	SE10
20-Dec	SSE6	SE5	SE4	SE8	SSE7	SSE7	SSE8	SSE7	SE7	SE7	SE8	SE9	ESE10	SE13	SE14	SE11	SE8	SSE7	SE4	ESE5	SE6	SSE6	SSE6	SE5	SE7.3	SE14
21-Dec	SE3	NE4	ENE3	SE2	S1	NW5	NW5	NNW6	NW5	NW6	WNN1	NNE1	SSE2	WSW4	WNN12	W11	W11	W12	W12	W13	W13	WNN12	WNN10	NW6	WNN5.2	W13
22-Dec	NNE4	NE4	NE4	NNE3	WNN3	W10	W12	WSW10	SW10	WSW12	W11	W12	W14	W13	W14	W13	W11	W11	W12	NW13	N15	N18	N18	NNW14	WNN7.9	N18
23-Dec	NNW8	NNW7	NNW5	NW3	NNE2	SSE2	ESE3	NE4	NNE2	NNW5	NNW7	NNW4	NNW6	W3	NNW4	WSW1	SSE5	ESE4	E5	ESE4	SSE5	ENE3	N5	NNW11	N2.2	NNW11
24-Dec	N14	N15	N16	N15	NNW9	NNW5	NNW6	NW5	NW5	NNW5	N2	SE4	SE4	ESE4	ENE4	ENE4	E3	S4	SE3	E4	SSE2	N3	NNW8	NNW7	N4.2	NNW7
25-Dec	N7	N9	N10	N9	N7	NNW10	NNW10	NNW5	NNW2	ESE3	SSE4	S5	S6	S4	SSE6	SSE5	S4	S6	S5	SSE7	S5	SSE6	SSE6	S5	SSE0.3	NNW10
26-Dec	SSE6	SE7	SSE8	SE7	SSE8	SE7	SE7	SE5	SE6	SSE8	SE6	SE7	SE7	SE9	SE8	SE7	SE7	SE3	SSE4	SE4	SE2	S4	E3	E3	SE5.8	SE9
27-Dec	SE4	SSE4	SSE3	SSE5	SSE7	SSE6	SSE6	SSE7	SSE7	SE5	SSE5	SE5	SE6	SE6	SE5	SE6	SSE6	S4	SSW5	SW6	SSW3	SE3	SSE3	ESE3	SSE4.6	SSE7
28-Dec	ESE2	SSE3	SSE2	NNE2	N2	NNW2	NNW4	NNW4	NW3	NNW3	N4	NNE2	N3	NNW4	NNW4	W1	NW2	NE2	NNE3	NNE1	N2	N0	SE0	SE1	N1.6	N4
29-Dec	E3	E1	E1	SE1	SSE3	SSE4	SSE4	SSE5	SSE6	SSE5	SSE5	SSE6	SSE5	SE4	SE4	SE5	SSE6	S6	S6	SSE5	SSE7	SSE7	SE5	S6	SSE4.3	SSE7
30-Dec	SSE4	SSE5	SSE7	SE6	SE5	SE5	SE4	SE4	SSE3	SSE5	SSE5	SE5	ESE5	ESE4	ESE4	SE5	ESE4	ESE4	SSE3	SSE4	SSE4	SSE4	SSE4	SSE5	SE4.3	SSE7
31-Dec	S6	S3	S4	SSE3	SSE2	SSE3	SSE4	SSE6	SE6	SE5	SE7	SE9	SE7	ESE8	SE8	SE6	SE6	ESE5	SE3	ESE4	SE5	SSE6	SE7	SE7	SE5.3	SE9

SSW1.9	SSW1.7	SSW2.0	SSW1.8	SSW2.0	SW2.2	SW2.6	WSW2.6	SW2.8	WSW2.6	SW3.0	SW2.6	WSW2.5	WSW2.0	WSW1.6	SW1.8	SW2.0	SW2.5	SW2.5	SW2.3	WSW1.9	W1.4	WSW1.1	SSW1.7	Diurnal Average
WSW14	N15	N16	N15	N16	WSW19	WSW24	WSW17	WSW25	WSW19	WSW19	WNN19	WNN24	WNN24	WNN24	WNN19	W16	W18	W18	W13	N15	N18	N18	WSW17	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

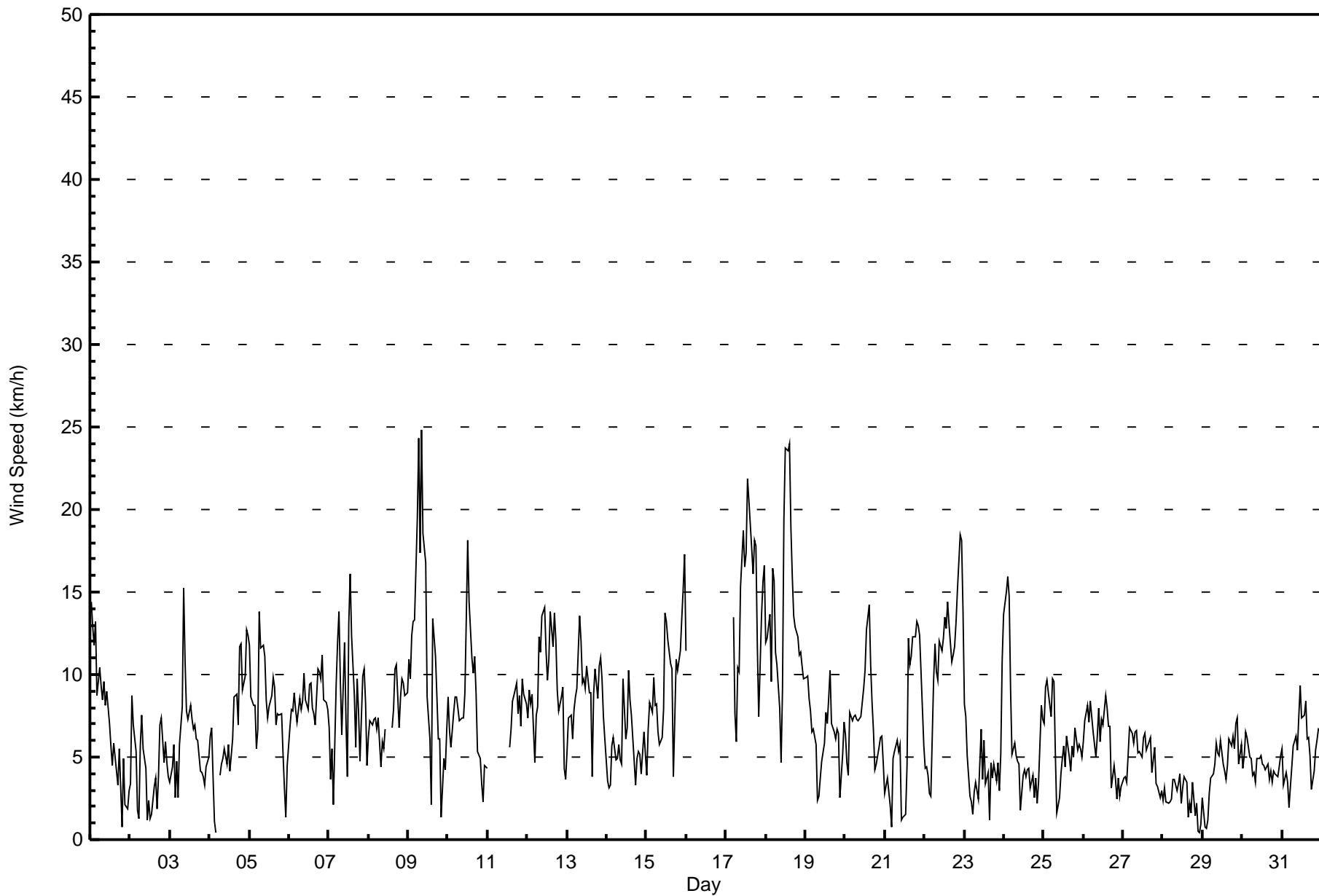
**Wind Speed (WS) - km/h**  
**Mildred Lake - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 7 km/h on Dec 9 06:00	Hours of Data: 701
Minimum Value: 0 km/h on Dec 28 15:00	Hours of Missing Data: 43
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6	Hours of Calibration: 3
	Percent Operational Time: 94.6

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

Diurnal Maximum

C - Calibration AF - Analyzer Failure





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Mildred Lake - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	260	37.09	37.09
6 - 11	340	48.50	85.59
12 - 19	94	13.41	99.00
20 - 28	7	1.00	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: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Mildred Lake - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	14	16	9	10	8	18	41	54	28	14	7	5	3	3	10	20	260
6 - 11	28	12	8	0	0	7	56	58	37	30	20	12	33	9	8	22	340
12 - 19	11	0	0	0	0	0	2	2	3	1	2	23	32	9	7	2	94
20 - 28	0	0	0	0	0	0	0	0	0	0	0	4	0	3	0	0	7
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	53	28	17	10	8	25	99	114	68	45	29	44	68	24	25	44	701

Total Number of Valid Hours: 701

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Mildred Lake - December 2017**

Direction of Maximum Speed: 242 deg on Dec 9 09:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 250.7 deg on Dec 17	Hours of Data: 701
Direction of Minimum Speed: 136 deg on Dec 28 23:00	Hours of Missing Data: 43
Direction of Minimum Daily Speed Average: 0.3 deg on Dec 25	Percent Operational Time: 94.6
Monthly Average Direction: 240.3 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-Dec	254	251	250	257	254	237	233	209	228	233	221	203	169	148	157	176	194	154	161	215	27	92	150	223	224.3
2-Dec	260	332	357	12	16	360	359	1	354	26	73	204	208	191	177	133	195	227	260	269	256	272	255	230	302.8
3-Dec	203	222	188	200	140	155	258	321	1	10	28	37	37	22	20	24	44	48	47	41	38	6	6	19	20.5
4-Dec	37	55	65	358	230	AF	202	210	192	199	182	187	185	154	150	172	193	185	161	165	173	178	175	187	172.4
5-Dec	193	193	187	182	178	304	317	330	351	13	33	11	9	34	30	30	34	35	37	21	7	348	347	156	9.0
6-Dec	148	178	171	191	187	196	194	168	183	174	189	173	182	178	233	224	242	249	257	277	269	260	245	213	208.4
7-Dec	227	183	158	196	299	311	305	296	271	321	332	53	310	300	299	333	352	327	348	333	331	325	305	258	309.5
8-Dec	199	232	236	210	200	211	211	186	193	191	196	C	C	C	137	126	129	133	151	166	192	187	180	176	180.8
9-Dec	173	175	222	237	249	245	241	248	242	244	240	271	272	275	175	247	241	201	199	183	339	65	153	203	233.8
10-Dec	209	211	183	210	217	218	200	157	153	204	245	268	302	312	338	353	5	4	11	347	34	64	75	121	271.2
11-Dec	153	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	128	123	124	118	129	136	133	149	150	148	146	--
12-Dec	176	209	188	206	194	209	205	260	259	257	266	290	268	256	264	269	284	274	268	274	291	317	323	222	256.7
13-Dec	191	178	186	195	213	189	156	230	252	263	272	275	302	328	318	300	269	281	266	263	271	276	1	16	259.1
14-Dec	31	159	146	168	178	176	158	135	126	133	131	128	114	124	129	131	123	172	146	163	146	109	143	130	138.2
15-Dec	125	148	147	130	129	116	149	165	234	227	223	262	272	266	262	256	191	212	235	220	263	259	259	255	228.9
16-Dec	268	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
17-Dec	AF	AF	AF	AF	171	158	182	224	223	249	257	249	244	253	255	260	264	271	274	275	274	264	258	256	250.7
18-Dec	265	264	256	302	350	351	359	354	350	333	294	293	292	295	298	298	289	280	272	269	290	357	353	351	304.5
19-Dec	354	350	1	1	353	341	332	312	173	169	172	156	151	134	118	131	132	141	130	145	149	132	152	148	113.3
20-Dec	149	143	139	131	149	147	147	155	140	139	143	131	115	128	128	128	137	156	127	117	142	150	147	128	137.2
21-Dec	131	53	75	127	186	326	315	337	313	325	294	23	148	258	282	269	266	266	270	270	275	290	302	326	287.1
22-Dec	26	48	48	18	290	270	265	255	228	246	265	275	274	277	277	278	270	273	278	319	1	355	351	338	295.3
23-Dec	340	330	335	310	20	164	103	39	33	347	334	337	327	271	345	241	165	114	94	113	165	71	10	347	357.3
24-Dec	353	356	355	350	344	341	347	319	313	341	6	145	128	113	59	61	81	173	128	87	159	352	335	346	0.4
25-Dec	354	351	349	349	350	346	341	343	332	119	151	177	174	178	166	165	170	183	175	165	169	160	161	171	166.4
26-Dec	162	146	161	138	156	138	135	129	134	147	133	141	124	126	125	130	146	135	149	124	145	173	94	97	138.7
27-Dec	146	154	157	155	156	157	150	154	153	131	147	128	137	142	138	140	165	182	207	216	196	140	149	109	153.9
28-Dec	123	163	163	21	360	341	346	330	318	336	5	29	355	331	331	278	323	38	16	14	351	357	136	128	352.7
29-Dec	88	79	81	144	159	161	156	162	161	162	163	167	151	132	126	140	161	175	175	168	166	161	144	169	157.4
30-Dec	156	160	152	137	128	131	130	140	147	156	161	139	116	110	114	132	119	114	154	160	156	160	163	161	141.8
31-Dec	169	176	169	168	152	158	167	159	143	146	131	135	127	123	127	136	136	121	143	118	139	153	141	136	141.7

209.5 212.3 198.1 208.7 204.0 231.0 235.5 241.4 233.0 237.3 228.7 233.8 258.4 248.1 249.1 223.7 218.1 224.6 228.2 226.9 247.8 263.9 246.8 212.0  
 Diurnal Average

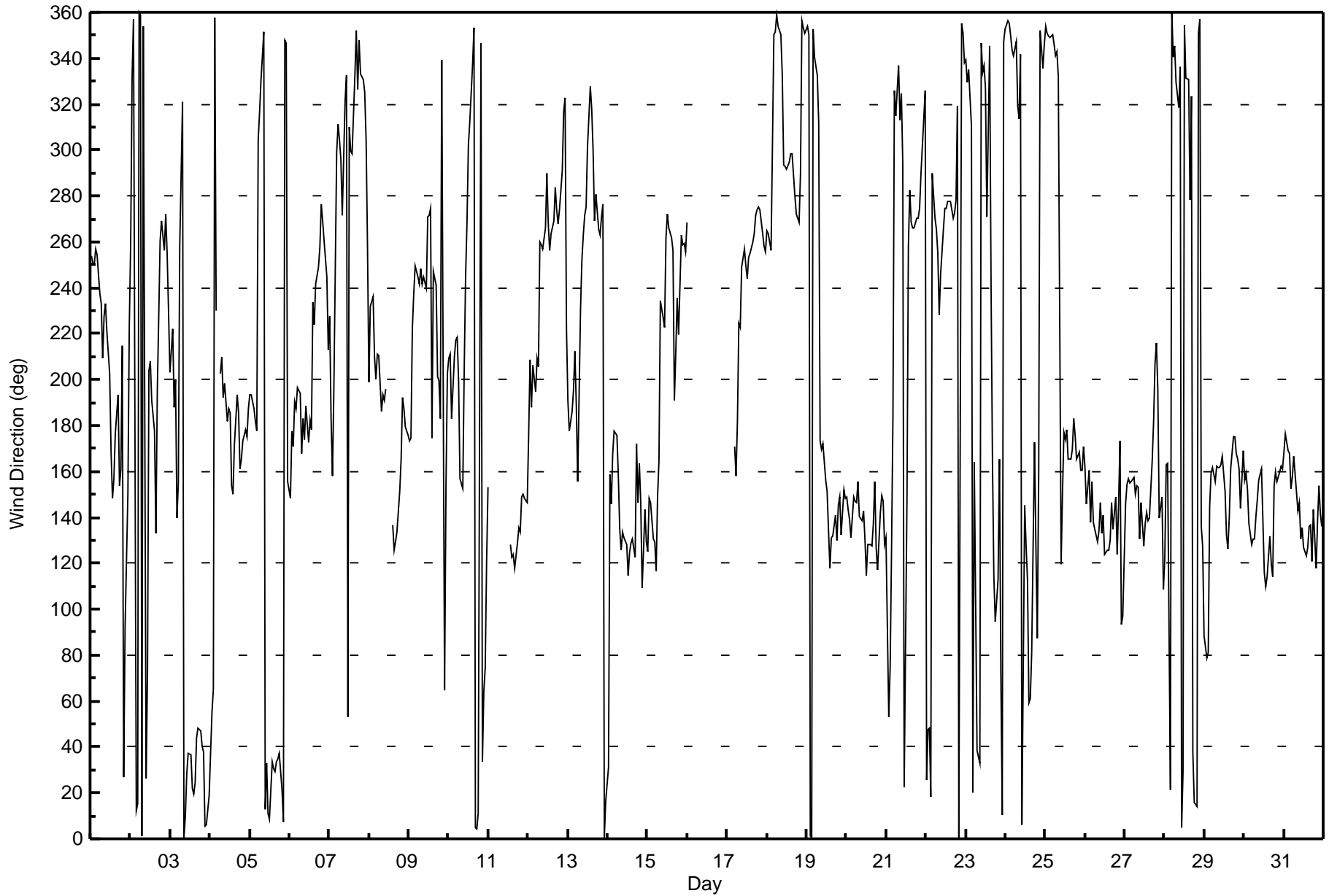
C - Calibration AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Mildred Lake - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Dec 22 05:00 Minimum Value: 6 deg on Dec 23 11:00 Percentiles: P <sub>1</sub> = 9 P <sub>10</sub> = 12 Q <sub>1</sub> = 15 Median = 18 Q <sub>3</sub> = 25 P <sub>90</sub> = 38 P <sub>99</sub> = 81																		Hours in Service: 744 Hours of Data: 701 Hours of Missing Data: 43 Hours of Calibration: 3 Percent Operational Time: 94.6																													
Day	Hourly Period Ending At (MST)																								Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	24	23	24	25	35	27	27	20	25	24	14	15	23	38	25	17	31	17	61	90	20	66	69	53	90																						
2-Dec	38	16	13	13	62	31	13	30	33	23	51	21	74	57	21	20	58	43	30	17	40	35	31	33	74																						
3-Dec	42	57	9	52	37	82	28	40	15	14	23	21	19	20	17	17	15	19	21	21	17	19	18	17	82																						
4-Dec	12	19	17	66	92	AF	18	19	17	19	20	15	20	21	17	16	13	20	14	12	15	16	14	16	92																						
5-Dec	12	15	16	20	23	88	15	10	20	11	15	19	16	21	19	20	17	18	18	18	25	45	80	49	88																						
6-Dec	15	15	14	14	11	15	12	19	15	16	18	15	18	20	39	30	34	22	21	18	15	18	21	24	39																						
7-Dec	20	39	26	74	33	21	19	23	40	23	21	32	24	17	21	20	26	18	20	56	27	16	16	37	74																						
8-Dec	18	20	23	18	10	14	17	30	19	19	14	C	C	C	17	18	14	14	21	15	17	19	16	14	30																						
9-Dec	15	18	30	34	27	20	19	23	19	21	20	39	41	41	83	21	25	24	24	17	86	37	36	19	86																						
10-Dec	20	21	30	21	20	20	21	23	19	33	31	18	12	11	17	20	17	18	18	25	36	54	22	23	54																						
11-Dec	52	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	15	14	11	14	11	13	10	15	15	16	18	52																						
12-Dec	26	22	24	20	27	18	42	21	17	19	21	35	22	17	16	16	14	13	15	13	14	14	75	46	75																						
13-Dec	21	19	15	29	26	23	17	34	38	21	19	17	30	20	14	26	17	13	14	15	15	19	30	16	38																						
14-Dec	19	38	23	14	13	20	13	10	15	15	12	29	16	13	13	20	33	32	20	24	29	30	16	22	38																						
15-Dec	25	16	19	19	14	20	14	18	49	38	32	19	15	16	16	25	61	36	28	24	22	18	17	18	61																						
16-Dec	31	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	31																						
17-Dec	AF	AF	AF	AF	15	25	35	27	29	22	18	19	20	20	18	17	16	17	15	15	18	19	18	17	35																						
18-Dec	16	17	17	45	18	16	19	17	19	24	18	14	13	12	9	11	13	17	15	17	42	17	16	17	45																						
19-Dec	16	14	15	15	16	11	8	45	16	11	18	17	15	20	14	10	12	12	13	11	36	55	19	15	55																						
20-Dec	22	27	34	22	16	11	12	10	13	14	13	14	15	12	9	11	15	21	71	29	23	14	19	26	71																						
21-Dec	47	29	18	31	71	16	11	10	12	15	80	67	91	53	18	16	16	17	17	17	16	14	17	27	91																						
22-Dec	42	15	19	16	98	19	17	29	23	27	21	17	17	16	16	15	17	16	16	34	18	17	17	13	98																						
23-Dec	12	11	11	64	48	49	29	15	16	21	6	24	59	32	66	69	18	20	14	32	16	25	27	15	69																						
24-Dec	18	18	18	17	14	19	15	15	24	13	70	16	21	22	12	19	21	26	26	32	55	51	10	11	70																						
25-Dec	13	14	15	14	14	12	11	11	42	24	12	18	18	27	31	26	34	17	23	13	15	13	18	18	42																						
26-Dec	15	13	13	15	16	17	15	16	14	13	18	13	12	14	15	10	12	32	22	29	37	10	33	17	37																						
27-Dec	22	11	14	12	13	14	14	15	12	19	17	18	15	16	15	19	14	32	26	17	38	19	42	28	42																						
28-Dec	26	13	46	47	24	19	13	29	26	11	14	26	23	13	9	27	17	66	11	21	10	73	75	38	75																						
29-Dec	26	56	64	50	17	10	15	12	11	12	12	12	14	16	17	20	16	14	17	18	13	13	21	15	64																						
30-Dec	15	14	13	13	14	14	12	15	19	12	13	20	17	17	16	17	21	12	18	32	16	12	9	8	32																						
31-Dec	8	8	11	8	15	13	11	16	13	9	10	12	12	12	11	12	10	16	25	17	15	13	12	8	25																						
Diurnal Maximum																								52	57	64	74	98	88	42	45	49	38	80	67	91	57	83	69	61	66	71	90	86	73	80	53
C - Calibration																								AF - Analyzer Failure																							





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-11-2017

### Station Information

Station Name:	Mildred Lake	Station number:	AMS 02
Calibration Date:	December 11, 2017	Last Cal Date:	November 22, 2017
Start time (MST):	12:30	End time (MST):	16:07
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.13</u>	ppm	Cal Gas Exp Date	December 12, 2019
Cal Gas Cylinder #	<u>EY0000363</u>			
Calibrator Make/Model	API T700		Serial Number	1185
ZAG Make/Model	API T701		Serial Number	825

### Analyzer Information

Analyzer make:		Analyzer serial #:			
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-601	-601
Calculated slope	0.995473	0.995150	Lamp voltage	790	788
Calculated intercept	0.118083	0.278655	Pressure	561.2	564.3
Analyzer Background	17.9	17.6	Flow	0.990	0.991
Analyzer Coefficient	0.927	0.918	Intensity	87	88
			Converter temp	326	327.5

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5002	0.0	0.0	0.1	----
as found span	4929	77.9	79.8	80.7	0.989
calibrator zero	5000	0.0	0.0	-0.1	----
high point	4929	77.9	79.8	79.9	0.999
second point	4970	39.1	40.0	40.2	0.996
third point	4988	19.6	20.1	19.5	1.030
as left zero	4976	0.0	0.0	-0.1	----
as left span	3926	62.3	80.1	79.9	1.003
SO2 Scrubber Check	5000	81.3	800.0	0.1	----
Date of last scrubber change:		22-Nov-17	Average Correction Factor		1.008
Corrected As found	80.60	Previous response	80.06	*% change	-0.7%

\* = > +/-5% change initiates investigation

#### Notes:

Scrubber check after As Finds, filter changed after scrubber check. Span adjusted.

Calibration Performed By: Ryan Power



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

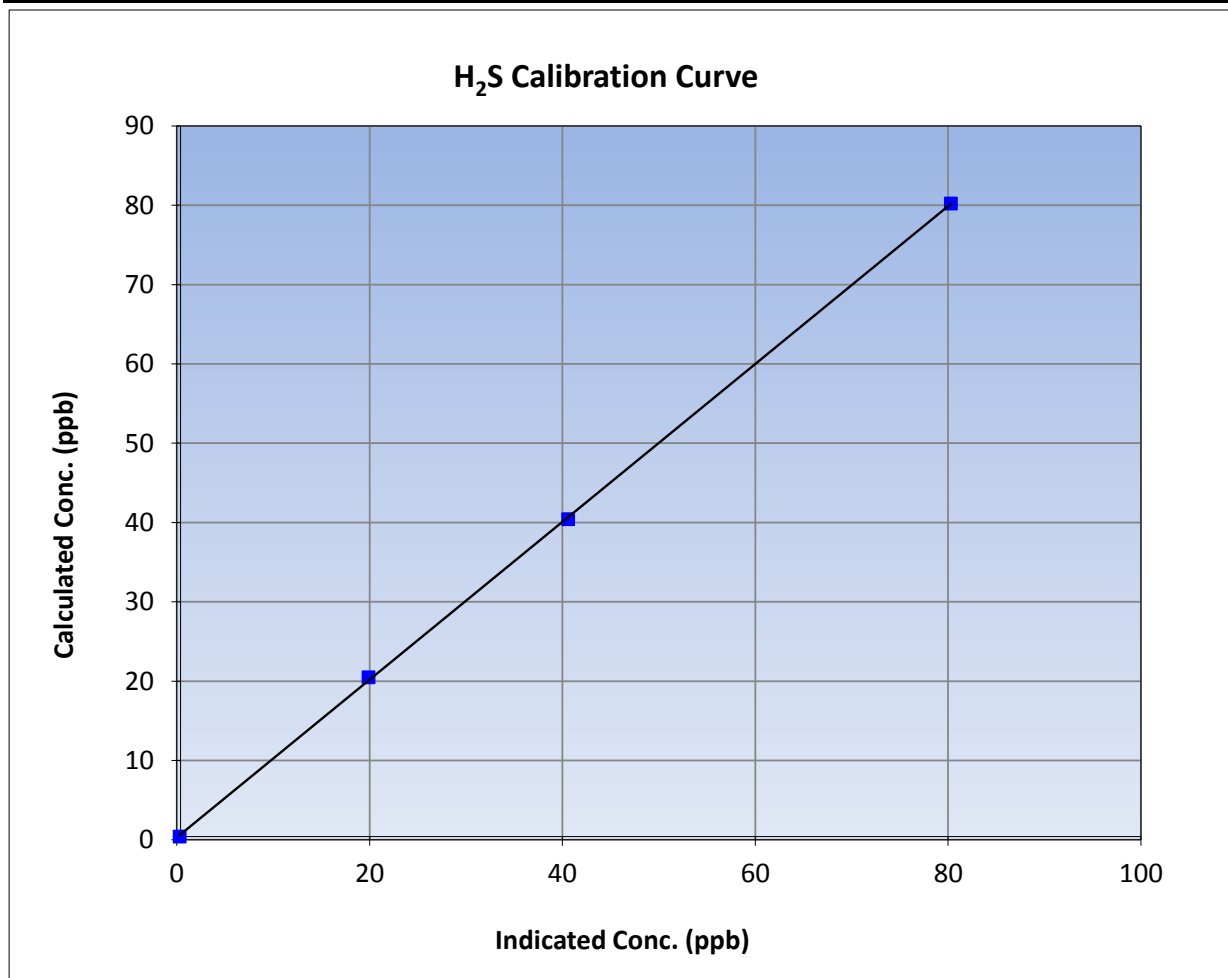
Version-03-2017

### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 22, 2017
Station Name	Mildred Lake	Station Number	AMS 02
Start Time (MST)	12:30	End Time (MST)	16:07
Analyzer make	API T701	Analyzer serial #	825

### Calibration Data

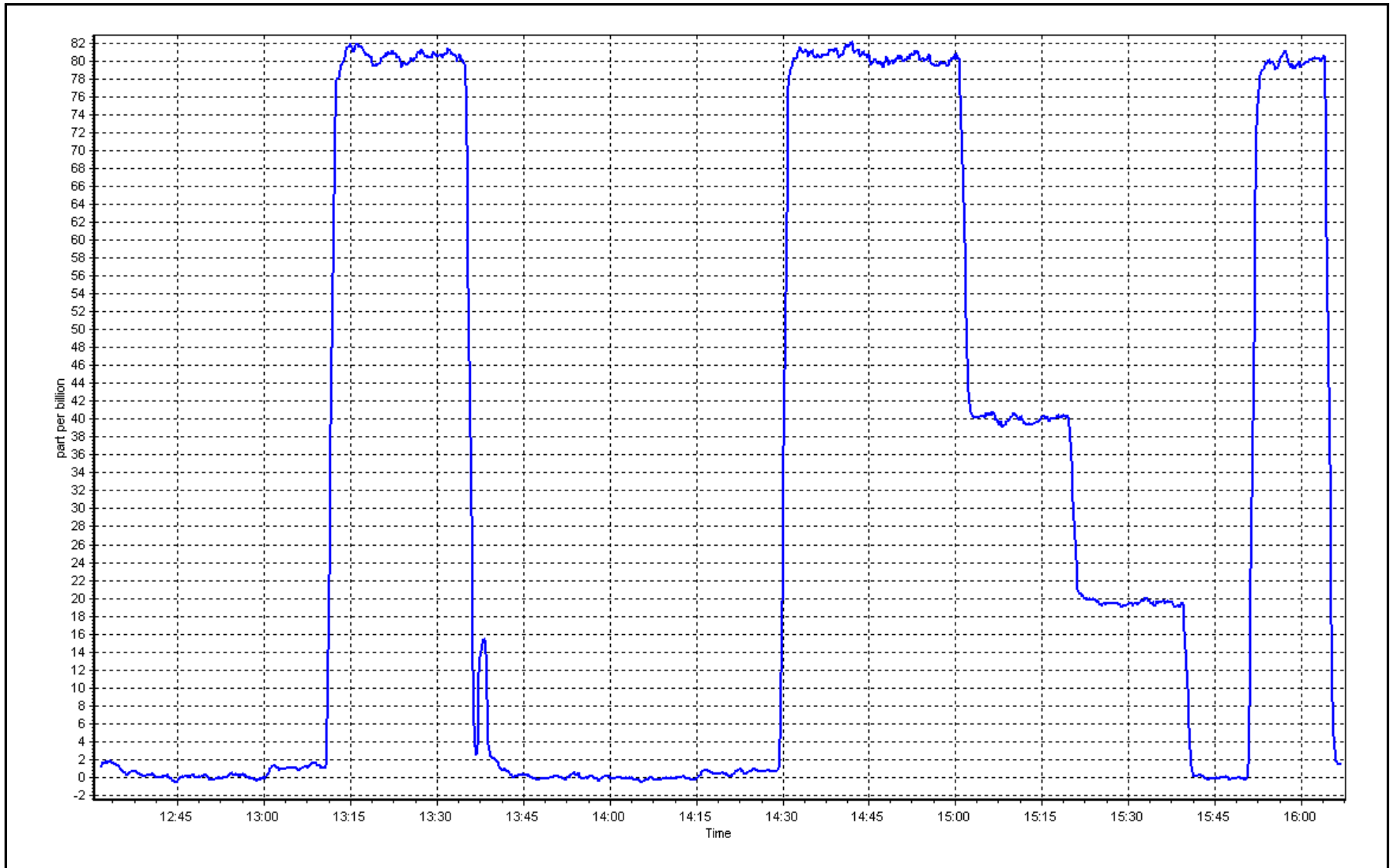
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.1	----	Correlation Coefficient	0.999929	≥0.995
79.8	79.9	0.9989			
40.0	40.2	0.9961	Slope	0.995150	0.90 - 1.10
20.1	19.5	1.0297			
			Intercept	0.278655	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 11, 2017

Location: Mildred Lake







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Mildred Lake	Station number:	AMS 02
Calibration Date:	December 6, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:35	End time (MST):	14:33
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	51.2	ppm	Cal Gas Exp Date	2/19/18
Calibrator Make/Model	API T700		Serial Number	1185
ZAG Make/Model	APT T701		Serial Number	4767

### Analyzer Information

Analyzer make:	Thermo 43i	Analyzer serial #:	JC1404901075		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
Analyzer Range	0 - 1000 ppb		PMT voltage	-653.4	-653.4
Calculated slope	1.010517	0.997227	Lamp voltage	804	804
Calculated intercept	1.526211	1.073856	Pressure	691.4	699.4
Analyzer Background	19.3	19.6	Flow	0.496	0.501
Analyzer Coefficient	0.948	0.967	Intensity	90	91

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5001	0.0	0.0	0.0	----
as found span	4933	76.5	781.9	764.5	1.023
calibrator zero	5000	0.0	0.0	0.1	----
high point	4933	76.5	781.9	784.0	0.997
second point	4969	38.3	391.6	389.7	1.005
third point	4986	19.2	196.4	195.6	1.004
as left zero	5003	0.0	0.0	-0.1	----
as left span	4932	76.5	782.0	781.7	1.000
Average Correction Factor					1.002

Corrected As found	764.50	Previous response	772.21	*% change	1.0%
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\* = > +/-5% change initiates investigation

Notes: Slight adjustment to span. Filter changed after As Finds.

Calibration Performed By: Ryan Power



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

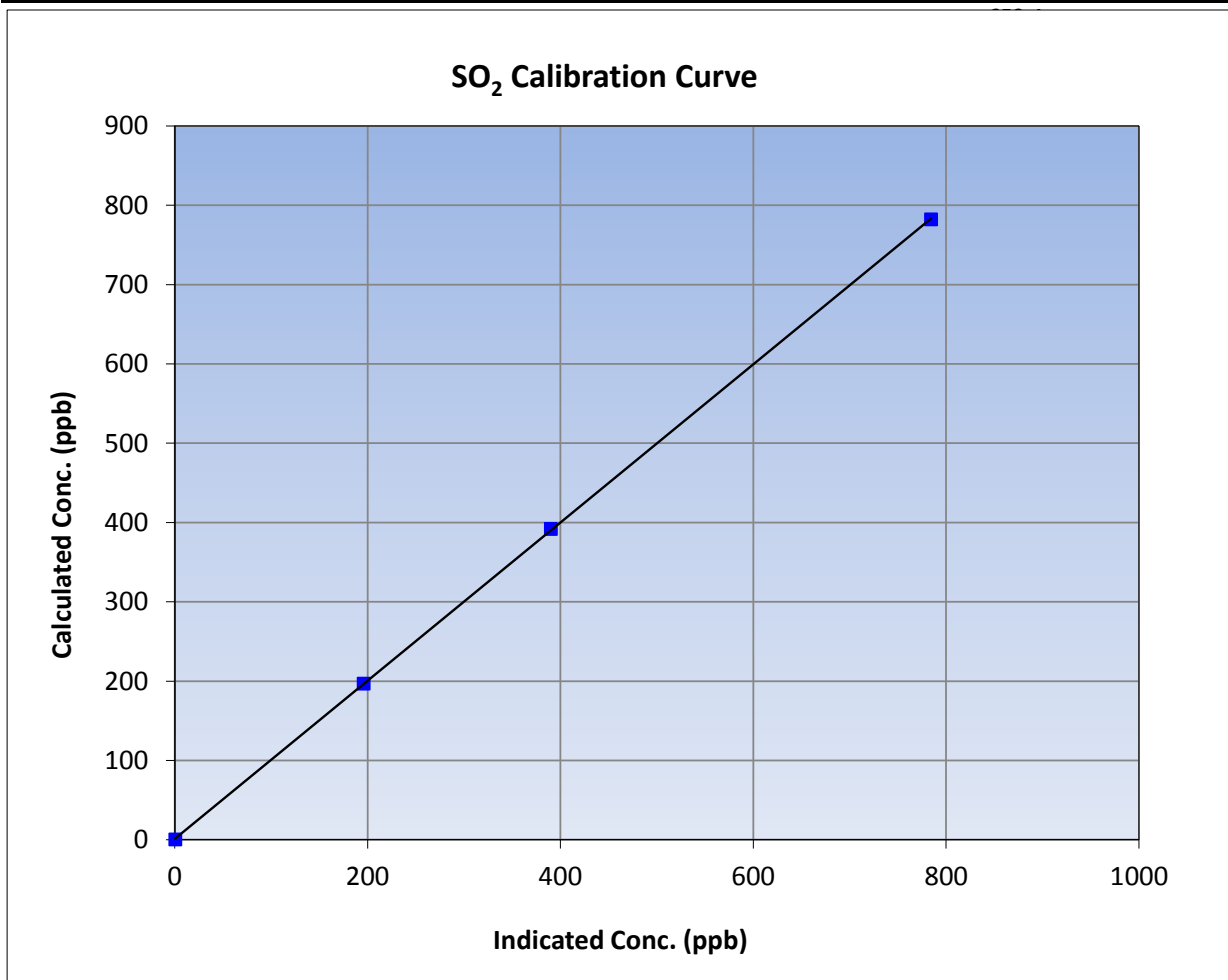
Version-03-2017

### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 13, 2017
Station Name	Mildred Lake	Station Number	AMS 02
Start Time (MST)	11:35	End Time (MST)	14:33
Analyzer make	Thermo 43i	Analyzer serial #	JC1404901075

### Calibration Data

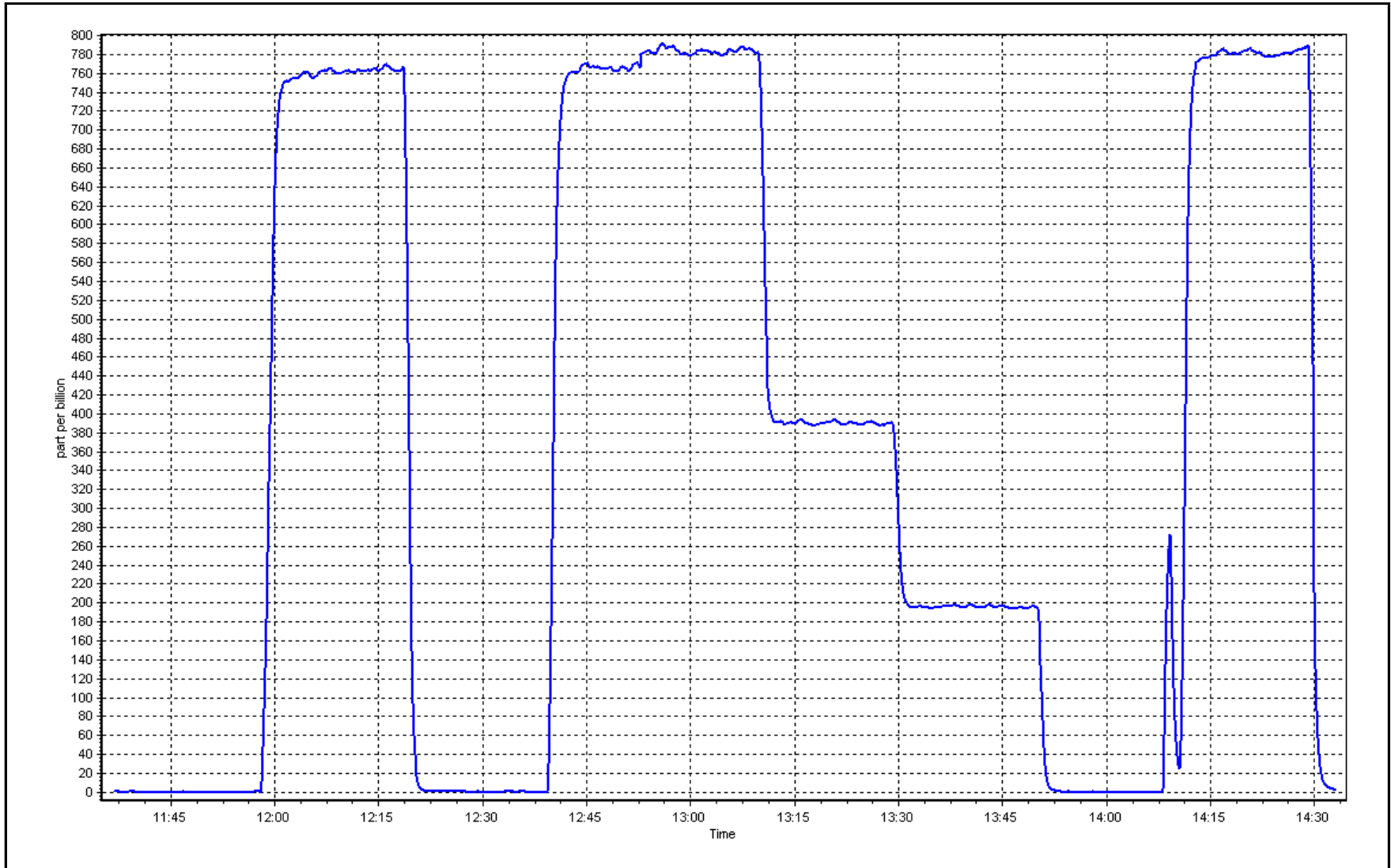
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.1	----	Correlation Coefficient	≥0.995
781.9	784.0	0.9973		
391.6	389.7	1.0049	Slope	0.90 - 1.10
196.4	195.6	1.0041		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 6, 2017

Location: Mildred Lake





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Mildred Lake	Station number:	AMS 02
Calibration Date:	December 6, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:35	End time (MST):	14:31
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL107930	Cal Gas Expiry Date	2/9/18
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

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1410661326
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-293.9
Calculated slope	1.003388	Sample pressure	8.5
Calculated intercept	-0.005877	Fuel pressure	24.0
Analyzer Background	6.00	Air pressure	37.3
Analyzer Coefficient	4.094	Flame temperature	155.4

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4999	0.0	0.00	0.22	----
as found span	4933	76.5	16.51	16.75	0.986
calibrator zero	5002	0.0	0.00	0.07	----
high point	4933	76.5	16.51	16.53	0.999
second point	4969	38.3	8.27	8.26	1.002
third point	4987	19.2	4.15	4.21	0.985
as left zero	5004	0.0	0.00	0.03	----
as left span	4932	76.5	16.51	16.31	1.012
Average Correction Factor					0.995
Corrected As found	16.53	Previous response	16.46	*% change	-0.4%

\* = > +/-5% change initiates investigation

Notes:

Slight adjustments to zero and span. Filter change after As Found

Calibration Performed By: Ryan Power



# Wood Buffalo Environmental Association

## THC Calibration Summary

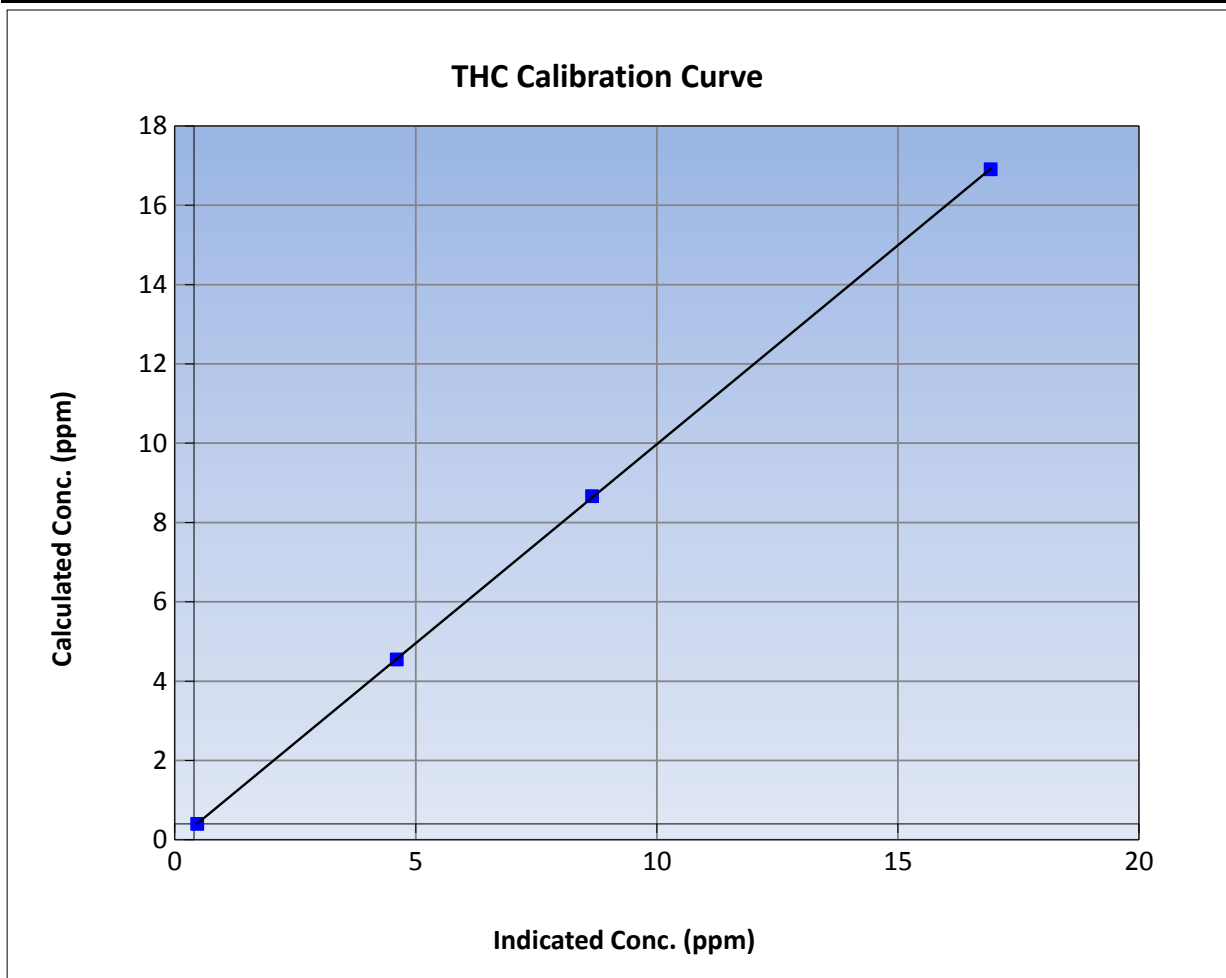
Version-03-2017

### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 13, 2017
Station Name	Mildred Lake	Station Number	AMS 02
Start Time (MST)	11:35	End Time (MST)	14:31
Analyzer make	Thermo 51i-LT	Analyzer serial #	1410661326

### Calibration Data

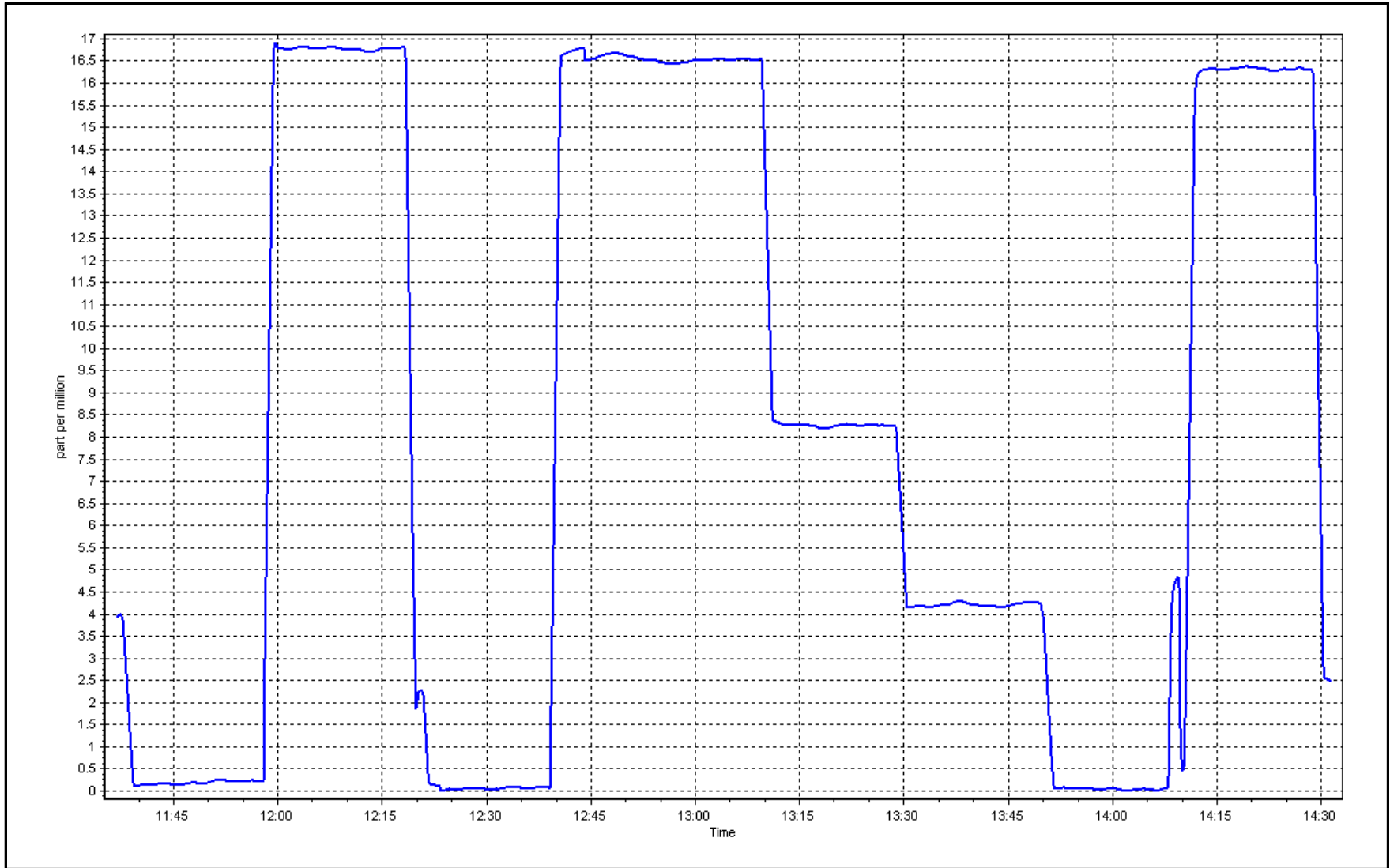
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999983	
16.5	16.5	0.9988			≥0.995
8.3	8.3	1.0015	Slope	1.003412	
4.1	4.2	0.9855			0.90 - 1.10
			Intercept	-0.058479	+/-1.5



THC Calibration Plot

Date: December-17

Location: Mildred Lake





# Wood Buffalo Environmental Association

## Wind Speed/Direction Calibration Report

Version-03-2017

### Station Information

Station Name:	Mildred Lake	Station Number:	AMS 02
Calibration Date:	Friday, December 08, 2017	Prev Cal Date:	Monday, August 29, 2016
Start Time (MST):	11:30	End Time (MST):	13:42
Barometric Press:	n/a	Station Temp:	22 Deg C
Reason:	Routine		

### Wind Speed Information

Sensor make/model:	Met One 010C-1	Serial Number:	E5130
WS Calibrator:	MetOne 053	Serial Number:	K13090

Shaft RPM	Actual Speed (K/hr) (Cv)	Indicated Speed (K/hr) (Iv)	Correction factor (Cv/Iv) <i>Limit = 0.95-1.05</i>
0	0.0	0.0	n/a
200	20.2	20.1	1.0031
400	39.4	39.5	0.9954
600	58.6	58.5	1.0009
800	77.8	77.7	1.0008
<b>Average Correction Factor</b>			<b>1.0001</b>

	<i>Start</i>	<i>Finish</i>	<i>Limits</i>
Correl Coeff (r <sup>2</sup> )	0.999997	0.999994	≥0.995
Calculated slope	0.998446	1.000586	0.90 - 1.10
Calculated intercept	0.046474	-0.023365	+/- 2

### Wind Direction Information

Sensor make/model:	Met One 020C-1	Serial Number:	B1462
As Found Declination (13 deg east of True North)		As Left Declination (13 deg east of TrueNorth)	

Physical Direction (Degrees) (Cv)	Indicated Direction (Degrees) (Iv)	Correction factor (Cv/Iv) <i>Limit = 0.95-1.05</i>
0	0.9	n/a
90	87.0	1.0345
180	179.0	1.0056
270	274.4	0.9840
357	359.0	0.9944
<b>Average Correction Factor</b>		<b>1.0046</b>

	<i>Start</i>	<i>Finish</i>	<i>Limits</i>
Correl Coeff (r <sup>2</sup> )	0.999975	0.999861	≥0.995
Calculated slope	0.986829	0.989080	0.90 - 1.10
Calculated intercept	0.349695	1.306334	+/- 7

Notes: B2027 WS sensor replaced with E5130 due to faulty bearings. No other issues.

Calibration Performed By: Aswin Sasi Kumar



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

### **AMS 3 LOWER CAMP METEOROLOGY DECEMBER 2017**

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

January 30, 2018



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
Temperature 20 m (C) Average	744	0	0	100	4.9	-	2.3	-
Temperature 45 m (C) Average	744	0	0	100	5.2	-	2.6	-
Temperature 100 m (C) Average	744	0	0	100	5.7	-	3.2	-
Temperature 167 m (C) Average	744	0	0	100	6.4	-	3.6	-
Relative Humidity 20 m (%) Average	744	0	0	100	98	-	93.0	-
Relative Humidity 45 m (%) Average	744	0	0	100	98	-	91.0	-
Relative Humidity 100 m (%) Average	744	0	0	100	97	-	89.0	-
Relative Humidity 167 m (%) Average	744	0	0	100	98	-	88.0	-
Wind Speed 20 m (km/h) Average	692	0	52	93.01	19	-	12.0	-
Wind Speed 45 m (km/h) Average	692	0	52	93.01	27	-	16.0	-
Wind Speed 100 m (km/h) Average	728	0	16	97.85	39	-	24.0	-
Wind Speed 167 m (km/h) Average	742	0	2	99.73	54	-	32.0	-
Wind Direction 20 m (deg) Average	692	0	52	93.01	-	-	-	-
Wind Direction 45 m (deg) Average	692	0	52	93.01	-	-	-	-
Wind Direction 100 m (deg) Average	728	0	16	97.85	-	-	-	-
Wind Direction 167 m (deg) Average	742	0	2	99.73	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	692	0	52	93.01	1	-	0.5	-
Vertical Wind Speed 45 m (km/h) Average	692	0	52	93.01	1.4	-	0.7	-
Vertical Wind Speed 100 m (km/h) Average	728	0	16	97.85	11.5	-	1.7	-
Vertical Wind Speed 167 m (km/h) Average	733	0	11	98.52	5.4	-	1.7	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)  
DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
Temperature 20 m (C) Average	744	-13.76	12.4	-	-40.8	-31.6	-26	-9.3	-3.8	1	4.9
Temperature 45 m (C) Average	744	-13.34	12.4	-	-38.9	-31.2	-25.9	-9.1	-2.9	1.4	5.2
Temperature 100 m (C) Average	744	-12.13	11.9	-	-34.7	-29.3	-24	-8.8	-1.7	1.8	5.7
Temperature 167 m (C) Average	744	-11.61	11.8	-	-34.2	-28.5	-23.4	-8.8	-1	2.3	6.4
Relative Humidity 20 m (%) Average	744	80.1	9	-	57	70	73	79	87	91	98
Relative Humidity 45 m (%) Average	744	79	8	-	58	70	73	79	85	91	98
Relative Humidity 100 m (%) Average	744	77.1	9	-	53	67	71	76	84	89	97
Relative Humidity 167 m (%) Average	744	75.6	10	-	47	63	70	74	83	89	98
Wind Speed 20 m (km/h) Average	692	7.1	4	-	0	2	3	7	10	13	19
Wind Speed 45 m (km/h) Average	692	9.7	6	-	0	2	5	9	14	18	27
Wind Speed 100 m (km/h) Average	728	12.8	8	-	0	4	7	11	17	24	39
Wind Speed 167 m (km/h) Average	742	17.3	10	-	1	6	10	15	24	31	54
Wind Direction 20 m (deg) Average	692	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	692	-	-	-	-	-	-	-	-	-	-
Wind Direction 100 m (deg) Average	728	-	-	-	-	-	-	-	-	-	-
Wind Direction 167 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	692	0.09	0.3	-	-0.9	-0.3	-0.1	0.1	0.3	0.4	1
Vertical Wind Speed 45 m (km/h) Average	692	0.22	0.3	-	-0.8	-0.2	0	0.2	0.4	0.6	1.4
Vertical Wind Speed 100 m (km/h) Average	728	0.38	0.9	-	-1.4	-0.3	0	0.2	0.6	1.1	11.5
Vertical Wind Speed 167 m (km/h) Average	733	0.35	0.7	-	-2.8	-0.3	0	0.2	0.5	1.1	5.4

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)  
 DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed. Wind Direction, Vertical Wind Speed 20 m	10 Dec 2017 09:00	10 Dec 2017 10:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 20 m	10 Dec 2017 14:00	12 Dec 2017 10:00	45	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 20 m	15 Dec 2017 05:00	15 Dec 2017 09:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 45 m	10 Dec 2017 09:00	10 Dec 2017 10:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 45 m	10 Dec 2017 14:00	12 Dec 2017 10:00	45	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 45 m	15 Dec 2017 04:00	15 Dec 2017 08:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 100 m	10 Dec 2017 14:00	10 Dec 2017 23:00	10	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 100 m	11 Dec 2017 13:00	11 Dec 2017 14:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 100 m	15 Dec 2017 05:00	15 Dec 2017 08:00	4	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 167 m	10 Dec 2017 14:00	10 Dec 2017 14:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 167 m	15 Dec 2017 06:00	15 Dec 2017 06:00	1	Flat line in sensor output signal - Sensor frozen

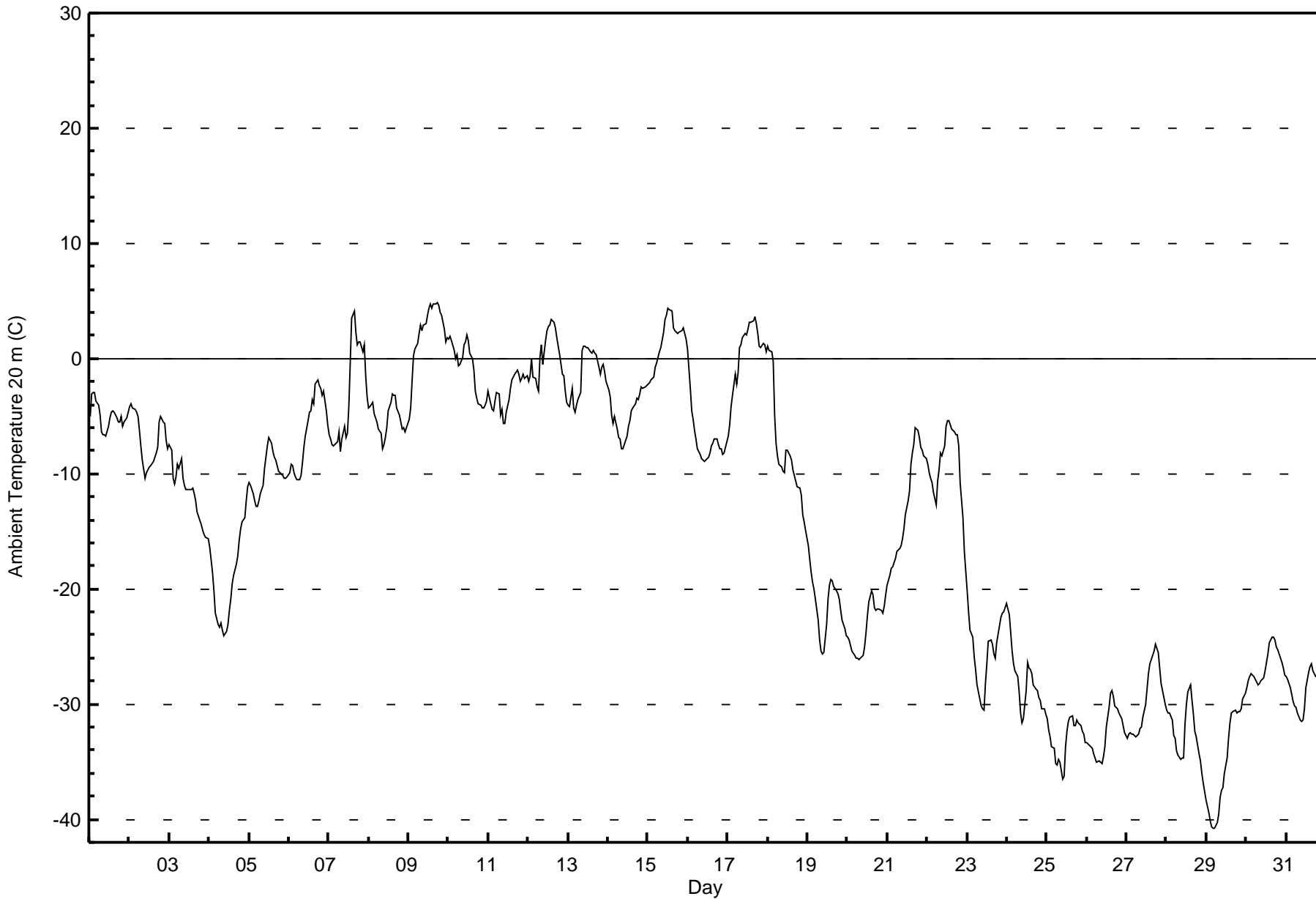


Maximum Value: 4.9 C on Dec 9 18:00		Maximum Daily Average: 2.3 C on Dec 9		Hours in Service: 744																						
Minimum Value: -40.8 C on Dec 29 06:00		Minimum Daily Average: -35.0 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -11.8 C at hour 15		Minimum Diurnal Average: -15.5 C at hour 8		Hours of Missing Data: 0																						
Monthly Average: -13.76 C		Percentiles: P <sub>1</sub> = -38.3 P <sub>10</sub> = -31.6 Q <sub>1</sub> = -26.0 Median = -9.3 Q <sub>3</sub> = -3.8 P <sub>90</sub> = 1.0 P <sub>99</sub> = 4.3		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.1	-3.1	-2.9	-3.0	-3.7	-4.0	-4.9	-6.3	-6.6	-6.6	-6.8	-5.9	-5.2	-4.7	-4.5	-4.6	-5.2	-5.5	-5.5	-5.0	-5.9	-5.5	-5.2	-4.7	-5.0	-2.9
2-Dec	-4.1	-3.9	-4.3	-4.4	-4.6	-5.0	-6.3	-7.6	-8.7	-10.4	-9.8	-9.7	-9.4	-9.3	-8.9	-8.6	-8.2	-7.7	-5.5	-5.0	-5.5	-5.6	-7.1	-7.8	-7.0	-3.9
3-Dec	-7.5	-7.9	-10.5	-10.9	-10.3	-9.2	-9.5	-8.7	-10.3	-11.0	-11.4	-11.4	-11.4	-11.4	-11.3	-11.7	-12.4	-13.3	-14.0	-14.4	-14.9	-15.2	-15.5	-15.6	-11.7	-7.5
4-Dec	-16.4	-17.5	-18.6	-20.2	-22.1	-23.1	-23.3	-23.0	-23.6	-24.0	-23.7	-23.1	-21.9	-20.9	-19.6	-18.8	-17.8	-17.1	-15.8	-14.8	-14.1	-13.8	-12.3	-11.1	-19.0	-11.1
5-Dec	-10.8	-11.0	-11.7	-12.4	-12.8	-12.8	-12.3	-11.7	-11.0	-9.5	-8.6	-7.6	-6.9	-7.3	-8.0	-8.6	-8.9	-9.3	-9.8	-10.1	-10.2	-10.4	-10.4	-10.3	-10.1	-6.9
6-Dec	-9.9	-9.2	-9.3	-9.9	-10.3	-10.5	-10.5	-10.1	-9.0	-7.7	-6.7	-5.4	-4.6	-4.6	-3.6	-3.9	-2.2	-1.8	-2.3	-2.5	-3.1	-2.9	-4.6	-5.8	-6.3	-1.8
7-Dec	-6.6	-7.0	-7.4	-7.6	-7.4	-7.2	-6.3	-8.1	-6.9	-5.8	-6.8	-6.5	-4.1	-0.4	3.5	4.1	2.3	1.2	1.4	1.4	0.6	1.3	-1.4	-3.3	-3.2	4.1
8-Dec	-4.3	-4.1	-3.8	-4.7	-5.2	-5.5	-6.1	-6.5	-7.8	-7.4	-6.8	-6.0	-4.6	-3.8	-3.1	-3.2	-3.2	-4.3	-4.9	-5.5	-6.1	-6.0	-6.4	-5.7	-5.2	-3.1
9-Dec	-5.2	-4.3	-2.0	0.2	0.8	1.3	2.1	2.9	2.4	2.9	3.0	3.8	4.3	4.7	4.4	4.8	4.7	4.9	4.6	4.0	3.8	2.5	1.5	1.8	2.3	4.9
10-Dec	1.7	1.9	1.6	0.7	0.0	0.3	-0.6	-0.5	0.0	1.2	1.5	2.0	1.5	0.4	0.0	-1.0	-2.8	-3.5	-3.9	-4.1	-4.3	-4.3	-4.0	-3.6	-0.8	2.0
11-Dec	-2.8	-3.9	-4.4	-4.5	-3.6	-2.9	-3.0	-4.9	-4.5	-5.6	-5.6	-4.6	-3.6	-2.6	-1.8	-1.6	-1.4	-1.0	-1.4	-2.0	-1.7	-1.3	-1.7	-1.5	-3.0	-1.0
12-Dec	-2.0	-1.5	0.0	-1.6	-1.7	-2.4	-2.8	0.1	1.2	-0.5	1.6	2.5	2.7	2.9	3.4	3.2	2.6	1.8	1.1	0.4	-1.4	-1.5	-2.8	-3.9	0.1	3.4
13-Dec	-4.1	-4.2	-2.6	-4.3	-4.7	-4.0	-3.5	-3.0	0.7	1.1	1.0	1.0	0.5	0.5	0.7	0.4	0.4	-0.8	-1.4	-0.8	-0.5	-1.1	-2.0	-1.2	1.1	
14-Dec	-2.7	-3.3	-4.9	-5.7	-5.0	-6.1	-6.8	-7.0	-7.8	-7.9	-7.5	-6.7	-5.9	-5.4	-4.5	-4.2	-4.0	-3.4	-3.6	-3.1	-2.4	-2.6	-2.4	-2.4	-4.8	-2.4
15-Dec	-2.2	-2.1	-1.9	-1.6	-0.8	-0.3	0.1	0.6	1.0	2.3	3.4	3.8	4.3	4.3	4.2	2.6	2.5	2.3	2.2	2.3	2.4	2.6	2.2	1.7	1.5	4.3
16-Dec	0.8	-2.6	-4.5	-5.3	-6.3	-7.0	-7.9	-8.3	-8.6	-8.8	-8.9	-8.8	-8.5	-8.2	-7.6	-7.3	-7.0	-7.0	-7.5	-7.8	-7.9	-8.3	-8.2	-7.2	-7.0	0.8
17-Dec	-6.8	-5.8	-4.2	-3.2	-1.4	-2.2	-1.3	1.0	1.2	1.8	2.1	2.1	2.6	3.1	3.1	3.3	3.6	3.1	2.2	1.0	0.9	1.3	1.1	0.6	0.4	3.6
18-Dec	1.1	0.8	0.5	-0.3	-4.9	-7.4	-8.4	-9.1	-9.4	-9.8	-9.9	-8.0	-7.9	-8.4	-8.8	-9.7	-10.1	-10.7	-11.2	-11.3	-11.9	-13.6	-14.1	-14.9	-8.2	1.1
19-Dec	-16.3	-17.4	-18.6	-19.4	-20.0	-20.9	-22.7	-24.4	-25.4	-25.7	-25.5	-23.0	-20.9	-19.7	-19.2	-19.3	-19.8	-20.1	-20.4	-20.9	-21.8	-22.8	-23.4	-24.1	-21.3	-16.3
20-Dec	-24.2	-24.4	-24.9	-25.4	-25.7	-26.0	-26.0	-26.1	-26.0	-25.8	-25.0	-23.8	-22.4	-21.1	-20.2	-20.5	-21.6	-21.9	-21.8	-21.7	-21.9	-22.2	-21.5	-20.5	-23.4	-20.2
21-Dec	-19.7	-18.9	-18.3	-18.1	-17.8	-17.3	-16.8	-16.5	-16.2	-15.7	-14.8	-13.6	-12.3	-11.5	-9.1	-8.1	-7.5	-6.0	-6.2	-6.9	-7.7	-8.0	-8.4	-8.7	-12.7	-6.0
22-Dec	-9.2	-9.9	-10.4	-10.8	-11.6	-12.7	-10.6	-9.7	-8.2	-8.4	-7.6	-5.9	-5.4	-5.4	-5.7	-6.1	-6.4	-6.6	-6.7	-7.6	-10.8	-13.8	-16.7	-18.4	-9.4	-5.4
23-Dec	-20.2	-22.0	-23.6	-24.2	-25.9	-27.0	-28.3	-29.0	-30.2	-30.4	-30.5	-28.2	-26.5	-24.6	-24.4	-24.8	-25.6	-26.0	-24.7	-23.2	-22.5	-22.1	-22.0	-21.6	-25.3	-20.2
24-Dec	-21.2	-22.3	-23.9	-25.4	-26.5	-27.1	-27.6	-29.0	-30.8	-31.6	-31.3	-28.8	-26.4	-26.9	-27.0	-27.4	-28.3	-28.7	-28.8	-29.5	-29.7	-30.4	-30.4	-30.9	-27.9	-21.2
25-Dec	-31.3	-32.2	-32.9	-33.7	-33.9	-35.2	-35.2	-34.7	-35.0	-36.5	-36.2	-33.7	-32.4	-31.6	-31.1	-31.1	-31.8	-31.9	-31.4	-31.6	-31.8	-32.3	-32.6	-33.3	-33.1	-31.1
26-Dec	-33.3	-33.4	-33.7	-33.9	-34.3	-34.7	-35.1	-35.0	-35.0	-35.2	-34.5	-33.7	-32.0	-30.3	-29.0	-28.8	-29.3	-30.1	-30.4	-30.7	-31.0	-31.3	-31.9	-32.5	-32.5	-28.8
27-Dec	-32.9	-32.6	-32.5	-32.6	-32.6	-32.9	-32.8	-32.6	-32.2	-32.0	-31.2	-30.0	-28.7	-27.4	-26.5	-26.1	-25.5	-24.8	-25.2	-25.5	-26.9	-28.2	-29.4	-30.0	-29.6	-24.8
28-Dec	-30.5	-30.7	-30.7	-31.4	-32.7	-33.0	-34.1	-34.4	-34.8	-34.6	-34.6	-31.8	-30.0	-28.9	-28.4	-29.6	-30.9	-32.3	-32.9	-34.3	-34.9	-36.0	-36.9	-37.5	-32.8	-28.4
29-Dec	-38.3	-39.4	-40.1	-40.7	-40.8	-40.8	-40.3	-39.6	-38.1	-37.5	-37.2	-36.0	-34.7	-32.9	-31.6	-30.8	-30.6	-30.5	-30.8	-30.7	-30.6	-30.4	-29.6	-29.1	-35.0	-29.1
30-Dec	-28.6	-27.9	-27.6	-27.4	-27.6	-27.8	-28.1	-28.3	-28.2	-28.0	-27.7	-27.1	-26.4	-25.6	-24.6	-24.2	-24.1	-24.4	-25.1	-25.3	-25.7	-26.4	-26.8	-27.4	-26.7	-24.1
31-Dec	-27.6	-27.8	-28.6	-29.1	-29.8	-30.2	-30.3	-30.8	-31.4	-31.5	-31.4	-30.4	-28.6	-27.2	-26.7	-26.5	-27.1	-27.3	-27.5	-27.6	-27.4	-27.6	-28.3	-28.5	-28.7	-26.5
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 20 m (AT20m) - C**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	267	35.89	35.89
-20 - 0	375	50.40	86.29
0 - 10	102	13.71	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

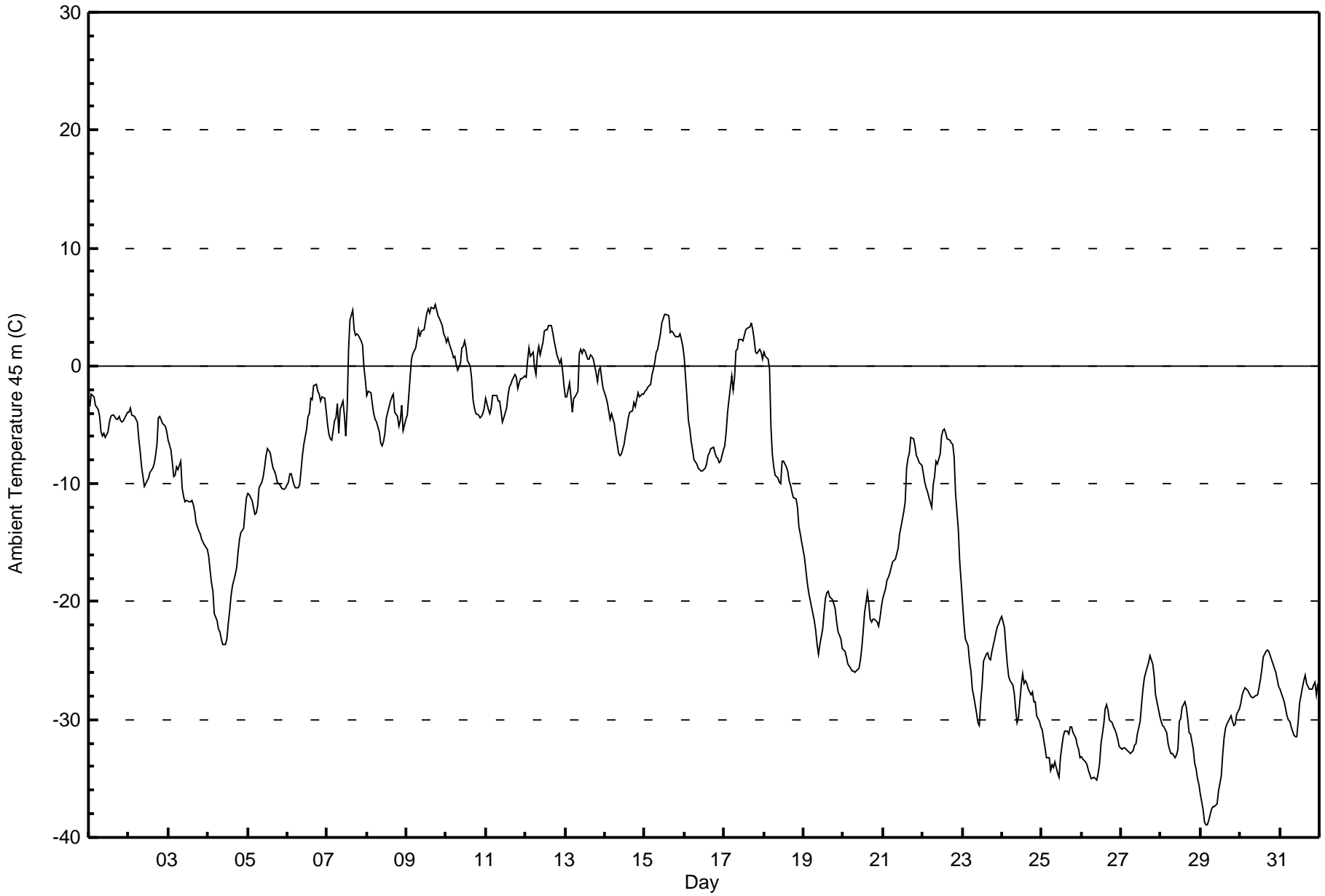


Maximum Value: 5.2 C on Dec 9 18:00		Maximum Daily Average: 2.6 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -38.9 C on Dec 29 05:00		Minimum Daily Average: -34.2 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -11.6 C at hour 16		Minimum Diurnal Average: -14.9 C at hour 10		Hours of Missing Data: 0																																												
Monthly Average: -13.34 C		Percentiles: P <sub>1</sub> = -37.4 P <sub>10</sub> = -31.2 Q <sub>1</sub> = -25.9 Median = -9.1 Q <sub>3</sub> = -2.9 P <sub>90</sub> = 1.4 P <sub>99</sub> = 4.2		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-3.5	-2.4	-2.5	-2.7	-3.4	-3.7	-4.3	-5.6	-5.9	-5.7	-6.1	-5.6	-4.8	-4.3	-4.1	-4.1	-4.6	-4.5	-4.3	-4.6	-4.8	-4.6	-4.1	-4.0	-4.3	-2.4																						
2-Dec	-3.9	-3.6	-4.2	-4.3	-4.5	-4.8	-6.1	-7.3	-8.5	-10.2	-10.0	-9.7	-9.5	-9.0	-8.7	-8.3	-7.6	-6.6	-4.4	-4.3	-4.9	-5.0	-5.1	-5.6	-6.5	-3.6																						
3-Dec	-6.4	-7.2	-8.2	-9.4	-9.2	-8.6	-8.8	-8.1	-10.4	-11.0	-11.5	-11.5	-11.5	-11.4	-11.7	-12.4	-13.3	-14.0	-14.3	-14.8	-15.0	-15.3	-15.5	-11.3	-6.4																							
4-Dec	-16.1	-17.3	-18.4	-19.1	-21.0	-21.6	-22.3	-22.5	-23.2	-23.7	-23.6	-23.1	-21.8	-20.8	-19.5	-18.6	-17.7	-17.0	-15.8	-14.7	-14.1	-13.7	-12.3	-11.2	-18.7	-11.2																						
5-Dec	-10.8	-10.9	-11.4	-12.0	-12.6	-12.4	-11.9	-10.3	-9.9	-9.4	-8.6	-7.6	-7.1	-7.4	-8.1	-8.7	-8.9	-9.3	-9.9	-10.1	-10.3	-10.4	-10.4	-10.3	-9.9	-7.1																						
6-Dec	-9.9	-9.2	-9.1	-9.6	-10.1	-10.3	-10.3	-10.1	-8.9	-7.6	-6.7	-5.4	-4.2	-4.0	-2.8	-2.8	-1.7	-1.6	-2.1	-2.4	-3.0	-2.7	-2.7	-3.8	-5.9	-1.6																						
7-Dec	-5.1	-5.9	-6.2	-6.3	-4.6	-4.4	-3.2	-5.7	-3.7	-2.9	-4.2	-5.9	-3.6	1.4	4.0	4.8	3.0	2.5	2.7	2.6	2.1	1.8	-0.1	-1.2	-1.6	4.8																						
8-Dec	-2.5	-2.2	-2.2	-3.2	-4.0	-4.5	-4.8	-5.6	-6.6	-6.8	-6.4	-5.7	-4.4	-3.5	-3.0	-2.7	-2.4	-3.9	-4.3	-5.1	-4.6	-3.4	-5.5	-4.5	-4.2	-2.2																						
9-Dec	-4.2	-2.7	-0.9	0.5	1.1	1.5	2.3	3.0	2.5	2.9	3.0	3.8	4.5	4.8	4.5	4.9	4.9	5.2	4.7	4.3	4.0	3.4	2.7	2.5	2.6	5.2																						
10-Dec	2.0	2.4	1.9	1.2	0.7	0.8	0.1	-0.3	0.2	1.6	1.6	2.1	1.5	0.4	-0.1	-1.1	-2.9	-3.6	-4.0	-4.2	-4.4	-4.3	-4.1	-3.6	-0.7	2.4																						
11-Dec	-2.7	-3.7	-4.0	-3.6	-2.5	-2.5	-2.6	-2.9	-3.0	-3.8	-4.8	-4.4	-3.5	-2.5	-1.7	-1.5	-1.2	-0.7	-1.0	-1.9	-1.4	-1.1	-1.1	-0.9	-2.5	-0.7																						
12-Dec	-1.0	0.4	1.5	0.8	1.1	-0.1	-0.8	0.9	1.6	0.9	2.0	2.9	3.0	3.1	3.4	3.4	2.9	2.1	1.5	0.9	0.2	0.5	-0.4	-1.6	1.2	3.4																						
13-Dec	-2.7	-2.7	-1.4	-2.6	-3.9	-2.7	-2.6	-2.1	1.0	1.4	1.1	1.4	1.3	0.5	0.6	0.9	0.8	0.6	-0.6	-1.3	-0.4	-0.2	-1.0	-1.9	-0.7	1.4																						
14-Dec	-2.6	-3.1	-3.8	-4.5	-4.0	-4.9	-5.8	-6.6	-7.4	-7.6	-7.5	-6.7	-5.8	-5.2	-4.4	-3.9	-3.8	-3.1	-3.4	-2.8	-2.3	-2.6	-2.4	-2.4	-4.4	-2.3																						
15-Dec	-2.2	-2.0	-1.8	-1.6	-0.8	-0.3	0.3	1.1	1.4	2.7	3.6	4.0	4.4	4.4	4.3	2.9	2.9	2.9	2.6	2.5	2.4	2.7	2.2	1.6	1.7	4.4																						
16-Dec	0.8	-2.8	-4.6	-5.4	-6.4	-7.1	-7.9	-8.3	-8.7	-8.9	-9.0	-8.9	-8.6	-8.3	-7.6	-7.4	-7.0	-6.9	-7.3	-7.7	-7.8	-8.2	-8.1	-7.1	-7.1	0.8																						
17-Dec	-6.8	-5.7	-3.9	-2.9	-0.9	-2.1	-0.9	1.3	1.4	2.2	2.2	2.1	2.6	3.1	3.1	3.3	3.6	3.1	2.2	1.1	1.0	1.4	1.1	0.6	0.5	3.6																						
18-Dec	1.2	0.8	0.6	-0.3	-5.1	-7.5	-8.6	-9.2	-9.5	-9.9	-10.0	-8.0	-8.0	-8.6	-8.9	-9.7	-10.1	-10.7	-11.2	-11.3	-12.0	-13.6	-14.2	-15.0	-8.3	1.2																						
19-Dec	-16.2	-17.3	-18.4	-19.3	-19.8	-20.5	-21.6	-22.4	-23.6	-24.4	-23.6	-22.3	-20.9	-19.8	-19.2	-19.1	-19.6	-19.9	-20.1	-20.6	-21.7	-22.6	-23.2	-23.9	-20.8	-16.2																						
20-Dec	-24.1	-24.3	-24.7	-25.3	-25.7	-25.9	-25.9	-26.0	-25.9	-25.6	-24.9	-23.9	-22.4	-20.9	-19.3	-20.2	-21.5	-21.7	-21.5	-21.5	-21.7	-22.1	-21.4	-20.5	-23.2	-19.3																						
21-Dec	-19.7	-18.9	-18.2	-18.0	-17.6	-17.1	-16.6	-16.4	-15.9	-15.4	-14.3	-13.7	-12.4	-11.5	-8.7	-7.8	-7.3	-6.1	-6.2	-6.8	-7.7	-7.9	-8.2	-8.5	-12.5	-6.1																						
22-Dec	-9.1	-9.9	-10.3	-10.7	-11.2	-12.0	-10.1	-9.4	-8.1	-8.3	-7.5	-5.9	-5.5	-5.4	-5.8	-6.1	-6.3	-6.6	-6.6	-7.7	-10.9	-13.9	-16.7	-18.3	-9.3	-5.4																						
23-Dec	-20.0	-21.8	-23.2	-23.8	-25.0	-25.9	-27.4	-28.0	-29.5	-30.2	-30.5	-28.5	-27.1	-25.0	-24.5	-24.4	-24.8	-24.9	-24.2	-23.1	-22.5	-22.0	-21.9	-21.4	-25.0	-20.0																						
24-Dec	-21.2	-22.2	-23.8	-25.3	-26.4	-26.7	-27.1	-27.7	-29.2	-30.2	-29.8	-27.1	-26.2	-26.9	-26.7	-27.0	-27.5	-27.9	-27.7	-28.5	-28.5	-29.7	-30.2	-30.6	-27.3	-21.2																						
25-Dec	-30.9	-31.7	-32.4	-33.2	-33.3	-34.4	-33.8	-34.1	-33.6	-34.5	-34.9	-33.2	-32.3	-31.5	-31.0	-31.0	-31.2	-30.6	-30.6	-31.1	-31.6	-32.2	-32.5	-33.2	-32.4	-30.6																						
26-Dec	-33.2	-33.3	-33.6	-33.8	-34.3	-34.6	-35.0	-34.9	-35.0	-35.1	-34.5	-33.7	-32.1	-30.4	-29.1	-28.7	-29.1	-30.0	-30.3	-30.6	-30.9	-31.2	-31.7	-32.3	-32.4	-28.7																						
27-Dec	-32.6	-32.4	-32.3	-32.5	-32.6	-32.9	-32.8	-32.7	-32.2	-32.0	-31.2	-30.1	-28.8	-27.4	-26.5	-26.0	-25.2	-24.6	-25.0	-25.2	-26.2	-27.9	-29.1	-29.7	-29.5	-24.6																						
28-Dec	-30.1	-30.5	-30.6	-31.1	-32.1	-32.5	-32.9	-32.9	-33.2	-33.0	-32.5	-30.1	-29.9	-29.0	-28.5	-28.9	-29.9	-31.1	-31.3	-32.6	-33.8	-34.2	-35.1	-35.5	-31.7	-28.5																						
29-Dec	-36.4	-37.7	-38.7	-38.9	-38.9	-38.5	-37.7	-37.4	-37.4	-37.2	-37.1	-36.0	-34.8	-33.0	-31.6	-30.8	-30.4	-29.9	-29.7	-30.2	-30.5	-30.4	-29.6	-29.0	-34.2	-29.0																						
30-Dec	-28.6	-27.9	-27.6	-27.4	-27.6	-27.8	-28.0	-28.2	-28.2	-28.0	-27.8	-27.3	-26.6	-25.7	-24.7	-24.2	-24.1	-24.3	-24.5	-24.9	-25.2	-26.0	-26.6	-27.2	-26.6	-24.1																						
31-Dec	-27.5	-27.7	-28.5	-29.1	-29.7	-30.1	-30.2	-30.7	-31.4	-31.5	-31.4	-30.1	-28.6	-27.3	-26.8	-26.3	-26.9	-27.2	-27.4	-27.4	-27.0	-26.9	-27.9	-26.9	-28.5	-26.3																						
																								-13.1	-13.3	-13.6	-14.0	-14.3	-14.6	-14.8	-14.8	-14.9	-14.9	-14.7	-13.8	-13.0	-12.3	-11.7	-11.6	-11.8	-11.9	-12.0	-12.4	-12.7	-13.0	-13.4	-13.6	Diurnal Average
																								2.0	2.4	1.9	1.2	1.1	1.5	2.3	3.0	2.5	2.9	3.6	4.0	4.5	4.8	4.5	4.9	4.9	5.2	4.7	4.3	4.0	3.4	2.7	2.5	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 45 m (AT45m) - C**  
**Lower Camp Met Tower - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	263	35.35	35.35
-20 - 0	370	49.73	85.08
0 - 10	111	14.92	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

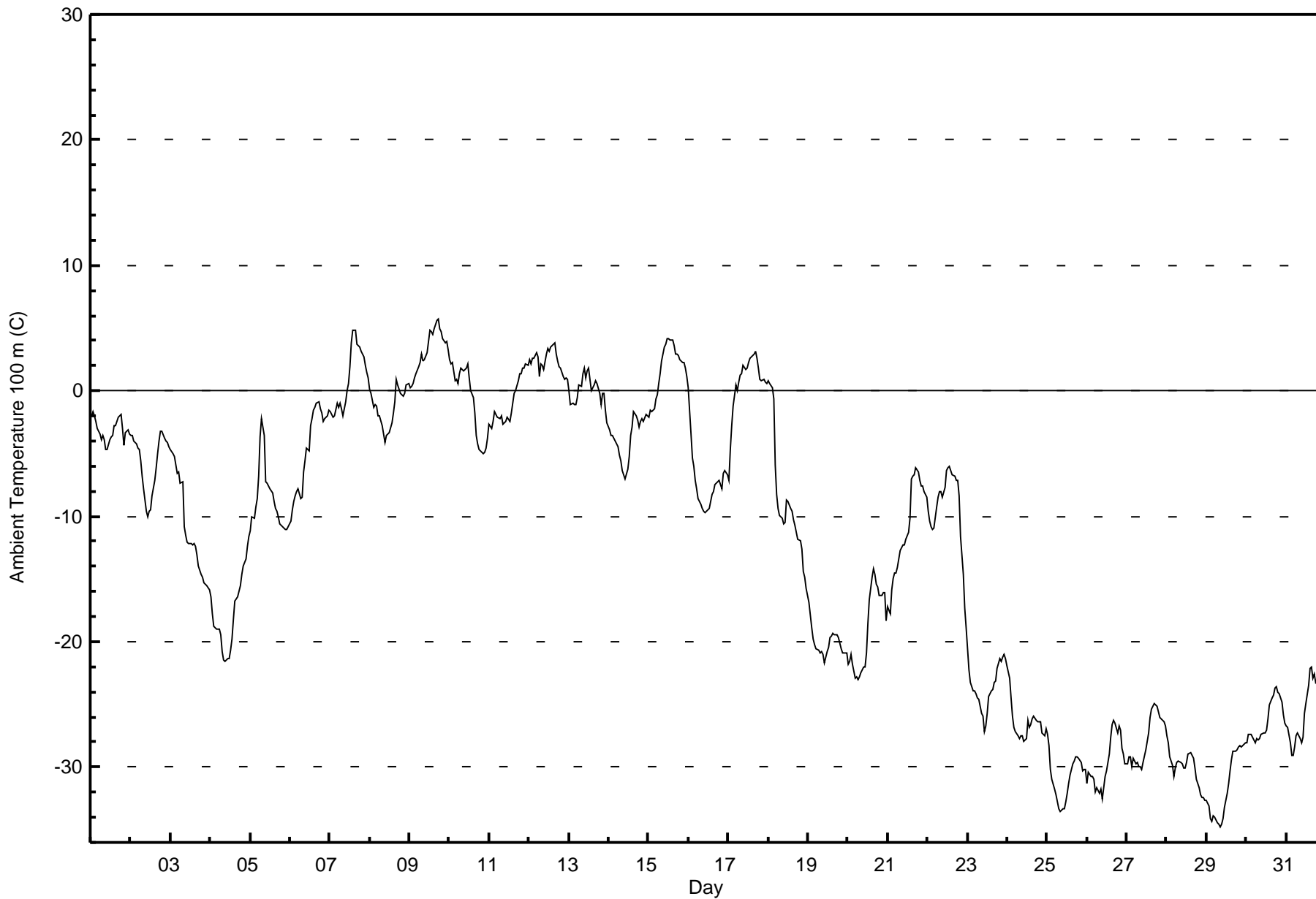


Maximum Value: 5.7 C on Dec 9 18:00		Maximum Daily Average: 3.2 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -34.7 C on Dec 29 09:00		Minimum Daily Average: -31.6 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -10.7 C at hour 17		Minimum Diurnal Average: -13.4 C at hour 10		Hours of Missing Data: 0																																												
Monthly Average: -12.13 C		Percentiles: P <sub>1</sub> = -34.0 P <sub>10</sub> = -29.3 Q <sub>1</sub> = -24.0 Median = -8.8 Q <sub>3</sub> = -1.7 P <sub>90</sub> = 1.8 P <sub>99</sub> = 4.8		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-2.0	-1.7	-2.0	-2.4	-3.1	-3.5	-3.9	-3.5	-3.9	-4.7	-4.6	-3.9	-3.7	-3.6	-2.7	-2.8	-2.1	-2.0	-1.9	-3.0	-4.4	-3.4	-3.1	-3.4	-3.1	-1.7																						
2-Dec	-3.5	-3.6	-4.0	-4.3	-4.5	-4.7	-5.5	-6.8	-7.8	-9.6	-10.1	-9.6	-9.5	-8.4	-7.1	-6.1	-5.0	-4.0	-3.2	-3.2	-3.8	-4.0	-4.1	-4.5	-5.7	-3.2																						
3-Dec	-4.7	-5.0	-5.3	-5.9	-6.6	-6.5	-7.4	-7.2	-10.8	-11.5	-12.0	-12.1	-12.2	-12.2	-12.2	-12.4	-13.0	-13.9	-14.6	-14.9	-15.3	-15.4	-15.5	-15.8	-10.9	-4.7																						
4-Dec	-16.4	-17.8	-18.8	-18.9	-19.0	-19.0	-19.4	-20.8	-21.5	-21.6	-21.4	-21.3	-20.7	-19.8	-18.2	-16.8	-16.5	-16.0	-15.5	-14.7	-13.9	-13.4	-12.4	-11.6	-17.7	-11.6																						
5-Dec	-11.2	-10.1	-10.1	-9.3	-8.6	-6.8	-3.7	-2.2	-3.5	-7.2	-7.4	-7.6	-7.8	-8.2	-8.8	-9.4	-9.6	-10.0	-10.6	-10.8	-11.0	-11.1	-11.0	-10.8	-8.6	-2.2																						
6-Dec	-10.4	-9.5	-8.8	-8.4	-8.0	-7.8	-8.6	-8.5	-6.5	-5.6	-4.5	-4.8	-2.7	-2.2	-1.6	-1.3	-1.0	-0.9	-1.4	-1.7	-2.4	-2.2	-2.0	-1.5	-4.7	-0.9																						
7-Dec	-1.7	-1.9	-2.1	-1.9	-1.0	-1.3	-1.0	-1.5	-2.0	-0.9	0.0	0.6	1.9	3.8	4.8	4.8	3.7	3.7	3.5	3.1	2.7	2.1	1.5	1.0	0.9	4.8																						
8-Dec	0.1	-0.2	-1.3	-1.1	-1.2	-2.0	-2.0	-2.8	-3.4	-4.1	-3.5	-3.4	-3.4	-2.6	-1.7	-0.9	0.9	0.5	-0.2	-0.3	-0.4	-0.2	0.5	0.6	-1.3	0.9																						
9-Dec	0.3	0.4	0.6	1.0	1.4	1.9	2.3	2.9	2.4	2.5	3.1	3.9	4.9	4.8	4.5	4.9	5.6	5.7	5.0	4.7	4.1	3.8	4.0	3.3	3.2	5.7																						
10-Dec	2.4	2.1	2.2	0.8	0.9	0.6	1.3	1.8	1.6	1.7	1.8	2.1	1.0	0.0	-0.6	-1.8	-3.5	-4.2	-4.7	-4.9	-5.0	-4.9	-4.5	-3.8	-0.7	2.4																						
11-Dec	-2.7	-3.0	-2.4	-1.7	-1.9	-2.1	-2.2	-2.0	-2.7	-2.5	-2.4	-2.1	-2.5	-1.8	-1.0	-0.2	0.1	0.8	1.4	1.3	1.8	1.8	2.2	2.0	-0.9	2.2																						
12-Dec	2.5	2.1	2.6	2.6	3.0	2.7	1.1	2.2	2.1	1.7	2.9	3.3	3.1	3.5	3.6	3.9	2.9	2.4	1.9	1.8	1.1	0.9	1.0	0.9	2.3	3.9																						
13-Dec	0.0	-1.1	-1.0	-1.1	-1.1	-0.5	0.5	0.3	1.4	1.8	1.0	1.6	1.8	0.1	0.2	0.4	0.9	0.5	-0.2	-1.0	-0.2	-0.2	-1.5	-2.5	0.0	1.8																						
14-Dec	-3.1	-3.5	-3.6	-3.8	-4.0	-4.4	-5.1	-5.6	-6.4	-6.7	-7.1	-6.3	-5.3	-3.5	-2.9	-1.6	-1.9	-2.3	-2.8	-2.5	-2.2	-2.5	-1.9	-2.0	-3.8	-1.6																						
15-Dec	-2.1	-1.6	-1.7	-1.4	-0.6	-0.3	0.6	1.4	2.4	3.5	3.7	4.2	4.1	4.1	4.1	3.6	3.0	2.9	2.8	2.5	2.2	2.3	1.8	1.1	1.8	4.2																						
16-Dec	0.2	-3.5	-5.3	-6.0	-7.1	-7.8	-8.6	-9.1	-9.4	-9.6	-9.7	-9.6	-9.4	-8.9	-8.3	-8.0	-7.5	-7.3	-7.1	-7.4	-7.8	-6.6	-6.4	-6.7	-7.4	0.2																						
17-Dec	-7.1	-4.6	-2.8	-1.2	0.5	0.0	0.6	1.3	1.3	2.0	1.7	1.8	2.2	2.6	2.7	2.9	3.2	2.6	1.8	0.9	0.8	0.9	0.7	0.6	0.6	3.2																						
18-Dec	0.8	0.6	0.3	-0.7	-5.9	-8.3	-9.3	-10.0	-10.2	-10.6	-10.4	-8.7	-8.8	-9.3	-9.6	-10.3	-10.7	-11.3	-11.8	-12.0	-12.7	-14.4	-14.9	-15.7	-8.9	0.8																						
19-Dec	-16.9	-17.8	-18.9	-19.8	-20.2	-20.6	-20.7	-20.9	-20.8	-21.1	-21.6	-20.8	-20.4	-19.7	-19.5	-19.4	-19.4	-19.4	-19.6	-20.1	-20.6	-20.9	-20.9	-20.9	-20.0	-16.9																						
20-Dec	-21.8	-21.6	-21.0	-21.8	-22.9	-22.8	-23.0	-22.8	-22.4	-22.1	-22.0	-21.0	-18.6	-16.7	-14.8	-14.1	-14.6	-15.4	-15.7	-16.3	-16.3	-16.1	-16.1	-18.3	-19.1	-14.1																						
21-Dec	-17.2	-17.7	-15.8	-15.0	-14.5	-14.5	-14.1	-12.7	-12.5	-12.3	-12.2	-11.8	-11.3	-10.1	-7.1	-6.8	-6.7	-6.1	-6.4	-7.1	-7.6	-7.6	-8.0	-8.4	-11.0	-6.1																						
22-Dec	-9.6	-10.4	-10.8	-11.1	-11.0	-9.3	-8.5	-8.1	-8.0	-8.5	-7.7	-6.3	-6.1	-6.0	-6.4	-6.7	-6.8	-7.1	-7.2	-8.3	-11.6	-14.7	-17.3	-18.9	-9.4	-6.0																						
23-Dec	-20.5	-22.3	-23.2	-24.0	-23.9	-24.1	-24.5	-24.5	-25.7	-25.9	-27.1	-26.7	-25.7	-24.4	-23.9	-23.8	-23.2	-23.1	-22.1	-21.4	-21.6	-21.3	-21.0	-21.3	-23.6	-20.5																						
24-Dec	-21.9	-22.9	-24.4	-25.9	-26.8	-27.2	-27.5	-27.8	-27.5	-27.5	-28.0	-27.8	-26.3	-26.9	-26.6	-26.1	-25.9	-26.2	-26.4	-26.3	-26.4	-27.3	-27.6	-26.9	-26.4	-21.9																						
25-Dec	-27.3	-28.3	-30.1	-31.0	-31.7	-32.2	-32.7	-33.4	-33.5	-33.3	-33.3	-32.7	-32.0	-31.3	-30.6	-29.8	-29.5	-29.2	-29.2	-29.3	-29.6	-30.3	-30.2	-30.2	-30.9	-27.3																						
26-Dec	-31.3	-30.4	-30.7	-30.8	-30.9	-32.0	-31.6	-32.1	-31.7	-32.5	-31.6	-30.8	-30.3	-29.0	-27.6	-26.6	-26.2	-26.5	-27.3	-26.8	-27.0	-28.5	-28.9	-29.7	-29.6	-26.2																						
27-Dec	-29.8	-29.2	-29.2	-29.9	-29.3	-29.7	-29.7	-29.9	-30.0	-30.1	-29.6	-28.6	-27.9	-27.3	-26.1	-25.4	-24.9	-25.0	-25.2	-25.6	-26.0	-26.1	-26.4	-26.8	-27.8	-24.9																						
28-Dec	-27.5	-28.1	-29.2	-29.9	-30.7	-30.1	-29.6	-29.5	-29.6	-29.7	-30.1	-30.1	-29.6	-28.9	-28.9	-29.0	-29.3	-30.0	-31.0	-31.6	-32.2	-32.5	-32.5	-32.6	-30.1	-27.5																						
29-Dec	-32.7	-33.0	-34.1	-34.3	-33.9	-34.0	-34.4	-34.6	-34.7	-34.6	-34.1	-33.2	-32.1	-31.3	-30.3	-29.4	-28.7	-28.7	-28.6	-28.4	-28.3	-28.4	-28.3	-28.1	-31.6	-28.1																						
30-Dec	-28.1	-27.4	-27.4	-27.4	-27.9	-28.1	-27.8	-27.8	-27.7	-27.4	-27.3	-27.3	-27.1	-26.1	-25.1	-24.4	-24.2	-23.7	-23.6	-24.0	-24.1	-24.8	-25.8	-26.5	-26.3	-23.6																						
31-Dec	-26.7	-26.9	-28.0	-29.0	-29.1	-28.3	-27.5	-27.3	-27.7	-28.1	-27.6	-25.7	-24.9	-23.5	-22.1	-22.0	-22.9	-22.5	-23.2	-22.9	-22.3	-22.4	-23.0	-23.2	-25.3	-22.0																						
																								-11.9	-12.2	-12.5	-12.7	-12.9	-13.0	-13.0	-12.9	-13.2	-13.4	-13.3	-12.7	-12.2	-11.7	-11.1	-10.8	-10.7	-10.8	-11.1	-11.3	-11.6	-11.8	-12.0	-12.3	Diurnal Average
																								2.5	2.1	2.6	2.6	3.0	2.7	2.3	2.9	2.4	3.5	3.7	4.2	4.9	4.8	4.8	4.9	5.6	5.7	5.0	4.7	4.1	3.8	4.0	3.3	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 100 m (AT100m) - C**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 100 m (AT100m) - C  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	248	33.33	33.33
-20 - 0	353	47.45	80.78
0 - 10	143	19.22	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature 167 m (AT167m) - C**

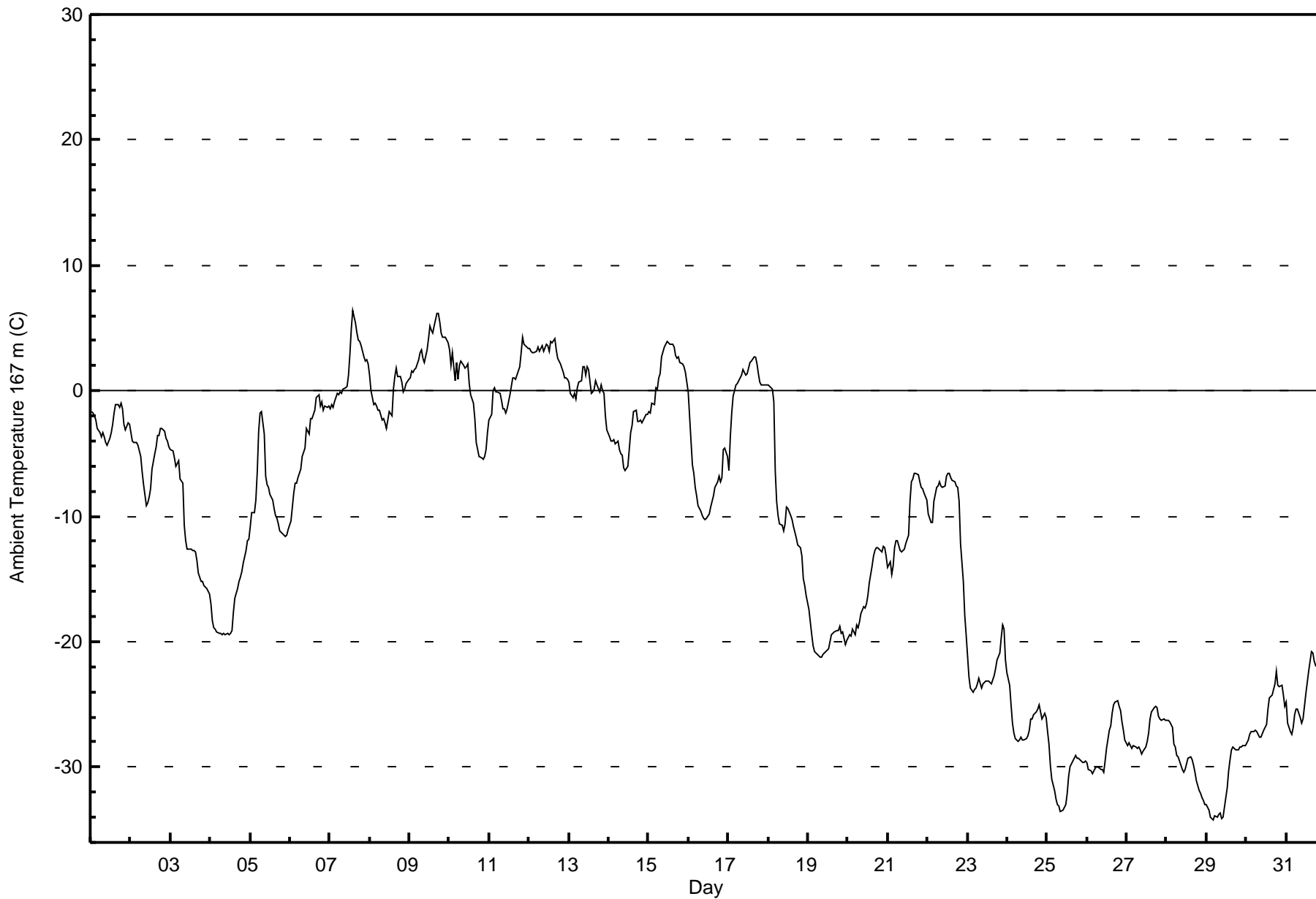
**Lower Camp Met Tower - December 2017**

Maximum Value: 6.4 C on Dec 7 15:00		Maximum Daily Average: 3.6 C on Dec 9		Hours in Service: 744																							
Minimum Value: -34.2 C on Dec 29 05:00		Minimum Daily Average: -31.4 C on Dec 29		Hours of Data: 744																							
Maximum Diurnal Average: -10.4 C at hour 17		Minimum Diurnal Average: -12.7 C at hour 10		Hours of Missing Data: 0																							
Monthly Average: -11.61 C		Percentiles: P <sub>1</sub> = -33.8 P <sub>10</sub> = -28.5 Q <sub>1</sub> = -23.4 Median = -8.8 Q <sub>3</sub> = -1.0 P <sub>90</sub> = 2.3 P <sub>99</sub> = 5.2		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-1.6	-1.7	-2.0	-2.3	-3.0	-3.3	-3.6	-3.3	-3.6	-4.1	-4.3	-3.8	-3.3	-2.7	-1.8	-1.1	-1.2	-1.3	-1.0	-1.4	-2.7	-3.1	-2.6	-2.7	-2.6	-1.0	
2-Dec	-3.4	-4.0	-4.2	-4.2	-4.3	-4.8	-5.2	-6.4	-7.5	-9.2	-9.0	-8.5	-7.8	-6.3	-5.1	-4.5	-3.6	-3.6	-3.0	-3.0	-3.3	-3.8	-4.0	-4.4	-5.1	-3.0	
3-Dec	-4.7	-4.8	-5.4	-6.0	-5.8	-5.6	-7.1	-7.3	-10.8	-11.9	-12.6	-12.6	-12.7	-12.7	-12.7	-12.9	-13.6	-14.5	-15.2	-15.2	-15.5	-15.7	-15.7	-16.2	-11.1	-4.7	
4-Dec	-17.0	-18.3	-18.9	-19.0	-19.2	-19.4	-19.3	-19.4	-19.4	-19.5	-19.3	-19.4	-19.3	-19.1	-17.7	-16.5	-15.8	-15.1	-14.9	-14.4	-13.7	-12.8	-11.9	-11.8	-17.1	-11.8	
5-Dec	-10.9	-9.7	-9.7	-8.8	-6.5	-3.2	-1.7	-1.7	-3.5	-6.8	-7.4	-7.8	-8.3	-8.7	-9.4	-9.9	-10.2	-10.6	-11.1	-11.4	-11.5	-11.6	-11.5	-11.1	-8.4	-1.7	
6-Dec	-10.3	-9.3	-8.1	-7.4	-7.4	-6.9	-6.3	-5.2	-4.9	-4.5	-3.0	-3.4	-2.3	-2.2	-1.8	-1.5	-0.6	-0.3	-1.2	-0.8	-1.6	-1.2	-1.3	-1.2	-3.9	-0.3	
7-Dec	-1.4	-1.1	-1.3	-0.9	-0.2	-0.3	-0.1	-0.2	0.1	0.2	0.3	1.3	2.9	5.0	6.4	5.4	4.6	4.0	3.9	3.6	2.8	2.3	2.5	2.1	1.8	6.4	
8-Dec	1.3	0.0	-1.1	-0.9	-1.2	-1.5	-1.5	-2.3	-2.2	-2.6	-3.0	-2.4	-1.7	-2.0	0.2	1.1	1.8	1.2	1.1	0.6	0.0	0.1	0.6	0.9	-0.6	1.8	
9-Dec	1.0	1.5	1.5	1.7	1.8	2.5	3.0	3.2	2.6	2.3	3.3	4.1	5.2	4.9	4.6	5.2	6.2	6.2	5.4	4.6	4.3	4.2	4.1	3.8	3.6	6.2	
10-Dec	3.2	2.1	3.1	0.8	2.3	0.9	2.0	2.4	2.0	1.8	1.9	2.1	0.6	-0.3	-1.0	-2.2	-4.1	-4.7	-5.2	-5.4	-5.4	-5.2	-4.7	-3.3	-0.7	3.2	
11-Dec	-2.3	-1.8	0.1	0.3	-0.1	-0.1	-0.2	-0.8	-1.5	-1.4	-1.8	-1.5	-0.3	0.3	1.0	1.0	0.9	1.6	1.9	3.0	4.3	3.7	3.6	3.4	0.6	4.3	
12-Dec	3.4	3.1	3.1	3.1	3.1	3.5	3.1	3.3	3.6	3.2	3.7	3.6	3.2	3.9	3.9	4.1	3.3	2.6	2.4	2.1	1.5	1.0	1.0	0.9	2.9	4.1	
13-Dec	0.7	-0.2	-0.5	-0.2	-0.6	0.2	0.7	0.8	1.9	1.9	1.2	1.9	1.7	-0.3	-0.1	0.1	0.8	0.5	-0.1	0.5	0.0	-0.2	-2.0	-3.1	0.2	1.9	
14-Dec	-3.7	-4.0	-4.0	-3.9	-4.2	-4.0	-4.7	-5.0	-5.1	-6.1	-6.4	-6.1	-4.6	-3.3	-2.8	-1.6	-1.6	-2.4	-2.4	-2.3	-2.6	-2.3	-1.9	-1.8	-3.6	-1.6	
15-Dec	-1.7	-1.7	-1.0	-1.1	0.2	0.1	1.0	1.4	2.7	3.5	3.7	4.0	3.9	3.8	3.7	3.5	2.8	2.6	2.7	2.3	2.1	1.9	1.4	0.7	1.8	4.0	
16-Dec	0.0	-4.0	-5.9	-6.6	-7.7	-8.3	-9.2	-9.6	-10.0	-10.1	-10.3	-10.2	-9.8	-9.3	-8.8	-8.4	-7.7	-7.3	-6.8	-7.2	-6.9	-4.6	-4.5	-5.2	-7.4	0.0	
17-Dec	-6.3	-3.7	-1.8	-0.5	0.4	0.6	0.8	1.0	1.2	1.7	1.3	1.3	1.8	2.3	2.4	2.7	2.7	2.2	1.4	0.6	0.4	0.5	0.4	0.4	0.6	2.7	
18-Dec	0.5	0.3	0.2	-0.9	-6.4	-8.8	-10.0	-10.6	-10.8	-11.1	-10.6	-9.2	-9.4	-9.9	-10.2	-10.8	-11.2	-11.8	-12.3	-12.5	-13.2	-14.9	-15.5	-16.3	-9.4	0.5	
19-Dec	-17.5	-18.4	-19.4	-20.3	-20.8	-20.9	-21.1	-21.2	-21.2	-21.0	-20.9	-20.7	-20.6	-20.1	-19.4	-19.4	-19.2	-19.1	-19.1	-18.8	-19.3	-19.2	-20.2	-19.9	-19.9	-17.5	
20-Dec	-19.7	-19.5	-19.6	-19.0	-19.5	-18.7	-18.9	-18.4	-17.8	-17.2	-17.3	-16.9	-16.4	-15.3	-14.0	-13.2	-12.8	-12.5	-12.5	-12.7	-12.9	-12.5	-12.6	-13.1	-15.9	-12.5	
21-Dec	-14.0	-13.7	-14.6	-13.9	-12.5	-12.0	-12.0	-12.8	-12.9	-12.8	-12.6	-12.2	-11.5	-8.8	-7.2	-7.0	-6.6	-6.5	-6.7	-7.2	-7.7	-7.8	-8.2	-8.7	-10.4	-6.5	
22-Dec	-9.9	-10.2	-10.5	-10.4	-8.8	-7.7	-7.6	-7.3	-7.6	-7.7	-7.6	-6.7	-6.6	-6.6	-6.9	-7.1	-7.2	-7.6	-7.6	-8.8	-12.2	-15.2	-17.8	-19.5	-9.4	-6.6	
23-Dec	-21.1	-22.8	-23.6	-24.0	-23.8	-23.7	-23.4	-22.9	-23.7	-23.4	-23.2	-23.1	-23.2	-23.2	-23.3	-23.0	-22.6	-22.1	-21.4	-20.9	-19.7	-18.6	-19.0	-21.4	-22.4	-18.6	
24-Dec	-22.4	-23.4	-25.0	-26.4	-27.3	-27.7	-27.9	-27.9	-27.6	-27.8	-27.9	-27.7	-27.5	-27.1	-26.1	-26.2	-25.9	-25.6	-25.3	-25.0	-25.6	-26.1	-25.7	-26.1	-26.3	-22.4	
25-Dec	-27.2	-28.2	-29.9	-30.9	-31.9	-32.5	-33.0	-33.0	-33.5	-33.5	-33.2	-33.0	-32.1	-30.7	-30.0	-29.5	-29.3	-29.1	-29.3	-29.3	-29.5	-29.6	-29.6	-29.5	-30.7	-27.2	
26-Dec	-29.6	-30.2	-30.3	-30.5	-30.3	-30.1	-30.0	-30.1	-30.2	-30.2	-30.4	-29.6	-28.5	-27.0	-26.7	-25.7	-25.0	-24.8	-24.7	-25.2	-25.5	-26.3	-27.1	-27.8	-28.1	-24.7	
27-Dec	-28.2	-28.0	-28.2	-28.5	-28.3	-28.4	-28.5	-28.4	-28.7	-28.9	-28.7	-28.4	-28.0	-27.3	-26.1	-25.6	-25.3	-25.2	-25.3	-25.9	-26.1	-26.2	-26.2	-26.3	-27.3	-25.2	
28-Dec	-26.2	-26.3	-26.4	-26.8	-28.1	-28.4	-29.0	-29.2	-29.8	-30.1	-30.4	-30.2	-29.7	-29.3	-29.2	-29.4	-29.8	-30.4	-31.1	-31.9	-32.1	-32.4	-32.6	-33.0	-29.7	-26.2	
29-Dec	-33.0	-33.4	-34.0	-34.1	-34.2	-33.9	-33.9	-33.8	-33.7	-34.1	-34.0	-33.2	-31.7	-30.3	-29.5	-28.6	-28.4	-28.6	-28.7	-28.6	-28.4	-28.3	-28.3	-28.2	-31.4	-28.2	
30-Dec	-28.1	-27.8	-27.4	-27.2	-27.2	-27.1	-27.1	-27.4	-27.6	-27.6	-27.1	-26.9	-26.6	-25.3	-24.5	-24.2	-23.8	-23.4	-22.3	-23.4	-23.5	-23.4	-24.2	-25.2	-25.8	-22.3	
31-Dec	-24.9	-26.4	-27.2	-27.4	-26.9	-25.9	-25.4	-25.4	-26.1	-26.5	-26.1	-25.2	-24.2	-22.3	-21.6	-20.8	-20.9	-21.6	-21.9	-21.7	-21.7	-21.8	-22.4	-22.6	-24.0	-20.8	
		-11.5	-11.8	-12.0	-12.1	-12.2	-12.1	-12.1	-12.2	-12.4	-12.7	-12.6	-12.3	-11.8	-11.3	-10.8	-10.5	-10.4	-10.6	-10.7	-10.8	-11.1	-11.3	-11.5	-11.8	Diurnal Average	
		3.4	3.1	3.1	3.1	3.1	3.5	3.1	3.3	3.6	3.5	3.7	4.1	5.2	5.0	6.4	5.4	6.2	6.2	5.4	4.6	4.3	4.2	4.1	3.8	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 167 m (AT167m) - C**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 167 m (AT167m) - C  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	225	30.24	30.24
-20 - 0	361	48.52	78.76
0 - 10	158	21.24	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 20m (RH20m) - %**

**Lower Camp Met Tower - December 2017**

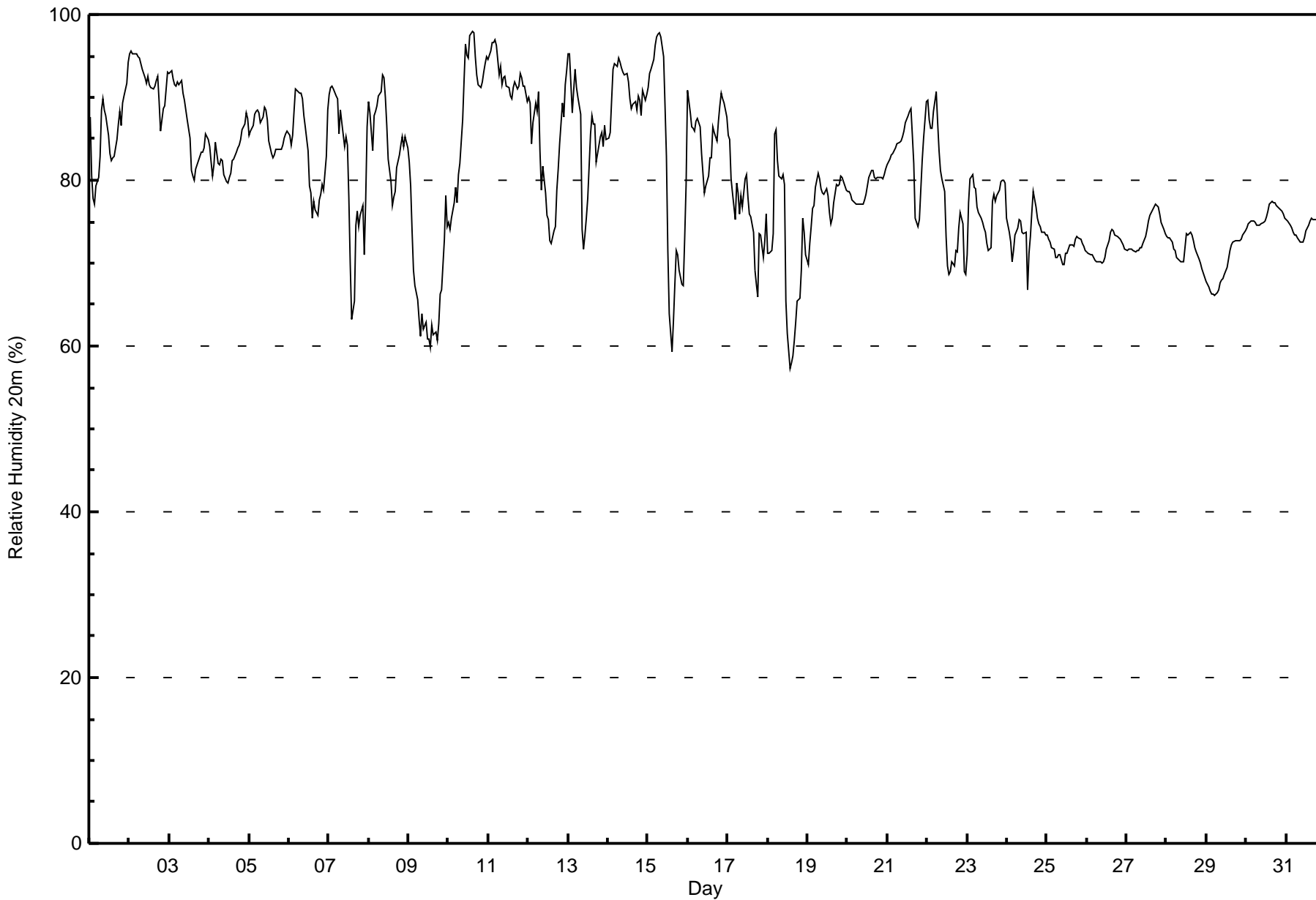
Maximum Value: 98 % on Dec 10 15:00      Maximum Daily Average: 92.7 % on Dec 11																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 57 % on Dec 18 14:00      Minimum Daily Average: 66.6 % on Dec 9 Maximum Diurnal Average: 82.3 % at hour 6      Minimum Diurnal Average: 77.0 % at hour 15 Monthly Average: 80.1 %      Percentiles: P <sub>1</sub> = 61 P <sub>10</sub> = 70 Q <sub>1</sub> = 73 Median = 79 O <sub>3</sub> = 87 P <sub>90</sub> = 91 P <sub>99</sub> = 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-Dec	88	81	78	77	79	80	83	89	90	88	88	85	83	82	83	83	85	87	88	87	89	90	92	94	85.4	94
2-Dec	95	96	95	95	95	95	95	94	93	92	92	93	92	91	91	91	92	93	89	86	89	89	91	93	92.4	96
3-Dec	93	93	92	91	91	92	91	92	91	90	88	87	85	81	81	80	81	82	83	83	83	84	86	85	86.9	93
4-Dec	84	82	81	82	85	82	82	82	82	81	80	80	80	81	82	82	83	84	84	85	86	87	88	88	83.0	88
5-Dec	85	86	87	88	88	88	88	87	88	89	88	87	85	83	83	83	84	84	84	84	84	85	86	86	85.8	89
6-Dec	85	84	86	88	91	91	91	91	90	88	87	84	79	79	75	77	76	76	78	78	79	79	83	88	83.4	91
7-Dec	90	91	91	91	90	90	86	88	87	84	85	84	78	70	63	65	75	76	74	76	77	71	78	86	81.2	91
8-Dec	89	88	84	88	88	89	90	91	93	92	90	87	83	80	77	78	79	81	83	84	85	84	85	84	85.5	93
9-Dec	82	79	74	69	67	66	63	61	64	62	63	61	61	60	63	61	62	61	63	66	67	73	78	74	66.6	82
10-Dec	75	74	75	77	79	77	81	82	87	92	96	95	95	97	98	98	95	93	91	91	92	93	94	95	88.5	98
11-Dec	95	96	97	97	97	96	93	94	92	92	93	91	91	90	90	91	92	91	91	93	92	91	91	89	92.7	97
12-Dec	90	89	84	87	89	88	91	84	79	82	78	76	75	73	72	74	74	79	81	84	89	88	92	93	83.0	93
13-Dec	95	95	88	91	93	91	90	88	74	72	73	75	78	86	88	87	87	82	84	85	86	84	87	85	85.2	95
14-Dec	85	86	90	93	94	94	95	94	94	93	93	93	92	90	89	89	89	89	90	90	88	91	90	90	90.8	95
15-Dec	91	93	93	95	96	97	98	98	97	95	89	83	71	64	59	63	67	72	71	69	67	67	73	80	81.2	98
16-Dec	91	88	87	86	86	87	87	86	83	81	79	79	81	83	83	86	86	85	87	89	91	90	89	88	85.7	91
17-Dec	85	85	80	78	75	80	78	76	78	77	80	81	78	76	76	74	69	67	66	74	73	71	73	76	76.1	85
18-Dec	71	71	72	73	86	86	82	80	80	81	79	65	61	57	58	59	61	63	66	66	69	75	74	71	71.1	86
19-Dec	70	72	74	77	77	79	81	80	79	78	78	79	78	76	75	75	77	80	79	80	80	80	79	79	77.7	81
20-Dec	79	79	78	78	77	77	77	77	77	77	78	78	79	80	81	81	80	80	80	80	80	80	81	81	79.1	81
21-Dec	82	83	83	83	84	84	84	85	85	85	86	87	88	88	89	85	82	75	74	75	79	82	85	90	83.5	90
22-Dec	90	87	86	86	88	91	87	84	81	80	79	73	70	69	69	70	70	72	71	74	76	75	69	69	77.7	91
23-Dec	71	77	80	81	79	79	77	76	75	75	74	74	72	72	72	77	78	77	78	79	80	80	80	80	76.8	81
24-Dec	75	74	73	70	71	73	74	75	75	74	74	74	67	71	73	76	79	77	75	75	74	74	74	73	73.8	79
25-Dec	73	73	73	72	72	71	71	71	71	70	70	71	71	72	72	72	72	73	73	73	73	72	72	72	71.8	73
26-Dec	71	71	71	71	71	70	70	70	70	70	70	71	72	73	74	74	74	73	73	73	73	73	72	72	71.7	74
27-Dec	71	72	72	72	72	71	71	72	72	72	72	73	74	75	76	76	77	77	77	77	76	75	74	74	73.7	77
28-Dec	73	73	73	73	72	71	71	70	70	70	70	72	74	73	74	73	73	72	71	71	70	69	69	68	71.5	74
29-Dec	68	67	67	66	66	66	66	67	68	68	68	69	69	71	71	72	73	73	73	73	73	73	73	74	69.7	74
30-Dec	74	75	75	75	75	75	75	75	75	75	75	75	76	76	77	77	77	77	77	77	77	76	76	75	75.7	77
31-Dec	75	75	75	74	74	73	73	73	73	72	72	73	74	75	75	75	75	75	75	75	75	75	75	75	74.3	75
	82.1	81.8	81.0	81.5	82.2	82.3	82.0	81.7	81.0	80.6	80.3	79.2	77.8	77.2	77.0	77.7	78.2	78.2	78.5	79.1	79.8	79.9	80.9	81.5	Diurnal Average	
	95	96	97	97	97	97	98	98	97	95	96	95	95	97	98	98	95	93	91	93	92	93	94	95	Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 20m (RH20m) - %**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity 20m (RH20m) - %  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	5	0.67	0.67
60 - 80	384	51.61	52.28
80 - 100	355	47.72	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity 45m (RH45m) - %**

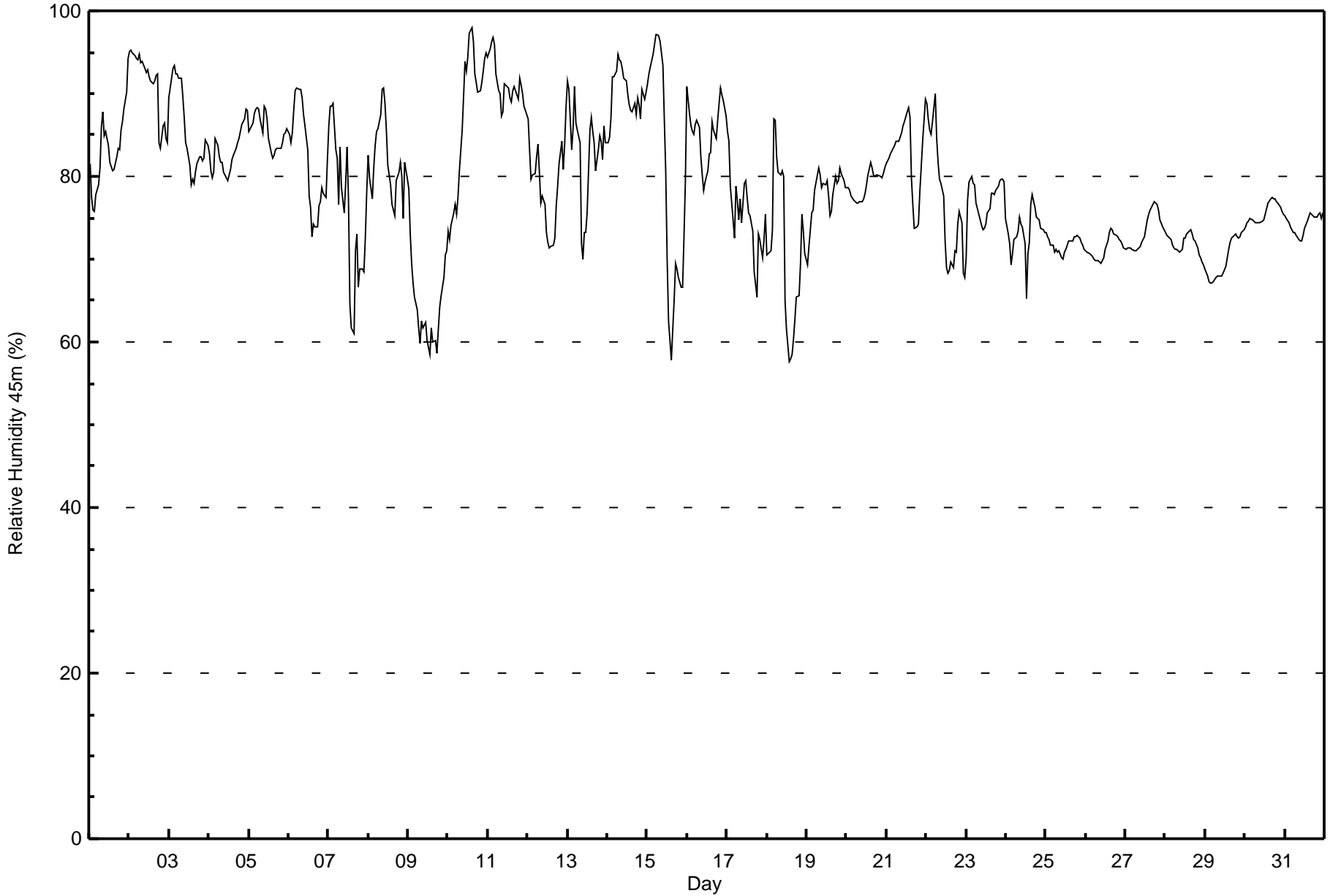
**Lower Camp Met Tower - December 2017**

Maximum Value: 98 % on Dec 10 15:00																	Maximum Daily Average: 91.2 % on Dec 2																	Hours in Service: 744	
Minimum Value: 58 % on Dec 18 14:00																	Minimum Daily Average: 64.4 % on Dec 9																	Hours of Data: 744	
Maximum Diurnal Average: 81.2 % at hour 6																	Minimum Diurnal Average: 76.6 % at hour 15																	Hours of Missing Data: 0	
Monthly Average: 79.0 %																	Percentiles: P <sub>1</sub> = 60 P <sub>10</sub> = 70 Q <sub>1</sub> = 73 Median = 79 O <sub>3</sub> = 85 P <sub>90</sub> = 91 P <sub>99</sub> = 96																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	82	77	76	76	78	79	81	86	88	85	85	84	82	81	81	81	82	83	83	86	87	88	90	94	83.1	94									
2-Dec	95	95	95	95	94	94	95	94	94	94	93	93	93	92	91	91	91	92	92	84	83	86	86	85	84	91.2	95								
3-Dec	90	92	93	93	92	92	92	92	90	87	84	83	81	79	80	79	80	82	82	82	82	84	84	84	85.8	93									
4-Dec	83	81	80	81	85	84	82	82	82	80	80	80	81	82	83	83	84	85	85	86	86	87	88	88	82.9	88									
5-Dec	85	86	86	88	88	88	88	87	85	88	88	87	85	83	82	83	83	83	83	83	84	85	85	86	85.5	88									
6-Dec	85	84	85	88	90	91	90	90	89	88	86	83	78	76	73	74	74	74	76	77	79	78	77	82	82.0	91									
7-Dec	86	89	89	89	83	82	77	84	79	76	79	83	77	65	62	61	71	73	67	69	69	68	72	78	76.1	89									
8-Dec	83	80	77	81	84	85	86	87	91	91	89	86	81	79	77	76	75	80	81	82	80	75	82	80	81.9	91									
9-Dec	78	73	69	67	65	64	62	60	63	62	62	60	59	59	62	60	60	59	62	64	66	68	71	71	64.4	78									
10-Dec	73	72	74	76	77	75	78	81	86	90	94	93	94	97	98	96	92	91	90	90	91	93	94	95	87.1	98									
11-Dec	94	95	96	97	96	92	90	90	87	88	91	91	91	89	89	90	91	90	89	92	91	90	88	88	91.1	97									
12-Dec	87	83	80	80	80	82	84	80	77	78	77	73	72	71	71	72	73	77	79	81	84	81	84	89	79.0	89									
13-Dec	92	91	83	86	91	86	86	84	72	70	73	73	76	86	87	85	84	81	83	85	84	82	86	84	82.9	92									
14-Dec	84	85	87	92	92	93	95	94	94	93	92	92	90	89	88	88	89	88	89	89	87	90	89	90	89.9	95									
15-Dec	91	92	93	95	96	97	97	97	96	93	87	80	70	62	58	62	65	70	69	68	67	67	73	80	80.2	97									
16-Dec	91	88	86	85	85	86	87	86	82	80	78	79	81	83	83	87	86	85	87	89	91	90	89	87	85.4	91									
17-Dec	85	84	79	77	73	79	77	75	77	74	79	80	77	76	75	73	68	67	65	73	72	70	72	75	75.2	85									
18-Dec	71	71	71	74	87	87	82	81	80	81	80	65	62	58	58	59	60	63	65	66	69	75	73	71	71.1	87									
19-Dec	69	72	73	76	76	78	80	81	80	79	79	79	80	78	75	76	78	80	79	79	81	80	79	79	77.8	81									
20-Dec	79	79	78	78	77	77	77	77	77	77	77	78	79	80	82	81	80	80	80	80	80	80	80	81	78.9	82									
21-Dec	82	82	83	83	83	84	84	84	85	85	86	87	88	88	87	80	77	74	74	74	78	81	84	89	82.6	89									
22-Dec	89	87	86	85	87	90	85	82	80	79	78	72	69	68	69	70	69	71	71	74	76	74	68	68	76.9	90									
23-Dec	70	77	79	80	79	79	77	76	75	74	74	74	74	76	76	78	78	78	78	79	79	80	80	79	77.0	80									
24-Dec	75	73	72	69	71	72	73	73	75	74	74	72	65	71	72	77	78	76	75	75	75	74	74	73	73.2	78									
25-Dec	73	73	72	72	72	71	71	71	71	70	70	71	71	72	72	72	72	73	73	73	72	72	72	71	71.8	73									
26-Dec	71	71	71	71	70	70	70	70	70	70	70	70	71	72	73	74	74	73	73	73	72	72	72	71	71.4	74									
27-Dec	71	71	71	71	71	71	71	71	71	72	72	73	74	75	75	76	77	77	77	77	76	75	74	73	73.4	77									
28-Dec	73	73	73	72	72	71	71	71	71	71	71	73	73	73	73	74	73	72	72	71	71	70	69	71.8	74										
29-Dec	69	68	67	67	67	67	68	68	68	68	68	68	69	70	71	72	72	73	73	73	73	73	74	74	70.0	74									
30-Dec	74	74	75	75	75	75	74	74	74	74	75	75	75	76	77	77	77	77	77	77	76	76	75	75.5	77										
31-Dec	75	75	74	74	74	73	73	73	72	72	72	73	74	75	75	76	75	75	75	75	75	76	75	76	74.3	76									
80.8																	80.4																	Diurnal Average	
95																	96																	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 45m (RH45m) - %**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity 45m (RH45m) - %  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	9	1.21	1.21
60 - 80	413	55.51	56.72
80 - 100	322	43.28	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity 100m (RH100m) - %**

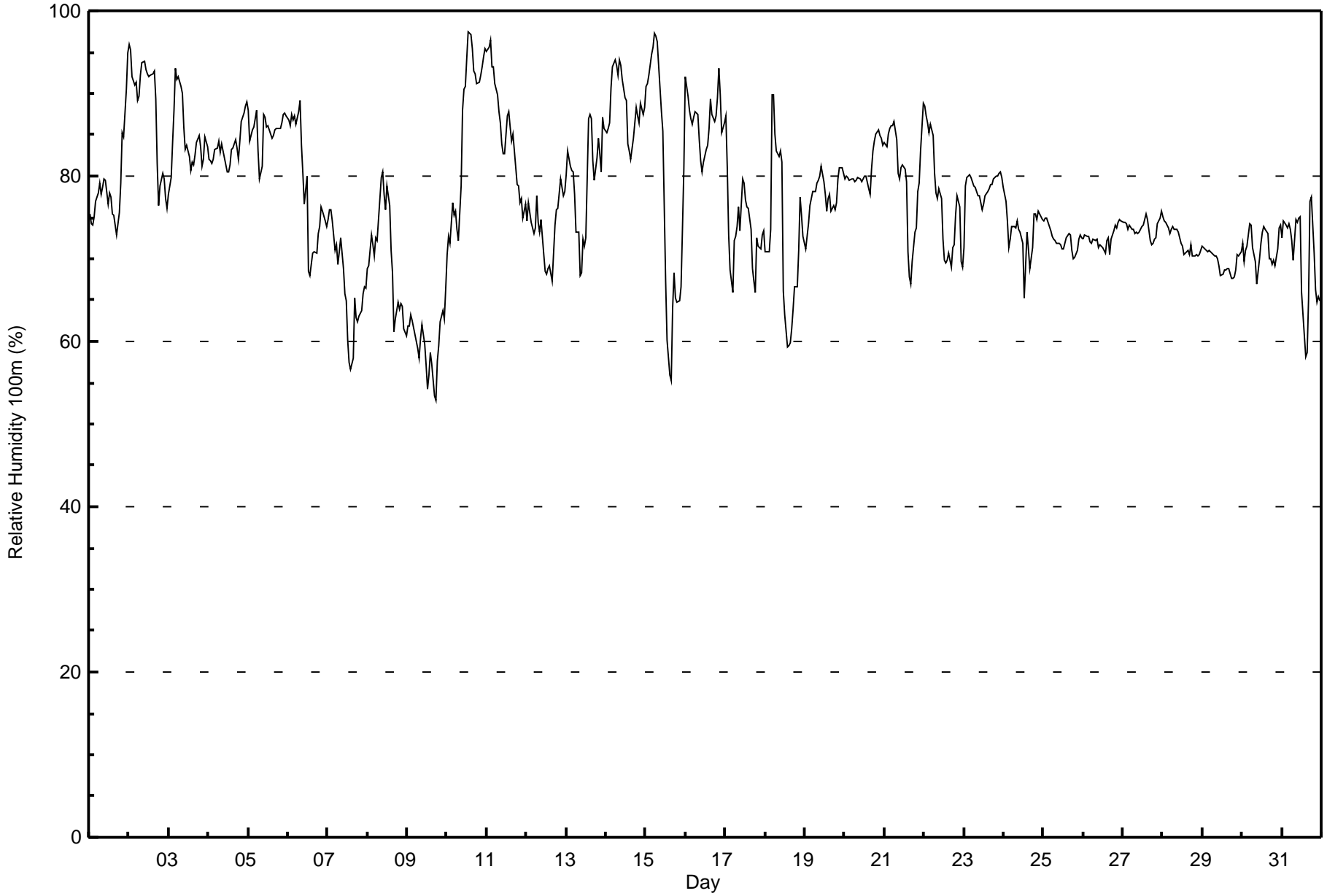
**Lower Camp Met Tower - December 2017**

Maximum Value: 97 % on Dec 10 14:00																		Maximum Daily Average: 88.5 % on Dec 14																		Hours in Service: 744							
Minimum Value: 53 % on Dec 9 18:00																		Minimum Daily Average: 59.7 % on Dec 9																		Hours of Data: 744							
Maximum Diurnal Average: 79.7 % at hour 6																		Minimum Diurnal Average: 74.0 % at hour 17																		Hours of Missing Data: 0							
Monthly Average: 77.1 %																		Percentiles: P <sub>1</sub> = 57 P <sub>10</sub> = 67 Q <sub>1</sub> = 71 Median = 76 O <sub>3</sub> = 84 P <sub>90</sub> = 89 P <sub>99</sub> = 96																		Hours of Calibration: 0							
																																				Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																			
1-Dec	75	74	74	75	77	78	79	78	79	80	79	77	78	77	75	75	73	74	76	79	85	85	90	95	78.7	95																	
2-Dec	96	95	92	91	91	89	90	92	94	94	93	92	92	92	92	93	89	82	76	79	80	80	77	76	88.3	96																	
3-Dec	78	80	84	88	93	92	92	91	90	86	83	84	82	81	82	81	83	84	85	84	81	82	85	84	84.7	93																	
4-Dec	82	82	82	82	83	83	84	83	84	83	81	80	81	81	83	83	84	83	82	84	87	88	89	89	83.5	89																	
5-Dec	88	84	86	86	87	88	83	80	81	87	87	86	86	85	85	85	86	86	86	86	86	87	88	87	85.6	88																	
6-Dec	87	86	88	87	87	86	88	89	84	80	77	80	68	68	69	71	71	71	73	74	76	76	75	74	78.5	89																	
7-Dec	75	76	76	75	71	72	69	71	73	69	66	65	60	57	57	58	65	63	62	63	64	66	67	67	66.8	76																	
8-Dec	69	69	73	72	70	73	72	77	80	80	78	76	79	76	71	68	61	63	65	64	65	64	61	61	70.3	80																	
9-Dec	62	62	63	63	62	60	59	58	60	62	60	57	54	56	59	57	53	53	58	59	62	64	63	66	59.7	66																	
10-Dec	71	73	72	77	75	76	74	72	79	88	90	91	94	97	97	96	93	92	91	91	92	93	94	95	86.0	97																	
11-Dec	95	96	96	93	93	91	90	88	86	84	83	83	87	88	86	84	85	81	79	79	77	77	75	77	85.6	96																	
12-Dec	74	77	76	74	73	74	78	74	73	75	70	68	68	69	69	67	71	74	76	76	80	79	78	78	73.8	80																	
13-Dec	80	83	81	81	80	78	73	73	68	68	72	72	73	87	87	87	82	80	82	85	83	80	87	86	79.5	87																	
14-Dec	85	86	87	91	93	94	93	92	94	93	92	89	89	84	83	82	85	86	88	87	86	89	87	88	88.5	94																	
15-Dec	91	91	92	95	96	97	97	96	93	88	85	76	67	60	56	55	64	68	65	65	65	67	74	81	78.6	97																	
16-Dec	92	90	88	87	86	87	88	88	84	82	81	82	83	84	86	89	87	87	87	89	93	90	85	87	86.7	93																	
17-Dec	87	81	73	69	66	72	73	74	76	73	80	79	77	76	76	74	69	67	66	73	72	71	73	73	73.7	87																	
18-Dec	71	71	71	74	90	90	85	83	82	83	82	66	63	59	59	60	61	64	67	67	71	77	75	73	72.7	90																	
19-Dec	71	73	74	77	77	78	78	79	79	80	81	79	78	76	77	78	76	76	76	77	80	81	81	80	77.6	81																	
20-Dec	80	80	80	80	80	80	79	79	80	80	79	80	80	80	78	78	81	83	84	85	86	85	85	84	81.0	86																	
21-Dec	84	84	85	86	86	86	87	84	80	80	81	81	81	79	71	68	67	70	73	74	78	79	83	89	79.8	89																	
22-Dec	89	87	87	85	86	85	80	78	77	78	77	72	70	69	70	71	69	71	72	75	78	76	70	69	76.8	89																	
23-Dec	71	79	80	80	80	79	79	79	78	78	77	76	77	78	78	79	79	80	80	80	80	80	80	80	78.5	80																	
24-Dec	79	77	75	71	72	74	74	74	75	74	73	72	65	69	73	71	69	71	75	75	75	76	75	75	73.3	79																	
25-Dec	75	75	75	74	73	73	72	72	72	72	72	71	71	72	73	73	73	71	70	70	71	72	73	72	72.4	75																	
26-Dec	72	73	73	73	72	72	72	72	72	71	72	72	71	71	72	72	71	72	73	74	74	74	75	75	72.5	75																	
27-Dec	74	74	74	74	74	74	73	73	73	73	73	74	74	75	75	75	72	72	72	72	73	74	75	76	73.7	76																	
28-Dec	75	75	74	74	73	74	74	74	74	73	73	72	72	71	71	71	70	72	70	70	71	70	71	71	72.2	75																	
29-Dec	72	71	71	71	71	71	70	70	70	70	69	68	68	69	69	69	69	68	68	68	69	71	70	71	69.6	72																	
30-Dec	72	70	71	71	74	74	71	71	70	67	70	72	73	74	74	73	70	70	69	70	69	71	74	74	71.4	74																	
31-Dec	72	75	74	74	74	74	72	70	75	74	75	75	66	61	58	59	65	77	77	71	66	65	65	65	69.9	77																	
																		78.8	78.9	78.9	78.9	79.6	79.7	79.0	78.5	78.5	78.2	77.8	76.4	75.1	74.9	74.6	74.2	74.0	74.5	75.0	75.6	76.5	77.1	77.4	77.9	Diurnal Average	
																		96	96	96	95	96	97	97	96	94	94	93	92	94	97	97	96	93	92	91	91	93	93	94	95	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 100m (RH100m) - %**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity 100m (RH100m) - %  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	22	2.96	2.96
60 - 80	464	62.37	65.32
80 - 100	258	34.68	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



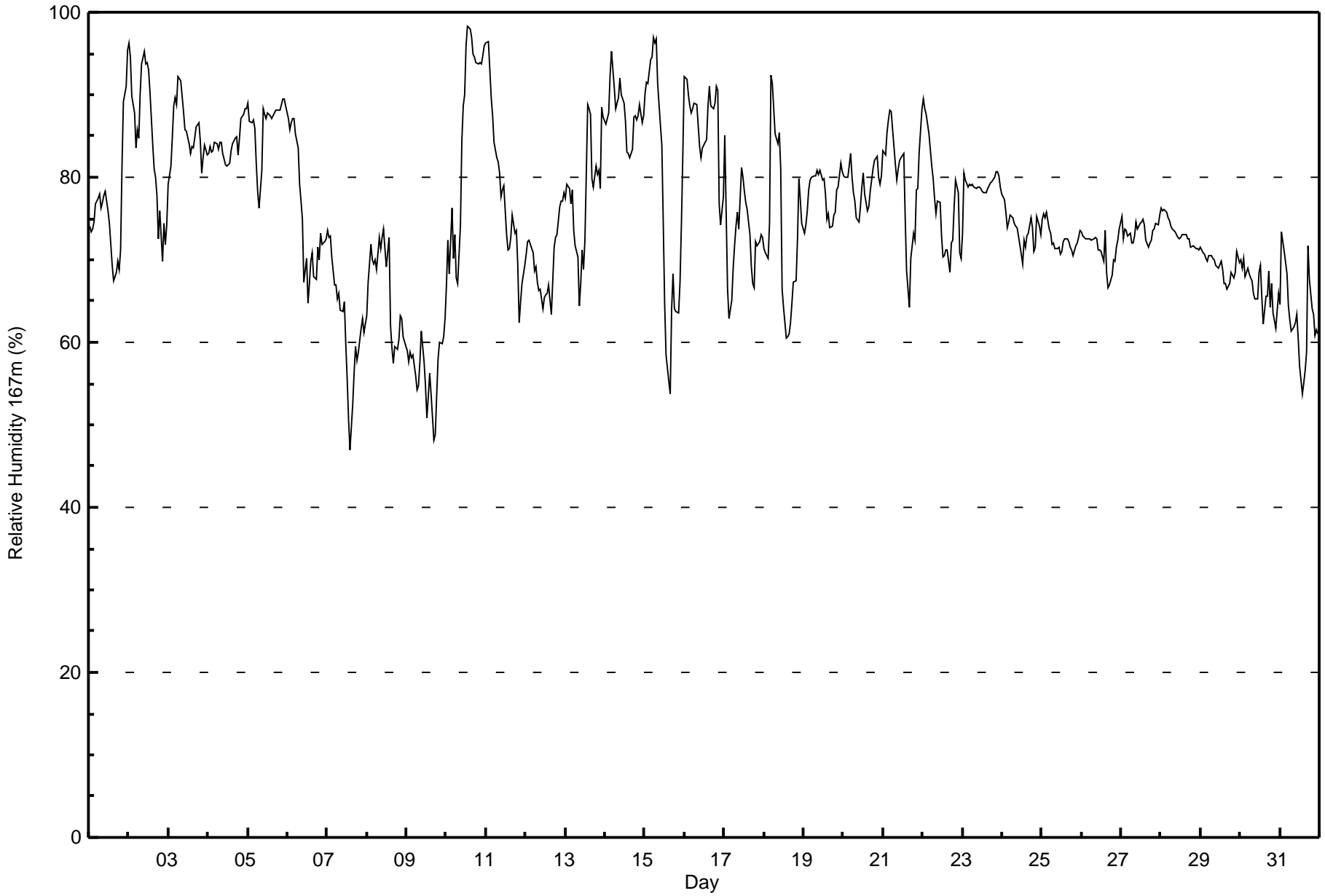


Maximum Value: 98 % on Dec 10 14:00																	Maximum Daily Average: 87.8 % on Dec 14																	Hours in Service: 744	
Minimum Value: 47 % on Dec 7 15:00																	Minimum Daily Average: 56.4 % on Dec 9																	Hours of Data: 744	
Maximum Diurnal Average: 78.5 % at hour 5																	Minimum Diurnal Average: 72.0 % at hour 17																	Hours of Missing Data: 0	
Monthly Average: 75.6 %																	Percentiles: P <sub>1</sub> = 54 P <sub>10</sub> = 63 Q <sub>1</sub> = 70 Median = 74 O <sub>3</sub> = 83 P <sub>90</sub> = 89 P <sub>99</sub> = 96																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	74	73	74	75	77	78	78	76	77	78	78	76	74	72	69	67	68	70	69	71	81	89	91	95	76.3	95									
2-Dec	96	95	90	88	84	86	85	90	94	95	94	94	93	90	84	81	80	78	73	76	70	74	72	74	84.8	96									
3-Dec	79	81	85	89	90	89	92	92	90	88	86	86	84	83	84	84	85	86	87	84	81	82	84	83	85.5	92									
4-Dec	83	84	83	83	84	84	83	84	84	83	81	81	82	82	83	84	85	85	83	85	87	88	88	88	84.1	88									
5-Dec	89	87	87	87	86	82	78	76	81	88	88	87	88	87	87	87	88	88	88	88	89	90	89	89	86.4	90									
6-Dec	87	86	87	87	87	85	84	79	77	75	67	70	65	67	70	71	68	68	71	70	73	72	72	73	75.4	87									
7-Dec	73	73	73	70	67	67	65	66	64	64	65	60	56	51	47	52	56	59	58	59	62	63	61	62	62.2	73									
8-Dec	63	67	72	70	70	70	69	73	71	73	74	71	69	73	62	59	57	60	59	60	63	63	61	60	66.2	74									
9-Dec	59	58	59	58	59	56	54	55	58	61	58	55	51	53	56	54	48	49	54	58	60	60	61	63	56.4	63									
10-Dec	67	72	68	76	70	73	68	67	74	84	89	90	96	98	98	97	95	95	94	94	94	94	95	96	85.2	98									
11-Dec	96	96	93	90	88	84	82	82	80	78	78	79	73	71	71	73	75	73	74	69	62	65	67	69	77.9	96									
12-Dec	71	72	72	72	71	69	69	67	66	67	64	65	66	66	67	63	67	72	73	73	76	77	77	78	70.0	78									
13-Dec	77	79	79	77	78	74	72	70	64	67	71	69	72	89	88	88	80	79	81	80	81	79	88	87	77.9	89									
14-Dec	87	87	88	92	95	91	88	89	90	92	90	89	87	83	83	82	83	87	87	87	87	89	87	87	87.8	95									
15-Dec	90	92	91	94	95	97	96	97	91	86	84	75	65	58	55	54	64	68	64	64	64	67	74	83	77.8	97									
16-Dec	92	92	90	89	88	88	89	89	86	84	82	84	84	85	89	91	89	88	89	91	91	77	74	78	86.5	92									
17-Dec	85	76	66	63	65	69	72	74	76	74	81	80	78	77	76	73	69	67	67	72	72	72	73	73	72.9	85									
18-Dec	71	71	70	74	92	91	88	85	84	86	81	66	64	61	61	61	62	65	67	67	72	80	77	74	73.9	92									
19-Dec	73	74	76	79	80	80	80	80	81	80	81	80	80	78	75	76	74	74	75	76	78	79	82	81	77.9	82									
20-Dec	80	80	80	80	83	80	78	77	75	75	76	79	80	78	76	76	78	80	81	82	83	80	79	80	79.0	83									
21-Dec	83	83	85	87	88	88	86	82	80	81	82	82	83	75	69	66	64	70	73	72	78	79	83	88	79.5	88									
22-Dec	90	88	88	86	85	81	80	77	76	77	77	73	70	70	71	71	69	72	72	76	80	78	71	70	77.1	90									
23-Dec	73	80	80	79	79	79	79	79	79	79	79	79	78	78	78	79	79	79	79	80	81	81	80	79	78.9	81									
24-Dec	78	77	76	74	75	75	75	74	74	74	73	71	70	72	72	73	73	75	74	71	72	75	74	73	73.7	78									
25-Dec	75	76	75	76	74	73	72	72	71	71	72	71	71	72	73	73	72	72	71	71	72	72	73	74	72.5	76									
26-Dec	73	73	73	73	72	73	72	73	73	72	71	71	71	70	74	69	67	67	68	70	70	71	72	74	71.3	74									
27-Dec	75	73	74	74	73	73	72	72	73	75	74	74	75	75	74	72	71	72	72	74	74	74	74	75	73.5	75									
28-Dec	76	76	76	76	75	75	74	74	73	73	73	72	73	73	73	73	73	73	72	72	72	71	71	71	73.3	76									
29-Dec	71	71	71	70	70	70	71	70	70	69	69	69	70	69	67	67	66	67	68	68	68	69	71	70	69.2	71									
30-Dec	70	69	70	68	69	68	68	67	66	65	65	68	69	65	62	66	66	69	64	67	64	62	64	66	66.6	70									
31-Dec	65	73	71	70	68	64	63	61	62	62	63	61	57	54	55	57	59	72	68	64	63	61	62	61	63.1	73									
																	78.2 78.5 78.1 78.2 78.5 77.8 76.9 76.5 76.1 76.6 76.3 75.0 74.0 73.4 72.5 72.2 72.0 73.5 73.4 73.9 74.8 75.2 75.8 76.6																	Diurnal Average	
																	96 96 93 94 95 97 96 97 94 95 94 94 96 98 98 97 95 95 94 94 94 94 94 95 96																	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 167m (RH167m) - %**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity 167m (RH167m) - %  
Lower Camp Met Tower - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	42	5.65	5.65
60 - 80	467	62.77	68.41
80 - 100	235	31.59	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed 20 m (WS20m) - km/h

## Lower Camp Met Tower - December 2017

Maximum Speed: 19 km/h on Dec 18 14:00	Maximum Daily Speed Average: 12.3 km/h on Dec 20	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 17 09:00	Minimum Daily Speed Average: 0.7 km/h on Dec 23	Hours of Data: 692
Maximum Diurnal Speed Average: 3.3 km/h at hour 7	Minimum Diurnal Speed Average: 1.4 km/h at hour 13	Hours of Missing Data: 52
Monthly Average Velocity: 2.1 km/h 156.3 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 13 P <sub>99</sub> = 18	Percent Operational Time: 93.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SE4	W11	W12	WSW9	SSW3	SSE2	SE5	SE8	SSE6	SSE8	SE10	SE12	SE10	SE7	SSE8	SE5	SSE1	S1	SE5	NNW1	NNW3	WSW1	NNE1	SSE1	SSE3.4	W12	
2-Dec	SE3	NNW4	N3	NW3	WNW2	NNW2	NNW3	NNW2	NNW3	NNW3	NNW2	WSW2	WNW1	W3	W2	NW1	S1	SSE3	W5	W6	WNW2	ESE2	SE4	SE6	WNW1.0	W6	
3-Dec	SSE8	SE7	SE6	SE3	SE4	SE8	E1	NNE2	NNW11	N8	N7	N6	N7	N7	N5	N6	N5	N4	N3	N3	NNW3	NNW2	NW2	N3	NNE2.3	NNW11	
4-Dec	NNW2	NNE3	NNW2	WNW2	WNW1	NW2	WSW0	S1	SSE3	SSE7	SSE10	SSE9	SSE4	SSE4	SSE10	SE7	SSE3	SE2	SSE5	SSE6	SSE6	SSE4	SSE6	S4	SSE3.3	SSE10	
5-Dec	SSE8	SE7	SE11	SE15	SE16	SE10	SE5	ENE1	NNW4	N7	NNW4	NNW4	N5	N7	N8	N7	NNE5	NNE6	N7	NNW4	NNW4	NNW3	NNE2	ESE2	ENE2.0	SE16	
6-Dec	SE7	SE8	SE8	SSE12	SE11	SE12	SE11	SE11	SE15	SE13	SE12	SE9	SSE17	SE15	SE11	SE8	W12	W19	W13	W11	W6	SE2	SE10	SE11	SSE7.4	W19	
7-Dec	SE10	SE12	SE12	SE11	SE11	SE12	SE14	SE8	SE11	SE14	SE6	SSE3	SE2	ENE1	NW8	WNW6	NW1	SSW1	NW2	NW2	NW1	WNW7	SSW3	SE10	SE4.8	SE14	
8-Dec	SE9	SE9	SE11	SE12	SE11	SSE10	SE9	SSE7	SSE8	SSE8	SSE10	SSE10	SSE10	SSE10	SE6	SE10	SE11	SE9	SE10	SE14	SE16	SE19	SE16	SE12	SE10.7	SE19	
9-Dec	SE17	SE16	S7	W10	W11	W13	W16	NNW13	W15	WNW5	W12	W10	W8	W6	WSW2	W8	W14	W18	W11	WSW5	WSW1	ENE0	S1	S2	W6.5	W18	
10-Dec	SW1	SSE2	SSW2	SE4	SSE6	SE8	SE12	SE9	AF	AF	W7	NNW13	NNW12	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	WNW13	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SSW4	W4	WNW4	W8	NNW2	NNW6	NW9	NNW5	NW4	NW5	SW3	S3	SE6	SE8	----	NW9
13-Dec	SE9	SE10	SSE9	SE12	SE13	SE13	SE14	SSE10	W14	W9	NW4	NNE2	N6	NNW7	N3	WNW3	WNW3	NW4	WNW4	NNW2	NNW3	NNW6	NNE4	NNE3	SE1.1	SE14	
14-Dec	NNE2	SW2	SSW2	SW1	SW3	W4	SSE3	SSE8	SSE8	SSE10	SE5	SE8	SE9	SE12	SE9	SE9	SE7	N1	SSE1	SSE2	SE2	SSE4	SE6	SE5	SSE4.3	SE12	
15-Dec	SSE2	SE5	SE4	SE5	AF	AF	AF	AF	AF	WSW6	WSW13	W13	NW13	NW13	WNW12	W5	SW9	SW12	WSW12	W8	W11	WNW13	W14	W15	W7.6	W15	
16-Dec	WNW10	N12	NNE9	NNE9	NNE8	N7	N7	NNE4	NE3	ENE3	E3	ESE2	E1	SE1	SSE6	SSE5	SE6	SSE9	SE7	SSE10	SSE10	SE12	SE13	SE9	ESE2.7	SE13	
17-Dec	E8	E7	ESE7	SE9	SSE8	ESE10	SE10	SW3	E0	W9	W16	W14	W15	W18	W16	WNW14	WNW18	NW17	NW16	NW11	WNW9	WNW12	WNW11	W14	W6.6	W18	
18-Dec	WNW12	WNW10	WNW13	NW10	N13	N13	NNE10	NNE8	NNE5	N3	N1	NW15	NW17	NW19	NW16	NW15	NW16	NW15	WNW12	WNW15	NW11	N8	N7	N8	NW10.0	NW19	
19-Dec	N7	N7	N5	WNW2	WNW3	NW2	NNW3	N2	NNW1	N0	SSE1	SE3	SE4	SE7	SE10	SSE10	SE6	SE6	SE7	SE9	SE8	SE8	SE7	SE11	SE3.0	SE11	
20-Dec	SE13	SE10	SE10	SE12	SE9	SE11	SE10	SE14	SE14	SSE13	SE15	SE13	SE12	SE15	SE15	SE16	SE18	SE15	SE11	SE9	SE9	SSE12	SSE11	SSE8	SE12.3	SE18	
21-Dec	SSE6	SSE3	SE4	SE6	SE6	ESE1	NE1	N0	NNW1	W0	WNW1	NNW1	SSW1	SSE4	N2	NW5	WNW9	WNW18	NW14	NW12	N6	N5	N4	N2	NW1.9	WNW18	
22-Dec	NE1	ENE2	NNE2	NNW2	NNW2	NW1	NW6	WNW6	W13	W10	WNW8	NW10	WNW12	NW11	WNW12	NW11	WNW12	WNW11	NW10	NNW10	NNE12	NNE13	N12	N9	NW6.8	W13	
23-Dec	N6	N4	N4	WNW2	NNW1	WNW1	NNW1	NNW2	NNW3	NW3	NW2	WNW1	NW2	WNW1	NNW3	WSW4	SE4	ESE2	SE5	SE8	SE5	SE3	NNW3	NNW6	N0.7	SE8	
24-Dec	N10	NNE10	NNE10	N10	N6	NW4	NW4	NW3	NNW2	NW2	WNW2	W1	SSW1	SE3	SW2	S1	SSE1	E0	NNE0	NW1	NNW3	NW3	NNW3	NNW3	NNW2.6	NNE10	
25-Dec	NNW4	N5	NNW5	N5	NW4	NNW3	N4	NNW2	W1	NW1	SE1	SE5	SE6	SE5	SE3	ESE2	SE1	SSE5	SE9	SE9	SE11	SE10	SE10	SE12	SE2.4	SE12	
26-Dec	SE10	SE11	SE11	SE12	SE13	SE13	SE14	SE11	SE10	SE10	SE10	SE11	SE9	SE8	SE7	SE6	SE7	SE8	SE10	SE10	SSE8	SSE7	SSE5	SSE3	SE9.3	SE14	
27-Dec	SSE5	SSE6	SSE7	SSE8	SSE10	SSE10	SE9	SE9	SE10	SE11	SE9	SE10	SE9	SE8	SE9	SE7	SE8	SE4	SSE5	SSE4	SE9	SE8	SE6	SE6	SE7.8	SE11	
28-Dec	SSE5	SE5	SE5	NE0	NNW2	NNW3	NW3	NNW2	NNW3	NW2	WNW2	WNW2	NW1	WSW2	WNW2	SW3	WNW1	NNW2	NW3	NNW2	NW3	NNW3	NNW3	NNW2	NW1.0	SSE5	
29-Dec	NNW2	NNW3	NNW3	NW3	NW1	SSE1	ESE1	SSE3	SSE5	SE11	SSE9	SE10	SE11	SE9	SE7	SE11	SE11	SE8	SE11	SE11	SE12	SE11	SE8	SE10	SE6.2	SE12	
30-Dec	SE8	SE9	SE8	SE9	SSE8	SSE8	SE7	SE8	SE8	SE10	SE9	SE8	SE7	SE6	SE7	SE5	SE6	SE6	SE4	SSE3	SSE4	SSE4	SSE5	SE4	SE6.7	SE10	
31-Dec	SSE9	SSE10	SSE8	SSE6	SSE5	SE5	SE10	SSE18	SE13	SE11	SE13	SE16	SE14	SE14	SE13	SE13	SSE11	SE10	SSE7	SSE8	SE12	SE16	SE14	SE17	SE11.4	SSE18	

SE3.1	SE3.0	SE2.8	SE3.0	SE3.2	SE3.2	SE3.3	SE3.1	SSE2.1	SSE2.7	S2.7	S2.1	S1.4	S1.7	SSE1.5	S1.5	SSW1.4	SW2.0	SW1.6	SSW1.5	SSE1.7	SE2.2	SE2.6	SE3.1	Diurnal Average	
SE17	SE16	WNW13	SE15	SE16	SE13	W16	SSE18	W15	SE14	W16	SE16	NW17	NW19	NW16	SE16	SE18	W19	NW16	WNW15	SE16	SE19	SE16	SE17	Diurnal Maximum	

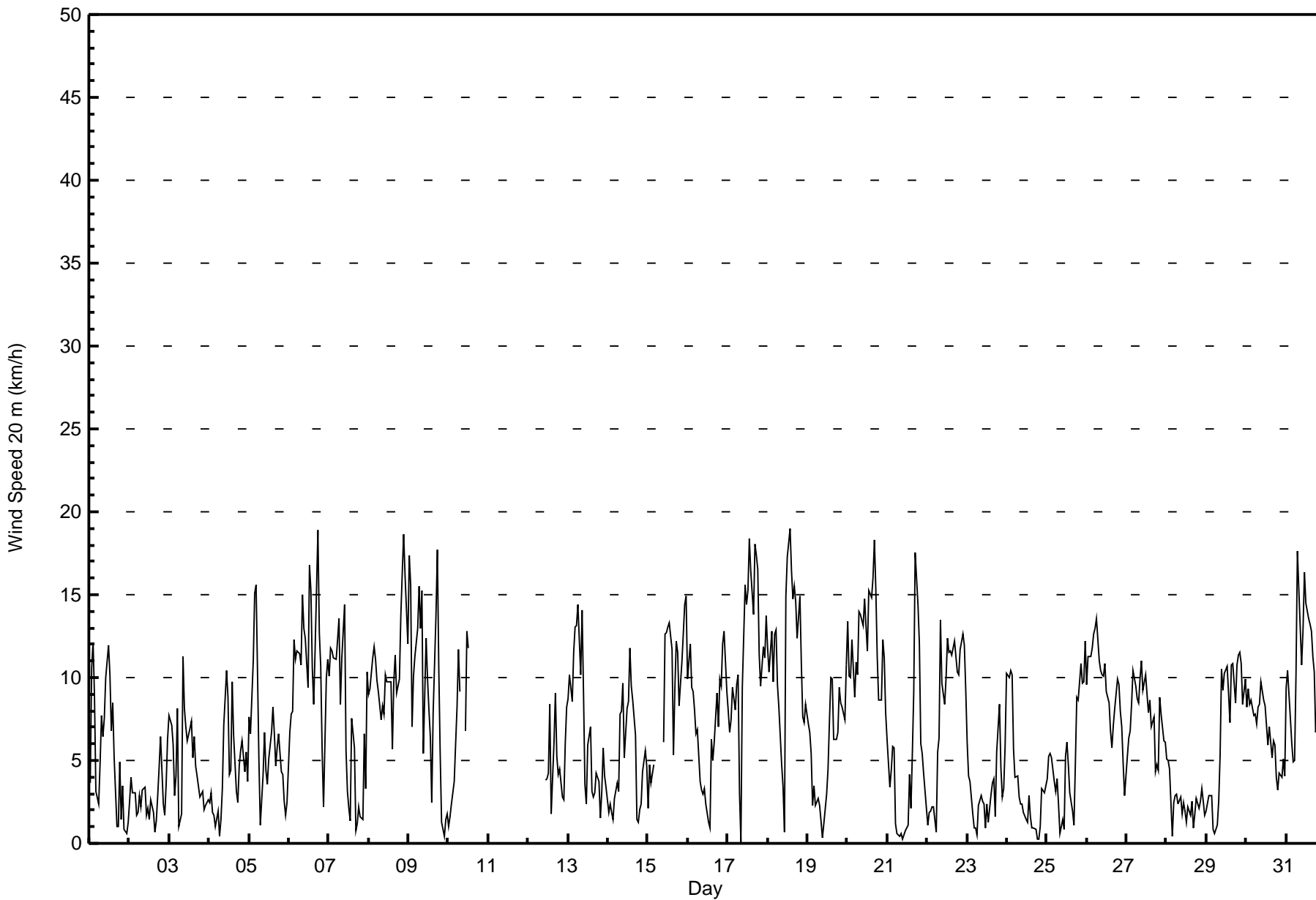
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed 20 m (WS20m) - km/h**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 9 07:00 Minimum Value: 0 km/h on Dec 24 17:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 692 Hours of Missing Data: 52 Hours of Calibration: 0 Percent Operational Time: 93.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	4	4	4	3	2	4	3	2	2	4	3	3	2	2	2	1	1	2	1	1	1	1	1	4
2-Dec	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	2	2	2	1	1	1	2
3-Dec	1	2	2	2	2	4	2	3	5	3	3	3	3	2	2	2	1	1	1	1	1	1	1	1	5
4-Dec	1	2	1	1	1	1	1	1	2	2	3	3	2	2	3	3	2	2	2	3	3	3	4	3	4
5-Dec	3	4	3	3	3	3	3	1	3	2	2	2	3	3	3	3	2	2	3	2	2	1	1	2	4
6-Dec	3	2	3	2	2	3	3	4	4	4	5	4	3	4	4	2	6	6	5	5	4	2	3	3	6
7-Dec	2	2	2	3	3	4	4	3	3	4	3	1	2	2	4	2	2	1	1	1	2	1	2	2	4
8-Dec	2	2	3	2	2	2	2	2	1	2	2	2	2	2	4	2	3	5	3	3	3	3	4	2	5
9-Dec	3	5	4	5	4	6	8	6	7	4	6	5	3	3	2	6	6	5	6	3	2	2	1	2	8
10-Dec	3	1	2	3	3	4	3	2	AF	AF	4	5	4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	5
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	4	3	3	4	2	3	2	2	2	2	3	1	3	2	4
13-Dec	2	2	3	3	3	5	3	4	7	5	2	2	2	2	2	1	2	2	3	2	2	2	2	7	
14-Dec	1	2	1	1	2	2	2	2	2	3	3	3	4	3	3	3	2	1	2	2	2	2	2	4	
15-Dec	2	2	4	3	AF	AF	AF	AF	AF	4	3	4	4	4	4	3	3	2	3	3	4	4	5	5	5
16-Dec	5	5	4	4	4	3	3	2	2	2	2	1	1	1	2	2	2	3	3	2	3	5	3	5	5
17-Dec	3	2	4	4	3	2	2	2	2	7	5	5	5	7	6	6	7	6	6	4	3	5	5	5	7
18-Dec	5	4	5	4	5	5	4	4	2	1	3	5	6	6	6	5	5	5	4	5	6	3	3	3	6
19-Dec	3	2	2	1	1	1	1	1	1	0	1	2	2	2	3	3	2	3	3	3	3	3	2	3	3
20-Dec	3	3	3	4	4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	2	3	3	3	3	4
21-Dec	2	2	1	2	2	1	1	1	1	1	1	1	1	2	2	2	5	6	4	5	2	2	2	1	6
22-Dec	1	1	1	1	1	1	2	4	5	4	4	3	4	4	4	4	4	4	3	4	5	6	4	4	6
23-Dec	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	3	3	1	2	2	3	3
24-Dec	4	4	5	4	2	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	5
25-Dec	1	2	2	2	1	2	2	1	0	1	1	1	1	2	1	1	1	2	2	2	3	3	3	3	3
26-Dec	3	3	3	3	3	3	3	3	3	2	2	3	2	3	2	2	2	2	2	2	3	2	3	1	3
27-Dec	1	2	2	2	3	2	2	2	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1	1	3
28-Dec	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2
29-Dec	1	1	1	1	1	1	1	1	2	3	2	3	3	3	2	3	2	2	2	3	3	3	2	2	3
30-Dec	2	2	2	3	2	2	3	2	2	3	3	3	2	2	2	2	2	1	2	3	1	1	2	2	3
31-Dec	3	3	2	3	3	3	3	4	5	5	5	4	4	4	4	4	4	4	3	3	4	4	4	4	5
Diurnal Maximum																									
AF - Analyzer Failure																									





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h  
Lower Camp Met Tower - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	287	41.47	41.47
6 - 11	283	40.90	82.37
12 - 19	122	17.63	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

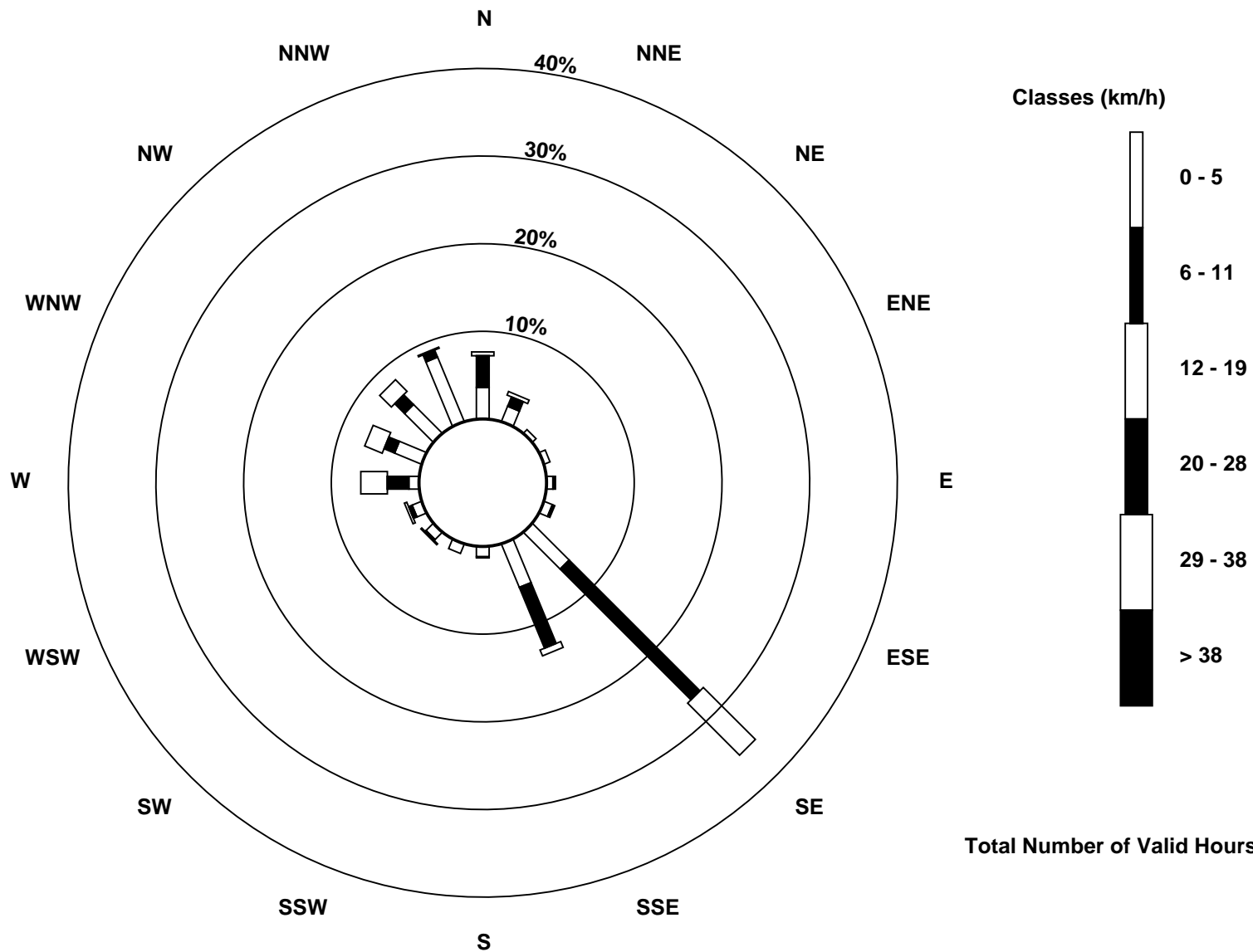
Total Number of Valid Hours: 692

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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 - December 2017

Maximum Speed: 27 km/h on Dec 6 18:00	Maximum Daily Speed Average: 15.9 km/h on Dec 31	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 21 08:00	Minimum Daily Speed Average: 0.2 km/h on Dec 13	Hours of Data: 692
Maximum Diurnal Speed Average: 4.1 km/h at hour 8	Minimum Diurnal Speed Average: 1.7 km/h at hour 13	Hours of Missing Data: 52
Monthly Average Velocity: 2.7 km/h 165.3 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 18 P <sub>99</sub> = 23	Percent Operational Time: 93.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW3	W16	W18WSW14	SW6	SSW2	SSE5	SE9	SSE8	SSE8	SSE12	SE16	SSE14	SE9	SSE11	SSE9	SSE4	SSE5	SSE9	ESE1	NNW5	W1	WNW1	SW2	S4.7	W18	
2-Dec	SE4	NNW6	N6	NNW4	NNW3	NNW3	NNW5	N4	N6	N6	NNW2	W2	NNW2	NW2	NW1	SE0	SSE4	SSE6	W9	W11	W7	SSE2	SSE4	SSE8	NW1.6	W11
3-Dec	SSE11	SSE10	SSE11	SSE9	SSE9	SSE13	ESE2	NNW2	NNW16	N12	NNE11	NNE9	NNE10	N11	N7	N9	NNE7	NNE6	NNE4	N5	N5	NNW3	NNW3	N5	NNE3.2	NNW16
4-Dec	N4	NNE5	NNE2	WNW2	WNW1	NNW2	WSW1	SSE3	SSE5	SSE10	SSE13	SSE11	SSE6	SSE6	SSE12	SE9	SSE5	SSE4	SSE6	SSE7	SSE8	SSE7	SSE8	SSE6	SSE4.7	SSE13
5-Dec	SSE9	SSE11	SSE13	SE19	SE19	SE13	SE7	ESE2	NNW7	N10	N6	NNW5	N7	NNE10	NNE13	N10	NNE8	NNE9	NNE10	N6	N6	NNW3	NNE3	ESE3	ENE3.0	SE19
6-Dec	SE9	SSE10	SSE13	SSE15	SSE15	SSE16	SSE16	SSE15	SSE20	SSE17	SE16	SSE12	SSE20	SSE18	SSE9	S7	W19	W27	W19	W17	W11	SSW2	SSE8	SE11	S9.3	W27
7-Dec	SSE15	SE14	SE15	SE15	SSE9	SSE11	SSE9	SSE11	SE8	SSE12	SSE10	SSE6	SE4	NW4	NW11	WNW8	NNW3	NE1	WNW3	NW4	NNW3	WNW9	W6	SSE10	SSE4.5	SE15
8-Dec	SE12	SSE9	SE11	SE14	SE14	SE12	SE11	SSE10	SSE11	SSE11	SSE12	SSE12	SSE13	SSE12	SE8	SE12	SE16	SSE15	SE11	SE17	SE17	SSE16	SE19	SE15	SSE12.8	SE19
9-Dec	SE20	SSE18	SW10	W18	W17	W19	W22WNW18	W22	WNW8	W17	W14	W13	W9	WSW5	W11	W20	W25	W16WSW10	WSW4	E2	SW4	SSW4	W10.5	W25		
10-Dec	WSW5	SSW2	SW4	SE4	SSW7	SSE8	SSE12	SE12	AF	AF	W12WNW18	NNW16	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	WNW18
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	WSW7	W4	NW7	W13	NW4	NNW10	NW12	NNW8	NW7	NW7	W4	W3	SSE4	SSE9	----	W13
13-Dec	SE10	SE11	S7	SE11	SE15	SSE14	SE16	SSE11	W19WNW13	NW5	N4	N10	NNW10	N5	NW4	WNW5	NW6	WNW5	NW3	N5	N9	NNE6	NE6	W0.2	W19	
14-Dec	NE3	SSW1	SSW2	S3	SSW4	SW4	SSE7	SSE11	SSE11	SSE13	SSE8	SE11	SSE13	SE16	SE13	SE11	SE8	NE1	SE3	SSE4	SSE4	SSE5	SSE8	SE6	SSE6.6	SSE16
15-Dec	SSE3	SE7	SE7	AF	AF	AF	AF	AF	S4WSW11WSW19	W17	NW17	NW18WNW16	W9	SW13	SW16WSW17	W12	W15WNW17WNW19	W20							W10.9	W20
16-Dec	WNW13	NNE18	NNE14	NNE14	NNE13	NNE10	NNE9	NE5	NE4	E4	ESE4	ESE3	E2	SE2	SSE7	SSE6	SSE8	SSE12	SSE10	SSE13	SSE12	SSE17	SSE18	SE13	ESE4.0	SSE18
17-Dec	ESE11	ESE9	SE11	SSE13	S11	SE11	SE10	WSW6	W2	W13	W21	W20	W21	W24	W22WNW18WNW24	NW23	NW22	NW15	NW13WNW15WNW15	W18				W18	W9.3	WNW24
18-Dec	NW15WNW14WNW17	NW13	NNE20	N18	NNE15	NNE13	NNE7	N5	N1	NW19	NW22	NW23	NW21	NW19	NW19	NW19	NW19	NW19	NW19	NW19	NW19	NW19	NW19	NW19	NNW13.1	NW23
19-Dec	N10	N10	NNE9	NNW3	NW4	NW3	NNW3	NNW2	NW1	WSW1	SSE3	SSE7	SSE7	SSE10	SSE13	SSE13	SE10	SSE9	SE10	SSE13	SSE11	SSE10	SSE11	SE15	SE4.3	SE15
20-Dec	SSE17	SSE13	SSE13	SSE16	SE12	SSE15	SSE14	SSE18	SSE18	SSE17	SSE18	SE17	SE15	SSE20	SSE20	SE19	SE22	SE18	SE14	SE9	SE11	SSE16	SSE15	SSE11	SSE15.7	SE22
21-Dec	SSE8	SSE4	SSE5	SSE8	SSE7	SE2	SSW1	W0	WSW1	WSW1	W1	NW1	S1	SSE5	NW5	NW9	NW13WNW24	NW19	NW17	N9	N9	N7	NNE4	NW2.9	WNW24	
22-Dec	ENE2	E3	NE3	N3	N3	NNW2	WNW9	W11	W19	W15WNW12	NW13WNW16	NW14	NW15	NW15	NW16WNW16	NW14	N14	NNE18	NNE21	NNE18	N13			NW9.0	NNE21	
23-Dec	N9	N7	N6	NW2	N1	NNW2	NW1	N3	NNW5	NNW4	NNW3	NW1	NNW3	WNW2	NNW5	W3	SSE6	SSE6	SE10	SE12	SSE7	SE4	N4	N9	N1.0	SSE12
24-Dec	N15	NNE15	NNE16	NNE15	N9	NNW6	NNW7	NNW6	N3	NNW4	W2	SW1	SSW1	SE4	ESE1	S1	SSE2	SSE3	SE1	SE2	SSW1	NNW4	NNW4	N6	N3.7	NNE16
25-Dec	N7	N10	N8	N8	NNW6	N7	NNW6	N3	WSW2	NW1	SSE1	SE7	SE9	SE7	ESE5	ESE3	SSE3	SE8	SSE12	SSE12	SE14	SSE13	SSE14	SSE16	SE3.4	SSE16
26-Dec	SSE14	SE15	SSE15	SE15	SSE16	SSE17	SSE17	SSE15	SSE14	SSE13	SSE13	SSE13	SSE12	SSE11	SE9	SSE8	SSE10	SSE12	SSE14	SSE13	SSE10	SSE9	SSE7	SSE5	SSE12.4	SSE17
27-Dec	SSE8	SSE9	SSE8	SSE11	SSE14	SSE12	SSE11	SSE11	SSE12	SSE13	SE11	SE13	SE12	SE10	SE11	SE9	SSE9	SSE5	SSE5	SSE5	SSE8	SSE9	SSE8	SSE9	SSE9.7	SSE14
28-Dec	SSE7	SSE8	SSE7	SSE2	NNW3	NNW3	NNW4	NW2	NNW4	NW2	N1	WNW3	NNW4	W2	NW2	W2	WNW2	NNW3	NW3	NW2	NNW3	NNW4	NNW4	NNW3	NW1.3	SSE8
29-Dec	NW1	NNW3	NNW5	NNW5	NNW1	SSE3	SSE6	SSE8	SSE9	SE13	SSE12	SE13	SSE14	SSE13	SE11	SSE14	SE15	SSE11	SSE12	SE14	SE14	SE14	SE11	SSE13	SSE8.6	SE15
30-Dec	SE11	SSE12	SE11	SSE13	SSE11	SSE11	SSE12	SSE12	SSE12	SE12	SE11	SE11	SE8	SE7	SE9	SSE8	SSE9	SSE8	SSE8	SSE6	SSE7	SSE8	SSE8	SSE7	SSE9.6	SSE13
31-Dec	SSE13	SSE13	SSE9	SSE8	SSE7	SE7	SSE14	SSE20	SSE19	SSE16	SSE19	SSE22	SSE20	SSE20	SSE20	SSE19	SSE17	SSE16	SE9	SSE11	SE19	SSE22	SE20	SSE22	SSE15.9	SSE22

SE3.9	SE3.6	SSE3.3	SSE3.8	SE3.7	SE3.9	SSE3.8	SSE4.1	S2.7	SSE3.2	S3.7	S3.0	S1.7	S2.2	S1.8	S1.9	SSW2.4	SW2.9	SW2.7	SSW2.3	SSE1.8	SE2.4	SSE3.1	SSE3.8		Diurnal Average
SE20	SSE18	W18	SE19	NNE20	W19	W22	SSE20	W22	SSE17	W21	SSE22	NW22	W24	WNW22	SSE19	WNW24	W27	NW22	WNW19	SE19	SSE22	SE20	SSE22		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 - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 9 km/h on Dec 9 07:00	Hours of Data: 692
Minimum Value: 0 km/h on Dec 21 08:00	Hours of Missing Data: 52
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 5 P <sub>99</sub> = 7	Hours of Calibration: 0
	Percent Operational Time: 93.0

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

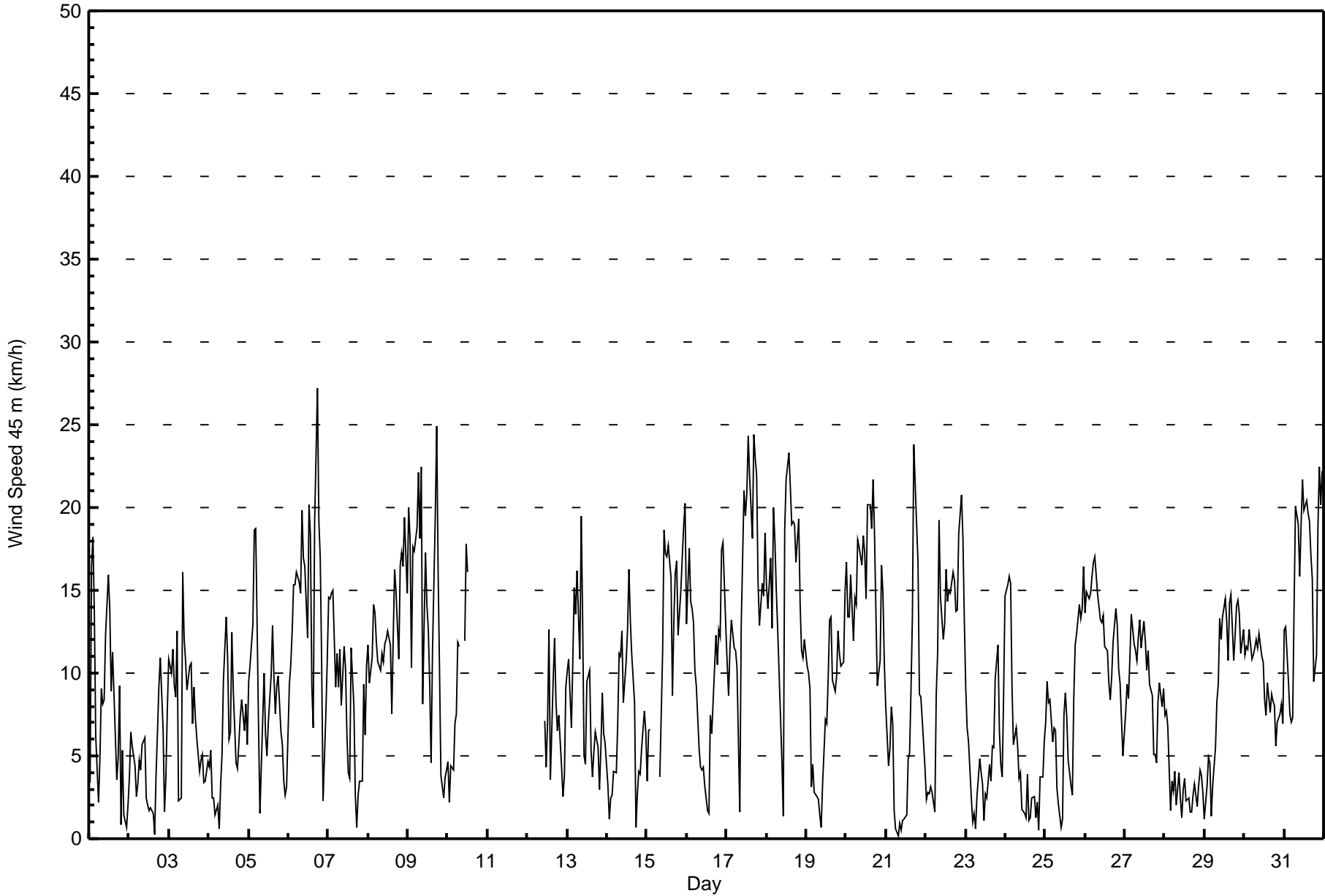
Diurnal Maximum

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed 45 m (WS45m) - km/h**  
**Lower Camp Met Tower - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h  
Lower Camp Met Tower - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	197	28.47	28.47
6 - 11	239	34.54	63.01
12 - 19	222	32.08	95.09
20 - 28	34	4.91	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

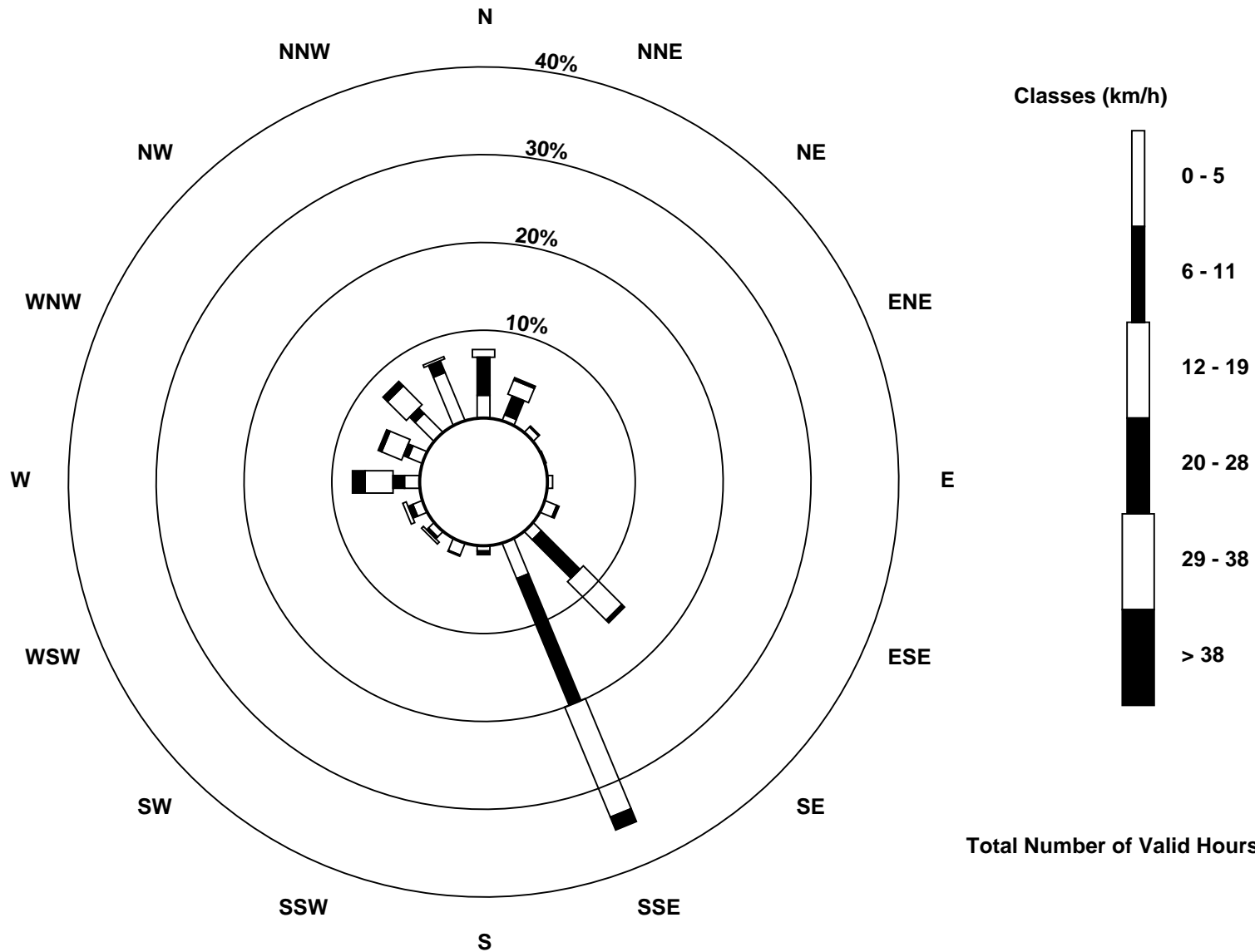
Total Number of Valid Hours: 692

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





Maximum Speed: 39 km/h on Dec 9 07:00	Maximum Daily Speed Average: 22.4 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 21 04:00	Minimum Daily Speed Average: 1.5 km/h on Dec 25	Hours of Data: 728
Maximum Diurnal Speed Average: 7.4 km/h at hour 18	Minimum Diurnal Speed Average: 1.7 km/h at hour 2	Hours of Missing Data: 16
Monthly Average Velocity: 4.3 km/h 235.0 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 7 Median = 11 Q <sub>3</sub> = 17 P <sub>90</sub> = 24 P <sub>99</sub> = 35	Percent Operational Time: 97.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	WSW17	WSW28	WSW29	WSW25	WSW18	WSW15	SW12	SSW4	SSW6	SW9	SSW9	SSE10	SE12	SSE10	SSE12	S11	SSW6	SSE10	SSE14	SE10	ENE2	NNE3	SSE1	SSW3	SSW8.3	WSW29
2-Dec	SSW3	NW12	NNW11	N8	NNW6	NW6	NNW9	NNW10	NNW9	N8	N1	NE1	NW1	SE4	SSE5	SE10	S6	SW13	WSW21	WSW20	WSW20	W14	WSW10	WSW8	W5.2	WSW21
3-Dec	SSW5	SSW6	S8	SSE8	SE12	SSE13	WSW9	NNW11	NNW26	N18	N15	N13	N14	N13	N9	N10	NNE9	NNE7	NNE6	NNE7	NNE8	N5	NNW6	N8	N5.0	NNW26
4-Dec	NNE7	NNE8	NE6	N4	N1	S1	SE3	SSE8	SSE6	S4	SSE10	SSE10	SSE7	SE9	SSE16	SSE11	SSE13	SE19	SE18	SE18	SSE14	SE17	SE21	SSE12	SE8.4	SE21
5-Dec	SSE11	SSE15	S12	SSW8	SSW8	WSW8	NW12	NW20	NNW19	NNW14	NNE13	N11	N11	N14	N17	N13	NNE10	NNE12	N13	N10	N7	NNW5	NW3	S3	NNW5.4	NW20
6-Dec	SE13	SSE14	SSE15	SSE13	SSE10	SSE12	SSE11	SSE20	SSE16	SSE14	S13	SSE17	S15	S10	SW16	WSW18	WSW32	WSW38	WSW31	WSW32	WSW25	WSW19	SW11	WSW9	SSW12.6	WSW38
7-Dec	SW7	SSW6	S7	SW10	WSW19	WSW15	W16	W13	WSW12	WSW11	W8	SSE3	WNW7	W20	W25	NW12	NNW11	WNW6	WNW9	WNW11	NW12	NNW19	W16	SW10	W10.2	W25
8-Dec	SW7	SW14	SSW8	SSW8	SW10	SW8	SW10	SE10	SSE9	S7	S8	SSE9	SE14	SSE14	SSE12	SSE18	S20	SSE21	SSE13	S11	SW14	SW15	SSW10	SW12	S10.3	SSE21
9-Dec	SSW10	SW13	WSW24	WSW30	WSW30	W35	W39	W32	W38	W16	WSW31	W27	W24	W19	WSW13	W23	W35	WSW34	WSW28	WSW17	WSW13	NE3	SW8	SW14	WSW22.4	W39
10-Dec	WSW18	SW7	SW14	SW5	SW19	SW7	SSW6	S7	S9	SW15	WSW20	NNW30	NW26	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SE10	----	WNW30
11-Dec	SSE6	SSW1	SW5	SW8	WSW12	WSW15	WSW12	SW10	WSW10	SW7	SSW4	SSE13	AF	AF	SSE34	SSE29	SSE27	SSE26	SSE19	SSE13	S13	S16	S17	SSE13	S12.2	SSE34
12-Dec	SSW11	SW9	SW15	WSW14	SW13	SW14	SW13	WSW23	W15	WSW17	WSW20	NNW10	NNW20	W24	NNW15	NNW25	NW21	NNW20	NNW19	NW18	NW12	NW12	NW7	WSW7	W13.3	WNW25
13-Dec	SW11	SW9	SW14	SW9	SSW6	SW10	SSW11	WSW13	W33	NNW22	NNW11	NNW14	NNW15	NNW16	NNW12	NW6	NNW13	NNW18	NNW15	W14	NW12	NW16	NNE10	NE9	WNW9.3	W33
14-Dec	NE6	ESE2	SSE3	SSW7	SSW8	S7	SSE7	SSE13	SE14	SSE16	SSE18	SSE14	SE16	SSE19	SSE16	SSE16	SE17	SSE5	SSE7	SSE9	SSE7	SE11	SSE12	SSE10	SSE10.1	SSE19
15-Dec	SE9	SSE9	SSE14	SSE16	AF	AF	AF	AF	WSW15	WSW21	WSW26	W27	NNW29	NNW29	NNW24	W19	WSW18	WSW19	WSW25	WSW21	W23	W25	W28	W30	WSW17.3	W30
16-Dec	W20	NNE23	NNE19	NNE21	N19	N16	NNE14	NNE8	NNE6	ENE5	E5	ESE4	ESE3	SSE6	SSE10	SSE9	SSW10	SSE15	SSE18	SSE16	SSE19	SSE22	SSE19	SE17	E4.7	NNE23
17-Dec	ESE12	SSE16	SSE22	S17	SSW22	S10	SSW12	WSW16	WSW8	W23	W31	W30	W33	W36	W32	W27	NNW35	NNW35	NNW33	NNW27	NNW22	NNW23	W23	W28	W18.4	W36
18-Dec	WNW25	WNW22	W25	WNW18	N25	N23	NNE20	NNE17	NNE11	N6	NW6	NW26	NW30	NW32	NW31	NW28	NW27	NNW27	NNW25	NNW28	NW20	N16	N15	N15	NW18.6	NW32
19-Dec	N14	N15	NNE13	N8	NNW7	NNW8	NNW10	NW4	W3	SW4	SW4	SSE4	SSE7	SSE9	SE14	SSE16	SSE16	SSE15	SSE13	SSE16	SSE10	SSE6	S6	S9	SSE2.8	SSE16
20-Dec	SSE10	SSE7	SSE8	SSE14	SSE13	SSE12	SSE14	SSE12	SSE15	SSE19	SSE16	SSE16	SSE18	SSE22	SSE20	SSE16	SSE16	SSE17	SSE16	SSE17	SSE15	SSE16	SSE17	SSE13	SSE15.0	SSE22
21-Dec	SE4	ESE8	ESE2	WSW0	WSW2	N4	NW7	N11	NNW8	NNW7	NW3	NW4	SSE1	WSW6	NNW19	NNW23	NNW29	NNW36	NNW29	NNW30	NW14	NW15	NW12	NNW10	NW9.9	WNW36
22-Dec	ENE4	E5	ENE4	ENE4	WNW2	W13	W26	W27	WSW32	W27	W20	NNW22	NNW25	NNW21	NNW22	NNW23	NNW26	NNW25	NNW22	NNW19	NNE23	NNE29	N26	N20	WNW14.1	WSW32
23-Dec	N13	N9	NNW9	NNW5	N3	NNE1	SE2	ESE4	ENE1	NE3	NNW9	NNW3	NNW7	W5	NNW5	NNW3	SSW4	SSE6	SSE9	SSE7	S3	SE4	NNE5	N16	N2.1	N16
24-Dec	N21	NNE24	NNE24	N23	N17	NNW9	N11	NNW11	NNW10	N12	NNE7	NW1	SSW1	SSE3	E2	E6	E5	SSE6	SSW3	SE6	SSW3	E1	N7	N15	N7.2	NNE24
25-Dec	NNE13	N17	N16	N16	N11	N15	NNW15	N10	NNE4	NE3	S2	S4	S4	SSE5	SE7	SSE5	SSW5	SSW7	SSW8	SSW8	SSW7	S8	S8	S7	N1.5	N17
26-Dec	S9	S9	S8	S9	S10	SSE12	SSE12	SSE13	SSE10	S9	SSE8	SSE9	SSE8	SSE10	SSE11	SSE12	SSE11	SSE9	SSE6	SSE7	S6	S5	SE6	SSE5	SSE8.8	SSE13
27-Dec	S5	SSE5	SSE5	S6	SSE9	S7	S9	S8	SSE8	SSE9	SSE8	SSE9	SSE9	SSE10	S7	SSW6	SSW8	SW9	SW10	SSW6	SSW5	S3	SSW2	SE6	S6.5	SSE10
28-Dec	SSE9	SSE6	SSE3	ESE4	NNE6	N7	N11	N11	NNW10	N9	NNE6	N3	NNE6	N4	NNW6	N4	N4	NE6	NE8	NE4	NNE4	NNE4	NNW4	NW2	NNE3.8	N11
29-Dec	NE5	NE7	NE5	NNE3	WSW2	SSW4	SSW4	S5	SSW6	SSW8	SSW6	SSW7	S6	SSE9	SSE8	S10	S10	SSW10	SSW10	SSW8	SSW9	S8	SSE7	S8	S4.9	S10
30-Dec	S7	SSW6	SSE10	SSE12	SSE14	SSE14	SSE11	SSE8	S6	S5	SSE7	SE11	SE11	SE13	SE13	SSE10	SE13	SE15	SSE10	S5	S6	SSE7	SSE9	SSE11	SSE9.6	SE15
31-Dec	SSE9	SSE13	SSE9	SSE9	SSE10	SSE9	S12	SSE18	SSE23	SSE21	SSE23	SSE24	SSE22	SSE24	SSE21	SSE16	SSE17	SSE20	SSE18	SSE20	SSE21	S17	S14	S17	SSE16.9	SSE24

SSW2.3	SW1.7	SW3.2	SW3.2	SW3.9	WSW3.9	WSW4.6	WSW4.2	WSW5.3	WSW4.8	SW5.0	WSW4.5	WSW4.0	WSW4.5	SW5.0	SW5.0	SW6.2	SW7.4	WSW7.1	SW6.0	WSW4.6	WSW3.0	SW2.8	SSW2.9	Diurnal Average	
WNW25	WSW28	WSW29	WSW30	WSW30	W35	W39	W32	W38	W27	WSW31	W30	W33	W36	SSE34	SSE29	NNW35	WSW38	NNW33	WSW32	WSW25	NNE29	W28	W30	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 - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 13 km/h on Dec 13 09:00	Hours of Data: 728
Minimum Value: 0 km/h on Dec 29 00:00	Hours of Missing Data: 16
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 8	Hours of Calibration: 0
	Percent Operational Time: 97.9

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

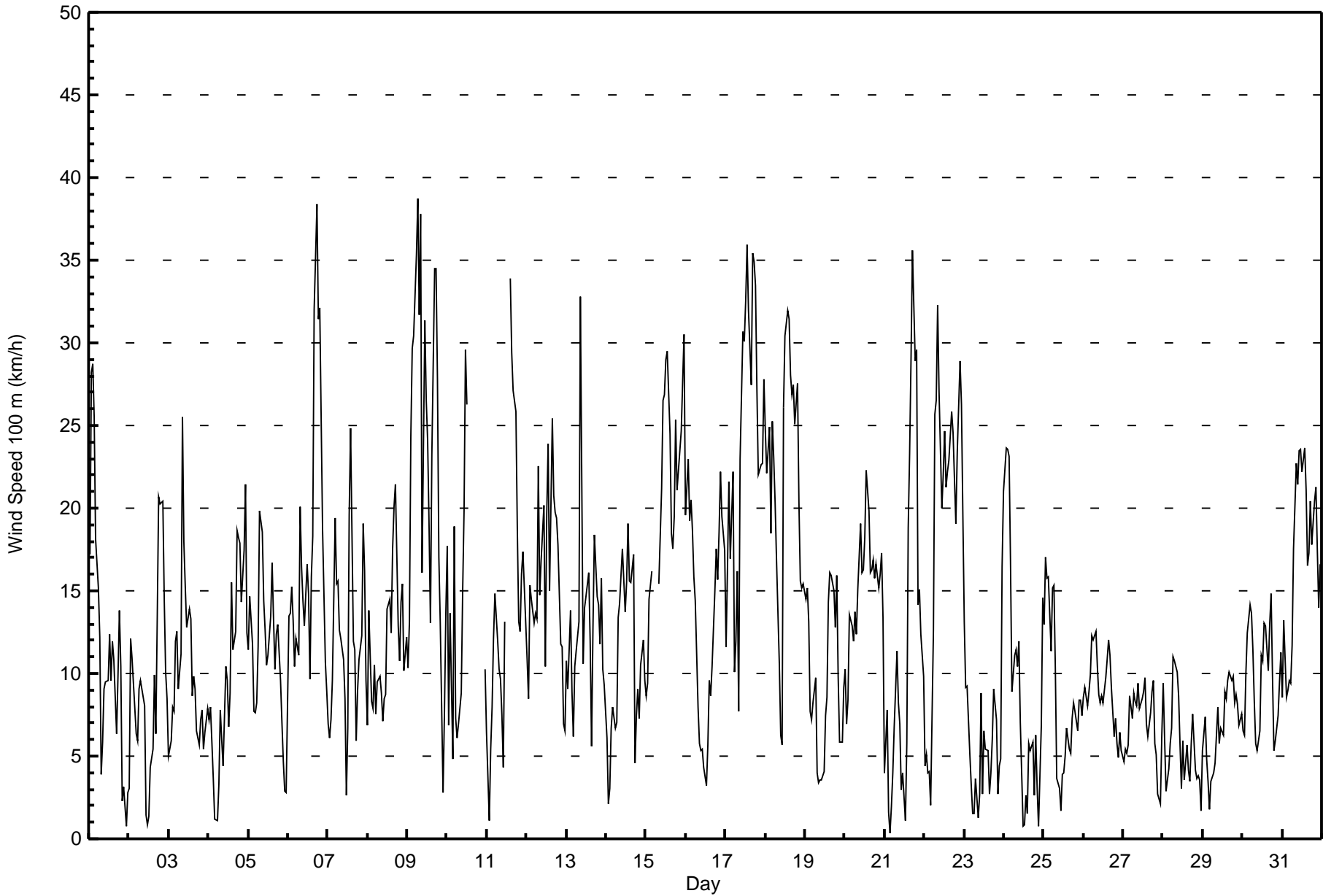
Diurnal Maximum

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed 100 m (WS100m) - km/h**  
**Lower Camp Met Tower - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 100 m (WS100m) - km/h  
Lower Camp Met Tower - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	111	15.25	15.25
6 - 11	267	36.68	51.92
12 - 19	214	29.40	81.32
20 - 28	98	13.46	94.78
29 - 38	37	5.08	99.86
> 38	1	0.14	100.00

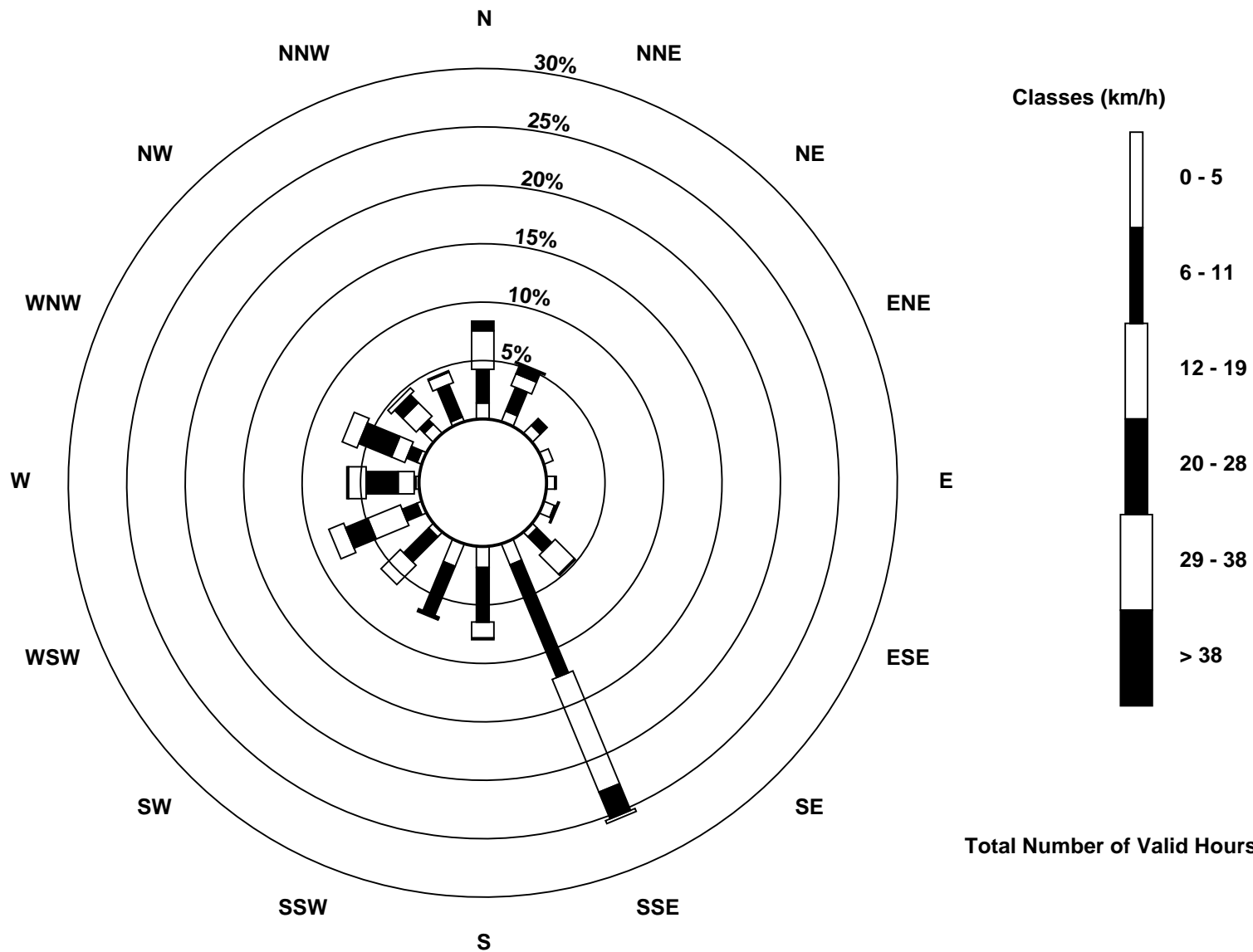
Total Number of Valid Hours: 728

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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 - December 2017

Maximum Speed: 54 km/h on Dec 9 07:00	Maximum Daily Speed Average: 31.0 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 22 03:00	Minimum Daily Speed Average: 2.7 km/h on Dec 19	Hours of Data: 742
Maximum Diurnal Speed Average: 11.1 km/h at hour 18	Minimum Diurnal Speed Average: 6.0 km/h at hour 23	Hours of Missing Data: 2
Monthly Average Velocity: 8.8 km/h 258.1 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 6 Q <sub>1</sub> = 10 Median = 15 Q <sub>3</sub> = 24 P <sub>90</sub> = 31 P <sub>99</sub> = 42	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	WSW31	WSW40	WSW40	WSW39	WSW30	WSW28	WSW25	SW13	WSW15	WSW24	SW21	SSW13	SSW6	S6	S8	SSW13	SSW15	SSW9	SSE13	SSE12	SE7	S1	ESE1	SW4	SW15.3	WSW40
2-Dec	WSW10	NW16	NNW13	NNE12	N9	NW6	NNW8	NNW11	N8	NNE4	WSW2	SSW6	SW8	SW12	WSW15	SW9	SW16	WSW24	WSW32	W30	W28	W25	W20	WSW17	W10.7	WSW32
3-Dec	WSW13	SW12	SW12	SSW8	SSW6	SSW11	WSW18	W17	N27	N18	N17	NNE13	NNE15	N13	N9	NNE9	NNE10	NE6	NE8	NNE11	NE13	NNE9	N9	NNE11	NNW5.9	N27
4-Dec	NNE10	NE12	NE13	NE8	ENE7	ESE4	SE5	S5	S7	SW10	SSW9	S7	SSE9	S9	SSE17	SSE16	SSE18	SSE26	SSE28	SSE24	SSE16	SSE25	SSE24	SSE14	SSE10.2	SE28
5-Dec	S19	SSW15	SSW18	SW17	WSW23	W31	WNNW31	NW33	NNW24	NNE17	NNE18	NNE14	N13	N14	N17	NNE13	NNE11	NNE13	NNE14	NNE10	N7	NW3	W4	SSW6	NNW7.2	NW33
6-Dec	SSE13	S16	S14	SSW14	SSW14	SSW14	SW15	S13	SSW18	SSW16	SW18	SSW16	SW18	SW17	WSW25	WSW28	W42	W45	W39	W38	W33	W26	WSW21	WSW17	SW19.0	W45
7-Dec	WSW14	SW16	SW15	WSW23	W33	W29	W30	W27	W29	W27	W15	WNNW7	W23	W34	WNNW34	NW20	WNNW16	WNNW15	WNNW22	WNNW19	WNNW20	NW26	NW23	W15	W21.0	W34
8-Dec	WSW8	WSW22	WSW20	SW17	WSW19	WSW21	WSW21	SW6	SW10	SW11	SW12	SSW10	S9	SSE15	S16	S18	S18	S23	SSW15	SW17	WSW26	SW26	SW19	WSW21	SW15.1	WSW26
9-Dec	WSW24	WSW29	WSW37	W43	W41	W47	W54	W44	W50	W28	W39	W36	W29	W27	W22	W34	W43	W40	W33	W20	W18	N10	WSW3	WSW17	W31.0	W54
10-Dec	WSW24	WSW13	WSW17	WSW19	WSW25	WSW23	SW15	SW11	SW16	WSW22	W24	WNNW37	NW32	AF	N23	NNE17	NNE17	NNE10	NNE9	NNW6	E3	SE4	SE9	SSE12	W9.3	WNNW37
11-Dec	SSW7	WSW9	WSW21	WSW26	WSW28	W25	W25	WSW29	WSW27	WSW25	WSW17	SW11	SSW10	S11	SSW12	S13	S19	S20	SSW13	SSW17	SSW23	SSW19	SSW18	SSW13	SW15.9	WSW29
12-Dec	SW22	WSW26	WSW27	WSW28	WSW22	WSW23	WSW32	W31	W26	W28	W31	WNNW20	WNNW27	WNNW27	WNNW26	NW35	NW31	NW31	NW28	NW21	NW16	NW23	NW16	WNNW8	WNNW22.6	NW35
13-Dec	WSW19	WSW22	WSW24	WSW20	WSW18	WSW22	SW19	WSW28	W38	WNNW31	WNNW19	WNNW25	WNNW21	N22	N16	NNW8	WNNW21	NW27	WNNW20	WNNW24	WNNW22	NW22	NE13	NE12	WNNW16.4	W38
14-Dec	NE9	E5	SSE5	SSW10	SSW14	SSW12	SSW8	S10	SSW9	SSE15	SSE21	S16	SSE16	SSE20	S20	SSE18	SE21	SSE7	SE15	SSE14	SSE12	SSE11	SSE13	SSE13	SSE11.7	SSE21
15-Dec	SSE11	S12	S15	SSE19	S17	AF	SSW12	WSW18	W25	W26	W34	WNNW32	WNNW38	WNNW36	WNNW29	W23	WSW24	WSW27	W34	WSW31	W30	WNNW30	W33	W36	W21.3	WNNW38
16-Dec	W25	NNE24	NNE21	NNE23	NNE21	NNE18	NNE17	NNE9	NNE6	ENE5	E6	ESE6	SE6	SSE8	SSE9	SSE8	SSE9	SSE15	SSE19	SSE18	SSE19	S19	SSW18	SSE22	ESE3.2	W25
17-Dec	SSE17	S22	S26	SSW34	SSW36	SSW23	SW23	WSW25	WSW16	W31	W38	W36	W38	W44	W43	W37	WNNW42	WNNW43	WNNW43	WNNW35	WNNW28	WNNW29	W30	W33	W26.3	W44
18-Dec	WNNW32	WNNW29	WNNW30	NW22	N25	N22	NNE22	NNE18	NNE12	N6	NW12	NW30	NW35	NW36	NW36	NW33	NW33	WNNW33	WNNW30	WNNW32	NW24	N16	N16	N17	NW21.8	NW36
19-Dec	N17	NNE19	NNE17	NNE12	N10	N10	N10	N6	WNNW3	WSW3	SSW4	S6	S10	S10	SSE11	SSE16	S19	S19	SSW14	SSW16	SSW14	WSW11	SW13	SSW13	SSW2.7	S19
20-Dec	SW13	WSW9	SW7	S10	S15	SSW12	SSW12	SSW14	S13	S14	SSW16	SSW19	S17	S21	S16	S16	S23	S23	S24	S26	S27	S20	S18	SSW17	S16.2	S27
21-Dec	SW10	WNNW7	NW8	WNNW10	WNNW15	NW17	WNNW14	N14	WNNW10	N9	WNNW5	WNNW5	WNNW3	WNNW19	NW26	WNNW28	WNNW37	WNNW40	WNNW38	NW36	NW22	NW22	NW18	WNNW13	NW16.4	WNNW40
22-Dec	ENE3	E1	E1	WNNW4	W18	WNNW28	W25	W27	W34	W30	WNNW24	WNNW29	WNNW30	WNNW26	WNNW28	WNNW30	WNNW30	WNNW28	WNNW28	WNNW22	NNE24	NNE31	NNE30	N22	NW18.8	W34
23-Dec	N15	N9	N6	WNNW2	WNNW2	W3	WSW4	WNNW3	NNE5	NNE8	NNE10	NNE7	NNE8	N4	N5	NNE4	SW5	SSW9	SW10	SW10	W13	WNNW11	WNNW12	NNE24	NNW4.0	NNE24
24-Dec	N25	NNE29	NNE29	N27	N22	N13	N18	N18	N16	N17	N12	NNE5	SW3	SW6	W6	NE2	ESE1	SW5	W7	WNNW5	WSW9	NW10	N14	NNE20	N10.7	NNE29
25-Dec	NNE19	NNE23	NNE24	NNE23	NNE18	NNE21	N18	N15	N6	WNNW3	WSW8	SW8	WSW10	WSW10	SW7	SW10	SW13	WSW13	SW13	SW13	SW14	SW14	SW14	SW13	NW4.0	NNE24
26-Dec	SW14	SW15	SW15	SW14	SW15	SW13	SW10	SSW10	SSW11	SW12	SSW9	S6	S8	S11	S12	S10	SSW8	SW9	SW12	SW10	SW10	SW8	WSW7	SSW10.3	SW15	
27-Dec	SSW6	SW9	SW8	SW9	SSW11	SW11	SSW9	SW8	SW10	SSW8	SW10	SSW8	SSW7	SSW9	SW11	SW11	SW14	SW17	WSW17	WSW14	WSW12	SW6	SW6	SW3	SSW9.5	WSW17
28-Dec	S1	S3	SW4	WNNW3	N13	NNE19	NNE21	NNE19	N13	NNE10	NNE11	NNE7	NNE10	N6	N7	NNE5	N7	NE6	NE14	NE11	NE10	NE10	NNE8	N2	NNE8.0	NNE21
29-Dec	NNE8	NNE11	NNE10	N6	NNE2	SSE2	S7	SSW10	SSW12	SW14	SW13	SW15	SW12	SW11	SW12	SW14	SW18	SW18	SW17	SW14	SW14	SW14	SSW9	SW12	SW8.2	SW18
30-Dec	SW10	SW10	SSW11	SSW10	SSW7	SSW8	SSW9	SW12	SW12	SW11	SW9	SSW7	S6	S5	S7	S9	SSE10	SSE13	SSW10	SW12	SW10	SSW7	S9	S10	SSW8.8	SSE13
31-Dec	S13	S12	S14	S14	S15	S19	S20	S21	S23	S22	S26	S28	S27	S27	S26	S24	S28	SSE28	SSE28	S28	S25	SSW22	SSW21	SSW21	S21.9	S28

WSW6.5	WSW6.6	WSW7.5	WSW8.7	WSW9.3	W10.1	W10.2	W9.8	W10.5	W9.5	WSW9.6	W8.9	W8.1	W8.7	W8.6	WSW8.0	WSW9.0	WSW11.1	WSW11.1	WSW10.0	WSW9.3	W7.6	WSW6.0	WSW6.0	Diurnal Average
WNNW32	WSW40	WSW40	W43	W41	W47	W54	W44	W50	W31	W39	WNNW37	W38	W44	W43	W37	W43	W45	WNNW43	W38	W33	NNE31	W33	W36	Diurnal Maximum

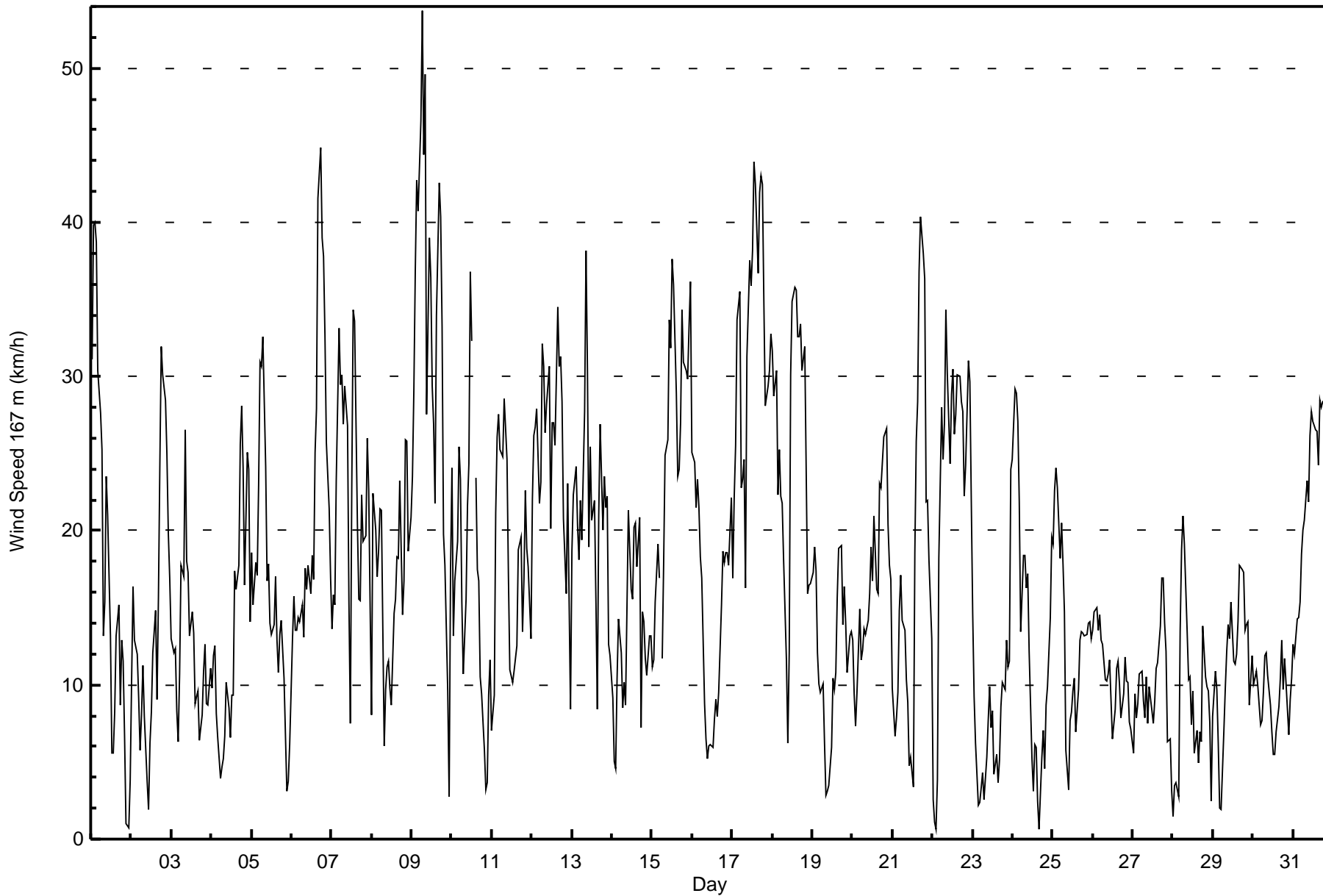
AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed 167 m (WS167m) - km/h**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744													
Maximum Value: 12 km/h on Dec 13 09:00														Hours of Data: 742													
Minimum Value: 0 km/h on Dec 23 09:00														Hours of Missing Data: 2													
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 5 P <sub>99</sub> = 8														Hours of Calibration: 0													
														Percent Operational Time: 99.7													
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	6	2	2	4	3	3	6	4	5	2	3	3	1	1	2	2	3	2	2	2	3	1	1	3	6		
2-Dec	2	2	2	1	1	1	1	1	2	2	2	2	2	3	1	2	1	4	1	1	2	2	2	2	4		
3-Dec	3	2	2	2	2	2	4	2	4	3	3	3	4	2	1	1	1	2	3	2	2	1	1	2	4		
4-Dec	2	3	3	3	2	1	1	2	1	2	2	1	1	2	4	3	5	4	2	4	3	4	4	5	5		
5-Dec	6	3	3	2	7	3	3	3	4	2	2	2	2	3	3	3	3	3	2	3	1	1	2	7			
6-Dec	4	2	2	2	2	2	2	2	3	4	3	3	3	3	4	4	3	2	2	1	2	2	3	4	4		
7-Dec	4	3	2	4	2	3	5	3	3	4	5	2	6	3	3	5	5	4	4	7	6	2	2	3	7		
8-Dec	2	5	7	1	2	3	4	2	2	2	2	2	2	3	3	3	3	3	3	3	4	2	4	5	7		
9-Dec	5	3	5	3	4	6	6	8	7	8	5	3	4	4	6	7	3	2	5	3	6	3	3	4	8		
10-Dec	4	5	2	6	7	7	6	1	4	4	3	5	4	AF	2	3	4	3	2	1	2	2	1	2	7		
11-Dec	2	2	3	3	1	1	4	3	3	3	5	2	1	1	2	2	2	3	3	4	3	2	4	4	5		
12-Dec	2	2	4	4	3	3	3	3	3	4	4	6	4	3	5	3	2	3	2	3	3	3	3	4	6		
13-Dec	3	2	3	4	4	4	3	11	12	11	7	3	3	2	4	3	7	4	4	6	4	4	2	3	12		
14-Dec	2	2	1	3	3	3	1	1	2	2	3	3	2	2	3	2	3	3	5	4	3	4	2	2	5		
15-Dec	4	2	2	3	2	AF	2	3	2	4	2	6	3	2	6	3	2	3	6	3	7	6	3	3	7		
16-Dec	5	4	4	5	4	3	4	3	2	2	2	1	1	2	2	1	2	6	3	3	3	3	2	4	6		
17-Dec	4	3	4	5	5	4	3	5	5	7	4	4	3	5	3	5	8	6	6	3	6	6	5	5	8		
18-Dec	7	5	4	7	3	4	4	5	4	2	9	5	7	6	5	5	4	4	3	3	8	3	3	3	9		
19-Dec	3	3	3	3	2	1	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	3		
20-Dec	2	3	2	3	2	2	2	2	1	2	4	3	3	2	1	1	2	1	3	2	3	2	2	1	4		
21-Dec	2	1	2	2	2	2	1	1	1	2	1	1	1	7	3	3	6	4	4	7	3	2	2	4	7		
22-Dec	2	1	1	2	4	6	2	3	2	3	5	4	3	4	4	3	3	2	3	4	4	4	4	5	6		
23-Dec	3	2	1	1	1	2	1	1	0	1	1	1	3	3	3	3	2	2	1	1	1	1	7	4	7		
24-Dec	5	6	5	5	5	2	2	2	2	1	3	2	1	2	2	1	1	1	2	1	4	1	1	2	6		
25-Dec	2	2	2	2	2	3	2	4	2	1	2	2	1	1	1	1	1	2	1	1	1	1	1	2	4		
26-Dec	2	2	1	2	3	2	2	2	2	2	1	3	1	2	2	2	1	1	3	3	2	1	1	1	3		
27-Dec	1	1	2	1	2	2	2	1	1	2	2	2	1	1	1	2	2	2	3	3	2	1	1	2	3		
28-Dec	1	1	1	2	3	2	2	2	2	2	1	1	1	1	2	1	2	3	2	2	2	2	2	1	3		
29-Dec	3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	3		
30-Dec	1	1	2	2	1	1	1	2	1	1	1	2	1	1	1	1	3	1	2	2	2	1	2	1	3		
31-Dec	2	2	2	2	1	2	1	1	2	2	2	2	2	1	2	2	2	3	3	2	2	2	1	2	3		
														Diurnal Maximum													
AF - Analyzer Failure																											





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 167 m (WS167m) - km/h  
Lower Camp Met Tower - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	53	7.14	7.14
6 - 11	188	25.34	32.48
12 - 19	239	32.21	64.69
20 - 28	162	21.83	86.52
29 - 38	79	10.65	97.17
> 38	21	2.83	100.00

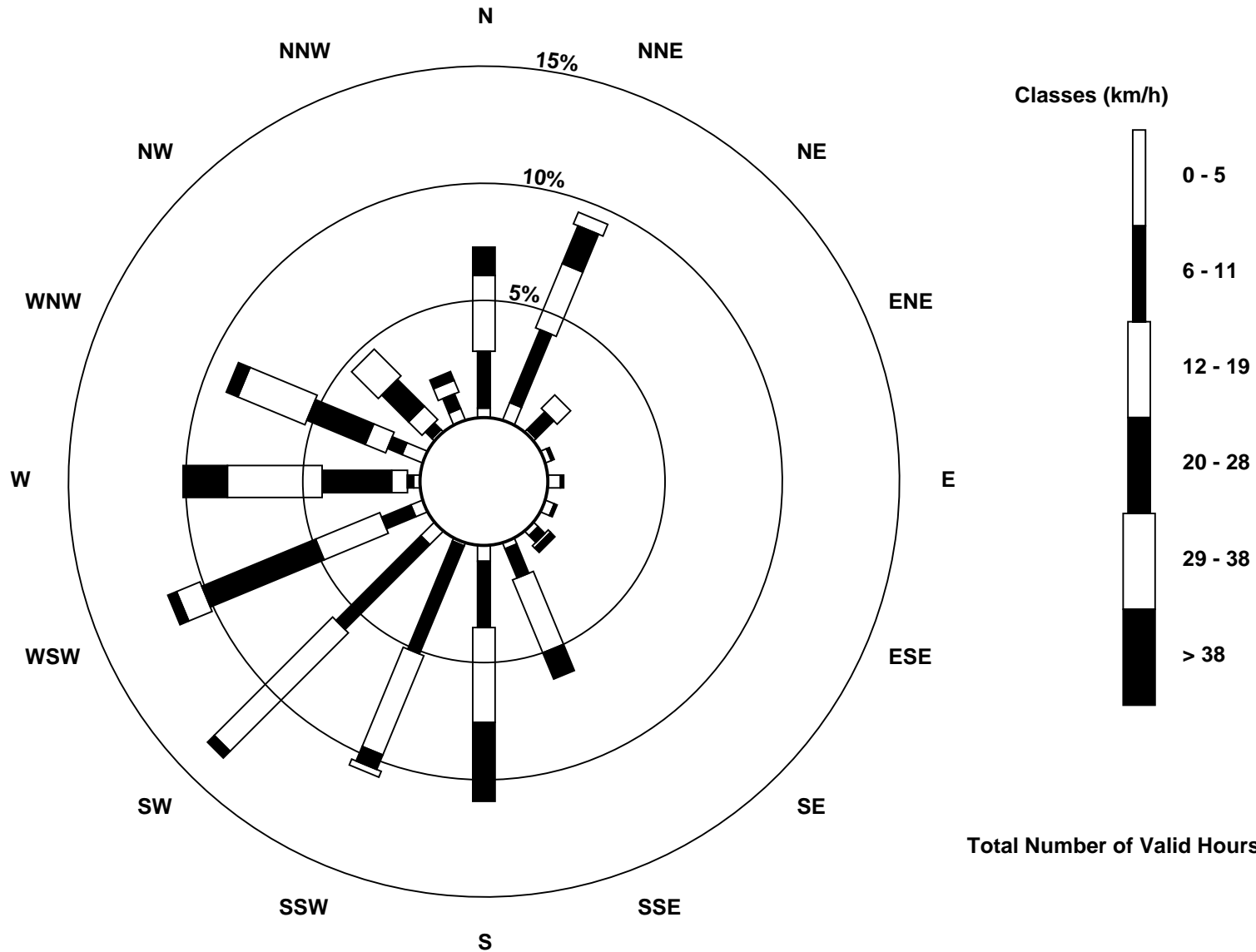
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction 20 m (WD20m) - deg**  
**Lower Camp Met Tower - December 2017**

Direction of Maximum Speed: 315 deg on Dec 18 14:00																						Hours in Service: 744				
Direction of Maximum Daily Speed Average: 141.9 deg on Dec 20																						Hours of Data: 692				
Direction of Minimum Speed: 90 deg on Dec 17 09:00											Direction of Minimum Daily Speed Average: 0.7 deg on Dec 23											Hours of Missing Data: 52				
Monthly Average Direction: 282.5 deg																						Percent Operational Time: 93.0				
Day	Hourly Period Ending At (MST)																								Daily Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	146	265	259	255	202	156	139	140	147	150	145	144	146	145	149	142	159	169	143	344	336	258	19	154	167.7	
2-Dec	130	337	351	317	298	342	332	338	340	345	328	253	302	263	271	324	180	151	281	266	295	120	130	145	299.3	
3-Dec	147	146	145	142	142	142	97	12	334	355	2	3	9	358	353	355	4	10	3	360	345	338	326	351	15.1	
4-Dec	344	17	333	293	288	319	240	175	159	151	150	152	161	147	147	136	148	145	168	159	149	149	161	178	153.0	
5-Dec	158	146	143	138	139	141	132	62	339	353	344	339	357	2	5	360	18	16	9	347	341	335	18	111	68.7	
6-Dec	137	145	143	148	146	146	145	145	145	143	138	142	149	141	146	146	260	266	268	277	263	129	138	135	159.4	
7-Dec	144	143	143	139	139	135	139	141	139	137	139	148	142	63	318	294	318	208	311	310	319	291	205	146	145.2	
8-Dec	143	142	142	141	143	147	144	148	147	152	149	147	149	149	145	142	139	145	145	143	138	138	139	138	143.2	
9-Dec	136	137	189	263	265	274	279	282	277	284	280	277	272	279	241	274	275	263	273	237	247	67	187	179	260.2	
10-Dec	228	147	194	130	166	141	140	137	AF	AF	259	292	327	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	212	260	303	273	344	337	312	328	313	317	232	179	140	142	--	
13-Dec	140	137	148	138	138	137	141	152	279	278	325	18	350	334	353	286	285	321	290	332	345	346	15	28	144.5	
14-Dec	15	229	203	223	236	265	159	148	149	149	140	139	145	142	137	136	139	1	163	161	134	147	141	126	147.6	
15-Dec	150	142	132	127	AF	AF	AF	AF	AF	AF	255	254	277	309	304	296	266	221	228	247	268	279	283	280	275	267.8
16-Dec	291	11	23	18	15	8	7	26	35	76	97	110	81	132	162	148	144	147	143	154	156	144	142	136	101.8	
17-Dec	95	85	118	142	164	122	127	236	90	269	278	272	271	279	278	283	297	305	307	306	303	301	285	272	280.5	
18-Dec	303	295	283	307	6	359	20	17	20	358	351	317	315	315	319	321	312	306	297	297	317	6	5	2	324.0	
19-Dec	359	355	4	288	295	320	337	353	346	352	160	144	137	141	144	147	132	136	132	141	140	145	134	136	129.6	
20-Dec	144	145	144	140	140	144	145	144	145	147	144	139	140	141	137	134	135	140	139	139	143	147	147	152	141.9	
21-Dec	151	155	142	142	139	108	52	360	330	276	282	334	203	150	349	326	319	298	308	306	356	354	349	352	314.6	
22-Dec	52	75	31	343	340	316	311	283	268	276	282	310	297	307	301	307	303	299	305	345	23	15	2	352	317.0	
23-Dec	351	354	358	291	337	300	336	346	338	322	308	291	314	282	329	241	132	123	131	139	141	134	342	337	351.5	
24-Dec	357	17	17	2	350	306	323	326	332	324	286	263	199	132	236	188	134	156	101	12	319	337	306	333	348.2	
25-Dec	339	349	344	350	318	345	349	347	266	321	138	141	132	129	132	112	135	150	140	144	134	141	141	141	125.5	
26-Dec	143	137	139	141	140	143	142	143	142	144	146	141	142	144	138	141	143	143	145	145	150	148	151	156	142.8	
27-Dec	149	147	155	150	147	148	141	145	144	143	142	137	139	140	138	137	132	144	147	150	140	145	144	145	143.3	
28-Dec	147	144	144	36	345	335	315	339	330	313	303	291	312	251	283	232	294	331	322	342	309	338	333	334	312.0	
29-Dec	337	338	335	316	316	148	122	152	156	139	147	142	144	141	141	143	138	143	140	140	138	138	140	139	140.8	
30-Dec	138	139	138	140	147	150	145	143	139	137	136	133	134	140	140	141	140	140	144	150	154	158	155	139	141.4	
31-Dec	148	152	150	148	153	137	144	149	141	145	143	143	145	143	139	143	147	144	158	155	142	142	140	144	144.9	
135.1 129.0 140.8 144.7 144.4 140.0 137.1 145.3 166.1 157.7 174.5 176.3 176.1 174.9 165.3 170.4 206.0 235.4 226.6 199.7 147.4 137.9 141.8 144.1																										
Diurnal Average																										
AF - Analyzer Failure																										
All monthly, daily, and diurnal averages have been calculated using vector methods																										





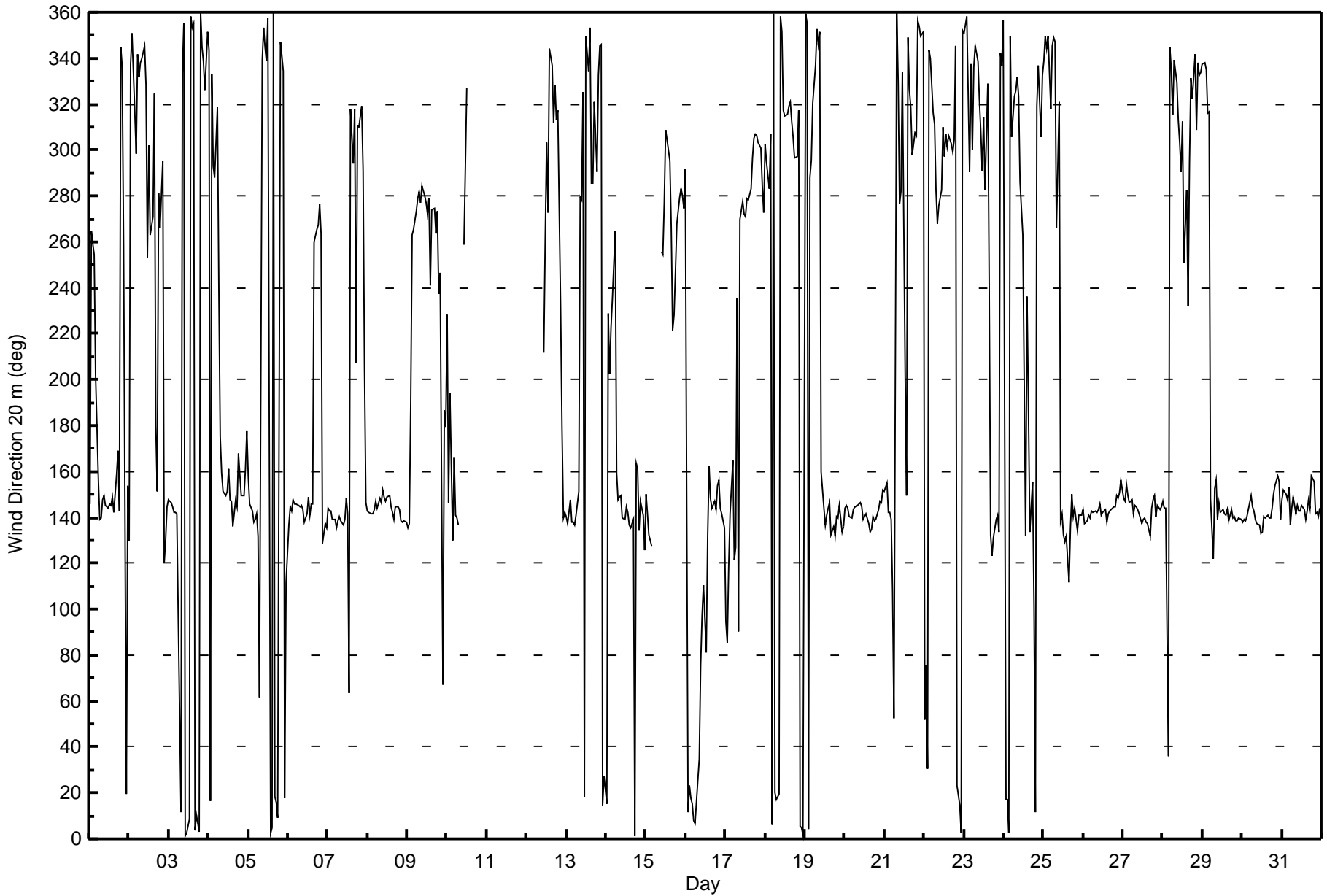
**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction 20 m (WD20m) - deg**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 104 deg on Dec 24 20:00	Hours of Data: 692
Minimum Value: 5 deg on Dec 8 00:00	Hours of Missing Data: 52
Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 10 Q <sub>1</sub> = 13 Median = 19 Q <sub>3</sub> = 34 P <sub>90</sub> = 62 P <sub>99</sub> = 99	Hours of Calibration: 0
	Percent Operational Time: 93.0

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	70	14	13	21	47	84	60	14	22	17	20	9	11	10	9	20	75	44	18	68	22	71	86	76	86
2-Dec	26	48	27	31	58	44	36	44	20	31	61	26	60	19	33	60	47	18	50	13	69	72	17	10	72
3-Dec	6	11	10	55	37	52	100	83	18	19	23	29	26	20	18	15	21	23	35	31	19	28	32	25	100
4-Dec	25	38	59	64	62	37	83	46	25	15	11	13	21	21	13	24	25	69	17	24	24	33	42	63	83
5-Dec	21	35	9	10	9	18	38	71	23	16	18	28	25	27	22	21	25	22	22	23	28	46	50	30	71
6-Dec	15	13	18	7	9	10	11	16	11	12	15	20	8	9	14	14	43	15	21	28	67	68	13	10	68
7-Dec	12	8	7	9	12	12	11	16	11	10	18	27	77	87	33	27	100	78	48	72	74	22	48	5	100
8-Dec	12	11	14	8	7	10	10	9	10	8	9	10	9	7	42	8	11	43	19	8	7	6	7	8	43
9-Dec	6	11	53	32	19	25	25	24	28	71	25	22	21	27	54	50	21	13	43	39	99	99	64	86	99
10-Dec	99	77	69	51	41	26	10	11	AF	AF	49	24	16	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	99
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	58	57	53	27	81	33	15	18	29	19	66	36	25	12	81
13-Dec	9	8	19	9	8	12	10	45	34	54	58	55	25	20	29	36	47	35	60	75	53	25	32	39	75
14-Dec	53	38	42	72	66	29	37	8	6	10	31	17	19	12	16	15	21	76	90	67	59	16	20	16	90
15-Dec	44	19	80	34	AF	AF	AF	AF	AF	35	13	20	14	16	15	40	16	6	16	18	17	17	16	17	80
16-Dec	38	26	23	22	25	27	24	42	39	39	33	33	45	74	17	21	17	14	25	11	16	17	11	32	74
17-Dec	17	20	34	24	35	15	10	71	99	41	17	15	16	18	18	19	18	17	17	15	15	18	19	17	99
18-Dec	19	18	17	43	20	17	22	23	28	27	94	16	15	15	15	15	13	15	16	15	43	20	20	23	94
19-Dec	19	16	17	41	17	29	19	22	40	92	37	22	16	11	12	11	21	31	46	11	12	11	13	11	92
20-Dec	9	12	15	17	17	13	16	11	11	12	10	12	11	11	13	7	7	9	11	9	13	11	12	18	18
21-Dec	12	30	14	13	11	74	71	81	82	85	84	61	60	24	70	25	23	15	15	25	19	14	19	46	85
22-Dec	77	28	40	25	28	103	28	43	18	24	24	15	16	16	16	15	14	16	14	30	22	22	20	19	103
23-Dec	20	20	18	26	61	78	92	18	14	23	29	62	42	81	60	29	30	32	13	13	15	32	30	27	92
24-Dec	22	26	23	19	29	14	9	22	26	21	39	44	35	17	39	52	30	46	88	104	82	25	29	19	104
25-Dec	14	16	22	18	22	44	42	47	73	41	92	9	10	14	12	19	27	8	10	9	9	11	14	12	92
26-Dec	12	11	11	11	12	11	10	11	13	11	10	12	12	14	14	13	12	12	12	11	11	11	20	16	20
27-Dec	6	13	9	11	13	11	13	12	12	11	13	13	14	13	11	11	10	30	21	25	9	9	9	9	30
28-Dec	8	12	15	87	58	27	15	17	31	36	42	34	36	14	23	42	82	38	25	34	14	17	18	27	87
29-Dec	35	21	16	13	51	66	71	21	11	10	10	13	12	12	13	11	8	9	11	11	11	12	14	11	71
30-Dec	12	12	14	15	13	14	17	10	11	12	12	15	15	17	14	20	19	10	36	63	12	14	20	17	63
31-Dec	12	8	12	16	34	32	11	9	16	18	16	11	11	14	13	12	14	16	18	17	17	10	11	9	34
99 77 80 87 66 103 100 83 99 92 94 62 77 87 81 60 100 78 90 104 99 99 86 86																									
Diurnal Maximum																									

AF - Analyzer Failure





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction 45 m (WD45m) - deg**  
**Lower Camp Met Tower - December 2017**

Direction of Maximum Speed: 267 deg on Dec 6 18:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 149.8 deg on Dec 31	Hours of Data: 692
Direction of Minimum Speed: 271 deg on Dec 21 08:00	Hours of Missing Data: 52
Direction of Minimum Daily Speed Average: 0.2 deg on Dec 13	Percent Operational Time: 93.0
Monthly Average Direction: 254.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	218	268	260	256	235	197	157	138	148	153	147	146	148	145	153	148	152	160	149	120	347	275	286	230	178.7	
2-Dec	140	333	359	333	327	346	348	353	354	356	344	280	336	304	310	143	164	164	268	272	277	155	152	160	306.2	
3-Dec	152	152	154	158	151	148	119	327	342	4	12	15	17	9	1	5	15	19	17	10	1	347	336	8	31.2	
4-Dec	5	27	12	299	301	346	255	164	160	156	153	154	156	147	151	144	149	147	160	157	154	149	156	168	151.0	
5-Dec	165	149	150	144	143	142	142	119	346	2	349	340	4	12	15	10	28	24	18	355	353	344	14	120	64.1	
6-Dec	143	149	150	153	149	149	148	149	151	151	145	150	156	148	164	172	263	267	268	274	263	193	150	144	172.8	
7-Dec	148	143	144	144	158	153	158	150	146	151	147	155	139	323	309	298	328	47	295	325	335	302	260	150	158.8	
8-Dec	141	154	145	144	145	145	144	149	151	154	148	147	150	151	144	145	144	150	144	144	146	149	144	142	146.4	
9-Dec	140	147	220	261	266	274	280	285	277	287	277	277	270	280	256	276	274	266	272	241	257	97	215	210	262.1	
10-Dec	251	204	215	140	202	150	148	142	AF	AF	259	293	334	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	238	273	309	273	323	329	319	329	314	317	278	275	164	152	--
13-Dec	143	143	177	146	137	147	146	162	281	284	324	4	360	344	350	308	297	318	296	307	354	349	29	36	262.7	
14-Dec	36	194	194	185	208	227	155	150	149	151	147	143	148	146	144	144	50	147	163	148	149	148	134	150.3		
15-Dec	151	146	143	AF	AF	AF	AF	AF	173	255	257	279	311	307	299	266	230	235	252	265	281	286	284	277	269.3	
16-Dec	294	19	29	24	22	18	16	36	44	80	102	114	82	142	166	153	150	152	151	158	158	150	148	141	102.5	
17-Dec	104	102	137	156	178	129	136	248	266	272	279	274	273	281	281	284	300	308	310	309	307	303	288	275	280.0	
18-Dec	305	299	285	313	15	8	26	23	27	11	357	322	321	320	325	326	318	309	301	302	321	13	13	11	331.5	
19-Dec	7	2	13	328	319	309	341	328	325	238	161	148	148	147	150	153	145	149	146	150	148	150	147	146	139.6	
20-Dec	149	151	150	147	145	148	149	149	149	149	148	145	143	147	148	141	143	144	141	138	146	150	149	153	146.8	
21-Dec	153	155	154	154	149	129	198	271	256	256	266	325	176	153	324	318	315	301	309	308	3	359	1	13	313.6	
22-Dec	66	81	46	3	349	331	290	278	268	275	284	312	302	310	306	308	305	303	309	353	30	22	12	359	321.4	
23-Dec	359	1	359	304	355	295	322	349	345	328	334	323	329	286	348	263	149	147	145	146	147	142	356	350	10.7	
24-Dec	7	26	26	14	3	330	339	331	354	340	272	234	197	136	122	175	165	159	124	145	211	341	332	351	6.3	
25-Dec	358	1	357	0	348	355	345	353	246	304	165	142	139	131	123	122	147	144	148	151	144	148	149	148	125.5	
26-Dec	149	145	147	146	147	148	149	149	148	148	149	148	147	149	144	147	148	149	150	149	152	151	152	158	148.3	
27-Dec	153	151	157	151	150	150	147	148	148	147	146	144	146	145	145	146	148	164	165	166	155	150	151	151	149.6	
28-Dec	158	151	149	150	345	327	328	308	336	304	353	288	329	279	309	271	293	345	324	322	334	330	339	330	315.7	
29-Dec	312	329	338	338	328	157	156	160	159	144	148	146	147	147	146	149	146	148	148	145	144	144	146	147	147.4	
30-Dec	146	147	146	147	151	152	149	150	147	145	143	140	140	143	146	147	147	148	152	153	154	157	158	152	148.0	
31-Dec	152	156	154	151	154	144	150	155	148	149	148	150	149	149	148	150	151	148	158	152	146	147	146	150	149.8	

139.2	131.7	148.2	152.3	148.3	145.0	146.9	155.3	176.9	168.3	181.3	181.4	176.3	179.1	175.7	184.0	212.5	229.7	227.9	211.1	158.8	141.3	148.0	150.4
Diurnal Average																							

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



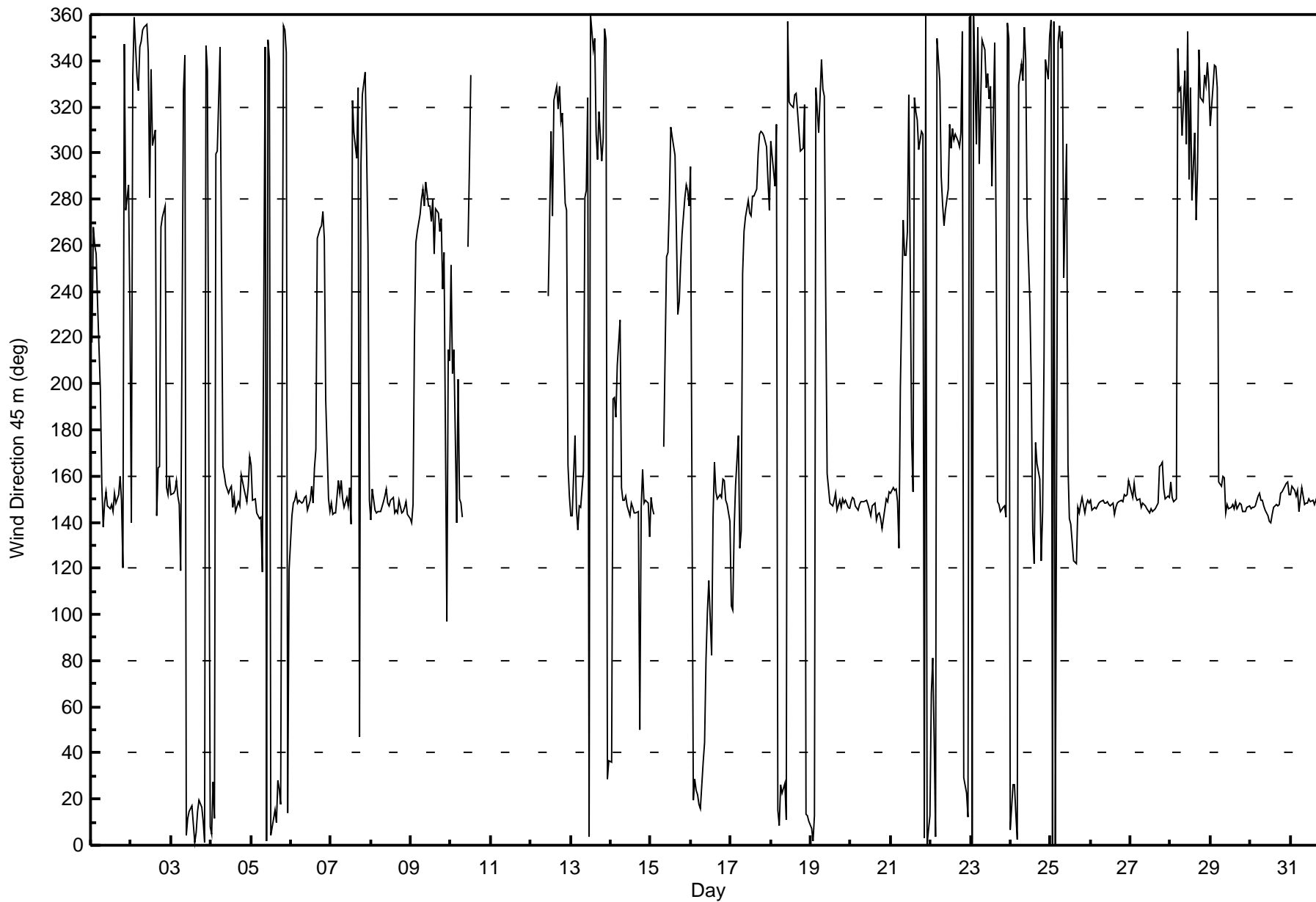
**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction 45 m (WD45m) - deg**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 105 deg on Dec 2 16:00	Hours of Data: 692
Minimum Value: 2 deg on Dec 29 17:00	Hours of Missing Data: 52
Percentiles: P <sub>1</sub> = 4 P <sub>10</sub> = 6 Q <sub>1</sub> = 8 Median = 14 Q <sub>3</sub> = 25 P <sub>90</sub> = 48 P <sub>99</sub> = 93	Hours of Calibration: 0
	Percent Operational Time: 93.0

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	59	9	8	13	34	80	42	11	18	16	12	4	6	8	5	11	40	24	10	86	15	47	77	44	86
2-Dec	28	32	17	29	48	32	19	24	10	14	42	29	49	26	30	105	19	19	13	7	27	61	20	12	105
3-Dec	5	6	6	17	8	32	81	92	13	15	17	21	18	14	13	9	15	17	29	24	13	21	27	15	92
4-Dec	14	25	51	42	46	26	72	30	12	8	7	9	11	12	7	15	20	55	15	18	15	20	31	43	72
5-Dec	17	21	8	6	6	11	25	72	18	9	13	22	20	21	15	14	18	15	18	16	28	38	37	27	72
6-Dec	11	9	9	3	4	5	6	10	6	7	10	15	5	6	22	21	30	8	12	16	36	77	25	14	77
7-Dec	9	6	4	6	14	11	21	11	19	11	8	15	63	79	24	13	83	96	42	41	37	18	39	9	96
8-Dec	8	21	21	8	6	8	9	6	6	7	9	5	4	7	15	6	5	21	12	5	8	10	4	5	21
9-Dec	5	11	50	13	11	15	18	20	20	55	17	14	12	20	39	32	14	7	28	19	82	75	36	64	82
10-Dec	80	93	53	41	37	32	12	8	AF	AF	32	20	13	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	93
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	63	57	35	26	69	25	10	12	19	13	43	31	51	15	69
13-Dec	8	12	21	19	6	19	10	46	30	43	48	29	21	17	18	34	23	25	45	74	41	23	26	74	
14-Dec	32	67	26	27	48	35	10	5	4	9	21	14	13	5	10	13	13	104	79	49	42	11	14	11	104
15-Dec	24	15	61	AF	AF	AF	AF	AF	56	15	10	18	12	12	11	28	8	5	11	12	14	13	12	12	61
16-Dec	37	19	15	17	16	18	19	33	31	33	23	31	34	61	13	16	12	10	16	9	13	9	6	24	61
17-Dec	11	18	28	16	26	15	16	59	86	40	12	11	11	13	13	15	13	13	14	12	12	17	15	14	86
18-Dec	16	16	12	45	13	13	16	15	21	22	77	13	13	13	13	13	11	11	11	12	44	15	15	17	77
19-Dec	16	11	12	41	17	19	34	19	31	58	30	5	8	6	8	7	12	15	24	7	6	7	8	6	58
20-Dec	4	6	8	9	12	6	9	5	6	5	5	6	6	4	5	5	3	4	8	10	9	6	7	12	12
21-Dec	8	21	10	6	7	54	70	96	73	89	83	58	78	20	31	20	17	10	13	21	17	10	9	21	96
22-Dec	61	19	37	20	22	93	18	25	11	14	19	13	11	13	12	11	11	11	11	30	16	16	14	14	93
23-Dec	16	17	14	28	64	43	71	20	9	11	23	48	34	44	30	27	22	8	7	7	9	14	51	22	71
24-Dec	18	18	16	14	21	9	7	20	16	10	34	44	37	11	41	26	17	20	52	58	98	36	24	17	98
25-Dec	8	9	16	11	18	13	15	52	26	67	64	5	4	7	6	11	14	6	5	4	4	6	8	6	67
26-Dec	5	5	5	5	7	4	4	4	5	5	6	6	6	7	6	7	7	6	5	6	7	6	11	6	11
27-Dec	5	7	7	8	7	7	8	7	6	6	8	6	9	8	5	6	12	27	20	24	12	6	6	5	27
28-Dec	6	7	9	84	47	36	16	25	23	33	70	14	14	20	22	35	53	22	29	42	27	12	10	17	84
29-Dec	58	20	10	6	46	24	11	7	6	5	6	7	6	6	6	5	2	8	9	8	5	6	9	5	58
30-Dec	6	7	9	8	8	8	7	4	5	6	7	12	11	13	9	13	14	6	6	29	8	6	11	10	29
31-Dec	7	6	8	12	22	18	6	5	8	11	8	4	5	6	5	4	5	8	11	11	6	3	3	3	22
	80	93	61	84	64	93	81	96	86	89	83	58	78	79	69	105	83	104	79	86	98	77	77	64	
	Diurnal Maximum																								

AF - Analyzer Failure





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction 100 m (WD100m) - deg**  
**Lower Camp Met Tower - December 2017**

Direction of Maximum Speed: 263 deg on Dec 9 07:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 255.8 deg on Dec 9	Hours of Data: 728
Direction of Minimum Speed: 244 deg on Dec 21 04:00	Hours of Missing Data: 16
Direction of Minimum Daily Speed Average: 1.5 deg on Dec 25	Percent Operational Time: 97.9
Monthly Average Direction: 236.5 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	246	250	248	247	246	241	234	200	213	228	207	166	146	149	156	169	195	153	150	142	60	30	150	208	213.0
2-Dec	210	310	328	351	338	321	333	335	330	359	7	43	317	134	147	138	176	231	251	255	255	260	250	238	275.0
3-Dec	195	193	173	162	145	153	253	283	339	0	3	7	11	3	353	3	17	22	19	18	27	350	337	11	0.2
4-Dec	16	31	45	351	4	173	137	152	162	187	149	157	152	146	152	162	152	142	137	143	148	143	144	150	142.8
5-Dec	168	162	178	193	194	258	312	304	335	348	16	4	1	4	7	5	20	14	10	0	349	332	317	170	347.7
6-Dec	140	150	151	161	166	160	161	148	161	165	174	156	177	190	227	239	252	255	256	258	249	242	235	240	209.7
7-Dec	219	209	184	226	255	250	263	265	244	254	261	165	283	279	275	309	333	285	300	299	307	294	279	234	269.4
8-Dec	218	224	211	209	221	224	226	144	167	176	173	163	146	150	160	161	169	162	163	179	220	222	208	217	185.0
9-Dec	206	223	244	251	257	259	263	268	262	266	258	266	262	266	253	265	262	254	255	241	248	34	220	225	255.8
10-Dec	241	218	231	224	236	216	197	172	183	233	257	286	317	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	143	--
11-Dec	154	194	217	224	241	250	241	226	238	226	192	160	AF	AF	165	163	161	162	161	167	178	173	171	167	181.7
12-Dec	194	222	233	243	233	227	233	253	267	244	253	297	289	272	286	295	308	303	295	306	304	311	308	255	271.2
13-Dec	227	221	227	223	199	217	212	239	266	285	302	295	330	346	335	326	294	297	282	267	309	314	31	34	282.6
14-Dec	39	108	168	192	193	175	165	152	145	149	147	155	146	158	162	150	138	167	147	153	160	140	150	152	152.4
15-Dec	142	154	153	151	AF	AF	AF	AF	247	251	252	273	295	293	287	263	239	241	251	247	267	278	272	265	258.6
16-Dec	276	12	19	14	10	10	12	27	27	71	96	107	104	147	152	149	150	148	151	154	147	152	152	140	98.0
17-Dec	120	153	159	189	206	187	209	238	252	261	267	261	261	267	266	270	287	294	295	297	293	287	274	270	262.2
18-Dec	291	287	276	302	6	3	16	14	14	2	312	312	310	310	315	315	308	298	293	293	309	5	3	3	319.8
19-Dec	0	2	13	2	347	333	339	307	261	234	226	160	166	157	144	150	158	161	160	160	164	166	180	171	151.4
20-Dec	162	156	161	156	154	156	155	160	156	159	159	158	158	161	162	164	163	162	163	158	159	160	157	147	158.8
21-Dec	139	115	121	244	256	1	325	350	335	336	314	306	165	249	302	292	293	288	291	296	318	317	320	343	304.2
22-Dec	71	80	67	59	295	281	259	263	257	261	276	297	293	298	296	297	294	292	297	340	21	14	8	355	302.9
23-Dec	354	352	343	328	352	29	124	106	68	34	343	301	330	267	312	290	205	154	156	165	178	140	33	1	351.0
24-Dec	5	17	16	5	1	345	353	344	337	350	13	323	192	149	87	80	93	151	202	137	205	92	360	9	9.0
25-Dec	20	358	358	359	6	357	342	357	27	41	170	180	174	154	138	156	198	212	205	192	196	179	180	184	357.9
26-Dec	172	181	185	177	172	154	161	156	160	169	166	165	160	157	158	154	155	158	167	161	170	171	146	158	163.3
27-Dec	173	164	160	169	168	172	169	169	161	157	159	155	158	155	179	192	206	218	216	210	213	182	209	145	175.4
28-Dec	150	158	164	107	15	356	353	352	333	351	16	349	13	10	345	0	5	45	50	34	18	21	327	322	11.3
29-Dec	42	36	35	21	245	193	195	190	193	208	202	200	171	163	165	173	188	207	206	197	192	184	167	183	184.1
30-Dec	171	192	164	152	147	148	154	162	176	180	156	145	139	139	142	148	143	146	160	184	182	154	156	150	153.8
31-Dec	164	152	159	149	154	162	169	163	157	156	154	156	160	159	159	164	159	151	155	157	162	172	169	174	159.5

211.5 214.5 218.2 224.4 234.1 238.9 250.9 242.0 248.4 242.1 234.6 238.0 256.7 237.3 225.7 226.7 234.4 232.8 236.6 235.8 241.6 241.3 220.4 212.1  
 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**

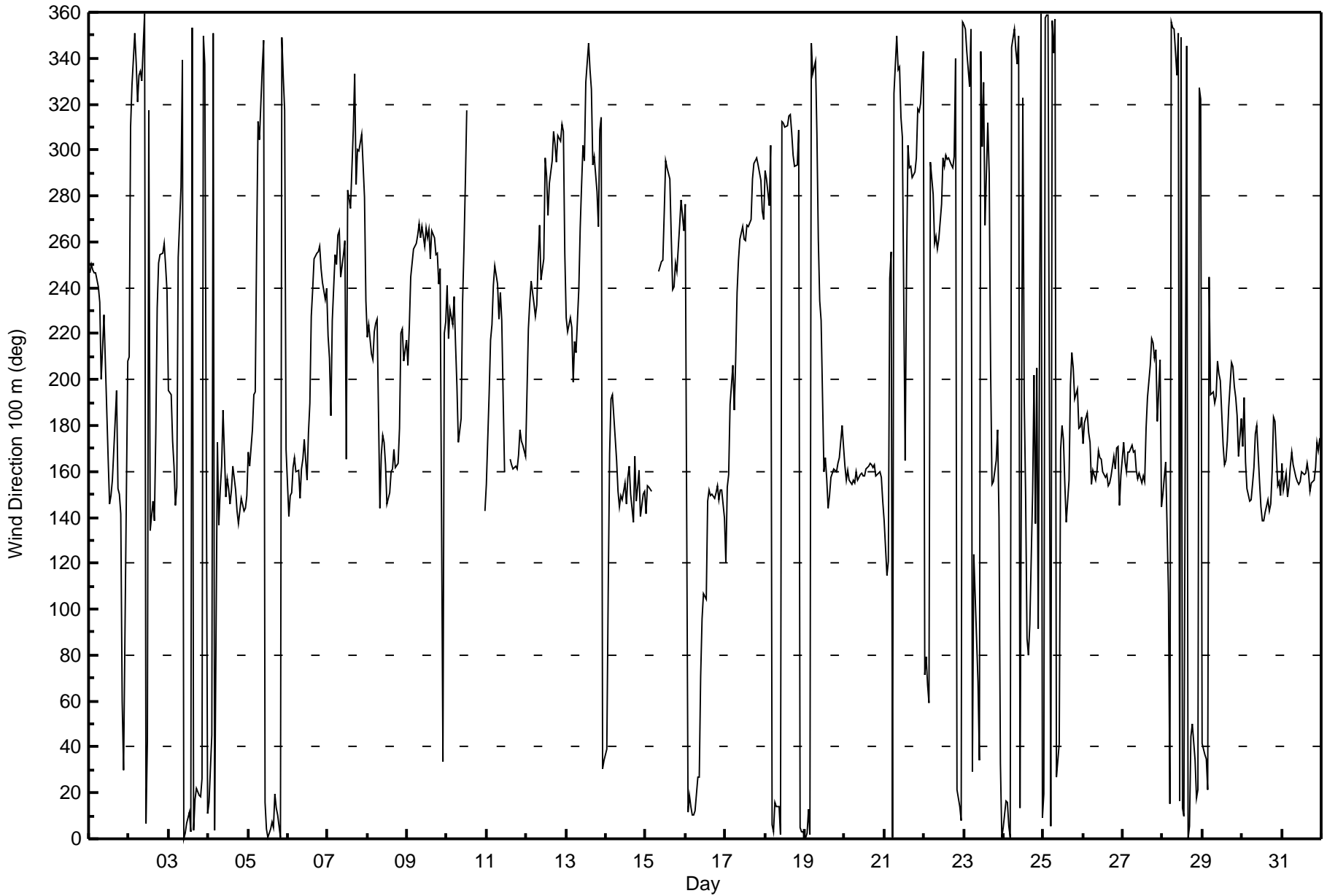
**Wind Direction 100 m (WD100m) - deg**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 96 deg on Dec 24 22:00														Hours in Service: 744 Hours of Data: 728 Hours of Missing Data: 16 Hours of Calibration: 0 Percent Operational Time: 97.9																								
Minimum Value: 2 deg on Dec 6 18:00																																						
Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 5 Q <sub>1</sub> = 7 Median = 11 Q <sub>3</sub> = 16 P <sub>90</sub> = 29 P <sub>99</sub> = 72																																						
Day	Hourly Period Ending At (MST)																							Daily Maximum														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24													
1-Dec	8	3	3	7	6	10	25	39	35	21	21	13	9	10	6	13	15	10	7	5	56	44	68	26	68													
2-Dec	47	24	9	14	9	10	6	6	4	22	48	68	84	19	13	9	17	7	5	3	3	7	14	18	84													
3-Dec	20	21	11	13	10	12	21	39	12	6	11	12	13	8	11	7	13	17	24	19	12	12	9	10	39													
4-Dec	10	21	26	26	62	53	23	21	29	18	8	9	13	9	8	9	10	8	6	7	10	6	5	20	62													
5-Dec	13	9	12	16	22	36	24	7	20	7	8	13	15	13	10	9	12	11	14	12	17	29	43	39	43													
6-Dec	5	7	6	7	7	9	11	7	8	12	15	10	10	17	13	7	3	2	3	3	7	8	17	27	27													
7-Dec	13	18	23	16	7	8	13	15	18	20	12	38	54	10	10	16	14	24	18	14	13	7	14	11	54													
8-Dec	20	7	19	11	6	18	30	8	15	8	10	8	5	9	11	11	7	4	6	13	12	8	12	12	30													
9-Dec	16	15	11	3	7	6	9	13	10	29	6	6	4	12	12	12	4	4	5	4	27	68	25	19	68													
10-Dec	59	29	14	70	11	52	27	15	20	13	11	13	10	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	15	70													
11-Dec	14	73	39	24	13	15	31	26	36	35	42	8	AF	AF	3	4	5	4	4	10	13	5	7	15	73													
12-Dec	16	17	13	13	9	10	24	11	10	20	10	40	13	11	20	8	7	8	6	5	8	9	18	14	40													
13-Dec	17	13	9	17	23	29	16	30	21	17	36	14	29	15	7	20	16	9	11	17	23	20	18	14	36													
14-Dec	18	56	29	16	19	15	11	5	6	6	10	13	8	5	7	12	8	30	43	14	11	7	7	12	56													
15-Dec	12	10	11	10	AF	AF	AF	AF	8	4	4	14	6	6	7	17	7	6	7	5	12	11	8	6	17													
16-Dec	38	12	10	9	8	10	12	18	22	31	17	20	18	21	9	10	9	8	7	7	5	5	8	14	38													
17-Dec	15	12	10	14	10	17	11	27	53	10	7	5	4	8	9	10	8	8	8	6	8	12	11	10	53													
18-Dec	9	10	9	43	7	8	10	10	13	15	53	9	10	7	7	8	7	7	6	8	43	9	10	12	53													
19-Dec	10	9	8	16	15	12	6	23	10	15	24	12	12	11	5	6	6	10	7	5	8	16	15	8	24													
20-Dec	7	11	9	9	7	6	5	5	8	4	5	6	4	5	3	4	4	4	6	6	5	4	4	9	11													
21-Dec	38	13	68	90	14	28	12	9	14	6	37	10	73	31	11	5	5	5	7	11	11	7	8	25	90													
22-Dec	25	9	31	18	82	22	5	7	4	5	17	7	7	8	8	6	6	5	6	32	10	10	9	8	82													
23-Dec	11	12	10	12	24	48	57	10	46	24	11	27	34	26	33	38	16	15	10	11	24	10	51	12	57													
24-Dec	12	11	11	8	12	10	6	10	7	6	6	86	69	14	36	12	14	11	36	9	50	96	10	14	96													
25-Dec	11	5	8	9	6	7	4	7	24	23	59	12	11	12	8	11	21	9	13	13	16	6	14	12	59													
26-Dec	6	8	12	8	9	8	9	4	9	5	8	6	5	5	5	4	5	7	10	10	12	10	13	9	13													
27-Dec	11	13	9	8	9	9	7	9	12	8	12	9	11	9	15	15	12	20	25	34	31	20	24	8	34													
28-Dec	4	11	22	36	8	21	8	8	12	6	12	19	9	19	8	33	25	27	11	20	13	18	24	25	36													
29-Dec	13	8	21	27	58	22	13	13	15	15	11	10	8	8	7	8	11	12	14	16	13	9	10	8	58													
30-Dec	9	15	12	10	5	6	8	11	16	19	19	12	6	4	5	7	10	5	16	14	9	8	8	6	19													
31-Dec	12	8	18	16	9	14	5	7	4	5	3	4	5	3	3	4	5	5	4	4	5	5	6	5	18													
														59	73	68	90	82	53	57	39	53	35	59	86	84	31	36	38	25	30	43	34	56	96	68	39	
Diurnal Maximum																																						
AF - Analyzer Failure																																						



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction 100 m (WD100m) - deg**  
**Lower Camp Met Tower - December 2017**







Maximum Value: 1.0 km/h on Dec 8 22:00      Maximum Daily Average: 0.5 km/h on Dec 8																								Hours in Service:	744		
Minimum Value: -0.9 km/h on Dec 17 14:00      Minimum Daily Average: -0.3 km/h on Dec 17																								Hours of Data:	692		
Maximum Diurnal Average: 0.2 km/h at hour 5      Minimum Diurnal Average: 0.0 km/h at hour 18																								Hours of Missing Data:	52		
Monthly Average: 0.09 km/h      Percentiles: P <sub>1</sub> = -0.9 P <sub>10</sub> = -0.3 Q <sub>1</sub> = -0.1 Median = 0.1 Q <sub>3</sub> = 0.3 P <sub>90</sub> = 0.4 P <sub>99</sub> = 0.8																								Hours of Calibration:	0		
																								Percent Operational Time:	93.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.4	-0.4	-0.5	-0.4	0.1	0.2	0.3	0.5	0.2	0.4	0.6	0.3	0.1	0.3	0.4	0.3	0.2	0.1	0.2	0.1	-0.1	0.1	0.1	0.2	0.2	0.6	
2-Dec	0.2	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1	-0.2	0.0	0.1	0.0	0.2	0.1	0.1	0.1	0.2	0.2	-0.1	0.0	0.1	0.3	0.3	0.4	0.1	0.4	
3-Dec	0.4	0.4	0.3	0.2	0.2	0.3	0.0	0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	-0.2	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.4		
4-Dec	-0.1	-0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.3	0.5	0.4	0.3	0.1	0.1	0.2	0.1	0.1	0.3	0.3	0.2	0.1	0.3	0.1	0.2	0.5	
5-Dec	0.4	0.2	0.3	0.5	0.4	0.5	0.1	0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.2	-0.1	0.0	0.1	0.0	-0.2	0.0	-0.1	0.0	0.1	0.1	0.1	0.5	
6-Dec	0.1	0.0	0.2	0.3	0.5	0.5	0.3	0.2	0.2	0.4	0.2	0.0	0.5	0.5	0.6	0.6	-0.3	-0.8	-0.5	-0.3	-0.2	0.2	0.6	0.5	0.2	0.6	
7-Dec	0.4	0.7	0.7	0.6	0.5	0.5	0.8	0.2	0.5	0.7	0.2	0.2	0.2	0.2	-0.1	-0.3	0.1	0.1	0.1	0.0	0.1	-0.2	0.3	0.5	0.3	0.8	
8-Dec	0.4	0.4	0.8	0.7	0.6	0.4	0.3	0.4	0.4	0.3	0.5	0.3	0.1	0.2	0.3	0.2	0.5	0.1	0.4	0.4	0.8	1.0	0.7	0.6	0.5	1.0	
9-Dec	0.8	1.0	0.3	-0.2	-0.4	-0.7	-0.9	-0.4	-0.6	0.0	-0.6	-0.4	-0.4	-0.3	0.1	-0.3	-0.7	-0.8	-0.3	0.1	0.2	0.1	0.2	0.2	-0.2	1.0	
10-Dec	0.0	0.1	0.1	0.4	0.2	0.5	0.5	0.3	AF	AF	-0.1	-0.6	-0.3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.5	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.2	-0.2	-0.2	-0.3	-0.1	-0.2	-0.5	-0.3	-0.1	-0.1	0.0	0.2	0.4	0.3	--	0.4
13-Dec	0.3	0.5	0.5	0.6	0.8	0.6	0.6	0.4	-0.6	-0.3	-0.1	-0.1	-0.1	-0.1	0.1	0.0	-0.1	-0.1	-0.4	0.1	-0.1	-0.1	0.0	0.0	0.1	0.8	
14-Dec	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.4	0.3	0.2	0.1	0.2	-0.1	0.0	0.0	0.4	0.1	0.0	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.4	
15-Dec	0.3	0.2	0.1	0.1	AF	AF	AF	AF	AF	AF	-0.1	0.3	-0.6	-0.5	-0.5	-0.2	-0.1	-0.1	-0.2	-0.3	-0.5	-0.6	-0.8	-0.7	-0.3	0.3	
16-Dec	-0.6	-0.2	0.1	0.1	0.2	0.1	-0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.5	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.3	0.1	0.1	0.5	
17-Dec	-0.2	-0.3	0.2	0.6	0.6	0.2	0.3	0.0	0.1	-0.5	-0.9	-0.9	-0.7	-0.9	-0.9	-0.6	-0.6	-0.5	-0.5	-0.4	-0.5	-0.3	-0.5	-0.7	-0.3	0.6	
18-Dec	-0.4	-0.4	-0.6	-0.4	0.0	-0.5	0.1	0.1	0.2	0.1	0.2	-0.5	-0.8	-0.9	-0.6	-0.5	-0.8	-0.5	-0.3	-0.6	-0.2	0.0	0.0	-0.1	-0.3	0.2	
19-Dec	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.2	0.5	0.2	0.3	0.3	0.2	0.1	0.5	
20-Dec	0.2	0.2	0.5	0.2	0.0	0.2	0.2	0.2	0.2	0.2	0.5	0.2	0.2	0.3	0.0	0.4	0.3	0.0	0.1	0.2	0.3	0.2	0.3	0.3	0.2	0.5	
21-Dec	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	-0.2	-0.2	-0.7	-0.5	-0.4	-0.1	0.1	0.0	0.0	0.0	0.3
22-Dec	0.0	0.1	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.7	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5	-0.4	-0.5	-0.1	0.0	0.0	-0.1	-0.2	-0.2	0.1	
23-Dec	-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	0.1	-0.1	-0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.0	-0.1	0.1	0.2	
24-Dec	-0.2	-0.2	-0.3	-0.1	-0.1	-0.1	-0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	-0.1	-0.1	-0.1	0.0	0.2	
25-Dec	-0.1	-0.2	-0.3	-0.2	-0.1	0.0	-0.2	0.0	0.1	0.1	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.3	0.4	0.4	0.6	0.4	0.5	0.4	0.1	0.6	
26-Dec	0.2	0.4	0.4	0.3	0.4	0.2	0.2	0.4	0.2	0.3	0.4	0.4	0.3	0.2	0.2	0.3	0.2	0.3	0.4	0.4	0.3	0.3	0.2	0.2	0.3	0.4	
27-Dec	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.4	0.5	0.3	0.2	0.4	0.5	0.4	0.3	0.2	0.3	0.5
28-Dec	0.2	0.2	0.2	0.1	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.2	
29-Dec	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.3	0.6	0.5	0.5	0.4	0.3	0.2	0.4	0.5	0.4	0.6	0.7	0.5	0.4	0.3	0.3	0.3	0.7	
30-Dec	0.2	0.4	0.2	0.3	0.3	0.1	0.2	0.2	0.4	0.4	0.3	0.1	0.2	0.1	0.2	0.1	-0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.4	
31-Dec	0.3	0.4	0.2	0.3	0.3	0.3	0.5	0.5	-0.2	0.0	0.0	0.2	0.3	0.4	0.3	0.5	0.3	0.2	0.2	0.2	0.4	0.5	0.6	0.8	0.3	0.8	
																								Diurnal Average			
																								Diurnal Maximum			
0.1   0.1   0.1   0.2   0.2   0.1   0.1   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   0.1   0.1   0.1   0.2   0.1																								Diurnal Average			
																								Diurnal Maximum			
0.8   1.0   0.8   0.7   0.8   0.6   0.8   0.5   0.5   0.7   0.6   0.5   0.5   0.5   0.6   0.6   0.5   0.4   0.6   0.7   0.8   1.0   0.7   0.8																								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 - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 3.6 km/h on Dec 9 07:00	Hours of Data: 692
Minimum Value: 0.1 km/h on Dec 29 05:00	Hours of Missing Data: 52
Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.2 Q <sub>1</sub> = 0.5 Median = 1.0 Q <sub>3</sub> = 1.6 P <sub>90</sub> = 2.2 P <sub>99</sub> = 3.2	Hours of Calibration: 0
	Percent Operational Time: 93.0

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.9	1.5	1.7	1.6	1.0	1.1	0.9	0.8	0.6	0.9	1.2	1.4	1.3	0.5	0.7	0.5	0.4	0.2	0.5	0.2	0.3	0.2	0.1	0.3	1.7
2-Dec	0.2	0.7	0.5	0.4	0.3	0.3	0.5	0.5	0.5	0.7	0.5	0.4	0.4	0.2	0.2	0.1	0.2	0.4	0.6	0.7	0.8	0.6	0.4	0.5	0.8
3-Dec	0.5	0.5	0.4	0.6	0.4	1.2	0.8	1.1	2.3	1.9	1.6	1.6	1.7	1.6	1.0	1.1	1.0	0.8	0.7	0.6	0.5	0.3	0.2	0.4	2.3
4-Dec	0.5	0.9	0.5	0.3	0.2	0.1	0.2	0.2	0.4	0.6	1.3	1.2	0.6	0.6	1.3	0.8	0.6	0.8	0.8	1.0	1.1	0.9	1.8	1.4	1.8
5-Dec	1.4	1.7	1.0	1.4	1.5	1.3	1.0	0.3	0.7	1.2	0.8	0.8	1.3	1.6	2.0	1.5	1.2	1.4	1.5	0.9	1.0	0.6	0.4	0.4	2.0
6-Dec	1.2	1.2	1.3	1.0	1.2	1.4	1.5	1.8	2.1	1.8	2.0	1.5	1.6	1.8	1.5	1.4	2.4	2.9	2.6	2.5	2.0	1.3	1.3	1.3	2.9
7-Dec	0.9	0.9	0.9	1.1	1.5	1.6	1.8	1.3	1.6	1.5	1.0	0.4	0.6	1.0	1.8	0.6	0.6	0.4	0.3	0.4	0.5	0.6	0.7	0.7	1.8
8-Dec	0.7	1.0	1.2	0.9	0.9	0.7	0.8	0.4	0.5	0.5	0.9	1.1	1.0	0.9	0.6	0.8	1.1	1.8	1.1	1.2	1.4	1.7	1.3	0.9	1.8
9-Dec	1.2	1.8	1.9	2.2	2.1	2.8	3.6	2.9	3.6	2.3	2.7	2.0	1.6	1.5	0.9	2.2	2.5	2.6	2.3	1.0	0.9	0.6	0.4	1.0	3.6
10-Dec	1.3	0.8	1.1	0.9	1.5	1.3	1.2	0.9	AF	AF	1.3	2.5	2.4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.5
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1.1	1.0	1.2	1.6	1.0	1.5	1.1	0.8	0.7	0.5	0.5	0.5	0.4	0.6	1.6
13-Dec	0.8	0.9	1.2	1.2	1.2	1.6	1.6	1.5	2.8	1.7	1.0	0.6	0.9	1.4	0.6	0.4	0.7	1.0	1.0	1.1	0.6	1.0	1.0	0.9	2.8
14-Dec	0.5	0.3	0.2	0.5	1.0	0.5	0.4	0.6	0.6	1.0	1.3	1.2	1.6	1.8	1.5	1.1	0.7	0.3	0.5	0.5	0.7	0.6	0.9	0.8	1.8
15-Dec	0.6	0.6	1.3	1.4	AF	AF	AF	AF	AF	1.0	1.5	2.0	2.2	2.4	2.0	1.0	0.7	0.8	1.5	1.4	1.9	2.2	2.5	2.7	2.7
16-Dec	2.2	2.7	2.3	2.3	2.1	1.8	1.7	1.1	0.9	0.8	0.8	0.6	0.5	0.5	1.0	0.9	1.0	1.4	1.2	1.4	1.6	1.9	1.8	1.6	2.7
17-Dec	1.5	1.3	1.9	1.9	1.7	1.1	0.9	1.0	0.6	1.9	2.7	2.4	2.6	3.5	3.1	2.7	3.4	3.3	3.1	2.1	1.7	2.4	2.2	2.3	3.5
18-Dec	2.3	1.9	2.3	2.3	3.0	2.8	2.5	2.1	1.4	0.9	0.8	2.8	3.2	3.3	3.1	2.7	2.5	2.6	2.3	2.6	2.5	1.9	1.7	1.8	3.3
19-Dec	1.5	1.2	1.1	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.3	0.7	1.0	1.4	1.3	1.1	1.0	0.9	1.0	1.0	0.8	0.8	1.2	1.5
20-Dec	1.6	1.5	1.3	1.6	1.6	1.7	1.9	2.0	1.9	1.8	2.1	2.0	1.7	2.3	2.3	1.5	1.9	1.8	1.5	1.0	1.3	1.7	1.6	1.4	2.3
21-Dec	0.9	0.7	0.7	0.9	0.8	0.3	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.7	0.7	1.2	2.0	3.1	2.5	2.5	1.1	0.8	0.6	0.3	3.1
22-Dec	0.5	0.3	0.3	0.3	0.2	0.4	1.3	1.6	2.5	2.1	1.7	1.8	2.3	2.0	2.1	2.1	2.2	2.2	1.8	2.4	2.8	3.2	2.7	2.0	3.2
23-Dec	1.1	0.7	0.5	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.4	0.5	0.7	0.6	0.5	0.3	0.3	0.2	0.7	1.2	0.8	0.5	0.6	1.4	1.4
24-Dec	2.3	2.6	2.5	2.3	1.4	0.4	0.4	0.2	0.2	0.1	0.2	0.2	0.3	0.5	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	2.6
25-Dec	0.4	0.8	1.1	0.9	0.4	0.6	0.5	0.3	0.1	0.1	0.2	0.3	0.7	0.7	0.4	0.2	0.2	0.3	0.7	0.8	1.1	1.3	1.6	1.7	1.7
26-Dec	1.3	1.4	1.4	1.6	1.7	1.8	1.7	1.5	1.6	1.3	1.3	1.6	1.5	1.4	1.1	0.8	0.8	1.2	1.3	1.2	0.9	0.8	0.6	0.3	1.8
27-Dec	0.3	0.8	0.7	1.0	1.5	1.2	1.4	1.2	1.4	1.5	1.4	1.7	1.6	1.3	1.2	0.8	0.7	0.8	0.9	0.8	0.8	0.5	0.4	0.5	1.7
28-Dec	0.4	0.5	0.5	0.3	0.3	0.2	0.1	0.2	0.4	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.1	0.3	0.3	0.2	0.2	0.2	0.1	0.5
29-Dec	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.2	0.5	1.2	1.1	1.4	1.7	1.4	1.0	1.3	1.1	0.7	0.9	1.2	1.5	1.4	1.3	1.3	1.7
30-Dec	1.2	1.1	1.3	1.4	1.1	1.3	1.2	0.9	1.1	1.3	1.3	1.4	1.2	1.2	1.3	1.0	0.9	0.5	0.4	0.4	0.3	0.4	0.6	0.7	1.4
31-Dec	1.1	1.0	0.8	0.8	0.8	0.8	1.4	1.8	2.5	2.0	2.5	2.1	2.1	2.3	2.2	1.7	1.7	1.8	1.0	1.2	2.1	1.9	1.8	1.8	2.5
2.3 2.7 2.5 2.3 3.0 2.8 3.6 2.9 3.6 2.3 2.7 2.8 3.2 3.5 3.1 2.7 3.4 3.3 3.1 2.6 2.8 3.2 2.7 2.7																									
Diurnal Maximum																									

AF - Analyzer Failure



Maximum Value: 1.4 km/h on Dec 9 02:00																				Maximum Daily Average: 0.7 km/h on Dec 8					Hours in Service: 744				
Minimum Value: -0.8 km/h on Dec 17 14:00																				Minimum Daily Average: -0.1 km/h on Dec 17					Hours of Data: 692				
Maximum Diurnal Average: 0.3 km/h at hour 4																				Minimum Diurnal Average: 0.1 km/h at hour 14					Hours of Missing Data: 52				
Monthly Average: 0.22 km/h																				Percentiles: P <sub>1</sub> = -0.5 P <sub>10</sub> = -0.2 Q <sub>1</sub> = 0.0 Median = 0.2 Q <sub>3</sub> = 0.4 P <sub>90</sub> = 0.6 P <sub>99</sub> = 1.1					Hours of Calibration: 0				
																									Percent Operational Time: 93.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0.2	-0.2	-0.2	0.0	0.2	0.4	0.3	0.7	0.3	0.4	1.1	0.6	0.2	0.3	0.5	0.4	0.3	0.2	0.4	0.1	0.0	0.1	0.1	0.2	0.3	1.1			
2-Dec	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	-0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.5	0.1	0.5			
3-Dec	0.6	0.6	0.7	0.4	0.4	0.6	0.1	0.1	-0.1	0.0	-0.1	0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	-0.2	0.0	-0.1	0.0	0.0	0.0	0.1	0.7			
4-Dec	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.6	0.4	0.3	0.1	0.1	0.3	0.1	0.2	0.2	0.3	0.2	0.0	0.3	0.1	0.2	0.6			
5-Dec	0.6	0.5	0.3	0.8	0.8	0.8	0.3	0.2	0.0	0.1	-0.1	0.0	0.2	0.2	0.0	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.2	0.8			
6-Dec	0.2	0.0	0.3	0.5	0.8	0.7	0.4	0.3	0.4	0.6	0.3	0.0	0.7	0.8	0.7	0.6	0.6	0.2	0.3	0.3	0.4	0.6	0.5	0.8	0.5	0.8			
7-Dec	0.8	1.1	1.2	1.1	0.6	0.6	0.6	0.5	0.5	0.9	0.6	0.2	0.3	0.1	0.1	-0.3	0.0	0.2	0.1	0.1	0.1	-0.3	0.0	0.7	0.4	1.2			
8-Dec	0.8	0.5	0.9	1.1	1.0	0.6	0.6	0.6	0.6	0.4	0.6	0.5	0.2	0.1	0.5	0.2	1.0	0.5	0.6	0.6	1.0	1.1	1.1	1.0	0.7	1.1			
9-Dec	1.2	1.4	0.8	0.4	0.0	-0.1	-0.4	0.2	-0.3	0.1	-0.1	-0.1	0.1	0.0	0.2	0.0	-0.3	-0.4	0.2	0.4	0.3	0.2	0.2	0.1	0.2	1.4			
10-Dec	0.3	0.0	0.1	0.6	0.2	0.6	0.7	0.6	AF	AF	0.3	-0.2	-0.3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.7			
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.4	-0.1	-0.2	0.0	0.1	-0.1	-0.5	-0.3	-0.1	-0.1	0.1	0.1	0.4	0.6	--	0.6		
13-Dec	0.6	0.8	0.2	0.8	1.1	0.8	1.0	0.6	-0.5	-0.2	0.0	0.0	-0.2	0.0	0.1	0.0	-0.1	0.1	-0.3	0.2	0.0	-0.1	0.0	0.1	0.2	1.1			
14-Dec	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.6	0.5	0.1	-0.1	0.2	-0.1	0.1	0.3	0.6	0.0	0.1	0.2	0.2	0.1	0.3	0.1	0.2	0.2	0.6			
15-Dec	0.3	0.2	0.2	AF	AF	AF	AF	AF	AF	0.4	0.2	-0.2	-0.2	-0.5	-0.6	-0.5	-0.1	0.1	0.2	0.1	-0.1	-0.3	-0.5	-0.7	-0.4	-0.1	0.4		
16-Dec	-0.4	0.2	0.1	0.2	0.3	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.0	0.1	0.4	0.2	0.1	0.2	0.1	0.0	-0.2	0.4	0.4	0.1	0.1	0.4			
17-Dec	0.0	-0.2	0.2	1.0	0.9	0.4	0.3	0.1	0.2	-0.4	-0.6	-0.5	-0.3	-0.8	-0.5	-0.4	-0.4	-0.5	-0.5	-0.3	-0.2	-0.2	-0.2	-0.4	-0.1	1.0			
18-Dec	-0.1	-0.3	-0.5	-0.1	0.0	-0.3	0.4	0.2	0.1	0.2	0.2	-0.4	-0.2	-0.6	-0.3	-0.4	-0.7	-0.2	0.0	-0.3	0.1	0.3	0.2	0.2	-0.1	0.4			
19-Dec	0.0	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.2	0.3	0.3	0.2	0.0	0.4	0.5	0.3	0.5	0.6	0.6	0.2	0.6			
20-Dec	0.2	0.6	0.8	0.4	0.2	0.3	0.1	0.2	0.3	0.8	0.1	0.3	0.4	0.1	0.9	0.6	0.0	0.3	0.3	0.4	0.4	0.6	0.7	0.3	0.4	0.9			
21-Dec	0.4	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.0	-0.2	-0.2	-0.4	-0.4	-0.1	0.0	0.2	0.1	0.1	0.1	0.4			
22-Dec	0.1	0.1	0.1	0.0	0.1	0.0	-0.4	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	-0.2	-0.2	-0.3	-0.4	-0.3	-0.4	0.0	0.1	0.2	0.1	0.1	-0.1	0.2			
23-Dec	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.2	0.1	0.0	0.1	0.4	0.3	0.1	0.0	0.0	0.4	0.3	0.4	0.4	0.3	0.2	0.0	0.0	0.2	0.4			
24-Dec	0.1	0.1	0.2	0.1	0.1	0.0	-0.1	0.0	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.1	0.2			
25-Dec	-0.1	-0.1	-0.2	-0.1	-0.2	0.0	-0.1	0.0	0.1	0.1	0.2	0.4	0.4	0.2	0.1	0.1	0.2	0.4	0.8	0.7	0.9	0.6	0.7	0.7	0.3	0.9			
26-Dec	0.4	0.7	0.6	0.6	0.6	0.3	0.2	0.4	0.3	0.3	0.5	0.5	0.4	0.3	0.5	0.5	0.4	0.5	0.6	0.7	0.4	0.4	0.3	0.2	0.4	0.7			
27-Dec	0.4	0.4	0.4	0.5	0.6	0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.4	0.6	0.8	0.4	0.2	0.3	0.5	0.5	0.4	0.4	0.4	0.8			
28-Dec	0.3	0.3	0.4	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.4			
29-Dec	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.9	0.8	0.8	0.6	0.5	0.4	0.5	0.8	0.6	0.8	0.9	0.8	0.7	0.4	0.4	0.5	0.9			
30-Dec	0.4	0.6	0.4	0.3	0.3	0.1	0.2	0.4	0.5	0.4	0.3	0.2	0.3	0.3	0.2	0.1	0.1	0.2	0.4	0.3	0.2	0.2	0.2	0.3	0.3	0.6			
31-Dec	0.4	0.2	0.2	0.2	0.2	0.4	0.8	0.4	-0.1	-0.1	0.0	0.4	0.5	0.6	0.9	0.9	0.7	0.4	0.1	0.3	1.0	1.0	1.1	1.2	0.5	1.2			
																								Diurnal Average					
																								Diurnal Maximum					
0.3 0.3 0.3 0.3 0.3 0.3 0.2 0.3 0.2 0.2 0.2 0.1 0.1 0.1 0.2 0.2 0.1 0.1 0.2 0.2 0.2 0.3 0.3 0.3																													
1.2 1.4 1.2 1.1 1.1 0.8 1.0 0.7 0.6 0.9 1.1 0.8 0.7 0.8 0.9 0.9 1.0 0.6 0.8 0.9 1.0 1.1 1.1 1.2																													
AF - Analyzer Failure																													



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Vertical Wind Speed 45 m (VW45m) - km/h**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4.3 km/h on Dec 9 07:00			Hours of Data:	692
Minimum Value: 0.1 km/h on Dec 29 05:00			Hours of Missing Data:	52
Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.3 Q <sub>1</sub> = 0.5 Median = 1.0 Q <sub>3</sub> = 1.4 P <sub>90</sub> = 2.3 P <sub>99</sub> = 3.5			Hours of Calibration:	0
			Percent Operational Time:	93.0

Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.0	1.7	1.6	1.7	1.1	1.3	1.1	0.8	0.8	1.2	1.2	0.9	0.8	0.5	0.6	0.5	0.6	0.2	0.5	0.3	0.3	0.2	0.1	0.2	1.7	
2-Dec	0.3	0.7	0.5	0.4	0.4	0.4	0.6	0.6	0.6	0.7	0.6	0.4	0.4	0.2	0.2	0.2	0.3	0.7	0.7	0.8	1.1	0.7	0.5	0.8	1.1	
3-Dec	0.5	0.5	0.5	0.6	0.4	1.0	0.9	1.1	2.7	1.9	1.7	1.6	1.8	1.5	1.0	1.0	1.0	0.9	0.7	0.7	0.5	0.2	0.2	0.5	2.7	
4-Dec	0.5	1.0	0.8	0.3	0.3	0.1	0.2	0.3	0.4	0.5	1.2	1.1	0.7	0.5	1.0	0.7	0.6	1.1	1.0	1.2	1.2	1.1	2.1	1.7	2.1	
5-Dec	1.6	1.8	1.1	1.1	1.1	1.2	1.0	0.4	0.7	1.1	0.7	0.8	1.3	1.6	2.0	1.5	1.3	1.5	1.5	1.0	1.0	0.6	0.4	0.3	2.0	
6-Dec	1.1	1.2	1.2	0.7	0.9	1.1	1.2	1.8	1.6	1.4	1.6	1.6	1.3	1.4	1.6	1.4	2.3	2.4	2.5	2.8	2.1	1.4	1.3	1.4	2.8	
7-Dec	0.9	0.6	0.6	0.9	1.5	1.6	1.6	1.5	1.5	1.4	1.1	0.5	0.8	1.4	2.2	0.8	0.7	0.4	0.5	0.6	0.8	0.8	0.8	0.7	2.2	
8-Dec	0.5	1.2	1.2	0.7	0.7	0.5	0.8	0.4	0.4	0.4	0.7	0.7	0.7	0.7	0.6	0.7	0.8	1.7	1.0	0.8	1.3	1.6	0.9	0.9	1.7	
9-Dec	1.0	2.0	2.0	2.3	2.1	3.1	4.3	3.4	4.1	2.9	3.0	2.3	1.6	1.8	1.1	2.6	2.7	2.2	2.4	1.0	1.2	0.7	0.6	1.3	4.3	
10-Dec	1.8	1.1	1.5	1.2	1.8	1.5	1.3	0.8	AF	AF	1.3	2.5	2.9	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.9	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1.5	1.1	1.5	1.7	1.3	1.9	1.1	1.1	0.9	0.7	0.6	0.6	0.5	0.7	1.9
13-Dec	0.9	0.9	1.3	1.2	1.0	1.5	1.3	1.6	3.0	1.7	1.2	1.0	0.9	1.4	0.8	0.4	0.9	1.3	1.1	1.4	0.9	1.1	1.1	1.1	3.0	
14-Dec	0.7	0.3	0.2	0.7	1.3	0.7	0.5	0.5	0.5	0.9	1.5	1.3	1.3	1.2	1.3	1.0	0.7	0.4	0.5	0.6	0.8	0.5	0.8	0.7	1.5	
15-Dec	0.7	0.6	1.4	AF	AF	AF	AF	AF	1.1	1.1	1.3	2.0	2.5	2.6	2.1	1.1	0.7	0.9	1.3	1.5	2.1	2.5	2.7	3.0	3.0	
16-Dec	2.4	2.6	2.5	2.4	2.2	2.0	1.9	1.3	1.0	0.8	0.8	0.7	0.5	0.6	1.1	1.0	1.0	1.3	1.2	1.3	1.8	1.9	1.4	1.5	2.6	
17-Dec	1.4	1.4	2.2	2.0	2.0	1.0	1.0	1.2	0.6	2.0	3.1	2.5	2.8	3.9	3.6	3.1	3.7	3.6	3.3	2.1	1.9	2.5	2.6	2.5	3.9	
18-Dec	2.7	2.1	2.4	2.5	2.9	2.6	2.6	2.1	1.4	0.9	0.9	3.1	3.6	3.6	3.4	2.9	2.7	2.7	2.4	2.7	2.8	1.8	1.7	1.7	3.6	
19-Dec	1.7	1.3	1.1	0.8	0.5	0.4	0.3	0.2	0.1	0.1	0.2	0.2	0.6	0.7	1.2	1.1	1.0	1.2	1.1	0.9	0.8	0.7	0.8	1.1	1.7	
20-Dec	1.2	1.0	1.1	1.3	1.3	1.4	1.7	1.6	1.4	1.5	1.5	1.6	1.4	1.5	1.5	1.0	0.9	1.2	1.2	0.9	1.1	1.3	1.3	1.3	1.7	
21-Dec	0.9	0.6	0.5	0.6	0.5	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.7	1.0	1.5	2.2	3.1	2.6	2.7	1.2	0.8	0.5	0.4	3.1	
22-Dec	0.5	0.3	0.3	0.3	0.2	0.5	1.7	2.0	2.6	2.4	2.1	2.0	2.3	2.3	2.3	2.1	2.3	2.3	1.9	2.5	2.7	3.2	2.8	2.1	3.2	
23-Dec	1.1	0.8	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.5	0.5	0.7	0.6	0.5	0.4	0.3	0.2	0.8	1.0	0.7	0.5	0.6	1.5	1.5	
24-Dec	2.5	2.9	2.6	2.4	1.5	0.5	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.4	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.5	2.9	
25-Dec	0.4	0.7	1.1	0.8	0.4	0.7	0.5	0.4	0.1	0.1	0.2	0.3	0.4	0.4	0.2	0.2	0.3	0.4	0.6	0.7	0.8	1.0	1.3	1.3	1.3	
26-Dec	1.0	1.0	1.0	1.1	1.3	1.2	1.1	1.0	1.2	1.0	1.1	1.2	1.1	1.1	0.9	0.7	0.7	1.0	1.0	0.9	0.8	0.8	0.6	0.3	1.3	
27-Dec	0.3	0.7	0.7	0.9	1.2	1.1	1.2	1.0	1.2	1.1	1.1	1.3	1.3	1.1	0.9	0.7	0.8	1.1	1.1	1.0	0.9	0.4	0.3	0.5	1.3	
28-Dec	0.4	0.5	0.5	0.3	0.3	0.3	0.2	0.3	0.6	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.4	0.4	0.2	0.3	0.2	0.1	0.6	
29-Dec	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.3	0.5	0.9	0.8	1.0	1.2	1.1	0.8	1.0	0.7	0.6	0.9	0.9	1.0	1.1	1.1	0.9	1.2	
30-Dec	1.0	0.9	1.0	1.2	0.9	1.1	1.0	0.7	0.8	1.1	1.1	1.2	1.1	1.1	1.2	1.0	0.7	0.5	0.4	0.5	0.3	0.4	0.6	0.8	1.2	
31-Dec	0.9	0.9	0.8	0.7	1.0	1.0	1.2	1.2	2.0	1.9	2.0	1.3	1.5	1.6	1.4	1.1	1.3	1.5	1.0	1.1	1.5	1.1	1.2	1.0	2.0	
	2.7	2.9	2.6	2.5	2.9	3.1	4.3	3.4	4.1	2.9	3.1	3.1	3.6	3.9	3.6	3.1	3.7	3.6	3.3	2.8	2.8	3.2	2.8	3.0		
	Diurnal Maximum																									

AF - Analyzer Failure



Wood Buffalo Environmental Association

Summary of Hour Averages

Vertical Wind Speed 100 m (VW100m) - km/h

Lower Camp Met Tower - December 2017

Maximum Value: 11.5 km/h on Dec 11 15:00		Maximum Daily Average: 1.7 km/h on Dec 11		Hours in Service:	744																					
Minimum Value: -1.4 km/h on Dec 17 18:00		Minimum Daily Average: -0.3 km/h on Dec 18		Hours of Data:	728																					
Maximum Diurnal Average: 0.8 km/h at hour 15		Minimum Diurnal Average: 0.2 km/h at hour 13		Hours of Missing Data:	16																					
Monthly Average: 0.38 km/h		Percentiles: P <sub>1</sub> = -1.1 P <sub>10</sub> = -0.3 Q <sub>1</sub> = 0.0 Median = 0.2 Q <sub>3</sub> = 0.6 P <sub>90</sub> = 1.1 P <sub>99</sub> = 3.4		Hours of Calibration:	0																					
				Percent Operational Time:	97.9																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.4	0.9	0.9	1.1	1.2	1.8	1.5	0.3	0.2	0.3	0.7	0.5	0.9	0.7	0.7	0.5	0.3	0.6	1.1	1.1	0.2	0.2	0.2	0.2	0.7	1.8
2-Dec	0.3	-0.3	-0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.4	0.5	0.7	0.2	0.6	0.5	0.6	1.5	0.9	0.4	0.4	0.3	1.5
3-Dec	0.1	0.2	0.2	0.5	1.0	1.0	0.3	-0.1	-0.7	0.3	0.1	0.4	0.0	-0.1	-0.1	0.0	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.1	0.1	1.0
4-Dec	0.3	-0.1	-0.1	0.1	0.1	0.1	0.3	0.8	0.6	0.1	1.0	0.5	0.4	0.4	0.9	0.4	0.7	1.0	1.3	1.3	1.0	0.7	2.8	2.1	0.7	2.8
5-Dec	1.8	1.9	0.1	0.2	0.0	0.0	-0.2	-0.5	-0.3	-0.1	-0.1	0.1	0.2	0.3	-0.3	0.0	0.5	0.3	0.2	0.2	0.0	0.0	0.1	0.2	0.2	1.9
6-Dec	1.0	0.4	1.1	0.5	0.6	0.8	0.6	1.5	1.0	0.9	0.4	0.3	0.6	0.2	1.6	2.0	2.8	1.9	3.1	3.8	5.0	3.6	0.2	0.1	1.4	5.0
7-Dec	0.3	0.1	0.3	0.2	0.2	0.3	-0.2	0.0	0.2	0.1	0.0	0.3	-0.1	0.1	1.5	-0.2	-0.3	0.0	0.0	-0.3	-0.3	-1.0	-0.2	0.3	0.1	1.5
8-Dec	0.3	0.2	-0.2	0.0	0.4	0.2	0.5	1.1	0.3	0.3	0.3	0.4	0.9	0.6	1.0	0.4	1.0	1.7	1.0	0.1	0.2	-0.1	0.0	0.2	0.5	1.7
9-Dec	0.2	0.5	2.5	2.7	1.3	1.3	1.0	0.7	1.1	-1.0	0.8	0.5	1.3	0.6	1.0	0.5	1.3	0.5	2.3	1.3	1.5	0.2	0.4	0.0	0.9	2.7
10-Dec	3.1	0.2	-0.4	0.2	0.5	0.7	0.0	0.2	0.3	0.5	1.3	-0.3	-0.6	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.7	--	3.1
11-Dec	0.6	0.3	0.4	0.5	-0.5	-1.1	0.3	0.5	-0.5	-0.4	0.1	2.2	AF	AF	11.5	8.2	6.0	4.4	2.1	1.0	0.3	0.2	1.0	0.5	1.7	11.5
12-Dec	0.3	0.2	0.4	0.3	0.1	0.1	0.5	1.9	-0.6	1.0	1.5	-0.2	-0.4	-0.3	1.1	0.4	-1.2	-0.8	-0.6	-0.5	-0.3	-0.4	-0.2	0.2	0.1	1.9
13-Dec	0.4	0.2	-0.4	-0.1	0.2	0.0	0.3	0.1	-0.3	-0.3	0.4	-0.3	-0.2	-0.2	0.0	0.0	-0.2	0.0	0.0	0.8	0.0	-0.4	0.4	0.1	0.0	0.8
14-Dec	0.1	0.2	0.2	0.2	-0.4	0.2	0.3	1.1	1.2	0.6	0.9	0.8	0.9	0.9	1.0	0.9	0.5	0.4	0.5	0.4	-0.1	0.8	0.7	0.5	0.5	1.2
15-Dec	0.5	0.5	1.8	1.9	AF	AF	AF	AF	1.1	1.2	0.1	-0.1	-1.3	-1.2	-0.7	0.9	0.3	0.3	0.4	0.3	-0.3	-0.4	-0.5	-0.4	0.2	1.9
16-Dec	-0.2	0.4	0.2	0.2	0.6	0.2	-0.2	0.1	0.0	0.3	0.3	0.2	0.1	0.4	0.9	0.7	0.9	1.2	1.3	0.6	0.0	1.5	1.2	0.7	0.5	1.5
17-Dec	0.0	1.7	2.2	1.6	1.6	0.2	-0.1	0.7	0.3	-0.3	-0.8	0.2	0.2	-0.7	-0.3	-0.5	-1.4	-1.4	-1.1	-0.8	-0.4	0.0	-0.1	0.5	0.1	2.2
18-Dec	-0.2	-0.2	-0.4	-0.1	-0.3	-0.1	0.7	0.0	0.1	0.2	-0.2	-1.0	-0.9	-1.1	-1.1	-0.8	-1.2	-0.9	-0.7	-0.7	-0.5	0.4	0.3	0.3	-0.3	0.7
19-Dec	0.0	-0.1	0.1	0.1	0.0	-0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.9	1.3	0.9	0.2	0.7	1.0	0.1	0.4	0.2	0.3	0.3	1.3
20-Dec	0.5	0.6	0.5	0.8	0.8	0.6	0.6	0.3	0.9	1.1	0.1	0.8	0.9	0.8	1.2	0.7	0.1	0.3	0.5	0.3	0.3	0.3	0.7	1.1	0.6	1.2
21-Dec	0.5	0.7	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	-0.5	-0.2	-0.3	-1.3	-1.0	-0.4	-0.1	-0.3	-0.2	-0.1	-0.1	0.7
22-Dec	0.2	0.1	0.0	0.2	0.1	-0.3	-0.1	0.9	1.1	1.0	0.1	-0.7	-0.7	-0.5	-0.5	-0.7	-0.7	-0.6	-0.6	0.1	0.5	0.5	0.3	0.1	0.0	1.1
23-Dec	0.1	0.0	-0.1	0.0	0.1	0.1	0.2	0.2	0.1	0.2	0.0	0.0	0.0	0.1	-0.1	0.1	0.2	0.5	0.5	0.3	0.2	0.5	0.2	-0.4	0.1	0.5
24-Dec	0.1	0.4	0.6	0.3	0.1	-0.1	-0.1	-0.1	0.0	0.0	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.5	0.2	0.6	0.3	0.2	0.1	0.1	0.2	0.6
25-Dec	-0.1	-0.2	0.0	0.1	0.0	0.0	-0.3	0.1	0.1	0.1	0.2	0.2	0.2	0.5	0.8	0.4	0.1	0.1	0.3	0.2	0.2	-0.1	0.1	0.1	0.1	0.8
26-Dec	0.0	0.1	-0.1	0.0	0.2	0.9	0.4	0.6	0.3	0.1	0.3	0.3	0.4	0.5	0.7	0.8	0.6	0.5	0.3	0.6	0.2	0.3	0.6	0.4	0.4	0.9
27-Dec	0.2	0.4	0.4	0.3	0.3	0.1	0.2	0.1	0.4	0.5	0.3	0.6	0.5	0.3	0.0	0.1	0.2	1.0	1.4	0.1	0.1	0.2	0.2	0.7	0.4	1.4
28-Dec	0.9	0.4	0.3	0.4	0.2	0.1	0.1	0.0	-0.1	0.0	0.2	0.1	0.0	0.0	-0.1	0.0	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.9
29-Dec	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.4	0.2	0.1	0.3	0.3	0.4	0.3	0.2	0.8	0.3	0.2	0.4	0.2	0.2	0.3	0.1	0.3	0.8
30-Dec	0.3	0.1	0.5	0.8	1.2	0.9	0.8	0.3	0.2	0.1	0.3	0.5	0.4	0.9	0.8	0.5	0.4	1.0	0.7	0.3	0.1	0.6	0.6	0.9	0.6	1.2
31-Dec	0.4	0.6	0.4	0.4	1.0	0.7	0.6	0.2	1.0	0.9	1.7	1.6	1.2	1.1	1.0	0.8	1.2	1.7	0.8	1.1	1.4	0.7	0.6	0.3	0.9	1.7
																								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 - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 4.5 km/h on Dec 9 10:00	Hours of Data: 728
Minimum Value: 0.1 km/h on Dec 23 09:00	Hours of Missing Data: 16
Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.6 Median = 1.0 Q <sub>3</sub> = 1.6 P <sub>90</sub> = 2.2 P <sub>99</sub> = 3.4	Hours of Calibration: 0
	Percent Operational Time: 97.9

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.4	1.2	0.9	1.8	1.5	1.9	1.7	1.3	1.3	1.6	1.4	0.9	1.1	0.6	0.7	0.8	0.9	0.6	0.8	0.6	0.6	0.3	0.2	0.5	1.9
2-Dec	0.5	0.8	0.5	0.4	0.3	0.4	0.3	0.3	0.2	0.3	0.3	0.4	0.5	0.4	0.5	0.5	0.5	0.6	0.9	0.8	0.8	1.0	0.9	0.9	1.0
3-Dec	1.0	0.8	0.8	0.6	0.6	1.0	1.3	1.5	1.8	1.1	1.7	1.7	1.6	1.1	0.8	0.5	1.0	1.3	1.0	1.1	0.7	0.3	0.2	0.6	1.8
4-Dec	0.8	1.5	1.5	0.6	0.5	0.3	0.3	0.6	0.7	0.5	0.7	0.7	0.5	0.5	1.1	0.9	1.2	1.9	1.6	1.7	1.3	1.4	1.7	1.9	1.9
5-Dec	1.7	1.6	1.2	1.1	1.1	1.7	1.7	1.2	0.8	0.5	0.8	0.9	1.3	1.6	1.7	1.3	1.5	1.5	1.7	1.0	0.7	0.3	0.2	0.3	1.7
6-Dec	0.9	1.0	0.9	0.9	0.9	0.9	0.9	1.0	1.2	1.1	1.1	1.7	1.4	1.3	2.2	1.6	1.4	1.0	1.0	1.5	1.6	2.0	1.7	1.6	2.2
7-Dec	0.9	0.6	0.9	1.2	1.5	1.3	1.7	1.7	2.4	1.8	0.9	0.3	1.4	2.2	2.9	1.3	1.4	1.2	1.1	1.1	1.5	0.7	1.1	0.9	2.9
8-Dec	0.8	1.6	1.4	0.8	0.8	1.2	0.9	0.7	0.5	0.5	0.7	0.6	0.7	0.8	1.2	0.9	1.2	1.2	1.1	0.9	1.0	1.2	1.0	0.9	1.6
9-Dec	1.2	2.2	2.3	1.6	1.9	2.8	4.4	3.2	3.7	4.5	2.4	2.0	1.4	2.5	2.0	2.7	1.6	1.1	1.7	1.0	1.9	0.8	1.0	1.9	4.5
10-Dec	2.4	1.8	2.0	2.1	3.7	2.3	1.4	0.7	0.9	1.4	1.5	2.2	2.5	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.7	3.7
11-Dec	0.7	0.5	0.6	1.7	1.8	1.9	2.3	2.2	2.2	2.1	1.8	2.2	AF	AF	3.2	2.8	2.7	1.9	1.9	0.9	0.9	1.1	1.1	1.1	3.2
12-Dec	1.1	1.7	1.8	2.0	1.6	1.3	2.9	2.6	1.8	2.6	2.3	1.8	2.0	2.3	2.0	2.0	1.2	1.5	1.2	0.7	1.0	1.3	0.7	0.4	2.9
13-Dec	1.3	1.4	1.8	1.5	1.3	1.9	1.2	2.1	2.5	1.8	2.1	1.8	1.3	1.2	0.9	0.5	1.2	1.5	1.2	2.0	1.5	1.4	1.3	1.4	2.5
14-Dec	1.0	0.7	0.4	1.0	1.9	0.9	0.6	0.7	0.7	0.9	1.5	1.4	1.2	1.1	1.1	1.0	1.0	0.6	0.7	1.0	1.0	0.7	0.7	0.8	1.9
15-Dec	0.9	0.8	1.2	1.4	AF	AF	AF	AF	1.2	1.1	1.2	2.1	2.4	2.1	1.6	1.5	1.1	1.5	1.2	1.2	2.3	2.4	2.8	2.5	2.8
16-Dec	2.4	2.6	2.7	2.6	2.1	2.1	2.1	1.6	1.2	0.8	1.0	0.7	0.5	0.7	1.3	1.0	1.0	1.2	1.3	1.1	1.9	1.5	1.1	1.7	2.7
17-Dec	1.7	2.3	2.5	1.8	2.4	1.3	1.5	1.8	1.2	2.0	2.8	1.8	1.7	3.5	3.9	3.3	3.2	3.4	3.0	1.9	2.0	3.1	3.2	2.5	3.9
18-Dec	2.8	2.4	2.5	2.0	2.0	2.0	2.8	2.2	1.4	0.8	1.0	3.0	3.5	3.5	3.1	2.6	2.4	2.3	1.7	2.2	2.4	1.9	1.8	1.8	3.5
19-Dec	2.1	1.6	1.5	1.0	0.9	0.7	0.5	0.4	0.3	0.4	0.4	0.4	0.7	0.7	1.0	1.3	1.3	1.2	1.2	1.3	0.7	0.7	0.6	0.7	2.1
20-Dec	0.7	0.7	0.8	0.9	1.0	0.7	0.8	0.7	0.9	1.1	0.8	1.0	0.9	0.9	0.9	0.9	0.8	0.7	0.9	0.9	0.8	0.7	0.9	0.9	1.1
21-Dec	0.7	0.6	0.3	0.1	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.2	0.3	0.9	1.6	1.2	1.7	2.0	2.5	1.7	1.6	1.3	0.8	0.5	2.5
22-Dec	0.6	0.4	0.4	0.5	0.4	1.3	1.4	1.7	1.7	1.8	2.2	2.0	2.2	2.2	2.4	2.0	1.6	1.3	1.7	2.3	2.8	2.8	2.6	1.8	2.8
23-Dec	1.3	0.8	0.3	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.3	0.2	0.5	0.4	0.3	0.3	1.1	0.5	0.7	0.5	0.4	0.3	0.7	2.0	2.0
24-Dec	2.9	3.5	3.1	2.6	1.7	0.9	0.7	0.4	0.6	0.4	0.3	0.6	0.3	0.3	0.2	0.2	0.2	0.5	0.4	0.5	0.5	0.4	0.3	0.4	3.5
25-Dec	0.4	0.4	0.7	0.9	0.7	0.9	0.6	0.3	0.3	0.2	0.3	0.4	0.5	0.5	0.4	0.4	0.6	0.8	0.9	0.7	0.8	0.6	0.7	0.6	0.9
26-Dec	0.6	0.7	0.7	0.7	0.8	0.9	1.1	1.0	0.9	0.6	0.7	0.5	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.7	0.6	0.4	0.5	0.4	1.1
27-Dec	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.5	0.6	0.6	0.8	0.8	0.9	0.8	0.6	0.9	1.7	1.8	1.6	1.2	0.3	0.3	0.4	1.8
28-Dec	0.4	0.5	0.4	0.4	0.3	0.7	0.3	0.4	1.1	0.3	0.4	0.4	0.2	0.2	0.2	0.3	0.5	0.4	0.7	0.8	0.4	0.6	0.3	0.2	1.1
29-Dec	0.5	0.3	0.5	0.6	0.3	0.3	0.6	0.5	0.9	0.7	0.7	0.8	0.8	0.6	0.7	0.8	2.0	1.2	1.2	1.1	0.7	0.7	0.6	0.7	2.0
30-Dec	1.0	0.8	1.0	1.1	1.3	0.8	1.1	0.8	0.8	0.8	0.7	0.9	0.9	0.8	0.6	0.7	0.8	0.7	0.7	0.6	0.5	0.5	0.7	0.8	1.3
31-Dec	0.8	1.0	0.8	0.8	0.9	1.0	0.9	1.1	1.0	1.0	1.2	1.4	1.4	1.1	0.9	0.8	1.2	1.1	1.1	1.2	1.1	0.9	0.8	0.9	1.4
	2.9	3.5	3.1	2.6	3.7	2.8	4.4	3.2	3.7	4.5	2.8	3.0	3.5	3.5	3.9	3.3	3.2	3.4	3.0	2.3	2.8	3.1	3.2	2.5	
	Diurnal Maximum																								

AF - Analyzer Failure



Maximum Value: 6.3 km/h on Dec 6 21:00																				Maximum Daily Average: 1.8 km/h on Dec 6					Hours in Service: 744				
Minimum Value: -2.8 km/h on Dec 11 07:00																				Minimum Daily Average: -0.2 km/h on Dec 21					Hours of Data: 742				
Maximum Diurnal Average: 0.7 km/h at hour 4																				Minimum Diurnal Average: 0.1 km/h at hour 14					Hours of Missing Data: 2				
Monthly Average: 0.39 km/h																				Percentiles: P <sub>1</sub> = -1.1 P <sub>10</sub> = -0.3 Q <sub>1</sub> = 0.0 Median = 0.2 Q <sub>3</sub> = 0.6 P <sub>90</sub> = 1.1 P <sub>99</sub> = 3.9					Hours of Calibration: 0				
																				Percent Operational Time: 99.7									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	1.0	1.3	1.0	1.9	1.8	3.4	3.2	0.4	0.4	1.3	1.8	0.9	0.2	0.1	0.2	0.7	1.0	0.5	0.3	0.3	0.3	0.0	0.0	0.2	0.9	3.4			
2-Dec	0.3	-0.4	-0.3	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.4	0.5	0.4	0.4	0.3	0.6	0.8	1.0	1.1	1.6	1.8	0.9	0.7	0.4	1.8			
3-Dec	0.4	0.5	0.5	0.5	0.3	0.5	0.7	0.1	0.0	0.3	0.1	0.5	0.0	-0.3	-0.3	-0.1	0.1	-0.1	0.1	0.2	0.0	-0.1	0.1	0.2	0.2	0.7			
4-Dec	0.3	0.0	-0.2	0.0	0.0	0.1	0.2	0.3	0.3	0.5	0.4	0.0	0.0	-0.2	0.1	0.0	0.4	1.2	1.5	1.3	0.9	0.5	2.6	2.2	0.5	2.6			
5-Dec	1.1	0.9	1.0	0.7	0.4	0.2	-0.5	-0.5	-0.2	0.2	0.0	0.2	0.4	0.3	-0.2	0.2	0.5	0.2	0.1	0.2	0.1	-0.1	-0.1	0.1	0.2	1.1			
6-Dec	0.4	-0.1	0.1	0.8	0.8	0.8	0.8	0.5	1.1	1.1	0.9	0.3	1.6	0.9	2.2	2.8	4.2	2.8	4.6	5.3	6.3	4.2	0.8	0.2	1.8	6.3			
7-Dec	0.2	0.4	0.6	0.3	0.6	0.3	0.0	0.1	1.3	0.3	-0.2	-0.2	0.1	1.2	2.0	-0.4	0.0	-0.3	-0.1	-0.3	-0.5	-0.9	0.1	-0.2	0.2	2.0			
8-Dec	0.1	0.7	0.2	0.4	0.6	0.8	0.4	0.3	0.6	0.7	0.5	0.4	0.0	0.1	0.0	0.3	0.4	0.2	0.9	0.6	0.7	0.5	0.6	0.6	0.5	0.9			
9-Dec	0.9	1.9	4.0	4.5	2.6	3.3	2.9	1.8	3.6	-1.4	1.9	1.0	1.3	1.2	1.2	1.6	1.8	0.5	2.4	1.1	2.0	0.3	0.2	0.5	1.7	4.5			
10-Dec	3.8	1.1	-0.3	0.2	0.7	2.2	0.1	0.3	0.8	0.5	1.1	-0.1	-0.3	AF	0.2	0.4	0.4	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.5	3.8			
11-Dec	0.4	0.2	0.9	0.3	-0.2	-2.6	-2.8	-1.1	-1.0	-0.1	0.4	0.4	0.6	0.5	0.9	0.6	0.2	0.4	0.8	1.6	1.4	1.1	1.2	0.6	0.2	1.6			
12-Dec	1.2	1.1	0.8	0.4	0.2	0.5	2.2	2.2	-0.4	1.8	1.9	-0.1	0.2	-0.5	1.6	1.0	-1.1	-0.6	-0.3	-0.4	-0.3	-0.6	-0.4	-0.1	0.4	2.2			
13-Dec	0.6	0.8	-0.4	0.1	0.7	0.6	1.0	0.7	0.1	0.0	0.5	-0.2	0.2	0.1	0.2	-0.1	0.0	0.5	0.4	1.6	0.2	-0.2	0.7	0.6	0.4	1.6			
14-Dec	0.2	0.1	0.1	0.9	0.3	1.2	0.4	0.4	0.4	0.3	0.6	0.0	0.7	0.8	0.2	0.4	0.4	0.2	0.6	0.4	-0.5	0.4	0.3	0.2	0.4	1.2			
15-Dec	0.3	-0.1	0.9	1.1	0.0	AF	0.6	0.2	1.1	1.2	0.1	-0.3	-1.2	-1.1	-0.6	1.0	0.2	0.2	0.6	0.5	0.1	0.1	0.1	-0.1	0.2	1.2			
16-Dec	0.1	0.7	0.4	0.2	0.8	0.3	-0.1	0.0	-0.1	0.1	0.2	0.1	0.2	0.3	0.2	0.3	0.3	0.7	0.8	-0.4	-0.7	0.4	0.9	-0.3	0.2	0.9			
17-Dec	-0.5	0.9	1.3	5.4	5.1	1.7	0.7	1.4	0.6	0.2	-0.5	0.7	0.6	0.1	0.2	0.1	-0.7	-1.1	-1.2	-0.7	-0.2	0.5	0.5	0.6	0.7	5.4			
18-Dec	-0.1	0.0	-0.1	0.1	-0.2	0.0	1.1	0.2	0.2	0.2	-0.2	-0.3	-0.5	-0.5	-1.0	-0.6	-1.1	-0.8	-0.4	-0.5	-0.2	0.5	0.5	0.2	-0.1	1.1			
19-Dec	0.0	-0.3	0.3	0.2	0.0	0.2	0.1	0.1	-0.1	0.0	0.2	0.2	0.2	-0.1	0.1	0.5	-0.1	0.3	1.1	1.4	0.3	0.2	0.5	0.7	0.3	1.4			
20-Dec	0.5	0.2	0.1	0.3	-0.1	0.3	0.2	0.7	0.4	0.3	0.6	1.1	0.5	0.1	0.0	-0.2	-0.4	-0.7	-0.4	-0.8	-0.8	0.1	0.8	1.0	0.2	1.1			
21-Dec	0.6	-0.2	-0.2	-0.2	-0.4	-0.3	0.0	0.0	-0.1	0.1	-0.1	-0.2	0.0	-0.4	-0.2	0.1	0.2	-1.2	-1.1	0.1	0.2	-0.4	-0.3	-0.2	-0.2	0.6			
22-Dec	0.3	0.1	0.1	0.0	0.1	-0.4	0.1	0.7	1.0	1.0	0.3	-0.6	-0.5	-0.3	-0.2	-0.4	-0.3	-0.5	-0.7	0.3	0.6	0.8	0.4	0.4	0.1	1.0			
23-Dec	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.8	0.6	-0.2	0.1	0.4	0.2	0.1	0.2	0.2	0.4	0.3	-0.1	0.0	-0.1	0.2	0.8			
24-Dec	0.5	1.3	1.0	0.9	0.3	0.0	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2	0.0	0.0	0.0	0.3	-0.1	-0.1	0.2	-0.2	0.3	0.5	0.3	1.3			
25-Dec	0.2	0.0	0.5	0.5	0.2	0.3	0.2	0.2	0.0	-0.1	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.3	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.6			
26-Dec	0.5	0.4	0.3	0.3	0.5	0.3	0.3	0.5	0.4	0.6	0.3	0.4	0.2	0.0	0.3	0.1	0.2	0.4	0.4	0.5	0.2	0.4	0.2	0.2	0.3	0.6			
27-Dec	0.2	0.4	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.6	2.2	2.8	0.0	0.0	0.2	0.2	0.1	0.5	2.8			
28-Dec	0.0	0.0	0.1	0.0	0.1	0.3	0.5	0.4	0.1	0.0	0.1	0.1	0.1	0.0	-0.1	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.5			
29-Dec	0.2	0.2	0.2	0.0	0.0	0.1	0.4	0.7	0.6	0.4	0.4	0.6	0.2	0.2	0.0	0.4	0.7	0.3	0.6	0.6	0.7	0.8	0.5	0.5	0.4	0.8			
30-Dec	0.2	0.3	0.5	0.5	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.0	0.2	0.6	0.6	0.4	0.4	0.1	0.4	0.3	0.6			
31-Dec	0.2	-0.2	-0.1	-0.5	0.2	0.0	0.3	0.5	-0.3	-0.3	0.0	0.0	-0.6	-0.5	0.1	-0.3	0.2	1.5	0.3	-0.6	0.7	1.6	1.4	1.5	0.2	1.6			
																								Diurnal Average					
																								Diurnal Maximum					
0.4 0.4 0.4 0.7 0.5 0.5 0.5 0.4 0.4 0.4 0.4 0.2 0.2 0.1 0.3 0.3 0.3 0.3 0.5 0.5 0.5 0.4 0.4 0.4																								0.4					
3.8 1.9 4.0 5.4 5.1 3.4 3.2 2.2 3.6 1.8 1.9 1.1 1.6 1.2 2.2 2.8 4.2 2.8 4.6 5.3 6.3 4.2 2.6 2.2																								3.8					
AF - Analyzer Failure																													



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Vertical Wind Speed 167 m (VW167m) - km/h**  
**Lower Camp Met Tower - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.5 km/h on Dec 9 10:00 Minimum Value: 0.1 km/h on Dec 23 06:00 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.6 Median = 0.9 Q <sub>3</sub> = 1.5 P <sub>90</sub> = 2.1 P <sub>99</sub> = 3.3																								Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.7	1.2	0.9	1.4	1.4	1.6	1.6	2.2	1.9	1.2	1.2	1.0	0.6	0.5	0.5	0.8	1.0	0.6	0.6	0.5	0.6	0.3	0.4	0.8	2.2
2-Dec	0.7	0.9	0.6	0.6	0.3	0.6	0.2	0.3	0.3	0.2	0.3	0.5	1.1	0.5	0.4	0.4	0.4	0.8	0.7	0.9	0.6	0.6	0.7	1.0	1.1
3-Dec	1.2	1.1	0.9	0.5	0.5	1.0	1.3	1.2	1.0	1.2	2.0	1.8	1.7	1.1	0.9	0.6	0.9	1.3	1.2	1.3	0.4	0.5	0.2	0.8	2.0
4-Dec	1.1	1.8	1.9	1.0	0.7	0.4	0.2	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.7	1.0	1.0	1.6	1.1	1.6	1.1	1.5	1.9	1.8	1.9
5-Dec	1.1	1.4	1.4	1.3	1.5	1.7	1.9	1.2	0.9	0.6	1.1	1.1	1.2	1.5	1.7	1.6	1.6	1.8	1.8	1.1	0.7	0.3	0.2	0.3	1.9
6-Dec	0.7	0.8	0.6	1.1	1.1	0.9	0.9	0.9	1.2	1.4	1.0	1.6	1.7	1.7	2.2	1.9	1.0	1.0	1.2	1.6	1.0	1.4	1.0	1.8	2.2
7-Dec	1.2	0.7	1.0	1.3	1.2	1.2	1.3	1.4	1.5	1.5	1.0	0.8	1.5	1.9	2.1	1.5	1.6	1.9	1.6	1.4	1.6	0.6	0.6	0.5	2.1
8-Dec	0.8	0.9	1.3	0.7	1.0	1.1	1.0	0.7	0.7	0.7	1.0	0.7	0.4	0.7	1.0	0.9	0.9	0.9	1.2	1.5	1.2	1.0	1.2	1.1	1.5
9-Dec	1.6	1.6	1.2	1.3	1.7	1.8	3.2	2.8	3.2	4.5	1.6	1.8	1.3	2.6	2.1	2.2	1.5	1.1	1.0	0.9	1.9	1.1	1.1	1.3	4.5
10-Dec	2.1	2.2	1.1	2.9	3.3	3.2	1.3	0.6	0.8	1.4	1.6	1.9	1.9	AF	1.3	1.6	1.9	1.3	1.0	0.5	0.3	0.3	0.3	0.5	3.3
11-Dec	0.4	0.4	0.8	1.0	0.8	1.2	2.5	2.0	1.8	1.4	0.8	0.6	0.5	0.6	1.0	0.7	0.9	1.0	0.8	0.9	1.1	0.8	1.5	1.7	2.5
12-Dec	1.4	1.2	1.4	1.5	1.2	1.2	1.9	2.5	1.4	1.7	2.3	2.2	1.9	1.9	2.3	1.7	1.0	1.3	1.0	0.4	1.1	1.1	0.7	0.4	2.5
13-Dec	1.0	1.0	1.0	1.0	1.5	2.0	1.2	2.0	2.4	1.8	2.6	1.6	1.6	1.3	0.8	0.7	1.2	1.2	0.8	1.7	1.8	1.6	1.4	1.4	2.6
14-Dec	1.1	0.8	0.4	0.8	1.5	1.1	0.6	0.6	0.5	0.8	1.2	0.9	1.1	0.9	0.6	1.1	1.2	0.7	1.0	1.0	0.9	0.7	0.7	0.7	1.5
15-Dec	0.7	0.7	0.8	1.1	0.6	AF	1.0	1.0	1.3	1.2	1.0	2.4	1.8	1.6	1.9	1.8	1.1	1.7	1.3	1.0	1.9	2.3	2.2	1.8	2.4
16-Dec	2.2	2.8	2.9	2.9	2.4	2.2	2.1	1.7	1.3	0.8	0.9	0.7	0.4	0.8	1.2	0.7	0.6	1.0	1.1	1.4	1.5	1.2	0.9	1.8	2.9
17-Dec	1.5	1.2	1.6	2.2	2.4	1.8	1.7	1.9	1.3	2.1	2.2	1.7	1.7	3.0	2.6	2.6	3.4	3.1	2.7	1.5	2.2	3.4	3.0	2.8	3.4
18-Dec	2.9	2.7	2.5	2.1	2.1	2.4	3.1	2.3	1.4	0.9	1.5	3.2	3.6	3.4	2.9	2.4	2.1	1.9	1.7	2.1	2.2	2.3	2.0	1.8	3.6
19-Dec	2.1	1.8	1.5	1.3	1.1	0.7	0.8	0.6	0.2	0.5	0.4	0.4	0.5	0.5	0.6	0.7	0.5	1.3	1.6	0.9	0.7	0.8	0.6	0.8	2.1
20-Dec	0.9	0.6	1.0	0.6	0.9	0.9	0.9	0.8	0.6	0.8	0.8	0.9	0.8	0.7	0.4	0.6	0.5	0.6	0.8	0.7	0.7	0.6	0.7	0.6	1.0
21-Dec	0.6	0.5	0.4	0.2	0.3	0.3	0.7	0.6	0.5	0.5	0.4	0.3	0.4	0.8	1.9	1.1	1.2	1.9	2.4	1.8	2.2	1.3	0.8	0.7	2.4
22-Dec	0.8	0.4	0.5	0.7	0.9	1.4	1.0	1.2	1.2	1.6	2.3	2.1	1.8	2.3	2.4	1.7	1.2	0.9	1.5	2.1	2.9	2.8	2.6	2.0	2.9
23-Dec	1.7	0.9	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.3	0.5	0.7	0.8	0.3	0.6	0.3	0.2	0.3	0.7	0.4	0.3	0.3	1.1	2.6	2.6
24-Dec	3.6	4.0	3.3	3.1	1.9	1.3	0.9	0.4	0.8	0.6	0.4	0.6	0.3	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.5	0.4	0.4	0.4	4.0
25-Dec	0.5	0.4	0.7	0.9	1.0	1.3	0.7	0.5	0.2	0.3	0.4	0.5	0.3	0.6	0.4	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.8	0.8	1.3
26-Dec	0.7	1.0	0.8	0.9	1.1	1.1	1.0	0.9	1.0	0.7	0.6	0.6	0.4	0.3	0.4	0.4	0.4	0.5	0.5	0.8	0.7	0.5	0.3	0.2	1.1
27-Dec	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.4	0.5	0.5	0.5	0.4	0.5	0.6	0.8	0.9	1.0	1.4	1.3	1.7	1.5	0.5	0.4	0.3	1.7
28-Dec	0.3	0.2	0.2	0.3	0.4	0.8	0.4	0.5	0.9	0.7	0.5	0.5	0.3	0.2	0.2	0.5	0.6	0.3	0.7	1.1	0.6	0.9	0.3	0.3	1.1
29-Dec	0.6	0.4	0.3	0.2	0.3	0.2	0.4	0.4	0.7	0.6	0.5	0.5	0.4	0.4	0.6	0.6	1.0	0.9	1.0	1.1	0.9	0.9	0.7	0.8	1.1
30-Dec	0.6	0.7	0.8	0.9	0.6	0.7	0.7	0.9	0.7	0.6	0.5	0.5	0.5	0.4	0.3	0.5	0.6	0.6	0.7	1.0	0.6	0.5	0.5	0.5	1.0
31-Dec	0.5	0.4	0.6	0.6	0.6	0.9	0.7	0.7	0.8	0.9	0.8	0.9	1.0	0.5	0.5	0.5	1.0	1.3	1.3	0.8	0.8	0.7	0.6	0.6	1.3
3.6 4.0 3.3 3.1 3.3 3.2 3.2 2.8 3.2 4.5 2.6 3.2 3.6 3.4 2.9 2.6 3.4 3.1 2.7 2.1 2.9 3.4 3.0 2.8																									
Diurnal Maximum																									
AF - Analyzer Failure																									





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

### **AMS 4 BUFFALO VIEWPOINT DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)  
DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	37	37	100	11	0	1	0
H2S (ppb) Average	709	35	35	100	4	0	1	0
THC (ppm) Average	707	37	37	100	3.9	-	2.8	-
O3(ppb) Average	711	33	33	100	42	0	39	-
NO2(ppb) Average	707	37	37	100	45	0	26	0
NO(ppb) Average	707	37	37	100	79	-	16	-
NOX(ppb) Average	707	37	37	100	124	-	43	-
PM2.5(ug/m3) Average	743	1	1	100	32.2	-	9.5	-
Temperature (C) Average	744	0	0	100	5.2	-	3.1	-
Relative Humidity (%) Average	744	0	0	100	99	-	93	-
Wind Speed 10 m (km/h) Average	705	0	39	94.76	40	-	20	-
Wind Direction 10 m (deg) Average	705	0	39	94.76	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.3	1	-	0	0	0	0	0	1	11
H2S (ppb) Average	709	0.3	0	-	0	0	0	0	0	1	4
THC (ppm) Average	707	2.28	0.2	-	2.1	2.1	2.2	2.2	2.3	2.4	3.9
O3(ppb) Average	711	24.3	10	-	1	10	18	25	33	36	42
NO2(ppb) Average	707	8.2	8	-	0	1	2	6	11	20	45
NO(ppb) Average	707	1.8	6	-	0	0	0	0	1	3	79
NOX(ppb) Average	707	10	13	-	0	1	2	6	12	23	124
PM2.5(ug/m3) Average	743	3.39	3.4	-	0	0.7	1.4	2.5	4.1	6.1	32.2
Temperature 2 m (C) Average	744	-13.25	12.6	-	-40.2	-31.9	-26	-9.3	-2.4	1.3	5.2
Relative Humidity (%) Average	744	79.1	9	-	56	70	73	77	86	92	99
Wind Speed 10 m (km/h) Average	707	9.6	6	-	1	4	6	8	12	18	40
Wind Direction 10 m (deg) Average	707	0	0	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	01 Dec 2017 23:00	01 Dec 2017 23:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	02 Dec 2017 12:00	02 Dec 2017 12:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	04 Dec 2017 04:00	04 Dec 2017 05:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	10 Dec 2017 16:00	12 Dec 2017 01:00	34	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	28 Dec 2017 17:00	28 Dec 2017 17:00	1	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 11 ppb on Dec 10 23:00	Maximum Daily Average: 1.0 ppb on Dec 10		Hours of Data:	707
Minimum Value: 0 ppb on Dec 6 23:00	Minimum Daily Average: 0.1 ppb on Dec 22		Hours of Missing Data:	37
Maximum Diurnal Average: 0.7 ppb at hour 23	Minimum Diurnal Average: 0.2 ppb at hour 9		Hours of Calibration:	37
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 3		Percent Operational Time:	100.0

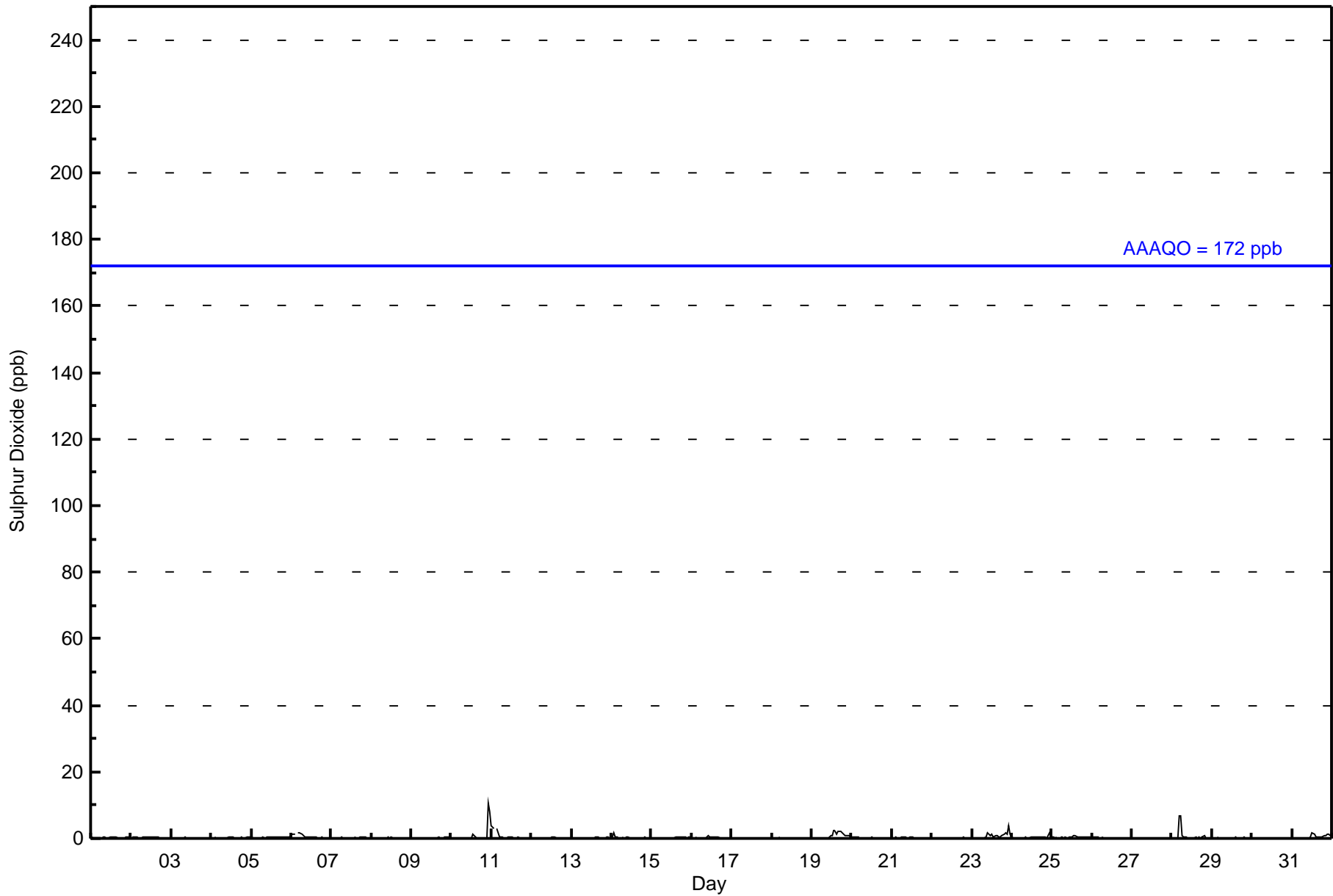
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1	
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
6-Dec	1	1	1	Z	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
7-Dec	0	0	0	0	Z	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	--	0
8-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	11	8	1.0	11
11-Dec	4	3	Z	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	2	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	2
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	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	0.2	1
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	2	2	1	2	2	2	2	1	1	1	1	0	0.8	2
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	1	4	1	0.9	4
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	0	0.3	2
25-Dec	1	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	0	0	1	0	1	1	1	1	0	0	0.4	1
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
28-Dec	0	Z	0	0	7	7	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.8	7
29-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	2	1	1	0	1	0	1	1	1	1	1	1	1	0.5	2
	0.4	0.4	0.2	0.3	0.6	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.7	0.5	Diurnal Average		
	4	3	1	3	7	7	1	1	0	1	1	1	2	2	2	1	2	2	2	2	1	2	1	11	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 (SO<sub>2</sub>) - ppb**  
**Buffalo Viewpoint - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	706	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	24	57	22	8	3	0	30	187	77	35	19	31	79	37	43	17	669
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
<b>Totals</b>	24	57	22	8	3	0	30	187	77	35	19	31	79	37	43	17	669

Total Number of Valid Hours: 669

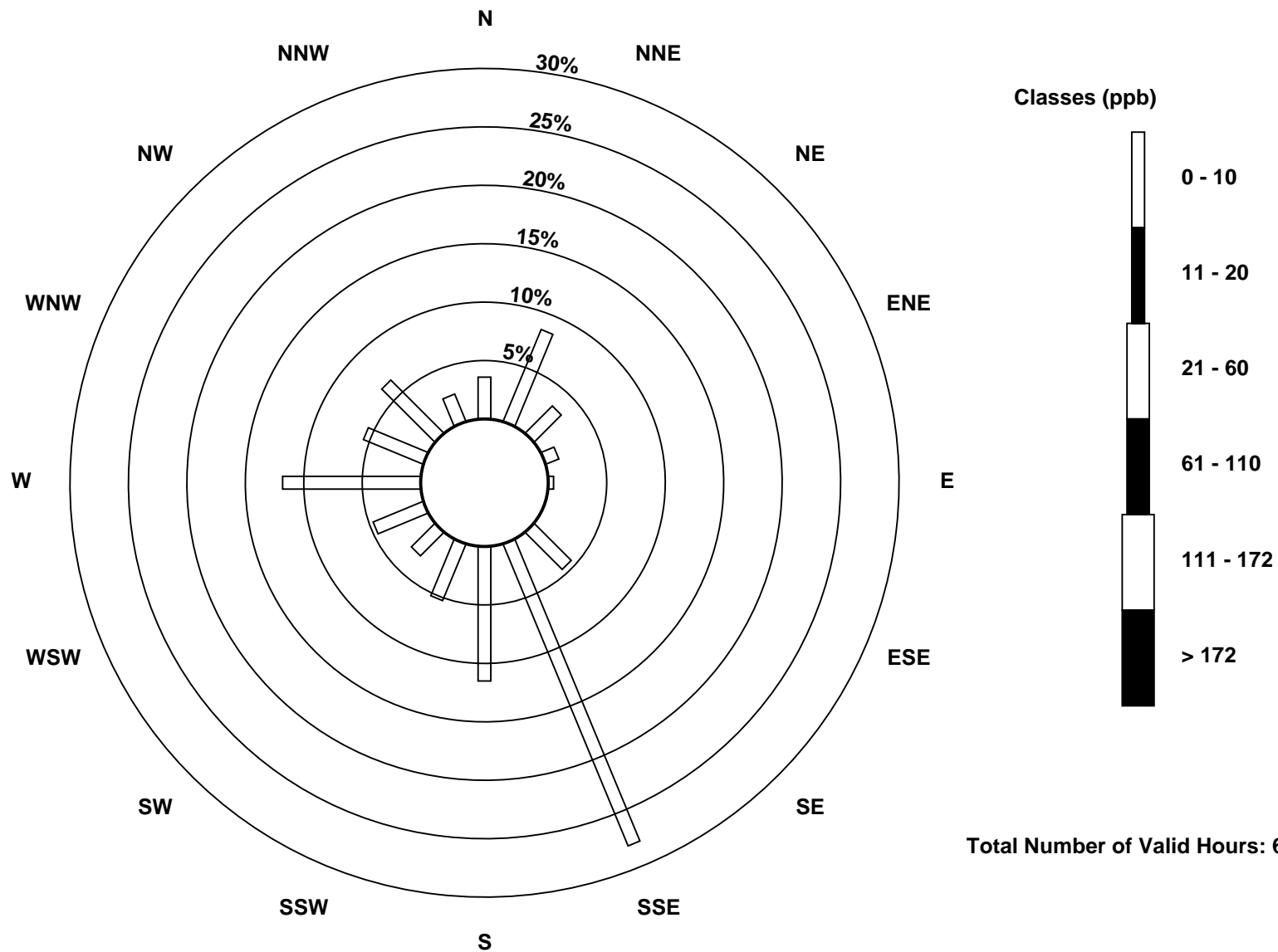
Total Number of Hours: 744



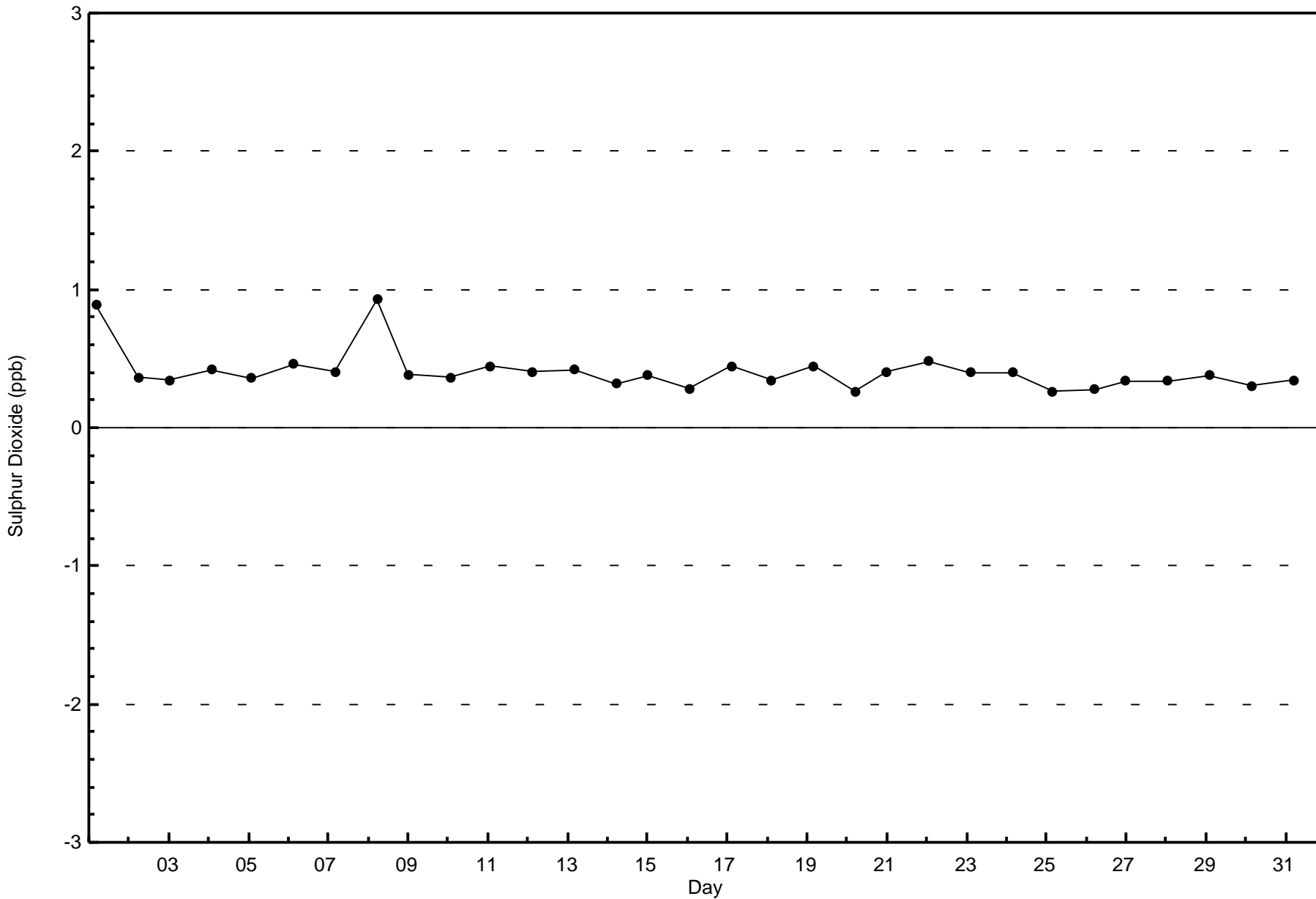


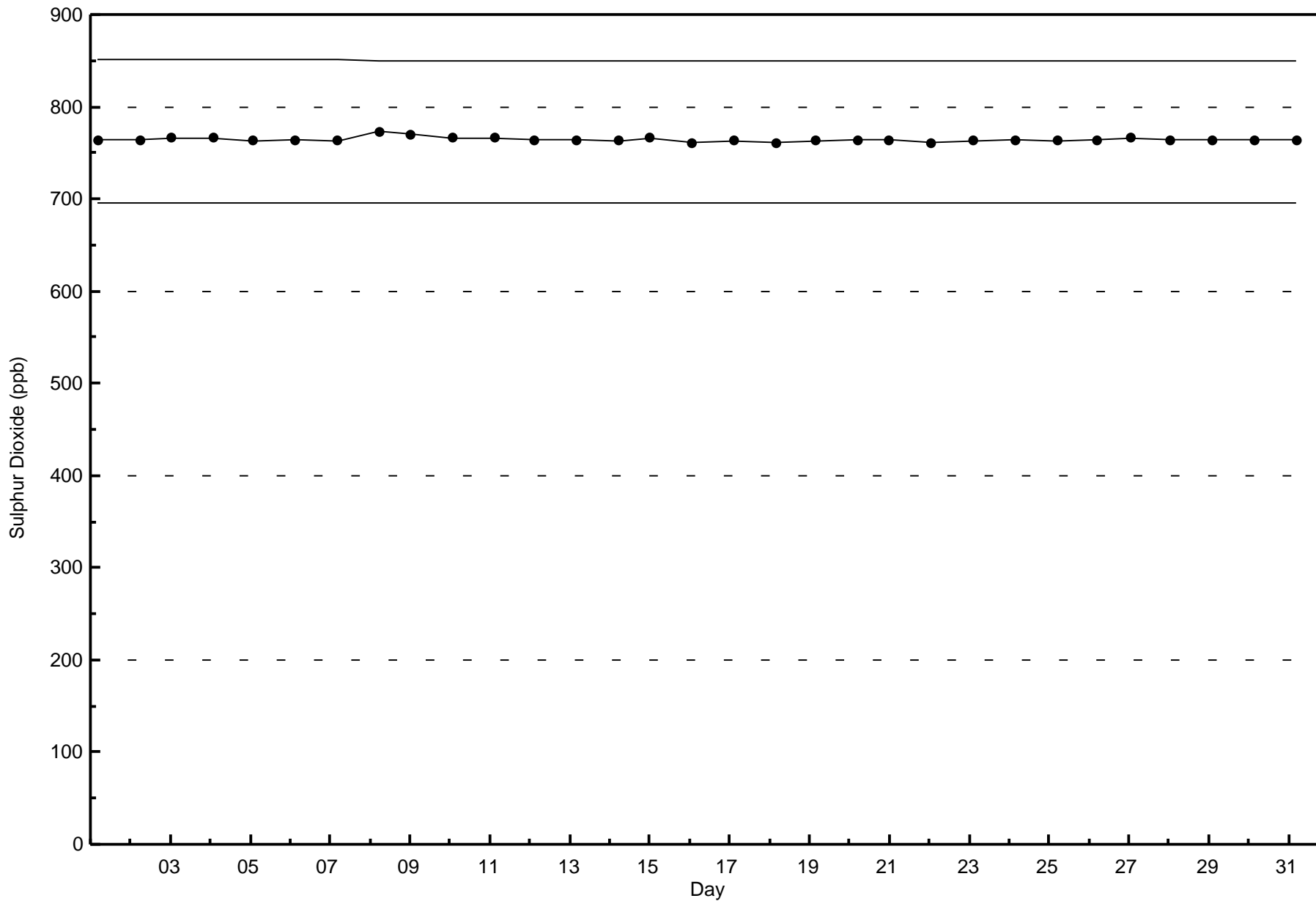
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 669







Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb

Buffalo Viewpoint - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 ppb on Dec 23 14:00	Maximum Daily Average: 1.3 ppb on Dec 23		Hours of Data:	709
Minimum Value: 0 ppb on Dec 8 22:00	Minimum Daily Average: 0.1 ppb on Dec 8		Hours of Missing Data:	35
Maximum Diurnal Average: 0.5 ppb at hour 14	Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 2		Percent Operational Time:	100.0

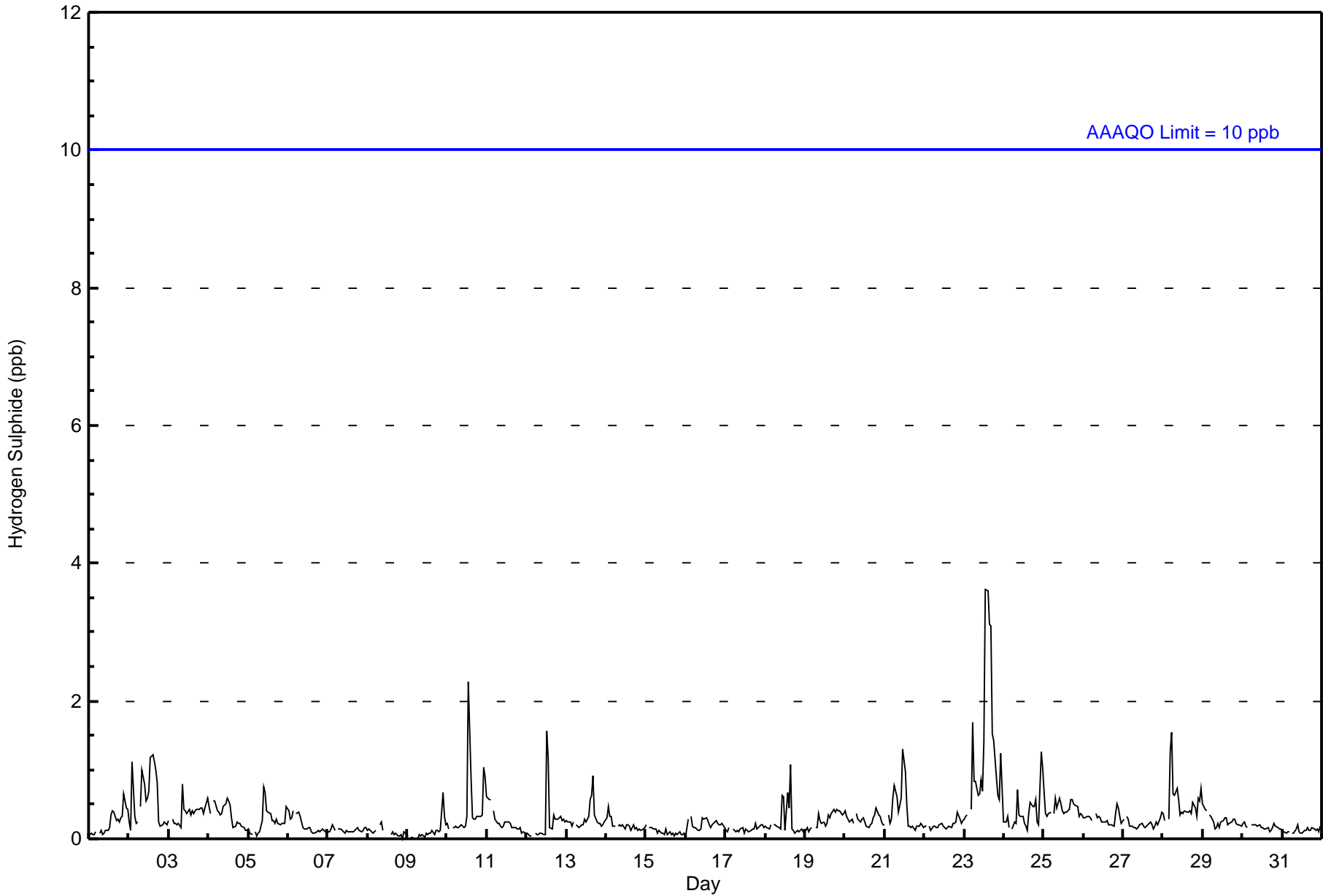
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
2-Dec	0	0	1	0	0	0	Z	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.6	1
3-Dec	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1
4-Dec	0	0	Z	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Dec	0	0	0	0	0	0	Z	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	1	0.4	2
11-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0.3	2
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.3	1
14-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	Z	0	0	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	Z	0	2	1	1	1	1	1	1	1	4	4	3	3	2	1	1	1	1	1	1	1.3	4
24-Dec	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0.4	1
25-Dec	1	0	0	0	0	Z	0	1	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0.4	1
26-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	Z	0	1	2	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0.5	2
29-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
																								Diurnal Average		
																								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 (H<sub>2</sub>S) - ppb  
Buffalo Viewpoint - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	705	99.44	99.44
3 - 4	4	0.56	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Buffalo Viewpoint - December 2017**

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	56	22	7	3	0	30	181	80	31	21	30	80	42	43	17	667
3 - 4	0	1	0	0	0	0	0	0	1	1	0	0	1	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
<b>Totals</b>	24	57	22	7	3	0	30	181	81	32	21	30	81	42	43	17	671

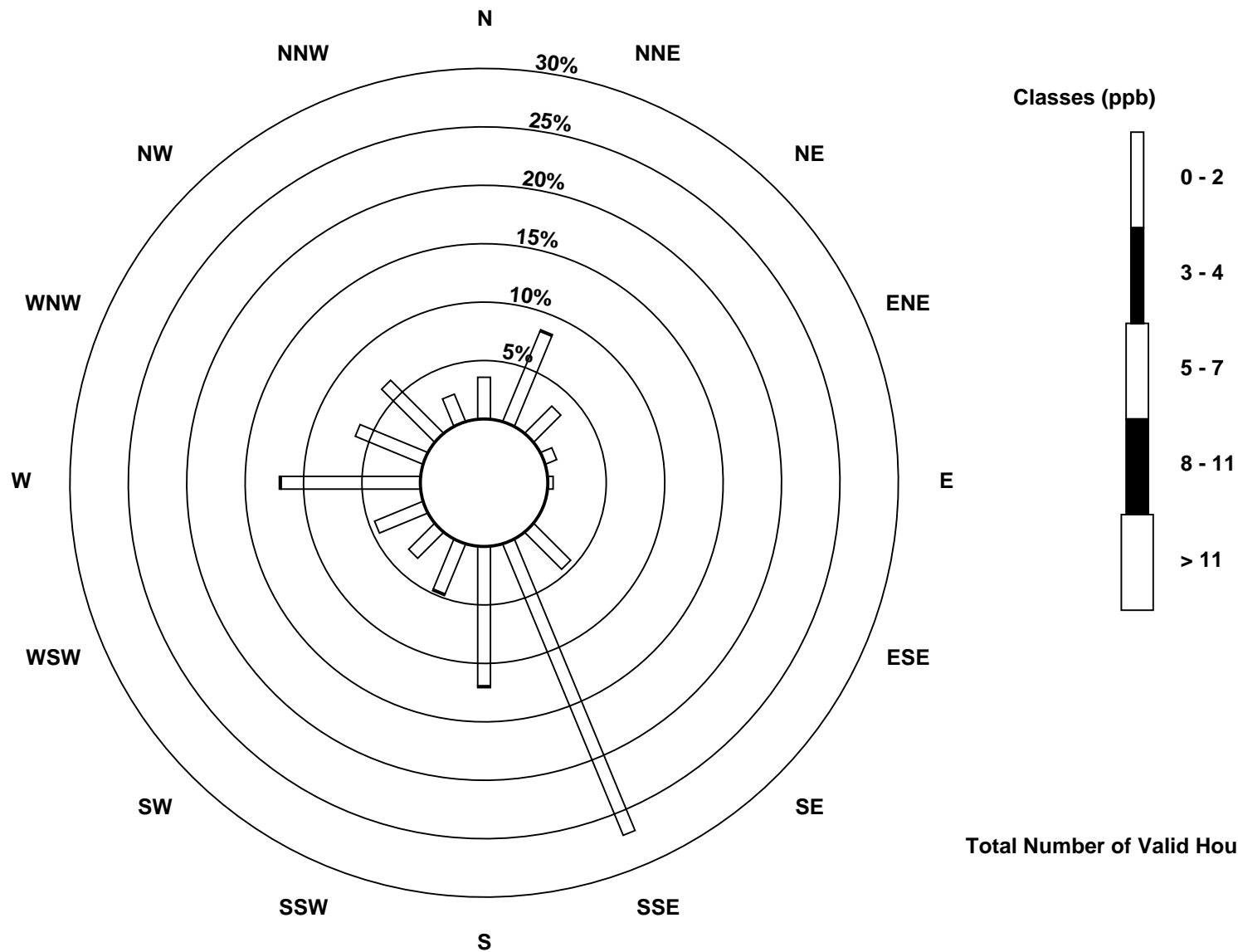
Total Number of Valid Hours: 671

Total Number of Hours: 744

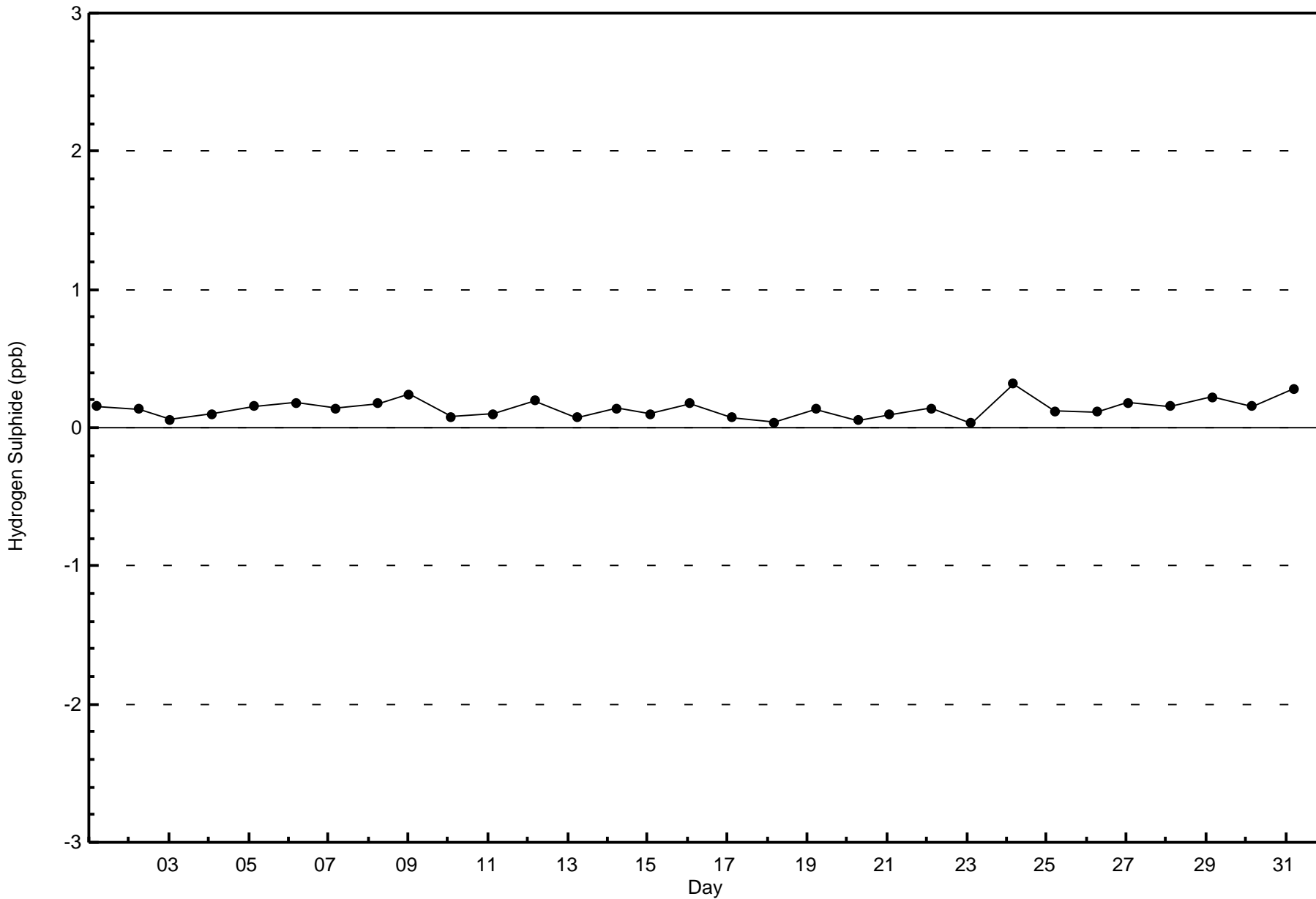


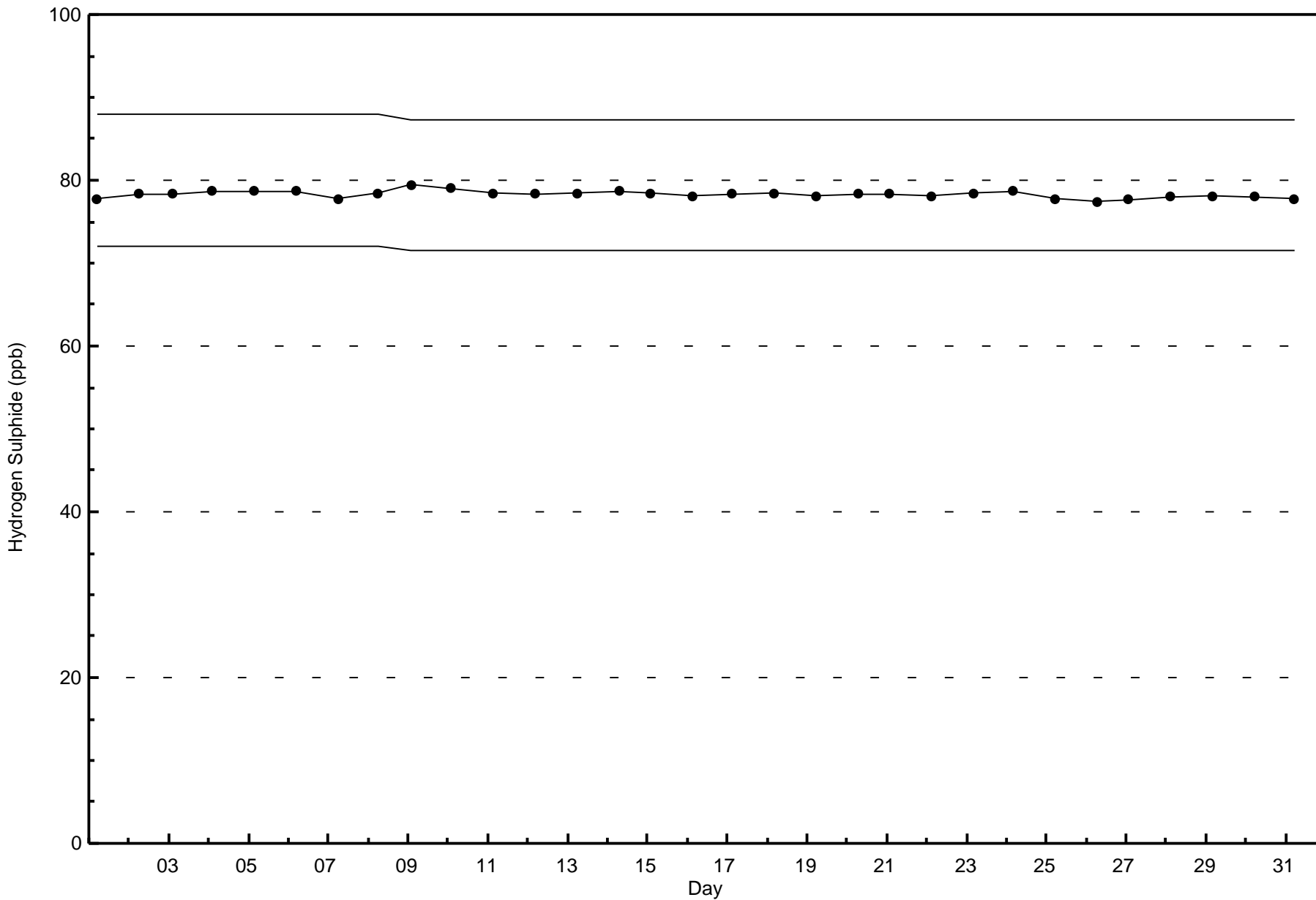
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Buffalo Viewpoint (AMS 4)









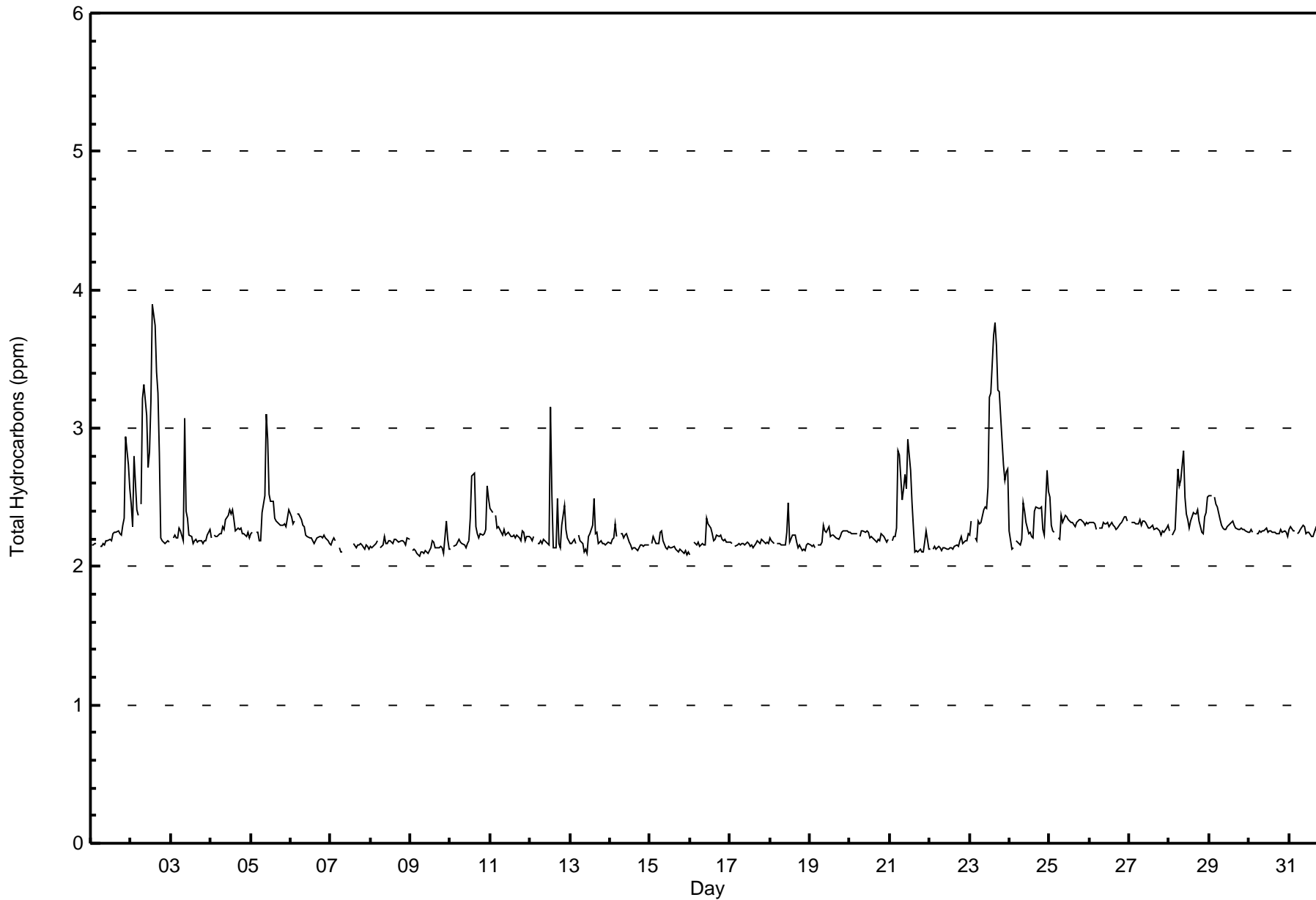


Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm  
Buffalo Viewpoint - December 2017

Maximum Value: 3.9 ppm on Dec 2 14:00																				Maximum Daily Average: 2.8 ppm on Dec 23					Hours in Service: 744				
Minimum Value: 2.1 ppm on Dec 9 06:00																				Minimum Daily Average: 2.1 ppm on Dec 9					Hours of Data: 707				
Maximum Diurnal Average: 2.4 ppm at hour 14																				Minimum Diurnal Average: 2.2 ppm at hour 4					Hours of Missing Data: 37				
Monthly Average: 2.28 ppm																				Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.2 Median = 2.2 Q <sub>3</sub> = 2.3 P <sub>90</sub> = 2.4 P <sub>99</sub> = 3.3					Hours of Calibration: 37				
																				Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	2.2	2.2	2.2	2.2	Z	2.1	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	2.3	2.3	2.9	2.7	2.6	2.3	2.9			
2-Dec	2.5	2.3	2.8	2.4	2.4	Z	2.5	3.2	3.3	3.1	2.7	2.8	3.2	3.9	3.7	3.4	3.3	2.8	2.2	2.2	2.2	2.2	2.2	2.2	2.8	3.9			
3-Dec	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.2	3.1	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	2.3	2.3	3.1			
4-Dec	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.3	2.4			
5-Dec	2.2	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.4	2.5	3.1	2.9	2.5	2.5	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	3.1			
6-Dec	2.4	2.3	2.3	Z	2.4	2.4	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	2.4			
7-Dec	2.2	2.2	2.2	2.2	Z	2.1	2.1	2.1	C	C	C	C	C	C	2.2	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	--	2.2			
8-Dec	2.1	2.1	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2			
9-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.1	2.1	2.3			
10-Dec	2.1	Z	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.3	2.7	2.7	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.6	2.5	2.3	2.7			
11-Dec	2.4	2.4	Z	2.4	2.3	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	2.3	2.2	2.2	2.2	2.2	2.3	2.4			
12-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	3.2	2.5	2.1	2.1	2.5	2.2	2.1	2.3	2.4	2.3	2.2	2.2	2.3	3.2			
13-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5			
14-Dec	2.2	2.2	2.2	2.3	2.2	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	2.2	2.1	2.2	2.2	2.2	2.2	2.3			
15-Dec	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3			
16-Dec	2.1	Z	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3			
17-Dec	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2			
18-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.2	2.2	2.5			
19-Dec	2.2	2.1	2.2	2.1	Z	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3			
20-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.3	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	2.2	2.2	2.2	2.2	2.3			
21-Dec	Z	2.2	2.2	2.2	2.3	2.8	2.8	2.5	2.6	2.7	2.6	2.9	2.7	2.5	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.1	2.4	2.9			
22-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2			
23-Dec	2.2	2.3	Z	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.6	3.2	3.3	3.7	3.8	3.6	3.3	3.3	2.9	2.7	2.6	2.7	2.7	2.8	3.8			
24-Dec	2.3	2.1	2.1	Z	2.2	2.2	2.2	2.2	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.4	2.4	2.4	2.4	2.4	2.3	2.2	2.7	2.5	2.3	2.7			
25-Dec	2.5	2.3	2.3	2.2	Z	2.2	2.2	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5			
26-Dec	2.3	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.4			
27-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.3	2.3	2.3	2.3			
28-Dec	2.3	Z	2.2	2.3	2.5	2.7	2.6	2.6	2.8	2.5	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.2	2.2	2.4	2.4	2.5	2.8			
29-Dec	2.5	2.5	Z	2.5	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	2.3	2.2	2.3	2.5			
30-Dec	2.2	2.3	2.3	Z	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3			
31-Dec	2.3	2.3	2.3	2.3	Z	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3			
																								Diurnal Average					
																								Diurnal Maximum					
Z - zerospan C - Calibration																													





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	689	97.45	97.45
3.1 - 10.0	18	2.55	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Buffalo Viewpoint - December 2017**

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	21	52	22	8	2	0	30	181	76	34	19	31	78	37	43	17	651
3.1 - 10.0	3	5	0	0	1	0	0	6	1	1	0	0	1	0	0	0	18
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	24	57	22	8	3	0	30	187	77	35	19	31	79	37	43	17	669

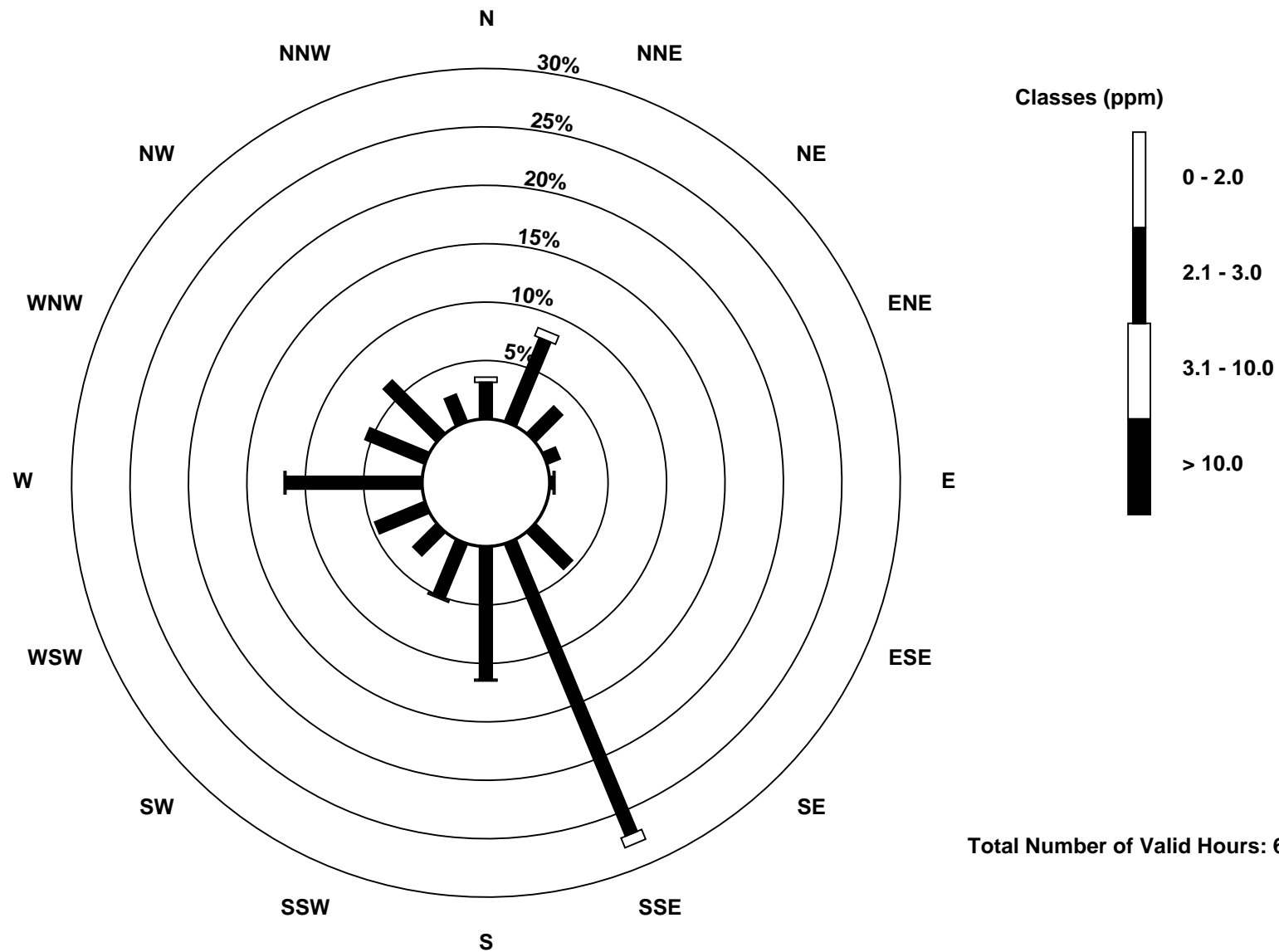
Total Number of Valid Hours: 669

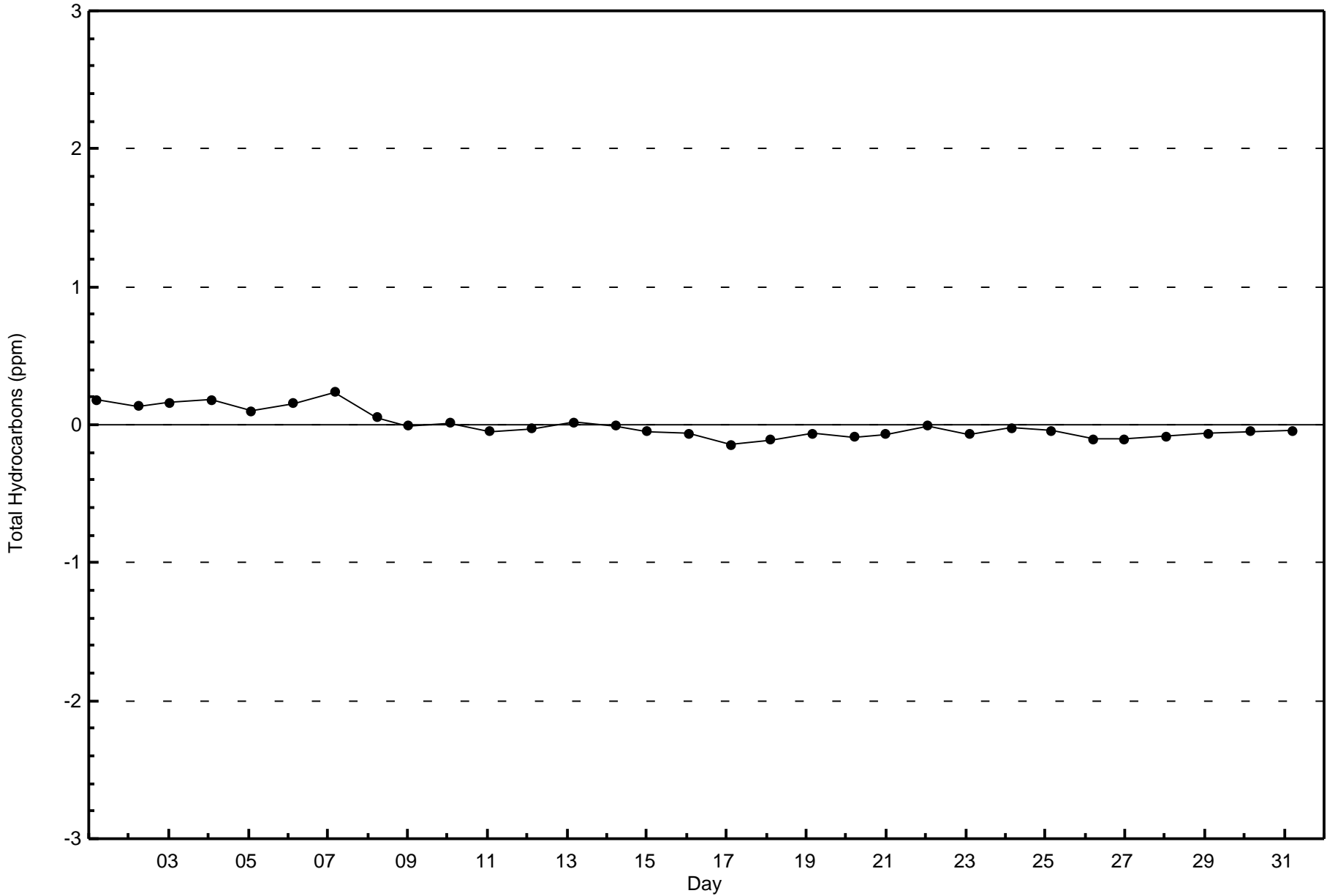
Total Number of Hours: 744



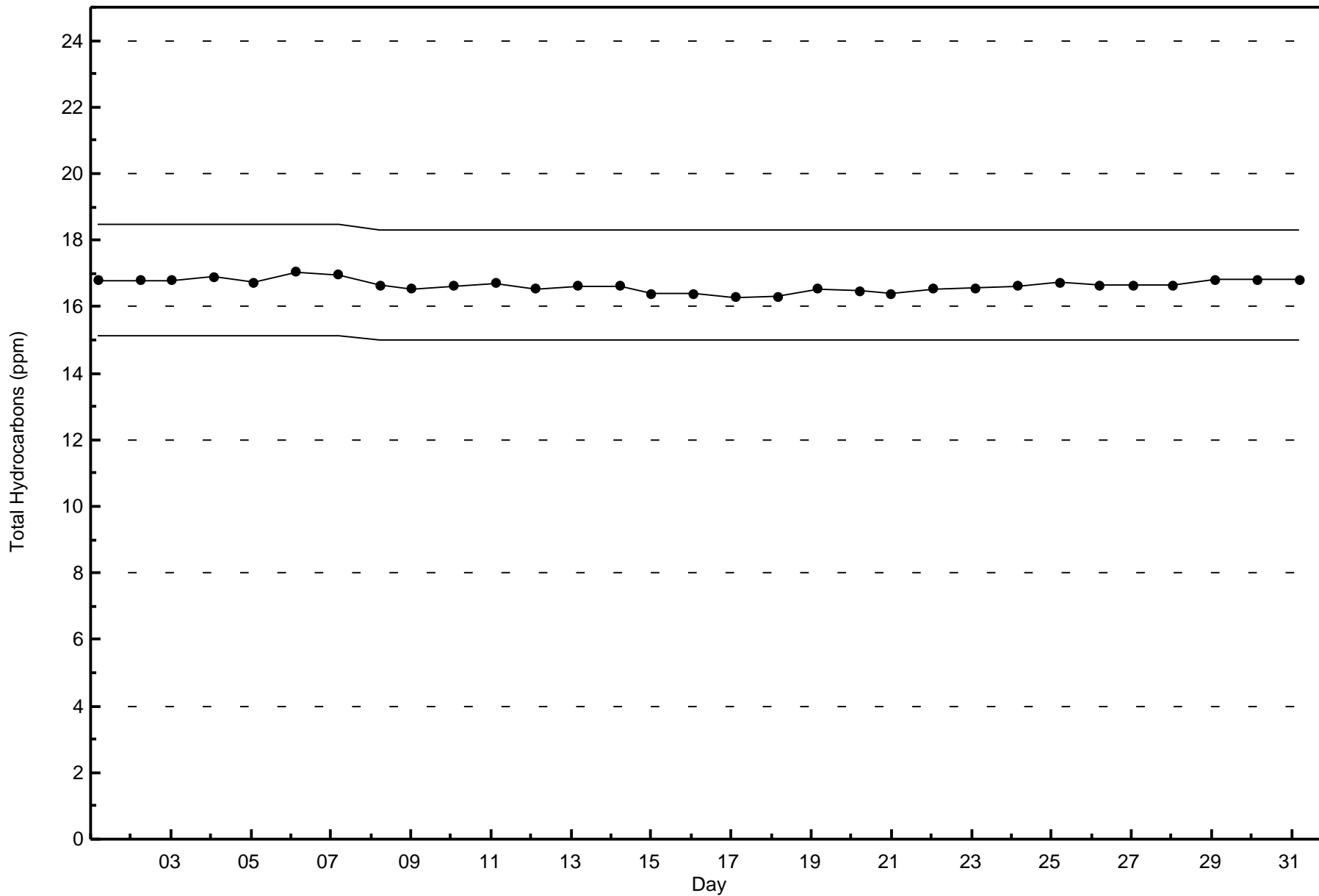
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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



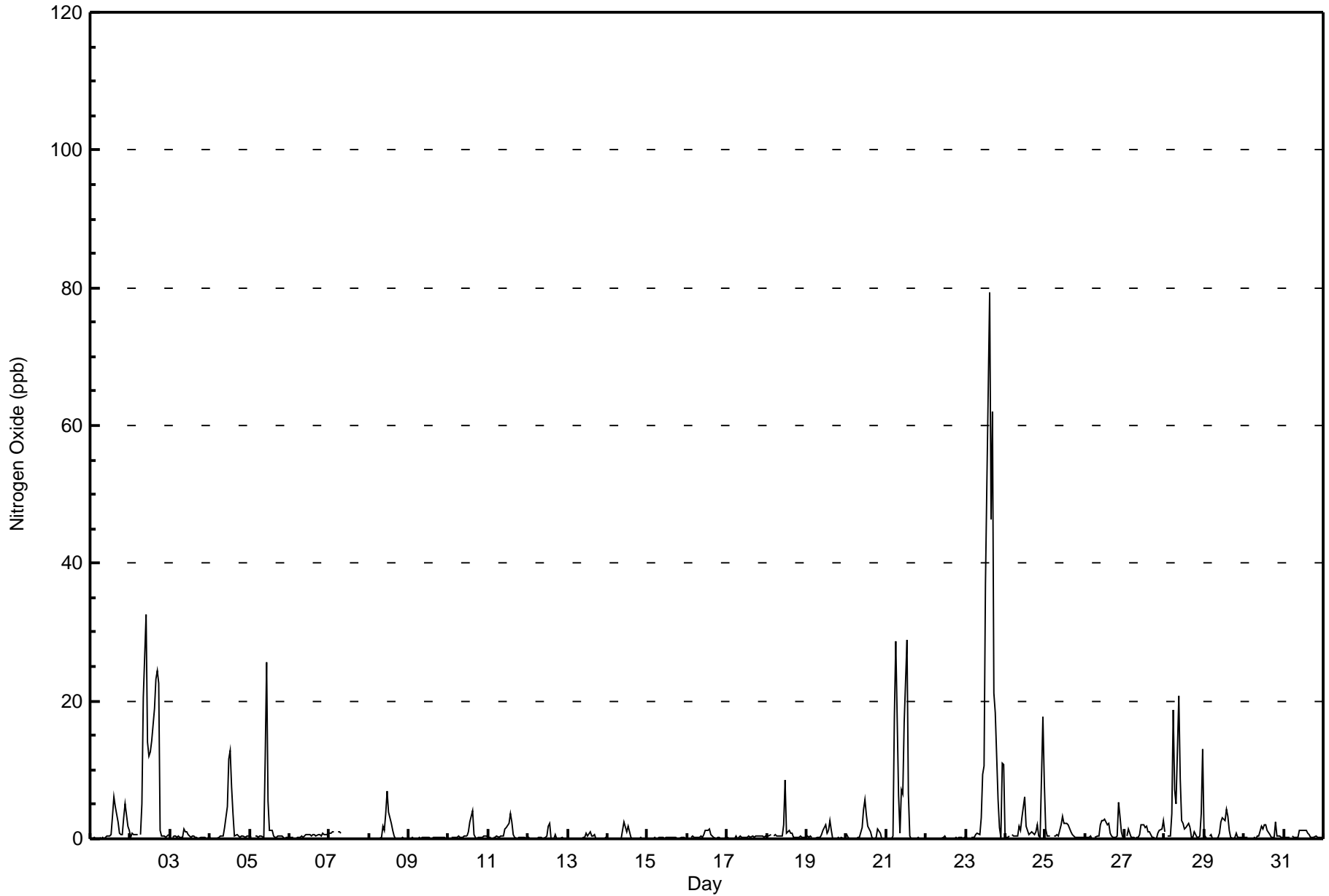








Maximum Value: 79 ppb on Dec 23 15:00																		Maximum Daily Average: 16.1 ppb on Dec 23																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 1 01:00																		Minimum Daily Average: 0.1 ppb on Dec 22																		Hours of Data: 707			
Maximum Diurnal Average: 4.4 ppb at hour 15																		Minimum Diurnal Average: 0.2 ppb at hour 2																		Hours of Missing Data: 37			
Monthly Average: 1.8 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 27																		Hours of Calibration: 37			
																																				Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	3	6	5	2	1	1	1	3	5	2	1	1.4	6													
2-Dec	0	1	1	1	1	Z	1	5	21	33	14	12	13	14	19	23	24	22	1	0	0	0	0	1	9.0	33													
3-Dec	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1													
4-Dec	0	Z	0	0	0	0	0	0	0	2	5	12	13	8	4	0	1	0	0	0	0	0	0	0	2.0	13													
5-Dec	0	0	Z	0	0	0	0	0	0	12	26	5	1	1	0	0	0	0	0	0	0	0	0	0	2.2	26													
6-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.5	1													
7-Dec	1	1	1	1	Z	1	1	1	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	1													
8-Dec	0	0	0	0	0	Z	0	0	2	1	4	7	4	2	1	0	0	0	0	0	0	0	0	0	1.0	7													
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	2	4	1	0	0	0	0	0	0	0	0	0.6	4													
11-Dec	0	0	Z	0	0	0	0	0	0	0	1	2	2	4	2	1	0	0	0	0	0	0	0	0	0.7	4													
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	0	0	0.3	2													
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0.2	1													
14-Dec	0	0	0	0	0	Z	0	0	0	1	3	1	2	1	0	0	0	0	0	0	0	0	0	0	0.3	3													
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
16-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1													
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0													
18-Dec	0	0	1	Z	0	1	0	0	0	0	2	9	1	1	1	1	0	0	0	0	0	0	0	0	0.9	9													
19-Dec	0	0	0	0	Z	0	0	0	0	1	1	2	1	1	3	1	0	0	0	0	0	0	0	0	0.5	3													
20-Dec	1	0	0	0	0	Z	0	0	0	2	4	6	3	2	1	0	0	0	0	0	2	1	0	0	1.0	6													
21-Dec	Z	0	0	0	0	18	29	6	1	7	6	17	29	6	0	0	0	0	0	0	0	0	0	0	5.2	29													
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
23-Dec	0	0	Z	0	0	0	1	1	1	3	9	11	37	51	79	46	62	21	18	6	2	0	11	11	16.1	79													
24-Dec	0	0	0	Z	1	0	0	0	2	1	3	6	2	1	1	1	1	1	1	2	0	0	18	8	2.2	18													
25-Dec	1	0	0	0	Z	0	0	1	0	2	3	2	2	2	2	1	1	0	0	0	0	0	0	0	0.9	3													
26-Dec	0	0	0	0	0	Z	0	0	0	2	3	3	3	2	2	1	0	0	0	1	5	3	1	0	1.2	5													
27-Dec	Z	0	1	1	0	0	0	0	0	1	2	2	2	2	1	1	0	0	0	0	1	1	2	3	0.9	3													
28-Dec	1	Z	0	1	4	19	7	5	21	9	3	2	1	2	2	2	0	0	1	0	0	0	4	13	4.2	21													
29-Dec	1	0	Z	0	1	0	0	0	0	1	2	3	3	4	3	1	0	0	0	1	0	0	0	0	0.9	4													
30-Dec	0	0	0	Z	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	2	0	0	0	0	0.6	2													
31-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1													
																								Diurnal Average															
																								Diurnal Maximum															
0.3 0.2 0.3 0.3 0.3 1.6 1.4 0.8 1.8 2.7 3.3 3.6 4.3 4.0 4.4 2.9 3.1 1.6 0.9 0.6 0.6 0.5 1.3 1.3																																							
1 1 1 1 4 19 29 6 21 33 26 17 37 51 79 46 62 22 18 6 5 5 18 13																																							
Z - zerospan C - Calibration																																							





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	692	97.88	97.88
21 - 40	11	1.56	99.43
41 - 80	4	0.57	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Buffalo Viewpoint - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	23	53	22	8	3	0	30	184	76	34	17	31	78	37	41	17	654
21 - 40	1	3	0	0	0	0	0	3	0	0	2	0	0	0	2	0	11
41 - 80	0	1	0	0	0	0	0	0	1	1	0	0	1	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
<b>Totals</b>	24	57	22	8	3	0	30	187	77	35	19	31	79	37	43	17	669

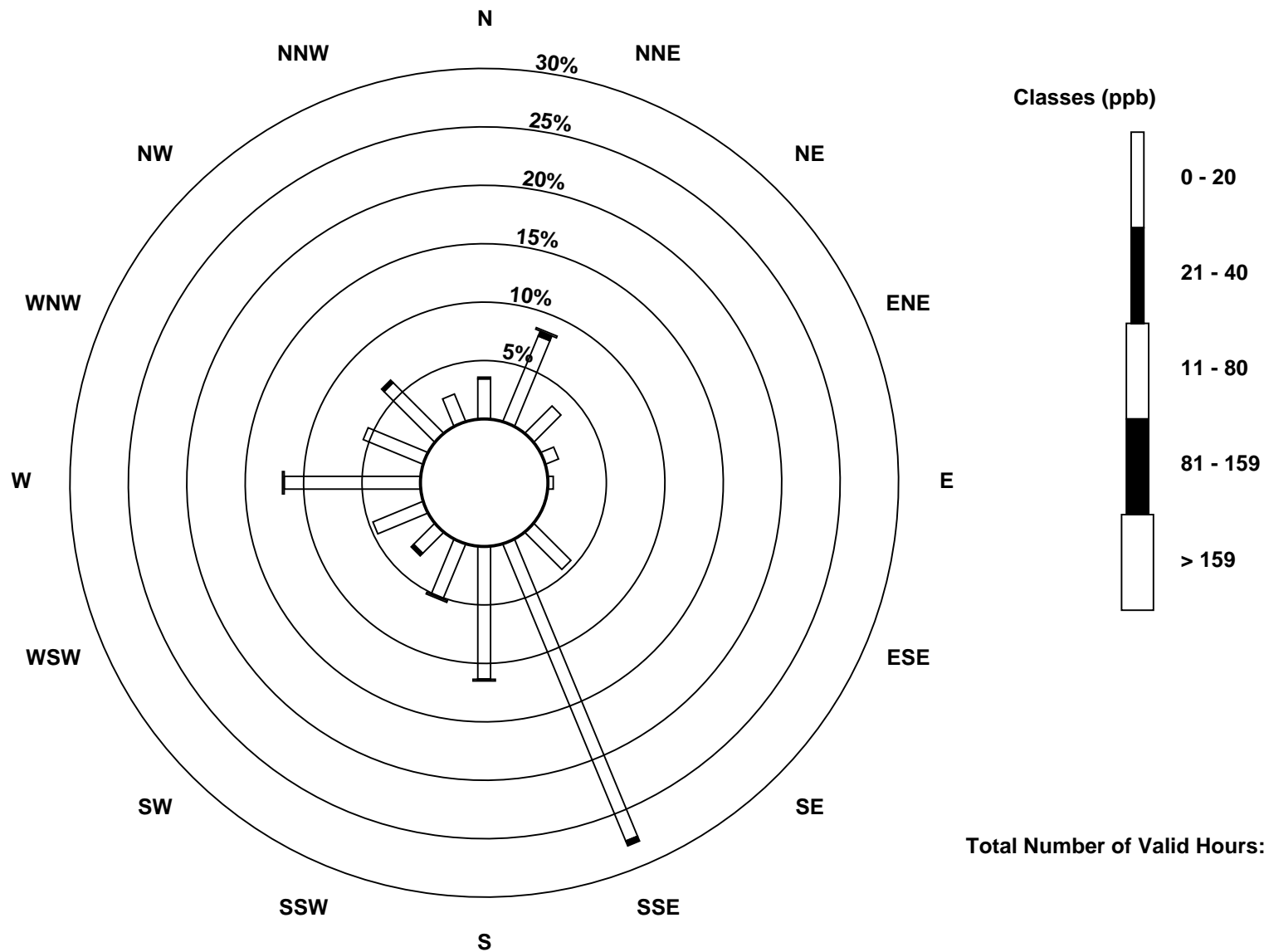
Total Number of Valid Hours: 669

Total Number of Hours: 744

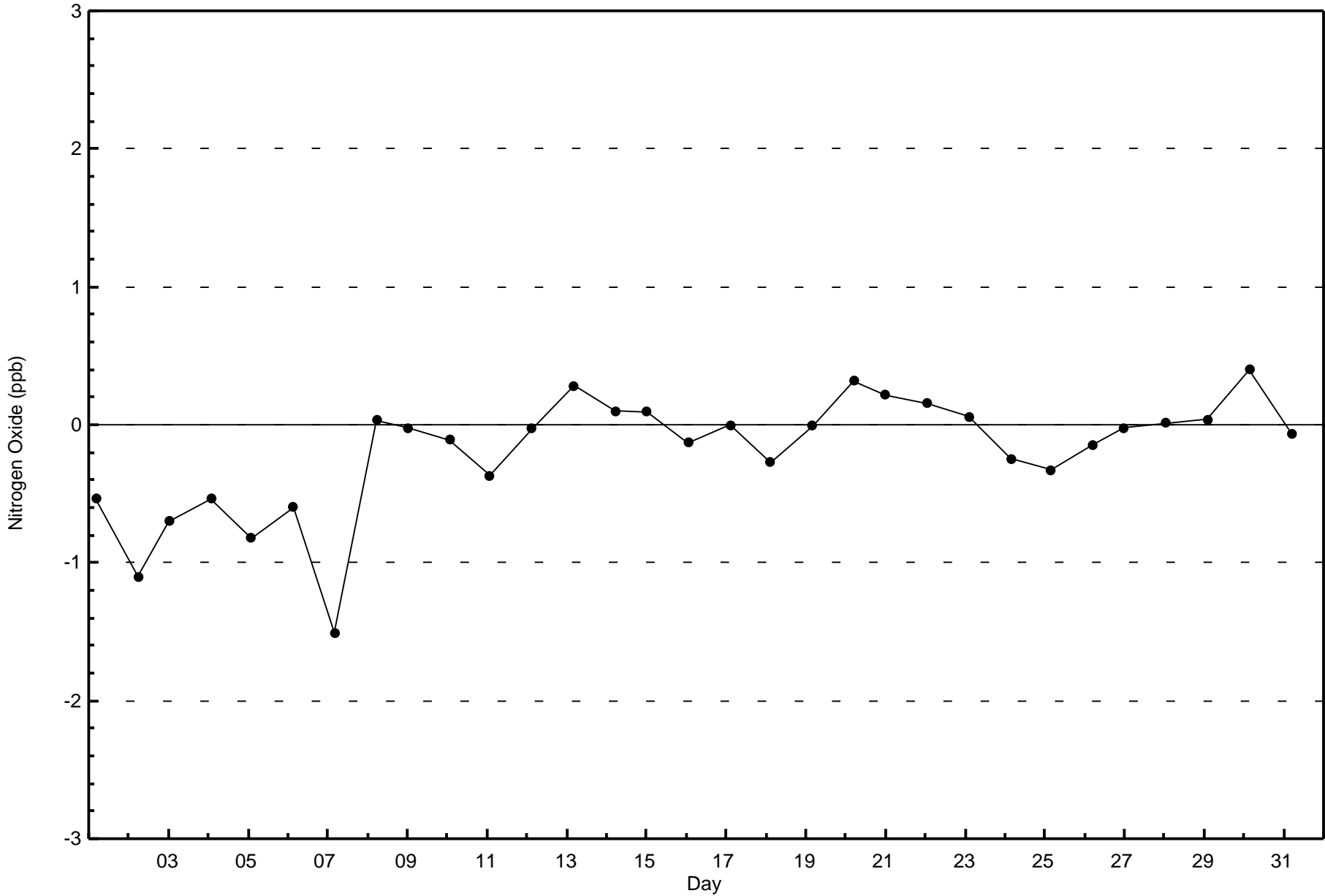


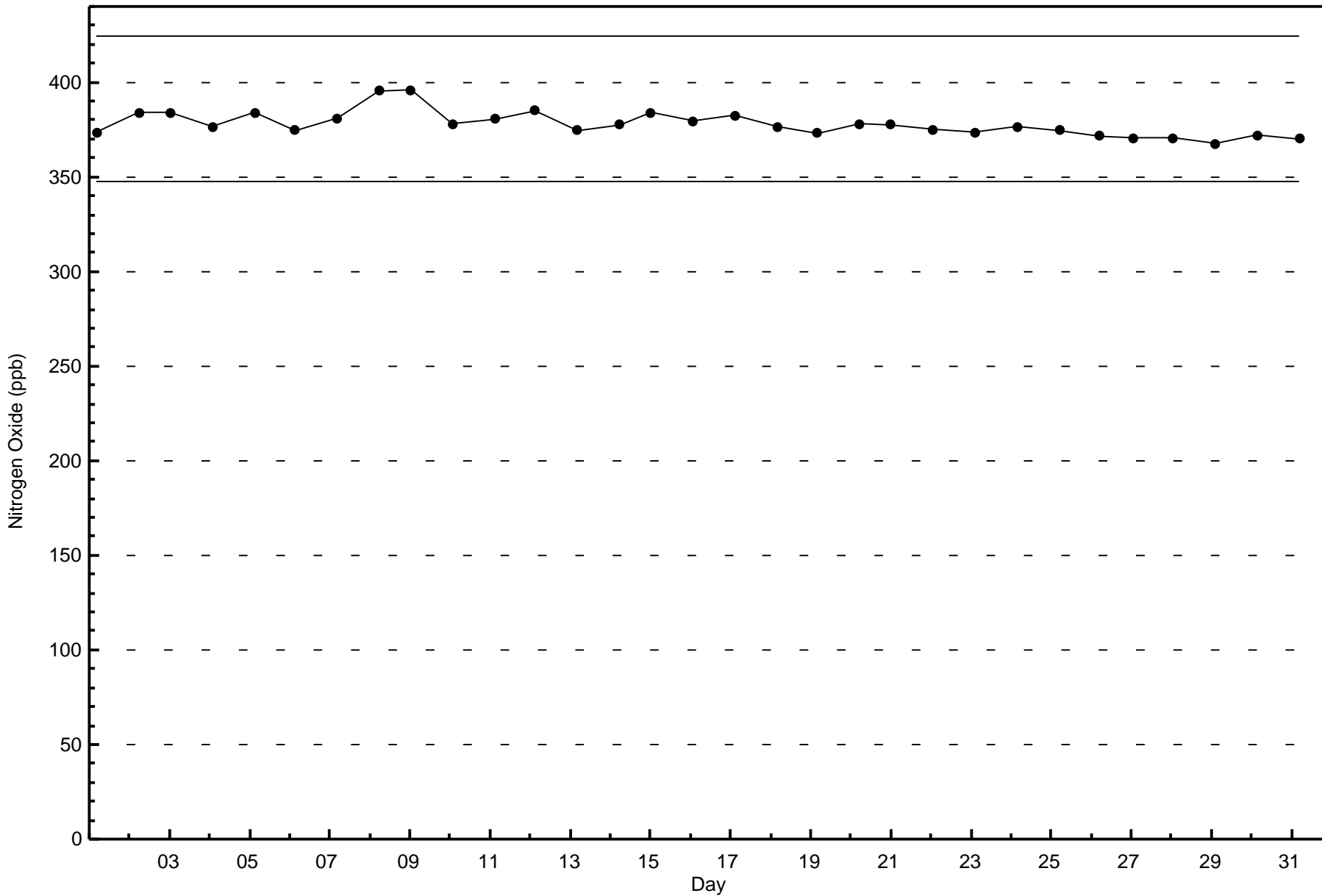
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxide (NO) - ppb  
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 669









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

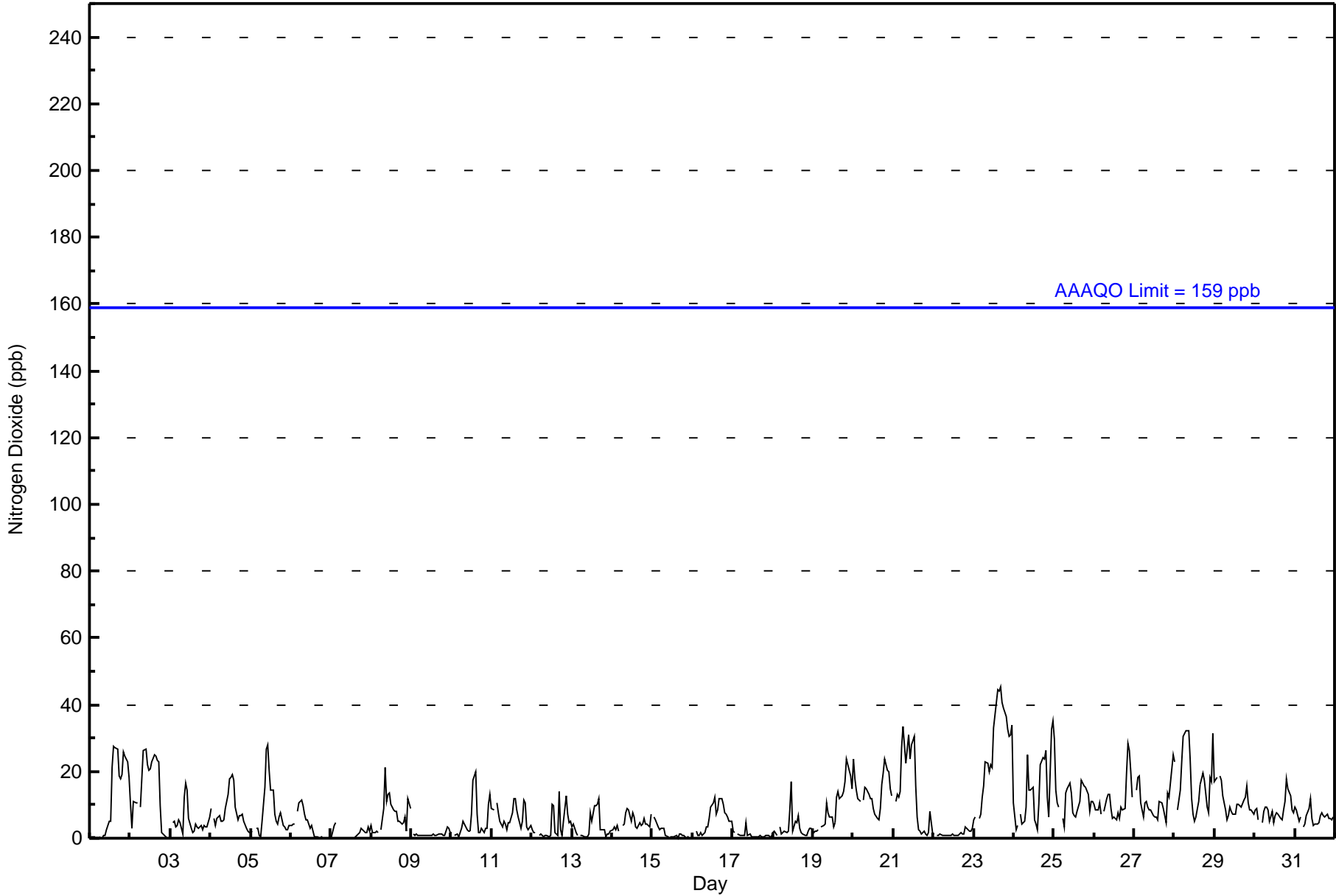
Buffalo Viewpoint - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 45 ppb on Dec 23 17:00	Maximum Daily Average: 26.5 ppb on Dec 23
Minimum Value: 0 ppb on Dec 6 20:00	Hours of Data: 707
Maximum Diurnal Average: 10.4 ppb at hour 9	Hours of Missing Data: 37
Monthly Average: 8.2 ppb	Hours of Calibration: 37
Minimum Daily Average: 1.0 ppb on Dec 17	Percent Operational Time: 100.0
Minimum Diurnal Average: 5.4 ppb at hour 3	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 6 Q <sub>3</sub> = 11 P <sub>90</sub> = 20 P <sub>99</sub> = 36	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	1	0	0	Z	1	0	0	1	1	3	5	5	21	28	27	27	19	18	19	26	25	23	18	11.6	28
2-Dec	10	3	11	10	11	Z	9	18	26	27	22	20	21	23	25	24	23	23	10	2	1	0	0	0	13.9	27
3-Dec	Z	5	5	3	4	6	5	1	12	17	14	6	3	2	2	4	3	3	4	3	4	3	3	6	5.1	17
4-Dec	9	Z	6	4	6	7	5	5	5	9	13	18	18	19	17	9	6	7	7	7	5	3	2	2	8.2	19
5-Dec	2	2	Z	3	3	1	0	5	15	27	28	20	14	14	7	5	4	6	8	4	3	3	3	4	7.9	28
6-Dec	4	4	4	Z	8	10	12	10	7	5	6	3	4	2	0	0	0	0	0	0	0	0	0	0	3.5	12
7-Dec	0	2	4	5	Z	0	0	0	C	C	C	C	C	C	0	1	1	2	3	3	2	2	3	2	--	5
8-Dec	4	2	2	2	2	Z	3	9	21	11	13	14	10	8	8	8	5	5	4	5	6	2	12	9	7.2	21
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	3	2	1.2	4
10-Dec	2	Z	1	1	1	2	3	5	4	2	2	2	7	17	20	7	2	2	3	2	3	3	10	13	4.9	20
11-Dec	9	8	Z	11	8	5	4	5	4	3	5	5	8	12	12	8	6	3	5	11	11	4	3	4	6.6	12
12-Dec	3	2	2	Z	1	1	1	1	1	1	1	1	10	10	2	1	14	3	1	5	13	7	5	5	3.8	14
13-Dec	4	4	2	1	Z	1	1	1	0	0	1	8	5	10	10	10	12	3	3	2	1	1	1	2	3.5	12
14-Dec	3	3	3	4	2	Z	4	4	8	9	9	5	8	6	3	3	5	4	4	6	4	4	4	7	4.8	9
15-Dec	Z	7	6	3	2	3	3	3	1	0	0	0	1	0	1	0	1	1	1	1	0	1	0	0	1.5	7
16-Dec	0	Z	2	1	1	2	1	2	4	3	6	9	11	12	7	8	12	12	10	8	7	6	5	5	5.9	12
17-Dec	2	2	Z	1	1	1	1	1	5	1	1	1	0	0	0	0	1	1	1	0	1	1	1	1	1.0	5
18-Dec	2	2	1	Z	4	1	2	2	2	2	8	17	2	5	5	7	3	2	1	1	1	2	3	3	3.3	17
19-Dec	2	2	2	2	Z	4	4	4	11	8	6	6	3	5	12	14	12	13	14	17	24	22	19	15	9.6	24
20-Dec	24	18	15	12	11	Z	12	15	15	13	12	12	9	7	6	6	9	16	20	24	20	20	15	13	14.0	24
21-Dec	Z	11	13	12	14	27	33	23	27	31	24	28	31	16	6	3	2	1	2	1	1	2	8	1	13.8	33
22-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	3	3	2	2	3	1.4	3
23-Dec	6	6	Z	6	7	12	16	23	23	20	22	21	33	37	44	44	45	41	39	36	33	30	31	34	26.5	45
24-Dec	11	3	4	Z	7	4	5	10	25	15	15	15	6	4	3	10	22	24	24	26	12	7	33	35	13.8	35
25-Dec	30	14	11	10	Z	6	4	14	15	17	14	8	7	7	8	11	17	17	16	15	13	8	11	11	12.2	30
26-Dec	10	9	8	11	7	Z	8	12	13	13	9	6	6	6	8	6	10	8	9	20	29	26	20	12	11.5	29
27-Dec	Z	14	18	19	10	6	10	11	10	9	8	7	6	6	6	11	10	9	7	5	14	12	21	25	11.0	25
28-Dec	23	Z	9	15	23	30	31	32	32	23	12	7	5	6	11	16	18	19	17	10	8	18	17	31	18.0	32
29-Dec	17	18	Z	19	17	13	8	5	7	9	8	7	7	10	10	10	9	11	12	16	11	8	9	7	10.9	19
30-Dec	8	9	6	Z	5	8	9	9	9	5	8	5	7	8	7	6	6	9	11	18	15	13	9	8	8.5	18
31-Dec	9	8	5	6	Z	4	4	7	9	12	6	4	4	4	5	7	8	7	6	7	6	6	6	6	6.3	12

7.4	6.1	5.4	6.3	6.2	6.0	6.4	7.7	10.4	9.8	9.2	8.7	8.4	9.3	8.9	8.7	9.6	8.8	8.4	8.9	8.9	7.9	9.0	9.2	Diurnal Average
30	18	18	19	23	30	33	32	32	31	28	28	33	37	44	44	45	41	39	36	33	30	33	35	Diurnal Maximum

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





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	640	90.52	90.52
21 - 40	63	8.91	99.43
41 - 80	4	0.57	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	19	43	20	7	2	0	27	164	73	33	17	31	78	35	39	15	603
21 - 40	5	13	2	1	1	0	3	22	3	1	2	0	1	2	4	2	62
11 - 80	0	1	0	0	0	0	0	1	1	1	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
<b>Totals</b>	24	57	22	8	3	0	30	187	77	35	19	31	79	37	43	17	669

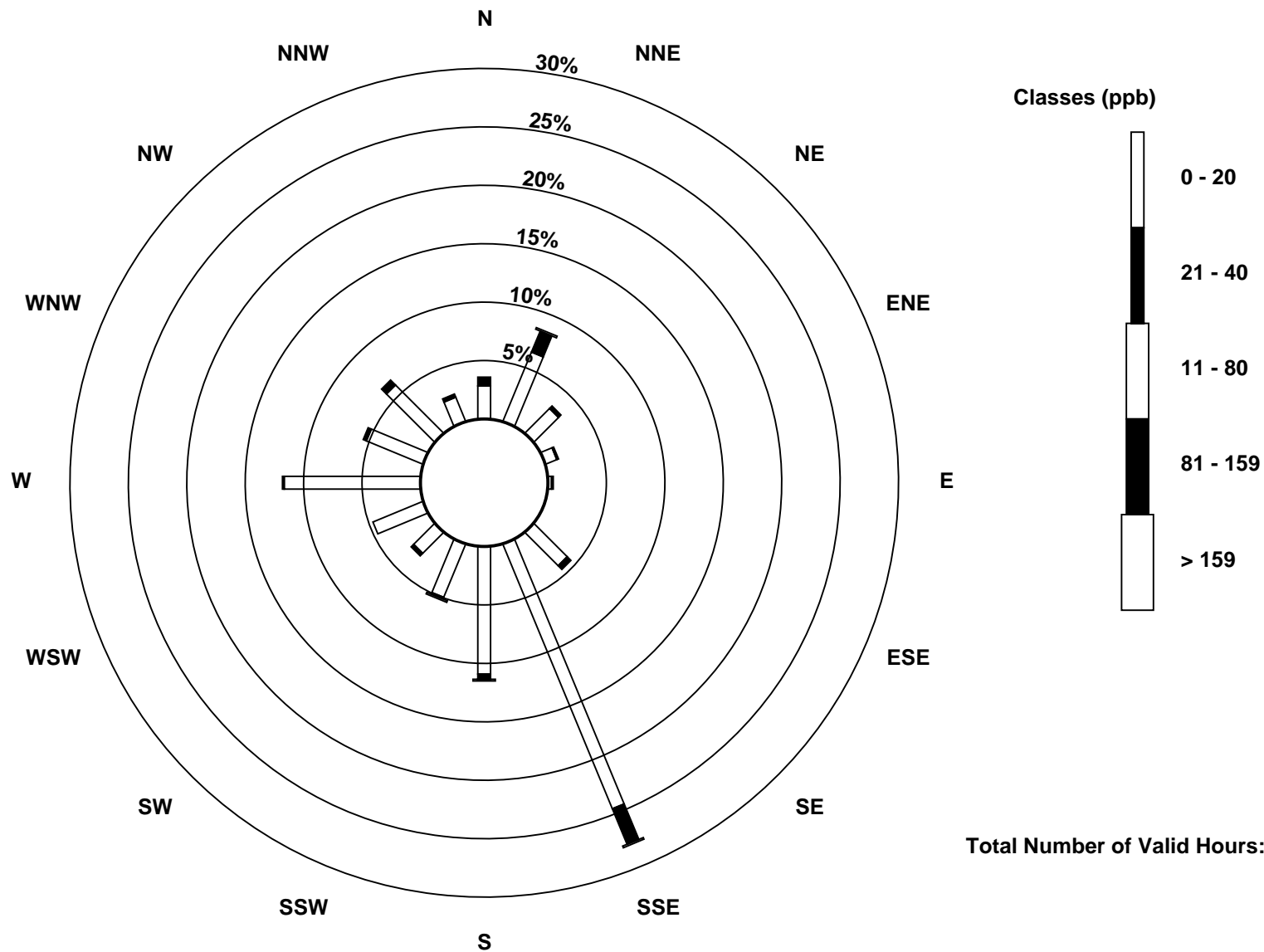
Total Number of Valid Hours: 669

Total Number of Hours: 744

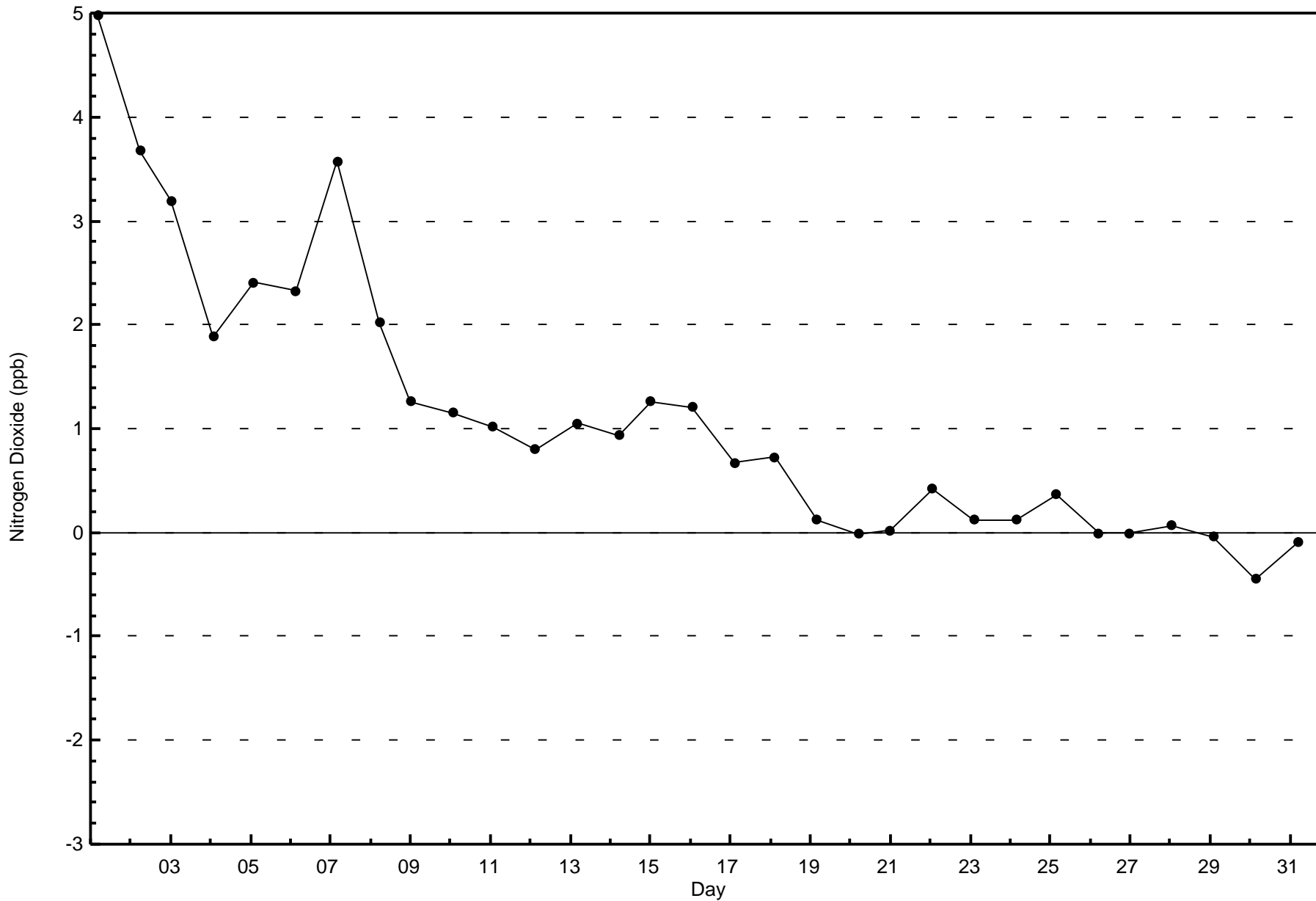


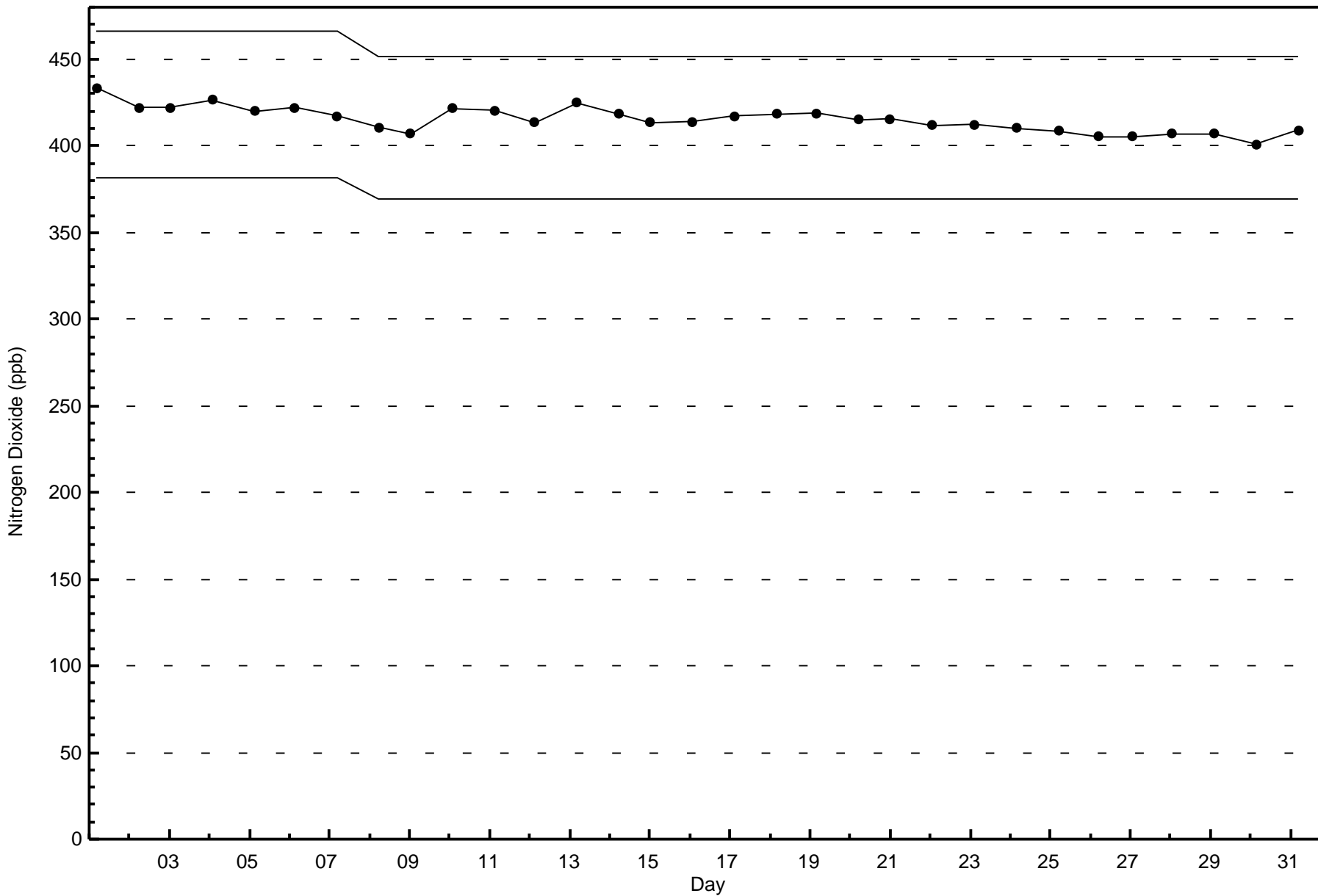
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 669







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

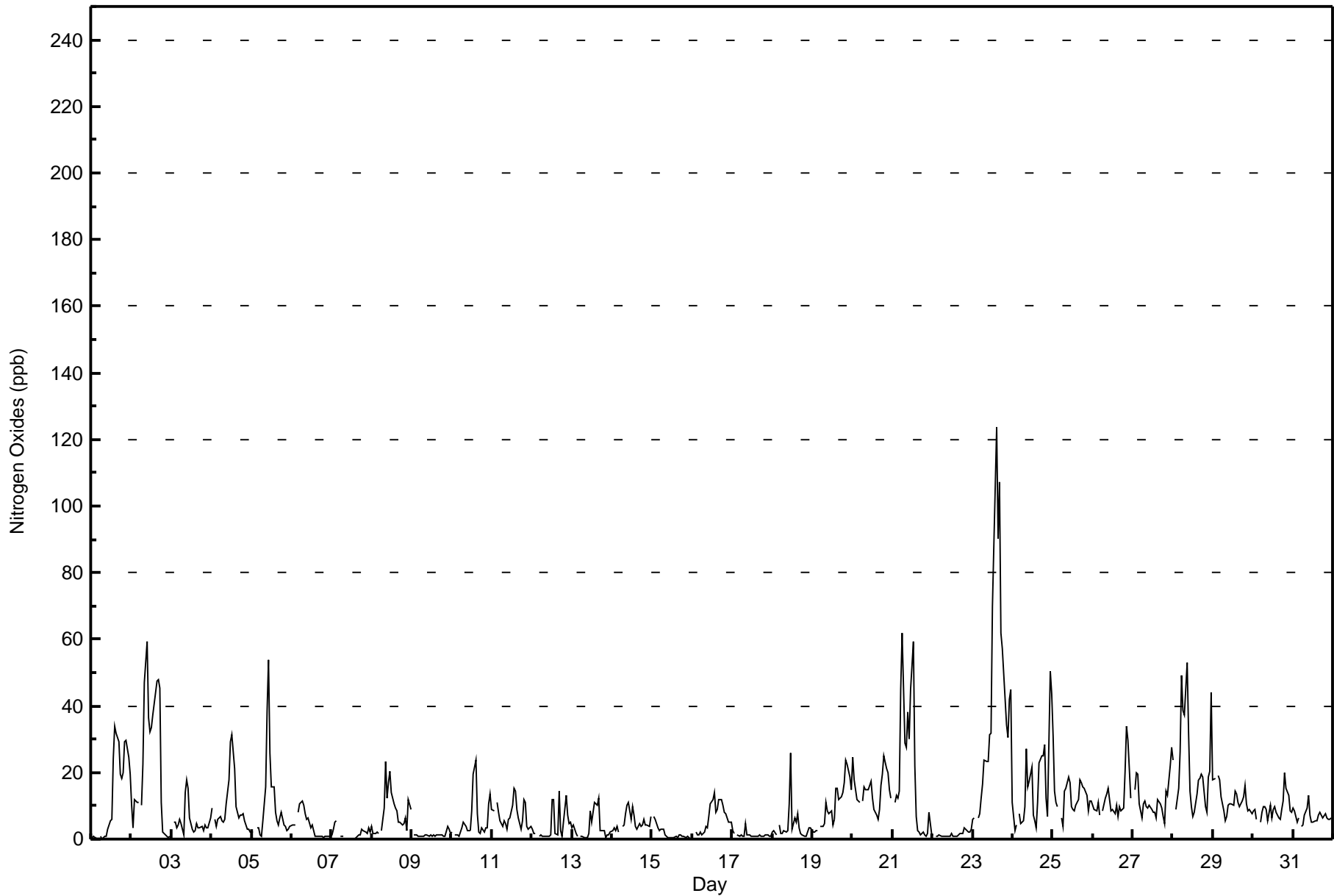
Buffalo Viewpoint - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 124 ppb on Dec 23 15:00	Maximum Daily Average: 42.6 ppb on Dec 23		Hours of Data:	707
Minimum Value: 0 ppb on Dec 7 15:00	Minimum Daily Average: 1.2 ppb on Dec 17		Hours of Missing Data:	37
Maximum Diurnal Average: 13.3 ppb at hour 14	Minimum Diurnal Average: 5.6 ppb at hour 3		Hours of Calibration:	37
Monthly Average: 10.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 6 Q <sub>3</sub> = 12 P <sub>90</sub> = 23 P <sub>99</sub> = 62		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	1	1	0	Z	1	0	0	1	1	3	6	6	24	34	32	29	20	18	20	29	30	25	19	13.0	34																							
2-Dec	10	4	12	11	11	Z	10	23	47	59	36	32	33	37	44	48	48	45	11	2	1	1	1	1	22.9	59																							
3-Dec	Z	5	5	3	4	6	5	1	14	18	15	6	3	2	2	5	4	3	4	3	4	3	3	7	5.5	18																							
4-Dec	9	Z	6	4	6	7	5	5	6	10	18	29	31	26	21	10	6	7	7	8	5	3	3	2	10.3	31																							
5-Dec	2	2	Z	3	3	1	1	5	16	39	54	26	16	16	8	5	4	7	8	4	4	3	3	4	10.1	54																							
6-Dec	4	4	4	Z	8	10	12	10	8	6	6	3	4	3	1	1	1	1	1	0	1	1	1	1	4.0	12																							
7-Dec	1	3	5	6	Z	1	1	1	C	C	C	C	C	C	0	1	1	1	3	3	2	2	3	2	--	6																							
8-Dec	4	2	2	2	2	Z	2	9	23	12	17	20	14	11	9	8	5	5	4	5	6	2	12	9	8.1	23																							
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	3	2	1.3	4																							
10-Dec	2	Z	1	1	1	2	3	5	4	3	3	3	8	20	24	8	2	2	3	2	3	3	11	14	5.5	24																							
11-Dec	9	8	Z	11	8	5	4	5	5	3	6	7	10	15	14	9	6	3	5	12	11	4	3	4	7.3	15																							
12-Dec	3	2	2	Z	1	1	1	1	1	1	1	1	12	12	2	1	14	3	1	5	13	7	4	5	4.1	14																							
13-Dec	4	4	2	1	Z	1	1	1	0	1	2	8	5	11	10	10	12	3	3	2	0	1	1	2	3.7	12																							
14-Dec	3	3	3	4	2	Z	4	4	8	10	11	6	10	7	4	3	5	4	4	6	4	4	4	7	5.2	11																							
15-Dec	Z	7	6	3	2	3	3	3	1	0	0	1	1	0	1	0	1	1	1	1	0	1	0	0	1.6	7																							
16-Dec	0	Z	2	1	1	2	1	2	4	3	7	11	12	14	8	9	12	12	10	8	7	6	5	5	6.2	14																							
17-Dec	2	2	Z	1	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	5																							
18-Dec	2	2	1	Z	4	2	2	2	2	3	10	26	3	6	5	7	3	2	1	1	1	2	3	3	4.2	26																							
19-Dec	2	2	2	3	Z	4	4	4	11	8	8	8	4	6	15	15	12	13	14	17	24	22	18	15	10.1	24																							
20-Dec	24	18	15	12	11	Z	12	16	15	15	16	18	12	9	7	6	9	16	20	25	21	20	15	12	14.9	25																							
21-Dec	Z	11	13	12	14	45	62	29	28	38	30	45	59	22	7	3	2	1	2	1	1	1	8	1	19.0	62																							
22-Dec	1	Z	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	2	2	3	3	2	2	3	1.4	3																							
23-Dec	6	7	Z	6	7	12	16	24	23	23	31	32	70	88	124	90	107	62	57	42	34	31	42	45	42.6	124																							
24-Dec	11	3	4	Z	8	5	5	10	27	16	18	22	7	5	3	11	23	25	25	28	12	7	50	43	16.0	50																							
25-Dec	31	14	11	10	Z	6	4	14	15	19	17	10	9	9	10	12	18	17	16	15	13	8	11	11	13.1	31																							
26-Dec	10	9	9	11	7	Z	8	12	13	15	12	9	9	8	10	7	10	9	9	20	34	29	21	12	12.8	34																							
27-Dec	Z	15	20	20	11	6	10	11	10	9	10	9	8	8	6	12	11	9	7	5	14	13	22	28	11.9	28																							
28-Dec	24	Z	9	15	26	49	38	37	53	32	14	10	7	8	13	18	18	20	18	10	8	19	21	44	22.2	53																							
29-Dec	18	18	Z	19	18	13	8	5	7	10	10	11	10	14	13	11	10	11	13	16	11	9	9	7	11.8	19																							
30-Dec	8	9	6	Z	5	8	10	10	9	6	10	6	9	10	8	6	6	9	12	20	15	13	9	8	9.1	20																							
31-Dec	9	9	5	7	Z	4	4	7	9	13	7	5	5	5	5	7	8	7	6	8	6	6	6	6	6.8	13																							
																								7.8	6.3	5.6	6.5	6.6	7.6	7.8	8.5	12.2	12.5	12.5	12.4	12.7	13.3	13.3	11.6	12.7	10.4	9.3	9.5	9.4	8.4	10.3	10.5	Diurnal Average	
																								31	18	20	20	26	49	62	37	53	59	54	45	70	88	124	90	107	62	57	42	34	31	50	45	Diurnal Maximum	

Z - zerospan C - Calibration







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	625	88.40	88.40
21 - 40	56	7.92	96.32
41 - 80	22	3.11	99.43
81 - 159	4	0.57	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Buffalo Viewpoint - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	17	42	20	6	2	0	24	160	73	32	17	31	78	35	37	15	589
21 - 40	5	8	1	2	1	0	6	21	3	1	0	0	0	1	3	2	54
11 - 80	2	6	1	0	0	0	0	6	0	1	2	0	0	1	3	0	22
81 - 159	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	4
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	24	57	22	8	3	0	30	187	77	35	19	31	79	37	43	17	669

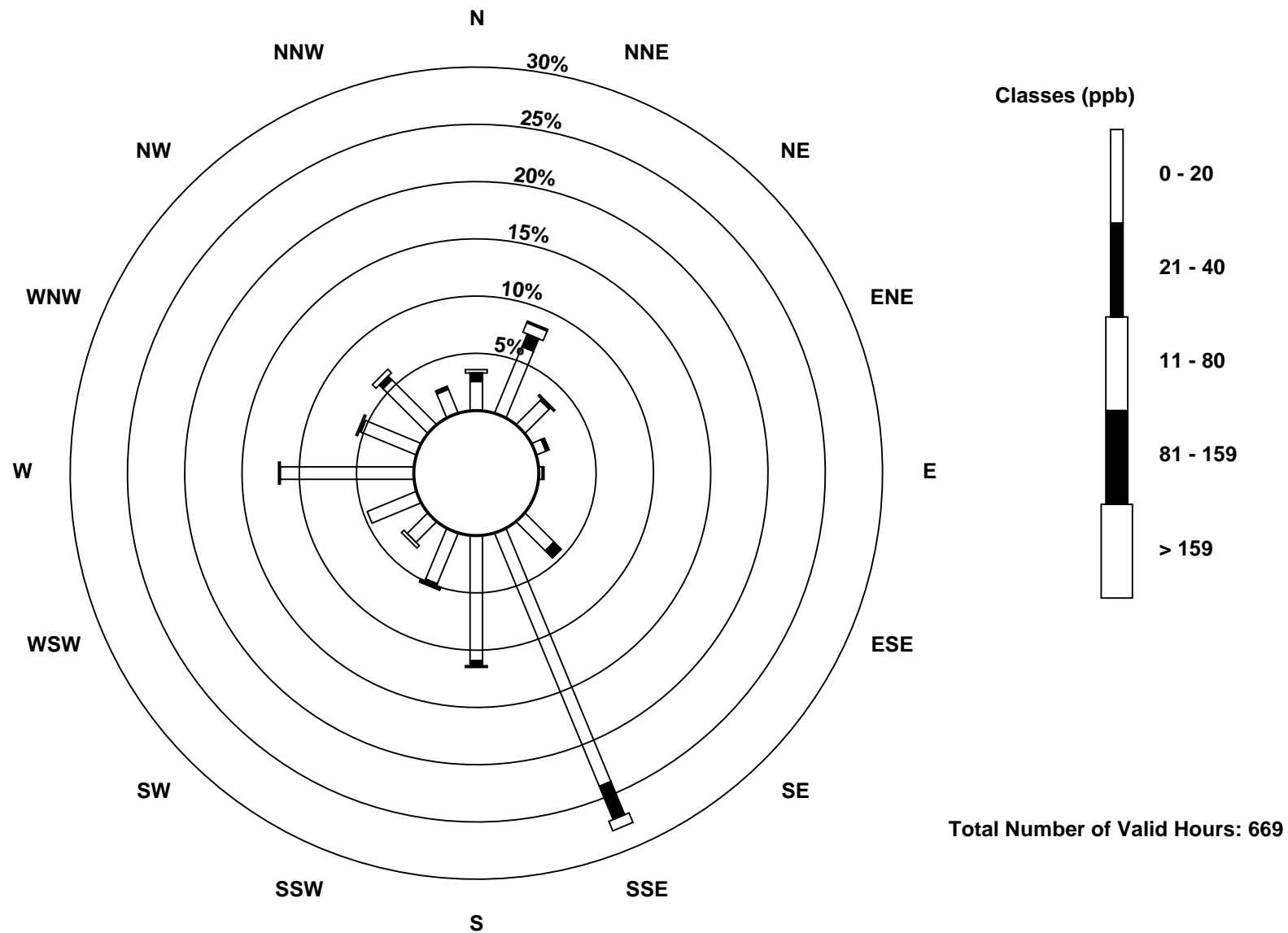
Total Number of Valid Hours: 669

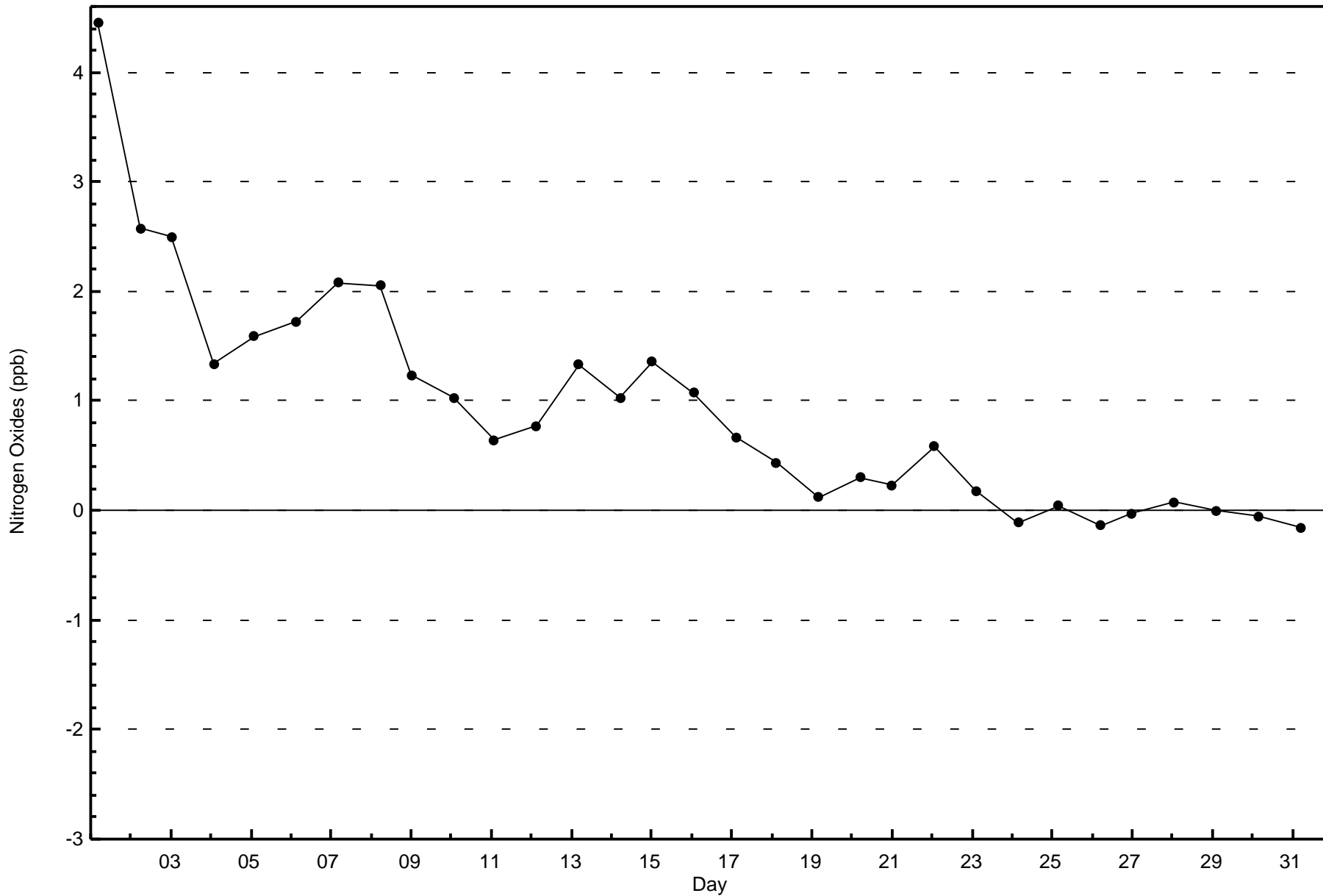
Total Number of Hours: 744

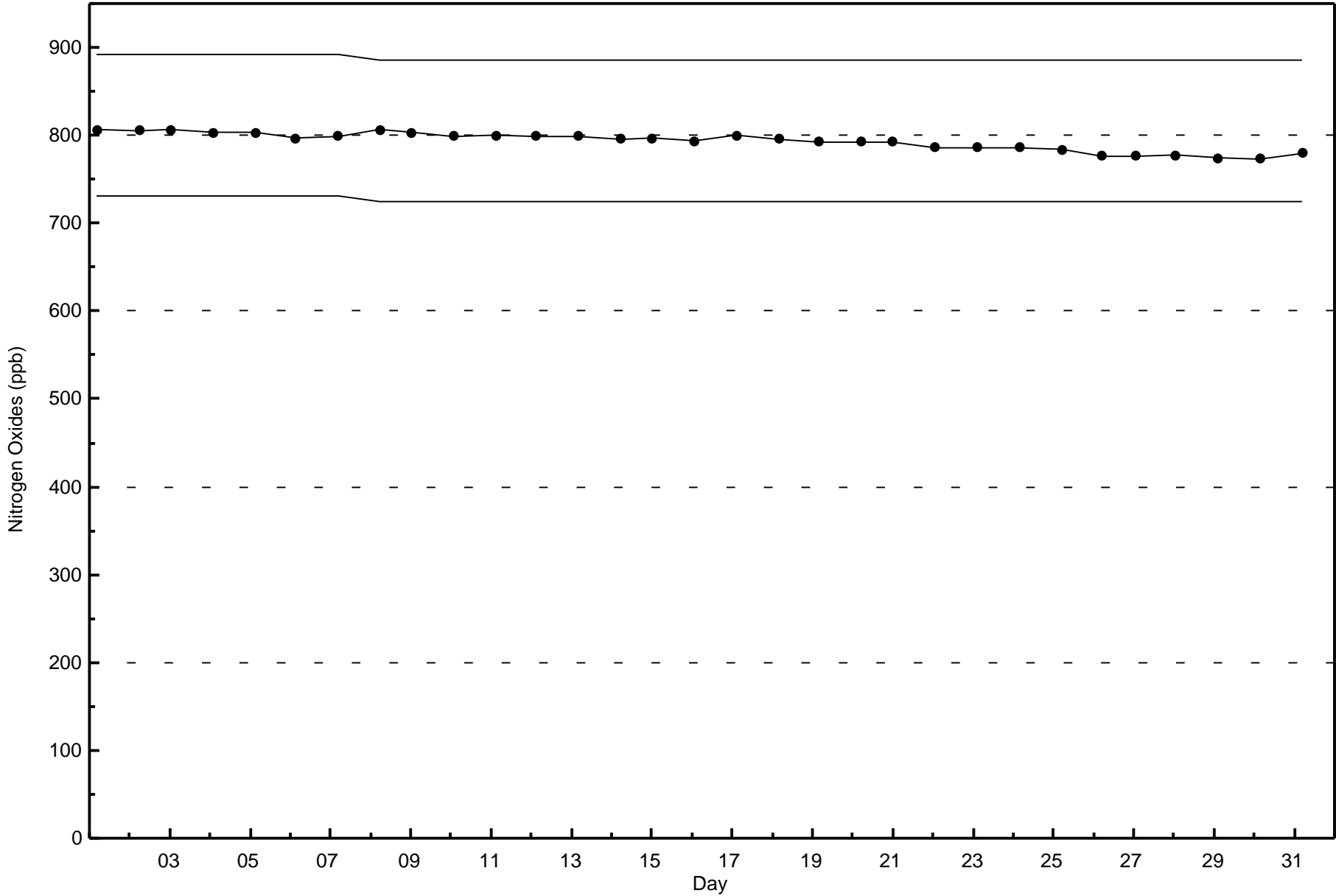


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Buffalo Viewpoint (AMS 4)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

Buffalo Viewpoint - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 42 ppb on Dec 9 17:00	Maximum Daily Average: 39.0 ppb on Dec 9		Hours of Data:	711
Minimum Value: 1 ppb on Dec 23 18:00	Minimum Daily Average: 13.0 ppb on Dec 23		Hours of Missing Data:	33
Maximum Diurnal Average: 25.9 ppb at hour 4	Minimum Diurnal Average: 21.3 ppb at hour 8		Hours of Calibration:	33
Monthly Average: 24.3 ppb	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 10 Q <sub>1</sub> = 18 Median = 25 Q <sub>3</sub> = 33 P <sub>90</sub> = 36 P <sub>99</sub> = 40		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	34	34	35	35	35	35	35	Z	33	33	27	26	25	13	9	9	8	12	13	6	4	4	5	10	20.9	35
2-Dec	14	27	17	19	19	20	15	6	Z	4	8	8	9	8	5	3	2	8	29	29	29	30	32	32	16.3	32
3-Dec	29	27	23	Z	22	18	25	26	8	17	18	25	24	25	25	23	25	22	23	23	23	26	23	19	22.6	29
4-Dec	20	25	25	24	Z	18	15	11	10	9	10	9	10	11	12	19	18	16	17	17	22	24	25	26	17.1	26
5-Dec	25	25	24	24	25	Z	35	23	16	4	6	15	16	17	22	23	23	21	23	28	28	29	28	24	21.9	35
6-Dec	24	23	20	17	13	10	Z	13	17	21	22	28	26	33	36	36	35	34	34	34	33	33	34	34	26.4	36
7-Dec	34	28	29	30	36	36	37	Z	36	37	37	39	39	40	40	38	38	38	36	36	36	36	32	31	35.6	40
8-Dec	27	30	32	33	34	34	31	28	C	C	C	17	23	25	25	26	29	31	31	31	30	34	24	29	28.6	34
9-Dec	31	38	38	Z	38	39	39	39	39	39	40	40	41	41	40	41	42	42	41	40	39	36	36	37	39.0	42
10-Dec	36	36	37	35	Z	33	28	25	25	30	28	31	26	14	13	25	30	30	28	28	26	25	18	14	27.1	37
11-Dec	16	16	14	13	18	Z	25	26	28	29	27	25	21	17	17	19	21	24	22	16	17	25	26	24	21.1	29
12-Dec	25	33	32	33	35	34	Z	34	32	32	33	34	28	29	36	37	22	34	34	29	20	27	30	24	30.7	37
13-Dec	22	21	25	26	26	27	25	Z	35	35	35	29	32	24	24	22	23	32	32	32	34	33	31	32	28.6	35
14-Dec	33	31	26	21	23	23	19	17	Z	14	15	21	21	23	26	25	22	22	20	18	21	20	19	16	21.5	33
15-Dec	17	15	15	Z	19	17	15	14	24	26	29	31	38	40	39	39	34	32	35	35	36	39	39	39	29.1	40
16-Dec	37	27	25	27	Z	29	32	31	31	32	29	26	25	22	25	22	18	16	17	19	19	19	21	23	25.0	37
17-Dec	27	30	30	35	36	Z	36	36	33	37	36	36	36	36	36	36	37	38	38	37	37	37	35	36	35.3	38
18-Dec	34	35	37	36	29	33	Z	32	32	31	25	19	35	33	33	33	37	37	38	40	40	38	36	35	33.8	40
19-Dec	36	35	35	35	34	34	34	Z	22	23	22	23	30	30	23	21	22	20	18	15	11	10	12	13	24.2	36
20-Dec	7	10	15	16	16	17	15	10	Z	14	16	18	22	25	26	27	23	15	12	8	11	10	15	17	15.9	27
21-Dec	17	18	15	Z	11	5	2	12	7	6	13	9	8	21	33	36	36	37	36	36	36	35	29	34	21.4	37
22-Dec	34	34	35	34	Z	35	35	35	36	36	36	36	37	37	37	37	36	36	36	34	35	37	38	37	35.7	38
23-Dec	34	32	33	33	31	Z	18	13	9	12	14	17	9	8	4	3	2	1	1	2	4	6	6	6	13.0	34
24-Dec	27	34	33	32	30	32	Z	27	12	23	21	23	29	32	34	26	15	12	11	9	20	26	7	5	22.6	34
25-Dec	8	23	26	26	27	30	32	Z	21	18	20	25	26	27	27	22	15	16	17	16	18	22	18	18	21.6	32
26-Dec	19	21	20	18	21	21	20	17	Z	15	19	20	24	26	24	26	23	23	21	10	3	5	8	13	18.1	26
27-Dec	9	10	9	Z	13	19	14	13	16	18	19	22	24	24	25	21	21	23	26	29	18	20	12	8	18.0	29
28-Dec	9	16	21	13	Z	2	2	2	2	10	19	22	26	25	21	17	15	14	17	25	26	14	16	3	14.6	26
29-Dec	10	9	7	7	10	Z	16	20	20	19	21	22	24	23	23	23	23	21	20	19	22	22	24	25	18.7	25
30-Dec	24	23	27	26	28	24	Z	22	23	24	22	27	26	25	27	28	28	25	23	17	19	20	23	22	24.0	28
31-Dec	18	22	26	25	24	26	24	Z	20	19	25	30	31	33	32	28	26	26	27	27	30	30	30	29	26.5	33

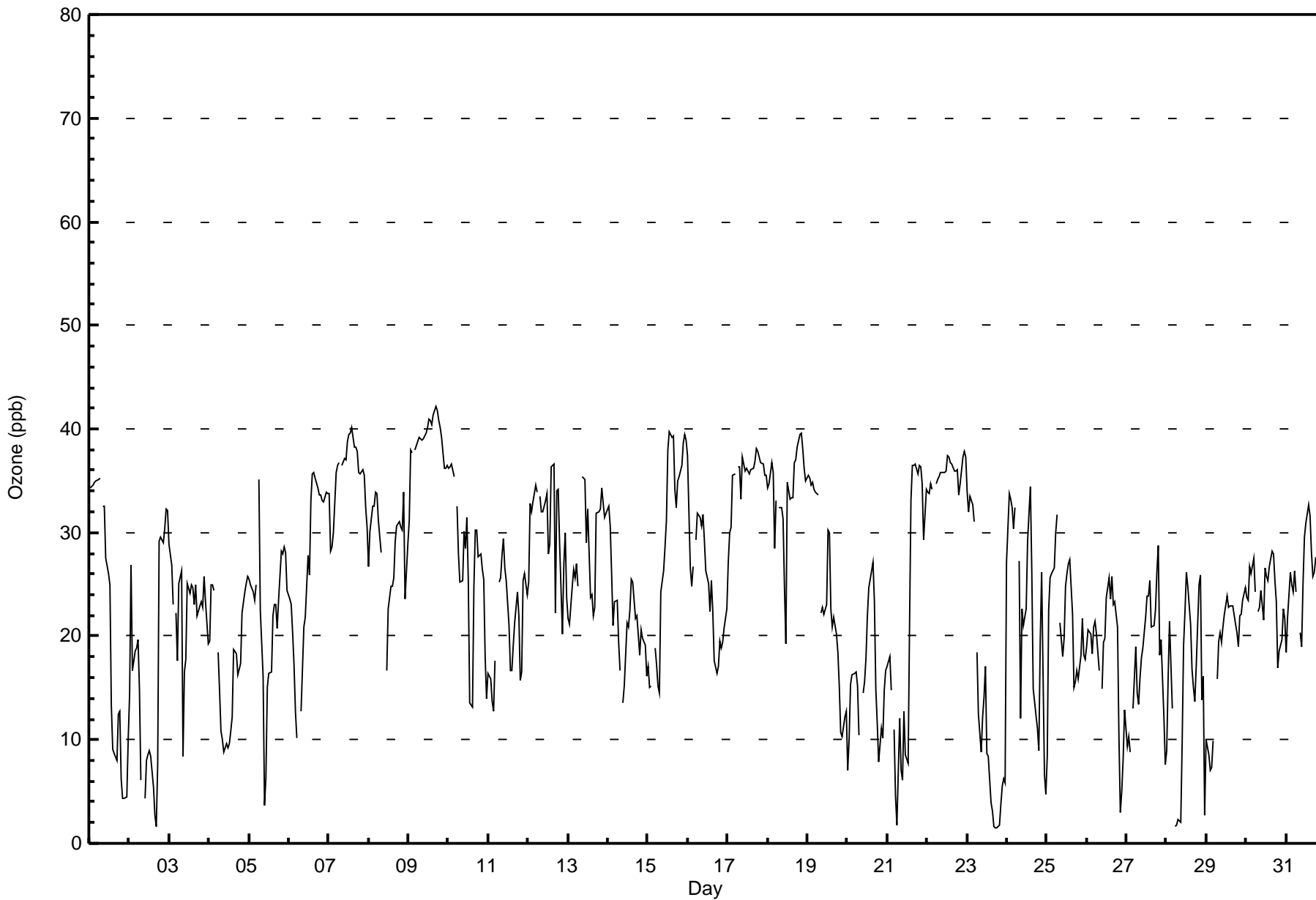
23.8	25.4	25.3	25.9	25.0	25.1	24.0	21.3	22.7	22.3	23.0	24.3	25.5	25.3	25.8	25.5	24.2	24.5	25.1	24.1	24.1	24.9	23.7	22.9	Diurnal Average	
37	38	38	36	38	39	39	39	39	39	40	40	41	41	40	41	42	42	41	40	40	39	39	39	Diurnal Maximum	

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Buffalo Viewpoint - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	232	32.63	32.63
21 - 50	479	67.37	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 711

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Buffalo Viewpoint - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	10	18	6	2	1	0	13	108	29	6	4	1	2	3	5	9	217
21 - 50	15	37	17	6	2	0	19	75	51	27	17	29	78	38	38	8	457
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
<b>Totals</b>	25	55	23	8	3	0	32	183	80	33	21	30	80	41	43	17	674

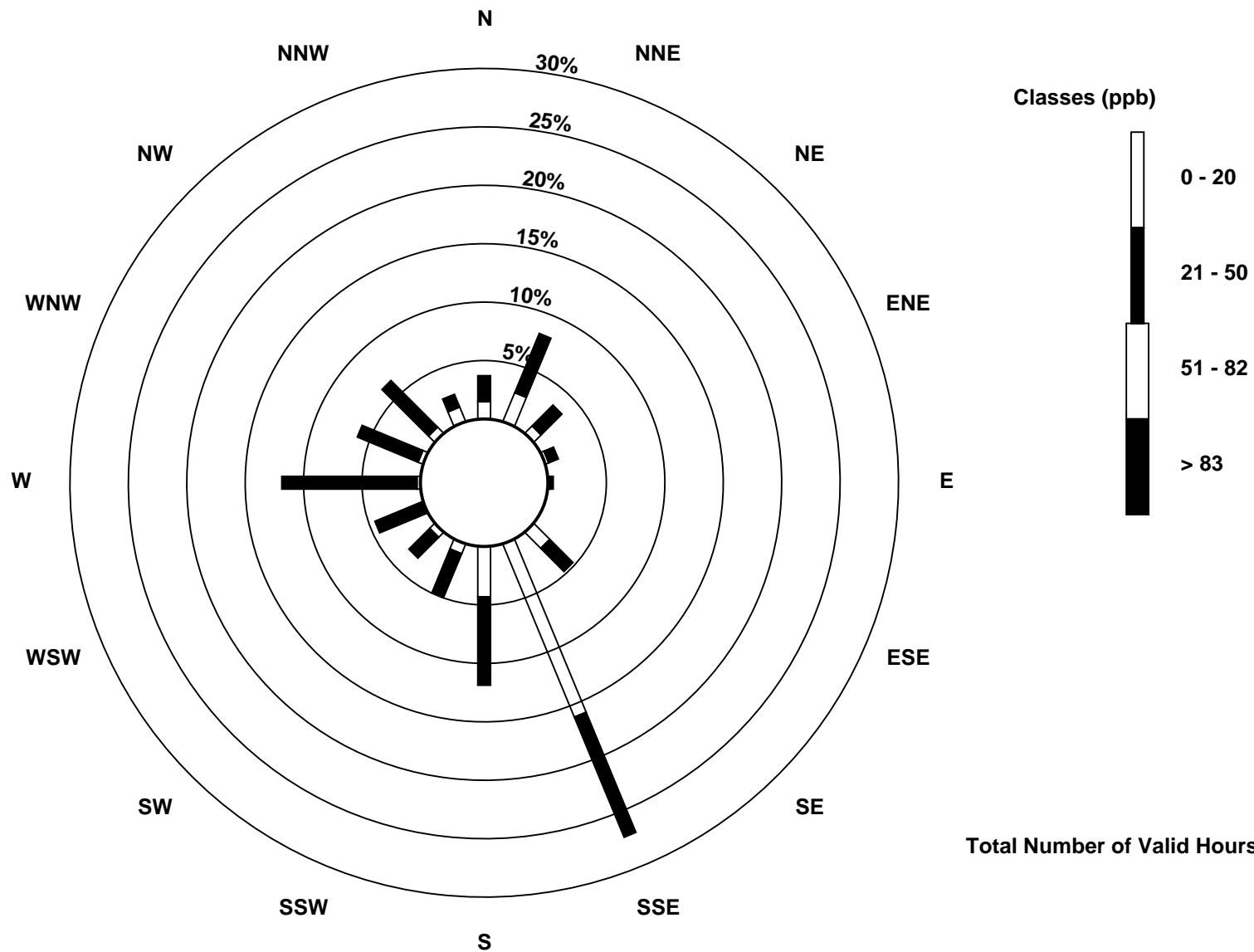
Total Number of Valid Hours: 674

Total Number of Hours: 744

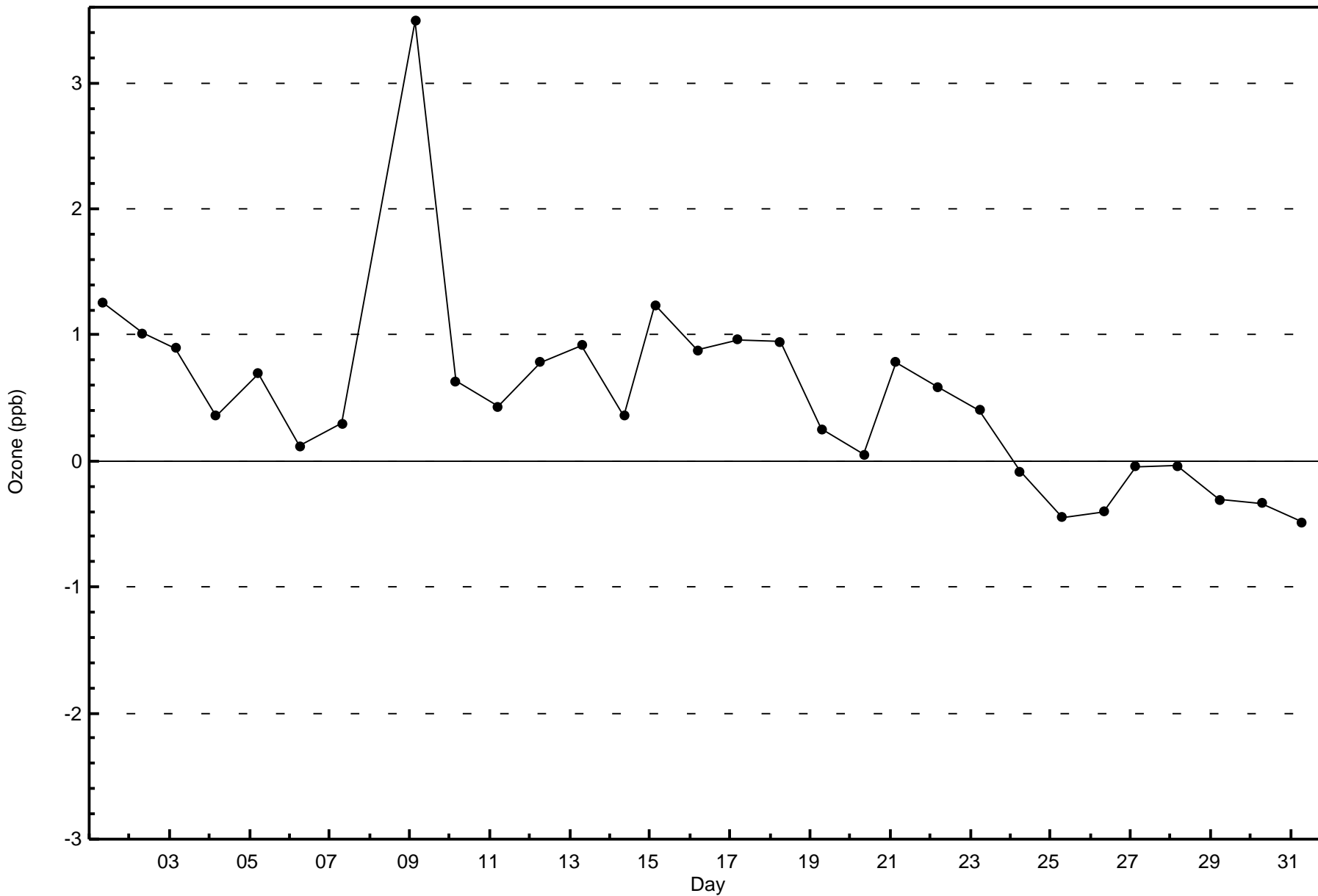


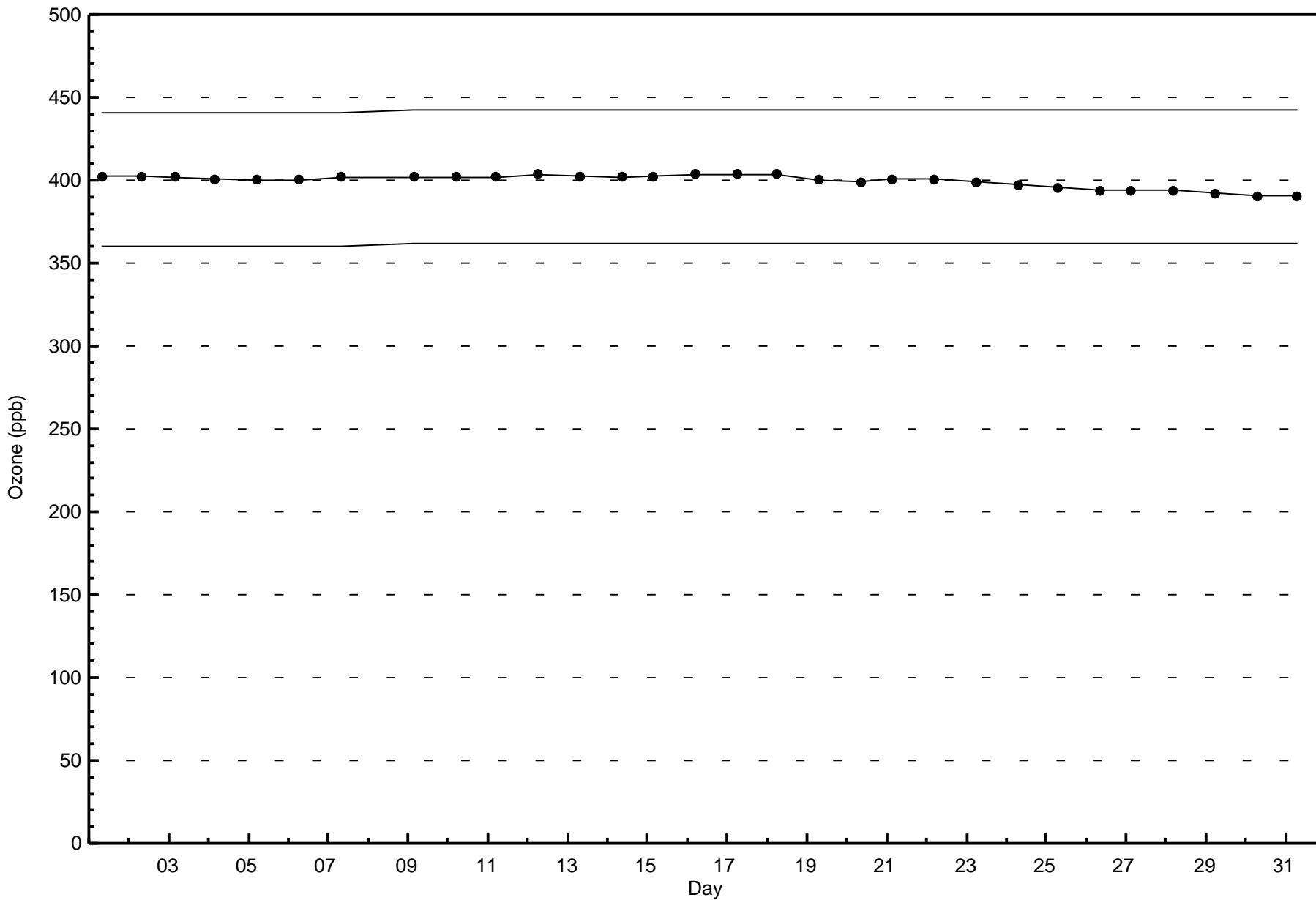
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 674





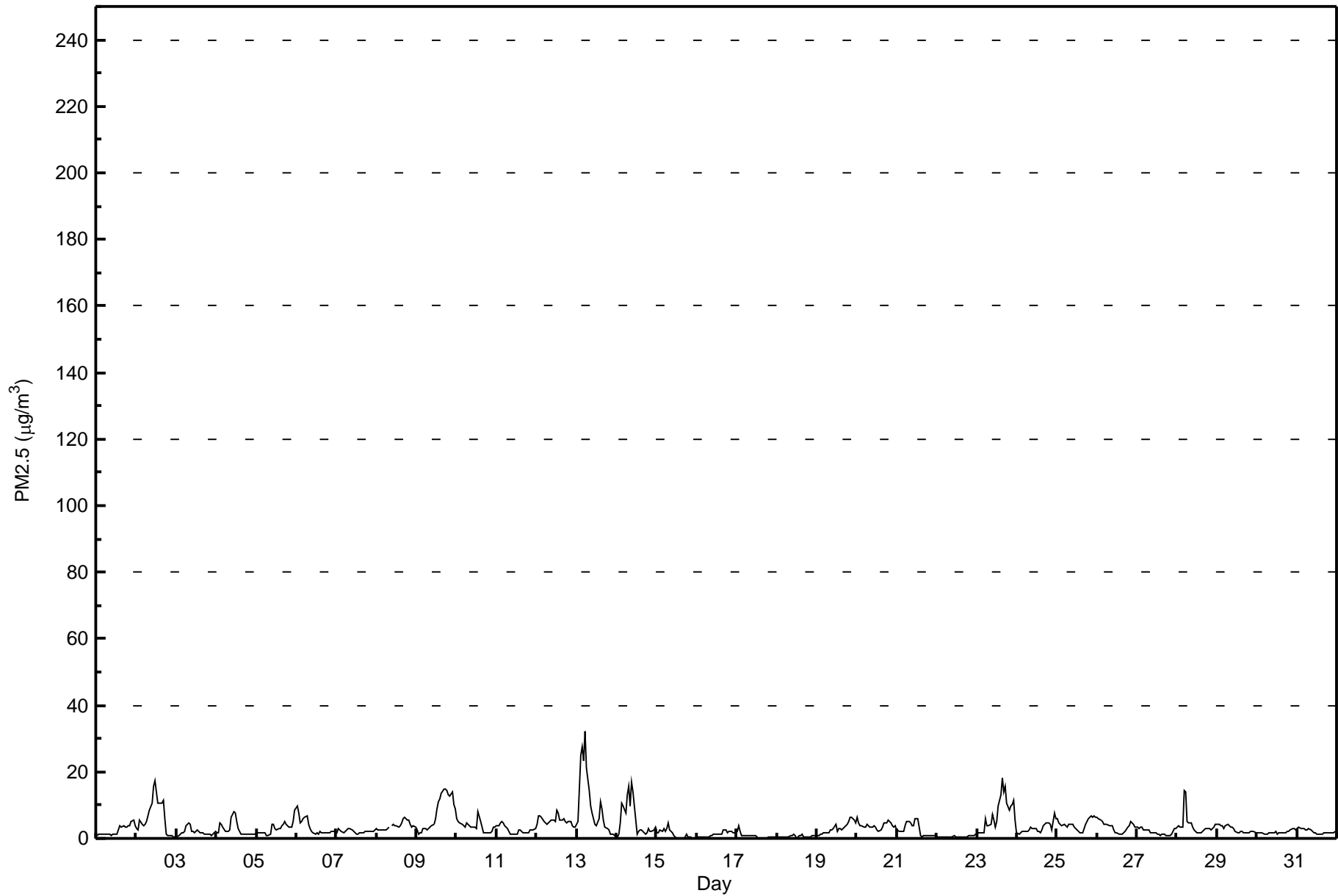


Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																														
Maximum Value: 32.2 µg/m <sup>3</sup> on Dec 13 06:00		Maximum Daily Average: 9.5 µg/m <sup>3</sup> on Dec 13																																														
Minimum Value: 0.0 µg/m <sup>3</sup> on Dec 15 15:00		Hours of Data: 743																																														
Maximum Diurnal Average: 4.2 µg/m <sup>3</sup> at hour 6		Hours of Missing Data: 1																																														
Monthly Average: 3.39 µg/m <sup>3</sup>		Hours of Calibration: 1																																														
Minimum Daily Average: 0.5 µg/m <sup>3</sup> on Dec 22		Percent Operational Time: 100.0																																														
Minimum Diurnal Average: 2.9 µg/m <sup>3</sup> at hour 1		Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.7 Q <sub>1</sub> = 1.4 Median = 2.5 Q <sub>3</sub> = 4.1 P <sub>90</sub> = 6.1 P <sub>99</sub> = 16.9																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	1.0	1.1	1.2	1.2	1.2	1.2	1.1	1.1	1.2	1.0	1.2	1.3	1.2	2.4	3.6	3.5	3.8	3.2	3.6	3.7	3.8	5.3	5.3	4.0	2.4	5.3																						
2-Dec	3.1	2.5	5.6	4.1	3.6	4.2	5.0	6.8	8.6	10.7	15.9	17.4	13.8	10.7	10.4	10.7	11.6	6.0	1.3	1.0	0.9	0.8	0.6	0.6	6.5	17.4																						
3-Dec	0.6	0.9	1.2	1.5	1.9	2.2	3.9	4.8	4.3	2.3	2.2	1.8	2.5	2.1	1.8	1.6	1.5	1.3	1.1	1.1	1.1	1.1	1.1	2.0	1.9	4.8																						
4-Dec	1.5	1.6	4.6	4.3	3.5	2.2	2.0	2.1	2.4	6.5	7.9	7.6	5.2	3.1	2.3	1.4	1.3	1.3	1.3	1.4	1.2	1.1	1.2	1.4	2.8	7.9																						
5-Dec	1.8	1.9	1.7	1.9	1.9	1.6	0.9	0.9	1.4	4.2	4.2	3.0	2.7	3.1	3.1	3.7	4.3	5.0	4.2	3.5	3.4	3.5	4.9	8.4	3.1	8.4																						
6-Dec	9.8	7.5	4.9	5.1	5.8	6.5	6.6	4.4	3.1	2.1	1.5	1.3	1.5	1.3	2.0	1.7	1.6	1.8	1.6	1.6	1.7	2.2	2.1	2.1	3.3	9.8																						
7-Dec	1.8	2.8	2.4	2.2	1.9	2.1	2.7	3.1	3.1	2.5	2.1	1.9	1.3	1.5	1.7	1.6	1.9	2.0	1.9	2.2	2.1	2.0	2.2	2.5	2.1	3.1																						
8-Dec	2.8	2.7	2.7	2.6	2.3	2.4	2.5	3.4	C	3.7	4.1	3.9	3.8	3.6	3.8	4.5	6.1	6.2	5.7	5.3	4.1	3.3	3.6	3.5	3.8	6.2																						
9-Dec	2.4	1.4	1.6	1.8	2.9	3.1	2.6	2.8	3.3	3.7	4.1	5.7	8.7	10.8	12.0	13.6	14.7	15.0	14.4	13.3	12.6	13.8	10.3	8.9	7.7	15.0																						
10-Dec	6.1	5.0	4.6	4.2	3.8	3.5	4.5	4.3	3.6	3.4	3.3	3.2	3.0	8.1	5.2	3.6	1.9	1.5	1.7	1.8	1.7	1.9	3.3	3.4	3.6	8.1																						
11-Dec	3.7	3.9	4.6	5.2	4.5	3.8	2.8	2.2	1.2	1.1	1.3	1.3	1.5	2.4	2.6	2.1	1.7	1.5	1.8	1.9	2.5	2.7	2.7	3.0	2.6	5.2																						
12-Dec	4.2	7.0	6.6	6.5	5.0	4.8	4.3	4.7	5.1	5.5	5.6	4.9	8.4	7.5	5.7	5.6	5.8	5.0	4.8	4.9	5.0	3.9	3.2	3.5	5.3	8.4																						
13-Dec	4.3	5.2	24.8	27.4	23.5	32.2	21.1	14.4	9.6	7.8	5.8	4.1	3.8	6.1	11.1	9.1	5.6	3.5	3.1	2.3	1.4	1.2	1.2	0.8	9.5	32.2																						
14-Dec	0.6	1.2	4.5	10.5	9.7	7.6	13.1	15.5	9.7	17.1	14.0	5.5	1.4	2.2	2.4	2.7	1.8	1.2	1.7	3.1	2.0	2.2	2.5	3.3	5.6	17.1																						
15-Dec	1.6	1.8	2.3	2.2	3.1	1.9	3.0	4.6	2.7	1.5	0.9	0.6	0.2	0.0	0.0	0.0	0.1	0.4	1.4	0.5	0.3	0.1	0.1	0.1	1.2	4.6																						
16-Dec	0.5	0.6	0.5	0.6	0.5	0.4	0.4	0.4	0.7	0.7	1.2	1.1	1.2	1.3	1.2	1.2	2.5	2.4	1.9	2.1	2.2	2.0	1.7	1.5	1.2	2.5																						
17-Dec	2.2	4.0	2.0	0.8	0.8	0.8	0.7	0.7	0.9	0.7	0.7	0.7	0.3	0.1	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.3	0.3	0.7	4.0																						
18-Dec	0.3	0.3	0.3	0.6	0.6	0.4	0.3	0.4	0.7	0.7	1.2	0.9	0.2	0.8	0.7	1.1	0.6	0.5	0.5	0.5	0.5	0.7	0.8	0.8	0.6	1.2																						
19-Dec	0.9	1.1	1.1	1.5	1.6	1.7	1.7	1.7	2.5	2.5	3.0	4.1	2.3	3.0	3.1	2.7	2.8	3.6	4.2	5.1	6.4	6.2	5.7	4.8	3.0	6.4																						
20-Dec	6.5	4.8	4.0	3.7	3.5	3.4	4.2	4.0	3.5	3.3	3.6	3.4	2.6	2.1	2.6	3.4	4.8	4.7	4.8	5.3	4.6	3.9	3.5	3.7	3.9	6.5																						
21-Dec	2.7	2.1	2.3	2.0	2.1	3.7	5.0	5.0	4.8	3.9	3.9	6.1	6.0	3.6	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	2.5	6.1																						
22-Dec	0.4	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.9	0.6	0.9	1.0	1.2	0.5	1.2																						
23-Dec	1.3	1.6	1.5	1.6	1.9	5.9	3.7	3.9	4.4	7.2	5.6	3.5	5.1	9.7	13.2	18.0	14.1	15.8	10.7	8.6	9.9	10.3	11.5	5.7	7.3	18.0																						
24-Dec	1.8	1.4	1.6	2.0	2.3	2.2	2.2	2.4	3.3	3.1	3.0	3.1	2.3	2.2	1.6	2.7	3.7	4.6	4.5	4.5	4.2	2.7	7.6	5.9	3.1	7.6																						
25-Dec	6.1	4.6	4.1	3.9	4.4	4.0	3.5	4.3	4.1	4.0	3.5	3.1	2.6	2.2	1.8	1.9	3.0	4.3	5.1	6.1	6.8	6.4	6.8	6.3	4.3	6.8																						
26-Dec	6.3	6.1	5.4	5.1	4.1	4.3	4.1	3.7	3.7	3.8	2.6	1.8	1.6	1.2	1.3	1.3	1.6	2.0	3.6	4.0	4.9	4.5	4.1	3.3	3.5	6.3																						
27-Dec	3.5	3.1	3.4	3.2	2.6	2.4	2.6	2.5	1.8	1.8	1.5	1.5	1.4	1.1	0.9	1.1	1.1	1.0	0.9	0.8	1.0	1.5	2.9	3.1	1.9	3.5																						
28-Dec	3.3	3.7	3.3	3.5	14.2	14.0	5.2	4.5	4.9	3.5	2.7	2.3	1.8	1.7	1.9	2.2	2.7	3.1	3.1	3.1	2.4	2.9	3.2	4.4	4.1	14.2																						
29-Dec	4.0	4.3	3.8	3.7	3.1	3.8	4.1	3.9	3.6	3.4	3.1	2.2	1.6	1.5	1.9	2.3	1.8	1.7	1.9	1.7	2.1	2.0	2.0	1.8	2.7	4.3																						
30-Dec	1.7	1.6	1.5	1.5	1.4	1.4	1.5	1.6	1.7	1.6	1.9	2.0	1.5	1.6	1.9	1.8	1.8	1.7	2.0	2.2	2.7	2.8	2.8	2.6	1.9	2.8																						
31-Dec	3.1	3.3	3.0	3.0	2.8	2.5	2.7	2.8	2.6	2.1	1.8	1.7	1.4	1.3	1.2	1.5	1.7	1.7	1.6	1.8	1.9	1.6	1.7	2.3	2.1	3.3																						
																								2.9	2.9	3.6	3.8	3.9	4.2	3.8	3.8	3.4	3.7	3.7	3.3	2.9	3.2	3.3	3.5	3.4	3.3	3.1	3.1	3.1	3.0	3.3	3.1	Diurnal Average
																								9.8	7.5	24.8	27.4	23.5	32.2	21.1	15.5	9.7	17.1	15.9	17.4	13.8	10.8	13.2	18.0	14.7	15.8	14.4	13.3	12.6	13.8	11.5	8.9	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**PM2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Buffalo Viewpoint - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**PM<sub>2.5</sub> (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	527	70.93	70.93
6 - 15	91	12.25	83.18
16 - 25	9	1.21	84.39
26 - 80	2	0.27	84.66
> 81.0	0	0.00	84.66

Total Number of Valid Hours: 743

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**PM2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Buffalo Viewpoint - December 2017**

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	20	36	17	5	1	0	31	158	76	23	13	20	40	20	17	12	489
6 - 15	5	8	2	1	1	0	0	29	7	4	2	7	12	7	2	4	91
16 - 25	0	1	0	0	0	0	0	3	0	3	1	0	0	0	0	0	8
26 - 80	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	25	45	19	6	2	0	31	190	83	31	16	28	52	27	19	16	590

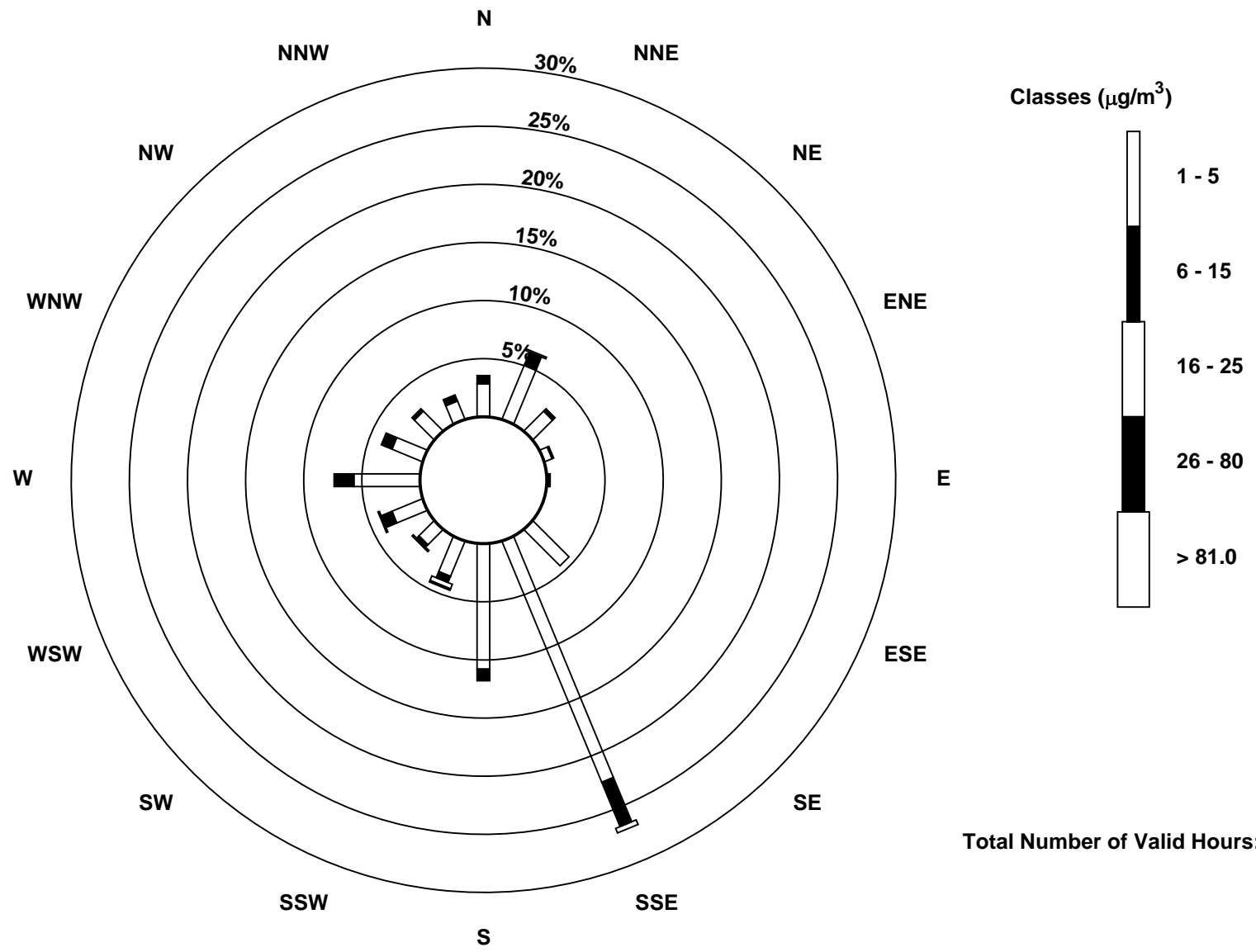
Total Number of Valid Hours: 704

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

PM2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Buffalo Viewpoint (AMS 4)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

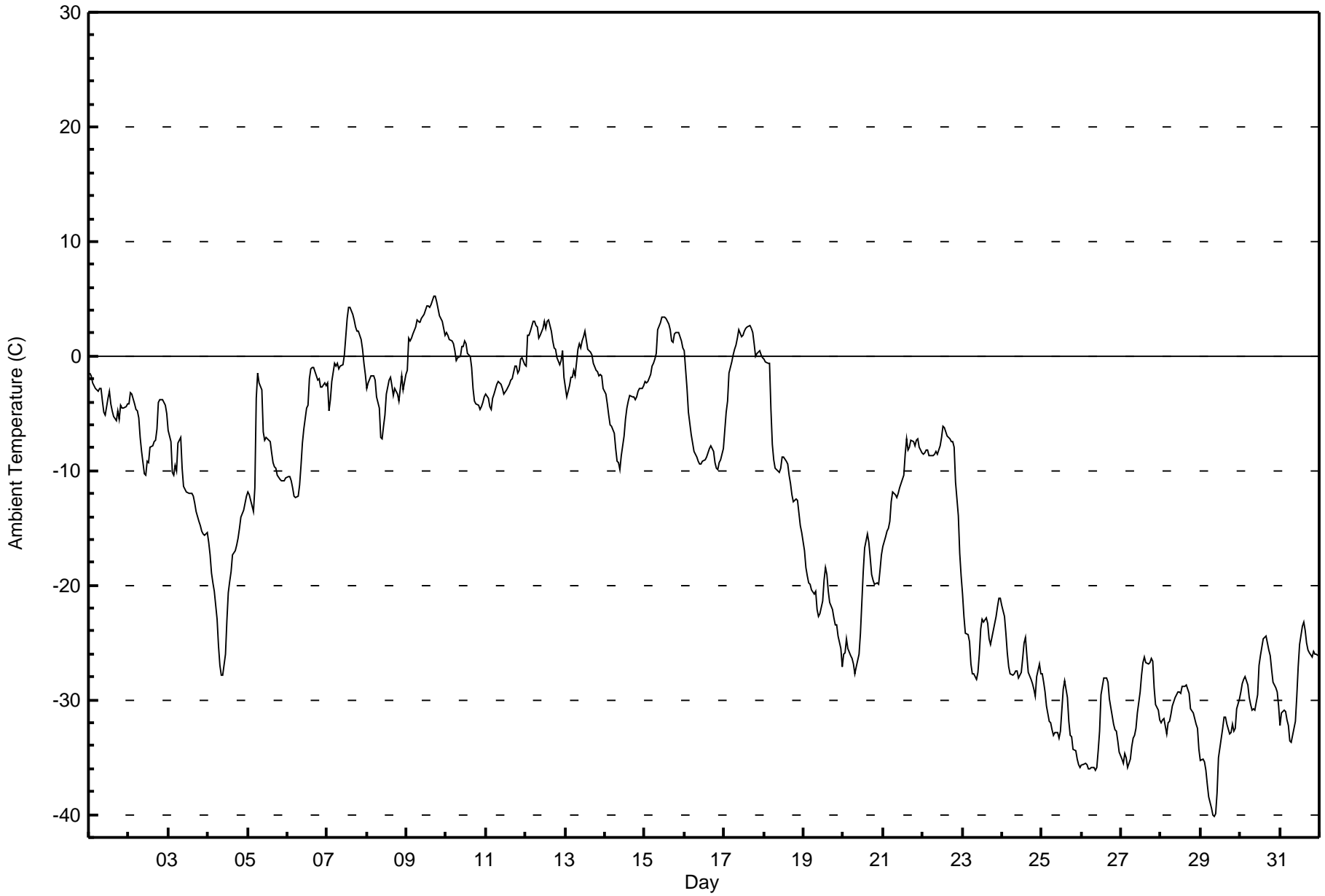
**Ambient Temperature (AT) - C**  
**Buffalo Viewpoint - December 2017**

Maximum Value: 5.2 C on Dec 9 18:00		Maximum Daily Average: 3.1 C on Dec 9		Hours in Service: 744																						
Minimum Value: -40.2 C on Dec 29 09:00		Minimum Daily Average: -34.8 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -11.2 C at hour 15		Minimum Diurnal Average: -14.7 C at hour 10		Hours of Missing Data: 0																						
Monthly Average: -13.25 C		Percentiles: P <sub>1</sub> = -36.2 P <sub>10</sub> = -31.9 Q <sub>1</sub> = -26.0 Median = -9.3 Q <sub>3</sub> = -2.4 P <sub>90</sub> = 1.3 P <sub>99</sub> = 4.2		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-1.5	-1.7	-2.4	-2.5	-2.9	-3.1	-2.8	-2.8	-3.9	-4.9	-5.1	-3.7	-3.1	-4.2	-4.8	-5.2	-5.6	-4.8	-5.5	-4.3	-4.5	-4.5	-4.4	-4.2	-3.9	-1.5
2-Dec	-4.2	-3.1	-3.4	-4.2	-4.7	-4.7	-5.4	-7.1	-8.3	-10.3	-10.5	-9.2	-9.3	-8.0	-7.9	-7.4	-7.3	-6.4	-4.0	-3.8	-3.8	-4.0	-4.3	-5.1	-6.1	-3.1
3-Dec	-6.4	-7.5	-10.1	-10.4	-9.5	-10.1	-7.6	-7.1	-9.8	-11.4	-11.6	-11.8	-12.0	-12.0	-12.0	-12.2	-12.8	-13.6	-14.4	-14.7	-15.2	-15.5	-15.6	-15.4	-11.6	-6.4
4-Dec	-16.3	-17.4	-18.9	-19.9	-20.5	-22.9	-25.2	-27.0	-27.8	-27.9	-26.0	-23.0	-20.6	-19.6	-18.9	-17.4	-17.0	-16.5	-15.8	-15.0	-14.1	-13.4	-12.8	-12.2	-19.4	-12.2
5-Dec	-11.8	-12.1	-13.1	-13.5	-11.5	-3.7	-1.5	-2.4	-2.9	-6.6	-7.3	-7.1	-7.2	-7.5	-8.4	-9.3	-9.6	-9.8	-10.4	-10.7	-10.9	-10.9	-10.9	-10.7	-8.7	-1.5
6-Dec	-10.5	-10.5	-10.9	-11.4	-12.2	-12.4	-12.3	-11.3	-9.5	-7.6	-6.3	-4.6	-4.3	-1.9	-1.2	-0.9	-1.0	-1.7	-2.0	-2.0	-2.7	-2.7	-2.4	-2.6	-6.0	-0.9
7-Dec	-2.3	-4.8	-3.8	-2.2	-0.6	-0.9	-0.6	-1.1	-0.9	-0.8	0.1	1.6	3.2	4.3	4.3	3.6	3.2	2.5	2.1	2.2	1.5	0.6	-0.6	-1.6	0.4	4.3
8-Dec	-2.8	-2.3	-1.7	-1.8	-1.7	-2.1	-3.6	-4.6	-7.1	-7.3	-6.2	-5.1	-3.4	-2.1	-1.8	-2.6	-3.4	-2.8	-3.3	-3.9	-2.8	-1.7	-3.0	-1.7	-3.3	-1.7
9-Dec	-1.3	1.6	1.4	1.6	1.9	2.6	3.1	3.1	2.9	3.2	3.6	4.0	4.4	4.4	4.2	4.5	5.2	5.2	4.7	4.1	3.6	3.0	2.5	1.8	3.1	5.2
10-Dec	2.1	1.8	1.4	1.3	1.1	0.5	-0.4	-0.2	0.0	0.8	0.8	1.3	1.1	0.2	-0.1	-1.0	-2.9	-3.9	-4.1	-4.3	-4.6	-4.4	-4.0	-3.5	-0.9	2.1
11-Dec	-3.3	-3.7	-4.4	-4.7	-3.7	-3.4	-2.5	-2.2	-2.3	-2.5	-2.9	-3.3	-3.0	-2.7	-2.4	-2.0	-1.9	-0.9	-0.9	-1.5	-1.3	-0.2	-0.1	-0.7	-2.4	-0.1
12-Dec	-0.9	1.8	1.8	2.2	3.0	3.1	2.7	2.5	1.5	1.9	2.4	3.0	2.4	3.1	3.2	2.1	1.3	0.7	0.6	-0.1	-0.8	-0.4	0.5	-1.8	1.5	3.2
13-Dec	-2.7	-3.6	-2.6	-1.8	-1.9	-1.3	-1.8	0.6	1.1	0.7	1.3	1.7	2.1	0.5	0.5	0.3	0.1	-0.6	-1.2	-1.3	-1.8	-1.5	-1.7	-2.8	-0.7	2.1
14-Dec	-3.3	-4.2	-5.2	-6.0	-6.1	-6.8	-8.1	-9.2	-9.3	-9.9	-8.6	-7.0	-5.5	-4.5	-3.9	-3.4	-3.6	-3.6	-3.7	-3.6	-3.1	-2.8	-2.8	-2.6	-5.3	-2.6
15-Dec	-2.3	-2.4	-2.3	-1.6	-0.9	-0.6	-0.3	0.2	2.3	2.9	3.4	3.4	3.5	3.2	2.8	2.3	1.3	1.2	1.9	2.0	2.0	1.7	1.4	0.8	1.1	3.5
16-Dec	0.5	-2.8	-4.9	-5.8	-6.9	-7.6	-8.3	-8.8	-9.2	-9.4	-9.4	-9.2	-9.0	-8.8	-8.4	-8.1	-7.9	-8.4	-9.3	-9.8	-9.9	-9.3	-9.1	-8.1	-7.8	0.5
17-Dec	-6.5	-4.8	-3.9	-1.5	-0.5	0.2	0.6	1.0	1.6	2.3	1.7	1.8	2.2	2.4	2.5	2.7	2.5	2.1	1.0	-0.1	0.2	0.5	0.1	-0.2	0.3	2.7
18-Dec	-0.3	-0.5	-0.6	-0.6	-4.6	-7.8	-9.1	-9.7	-10.0	-10.1	-9.7	-8.8	-8.8	-9.1	-9.4	-10.5	-11.1	-12.1	-12.7	-12.4	-12.5	-13.6	-14.8	-15.4	-8.9	-0.3
19-Dec	-17.0	-18.4	-19.2	-19.7	-19.9	-20.4	-20.7	-20.5	-22.1	-22.7	-22.5	-21.4	-19.5	-18.5	-19.0	-20.6	-21.5	-22.2	-22.8	-23.4	-23.5	-24.4	-25.6	-27.1	-21.4	-17.0
20-Dec	-26.0	-25.9	-24.6	-25.6	-26.2	-26.4	-26.9	-27.7	-27.1	-26.0	-24.1	-21.5	-18.8	-16.7	-15.5	-16.3	-17.5	-19.1	-19.6	-19.9	-19.8	-19.9	-18.7	-17.3	-22.0	-15.5
21-Dec	-16.7	-15.7	-15.2	-15.0	-14.4	-12.7	-11.9	-12.1	-12.4	-12.0	-11.4	-11.1	-10.3	-8.5	-7.2	-8.2	-7.9	-7.3	-7.5	-7.8	-7.3	-7.2	-7.9	-8.4	-10.7	-7.2
22-Dec	-8.5	-8.5	-8.2	-8.3	-8.7	-8.7	-8.7	-8.6	-8.3	-8.5	-7.9	-7.1	-6.1	-6.2	-6.6	-6.9	-7.3	-7.4	-7.4	-8.0	-11.0	-13.9	-17.2	-19.2	-9.1	-6.1
23-Dec	-20.7	-22.8	-24.2	-24.3	-24.9	-26.8	-27.7	-27.8	-28.2	-27.6	-26.0	-23.8	-23.0	-23.2	-22.9	-23.4	-24.7	-25.2	-24.6	-23.3	-22.7	-21.8	-21.1	-21.1	-24.2	-20.7
24-Dec	-21.7	-22.7	-24.2	-25.9	-27.2	-27.7	-27.9	-27.8	-27.5	-27.4	-28.1	-27.6	-26.4	-25.1	-24.6	-26.1	-27.6	-28.2	-28.5	-29.0	-29.7	-28.0	-26.9	-27.7	-26.8	-21.7
25-Dec	-27.8	-28.5	-29.4	-30.5	-31.8	-32.0	-32.6	-33.2	-32.9	-32.8	-33.3	-32.7	-30.9	-29.0	-28.3	-29.8	-31.8	-33.1	-33.2	-34.3	-34.5	-35.1	-35.7	-35.9	-32.1	-27.8
26-Dec	-35.6	-35.6	-35.5	-35.6	-36.0	-36.0	-35.9	-35.9	-36.2	-35.9	-34.4	-32.7	-29.5	-28.1	-28.1	-28.1	-28.4	-29.9	-31.4	-32.2	-32.6	-32.7	-33.5	-34.5	-33.1	-28.1
27-Dec	-35.1	-35.5	-34.7	-35.0	-35.8	-35.1	-34.0	-33.3	-33.1	-32.5	-31.2	-29.4	-27.8	-26.8	-26.3	-26.8	-26.8	-26.7	-26.4	-26.6	-29.0	-30.4	-30.9	-31.7	-30.9	-26.3
28-Dec	-32.0	-31.8	-31.7	-33.0	-32.0	-31.9	-31.3	-30.5	-29.7	-29.5	-29.3	-29.4	-29.4	-28.8	-28.9	-28.7	-29.1	-29.4	-30.8	-31.2	-31.6	-32.1	-32.5	-34.3	-30.8	-28.7
29-Dec	-35.3	-35.2	-35.4	-36.1	-37.4	-38.4	-39.4	-40.0	-40.2	-39.9	-38.1	-35.1	-33.3	-32.5	-31.5	-31.5	-32.1	-32.9	-32.8	-32.2	-32.7	-32.5	-30.7	-29.9	-34.8	-29.9
30-Dec	-29.3	-28.6	-28.2	-28.0	-28.7	-29.8	-30.5	-30.8	-30.8	-30.8	-29.5	-27.0	-26.2	-25.5	-24.7	-24.5	-25.0	-25.6	-26.2	-27.3	-28.5	-28.9	-29.3	-30.5	-28.1	-24.5
31-Dec	-32.2	-31.2	-30.9	-31.0	-31.7	-32.2	-33.5	-33.7	-32.4	-31.9	-29.7	-27.1	-25.2	-23.6	-23.2	-23.9	-25.0	-25.7	-25.9	-26.2	-25.8	-26.0	-26.0	-26.1	-28.3	-23.2
	-13.3	-13.4	-13.7	-13.9	-14.1	-14.2	-14.3	-14.4	-14.6	-14.7	-14.1	-13.0	-12.1	-11.4	-11.2	-11.6	-12.1	-12.4	-12.7	-12.9	-13.2	-13.3	-13.5	-13.9	Diurnal Average	
	2.1	1.8	1.8	2.2	3.0	3.1	3.1	3.1	2.9	3.2	3.6	4.0	4.4	4.4	4.3	4.5	5.2	5.2	4.7	4.1	3.6	3.0	2.5	1.8	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Buffalo Viewpoint - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Buffalo Viewpoint - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	253	34.01	34.01
-20 - 0	381	51.21	85.22
0 - 10	110	14.78	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

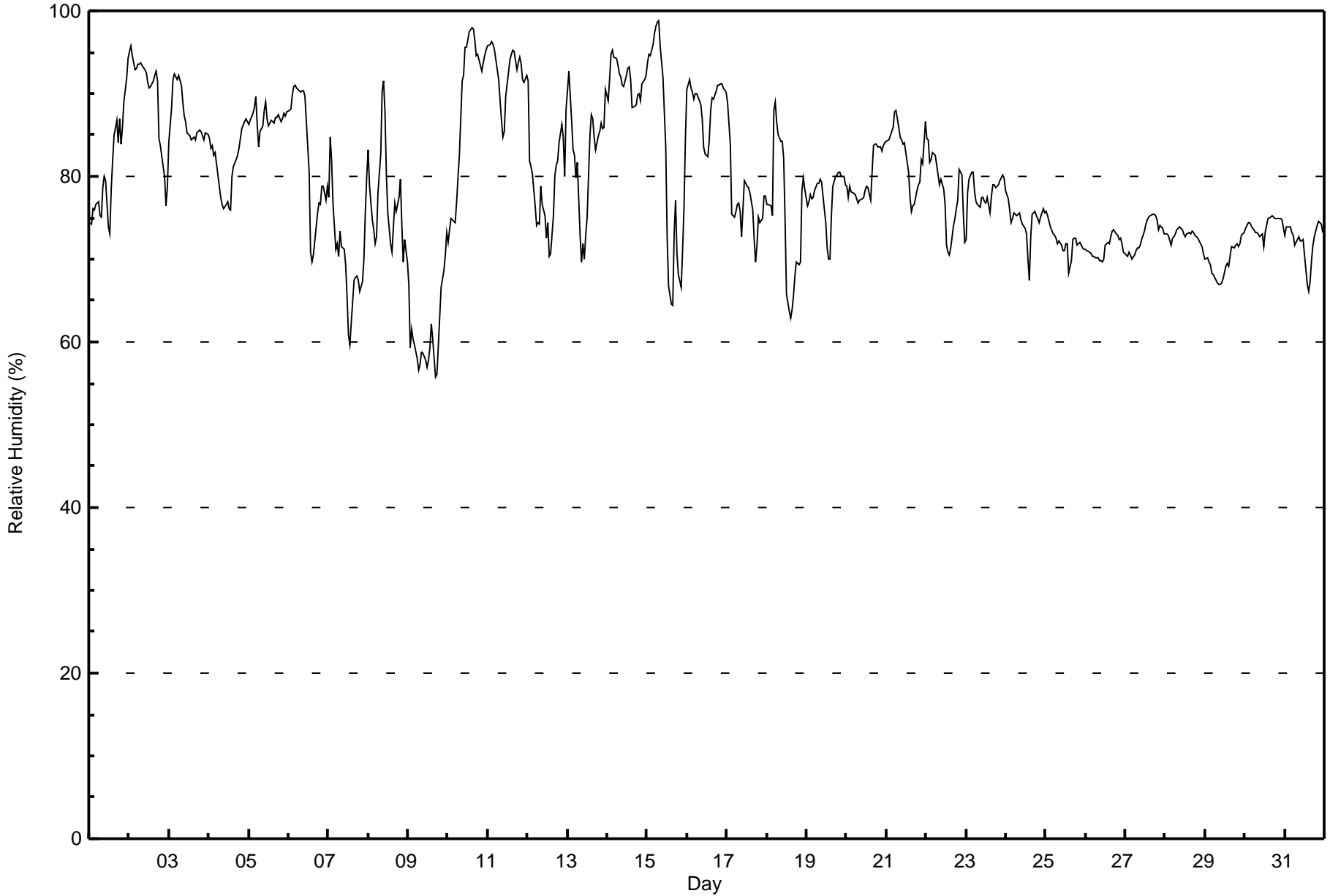
**Buffalo Viewpoint - December 2017**

Maximum Value: 99 % on Dec 15 08:00																			Maximum Daily Average: 92.6 % on Dec 11						Hours in Service: 744																				
Minimum Value: 56 % on Dec 9 17:00																			Minimum Daily Average: 61.0 % on Dec 9						Hours of Data: 744																				
Maximum Diurnal Average: 81.0 % at hour 2																			Minimum Diurnal Average: 76.2 % at hour 14						Hours of Missing Data: 0																				
Monthly Average: 79.1 %																			Percentiles: P <sub>1</sub> = 58 P <sub>10</sub> = 70 Q <sub>1</sub> = 73 Median = 77 O <sub>3</sub> = 86 P <sub>90</sub> = 92 P <sub>99</sub> = 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-Dec	74	74	76	76	77	77	75	75	79	80	80	74	73	78	82	85	87	84	87	84	86	89	92	94	80.7	94																			
2-Dec	95	96	95	93	93	94	93	94	93	93	93	91	91	91	91	92	93	91	85	84	81	80	77	79	89.9	96																			
3-Dec	84	88	92	92	92	92	92	91	89	87	87	85	85	84	85	85	84	85	86	85	85	84	85	85	87.1	92																			
4-Dec	85	83	84	83	83	80	79	77	77	76	77	76	76	80	81	82	82	83	85	86	87	87	87	87	81.3	87																			
5-Dec	86	87	88	88	90	86	84	85	86	88	89	87	86	87	87	87	87	87	87	87	88	87	88	88	87.0	90																			
6-Dec	88	88	90	91	91	91	90	90	90	90	90	84	80	71	70	71	72	76	77	77	79	79	77	79	82.5	91																			
7-Dec	77	85	82	77	71	72	70	73	72	71	69	66	61	60	62	67	68	68	68	66	67	70	76	80	70.7	85																			
8-Dec	83	79	75	73	72	73	78	83	90	91	88	80	76	72	71	74	77	76	77	80	74	70	72	70	77.2	91																			
9-Dec	67	59	61	60	60	58	57	57	59	59	58	57	58	59	62	60	56	56	60	63	67	69	71	73	61.0	73																			
10-Dec	72	74	75	75	74	77	80	82	92	92	96	96	96	98	98	98	96	95	95	93	93	94	95	95	88.7	98																			
11-Dec	96	96	96	96	95	94	92	89	87	85	85	90	93	94	95	95	95	93	94	94	93	92	91	92	92.6	96																			
12-Dec	92	82	81	80	76	74	74	74	79	77	75	72	74	70	71	75	80	81	82	84	86	85	80	88	78.9	92																			
13-Dec	90	93	87	83	82	80	82	73	70	72	70	73	75	85	88	87	85	83	85	85	86	86	86	90	82.3	93																			
14-Dec	89	92	95	95	94	94	93	92	92	91	91	92	93	93	92	88	88	89	90	90	89	91	92	92	91.6	95																			
15-Dec	94	95	95	96	97	98	99	99	96	92	88	84	73	67	65	64	73	77	71	68	67	71	76	84	82.8	99																			
16-Dec	90	92	91	90	89	90	90	89	89	87	84	83	82	84	88	89	89	90	91	91	91	91	91	90	88.8	92																			
17-Dec	89	86	84	75	75	76	77	77	76	73	79	79	79	79	78	76	72	70	72	75	74	75	78	78	77.1	89																			
18-Dec	77	77	77	75	88	89	87	85	84	84	82	75	66	64	63	64	66	68	70	69	70	78	80	78	75.6	89																			
19-Dec	76	77	78	77	78	78	79	79	80	79	78	74	71	70	70	75	79	80	80	80	81	80	80	79	77.5	81																			
20-Dec	79	78	79	78	78	78	77	77	77	77	77	78	79	79	77	81	84	84	84	84	84	83	84	84	79.9	84																			
21-Dec	84	84	85	85	86	88	88	86	85	84	84	84	82	80	78	76	76	77	78	79	79	82	82	87	82.5	88																			
22-Dec	85	84	82	82	83	83	81	80	79	80	78	77	72	71	71	71	74	75	76	77	81	80	76	72	77.9	85																			
23-Dec	72	78	80	81	80	78	77	77	76	77	77	77	77	77	76	78	79	79	79	79	79	80	80	80	78.1	81																			
24-Dec	78	77	76	74	75	76	75	75	76	75	74	74	73	70	67	73	75	76	75	75	74	75	76	76	74.6	78																			
25-Dec	76	75	75	74	73	73	73	72	72	72	71	71	72	72	68	70	72	72	72	72	72	71	71	71	72.2	76																			
26-Dec	71	71	71	71	70	70	70	70	70	70	70	70	72	72	72	73	73	74	73	73	72	73	72	71	71.4	74																			
27-Dec	70	70	71	71	70	71	71	71	71	72	72	73	74	75	75	75	75	75	75	75	73	74	74	73	72.8	75																			
28-Dec	73	73	73	72	73	73	73	74	74	74	74	73	73	73	73	73	73	73	73	72	72	72	71	71	72.8	74																			
29-Dec	70	70	70	69	68	68	67	67	67	67	67	68	69	70	69	70	71	71	72	72	71	72	73	73	69.7	73																			
30-Dec	74	74	74	74	74	73	73	73	73	73	73	73	71	73	74	75	75	75	75	75	75	75	75	74	74.0	75																			
31-Dec	73	74	74	74	73	73	72	72	73	72	72	72	71	67	66	67	70	72	73	74	75	74	74	73	72.1	75																			
																			81.0	81.0	80.9	80.1	80.1	79.8	79.6	79.4	79.7	79.3	78.9	77.6	76.6	76.2	76.2	77.3	78.4	78.5	78.8	78.9	79.1	79.6	80.0	80.8	Diurnal Average		
																			96	96	96	96	97	98	99	99	99	96	93	96	96	96	98	98	98	96	95	95	94	93	94	95	95	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Buffalo Viewpoint - December 2017**





Maximum Speed: 40 km/h on Dec 9 08:00	Maximum Daily Speed Average: 19.2 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 28 23:00	Minimum Daily Speed Average: 1.0 km/h on Dec 23	Hours of Data: 705
Maximum Diurnal Speed Average: 4.2 km/h at hour 9	Minimum Diurnal Speed Average: 1.5 km/h at hour 2	Hours of Missing Data: 39
Monthly Average Velocity: 2.9 km/h 248.8 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 8 Q <sub>3</sub> = 12 P <sub>90</sub> = 18 P <sub>99</sub> = 25	Percent Operational Time: 94.8

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	WSW16	WSW18	W13	WSW17	W19	WSW16	WSW17	WSW10	WSW6	W9	SSW8	S6	SSE3	SE7	SE8	SSE7	S6	SSE7	SSE6	SE6	NNE2	ENE2	AF	SW5	SW6.3	W19
2-Dec	SSW5	NW10	NNW7	NNE4	SE2	NNW1	NNW3	NNE5	NNE5	NNE6	NNE3	AF	E1	SSE3	SSE5	SSE6	SSE6	SW7	WSW9	W12	W15	W10	W10	SW6	W2.5	W15
3-Dec	SSE6	SE8	SSE9	SSE8	SE6	SSE5	W9	WNW9	N18	N16	NNE9	NE9	NE8	NNE8	NNE8	NNE9	NE10	NE9	NE8	NE6	NE6	NW2	NW3	NE5	NNE3.9	N18
4-Dec	NE7	NE8	ENE5	AF	AF	S3	SSE7	S7	SSE7	SSE9	SSE8	SSE5	SSE3	SE4	SE6	SSE9	S8	S7	SSE7	S7	S8	S9	S9	S9	SSE5.4	S9
5-Dec	S8	S8	S8	SSE13	SSW9	W18	NW20	NW14	NNW14	NNE14	NNE11	N10	N9	NNE8	NNE12	NNE13	NNE10	NNE12	NE11	NNE9	N4	NW3	SW2	SSE5	N4.4	NW20
6-Dec	SSE7	S8	SSE8	SSE8	SSE9	S9	SSE9	SSE9	SSE10	SE9	S8	SSE7	SSE7	WSW14	W25	WSW16	WSW18	W12	W18	W18	WNW13	WNW7	SSW5	SW3	SW6.5	W25
7-Dec	WSW8	S6	S7	WSW13	W17	W24	W26	WNW13	W11	W17	WNW11	WNW13	WNW19	WNW21	WNW20	WNW13	WNW13	W11	W10	WSW11	W9	W8	SSW4	S7	W11.7	W26
8-Dec	SSE8	SW8	SW8	SW11	SSW8	S7	SSW6	SSE6	SSE8	S8	SSE7	SSE6	SE7	SSE5	SE7	SSE9	SSE11	SSE10	SSE7	SSE8	SW9	SW8	SSE8	SW8	S6.9	SW11
9-Dec	SW10	WSW12	W22	W27	W31	W35	W35	W40	W35	W33	W25	W25	W18	WNW15	WNW11	NW11	W21	WSW16	WSW10	W13	W19	N6	WSW7	SSW5	W19.2	W40
10-Dec	WSW8	WSW9	W12	W16	W16	NW5	SSE5	SE8	S7	SSW6	WSW7	WNW14	NW19	NNW15	N10	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	NW19
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----
12-Dec	AF	WSW11	WSW7	W13	W9	W9	W20	W27	WNW16	W19	W18	W16	N7	W10	W16	WNW14	NW16	NW13	NW10	NW7	WNW3	SSW4	WSW4	SSW5	W10.7	W27
13-Dec	SSW6	S8	SSW6	WSW8	SW8	SSW8	SSW8	WSW21	W27	WNW15	WNW13	NW10	NW18	N16	N12	NNW4	WNW10	W8	W9	WNW10	NW11	WNW12	NW6	ENE6	WNW7.3	W27
14-Dec	ENE4	SE4	S6	S7	SSW7	SSW6	SSE7	SSE6	SSE7	SSE6	S7	SSE7	SE6	SSE5	S8	SSE7	S8	S7	SSE7	S6	SSE6	SSE7	SSE7	SSE5	SSE6.0	S8
15-Dec	SSE6	SSE7	SSE6	SSE6	SSE8	SSE6	SSE6	S6	W13	W13	WSW17	W14	NW21	WNW21	WNW14	W13	SSW7	SW7	WSW14	WSW14	W22	W18	W19	W22	W9.3	W22
16-Dec	W19	NNE21	NE18	NNE15	NNE15	NNE13	NE11	NE7	NE6	E5	E6	SE5	SE4	SSE5	SSE6	SSE7	SSE8	SSE11	SSE10	SSE11	SSE12	SSE12	SSE11	SE12	E4.1	NNE21
17-Dec	SSE11	SSE11	SSE11	SSW14	SSW15	SSW12	SW15	SW14	WSW11	W19	W18	W24	W25	W26	W25	W23	WNW21	NW26	NW20	NW14	WNW14	W18	W19	W16	W13.8	W26
18-Dec	WNW16	W16	W17	WNW18	NNE21	NNE20	NNE20	NNE15	NNE10	N6	NNW5	NW16	NW26	NNW21	NW21	NNW22	NW19	NW15	NW15	WNW18	NW19	NNE15	NNE17	NNE16	NNW13.3	NW26
19-Dec	NNE15	NNE10	NNE9	NE7	NNE8	NNE8	N6	NNW4	SSW5	S4	SSE4	S5	S7	S6	SE7	SSE8	SSE8	SSE10	SSE11	SSE11	SSE8	SSE6	S9	S12	SE3.3	NNE15
20-Dec	SSE10	SSE7	SE8	SSE8	SSE8	S8	SSE9	SSE9	SSE9	SSE9	SSE9	SSE6	SSE7	SSE7	SSE7	SSE7	S8	SSE9	SSE9	SSE11	SSE10	SSE10	SSE10	SSE9	SSE8.4	SSE11
21-Dec	SE5	S2	NNE1	SSW2	W3	NW9	NW7	NNE6	NNE5	N6	WNW2	WNW3	SW3	NW9	NW15	WNW13	NW12	WNW18	WNW19	NW17	NW17	NW15	NW11	WNW10	NW7.3	WNW19
22-Dec	WNW9	W8	W14	W13	W14	W14	W18	W19	W19	W20	W18	WNW14	NW18	NW18	NW19	WNW17	WNW15	NW13	NW16	NNW17	NNE20	NNE22	NNE18	N16	WNW12.7	NNE22
23-Dec	N12	N8	N7	N4	ENE1	SSW4	SSE5	SSE4	S4	ENE2	NNW4	N4	N4	W3	NNE3	SSW1	S7	SSE9	SSE8	SSE9	SSE6	SSE4	NE5	NNE18	ENE1.0	NNE18
24-Dec	NNE24	NNE23	NNE22	NNE23	NNE13	NNE13	NNE10	NNW5	NW6	NNW5	SSW3	SSW3	S4	SW3	WNW3	ENE3	SSE7	S8	SSE5	SSE4	SW5	WNW5	NNE7	NNE7	NNE5.0	NNE24
25-Dec	NE10	NNE11	NNE12	N10	N7	N10	N10	N6	NNW2	WSW2	SSW3	SSE4	SSW3	SSW4	SW6	S4	SSE6	SSE8	SSE8	SSE8	S9	SSE9	SSE9	SSE8	ESE1.3	NNE12
26-Dec	SSE8	SSE8	S9	SSE8	SSE9	SSE8	SSE9	SSE9	S9	S8	SSE8	SSE6	SSE5	SSE6	SE8	SSE8	SSE7	SSE9	SSE9	SSE9	SSE9	SSE8	SSE8	S7	SSE7.9	SSE9
27-Dec	SSE8	SSE9	SSE8	SSE8	SSE9	SSE8	SSE7	S7	S8	SSE8	S6	S6	SSE5	SSE5	SSE5	SE6	S6	SSW5	SW5	WSW4	SSW5	SE7	SSE5	SE7	SSE6.1	SSE9
28-Dec	SSE7	S7	SSE7	SE3	NNE5	N5	N7	NNW6	NW5	NNE4	NNE4	ENE3	NE6	NNE1	NE2	NNW1	AF	NE3	NE6	NE4	NNE3	NNW1	SE1	SSW2	NE1.7	SSE7
29-Dec	SSE3	SSE2	SE1	SSW2	SSE4	SSE5	SSE5	SSE6	SSE6	SSE7	S6	S5	SSE5	SE6	SE6	SSE7	SSE6	SSE7	SSE6	SSE5	S6	S7	SSE5	S5	SSE5.1	SSE7
30-Dec	SSE5	S5	S4	S5	SSE4	SSE6	SSE6	SSE6	SSE6	S6	S4	S5	SE4	SE5	SSE5	SSE5	SSE6	SE7	SSE6	SSE6	S6	SSE5	S5	S6	SSE5.2	SE7
31-Dec	S7	S6	SSW5	SSW4	S5	S5	S6	S6	S7	S6	SSE6	SSE7	SSE8	SSE9	SSE8	SSE8	SSE10	SSE11	S8	S7	S7	S7	S7	SSE7	S6.9	SSE11

SSW2.1 SW1.5 SW1.8WSW3.5WSW3.2WSW3.3WSW4.0WSW4.1WSW4.2WSW3.8WSW3.6WSW3.8WNW3.4WNW3.7 W3.6WSW2.6WSW3.6 SW3.2 SW3.6WSW3.3WSW3.8WSW2.0 SW1.9SSW2.0	Diurnal Average
NNE24 NNE23 W22 W27 W31 W35 W35 W40 W35 W33 W25 W25 NW26 W26 W25 W23WNW21 NW26 NW20 W18 W22 NNE22 W19 W22	Diurnal Maximum

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

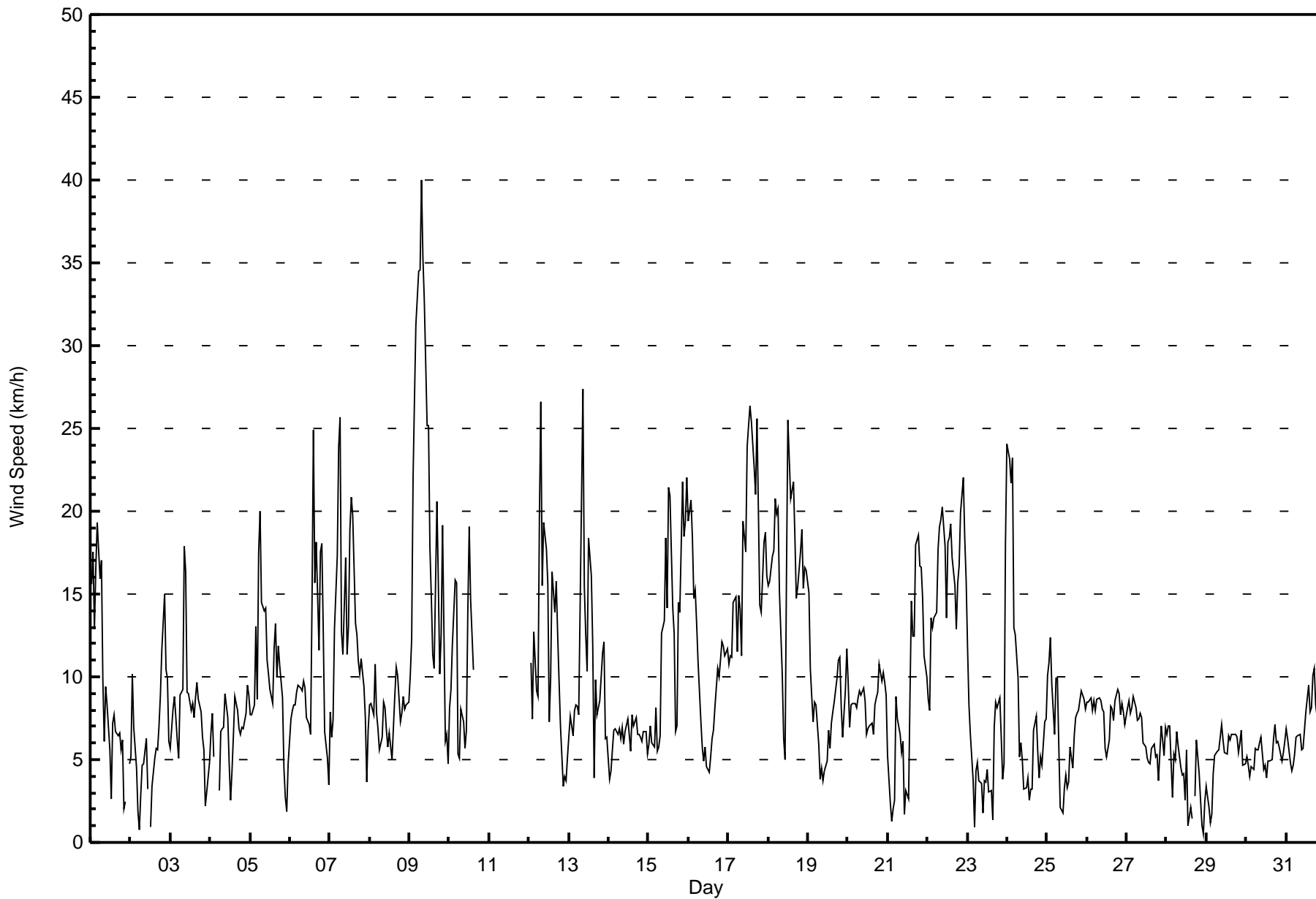




**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Buffalo Viewpoint - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 13 08:00 Minimum Value: 0 km/h on Dec 31 04:00 Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 O <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 705 Hours of Missing Data: 39 Hours of Calibration: 0 Percent Operational Time: 94.8								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	4	4	3	4	4	4	5	3	4	3	2	2	2	2	1	1	1	1	2	3	2	2	AF	1	5
2-Dec	1	2	2	2	1	1	1	1	2	2	2	AF	1	2	1	1	1	2	2	4	2	3	2	2	4
3-Dec	2	1	1	1	2	3	2	3	4	3	4	3	2	2	2	2	2	2	2	2	2	1	2	3	4
4-Dec	1	2	2	AF	AF	2	1	1	0	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2
5-Dec	2	1	2	3	3	4	4	3	3	3	3	2	2	2	4	3	3	3	3	3	2	2	2	1	4
6-Dec	2	2	2	2	2	1	1	2	2	2	2	1	2	6	5	4	5	5	5	4	3	2	2	1	6
7-Dec	2	1	1	5	3	5	6	4	4	5	6	3	5	5	6	4	3	3	4	3	3	2	2	1	6
8-Dec	1	1	3	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	2	3	3
9-Dec	4	4	5	6	5	5	5	6	6	6	5	5	4	4	2	3	4	4	5	3	3	4	2	2	6
10-Dec	2	2	1	3	4	2	2	1	2	2	3	3	4	4	3	AF	AF	AF	AF	AF	AF	AF	AF	AF	4
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	3	3	8	4	3	6	4	5	4	4	5	2	3	4	3	3	3	3	1	3	2	2	3	8
13-Dec	2	1	2	3	2	2	2	9	5	3	5	3	4	4	3	3	2	3	2	2	3	3	2	1	9
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	1	2	1	1	1	1	1	2
15-Dec	1	1	1	2	2	2	1	1	3	3	4	3	5	4	4	2	2	3	4	4	4	4	4	4	5
16-Dec	4	5	4	4	3	3	2	2	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	5
17-Dec	2	2	3	3	4	2	3	3	3	4	4	4	4	5	4	4	5	6	5	3	4	4	3	3	6
18-Dec	4	4	3	4	4	4	4	4	4	3	3	6	5	5	5	5	5	3	3	4	4	3	4	3	6
19-Dec	3	3	2	2	2	1	2	1	1	1	1	1	2	2	2	1	1	1	1	2	1	2	2	2	3
20-Dec	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	2	2	2	2	1	1	1	2
21-Dec	2	1	1	1	2	2	2	1	1	2	2	1	1	5	3	3	3	4	4	4	4	4	3	3	5
22-Dec	3	2	4	2	2	3	3	3	3	3	4	3	4	4	4	4	3	3	3	5	4	5	6	3	6
23-Dec	3	1	2	1	1	1	1	1	1	1	1	1	3	1	1	2	1	1	2	1	1	1	5	4	5
24-Dec	5	5	4	5	3	2	3	1	3	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	5
25-Dec	2	2	3	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
26-Dec	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
27-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
28-Dec	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	AF	2	1	1	2	1	1	1	2
29-Dec	1	1	1	1	1	0	1	0	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2
30-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1
31-Dec	1	1	0	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	1	1	3
Diurnal Maximum																									
AF - Analyzer Failure																									





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Buffalo Viewpoint - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	151	21.42	21.42
6 - 11	367	52.06	73.48
12 - 19	139	19.72	93.19
20 - 28	42	5.96	99.15
29 - 38	5	0.71	99.86
> 38	1	0.14	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Buffalo Viewpoint - December 2017**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	13	5	7	2	0	11	37	17	21	7	3	2	5	5	11	151
6 - 11	15	20	17	1	1	0	20	153	65	12	12	14	15	9	11	2	367
12 - 19	6	17	1	0	0	0	1	3	1	3	2	14	43	24	21	3	139
20 - 28	0	10	0	0	0	0	0	0	0	0	0	1	19	4	6	2	42
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5
> 38	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
<b>Totals</b>	26	60	23	8	3	0	32	193	83	36	21	32	85	42	43	18	705

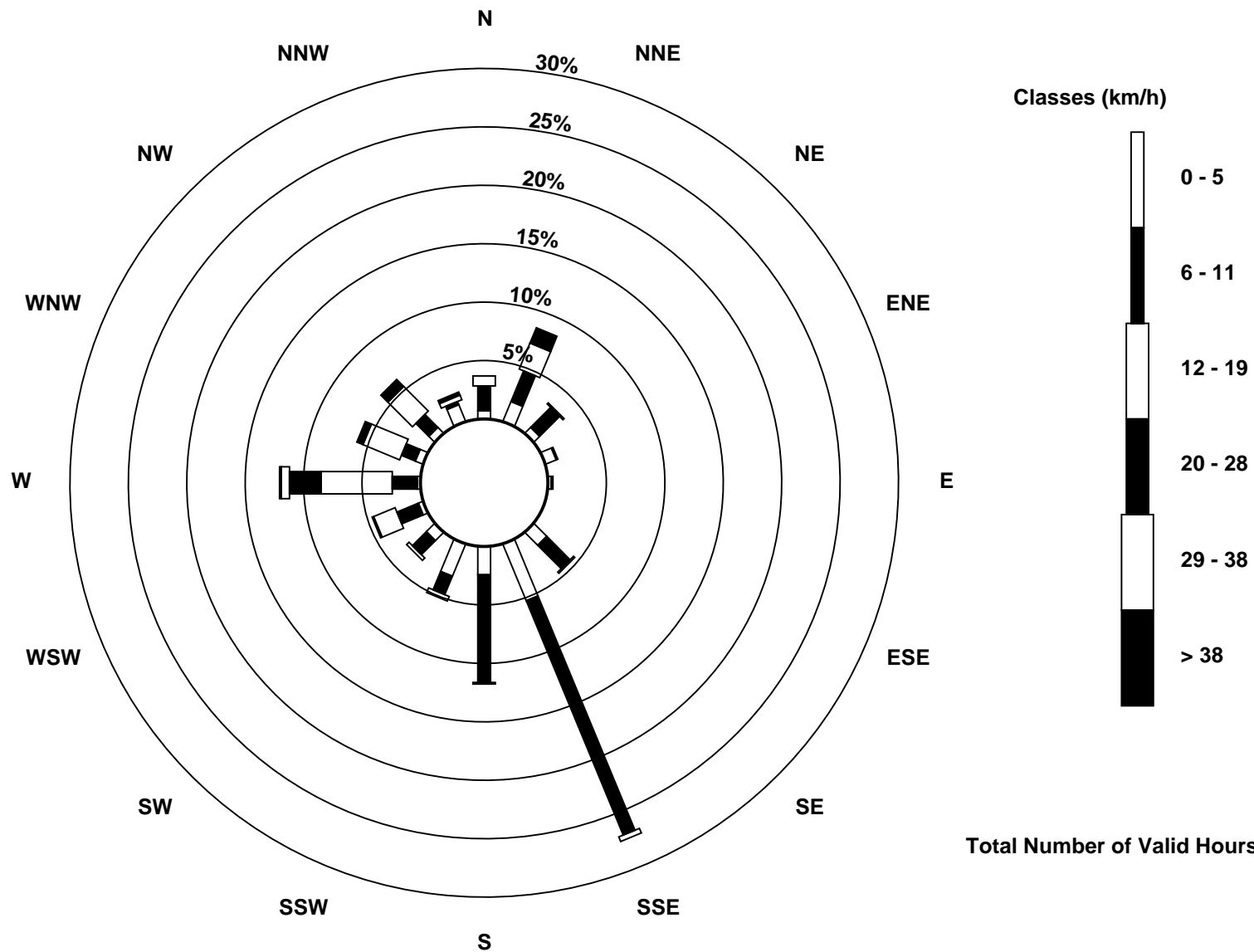
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Buffalo Viewpoint - December 2017**

Direction of Maximum Speed: 264 deg on Dec 9 08:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 264.1 deg on Dec 9	Hours of Data: 705
Direction of Minimum Speed: 124 deg on Dec 28 23:00	Hours of Missing Data: 39
Direction of Minimum Daily Speed Average: 1.0 deg on Dec 23	Percent Operational Time: 94.8
Monthly Average Direction: 232.5 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	249	252	261	258	265	257	254	238	239	266	202	179	151	132	139	161	173	149	166	140	21	59	AF	226	231.7
2-Dec	205	312	342	26	141	333	333	18	17	23	25	AF	85	154	156	154	161	216	249	260	264	276	275	220	269.0
3-Dec	162	138	158	147	138	159	261	292	352	359	18	48	50	25	21	19	43	38	39	34	42	309	305	35	30.9
4-Dec	54	43	58	AF	AF	180	158	177	160	153	157	167	157	138	145	163	172	170	162	171	172	170	177	182	156.9
5-Dec	182	187	178	150	202	280	306	321	335	24	25	8	5	13	29	31	24	25	34	24	357	323	218	160	359.1
6-Dec	153	171	164	161	164	171	155	149	155	142	173	162	168	253	264	255	255	279	271	272	284	290	208	215	221.9
7-Dec	249	190	179	252	266	270	274	289	280	280	299	292	286	287	283	294	293	272	266	254	262	262	208	190	271.9
8-Dec	163	221	231	224	202	190	192	151	163	171	147	165	141	153	140	152	157	164	168	163	217	214	168	217	179.0
9-Dec	219	249	268	263	261	263	264	264	263	262	260	266	275	287	290	308	261	244	249	264	272	357	247	209	264.1
10-Dec	245	253	265	264	272	311	167	146	185	212	245	295	325	333	354	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	249	247	269	276	267	264	265	283	273	278	280	0	277	277	299	318	309	309	309	291	200	257	207	279.0
13-Dec	199	174	208	238	228	206	194	258	268	282	282	304	318	5	4	327	302	274	267	282	306	300	318	58	281.6
14-Dec	77	143	185	177	198	194	156	157	152	165	170	158	143	155	169	164	175	187	159	169	163	149	161	159	164.3
15-Dec	164	166	162	160	161	147	167	177	267	264	258	276	309	303	291	268	207	222	247	245	269	279	270	269	258.8
16-Dec	268	22	35	27	24	28	41	41	55	91	96	137	134	160	166	159	161	152	157	156	152	156	150	144	97.0
17-Dec	153	153	156	207	210	205	219	231	244	263	273	266	265	271	270	270	292	306	304	307	286	279	271	273	262.2
18-Dec	288	278	274	282	16	19	28	27	18	4	337	321	325	327	324	328	318	311	306	299	305	13	29	25	333.3
19-Dec	30	27	32	37	26	14	5	338	211	188	155	173	175	180	140	151	164	155	149	149	151	163	174	179	130.2
20-Dec	157	154	141	155	153	170	167	166	158	156	158	153	150	154	149	157	170	155	159	153	164	156	156	160	157.3
21-Dec	146	170	24	196	276	326	317	14	24	9	290	301	227	310	315	300	306	294	289	306	313	315	316	288	308.6
22-Dec	283	276	266	271	275	276	272	265	262	266	276	284	308	305	307	303	297	304	304	336	25	23	15	356	301.1
23-Dec	354	354	3	3	76	209	151	155	181	76	341	359	356	273	15	193	187	150	160	158	167	153	36	24	64.9
24-Dec	21	20	18	17	14	28	17	334	323	346	198	205	175	219	298	67	156	183	153	167	220	291	31	31	17.8
25-Dec	49	21	17	11	360	360	353	10	329	247	195	161	195	207	235	178	156	159	160	165	169	165	155	153	110.2
26-Dec	158	156	170	159	160	159	157	152	169	173	159	167	156	147	146	149	151	152	162	161	157	164	150	175	158.7
27-Dec	160	156	160	164	162	164	164	170	172	167	172	172	168	162	164	146	182	193	218	246	207	142	151	137	167.5
28-Dec	149	170	155	143	23	9	350	337	320	22	32	63	36	30	39	341	AF	38	54	53	14	341	124	205	41.1
29-Dec	151	162	143	205	156	148	155	160	158	157	169	172	150	145	146	152	161	148	160	149	177	181	151	183	159.1
30-Dec	158	170	180	173	160	148	160	152	159	169	182	182	144	140	163	163	153	144	165	155	170	155	174	171	161.7
31-Dec	169	173	195	192	190	184	179	170	171	174	168	164	168	159	161	168	168	165	172	172	176	182	176	168	172.0

195.7 214.3 228.2 240.3 246.1 256.9 254.3 250.1 253.5 256.1 244.6 258.4 292.4 285.2 280.2 258.0 238.1 229.9 236.1 239.2 253.5 249.2 214.4 199.1

Diurnal Average

AF - Analyzer Failure

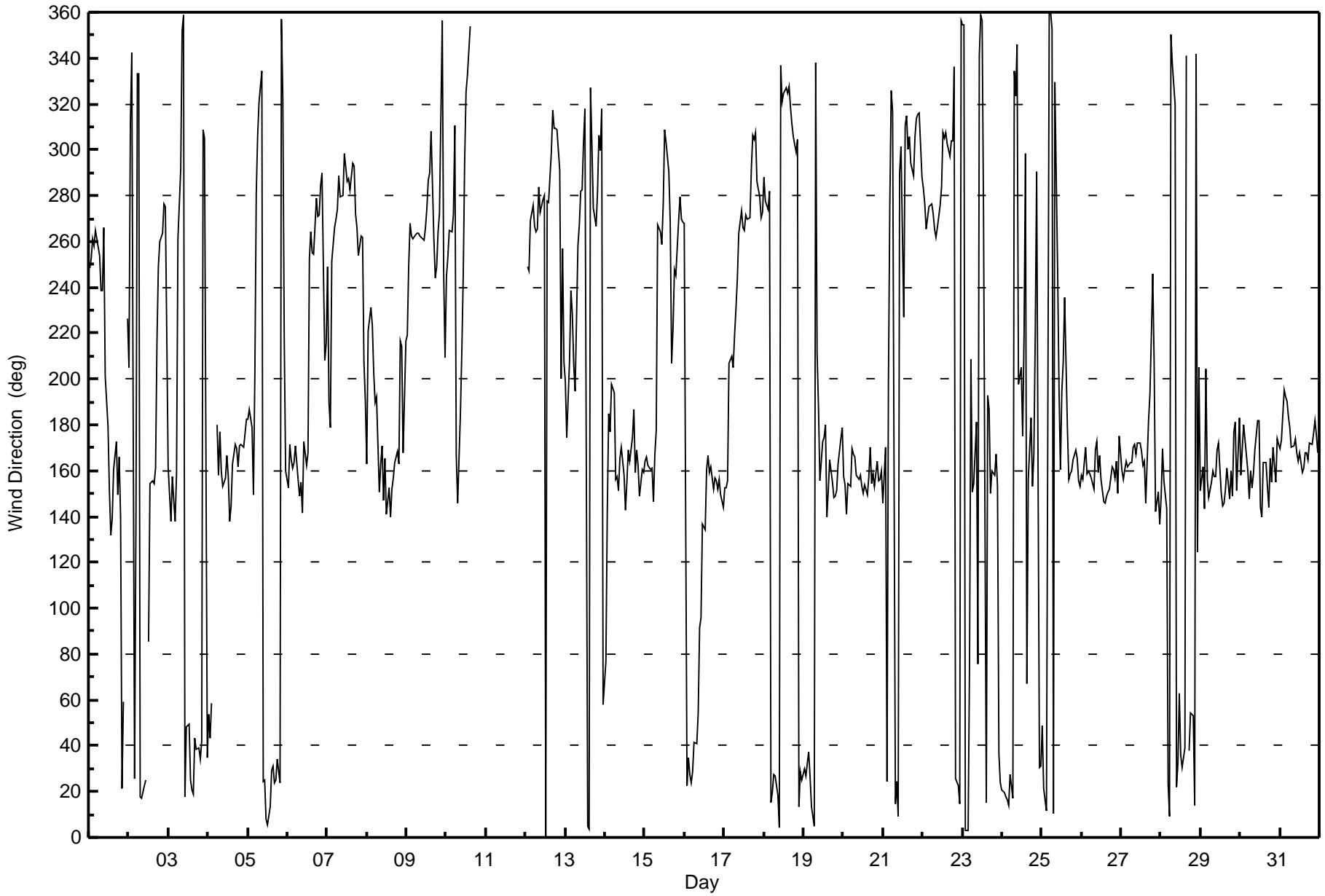
All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Buffalo Viewpoint - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 86 deg on Dec 23 16:00 Minimum Value: 4 deg on Dec 30 18:00 Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 10 Q <sub>1</sub> = 13 Median = 17 Q <sub>3</sub> = 22 P <sub>90</sub> = 34 P <sub>99</sub> = 70		Hours in Service: 744 Hours of Data: 705 Hours of Missing Data: 39 Hours of Calibration: 0 Percent Operational Time: 94.8																							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	15	15	12	13	14	17	15	22	62	23	26	24	59	16	9	11	16	15	29	12	67	79	AF	18	79
2-Dec	36	19	22	28	63	70	35	15	29	11	16	AF	69	21	14	13	8	25	15	10	7	12	9	25	70
3-Dec	35	9	10	14	19	69	22	28	24	23	23	15	16	17	17	14	14	15	21	16	47	44	37	69	
4-Dec	11	13	20	AF	AF	40	11	10	11	9	11	20	38	20	20	20	21	21	22	19	20	20	21	19	40
5-Dec	24	16	21	20	40	17	16	13	23	10	15	22	21	17	17	19	18	15	19	21	34	48	61	17	61
6-Dec	16	17	13	12	11	13	8	14	12	15	18	16	24	31	9	18	17	29	14	13	14	25	50	51	51
7-Dec	20	28	22	23	10	9	11	18	17	15	26	17	16	15	16	17	17	13	20	13	14	30	39	21	39
8-Dec	20	16	29	12	31	23	42	22	17	19	12	23	15	18	12	17	17	17	15	20	27	29	31	33	42
9-Dec	32	19	12	12	10	9	8	8	9	10	12	10	13	15	14	25	12	17	19	12	12	56	46	49	56
10-Dec	17	13	6	9	17	47	32	14	34	39	45	21	15	17	25	AF	AF	AF	AF	AF	AF	AF	AF	AF	47
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
12-Dec	AF	23	58	39	38	25	13	10	19	11	18	39	27	28	13	16	12	15	18	17	64	56	45	29	64
13-Dec	29	23	24	30	24	25	25	19	11	16	17	16	16	24	23	47	16	25	17	14	16	17	50	16	50
14-Dec	21	19	12	19	17	27	11	21	9	14	14	16	18	25	21	20	22	24	17	19	27	11	15	20	27
15-Dec	15	14	22	22	19	24	20	20	20	13	12	25	16	16	17	11	37	28	17	15	13	14	10	10	37
16-Dec	17	20	13	15	14	13	15	18	16	26	16	24	19	22	20	17	14	13	14	13	13	15	13	15	26
17-Dec	17	16	19	16	14	15	13	14	15	12	13	9	9	12	9	11	17	17	16	15	17	15	8	14	19
18-Dec	15	15	11	29	17	15	15	14	18	24	32	17	16	16	16	17	18	16	15	16	17	29	13	14	32
19-Dec	14	14	13	16	13	13	20	22	20	25	12	19	23	26	17	15	11	8	9	10	9	26	11	18	26
20-Dec	12	12	9	14	11	17	12	10	8	6	13	17	20	21	18	15	14	15	15	10	12	12	12	12	21
21-Dec	30	63	66	30	36	18	16	17	15	19	50	22	51	32	16	15	16	17	16	17	16	17	19	17	66
22-Dec	14	14	11	10	12	13	10	10	10	8	15	16	17	16	16	16	17	17	16	29	15	19	21	22	29
23-Dec	24	22	22	32	76	21	20	17	26	71	26	26	54	46	66	86	15	8	15	12	22	28	68	15	86
24-Dec	15	14	14	15	15	13	20	31	27	37	25	20	30	58	35	41	15	13	22	50	31	46	15	13	58
25-Dec	12	13	15	16	22	22	24	21	37	40	32	21	25	34	13	34	11	7	7	8	6	8	8	9	40
26-Dec	15	12	14	12	17	12	11	15	24	18	16	22	21	15	10	8	9	5	5	8	11	10	6	9	24
27-Dec	5	6	7	8	8	11	17	12	9	14	17	16	17	19	14	10	17	24	24	41	25	12	20	9	41
28-Dec	8	10	9	67	9	23	24	21	22	15	20	55	14	77	42	37	AF	18	16	19	32	48	85	37	85
29-Dec	15	31	62	26	13	5	7	7	9	7	12	12	15	10	12	7	12	11	15	28	13	10	26	17	62
30-Dec	12	17	20	19	16	8	14	11	8	28	18	20	21	17	19	18	17	4	14	12	8	10	11	7	28
31-Dec	6	11	12	10	9	8	9	13	13	16	18	23	20	20	22	19	19	19	19	21	18	25	18	12	25
Diurnal Maximum																									
36 63 66 67 76 70 42 31 62 71 50 55 69 77 66 86 37 29 29 50 67 79 85 51																									
AF - Analyzer Failure																									









# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

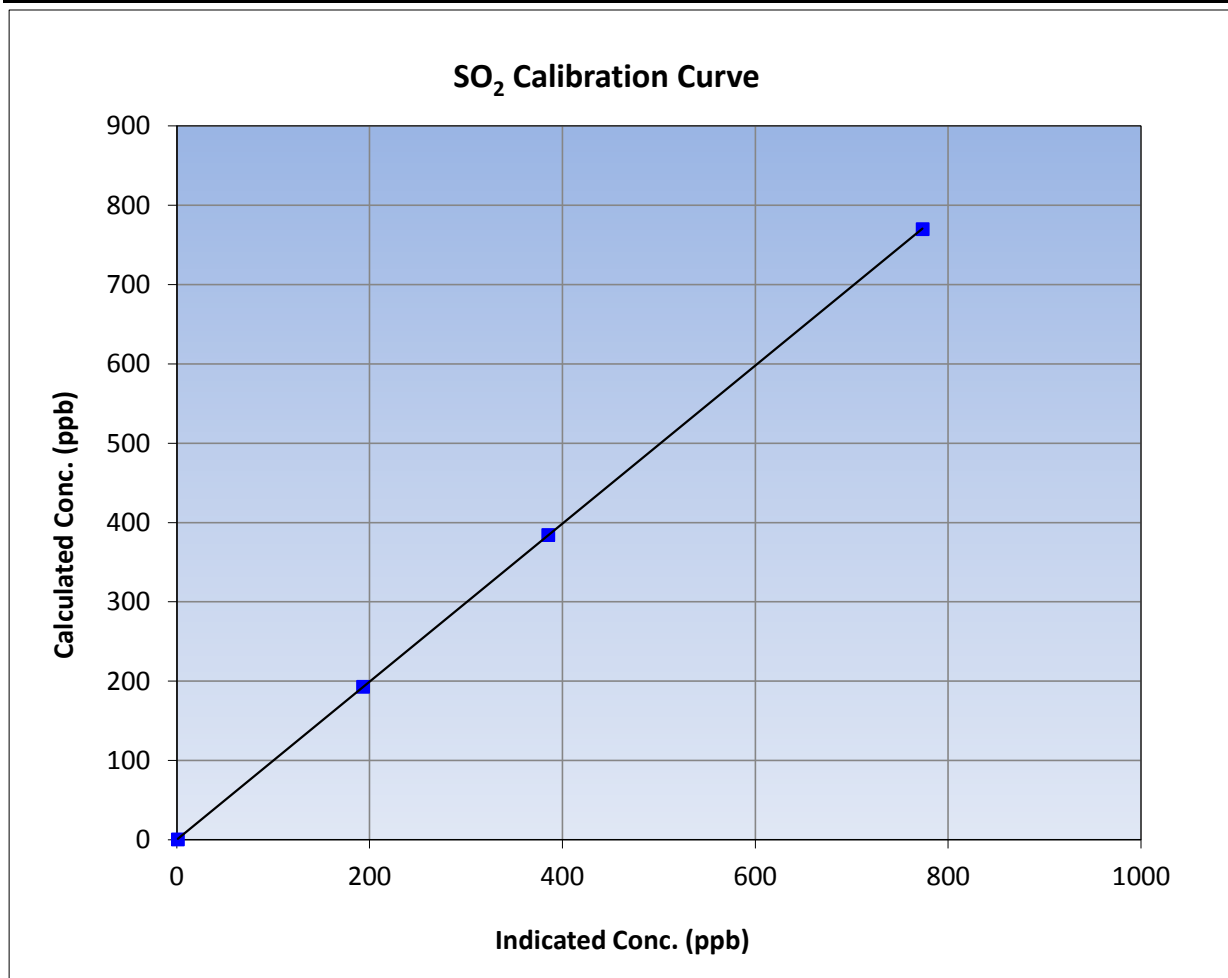
Version-03-2017

### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	8:40	End Time (MST)	13:26
Analyzer make	Thermo 43i	Analyzer serial #	JC1327300932

### Calibration Data

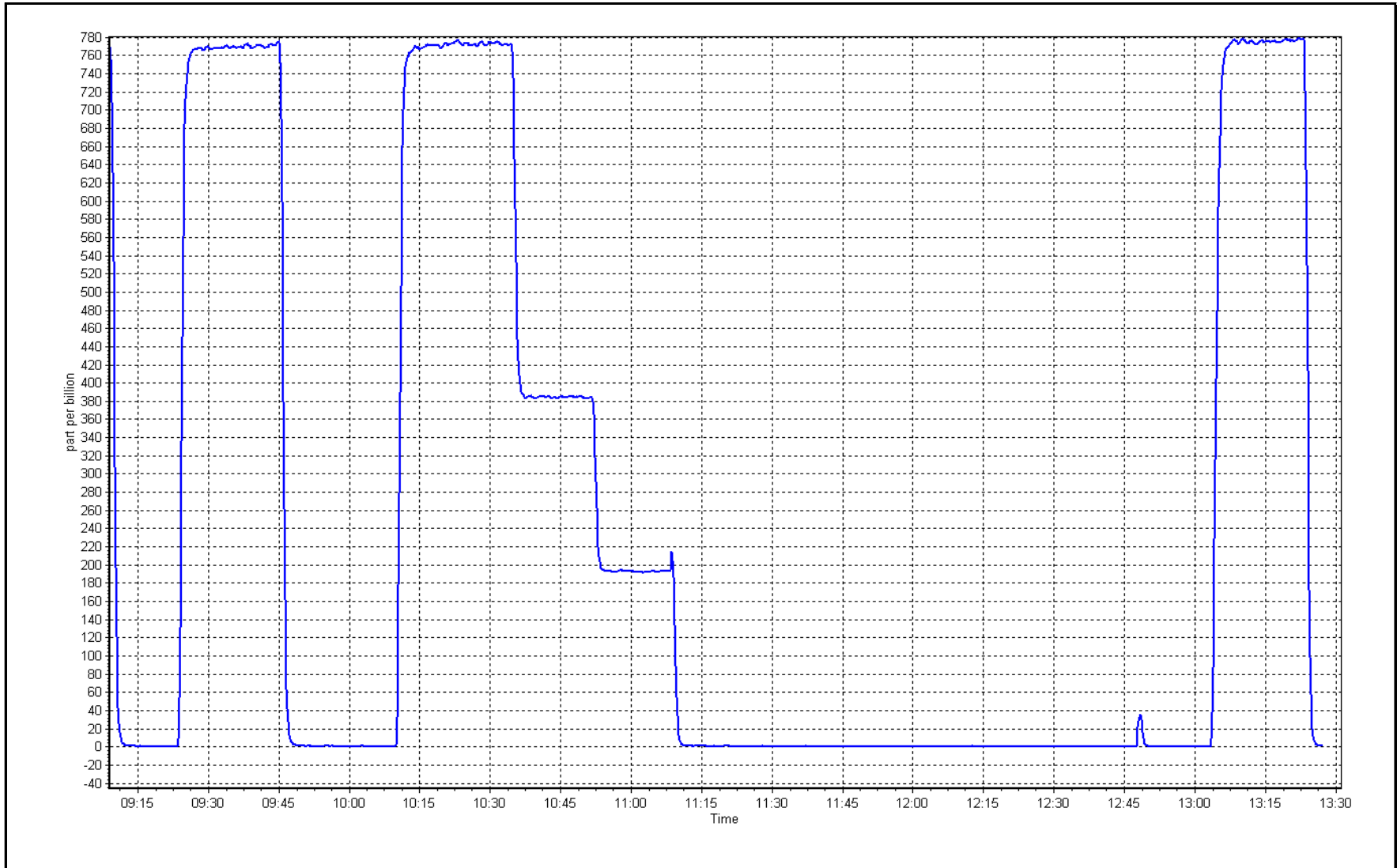
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.7	----	Correlation Coefficient	0.999996	≥0.995
769.6	773.1	0.9955	Slope	0.996164	0.90 - 1.10
384.0	384.9	0.9978	Intercept	-0.085799	+/-30
192.4	192.9	0.9975			



SO2 Calibration Plot

Date: December 7, 2017

Location: Buffalo Viewpoint







# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

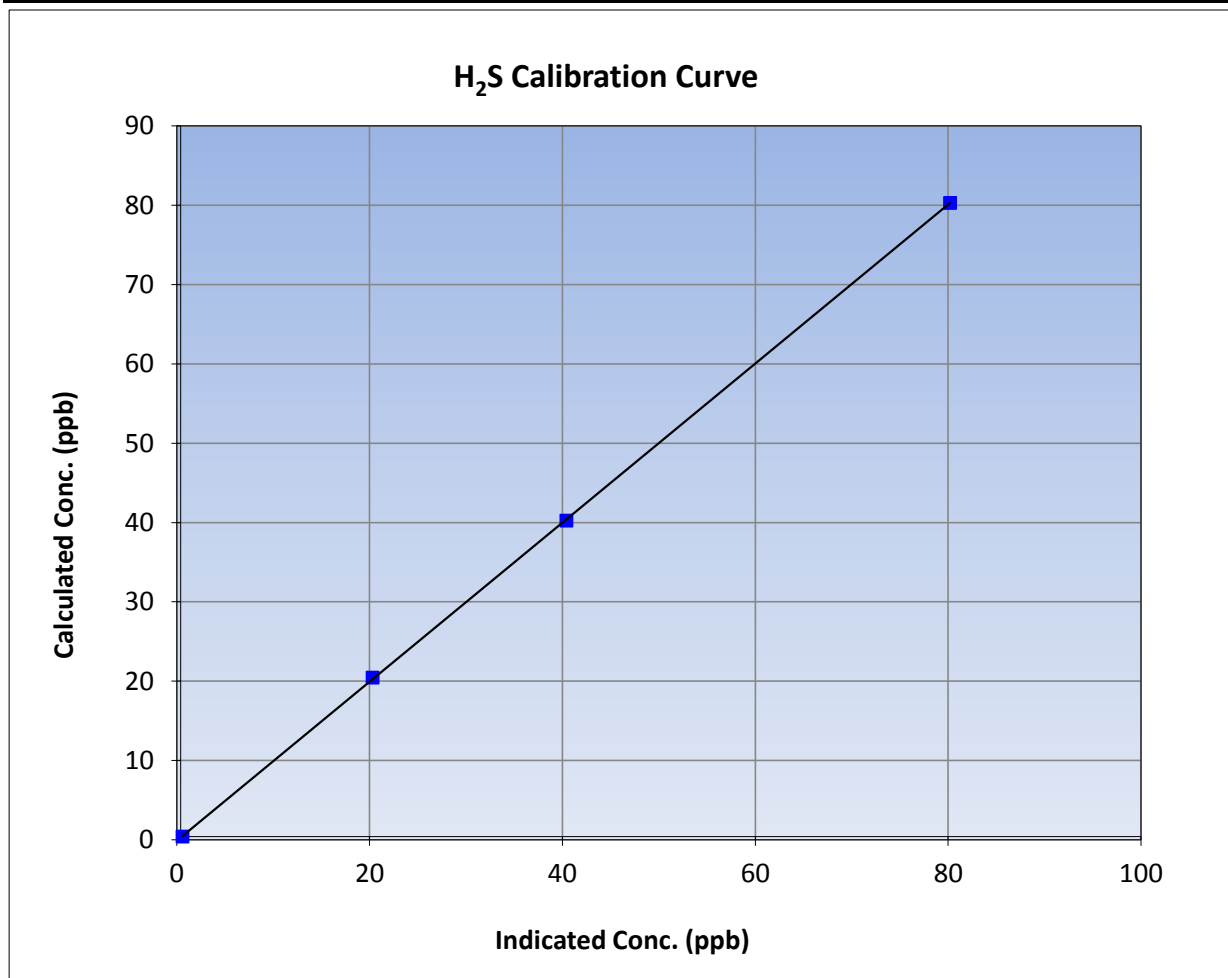
Version-03-2017

### Station Information

Calibration Date	December 8, 2017	Previous Calibration	November 7, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	10:44	End Time (MST)	13:24
Analyzer make	Thermo 450i	Analyzer serial #	1336160094

### Calibration Data

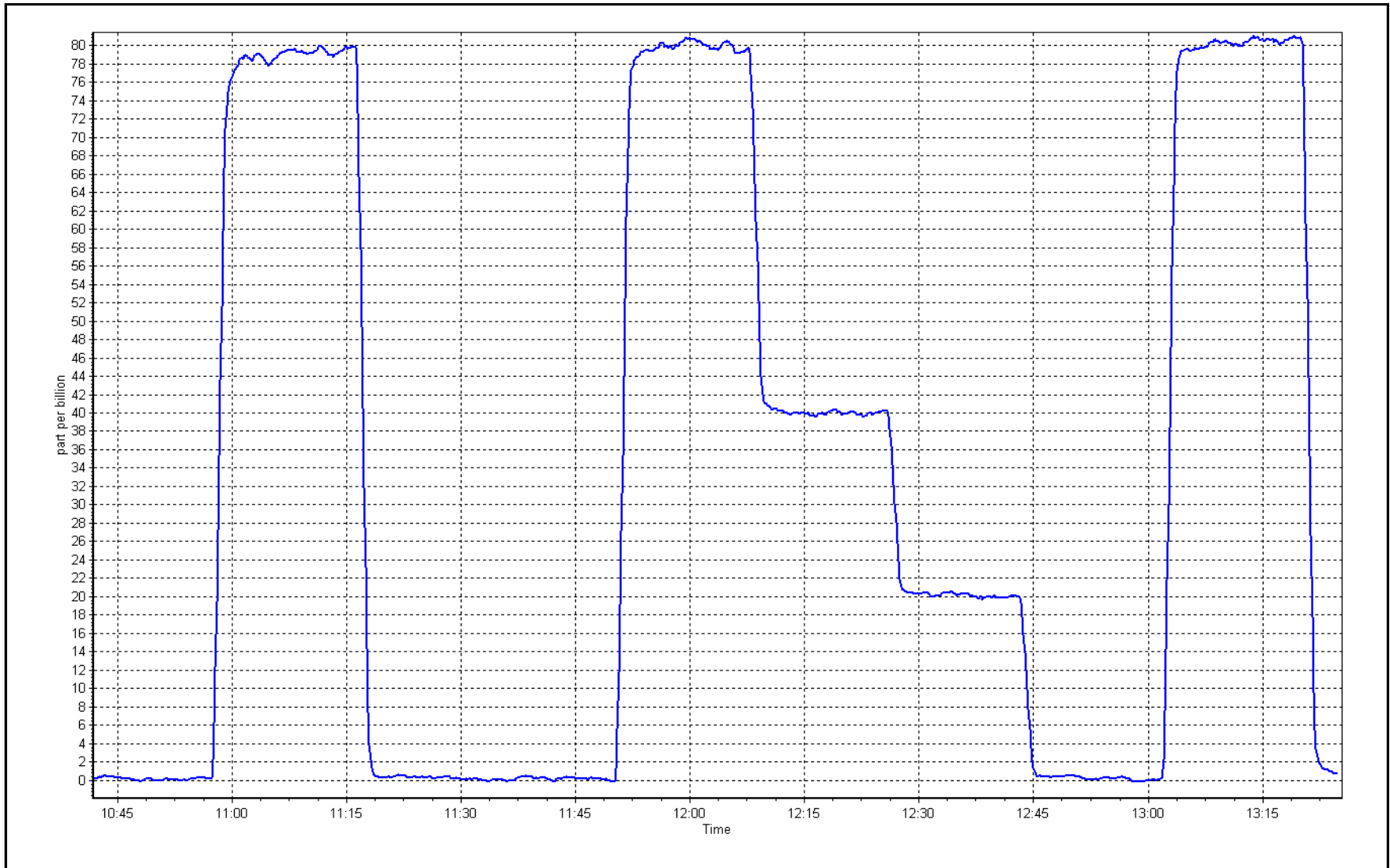
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.2	----	Correlation Coefficient	0.999977	≥0.995
79.9	79.8	1.0014			
39.8	40.0	0.9962	Slope	1.002490	0.90 - 1.10
20.1	19.9	1.0084			
			Intercept	-0.105862	+/-3



H<sub>2</sub>S Calibration Plot

Date: December 8, 2017

Location: Buffalo Viewpoint





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Buffalo Viewpoint	Station number:	AMS 04
Calibration Date:	December 7, 2017	Last Cal Date:	November 6, 2017
Start time (MST):	8:40	End time (MST):	13:25
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL28372	Cal Gas Expiry Date	August-18-20
CH4 Cal Gas Conc.	<u>501.0</u> ppm	CH4 Equiv Conc.	1053.8 ppm
C3H8 Cal Gas Conc.	<u>201.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	3060
ZAG Make/Model	API 701	Serial Number	4297

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1170050149
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-286.6
Calculated slope	1.003581	Sample pressure	8.7
Calculated intercept	-0.019033	Fuel pressure	19.3
Analyzer Background	3.260	Air pressure	34.6
Analyzer Coefficient	3.812	Flame temperature	147.4

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5008	0.0	0.00	0.22	----
as found span	4932	78.7	16.55	16.79	0.986
calibrator zero	5000	0.0	0.00	-0.01	----
high point	4932	78.7	16.55	16.50	1.003
second point	4975	39.3	8.26	8.20	1.007
third point	4997	19.7	4.14	4.08	1.014
as left zero	5008	0.0	0.00	0.11	----
as left span	4932	78.7	16.55	16.72	0.990

Average Correction Factor				1.008
Corrected As found	16.57	Previous response	16.51	*% change -0.4%

\* = > +/-5% change initiates investigation

Notes: No maintenance done, Zero and Span adjusted

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## THC Calibration Summary

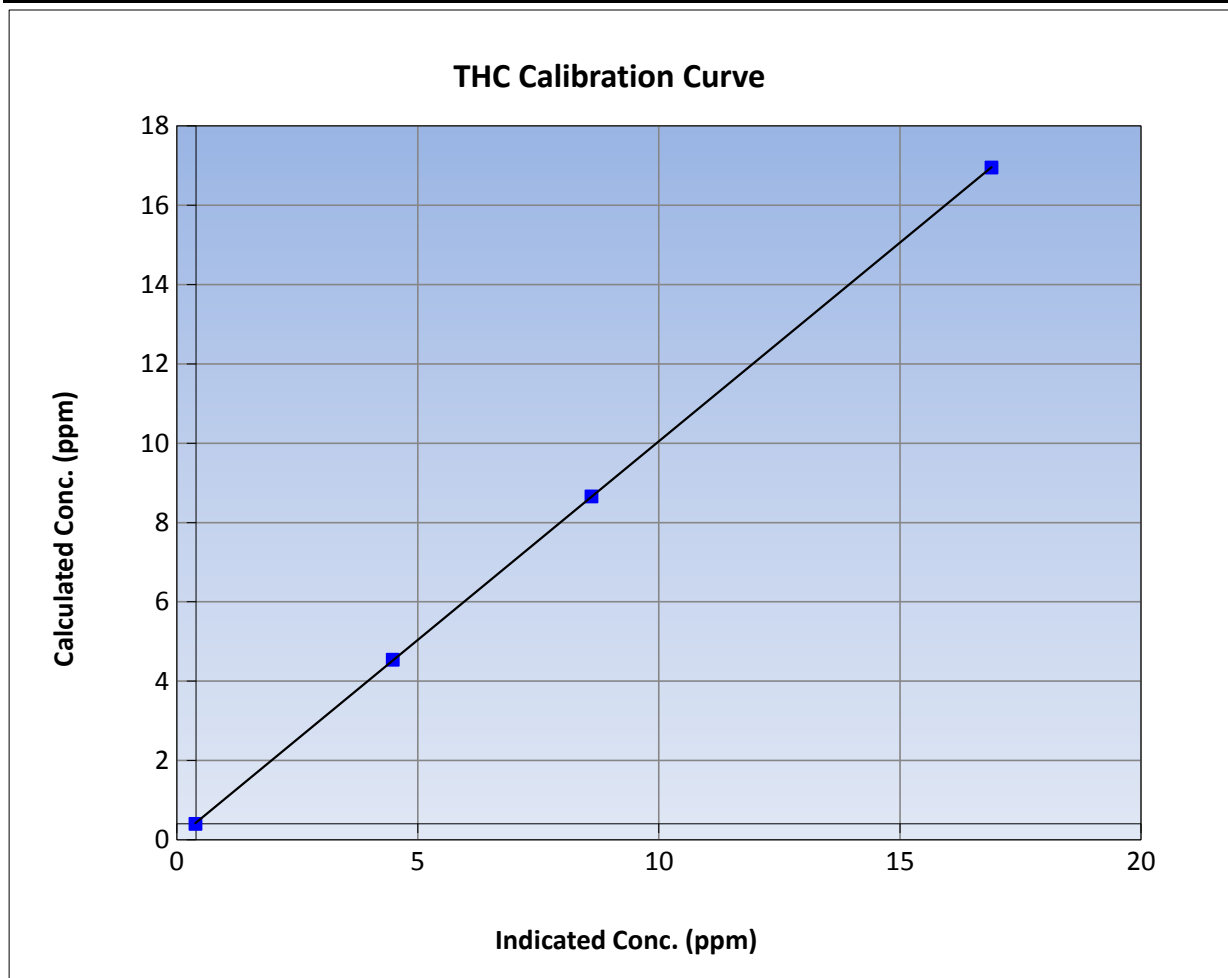
Version-03-2017

### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	8:00	End Time (MST)	13:25
Analyzer make	Thermo 51i-LT	Analyzer serial #	1170050149

### Calibration Data

Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999993	
16.6	16.5	1.0031			≥0.995
8.3	8.2	1.0072	Slope	1.001863	
4.1	4.1	1.0142			0.90 - 1.10
			Intercept	0.030957	+/-1.5

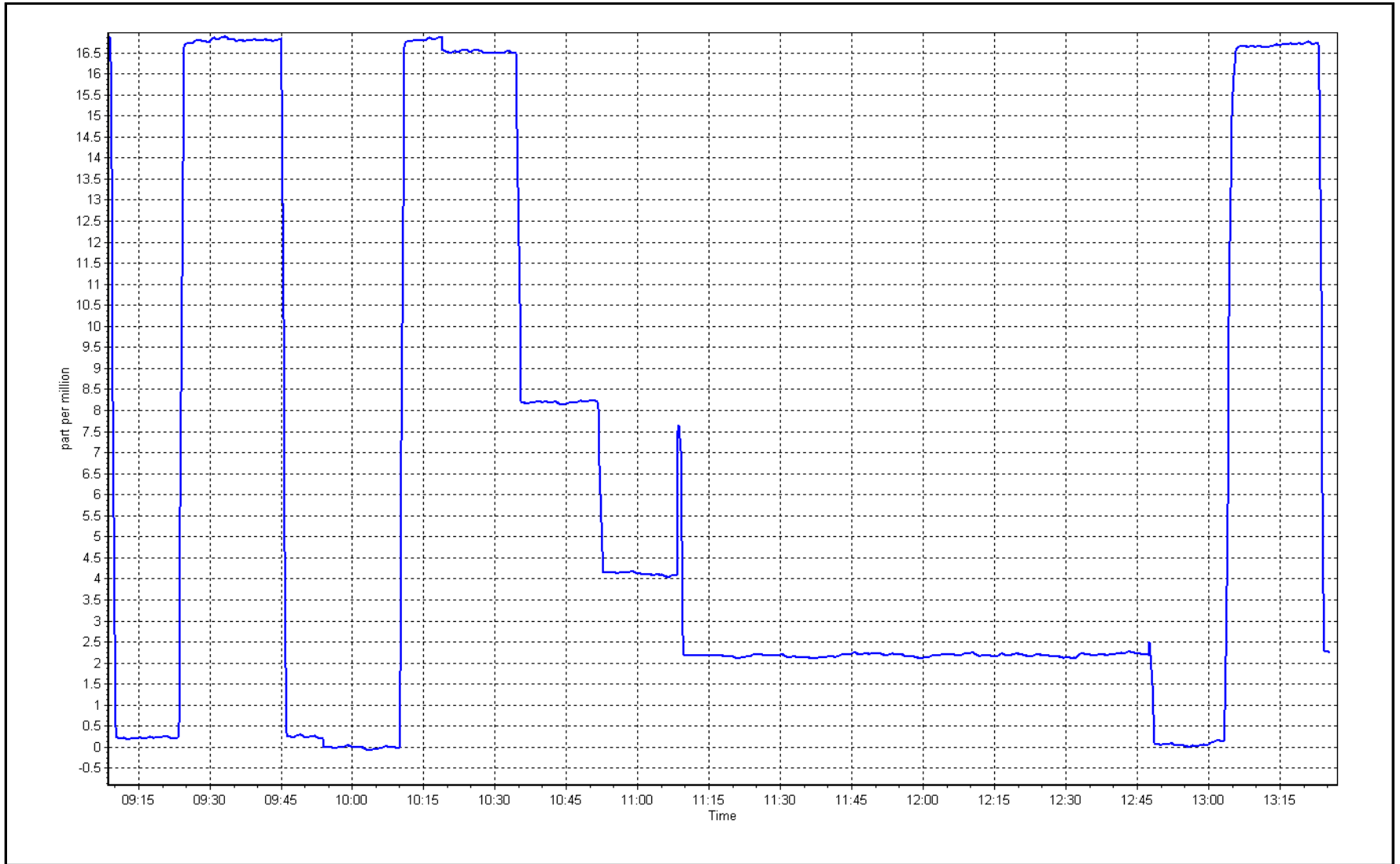




THC Calibration Plot

Date: December 7, 2017

Location: Buffalo Viewpoint





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Buffalo Viewpoint	Station number:	AMS 04
Calibration Date:	December 8, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	8:05	End time (MST):	10:44
Reason:	Routine		

### Calibration Standards

O3 generation mode:	Photometer	O3 reference Date:	Photometer
Calibrator Make/Model:	API T700	Serial Number:	3060
ZAG Make/Model:	API T701	Serial Number:	60

### Analyzer Information

Analyzer make: API T400

Analyzer serial #: 2961

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 500 ppb		Pressure	26.5	26.5
Calculated slope	0.995861	1.002938	Flow	804	804
Calculated intercept	0.425648	0.088394	O3 Measure	3852.1	3852.1
Analyzer Background	-2.2	-2.2			
Analyzer Coefficient	1.041	1.041			

### O<sub>3</sub> Calibration Data

Set Point	Total air flow rate (scm)	Calibrator Lamp Voltage Drive	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5002	0.0	0.0	-0.1	----
as found span	5023	1014.4	400.0	398.5	1.004
calibrator zero	5002	0.0	0.0	0.9	----
high point	5023	1014.4	400.0	399.4	1.002
second point	5024	848.3	200.0	198.3	1.009
third point	5025	741.1	99.0	98.0	1.010
as left zero	5002	0.0	0.0	1.0	----
as left span	5023	1019.4	399.0	400.4	0.997
Average Correction Factor					1.007

Corrected As found	398.60	Previous response	401.24	*% change	0.7%
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\* = > +/-8% change initiates investigation

#### Notes:

No maintenance or adjustments done,

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

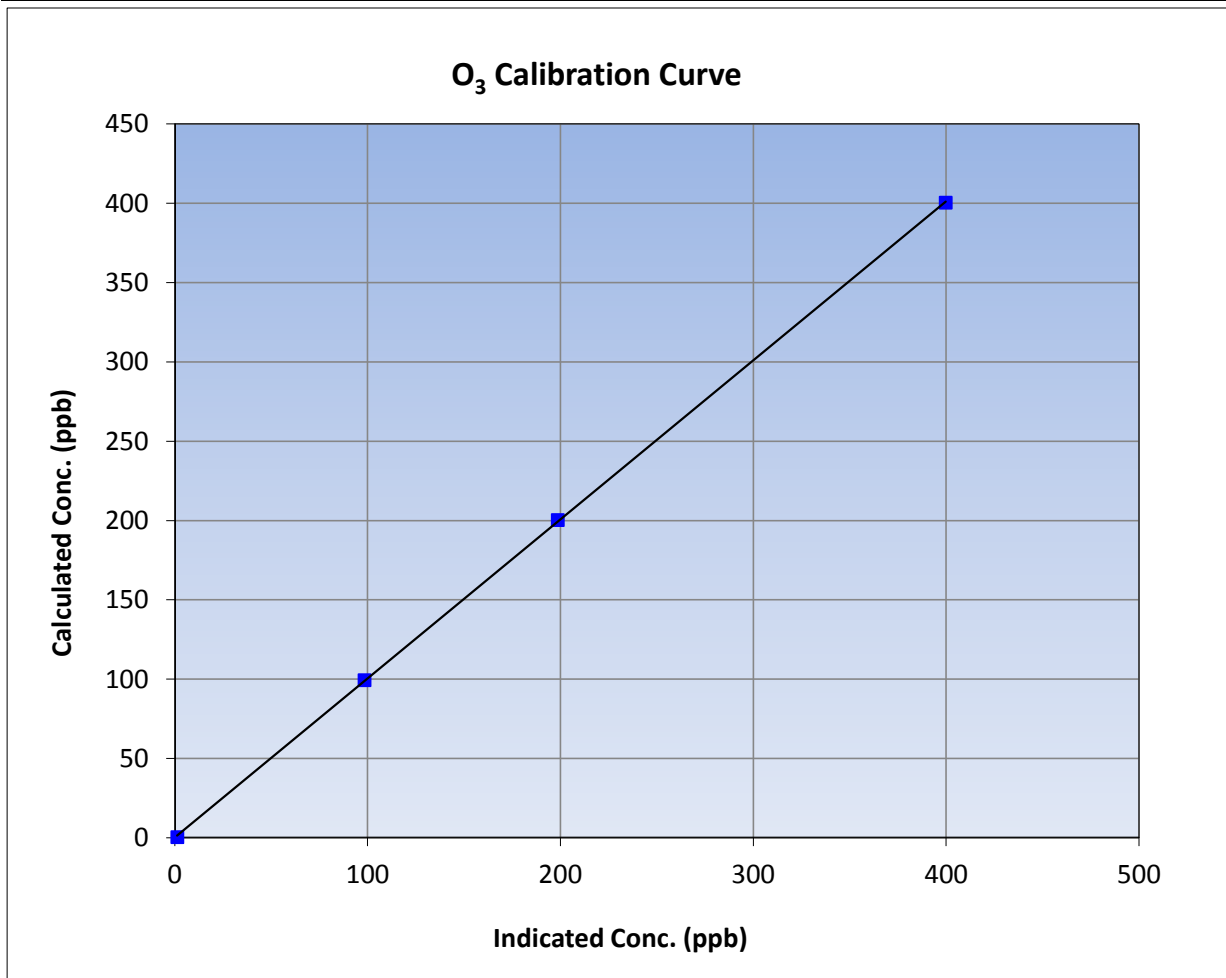
Version-03-2017

### Station Information

Calibration Date	December 8, 2017	Previous Calibration	November 7, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	8:05	End Time (MST)	10:44
Analyzer make	API T400	Analyzer serial #	2961

### Calibration Data

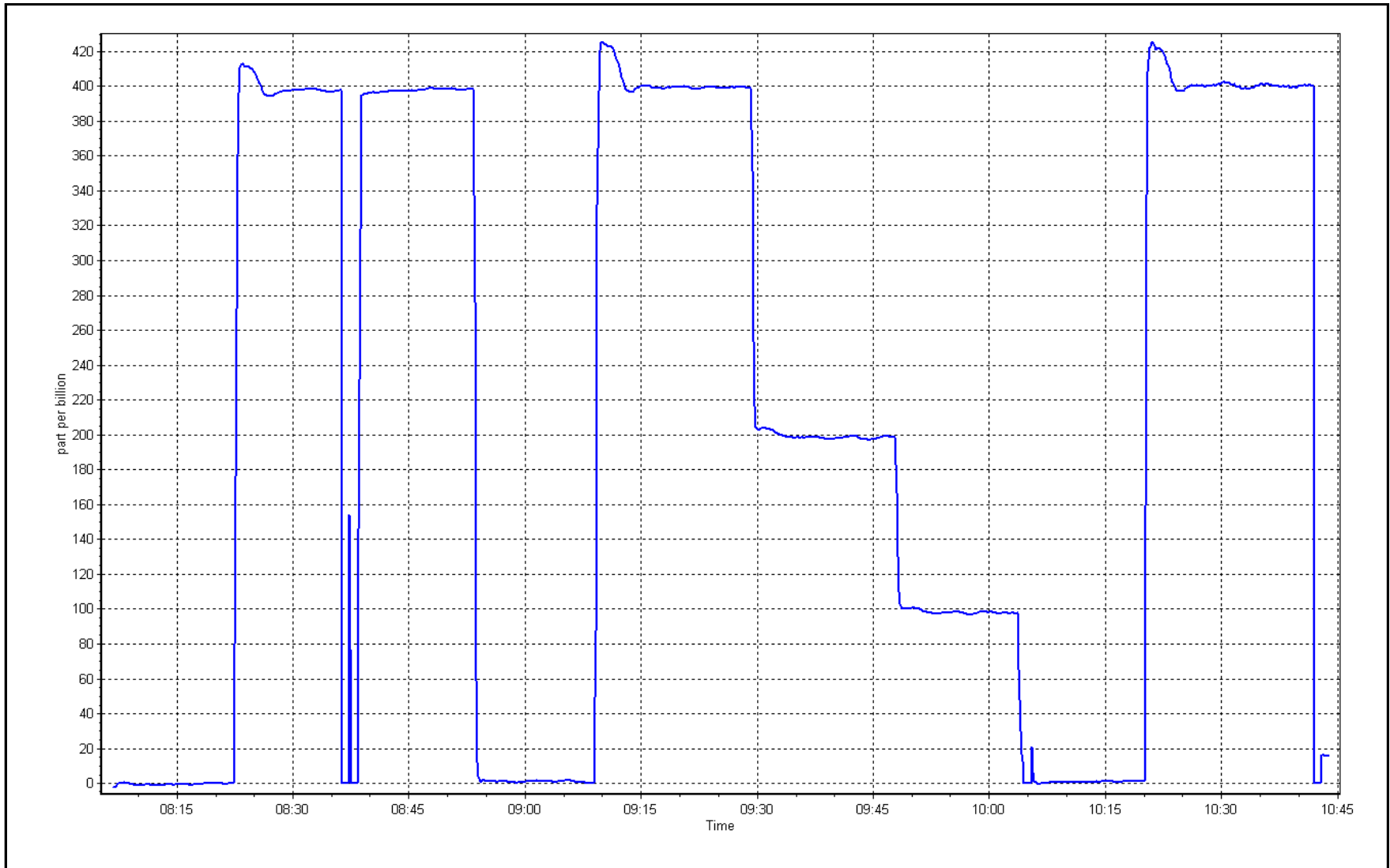
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.9	----	Correlation Coefficient	0.999967	<b>≥0.995</b>
400.0	399.4	1.0015	Slope	1.002938	<b>0.90 - 1.10</b>
200.0	198.3	1.0086	Intercept	0.088394	<b>+/- 10</b>
99.0	98.0	1.0102			



O<sub>3</sub> Calibration Plot

Date: December 8, 2017

Location: Buffalo Viewpoint





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Buffalo Viewpoint	Station number:	AMS 04
Calibration Date:	December 7, 2017	Last Cal Date:	November 6, 2017
Start time (MST):	8:40	End time (MST):	13:26
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL28372	Cal Gas Expiry Date	August-18-20
NOX Cal Gas Conc.	<u>50.9</u> ppb	NO Cal Gas Conc.	<u>50.9</u> ppb
Calibrator Model	API T700	Serial Number	3060
ZAG make/model	API T701	Serial Number	60

### Analyzer Information

Analyzer make: API T200		Analyzer serial #: 1035	
	<u>Start</u>	<u>Finish</u>	
NO coefficient	1.248	1.248	NOX Range (ppb) 0 - 1000 ppb
NOX coefficient	1.247	1.247	PMT Temperature 7.3 7.3
NO2 coefficient	1.000	1.000	Reaction cell Press 4.4 4.4
NO bkgrnd	-0.2	-0.2	Sample Flow 491 491
NOX bkgrnd	0.1	0.1	PMT Voltage 750 750

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.994384	1.002261
NO <sub>x</sub> Cal Offset	1.084856	0.629500
NO Cal Slope	0.996389	1.001010
NO Cal Offset	1.851926	1.840808
NO <sub>2</sub> Cal Slope	0.998476	1.017042
NO <sub>2</sub> Cal Offset	-1.103945	0.756771



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5008	0.0	0.0	0.0	0.0	1.5	-0.7	2.2	----	----
as found span	4932	78.7	799.5	799.5	0.0	798.4	796.6	1.8	1.0013	1.0036
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.3	0.2	----	----
high point	4932	78.7	799.5	799.5	0.0	797.2	798.1	-1.0	1.0028	1.0017
second point	4975	39.3	398.9	398.9	0.0	397.4	394.3	3.0	1.0039	1.0118
third point	4997	19.7	199.9	199.9	0.0	198.1	197.4	0.6	1.0090	1.0126
as left zero	5008	0.0	0.0	0.0	0.0	-0.5	-0.6	0.2	----	----
as left span	4932	78.7	799.5	406.0	393.5	809.7	410.8	398.8	0.9873	0.9883
<b>Average Correction Factor</b>									<b>1.0052</b>	<b>1.0087</b>

Corrected As found	NO <sub>x</sub> = 796.9 ppb	NO = 797.3 ppb		*Percent Change	NO <sub>x</sub> = 0.8%
Previous Response	NO <sub>x</sub> = 802.9 ppb	NO = 800.5 ppb		*Percent Change	NO = 0.4%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	807.9	810.2	-2.2	0.9895	0.9867	----	----
1st NO2 (400 ppb O3)	406.0	404.2	803.1	406.0	397.1	0.9955	----	1.0179	98.2%
2nd NO2 (200 ppb O3)	604.6	205.6	805.7	604.6	201.1	0.9922	----	1.0224	97.8%
3rd NO2 (100 ppb O3)	708.4	101.8	806.8	708.4	98.3	0.9909	----	1.0356	96.6%
2nd NO ref point	----	0.0	800.7	801.9	-1.2	0.9984	0.9970	----	----
<b>Average Correction Factor</b>						<b>0.9943</b>	<b>0.9918</b>	<b>1.0253</b>	<b>97.5%</b>

**Notes:** No maintenance or adjustments done, 2nd NO ref point used during GPT due to drift

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

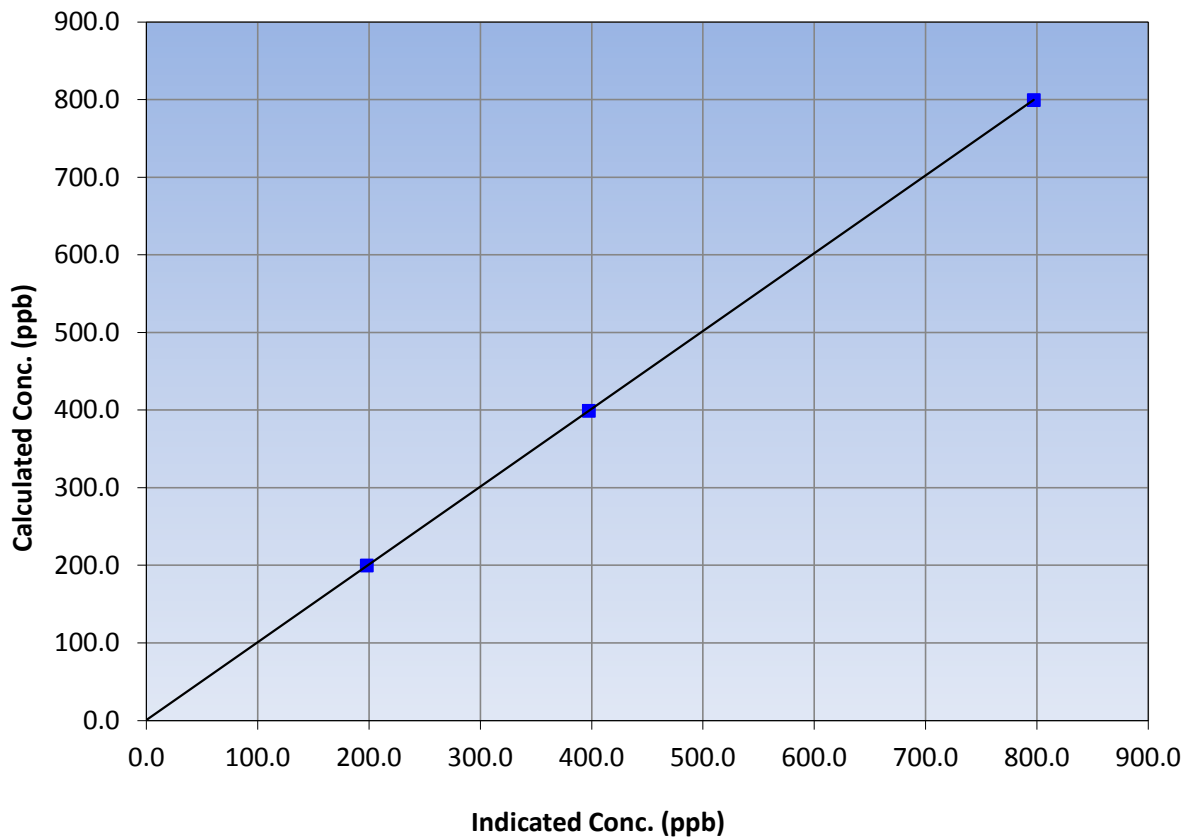
### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	8:40	End Time (MST)	13:26
Analyzer make	API T200	Analyzer serial #	1035

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
799.5	797.2	1.0028			
398.9	397.4	1.0039			
199.9	198.1	1.0090			
			Slope	1.002261	0.90 - 1.10
			Intercept	0.629500	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

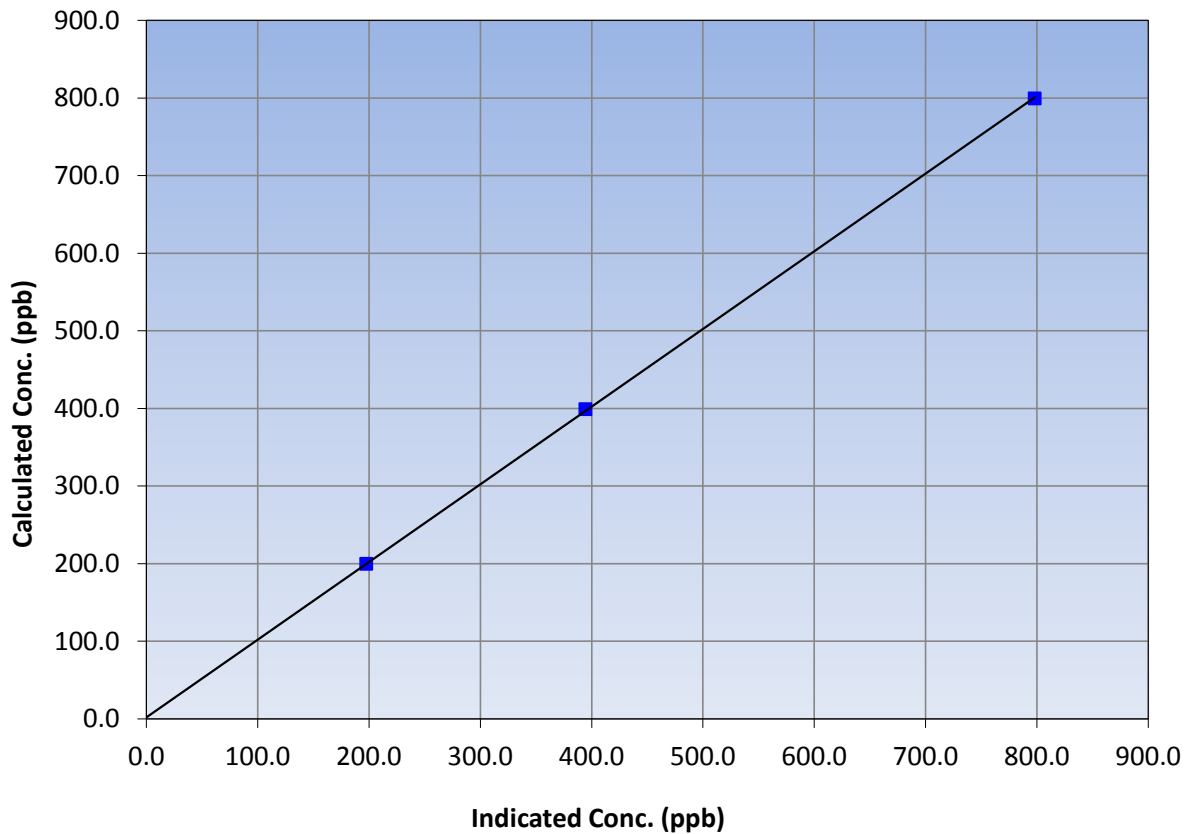
### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	8:40	End Time (MST)	13:26
Analyzer make	API T200	Analyzer serial #	1035

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>
0.0	-0.3	----	Correlation Coefficient	≥0.995
799.5	798.1	1.0017		
398.9	394.3	1.0118		
199.9	197.4	1.0126		
			Slope	0.90 - 1.10
			Intercept	+/-20

**NO Calibration Curve**







# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

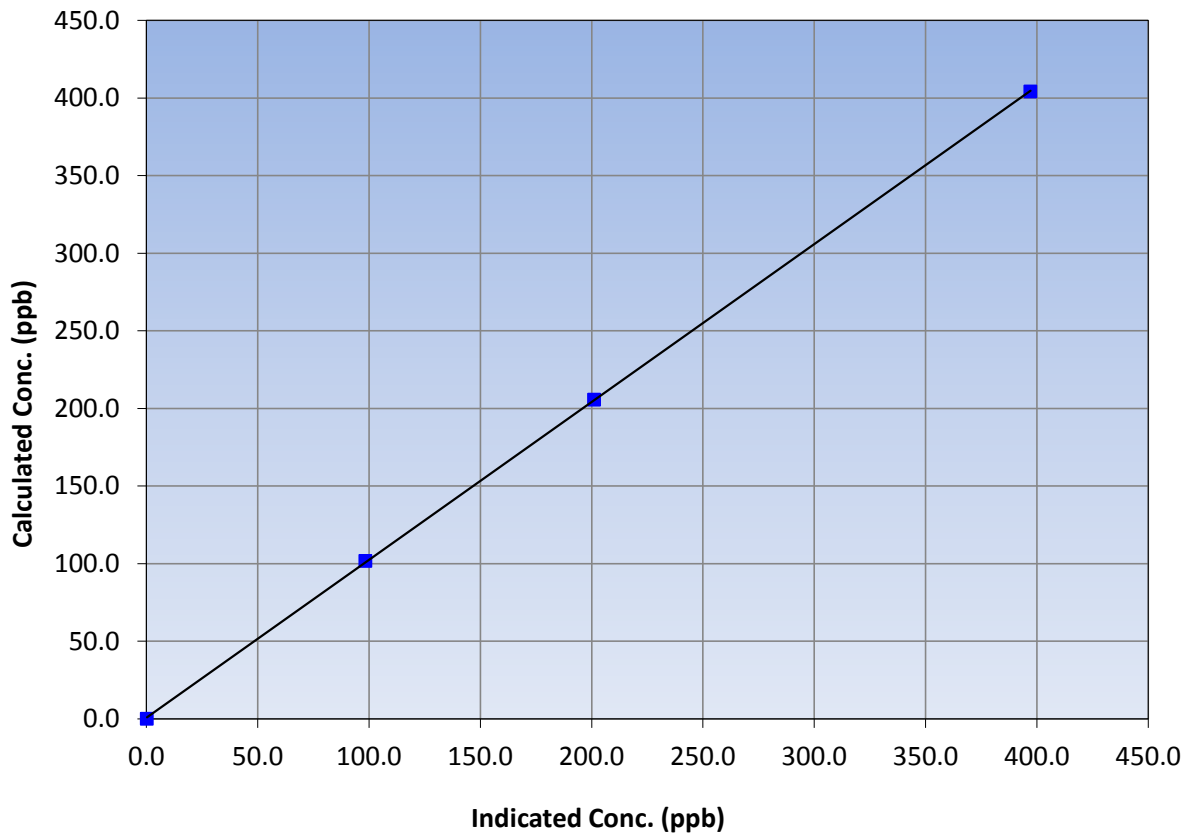
### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Buffalo Viewpoint	Station Number	AMS 04
Start Time (MST)	8:40	End Time (MST)	13:26
Analyzer make	API T200	Analyzer serial #	1035

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.2	----	Correlation Coefficient	≥0.995	
404.2	397.1	1.0179			
205.6	201.1	1.0224			
101.8	98.3	1.0356			
			Slope	1.017042	0.90 - 1.10
			Intercept	0.756771	+/-20

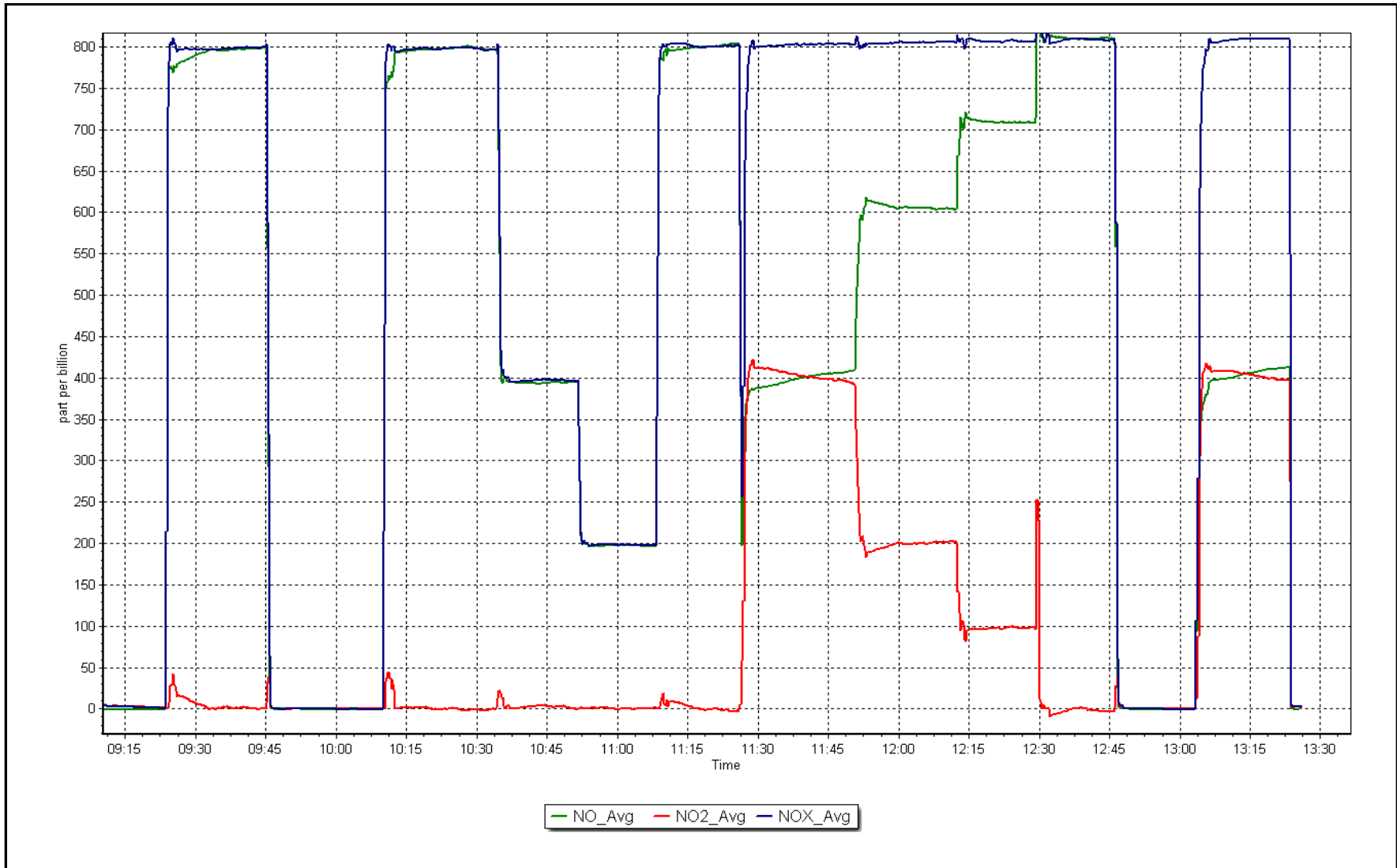
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: December 7, 2017

Location: Buffalo Viewpoint





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Buffalo Viewpoint	Station number:	AMS 04
Calibration Date:	December 8, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	8:22	End time (MST):	8:49
Sharp Model:	Thermo 5030	S/N:	4173
Particulate Fraction:	PM2.5	C14 Source S/N:	E-803
Flow Meter Make/Model:	Delta Cal	S/N:	1450
Temp/RH standard:	Delta Cal	S/N:	1450

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	-7	-6.9	-7	<input type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	979	975	979	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	1000	1000	<input type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	0.1	-----	0.1	<input type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Concentration zero	0.1	-----	0.1	<input type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test: \_\_\_\_\_ Date of check: \_\_\_\_\_ Last Cal Date: November 7, 2017  
 Flow w/o adaptor: \_\_\_\_\_ Flow w/ adaptor: \_\_\_\_\_

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>8061</u>	
Foil Mass: _____	Foil Mass: <u>1159</u>	
Calibration Date: _____	Calibration Date: <u>November 7, 2017</u>	
Correction Factor: _____	Correction Factor: <u>7058</u>	<u>---</u>

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)				<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes:

Cyclone head cleaned, No adjustments Done

Calibration by: Melissa Lemay



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 5  
MANNIX  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)  
DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100	39	0	4	0
H2S (ppb) Average	710	34	34	100	5	0	1	0
THC (ppm) Average	709	35	35	100	7.7	-	3.4	-
Temperature 2 m (C) Average	744	0	0	100	4.6	-	2.4	-
Temperature 20 m (C) Average	710	0	34	95.43	5.5	-	3.7	-
Temperature 45 m (C) Average	744	0	0	100	5.7	-	4.1	-
Temperature 75 m (C) Average	744	0	0	100	5.7	-	4.1	-
Temperature 90 m (C) Average	744	0	0	100	5.7	-	4.1	-
Relative Humidity 2 m (%) Average	744	0	0	100	97	-	93	-
Relative Humidity 20 m (%) Average	710	0	34	95.43	97	-	89	-
Relative Humidity 45 m (%) Average	744	0	0	100	98	-	89	-
Relative Humidity 75 m (%) Average	744	0	0	100	98	-	88	-
Relative Humidity 90 m (%) Average	744	0	0	100	98	-	88	-
Wind Speed 20 m (km/h) Average	666	0	78	89.52	31	-	19	-
Wind Speed 45 m (km/h) Average	723	0	21	97.18	36	-	25	-
Wind Speed 75 m (km/h) Average	739	0	5	99.33	40	-	29	-
Wind Speed 90 m (km/h) Average	724	0	20	97.31	43	-	31	-
Wind Direction 20 m (deg) Average	666	0	78	89.52	-	-	-	-
Wind Direction 45 m (deg) Average	723	0	21	97.18	-	-	-	-
Wind Direction 75 m (deg) Average	739	0	5	99.33	-	-	-	-
Wind Direction 90 m (deg) Average	724	0	20	97.31	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	666	0	78	89.52	1	-	0.7	-
Vertical Wind Speed 45 m (km/h) Average	723	0	21	97.18	2.2	-	1.6	-
Vertical Wind Speed 75 m (km/h) Average	739	0	5	99.33	1.6	-	0.9	-
Vertical Wind Speed 90 m (km/h) Average	724	0	20	97.31	2.1	-	0.6	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)  
DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1	3	-	0	0	0	0	1	2	39
H2S (ppb) Average	710	0.5	0	-	0	0	0	0	1	1	5
THC (ppm) Average	709	2.38	0.4	-	2	2.1	2.2	2.3	2.4	2.7	7.7
Temperature 2 m (C) Average	744	-13.49	11.9	-	-37.4	-30.9	-26.3	-9.1	-3.4	0.2	4.6
Temperature 20 m (C) Average	710	-11.7	11.7	-	-35.7	-29.3	-23.5	-8.2	-1.7	1.5	5.5
Temperature 45 m (C) Average	744	-12.06	12	-	-34.3	-29.4	-23.6	-8.8	-1.1	2	5.7
Temperature 75 m (C) Average	744	-11.64	11.9	-	-34.3	-28.6	-23.3	-8.4	-0.7	2.2	5.7
Temperature 90 m (C) Average	744	-11.51	11.8	-	-34.3	-28.3	-23.3	-8.5	-0.7	2.2	5.7
Relative Humidity 2 m (%) Average	744	80.1	8	-	56	71	74	79	87	92	97
Relative Humidity 20 m (%) Average	710	77.9	9	-	52	69	73	77	84	90	97
Relative Humidity 45 m (%) Average	744	76.7	9	-	51	66	71	75	83	89	98
Relative Humidity 75 m (%) Average	744	75.8	10	-	50	64	70	75	83	88	98
Relative Humidity 90 m (%) Average	744	75.6	10	-	50	64	70	75	83	89	98
Wind Speed 20 m (km/h) Average	666	10.5	6	-	0	4	6	9	14	18	31
Wind Speed 45 m (km/h) Average	723	15	7	-	0	6	10	14	21	25	36
Wind Speed 75 m (km/h) Average	739	17.3	9	-	0	6	10	16	24	29	40
Wind Speed 90 m (km/h) Average	724	18.3	10	-	0	6	10	17	26	32	43
Wind Direction 20 m (deg) Average	666	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	723	-	-	-	-	-	-	-	-	-	-
Wind Direction 75 m (deg) Average	739	-	-	-	-	-	-	-	-	-	-
Wind Direction 90 m (deg) Average	724	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	666	0.06	0.4	-	-0.9	-0.5	-0.2	0	0.3	0.6	1
Vertical Wind Speed 45 m (km/h) Average	723	0.19	0.7	-	-1.6	-0.6	-0.4	0	0.7	1.3	2.2
Vertical Wind Speed 75 m (km/h) Average	739	0.23	0.4	-	-1	-0.1	0	0.2	0.4	0.7	1.6
Vertical Wind Speed 90 m (km/h) Average	724	0.19	0.3	-	-0.7	-0.2	0	0.1	0.3	0.6	2.1

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Temperature, Relative Humidity 20 m	23 Dec 2017 05:00	23 Dec 2017 10:00	6	Flat line in sensor output signal - Sensor frozen
Temperature, Relative Humidity 20 m	23 Dec 2017 17:00	23 Dec 2017 18:00	2	Flat line in sensor output signal - Sensor frozen
Temperature, Relative Humidity 20 m	24 Dec 2017 08:00	24 Dec 2017 09:00	2	Flat line in sensor output signal - Sensor frozen
Temperature, Relative Humidity 20 m	25 Dec 2017 07:00	25 Dec 2017 12:00	6	Flat line in sensor output signal - Sensor frozen
Temperature, Relative Humidity 20 m	25 Dec 2017 22:00	26 Dec 2017 15:00	18	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	04 Dec 2017 10:00	04 Dec 2017 10:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	10 Dec 2017 15:00	11 Dec 2017 23:00	33	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	15 Dec 2017 04:00	15 Dec 2017 09:00	6	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	20 Dec 2017 00:00	20 Dec 2017 00:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	23 Dec 2017 05:00	23 Dec 2017 10:00	6	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	23 Dec 2017 17:00	23 Dec 2017 18:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	24 Dec 2017 03:00	24 Dec 2017 03:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	24 Dec 2017 08:00	24 Dec 2017 09:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	25 Dec 2017 07:00	25 Dec 2017 12:00	6	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	25 Dec 2017 14:00	25 Dec 2017 14:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	25 Dec 2017 17:00	25 Dec 2017 17:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	25 Dec 2017 22:00	26 Dec 2017 15:00	18	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	10 Dec 2017 15:00	11 Dec 2017 06:00	16	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	15 Dec 2017 04:00	15 Dec 2017 08:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	15 Dec 2017 04:00	15 Dec 2017 08:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	10 Dec 2017 14:00	11 Dec 2017 03:00	14	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	15 Dec 2017 04:00	15 Dec 2017 08:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	26 Dec 2017 09:00	26 Dec 2017 09:00	1	Flat line in sensor output signal - Sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 39 ppb on Dec 23 01:00	Maximum Daily Average: 4.5 ppb on Dec 24		Hours of Data:	709
Minimum Value: 0 ppb on Dec 16 01:00	Minimum Daily Average: 0.0 ppb on Dec 17		Hours of Missing Data:	35
Maximum Diurnal Average: 2.7 ppb at hour 8	Minimum Diurnal Average: 0.4 ppb at hour 5		Hours of Calibration:	35
Monthly Average: 1.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 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-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	Z	0	0	1	1	0	1	1	0	1	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0.5	2
3-Dec	0	Z	0	0	0	0	0	0	0	5	13	6	4	4	3	1	0	0	0	0	0	0	0	1.6	13	
4-Dec	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
5-Dec	0	0	0	Z	0	0	0	0	1	5	1	1	1	1	1	1	1	1	0	1	2	1	0	0.8	5	
6-Dec	1	2	3	2	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3	
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1	
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3	2	
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	16	0	3	8	1	6	4	6	2.1	16
11-Dec	6	5	3	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	6	
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0.2	0	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	4	2	1	0	0	0	0	0	0	0	0.4	4	
14-Dec	Z	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	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
18-Dec	0	0	0	0	Z	1	1	0	0	0	1	3	2	3	3	1	2	0	0	0	0	1	2	1.0	3	
19-Dec	1	2	0	1	1	Z	3	9	1	0	1	0	1	1	2	3	2	2	1	1	1	1	0	1.5	9	
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
21-Dec	0	Z	0	0	0	0	1	21	7	2	1	0	0	0	3	0	0	0	0	0	0	1	3	1	1.8	21
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	15	39	25	3.6	39
23-Dec	39	6	5	Z	0	0	0	0	0	1	2	4	4	2	1	1	1	1	2	3	3	3	2	17	4.3	39
24-Dec	13	1	3	14	Z	9	17	20	1	1	2	3	1	1	0	2	3	1	1	1	1	0	4	5	4.5	20
25-Dec	1	2	0	15	0	Z	11	3	2	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	2.0	15
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0.4	1
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1
28-Dec	0	0	Z	0	0	2	18	22	14	3	0	1	2	2	0	0	0	1	0	0	0	0	1	1	3.0	22
29-Dec	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.3	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.4	1
	2.4	0.8	0.7	1.4	0.4	0.8	1.9	2.7	1.1	0.7	0.9	0.8	0.8	0.8	0.7	0.5	1.0	0.4	0.4	0.6	0.4	1.1	2.0	2.0	Diurnal Average	
	39	6	5	15	1	9	18	22	14	5	13	6	4	4	3	3	16	2	3	8	3	15	39	25	Diurnal Maximum	

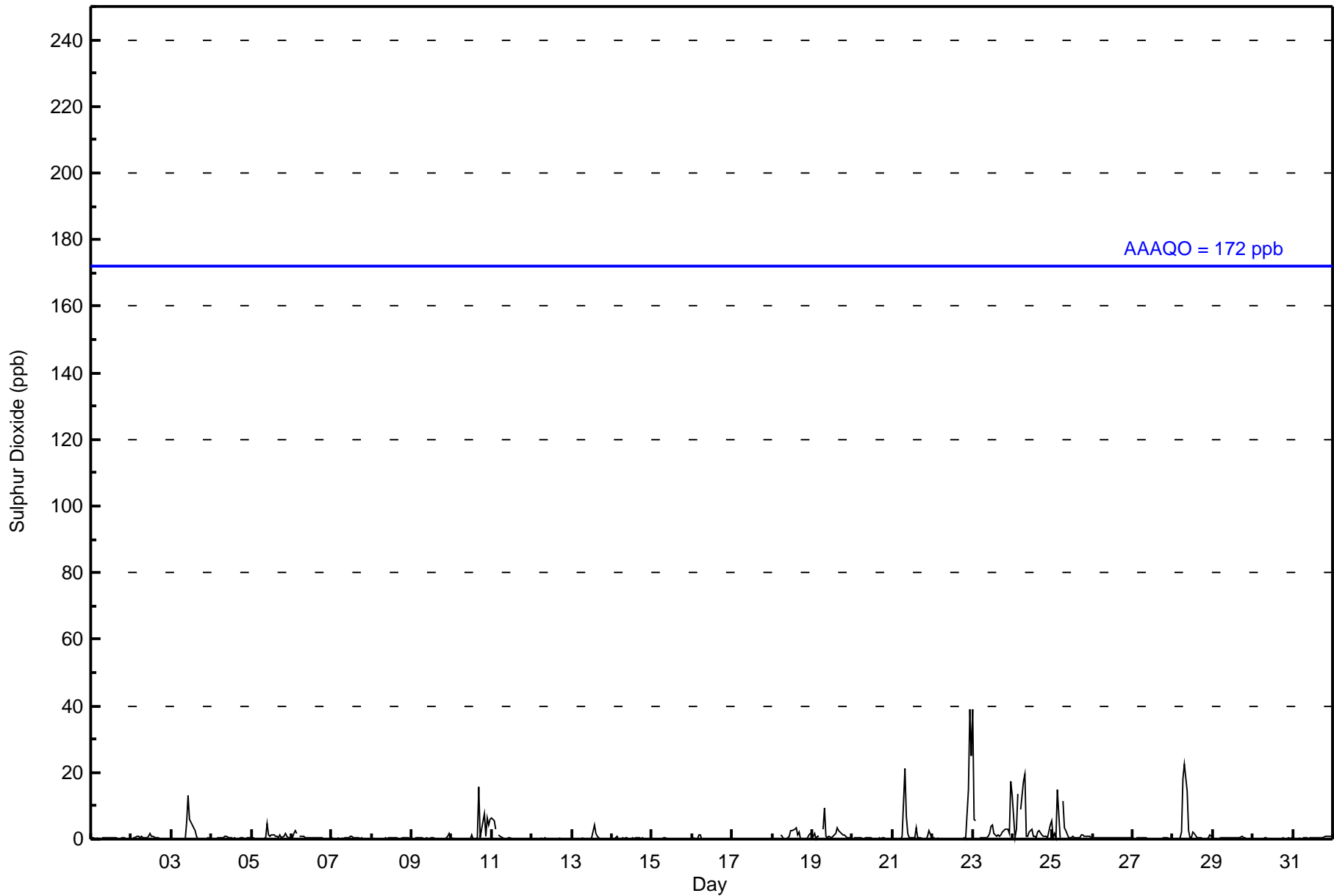
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mannix - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mannix - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	692	97.60	97.60
11 - 20	12	1.69	99.29
21 - 60	5	0.71	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Mannix - December 2017**

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	38	3	5	2	5	46	207	36	17	24	49	68	45	26	17	619
11 - 20	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9
21 - 60	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	41	41	3	5	2	5	46	207	36	17	24	49	68	45	26	18	633

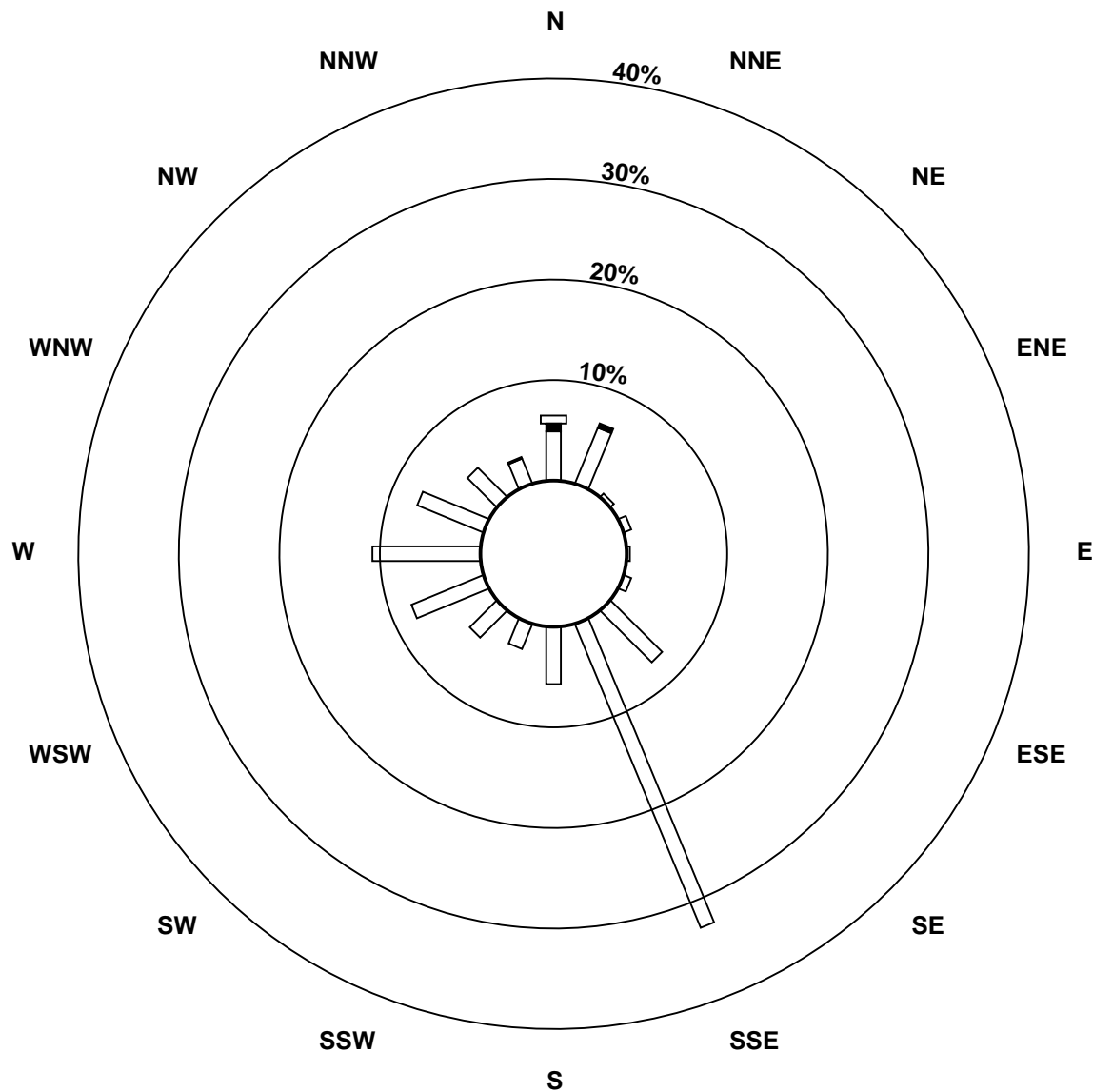
Total Number of Valid Hours: 633

Total Number of Hours: 744

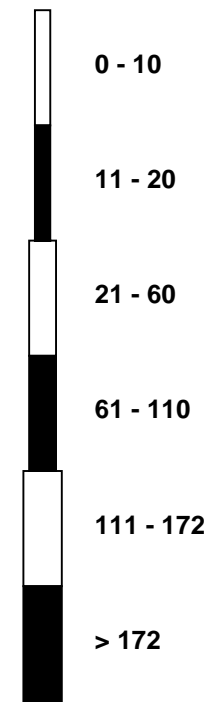


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

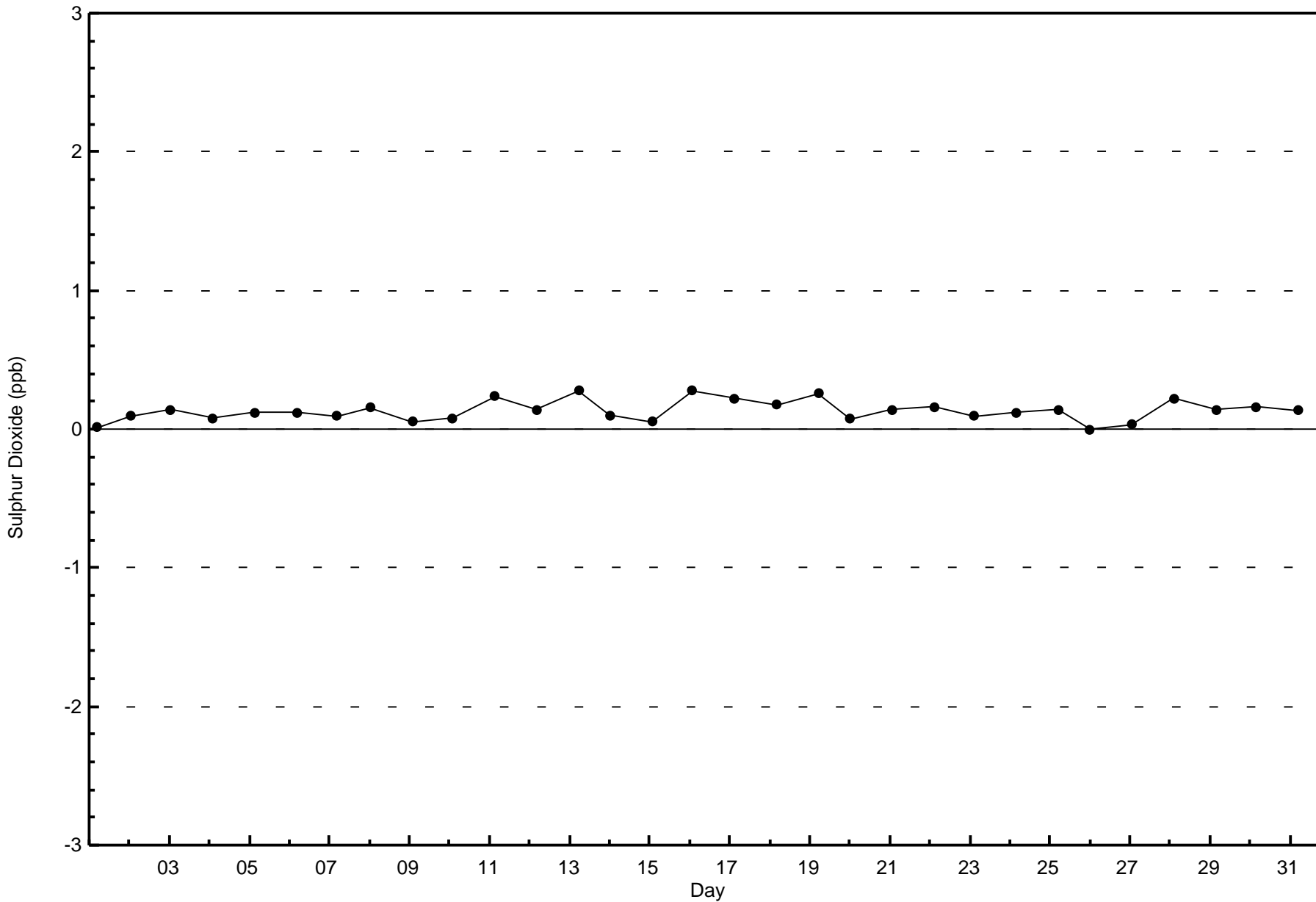
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mannix (AMS 5)

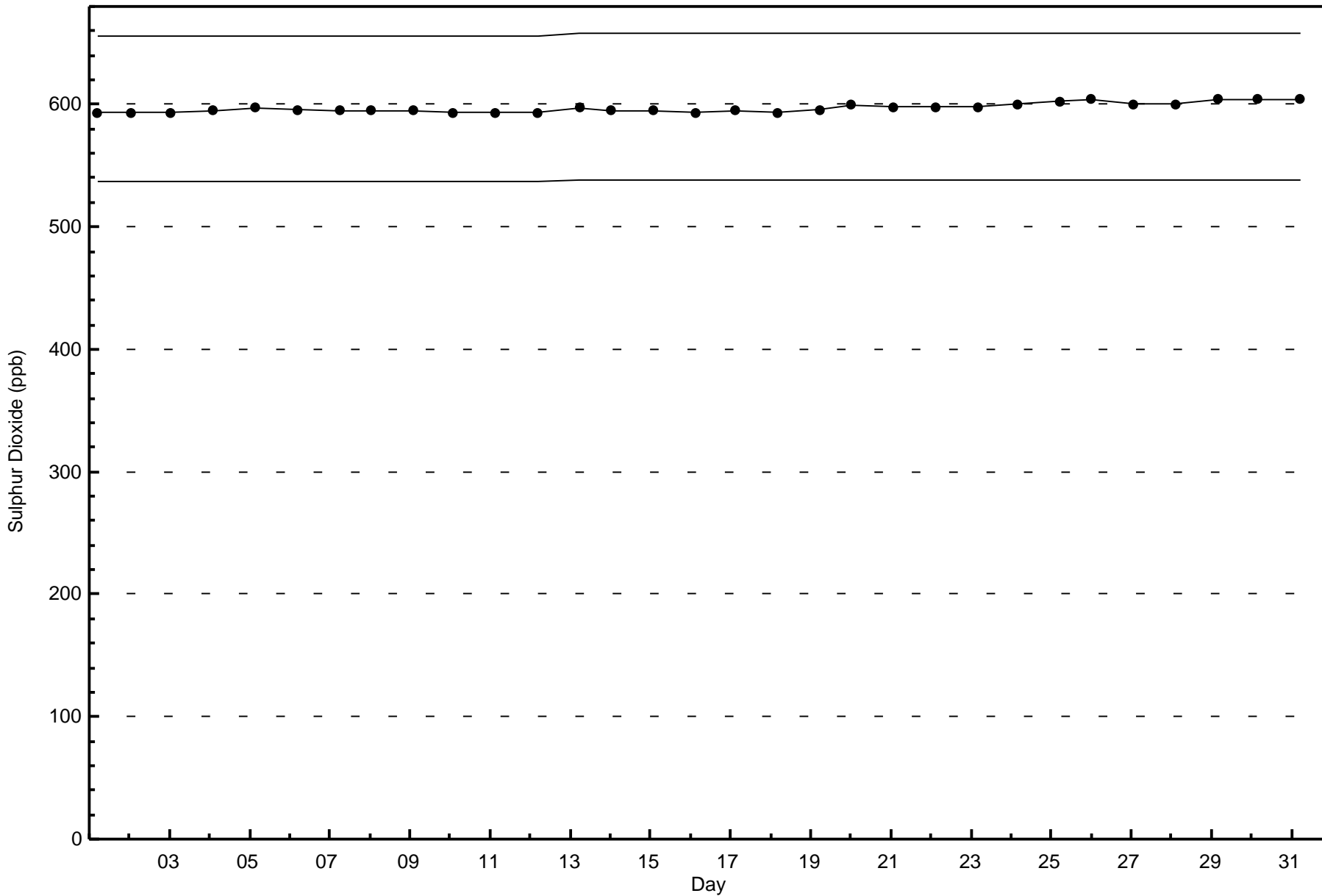


Classes (ppb)



Total Number of Valid Hours: 633







Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb

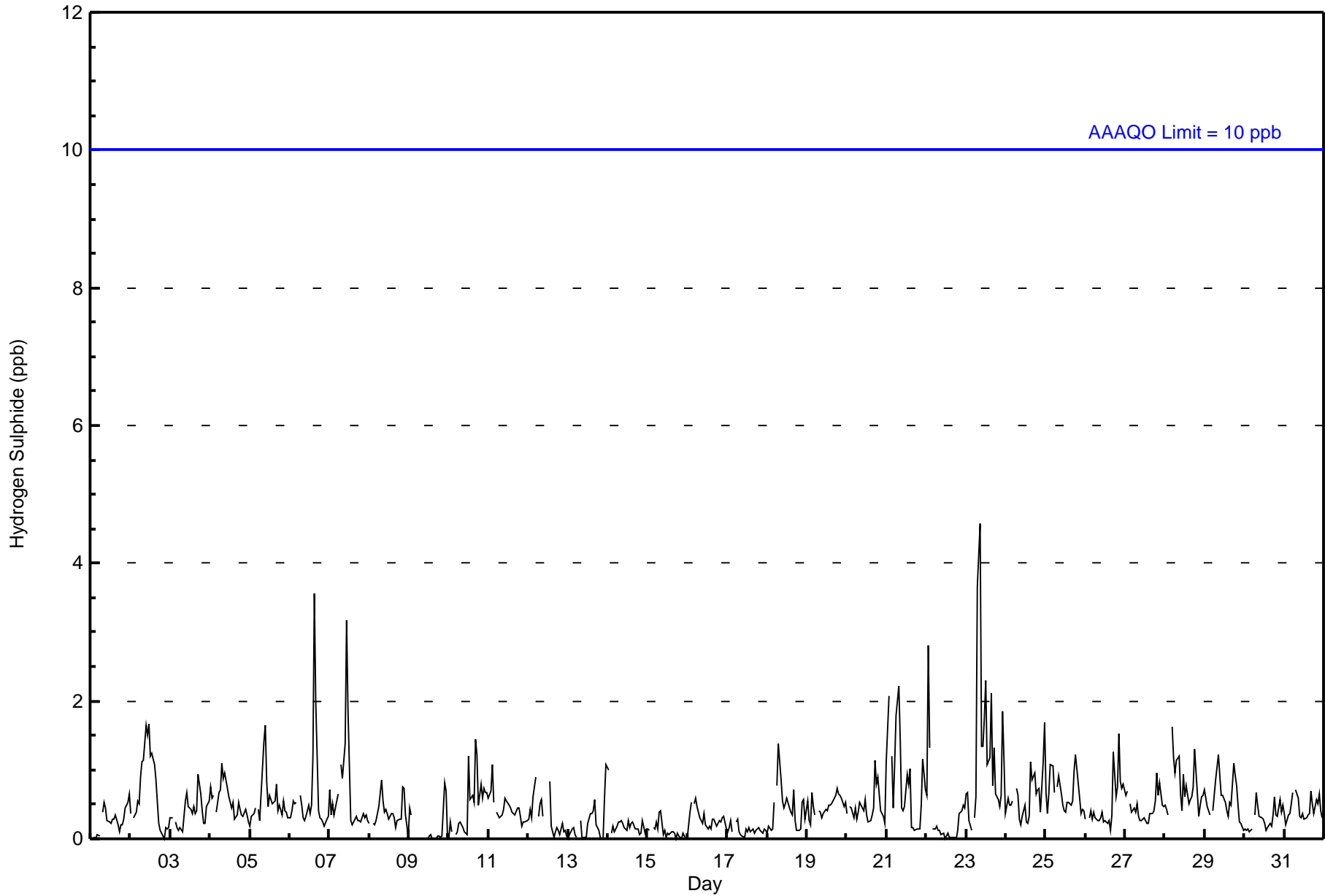
Mannix - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 5 ppb on Dec 23 09:00	Maximum Daily Average: 1.3 ppb on Dec 23		Hours of Data:	710
Minimum Value: 0 ppb on Dec 1 02:00	Minimum Daily Average: 0.1 ppb on Dec 9		Hours of Missing Data:	34
Maximum Diurnal Average: 0.7 ppb at hour 8	Minimum Diurnal Average: 0.4 ppb at hour 21		Hours of Calibration:	34
Monthly Average: 0.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2		Percent Operational Time:	100.0

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

0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.5	0.4	Diurnal Average
1	3	1	1	2	1	2	4	5	2	3	2	2	2	1	1	4	2	1	1	1	2	1	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  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mannix - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	705	99.30	99.30
3 - 4	4	0.56	99.86
5 - 7	1	0.14	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mannix - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2	43	43	2	5	2	3	45	207	37	17	25	48	67	46	25	18	633
3 - 4	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	3
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	43	43	3	5	2	4	45	207	37	17	26	48	67	46	25	18	636

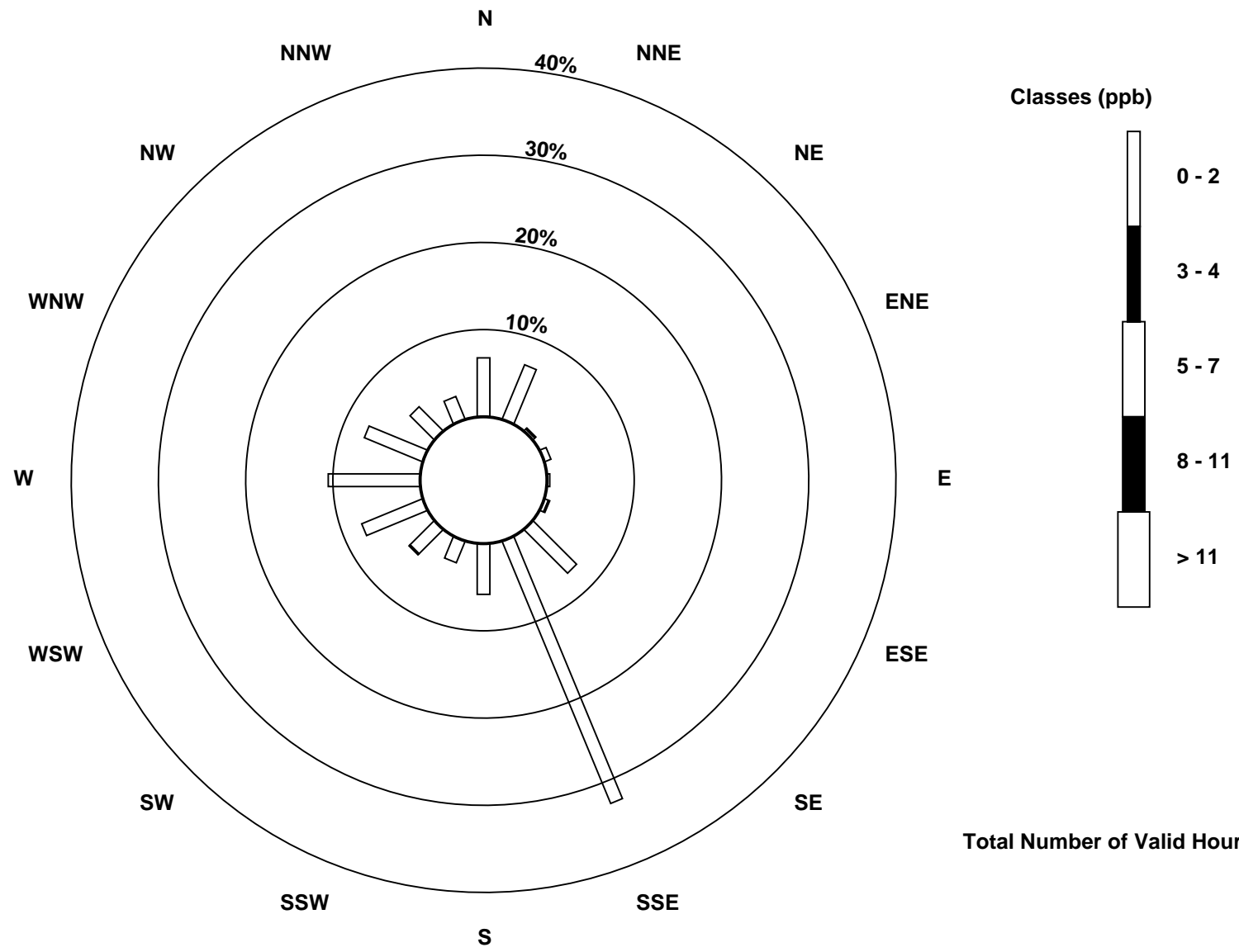
Total Number of Valid Hours: 636

Total Number of Hours: 744

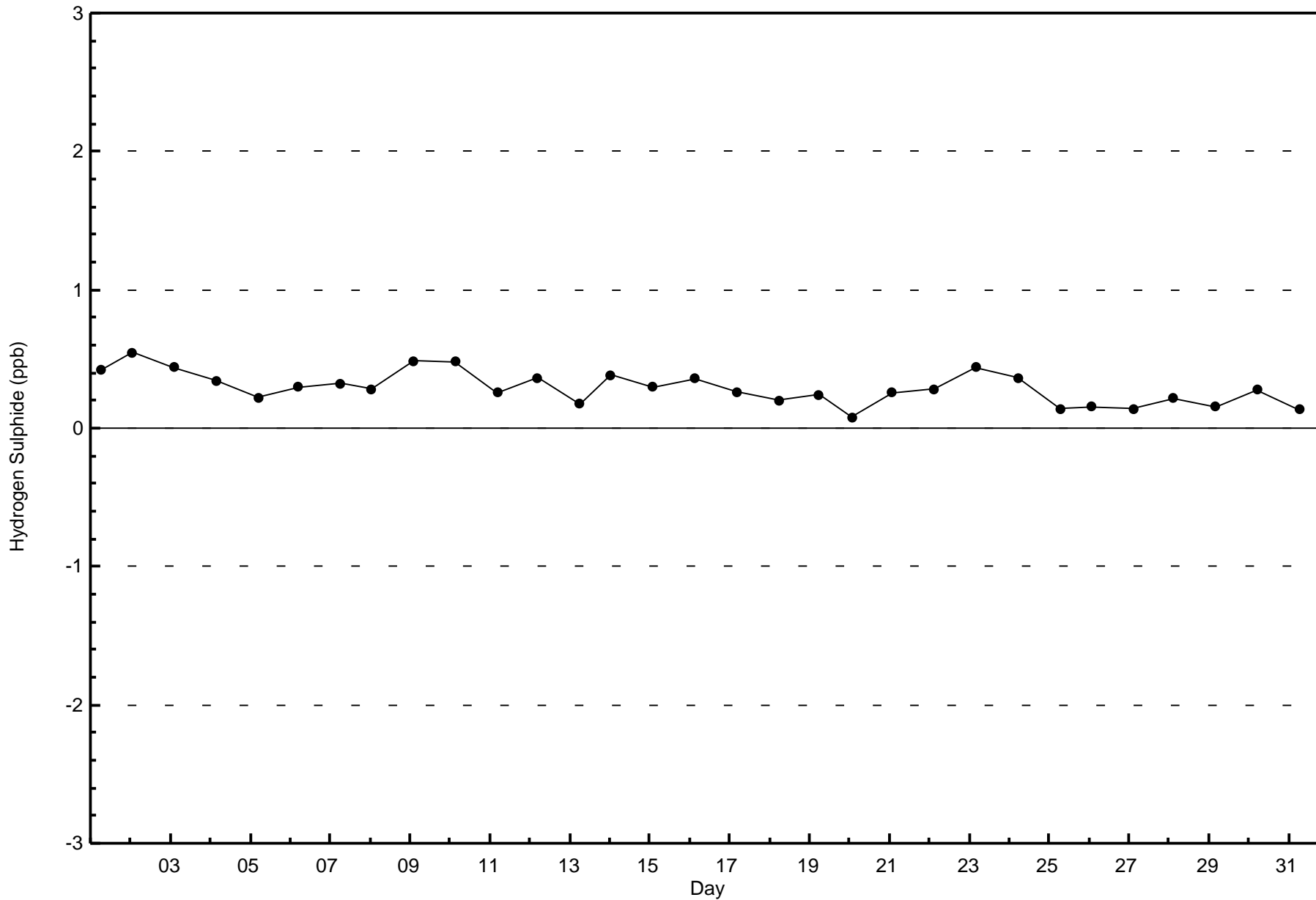


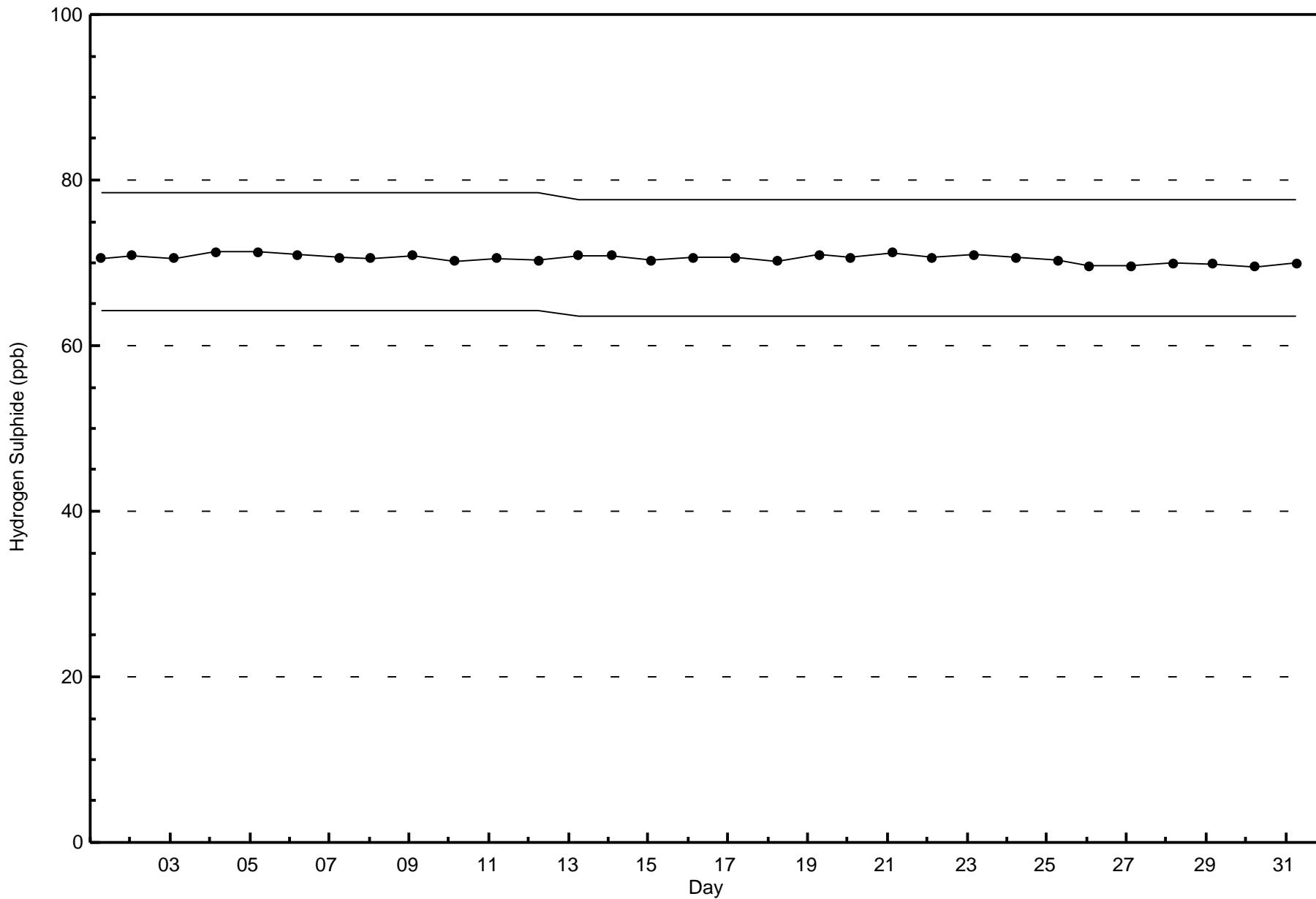
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mannix (AMS 5)

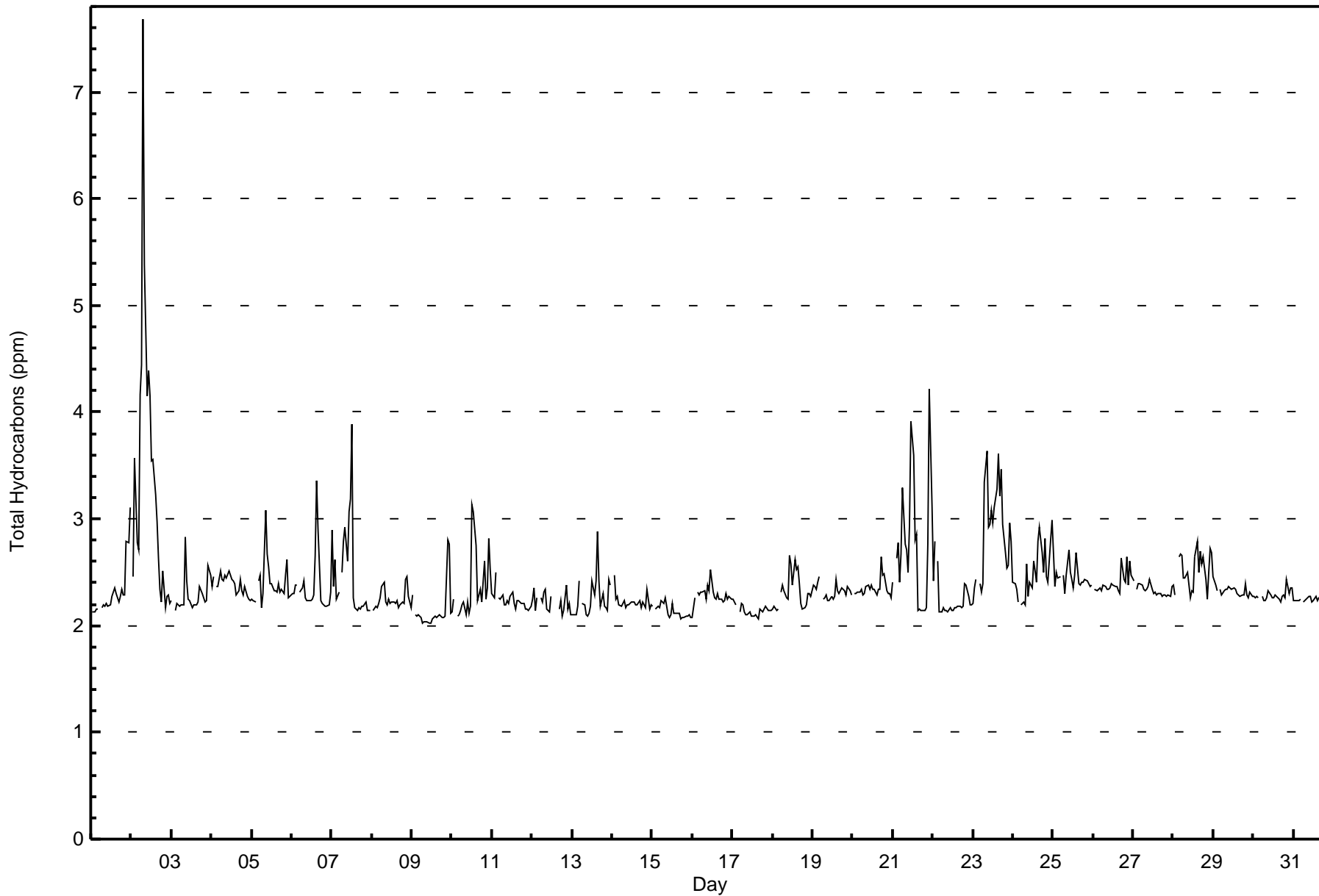


Total Number of Valid Hours: 636











**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mannix - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	6	0.85	0.85
2.1 - 3.0	671	94.64	95.49
3.1 - 10.0	32	4.51	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Mannix - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	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	6	0	0	0	6
2.1 - 3.0	40	40	3	4	2	4	45	204	34	17	22	48	60	42	16	18	599
3.1 - 10.0	1	1	0	1	0	1	1	3	2	0	2	1	2	3	10	0	28
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	41	41	3	5	2	5	46	207	36	17	24	49	68	45	26	18	633

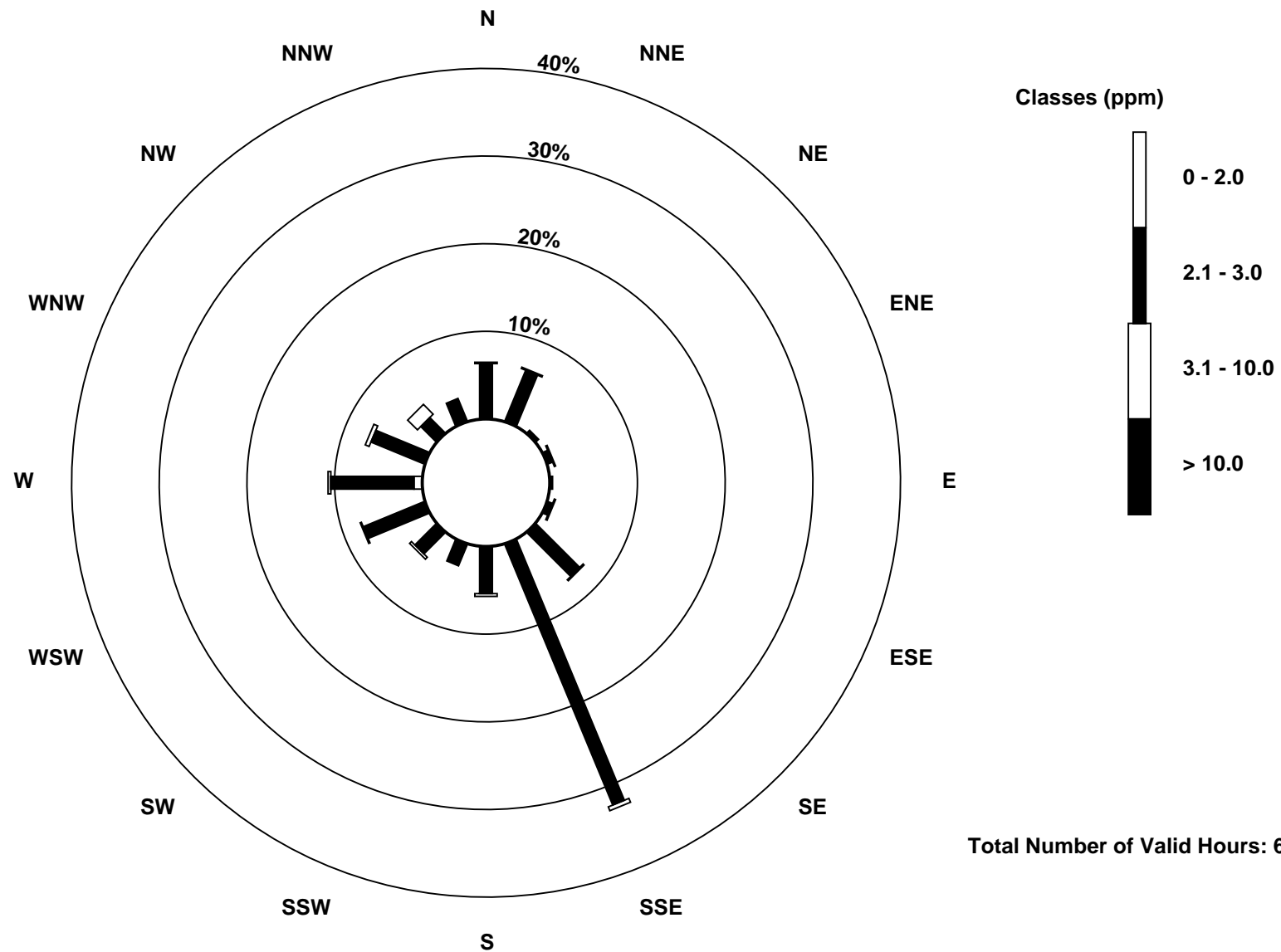
Total Number of Valid Hours: 633

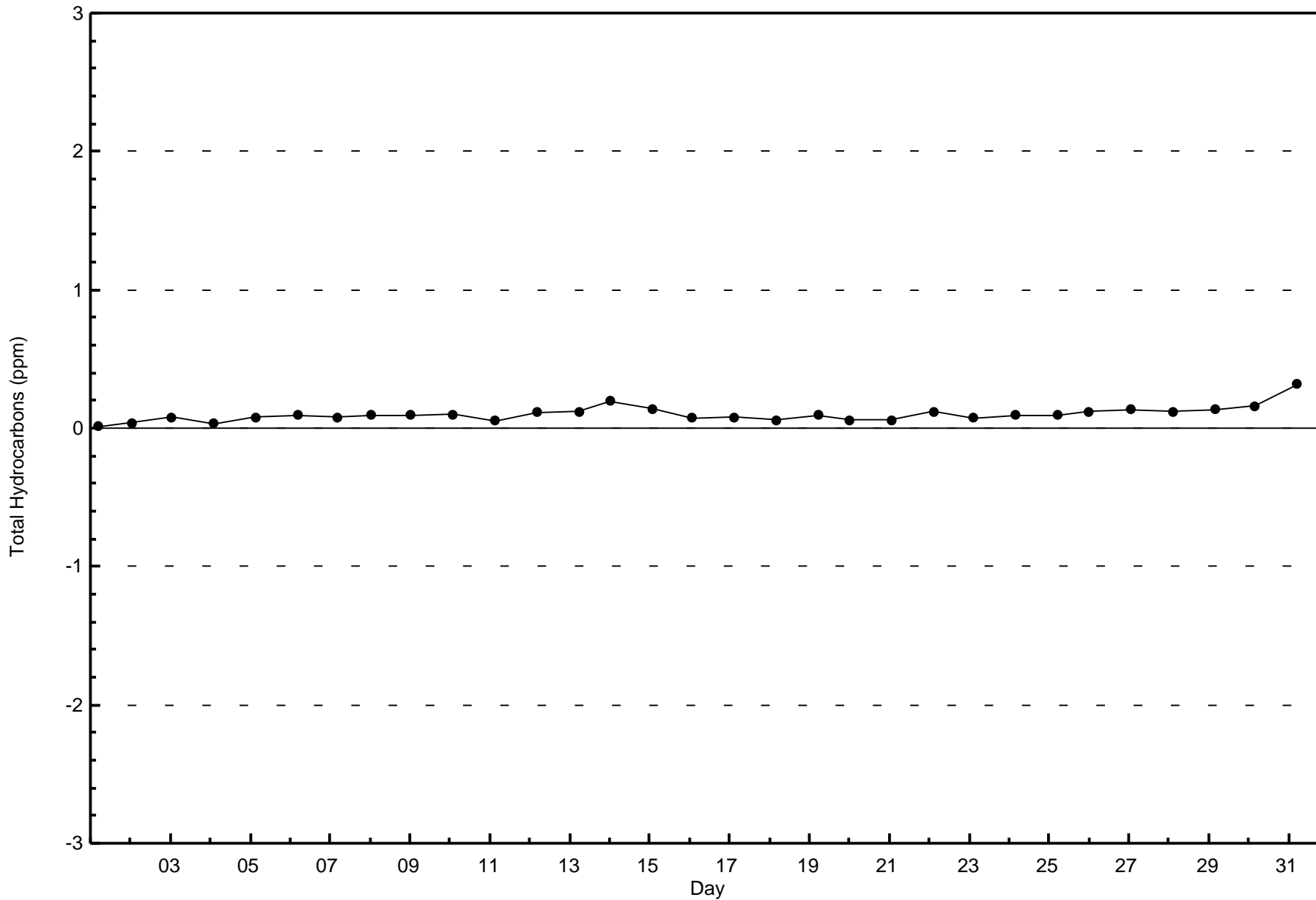
Total Number of Hours: 744

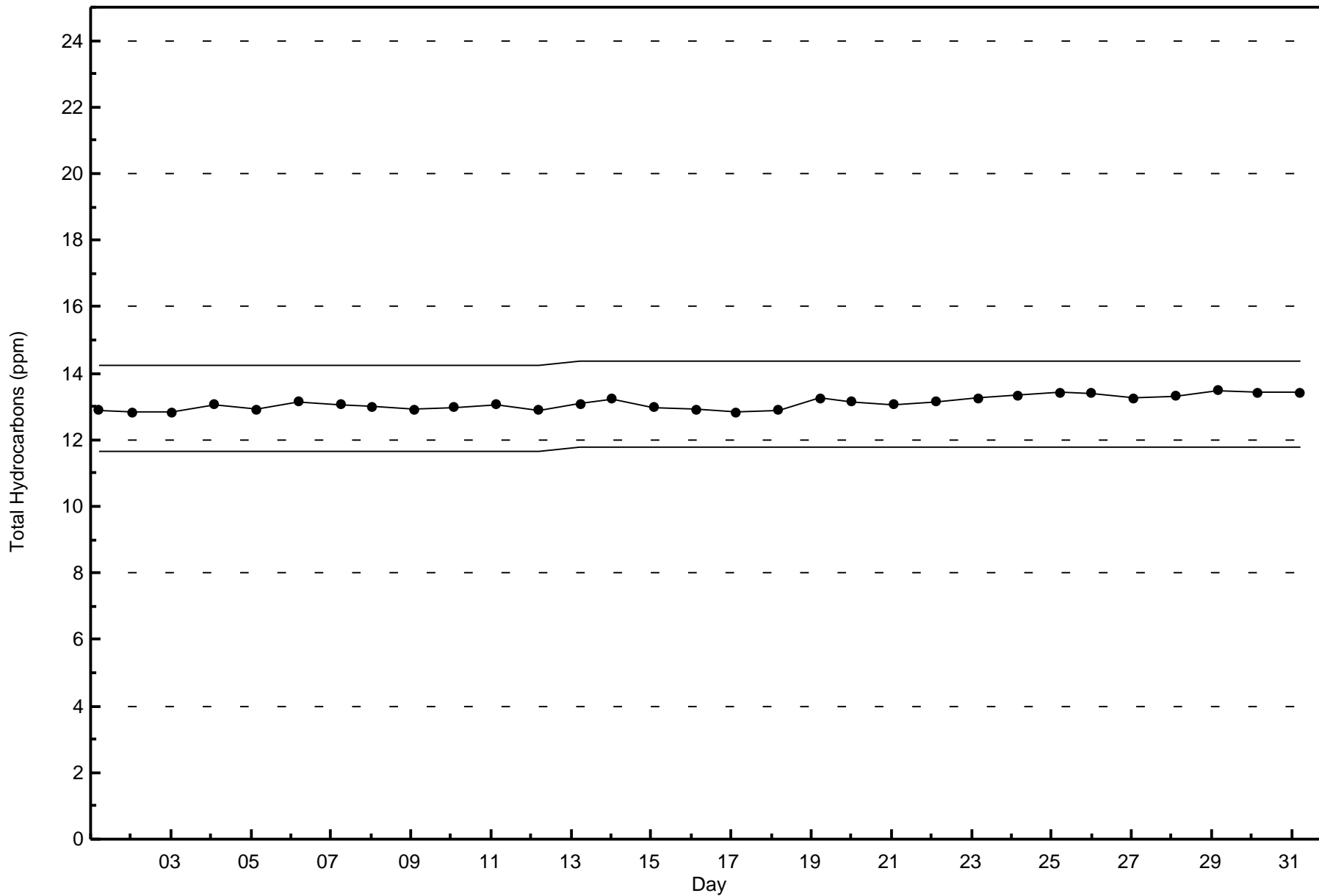


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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







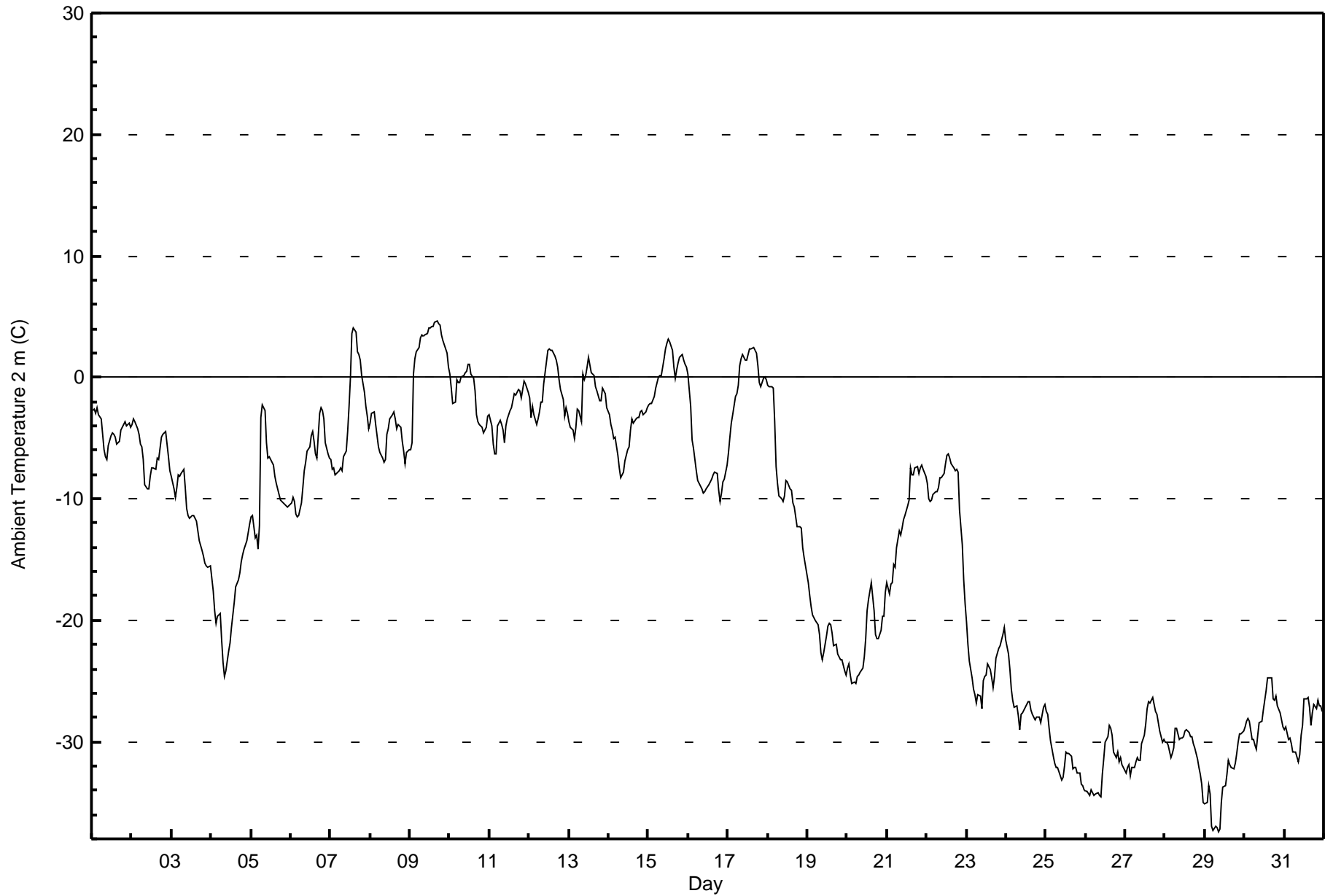


Maximum Value: 4.6 C on Dec 9 17:00		Maximum Daily Average: 2.4 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -37.4 C on Dec 29 09:00		Minimum Daily Average: -33.5 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -11.8 C at hour 15		Minimum Diurnal Average: -14.7 C at hour 6		Hours of Missing Data: 0																																												
Monthly Average: -13.49 C		Percentiles: P <sub>1</sub> = -35.1 P <sub>10</sub> = -30.9 Q <sub>1</sub> = -26.3 Median = -9.1 Q <sub>3</sub> = -3.4 P <sub>90</sub> = 0.2 P <sub>99</sub> = 4.0		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-2.7	-2.6	-2.9	-2.5	-3.1	-3.4	-4.7	-6.0	-6.5	-6.8	-5.6	-4.8	-4.6	-4.7	-4.9	-5.5	-5.2	-4.4	-4.1	-3.9	-3.6	-4.0	-3.7	-4.1	-4.3	-2.5																						
2-Dec	-3.9	-3.5	-3.7	-4.2	-4.7	-5.5	-5.7	-6.7	-8.8	-9.2	-9.1	-8.2	-7.5	-7.5	-7.6	-6.7	-6.7	-5.9	-5.0	-4.6	-4.5	-5.5	-6.5	-7.6	-6.2	-3.5																						
3-Dec	-8.2	-9.1	-9.9	-9.1	-8.1	-8.1	-7.9	-7.6	-9.1	-10.7	-11.4	-11.6	-11.3	-11.4	-11.6	-11.8	-12.6	-13.4	-14.3	-14.7	-15.3	-15.6	-15.7	-15.5	-11.4	-7.6																						
4-Dec	-16.6	-17.6	-19.2	-20.3	-19.7	-19.5	-21.6	-23.5	-24.7	-24.2	-22.5	-21.8	-20.6	-19.5	-18.6	-17.3	-16.7	-16.1	-15.1	-14.6	-14.1	-13.5	-12.7	-12.1	-18.4	-12.1																						
5-Dec	-11.4	-11.4	-13.2	-13.0	-14.1	-12.2	-3.3	-2.3	-2.7	-5.4	-6.7	-6.6	-6.8	-7.3	-8.1	-8.8	-9.2	-9.6	-10.1	-10.3	-10.5	-10.6	-10.7	-10.6	-9.0	-2.3																						
6-Dec	-10.4	-9.8	-10.2	-11.3	-11.5	-11.4	-10.3	-9.1	-7.7	-7.0	-6.1	-5.7	-4.9	-4.4	-5.2	-6.3	-6.7	-2.9	-2.5	-2.7	-3.4	-5.4	-6.3	-6.6	-7.0	-2.5																						
7-Dec	-6.7	-7.5	-7.4	-8.0	-7.8	-7.7	-7.4	-7.7	-6.5	-6.1	-4.5	-2.4	0.1	3.6	4.1	3.8	2.1	1.9	1.4	0.2	-1.3	-2.4	-3.2	-4.3	-3.1	4.1																						
8-Dec	-3.7	-3.0	-2.8	-3.9	-4.8	-5.7	-6.2	-6.7	-7.0	-6.8	-4.7	-4.3	-3.4	-3.0	-2.8	-3.4	-4.2	-3.8	-4.1	-5.3	-6.0	-7.1	-6.2	-6.0	-4.8	-2.8																						
9-Dec	-6.0	-5.4	0.3	1.5	2.1	2.5	3.2	3.5	3.4	3.5	3.6	4.0	4.1	4.2	4.2	4.6	4.6	4.4	4.3	3.5	3.0	2.3	2.0	0.9	2.4	4.6																						
10-Dec	0.3	-0.9	-2.2	-2.1	-0.2	-0.4	-0.4	0.0	0.2	0.3	0.5	1.1	1.1	0.3	0.0	-1.1	-3.0	-3.7	-3.9	-4.1	-4.5	-4.3	-4.1	-3.2	-1.4	1.1																						
11-Dec	-3.1	-4.0	-5.5	-6.3	-6.3	-4.0	-3.5	-3.9	-4.3	-5.4	-3.9	-3.5	-2.8	-2.5	-1.9	-1.4	-1.4	-1.0	-1.1	-1.7	-1.0	-0.3	-0.5	-1.2	-2.9	-0.3																						
12-Dec	-1.7	-3.3	-2.4	-3.1	-3.9	-3.4	-2.8	-2.1	-2.0	-0.5	1.3	2.2	2.4	2.3	2.2	1.8	1.4	0.9	-0.2	-1.0	-1.9	-3.2	-2.5	-3.0	-0.9	2.4																						
13-Dec	-3.7	-4.1	-4.4	-5.0	-4.1	-2.7	-2.8	-3.6	0.2	-0.2	0.2	0.8	1.6	0.4	0.3	0.2	-0.8	-1.1	-2.0	-1.9	-0.9	-1.1	-1.4	-2.5	-1.6	1.6																						
14-Dec	-3.1	-3.9	-4.4	-5.0	-4.9	-6.4	-7.5	-8.2	-8.0	-7.8	-6.9	-5.9	-5.8	-4.3	-3.4	-3.7	-3.4	-3.3	-3.4	-2.9	-2.7	-3.1	-2.9	-2.4	-4.7	-2.4																						
15-Dec	-2.2	-2.2	-2.2	-1.6	-0.9	-0.4	0.0	0.1	0.2	1.6	2.3	2.8	3.1	2.9	2.2	0.9	-0.1	0.6	1.2	1.7	1.8	1.4	1.1	0.8	0.6	3.1																						
16-Dec	0.3	-2.4	-5.1	-5.9	-6.8	-7.7	-8.5	-8.9	-9.2	-9.5	-9.4	-9.2	-8.8	-8.6	-8.4	-8.0	-7.8	-8.0	-9.4	-10.3	-9.5	-8.7	-8.4	-7.2	-7.7	0.3																						
17-Dec	-6.2	-5.0	-3.8	-3.1	-1.6	-1.4	-0.7	1.0	1.5	1.8	1.5	1.4	1.9	2.3	2.4	2.5	2.3	1.9	1.0	-0.4	-0.8	-0.1	0.0	-0.2	-0.1	2.5																						
18-Dec	-0.7	-0.8	-0.8	-0.9	-3.6	-7.3	-8.7	-9.7	-10.0	-10.2	-9.8	-8.5	-8.6	-9.1	-9.3	-10.3	-10.7	-11.4	-12.3	-12.3	-12.4	-14.1	-14.8	-15.6	-8.8	-0.7																						
19-Dec	-16.9	-17.9	-18.9	-19.5	-19.8	-20.0	-20.4	-21.2	-22.7	-23.3	-22.7	-21.3	-20.4	-20.2	-20.3	-21.0	-22.1	-22.0	-22.8	-23.0	-23.2	-23.2	-24.2	-24.5	-21.3	-16.9																						
20-Dec	-24.0	-23.6	-24.5	-25.2	-25.1	-25.2	-24.7	-24.5	-24.2	-23.9	-23.0	-21.5	-19.2	-18.3	-17.0	-18.0	-19.3	-21.2	-21.5	-21.5	-20.9	-19.7	-19.6	-17.7	-21.8	-17.0																						
21-Dec	-16.9	-17.8	-17.0	-17.0	-15.4	-15.6	-14.1	-12.7	-13.0	-12.4	-11.8	-11.4	-10.6	-10.1	-7.5	-8.0	-8.1	-7.5	-7.3	-8.0	-7.5	-7.2	-7.6	-8.2	-11.4	-7.2																						
22-Dec	-8.7	-9.9	-10.3	-10.2	-9.7	-9.4	-9.4	-9.1	-8.3	-8.3	-7.9	-7.1	-6.4	-6.3	-6.7	-7.1	-7.4	-7.6	-7.6	-7.8	-11.0	-13.8	-16.6	-18.7	-9.4	-6.3																						
23-Dec	-20.2	-22.0	-23.4	-24.8	-25.7	-26.2	-26.8	-26.1	-26.3	-27.3	-25.0	-24.6	-24.5	-23.6	-24.1	-24.8	-25.6	-24.7	-23.2	-22.4	-22.1	-21.6	-21.2	-20.6	-24.0	-20.2																						
24-Dec	-21.6	-22.8	-24.1	-25.7	-26.6	-27.1	-27.0	-27.8	-29.0	-27.8	-27.6	-27.2	-27.0	-26.8	-26.7	-27.4	-27.8	-28.3	-27.9	-27.9	-28.0	-28.5	-27.2	-27.0	-26.9	-21.6																						
25-Dec	-27.5	-27.7	-28.9	-30.0	-31.2	-31.8	-32.1	-32.1	-32.5	-33.2	-32.9	-32.0	-30.8	-31.0	-30.9	-31.2	-32.2	-32.1	-32.1	-32.6	-32.6	-33.5	-33.6	-33.9	-31.6	-27.5																						
26-Dec	-34.1	-34.1	-34.4	-34.0	-34.2	-34.4	-34.3	-34.2	-34.5	-34.6	-32.7	-31.5	-30.0	-29.6	-28.7	-28.9	-29.5	-30.9	-31.3	-30.8	-31.6	-31.3	-31.9	-32.1	-32.2	-28.7																						
27-Dec	-32.6	-32.1	-31.9	-32.8	-32.2	-32.1	-31.7	-31.3	-31.5	-31.5	-30.2	-29.5	-28.6	-27.2	-26.7	-26.8	-26.3	-26.9	-27.6	-27.8	-28.5	-29.1	-30.1	-29.8	-29.8	-26.3																						
28-Dec	-30.1	-30.0	-30.2	-31.3	-31.0	-30.5	-28.9	-28.9	-29.8	-29.7	-29.7	-29.6	-29.2	-29.0	-29.3	-29.6	-29.6	-30.1	-30.5	-31.4	-32.1	-32.7	-33.5	-35.0	-30.5	-28.9																						
29-Dec	-35.2	-35.1	-33.6	-34.3	-37.0	-37.3	-37.0	-37.1	-37.4	-37.2	-35.0	-33.8	-33.6	-32.7	-31.5	-31.9	-32.1	-32.2	-31.7	-31.0	-30.1	-29.4	-29.4	-29.1	-33.5	-29.1																						
30-Dec	-28.7	-28.4	-28.1	-28.3	-29.8	-29.8	-30.3	-30.6	-29.5	-28.5	-28.3	-27.4	-26.6	-25.8	-24.8	-24.7	-24.8	-26.4	-26.6	-26.2	-27.1	-27.7	-28.2	-28.7	-27.7	-24.7																						
31-Dec	-29.0	-28.7	-29.8	-29.7	-30.2	-30.9	-30.8	-30.8	-31.7	-31.0	-29.5	-28.6	-26.5	-26.4	-26.4	-27.2	-28.7	-27.6	-26.9	-27.2	-26.6	-27.0	-27.1	-27.5	-28.6	-26.4																						
																								-13.4	-13.8	-14.0	-14.4	-14.6	-14.7	-14.4	-14.4	-14.6	-14.6	-13.8	-13.1	-12.4	-12.0	-11.8	-12.2	-12.6	-12.7	-12.8	-13.0	-13.2	-13.5	-13.8	-14.0	Diurnal Average
																								0.3	-0.8	0.3	1.5	2.1	2.5	3.2	3.5	3.4	3.5	3.6	4.0	4.1	4.2	4.2	4.6	4.6	4.4	4.3	3.5	3.0	2.3	2.0	0.9	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 2 m (AT2m) - C**  
**Mannix - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2 m (AT2m) - C  
Mannix - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	259	34.81	34.81
-20 - 0	403	54.17	88.98
0 - 10	82	11.02	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

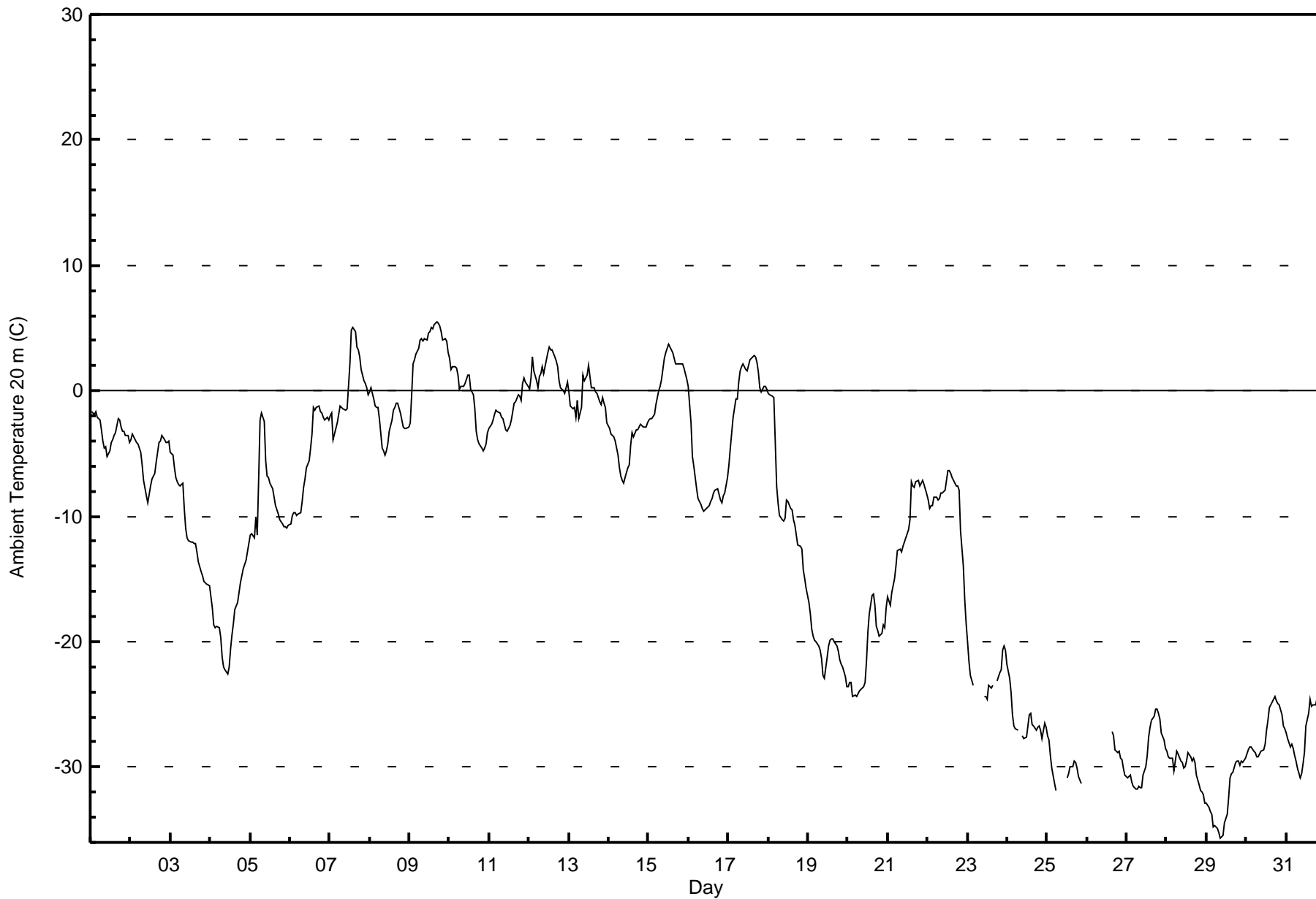
Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 5.5 C on Dec 9 17:00		Maximum Daily Average: 3.7 C on Dec 9		Hours in Service: 744																							
Minimum Value: -35.7 C on Dec 29 09:00		Minimum Daily Average: -32.5 C on Dec 29		Hours of Data: 710																							
Maximum Diurnal Average: -10.7 C at hour 15		Minimum Diurnal Average: -12.3 C at hour 11		Hours of Missing Data: 34																							
Monthly Average: -11.70 C		Percentiles: P <sub>1</sub> = -34.7 P <sub>10</sub> = -29.3 Q <sub>1</sub> = -23.5 Median = -8.2 Q <sub>3</sub> = -1.7 P <sub>90</sub> = 1.5 P <sub>99</sub> = 4.9		Hours of Calibration: 0																							
				Percent Operational Time: 95.4																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-1.7	-1.7	-1.9	-1.7	-2.1	-2.3	-3.1	-4.0	-4.6	-4.5	-5.3	-4.8	-4.2	-3.9	-3.5	-3.3	-2.2	-2.3	-2.8	-3.2	-3.2	-3.6	-3.6	-4.1	-3.2	-1.7	
2-Dec	-3.8	-3.5	-3.7	-4.1	-4.2	-4.5	-4.9	-5.9	-7.2	-8.4	-8.9	-8.3	-7.6	-7.1	-6.5	-5.7	-4.9	-4.2	-4.0	-3.6	-3.9	-4.1	-4.1	-4.0	-5.3	-3.5	
3-Dec	-4.9	-5.2	-6.1	-7.0	-7.3	-7.5	-7.6	-7.4	-9.4	-11.0	-11.8	-12.0	-12.0	-12.0	-12.2	-12.2	-12.8	-13.6	-14.4	-14.8	-15.2	-15.3	-15.5	-15.6	-10.9	-4.9	
4-Dec	-16.4	-17.3	-18.6	-18.8	-18.8	-18.9	-19.7	-21.2	-22.0	-22.2	-22.6	-22.0	-20.6	-19.5	-18.6	-17.4	-16.9	-16.1	-15.3	-14.8	-14.2	-13.6	-12.8	-12.2	-17.9	-12.2	
5-Dec	-11.5	-11.3	-11.8	-10.1	-11.6	-7.0	-2.3	-1.7	-2.4	-5.6	-6.8	-6.9	-7.4	-7.8	-8.5	-9.1	-9.5	-9.9	-10.3	-10.6	-10.8	-10.9	-10.9	-10.8	-8.6	-1.7	
6-Dec	-10.6	-9.9	-9.7	-9.8	-9.9	-9.9	-9.7	-8.8	-7.7	-7.0	-6.2	-5.5	-4.6	-3.4	-1.3	-1.6	-1.3	-1.2	-1.7	-1.8	-2.1	-2.3	-2.1	-2.3	-5.4	-1.2	
7-Dec	-2.0	-1.7	-3.9	-3.4	-2.5	-1.9	-1.2	-1.4	-1.4	-1.6	-1.4	0.4	2.1	4.8	5.1	4.7	3.5	3.3	2.7	1.7	0.8	0.6	0.2	-0.3	0.3	5.1	
8-Dec	-0.1	0.3	-0.7	-1.2	-1.3	-1.3	-2.2	-4.5	-4.8	-5.1	-4.7	-4.2	-3.2	-2.3	-1.5	-1.3	-1.0	-1.0	-1.8	-2.4	-2.9	-3.1	-3.0	-2.9	-2.3	0.3	
9-Dec	-2.6	-0.3	2.1	2.5	2.9	3.3	4.0	4.2	4.0	4.1	4.1	4.6	4.8	5.1	4.9	5.3	5.5	5.3	5.2	4.7	4.1	4.1	4.0	3.0	3.7	5.5	
10-Dec	2.6	1.7	1.9	1.9	1.8	1.2	0.1	0.3	0.4	0.6	0.9	1.3	1.2	0.2	-0.3	-1.5	-3.2	-3.9	-4.2	-4.5	-4.8	-4.5	-4.3	-3.4	-0.8	2.6	
11-Dec	-3.0	-2.7	-2.3	-1.9	-1.5	-1.7	-1.8	-2.1	-2.3	-2.7	-3.1	-3.3	-2.8	-2.4	-1.7	-1.0	-0.8	-0.3	-0.4	-0.7	0.6	1.0	0.7	0.3	-1.5	1.0	
12-Dec	0.1	1.1	2.7	1.5	0.8	0.3	1.2	1.3	2.0	1.4	2.5	3.0	3.5	3.3	3.3	2.7	2.4	1.9	0.8	0.2	0.0	-0.2	0.2	0.7	1.5	3.5	
13-Dec	-0.1	-1.3	-1.4	-1.3	-2.1	-0.8	-2.2	-1.4	1.2	0.8	1.0	1.3	2.1	0.2	0.3	0.3	-0.1	-0.2	-0.9	-1.1	-0.5	-1.0	-1.3	-2.5	-0.5	2.1	
14-Dec	-3.0	-3.5	-3.6	-3.7	-4.0	-5.2	-6.2	-6.8	-7.1	-7.4	-6.9	-6.1	-5.9	-4.4	-3.3	-3.7	-3.2	-3.1	-2.9	-2.7	-2.7	-2.9	-2.9	-2.5	-4.3	-2.5	
15-Dec	-2.3	-2.3	-2.2	-1.9	-1.1	-0.6	0.0	0.4	0.9	2.6	3.1	3.4	3.7	3.5	3.1	2.6	2.1	2.1	2.1	2.1	2.2	1.8	1.4	1.0	1.2	3.7	
16-Dec	0.4	-2.5	-5.3	-6.0	-7.0	-7.8	-8.6	-9.0	-9.4	-9.6	-9.5	-9.4	-9.1	-8.9	-8.6	-8.2	-7.9	-7.8	-8.3	-8.7	-9.0	-8.3	-8.1	-6.9	-7.6	0.4	
17-Dec	-5.9	-4.6	-3.3	-2.1	-0.6	-0.7	0.7	1.6	1.9	2.1	1.6	1.6	2.0	2.5	2.6	2.8	2.7	2.3	1.5	0.3	-0.1	0.4	0.3	0.1	0.4	2.8	
18-Dec	-0.2	-0.3	-0.5	-0.6	-4.0	-7.6	-9.0	-9.9	-10.3	-10.4	-10.2	-8.7	-8.8	-9.3	-9.5	-10.3	-10.7	-11.5	-12.3	-12.4	-12.6	-14.3	-15.0	-15.7	-8.9	-0.2	
19-Dec	-16.9	-17.8	-19.0	-19.5	-19.9	-20.0	-20.4	-20.7	-21.3	-22.7	-22.9	-21.3	-20.4	-19.9	-19.8	-19.8	-20.0	-20.4	-20.8	-21.5	-21.8	-22.0	-22.8	-23.6	-20.6	-16.9	
20-Dec	-23.6	-23.3	-23.2	-24.3	-24.3	-24.4	-24.1	-23.9	-23.8	-23.6	-23.3	-21.6	-19.3	-17.8	-16.3	-16.2	-17.1	-18.8	-19.1	-19.6	-19.4	-18.6	-18.9	-17.3	-20.9	-16.2	
21-Dec	-16.4	-17.1	-16.1	-15.6	-14.9	-13.9	-12.7	-12.6	-12.8	-12.4	-12.1	-11.8	-11.1	-10.2	-7.2	-7.6	-7.7	-7.2	-7.1	-7.6	-7.3	-7.1	-7.5	-8.2	-11.0	-7.1	
22-Dec	-8.7	-9.4	-9.2	-9.1	-8.5	-8.5	-8.7	-8.6	-8.2	-8.2	-7.9	-7.2	-6.4	-6.3	-6.6	-6.9	-7.3	-7.6	-7.6	-7.9	-11.2	-14.0	-16.7	-18.5	-9.1	-6.3	
23-Dec	-20.0	-21.5	-22.7	-23.5	AF	AF	AF	AF	AF	AF	-24.3	-24.4	-24.6	-23.4	-23.7	-23.5	AF	AF	-23.1	-22.5	-22.3	-20.6	-20.3	-20.7	--	-20.0	
24-Dec	-21.7	-22.9	-24.0	-25.8	-26.7	-26.9	-27.1	AF	AF	AF	-27.5	-27.7	-27.6	-26.7	-25.8	-25.7	-26.6	-26.7	-27.0	-26.8	-26.7	-27.1	-27.8	-26.4	-26.9	-26.3	-21.7
25-Dec	-27.5	-27.8	-29.0	-30.1	-31.3	-31.9	AF	AF	AF	AF	AF	AF	-30.9	-30.5	-30.0	-29.9	-29.5	-29.7	-30.0	-30.7	-31.3	AF	AF	AF	--	-27.5	
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	-27.2	-27.5	-28.7	-28.8	-28.8	-29.3	-29.4	-30.1	-30.6	--	-27.2	
27-Dec	-30.9	-30.7	-30.6	-31.2	-31.5	-31.8	-31.8	-31.5	-31.6	-31.6	-30.6	-29.9	-29.0	-27.6	-26.8	-26.3	-25.9	-25.4	-25.3	-25.7	-26.2	-27.2	-27.9	-28.5	-29.0	-25.3	
28-Dec	-28.7	-29.2	-29.3	-29.3	-30.3	-29.6	-28.8	-29.0	-29.5	-29.6	-30.0	-29.9	-29.5	-28.8	-29.2	-29.5	-29.3	-29.6	-30.6	-31.4	-31.8	-31.9	-32.2	-32.9	-30.0	-28.7	
29-Dec	-32.8	-33.2	-33.6	-33.7	-34.7	-34.7	-34.9	-35.2	-35.7	-35.6	-35.4	-34.4	-33.8	-32.4	-30.8	-30.5	-30.4	-29.6	-29.5	-29.5	-29.8	-29.6	-29.6	-29.3	-32.5	-29.3	
30-Dec	-29.0	-28.6	-28.4	-28.4	-28.7	-28.8	-29.2	-29.1	-29.0	-28.7	-28.7	-28.1	-27.1	-26.3	-25.2	-24.8	-24.5	-24.4	-24.7	-24.9	-25.0	-25.8	-26.8	-26.9	-27.1	-24.4	
31-Dec	-27.3	-27.7	-28.4	-28.2	-28.5	-29.0	-29.5	-30.0	-30.9	-30.5	-29.7	-28.9	-26.7	-25.8	-24.6	-25.2	-25.0	-25.1	-25.0	-24.0	-23.9	-24.1	-24.5	-24.6	-27.0	-23.9	
																								Diurnal Average			
																								Diurnal Maximum			
AF - Analyzer Failure																											







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C  
Mannix - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	214	30.14	30.14
-20 - 0	378	53.24	83.38
0 - 10	118	16.62	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 710

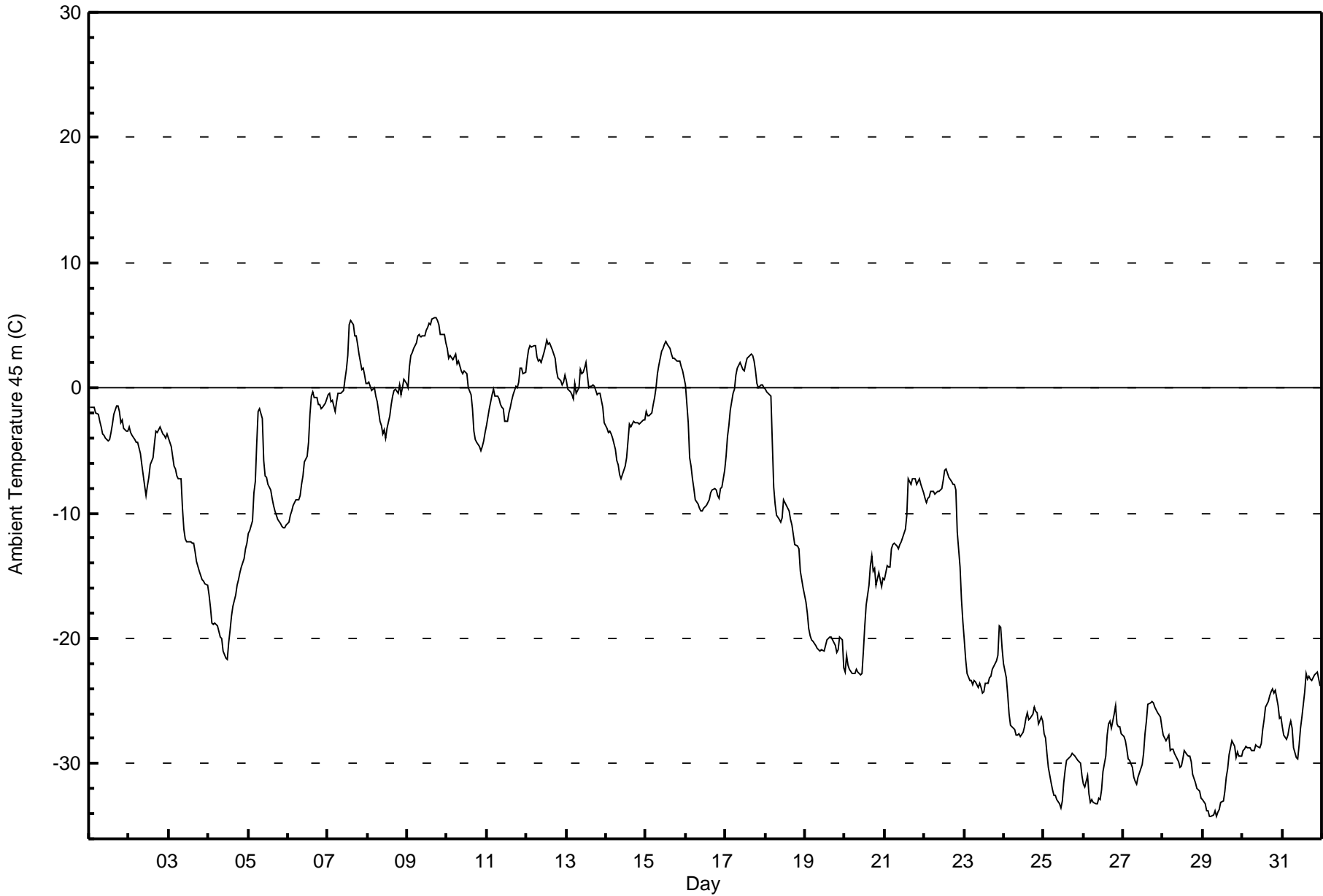
Total Number of Hours: 744



Summary of Hour Averages

Mannix - December 2017

Maximum Value: 5.7 C on Dec 9 17:00		Maximum Daily Average: 4.1 C on Dec 9		Hours in Service: 744																						
Minimum Value: -34.3 C on Dec 29 06:00		Minimum Daily Average: -31.8 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -10.9 C at hour 17		Minimum Diurnal Average: -13.3 C at hour 10		Hours of Missing Data: 0																						
Monthly Average: -12.06 C		Percentiles: P <sub>1</sub> = -33.8 P <sub>10</sub> = -29.4 Q <sub>1</sub> = -23.6 Median = -8.8 Q <sub>3</sub> = -1.1 P <sub>90</sub> = 2.0 P <sub>99</sub> = 5.1		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-1.5	-1.5	-1.5	-1.5	-2.0	-2.1	-2.6	-3.1	-3.6	-3.8	-4.0	-4.3	-4.1	-3.5	-2.9	-2.1	-1.4	-1.4	-1.8	-2.8	-2.5	-3.2	-3.4	-3.4	-2.7	-1.4
2-Dec	-3.1	-3.5	-3.8	-4.1	-4.3	-4.4	-4.8	-5.3	-6.1	-7.8	-8.5	-7.8	-7.1	-6.1	-5.6	-4.4	-3.5	-3.6	-3.3	-3.2	-3.6	-3.8	-4.0	-3.7	-4.8	-3.1
3-Dec	-4.0	-4.7	-5.4	-6.2	-6.5	-7.0	-7.2	-7.3	-9.6	-11.2	-12.0	-12.3	-12.3	-12.4	-12.4	-13.1	-13.8	-14.7	-15.0	-15.3	-15.5	-15.6	-15.8	-10.9	-4.0	
4-Dec	-16.6	-17.5	-18.8	-18.8	-18.8	-19.1	-19.4	-19.9	-20.0	-21.0	-21.6	-21.7	-20.4	-19.4	-18.2	-17.4	-16.5	-15.7	-15.3	-14.8	-14.3	-13.6	-12.9	-12.4	-17.7	-12.4
5-Dec	-11.7	-11.4	-10.6	-8.3	-7.5	-4.5	-1.9	-1.7	-2.5	-5.8	-7.0	-7.2	-7.7	-8.1	-8.8	-9.4	-9.8	-10.1	-10.5	-10.8	-11.1	-11.1	-11.2	-11.0	-8.3	-1.7
6-Dec	-10.8	-10.1	-9.8	-9.4	-9.1	-8.9	-8.9	-8.6	-7.7	-7.1	-5.9	-5.4	-4.4	-2.2	-0.6	-0.3	-0.8	-0.7	-1.3	-1.4	-1.7	-1.5	-1.2	-0.8	-4.9	-0.3
7-Dec	-0.5	-0.4	-1.1	-1.0	-1.9	-1.1	-0.5	-0.4	-0.5	-0.2	0.7	1.4	2.6	5.0	5.4	5.1	4.2	4.2	3.5	2.7	1.4	1.6	1.0	0.4	1.3	5.4
8-Dec	0.3	0.4	-0.2	-0.1	0.0	-0.7	-1.1	-2.7	-3.0	-3.7	-3.3	-4.0	-3.3	-2.2	-1.3	-0.6	-0.2	-0.1	-0.4	0.3	-0.5	0.0	0.7	0.3	-1.1	0.7
9-Dec	0.1	1.7	2.6	2.8	3.2	3.6	4.1	4.2	4.0	4.2	4.2	4.6	4.8	5.1	5.1	5.5	5.7	5.6	5.4	5.1	4.3	4.3	4.3	3.5	4.1	5.7
10-Dec	3.2	2.3	2.6	2.3	2.4	2.7	1.9	2.2	1.4	1.1	1.4	1.3	1.1	0.0	-0.5	-1.7	-3.4	-4.1	-4.4	-4.7	-5.0	-4.7	-4.2	-3.5	-0.4	3.2
11-Dec	-3.0	-1.6	-1.1	-0.5	-0.1	-0.7	-0.7	-0.9	-1.3	-1.5	-1.6	-2.6	-2.6	-2.0	-1.5	-0.9	-0.5	0.2	0.0	0.4	1.5	1.6	1.1	1.3	-0.7	1.6
12-Dec	2.3	3.0	3.4	3.3	3.4	3.4	2.5	2.2	2.2	2.0	2.8	3.3	3.8	3.5	3.6	3.0	2.7	2.4	1.4	0.8	0.5	0.2	0.4	1.0	2.4	3.8
13-Dec	0.6	-0.1	-0.3	-0.5	-0.8	0.4	-0.4	0.0	1.5	1.1	1.3	1.6	2.1	0.1	0.1	0.2	0.2	0.1	-0.5	-0.4	-0.4	-1.0	-1.5	-2.8	0.0	2.1
14-Dec	-3.3	-3.6	-3.5	-3.6	-4.0	-4.9	-5.7	-6.1	-7.0	-7.3	-6.9	-6.2	-5.6	-4.2	-2.9	-3.1	-2.7	-2.8	-2.8	-2.7	-2.9	-2.8	-2.6	-2.5	-4.2	-2.5
15-Dec	-1.9	-2.2	-2.2	-2.0	-1.3	-0.7	0.0	1.1	1.8	2.9	3.1	3.5	3.7	3.5	3.2	2.7	2.4	2.4	2.3	2.2	2.1	1.7	1.3	0.8	1.3	3.7
16-Dec	0.2	-2.8	-5.5	-6.3	-7.2	-8.0	-8.9	-9.3	-9.6	-9.9	-9.8	-9.6	-9.4	-9.1	-8.9	-8.4	-8.2	-8.0	-8.2	-8.5	-8.8	-8.0	-7.9	-6.6	-7.8	0.2
17-Dec	-5.4	-3.8	-3.0	-1.7	-0.5	-0.1	1.1	1.5	1.9	2.1	1.5	1.4	1.9	2.4	2.5	2.7	2.6	2.2	1.4	0.4	0.0	0.3	0.2	0.1	0.5	2.7
18-Dec	-0.1	-0.3	-0.5	-0.6	-4.3	-7.9	-9.3	-10.2	-10.5	-10.7	-10.4	-8.9	-9.1	-9.6	-9.8	-10.5	-10.9	-11.7	-12.5	-12.7	-12.8	-14.6	-15.3	-16.0	-9.1	-0.1
19-Dec	-17.1	-18.0	-19.2	-19.8	-20.1	-20.3	-20.6	-20.8	-21.0	-21.0	-20.9	-21.0	-20.6	-20.1	-20.0	-19.8	-19.9	-20.3	-20.6	-21.2	-20.9	-19.9	-20.1	-22.3	-20.2	-17.1
20-Dec	-22.7	-21.3	-22.1	-22.5	-22.8	-22.8	-22.8	-22.5	-22.7	-23.0	-22.8	-21.0	-19.0	-17.3	-15.7	-14.1	-13.4	-14.6	-14.5	-15.7	-14.7	-15.3	-15.9	-15.2	-18.9	-13.4
21-Dec	-15.3	-14.2	-14.3	-14.3	-12.8	-12.5	-12.4	-12.6	-12.9	-12.5	-12.3	-11.9	-11.3	-10.1	-7.3	-7.5	-7.7	-7.3	-7.3	-7.6	-7.4	-7.3	-7.7	-8.4	-10.6	-7.3
22-Dec	-8.8	-9.1	-8.8	-8.7	-8.3	-8.3	-8.5	-8.4	-8.2	-8.3	-8.0	-7.3	-6.6	-6.5	-6.8	-7.1	-7.5	-7.7	-7.7	-8.1	-11.5	-14.3	-16.9	-18.7	-9.2	-6.5
23-Dec	-20.1	-21.7	-22.9	-23.4	-23.3	-23.7	-23.3	-23.5	-23.9	-23.6	-23.9	-24.3	-24.2	-23.6	-23.6	-23.2	-23.0	-22.5	-22.3	-21.8	-21.3	-19.0	-19.1	-20.8	-22.6	-19.0
24-Dec	-22.0	-23.2	-24.5	-26.0	-26.9	-27.1	-27.3	-27.7	-27.7	-27.6	-27.8	-27.5	-27.0	-26.4	-26.0	-26.5	-26.4	-26.1	-25.5	-25.9	-25.9	-26.8	-26.3	-26.6	-26.3	-22.0
25-Dec	-27.6	-27.9	-29.2	-30.3	-31.5	-32.1	-32.5	-32.5	-32.9	-33.2	-33.6	-33.0	-31.5	-30.5	-29.7	-29.5	-29.4	-29.2	-29.3	-29.4	-29.8	-29.9	-29.9	-30.9	-30.6	-27.6
26-Dec	-31.6	-31.9	-31.0	-32.4	-33.1	-32.9	-33.0	-33.2	-33.2	-32.8	-32.9	-32.1	-30.7	-29.4	-27.7	-26.8	-26.6	-27.1	-26.0	-25.4	-26.8	-27.0	-27.1	-27.6	-29.9	-25.4
27-Dec	-27.8	-28.2	-28.9	-29.6	-29.8	-30.3	-31.0	-31.4	-31.6	-31.1	-30.7	-30.0	-29.1	-27.7	-26.5	-25.3	-25.2	-25.0	-25.1	-25.4	-25.7	-26.0	-26.3	-27.0	-28.1	-25.0
28-Dec	-27.7	-28.0	-28.2	-27.7	-28.9	-28.8	-28.8	-29.1	-29.7	-29.8	-30.3	-30.2	-29.7	-29.0	-29.3	-29.4	-29.4	-29.8	-30.9	-31.6	-32.0	-32.1	-32.1	-32.7	-29.8	-27.7
29-Dec	-32.9	-33.2	-33.8	-33.8	-34.2	-34.3	-34.1	-33.8	-34.2	-33.9	-33.6	-33.1	-33.0	-32.2	-31.0	-30.5	-29.3	-28.2	-28.4	-28.6	-29.5	-29.1	-29.4	-29.4	-31.8	-28.2
30-Dec	-29.0	-28.8	-28.6	-28.7	-28.7	-29.0	-28.9	-29.0	-28.6	-28.7	-28.8	-28.3	-27.3	-26.5	-25.5	-25.0	-24.6	-24.2	-24.1	-24.4	-24.1	-25.3	-26.4	-26.3	-27.0	-24.1
31-Dec	-27.0	-27.7	-28.1	-27.8	-27.1	-26.6	-27.2	-28.8	-29.5	-29.6	-28.5	-27.1	-26.2	-24.3	-22.8	-23.2	-23.0	-23.2	-23.4	-22.9	-22.8	-22.7	-23.2	-23.8	-25.7	-22.7
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C  
Mannix - December 2017**

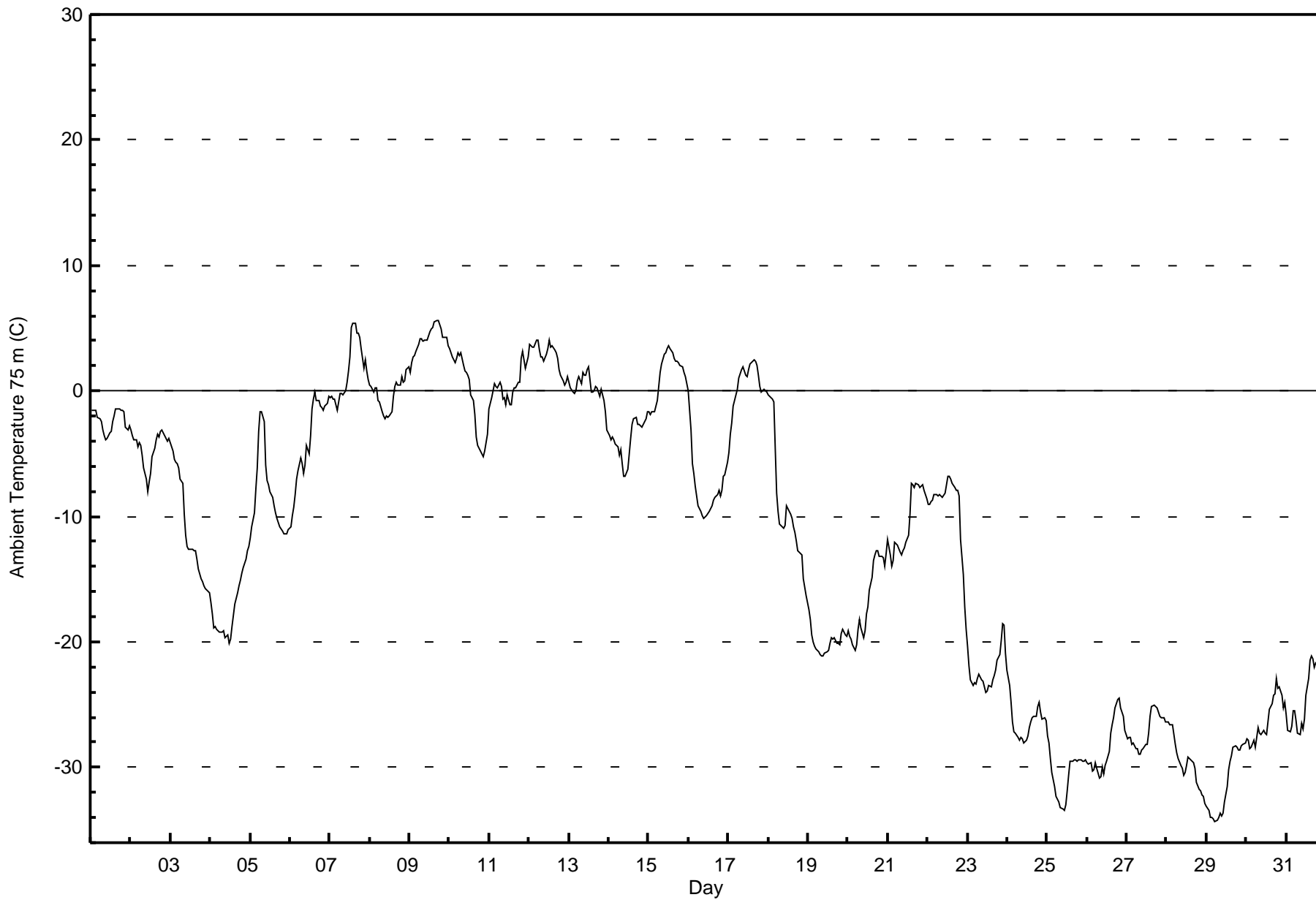
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	247	33.20	33.20
-20 - 0	362	48.66	81.85
0 - 10	135	18.15	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 5.7 C on Dec 9 17:00		Maximum Daily Average: 4.1 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -34.3 C on Dec 29 06:00		Minimum Daily Average: -31.3 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -10.7 C at hour 16		Minimum Diurnal Average: -12.7 C at hour 11		Hours of Missing Data: 0																																												
Monthly Average: -11.64 C		Percentiles: P <sub>1</sub> = -33.7 P <sub>10</sub> = -28.6 Q <sub>1</sub> = -23.3 Median = -8.4 Q <sub>3</sub> = -0.7 P <sub>90</sub> = 2.2 P <sub>99</sub> = 4.7		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-1.5	-1.5	-1.5	-1.5	-2.1	-2.3	-2.5	-3.1	-3.6	-3.8	-3.8	-3.4	-3.3	-2.4	-2.0	-1.5	-1.5	-1.4	-1.5	-1.6	-1.7	-2.8	-3.1	-2.8	-2.3	-1.4																						
2-Dec	-3.1	-3.6	-3.9	-3.9	-4.4	-4.2	-4.3	-5.1	-6.2	-7.0	-8.0	-7.3	-6.6	-5.3	-4.6	-3.9	-3.4	-3.6	-3.2	-3.1	-3.6	-3.8	-4.1	-3.8	-4.6	-3.1																						
3-Dec	-4.2	-4.8	-5.5	-5.7	-5.9	-6.1	-7.0	-7.3	-9.8	-11.5	-12.4	-12.6	-12.6	-12.7	-12.8	-12.7	-13.4	-14.2	-14.9	-15.2	-15.5	-15.7	-15.8	-16.1	-11.0	-4.2																						
4-Dec	-16.9	-17.8	-18.9	-18.8	-18.9	-19.2	-19.2	-19.3	-19.1	-19.6	-19.4	-20.2	-19.8	-18.7	-17.9	-17.0	-16.1	-15.5	-15.1	-14.5	-14.0	-13.4	-12.8	-12.3	-17.3	-12.3																						
5-Dec	-11.8	-10.9	-9.7	-7.9	-6.2	-3.2	-1.6	-1.7	-2.5	-5.9	-7.1	-7.4	-8.0	-8.4	-9.1	-9.7	-10.2	-10.5	-10.9	-11.1	-11.3	-11.4	-11.4	-11.1	-8.3	-1.6																						
6-Dec	-10.8	-9.9	-9.3	-8.2	-7.0	-6.4	-5.4	-5.8	-6.6	-5.9	-4.3	-5.0	-3.6	-1.4	-0.6	-0.1	-0.7	-0.8	-1.2	-1.3	-1.6	-1.3	-1.0	-0.4	-4.1	-0.1																						
7-Dec	-0.5	-0.4	-0.7	-0.7	-1.5	-0.8	-0.2	-0.2	-0.3	0.0	0.7	1.6	2.7	5.0	5.4	5.3	4.6	4.6	4.3	3.4	1.9	2.4	1.6	0.9	1.6	5.4																						
8-Dec	0.4	0.3	-0.1	0.2	0.2	-0.8	-0.9	-1.7	-2.0	-2.2	-1.9	-2.1	-2.0	-1.6	-0.4	0.3	0.7	0.5	0.5	1.2	0.7	0.9	1.7	1.9	-0.3	1.9																						
9-Dec	1.5	2.3	2.7	2.8	3.2	3.7	4.2	4.2	3.9	4.1	4.1	4.4	4.7	5.0	5.0	5.5	5.7	5.6	5.3	5.0	4.3	4.3	4.3	3.6	4.1	5.7																						
10-Dec	3.4	3.0	2.7	2.3	2.6	3.1	2.8	3.0	2.0	1.6	1.5	1.3	0.9	-0.3	-0.8	-1.9	-3.7	-4.3	-4.6	-5.0	-5.2	-4.8	-4.1	-3.5	-0.3	3.4																						
11-Dec	-1.5	-0.5	0.0	0.6	0.4	0.2	0.7	0.4	-0.6	-0.6	-1.0	-0.3	-1.0	-1.1	-0.1	0.3	0.2	0.7	0.7	2.6	3.1	2.5	1.8	2.7	0.4	3.1																						
12-Dec	3.7	3.6	3.5	3.5	4.0	4.0	3.2	2.7	2.7	2.4	2.9	3.4	4.0	3.5	3.6	3.2	3.1	2.6	1.7	1.2	0.8	0.5	0.6	1.1	2.7	4.0																						
13-Dec	0.7	0.2	-0.1	-0.2	0.0	0.8	1.2	0.6	1.5	1.3	1.3	1.7	2.0	-0.1	0.0	0.1	0.3	0.2	-0.4	0.2	-0.3	-0.8	-1.7	-3.1	0.2	2.0																						
14-Dec	-3.6	-3.9	-3.7	-3.9	-4.2	-4.5	-5.1	-4.7	-5.8	-6.8	-6.9	-6.2	-5.0	-3.8	-2.7	-2.3	-2.1	-2.6	-2.7	-2.8	-2.9	-2.7	-2.2	-1.7	-3.9	-1.7																						
15-Dec	-1.7	-1.9	-1.6	-1.6	-1.3	-0.7	0.3	1.5	2.2	2.9	3.1	3.4	3.6	3.3	3.0	2.6	2.3	2.4	2.2	2.1	1.9	1.5	1.1	0.5	1.3	3.6																						
16-Dec	0.0	-3.1	-5.8	-6.6	-7.5	-8.3	-9.2	-9.6	-9.9	-10.2	-10.1	-9.9	-9.6	-9.4	-9.2	-8.7	-8.4	-8.2	-7.9	-8.4	-7.9	-6.8	-6.7	-5.7	-7.8	0.0																						
17-Dec	-4.9	-3.4	-2.6	-1.3	-0.4	0.1	1.0	1.4	1.7	1.9	1.3	1.2	1.6	2.1	2.3	2.5	2.4	2.0	1.2	0.3	-0.1	0.1	0.0	-0.1	0.4	2.5																						
18-Dec	-0.3	-0.4	-0.7	-0.8	-4.6	-8.2	-9.6	-10.6	-10.8	-11.0	-10.7	-9.2	-9.4	-9.9	-10.1	-10.8	-11.2	-12.0	-12.7	-12.9	-13.1	-15.0	-15.6	-16.3	-9.4	-0.3																						
19-Dec	-17.4	-18.3	-19.5	-20.1	-20.4	-20.5	-20.8	-21.1	-21.1	-21.1	-20.9	-20.8	-20.7	-20.1	-19.7	-19.7	-19.6	-20.1	-20.2	-20.3	-19.3	-19.0	-19.4	-19.6	-20.0	-17.4																						
20-Dec	-19.1	-19.5	-19.8	-20.2	-20.7	-20.2	-19.0	-18.2	-18.9	-19.6	-19.1	-17.8	-17.2	-15.9	-14.8	-13.5	-13.0	-12.7	-12.8	-13.1	-13.2	-13.3	-14.0	-13.0	-16.6	-12.7																						
21-Dec	-11.9	-13.1	-14.0	-13.5	-12.1	-12.2	-12.3	-12.8	-13.1	-12.8	-12.5	-12.1	-11.5	-9.8	-7.4	-7.5	-7.6	-7.4	-7.5	-7.7	-7.6	-7.5	-7.9	-8.6	-10.4	-7.4																						
22-Dec	-9.0	-9.1	-8.9	-8.7	-8.3	-8.3	-8.3	-8.3	-8.3	-8.5	-8.2	-7.5	-6.8	-6.8	-7.1	-7.4	-7.7	-7.9	-7.9	-8.4	-11.8	-14.6	-17.2	-19.0	-9.3	-6.8																						
23-Dec	-20.4	-21.9	-23.0	-23.5	-23.2	-23.4	-22.9	-22.6	-23.0	-23.1	-23.6	-24.0	-23.9	-23.4	-23.6	-23.0	-22.7	-22.3	-21.5	-21.0	-19.9	-18.5	-18.7	-20.9	-22.3	-18.5																						
24-Dec	-22.2	-23.5	-24.8	-26.3	-27.2	-27.3	-27.6	-27.8	-27.7	-27.7	-28.1	-27.8	-27.5	-26.9	-26.3	-26.1	-26.0	-25.9	-25.2	-24.8	-25.6	-26.2	-26.0	-26.3	-26.3	-22.2																						
25-Dec	-27.5	-28.1	-29.3	-30.5	-31.6	-32.3	-32.6	-32.7	-33.2	-33.3	-33.4	-33.0	-31.8	-30.6	-29.5	-29.5	-29.4	-29.3	-29.5	-29.4	-29.4	-29.5	-29.5	-29.4	-30.6	-27.5																						
26-Dec	-29.7	-29.7	-29.7	-30.3	-30.2	-29.7	-30.1	-30.8	-30.8	-29.9	-30.5	-29.9	-29.5	-28.8	-27.3	-26.6	-26.1	-25.3	-24.5	-24.4	-25.2	-25.6	-26.0	-27.0	-28.2	-24.4																						
27-Dec	-27.7	-27.6	-27.7	-28.1	-28.0	-28.5	-28.5	-28.9	-28.9	-28.6	-28.5	-28.1	-28.2	-27.2	-26.0	-25.1	-25.1	-25.2	-25.3	-25.6	-25.9	-26.0	-26.1	-26.3	-27.1	-25.1																						
28-Dec	-26.3	-26.4	-26.6	-26.6	-27.4	-28.1	-28.8	-29.3	-29.8	-30.0	-30.6	-30.4	-29.9	-29.2	-29.4	-29.5	-29.6	-30.0	-31.2	-31.8	-31.9	-32.2	-32.3	-32.9	-29.6	-26.3																						
29-Dec	-33.1	-33.4	-34.0	-34.0	-34.1	-34.3	-34.2	-34.0	-33.6	-33.9	-33.7	-32.7	-31.5	-30.2	-29.6	-29.1	-28.4	-28.2	-28.4	-28.6	-28.6	-28.3	-28.1	-28.1	-31.3	-28.1																						
30-Dec	-27.8	-27.8	-28.6	-28.4	-27.8	-28.4	-27.6	-26.9	-27.2	-27.4	-27.1	-27.3	-27.4	-26.4	-25.4	-24.9	-24.2	-24.2	-22.9	-23.7	-23.6	-24.3	-25.2	-24.8	-26.2	-22.9																						
31-Dec	-25.8	-27.1	-27.1	-26.7	-25.4	-25.5	-26.2	-27.3	-27.4	-26.5	-27.0	-26.2	-24.2	-22.9	-21.4	-21.1	-21.4	-22.0	-21.6	-21.9	-22.2	-22.6	-22.9	-23.3	-24.4	-21.1																						
																								-11.3	-11.6	-11.9	-11.9	-11.9	-12.0	-12.0	-12.1	-12.5	-12.7	-12.7	-12.4	-12.0	-11.4	-10.9	-10.7	-10.7	-10.8	-10.9	-11.0	-11.3	-11.4	-11.6	-11.8	Diurnal Average
																								3.7	3.6	3.5	3.5	4.0	4.0	4.2	4.2	3.9	4.1	4.1	4.4	4.7	5.0	5.4	5.5	5.7	5.6	5.3	5.0	4.3	4.3	4.3	3.6	Diurnal Maximum





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 75 m (AT75m) - C  
Mannix - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	231	31.05	31.05
-20 - 0	359	48.25	79.30
0 - 10	154	20.70	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

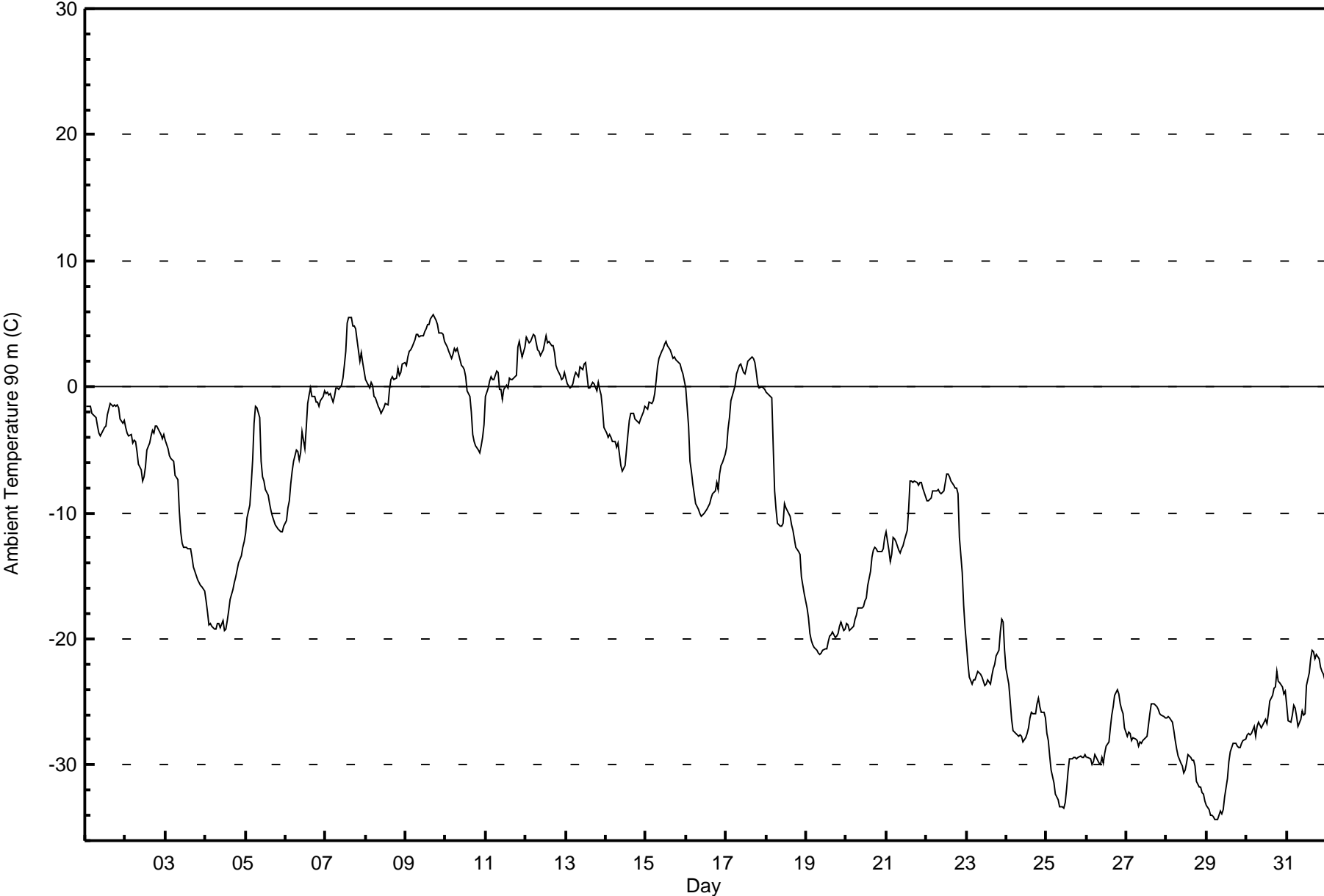
Total Number of Valid Hours: 744

Total Number of Hours: 744





Maximum Value: 5.7 C on Dec 9 17:00		Maximum Daily Average: 4.1 C on Dec 9		Hours in Service: 744																						
Minimum Value: -34.3 C on Dec 29 06:00		Minimum Daily Average: -31.2 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -10.6 C at hour 16		Minimum Diurnal Average: -12.5 C at hour 11		Hours of Missing Data: 0																						
Monthly Average: -11.51 C		Percentiles: P <sub>1</sub> = -33.7 P <sub>10</sub> = -28.3 Q <sub>1</sub> = -23.3 Median = -8.5 Q <sub>3</sub> = -0.7 P <sub>90</sub> = 2.2 P <sub>99</sub> = 4.8		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-1.6	-1.5	-1.6	-1.6	-2.1	-2.3	-2.5	-3.1	-3.6	-3.9	-3.7	-3.2	-3.1	-2.2	-1.8	-1.3	-1.5	-1.5	-1.5	-1.4	-1.6	-2.6	-2.9	-2.6	-2.3	-1.3
2-Dec	-3.2	-3.6	-3.9	-3.8	-4.5	-4.2	-4.4	-5.1	-6.2	-6.6	-7.5	-7.2	-6.4	-5.0	-4.4	-3.9	-3.4	-3.7	-3.1	-3.1	-3.6	-3.8	-4.1	-3.8	-4.5	-3.1
3-Dec	-4.3	-4.9	-5.5	-5.6	-5.7	-5.9	-7.0	-7.4	-9.9	-11.5	-12.5	-12.7	-12.7	-12.8	-12.9	-12.8	-13.5	-14.3	-15.0	-15.3	-15.5	-15.8	-15.9	-16.2	-11.1	-4.3
4-Dec	-17.0	-17.9	-18.9	-18.8	-19.0	-19.2	-19.2	-18.8	-18.8	-19.1	-18.5	-19.4	-19.2	-18.5	-17.7	-16.8	-16.1	-15.6	-15.1	-14.5	-14.0	-13.4	-12.7	-12.3	-17.1	-12.3
5-Dec	-11.7	-10.4	-9.4	-7.7	-5.8	-2.8	-1.6	-1.7	-2.4	-5.9	-7.1	-7.5	-8.1	-8.6	-9.2	-9.8	-10.3	-10.6	-11.0	-11.3	-11.4	-11.5	-11.5	-11.0	-8.3	-1.6
6-Dec	-10.7	-9.6	-9.0	-7.7	-6.6	-5.9	-5.0	-5.1	-5.8	-5.2	-3.5	-4.9	-3.2	-1.3	-0.7	-0.1	-0.7	-0.8	-1.2	-1.3	-1.6	-1.1	-0.8	-0.4	-3.8	-0.1
7-Dec	-0.5	-0.4	-0.7	-0.6	-1.3	-0.7	-0.1	-0.1	-0.2	0.1	0.7	1.7	2.8	5.0	5.5	5.5	4.8	4.8	4.6	3.7	2.0	2.7	1.9	1.3	1.8	5.5
8-Dec	0.6	0.3	-0.1	0.3	0.2	-0.8	-0.8	-1.5	-1.8	-2.1	-1.9	-1.6	-1.3	-1.4	-0.2	0.6	0.8	0.6	0.7	1.5	0.9	1.2	1.8	1.9	-0.1	1.9
9-Dec	1.7	2.4	2.8	2.9	3.2	3.7	4.2	4.1	3.9	4.0	4.0	4.4	4.6	4.9	4.9	5.4	5.7	5.6	5.3	4.9	4.3	4.3	4.2	3.5	4.1	5.7
10-Dec	3.4	3.2	2.8	2.3	2.6	3.1	2.8	3.0	2.1	1.7	1.6	1.3	0.8	-0.3	-0.8	-2.0	-3.8	-4.4	-4.7	-5.1	-5.3	-4.7	-4.0	-3.0	-0.3	3.4
11-Dec	-0.8	-0.1	0.5	0.8	0.6	0.6	1.2	1.1	-0.2	-0.2	-0.9	-0.2	0.1	-0.1	0.7	0.6	0.6	0.8	0.9	3.1	3.6	2.9	2.4	3.1	0.9	3.6
12-Dec	4.0	3.7	3.5	3.6	4.2	4.1	3.4	2.9	2.9	2.5	3.0	3.4	4.0	3.5	3.6	3.3	3.2	2.7	1.7	1.4	0.9	0.6	0.7	1.1	2.8	4.2
13-Dec	0.7	0.3	0.0	0.0	0.2	0.8	1.2	0.8	1.5	1.4	1.4	1.8	1.9	-0.1	-0.1	0.1	0.3	0.2	-0.4	0.4	-0.2	-0.6	-1.7	-3.2	0.3	1.9
14-Dec	-3.7	-4.0	-3.8	-4.0	-4.3	-4.3	-4.8	-4.4	-5.3	-6.2	-6.7	-6.2	-5.0	-3.7	-2.7	-2.1	-2.1	-2.6	-2.7	-2.8	-2.9	-2.6	-2.0	-1.5	-3.8	-1.5
15-Dec	-1.7	-1.7	-1.2	-1.4	-1.1	-0.5	0.5	1.5	2.2	2.9	3.1	3.4	3.6	3.3	3.0	2.6	2.2	2.4	2.2	2.0	1.9	1.4	1.0	0.4	1.3	3.6
16-Dec	-0.1	-3.2	-6.0	-6.7	-7.6	-8.5	-9.3	-9.7	-10.1	-10.3	-10.1	-10.0	-9.7	-9.5	-9.3	-8.8	-8.5	-8.2	-7.6	-8.1	-6.9	-6.3	-6.0	-5.4	-7.7	-0.1
17-Dec	-4.8	-3.3	-2.5	-1.1	-0.3	0.2	1.0	1.3	1.7	1.8	1.2	1.1	1.5	2.0	2.2	2.4	2.3	1.9	1.1	0.3	-0.1	0.0	-0.1	-0.2	0.4	2.4
18-Dec	-0.4	-0.5	-0.7	-0.9	-4.7	-8.3	-9.7	-10.8	-11.0	-11.1	-10.8	-9.3	-9.6	-10.0	-10.3	-10.9	-11.3	-12.1	-12.8	-13.0	-13.2	-15.1	-15.8	-16.4	-9.5	-0.4
19-Dec	-17.5	-18.3	-19.6	-20.2	-20.5	-20.6	-20.9	-21.1	-21.2	-21.1	-21.0	-20.8	-20.7	-20.2	-19.8	-19.7	-19.4	-19.9	-19.8	-19.6	-19.0	-18.7	-19.3	-19.2	-19.9	-17.5
20-Dec	-18.7	-18.9	-19.3	-19.2	-18.9	-18.5	-18.1	-17.5	-17.5	-17.6	-17.5	-17.0	-16.8	-15.7	-14.7	-13.5	-13.0	-12.8	-12.8	-13.1	-13.1	-13.1	-12.8	-12.0	-15.9	-12.0
21-Dec	-11.5	-12.9	-13.8	-13.2	-11.9	-12.1	-12.2	-12.9	-13.1	-12.9	-12.6	-12.1	-11.4	-9.7	-7.5	-7.5	-7.6	-7.5	-7.5	-7.8	-7.6	-7.6	-8.0	-8.7	-10.4	-7.5
22-Dec	-9.1	-9.1	-8.9	-8.8	-8.2	-8.2	-8.2	-8.2	-8.4	-8.5	-8.2	-7.6	-6.9	-6.9	-7.2	-7.5	-7.8	-8.0	-8.0	-8.5	-11.9	-14.7	-17.3	-19.1	-9.4	-6.9
23-Dec	-20.4	-21.9	-23.0	-23.5	-23.3	-23.3	-22.9	-22.5	-22.8	-23.0	-23.4	-23.7	-23.6	-23.2	-23.5	-22.9	-22.4	-22.1	-21.4	-20.9	-19.4	-18.4	-18.6	-20.9	-22.1	-18.4
24-Dec	-22.3	-23.6	-24.9	-26.4	-27.2	-27.4	-27.6	-27.8	-27.6	-27.7	-28.2	-27.8	-27.5	-27.0	-26.3	-25.9	-25.9	-25.9	-25.1	-24.7	-25.4	-25.9	-25.8	-26.2	-26.3	-22.3
25-Dec	-27.5	-28.1	-29.3	-30.4	-31.5	-32.3	-32.6	-32.8	-33.3	-33.4	-33.4	-32.9	-31.9	-30.5	-29.5	-29.5	-29.4	-29.4	-29.5	-29.4	-29.3	-29.4	-29.4	-29.2	-30.6	-27.5
26-Dec	-29.4	-29.5	-29.5	-29.9	-29.7	-29.2	-29.4	-29.9	-29.9	-29.4	-29.8	-29.0	-28.5	-28.1	-27.1	-26.1	-25.4	-24.4	-24.0	-24.4	-25.1	-25.6	-25.9	-27.0	-27.8	-24.0
27-Dec	-27.7	-27.3	-27.6	-28.0	-27.9	-28.0	-28.1	-28.5	-28.2	-28.3	-28.1	-27.8	-27.8	-26.8	-25.9	-25.2	-25.1	-25.2	-25.3	-25.6	-25.9	-26.1	-26.1	-26.3	-27.0	-25.1
28-Dec	-26.2	-26.2	-26.2	-26.6	-27.3	-28.0	-28.7	-29.3	-29.8	-30.1	-30.7	-30.4	-29.9	-29.2	-29.5	-29.6	-29.7	-30.1	-31.2	-31.8	-31.8	-32.2	-32.3	-32.9	-29.6	-26.2
29-Dec	-33.2	-33.5	-34.0	-34.0	-34.1	-34.3	-34.3	-34.0	-33.7	-33.9	-33.6	-32.6	-31.1	-29.7	-29.0	-28.7	-28.2	-28.3	-28.5	-28.6	-28.6	-28.3	-28.0	-28.0	-31.2	-28.0
30-Dec	-27.6	-27.5	-27.7	-27.5	-26.9	-27.7	-27.0	-26.6	-26.9	-27.0	-26.6	-26.3	-26.7	-26.0	-25.0	-24.4	-23.9	-23.8	-22.6	-23.4	-23.4	-23.8	-24.4	-24.2	-25.7	-22.6
31-Dec	-25.2	-26.5	-26.6	-26.1	-25.2	-25.5	-26.1	-26.9	-26.4	-25.7	-26.0	-25.9	-23.7	-22.6	-21.6	-20.9	-21.0	-21.6	-21.2	-21.6	-22.2	-22.5	-22.9	-23.2	-24.1	-20.9
	-11.2	-11.4	-11.7	-11.7	-11.8	-11.8	-11.8	-12.0	-12.3	-12.5	-12.5	-12.2	-11.8	-11.3	-10.9	-10.6	-10.6	-10.8	-10.8	-10.9	-11.1	-11.3	-11.5	-11.7		Diurnal Average
	4.0	3.7	3.5	3.6	4.2	4.1	4.2	4.1	3.9	4.0	4.0	4.4	4.6	5.0	5.5	5.5	5.7	5.6	5.3	4.9	4.3	4.3	4.2	3.5		Diurnal Maximum





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 90 m (AT90m) - C  
Mannix - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	224	30.11	30.11
-20 - 0	365	49.06	79.17
0 - 10	155	20.83	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

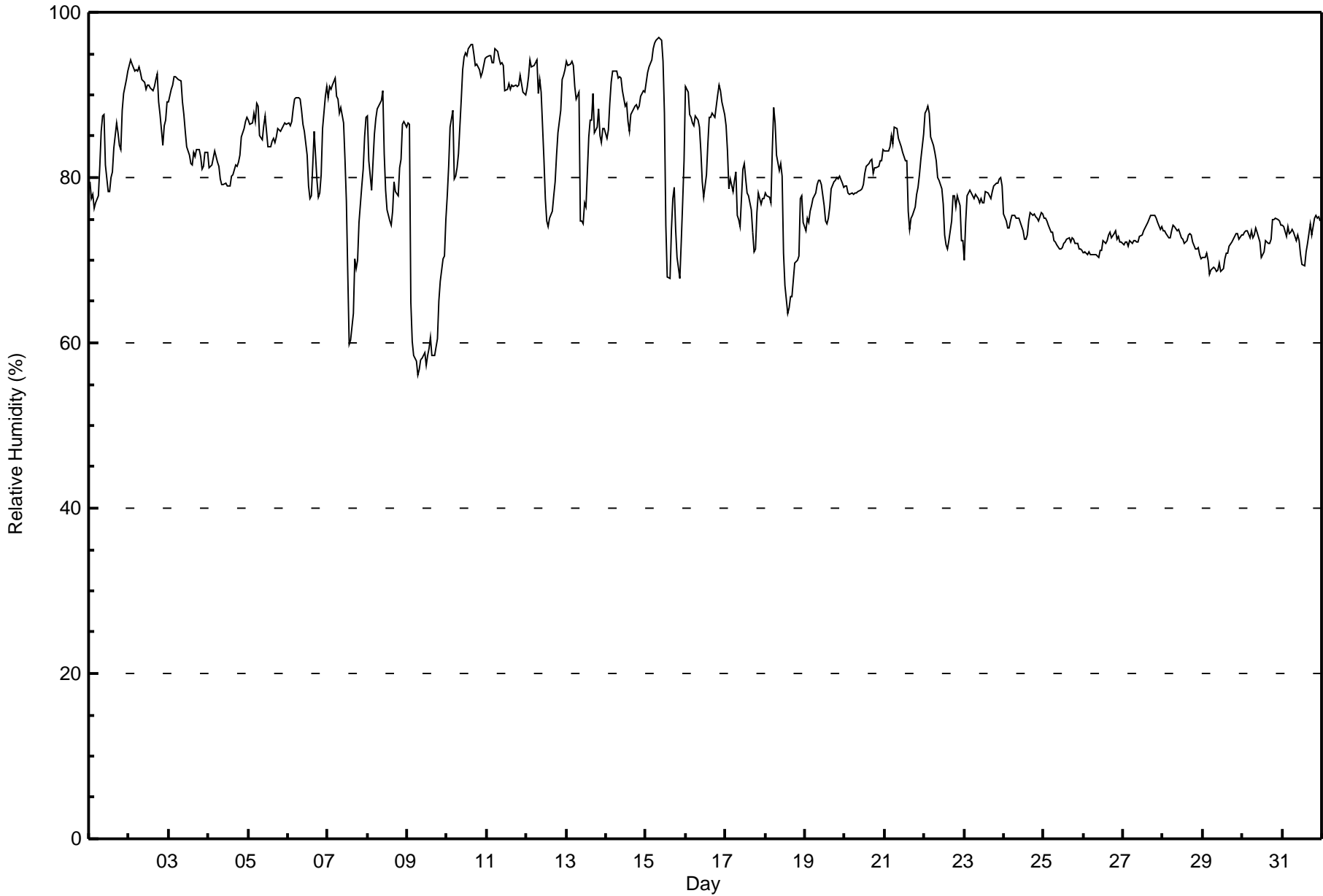
**Mannix - December 2017**

Maximum Value: 97 % on Dec 15 09:00      Maximum Daily Average: 92.5 % on Dec 11																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 56 % on Dec 9 07:00      Minimum Daily Average: 63.5 % on Dec 9 Maximum Diurnal Average: 82.3 % at hour 2      Minimum Diurnal Average: 76.6 % at hour 14 Monthly Average: 80.1 %      Percentiles: P <sub>1</sub> = 58 P <sub>10</sub> = 71 Q <sub>1</sub> = 74 Median = 79 O <sub>3</sub> = 87 P <sub>90</sub> = 92 P <sub>99</sub> = 96																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	80	77	78	76	77	78	81	86	87	88	81	78	78	80	81	84	87	85	84	83	88	90	92	93	83.0	93	
2-Dec	94	94	94	93	93	93	93	93	92	92	91	91	91	91	91	91	92	93	89	88	84	86	87	89	90.9	94	
3-Dec	89	91	91	92	92	92	92	92	89	88	86	84	83	82	82	83	82	83	83	83	81	81	83	83	86.1	92	
4-Dec	81	81	81	82	83	82	81	80	79	79	79	79	79	80	80	81	81	81	82	83	85	86	87	87	81.7	87	
5-Dec	87	86	87	88	87	89	89	85	85	86	87	86	84	84	84	85	84	85	86	86	86	86	87	87	86.0	89	
6-Dec	87	86	87	88	89	90	90	89	88	86	86	83	79	77	78	82	86	80	78	78	80	86	90	91	84.7	91	
7-Dec	90	91	91	91	92	90	89	88	89	87	82	77	68	60	60	64	70	69	70	75	79	81	85	87	80.2	92	
8-Dec	87	82	78	82	85	87	88	89	89	91	83	78	76	75	74	76	80	78	78	81	82	86	87	86	82.5	91	
9-Dec	87	86	65	60	59	58	56	57	58	58	59	57	58	59	61	59	58	59	60	65	67	70	70	75	63.5	87	
10-Dec	78	81	86	88	80	80	81	83	90	93	95	95	95	96	96	96	95	94	94	93	92	93	94	94	90.0	96	
11-Dec	95	95	95	94	94	96	95	94	94	94	94	91	91	91	91	91	91	91	91	91	92	91	90	90	92.5	96	
12-Dec	91	92	94	93	94	94	94	90	92	90	82	78	75	74	75	76	78	79	83	85	88	92	92	93	86.5	94	
13-Dec	94	94	94	94	94	91	90	90	75	75	74	77	76	85	87	87	90	85	86	88	85	84	86	86	86.2	94	
14-Dec	85	86	89	91	93	93	93	92	92	92	90	89	89	87	86	88	88	89	89	88	89	90	90	90	89.5	93	
15-Dec	91	93	93	94	96	96	97	97	97	97	94	88	74	68	68	74	77	79	74	70	68	72	77	82	84.0	97	
16-Dec	91	90	88	87	87	86	87	87	86	83	80	78	80	84	87	87	88	87	89	90	91	90	89	88	86.7	91	
17-Dec	86	83	79	80	78	80	81	75	75	74	81	82	80	78	78	76	73	71	71	76	78	77	77	77	77.8	86	
18-Dec	78	78	78	77	83	89	87	83	81	82	80	71	67	64	64	66	66	68	70	70	71	77	78	75	74.9	89	
19-Dec	74	75	75	76	77	77	78	79	80	80	79	77	75	74	75	76	79	80	80	80	80	80	79	79	77.6	80	
20-Dec	79	79	78	78	78	78	78	78	78	78	79	79	80	81	82	82	82	81	81	81	81	82	82	83	80.0	83	
21-Dec	83	83	83	84	85	84	86	86	85	84	84	83	82	82	76	74	75	75	76	78	79	80	82	85	81.5	86	
22-Dec	88	88	89	88	85	84	83	82	80	80	79	77	73	72	71	72	75	78	78	76	78	77	72	72	79.0	89	
23-Dec	70	75	78	78	78	78	77	78	78	77	78	77	78	78	78	77	78	79	79	79	79	80	80	79	77.7	80	
24-Dec	76	75	74	74	75	75	75	75	75	75	74	73	72	73	75	76	75	76	75	76	75	75	76	76	74.7	76	
25-Dec	75	75	75	74	73	73	72	72	72	71	71	72	72	72	73	73	72	73	73	72	72	71	71	71	72.6	75	
26-Dec	71	71	71	71	71	71	71	71	71	70	71	71	72	72	72	73	73	73	73	73	73	72	73	72	71.8	73	
27-Dec	72	72	72	72	72	72	72	72	72	72	73	73	74	74	74	75	75	75	75	76	75	75	74	74	73.4	76	
28-Dec	74	74	73	73	73	74	74	74	73	74	73	73	73	73	72	72	73	73	73	72	71	71	72	71	70	72.7	74
29-Dec	70	70	71	70	68	69	69	69	69	69	70	69	69	70	71	71	72	72	73	73	73	73	73	73	70.6	73	
30-Dec	73	73	74	74	73	74	73	73	74	73	72	70	71	71	72	72	72	73	75	75	75	75	74	74	73.1	75	
31-Dec	74	74	73	74	73	73	74	73	72	73	72	71	70	69	71	72	73	74	73	75	75	75	75	75	73.1	75	
82.2 82.3 81.6 81.8 81.8 82.1 82.2 81.7 81.1 81.0 80.0 78.2 76.9 76.6 76.9 77.7 78.8 78.6 78.7 79.3 79.8 80.9 81.4 81.9																		Diurnal Average									
95 95 95 94 96 96 97 97 97 97 95 95 95 96 96 96 96 95 94 94 93 92 93 94 94																		Diurnal Maximum									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Mannix - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %  
Mannix - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	14	1.88	1.88
60 - 80	382	51.34	53.23
80 - 100	348	46.77	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



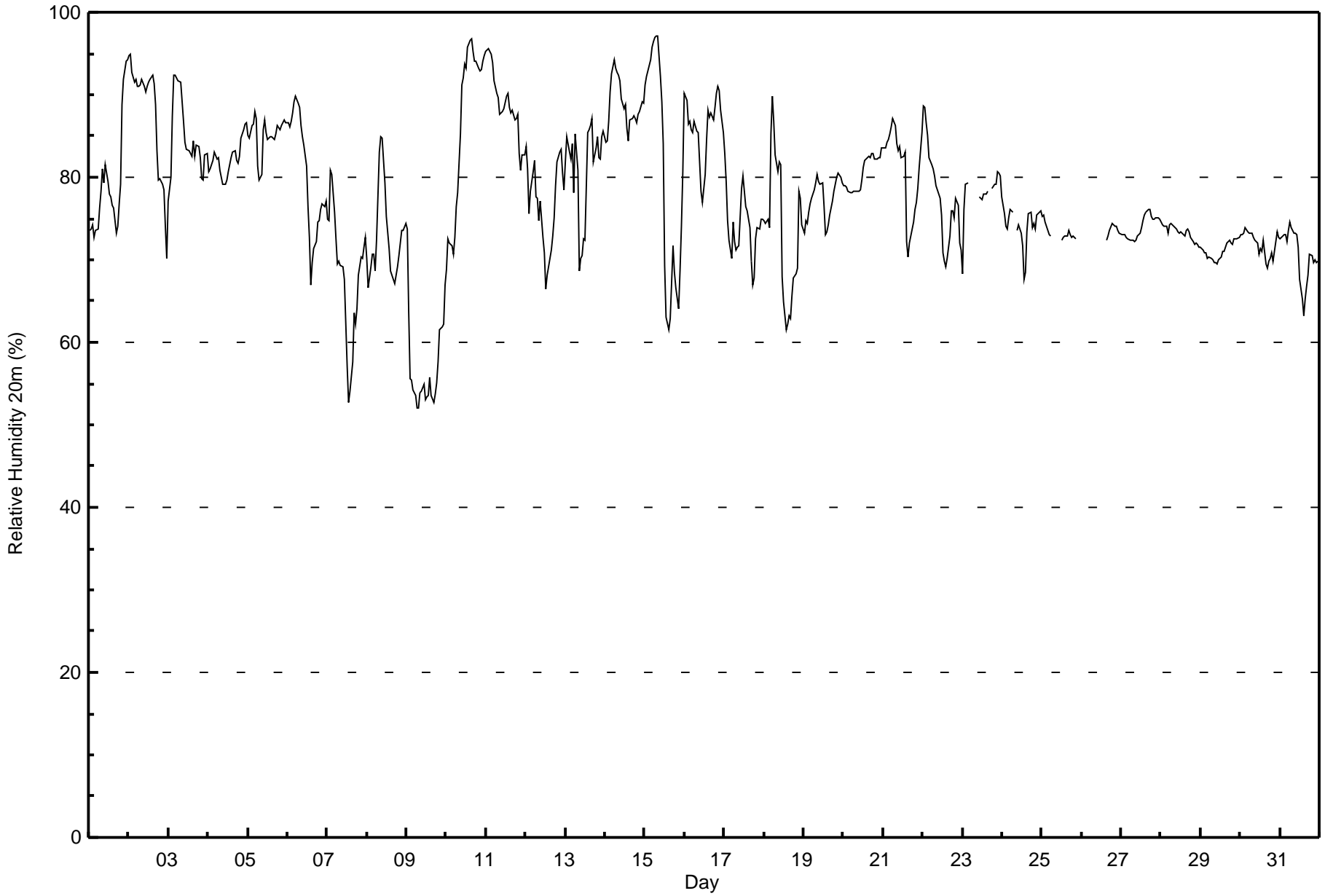
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 20m (RH20m) - %

Mannix - December 2017

Maximum Value: 97 % on Dec 15 09:00																			Maximum Daily Average: 88.9 % on Dec 11						Hours in Service: 744																								
Minimum Value: 52 % on Dec 9 07:00																			Minimum Daily Average: 56.8 % on Dec 9						Hours of Data: 710																								
Maximum Diurnal Average: 79.9 % at hour 8																			Minimum Diurnal Average: 74.9 % at hour 15						Hours of Missing Data: 34																								
Monthly Average: 77.9 %																			Percentiles: P <sub>1</sub> = 53 P <sub>10</sub> = 69 Q <sub>1</sub> = 73 Median = 77 O <sub>3</sub> = 84 P <sub>90</sub> = 90 P <sub>99</sub> = 95						Hours of Calibration: 0																								
																									Percent Operational Time: 95.4																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	73	74	74	73	74	74	76	78	81	79	82	80	78	78	77	76	73	74	77	79	89	92	94	94	79.1	94																							
2-Dec	95	95	93	92	92	91	91	91	92	91	90	91	92	92	92	91	89	83	80	80	79	78	74	70	87.7	95																							
3-Dec	77	80	88	92	92	92	92	92	89	87	84	83	83	83	84	83	84	84	82	80	80	83	83	85.0	92																								
4-Dec	81	81	82	82	83	82	82	81	80	79	79	80	81	81	82	83	83	82	82	82	85	86	86	87	82.2	87																							
5-Dec	85	85	86	86	88	87	81	80	80	86	87	85	84	85	85	85	85	86	86	86	87	87	87	85.2	88																								
6-Dec	87	86	87	88	89	90	89	89	86	85	84	81	76	73	67	70	71	72	75	75	76	77	76	77	80.2	90																							
7-Dec	75	75	81	80	76	73	70	70	69	69	68	62	57	53	54	58	64	62	64	68	70	70	72	73	68.0	81																							
8-Dec	70	67	69	71	71	69	72	83	85	85	82	79	75	71	69	68	68	67	69	70	72	74	74	74	73.1	85																							
9-Dec	74	64	56	55	54	54	52	52	54	54	55	53	53	53	56	53	53	54	55	58	61	62	62	67	56.8	74																							
10-Dec	69	73	72	72	71	73	76	78	85	91	92	94	93	96	97	97	95	94	94	93	93	93	94	95	86.6	97																							
11-Dec	95	96	95	95	94	92	90	90	88	88	88	88	90	90	89	88	88	87	87	88	83	81	83	83	88.9	96																							
12-Dec	84	81	76	78	81	82	78	77	75	77	73	71	67	68	69	71	73	75	79	82	83	83	81	78	76.7	84																							
13-Dec	82	85	83	82	84	78	85	81	69	70	71	73	72	85	86	86	87	82	84	85	82	82	85	86	81.0	87																							
14-Dec	84	84	87	90	92	94	93	93	92	90	88	89	86	84	87	87	87	87	87	88	88	89	89	89	88.7	94																							
15-Dec	91	92	93	94	96	97	97	97	97	92	89	84	69	63	61	63	67	72	69	67	64	69	74	81	80.7	97																							
16-Dec	90	89	87	87	86	85	87	86	85	82	78	77	80	85	88	87	88	87	88	90	91	90	88	85	86.2	91																							
17-Dec	83	80	75	72	70	75	72	71	72	72	79	80	78	76	76	74	70	67	68	73	74	74	75	75	74.1	83																							
18-Dec	75	74	75	74	85	90	87	83	81	82	81	68	65	62	62	63	63	66	68	68	69	78	78	74	73.8	90																							
19-Dec	73	75	74	76	77	77	78	79	80	80	79	79	76	73	73	74	75	77	78	79	80	80	80	79	77.3	80																							
20-Dec	79	79	79	78	78	78	78	78	78	78	78	80	81	82	82	82	83	83	83	82	82	82	82	83	80.5	83																							
21-Dec	84	84	84	85	85	86	87	86	84	83	84	82	83	83	72	70	72	73	75	76	77	79	81	85	80.8	87																							
22-Dec	89	88	87	85	82	81	81	80	79	78	77	75	71	70	69	70	73	76	76	75	77	77	72	71	77.6	89																							
23-Dec	68	76	79	79	AF	AF	AF	AF	AF	AF	78	77	77	78	78	78	AF	AF	79	79	79	81	81	80	--	81																							
24-Dec	78	76	74	74	75	76	76	AF	AF	AF	74	74	73	72	68	69	73	76	76	74	74	74	75	76	76	74.1	78																						
25-Dec	75	75	75	74	73	73	AF	AF	AF	AF	AF	AF	AF	72	73	73	73	74	73	73	73	AF	AF	AF	--	75																							
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	72	73	73	74	74	74	74	74	73	--	74																							
27-Dec	73	73	73	73	73	72	72	72	72	72	73	73	74	75	75	76	76	76	75	75	75	75	75	75	73.9	76																							
28-Dec	75	74	74	74	73	74	74	74	74	74	73	73	73	73	73	73	74	73	73	72	72	72	72	72	73.3	75																							
29-Dec	72	71	71	71	70	70	70	70	70	70	69	70	70	71	71	71	72	72	72	72	73	73	72	73	71.1	73																							
30-Dec	73	73	73	74	73	73	73	73	73	72	72	71	71	71	72	69	69	70	70	71	70	72	73	73	71.9	74																							
31-Dec	73	73	73	73	72	74	75	74	73	73	73	72	68	65	63	65	67	68	71	70	70	70	70	70	70.5	75																							
																								79.3	79.2	79.1	79.3	79.7	79.7	79.9	79.9	79.4	79.1	78.7	77.4	75.7	75.4	74.9	75.3	75.6	75.7	76.4	77.0	77.4	78.4	78.7	78.9	Diurnal Average	
																								95	96	95	95	96	97	97	97	97	92	92	94	93	96	97	97	95	94	94	93	93	93	94	95	Diurnal Maximum	
AF - Analyzer Failure																																																	







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 20m (RH20m) - %**  
**Mannix - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	22	3.10	3.10
60 - 80	405	57.04	60.14
80 - 100	283	39.86	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



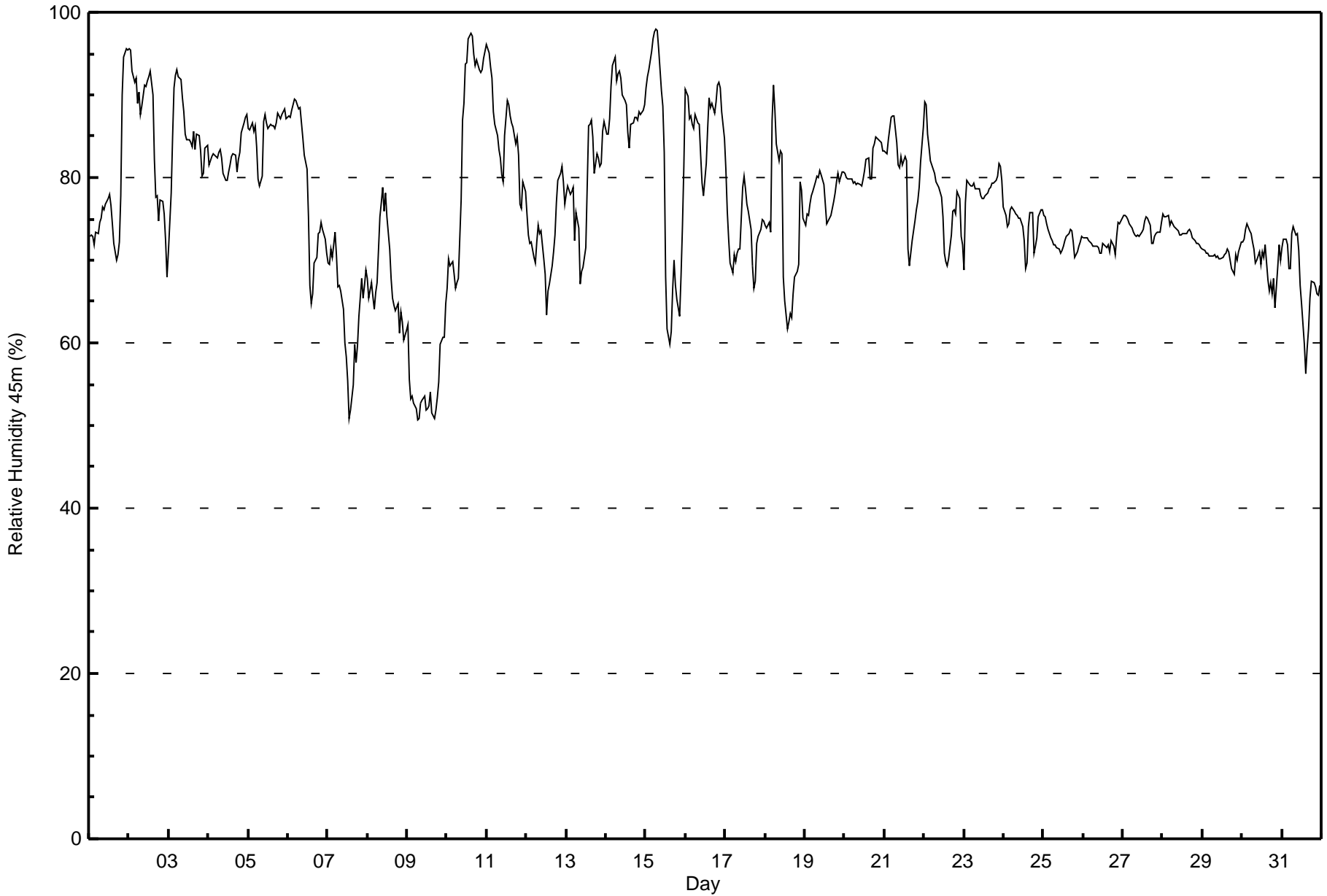
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity 45m (RH45m) - %**

**Mannix - December 2017**

Maximum Value: 98 % on Dec 15 07:00																	Maximum Daily Average: 88.7 % on Dec 14										Hours in Service: 744																
Minimum Value: 51 % on Dec 9 07:00																	Minimum Daily Average: 54.6 % on Dec 9										Hours of Data: 744																
Maximum Diurnal Average: 78.5 % at hour 5																	Minimum Diurnal Average: 74.2 % at hour 16										Hours of Missing Data: 0																
Monthly Average: 76.7 %																	Percentiles: P <sub>1</sub> = 52 P <sub>10</sub> = 66 Q <sub>1</sub> = 71 Median = 75 O <sub>3</sub> = 83 P <sub>90</sub> = 89 P <sub>99</sub> = 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-Dec	73	73	73	72	73	73	75	75	76	76	77	77	78	77	74	72	70	71	72	78	90	95	96	95	77.5	96																	
2-Dec	96	95	93	92	92	89	90	88	89	91	91	92	92	93	90	82	78	78	75	77	77	76	72	68	85.6	96																	
3-Dec	71	78	85	91	92	93	92	92	90	88	85	85	84	84	86	83	85	85	83	80	81	84	84	84	85.2	93																	
4-Dec	82	82	82	83	83	82	83	83	82	81	80	80	81	82	83	83	83	81	82	83	85	87	87	88	82.8	88																	
5-Dec	86	86	87	86	86	84	80	79	80	87	88	87	86	86	86	86	86	87	88	87	88	88	88	87	85.7	88																	
6-Dec	87	87	88	89	90	89	88	89	87	85	83	81	75	67	65	66	70	70	73	73	75	74	73	71	78.9	90																	
7-Dec	70	70	71	70	73	71	67	67	66	64	60	58	55	51	52	55	60	58	60	63	68	65	67	69	63.7	73																	
8-Dec	68	65	67	66	64	66	67	75	77	79	76	78	75	71	68	65	65	64	65	61	64	63	60	62	68.0	79																	
9-Dec	62	56	53	54	53	52	51	51	53	53	54	52	52	52	54	52	51	52	53	55	60	61	61	65	54.6	65																	
10-Dec	67	70	69	70	68	67	67	68	77	87	89	94	94	97	97	97	95	94	94	93	93	93	94	95	84.6	97																	
11-Dec	96	95	93	92	88	86	85	83	82	80	80	85	89	89	87	87	86	84	85	83	77	76	80	78	85.3	96																	
12-Dec	76	73	72	72	70	70	72	74	73	74	70	68	63	66	67	69	71	73	77	80	80	81	79	77	72.9	81																	
13-Dec	78	79	78	78	79	72	76	74	67	69	69	70	71	86	86	87	85	80	83	82	81	82	86	87	78.6	87																	
14-Dec	85	85	87	91	94	95	92	92	93	92	90	89	89	85	84	86	87	87	87	87	88	88	88	89	88.7	95																	
15-Dec	91	92	93	95	97	98	98	98	96	90	89	83	68	62	60	61	66	70	67	65	63	68	74	81	80.2	98																	
16-Dec	91	90	87	88	86	86	88	87	86	83	79	78	82	86	90	89	89	88	89	91	92	91	88	85	86.9	92																	
17-Dec	81	76	73	70	68	71	70	71	71	71	79	80	79	77	76	74	69	67	67	72	73	74	75	75	73.2	81																	
18-Dec	74	74	75	73	87	91	88	84	82	83	83	68	65	62	63	64	63	66	68	69	69	80	79	75	74.3	91																	
19-Dec	74	76	75	77	78	78	79	80	80	81	80	79	77	74	75	75	75	77	78	79	81	79	81	81	78.0	81																	
20-Dec	80	80	80	80	80	79	79	79	79	79	79	80	81	82	82	80	80	84	84	85	85	84	84	83	81.2	85																	
21-Dec	83	83	85	86	87	88	87	84	82	81	82	82	82	82	71	69	71	72	75	76	77	79	82	86	80.5	88																	
22-Dec	89	89	85	84	82	81	81	80	79	79	78	75	71	70	69	70	73	76	76	76	78	77	73	72	77.6	89																	
23-Dec	69	77	80	79	79	79	79	79	79	79	78	77	77	78	78	79	79	79	79	80	80	82	81	80	78.5	82																	
24-Dec	76	75	74	74	76	76	76	76	75	75	74	72	69	70	74	76	76	71	72	73	75	76	76	76	74.3	76																	
25-Dec	75	75	74	74	73	72	72	72	72	71	71	71	72	72	73	73	74	74	72	70	71	72	72	73	72.5	75																	
26-Dec	73	73	73	72	72	72	72	72	72	72	71	71	72	72	71	72	71	72	72	71	73	74	74	75	72.2	75																	
27-Dec	75	75	75	75	74	74	73	73	73	73	73	73	74	75	75	74	72	72	72	73	73	73	73	75	73.8	75																	
28-Dec	76	75	75	75	74	75	74	74	74	74	73	73	73	73	73	74	74	73	73	72	72	72	71	71	73.6	76																	
29-Dec	71	71	71	71	70	70	71	71	70	70	70	70	70	71	71	71	71	69	69	68	71	70	71	72	70.5	72																	
30-Dec	72	73	74	74	74	73	72	71	70	70	71	70	71	70	72	68	66	67	66	68	64	69	72	70	70.3	74																	
31-Dec	72	72	73	72	69	69	73	74	73	73	71	67	65	60	56	59	62	65	67	67	67	66	66	67	67.7	74																	
																	78.0	78.1	78.1	78.2	78.5	78.1	78.0	77.9	77.6	77.7	77.2	76.4	75.4	74.9	74.3	74.2	74.2	74.5	75.0	75.5	76.4	77.2	77.7	77.7	Diurnal Average		
																	96	95	93	95	97	98	98	98	98	96	92	91	94	94	97	97	97	95	94	94	93	93	95	96	95	Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 45m (RH45m) - %**  
**Mannix - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	32	4.30	4.30
60 - 80	455	61.16	65.46
80 - 100	257	34.54	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity 75m (RH75m) - %**

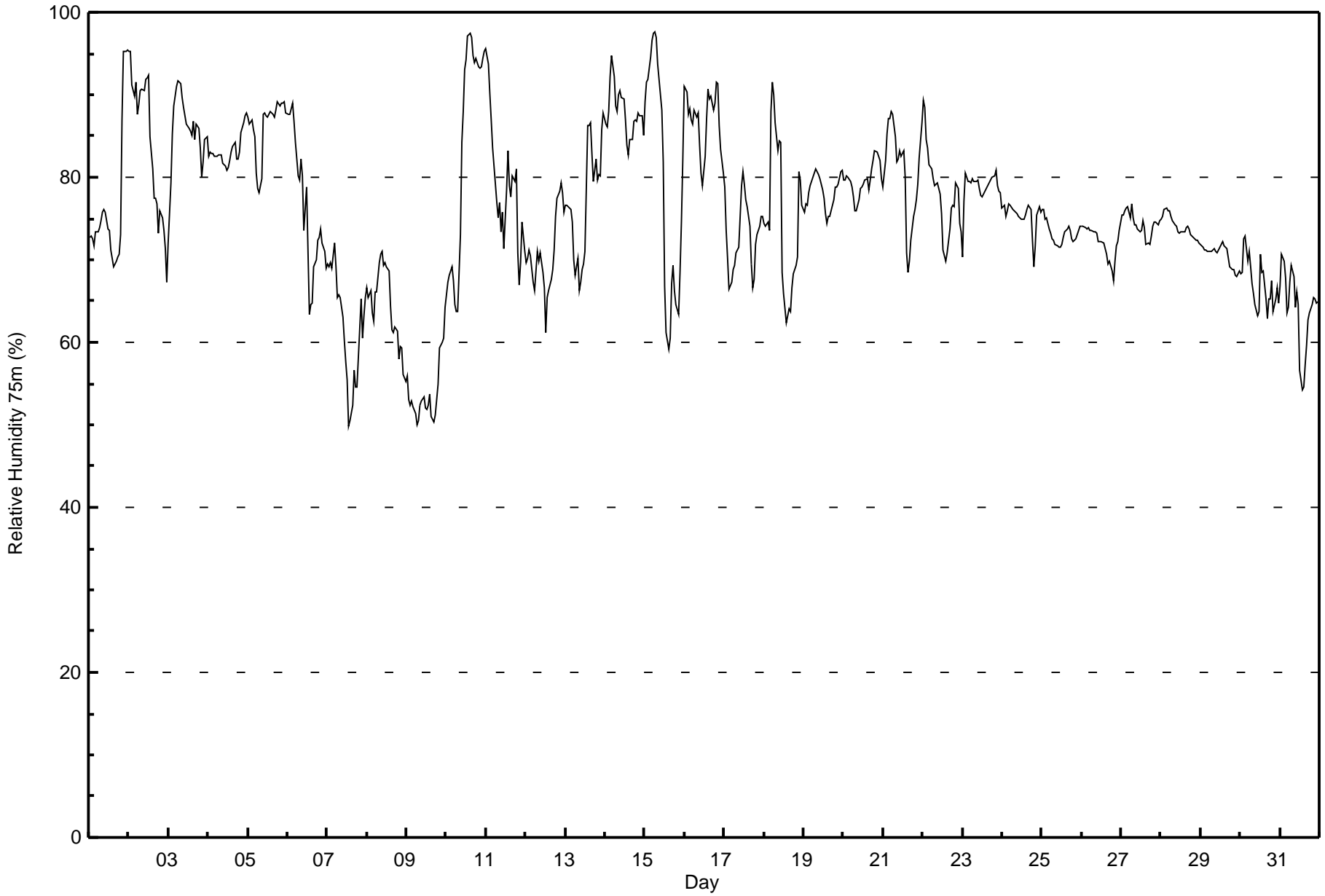
**Mannix - December 2017**

Maximum Value: 98 % on Dec 15 07:00																	Maximum Daily Average: 87.8 % on Dec 14																	Hours in Service: 744														
Minimum Value: 50 % on Dec 7 14:00																	Minimum Daily Average: 53.8 % on Dec 9																	Hours of Data: 744														
Maximum Diurnal Average: 77.8 % at hour 5																	Minimum Diurnal Average: 73.2 % at hour 16																	Hours of Missing Data: 0														
Monthly Average: 75.8 %																	Percentiles: P <sub>1</sub> = 51 P <sub>10</sub> = 64 Q <sub>1</sub> = 70 Median = 75 O <sub>3</sub> = 83 P <sub>90</sub> = 88 P <sub>99</sub> = 96																	Hours of Calibration: 0														
																																		Percent Operational Time: 100.0														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	73	73	73	72	73	73	74	75	76	76	76	74	74	71	70	69	70	70	71	73	87	95	95	95	76.2	95																						
2-Dec	95	95	91	90	92	88	89	90	91	91	92	92	92	85	81	77	77	77	73	76	75	74	71	67	84.2	95																						
3-Dec	72	79	85	89	90	91	92	91	90	89	87	86	86	86	85	87	85	87	86	84	80	82	85	85	85.7	92																						
4-Dec	82	83	83	83	83	82	83	83	83	82	81	81	81	82	83	84	84	82	82	83	85	87	87	88	83.2	88																						
5-Dec	87	86	87	86	85	81	79	78	80	88	88	87	87	88	88	88	87	88	89	89	89	89	88	88	86.2	89																						
6-Dec	88	88	88	89	87	84	80	80	82	80	74	79	71	63	65	65	69	70	72	73	74	72	71	69	76.3	89																						
7-Dec	69	69	70	69	72	69	65	66	65	63	60	58	55	50	51	52	57	54	55	58	65	61	63	65	61.7	72																						
8-Dec	67	65	66	64	63	66	66	70	71	71	69	70	69	69	64	62	61	62	61	58	59	59	56	55	64.3	71																						
9-Dec	56	53	52	53	52	51	50	51	52	53	53	52	52	52	54	51	50	51	53	55	59	60	60	64	53.8	64																						
10-Dec	66	67	68	69	67	65	64	64	73	84	88	93	94	97	97	97	95	94	94	93	93	93	94	95	83.6	97																						
11-Dec	96	94	90	87	84	81	77	75	77	73	76	71	78	83	79	78	80	80	81	71	67	70	75	71	78.9	96																						
12-Dec	70	70	71	70	67	66	69	71	70	71	68	67	61	65	66	68	69	71	75	78	78	79	78	76	70.6	79																						
13-Dec	77	77	76	76	75	70	68	70	66	67	69	69	71	86	86	87	83	80	82	80	80	80	86	88	77.0	88																						
14-Dec	86	86	88	92	95	92	89	88	90	91	90	90	87	84	83	85	85	87	87	87	88	87	87	85	87.8	95																						
15-Dec	89	92	92	95	97	97	98	97	94	90	88	82	67	61	59	60	67	69	66	65	63	69	75	82	79.7	98																						
16-Dec	91	90	88	88	87	86	88	87	88	84	81	79	83	87	91	90	90	88	89	92	91	86	83	80	87.0	92																						
17-Dec	79	73	70	66	67	69	69	71	71	71	79	81	79	77	76	74	70	67	68	72	73	74	75	75	72.8	81																						
18-Dec	74	74	75	74	88	91	90	87	83	84	84	68	66	62	63	64	64	67	68	69	70	81	80	77	75.2	91																						
19-Dec	76	77	77	78	79	79	81	81	81	80	80	79	78	76	74	75	75	77	77	79	79	79	81	81	78.2	81																						
20-Dec	80	80	80	80	79	79	78	76	76	77	79	79	79	80	80	79	80	81	82	83	83	83	82	80	79.7	83																						
21-Dec	79	82	85	87	87	88	88	85	82	82	83	83	83	80	71	68	70	72	75	76	77	79	82	87	80.5	88																						
22-Dec	89	88	85	84	82	81	80	79	79	79	78	76	71	70	70	71	74	76	77	76	79	79	74	73	77.9	89																						
23-Dec	70	77	81	80	79	79	80	80	79	80	79	78	78	79	79	79	80	80	80	81	79	78	78	78	78.8	81																						
24-Dec	76	77	75	76	77	77	76	76	76	76	75	75	75	75	75	76	77	76	72	69	72	75	76	76	75.2	77																						
25-Dec	76	76	75	75	74	73	73	72	72	72	72	72	72	73	73	74	74	74	72	72	73	73	74	74	73.3	76																						
26-Dec	74	74	74	74	74	74	74	73	73	73	72	72	72	72	71	71	70	70	69	68	70	72	72	74	72.1	74																						
27-Dec	75	75	76	76	76	75	77	75	74	74	74	73	74	75	74	72	72	72	73	74	75	75	74	75	74.4	77																						
28-Dec	75	75	76	76	76	76	75	75	74	74	73	73	73	73	73	74	74	74	73	73	73	72	72	72	74.0	76																						
29-Dec	72	72	71	71	71	71	71	71	71	71	71	71	72	72	72	72	71	69	69	69	69	68	68	69	70.6	72																						
30-Dec	68	69	73	73	70	71	69	67	66	65	63	64	71	68	69	65	63	65	65	67	64	65	67	65	67.1	73																						
31-Dec	67	71	70	68	64	64	67	69	68	64	66	65	57	54	55	57	60	63	64	65	65	65	65	65	64.0	71																						
																								77.2	77.7	77.8	77.7	77.8	77.2	76.6	76.5	76.6	76.6	76.4	75.4	74.4	74.1	73.5	73.2	73.5	73.9	74.3	74.3	75.4	76.2	76.7	76.6	Diurnal Average
																								96	95	92	95	97	97	98	97	94	91	92	93	94	97	97	97	95	94	94	93	93	95	95	95	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 75m (RH75m) - %**  
**Mannix - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity 75m (RH75m) - %  
Mannix - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	42	5.65	5.65
60 - 80	469	63.04	68.68
80 - 100	233	31.32	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

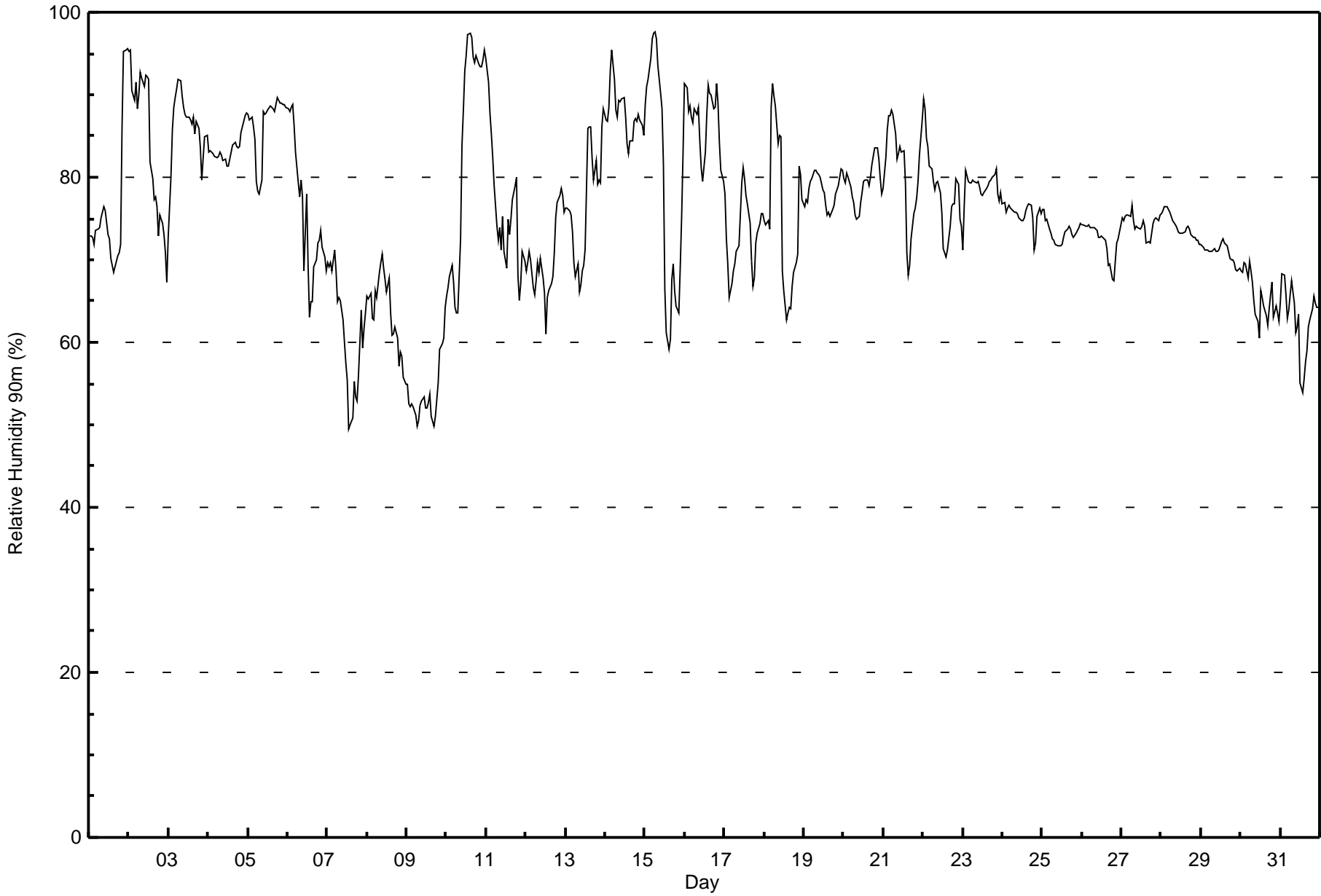
**Summary of Hour Averages**

**Relative Humidity 90m (RH90m) - %**

**Mannix - December 2017**

Maximum Value: 98 % on Dec 15 07:00														Maximum Daily Average: 87.7 % on Dec 14														Hours in Service: 744											
Minimum Value: 50 % on Dec 7 14:00														Minimum Daily Average: 53.7 % on Dec 9														Hours of Data: 744											
Maximum Diurnal Average: 77.6 % at hour 3														Minimum Diurnal Average: 73.0 % at hour 16														Hours of Missing Data: 0											
Monthly Average: 75.6 %														Percentiles: P <sub>1</sub> = 51 P <sub>10</sub> = 64 Q <sub>1</sub> = 70 Median = 75 O <sub>3</sub> = 83 P <sub>90</sub> = 89 P <sub>99</sub> = 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-Dec	73	73	73	72	74	74	74	75	76	76	76	73	72	70	69	68	70	70	71	72	86	95	95	96	76.0	96													
2-Dec	95	95	90	89	92	88	90	93	92	91	92	92	92	82	80	77	78	76	73	75	74	73	71	67	84.1	95													
3-Dec	73	80	86	89	90	91	92	92	90	89	88	87	87	86	87	85	87	86	84	80	82	85	85	85	86.1	92													
4-Dec	83	83	83	83	83	82	83	83	83	82	82	81	81	82	83	84	84	84	84	84	85	87	88	88	83.5	88													
5-Dec	88	87	87	86	85	80	78	78	80	88	88	88	88	89	88	88	88	89	90	89	89	89	89	89	86.5	90													
6-Dec	88	88	88	89	86	83	79	78	80	78	69	78	69	63	65	65	69	70	72	72	73	72	70	69	75.6	89													
7-Dec	70	69	70	69	71	69	65	65	65	63	60	57	55	50	50	51	55	53	53	56	64	59	62	64	61.0	71													
8-Dec	66	65	66	63	63	66	65	69	70	71	69	68	66	68	64	61	61	62	60	57	59	58	56	55	63.6	71													
9-Dec	55	53	52	53	52	51	50	51	52	53	53	52	52	53	54	51	50	51	53	55	59	60	61	64	53.7	64													
10-Dec	66	67	68	69	67	64	64	64	73	84	88	93	95	97	97	97	95	94	95	94	93	93	94	95	83.6	97													
11-Dec	94	92	88	85	82	79	74	72	74	71	75	71	69	75	73	75	77	79	80	68	65	67	71	70	76.2	94													
12-Dec	69	70	71	70	67	66	67	70	69	70	68	66	61	65	66	67	68	71	75	77	78	79	78	76	70.1	79													
13-Dec	76	76	76	75	73	70	68	69	66	67	69	69	71	86	86	86	82	80	82	79	80	79	86	88	76.7	88													
14-Dec	87	87	89	93	95	92	88	87	89	89	90	87	84	83	84	84	87	87	87	88	87	86	85	85	87.7	95													
15-Dec	89	91	92	94	97	97	98	97	94	90	88	82	66	61	59	60	68	69	66	64	64	69	75	83	79.7	98													
16-Dec	91	91	88	89	87	87	88	88	88	84	81	80	83	88	91	90	90	88	89	91	89	84	81	79	86.9	91													
17-Dec	78	73	69	65	67	69	70	71	71	72	79	81	80	78	77	74	70	67	68	72	73	74	76	76	72.9	81													
18-Dec	75	74	75	74	88	91	90	89	84	85	85	69	66	63	64	64	64	67	68	70	71	81	80	77	75.6	91													
19-Dec	76	77	77	79	79	80	81	81	81	80	80	79	78	77	75	76	75	76	77	78	79	79	81	81	78.4	81													
20-Dec	80	79	81	80	79	78	77	76	75	75	77	78	79	80	80	79	80	81	83	84	84	82	80	78	79.3	84													
21-Dec	79	82	86	87	87	88	88	85	82	83	84	83	83	79	71	68	69	72	76	76	77	79	83	87	80.7	88													
22-Dec	90	88	85	84	81	81	80	78	79	79	78	76	71	71	70	71	74	76	77	77	80	79	75	74	78.1	90													
23-Dec	71	76	81	80	79	79	80	79	79	79	79	78	78	78	79	79	80	80	80	81	81	78	77	78	78.7	81													
24-Dec	77	77	76	76	77	76	76	76	76	76	75	75	75	75	76	76	77	77	75	71	72	75	76	76	75.5	77													
25-Dec	76	76	75	75	74	73	73	72	72	72	72	72	72	73	73	74	74	74	73	73	73	74	74	74	73.4	76													
26-Dec	74	74	74	74	74	74	74	74	74	74	73	73	73	73	72	71	69	69	68	67	70	72	73	73	72.3	74													
27-Dec	75	75	75	75	75	75	77	75	74	74	74	74	74	75	74	72	72	72	73	74	75	75	75	75	74.4	77													
28-Dec	76	76	76	76	76	76	75	75	74	74	73	73	73	73	73	74	74	74	73	73	73	72	72	72	74.1	76													
29-Dec	72	72	71	71	71	71	71	71	71	71	71	71	71	72	73	72	72	72	70	70	70	70	69	69	70.9	73													
30-Dec	69	68	70	70	68	70	69	67	65	63	62	61	66	65	64	63	62	64	66	67	63	64	64	63	65.6	70													
31-Dec	65	68	68	66	63	64	66	67	65	61	62	63	55	54	56	58	59	62	63	64	66	65	64	64	62.8	68													
														77.2	77.5	77.6	77.4	77.5	76.9	76.4	76.3	76.2	76.3	76.1	75.2	74.0	73.7	73.3	73.0	73.4	73.9	74.3	74.2	75.2	75.9	76.3	76.4	Diurnal Average	
														95	95	92	94	97	97	98	97	94	91	92	93	95	97	97	97	97	95	94	95	94	93	95	96	Diurnal Maximum	







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 90m (RH90m) - %**  
**Mannix - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	44	5.91	5.91
60 - 80	478	64.25	70.16
80 - 100	222	29.84	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 31 km/h on Dec 9 11:00	Maximum Daily Speed Average: 16.8 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 21 03:00	Minimum Daily Speed Average: 2.3 km/h on Dec 19	Hours of Data: 666
Maximum Diurnal Speed Average: 5.4 km/h at hour 18	Minimum Diurnal Speed Average: 1.4 km/h at hour 6	Hours of Missing Data: 78
Monthly Average Velocity: 3.1 km/h 225.3 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 18 P <sub>99</sub> = 27	Percent Operational Time: 89.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	WSW14	WSW14	WSW14	WSW18	WSW10	WSW15	SSW6	S10	S8	S8	SSE11	SSE10	SE5	SE7	SE7	SSE10	S9	SE7	SE8	SSE9	SE5	ENE1	SE2	SW4	SSW6.6	WSW18	
2-Dec	SW8	W10	NW10	NNW4	WNW1	WNW3	N3	NW6	NW8	NNE5	WNW1	SSE2	S2	SSE2	S5	SSE5	S7	SW9	WSW11	WSW11	W11	WSW4	S5	SSW6	WSW3.4	WSW11	
3-Dec	SSE9	SSE7	SSE8	SSE7	SSE9	SSE10	WSW6	WSW7	NNW15	NNW13	N11	N10	NNW9	NNW7	NNW7	N5	NNE11	NNE9	NNE10	N8	N8	N5	WNW3	NNE6	N3.2	NNW15	
4-Dec	NNE9	NNE8	NNE6	W1	WSW3	SE1	S3	SSW5	S4	AF	SE7	SSE10	SSE10	SSE11	SSE13	SSE10	SSE11	SE11	SE11	SSE13	SSE12	SE13	SE15	SSE11	SSE6.8	SE15	
5-Dec	SSE12	SSE12	SSE10	S8	SSE6	W13	W16	NNW18	NW15	N11	N14	N10	NNW6	NNW8	N11	N9	NNE9	N8	NNE8	N5	NW5	NW4	W6	S3	NNW3.6	WNW18	
6-Dec	SE8	SSE10	SE11	SSE12	SSE12	SSE11	SSE12	SSE15	SSE15	SSE15	SSE13	SSE12	SSE15	SSE9	SW6	SW5	WSW6	WSW17	WSW15	W17	WSW12	WSW8	SSE8	S3	S7.8	WSW17	
7-Dec	S4	S8	SE6	SSE7	SSE7	SSW3	SSW3	S5	SSE7	SE5	E4	SE3	SSE3	W20	W21	W22	NNW14	NNW17	NNW16	W13	WNW4	W9	WSW5	SW9	WSW5.6	W22	
8-Dec	SW8	SW12	SW9	SSW7	S6	SSW7	SSW7	SE6	SSE10	SSE10	SSE10	SSE10	SSE12	SSE10	SSE14	SSE15	SSE14	SSE17	SSE11	SSE13	SSE7	SSE7	SE10	SSE9	SSE9.0	SSE17	
9-Dec	SE6	SW8	WSW20	WSW19	WSW18	WSW16	W22	W29	W29	W27	W31	W26	W18	W11	W12	W19	W26	WSW17	WSW14	W12	WSW10	NNW6	WSW11	SW15	WSW16.8	W31	
10-Dec	WSW13	S4	WSW7	WSW10	WSW13	S4	SSE10	SSE9	SSE9	S5	SW8	W18	NNW24	NW17	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	NW24	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SSE12	----	SSE12	
12-Dec	SSE9	SSW5	SW8	SSE4	SE6	SSE7	SW9	WSW4	WSW5	SW9	W13	W13	NNW15	W18	W19	NNW19	NNW19	NNW16	NNW17	NNW11	W9	SW6	SW2	WSW5	W7.8	WNW19	
13-Dec	SW12	SW8	SW8	SSW7	SSW5	SSW9	SSE10	S5	W22	W20	NNW15	W16	NNW16	N15	NNW11	NW6	W8	NNW16	W13	W13	NNW14	NNW16	N9	NNE8	W8.3	W22	
14-Dec	NNE7	SSE1	SSW6	SSW8	S8	SSE6	SSE8	SSE9	SE9	SE9	SSW16	SSE10	SE11	SSE12	SSE11	SSE9	SSE8	S6	SSE9	SSE10	S4	SE5	SSE8	SSE8	SSE7.5	SSE16	
15-Dec	SSE6	SSE6	SSE12	AF	AF	AF	AF	AF	AF	AF	W13	WSW14	W18	NNW19	NNW17	W13	WSW6	SSW6	WSW12	WSW13	WSW16	W19	W23	W21	W23	WSW12.3	W23
16-Dec	W19	N19	NNE24	NNE17	NNE13	NNE14	NNE12	NNE9	NE5	ENE6	ENE6	E4	SSE5	SSE7	SSE9	SE8	SSE9	SE10	SSE9	SSE10	SSE11	SSE13	SE11	SSE19	E3.8	NNE24	
17-Dec	SSE18	SSE16	SSE19	S14	S14	SSE8	SSW11	SW18	SW16	WSW17	W20	WSW22	WSW23	W29	W27	WSW23	W28	NNW27	NNW23	NNW16	W11	W15	W17	W19	WSW14.5	W29	
18-Dec	W16	W16	W16	W17	N15	N17	NNE16	NNE15	NNE9	N5	WNW4	NW24	NNW27	NW29	NW24	NW22	NNW24	NNW19	NNW20	NNW20	NNW20	NNE14	NNE14	N16	NW13.5	NW29	
19-Dec	NNE15	NNE14	NNE12	NNE11	NNE13	N11	N8	NW3	SW6	WSW6	WSW4	SSE4	SSE8	SSE9	SSE11	SSE11	SSE10	SSE9	SSE8	SSE10	SSE9	SE7	SE7	AF	ESE2.3	NNE15	
20-Dec	SSE11	SE9	SE5	SE10	SE9	SE12	SSE14	SSE14	SSE16	SSE17	SSE13	SSE12	SSE15	SSE15	SSE14	SSE12	SE12	SE8	SSE9	SE9	SSE11	SSE12	SSE11	SSE13	SSE11.7	SSE17	
21-Dec	SSE5	SSE5	NW0	SW1	W4	NNW4	NW3	N6	NNW4	NNW4	NW2	NW5	WSW2	SW3	NNW17	NNW16	W17	W22	NNW21	NNW20	NNW17	NNW17	NW13	WNW9	WNW7.9	W22	
22-Dec	NW4	NE2	W6	WNW6	W16	W16	W16	W16	WSW18	W21	W17	W18	NNW20	NNW20	NNW19	NNW18	NNW18	W18	NNW16	NW17	NNE22	N24	N22	N14	WNW12.5	N24	
23-Dec	N14	N7	NNW3	WNW5	AF	AF	AF	AF	AF	AF	N4	ENE0	NNW2	W4	NW4	W4	AF	AF	SSE7	SSE6	S3	W2	N4	NNE21	----	NNE21	
24-Dec	NNE25	NNE23	AF	N21	N15	N11	N14	AF	AF	NNW11	NW3	WSW2	SSW2	SSW2	ENE1	E4	ESE3	S5	SW5	ESE3	SW4	NW3	N7	NNE11	N5.7	NNE25	
25-Dec	NNE12	N15	NNE16	NNE16	NNE16	N20	AF	AF	AF	AF	AF	AF	AF	S3	AF	ESE2	SSE5	AF	S6	SSE8	SSE10	SSE12	AF	AF	AF	----	N20
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SE7	SE7	SE4	SE6	SSE9	SE5	SSE8	SSE6	SE7	----	SSE9	
27-Dec	SSE7	SSE7	SSE7	SSE6	SSE8	SSE8	SSE9	SSE8	SSE10	SSE9	SSE9	SSE8	SSE10	SSE9	SSE7	SSE8	S7	S7	S6	S6	SSE5	SSE6	SSE10	SE6	SSE7.5	SSE10	
28-Dec	SE4	SSE5	SSE3	ESE1	N5	NNE10	N15	N10	NNW7	N7	N7	NNE5	N6	W3	WSW5	W5	NW3	N5	NNE8	NNE7	N6	NNW3	NW3	WNW2	N3.8	N15	
29-Dec	NE3	N6	NNE9	N5	WSW6	SSW7	S7	S8	SSE8	SSE9	SSE9	SSE7	SSE7	SSE9	SSE7	SSE9	SSE9	S8	SSE8	SSE8	SSE10	SSE8	SSE8	SSE9	SSE5.5	SSE10	
30-Dec	SSE7	SSE8	SSE9	SSE9	SSE10	SE8	SSE8	SSE7	SSE7	SSE8	SSE8	SSE9	SE6	SSE8	SSE8	SSE9	SSE8	SE7	SSE9	S8	SSE9	SSE9	SSE9	SSE13	SSE8.3	SSE13	
31-Dec	SSE11	SSE11	SSE10	SSE14	SSE13	SSE11	SSE15	SSE12	SSE13	SSE14	SSE13	SSE15	SSE14	SSE11	SSE14	SSE12	SSE15	SSE16	SSE14	SSE13	SSE16	SSE15	SSE17	SSE14	SSE13.5	SSE17	

S2.1	S1.4	SSW2.2	SSW2.1	SSW2.0	SSW1.4	SSW2.5	SSW3.4	SW4.2	SW3.6	SW3.6	WSW4.2	WSW3.8	WSW4.2	SW4.4	SW4.9	WSW5.4	SW4.8	SW4.4	SW3.4	WSW1.8	SSW2.1	SSW2.6	Diurnal Average		
NNE25	NNE23	NNE24	N21	WSW18	N20	W22	W29	W29	W27	W31	W26	NNW27	W29	WSW27	WSW23	W28	NNW27	NNW23	NNW20	NNE22	N24	N22	W23	Diurnal Maximum	

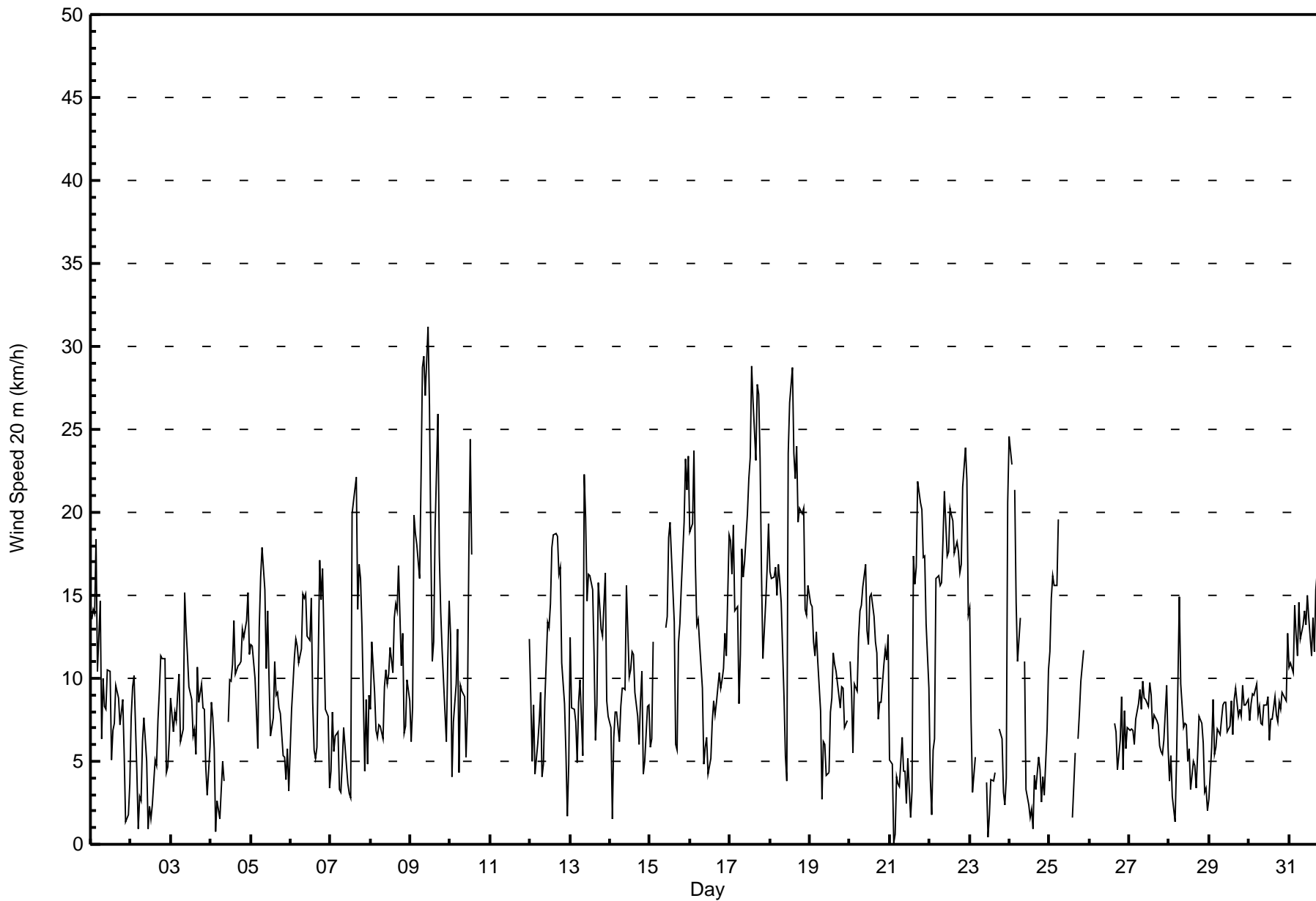
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed 20 m (WS20m) - km/h**  
**Mannix - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 10 km/h on Dec 9 07:00 Minimum Value: 1 km/h on Dec 25 15:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 O <sub>1</sub> = 2 Median = 2 O <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 666 Hours of Missing Data: 78 Hours of Calibration: 0 Percent Operational Time: 89.5																														
Day	Hourly Period Ending At (MST)																								Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	3	3	3	4	4	4	3	2	2	2	2	1	2	2	2	2	2	2	2	2	3	1	1	1	4																						
2-Dec	2	2	3	2	1	1	1	2	1	2	1	2	1	1	1	2	1	2	1	2	5	2	1	2	5																						
3-Dec	1	1	1	2	1	2	2	3	4	4	5	3	3	2	2	2	3	2	2	2	2	1	2	5																							
4-Dec	2	3	2	1	1	1	1	1	2	2	2	2	2	3	3	2	2	2	3	2	3	3	3	3																							
5-Dec	2	3	3	3	3	5	3	4	4	3	3	3	2	3	3	3	3	3	2	2	2	2	1	5																							
6-Dec	2	2	2	2	2	3	2	3	3	3	2	4	3	2	2	3	2	3	3	3	3	2	1	2																							
7-Dec	2	2	2	2	2	2	2	2	2	1	2	2	2	6	3	5	3	3	3	2	3	2	2	3																							
8-Dec	2	1	3	2	1	3	2	3	2	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3																							
9-Dec	2	4	5	5	4	4	10	5	6	4	4	4	4	3	4	4	3	4	3	2	5	4	4	2																							
10-Dec	3	2	2	2	2	3	2	2	2	2	3	3	5	4	AF	AF	AF	AF	AF	AF	AF	AF	AF	5																							
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	3																							
12-Dec	5	3	4	2	2	2	3	4	3	4	3	4	3	3	2	3	3	3	3	3	3	1	2	3																							
13-Dec	2	3	2	2	3	4	3	4	6	6	3	2	3	4	4	3	3	2	3	2	3	3	2	6																							
14-Dec	2	2	2	2	2	1	3	2	3	2	4	3	3	2	2	2	2	2	3	3	2	2	2	4																							
15-Dec	2	2	3	AF	AF	AF	AF	AF	AF	2	3	3	5	4	5	2	2	3	5	3	4	4	3	4																							
16-Dec	3	6	6	5	4	4	4	3	2	2	1	2	2	2	2	2	2	3	2	2	2	3	3	4																							
17-Dec	3	3	4	3	4	2	5	4	4	4	5	5	4	5	5	5	5	6	6	3	2	5	2	3																							
18-Dec	2	3	2	3	5	5	4	4	4	2	3	8	6	6	5	5	6	4	3	4	5	4	4	4																							
19-Dec	3	3	3	3	3	3	3	2	1	1	2	2	2	1	2	1	2	2	2	2	2	2	2	AF																							
20-Dec	2	2	2	3	2	2	2	2	3	4	3	3	3	2	2	1	2	2	2	4	3	2	2	2																							
21-Dec	3	3	1	1	2	1	2	2	1	1	2	2	1	1	6	3	2	4	5	5	4	4	3	3																							
22-Dec	1	1	4	4	1	2	2	2	4	2	2	3	4	4	4	3	3	3	3	4	5	6	7	4																							
23-Dec	4	2	2	2	AF	AF	AF	AF	AF	AF	2	1	2	1	2	1	AF	AF	1	2	2	2	3	8																							
24-Dec	6	6	AF	6	4	3	4	AF	AF	AF	3	2	1	1	2	1	1	3	2	2	2	2	3	6																							
25-Dec	3	3	3	4	4	4	AF	AF	AF	AF	AF	AF	1	AF	1	1	AF	1	1	1	2	AF	AF	AF																							
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1	2	1	2	1	2	2	2	3	3																							
27-Dec	2	2	1	2	2	2	2	2	2	3	2	2	2	2	1	1	1	1	1	1	1	3	1	2																							
28-Dec	2	1	1	1	2	6	5	4	2	2	2	2	2	2	1	2	2	2	2	2	3	2	1	1																							
29-Dec	1	2	2	3	3	1	2	1	1	1	1	2	2	2	2	2	2	1	1	3	2	2	2	2																							
30-Dec	2	2	2	2	2	2	2	1	1	2	1	2	2	2	2	2	2	2	1	2	1	2	1	2																							
31-Dec	2	2	2	3	2	1	2	2	2	2	2	3	2	1	1	2	2	2	3	2	2	2	2	2																							
Diurnal Maximum																								6	6	6	6	5	6	10	5	6	6	5	8	6	6	6	5	6	6	6	5	5	6	7	8
AF - Analyzer Failure																																															





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h  
Mannix - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	126	18.92	18.92
6 - 11	300	45.05	63.96
12 - 19	190	28.53	92.49
20 - 28	45	6.76	99.25
29 - 38	5	0.75	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 666

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h**  
**Mannix - December 2017**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	9	3	3	3	2	5	11	14	17	7	7	10	7	8	13	7	126
6 - 11	21	20	0	2	0	0	32	140	19	12	15	15	8	3	4	9	300
12 - 19	12	16	0	0	0	0	4	62	2	0	5	21	36	26	4	2	190
20 - 28	4	5	0	0	0	0	0	0	0	0	0	5	16	11	4	0	45
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	0	5
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	46	44	3	5	2	5	47	216	38	19	27	51	71	48	26	18	666

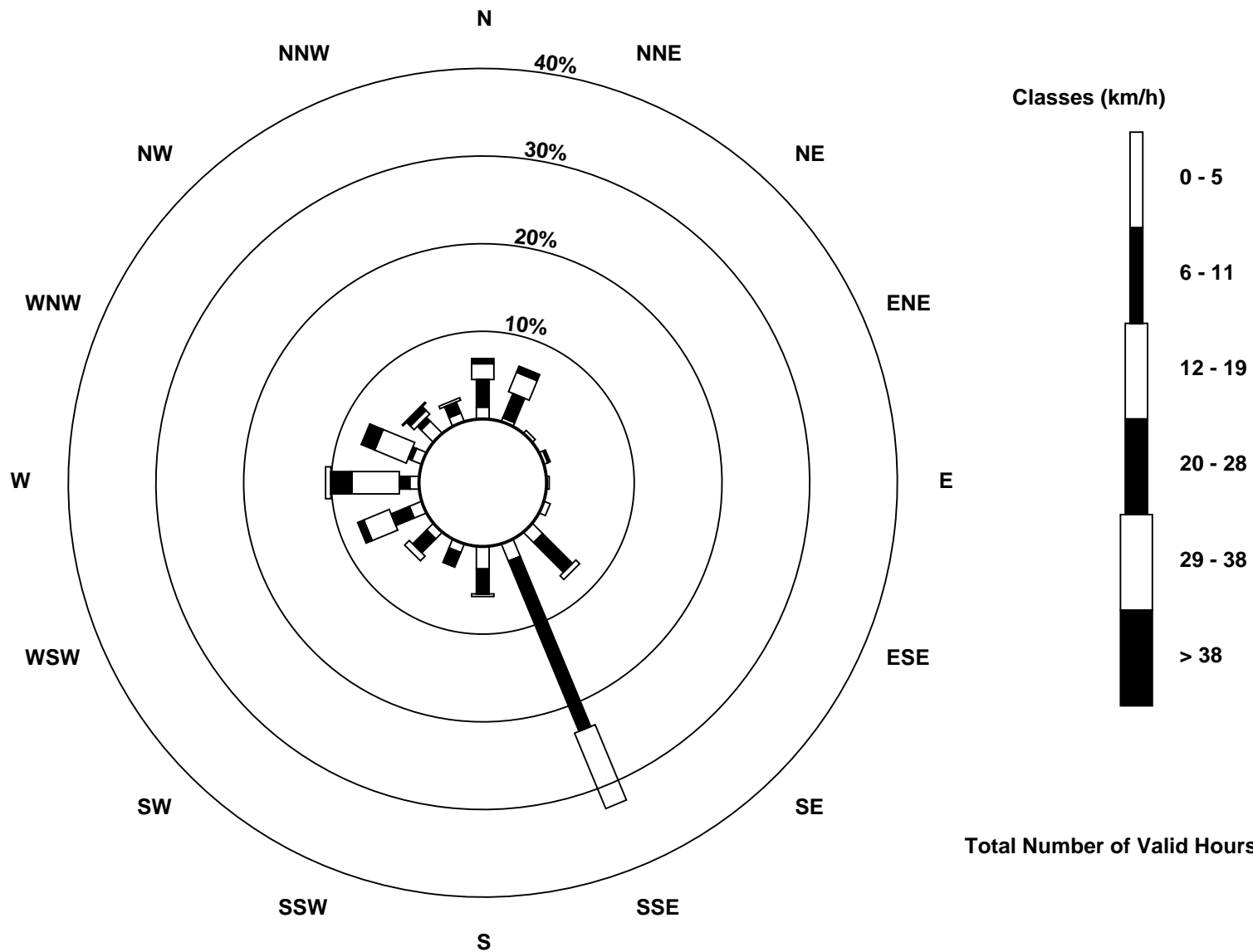
Total Number of Valid Hours: 666

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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







Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 45 m (WS45m) - km/h

Mannix - December 2017

Maximum Speed: 36 km/h on Dec 9 11:00	Maximum Daily Speed Average: 22.3 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 24 15:00	Minimum Daily Speed Average: 1.8 km/h on Dec 25	Hours of Data: 723
Maximum Diurnal Speed Average: 7.8 km/h at hour 18	Minimum Diurnal Speed Average: 2.9 km/h at hour 2	Hours of Missing Data: 21
Monthly Average Velocity: 5.1 km/h 216.5 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 6 Q <sub>1</sub> = 10 Median = 14 Q <sub>3</sub> = 21 P <sub>90</sub> = 25 P <sub>99</sub> = 33	Percent Operational Time: 97.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW21	WSW21	WSW21	WSW26	WSW17	SW21	SW12	S14	SSW11	SSW10	S13	SSE14	SE9	SE12	SE13	S17	S16	SE13	SE13	SSE15	SSE9	SE4	ESE2	WSW2	SSW10.4	WSW26
2-Dec	SW12	W14	NW14	NNW7	NNW1	WNW4	NNW4	NW10	NW11	N9	SSW1	SSE6	S6	SSW6	SSW7	S7	SSW11	SW16	WSW19	WSW18	WSW18	WSW11	SW6	SW9	WSW6.4	WSW19
3-Dec	S12	S9	S11	SSE12	SSE14	SSE16	WSW11	WSW12	NW20	NNW17	N16	N13	NNW11	NNW8	NNW9	N7	N13	NNE10	NNE12	N11	N11	N6	NW4	N7	NNW3.8	NW20
4-Dec	NNE11	NNE10	NNE8	NNW2	NW1	E2	ESE2	SSE7	SSE9	SSE11	SE10	SE13	SSE13	SSE16	SE21	SSE15	SE16	SE16	SE18	SE18	SE19	SE21	SSE16	SE9.8	SE21	
5-Dec	SSE16	SSE16	SSE15	SSW13	SW13	W25	W24	WNW26	NW22	N15	N20	N14	NNW8	NNW10	N15	N12	NNE12	N11	N10	N7	NW6	NW5	WSW6	SSW4	NW5.5	WNW26
6-Dec	SE9	SE13	SE16	SSE19	SSE18	SSE19	SSE19	SSE22	SSE21	SSE20	SSE19	SSE18	SSE19	S12	SW12	SW12	WSW12	WSW23	WSW23	WSW22	WSW19	WSW15	SSW7	SW6	S11.5	WSW23
7-Dec	SW9	SW12	S6	SW10	SW6	WSW8	WSW8	SW8	SSW9	SSW7	SW2	WSW1	WSW4	W25	W26	W29	W23	W27	W26	W19	W13	W15	WSW11	SW13	WSW12.0	W29
8-Dec	SW12	SW16	SW16	SW13	SSW12	SW10	SW12	SE10	SSE15	SSE16	SSE13	SSE14	SE16	SE16	SSE20	SSE22	SSE22	SSE24	SSE18	SSE21	S12	SSW9	SSE14	S15	S13.1	SSE24
9-Dec	S11	SW17	WSW28	WSW25	WSW25	WSW24	WSW29	W33	WSW35	WSW32	WSW36	WSW30	W23	W15	WSW17	WSW25	WSW31	WSW23	WSW19	WSW17	WSW16	NW10	WSW14	WSW19	WSW22.3	WSW36
10-Dec	WSW19	WSW9	WSW15	WSW16	WSW18	SSW7	SSE14	S12	S14	SSW10	WSW12	W23	WNW31	NW22	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	WNW31
11-Dec	AF	AF	AF	AF	AF	AF	WSW21	WSW23	SW17	SW15	S11	SSE12	SSE14	SSE14	SSE16	SSE17	SSE18	SSE19	SSE16	SSE21	S24	SSE24	SSE21	SSE21	S14.8	SSE24
12-Dec	S15	WSW14	SW15	SW7	SSW3	SSW9	WSW19	W14	W10	WSW15	WSW20	W20	WNW23	W25	W25	W27	WNW28	WNW26	W26	WNW20	WNW15	W7	W5	W7	W14.7	WNW28
13-Dec	SW15	SW17	WSW16	SW12	SW14	SSW14	S13	SW10	W28	W26	W21	W22	WNW22	NNW21	NNW16	NW9	W13	W23	W18	W20	W21	WNW23	NNW11	NNE10	W13.4	W28
14-Dec	NNE9	ESE1	SSW8	S12	S13	S10	SSE10	SSE15	SE15	SE16	SSE21	SSE14	SE18	SSE18	SSE18	SE14	SE12	SSE11	SE13	SSE15	S8	SE9	SE12	SSE13	SSE11.7	SSE21
15-Dec	SE9	SSE11	SSE17	AF	AF	AF	AF	AF	WSW11	W19	WSW19	W23	W26	W23	W17	WSW10	SW10	WSW18	WSW20	SW22	W24	W27	W25	WSW26	WSW15.9	W27
16-Dec	WSW22	N25	N31	N22	NNE17	NNE18	NNE16	NNE12	NNE6	ENE7	E5	SE6	SE8	SE10	SE9	SE11	SE14	SSE15	SSE16	SE17	SE20	SE18	SSE27	E4.8	N31	
17-Dec	SSE24	SSE22	SSE26	S24	S24	S15	SSW18	SW25	SW22	WSW22	WSW23	WSW26	WSW27	WSW33	WSW32	WSW29	W32	W34	W30	W23	W16	W19	WSW21	WSW23	WSW19.1	W34
18-Dec	W21	W20	WSW20	W20	NNW20	N22	NNE20	NNE18	NNE11	N7	WNW5	NW30	WNW33	NW36	NW29	NW28	WNW31	W25	W26	W25	WNW26	N17	N18	N20	NW17.4	NW36
19-Dec	N19	N19	N16	N15	N16	N15	N11	NNW5	SW3	WSW5	SW6	S8	SSE10	SSE10	SE14	SSE15	SSE16	SSE13	SSE12	SSE16	SSE16	SSE10	SSE9	SSE18	ESE3.5	N19
20-Dec	SSE17	SSE12	SE13	SE18	SE19	SE23	SSE23	SSE23	SSE26	SSE26	SSE21	SSE18	SSE22	SSE24	SSE22	SSE22	SE22	SSE21	SSE24	SSE23	SE25	SSE25	SSE24	SSE24	SSE21.5	SSE26
21-Dec	SSE14	SSW6	NW6	NW4	W14	WNW11	NW9	N10	NNW8	NNW7	NW4	NW7	W3	WSW7	WNW24	W22	W22	W28	W26	W27	WNW24	WNW23	WNW17	WNW13	WNW12.1	W28
22-Dec	WNW7	WNW4	W11	W12	W21	W21	W21	WSW21	WSW25	WSW25	W20	W22	W25	W25	W25	W23	W23	W22	W21	NW22	N27	N31	N30	N19	WNW16.6	N31
23-Dec	N20	N11	NNW5	WNW4	WNW3	WSW4	W5	NNE5	NE6	NNE8	N8	NNE4	N5	W5	NW5	WNW4	SW7	S9	SSE10	SSE9	SSW7	W10	NNW10	N28	NNW3.4	N28
24-Dec	N32	N30	N31	N28	N19	NNW16	N18	NNW14	NW14	NNW17	NNW5	W1	SSW3	SSW3	NE0	ENE4	E3	S4	W9	N2	WSW7	WNW7	N10	N16	N9.9	N32
25-Dec	NNE16	N21	N22	NNE21	NNE21	N25	NNW14	NNW13	N3	WSW2	SSW7	SSW7	SSW5	S3	SE3	S3	SSW7	SSW9	S10	SSE12	SSE13	S12	SE12	SSE17	NNE1.8	N25
26-Dec	SSE17	SSE16	SSE16	SE15	SE15	SSE17	SE19	SE15	SE16	SSE18	SE13	SSE17	SSE13	SSE15	SE14	SE11	SE12	SSE11	S10	SSE13	SSE12	SSE15	SSE10	SSE8	SSE13.8	SE19
27-Dec	SSE9	SSE10	SSE12	SSE13	SSE12	SSE14	SSE16	SSE12	SSE14	SSE14	SSE12	SSE10	SSE13	SSE10	SSE10	S9	S10	SSW10	SSW8	SSW6	S6	SSE8	SSE10	SE11	SSE10.3	SSE16
28-Dec	SE8	SE8	S8	SSW2	N8	N19	N23	N15	NNW11	N11	N10	N6	N8	W3	W4	NW5	NNW4	N7	NNE10	NNE10	N9	N6	N5	NNE2	N5.9	N23
29-Dec	NNE5	NNE9	NNE11	N8	NW2	SSW5	S9	S13	S13	SSW9	SSW8	SSW10	SSE10	SSE13	SSE9	SSE15	SSE14	SSW11	S11	S12	SSE15	S14	SSE11	SSE12	S7.2	SSE15
30-Dec	SSE10	SSE11	SSE11	SSE12	SE14	SE12	SSE15	SSE13	SSE11	SSE11	SSE9	SSE11	SE6	SE8	SSE9	SSE11	SE12	SE11	SSE15	SSE13	SSE12	SSE14	SSE15	SSE19	SSE11.9	SSE19
31-Dec	SSE18	SE17	SSE18	SSE21	SSE22	SSE23	SSE24	SSE21	SSE24	SSE24	SE23	SSE25	SSE20	SSE21	SSE22	SSE20	SSE24	SE24	SE25	SSE24	SSE25	SSE24	SSE26	SSE22	SSE22.2	SSE26

SSW3.9	SSW2.9	SW3.3	SW4.2	SW4.0	SW3.4	SW4.6	SW4.9	SW5.7	SW5.2	SSW5.2	SW5.7	SW5.0	SW5.5	SW5.4	SW6.2	SW6.9	SW7.8	SW7.6	SW7.2	SW6.3	SW4.2	S4.0	S4.7	Diurnal Average
N32	NNE30	N31	N28	WSW25	N25	WSW29	WSW33	WSW35	WSW32	WSW36	WSW30	WNW33	NW36	WSW32	WSW29	W32	W34	W30	W27	N27	N31	N30	N28	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**

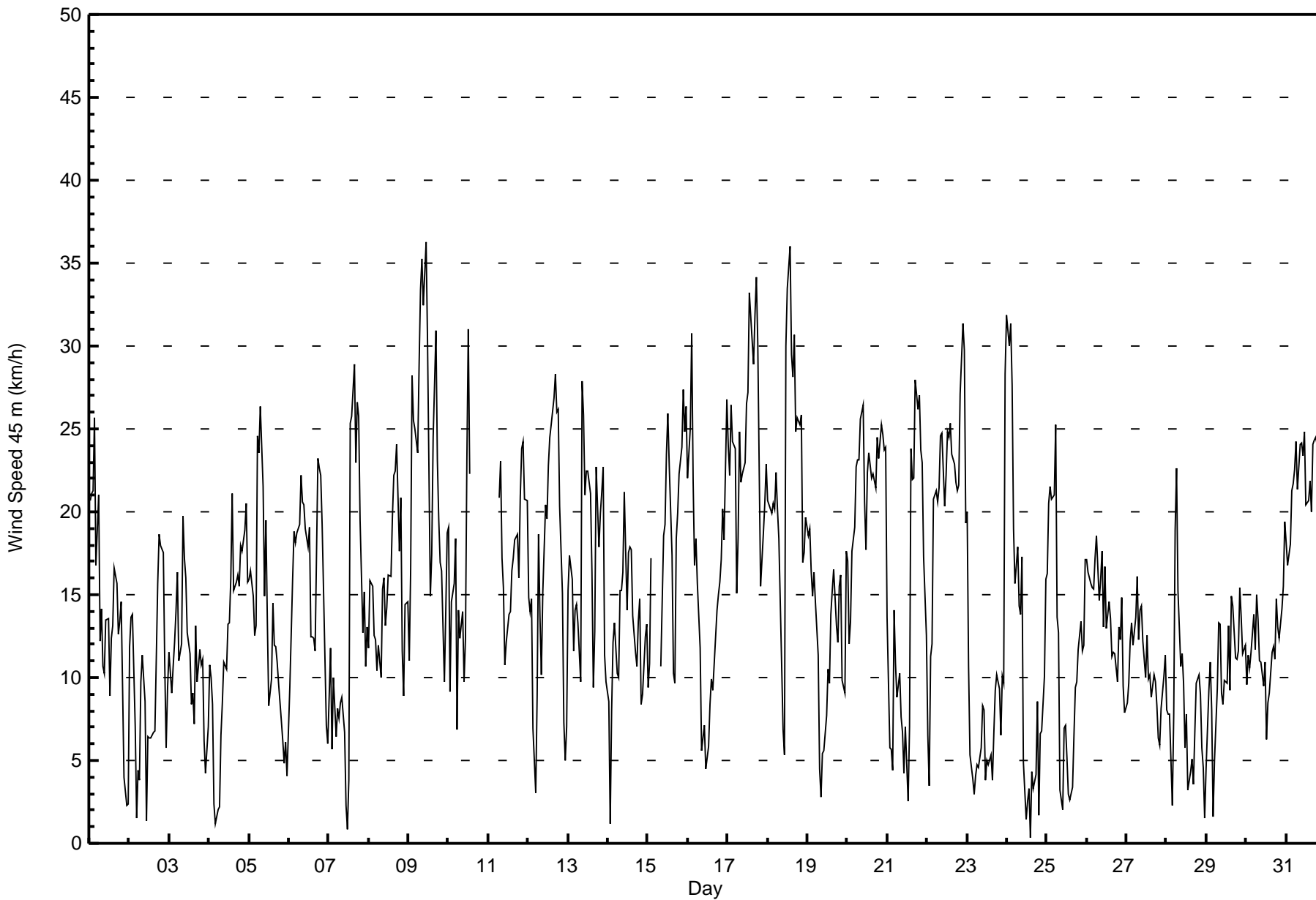
**Wind Speed 45 m (WS45m) - km/h**  
**Mannix - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744													
Maximum Value: 9 km/h on Dec 9 07:00														Hours of Data: 723													
Minimum Value: 1 km/h on Dec 25 16:00														Hours of Missing Data: 21													
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 7														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-Dec	3	3	3	4	4	4	3	3	2	1	1	2	2	3	2	1	1	1	1	2	3	3	1	1	4		
2-Dec	4	2	3	3	1	1	1	2	1	3	1	2	2	2	1	2	2	2	1	2	5	3	2	3	5		
3-Dec	1	1	1	3	3	2	2	3	4	5	5	3	2	2	2	2	2	2	3	2	2	1	2	5			
4-Dec	2	3	3	2	1	1	1	2	1	2	2	2	2	3	3	2	2	2	3	3	2	3	3	3			
5-Dec	2	3	3	3	2	5	3	3	3	3	3	4	2	3	3	3	3	3	2	2	3	3	2	1			
6-Dec	2	2	2	2	1	2	1	2	3	2	2	4	3	2	3	3	2	3	3	2	2	3	2	3			
7-Dec	2	2	2	2	2	4	4	2	2	2	2	2	3	6	3	6	3	2	3	2	3	2	3	4			
8-Dec	2	1	2	2	2	3	3	3	1	2	1	2	3	2	2	2	2	2	2	1	3	1	4	2			
9-Dec	2	7	5	6	4	4	9	5	5	4	4	4	4	3	5	4	3	3	3	2	7	5	5	2			
10-Dec	3	3	1	2	2	3	2	2	2	3	4	3	4	4	AF	AF	AF	AF	AF	AF	AF	AF	AF	4			
11-Dec	AF	AF	AF	AF	AF	AF	2	2	2	2	1	2	2	2	2	2	2	3	2	2	2	2	2	3			
12-Dec	5	4	5	4	2	3	4	7	5	5	4	5	3	2	2	2	2	3	2	2	4	1	3	7			
13-Dec	2	3	3	2	5	3	2	4	6	6	2	2	3	4	5	4	4	3	3	2	3	3	2	6			
14-Dec	2	2	3	1	2	2	4	1	3	3	3	4	3	2	2	3	4	3	3	3	3	3	3	4			
15-Dec	3	2	2	AF	AF	AF	AF	AF	4	2	4	3	5	3	5	2	3	3	5	3	4	3	3	5			
16-Dec	3	7	5	5	4	4	4	3	3	2	1	2	2	2	2	2	2	3	2	2	2	3	3	7			
17-Dec	3	2	4	3	4	2	5	4	4	4	4	4	4	5	4	4	4	5	5	3	3	5	3	5			
18-Dec	2	3	2	3	5	5	4	5	5	2	3	8	5	5	5	4	5	4	3	3	5	4	4	8			
19-Dec	3	3	4	3	3	3	3	3	1	1	1	1	2	1	2	1	2	2	2	3	2	1	2	4			
20-Dec	2	2	3	4	3	1	1	1	2	3	3	3	3	2	2	1	1	2	2	4	3	2	2	4			
21-Dec	6	2	1	3	2	3	1	2	2	1	2	2	1	2	6	3	2	3	5	4	3	4	3	6			
22-Dec	2	1	4	4	2	2	2	2	3	2	2	2	4	3	4	3	3	2	3	4	5	6	7	7			
23-Dec	4	3	2	1	1	2	2	1	1	3	2	2	2	1	1	2	1	1	1	1	1	1	3	8			
24-Dec	6	6	6	6	5	3	3	4	3	3	3	1	2	1	1	1	1	1	2	2	5	3	2	6			
25-Dec	3	3	3	3	4	3	5	5	1	2	1	1	1	1	1	1	3	1	1	1	2	3	1	5			
26-Dec	1	1	1	3	3	3	2	3	3	2	3	2	2	3	2	2	2	2	1	2	2	2	2	3			
27-Dec	2	2	1	1	2	2	1	3	2	3	3	2	1	1	1	1	1	1	1	1	1	2	1	3			
28-Dec	1	1	1	1	4	6	5	4	2	2	2	2	2	1	1	2	2	2	3	2	3	3	2	6			
29-Dec	1	2	2	3	1	2	2	1	2	2	1	2	3	2	2	2	2	1	2	3	2	3	2	3			
30-Dec	1	2	2	1	2	1	2	1	1	2	2	3	1	2	2	2	3	3	1	1	1	2	1	3			
31-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	1	4	3	1	1	2	4			
														Diurnal Maximum													
														6 7 6 6 5 6 9 7 6 6 5 8 5 6 6 6 5 5 5 4 7 6 7 8													
AF - Analyzer Failure																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed 45 m (WS45m) - km/h**  
**Mannix - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h  
Mannix - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	65	8.99	8.99
6 - 11	191	26.42	35.41
12 - 19	261	36.10	71.51
20 - 28	180	24.90	96.40
29 - 38	26	3.60	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 723

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h**  
**Mannix - December 2017**

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	4	1	1	3	3	2	0	3	8	2	6	7	6	8	7	65
6 - 11	24	13	2	1	0	0	18	37	18	27	11	12	6	3	7	12	191
12 - 19	20	9	0	0	0	0	40	97	19	4	21	26	13	3	2	7	261
20 - 28	13	3	0	0	0	0	9	50	3	0	4	29	48	14	5	2	180
29 - 38	5	1	0	0	0	0	0	0	0	0	0	10	4	3	3	0	26
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	66	30	3	2	3	3	69	184	43	39	38	83	78	29	25	28	723

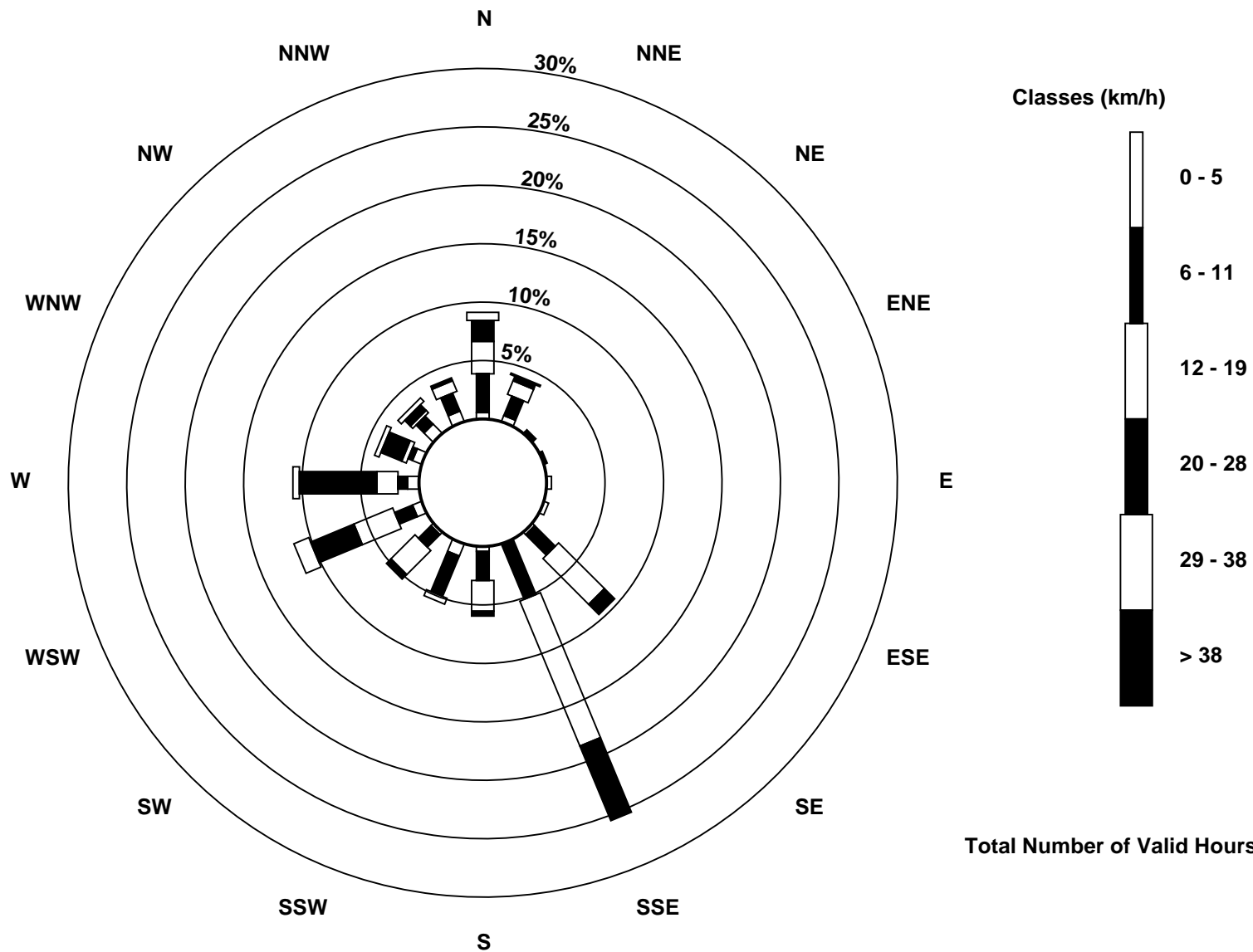
Total Number of Valid Hours: 723

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





Maximum Speed: 40 km/h on Dec 9 11:00	Maximum Daily Speed Average: 27.2 km/h on Dec 31	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 1 23:00	Minimum Daily Speed Average: 3.3 km/h on Dec 19	Hours of Data: 739
Maximum Diurnal Speed Average: 9.2 km/h at hour 19	Minimum Diurnal Speed Average: 4.4 km/h at hour 23	Hours of Missing Data: 5
Monthly Average Velocity: 6.6 km/h 237.0 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 6 Q <sub>1</sub> = 10 Median = 16 Q <sub>3</sub> = 24 P <sub>90</sub> = 29 P <sub>99</sub> = 37	Percent Operational Time: 99.3

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW26	WSW27	WSW26	WSW31	WSW22	WSW25	SW17	SSW16	SW14	SW13	SSW14	SSW16	SSE11	SSE12	SSE15	S20	S15	SSE12	SE16	SSE14	SSE7	SE7	ENE0	W4	SSW12.8	WSW31
2-Dec	WSW14	WNW17	NW16	NNW10	N3	NW7	NW7	WNW9	NW11	NNW7	SW4	SSW5	SSW7	WSW12	WSW12	SW9	SW13	WSW20	WSW24	WSW23	WSW23	WSW16	WSW9	SW11	W9.7	WSW24
3-Dec	SSW12	SSW10	SSW12	S12	S11	SSE14	WSW15	W16	NNW23	N20	N19	N15	N12	NNW9	N10	N8	NNE15	NNE11	NNE14	NNE15	NNE8	NW5	N8	NNW5.2	NNW23	
4-Dec	NNE13	NNE13	NNE12	N5	NE3	ENE2	ESE1	SSE5	SSE8	S6	SSE6	SE15	SSE17	SSE19	SE27	SE21	SE21	SE21	SE24	SE23	SE25	SE26	SSE20	SE11.7	SE27	
5-Dec	SSE20	SSE21	S16	SW17	WSW21	W35	W30	NNW32	NW26	N17	NNE24	N16	NNW9	NNW11	N16	N14	NNE14	N13	NNE11	N9	NW6	NW5	WSW6	S6	NW6.9	W35
6-Dec	SE11	SSE18	SSE20	S19	S14	S14	S14	SSE21	SSE25	SSE23	S23	SSE22	S20	SW17	SW15	WSW16	WSW16	WSW27	WSW28	WSW27	WSW25	W21	WSW11	WSW11	SSW14.2	WSW28
7-Dec	SW11	SW15	SW9	WSW16	WSW14	WSW15	WSW14	WSW14	WSW13	WSW12	W8	WNW8	W11	W30	W30	W34	W28	W32	WNW32	W25	W19	WNW19	W12	WSW16	W17.5	W34
8-Dec	WSW14	SW18	SW20	WSW17	SW14	WSW13	WSW16	S6	S9	S10	S7	SSE12	SE16	SSE22	SSE24	S27	SSE28	SSE29	S19	S19	SW15	SW15	SSW9	SW12	SSW13.3	SSE29
9-Dec	SW12	WSW23	WSW33	WSW31	WSW30	WSW29	WSW35	W38	WSW40	WSW37	WSW40	W34	W26	W18	WSW21	WSW29	W35	WSW28	WSW23	WSW20	WSW20	NW12	WSW15	WSW20	WSW26.7	WSW40
10-Dec	WSW24	WSW17	WSW20	WSW21	WSW22	SW10	S10	SSW14	SSW14	SW12	WSW16	W28	WNW35	NW26	NNW23	N18	NNE22	NNE17	N5	NW6	NE3	SSE3	SE8	SSE12	W8.7	WNW35
11-Dec	SSW12	WSW13	WSW16	WSW21	WSW24	WSW28	WSW27	WSW31	WSW24	WSW23	SW11	SSW10	SSE17	SSE18	SSE18	SSE19	SSE25	SSE24	SSE20	S19	S27	S32	S27	SSE19	SSW16.4	S32
12-Dec	SSW17	WSW22	WSW18	WSW13	WSW10	WSW13	WSW28	W22	W18	WSW22	WSW26	W25	WNW28	W29	W29	W33	WNW35	WNW32	WNW32	WNW27	WNW21	WNW13	WNW10	WNW11	W20.7	WNW35
13-Dec	WSW18	WSW22	WSW21	WSW17	SW21	SW17	SSW13	WSW16	W33	W31	W26	WNW27	WNW26	NNW26	NNW21	NNW13	WNW17	WNW27	W22	W25	W26	WNW27	NNW13	NNE12	W17.5	W33
14-Dec	NNE10	ENE2	SSW7	S13	S16	S14	S9	S11	SSE15	SSE24	SSE26	SSE19	SE23	SSE24	SSE23	SE14	SE11	SE15	SE16	SE19	SSE13	SE12	SE14	SSE19	SSE13.9	SSE26
15-Dec	SE14	SSE15	SSE24	AF	AF	AF	AF	AF	WSW17	W23	WSW24	W27	WNW30	W26	W21	W15	SW13	WSW23	WSW25	WSW27	W27	W30	W27	W29	WSW18.9	WNW30
16-Dec	W25	N28	N35	NNE25	NNE20	NNE22	NNE19	NNE14	NNE6	NE7	ENE6	E4	SE7	SE9	SE11	SE12	SE14	SE18	SSE21	SSE22	SSE25	SSE28	SSE25	SSE32	ESE5.7	N35
17-Dec	SSE30	SSE29	SSE32	S31	S30	S20	SSW23	SW30	SW26	WSW26	W25	WSW30	WSW31	WSW36	WSW35	WSW32	W35	WNW38	W34	WNW27	W19	W22	W24	W26	WSW22.6	WNW38
18-Dec	W24	W24	W23	W23	N23	N26	NNE24	NNE21	NNE13	N8	WNW6	NW33	WNW36	NW39	NW33	NW31	WNW33	WNW28	WNW29	W28	WNW29	NNE19	N20	N21	NW19.5	NW39
19-Dec	N21	N22	N20	NNE18	N19	N18	N14	N7	SW1	WSW3	SSW3	S9	SSE14	SSE10	SSE14	SSE19	SSE23	SSE19	SSE18	SSE22	S16	SW8	SW7	S15	SE3.3	SSE23
20-Dec	S12	SSW7	SE10	SE20	SSE23	SSE21	S16	S15	SSE21	SSE26	S23	S16	SSE24	SSE28	SSE26	SSE20	SSE24	SSE26	SSE29	SSE29	SSE31	SSE30	SSE30	S27	SSE22.0	SSE31
21-Dec	SSW15	W10	NW10	WNW12	WNW18	NW15	NNW13	N12	NNW10	NNW8	NW6	NW8	WNW5	W12	WNW27	WNW27	W27	W32	W30	WNW32	WNW28	WNW26	NW19	WNW14	WNW15.7	W32
22-Dec	WNW9	WNW8	W15	W17	W26	W26	W25	W26	WSW29	W28	W24	W25	W27	W27	WNW28	WNW26	W26	W24	WNW24	NW24	NNE30	N35	N33	N22	WNW19.4	N35
23-Dec	N24	N14	N7	WNW2	WNW2	W5	W6	NNW2	NNE5	NNE11	N12	N10	N8	NW6	NW6	NW5	SW7	S8	SSW6	SSW6	WSW13	W15	NW12	N33	NNW5.7	N33
24-Dec	N37	NNE36	N36	N31	N21	N18	N20	N19	NNW19	NNW23	N6	NNW2	SW3	SW5	WNW4	N3	ENE2	SW5	W12	WNW8	W12	WNW12	N14	N21	N12.7	N37
25-Dec	NNE23	N25	NNE27	NNE26	NNE27	N29	N17	N15	N4	W1	SW5	SW9	SW7	SW5	SSW4	SW5	SW10	SW11	SSW9	S9	SSW8	SSW9	SSW9	S10	NNW4.0	N29
26-Dec	S10	S10	SSW9	SSE10	SSE11	S11	SSE11	SSE13	SSE14	S11	SSE10	SSE13	SSE15	SSE16	SE17	SE16	SE17	S12	SW9	SSW8	S7	SSW6	WSW5	WSW4	SSE10.1	SSE17
27-Dec	SSW4	SSW3	S3	SSW4	S5	S6	SSE7	S8	S9	S9	S10	S8	SSE12	S10	S9	SSW8	SW10	SW12	SW11	SW7	SW5	S5	SSW4	SSE4	SSW6.7	SSE12
28-Dec	SE4	SE5	SE4	N1	N13	N28	N29	N20	NNW14	N14	N12	N6	NNW9	WNW3	NW5	NNW6	N5	N7	NNE12	NNE14	N13	N9	N6	NNE3	N8.9	N29
29-Dec	NNE6	NNE11	NNE13	N8	N3	SSE2	S8	SSE11	SSW11	SW11	SW10	SW13	SSW10	S9	S10	SSE12	SSW12	SW14	SSW12	S10	S14	SSW14	S10	S12	SSW6.4	S14
30-Dec	S8	S11	SSE13	SSE14	SSE14	SSE16	SSE11	S9	SSW6	S6	SSE6	SSE12	SE7	SE9	SSE12	SSE14	SSE16	SE16	S11	SSW9	S9	SSE10	SSE17	SSE15	SSE10.8	SSE17
31-Dec	SSE20	SSE22	SSE24	SSE25	S26	SSE26	SSE24	SSE24	SSE27	SSE29	SSE28	SSE31	SSE30	SSE26	SSE27	SSE28	SSE31	SE31	SSE35	SSE34	SSE30	S26	S29	S27	SSE27.2	SSE35

SW5.0WSW4.7WSW4.8WSW6.8WSW6.6WSW6.1WSW7.0WSW7.2WSW7.8WSW7.1 SW6.8WSW7.4 SW6.7WSW6.9 SW6.5 SW6.8 SW7.7 SW8.9 SW9.2 SW8.6WSW8.1WSW5.6 SW4.4SSW4.7	Diurnal Average
N37 NNE36 N36 S31 SSW30 W35 WSW35 W38 WSW40 WSW37 WSW40 W34 WNW36 NW39 WSW35 W34 W35 WNW38 SSE35 SSE34 SSE31 N35 N33 N33	Diurnal Maximum

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

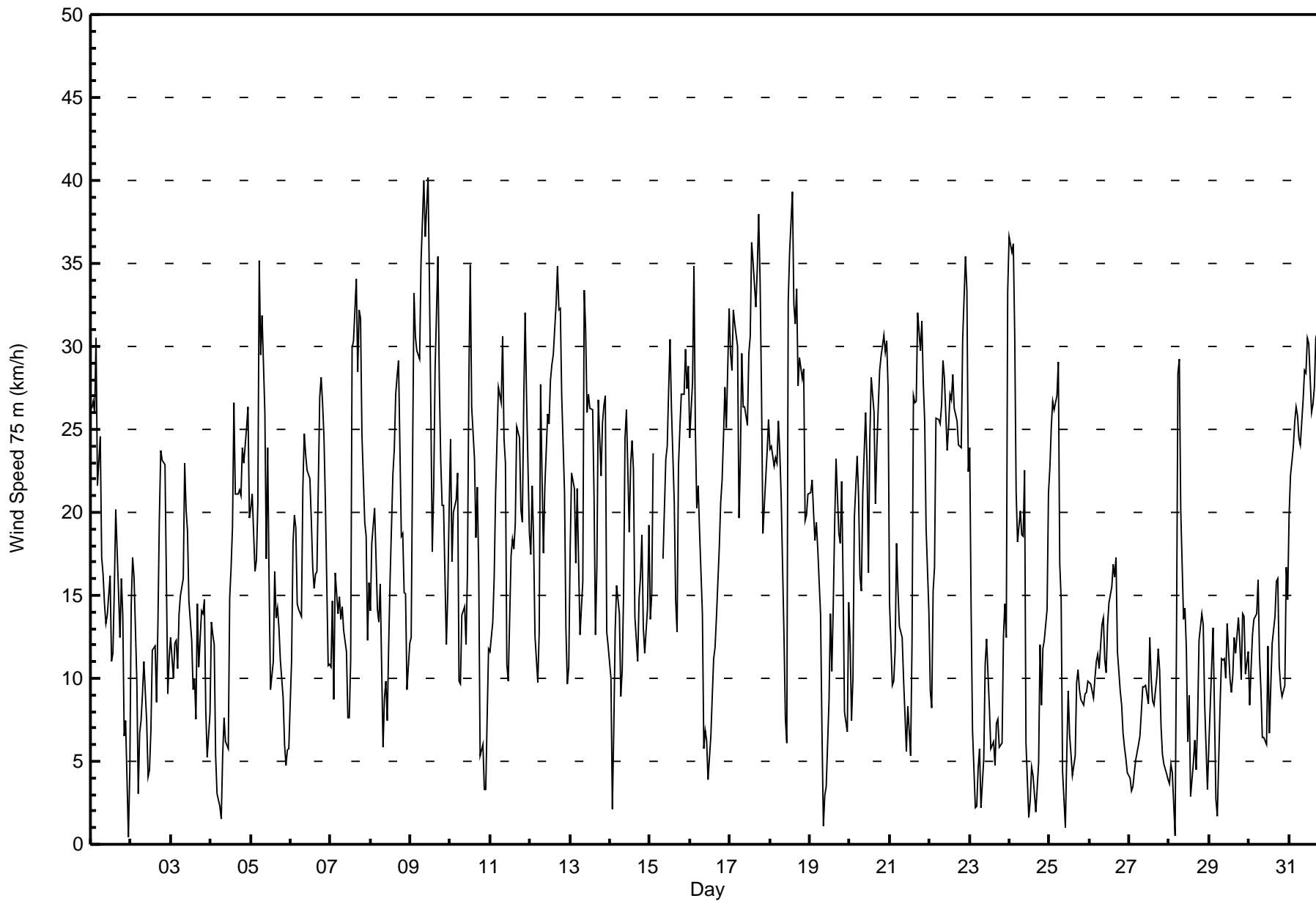


**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed 75 m (WS75m) - km/h**  
**Mannix - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 9 07:00 Minimum Value: 1 km/h on Dec 27 03:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 5 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 739 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-Dec	3	4	3	4	5	4	3	3	3	2	1	1	1	2	3	1	2	1	1	4	2	3	2	2	5
2-Dec	4	1	3	3	1	1	1	1	1	2	2	1	2	2	2	2	2	4	2	2	4	2	3	3	4
3-Dec	1	2	1	3	2	2	3	3	4	5	6	3	2	2	1	1	3	2	4	2	2	3	1	2	6
4-Dec	3	3	3	3	1	1	1	1	1	2	2	2	2	2	3	1	1	2	3	2	2	3	3	2	3
5-Dec	2	3	3	3	5	3	4	2	3	3	3	4	3	3	3	3	3	3	3	2	2	3	2	2	5
6-Dec	3	2	2	2	1	1	2	3	2	2	2	4	3	2	3	3	3	4	3	3	2	3	2	4	4
7-Dec	3	3	2	3	3	4	3	2	3	3	3	5	6	5	3	6	3	2	2	2	3	2	2	4	6
8-Dec	2	1	2	3	2	2	4	1	1	2	1	2	3	1	2	2	2	2	3	2	3	3	2	2	4
9-Dec	2	7	5	6	4	4	9	5	6	4	4	5	5	3	5	4	3	3	3	3	7	6	6	1	9
10-Dec	4	3	2	1	2	3	3	3	3	4	5	3	4	4	3	5	5	5	2	1	2	1	2	4	5
11-Dec	1	4	3	3	1	1	1	2	2	3	2	2	1	2	1	3	2	1	4	4	2	2	3	4	4
12-Dec	3	4	6	4	3	4	4	7	6	5	4	5	3	2	3	2	2	3	2	2	5	2	4	2	7
13-Dec	3	3	4	2	4	3	2	5	6	6	2	2	4	4	7	5	5	3	2	2	2	3	4	2	7
14-Dec	2	2	3	2	2	3	2	1	3	2	2	4	2	2	2	5	4	4	2	2	3	2	4	2	5
15-Dec	3	3	2	AF	AF	AF	AF	AF	3	2	4	3	4	3	5	2	3	4	5	3	4	3	3	4	5
16-Dec	4	7	5	5	5	4	4	3	3	2	2	2	2	3	2	2	2	3	1	2	2	3	2	2	7
17-Dec	2	2	3	3	4	2	5	3	4	4	4	4	4	5	4	4	5	5	5	3	4	5	3	3	5
18-Dec	3	3	2	3	5	5	4	5	5	2	4	8	5	5	4	5	5	4	2	3	5	4	5	4	8
19-Dec	3	3	4	3	3	3	3	3	1	1	1	2	1	1	2	2	1	2	2	1	3	2	2	4	4
20-Dec	3	3	1	3	2	1	2	2	3	1	2	1	3	1	2	1	1	1	2	1	1	1	2	2	3
21-Dec	6	4	1	3	1	2	2	1	2	2	2	2	2	3	5	3	2	3	5	3	3	4	3	3	6
22-Dec	2	2	3	3	2	3	2	2	3	3	3	2	3	3	3	3	2	2	3	4	5	5	7	5	7
23-Dec	3	4	2	1	1	2	3	1	1	3	2	2	2	3	2	2	1	1	1	2	3	1	4	7	7
24-Dec	6	6	6	6	5	4	3	4	3	4	4	1	1	1	2	1	1	2	2	3	6	4	2	2	6
25-Dec	3	2	2	3	3	3	5	5	2	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	5
26-Dec	1	1	1	2	1	1	1	3	2	2	2	3	2	3	1	1	1	2	3	1	1	1	1	1	3
27-Dec	1	1	1	1	1	2	1	2	2	2	1	1	2	2	1	1	1	1	1	2	1	1	1	2	2
28-Dec	2	2	1	2	6	5	5	4	3	3	2	3	2	1	1	2	3	2	4	3	3	3	2	1	6
29-Dec	1	2	2	2	2	1	2	1	2	2	1	3	2	1	2	2	1	1	2	3	1	2	1	1	3
30-Dec	2	2	2	1	1	1	2	2	1	2	2	2	2	2	2	1	2	2	2	1	2	2	1	1	2
31-Dec	3	1	1	1	2	2	1	1	1	2	1	2	1	1	1	1	2	2	3	2	3	1	2	2	3
Diurnal Maximum																									
AF - Analyzer Failure																									







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 75 m (WS75m) - km/h  
Mannix - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	61	8.25	8.25
6 - 11	162	21.92	30.18
12 - 19	220	29.77	59.95
20 - 28	208	28.15	88.09
29 - 38	85	11.50	99.59
> 38	3	0.41	100.00

Total Number of Valid Hours: 739

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed 75 m (WS75m) - km/h  
Mannix - December 2017**

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	2	2	4	1	1	3	4	3	8	8	3	3	5	4	2	61
6 - 11	15	8	1	1	0	0	10	14	38	20	19	5	4	8	10	9	162
12 - 19	24	18	0	0	0	0	16	43	22	14	20	32	13	8	5	5	220
20 - 28	17	11	0	0	0	0	11	48	12	1	2	43	39	16	3	5	208
29 - 38	9	2	0	0	0	0	1	17	3	1	1	15	20	13	3	0	85
> 38	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	3
<b>Totals</b>	73	41	3	5	1	1	41	126	78	44	50	100	79	50	26	21	739

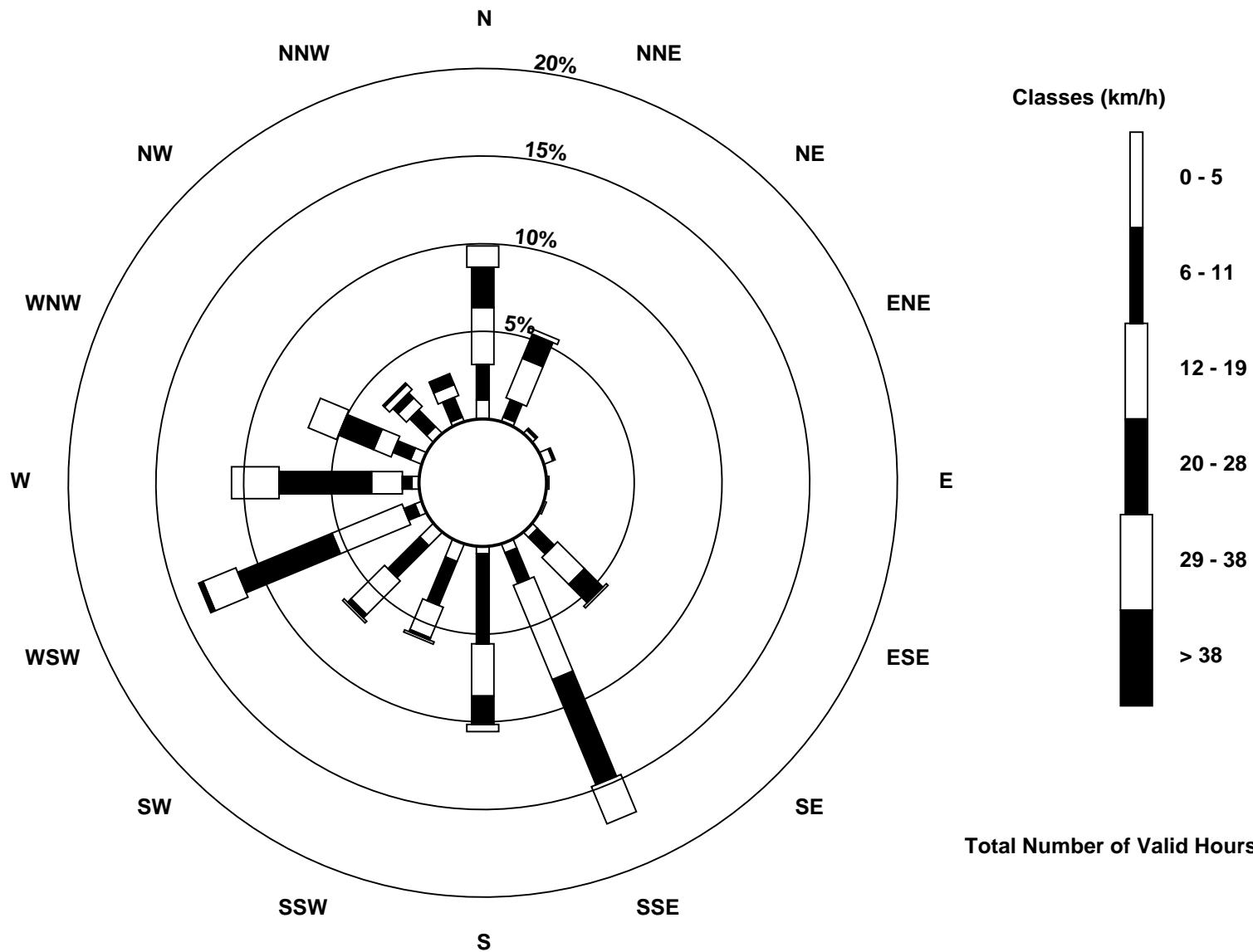
Total Number of Valid Hours: 739

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





Maximum Speed: 43 km/h on Dec 9 09:00	Maximum Daily Speed Average: 29.2 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 19 09:00	Minimum Daily Speed Average: 2.3 km/h on Dec 19	Hours of Data: 724
Maximum Diurnal Speed Average: 11.0 km/h at hour 19	Minimum Diurnal Speed Average: 5.4 km/h at hour 24	Hours of Missing Data: 20
Monthly Average Velocity: 8.2 km/h 248.9 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 6 Q <sub>1</sub> = 10 Median = 17 Q <sub>3</sub> = 26 P <sub>90</sub> = 32 P <sub>99</sub> = 39	Percent Operational Time: 97.3

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	WSW29	WSW29	WSW28	WSW33	WSW24	WSW26	SW19	SW17	SW17	SW15	SW15	SSW17	S9	SSE9	SSE14	S19	SSW14	SSE11	SSE16	SSE12	SSE4	SSE8	WNW1	W5	SW13.7	WSW33	
2-Dec	WSW16	WNW19	NW17	NNW11	N4	NW7	WNW8	WNW10	WNW11	NW7	WSW6	SW5	SW8	WSW14	WSW15	SW11	SW15	WSW22	WSW26	WSW26	W26	W18	WSW11	WSW13	W11.6	WSW26	
3-Dec	SSW13	SW11	SSW13	SSW13	SSW10	S11	WSW17	W18	NNW25	N21	N20	N16	N12	NNW10	N10	N8	NNE15	NNE11	NNE15	NNE16	NNE16	NNE9	NW6	N8	NNW6.1	NNW25	
4-Dec	NNE14	NNE13	NNE14	NNE6	NE4	NE2	ESE3	SSE6	S8	SSW6	SSW4	SE13	SSE15	SSE17	SSE27	SE22	SE23	SE23	SE24	SE25	SE24	SE27	SE29	SSE22	SE11.8	SE29	
5-Dec	SSE22	S21	S16	SW19	WSW25	W41	WNW34	WNW35	NW29	N18	NNE26	N17	NNW10	NNW11	N17	N14	NNE15	N14	NNE12	N9	NNW6	NNW5	WSW5	S7	NNW8.2	W41	
6-Dec	SSE13	SSE20	SSE20	S17	SSW14	SSW13	SSW13	S18	S22	S22	SSW21	S22	S19	SW19	SW17	WSW18	WSW19	WSW29	WSW31	WSW30	WSW28	W24	WSW14	WSW13	SW15.7	WSW31	
7-Dec	WSW12	WSW16	WSW11	WSW20	WSW19	W19	W17	WSW17	WSW16	WSW15	W11	WNW11	W15	W33	W34	W38	W32	W36	WNW35	WNW27	W23	WNW21	WNW14	W15	W20.5	W38	
8-Dec	WSW16	WSW20	WSW23	WSW20	SW15	WSW16	WSW18	SSW5	SSW7	SSW9	SSW7	S9	SSE12	SSE22	SSE23	S26	S28	S30	S17	SSW17	WSW18	WSW19	SSW9	SW13	SSW13.6	SSE30	
9-Dec	WSW16	WSW26	WSW36	WSW33	WSW33	WSW32	WSW38	W40	WSW43	WSW40	W43	W36	W28	W20	W24	W31	W39	WSW30	WSW25	WSW22	W23	NW13	W16	WSW21	WSW29.2	WSW43	
10-Dec	WSW27	WSW20	WSW23	WSW23	WSW24	WSW12	SSW9	SW15	SW15	SW13	W19	WNW32	NW38	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	NW38	
11-Dec	AF	AF	AF	WSW25	WSW28	W29	W26	WSW30	WSW28	WSW27	SW13	SSW10	S15	S16	S13	S16	S26	SSE25	S19	SSW18	SSW23	S29	S25	S16	SSW17.3	WSW30	
12-Dec	SW20	WSW25	WSW20	WSW16	WSW13	WSW16	WSW32	W27	W22	WSW24	W29	W29	WNW31	WNW32	W33	WNW36	WNW38	WNW36	WNW36	WNW30	WNW25	WNW17	WNW12	WNW12	W23.9	WNW38	
13-Dec	WSW19	WSW24	WSW24	WSW20	WSW23	SW18	SW13	WSW19	W37	W34	WNW29	WNW30	WNW29	N29	NNW23	NNW14	WNW20	WNW29	W25	WNW28	WNW30	WNW30	NNW13	NNE12	NNW19.9	W37	
14-Dec	NNE11	ENE3	SSW7	S13	S16	S14	SSW9	SSW10	SSE12	SSE25	SSE28	SSE20	SSE22	SSE25	SSE23	SE16	ESE14	SE17	SE16	SE20	SSE15	SE14	SE16	SSE19	SSSE14.4	SSE28	
15-Dec	SSE15	SSE17	SSE24	AF	AF	AF	AF	AF	AF	W20	W26	WSW27	W30	WNW34	WNW29	W23	W17	WSW14	WSW25	WSW28	WSW30	W29	W32	W30	W31	WSW21.0	WNW34
16-Dec	W26	N29	NNE36	NNE26	NNE21	NNE23	NNE20	NNE14	NNE5	NE7	E7	ESE5	SE7	SSE10	SSE12	SSE13	SSE15	SSE20	SSE23	SSE25	SSE27	SSE28	S27	SSE33	ESE5.4	NNE36	
17-Dec	S32	S31	S33	SSW34	SSW32	SSW21	SW25	SW32	SW28	WSW29	W27	WSW31	WSW33	W39	WSW37	WSW34	W37	WNW41	WNW37	WNW30	W21	W24	W26	W28	WSW24.9	WNW41	
18-Dec	W26	W27	W25	W26	N24	N27	NNE24	NNE22	NNE13	N7	WNW7	NW35	WNW38	NW42	NW35	NW34	WNW36	WNW30	WNW32	WNW31	WNW31	NNE20	N21	N22	NW21.2	NW42	
19-Dec	N22	N23	NNE22	NNE19	NNE21	N19	N15	N8	WNW0	SW2	SSW3	SSE8	SSE14	SSE11	SSE13	SSE19	SSE25	SSE21	S22	S23	SSW16	WSW10	WSW9	S11	SE2.3	SSE25	
20-Dec	SSW11	SW11	SE6	SSE15	SSE17	SSE14	SSW13	SSW14	S15	SSE19	S18	SSW15	SSE21	SSE27	SSE24	SSE20	SSE23	S26	SSE28	SSE29	SSE30	S28	S29	S24	S19.0	SSE30	
21-Dec	SW14	W12	NW12	WNW15	WNW19	NW18	NNW15	N13	NNW11	NNW8	NW6	NW9	WNW7	WNW15	WNW29	WNW29	WNW30	W35	W33	WNW35	WNW31	NW28	NW20	WNW15	WNW17.8	W35	
22-Dec	WNW11	W10	W17	W19	W29	W29	W28	W30	WSW32	W31	W26	W28	WNW29	WNW29	WNW30	WNW29	WNW28	W26	WNW26	NW25	NNE31	N37	N35	N24	WNW21.7	N37	
23-Dec	N25	N16	N7	NW2	WNW1	WSW4	WSW6	WNW1	NE3	NNE9	N14	N13	N9	NW7	NNW7	NW5	SW8	SSW7	SW6	SW7	W17	W17	NW14	N35	NNW6.3	N35	
24-Dec	N38	NNE38	N38	N32	N22	N20	N21	N21	NNW21	NNW25	N6	NNW2	SW3	SW6	WNW7	NNW4	N1	SW6	WNW13	WNW11	W14	WNW15	N16	NNE22	N13.9	N38	
25-Dec	NNE25	N26	NNE28	NNE28	NNE30	N31	N19	N16	N5	WNW2	SW5	SW10	SW8	SW7	SW6	SW7	SW11	SW11	SSW10	SSW9	SW8	SW10	SW10	SSW9	NNW5.3	N31	
26-Dec	SSW8	SSW8	SW8	S7	S7	SSW8	SSW8	S9	AF	SSW9	S7	S9	SSE11	SSE14	SSE17	SSE16	SSE16	SSW11	SW10	SW10	SW7	SW6	WSW7	WSW6	S8.4	SSE17	
27-Dec	WSW5	SW5	SW4	SW5	SSW5	SSW6	S5	SSW7	SW9	SSW8	SSW9	SSW8	S10	SSW10	SSW8	SW9	SW11	SW13	WSW13	WSW9	SW6	SSW4	SW4	SSE1	SW6.9	SW13	
28-Dec	ESE3	ESE2	SSE2	NNW1	N14	N31	N32	N23	N15	N16	N13	N7	NNW10	WNW3	NNW6	N7	N5	N8	NNE14	NNE15	N15	N10	N6	NNE4	N10.1	N32	
29-Dec	NNE6	NNE11	N13	N8	N3	ESE1	S7	S10	SSW11	WSW13	WSW12	SW15	SW11	SSW8	SSW9	S9	SW11	SW15	SW13	SSW10	SSW13	SSW14	SSW9	SSW10	SW6.3	SW15	
30-Dec	SSW8	S8	S11	S11	S9	S13	S6	SSW7	SW8	SSW5	SSW5	SSE10	SSE8	SE9	SSE12	SSE13	SSE15	SSE16	SSW9	SW9	SSW9	SSE6	SSE12	S11	S8.9	SSE16	
31-Dec	S16	SSE21	S22	S22	S24	S26	S25	S25	S30	S31	SSE28	SSE31	S32	SSE28	SSE27	SSE29	SSE33	SSE34	SSE38	SSE36	S30	S25	S29	S28	SSE27.5	SSE38	

WSW6.0	WSW6.3	WSW6.0	WSW8.5	WSW8.2	W7.9	W8.7	W8.0	WSW10.1	WSW8.8	WSW8.4	WSW8.9	WSW8.2	WSW8.4	WSW8.0	WSW8.6	SW9.8	SW10.0	WSW11.0	WSW10.0	WSW10.1	WSW7.3	WSW5.8	WSW5.4	Diurnal Average	
N38	NNE38	N38	SSW34	WSW33	W41	WSW38	W40	WSW43	WSW40	WSW43	W36	NW38	NW42	WSW37	W38	W39	WNW41	SSE38	SSE36	NNE31	N37	N35	N35	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**

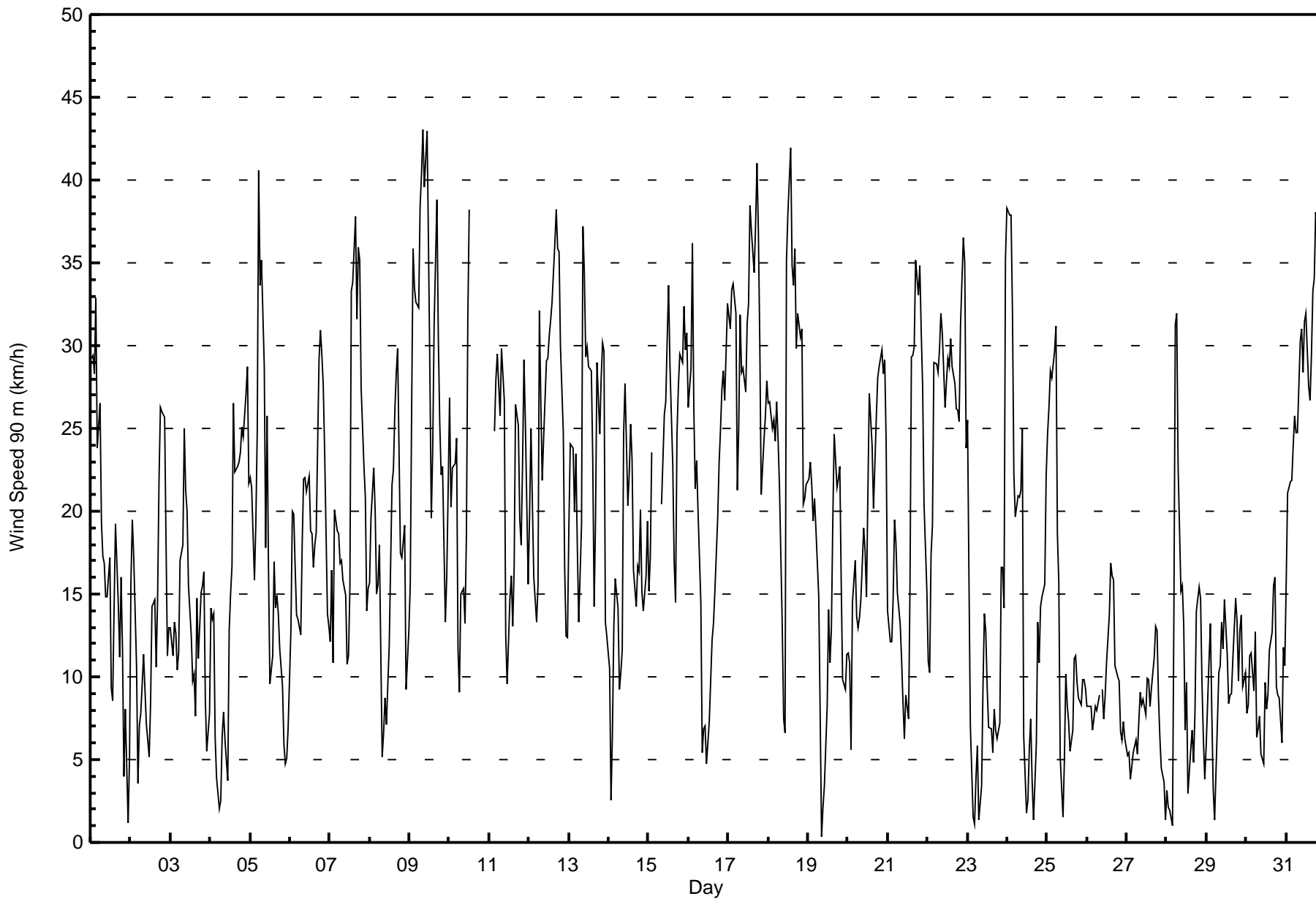
**Wind Speed 90 m (WS90m) - km/h**  
**Mannix - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 9 07:00 Minimum Value: 1 km/h on Dec 19 17:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 5 P <sub>99</sub> = 7														Hours in Service: 744 Hours of Data: 724 Hours of Missing Data: 20 Hours of Calibration: 0 Percent Operational Time: 97.3											
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-Dec	3	4	3	5	5	4	3	3	3	2	2	2	2	2	4	2	3	2	1	5	1	3	2	2	5
2-Dec	3	1	4	2	1	1	2	1	1	2	2	1	2	2	2	2	1	4	2	3	4	3	3	3	4
3-Dec	2	2	2	3	2	2	3	3	4	5	5	3	2	2	1	1	3	2	4	2	2	3	2	2	5
4-Dec	3	3	3	3	1	1	2	1	1	2	1	2	2	2	1	1	1	2	2	2	1	2	3	2	3
5-Dec	2	3	3	4	7	3	5	2	3	4	3	5	3	3	3	3	3	3	3	2	2	3	2	2	7
6-Dec	3	1	1	3	1	1	2	3	3	2	2	3	2	2	3	3	3	4	3	3	2	3	2	4	4
7-Dec	3	3	2	4	3	4	3	3	3	3	4	7	7	5	3	7	3	2	2	2	3	2	2	2	7
8-Dec	2	1	2	3	2	2	4	2	2	1	1	1	4	1	2	2	2	2	3	2	3	3	2	4	4
9-Dec	3	6	6	6	5	4	9	5	6	4	4	5	5	3	5	4	4	3	3	3	7	6	6	1	9
10-Dec	4	2	1	2	2	3	3	3	4	4	6	3	4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	6
11-Dec	AF	AF	AF	4	1	1	2	2	2	4	3	1	2	2	1	4	2	1	4	3	1	3	4	3	4
12-Dec	4	3	6	4	3	5	4	6	6	5	5	5	3	2	3	2	2	3	2	2	5	3	4	2	6
13-Dec	3	3	4	2	3	3	2	6	7	6	2	2	4	5	8	6	5	3	1	3	2	4	4	2	8
14-Dec	2	3	3	2	2	4	2	1	2	3	2	4	3	1	2	4	3	4	3	2	3	2	3	1	4
15-Dec	3	3	1	AF	AF	AF	AF	AF	4	2	5	4	5	3	5	3	3	4	5	3	4	4	3	4	5
16-Dec	4	6	5	5	5	4	4	3	3	2	1	2	2	3	2	2	1	3	1	2	1	3	2	2	6
17-Dec	2	3	3	3	4	3	5	3	4	4	4	4	4	5	5	4	5	6	6	3	4	5	3	3	6
18-Dec	3	3	2	3	5	5	3	4	5	2	4	8	5	5	4	5	5	4	2	3	6	4	5	4	8
19-Dec	3	3	4	3	3	3	3	4	1	1	2	1	1	1	2	3	1	2	2	2	2	2	2	2	4
20-Dec	2	4	1	3	3	2	2	2	2	3	2	1	3	1	1	1	2	1	2	1	1	1	2	3	4
21-Dec	4	4	2	3	1	2	3	1	2	2	3	2	3	4	5	3	2	3	5	3	3	4	3	3	5
22-Dec	3	1	3	3	2	3	2	2	3	3	3	3	3	3	3	3	3	2	3	4	4	5	7	5	7
23-Dec	3	4	2	1	1	2	3	1	1	4	1	1	3	4	2	2	1	1	1	2	3	1	4	7	7
24-Dec	6	6	6	6	5	4	3	4	3	3	4	1	1	1	3	1	1	3	1	2	6	4	2	2	6
25-Dec	2	1	2	2	3	3	5	6	2	2	1	3	1	1	1	1	2	1	1	1	1	1	2	1	6
26-Dec	1	1	1	2	2	3	1	2	AF	2	1	2	3	2	1	1	2	2	2	2	1	1	2	2	3
27-Dec	1	1	1	1	1	2	1	1	1	2	1	1	2	2	1	1	2	1	1	2	1	1	1	1	2
28-Dec	1	1	1	2	6	5	4	4	3	2	2	4	2	1	1	2	3	2	4	3	3	2	2	2	6
29-Dec	1	2	2	2	2	1	2	2	2	2	1	3	2	1	2	2	2	1	2	3	1	2	1	1	3
30-Dec	2	2	2	2	1	2	1	1	1	1	1	3	1	1	1	1	2	1	1	1	2	1	2	1	3
31-Dec	4	1	1	1	2	1	1	2	2	1	1	1	1	1	1	2	1	2	2	2	2	2	2	1	4
Diurnal Maximum																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed 90 m (WS90m) - km/h**  
**Mannix - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed 90 m (WS90m) - km/h  
Mannix - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	51	7.04	7.04
6 - 11	166	22.93	29.97
12 - 19	197	27.21	57.18
20 - 28	175	24.17	81.35
29 - 38	126	17.40	98.76
> 38	9	1.24	100.00

Total Number of Valid Hours: 724

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed 90 m (WS90m) - km/h  
Mannix - December 2017**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	2	3	1	0	5	0	3	1	7	8	3	1	6	2	4	51
6 - 11	15	7	1	0	1	0	3	11	19	41	32	9	2	9	6	10	166
12 - 19	21	15	0	0	0	1	6	31	19	16	22	31	15	11	5	4	197
20 - 28	16	14	0	0	0	0	8	32	22	4	2	35	28	7	3	4	175
29 - 38	11	4	0	0	0	0	1	10	10	2	1	21	25	36	5	0	126
> 38	0	0	0	0	0	0	0	0	0	0	0	3	4	1	1	0	9
<b>Totals</b>	68	42	4	1	1	6	18	87	71	70	65	102	75	70	22	22	724

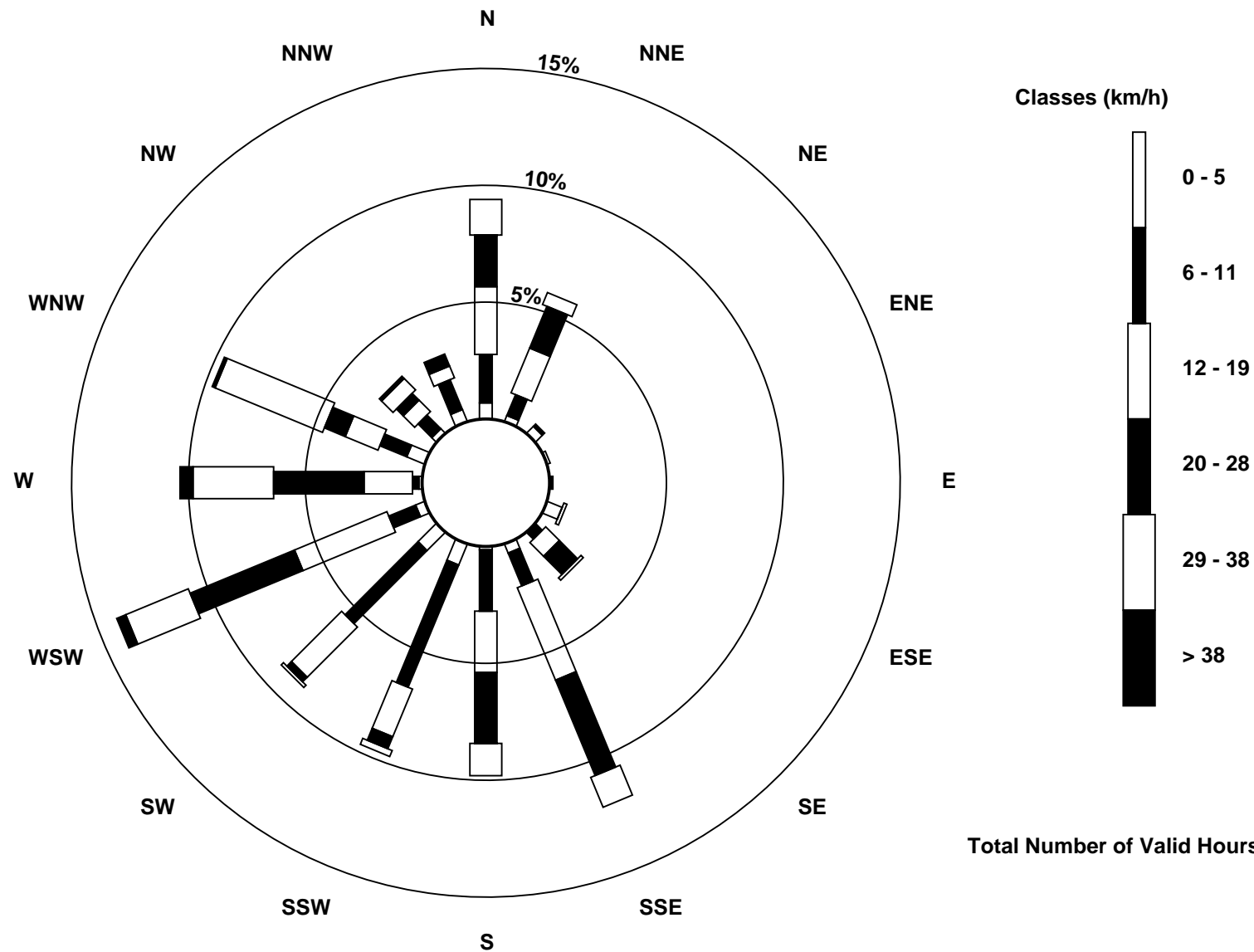
Total Number of Valid Hours: 724

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction 20 m (WD20m) - deg**  
**Mannix - December 2017**

Direction of Maximum Speed: 261 deg on Dec 9 11:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 258.3 deg on Dec 9	Hours of Data: 666
Direction of Minimum Speed: 325 deg on Dec 21 03:00	Direction of Minimum Daily Speed Average: 2.3 deg on Dec 19
Direction of Minimum Daily Speed Average: 2.3 deg on Dec 19	Hours of Missing Data: 78
Monthly Average Direction: 228.1 deg	Percent Operational Time: 89.5

Day	Hourly Period Ending At (MST)																								Daily Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	240	245	241	241	239	237	194	172	170	175	167	160	137	139	139	158	179	142	139	150	143	74	145	216	191.7	
2-Dec	221	281	315	339	283	292	354	309	314	18	294	168	180	157	172	153	176	227	245	244	260	247	184	199	250.2	
3-Dec	167	165	153	151	153	151	241	254	328	347	351	2	348	339	347	356	13	21	15	11	11	6	302	19	0.1	
4-Dec	22	25	30	273	251	126	171	205	175	AF	142	151	154	157	147	157	158	148	140	148	153	144	146	158	146.9	
5-Dec	163	157	157	169	157	263	279	294	313	3	11	4	341	347	3	10	19	11	13	356	317	304	259	191	328.2	
6-Dec	134	148	145	154	154	153	151	153	154	157	163	152	158	162	219	222	248	255	253	263	256	247	163	173	180.2	
7-Dec	185	184	136	165	159	197	194	177	158	140	101	125	154	268	267	279	285	284	285	268	287	271	243	217	248.2	
8-Dec	217	224	218	193	189	210	212	134	154	158	153	150	147	147	153	158	155	157	152	157	156	150	145	161	165.6	
9-Dec	144	215	252	255	254	255	259	265	260	260	261	264	268	271	262	260	263	258	255	263	256	345	251	233	258.3	
10-Dec	240	189	246	237	247	175	156	159	167	177	230	273	305	318	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	153	--	
12-Dec	155	198	216	167	136	157	224	256	246	232	259	277	301	275	275	282	290	290	283	290	278	225	227	240	263.0	
13-Dec	219	222	232	198	210	207	156	182	268	272	282	277	297	350	340	316	267	283	272	277	284	287	354	30	274.9	
14-Dec	27	160	209	193	189	167	152	152	142	142	153	153	143	153	154	155	151	185	154	156	182	136	154	150	156.0	
15-Dec	159	161	155	AF	AF	AF	AF	AF	AF	AF	263	254	267	286	282	270	247	206	241	246	240	266	275	265	264	256.9
16-Dec	264	5	14	19	20	21	19	23	37	58	77	94	154	151	148	145	147	142	150	155	147	147	143	154	85.9	
17-Dec	160	154	156	178	189	165	202	225	235	247	263	257	258	261	259	257	271	286	283	284	272	272	262	263	246.5	
18-Dec	276	266	262	267	352	11	22	29	19	7	303	309	298	312	312	311	295	286	282	284	292	17	15	9	313.4	
19-Dec	16	12	13	16	16	9	4	319	235	248	241	163	161	148	149	153	159	152	156	152	156	143	153	AF	109.3	
20-Dec	151	146	136	144	143	146	152	152	151	150	152	153	155	156	154	150	142	146	147	142	151	148	152	159	149.9	
21-Dec	154	164	325	217	270	336	320	352	337	336	308	305	243	226	300	284	277	280	285	285	292	303	307	300	291.6	
22-Dec	320	41	277	291	265	271	264	262	255	263	266	278	282	283	285	286	282	276	284	319	16	10	5	353	293.0	
23-Dec	5	9	334	282	AF	AF	AF	AF	AF	AF	350	66	331	266	315	260	AF	AF	152	160	179	271	2	13	--	
24-Dec	17	18	AF	6	4	354	7	AF	AF	AF	333	321	240	200	195	77	81	107	191	234	123	223	308	1	15	5.2
25-Dec	16	10	18	20	19	11	AF	AF	AF	AF	AF	AF	185	AF	122	166	AF	171	164	160	163	AF	AF	AF	--	
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	142	142	140	141	152	145	161	149	160	--	
27-Dec	155	158	159	157	152	160	155	159	156	155	159	154	153	152	160	165	171	187	188	170	157	150	161	138	159.2	
28-Dec	138	153	168	103	11	15	7	2	343	358	9	13	2	270	255	277	305	10	29	22	0	345	319	286	359.8	
29-Dec	40	11	15	4	237	207	181	174	168	168	165	166	153	153	153	160	166	171	165	159	164	167	154	160	163.4	
30-Dec	154	163	159	154	150	144	155	157	156	160	153	156	145	149	155	159	150	141	159	170	164	148	153	157	154.9	
31-Dec	158	151	156	158	160	153	159	153	149	150	147	155	159	159	160	167	161	153	153	157	161	160	162	163	156.9	

187.1 177.3 203.1 209.7 205.9 212.5 204.7 209.9 220.8 226.5 224.4 237.8 246.1 248.0 240.5 229.4 233.0 239.6 235.9 227.3 232.1 237.6 194.2 193.1  
 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 20 m (WD20m) - deg**  
**Mannix - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 98 deg on Dec 24 15:00	Hours of Data: 666
Minimum Value: 3 deg on Dec 31 17:00	Hours of Missing Data: 78
Percentiles: P <sub>1</sub> = 4 P <sub>10</sub> = 7 Q <sub>1</sub> = 8 Median = 11 Q <sub>3</sub> = 18 P <sub>90</sub> = 36 P <sub>99</sub> = 75	Hours of Calibration: 0
	Percent Operational Time: 89.5

Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	10	10	9	10	15	10	31	11	15	14	8	5	13	14	10	14	10	10	8	9	28	75	63	32	75	
2-Dec	9	24	17	47	76	40	40	9	19	16	65	30	40	24	8	21	16	9	6	8	22	36	28	16	76	
3-Dec	8	14	9	9	9	7	36	22	18	19	18	20	15	21	14	19	10	13	12	14	9	16	36	18	36	
4-Dec	12	19	17	83	27	65	29	21	37	AF	10	9	9	12	7	10	9	10	9	7	9	8	9	8	83	
5-Dec	8	9	16	20	28	46	13	9	19	13	10	14	19	20	16	17	14	16	14	25	21	46	18	37	46	
6-Dec	12	8	8	7	6	6	7	8	7	10	8	10	6	12	21	40	21	6	8	6	10	14	11	48	48	
7-Dec	38	14	13	21	20	50	51	27	18	17	27	52	62	25	6	6	8	7	7	7	61	11	22	17	62	
8-Dec	11	6	10	22	15	27	40	17	12	10	8	7	7	8	7	9	8	5	10	8	22	16	10	9	40	
9-Dec	14	47	10	9	9	10	12	7	8	7	6	7	9	11	12	7	5	10	9	8	52	43	22	4	52	
10-Dec	6	36	11	10	8	46	12	15	15	30	35	12	11	12	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	46	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	8	8
12-Dec	24	36	18	50	17	25	22	82	49	32	13	40	14	14	6	7	8	10	8	9	23	16	70	13	82	
13-Dec	7	14	21	19	42	25	11	54	12	14	8	6	21	19	17	28	13	8	7	7	8	9	40	13	54	
14-Dec	12	65	10	13	12	14	8	10	9	10	8	16	8	10	11	8	19	25	12	10	31	26	10	13	65	
15-Dec	18	15	8	AF	AF	AF	AF	AF	AF	9	11	12	9	9	14	16	18	11	12	9	12	7	7	7	18	
16-Dec	8	32	10	11	14	14	12	15	24	25	19	16	12	9	9	9	10	11	11	10	8	8	9	9	32	
17-Dec	5	7	7	12	12	12	21	11	10	12	8	9	9	8	9	10	7	10	8	8	9	14	7	8	21	
18-Dec	6	10	7	11	17	12	12	13	15	27	29	14	10	9	10	13	10	9	7	8	25	12	13	11	29	
19-Dec	11	10	13	15	12	13	16	52	13	10	32	19	8	5	5	6	6	11	7	7	7	11	11	AF	52	
20-Dec	8	9	14	13	10	7	6	6	6	7	8	7	7	7	6	6	5	9	11	14	7	6	8	10	14	
21-Dec	52	32	95	76	23	29	33	13	15	18	43	14	39	21	16	9	7	8	12	9	9	11	10	14	95	
22-Dec	32	36	62	37	5	5	7	9	9	5	7	8	8	9	9	9	8	8	10	28	10	11	13	14	62	
23-Dec	12	23	27	22	AF	AF	AF	AF	AF	AF	41	97	64	33	45	32	AF	AF	10	10	18	83	48	11	97	
24-Dec	11	13	AF	12	13	14	10	AF	AF	AF	14	34	52	36	98	11	21	29	44	70	64	74	16	9	98	
25-Dec	11	9	9	11	11	9	AF	AF	AF	AF	AF	AF	26	AF	22	6	AF	8	6	5	4	AF	AF	AF	26	
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	7	9	12	10	8	32	7	14	16	32	32	
27-Dec	15	11	6	17	14	14	7	9	10	10	9	9	7	6	6	7	10	9	9	12	11	15	6	12	17	
28-Dec	15	10	32	41	16	34	12	15	16	16	11	16	14	68	13	17	35	29	13	10	25	54	22	64	68	
29-Dec	25	16	11	16	27	16	11	8	6	9	7	14	16	10	12	6	9	9	13	14	10	12	9	10	27	
30-Dec	9	10	10	9	8	8	10	8	9	9	9	8	13	10	8	9	15	9	11	8	6	8	7	6	15	
31-Dec	7	7	8	6	5	8	6	9	7	7	7	6	6	5	4	6	3	6	7	5	5	4	4	5	9	
	52	65	95	83	76	65	51	82	49	32	65	97	64	68	98	40	35	29	44	70	64	83	70	64		

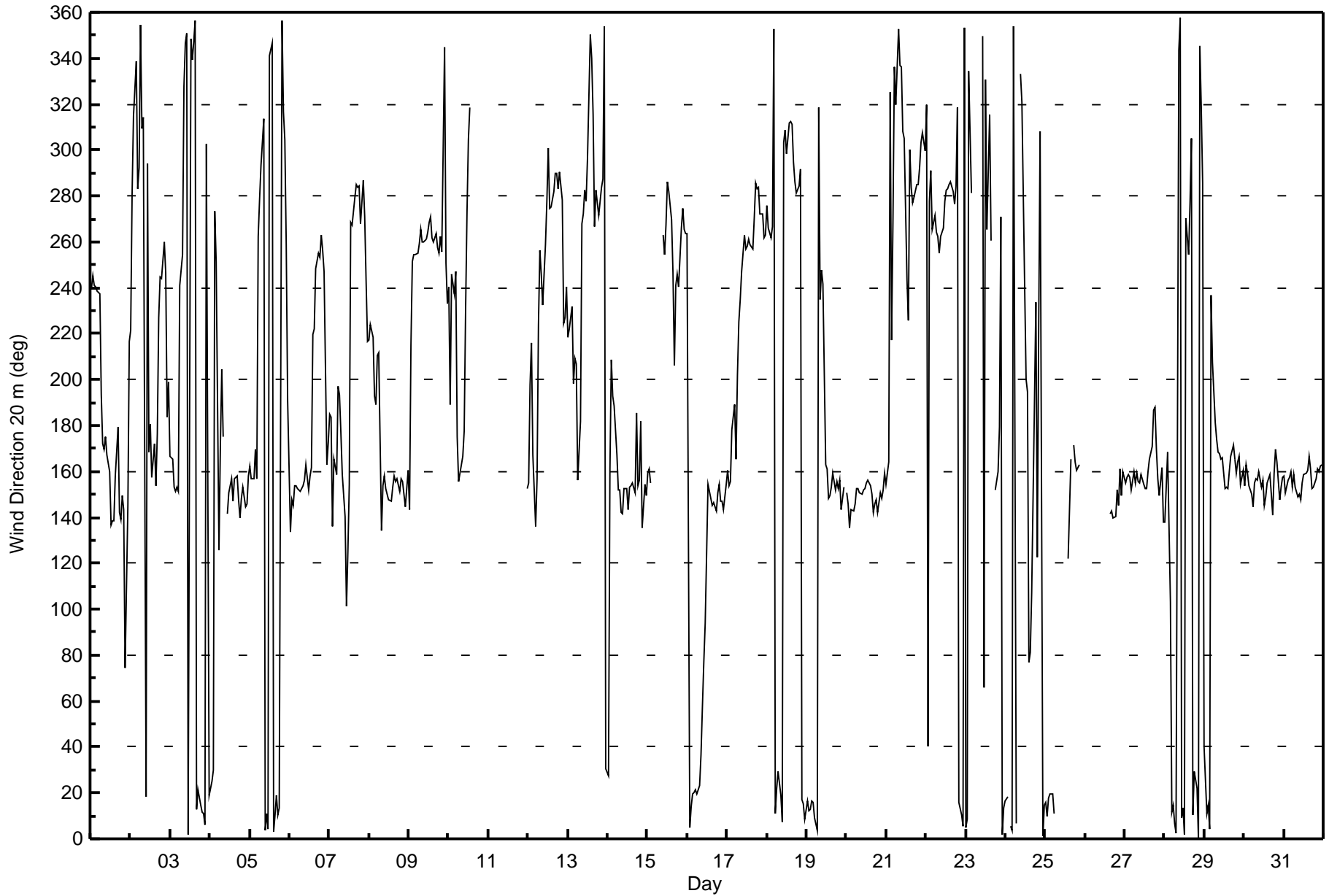
Diurnal Maximum

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction 20 m (WD20m) - deg**  
**Mannix - December 2017**





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 45 m (WD45m) - deg

Mannix - December 2017

Direction of Maximum Speed: 255 deg on Dec 9 11:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 252.8 deg on Dec 9	Hours of Data: 723
Direction of Minimum Speed: 40 deg on Dec 24 15:00	Hours of Missing Data: 21
Direction of Minimum Daily Speed Average: 1.8 deg on Dec 25	Percent Operational Time: 97.2
Monthly Average Direction: 235.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	234	239	237	238	237	234	217	190	198	204	176	166	139	140	143	169	178	143	132	147	150	129	105	239	193.8
2-Dec	231	278	316	341	342	301	333	313	319	360	198	168	169	213	210	181	203	233	243	245	254	254	220	214	252.8
3-Dec	188	186	172	156	154	150	239	256	323	343	350	357	347	335	342	353	8	16	13	7	11	7	305	10	345.0
4-Dec	17	16	23	344	323	80	122	163	160	157	138	145	150	152	142	149	144	135	131	139	145	135	137	153	137.4
5-Dec	159	153	157	199	217	262	276	291	309	356	7	359	338	343	357	5	12	6	8	353	314	307	256	194	312.1
6-Dec	130	143	142	152	153	153	155	149	150	152	166	150	155	190	225	231	247	250	248	256	255	255	204	236	185.4
7-Dec	221	217	180	232	214	240	241	232	203	208	228	257	248	265	264	273	276	276	276	267	272	272	254	234	256.0
8-Dec	231	228	227	222	211	234	233	143	154	157	157	148	142	146	150	158	154	156	156	161	183	201	158	180	172.9
9-Dec	176	231	249	250	250	250	253	259	253	254	255	258	262	264	257	255	258	252	250	254	253	326	250	237	252.8
10-Dec	245	237	253	244	245	211	163	180	174	193	239	271	300	315	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
11-Dec	AF	AF	AF	AF	AF	AF	246	239	234	234	176	152	151	153	150	149	153	152	148	156	171	167	162	152	173.5
12-Dec	176	240	230	227	198	201	247	262	263	245	255	273	297	274	270	277	288	289	281	288	288	273	280	269	267.0
13-Dec	230	236	242	226	223	211	172	214	262	269	277	275	293	345	336	319	274	281	269	271	279	283	343	23	271.1
14-Dec	20	108	202	184	180	175	159	152	141	141	149	153	140	151	148	140	128	157	141	147	170	139	141	147	150.4
15-Dec	135	159	151	AF	AF	AF	AF	AF	248	259	249	262	281	278	269	254	224	239	242	236	259	269	260	258	251.1
16-Dec	258	359	7	11	12	14	13	16	27	47	71	85	143	145	143	141	142	138	148	152	145	146	144	150	87.8
17-Dec	160	159	156	179	186	177	205	221	230	243	258	251	251	255	253	252	266	280	278	281	272	267	257	257	238.9
18-Dec	270	262	258	263	347	5	14	20	12	356	300	304	293	308	308	306	290	281	277	278	285	11	9	3	308.4
19-Dec	9	6	6	9	9	5	0	341	228	242	218	173	162	150	146	150	154	150	158	152	159	166	165	151	122.3
20-Dec	152	151	137	138	143	145	150	152	149	148	152	154	149	152	148	147	140	149	153	149	146	151	155	158	148.9
21-Dec	164	213	304	306	280	299	320	350	337	333	311	305	262	255	296	280	274	274	277	280	287	300	302	293	287.7
22-Dec	301	299	264	269	262	268	261	258	250	258	262	273	277	278	281	281	277	272	279	313	9	5	360	350	287.6
23-Dec	0	1	340	285	298	257	272	31	42	23	5	13	351	272	313	300	214	174	155	166	211	280	331	5	338.5
24-Dec	9	11	9	1	357	348	0	347	325	331	340	274	205	208	40	62	92	172	261	360	250	293	353	7	353.7
25-Dec	15	4	11	12	12	5	342	348	351	250	196	209	196	169	136	180	207	205	179	167	165	172	165	152	25.9
26-Dec	152	150	160	144	144	148	143	138	139	153	142	147	150	148	139	137	138	160	170	163	148	158	166	166	149.2
27-Dec	165	154	155	157	151	154	147	154	151	152	157	155	152	154	158	178	185	211	213	197	183	155	163	143	161.3
28-Dec	129	139	177	206	354	7	1	356	341	355	4	7	350	274	280	313	335	4	24	17	3	355	354	25	0.9
29-Dec	29	13	12	7	316	196	187	172	183	207	197	194	157	151	151	154	167	212	188	173	161	170	154	157	169.5
30-Dec	153	156	154	150	145	143	153	155	157	158	151	150	137	138	149	153	146	133	156	168	167	149	150	153	151.6
31-Dec	153	146	151	155	161	159	156	153	147	148	141	150	160	156	151	159	154	140	145	152	159	161	163	165	153.5

193.8 212.3 214.2 215.2 213.9 218.2 220.2 217.9 218.2 218.8 212.8 221.9 229.0 228.7 221.1 217.7 218.0 225.2 222.9 215.5 218.3 217.9 191.2 183.2

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

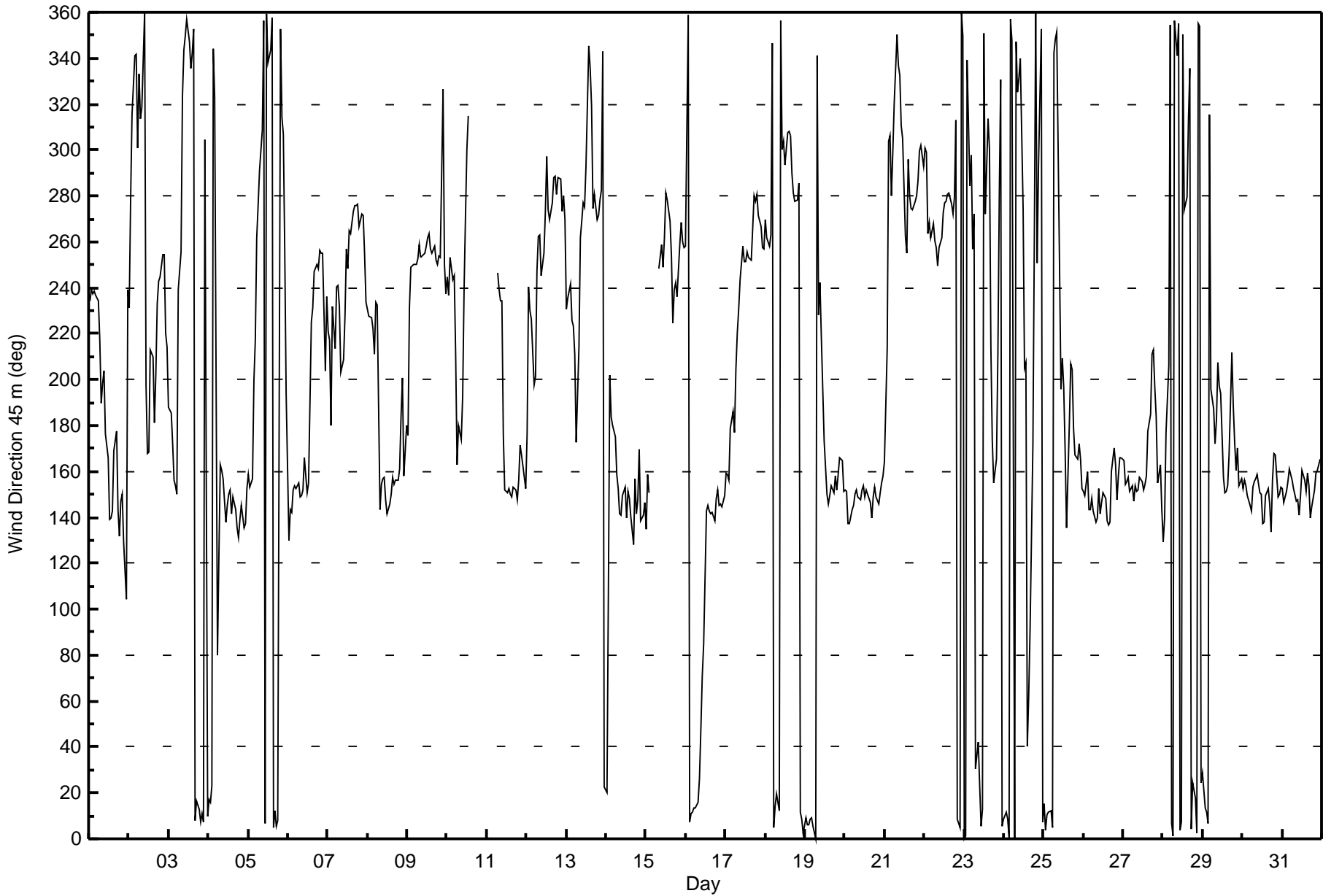
Wind Direction 45 m (WD45m) - deg

Mannix - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 94 deg on Dec 7 12:00			Hours of Data:	723
Minimum Value: 2 deg on Dec 31 00:00			Hours of Missing Data:	21
			Hours of Calibration:	0
			Percent Operational Time:	97.2
Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 8 Q <sub>3</sub> = 13 P <sub>90</sub> = 23 P <sub>99</sub> = 62				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	7	7	6	7	10	8	17	9	21	16	12	6	9	8	7	15	7	9	3	7	10	28	56	61	61
2-Dec	5	22	16	21	66	32	38	4	11	12	81	9	15	18	10	16	11	5	3	4	6	9	28	11	81
3-Dec	7	16	10	11	5	4	35	14	16	17	13	14	9	15	11	14	7	9	9	10	8	16	22	14	35
4-Dec	8	12	11	52	55	49	23	17	16	11	7	6	8	10	5	8	7	5	7	6	5	6	7	7	55
5-Dec	5	6	13	20	21	7	11	6	17	8	6	9	16	17	12	11	11	12	12	19	15	35	12	35	35
6-Dec	10	7	5	6	4	4	5	5	5	9	4	7	7	20	11	13	10	4	5	4	4	6	14	43	43
7-Dec	20	11	26	11	28	26	30	18	19	25	77	94	91	8	5	4	4	4	3	6	11	5	7	10	94
8-Dec	7	4	5	11	8	7	22	12	9	7	8	6	4	6	4	7	7	3	6	5	22	20	9	12	22
9-Dec	19	21	6	6	6	7	8	6	6	6	4	6	7	8	9	5	4	7	6	5	28	36	27	3	36
10-Dec	3	17	5	5	3	26	14	17	16	21	30	10	10	10	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	30
11-Dec	AF	AF	AF	AF	AF	AF	5	2	3	5	11	6	9	9	5	4	5	5	6	6	6	4	6	5	11
12-Dec	23	9	9	26	64	30	8	24	22	16	9	24	10	13	5	6	4	6	5	5	14	15	54	17	64
13-Dec	8	5	6	13	18	19	14	41	9	9	5	4	18	15	14	20	10	5	6	3	6	5	38	10	41
14-Dec	10	68	10	11	8	8	17	6	6	7	6	12	5	6	10	9	10	19	7	7	16	9	5	10	68
15-Dec	10	10	7	AF	AF	AF	AF	AF	28	6	7	11	7	7	10	9	11	7	9	6	11	6	6	6	28
16-Dec	7	31	7	8	11	10	9	11	18	24	17	22	10	9	8	8	8	9	8	7	5	6	6	6	31
17-Dec	4	5	5	7	6	8	12	8	7	9	7	7	7	7	7	8	6	9	7	6	7	11	6	7	12
18-Dec	5	8	6	10	13	9	10	10	11	23	17	12	9	7	8	11	8	7	5	6	23	9	10	8	23
19-Dec	8	7	10	9	9	9	10	44	43	7	16	11	8	5	5	4	4	8	5	4	6	9	15	4	44
20-Dec	6	13	9	6	5	5	2	2	2	3	6	5	4	3	3	3	2	4	3	4	5	3	3	5	13
21-Dec	15	39	28	21	2	14	13	7	9	13	23	9	32	15	11	6	5	6	10	7	7	10	8	12	39
22-Dec	22	31	9	12	5	4	5	7	6	5	6	6	7	7	6	6	6	6	7	27	7	7	9	12	31
23-Dec	9	19	22	30	17	58	25	19	6	9	10	21	12	32	46	37	17	11	8	11	29	8	26	8	58
24-Dec	8	9	9	9	10	11	7	16	14	10	23	55	42	25	90	11	16	25	18	75	48	31	16	8	90
25-Dec	9	6	7	8	8	6	15	8	18	57	9	11	16	31	12	20	10	7	13	4	4	11	7	3	57
26-Dec	3	4	6	7	8	6	4	8	7	3	10	4	6	4	5	6	5	10	10	5	7	5	6	7	10
27-Dec	7	5	3	7	9	7	3	6	7	8	5	7	5	5	4	11	9	9	8	13	12	11	6	8	13
28-Dec	5	6	9	53	17	9	7	9	12	9	9	12	10	47	17	21	38	23	10	9	14	28	8	57	57
29-Dec	16	8	8	8	63	12	5	5	9	13	8	10	13	7	9	3	16	5	13	13	6	10	6	6	63
30-Dec	8	7	8	8	5	5	8	4	5	5	7	8	14	9	8	7	13	8	10	5	10	4	4	2	14
31-Dec	3	4	4	3	3	4	4	6	3	2	3	6	3	4	3	4	4	6	4	4	3	3	2	3	6
23 68 28 53 66 58 38 44 43 57 81 94 91 47 90 37 38 25 18 75 48 36 56 61																									
Diurnal Maximum																									

AF - Analyzer Failure







# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Direction 75 m (WD75m) - deg

## Mannix - December 2017

Direction of Maximum Speed: 256 deg on Dec 9 11:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 160.1 deg on Dec 31		Hours of Data:	739
Direction of Minimum Speed: 58 deg on Dec 1 23:00		Hours of Missing Data:	5
Direction of Minimum Daily Speed Average: 3.3 deg on Dec 19		Percent Operational Time:	99.3
Monthly Average Direction: 242.5 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	235	241	241	242	240	237	228	205	220	220	204	198	157	151	154	181	187	151	144	154	159	137	58	270	207.7
2-Dec	239	283	323	348	354	317	308	299	308	342	221	205	202	246	240	224	222	240	246	250	256	257	246	229	260.6
3-Dec	201	203	194	182	177	165	248	261	328	349	355	2	353	343	350	1	12	20	19	14	19	13	313	10	340.4
4-Dec	20	20	25	7	36	59	106	162	165	185	149	146	154	155	144	140	134	131	130	134	139	132	134	149	132.6
5-Dec	155	157	172	220	244	267	279	294	311	0	12	4	345	348	360	9	15	9	12	1	324	321	258	185	311.7
6-Dec	140	152	154	170	185	184	185	162	158	164	183	160	172	215	230	238	249	251	250	255	256	259	240	252	203.5
7-Dec	234	232	234	251	249	255	256	252	237	242	263	284	270	268	267	274	276	277	282	276	270	286	274	251	264.8
8-Dec	244	236	236	238	227	246	244	178	174	182	190	160	141	147	158	169	165	162	173	180	225	236	192	219	192.6
9-Dec	228	242	251	250	251	251	254	259	254	255	256	259	262	264	258	257	259	252	252	254	256	319	257	247	255.1
10-Dec	249	249	254	247	247	234	188	212	203	220	254	277	303	321	329	1	16	13	354	326	35	165	130	150	276.1
11-Dec	192	252	254	245	252	257	256	247	242	245	218	192	167	168	168	162	165	160	160	179	184	175	171	168	203.3
12-Dec	213	250	240	247	253	240	254	264	270	251	258	275	298	278	272	281	295	294	286	294	294	294	294	284	273.0
13-Dec	243	244	247	243	236	226	210	240	262	274	280	282	296	348	342	331	285	286	275	279	281	287	344	25	277.1
14-Dec	22	62	199	181	178	187	183	172	152	147	153	159	145	153	151	131	124	140	131	143	162	137	136	149	151.3
15-Dec	140	150	153	AF	AF	AF	AF	AF	258	259	251	265	284	281	274	260	236	243	244	239	259	270	261	259	252.3
16-Dec	259	2	10	12	13	14	16	19	27	50	74	94	137	143	144	145	144	141	147	151	150	156	161	159	101.6
17-Dec	166	166	164	187	191	190	208	223	231	247	260	253	252	257	255	254	268	282	280	285	275	268	259	260	239.8
18-Dec	271	265	262	266	349	6	16	19	16	357	302	306	296	310	311	309	293	285	282	281	287	14	10	4	311.2
19-Dec	10	8	11	12	11	10	5	359	227	238	209	169	162	156	147	152	158	156	162	162	187	216	227	171	126.3
20-Dec	189	209	142	146	152	154	173	179	162	156	169	177	154	158	154	159	152	161	161	159	158	164	168	176	162.0
21-Dec	202	265	307	299	287	305	329	355	343	340	320	309	282	280	300	285	280	276	278	283	290	303	305	293	292.6
22-Dec	293	284	263	266	266	271	265	262	253	261	265	275	280	280	284	283	279	276	283	316	12	8	3	354	289.3
23-Dec	3	6	354	296	292	270	264	334	32	12	6	8	358	306	324	315	226	190	195	208	255	278	320	7	334.7
24-Dec	10	13	9	2	358	353	1	352	340	341	355	327	216	217	293	9	61	216	276	297	265	293	354	11	351.1
25-Dec	18	7	12	13	13	8	353	354	358	281	216	225	217	217	212	227	224	217	197	188	198	206	199	181	346.4
26-Dec	178	177	196	161	162	180	166	157	153	176	159	156	153	153	140	144	154	186	223	200	190	200	249	241	168.4
27-Dec	213	195	186	200	180	179	161	182	183	181	189	184	159	171	174	207	215	229	231	228	214	179	193	148	191.6
28-Dec	129	131	146	8	355	9	5	360	347	1	8	4	346	294	323	343	2	4	26	21	11	7	3	28	5.6
29-Dec	26	17	12	10	358	147	178	168	193	228	225	220	199	177	174	167	196	222	210	189	182	196	181	181	193.9
30-Dec	188	171	160	162	162	157	165	185	209	183	166	152	139	137	147	156	151	143	179	196	187	153	159	166	163.0
31-Dec	161	153	160	168	173	165	167	163	165	168	150	151	165	154	149	150	151	144	151	158	165	170	173	177	160.1

228.6 245.9 242.1 240.7 244.3 254.6 255.5 247.2 241.7 241.3 235.8 238.5 235.7 236.6 233.8 229.6 227.2 230.3 232.6 232.1 236.9 240.5 220.3 211.9

Diurnal Average

AF - Analyzer Failure

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



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

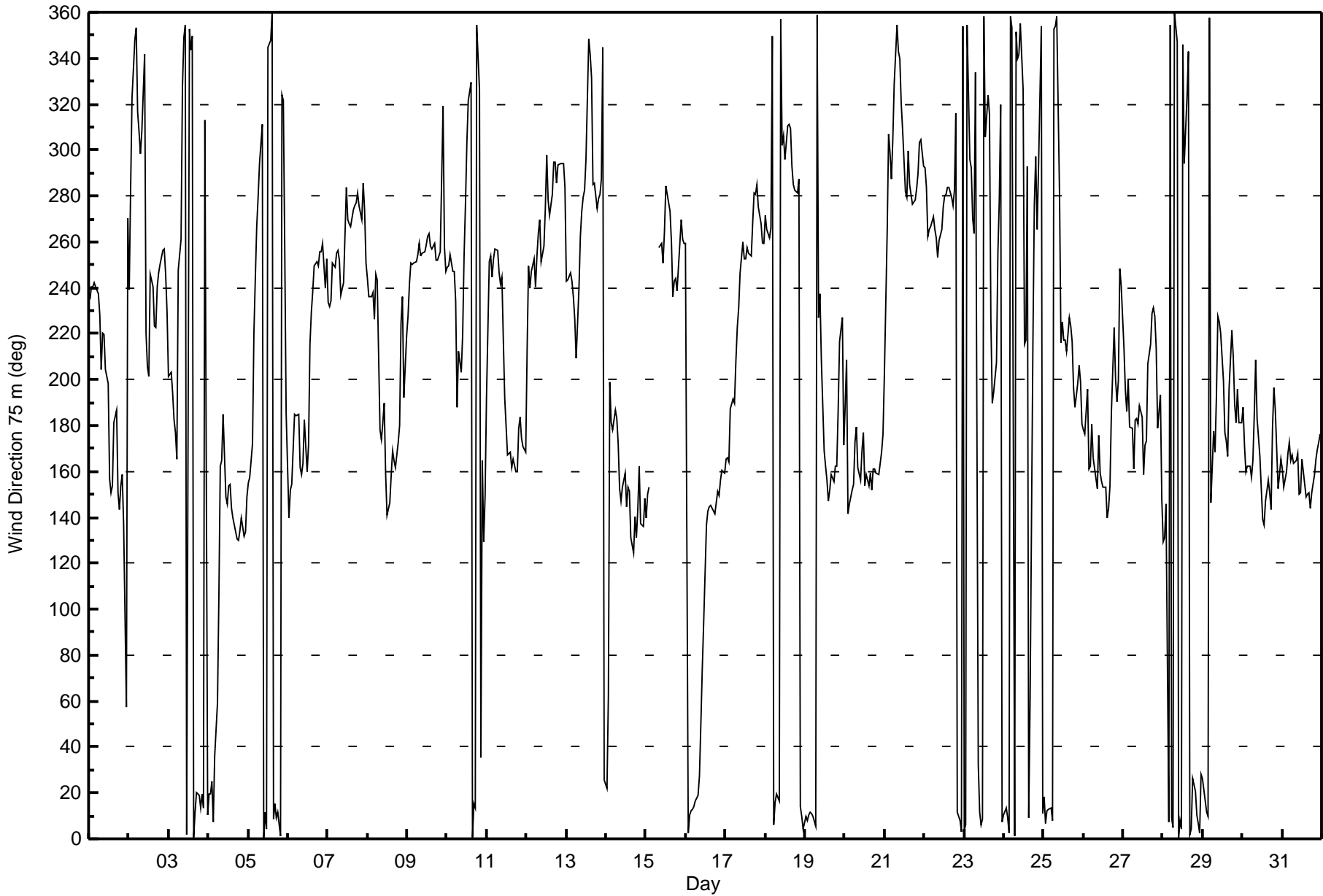
Wind Direction 75 m (WD75m) - deg

Mannix - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 87 deg on Dec 25 10:00	Hours of Data: 739
Minimum Value: 1 deg on Dec 11 08:00	Hours of Missing Data: 5
Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 4 O <sub>1</sub> = 5 Median = 8 O <sub>3</sub> = 12 P <sub>90</sub> = 20 P <sub>99</sub> = 52	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-Dec	6	6	5	6	8	7	12	9	14	9	8	6	12	8	7	14	7	10	3	12	10	10	83	26	83	
2-Dec	5	20	16	10	47	10	21	5	9	14	31	27	22	7	8	10	6	5	3	4	4	6	14	11	47	
3-Dec	7	16	9	16	11	8	25	13	15	11	11	7	14	10	11	7	8	8	8	6	23	19	13	25	25	
4-Dec	8	9	8	17	22	43	25	17	12	21	27	5	4	8	4	5	4	4	4	4	4	5	8	8	43	
5-Dec	5	5	21	15	14	6	8	5	15	6	5	9	15	16	11	9	8	9	10	15	14	37	13	25	37	
6-Dec	8	5	3	11	6	6	11	6	6	13	8	7	16	11	9	9	7	4	4	4	3	3	12	18	18	
7-Dec	16	9	14	8	13	11	11	9	12	12	28	72	45	6	5	4	2	4	5	8	3	6	7	9	72	
8-Dec	6	4	5	7	8	7	4	27	12	11	12	13	3	4	4	6	5	3	8	9	17	12	20	16	27	
9-Dec	13	6	5	5	6	5	6	6	5	5	4	6	6	7	8	5	4	6	6	5	13	32	23	4	32	
10-Dec	3	6	3	4	4	10	21	11	14	18	23	9	9	7	7	14	9	8	17	27	28	37	8	15	37	
11-Dec	21	15	13	4	2	3	8	1	3	4	9	16	7	7	4	5	5	5	6	8	5	3	3	8	21	
12-Dec	21	6	7	10	15	14	4	8	11	8	7	18	8	12	4	7	3	5	4	3	5	8	18	15	21	
13-Dec	7	2	3	6	9	12	13	25	8	6	4	4	16	12	10	18	11	5	6	4	5	4	38	7	38	
14-Dec	8	67	14	11	6	17	21	15	10	4	5	8	3	4	8	11	9	7	5	7	9	9	7	6	67	
15-Dec	8	10	4	AF	AF	AF	AF	AF	10	6	6	11	6	6	9	8	11	6	7	5	10	6	6	6	11	
16-Dec	6	32	5	7	9	8	7	8	15	24	18	28	11	12	9	7	7	7	5	5	4	3	4	3	32	
17-Dec	4	5	6	7	4	7	9	7	6	9	7	6	7	7	6	7	6	8	6	5	6	10	6	7	10	
18-Dec	5	8	6	10	12	8	7	8	9	22	15	12	8	6	7	10	7	6	4	5	21	7	9	8	22	
19-Dec	7	5	8	8	7	7	8	20	66	28	18	8	5	4	4	3	3	6	3	9	11	12	18	12	66	
20-Dec	12	32	7	3	2	5	7	10	7	2	11	9	3	3	2	4	3	3	3	3	6	3	3	6	32	
21-Dec	15	19	16	10	7	12	11	5	9	13	17	11	21	10	9	5	4	5	8	6	6	9	6	11	21	
22-Dec	15	14	7	6	4	3	4	7	5	4	7	5	6	6	5	6	5	6	5	6	28	6	5	8	10	28
23-Dec	7	12	19	44	38	37	7	30	12	5	4	6	10	33	45	33	13	13	15	15	16	6	24	7	45	
24-Dec	7	7	8	9	9	10	7	11	8	6	15	59	41	16	42	26	55	18	11	18	9	19	18	7	59	
25-Dec	7	4	4	5	5	5	8	7	17	87	20	11	9	6	7	9	7	6	12	6	12	13	9	8	87	
26-Dec	8	6	11	10	13	9	9	11	4	13	17	7	3	5	3	5	5	23	12	13	15	16	13	23	23	
27-Dec	19	20	16	16	15	24	12	13	19	11	9	8	4	10	9	10	8	6	8	10	15	17	16	29	29	
28-Dec	18	9	9	86	12	4	5	6	11	6	7	15	10	37	22	16	35	19	8	8	7	10	8	22	86	
29-Dec	13	7	7	10	37	46	9	7	19	9	5	6	10	11	10	6	21	3	8	16	8	7	8	8	46	
30-Dec	9	8	8	7	4	4	7	12	10	17	13	5	13	9	6	5	12	7	18	9	14	9	3	4	18	
31-Dec	5	2	3	4	4	3	4	4	4	3	5	6	2	5	3	4	5	3	3	3	3	3	3	3	6	
	21	67	21	86	47	46	25	30	66	87	31	72	45	37	45	33	55	23	18	28	28	37	83	29		
	Diurnal Maximum																									

AF - Analyzer Failure





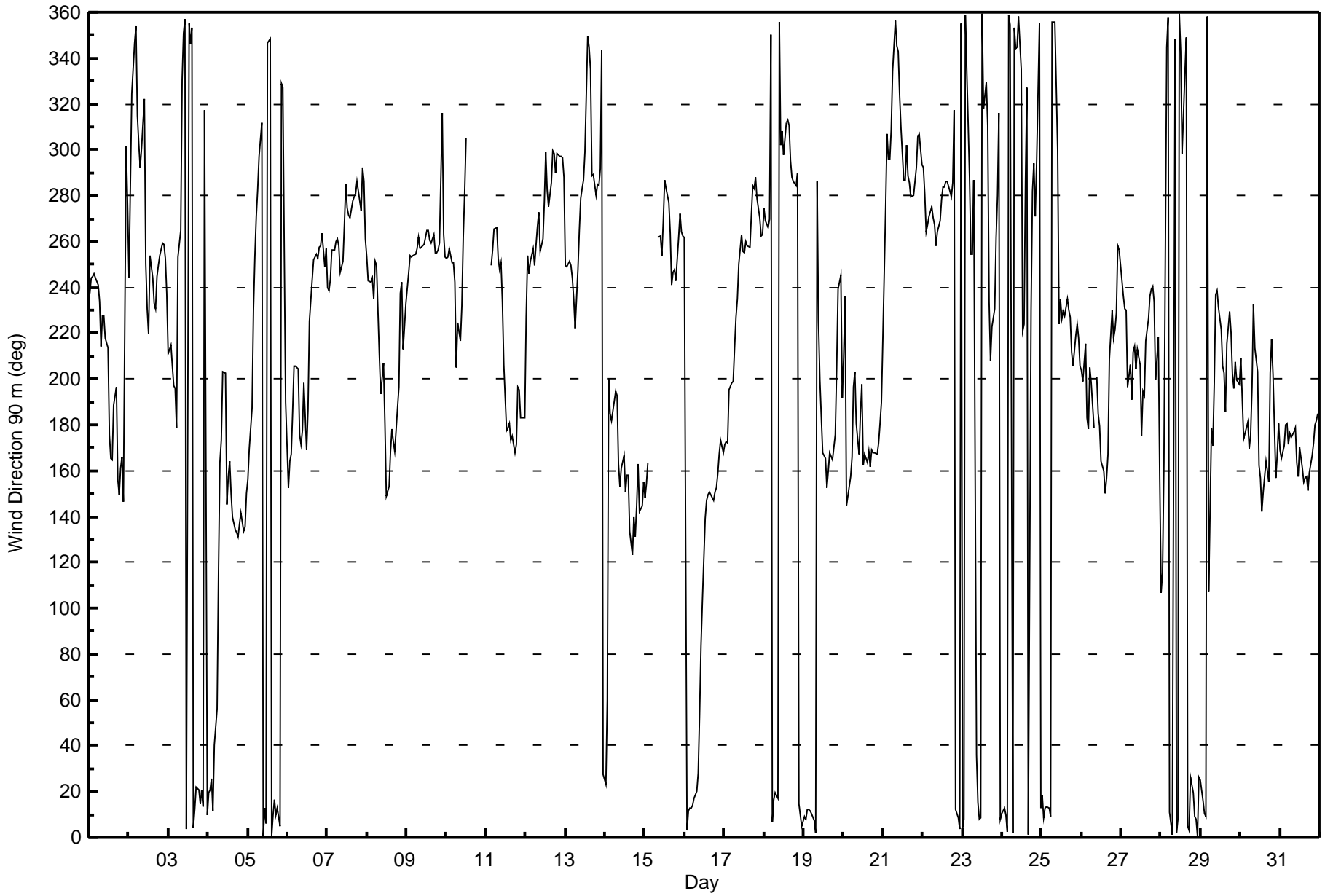
**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction 90 m (WD90m) - deg**  
**Mannix - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 97 deg on Dec 19 09:00	Hours of Data: 724
Minimum Value: 2 deg on Dec 19 19:00	Hours of Missing Data: 20
Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 4 O <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 12 P <sub>90</sub> = 18 P <sub>99</sub> = 57	Hours of Calibration: 0
	Percent Operational Time: 97.3

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-Dec	5	5	5	6	7	6	10	9	11	7	7	5	17	12	8	12	6	12	4	14	16	15	84	36	84
2-Dec	5	19	16	8	42	6	17	5	7	12	23	29	20	6	6	7	4	5	4	3	4	6	9	11	42
3-Dec	7	13	7	16	12	11	19	13	15	14	9	10	7	14	10	10	7	7	8	7	5	26	18	13	26
4-Dec	7	8	8	11	16	48	25	13	8	24	37	4	7	9	3	5	4	3	2	3	3	3	4	8	48
5-Dec	6	7	21	13	12	6	7	4	14	6	5	9	14	15	11	8	7	9	10	14	14	39	17	17	39
6-Dec	8	5	2	12	7	7	11	9	8	13	9	6	19	9	8	8	7	4	4	3	3	3	9	15	19
7-Dec	14	8	12	7	9	8	9	8	9	10	18	46	25	5	5	5	3	4	4	6	3	5	8	9	46
8-Dec	6	4	4	6	7	6	3	22	12	11	9	16	6	5	4	6	5	3	10	9	12	9	19	13	22
9-Dec	10	5	5	5	6	5	6	6	5	5	4	6	6	7	7	5	4	6	5	6	8	29	21	5	29
10-Dec	3	5	3	4	5	9	22	8	12	15	19	8	9	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	22
11-Dec	AF	AF	AF	4	2	5	9	2	2	4	8	18	7	9	6	7	4	5	10	8	7	3	5	12	18
12-Dec	17	6	7	8	10	10	4	6	8	7	7	15	7	11	4	7	2	4	4	4	3	7	13	13	17
13-Dec	8	3	2	5	7	10	12	20	7	5	3	3	15	9	9	16	9	5	6	4	5	4	37	6	37
14-Dec	7	63	19	10	6	18	16	14	15	3	6	7	3	4	8	10	6	5	5	7	8	7	6	5	63
15-Dec	6	7	4	AF	AF	AF	AF	AF	9	6	5	11	6	6	8	8	9	6	6	5	9	6	6	6	11
16-Dec	7	31	5	7	9	8	6	8	17	26	18	25	10	11	8	6	6	6	4	4	7	2	5	3	31
17-Dec	3	4	6	6	4	7	9	7	5	9	7	6	7	7	6	7	6	7	6	4	6	9	6	7	9
18-Dec	5	7	6	10	12	9	6	8	9	24	14	11	8	6	7	9	6	6	4	5	20	7	8	8	24
19-Dec	7	5	7	7	7	7	8	15	97	48	19	7	4	5	5	4	2	5	2	11	11	9	13	17	97
20-Dec	12	24	15	3	4	9	10	10	11	4	14	12	4	2	3	4	3	2	3	3	6	4	4	5	24
21-Dec	17	11	12	8	8	10	10	5	8	13	16	12	16	8	9	4	4	5	8	5	5	8	6	10	17
22-Dec	13	11	6	5	4	3	4	6	4	5	7	5	5	6	5	5	5	5	6	28	5	5	7	9	28
23-Dec	6	10	19	42	83	59	10	44	17	10	4	4	6	28	42	35	10	14	14	12	9	5	25	6	83
24-Dec	7	7	7	9	8	9	6	9	6	5	16	63	30	15	22	19	61	14	11	13	8	14	19	7	63
25-Dec	5	3	3	4	4	5	7	6	17	92	24	11	7	6	6	5	5	6	11	8	10	12	7	9	92
26-Dec	10	13	8	22	23	11	11	18	AF	13	23	13	9	5	4	5	7	19	8	11	12	16	9	16	23
27-Dec	16	12	15	14	13	16	11	12	17	10	8	8	7	12	12	7	7	5	7	8	14	19	14	72	72
28-Dec	18	22	36	82	12	3	4	5	10	6	7	18	9	40	22	16	32	17	7	9	5	8	6	16	82
29-Dec	14	7	6	10	26	59	12	8	19	7	5	6	5	11	11	10	17	3	7	16	8	8	7	6	59
30-Dec	8	11	10	7	8	6	9	12	5	16	16	5	15	8	6	5	13	7	16	5	12	12	6	9	16
31-Dec	4	3	3	5	5	2	5	4	4	3	6	8	2	4	3	3	5	2	4	3	3	4	2	3	8
Diurnal Maximum																									
18 63 36 82 83 59 25 44 97 92 37 63 30 40 42 35 61 19 16 28 20 39 84 72																									

AF - Analyzer Failure





Maximum Value: 1.0 km/h on Dec 31 23:00      Maximum Daily Average: 0.7 km/h on Dec 31																								Hours in Service: 744 Hours of Data: 666			
Minimum Value: -0.9 km/h on Dec 18 14:00      Minimum Daily Average: -0.4 km/h on Dec 9																								Hours of Missing Data: 78 Hours of Calibration: 0			
Maximum Diurnal Average: 0.2 km/h at hour 24      Minimum Diurnal Average: 0.0 km/h at hour 18																								Percent Operational Time: 89.5			
Monthly Average: 0.06 km/h      Percentiles: P <sub>1</sub> = -0.8 P <sub>10</sub> = -0.5 Q <sub>1</sub> = -0.2 Median = 0.0 Q <sub>3</sub> = 0.3 P <sub>90</sub> = 0.6 P <sub>99</sub> = 0.9																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-0.4	-0.6	-0.5	-0.8	-0.2	-0.6	-0.1	-0.1	0.0	-0.1	0.0	0.3	0.4	0.6	0.5	0.3	-0.1	0.4	0.6	0.5	0.4	0.2	0.2	-0.1	0.0	0.6	
2-Dec	-0.3	-0.2	-0.1	-0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.2	0.2	0.1	0.1	0.2	0.0	-0.4	-0.4	-0.4	-0.2	0.0	0.0	-0.2	-0.1	0.2	
3-Dec	0.1	0.1	0.3	0.3	0.4	0.4	-0.2	-0.2	-0.4	-0.2	-0.3	0.0	-0.2	0.1	0.0	0.1	0.0	0.3	0.0	-0.1	0.0	-0.1	0.0	0.2	0.0	0.4	
4-Dec	0.0	0.1	0.2	0.1	-0.1	0.2	0.1	-0.1	0.0	AF	0.3	0.4	0.3	0.4	0.6	0.4	0.3	0.5	0.7	0.5	0.5	0.6	0.5	0.6	0.3	0.7	
5-Dec	0.5	0.5	0.4	-0.1	0.2	-0.3	-0.3	-0.5	-0.4	-0.1	0.0	0.0	-0.2	-0.1	-0.1	0.1	0.2	0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.0	0.5	
6-Dec	0.3	0.5	0.7	0.7	0.5	0.5	0.4	0.9	1.0	0.8	0.5	0.7	0.8	0.2	0.0	-0.1	-0.1	-0.6	-0.6	-0.2	-0.4	-0.3	0.1	0.1	0.3	1.0	
7-Dec	0.0	-0.1	0.2	0.0	0.1	-0.1	0.0	0.0	0.1	0.2	0.4	0.2	0.0	-0.4	-0.4	-0.6	-0.4	-0.4	-0.4	-0.2	0.0	-0.1	-0.1	-0.2	-0.1	0.4	
8-Dec	-0.3	-0.6	-0.3	-0.2	-0.2	-0.2	-0.1	0.3	0.4	0.3	0.4	0.5	0.7	0.7	0.7	0.7	0.7	0.9	0.6	0.5	0.2	0.2	0.4	0.3	0.3	0.9	
9-Dec	0.3	-0.2	-0.8	-0.7	-0.6	-0.3	-0.5	-0.7	-0.8	-0.7	-0.9	-0.6	-0.3	-0.1	-0.2	-0.5	-0.5	-0.4	-0.5	-0.2	-0.2	-0.1	-0.4	-0.6	-0.4	0.3	
10-Dec	-0.5	0.0	-0.3	-0.3	-0.6	0.0	0.3	0.1	0.1	0.1	-0.3	-0.4	-0.8	-0.6	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.3	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.7	0.7	
12-Dec	0.2	-0.1	-0.3	0.0	0.4	0.0	-0.4	0.1	-0.1	-0.3	-0.3	-0.1	-0.4	-0.4	-0.4	-0.5	-0.6	-0.5	-0.4	-0.1	-0.2	-0.2	-0.1	-0.1	-0.2	0.4	
13-Dec	-0.5	-0.2	-0.4	-0.1	-0.1	-0.3	0.1	0.1	-0.5	-0.3	-0.3	-0.4	-0.4	-0.3	-0.3	-0.1	-0.2	-0.4	-0.3	-0.3	-0.3	-0.5	0.0	0.4	-0.2	0.4	
14-Dec	0.2	0.1	-0.2	-0.1	-0.1	0.1	0.4	0.4	0.6	0.7	0.9	0.6	0.7	0.6	0.5	0.4	0.3	-0.1	0.4	0.5	0.1	0.4	0.4	0.7	0.4	0.9	
15-Dec	0.2	0.2	0.6	AF	AF	AF	AF	AF	AF	-0.2	-0.4	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.5	-0.5	-0.6	-0.4	-0.4	-0.4	-0.5	-0.3	0.6	
16-Dec	-0.4	0.0	-0.1	0.1	0.1	0.4	0.2	0.3	0.5	0.5	0.4	0.5	0.2	0.5	0.3	0.3	0.5	0.6	0.5	0.6	0.6	0.8	0.7	1.0	0.4	1.0	
17-Dec	0.9	1.0	1.0	-0.1	-0.3	0.2	-0.3	-0.7	-0.5	-0.7	-0.4	-0.7	-0.5	-0.9	-0.8	-0.7	-0.6	-0.5	-0.6	-0.4	-0.1	-0.2	-0.3	-0.5	-0.3	1.0	
18-Dec	-0.2	-0.3	-0.3	-0.3	-0.1	0.0	0.2	0.4	0.2	0.3	0.1	-0.7	-0.6	-0.9	-0.5	-0.7	-0.8	-0.4	-0.6	-0.4	-0.4	0.1	0.1	0.0	-0.2	0.4	
19-Dec	0.1	-0.1	0.0	0.1	0.2	0.1	-0.1	-0.1	-0.4	-0.3	-0.2	0.2	0.3	0.3	0.5	0.6	0.5	0.5	0.4	0.5	0.3	0.2	0.2	AF	0.2	0.6	
20-Dec	0.3	0.2	0.2	0.5	0.4	0.6	0.7	0.7	0.8	0.9	0.6	0.5	0.8	0.7	0.7	0.6	0.7	0.5	0.7	0.4	0.4	0.5	0.3	0.5	0.6	0.9	
21-Dec	0.3	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.1	0.0	0.0	0.0	-0.3	-0.3	-0.3	-0.5	-0.5	-0.5	-0.4	-0.4	-0.2	-0.2	-0.1	0.3	
22-Dec	0.0	0.2	-0.1	0.0	-0.2	-0.2	-0.4	-0.5	-0.7	-0.5	-0.2	-0.3	-0.5	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.5	-0.1	0.0	-0.1	-0.2	-0.2	0.2	
23-Dec	-0.1	0.2	0.0	0.0	AF	AF	AF	AF	AF	AF	0.0	0.1	0.0	0.0	0.0	-0.1	AF	AF	0.2	0.2	0.1	0.0	0.0	0.0	--	0.2	
24-Dec	0.0	0.2	AF	-0.3	0.0	0.0	0.2	AF	AF	AF	0.0	0.0	0.3	0.3	0.2	0.4	0.2	-0.1	0.0	0.2	-0.1	0.1	-0.1	0.0	0.1	0.4	
25-Dec	-0.1	-0.1	0.1	0.1	-0.1	-0.3	AF	AF	AF	AF	AF	AF	AF	AF	0.4	AF	0.3	0.0	AF	0.0	0.1	0.3	0.2	AF	AF	AF	0.4
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.4	0.3	0.2	0.3	0.3	0.2	0.2	0.3	0.1	--	0.4	
27-Dec	0.2	0.2	0.1	0.1	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.5	0.4	0.2	0.0	-0.1	-0.2	-0.1	0.0	0.1	0.2	0.2	0.2	0.2	0.5	
28-Dec	0.3	0.2	0.1	0.1	0.0	0.1	-0.1	0.0	-0.1	0.0	-0.2	0.0	0.1	0.1	-0.2	0.0	-0.1	0.0	0.6	0.2	0.0	0.0	-0.2	0.0	0.0	0.6	
29-Dec	0.2	0.0	0.0	0.0	-0.5	-0.3	0.0	0.1	0.0	0.0	-0.1	0.0	0.3	0.4	0.2	0.3	0.0	-0.1	0.1	0.3	0.4	0.1	0.5	0.5	0.1	0.5	
30-Dec	0.3	0.3	0.4	0.5	0.6	0.3	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.5	0.5	0.3	0.1	0.1	0.4	0.4	0.8	0.4	0.8	
31-Dec	0.5	0.5	0.6	1.0	0.7	0.6	0.8	0.7	0.8	0.8	0.7	0.7	0.9	0.5	0.6	0.3	0.8	0.8	0.7	0.8	0.9	0.9	1.0	0.6	0.7	1.0	
																								Diurnal Average			
																								Diurnal Maximum			
AF - Analyzer Failure																											



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3.2 km/h on Dec 24 02:00			Hours of Data:	666
Minimum Value: 0.1 km/h on Dec 28 04:00			Hours of Missing Data:	78
			Hours of Calibration:	0
			Percent Operational Time:	89.5
Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.6 Median = 0.9 Q <sub>3</sub> = 1.3 P <sub>90</sub> = 1.9 P <sub>99</sub> = 2.9				

Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.9	1.7	1.4	2.1	1.7	1.6	0.9	0.7	0.7	0.5	0.8	0.5	0.8	0.8	0.8	0.6	0.6	0.6	0.7	0.8	0.5	0.4	0.3	0.3	2.1	
2-Dec	0.6	0.9	1.1	0.5	0.3	0.2	0.3	0.4	0.4	0.4	0.2	0.4	0.4	0.2	0.3	0.3	0.5	0.6	0.8	0.9	1.0	0.6	0.5	0.6	1.1	
3-Dec	0.3	0.3	0.4	0.6	0.6	0.7	0.8	0.7	2.2	1.9	2.0	1.5	1.2	1.1	1.0	0.9	1.3	1.2	1.1	1.1	0.9	0.5	0.3	0.9	2.2	
4-Dec	1.0	1.0	0.8	0.4	0.3	0.5	0.3	0.3	0.4	AF	0.8	0.9	0.8	1.1	1.2	0.9	0.9	1.0	1.4	1.2	1.1	1.4	1.5	1.0	1.5	
5-Dec	1.0	1.0	0.9	0.9	0.5	0.6	1.5	2.0	1.7	1.5	1.7	1.5	1.2	1.3	1.6	1.4	1.5	1.4	1.2	0.9	0.6	0.5	0.5	0.4	2.0	
6-Dec	0.9	1.0	1.2	0.9	0.7	0.7	0.9	1.3	1.3	1.4	1.0	1.1	1.1	0.6	0.8	0.8	0.6	1.3	1.7	1.1	1.0	0.7	0.4	0.5	1.7	
7-Dec	0.6	0.6	0.5	0.6	0.7	0.9	0.7	0.7	0.7	0.7	0.8	1.1	1.5	1.2	1.5	1.1	1.3	1.3	0.4	0.8	0.3	0.4	0.4	1.5		
8-Dec	0.3	0.6	0.8	0.4	0.4	0.5	0.4	0.6	0.5	0.7	0.6	0.8	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.6	0.6	0.4	0.7	0.5	1.0	
9-Dec	0.5	1.0	2.2	2.1	2.1	2.1	2.3	2.1	2.7	2.4	2.3	2.0	1.6	1.0	1.3	1.5	1.5	1.4	1.3	0.9	1.5	1.0	0.9	0.5	2.7	
10-Dec	0.8	0.6	0.5	0.6	0.7	0.4	0.7	0.6	0.8	0.7	0.9	1.5	2.4	2.2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.4	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.9	0.9
12-Dec	0.7	0.7	0.7	0.6	0.7	0.6	1.2	1.3	0.8	1.3	1.5	1.4	1.6	1.5	1.3	1.5	1.8	1.6	1.5	1.1	0.6	0.5	0.6	0.2	1.8	
13-Dec	0.6	0.6	0.5	0.4	0.9	0.7	0.7	0.9	1.8	1.1	1.2	1.0	1.7	2.2	1.6	1.0	0.6	1.1	0.6	0.7	1.4	1.6	1.2	1.2	2.2	
14-Dec	0.9	0.5	0.5	0.6	0.9	0.4	0.5	0.7	1.1	1.2	1.4	1.1	1.1	1.2	1.0	0.6	0.7	0.8	0.7	0.9	0.7	0.6	0.7	1.0	1.4	
15-Dec	0.6	0.6	1.0	AF	AF	AF	AF	AF	AF	0.9	1.5	1.6	2.1	1.8	1.0	0.7	0.8	1.4	1.7	1.8	1.9	1.7	1.5	1.8	2.1	
16-Dec	1.6	2.7	2.9	2.4	2.0	2.1	1.8	1.3	1.0	1.0	0.8	0.7	0.6	0.7	1.0	0.9	1.0	1.1	0.9	0.8	1.1	1.2	1.3	1.6	2.9	
17-Dec	1.2	1.2	1.5	1.7	1.9	0.9	1.7	2.1	2.0	2.1	1.8	2.4	2.5	2.7	2.6	2.5	2.0	2.8	2.3	1.5	0.9	1.6	1.4	1.4	2.8	
18-Dec	1.2	1.2	1.3	1.3	2.3	2.5	2.2	2.2	1.4	0.9	0.8	2.7	2.8	3.0	2.5	2.4	2.4	2.0	1.7	1.9	2.2	1.9	2.0	1.9	3.0	
19-Dec	1.8	1.8	1.8	1.7	1.8	1.6	1.4	0.7	0.4	0.4	0.4	0.5	0.7	0.5	0.8	0.7	0.8	0.7	0.5	0.7	0.7	0.5	0.5	AF	1.8	
20-Dec	0.9	0.8	0.6	0.8	0.9	1.0	1.0	1.1	1.3	1.4	1.3	1.0	1.2	1.1	1.0	0.6	0.7	0.7	0.9	0.9	0.7	0.7	0.9	1.1	1.4	
21-Dec	1.0	0.5	0.2	0.2	0.2	0.4	0.7	0.9	0.7	0.6	0.4	0.5	0.5	0.6	1.8	1.5	1.0	1.9	2.0	1.8	1.8	1.8	1.3	1.0	2.0	
22-Dec	0.7	0.4	0.5	0.6	0.6	0.7	0.8	1.2	2.0	1.4	1.3	1.4	1.9	1.9	2.1	1.9	1.5	1.4	1.5	2.1	2.5	3.1	3.1	2.3	3.1	
23-Dec	1.9	1.1	0.5	0.2	AF	AF	AF	AF	AF	AF	0.5	0.4	0.5	0.5	0.4	0.3	AF	AF	0.6	0.6	0.4	0.2	0.5	2.8	2.8	
24-Dec	3.2	3.2	AF	3.0	2.2	1.7	2.0	AF	AF	AF	1.7	0.7	0.5	0.7	0.7	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.6	1.0	3.2	
25-Dec	1.4	1.7	1.9	2.1	1.9	2.2	AF	AF	AF	AF	AF	AF	AF	0.9	AF	0.3	0.2	AF	0.2	0.3	0.4	0.6	AF	AF	AF	2.2
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.7	0.7
27-Dec	0.3	0.4	0.3	0.4	0.5	0.6	0.7	0.7	0.9	0.9	0.8	0.7	0.8	0.6	0.5	0.4	0.6	0.5	0.3	0.2	0.3	0.4	0.4	0.6	0.9	
28-Dec	0.3	0.4	0.3	0.1	0.3	1.6	2.1	1.6	0.9	1.2	1.1	0.7	0.9	0.5	0.4	0.4	0.4	0.6	1.3	0.9	0.7	0.5	0.3	0.2	2.1	
29-Dec	0.4	0.8	1.0	0.7	0.4	0.3	0.5	0.5	0.5	0.4	0.6	0.6	0.6	0.8	0.6	0.6	0.8	0.3	0.4	0.7	1.0	0.9	0.8	0.9	1.0	
30-Dec	0.7	0.9	0.9	0.8	0.8	0.9	0.7	0.6	0.6	0.8	0.6	0.9	0.8	0.8	0.8	0.8	0.9	0.8	0.6	0.7	0.4	0.7	0.6	1.0	1.0	
31-Dec	0.9	1.0	0.9	1.1	0.7	0.7	1.0	1.0	1.1	1.2	1.1	1.0	1.0	0.7	0.5	0.7	0.4	0.7	0.9	0.8	0.9	0.7	0.8	0.7	1.2	
	3.2	3.2	2.9	3.0	2.3	2.5	2.3	2.2	2.7	2.4	2.3	2.7	2.8	3.0	2.6	2.5	2.4	2.8	2.3	2.1	2.5	3.1	3.1	2.8		
	Diurnal Maximum																									

AF - Analyzer Failure



Maximum Value: 2.2 km/h on Dec 20 19:00      Maximum Daily Average: 1.6 km/h on Dec 31																								Hours in Service: 744 Hours of Data: 723		
Minimum Value: -1.6 km/h on Dec 18 14:00      Minimum Daily Average: -0.6 km/h on Dec 18 Maximum Diurnal Average: 0.3 km/h at hour 24      Minimum Diurnal Average: 0.1 km/h at hour 2 Monthly Average: 0.19 km/h      Percentiles: P <sub>1</sub> = -1.1 P <sub>10</sub> = -0.6 Q <sub>1</sub> = -0.4 Median = 0.0 Q <sub>3</sub> = 0.7 P <sub>90</sub> = 1.3 P <sub>99</sub> = 1.9																								Hours of Missing Data: 21 Hours of Calibration: 0 Percent Operational Time: 97.2		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-0.2	-0.5	-0.4	-0.4	-0.1	-0.4	0.0	0.2	0.1	-0.1	0.5	0.7	0.9	1.4	1.1	0.7	0.5	1.0	1.3	1.1	0.7	0.3	0.2	0.0	0.4	1.4
2-Dec	-0.2	-0.4	-0.5	-0.3	0.0	-0.1	-0.1	-0.3	-0.4	-0.1	0.1	0.3	0.3	0.0	0.0	0.2	0.0	-0.3	-0.4	-0.4	-0.3	-0.2	0.0	-0.1	-0.1	0.3
3-Dec	0.3	0.2	0.5	0.8	0.9	1.0	-0.2	-0.3	-1.0	-0.6	-0.5	-0.3	-0.7	-0.1	-0.3	0.1	-0.4	0.2	-0.4	-0.6	-0.4	-0.3	-0.2	0.0	-0.1	1.0
4-Dec	-0.4	-0.1	-0.1	0.0	0.0	0.2	0.1	0.4	0.4	0.8	0.8	1.1	0.5	0.9	1.2	0.8	0.9	1.2	1.1	1.0	1.1	1.1	1.1	1.1	0.6	1.2
5-Dec	1.0	1.2	1.1	0.0	0.0	-0.5	-0.4	-0.8	-0.6	-0.6	-0.5	-0.5	-0.6	-0.3	-0.5	-0.3	-0.1	0.0	-0.3	-0.3	-0.1	-0.1	0.0	0.2	-0.1	1.2
6-Dec	0.5	0.9	1.3	1.6	1.2	1.1	0.9	1.8	1.7	1.6	1.1	1.2	1.5	0.1	0.0	-0.2	-0.3	-0.5	-0.5	-0.2	-0.4	-0.2	0.1	0.0	0.6	1.8
7-Dec	0.1	-0.1	0.1	-0.1	-0.1	-0.3	-0.2	-0.2	0.1	0.2	0.1	0.1	0.0	-0.4	-0.5	-1.0	-0.6	-0.7	-0.7	-0.5	-0.1	-0.2	-0.2	-0.1	-0.2	0.2
8-Dec	-0.2	-0.4	-0.2	-0.1	-0.1	-0.1	0.0	0.6	1.0	0.8	0.6	1.1	1.3	1.5	1.5	1.6	1.7	1.8	1.2	1.2	0.4	0.2	0.9	0.5	0.7	1.8
9-Dec	0.5	-0.1	-0.6	-0.6	-0.4	-0.4	-0.3	-0.5	-0.5	-0.5	-0.7	-0.5	-0.3	-0.2	-0.2	-0.4	-0.5	-0.5	-0.4	-0.3	-0.2	-0.5	-0.3	-0.4	-0.4	0.5
10-Dec	-0.4	-0.1	-0.4	-0.4	-0.4	0.1	0.7	0.3	0.4	0.3	-0.2	-0.5	-1.1	-1.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.7
11-Dec	AF	AF	AF	AF	AF	AF	-0.5	-0.6	-0.3	-0.1	0.3	0.6	1.1	0.9	1.3	1.3	1.5	1.3	0.9	1.3	1.1	1.3	1.4	1.7	0.8	1.7
12-Dec	0.5	-0.2	-0.3	0.0	0.2	0.1	-0.4	0.1	-0.4	-0.2	-0.1	0.0	-0.8	-0.7	-0.5	-0.8	-1.1	-0.9	-0.9	-0.5	-0.6	-0.4	-0.1	-0.3	-0.3	0.5
13-Dec	-0.3	-0.3	-0.4	-0.1	-0.1	-0.1	0.3	0.1	-0.7	-0.6	-0.6	-0.6	-0.8	-1.0	-0.9	-0.4	-0.3	-0.7	-0.4	-0.6	-0.7	-0.7	-0.4	0.1	-0.4	0.3
14-Dec	0.0	0.2	0.0	0.4	0.4	0.4	0.7	1.0	1.3	1.3	1.8	1.2	1.4	1.2	1.2	0.9	0.8	0.6	0.7	1.0	0.4	0.7	0.9	1.2	0.8	1.8
15-Dec	0.7	0.5	1.3	AF	AF	AF	AF	AF	-0.1	-0.3	-0.4	-0.4	-0.9	-0.7	-0.5	-0.3	-0.2	-0.4	-0.4	-0.4	-0.5	-0.4	-0.3	-0.4	-0.2	1.3
16-Dec	-0.4	-0.6	-1.3	-0.5	-0.3	-0.1	-0.2	-0.2	0.6	0.4	0.2	0.5	0.3	0.6	0.5	0.6	0.7	1.0	1.2	1.2	1.4	1.6	1.6	2.0	0.4	2.0
17-Dec	1.6	1.6	1.9	1.0	0.6	0.7	0.1	-0.1	-0.1	-0.8	-0.4	-0.5	-0.5	-1.0	-0.7	-0.7	-0.6	-0.8	-0.8	-0.7	-0.4	-0.4	-0.2	-0.4	-0.1	1.9
18-Dec	-0.4	-0.3	-0.4	-0.3	-0.6	-0.4	-0.4	-0.1	0.0	0.1	0.0	-1.2	-0.7	-1.6	-0.9	-1.1	-1.0	-0.6	-0.8	-0.7	-0.6	-0.3	-0.2	-0.7	-0.6	0.1
19-Dec	-0.3	-0.7	-0.6	-0.3	-0.2	-0.3	-0.5	-0.1	-0.1	-0.1	0.0	0.2	0.5	0.4	0.8	1.1	1.2	0.8	0.8	1.1	0.8	0.6	0.5	1.0	0.3	1.2
20-Dec	0.8	0.7	0.5	1.1	1.5	1.9	1.6	1.6	2.1	2.1	1.4	1.0	1.8	1.6	1.6	1.7	1.9	1.6	2.2	1.7	1.7	1.8	1.4	1.6	1.5	2.2
21-Dec	0.6	0.1	-0.2	-0.2	-0.4	-0.4	-0.4	-0.5	-0.5	-0.3	0.1	-0.3	0.0	-0.1	-0.6	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-0.9	-0.4	-0.3	-0.4	0.6
22-Dec	-0.1	0.0	-0.2	-0.2	-0.4	-0.5	-0.6	-0.6	-0.6	-0.5	-0.2	-0.5	-0.8	-0.5	-0.5	-0.7	-0.6	-0.5	-0.6	-1.0	-0.9	-1.0	-0.8	-0.7	-0.5	0.0
23-Dec	-0.4	0.0	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	0.1	0.3	0.4	0.2	0.0	-0.4	-0.4	-0.9	-0.1	0.4
24-Dec	-0.9	-0.8	-0.7	-0.5	-0.2	0.0	-0.8	-0.4	-0.5	-0.5	-0.2	-0.1	0.2	0.2	0.0	0.1	0.2	0.1	-0.1	0.0	0.0	-0.1	-0.3	-0.6	-0.2	0.2
25-Dec	-0.4	-0.9	-0.5	-0.7	-1.1	-1.3	-0.4	-0.5	0.0	0.1	0.1	0.1	0.4	0.1	0.2	0.1	0.0	0.0	0.2	0.4	0.4	0.4	0.3	0.7	-0.1	0.7
26-Dec	0.7	0.9	0.8	1.1	1.2	0.9	1.2	0.9	1.2	0.9	0.9	1.2	0.8	0.9	1.1	0.8	0.8	0.6	0.5	0.8	0.8	0.9	0.6	0.4	0.9	1.2
27-Dec	0.6	0.7	0.9	0.9	0.8	0.7	1.1	0.5	0.7	0.7	0.4	0.5	0.7	0.6	0.3	0.2	0.2	-0.2	-0.1	0.1	0.2	0.5	0.4	0.9	0.5	1.1
28-Dec	0.5	0.4	0.4	0.1	-0.3	-0.6	-0.8	-0.4	-0.5	-0.2	-0.7	-0.1	-0.2	0.1	-0.1	-0.1	-0.2	-0.1	0.6	-0.2	-0.2	-0.2	-0.1	0.1	-0.1	0.6
29-Dec	0.0	-0.1	-0.2	-0.2	-0.1	0.1	0.1	0.4	0.2	-0.1	-0.1	0.0	0.5	0.7	0.5	0.8	0.5	-0.1	0.1	0.4	0.9	0.4	0.7	0.8	0.3	0.9
30-Dec	0.4	0.6	0.7	0.7	1.1	0.6	1.1	0.9	0.4	0.5	0.4	0.7	0.4	0.7	0.7	0.7	0.9	0.8	0.9	0.5	0.5	1.1	1.1	1.5	0.7	1.5
31-Dec	1.1	0.9	1.5	1.6	1.4	1.5	1.8	1.6	2.0	2.1	1.8	1.8	1.5	1.4	1.5	1.3	1.7	1.7	1.6	1.6	1.9	1.7	1.8	1.3	1.6	2.1
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										





Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.8 km/h on Dec 24 03:00 Minimum Value: 0.1 km/h on Dec 23 07:00 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.6 Median = 0.9 Q <sub>3</sub> = 1.3 P <sub>90</sub> = 2.0 P <sub>99</sub> = 3.0																								Hours in Service: 744 Hours of Data: 723 Hours of Missing Data: 21 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-Dec	2.0	1.8	1.5	2.4	2.0	1.5	1.0	0.9	1.2	0.7	0.7	0.5	1.1	0.9	0.8	0.6	0.4	0.7	0.7	0.8	0.7	0.5	0.4	0.3	2.4
2-Dec	0.4	0.9	1.1	0.6	0.4	0.2	0.4	0.3	0.3	0.3	0.2	0.4	0.4	0.3	0.2	0.3	0.4	0.5	0.5	0.8	1.0	0.8	0.9	0.8	1.1
3-Dec	0.6	0.6	0.7	1.0	0.7	0.6	0.8	0.8	2.6	1.8	2.0	1.7	1.2	1.2	1.0	0.9	1.3	1.4	1.2	1.3	0.9	0.7	0.5	1.2	2.6
4-Dec	1.2	1.3	0.9	0.4	0.4	0.5	0.2	0.3	0.4	0.4	0.9	0.8	0.7	0.9	1.1	0.9	0.9	1.1	1.5	1.2	1.0	1.6	1.5	1.0	1.6
5-Dec	1.0	1.0	1.5	1.4	0.8	1.0	1.7	1.6	1.7	1.0	1.4	1.4	1.5	1.5	1.7	1.4	1.7	1.5	1.3	1.1	0.7	0.6	0.5	0.3	1.7
6-Dec	0.9	1.1	1.2	0.8	0.6	0.7	0.7	1.1	1.3	1.3	0.9	1.0	1.1	1.0	1.1	1.2	1.1	1.0	1.4	1.0	0.9	0.6	0.8	0.9	1.4
7-Dec	0.9	0.8	0.8	1.0	1.3	1.5	1.3	1.1	1.2	1.2	1.1	1.2	1.5	1.8	1.5	1.3	0.8	0.9	0.8	0.4	0.8	0.3	0.3	0.3	1.8
8-Dec	0.2	0.5	0.8	0.5	0.6	0.7	0.3	0.7	0.6	0.5	0.4	0.7	0.9	1.0	0.8	0.8	0.8	0.7	0.8	0.5	1.0	0.6	0.8	0.6	1.0
9-Dec	0.8	1.2	1.8	1.9	2.1	2.2	2.6	2.5	2.7	2.5	2.2	2.3	1.8	1.4	1.4	1.6	1.6	1.4	1.2	1.0	1.4	1.3	0.9	0.6	2.7
10-Dec	0.7	0.8	0.5	0.7	0.5	0.5	0.6	0.6	0.8	0.9	1.1	1.5	2.4	2.2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.4
11-Dec	AF	AF	AF	AF	AF	AF	0.3	0.4	0.3	0.3	0.4	0.6	0.8	0.6	0.7	0.9	0.9	0.9	1.0	0.7	0.9	1.1	0.9	0.8	1.1
12-Dec	1.0	0.9	0.8	0.9	1.1	1.1	1.4	1.5	1.2	1.3	1.4	1.5	1.3	1.2	1.3	1.2	1.6	1.3	1.0	0.9	0.7	0.8	0.8	0.3	1.6
13-Dec	0.4	0.6	0.5	0.5	1.3	0.5	0.7	1.5	2.0	1.2	1.1	0.8	1.7	2.3	1.9	1.1	0.6	0.9	0.5	0.4	1.1	1.3	1.2	1.3	2.3
14-Dec	1.1	0.5	0.3	0.6	0.8	0.4	0.7	0.6	1.1	1.3	1.4	1.3	1.2	1.0	0.9	0.6	0.9	0.9	0.7	0.9	0.8	0.7	0.6	1.0	1.4
15-Dec	0.7	0.5	0.8	AF	AF	AF	AF	AF	0.9	0.9	1.6	1.6	2.2	1.9	1.3	0.9	1.1	1.6	2.0	1.8	2.2	2.0	1.7	2.1	2.2
16-Dec	1.8	2.5	2.7	2.4	2.2	2.5	2.1	1.5	1.1	1.2	0.9	0.8	0.8	1.1	1.3	1.1	1.2	1.3	0.8	0.8	0.9	1.2	1.2	1.5	2.7
17-Dec	0.9	1.1	1.4	1.6	1.6	1.1	1.9	2.0	2.2	2.2	2.1	2.4	2.6	2.9	2.6	2.4	2.4	3.0	2.3	1.5	1.1	1.9	1.5	1.5	3.0
18-Dec	1.3	1.4	1.3	1.4	2.5	2.7	2.3	2.5	1.8	1.1	0.9	3.0	2.9	3.3	3.0	2.6	2.5	2.1	1.6	2.0	2.4	2.2	2.1	1.8	3.3
19-Dec	1.8	1.8	2.1	1.9	2.0	1.7	1.4	0.9	0.4	0.2	0.2	0.5	0.9	0.6	0.7	0.8	0.8	0.7	0.5	0.7	0.6	0.7	0.9	1.0	2.1
20-Dec	0.8	1.1	1.1	1.0	0.9	0.6	0.7	0.9	1.0	1.0	1.0	0.9	1.2	1.0	1.0	0.4	0.5	0.5	0.6	0.7	0.7	0.5	0.5	0.6	1.2
21-Dec	0.9	0.8	0.3	0.4	0.2	0.6	0.8	0.8	0.7	0.6	0.6	0.6	0.5	0.5	2.1	1.4	1.0	1.8	2.2	1.8	1.9	1.9	1.4	1.1	2.2
22-Dec	1.0	0.7	0.7	0.8	0.7	0.9	0.7	1.0	1.7	1.5	1.5	1.5	1.8	2.0	2.2	1.8	1.6	1.3	1.6	2.2	2.7	2.7	3.0	2.4	3.0
23-Dec	2.0	1.4	0.6	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.5	0.5	0.4	0.6	0.3	0.3	0.3	0.3	0.6	0.5	0.4	0.2	0.5	2.9	2.9
24-Dec	3.5	3.6	3.8	3.2	2.4	2.2	1.7	1.5	1.5	2.1	0.7	0.7	0.8	0.4	0.4	0.3	0.2	0.3	0.3	0.3	0.4	0.5	0.7	1.1	3.8
25-Dec	1.7	1.5	1.8	2.1	1.9	2.0	1.6	1.4	0.6	0.5	0.3	0.7	0.9	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.6	0.5	0.4	0.4	2.1
26-Dec	0.4	0.5	0.5	0.9	1.0	0.6	1.1	1.2	1.2	0.5	1.1	0.9	1.0	0.9	0.8	0.9	0.6	0.4	0.5	0.6	0.6	0.5	0.5	0.5	1.2
27-Dec	0.6	0.4	0.2	0.5	0.6	0.6	0.5	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.6	0.3	0.5	0.6	0.4	0.5	0.4	0.4	0.3	0.7	0.8
28-Dec	0.4	0.3	0.3	0.2	0.4	1.7	1.7	1.7	1.1	1.3	1.2	0.8	0.7	0.7	0.5	0.5	0.6	0.6	1.6	1.3	0.8	0.8	0.3	0.4	1.7
29-Dec	0.5	0.9	1.1	0.5	0.3	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.5	0.7	0.6	0.6	0.6	0.3	0.4	0.5	0.7	0.6	0.8	0.8	1.1
30-Dec	0.7	0.7	1.0	0.8	0.6	0.7	0.5	0.5	0.5	0.5	0.6	0.8	1.1	1.1	0.9	0.8	1.0	1.2	0.5	0.4	0.4	0.5	0.6	0.6	1.2
31-Dec	0.7	0.9	1.0	0.8	0.3	0.4	0.4	0.7	0.9	0.8	1.0	0.5	0.7	0.3	0.3	0.4	0.4	0.6	1.0	1.2	0.7	0.5	0.8	0.7	1.2
3.5 3.6 3.8 3.2 2.5 2.7 2.6 2.5 2.7 2.5 2.2 3.0 2.9 3.3 3.0 2.6 2.5 3.0 2.3 2.2 2.7 2.7 3.0 2.9																								Diurnal Maximum	
AF - Analyzer Failure																									



Summary of Hour Averages

Mannix - December 2017

Maximum Value: 1.6 km/h on Dec 20 19:00      Maximum Daily Average: 0.9 km/h on Dec 31																				Hours in Service: 744 Hours of Data: 739 Hours of Missing Data: 5 Hours of Calibration: 0 Percent Operational Time: 99.3						
Minimum Value: -1.0 km/h on Dec 25 06:00      Minimum Daily Average: -0.1 km/h on Dec 25 Maximum Diurnal Average: 0.3 km/h at hour 13      Minimum Diurnal Average: 0.1 km/h at hour 1 Monthly Average: 0.23 km/h      Percentiles: P <sub>1</sub> = -0.6 P <sub>10</sub> = -0.1 Q <sub>1</sub> = 0.0 Median = 0.2 Q <sub>3</sub> = 0.4 P <sub>90</sub> = 0.7 P <sub>99</sub> = 1.3																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.3	0.0	0.1	0.2	0.5	0.0	0.3	-0.1	-0.1	-0.2	0.1	0.2	0.7	0.9	0.9	0.2	0.1	0.6	0.6	0.5	0.3	0.2	0.1	0.0	0.3	0.9
2-Dec	-0.2	0.1	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0	-0.1	-0.1	0.0	0.3	0.3	0.1	0.1	0.0	0.3
3-Dec	0.0	0.1	0.1	0.3	0.2	0.3	0.1	0.1	-0.4	0.0	0.0	0.1	-0.5	0.4	0.0	0.5	-0.1	0.3	-0.3	-0.6	-0.3	-0.3	-0.1	0.0	0.0	0.5
4-Dec	-0.5	-0.1	-0.1	0.1	0.2	0.1	0.1	0.2	0.3	0.2	0.3	0.7	0.3	0.7	0.7	0.3	0.1	0.2	0.1	0.1	0.1	-0.2	-0.1	0.6	0.2	0.7
5-Dec	0.7	0.8	0.5	0.0	0.1	0.3	0.6	0.3	0.4	-0.3	-0.1	-0.2	-0.2	0.0	-0.1	-0.2	0.1	0.4	0.1	-0.1	0.0	0.2	0.1	0.1	0.2	0.8
6-Dec	0.3	0.7	1.0	0.6	0.2	0.1	0.0	0.9	1.1	0.9	0.4	0.8	0.6	-0.1	0.2	0.1	0.0	-0.1	0.0	0.3	0.0	0.4	0.0	0.1	0.4	1.1
7-Dec	0.1	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.2	0.3	0.0	0.2	0.3	0.4	0.3	0.2	0.5	0.4	0.4	0.1	0.6	0.3	0.1	0.3	0.2	0.6
8-Dec	-0.1	-0.4	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.1	0.5	0.5	1.2	1.0	0.9	1.1	1.1	0.5	0.3	0.2	0.2	0.3	0.1	0.3	1.2
9-Dec	0.2	0.1	0.1	-0.1	0.0	0.2	0.8	0.2	0.6	0.4	0.3	0.6	0.3	0.3	0.3	0.3	0.2	0.0	-0.1	0.1	0.6	-0.2	0.0	-0.1	0.2	0.8
10-Dec	0.1	0.2	0.1	0.0	-0.2	0.0	0.2	0.0	0.0	0.2	0.0	0.4	0.3	-0.2	-0.5	0.0	-0.2	-0.4	0.1	0.2	0.1	0.1	0.0	0.4	0.0	0.4
11-Dec	0.1	0.0	0.1	-0.2	-0.1	-0.2	-0.1	-0.3	-0.2	0.1	0.0	0.2	0.6	0.4	0.5	0.7	1.0	0.9	0.7	0.5	0.6	0.8	0.7	0.7	0.3	1.0
12-Dec	0.2	0.2	-0.1	0.1	0.2	0.2	0.4	1.0	0.0	0.3	0.5	0.9	0.3	0.1	0.3	0.2	0.3	0.4	0.3	0.7	0.2	0.0	0.2	0.0	0.3	1.0
13-Dec	-0.2	0.1	-0.2	0.2	0.1	-0.1	0.0	0.1	0.1	0.3	0.2	0.2	0.2	-0.7	-0.3	-0.2	0.2	0.2	0.2	0.1	0.2	0.2	-0.1	0.1	0.0	0.3
14-Dec	0.1	0.2	0.0	0.2	0.3	0.3	0.3	0.2	0.9	1.2	1.4	1.0	0.9	1.0	0.7	-0.1	-0.2	0.2	0.0	0.4	0.4	0.3	0.3	1.1	0.5	1.4
15-Dec	0.3	0.5	1.1	AF	AF	AF	AF	AF	0.3	0.3	0.1	0.4	0.3	0.3	0.1	0.0	-0.1	0.1	0.0	-0.1	0.3	0.5	0.3	0.3	0.3	1.1
16-Dec	0.3	-0.1	-0.8	-0.2	-0.1	0.1	0.0	-0.2	0.6	0.3	0.2	0.5	0.0	0.4	0.1	0.3	0.4	0.5	0.9	1.0	1.2	1.3	1.2	1.4	0.4	1.4
17-Dec	0.8	0.7	1.0	0.4	0.2	0.3	0.1	0.0	0.1	-0.2	0.2	0.2	0.0	0.1	0.1	0.1	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.3	1.0
18-Dec	0.3	0.2	0.2	0.4	0.2	0.3	-0.1	0.1	-0.1	0.2	0.3	0.0	0.9	0.1	0.2	0.1	0.3	0.2	0.1	0.3	0.5	0.0	0.1	-0.3	0.2	0.9
19-Dec	-0.1	-0.2	-0.6	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.4	0.2	0.5	0.8	1.1	0.7	0.6	0.9	0.2	0.2	0.2	0.4	0.3	1.1
20-Dec	0.2	0.2	0.2	0.8	1.5	1.3	0.4	0.3	1.0	1.3	0.8	0.2	1.3	1.2	1.3	0.9	1.3	1.1	1.6	1.4	1.3	1.1	0.4	0.5	0.9	1.6
21-Dec	0.2	0.1	0.0	0.1	0.1	0.1	-0.2	-0.2	-0.2	0.0	0.2	0.0	0.0	0.2	0.6	0.3	0.1	0.3	0.2	0.2	0.2	0.1	0.5	0.2	0.1	0.6
22-Dec	0.4	0.1	0.2	0.4	0.2	0.2	-0.1	0.0	0.0	0.1	0.2	0.3	0.2	0.4	0.2	0.3	0.3	0.3	0.2	0.0	-0.5	-0.4	0.0	0.2	0.1	0.4
23-Dec	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	-0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.2	0.2	0.0	-0.1	0.0	-0.1	-0.6	0.0	0.2
24-Dec	-0.7	-0.4	-0.2	0.5	0.4	0.7	-0.4	0.2	0.1	0.1	-0.1	-0.2	0.2	0.0	0.1	-0.1	0.0	0.0	0.2	0.0	0.2	0.3	-0.2	-0.5	0.0	0.7
25-Dec	-0.2	-0.4	-0.2	-0.4	-0.9	-1.0	0.0	-0.2	0.0	0.2	0.3	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.4
26-Dec	0.1	0.3	0.0	0.6	0.7	0.3	0.5	0.6	0.9	0.2	0.6	0.7	0.5	0.7	0.4	0.5	0.8	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.9
27-Dec	0.1	0.1	0.2	0.1	0.2	0.1	0.3	0.1	0.1	0.2	-0.1	0.1	0.4	0.2	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	0.2	0.1	0.2	0.1	0.4
28-Dec	0.1	0.1	0.3	0.1	-0.2	-0.2	-0.2	-0.1	-0.1	0.1	-0.6	0.0	0.0	0.2	-0.1	0.0	0.0	-0.1	0.4	-0.1	0.0	-0.1	0.0	0.1	0.0	0.4
29-Dec	0.0	0.1	0.0	0.1	0.0	0.1	0.3	0.3	0.1	-0.1	-0.2	0.0	0.1	0.2	0.3	0.3	0.1	-0.1	-0.1	0.1	0.4	0.0	0.2	0.2	0.1	0.4
30-Dec	0.0	0.1	0.3	0.3	0.7	0.8	0.6	0.3	0.0	0.0	0.2	0.5	0.0	0.3	0.4	0.4	0.5	0.6	0.3	0.1	0.1	0.5	0.9	0.5	0.4	0.9
31-Dec	0.5	0.5	1.2	0.8	0.6	0.8	0.7	0.9	1.1	1.0	1.3	1.1	1.1	1.1	1.0	1.0	1.0	0.5	1.3	1.2	1.1	0.6	0.7	0.7	0.9	1.3
																								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 - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.5 km/h on Dec 24 03:00 Minimum Value: 0.1 km/h on Dec 23 08:00 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.3 Q <sub>1</sub> = 0.5 Median = 0.7 Q <sub>3</sub> = 1.4 P <sub>90</sub> = 1.9 P <sub>99</sub> = 2.9																								Hours in Service: 744 Hours of Data: 739 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-Dec	2.1	2.0	1.7	2.5	2.1	1.9	1.1	1.0	1.3	0.7	0.8	0.5	0.7	0.5	0.5	0.5	0.4	0.5	0.4	0.6	0.4	0.6	0.4	0.3	2.5
2-Dec	0.5	0.8	0.8	0.6	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.2	0.2	0.4	0.7	0.5	0.9	0.9	1.0	1.0	1.1	1.1
3-Dec	0.7	0.6	0.9	1.3	0.8	0.5	0.8	0.8	2.3	1.8	1.9	1.7	1.1	1.2	0.9	1.0	1.1	1.4	1.3	1.2	0.8	0.7	0.7	1.3	2.3
4-Dec	1.0	1.3	0.8	0.5	0.5	0.5	0.4	0.2	0.2	0.3	0.3	0.4	0.5	0.7	0.6	0.5	0.8	0.9	1.2	0.9	0.6	1.1	1.3	0.8	1.3
5-Dec	0.9	1.1	1.8	1.7	1.1	1.0	1.9	1.5	1.5	0.7	1.1	1.2	1.5	1.6	1.3	1.3	1.6	1.5	1.4	1.1	0.7	0.6	0.4	0.2	1.9
6-Dec	0.9	0.7	0.5	0.7	0.6	0.6	0.6	1.0	1.2	1.0	0.7	0.8	1.1	1.1	1.2	1.4	1.3	1.3	1.4	1.2	1.0	0.6	0.9	1.3	1.4
7-Dec	1.4	1.0	1.0	1.3	1.6	1.7	1.6	1.4	1.4	1.7	1.4	1.4	1.7	2.1	1.7	1.1	0.6	0.8	0.6	0.4	0.7	0.4	0.3	0.4	2.1
8-Dec	0.2	0.5	0.8	0.6	0.9	0.9	0.4	0.3	0.4	0.6	0.3	0.5	0.5	0.7	0.6	0.4	0.6	0.6	0.8	0.6	1.2	0.8	0.8	0.8	1.2
9-Dec	1.0	1.4	1.7	1.9	2.3	2.3	2.7	2.8	2.7	2.5	2.3	2.7	2.0	1.6	1.5	1.6	1.7	1.4	1.4	1.2	1.3	1.4	1.0	0.6	2.8
10-Dec	0.8	0.8	0.5	0.7	0.5	0.7	0.5	0.6	0.9	1.1	1.2	1.3	2.2	2.1	1.6	1.6	1.5	1.2	0.7	0.8	0.7	0.3	0.7	0.7	2.2
11-Dec	0.6	0.6	0.6	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.7	0.5	0.7	0.4	0.5	0.7	0.6	0.7	0.9	0.6	0.6	0.7	0.7	0.9	0.9
12-Dec	1.5	1.2	1.1	1.4	1.4	1.3	1.3	1.5	1.5	1.3	1.4	1.6	1.1	1.0	1.5	0.9	1.2	1.1	0.7	0.7	0.8	0.9	1.0	0.3	1.6
13-Dec	0.4	0.6	0.5	0.6	1.0	0.4	0.9	1.9	2.3	1.3	1.0	0.6	1.8	1.9	1.7	0.9	0.7	0.7	0.5	0.4	1.0	1.1	1.1	1.3	2.3
14-Dec	1.1	0.6	0.4	0.7	0.8	0.4	0.6	0.6	0.6	0.8	1.0	0.9	0.6	0.7	0.7	1.1	1.5	0.9	0.9	0.8	0.6	0.7	0.6	0.6	1.5
15-Dec	0.4	0.5	0.6	AF	AF	AF	AF	AF	1.0	1.0	1.8	1.8	2.4	2.0	1.4	1.1	1.4	1.9	1.9	1.7	2.5	2.3	2.0	2.2	2.5
16-Dec	2.0	2.1	2.1	2.2	2.2	2.5	1.9	1.3	1.1	1.4	1.2	1.0	0.7	0.9	1.0	0.8	0.9	1.0	0.7	0.7	0.7	0.8	0.6	1.0	2.5
17-Dec	1.0	1.4	1.3	1.4	1.4	1.2	1.9	2.0	2.1	2.4	2.3	2.4	2.8	3.0	2.7	2.5	2.5	3.1	2.3	1.4	1.1	2.0	1.7	1.7	3.1
18-Dec	1.6	1.6	1.4	1.7	2.3	2.3	1.9	2.3	1.7	1.1	1.0	2.8	2.9	3.0	2.7	2.3	2.4	2.1	1.4	1.9	2.3	2.0	2.1	1.8	3.0
19-Dec	1.6	1.7	2.0	1.8	2.0	1.7	1.5	1.0	0.6	0.4	0.2	0.3	0.6	0.5	0.4	0.5	0.4	0.7	0.5	0.6	0.6	0.7	0.9	1.1	2.0
20-Dec	0.5	0.9	0.5	0.7	0.5	0.6	0.8	0.9	0.9	0.6	0.9	0.5	0.6	0.5	0.5	0.3	0.4	0.5	0.5	0.4	0.6	0.5	0.5	0.4	0.9
21-Dec	0.4	0.6	0.4	0.4	0.3	0.6	0.8	0.6	0.8	0.6	0.7	0.6	0.4	0.6	2.3	1.4	1.0	1.7	2.2	1.6	1.7	1.8	1.4	1.2	2.3
22-Dec	1.1	0.7	0.8	0.9	0.8	1.0	0.7	1.0	1.5	1.7	1.7	1.5	1.8	2.0	2.1	1.8	1.5	1.3	1.6	2.0	2.3	2.3	2.7	2.5	2.7
23-Dec	1.7	1.2	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.4	0.6	0.4	0.6	0.3	0.4	0.2	0.4	0.6	0.3	0.3	0.2	0.6	2.8	2.8
24-Dec	3.4	3.4	3.5	3.3	2.6	2.4	1.7	1.5	1.5	1.8	0.7	0.6	0.6	0.7	0.5	0.4	0.3	0.2	0.3	0.4	0.6	0.6	0.7	0.9	3.5
25-Dec	1.4	0.9	1.3	1.6	1.5	1.9	1.6	1.3	0.7	0.6	0.8	0.6	0.7	0.2	0.1	0.2	0.2	0.4	0.4	0.4	0.7	0.4	0.5	0.7	1.9
26-Dec	0.5	0.5	0.4	0.7	0.4	0.6	0.6	1.0	0.5	0.5	1.0	0.5	0.5	0.5	0.4	0.5	0.3	0.3	0.4	0.6	0.5	0.6	0.4	0.4	1.0
27-Dec	0.4	0.2	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.4	0.4	0.6	0.6	0.6	0.3	0.5	0.7	0.6	0.6	0.4	0.4	0.3	0.4	0.7
28-Dec	0.4	0.4	0.3	0.2	0.5	1.2	1.3	1.6	1.2	1.1	1.2	0.9	0.8	0.9	0.7	0.6	0.7	0.7	1.5	1.1	0.7	0.7	0.4	0.5	1.6
29-Dec	0.5	0.9	1.0	0.5	0.3	0.3	0.3	0.2	0.3	0.5	0.4	0.3	0.3	0.4	0.6	0.7	0.5	0.3	0.6	0.5	0.4	0.4	0.5	0.5	1.0
30-Dec	0.4	0.5	0.6	0.5	0.5	0.5	0.5	0.3	0.2	0.3	0.4	0.5	0.8	0.8	0.6	0.4	0.7	0.7	0.6	0.3	0.4	0.4	0.4	0.5	0.8
31-Dec	0.5	0.6	0.7	0.5	0.4	0.4	0.5	0.6	0.5	0.6	0.5	0.6	0.5	0.3	0.5	0.5	0.6	0.6	0.9	1.0	0.7	0.7	0.7	0.6	1.0
	3.4	3.4	3.5	3.3	2.6	2.5	2.7	2.8	2.7	2.5	2.3	2.8	2.9	3.0	2.7	2.5	2.5	3.1	2.3	2.0	2.5	2.3	2.7	2.8	
	Diurnal Maximum																								
AF - Analyzer Failure																									



Summary of Hour Averages

Mannix - December 2017

Maximum Value: 2.1 km/h on Dec 24 04:00      Maximum Daily Average: 0.6 km/h on Dec 18																								Hours in Service: 744 Hours of Data: 724		
Minimum Value: -0.7 km/h on Dec 26 06:00      Minimum Daily Average: -0.1 km/h on Dec 17																								Hours of Missing Data: 20 Hours of Calibration: 0		
Maximum Diurnal Average: 0.3 km/h at hour 15      Minimum Diurnal Average: 0.1 km/h at hour 3																								Percent Operational Time: 97.3		
Monthly Average: 0.19 km/h      Percentiles: P <sub>1</sub> = -0.4 P <sub>10</sub> = -0.2 Q <sub>1</sub> = 0.0 Median = 0.1 Q <sub>3</sub> = 0.3 P <sub>90</sub> = 0.6 P <sub>99</sub> = 1.3																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-0.1	-0.3	-0.2	0.0	0.4	-0.3	0.2	-0.3	-0.2	-0.3	-0.1	-0.1	0.4	0.5	0.5	-0.2	-0.2	0.4	0.5	0.3	0.1	0.2	0.1	0.1	0.1	0.5
2-Dec	-0.3	0.2	0.2	0.3	0.1	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.0	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.1	0.2	0.3	0.1	0.0	0.1	0.3
3-Dec	-0.2	-0.1	-0.2	0.1	-0.1	0.0	0.1	0.1	0.2	0.8	0.8	0.7	-0.1	0.7	0.4	0.9	0.5	0.7	0.2	-0.2	0.3	0.0	0.1	0.3	0.2	0.9
4-Dec	-0.1	0.3	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.1	0.4	0.2	0.2	0.5	0.5	0.6	0.8	0.6	0.9	0.4	0.4	0.4	0.5	0.4	0.9
5-Dec	0.3	0.2	0.2	-0.2	0.1	0.2	0.6	0.7	0.8	0.4	0.8	0.5	0.0	0.4	0.5	0.4	0.7	0.9	0.6	0.3	0.2	0.3	0.1	0.0	0.4	0.9
6-Dec	0.3	0.3	0.2	0.0	-0.2	-0.3	-0.3	0.3	0.3	0.1	-0.3	0.2	0.0	-0.3	-0.1	0.0	-0.1	-0.4	-0.3	0.1	-0.2	0.3	0.0	0.1	0.0	0.3
7-Dec	0.0	-0.1	0.0	0.1	0.0	-0.2	0.0	0.0	0.2	0.2	0.0	0.2	0.6	0.3	0.1	0.0	0.4	0.3	0.4	0.1	0.6	0.5	0.2	0.2	0.2	0.6
8-Dec	-0.1	-0.6	-0.2	0.0	-0.2	0.0	0.3	0.1	0.0	0.0	0.0	0.1	0.4	0.9	0.1	0.1	0.2	0.1	0.0	-0.2	0.1	0.1	0.1	0.0	0.0	0.9
9-Dec	0.1	0.1	-0.2	-0.5	-0.1	-0.1	0.6	-0.1	0.4	0.1	-0.1	0.3	0.1	0.3	0.2	0.1	-0.1	-0.3	-0.2	-0.1	0.5	0.1	-0.1	-0.2	0.0	0.6
10-Dec	-0.1	0.2	0.0	-0.1	-0.4	0.0	0.0	-0.2	-0.2	0.1	-0.2	0.2	0.5	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.5
11-Dec	AF	AF	AF	-0.2	-0.1	-0.2	-0.1	-0.3	-0.3	0.1	0.0	0.0	0.2	0.0	0.1	0.1	0.4	0.2	0.1	-0.1	-0.2	0.0	0.2	0.1	0.0	0.4
12-Dec	0.0	0.1	-0.2	-0.1	0.1	0.2	0.3	1.1	0.1	0.2	0.3	1.1	0.6	0.1	0.2	0.3	0.7	0.7	0.4	1.2	0.5	0.2	0.3	0.1	0.4	1.2
13-Dec	-0.3	0.0	-0.2	0.1	0.1	-0.3	-0.1	-0.1	-0.2	0.2	0.2	0.2	0.6	0.4	0.4	0.1	0.2	0.3	0.1	0.1	0.2	0.4	0.2	0.5	0.1	0.6
14-Dec	0.5	0.3	-0.1	0.0	-0.1	0.1	0.0	0.0	0.5	0.9	0.7	0.5	0.7	0.4	0.3	0.1	-0.2	0.4	0.2	0.4	0.2	0.3	0.5	0.8	0.3	0.9
15-Dec	0.4	0.3	0.3	AF	AF	AF	AF	AF	0.2	0.0	-0.2	0.1	0.4	0.3	0.1	-0.1	-0.2	0.0	-0.2	-0.4	0.1	0.2	0.0	0.1	0.1	0.4
16-Dec	0.0	0.9	0.3	0.6	0.8	0.9	0.7	0.3	0.9	0.5	0.2	0.5	0.1	0.3	0.0	0.3	0.3	0.6	0.8	0.6	0.6	0.3	0.3	0.2	0.5	0.9
17-Dec	0.0	0.0	0.0	-0.3	-0.6	-0.1	-0.3	-0.5	-0.4	-0.3	0.1	-0.1	-0.3	-0.3	-0.2	-0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.0	-0.1	0.2
18-Dec	0.1	0.0	0.2	0.3	1.2	1.6	0.8	0.8	0.4	0.5	0.5	0.3	1.3	0.8	0.8	0.6	0.5	0.3	0.1	0.2	0.6	0.6	0.7	0.6	0.6	1.6
19-Dec	0.7	0.7	0.2	0.9	0.7	0.9	0.6	0.3	0.0	0.2	0.0	0.1	0.0	-0.1	0.3	0.3	0.3	0.2	0.1	0.3	-0.2	0.2	0.1	0.0	0.3	0.9
20-Dec	-0.1	0.1	0.0	0.4	0.7	0.5	0.0	-0.1	0.3	0.3	0.1	-0.3	0.5	0.1	0.4	0.1	0.7	0.1	0.6	0.2	0.4	0.2	-0.1	-0.1	0.2	0.7
21-Dec	0.0	0.1	0.2	0.3	0.4	0.4	0.2	0.3	0.2	0.3	0.3	0.0	0.1	0.3	0.8	0.3	0.1	0.0	0.0	0.2	0.3	0.4	0.8	0.3	0.3	0.8
22-Dec	0.5	0.3	0.1	0.3	0.1	0.1	-0.2	-0.2	-0.2	-0.2	-0.1	0.3	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.4	0.6	0.7	1.4	1.1	0.3	1.4
23-Dec	1.1	0.8	0.3	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.5	0.2	0.2	0.1	0.3	0.2	0.0	0.0	0.1	-0.1	0.0	0.1	0.2	0.7	0.2	1.1
24-Dec	0.7	0.9	1.3	2.1	1.4	1.4	0.4	1.0	0.8	0.9	0.2	-0.2	0.1	-0.1	0.4	0.0	0.1	0.0	0.2	0.2	0.5	0.4	0.3	0.5	0.5	2.1
25-Dec	0.7	0.4	0.9	0.7	0.0	-0.1	0.6	0.4	0.1	0.2	0.1	0.0	0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	0.1	0.9
26-Dec	-0.1	0.2	-0.1	0.3	0.2	-0.7	0.1	0.2	AF	-0.1	0.1	0.1	0.1	0.2	0.5	0.3	0.3	-0.1	0.0	-0.1	0.0	0.0	0.1	0.2	0.1	0.5
27-Dec	0.1	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
28-Dec	0.0	0.1	0.1	0.2	0.3	1.0	1.1	0.8	0.4	0.7	0.1	0.4	0.3	0.2	0.1	0.3	0.1	0.1	0.9	0.5	0.5	0.2	0.3	0.2	0.4	1.1
29-Dec	0.1	0.4	0.5	0.4	0.1	0.1	0.1	0.1	-0.1	-0.1	-0.2	-0.1	0.0	0.0	0.1	0.0	-0.1	-0.2	-0.2	-0.1	0.0	-0.3	-0.1	-0.1	0.0	0.5
30-Dec	-0.1	-0.1	-0.1	0.0	0.2	0.3	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.4	0.3	0.0	0.4	0.5	0.0	0.0	0.0	0.2	0.3	0.1	0.1	0.5
31-Dec	-0.1	-0.2	0.3	0.1	0.0	0.0	0.0	0.2	0.3	0.4	0.7	0.5	0.1	0.3	0.4	0.5	0.4	0.5	0.6	0.2	0.1	0.1	0.0	-0.2	0.2	0.7
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3.7 km/h on Dec 24 01:00			Hours of Data:	724
Minimum Value: 0.1 km/h on Dec 25 15:00			Hours of Missing Data:	20
Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.3 Q <sub>1</sub> = 0.5 Median = 0.7 Q <sub>3</sub> = 1.3 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.8			Hours of Calibration:	0
			Percent Operational Time:	97.3

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-Dec	2.1	2.1	1.8	2.6	2.2	2.0	1.2	1.1	1.4	0.8	0.9	0.6	0.6	0.4	0.5	0.4	0.4	0.7	0.4	0.7	0.4	0.6	0.4	0.4	2.6
2-Dec	0.5	0.8	0.7	0.7	0.5	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.4	0.2	0.2	0.5	0.7	0.6	0.9	0.9	1.0	1.0	1.3	1.3
3-Dec	0.7	0.7	0.8	1.5	0.9	0.5	1.0	0.8	2.2	1.9	1.8	1.8	1.1	1.2	0.8	1.0	1.1	1.4	1.2	1.1	0.7	0.6	0.8	1.2	2.2
4-Dec	1.0	1.3	0.8	0.6	0.5	0.4	0.3	0.1	0.2	0.3	0.3	0.4	0.5	0.4	0.4	0.6	0.6	0.6	0.8	0.8	0.6	0.8	1.0	0.8	1.3
5-Dec	0.9	1.2	2.0	1.9	1.1	1.0	1.9	1.4	1.4	0.7	1.1	1.1	1.4	1.5	1.3	1.2	1.6	1.6	1.3	1.1	0.7	0.6	0.4	0.2	2.0
6-Dec	0.7	0.6	0.5	0.7	0.6	0.6	0.6	1.0	1.3	1.0	0.6	0.7	1.1	1.2	1.5	1.7	1.4	1.4	1.3	1.3	0.9	0.6	0.8	1.4	1.7
7-Dec	1.4	1.2	1.2	1.4	1.4	1.6	1.8	1.4	1.5	1.8	1.6	1.6	1.9	2.1	1.8	1.1	0.6	0.8	0.5	0.4	0.7	0.5	0.4	0.4	2.1
8-Dec	0.2	0.5	0.9	0.6	1.0	0.9	0.4	0.3	0.3	0.6	0.4	0.4	0.4	0.7	0.5	0.5	0.4	0.6	0.9	0.7	1.3	0.8	1.0	0.9	1.3
9-Dec	1.1	1.5	1.8	2.0	2.3	2.4	2.5	2.8	2.8	2.5	2.3	2.7	2.0	1.7	1.5	1.7	1.6	1.4	1.3	1.2	1.3	1.4	1.2	0.6	2.8
10-Dec	0.8	0.8	0.5	0.6	0.6	0.8	0.5	0.6	1.0	1.3	1.2	1.2	2.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.1
11-Dec	AF	AF	AF	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.7	0.6	0.6	0.4	0.4	0.6	0.5	0.7	0.9	0.6	0.5	0.7	0.8	1.1	1.1
12-Dec	1.7	1.3	1.2	1.5	1.6	1.4	1.2	1.5	1.4	1.3	1.5	1.7	1.2	0.9	1.4	0.8	1.1	1.1	0.7	0.7	0.8	1.0	1.0	0.3	1.7
13-Dec	0.4	0.7	0.5	0.6	0.8	0.4	1.0	1.8	2.4	1.3	1.0	0.6	1.9	1.7	1.6	0.7	0.7	0.7	0.5	0.4	0.9	1.0	1.1	1.2	2.4
14-Dec	1.1	0.6	0.4	0.8	0.9	0.3	0.6	0.7	0.5	0.8	0.9	0.9	0.5	0.6	0.7	0.9	1.1	1.1	0.9	0.8	0.6	0.8	0.6	0.4	1.1
15-Dec	0.4	0.5	0.6	AF	AF	AF	AF	AF	1.0	1.0	1.9	1.9	2.4	2.1	1.4	1.2	1.6	1.9	2.0	1.7	2.6	2.4	2.0	2.3	2.6
16-Dec	2.0	2.0	2.1	2.3	2.3	2.5	1.7	1.3	1.1	1.3	0.9	0.9	0.7	0.9	1.0	0.7	0.8	0.8	0.6	0.7	0.6	0.7	0.6	0.9	2.5
17-Dec	1.1	1.4	1.3	1.4	1.4	1.2	2.1	2.0	2.2	2.5	2.3	2.6	2.9	3.2	2.8	2.6	2.6	3.2	2.4	1.3	1.1	2.0	1.7	1.7	3.2
18-Dec	1.7	1.7	1.5	1.7	2.3	2.3	1.8	2.2	1.6	1.2	1.2	2.6	3.0	2.9	2.8	2.2	2.4	2.1	1.3	2.0	2.4	1.9	2.2	1.8	3.0
19-Dec	1.5	1.6	1.8	1.9	2.0	1.7	1.5	1.1	0.6	0.5	0.2	0.2	0.4	0.4	0.3	0.4	0.4	0.7	0.4	0.5	0.6	0.7	1.0	1.2	2.0
20-Dec	0.6	0.9	0.5	0.6	0.6	0.7	0.8	1.0	0.9	0.7	0.7	0.4	0.5	0.4	0.4	0.3	0.5	0.5	0.6	0.5	0.6	0.4	0.5	0.4	1.0
21-Dec	0.5	0.6	0.5	0.5	0.4	0.6	0.8	0.7	0.9	0.7	0.7	0.5	0.4	0.7	2.4	1.3	1.0	1.6	2.2	1.6	1.7	1.7	1.4	1.2	2.4
22-Dec	1.2	0.6	0.8	0.9	0.7	0.9	0.6	1.0	1.5	1.7	1.8	1.5	1.9	2.0	2.1	1.8	1.5	1.3	1.6	1.9	2.3	2.3	2.9	2.7	2.9
23-Dec	1.8	1.1	0.5	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.5	0.6	0.5	0.6	0.4	0.5	0.2	0.4	0.7	0.3	0.3	0.2	0.7	2.8	2.8
24-Dec	3.7	3.5	3.6	3.6	2.8	2.6	1.8	1.5	1.5	1.6	0.8	0.6	0.5	0.6	0.4	0.4	0.3	0.2	0.4	0.4	0.7	0.6	0.7	0.8	3.7
25-Dec	1.1	0.8	1.1	1.5	1.3	2.0	1.6	1.4	0.7	0.8	0.7	0.5	0.7	0.2	0.1	0.2	0.2	0.5	0.4	0.4	0.7	0.5	0.5	0.7	2.0
26-Dec	0.5	0.9	0.5	1.0	1.0	1.3	0.6	0.8	AF	1.1	0.4	0.4	0.4	0.5	0.4	0.3	0.3	0.2	0.4	0.7	0.5	0.7	0.4	0.4	1.3
27-Dec	0.4	0.2	0.3	0.2	0.2	0.2	0.3	0.4	0.3	0.4	0.3	0.3	0.5	0.6	0.6	0.3	0.5	0.8	0.7	0.6	0.5	0.4	0.3	0.4	0.8
28-Dec	0.3	0.3	0.3	0.3	0.5	1.1	1.2	1.6	1.3	1.2	1.4	1.3	0.8	0.9	0.7	0.7	0.7	0.7	1.4	1.1	0.6	0.8	0.4	0.5	1.6
29-Dec	0.5	1.0	0.9	0.6	0.3	0.3	0.4	0.2	0.3	0.7	0.4	0.2	0.2	0.3	0.5	0.6	0.4	0.3	0.7	0.5	0.4	0.4	0.5	0.4	1.0
30-Dec	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.2	0.2	0.3	0.3	0.4	0.8	0.7	0.5	0.4	0.5	0.5	0.4	0.3	0.5	0.5	0.4	0.4	0.8
31-Dec	0.4	0.5	0.6	0.4	0.4	0.4	0.5	0.6	0.4	0.6	0.5	0.6	0.3	0.4	0.5	0.5	0.5	0.6	0.9	1.0	0.7	0.8	0.8	0.7	1.0
	3.7	3.5	3.6	3.6	2.8	2.6	2.5	2.8	2.8	2.5	2.3	2.7	3.0	3.2	2.8	2.6	2.6	3.2	2.4	2.0	2.6	2.4	2.9	2.8	
	Diurnal Maximum																								

AF - Analyzer Failure





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

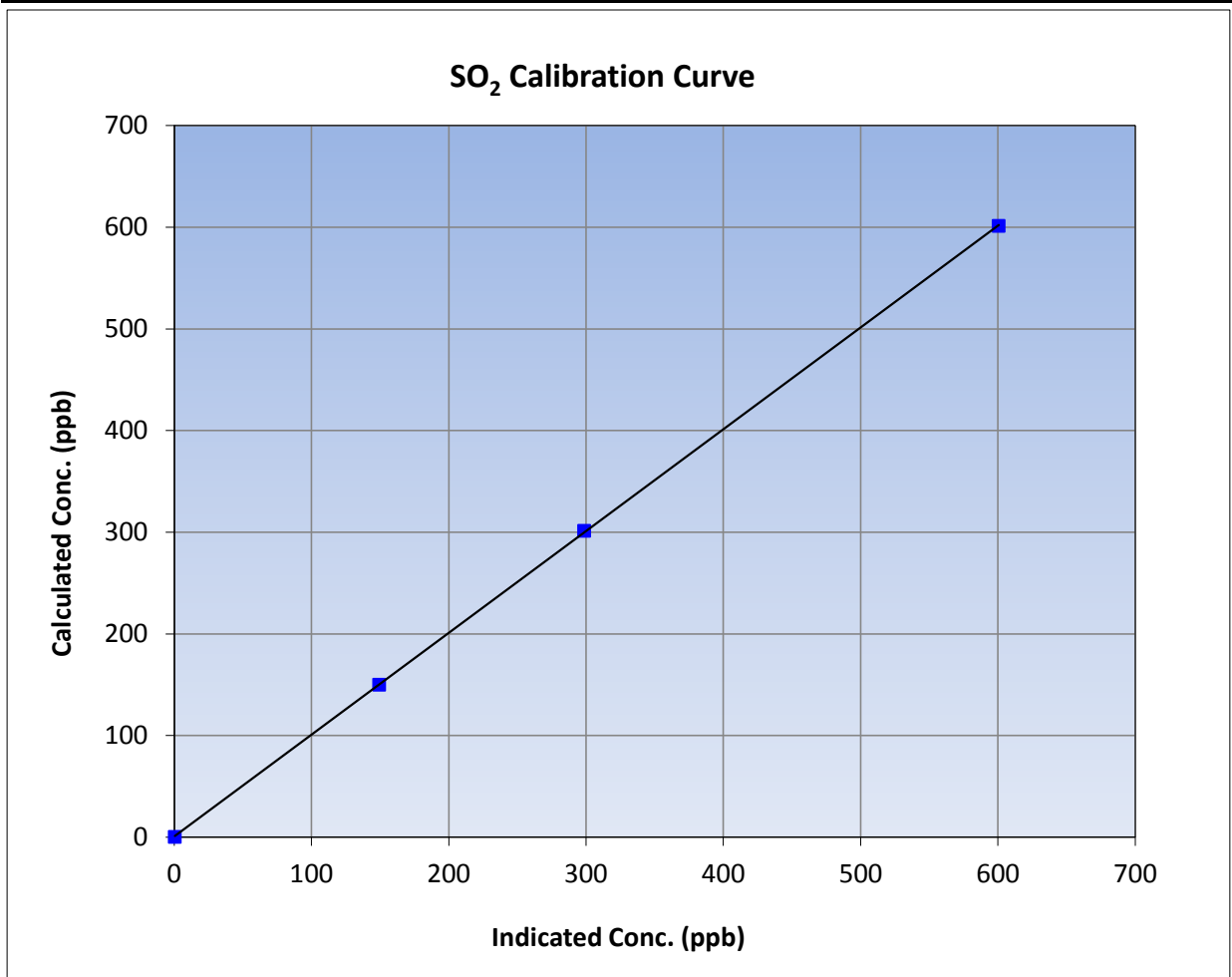
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Mannix	Station Number	AMS 05
Start Time (MST)	12:40	End Time (MST)	15:29
Analyzer make	Thermo 43i	Analyzer serial #	108841399

### Calibration Data

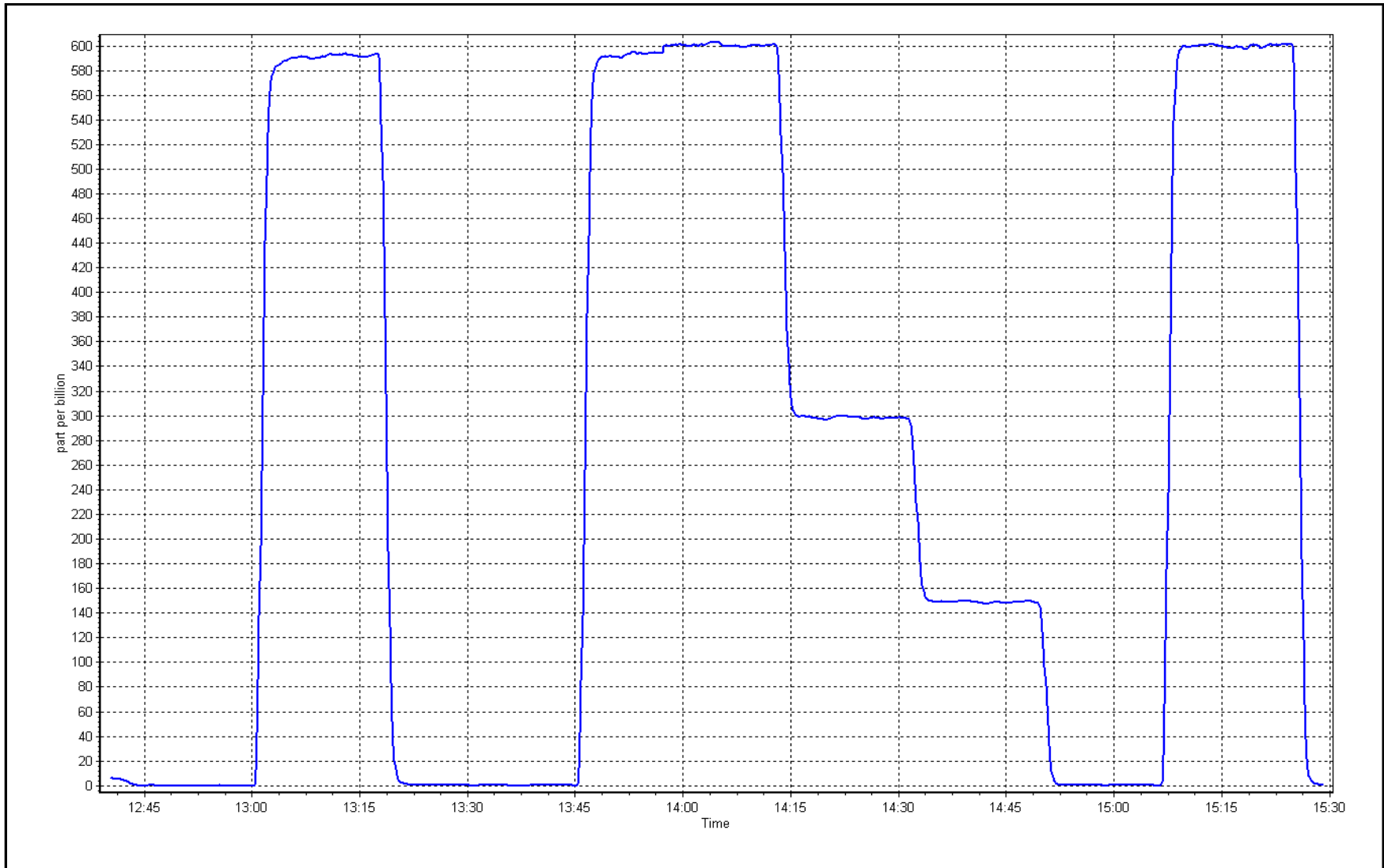
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.1	----	Correlation Coefficient	≥0.995
601.0	600.1	1.0014		
301.1	298.1	1.0102	Slope	0.90 - 1.10
149.7	149.0	1.0046		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 12, 2017

Location: Mannix







# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-11-2017

### Station Information

Station Name:	Mannix	Station number:	AMS 05
Calibration Date:	December 12, 2017	Last Cal Date:	November 21, 2017
Start time (MST):	9:48	End time (MST):	12:50
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.03</u>	ppm	Cal Gas Exp Date	December 2, 2019
Cal Gas Cylinder #	<u>ET0005008</u>			
Calibrator Make/Model	Sabio 4010		Serial Number	14300410
ZAG Make/Model	API T701		Serial Number	138

### Analyzer Information

Analyzer make:	Thermo 430i	Analyzer serial #:	815129108		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
Analyzer Range	0 - 100 ppb	PMT voltage	-644	-644	
Calculated slope	1.006830	1.004214	Lamp voltage	797	798
Calculated intercept	-0.197913	0.063482	Pressure	525.6	532.8
Analyzer Background	16.5	16.8	Flow	1.031	1.043
Analyzer Coefficient	0.959	0.962	Intensity	96	96
			Converter temp	324.7	324.4

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5997	0.0	0.0	0.2	----
as found span	5912	85.2	71.5	71.1	1.005
calibrator zero	5997	0.0	0.0	0.1	----
high point	5912	85.2	71.5	71.3	1.002
second point	5954	45.5	38.1	37.5	1.017
third point	5968	28.5	23.9	23.8	1.004
as left zero	5997	0.0	0.0	0.2	----
as left span	5912	85.2	71.5	70.3	1.016
SO2 Scrubber Check	4998	81.0	797.4	0.3	----
Date of last scrubber change:			Average Correction Factor		1.008
Corrected As found	70.90	Previous response	71.17	*% change	0.4%

\* = > +/-5% change initiates investigation

#### Notes:

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

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

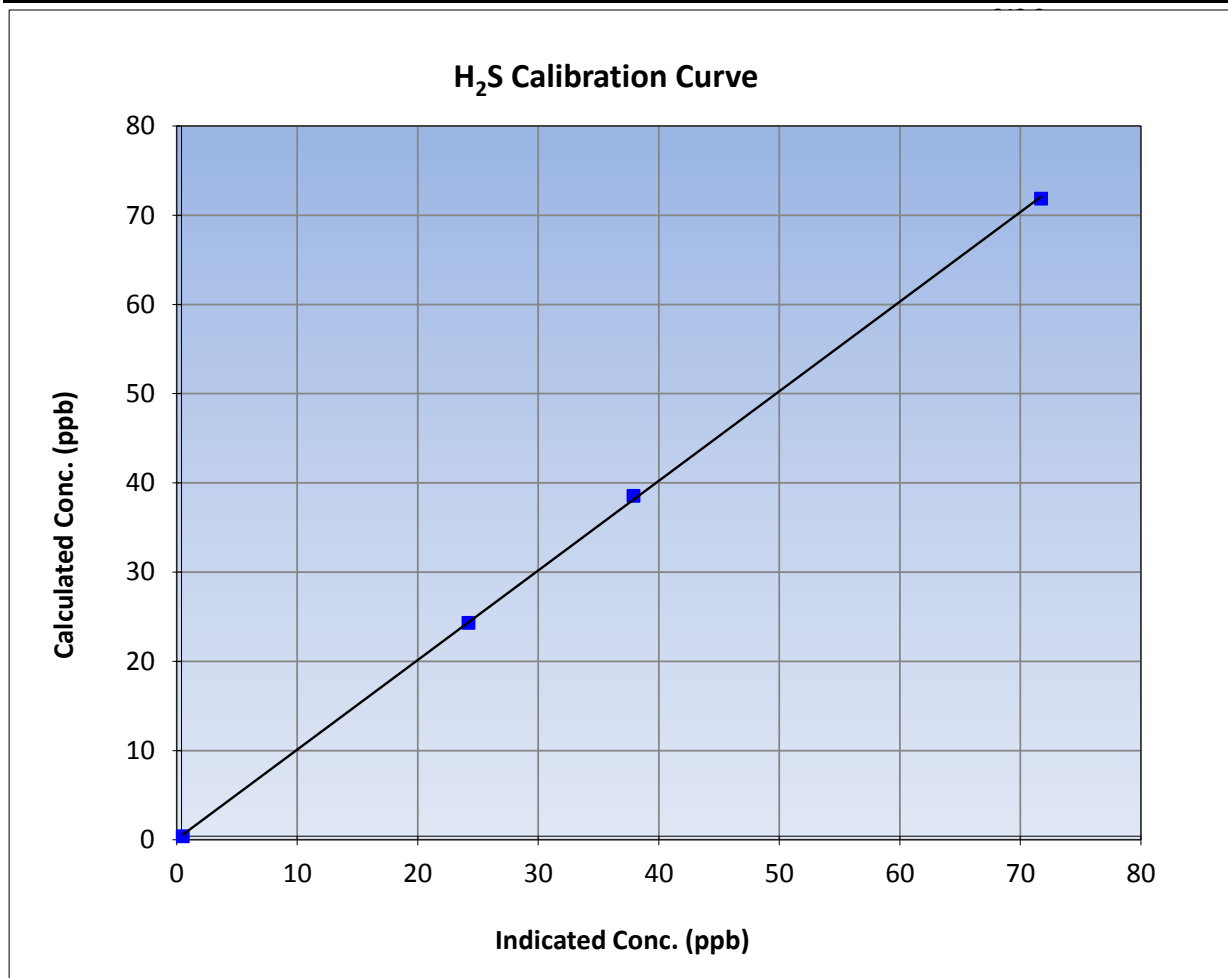
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Mannix	Station Number	AMS 05
Start Time (MST)	9:48	End Time (MST)	12:50
Analyzer make	Thermo 430i	Analyzer serial #	815129108

### Calibration Data

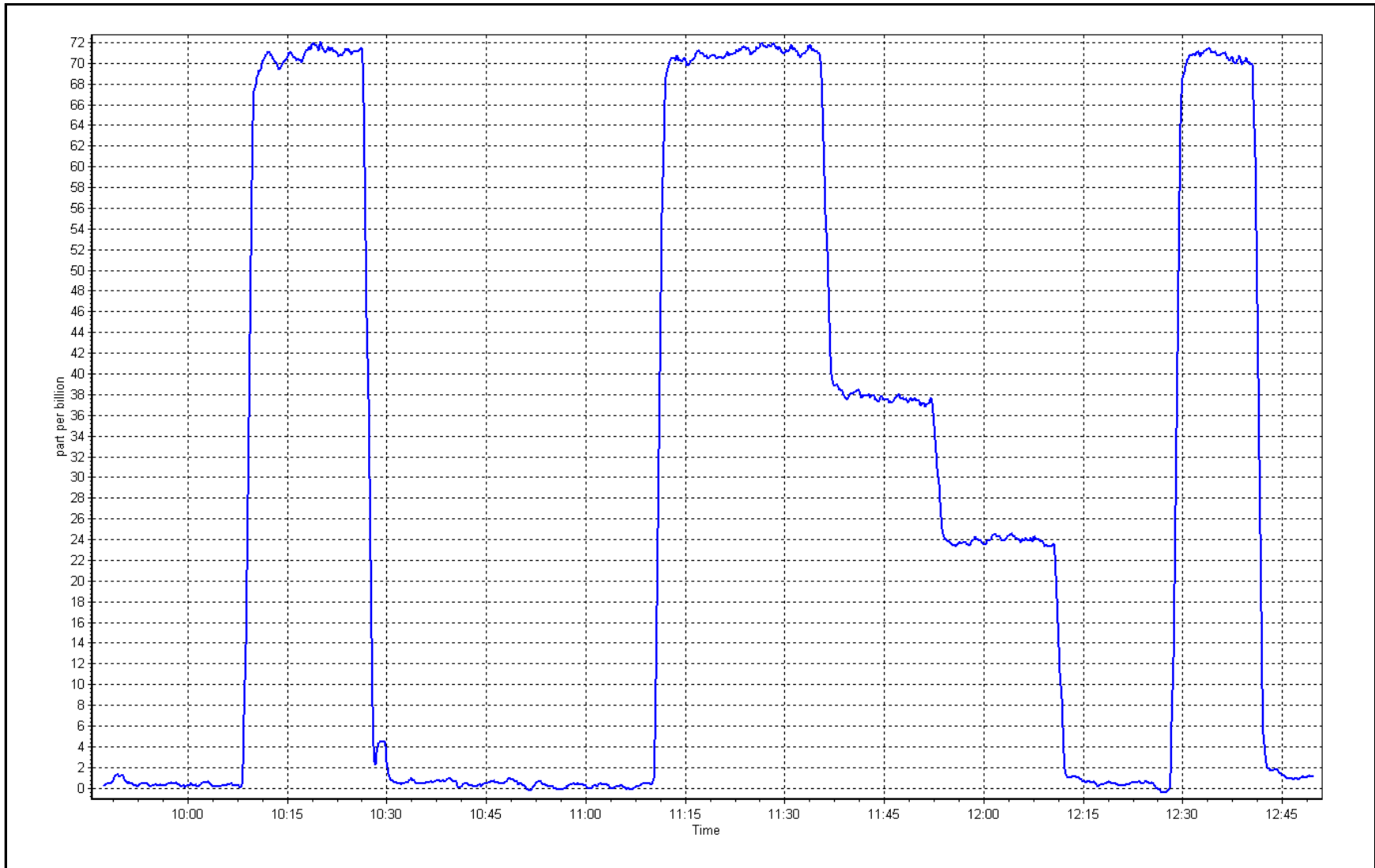
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.1	----	Correlation Coefficient	0.999905	
71.5	71.3	1.0022			≥0.995
38.1	37.5	1.0173	Slope	1.004214	
23.9	23.8	1.0045			0.90 - 1.10
			Intercept	0.063482	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 12, 2017

Location: Mannix





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Mannix	Station number:	AMS 05
Calibration Date:	December 12, 2017	Last Cal Date:	November 21, 2017
Start time (MST):	12:40	End time (MST):	15:27
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000646	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>514.0</u> ppm	CH4 Equiv Conc.	1064.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4080	Serial Number	14300410
ZAG Make/Model	Teledyne API 701	Serial Number	146

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1317958295	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-296	-295
Calculated slope	1.000864	Sample pressure	9.4	9.4
Calculated intercept	0.050666	Fuel pressure	20.2	20.2
Analyzer Background	3.41	Air pressure	42.3	42.3
Analyzer Coefficient	3.600	Flame temperature	162.1	162.4

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4997	0.0	0.00	0.15	----
as found span	4935	61.0	12.99	12.84	1.012
calibrator zero	4997	0.0	0.00	0.04	----
high point	4935	61.0	12.99	12.93	1.005
second point	4969	30.6	6.51	6.39	1.019
third point	4983	15.2	3.24	3.21	1.010
as left zero	4997	0.0	0.00	0.05	----
as left span	4933	61.0	13.00	13.00	1.000
Average Correction Factor					1.011
Corrected As found	12.69	Previous response	12.93	*% change	1.9%

\* = > +/-5% change initiates investigation

Notes: Changed inlet filter after as founds. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## THC Calibration Summary

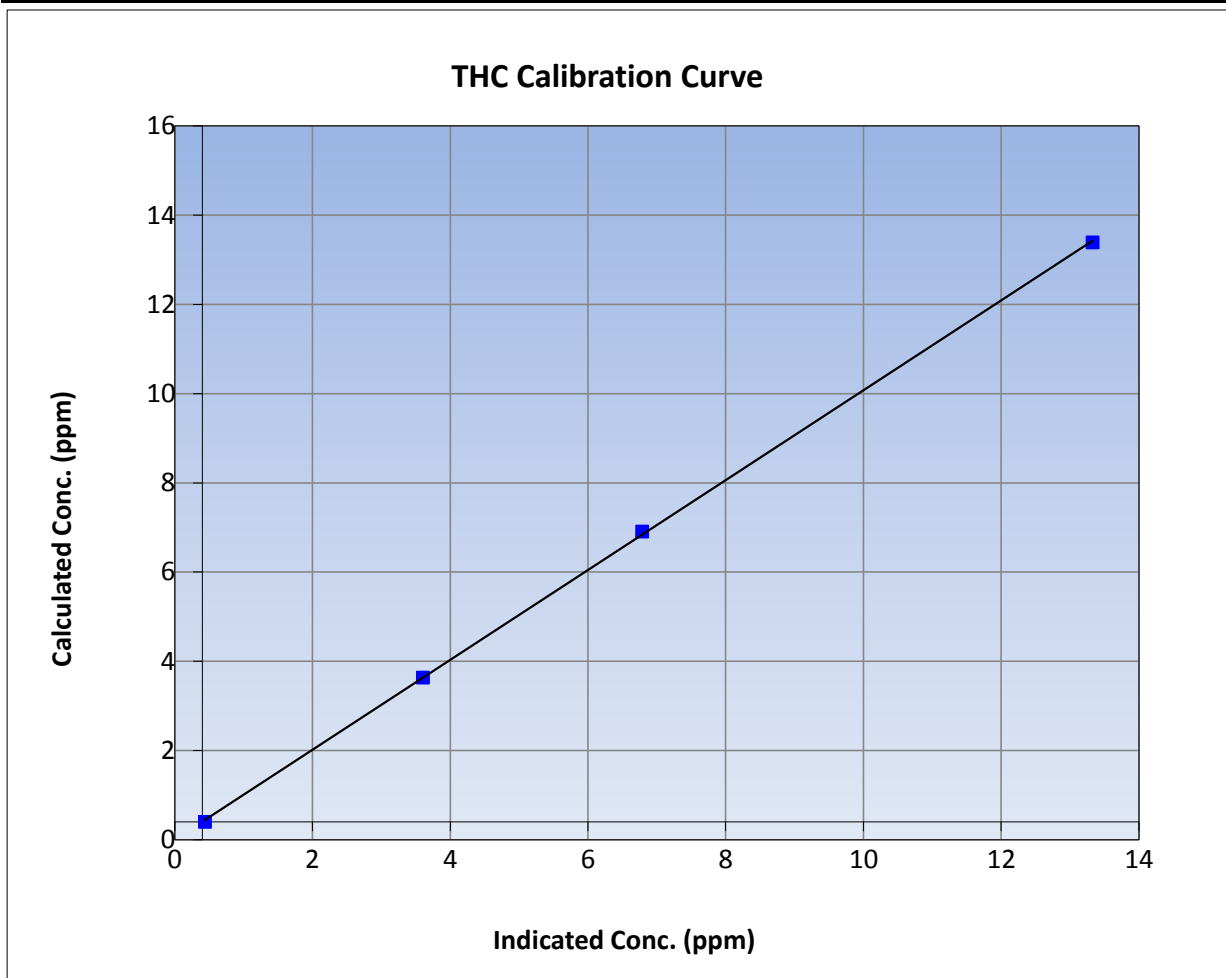
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Mannix	Station Number	AMS 05
Start Time (MST)	12:40	End Time (MST)	15:27
Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295

### Calibration Data

Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999908	
13.0	12.9	1.0048			≥0.995
6.5	6.4	1.0194	Slope	1.007520	
3.2	3.2	1.0096			0.90 - 1.10
			Intercept	0.002369	+/-1.5



THC Calibration Plot

Date: December 12, 2017

Location: Mannix





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 6  
PATRICIA MCINNES  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)  
 DECEMBER 2017

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	675	35	69	95.43	21	0	5	0
TRS (ppb) Average	677	33	67	95.43	1	0	1	0
THC (ppm) Average	674	35	70	95.3	2.4	-	2.1	-
NMHC(ppm) Average	674	35	70	95.3	0.273	-	0.022	-
CH4(ppm) Average	674	35	70	95.3	2.3	-	2.1	-
O3 (ppb) Average	676	34	68	95.43	44	0	40	-
NO2 (ppb) Average	675	35	69	95.43	45	0	21	-
NO (ppb) Average	675	35	69	95.43	69	-	13	-
NOX (ppb) Average	675	35	69	95.43	113	-	34	-
NH3 (ppb) Average	631	39	113	90.05	0	0	0	-
PM2.5 (ug/m3) Average	743	1	1	100	41.8	-	8.6	0
Temperature 2 m (C) Average	744	0	0	100	7	-	4.4	-
Relative Humidity (%) Average	744	0	0	100	99	-	91	-
Wind Speed 10 m (km/h) Average	725	0	19	97.45	29	-	17	-
Wind Direction 10 m (deg) Average	725	0	19	97.45	-	-	-	-

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



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	675	0.7	2	-	0	0	0	0	0	1	21
TRS (ppb) Average	677	0.4	0	-	0	0	0	0	0	1	1
THC (ppm) Average	674	2	0.1	-	1.9	1.9	1.9	2	2	2.1	2.4
NMHC(ppm) Average	674	0.002	0.015	-	0	0	0	0	0	0	0.273
CH4(ppm) Average	674	2	0.1	-	1.9	1.9	1.9	2	2	2.1	2.3
O3 (ppb) Average	676	25.1	10	-	2	10	18	27	33	37	44
NO2 (ppb) Average	675	8.2	8	-	0	0	2	5	12	21	45
NO (ppb) Average	675	2.9	7	-	0	0	0	1	2	7	69
NOX (ppb) Average	675	11.2	14	-	0	0	3	6	15	27	113
NH3 (ppb) Average	631	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	743	4.23	4.2	-	0.3	1	1.8	3.1	5.3	8.2	41.8
Temperature 2 m (C) Average	744	-12.42	12.4	-	-40.1	-29.7	-25.1	-8.3	-2	1.6	7
Relative Humidity (%) Average	744	76.6	10	-	43	65	71	76	83	91	99
Wind Speed 10 m (km/h) Average	725	9.5	5	-	0	4	6	8	12	17	29
Wind Direction 10 m (deg) Average	725	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	04 Dec 2017 02:00	05 Dec 2017 11:00	34	Analyzer Failure - Sample Manifold Broken
NMHC, CH4, THC	15 Dec 2017 15:00	15 Dec 2017 15:00	1	Maintenance - replaced carrier gas
NH3	01 Dec 2017 07:00	31 Dec 2017 07:00	32	Stabilization after daily span
NH3	18 Dec 2017 11:00	18 Dec 2017 12:00	2	Maintenance - technician on site
NH3	20 Dec 2017 14:00	20 Dec 2017 20:00	7	Stabilization after monthly calibration
Wind Speed, Wind Direction	10 Dec 2017 17:00	11 Dec 2017 11:00	19	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Patricia McInnes - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 21 ppb on Dec 10 21:00	Maximum Daily Average: 4.7 ppb on Dec 10		Hours of Data:	675
Minimum Value: 0 ppb on Dec 22 14:00	Minimum Daily Average: 0.1 ppb on Dec 17		Hours of Missing Data:	69
Maximum Diurnal Average: 1.2 ppb at hour 24	Minimum Diurnal Average: 0.4 ppb at hour 18		Hours of Calibration:	35
Monthly Average: 0.7 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 9		Percent Operational Time:	95.4

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1	
2-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
3-Dec	0	0	0	Z	0	0	0	0	0	0	2	7	10	8	7	4	1	0	0	0	0	0	0	0	2.0	10	
4-Dec	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0	
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	4	12	2	1	2	1	1	0	0	1	2	3	8	--	12
6-Dec	7	5	4	3	3	2	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	7	
7-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
8-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1	
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0.3	1	
10-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	4	1	1	5	21	21	20	16	14	4.7	21	
11-Dec	8	5	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	8	
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
13-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	4	1	1	0	0	0	0	0	0	0	0.4	4	
14-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
17-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	0	0	0	0	0	2	Z	1	0	3	C	C	C	C	C	C	0	0	0	0	0	0	1	4	--	4	
19-Dec	2	0	1	1	0	0	2	Z	0	0	0	1	5	6	5	3	2	1	1	1	1	0	0	0	1.5	6	
20-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
21-Dec	0	0	0	Z	0	0	0	1	8	9	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1.1	9	
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	5	0.5	5	
23-Dec	1	2	1	1	0	Z	0	0	0	0	1	4	6	1	3	2	2	4	7	5	4	2	2	2	2.2	7	
24-Dec	1	0	2	3	2	1	Z	0	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0.7	3	
25-Dec	1	0	1	0	0	1	2	Z	0	0	1	1	1	2	1	1	1	1	1	1	1	0	0	0	0.8	2	
26-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
27-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
28-Dec	0	0	0	0	Z	0	2	4	3	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0.7	4	
29-Dec	0	0	0	0	0	Z	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
30-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
31-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.3	1

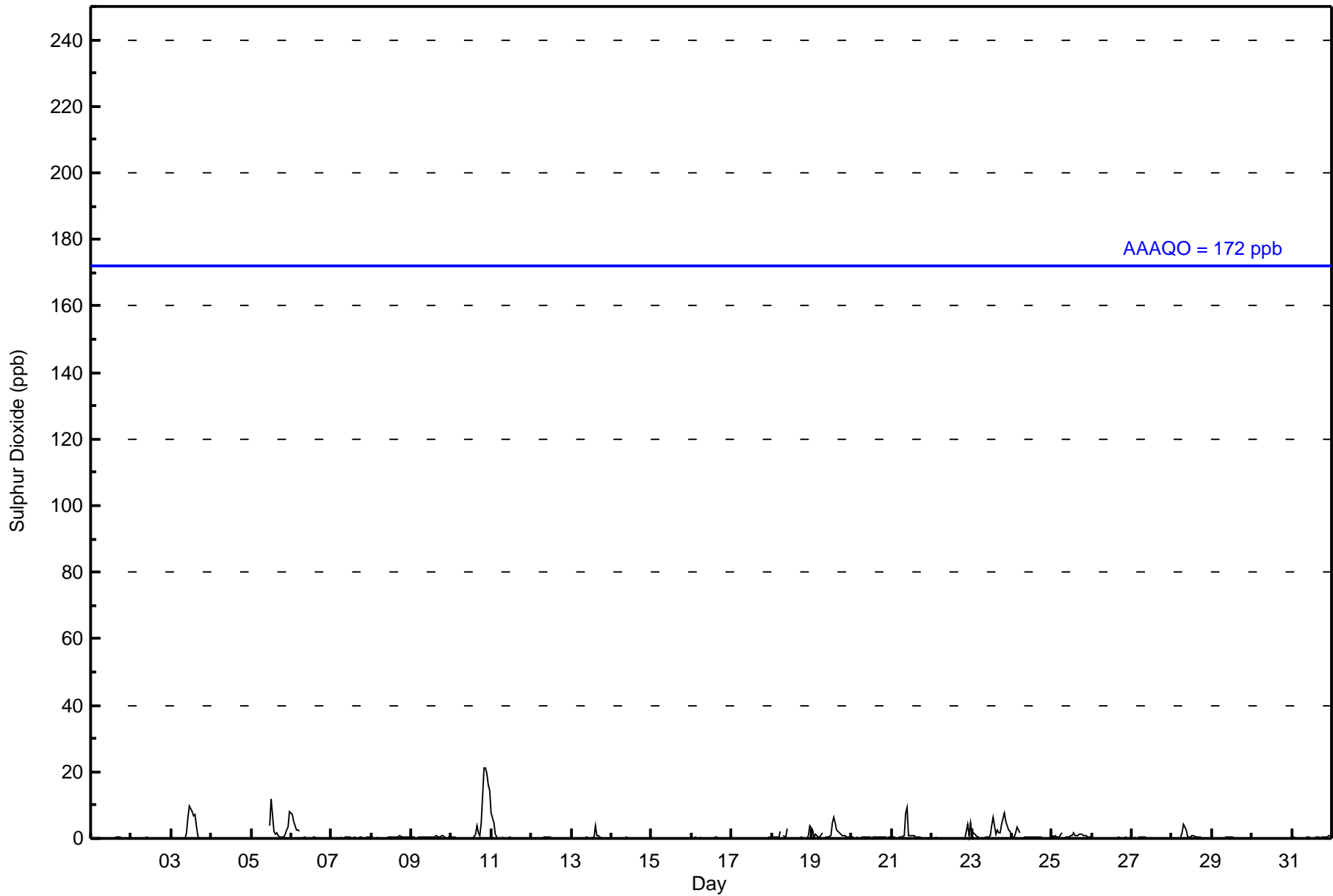
0.8	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.7	0.5	0.8	1.2	1.0	0.9	0.7	0.5	0.4	0.5	1.2	1.1	1.2	0.9	1.2	Diurnal Average
8	5	4	3	3	2	2	4	8	9	7	10	12	7	7	4	2	2	5	21	21	20	16	14	Diurnal Maximum	

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	669	99.11	99.11
11 - 20	4	0.59	99.70
21 - 60	2	0.30	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: 675

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	56	9	1	0	2	6	25	47	58	97	111	49	68	61	27	39	656
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
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	68	61	27	40	657

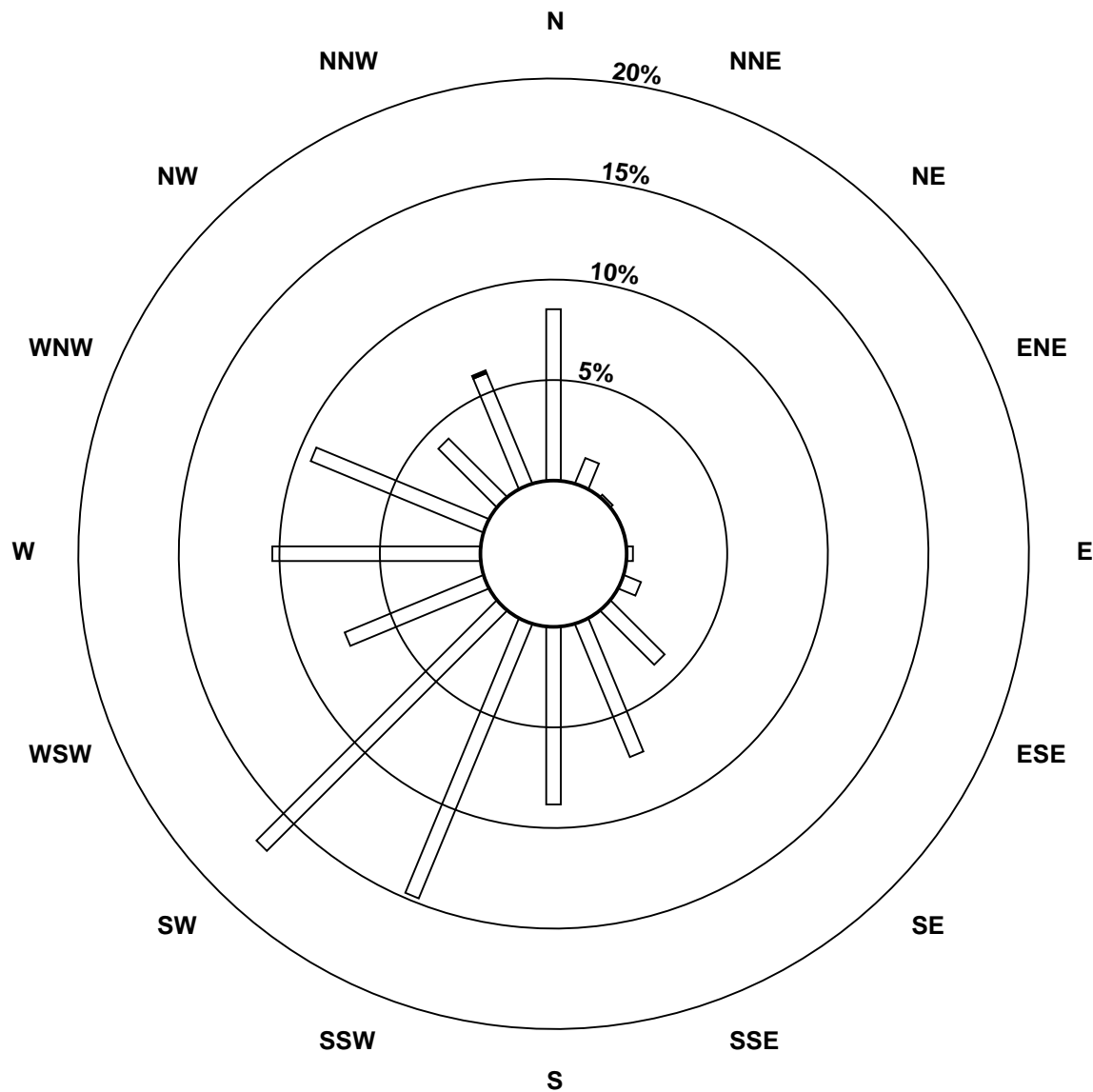
Total Number of Valid Hours: 657

Total Number of Hours: 744

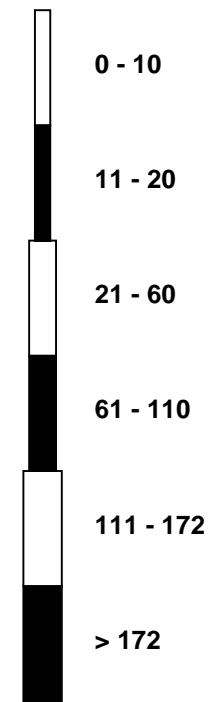


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

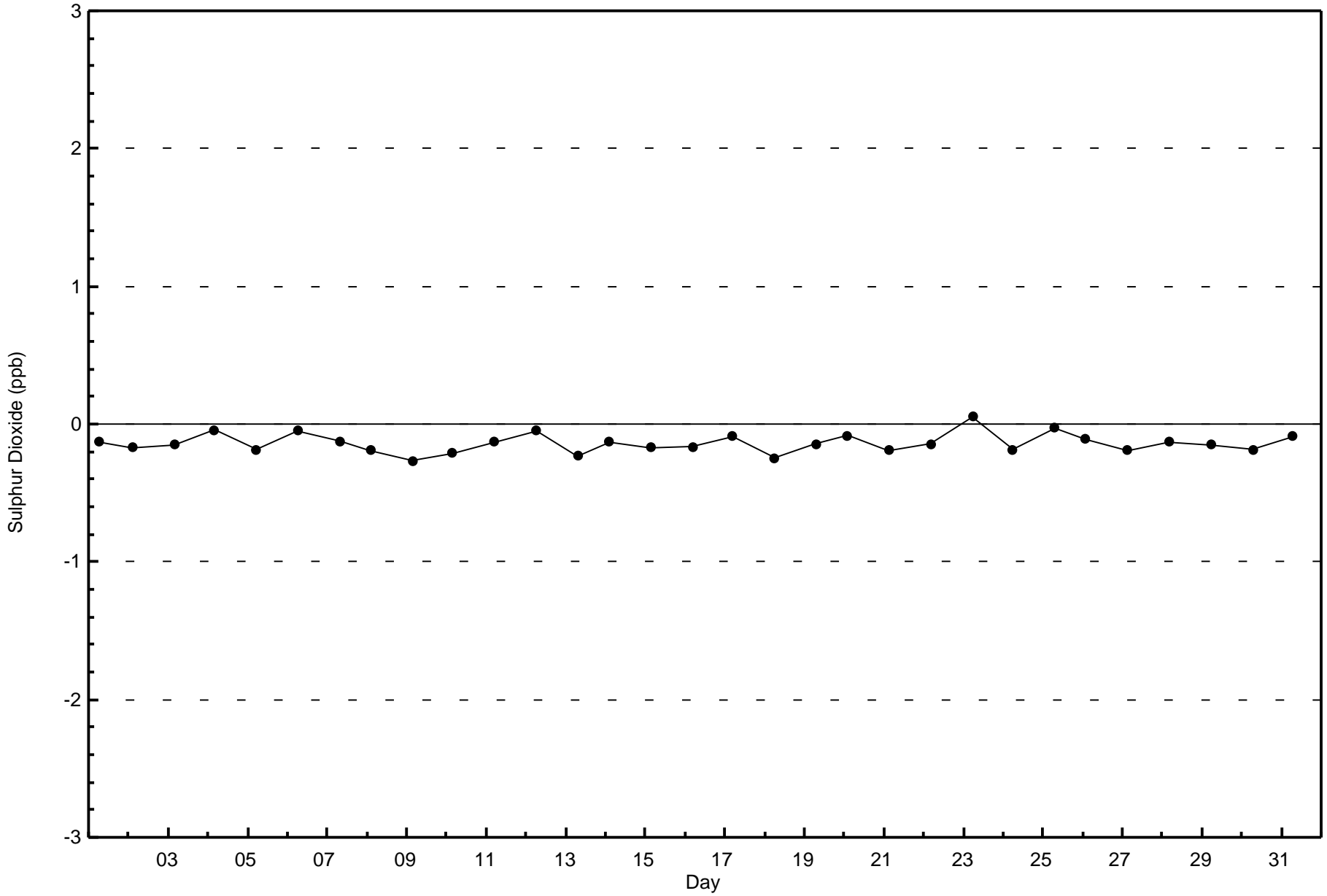
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Patricia McInnes (AMS 6)



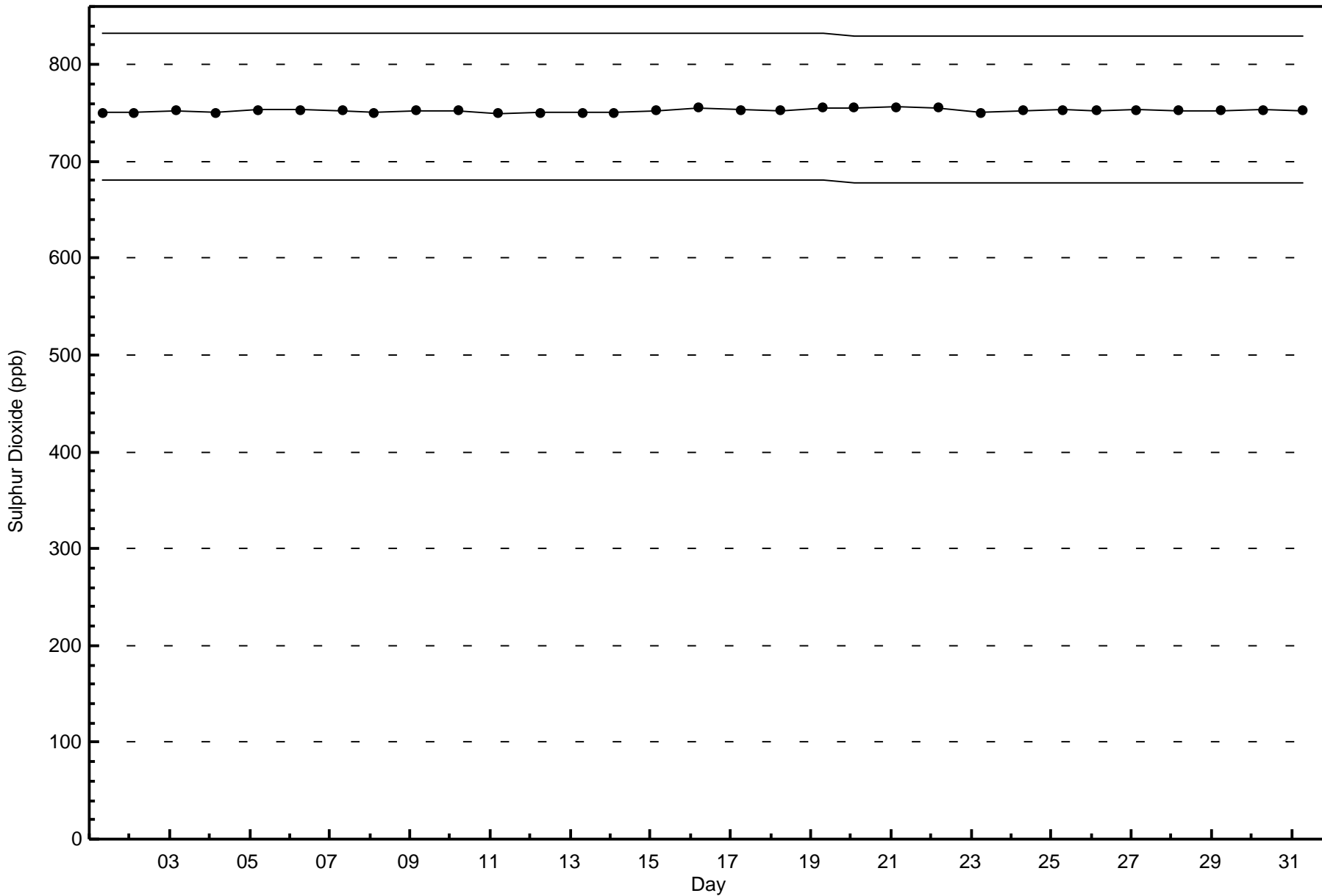
Classes (ppb)



Total Number of Valid Hours: 657









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

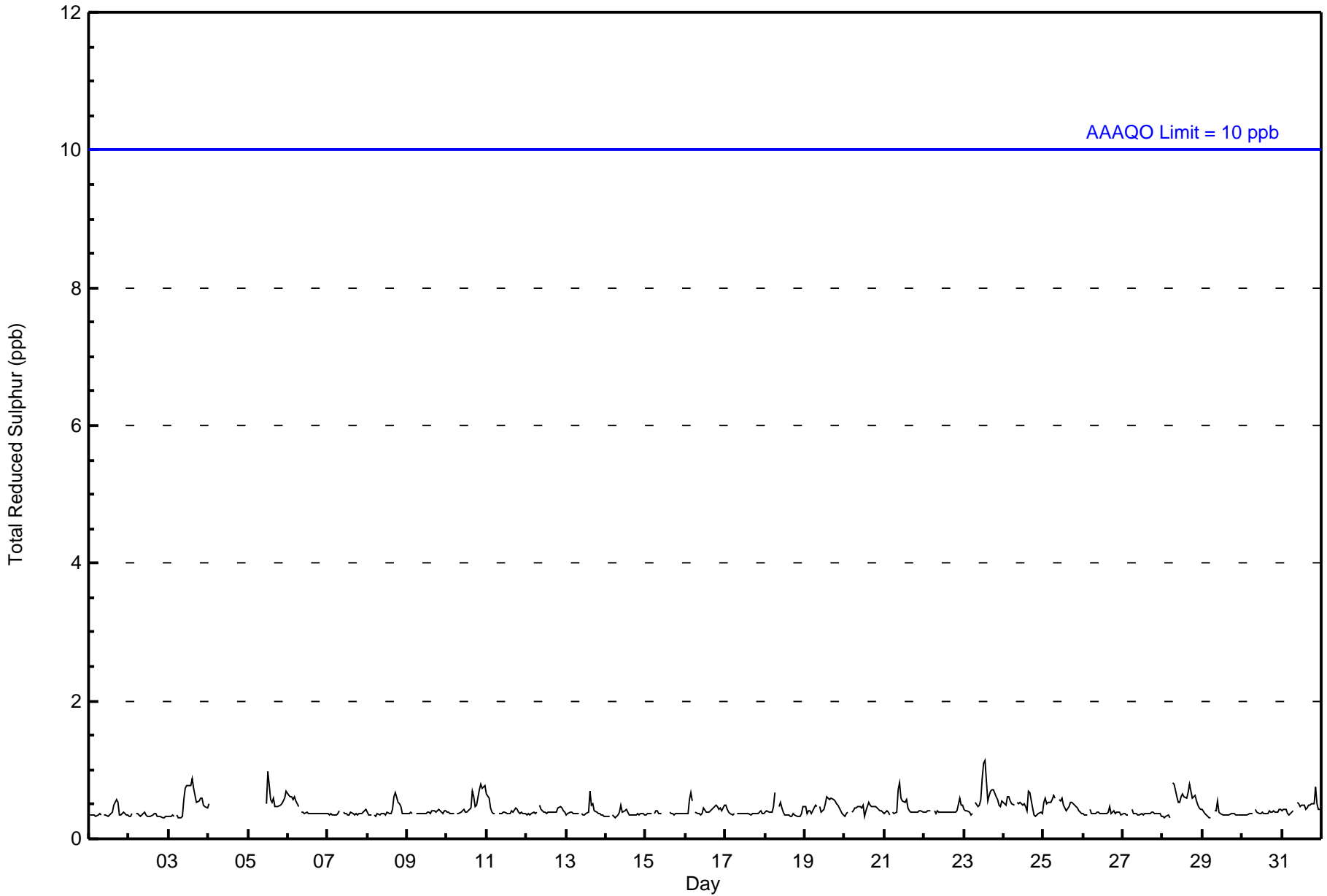
Patricia McInnes - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 1 ppb on Dec 23 14:00										Maximum Daily Average: 0.6 ppb on Dec 23										Hours of Data: 677							
Minimum Value: 0 ppb on Dec 3 07:00										Minimum Daily Average: 0.3 ppb on Dec 2										Hours of Missing Data: 67							
Maximum Diurnal Average: 0.5 ppb at hour 17										Minimum Diurnal Average: 0.4 ppb at hour 6										Hours of Calibration: 33							
Monthly Average: 0.4 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 1										Percent Operational Time: 95.4							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.4	1	
2-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
3-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.5	1	
4-Dec	1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	1	
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1	1	1	1	1	0	0	0	0	1	1	1	1	--	1	
6-Dec	1	1	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
7-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
8-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0.4	1	
9-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
10-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	0.5	1		
11-Dec	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
12-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
13-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0.4	1	
14-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
15-Dec	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.4	0	
16-Dec	0	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
17-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
18-Dec	0	0	0	0	0	0	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
19-Dec	0	0	0	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0.5	1	
20-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1	
21-Dec	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	1	
22-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.4	1	
23-Dec	0	0	0	0	0	0	Z	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0.6	1	
24-Dec	1	0	1	1	1	1	0	Z	1	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0.5	1	
25-Dec	1	1	1	1	1	1	1	1	Z	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0.5	1	
26-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
27-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
28-Dec	0	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1	
29-Dec	0	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
30-Dec	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
31-Dec	0	0	0	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.5	1
0.4																								Diurnal Average			
1																								Diurnal Maximum			
Z - zerospan C - Calibration AF - Analyzer Failure																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Reduced Sulphur (TRS) - ppb**  
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	677	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: 677

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	55	9	1	0	2	6	26	46	56	100	111	50	63	60	32	42	659
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
<b>Totals</b>	55	9	1	0	2	6	26	46	56	100	111	50	63	60	32	42	659

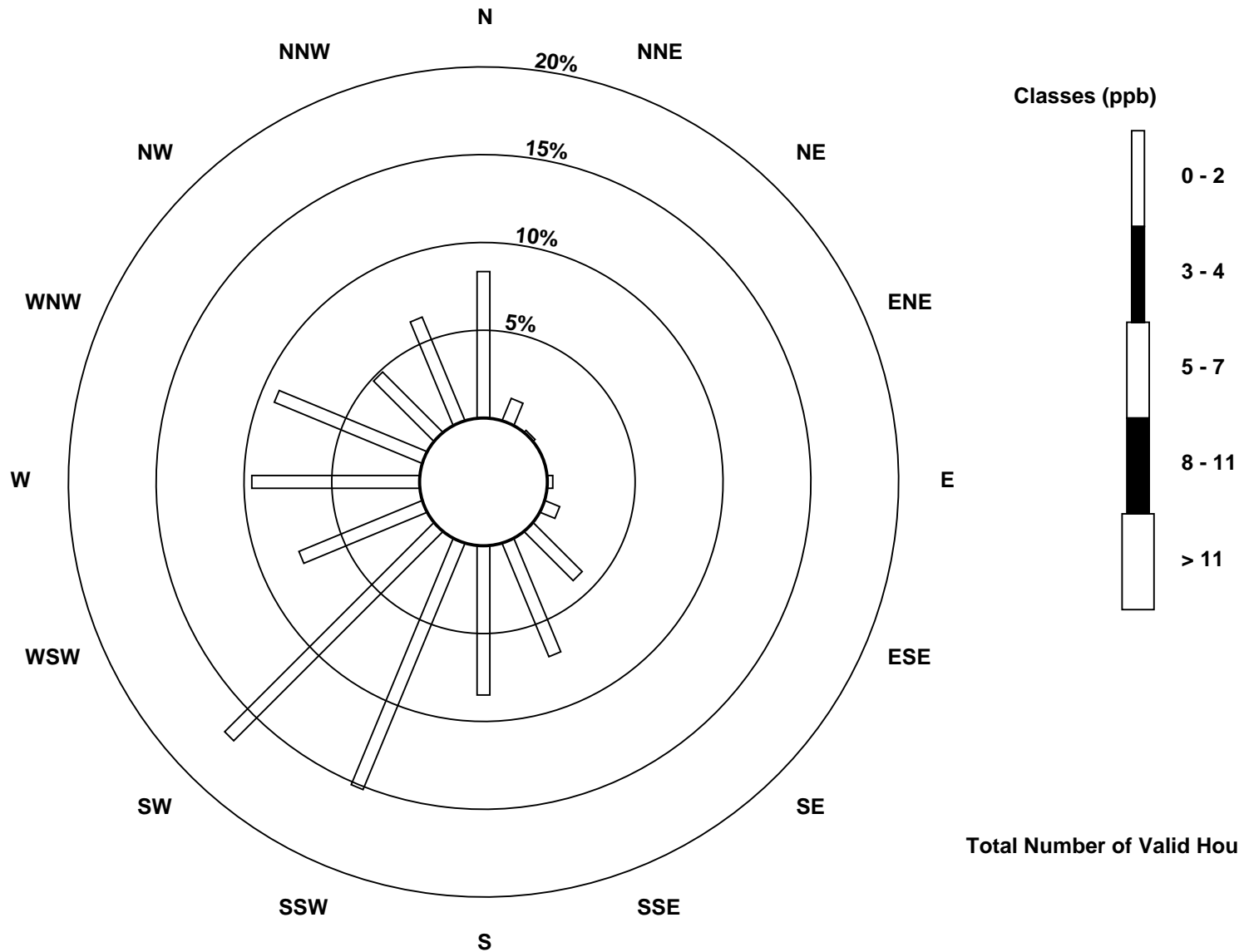
Total Number of Valid Hours: 659

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

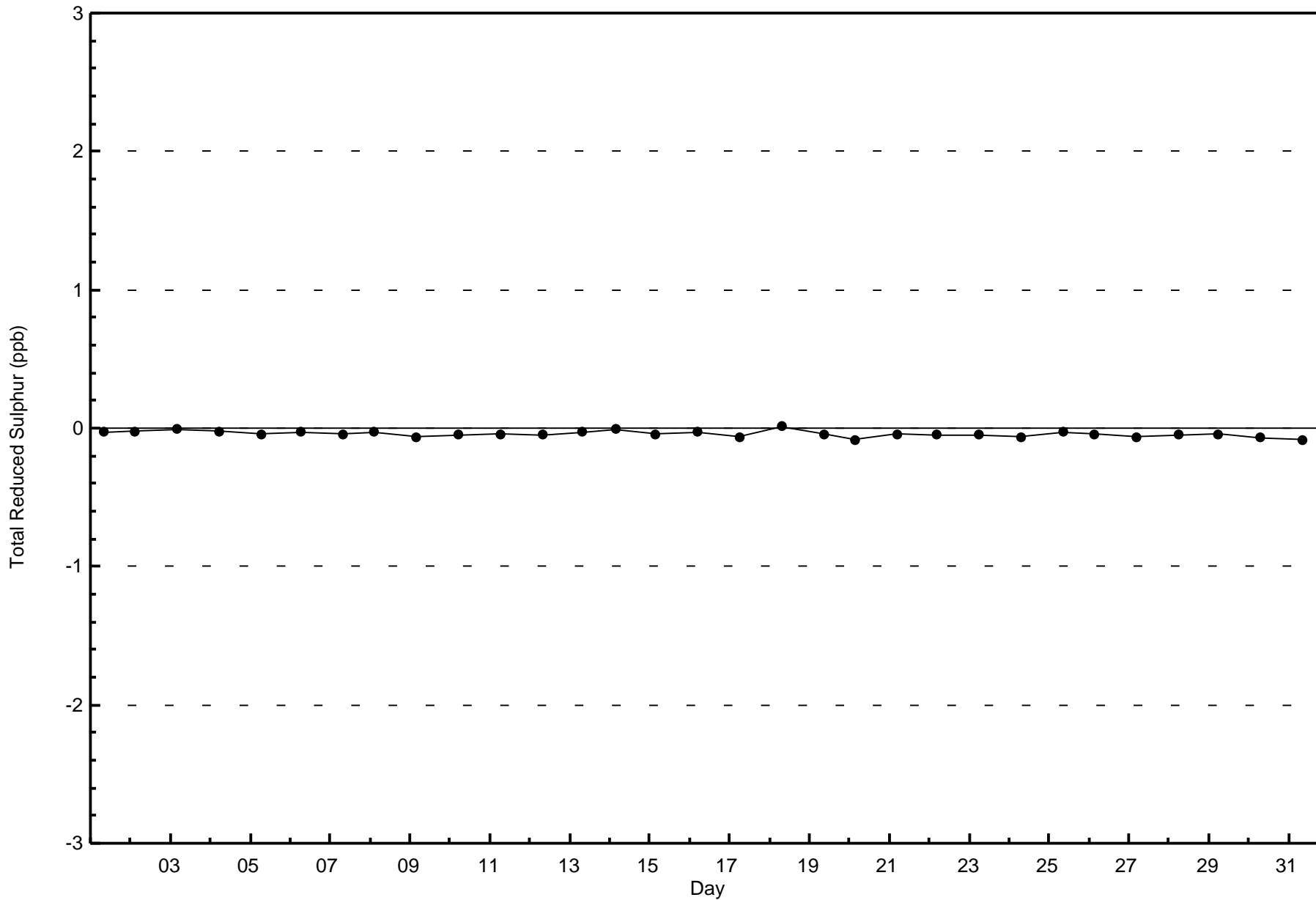
Total Reduced Sulphur (TRS) - ppb  
Patricia McInnes (AMS 6)

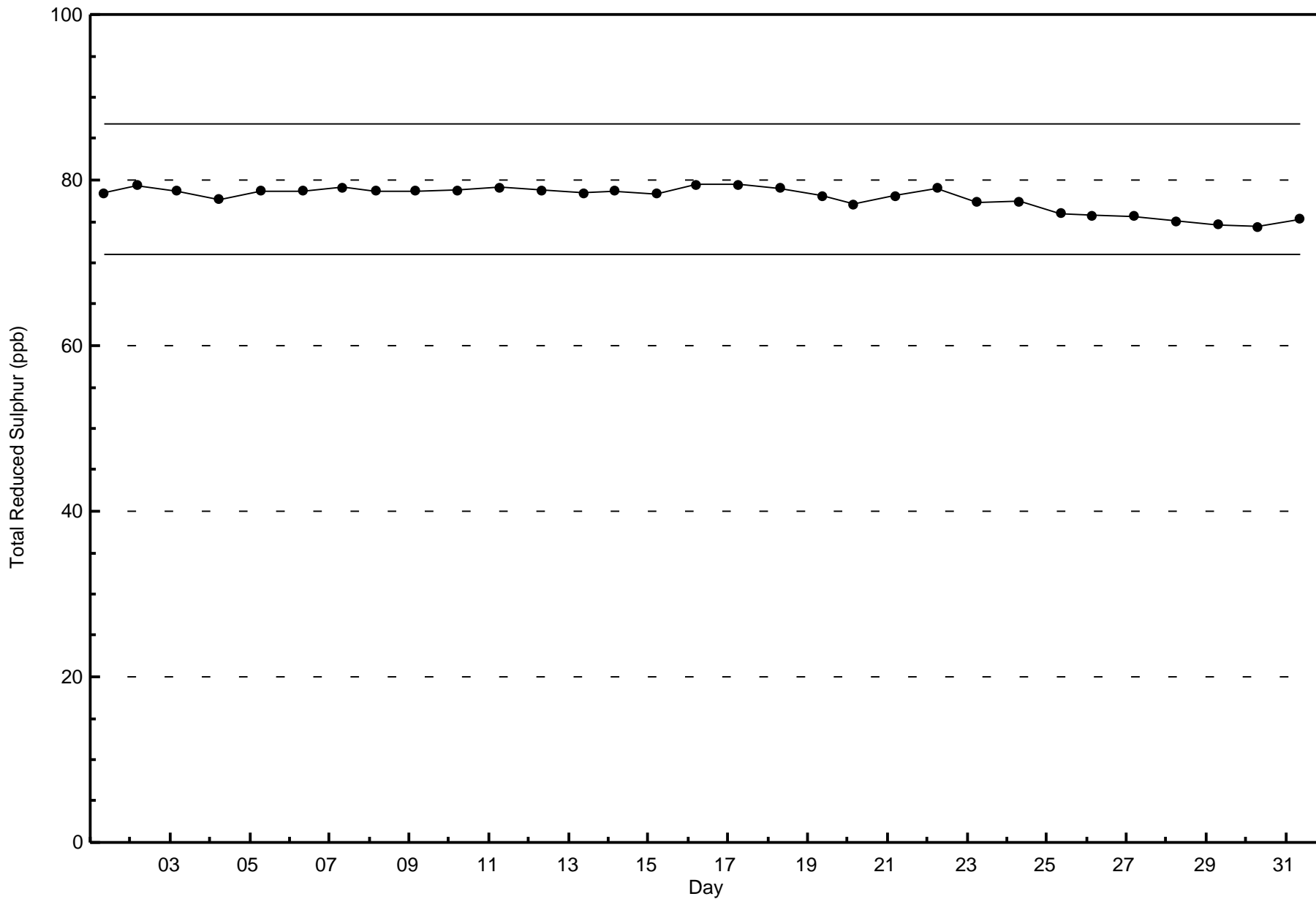




Wood Buffalo Environmental Association  
Zero Responses

Total Reduced Sulphur (TRS) - ppb  
Patricia McInnes - December 2017





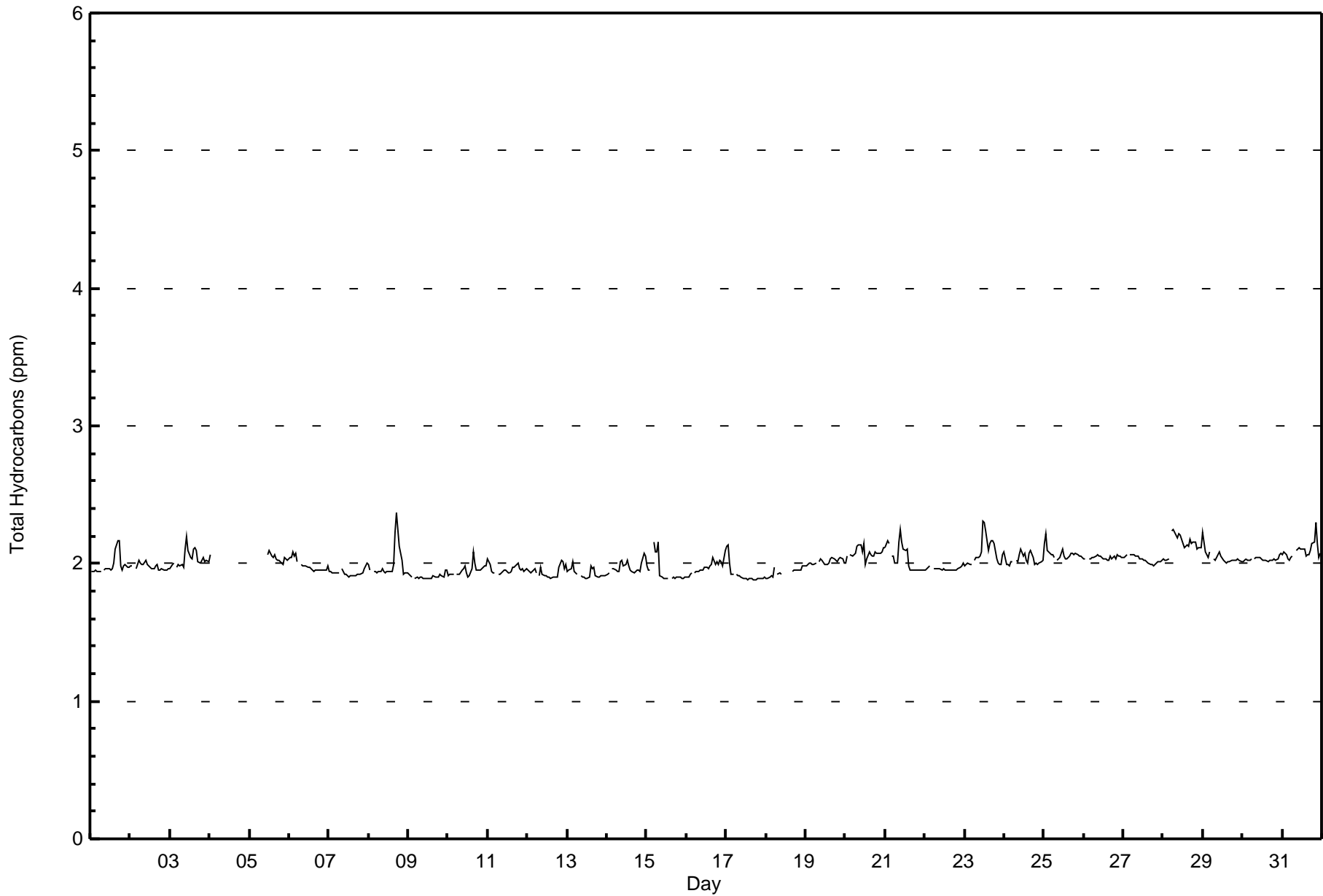






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	517	76.71	76.71
2.1 - 3.0	157	23.29	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	32	5	1	0	2	2	15	19	39	83	93	44	61	57	22	24	499
2.1 - 3.0	24	4	0	0	0	4	10	28	19	14	18	5	6	4	5	16	157
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
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	67	61	27	40	656

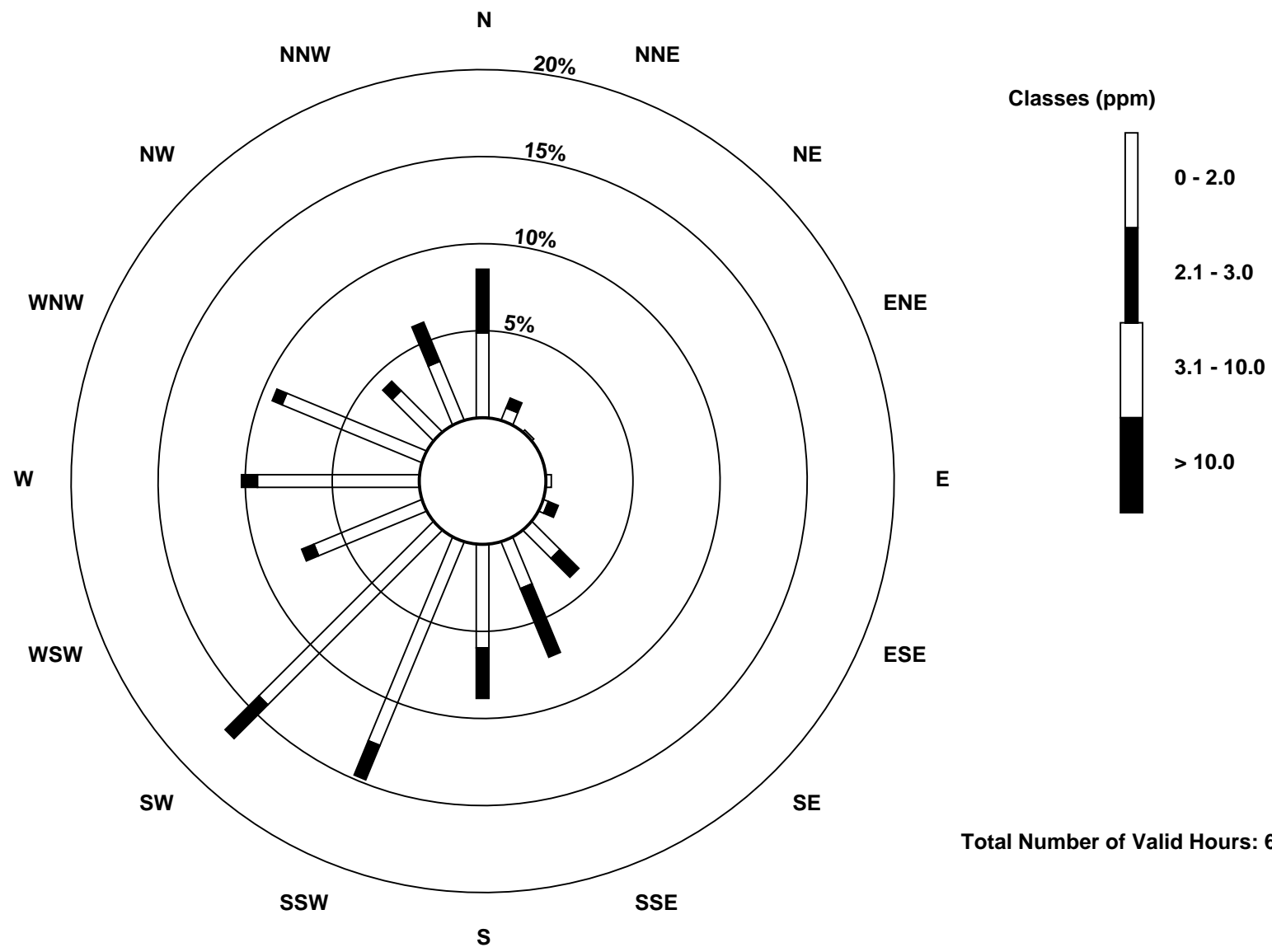
Total Number of Valid Hours: 656

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

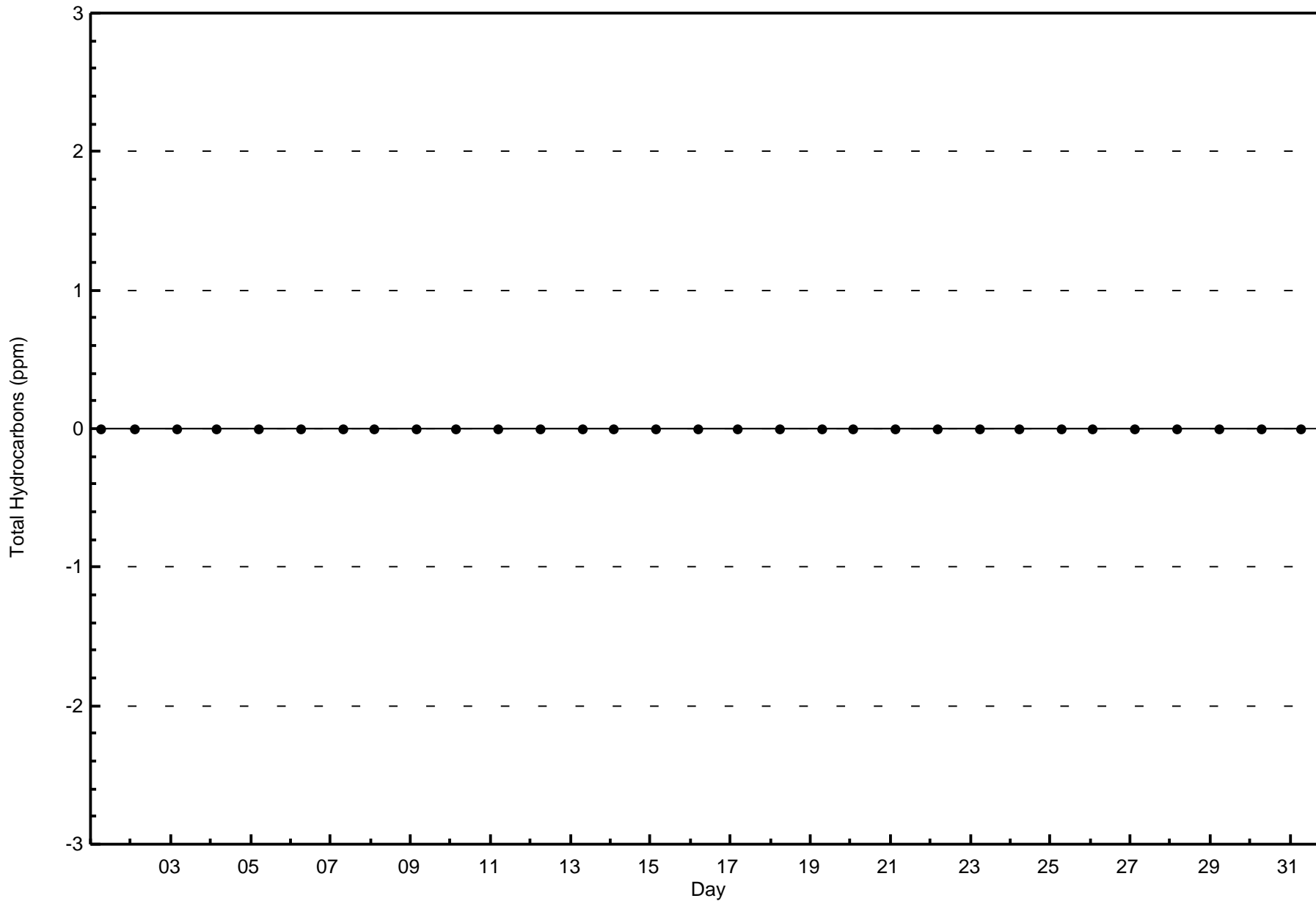
Total Hydrocarbons (THC) - ppm  
Patricia McInnes (AMS 6)





Wood Buffalo Environmental Association  
Zero Responses

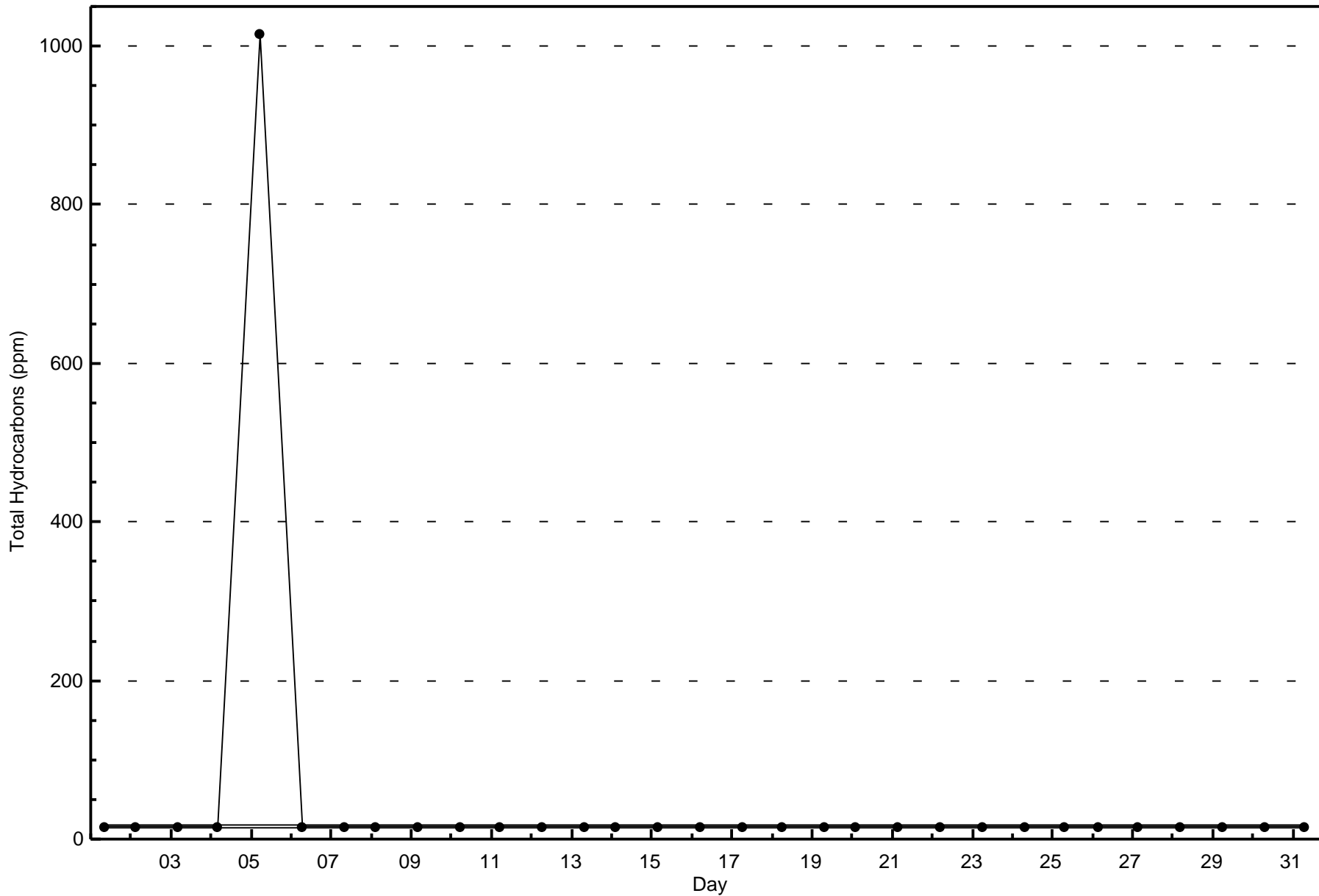
Total Hydrocarbons (THC) - ppm  
Patricia McInnes - December 2017





**Wood Buffalo Environmental Association**  
**Span Responses**

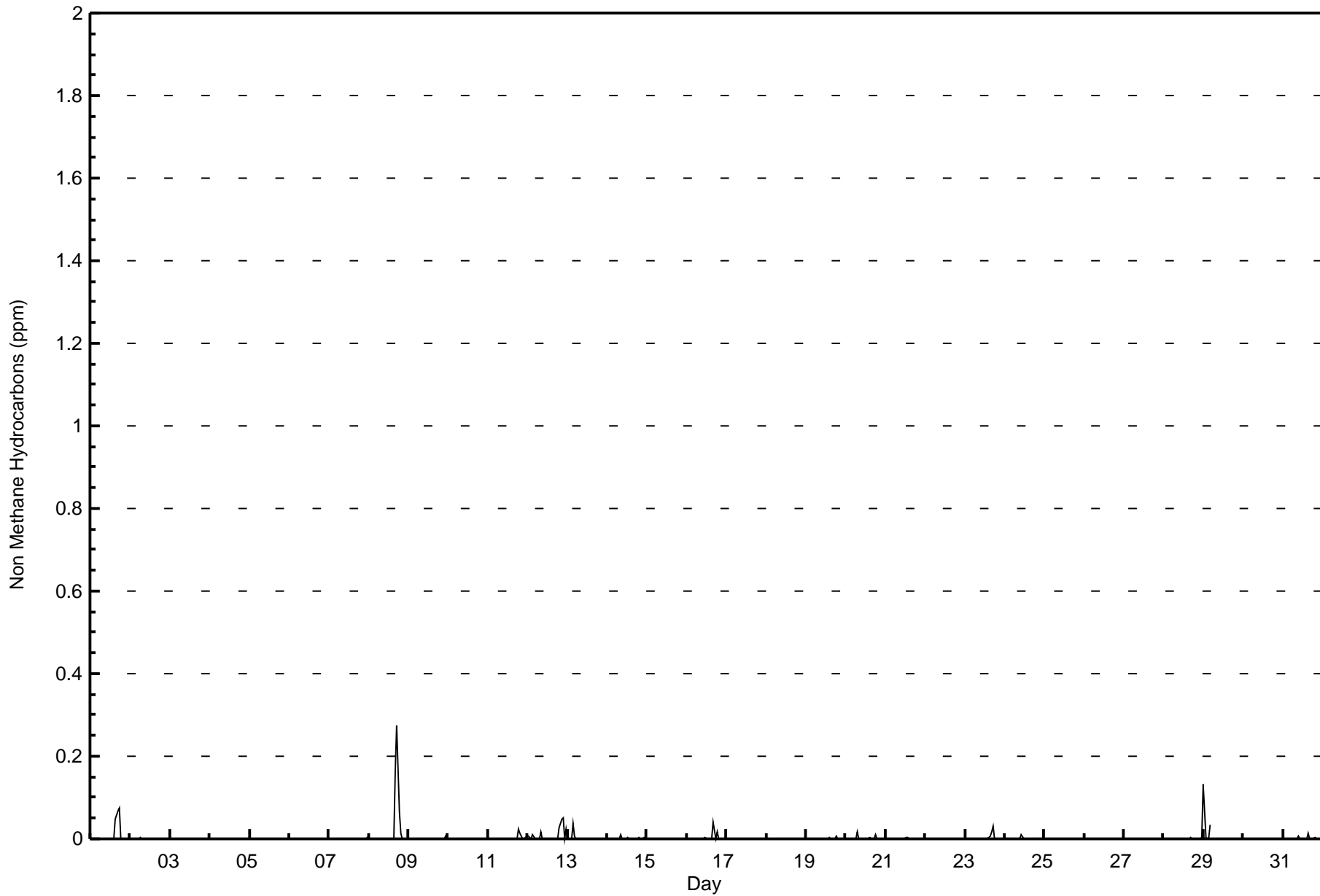
**Total Hydrocarbons (THC) - ppm**  
**Patricia McInnes - December 2017**





Maximum Value: 0.273 ppm on Dec 8 18:00		Maximum Daily Average: 0.022 ppm on Dec 8		Hours in Service: 744																							
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 3		Hours of Data: 674																							
Maximum Diurnal Average: 0.013 ppm at hour 18		Minimum Diurnal Average: 0.000 ppm at hour 6		Hours of Missing Data: 70																							
Monthly Average: 0.002 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0		Hours of Calibration: 35																							
				Percent Operational Time: 95.3																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.000	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	0.047	0.066	0.076	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.076	
2-Dec	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
3-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4-Dec	0.000	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.000	
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.000	
6-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	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	0.003	0.003
8-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.162	0.273	0.066	0.015	0.000	0.000	0.000	0.000	0.022	0.273	
9-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	
10-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025	0.012	0.007	0.000	0.000	0.007	0.002	0.025	
12-Dec	0.008	0.002	0.000	0.010	0.000	0.000	Z	0.000	0.016	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.046	0.052	0.000	0.024	0.008	0.052	
13-Dec	0.000	0.000	0.001	0.039	0.007	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	0.002	0.039	
14-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.004	0.000	0.001	0.009	
15-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
16-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.042	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.042	
17-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
18-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	C	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	--	0.000	
19-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007	
20-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.001	0.019	
21-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
22-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
23-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.008	0.017	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.030	
24-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	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	0.000	0.000	0.000	0.009	
25-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
26-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
27-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
28-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.002	0.000	0.000	0.000	0.000	0.004	0.000	0.005	
29-Dec	0.133	0.002	0.000	0.002	0.034	Z	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	0.007	0.133	
30-Dec	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
31-Dec	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.001	0.013	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan      C - Calibration      M - Maintenance      AF - Analyzer Failure																											







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	640	94.96	94.96
0.006 - 0.05	28	4.15	99.11
0.06 - 0.1	4	0.59	99.70
> 0.1	2	0.30	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	56	8	0	0	2	6	23	39	51	87	110	49	64	60	27	40	622
0.006 - 0.05	0	1	1	0	0	0	1	5	6	10	1	0	2	1	0	0	28
0.06 - 0.1	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	4
> 0.1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	67	61	27	40	656

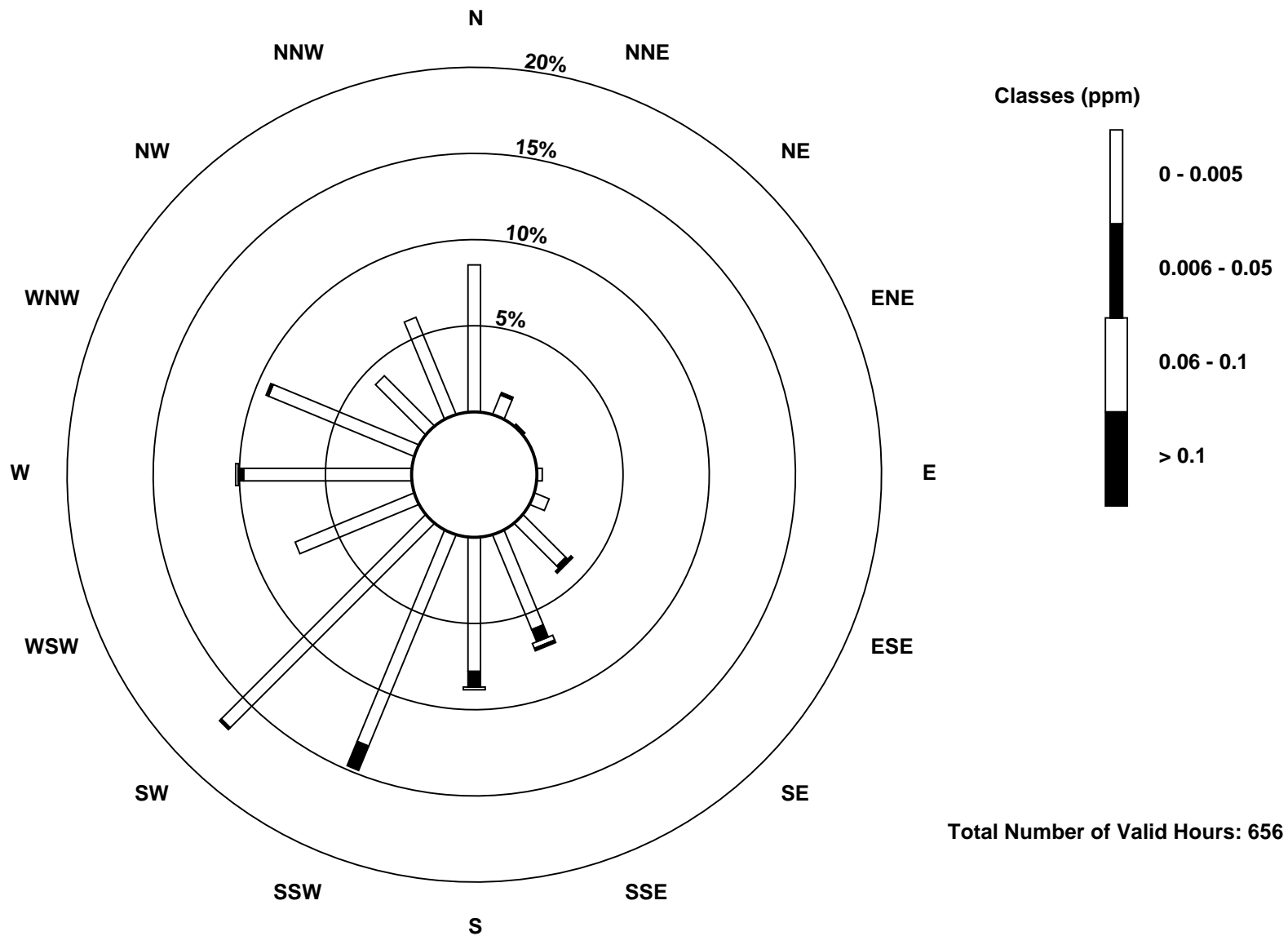
Total Number of Valid Hours: 656

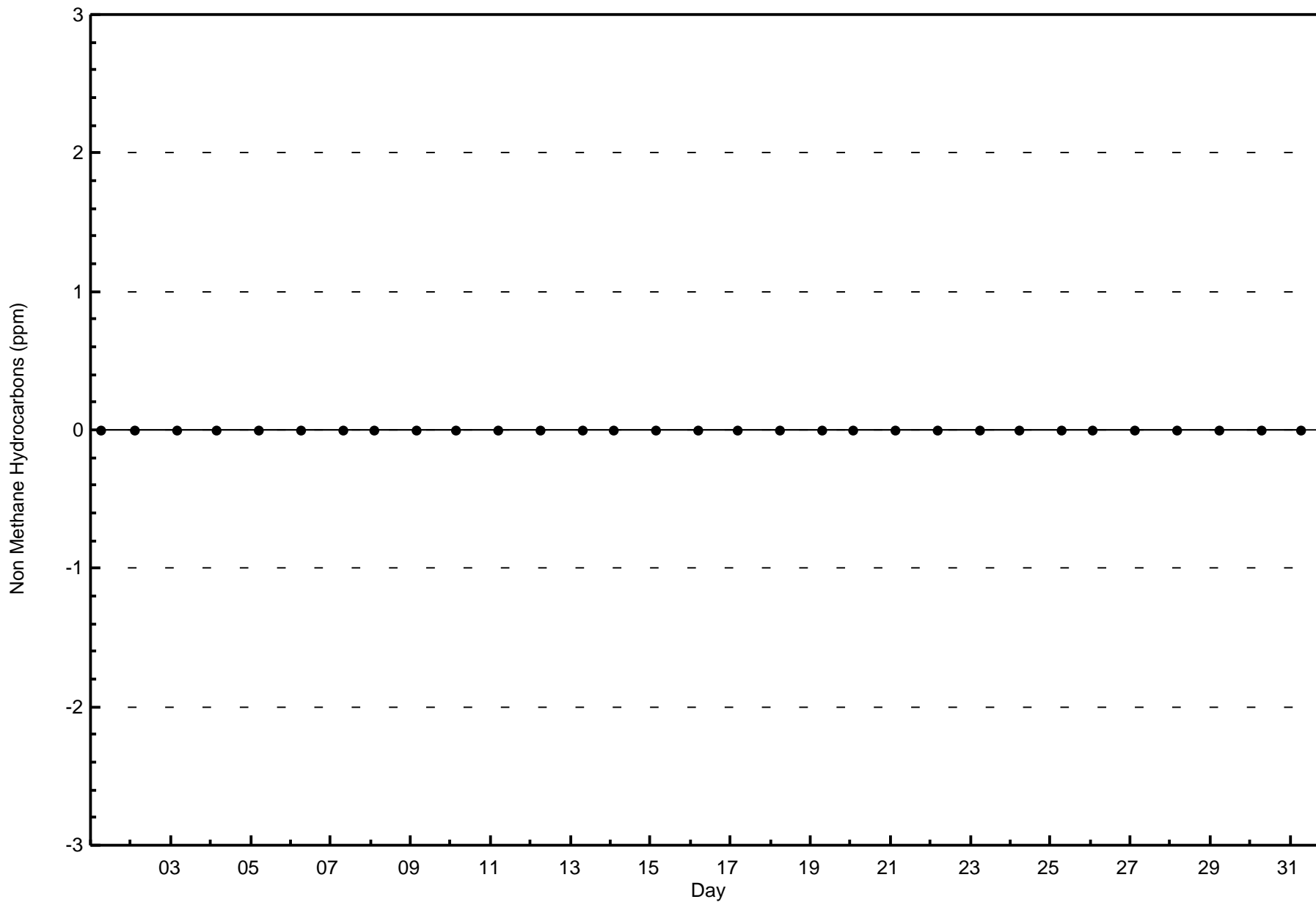
Total Number of Hours: 744

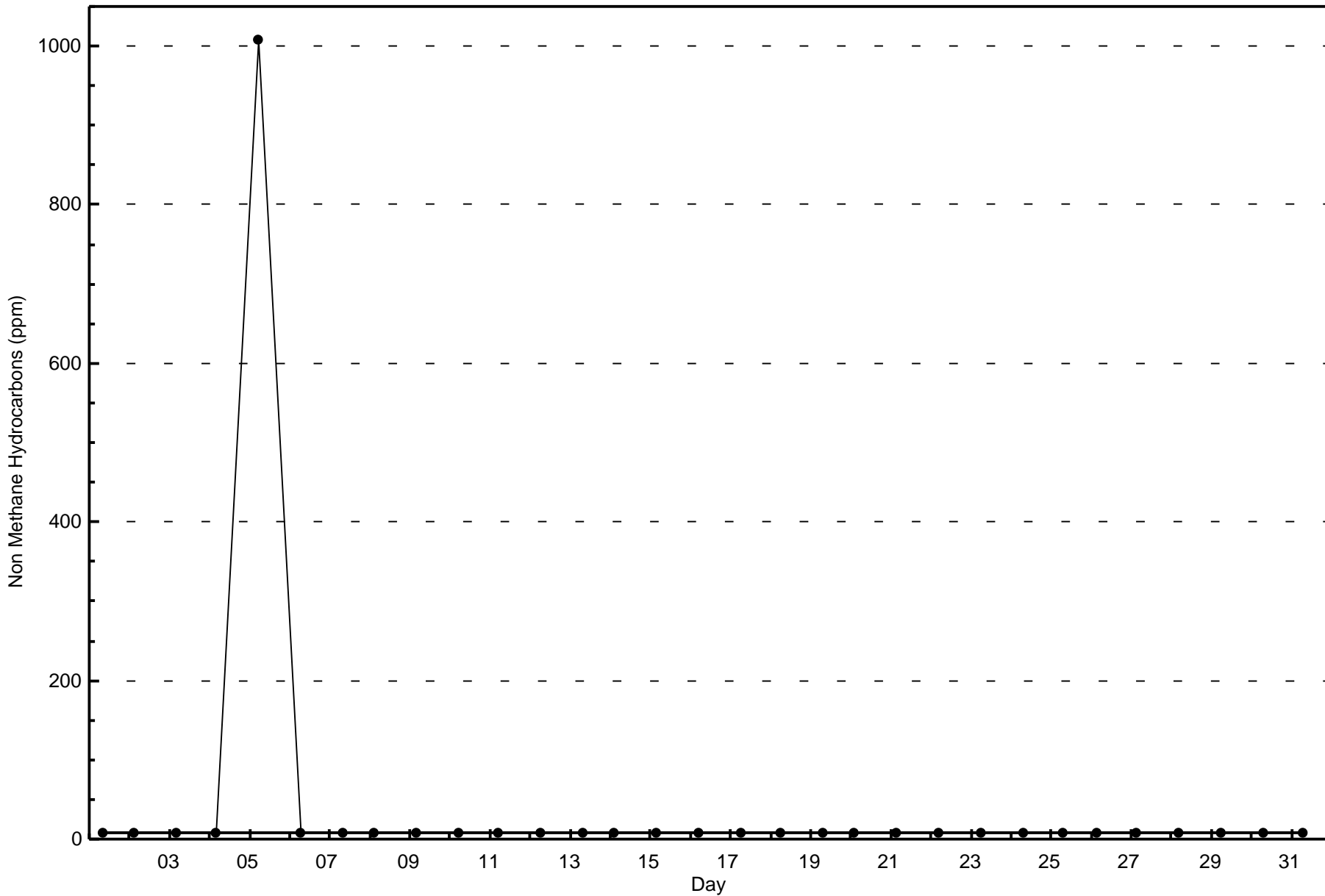


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

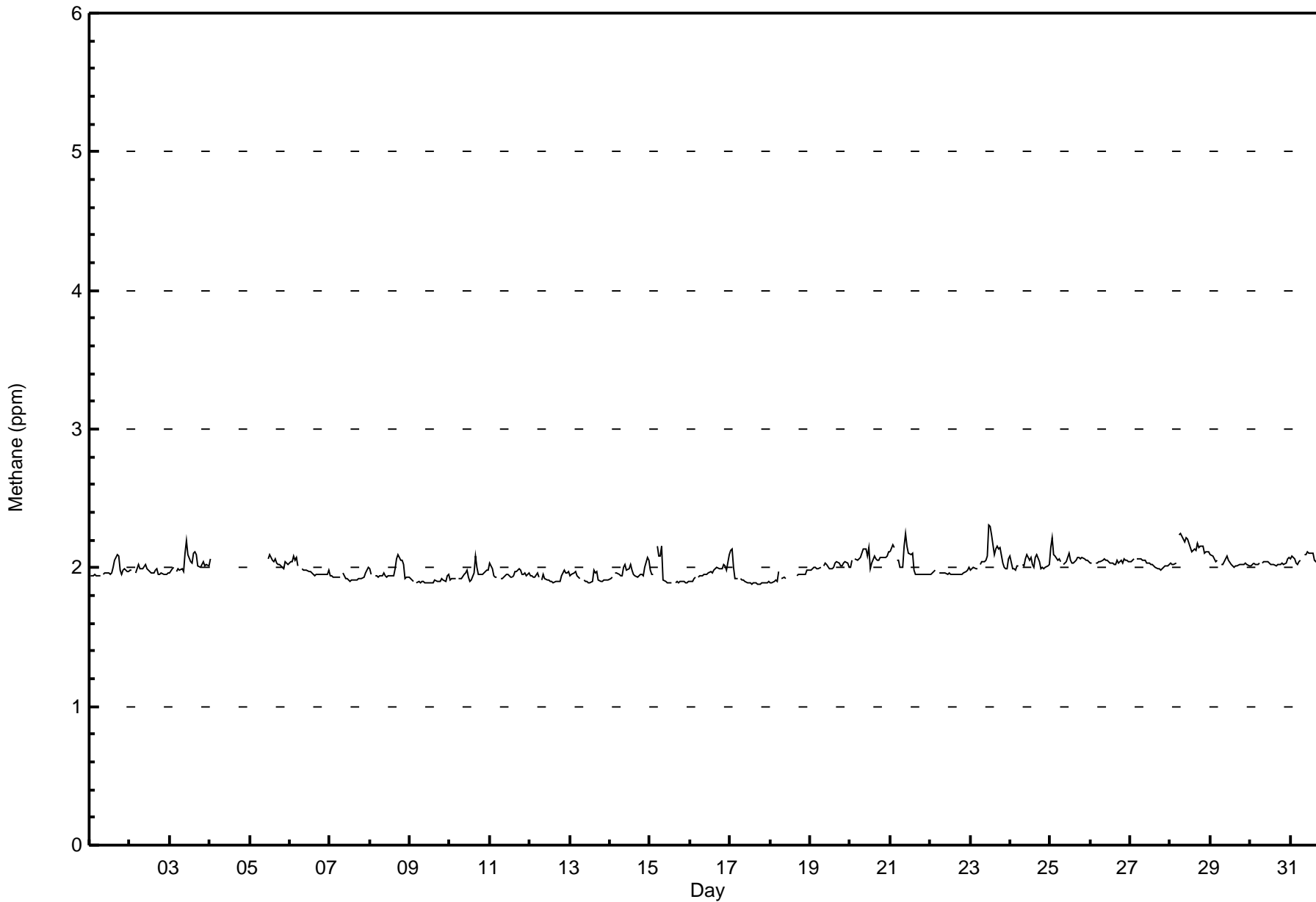
Non Methane Hydrocarbons (NMHC) - ppm  
Patricia McInnes (AMS 6)















**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	518	76.85	76.85
2.1 - 3.0	156	23.15	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	32	5	1	0	2	2	15	20	39	83	93	44	61	57	22	24	500
2.1 - 3.0	24	4	0	0	0	4	10	27	19	14	18	5	6	4	5	16	156
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
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	67	61	27	40	656

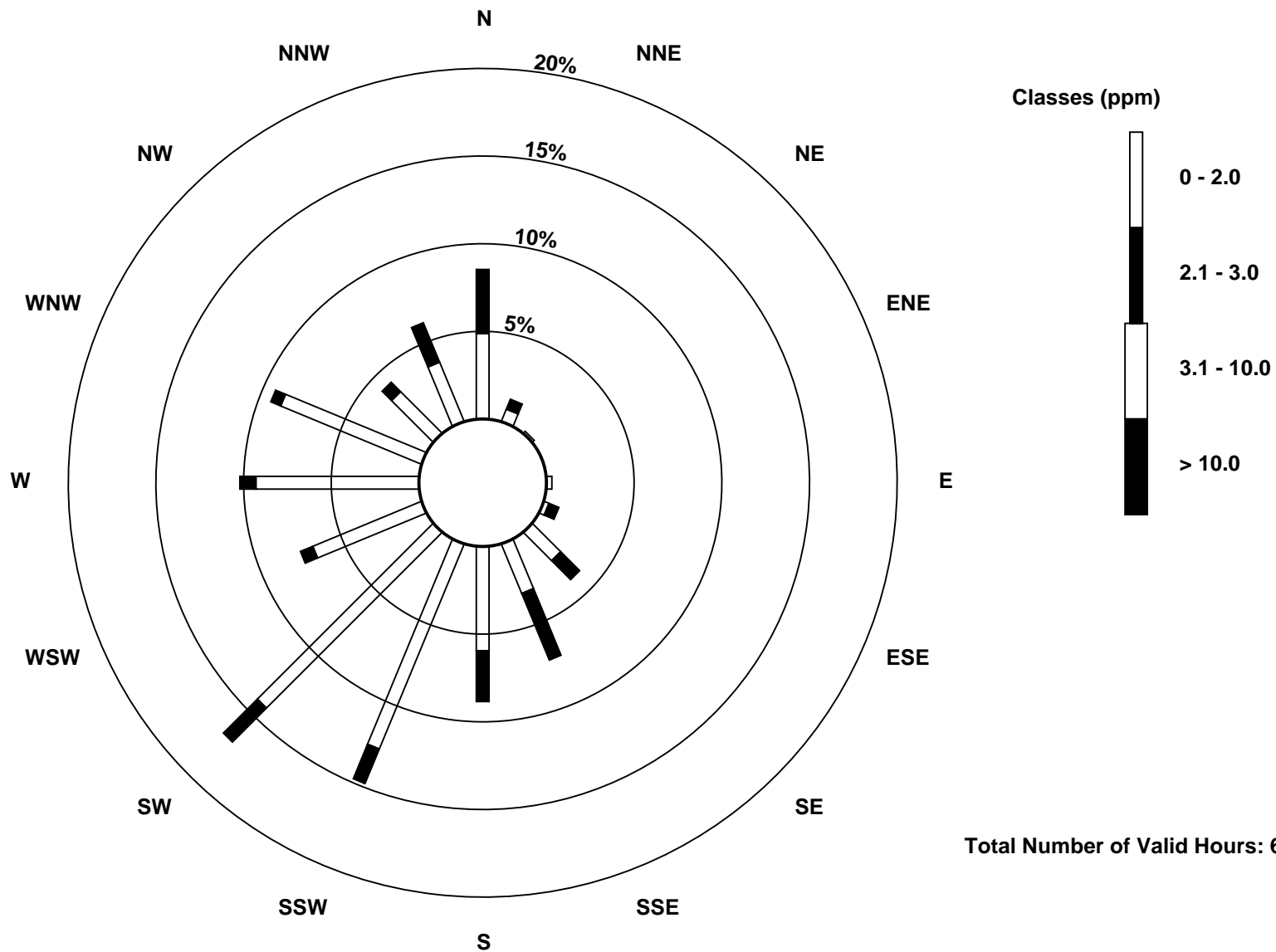
Total Number of Valid Hours: 656

Total Number of Hours: 744

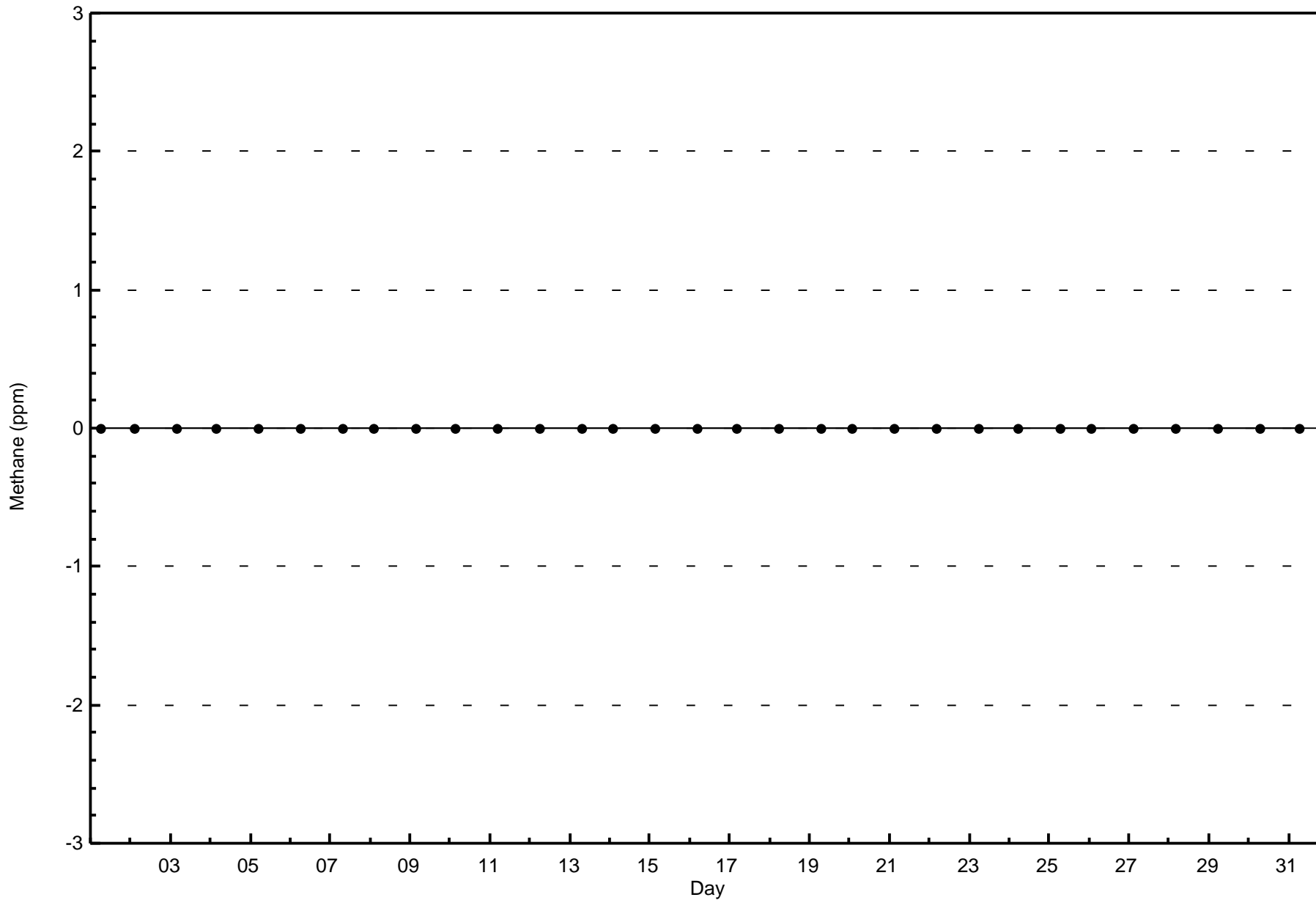


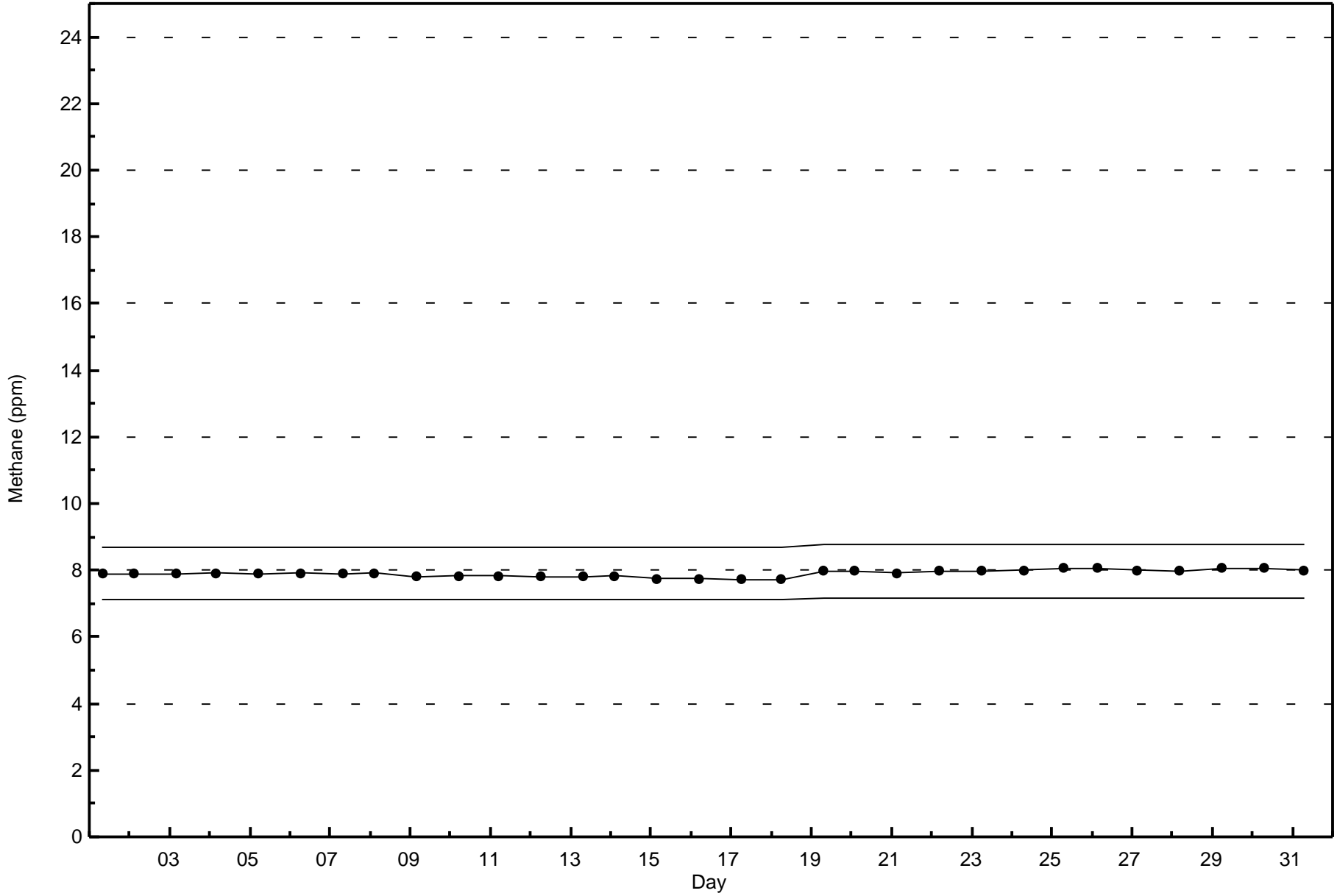
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Patricia McInnes (AMS 6)



Total Number of Valid Hours: 656







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

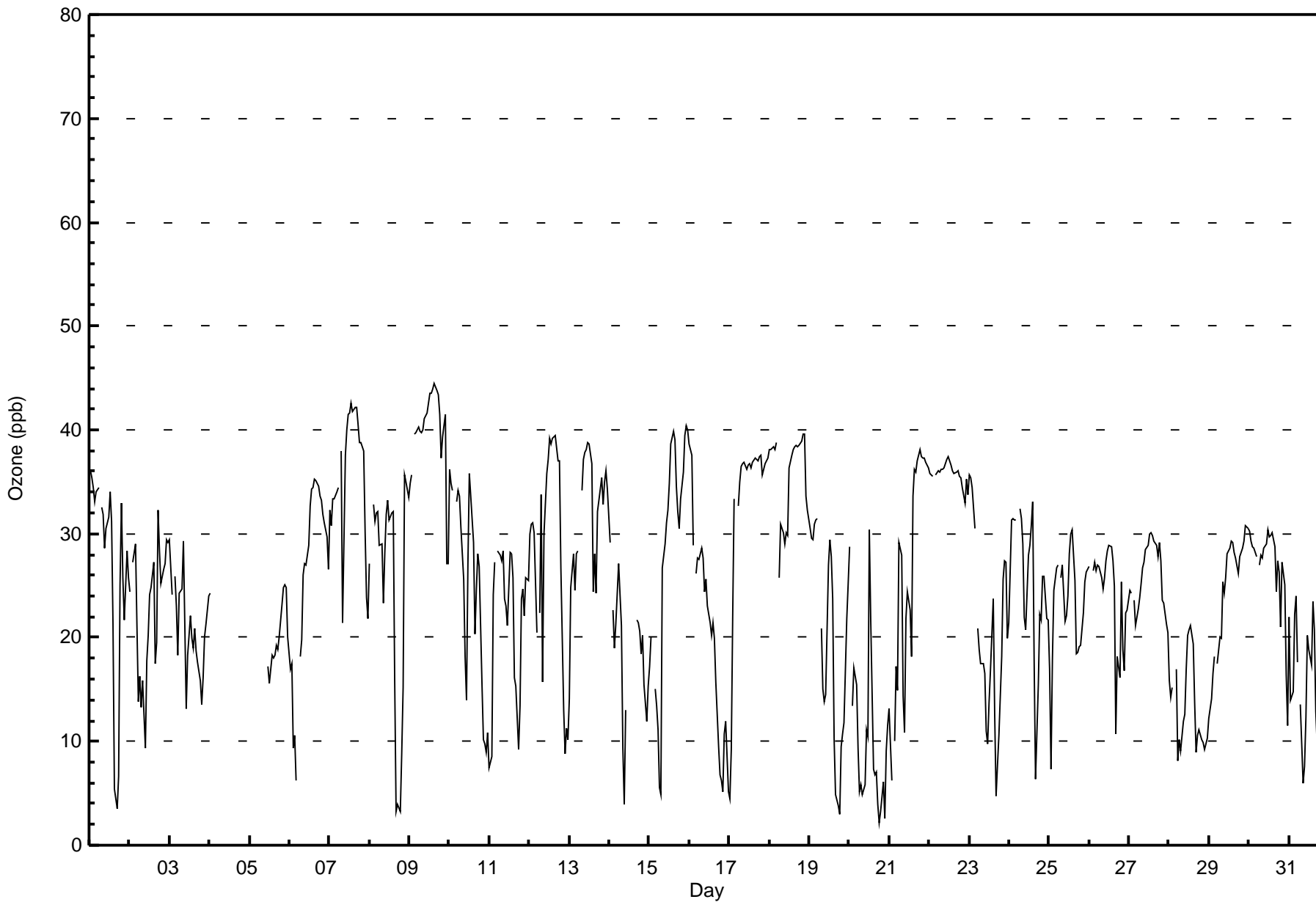
Patricia McInnes - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 44 ppb on Dec 9 16:00	Maximum Daily Average: 39.6 ppb on Dec 9		Hours of Data:	676
Minimum Value: 2 ppb on Dec 20 19:00	Minimum Daily Average: 10.4 ppb on Dec 20		Hours of Missing Data:	68
Maximum Diurnal Average: 29.7 ppb at hour 13	Minimum Diurnal Average: 22.1 ppb at hour 17		Hours of Calibration:	34
Monthly Average: 25.1 ppb	Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 10 Q <sub>1</sub> = 18 Median = 27 Q <sub>3</sub> = 33 P <sub>90</sub> = 37 P <sub>99</sub> = 42		Percent Operational Time:	95.4

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	36	35	35	33	34	34	Z	32	32	29	31	32	34	31	21	5	4	7	25	33	26	22	28	26	27.1	36	
2-Dec	24	Z	27	29	21	14	16	13	16	9	18	20	24	25	27	17	20	32	28	25	27	27	29	29	22.6	32	
3-Dec	29	24	Z	26	23	18	24	25	29	21	13	18	22	20	19	21	19	18	16	14	16	20	21	24	20.9	29	
4-Dec	24	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	24	
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	25	
6-Dec	17	17	9	11	6	Z	18	20	26	27	27	29	33	34	34	35	35	35	34	33	32	31	30	27	26.1	35	
7-Dec	32	31	33	33	34	34	Z	38	21	38	40	41	42	43	42	42	42	41	39	39	38	30	24	22	35.6	43	
8-Dec	27	Z	33	31	32	32	29	29	23	28	32	33	31	32	32	16	3	4	3	9	15	36	35	34	25.2	36	
9-Dec	35	36	Z	40	40	40	40	40	40	41	42	43	44	44	44	44	44	43	42	37	39	42	27	27	39.6	44	
10-Dec	36	35	34	Z	33	34	34	31	26	18	14	27	36	34	29	20	25	28	27	15	10	10	9	11	25.0	36	
11-Dec	8	9	24	27	Z	28	28	27	28	24	23	21	28	28	26	16	15	9	13	24	25	22	26	26	22.0	28	
12-Dec	30	31	31	30	20	Z	22	34	16	30	36	37	39	39	39	40	38	37	37	27	13	9	11	10	28.5	40	
13-Dec	14	25	28	24	28	Z	34	37	38	38	39	39	37	24	28	24	32	34	35	33	35	36	34	31.6	39		
14-Dec	29	Z	23	19	21	27	24	21	9	4	13	C	C	C	C	C	22	21	18	20	15	12	15	18.6	29		
15-Dec	17	20	Z	15	13	11	6	5	27	29	31	32	35	39	40	39	35	32	31	33	36	39	40	40	28.0	40	
16-Dec	39	38	29	Z	26	28	28	29	28	24	26	23	21	20	21	20	16	10	7	6	5	11	12	5	20.4	39	
17-Dec	4	9	22	33	Z	33	35	37	37	37	36	37	37	36	37	37	37	37	37	37	38	36	37	37	33.2	38	
18-Dec	38	38	38	38	39	Z	26	31	30	29	30	30	36	38	38	38	38	38	38	38	39	40	40	34	32	35.5	40
19-Dec	31	30	29	31	31	31	Z	21	15	14	14	27	29	28	24	10	5	4	3	9	11	12	22	25	19.8	31	
20-Dec	29	Z	13	17	16	9	5	6	5	6	11	10	30	22	7	7	7	4	2	3	6	3	9	12	10.4	30	
21-Dec	13	6	Z	10	17	15	29	28	14	11	22	24	23	18	34	36	36	37	38	37	37	37	37	36	25.9	38	
22-Dec	36	36	35	Z	36	36	36	36	36	36	36	37	37	37	37	36	36	36	36	35	35	35	33	35	34	35.8	37
23-Dec	36	35	34	30	Z	21	19	17	17	17	11	10	14	17	24	13	5	8	11	18	26	27	27	20	19.8	36	
24-Dec	21	31	31	31	31	Z	32	31	29	22	21	28	29	31	33	18	6	15	22	22	26	26	22	22	25.3	33	
25-Dec	17	7	18	24	27	27	Z	26	27	22	22	24	28	30	30	25	18	19	19	19	22	25	26	27	23.1	30	
26-Dec	27	Z	27	27	26	27	27	26	25	26	27	28	29	29	27	25	11	18	16	25	19	17	22	23	24.1	29	
27-Dec	25	24	Z	24	21	23	24	25	27	27	28	29	30	30	30	29	29	28	29	27	24	23	21	20	26.0	30	
28-Dec	16	14	15	Z	17	8	10	9	12	13	17	20	21	21	19	14	9	11	11	10	10	9	10	10	13.3	21	
29-Dec	12	14	17	18	Z	17	20	20	25	24	26	28	29	29	29	28	28	26	28	28	29	29	31	30	24.6	31	
30-Dec	30	29	29	29	28	Z	27	28	28	29	29	30	30	30	30	29	24	27	26	21	27	25	16	11	26.6	30	
31-Dec	22	14	15	22	24	18	Z	14	6	8	12	20	19	17	23	21	13	9	4	3	5	16	30	30	15.8	30	

25.2	24.5	26.3	26.2	25.8	24.8	24.3	25.3	23.8	23.4	25.1	27.5	29.7	29.5	29.0	25.2	22.1	22.8	23.2	23.6	23.7	24.4	24.8	24.0	Diurnal Average	
39	38	38	40	40	40	40	40	40	41	42	43	44	44	44	44	44	43	42	39	40	42	40	40	Diurnal Maximum	

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





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	208	30.77	30.77
21 - 50	468	69.23	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 676

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	29	3	0	0	1	4	18	39	38	21	13	2	8	3	3	19	201
21 - 50	27	6	1	0	1	2	4	6	20	75	101	44	59	60	29	22	457
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
<b>Totals</b>	56	9	1	0	2	6	22	45	58	96	114	46	67	63	32	41	658

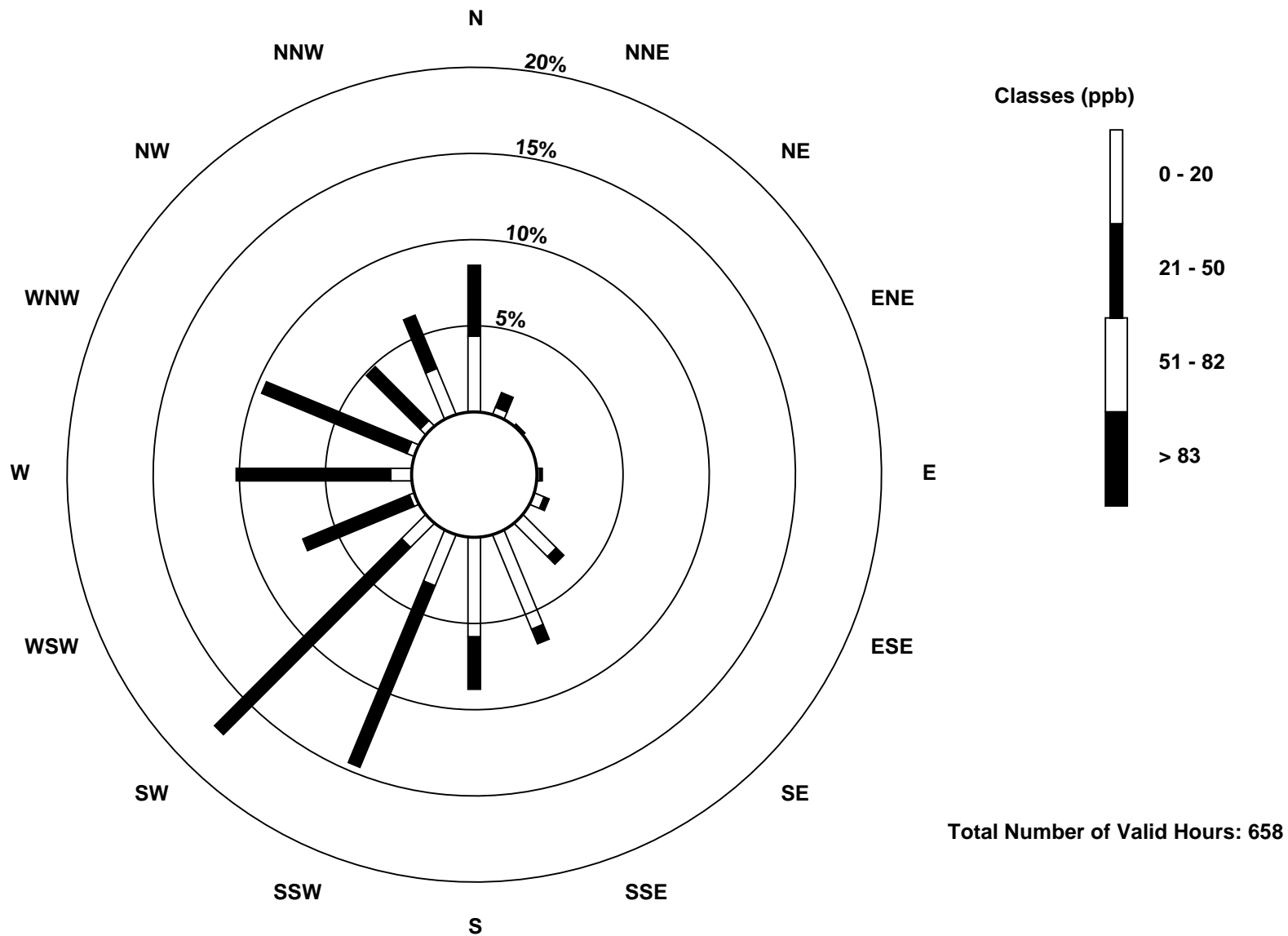
Total Number of Valid Hours: 658

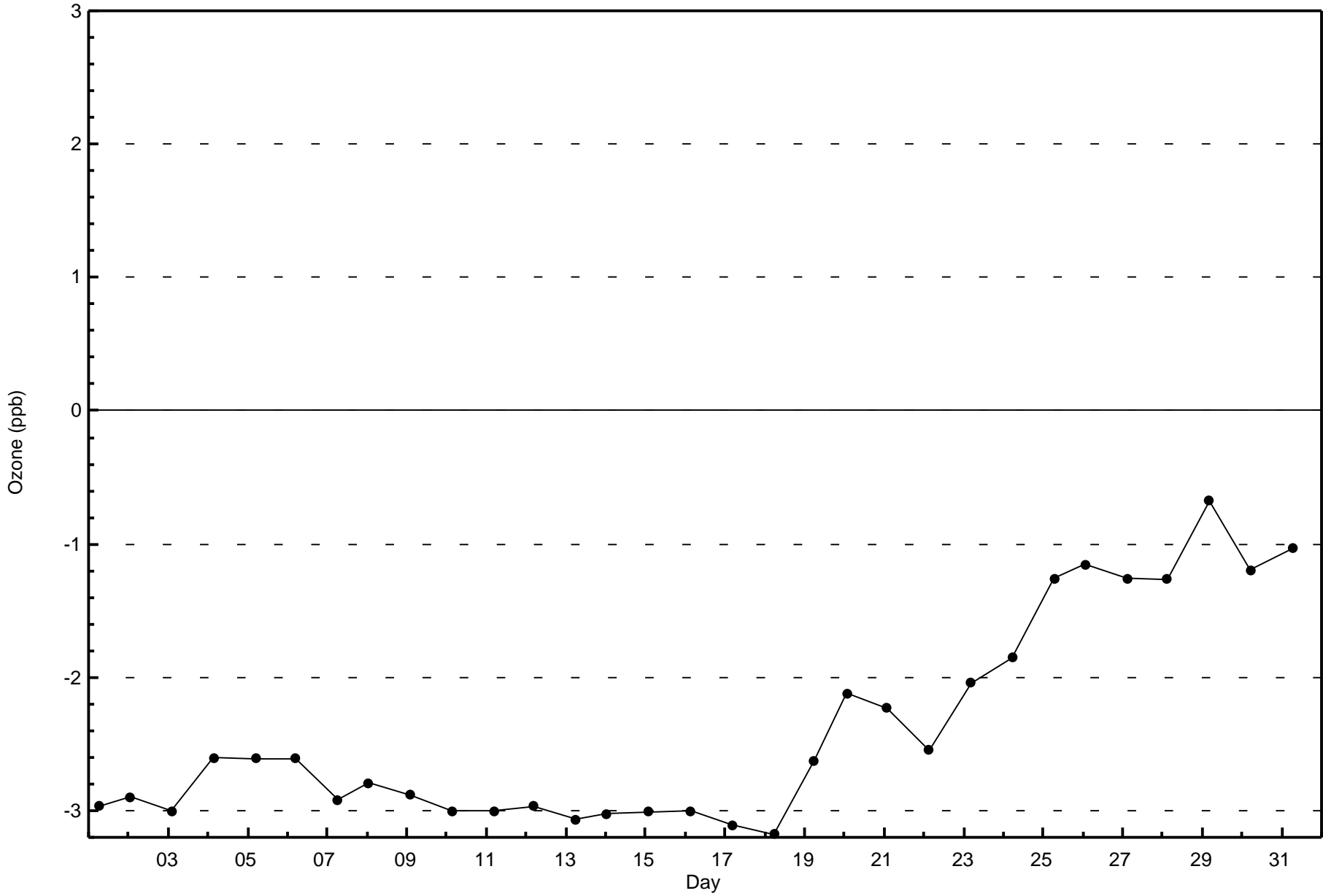
Total Number of Hours: 744

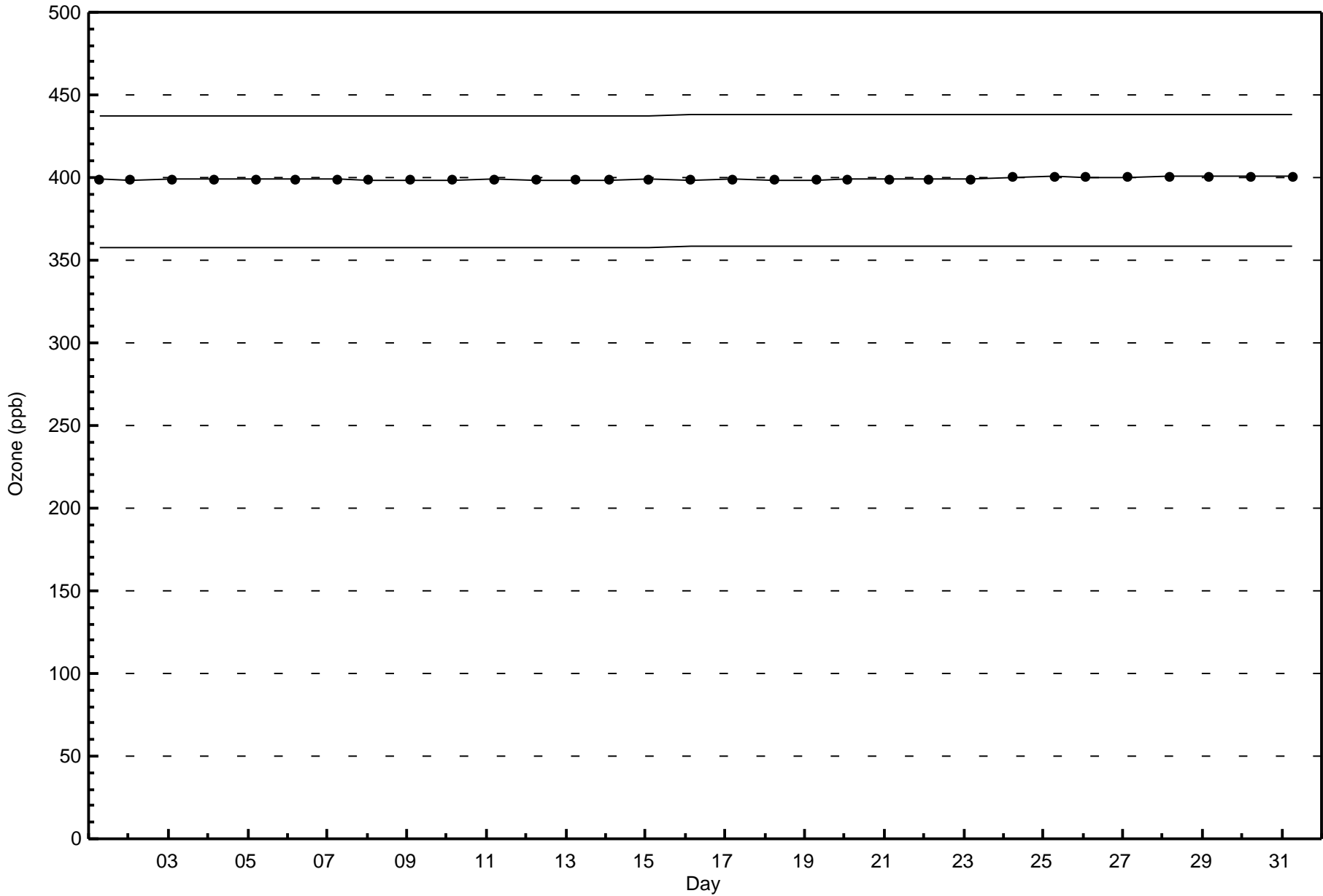


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitric Oxide (NO) - ppb

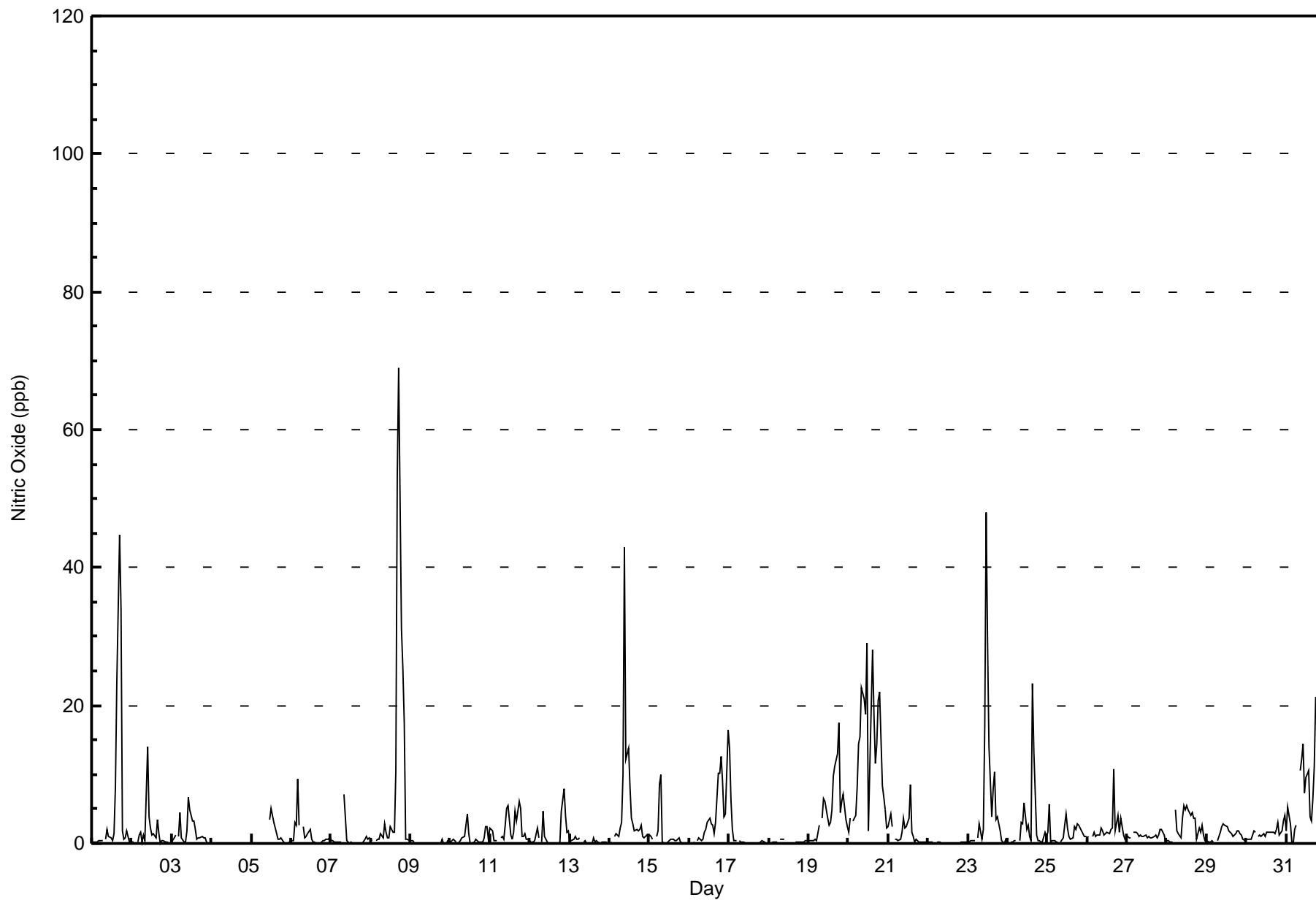
Patricia McInnes - December 2017

Maximum Value: 69 ppb on Dec 8 18:00		Maximum Daily Average: 12.7 ppb on Dec 20		Hours in Service: 744																																												
Minimum Value: 0 ppb on Dec 4 00:00		Minimum Daily Average: 0.1 ppb on Dec 22		Hours of Data: 675																																												
Maximum Diurnal Average: 6.2 ppb at hour 17		Minimum Diurnal Average: 0.6 ppb at hour 4		Hours of Missing Data: 69																																												
Monthly Average: 2.9 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 O <sub>3</sub> = 2 P <sub>90</sub> = 7 P <sub>99</sub> = 32		Hours of Calibration: 35																																												
				Percent Operational Time: 95.4																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0	0	0	0	0	0	0	Z	1	2	1	1	0	1	8	23	45	34	2	1	1	2	0	0	5.4	45																						
2-Dec	0	0	Z	0	1	2	0	1	0	14	4	2	1	1	1	3	1	0	0	0	0	0	0	0	1.5	14																						
3-Dec	0	1	1	Z	1	4	1	0	0	2	7	5	3	3	2	1	1	1	1	1	1	0	0	0	1.6	7																						
4-Dec	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0																						
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	5																						
6-Dec	0	0	3	3	9	3	Z	2	1	1	2	1	0	0	0	0	0	0	0	0	0	1	1	1	1.3	9																						
7-Dec	0	0	0	0	0	0	0	Z	7	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.6	7																						
8-Dec	1	0	Z	0	1	1	1	1	3	2	1	1	2	2	2	11	53	69	31	25	17	1	1	0	9.8	69																						
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	1																						
10-Dec	0	0	1	0	Z	0	0	1	1	3	4	1	0	0	0	1	0	0	0	0	1	2	2	1	0.9	4																						
11-Dec	2	2	0	0	0	Z	1	1	1	3	5	6	1	1	2	5	3	6	5	1	1	1	1	1	2.1	6																						
12-Dec	0	0	0	0	2	1	Z	0	5	1	0	0	0	0	0	0	0	0	0	5	8	4	2	2	1.3	8																						
13-Dec	1	0	1	1	1	1	1	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1																						
14-Dec	0	0	Z	1	1	1	2	3	10	43	12	14	8	4	3	2	2	2	2	3	1	1	1	1	5.1	43																						
15-Dec	1	1	1	Z	1	2	8	10	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	1.3	10																						
16-Dec	0	0	0	0	Z	0	1	0	1	2	2	3	4	3	3	1	3	10	10	13	9	4	4	17	3.9	17																						
17-Dec	14	6	2	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	14																						
18-Dec	0	0	0	0	0	0	Z	1	1	1	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	1																						
19-Dec	0	0	0	0	1	0	3	Z	4	7	6	4	3	3	5	10	11	13	17	4	6	7	4	2	4.8	17																						
20-Dec	2	4	Z	3	4	8	15	15	23	21	19	29	2	11	28	18	12	14	21	22	8	7	5	2	12.7	29																						
21-Dec	2	4	2	Z	1	1	0	1	2	4	2	2	4	8	2	1	0	1	0	0	0	0	0	0	1.6	8																						
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
23-Dec	0	0	0	0	0	Z	1	3	1	2	17	48	29	14	4	8	10	3	4	2	0	0	0	1	6.5	48																						
24-Dec	0	0	0	0	0	0	Z	0	3	3	6	2	3	1	0	23	14	1	0	1	0	0	2	1	2.7	23																						
25-Dec	2	6	0	0	0	0	0	Z	0	1	3	4	2	1	1	1	2	2	3	3	2	1	1	1	1.6	6																						
26-Dec	1	1	Z	1	2	1	1	1	2	2	1	1	2	1	2	2	11	2	4	2	4	2	1	1	2.1	11																						
27-Dec	1	1	1	Z	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	0	1.1	2																						
28-Dec	0	0	0	0	Z	5	2	1	1	4	6	5	5	5	4	4	4	4	1	2	2	3	1	0	2.6	6																						
29-Dec	0	0	0	0	0	Z	0	1	2	3	3	3	2	2	2	1	1	2	2	2	1	1	1	0	1.3	3																						
30-Dec	1	1	1	1	2	2	Z	1	1	1	1	1	2	2	2	2	2	1	2	3	1	2	3	4	1.6	4																						
31-Dec	2	5	3	0	0	2	3	Z	10	12	14	7	10	11	4	3	7	11	21	21	66	15	2	1	10.1	66																						
																								1.1	1.2	0.8	0.6	1.2	1.4	1.8	2.0	2.7	4.6	4.2	5.0	3.1	2.7	2.7	4.3	6.2	6.0	4.3	3.8	4.5	2.0	1.1	1.3	Diurnal Average
																								14	6	3	3	9	8	15	15	23	43	19	48	29	14	28	23	53	69	31	25	66	15	5	17	Diurnal Maximum
Z - zerospan																								C - Calibration						AF - Analyzer Failure																		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	655	97.04	97.04
21 - 40	14	2.07	99.11
41 - 80	6	0.89	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 675

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	54	9	1	0	2	5	22	36	56	97	111	49	68	61	27	39	637
21 - 40	2	0	0	0	0	1	1	8	2	0	0	0	0	0	0	0	14
11 - 80	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	1	6
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
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	68	61	27	40	657

Total Number of Valid Hours: 657

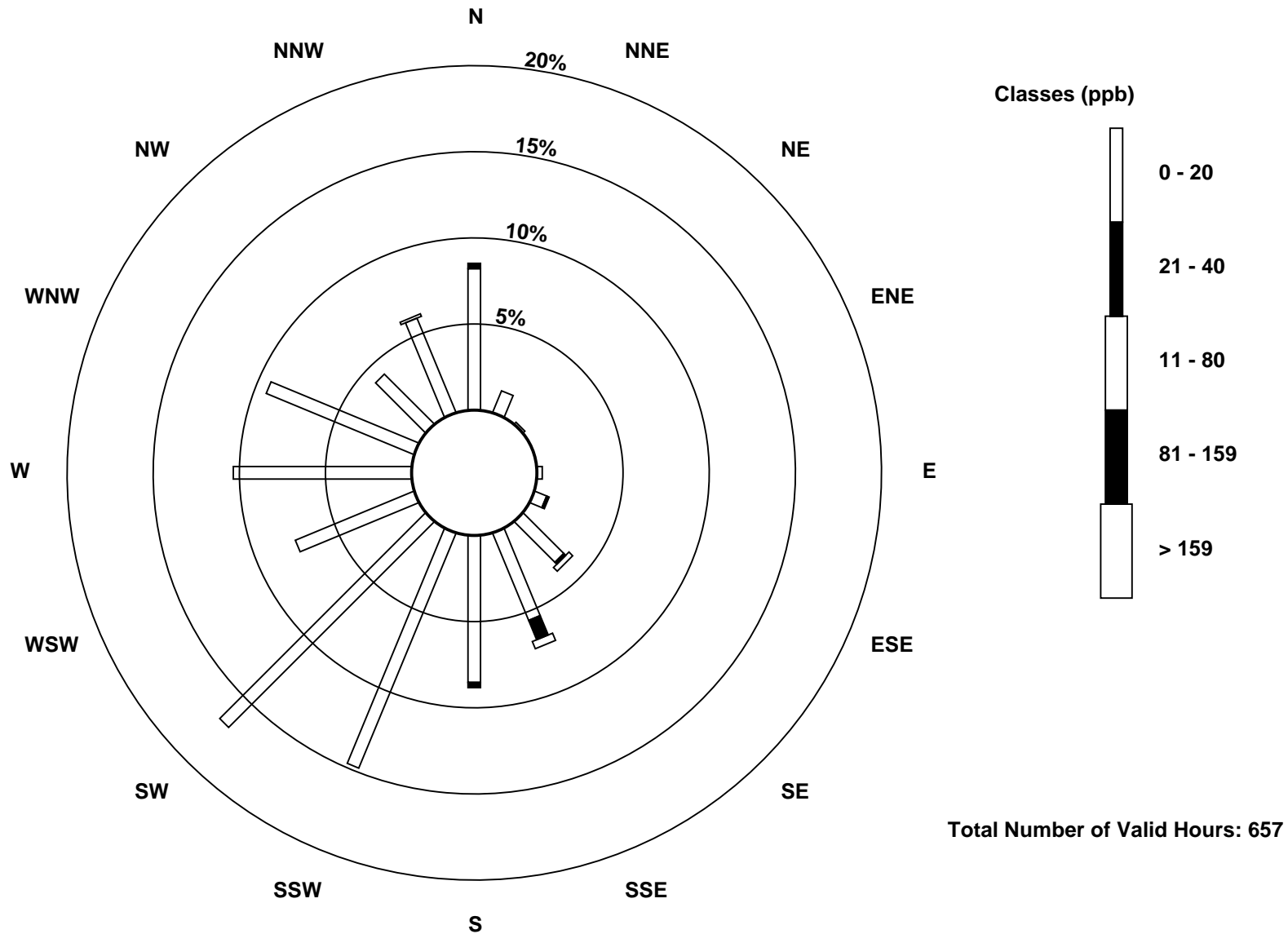
Total Number of Hours: 744

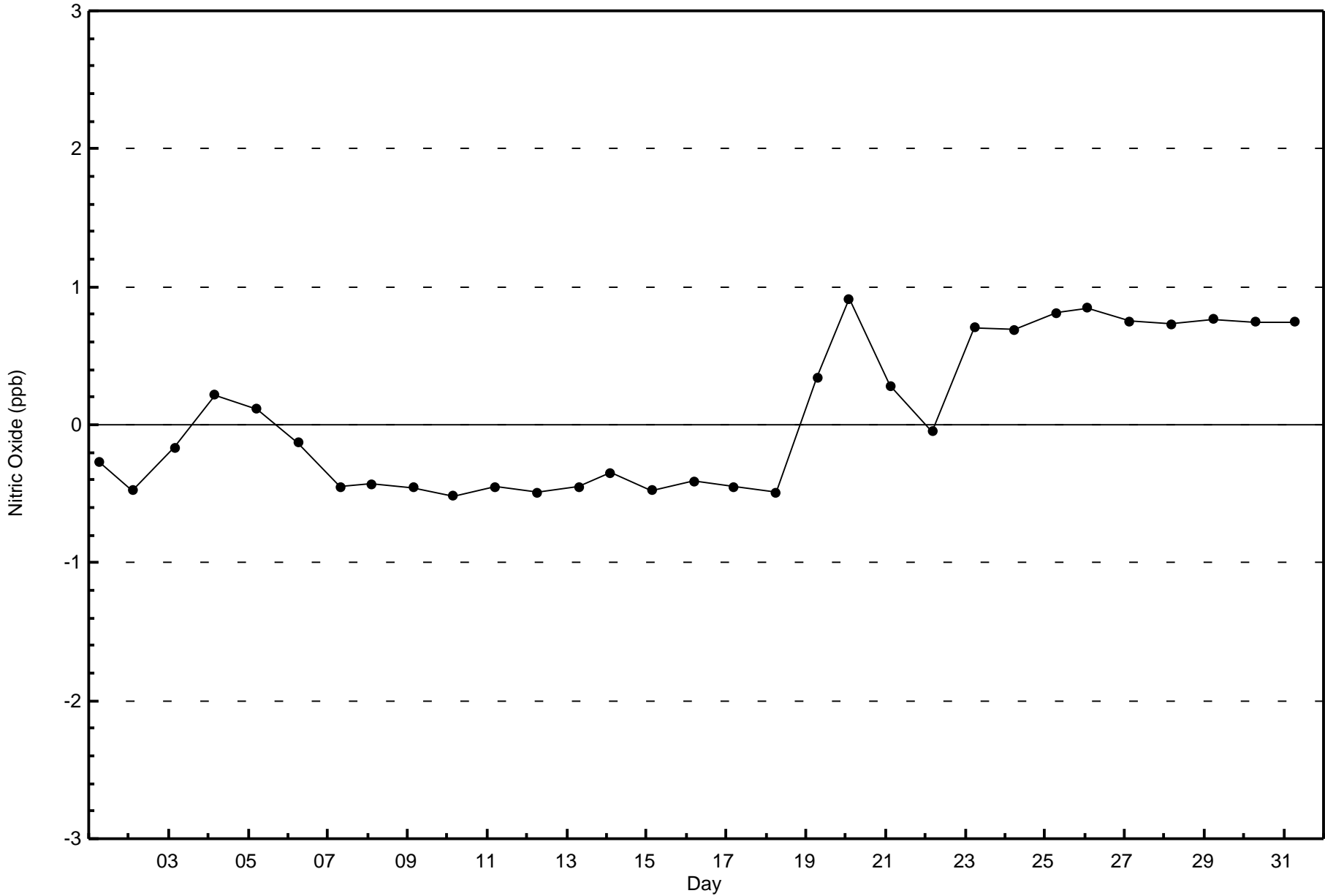


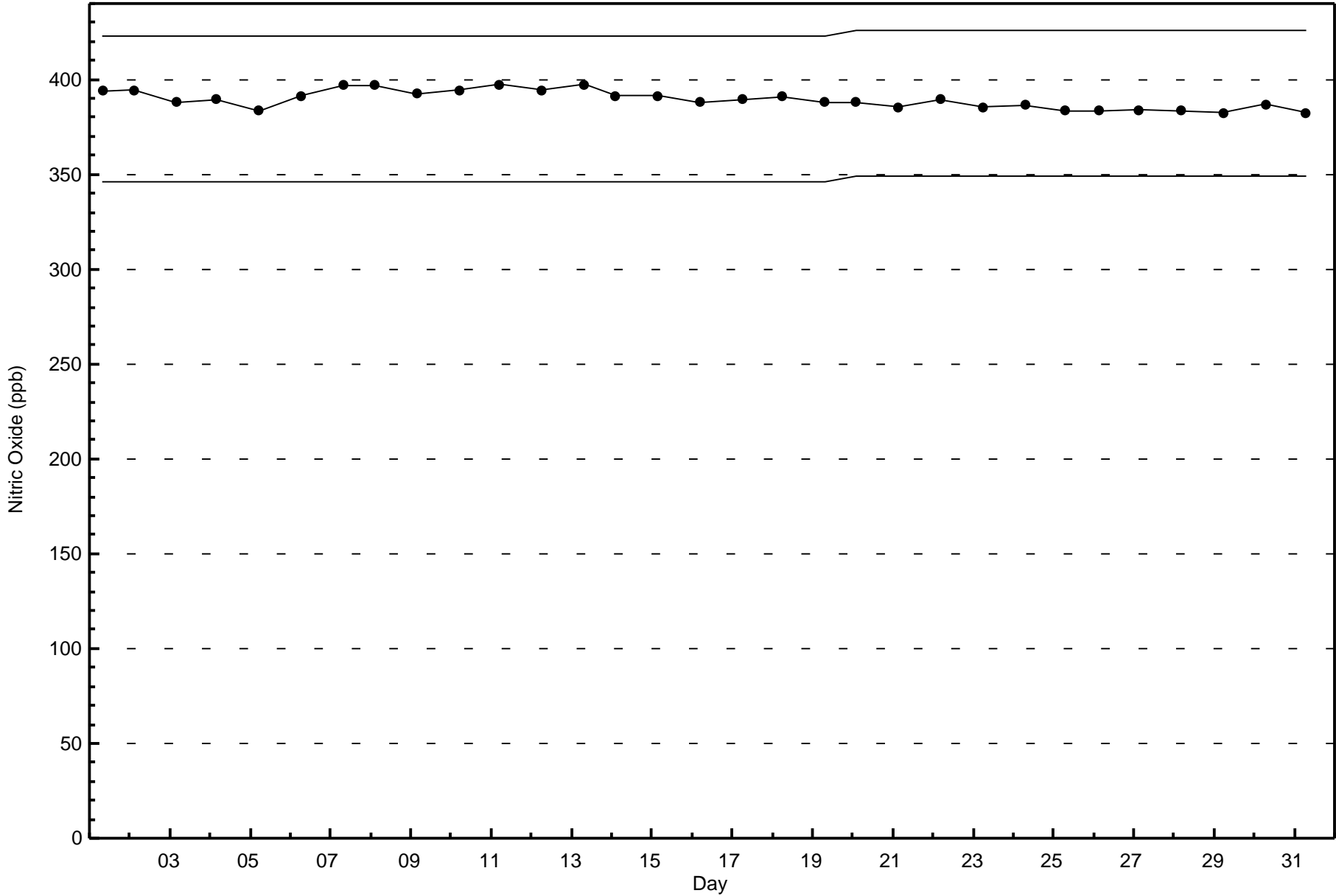


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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









# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

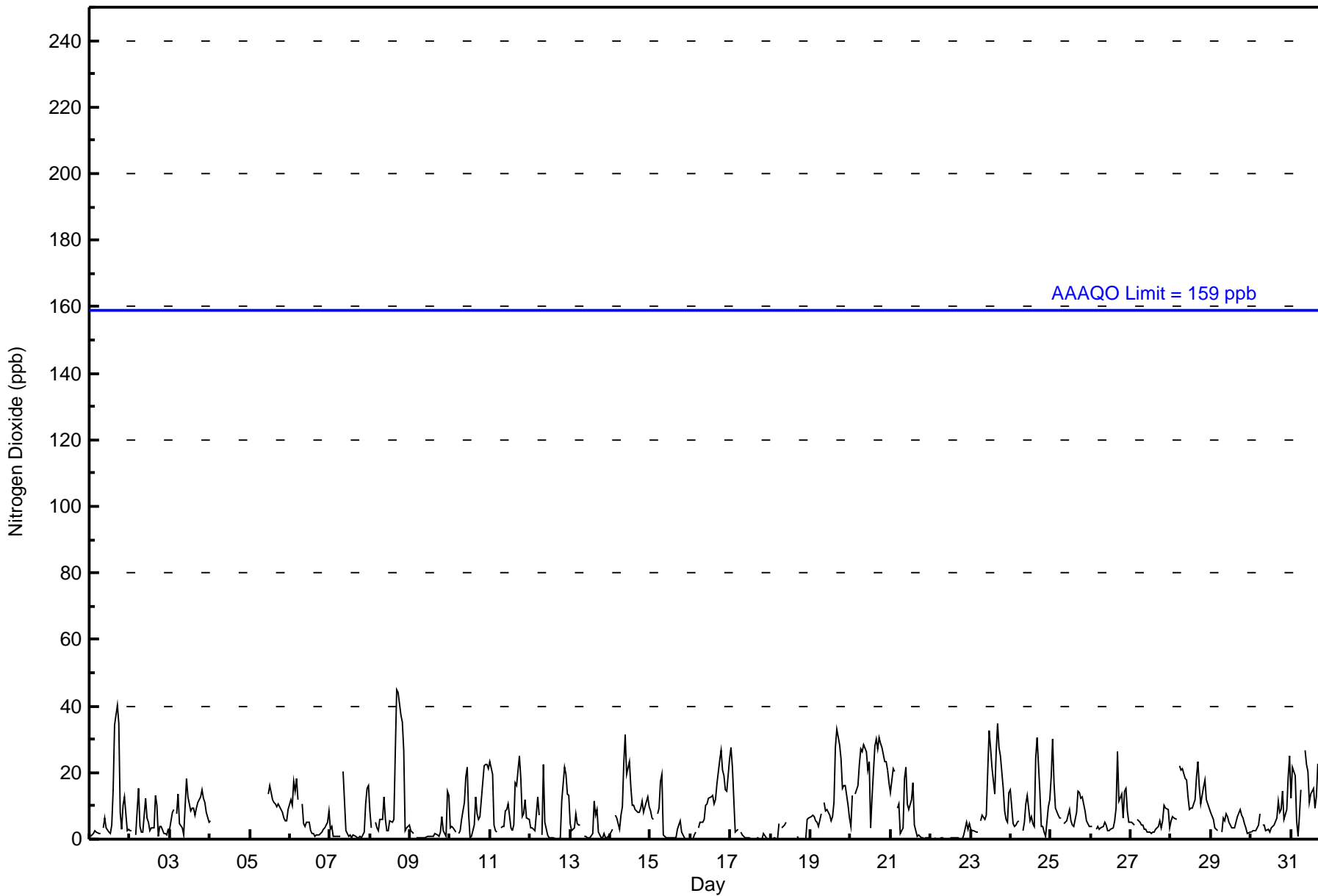
## Patricia McInnes - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 45 ppb on Dec 8 17:00										Maximum Daily Average: 21.5 ppb on Dec 20																
Minimum Value: 0 ppb on Dec 22 18:00										Minimum Daily Average: 0.8 ppb on Dec 22																
Maximum Diurnal Average: 13.8 ppb at hour 17										Minimum Diurnal Average: 4.4 ppb at hour 4																
Monthly Average: 8.2 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 2 Median = 5 O <sub>3</sub> = 12 P <sub>90</sub> = 21 P <sub>99</sub> = 35																
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	2	3	2	2	2	Z	3	6	4	2	2	4	15	34	40	35	8	3	10	13	3	3	8.5	40
2-Dec	2	3	Z	1	9	15	4	2	2	12	6	5	3	4	3	13	10	1	4	4	2	2	1	3	4.8	15
3-Dec	3	8	9	Z	8	14	5	3	1	10	18	13	9	9	7	10	11	13	15	12	11	8	5	9.1	18	
4-Dec	6	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	6
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	16
6-Dec	12	10	18	14	18	12	Z	10	5	4	5	2	2	2	1	1	1	2	2	3	4	5	9	6.3	18	
7-Dec	3	4	1	1	1	1	1	Z	21	2	2	1	1	1	1	1	0	1	1	1	2	11	15	16	3.8	21
8-Dec	9	3	Z	5	3	3	6	6	13	6	2	2	6	5	6	26	45	44	37	35	27	3	3	4	13.0	45
9-Dec	3	2	2	Z	0	0	1	1	1	1	1	1	1	1	2	1	1	2	7	3	1	15	13	2.5	15	
10-Dec	3	4	4	2	Z	2	2	6	11	19	22	8	1	1	4	13	8	6	7	17	22	22	23	21	9.8	23
11-Dec	23	20	4	3	2	Z	3	4	4	8	9	11	3	3	4	17	16	25	18	7	8	12	6	6	9.4	25
12-Dec	3	3	3	3	13	7	Z	1	23	5	1	1	0	1	0	0	0	0	0	11	21	20	14	13	6.2	23
13-Dec	5	2	3	8	5	4	4	Z	1	1	0	1	1	2	12	7	9	2	1	0	2	1	0	1	3.1	12
14-Dec	2	3	Z	7	7	3	7	10	23	31	19	23	16	10	10	9	8	8	9	11	8	10	13	10	11.2	31
15-Dec	9	6	6	Z	8	9	18	19	1	1	0	0	0	1	0	0	3	4	6	2	1	0	0	0	4.1	19
16-Dec	0	0	1	2	Z	4	5	5	6	10	11	12	13	13	11	12	16	24	27	21	19	15	14	24	11.5	27
17-Dec	28	22	12	2	3	Z	2	1	1	1	1	0	0	0	0	0	0	0	0	0	2	1	0	0	3.3	28
18-Dec	0	0	0	0	0	5	Z	3	4	5	C	C	C	C	C	C	1	0	0	0	0	0	6	7	--	7
19-Dec	7	7	7	6	5	4	8	Z	11	8	9	7	5	7	11	28	33	28	24	15	16	16	10	6	12.1	33
20-Dec	4	13	Z	14	16	23	27	26	28	26	21	23	3	13	28	30	27	31	29	28	23	23	21	17	21.5	31
21-Dec	14	21	20	Z	9	11	2	4	18	22	11	9	12	17	4	2	1	1	0	0	0	0	0	0	7.8	22
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	5	0.8	5	
23-Dec	3	3	2	2	2	Z	6	7	6	7	20	33	28	22	14	26	35	27	25	15	8	6	5	14	13.7	35
24-Dec	15	5	4	4	5	5	Z	3	5	11	13	6	7	5	4	24	31	14	4	4	2	1	10	12	8.3	31
25-Dec	19	30	17	10	7	6	7	Z	5	6	7	9	5	4	4	8	14	14	12	13	9	6	5	4	9.5	30
26-Dec	4	4	Z	3	4	3	3	4	5	4	3	3	3	3	5	9	26	11	14	7	14	15	8	5	7.0	26
27-Dec	5	5	4	Z	6	5	4	4	3	3	2	2	2	2	3	4	6	4	5	10	10	9	3	4.4	10	
28-Dec	5	7	7	6	Z	22	21	21	18	18	13	9	9	9	12	19	23	16	11	16	18	12	11	9	13.5	23
29-Dec	8	6	4	3	2	Z	2	7	6	8	7	5	4	3	4	5	7	9	7	6	5	4	2	2	4.9	9
30-Dec	2	3	3	2	4	8	Z	4	4	3	3	2	4	4	4	6	11	8	9	15	6	9	19	25	6.8	25
31-Dec	12	21	19	6	1	7	15	Z	27	22	20	11	14	15	9	13	23	22	29	28	43	26	7	5	17.2	43
6.9 7.4 6.3 4.4 5.6 6.9 6.4 6.6 8.8 8.9 8.1 7.5 5.8 5.9 6.6 11.3 13.8 12.0 10.4 9.9 10.1 8.7 8.0 8.4																								Diurnal Average		
28 30 20 14 18 23 27 26 28 31 22 33 28 22 28 34 45 44 37 35 43 26 23 25																								Diurnal Maximum		
Z - zerospan C - Calibration AF - Analyzer Failure																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Patricia McInnes - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	600	88.89	88.89
21 - 40	72	10.67	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: 675

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	50	8	1	0	2	4	17	20	44	92	110	49	67	61	27	35	587
21 - 40	6	1	0	0	0	2	6	26	14	5	1	0	1	0	0	5	67
11 - 80	0	0	0	0	0	0	2	1	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
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	68	61	27	40	657

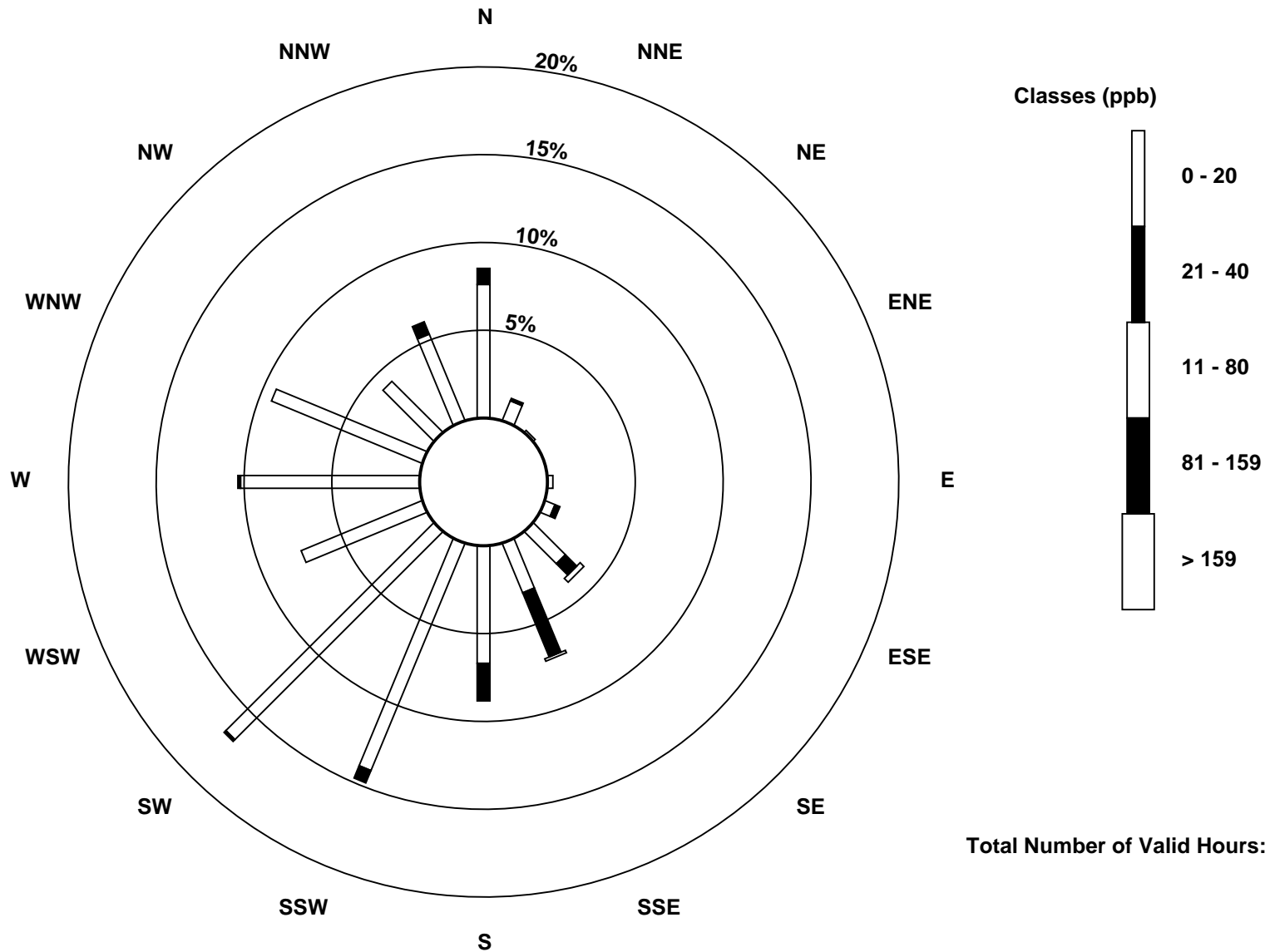
Total Number of Valid Hours: 657

Total Number of Hours: 744



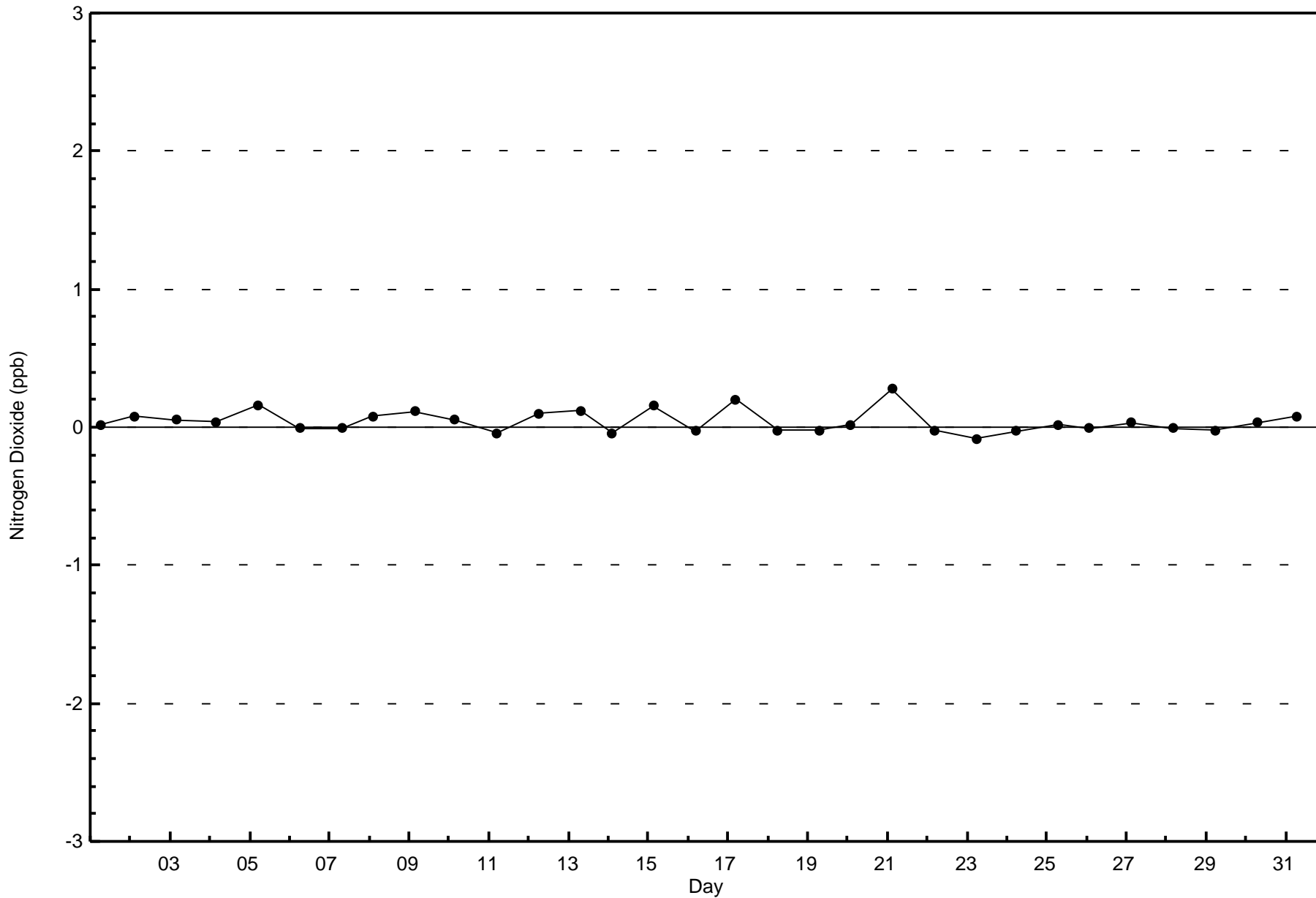
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

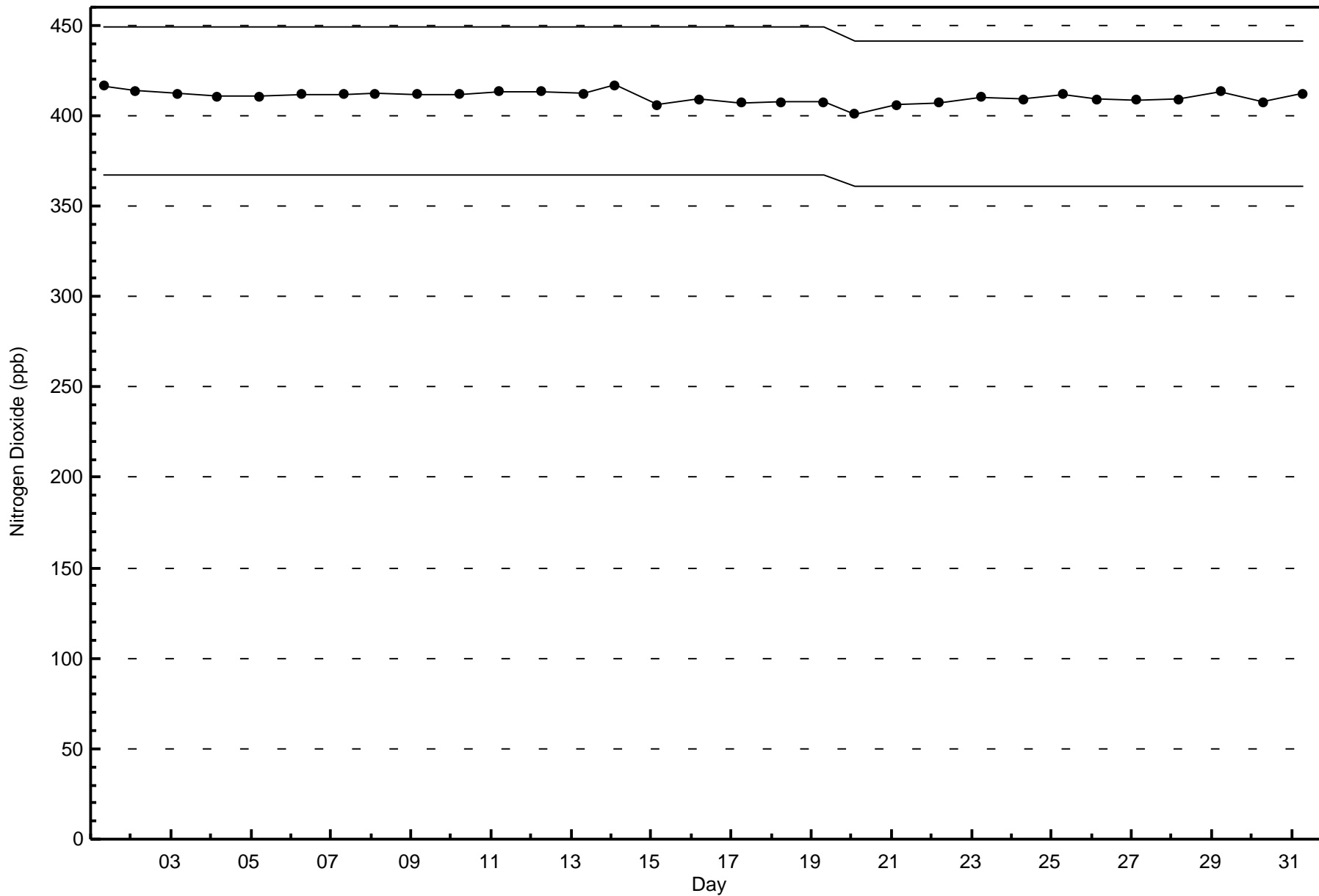
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Patricia McInnes (AMS 6)



Total Number of Valid Hours: 657









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

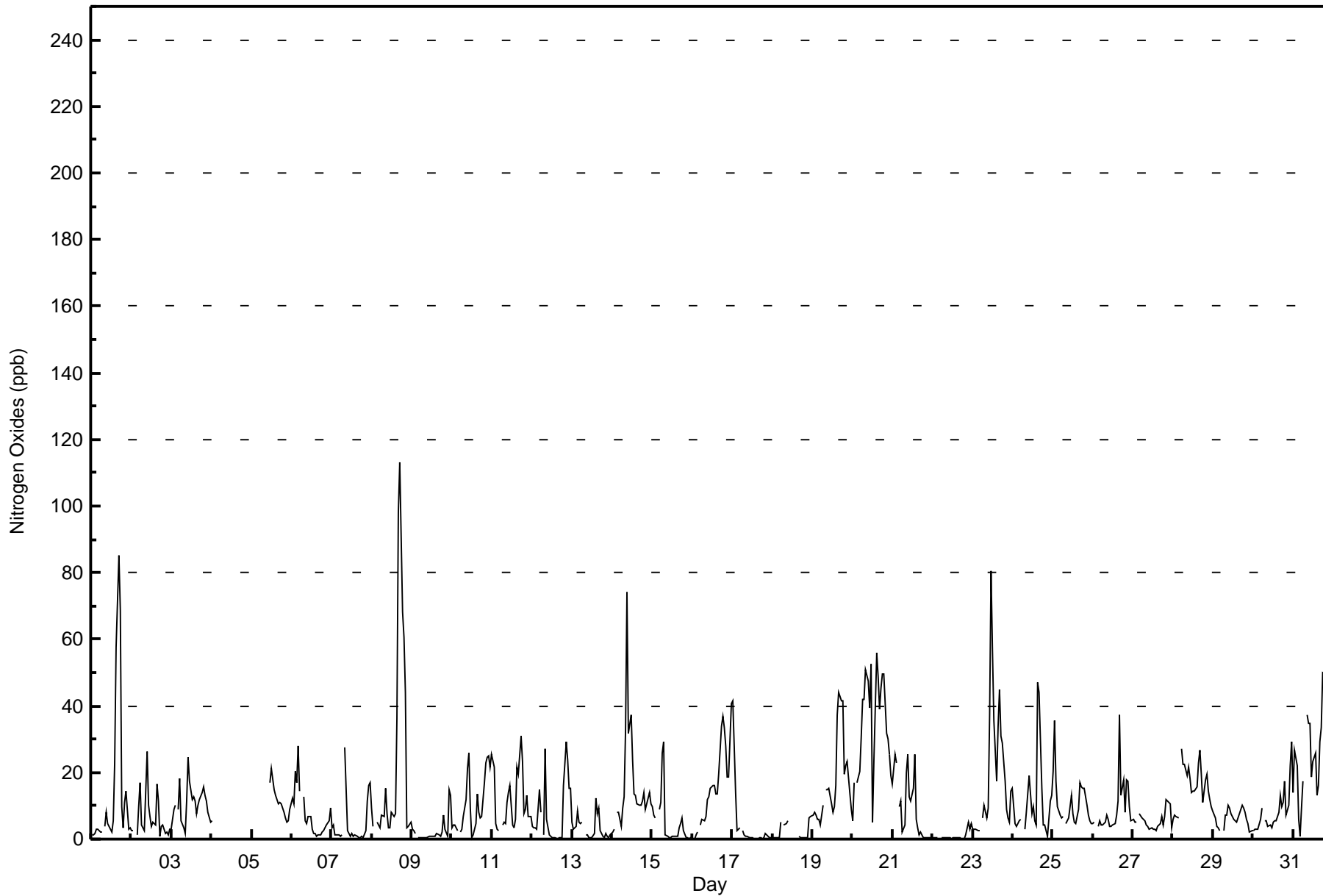
Patricia McInnes - December 2017

Maximum Value: 113 ppb on Dec 8 18:00																			Maximum Daily Average: 34.2 ppb on Dec 20						Hours in Service: 744	
Minimum Value: 0 ppb on Dec 22 18:00																			Minimum Daily Average: 0.9 ppb on Dec 22						Hours of Data: 675	
Maximum Diurnal Average: 20.0 ppb at hour 17																			Minimum Diurnal Average: 5.0 ppb at hour 4						Hours of Missing Data: 69	
Monthly Average: 11.2 ppb																			Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 3 Median = 6 Q <sub>3</sub> = 15 P <sub>90</sub> = 27 P <sub>99</sub> = 67						Hours of Calibration: 35	
																									Percent Operational Time: 95.4	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	2	3	3	2	2	Z	4	8	5	3	2	6	23	57	85	69	10	3	11	15	3	3	13.9	85
2-Dec	3	3	Z	1	10	17	4	3	2	26	10	7	4	5	4	17	12	1	4	4	2	2	1	3	6.3	26
3-Dec	3	9	10	Z	9	18	5	4	2	12	25	18	12	13	11	8	10	12	14	15	13	11	8	5	10.7	25
4-Dec	6	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	6
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	21
6-Dec	12	11	20	17	28	15	Z	13	5	5	7	3	2	2	1	1	1	2	2	3	4	5	9	7.7	28	
7-Dec	3	4	1	1	1	1	1	Z	28	3	2	1	2	1	1	1	0	0	1	0	3	12	16	17	4.3	28
8-Dec	9	4	Z	5	4	3	7	7	15	8	3	3	8	7	7	36	98	113	68	61	44	3	4	5	22.7	113
9-Dec	3	3	2	Z	0	0	0	0	0	1	1	1	1	1	1	2	1	1	2	7	3	1	15	13	2.6	15
10-Dec	3	4	4	2	Z	2	3	7	12	21	26	9	1	1	5	13	8	6	7	17	23	25	25	22	10.7	26
11-Dec	25	22	5	3	2	Z	4	5	5	11	14	16	4	3	6	22	19	31	23	8	9	13	7	7	11.5	31
12-Dec	4	3	3	3	15	8	Z	1	27	6	1	1	0	0	0	0	0	0	0	16	29	24	15	15	7.6	29
13-Dec	5	3	4	9	5	5	5	Z	1	1	0	1	1	2	12	8	9	2	1	0	2	1	0	1	3.4	12
14-Dec	2	3	Z	8	8	4	9	13	33	74	32	37	24	14	13	11	10	10	11	14	9	10	14	10	16.3	74
15-Dec	10	7	7	Z	9	11	26	29	1	1	0	1	1	1	1	3	5	6	2	1	0	0	0	0	5.4	29
16-Dec	0	0	1	2	Z	4	6	6	7	12	13	15	16	16	13	13	19	34	37	34	28	19	18	41	15.4	41
17-Dec	41	28	14	2	3	Z	2	1	1	1	1	0	0	0	0	0	0	0	0	0	2	1	0	0	4.4	41
18-Dec	0	0	0	0	0	5	Z	4	5	6	C	C	C	C	C	C	1	0	0	0	0	0	6	7	--	7
19-Dec	7	8	7	6	6	4	10	Z	15	15	15	11	8	10	16	37	44	41	42	20	22	23	14	9	16.9	44
20-Dec	6	17	Z	17	20	31	42	42	51	47	39	52	5	24	56	49	39	45	50	50	32	30	26	19	34.2	56
21-Dec	16	25	23	Z	10	11	2	4	20	25	13	11	15	25	6	3	1	2	0	0	0	0	0	0	9.5	25
22-Dec	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	5	3	5	5	0.9	5
23-Dec	3	3	3	3	3	Z	6	10	7	9	37	81	57	35	17	34	45	31	29	17	9	6	5	14	20.2	81
24-Dec	15	5	4	5	5	6	Z	3	8	13	19	8	10	6	4	47	44	15	4	4	2	1	12	13	11.0	47
25-Dec	20	36	17	10	7	7	Z	5	6	10	13	8	5	5	9	17	16	15	15	10	7	6	5	5	11.1	36
26-Dec	5	5	Z	4	5	4	4	5	7	6	4	4	4	5	7	12	37	13	18	8	18	18	10	5	9.1	37
27-Dec	6	5	5	Z	8	7	6	5	4	4	3	3	3	3	3	4	5	7	4	7	12	11	10	3	5.6	12
28-Dec	6	7	7	6	Z	27	22	23	19	22	18	14	15	14	16	23	27	20	11	18	20	15	12	10	16.1	27
29-Dec	9	6	4	3	3	Z	2	7	7	10	10	8	6	5	5	6	8	10	9	8	6	5	2	3	6.2	10
30-Dec	2	3	3	3	6	9	Z	5	5	4	4	3	5	5	6	8	13	10	11	18	7	10	22	29	8.4	29
31-Dec	14	27	22	6	1	9	18	Z	37	35	35	18	23	26	13	16	29	33	50	49	109	41	9	6	27.2	109
																			8.0 8.7 7.0 5.0 6.8 8.4 8.2 8.6 11.5 13.5 12.3 12.5 8.9 8.6 9.3 15.5 20.0 18.0 14.7 13.6 14.6 10.6 9.2 9.7						Diurnal Average	
																			41 36 23 17 28 31 42 42 51 74 39 81 57 35 56 57 98 113 68 61 109 41 26 41						Diurnal Maximum	
Z - zerospan			C - Calibration				AF - Analyzer Failure																			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	572	84.74	84.74
21 - 40	70	10.37	95.11
41 - 80	28	4.15	99.26
81 - 159	4	0.59	99.85
> 159	0	0.00	99.85

Total Number of Valid Hours: 675

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Patricia McInnes - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	48	8	1	0	1	3	13	15	37	88	110	49	67	61	26	33	560
21 - 40	6	1	0	0	1	1	9	15	17	6	1	0	0	0	1	6	64
11 - 80	2	0	0	0	0	2	1	15	4	3	0	0	1	0	0	0	28
81 - 159	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	4
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	56	9	1	0	2	6	25	47	58	97	111	49	68	61	27	39	656

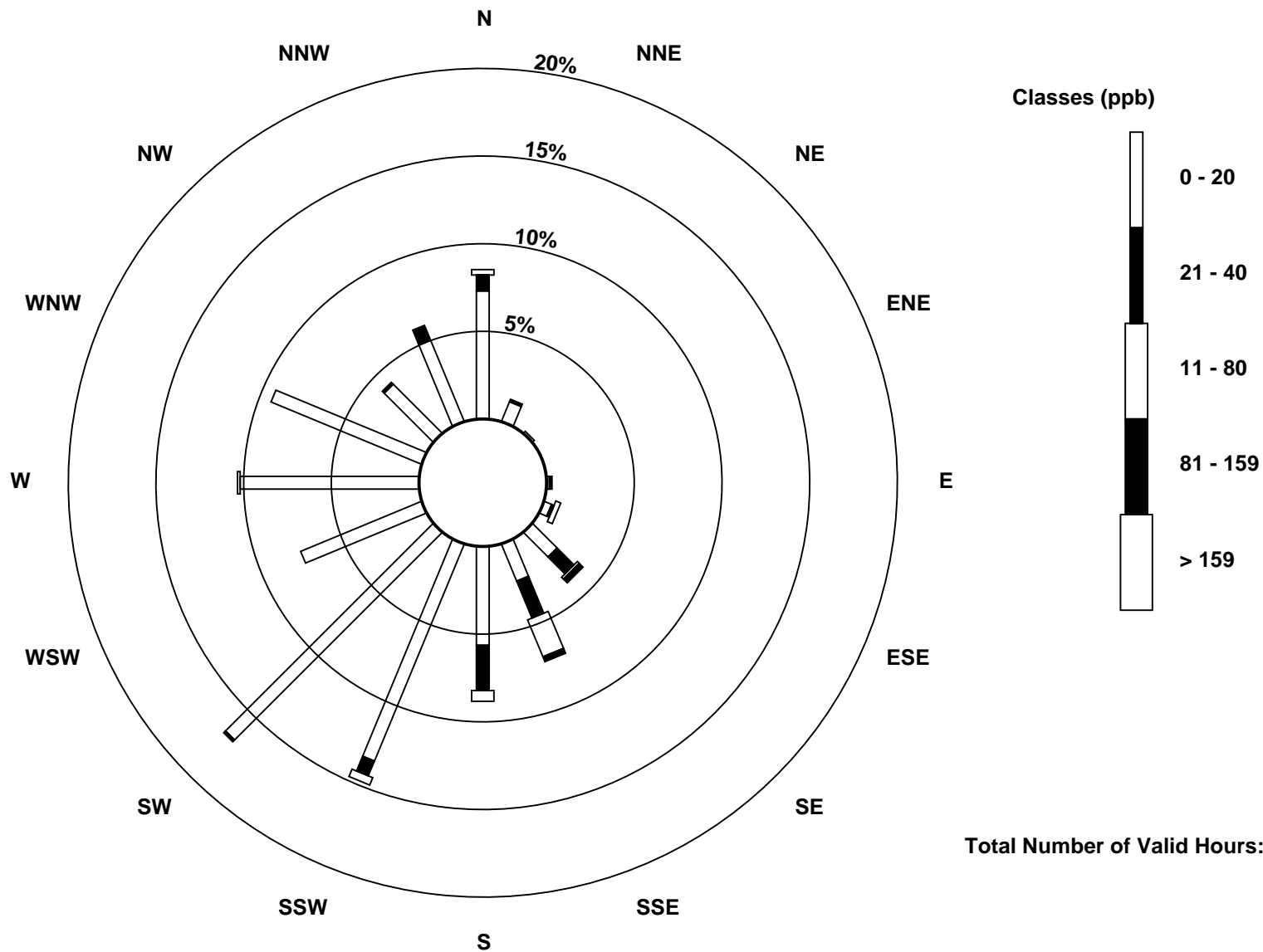
Total Number of Valid Hours: 657

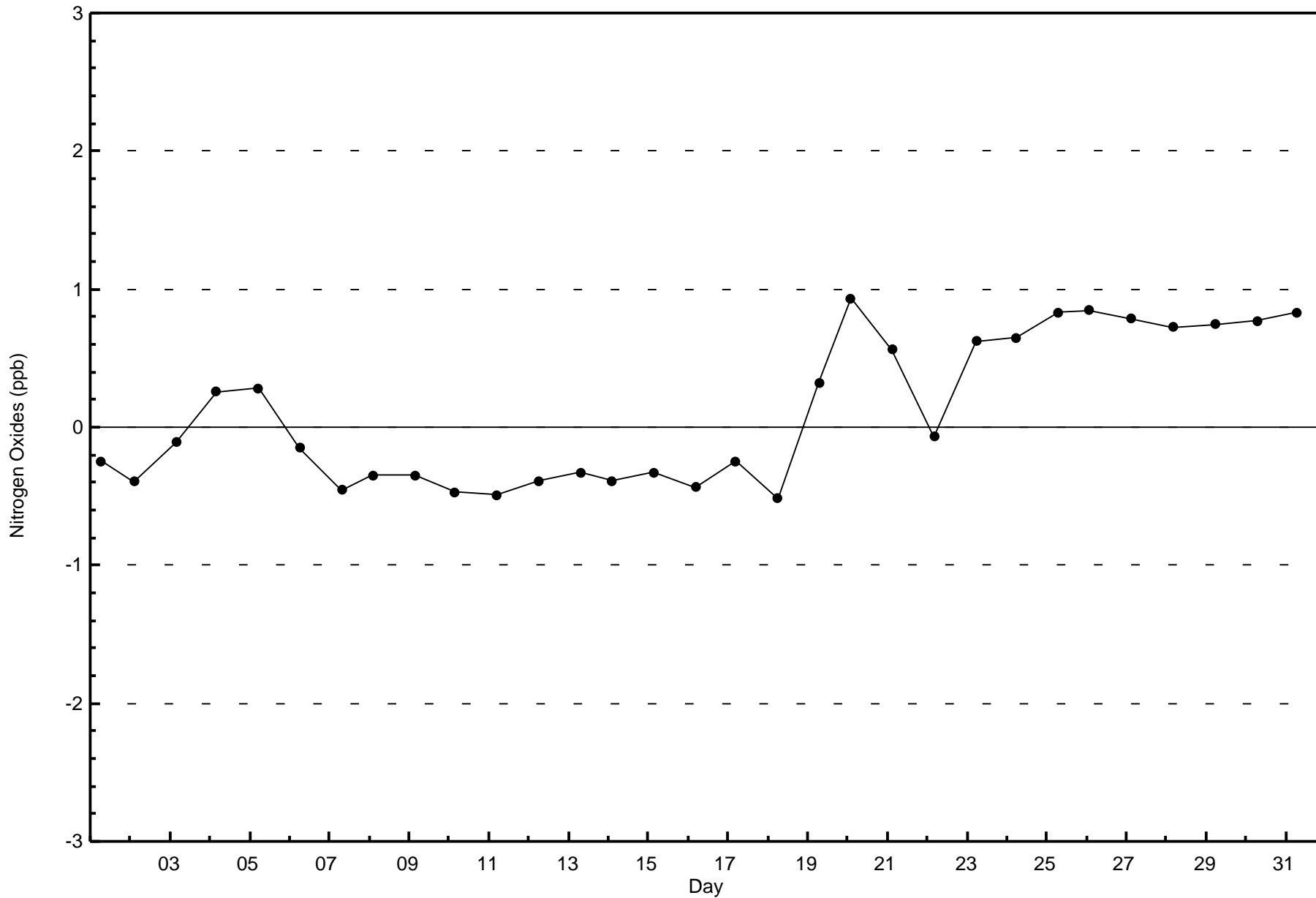
Total Number of Hours: 744



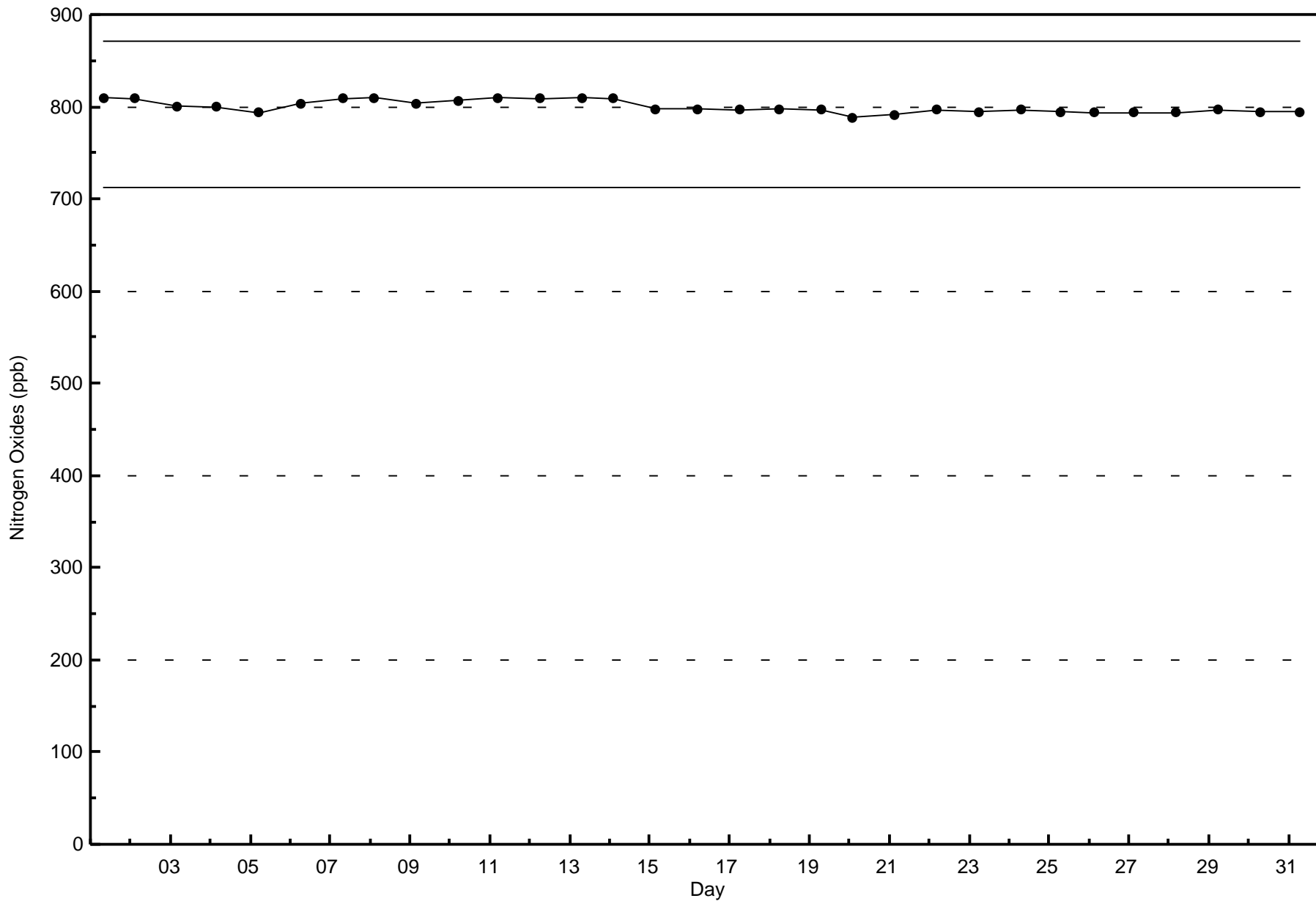
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Patricia McInnes (AMS 6)











Number of Exceedences (AAAQO): 1-hr: 0	Maximum Value: 0 ppb on Dec 1 01:00	Maximum Daily Average: 0.0 ppb on Dec 1	Hours in Service: 744
Minimum Value: 0 ppb on Dec 1 01:00	Maximum Diurnal Average: 0.0 ppb at hour 1	Minimum Daily Average: 0.0 ppb on Dec 1	Hours of Data: 631
Monthly Average: 0.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0	Minimum Diurnal Average: 0.0 ppb at hour 1	Hours of Missing Data: 113
			Hours of Calibration: 39
			Percent Operational Time: 90.1

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

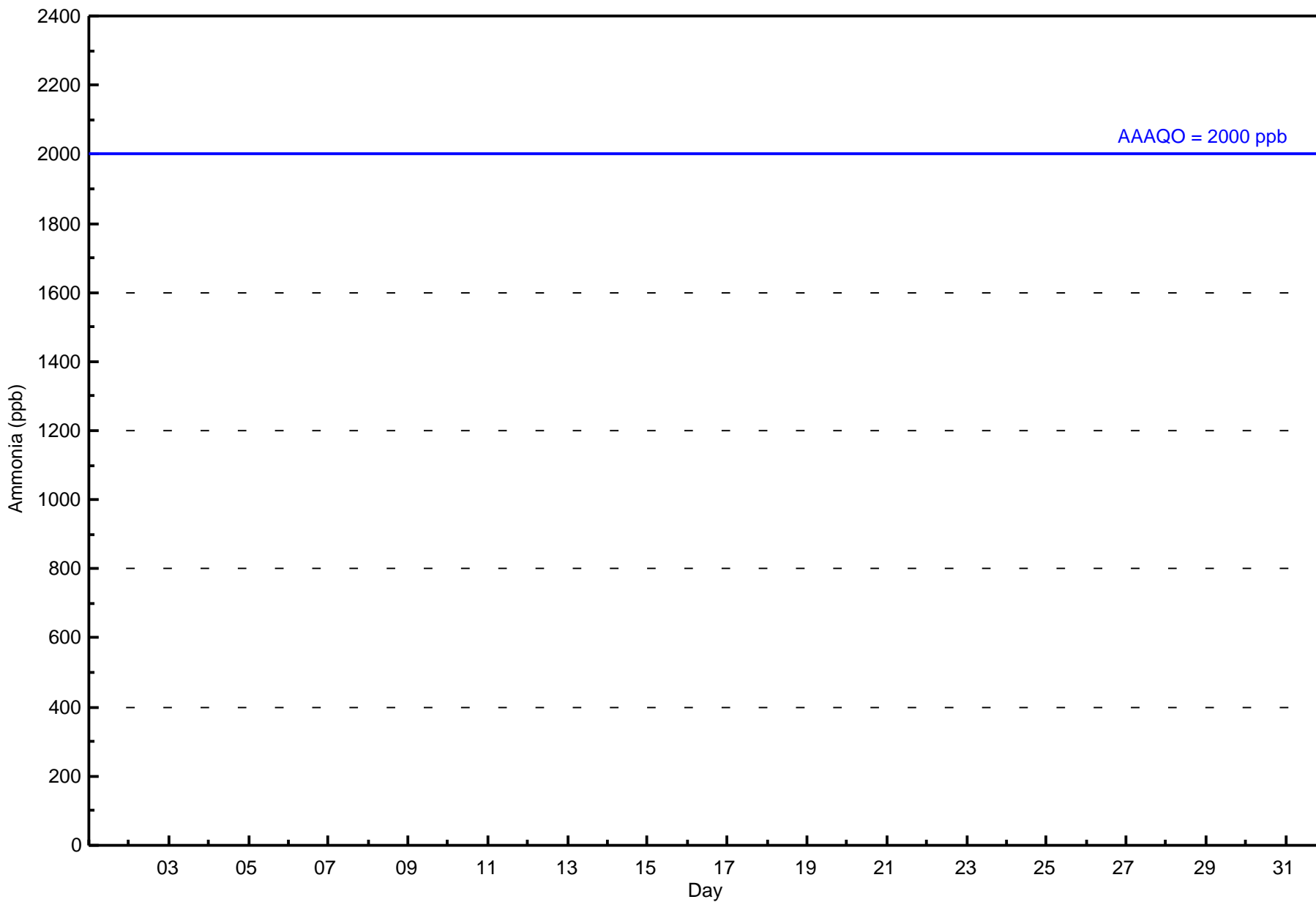
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

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



Wood Buffalo Environmental Association  
Hourly Averages

Ammonia (NH<sub>3</sub>) - ppb  
Patricia McInnes - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	631	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: 631

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb  
Patricia McInnes - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	54	9	1	0	2	4	24	37	55	85	107	43	65	62	30	36	614
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
<b>Totals</b>	54	9	1	0	2	4	24	37	55	85	107	43	65	62	30	36	614

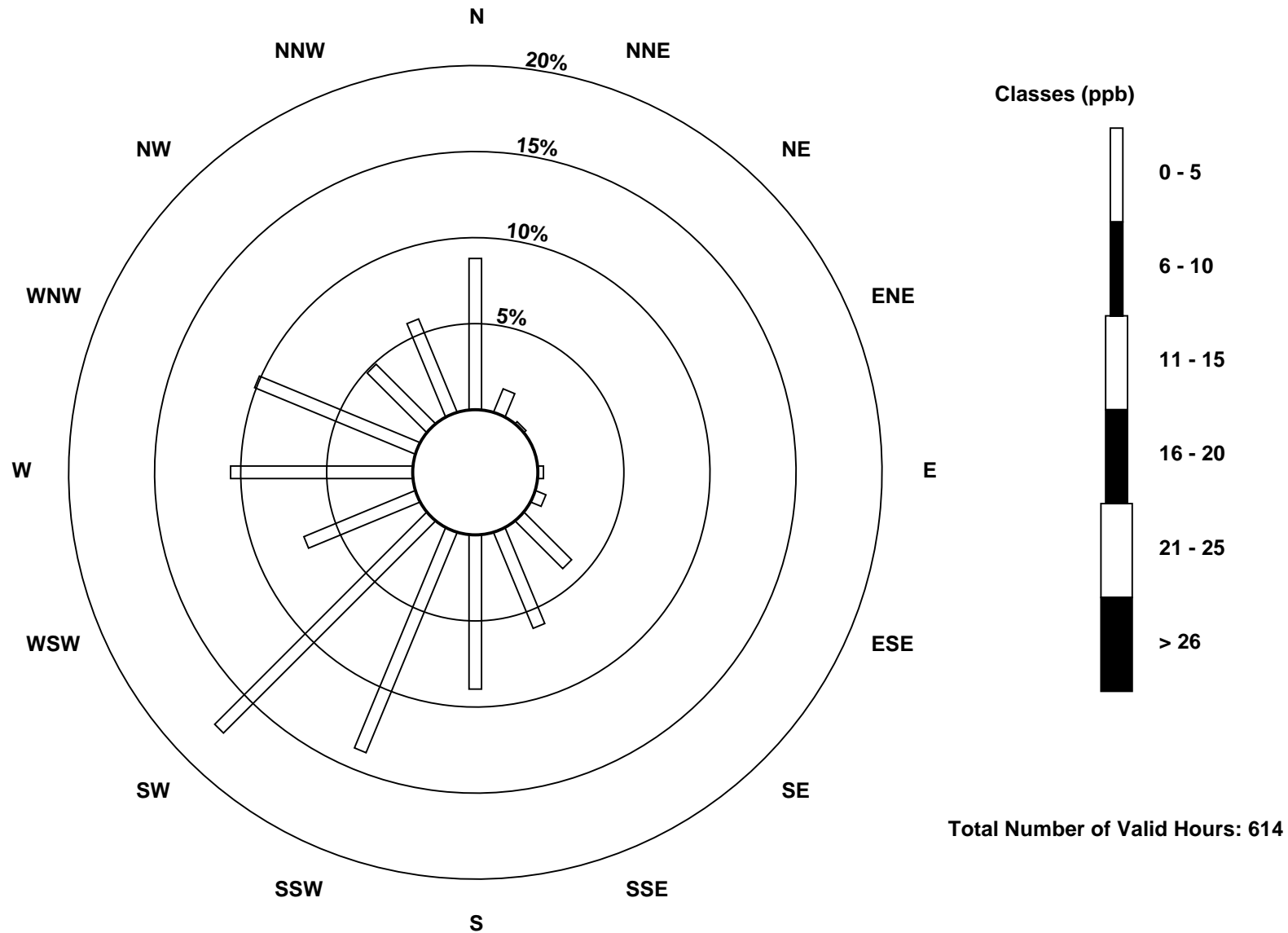
Total Number of Valid Hours: 614

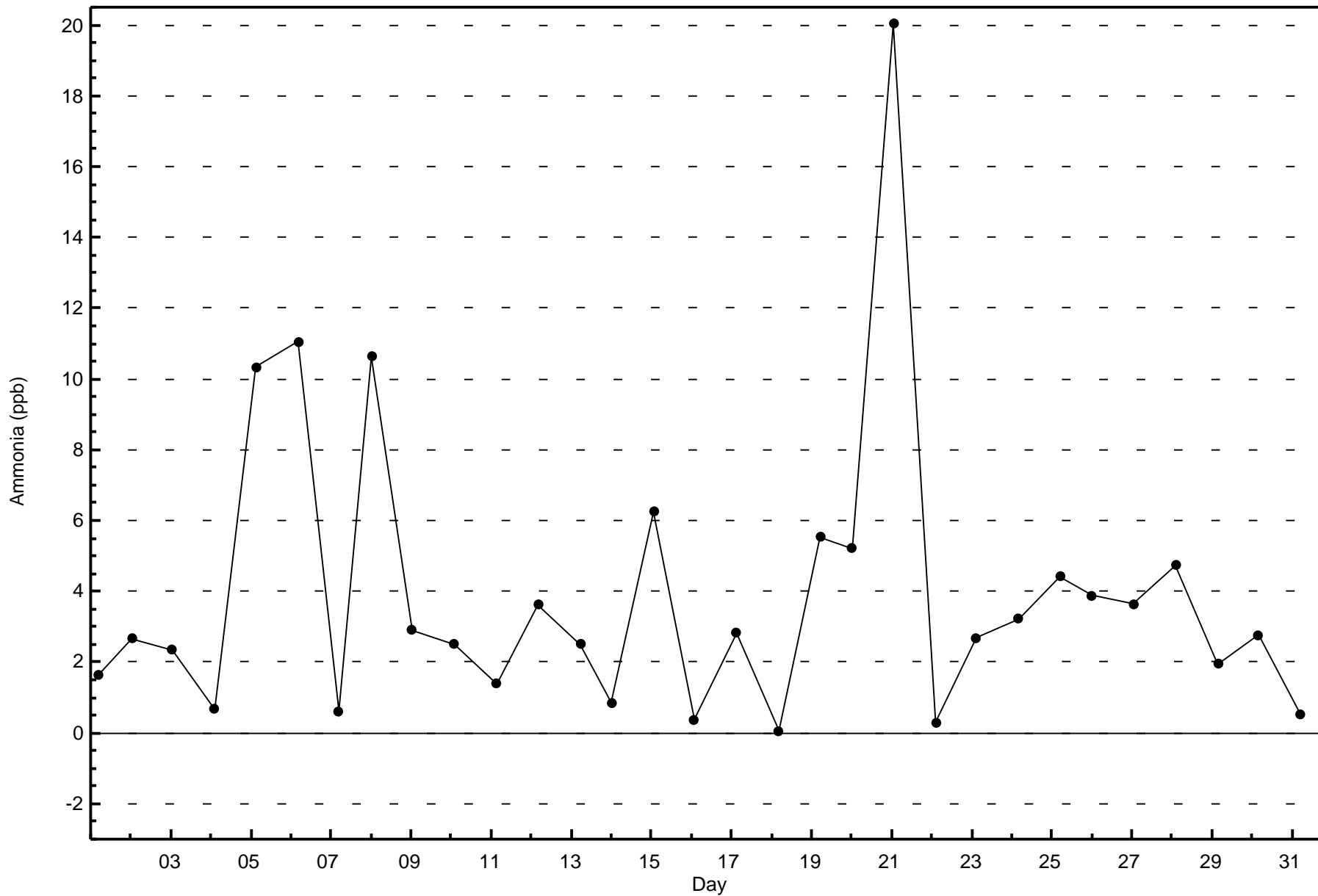
Total Number of Hours: 744

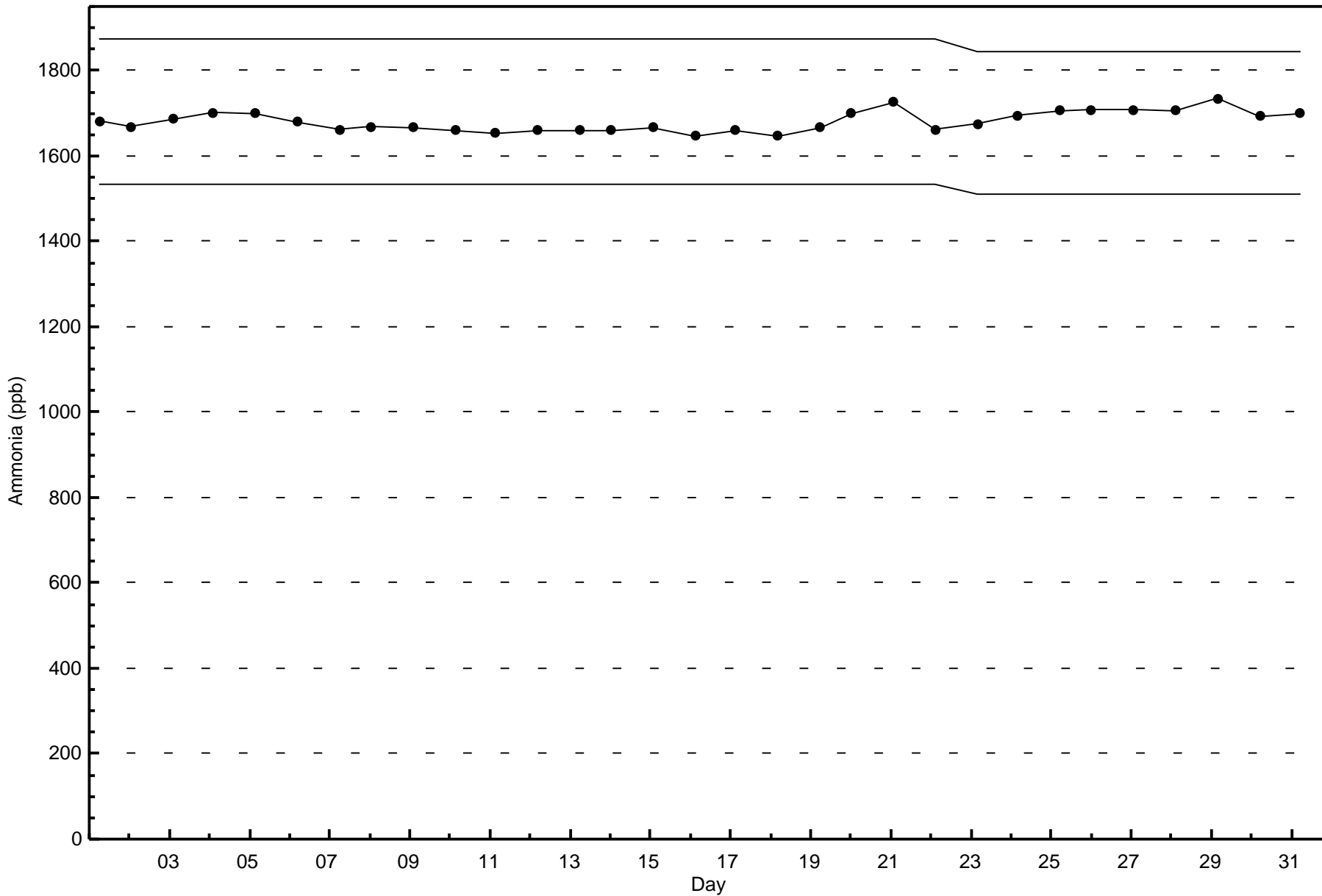


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ammonia (NH<sub>3</sub>) - ppb  
Patricia McInnes (AMS 6)









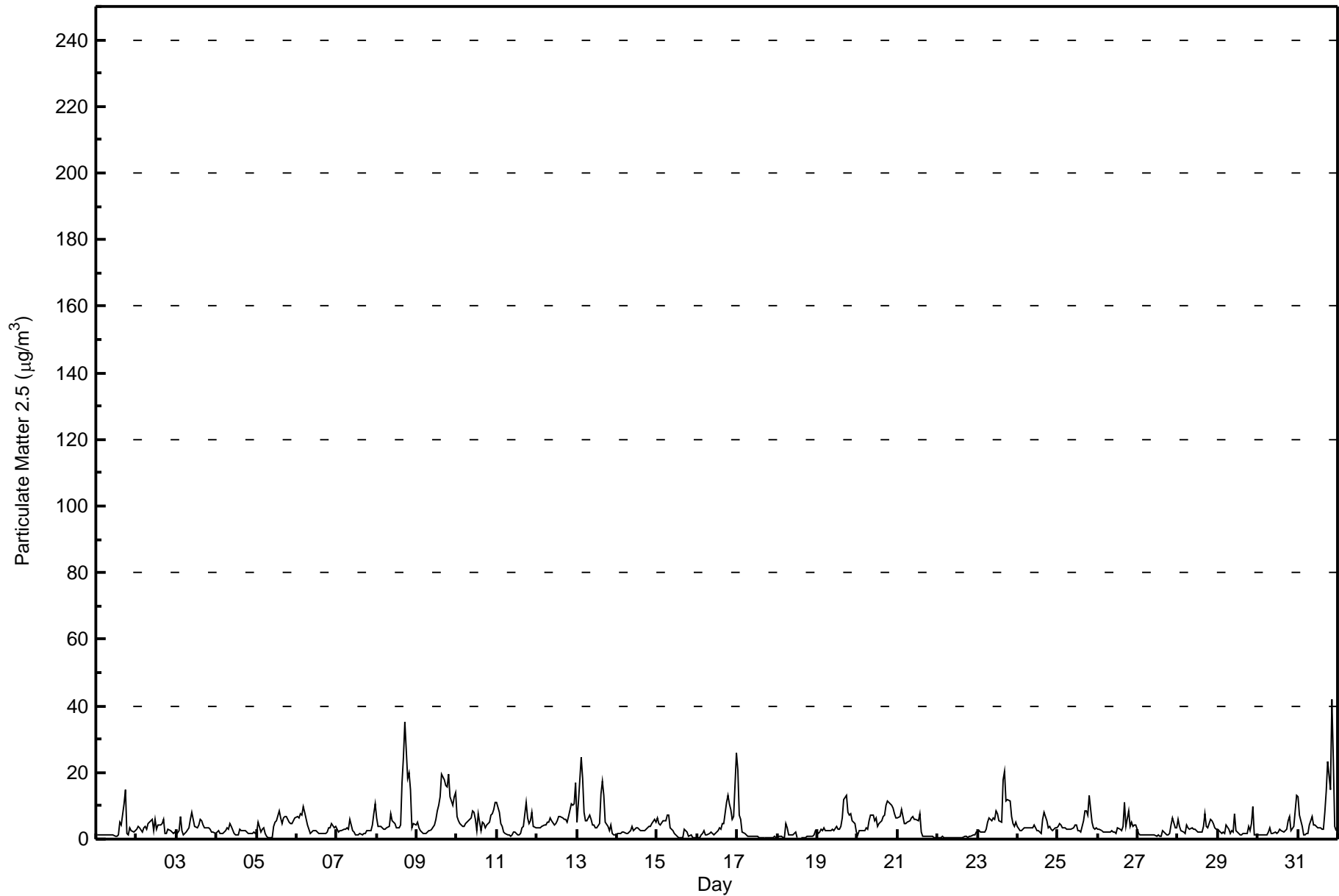


Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																															
Maximum Value: 41.8 µg/m <sup>3</sup> on Dec 31 21:00		Maximum Daily Average: 8.6 µg/m <sup>3</sup> on Dec 9																																															
Minimum Value: 0.3 µg/m <sup>3</sup> on Dec 15 15:00		Hours of Data: 743																																															
Maximum Diurnal Average: 6.7 µg/m <sup>3</sup> at hour 18		Hours of Missing Data: 1																																															
Monthly Average: 4.23 µg/m <sup>3</sup>		Hours of Calibration: 1																																															
Minimum Daily Average: 0.7 µg/m <sup>3</sup> on Dec 22		Percent Operational Time: 100.0																																															
Minimum Diurnal Average: 2.8 µg/m <sup>3</sup> at hour 5		Percentiles: P <sub>1</sub> = 0.4 P <sub>10</sub> = 1.0 Q <sub>1</sub> = 1.8 Median = 3.1 Q <sub>3</sub> = 5.3 P <sub>90</sub> = 8.2 P <sub>99</sub> = 22.8																																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.2	1.1	1.3	1.3	1.0	1.0	1.2	5.0	4.2	10.4	15.0	1.8	1.3	3.3	2.4	2.1	2.6	2.7	15.0																							
2-Dec	3.1	3.9	3.6	2.2	3.3	3.7	3.0	4.5	4.9	5.8	2.5	6.0	3.0	4.3	4.1	4.8	6.0	1.7	1.8	2.8	2.5	2.0	1.7	2.2	3.5	6.0																							
3-Dec	1.4	2.5	7.0	2.5	1.2	1.7	2.2	3.3	5.7	7.9	5.8	3.8	3.6	4.2	5.9	5.3	4.3	3.5	3.4	3.4	3.1	2.3	2.3	1.7	3.7	7.9																							
4-Dec	2.0	2.4	1.6	1.7	1.9	2.5	3.5	3.1	4.5	3.8	1.9	1.4	1.1	1.2	3.0	2.7	2.5	2.3	2.2	1.8	1.6	1.9	2.0	1.9	2.3	4.5																							
5-Dec	2.2	5.1	2.0	3.1	3.5	1.8	1.0	0.6	0.5	0.4	3.7	4.9	5.5	8.4	6.4	4.6	6.3	6.9	6.7	4.9	4.7	4.6	5.5	6.6	4.2	8.4																							
6-Dec	6.9	6.5	7.8	7.2	9.6	8.1	4.4	2.9	1.8	2.2	2.6	2.6	2.0	1.7	1.6	1.6	1.8	2.1	3.3	3.3	4.5	3.3	4.0	3.9	9.6																								
7-Dec	2.8	2.3	2.4	2.7	2.9	3.1	3.3	2.9	5.9	2.4	2.0	1.4	1.3	1.5	1.9	1.4	1.6	1.8	2.4	2.5	2.5	4.1	7.6	10.6	3.1	10.6																							
8-Dec	6.3	3.7	3.6	3.2	2.9	2.9	3.3	3.7	7.5	5.4	5.1	4.5	3.4	3.5	4.2	16.9	24.8	35.2	18.2	19.9	14.9	3.5	4.5	4.4	8.6	35.2																							
9-Dec	5.3	3.6	2.6	2.0	1.8	1.8	2.2	2.5	2.6	3.1	4.4	5.9	8.5	10.2	12.8	19.5	17.6	16.1	15.6	19.7	12.6	10.3	12.7	13.8	8.6	19.7																							
10-Dec	6.8	5.6	4.5	3.9	4.0	4.6	5.0	5.3	6.4	8.3	7.9	5.8	2.7	7.7	2.6	5.2	4.5	3.6	4.3	5.2	7.3	7.7	8.9	11.1	5.8	11.1																							
11-Dec	10.9	8.2	4.5	3.7	2.3	1.8	1.4	1.2	1.1	1.4	2.3	2.1	1.4	1.4	1.5	3.4	3.9	11.2	6.3	4.6	5.5	8.2	3.6	3.6	4.0	11.2																							
12-Dec	3.4	3.4	3.3	3.7	4.1	4.4	5.0	5.1	6.4	5.4	4.2	4.7	5.7	7.0	6.6	6.2	6.0	5.8	5.0	6.6	10.5	10.3	10.6	17.1	6.3	17.1																							
13-Dec	5.1	11.1	24.7	18.3	8.3	5.3	5.4	7.0	5.8	4.4	4.1	3.2	3.3	4.7	13.4	17.2	13.0	5.2	3.8	2.6	4.0	1.7	1.1	1.4	7.2	24.7																							
14-Dec	1.9	1.8	1.8	2.3	2.0	1.9	1.8	1.9	2.7	4.0	2.6	3.2	3.2	3.0	2.5	2.5	2.6	3.1	3.4	3.8	3.7	4.7	5.8	5.0	3.0	5.8																							
15-Dec	6.3	4.6	4.3	5.5	5.3	5.3	7.1	7.2	3.4	2.4	1.7	1.1	0.7	0.4	0.3	0.4	3.0	2.5	2.3	1.0	1.2	0.6	0.5	0.4	2.8	7.2																							
16-Dec	0.6	0.5	1.2	1.7	2.5	1.2	1.2	1.5	2.0	1.8	1.4	1.7	2.5	3.3	2.9	4.5	4.7	10.9	13.3	10.5	9.1	5.9	7.0	25.8	4.9	25.8																							
17-Dec	20.7	7.2	6.1	2.3	1.7	1.3	0.9	0.8	0.8	0.7	0.6	0.8	0.7	0.5	0.6	0.6	0.4	0.4	0.4	0.4	0.5	0.4	0.9	0.6	2.1	20.7																							
18-Dec	0.4	0.9	1.0	0.6	0.4	4.8	3.2	1.2	1.2	1.3	1.9	1.9	0.5	C	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.8	1.5	2.7	1.3	4.8																							
19-Dec	1.5	2.0	2.8	2.6	3.4	2.7	2.5	2.3	2.6	2.9	2.5	3.8	3.1	3.0	3.8	6.2	11.7	13.1	8.2	7.0	7.5	5.5	4.5	2.0	4.5	13.1																							
20-Dec	1.4	2.6	2.7	2.5	2.4	3.2	2.8	5.5	7.2	7.2	5.6	6.4	3.7	4.5	5.4	6.6	7.4	10.4	11.4	11.0	10.2	9.2	7.7	6.2	6.0	11.4																							
21-Dec	6.5	6.6	8.9	6.6	4.5	4.6	5.1	5.6	6.5	6.6	5.8	5.7	5.3	7.8	2.1	1.0	0.9	0.9	0.7	0.7	0.7	0.7	0.6	0.6	4.0	8.9																							
22-Dec	0.6	0.6	0.6	0.7	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.7	0.7	1.3	1.4	2.1	0.7	2.1																							
23-Dec	2.0	2.5	2.2	2.2	2.3	2.9	4.9	6.2	5.3	6.4	5.8	8.6	7.6	5.7	5.2	17.9	20.5	11.6	11.8	11.6	6.8	4.5	3.8	4.9	6.8	20.5																							
24-Dec	3.6	2.5	2.5	2.9	3.4	3.3	3.2	3.3	3.4	3.6	4.2	2.7	2.7	2.0	1.9	5.8	8.2	5.4	3.3	3.6	2.8	2.4	3.6	3.5	3.5	8.2																							
25-Dec	3.8	4.7	4.1	3.4	3.2	3.0	2.9	3.0	2.8	3.3	4.3	4.2	2.6	2.5	2.3	5.5	8.3	8.6	7.0	13.1	5.1	3.4	2.8	3.4	4.5	13.1																							
26-Dec	3.0	2.8	2.3	2.2	2.3	2.3	2.0	2.0	2.6	2.1	2.2	1.6	3.5	2.9	2.5	4.0	10.9	3.8	8.3	4.0	5.2	3.9	4.4	4.1	3.5	10.9																							
27-Dec	1.5	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.4	1.1	1.1	1.0	1.1	1.0	1.0	2.4	1.9	1.4	1.3	1.6	4.1	6.3	3.5	3.4	1.8	6.3																							
28-Dec	5.9	3.6	2.7	2.3	1.8	4.1	3.2	2.8	3.4	3.2	3.1	2.7	2.0	2.2	2.3	3.8	7.6	3.8	3.6	6.0	5.5	4.7	3.4	3.0	3.6	7.6																							
29-Dec	2.9	2.1	1.8	2.0	1.7	4.2	2.8	1.8	2.5	2.1	7.6	2.7	1.7	1.4	1.3	1.5	1.8	1.8	4.0	2.6	4.7	9.8	1.3	1.4	2.8	9.8																							
30-Dec	1.2	1.3	1.2	1.2	1.2	1.2	2.1	3.2	1.5	1.7	2.3	1.6	2.1	2.8	2.6	2.2	2.6	3.2	5.4	6.8	2.7	3.7	8.3	13.1	3.1	13.1																							
31-Dec	12.5	7.3	3.8	1.5	1.3	1.7	1.8	4.1	6.6	4.4	4.3	3.7	3.4	3.5	2.9	3.1	8.0	14.6	23.4	14.8	41.8	24.0	3.7	2.4	8.3	41.8																							
																								4.3	3.7	3.9	3.2	2.8	3.0	2.9	3.1	3.6	3.5	3.4	3.3	2.9	3.5	3.5	5.2	6.6	6.7	5.9	5.8	6.1	5.0	4.2	5.3	Diurnal Average	
																								20.7	11.1	24.7	18.3	9.6	8.1	7.1	7.2	7.5	8.3	7.9	8.6	8.5	10.2	13.4	19.5	24.8	35.2	23.4	19.9	41.8	24.0	12.7	25.8	Diurnal Maximum	
C - Calibration																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Patricia McInnes - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	498	67.03	67.03
6 - 15	147	19.78	86.81
16 - 25	18	2.42	89.23
26 - 80	3	0.40	89.64
> 81.0	0	0.00	89.64

Total Number of Valid Hours: 743

Total Number of Hours: 744



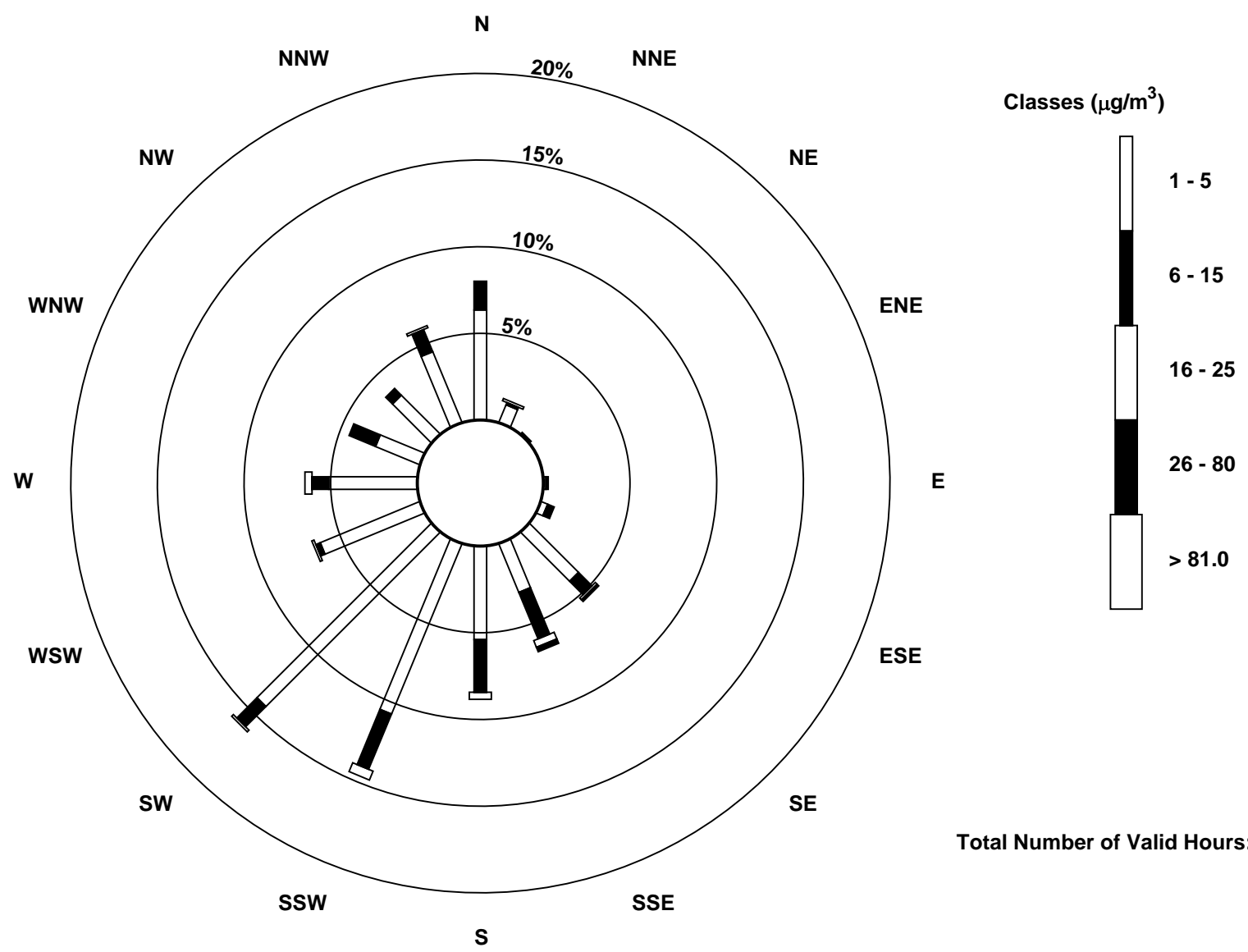
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Patricia McInnes - December 2017**

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	46	8	0	0	1	3	29	22	39	77	103	45	37	20	23	32	485
6 - 15	12	1	1	0	1	3	8	21	22	25	12	2	7	12	4	10	141
16 - 25	0	1	0	0	0	0	1	3	3	4	1	1	3	0	0	1	18
26 - 80	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	58	10	1	0	2	6	39	48	64	106	116	48	47	32	27	43	647

Total Number of Valid Hours: 724

Total Number of Hours: 744



Total Number of Valid Hours: 724



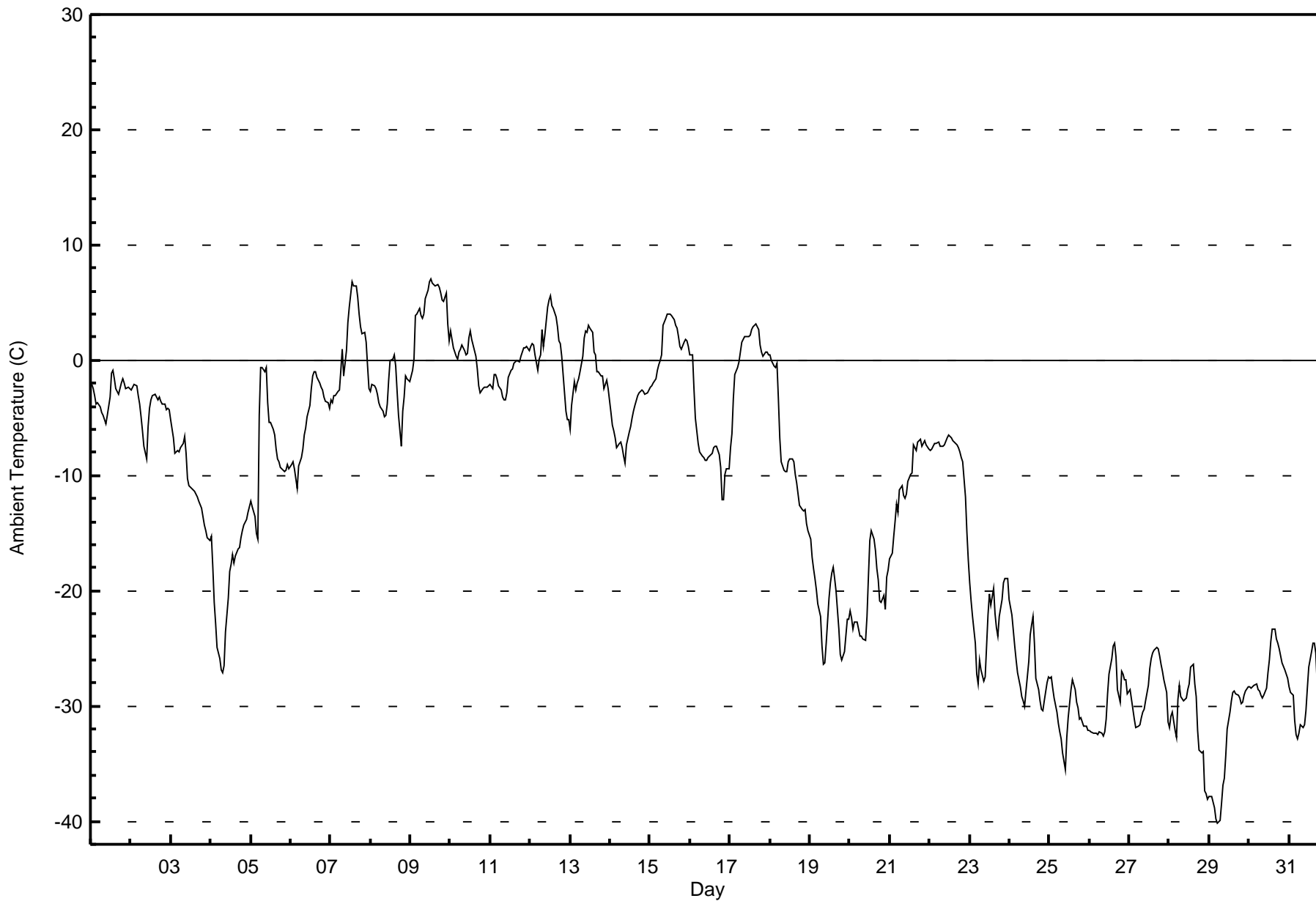
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**Patricia McInnes - December 2017**

Maximum Value: 7.0 C on Dec 9 13:00		Maximum Daily Average: 4.4 C on Dec 9		Hours in Service: 744																							
Minimum Value: -40.1 C on Dec 29 06:00		Minimum Daily Average: -33.4 C on Dec 29		Hours of Data: 744																							
Maximum Diurnal Average: -9.9 C at hour 15		Minimum Diurnal Average: -13.9 C at hour 5		Hours of Missing Data: 0																							
Monthly Average: -12.42 C		Percentiles: P <sub>1</sub> = -37.9 P <sub>10</sub> = -29.7 Q <sub>1</sub> = -25.1 Median = -8.3 Q <sub>3</sub> = -2.0 P <sub>90</sub> = 1.6 P <sub>99</sub> = 6.3		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-2.1	-2.4	-3.1	-3.8	-3.7	-4.1	-4.6	-4.8	-5.2	-5.5	-4.8	-3.1	-1.1	-0.8	-1.6	-2.4	-3.0	-2.5	-2.0	-1.6	-2.0	-2.5	-2.3	-2.5	-3.0	-0.8	
2-Dec	-2.6	-2.3	-2.1	-2.2	-3.0	-3.8	-4.9	-6.2	-7.5	-8.6	-5.7	-4.2	-3.5	-3.1	-2.9	-3.1	-3.5	-3.2	-3.6	-3.8	-3.8	-4.3	-4.2	-4.3	-4.0	-2.1	
3-Dec	-5.2	-6.7	-8.0	-7.9	-7.8	-7.9	-7.6	-7.2	-6.7	-8.1	-10.2	-10.8	-11.2	-11.3	-11.4	-11.6	-11.8	-12.2	-12.8	-13.6	-14.3	-14.7	-15.4	-15.6	-10.4	-5.2	
4-Dec	-15.3	-18.0	-21.0	-22.8	-24.9	-25.8	-26.9	-27.1	-26.6	-23.6	-20.6	-18.3	-17.7	-16.9	-17.5	-16.9	-16.4	-16.2	-15.4	-14.8	-14.3	-13.8	-13.2	-12.8	-19.0	-12.8	
5-Dec	-12.2	-12.7	-13.5	-15.0	-15.6	-4.7	-0.6	-0.6	-1.0	-0.6	-3.6	-5.4	-5.4	-6.0	-6.5	-7.7	-8.5	-8.9	-9.2	-9.5	-9.6	-9.5	-9.1	-9.4	-7.7	-0.6	
6-Dec	-9.1	-8.9	-9.5	-10.2	-11.1	-9.2	-8.4	-7.7	-6.4	-5.9	-4.9	-3.9	-2.5	-1.3	-1.0	-0.9	-1.4	-2.0	-2.3	-2.6	-3.2	-3.6	-3.7	-4.2	-5.2	-0.9	
7-Dec	-3.4	-3.7	-3.1	-3.0	-2.6	-2.6	-0.8	0.9	-1.3	0.9	3.3	4.6	5.8	6.8	6.4	6.4	5.5	4.0	2.9	2.4	2.4	1.6	-0.5	-2.4	1.3	6.8	
8-Dec	-2.7	-2.2	-2.3	-2.4	-3.0	-3.6	-4.1	-4.4	-4.9	-4.8	-3.8	-1.7	0.0	0.1	0.5	-0.5	-2.7	-4.7	-7.5	-4.4	-3.3	-1.3	-1.7	-1.9	-2.8	0.5	
9-Dec	-1.4	-0.9	0.1	3.9	4.0	4.5	3.8	3.6	4.0	5.4	6.1	6.8	7.0	6.7	6.6	6.4	6.5	6.3	5.8	5.2	5.1	5.9	3.2	1.7	4.4	7.0	
10-Dec	2.5	1.8	1.1	0.3	0.1	0.7	1.0	1.3	0.8	0.4	0.6	2.0	2.5	1.8	0.8	0.3	-0.7	-2.2	-2.8	-2.5	-2.4	-2.3	-2.4	-2.2	0.0	2.5	
11-Dec	-2.1	-2.5	-1.3	-1.2	-1.7	-2.2	-2.6	-3.2	-3.5	-3.4	-2.8	-1.4	-0.9	-0.7	-0.2	-0.1	-0.1	-0.2	0.3	0.7	1.1	1.1	1.2	0.8	-1.0	1.2	
12-Dec	1.2	1.5	1.4	0.5	-0.8	0.0	0.5	2.6	1.3	2.2	4.6	5.2	5.6	4.8	4.5	3.8	2.9	1.7	1.4	0.4	-2.8	-4.4	-5.1	-5.1	1.1	5.6	
13-Dec	-6.1	-3.9	-1.9	-2.5	-2.0	-1.6	-0.9	0.3	2.0	2.5	2.5	3.0	2.8	2.4	0.7	0.5	-1.0	-1.0	-1.4	-1.4	-2.4	-2.0	-1.8	-2.5	-0.7	3.0	
14-Dec	-4.6	-5.6	-6.1	-6.8	-7.6	-7.2	-7.1	-7.5	-8.3	-8.9	-7.3	-6.2	-5.8	-5.0	-4.4	-3.9	-3.1	-2.8	-2.7	-2.6	-2.7	-3.0	-2.8	-2.6	-5.2	-2.6	
15-Dec	-2.4	-2.2	-2.0	-1.6	-0.8	-0.3	0.0	0.5	3.1	3.6	4.0	4.0	4.1	3.8	3.5	3.1	2.8	2.1	1.1	1.0	1.5	1.8	1.6	1.2	1.4	4.1	
16-Dec	0.5	0.4	-2.4	-5.0	-6.1	-7.2	-7.9	-8.4	-8.4	-8.7	-8.7	-8.5	-8.2	-8.0	-7.6	-7.5	-7.4	-8.2	-9.2	-12.1	-12.0	-9.9	-9.4	-9.4	-7.5	0.5	
17-Dec	-7.6	-6.4	-3.3	-1.2	-0.6	-0.2	0.7	1.6	1.8	2.0	2.1	2.0	2.2	2.7	2.9	3.2	3.0	2.6	1.3	0.7	0.4	0.8	0.7	0.5	0.5	3.2	
18-Dec	0.4	-0.1	-0.5	-0.6	-0.3	-3.3	-6.7	-8.8	-9.6	-9.7	-9.6	-8.9	-8.6	-8.6	-8.8	-9.9	-10.7	-11.6	-12.6	-13.0	-13.1	-13.0	-14.1	-14.8	-8.2	0.4	
19-Dec	-15.6	-17.1	-18.1	-19.0	-19.9	-21.2	-22.3	-24.8	-26.3	-26.3	-24.5	-20.6	-19.3	-18.4	-18.0	-19.0	-20.0	-23.4	-25.6	-26.0	-25.6	-25.3	-22.5	-22.5	-21.7	-15.6	
20-Dec	-21.7	-22.4	-23.3	-22.7	-22.7	-23.3	-23.9	-24.0	-24.2	-24.3	-22.3	-18.9	-15.6	-14.8	-15.6	-16.5	-18.1	-19.1	-20.8	-21.0	-20.4	-21.7	-18.8	-18.2	-20.6	-14.8	
21-Dec	-17.2	-16.8	-15.2	-13.9	-12.5	-13.2	-11.2	-10.9	-11.8	-12.0	-11.6	-10.6	-9.9	-9.8	-7.3	-7.6	-7.8	-7.1	-6.9	-7.5	-7.2	-7.0	-7.3	-7.7	-10.4	-6.9	
22-Dec	-7.9	-7.7	-7.5	-7.3	-7.3	-7.1	-7.4	-7.4	-7.5	-7.3	-6.8	-6.5	-6.6	-6.7	-7.0	-7.1	-7.4	-7.6	-8.0	-8.4	-8.8	-11.9	-14.9	-17.3	-8.3	-6.5	
23-Dec	-19.3	-20.9	-22.2	-24.5	-27.2	-28.1	-26.0	-26.8	-27.9	-27.4	-24.8	-22.1	-20.2	-21.2	-19.8	-22.0	-23.3	-24.0	-22.3	-20.8	-19.3	-18.9	-18.9	-18.9	-22.8	-18.9	
24-Dec	-20.8	-22.1	-23.4	-24.9	-26.0	-27.1	-28.3	-29.2	-29.5	-30.1	-28.8	-26.2	-23.9	-23.0	-22.2	-24.5	-27.6	-28.6	-29.6	-30.3	-30.4	-29.5	-28.0	-27.5	-26.7	-20.8	
25-Dec	-27.6	-27.5	-28.5	-29.3	-30.6	-31.6	-32.2	-32.8	-34.1	-35.5	-32.8	-31.0	-29.7	-28.6	-27.8	-28.6	-29.7	-30.2	-31.1	-31.1	-31.7	-31.7	-31.8	-32.2	-30.7	-27.5	
26-Dec	-32.1	-32.3	-32.3	-32.3	-32.4	-32.5	-32.2	-32.3	-32.5	-32.3	-31.2	-28.9	-27.2	-25.8	-24.8	-24.6	-25.8	-28.6	-29.7	-27.0	-27.3	-27.8	-27.8	-28.9	-29.5	-24.6	
27-Dec	-28.6	-29.4	-30.3	-31.2	-31.9	-31.7	-31.7	-31.1	-30.5	-30.2	-29.6	-28.2	-26.7	-25.9	-25.4	-25.2	-25.0	-25.0	-25.7	-26.4	-27.0	-27.7	-28.8	-31.3	-28.5	-25.0	
28-Dec	-31.9	-30.8	-30.5	-32.1	-32.8	-29.4	-28.2	-29.2	-29.6	-29.4	-29.3	-28.6	-28.1	-26.7	-26.4	-28.1	-29.2	-32.1	-33.8	-34.1	-34.0	-37.3	-37.7	-38.1	-31.1	-26.4	
29-Dec	-37.9	-37.8	-38.3	-38.8	-39.8	-40.1	-39.9	-38.5	-36.9	-36.3	-34.3	-32.0	-30.5	-29.5	-28.9	-28.7	-28.9	-29.0	-29.3	-29.8	-29.6	-29.0	-28.7	-28.4	-33.4	-28.4	
30-Dec	-28.3	-28.5	-28.3	-28.2	-28.1	-28.6	-28.8	-29.0	-29.2	-29.1	-28.5	-27.2	-26.0	-24.5	-23.3	-23.3	-24.2	-24.6	-25.1	-25.7	-26.2	-26.9	-27.3	-27.6	-26.9	-23.3	
31-Dec	-28.3	-28.8	-29.0	-31.3	-32.5	-32.8	-32.4	-31.7	-31.9	-31.6	-30.4	-28.4	-26.6	-25.3	-24.5	-24.5	-25.4	-28.2	-28.5	-29.9	-27.5	-25.3	-23.9	-23.5	-28.4	-23.5	
		-12.5	-12.8	-13.0	-13.5	-13.9	-13.7	-13.6	-13.6	-13.8	-13.6	-12.7	-11.4	-10.5	-10.1	-9.9	-10.3	-11.0	-11.8	-12.4	-12.6	-12.6	-12.7	-12.8	-13.1	Diurnal Average	
		2.5	1.8	1.4	3.9	4.0	4.5	3.8	3.6	4.0	5.4	6.1	6.8	7.0	6.8	6.6	6.4	6.5	6.3	5.8	5.2	5.1	5.9	3.2	1.7	Diurnal Maximum	





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Patricia McInnes - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	248	33.33	33.33
-20 - 0	369	49.60	82.93
0 - 10	127	17.07	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

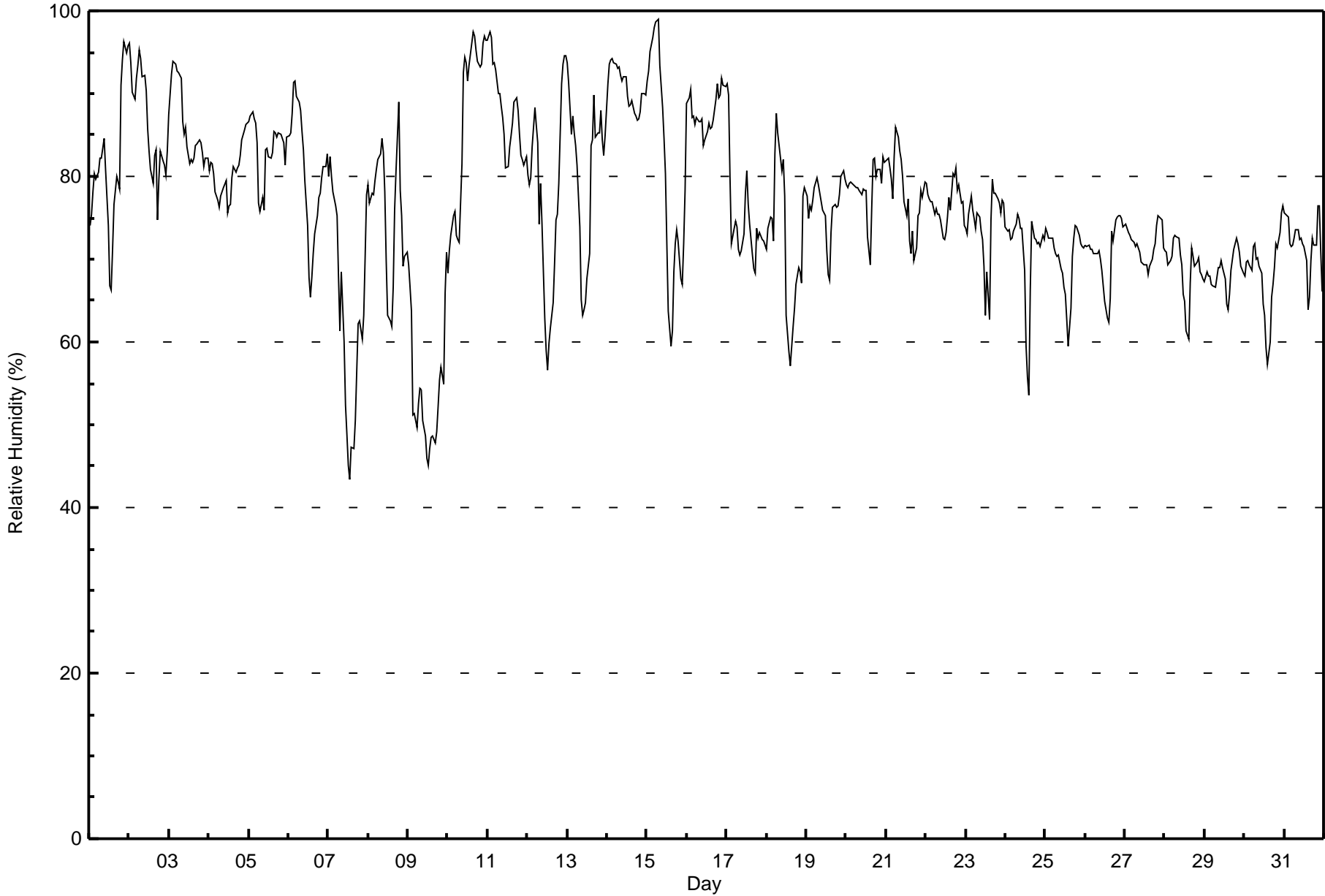
**Patricia McInnes - December 2017**

Maximum Value: 99 % on Dec 15 08:00      Maximum Daily Average: 90.7 % on Dec 14																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 43 % on Dec 7 14:00      Minimum Daily Average: 54.2 % on Dec 9 Maximum Diurnal Average: 80.1 % at hour 2      Minimum Diurnal Average: 69.3 % at hour 15 Monthly Average: 76.6 %      Percentiles: P <sub>1</sub> = 48 P <sub>10</sub> = 65 Q <sub>1</sub> = 71 Median = 76 O <sub>3</sub> = 83 P <sub>90</sub> = 91 P <sub>99</sub> = 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-Dec	74	75	78	80	80	80	82	82	83	85	81	74	67	66	71	77	80	79	78	91	94	96	95	96	81.1	96
2-Dec	96	94	90	89	92	93	95	94	92	92	90	86	83	81	79	83	83	75	80	83	82	81	80	83	86.6	96
3-Dec	87	92	94	94	93	93	93	92	87	85	86	84	82	82	82	84	84	84	84	84	83	81	82	82	86.3	94
4-Dec	81	82	82	80	78	77	76	78	78	79	79	76	77	77	80	81	80	81	81	83	84	86	86	86	80.3	86
5-Dec	87	87	88	87	86	84	77	76	77	76	83	83	82	82	83	85	85	85	85	85	84	84	81	85	83.3	88
6-Dec	85	85	88	91	91	90	89	88	85	83	80	74	68	66	68	71	73	75	78	78	80	81	81	83	80.4	91
7-Dec	80	82	80	78	76	75	68	61	69	60	52	49	45	43	47	47	50	56	62	63	60	63	70	78	63.2	82
8-Dec	79	77	78	78	79	81	82	83	85	83	78	70	63	63	62	67	76	81	89	78	75	69	70	71	75.6	89
9-Dec	69	67	64	51	51	50	53	54	54	50	49	46	45	47	48	49	48	49	52	55	57	55	66	71	54.2	71
10-Dec	68	71	73	75	76	73	72	72	81	93	94	94	92	93	96	97	97	95	94	93	94	96	97	96	86.8	97
11-Dec	97	97	97	94	94	93	90	90	88	87	85	81	81	84	85	87	89	90	88	85	83	82	81	82	87.9	97
12-Dec	80	79	80	84	88	86	84	74	79	74	63	59	57	60	62	65	70	75	75	79	91	94	95	95	76.9	95
13-Dec	94	91	85	87	85	84	81	74	65	63	64	65	68	71	84	84	90	85	85	85	88	84	82	85	80.4	94
14-Dec	91	94	94	94	94	94	93	93	92	92	92	90	89	89	88	87	87	87	87	87	88	90	90	90	90.7	94
15-Dec	92	93	95	97	98	99	99	99	93	88	85	80	72	64	59	61	68	72	74	72	68	67	72	78	81.0	99
16-Dec	89	89	90	87	87	86	87	87	87	87	84	84	85	86	86	86	87	89	91	90	90	92	91	91	87.9	92
17-Dec	91	90	80	72	74	75	74	71	71	71	73	78	81	77	74	71	69	68	74	72	73	72	72	72	74.8	91
18-Dec	71	74	75	75	72	83	88	85	82	81	82	78	63	59	57	60	62	64	67	69	68	67	78	79	72.4	88
19-Dec	78	75	77	76	77	79	80	79	78	77	76	75	71	68	67	73	76	77	76	77	78	80	81	80	76.2	81
20-Dec	79	79	79	79	79	79	79	79	78	78	78	78	78	73	69	76	82	82	80	81	81	79	82	82	78.7	82
21-Dec	82	82	81	80	77	82	86	85	83	82	80	77	75	77	72	71	73	70	71	75	76	78	77	79	78.0	86
22-Dec	79	78	77	77	77	75	76	75	75	75	73	72	73	75	77	76	80	80	81	78	79	77	77	74	76.6	81
23-Dec	74	73	75	78	76	75	74	76	75	73	72	69	63	69	63	75	80	78	78	77	77	76	77	77	74.1	80
24-Dec	74	73	74	72	72	73	74	75	75	74	74	69	60	56	53	66	75	73	72	72	72	72	73	72	70.6	75
25-Dec	74	73	73	73	72	71	71	70	71	69	68	67	66	63	60	64	70	73	74	74	73	72	71	71	70.1	74
26-Dec	72	72	72	71	71	71	71	71	71	70	69	67	65	63	62	65	73	72	75	75	75	75	75	74	70.7	75
27-Dec	74	74	73	73	72	72	72	72	71	71	70	69	69	69	68	69	70	71	72	74	75	75	75	71	71.8	75
28-Dec	71	71	69	70	70	73	73	73	73	71	69	66	65	61	60	67	71	70	69	70	70	68	68	68	69.0	73
29-Dec	67	68	68	68	67	67	67	68	69	69	70	69	68	65	64	66	69	71	72	73	72	71	69	68	68.5	73
30-Dec	68	70	70	69	69	72	72	70	70	69	68	65	63	59	57	60	65	67	69	72	71	73	76	76	68.4	76
31-Dec	76	75	75	72	71	72	73	74	74	72	73	72	72	70	64	65	70	73	72	72	76	76	71	66	71.9	76
79.9 80.1 79.8 79.1 79.0 79.2 79.0 78.0 77.8 76.7 75.5 73.1 70.6 69.5 69.3 72.1 75.3 75.7 77.0 77.5 78.0 77.9 78.8 79.4																	Diurnal Average									
97 97 97 97 98 99 99 99 99 93 93 94 94 92 93 96 97 97 95 94 93 94 96 97 96																	Diurnal Maximum									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Patricia McInnes - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

Wind Speed (WS) - km/h

Patricia McInnes - December 2017

Maximum Speed: 29 km/h on Dec 9 07:00		Maximum Daily Speed Average: 15.2 km/h on Dec 22		Hours in Service: 744																																												
Minimum Speed Value: 0 km/h on Dec 10 11:00		Minimum Daily Speed Average: 1.1 km/h on Dec 19		Hours of Data: 725																																												
Maximum Diurnal Speed Average: 6.4 km/h at hour 7		Minimum Diurnal Speed Average: 3.7 km/h at hour 24		Hours of Missing Data: 19																																												
Monthly Average Velocity: 5.0 km/h 257.2 deg		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 8 Q <sub>3</sub> = 12 P <sub>90</sub> = 17 P <sub>99</sub> = 24		Percent Operational Time: 97.5																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	WSW18	WSW18	SW14	SSW9	SW12	WSW15	WSW16	SW9	SW11	SW9	SW8	SW10	SW11	SW8	S4	SE5	SSE5	S6	SSW9	SW11	S6	SSW6	SW7	SW7	SW9.1	WSW18																						
2-Dec	SW7	WSW6	WNW6	WNW5	NNW2	N1	W4	W4	WNW3	SSW2	SW6	SW5	SW8	SW7	WSW6	SSW5	SW6	WSW11	WSW8	WSW9	WSW10	SW9	WSW4	SW5	WSW5.2	WSW11																						
3-Dec	SW9	SW7	SSW8	SW7	SW6	S7	SW7	WSW8	WNW13	NNW16	N14	NNW14	N13	N9	N9	N10	N10	N10	N9	N8	N8	N6	NW5	NW5	NNW5.1	NNW16																						
4-Dec	N6	NNW5	NW5	NW6	W3	WSW3	WSW2	SSW4	SSW5	SSW5	SSW6	S5	S8	S7	SE7	SE8	SE13	SE12	SE13	SE13	SE14	SE14	SE14	SE11	SSE5.1	SE14																						
5-Dec	SE8	S7	S5	SE4	SE4	WNW17	WNW22	NW23	NW17	NW17	NNE12	N13	NNW11	N14	NNW12	NNE13	N12	N11	N11	N11	NNW8	NW6	WNW2	SSW4	NNW7.2	NW23																						
6-Dec	S6	S7	S7	SSW7	SSW5	SW11	SW10	S9	SSW11	SSW12	SSW9	SSW12	SW10	WSW14	WSW16	WSW19	WSW17	WSW16	WSW17	WSW15	SW13	SW12	SW10	SW7	SW10.5	WSW19																						
7-Dec	SW10	SW10	WSW18	WSW14	WSW19	WSW18	W14	W11	SW5	W12	WNW14	WNW14	WNW14	W21	W20	W10	W14	W13	W12	W9	WNW10	N6	W3	SSW5	W11.3	W21																						
8-Dec	SSW7	SW10	SSW9	SSW9	SW12	SW12	SW9	SW8	SSW9	SSW8	SW11	SW9	SSW6	SSW8	SSW9	S8	SE7	SSE6	SSE4	S10	SSW10	SW17	SSW12	SSW10	SSW8.4	SW17																						
9-Dec	SSW11	SW10	SW13	W20	W23	W26	WSW29	W28	W24	W24	W25	W18	WNW11	W12	W12	W16	W20	W17	WSW13	SW8	WNW8	WNW14	NE5	SW7	W15.1	WSW29																						
10-Dec	SW8	SW11	SSW9	SSW12	SW12	SW14	SW12	SSW7	SE6	E3	NNW0	W12	NW22	NW19	NNW14	NNW11	AF	AF	AF	AF	AF	AF	AF	AF	---	NW22																						
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	S6	SSW7	SSW8	SSW8	SSE6	SSE8	SSE7	SSW8	SSW8	S9	S9	SSW10	SSW7	---	SSW10																						
12-Dec	SW10	SW8	SW13	SSW10	SSE8	SSW12	SSW10	W15	SSE3	WSW8	W17	WNW15	NW15	NW15	WNW21	NW21	WNW19	WNW13	WNW11	WNW2	S3	S4	SSE2	SSW1	W7.4	WNW21																						
13-Dec	SW6	SW9	SSW9	SSW7	SSW8	SSW9	SW10	WSW15	W20	WNW18	WNW21	NW23	NW23	NW20	N14	NNW10	WNW7	WNW10	WNW11	W9	WSW11	WNW12	WNW9	NW7	WNW9.7	NW23																						
14-Dec	NNW4	WSW2	SW4	S4	SW7	SW11	SW9	SW8	S4	SSE5	SSE6	SSE5	SE7	SE8	SSE8	SE10	ESE10	SE8	SE8	SE6	S5	S3	S5	SE5	S4.6	SW11																						
15-Dec	SE3	SSE7	SSE7	SSE5	SSE6	SE6	SSW5	W13	W15	W19	W16	WNW14	WNW15	W14	W11	SW11	SW10	SW10	WSW12	W15	WNW17	W18	W19	WSW8.7	W19																							
16-Dec	W17	W17	NNW18	N21	N18	N16	NNE13	N8	N6	NNE7	E5	ESE4	SSE6	S6	SE5	SSE5	SSE5	SE4	S5	S4	S4	SSW5	SSW6	SSE7	NNW1.8	N21																						
17-Dec	SSE5	SE6	SSW9	SSW11	SSW11	SSW10	SW16	WSW17	WSW17	WSW17	WSW17	W20	W22	W22	W22	W24	W23	W23	WNW19	WNW17	W6	W15	W17	W18	WSW13.9	W24																						
18-Dec	WNW16	W14	W14	W14	W18	NNW19	N17	N18	N16	NNW9	NW7	NW14	NW25	NW24	NW23	NW22	NW18	NW18	NW14	WNW17	WNW18	WNW18	NNE14	N11	NW14.2	NW25																						
19-Dec	NNE13	NNE11	N8	N9	NNW8	NNW8	NW7	WNW6	W3	SW4	SW3	SSW6	S7	S7	SSE5	SE6	SSE5	S4	SSW4	SSW4	S5	S5	SSW7	S7	WSW1.1	NNE13																						
20-Dec	SW9	SE5	SE6	S6	S8	S8	SSE8	SSE8	SSE7	SSE7	S6	SSE5	SSW10	SSE7	ESE6	ESE6	SE6	SSE5	SSE4	SSE5	SSE4	SSE3	S6	SSW5	SSE5.7	SSW10																						
21-Dec	S5	SSE4	NW1	NNW2	NNW3	WNW3	NW9	NNW9	NNE9	NNW6	WNW4	NNW4	N3	SSE2	NW15	WNW12	W11	WNW15	WNW18	WNW16	WNW16	NW15	NW16	WNW12	WNW7.2	WNW18																						
22-Dec	WNW14	WNW14	WNW15	WNW16	WNW17	WNW19	WNW16	WNW16	W16	W18	WNW19	WNW21	WNW18	WNW17	WNW16	WNW17	WNW16	WNW15	WNW16	WNW16	NNW17	N22	N23	NNW17	WNW15.2	N23																						
23-Dec	NNW14	NNW11	NNW7	W3	WSW2	SW2	W1	NNW3	NNW4	ESE2	ESE1	NNW4	N5	N7	NW4	NNE6	SSW4	SSW6	SSW6	SSW6	WSW11	WSW10	WSW7	N11	WNW2.7	NNW14																						
24-Dec	N21	N19	N19	N19	N14	N9	NW7	NW8	NW8	WNW7	W5	WSW3	WSW1	SW3	WN5	N2	W2	WSW2	SSW2	SSW3	SW5	WSW4	N4	NNW4	NNW5.3	N21																						
25-Dec	N8	N9	NNW9	N11	NNW9	NNW9	NNW9	NNW7	NW5	WSW3	WSW4	WSW5	WSW8	WSW8	WSW5	SW6	SW7	SW7	SW7	SW8	SW11	SW12	SW12	SSW10	W4.7	SW12																						
26-Dec	SSW8	SSW8	SSW9	SSW11	SSW9	SW9	SW9	SSW8	SSW9	SW10	SW11	SSW8	S8	S8	S7	SSW6	S5	S5	SSW5	SSW8	S3	S4	SSW5	SW5	SSW7.3	SSW11																						
27-Dec	SW7	SW6	SW7	SW6	SW5	SW8	SW8	SW7	SW12	SW10	SW10	SW12	SW14	SW14	SW11	SW10	SW9	SW8	WSW10	SW8	SW6	SSW5	SSW4	SE3	SW8.1	SW14																						
28-Dec	SE1	S1	WSW1	W1	NNW3	N8	NNW16	NNW14	NNW12	NNW9	N9	N7	NNE6	N4	N5	N6	N7	NW4	W3	N7	NNW6	NW4	W3	WNW6	NNW5.3	NNW16																						
29-Dec	W2	NW5	NNW4	N4	W2	SW3	SW4	SW5	SW7	SW6	SSW5	SSW7	S8	S8	S10	SSW8	SW7	SSW6	SW8	SSW9	SSW7	SSW9	SW12	SSW8	SSW5.2	SW12																						
30-Dec	SSW11	SSW9	SSW9	SSW11	SSW8	SSW7	SSW10	SW9	SW11	SW12	SW12	SW10	S7	S7	SSE6	S7	SSW6	SW8	SSW7	S8	SSW10	S7	S7	SSE5	SSW8.2	SW12																						
31-Dec	S6	S5	S6	S3	SW2	S3	S4	S6	SSE5	SE4	SE6	SE6	SSE5	SE5	SSE8	SSE7	SSE5	SSE4	SSE4	SSE4	SE9	S10	S12	SSW12	SSE5.6	SSW12																						
WSW4.2																								WSW4.3	WSW4.5	WSW4.2	WSW4.9	WSW5.7	W6.4	W6.3	W5.7	W5.8	W6.1	W5.9	W5.9	W5.5	W5.1	W4.1	WSW4.3	WSW4.9	WSW5.2	WSW5.2	WSW4.9	WSW4.9	WSW3.9	WSW3.7	Diurnal Average	
N21																								N19	N19	N21	W23	W26	WSW29	W28	W24	W24	W25	NW23	NW25	NW24	NW23	W24	W23	W23	WNW19	WNW17	WNW18	N22	N23	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**

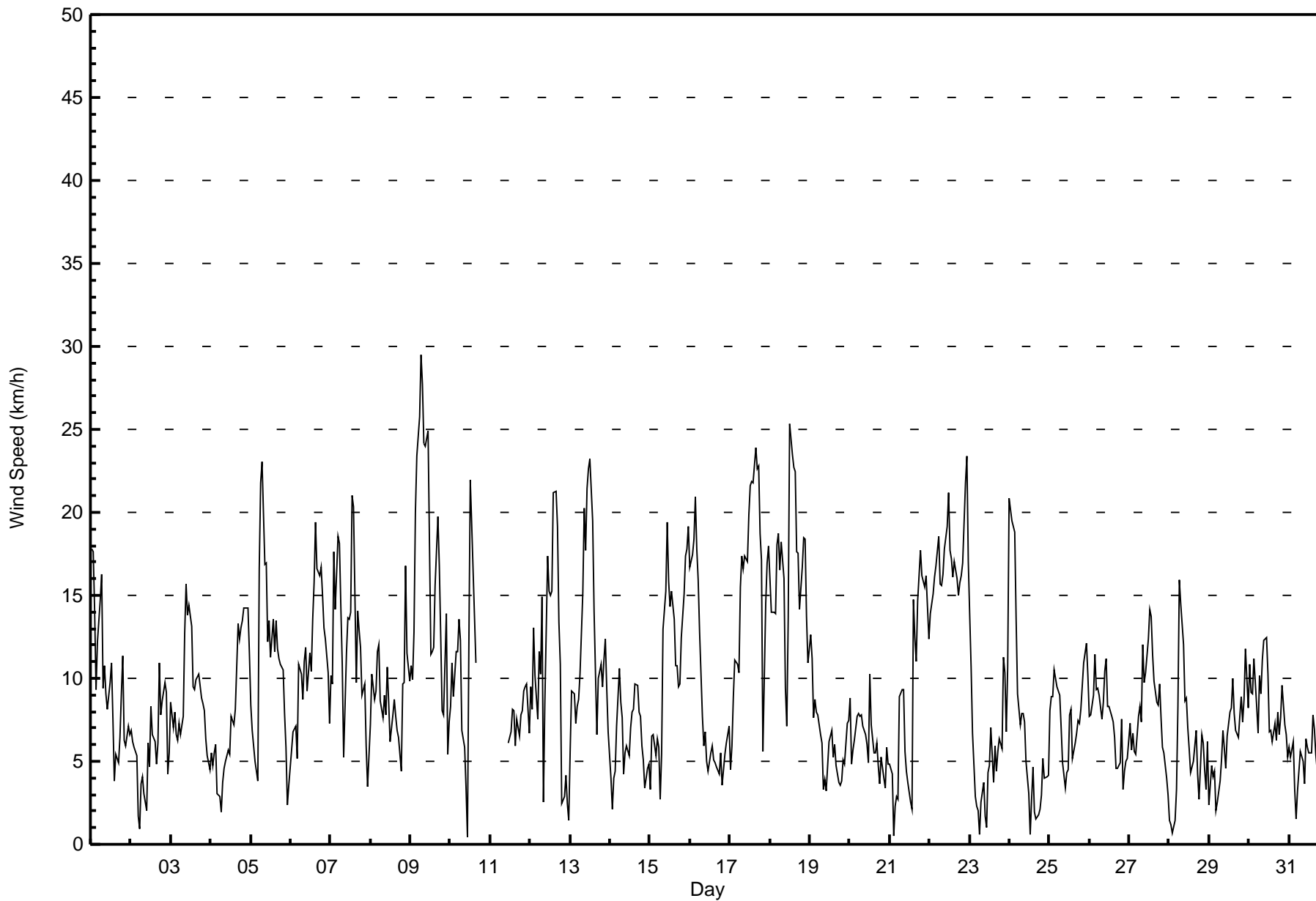
**Wind Speed (WS) - km/h**  
**Patricia McInnes - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 10 12:00 Minimum Value: 0 km/h on Dec 29 05:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 725 Hours of Missing Data: 19 Hours of Calibration: 0 Percent Operational Time: 97.5																														
Day	Hourly Period Ending At (MST)																								Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	3	3	2	2	2	4	3	2	2	3	2	2	2	3	1	1	1	2	2	2	1	1	2	2	4																						
2-Dec	2	1	2	1	1	1	1	2	2	2	1	1	1	2	2	1	3	2	1	2	2	1	3	1	3																						
3-Dec	1	1	1	2	1	1	1	1	2	3	2	3	2	2	2	2	2	2	2	2	1	2	1	1	3																						
4-Dec	2	1	1	1	1	1	1	1	1	2	1	1	1	1	2	2	3	3	3	3	3	3	3	3	3																						
5-Dec	2	2	3	2	1	7	4	5	4	4	3	3	3	2	2	2	2	2	2	2	2	2	1	1	7																						
6-Dec	1	1	1	1	1	2	3	2	3	3	2	2	3	3	3	3	3	3	3	3	2	3	4	2	4																						
7-Dec	2	2	4	5	3	3	5	3	2	4	3	3	4	4	4	3	3	2	3	2	4	5	1	2	5																						
8-Dec	2	2	2	2	2	2	4	3	3	2	3	2	2	2	1	1	1	2	3	2	2	3	4	2	4																						
9-Dec	2	2	3	5	3	4	4	4	4	5	5	5	4	4	4	4	4	3	3	2	4	5	3	2	5																						
10-Dec	3	1	2	2	3	3	3	3	2	2	2	8	6	5	3	2	AF	AF	AF	AF	AF	AF	AF	AF	8																						
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2	1	2	2	1	1	1	2	1	1	1	2	2	2																						
12-Dec	2	2	2	3	3	3	4	4	2	2	4	3	4	4	4	4	3	2	3	2	1	1	1	1	4																						
13-Dec	2	3	2	2	2	2	2	3	6	4	5	5	4	4	3	3	2	2	2	2	2	2	3	6																							
14-Dec	1	1	1	1	1	2	2	2	1	1	1	1	1	2	2	2	3	2	2	1	2	1	1	1	3																						
15-Dec	1	2	2	1	1	1	1	2	3	3	4	3	4	4	3	3	3	3	2	3	2	4	4	4	4																						
16-Dec	3	3	4	4	4	4	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	4																						
17-Dec	2	1	3	2	2	2	3	3	3	3	3	4	4	5	4	5	4	4	4	4	4	3	5	3	5																						
18-Dec	3	2	2	2	4	4	3	3	3	2	1	7	5	5	5	6	4	4	3	3	4	3	3	2	7																						
19-Dec	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2																						
20-Dec	2	1	1	2	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	2	1	1	2	1	2																						
21-Dec	1	1	1	1	1	2	1	2	2	1	1	1	1	1	6	2	2	3	3	3	4	4	4	3	6																						
22-Dec	2	3	3	4	3	4	3	3	3	3	4	4	4	4	3	3	3	3	3	3	4	5	5	4	5																						
23-Dec	2	2	1	1	1	1	1	1	1	1	1	1	3	2	2	2	2	1	2	2	2	2	1	6	6																						
24-Dec	5	5	4	4	3	2	1	1	1	1	1	2	1	2	2	2	2	1	1	1	1	1	1	1	5																						
25-Dec	1	2	2	2	1	1	2	1	1	1	1	1	2	2	1	1	1	1	1	2	2	2	2	2	2																						
26-Dec	2	2	4	3	3	2	2	2	2	2	2	2	1	1	1	2	1	1	2	2	1	1	1	1	4																						
27-Dec	2	1	1	1	1	1	2	2	2	2	2	3	2	2	2	2	1	2	2	2	1	2	1	1	3																						
28-Dec	1	1	1	1	1	3	2	2	2	2	2	1	1	1	1	1	2	1	1	2	2	1	1	1	3																						
29-Dec	1	1	1	1	0	1	1	1	1	1	1	1	2	2	2	2	2	1	2	2	2	2	3	2	3																						
30-Dec	2	2	2	2	2	1	3	3	3	2	2	2	2	1	2	1	1	2	2	2	2	1	1	1	3																						
31-Dec	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	2	1	1	1	1	1	2	3	3																						
Diurnal Maximum																								5	5	4	5	4	7	5	5	6	5	5	8	6	5	6	6	4	4	4	4	4	5	5	6
AF - Analyzer Failure																																															



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Patricia McInnes - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Patricia McInnes - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	174	24.00	24.00
6 - 11	337	46.48	70.48
12 - 19	177	24.41	94.90
20 - 28	36	4.97	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 725

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Patricia McInnes - December 2017**

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	0	1	0	2	3	13	27	26	22	15	14	14	6	10	13	174
6 - 11	31	5	0	0	0	3	19	21	37	78	82	15	7	12	9	18	337
12 - 19	15	5	0	0	0	0	7	0	1	6	22	22	32	43	12	12	177
20 - 28	4	0	0	0	0	0	0	0	0	0	0	0	18	5	8	1	36
29 - 38	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	58	10	1	0	2	6	39	48	64	106	119	52	71	66	39	44	725

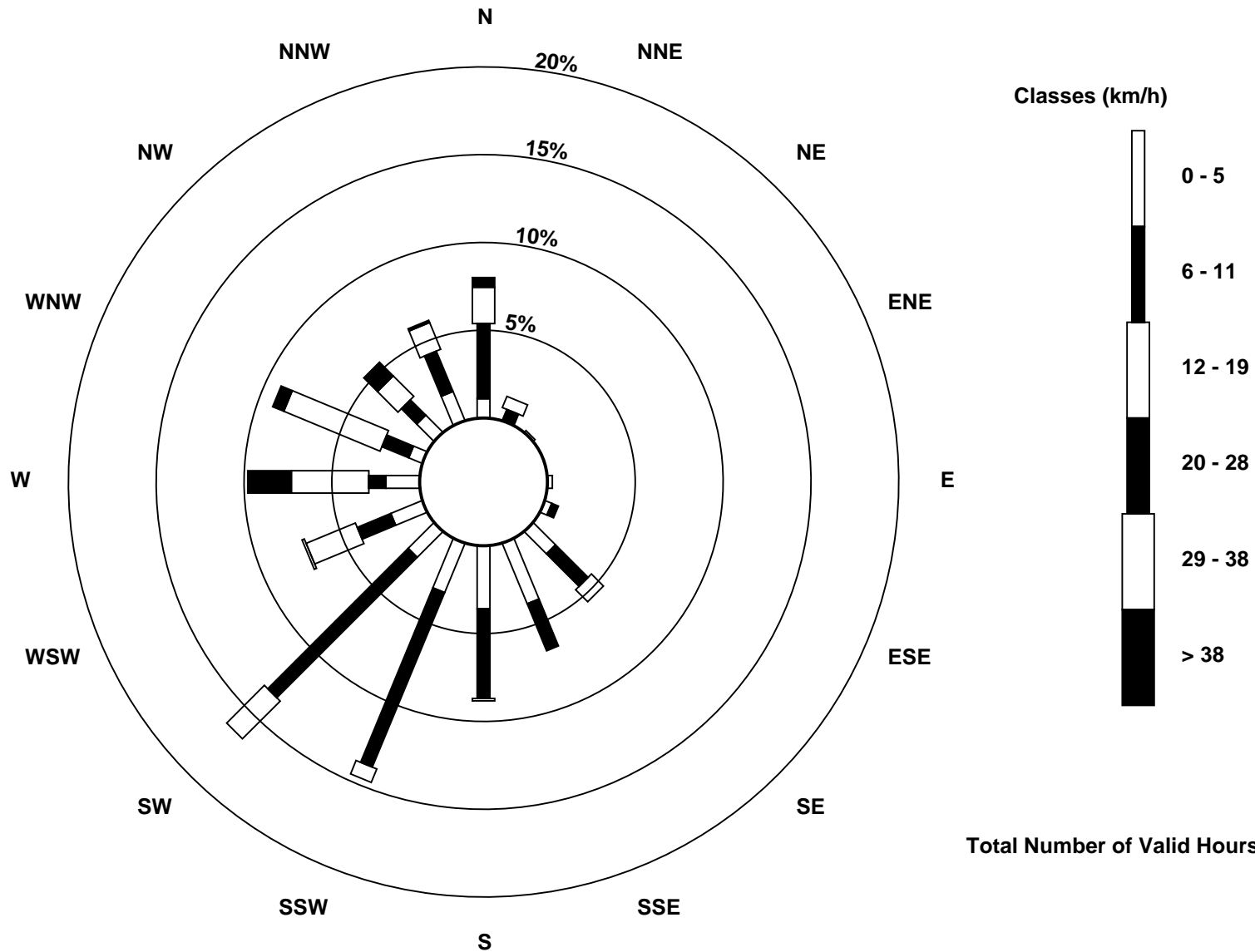
Total Number of Valid Hours: 725

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Patricia McInnes - December 2017**

Direction of Maximum Speed: 258 deg on Dec 9 07:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 299.8 deg on Dec 22	Hours of Data: 725
Direction of Minimum Speed: 337 deg on Dec 10 11:00	Hours of Missing Data: 19
Direction of Minimum Daily Speed Average: 1.1 deg on Dec 19	Percent Operational Time: 97.5
Monthly Average Direction: 252.8 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	246	242	229	213	230	240	241	224	236	222	226	227	234	217	185	144	166	173	201	224	191	204	233	225	224.2
2-Dec	232	245	296	302	329	11	266	279	295	209	214	214	230	235	245	211	228	256	241	241	238	236	244	226	243.9
3-Dec	233	226	213	225	216	191	225	238	287	340	351	347	5	3	360	355	5	7	360	352	355	355	306	308	326.8
4-Dec	352	343	325	321	263	249	246	212	208	205	198	185	185	136	141	133	131	131	133	133	133	129	133	138	149.2
5-Dec	140	172	174	128	141	293	290	307	313	320	19	359	339	352	342	18	11	4	357	353	342	321	289	201	334.1
6-Dec	169	185	178	196	200	223	216	188	207	199	197	202	226	237	238	248	249	249	243	244	236	229	215	217	223.6
7-Dec	235	217	244	252	253	256	263	270	230	261	284	294	288	278	276	276	277	275	280	279	297	349	276	209	267.7
8-Dec	206	223	213	202	219	225	225	218	197	205	219	215	199	196	192	177	144	152	147	179	202	226	212	200	204.3
9-Dec	200	223	231	267	260	262	258	265	266	272	274	279	299	272	263	263	279	277	255	232	289	289	41	228	264.8
10-Dec	233	219	200	204	218	225	225	206	144	100	337	281	307	320	333	345	AF	AF	AF	AF	AF	AF	AF	AF	--
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	183	196	207	201	155	155	157	200	204	191	172	193	208	--
12-Dec	218	226	215	208	157	201	206	260	154	240	271	286	320	323	301	304	302	295	303	294	185	178	152	202	268.0
13-Dec	217	231	213	211	209	213	218	240	274	287	293	312	307	326	350	336	298	297	298	274	253	284	283	309	282.1
14-Dec	336	242	235	190	224	231	223	220	183	165	154	151	140	135	151	134	123	134	134	140	188	182	178	141	168.9
15-Dec	146	151	148	160	157	156	131	212	264	270	272	272	289	286	281	260	233	222	228	239	259	284	274	272	256.0
16-Dec	262	266	340	2	2	10	12	5	354	29	79	106	158	176	143	160	156	135	185	187	186	195	192	151	347.3
17-Dec	156	145	196	204	199	209	226	240	243	248	251	265	264	268	265	267	272	278	292	287	275	275	269	273	257.0
18-Dec	284	269	262	264	278	344	357	8	9	347	307	317	315	318	316	314	312	311	306	298	295	303	12	3	315.4
19-Dec	14	13	352	354	347	337	318	296	278	235	222	208	191	182	165	137	161	179	198	192	182	185	200	190	247.5
20-Dec	216	144	140	173	178	172	167	167	164	165	179	151	192	164	114	120	139	148	150	154	165	167	186	202	166.0
21-Dec	169	157	312	339	331	294	319	336	12	338	302	331	11	156	316	285	275	287	282	284	294	307	304	297	301.4
22-Dec	296	295	285	287	289	297	292	285	275	274	286	292	285	290	292	289	298	292	285	291	332	7	10	348	299.8
23-Dec	343	340	328	278	241	223	276	337	336	102	122	347	350	5	322	19	201	210	201	209	244	247	252	3	303.3
24-Dec	4	3	2	1	354	356	322	306	305	292	262	251	239	223	315	360	279	239	201	195	233	239	349	341	336.7
25-Dec	350	351	344	351	339	333	328	333	311	239	253	241	243	251	250	231	233	222	227	217	226	228	221	210	269.4
26-Dec	209	198	199	207	205	215	216	210	202	215	221	211	186	183	183	202	185	191	201	207	186	188	206	221	203.6
27-Dec	224	224	223	222	218	216	220	215	224	220	227	229	230	229	229	221	225	227	238	231	214	210	199	128	223.3
28-Dec	130	184	245	265	333	351	346	340	340	339	349	1	18	359	8	10	6	316	272	0	341	305	262	297	342.8
29-Dec	269	326	339	356	277	236	231	223	228	217	199	193	186	188	189	193	219	205	216	211	198	200	220	212	212.8
30-Dec	213	198	204	210	207	195	212	224	216	219	220	223	189	181	166	186	198	220	205	184	203	190	169	168	203.5
31-Dec	181	175	183	185	226	178	184	176	159	143	139	145	160	142	148	147	158	153	153	158	146	182	189	198	167.0

249.7 244.2 245.7 252.1 249.5 256.2 259.7 263.8 262.4 261.0 261.3 268.9 271.1 270.1 273.3 268.2 257.3 256.9 251.5 244.6 244.9 252.4 242.0 241.5  
 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**

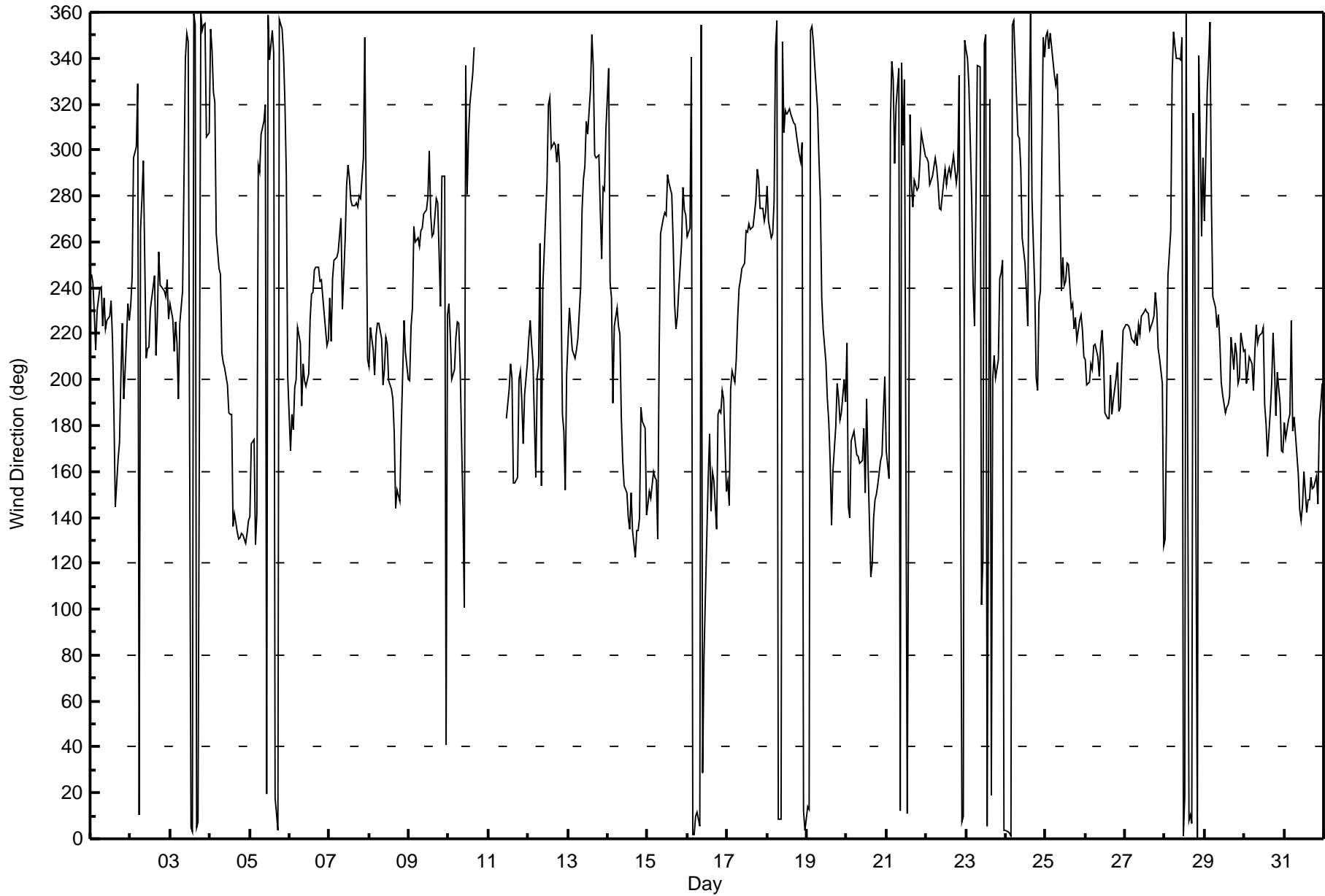
**Wind Direction (WD) - deg**  
**Patricia McInnes - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 89 deg on Dec 21 03:00	Hours of Data: 725
Minimum Value: 6 deg on Dec 10 02:00	Hours of Missing Data: 19
Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 10 Q <sub>1</sub> = 11 Median = 14 Q <sub>3</sub> = 18 P <sub>90</sub> = 29 P <sub>99</sub> = 77	Hours of Calibration: 0
	Percent Operational Time: 97.5

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	9	9	11	14	13	10	9	13	9	15	16	13	13	23	36	14	6	18	12	10	16	15	22	15	36
2-Dec	13	15	40	15	59	79	15	19	46	73	14	19	11	14	25	23	24	11	9	10	10	11	48	16	79
3-Dec	10	10	13	8	11	18	23	10	15	21	14	11	16	18	15	14	13	11	14	14	17	21	13	12	23
4-Dec	21	14	13	8	14	17	29	19	12	16	15	19	13	18	21	14	13	13	13	13	12	13	13	22	29
5-Dec	18	16	51	28	39	48	11	9	10	15	15	15	15	15	17	11	13	13	14	15	15	16	36	33	51
6-Dec	16	12	9	10	16	11	11	15	12	18	17	16	18	15	11	10	11	9	9	9	10	9	16	17	18
7-Dec	12	16	10	14	10	9	14	14	60	17	15	12	14	12	11	15	11	10	10	17	32	53	48	19	60
8-Dec	14	11	10	10	8	9	17	17	20	14	13	14	23	14	11	13	8	17	63	16	23	10	17	13	63
9-Dec	15	18	22	12	8	9	9	9	10	11	11	15	22	20	15	15	11	12	12	13	24	38	58	23	58
10-Dec	10	6	11	10	12	9	10	40	25	39	79	33	14	16	10	13	AF	AF	AF	AF	AF	AF	AF	AF	79
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	15	13	11	15	24	13	12	19	10	16	11	14	16	24
12-Dec	14	18	10	19	27	15	33	17	82	14	13	11	15	13	10	9	8	8	10	83	34	21	64	74	83
13-Dec	15	9	20	17	15	17	19	10	13	13	12	11	10	20	13	11	16	14	7	14	14	10	16	42	42
14-Dec	17	57	20	19	11	9	12	11	14	14	12	20	13	12	13	15	16	16	14	19	39	33	19	19	57
15-Dec	30	16	13	24	15	14	34	16	13	12	12	14	13	13	12	15	14	18	14	9	15	12	14	11	34
16-Dec	10	10	29	15	14	12	12	18	16	21	16	26	16	17	21	22	20	22	14	25	16	11	16	6	29
17-Dec	17	18	18	12	12	13	10	11	11	10	11	11	12	13	12	12	11	11	11	12	37	15	11	11	37
18-Dec	11	11	9	11	13	24	15	14	13	17	15	14	10	11	12	12	11	10	10	9	10	10	20	16	24
19-Dec	12	12	15	17	14	16	15	9	31	10	17	16	17	13	29	13	19	13	14	12	10	15	14	14	31
20-Dec	13	25	13	17	10	9	11	11	10	12	13	28	13	26	13	14	11	12	22	29	29	26	19	15	29
21-Dec	23	21	89	32	19	40	9	11	15	19	12	25	27	45	34	14	12	12	12	11	12	12	12	12	89
22-Dec	9	9	11	11	9	10	10	10	11	13	13	11	12	11	10	9	9	10	11	10	28	16	16	12	28
23-Dec	10	11	8	32	36	59	87	23	10	53	70	20	20	20	29	15	47	15	15	25	9	7	14	32	87
24-Dec	15	15	16	15	14	14	15	7	8	7	25	55	83	54	27	66	88	50	28	25	18	10	44	35	88
25-Dec	13	17	11	11	12	9	14	11	24	26	14	14	15	11	19	22	8	9	8	12	9	9	9	12	26
26-Dec	15	14	14	12	13	14	11	16	14	12	10	14	15	13	10	11	8	19	19	15	29	29	15	14	29
27-Dec	12	16	17	13	13	12	15	16	10	13	12	11	10	10	11	11	11	11	10	11	15	25	14	29	29
28-Dec	72	55	71	63	35	15	10	9	9	11	17	16	23	27	15	16	11	16	20	14	18	15	28	8	72
29-Dec	38	15	15	12	36	16	12	13	12	13	19	14	11	12	10	12	16	14	13	14	17	16	12	13	38
30-Dec	12	13	14	10	12	12	11	11	10	9	8	11	20	13	18	11	13	11	30	16	12	11	14	16	30
31-Dec	8	11	11	15	56	25	14	14	17	15	14	19	14	18	15	12	15	11	10	14	12	10	10	13	56
	72	57	89	63	59	79	87	40	82	73	79	55	83	54	36	66	88	50	63	83	39	53	64	74	

Diurnal Maximum

AF - Analyzer Failure







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

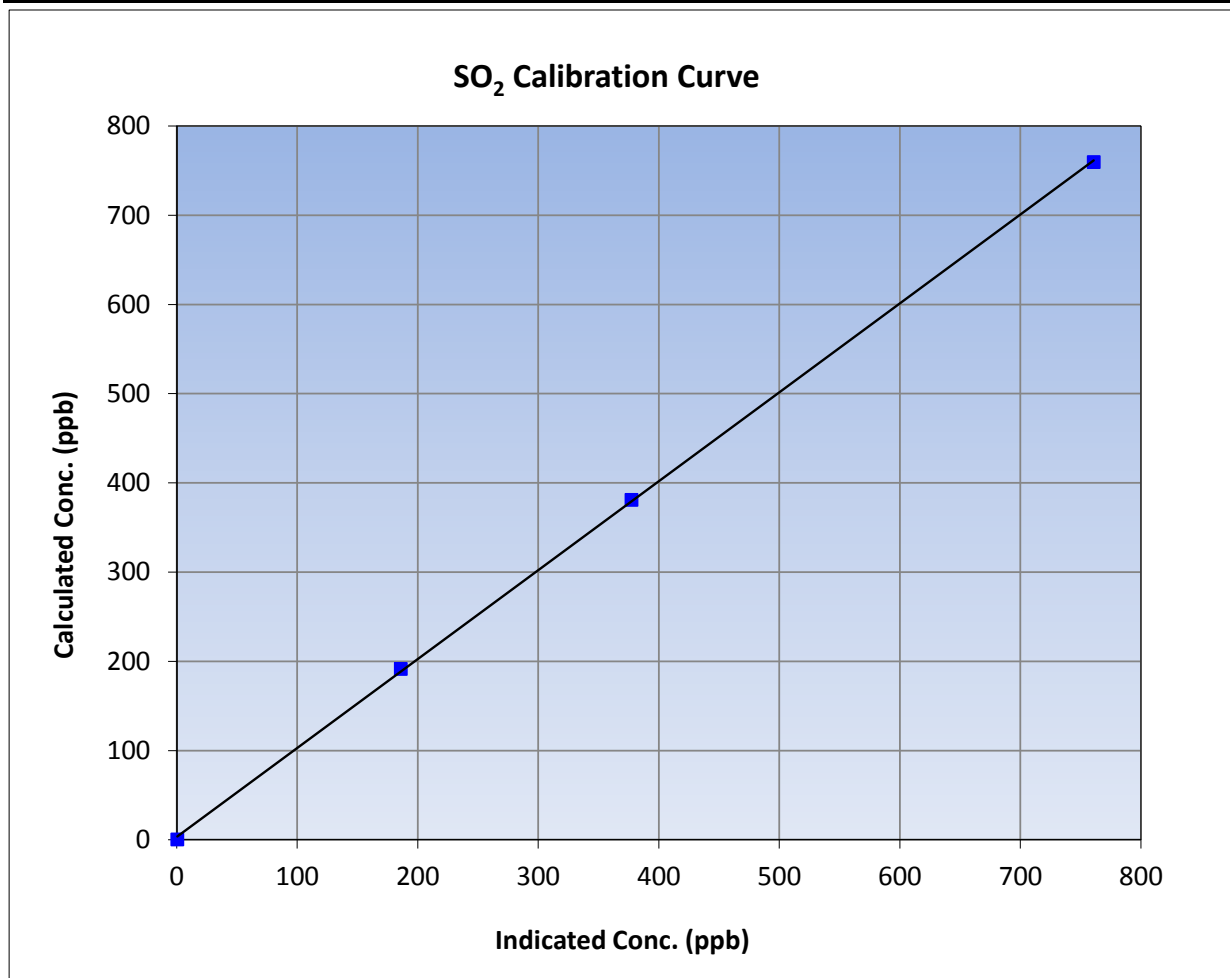
Version-03-2017

### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:25	End Time (MST)	15:45
Analyzer make	Thermo 43i	Analyzer serial #	1008841397

### Calibration Data

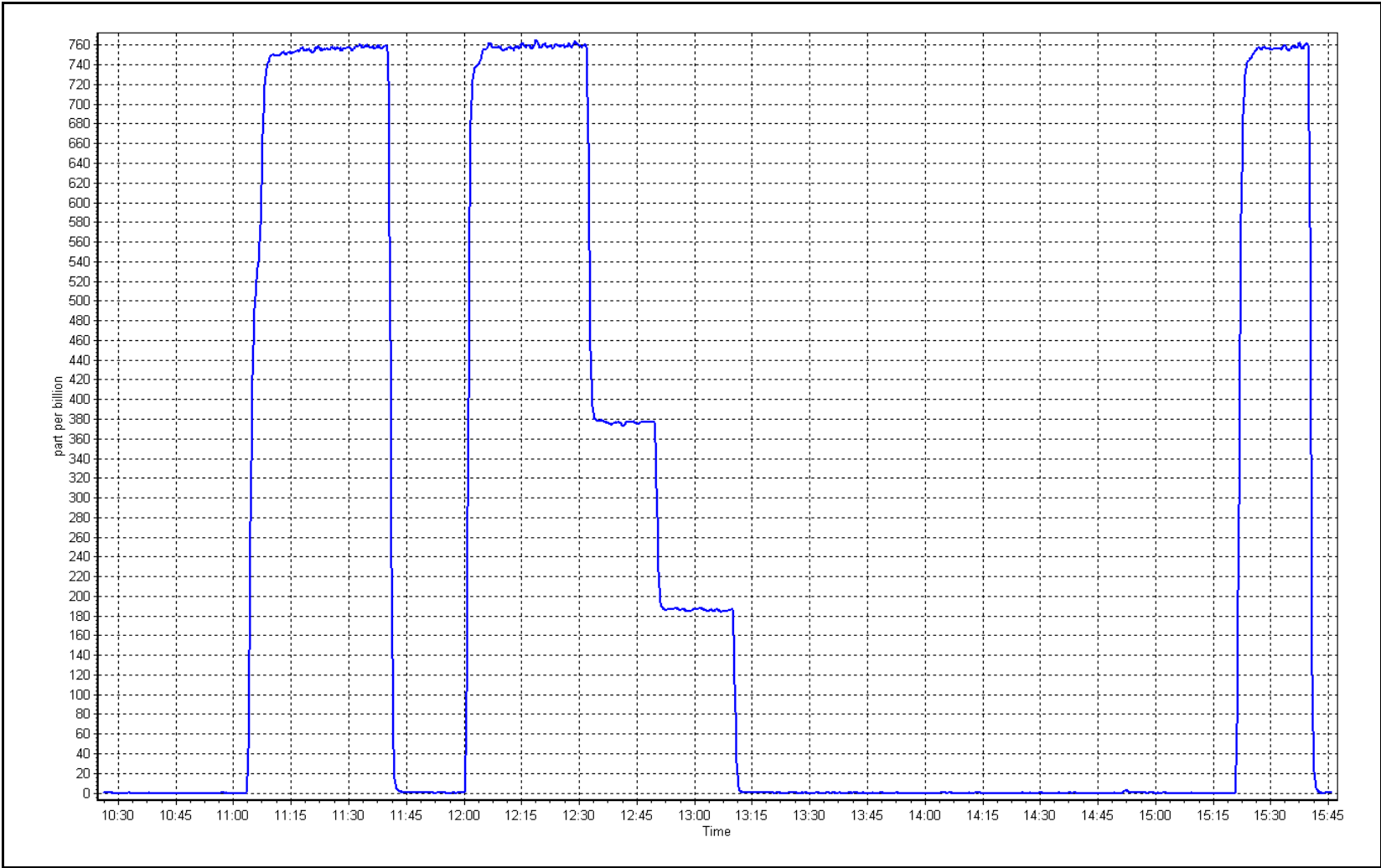
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Serial Number	Limits	
0.0	0.1	----	Serial Number	0.999916	≥0.995
759.4	760.4	0.9986	Slope	0.996649	0.90 - 1.10
380.5	376.8	1.0099	Intercept	3.178194	+/-30
191.2	185.5	1.0306			



SO2 Calibration Plot

Date: December 18, 2017

Location: Patricia McInnes







# Wood Buffalo Environmental Association

## TRS Calibration Summary

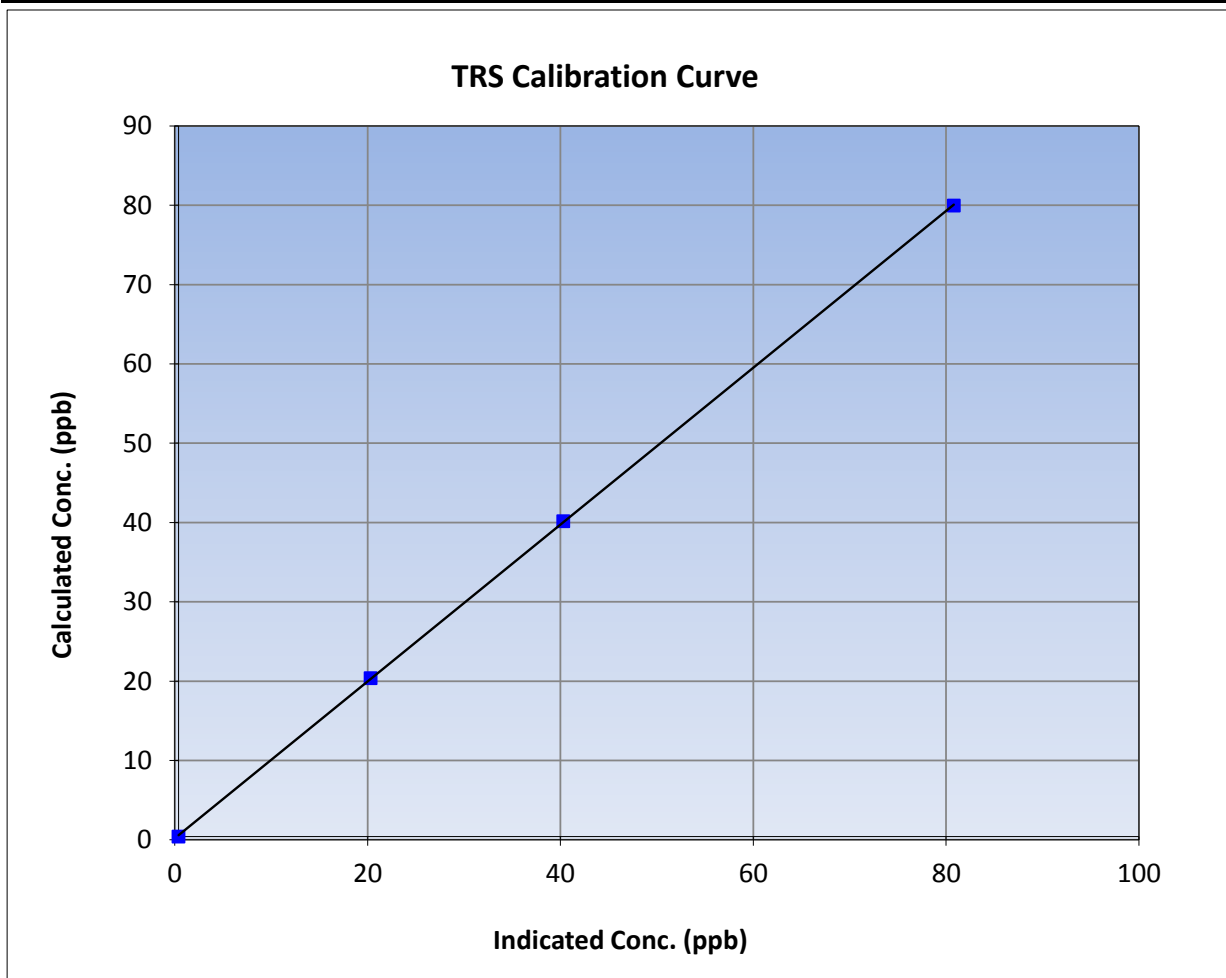
Version-03-2017

### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 20, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:05	End Time (MST)	13:52
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153358

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999976	≥0.995
79.6	80.4	0.9897			
39.8	39.9	0.9972	Slope	0.988942	0.90 - 1.10
20.0	19.9	1.0039			
			Intercept	0.172868	+/-3

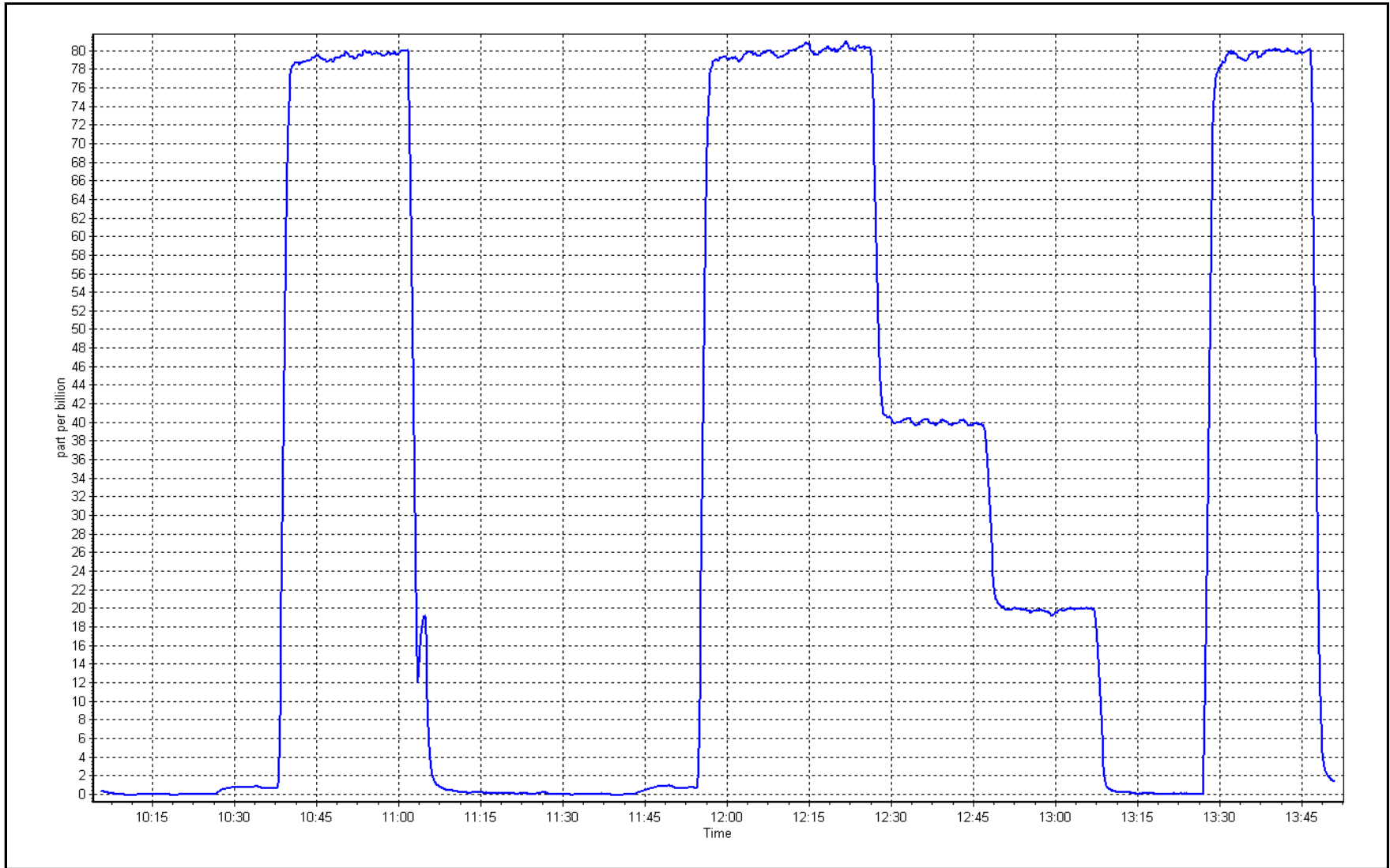




TRS Calibration Plot

Date: December 15, 2017

Location: Patricia McInnes





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Patricia McInnes	Station number:	AMS 06
Calibration Date:	December 18, 2017	Last Cal Date:	November 24, 2017
Start time (MST):	10:25	End time (MST):	15:50
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL87837	Cal Gas Expiry Date	August 18, 2020
CH4 Cal Gas Conc.	<u>513.0</u> ppm	CH4 Equiv Conc.	1068.5 ppm
C3H8 Cal Gas Conc.	<u>202.0</u> ppm	Station temp.	21 Deg C
Calibrator Model	API T700	Serial Number	2449
ZAG make/model	API T701	Serial Number	260

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1331259521

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.0
CH4 SP Ratio	2.19E-04	2.23E-04	Flame Temp	405.0	405.0
CH4 Retention time	12.3	12.3	Carrier Pressure	35.8	35.8
NMHC SP Ratio	4.52E-05	4.58E-05	Fuel Pressure	42.3	42.3
NMHC Peak Area	189589	186966	Air Pressure	37.4	37.4

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	0.999002	1.001490
THC Cal Offset	0.056853	0.045031
CH4 Cal Slope	0.997480	0.997917
CH4 Cal Offset	0.039360	0.035114
NMHC Cal Slope	1.000411	1.004540
NMHC Cal Offset	0.017958	0.010332

Notes: Span adjusted. Filter changed after As Found. Long points because of aborted NH3 cal.

Calibration Performed By:

Ryan Power



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5537	0.0	0.00	0.00	----
as found span	5458	85.5	16.48	16.19	1.018
calibrator zero	5537	0.0	0.00	0.00	----
high point	5459	85.5	16.48	16.43	1.003
second point	5502	42.8	8.25	8.16	1.011
third point	5526	21.5	4.14	4.05	1.021
as left zero	5538	0.0	0.00	0.00	----
as left span	5458	85.5	16.48	16.48	1.000
Average Correction Factor					1.012
Corrected As found	16.19	Prev response	16.44	*% change	1.5%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5537	0	0.00	0.00	----
as found span	5458	85.5	8.57	8.44	1.015
calibrator zero	5537	0	0.00	0.00	----
high point	5459	85.5	8.57	8.52	1.005
second point	5502	42.8	4.29	4.25	1.008
third point	5526	21.5	2.15	2.12	1.015
as left zero	5538	0	0.00	0.00	----
as left span	5458	85.5	8.57	8.58	0.998
Average Correction Factor					1.009
Corrected As found	8.44	Prev response	8.55	*% change	1.2%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5537	0.0	0.00	0.00	----
as found span	5458	85.5	7.91	7.75	1.021
calibrator zero	5537	0.0	0.00	0.00	----
high point	5459	85.5	7.91	7.91	1.000
second point	5502	42.8	3.96	3.90	1.015
third point	5526	21.5	1.99	1.93	1.029
as left zero	5538	0.0	0.00	0.00	----
as left span	5458	85.5	7.91	7.90	1.002
Average Correction Factor					1.015
Corrected As found	7.75	Prev response	7.89	*% change	1.9%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## THC Calibration Summary

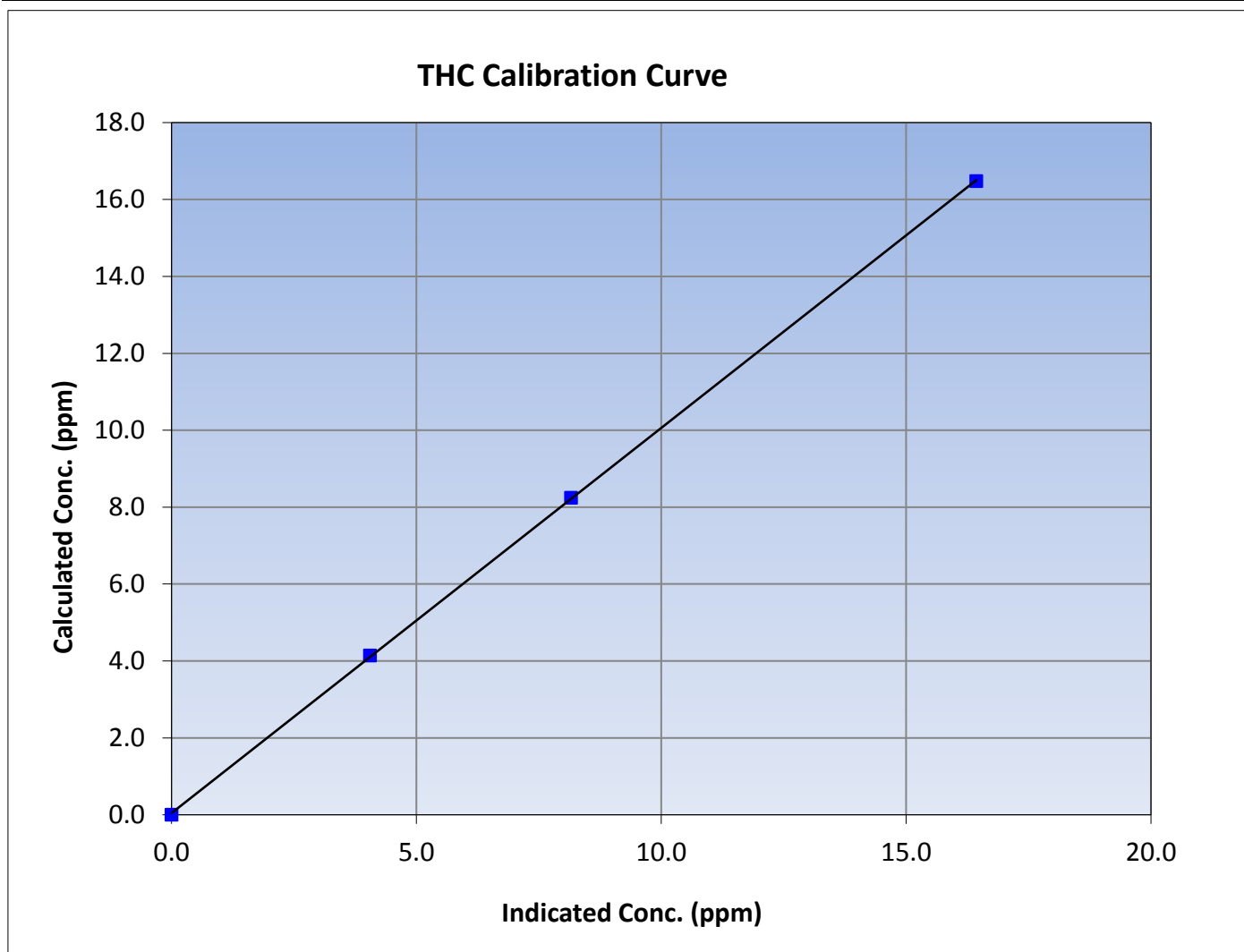
Version-02-2017

### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:25	End Time (MST)	15:50
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999964	$\geq 0.995$			
16.48	16.43	1.0026						
8.25	8.16	1.0114				Slope	1.001490	0.90 - 1.10
4.14	4.05	1.0215						
			Intercept	0.045031	$\pm 0.5$			





# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

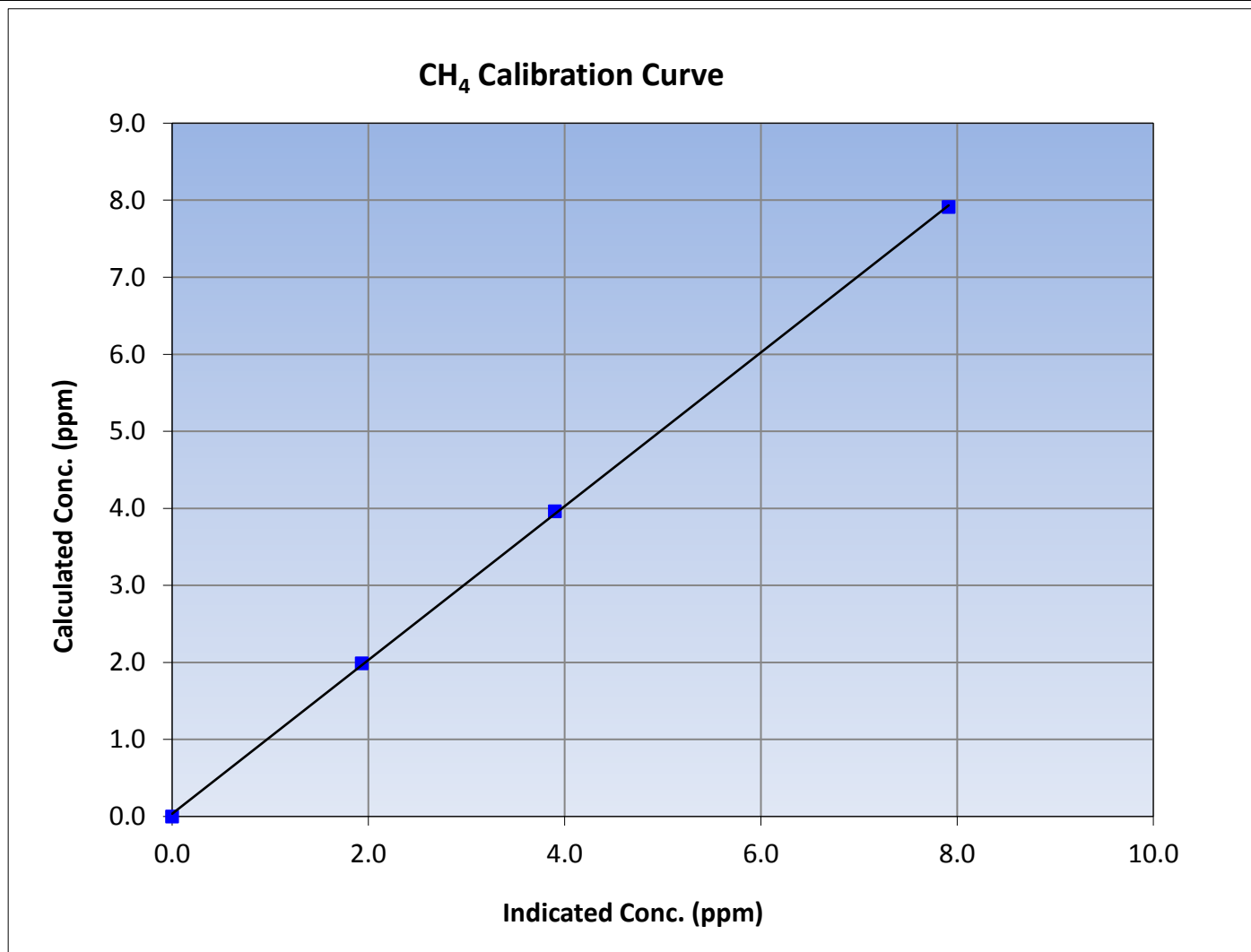
Version-02-2017

### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:25	End Time (MST)	15:50
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999902	<i>≥0.995</i>			
7.91	7.91	0.9996						
3.96	3.90	1.0151				Slope	0.997917	<i>0.90 - 1.10</i>
1.99	1.93	1.0291						
			Intercept	0.035114	<i>+/-0.5</i>			





# Wood Buffalo Environmental Association

## NMHC Calibration Summary

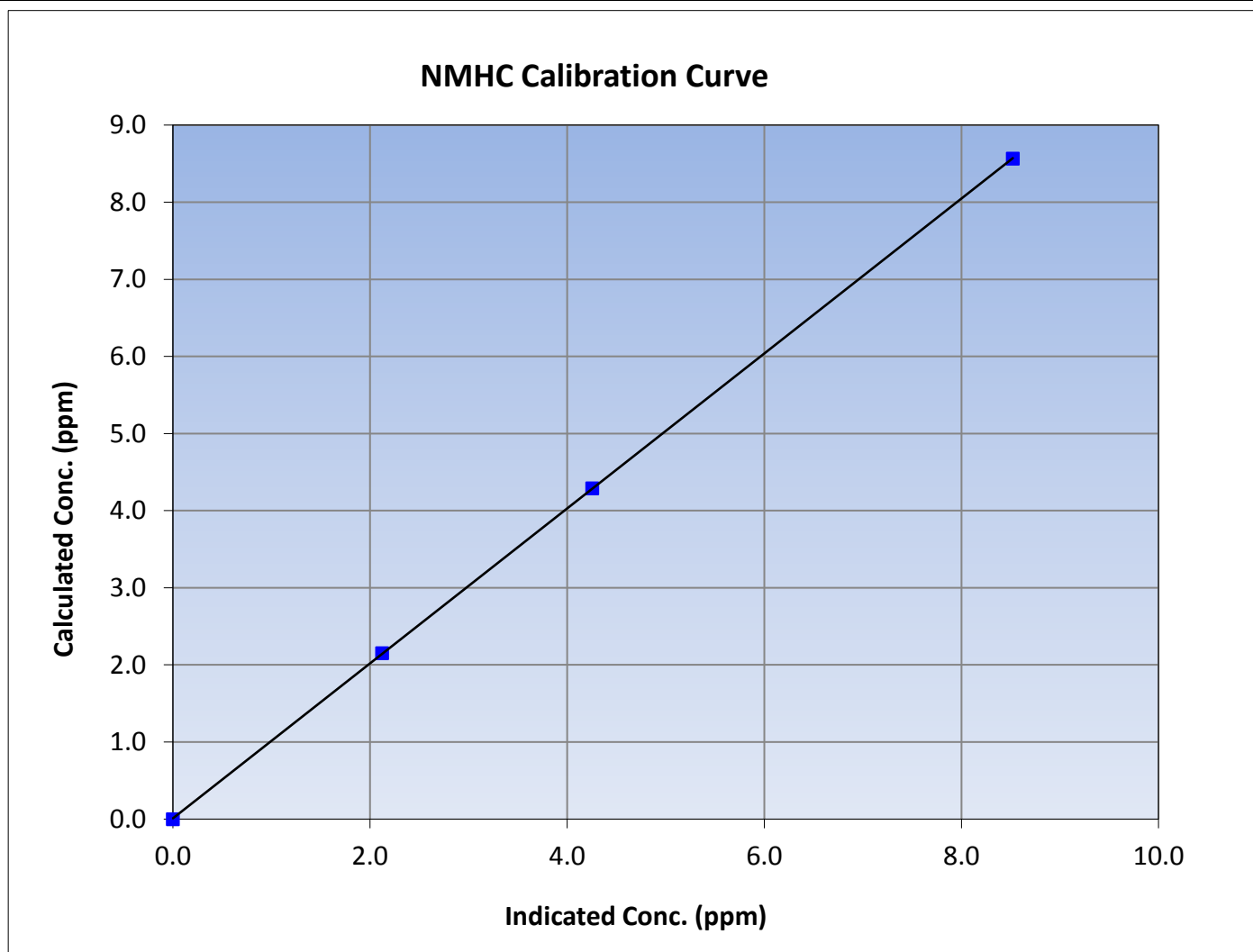
Version-02-2017

### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:25	End Time (MST)	15:50
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999993	$\geq 0.995$			
8.57	8.52	1.0052						
4.29	4.25	1.0080				Slope	1.004540	0.90 - 1.10
2.15	2.12	1.0146						
			Intercept	0.010332	$\pm 0.5$			



NMHC Calibration Plot

Date: December 18, 2017

Location: Patricia McInnes









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

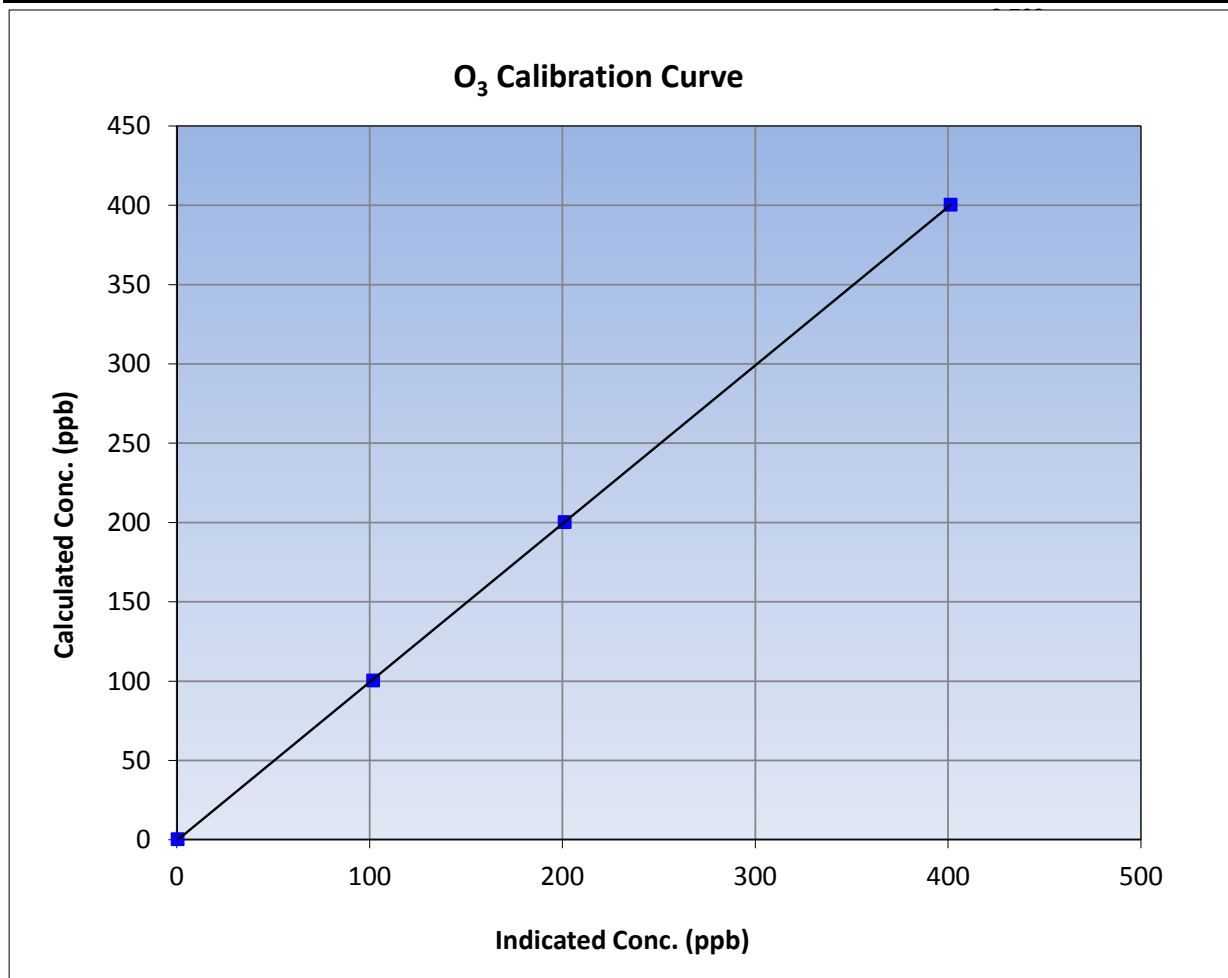
Version-03-2017

### Station Information

Calibration Date	December 14, 2017	Previous Calibration	November 23, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	11:39	End Time (MST)	15:40
Analyzer make	Thermo 49i	Analyzer serial #	1300156234

### Calibration Data

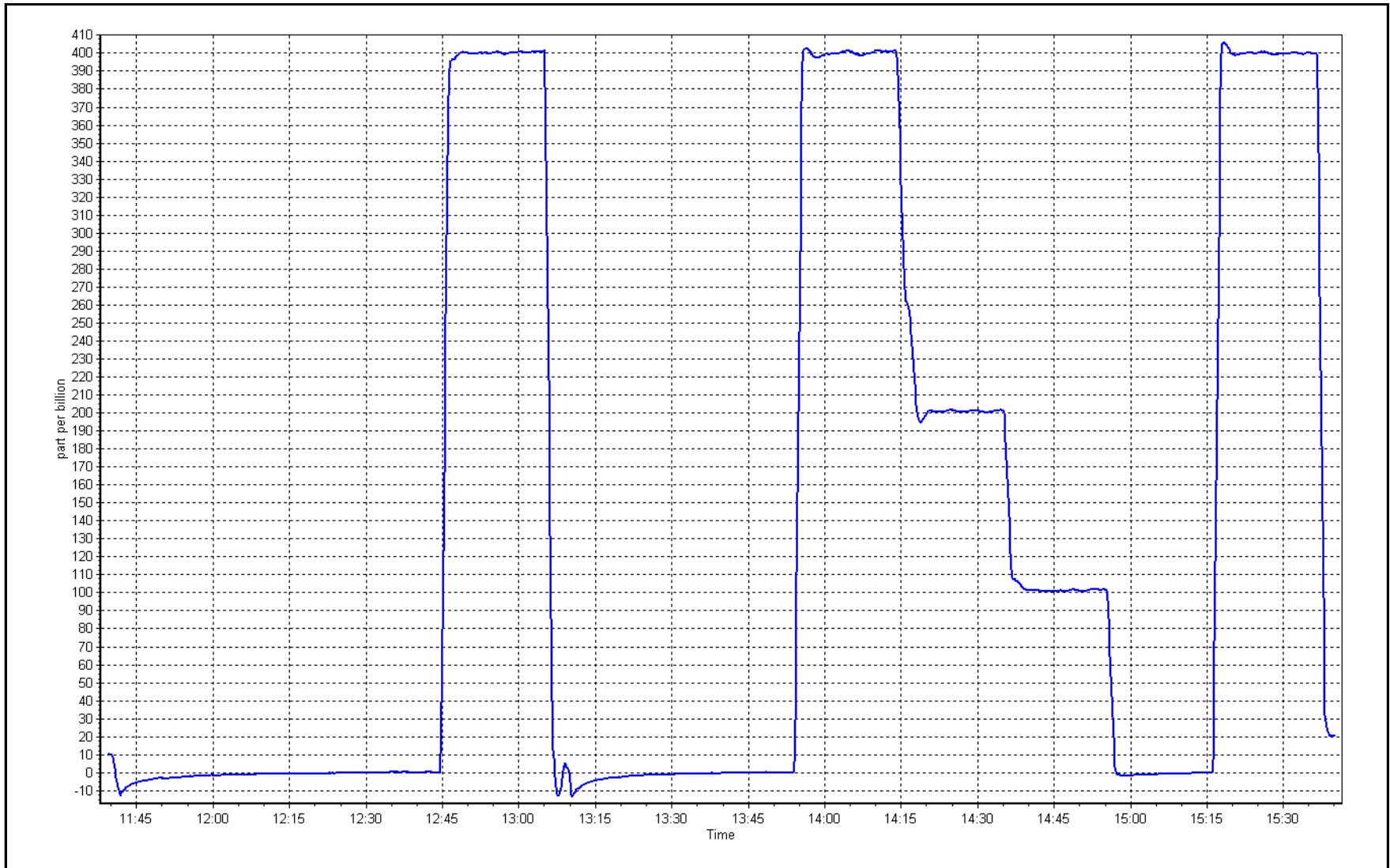
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999990	≥0.995
400.0	400.9	0.9978			
200.0	200.8	0.9960	Slope	0.998649	0.90 - 1.10
100.0	101.4	0.9862			
			Intercept	-0.537576	+/- 10



# O<sub>3</sub> Calibration Plot

Date: December 14, 2017

Location: Patricia McInnes





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Patricia McInnes	Station number:	AMS 06
Calibration Date:	December 18, 2017	Last Cal Date:	November 24, 2017
Start time (MST):	10:20	End time (MST):	15:45
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL57837	Cal Gas Expiry Date	August 18, 2020
NOX Cal Gas Conc.	<u>51.6</u> ppb	NO Cal Gas Conc.	<u>51.6</u> ppb
Calibrator Model	API T700	Serial Number	2449
ZAG make/model	API T701	Serial Number	260

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 1218153460		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.019	1.021	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	1.001	1.001	PMT Temperature	-2.9	-2.2
NO2 coefficient	1.000	1.000	Reaction cell Press	182.4	182.1
NO bkgrnd	3.3	3.3	Sample Flow	0.754	0.756
NOX bkgrnd	3.5	3.6	PMT Voltage	-772.6	-772.6

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.996751	0.996608
NO <sub>x</sub> Cal Offset	3.053344	3.053025
NO Cal Slope	0.997234	0.996819
NO Cal Offset	3.035560	3.353855
NO <sub>2</sub> Cal Slope	0.995385	0.998616
NO <sub>2</sub> Cal Offset	-1.587898	-0.577628



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Total flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5500	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.1	----	----
as found span	5544	85.5	795.8	795.8	0.0	795.4	793.8	1.6	1.0005	1.0025
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.1	-0.3	0.2	----	----
high point	5544	85.4	794.8	794.8	0.0	795.9	795.5	0.4	0.9987	0.9992
second point	5544	42.8	398.4	398.4	0.0	395.3	394.8	0.4	1.0077	1.0090
third point	5544	21.5	200.1	200.1	0.0	194.7	194.3	0.4	1.0278	1.0299
as left zero	5543	0.0	0.0	0.0	0.0	-0.1	-0.3	0.2	----	----
as left span	5543	85.4	795.0	386.8	408.2	795.1	386.4	408.7	0.9999	1.0010
<b>Average Correction Factor</b>									<b>1.0114</b>	<b>1.0127</b>

Corrected As found	NO <sub>x</sub> = 795.7 ppb	NO = 794.1 ppb		*Percent Change	NO <sub>x</sub> = 0.0%
Previous Response	NO <sub>x</sub> = 795.3 ppb	NO = 795.0 ppb		*Percent Change	NO = 0.1%

\* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	795.1	793.0	2.1	0.9997	1.0023	----	----
1st NO2 (400 ppb O3)	386.8	406.2	793.9	386.8	407.1	1.0012	----	0.9978	100.2%
2nd NO2 (200 ppb O3)	589.0	204.0	794.3	589.0	205.2	1.0007	----	0.9942	100.6%
3rd NO2 (100 ppb O3)	691.5	101.5	794.0	691.5	102.5	1.0011	----	0.9902	101.0%
2nd NO ref point	----	0.0	794.1	792.5	1.6	1.0009	1.0030	----	----
<b>Average Correction Factor</b>						<b>1.0010</b>	<b>1.0026</b>	<b>0.9941</b>	<b>100.6%</b>

**Notes:** Span adjusted. Filter changed after As Finds. Long points to begin because of aborted NH3 cal.

Calibration Performed By: Ryan Power



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

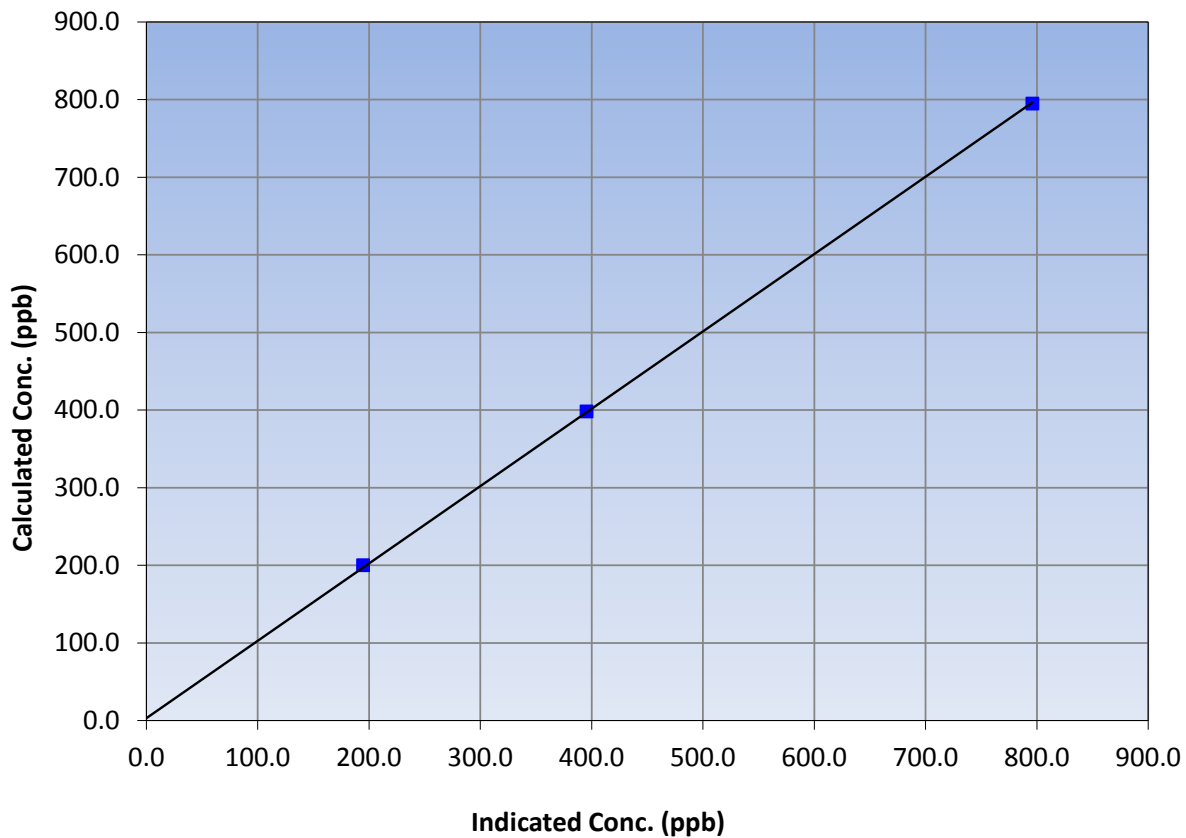
### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:20	End Time (MST)	15:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
794.8	795.9	0.9987			
398.4	395.3	1.0077			
200.1	194.7	1.0278			
			Slope	0.996608	0.90 - 1.10
			Intercept	3.053025	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

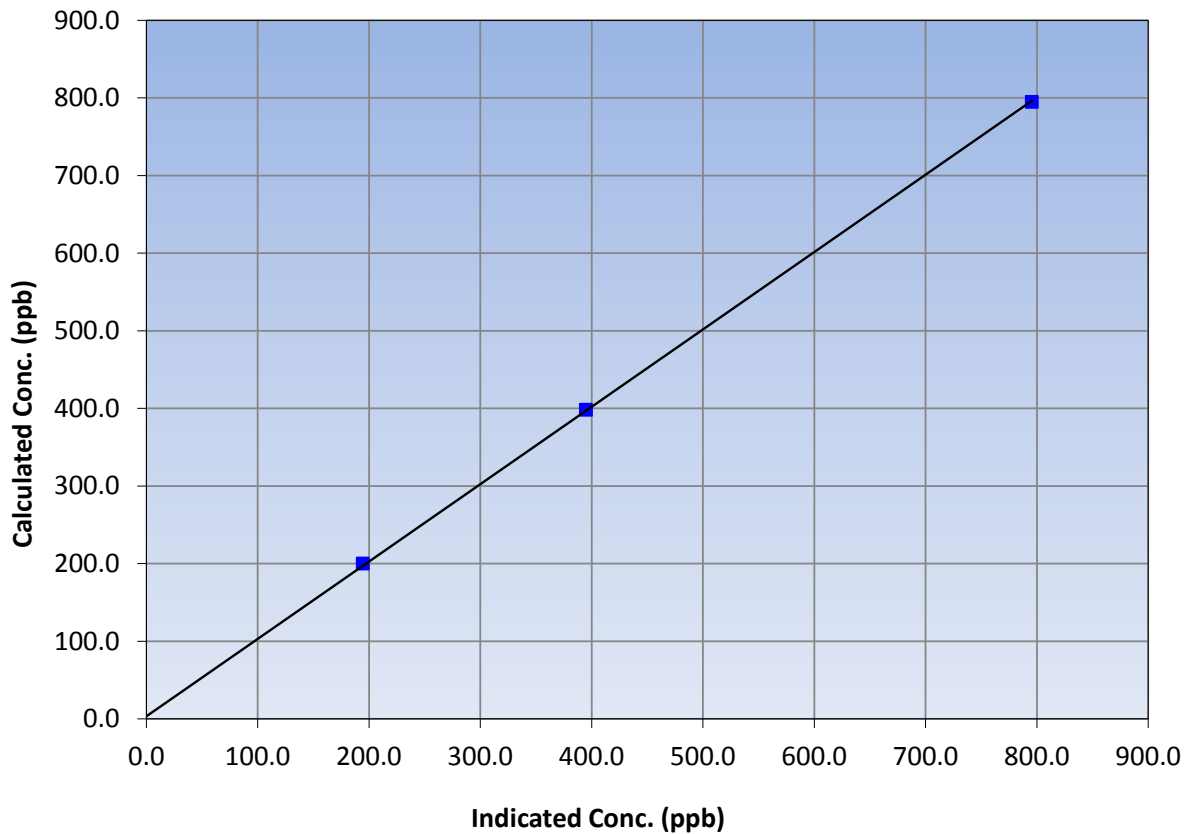
### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:20	End Time (MST)	15:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.3	----	Correlation Coefficient	≥0.995	
794.8	795.5	0.9992			
398.4	394.8	1.0090			
200.1	194.3	1.0299			
			Slope	0.996819	0.90 - 1.10
			Intercept	3.353855	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

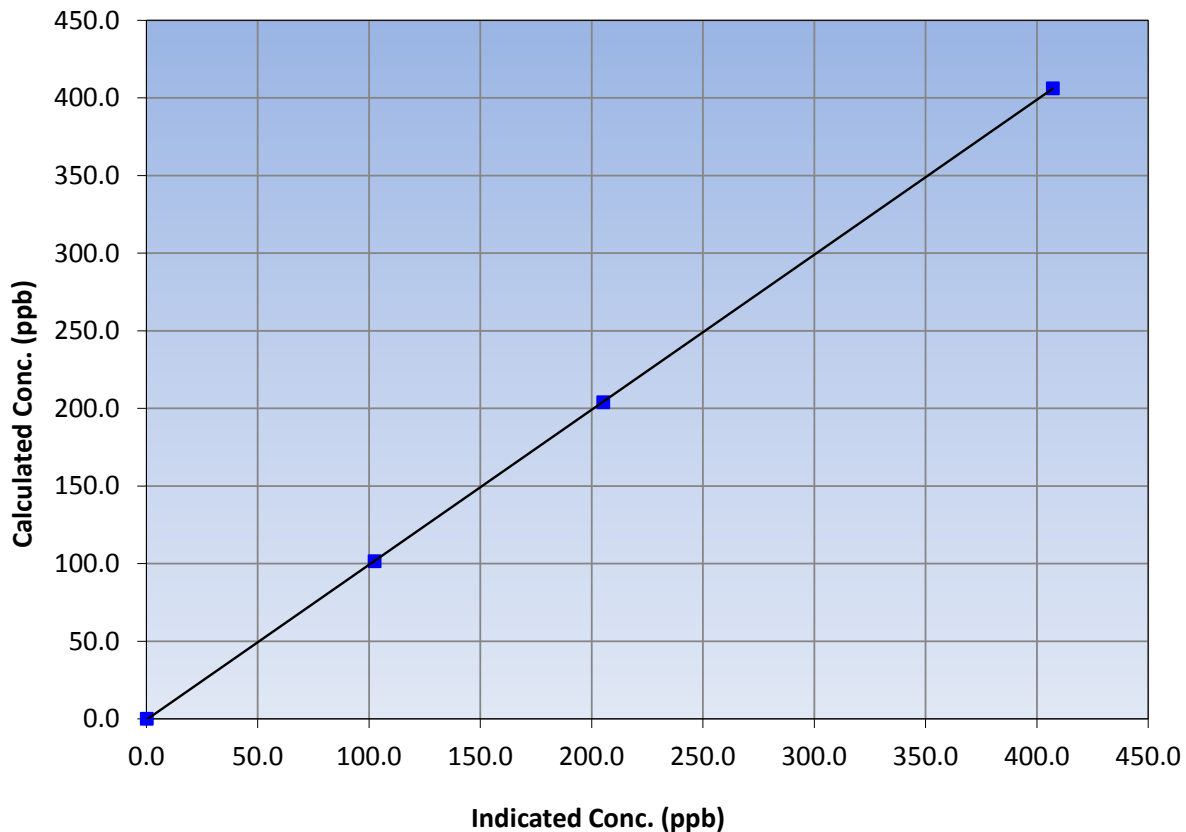
### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 24, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	10:20	End Time (MST)	15:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>
0.0	0.2	----	Correlation Coefficient Slope Intercept	≥0.995 0.90 - 1.10 +/-20
406.2	407.1	0.9978		
204.0	205.2	0.9942		
101.5	102.5	0.9902		
			0.999996	
			0.998616	
			-0.577628	

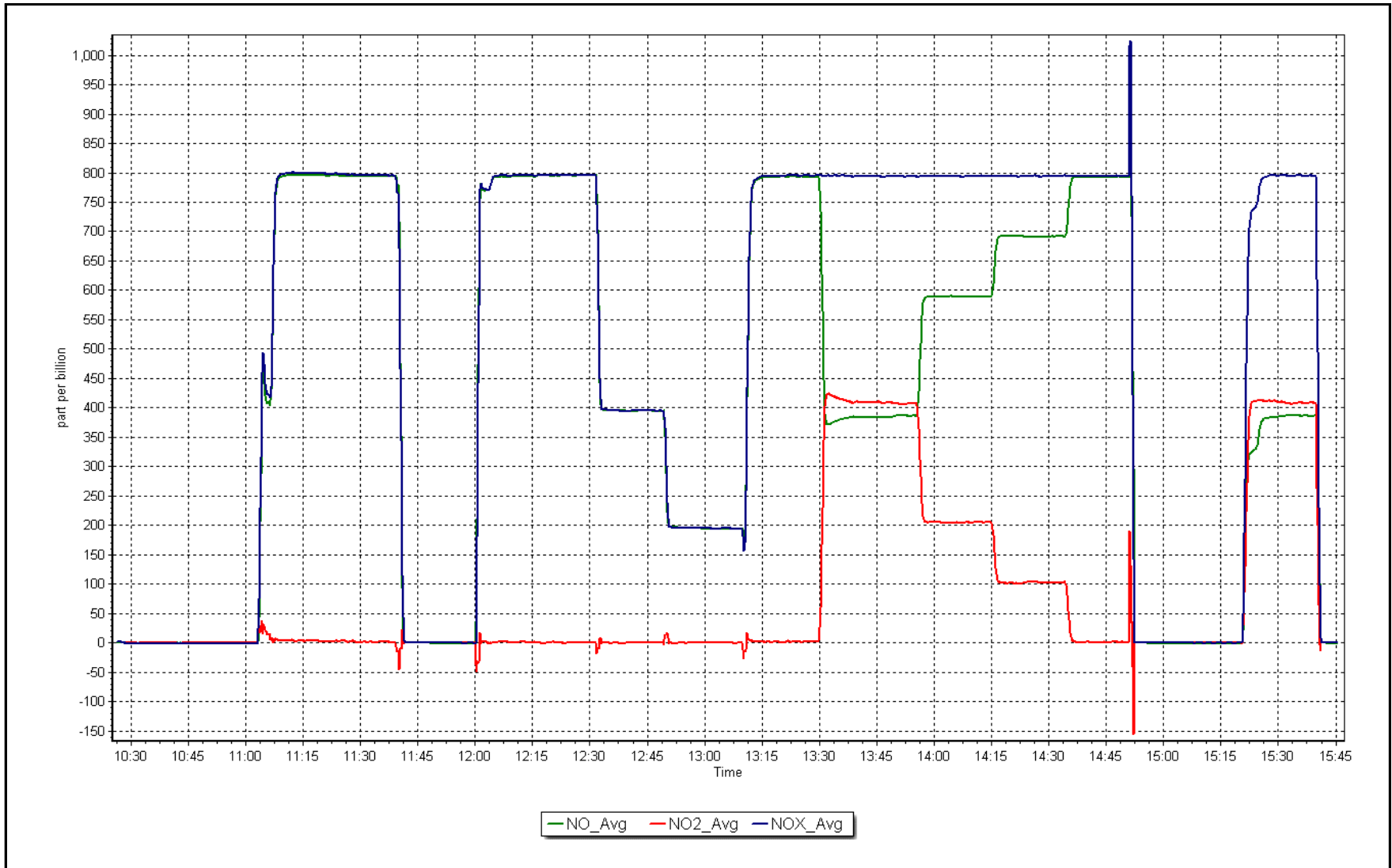
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 18, 2017

Location: Patricia McInnes







# Wood Buffalo Environmental Association

## TN - NO<sub>x</sub> - NH<sub>3</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Patricia McInnes	Station number:	AMS 06
NOX Cal Date:	December 19, 2017	Last Cal Date:	November 29, 2017
Start time (MST):	9:30	End time (MST):	14:22
NH3 Cal Date:	December 20, 2017	Last Cal Date:	November 29, 2017
Start time (MST):	9:00	End time (MST):	11:55
Reason:	Routine		

### Calibration Standards

NOX Cal Gas Conc.	<u>51.6</u>	ppb	NO Gas Cylinder #	LL87837
NO Cal Gas Conc.	<u>51.6</u>	ppb	NO Cal Gas Expiry	August 18, 2020
NH3 Cal Gas Conc.	<u>72.9</u>	ppm	NH3 Gas Cylinder #	LL84697
			NH3 Cal Gas Expiry	September 26, 2018
Calibrator Model	API T700		Serial Number	2449
ZAG make/model	API T701		Serial Number	260

### Analyzer Information

Analyzer make: API T201		Analyzer serial #: 215			
Converter make: API 501		Converter serial #: 217			
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.446	1.436	NH3 Range (ppb)	0 - 2000 ppb	
NOX coefficient	1.479	1.475	NOX Range (ppb)	0 - 1000 ppb	
NO2 coefficient	1.000	1.000	PMT Temperature	7.0	7.0
NH3 coefficient	0.971	0.971	Reaction cell Press	4.5	4.5
TN coefficient	1.478	1.483	Sample Flow	556	562
NO bkgnd	-0.6	-0.6	PMT Voltage	693	693
NOX bkgnd	-0.4	-0.4	Moly Temperature	316.3	316.1
TN bkgnd	0.1	0.1	NH3 Conv Temp	825	825

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	1.002320	1.005294
NO <sub>x</sub> Cal Offset	3.035852	4.448629
NO Cal Slope	1.000165	1.005657
NO Cal Offset	3.628716	4.474934
NO <sub>2</sub> Cal Slope	0.997535	0.993540
NO <sub>2</sub> Cal Offset	1.022199	-0.455949
NH3 Cal Slope	0.998488	0.999850
NH3 Cal Offset	-2.805152	4.046546
TN Cal Slope	0.991505	0.993012
TN Cal Offset	-3.102696	3.566611



# Wood Buffalo Environmental Association

## TN - NOX - NH<sub>3</sub> Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Total flow rate (sccm)	Source gas flow rate (sccm)	Calculated TN concentration (ppb) (Cc)	Calculated NOX concentration (ppb) (Cc)	Calculated NH3 concentration (ppb) (Cc)	Indicated TN concentration (ppb) (Ic)	Indicated NOX concentration (ppb) (Ic)	Indicated NH3 concentration (ppb) (Ic)	TN Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NH3 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5543	0.0	0.0	0.0	0.0	0.2	0.1	0.1	----	----
as found NO	5544	85.5	795.8	795.8	----	794.0	794.8	-0.7	1.002	----
calibrator zero	5543	0.0	0.0	0.0	0.0	0.3	0.3	0.1	----	----
high NO point	5543	85.5	795.9	795.9	----	794.0	790.6	3.4	1.002	----
NO/O3 point	5543	84.2	783.8	783.8	----	792.3	792.8	-1.3	0.989	----
as found NH3	3530	86.6	1788.4	NA	1788.4	1798.9	----	1786.3	0.994	1.001
first NH3	3530	86.6	1788.4	NA	1788.4	1798.9	----	1786.3	0.994	1.001
second NH3	3538	48.2	993.2	NA	993.2	996.5	----	989.0	0.997	1.004
third NH3	3537	24.1	496.7	NA	496.7	491.3	----	487.2	1.011	1.020
<b>Average Correction Factor</b>									<b>0.9959</b>	<b>1.0083</b>

Corrected As found    TN = 793.8 ppb    NO<sub>x</sub> = 794.7 ppb    NH3 = 1786.2 ppb

Previous Response    TN = 805.7 ppb    NO<sub>x</sub> = 790.9 ppb    NH3 = 1793.9 ppb

NH3 Previous Converter Efficiency = 97.1 %

NH3 Current Converter Efficiency = 97.1 %

\*Percent Change    TN = 1.5%

\*Percent Change    NO<sub>x</sub> = -0.5%

\*Percent Change    NH3 = 0.4%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Total flow rate (sccm)	Source gas flow rate (sccm)	Calculated NO <sub>x</sub> concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated TN concentration (ppb) (Cc)	Indicated NO <sub>x</sub> concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated TN concentration (ppb) (Ic)	NO <sub>x</sub> Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5543	0.0	0.0	0.0	0.0	-1.0	-0.7	-0.8	----	----
as found span	5544	85.5	795.8	795.8	795.8	799.6	800.1	797.6	0.9952	0.9946
calibrator zero	5543	0.0	0.0	0.0	0.0	0.3	0.4	0.3	----	----
high point	5544	85.5	795.8	795.8	795.8	790.6	790.4	794.0	1.0066	1.0068
second point	5544	42.8	398.4	398.4	398.4	385.9	385.5	388.3	1.0323	1.0333
third point	5544	21.5	200.1	200.1	200.1	192.4	192.3	192.4	1.0401	1.0406
<b>Average Correction Factor</b>									<b>1.0263</b>	<b>1.0269</b>

Corrected As found    TN = 798.4 ppb    NO<sub>x</sub> = 800.6 ppb    NO = 800.8 ppb  
 Previous Response    TN = 805.7 ppb    NO<sub>x</sub> = 790.9 ppb    NO = 792.0 ppb

\*Percent Change    TN = 0.9%  
 \*Percent Change    NO<sub>x</sub> = -1.2%  
 \*Percent Change    NO = -1.1%  
 \* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO <sub>2</sub> concentration (ppb) (Cc)	Indicated NO <sub>x</sub> concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO <sub>2</sub> concentration (ppb) (Ic)	NO <sub>x</sub> Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO <sub>2</sub> Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point	----	0.0	792.8	787.9	4.9	1.0038	1.0100	----	----
1st NO <sub>2</sub> (400 ppb O <sub>3</sub> )	374.4	413.5	790.6	374.4	416.2	1.0066	----	0.9935	100.7%
2nd NO <sub>2</sub> (200 ppb O <sub>3</sub> )	587.4	200.5	790.9	587.4	203.5	1.0062	----	0.9853	101.5%
3rd NO <sub>2</sub> (100 ppb O <sub>3</sub> )	684.5	103.4	788.4	684.5	103.9	1.0094	----	0.9952	100.5%
2nd NO ref point	----	0.0	789.5	785.5	4.0	1.0080	1.0131	----	----
<b>Average Correction Factor</b>						<b>1.0075</b>	<b>1.0115</b>	<b>0.9913</b>	<b>100.9%</b>

**Notes:**

Span adjustment performed after filter was replaced.

Calibration Performed By:    Devin Russell / Kelly Baragar



# Wood Buffalo Environmental Association

## TN Calibration Summary

Version-03-2017

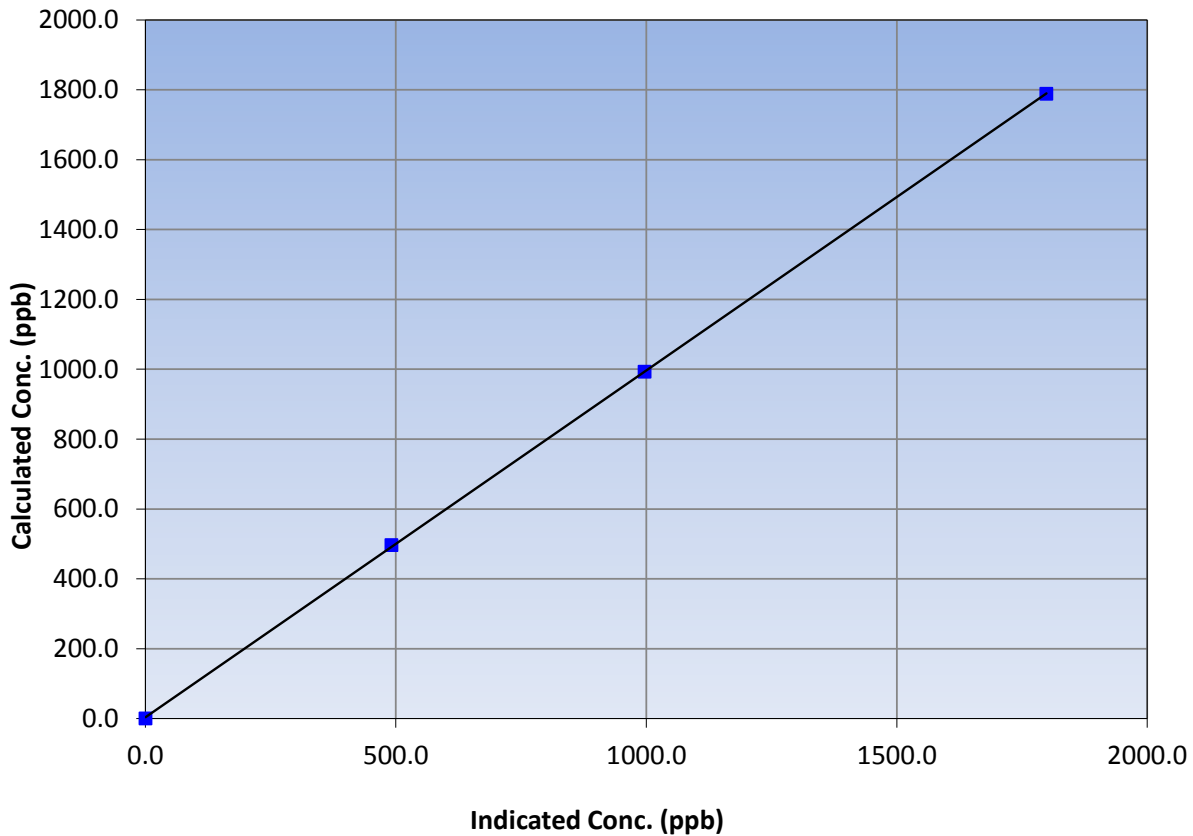
### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 29, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	9:00	End Time (MST)	11:55
Analyzer make	API T201	Analyzer serial #	215

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.3	----	Correlation Coefficient	≥0.995	
1788.4	1798.9	0.9942			
993.2	996.5	0.9966			
496.7	491.3	1.0110			
			Slope	0.993012	0.90 - 1.10
			Intercept	3.566611	+/-20

**TN Calibration Curve**





# Wood Buffalo Environmental Association

## NH<sub>3</sub> Calibration Summary

Version-03-2017

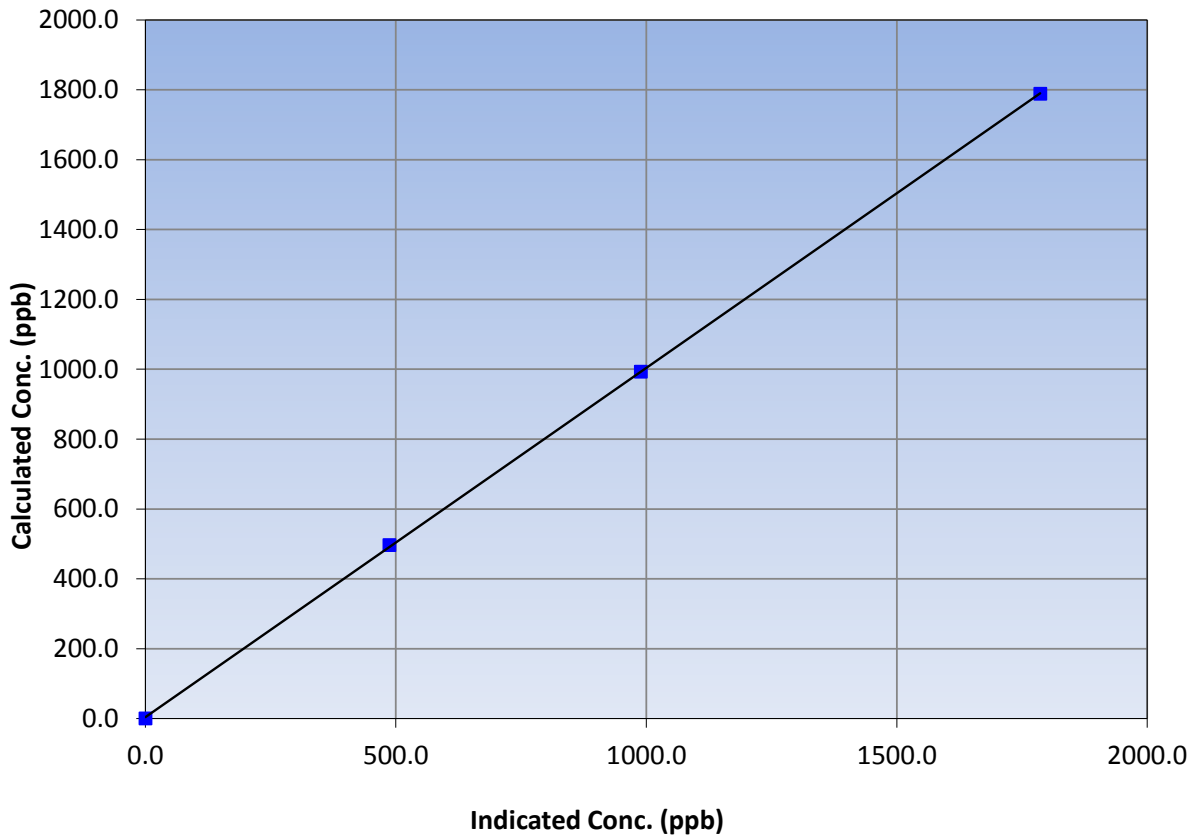
### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 29, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	9:00	End Time (MST)	11:55
Analyzer make	API T201	Analyzer serial #	215

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.1	----	Correlation Coefficient	≥0.995	
1788.4	1786.3	1.0012			
993.2	989.0	1.0042			
496.7	487.2	1.0195			
			Slope	0.999850	0.90 - 1.10
			Intercept	4.046546	+/-20

NH<sub>3</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

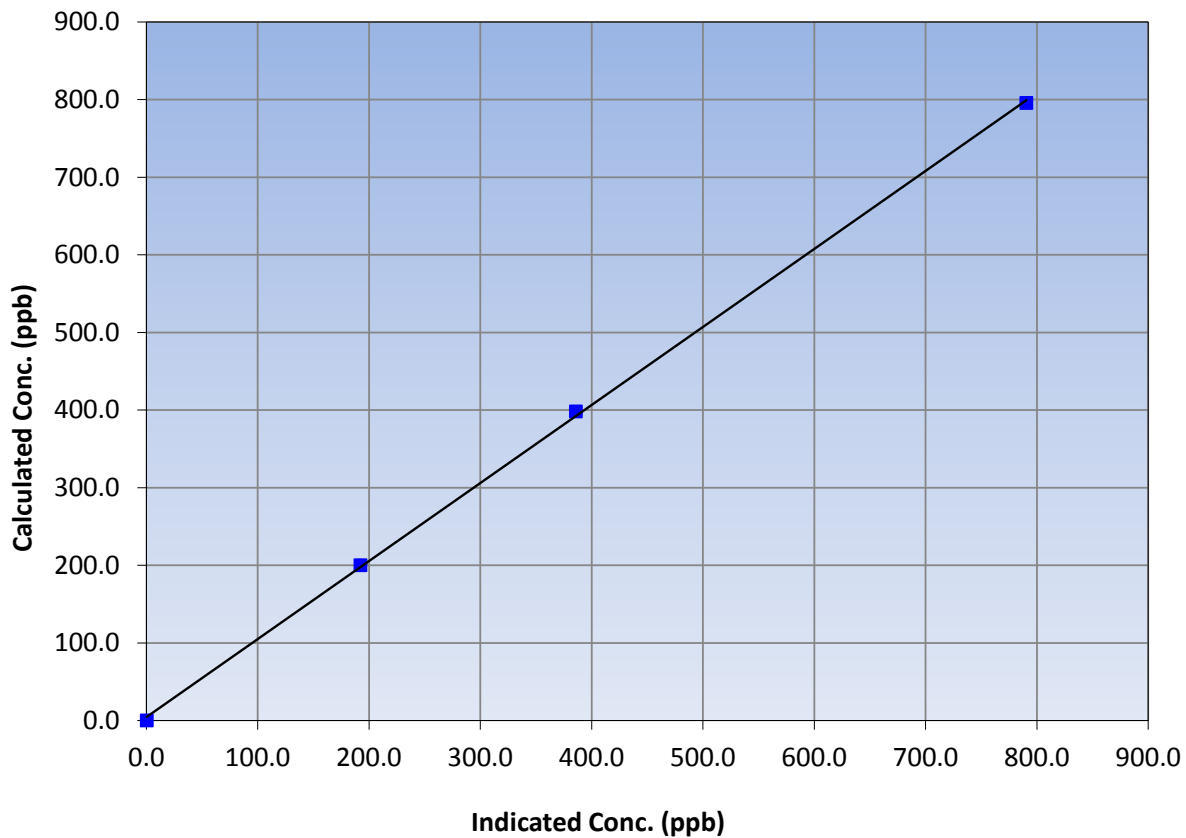
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 29, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	9:30	End Time (MST)	14:22
Analyzer make	API T201	Analyzer serial #	215

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.3	----	Correlation Coefficient	≥0.995	
795.8	790.6	1.0066			
398.4	385.9	1.0323			
200.1	192.4	1.0401			
			Slope	1.005294	0.90 - 1.10
			Intercept	4.448629	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

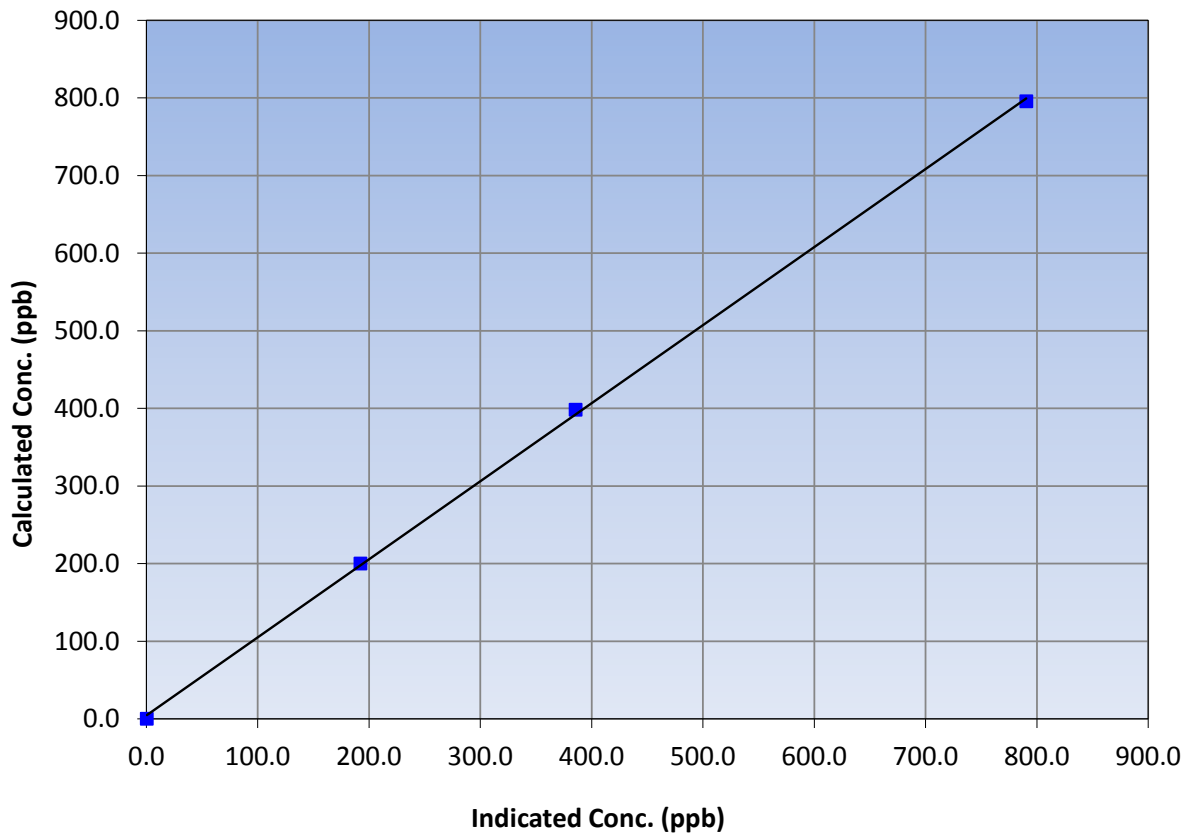
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 29, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	9:30	End Time (MST)	14:22
Analyzer make	API T201	Analyzer serial #	215

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.4	----	Correlation Coefficient	≥0.995	
795.8	790.4	1.0068			
398.4	385.5	1.0333			
200.1	192.3	1.0406			
			Slope	1.005657	0.90 - 1.10
			Intercept	4.474934	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

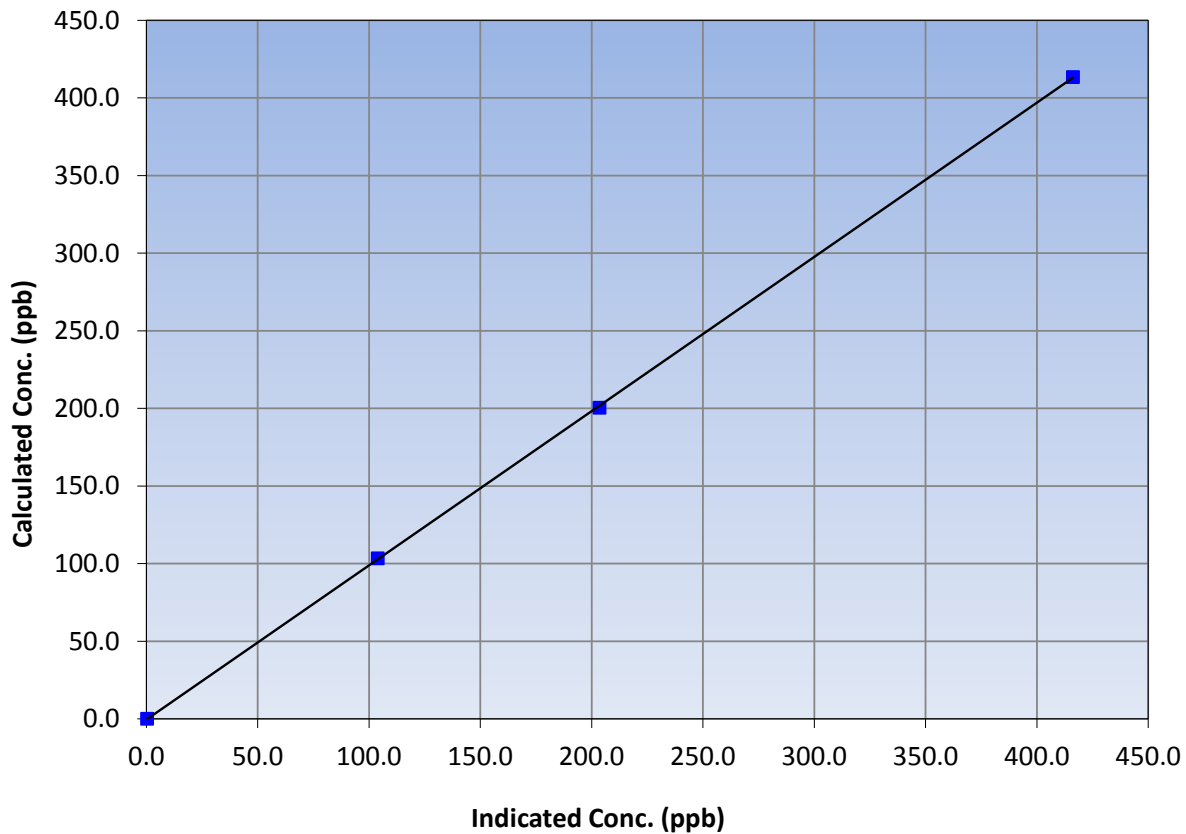
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 29, 2017
Station Name	Patricia McInnes	Station Number	AMS 06
Start Time (MST)	9:30	End Time (MST)	14:22
Analyzer make	API T201	Analyzer serial #	215

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.3	----	Correlation Coefficient	≥0.995	
413.5	416.2	0.9935			
200.5	203.5	0.9853			
103.4	103.9	0.9952			
			Slope	0.993540	0.90 - 1.10
			Intercept	-0.455949	+/-20

NO<sub>2</sub> Calibration Curve

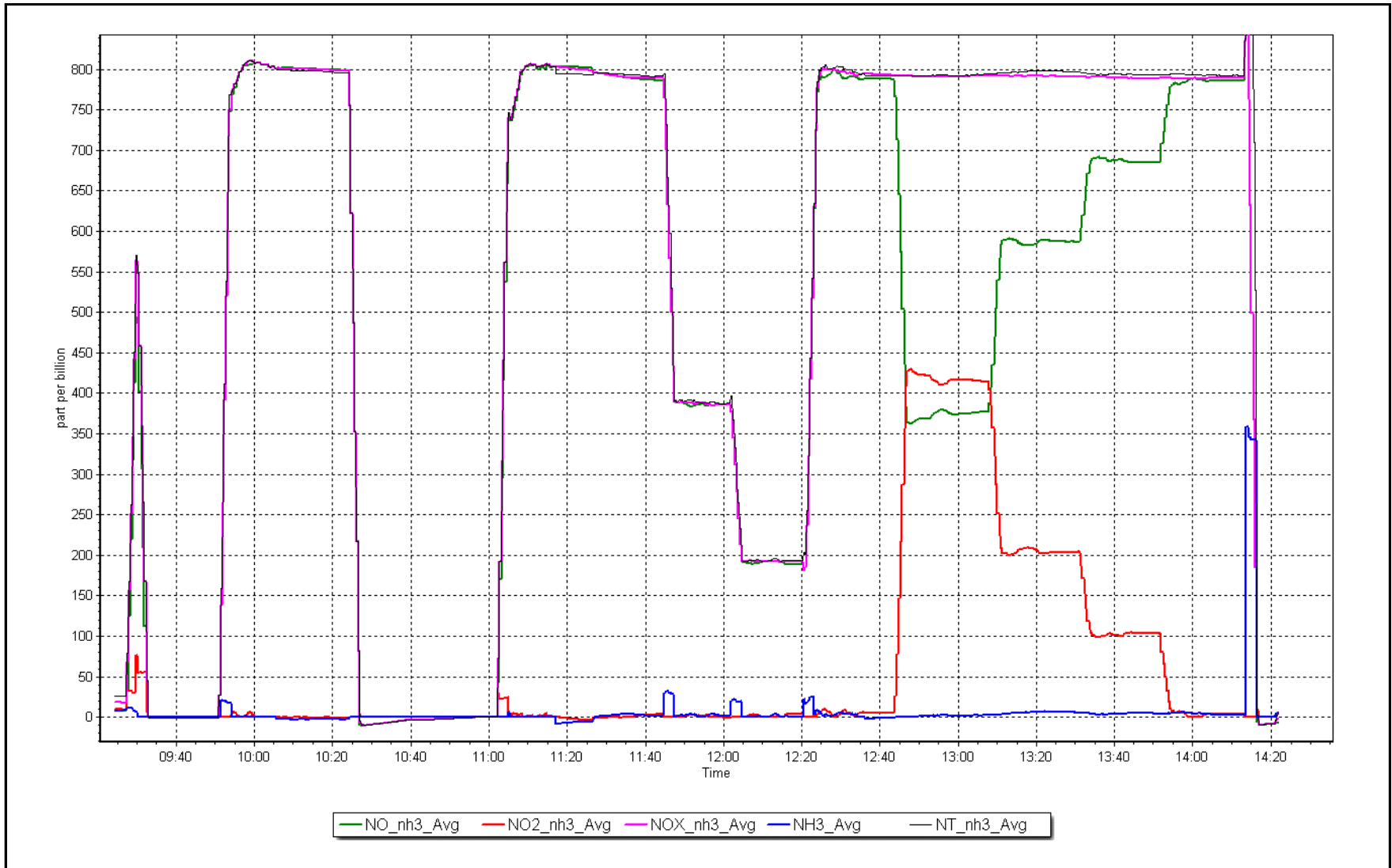




NO<sub>x</sub> Calibration Plot

Date: December 19, 2017

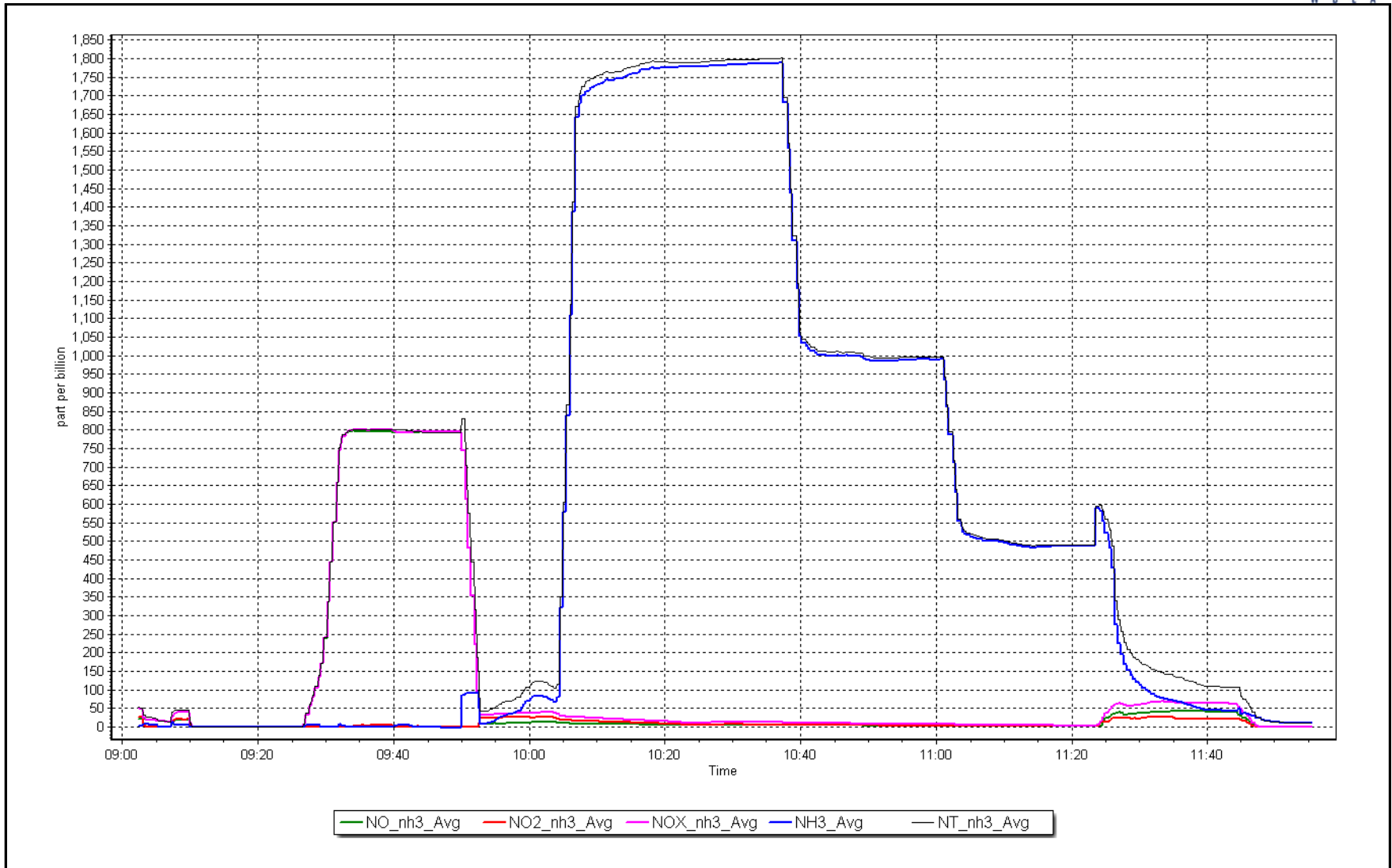
Location: Patricia McInnes



# NH<sub>3</sub> Calibration Plot

Date: December 20, 2017

Location: Patricia McInnes





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Patricia McInnes	Station number:	AMS 06
Calibration Date:	December 18, 2017	Last Cal Date:	November 29, 2017
Start time (MST):	12:56	End time (MST):	13:49
Sharp Model:	Thermo SHARP 5030	S/N:	E-1475
Particulate Fraction:	PM2.5	C14 Source S/N:	5680
Flow Meter Make/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>	<b>(Limits)</b>
T1 (°C)	-9	-8.8	-9	<input type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	962	958	962	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	998.4	1000	<input type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	-0.2	-----	-0.2	<input type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Concentration zero	-0.2	-----	-0.2	<input type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:	NA				

### Quarterly Calibration Test

Leak Test: \_\_\_\_\_ Date of check: \_\_\_\_\_ Last Cal Date: November 29, 2017  
 Flow w/o adaptor: \_\_\_\_\_ Flow w/ adaptor: \_\_\_\_\_

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>2597</u>	
Foil Mass: _____	Foil Mass: <u>1167</u>	
Calibration Date: _____	Calibration Date: <u>October-23-17</u>	
Correction Factor: _____	Correction Factor: <u>6941</u>	<u>---</u>

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)				<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes:

No adjustments.

Calibration by: Ryan Power



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 7**  
**ATHABASCA VALLEY**  
**DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)  
DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100	7	0	1	0
TRS (ppb) Average	705	36	39	99.6	1	0	1	0
THC (ppm) Average	687	36	57	97.18	2.9	-	2.4	-
NMHC (ppm) Average	687	36	57	97.18	0.465	-	0.089	-
CH4(ppm) Average	687	36	57	97.18	2.6	-	2.3	-
O3 (ppb) Average	709	34	35	99.87	40	0	35	-
NO2 (ppb) Average	643	34	101	90.99	40	0	25	-
NO (ppb) Average	643	34	101	90.99	102	-	24	-
NOX (ppb) Average	643	34	101	90.99	142	-	49	-
PM2.5 (ug/m3) Average	722	1	22	97.18	24.4	-	12.5	0
CO(ppm) Average	709	34	35	99.87	0.8	0	0.3	-
Temperature 2 m (C) Average	744	0	0	100	6.2	-	1	-
Barometric Pressure (inHg) Average	743	0	1	99.87	29.9	-	29.8	-
Relative Humidity (%) Average	744	0	0	100	97	-	93	-
Wind Speed 10 m (km/h) Average	708	0	36	95.16	27	-	17	-
Wind Direction 10 m (deg) Average	708	0	36	95.16	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.5	1	-	0	0	0	0	1	1	7
TRS (ppb) Average	705	0.5	0	-	0	0	0	0	1	1	1
THC (ppm) Average	687	2.09	0.1	-	2	2	2	2.1	2.1	2.2	2.9
NMHC (ppm) Average	687	0.012	0.047	-	0	0	0	0	0	0	0.465
CH4(ppm) Average	687	2.07	0.1	-	2	2	2	2.1	2.1	2.2	2.6
O3 (ppb) Average	709	16.7	10	-	1	6	9	14	23	34	40
NO2 (ppb) Average	643	14	9	-	1	3	7	13	19	27	40
NO (ppb) Average	643	7.9	12	-	0	0	1	3	9	22	102
NOX (ppb) Average	643	21.9	19	-	1	3	9	16	28	48	142
PM2.5 (ug/m3) Average	722	6.21	3.9	-	0.1	2.1	3.3	5.4	8.2	11.4	24.4
CO(ppm) Average	709	0.19	0.1	-	0.1	0.1	0.1	0.2	0.2	0.3	0.8
Temperature 2 m (C) Average	744	-14.66	12.5	-	-39.8	-32.8	-27.2	-10	-4.9	0	6.2
Barometric Pressure (inHg) Average	743	29.15	0.4	-	28.3	28.7	28.9	29.2	29.4	29.7	29.9
Relative Humidity (%) Average	744	79.6	9	-	52	69	72	78	89	93	97
Wind Speed 10 m (km/h) Average	708	7.1	5	-	0	2	3	6	10	15	27
Wind Direction 10 m (deg) Average	708	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
CO, O3, TRS	05 Dec 2017 10:00	05 Dec 2017 10:00	1	Maintenance - cleaned glass manifold
TRS	25 Dec 2017 15:00	25 Dec 2017 16:00	2	Unstable operation - excessive baseline drift
NMHC, CH4, THC	26 Dec 2017 09:00	26 Dec 2017 13:00	5	Unstable Operation - station temperature fluctuations
NMHC, CH4, THC	27 Dec 2017 08:00	27 Dec 2017 11:00	4	Unstable Operation - station temperature fluctuations
NMHC, CH4, THC	28 Dec 2017 23:00	29 Dec 2017 02:00	4	Unstable Operation - station temperature fluctuations
NMHC, CH4, THC	29 Dec 2017 04:00	29 Dec 2017 11:00	8	Unstable Operation - station temperature fluctuations
NO2, NO, NOX	11 Dec 2017 11:00	11 Dec 2017 12:00	2	Maintenance - reinitiated daily QA check
NO2, NO, NOX	21 Dec 2017 09:00	21 Dec 2017 13:00	5	Maintenance - recalibration
NO2, NO, NOX	28 Dec 2017 03:00	30 Dec 2017 10:00	56	Unstable operation
NO2, NO, NOX	30 Dec 2017 11:00	30 Dec 2017 14:00	4	Maintenance - recalibration
PM2.5	15 Dec 2017 16:00	15 Dec 2017 16:00	1	Unstable operation - excessive baseline drift
PM2.5	15 Dec 2017 22:00	16 Dec 2017 02:00	5	Unstable operation - excessive baseline drift
PM2.5	17 Dec 2017 15:00	18 Dec 2017 05:00	15	Unstable operation - excessive baseline drift
Barometric Pressure	12 Dec 2017 12:00	12 Dec 2017 12:00	1	DAS collection error
Wind Speed, Wind Direction	02 Dec 2017 11:00	02 Dec 2017 11:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	02 Dec 2017 17:00	02 Dec 2017 19:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	03 Dec 2017 04:00	03 Dec 2017 04:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	10 Dec 2017 17:00	11 Dec 2017 13:00	21	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	12 Dec 2017 01:00	12 Dec 2017 10:00	10	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association

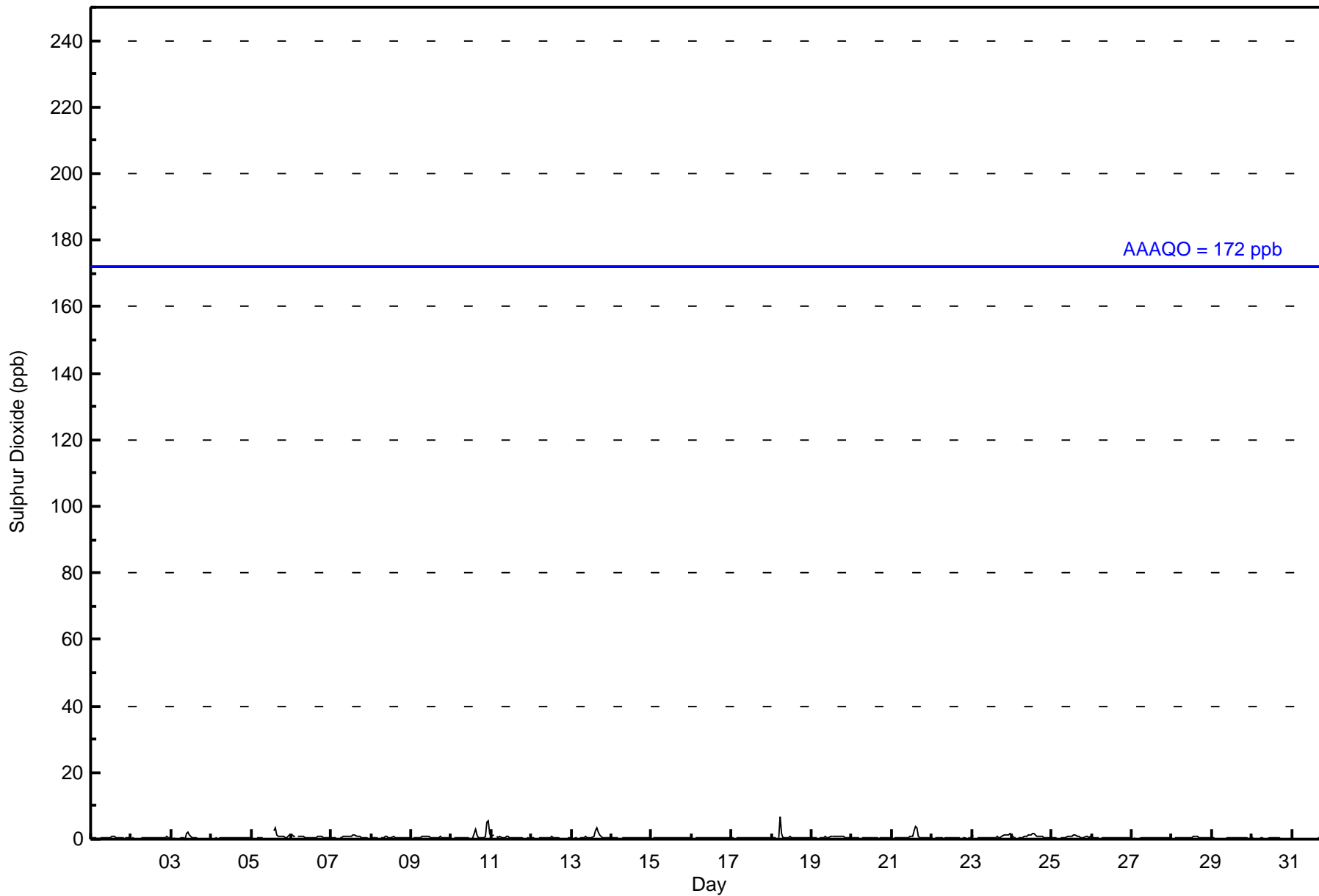
Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Athabasca Valley - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																	Hours in Service: 744									
Maximum Value: 7 ppb on Dec 18 06:00																	Maximum Daily Average: 1.0 ppb on Dec 10							Hours of Data: 708		
Minimum Value: 0 ppb on Dec 31 02:00																	Minimum Daily Average: 0.1 ppb on Dec 31							Hours of Missing Data: 36		
Maximum Diurnal Average: 0.9 ppb at hour 15																	Minimum Diurnal Average: 0.3 ppb at hour 3							Hours of Calibration: 36		
Monthly Average: 0.5 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 3							Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0.4	1
3-Dec	Z	0	0	0	0	0	0	0	0	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2
4-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0.4	1
5-Dec	0	0	Z	0	0	0	1	0	C	C	C	C	C	3	3	1	1	1	1	1	1	1	1	0.9	3	
6-Dec	1	1	1	Z	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0.7	1	
7-Dec	0	1	0	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.6	1	
8-Dec	0	0	0	0	0	Z	0	0	1	1	0	1	1	1	1	0	0	0	0	1	0	0	0	0.4	1	
9-Dec	Z	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0.6	1	
10-Dec	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	3	1	0	0	0	0	1	5	5	2	1.0	5
11-Dec	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
12-Dec	0	0	0	Z	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1	
13-Dec	0	0	0	0	Z	0	0	1	1	1	0	0	0	1	2	3	2	1	1	0	0	0	0	0.7	3	
14-Dec	0	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0.4	1	
15-Dec	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0.4	1	
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	0	0	0.4	1	
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
18-Dec	0	0	0	Z	0	7	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.7	7	
19-Dec	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.6	1	
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
21-Dec	Z	0	0	0	0	0	0	0	1	0	1	1	1	2	4	3	1	1	0	1	0	0	0	0.8	4	
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
23-Dec	1	1	Z	1	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0.7	1	
24-Dec	1	1	0	Z	0	0	0	1	1	1	1	1	2	1	1	1	1	1	1	0	0	0	0	0.8	2	
25-Dec	0	0	0	0	Z	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1	
26-Dec	1	1	0	1	0	Z	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0.4	1	
28-Dec	0	Z	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0.4	1	
29-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
0.4 0.4 0.3 0.4 0.4 0.6 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.7 0.9 0.7 0.5 0.5 0.4 0.4 0.4 0.5 0.5 0.4																								Diurnal Average		
1 1 1 1 1 7 2 1 1 2 2 1 2 3 4 3 2 1 1 1 1 5 5 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  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Athabasca Valley - December 2017**

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

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Athabasca Valley - December 2017**

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	8	5	11	11	18	158	88	33	45	64	39	60	22	33	57	674
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
<b>Totals</b>	22	8	5	11	11	18	158	88	33	45	64	39	60	22	33	57	674

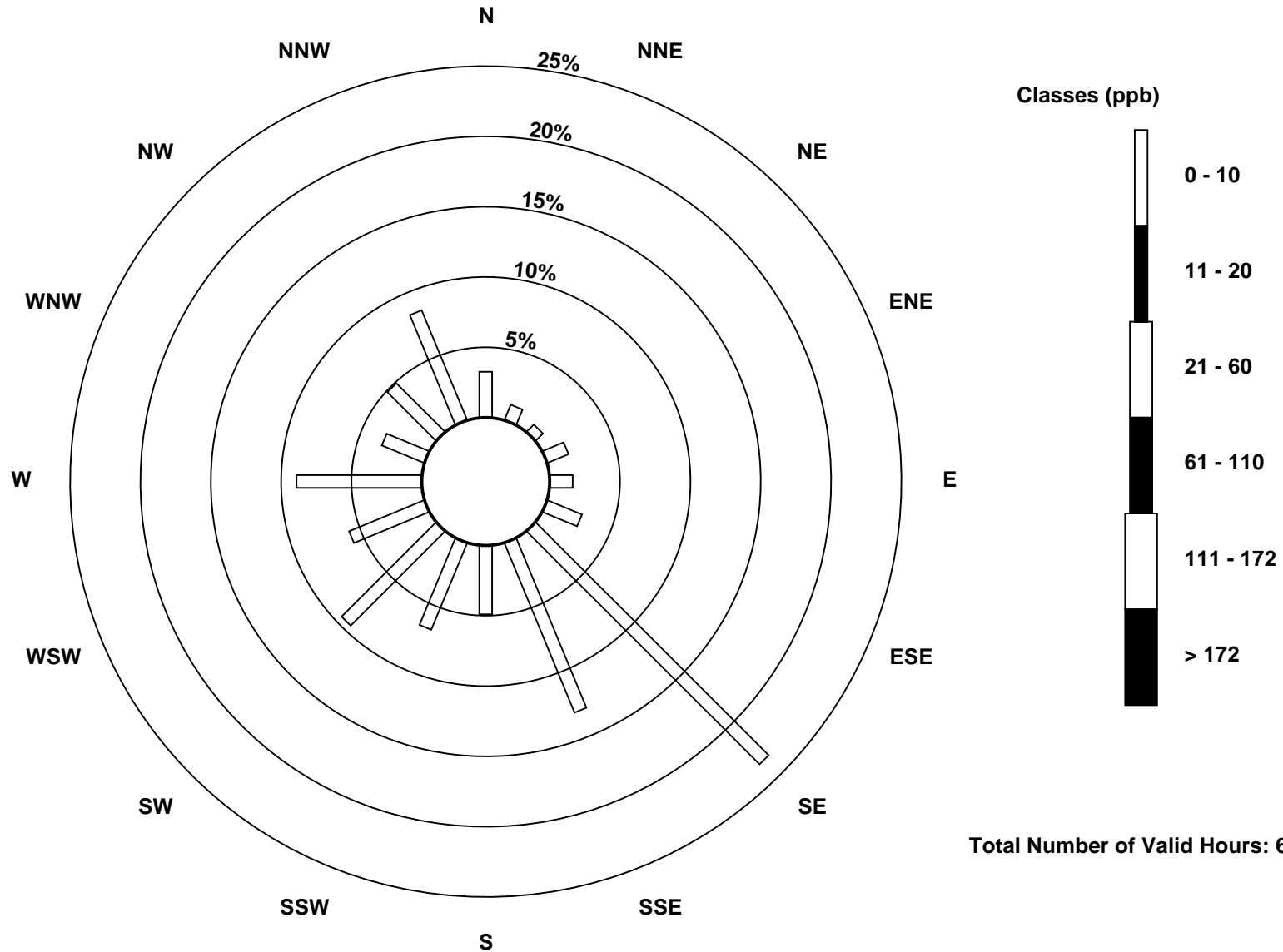
Total Number of Valid Hours: 674

Total Number of Hours: 744

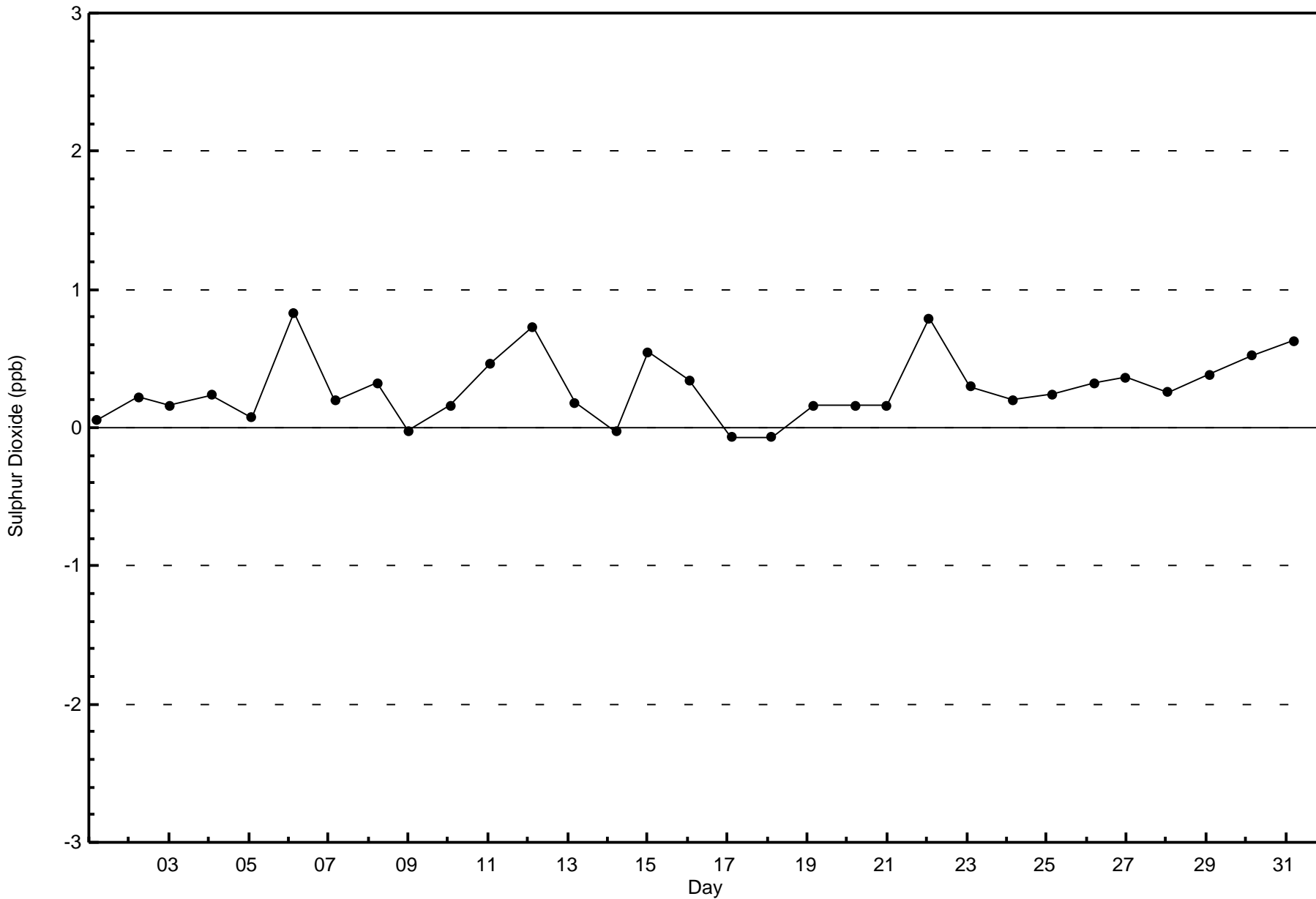


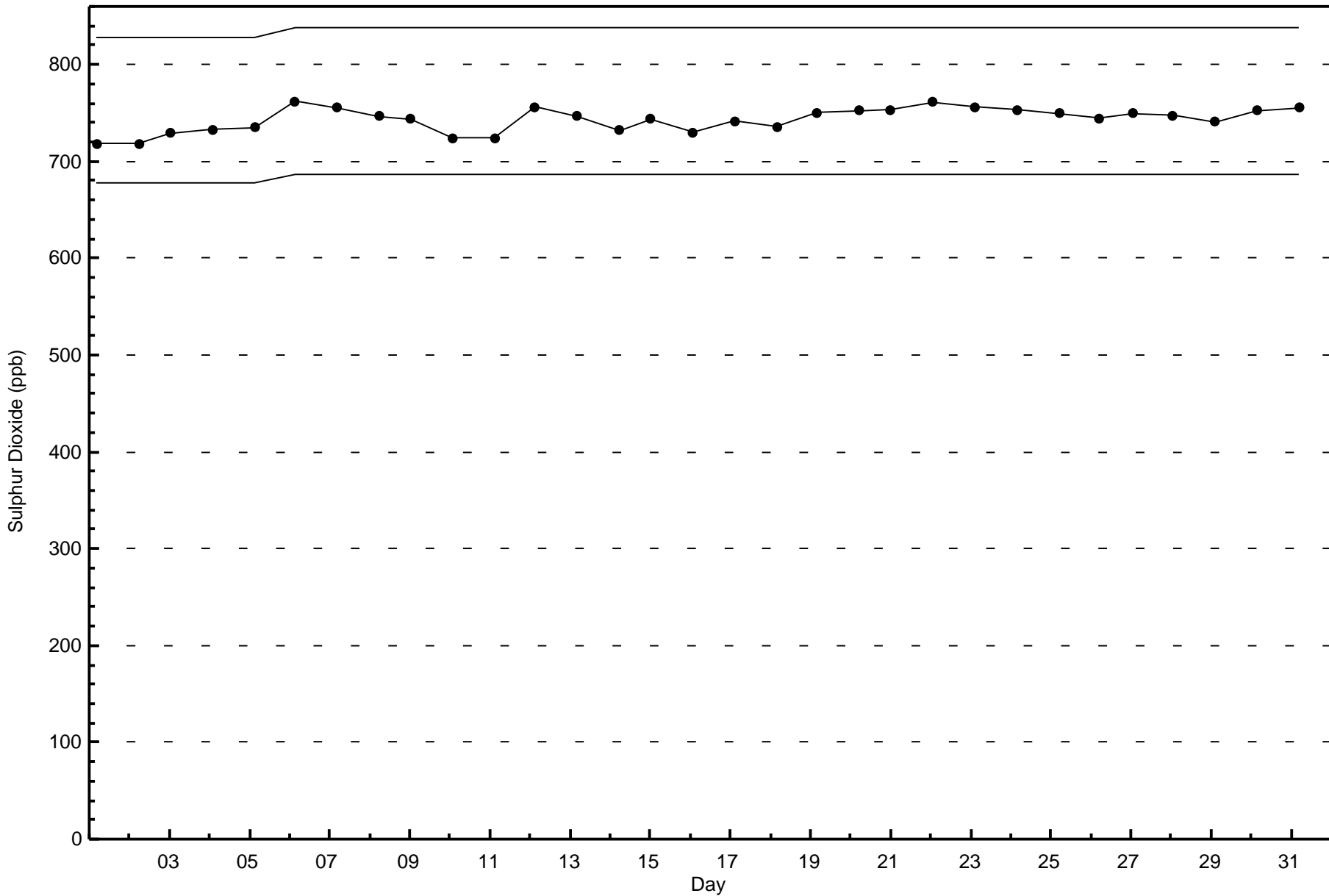
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 674







**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Total Reduced Sulphur (TRS) - ppb**

**Athabasca Valley - December 2017**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 12 14:00	Maximum Daily Average: 0.8 ppb on Dec 2		Hours of Data:	705
Minimum Value: 0 ppb on Dec 18 19:00	Minimum Daily Average: 0.3 ppb on Dec 15		Hours of Missing Data:	39
Maximum Diurnal Average: 0.5 ppb at hour 14	Minimum Diurnal Average: 0.4 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 0.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 1		Percent Operational Time:	99.6

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

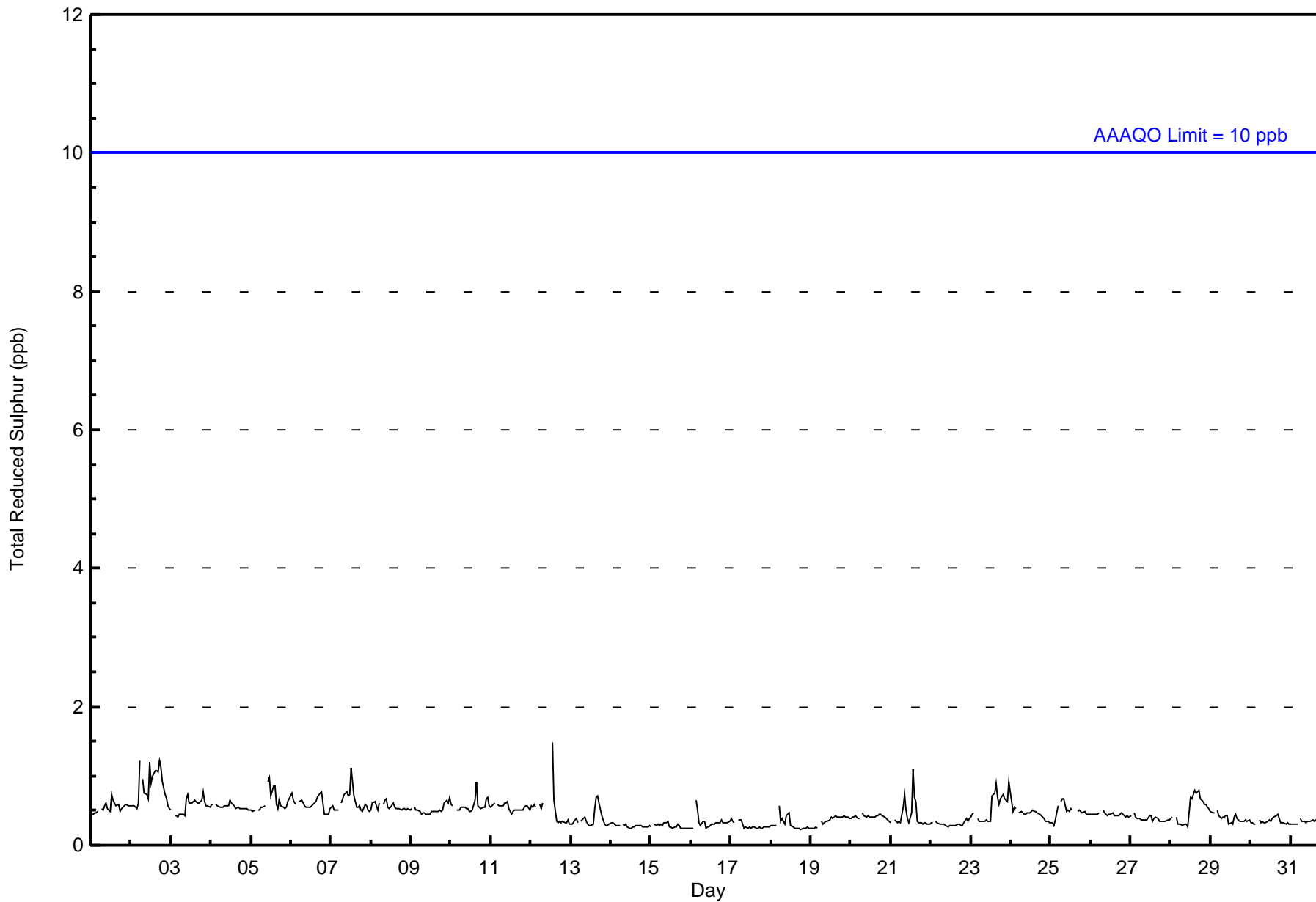
0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	Diurnal Average
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum

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**

**Total Reduced Sulphur (TRS) - ppb**  
**Athabasca Valley - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	23	8	5	10	11	17	159	90	31	43	64	40	60	21	33	58	673
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
<b>Totals</b>	23	8	5	10	11	17	159	90	31	43	64	40	60	21	33	58	673

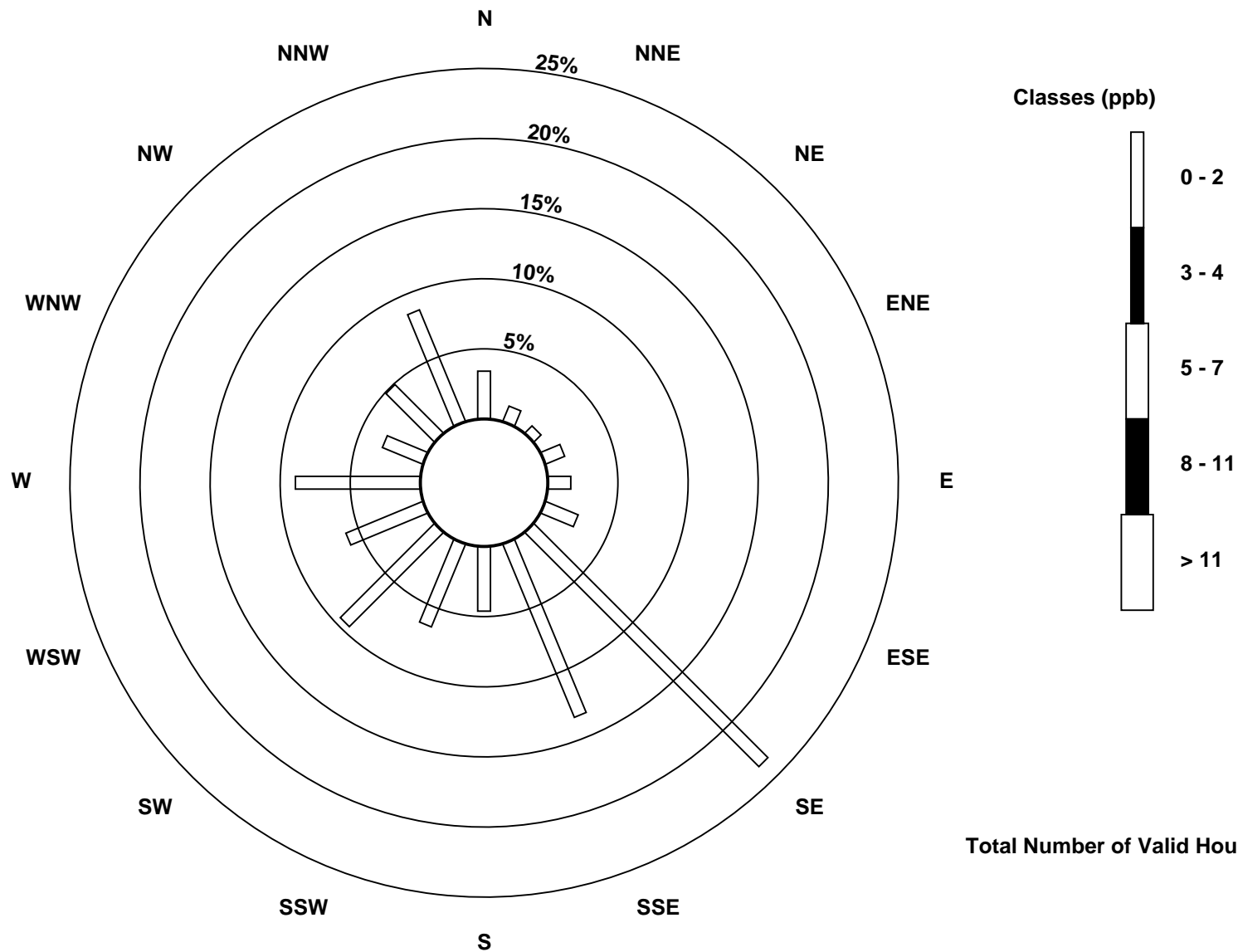
Total Number of Valid Hours: 673

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

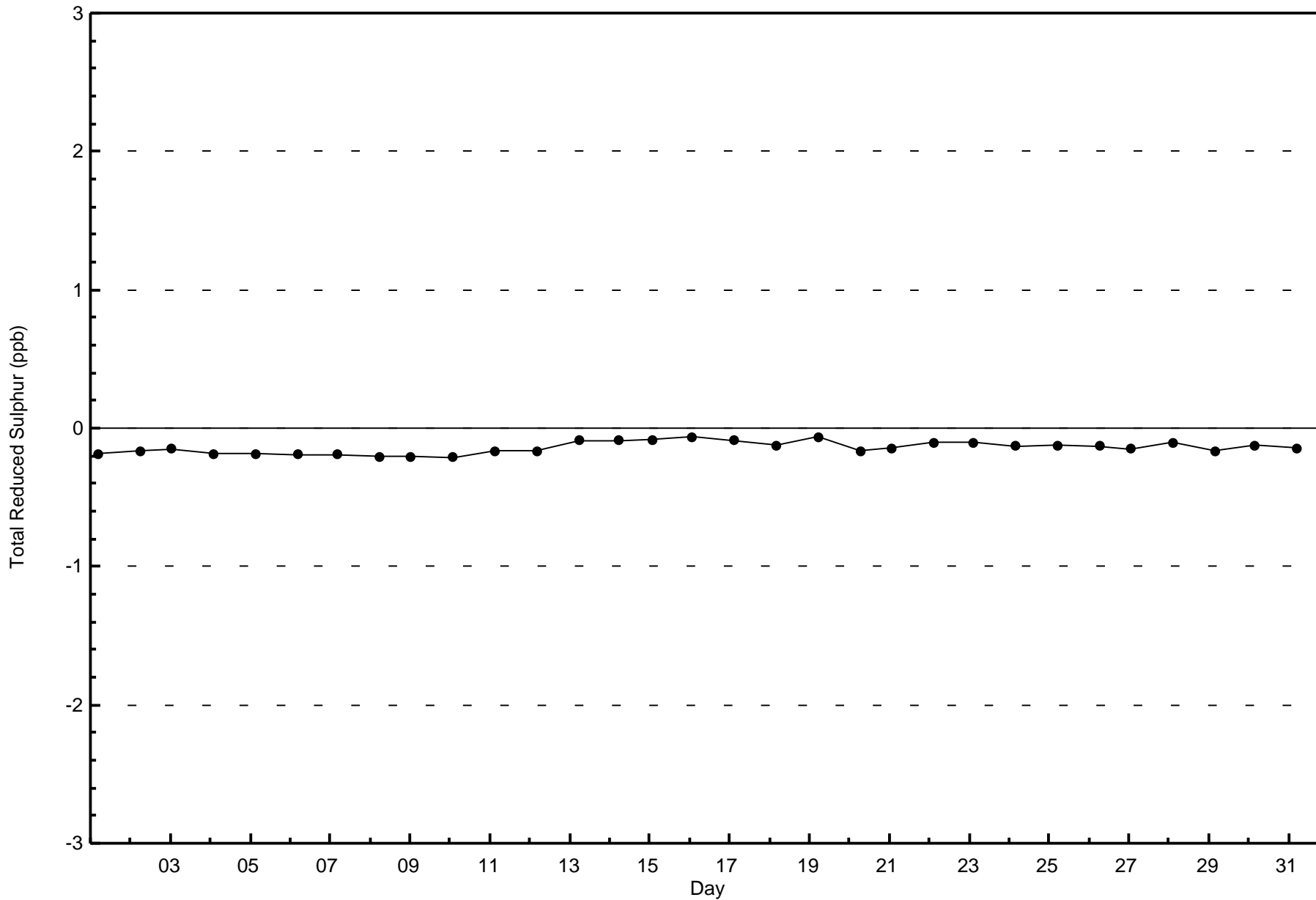
Total Reduced Sulphur (TRS) - ppb  
Athabasca Valley (AMS 7)

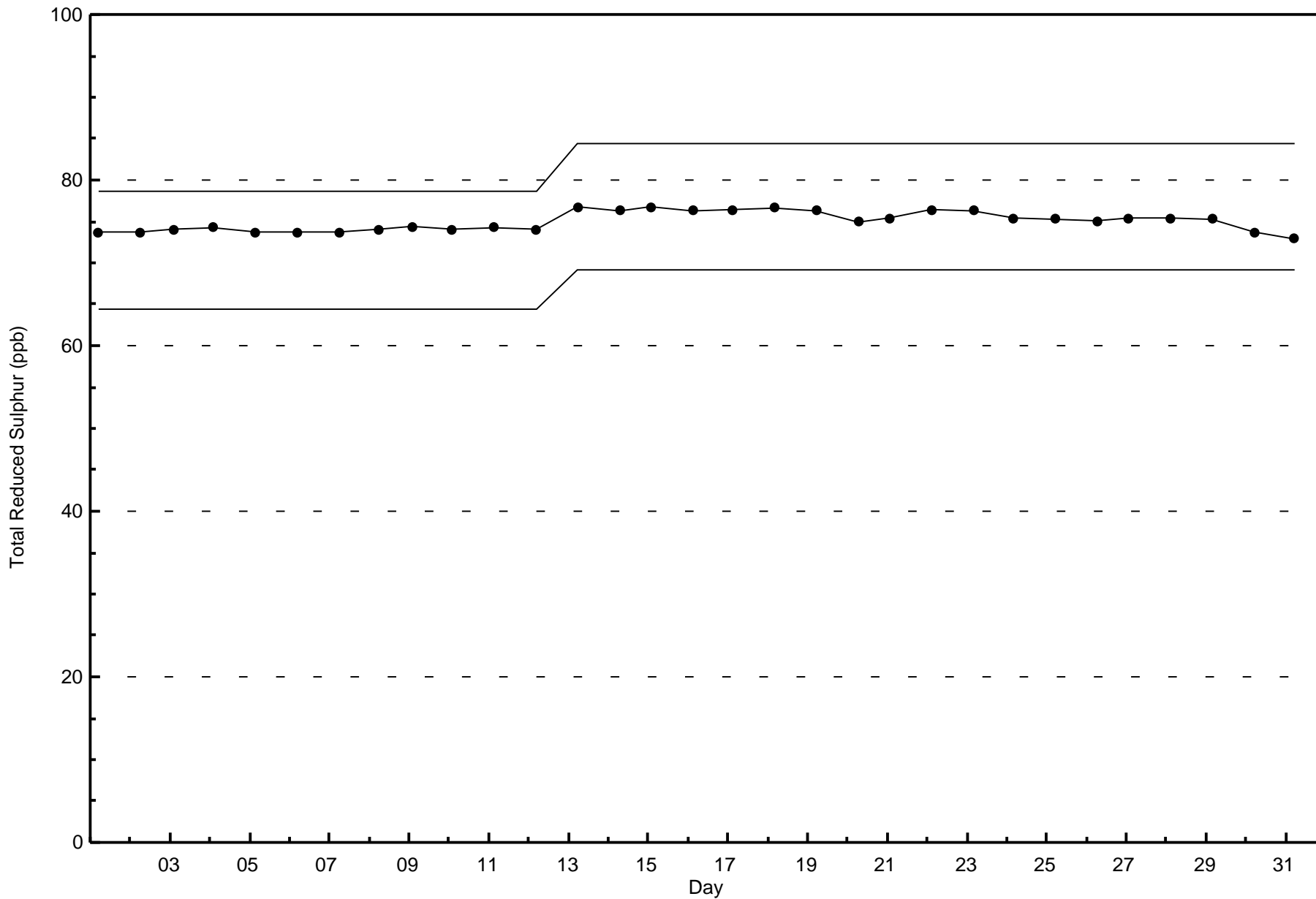




Wood Buffalo Environmental Association  
Zero Responses

Total Reduced Sulphur (TRS) - ppb  
Athabasca Valley - December 2017



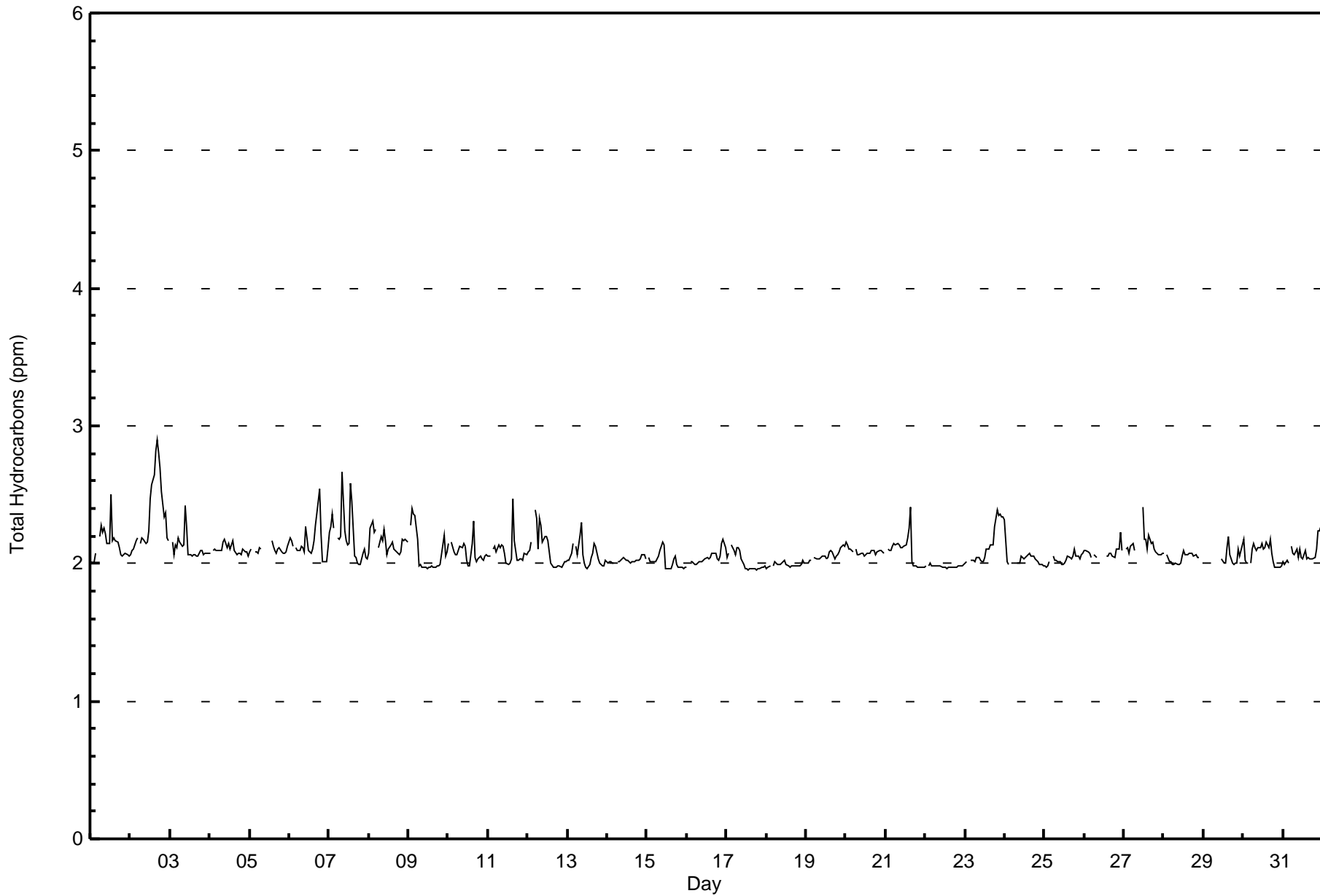






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Athabasca Valley - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	289	42.07	42.07
2.1 - 3.0	398	57.93	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	12	3	2	4	4	1	26	10	8	27	44	31	50	14	23	23	282
2.1 - 3.0	10	3	3	6	6	17	124	77	24	18	18	7	7	7	10	34	371
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
<b>Totals</b>	22	6	5	10	10	18	150	87	32	45	62	38	57	21	33	57	653

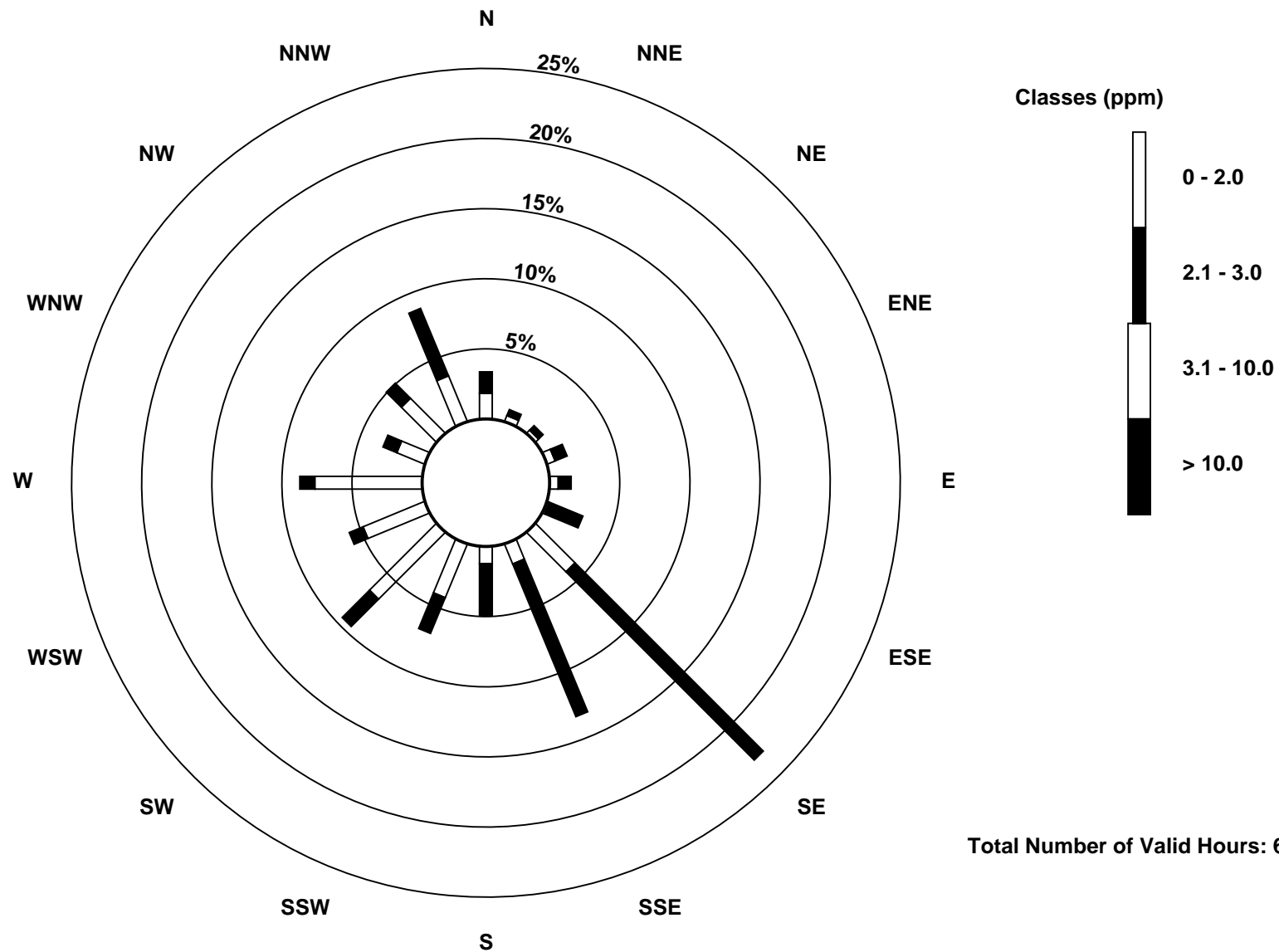
Total Number of Valid Hours: 653

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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

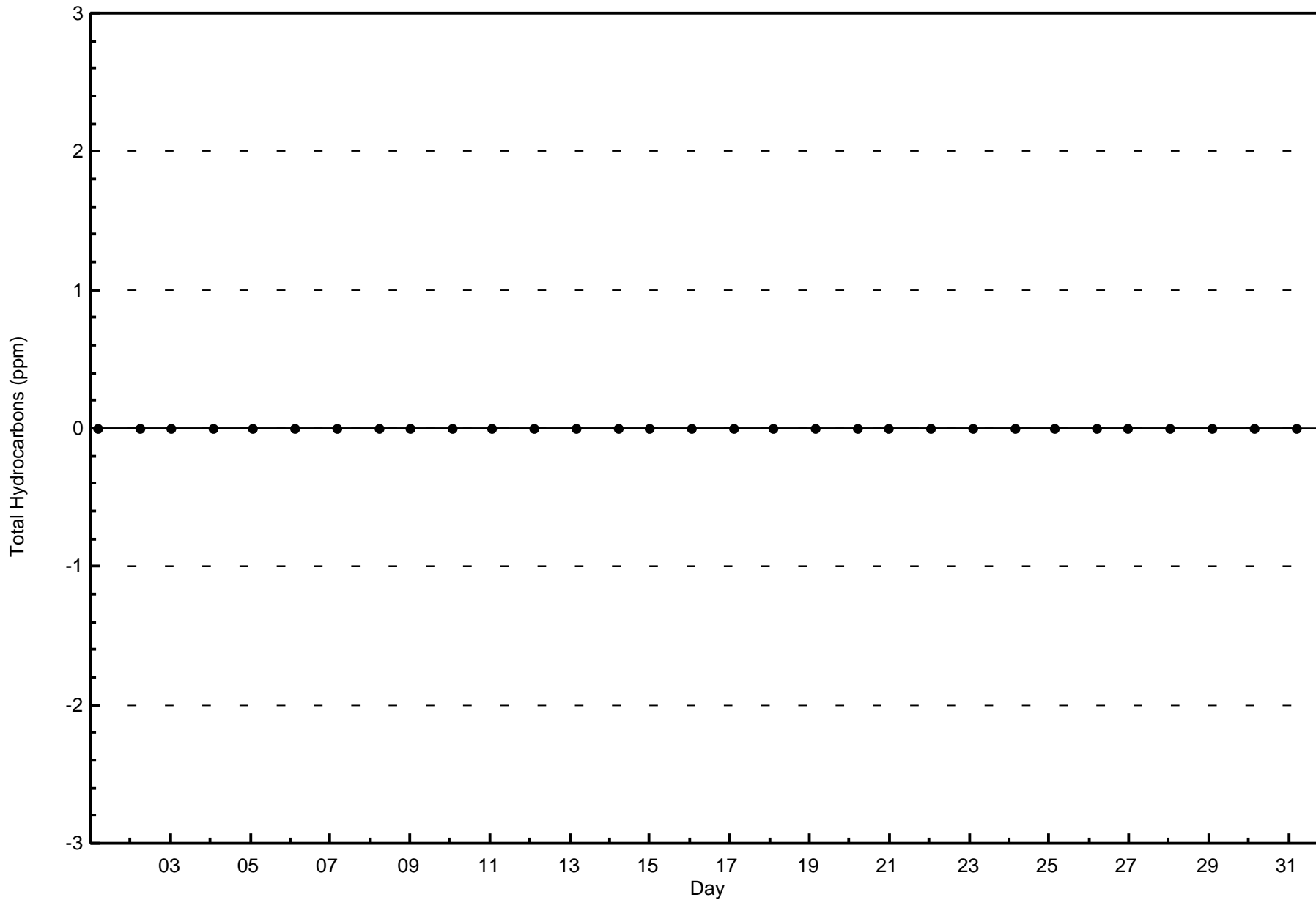


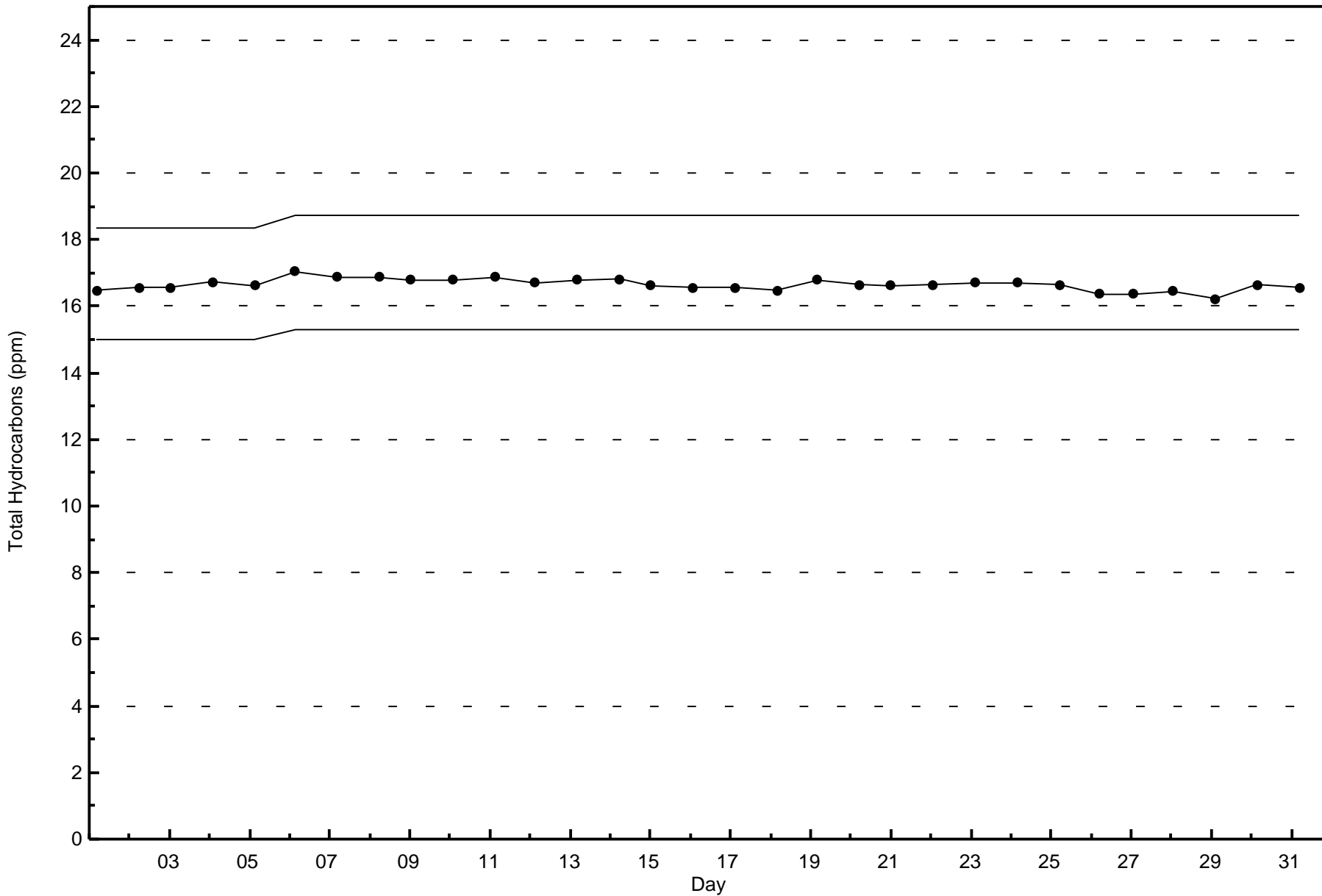
Total Number of Valid Hours: 653



Wood Buffalo Environmental Association  
Zero Responses

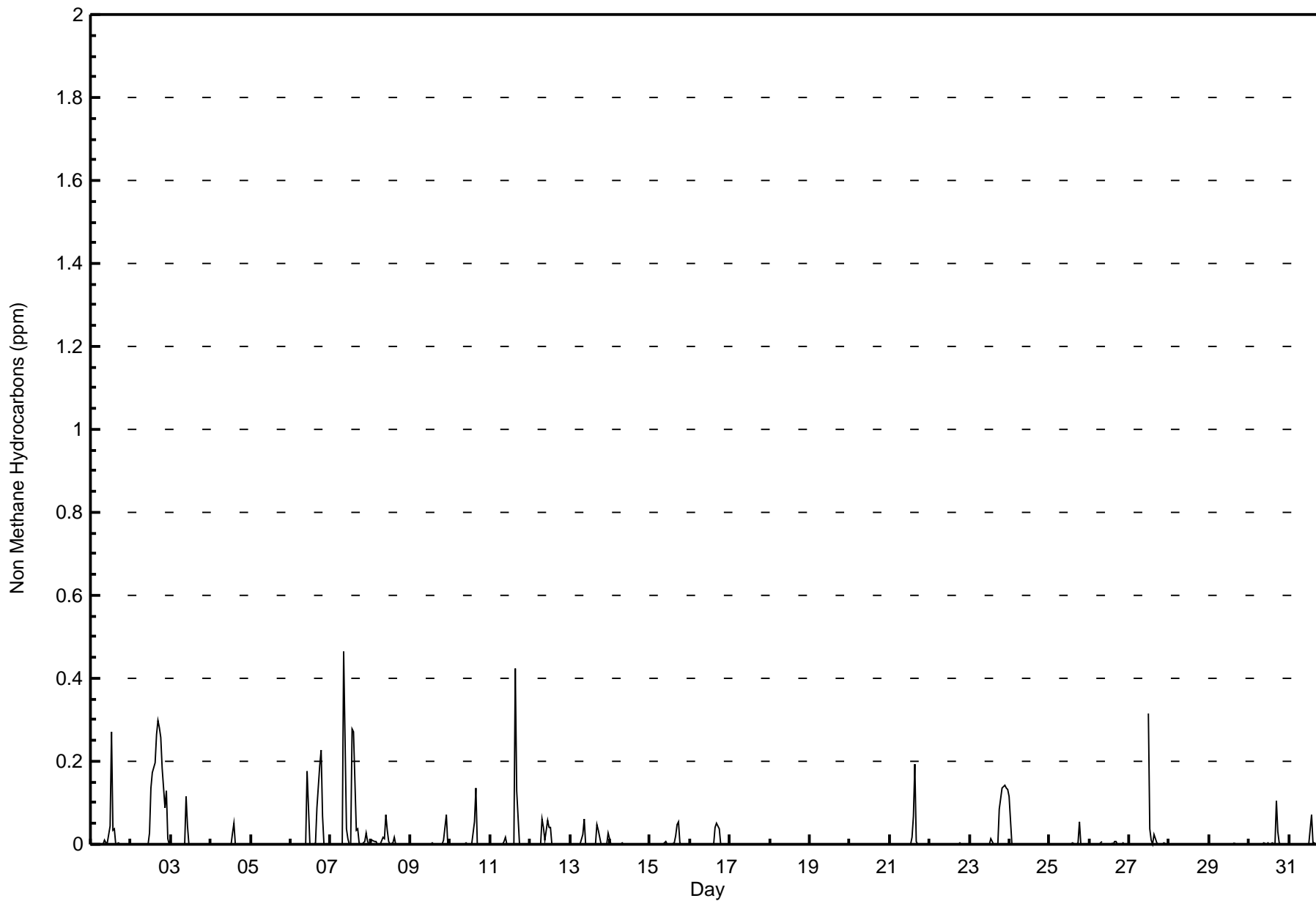
Total Hydrocarbons (THC) - ppm  
Athabasca Valley - December 2017







Maximum Value: 0.465 ppm on Dec 7 09:00		Maximum Daily Average: 0.089 ppm on Dec 2		Hours in Service: 744																							
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 17		Hours of Data: 687																							
Maximum Diurnal Average: 0.037 ppm at hour 16		Minimum Diurnal Average: 0.000 ppm at hour 5		Hours of Missing Data: 57																							
Monthly Average: 0.012 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.3		Hours of Calibration: 36																							
				Percent Operational Time: 97.2																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.011	0.003	0.004	0.042	0.271	0.035	0.036	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.271	
2-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.029	0.137	0.173	0.196	0.264	0.298	0.283	0.256	0.183	0.090	0.129	0.013	0.000	0.089	0.298	
3-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.117	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.117	
4-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.050	
5-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	C	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
6-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.177	0.000	0.000	0.000	0.001	0.002	0.087	0.188	0.226	0.067	0.000	0.000	0.000	0.000	0.033	0.226	
7-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.465	0.037	0.012	0.000	0.000	0.278	0.271	0.034	0.036	0.002	0.000	0.000	0.007	0.029	0.006	0.000	0.051	0.465	
8-Dec	0.003	0.011	0.006	0.006	0.000	Z	0.000	0.017	0.013	0.072	0.034	0.006	0.000	0.005	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.072	
9-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.072	0.072	
10-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.054	0.137	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.137	
11-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.005	0.016	0.000	0.000	0.000	0.000	0.000	0.424	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025	0.424	
12-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.060	0.042	0.009	0.057	0.042	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.060	
13-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.025	0.060	0.000	0.000	0.000	0.000	0.000	0.001	0.046	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.008	0.060	
14-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003
15-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000	0.001	0.003	0.019	0.048	0.053	0.004	0.000	0.000	0.000	0.000	0.000	0.006	0.053	
16-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042	0.052	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.052	
17-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
21-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.068	0.195	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.195	
22-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
23-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.083	0.136	0.141	0.142	0.134	0.132	0.034	0.142	
24-Dec	0.114	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	0.005	0.114	
25-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.000	0.000	0.003	0.053	0.000	0.000	0.000	0.000	0.000	0.003	0.053	
26-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.006	UO	UO	UO	UO	UO	0.004	0.000	0.007	0.005	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.001	0.007	
27-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	UO	UO	UO	UO	0.315	0.036	0.010	0.000	0.025	0.004	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.021	0.315	
28-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	UO	UO	0.000	0.000
29-Dec	UO	UO	Z	UO	UO	UO	UO	UO	UO	UO	UO	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	--	0.004	
30-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.004	0.000	0.000	0.005	0.000	0.106	0.029	0.002	0.000	0.000	0.000	0.000	0.000	0.007	0.106	
31-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.072	0.004	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.072	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan																											
C - Calibration																											
UO - Unstable Operation																											





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	597	86.90	86.90
0.006 - 0.05	50	7.28	94.18
0.06 - 0.1	23	3.35	97.53
> 0.1	17	2.47	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	20	4	4	10	7	14	125	70	25	42	57	34	57	21	30	50	570
0.006 - 0.05	1	2	0	0	0	3	13	12	5	2	2	4	0	0	1	2	47
0.06 - 0.1	0	0	1	0	2	0	6	3	2	0	3	0	0	0	0	5	22
> 0.1	1	0	0	0	1	1	6	2	0	1	0	0	0	0	2	0	14
<b>Totals</b>	22	6	5	10	10	18	150	87	32	45	62	38	57	21	33	57	653

Total Number of Valid Hours: 653

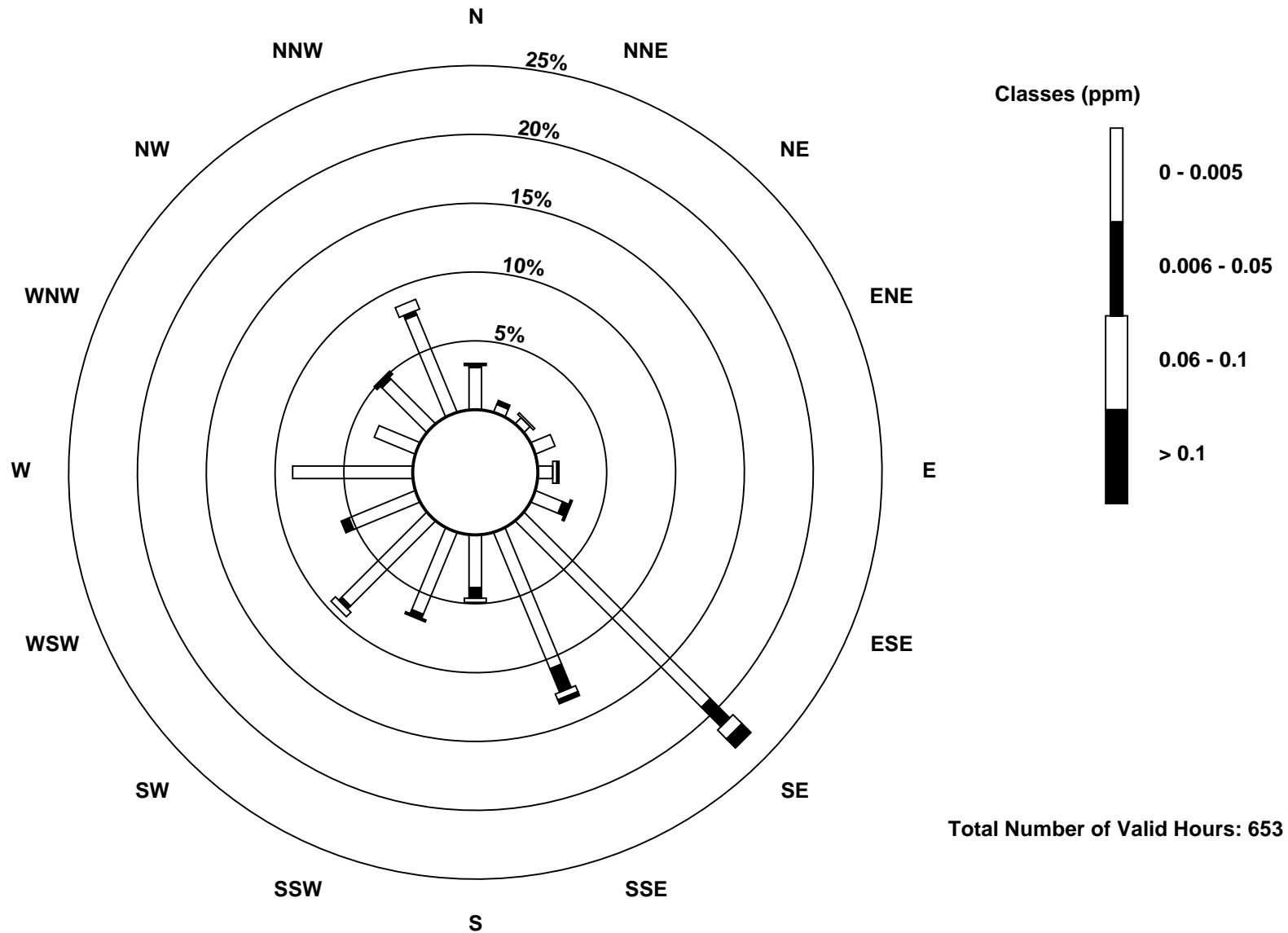
Total Number of Hours: 744

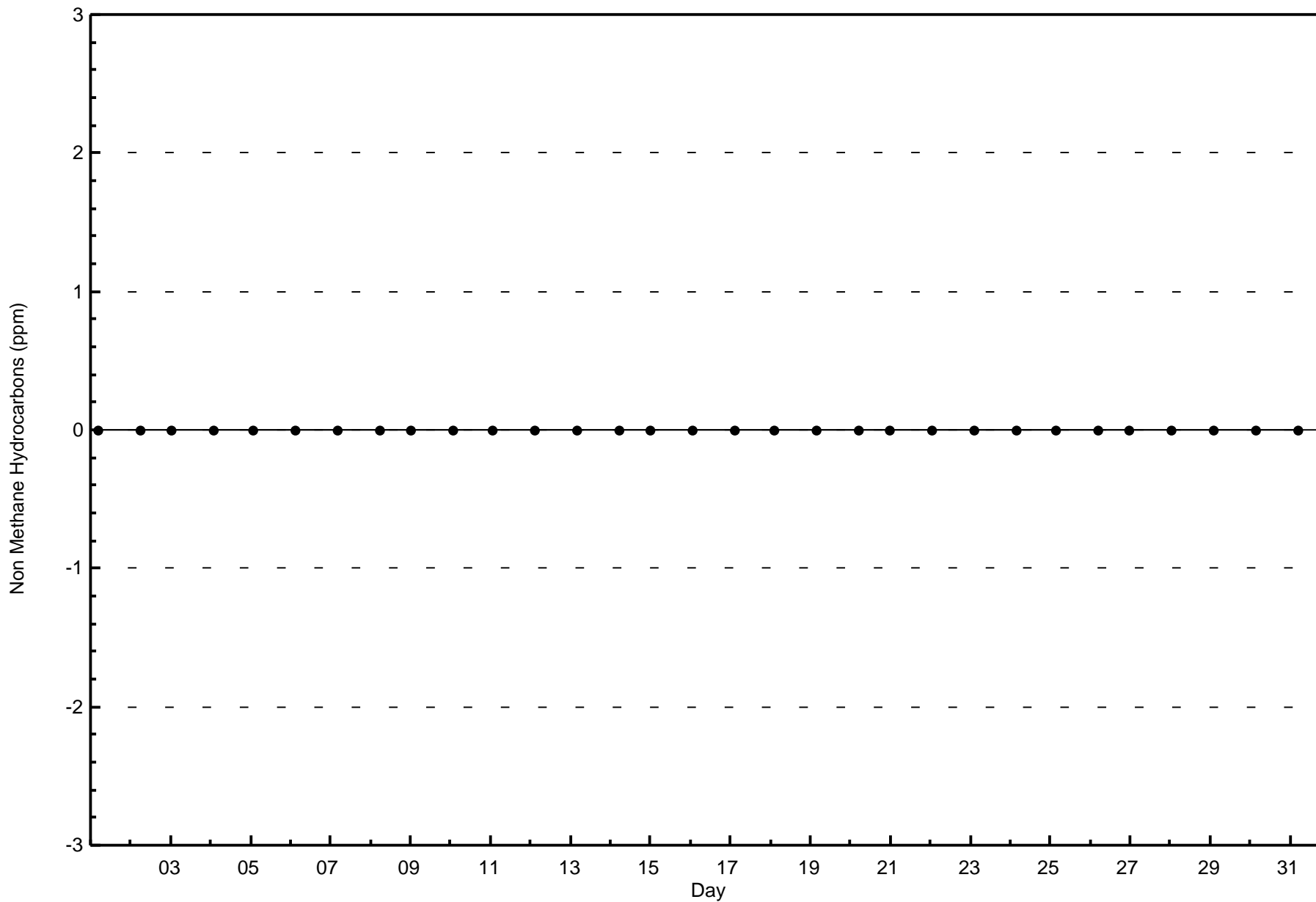


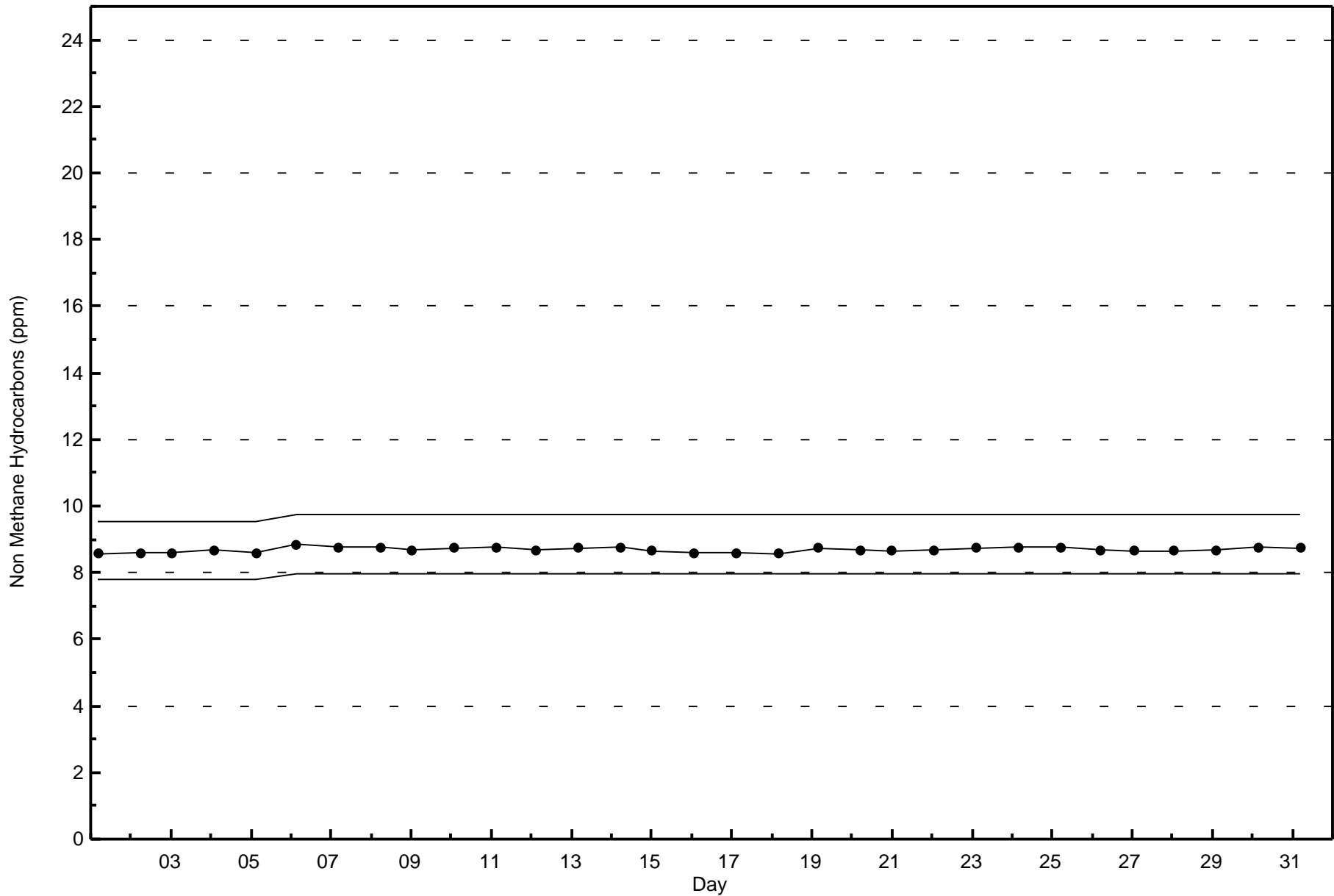


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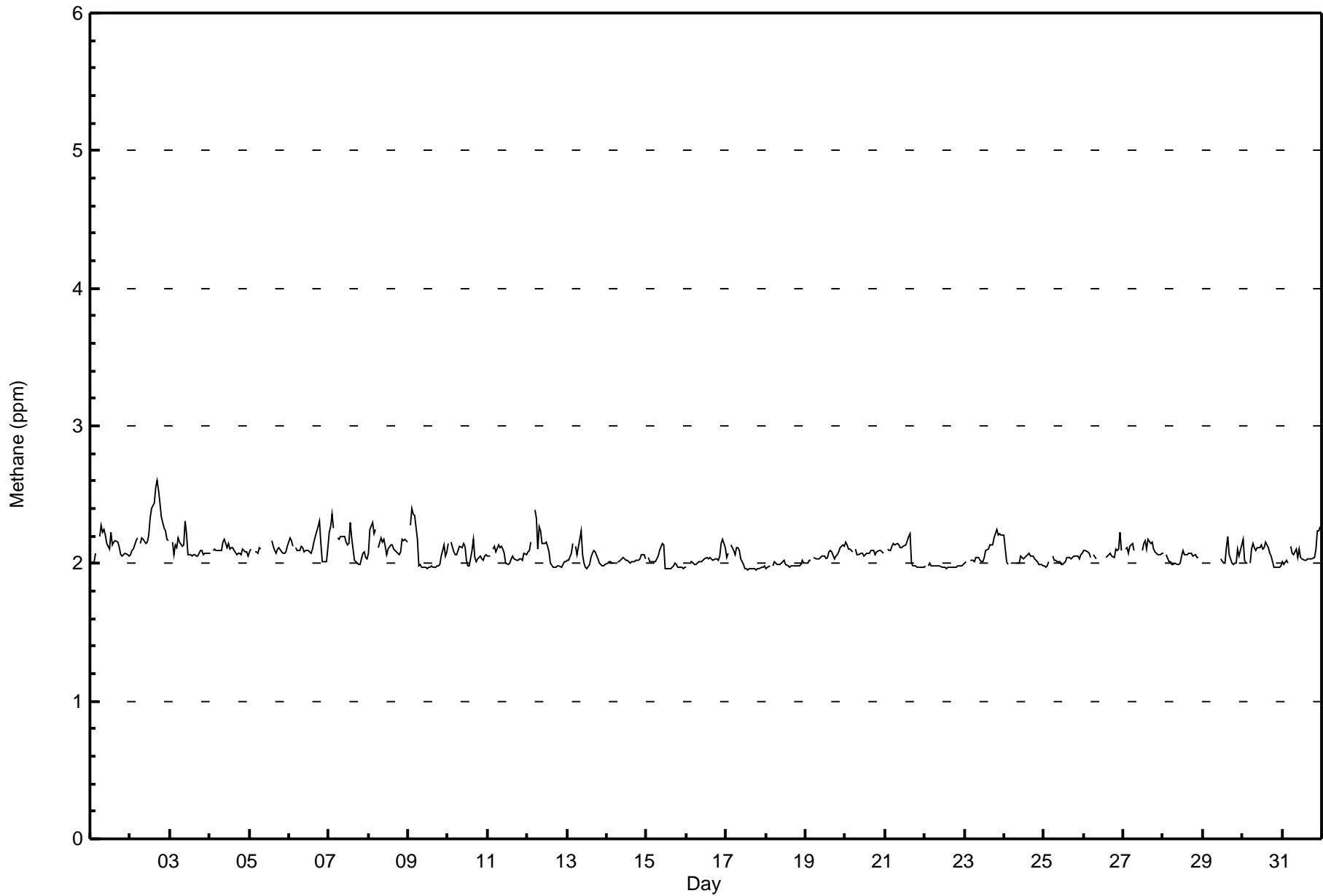
Non Methane Hydrocarbons (NMHC) - ppm  
Athabasca Valley (AMS 7)













**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	300	43.67	43.67
2.1 - 3.0	387	56.33	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Athabasca Valley - December 2017**

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	12	3	2	4	4	1	30	13	10	28	44	32	50	14	23	23	293
2.1 - 3.0	10	3	3	6	6	17	120	74	22	17	18	6	7	7	10	34	360
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
<b>Totals</b>	22	6	5	10	10	18	150	87	32	45	62	38	57	21	33	57	653

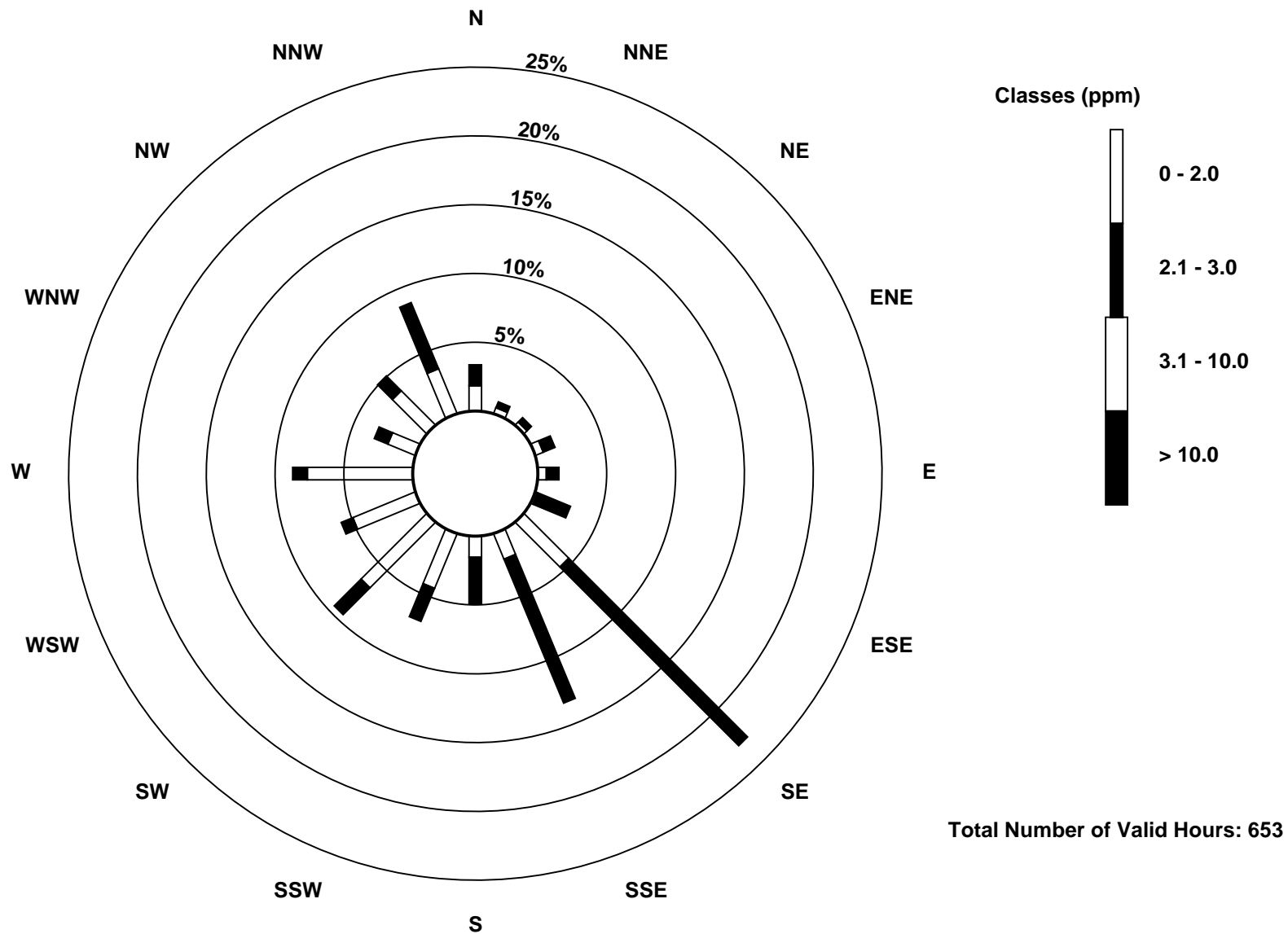
Total Number of Valid Hours: 653

Total Number of Hours: 744

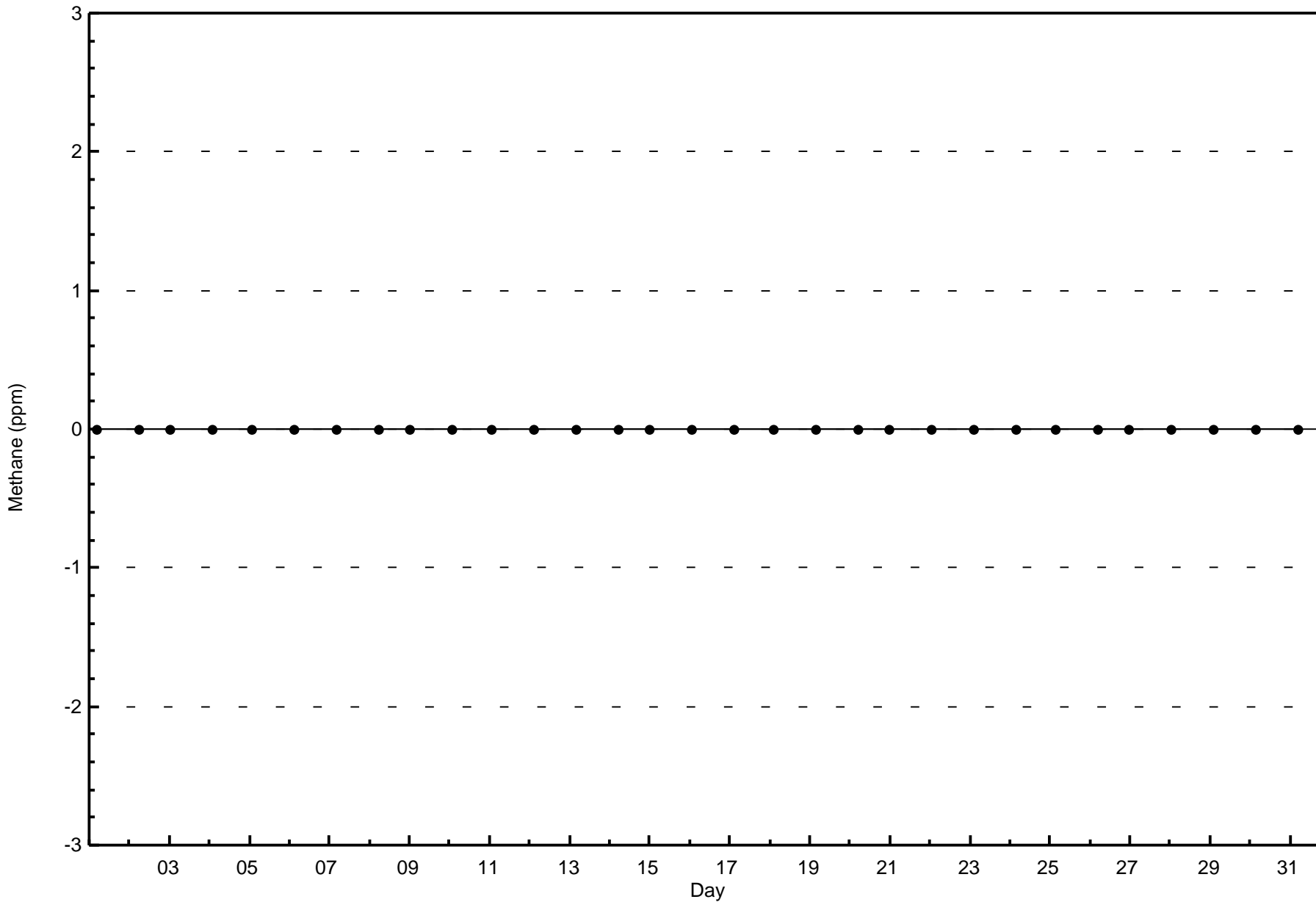


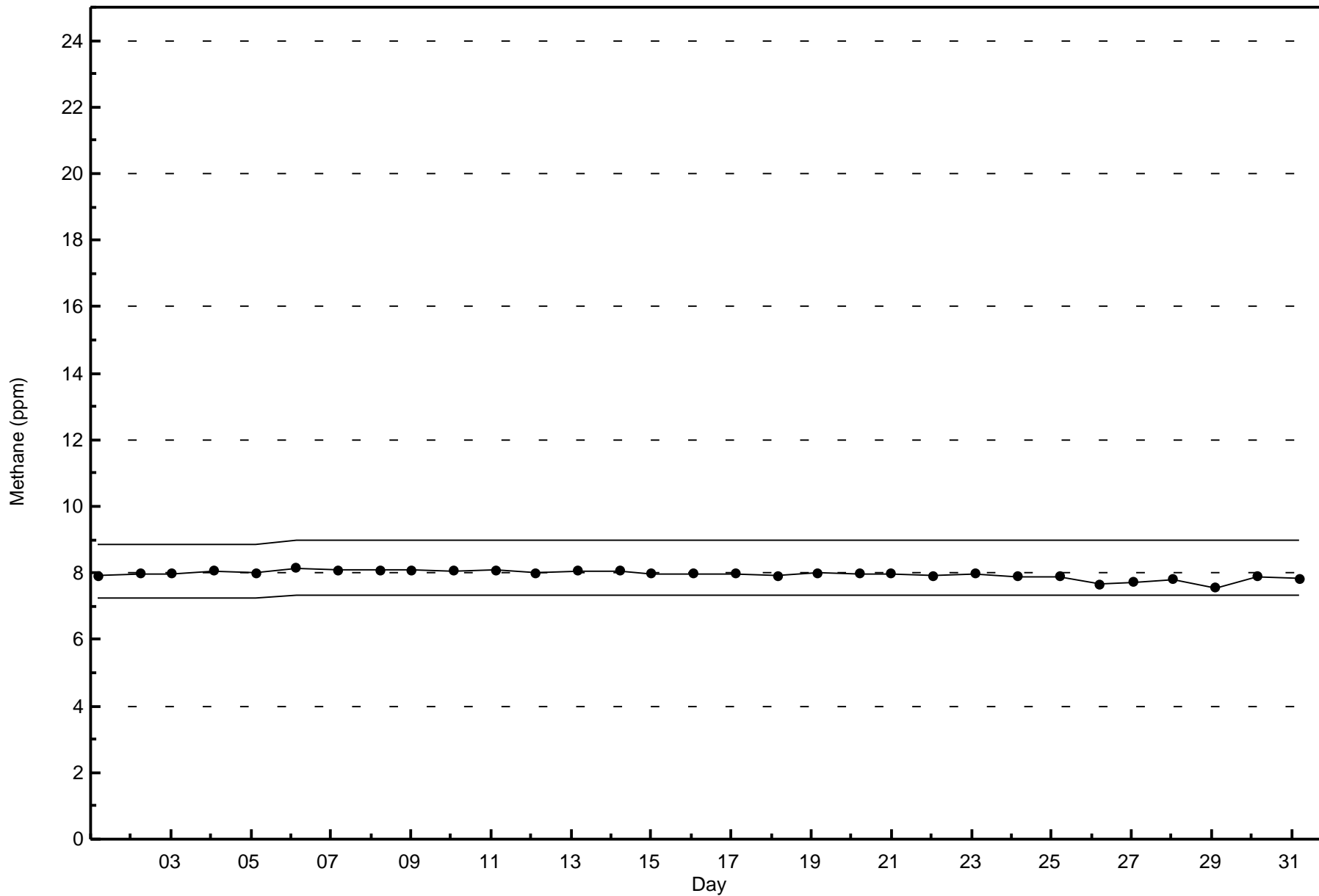
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Athabasca Valley (AMS 7)











**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ozone (O<sub>3</sub>) - ppb**

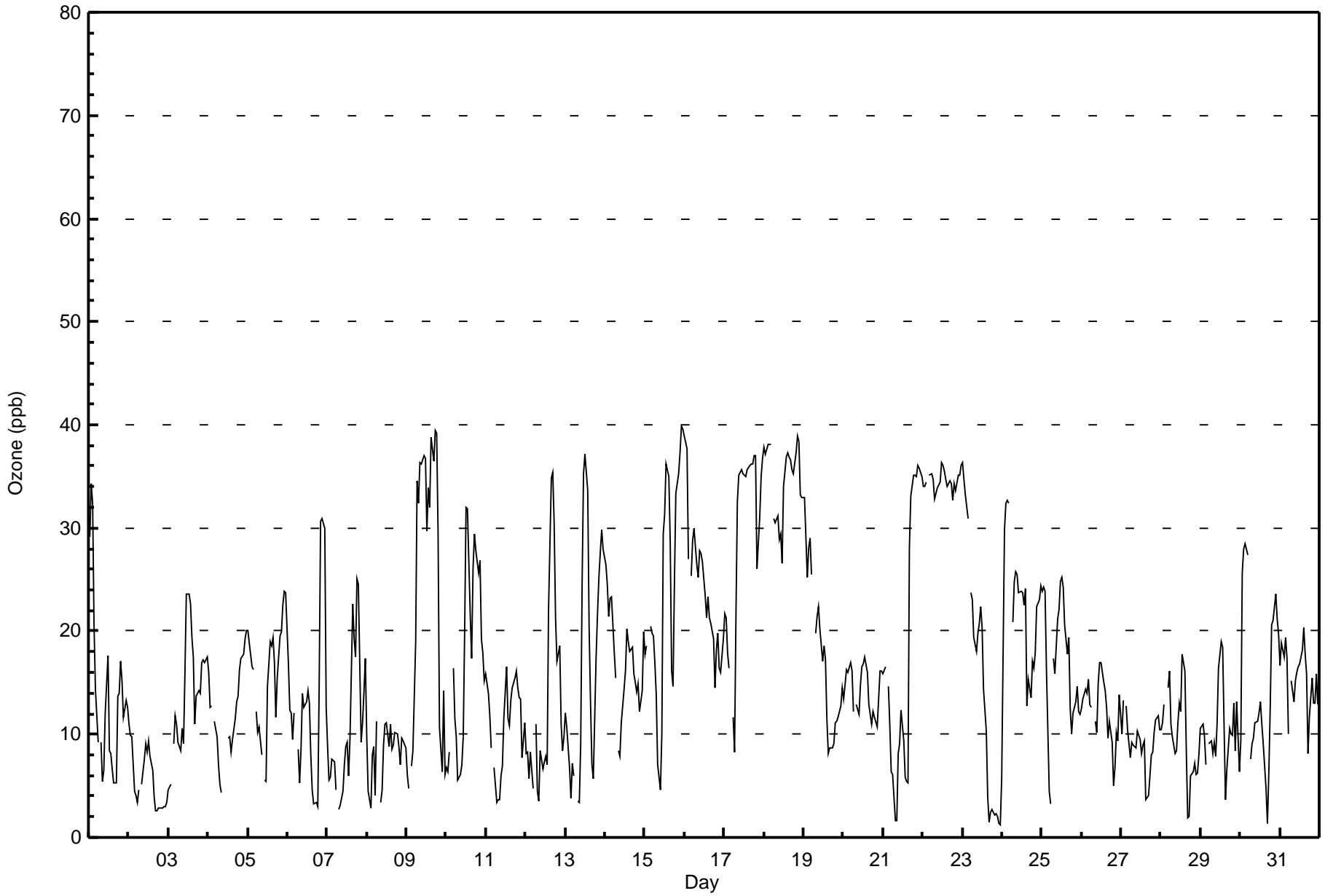
**Athabasca Valley - December 2017**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 40 ppb on Dec 15 23:00	Maximum Daily Average: 34.8 ppb on Dec 18		Hours of Data:	709
Minimum Value: 1 ppb on Dec 24 00:00	Minimum Daily Average: 5.6 ppb on Dec 2		Hours of Missing Data:	35
Maximum Diurnal Average: 19.4 ppb at hour 13	Minimum Diurnal Average: 12.7 ppb at hour 9		Hours of Calibration:	34
Monthly Average: 16.7 ppb	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 6 Q <sub>1</sub> = 9 Median = 14 Q <sub>3</sub> = 23 P <sub>90</sub> = 34 P <sub>99</sub> = 39		Percent Operational Time:	99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	29	34	32	21	14	9	Z	9	5	6	12	18	8	8	7	5	5	14	14	17	15	12	13	13	14.0	34
2-Dec	11	10	10	5	4	3	5	Z	5	8	9	8	9	8	7	4	3	3	3	3	3	3	3	3	5.6	11
3-Dec	5	5	Z	9	12	11	9	8	11	9	16	24	24	23	19	18	11	14	14	14	17	17	17	18	14.0	24
4-Dec	16	13	13	Z	11	10	7	5	4	C	C	C	10	10	8	9	12	13	14	16	17	18	19	20	12.3	20
5-Dec	20	19	17	16	Z	12	10	11	8	M	6	5	15	19	19	19	17	12	15	20	20	23	24	24	15.9	24
6-Dec	17	12	12	10	12	Z	9	5	8	14	13	13	14	13	8	5	3	3	3	15	31	31	30	13	12.8	31
7-Dec	9	6	6	8	7	5	Z	3	3	4	7	9	9	6	10	23	19	18	25	24	9	11	14	17	10.9	25
8-Dec	10	5	3	8	9	4	11	Z	3	5	9	11	11	9	11	9	9	10	10	9	7	10	9	9	8.2	11
9-Dec	6	5	Z	7	8	19	35	32	36	36	37	37	30	34	32	39	37	39	39	30	11	6	14	6	25.0	39
10-Dec	7	6	8	Z	16	11	10	6	6	7	10	20	32	32	22	17	26	29	28	26	27	19	18	15	17.3	32
11-Dec	16	14	12	9	Z	7	3	4	4	6	7	12	17	12	11	13	14	15	16	14	14	13	8	11	10.9	17
12-Dec	8	8	6	8	5	Z	11	5	3	8	7	7	8	7	22	35	35	31	21	17	19	11	8	10	13.1	35
13-Dec	12	11	7	4	7	6	Z	4	3	9	25	35	37	34	20	13	7	6	18	22	25	28	30	28	16.9	37
14-Dec	26	25	21	23	23	18	15	Z	8	8	11	14	16	20	19	18	18	16	15	14	15	12	14	20	17.0	26
15-Dec	18	19	Z	20	20	20	17	14	7	5	10	29	31	36	35	29	16	15	25	33	35	37	40	40	23.9	40
16-Dec	39	38	27	Z	25	29	30	26	25	28	28	27	23	21	23	21	21	19	15	18	20	16	16	19	24.1	39
17-Dec	22	21	18	16	Z	12	8	22	32	35	36	35	35	35	36	36	36	36	37	37	26	31	35	37	29.3	37
18-Dec	38	37	38	38	38	Z	31	31	31	29	29	27	34	37	37	37	37	36	35	37	39	38	33	33	34.8	39
19-Dec	33	29	25	28	29	25	Z	20	21	22	20	17	19	17	11	8	9	9	9	11	11	12	13	14	18.0	33
20-Dec	13	15	16	16	17	16	12	Z	13	12	15	16	17	17	16	13	12	11	12	12	11	13	16	16	14.3	17
21-Dec	16	17	Z	15	11	6	6	2	2	8	9	12	9	6	5	5	28	33	35	35	35	36	36	35	17.5	36
22-Dec	34	34	34	Z	35	35	35	33	33	34	34	36	36	35	35	34	35	34	33	34	34	35	35	36	34.5	36
23-Dec	36	35	33	31	Z	24	23	19	18	20	21	22	20	14	10	4	1	2	3	2	2	2	1	1	15.1	36
24-Dec	6	30	32	33	32	Z	21	25	26	26	24	24	24	22	24	13	15	14	17	16	18	22	23	24	22.2	33
25-Dec	24	24	24	16	5	3	Z	17	16	21	22	25	25	24	21	18	19	12	10	12	13	15	12	12	17.0	25
26-Dec	13	13	14	14	15	13	13	Z	11	10	15	17	17	15	14	13	10	11	9	5	7	10	9	14	12.3	17
27-Dec	10	13	Z	13	10	8	9	9	9	9	10	10	8	9	9	4	4	6	8	8	10	11	12	10	9.1	13
28-Dec	11	11	13	Z	15	16	11	10	8	8	11	13	12	18	16	8	2	2	6	6	7	6	6	8	9.8	18
29-Dec	11	11	10	7	Z	9	9	8	9	8	11	16	19	18	11	4	7	11	10	10	13	8	13	6	10.4	19
30-Dec	9	26	28	29	27	Z	8	9	10	11	11	12	13	11	9	5	1	6	13	21	21	24	21	20	15.0	29
31-Dec	17	19	17	19	17	10	Z	15	13	15	16	17	17	18	20	18	16	8	12	15	13	13	16	13	15.4	20

17.4	18.2	18.4	16.2	16.4	13.1	14.3	13.5	12.7	14.5	16.3	19.0	19.4	19.0	17.7	16.0	15.7	15.7	16.9	17.9	17.6	17.6	18.1	17.6	Diurnal Average	
39	38	38	38	38	35	35	33	36	36	37	37	37	37	37	39	37	39	39	39	37	39	38	40	40	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 (O<sub>3</sub>) - ppb**  
**Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	503	70.94	70.95
21 - 50	206	29.06	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Athabasca Valley - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	7	6	5	8	9	18	154	85	30	32	39	8	15	7	14	37	474
21 - 50	16	2	0	2	1	0	4	5	4	11	24	31	45	13	22	21	201
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
<b>Totals</b>	23	8	5	10	10	18	158	90	34	43	63	39	60	20	36	58	675

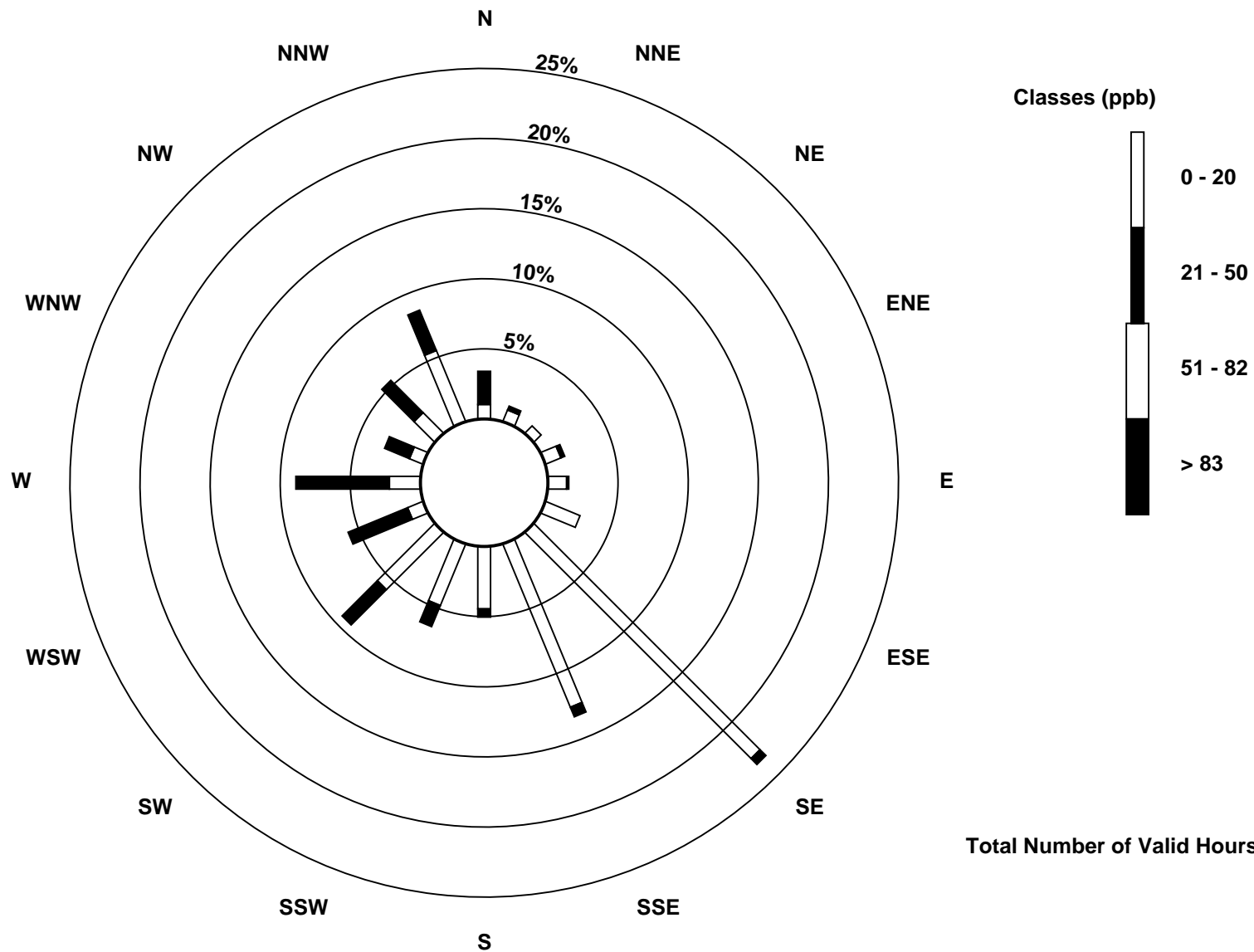
Total Number of Valid Hours: 675

Total Number of Hours: 744

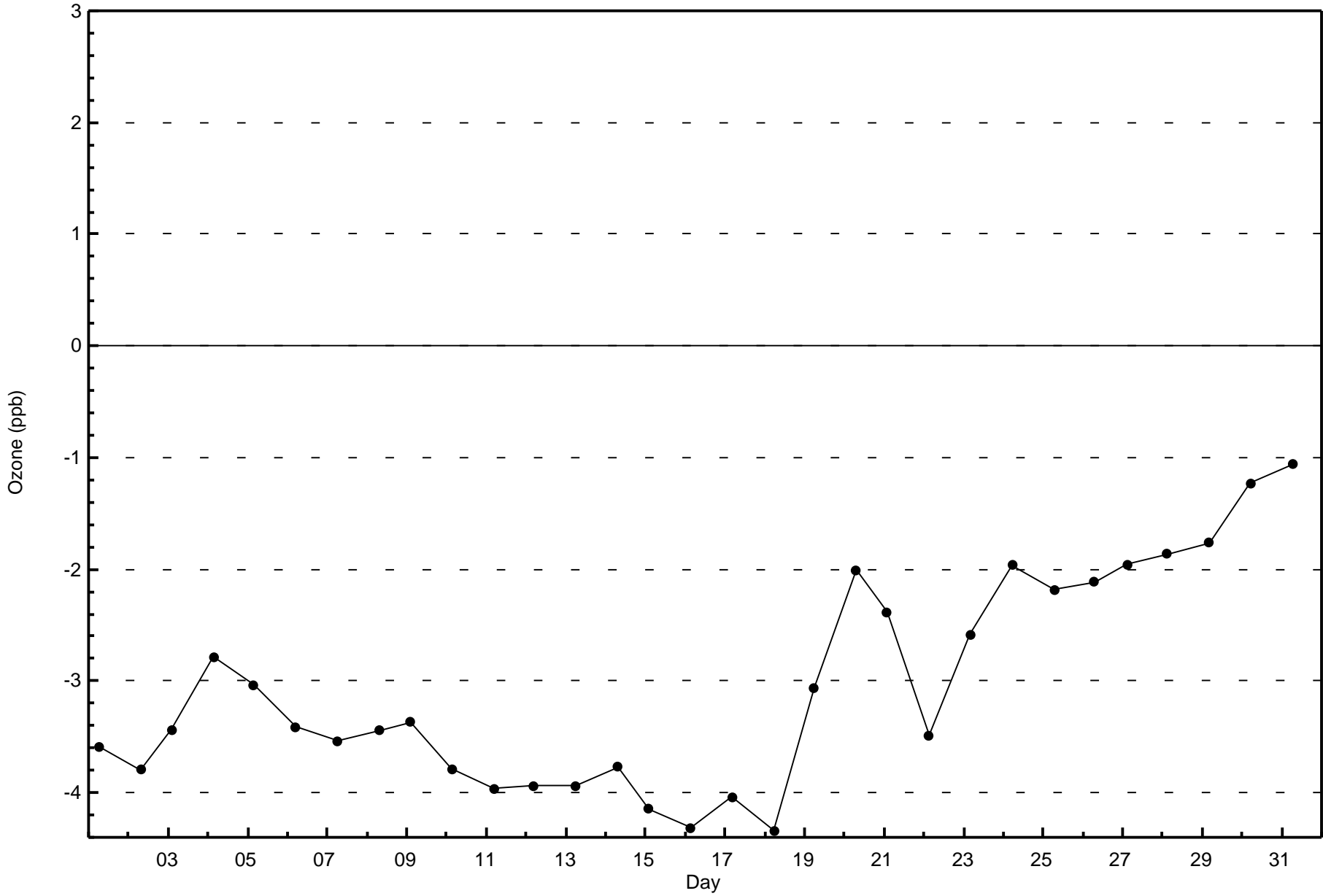


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

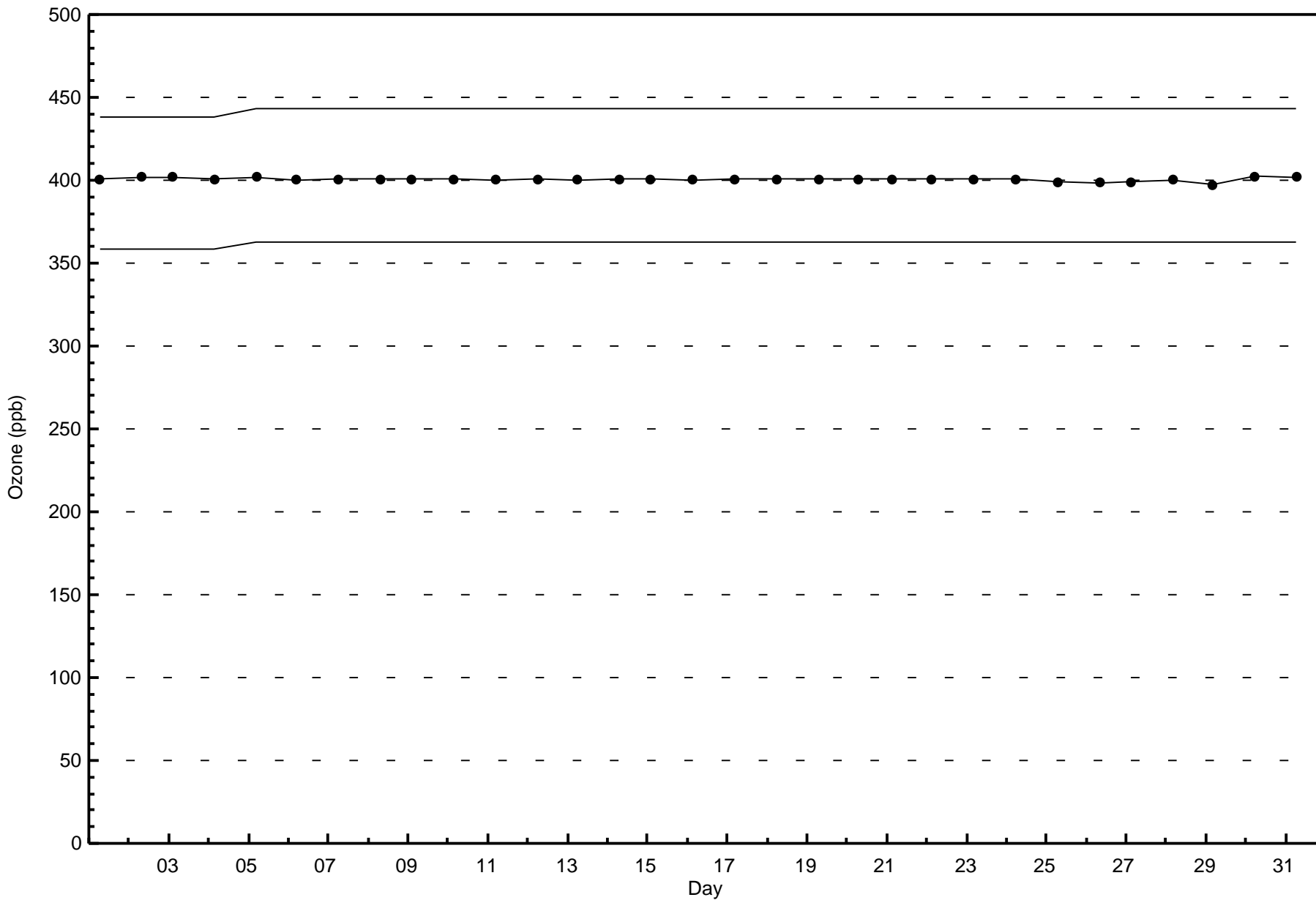
Ozone (O<sub>3</sub>) - ppb  
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 675

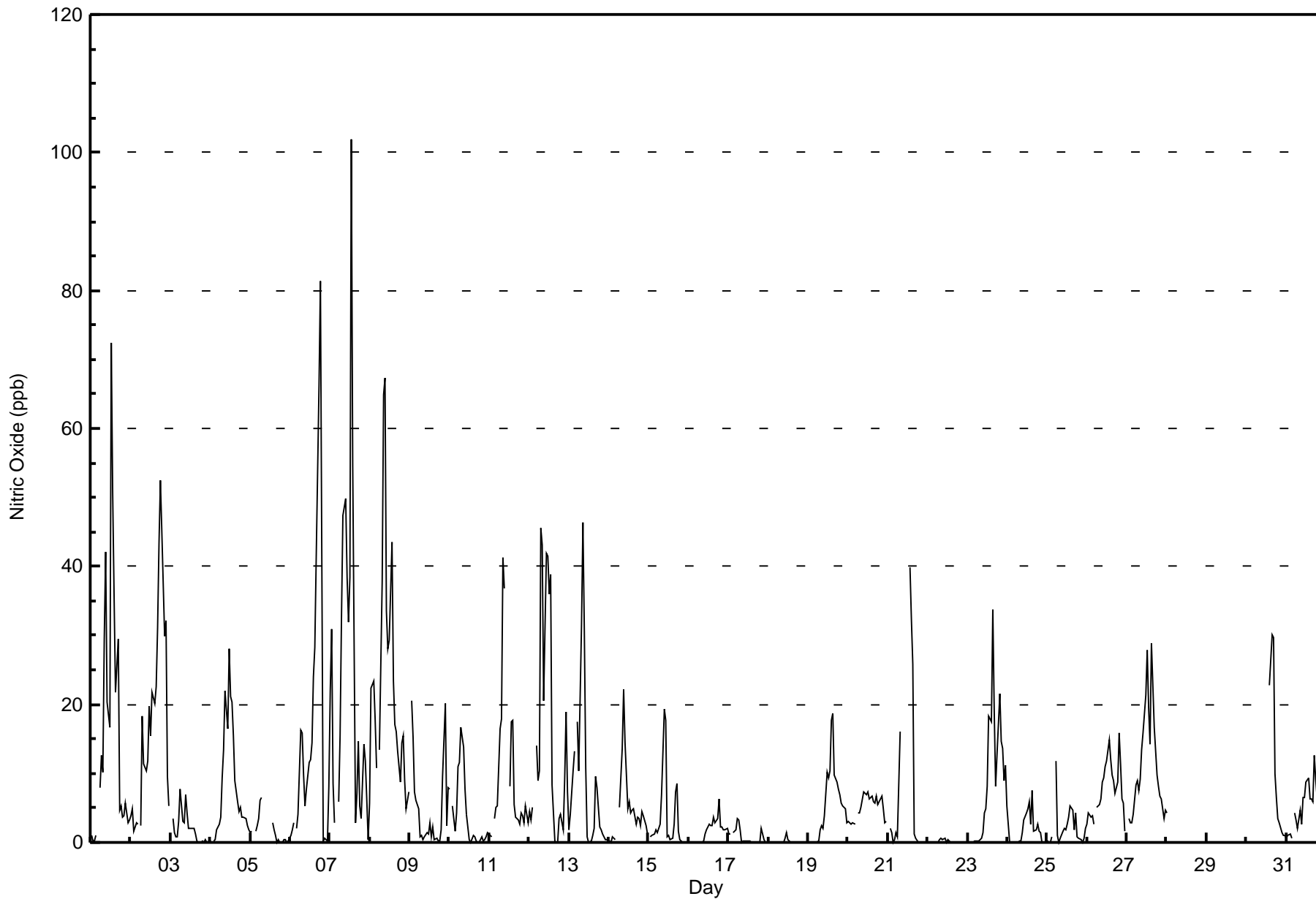








Maximum Value: 102 ppb on Dec 7 14:00		Maximum Daily Average: 23.8 ppb on Dec 7		Hours in Service: 744																									
Minimum Value: 0 ppb on Dec 5 20:00		Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Data: 643																									
Maximum Diurnal Average: 16.1 ppb at hour 14		Minimum Diurnal Average: 2.8 ppb at hour 24		Hours of Missing Data: 101																									
Monthly Average: 7.9 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 3 Q <sub>3</sub> = 9 P <sub>90</sub> = 22 P <sub>99</sub> = 64		Hours of Calibration: 34																									
				Percent Operational Time: 91.0																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	1	0	0	1	Z	8	13	10	29	42	20	17	72	51	36	22	29	5	5	4	4	6	3	3	16.6	72			
2-Dec	4	5	2	3	3	Z	2	18	11	10	12	20	16	22	20	23	31	43	52	45	30	32	9	5	18.2	52			
3-Dec	Z	4	1	1	1	3	8	3	3	7	4	2	2	2	2	1	0	0	0	0	0	0	0	0	1.9	8			
4-Dec	0	Z	0	0	2	3	4	9	13	22	16	28	21	20	15	9	6	4	5	4	4	3	3	2	8.5	28			
5-Dec	1	2	Z	2	2	4	6	6	C	C	C	C	C	3	2	1	0	0	0	0	0	0	0	0	1.7	6			
6-Dec	1	2	3	Z	2	4	16	16	10	5	8	12	12	14	24	28	41	66	81	41	0	1	0	8	17.2	81			
7-Dec	22	31	8	3	Z	6	16	33	47	50	38	32	39	102	55	3	7	15	5	3	14	12	6	0	23.8	102			
8-Dec	6	22	23	18	11	Z	14	38	65	67	34	28	29	43	23	17	16	13	9	15	16	9	5	7	22.9	67			
9-Dec	Z	20	15	7	6	5	1	1	0	1	1	1	3	1	2	0	1	0	0	2	10	20	2	8	4.7	20			
10-Dec	8	Z	5	2	4	11	12	17	14	8	4	2	0	0	1	1	0	0	0	1	0	0	1	1	4.0	17			
11-Dec	1	1	Z	4	5	5	17	18	41	37	M	M	8	17	18	6	4	3	3	4	4	3	5	3	9.8	41			
12-Dec	5	3	5	Z	14	9	10	46	43	20	42	41	36	39	8	0	0	0	3	4	2	9	19	7	16.0	46			
13-Dec	2	4	10	13	Z	18	10	32	46	31	11	1	0	0	1	2	10	8	2	2	1	1	0	0	8.9	46			
14-Dec	0	0	1	1	0	Z	5	9	14	22	14	5	6	4	5	5	3	4	4	2	4	4	2	1	5.0	22			
15-Dec	Z	1	1	1	2	1	2	3	7	19	18	1	1	0	1	3	7	9	2	0	0	0	0	0	3.4	19			
16-Dec	0	Z	0	0	0	0	0	0	0	0	1	2	3	2	2	4	3	4	6	2	2	2	2	2	1.6	6			
17-Dec	1	1	Z	1	2	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0.8	3			
18-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1			
19-Dec	0	0	0	0	Z	0	0	2	2	2	4	10	9	10	18	19	10	9	8	7	6	5	5	3	5.6	19			
20-Dec	3	3	3	3	3	Z	4	4	5	7	7	7	7	6	7	6	6	7	5	6	7	5	3	3	5.1	7			
21-Dec	Z	2	1	0	0	1	1	16	M	M	M	M	M	40	32	26	1	1	0	0	0	0	0	0	6.8	40			
22-Dec	0	Z	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1			
23-Dec	0	0	Z	0	0	0	0	0	1	1	4	5	8	18	17	34	19	8	13	21	15	14	9	11	8.7	34			
24-Dec	5	0	0	Z	0	0	0	0	0	1	3	4	5	6	3	8	2	2	3	2	1	0	0	0	2.0	8			
25-Dec	0	0	0	1	Z	12	1	0	1	2	2	3	4	5	5	5	2	4	1	1	0	0	1	2	2.0	12			
26-Dec	3	4	4	4	3	Z	5	6	6	9	9	11	12	15	12	10	9	7	9	16	11	6	6	2	7.7	16			
27-Dec	Z	4	3	3	4	8	9	7	9	14	16	21	28	20	14	29	17	13	10	8	7	6	4	5	11.2	29			
28-Dec	4	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	4			
29-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--			
30-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	30			
31-Dec	1	1	1	1	Z	4	3	2	5	3	6	6	9	9	6	6	6	13	9	4	4	4	2	4	4.8	13			
																								Diurnal Average					
																								Diurnal Maximum					
Z - zerospan																								C - Calibration		M - Maintenance		UO - Unstable Operation	





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	576	89.58	89.58
21 - 40	44	6.84	96.42
41 - 80	21	3.27	99.69
81 - 159	1	0.16	99.84
> 159	0	0.00	99.84

Total Number of Valid Hours: 643

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	21	6	4	7	7	13	127	68	23	40	54	36	50	17	30	48	551
21 - 40	1	0	1	2	2	1	13	9	5	2	2	0	0	0	2	2	42
11 - 80	0	0	0	0	0	0	7	6	1	1	1	0	0	0	0	0	16
81 - 159	0	0	0	0	0	0	0	1	0	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
<b>Totals</b>	22	6	5	9	9	14	147	84	29	43	57	36	50	17	32	50	610

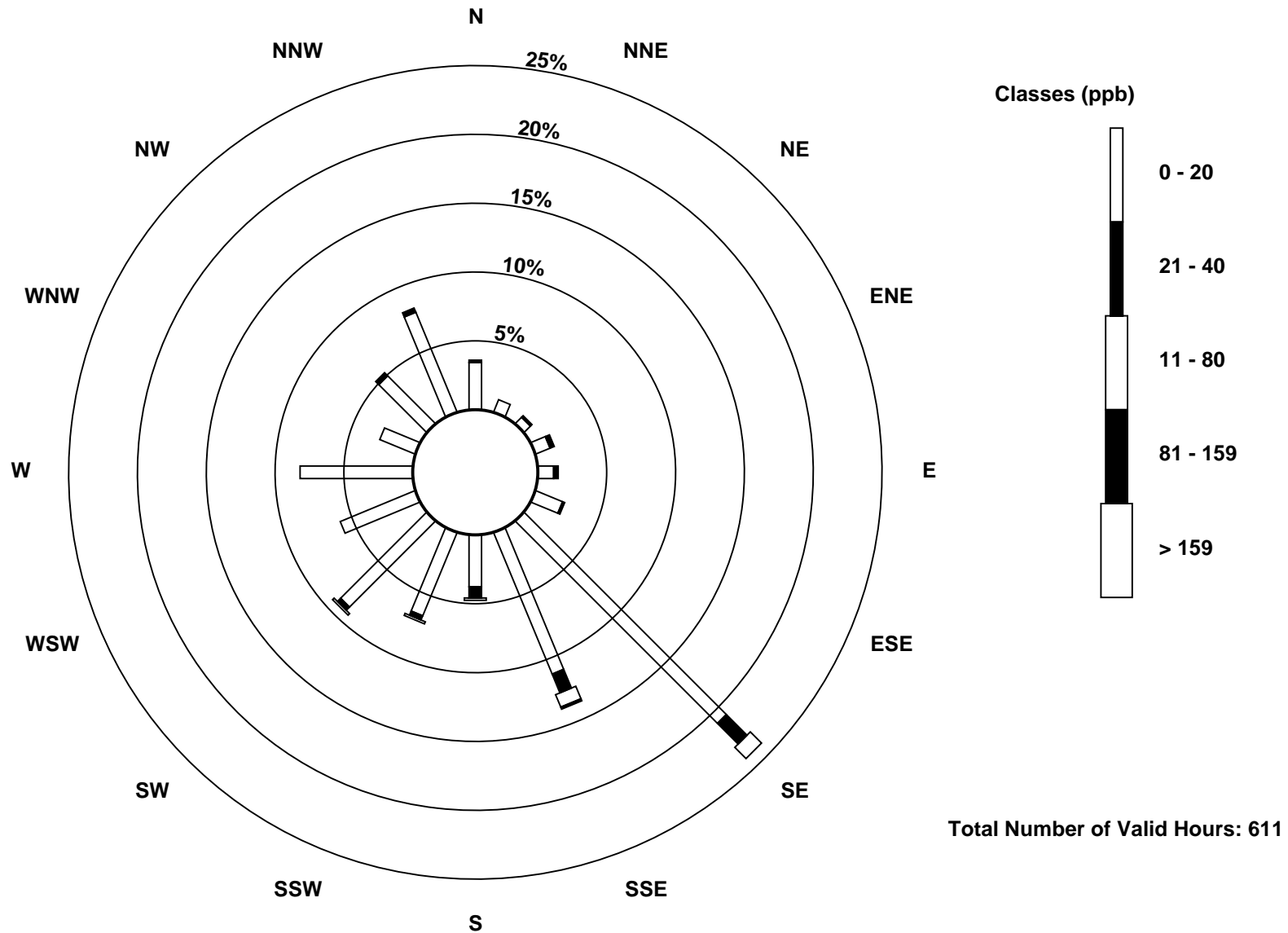
Total Number of Valid Hours: 611

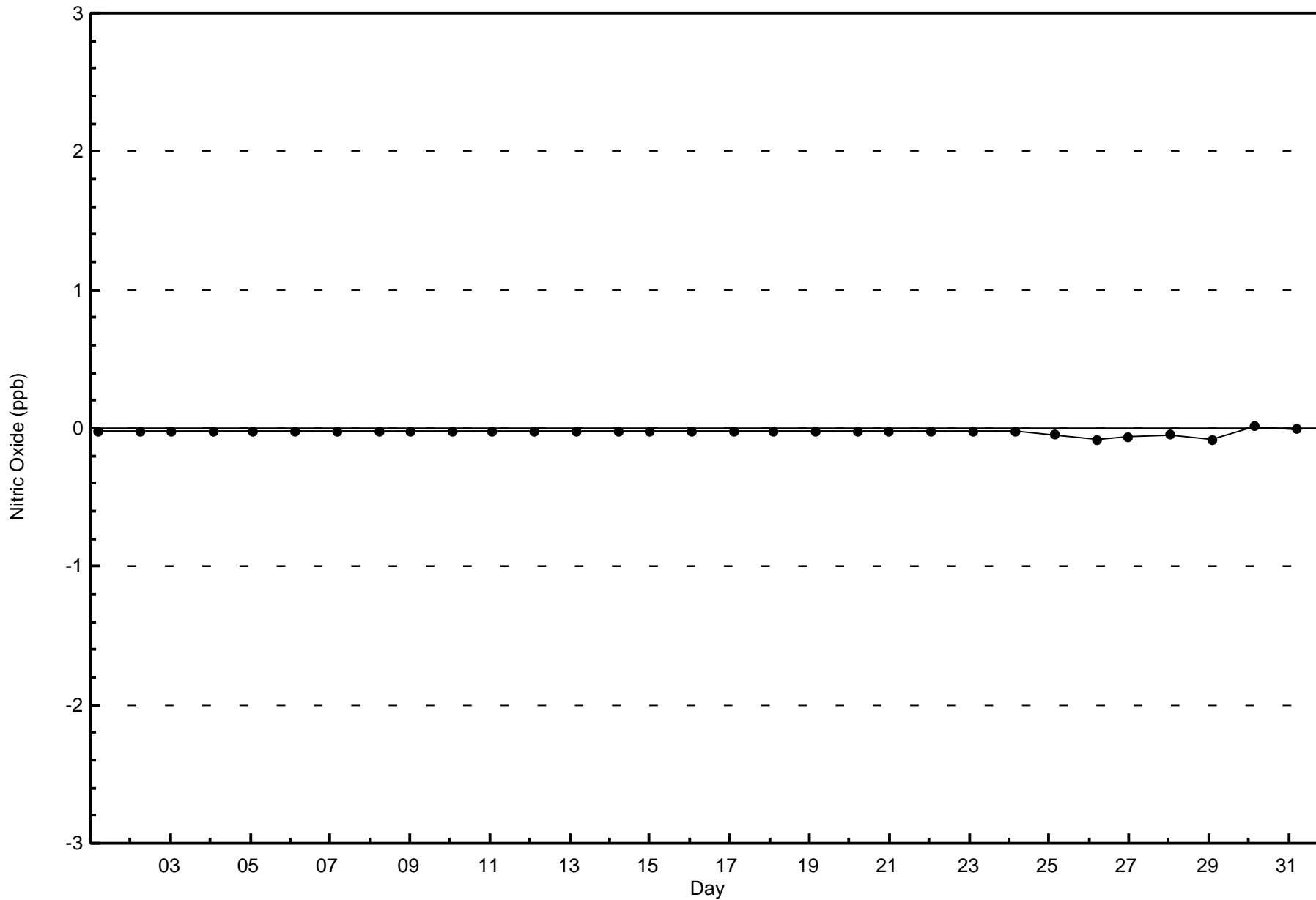
Total Number of Hours: 744

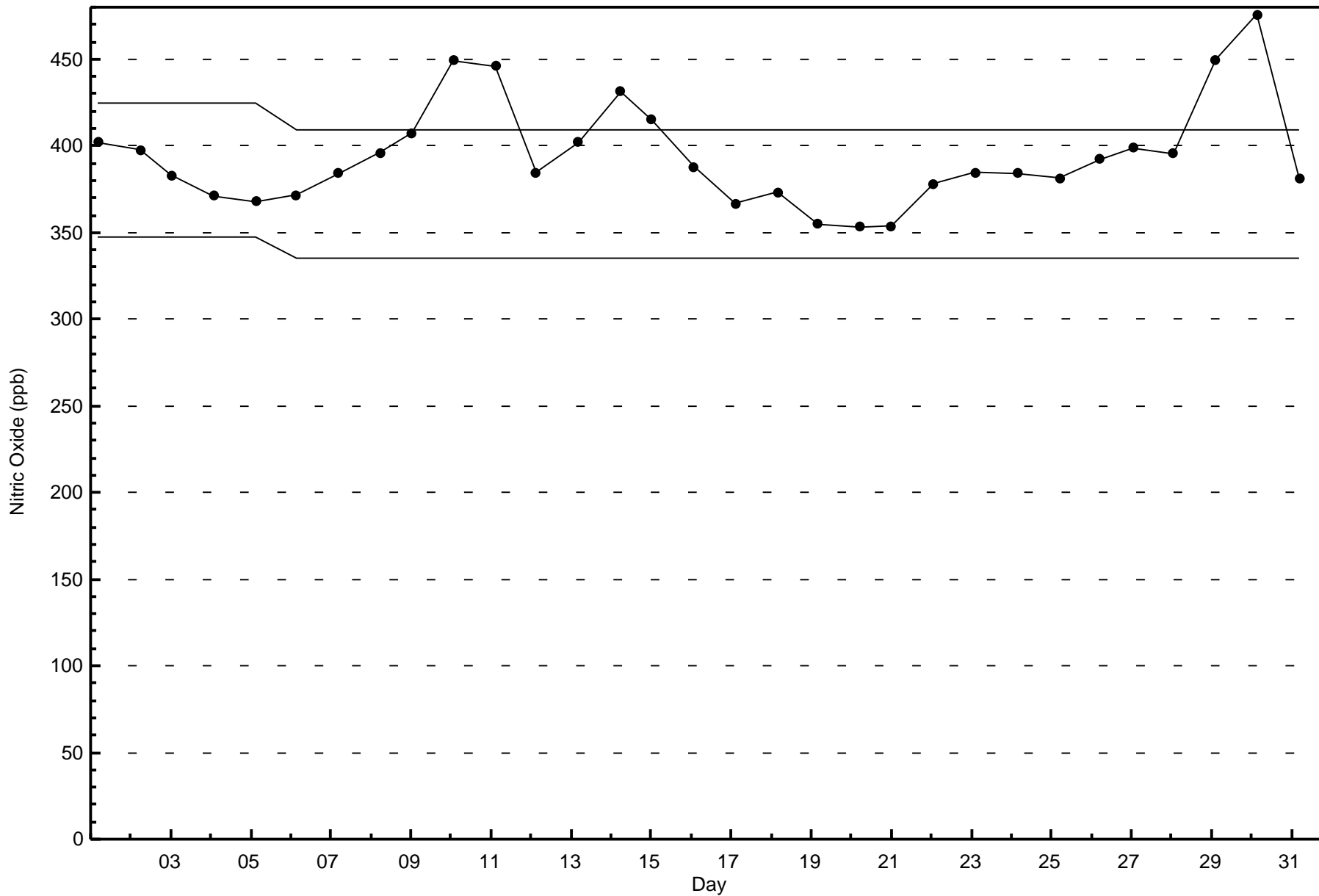


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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











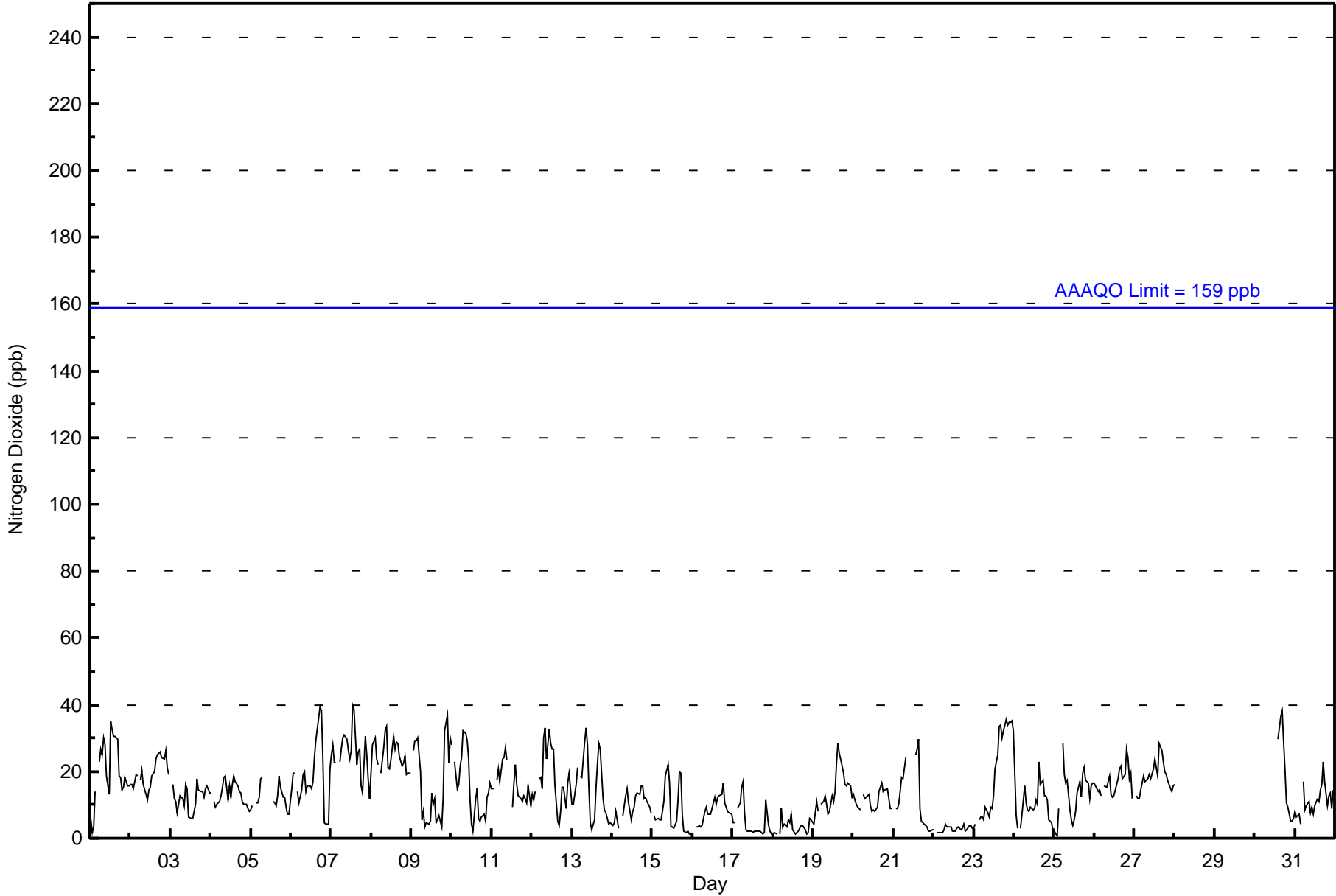
# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

## Athabasca Valley - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																								
Maximum Value: 40 ppb on Dec 7 14:00										Maximum Daily Average: 25.3 ppb on Dec 7										Hours of Data: 643																														
Minimum Value: 1 ppb on Dec 25 03:00										Minimum Daily Average: 2.8 ppb on Dec 22										Hours of Missing Data: 101																														
Maximum Diurnal Average: 18.1 ppb at hour 16										Minimum Diurnal Average: 10.8 ppb at hour 12										Hours of Calibration: 34																														
Monthly Average: 14.0 ppb										Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 7 Median = 13 Q <sub>3</sub> = 19 P <sub>90</sub> = 27 P <sub>99</sub> = 36										Percent Operational Time: 91.0																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	6	2	4	14	Z	23	27	25	30	28	19	13	35	33	31	30	30	19	18	14	15	18	16	16	20.1	35																								
2-Dec	16	16	15	19	19	Z	17	20	16	13	12	15	15	19	20	24	25	26	26	24	24	26	21	19	19.4	26																								
3-Dec	Z	16	12	11	8	10	13	12	10	16	15	7	6	6	8	10	18	15	14	14	12	15	16	14	11.9	18																								
4-Dec	14	Z	11	9	10	11	13	15	18	19	11	16	12	16	19	17	16	14	14	11	10	10	9	8	13.1	19																								
5-Dec	8	10	Z	11	11	12	18	18	C	C	C	C	C	11	11	10	13	19	15	12	12	9	7	7	11.9	19																								
6-Dec	15	20	19	Z	14	10	15	19	20	14	16	16	15	17	24	29	33	39	38	24	5	4	4	21	18.7	39																								
7-Dec	25	28	23	22	Z	23	27	30	31	30	26	24	26	40	38	22	26	27	16	14	31	25	18	12	25.3	40																								
8-Dec	20	28	30	24	22	Z	20	27	32	33	21	21	23	30	27	29	28	25	22	22	25	19	20	20	24.6	33																								
9-Dec	Z	26	29	29	30	20	6	8	4	5	4	5	14	10	12	5	7	5	4	12	32	37	22	30	15.4	37																								
10-Dec	28	Z	23	15	16	22	24	32	31	29	24	11	4	2	12	15	6	5	6	7	5	12	14	17	15.7	32																								
11-Dec	15	15	Z	17	21	17	24	24	27	23	M	M	9	16	22	16	13	12	11	13	12	10	16	10	16.3	27																								
12-Dec	13	11	14	Z	18	18	15	30	33	24	33	28	27	27	16	5	4	8	15	15	9	17	19	15	18.0	33																								
13-Dec	10	10	16	21	Z	19	18	29	33	28	15	5	3	6	15	22	28	27	12	9	8	6	4	5	15.1	33																								
14-Dec	4	5	8	6	3	Z	7	10	13	15	11	6	8	9	13	13	16	16	12	12	11	9	8	8	9.8	16																								
15-Dec	Z	7	6	6	6	6	8	11	19	22	17	4	3	3	5	11	20	19	7	2	2	2	1	1	8.1	22																								
16-Dec	1	Z	3	3	4	3	4	8	9	7	7	7	11	12	10	12	13	13	17	11	9	8	8	7	8.2	17																								
17-Dec	5	5	Z	9	11	15	17	8	3	2	2	2	2	2	2	2	2	2	1	2	11	4	2	1	4.9	17																								
18-Dec	1	2	1	Z	1	9	3	4	4	6	5	7	3	1	2	2	3	4	4	3	1	2	6	6	3.4	9																								
19-Dec	4	8	11	8	Z	10	11	13	10	7	8	13	11	14	23	29	25	22	19	16	16	17	16	12	14.0	29																								
20-Dec	13	11	10	10	9	Z	13	12	12	13	10	8	8	8	10	14	15	16	14	14	15	12	9	9	11.5	16																								
21-Dec	Z	9	9	10	14	18	18	24	M	M	M	M	M	25	27	30	9	5	4	4	3	2	2	3	11.9	30																								
22-Dec	3	Z	2	2	2	2	3	4	3	3	3	2	2	2	3	3	3	3	4	2	3	4	4	3	2.8	4																								
23-Dec	3	4	Z	6	6	6	6	9	8	7	9	9	13	21	25	33	34	30	32	36	34	35	35	35	18.9	36																								
24-Dec	32	7	3	Z	3	7	16	11	9	8	9	8	9	12	10	23	16	17	13	13	12	6	5	2	10.7	32																								
25-Dec	2	1	1	9	Z	28	19	17	17	8	6	4	6	8	13	17	12	19	21	17	16	12	16	16	12.4	28																								
26-Dec	17	16	14	15	13	Z	16	15	17	19	13	12	13	16	18	21	22	18	19	27	24	18	20	12	17.0	27																								
27-Dec	Z	13	12	12	15	19	17	17	18	19	18	21	24	21	19	28	26	23	20	19	17	16	14	16	18.4	28																								
28-Dec	16	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	16																							
29-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--																							
30-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	30	37	38	29	20	11	9	5	5	6	--	38																							
31-Dec	8	6	7	4	Z	17	9	10	11	8	9	7	10	12	11	14	16	23	17	10	13	14	9	14	11.3	23																								
																								11.6	11.4	11.8	12.1	11.5	14.1	14.3	16.5	16.8	15.6	12.9	10.8	12.0	14.3	16.3	18.1	17.7	17.1	15.1	13.4	13.7	13.0	11.9	11.8	Diurnal Average		
																								32	28	30	29	30	28	27	32	33	33	33	33	28	35	40	38	37	38	39	38	36	34	37	35	35	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation																																																		
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																																																		





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	506	78.69	78.69
21 - 40	137	21.31	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: 643

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	21	6	2	7	6	9	110	46	19	40	48	33	49	17	29	43	485
21 - 40	1	0	3	2	3	6	37	38	10	3	9	3	1	0	3	7	126
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
<b>Totals</b>	22	6	5	9	9	15	147	84	29	43	57	36	50	17	32	50	611

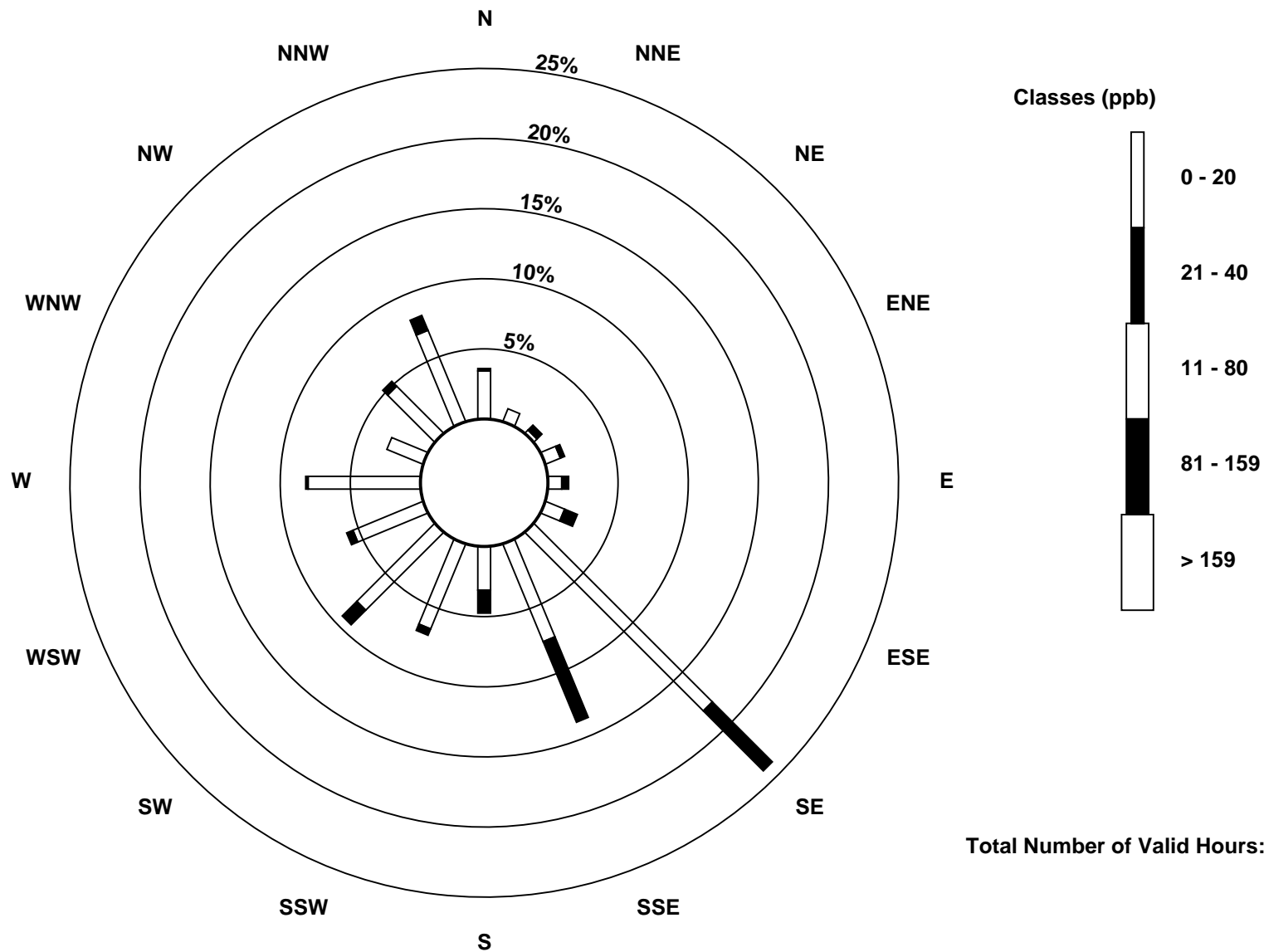
Total Number of Valid Hours: 611

Total Number of Hours: 744

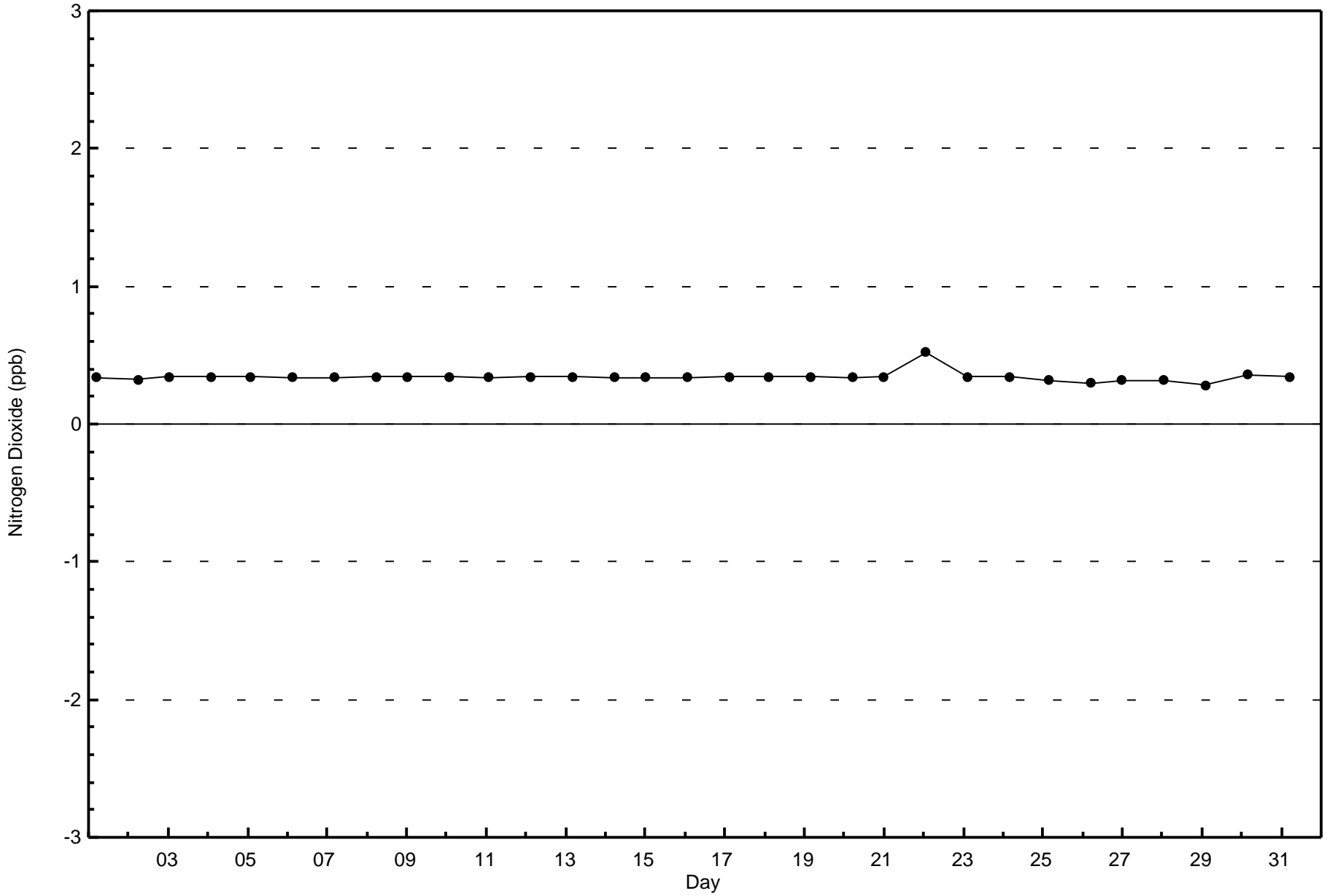


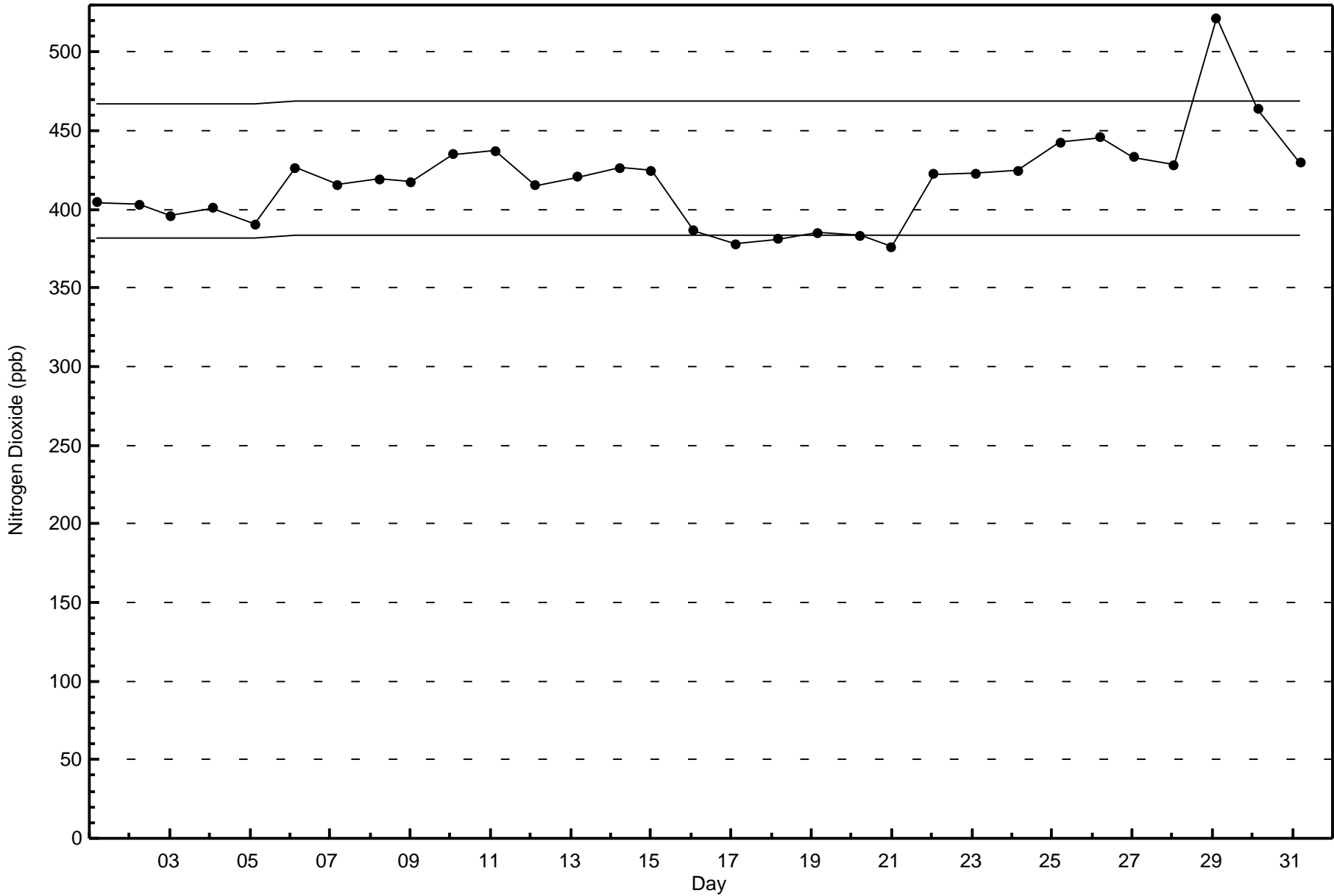
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 611





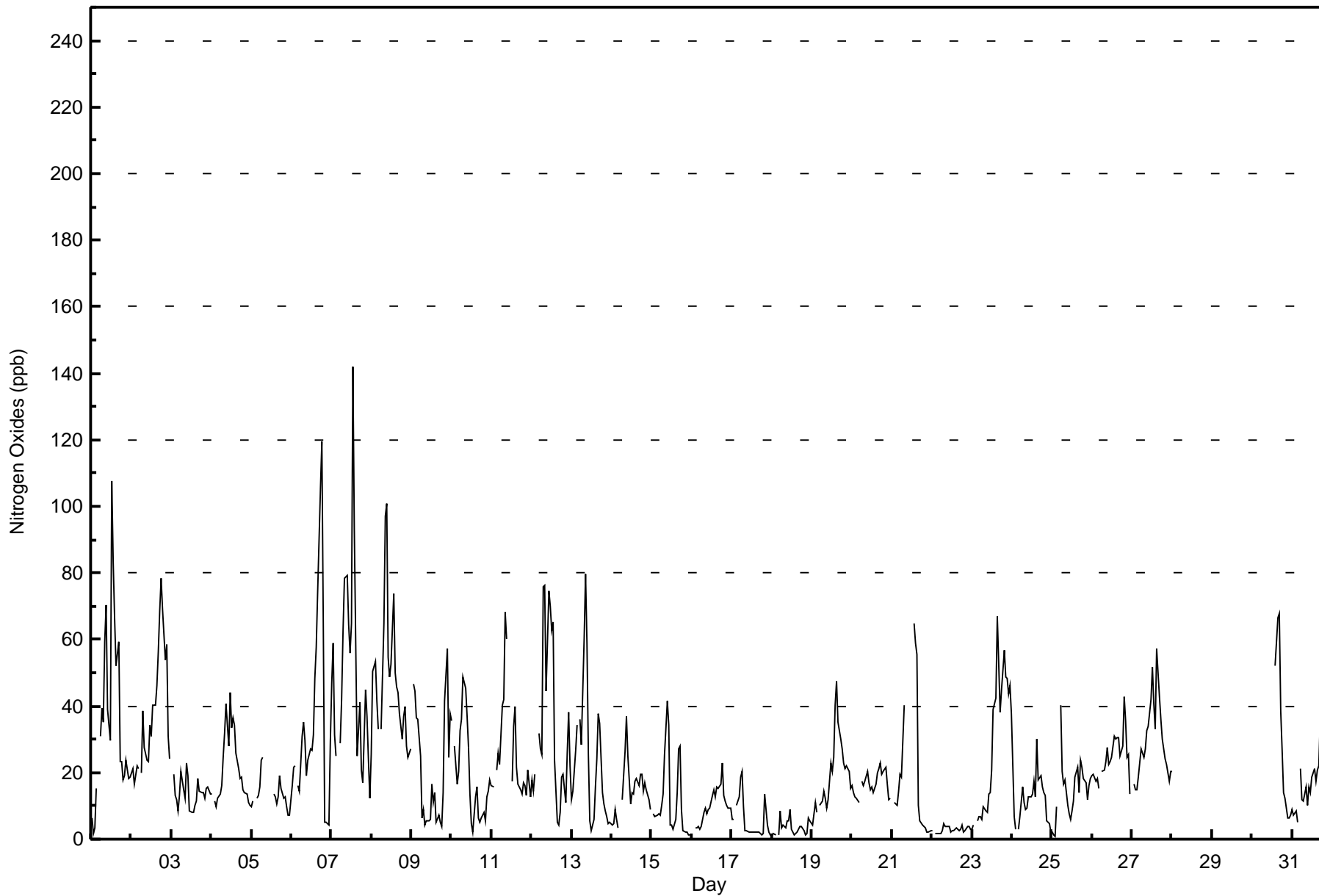


**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Athabasca Valley - December 2017**

Maximum Value: 142 ppb on Dec 7 14:00		Maximum Daily Average: 49.1 ppb on Dec 7		Hours in Service: 744																							
Minimum Value: 1 ppb on Dec 25 03:00		Minimum Daily Average: 2.9 ppb on Dec 22		Hours of Data: 643																							
Maximum Diurnal Average: 31.2 ppb at hour 9		Minimum Diurnal Average: 14.4 ppb at hour 1		Hours of Missing Data: 101																							
Monthly Average: 21.9 ppb		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 9 Median = 16 Q <sub>3</sub> = 28 P <sub>90</sub> = 48 P <sub>99</sub> = 93		Hours of Calibration: 34																							
				Percent Operational Time: 91.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	7	2	4	15	Z	31	40	35	59	70	39	30	107	83	66	52	59	23	23	18	19	24	18	19	36.7	107	
2-Dec	20	21	16	22	21	Z	20	39	27	24	23	34	31	40	40	46	56	69	78	69	54	59	31	24	37.6	78	
3-Dec	Z	19	13	12	9	13	20	15	12	23	19	9	8	8	10	11	18	15	14	14	12	15	16	14	13.9	23	
4-Dec	14	Z	11	10	12	14	16	25	32	41	28	44	34	36	34	26	21	18	18	15	14	14	11	10	21.6	44	
5-Dec	10	11	Z	12	13	16	24	25	C	C	C	C	C	14	13	11	13	19	15	12	13	10	7	7	13.5	25	
6-Dec	16	22	22	Z	16	14	31	35	30	19	24	27	27	32	48	58	74	105	120	65	5	5	4	29	36.0	120	
7-Dec	47	59	31	25	Z	29	42	62	79	79	65	56	65	142	93	25	33	41	21	17	45	37	24	12	49.1	142	
8-Dec	25	50	53	42	33	Z	33	65	97	101	55	49	52	74	50	46	44	38	30	37	40	28	25	27	47.6	101	
9-Dec	Z	47	45	37	36	25	6	9	4	6	6	6	17	11	14	5	7	5	4	14	42	57	25	38	20.2	57	
10-Dec	36	Z	28	16	20	33	36	49	45	37	28	14	5	2	13	16	6	5	6	8	5	13	14	18	19.7	49	
11-Dec	16	16	Z	21	26	22	40	42	68	60	M	M	17	34	40	22	16	15	14	17	16	13	21	13	26.1	68	
12-Dec	18	15	19	Z	32	27	25	76	76	44	74	70	63	65	24	5	4	8	19	19	11	26	38	22	33.9	76	
13-Dec	12	14	27	34	Z	36	29	60	80	59	25	5	3	6	16	24	38	35	14	10	9	7	5	5	24.0	80	
14-Dec	4	5	9	6	3	Z	12	19	26	37	25	11	14	13	17	18	16	19	19	14	17	15	12	9	14.8	37	
15-Dec	Z	8	7	7	7	7	10	14	26	41	34	4	4	3	6	14	27	28	9	2	2	2	1	1	11.5	41	
16-Dec	1	Z	3	3	4	3	4	8	9	7	9	9	13	15	13	16	15	16	23	13	11	10	9	9	9.8	23	
17-Dec	6	6	Z	10	13	19	20	10	3	3	2	2	2	2	2	2	2	2	1	1	14	4	2	1	5.7	20	
18-Dec	1	2	1	Z	1	9	3	4	4	6	5	9	3	1	2	2	3	4	4	2	1	2	6	6	3.5	9	
19-Dec	4	8	11	8	Z	10	11	14	12	9	12	23	20	24	40	47	35	30	27	23	21	22	20	15	19.6	47	
20-Dec	16	14	13	12	11	Z	17	16	17	20	17	15	16	14	16	20	21	23	19	20	22	17	12	12	16.6	23	
21-Dec	Z	11	10	10	14	19	19	40	M	M	M	M	M	65	59	56	10	6	4	4	3	2	2	2	18.7	65	
22-Dec	3	Z	2	2	2	2	3	5	4	4	4	2	3	2	3	3	3	3	4	2	3	4	4	3	2.9	5	
23-Dec	3	4	Z	6	7	7	6	10	8	8	14	14	21	39	42	67	53	38	45	57	49	48	43	46	27.6	67	
24-Dec	38	7	3	Z	3	7	16	11	9	9	13	13	14	17	13	30	18	19	16	14	13	6	5	2	12.7	38	
25-Dec	2	1	1	10	Z	40	20	16	18	10	8	6	8	11	19	22	14	24	22	18	17	12	16	18	14.5	40	
26-Dec	19	20	17	18	15	Z	21	21	23	27	22	23	24	31	30	31	31	25	28	43	36	24	25	13	24.8	43	
27-Dec	Z	16	15	15	19	27	26	25	27	33	34	42	52	41	33	57	43	36	30	27	24	22	17	20	29.6	57	
28-Dec	20	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	20	
29-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
30-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	52	66	68	39	27	14	12	6	6	7	--	68
31-Dec	9	7	8	5	Z	21	12	12	16	10	16	14	19	21	17	21	22	36	26	14	17	18	11	18	16.0	36	
																								Diurnal Average			
																								Diurnal Maximum			
14.4 16.0 15.4 14.9 14.4 18.7 20.0 27.2 31.2 30.3 24.0 21.2 24.7 30.3 28.5 28.2 26.6 25.6 23.4 20.1 18.8 18.0 14.9 14.6 47 59 53 42 36 40 42 76 97 101 74 70 107 142 93 67 74 105 120 69 54 59 43 46																											
Z - zerospan      C - Calibration      M - Maintenance      UO - Unstable Operation																											







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	393	61.12	61.12
21 - 40	160	24.88	86.00
41 - 80	82	12.75	98.76
81 - 159	8	1.24	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 643

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Athabasca Valley - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	21	3	1	6	5	7	67	31	6	30	41	33	48	16	24	39	378
21 - 40	0	3	2	1	1	4	54	29	16	11	11	3	2	1	6	8	152
11 - 80	1	0	2	2	3	3	24	21	6	1	5	0	0	0	2	3	73
81 - 159	0	0	0	0	0	1	2	3	1	1	0	0	0	0	0	0	8
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	22	6	5	9	9	15	147	84	29	43	57	36	50	17	32	50	611

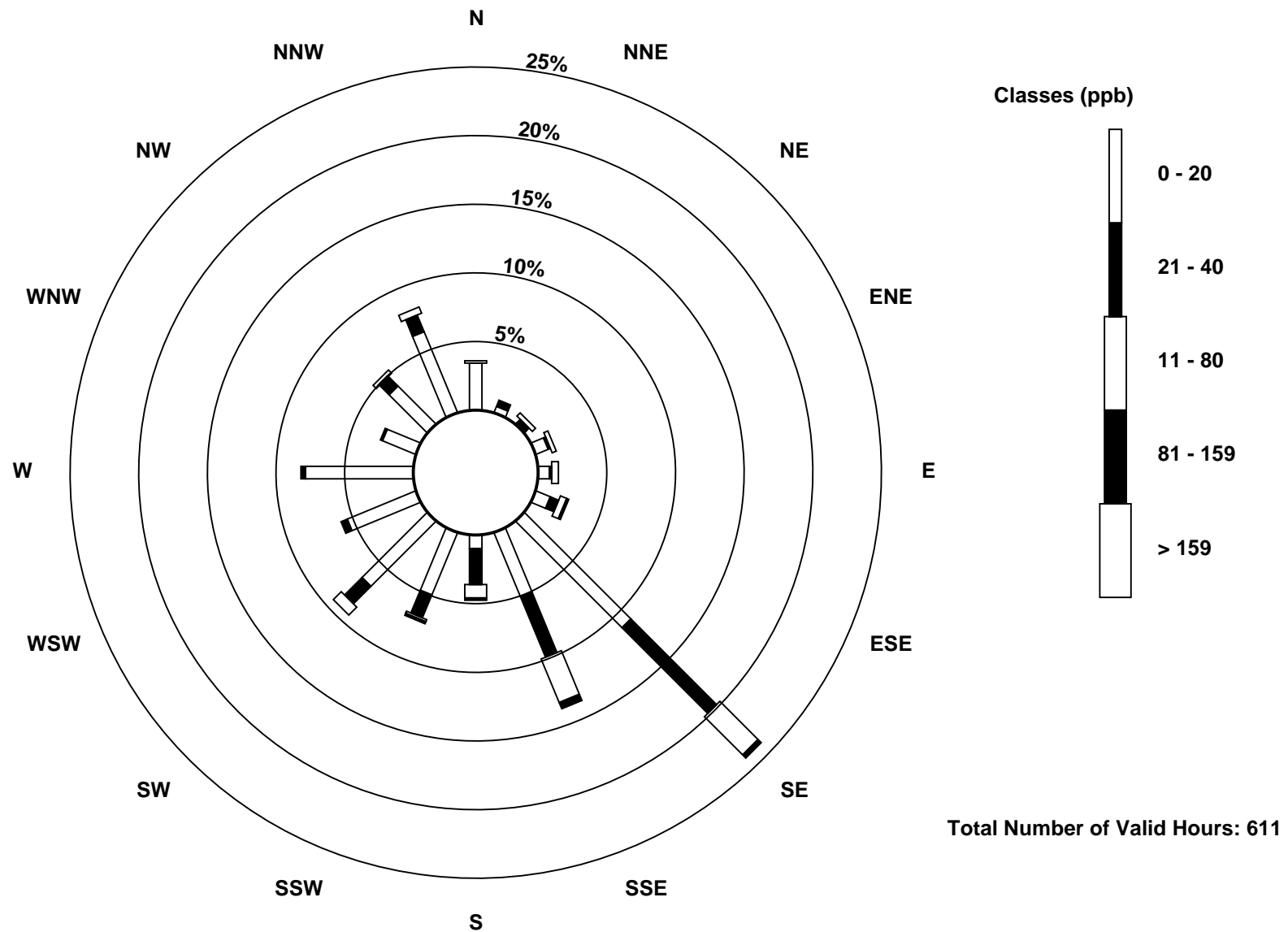
Total Number of Valid Hours: 611

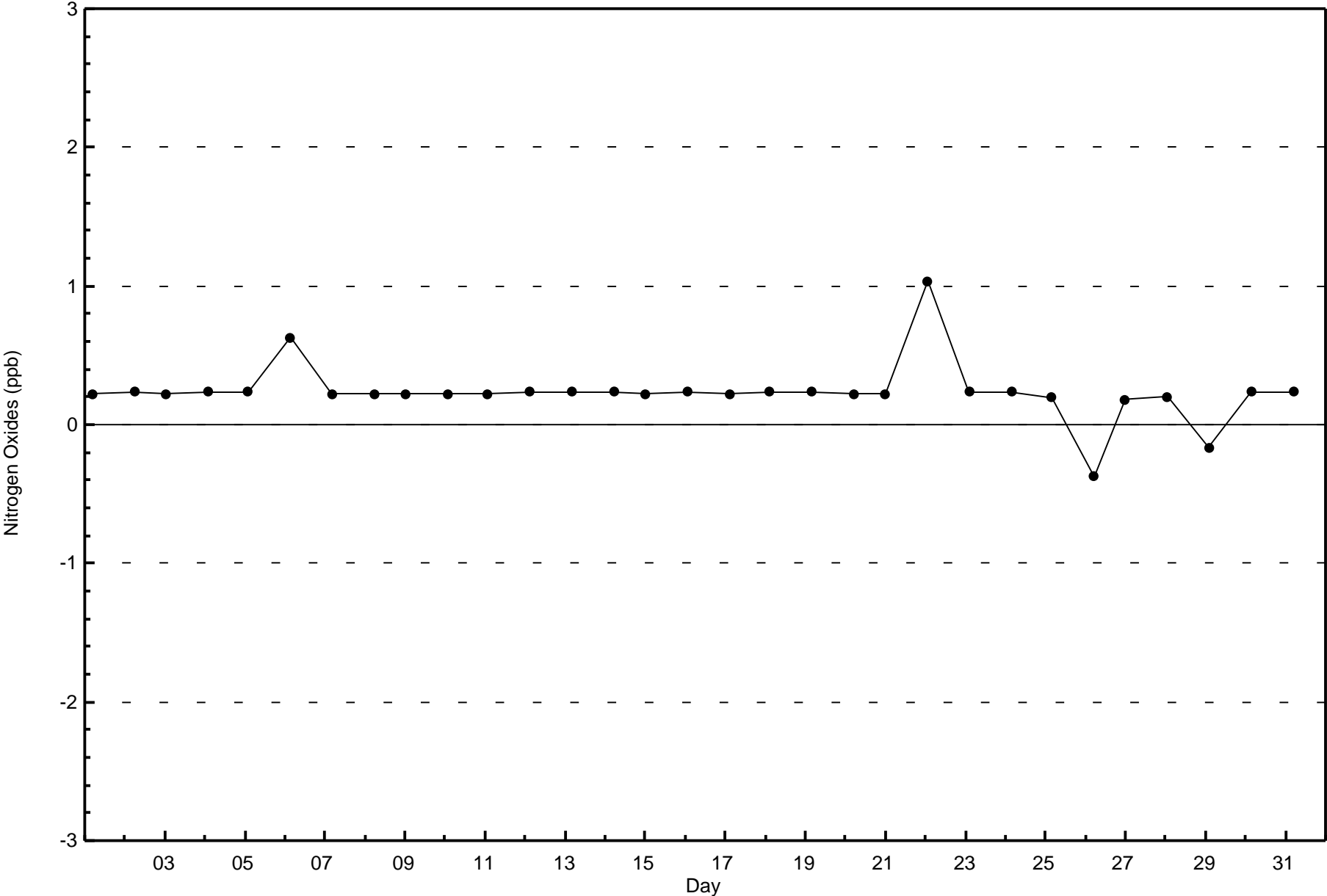
Total Number of Hours: 744

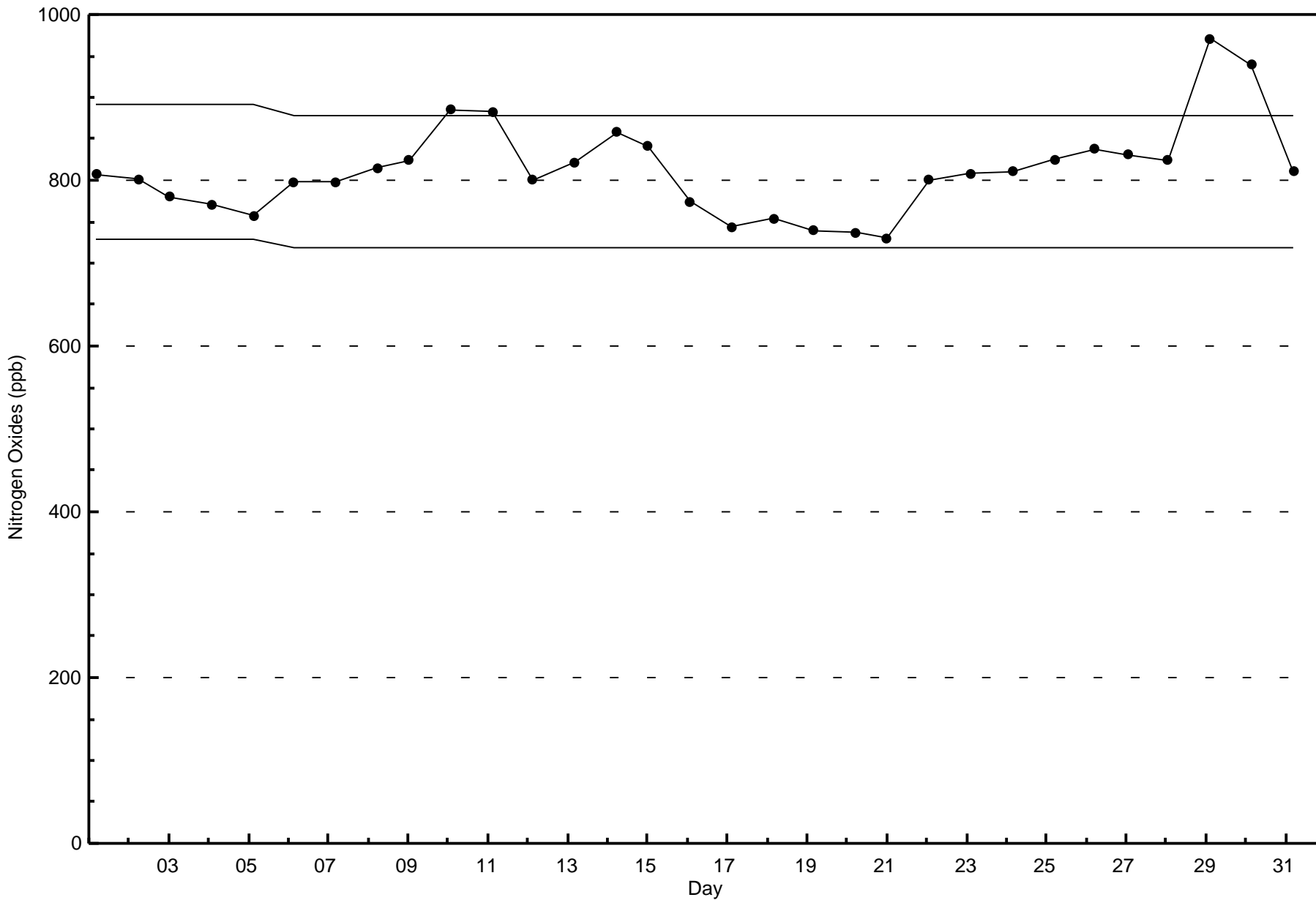


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Athabasca Valley (AMS 7)









Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	744
Maximum Value: 24.4 µg/m <sup>3</sup> on Dec 9 18:00	Maximum Daily Average: 12.5 µg/m <sup>3</sup> on Dec 9	Hours of Data:	722
Minimum Value: 0.1 µg/m <sup>3</sup> on Dec 17 14:00	Minimum Daily Average: 1.7 µg/m <sup>3</sup> on Dec 22	Hours of Missing Data:	22
Maximum Diurnal Average: 7.9 µg/m <sup>3</sup> at hour 18	Minimum Diurnal Average: 4.4 µg/m <sup>3</sup> at hour 7	Hours of Calibration:	1
Monthly Average: 6.21 µg/m <sup>3</sup>	Percentiles: P <sub>1</sub> = 0.4 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 3.3 Median = 5.4 Q <sub>3</sub> = 8.2 P <sub>90</sub> = 11.4 P <sub>99</sub> = 17.8	Percent Operational Time:	97.2

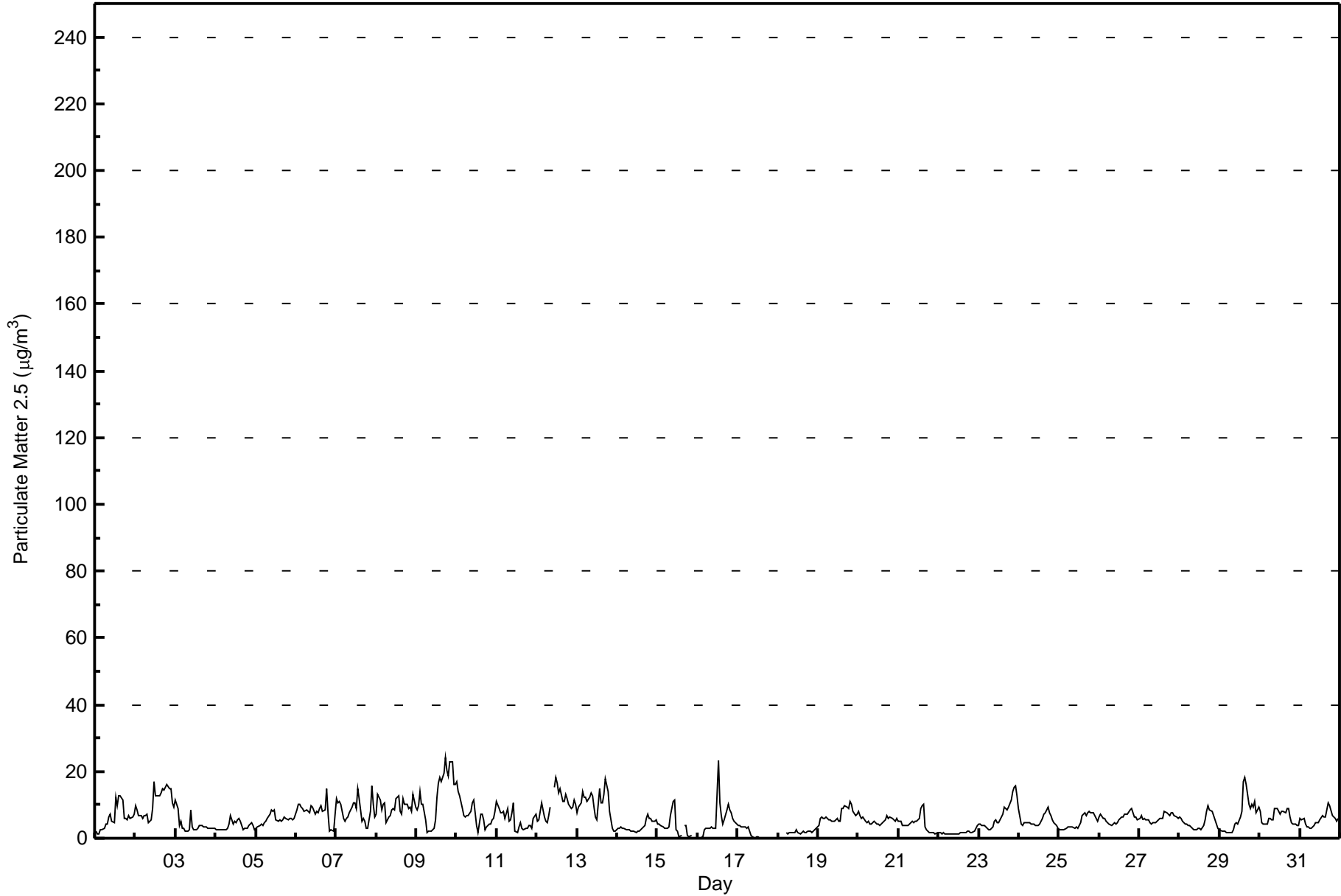
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	2.0	1.3	1.2	2.6	2.7	2.9	4.4	4.2	6.5	7.2	5.2	4.6	12.1	9.7	12.7	12.7	11.4	6.0	5.9	5.3	6.6	6.0	6.2	7.0	6.1	12.7																							
2-Dec	9.6	8.5	6.9	6.8	6.1	6.6	6.8	7.4	4.7	5.5	8.9	17.1	12.8	12.7	12.8	13.5	14.6	14.4	15.4	16.0	14.7	14.7	10.7	9.5	10.7	17.1																							
3-Dec	11.4	8.8	4.0	5.2	3.0	2.9	2.2	2.1	2.4	8.5	3.4	2.4	2.4	3.1	3.9	3.8	3.7	3.5	3.3	3.1	2.8	3.0	3.0	2.9	3.9	11.4																							
4-Dec	2.3	2.4	2.4	2.4	2.5	2.6	2.7	3.0	4.1	6.8	4.3	5.0	4.5	5.5	5.8	5.1	2.6	2.9	3.0	3.1	3.7	4.5	3.9	2.7	3.7	6.8																							
5-Dec	2.8	3.3	3.8	4.0	4.0	4.6	5.1	5.9	7.3	8.6	7.8	8.6	5.6	5.0	5.4	5.1	5.7	6.4	6.0	5.5	5.9	5.9	5.7	5.8	5.6	8.6																							
6-Dec	8.5	10.2	10.2	9.5	8.7	8.2	8.4	8.1	7.7	9.6	9.1	7.4	8.0	7.6	9.0	9.9	8.2	8.5	14.9	7.7	2.0	2.5	2.3	7.3	8.1	14.9																							
7-Dec	11.8	10.5	10.9	10.2	6.1	5.3	5.8	6.4	7.7	9.4	10.6	10.6	8.7	14.7	11.7	5.1	5.8	5.1	3.1	2.9	8.1	15.5	10.1	6.2	8.4	15.5																							
8-Dec	7.4	13.3	11.6	8.5	10.2	10.4	4.5	6.2	6.9	8.3	8.8	8.5	11.8	12.9	7.9	7.3	11.9	10.4	10.1	9.1	9.5	8.2	12.9	9.5	9.4	13.3																							
9-Dec	8.4	9.7	14.2	10.4	10.1	5.4	1.8	2.1	1.9	2.1	3.0	5.7	12.2	16.3	18.2	17.1	19.7	24.4	20.3	18.6	22.7	23.1	16.1	16.2	12.5	24.4																							
10-Dec	16.9	14.2	12.6	8.9	6.9	6.2	6.7	6.8	8.2	10.7	11.4	7.6	4.0	1.7	7.1	7.2	5.4	2.4	3.6	4.4	4.3	5.5	6.1	7.9	7.4	16.9																							
11-Dec	11.1	9.1	7.6	7.6	8.1	5.8	8.8	5.0	5.4	7.6	10.6	2.3	1.5	3.6	4.5	2.8	2.7	2.8	3.1	3.7	3.7	3.0	6.1	7.1	5.6	11.1																							
12-Dec	5.2	5.5	8.2	10.6	6.3	5.2	4.8	6.7	9.3	C	15.3	18.1	16.4	13.6	14.7	10.8	11.2	12.9	11.8	10.3	8.7	9.5	11.5	10.1	10.3	18.1																							
13-Dec	7.8	9.2	10.5	14.1	12.2	12.4	10.9	12.3	13.4	12.8	9.5	6.4	5.5	15.0	10.6	10.4	13.1	17.8	14.0	8.0	5.7	3.1	2.1	1.9	10.0	17.8																							
14-Dec	3.0	2.9	3.3	3.0	2.9	2.8	2.7	2.6	2.1	2.1	2.3	1.7	2.1	2.2	2.6	2.9	3.7	6.0	7.2	6.1	5.9	4.9	5.1	5.6	3.6	7.2																							
15-Dec	4.2	4.1	3.6	3.4	3.1	2.8	2.9	3.5	7.0	11.1	11.4	2.7	2.2	0.4	0.7	UO	3.8	3.9	1.0	0.4	0.8	UO	UO	UO	3.7	11.4																							
16-Dec	UO	UO	0.4	0.6	2.7	2.8	2.8	3.1	3.4	3.0	2.9	3.1	23.4	10.5	6.7	4.2	5.3	8.6	10.3	8.3	7.6	6.0	5.2	4.2	5.7	23.4																							
17-Dec	4.0	3.9	3.4	3.5	3.4	3.2	3.2	2.1	0.6	0.4	0.2	0.4	0.3	0.1	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	4.0																							
18-Dec	UO	UO	UO	UO	UO	1.9	1.3	1.7	1.6	1.8	1.8	2.6	1.5	1.4	1.7	2.0	1.8	1.7	1.9	1.9	1.9	1.9	2.6	3.0	1.9	3.0																							
19-Dec	3.6	5.8	6.2	5.8	6.0	6.2	5.7	5.4	5.2	5.1	4.9	6.1	5.2	5.1	8.8	9.1	9.7	9.2	8.9	11.0	10.4	8.0	6.9	7.2	6.9	11.0																							
20-Dec	8.0	6.7	6.1	6.1	5.1	4.8	5.0	4.4	4.4	5.1	4.8	4.1	4.0	3.8	4.5	5.1	5.5	6.9	5.9	6.3	5.9	5.3	5.1	6.0	5.4	8.0																							
21-Dec	4.9	4.9	4.0	3.8	3.8	3.9	4.0	4.5	4.9	4.8	4.9	4.9	6.1	8.9	9.6	10.3	3.4	2.4	1.9	1.8	1.9	1.5	1.5	1.6	4.3	10.3																							
22-Dec	1.7	1.5	1.4	1.6	1.1	1.1	1.2	1.4	1.3	1.4	1.4	1.4	1.4	1.5	1.7	1.7	1.7	1.9	2.1	1.8	1.7	2.2	3.1	3.8	1.7	3.8																							
23-Dec	4.2	4.1	4.0	3.6	3.3	2.8	2.6	2.7	3.2	5.0	5.4	4.6	4.7	5.7	7.4	9.4	8.9	8.4	9.5	11.5	13.8	15.1	15.5	12.7	7.0	15.5																							
24-Dec	9.1	4.1	4.0	4.5	4.8	4.7	4.6	4.3	4.2	4.4	4.0	3.9	4.3	5.2	5.9	7.0	7.7	9.5	7.7	6.9	5.5	4.6	3.8	3.0	5.3	9.5																							
25-Dec	2.7	2.4	2.4	2.7	3.1	3.4	3.3	3.4	3.2	3.1	3.2	3.2	3.9	4.8	6.6	7.5	6.7	7.5	8.2	7.6	7.6	6.7	6.0	5.1	4.8	8.2																							
26-Dec	6.5	7.3	6.1	6.1	5.2	4.8	4.1	3.8	4.4	4.5	4.3	4.7	5.4	6.5	6.4	7.3	7.0	7.4	8.3	8.7	7.5	6.4	6.3	5.5	6.0	8.7																							
27-Dec	6.0	6.9	5.7	6.1	5.6	5.4	4.7	4.4	4.5	4.7	4.5	5.4	6.1	6.1	6.1	8.1	7.5	7.2	6.9	7.8	7.5	6.8	6.2	6.0	6.1	8.1																							
28-Dec	6.5	5.8	5.0	4.4	4.1	3.9	4.0	3.5	2.6	2.7	2.7	2.8	2.8	2.7	4.0	5.4	7.9	9.7	8.3	7.9	6.7	5.7	4.3	2.9	4.8	9.7																							
29-Dec	2.5	2.3	2.1	2.0	1.8	1.7	1.6	1.8	2.6	4.3	4.7	4.3	6.2	8.2	17.1	18.3	15.9	10.2	9.0	10.3	9.4	11.2	7.7	9.4	6.8	18.3																							
30-Dec	8.1	4.5	4.3	4.1	4.3	5.9	6.0	5.4	5.5	8.9	9.1	8.0	7.1	8.0	8.1	7.7	9.0	9.0	6.2	4.5	4.4	4.1	3.9	3.8	6.2	9.1																							
31-Dec	5.8	5.5	5.9	4.4	3.6	3.5	3.1	3.1	3.7	4.7	4.9	4.9	5.4	6.8	6.2	6.4	8.3	10.7	9.9	6.7	6.5	5.9	5.1	5.8	5.7	10.7																							
																								6.4	6.2	5.7	5.6	5.0	4.6	4.4	4.4	4.8	5.8	6.0	5.6	6.4	6.8	7.6	7.7	7.7	7.9	7.6	6.9	6.8	6.9	6.4	6.2	Diurnal Average	
																								16.9	14.2	14.2	14.1	12.2	12.4	10.9	12.3	13.4	12.8	15.3	18.1	23.4	16.3	18.2	18.3	19.7	24.4	20.3	18.6	22.7	23.1	16.1	16.2	Diurnal Maximum	

C - Calibration      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO):    24-hr 30 µg/m<sup>3</sup>



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Athabasca Valley - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Athabasca Valley - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	353	48.89	48.89
6 - 15	335	46.40	95.29
16 - 25	21	2.91	98.20
26 - 80	0	0.00	98.20
> 81.0	0	0.00	98.20

Total Number of Valid Hours: 722

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Athabasca Valley - December 2017**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	17	6	2	7	7	4	70	25	10	28	36	18	38	16	22	34	340
6 - 15	6	1	2	5	4	13	90	67	26	17	27	7	6	3	13	26	313
16 - 25	0	1	1	0	0	1	5	4	0	1	2	5	0	0	0	1	21
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
<b>Totals</b>	23	8	5	12	11	18	165	96	36	46	65	30	44	19	35	61	674

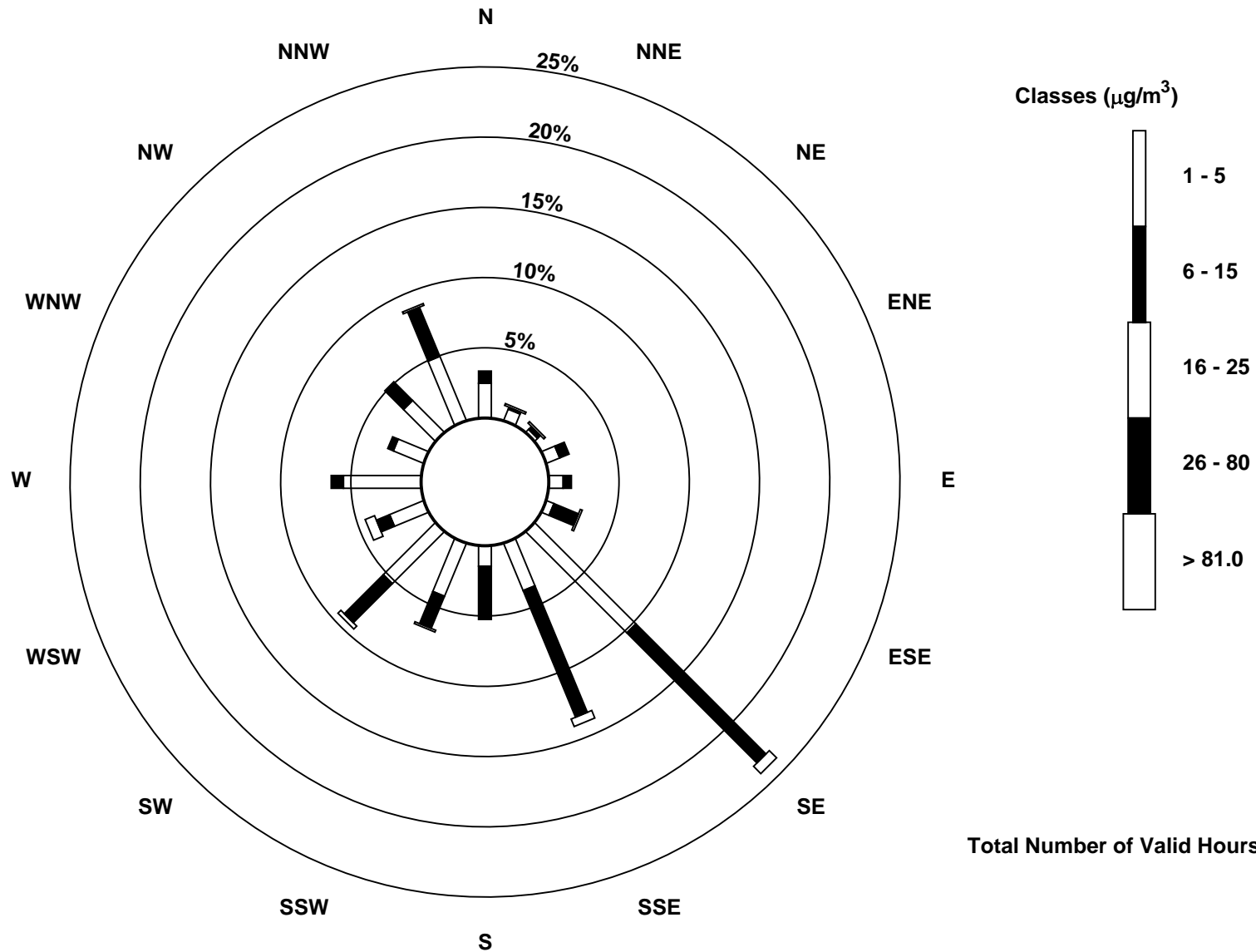
Total Number of Valid Hours: 687

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Carbon Monoxide (CO) - ppm

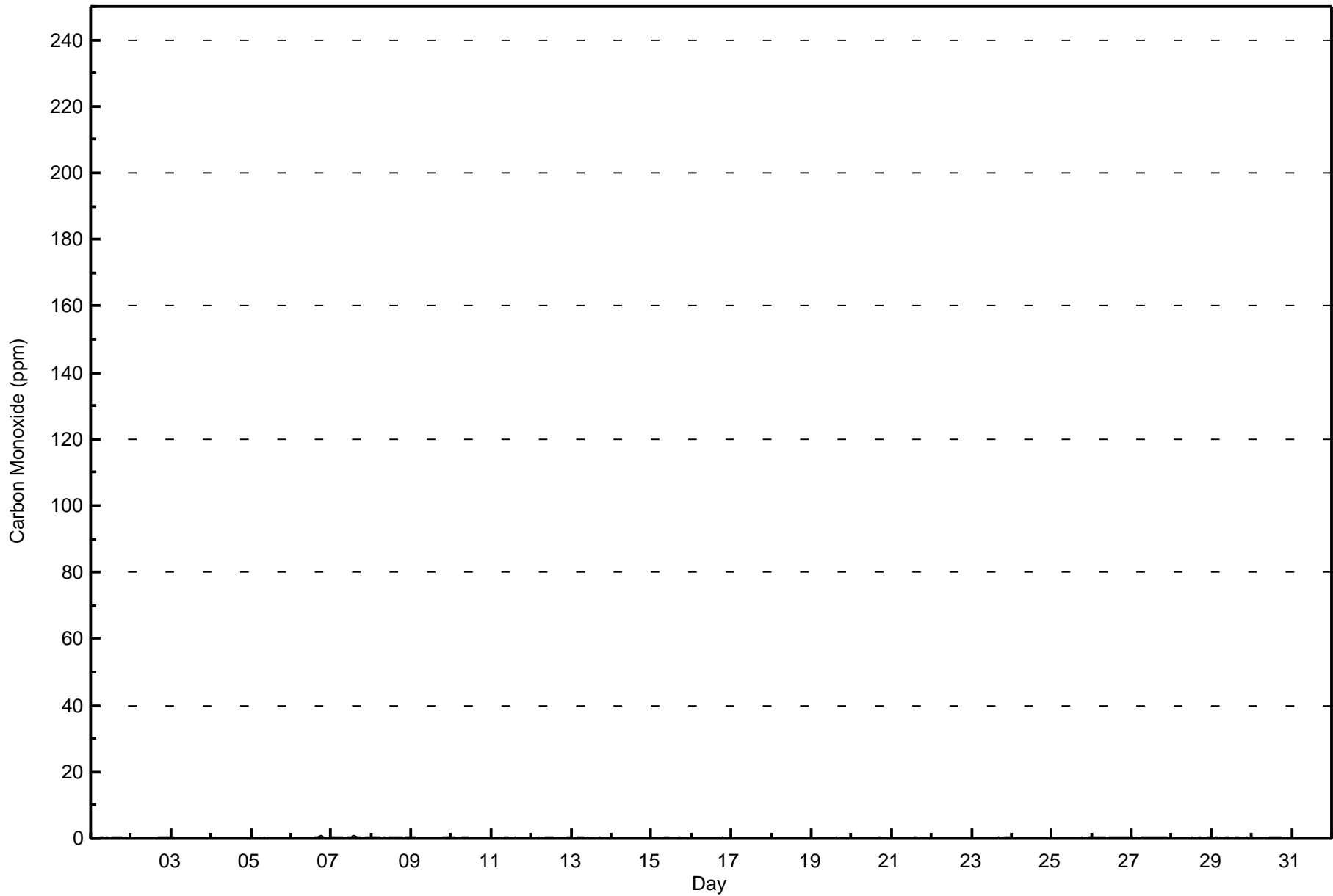
Athabasca Valley - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 0.8 ppm on Dec 7 14:00 Maximum Daily Average: 0.3 ppm on Dec 7																	Hours in Service: 744 Hours of Data: 709 Hours of Missing Data: 35 Hours of Calibration: 34 Percent Operational Time: 99.9										
Minimum Value: 0.1 ppm on Dec 24 04:00 Minimum Daily Average: 0.1 ppm on Dec 18 Maximum Diurnal Average: 0.2 ppm at hour 17 Minimum Diurnal Average: 0.1 ppm at hour 5 Monthly Average: 0.19 ppm Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.1 Q <sub>1</sub> = 0.1 Median = 0.2 Q <sub>3</sub> = 0.2 P <sub>90</sub> = 0.3 P <sub>99</sub> = 0.5																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.2	Z	0.4	0.2	0.2	0.6	0.5	0.5	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.6
2-Dec	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Z	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.5	0.3	0.3	0.2	0.2	0.5
3-Dec	0.3	0.2	0.2	0.2	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3
4-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.2	C	C	C	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2
5-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.2	0.3	M	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3
6-Dec	0.1	0.2	0.2	0.2	0.1	0.1	0.1	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.7	0.7	0.4	0.1	0.1	0.1	0.3	0.3	0.7	
7-Dec	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.4	Z	0.5	0.5	0.4	0.4	0.8	0.7	0.3	0.3	0.3	0.2	0.2	0.4	0.4	0.3	0.2	0.3	0.8	
8-Dec	0.3	0.3	0.3	0.3	0.2	0.4	0.2	0.3	0.4	Z	0.3	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.3	0.4	
9-Dec	0.3	0.3	0.3	0.3	Z	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.6	0.3	0.4	0.2	0.6	
10-Dec	0.4	0.4	0.3	0.2	0.2	Z	0.2	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	
11-Dec	0.2	0.2	0.1	0.2	0.2	0.2	Z	0.3	0.4	0.4	0.3	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	0.4	
12-Dec	0.2	0.1	0.2	0.2	0.2	0.2	0.2	Z	0.4	0.3	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.4	
13-Dec	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.4	Z	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.4	
14-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	
15-Dec	0.1	0.1	0.1	0.1	Z	0.1	0.2	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	
16-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	
17-Dec	0.1	0.1	0.1	0.1	0.1	0.2	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	
18-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
19-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.3	
20-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	Z	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.3	
21-Dec	0.1	0.1	0.1	0.1	Z	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	
22-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
23-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.3	
24-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
25-Dec	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	Z	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
26-Dec	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	Z	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.4	
27-Dec	0.2	0.2	0.2	0.2	Z	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	
28-Dec	0.2	0.2	0.2	0.1	0.2	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
29-Dec	0.2	0.2	0.2	0.2	0.2	0.2	Z	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.5	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.5	
30-Dec	0.2	0.1	0.1	0.1	0.1	0.2	0.2	Z	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.4	
31-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan      C - Calibration      M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 13 ppm																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Carbon Monoxide (CO) - ppm**  
**Athabasca Valley - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Carbon Monoxide (CO) - ppm**  
**Athabasca Valley - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	659	92.95	92.95
0.4 - 0.5	44	6.21	99.15
0.6 - 0.7	5	0.71	99.86
0.8 - 1.4	1	0.14	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Carbon Monoxide (CO) - ppm  
Athabasca Valley - December 2017**

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	22	7	4	10	9	15	135	78	32	41	62	39	60	21	36	58	629
0.4 - 0.5	0	0	1	1	1	1	21	8	4	1	1	0	0	0	0	1	40
0.6 - 0.7	0	0	0	0	0	1	1	2	0	1	0	0	0	0	0	0	5
0.8 - 1.4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
1.5 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	22	7	5	11	10	17	157	89	36	43	63	39	60	21	36	59	675

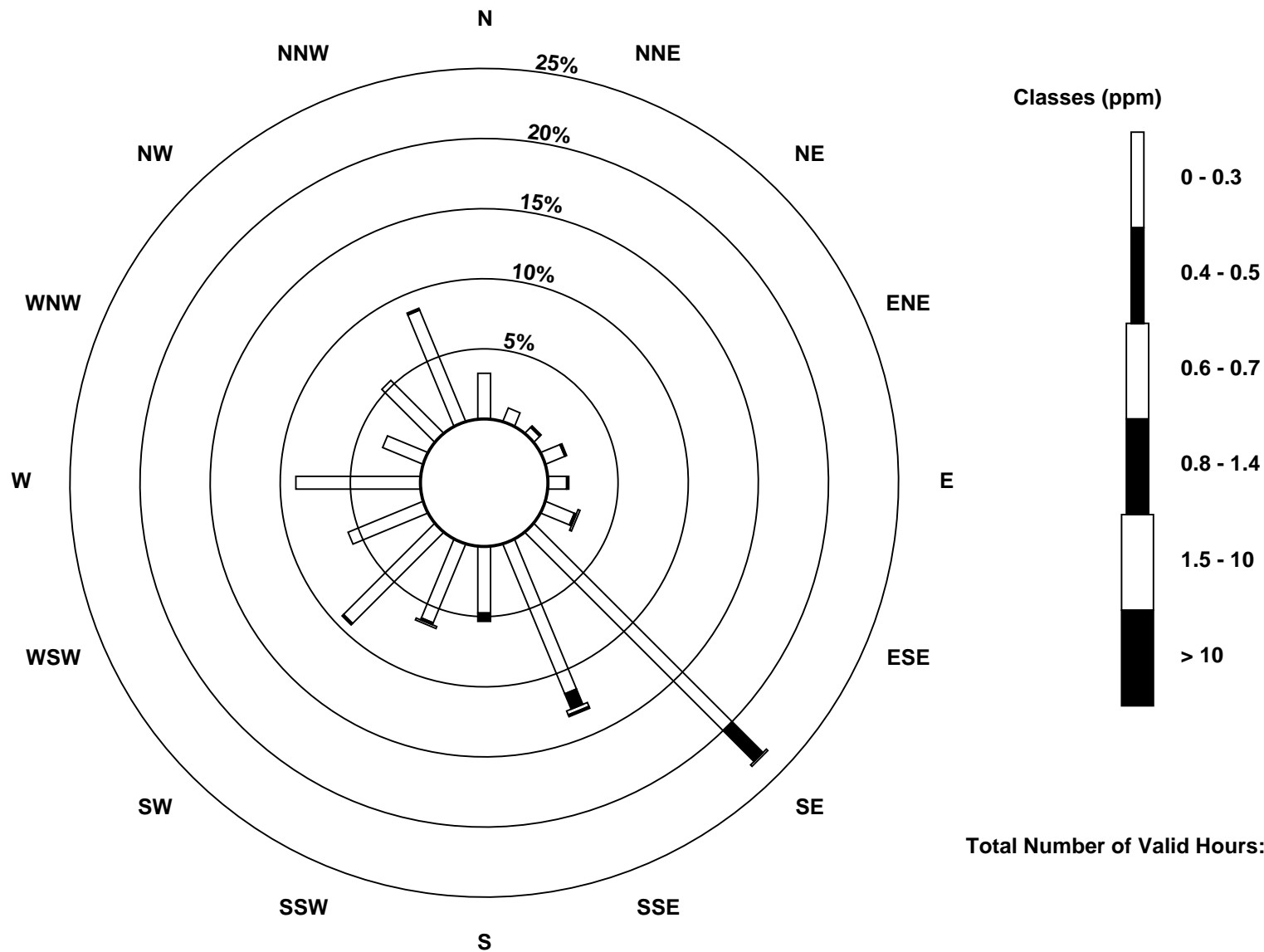
Total Number of Valid Hours: 675

Total Number of Hours: 744



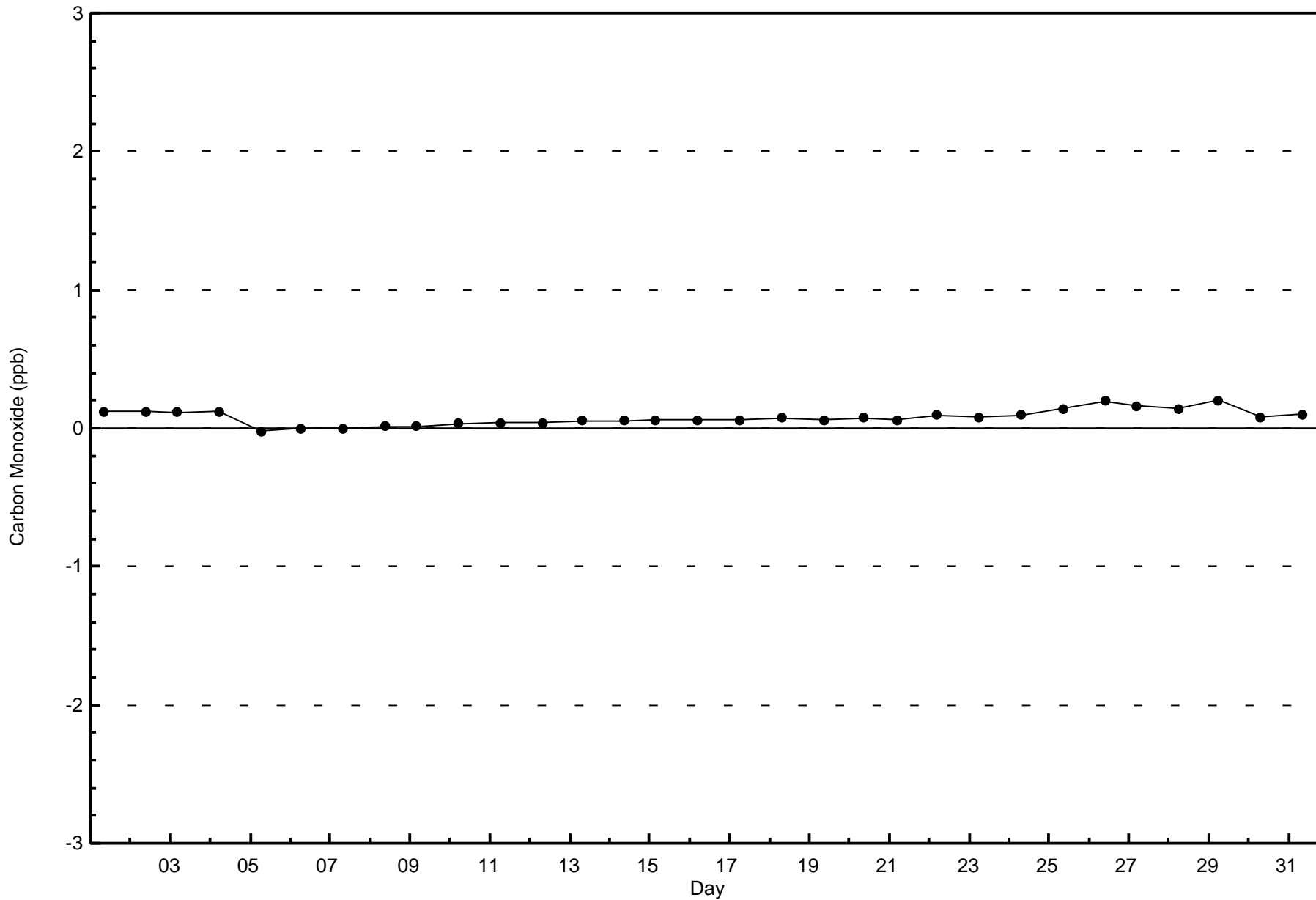
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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



Total Number of Valid Hours: 675

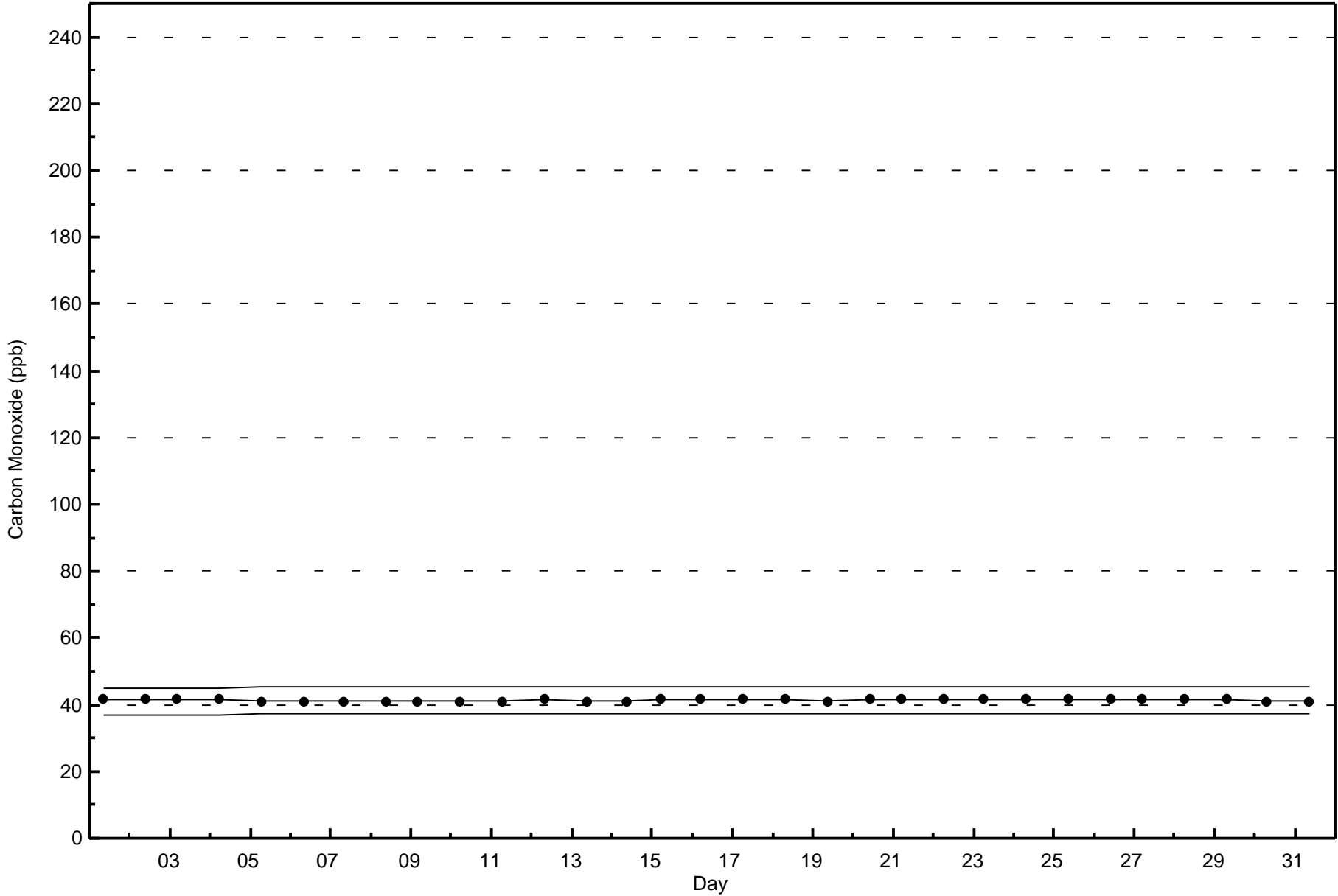






**Wood Buffalo Environmental Association**  
**Span Responses**

**Carbon Monoxide (CO) - ppb**  
**Athabasca Valley - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

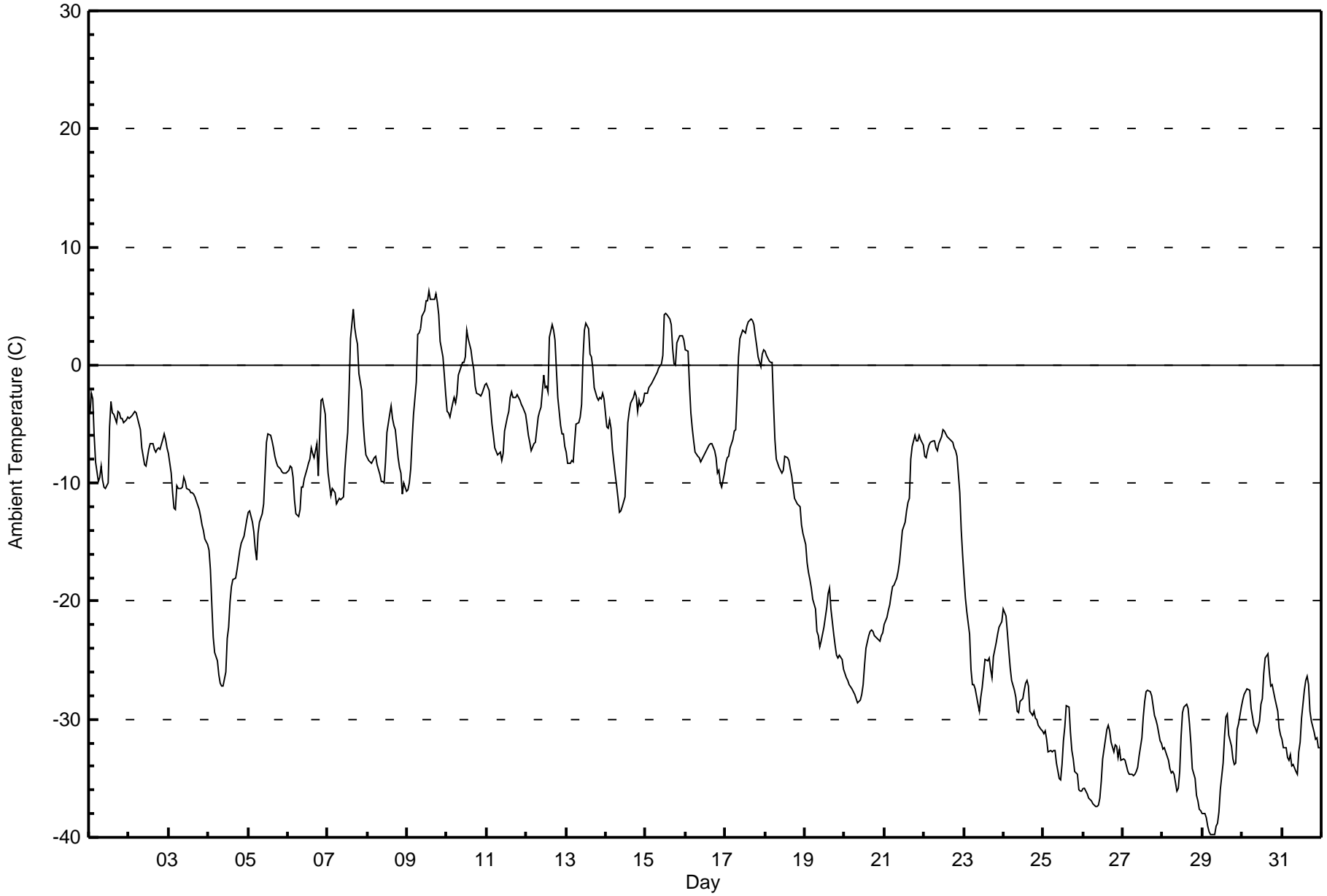
**Ambient Temperature (AT) - C**  
**Athabasca Valley - December 2017**

<b>Maximum Value: 6.2 C on Dec 9 14:00</b>		<b>Maximum Daily Average: 1.0 C on Dec 9</b>		<b>Hours in Service: 744</b>																																												
<b>Minimum Value: -39.8 C on Dec 29 08:00</b>		<b>Minimum Daily Average: -35.1 C on Dec 29</b>		<b>Hours of Data: 744</b>																																												
<b>Maximum Diurnal Average: -11.8 C at hour 16</b>		<b>Minimum Diurnal Average: -16.8 C at hour 9</b>		<b>Hours of Missing Data: 0</b>																																												
<b>Monthly Average: -14.66 C</b>		<b>Percentiles: P<sub>1</sub> = -38.3 P<sub>10</sub> = -32.8 Q<sub>1</sub> = -27.2 Median = -10.0 Q<sub>3</sub> = -4.9 P<sub>90</sub> = 0.0 P<sub>99</sub> = 5.3</b>		<b>Hours of Calibration: 0</b>																																												
				<b>Percent Operational Time: 100.0</b>																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-4.2	-2.4	-2.8	-6.0	-8.2	-9.8	-9.5	-8.6	-9.7	-10.4	-10.5	-10.0	-5.2	-3.2	-4.0	-4.2	-4.8	-3.9	-4.0	-4.5	-4.5	-4.8	-4.6	-4.5	-6.0	-2.4																						
2-Dec	-4.5	-4.4	-4.3	-3.9	-4.1	-4.5	-5.0	-5.5	-7.0	-8.5	-8.5	-7.9	-7.2	-6.6	-6.6	-7.1	-7.4	-7.2	-7.1	-7.2	-6.4	-5.8	-6.3	-7.0	-6.2	-3.9																						
3-Dec	-7.5	-9.2	-10.9	-12.1	-12.3	-10.2	-10.5	-10.5	-10.3	-9.5	-9.8	-10.4	-10.6	-10.8	-10.8	-10.9	-11.2	-11.5	-12.3	-12.8	-13.5	-14.0	-14.7	-15.2	-11.3	-7.5																						
4-Dec	-15.7	-17.3	-20.3	-23.0	-24.3	-25.0	-26.2	-27.0	-27.2	-27.2	-26.0	-23.1	-22.3	-20.1	-18.8	-18.2	-18.1	-17.4	-16.5	-15.7	-15.0	-14.5	-13.8	-13.0	-20.2	-13.0																						
5-Dec	-12.4	-12.4	-13.3	-14.1	-15.5	-16.5	-14.2	-13.3	-12.6	-11.8	-9.2	-6.5	-5.8	-6.0	-6.4	-7.1	-7.7	-8.1	-8.6	-8.8	-9.1	-9.2	-9.2	-9.2	-10.3	-5.8																						
6-Dec	-8.9	-8.6	-8.6	-9.5	-11.5	-12.6	-12.8	-12.2	-10.3	-10.4	-9.7	-8.8	-8.3	-7.9	-7.1	-7.5	-7.8	-6.7	-9.4	-6.0	-3.0	-2.9	-4.1	-7.2	-8.4	-2.9																						
7-Dec	-9.2	-10.1	-11.0	-10.5	-10.8	-11.8	-11.6	-11.3	-11.4	-11.1	-8.8	-7.1	-5.7	-2.1	2.3	4.7	3.1	2.4	1.8	-0.7	-2.1	-4.7	-6.5	-7.6	-5.8	4.7																						
8-Dec	-7.8	-8.1	-8.3	-8.1	-7.9	-7.8	-8.4	-9.3	-9.9	-9.8	-9.9	-8.2	-5.7	-4.2	-3.5	-4.5	-5.1	-5.4	-7.8	-8.6	-9.2	-10.9	-10.0	-10.7	-7.9	-3.5																						
9-Dec	-10.6	-10.0	-8.8	-6.3	-4.2	-1.4	2.6	2.7	3.1	4.1	4.6	5.5	5.4	6.2	5.5	5.6	5.5	6.0	5.3	4.2	2.0	0.7	-0.8	-2.5	1.0	6.2																						
10-Dec	-4.0	-4.1	-4.5	-3.2	-2.7	-3.3	-2.5	-0.9	-0.2	0.2	0.2	0.7	2.9	2.3	1.2	0.4	-0.3	-1.8	-2.4	-2.5	-2.6	-2.4	-2.1	-1.7	-1.4	2.9																						
11-Dec	-1.6	-2.2	-3.5	-5.0	-5.9	-7.0	-7.6	-7.5	-7.4	-8.1	-7.5	-5.6	-4.5	-3.9	-2.8	-2.3	-2.7	-2.7	-2.5	-2.7	-3.0	-3.3	-3.6	-4.2	-4.5	-1.6																						
12-Dec	-5.0	-5.9	-6.6	-7.3	-6.7	-6.6	-5.5	-4.4	-3.9	-3.6	-0.8	-1.9	-1.8	-2.2	2.4	3.4	3.0	2.1	-0.3	-2.7	-5.1	-5.8	-5.9	-6.9	-3.3	3.4																						
13-Dec	-7.3	-8.3	-8.4	-8.1	-8.2	-6.5	-5.0	-4.9	-4.4	-3.3	0.5	2.9	3.5	3.0	0.9	0.7	-0.3	-1.9	-2.8	-3.0	-2.8	-2.9	-2.3	-2.9	-3.0	3.5																						
14-Dec	-5.3	-5.3	-4.6	-5.3	-7.1	-9.3	-10.3	-11.2	-12.5	-12.4	-12.0	-11.2	-8.0	-4.9	-3.9	-3.3	-2.8	-2.3	-2.6	-3.9	-3.0	-3.5	-3.1	-2.3	-6.3	-2.3																						
15-Dec	-2.4	-2.4	-1.9	-1.6	-1.3	-1.1	-0.8	-0.6	-0.3	0.1	0.8	4.2	4.4	4.3	3.9	3.4	1.4	0.1	0.0	1.9	2.5	2.5	2.5	2.2	0.9	4.4																						
16-Dec	1.3	1.2	-1.7	-4.1	-5.3	-6.5	-7.3	-7.7	-7.8	-8.2	-8.0	-7.7	-7.3	-7.0	-6.8	-6.6	-6.7	-7.2	-7.9	-9.1	-8.9	-10.0	-10.4	-9.2	-6.6	1.3																						
17-Dec	-8.4	-7.9	-7.7	-7.0	-6.3	-5.7	-5.5	-2.6	0.7	2.2	2.9	2.8	2.7	3.3	3.7	3.9	3.7	3.5	2.5	1.6	0.7	-0.1	1.0	1.2	-0.6	3.9																						
18-Dec	1.2	0.8	0.4	0.2	0.3	-3.2	-6.4	-7.9	-8.7	-9.0	-9.2	-8.9	-7.7	-7.9	-8.1	-8.8	-9.4	-10.3	-11.3	-11.8	-11.9	-12.0	-13.6	-14.2	-7.4	1.2																						
19-Dec	-15.2	-16.8	-17.5	-18.2	-18.9	-19.8	-20.6	-22.6	-22.9	-23.8	-23.4	-22.2	-21.4	-20.5	-19.3	-18.8	-20.6	-22.8	-23.7	-24.6	-24.8	-24.6	-25.0	-25.8	-21.4	-15.2																						
20-Dec	-26.1	-26.4	-26.7	-27.1	-27.4	-27.7	-27.8	-28.2	-28.6	-28.4	-27.8	-27.0	-25.4	-23.9	-22.9	-22.6	-22.5	-22.5	-22.9	-23.1	-23.2	-23.3	-22.9	-22.7	-25.3	-22.5																						
21-Dec	-22.0	-21.4	-20.8	-20.2	-19.5	-18.8	-18.6	-18.1	-17.4	-16.6	-15.3	-14.1	-13.3	-12.4	-11.7	-11.3	-8.0	-6.9	-6.0	-6.4	-6.4	-6.0	-6.3	-6.8	-13.5	-6.0																						
22-Dec	-7.7	-7.8	-7.3	-6.8	-6.5	-6.4	-6.4	-7.0	-7.3	-6.7	-6.1	-5.5	-5.6	-5.8	-6.0	-6.2	-6.5	-6.6	-7.0	-7.2	-7.7	-10.9	-13.9	-16.0	-7.5	-5.5																						
23-Dec	-18.0	-19.7	-20.9	-22.8	-25.8	-27.1	-27.1	-27.4	-28.7	-29.3	-28.2	-27.4	-26.1	-25.0	-25.0	-24.8	-25.8	-26.5	-24.7	-23.5	-22.7	-22.2	-22.0	-21.7	-24.7	-18.0																						
24-Dec	-20.7	-21.3	-22.6	-24.2	-25.7	-26.7	-27.6	-28.2	-29.4	-29.5	-28.5	-28.2	-27.5	-27.0	-26.7	-27.1	-29.4	-29.7	-29.3	-29.9	-30.0	-30.5	-30.8	-31.0	-27.6	-20.7																						
25-Dec	-31.2	-30.9	-31.7	-32.8	-32.7	-32.7	-32.7	-32.7	-33.7	-35.0	-35.1	-33.8	-31.8	-30.7	-28.8	-28.9	-31.2	-32.7	-33.4	-34.4	-34.7	-36.0	-36.1	-36.1	-32.9	-28.8																						
26-Dec	-35.8	-35.8	-36.3	-36.7	-36.8	-36.9	-37.1	-37.4	-37.4	-37.3	-36.6	-35.3	-33.4	-31.7	-30.9	-30.5	-31.0	-31.9	-32.8	-32.2	-32.3	-33.2	-33.5	-33.5	-34.4	-30.5																						
27-Dec	-33.4	-33.5	-34.0	-34.4	-34.7	-34.6	-34.7	-34.6	-34.5	-34.0	-33.1	-31.5	-29.8	-28.5	-27.7	-27.5	-27.6	-28.0	-28.9	-29.7	-30.0	-30.5	-31.9	-32.1	-31.6	-27.5																						
28-Dec	-32.5	-32.4	-32.7	-33.4	-34.2	-34.6	-34.4	-34.7	-36.1	-35.8	-34.4	-31.5	-29.4	-29.0	-28.7	-29.1	-30.4	-32.1	-34.2	-35.1	-36.4	-36.9	-37.6	-37.7	-33.5	-28.7																						
29-Dec	-38.0	-38.0	-38.3	-39.0	-39.6	-39.7	-39.8	-39.8	-39.1	-38.9	-37.8	-36.0	-33.7	-31.5	-29.8	-29.6	-31.3	-32.3	-33.4	-33.8	-33.7	-30.8	-30.4	-28.9	-35.1	-28.9																						
30-Dec	-28.4	-27.9	-27.6	-27.5	-27.5	-29.0	-29.8	-30.5	-30.8	-31.1	-30.1	-28.7	-28.2	-26.1	-24.8	-24.5	-26.0	-27.2	-27.1	-27.7	-28.3	-29.3	-30.8	-31.3	-28.3	-24.5																						
31-Dec	-31.7	-32.4	-32.5	-33.3	-33.5	-33.1	-33.9	-33.9	-34.5	-34.6	-32.7	-32.0	-29.9	-27.6	-26.7	-26.4	-27.0	-29.4	-30.1	-31.0	-31.7	-31.6	-32.4	-32.4	-31.4	-26.4																						
																								-14.6	-14.9	-15.3	-15.9	-16.3	-16.6	-16.7	-16.7	-16.8	-16.7	-15.8	-14.7	-13.4	-12.5	-11.9	-11.8	-12.4	-12.9	-13.5	-13.9	-14.1	-14.5	-14.8	-15.2	Diurnal Average
																								1.3	1.2	0.4	0.2	0.3	-1.1	2.6	2.7	3.1	4.1	4.6	5.5	5.4	6.2	5.5	5.6	5.5	6.0	5.3	4.2	2.5	2.5	2.5	2.2	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Athabasca Valley - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Athabasca Valley - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	270	36.29	36.29
-20 - 0	399	53.63	89.92
0 - 10	75	10.08	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

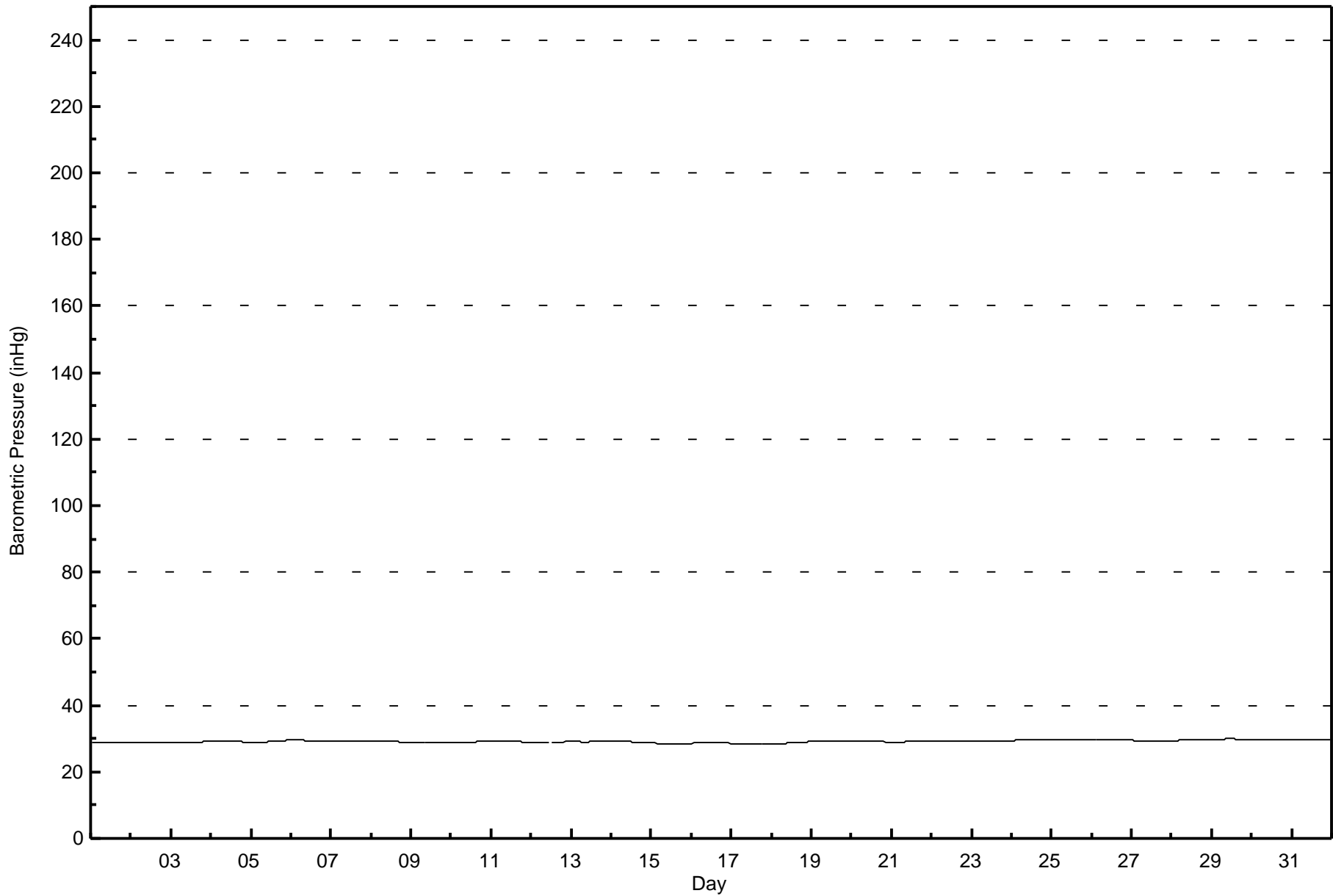
Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Barometric Pressure (BP) - inHg**  
**Athabasca Valley - December 2017**





**Wood Buffalo Environmental Association**

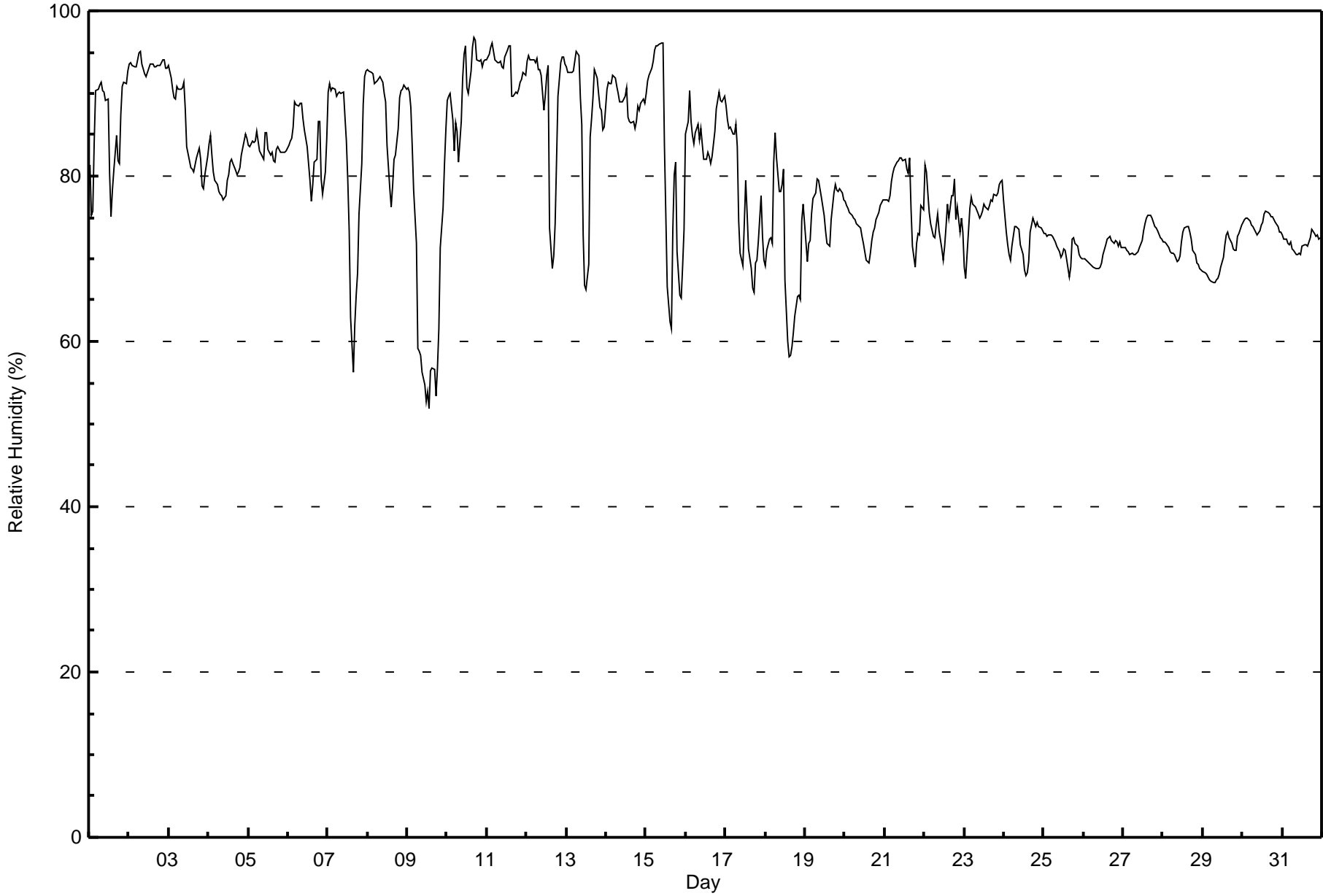
**Summary of Hour Averages**

**Relative Humidity (RH) - %**

**Athabasca Valley - December 2017**

Maximum Value: 97 % on Dec 10 17:00																			Maximum Daily Average: 93.4 % on Dec 2						Hours in Service: 744																				
Minimum Value: 52 % on Dec 9 14:00																			Minimum Daily Average: 66.8 % on Dec 9						Hours of Data: 744																				
Maximum Diurnal Average: 82.0 % at hour 1																			Minimum Diurnal Average: 75.5 % at hour 16						Hours of Missing Data: 0																				
Monthly Average: 79.6 %																			Percentiles: P <sub>1</sub> = 56 P <sub>10</sub> = 69 Q <sub>1</sub> = 72 Median = 78 O <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 96						Hours of Calibration: 0																				
																									Percent Operational Time: 100.0																				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																					
1-Dec	81	75	76	84	90	91	91	91	90	90	89	89	80	75	78	81	85	82	82	87	91	91	91	93	85.6	93																			
2-Dec	94	94	93	93	93	94	95	95	94	92	92	93	93	94	94	93	93	93	93	93	94	94	93	93	93.4	95																			
3-Dec	93	92	90	89	89	91	91	91	91	91	88	84	82	81	81	81	82	83	82	79	78	80	82	85.5	93																				
4-Dec	84	85	83	80	80	79	78	78	78	77	78	80	82	82	81	81	80	81	81	83	84	85	85	80.9	85																				
5-Dec	84	84	84	84	84	85	84	83	82	82	85	85	83	83	83	82	82	83	84	83	83	83	83	83.4	85																				
6-Dec	84	84	85	86	89	89	88	89	89	87	86	84	82	79	77	79	82	82	87	87	80	78	80	85	83.9	89																			
7-Dec	90	91	90	91	90	90	90	90	90	90	87	84	79	73	63	56	62	66	68	75	82	89	92	93	82.2	93																			
8-Dec	93	93	93	92	91	91	92	92	92	91	90	89	84	78	76	79	82	82	86	89	90	91	91	91	88.2	93																			
9-Dec	91	90	88	83	78	72	59	59	58	56	55	53	54	52	56	57	57	53	57	62	71	76	81	86	66.8	91																			
10-Dec	89	90	90	87	83	86	85	82	87	92	95	96	91	90	93	96	97	96	94	94	94	93	94	94	91.1	97																			
11-Dec	94	95	96	96	95	94	94	94	94	93	93	94	95	96	96	90	90	90	90	90	91	92	92	92	93.2	96																			
12-Dec	94	95	94	94	94	94	94	93	93	92	88	90	92	93	74	69	70	74	82	90	94	94	94	94	89.0	95																			
13-Dec	93	93	92	93	93	94	95	95	89	86	73	67	66	69	85	87	89	93	92	90	88	88	86	86	86.8	95																			
14-Dec	91	91	91	91	92	92	91	90	89	89	89	90	91	87	87	86	87	86	87	88	88	89	89	89	89.1	92																			
15-Dec	90	91	92	93	94	95	96	96	96	96	96	84	75	67	62	62	74	80	82	71	66	65	69	74	81.9	96																			
16-Dec	85	87	90	87	85	84	85	86	84	86	84	82	82	83	82	82	82	85	88	89	90	89	89	90	85.7	90																			
17-Dec	89	87	86	86	85	85	86	84	75	71	69	74	79	76	71	69	66	66	69	70	72	78	73	70	76.4	89																			
18-Dec	69	71	72	73	72	82	85	82	78	78	79	81	67	60	58	58	59	61	63	66	66	65	75	77	70.7	85																			
19-Dec	72	70	72	72	75	77	78	80	79	79	78	75	73	72	72	71	75	78	79	78	78	78	77	77	75.7	80																			
20-Dec	77	76	76	76	75	75	75	74	74	74	73	72	71	70	70	71	72	73	74	75	76	76	77	77	74.1	77																			
21-Dec	77	77	77	78	79	80	81	82	82	82	82	82	82	81	80	82	76	71	69	72	73	73	76	76	78.0	82																			
22-Dec	81	81	78	76	74	73	72	74	75	73	71	70	72	74	77	75	78	78	80	75	76	73	75	73	75.1	81																			
23-Dec	69	68	71	76	77	77	76	76	75	75	75	76	77	76	76	76	77	77	78	78	78	79	79	79	75.9	79																			
24-Dec	77	73	72	71	70	72	74	74	74	74	72	70	69	68	68	70	73	75	74	74	74	74	73	73	72.4	77																			
25-Dec	73	73	73	73	73	73	72	72	72	71	70	71	71	71	70	68	69	72	73	72	72	70	70	70	71.4	73																			
26-Dec	70	70	70	69	69	69	69	69	69	69	69	69	71	72	72	73	73	72	72	72	72	72	71	71	70.6	73																			
27-Dec	71	71	71	71	71	71	70	71	71	71	71	72	73	74	75	75	75	75	74	74	74	73	73	72	72.5	75																			
28-Dec	72	72	72	71	71	71	71	71	70	70	70	72	73	74	74	74	73	72	71	70	70	69	69	69	71.3	74																			
29-Dec	68	68	68	68	67	67	67	67	67	68	68	68	69	70	72	73	73	72	72	71	71	71	73	73	74	70.0	74																		
30-Dec	74	75	75	75	75	74	74	74	74	73	73	73	74	74	75	76	76	75	75	75	74	74	73	73	74.4	76																			
31-Dec	73	72	72	72	72	72	71	71	71	70	71	70	71	72	72	71	72	73	73	73	73	73	72	73	71.9	73																			
																			82.0	81.7	81.7	81.6	81.5	81.8	81.7	81.3	80.7	80.3	79.3	78.7	77.5	76.4	75.9	75.5	76.8	77.4	78.4	78.9	79.4	79.8	80.6	81.0	Diurnal Average		
																			94	95	96	96	95	95	96	96	96	96	96	96	95	96	96	96	96	97	96	94	94	94	94	94	94	Diurnal Maximum	







Maximum Speed: 27 km/h on Dec 17 17:00	Maximum Daily Speed Average: 14.9 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 25 22:00	Minimum Daily Speed Average: 0.5 km/h on Dec 2	Hours of Data: 708
Maximum Diurnal Speed Average: 3.9 km/h at hour 20	Minimum Diurnal Speed Average: 0.8 km/h at hour 6	Hours of Missing Data: 36
Monthly Average Velocity: 1.7 km/h 221.6 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 6 Q <sub>3</sub> = 10 P <sub>90</sub> = 15 P <sub>99</sub> = 24	Percent Operational Time: 95.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SW9	WSW15	SW4	SSE3	SE3	SE3	SE8	SE9	SSE4	SSE2	SSW2	S1	SSE3	SE5	SE6	SE4	SE4	SE9	SE7	SE10	SE9	SE6	SE6	SE5	SSE4.6	WSW15	
2-Dec	ESE4	ESE3	NNW1	WNW2	NNW2	NW2	NNW2	W3	NW3	NNW2	AF	NNE1	NNW1	NW1	NW1	N2	AF	AF	AF	SE2	E4	SE5	ESE4	SE3	ENE0.5	SE5	
3-Dec	SSE4	S1	SSW1	AF	SSE2	SE7	SSE5	E1	NE1	NNW12	N13	N12	NNW11	NNW12	NNW9	N7	NNW9	NNW8	NNW8	NNW10	NNW9	N6	NW4	NNW3	NNW4.9	N13	
4-Dec	WNW3	W3	W5	W4	SSW2	WSW1	NE1	NNE0	S1	ENE1	S1	SSE5	SSW3	SSE5	SE8	SE8	SE11	SE10	SE10	SE13	SE13	SE14	SE15	SE11	SSE4.9	SE15	
5-Dec	SE9	SSE8	SSE7	SSE7	SSE5	SE4	SE7	SE12	SE9	ENE4	N10	NNW10	NNW14	NNW14	N10	N10	NNW10	NNW11	NNW12	NNW11	N8	N5	NNW3	N2	N3.1	NNW14	
6-Dec	ESE4	SE7	SE8	SSE6	SSW5	SW7	SW6	SSE6	SE10	SE14	SE10	SE11	SE13	SE13	SE10	SE8	SE8	SE5	ESE5	SW5	WSW7	SW8	SW6	SE4	SSE6.2	SE14	
7-Dec	SSE4	S3	SSE3	SE6	SE6	ESE7	SE8	SE7	SE6	SE8	SE7	NE3	NE2	SSE4	SSW2	WSW5	SW5	SW8	SW9	SW7	SSW3	S1	NNE1	ENE1	SSE3.4	SW9	
8-Dec	ESE1	SSE2	SSE2	SSE3	SSE6	S3	SSW3	S3	S2	SSE3	SSE3	S3	SSE4	SSE4	SSE8	SSE6	SSE8	SSE9	SE6	SSE6	SSE5	SSE3	SE5	S3	SSE4.1	SSE9	
9-Dec	S4	S3	SSE5	SSE7	SSE5	S8	SSW10	SSE6	SW8	SSW8	SW12	SW9	W3	WSW7	SW8	WSW6	SW6	WSW15	WSW12	SSW6	SSE3	SSE4	NE1	SSE3	SSW5.5	WSW15	
10-Dec	SE5	SSE4	SSE3	SSW6	SSW4	SSW4	S4	SE4	SE5	SE3	ENE2	WSW5	NW17	NW21	NW13	NNW10	AF	AF	AF	AF	AF	AF	AF	AF	----	NW21	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SSW2	SE6	SE11	SE13	SE13	SE10	SE10	SE9	SSE11	SSE5	S3	----	SE13
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SE6	SSE2	NNW2	NW6	NW7	NNW11	NW14	NW6	WSW4	SSW2	SSW2	S1	S0	SW1	----	NW14
13-Dec	SSW1	SSW2	S2	S1	SSE3	S3	SSE3	SE4	SE6	SW7	NW3	NW18	NNW27	NW20	NNW12	NNW9	WSW4	SW3	SW9	SW8	SW5	SW6	SW8	WSW3	W3.7	WNW27	
14-Dec	W5	SSW3	SSW4	SSW4	SSW5	SW9	SW8	SW6	SW4	SSW4	SSW3	SW5	SSE5	SE11	SE10	SE10	SE10	SE7	SE6	SSE3	S5	SW4	SSW5	SSE7	S4.7	SE11	
15-Dec	SSE5	SSE5	SE10	SE10	SE11	SE9	SW8	SE7	SE5	SE5	SSE1	W11	W15	W17	W11	WSW6	SSW2	S3	SW8	WSW12	WSW13	W15	W18	W21	SW5.2	W21	
16-Dec	W18	W18	NNW23	NNW20	N15	N14	NNW14	NNW9	NNW8	N7	NNE2	NNE2	SE4	SSE5	SE6	SSE6	SE6	SE5	SSE6	SSE5	SSE9	SSE7	S7	SSE11	NW1.9	NW23	
17-Dec	SE13	SSE14	SSE7	SSE6	SSE6	SE6	ESE3	SW6	WSW6	WSW10	WSW13	W19	W19	W19	W22	W24	W27	W26	NNW22	NNW15	W2	WSW6	W13	W17	WSW9.9	W27	
18-Dec	WNW13	W13	WSW13	WSW14	W15	NNW21	NNW20	NNW20	NNW18	NNW12	NNW9	NNW6	NW24	NW24	NW23	NW21	NW19	NW16	NNW17	W24	W26	NNW19	N11	N10	NW14.9	W26	
19-Dec	N10	N10	N7	NNW10	NNW9	NNW6	NNW4	SW4	SW6	SSW4	SE1	SW1	SW3	SW3	SW2	SSE7	SSE4	WSW2	SW3	S5	SSW4	SSE7	SSE9	SSE11	SW0.6	SSE11	
20-Dec	SSE8	SE9	SE10	SE10	SE11	SE11	SE9	SE11	SE11	SE10	SE10	SE11	SE12	SE12	SE12	SE12	ESE7	SE8	SE9	SE8	SE8	SE7	SE8	SE9	SE8	SE9.4	SE12
21-Dec	SE7	SE7	SE5	ENE4	E4	ENE1	NW3	NNW4	NNW4	WNW4	ESE1	W2	WNW2	ESE1	SW2	E1	WSW12	W15	W18	W21	W18	NNW21	NW16	NNW12	W4.9	WNW21	
22-Dec	WNW4	NW4	W7	WNW8	W14	NNW17	W21	WSW14	WSW13	WSW16	W11	NNW20	W21	W21	W19	W20	W20	W19	W17	W21	NNW18	N20	N17	NNW17	WNW13.8	W21	
23-Dec	NNW16	NNW10	NNW6	NW4	WSW3	WSW4	W4	ENE1	E5	E7	E6	ENE5	NE2	NNW5	NW3	NNW4	SE1	SW3	SW4	S5	SE3	E3	NE3	NNW8	N1.7	NNW16	
24-Dec	NNW17	N17	N19	N17	NNW15	NNW11	NW6	W6	W4	WSW6	SW7	SW5	WSW4	NNW3	NW4	W3	WSW5	SW2	SW3	SW2	SSW1	ENE1	NNW1	WSW4	NW4.7	N19	
25-Dec	WSW5	WSW4	W5	NW5	NNW6	NNW5	WNW6	W5	SW5	WSW5	SSW2	WSW4	SSW1	SW3	S1	SSW4	SW2	SSW2	SE0	W1	SW1	ESE0	ESE1	SSE3	WSW2.1	NW6	
26-Dec	SE5	SSE9	SE10	SE9	SE9	SE9	SE11	SE11	SSE10	SE8	SE12	SE12	SE11	SE8	SE8	SE8	SSE7	SE7	SE5	SSE7	SSE7	SSE7	SSE6	ESE4	SE8.3	SE12	
27-Dec	SE5	SE7	SE5	SE6	SSE5	SSE7	SE9	SE8	SE10	SE9	SE9	SE8	SE7	E7	E6	SE6	SE8	SE9	SE10	SE7	SE8	SE9	SSE5	SSE6	SE7.1	SE10	
28-Dec	SE4	SSE5	ENE1	E3	NNW2	NNW3	W3	NW3	W4	W3	W3	WNW4	NNW7	NNW6	NNW5	NNW5	WNW2	WSW3	WSW5	W4	W4	SW4	SW4	SW3	WNW2.0	NNW7	
29-Dec	WSW5	W6	W4	WNW4	W5	W1	NNE1	NNE1	S2	ENE2	E1	SW2	SW3	S1	ESE2	SE4	SE2	SW1	SSW1	SW1	SE2	SSE5	SSE2	SSE5	SSW1.2	W6	
30-Dec	SE4	S5	SSW4	S4	S5	SSE4	SE7	SE8	SE8	SE8	SE6	SE6	ESE4	SE5	SE4	SSE5	S3	SSE2	S3	SW6	SW5	SW6	SW3	SW3	SSE4.0	SE8	
31-Dec	SW2	SSW2	SSW2	SSW3	SSW3	SSE2	SSW4	SW3	SW4	NW1	SSE5	SSW2	SSW2	SSE5	SE8	SE9	SE8	SSE5	S5	SW5	SSW4	SSW6	SSW6	S5	S3.6	SE9	

SSW1.5SSW2.1SSW1.2SSW0.9SSW1.4SSW0.8SSW1.3	S1.8	S2.2	S1.8	S1.5	WSW2.0	W3.1	NNW2.5	W1.4	WSW1.2	SW2.3	SW2.6	SW3.4	SW3.9	SW2.6	SSW2.0	SW1.4	SSW1.5							Diurnal Average						
W18	W18	NNW23	NNW20	W15	NNW21	W21	NNW20	NNW18	WSW16	WSW13	NNW20	NNW27	NW24	NW23	W24	W27	W26	NNW22	W24	W26	NNW21	W18	W21							Diurnal Maximum

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



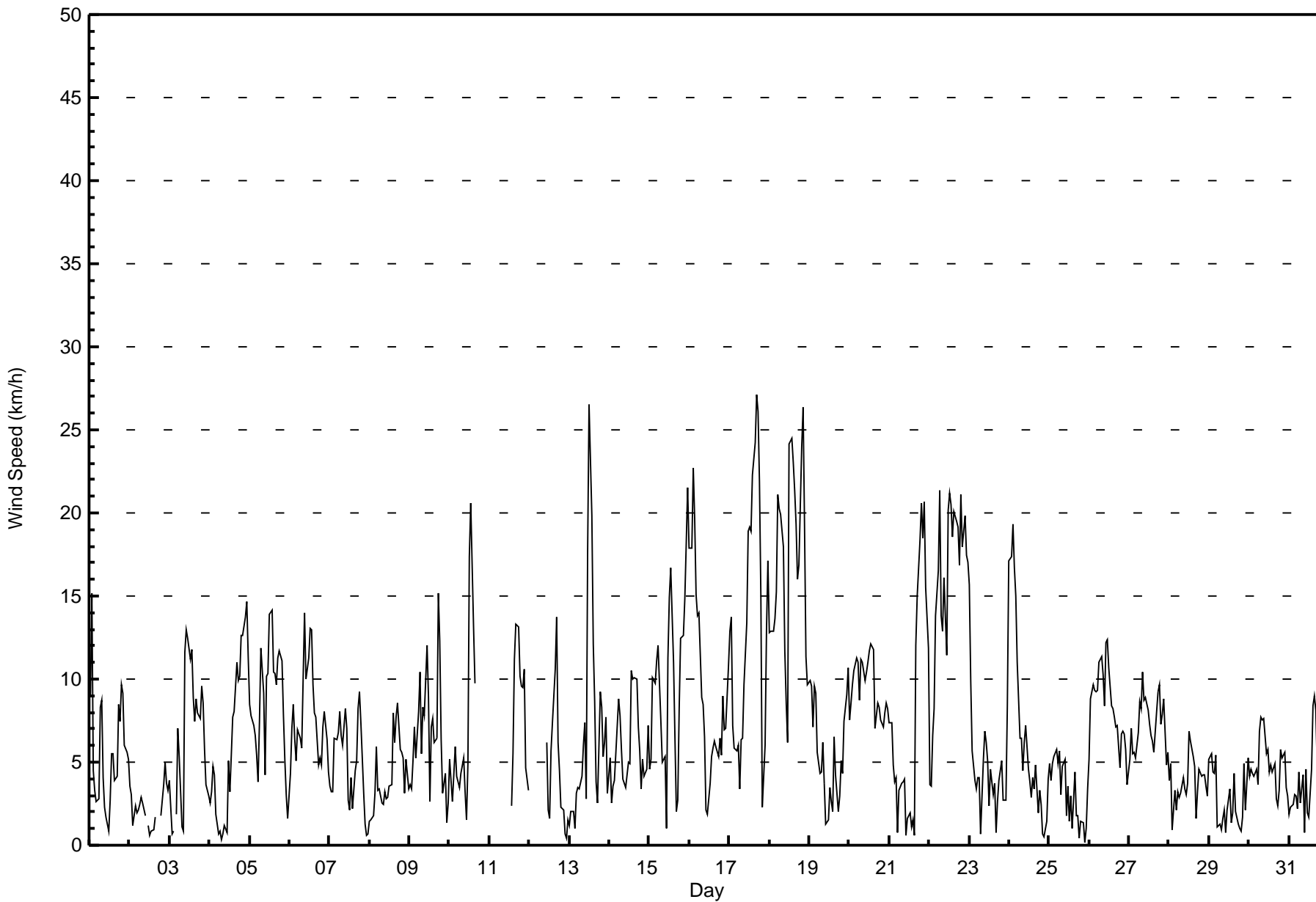
**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Athabasca Valley - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 9 km/h on Dec 18 13:00	Hours of Data: 708
Minimum Value: 0 km/h on Dec 24 14:00	Hours of Missing Data: 36
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 3 P <sub>99</sub> = 5	Hours of Calibration: 0
	Percent Operational Time: 95.2

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

AF - Analyzer Failure





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Athabasca Valley - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	341	48.16	48.16
6 - 11	251	35.45	83.62
12 - 19	86	12.15	95.76
20 - 28	30	4.24	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Athabasca Valley - December 2017**

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	8	5	12	8	15	37	55	34	40	40	18	23	10	16	17	341
6 - 11	11	0	0	0	3	3	111	40	2	6	24	10	6	2	5	28	251
12 - 19	8	0	0	0	0	0	17	1	0	0	1	12	20	6	8	13	86
20 - 28	1	0	0	0	0	0	0	0	0	0	0	0	14	4	7	4	30
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	23	8	5	12	11	18	165	96	36	46	65	40	63	22	36	62	708

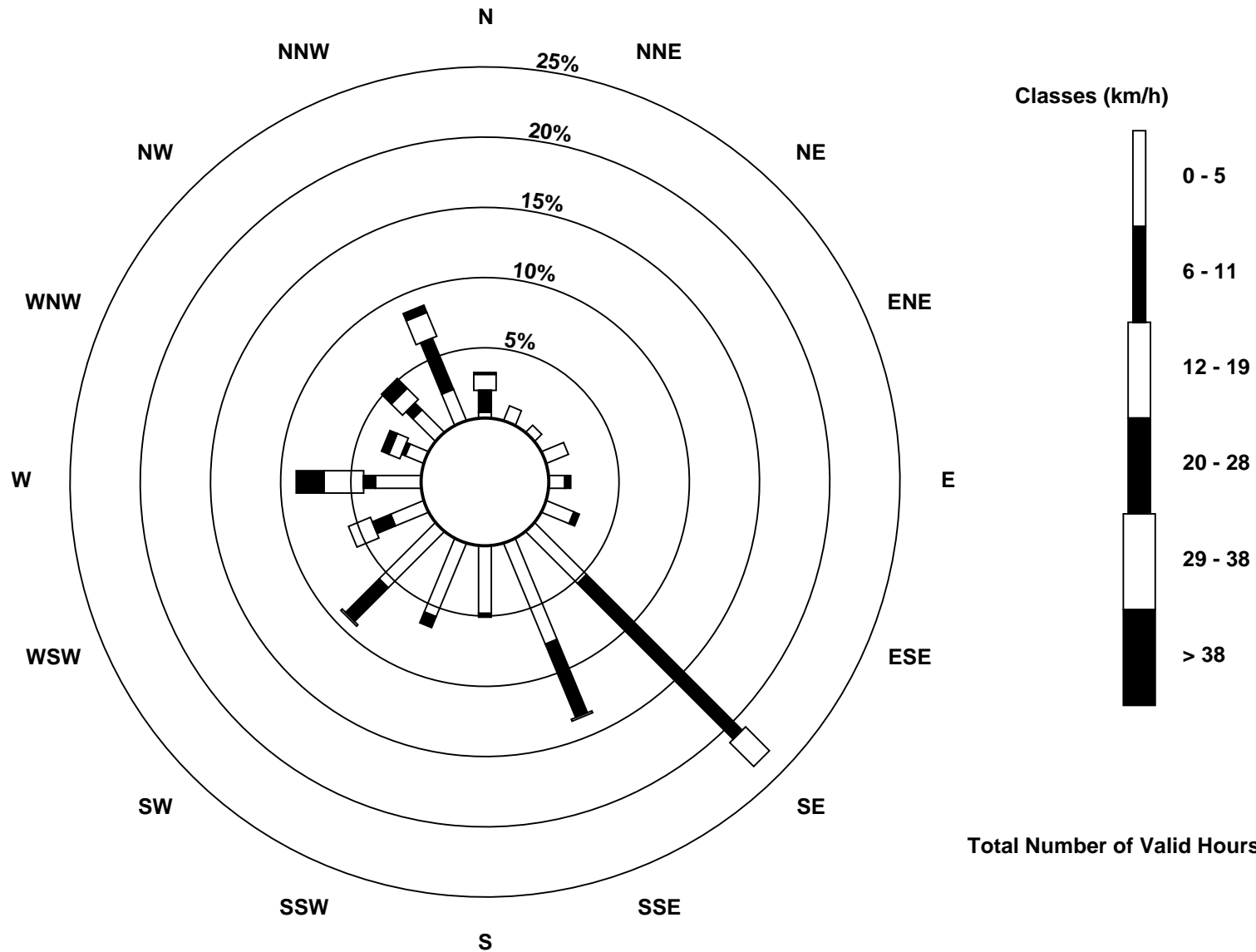
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Athabasca Valley (AMS 7)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Athabasca Valley - December 2017**

Direction of Maximum Speed: 270 deg on Dec 17 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 309.0 deg on Dec 18	Hours of Data: 708
Direction of Minimum Speed: 102 deg on Dec 25 22:00	Hours of Missing Data: 36
Direction of Minimum Daily Speed Average: 0.5 deg on Dec 2	Percent Operational Time: 95.2
Monthly Average Direction: 237.3 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-Dec	223	240	220	154	141	133	136	136	150	152	202	183	147	137	133	137	141	138	144	136	138	142	130	144	155.2	
2-Dec	123	121	339	297	338	314	347	262	310	341	AF	27	341	320	311	359	AF	AF	AF	144	96	129	112	125	66.9	
3-Dec	150	174	194	AF	165	143	161	100	34	337	349	351	347	341	343	350	341	345	345	335	342	349	326	337	345.9	
4-Dec	284	274	267	260	199	240	50	31	169	73	185	151	196	147	144	133	139	135	139	145	140	139	140	142	147.7	
5-Dec	139	150	160	154	166	139	141	129	124	78	349	342	341	341	352	356	347	337	340	342	351	1	345	350	8.7	
6-Dec	121	145	142	159	198	219	215	158	144	136	135	139	140	142	135	130	128	124	116	235	246	234	229	130	154.8	
7-Dec	159	179	150	124	130	122	134	140	137	146	129	46	56	147	208	243	220	216	219	219	194	173	24	57	161.9	
8-Dec	117	157	166	164	149	173	202	185	183	159	162	172	156	156	148	156	153	151	146	166	168	148	140	172	158.4	
9-Dec	184	170	156	156	157	190	203	162	223	207	215	223	266	247	236	239	229	256	242	212	154	155	48	156	211.0	
10-Dec	142	150	160	212	205	197	190	139	138	124	78	254	310	321	324	338	AF	AF	AF	AF	AF	AF	AF	AF	--	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	211	145	140	138	135	132	137	140	147	154	171	--	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	145	163	333	307	316	330	320	314	247	209	199	173	173	230	--
13-Dec	202	192	170	171	159	171	155	131	141	218	305	306	297	326	346	333	249	222	236	224	224	224	223	253	271.2	
14-Dec	260	208	192	207	209	223	223	218	214	206	195	230	159	142	144	143	144	143	138	153	185	221	204	149	180.4	
15-Dec	151	149	144	145	139	136	139	155	137	125	155	262	281	279	270	246	193	177	236	239	253	273	270	267	228.9	
16-Dec	259	261	326	346	349	351	345	330	340	353	15	32	146	153	139	147	143	139	163	156	150	166	174	150	313.5	
17-Dec	144	147	157	155	154	133	108	226	244	242	256	265	261	266	269	270	270	279	284	291	263	249	269	275	257.3	
18-Dec	285	267	258	252	261	340	343	340	340	335	342	338	308	313	320	318	309	313	299	277	278	297	0	352	309.0	
19-Dec	7	3	2	346	341	334	347	235	220	204	126	214	228	217	221	149	162	254	236	189	199	147	147	153	225.1	
20-Dec	147	141	139	142	145	136	132	133	136	140	141	140	136	136	136	119	130	134	137	134	139	136	134	142	137.1	
21-Dec	138	145	129	78	82	76	325	333	327	285	119	269	291	105	220	94	255	263	274	271	278	295	306	294	279.0	
22-Dec	282	313	273	286	278	285	279	258	247	257	265	285	277	280	276	275	281	278	273	275	318	354	356	348	286.5	
23-Dec	339	331	343	323	253	245	266	59	90	92	96	70	47	335	308	346	124	234	224	191	136	83	55	342	350.8	
24-Dec	335	356	351	351	348	344	319	280	266	237	232	225	248	302	325	262	242	214	230	229	211	65	300	254	317.6	
25-Dec	246	242	260	322	324	312	286	311	277	226	212	239	202	215	178	202	214	213	124	259	219	102	109	159	256.1	
26-Dec	145	147	145	133	140	135	135	133	147	129	139	139	137	137	145	145	147	135	143	153	150	154	149	121	140.7	
27-Dec	145	137	144	139	149	148	143	139	139	135	133	136	126	101	89	124	127	131	132	126	134	142	153	153	134.3	
28-Dec	143	154	73	80	338	348	279	305	268	265	260	295	345	331	329	327	291	240	242	274	266	232	230	236	284.4	
29-Dec	255	267	270	283	259	278	22	22	171	68	99	229	216	188	107	143	135	236	205	218	134	156	151	150	210.1	
30-Dec	143	174	195	188	186	149	135	140	139	137	126	130	121	141	145	150	177	164	189	220	218	223	232	218	163.0	
31-Dec	221	211	204	199	198	164	212	232	219	311	163	194	206	148	133	136	142	162	187	218	197	198	204	177	180.1	

207.9 199.9 206.7 192.8 202.3 194.1 200.3 172.3 177.4 181.2 176.7 251.5 281.2 285.3 270.2 244.2 220.8 227.2 231.0 231.2 220.3 211.9 215.0 209.9  
 Diurnal Average

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





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

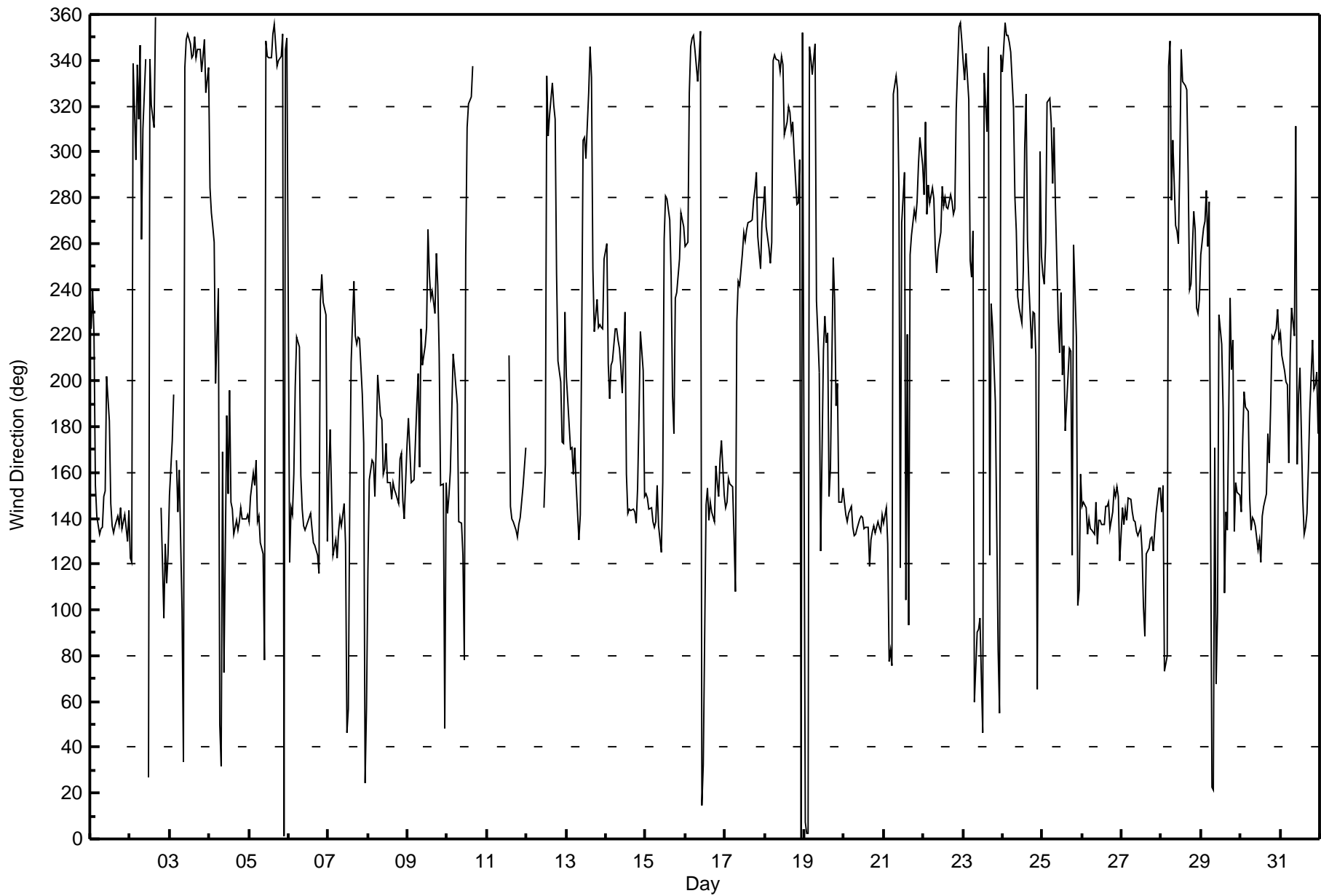
**Wind Direction (WD) - deg**  
**Athabasca Valley - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 104 deg on Dec 24 22:00	Hours of Data: 708
Minimum Value: 8 deg on Dec 18 21:00	Hours of Missing Data: 36
Percentiles: P <sub>1</sub> = 9 P <sub>10</sub> = 12 Q <sub>1</sub> = 15 Median = 24 Q <sub>3</sub> = 46 P <sub>90</sub> = 74 P <sub>99</sub> = 97	Hours of Calibration: 0
	Percent Operational Time: 95.2

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	60	10	73	42	55	76	15	13	37	60	77	97	38	19	18	37	30	14	25	12	16	30	23	25	97
2-Dec	36	50	78	30	55	44	33	38	42	55	AF	37	20	36	33	27	AF	AF	AF	73	33	20	22	37	78
3-Dec	28	78	85	AF	78	28	34	75	92	21	16	18	15	12	14	17	13	14	13	10	14	18	22	38	92
4-Dec	40	24	15	34	72	99	84	83	83	84	101	60	62	51	25	24	16	18	17	13	13	13	12	17	101
5-Dec	20	25	34	26	38	65	25	16	15	48	26	14	10	12	17	18	17	9	9	12	18	28	24	69	69
6-Dec	24	18	13	22	33	15	17	34	16	12	19	14	10	12	13	20	26	37	32	61	28	21	30	45	61
7-Dec	64	57	76	27	43	20	18	18	15	10	27	51	68	46	88	56	49	15	9	19	43	74	99	85	99
8-Dec	77	68	81	54	45	51	59	56	43	53	59	47	39	36	15	30	19	18	33	34	26	55	35	47	81
9-Dec	48	54	34	28	42	32	28	54	28	33	12	17	70	30	18	58	36	11	10	44	42	52	93	65	93
10-Dec	37	32	59	45	47	34	38	41	38	58	89	41	18	16	8	14	AF	AF	AF	AF	AF	AF	AF	AF	89
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	21	32	11	13	12	16	15	18	23	41	52	52
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	24	73	73	26	39	23	23	22	16	56	73	86	98	82	98
13-Dec	74	68	59	79	52	48	58	49	52	52	87	13	10	23	18	16	39	48	10	34	43	28	32	76	87
14-Dec	16	70	54	29	45	15	13	15	17	43	73	23	74	17	16	17	18	24	27	54	33	24	31	26	74
15-Dec	42	38	14	17	12	13	13	16	26	17	85	13	11	9	12	24	80	61	14	10	14	15	12	10	85
16-Dec	10	10	26	15	18	18	15	13	12	16	47	70	79	26	28	21	22	31	29	54	26	40	35	16	79
17-Dec	13	15	21	26	20	20	45	56	36	14	13	11	11	13	11	11	10	10	10	18	64	32	24	10	64
18-Dec	12	11	10	10	14	22	13	12	11	13	20	21	16	11	13	11	10	11	13	8	8	35	18	17	35
19-Dec	20	17	18	15	11	15	32	42	30	58	81	96	19	43	48	22	51	66	59	37	33	22	14	14	96
20-Dec	19	18	17	14	16	15	16	13	14	17	14	15	14	15	15	22	21	18	23	28	27	19	17	17	28
21-Dec	19	17	29	14	17	77	14	15	14	23	87	43	76	78	73	94	11	15	12	10	14	12	9	20	94
22-Dec	33	37	30	23	16	18	8	13	11	12	25	13	9	10	9	8	11	8	10	9	26	19	19	17	37
23-Dec	11	10	20	32	46	21	25	70	14	18	29	13	44	35	23	44	82	64	53	31	66	63	43	15	82
24-Dec	11	19	18	17	16	13	18	21	25	27	49	52	22	27	12	26	11	94	53	80	100	104	57	25	104
25-Dec	17	66	13	28	11	17	15	41	17	15	74	35	86	56	96	21	81	51	89	72	100	95	82	72	100
26-Dec	55	18	18	15	26	20	14	14	23	16	10	11	13	16	14	17	18	18	22	16	19	33	32	41	55
27-Dec	25	17	34	27	32	20	15	19	11	14	14	13	16	20	21	20	14	12	15	20	22	16	26	25	34
28-Dec	41	26	88	49	54	30	24	20	18	40	51	36	13	20	24	9	67	41	18	11	19	23	28	74	88
29-Dec	18	16	15	14	9	92	65	83	71	56	81	69	33	74	78	21	70	75	96	96	81	36	63	17	96
30-Dec	24	20	33	53	31	32	14	15	18	14	22	24	28	20	24	26	56	73	63	16	12	16	46	57	73
31-Dec	82	61	75	60	48	73	28	63	24	87	50	76	85	35	17	19	27	32	39	18	33	25	22	53	87
	82	78	88	79	78	99	84	83	92	87	101	97	86	78	96	94	82	94	96	96	100	104	99	85	

Diurnal Maximum

AF - Analyzer Failure





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Athabasca Valley	Station number:	AMS 07
Calibration Date:	December 5, 2017	Last Cal Date:	November 1, 2017
Start time (MST):	8:10	End time (MST):	12:38
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>49.3</u>	ppm	Cal Gas Exp Date	8/18/2020
Calibrator Make/Model	Teledyne API 700		Serial Number	2445
ZAG Make/Model	Teledyne API 701		Serial Number	1864

### Analyzer Information

Analyzer make: Thermo 45C

Analyzer serial #: 630718530

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-619
Calculated slope	0.998018	0.996691	Lamp voltage	801	801
Calculated intercept	2.498617	1.648608	Pressure	694.2	694.2
Analyzer Background	18.8	19.1	Flow	0.479	0.479
Analyzer Coefficient	1.010	1.027	Intensity	43631	43631

### SO<sub>2</sub> Calibration Data

Set Point	Total air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	0.2	----
as found span	4978	78.8	768.2	755.0	1.018
calibrator zero	5000	0.0	0.0	0.4	----
high point	4978	78.8	768.2	770.6	0.997
second point	4973	39.5	388.5	385.8	1.007
third point	4994	19.8	194.7	192.5	1.011
as left zero	5000	0.0	0.0	0.3	----
as left span	4978	78.8	768.2	768.0	1.000
Average Correction Factor					1.005

Corrected As found	754.80	Previous response	767.27	*% change	1.7%
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\* = > +/-5% change initiates investigation

Notes:

No maintenance done; Span adjusted

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

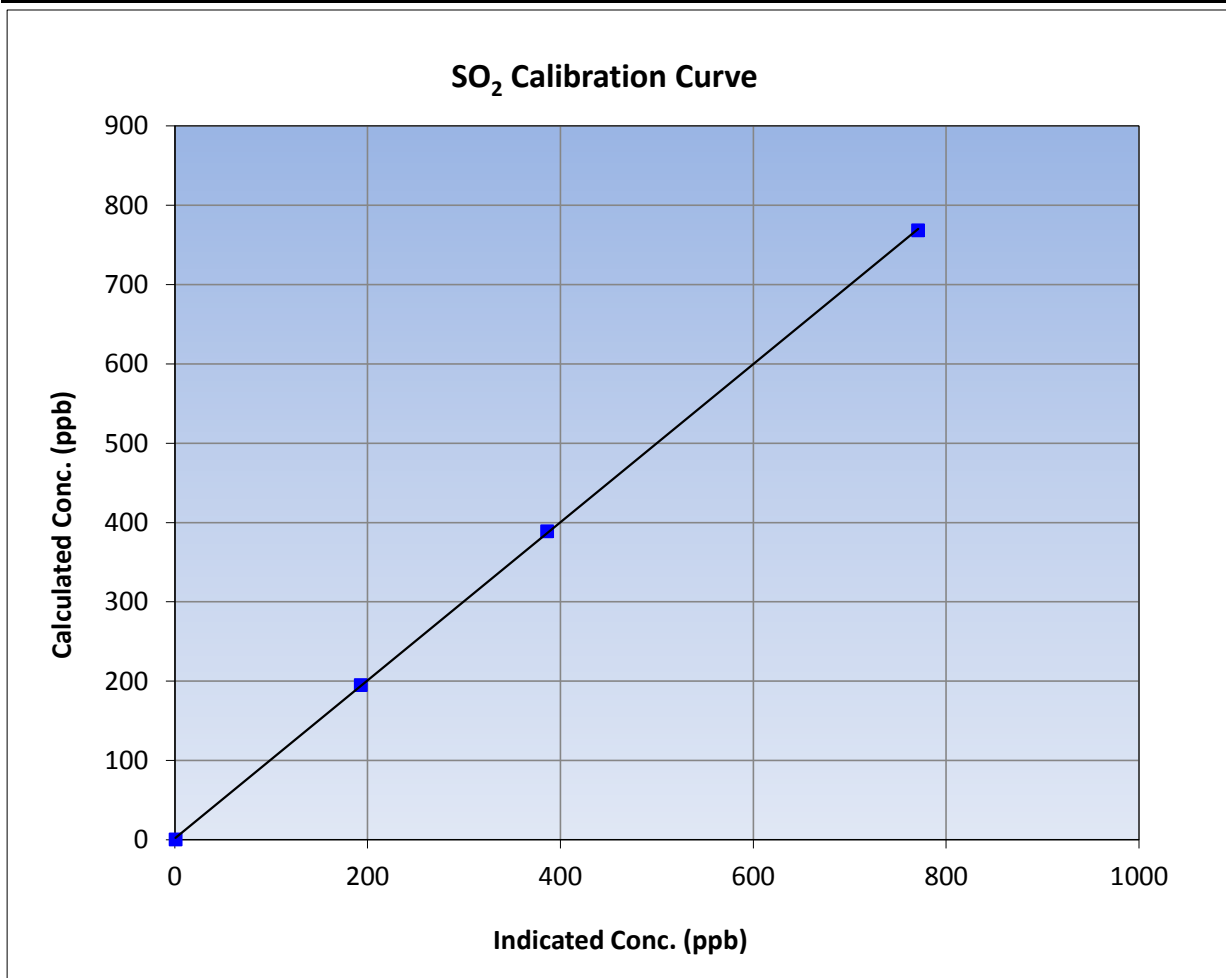
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	13:09
Analyzer make	Thermo 45C	Analyzer serial #	630718530

### Calibration Data

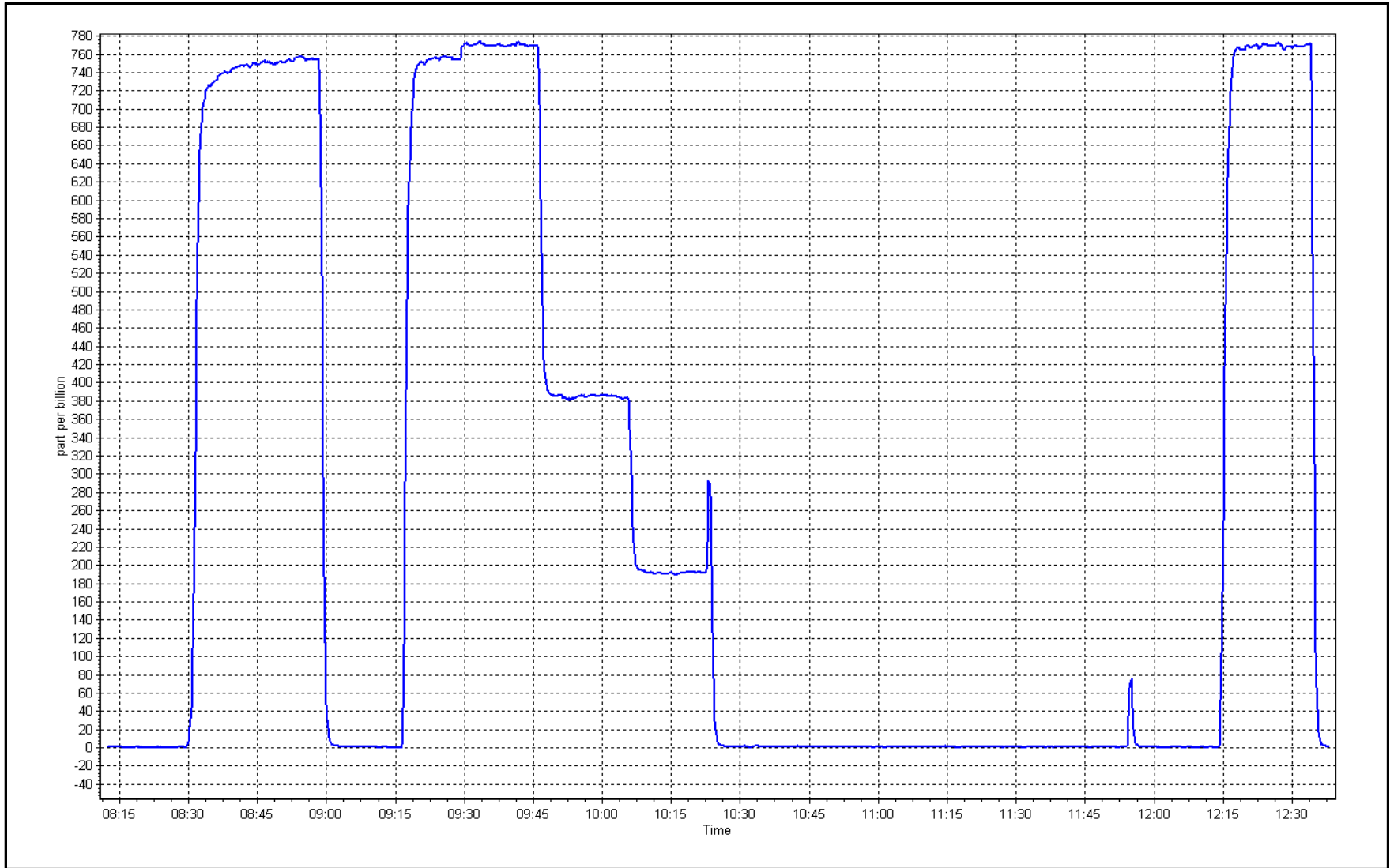
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.4	----	Correlation Coefficient	≥0.995
768.2	770.6	0.9969		
388.5	385.8	1.0070	Slope	0.90 - 1.10
194.7	192.5	1.0114		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 5, 2017

Location: Athabasca Valley





# Wood Buffalo Environmental Association

## TRS Calibration Report

Version-11-2017

### Station Information

Station Name:	Athabasca Valley	Station number:	AMS 07
Calibration Date:	December 12, 2017	Last Cal Date:	November 9, 2017
Start time (MST):	8:00	End time (MST):	11:45
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>10.02</u>	ppm	Cal Gas Exp Date	March 18, 2017
Cal Gas Cylinder #	<u>5603861</u>			
Calibrator Make/Model	API T700		Serial Number	2445
ZAG Make/Model	API T701H		Serial Number	1864

### Analyzer Information

Analyzer make:	Thermo 43i LTE	Analyzer serial #:	1507864683
Converter Make:	CDN-101	Converter serial #:	460

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-699.3	-699.3
Calculated slope	0.993286	1.001540	Lamp voltage	1145	1145
Calculated intercept	0.156073	0.074922	Pressure	697.7	696.8
Analyzer Background	2.5	2.7	Flow	0.426	0.418
Analyzer Coefficient	0.927	0.965	Intensity	72	72
			Converter temp	800	800

### TRS Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5011	0.0	0.0	-0.1	----
as found span	4976	40.0	79.9	77.0	1.038
calibrator zero	5011	0.0	0.0	0.0	----
high point	4976	40.0	79.9	79.8	1.001
second point	4997	20.1	40.1	39.8	1.009
third point	5008	10.1	20.2	20.1	1.003
as left zero	5012	0.0	0.0	0.0	----
as left span	4976	40.0	79.9	79.7	1.003
SO2 Scrubber Check	4932	79.9	800.0	-0.1	----
Date of last scrubber change:		9-Nov-17	Average Correction Factor		1.004
Corrected As found	77.10	Previous response	80.29	*% change	4.1%

\* = > +/-5% change initiates investigation

#### Notes:

span adjusted; After as founds was put back into original rack spot;

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## TRS Calibration Summary

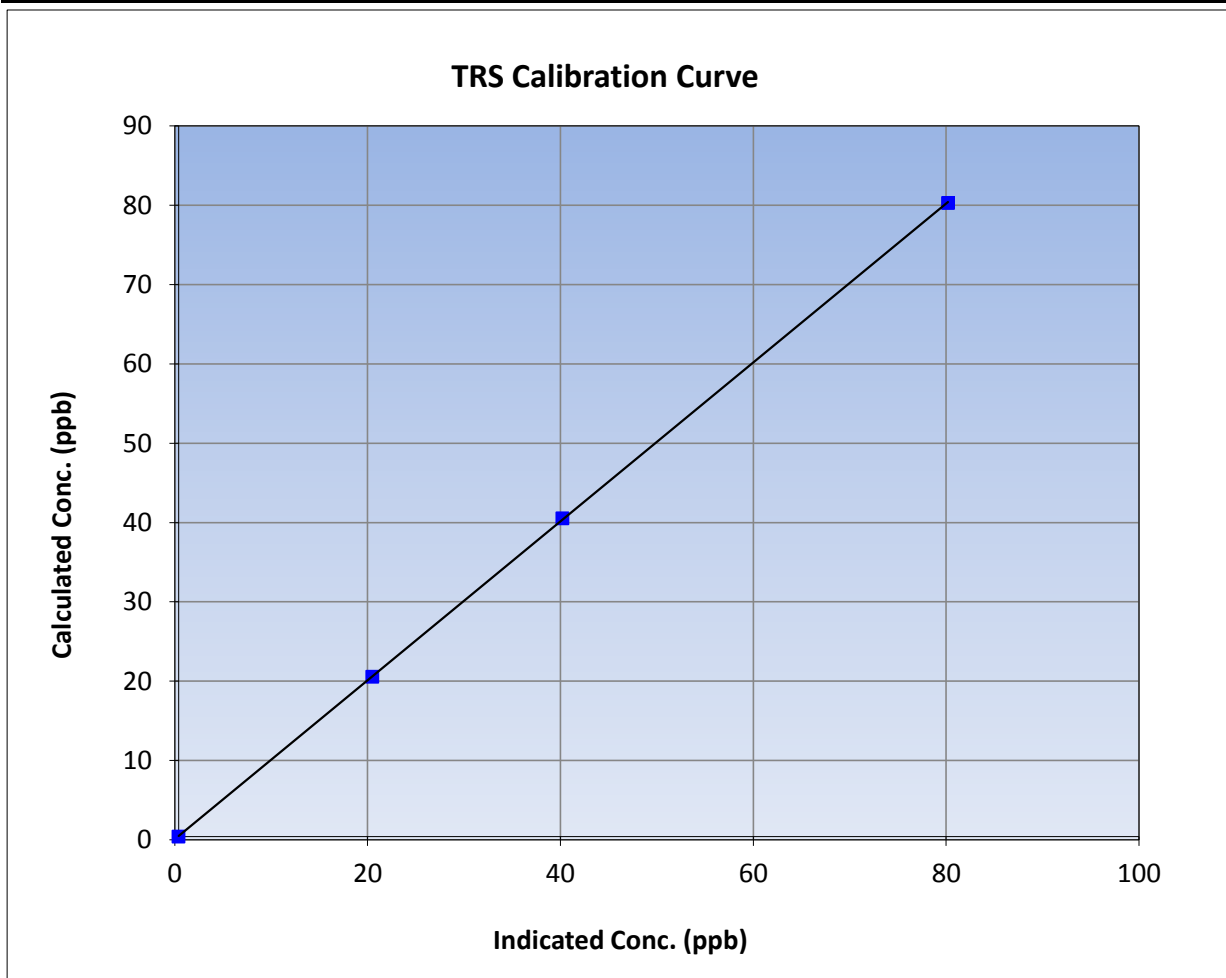
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 9, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:00	End Time (MST)	11:45
Analyzer make	Thermo 43i LTE	Analyzer serial #	1507864683

### Calibration Data

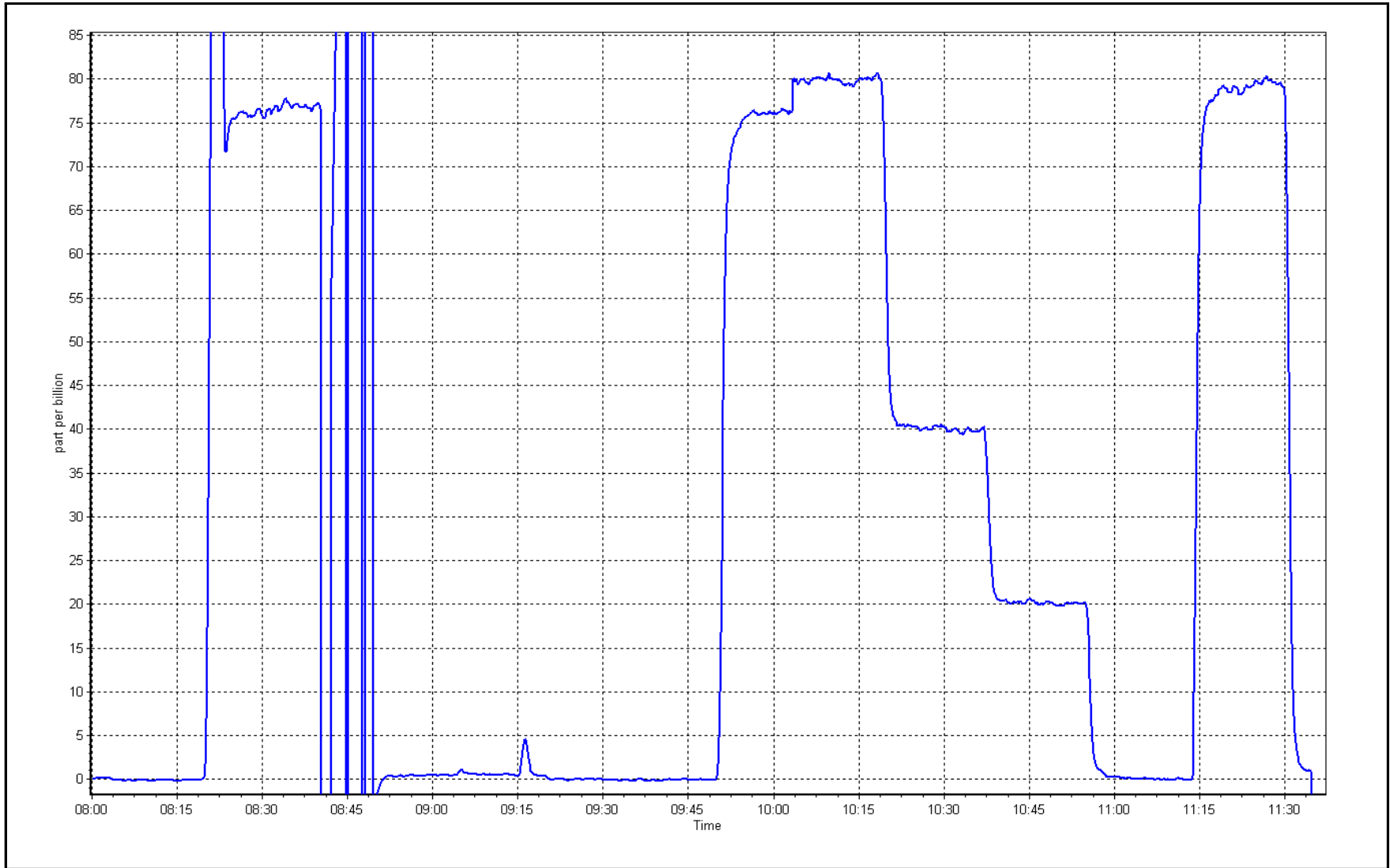
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999983	≥0.995
79.9	79.8	1.0013			
40.1	39.8	1.0086	Slope	1.001540	0.90 - 1.10
20.2	20.1	1.0034			
			Intercept	0.074922	+/-3



TRS Calibration Plot

Date: December 12, 2017

Location: Athabasca Valley







# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Athabasca Valley	Station number:	AMS 07
Calibration Date:	December 5, 2017	Last Cal Date:	November 3, 2017
Start time (MST):	8:10	End time (MST):	12:36
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL36513	Cal Gas Expiry Date	8/18/2020
CH4 Cal Gas Conc.	<u>510.0</u> ppm	CH4 Equiv Conc.	1060.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	25 Deg C
Calibrator Model	Teledyne API 700	Serial Number	2445
ZAG make/model	Teledyne API 701	Serial Number	1864

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1426262594

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.1
CH4 SP Ratio	0.000218	0.000220	Flame Temp	405.0	405.0
CH4 Retention time	12.8	13.0	Carrier Pressure	37.9	37.9
NMHC SP Ratio	4.18E-05	4.24E-05	Fuel Pressure	44.8	44.8
NMHC Peak Area	208396	205857	Air Pressure	25.9	25.9

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	0.998524	1.004662
THC Cal Offset	0.026451	-0.001378
CH4 Cal Slope	0.997875	1.004500
CH4 Cal Offset	0.030292	0.008768
NMHC Cal Slope	0.998700	1.004667
NMHC Cal Offset	0.000264	-0.012109

Notes:

Span adjusted, no maintenance done

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5000	0.0	0.00	0.00	----
as found span	4938	78.8	16.92	16.64	1.017
calibrator zero	5000	0.0	0.00	0.00	----
high point	4938	78.8	16.92	16.84	1.004
second point	4976	39.5	8.41	8.37	1.005
third point	4995	19.8	4.20	4.19	1.003
as left zero	5000	0.0	0.00	0.00	----
as left span	4938	78.8	16.92	16.88	1.002
Average Correction Factor					1.004
Corrected As found	16.64	Prev response	16.91	*% change	1.6%

### NMHC Calibration Data

Set Point	Total air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5000	0.0	0.00	0.00	----
as found span	4938	78.8	8.78	8.63	1.017
calibrator zero	5000	0.0	0.00	0.00	----
high point	4938	78.8	8.78	8.74	1.004
second point	4976	39.5	4.37	4.37	0.999
third point	4995	19.8	2.18	2.19	0.996
as left zero	5000	0.0	0.00	0.00	----
as left span	4938	78.8	8.78	8.77	1.001
Average Correction Factor					1.000
Corrected As found	8.63	Prev response	8.79	*% change	1.8%

### CH4 Calibration Data

Set Point	Total air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5000	0.0	0.00	0.00	----
as found span	4938	78.8	8.14	8.01	1.016
calibrator zero	5000	0.0	0.00	0.00	----
high point	4938	78.8	8.14	8.10	1.005
second point	4976	39.5	4.05	4.01	1.010
third point	4995	19.8	2.02	2.00	1.011
as left zero	5000	0.0	0.00	0.00	----
as left span	4938	78.8	8.14	8.11	1.004
Average Correction Factor					1.008
Corrected As found	8.01	Prev response	8.13	*% change	1.4%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## THC Calibration Summary

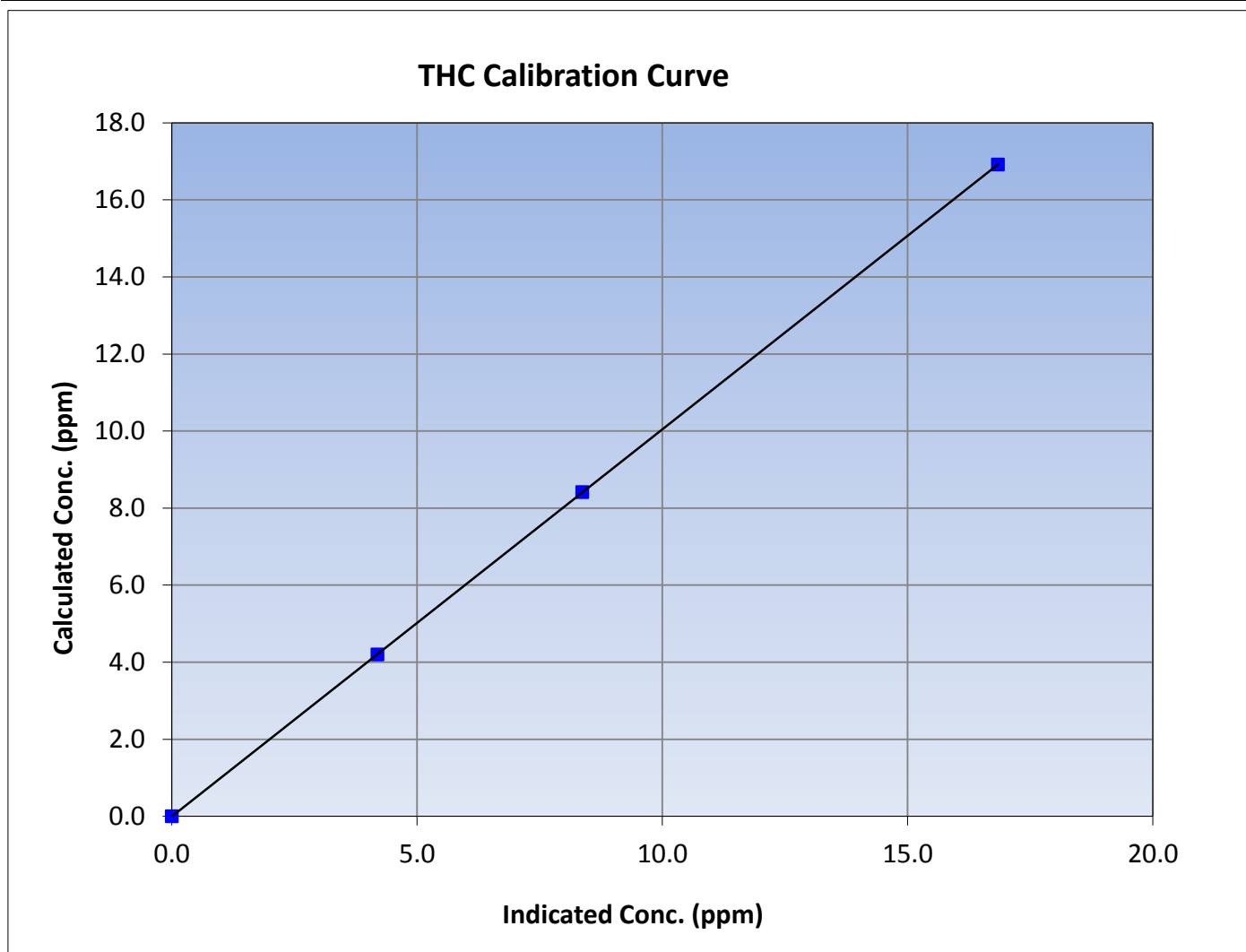
Version-02-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 3, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	12:36
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999999	$\geq 0.995$			
16.92	16.84	1.0045						
8.41	8.37	1.0053				Slope	1.004662	0.90 - 1.10
4.20	4.19	1.0028						
			Intercept	-0.001378	$\pm 0.5$			





# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

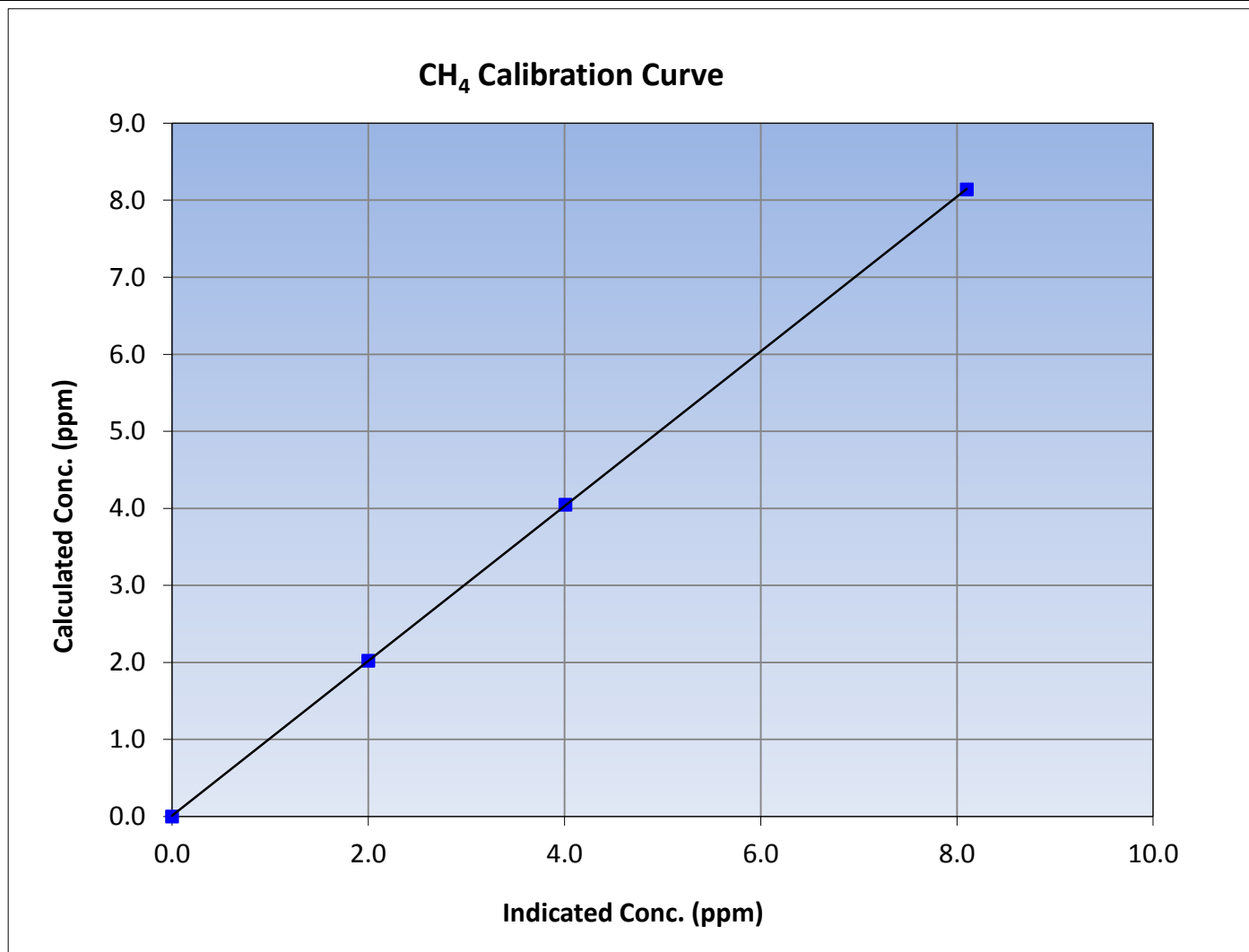
Version-02-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 3, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	12:36
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999993	<i>≥0.995</i>			
8.14	8.10	1.0048						
4.05	4.01	1.0096				Slope	1.004500	<i>0.90 - 1.10</i>
2.02	2.00	1.0108						
			Intercept	0.008768	<i>+/-0.5</i>			





# Wood Buffalo Environmental Association

## NMHC Calibration Summary

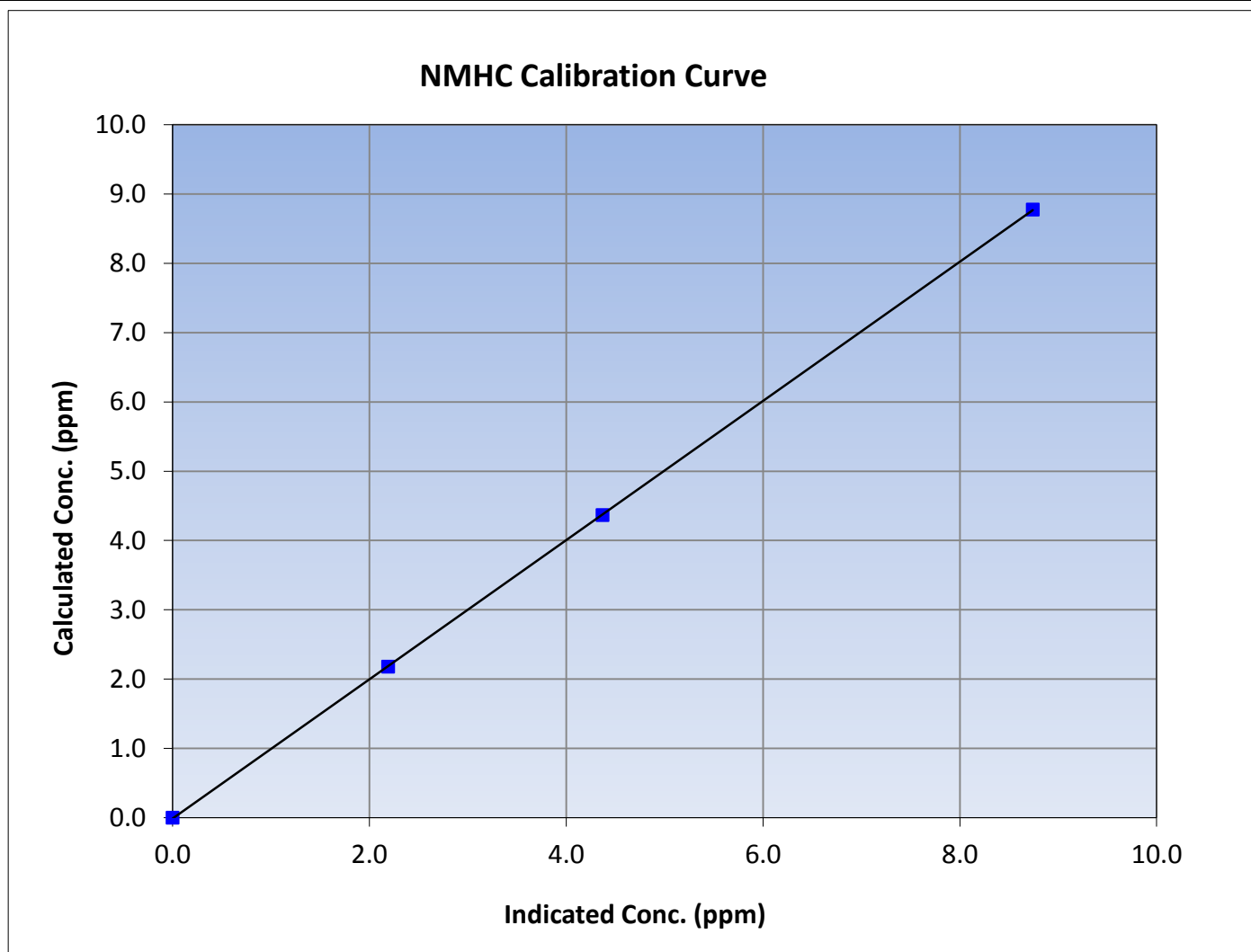
Version-02-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 3, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	12:36
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

### Calibration Data

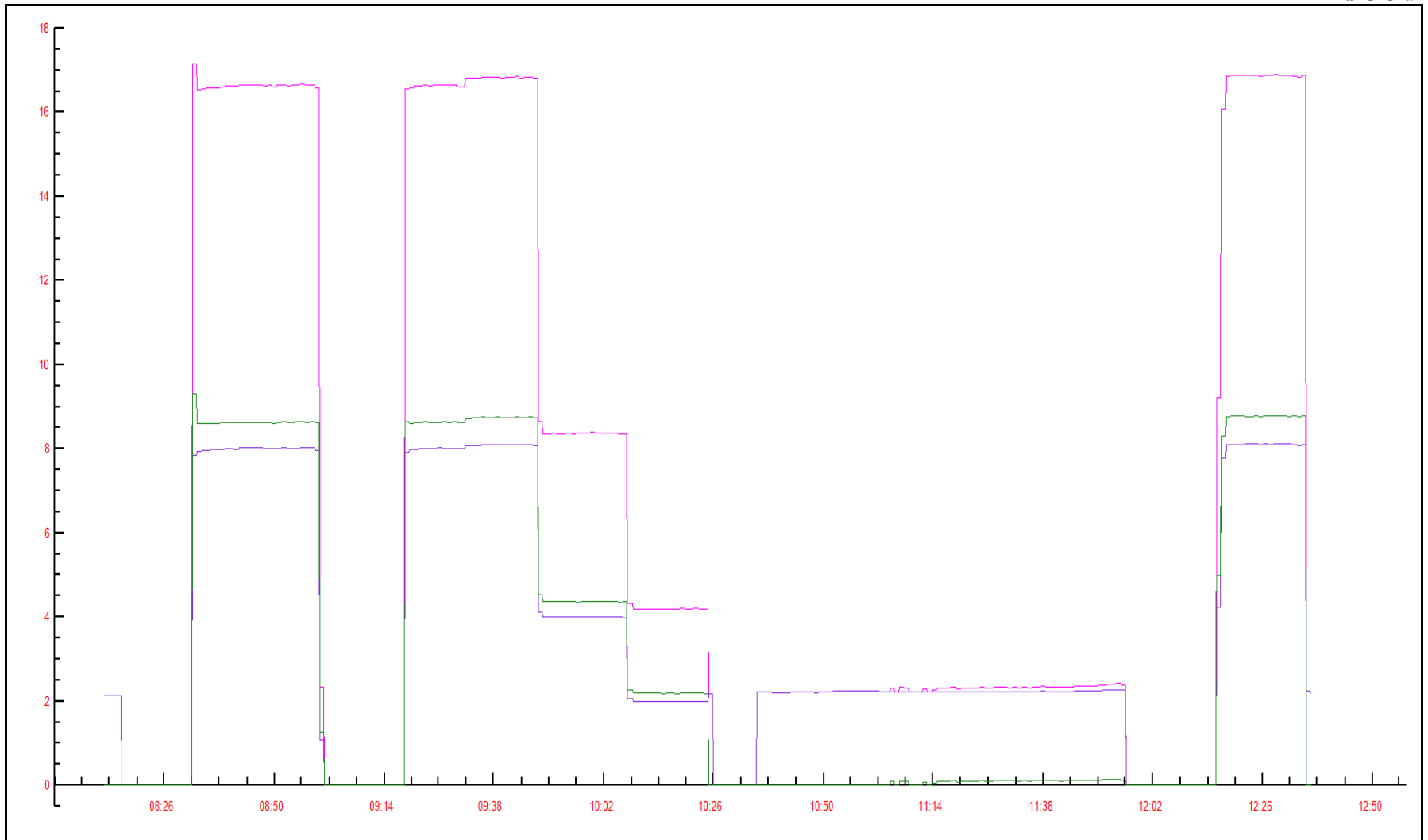
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999990	$\geq 0.995$			
8.78	8.74	1.0042						
4.37	4.37	0.9991				Slope	1.004667	0.90 - 1.10
2.18	2.19	0.9955						
			Intercept	-0.012109	$\pm 0.5$			



NMHC Calibration Plot

Date: December 5, 2017

Location: Athabasca Valley







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

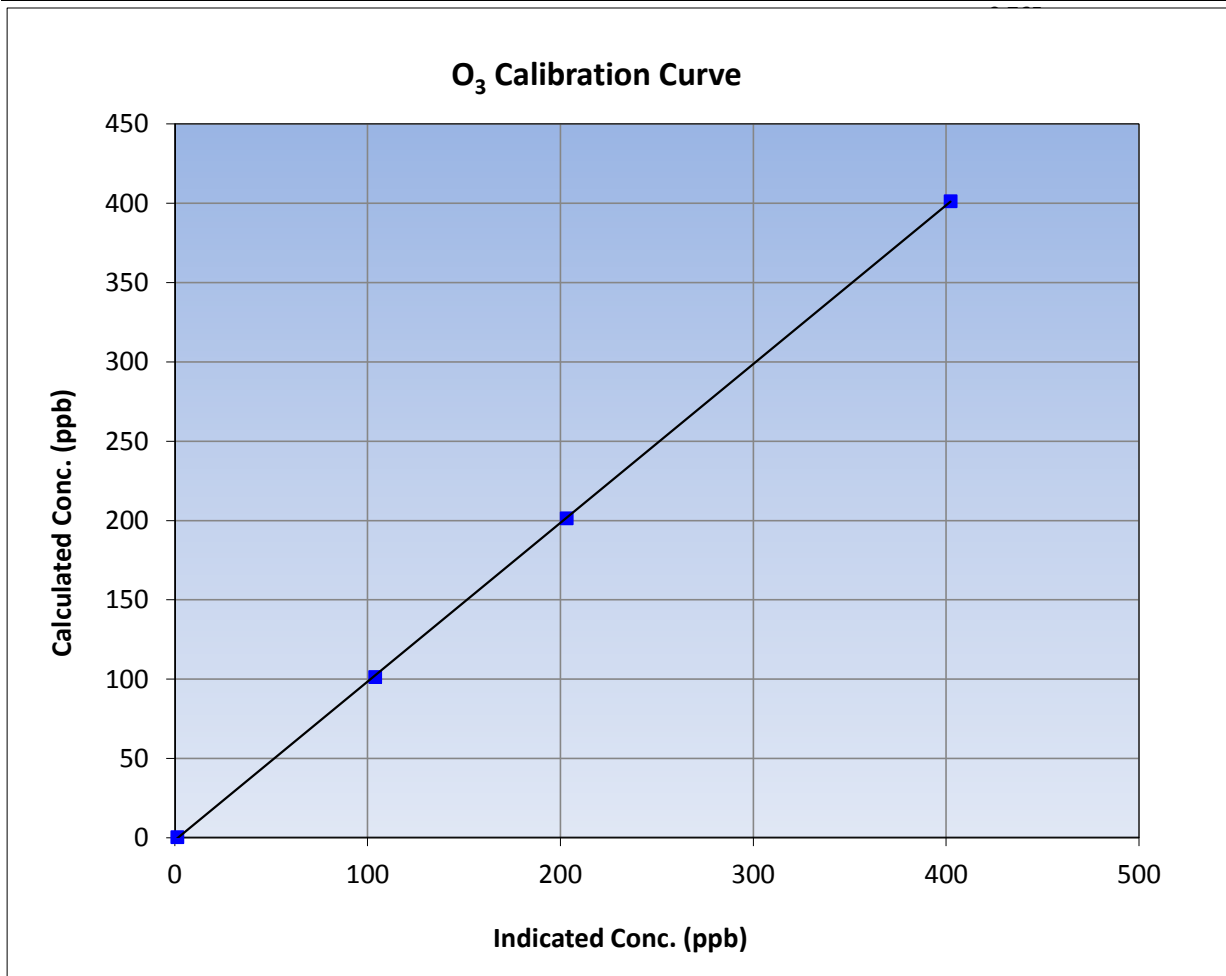
Version-03-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 2, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	9:30	End Time (MST)	14:00
Analyzer make	Thermo 49i	Analyzer serial #	1507964700

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.9	----	Correlation Coefficient	0.999980	$\geq 0.995$
401.0	401.9	0.9978	Slope	1.001055	0.90 - 1.10
201.0	202.9	0.9906	Intercept	-1.737041	+/- 10
101.0	103.5	0.9758			

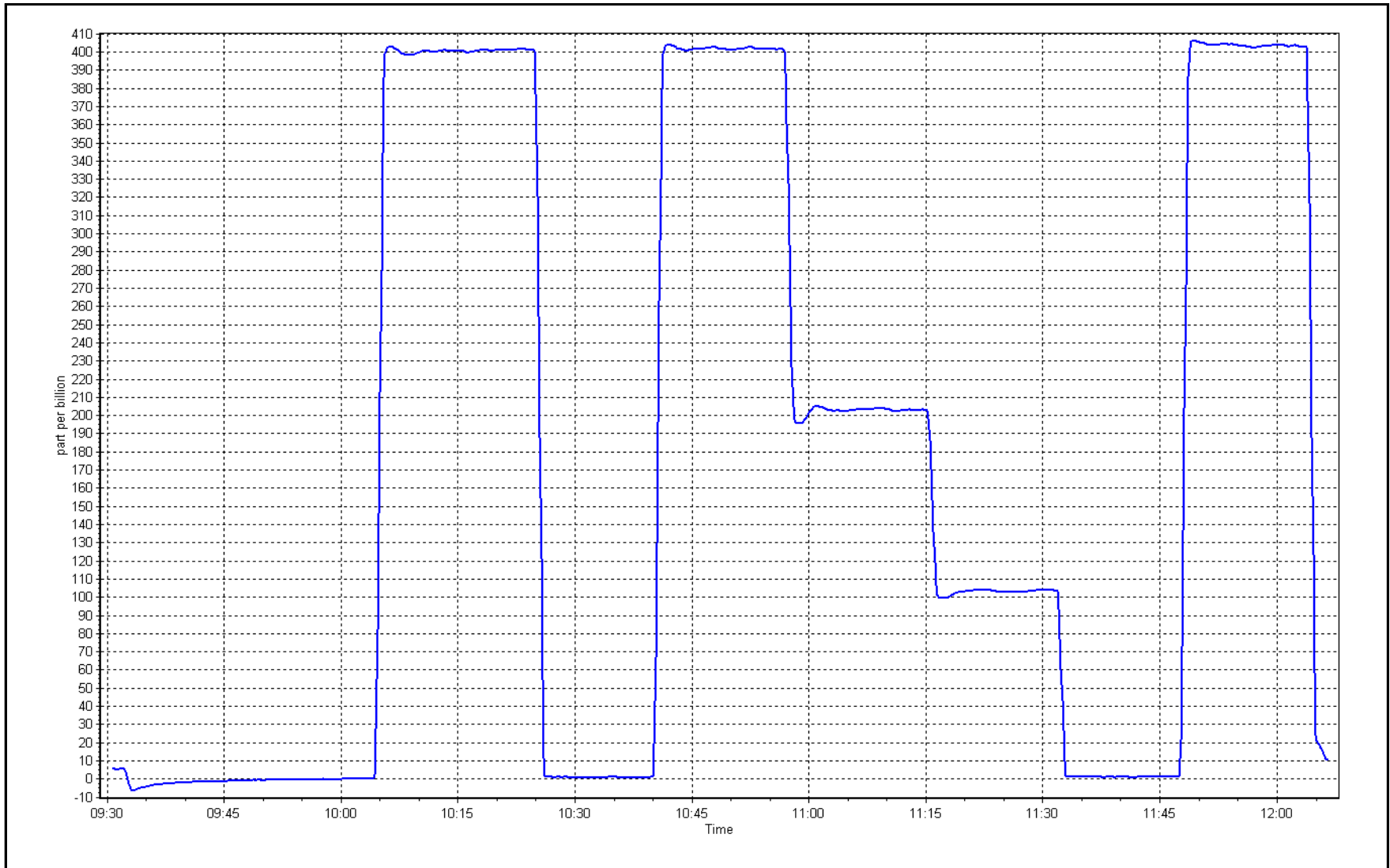




O<sub>3</sub> Calibration Plot

Date: December 4, 2017

Location: Athabasca Valley





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Athabasca Valley	Station number:	AMS 07
Calibration Date:	December 5, 2017	Last Cal Date:	November 1, 2017
Start time (MST):	8:10	End time (MST):	12:37
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL36513	Cal Gas Expiry Date	8/18/2020
NOX Cal Gas Conc.	<u>50.8</u> ppb	NO Cal Gas Conc.	<u>50.8</u> ppb
Calibrator Model	Teledyne API T700	Serial Number	2445
ZAG make/model	Teledyne API T701	Serial Number	1864

### Analyzer Information

Analyzer make: Thermo 42C			Analyzer serial #: 601114773		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.662	1.770	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	1.002	1.002	PMT Temperature	-3.7	-3.7
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	182.3	182.3
NO bkgrnd	4.7	5.0	Sample Flow	0.726	0.726
NOX bkgrnd	4.9	5.2	PMT Voltage	-784	-784

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	1.002036	1.002718
NO <sub>x</sub> Cal Offset	-1.412479	-1.052586
NO Cal Slope	1.001825	1.003525
NO Cal Offset	-1.212300	-0.811326
NO <sub>2</sub> Cal Slope	1.005644	1.003579
NO <sub>2</sub> Cal Offset	1.686222	0.704363



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.0	0.0	0.0	0.2	0.0	0.3	----	----
as found span	4938	78.8	810.7	810.7	0.0	764.4	762.4	2.0	1.0605	1.0633
calibrator zero	5009	0.0	0.0	0.0	0.0	0.2	0.0	0.3	----	----
high point	4932	78.8	811.6	811.6	0.0	809.9	809.0	1.0	1.0022	1.0033
second point	4973	39.5	403.5	403.5	0.0	404.4	403.9	0.7	0.9978	0.9990
third point	4994	19.7	200.4	200.4	0.0	201.4	200.9	0.7	0.9950	0.9975
as left zero	5009	0.0	0.0	0.0	0.0	0.2	0.0	0.3	----	----
as left span	4973	78.8	805.0	381.9	423.1	801.3	376.6	424.4	1.0046	1.0141
<b>Average Correction Factor</b>									<b>0.9983</b>	<b>0.9999</b>

Corrected As found	NO <sub>x</sub> = 764.2 ppb	NO = 762.4 ppb	*Percent Change	NO <sub>x</sub> = 6.0%
Previous Response	NO <sub>x</sub> = 810.4 ppb	NO = 810.4 ppb	*Percent Change	NO = 6.3%

\* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	808.9	808.6	0.2	1.0034	1.0038	----	----
1st NO2 (400 ppb O3)	381.9	426.7	806.9	381.9	424.9	1.0059	----	1.0042	99.6%
2nd NO2 (200 ppb O3)	592.4	216.2	806.8	592.4	214.5	1.0060	----	1.0079	99.2%
3rd NO2 (100 ppb O3)	696.5	112.1	806.5	696.5	109.8	1.0064	----	1.0209	97.9%
2nd NO ref point	----	0.0	806.9	806.6	0.3	1.0059	1.0063	----	----
<b>Average Correction Factor</b>						<b>1.0060</b>	<b>1.0050</b>	<b>1.0110</b>	<b>98.9%</b>

**Notes:** Span adjusted; diagnostics show changes to pressure and flow from last calibration; No maintenance done

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

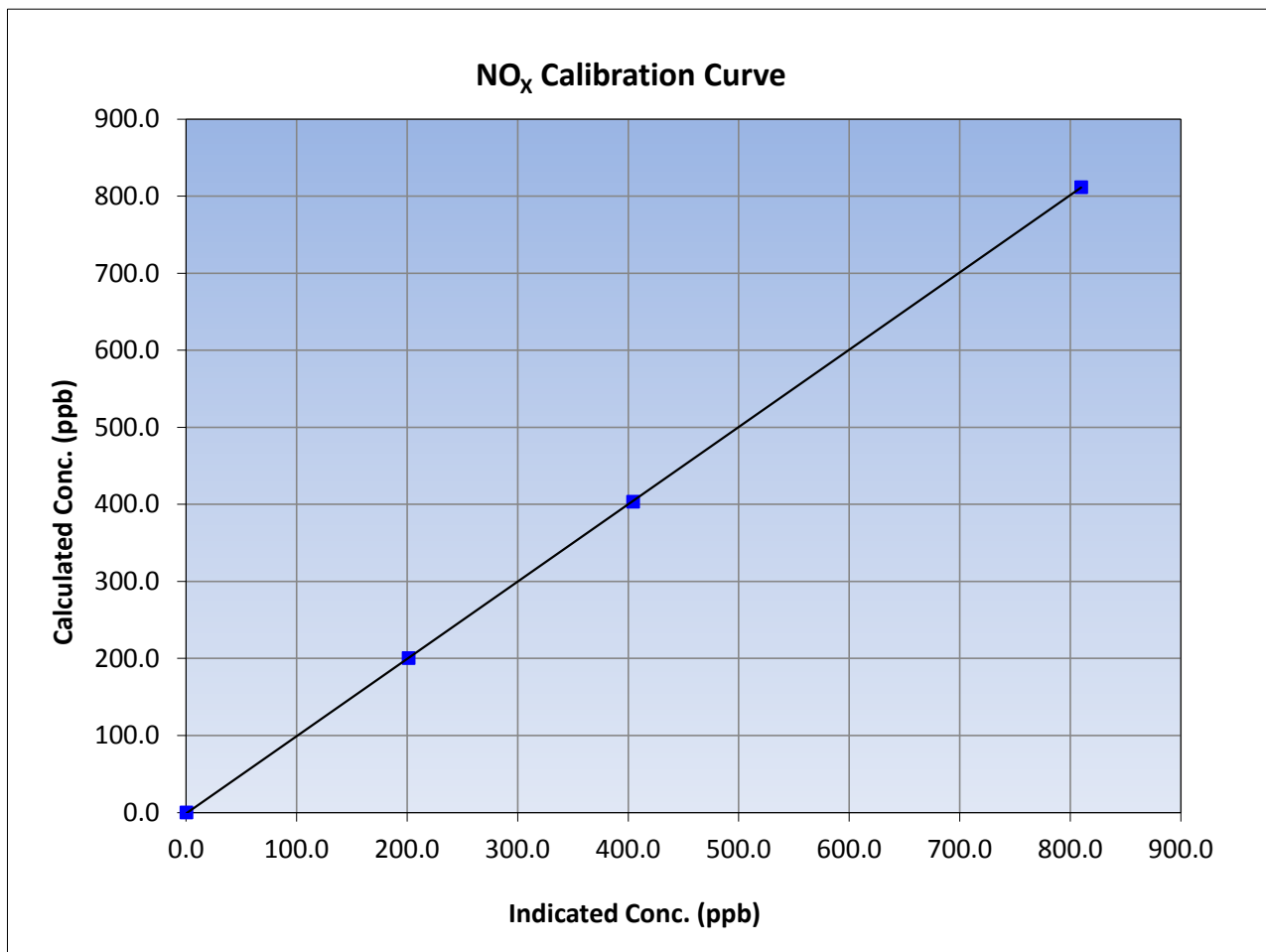
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	12:37
Analyzer make	Thermo 42C	Analyzer serial #	601114773

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.2	----	Correlation Coefficient	≥0.995	
811.6	809.9	1.0022			
403.5	404.4	0.9978			
200.4	201.4	0.9950			
			Slope	1.002718	0.90 - 1.10
			Intercept	-1.052586	+/-20





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

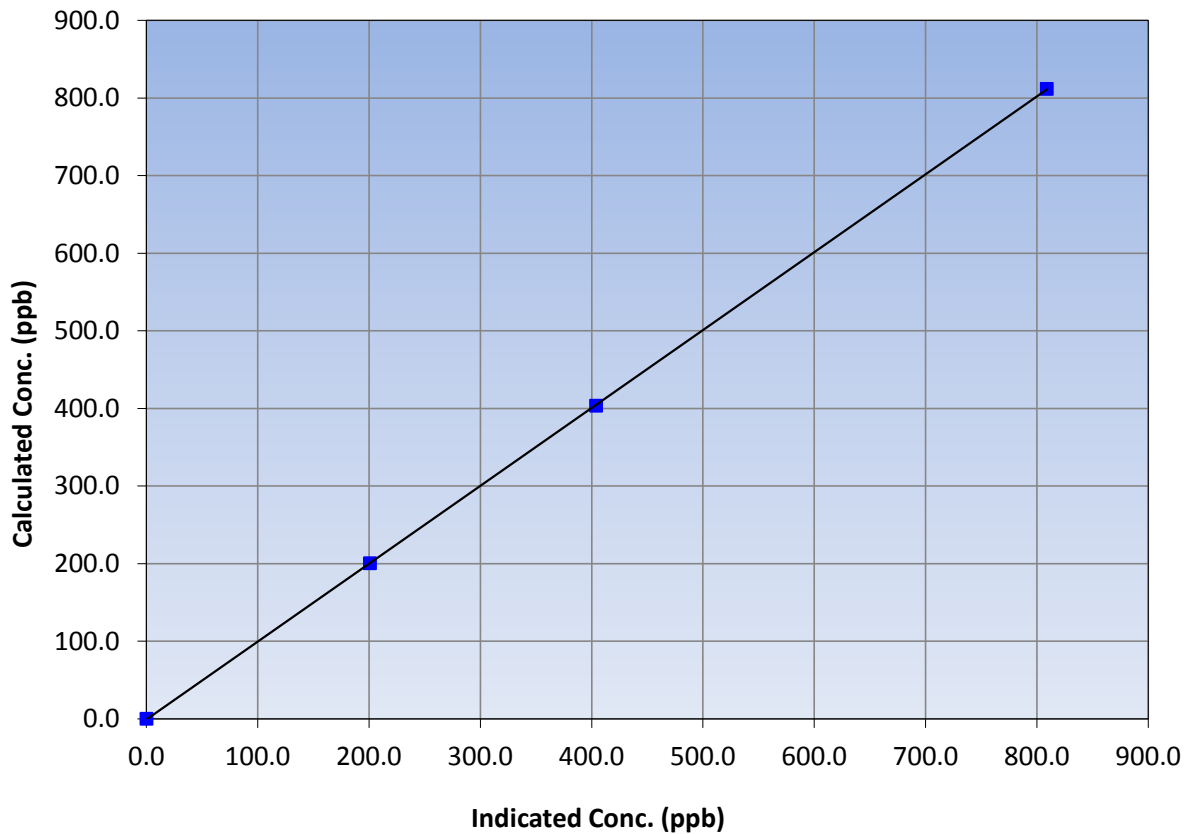
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	12:37
Analyzer make	Thermo 42C	Analyzer serial #	601114773

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	$\geq 0.995$	
811.6	809.0	1.0033			
403.5	403.9	0.9990			
200.4	200.9	0.9975			
			Slope	1.003525	0.90 - 1.10
			Intercept	-0.811326	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

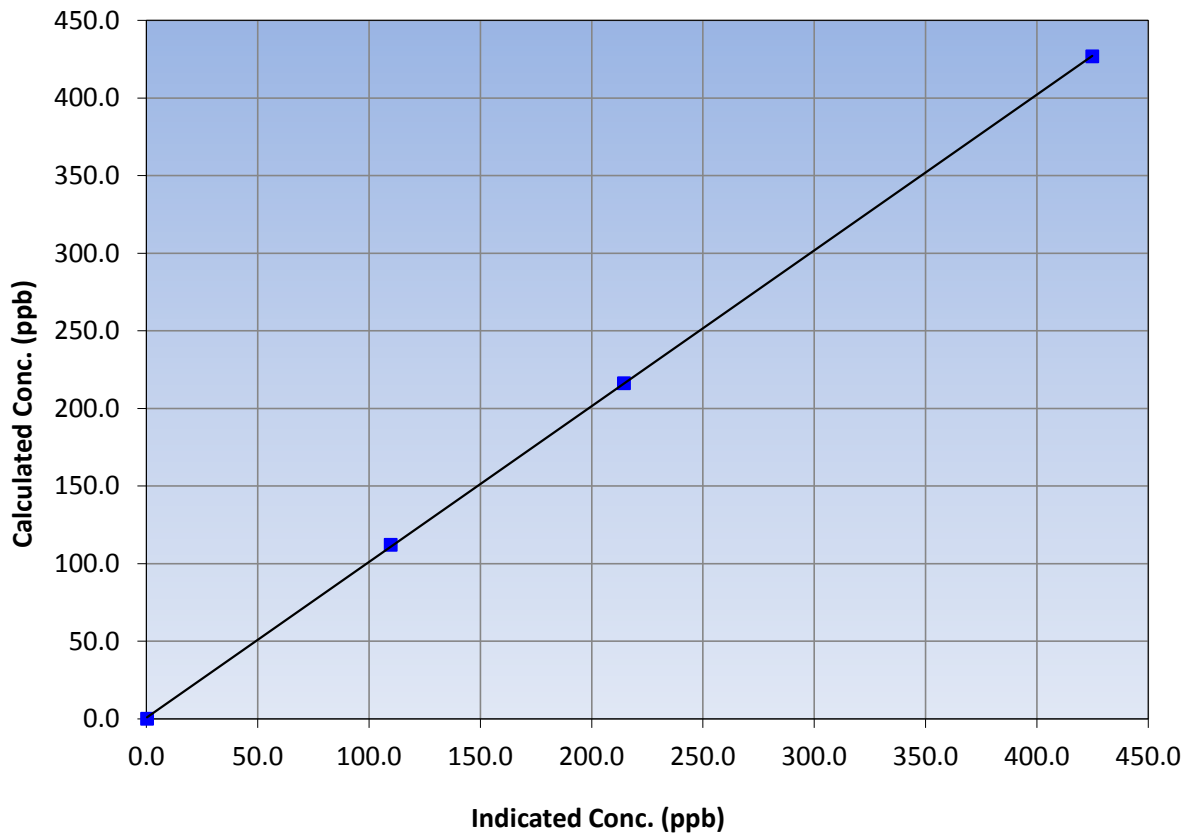
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	8:10	End Time (MST)	12:37
Analyzer make	Thermo 42C	Analyzer serial #	601114773

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.3	----	Correlation Coefficient	≥0.995	
426.7	424.9	1.0042			
216.2	214.5	1.0079			
112.1	109.8	1.0209			
			Slope	0.999973	0.90 - 1.10
			Intercept	1.003579	+/-20
				0.704363	

NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 5, 2017

Location: Athabasca Valley





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Athabasca Valley	Station number:	AMS 07
Calibration Date:	December 12, 2017	Last Cal Date:	November 3, 2017
Start time (MST):	8:55	End time (MST):	9:42
Sharp Model:	Thermo 5030	S/N:	E515
Particulate Fraction:	PM2.5	C14 Source S/N:	3256
Flow Meter Make/Model:	Delta Cal	S/N:	1450
Temp/RH standard:	Delta Cal	S/N:	1450

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	-2	-3	-2	<input type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	979	974	979	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	995	1000	<input type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	-0.8	-----	0.1	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Concentration zero	-1.3	-----	0.2	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:	November 3, 2017				

### Quarterly Calibration Test

Leak Test: \_\_\_\_\_ Date of check: \_\_\_\_\_ Last Cal Date: November 3, 2017  
 Flow w/o adaptor: \_\_\_\_\_ Flow w/ adaptor: \_\_\_\_\_

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>2518</u>	
Foil Mass: _____	Foil Mass: <u>1337</u>	
Calibration Date: _____	Calibration Date: <u>October 23, 2017</u>	
Correction Factor: <u>7120</u>	Correction Factor: <u>6893</u>	<u>3.29%</u>

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)				<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes:

Cyclone head cleaned; Nephelometer adjusted

Calibration by: Melissa Lemay







# Wood Buffalo Environmental Association

## CO Calibration Summary

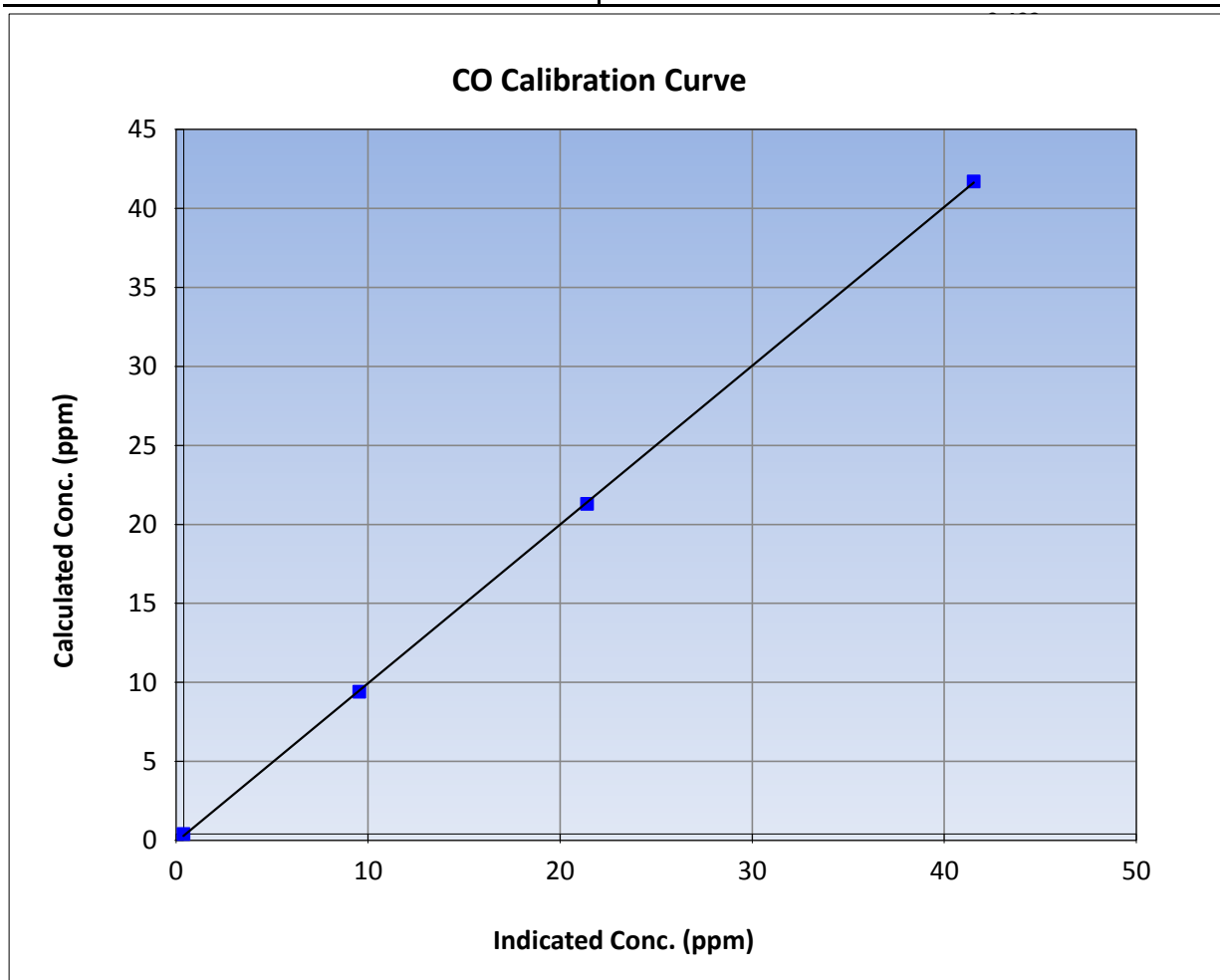
Version-03-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 2, 2017
Station Name	Athabasca Valley	Station Number	AMS 07
Start Time (MST)	7:15	End Time (MST)	14:37
Analyzer make	Thermo 48i-LTE	Analyzer serial #	1408761381

### Calibration Data

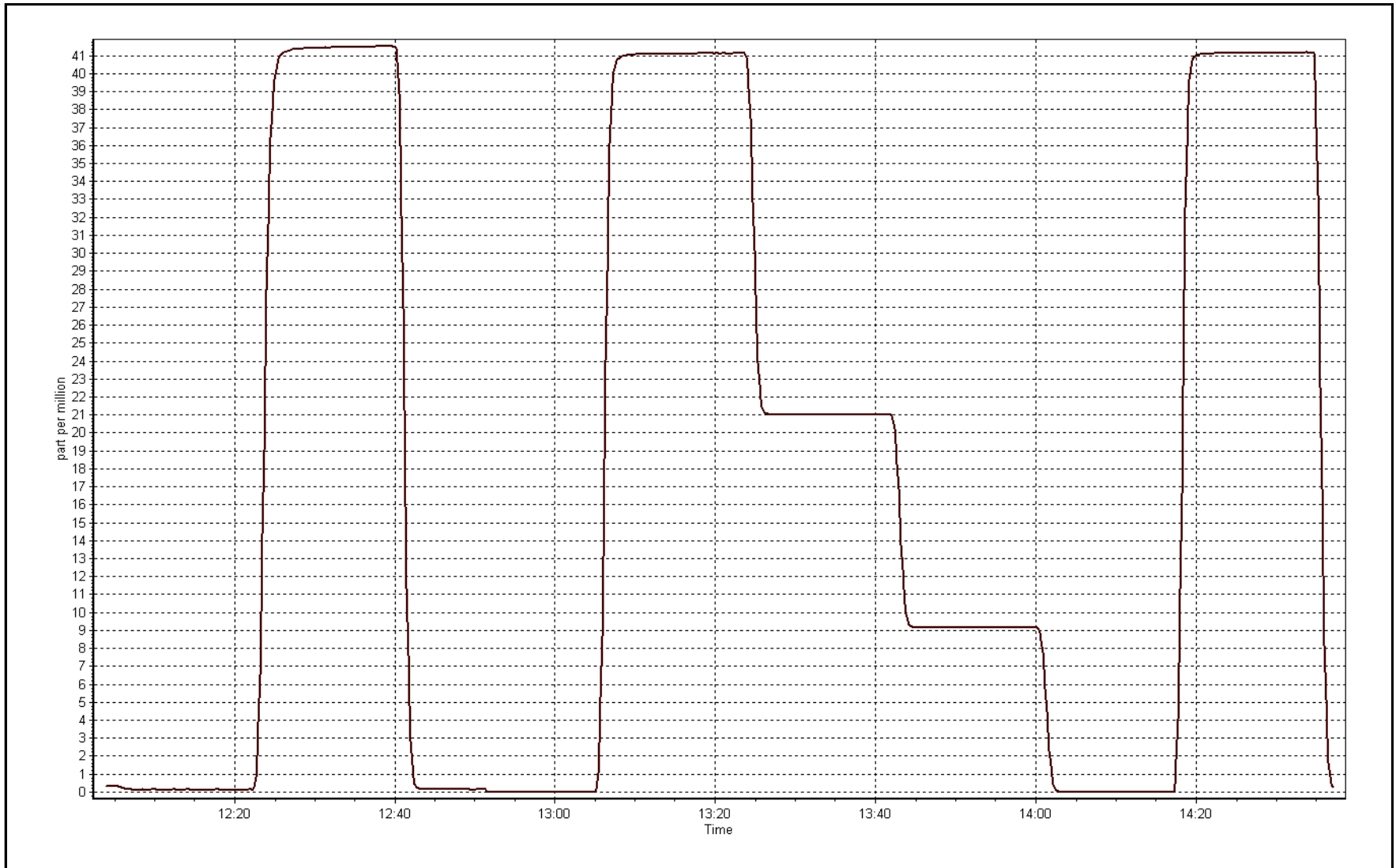
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999965	≥0.995
41.3	41.1	1.0042			
20.9	21.0	0.9957	Slope	1.005058	0.90 - 1.10
9.0	9.2	0.9840			
			Intercept	-0.104085	+/-1.5



CO Calibration Plot

Date: December 4, 2017

Location: Athabasca Valley





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 8**  
**FORT CHIPEWYAN**  
**DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)  
 DECEMBER 2017

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	694	39	50	98.52	5	0	2	0
O3(ppb) Average	700	33	44	98.52	41	0	36	-
NO2(ppb) Average	244	15	500	34.81	27	0	11	-
NO(ppb) Average	244	15	500	34.81	2	-	1	-
NOX(ppb) Average	244	15	500	34.81	28	-	12	-
PM2.5(ug/m3) Average	720	2	24	97.04	39.2	-	10.9	0
Wind Speed 10 m (km/h) Average	743	0	1	99.87	30	-	19	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100	1.6	-	-1.8	-
Relative Humidity (%) Average	744	0	0	100	95	-	91	-
Precipitation (mm) Total	564	0	180	75.81	0.3	-	0.8	-
Leaf Wetness (% of range) Average	744	0	0	100	13	-	8	-
Global Solar Radiation (W/m2) Average	744	0	0	100	244	-	45	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)  
DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	694	0.3	1	-	0	0	0	0	0	1	5
O3(ppb) Average	700	26.9	7	-	6	18	23	28	32	35	41
NO2(ppb) Average	244	2.2	5	-	0	0	0	0	1	6	27
NO(ppb) Average	244	0.2	0	-	0	0	0	0	0	0	2
NOX(ppb) Average	244	2.3	5	-	0	0	0	1	1	8	28
PM2.5(ug/m3) Average	720	2.99	3.9	-	0	0.3	0.7	1.6	3.9	6.9	39.2
Wind Speed 10 m (km/h) Average	743	10.4	5	-	1	4	6	10	13	17	30
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-16.99	10	-	-37.6	-31	-26.7	-13.5	-8.7	-5.5	1.6
Relative Humidity (%) Average	744	82.1	7	-	65	72	75	83	88	91	95
Precipitation (mm) Total	564	-	-	1.52	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	744	1.8	2	-	0	0	1	1	2	4	13
Global Solar Radiation (W/m2) Average	744	20.2	43	-	1	1	1	2	10	70	244

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NO2, NO, NOX	01 Dec 2017 06:00	21 Dec 2017 10:00	485	Analyzer failure
SO2, O3	20 Dec 2017 23:00	21 Dec 2017 09:00	11	Analyzer Failure - Sample Manifold Broken
PM2.5	23 Dec 2017 07:00	23 Dec 2017 09:00	3	Unstable operation - excessive baseline drift
PM2.5	23 Dec 2017 13:00	23 Dec 2017 14:00	2	Unstable operation - excessive baseline drift
PM2.5	25 Dec 2017 12:00	25 Dec 2017 12:00	1	Unstable operation - excessive baseline drift
PM2.5	26 Dec 2017 22:00	26 Dec 2017 22:00	1	Unstable operation - excessive baseline drift
PM2.5	27 Dec 2017 16:00	27 Dec 2017 16:00	1	Unstable operation - excessive baseline drift
PM2.5	28 Dec 2017 07:00	28 Dec 2017 13:00	7	Unstable operation - excessive baseline drift
PM2.5	29 Dec 2017 10:00	29 Dec 2017 10:00	1	Unstable operation - excessive baseline drift
PM2.5	30 Dec 2017 05:00	30 Dec 2017 07:00	3	Unstable operation - excessive baseline drift
PM2.5	30 Dec 2017 09:00	30 Dec 2017 09:00	1	Unstable operation - excessive baseline drift
PM2.5	30 Dec 2017 13:00	30 Dec 2017 14:00	2	Unstable operation - excessive baseline drift
PC	01 Dec 2017 01:00	08 Dec 2017 11:00	179	Analyzer Failure - inconsistent response
PC	21 Dec 2017 12:00	21 Dec 2017 12:00	1	Maintenance - tipping bucket cleaned
Wind Speed, Wind Direction	04 Dec 2017 08:00	04 Dec 2017 08:00	1	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Fort Chipewyan - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 5 ppb on Dec 31 18:00	Maximum Daily Average: 2.4 ppb on Dec 31		Hours of Data:	694
Minimum Value: 0 ppb on Dec 7 21:00	Minimum Daily Average: 0.0 ppb on Dec 29		Hours of Missing Data:	50
Maximum Diurnal Average: 0.4 ppb at hour 20	Minimum Diurnal Average: 0.1 ppb at hour 5		Hours of Calibration:	39
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 4		Percent Operational Time:	98.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	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-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0.1	1
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	2	2	2	1	0.7	4
5-Dec	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
6-Dec	0	0	0	Z	0	1	1	1	2	2	2	2	2	3	3	2	1	0	0	0	0	0	0	0	1.0	3
7-Dec	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	0	--	0
8-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0.2	2
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	0	0	0	1	1	Z	1	1	1	1	1	2	3	4	4	3	3	4	4	3	3	3	AF	AF	2.0	4
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.2	1
31-Dec	2	2	3	2	Z	2	2	2	2	3	2	1	1	2	4	4	4	5	4	3	2	1	1	1	2.4	5
	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.2	0.2	Diurnal Average	
	2	2	3	2	1	2	2	2	2	3	2	2	3	4	4	4	4	5	4	4	3	3	2	2	Diurnal Maximum	

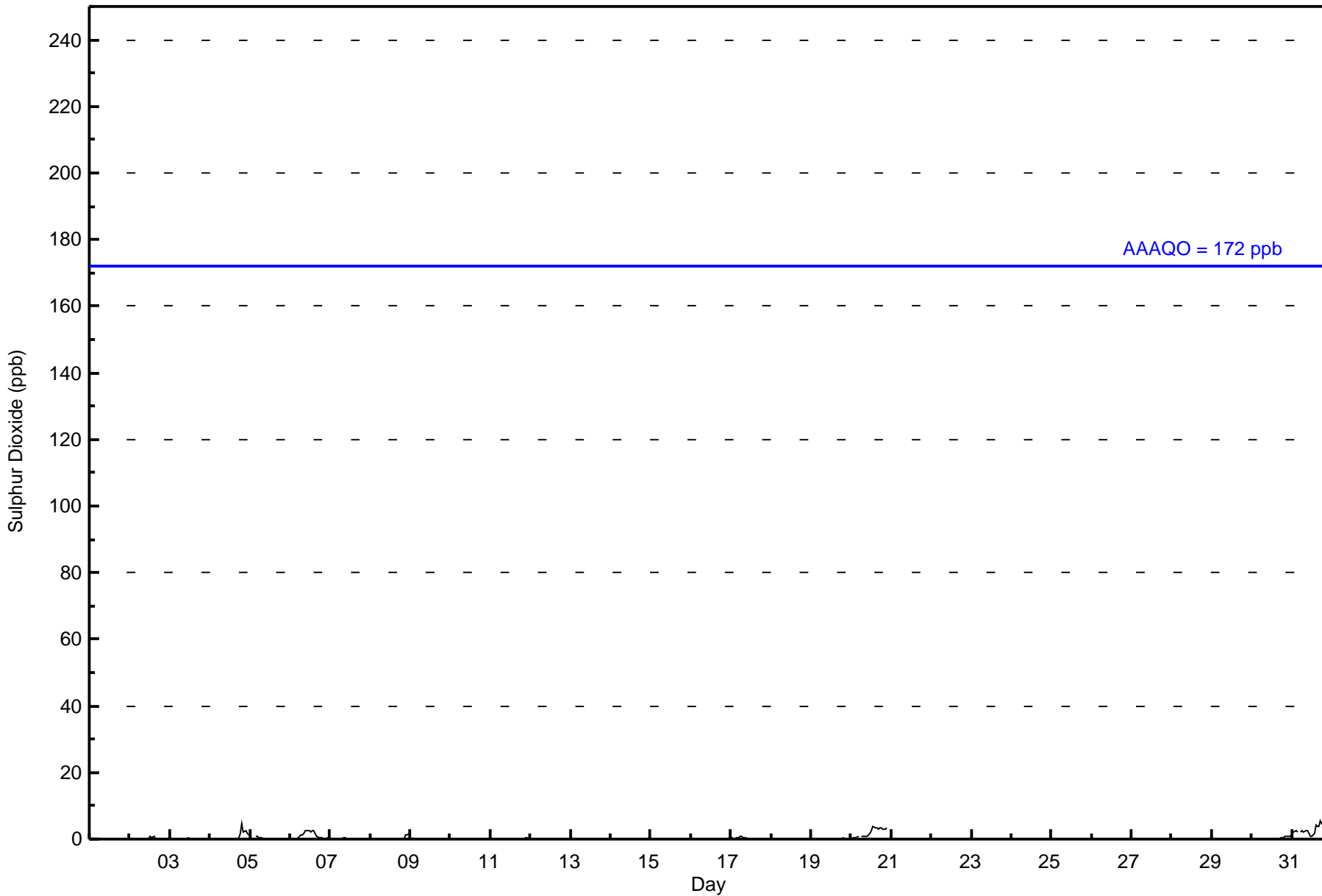
Z - zerospan      C - Calibration      AF - Analyzer Failure  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	694	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: 694

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	27	16	9	25	97	47	18	8	21	7	21	26	104	110	95	62	693
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
<b>Totals</b>	27	16	9	25	97	47	18	8	21	7	21	26	104	110	95	62	693

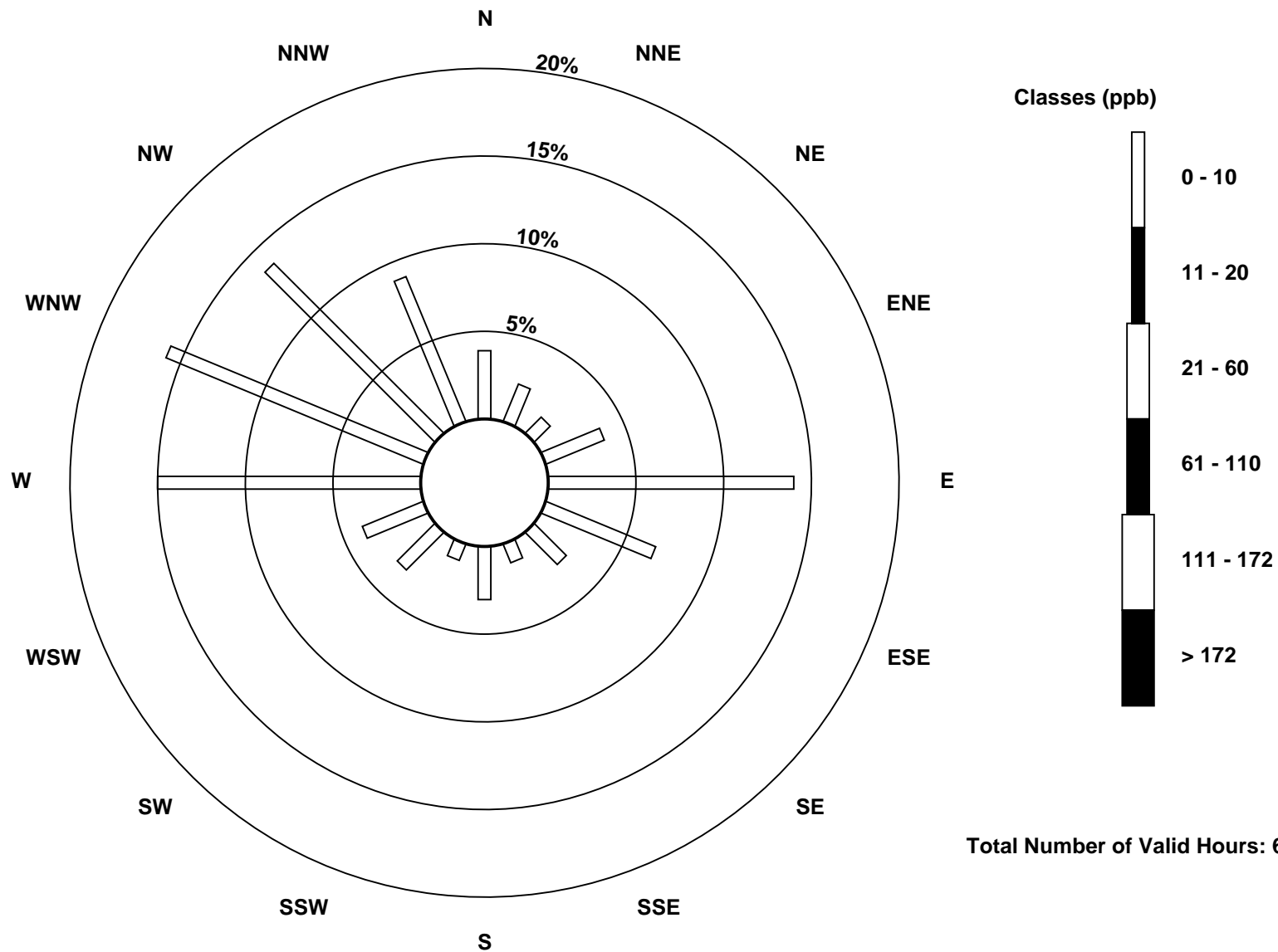
Total Number of Valid Hours: 693

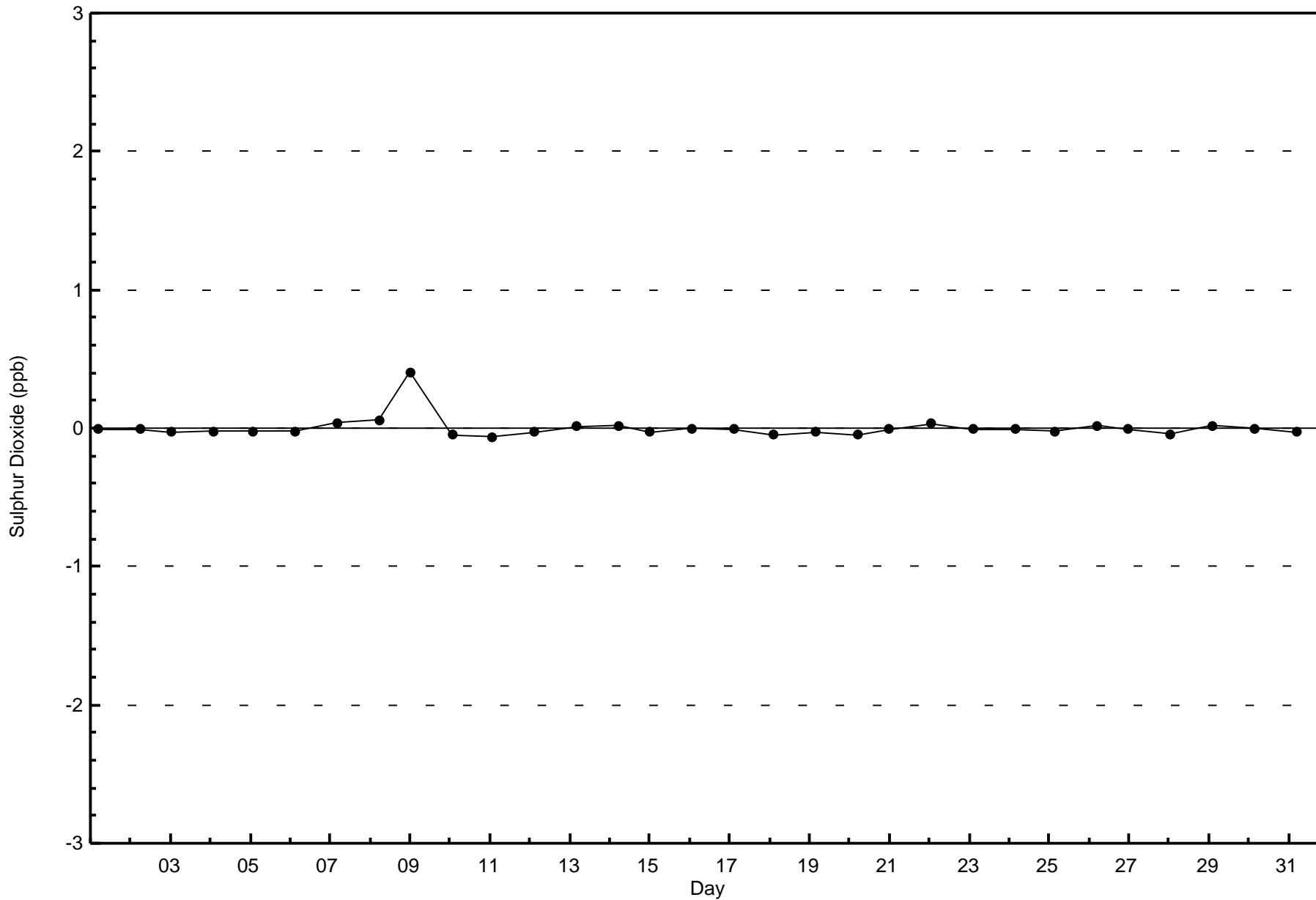
Total Number of Hours: 744

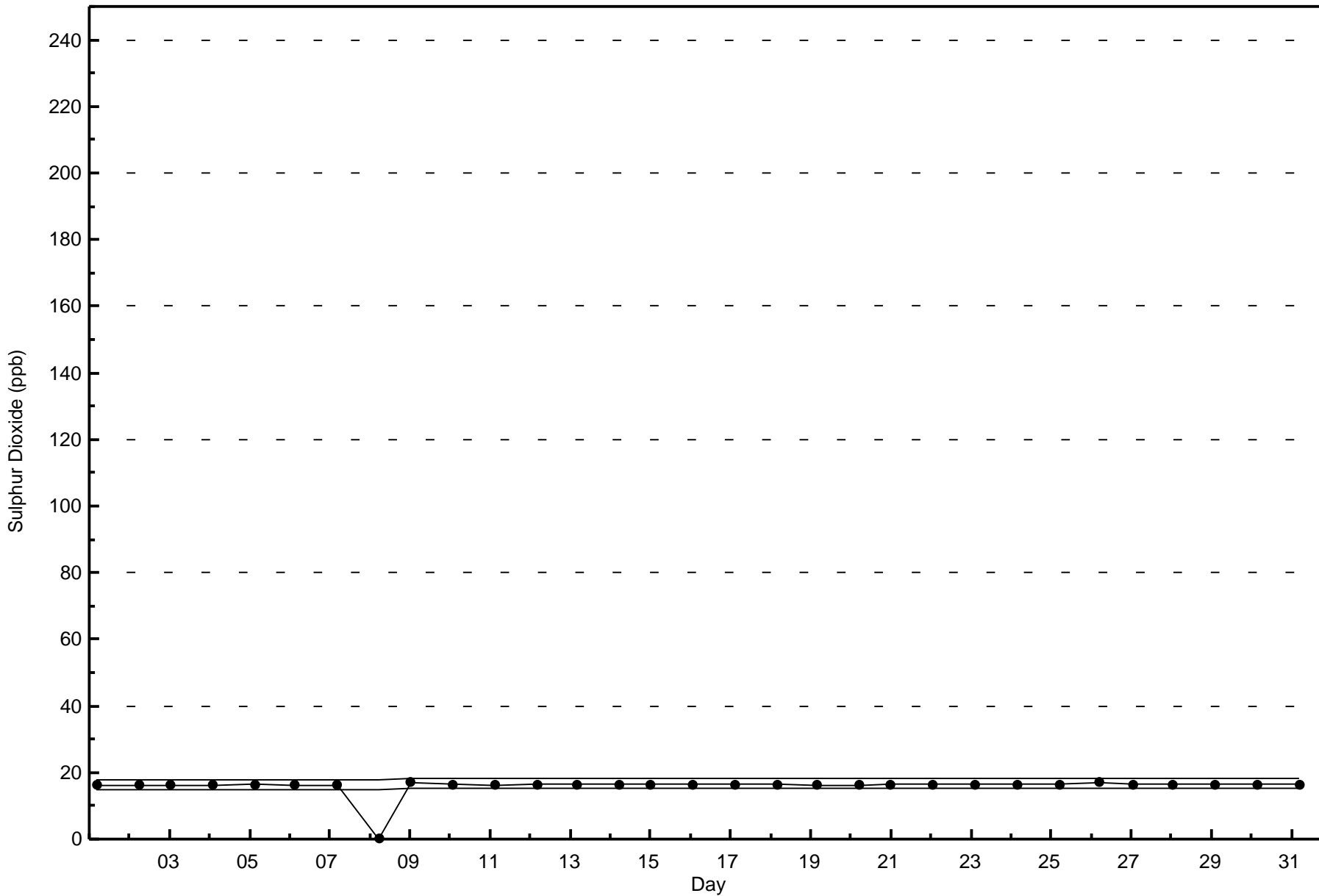


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort Chipewyan (AMS 8)







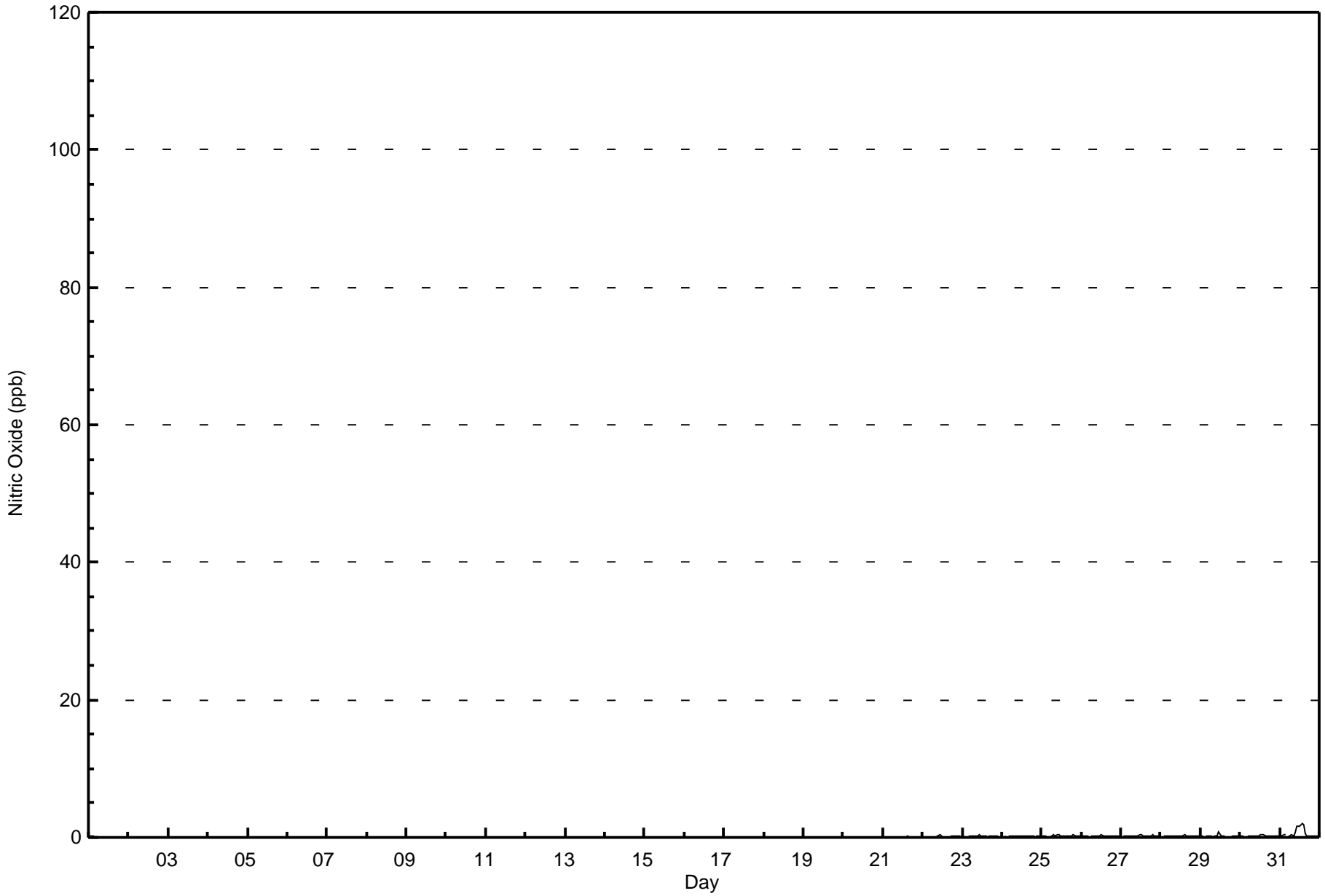


Maximum Value: 2 ppb on Dec 31 14:00														Maximum Daily Average: 0.6 ppb on Dec 31														Hours in Service: 744	
Minimum Value: 0 ppb on Dec 22 07:00														Minimum Daily Average: 0.1 ppb on Dec 22														Hours of Data: 244	
Maximum Diurnal Average: 0.4 ppb at hour 11														Minimum Diurnal Average: 0.1 ppb at hour 5														Hours of Missing Data: 500	
Monthly Average: 0.2 ppb														Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 2														Hours of Calibration: 15	
																												Percent Operational Time: 34.8	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0	0	0	0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0			
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
13-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
15-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
18-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
19-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	0			
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0			
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0			
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0			
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0			
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0			
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0			
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0			
29-Dec	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			
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0			
31-Dec	0	0	0	0	Z	0	0	0	0	1	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0.6	2			
0.2														0.1														Diurnal Average	
0														0														Diurnal Maximum	
Z - zerospan			C - Calibration				AF - Analyzer Failure																						



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Fort Chipewyan - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	244	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: 244

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	19	3	1	0	2	1	4	4	7	5	16	13	61	45	25	38	244
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
<b>Totals</b>	19	3	1	0	2	1	4	4	7	5	16	13	61	45	25	38	244

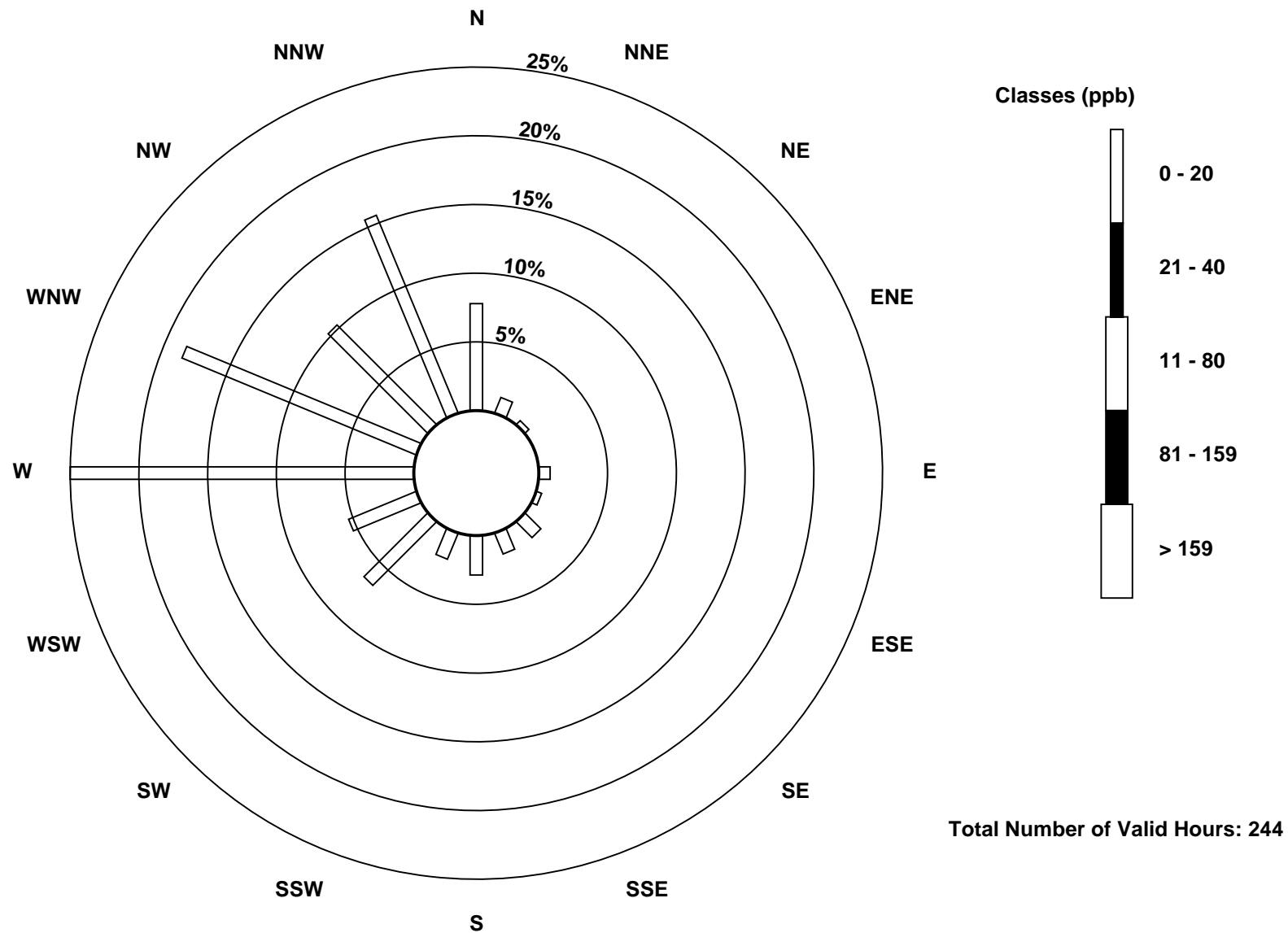
Total Number of Valid Hours: 244

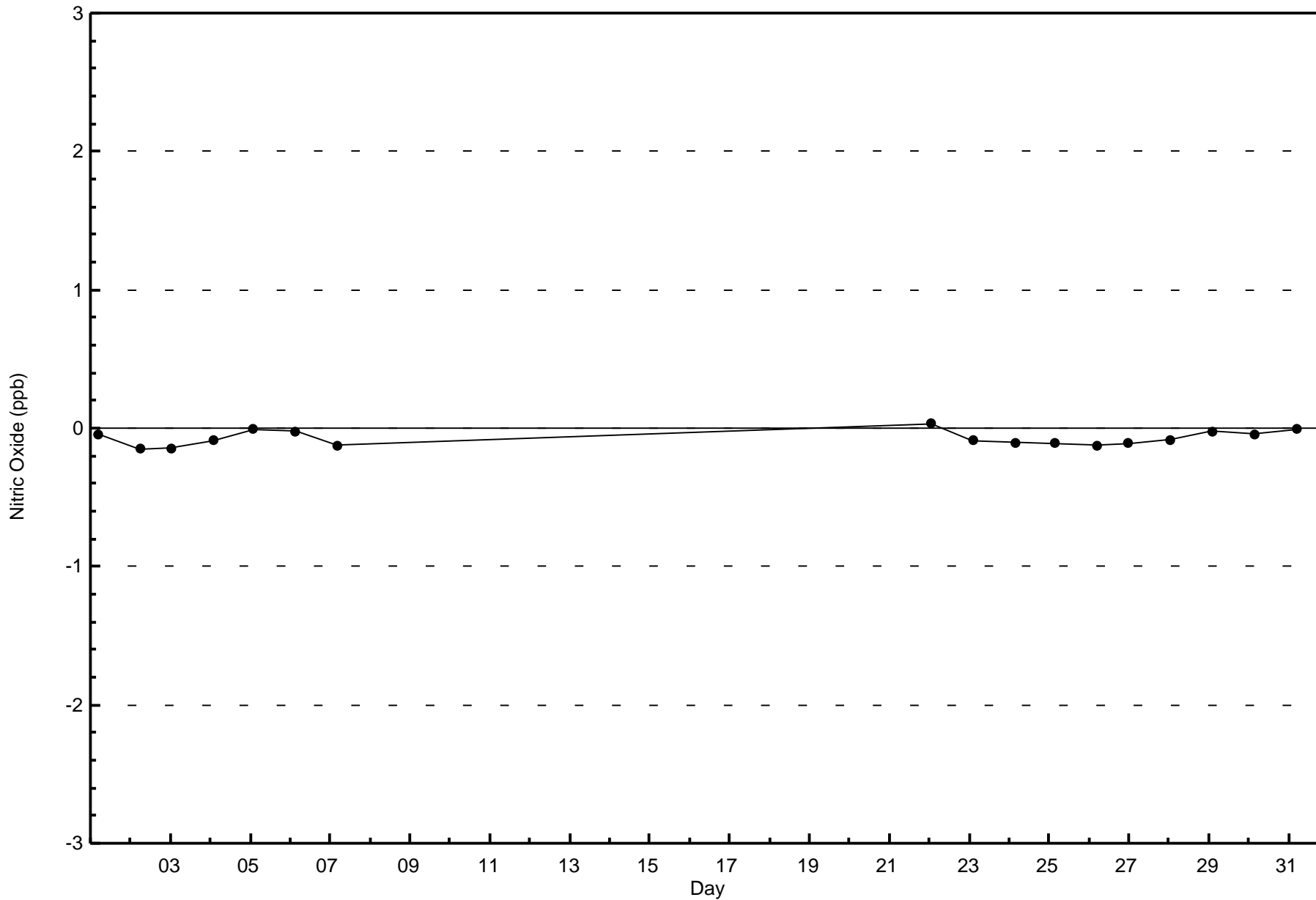
Total Number of Hours: 744

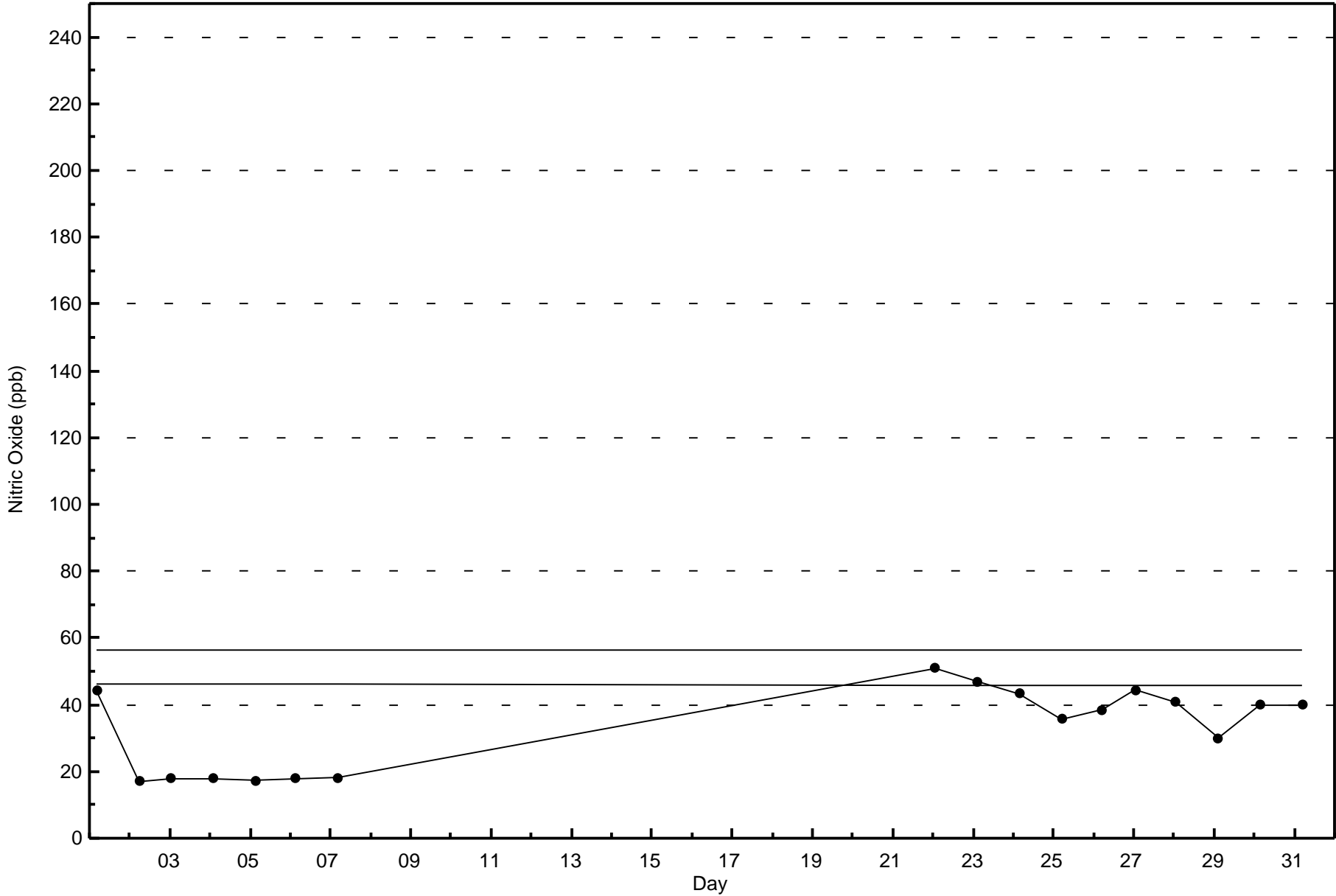


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Fort Chipewyan (AMS 8)









# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

## Fort Chipewyan - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 27 ppb on Dec 31 03:00	Maximum Daily Average: 11.4 ppb on Dec 31		Hours of Data:	244
Minimum Value: 0 ppb on Dec 21 16:00	Minimum Daily Average: 0.2 ppb on Dec 22		Hours of Missing Data:	500
Maximum Diurnal Average: 3.8 ppb at hour 4	Minimum Diurnal Average: 0.7 ppb at hour 12		Hours of Calibration:	15
Monthly Average: 2.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 6 P <sub>99</sub> = 26		Percent Operational Time:	34.8

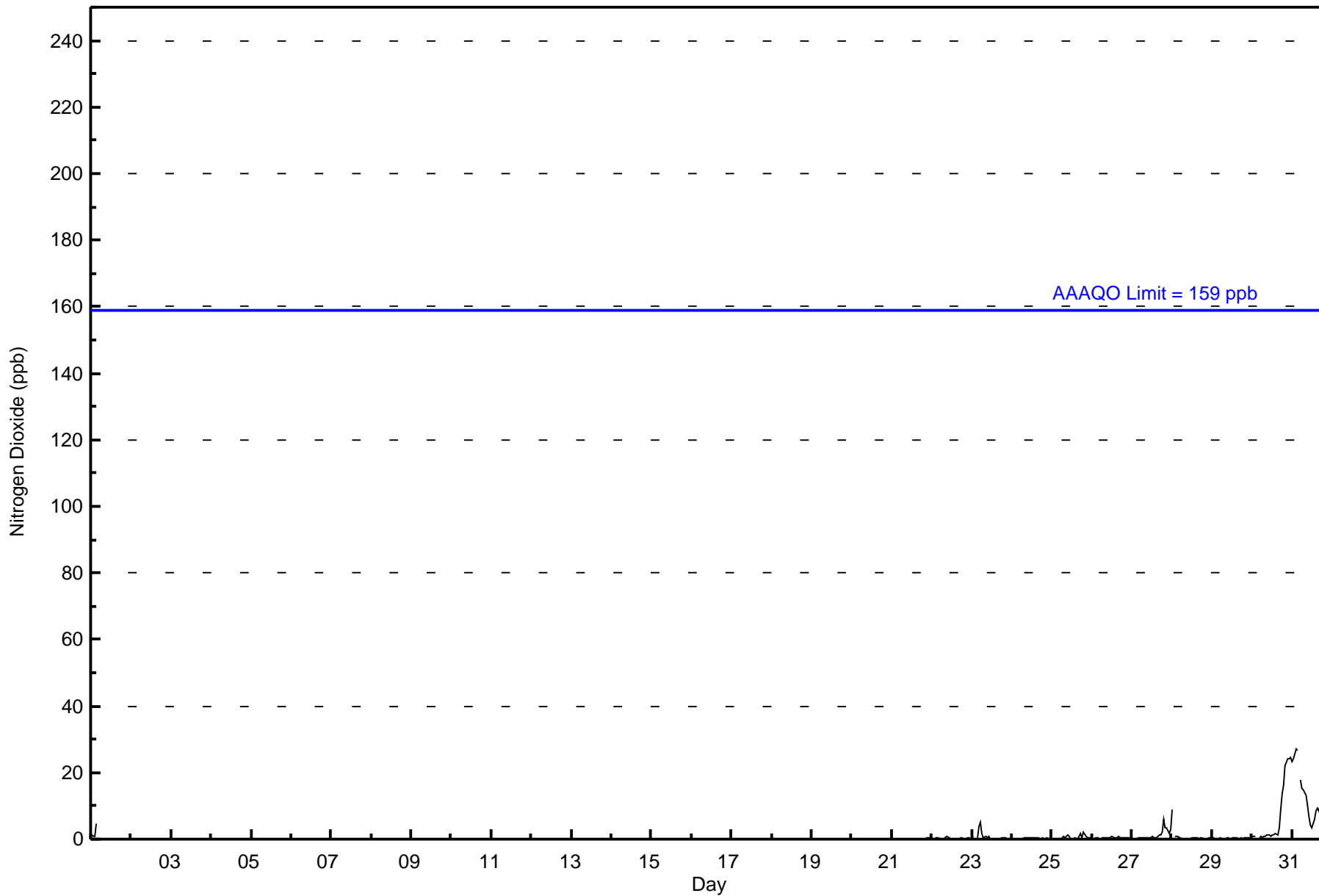
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	1	1	1	5	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	5																							
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
13-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
15-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
18-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
19-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	0																							
22-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1																						
23-Dec	0	1	Z	0	4	5	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	5																						
24-Dec	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	0.2	1																						
25-Dec	0	0	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	1	2	0	2	1	1	0	0	0	0.6	2																						
26-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0.4	1																						
27-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	2	6	3	4	2	3	1.2	6																							
28-Dec	9	Z	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0.7	9																							
29-Dec	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1																							
30-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	2	1	3	9	14	16	22	24	24	25	6.6	25																							
31-Dec	24	24	27	27	Z	18	15	15	13	10	7	4	4	6	8	9	8	10	8	6	5	4	4	5	11.4	27																							
																								3.7	3.0	3.4	3.8	0.8	2.8	2.0	1.8	1.7	1.6	1.2	0.7	0.8	0.9	1.2	1.2	1.4	2.2	2.4	3.0	2.9	3.1	2.9	3.2	Diurnal Average	
																								24	24	27	27	4	18	15	15	13	10	7	4	4	6	8	9	8	10	14	16	22	24	24	25	Diurnal Maximum	

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



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Chipewyan - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	236	96.72	96.72
21 - 40	8	3.28	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: 244

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

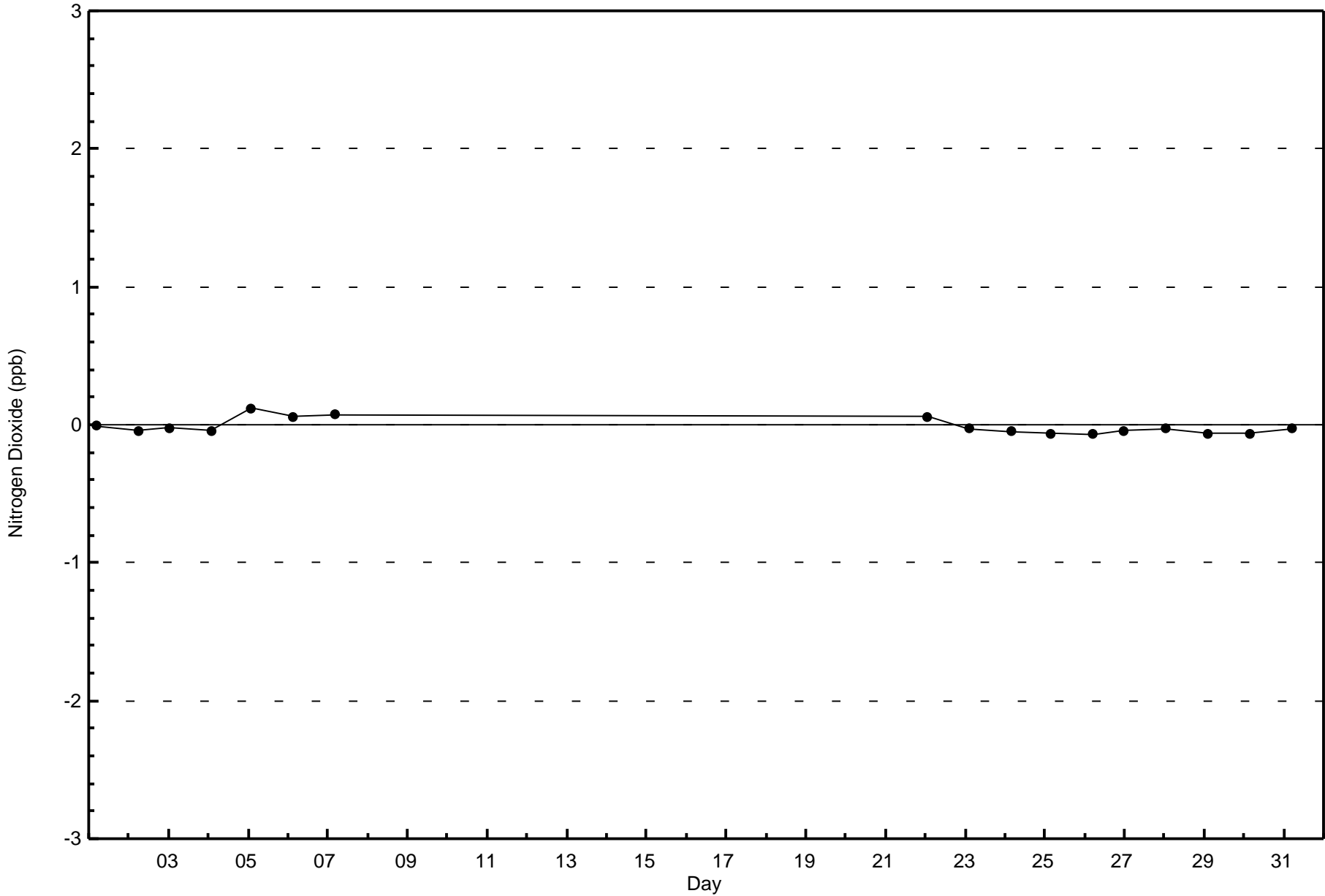
**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Chipewyan - December 2017**

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	3	1	0	2	1	2	3	6	3	14	13	61	45	25	38	236
21 - 40	0	0	0	0	0	0	2	1	1	2	2	0	0	0	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
<b>Totals</b>	19	3	1	0	2	1	4	4	7	5	16	13	61	45	25	38	244

Total Number of Valid Hours: 244

Total Number of Hours: 744

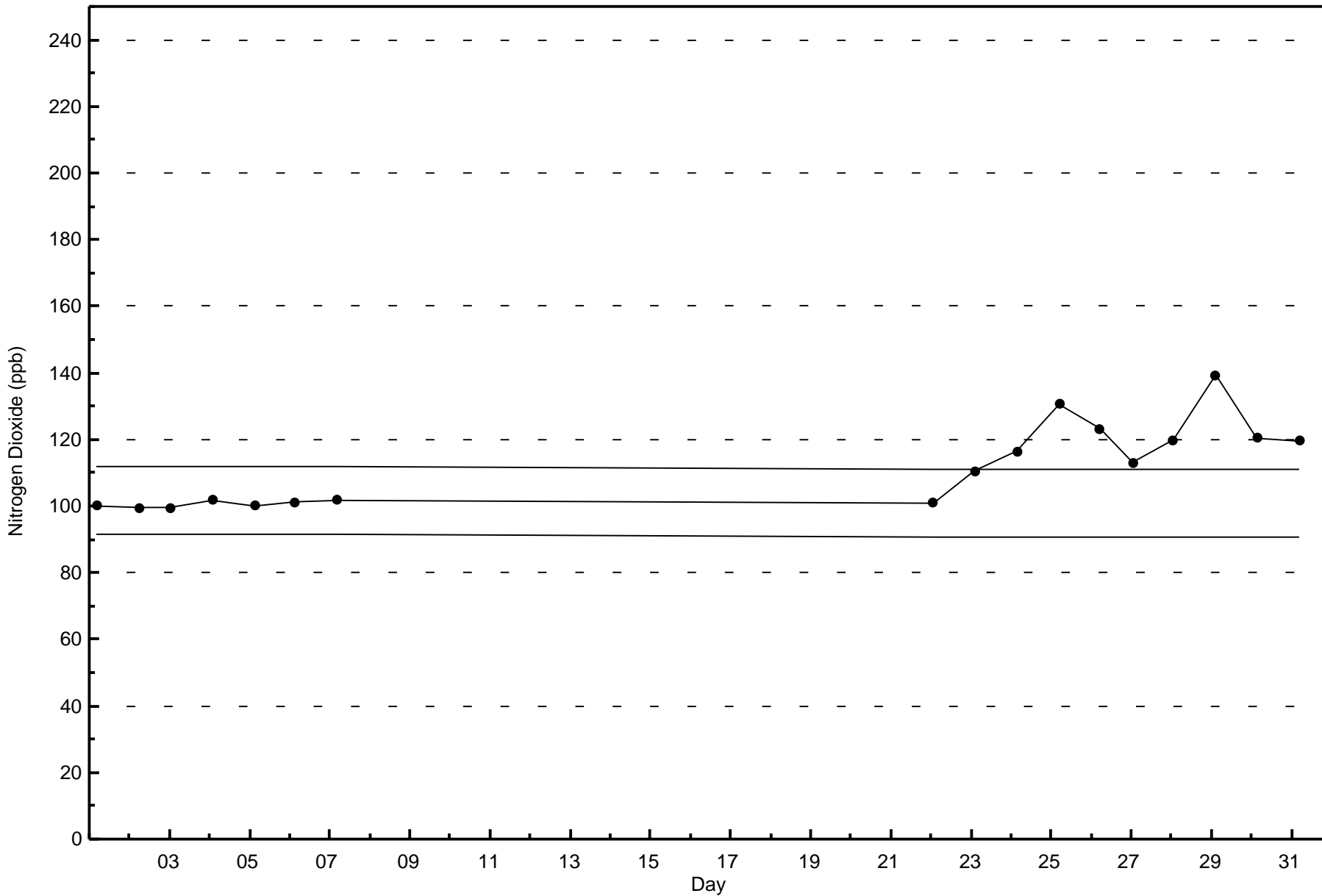






**Wood Buffalo Environmental Association**  
**Span Responses**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

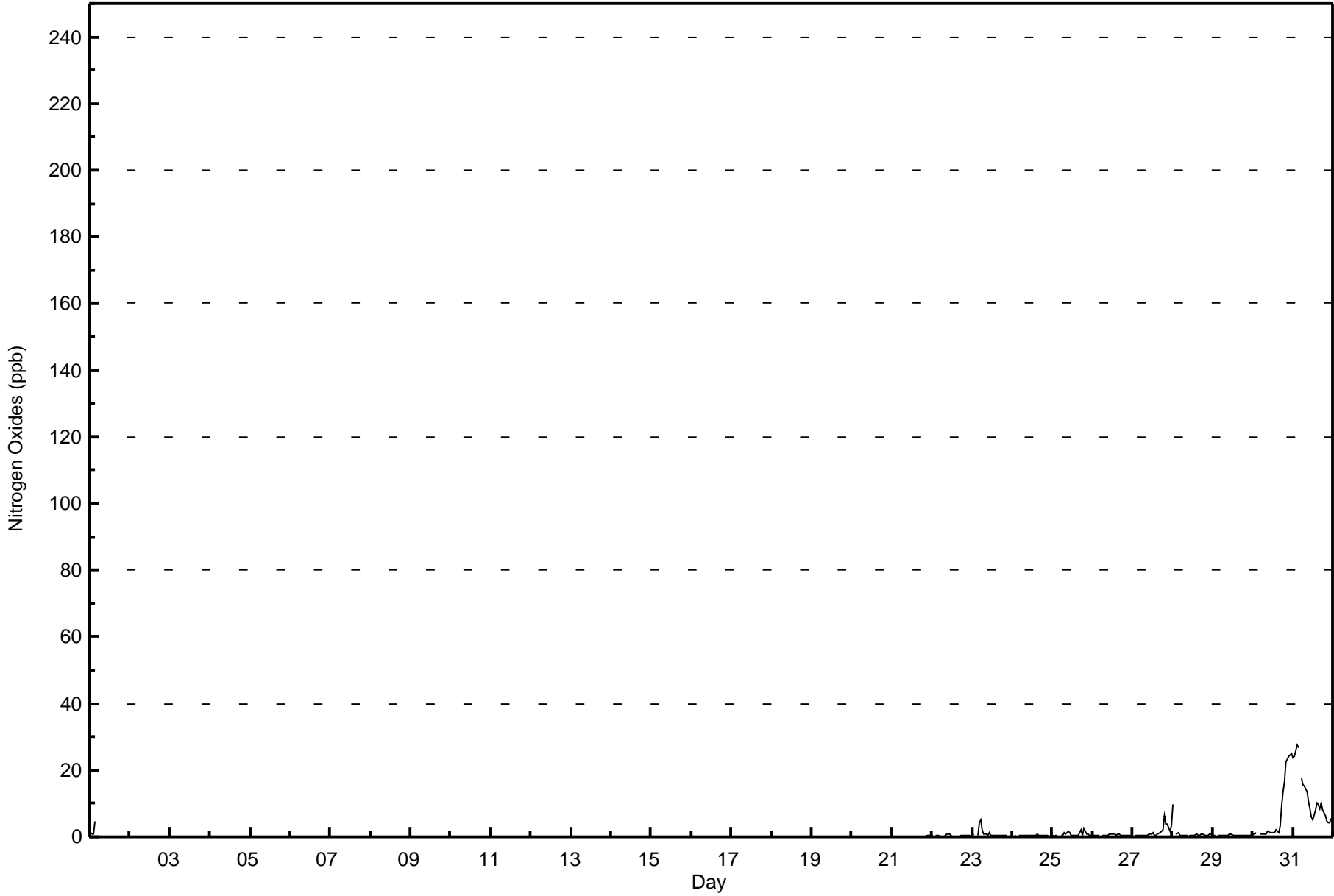
**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort Chipewyan - December 2017**

Maximum Value: 28 ppb on Dec 31 03:00														Maximum Daily Average: 12.0 ppb on Dec 31														Hours in Service: 744	
Minimum Value: 0 ppb on Dec 22 07:00														Minimum Daily Average: 0.3 ppb on Dec 22														Hours of Data: 244	
Maximum Diurnal Average: 3.9 ppb at hour 4														Minimum Diurnal Average: 0.9 ppb at hour 5														Hours of Missing Data: 500	
Monthly Average: 2.3 ppb														Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 8 P <sub>99</sub> = 26														Hours of Calibration: 15	
																												Percent Operational Time: 34.8	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	1	1	1	5	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	5			
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
9-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
10-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
13-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
15-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
18-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
19-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	0			
22-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1			
23-Dec	1	1	Z	1	4	5	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	5			
24-Dec	0	0	0	Z	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1			
25-Dec	0	0	0	0	Z	0	1	1	1	2	1	0	0	0	1	0	1	2	1	3	1	1	0	1	0.8	3			
26-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1			
27-Dec	Z	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	2	2	6	4	4	2	4	1.5	6			
28-Dec	10	Z	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1	0.9	10			
29-Dec	0	1	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	0	1	1	0.5	1			
30-Dec	1	1	1	Z	1	1	1	1	1	2	1	1	1	1	2	1	3	9	14	17	22	24	24	25	6.8	25			
31-Dec	24	24	28	27	Z	18	16	15	13	11	8	6	5	8	10	10	9	10	8	6	5	4	4	5	12.0	28			
3.8														3.2														Diurnal Average	
24														28														Diurnal Maximum	
Z - zerospan			C - Calibration						AF - Analyzer Failure																				



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	236	96.72	96.72
21 - 40	8	3.28	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: 244

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Chipewyan - December 2017**

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	3	1	0	2	1	2	3	6	3	14	13	61	45	25	38	236
21 - 40	0	0	0	0	0	0	2	1	1	2	2	0	0	0	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
<b>Totals</b>	19	3	1	0	2	1	4	4	7	5	16	13	61	45	25	38	244

Total Number of Valid Hours: 244

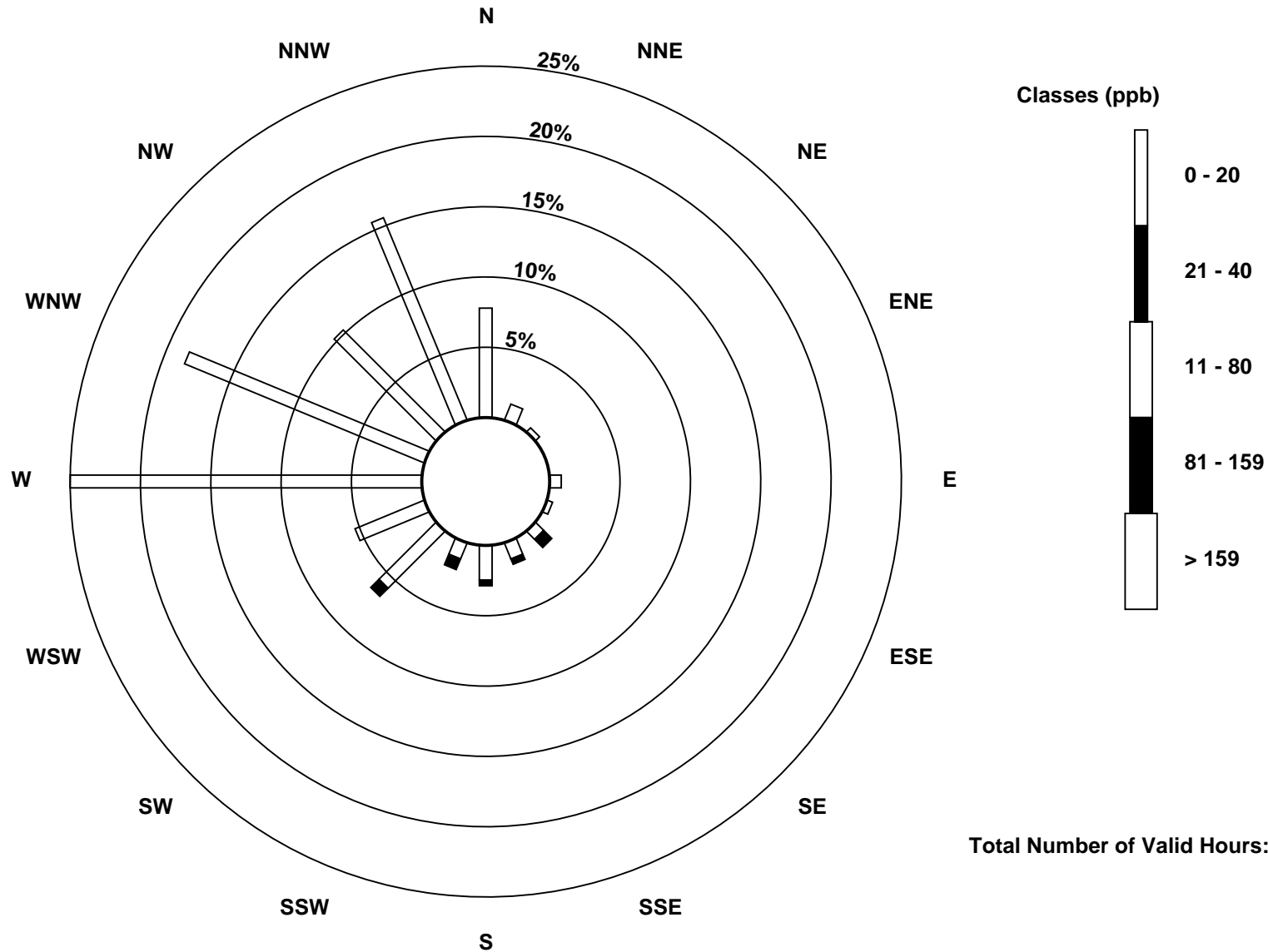
Total Number of Hours: 744

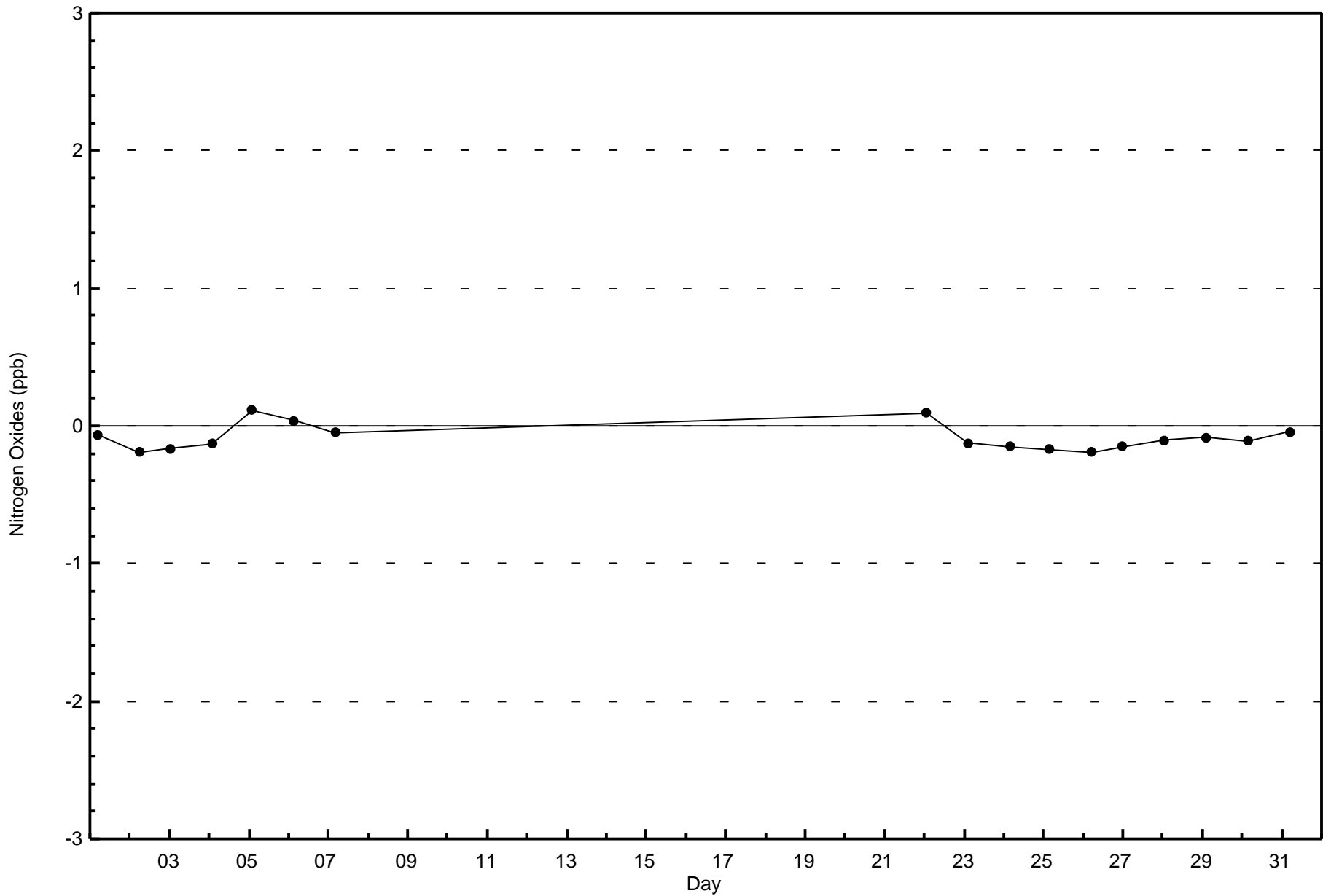


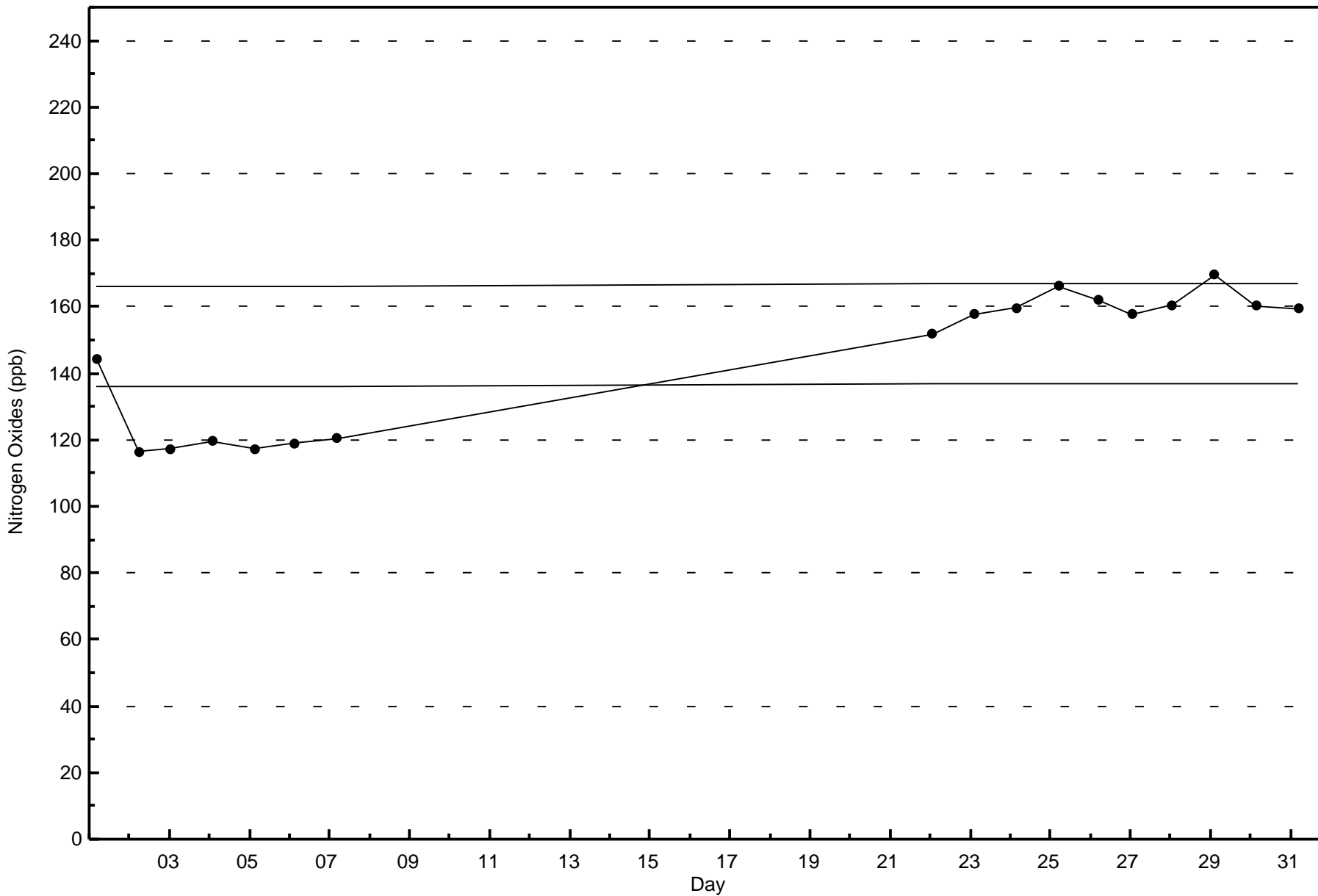


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Chipewyan (AMS 8)









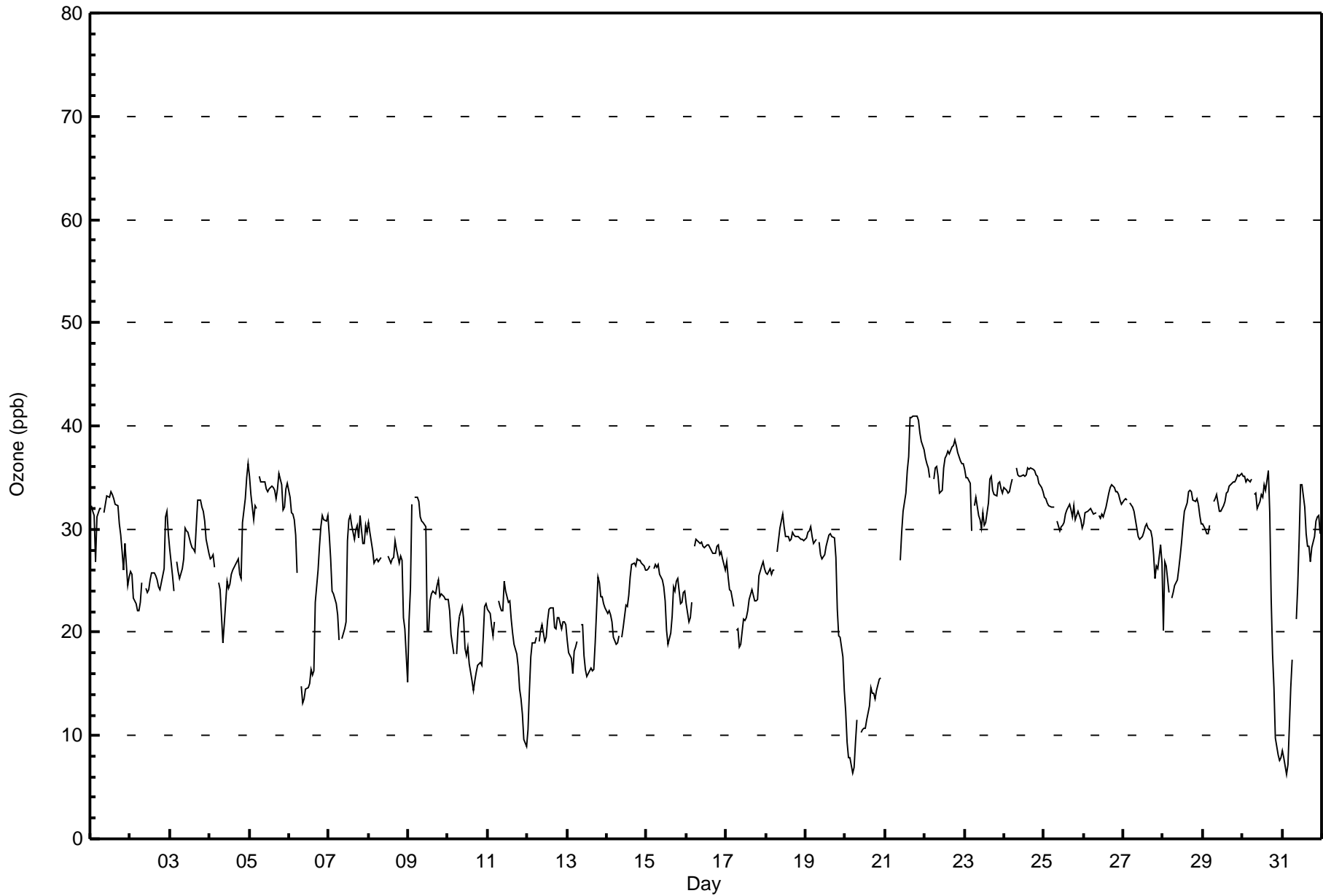
# Wood Buffalo Environmental Association

## Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

Fort Chipewyan - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 41 ppb on Dec 21 18:00										Maximum Daily Average: 36.4 ppb on Dec 22										Hours of Data: 700							
Minimum Value: 6 ppb on Dec 31 03:00										Minimum Daily Average: 11.4 ppb on Dec 20										Hours of Missing Data: 44							
Maximum Diurnal Average: 28.2 ppb at hour 17										Minimum Diurnal Average: 25.2 ppb at hour 4										Hours of Calibration: 33							
Monthly Average: 26.9 ppb										Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 18 Q <sub>1</sub> = 23 Median = 28 Q <sub>3</sub> = 32 P <sub>90</sub> = 35 P <sub>99</sub> = 39										Percent Operational Time: 98.5							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	32	32	31	27	31	32	32	Z	32	32	33	33	34	33	33	32	32	31	29	28	26	29	25	25	30.6	34	
2-Dec	26	26	23	23	22	22	23	25	Z	24	24	24	25	26	26	25	25	24	24	25	26	31	32	30	25.3	32	
3-Dec	28	26	24	Z	27	26	25	26	27	30	30	30	29	28	28	28	30	33	33	32	32	31	29	28	28.6	33	
4-Dec	27	27	28	26	Z	25	24	22	19	21	25	24	25	26	26	26	27	27	26	25	31	33	35	36	26.5	36	
5-Dec	35	33	31	32	32	Z	35	35	35	35	34	34	34	34	34	34	33	34	35	34	32	32	34	34	33.7	35	
6-Dec	33	32	31	31	29	26	Z	15	13	14	14	15	15	16	16	16	23	26	28	30	31	31	31	31	23.8	33	
7-Dec	29	27	24	24	23	22	19	Z	19	20	21	29	31	31	30	29	30	30	29	31	29	29	30	30	26.8	31	
8-Dec	31	30	28	27	27	27	27	27	Z	C	C	C	27	27	27	27	29	28	27	27	27	21	20	15	26.3	31	
9-Dec	21	24	32	Z	33	33	33	31	31	31	30	20	20	23	24	24	24	25	25	23	24	23	23	23	26.1	33	
10-Dec	23	22	20	18	Z	18	20	22	22	21	18	18	19	17	15	14	15	16	17	17	17	20	23	23	18.9	23	
11-Dec	22	22	21	20	21	Z	23	22	22	22	25	24	23	23	21	20	19	18	17	15	14	12	10	9	19.3	25	
12-Dec	11	14	18	19	19	20	Z	19	20	21	19	20	21	22	22	22	20	20	21	21	20	21	21	21	19.7	22	
13-Dec	19	18	17	16	18	19	19	Z	21	21	18	16	16	16	17	16	16	19	25	25	24	23	23	22	19.3	25	
14-Dec	22	22	22	21	20	19	19	20	Z	20	21	23	23	24	25	27	27	26	27	27	27	26	26	26	23.4	27	
15-Dec	26	26	26	Z	26	27	26	27	26	25	24	23	20	19	20	22	24	24	25	25	23	23	24	24	24.1	27	
16-Dec	23	21	21	23	Z	28	29	29	29	29	28	28	28	28	28	28	28	28	28	28	28	28	27	26	27.0	29	
17-Dec	27	25	24	24	22	Z	20	20	19	19	21	21	21	22	23	24	24	23	23	23	25	26	27	26	23.1	27	
18-Dec	26	26	26	26	26	26	Z	28	30	31	31	30	29	29	29	29	30	29	29	29	29	29	29	29	28.5	31	
19-Dec	29	30	30	30	29	29	29	Z	29	28	27	28	28	29	29	30	29	29	27	22	20	20	18	14	26.6	30	
20-Dec	12	9	8	8	6	7	9	11	Z	10	11	11	11	12	13	15	14	14	14	14	15	16	AF	AF	11.4	16	
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	27	30	32	34	36	37	41	41	41	41	41	40	39	39	38	--	41	
22-Dec	37	36	36	35	Z	35	36	36	35	33	34	36	37	37	38	37	38	38	39	38	37	37	36	36	36.4	39	
23-Dec	36	35	35	34	30	Z	32	33	31	31	30	32	30	31	33	35	35	34	33	33	34	35	34	34	33.0	36	
24-Dec	34	34	34	34	34	35	Z	36	35	35	35	35	35	36	36	36	36	36	36	35	35	34	34	34	34.9	36	
25-Dec	33	33	33	32	32	32	32	Z	31	30	30	30	31	31	32	32	32	31	32	31	32	31	31	30	31.5	33	
26-Dec	30	32	32	32	32	32	31	32	Z	31	31	31	31	32	33	34	34	34	34	34	34	34	33	33	32	32.4	34
27-Dec	33	33	33	Z	33	32	32	31	30	29	29	29	30	30	30	30	30	29	27	25	26	26	28	27	29.7	33	
28-Dec	20	27	26	24	Z	23	24	25	25	26	27	29	30	32	33	34	34	34	33	33	33	32	31	31	28.9	34	
29-Dec	30	30	30	30	30	Z	33	33	33	33	32	32	32	33	33	34	34	34	35	35	35	35	35	35	32.8	35	
30-Dec	35	35	35	35	35	35	Z	33	34	32	33	33	33	34	34	36	32	23	18	15	10	8	8	8	27.5	36	
31-Dec	9	8	6	7	11	15	17	Z	21	25	29	34	34	32	30	28	28	27	28	29	31	31	31	30	23.6	34	
26.7 26.5 26.1 25.2 26.0 25.7 26.0 26.5 26.7 26.2 26.5 26.8 27.0 27.4 27.6 27.9 28.2 28.0 28.0 27.5 27.3 27.3 27.5 26.9																								Diurnal Average			
37 36 36 35 35 35 36 36 35 35 35 36 37 37 38 41 41 41 41 41 41 40 39 39 38																								Diurnal Maximum			
Z - zerospan C - Calibration AF - Analyzer Failure																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	122	17.43	17.43
21 - 50	578	82.57	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	3	3	3	4	27	29	10	1	3	3	5	3	6	7	9	6	122
21 - 50	25	12	6	21	67	20	7	6	17	6	17	21	98	111	87	56	577
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
<b>Totals</b>	28	15	9	25	94	49	17	7	20	9	22	24	104	118	96	62	699

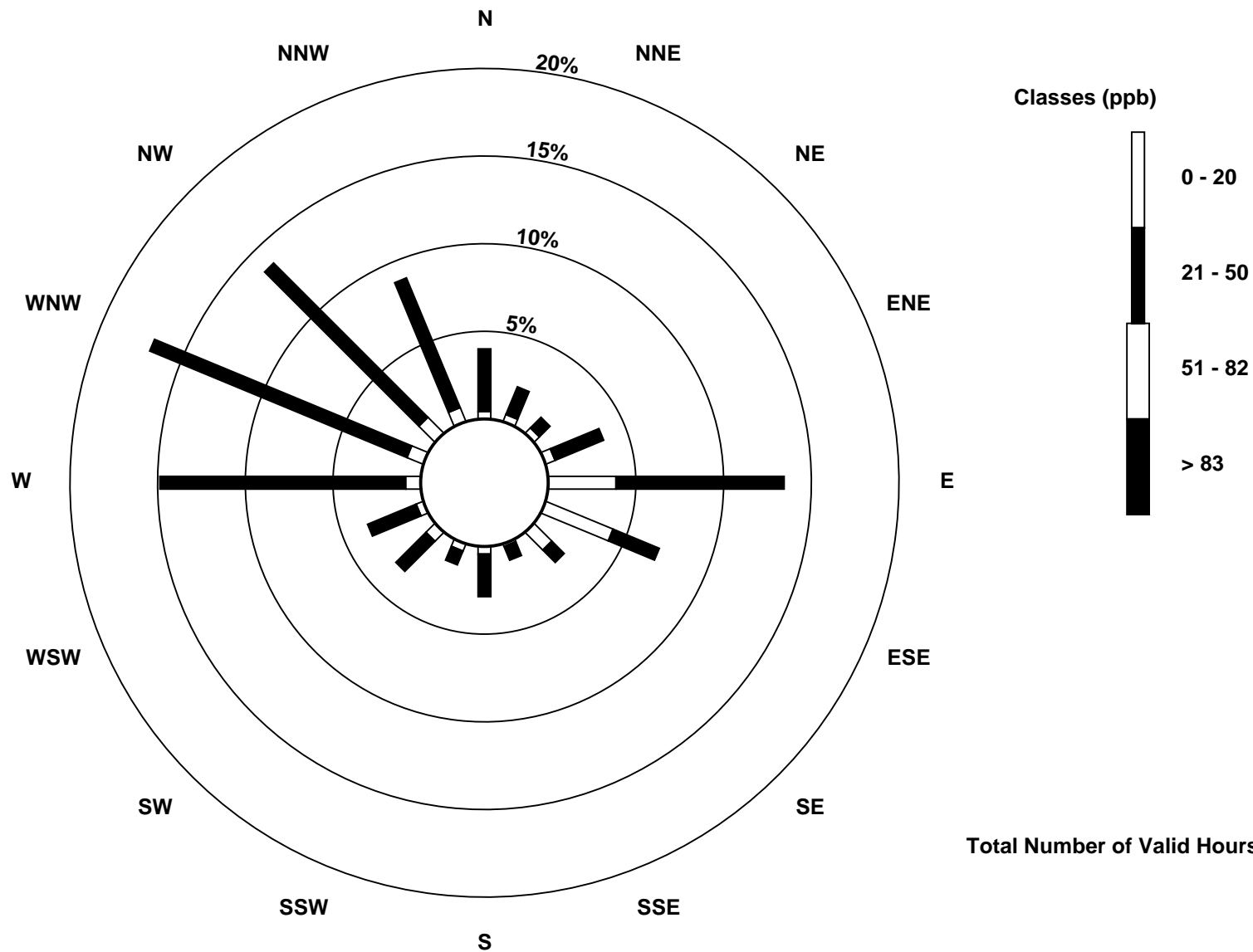
Total Number of Valid Hours: 699

Total Number of Hours: 744

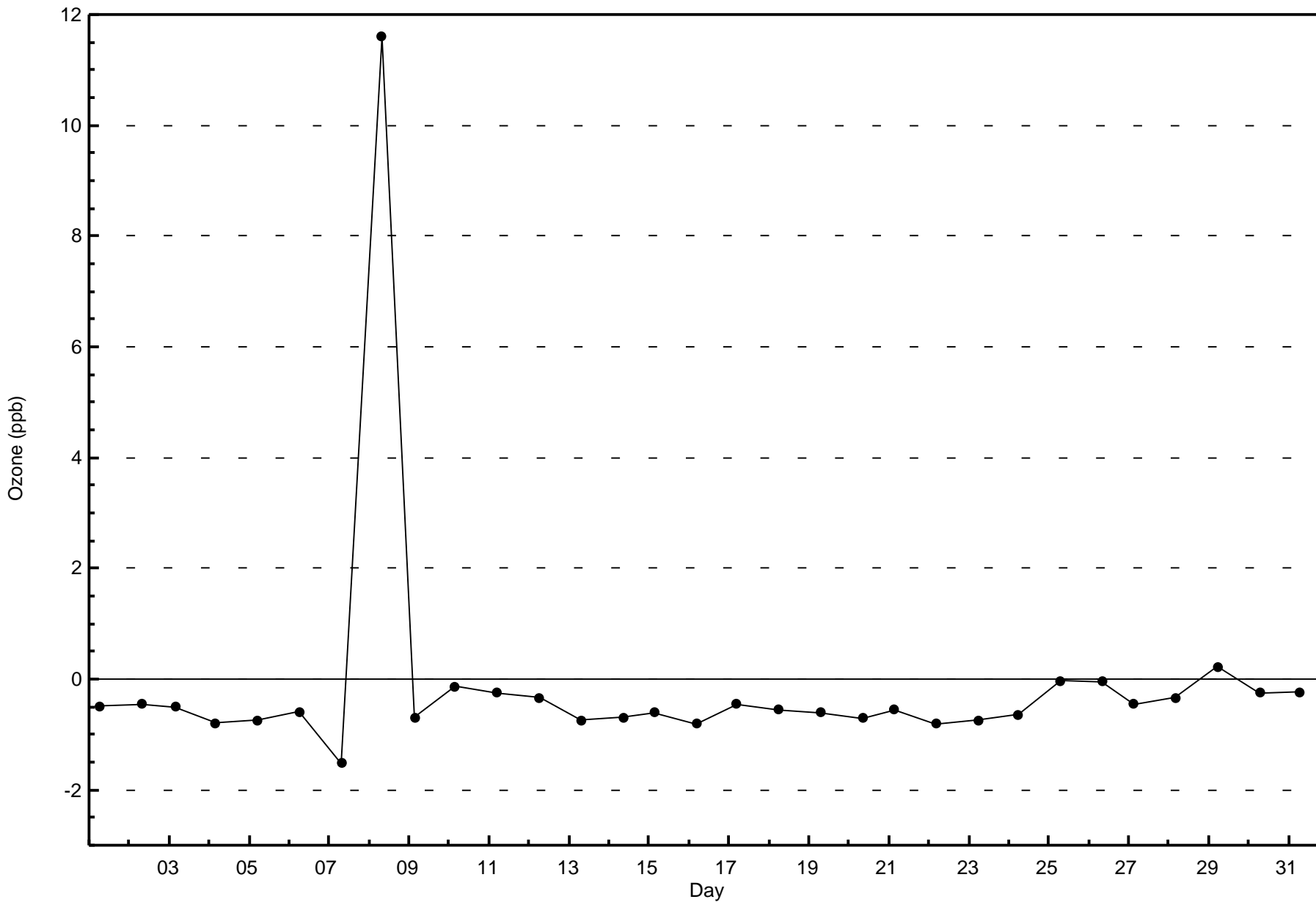


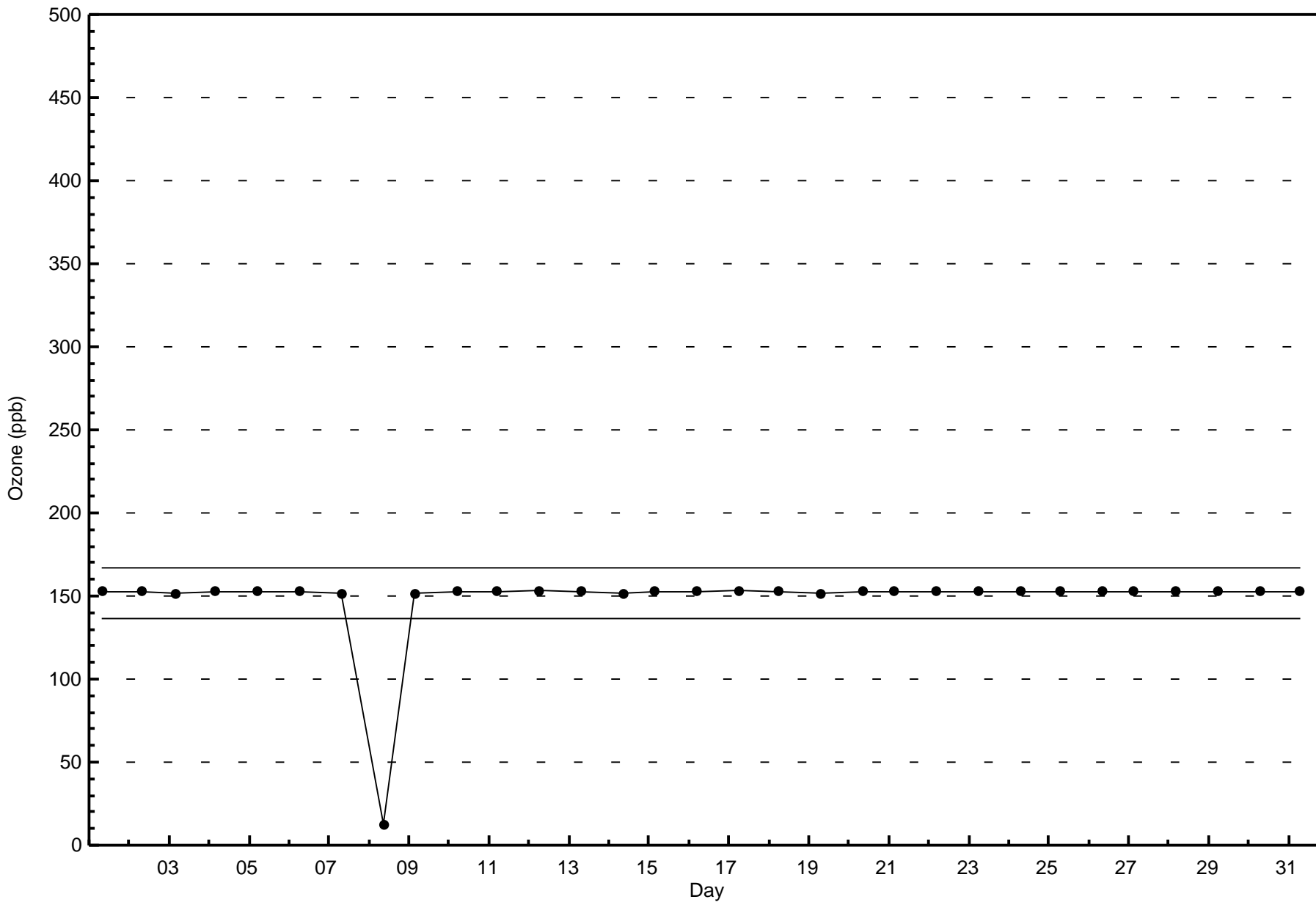
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Fort Chipewyan (AMS 8)









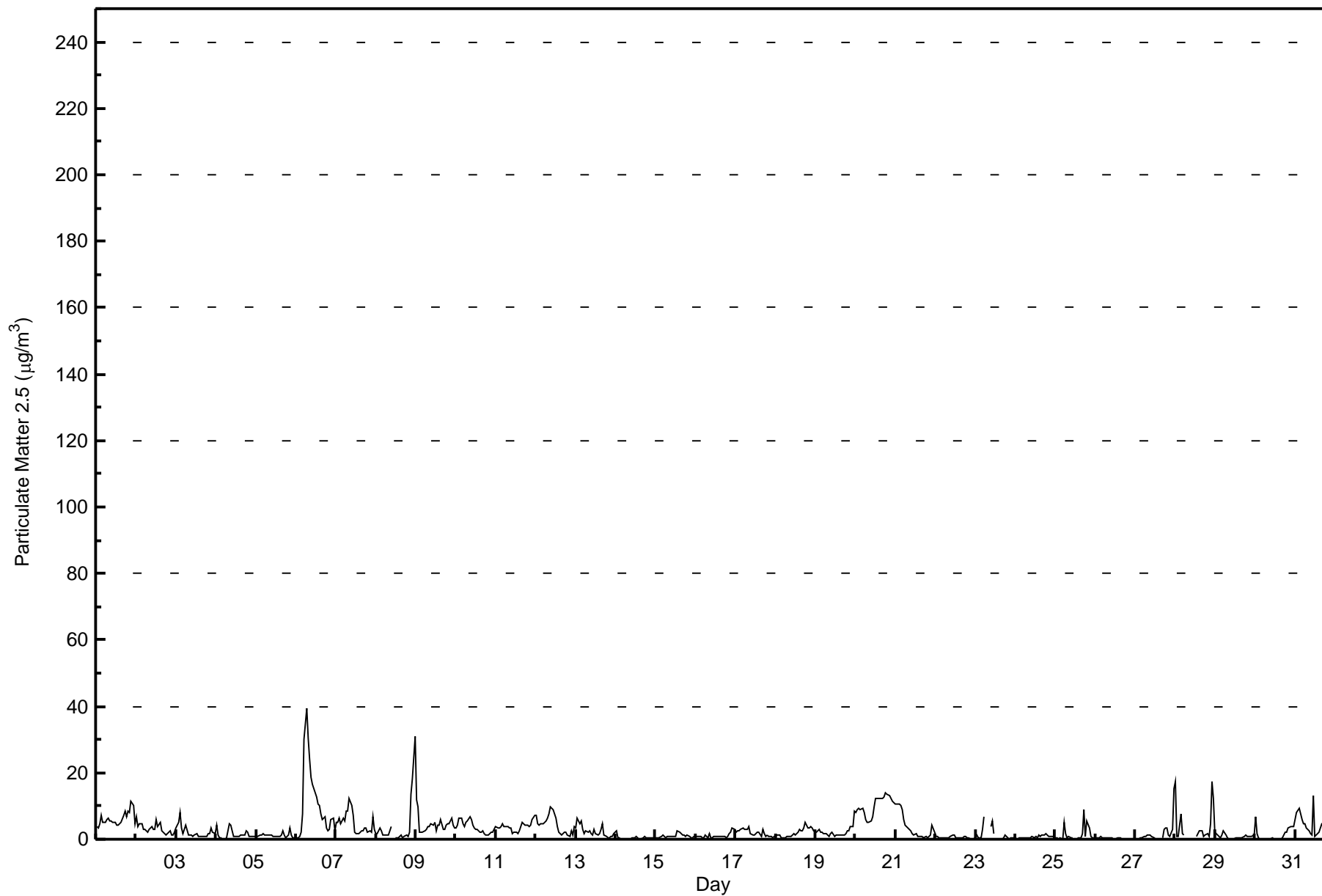


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 39.2 µg/m <sup>3</sup> on Dec 6 07:00 Minimum Value: 0.0 µg/m <sup>3</sup> on Dec 23 15:00 Maximum Diurnal Average: 4.2 µg/m <sup>3</sup> at hour 24 Monthly Average: 2.99 µg/m <sup>3</sup>		Maximum Daily Average: 10.9 µg/m <sup>3</sup> on Dec 6 Minimum Daily Average: 0.3 µg/m <sup>3</sup> on Dec 26 Minimum Diurnal Average: 2.2 µg/m <sup>3</sup> at hour 15 Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.3 Q <sub>1</sub> = 0.7 Median = 1.6 Q <sub>3</sub> = 3.9 P <sub>90</sub> = 6.9 P <sub>99</sub> = 18.2		Hours in Service: 744 Hours of Data: 720 Hours of Missing Data: 24 Hours of Calibration: 2 Percent Operational Time: 97.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	4.0	3.4	4.9	7.1	5.0	5.0	6.1	6.2	5.5	5.4	5.3	5.2	4.2	4.3	4.7	5.3	7.3	8.4	6.8	8.4	8.1	11.3	10.3	4.5	6.1	11.3	
2-Dec	6.8	3.8	4.6	4.5	3.2	2.9	2.4	2.0	3.0	3.9	3.2	2.8	6.1	3.8	4.9	2.7	2.1	1.8	1.3	1.8	2.4	1.2	1.3	2.3	3.1	6.8	
3-Dec	3.3	5.1	7.9	3.3	1.7	3.1	4.1	1.5	1.3	1.1	0.8	1.3	1.5	0.8	0.8	0.6	0.8	1.1	0.7	1.8	1.6	3.5	2.1	1.8	2.2	7.9	
4-Dec	4.2	1.1	0.5	0.2	0.1	0.1	0.4	2.3	4.6	4.3	0.6	0.7	0.7	0.9	1.0	1.2	1.2	1.4	2.5	2.2	1.0	0.9	0.7	0.7	1.4	4.6	
5-Dec	0.8	1.0	1.3	1.3	1.6	1.3	1.1	1.3	1.2	1.1	1.0	1.0	1.0	1.0	0.8	1.2	2.4	1.2	0.6	1.4	3.4	1.3	0.4	0.4	1.2	3.4	
6-Dec	0.5	0.5	1.0	2.0	7.6	30.2	39.2	30.6	24.0	18.7	16.3	13.9	12.6	10.6	10.0	7.6	5.9	7.0	3.3	2.7	3.1	6.0	6.2	2.7	10.9	39.2	
7-Dec	5.2	5.2	6.3	4.7	6.3	5.4	8.7	8.4	12.4	10.1	7.4	2.2	1.7	1.8	1.8	2.4	2.5	3.5	3.6	2.2	2.4	2.1	7.0	3.0	4.8	12.4	
8-Dec	1.6	1.5	3.5	2.5	1.4	1.2	1.3	1.3	2.5	3.9	C	C	0.5	0.5	0.9	1.1	0.6	1.0	1.3	0.9	2.2	13.4	18.4	31.0	4.2	31.0	
9-Dec	11.7	9.7	2.3	2.1	2.3	2.5	3.0	3.7	4.0	4.5	4.2	5.0	2.6	4.3	4.1	5.8	3.2	3.1	4.2	4.6	4.6	6.4	4.3	3.5	4.4	11.7	
10-Dec	3.3	4.4	6.2	6.3	4.7	4.0	5.3	5.7	7.0	6.1	4.3	3.5	2.9	2.9	2.2	2.3	2.5	1.6	1.3	1.2	1.9	2.1	2.2	3.1	3.6	7.0	
11-Dec	3.8	3.5	3.4	3.8	4.6	3.7	4.0	3.9	3.4	3.3	1.8	1.9	2.0	1.9	2.7	4.0	5.1	4.4	4.2	4.3	3.8	4.1	6.1	7.3	3.8	7.3	
12-Dec	7.4	4.7	4.2	4.6	4.7	5.0	5.5	6.3	7.8	9.6	8.7	7.7	6.2	4.0	2.1	1.1	1.6	2.0	2.1	1.2	1.0	2.7	1.4	3.9	4.4	9.6	
13-Dec	3.3	6.5	4.7	5.4	3.1	1.8	2.7	2.0	2.7	1.9	1.2	3.1	1.5	1.2	1.5	3.1	4.5	1.2	0.9	0.5	0.5	0.9	0.9	1.9	2.4	6.5	
14-Dec	2.4	0.4	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.7	0.3	0.2	0.2	0.4	0.7	0.5	0.4	0.4	0.3	0.3	0.6	0.4	2.4	
15-Dec	0.5	0.5	0.5	0.8	1.2	1.0	0.6	0.9	0.9	1.0	0.9	0.9	0.8	2.3	2.2	1.5	1.1	1.3	0.7	1.3	0.7	0.3	0.5	0.6	1.0	2.3	
16-Dec	0.9	0.8	0.8	0.9	0.6	0.6	1.2	0.5	1.5	0.6	0.5	0.7	0.9	0.8	1.0	1.0	0.9	0.6	0.5	0.8	1.7	2.2	3.3	3.0	1.1	3.3	
17-Dec	2.2	2.4	2.7	2.8	3.2	3.1	3.0	3.1	3.9	1.8	1.2	1.3	1.8	1.9	1.9	1.0	2.9	1.7	0.6	1.4	0.8	0.7	0.5	0.6	1.9	3.9	
18-Dec	0.9	1.4	1.4	0.5	0.4	0.4	0.3	0.7	0.7	0.8	1.4	1.7	1.5	2.1	2.8	2.3	2.4	3.4	5.2	3.2	3.5	3.9	3.3	2.6	1.9	5.2	
19-Dec	2.1	2.4	2.9	2.0	1.9	1.9	1.7	1.3	0.9	1.6	2.0	0.9	1.4	1.3	1.4	1.4	1.5	1.5	1.9	2.3	2.6	3.7	3.9	8.3	2.2	8.3	
20-Dec	8.0	8.8	9.5	9.0	9.3	8.0	5.8	5.2	5.2	5.5	6.7	9.8	12.2	12.4	12.2	12.1	12.1	12.7	14.0	13.8	13.2	12.2	11.2	11.1	10.0	14.0	
21-Dec	10.7	10.6	10.7	10.2	8.8	6.0	4.1	3.3	2.8	2.4	1.9	1.4	1.5	0.9	0.8	0.7	0.7	0.6	0.6	0.6	1.0	1.2	4.0	2.1	3.7	10.7	
22-Dec	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.5	0.4	0.7	1.1	1.1	0.3	0.4	0.5	0.4	0.5	1.0	1.0	0.4	0.3	0.2	0.1	0.1	0.5	1.1	
23-Dec	0.9	1.3	0.6	0.5	2.9	6.7	UO	UO	UO	4.0	5.5	1.6	UO	UO	0.0	0.1	0.1	0.5	1.2	0.6	0.2	0.3	0.3	0.3	1.5	6.7	
24-Dec	0.3	0.2	0.4	0.5	0.4	0.4	0.5	0.6	0.5	0.4	0.7	0.5	0.7	0.6	1.1	0.8	1.1	1.3	1.9	1.3	0.7	0.7	0.8	0.3	0.7	1.9	
25-Dec	0.6	0.2	0.1	0.2	0.2	5.0	1.5	0.6	0.8	0.3	0.3	UO	UO	0.1	0.2	0.5	0.4	1.8	9.1	0.8	5.7	3.4	0.7	0.4	0.4	1.4	9.1
26-Dec	0.5	0.5	0.6	0.8	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	UO	0.0	0.0	0.3	0.8	
27-Dec	0.1	0.2	0.2	0.3	0.5	0.8	0.9	1.2	1.4	1.1	0.7	0.3	0.2	0.0	0.0	UO	0.2	2.9	3.3	3.3	1.1	0.8	3.1	15.3	1.6	15.3	
28-Dec	17.2	0.8	0.7	7.8	1.6	1.2	UO	UO	UO	UO	UO	UO	UO	0.9	2.5	2.7	2.5	1.0	1.2	1.9	1.0	4.7	17.5	12.2	--	17.5	
29-Dec	2.3	1.2	0.9	0.6	1.1	2.7	1.1	0.3	0.2	UO	0.0	0.1	0.3	0.4	0.5	0.4	0.4	0.9	1.2	1.0	0.8	0.8	1.0	1.2	0.8	2.7	
30-Dec	6.7	1.5	0.3	0.0	UO	UO	UO	0.2	UO	0.1	0.3	0.1	UO	UO	0.1	0.0	0.3	1.2	2.0	2.2	3.2	3.7	3.9	3.9	1.7	6.7	
31-Dec	5.8	8.2	9.3	7.7	6.0	4.5	4.8	3.5	2.6	1.9	1.4	13.3	0.7	1.7	2.2	3.3	4.5	4.9	4.7	4.4	2.9	2.3	1.9	2.1	4.4	13.3	
																								Diurnal Average			
																								Diurnal Maximum			
3.8 3.0 3.0 3.0 2.8 3.6 3.9 3.4 3.6 3.3 2.8 2.9 2.4 2.2 2.2 2.2 2.4 2.7 2.4 2.5 2.4 3.2 3.8 4.2 17.2 10.6 10.7 10.2 9.3 30.2 39.2 30.6 24.0 18.7 16.3 13.9 12.6 12.4 12.2 12.1 12.1 12.7 14.0 13.8 13.2 13.4 18.4 31.0																											
C - Calibration      UO - Unstable Operation Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort Chipewyan - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	358	49.72	49.72
6 - 15	95	13.19	62.92
16 - 25	6	0.83	63.75
26 - 80	4	0.56	64.31
> 81.0	0	0.00	64.31

Total Number of Valid Hours: 720

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Chipewyan - December 2017**

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	5	8	5	11	54	22	8	4	14	6	17	13	37	65	62	26	357
6 - 15	2	2	3	2	18	23	3	2	1	3	1	3	8	12	9	3	95
16 - 25	1	0	0	0	2	1	1	0	0	0	0	0	0	0	1	0	6
26 - 80	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	4
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	8	10	8	13	75	46	15	6	15	9	18	16	45	77	72	29	462

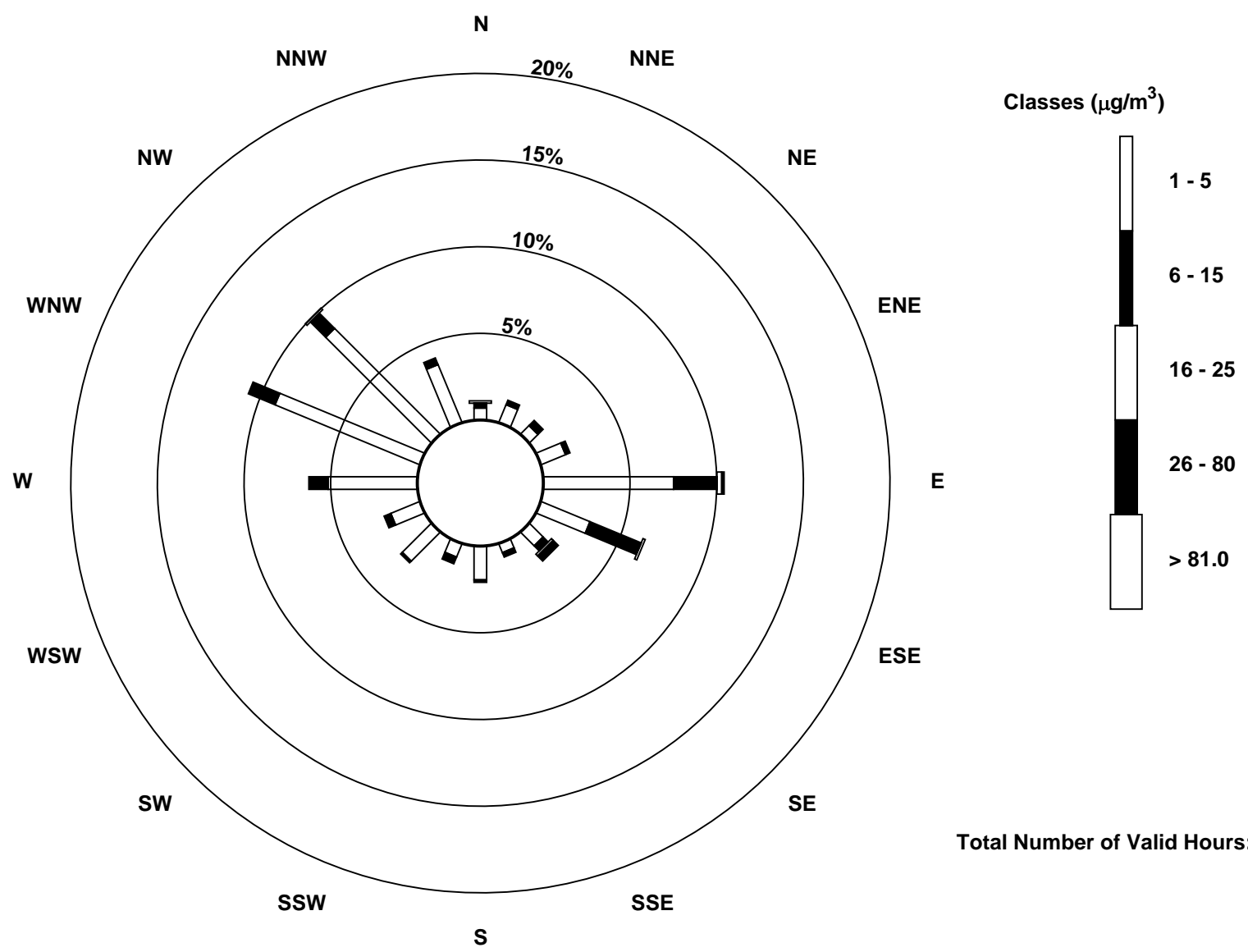
Total Number of Valid Hours: 719

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

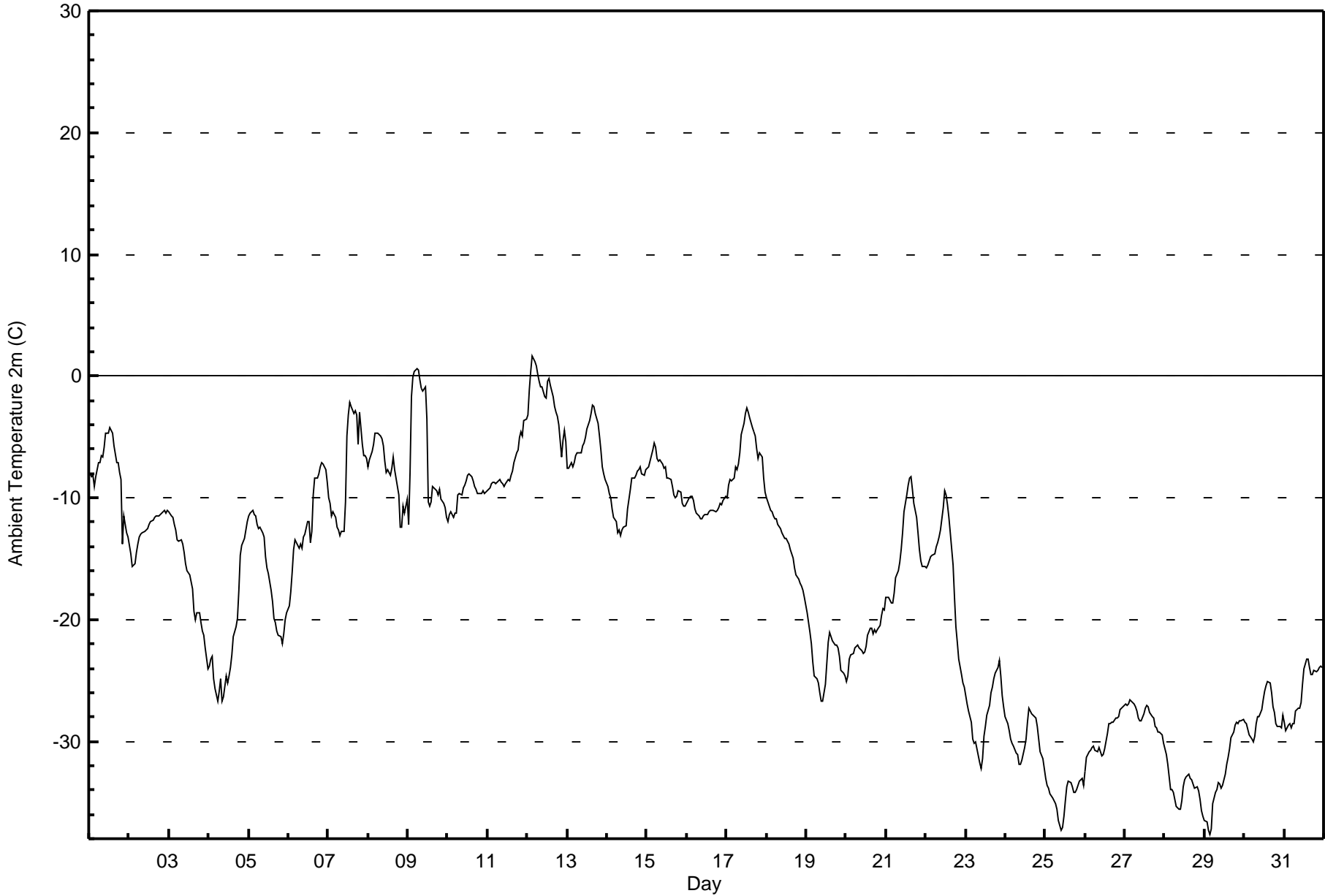
Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort Chipewyan (AMS 8)





Maximum Value: 1.6 C on Dec 12 04:00      Maximum Daily Average: -1.8 C on Dec 12																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: -37.6 C on Dec 29 04:00      Minimum Daily Average: -34.4 C on Dec 25 Maximum Diurnal Average: -15.9 C at hour 15      Minimum Diurnal Average: -17.8 C at hour 24 Monthly Average: -16.99 C      Percentiles: P <sub>1</sub> = -36.5 P <sub>10</sub> = -31.0 Q <sub>1</sub> = -26.7 Median = -13.5 Q <sub>3</sub> = -8.7 P <sub>90</sub> = -5.5 P <sub>99</sub> = 0.4																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-8.1	-8.3	-8.1	-9.1	-8.2	-7.1	-7.1	-6.6	-6.6	-5.9	-4.7	-4.7	-4.2	-4.5	-4.7	-5.7	-7.1	-7.1	-7.9	-8.5	-13.8	-11.5	-12.8	-13.2	-7.7	-4.2
2-Dec	-13.9	-14.7	-15.7	-15.4	-14.5	-13.8	-13.2	-13.0	-12.9	-12.8	-12.7	-12.6	-12.2	-11.9	-11.8	-11.7	-11.5	-11.5	-11.5	-11.4	-11.1	-11.0	-11.3	-11.0	-12.6	-11.0
3-Dec	-11.1	-11.5	-11.6	-12.2	-12.6	-13.5	-13.5	-13.5	-13.8	-14.5	-15.4	-16.0	-16.3	-17.0	-17.5	-19.3	-20.1	-19.4	-19.4	-20.3	-21.0	-21.3	-22.3	-24.0	-16.5	-11.1
4-Dec	-23.8	-23.3	-23.0	-24.9	-25.7	-26.7	-25.9	-24.9	-26.7	-26.4	-24.7	-25.2	-24.6	-23.9	-22.8	-21.4	-20.5	-19.9	-17.6	-14.7	-13.9	-13.3	-12.6	-12.0	-21.6	-12.0
5-Dec	-11.5	-11.3	-11.1	-11.3	-11.5	-12.2	-12.5	-12.5	-12.8	-13.3	-14.8	-15.8	-16.2	-17.7	-18.6	-19.9	-20.2	-21.0	-21.3	-21.4	-21.9	-21.2	-20.0	-19.5	-16.2	-11.1
6-Dec	-18.8	-17.8	-16.1	-14.3	-13.5	-13.7	-14.2	-13.8	-14.1	-13.3	-13.0	-11.9	-12.0	-13.7	-12.7	-9.8	-8.4	-8.4	-8.1	-7.5	-7.1	-7.2	-7.7	-8.7	-11.9	-7.1
7-Dec	-10.0	-10.5	-11.5	-11.1	-11.6	-12.4	-12.7	-13.1	-12.8	-12.7	-10.3	-4.9	-3.2	-2.1	-2.4	-3.1	-2.8	-3.2	-5.6	-3.0	-5.6	-6.5	-6.5	-6.7	-7.7	-2.1
8-Dec	-7.4	-6.9	-6.2	-5.7	-4.7	-4.7	-4.7	-4.9	-5.1	-5.7	-6.9	-7.9	-7.7	-8.1	-7.6	-6.6	-7.7	-8.3	-9.8	-12.4	-12.4	-10.7	-11.3	-10.1	-7.6	-4.7
9-Dec	-12.1	-7.9	-1.7	-0.1	0.4	0.6	0.5	-0.3	-1.0	-1.2	-0.8	-3.6	-10.4	-10.7	-10.3	-9.1	-9.3	-9.4	-9.7	-9.3	-10.1	-10.5	-10.8	-11.6	-6.2	0.6
10-Dec	-12.0	-11.4	-11.2	-11.6	-11.3	-11.3	-9.8	-9.6	-9.7	-9.2	-8.9	-8.6	-8.1	-8.1	-8.2	-8.7	-9.1	-9.3	-9.6	-9.7	-9.7	-9.5	-9.6	-9.5	-9.7	-8.1
11-Dec	-9.5	-9.2	-8.9	-8.7	-8.7	-8.9	-8.7	-8.5	-8.7	-8.8	-9.1	-8.8	-8.5	-8.6	-8.2	-7.8	-7.1	-6.3	-6.1	-5.0	-4.6	-4.9	-3.7	-3.6	-7.5	-3.6
12-Dec	-3.2	-1.2	0.4	1.6	1.2	0.8	0.2	-0.4	-0.9	-0.9	-1.7	-1.8	-0.5	-0.2	-0.7	-1.7	-2.5	-3.0	-3.3	-4.0	-6.7	-5.3	-4.4	-5.4	-1.8	1.6
13-Dec	-7.6	-7.6	-7.2	-7.4	-7.1	-6.5	-6.3	-6.3	-6.3	-5.7	-5.4	-5.0	-4.3	-3.7	-3.1	-2.4	-2.5	-3.1	-3.9	-4.9	-6.1	-7.4	-8.0	-8.6	-5.7	-2.4
14-Dec	-9.1	-9.6	-10.0	-10.9	-11.7	-12.0	-12.9	-12.7	-13.1	-12.7	-12.4	-12.3	-10.9	-10.1	-9.3	-8.4	-8.4	-8.1	-7.8	-7.7	-7.5	-8.1	-8.2	-7.7	-10.1	-7.5
15-Dec	-7.6	-7.5	-7.0	-6.1	-5.5	-5.9	-6.8	-6.9	-6.9	-7.3	-7.5	-7.5	-8.4	-8.4	-8.4	-9.1	-9.7	-10.0	-9.8	-9.4	-9.5	-10.4	-10.7	-10.7	-8.2	-5.5
16-Dec	-10.4	-10.0	-9.9	-9.9	-10.3	-10.9	-11.2	-11.5	-11.7	-11.8	-11.5	-11.4	-11.3	-11.2	-11.0	-11.0	-11.0	-11.1	-11.1	-10.8	-10.5	-10.5	-10.2	-9.9	-10.8	-9.9
17-Dec	-9.9	-9.0	-8.5	-8.7	-8.4	-7.5	-7.7	-7.3	-6.3	-4.8	-3.9	-3.1	-2.7	-2.9	-3.4	-4.2	-4.6	-5.0	-5.9	-6.8	-6.3	-6.7	-8.3	-9.5	-6.3	-2.7
18-Dec	-10.0	-10.3	-11.0	-11.2	-11.5	-11.7	-11.7	-12.2	-12.6	-12.9	-13.1	-13.3	-13.4	-13.8	-14.3	-14.6	-15.0	-15.8	-16.4	-16.7	-17.0	-17.2	-17.5	-18.2	-13.8	-10.0
19-Dec	-19.4	-20.2	-21.0	-21.9	-23.4	-24.6	-24.9	-25.2	-26.1	-26.7	-26.7	-25.3	-23.6	-21.8	-21.0	-21.4	-21.8	-22.1	-22.1	-22.3	-23.0	-24.2	-24.4	-24.6	-23.2	-19.4
20-Dec	-25.1	-24.6	-23.3	-23.0	-22.8	-22.4	-22.2	-22.1	-22.3	-22.5	-22.7	-22.7	-22.2	-21.3	-20.7	-20.7	-21.2	-20.9	-21.0	-20.8	-20.4	-19.7	-19.1	-19.2	-21.8	-19.1
21-Dec	-18.2	-18.2	-18.5	-18.6	-18.6	-17.8	-16.5	-16.0	-15.2	-14.3	-12.9	-11.2	-9.7	-8.9	-8.4	-8.2	-9.3	-10.4	-11.6	-12.9	-14.2	-15.2	-15.6	-15.7	-14.0	-8.2
22-Dec	-15.8	-15.5	-15.1	-14.9	-14.8	-14.6	-14.0	-13.7	-13.2	-12.6	-10.8	-9.4	-9.7	-10.5	-11.6	-12.9	-15.5	-18.2	-20.6	-21.9	-23.2	-24.5	-25.3	-25.6	-16.0	-9.4
23-Dec	-26.2	-27.0	-27.6	-28.4	-29.8	-30.2	-30.0	-30.6	-31.8	-32.3	-31.4	-29.6	-28.8	-27.8	-27.1	-26.1	-25.5	-24.9	-24.3	-24.0	-23.4	-24.6	-26.2	-27.2	-27.7	-23.4
24-Dec	-28.0	-28.6	-29.1	-29.8	-30.2	-30.4	-30.9	-31.0	-31.8	-31.9	-31.5	-30.6	-29.8	-28.5	-27.3	-27.5	-27.8	-27.9	-28.0	-28.7	-29.8	-30.8	-31.5	-32.2	-29.7	-27.3
25-Dec	-33.1	-33.6	-33.9	-34.3	-34.6	-34.9	-35.1	-35.6	-36.5	-37.3	-37.1	-36.2	-34.9	-33.7	-33.3	-33.4	-33.7	-34.2	-34.1	-33.9	-33.3	-33.2	-33.1	-33.6	-34.4	-33.1
26-Dec	-32.4	-31.3	-30.8	-30.7	-30.5	-30.4	-30.7	-30.9	-30.5	-30.9	-31.2	-31.1	-30.6	-29.3	-28.6	-28.5	-28.5	-28.5	-28.1	-28.1	-27.9	-27.4	-27.3	-27.1	-29.6	-27.1
27-Dec	-26.9	-27.1	-26.9	-26.6	-26.7	-27.0	-27.1	-27.5	-28.0	-28.4	-28.3	-27.7	-27.3	-27.1	-27.1	-27.7	-28.0	-28.1	-28.8	-28.9	-29.3	-29.2	-29.5	-30.2	-27.9	-26.6
28-Dec	-30.7	-31.1	-31.9	-34.0	-34.0	-34.2	-34.7	-35.3	-35.5	-35.5	-34.9	-33.7	-33.2	-32.9	-32.7	-33.0	-33.2	-33.5	-33.9	-33.8	-34.0	-34.8	-35.6	-36.1	-33.8	-30.7
29-Dec	-36.5	-36.7	-37.3	-37.6	-37.1	-35.1	-34.2	-33.9	-33.3	-33.6	-33.9	-33.6	-32.7	-31.9	-31.4	-30.7	-29.7	-29.2	-28.7	-28.5	-28.6	-28.3	-28.3	-28.2	-32.5	-28.2
30-Dec	-28.5	-28.5	-29.0	-29.5	-29.9	-30.0	-29.6	-28.6	-28.0	-28.0	-27.4	-26.5	-25.9	-25.4	-25.1	-25.2	-26.0	-27.1	-27.7	-28.5	-28.7	-28.8	-28.9	-27.9	-27.9	-25.1
31-Dec	-28.4	-29.2	-28.7	-28.5	-28.9	-28.5	-28.5	-27.5	-27.3	-27.3	-26.8	-25.3	-24.0	-23.3	-23.2	-23.9	-24.5	-24.5	-24.1	-24.3	-24.1	-24.0	-23.9	-23.9	-25.9	-23.2
																								Diurnal Average		
																								Diurnal Maximum		







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Fort Chipewyan - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	295	39.65	39.65
-20 - 0	441	59.27	98.92
0 - 10	8	1.08	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

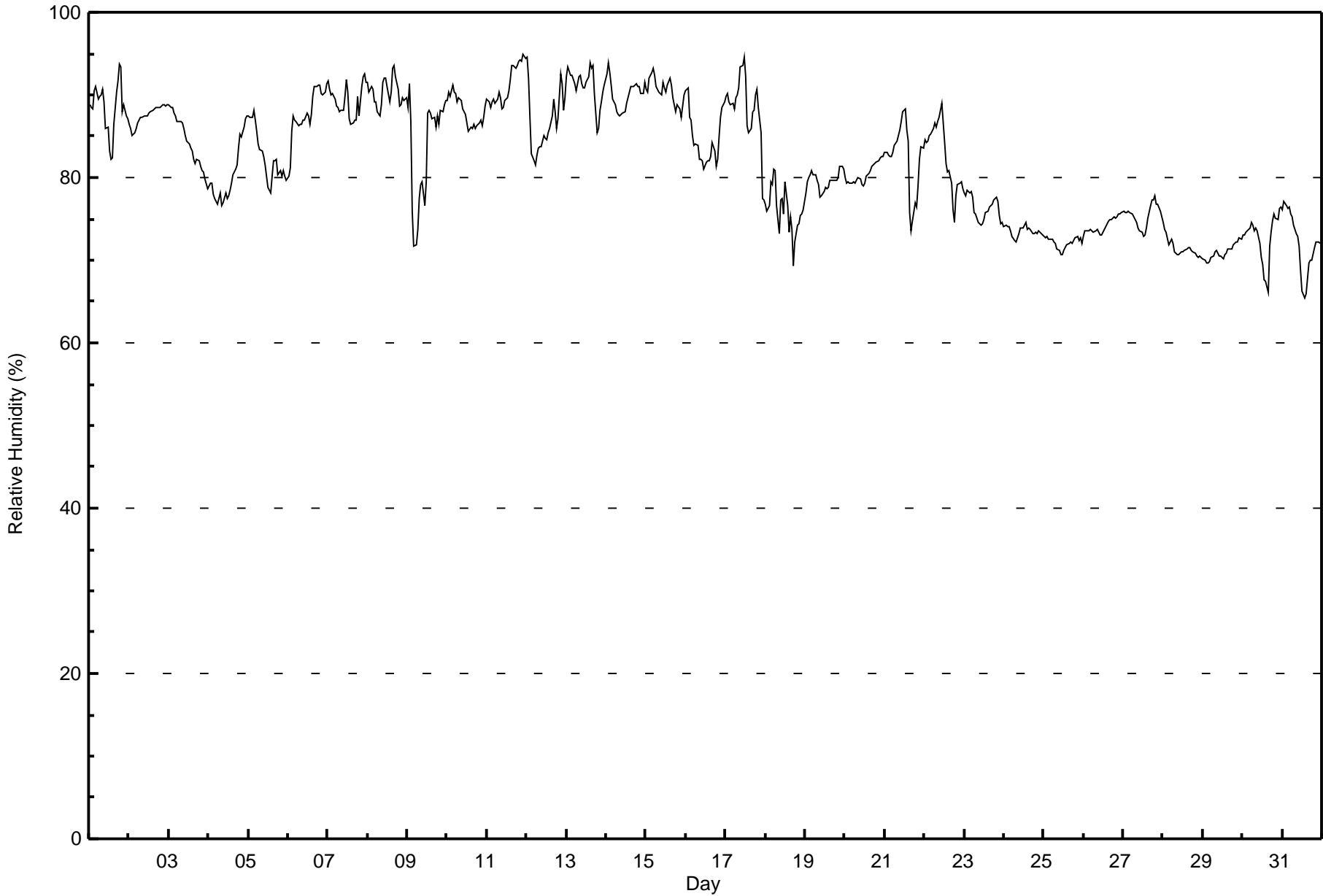
**Fort Chipewyan - December 2017**

Maximum Value: 95 % on Dec 11 23:00																	Maximum Daily Average: 91.2 % on Dec 11																	Hours in Service: 744			
Minimum Value: 65 % on Dec 31 14:00																	Minimum Daily Average: 71.0 % on Dec 29																	Hours of Data: 744			
Maximum Diurnal Average: 83.3 % at hour 2																	Minimum Diurnal Average: 81.0 % at hour 14																	Hours of Missing Data: 0			
Monthly Average: 82.1 %																	Percentiles: P <sub>1</sub> = 69 P <sub>10</sub> = 72 Q <sub>1</sub> = 75 Median = 83 Q <sub>3</sub> = 88 P <sub>90</sub> = 91 P <sub>99</sub> = 94																	Hours of Calibration: 0			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	89	88	88	91	91	89	90	90	91	89	86	86	83	82	82	86	90	92	94	93	88	89	88	87	88.5	94											
2-Dec	87	86	85	85	86	87	87	87	87	87	87	87	88	88	88	88	88	88	88	89	89	89	89	89	87.5	89											
3-Dec	89	88	88	88	88	87	87	87	87	86	85	84	84	83	82	82	82	82	82	81	81	81	80	79	84.3	89											
4-Dec	79	79	79	78	77	77	78	78	77	77	78	77	78	79	79	80	81	82	83	85	85	86	87	87	80.3	87											
5-Dec	87	87	87	88	87	86	84	83	83	82	82	80	79	78	80	82	82	82	80	81	80	81	80	80	82.6	88											
6-Dec	80	81	86	88	87	87	86	86	86	87	87	88	88	86	88	90	91	91	91	91	90	90	90	91	87.8	91											
7-Dec	92	91	90	90	89	89	88	88	88	88	90	92	90	87	86	87	87	87	90	87	91	92	93	92	89.3	93											
8-Dec	91	90	91	91	89	89	88	87	89	91	92	92	91	89	90	93	93	92	91	89	89	90	89	90	90.3	93											
9-Dec	88	91	87	76	72	72	74	77	79	79	77	79	88	88	88	87	87	86	87	87	88	88	89	89	83.5	91											
10-Dec	89	90	90	91	90	90	89	90	89	88	88	88	87	86	86	86	86	86	86	87	87	86	87	89	88.0	91											
11-Dec	89	89	89	89	89	89	89	90	90	88	89	89	90	90	92	94	94	93	94	94	94	94	95	94	91.2	95											
12-Dec	95	92	87	83	82	82	83	84	84	84	85	85	85	85	86	87	89	88	86	87	92	91	88	90	86.6	95											
13-Dec	92	93	92	92	92	91	91	92	92	91	91	91	92	92	94	93	94	90	85	86	88	89	90	91	91.1	94											
14-Dec	93	94	93	91	90	89	88	88	87	88	88	88	89	90	90	91	91	91	91	91	91	90	90	91	90.1	94											
15-Dec	91	90	92	93	93	92	91	91	90	90	92	91	90	91	92	91	90	89	88	89	88	87	89	90	90.4	93											
16-Dec	91	91	87	87	85	84	84	84	82	82	82	81	82	82	82	83	84	83	81	82	85	87	89	89	84.6	91											
17-Dec	90	90	89	89	89	88	90	90	91	93	94	95	92	86	85	86	88	88	90	91	88	85	77	77	88.4	95											
18-Dec	77	76	77	80	79	81	81	77	73	77	77	76	80	77	73	75	74	69	72	74	74	75	76	76	76.1	81											
19-Dec	78	79	80	80	81	80	80	80	79	78	78	78	79	79	79	80	80	80	80	80	80	81	81	81	79.6	81											
20-Dec	80	79	80	79	79	80	79	80	80	80	79	79	79	80	80	81	81	82	82	82	82	83	83	83	80.4	83											
21-Dec	83	83	83	83	83	83	84	84	85	86	87	88	88	86	84	76	73	75	77	77	79	82	84	84	82.3	88											
22-Dec	85	84	84	85	85	86	87	86	87	87	89	87	84	82	81	81	79	76	75	78	79	79	80	79	82.6	89											
23-Dec	78	78	78	78	78	78	76	76	75	74	74	74	75	76	76	77	77	77	77	78	77	75	74	75	76.3	78											
24-Dec	74	74	74	74	74	73	72	72	73	73	74	74	74	75	74	74	74	73	73	73	73	74	73	73	73.5	75											
25-Dec	73	73	73	73	73	72	72	72	71	71	71	71	71	71	72	72	72	72	72	73	73	72	73	72	72.1	73											
26-Dec	73	74	74	73	74	74	73	73	74	73	73	73	73	74	74	75	75	75	75	75	75	76	76	76	74.2	76											
27-Dec	76	76	76	76	76	76	75	75	75	74	74	73	73	73	74	75	77	77	77	78	77	77	76	75	75.4	78											
28-Dec	75	74	73	72	72	73	72	71	71	71	71	71	71	71	71	72	71	71	71	71	70	70	71	70	71.5	75											
29-Dec	70	70	70	70	70	70	71	71	71	71	71	71	70	70	71	71	71	71	72	72	72	72	73	72	71.0	73											
30-Dec	73	73	73	74	74	75	74	74	74	74	72	70	69	68	67	66	72	73	75	76	75	75	76	76	72.8	76											
31-Dec	76	77	77	76	76	76	75	74	73	73	72	69	66	65	66	68	70	70	70	71	72	72	72	72	72.1	77											
83.3																	83.3																	Diurnal Average			
95																	94																	Diurnal Maximum			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	312	41.94	41.94
80 - 100	432	58.06	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

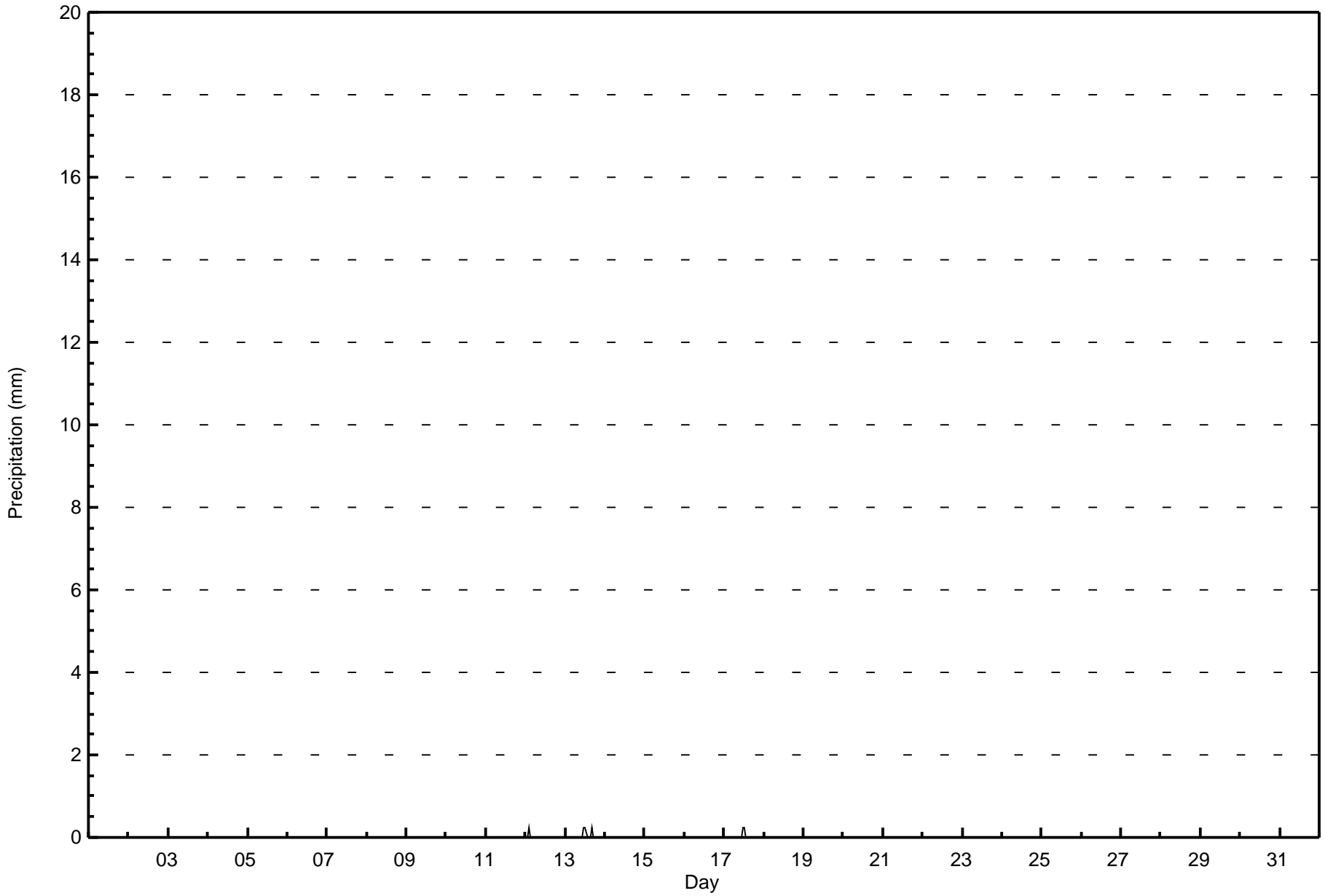
Fort Chipewyan - December 2017

Maximum Value: 0.3 mm on Dec 12 03:00      Maximum Daily Total: 0.8 mm on Dec 13																								Hours in Service: 744 Hours of Data: 564			
Minimum Value: 0.0 mm on Dec 8 12:00      Minimum Daily Total: 0.0 mm on Dec 9 Maximum Diurnal Total: 0.5 mm at hour 12      Minimum Diurnal Total: 0.0 mm at hour 1 Monthly Total: 1.52 mm      Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.3																								Hours of Missing Data: 180 Hours of Calibration: 0 Percent Operational Time: 75.8			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.3
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	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	0.5	0.3
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0   0.0   0.3   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.5   0.5   0.0   0.0   0.0   0.3   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0																								Diurnal Average			
0.0   0.0   0.3   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   0.3   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0																								Diurnal Maximum			
M - Maintenance      AF - Analyzer Failure																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	564	100.00	100.00
0.4 - 0.5	0	0.00	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: 564

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Leaf Wetness (SW) - %**

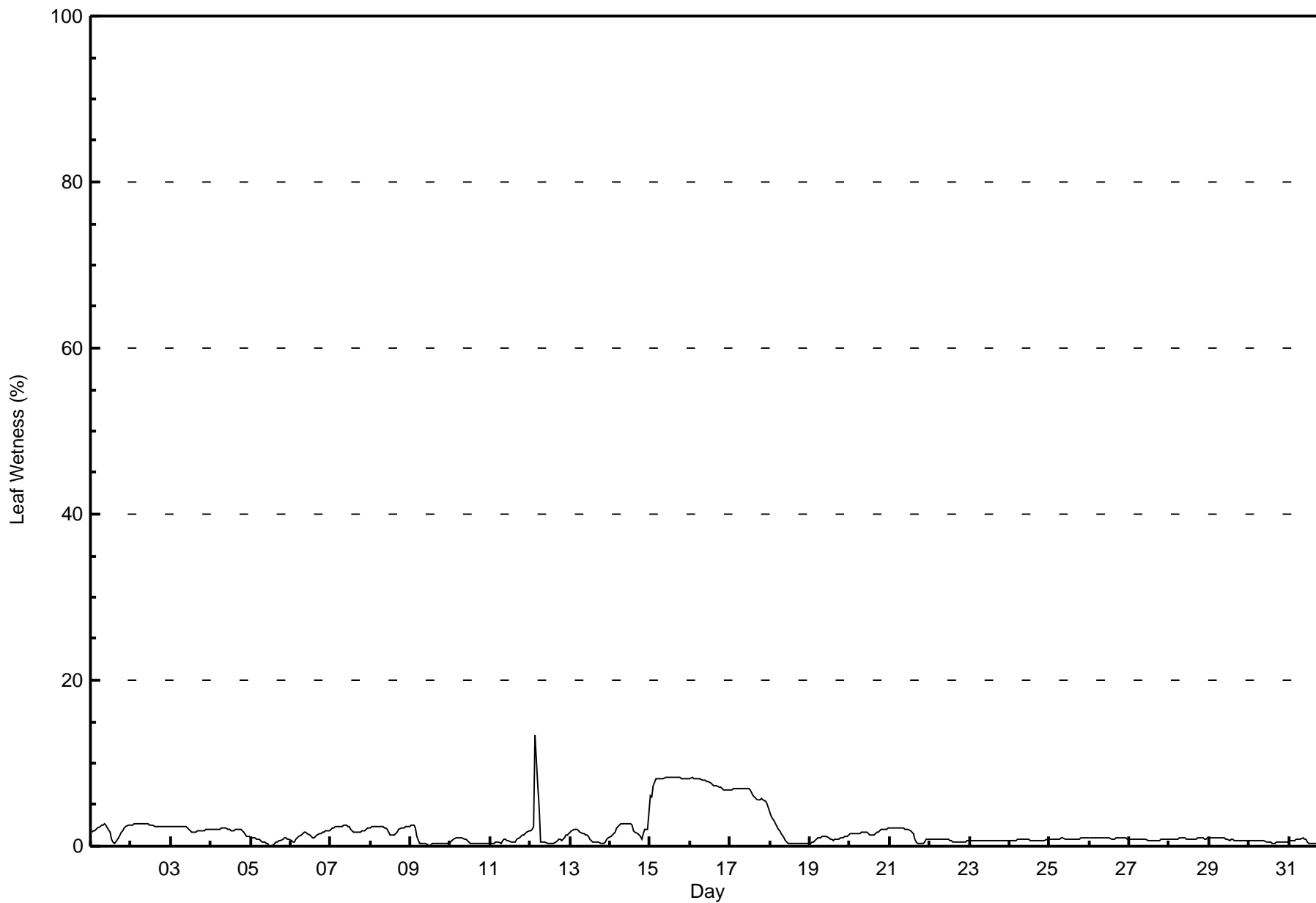
**Fort Chipewyan - December 2017**

Maximum Value: 13 % on Dec 12 04:00      Maximum Daily Average: 8.0 % on Dec 15																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 0 % on Dec 5 13:00      Minimum Daily Average: 0.6 % on Dec 30 Maximum Diurnal Average: 2.4 % at hour 4      Minimum Diurnal Average: 1.5 % at hour 16 Monthly Average: 1.8 %      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 4 P <sub>99</sub> = 8																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	2	2	2	2	2	3	3	3	2	2	1	0	0	1	1	1	2	2	2	2	2	3	1.8	3
2-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3
3-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2
4-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1.9	2
5-Dec	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.6	1	
6-Dec	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	1.3	2
7-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2
8-Dec	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	2
9-Dec	2	3	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3
10-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1
11-Dec	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.8	2
12-Dec	2	2	2	13	7	5	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	1.9	13
13-Dec	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1.1	2
14-Dec	1	1	1	2	2	3	3	3	3	3	3	3	3	2	2	1	1	1	1	1	2	2	4	2.1	4	
15-Dec	6	6	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8.0	8
16-Dec	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7	7.6	8
17-Dec	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6	6	6	6	6	5	5	5	6.3	7
18-Dec	4	4	3	3	2	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	4
19-Dec	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
20-Dec	1	2	2	2	2	1	2	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	1.7	2
21-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	0	0	0	0	0	1	1	1	1.5	2
22-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
23-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
27-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
28-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
29-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
30-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0.6	1
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1
1.9   2.0   2.0   2.4   2.2   2.1   2.0   2.0   2.0   2.0   1.9   1.7   1.6   1.6   1.5   1.5   1.5   1.6   1.6   1.6   1.7   1.7   1.7   1.8																								Diurnal Average		
8   8   8   13   8																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Leaf Wetness (SW) - %**  
**Fort Chipewyan - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (SW) - %**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	45	6.05	6.05
0.4 - 0.5	70	9.41	15.46
0.6 - 0.7	108	14.52	29.97
0.8 - 1.4	221	29.70	59.68
1.5 - 10	292	39.25	98.92
> 10	1	0.13	99.06

Total Number of Valid Hours: 744

Total Number of Hours: 744



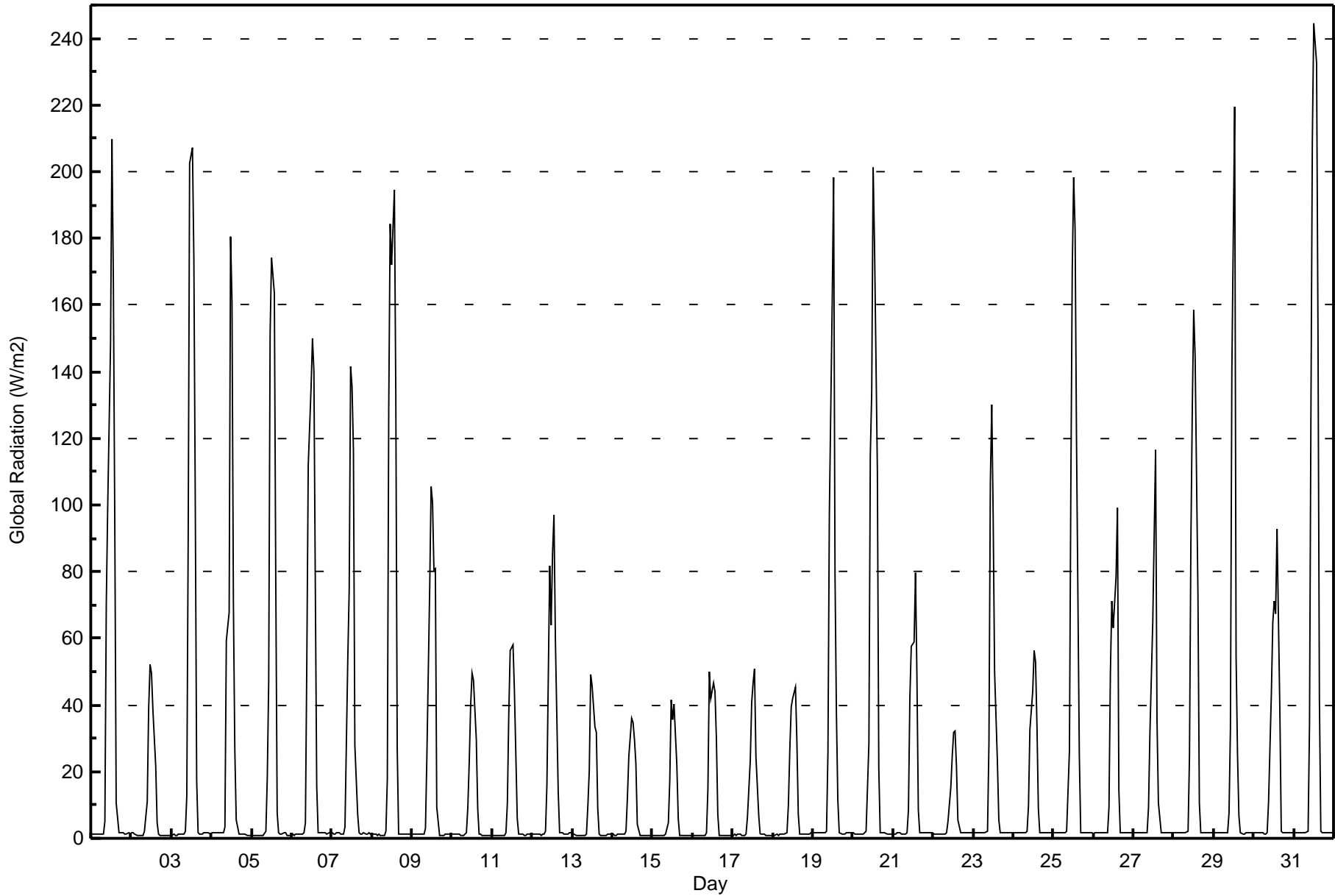
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Global Radiation (GR) - W/m2**

**Fort Chipewyan - December 2017**

Maximum Value: 244 W/m2 on Dec 31 13:00																		Maximum Daily Average: 44.6 W/m2 on Dec 31																		Hours in Service: 744	
Minimum Value: 1 W/m2 on Dec 15 06:00																		Minimum Daily Average: 6.8 W/m2 on Dec 22																		Hours of Data: 744	
Maximum Diurnal Average: 112.7 W/m2 at hour 13																		Minimum Diurnal Average: 1.3 W/m2 at hour 7																		Hours of Missing Data: 0	
Monthly Average: 20.2 W/m2																		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 10 P <sub>90</sub> = 70 P <sub>99</sub> = 199																		Hours of Calibration: 0	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	1	1	1	1	1	5	70	100	148	210	167	95	11	2	2	1	1	1	1	1	1	34.5	210											
2-Dec	2	2	1	1	1	1	1	1	2	11	39	52	49	39	22	5	1	1	1	1	1	1	1	1	9.8	52											
3-Dec	1	1	1	1	1	1	1	1	2	13	91	203	207	174	101	17	2	1	1	2	2	2	2	1	34.6	207											
4-Dec	2	2	2	2	2	2	2	2	3	59	68	181	161	71	27	5	1	1	1	1	1	1	1	1	24.9	181											
5-Dec	1	1	1	1	1	1	1	1	2	18	47	151	174	164	78	8	2	1	1	2	2	1	1	1	27.5	174											
6-Dec	1	1	1	1	1	1	1	2	4	54	112	135	150	140	76	16	2	2	2	2	2	1	2	2	29.6	150											
7-Dec	2	1	1	1	1	1	1	1	4	54	75	142	136	117	28	7	2	1	1	2	1	1	1	1	24.3	142											
8-Dec	1	1	1	1	1	1	1	1	2	18	129	184	172	194	133	27	1	1	1	1	1	1	1	1	36.6	194											
9-Dec	1	1	1	1	1	1	1	1	3	25	75	105	101	80	81	9	1	1	1	1	1	1	1	1	20.8	105											
10-Dec	1	1	1	1	1	1	1	1	2	9	23	40	50	48	30	9	1	1	1	1	1	1	1	1	9.4	50											
11-Dec	1	1	1	1	1	1	1	1	2	11	37	56	58	44	25	6	1	1	1	1	1	1	1	1	10.7	58											
12-Dec	1	1	1	1	1	1	1	1	2	16	82	64	85	97	60	14	2	1	2	1	1	1	2	1	18.4	97											
13-Dec	1	1	1	1	1	1	1	1	1	10	20	49	46	33	32	9	1	1	1	1	1	1	1	1	9.0	49											
14-Dec	1	1	1	1	1	1	1	1	2	12	25	36	35	30	22	4	1	1	1	1	1	1	1	1	7.6	36											
15-Dec	1	1	1	1	1	1	1	1	1	5	17	42	36	40	22	6	1	1	1	1	1	1	1	1	7.6	42											
16-Dec	1	1	1	1	1	1	1	1	2	15	50	42	46	44	30	7	1	1	1	1	1	1	1	1	10.5	50											
17-Dec	1	1	1	1	1	1	1	1	1	7	23	41	47	51	24	7	1	1	1	1	1	1	1	1	9.1	51											
18-Dec	1	1	1	1	1	1	1	1	2	10	27	39	42	46	29	7	1	1	1	1	1	1	1	2	9.3	46											
19-Dec	2	2	2	2	2	2	2	2	2	26	98	160	198	79	37	11	2	1	1	1	2	2	2	2	26.6	198											
20-Dec	2	1	1	1	1	1	1	2	2	29	115	134	201	178	110	21	2	2	2	2	1	1	1	1	33.9	201											
21-Dec	1	1	2	2	2	1	1	1	2	9	42	58	59	80	49	8	2	2	2	2	2	2	2	2	13.8	80											
22-Dec	1	1	1	1	1	1	1	1	2	5	15	25	32	32	22	6	2	2	2	2	2	2	2	2	6.8	32											
23-Dec	2	2	2	2	2	2	2	2	2	28	107	130	96	50	23	6	2	2	2	2	2	2	2	2	19.5	130											
24-Dec	2	2	2	2	2	2	2	2	2	10	33	44	56	53	34	9	2	2	2	2	2	2	2	2	11.2	56											
25-Dec	2	2	2	2	2	2	2	2	2	26	106	171	198	183	120	25	2	2	2	2	2	2	2	2	35.8	198											
26-Dec	1	1	2	2	2	2	2	2	2	9	50	71	63	78	99	15	2	2	2	2	2	2	2	2	17.2	99											
27-Dec	2	2	2	2	2	2	2	2	2	9	32	65	90	117	36	11	2	2	2	2	2	2	2	2	16.2	117											
28-Dec	2	2	2	2	2	2	2	2	2	25	89	129	159	144	73	11	2	2	2	2	2	2	2	2	27.4	159											
29-Dec	2	2	2	2	2	2	2	2	2	7	33	140	219	55	26	7	2	1	1	2	2	2	2	2	21.4	219											
30-Dec	2	2	2	2	2	2	1	1	2	11	44	65	71	67	93	38	2	2	2	2	2	2	2	2	17.4	93											
31-Dec	2	2	2	2	2	2	2	2	2	34	127	209	244	233	152	42	2	2	2	2	2	2	2	2	44.6	244											
1.4																		1.4																		Diurnal Average	
2																		2																		Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2**  
**Fort Chipewyan - December 2017**

<b>Concentration Ranges (W/m2)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	576	77.42	77.42
21 - 100	117	15.73	93.15
101 - 300	51	6.85	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Fort Chipewyan - December 2017

Maximum Speed: 30 km/h on Dec 15 02:00	Maximum Daily Speed Average: 18.9 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 21 03:00	Minimum Daily Speed Average: 0.6 km/h on Dec 9	Hours of Data: 743
Maximum Diurnal Speed Average: 4.6 km/h at hour 13	Minimum Diurnal Speed Average: 1.7 km/h at hour 19	Hours of Missing Data: 1
Monthly Average Velocity: 2.9 km/h 321.5 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 10 Q <sub>3</sub> = 13 P <sub>90</sub> = 17 P <sub>99</sub> = 28	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW10	SW13	SW6	E5	SW6	W8	W9	W7	W9	W10	W14WSW11	W12	W12	W8	WSW5	WNW5	NNW4	N3	NE2	E6	NE4	N6	NNE4	W5.2	W14	
2-Dec	NNW2	NW2	W2	W3	W3	W4	WNW3	WNW5	WNW6	WNW6	W6	W5	WNW6	WNW5	WNW4	WNW3	W2	WSW3	WSW2	WSW2	SW3	W9	WSW9	W6	W4.0	W9
3-Dec	W5	WNW5	WNW4	WSW5	WNW4	NW5	NW6	NW6	NW8	NW9	NW9	WNW8	NW10	NW11	WNW10	W9WNW12	WNW11	NW11	NW13	NW12	NW11	WNW8	WNW10	WNW8.0	NW13	
4-Dec	NW10	NW10	NW9	WNW9	WNW6	W1	WNW6	AF	ENE6	E4	S3	E7	E8	E13	E14	E13	E14	E16	ESE15	SE18	SE22	SE28	ESE24	ESE22	ESE7.2	SE28
5-Dec	SE17	ESE17	ESE15	E12	ENE13	ENE17	ENE17	NE12	NNE8	NNE9	NNE9	N8	NNE7	ENE4	NNE4	N3	ENE2	E2	SSE3	SE3	WNW1	WSW2	S4	ESE8	ENE5.9	ESE17
6-Dec	ESE7	ESE5	S5	SSW6	S5	SE4	SE4	SE3	SE4	ESE3	E4	E3	E9	E9	E4	WSW3	W4	W6	WNW6	WNW10	WNW11	WNW8	W6	SW4	S1.2	WNW11
7-Dec	E3	ESE3	E7	SW3	SSW3	S2	ESE2	E5	E3	ESE3	WNW2	WNW11	WNW14	WNW15	WNW11	WNW11	WNW10	WNW8	WNW10	NNW10	WNW11	WNW12	NW12	WNW13	WNW5.2	WNW15
8-Dec	WNW16	WNW15	WNW9	NW7	NNW7	NNW7	NNW7	N6	NNE3	S4	ESE13	ESE14	E15	E16	E17	E24	E22	ESE16	ESE12	E9	E10	E9	E8	E5	ENE5.8	E24
9-Dec	ESE4	WSW10	W19	W21	W21	W19	WNW15	WNW12	WNW12	WNW15	WNW12	NE3	ESE10	ESE15	E15	E14	E14	E18	E17	E11	E14	E10	E11	E12	ENE0.6	W21
10-Dec	E11	ENE6	ENE3	E4	E5	E4	E10	E11	ENE13	NNE4	N8	N9	NNW8	NW8	NW10	NW11	NW8	NNW6	NNW4	NNE3	ENE5	ESE12	ESE15	ESE14	NE4.3	ESE15
11-Dec	E12	E10	E8	ENE8	E11	E15	E12	E11	ENE9	E11	E18	E14	E15	E16	E15	E16	E16	E17	E16	E13	ESE12	ESE7	SSW6	SW11	E11.2	E18
12-Dec	WSW11	W16	W20	W22	W19	W19	W16	WNW16	WNW17	WNW15	WNW15	WNW16	NW15	NW17	NW19	NW15	NW10	NW12	NW13	WNW11	WNW10	WNW9	NNW11	NNW7	WNW13.7	W22
13-Dec	W6	NNE2	NE4	E5	ESE9	SE10	E12	E15	E12	NNE6	NNW4	NW7	NW10	WNW11	WNW9	NW10	NNW11	NW14	NW18	NW15	NW15	NW16	NNW12	NNW9	NNW5.3	NW18
14-Dec	NW8	N4	NE5	E5	SE5	SE5	E7	ESE8	E6	E5	E7	E10	E9	E12	E18	E27	E27	E27	ENE28	ENE25	E24	ENE29	ENE28	ENE25	E13.8	ENE29
15-Dec	ENE28	ENE30	ENE27	ENE24	E25	E28	ENE30	E29	ENE26	ENE23	ENE16	NNE5	NNE5	NE2	E5	E10	E12	ENE12	E16	ENE9	NNW8	N11	N7	NNW5	ENE14.9	ENE30
16-Dec	NW7	NW10	NW12	NW9	NW13	NW12	NNW9	NW8	NW12	WNW8	WNW9	W9	WNW11	W10	W7	SW8	S10	S13	SSE17	S17	SSE18	SE14	ESE17	E21	WSW2.5	E21
17-Dec	E20	ESE17	E20	ESE18	ESE12	ESE8	ESE8	E6	S3	WSW9	W9	WNW9	WNW15	NW15	NW15	NW15	NW12	WNW11	WNW10	WNW11	NW17	NW17	NW18	NNW18	NNW4.2	E20
18-Dec	NNW18	NW17	NW17	WNW18	NW19	WNW17	WNW17	NW23	NW24	NW21	NW23	NW21	NNW13	NNW18	NW22	NW14	NW17	NW24	NW20	NW21	NW21	NW17	NW19	NW17	NW18.9	NW24
19-Dec	NW13	NW13	NW12	WNW11	WNW10	W8	WNW11	WNW9	WNW8	W6	W5	W5	W7	W5	WSW5	S6	S6	SSE4	SSW5	S5	S3	E3	E3	E5	W4.3	NW13
20-Dec	E5	E4	ESE3	ESE7	ESE8	ESE8	ESE10	ESE8	SE5	SE7	ESE9	SE7	ESE10	ESE10	ESE10	ESE11	ESE11	ESE11	ESE12	ESE11	ESE10	ESE10	ESE10	ESE7	ESE8.5	ESE12
21-Dec	E9	ESE7	NW1	NW8	NW13	NW12	NW11	WNW14	WNW13	WNW12	WNW10	W11	WNW14	WNW14	WNW18	NW21	NNW21	NNW21	NNW16	NNW13	NNW10	NW7	NW5	WNW4	NW10.1	NW21
22-Dec	W5	W4	WSW4	WSW4	WSW4	WSW5	SW5	SW5	WSW4	W5	WNW10	NNW11	NNW11	NNW12	N11	N12	N12	NNE14	NNE9	N8	N8	N7	NNW6	N7	NNW5.1	NNE14
23-Dec	N6	N6	N6	N5	E2	N3	N5	NNW3	WNW3	WNW2	NW5	NW5	WNW7	WNW8	W8	W9	WNW11	WNW12	NW8	NW9	NNW11	N14	N13	N14	NW6.1	N14
24-Dec	N12	NNW14	NNW15	NW14	NW15	NNW16	NNW13	NNW12	WNW9	WNW13	WNW12	WNW11	WNW11	WNW13	NW13	NW9	NW10	NNW7	NNW7	N6	N6	NNW7	NNW13	NNW13	NW10.6	NNW16
25-Dec	NNW9	NNW12	NNW14	NNW15	NNW15	NNW12	NNW12	NW11	WNW11	WNW11	WNW11	WNW8	W10	WNW9	WNW9	W8	W7	W5	W8	WNW8	WNW8	W5	W9	WSW5	NW8.5	NNW15
26-Dec	W7	W12	W8	W8	W10	W9	W8	W10	W14	WNW13	W12	W15	W12	W9	WSW8	W8	WNW9	W9	W9	W10	W11	W13	W11	W11	W10.2	W15
27-Dec	WNW12	WNW13	W10	W9	W9	W10	W12	WNW13	W11	W9	W8	W11	W11	W11	W10	WSW6	WSW5	WSW5	SW4	WSW2	WSW2	NNW1	NNE2	NE3	W7.4	WNW13
28-Dec	N4	N6	N5	NW3	NNW9	NNW10	NNW10	NNW13	NNW17	NNW16	NNW12	NW12	NW14	NW11	NW11	NW15	NW16	NW13	NW10	NW10	NNW11	NNW12	NW11	NW10	NNW10.5	NNW17
29-Dec	NW9	WNW8	WNW8	WNW11	WNW11	WNW11	WNW12	WNW12	WNW12	W11	W13	W13	W13	W14	W14	W12	W15	W15	W15	WNW14	WNW14	WNW12	WNW11	WNW10	WNW11.8	W15
30-Dec	WNW9	WNW7	WNW7	W6	W6	W6	W6	W5	WNW8	WNW9	WNW8	W8	W7	W8	W7	WSW8	SW8	SW9	SW9	SW12	SW10	SW9	SSW5	S7	WSW6.5	SW12
31-Dec	SE6	SSE4	SSW5	SE6	ESE8	SE8	ESE8	SSE9	S11	SSE9	SE10	SSE11	S16	S16	S16	S13	S15	SSW16	SSW16	SSW13	SW14	SW16	SW17	SW16	S10.1	SW17

N2.1	NNW2.8	NW3.0	NW2.8	NW2.9	NW2.7	NNW2.9	NNW3.1	NW3.9	NW4.4	WNW4.5	WNW4.4	NW4.6	NW4.1	NW3.8	NNW2.7	NNW2.4	NNW2.3	NNW1.7	NW2.3	NW2.4	NNW2.5	NNW2.5	N2.1			Diurnal Average
ENE28	ENE30	ENE27	ENE24	E25	E28	ENE30	E29	ENE26	ENE23	NW23	NW21	S16	NNW18	NW22	E27	E27	E27	ENE28	ENE25	E24	ENE29	ENE28	ENE25			Diurnal Maximum

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

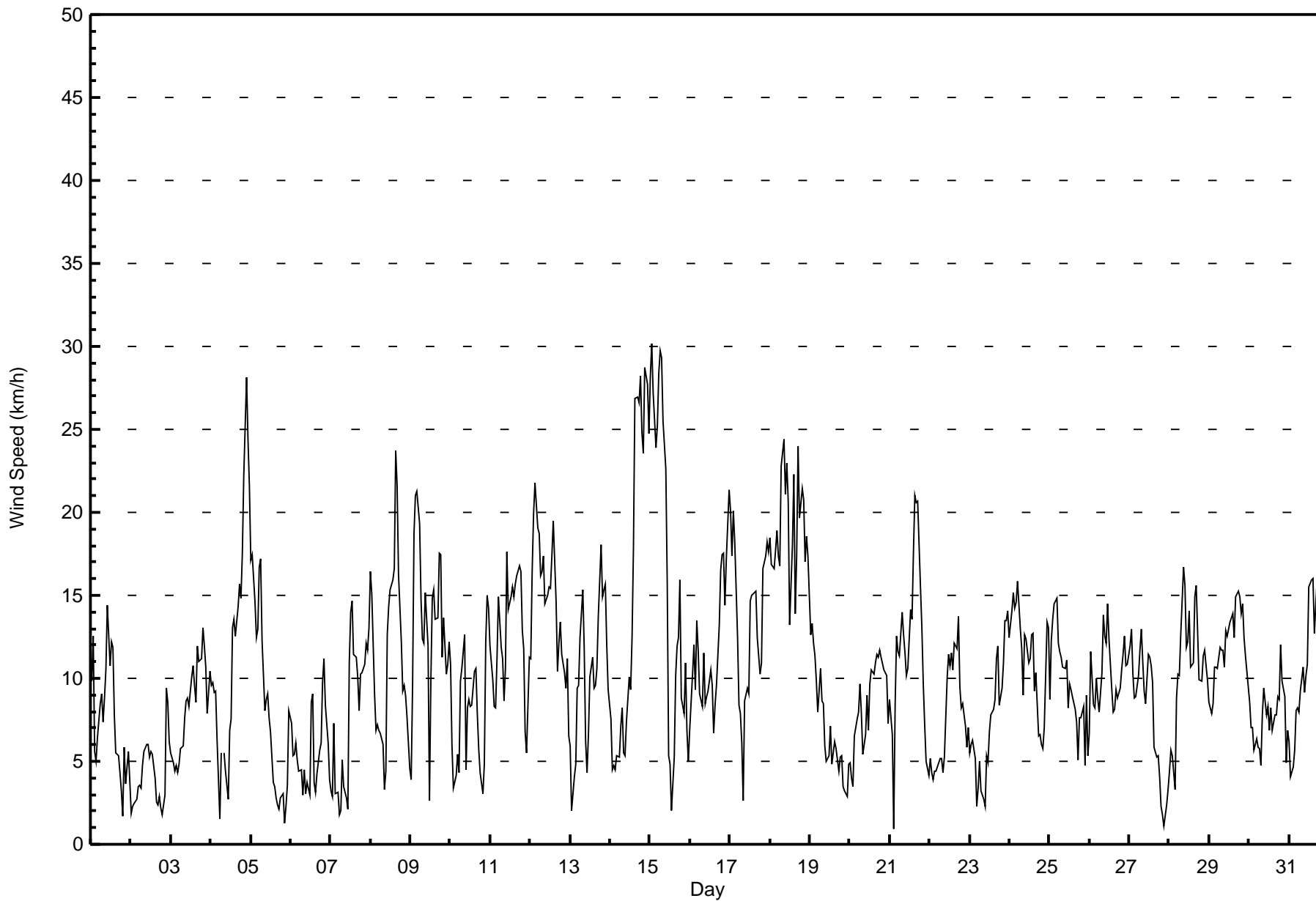


**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Fort Chipewyan - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 18 17:00 Minimum Value: 0 km/h on Dec 2 03:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																		Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	4	2	3	2	2	2	2	1	1	2	3	3	3	3	2	1	1	2	1	2	2	1	2	2	4
2-Dec	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	2	3	3	1	3
3-Dec	1	1	1	1	1	1	1	2	2	2	2	3	3	2	2	2	2	2	3	2	2	3	2	2	3
4-Dec	2	2	2	2	2	2	2	AF	1	1	1	1	2	1	1	1	2	2	1	2	2	2	2	1	2
5-Dec	2	1	1	1	2	2	3	3	3	2	3	2	2	2	2	2	1	1	1	1	2	1	1	1	3
6-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	2	1	3	3	2	2	1	3
7-Dec	2	3	1	2	1	1	2	3	1	1	3	3	3	3	2	2	2	2	2	3	2	2	2	2	3
8-Dec	3	4	1	2	2	2	3	3	2	2	1	1	3	1	2	3	3	3	2	1	1	1	1	1	4
9-Dec	2	3	4	4	4	4	5	2	2	3	4	4	1	2	4	3	2	2	4	2	2	1	1	2	5
10-Dec	3	1	1	1	1	2	1	4	2	3	2	4	3	3	3	3	3	2	2	1	1	2	1	2	4
11-Dec	1	1	1	2	2	1	2	1	2	2	2	1	1	1	2	2	2	2	3	1	2	2	2	2	3
12-Dec	1	3	4	4	4	4	3	3	3	3	3	3	5	5	5	4	3	3	3	3	2	2	3	2	5
13-Dec	1	1	1	2	1	1	5	1	2	2	1	2	2	3	2	3	4	6	6	4	4	4	4	3	6
14-Dec	3	2	1	1	1	1	1	1	1	0	1	1	1	2	2	4	3	3	3	3	3	4	4	3	4
15-Dec	3	3	5	3	2	3	3	3	4	3	4	2	2	1	2	1	1	2	3	3	3	3	2	2	5
16-Dec	2	3	3	3	4	3	3	2	3	2	2	2	2	2	2	2	1	2	3	3	2	2	2	2	4
17-Dec	2	1	2	3	1	1	1	1	1	4	2	2	4	5	4	3	3	3	3	4	5	5	6	6	6
18-Dec	6	5	4	4	5	4	4	6	7	6	6	8	5	7	7	5	8	7	6	6	5	5	5	5	8
19-Dec	3	3	3	2	3	2	2	1	2	1	1	1	2	1	1	1	1	1	1	2	2	1	1	1	3
20-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2
21-Dec	1	1	2	2	3	3	3	3	3	2	2	2	3	3	5	6	6	6	5	5	3	2	1	1	6
22-Dec	1	1	1	1	1	1	1	2	1	2	2	4	4	5	3	4	4	4	2	2	2	2	2	2	5
23-Dec	2	2	2	2	1	2	3	2	1	2	2	2	2	2	2	2	3	3	2	2	4	5	4	4	5
24-Dec	4	5	5	3	4	5	4	4	2	2	2	2	3	3	4	2	3	2	3	2	2	2	3	4	5
25-Dec	4	3	3	3	4	3	2	2	2	2	3	2	2	2	2	2	2	1	1	1	2	2	2	2	4
26-Dec	4	3	2	2	3	3	2	3	3	3	3	3	3	3	2	3	3	2	2	2	3	3	3	2	4
27-Dec	3	3	2	2	2	3	3	3	3	2	2	2	2	3	2	1	1	2	2	1	1	1	1	2	3
28-Dec	2	2	3	2	3	3	2	4	4	4	3	4	3	3	3	4	4	4	3	3	4	3	2	2	4
29-Dec	2	1	2	2	2	3	2	2	3	2	3	3	3	3	4	3	3	4	4	4	3	3	2	2	4
30-Dec	2	2	1	1	1	1	1	1	2	2	2	2	2	2	2	1	2	2	1	2	2	2	3	1	3
31-Dec	1	1	1	1	1	1	1	2	2	1	2	2	3	2	2	2	2	3	3	2	2	2	2	2	3
Diurnal Maximum																									
AF - Analyzer Failure																									







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort Chipewyan - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	152	20.46	20.46
6 - 11	320	43.07	63.53
12 - 19	226	30.42	93.94
20 - 28	41	5.52	99.46
29 - 38	4	0.54	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort Chipewyan - December 2017**

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	9	8	4	23	7	8	3	9	4	6	18	18	14	7	8	152
6 - 11	17	6	0	5	29	28	7	3	5	2	10	8	63	70	41	26	320
12 - 19	6	1	1	6	36	18	2	2	7	3	6	0	25	41	44	28	226
20 - 28	0	0	0	9	11	2	2	0	0	0	0	0	4	0	11	2	41
29 - 38	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	4
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	29	16	9	27	100	55	19	8	21	9	22	26	110	125	103	64	743

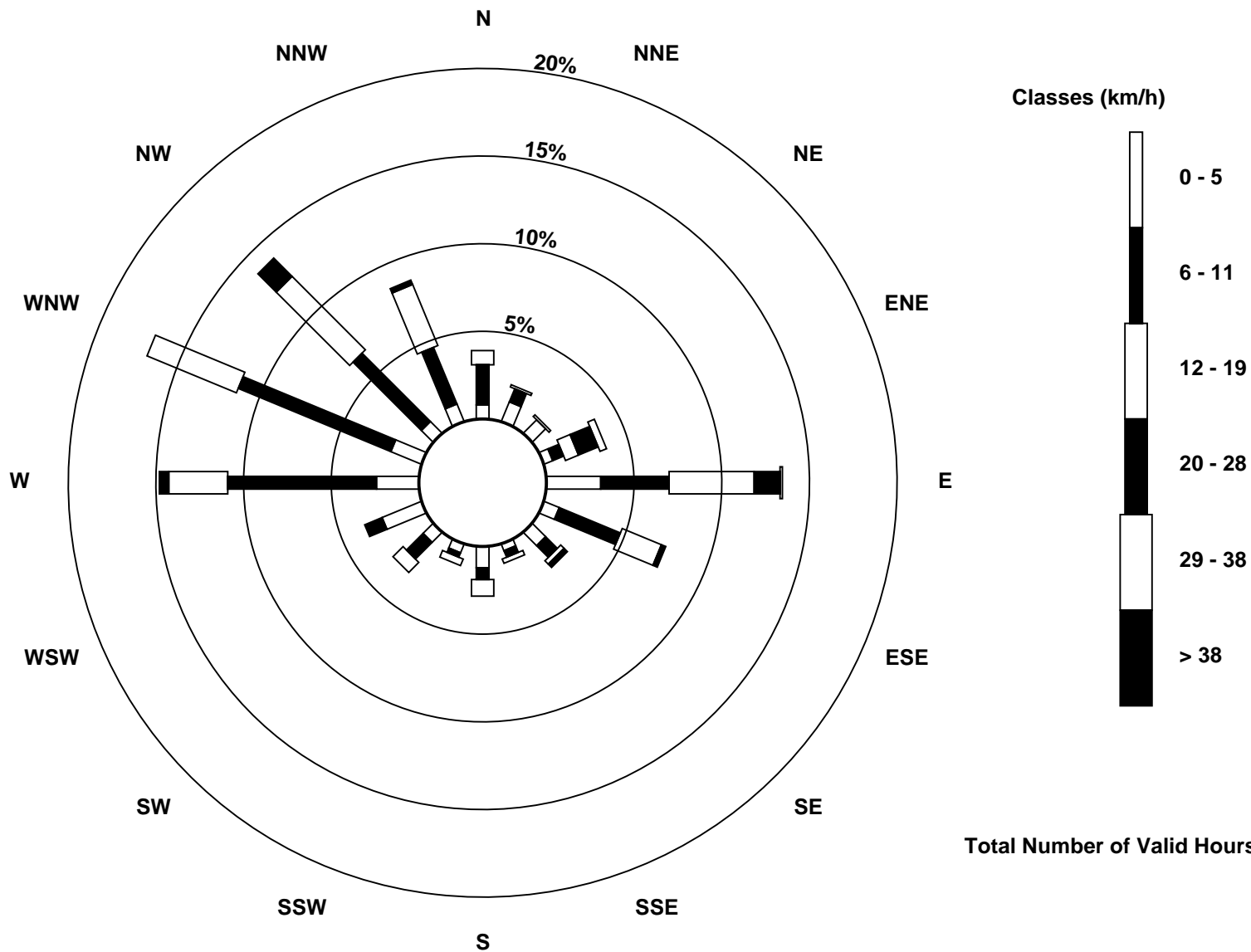
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 743



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Fort Chipewyan - December 2017**

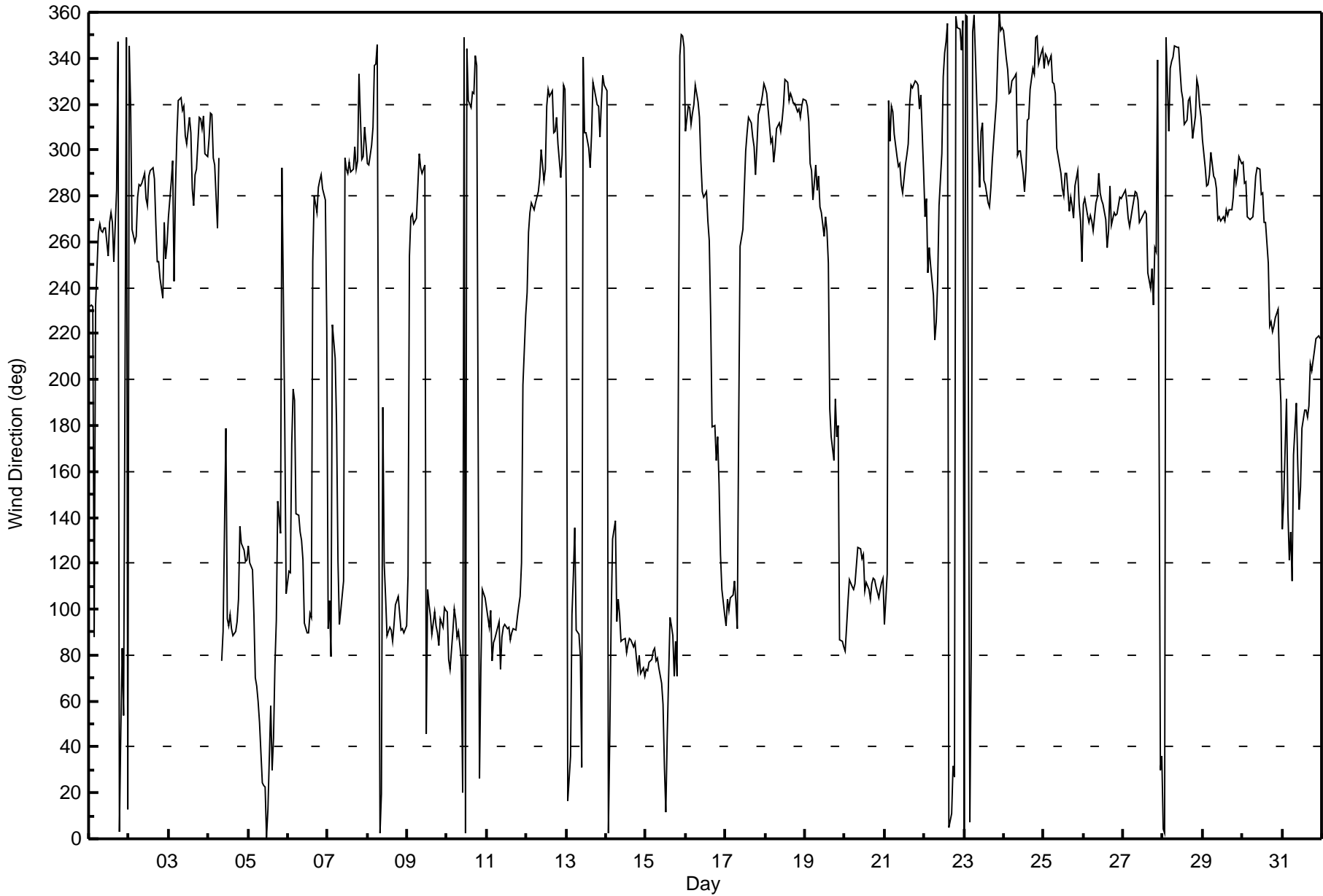
Direction of Maximum Speed: 73 deg on Dec 15 02:00 Direction of Maximum Daily Speed Average: 316.0 deg on Dec 18																							Hours in Service: 744		
Direction of Minimum Speed: 322 deg on Dec 21 03:00 Direction of Minimum Daily Speed Average: 0.6 deg on Dec 9																							Hours of Data: 743		
Monthly Average Direction: 299.3 deg																							Hours of Missing Data: 1		
																							Percent Operational Time: 99.9		
Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	232	232	232	88	233	264	268	265	264	266	266	254	268	273	268	252	282	347	3	47	83	54	349	13	266.2
2-Dec	345	320	265	260	262	279	285	284	286	290	279	276	289	291	292	287	268	252	252	244	236	269	253	259	274.8
3-Dec	271	286	295	243	283	306	321	323	317	319	306	303	314	308	283	276	290	292	314	314	309	315	298	297	301.7
4-Dec	305	316	315	297	294	266	297	AF	77	90	179	96	93	98	92	89	90	94	104	136	129	126	121	121	106.9
5-Dec	128	120	117	98	70	66	60	51	24	23	22	0	13	58	30	44	75	95	147	133	292	238	182	107	75.9
6-Dec	117	116	172	196	191	141	141	134	130	122	94	90	90	98	96	251	280	273	283	287	289	283	278	222	188.5
7-Dec	92	104	79	224	209	180	121	93	100	112	297	291	290	294	290	291	302	292	296	333	296	297	310	303	299.6
8-Dec	294	294	302	310	337	338	346	2	19	188	120	105	88	92	91	86	93	102	105	98	91	92	90	93	78.6
9-Dec	115	254	271	272	268	271	284	298	292	290	293	46	109	102	97	89	99	93	89	84	96	92	101	100	63.6
10-Dec	99	78	74	90	100	96	88	90	78	20	349	3	344	321	319	325	325	341	337	26	75	109	107	105	53.5
11-Dec	101	92	99	78	85	87	92	94	74	88	92	93	91	92	87	90	91	91	97	101	106	120	198	228	95.4
12-Dec	238	264	273	277	274	277	280	282	288	300	287	292	319	326	324	326	307	308	314	303	288	298	328	327	294.2
13-Dec	278	17	36	98	115	135	91	89	79	31	340	308	308	301	292	307	329	326	320	319	305	321	333	328	337.7
14-Dec	326	2	45	97	131	139	95	104	98	86	87	87	81	85	87	87	84	86	78	73	80	72	75	71	80.4
15-Dec	74	73	77	78	82	83	78	79	75	67	58	31	12	45	97	93	89	71	86	71	341	350	350	345	70.7
16-Dec	308	319	319	311	316	320	328	321	314	296	282	280	282	269	261	228	180	180	165	175	154	124	109	97	252.6
17-Dec	93	104	100	105	106	112	103	92	180	258	265	283	300	308	314	312	306	301	289	301	316	320	324	329	332.1
18-Dec	327	325	311	303	305	295	301	309	312	308	313	320	331	329	322	325	323	321	320	317	318	314	319	322	316.0
19-Dec	322	319	312	294	291	278	293	283	289	275	272	263	271	265	251	188	175	165	192	175	180	86	86	84	278.4
20-Dec	82	92	103	113	110	108	111	119	127	126	122	124	108	112	108	104	111	114	113	110	105	109	112	113	111.2
21-Dec	93	115	322	304	319	317	307	297	293	294	285	281	293	298	302	320	328	327	330	329	328	318	324	291	312.4
22-Dec	271	279	247	258	249	237	217	225	242	276	298	332	343	347	355	5	11	32	27	358	353	353	344	356	335.2
23-Dec	1	359	358	7	83	352	359	340	299	284	308	312	287	285	277	275	284	295	304	322	342	359	352	353	325.0
24-Dec	352	340	335	324	325	330	332	333	298	299	299	290	282	291	313	314	326	336	333	349	350	338	343	344	323.5
25-Dec	335	342	340	337	341	330	329	325	301	294	290	283	280	290	290	274	279	276	271	284	291	277	269	251	305.3
26-Dec	276	279	271	268	271	269	265	277	280	290	281	278	276	270	258	265	285	267	273	272	272	276	279	279	274.9
27-Dec	282	282	277	270	266	275	278	282	281	278	268	271	272	273	272	247	240	249	232	258	256	339	30	36	273.7
28-Dec	4	2	349	308	336	338	340	345	345	345	335	326	322	311	313	322	323	315	305	315	331	328	319	314	328.7
29-Dec	304	292	284	285	289	299	289	288	283	270	271	269	271	269	274	271	274	274	279	292	285	289	297	294	282.1
30-Dec	295	285	286	271	270	270	271	279	289	293	292	281	281	269	268	251	223	225	221	223	227	230	205	190	257.6
31-Dec	135	148	192	142	121	134	113	167	190	164	143	153	179	187	187	184	189	207	204	213	218	218	219	218	185.7
352.8 331.5 323.0 306.9 310.5 316.8 339.4 335.2 316.8 307.5 302.8 302.3 307.5 308.3 313.3 329.1 336.3 337.3 337.8 322.3 321.0 339.0 346.7 356.8																									
Diurnal Average																									
AF - Analyzer Failure																									
All monthly, daily, and diurnal averages have been calculated using vector methods																									



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Fort Chipewyan - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																	Hours in Service: 744																								
Maximum Value: 97 deg on Dec 5 21:00																	Hours of Data: 743																								
Minimum Value: 3 deg on Dec 20 16:00																	Hours of Missing Data: 1																								
Percentiles: P <sub>1</sub> = 5 P <sub>10</sub> = 7 Q <sub>1</sub> = 11 Median = 15 Q <sub>3</sub> = 19 P <sub>90</sub> = 29 P <sub>99</sub> = 75																	Hours of Calibration: 0																								
																	Percent Operational Time: 99.9																								
Day	Hourly Period Ending At (MST)																								Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																	
1-Dec	27	8	45	33	15	11	10	10	12	12	12	13	14	14	14	19	33	27	43	88	19	23	18	22	88																
2-Dec	38	29	21	22	15	15	14	14	15	13	15	17	15	14	16	26	21	16	27	29	19	22	15	15	38																
3-Dec	15	14	16	17	16	17	15	19	17	17	16	18	15	14	14	14	12	13	16	12	13	17	14	10	19																
4-Dec	11	16	16	9	17	49	13	AF	13	26	32	12	5	5	5	5	5	15	7	6	4	6	4	4	49																
5-Dec	8	5	6	11	8	8	10	13	20	18	19	27	25	51	62	80	57	60	45	39	97	42	26	15	97																
6-Dec	9	16	27	27	22	14	19	31	22	35	20	32	11	8	49	23	14	11	14	15	14	14	17	26	49																
7-Dec	62	69	7	70	44	75	67	50	52	54	95	13	13	13	11	12	14	18	12	19	9	14	15	15	95																
8-Dec	10	10	12	21	20	19	41	51	68	50	9	6	5	4	7	5	7	8	8	11	9	5	7	11	68																
9-Dec	49	17	12	13	12	12	27	15	13	12	16	72	16	6	6	5	6	7	12	14	10	10	6	8	72																
10-Dec	9	23	43	16	26	24	10	8	12	38	20	22	23	20	16	20	20	24	34	37	15	10	5	5	43																
11-Dec	5	7	8	20	7	5	9	10	11	9	5	6	5	5	5	5	6	7	8	6	8	13	26	8	26																
12-Dec	14	11	13	12	12	13	12	13	13	14	13	12	22	19	17	18	17	17	14	21	12	17	19	24	24																
13-Dec	20	51	38	37	13	14	13	5	10	25	28	18	15	14	14	15	25	21	18	16	14	16	20	22	51																
14-Dec	25	31	30	19	14	16	4	6	9	8	6	6	7	6	4	5	6	6	7	7	7	7	7	8	31																
15-Dec	7	7	7	6	5	6	6	6	8	8	10	30	31	45	31	9	12	9	7	29	31	19	23	31	45																
16-Dec	17	17	18	15	16	17	22	18	17	16	14	14	13	14	18	16	15	13	16	12	16	10	6	7	22																
17-Dec	7	6	5	8	8	8	7	9	52	23	12	17	17	16	15	14	14	14	13	17	17	19	20	20	52																
18-Dec	19	19	18	15	15	15	15	16	16	16	17	17	22	21	18	22	21	18	17	15	16	15	16	18	22																
19-Dec	16	16	16	14	17	19	9	10	10	15	21	14	11	18	13	22	18	20	14	35	34	28	22	11	35																
20-Dec	9	20	35	11	8	7	8	8	10	8	8	11	6	6	4	3	6	7	7	6	6	6	5	5	35																
21-Dec	11	24	90	10	13	14	14	13	13	13	15	17	15	17	16	17	20	19	20	21	19	14	16	23	90																
22-Dec	10	10	26	16	13	21	13	9	10	18	18	22	23	24	22	20	21	15	17	20	17	18	41	26	41																
23-Dec	22	10	12	12	42	41	27	32	63	75	42	42	15	14	15	14	15	15	16	17	21	21	20	18	75																
24-Dec	19	18	18	14	17	18	20	15	13	13	15	14	14	16	17	17	25	24	25	23	20	15	17	25	25																
25-Dec	28	15	16	15	14	14	13	10	9	9	12	13	13	14	17	15	15	13	8	11	15	23	17	23	28																
26-Dec	21	14	17	16	16	17	16	16	16	14	14	14	14	17	16	17	16	19	15	15	14	13	14	13	21																
27-Dec	12	13	13	14	15	15	15	14	13	16	17	14	14	15	13	16	9	20	31	17	39	48	47	72	72																
28-Dec	32	13	31	46	21	16	15	15	14	15	19	19	16	16	16	14	15	16	16	18	23	19	14	13	46																
29-Dec	14	14	13	10	12	15	13	13	14	14	14	15	15	15	14	15	15	15	15	14	13	15	14	15	15																
30-Dec	12	14	12	10	9	7	12	15	13	11	13	14	19	16	25	13	7	10	9	8	10	10	28	14	28																
31-Dec	19	22	26	27	8	15	15	15	10	17	12	14	9	7	7	8	12	8	8	8	7	6	6	7	27																
																	62	69	90	70	44	75	67	51	68	75	95	72	31	51	62	80	57	60	45	88	97	48	47	72	
Diurnal Maximum																																									
AF - Analyzer Failure																																									









# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

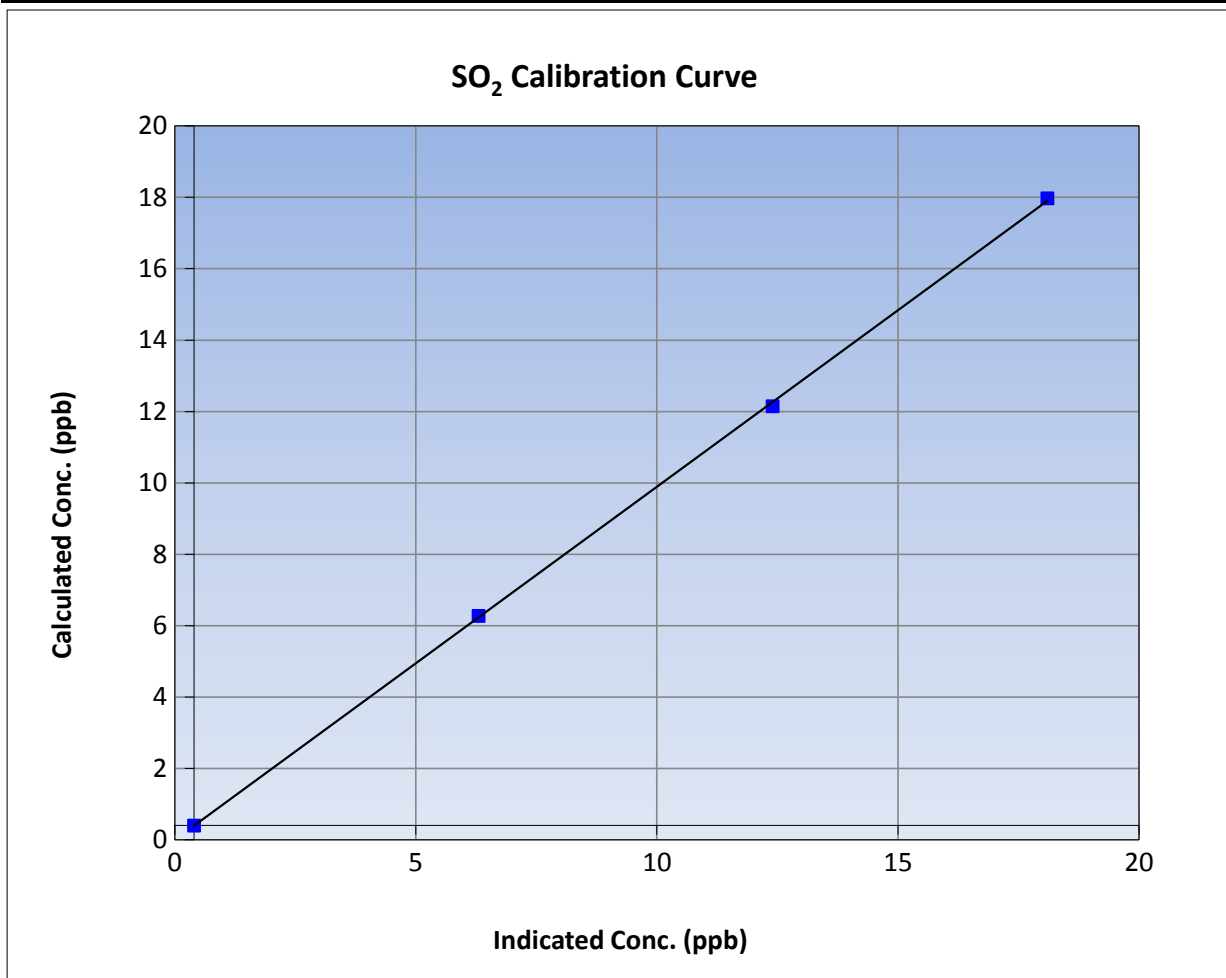
Version-03-2017

### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 7, 2017
Station Name	Fort Chipewyan	Station Number	AMS 08
Start Time (MST)	9:55	End Time (MST)	18:14
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1136451241

### Calibration Data

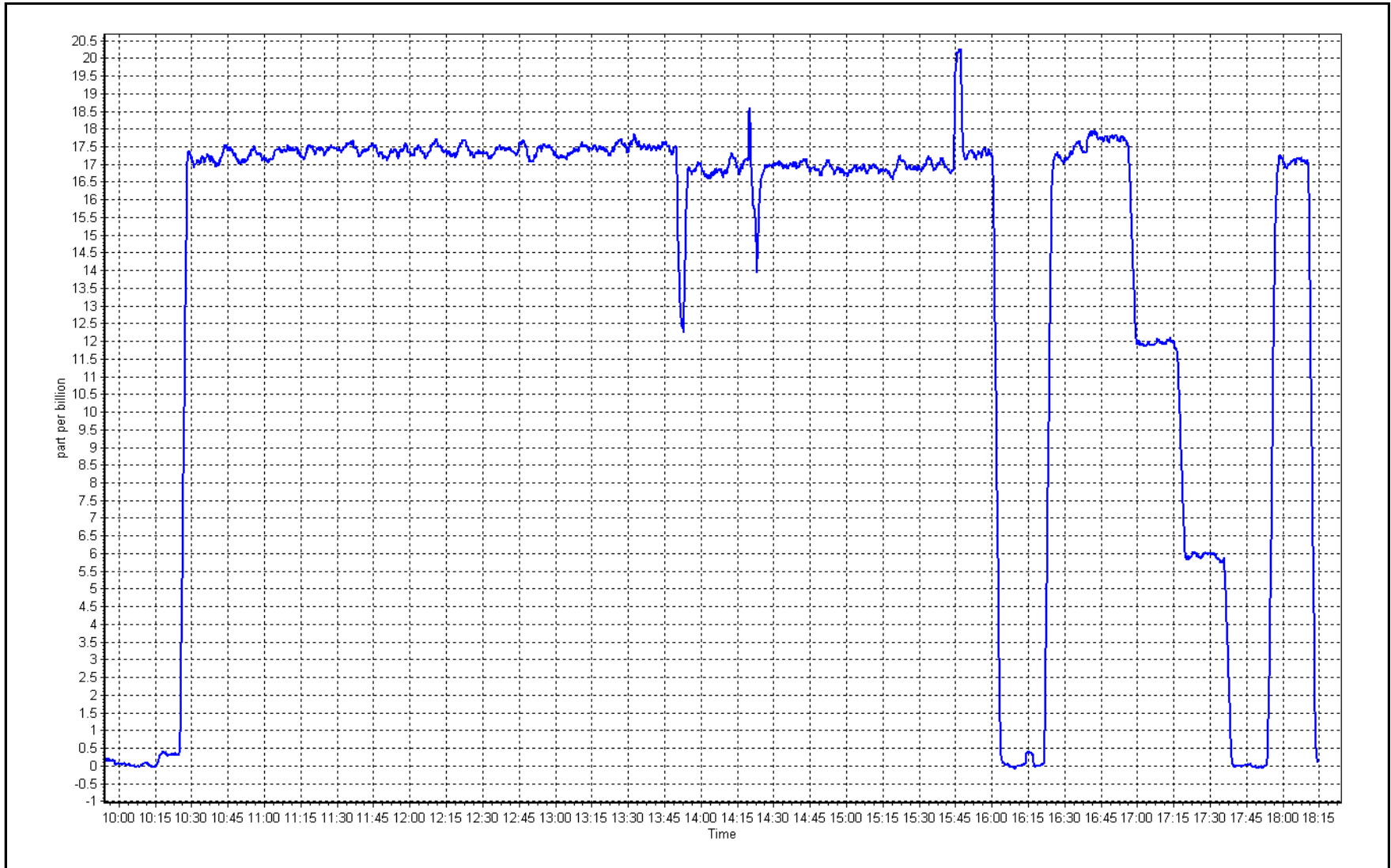
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999880	≥0.995
17.6	17.7	0.9928			
11.7	12.0	0.9790	Slope	0.989602	0.90 - 1.10
5.9	5.9	0.9957			
			Intercept	-0.008669	+/-30



SO2 Calibration Plot

Date: December 7, 2017

Location: Fort Chipewyan







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

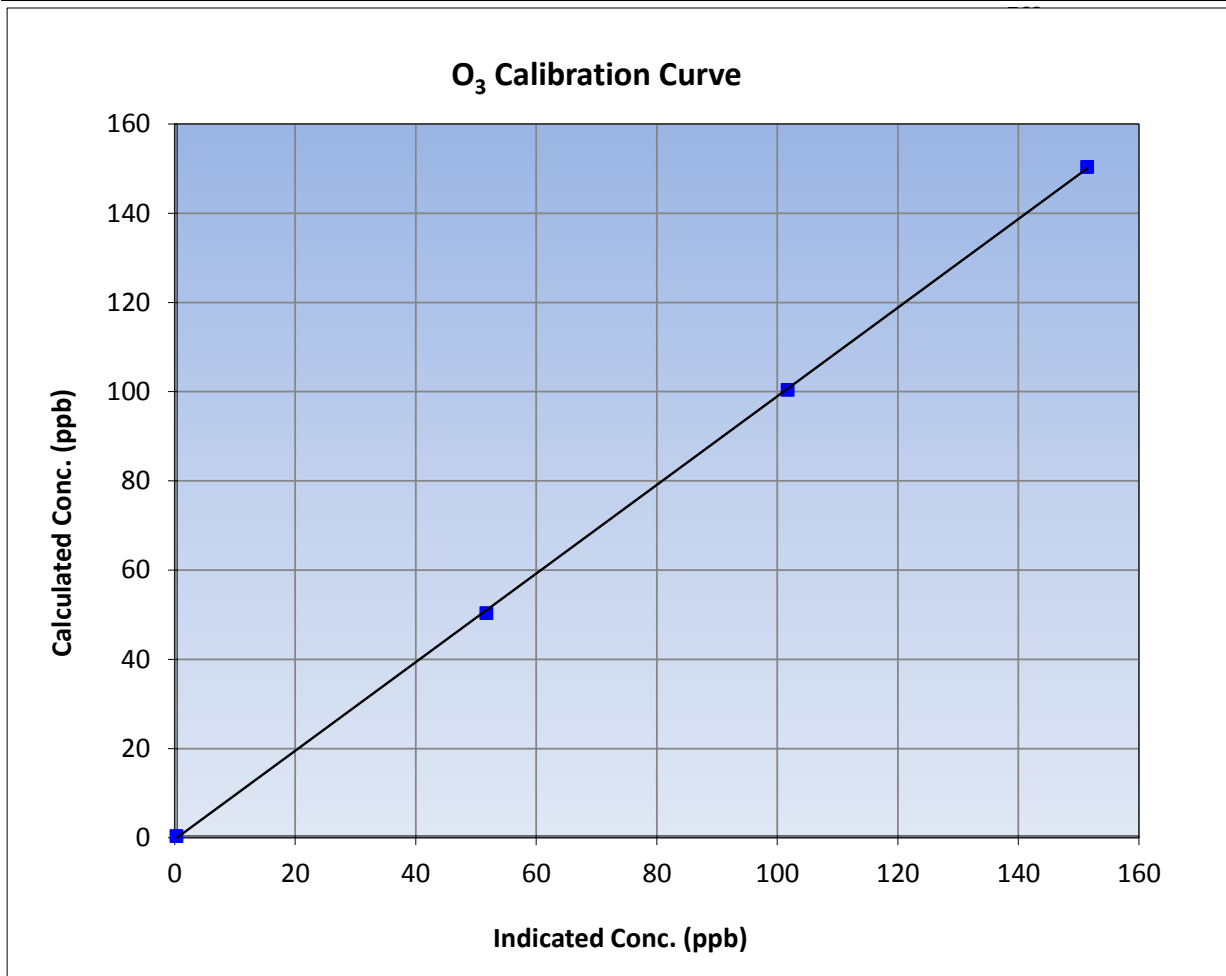
Version-03-2017

### Station Information

Calibration Date	December 8, 2017	Previous Calibration	November 8, 2017
Station Name	Fort Chipewyan	Station Number	AMS 08
Start Time (MST)	9:00	End Time (MST)	11:58
Analyzer make	API T400	Analyzer serial #	1020

### Calibration Data

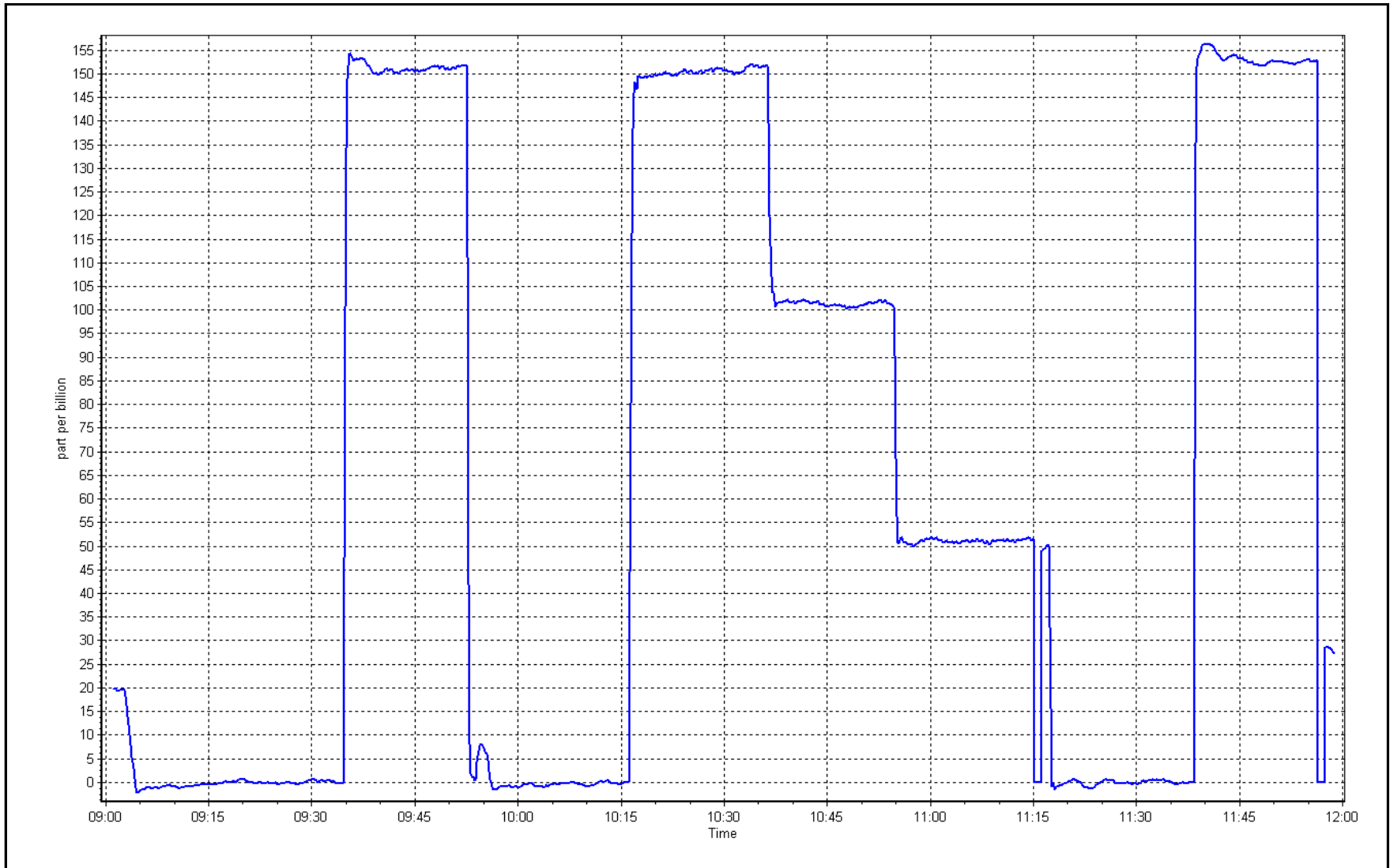
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.1	----	Correlation Coefficient	0.999938	≥0.995
150.0	151.0	0.9934			
100.0	101.3	0.9872	Slope	0.993382	0.90 - 1.10
50.0	51.3	0.9747			
			Intercept	-0.372849	+/- 10



O<sub>3</sub> Calibration Plot

Date: December 8, 2017

Location: Fort Chipewyan





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort Chipewyan	Station number:	AMS 08
Calibration Date:	December 21, 2017	Last Cal Date:	NA
Start time (MST):	9:00	End time (MST):	13:16
Reason:	Install		

### Calibration Standards

NO Gas Cylinder #	LL79696	Cal Gas Expiry Date	February-13-17
NOX Cal Gas Conc.	<u>20.1</u> ppb	NO Cal Gas Conc.	<u>20.1</u> ppb
Calibrator Model	API T700P	Serial Number	2656
ZAG make/model	API T701	Serial Number	4698

### Analyzer Information

Analyzer make: Thermo 42i-TL			Analyzer serial #: 917536332		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	NA	1.017	NOX Range (ppb)	0 - 200 ppb	
NOX coefficient	NA	1.012	PMT Temperature	NA	-14.6
NO2 coefficient	NA	0.991	Reaction cell Press	NA	326.3
NO bkgrnd	NA	3.1	Sample Flow	NA	1.200
NOX bkgrnd	NA	3.3	PMT Voltage	NA	-1123.0

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	NA	0.997754
NO <sub>x</sub> Cal Offset	NA	0.234126
NO Cal Slope	NA	0.995176
NO Cal Offset	NA	0.353329
NO <sub>2</sub> Cal Slope	NA	0.998799
NO <sub>2</sub> Cal Offset	NA	0.545914



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero										
as found span										
calibrator zero	4997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	4963	37.4	150.3	150.3	0.0	150.8	151.0	-0.2	0.9969	0.9956
second point	4975	25.0	100.5	100.5	0.0	100.0	100.4	-0.4	1.0050	1.0010
third point	4990	12.5	50.2	50.2	0.0	50.0	49.7	0.2	1.0045	1.0106
as left zero	4997	0.0	0.0	0.0	0.0	0.0	0.1	0.0	----	----
as left span	4857	37.2	152.8	50.3	102.5	146.8	47.8	99.1	1.0407	<b>1.0523</b>
<b>Average Correction Factor</b>									<b>1.0021</b>	<b>1.0024</b>

Corrected As found	NO <sub>x</sub> = NA	ppb	NO = NA	ppb		*Percent Change	NO <sub>x</sub> = NA
Previous Response	NO <sub>x</sub> = NA	ppb	NO = NA	ppb		*Percent Change	NO = NA

\* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	150.3	150.6	-0.3	1.0002	0.9982	----	----
1st NO2 (100 ppb O3)	50.3	100.3	150.8	50.3	100.5	0.9969	----	0.9980	100.2%
2nd NO2 (80 ppb O3)	66.6	84.0	150.1	66.6	83.5	1.0016	----	1.0060	99.4%
3rd NO2 (50 ppb O3)	96.8	53.8	149.0	96.8	52.2	1.0090	----	1.0307	97.0%
2nd NO ref point	----	0.0	148.4	148.7	-0.2	1.0130	1.0110	----	----
<b>Average Correction Factor</b>						<b>1.0051</b>	<b>1.0046</b>	<b>1.0115</b>	<b>98.9%</b>

Notes:

Install cal

Calibration Performed By:

Ryan Power



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

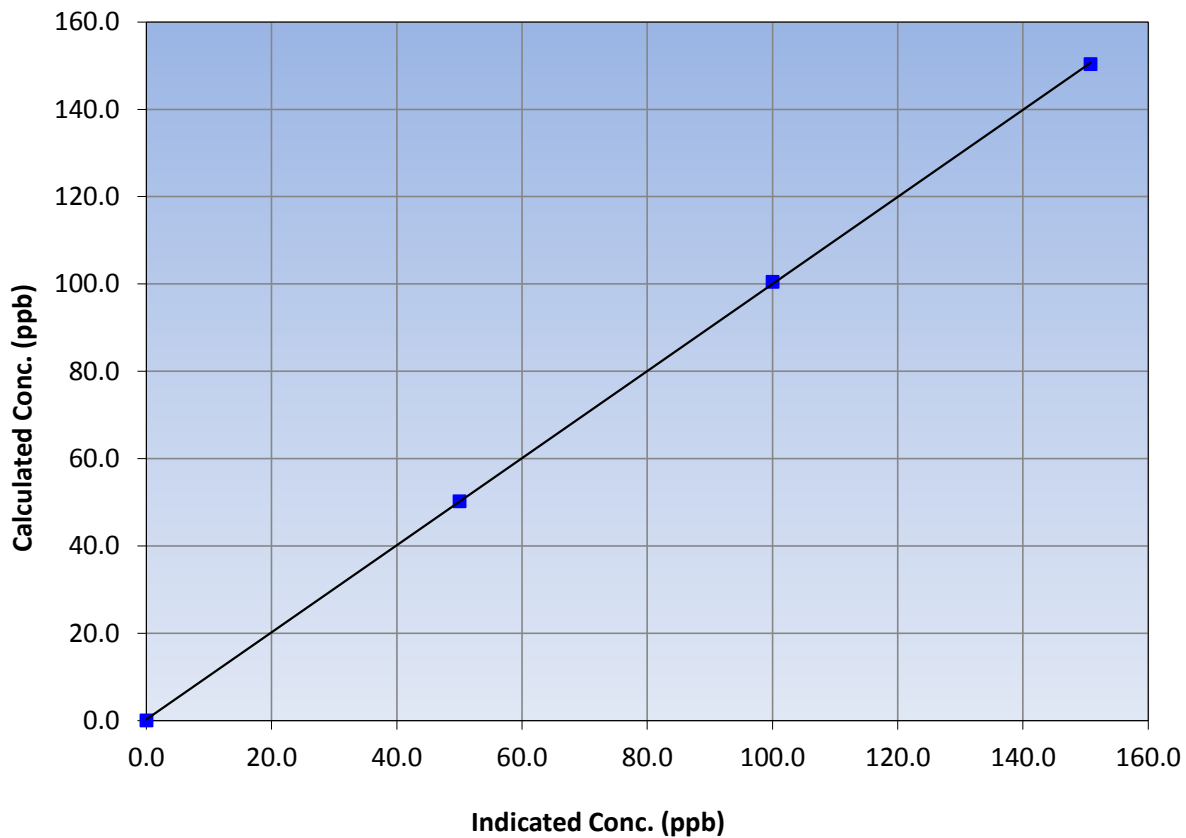
### Station Information

Calibration Date	December 21, 2017	Previous Calibration	NA
Station Name	Fort Chipewyan	Station Number	AMS 08
Start Time (MST)	9:00	End Time (MST)	13:16
Analyzer make	Thermo 42i-TL	Analyzer serial #	917536332

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
150.3	150.8	0.9969			
100.5	100.0	1.0050			
50.2	50.0	1.0045			
			Slope	0.997754	0.90 - 1.10
			Intercept	0.234126	+/-20

NO<sub>x</sub> Calibration Curve







# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

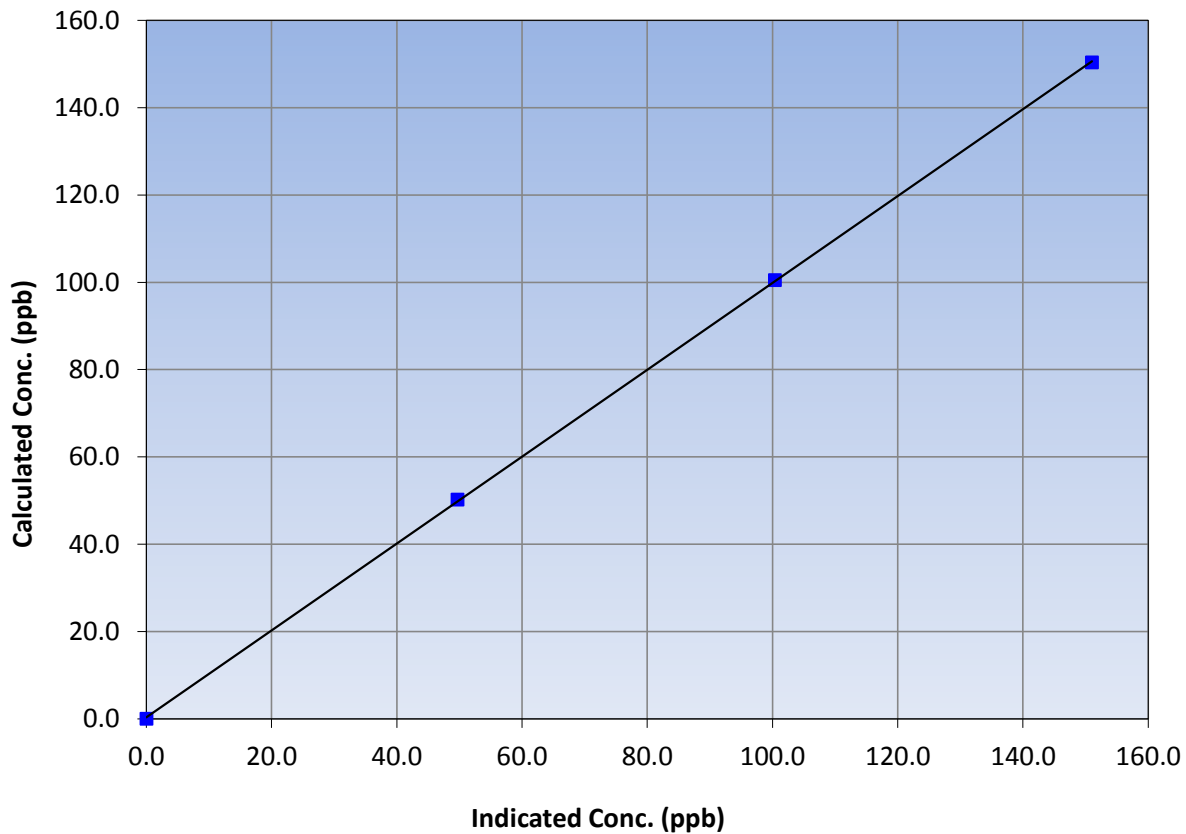
### Station Information

Calibration Date	December 21, 2017	Previous Calibration	NA
Station Name	Fort Chipewyan	Station Number	AMS 08
Start Time (MST)	9:00	End Time (MST)	13:16
Analyzer make	Thermo 42i-TL	Analyzer serial #	917536332

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
150.3	151.0	0.9956			
100.5	100.4	1.0010			
50.2	49.7	1.0106			
			Slope	0.995176	0.90 - 1.10
			Intercept	0.353329	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

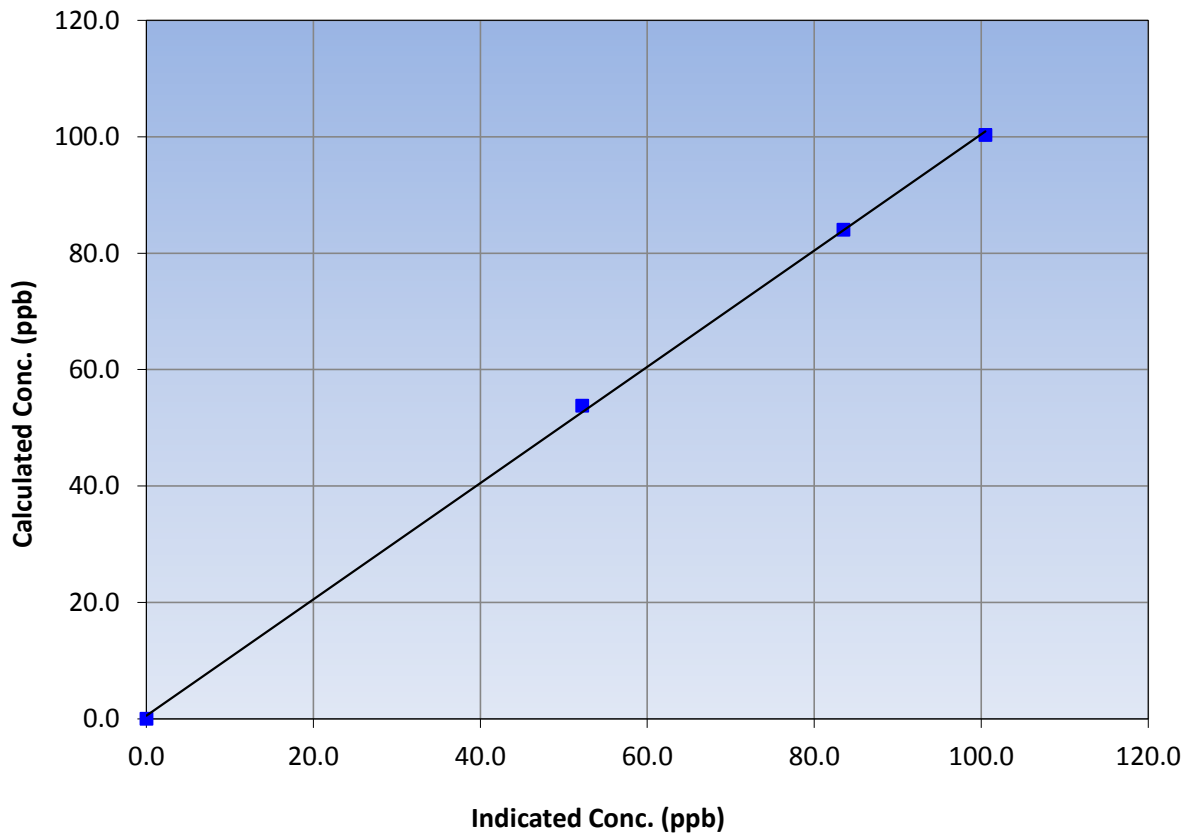
### Station Information

Calibration Date	December 21, 2017	Previous Calibration	NA
Station Name	Fort Chipewyan	Station Number	AMS 08
Start Time (MST)	9:00	End Time (MST)	13:16
Analyzer make	Thermo 42i-TL	Analyzer serial #	917536332

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
100.3	100.5	0.9980			
84.0	83.5	1.0060			
53.8	52.2	1.0307			
			Slope	0.998799	0.90 - 1.10
			Intercept	0.545914	+/-20

**NO<sub>2</sub> Calibration Curve**







# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Fort Chipewyan	Station number:	AMS 08
Calibration Date:	December 8, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	10:05	End time (MST):	11:40
Sharp Model:	Thermo 5030	S/N:	E-772
Particulate Fraction:	PM2.5	C14 Source S/N:	4085
Flow Meter Make/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>	<b>(Limits)</b>
T1 (°C)	-6	-6.7	-6	<input type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	985	988	985	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	949.2	1000	<input checked="" type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	0.7	-----	0	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check:	<u>October 10, 2017</u>	Last Cal Date:	<u>NA</u>
	Flow w/o adaptor:	<u>16.7</u>	Flow w/ adaptor:	<u>16.6</u>

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: <u>5868</u>	Foil S/N: _____	
Foil Mass: <u>1324</u>	Foil Mass: _____	
Calibration Date: <u>October 11, 2017</u>	Calibration Date: _____	
Correction Factor: <u>6905</u>	Correction Factor: _____	---

### Annual Calibration Test (Oct 10, 2017)

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)	22	24	24	<input checked="" type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)	23	24	24	<input checked="" type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)	24	24	24	<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)	25	25	25	<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:		June 2, 2017			
Date Pump Rebuilt/Replaced:		Not available			

Notes:

Nephelometer zeroed, flow adjusted

Calibration by: Ryan Power



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 9  
BARGE LANDING  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)  
 DECEMBER 2017

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	705	35	39	99.46	2	0	1	0
THC(ppm) Average	709	34	35	99.87	4	-	3	-
Temperature (C) Average	744	0	0	100	4	-	1.7	-
Relative Humidity (%) Average	744	0	0	100	99	-	95	-
Wind Speed 10 m (km/h) Average	686	0	58	92.2	13	-	8	-
Wind Direction 10 m (deg) Average	677	0	67	90.99	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
TRS(ppb) Average	705	0.5	0	-	0	0	0	0	1	1	2
THC(ppm) Average	709	2.42	0.3	-	2	2.1	2.2	2.4	2.6	2.7	4
Temperature (C) Average	744	-14.23	12.1	-	-41	-31.5	-26.2	-10.8	-4	0.1	4
Relative Humidity (%) Average	744	82.6	8	-	62	72	75	83	90	93	99
Wind Speed 10 m (km/h) Average	686	4.6	2	-	0	2	3	5	6	8	13
Wind Direction 10 m (deg) Average	677	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS	28 Dec 2017 13:00	28 Dec 2017 16:00	4	Maintenance - calibration to adjust high point
THC	08 Dec 2017 14:00	08 Dec 2017 14:00	1	Maintenance - technician on site
Wind Speed, Wind Direction	01 Dec 2017 18:00	01 Dec 2017 19:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	02 Dec 2017 14:00	02 Dec 2017 14:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	03 Dec 2017 01:00	03 Dec 2017 01:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	03 Dec 2017 22:00	04 Dec 2017 00:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	05 Dec 2017 08:00	05 Dec 2017 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Direction	11 Dec 2017 01:00	11 Dec 2017 09:00	9	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	16 Dec 2017 01:00	17 Dec 2017 10:00	34	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	19 Dec 2017 08:00	19 Dec 2017 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	21 Dec 2017 06:00	21 Dec 2017 06:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	23 Dec 2017 09:00	23 Dec 2017 09:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	23 Dec 2017 22:00	23 Dec 2017 22:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	24 Dec 2017 08:00	24 Dec 2017 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	25 Dec 2017 09:00	25 Dec 2017 09:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Dec 2017 03:00	28 Dec 2017 03:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Dec 2017 20:00	29 Dec 2017 00:00	5	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Dec 2017 02:00	29 Dec 2017 05:00	4	Flat line in sensor output signal -sensor frozen





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

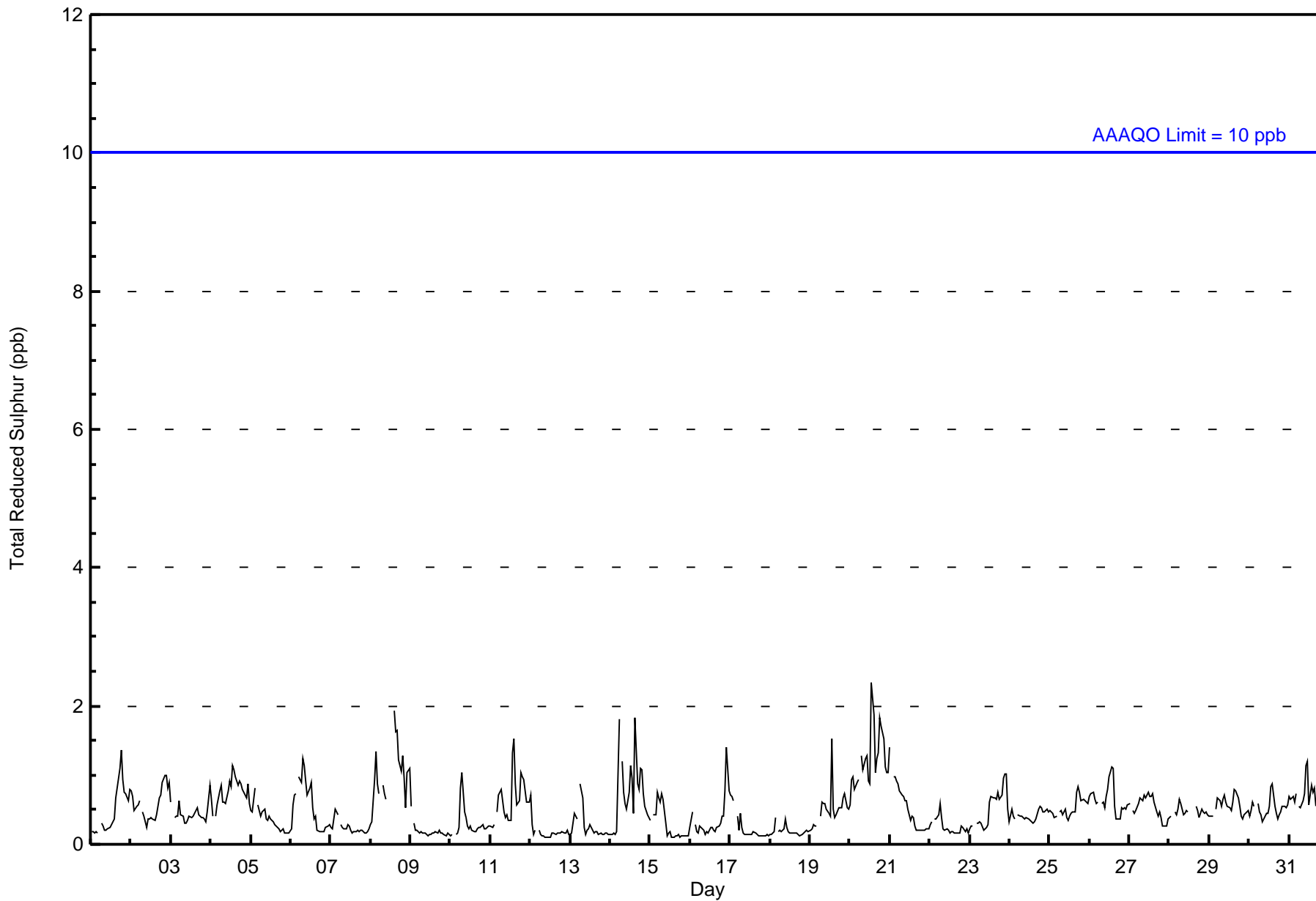
Barge Landing - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 2 ppb on Dec 20 14:00										Maximum Daily Average: 1.2 ppb on Dec 20										Hours of Data: 705																													
Minimum Value: 0 ppb on Dec 15 15:00										Minimum Daily Average: 0.2 ppb on Dec 12										Hours of Missing Data: 39																													
Maximum Diurnal Average: 0.6 ppb at hour 6										Minimum Diurnal Average: 0.4 ppb at hour 2										Hours of Calibration: 35																													
Monthly Average: 0.5 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2										Percent Operational Time: 99.5																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1																							
2-Dec	1	1	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.6	1																							
3-Dec	1	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.4	1																							
4-Dec	1	0	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																							
5-Dec	0	0	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																							
6-Dec	0	1	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.6	1																							
7-Dec	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
8-Dec	0	0	1	1	1	1	Z	1	1	1	C	C	C	C	2	2	2	1	1	1	1	1	1	1	1.0	2																							
9-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
10-Dec	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
11-Dec	0	0	0	Z	0	1	1	1	0	0	0	0	1	2	1	1	1	1	1	1	1	1	1	1	0.7	2																							
12-Dec	1	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	1																							
13-Dec	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
14-Dec	0	0	0	0	0	2	Z	1	1	1	1	1	1	1	0	2	1	1	1	1	1	1	0	0	0.7	2																							
15-Dec	0	Z	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1																							
17-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
19-Dec	0	0	0	0	0	Z	0	1	1	1	1	0	0	2	0	0	0	1	1	1	1	1	1	1	0.5	2																							
20-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	2	2	1	1	1	2	2	2	1	1	1	1.2	2																							
21-Dec	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																							
22-Dec	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1																							
24-Dec	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0.4	1																							
25-Dec	0	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	1																							
26-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0.6	1																							
27-Dec	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1																							
28-Dec	0	0	Z	0	0	1	1	1	0	0	0	0	M	M	M	M	1	0	0	1	0	0	0	0	0.5	1																							
29-Dec	0	0	0	Z	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0.5	1																							
30-Dec	0	0	1	1	Z	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0.5	1																							
31-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																							
																								0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.4	0.4	0.4	0.4	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Diurnal Average	
																								1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	2	2	2	1	2	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**  
**Barge Landing - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Barge Landing - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Barge Landing - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	20	36	20	12	13	12	36	121	146	48	38	36	37	21	29	18	643
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
<b>Totals</b>	20	36	20	12	13	12	36	121	146	48	38	36	37	21	29	18	643

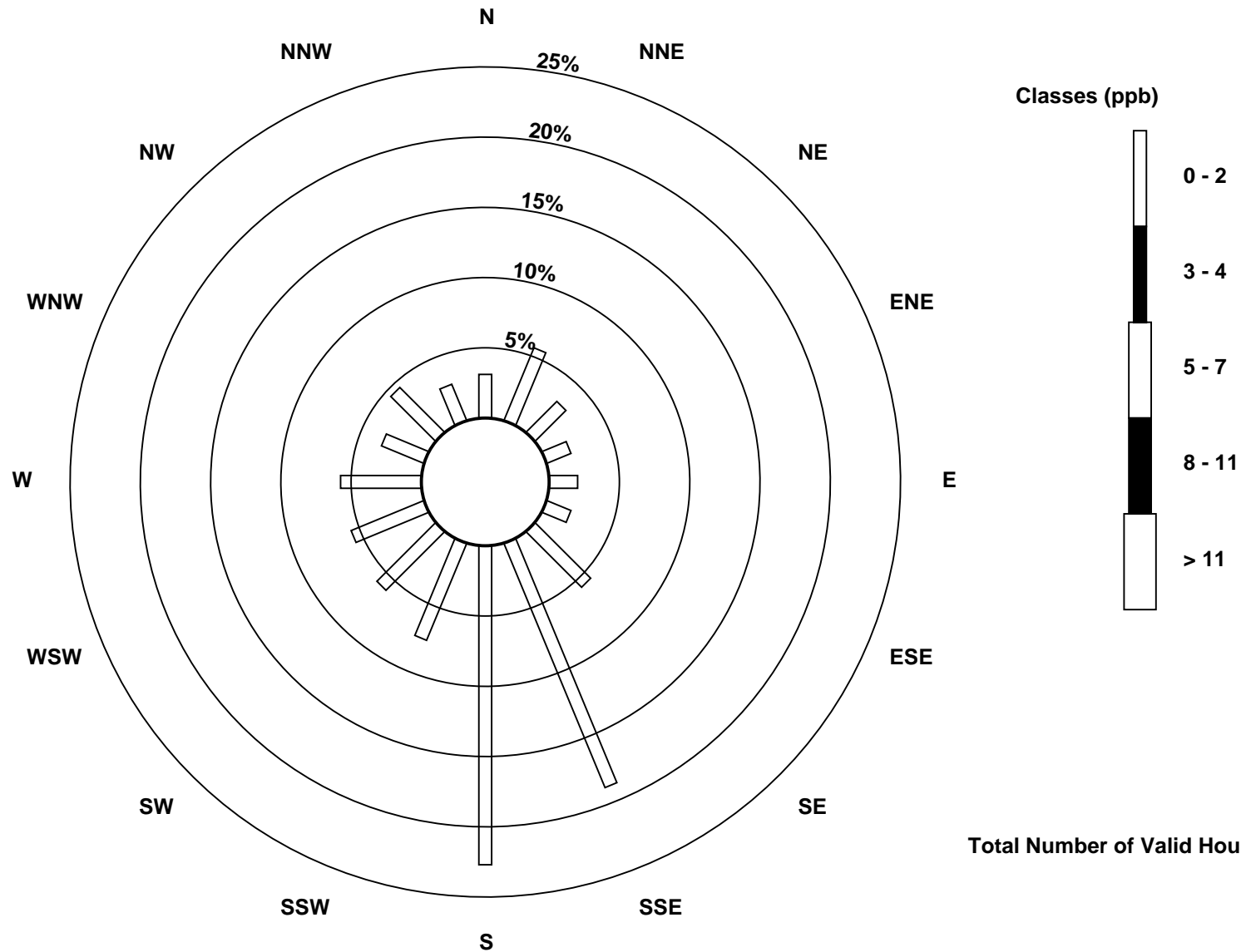
Total Number of Valid Hours: 643

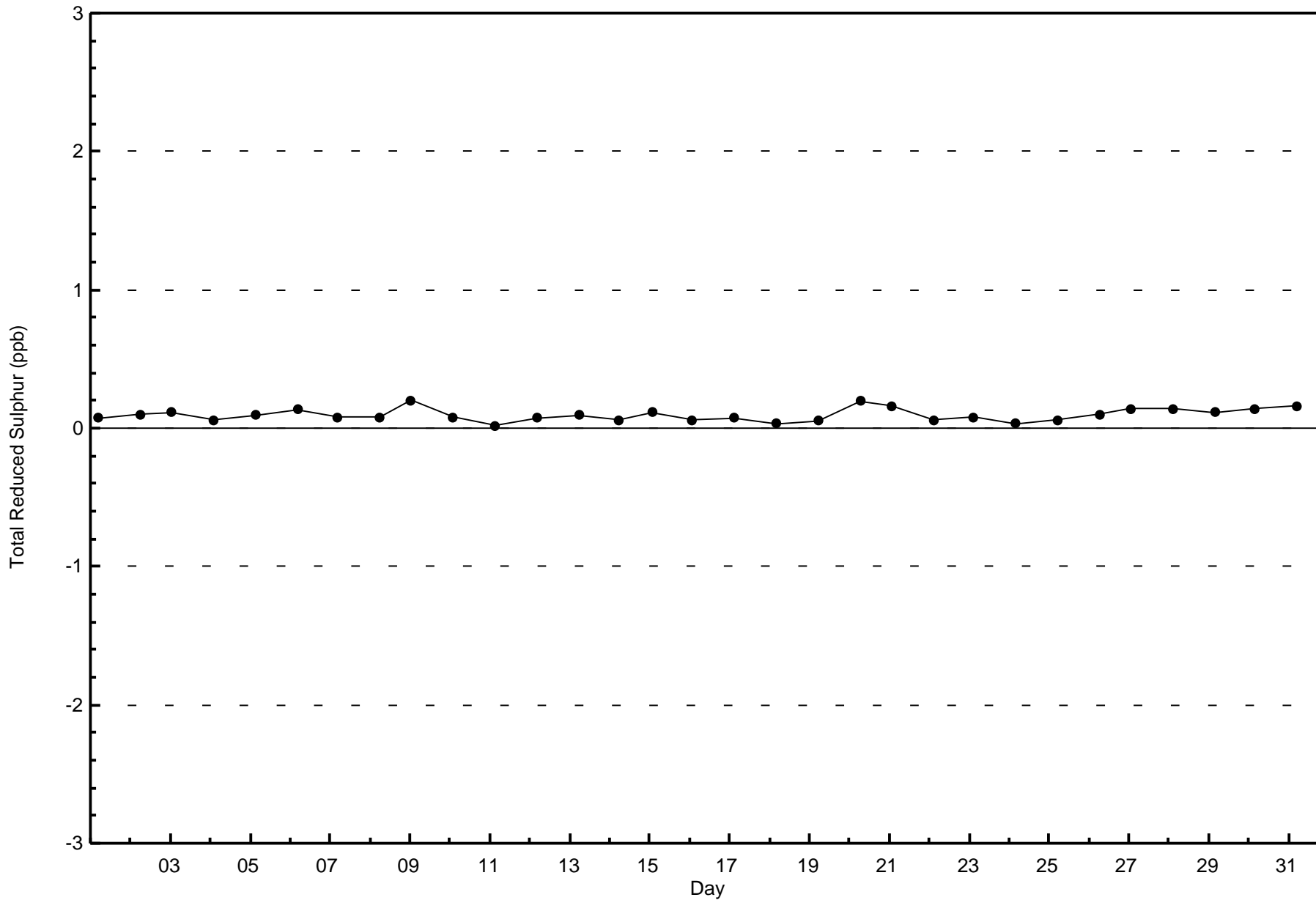
Total Number of Hours: 744

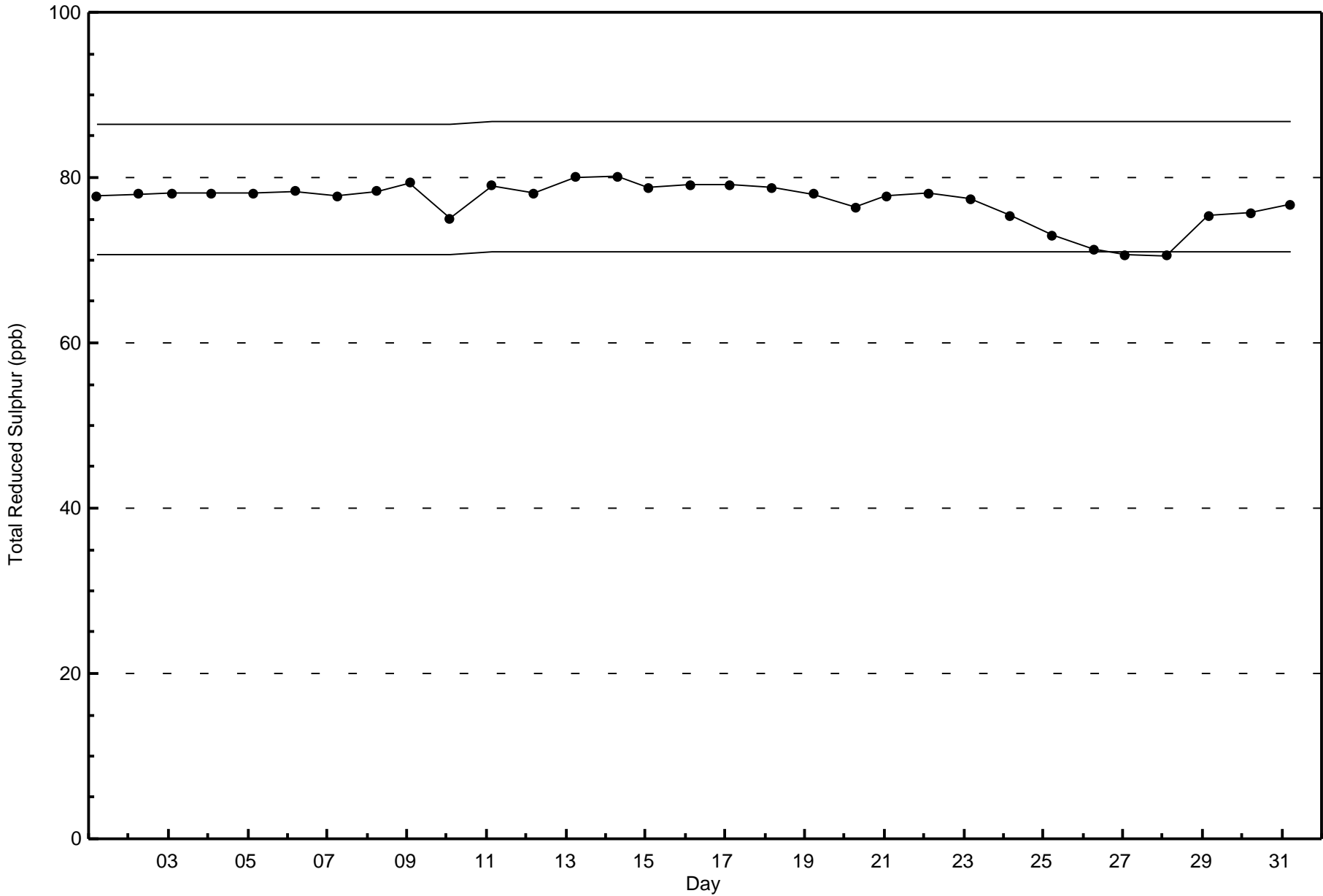


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Reduced Sulphur (TRS) - ppb  
Barge Landing (AMS 9)









**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Total Hydrocarbons (THC) - ppm**  
**Barge Landing - December 2017**

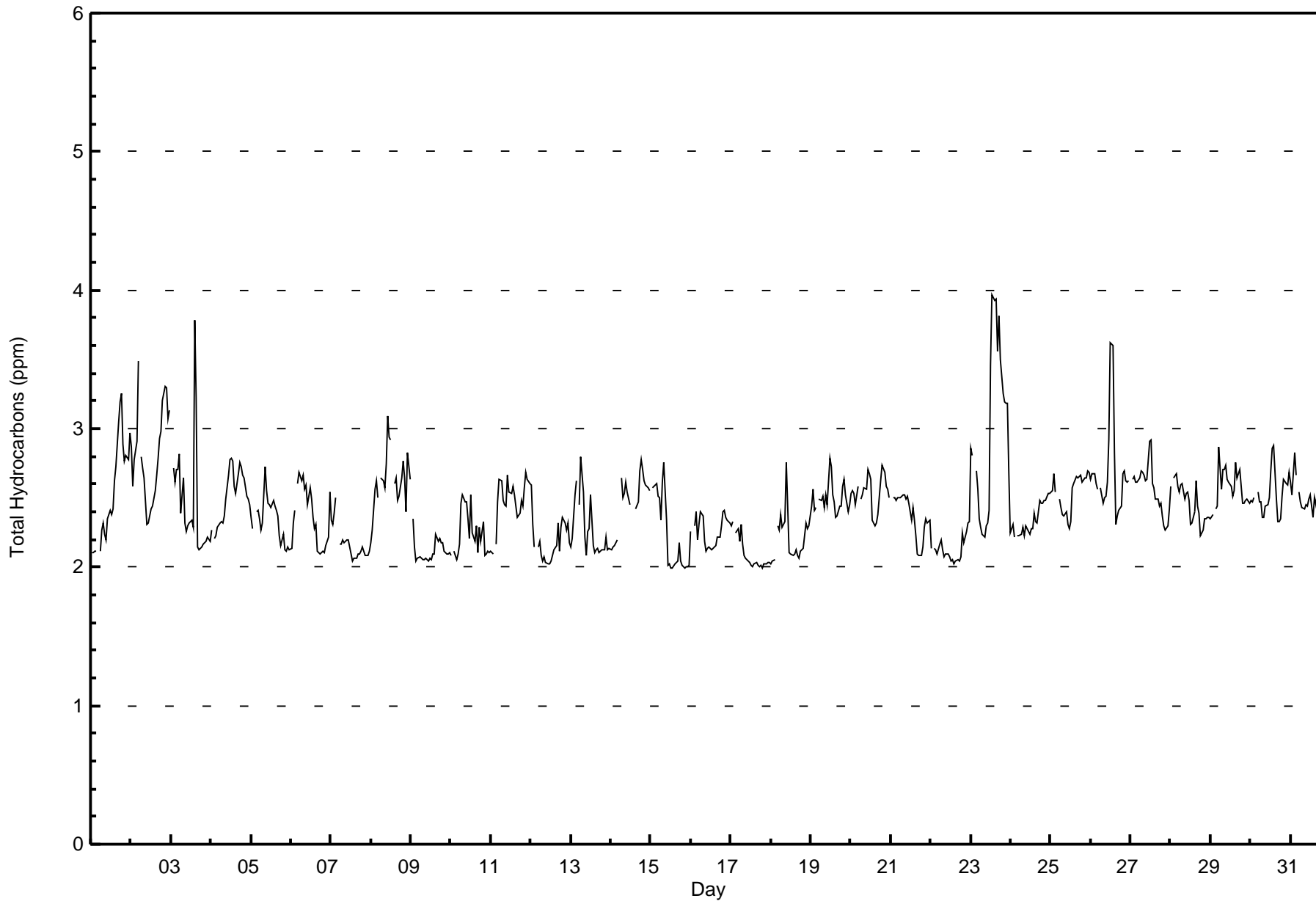
Maximum Value: 4.0 ppm on Dec 23 14:00																				Maximum Daily Average: 3.0 ppm on Dec 23					Hours in Service: 744	
Minimum Value: 2.0 ppm on Dec 15 21:00																				Minimum Daily Average: 2.1 ppm on Dec 17					Hours of Data: 709	
Maximum Diurnal Average: 2.5 ppm at hour 13																				Minimum Diurnal Average: 2.4 ppm at hour 1					Hours of Missing Data: 35	
Monthly Average: 2.42 ppm																				Percentiles: P <sub>1</sub> = 2.0 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.2 Median = 2.4 Q <sub>3</sub> = 2.6 P <sub>90</sub> = 2.7 P <sub>99</sub> = 3.6					Hours of Calibration: 34	
																									Percent Operational Time: 99.9	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.1	2.1	2.1	2.1	Z	2.1	2.3	2.3	2.2	2.2	2.4	2.4	2.4	2.4	2.6	2.7	3.1	3.2	3.3	2.9	2.8	2.8	2.8	3.0	2.5	3.3
2-Dec	2.9	2.6	2.8	2.9	3.5	Z	2.8	2.7	2.6	2.3	2.3	2.4	2.4	2.4	2.5	2.7	2.8	2.9	3.0	3.2	3.3	3.3	3.1	3.1	2.8	3.5
3-Dec	Z	2.7	2.6	2.7	2.7	2.8	2.4	2.6	2.3	2.3	2.3	2.3	2.3	3.8	3.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.5	3.8
4-Dec	2.3	Z	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.5	2.7	2.8	2.8	2.8	2.6	2.5	2.7	2.8	2.7	2.7	2.6	2.5	2.5	2.5	2.5	2.8
5-Dec	2.4	2.3	Z	2.4	2.4	2.4	2.3	2.3	2.7	2.6	2.5	2.4	2.4	2.5	2.4	2.4	2.4	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.3	2.7
6-Dec	2.1	2.3	2.4	Z	2.6	2.7	2.6	2.7	2.6	2.6	2.4	2.6	2.5	2.4	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.5	2.4	2.7
7-Dec	2.3	2.3	2.4	2.5	Z	2.2	2.2	2.2	2.2	2.2	2.2	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	2.2	2.5
8-Dec	2.2	2.3	2.6	2.6	2.5	Z	2.6	2.6	2.6	2.7	3.1	2.9	2.9	M	2.6	2.6	2.5	2.5	2.6	2.8	2.6	2.4	2.8	2.6	2.6	3.1
9-Dec	Z	2.3	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.3
10-Dec	2.1	Z	2.1	2.1	2.1	2.2	2.5	2.5	2.5	2.5	2.3	2.2	2.5	2.3	2.2	2.3	2.1	2.3	2.2	2.3	2.1	2.1	2.1	2.1	2.2	2.5
11-Dec	2.1	2.1	Z	2.2	2.5	2.6	2.6	2.5	2.5	2.4	2.7	2.5	2.5	2.6	2.5	2.4	2.4	2.4	2.5	2.4	2.6	2.7	2.6	2.6	2.5	2.7
12-Dec	2.6	2.3	2.1	Z	2.1	2.2	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.3	2.1	2.3	2.4	2.3	2.3	2.3	2.2	2.2	2.6
13-Dec	2.1	2.2	2.5	2.6	Z	2.4	2.8	2.5	2.2	2.1	2.3	2.3	2.5	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.3	2.8
14-Dec	2.1	2.1	2.2	2.2	2.2	Z	2.6	2.5	2.5	2.6	2.5	2.5	C	C	C	2.4	2.5	2.7	2.8	2.7	2.6	2.6	2.6	2.6	2.5	2.8
15-Dec	Z	2.6	2.6	2.6	2.5	2.5	2.3	2.6	2.8	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.8
16-Dec	2.3	Z	2.3	2.4	2.2	2.3	2.4	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.3	2.3	2.3	2.4
17-Dec	2.3	2.3	Z	2.3	2.3	2.2	2.3	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3
18-Dec	2.0	2.0	2.1	Z	2.3	2.3	2.4	2.3	2.3	2.8	2.4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.2	2.8
19-Dec	2.4	2.6	2.4	2.4	Z	2.5	2.5	2.5	2.4	2.5	2.5	2.8	2.7	2.5	2.5	2.4	2.4	2.4	2.4	2.6	2.6	2.5	2.4	2.5	2.5	2.8
20-Dec	2.5	2.5	2.5	2.4	2.6	Z	2.5	2.5	2.6	2.6	2.7	2.7	2.6	2.3	2.3	2.3	2.4	2.5	2.6	2.7	2.7	2.6	2.6	2.5	2.5	2.7
21-Dec	Z	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.3	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.3	2.3	2.3	2.3	2.4	2.5
22-Dec	2.1	Z	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.3	2.1	2.3
23-Dec	2.9	2.8	Z	2.7	2.6	2.4	2.3	2.2	2.2	2.3	2.3	2.4	3.5	4.0	3.9	3.9	3.6	3.8	3.5	3.3	3.2	3.2	3.2	2.7	3.0	4.0
24-Dec	2.2	2.3	2.2	Z	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.2	2.3	2.3	2.4	2.3	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.3	2.5
25-Dec	2.5	2.6	2.7	2.5	Z	2.5	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.6	2.6	2.7	2.6	2.7	2.7	2.6	2.6	2.6	2.7	2.7	2.5	2.7
26-Dec	2.6	2.7	2.7	2.6	2.6	Z	2.6	2.5	2.5	2.5	2.6	2.9	3.6	3.6	2.8	2.3	2.4	2.4	2.4	2.7	2.7	2.6	2.6	2.6	2.7	3.6
27-Dec	Z	2.6	2.7	2.6	2.6	2.6	2.7	2.7	2.7	2.6	2.6	2.9	2.9	2.6	2.6	2.5	2.5	2.4	2.5	2.4	2.3	2.3	2.3	2.4	2.6	2.9
28-Dec	2.6	Z	2.6	2.7	2.6	2.5	2.6	2.6	2.5	2.5	2.5	2.5	2.3	2.3	2.4	2.6	2.4	2.4	2.2	2.3	2.3	2.4	2.4	2.4	2.5	2.7
29-Dec	2.4	2.4	Z	2.4	2.4	2.9	2.6	2.7	2.7	2.7	2.6	2.6	2.6	2.5	2.6	2.8	2.6	2.7	2.6	2.5	2.5	2.5	2.5	2.5	2.6	2.9
30-Dec	2.5	2.5	2.5	Z	2.5	2.5	2.5	2.4	2.4	2.4	2.5	2.5	2.7	2.9	2.9	2.5	2.3	2.3	2.4	2.5	2.6	2.6	2.6	2.7	2.5	2.9
31-Dec	2.6	2.5	2.8	2.7	Z	2.5	2.5	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.5	2.6	3.0	2.6	3.0
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan      C - Calibration      M - Maintenance																										





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Barge Landing - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Barge Landing - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	43	6.06	6.06
2.1 - 3.0	641	90.41	96.47
3.1 - 10.0	25	3.53	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Barge Landing - December 2017**

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	1	0	2	1	9	13	8	9	0	43
2.1 - 3.0	21	31	18	13	14	11	33	119	138	47	37	26	24	13	20	17	582
3.1 - 10.0	0	3	1	1	1	1	4	2	5	2	0	1	0	0	0	1	22
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	21	34	19	14	15	12	37	122	143	51	38	36	37	21	29	18	647

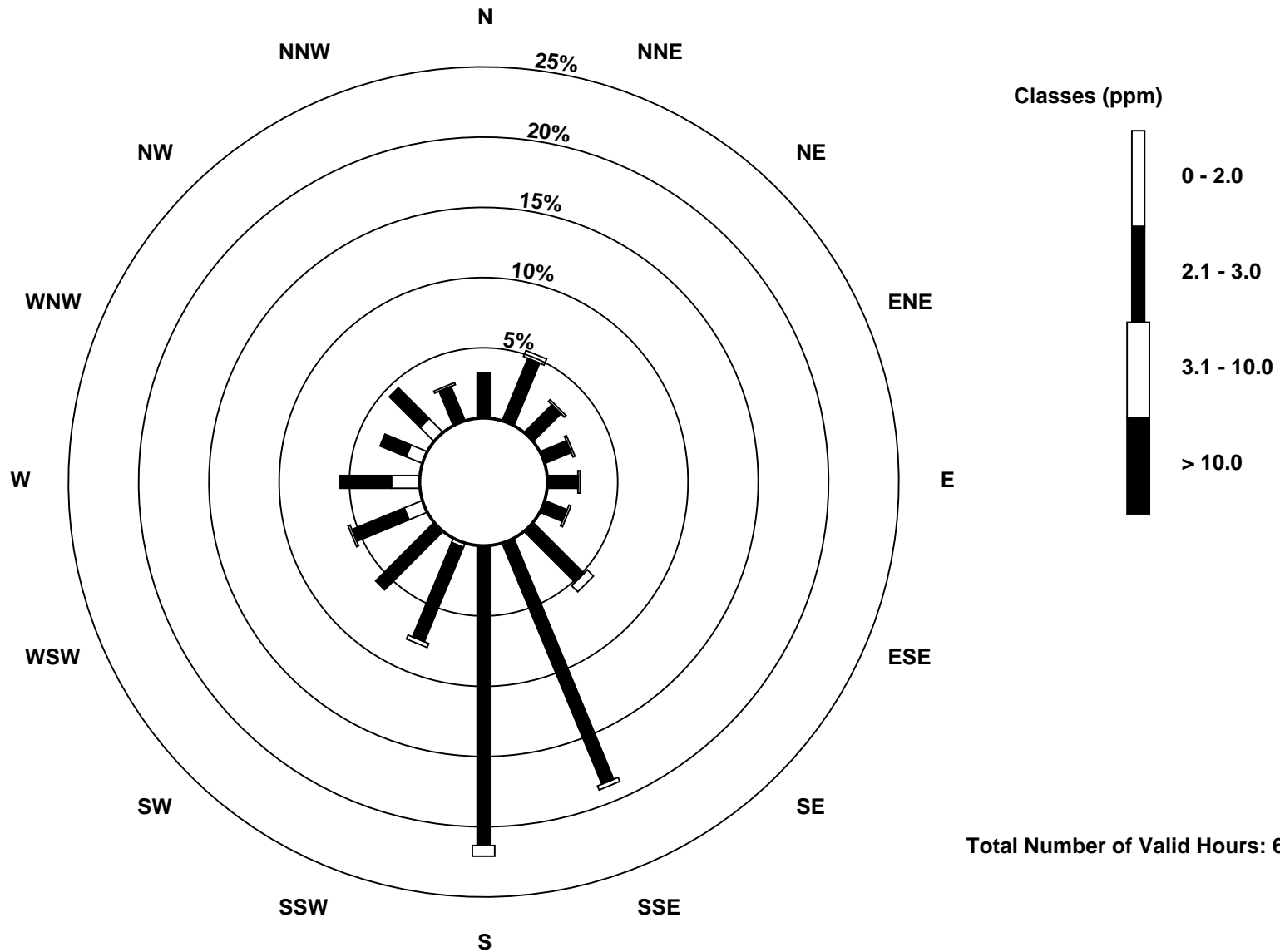
Total Number of Valid Hours: 647

Total Number of Hours: 744

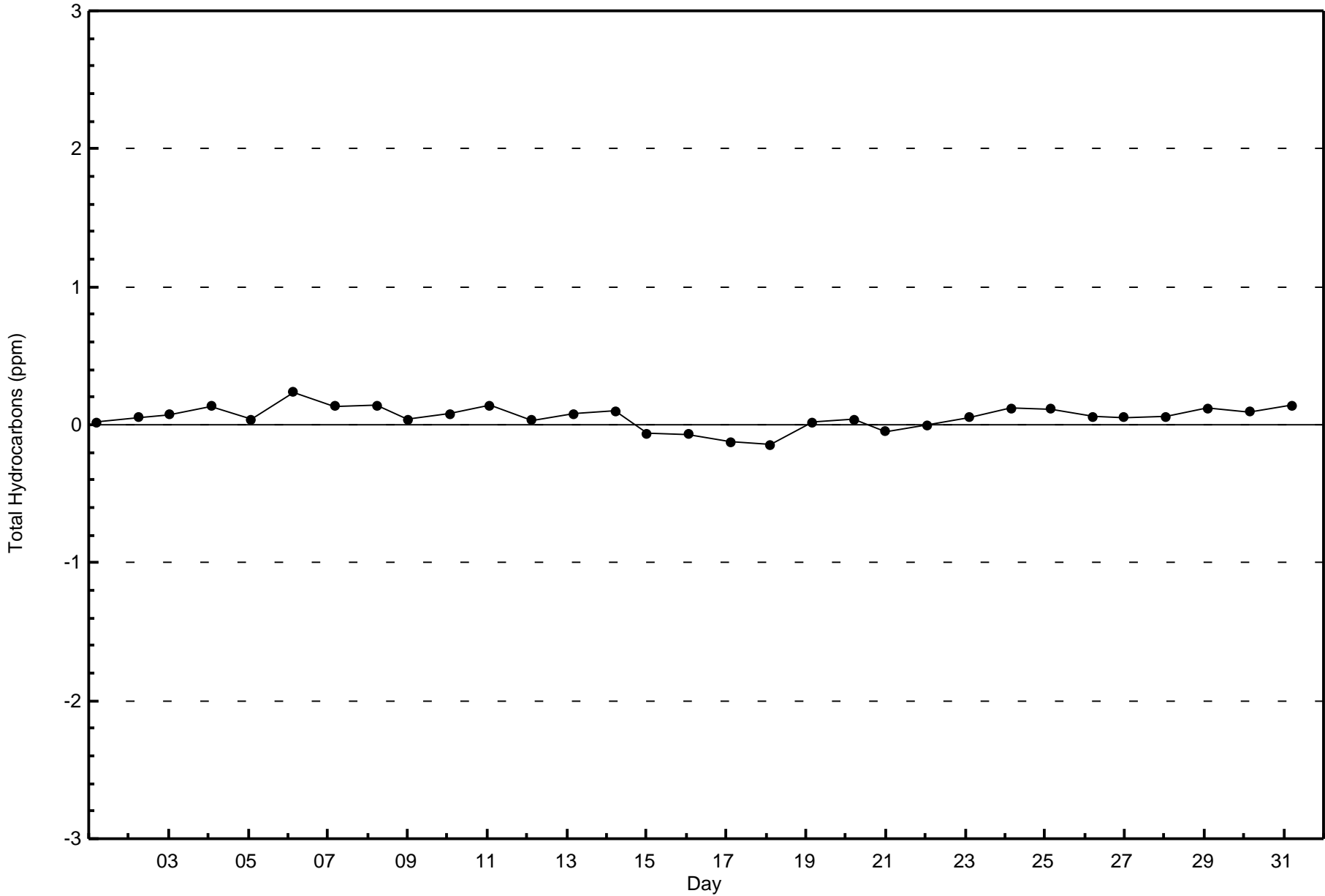


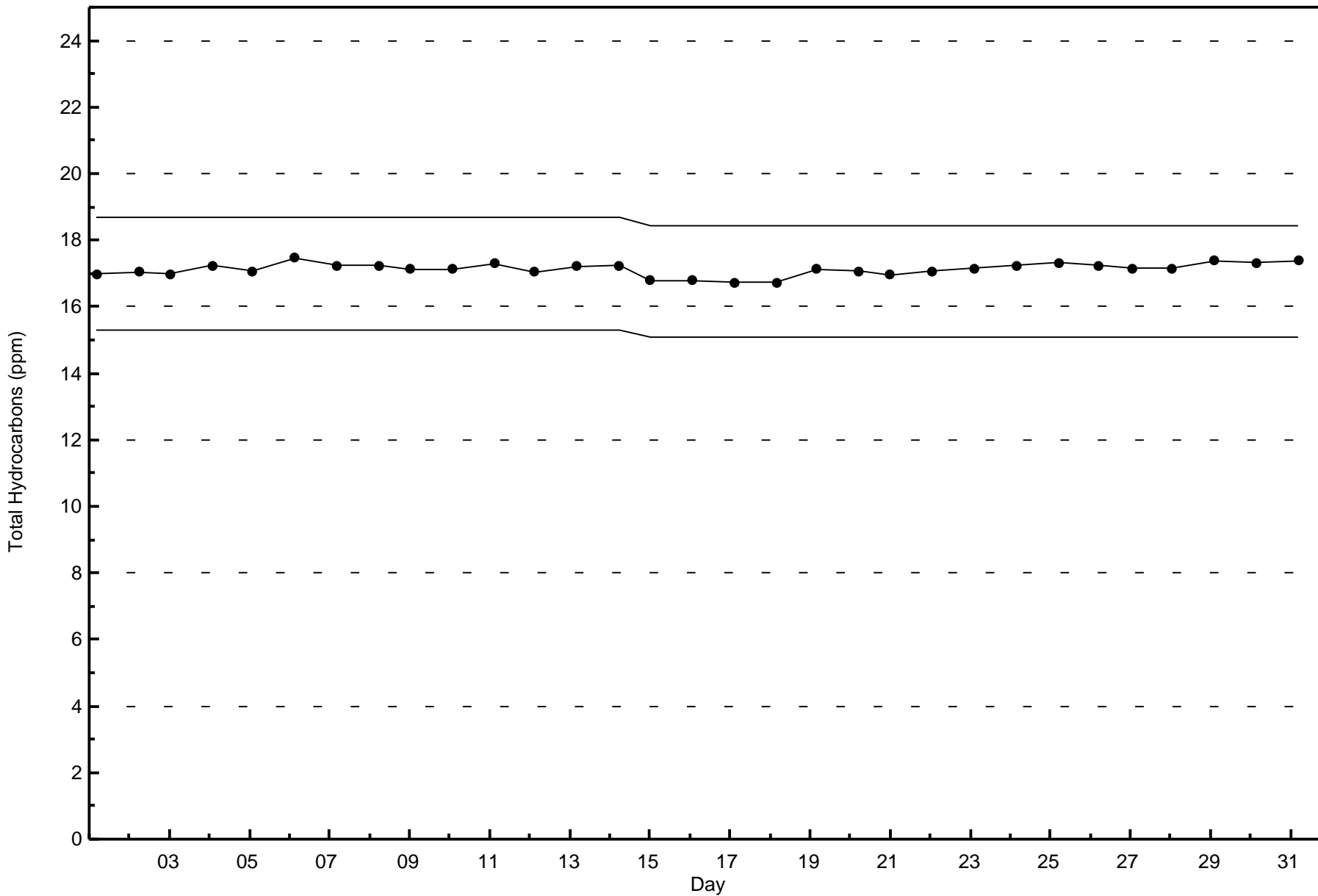
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Barge Landing (AMS 9)



Total Number of Valid Hours: 647







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

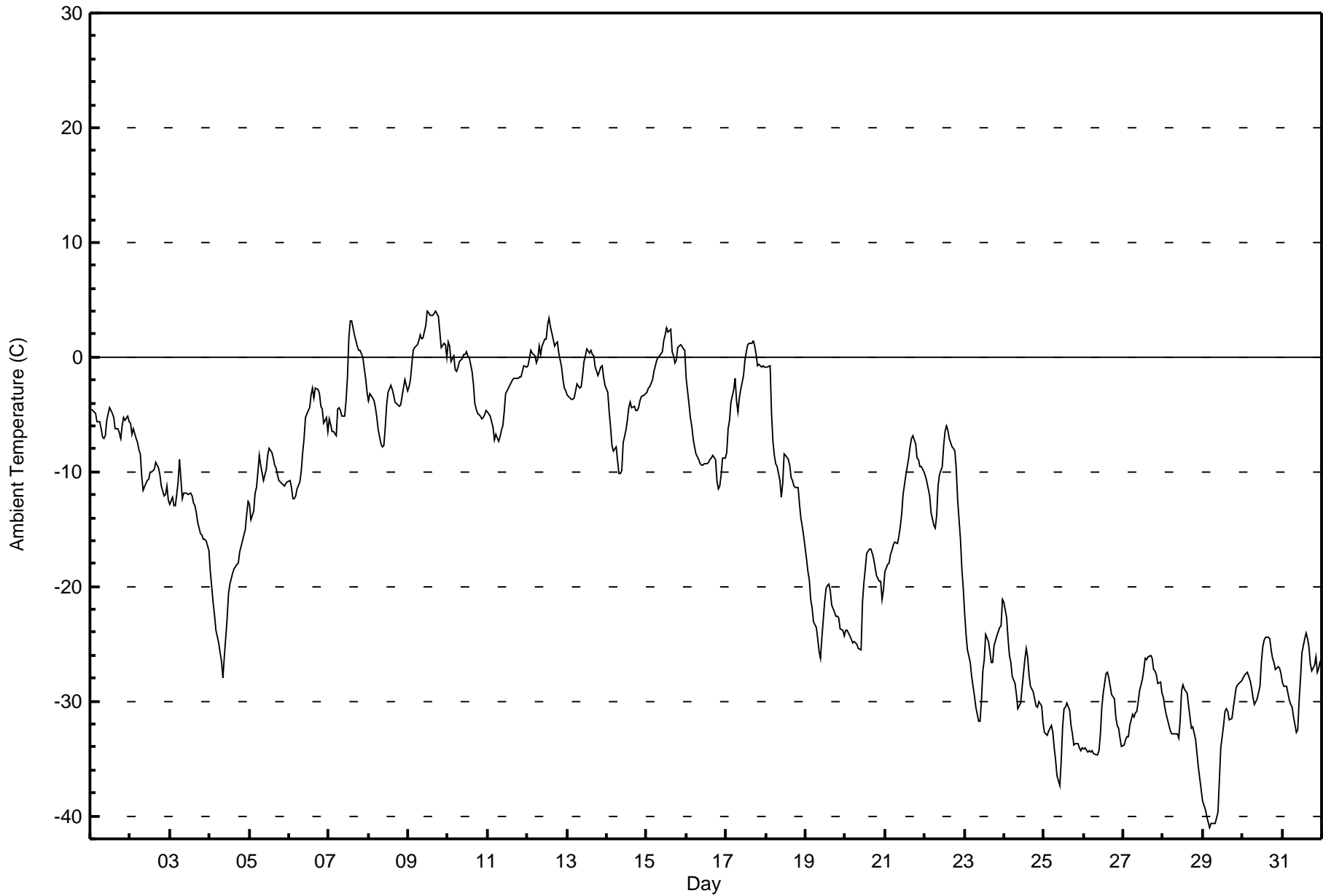
**Ambient Temperature (AT) - C**  
**Barge Landing - December 2017**

Maximum Value: 4.0 C on Dec 9 17:00		Maximum Daily Average: 1.7 C on Dec 9		Hours in Service: 744																						
Minimum Value: -41.0 C on Dec 29 05:00		Minimum Daily Average: -34.8 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -11.8 C at hour 14		Minimum Diurnal Average: -16.4 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -14.23 C		Percentiles: P <sub>1</sub> = -39.7 P <sub>10</sub> = -31.5 Q <sub>1</sub> = -26.2 Median = -10.8 Q <sub>3</sub> = -4.0 P <sub>90</sub> = 0.1 P <sub>99</sub> = 3.6		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.5	-4.7	-4.8	-5.0	-5.7	-5.6	-6.3	-7.0	-7.1	-6.9	-5.5	-4.4	-4.6	-4.9	-5.3	-6.3	-6.2	-6.6	-7.2	-6.0	-5.3	-5.6	-5.1	-5.6	-5.7	-4.4
2-Dec	-5.8	-6.8	-6.3	-7.1	-7.5	-8.1	-8.4	-10.3	-11.6	-11.1	-10.8	-10.6	-10.1	-10.0	-9.8	-9.2	-9.4	-9.6	-10.2	-11.3	-12.1	-12.0	-11.2	-12.5	-9.7	-5.8
3-Dec	-12.8	-12.2	-12.9	-12.9	-12.0	-10.9	-9.0	-12.3	-11.9	-11.9	-11.8	-12.0	-11.8	-12.1	-12.7	-12.9	-13.6	-14.4	-15.4	-15.6	-15.8	-15.9	-16.0	-16.9	-13.2	-9.0
4-Dec	-18.7	-20.0	-21.4	-22.5	-23.9	-24.9	-25.7	-26.6	-27.9	-26.1	-22.9	-20.6	-19.8	-19.3	-18.8	-18.5	-18.1	-18.0	-17.0	-16.5	-16.0	-15.0	-13.7	-12.6	-20.2	-12.6
5-Dec	-12.8	-14.2	-13.4	-11.8	-11.4	-10.1	-8.5	-9.4	-10.8	-10.3	-9.7	-8.6	-8.0	-8.3	-8.9	-9.4	-9.7	-10.3	-10.7	-11.0	-11.1	-11.2	-11.1	-10.9	-10.5	-8.0
6-Dec	-10.8	-11.4	-12.3	-12.4	-12.1	-11.4	-10.8	-9.9	-8.3	-7.0	-5.2	-4.6	-4.4	-3.3	-2.7	-3.5	-2.8	-2.8	-3.2	-4.3	-4.5	-5.7	-5.3	-6.5	-6.9	-2.7
7-Dec	-5.4	-5.9	-6.5	-6.5	-6.8	-4.6	-4.4	-4.6	-5.1	-5.1	-3.8	-1.7	1.7	3.1	3.1	1.9	1.5	1.0	0.6	0.5	0.0	-1.0	-1.9	-3.0	-2.2	3.1
8-Dec	-3.8	-3.2	-3.5	-3.8	-4.4	-5.3	-6.4	-7.5	-7.8	-7.7	-6.1	-4.1	-3.1	-2.5	-2.8	-3.4	-4.0	-4.1	-4.3	-4.1	-3.5	-2.7	-1.9	-2.9	-4.3	-1.9
9-Dec	-2.6	-2.0	-0.7	0.6	0.8	1.1	1.4	1.9	1.6	1.7	2.8	4.0	3.9	3.6	3.6	3.6	4.0	3.8	3.5	2.2	0.9	1.1	1.1	-0.1	1.7	4.0
10-Dec	1.4	1.0	-0.4	0.1	-1.2	-1.2	-0.8	-0.4	-0.1	0.2	0.3	0.5	0.1	-0.1	-1.2	-2.4	-4.0	-4.5	-4.9	-5.1	-5.4	-5.2	-5.1	-4.7	-1.8	1.4
11-Dec	-4.8	-5.1	-5.7	-6.1	-7.2	-6.7	-7.4	-6.9	-6.3	-6.0	-4.8	-3.2	-2.7	-2.5	-2.3	-2.0	-1.8	-1.9	-1.8	-1.7	-1.8	-1.3	-0.7	-0.9	-3.8	-0.7
12-Dec	-0.8	-0.1	0.6	0.4	0.1	-0.5	-0.2	1.0	0.2	1.0	1.6	1.6	2.7	3.4	2.7	1.6	0.9	1.2	1.4	0.3	-0.9	-1.9	-2.7	-3.0	0.4	3.4
13-Dec	-3.3	-3.5	-3.6	-3.7	-3.6	-3.0	-2.4	-2.8	-2.6	-1.6	-0.4	0.1	0.7	0.4	0.6	0.2	0.1	-0.8	-1.6	-1.3	-0.9	-0.7	-1.8	-2.5	-1.6	0.7
14-Dec	-3.1	-4.8	-6.1	-7.7	-8.2	-7.8	-9.1	-10.1	-10.1	-9.9	-7.4	-6.3	-5.5	-4.4	-4.0	-4.4	-4.3	-4.6	-4.4	-4.4	-3.7	-3.5	-3.3	-3.2	-5.9	-3.1
15-Dec	-3.0	-2.7	-2.6	-2.0	-1.2	-0.7	-0.3	0.0	0.1	0.5	1.4	1.9	2.6	2.2	2.4	0.5	0.1	-0.5	-0.3	0.8	1.1	1.0	0.7	0.6	0.1	2.6
16-Dec	-1.9	-4.1	-5.2	-6.0	-7.1	-7.8	-8.4	-8.9	-9.2	-9.4	-9.4	-9.3	-9.3	-9.2	-9.0	-8.8	-8.5	-8.9	-10.8	-11.5	-11.3	-10.3	-8.8	-8.8	-8.4	-1.9
17-Dec	-8.3	-6.2	-5.5	-3.9	-2.8	-1.8	-3.8	-4.8	-3.6	-2.8	-1.6	-0.3	0.5	1.1	1.2	1.2	1.4	0.9	0.2	-0.8	-0.7	-0.8	-0.7	-0.9	-1.8	1.4
18-Dec	-0.8	-0.9	-0.7	-4.9	-7.4	-8.6	-9.3	-9.5	-10.8	-12.2	-11.0	-8.5	-8.6	-8.9	-9.5	-10.5	-10.8	-11.2	-11.4	-11.3	-12.9	-14.1	-14.7	-15.7	-9.3	-0.7
19-Dec	-17.5	-18.7	-19.4	-21.1	-21.9	-23.1	-23.5	-24.5	-25.6	-26.3	-24.4	-21.2	-20.1	-19.9	-19.8	-20.3	-21.6	-22.2	-22.6	-22.6	-22.7	-23.7	-23.8	-24.3	-22.1	-17.5
20-Dec	-23.8	-23.9	-24.0	-24.3	-24.9	-24.8	-24.9	-25.0	-25.4	-25.5	-21.4	-19.7	-18.4	-17.1	-16.7	-16.7	-17.1	-17.6	-18.3	-19.0	-19.5	-19.6	-21.2	-20.2	-21.2	-16.7
21-Dec	-18.7	-18.1	-18.0	-17.3	-16.8	-16.3	-16.2	-16.3	-15.6	-14.8	-13.7	-12.0	-10.3	-9.5	-8.8	-7.9	-7.1	-6.8	-7.6	-8.8	-8.9	-9.5	-9.6	-10.0	-12.4	-6.8
22-Dec	-10.3	-10.9	-11.5	-12.1	-13.5	-14.7	-14.9	-13.8	-11.2	-10.3	-9.6	-7.7	-6.4	-6.0	-6.4	-7.1	-7.8	-7.9	-8.2	-9.8	-12.4	-15.9	-18.4	-20.1	-11.1	-6.0
23-Dec	-22.4	-24.2	-25.6	-26.7	-27.8	-28.7	-29.5	-30.5	-31.7	-31.8	-30.0	-27.4	-26.3	-24.1	-24.8	-25.6	-26.6	-26.7	-25.2	-24.3	-23.9	-23.5	-23.5	-21.1	-26.3	-21.1
24-Dec	-21.4	-22.7	-24.6	-26.0	-26.6	-27.8	-28.4	-29.4	-30.7	-30.4	-30.2	-27.6	-26.4	-25.5	-26.1	-27.7	-28.7	-29.1	-29.8	-30.4	-30.5	-30.0	-30.5	-31.8	-28.0	-21.4
25-Dec	-32.7	-32.9	-33.0	-32.6	-32.1	-32.8	-34.1	-35.2	-36.5	-37.4	-35.2	-32.3	-30.7	-30.5	-30.2	-30.8	-32.1	-32.9	-33.8	-33.7	-33.6	-34.1	-34.3	-34.1	-33.2	-30.2
26-Dec	-34.1	-34.1	-34.4	-34.4	-34.4	-34.4	-34.5	-34.7	-34.7	-34.4	-32.8	-30.5	-29.4	-27.7	-27.4	-28.0	-28.7	-29.4	-29.8	-31.4	-32.1	-32.3	-33.2	-33.9	-32.1	-27.4
27-Dec	-33.9	-33.4	-33.1	-33.1	-32.1	-31.1	-31.3	-31.0	-30.9	-30.1	-29.0	-28.1	-27.2	-26.3	-26.3	-26.1	-26.0	-26.3	-27.2	-27.3	-27.7	-28.5	-28.3	-29.3	-29.3	-26.0
28-Dec	-29.7	-30.6	-31.2	-32.1	-32.6	-32.8	-32.8	-32.8	-32.8	-33.2	-31.7	-29.1	-28.6	-29.0	-29.3	-30.4	-31.4	-32.4	-32.3	-33.4	-34.5	-35.8	-36.8	-37.8	-32.2	-28.6
29-Dec	-38.7	-39.5	-40.0	-40.6	-41.0	-40.6	-40.7	-40.7	-40.2	-39.7	-36.9	-34.0	-32.1	-30.9	-30.6	-30.9	-31.6	-31.5	-30.5	-29.7	-28.9	-28.6	-28.5	-28.2	-34.8	-28.2
30-Dec	-28.0	-27.7	-27.5	-27.5	-28.2	-28.8	-29.7	-30.3	-30.0	-29.8	-28.7	-26.6	-25.3	-24.7	-24.5	-24.4	-24.5	-25.5	-26.2	-26.7	-27.2	-27.0	-27.1	-27.6	-27.2	-24.4
31-Dec	-28.3	-28.7	-28.7	-29.3	-29.9	-30.3	-30.6	-31.3	-32.7	-32.5	-29.9	-27.9	-25.7	-24.6	-24.1	-24.5	-25.3	-26.8	-27.3	-26.8	-26.1	-27.4	-27.1	-26.5	-28.0	-24.1
	-14.2	-14.6	-14.9	-15.2	-15.6	-15.6	-15.8	-16.3	-16.4	-16.1	-14.8	-13.2	-12.3	-11.8	-11.9	-12.3	-12.7	-13.1	-13.4	-13.7	-13.9	-14.2	-14.3	-14.7		Diurnal Average
	1.4	1.0	0.6	0.6	0.8	1.1	1.4	1.9	1.6	1.7	2.8	4.0	3.9	3.6	3.6	3.6	4.0	3.8	3.5	2.2	1.1	1.1	1.1	0.6		Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Barge Landing - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Barge Landing - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	260	34.95	34.95
-20 - 0	405	54.44	89.38
0 - 10	79	10.62	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

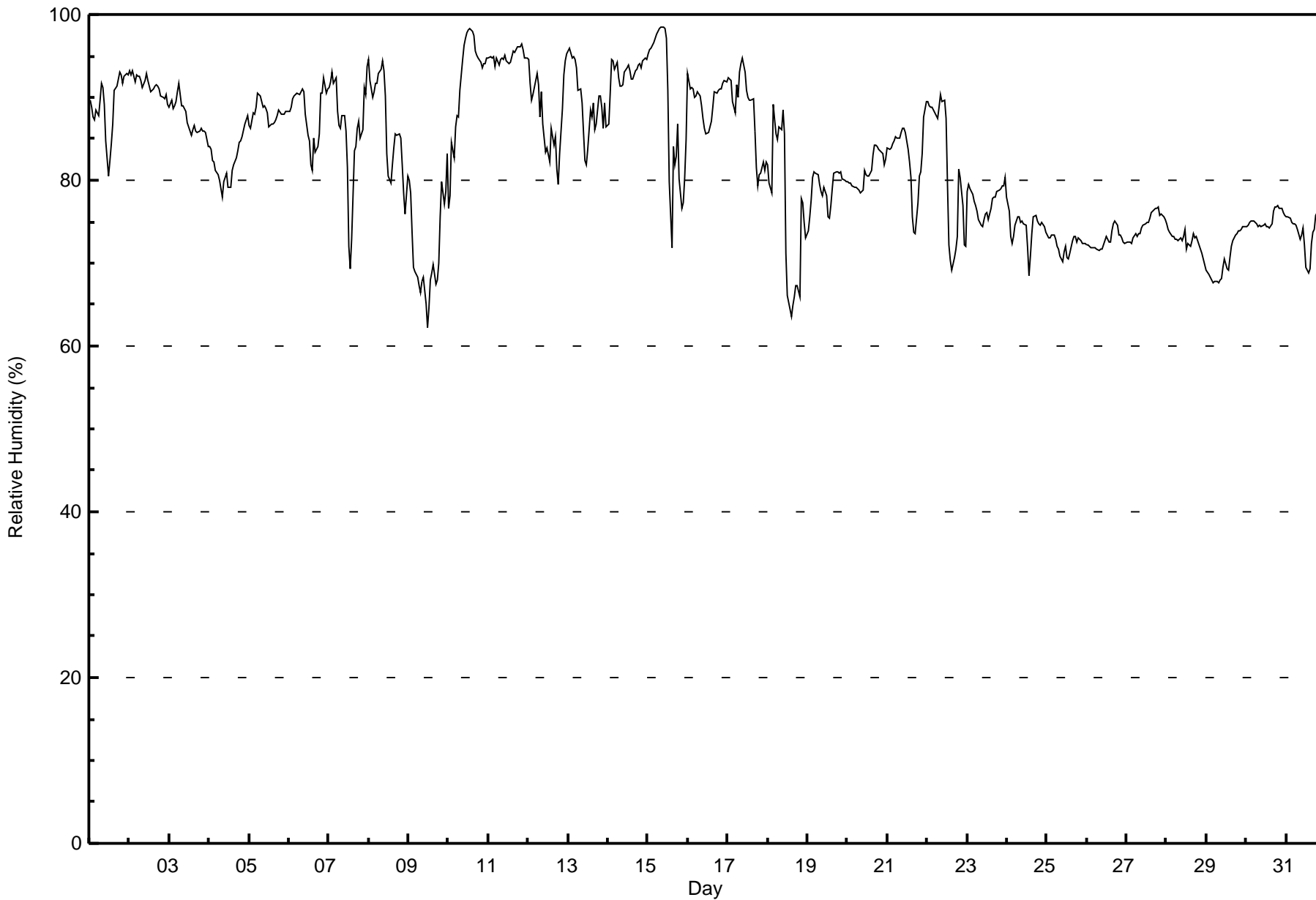
**Barge Landing - December 2017**

Maximum Value: 99 % on Dec 15 10:00      Maximum Daily Average: 95.0 % on Dec 11																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 62 % on Dec 9 12:00      Minimum Daily Average: 70.5 % on Dec 29 Maximum Diurnal Average: 84.0 % at hour 1      Minimum Diurnal Average: 79.3 % at hour 14 Monthly Average: 82.6 %      Percentiles: P <sub>1</sub> = 66 P <sub>10</sub> = 72 Q <sub>1</sub> = 75 Median = 83 O <sub>3</sub> = 90 P <sub>90</sub> = 93 P <sub>99</sub> = 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-Dec	90	89	88	87	88	88	90	92	91	89	85	81	82	84	87	91	91	92	93	93	92	93	93	93	89.2	93
2-Dec	93	93	93	92	93	93	92	92	91	92	93	92	91	91	91	91	91	91	91	91	90	90	90	90	91.5	93
3-Dec	89	90	89	89	89	91	92	89	89	89	88	87	86	85	86	87	86	86	86	86	86	86	86	84	87.5	92
4-Dec	84	84	82	82	81	81	80	79	78	80	81	79	79	81	82	83	84	85	85	85	87	87	88	88	82.3	88
5-Dec	87	86	88	88	89	91	90	90	89	89	89	88	87	87	87	87	88	89	88	88	88	88	88	88	88.1	91
6-Dec	88	89	90	90	90	91	90	91	91	91	88	85	85	82	81	85	83	84	86	90	90	92	91	91	88.1	92
7-Dec	91	92	93	92	92	88	87	86	88	88	86	81	72	69	73	83	84	86	87	85	86	91	90	94	86.1	94
8-Dec	95	92	90	91	92	92	93	93	94	93	90	83	81	80	82	84	86	85	86	85	82	78	76	80	86.8	95
9-Dec	80	78	74	69	69	68	67	66	68	68	65	62	65	68	69	70	67	68	70	76	80	77	79	83	71.1	83
10-Dec	77	78	85	83	86	88	88	91	95	96	97	98	98	98	98	97	96	95	95	94	94	94	94	95	92.0	98
11-Dec	95	95	95	95	94	95	94	95	95	95	95	94	94	94	95	96	95	96	96	96	96	96	95	95	95.0	96
12-Dec	95	92	90	90	92	93	91	88	91	87	83	84	83	82	86	84	85	81	79	83	89	93	94	95	87.9	95
13-Dec	96	96	95	95	95	93	91	91	89	86	82	82	84	88	88	89	86	87	90	90	89	86	89	86	89.3	96
14-Dec	87	90	95	94	93	94	92	91	91	92	93	94	94	93	92	92	93	93	94	94	94	94	95	94	92.9	95
15-Dec	95	96	96	97	97	98	98	98	98	99	98	97	91	80	72	84	82	83	87	80	77	77	80	85	89.4	99
16-Dec	93	91	91	91	90	90	91	90	89	87	86	86	86	86	87	89	91	91	91	91	91	92	92	92	89.7	93
17-Dec	92	92	92	90	88	91	90	93	94	95	93	91	90	90	90	90	86	82	79	81	81	82	81	82	88.1	95
18-Dec	82	80	79	89	87	86	85	86	86	88	86	71	66	64	64	65	66	67	67	66	78	77	75	73	76.4	89
19-Dec	74	76	78	80	81	81	81	79	79	78	79	78	76	76	77	79	81	81	81	81	81	80	80	80	79.0	81
20-Dec	80	80	80	79	79	79	79	79	78	79	81	81	81	80	81	83	84	84	84	84	83	83	82	83	81.1	84
21-Dec	84	84	84	84	85	85	85	85	86	86	86	86	84	82	80	76	74	74	77	80	81	83	88	90	82.9	90
22-Dec	89	89	89	89	88	88	88	89	90	89	90	87	80	72	70	69	71	72	73	81	80	77	72	72	81.5	90
23-Dec	79	79	79	78	77	77	76	75	75	74	75	76	76	75	77	78	78	78	79	79	79	79	79	80	77.4	80
24-Dec	78	76	73	72	73	75	76	76	75	75	75	75	72	68	71	74	76	76	75	75	75	75	74	74	74.2	78
25-Dec	73	73	73	73	73	73	72	72	71	70	71	72	71	71	71	73	73	73	73	73	73	72	72	72	72.3	73
26-Dec	72	72	72	72	72	72	72	72	72	72	72	73	73	73	72	74	75	75	75	73	73	73	72	72	72.7	75
27-Dec	72	73	72	72	73	74	73	73	74	74	75	75	75	75	75	76	76	77	77	77	76	76	76	75	74.6	77
28-Dec	75	74	74	73	73	73	73	73	73	73	73	74	72	72	72	73	73	73	73	72	72	71	70	70	72.7	75
29-Dec	69	69	68	68	68	68	68	68	68	68	70	70	69	69	71	72	73	73	74	74	74	74	74	74	70.5	74
30-Dec	74	75	75	75	75	75	75	74	75	74	75	75	74	74	74	75	76	77	77	77	77	77	76	76	75.3	77
31-Dec	76	76	75	75	75	75	75	74	73	73	74	72	69	69	69	72	74	74	76	76	76	75	77	76	74.0	77
84.0 83.8 83.7 83.8 83.8 83.9 83.6 83.6 83.7 83.5 83.1 81.6 80.1 79.3 79.7 81.3 81.4 81.5 82.0 82.5 82.8 82.9 82.9 83.3																		Diurnal Average								
96 96 96 97 97 98 98 98 98 98 99 98 98 98 98 97 96 96 96 96 96 96 96 95 95																		Diurnal Maximum								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Barge Landing - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Barge Landing - December 2017

Maximum Speed: 13 km/h on Dec 18 14:00	Maximum Daily Speed Average: 6.1 km/h on Dec 8	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 25 08:00	Minimum Daily Speed Average: 0.5 km/h on Dec 2	Hours of Data: 686
Maximum Diurnal Speed Average: 2.5 km/h at hour 11	Minimum Diurnal Speed Average: 1.4 km/h at hour 19	Hours of Missing Data: 58
Monthly Average Velocity: 1.9 km/h 192.9 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 5 Q <sub>3</sub> = 6 P <sub>90</sub> = 8 P <sub>99</sub> = 12	Percent Operational Time: 92.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SW6	WSW7	SW8	SW5	SW7	WSW9	S4	SSW4	SSW5	SW6	SSW6	SSW8	S7	S5	S3	S6	S5	AF	AF	SW3	S4	SSE5	S3	WNW1	SSW4.7	WSW9	
2-Dec	NNW2	NNW3	NE1	NW2	NNE3	N2	N3	NNE3	N2	E3	E2	ENE2	WSW1	AF	SSE2	S1	SW2	SW1	W1	E1	SSE3	S2	SE1	SE1	NNE0.5	N3	
3-Dec	AF	SE3	E0	SE1	SE3	WSW2	WNW1	NNW7	N6	NNE3	NNE4	NNE5	NE4	NE2	NNE1	NE2	ENE4	ENE3	ENE3	E2	E1	AF	AF	AF	NE1.9	NNW7	
4-Dec	NE2	E4	ESE3	SSE1	SE3	SSE3	ESE3	SSE1	SE4	S3	S4	S5	SSW4	S4	S3	SSW3	SW2	S0	WSW1	W2	SSW1	S3	SSW5	SW5	S2.2	SW5	
5-Dec	WSW6	SSW4	SW7	SSW5	S4	SSW3	SE1	AF	N6	N4	N3	NNW3	NNE3	NE5	NE6	NE5	NE6	NE5	ENE5	NE4	E2	NW0	SSE2	SSE5	ENE0.9	SW7	
6-Dec	SSE5	S5	SSE6	S6	SSE7	SSE6	SSE7	S7	S7	S7	SSW8	S9	S9	S6	S6	S6	SW8	WSW9	WSW5	SW3	SW4	S6	S6	S6	S5.8	S9	
7-Dec	S6	SSE5	SSE6	S5	SSE6	SW5	SSW4	SSW4	SSE6	SE6	SE6	SSW4	WSW4	WNW6	W4	WNW3	WNW4	W6	W7	W6	W4	NW3	W3	SSE5	SW2.8	W7	
8-Dec	SE5	S6	SSE6	SSE6	S5	S5	SE5	SE4	SSE4	S5	SSE5	S6	S7	S8	S8	S8	S9	S8	S6	SSW8	SSW7	SW9	SSW8	S9	S6.1	S9	
9-Dec	S8	SSW7	SW5	W8	WSW6	W6	W8	WSW4	W13	W11	W10	W7	W5	WSW5	WSW7	WSW11	WSW7	SW7	SW4	SSE5	E3	S1	SSW5	S3	WSW5.5	W13	
10-Dec	WSW7	WSW7	SSW4	WSW6	S3	SSE5	SSE5	SSE5	SSE4	SSW3	SE1	NNW4	N7	N6	NNE7	NE5	ENE5	ENE4	ENE3	ENE2	ESE3	SE1	SE3	SE1	ESE0.7	WSW7	
11-Dec	AF2	AF2	AF4	AF3	AF2	AF3	AF3	AF4	AF4	S4	SSE4	SSE4	S5	S6	SSE6	SSE6	S5	S5	S6	S5	S5	SSW7	S8	SSW6	----	S8	
12-Dec	SSW7	SW6	SW8	WSW8	SW7	S4	WSW5	W5	W3	WNW6	WNW6	NW4	SSW2	SW5	WNW1	NNW7	NW7	NNW10	NNW11	NNW6	W5	W1	SSE4	SSE4	W3.3	NNW11	
13-Dec	SSE5	S5	SSE5	SSE5	SSE5	S6	S7	S5	WNW1	WSW5	NW2	N2	NNE6	NNW6	N4	SW2	WNW5	NW5	W4	WNW2	NW2	NNE4	E4	E3	SSW0.7	S7	
14-Dec	ESE3	SSE2	S4	SE4	SSE3	SSE3	SSE2	S2	S3	SSE5	S7	S6	S5	S5	SSW4	W1	NNE1	NNW3	SSE3	SW5	SW3	SSE4	SW2	NW1	S2.6	S7	
15-Dec	W0	SSW4	S4	S6	SSW3	SSE5	SSW5	SSW6	S3	SW5	SW6	W6	W7	NW8	WSW2	SSE4	SSW6	SSW5	WSW7	WSW8	W8	W7	W8	W8	SW4.2	WSW8	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	WSW7	WSW10	WSW11	WSW12	W9	WSW8	WNW10	NW8	NW9	NW5	WNW3	W5	W5	WNW3	----	WSW12
18-Dec	W8	W9	WNW7	NE9	NNE9	NE9	NE7	NNE6	NE4	SSE1	N1	NW9	NW12	NW13	NNW11	NW9	NW9	NW8	NW9	NW9	NNE8	NNE7	NNE6	NNE6	NNW5.9	NW13	
19-Dec	NNE5	N4	NNE3	NNE3	N3	WSW0	WSW1	AF	SW1	SSE3	SSE3	SSE3	S5	S6	S6	S6	SSE7	SSE6	SSE6	S6	S5	S4	S5	S6	SSE2.5	SSE7	
20-Dec	SSE5	SSE4	SSE7	SSE5	S5	S6	S4	S5	S3	S4	S8	S9	S10	S10	S9	S7	S7	S7	S6	S7	S6	S4	SSW4	SSW3	S6.0	S10	
21-Dec	S3	W0	SSW1	SSE2	ESE1	AF	SW1	W1	SSW1	SE2	SE2	S1	S3	W2	NNW4	NW5	WNW6	WNW7	WNW6	NW4	WNW2	SE2	SSE2	ESE4	W0.8	WNW7	
22-Dec	ESE5	ESE5	E3	SSW2	S1	SSE2	SSE4	SSW4	SW4	S3	SW2	W3	WNW5	NW7	NW8	NW7	NW4	NW5	NNW4	NE10	NE11	NNE12	NNE9	NNE7	N1.9	NNE12	
23-Dec	NE4	NNE3	NNE2	S2	SE2	SSE2	SE4	ESE2	AF	NNE1	N3	ESE1	NNW2	ESE2	ENE2	SSW2	SSW3	SE4	SE4	S2	WSW0	AF	N3	NNE8	E1.0	NNE8	
24-Dec	NE12	NE12	NNE12	NNE10	N7	N4	N2	AF	WSW1	NE1	SSW1	S2	SE4	S4	SSE3	ESE3	S3	SSE3	SE2	SE2	ENE1	W1	E1	NNE1	NE2.1	NNE12	
25-Dec	N4	N4	N3	NNE4	NNE3	N1	NW2	NNE0	AF	SSE4	SSW2	SSW3	S3	SSE5	S4	SSE4	SSE5	SE5	SE5	SSE4	SE6	SSE5	S6	SSE6	SSE2.0	S6	
26-Dec	SSE6	SSE6	SSE5	SSE5	S5	SSE5	SSE6	SSE4	SSE5	SSE4	SSE4	S4	S5	S7	S6	S5	SSE4	SSE4	SSE3	SW2	WSW2	SSE2	SW1	S3	S4.1	S7	
27-Dec	S4	SSE4	SE4	SSE3	SSE3	S2	SSE1	SW2	SW2	S3	S4	S5	S6	S5	SSE5	SSE5	SSE6	SSE5	SSE5	S3	SW4	SW4	S4	SSE4	S3.6	S6	
28-Dec	SSW2	SE1	AF	N2	NNW2	NNW1	WNW1	NNW1	NNE1	SE1	SSE2	S1	ENE1	ENE3	E3	E2	S1	E3	ENE2	AF	AF	AF	AF	AF	E0.8	ENE3	
29-Dec	SSE1	AF	AF	AF	AF	SSE4	SSE3	SSE4	S4	SSE5	SSE5	S6	S5	S6	SSE5	S5	SSE5	SSE5	SSE6	SSE5	S5	SSE5	SSE5	S5	S4.6	SSE6	
30-Dec	S4	S5	SSE5	SSE5	SSE5	SSE5	SE4	SE4	SE4	SE4	SSE3	SSE4	S5	SSE5	SSE5	S4	SE5	S4	S5	SSE5	SSE6	S7	S7	S6	SSE4.7	S7	
31-Dec	SSE6	SSE6	S6	SSE6	SSE6	SSE6	S5	SSE5	WSW3	S3	S5	SW5	SW5	SSW6	SSW7	SSW8	SSW8	SW6	SSW5	S7	S8	SW5	S7	S8	S5.5	S8	

S1.8	S2.0	S2.3	S1.7	SSE1.9	S2.3	S2.1	S1.9	SSW1.6	S2.1	SSW2.5	SSW2.4	SSW2.3	SSW2.4	SSW1.8	SSW1.9	SSW2.0	SW1.4	SW1.4	SSW1.6	SSW1.6	SSW1.7	S2.3	S2.2	Diurnal Average	
NE12	NE12	NNE12	NNE10	NNE9	NE9	W8	S7	W13	W11	W10	WSW10	NW12	NW13	NNW11	WSW11	WNW10	NNW10	NNW11	NNE10	NE11	NNE12	NNE9	S9	Diurnal Maximum	

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

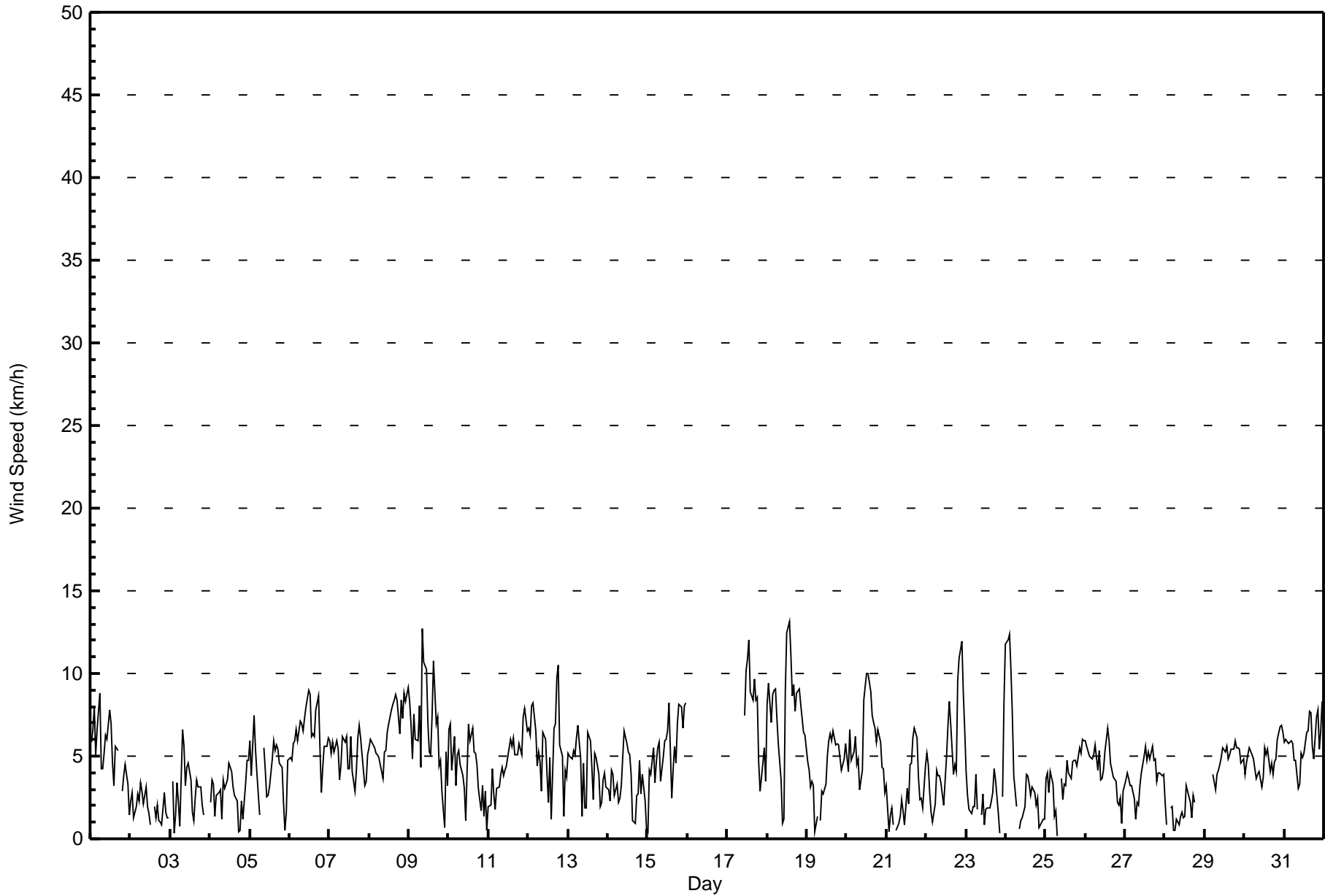
**Wind Speed (WS) - km/h**  
**Barge Landing - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Dec 18 14:00 Minimum Value: 0 km/h on Dec 4 07:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 O <sub>1</sub> = 1 Median = 1 O <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 4														Hours in Service: 744 Hours of Data: 686 Hours of Missing Data: 58 Hours of Calibration: 0 Percent Operational Time: 92.2												
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	3	3	3	2	1	1	1	2	2	2	2	1	1	1	1	AF	AF	3	2	1	1	1	3	
2-Dec	2	1	1	1	2	1	1	1	1	1	1	1	1	AF	1	2	2	2	1	1	1	1	1	1	2	
3-Dec	AF	1	1	2	1	1	2	2	2	1	2	1	1	1	1	1	2	2	1	1	1	AF	AF	AF	2	
4-Dec	1	2	1	1	1	0	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	2	
5-Dec	2	1	2	2	1	2	1	AF	1	1	1	1	2	2	2	1	2	2	2	2	2	1	1	1	2	
6-Dec	2	1	1	1	1	1	1	2	2	2	3	3	3	2	2	2	2	3	3	2	1	1	1	1	3	
7-Dec	2	1	1	2	1	2	1	1	1	1	1	2	3	3	3	2	2	2	2	1	1	2	2	2	1	3
8-Dec	1	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	2	4	2	3	4	
9-Dec	2	2	3	2	3	3	3	3	3	4	4	3	3	2	2	3	3	2	2	2	2	2	1	2	4	
10-Dec	3	3	1	2	1	1	1	1	1	2	1	3	2	2	2	2	2	1	1	1	1	1	1	2	3	
11-Dec	1	1	1	1	1	1	1	0	0	1	1	1	1	2	2	2	2	2	1	2	1	2	2	2	2	
12-Dec	2	3	2	2	2	1	3	3	2	2	2	2	2	2	1	2	2	3	3	2	1	1	2	1	3	
13-Dec	1	1	1	1	1	2	2	2	3	3	1	2	2	1	3	1	2	2	2	1	2	2	1	1	3	
14-Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	2	1	2	1	1	1	1	2	
15-Dec	1	1	1	2	2	2	2	2	1	2	2	2	2	3	3	2	1	1	2	3	3	2	2	2	3	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	4	
18-Dec	3	3	3	3	2	3	2	2	1	1	2	3	4	5	4	3	3	3	3	3	3	2	2	2	5	
19-Dec	2	1	2	1	1	1	1	AF	1	1	1	1	2	2	2	1	1	1	1	1	2	2	1	1	2	
20-Dec	1	1	1	1	1	2	1	1	1	2	3	3	3	3	3	2	2	2	2	2	2	2	1	2	3	
21-Dec	1	2	1	1	1	AF	1	1	1	2	1	1	1	1	2	2	3	2	2	1	1	1	1	2	3	
22-Dec	1	2	2	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1	2	3	3	4	3	2	4	
23-Dec	2	1	1	2	1	1	1	1	AF	1	1	1	1	2	1	1	1	1	1	1	1	AF	1	2	2	
24-Dec	3	3	3	3	2	1	1	AF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	
25-Dec	1	1	1	1	1	1	1	1	AF	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	
26-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	2	1	1	1	1	1	2	
27-Dec	1	1	2	1	1	2	2	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	
28-Dec	1	1	AF	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	AF	AF	AF	AF	AF	AF	2	
29-Dec	1	AF	AF	AF	AF	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	2	2	1	2	2	
30-Dec	1	2	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	1	2	
31-Dec	1	1	2	1	1	1	1	1	1	1	2	1	2	2	2	2	2	1	1	2	3	2	2	2	3	
Diurnal Maximum																										
AF - Analyzer Failure																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Barge Landing - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Barge Landing - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	466	67.93	67.93
6 - 11	212	30.90	98.83
12 - 19	8	1.17	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: 686

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Barge Landing - December 2017**

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	18	22	12	14	16	13	35	99	90	35	28	17	20	13	14	11	457
6 - 11	5	13	6	0	0	0	3	29	62	17	12	20	17	8	13	7	212
12 - 19	0	2	2	0	0	0	0	0	0	0	0	1	1	0	2	0	8
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
<b>Totals</b>	23	37	20	14	16	13	38	128	152	52	40	38	38	21	29	18	677

Total Number of Valid Hours: 677

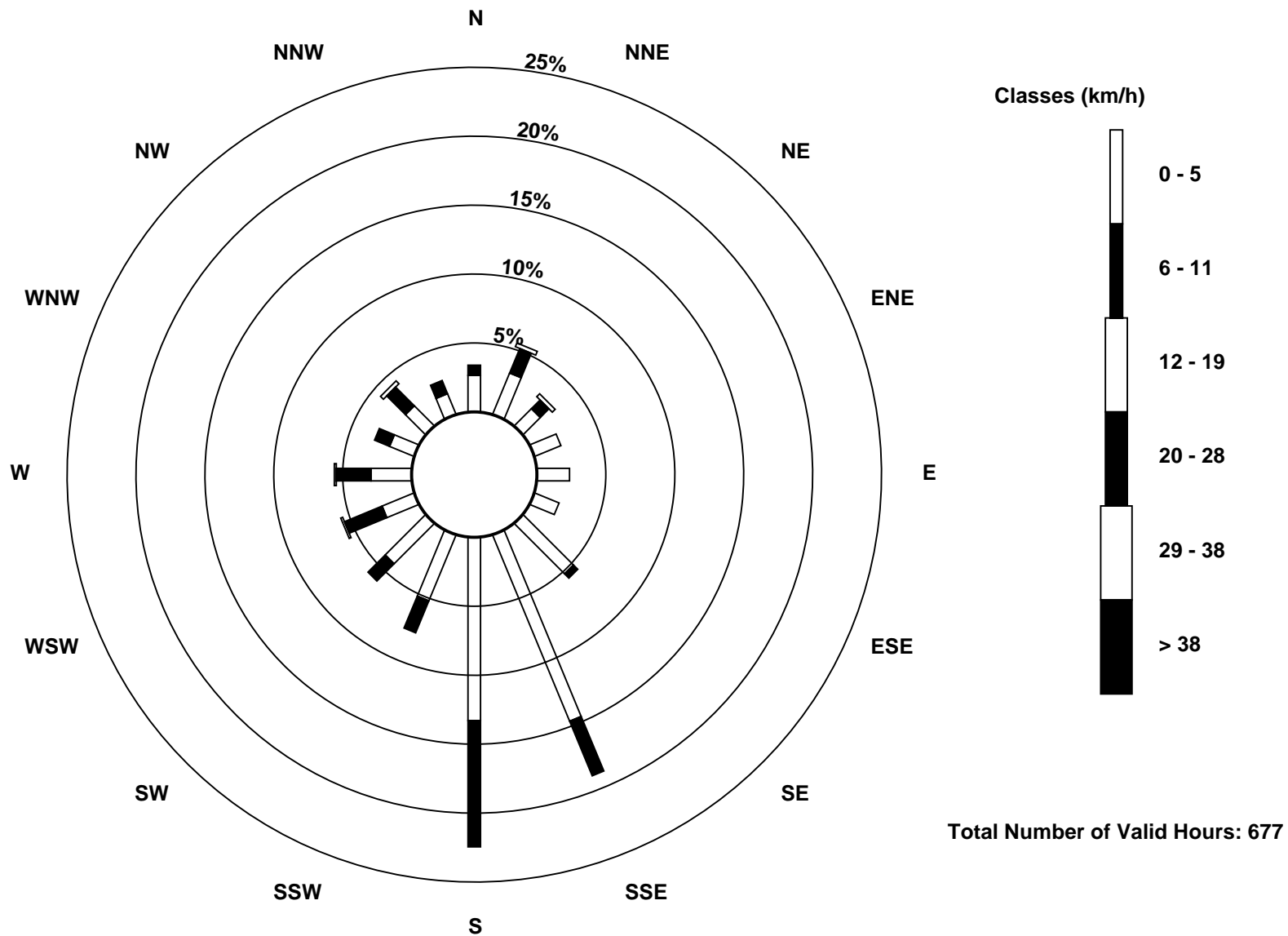
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Barge Landing (AMS 9)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Barge Landing - December 2017**

Direction of Maximum Speed: 323 deg on Dec 18 14:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 178.0 deg on Dec 8	Hours of Data: 677
Direction of Minimum Speed: 19 deg on Dec 25 08:00	Hours of Missing Data: 67
Direction of Minimum Daily Speed Average: 0.5 deg on Dec 2	Percent Operational Time: 91.0
Monthly Average Direction: 209.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	221	237	232	226	229	249	178	199	209	223	192	192	189	184	174	178	179	AF	AF	215	171	155	172	303	205.3	
2-Dec	345	347	35	324	16	353	353	14	9	88	100	62	247	AF	168	181	229	231	261	95	157	184	142	127	30.5	
3-Dec	AF	139	98	133	130	244	293	347	10	17	15	33	41	47	26	37	71	66	75	82	93	AF	AF	AF	43.7	
4-Dec	53	101	115	150	145	159	123	162	145	188	172	183	192	191	188	201	214	184	244	262	205	179	210	225	176.9	
5-Dec	246	196	220	192	177	213	137	AF	350	351	351	343	19	56	47	42	52	53	64	54	82	313	152	148	61.3	
6-Dec	162	190	155	173	162	167	162	178	180	187	200	176	177	174	187	174	223	244	244	220	225	182	185	187	187.0	
7-Dec	190	157	168	179	155	233	200	192	161	127	143	205	248	283	279	287	284	274	273	266	280	324	263	151	215.8	
8-Dec	131	189	161	152	169	174	128	131	161	171	166	179	177	183	174	170	172	182	191	199	208	229	199	184	178.0	
9-Dec	182	196	226	266	251	270	261	248	262	273	264	262	264	245	247	253	244	236	228	163	84	171	199	188	243.4	
10-Dec	248	242	196	254	178	148	158	151	165	198	132	344	350	8	32	55	59	63	76	68	120	127	127	129	120.0	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	186	163	161	175	180	168	168	174	191	180	178	188	197	188	195	--	
12-Dec	209	221	216	243	216	187	248	276	281	291	291	324	200	220	302	329	319	331	329	332	261	262	152	156	267.5	
13-Dec	164	169	162	151	154	188	179	176	288	252	313	359	15	341	354	232	289	310	272	288	316	22	92	101	210.5	
14-Dec	104	167	185	132	160	165	164	184	178	155	181	180	184	176	201	261	15	332	148	225	236	165	232	325	178.7	
15-Dec	277	194	184	172	207	166	202	208	175	220	229	265	279	307	254	164	212	198	241	254	278	281	267	259	235.9	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	244	251	251	256	260	257	287	308	320	320	282	267	277	286	--
18-Dec	280	270	292	36	32	38	43	30	34	152	353	318	322	323	327	326	323	311	320	321	30	21	20	29	342.9	
19-Dec	16	10	22	14	9	243	238	AF	235	152	154	164	183	178	173	170	163	153	156	174	188	182	172	170	164.3	
20-Dec	161	159	166	152	170	169	171	180	181	180	180	174	176	177	169	169	177	177	183	174	189	180	202	212	175.1	
21-Dec	179	266	209	157	114	AF	232	264	207	139	129	177	170	261	339	324	302	302	289	315	290	124	163	113	270.0	
22-Dec	117	111	95	196	187	150	149	208	228	173	222	279	298	321	319	312	318	315	327	34	42	33	21	16	2.8	
23-Dec	37	16	23	171	140	159	129	118	AF	13	350	123	345	123	76	210	196	134	139	186	245	AF	11	26	84.7	
24-Dec	34	36	26	21	5	360	357	AF	246	54	205	170	143	176	160	115	172	168	126	138	78	270	87	24	48.1	
25-Dec	355	356	6	21	18	4	322	19	AF	147	211	195	180	163	170	163	157	138	143	152	146	164	173	155	151.0	
26-Dec	157	165	165	153	170	163	158	162	168	167	158	183	174	185	190	179	165	147	155	234	241	163	218	177	170.3	
27-Dec	173	157	144	168	160	184	147	214	219	172	178	180	171	174	166	163	159	158	148	190	217	222	186	149	172.8	
28-Dec	193	143	AF	357	347	334	300	342	23	133	153	188	61	74	81	80	180	89	61	AF	AF	AF	AF	AF	81.2	
29-Dec	156	AF	AF	AF	AF	152	164	154	184	159	162	182	183	180	167	171	165	165	157	163	178	168	167	182	169.0	
30-Dec	175	182	160	158	163	160	142	135	125	130	162	149	182	166	163	183	134	170	179	166	160	173	174	170	162.3	
31-Dec	164	164	171	162	166	166	170	166	245	182	179	220	214	201	195	193	194	220	201	188	180	225	186	182	187.4	

176.0 184.0 179.3 173.6 166.5 181.7 170.3 182.1 200.6 185.8 194.7 207.5 209.3 212.6 200.3 200.1 209.1 223.4 219.3 209.6 194.3 192.9 188.1 171.9  
 Diurnal Average

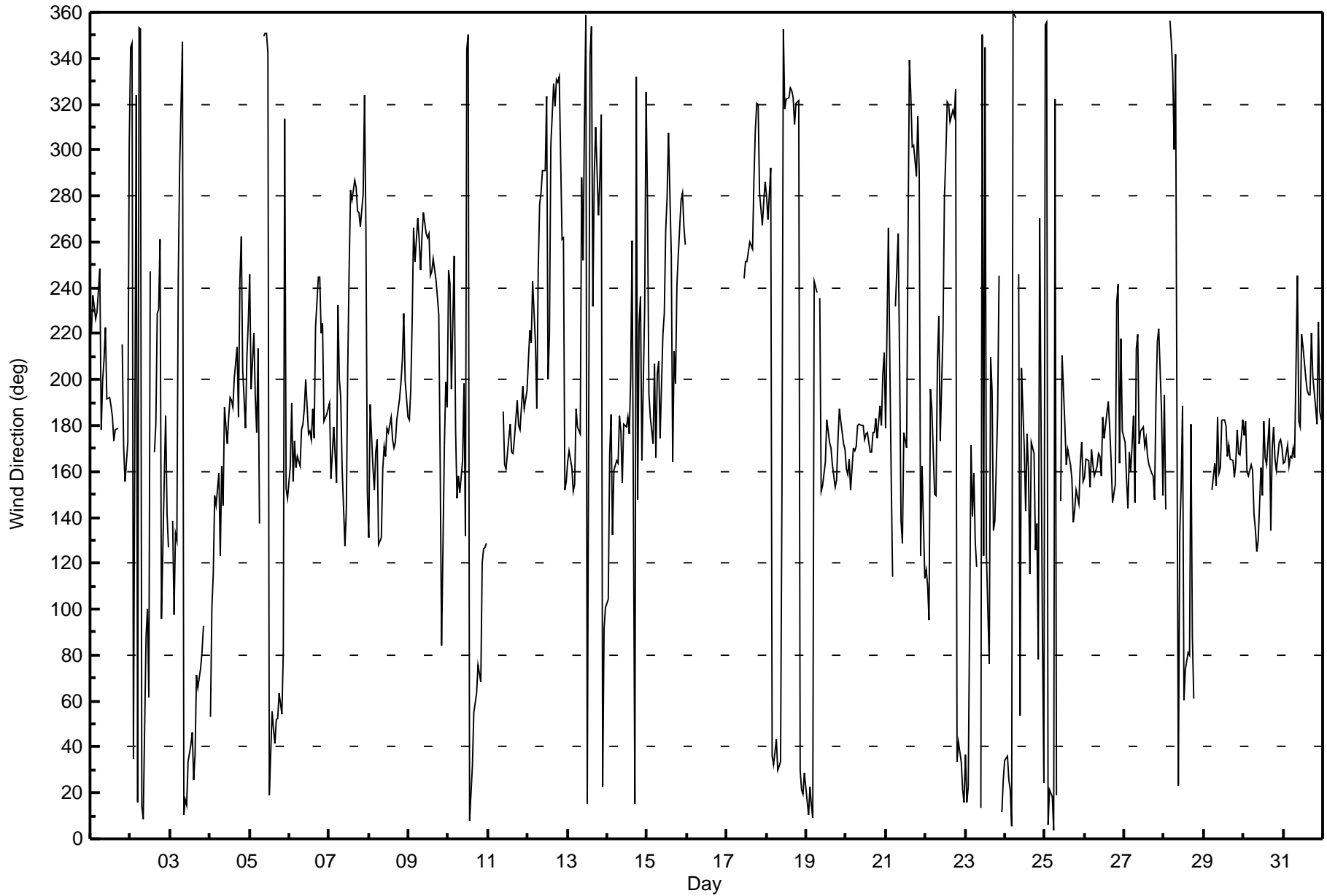
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Barge Landing - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 111 deg on Dec 11 00:00 Minimum Value: 7 deg on Dec 25 18:00 Percentiles: P <sub>1</sub> = 10 P <sub>10</sub> = 15 Q <sub>1</sub> = 20 Median = 25 Q <sub>3</sub> = 35 P <sub>90</sub> = 55 P <sub>99</sub> = 89		Hours in Service: 744 Hours of Data: 677 Hours of Missing Data: 67 Hours of Calibration: 0 Percent Operational Time: 91.0																								
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	25	24	28	41	30	15	30	19	22	21	20	22	24	23	29	16	22	AF	AF	57	44	16	56	72	72	
2-Dec	54	16	55	25	29	29	11	14	33	28	39	48	75	AF	24	33	40	69	49	89	41	55	58	43	89	
3-Dec	AF	28	86	64	14	61	84	18	20	28	28	21	22	27	25	19	26	29	20	26	19	AF	AF	AF	86	
4-Dec	15	39	22	46	18	23	14	89	23	33	27	28	27	32	28	32	44	96	59	29	54	25	28	26	96	
5-Dec	23	38	24	35	37	59	51	AF	17	20	27	28	36	20	20	18	20	23	24	22	35	60	80	13	80	
6-Dec	31	17	12	16	12	15	14	21	25	28	26	23	23	21	21	23	23	17	24	45	38	25	23	19	45	
7-Dec	20	21	24	33	25	40	49	30	21	15	15	40	70	42	35	45	51	17	13	12	28	21	32	19	70	
8-Dec	9	21	19	16	15	20	20	20	19	22	21	23	21	22	20	16	18	22	25	21	28	33	24	21	33	
9-Dec	22	24	46	20	39	58	30	81	14	25	30	29	30	22	19	18	30	19	42	37	53	97	24	70	97	
10-Dec	26	34	39	14	44	14	22	26	30	37	58	21	20	25	19	29	22	23	29	45	19	40	9	111	111	
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	25	10	17	23	23	20	19	24	20	21	25	25	19	21	28	28	
12-Dec	29	41	26	15	27	40	41	35	67	33	35	62	63	28	65	19	17	19	20	18	21	81	34	41	81	
13-Dec	24	29	24	12	27	30	24	40	101	70	79	95	32	19	27	44	27	23	27	53	57	47	23	30	101	
14-Dec	20	30	23	29	45	23	50	43	31	17	24	27	25	25	29	73	72	46	18	29	37	24	45	55	73	
15-Dec	69	30	33	23	51	31	24	24	28	26	23	41	21	27	68	42	26	22	19	15	26	24	18	17	69	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	44
18-Dec	25	21	50	21	17	17	18	22	24	81	84	23	24	22	21	26	22	26	24	23	22	19	22	21	84	
19-Dec	18	17	23	16	13	90	43	AF	51	14	26	29	26	24	21	20	14	11	11	17	27	32	24	18	90	
20-Dec	20	21	14	29	19	18	17	19	28	20	23	21	22	22	21	17	17	20	28	22	23	45	27	52	52	
21-Dec	38	82	69	33	83	AF	84	51	38	60	54	68	35	52	20	28	38	29	28	26	54	25	46	19	84	
22-Dec	21	26	19	61	52	68	15	27	26	34	40	29	32	24	24	28	26	22	28	26	20	19	20	20	68	
23-Dec	23	56	24	79	27	58	12	35	AF	39	15	63	52	45	44	28	35	8	23	56	86	AF	27	17	86	
24-Dec	18	17	16	17	19	27	24	AF	97	58	69	51	30	29	30	20	33	24	59	26	79	39	36	51	97	
25-Dec	14	20	18	18	19	25	26	41	AF	31	39	38	32	23	20	14	13	7	12	12	9	17	13	13	41	
26-Dec	11	14	12	10	19	18	14	11	15	16	21	32	28	26	21	23	17	14	27	41	17	37	58	25	58	
27-Dec	21	14	32	28	34	39	81	44	33	30	29	25	25	28	23	19	15	15	10	32	21	15	23	12	81	
28-Dec	32	61	AF	35	20	34	31	35	51	69	50	62	42	21	22	59	76	15	26	AF	AF	AF	AF	AF	76	
29-Dec	83	AF	AF	AF	AF	12	15	9	22	13	22	26	27	25	21	20	16	24	17	16	23	25	25	24	83	
30-Dec	25	26	23	16	14	13	15	9	13	11	29	25	25	25	22	25	19	27	18	14	14	15	18	16	29	
31-Dec	14	18	20	15	14	12	13	14	23	27	22	26	27	27	22	20	21	22	24	19	23	36	19	18	36	
	83	82	86	79	83	90	84	89	101	81	84	95	75	52	68	73	76	96	59	89	86	97	80	111		
	Diurnal Maximum																									
AF - Analyzer Failure																										





# Wood Buffalo Environmental Association

## TRS Calibration Report

Version-11-2017

### Station Information

Station Name: Barge Landing                      Station number: AMS 09  
 Calibration Date: December 8, 2017              Last Cal Date: November 9, 2017  
 Start time (MST): 9:52                              End time (MST): 13:15  
 Reason: Routine

### Calibration Standards

Cal Gas Concentration              5.18              ppm              Cal Gas Exp Date      December 2, 2019  
 Cal Gas Cylinder #                      LL29997  
 Calibrator Make/Model      API T700                      Serial Number              746  
 ZAG Make/Model                      API T701                      Serial Number              4888

### Analyzer Information

Analyzer make: Thermo 43i-YLE                      Analyzer serial #: 1331259320  
 Converter Make: CDN-101                              Converter serial #: 519

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-689	-690
Calculated slope	1.009041	0.989956	Lamp voltage	1056	1056
Calculated intercept	-0.509141	-0.370365	Pressure	694.9	687.2
Analyzer Background	2.03	2.03	Flow	0.442	0.437
Analyzer Coefficient	1.045	1.045	Intensity	91	91
			Converter temp	800	800

### TRS Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5012	0.0	0.0	0.1	----
as found span	4942	77.4	79.9	79.1	1.010
calibrator zero	5004	0.0	0.0	0.4	----
high point	4941	77.4	79.9	81.1	0.985
second point	4978	38.8	40.1	40.8	0.982
third point	4998	19.4	20.0	20.6	0.972
as left zero	5006	0.0	0.0	0.4	----
as left span	4942	77.4	79.9	80.5	0.992
SO2 Scrubber Check	4935	81.8	815.3	0.6	----
Date of last scrubber change:		8-Dec-17	Average Correction Factor		0.980
Corrected As found	79.00	Previous response	79.67	*% change	0.8%

\* = > +/-5% change initiates investigation

Notes: Changed inlet filter after asfound. Scrubber check concentration started to increase. Changed scrubber. Scrubber check at 0.6ppb, calibrator zero at 0.4ppb.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## TRS Calibration Summary

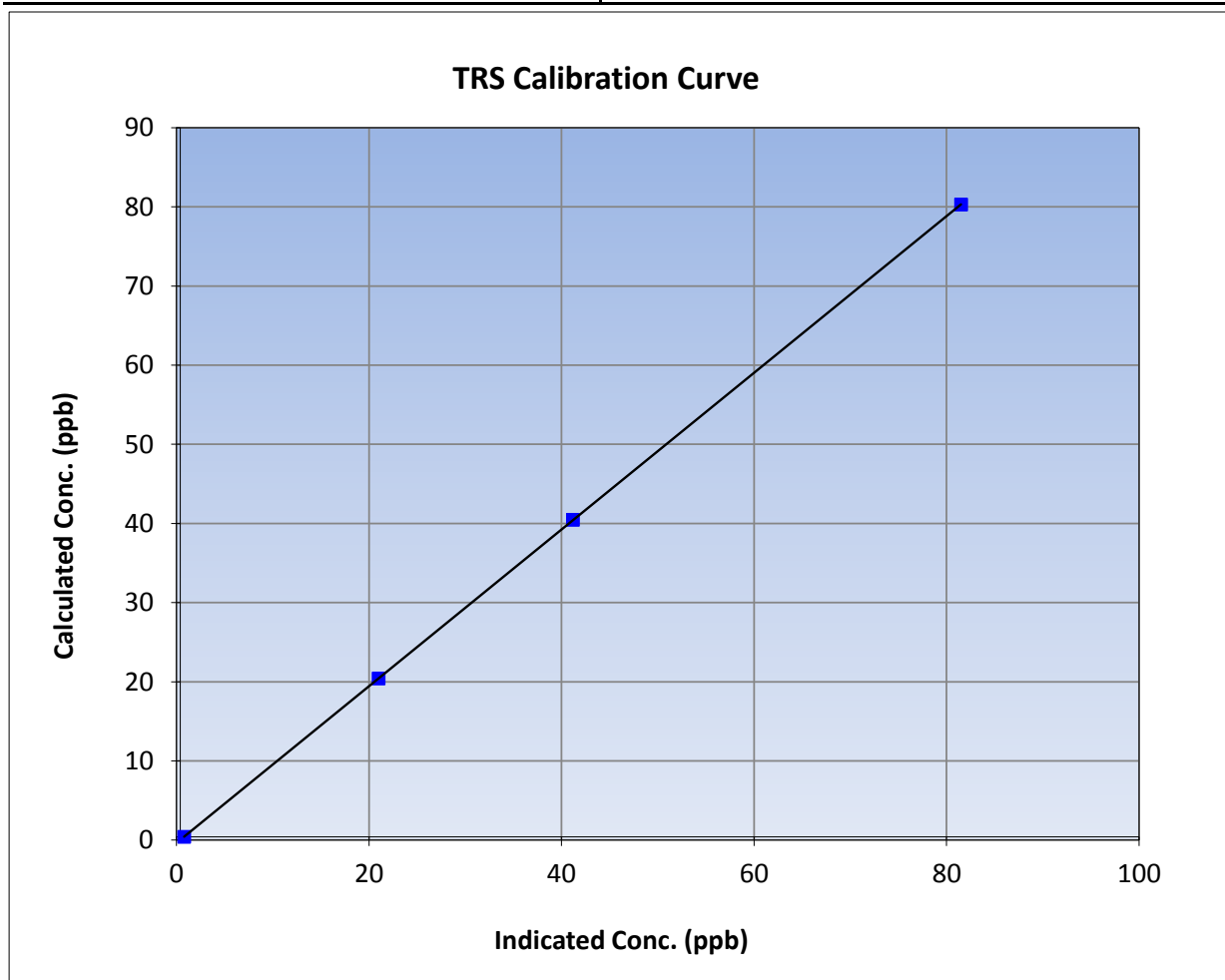
Version-03-2017

### Station Information

Calibration Date	December 8, 2017	Previous Calibration	November 9, 2017
Station Name	Barge Landing	Station Number	AMS 09
Start Time (MST)	9:52	End Time (MST)	13:15
Analyzer make	Thermo 43i-YLE	Analyzer serial #	1331259320

### Calibration Data

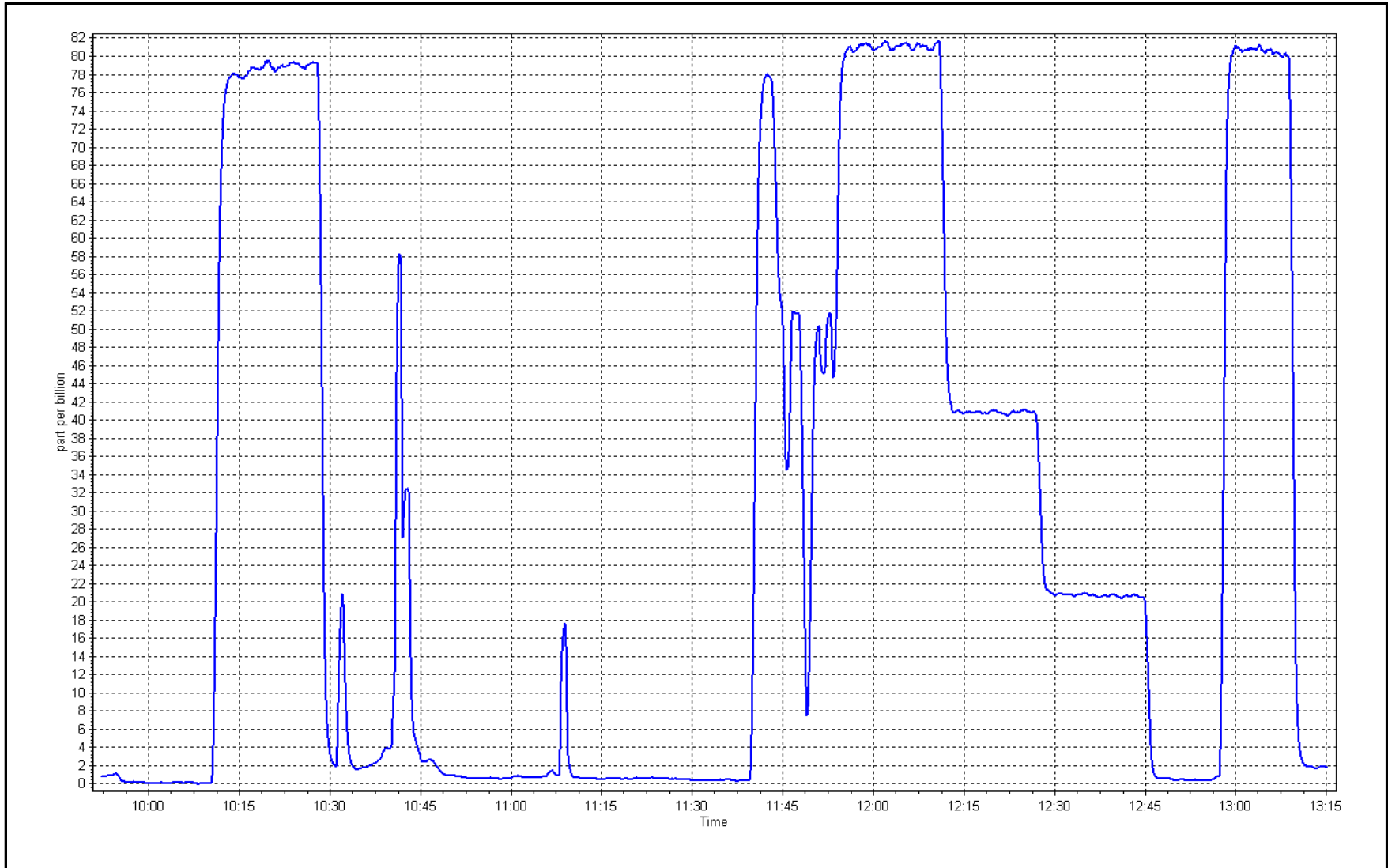
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.4	----	Correlation Coefficient	0.999999	≥0.995
79.9	81.1	0.9851			
40.1	40.8	0.9819	Slope	0.989956	0.90 - 1.10
20.0	20.6	0.9723			
			Intercept	-0.370365	+/-3



TRS Calibration Plot

Date: December 8, 2017

Location: Barge Landing









# Wood Buffalo Environmental Association

## TRS Calibration Summary

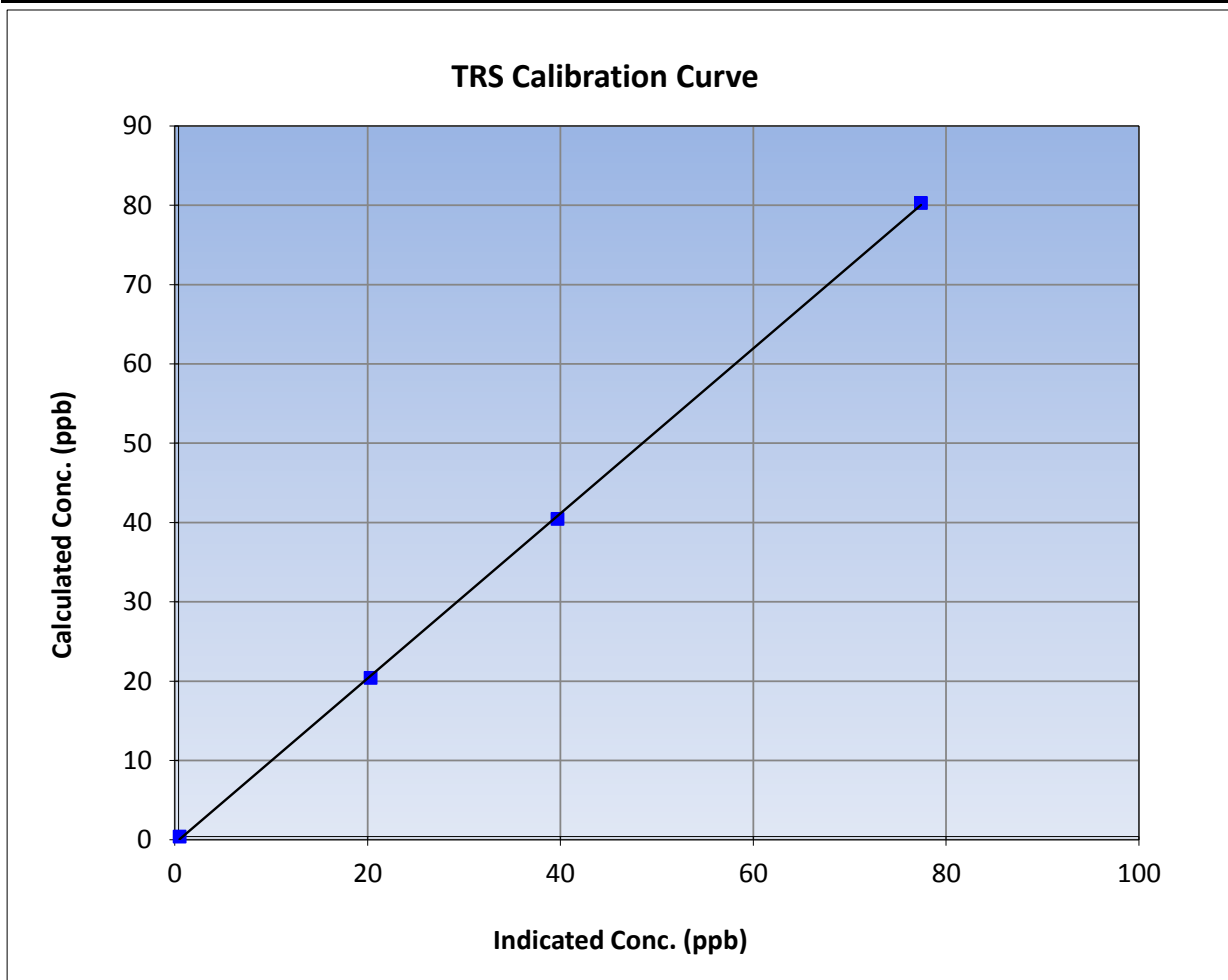
Version-03-2017

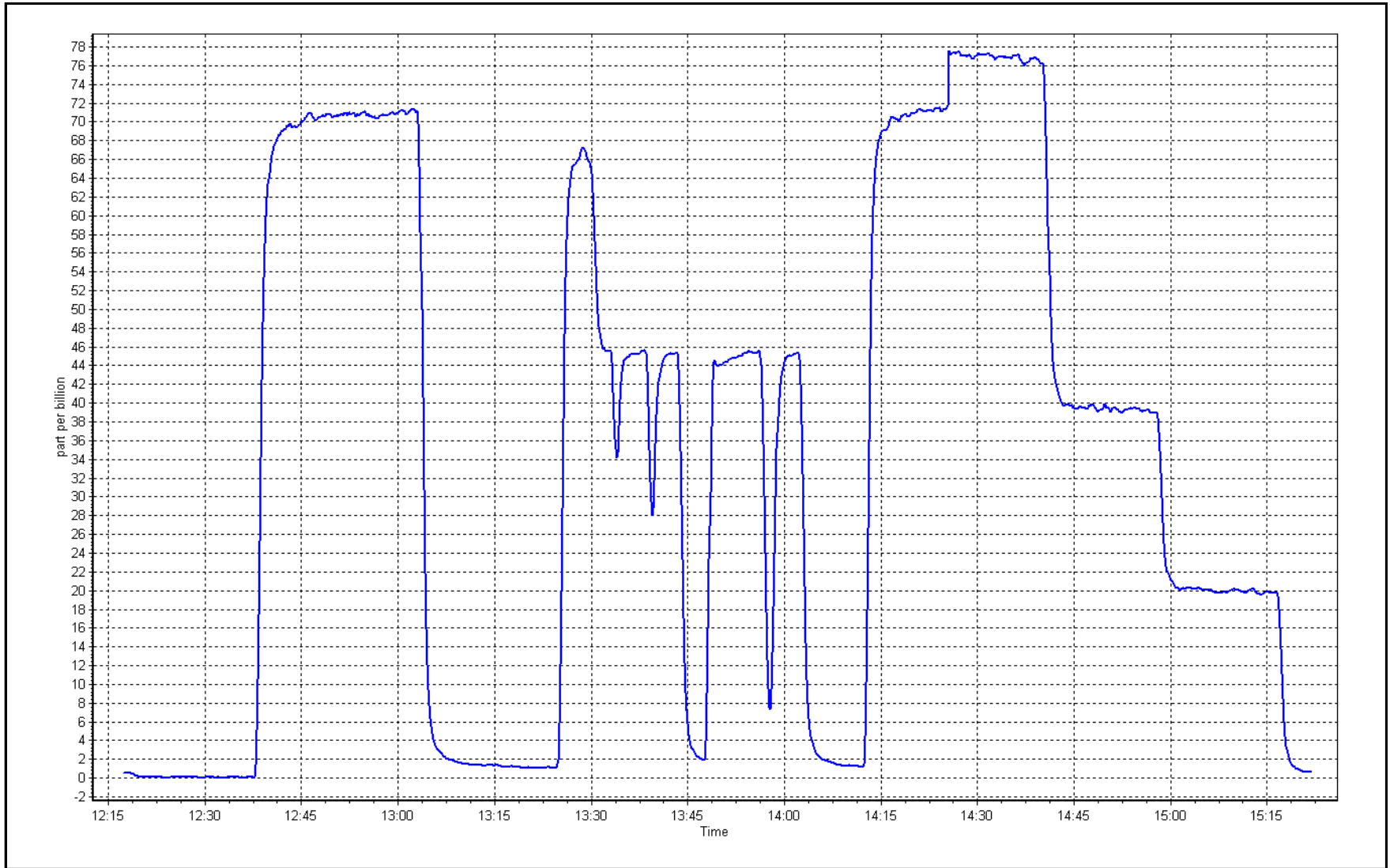
### Station Information

Calibration Date	December 28, 2017	Previous Calibration	December 8, 2017
Station Name	Barge Landing	Station Number	AMS 09
Start Time (MST)	12:15	End Time (MST)	15:25
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1331259320

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999895	
79.9	77.0	1.0376			≥0.995
40.1	39.3	1.0194	Slope	1.040220	
20.0	19.9	1.0065			0.90 - 1.10
			Intercept	-0.449661	+/-3







# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Barge Landing	Station number:	AMS 09
Calibration Date:	December 14, 2017	Last Cal Date:	November 9, 2017
Start time (MST):	12:11	End time (MST):	14:51
Reason:	As Found		

### Calibration Standards

Gas Cert Reference	EY0000675	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>511.0</u> ppm	CH4 Equiv Conc.	1055.5 ppm
C3H8 Cal Gas Conc.	<u>198.0</u> ppm	Station temp.	27 Deg C
Calibrator Make/Model	API T700	Serial Number	746
ZAG Make/Model	API 701	Serial Number	4888

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1327059296
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-301
Calculated slope	1.010125	Sample pressure	9.2
Calculated intercept	-0.071167	Fuel pressure	24.1
Analyzer Background	5.84	Air pressure	34.7
Analyzer Coefficient	4.460	Flame temperature	160.4

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5007	0.0	0.00	0.10	----
as found span	4937	80.2	16.87	17.10	0.987
calibrator zero	5007	0.0	0.00	-0.05	----
high point	4937	80.2	16.87	16.80	1.004
second point	4980	40.1	8.43	8.33	1.013
third point	4996	20.1	4.23	4.19	1.010
as left zero	5007	0.0	0.00	-0.04	----
as left span	4939	80.2	16.87	16.40	1.028
Average Correction Factor					1.009
Corrected As found	17.00	Previous response	16.77	*% change	-1.3%

\* = > +/-5% change initiates investigation

Notes:

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

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## THC Calibration Summary

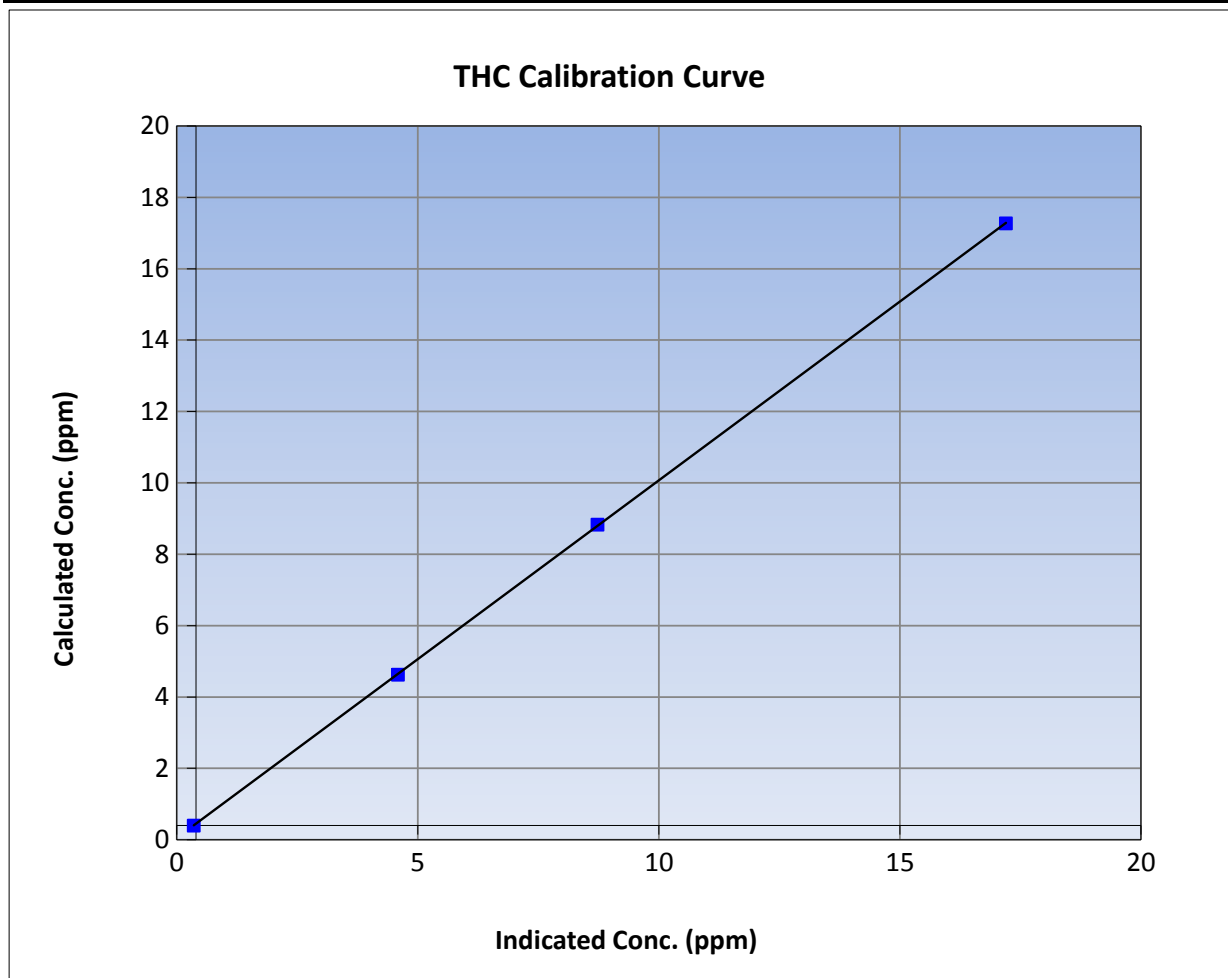
Version-03-2017

### Station Information

Calibration Date	December 14, 2017	Previous Calibration	November 9, 2017
Station Name	Barge Landing	Station Number	AMS 09
Start Time (MST)	12:11	End Time (MST)	14:51
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296

### Calibration Data

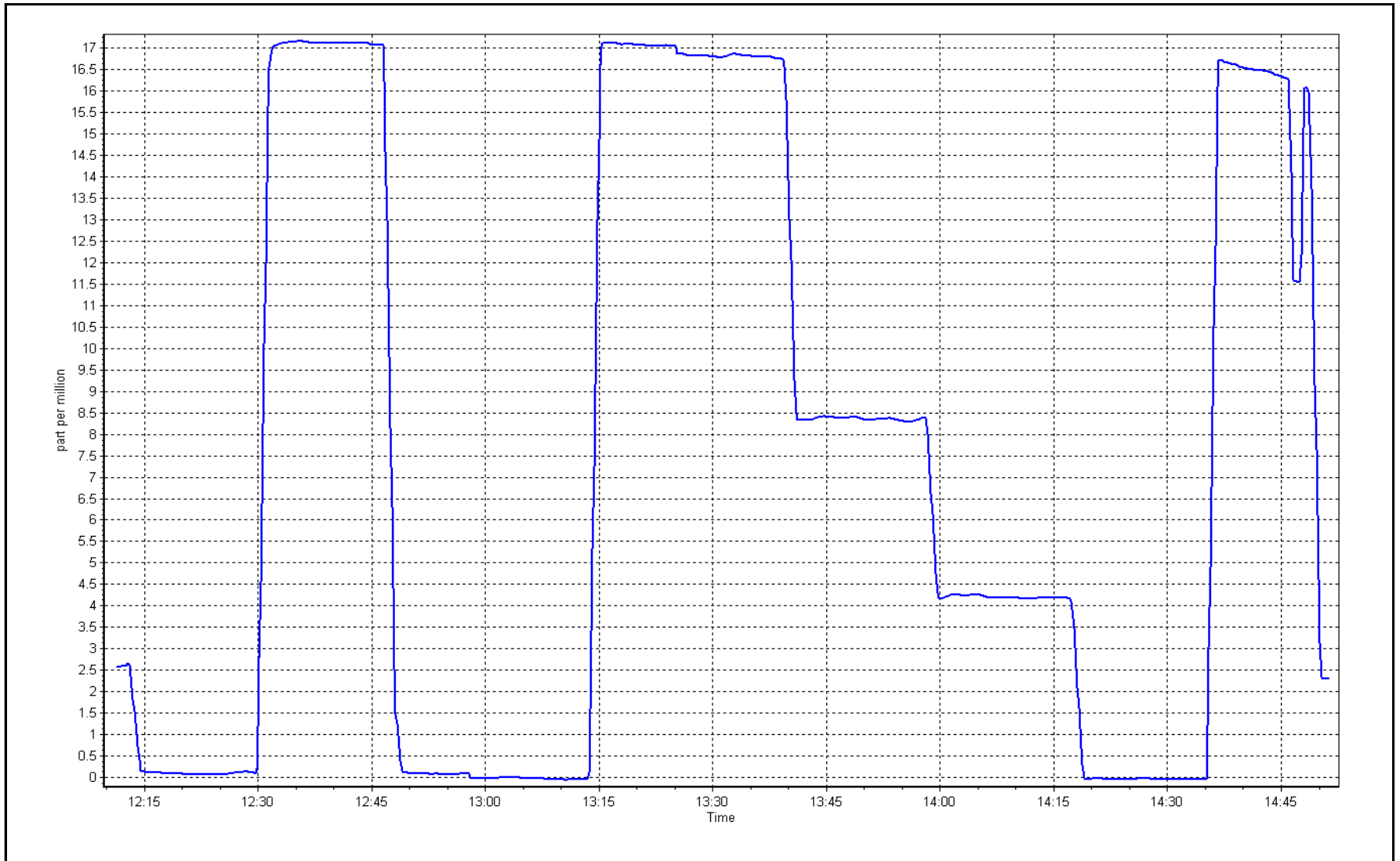
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999988	≥0.995
16.9	16.8	1.0042			
8.4	8.3	1.0125	Slope	1.001991	0.90 - 1.10
4.2	4.2	1.0101			
			Intercept	0.051403	+/-1.5



THC Calibration Plot

Date: December 14, 2017

Location: Barge Landing





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 11  
LOWER CAMP  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)  
 DECEMBER 2017

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	706	36	38	99.73	29	0	3	0
H2S (ppb) Average	707	35	37	99.73	17	2	4	1
THC (ppm) Average	697	35	47	98.39	5.8	-	3.3	-
Temperature (C) Average	744	0	0	100	4.7	-	1.3	-
Relative Humidity (%) Average	744	0	0	100	97	-	94	-
Wind Speed 10 m (km/h) Average	729	0	15	97.98	25	-	15	-
Wind Direction 10 m (deg) Average	729	0	15	97.98	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	706	0.9	2	-	0	0	0	0	1	2	29
H2S (ppb) Average	707	0.8	1	-	0	0	0	0	1	2	17
THC (ppm) Average	697	2.5	0.4	-	2	2.1	2.2	2.4	2.7	3	5.8
Temperature 2 m (C) Average	744	-14.58	12.4	-	-42.3	-32.5	-26.7	-9.9	-4.7	0.1	4.7
Relative Humidity (%) Average	744	80.8	9	-	59	70	74	80	89	93	97
Wind Speed 10 m (km/h) Average	729	8.3	5	-	0	2	3	8	12	16	25
Wind Direction 10 m (deg) Average	729	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S, SO2	05 Dec 2017 12:00	05 Dec 2017 13:00	2	Maintenance - WBEA audit
THC	25 Dec 2017 02:00	25 Dec 2017 13:00	12	Unstable operation - station temperature fluctuation
Wind Speed, Wind Direction	11 Dec 2017 02:00	11 Dec 2017 12:00	11	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	15 Dec 2017 06:00	15 Dec 2017 06:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	24 Dec 2017 16:00	24 Dec 2017 17:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Dec 2017 08:00	29 Dec 2017 08:00	1	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Lower Camp - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 29 ppb on Dec 16 21:00	Maximum Daily Average: 3.5 ppb on Dec 2		Hours of Data:	706
Minimum Value: 0 ppb on Dec 24 08:00	Minimum Daily Average: 0.1 ppb on Dec 20		Hours of Missing Data:	38
Maximum Diurnal Average: 1.9 ppb at hour 15	Minimum Diurnal Average: 0.4 ppb at hour 8		Hours of Calibration:	36
Monthly Average: 0.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 13		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	2	2	1	Z	2	2	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	3
2-Dec	1	1	0	0	0	Z	0	0	1	1	0	1	4	5	18	23	14	4	2	1	1	0	0	0	3.5	23
3-Dec	Z	1	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
4-Dec	0	Z	0	3	1	0	0	1	4	0	0	0	1	1	0	0	0	0	0	1	2	0	1	1	0.8	4
5-Dec	1	1	Z	0	0	1	1	1	1	1	1	M	M	1	1	1	1	1	0	0	0	0	0	0	0.6	1
6-Dec	1	2	3	Z	1	1	1	1	1	C	C	C	C	C	1	1	1	1	3	3	1	3	1	0	1.4	3
7-Dec	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.7	1
8-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
9-Dec	Z	0	1	1	1	1	0	0	0	0	0	0	1	2	2	1	1	1	1	0	1	1	0	0	0.7	2
10-Dec	1	Z	1	1	0	3	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3
11-Dec	2	1	Z	3	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.7	3
12-Dec	0	0	1	Z	1	0	1	2	1	1	2	1	3	4	1	1	0	0	0	0	0	0	0	0	0.9	4
13-Dec	0	0	0	0	Z	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0.4	2
14-Dec	0	1	7	6	2	1	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1.0	7
15-Dec	Z	0	0	0	1	1	2	1	1	1	0	2	1	3	18	2	8	5	1	1	1	1	0	0	2.2	18
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	16	29	8	5	5	3.1	29
17-Dec	1	1	Z	0	1	0	0	1	1	1	0	0	0	0	0	0	6	3	2	0	2	4	1	2	1.2	6
18-Dec	3	3	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	0.7	6
19-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	2	4	2	3	4	2	2	0	0	0	1.1	4
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Dec	Z	0	0	0	0	0	1	1	1	1	1	1	2	2	1	0	12	18	2	0	0	0	0	0	2.0	18
22-Dec	0	Z	0	0	1	0	0	0	2	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0.5	2
23-Dec	0	0	Z	1	0	0	0	0	0	0	0	1	2	1	1	0	0	0	1	1	2	2	1	1	0.6	2
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0.3	3
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0.2	1
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	3	4	1	0	0	0	0.6	4
28-Dec	0	Z	0	1	1	0	0	0	0	0	0	0	0	1	2	3	1	0	0	0	0	0	0	0	0.6	3
29-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
31-Dec	0	0	0	0	Z	0	0	1	1	0	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0.5	2

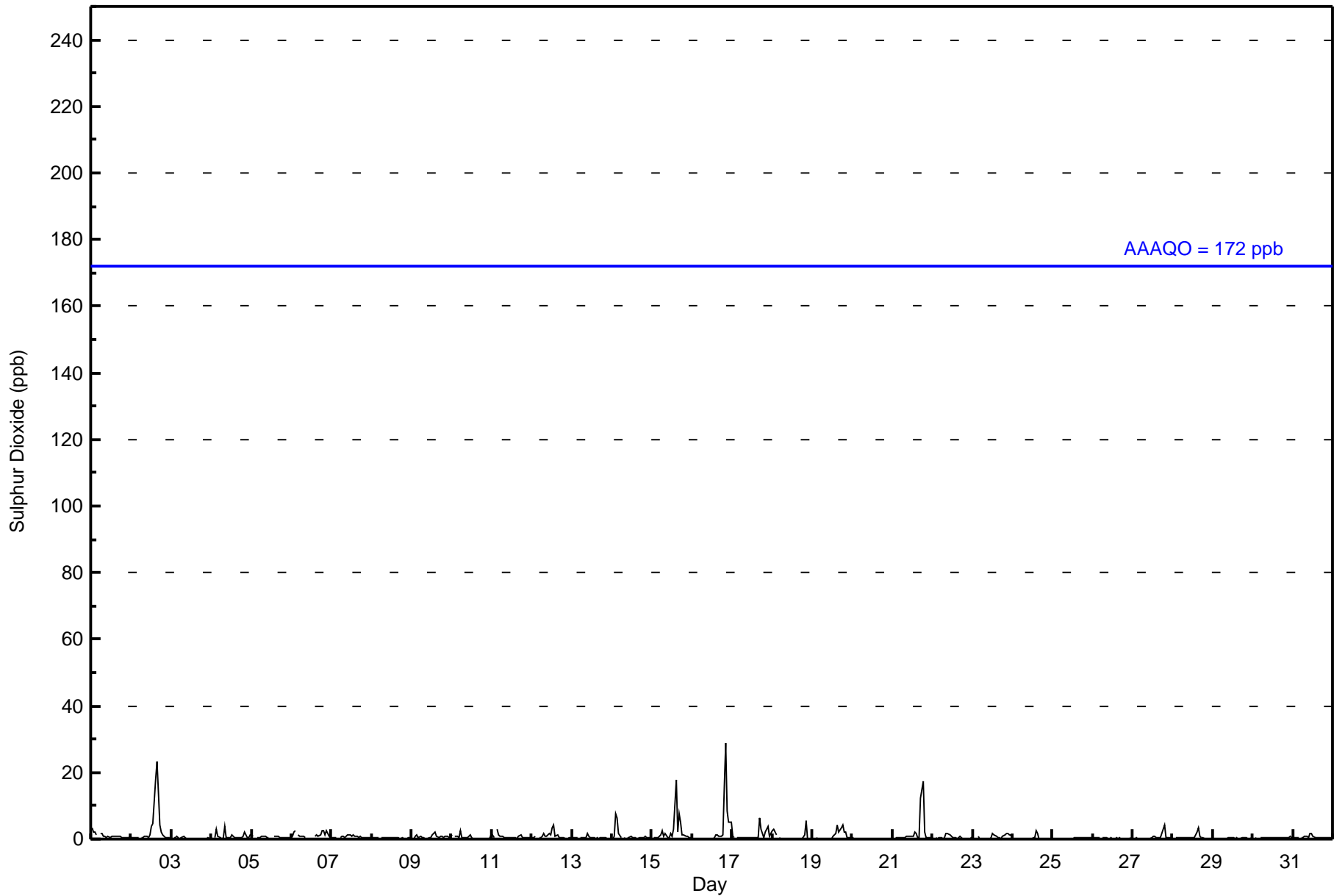
0.6	0.6	0.8	0.9	0.5	0.5	0.5	0.4	0.6	0.5	0.5	0.6	0.7	0.9	1.9	1.5	1.4	1.3	1.3	1.2	1.7	0.8	0.5	0.6	Diurnal Average
3	3	7	6	2	3	2	2	4	2	2	2	4	5	18	23	14	12	18	16	29	8	5	5	Diurnal Maximum

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 (SO<sub>2</sub>) - ppb**  
**Lower Camp - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Lower Camp - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	698	98.87	98.87
11 - 20	6	0.85	99.72
21 - 60	2	0.28	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Lower Camp - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	43	42	22	5	13	17	27	292	21	3	1	6	18	47	73	54	684
11 - 20	0	1	0	0	0	0	0	1	0	0	0	0	1	1	2	0	6
21 - 60	0	0	0	0	0	0	0	1	0	0	0	0	0	1	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
<b>Totals</b>	43	43	22	5	13	17	27	294	21	3	1	6	19	49	75	54	692

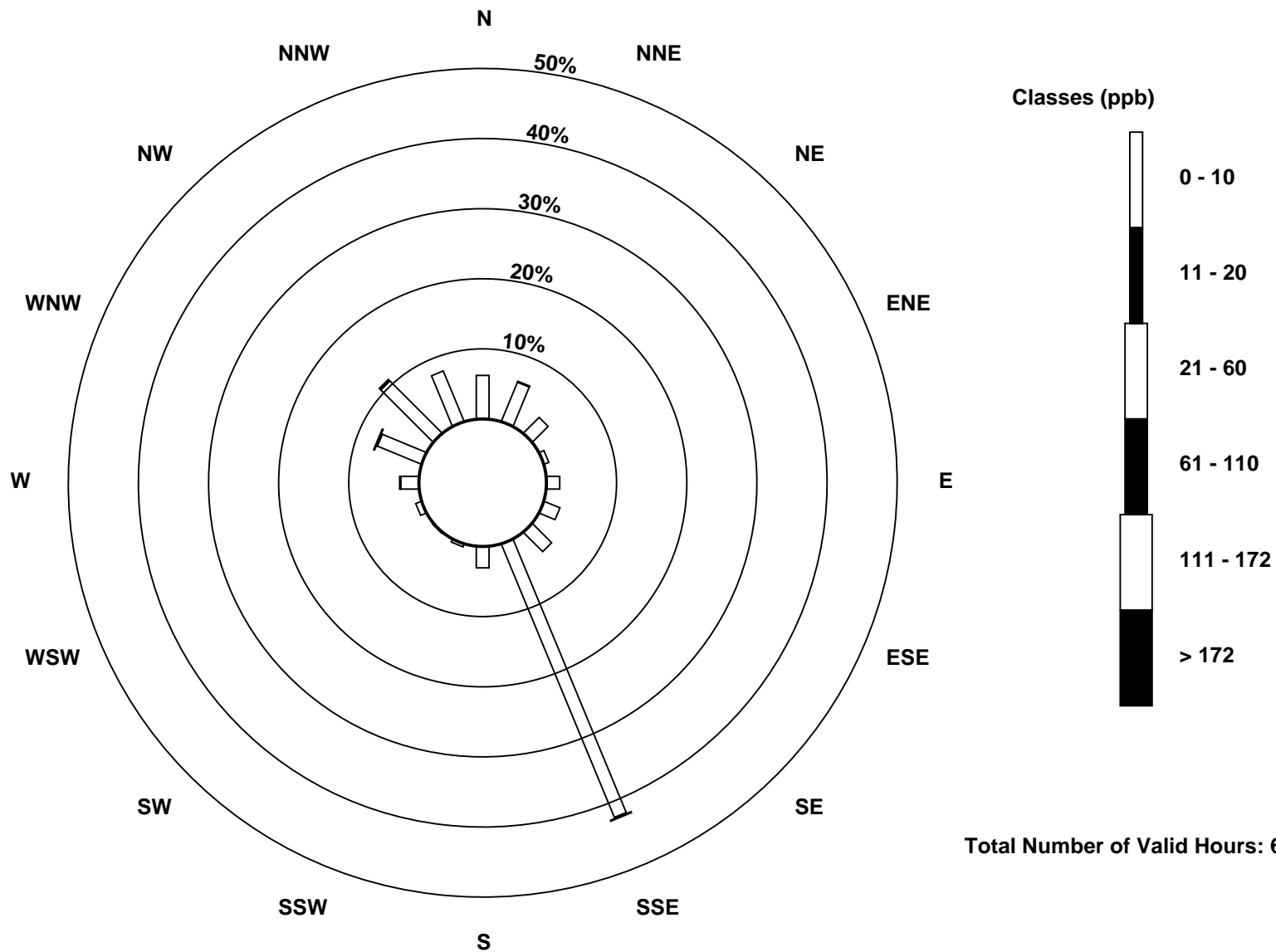
Total Number of Valid Hours: 692

Total Number of Hours: 744

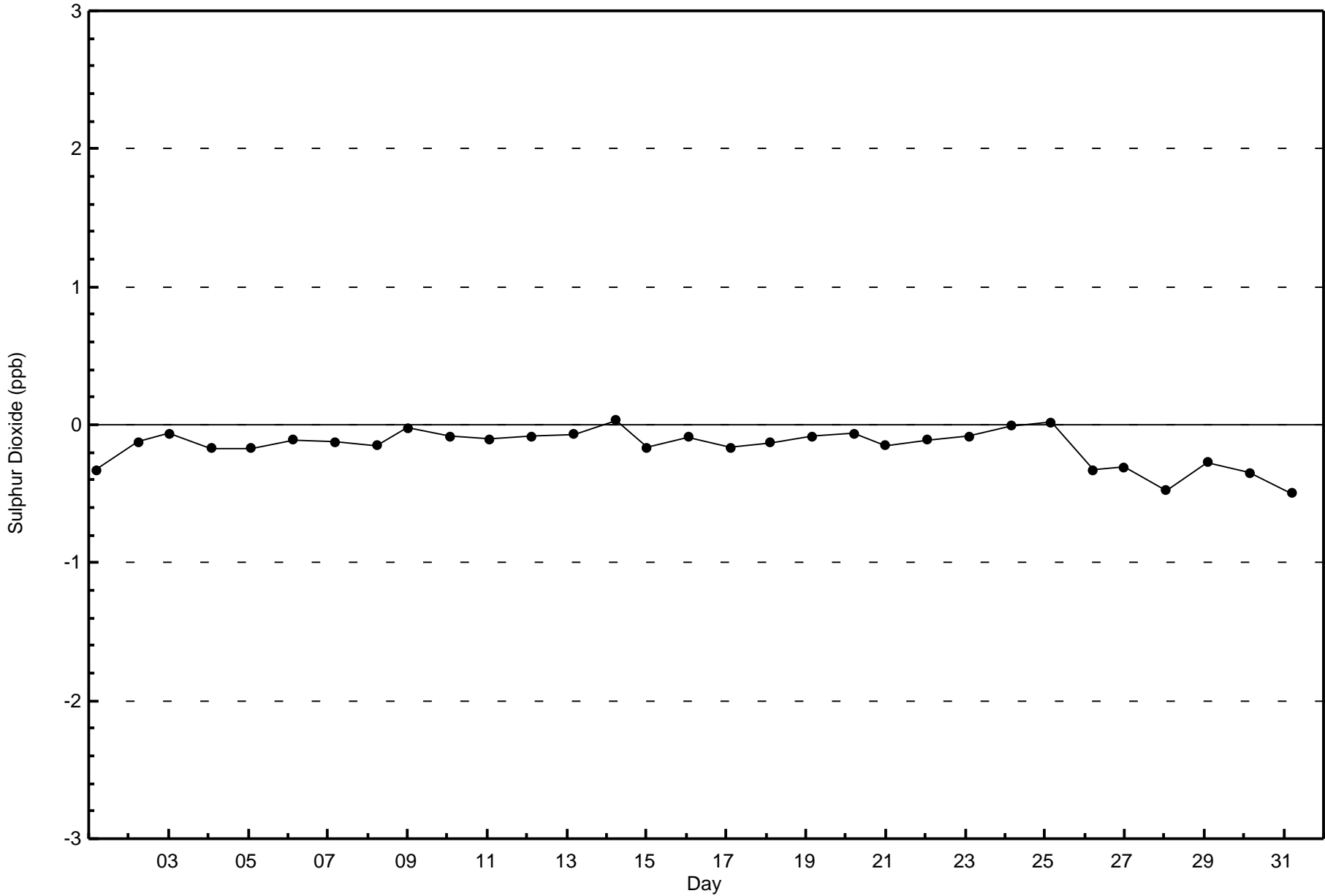


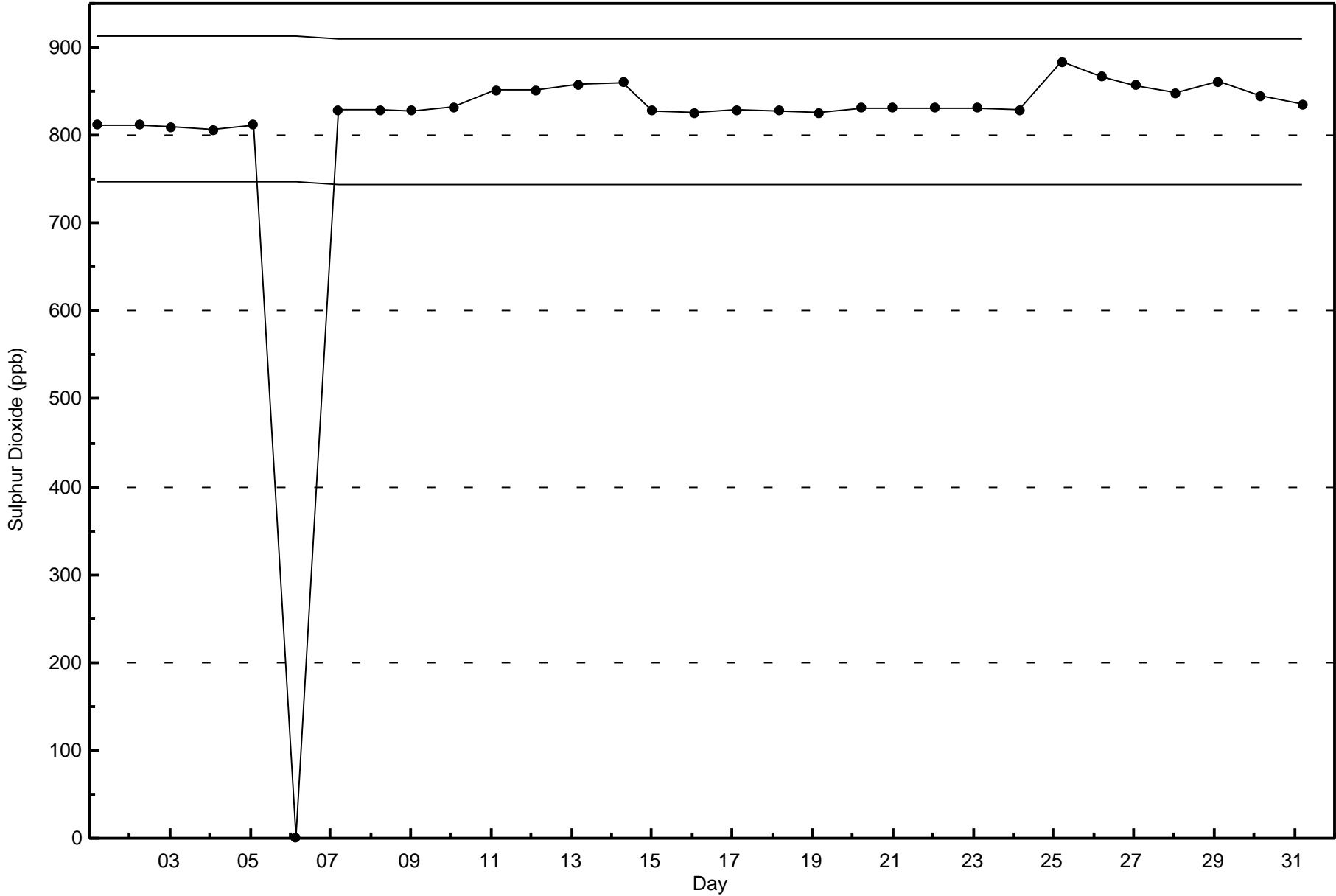
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Lower Camp (AMS 11)



Total Number of Valid Hours: 692









Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb

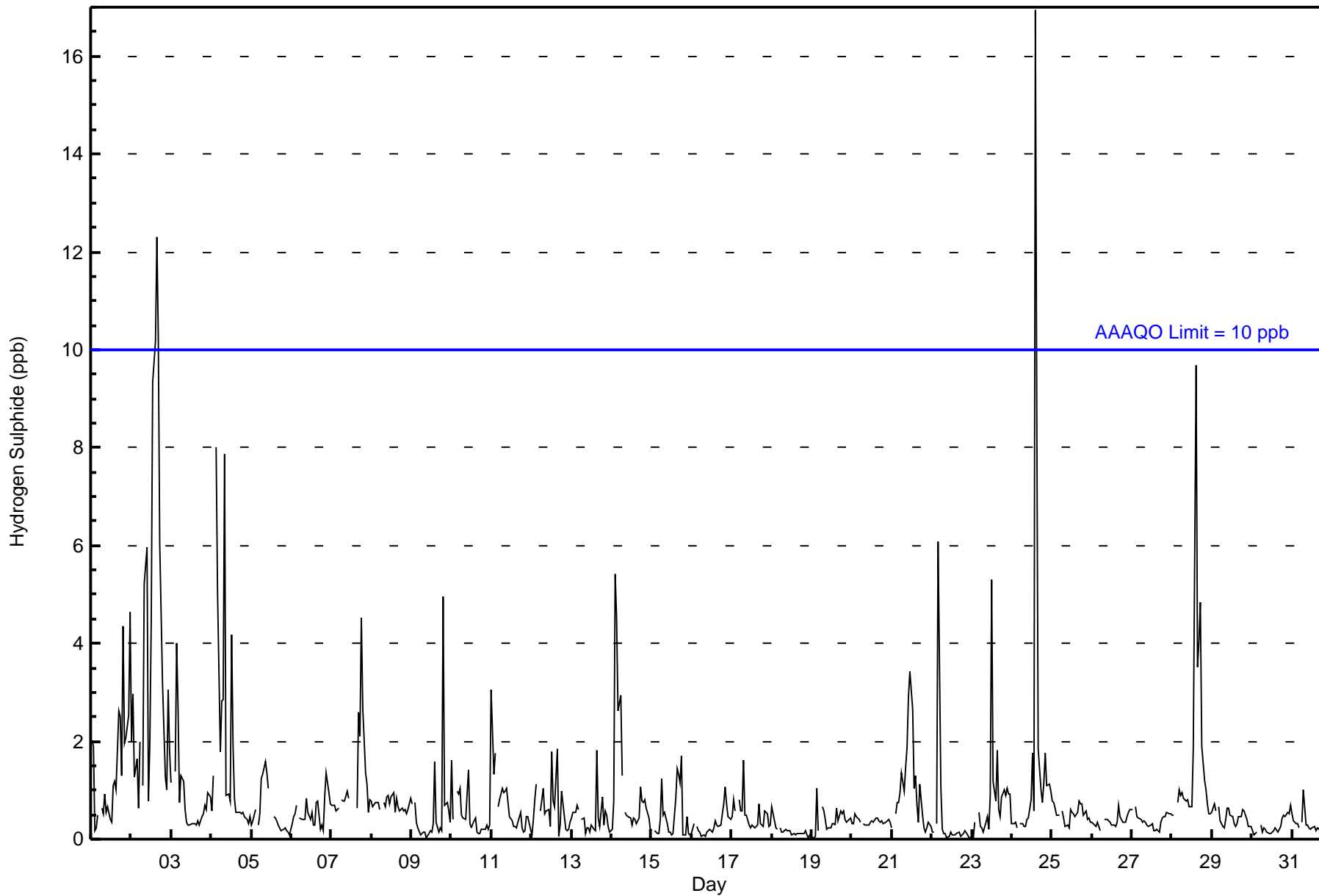
Lower Camp - December 2017

Number of Exceedences (AAAQO):	1-hr: 2	24-hr: 1	Hours in Service:	744
Maximum Value: 17 ppb on Dec 24 15:00	Maximum Daily Average: 4.0 ppb on Dec 2		Hours of Data:	707
Minimum Value: 0 ppb on Dec 19 02:00	Minimum Daily Average: 0.2 ppb on Dec 18		Hours of Missing Data:	37
Maximum Diurnal Average: 1.7 ppb at hour 15	Minimum Diurnal Average: 0.5 ppb at hour 12		Hours of Calibration:	35
Monthly Average: 0.8 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 8		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	0	0	0	Z	1	1	1	1	1	0	0	1	1	1	3	2	1	4	2	2	3	5	1.5	5
2-Dec	2	3	1	2	1	2	Z	1	5	6	1	2	4	9	10	12	10	6	5	3	1	1	3	2	4.0	12
3-Dec	1	Z	1	4	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.9	4
4-Dec	1	1	Z	8	5	2	3	3	8	1	1	1	4	2	1	1	1	1	1	1	0	0	0	0	1.9	8
5-Dec	0	0	1	Z	0	1	1	1	2	1	1	M	M	0	0	0	0	0	0	0	0	0	0	0	0.5	2
6-Dec	0	0	1	1	Z	0	0	0	0	1	1	0	1	0	0	1	1	0	0	0	1	1	1	1	0.5	1
7-Dec	1	1	1	1	1	Z	1	1	1	1	1	C	C	C	C	1	3	2	5	3	1	1	1	1	1.3	5
8-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
9-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	5	1	1	1	0	0.6	5
10-Dec	2	0	Z	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
11-Dec	3	1	2	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0.7	3
12-Dec	0	0	1	1	Z	1	1	1	1	1	1	0	2	1	1	2	0	0	1	1	0	0	0	0	0.6	2
13-Dec	0	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	2	0	0	1	0	1	0	0	0	0.4	2
14-Dec	0	1	5	5	3	3	1	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1.1	5
15-Dec	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	1	2	0	0	0	0	0.5	2
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.3	1
17-Dec	0	1	1	Z	1	1	1	2	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0.5	2
18-Dec	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
19-Dec	0	0	0	1	0	Z	1	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0.4	1
20-Dec	0	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
21-Dec	0	Z	1	1	1	1	1	1	1	2	3	3	3	1	1	1	0	1	1	0	0	0	0	0	1.0	3
22-Dec	0	0	Z	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	6
23-Dec	0	0	0	Z	1	0	0	0	0	0	0	1	5	1	1	2	1	0	1	1	1	1	1	1	0.8	5
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	2	1	1	17	9	2	1	1	1	2	1	1	1.8	17
25-Dec	1	1	1	0	0	Z	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	0	0	0	0.5	1
26-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0.4	1
27-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
28-Dec	0	0	Z	1	1	1	1	1	1	1	1	1	1	2	10	4	4	5	2	1	1	1	1	1	1.7	10
29-Dec	1	1	1	Z	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0.5	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
31-Dec	1	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1

0.6	0.7	0.8	1.1	1.1	0.7	0.7	0.7	0.9	0.7	0.5	0.5	1.0	0.8	1.7	1.3	1.0	0.9	0.8	0.9	0.6	0.6	0.6	0.6	0.6	Diurnal Average
3	3	5	8	6	3	3	3	8	6	3	3	5	9	17	12	10	6	5	5	2	2	3	5	Diurnal Maximum	

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





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Lower Camp - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	663	93.78	93.78
3 - 4	22	3.11	96.89
5 - 7	13	1.84	98.73
8 - 11	7	0.99	99.72
> 11	2	0.28	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Lower Camp - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	37	43	17	5	10	16	23	297	16	3	1	4	14	45	73	46	650
3 - 4	3	0	2	0	2	1	1	2	3	0	0	1	1	1	1	4	22
5 - 7	1	0	2	1	1	1	0	0	0	0	0	1	0	1	2	3	13
8 - 11	1	1	0	0	0	0	0	1	0	0	0	0	3	0	0	0	6
> 11	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
<b>Totals</b>	42	44	21	6	13	18	24	300	19	3	1	6	19	48	76	53	693

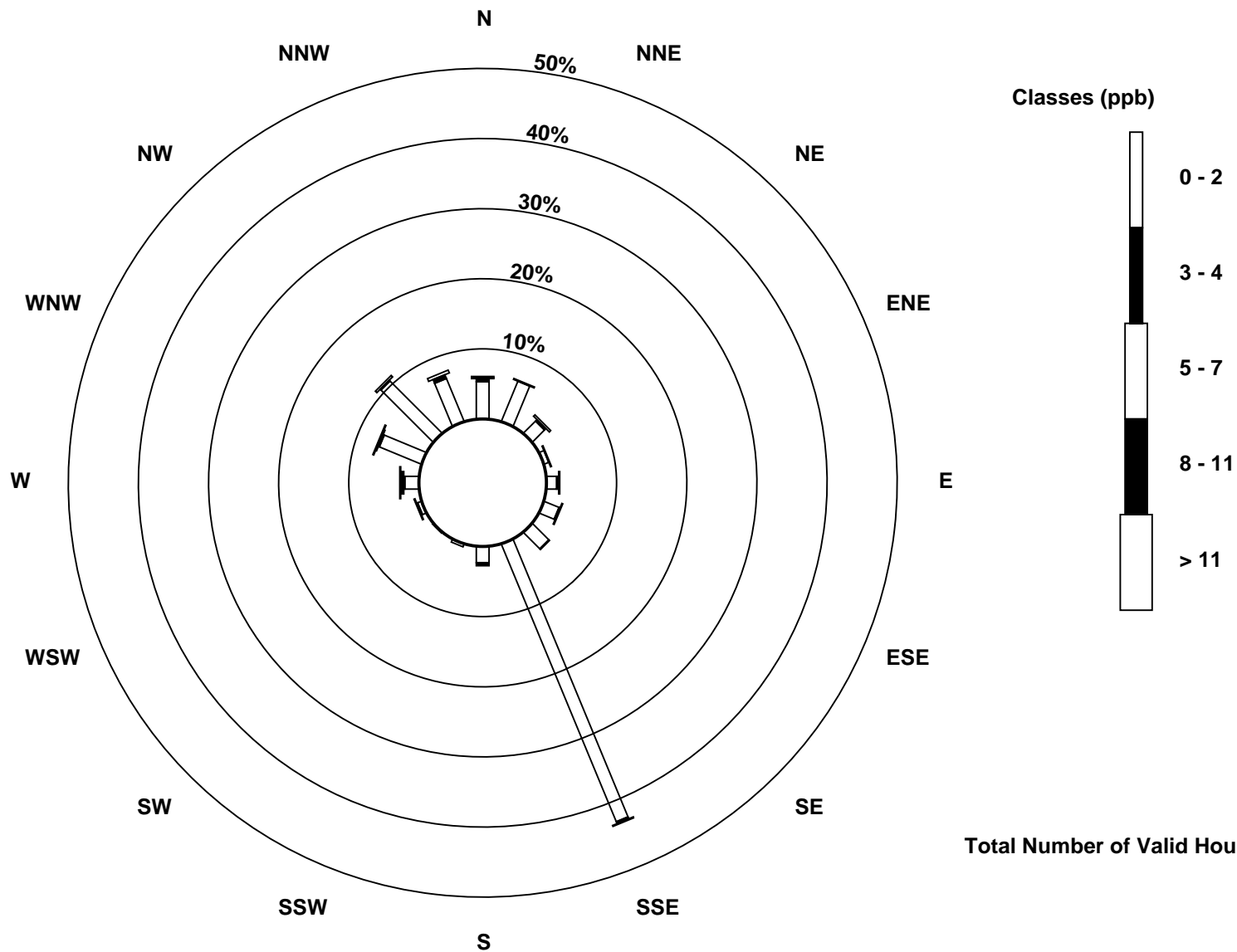
Total Number of Valid Hours: 693

Total Number of Hours: 744

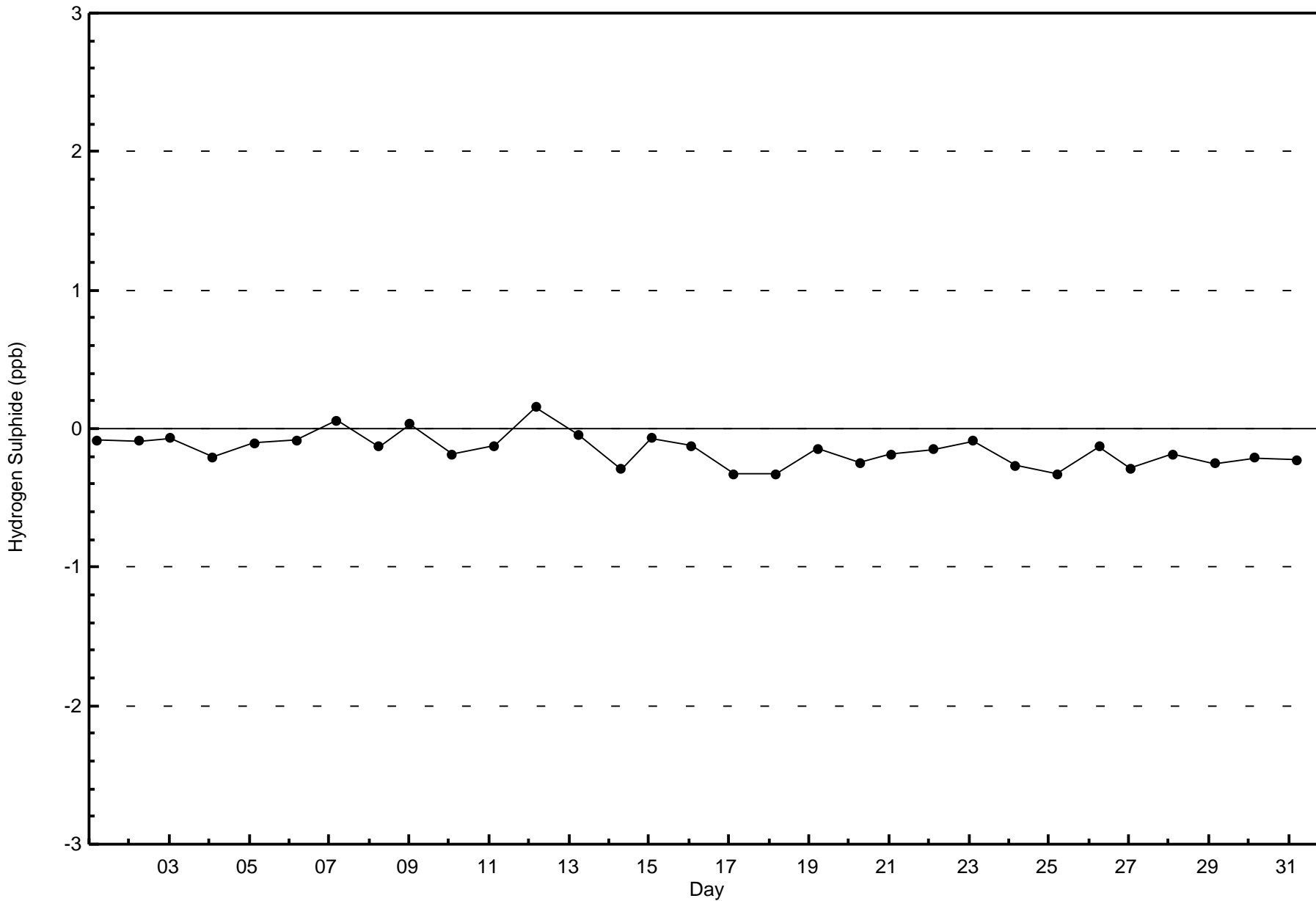


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Lower Camp (AMS 11)



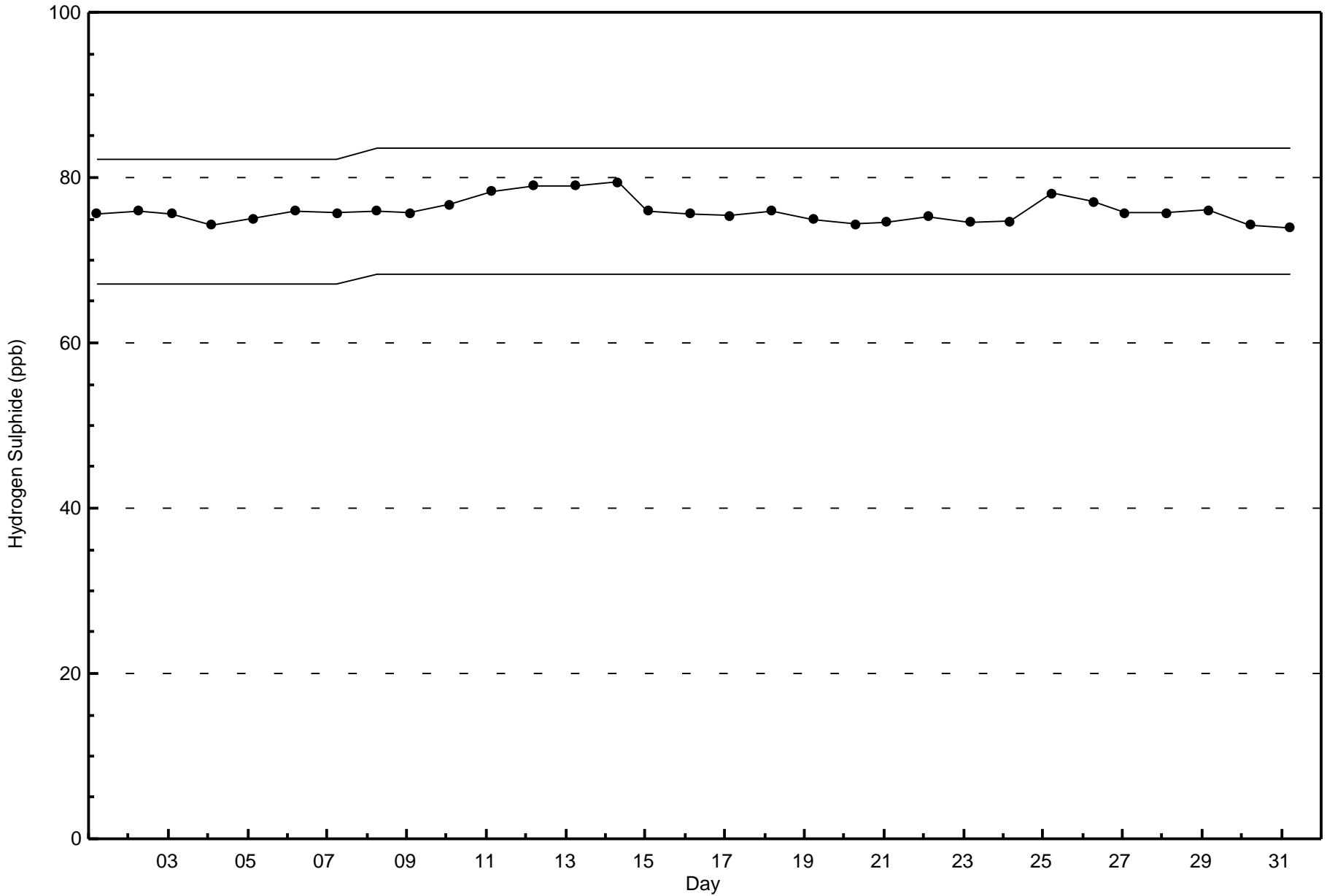
Total Number of Valid Hours: 693





Wood Buffalo Environmental Association  
Span Responses

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Lower Camp - December 2017





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Total Hydrocarbons (THC) - ppm**  
**Lower Camp - December 2017**

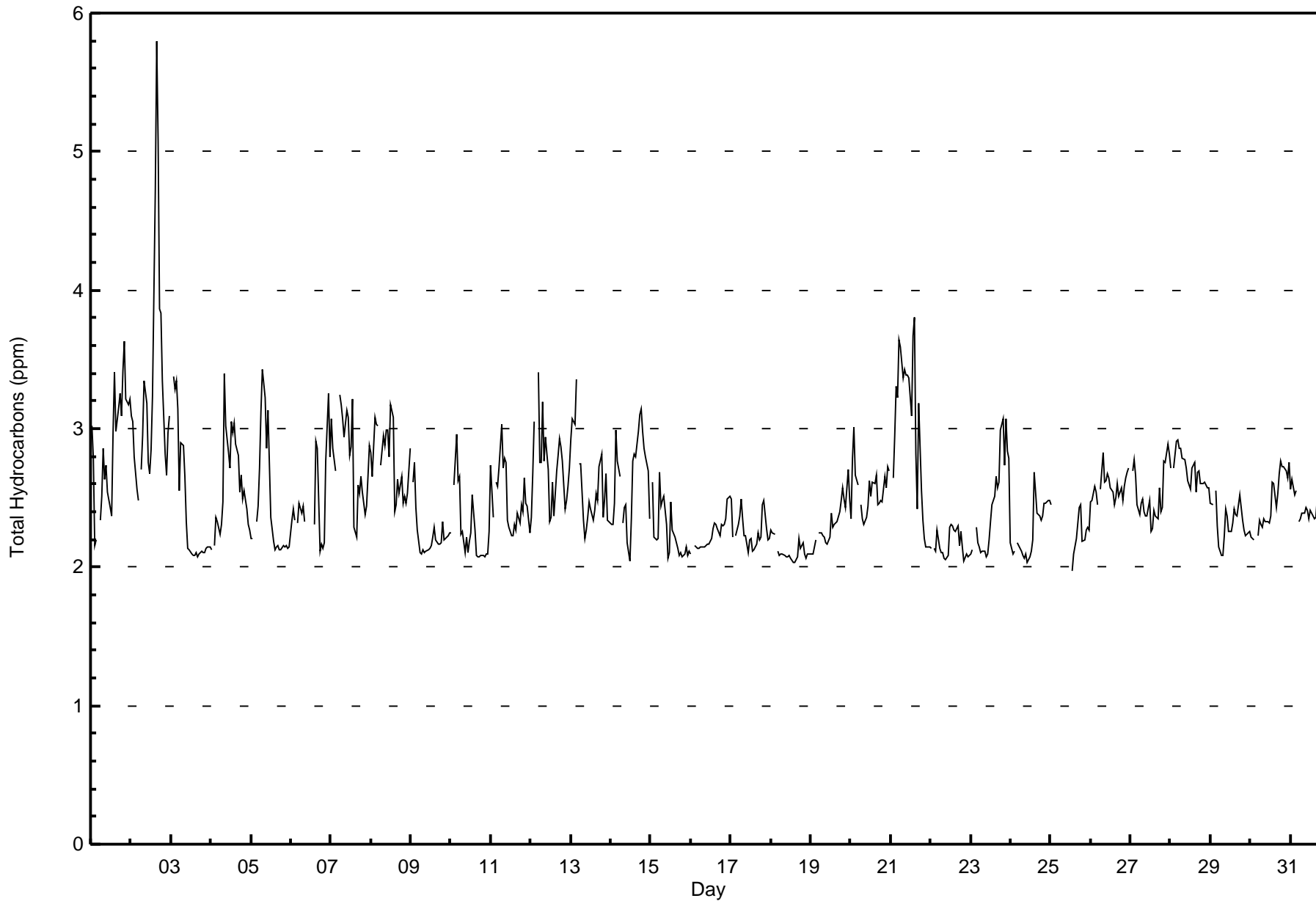
Maximum Value: 5.8 ppm on Dec 2 16:00		Maximum Daily Average: 3.3 ppm on Dec 2		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Dec 25 14:00		Minimum Daily Average: 2.1 ppm on Dec 18		Hours of Data: 697																						
Maximum Diurnal Average: 2.6 ppm at hour 4		Minimum Diurnal Average: 2.4 ppm at hour 12		Hours of Missing Data: 47																						
Monthly Average: 2.50 ppm		Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.2 Median = 2.4 Q <sub>3</sub> = 2.7 P <sub>90</sub> = 3.0 P <sub>99</sub> = 3.6		Hours of Calibration: 35																						
				Percent Operational Time: 98.4																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3.0	2.8	2.2	2.2	Z	2.3	2.5	2.9	2.6	2.7	2.5	2.4	2.4	3.0	3.4	3.0	3.2	3.3	3.1	3.4	3.6	3.2	3.2	3.2	2.9	3.6
2-Dec	3.1	3.1	2.8	2.6	2.5	Z	2.7	2.9	3.3	3.2	2.8	2.7	2.8	3.2	4.7	5.8	5.1	3.9	3.8	3.3	2.8	2.7	3.0	3.1	3.3	5.8
3-Dec	Z	3.4	3.3	3.3	3.1	2.6	2.9	2.9	2.7	2.3	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	2.4	3.4
4-Dec	2.1	Z	2.2	2.4	2.3	2.2	2.3	2.5	3.4	3.0	2.8	2.7	3.1	3.0	3.0	2.9	2.8	2.5	2.7	2.5	2.6	2.4	2.3	2.3	2.6	3.4
5-Dec	2.2	2.2	Z	2.3	2.4	2.7	3.1	3.4	3.2	2.9	3.1	2.7	2.4	2.2	2.1	2.1	2.2	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.5	3.4
6-Dec	2.3	2.4	2.3	Z	2.3	2.5	2.4	2.4	2.3	C	C	C	C	C	2.3	2.9	2.9	2.1	2.2	2.1	2.2	2.8	3.3	2.8	2.5	3.3
7-Dec	3.1	2.9	2.8	2.7	Z	3.2	3.2	3.1	2.9	3.1	3.1	2.8	2.9	3.2	2.3	2.2	2.6	2.5	2.7	2.5	2.4	2.4	2.7	2.9	2.8	3.2
8-Dec	2.8	2.7	3.1	3.0	3.0	Z	2.7	2.9	2.9	3.0	3.0	2.8	3.2	3.1	2.4	2.4	2.6	2.5	2.7	2.5	2.5	2.5	2.5	2.9	2.8	3.2
9-Dec	Z	2.6	2.8	2.4	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.8
10-Dec	2.2	Z	2.6	3.0	2.6	2.7	2.2	2.3	2.1	2.2	2.1	2.2	2.2	2.5	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.3	3.0
11-Dec	2.7	2.4	Z	2.6	2.6	2.7	3.0	2.7	2.8	2.8	2.3	2.3	2.2	2.2	2.3	2.3	2.4	2.3	2.5	2.4	2.6	2.5	2.4	2.2	2.5	3.0
12-Dec	2.4	2.7	3.1	Z	3.4	2.8	2.8	3.2	2.8	2.9	2.7	2.3	2.4	2.6	2.4	2.7	2.8	2.9	2.9	2.8	2.4	2.5	2.6	2.7	2.7	3.4
13-Dec	2.9	3.1	3.0	3.4	Z	2.8	2.7	2.3	2.2	2.3	2.4	2.5	2.4	2.3	2.4	2.5	2.5	2.7	2.8	2.4	2.5	2.7	2.3	2.3	2.6	3.4
14-Dec	2.3	2.3	2.5	3.0	2.8	2.7	Z	2.3	2.4	2.5	2.2	2.0	2.4	2.8	2.8	3.0	3.1	3.1	3.0	2.9	2.8	2.7	2.3	2.3	2.6	3.1
15-Dec	Z	2.6	2.2	2.2	2.2	2.7	2.4	2.5	2.5	2.3	2.1	2.1	2.5	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.3	2.7
16-Dec	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.5	2.5	2.2	2.5
17-Dec	2.5	2.2	Z	2.2	2.3	2.4	2.5	2.3	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.4	2.5	2.3	2.2	2.2	2.3	2.5
18-Dec	2.3	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.3
19-Dec	2.1	2.1	2.1	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.3	2.3	2.3	2.3	2.4	2.5	2.6	2.5	2.4	2.7	2.5	2.3	2.7
20-Dec	2.4	2.8	3.0	2.7	2.6	Z	2.4	2.3	2.3	2.4	2.4	2.6	2.5	2.6	2.6	2.7	2.5	2.5	2.5	2.5	2.7	2.6	2.7	2.7	2.6	3.0
21-Dec	Z	2.6	2.9	3.3	3.2	3.6	3.6	3.4	3.4	3.4	3.4	3.4	3.1	3.7	3.8	2.8	2.4	3.2	2.6	2.3	2.2	2.1	2.1	2.1	3.0	3.8
22-Dec	2.1	Z	2.1	2.1	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.1	2.0	2.1	2.1	2.1	2.2	2.3
23-Dec	2.1	2.1	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.4	2.5	2.6	2.6	2.6	3.0	3.1	2.7	3.1	2.8	2.8	2.4	3.1
24-Dec	2.2	2.1	2.1	Z	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.2	2.7	2.5	2.4	2.4	2.3	2.4	2.5	2.5	2.5	2.5	2.3	2.7
25-Dec	2.5	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	2.0	2.1	2.2	2.3	2.4	2.5	2.2	2.2	2.3	2.3	2.3	--	2.5
26-Dec	2.5	2.5	2.6	2.5	2.4	Z	2.6	2.8	2.6	2.6	2.7	2.6	2.6	2.5	2.5	2.5	2.6	2.5	2.6	2.5	2.6	2.6	2.7	2.7	2.6	2.8
27-Dec	Z	2.7	2.8	2.7	2.4	2.4	2.5	2.5	2.4	2.4	2.4	2.5	2.3	2.3	2.4	2.4	2.4	2.6	2.4	2.4	2.8	2.8	2.9	2.8	2.5	2.9
28-Dec	2.7	Z	2.7	2.9	2.9	2.9	2.9	2.8	2.8	2.7	2.6	2.6	2.6	2.7	2.8	2.5	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.9
29-Dec	2.5	2.5	Z	2.6	2.3	2.1	2.1	2.1	2.2	2.4	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.4	2.3	2.3	2.2	2.2	2.3	2.3	2.6
30-Dec	2.2	2.2	2.2	Z	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.6	2.6	2.4	2.5	2.7	2.8	2.7	2.7	2.7	2.6	2.8	2.5	2.8
31-Dec	2.6	2.6	2.5	2.5	Z	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.7	2.7	2.4	2.4	2.4	2.5	2.7
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan																										
C - Calibration																										
UO - Unstable Operation																										





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Lower Camp - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Lower Camp - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	6	0.86	0.86
2.1 - 3.0	627	89.96	90.82
3.1 - 10.0	64	9.18	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 697

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Lower Camp - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	2	6
2.1 - 3.0	38	41	15	3	9	13	20	267	19	3	1	6	17	47	67	47	613
3.1 - 10.0	3	2	6	2	4	3	5	26	2	0	0	0	2	2	4	3	64
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	41	43	22	5	13	16	26	294	21	3	1	6	19	49	72	52	683

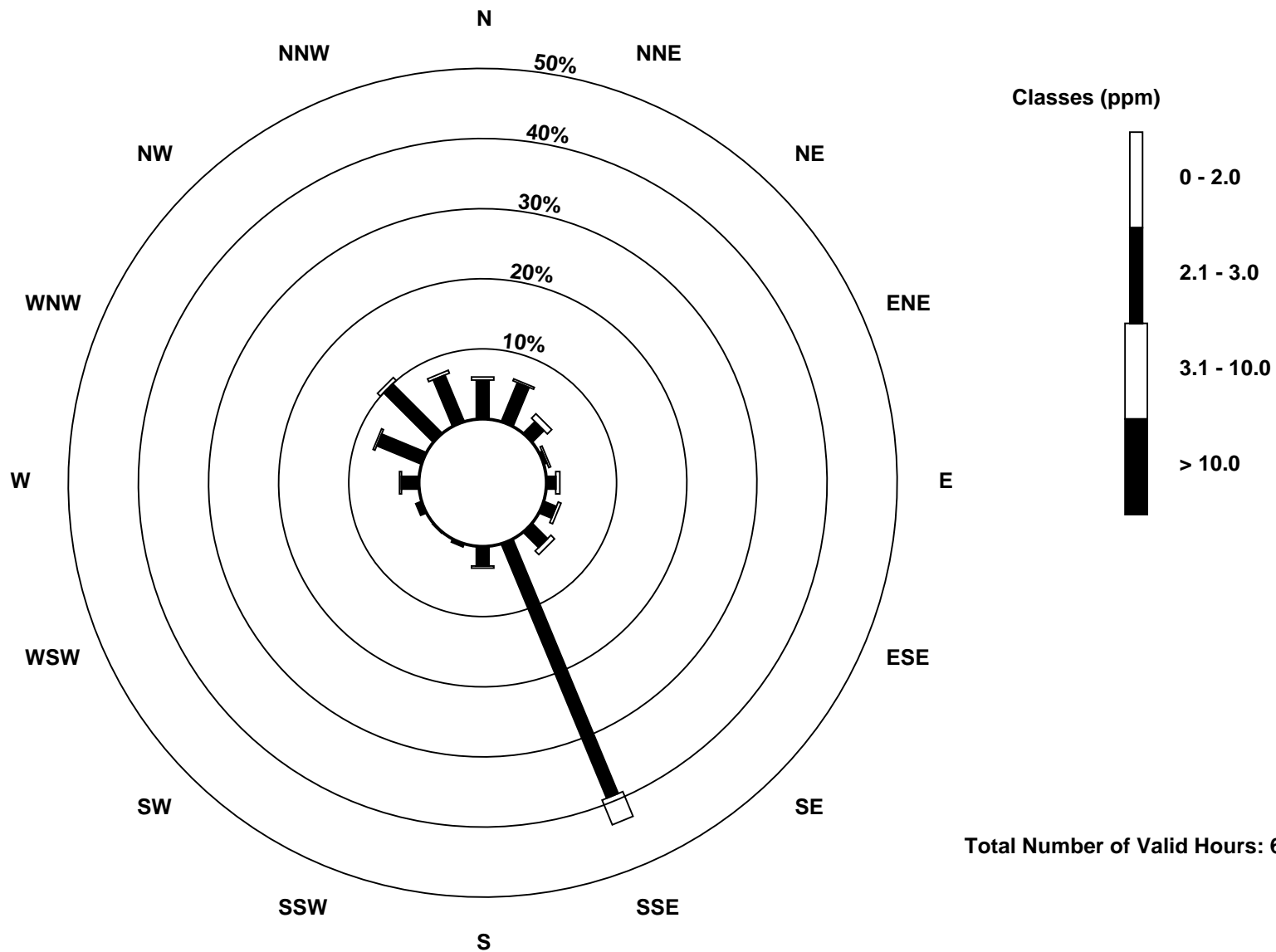
Total Number of Valid Hours: 683

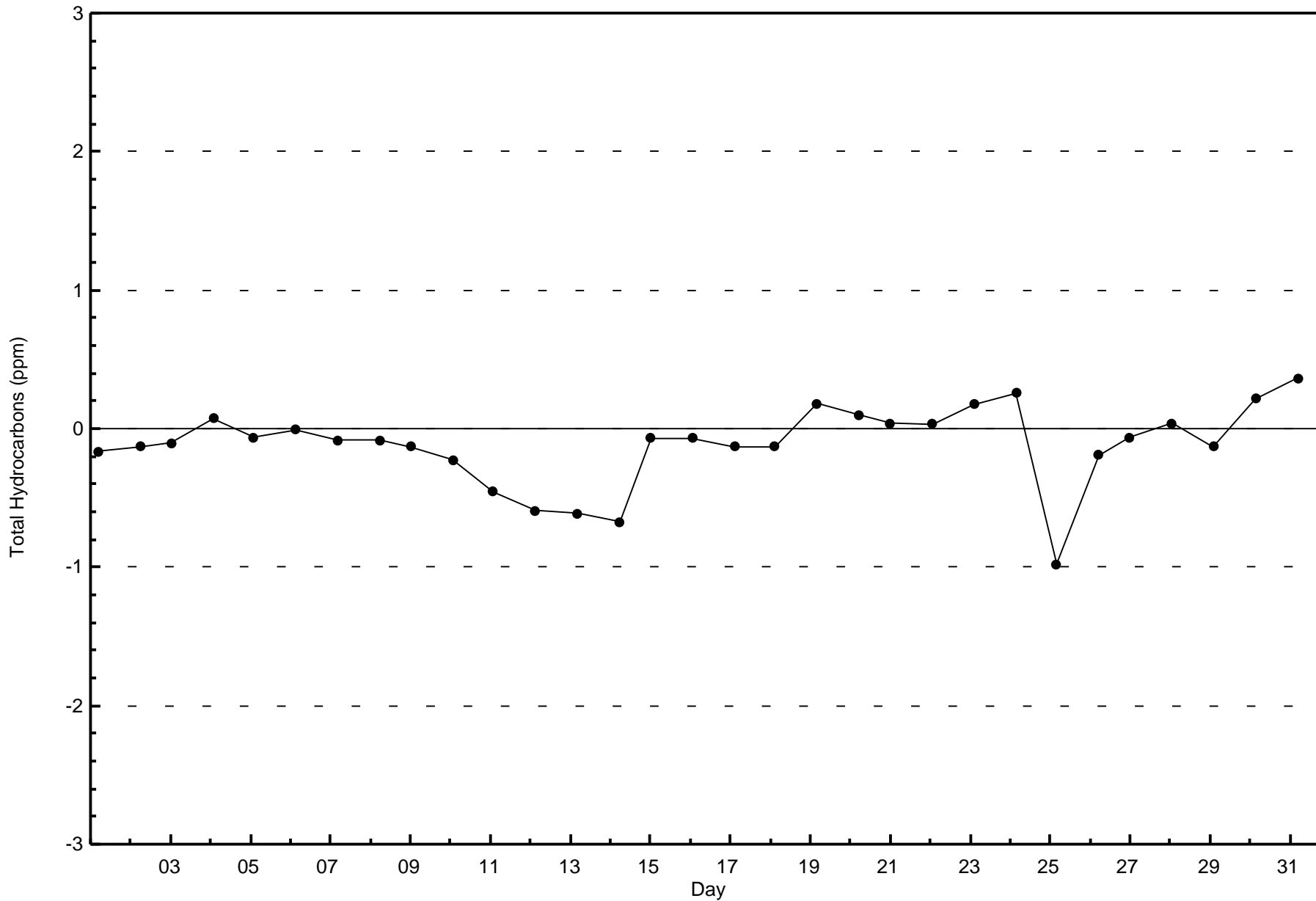
Total Number of Hours: 744

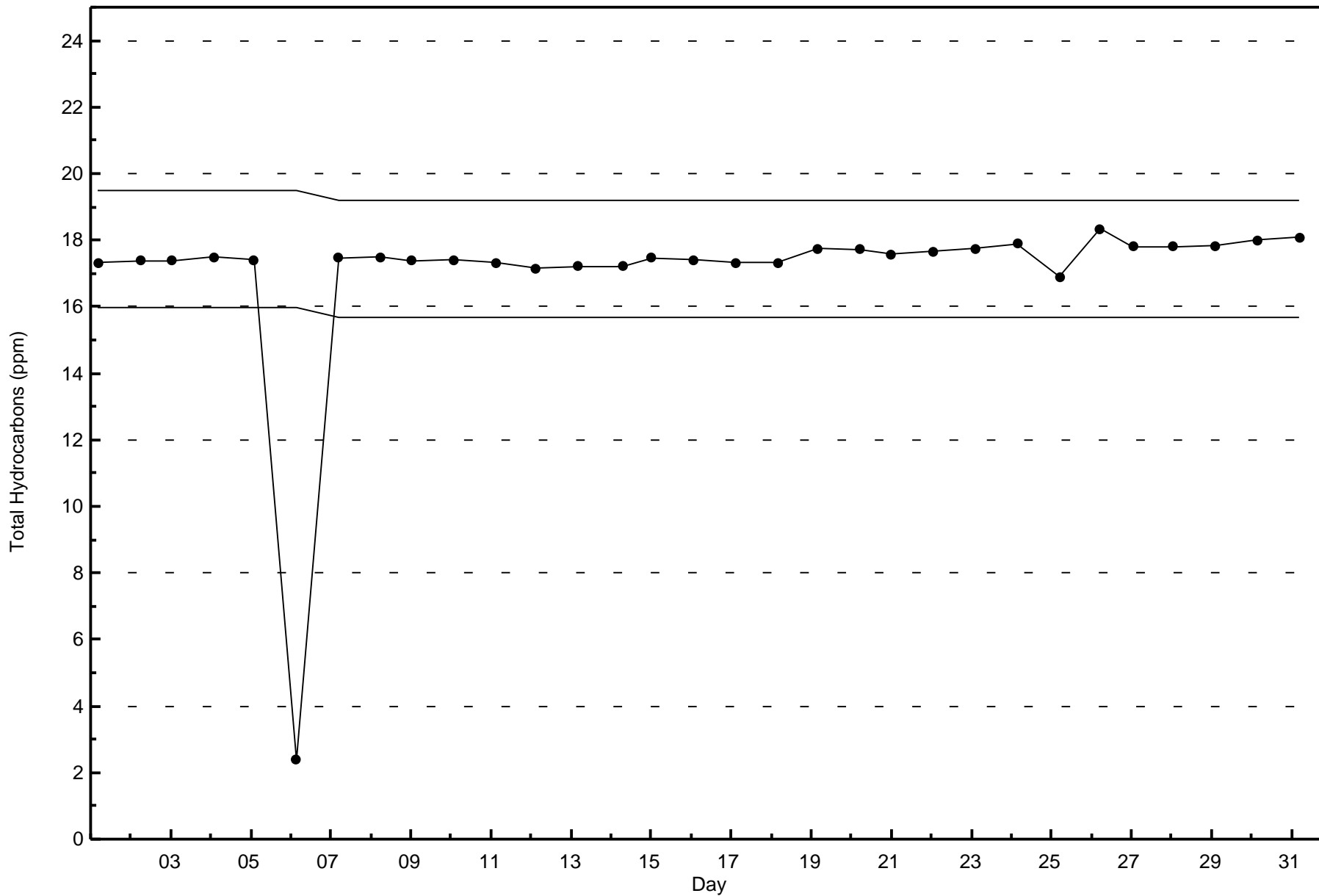


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Lower Camp (AMS 11)









**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

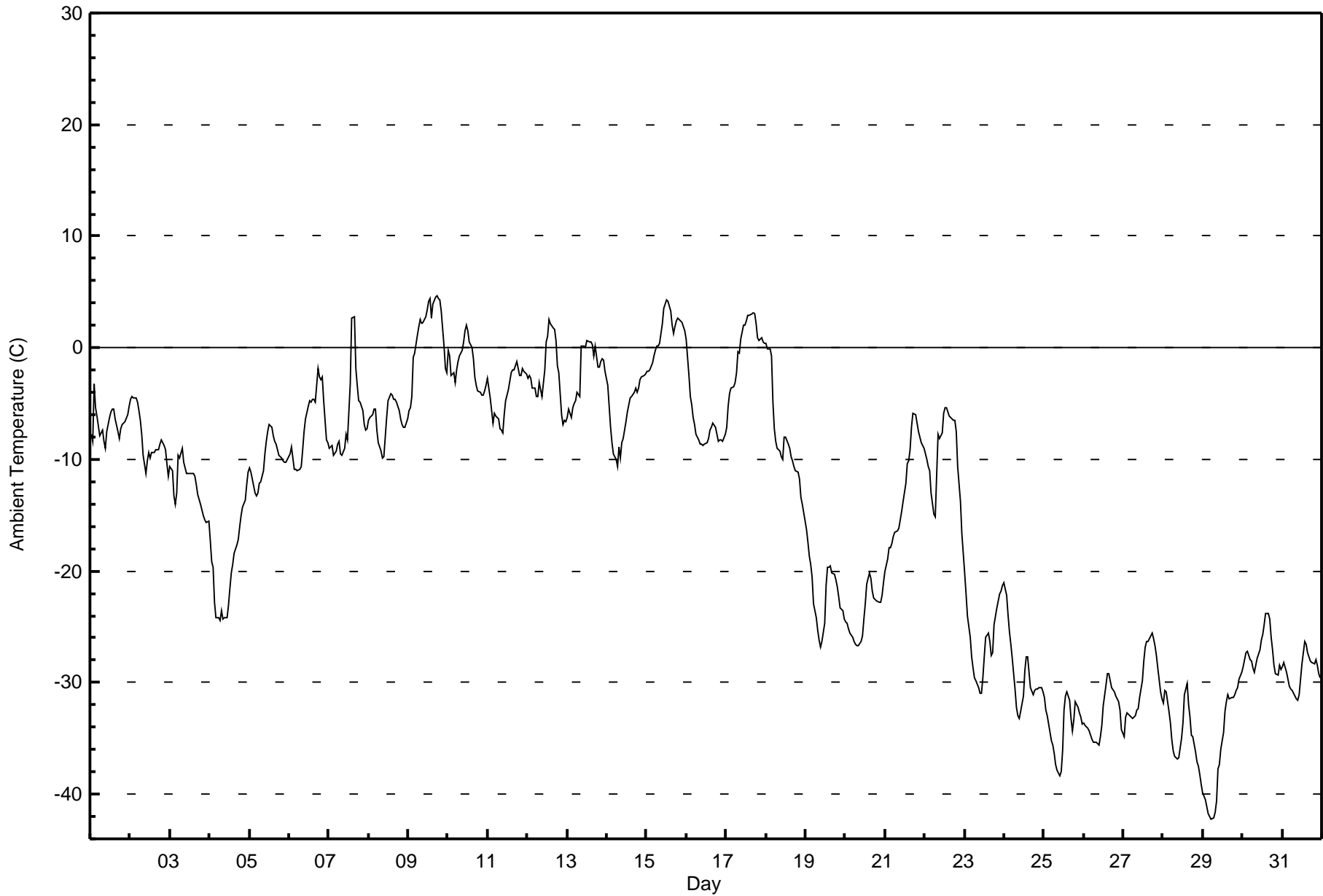
**Ambient Temperature (AT) - C**  
**Lower Camp - December 2017**

Maximum Value: 4.7 C on Dec 9 18:00		Maximum Daily Average: 1.3 C on Dec 9		Hours in Service: 744																						
Minimum Value: -42.3 C on Dec 29 06:00		Minimum Daily Average: -35.7 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -12.2 C at hour 15		Minimum Diurnal Average: -16.7 C at hour 7		Hours of Missing Data: 0																						
Monthly Average: -14.58 C		Percentiles: P <sub>1</sub> = -40.5 P <sub>10</sub> = -32.5 Q <sub>1</sub> = -26.7 Median = -9.9 Q <sub>3</sub> = -4.7 P <sub>90</sub> = 0.1 P <sub>99</sub> = 4.2		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-7.7	-8.4	-3.2	-5.3	-6.2	-7.9	-7.7	-7.4	-8.3	-9.0	-7.5	-6.3	-5.7	-5.5	-5.5	-6.3	-7.5	-8.2	-7.2	-6.8	-6.8	-6.6	-6.0	-5.3	-6.8	-3.2
2-Dec	-4.6	-4.4	-4.4	-4.4	-4.9	-5.6	-6.5	-7.8	-9.6	-11.2	-10.2	-9.4	-9.9	-9.4	-9.3	-9.2	-9.2	-9.1	-8.7	-8.3	-8.8	-9.2	-10.4	-11.5	-8.2	-4.4
3-Dec	-10.6	-11.0	-13.3	-14.1	-13.0	-9.6	-9.9	-9.0	-10.2	-10.8	-11.3	-11.2	-11.3	-11.3	-11.3	-11.5	-12.2	-13.2	-14.0	-14.6	-15.0	-15.4	-15.7	-15.6	-12.3	-9.0
4-Dec	-17.3	-19.1	-19.7	-22.8	-24.2	-24.2	-24.5	-23.5	-24.3	-24.2	-24.1	-23.1	-21.5	-20.1	-19.4	-18.4	-17.7	-17.2	-16.0	-15.0	-14.3	-13.6	-12.3	-11.1	-19.5	-11.1
5-Dec	-10.8	-11.1	-12.4	-13.0	-13.3	-13.0	-12.2	-12.0	-11.0	-9.5	-8.4	-7.5	-6.9	-7.2	-7.9	-8.4	-8.7	-9.1	-9.7	-9.9	-10.1	-10.2	-10.2	-10.0	-10.1	-6.9
6-Dec	-9.6	-8.9	-9.9	-10.8	-10.9	-11.0	-10.9	-10.6	-9.1	-7.5	-6.4	-5.3	-4.7	-4.9	-4.6	-4.6	-4.9	-1.9	-2.6	-2.8	-2.6	-4.8	-8.3	-8.4	-6.9	-1.9
7-Dec	-9.0	-8.8	-8.8	-9.6	-9.2	-8.6	-8.4	-9.5	-9.6	-9.0	-7.8	-8.2	-5.8	-3.3	2.6	2.8	-1.8	-3.4	-4.7	-4.8	-5.7	-6.9	-7.4	-7.2	-6.3	2.8
8-Dec	-6.4	-6.2	-6.1	-5.5	-5.5	-7.3	-8.5	-9.2	-9.9	-9.7	-8.0	-6.3	-4.7	-4.2	-4.3	-4.6	-4.6	-4.8	-5.6	-6.3	-6.9	-7.1	-7.2	-6.4	-6.5	-4.2
9-Dec	-5.6	-5.3	-4.4	-0.8	-0.5	1.1	1.9	2.5	2.2	2.3	2.8	3.4	4.1	4.4	2.7	3.9	4.5	4.7	4.4	4.3	3.3	0.1	-1.9	-2.3	1.3	4.7
10-Dec	-0.2	-0.7	-2.5	-2.2	-3.1	-2.0	-1.3	-0.7	-0.2	0.5	1.6	2.0	1.5	0.5	0.1	-1.0	-2.7	-3.4	-3.8	-4.0	-4.2	-4.2	-3.9	-3.3	-1.6	2.0
11-Dec	-2.8	-4.5	-5.6	-6.8	-5.9	-6.1	-6.4	-7.2	-7.3	-7.6	-6.0	-4.8	-3.8	-3.0	-2.3	-2.0	-1.9	-1.3	-1.8	-2.4	-2.5	-1.9	-2.1	-2.4	-4.1	-1.3
12-Dec	-2.7	-2.5	-2.8	-3.6	-3.7	-4.4	-4.4	-3.2	-3.8	-4.3	-2.0	0.5	1.1	2.6	2.1	1.7	1.6	0.6	-1.7	-2.2	-6.0	-6.8	-6.5	-6.6	-2.4	2.6
13-Dec	-6.2	-5.5	-6.3	-5.4	-5.0	-4.7	-4.0	-4.4	0.1	0.2	0.2	0.0	0.6	0.5	0.5	0.3	-0.8	0.1	-1.7	-1.7	-1.2	-1.0	-1.1	-2.1	-2.0	0.6
14-Dec	-3.4	-5.2	-7.1	-8.5	-9.5	-10.0	-10.6	-8.8	-9.8	-8.6	-8.1	-6.6	-5.7	-5.2	-4.5	-4.4	-4.0	-3.7	-4.0	-3.6	-2.8	-2.6	-2.4	-2.4	-5.9	-2.4
15-Dec	-2.2	-2.1	-1.9	-1.4	-0.8	-0.3	0.2	0.2	0.4	2.1	3.6	3.9	4.2	4.2	3.3	2.0	1.2	1.9	2.4	2.7	2.4	2.2	1.9	1.5	1.3	4.2
16-Dec	0.8	-2.5	-4.4	-5.2	-6.2	-6.9	-7.8	-8.2	-8.6	-8.7	-8.7	-8.6	-8.5	-8.1	-7.4	-7.1	-6.7	-7.1	-7.8	-8.4	-8.2	-8.3	-8.3	-7.8	-7.0	0.8
17-Dec	-7.1	-5.2	-4.1	-3.6	-3.5	-3.1	-2.3	-0.4	-0.4	0.7	2.1	2.1	2.5	2.9	2.9	3.0	3.2	3.0	2.1	0.9	0.7	0.9	0.6	0.4	-0.1	3.2
18-Dec	0.4	-0.1	-0.1	-0.7	-4.9	-7.3	-8.3	-9.0	-9.3	-9.8	-10.0	-8.0	-8.0	-8.6	-9.0	-9.8	-10.1	-10.7	-11.0	-11.2	-11.7	-13.4	-14.0	-14.8	-8.3	0.4
19-Dec	-16.3	-17.4	-18.7	-19.4	-20.5	-22.9	-24.2	-25.4	-26.2	-26.8	-26.3	-24.6	-21.3	-19.7	-19.6	-19.6	-20.1	-20.3	-20.8	-21.4	-22.3	-23.3	-23.6	-24.3	-21.9	-16.3
20-Dec	-24.6	-24.7	-25.2	-25.6	-26.0	-26.3	-26.6	-26.7	-26.7	-26.3	-25.8	-24.3	-22.9	-21.2	-20.1	-20.6	-21.9	-22.5	-22.5	-22.6	-22.8	-22.9	-22.1	-21.0	-23.8	-20.1
21-Dec	-20.0	-18.9	-18.0	-17.9	-17.5	-17.0	-16.6	-16.4	-16.2	-15.4	-14.6	-13.7	-12.2	-10.3	-10.2	-9.1	-7.2	-5.9	-5.9	-6.7	-7.5	-8.0	-8.5	-9.0	-12.6	-5.9
22-Dec	-9.5	-10.0	-10.6	-11.0	-13.0	-14.8	-15.1	-11.4	-7.7	-8.2	-7.6	-5.9	-5.4	-5.3	-5.8	-6.1	-6.4	-6.5	-6.6	-7.6	-10.7	-13.7	-16.6	-18.4	-9.7	-5.3
23-Dec	-20.2	-22.1	-24.0	-26.0	-27.6	-28.7	-29.6	-29.8	-30.4	-31.0	-30.9	-29.6	-27.7	-25.9	-25.6	-26.3	-27.5	-27.3	-24.8	-23.3	-22.7	-22.0	-21.8	-21.3	-26.1	-20.2
24-Dec	-21.1	-22.2	-23.9	-25.4	-26.5	-27.8	-30.6	-32.2	-33.0	-33.2	-32.6	-31.2	-29.0	-27.8	-27.7	-29.0	-30.4	-31.1	-30.7	-30.6	-30.6	-30.5	-30.5	-30.8	-29.1	-21.1
25-Dec	-31.3	-32.4	-32.9	-33.7	-35.2	-35.6	-36.3	-37.3	-37.9	-38.3	-38.0	-36.2	-32.5	-31.2	-30.8	-31.6	-33.2	-34.4	-33.3	-31.7	-32.3	-32.8	-33.1	-33.7	-34.0	-30.8
26-Dec	-33.6	-33.8	-34.1	-34.4	-34.7	-35.1	-35.4	-35.4	-35.5	-35.6	-34.9	-33.8	-32.1	-30.2	-29.2	-29.2	-29.8	-30.4	-30.8	-31.2	-31.4	-31.7	-32.5	-34.3	-32.9	-29.2
27-Dec	-34.9	-33.0	-32.7	-32.8	-32.9	-33.2	-33.1	-33.0	-32.5	-32.3	-31.3	-29.8	-28.1	-26.8	-26.3	-26.3	-25.8	-25.6	-26.0	-26.7	-27.5	-28.7	-30.9	-31.4	-30.1	-25.6
28-Dec	-31.8	-30.7	-30.9	-32.5	-33.6	-35.0	-36.1	-36.6	-36.9	-36.7	-35.8	-35.0	-33.5	-31.1	-30.0	-32.0	-33.1	-34.7	-34.9	-36.2	-37.1	-37.5	-38.2	-39.2	-34.5	-30.0
29-Dec	-39.8	-40.4	-41.2	-41.8	-42.0	-42.3	-42.1	-41.7	-40.6	-37.7	-37.3	-35.9	-34.5	-32.6	-31.7	-31.0	-31.5	-31.4	-31.4	-31.0	-30.7	-30.5	-29.7	-29.1	-35.7	-29.1
30-Dec	-28.5	-27.9	-27.3	-27.1	-27.9	-28.0	-28.7	-29.1	-28.5	-27.8	-27.0	-26.1	-25.6	-24.8	-23.8	-23.8	-24.3	-25.9	-27.1	-28.5	-29.2	-29.3	-28.5	-28.8	-27.2	-23.8
31-Dec	-28.6	-28.2	-29.1	-29.8	-30.3	-30.6	-30.7	-30.9	-31.5	-31.6	-31.1	-29.7	-28.3	-26.3	-26.6	-27.3	-27.7	-28.1	-28.2	-28.3	-27.9	-28.4	-29.2	-29.5	-29.1	-26.3
	-14.4	-14.6	-15.0	-15.5	-16.1	-16.4	-16.7	-16.6	-16.5	-16.3	-15.5	-14.5	-13.4	-12.5	-12.2	-12.4	-12.9	-13.1	-13.4	-13.5	-14.0	-14.4	-14.9	-15.0	Diurnal Average	
	0.8	-0.1	-0.1	-0.7	-0.5	1.1	1.9	2.5	2.2	2.3	3.6	3.9	4.2	4.4	3.3	3.9	4.5	4.7	4.4	4.3	3.3	2.2	1.9	1.5	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Lower Camp - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Lower Camp - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	268	36.02	36.02
-20 - 0	401	53.90	89.92
0 - 10	75	10.08	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

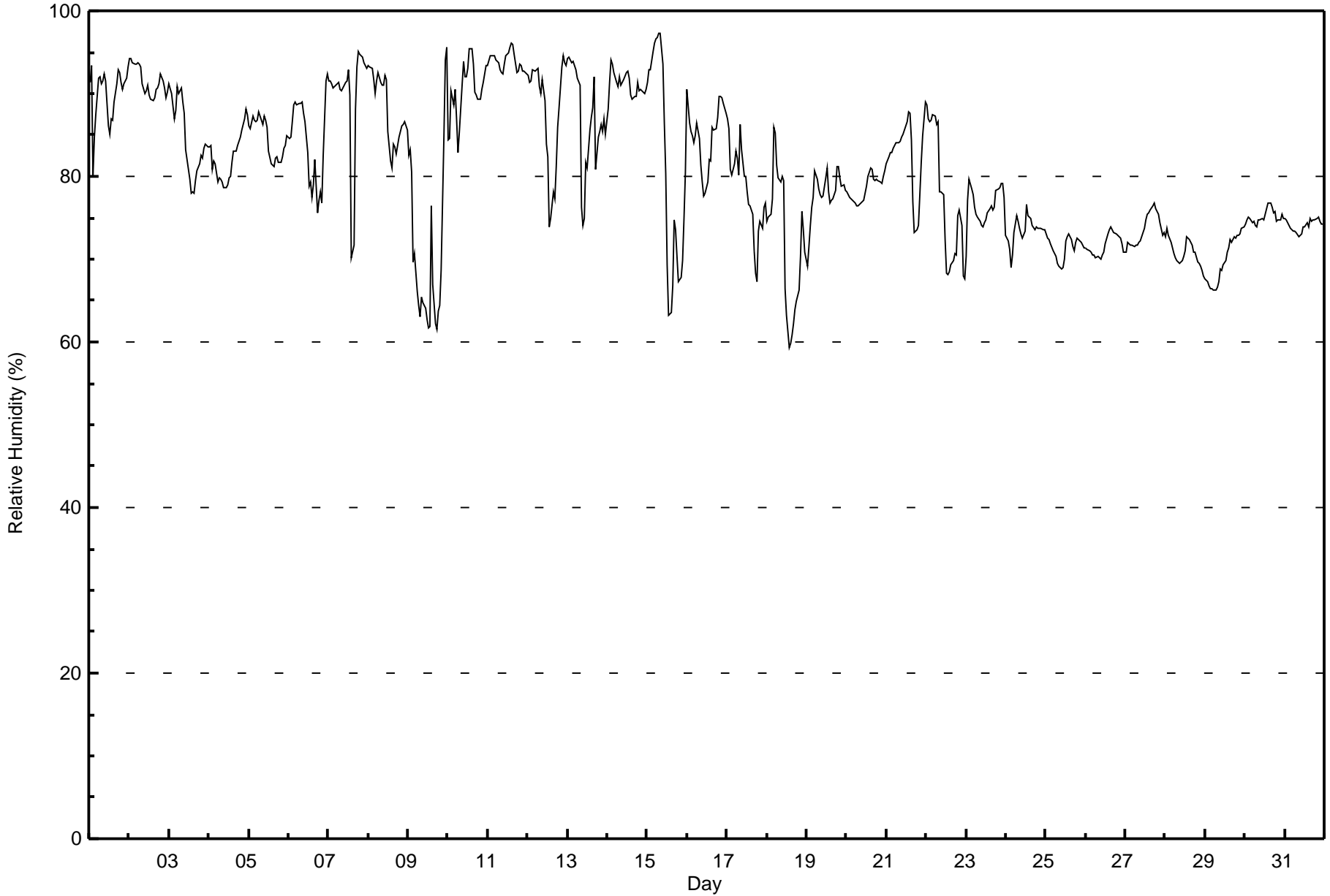
**Relative Humidity (RH) - %  
Lower Camp - December 2017**

Maximum Value: 97 % on Dec 15 09:00      Maximum Daily Average: 93.9 % on Dec 11																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 59 % on Dec 18 14:00      Minimum Daily Average: 69.8 % on Dec 29 Maximum Diurnal Average: 82.9 % at hour 2      Minimum Diurnal Average: 78.4 % at hour 15 Monthly Average: 80.8 %      Percentiles: P <sub>1</sub> = 62 P <sub>10</sub> = 70 Q <sub>1</sub> = 74 Median = 80 O <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 96																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	91	93	80	85	88	92	92	91	92	92	92	86	85	87	87	89	91	93	93	91	90	91	92	93	89.8	93
2-Dec	94	94	94	93	94	94	94	93	91	90	90	91	90	89	89	90	91	91	91	92	92	91	90	90	91.5	94
3-Dec	91	90	88	87	88	91	90	91	89	88	83	82	80	78	78	78	80	81	82	83	82	83	84	84	84.6	91
4-Dec	84	84	81	82	82	79	80	80	79	79	79	79	80	80	82	83	83	84	84	85	86	87	88	88	82.3	88
5-Dec	86	86	87	87	87	87	88	87	86	87	87	86	83	82	81	81	82	82	82	82	83	84	85	84.6	88	
6-Dec	85	85	87	89	89	89	89	89	89	88	87	83	79	79	77	79	82	76	77	78	77	83	91	92	84.0	92
7-Dec	91	92	91	91	91	91	91	90	90	91	91	92	93	90	70	72	88	93	95	95	94	94	93	93	90.1	95
8-Dec	93	93	93	92	90	92	93	91	91	91	92	92	85	82	81	84	84	83	85	85	86	86	87	86	88.2	93
9-Dec	83	83	81	70	71	66	64	63	65	65	64	63	62	62	76	67	62	62	64	64	69	85	94	96	70.8	96
10-Dec	84	85	90	89	90	87	83	85	91	94	92	92	93	95	95	94	90	90	89	89	91	91	92	93	90.3	95
11-Dec	93	95	95	95	95	94	94	93	93	92	94	95	95	96	96	96	95	93	93	94	93	93	93	92	93.9	96
12-Dec	92	91	91	93	93	93	93	91	90	92	89	84	82	74	75	78	77	81	86	88	93	95	94	93	87.9	95
13-Dec	94	94	94	94	93	93	92	91	76	74	75	82	81	86	87	88	92	81	85	85	86	85	87	85	86.7	94
14-Dec	88	91	94	94	92	91	91	92	91	91	92	93	93	92	90	89	90	91	90	91	90	91	90	91	91.1	94
15-Dec	91	93	93	95	96	97	97	97	97	94	86	80	69	63	63	67	75	74	70	67	68	70	75	80	81.6	97
16-Dec	91	86	85	85	84	85	86	85	81	79	78	78	79	82	82	86	86	86	87	90	90	90	89	88	84.9	91
17-Dec	87	86	81	80	81	83	82	80	86	83	80	80	78	77	76	75	71	68	67	73	75	74	76	77	78.3	87
18-Dec	75	75	75	77	86	85	81	80	79	80	79	66	63	59	60	61	62	64	65	66	70	76	74	71	72.1	86
19-Dec	69	72	74	76	78	81	80	78	78	77	78	80	81	78	77	77	77	78	81	81	80	79	79	78	77.8	81
20-Dec	78	78	77	77	77	77	76	76	77	77	77	78	79	80	81	81	80	79	80	79	79	79	80	81	78.5	81
21-Dec	81	82	83	83	83	84	84	84	84	85	85	86	87	88	88	84	77	73	74	74	78	82	85	89	82.6	89
22-Dec	89	87	87	87	88	87	86	87	78	78	78	72	68	68	69	69	70	71	71	75	76	74	68	68	77.0	89
23-Dec	70	77	80	78	78	76	75	75	75	74	74	74	75	76	76	76	76	78	78	79	79	79	77	76.4	80	
24-Dec	73	72	71	69	70	73	75	75	74	73	73	73	77	75	75	74	74	74	74	74	74	74	74	74	73.5	77
25-Dec	73	73	72	72	71	71	70	70	69	69	69	70	72	73	73	72	72	71	72	73	72	72	71	71	71.4	73
26-Dec	71	71	71	71	71	70	70	70	70	70	70	71	72	73	74	74	74	73	73	73	73	72	72	71	71.7	74
27-Dec	71	72	72	72	72	72	72	72	72	72	73	74	75	75	76	76	76	77	76	76	75	74	73	73	73.6	77
28-Dec	73	74	73	72	71	71	70	70	70	70	70	70	71	73	72	72	72	71	71	70	69	69	69	68	70.8	74
29-Dec	68	67	67	66	66	66	66	67	67	69	69	69	70	71	71	72	72	73	72	73	73	73	74	74	69.8	74
30-Dec	74	75	75	75	74	75	74	74	75	75	75	75	75	76	77	77	76	76	76	75	75	75	75	75	75.1	77
31-Dec	75	75	74	74	74	73	73	73	73	73	73	74	74	74	74	75	75	75	75	75	75	75	74	74	74.1	75
																			82.6 82.9 82.5 82.2 82.6 82.7 82.3 81.9 81.3 81.0 80.4 79.6 78.9 78.5 78.4 78.6 79.0 78.6 79.3 79.8 80.4 81.4 82.1 82.2				Diurnal Average			
																			94 95 95 95 96 97 97 97 97 94 94 95 95 96 96 96 95 93 95 95 94 95 94 96				Diurnal Maximum			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Lower Camp - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Lower Camp - December 2017

Maximum Speed: 25 km/h on Dec 17 18:00	Maximum Daily Speed Average: 15.0 km/h on Dec 20	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 9 22:00	Minimum Daily Speed Average: 0.6 km/h on Dec 10	Hours of Data: 729
Maximum Diurnal Speed Average: 4.0 km/h at hour 5	Minimum Diurnal Speed Average: 1.5 km/h at hour 17	Hours of Missing Data: 15
Monthly Average Velocity: 2.3 km/h 175.0 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 8 Q <sub>3</sub> = 12 P <sub>90</sub> = 16 P <sub>99</sub> = 21	Percent Operational Time: 98.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SE3	SSE2	WNW10	NW3	SSE6	SSE4	SSE6	SSE8	SSE4	SSE5	SSE11	SSE15	SSE11	SSE6	SSE8	SE4	E0	E1	ESE2	NNW2	WNW4	NE1	NW1	ESE1	SSE3.4	SSE15
2-Dec	SE2	N4	NW3	NW4	NW2	NNW2	NW5	NNW3	NNW4	NW4	NW3	W3	W3	W4	W3	WNW1	NNE0	ENE2	NE2	SE2	ENE2	ESE0	ESE1	SSE3	NW1.4	NW5
3-Dec	SSE4	SSE3	SE4	NE1	E1	SSE7	E1	ENE1	NNW12	N7	NNE9	NNE8	NNE10	N9	N7	N8	NNE7	NE7	N3	NNW4	NNW4	NW4	NNW4	NNW3	NNE3.7	NNW12
4-Dec	NW2	NNE2	WNW2	N1	N1	NNW2	WNW1	S0	SSE3	S7	SSE11	S9	S5	S6	SSE10	SSE9	SSE9	SSE9	SSE9	SSE8	SSE10	SSE16	SSE16	SSE13	SSE5.5	SSE16
5-Dec	SSE9	SSE13	SSE12	SSE14	SSE16	SSE12	SSE7	NE1	NW4	NW4	NNW5	NNW5	N7	NNE10	NNE11	NNE9	NE8	NNE10	NNE10	N6	N6	NNW4	N3	ESE4	ENE2.0	SSE16
6-Dec	SSE9	SSE11	SSE10	SSE11	SSE13	SSE13	SSE14	SSE17	SSE18	SSE14	SSE17	SSE14	SSE14	SSE16	SSE12	SSE9	SW5	W19	W9	W13	W12	S7	SSE11	SSE9	S9.3	W19
7-Dec	SSE8	SSE9	SSE9	SSE9	SSE10	SSE11	SSE11	SSE9	SSE12	SSE11	SSE9	SSE3	SSE3	SE6	NW11	NW10	WSW0	NNW1	NNW4	NNW2	SSW1	S3	SSE8	SSE7	SSE4.6	SSE12
8-Dec	SSE8	SSE7	SSE9	SSE10	SSE10	SSE8	SE6	SE5	SSE5	SE3	SSE8	SSE10	SSE10	SSE10	SSE7	SSE12	SSE13	SSE16	SSE12	SSE13	SSE15	SSE16	SSE16	SSE11	SSE9.9	SSE16
9-Dec	SSE16	SSE15	S9	WSW10	W11	WNW14	WNW20	WNW17	WNW20	NW11	WNW16	WNW12	W9	W7	ESE1	WNW4	WNW16	WNW15	WNW11	WSW10	WNW3	WSW0	E2	SE3	W7.2	WNW20
10-Dec	SSW2	SSE5	SE6	SSE8	SSE9	SSE10	SSE10	SSE11	SSE11	S6	W10	WNW17	NNW16	NNW14	N11	NNE10	NNE11	NNE8	N6	N6	NNW3	NNE2	E1	SE2	N0.6	WNW17
11-Dec	SSE3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SSE9	SSE9	SSE12	SSE13	SSE12	SSE12	SSE15	SSE16	SSE15	SSE16	SSE17	SSE12	----	SSE17
12-Dec	SSE18	SSE13	SSE11	SSE12	SSE12	SSE16	SSE16	SSE9	SSE5	SSE14	S5	NW4	WNW7	WNW14	NW8	NW7	NW9	NW7	NW9	WNW7	NE0	SSE6	SSE7	SSE6	S4.2	SSE18
13-Dec	SSE7	SSE8	SSE7	SSE10	SSE12	SSE12	SSE13	SSE11	WNW15	WNW13	NW8	NNE2	N7	NNW8	N3	WNW3	NW3	NW10	NW6	N5	NW6	NNW7	NNE5	NE4	W0.9	WNW15
14-Dec	NNE1	SSW2	E1	NE1	NNW2	N1	SSE2	SSE5	SSE6	SSE9	SSE13	SSE11	SSE13	SSE14	SSE13	SSE11	SSE9	NE1	SSE3	ESE3	SE3	SSE6	SSE9	SE7	SSE5.5	SSE14
15-Dec	SSE4	SSE5	SSE12	SSE12	SSE12	AF	SSE8	SSE8	SSE5	W8	W15	WNW15	NW20	NW17	WNW12	W7	WSW8	WSW8	W12	WNW11	WNW14	WNW15	WNW16	WNW18	W6.6	NW20
16-Dec	NW13	NNE17	NE14	NNE14	NNE14	NNE10	NNE8	NE6	NE6	E5	ESE5	ESE5	NE2	ESE0	SSE7	SSE7	SE8	SSE10	SSE10	SSE10	SSE14	SSE15	SSE15	SSE14	E4.2	NNE17
17-Dec	SE7	SSE12	SSE15	S16	S13	SSE11	SSE8	WNW3	SE1	WNW8	WNW19	WNW16	WNW18	WNW22	WNW21	WNW17	NW22	NW25	NW24	NW17	NW11	WNW13	WNW12	W17	WNW8.5	NW25
18-Dec	NW15	NW14	WNW15	NNW10	NNE19	NNE17	NE18	NNE13	NNE9	NNE5	NNE2	NW18	NW23	NW23	NNW21	NNW18	NW20	NW19	NW18	NW19	NNW15	NNE13	NNE12	NNE12	NNW12.8	NW23
19-Dec	NNE10	N8	NNE7	NW4	NW5	NNW3	NNW3	NNW2	NNW2	N2	NNE1	E1	SE5	SSE9	SSE10	SSE10	SSE10	SSE10	SE7	SE7	SSE10	SSE9	SSE10	SSE15	SSE3.0	SSE15
20-Dec	SSE14	SSE12	SSE11	SSE15	SSE12	SSE11	SSE13	SSE15	SSE16	SSE16	SSE17	SSE17	SSE17	SSE19	SSE17	SSE18	SSE19	SSE18	SSE17	SSE16	SSE14	SSE15	SSE14	SSE10	SSE15.0	SSE19
21-Dec	S7	S5	SSE5	SSE7	SSE6	SE2	ENE1	E1	NNE1	N1	NE1	N1	SSE1	SSE5	ESE2	NNW7	NW12	NW18	NW19	NW17	N7	N6	NNW5	NW2	NW2.3	NW19
22-Dec	E2	ENE3	NE3	NW3	NW3	N1	NNE4	NW5	W16	WNW13	WNW11	NW15	NW18	NW17	NW18	NW18	NW14	NW16	NW17	N13	NE19	NNE20	NNE16	N11	NNW9.0	NNE20
23-Dec	N8	N6	NW3	NNW2	NNE2	N1	NNE2	N2	NW4	NNW4	NW4	WNW3	WNW5	NNW2	WNW3	WNW1	ESE2	NE2	SE6	SSE11	S6	S5	N4	NNW7	NNW1.2	SSE11
24-Dec	NNE13	NE16	NE16	NNE15	N8	NW6	N2	N2	NNW2	NNW3	NNW2	NW2	SSE2	ESE2	W2	AF	AF	NNW1	NNE2	N2	N2	NNW4	NW3	NW5	N3.9	NE16
25-Dec	NW5	NW5	NW4	NNW5	NW3	NW4	NNW3	N2	N1	NNW2	N1	ESE1	SE5	SE7	SE6	E2	ENE1	SE1	SSE6	SSE10	SSE11	SSE11	SSE14	SSE14	SSE2.2	SSE14
26-Dec	SSE10	SSE14	SSE13	SSE14	SSE15	SSE13	SSE14	SSE11	SSE11	SSE9	SSE11	SSE11	SSE10	SSE9	SSE8	S7	SSE9	SSE10	SSE10	SSE10	S8	S8	SSE5	ESE2	SSE9.9	SSE15
27-Dec	ESE3	SSE7	S7	SSE9	SSE11	SSE9	SSE10	S8	SSE11	SSE12	SSE11	SSE13	SSE11	SSE10	SSE9	SSE7	SSE6	SSE5	SSE5	S4	SSE7	SSE7	SE4	SSE6	SSE7.8	SSE13
28-Dec	E2	SSE5	S5	NE1	NW2	NNW2	NNW3	NNW2	NNW2	NNW2	NNW2	N1	NW1	WNW1	W1	S0	NNW1	NNW1	NW2	NNW1	NNW2	NW3	NW3	N1	NNW0.9	SSE5
29-Dec	NNW1	NW2	NW3	NNW3	N1	NE0	NNE1	AF	SSE2	SSE10	SSE8	SSE10	SSE12	SSE10	SSE9	SSE11	SSE10	SSE6	SSE8	SSE10	SSE11	SSE11	SSE9	SSE9	SSE5.9	SSE12
30-Dec	SSE9	SSE7	SSE9	SSE10	SSE9	SSE9	SSE9	SSE7	SSE9	SSE9	SSE10	SSE10	SE10	SSE9	SSE8	SSE7	SSE8	SE4	ESE1	SSE1	ESE1	S1	SSE4	SE3	SSE6.7	SSE10
31-Dec	SSE7	SSE6	SSE6	SSE6	SSE7	SSE8	SSE11	SSE13	SSE16	SSE16	SSE14	SSE13	SSE13	SSE13	SSE12	SSE12	SSE12	SSE11	SSE8	SSE9	SSE13	SSE13	SSE12	SSE13	SSE10.9	SSE16

SSE2.9 SSE3.6 SSE3.5 SSE3.5 SSE4.0 SSE3.6 SSE3.6 SSE3.2 S2.1 S2.7SSW2.9SSW2.3 SW1.6SSW1.8SSW1.6 S1.5SSW1.5WSW1.9WSW1.7 SW1.8 S1.9 SSE2.7 SSE3.5 SSE3.4 SSE18 NNE17 NE16 S16 NNE19 NNE17WNW20WNW17WNW20 SSE16WNW19 NW18 NW23 NW23WNW21 SSE18 NW22 NW25 NW24 NW19 NE19 NNE20 SSE17WNW18	Diurnal Average
	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

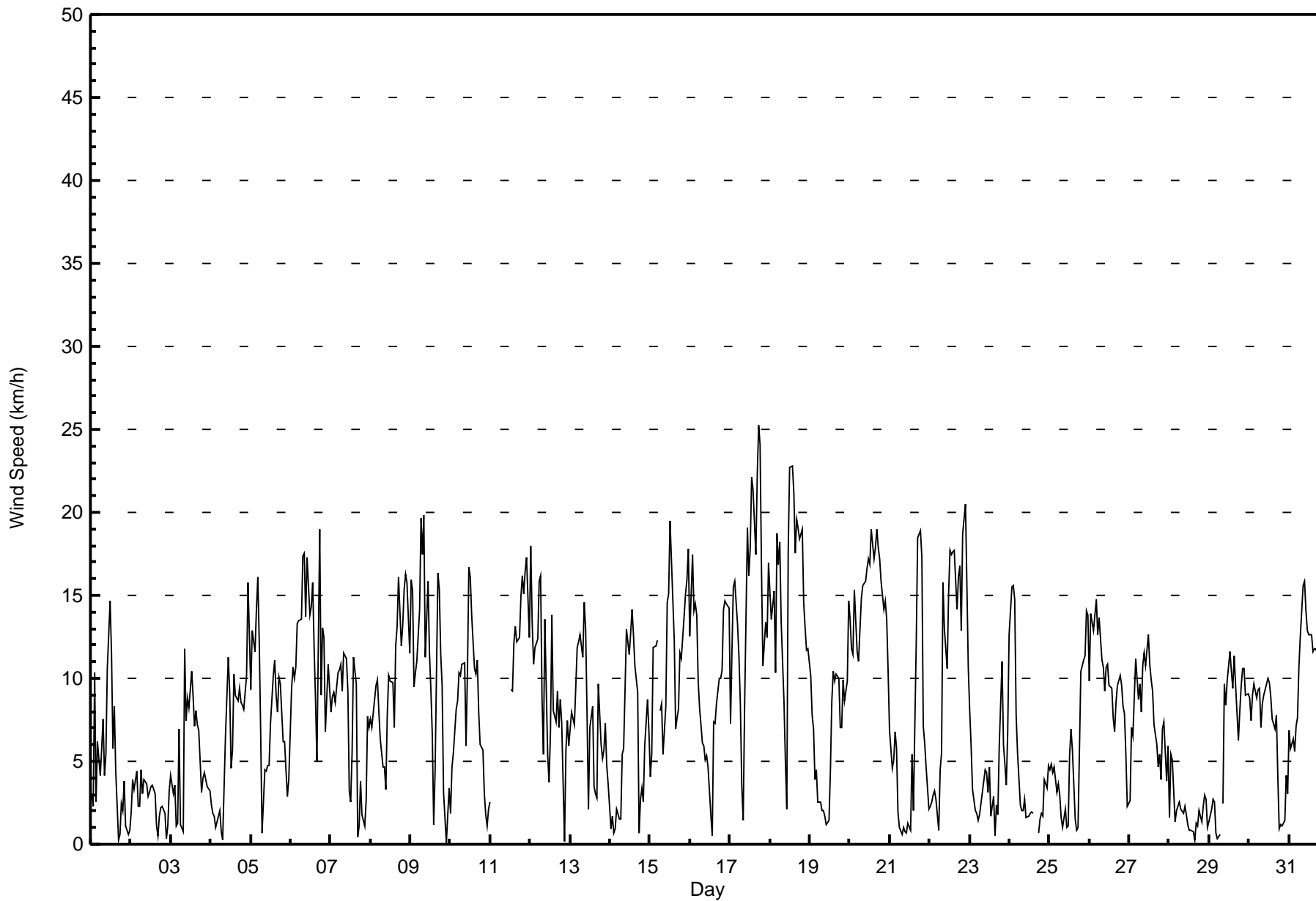
**Wind Speed (WS) - km/h**  
**Lower Camp - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 17 10:00														Hours in Service: 744 Hours of Data: 729 Hours of Missing Data: 15 Hours of Calibration: 0 Percent Operational Time: 98.0											
Minimum Value: 0 km/h on Dec 3 22:00																									
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	1	2	3	4	2	2	3	3	2	2	2	2	3	2	2	4	1	1	1	1	1	1	1	1	4
2-Dec	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
3-Dec	1	1	1	1	1	2	2	2	3	3	2	3	2	2	2	2	1	2	1	1	1	0	1	1	3
4-Dec	1	2	2	1	1	1	1	2	2	2	2	4	2	2	3	2	2	2	2	2	3	2	4	4	4
5-Dec	2	2	3	3	2	4	4	1	2	1	2	2	3	3	3	3	2	2	2	2	1	2	1	2	4
6-Dec	2	2	3	3	2	2	3	2	3	4	2	3	3	2	3	2	3	4	5	4	4	2	2	2	5
7-Dec	2	2	2	1	2	2	2	2	2	2	3	1	2	2	3	4	2	1	2	2	1	1	2	1	4
8-Dec	1	1	1	2	2	1	2	2	1	1	3	2	1	2	2	2	2	3	3	2	2	2	3	2	3
9-Dec	2	3	4	5	4	4	7	5	4	3	4	3	3	3	1	4	4	4	3	4	3	3	1	1	7
10-Dec	3	2	3	2	2	2	3	3	3	3	5	3	3	2	3	3	3	2	1	1	1	1	1	2	5
11-Dec	2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2	2	2	2	2	3	2	2	3	2	2	4	4
12-Dec	3	3	3	3	2	2	3	4	3	4	4	2	2	5	3	3	2	1	3	2	2	1	1	1	5
13-Dec	2	2	2	2	2	3	3	3	6	4	3	2	2	2	2	2	3	3	2	1	2	3	2	3	6
14-Dec	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	3	1	4	3	2	2	2	2	3	4
15-Dec	2	2	2	2	3	AF	3	2	2	5	3	3	4	3	3	3	2	3	4	3	3	4	3	4	5
16-Dec	4	5	4	4	4	2	3	2	1	1	1	1	1	2	2	2	2	3	3	3	3	2	3	2	5
17-Dec	3	3	4	4	4	3	2	4	2	7	4	4	3	4	4	4	6	6	5	4	3	3	3	4	7
18-Dec	4	3	3	3	3	4	4	4	3	2	2	4	5	5	4	4	4	4	4	4	5	3	2	3	5
19-Dec	3	2	2	1	1	1	1	1	1	1	1	1	2	2	3	3	2	2	3	2	4	3	2	2	4
20-Dec	3	3	3	3	3	2	3	2	2	3	2	3	2	2	2	2	2	2	3	2	2	2	2	2	3
21-Dec	1	2	2	1	1	1	1	1	1	1	1	1	2	1	2	4	5	3	4	4	1	1	1	1	5
22-Dec	1	1	2	1	1	2	2	3	3	3	2	5	3	4	4	3	3	3	3	4	4	4	5	4	5
23-Dec	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	4	2	1	2	2	2	4
24-Dec	3	4	4	3	3	2	1	1	1	1	1	1	2	1	2	AF	AF	1	1	1	1	1	1	1	4
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	3	3
26-Dec	2	1	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	1	3
27-Dec	1	2	1	2	2	2	2	2	2	2	2	1	2	1	2	2	1	1	1	2	1	1	2	2	2
28-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29-Dec	1	1	1	1	1	1	1	AF	3	2	2	2	2	1	1	1	1	1	2	2	1	1	1	1	3
30-Dec	1	1	1	2	2	1	1	1	1	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	2
31-Dec	2	2	1	1	2	2	2	4	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	4
Diurnal Maximum																									
4 5 4 5 4 4 7 5 6 7 5 5 5 5 4 4 6 6 5 4 5 5 4 4																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Lower Camp - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Lower Camp - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	258	35.39	35.39
6 - 11	271	37.17	72.57
12 - 19	187	25.65	98.22
20 - 28	13	1.78	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 729

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Lower Camp - December 2017**

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	25	16	13	6	13	18	17	32	10	3	1	2	6	13	37	46	258
6 - 11	18	17	4	0	0	0	10	175	10	0	0	4	6	8	14	5	271
12 - 19	1	12	5	0	0	0	0	110	2	0	0	0	7	24	21	5	187
20 - 28	0	1	0	0	0	0	0	0	0	0	0	0	0	4	7	1	13
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
<b>Totals</b>	44	46	22	6	13	18	27	317	22	3	1	6	19	49	79	57	729

Total Number of Valid Hours: 729

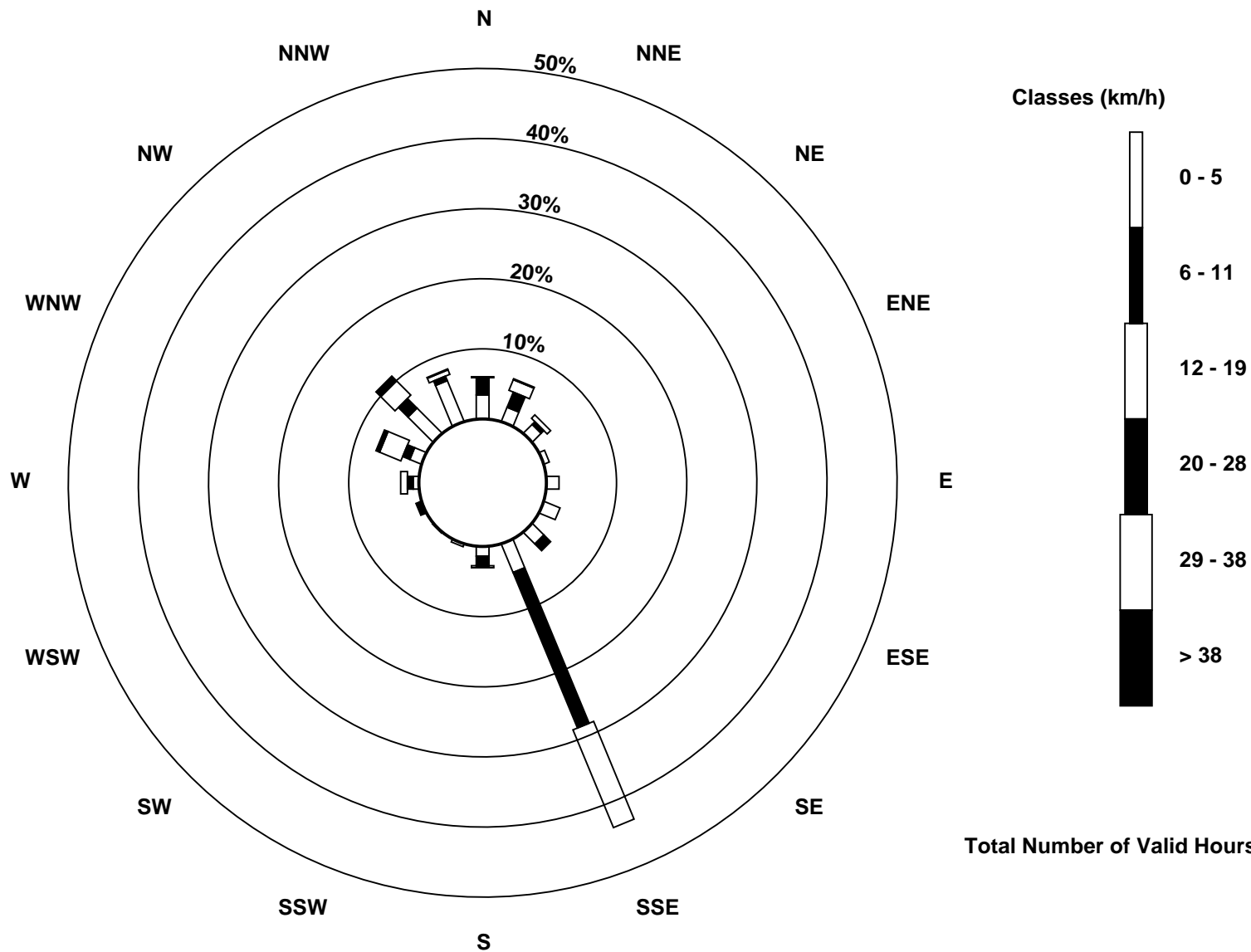
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Lower Camp (AMS 11)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Lower Camp - December 2017**

Direction of Maximum Speed: 318 deg on Dec 17 18:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 161.8 deg on Dec 20	Hours of Data: 729
Direction of Minimum Speed: 245 deg on Dec 9 22:00	Hours of Missing Data: 15
Direction of Minimum Daily Speed Average: 0.6 deg on Dec 10	Percent Operational Time: 98.0
Monthly Average Direction: 256.8 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	143	162	291	321	165	154	161	159	152	155	161	161	159	155	160	139	88	100	117	332	295	40	315	107	163.0
2-Dec	130	351	320	311	305	334	325	335	342	320	314	281	281	274	275	300	27	77	38	127	68	112	111	147	322.7
3-Dec	148	147	141	40	82	151	95	77	344	10	14	23	17	10	5	7	20	38	2	345	333	316	338	334	14.0
4-Dec	319	26	297	3	7	340	299	187	166	172	167	169	180	169	157	152	158	159	164	168	163	155	157	165	162.8
5-Dec	167	160	156	160	160	162	153	37	326	324	335	329	6	22	21	19	35	31	19	358	358	345	9	111	70.8
6-Dec	148	153	158	162	161	161	160	160	160	160	157	160	162	157	162	166	217	274	277	279	271	185	156	151	173.1
7-Dec	152	152	153	149	152	149	153	149	158	155	154	149	160	139	320	315	239	330	342	327	194	186	160	156	156.6
8-Dec	156	155	156	162	162	153	145	141	147	145	156	162	161	157	159	158	160	163	159	162	161	161	161	159	158.4
9-Dec	161	157	172	254	281	295	294	301	298	320	300	301	280	281	106	303	288	282	285	257	288	245	83	136	279.5
10-Dec	213	160	138	156	152	157	163	158	158	170	269	295	336	332	349	30	23	24	1	350	348	12	96	139	5.7
11-Dec	161	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	163	160	156	156	154	164	162	158	159	159	157	159	--
12-Dec	159	162	160	158	159	157	158	160	147	161	177	305	301	283	312	325	306	322	307	293	41	156	155	150	181.8
13-Dec	155	160	155	162	162	161	163	164	296	294	324	17	359	342	352	289	322	308	314	1	324	348	29	45	270.6
14-Dec	20	207	92	35	348	4	149	150	148	160	157	147	156	158	157	149	43	168	123	139	158	154	149	152.4	
15-Dec	163	155	162	155	161	AF	158	163	160	273	272	286	318	314	303	277	242	245	267	285	290	293	294	287	267.4
16-Dec	304	28	38	30	31	24	21	45	36	96	103	122	48	113	167	150	146	156	158	161	160	147	149	158	101.2
17-Dec	128	157	161	169	170	152	147	288	142	291	293	288	287	291	291	292	306	318	320	314	308	303	289	278	283.9
18-Dec	307	304	287	330	19	17	34	30	31	29	23	326	325	323	328	328	322	314	310	308	330	27	26	22	338.7
19-Dec	14	6	22	306	313	347	337	341	344	358	15	83	140	164	162	168	165	160	141	125	162	168	162	161	147.8
20-Dec	164	167	165	162	164	165	166	164	163	160	163	162	160	160	158	158	160	158	157	159	163	164	164	167	161.8
21-Dec	171	176	160	165	164	139	72	94	33	359	48	350	153	156	110	328	322	306	313	315	6	352	335	310	312.8
22-Dec	87	75	34	322	312	350	26	305	280	283	298	317	311	316	312	313	311	312	316	360	41	29	14	358	330.1
23-Dec	357	356	326	341	13	8	20	353	326	327	309	290	288	328	292	282	115	44	145	165	172	173	356	331	329.7
24-Dec	16	35	35	20	2	305	352	359	334	337	331	324	159	114	269	AF	AF	340	23	4	356	337	314	309	7.4
25-Dec	310	304	320	338	316	313	327	355	9	336	354	116	145	134	129	89	71	138	149	166	163	165	163	163	161.7
26-Dec	166	163	164	164	163	164	162	166	166	168	167	166	167	167	167	169	164	166	166	167	169	171	159	103	164.9
27-Dec	118	167	172	168	165	168	166	169	165	165	164	161	162	160	164	165	161	151	166	169	162	164	145	151	163.1
28-Dec	99	168	169	41	318	336	335	343	331	332	329	4	315	301	274	187	345	347	324	329	336	322	322	2	328.6
29-Dec	338	323	318	337	6	42	22	AF	148	165	165	165	163	162	162	162	162	165	162	164	162	162	161	163	163.2
30-Dec	163	163	159	158	162	162	161	163	162	159	153	153	144	156	156	157	156	146	106	150	120	171	161	130	156.6
31-Dec	163	167	166	164	166	151	152	153	153	155	156	157	163	161	157	161	165	162	165	166	165	162	159	161	159.8

155.8	148.2	156.4	158.7	156.2	155.1	152.0	157.8	179.4	182.3	194.9	207.1	216.8	208.1	200.0	190.9	211.2	256.6	254.2	223.9	178.4	159.2	156.0	163.9
Diurnal Average																							

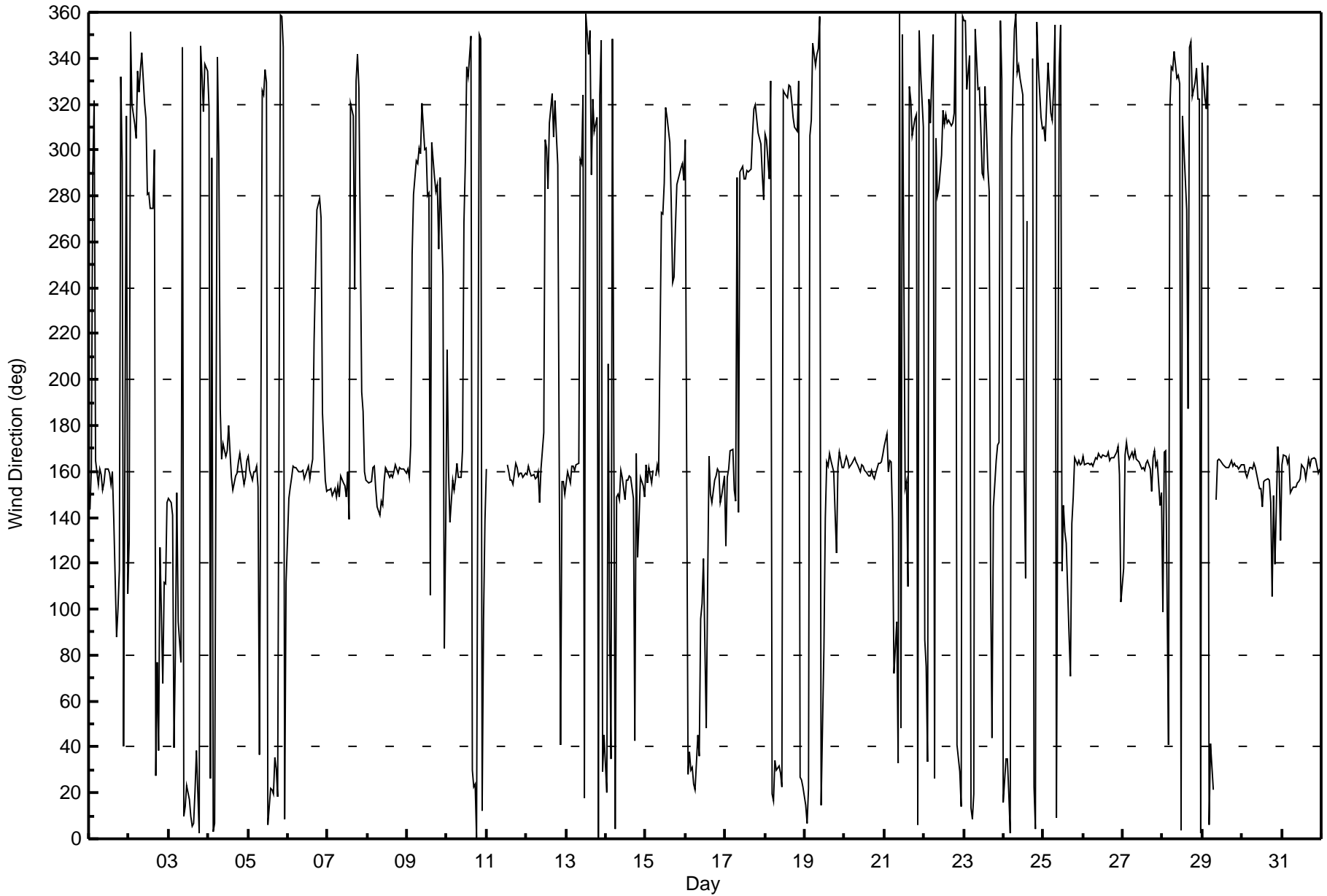
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Lower Camp - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 99 deg on Dec 4 08:00 Minimum Value: 5 deg on Dec 29 17:00 Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 8 Q <sub>1</sub> = 11 Median = 17 Q <sub>3</sub> = 34 P <sub>90</sub> = 63 P <sub>99</sub> = 95																	Hours in Service: 744 Hours of Data: 729 Hours of Missing Data: 15 Hours of Calibration: 0 Percent Operational Time: 98.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	49	64	21	95	29	58	33	17	39	22	8	6	8	26	11	59	97	78	58	48	31	81	86	84	97
2-Dec	36	26	38	27	52	31	17	20	19	26	30	13	22	13	14	60	79	60	36	31	63	95	75	25	95
3-Dec	14	19	21	73	71	29	91	82	13	19	20	15	16	17	18	17	20	18	44	29	17	15	33	31	91
4-Dec	54	72	75	73	48	41	85	99	37	18	15	13	30	19	15	16	13	13	18	19	19	14	12	17	99
5-Dec	19	10	14	12	9	14	50	93	24	32	23	27	23	24	20	20	13	13	17	20	25	37	41	42	93
6-Dec	16	12	15	12	8	8	9	7	7	11	7	16	8	7	12	23	63	12	57	15	27	42	6	8	63
7-Dec	13	10	9	9	8	10	10	15	10	10	18	38	77	56	22	26	87	86	38	65	86	48	18	8	87
8-Dec	8	13	8	12	9	10	15	23	21	30	19	10	8	14	18	7	8	7	13	9	8	8	9	9	30
9-Dec	7	8	50	52	33	17	16	17	16	20	17	18	20	52	81	90	15	14	18	17	94	90	76	65	94
10-Dec	96	34	62	25	17	13	14	11	10	43	38	20	12	11	15	30	24	25	21	23	38	54	54	67	96
11-Dec	78	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	10	11	8	8	9	12	7	6	6	6	5	16	78
12-Dec	7	9	16	9	8	9	9	36	64	12	56	80	28	28	25	35	14	16	16	14	90	9	6	13	90
13-Dec	14	14	16	12	9	16	10	13	34	25	32	84	28	23	27	69	75	17	41	25	30	30	38	61	84
14-Dec	80	46	69	90	59	70	44	24	25	10	9	16	9	7	9	11	19	82	94	64	73	18	11	18	94
15-Dec	34	19	11	7	9	AF	7	10	35	58	14	18	10	11	10	66	20	19	17	16	12	12	10	12	66
16-Dec	32	21	14	12	14	18	20	26	20	34	20	24	60	96	18	21	16	16	16	14	11	12	15	11	96
17-Dec	35	19	14	13	17	14	13	94	70	78	11	12	11	11	11	11	13	10	11	10	13	11	15	15	94
18-Dec	10	11	14	47	12	17	14	14	16	26	60	12	12	12	12	11	9	11	10	10	45	13	16	18	60
19-Dec	18	18	22	30	23	37	36	32	17	28	38	53	35	10	10	13	10	19	31	27	18	14	13	9	53
20-Dec	10	11	12	8	11	11	11	9	9	9	8	7	6	6	8	7	6	7	8	8	7	7	8	12	12
21-Dec	13	19	18	9	9	68	30	68	47	51	70	40	96	13	56	29	22	11	13	24	18	15	20	60	96
22-Dec	76	21	59	29	35	86	27	51	14	15	18	12	10	10	10	10	10	10	10	33	13	16	17	18	86
23-Dec	23	23	39	45	39	47	31	26	11	17	18	18	20	68	74	95	51	18	48	9	15	28	53	35	95
24-Dec	19	16	16	15	29	23	39	32	45	23	36	60	72	62	40	AF	AF	65	54	53	54	35	29	14	72
25-Dec	12	28	32	23	41	23	28	42	37	25	46	53	19	16	12	35	64	38	20	11	8	9	6	8	64
26-Dec	11	6	7	7	6	8	7	10	10	12	11	8	9	9	10	13	10	10	9	11	13	13	41	39	41
27-Dec	28	18	15	13	9	12	10	14	9	7	8	7	8	8	8	11	13	15	15	43	12	9	23	25	43
28-Dec	38	16	16	70	40	36	18	33	42	34	40	35	48	80	68	96	55	42	27	50	22	19	15	26	96
29-Dec	44	32	18	22	43	39	43	AF	56	9	10	9	6	7	7	6	5	12	11	8	6	6	9	7	56
30-Dec	7	11	10	11	8	7	7	12	7	10	11	12	9	11	13	12	12	30	67	81	37	31	24	26	81
31-Dec	17	19	14	16	12	15	12	11	8	8	7	7	8	7	7	6	7	8	12	10	7	7	6	6	19
96 72 75 95 71 86 91 99 70 78 70 84 96 96 81 96 97 86 94 81 94 95 86 84																								Diurnal Maximum	
AF - Analyzer Failure																									





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Lower Camp	Station number:	AMS 11
Calibration Date:	December 6, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:07	End time (MST):	13:58
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>49.5</u>	ppm	Cal Gas Exp Date	February 16, 2019
Cal Gas Cylinder #	<u>LL101792</u>			
Calibrator Make/Model	Sabio 4010		Serial Number	11051107
ZAG Make/Model	API 701		Serial Number	3411

### Analyzer Information

Analyzer make:	TEI 43i	Analyzer serial #:	100841398		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
Analyzer Range	0 - 1000 ppb	PMT voltage	-674.9	-674.9	
Calculated slope	0.996652	0.996020	Lamp voltage	796	796
Calculated intercept	0.836669	0.420114	Pressure	723.5	717.5
Analyzer Background	11.8	12.0	Flow	0.644	0.638
Analyzer Coefficient	1.049	1.067	Intensity	90	90

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5002	0.0	0.0	0.0	----
as found span	4916	83.8	829.7	817.2	1.015
calibrator zero	5005	0.0	0.0	0.3	----
high point	4916	83.8	829.7	832.9	0.996
second point	4961	42.4	419.5	420.4	0.998
third point	4980	21.2	209.8	209.5	1.002
as left zero	5004	0.0	0.0	0.1	----
as left span	4915	83.8	829.8	834.0	0.995
Average Correction Factor					0.998
Corrected As found	817.20	Previous response	831.60	*% change	1.8%

\* = > +/-5% change initiates investigation

Notes:

Span adjusted.

Calibration Performed By: Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

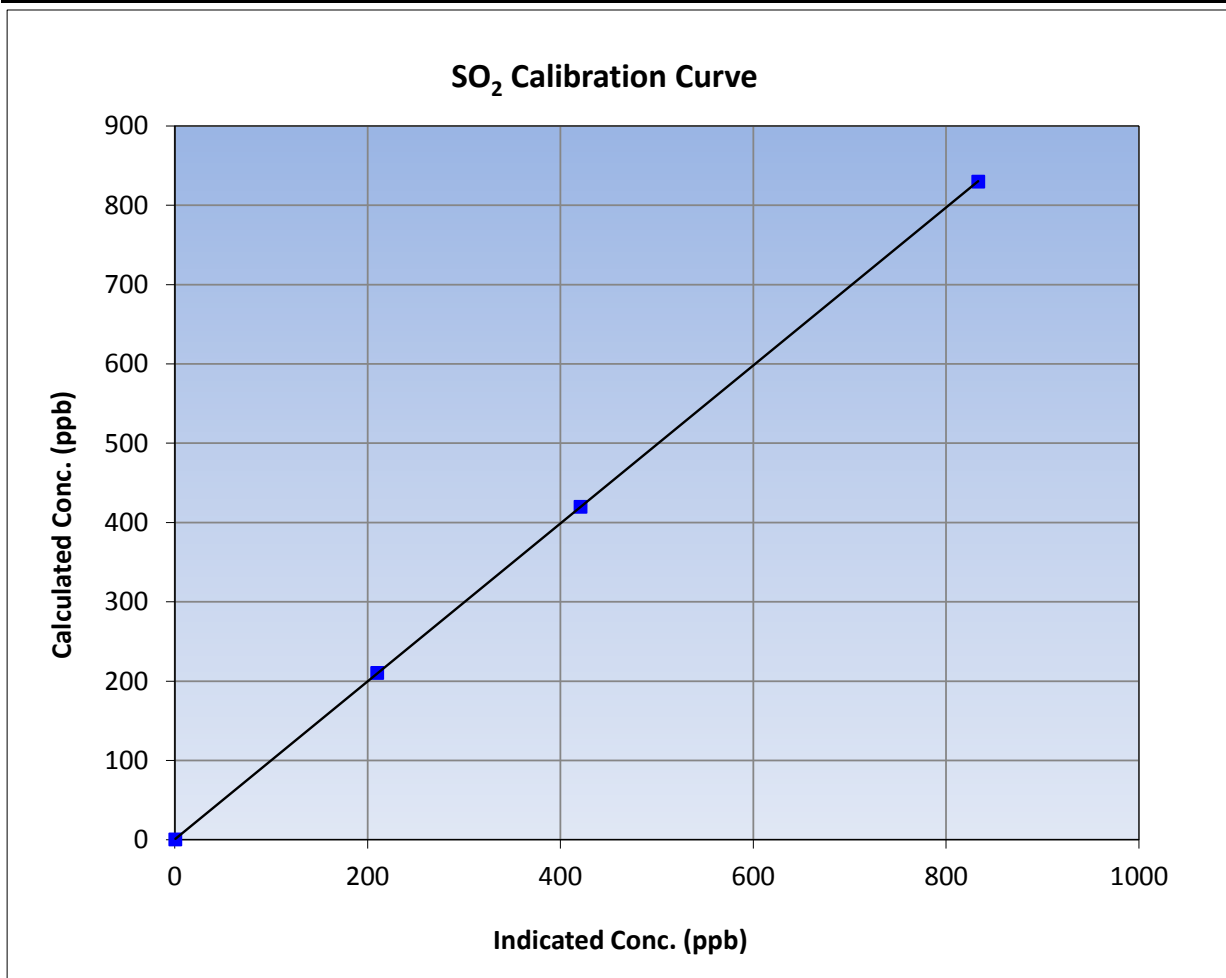
Version-03-2017

### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 13, 2017
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	11:07	End Time (MST)	13:58
Analyzer make	TEI 43i	Analyzer serial #	100841398

### Calibration Data

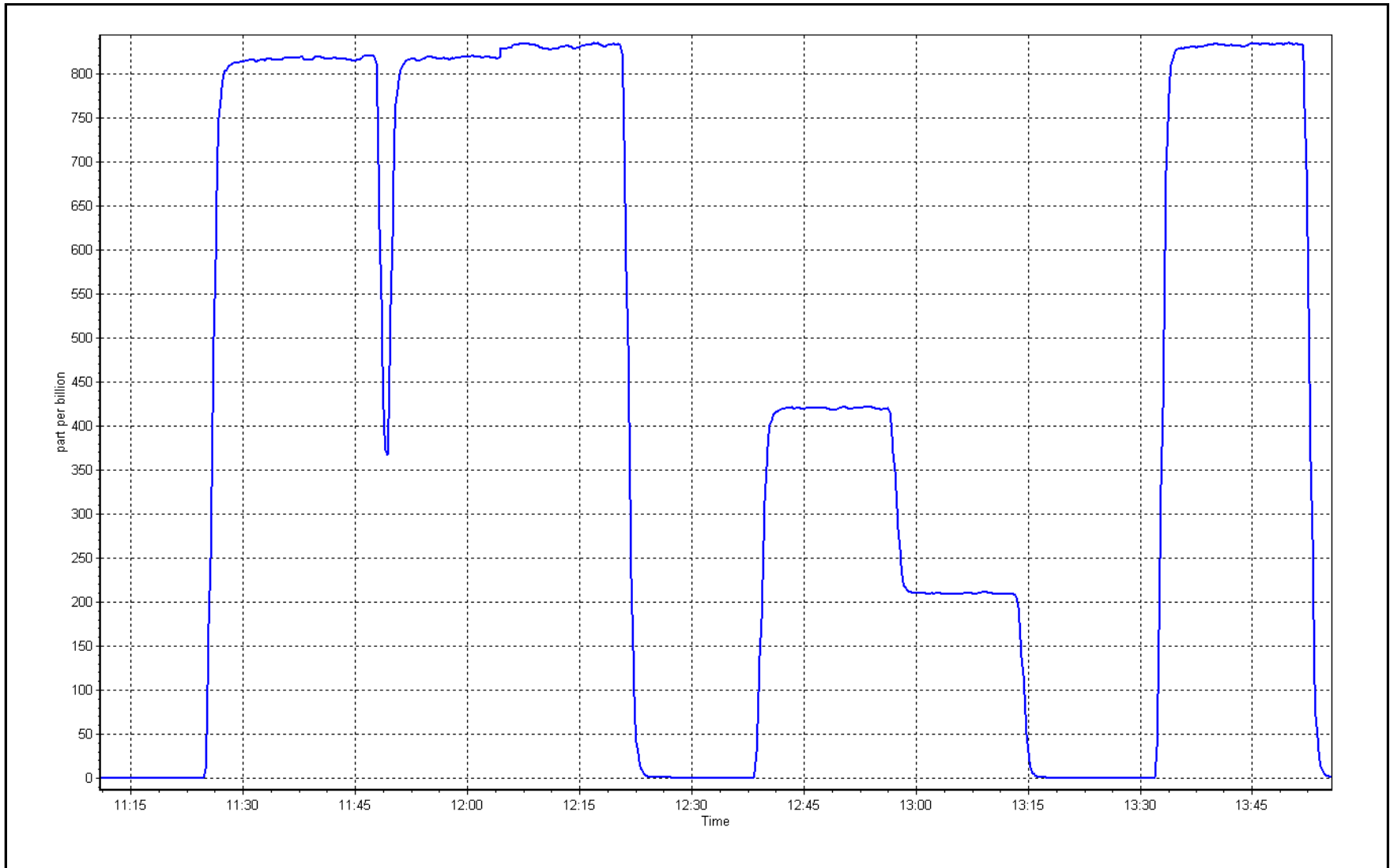
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.3	----	Correlation Coefficient	0.999997	≥0.995
829.7	832.9	0.9961			
419.5	420.4	0.9978	Slope	0.996020	0.90 - 1.10
209.8	209.5	1.0016			
			Intercept	0.420114	+/-30



SO2 Calibration Plot

Date: 6-Dec

Location: Lower Camp









# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

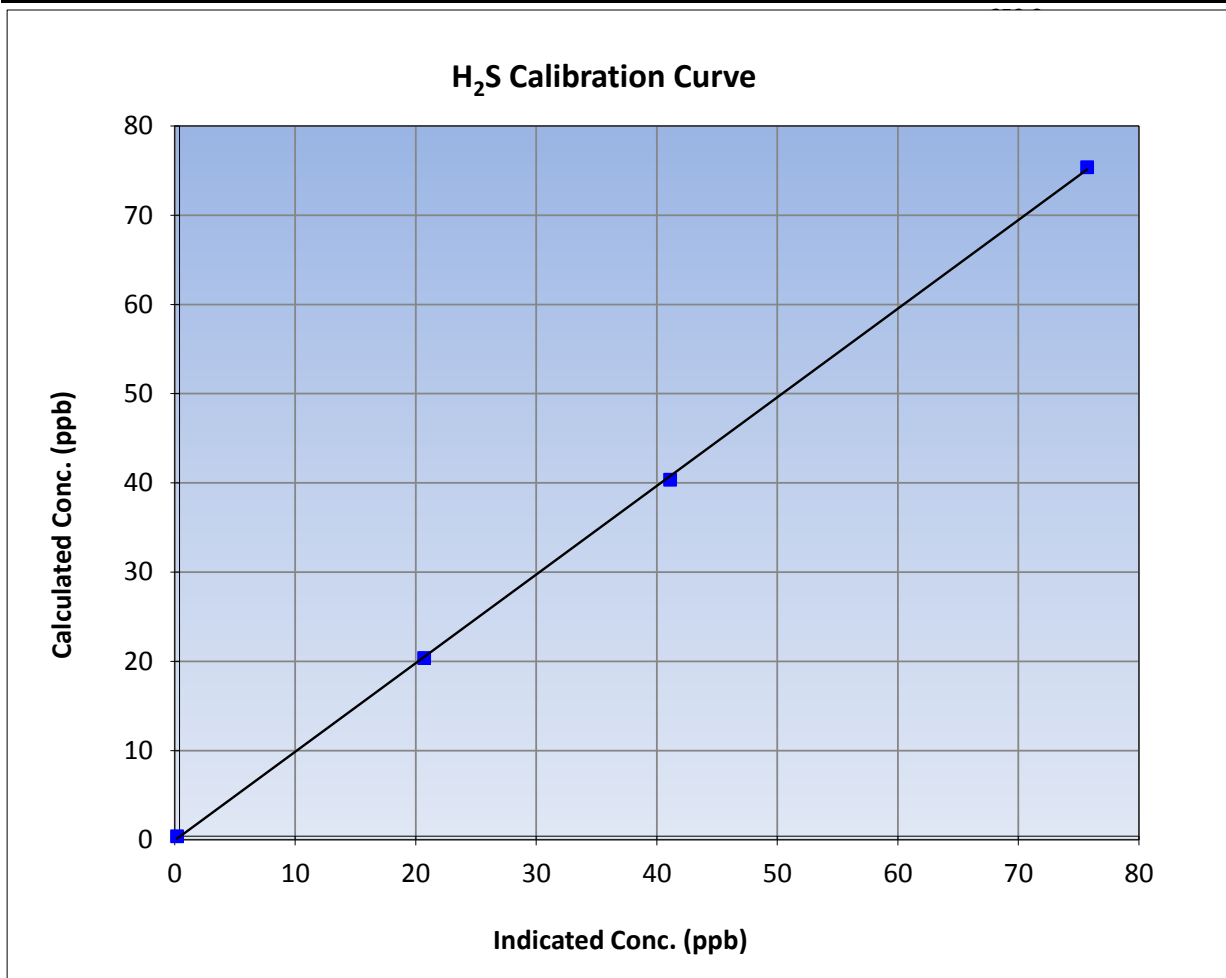
Version-03-2017

### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 30, 2017
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	11:27	End Time (MST)	14:53
Analyzer make	Thermo 450i	Analyzer serial #	1410661328

### Calibration Data

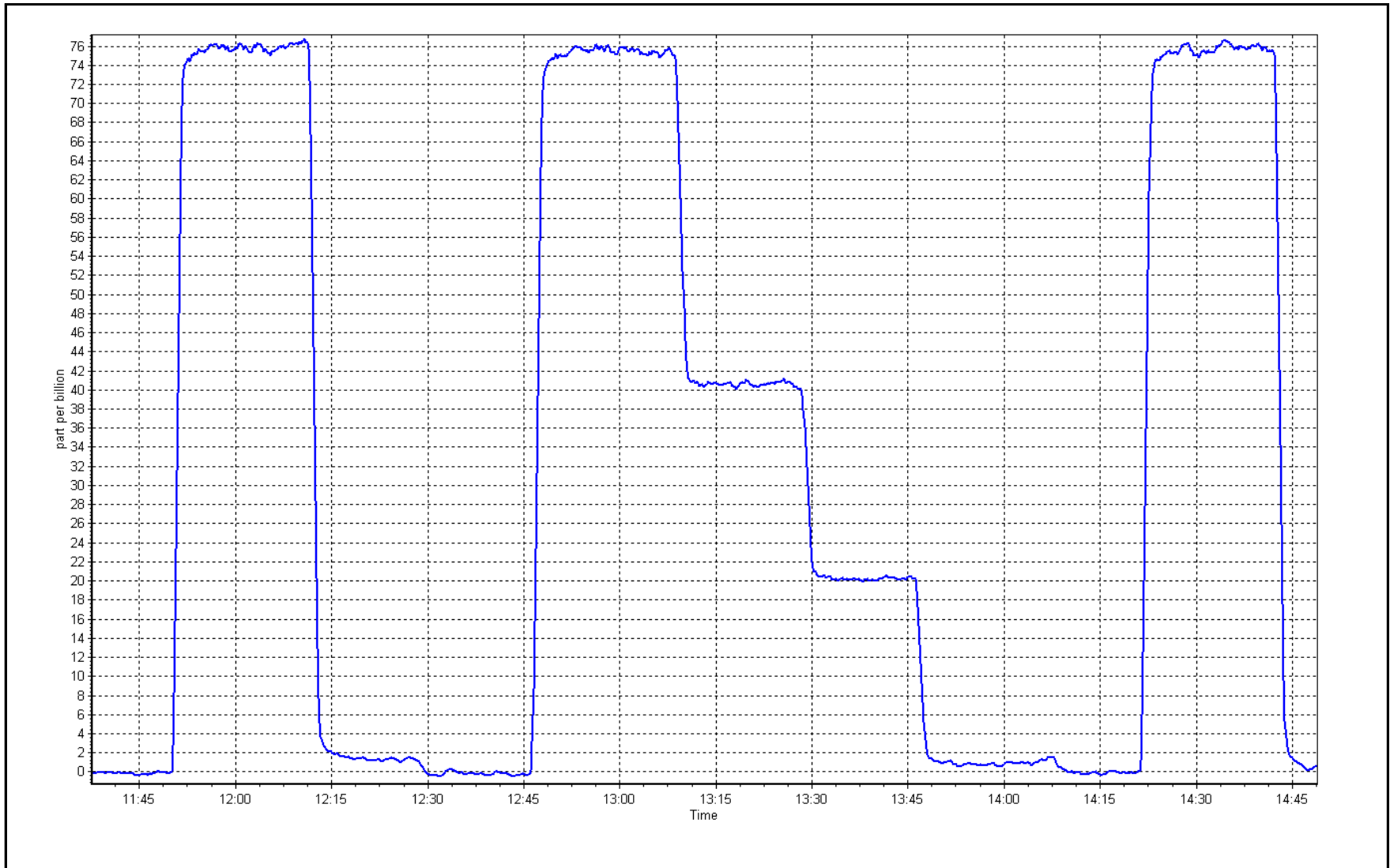
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>
0.0	-0.2	----	Correlation Coefficient	≥0.995
75.0	75.3	0.9957		
40.0	40.7	0.9816	Slope	0.90 - 1.10
20.0	20.3	0.9842		
			Intercept	+/-3



# H<sub>2</sub>S Calibration Plot

Date: 7-Dec

Location: Lower Camp





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Lower Camp	Station number:	AMS 11
Calibration Date:	December 6, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:07	End time (MST):	13:58
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL101792	Cal Gas Expiry Date	February 16, 2019
CH4 Cal Gas Conc.	<u>493.0</u> ppm	CH4 Equiv Conc.	1043.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG Make/Model	API 701	Serial Number	3411

### Analyzer Information

Analyzer make:	51-i-LT	Analyzer serial #:	1218153353
	<u>Start</u>	<u>Finish</u>	<u>Start</u> <u>Finish</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-297.0      -297.0
Calculated slope	1.000081	Sample pressure	7.8      7.8
Calculated intercept	-0.019060	Fuel pressure	25.1      25.1
Analyzer Background	3.340	Air pressure	40.2      40.2
Analyzer Coefficient	4.470	Flame temperature	166.9      166.7

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5002	0.0	0.00	-0.05	----
as found span	4916	83.8	17.48	17.46	1.001
calibrator zero	5002	0.0	0.00	-0.04	----
high point	4916	83.8	17.48	17.43	1.003
second point	4961	42.4	8.84	8.81	1.003
third point	4980	21.2	4.42	4.40	1.005
as left zero	5004	0.0	0.00	-0.04	----
as left span	4915	83.8	17.48	17.46	1.001
Average Correction Factor					1.004
Corrected As found	17.51	Previous response	17.50	*% change	0.0%

\* = > +/-5% change initiates investigation

Notes: No adjustments made.

Calibration Performed By: Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## THC Calibration Summary

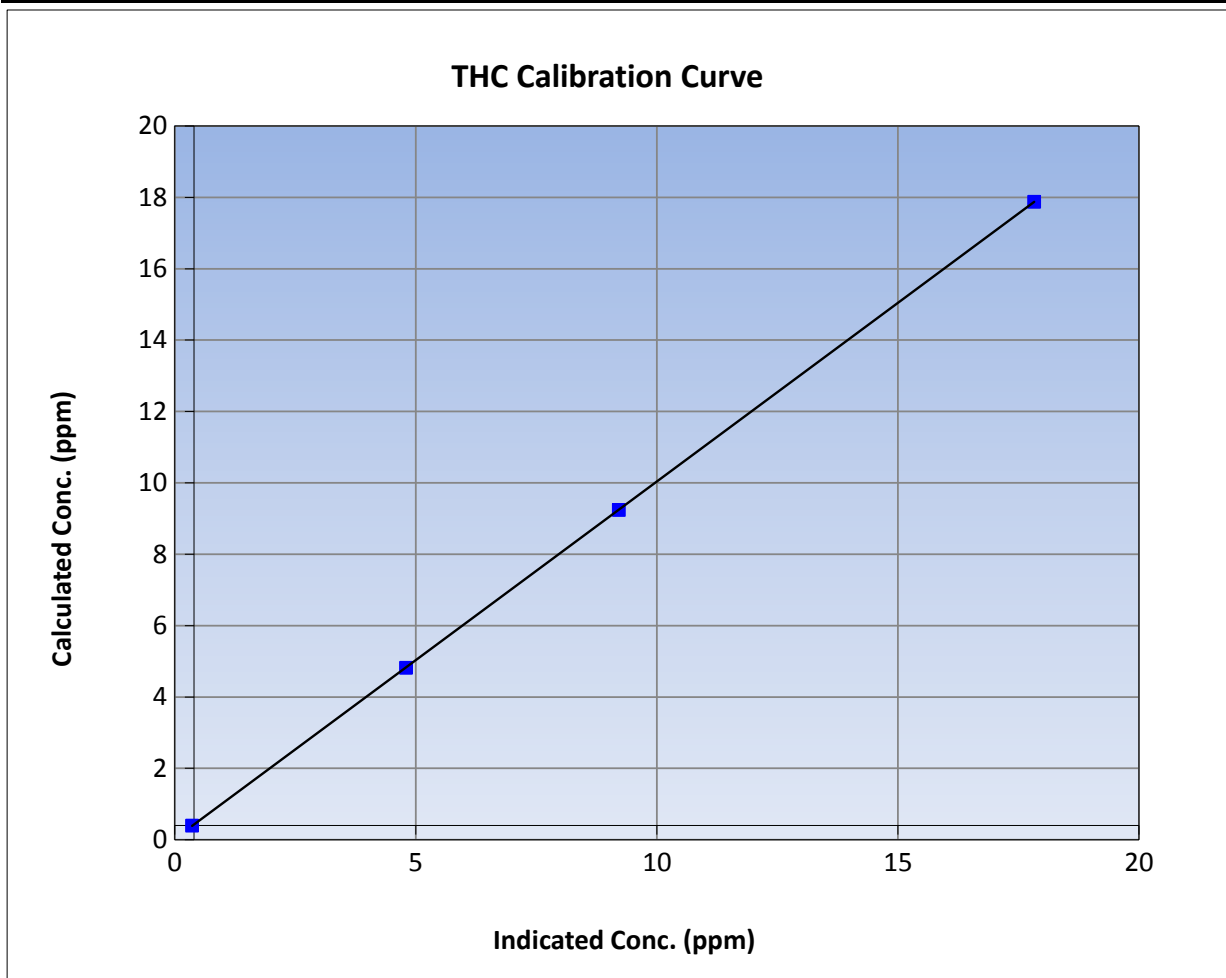
Version-03-2017

### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 13, 2017
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	10:48	End Time (MST)	13:58
Analyzer make	51-i-LT	Analyzer serial #	1218153353

### Calibration Data

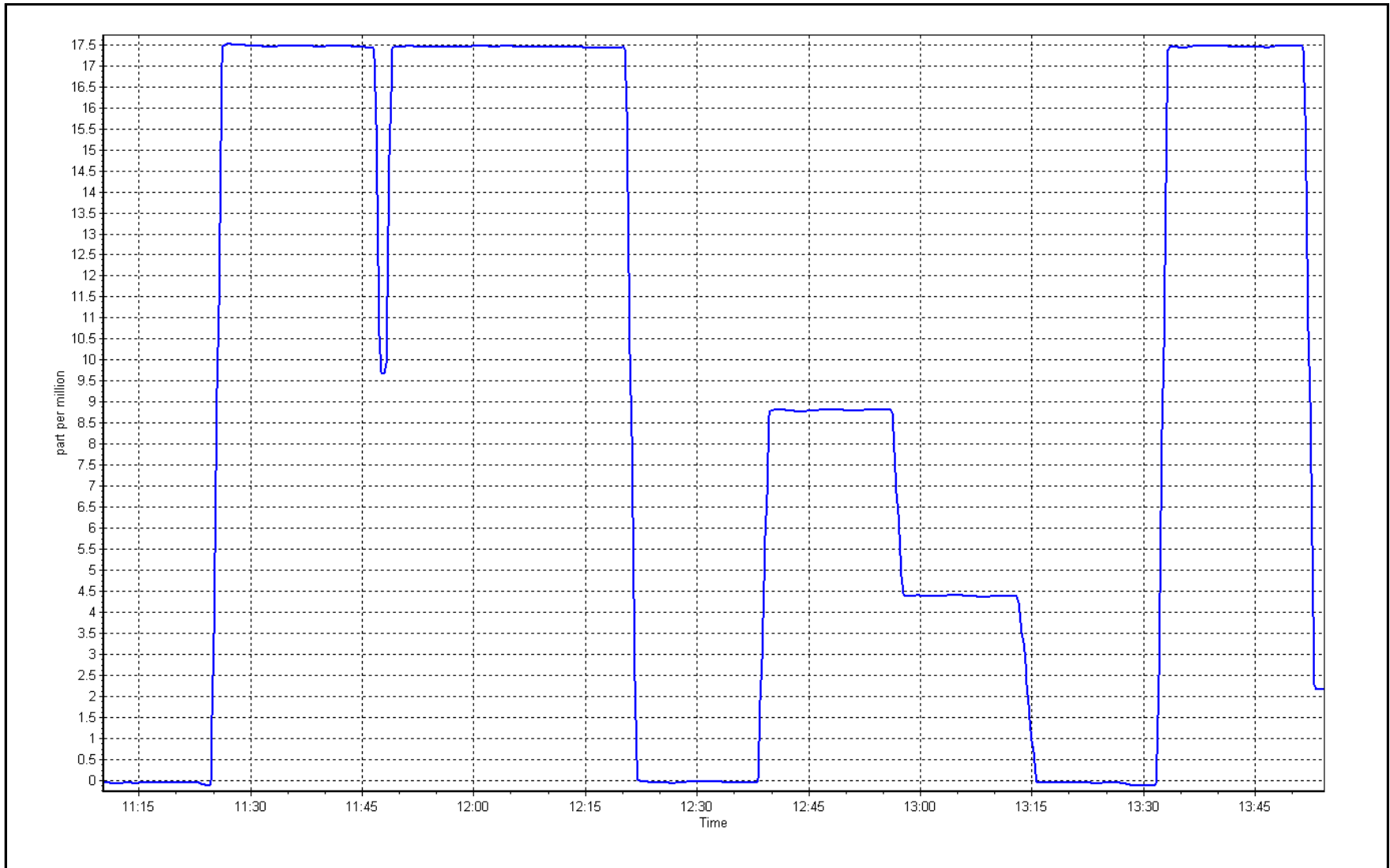
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999998	
17.5	17.4	1.0031			≥0.995
8.8	8.8	1.0034	Slope	1.001078	
4.4	4.4	1.0048			0.90 - 1.10
			Intercept	0.027819	+/-1.5



THC Calibration Plot

Date: 6-Dec

Location: Lower Camp





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 13**  
**FORT MCKAY SOUTH**  
**DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100	4	0	1	0
TRS(ppb) Average	709	35	35	100	3	0	1	0
THC(ppm) Average	708	36	36	100	6	-	3	-
O3(ppb) Average	710	34	34	100	39	0	31	-
NO2(ppb) Average	708	36	36	100	40	0	26	-
NO(ppb) Average	708	36	36	100	180	-	46	-
NOX(ppb) Average	708	36	36	100	209	-	65	-
PM2.5(ug/m3) Average	737	1	7	99.19	24.6	-	9.3	0
ET(C) Average	744	0	0	100	4.7	-	1.1	-
RH(%) Average	744	0	0	100	98	-	93	-
WS(km/h) Average	730	0	14	98.12	23	-	11	-
WD(deg) Average	730	0	14	98.12	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	708	0.5	0	-	0	0	0	0	1	1	4
TRS(ppb) Average	709	0.4	0	-	0	0	0	0	1	1	3
THC(ppm) Average	708	2.56	0.4	-	2.1	2.1	2.2	2.5	2.8	3	6
O3(ppb) Average	710	13	12	-	0	1	2	9	22	32	39
NO2(ppb) Average	708	14.8	10	-	0	1	5	15	23	28	40
NO(ppb) Average	708	10.5	20	-	0	0	0	2	13	32	180
NOX(ppb) Average	708	25.3	27	-	0	1	5	20	34	58	209
PM2.5(ug/m3) Average	737	4.53	3.7	-	0	1.1	1.9	3.7	5.9	8.8	24.6
Temperature 2 m (C) Average	744	-15.54	13	-	-43.5	-34.3	-28.5	-11.3	-4.7	0.1	4.7
Relative Humidity (%) Average	744	81	9	-	61	69	73	81	89	93	98
Wind Speed 10 m (km/h) Average	730	4.9	4	-	0	1	2	4	7	9	23
Wind Direction 10 m (deg) Average	730	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -FORT McKAY SOUTH (AMS 13)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
PM2.5	18 Dec 2017 13:00	18 Dec 2017 15:00	3	Unstable operation - baseline drift
PM2.5	22 Dec 2017 13:00	22 Dec 2017 15:00	3	Unstable operation - baseline drift
Wind Speed, Wind Direction	11 Dec 2017 02:00	11 Dec 2017 15:00	14	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Fort McKay South - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 ppb on Dec 2 21:00	Maximum Daily Average: 1.0 ppb on Dec 27		Hours of Data:	708
Minimum Value: 0 ppb on Dec 23 02:00	Minimum Daily Average: 0.2 ppb on Dec 22		Hours of Missing Data:	36
Maximum Diurnal Average: 0.8 ppb at hour 14	Minimum Diurnal Average: 0.3 ppb at hour 2		Hours of Calibration:	36
Monthly Average: 0.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2		Percent Operational Time:	100.0

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

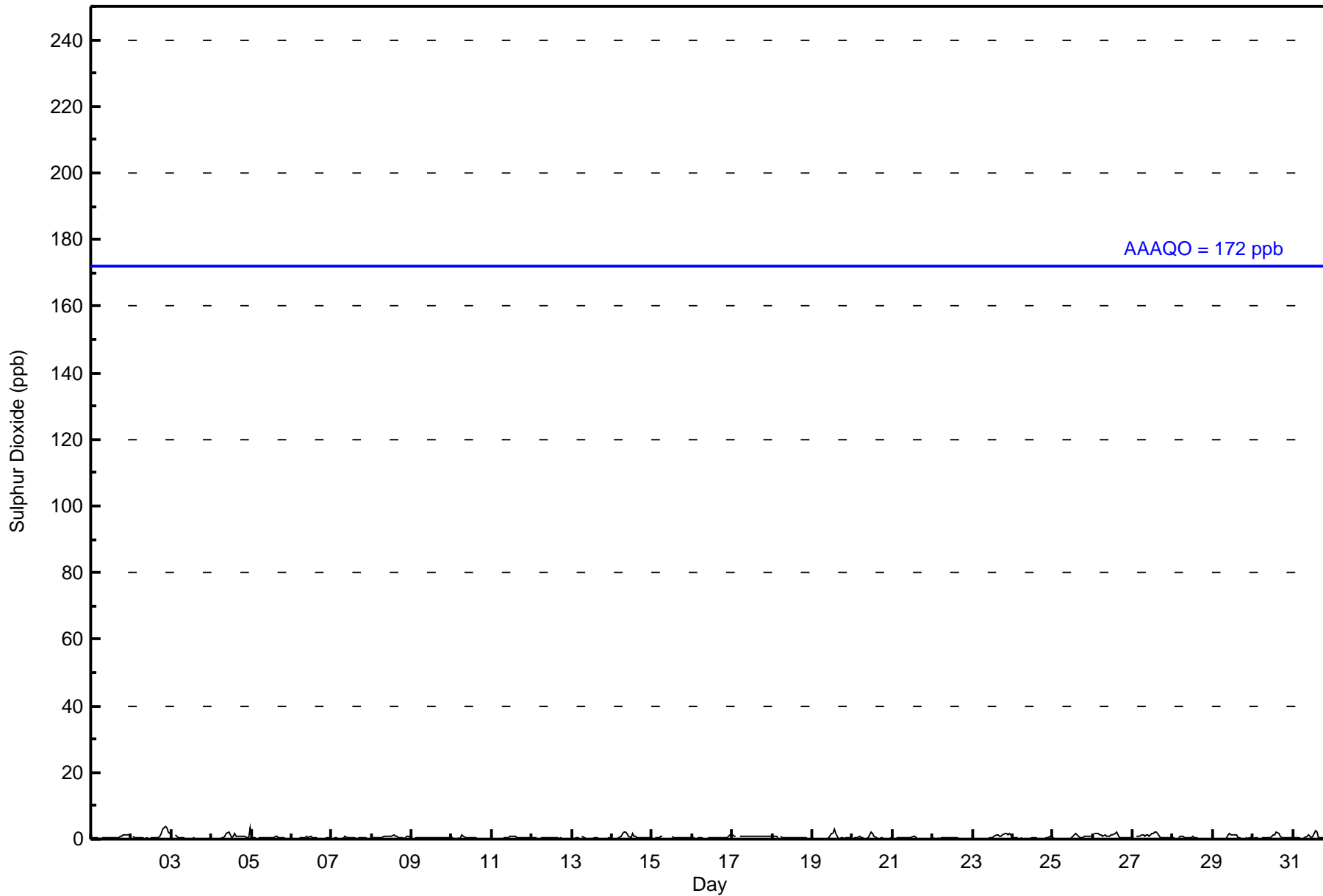
0.4	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.8	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	Diurnal Average
2	2	2	2	1	1	1	2	2	2	2	2	2	2	3	2	2	1	1	2	3	4	3	2	3	Diurnal Maximum

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 (SO<sub>2</sub>) - ppb**  
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort McKay South - December 2017**

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

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay South - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	44	42	9	5	3	6	20	68	136	97	62	69	50	29	34	21	695
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
<b>Totals</b>	44	42	9	5	3	6	20	68	136	97	62	69	50	29	34	21	695

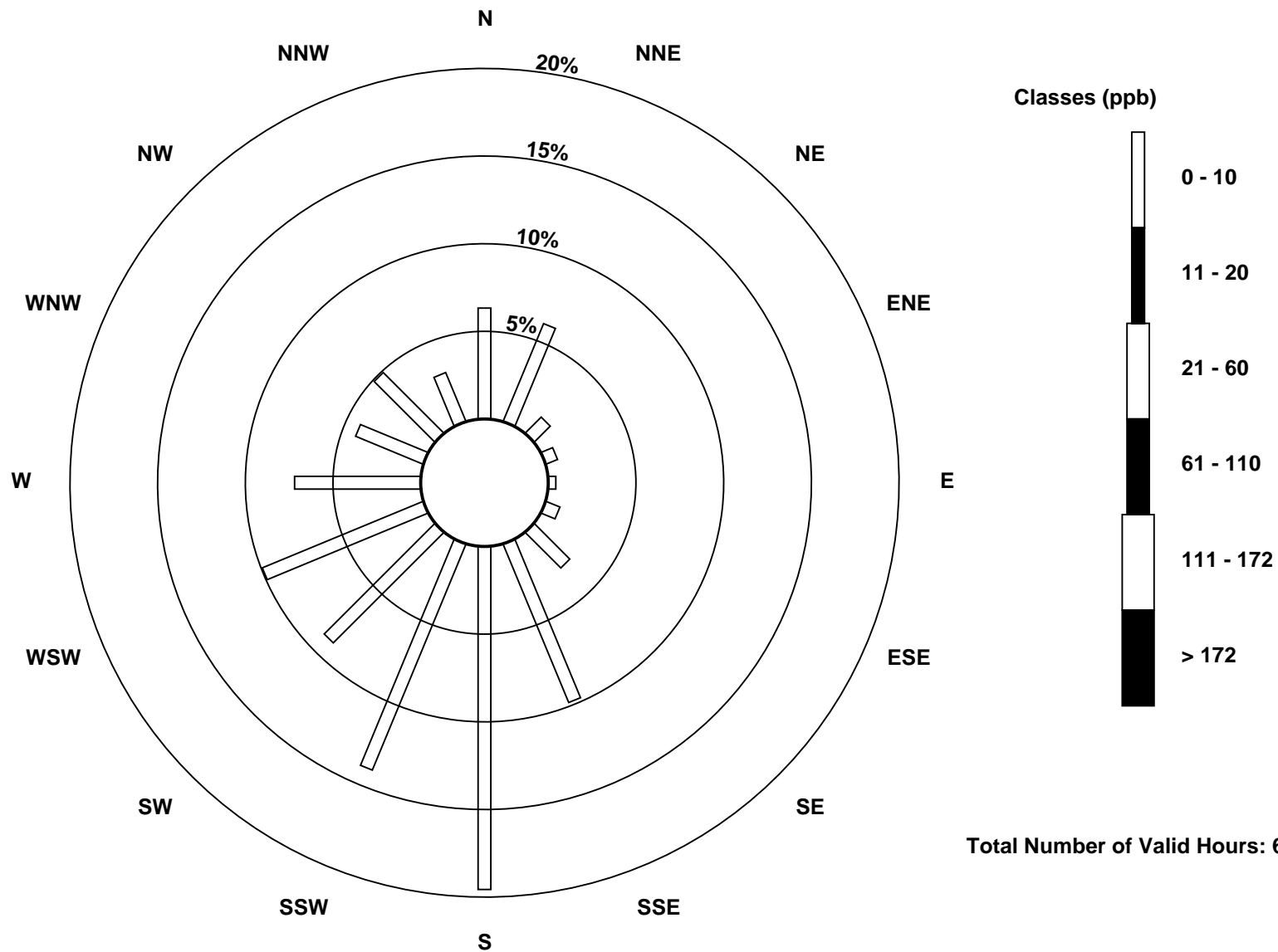
Total Number of Valid Hours: 695

Total Number of Hours: 744

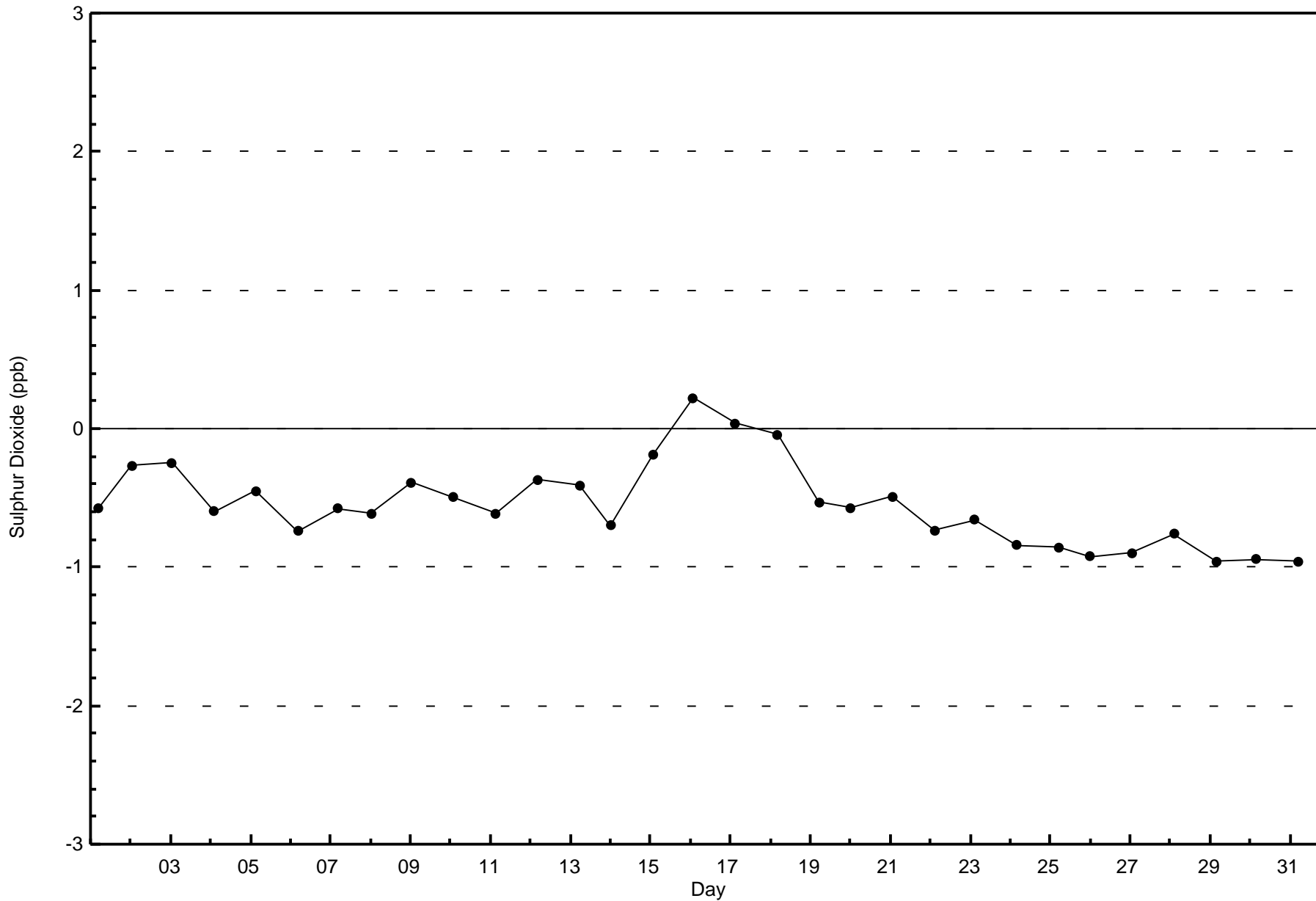


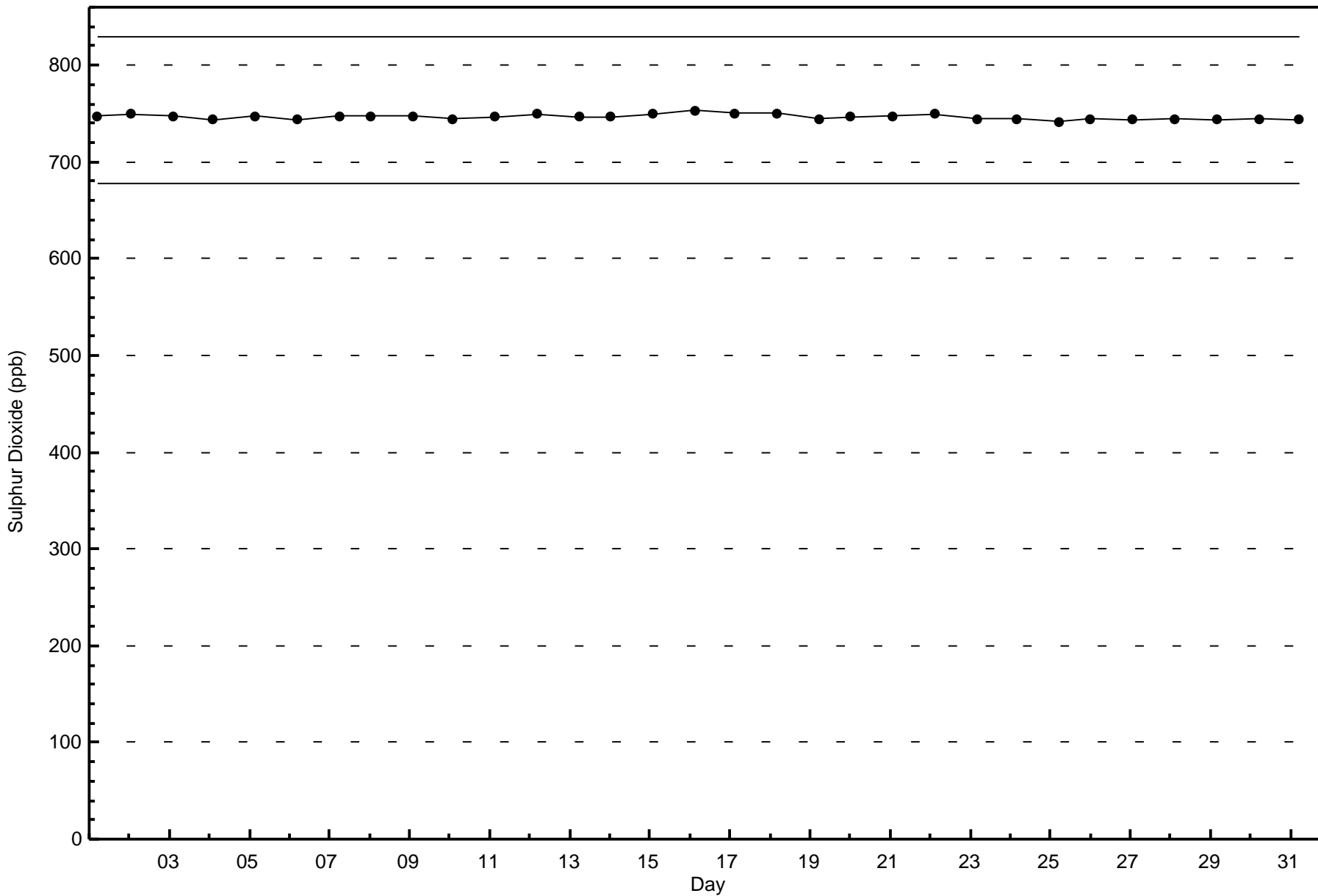
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort McKay South (AMS 13)



Total Number of Valid Hours: 695









**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Total Reduced Sulphur (TRS) - ppb**

**Fort McKay South - December 2017**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3 ppb on Dec 19 22:00	Maximum Daily Average: 0.9 ppb on Dec 31		Hours of Data:	709
Minimum Value: 0 ppb on Dec 17 19:00	Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Missing Data:	35
Maximum Diurnal Average: 0.5 ppb at hour 4	Minimum Diurnal Average: 0.3 ppb at hour 1		Hours of Calibration:	35
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2		Percent Operational Time:	100.0

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

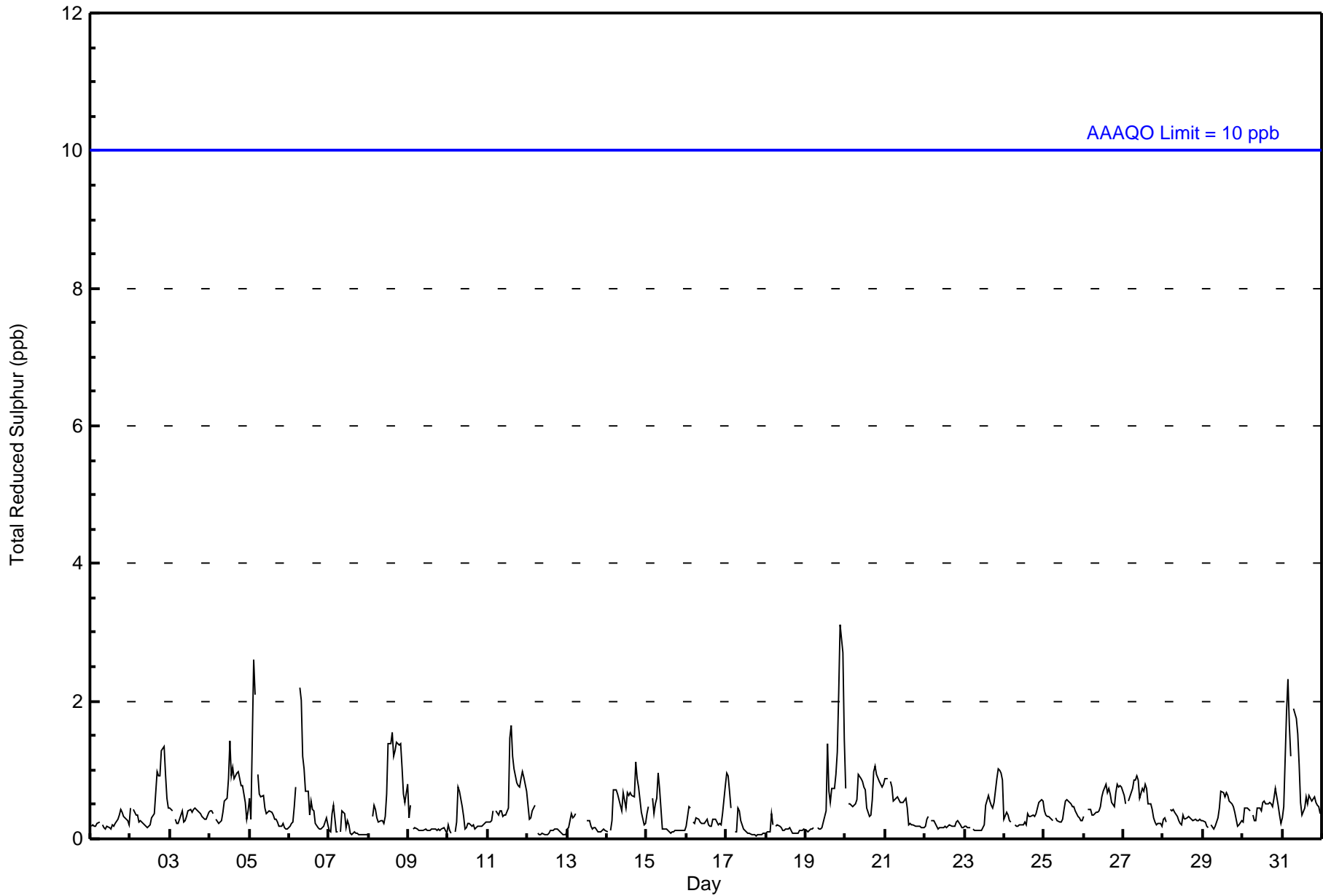
0.3	0.3	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.3	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	Diurnal Average
1	1	3	2	2	1	2	2	2	2	2	1	1	1	1	2	1	1	1	1	1	1	2	3	3	1	1	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Fort McKay South - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	706	99.58	99.58
3 - 4	3	0.42	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Fort McKay South - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	43	44	9	5	3	6	18	69	142	96	63	67	47	27	34	20	693
3 - 4	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	3
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	43	44	9	5	3	6	18	69	144	96	64	67	47	27	34	20	696

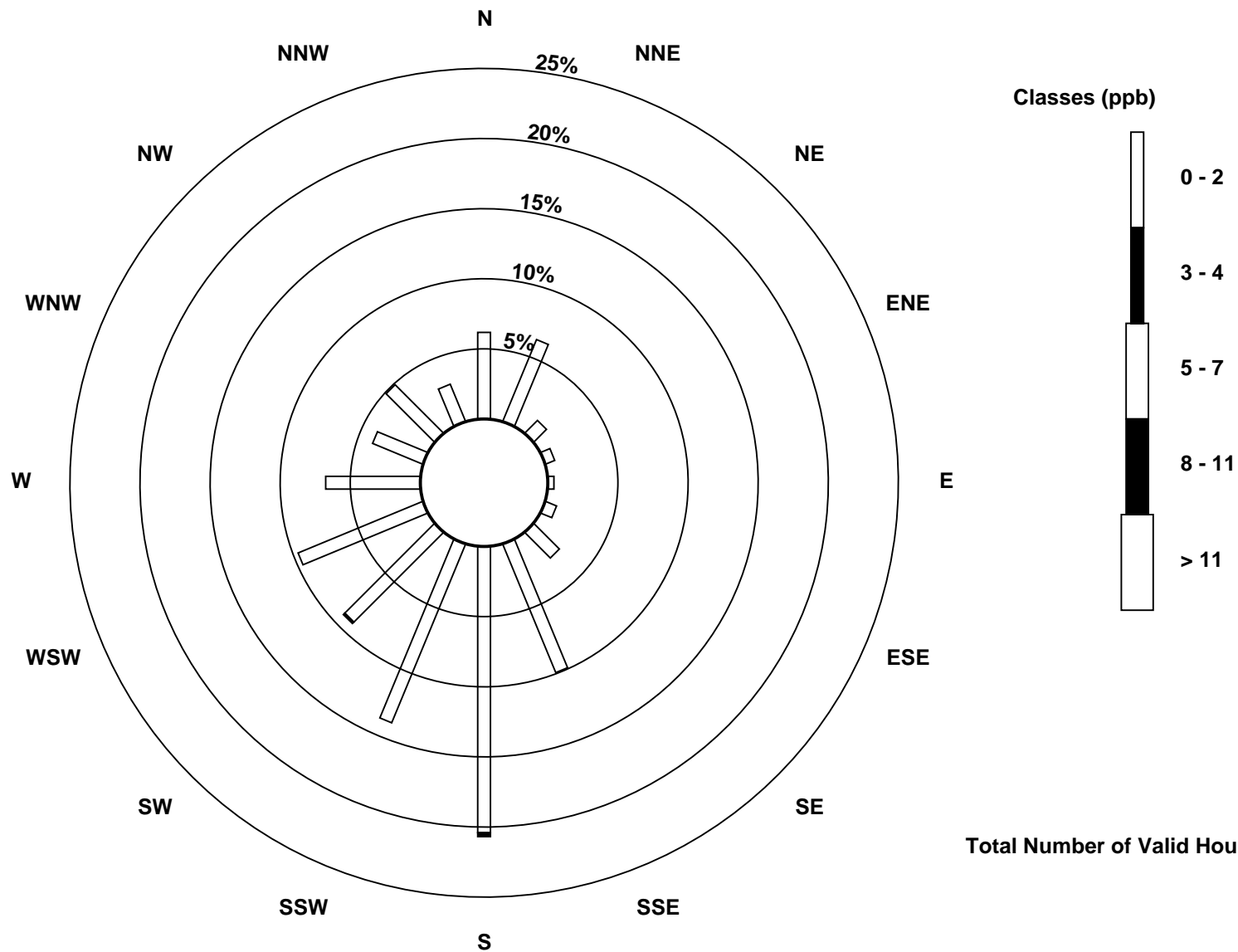
Total Number of Valid Hours: 696

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Reduced Sulphur (TRS) - ppb  
Fort McKay South (AMS 13)

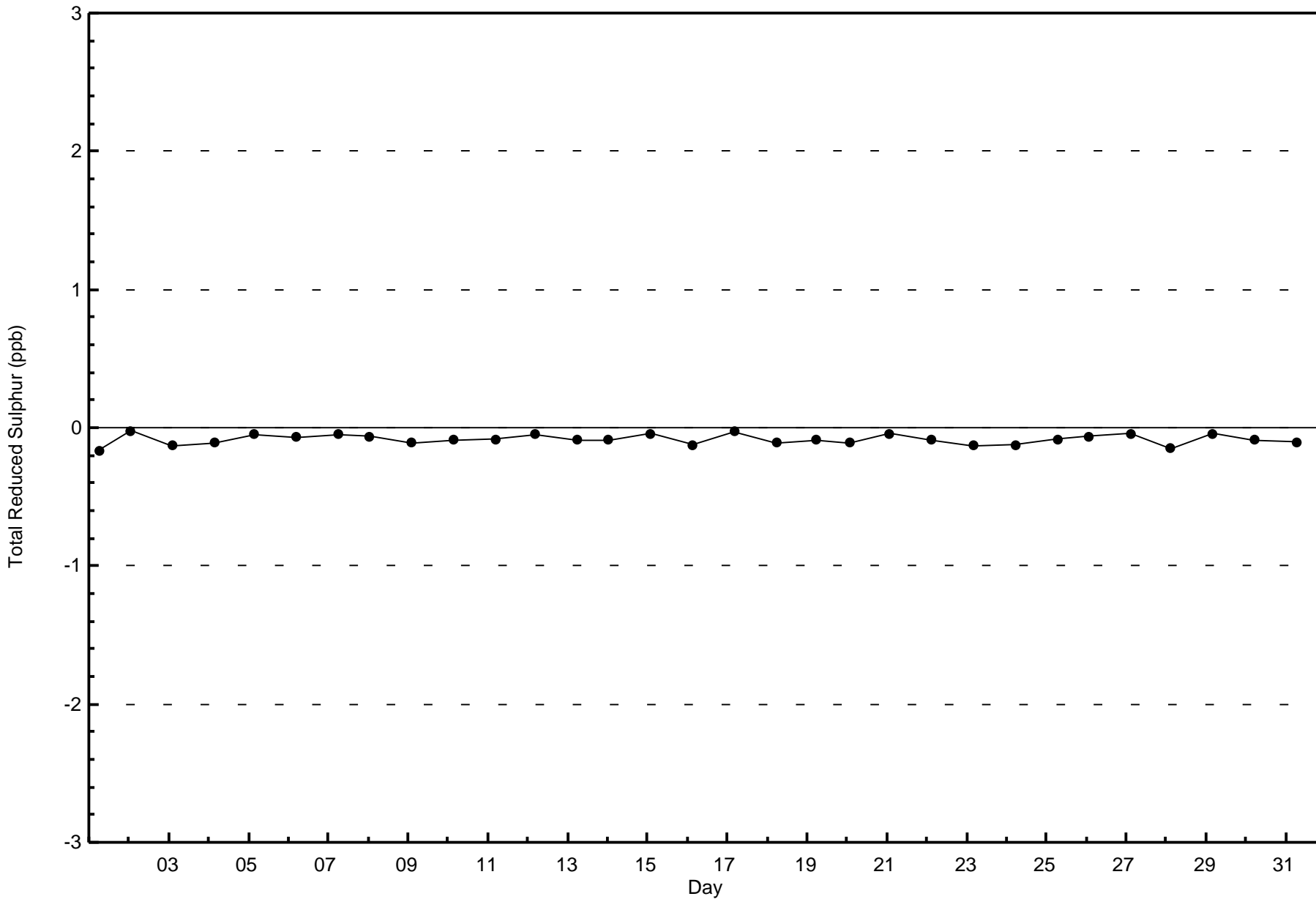


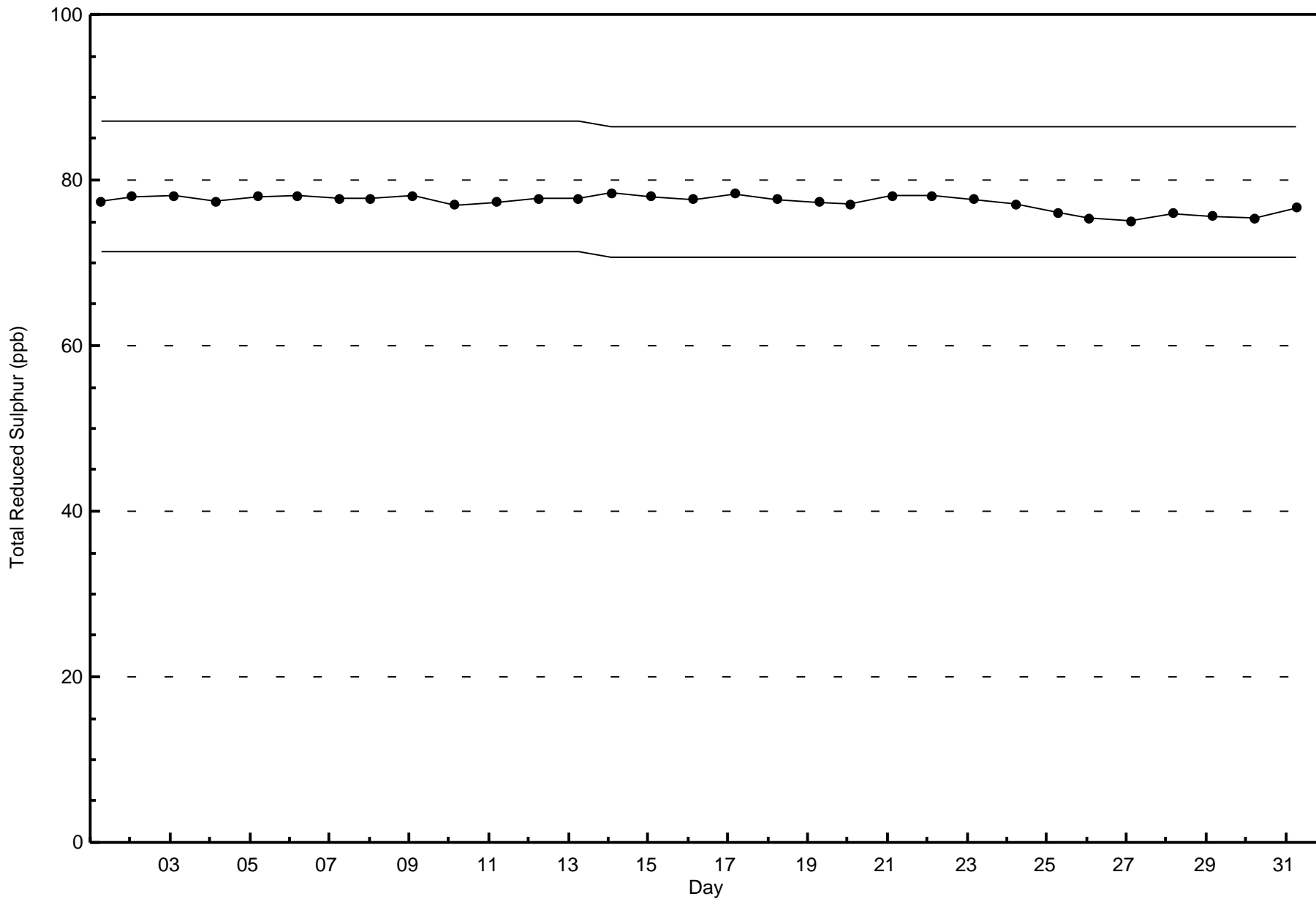
Total Number of Valid Hours: 696



Wood Buffalo Environmental Association  
Zero Responses

Total Reduced Sulphur (TRS) - ppb  
Fort McKay South - December 2017







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay South - December 2017**

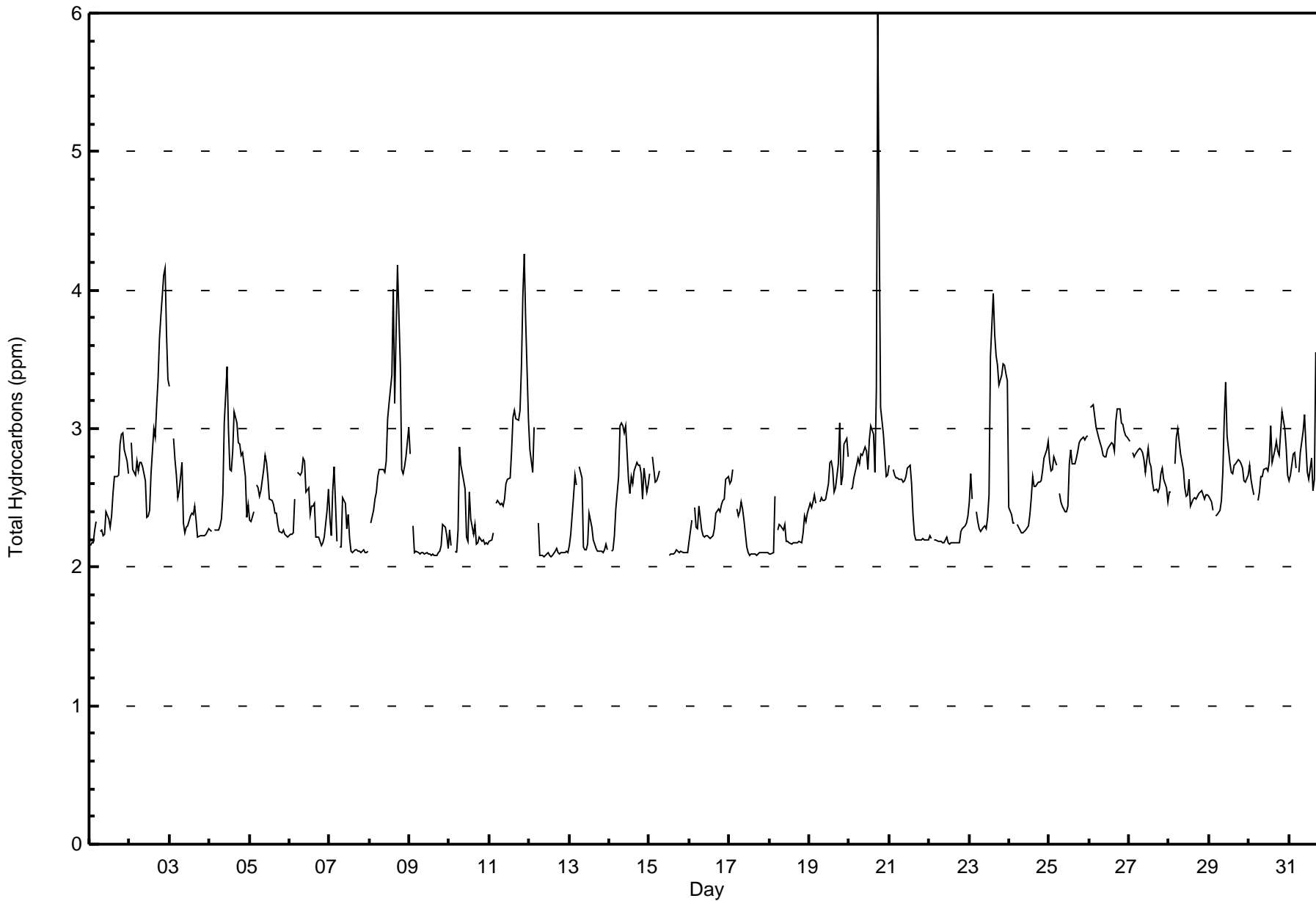
Maximum Value: 6.0 ppm on Dec 20 18:00		Maximum Daily Average: 3.0 ppm on Dec 20		Hours in Service: 744																																												
Minimum Value: 2.1 ppm on Dec 12 14:00		Minimum Daily Average: 2.2 ppm on Dec 9		Hours of Data: 708																																												
Maximum Diurnal Average: 2.7 ppm at hour 18		Minimum Diurnal Average: 2.4 ppm at hour 2		Hours of Missing Data: 36																																												
Monthly Average: 2.56 ppm		Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.2 Median = 2.5 Q <sub>3</sub> = 2.8 P <sub>90</sub> = 3.0 P <sub>99</sub> = 3.9		Hours of Calibration: 36																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	2.2	2.2	2.2	2.3	2.3	Z	2.3	2.3	2.2	2.2	2.4	2.4	2.3	2.4	2.5	2.7	2.7	2.7	2.9	3.0	3.0	2.9	2.8	2.7	2.5	3.0																						
2-Dec	Z	2.9	2.7	2.7	2.8	2.7	2.8	2.8	2.7	2.6	2.4	2.4	2.4	2.7	3.0	2.9	3.2	3.4	3.7	3.8	4.1	4.2	3.7	3.4	3.0	4.2																						
3-Dec	3.3	Z	2.9	2.8	2.7	2.5	2.5	2.8	2.3	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	3.3																						
4-Dec	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.5	3.0	3.4	3.0	2.7	2.7	2.8	3.1	3.0	2.9	2.9	2.8	2.8	2.7	2.4	2.4	2.7	3.4																						
5-Dec	2.3	2.3	2.4	Z	2.6	2.6	2.5	2.6	2.7	2.8	2.8	2.6	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.4	2.8																						
6-Dec	2.2	2.2	2.3	2.5	Z	2.7	2.7	2.7	2.8	2.8	2.5	2.6	2.4	2.4	2.4	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.6	2.4	2.8																						
7-Dec	2.3	2.2	2.6	2.7	2.2	Z	2.1	2.1	2.5	2.5	2.3	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	2.2	2.7																						
8-Dec	Z	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.7	2.7	2.8	3.1	3.2	3.4	4.0	3.2	3.7	4.2	3.5	2.7	2.7	2.7	2.8	3.0	3.0	4.2																						
9-Dec	2.8	Z	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.1	2.2	2.8																						
10-Dec	2.3	2.2	Z	2.1	2.1	2.3	2.9	2.7	2.6	2.6	2.2	2.2	2.5	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.9																						
11-Dec	2.2	2.2	2.3	Z	2.5	2.5	2.5	2.5	2.4	2.5	2.6	2.6	2.6	2.8	3.1	3.1	3.1	3.1	3.1	3.5	4.0	4.3	3.8	3.1	2.9	4.3																						
12-Dec	2.9	2.8	2.7	3.0	Z	2.3	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	3.0																						
13-Dec	2.2	2.2	2.5	2.7	2.6	Z	2.7	2.6	2.2	2.1	2.1	2.2	2.4	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.3	2.7																						
14-Dec	Z	2.1	2.1	2.2	2.4	2.7	3.0	3.0	3.0	3.0	3.0	2.6	2.5	2.7	2.6	2.7	2.8	2.7	2.7	2.7	2.5	2.7	2.5	2.6	2.7	3.0																						
15-Dec	2.7	Z	2.8	2.6	2.6	2.7	2.7	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	2.1	2.3	2.8																						
16-Dec	2.2	2.3	Z	2.4	2.3	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.7	2.3	2.7																						
17-Dec	2.6	2.6	2.7	Z	2.4	2.4	2.4	2.5	2.4	2.3	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	2.3	2.7																						
18-Dec	2.1	2.1	2.1	2.5	Z	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	2.4	2.3	2.4	2.2	2.5																						
19-Dec	2.5	2.4	2.5	2.5	2.5	Z	2.5	2.5	2.5	2.5	2.5	2.6	2.8	2.8	2.7	2.5	2.6	2.7	3.0	2.6	2.7	2.9	2.9	2.8	2.6	3.0																						
20-Dec	Z	2.6	2.6	2.6	2.7	2.8	2.7	2.8	2.8	2.9	2.8	2.7	2.9	3.0	3.0	2.7	3.3	6.0	4.5	3.2	3.0	2.8	2.7	2.7	3.0	6.0																						
21-Dec	2.7	Z	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.6	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5	2.7																						
22-Dec	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.2	2.4																					
23-Dec	2.5	2.7	2.5	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	3.5	4.0	3.7	3.5	3.5	3.3	3.4	3.5	3.5	3.4	3.3	2.9	4.0																						
24-Dec	2.4	2.4	2.3	2.3	Z	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.8	2.9	2.5	2.9																						
25-Dec	2.8	2.7	2.7	2.8	2.7	Z	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.7	2.9	2.7	2.8	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.7	2.9																						
26-Dec	Z	3.1	3.2	3.1	3.0	3.0	2.9	2.9	2.8	2.8	2.8	2.8	2.9	2.9	2.9	2.8	3.1	3.1	3.1	3.0	3.0	3.0	3.0	2.9	3.0	3.2																						
27-Dec	2.9	Z	2.8	2.8	2.8	2.9	2.9	2.9	2.8	2.8	2.7	2.9	2.8	2.7	2.6	2.5	2.6	2.5	2.6	2.7	2.7	2.6	2.6	2.5	2.7	2.9																						
28-Dec	2.5	2.5	Z	2.7	2.9	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.6	2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.5	2.5	2.5	2.5	2.6	3.0																						
29-Dec	2.5	2.5	2.4	Z	2.4	2.4	2.4	2.5	2.7	3.1	3.3	2.9	2.8	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.7	2.7	2.6	2.6	2.7	2.7	3.3																					
30-Dec	2.7	2.6	2.6	2.5	Z	2.5	2.5	2.7	2.7	2.7	2.7	2.7	2.7	2.8	3.0	2.8	2.8	2.9	2.8	3.0	3.1	3.0	2.9	2.7	2.8	3.1																						
31-Dec	2.6	2.7	2.8	2.8	2.7	Z	2.7	2.8	3.0	3.1	2.9	2.7	2.6	2.8	2.6	2.6	3.6	3.5	2.9	3.4	3.2	3.0	2.7	2.7	2.9	3.6																						
																								2.5	2.4	2.5	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.7	2.7	2.6	2.6	2.6	2.6	2.6	Diurnal Average
																								3.3	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.4	3.1	3.2	3.5	4.0	3.7	3.7	6.0	4.5	3.8	4.1	4.3	3.8	3.4	Diurnal Maximum
Z - zerospan      C - Calibration																																																





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Fort McKay South - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	650	91.81	91.81
3.1 - 10.0	58	8.19	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**  
**Fort McKay South - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	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	41	42	9	5	3	6	19	65	110	87	55	67	47	29	32	21	638
3.1 - 10.0	3	0	0	0	0	0	1	3	26	10	7	2	3	0	2	0	57
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	44	42	9	5	3	6	20	68	136	97	62	69	50	29	34	21	695

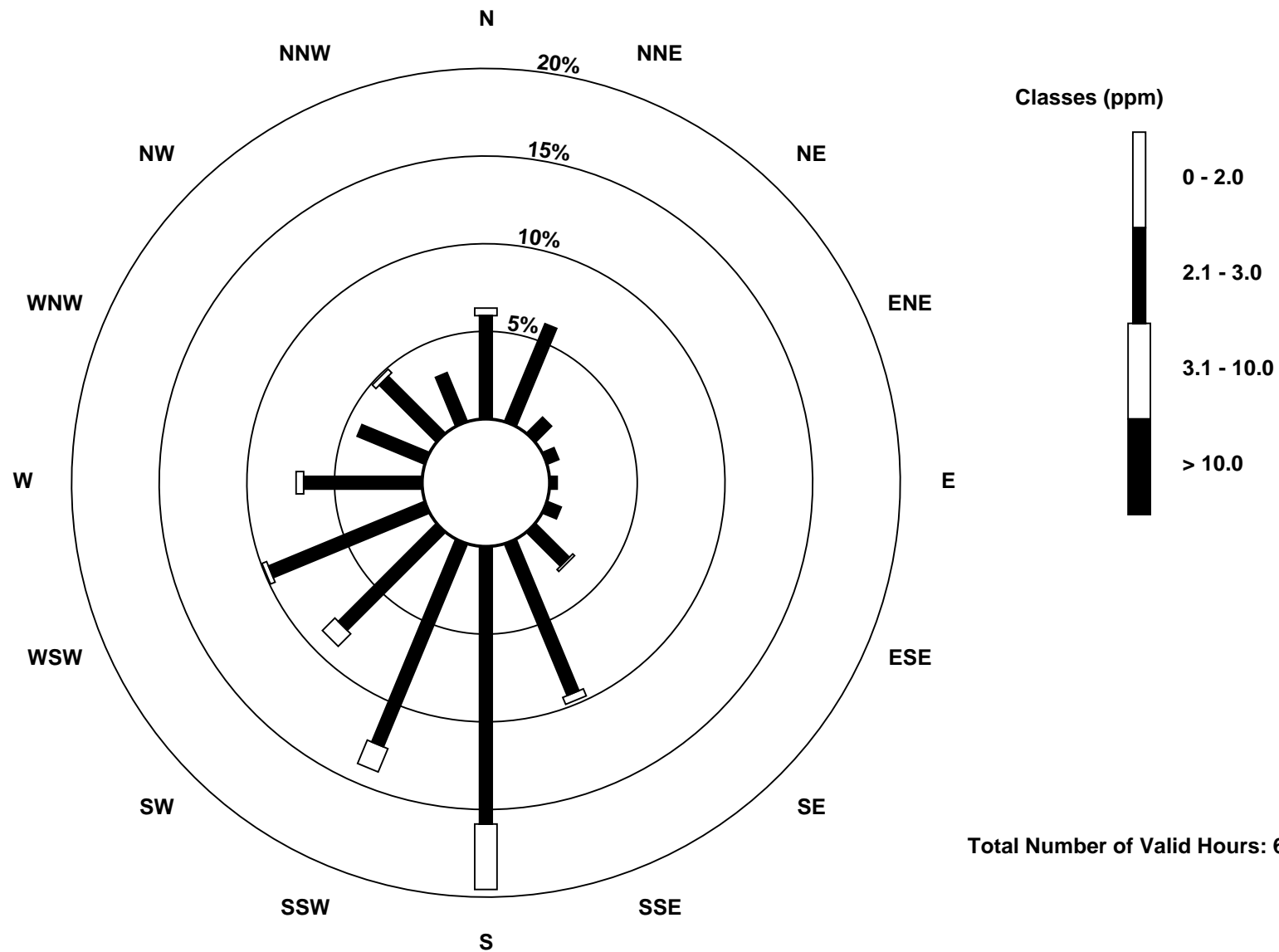
Total Number of Valid Hours: 695

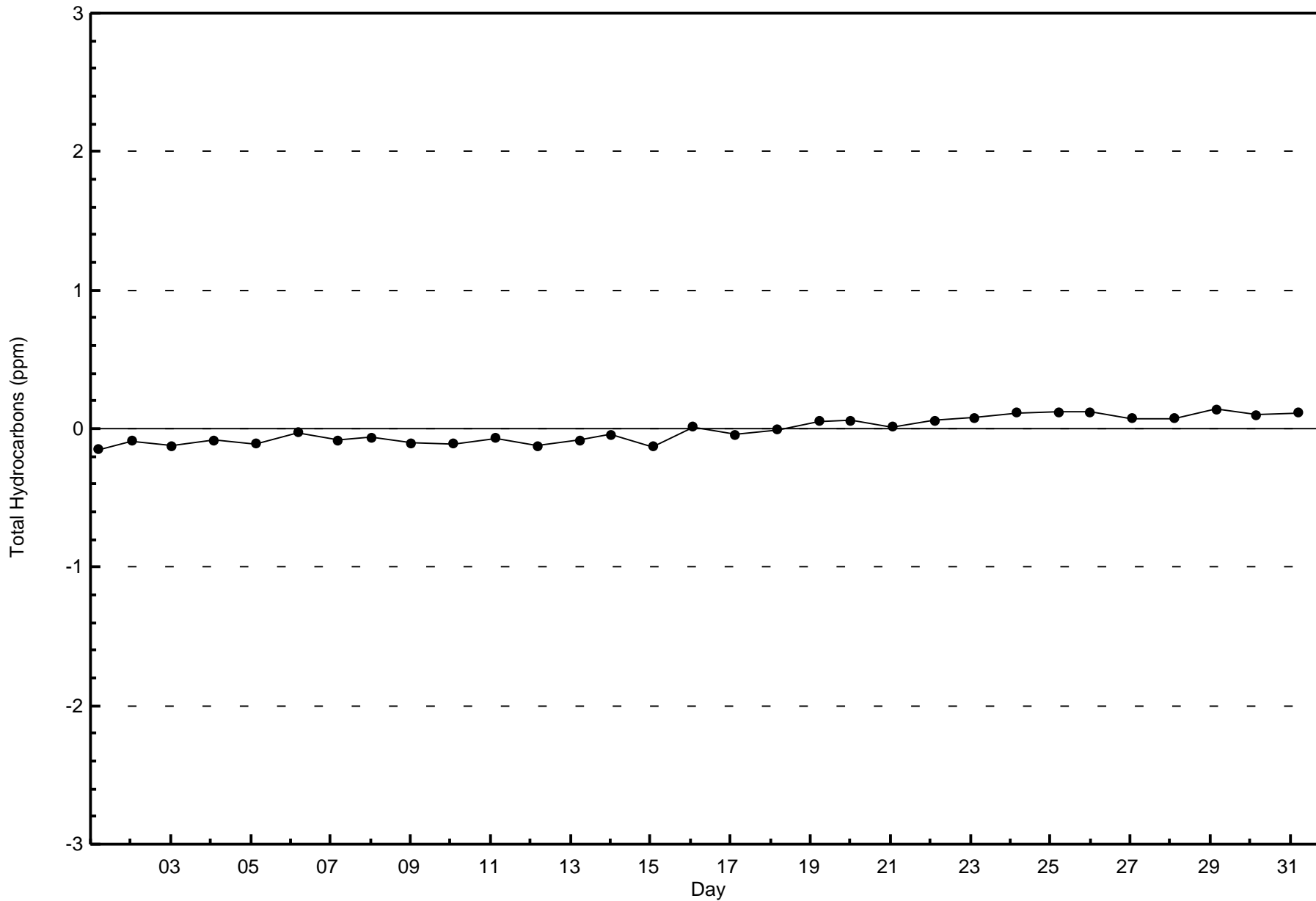
Total Number of Hours: 744

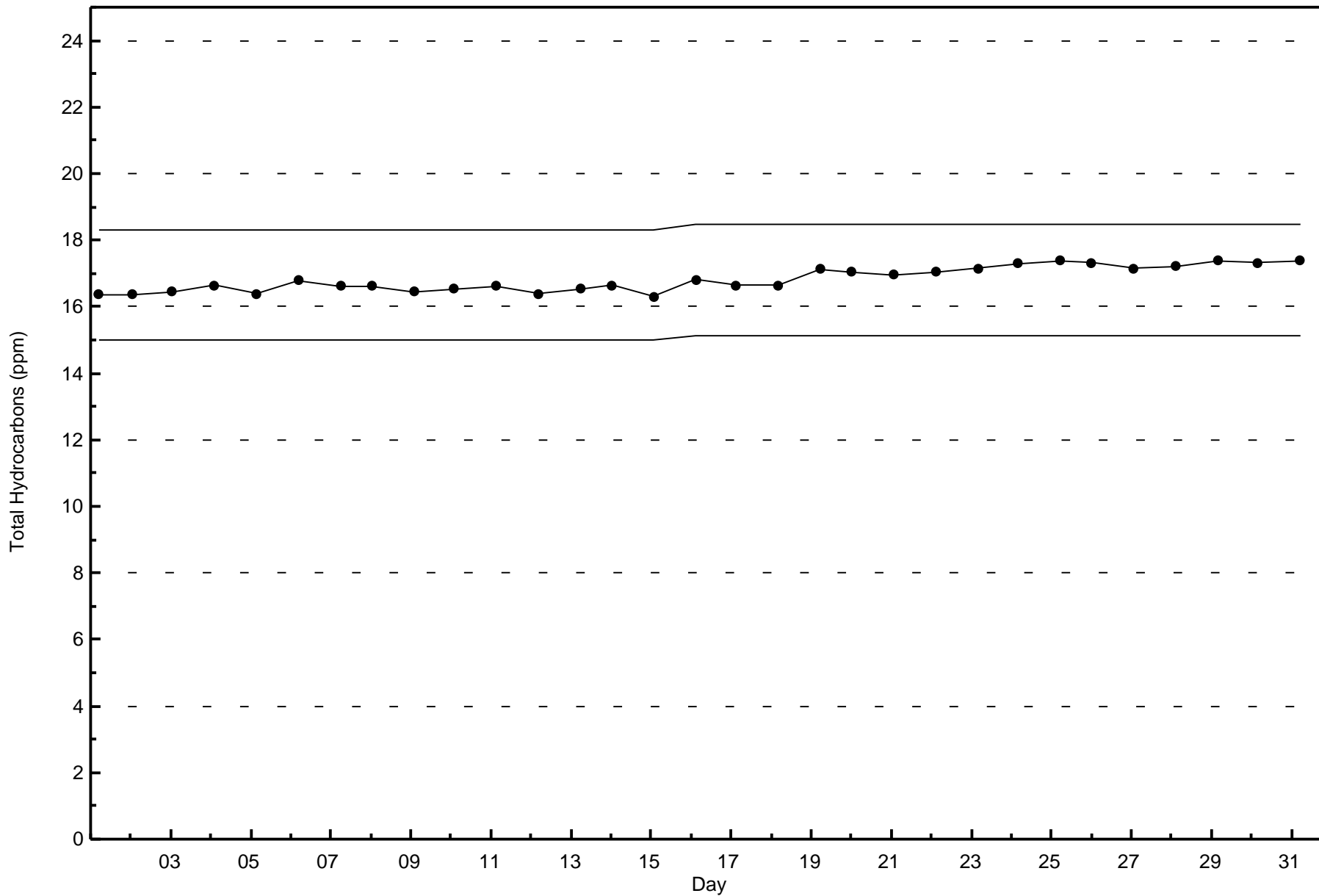


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Fort McKay South (AMS 13)









Wood Buffalo Environmental Association

Summary of Hour Averages

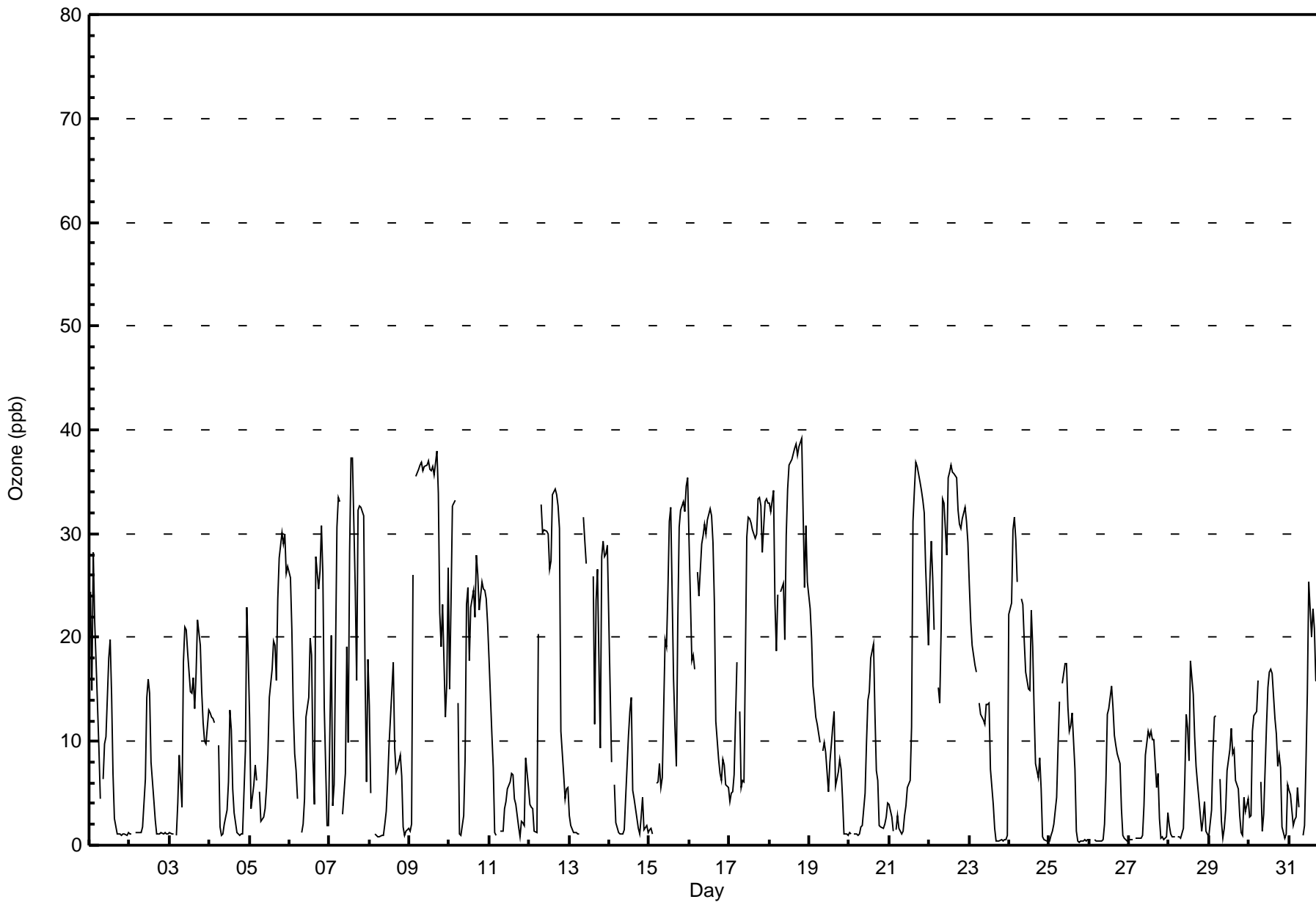
Ozone (O<sub>3</sub>) - ppb

Fort McKay South - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 39 ppb on Dec 18 20:00	Maximum Daily Average: 31.1 ppb on Dec 18		Hours of Data:	710
Minimum Value: 0 ppb on Dec 25 19:00	Minimum Daily Average: 3.7 ppb on Dec 2		Hours of Missing Data:	34
Maximum Diurnal Average: 19.5 ppb at hour 14	Minimum Diurnal Average: 8.0 ppb at hour 7		Hours of Calibration:	34
Monthly Average: 13.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 9 Q <sub>3</sub> = 22 P <sub>90</sub> = 32 P <sub>99</sub> = 37		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	24	15	28	22	18	9	5	Z	6	10	10	18	20	15	7	3	1	1	1	1	1	1	1	1	9.5	28
2-Dec	1	1	Z	1	1	1	1	1	2	6	14	16	15	8	4	2	1	1	1	1	1	1	1	1	3.7	16
3-Dec	1	1	1	Z	1	4	9	4	18	21	21	19	15	15	16	13	16	22	19	15	12	10	10	13	11.9	22
4-Dec	13	12	12	12	Z	10	2	1	1	2	3	6	13	11	5	3	1	1	1	1	9	23	18	18	7.1	23
5-Dec	12	4	6	8	6	Z	5	2	3	4	6	9	14	17	20	19	16	24	28	30	29	30	26	27	14.9	30
6-Dec	26	21	13	9	7	4	Z	1	2	5	12	14	20	18	8	4	28	25	26	31	26	13	2	2	13.8	31
7-Dec	11	20	4	6	31	33	33	Z	3	7	19	10	28	37	37	25	16	32	33	32	32	16	6	18	21.3	37
8-Dec	13	5	Z	1	1	1	1	1	1	2	3	6	10	15	18	9	7	7	9	7	2	1	1	2	5.3	18
9-Dec	1	2	26	Z	36	36	37	37	36	36	37	37	36	36	36	36	38	34	22	19	23	12	16	27	28.5	38
10-Dec	15	23	33	33	Z	14	1	1	3	8	23	25	18	23	25	22	28	26	23	25	25	25	24	21	20.1	33
11-Dec	18	11	8	1	1	Z	1	1	1	3	4	5	6	7	7	5	4	2	1	2	2	2	8	6	4.6	18
12-Dec	4	4	4	1	1	20	Z	33	30	30	30	30	27	27	34	34	34	33	31	11	7	5	5	6	19.1	34
13-Dec	3	2	1	1	1	1	1	Z	32	29	27	C	C	C	26	12	24	27	9	28	29	28	28	29	16.9	32
14-Dec	15	8	Z	6	2	1	1	1	1	1	5	11	13	14	5	4	3	2	1	3	5	1	2	1	4.6	15
15-Dec	1	2	1	Z	6	6	8	6	7	20	19	24	31	33	16	11	8	21	31	32	33	32	35	35	18.2	35
16-Dec	29	18	18	17	Z	26	24	29	30	31	30	31	32	32	29	23	12	8	7	6	8	8	6	6	20.0	32
17-Dec	4	5	5	7	18	Z	13	5	6	6	30	32	31	31	30	30	30	33	34	33	28	33	33	33	22.2	34
18-Dec	33	32	34	23	19	24	Z	24	25	20	30	34	37	37	38	38	39	38	38	39	32	25	31	25	31.1	39
19-Dec	23	20	15	14	12	12	10	Z	9	10	9	5	8	10	11	13	6	7	8	7	4	1	1	1	9.4	23
20-Dec	1	1	Z	1	1	1	1	2	2	5	10	14	15	18	19	13	7	6	2	2	2	2	3	4	5.7	19
21-Dec	4	3	1	Z	1	3	2	1	1	3	4	5	6	11	31	34	37	36	35	34	33	32	27	19	15.9	37
22-Dec	25	29	26	21	Z	15	14	21	33	33	28	35	36	37	36	36	35	32	31	31	31	33	31	29	29.5	37
23-Dec	25	22	19	17	17	Z	14	13	12	12	13	14	14	7	4	2	0	0	0	1	0	0	1	1	9.0	25
24-Dec	22	23	30	32	29	25	Z	24	23	20	17	15	15	23	19	13	8	7	8	5	1	1	0	0	15.7	32
25-Dec	0	1	1	2	5	10	14	Z	16	17	17	13	11	12	13	7	1	0	0	0	0	0	0	0	6.2	17
26-Dec	0	1	Z	1	0	0	0	0	1	2	6	13	13	15	13	11	10	9	8	3	1	1	1	0	4.8	15
27-Dec	1	1	1	Z	1	1	1	1	1	4	9	11	10	11	10	10	6	7	3	1	1	1	1	3	4.0	11
28-Dec	2	1	1	1	Z	1	1	1	2	6	13	11	8	18	15	10	8	6	4	1	3	4	1	1	5.1	18
29-Dec	1	3	9	12	13	Z	6	2	1	2	3	7	9	11	9	9	6	5	3	1	1	5	3	4	5.5	13
30-Dec	3	3	11	12	13	16	Z	6	1	3	12	15	17	17	17	12	11	8	9	7	2	1	1	6	8.7	17
31-Dec	5	5	2	2	3	6	4	Z	1	2	8	15	25	20	23	21	16	16	16	13	12	14	8	1	10.3	25
	10.9	9.6	11.9	10.1	9.4	10.8	8.0	8.7	10.0	11.6	15.2	16.7	18.4	19.5	18.8	15.6	14.7	15.4	14.2	13.7	12.5	11.2	10.8	11.0	Diurnal Average	
	33	32	34	33	36	36	37	37	36	36	37	37	37	37	38	38	39	38	38	39	33	33	35	35	Diurnal Maximum	

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







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay South - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	519	73.10	73.10
21 - 50	191	26.90	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay South - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	29	21	4	1	1	4	15	63	135	97	50	33	19	5	14	15	506
21 - 50	14	23	4	4	2	2	5	5	7	2	11	34	31	23	18	6	191
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
<b>Totals</b>	43	44	8	5	3	6	20	68	142	99	61	67	50	28	32	21	697

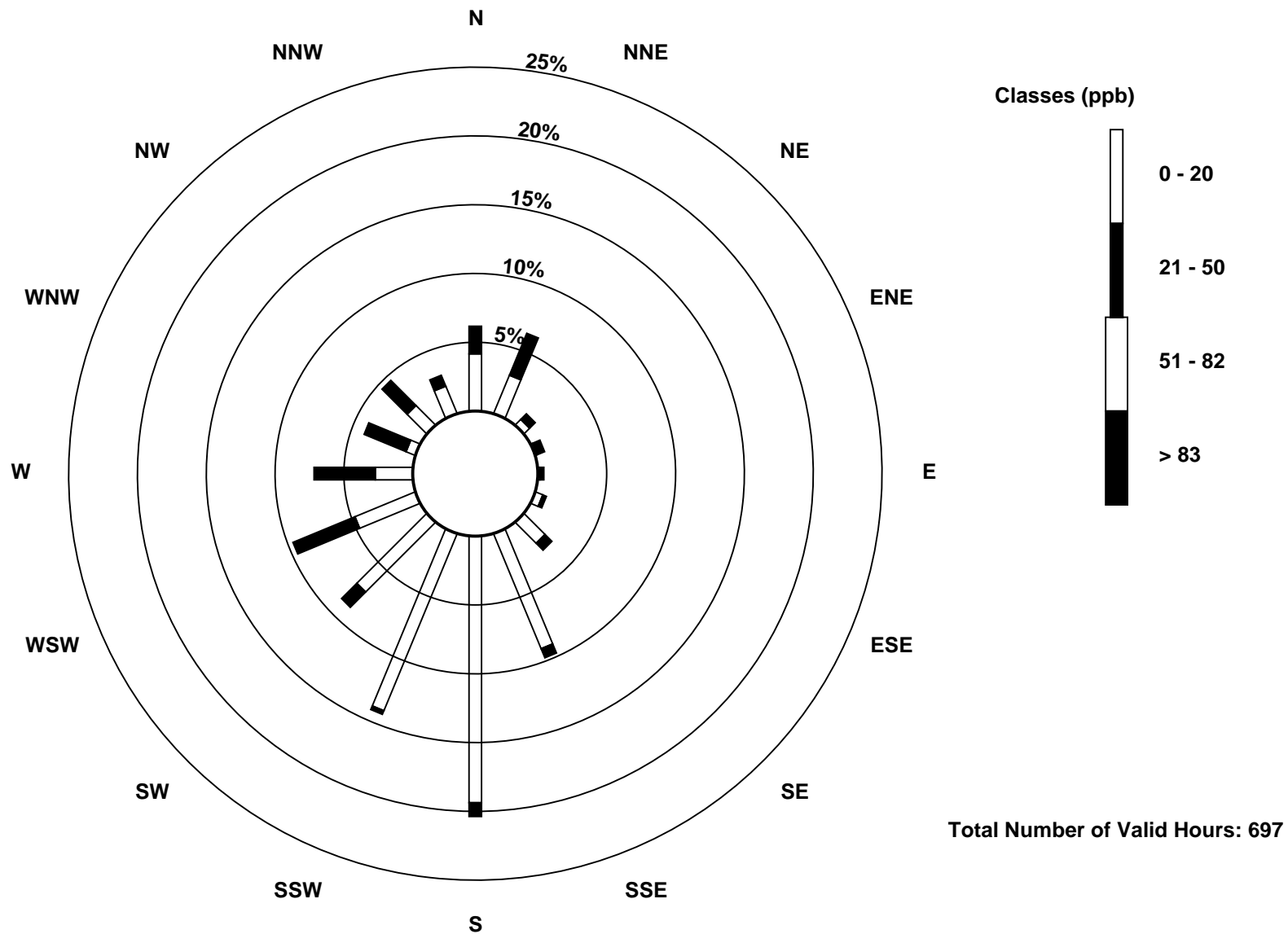
Total Number of Valid Hours: 697

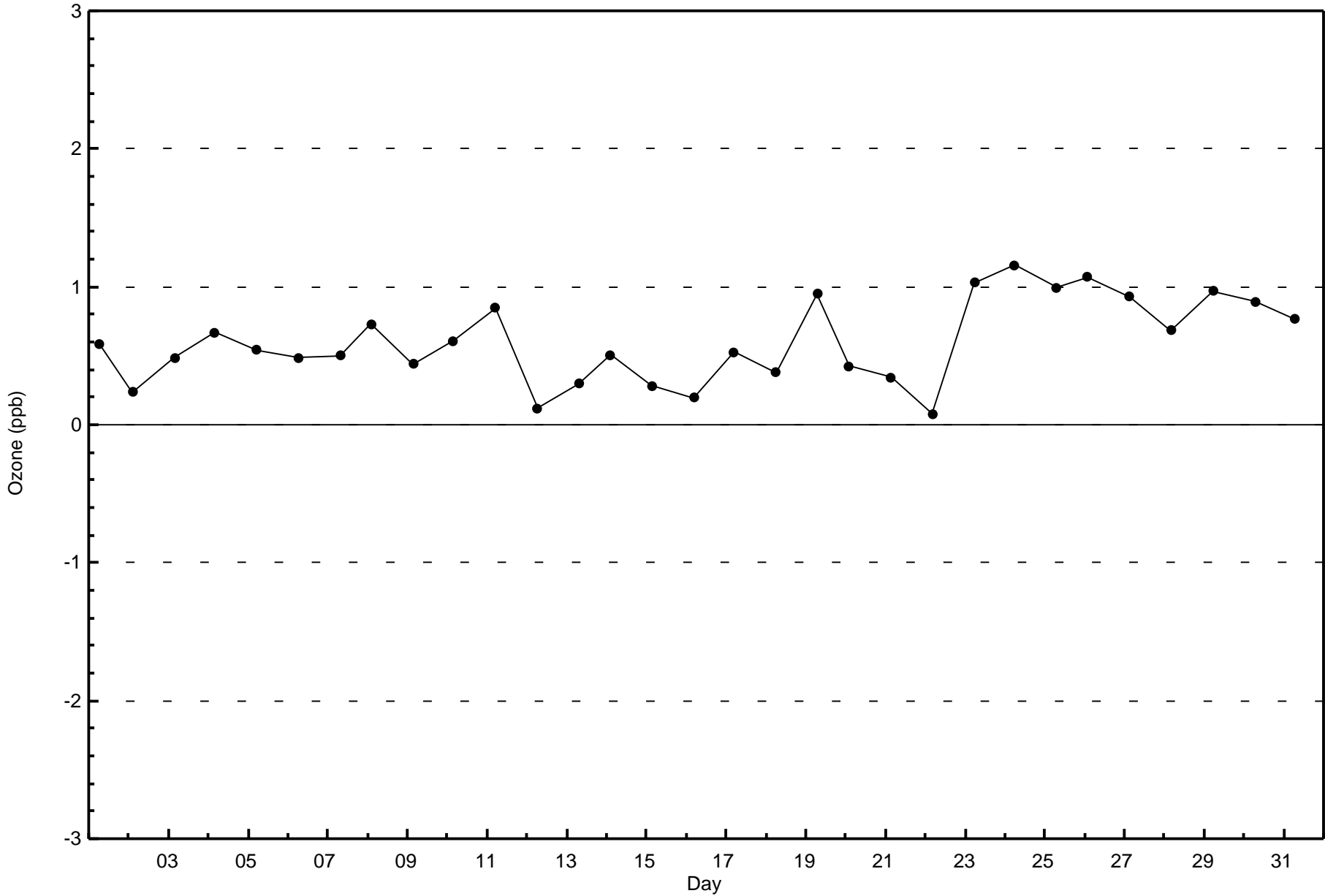
Total Number of Hours: 744

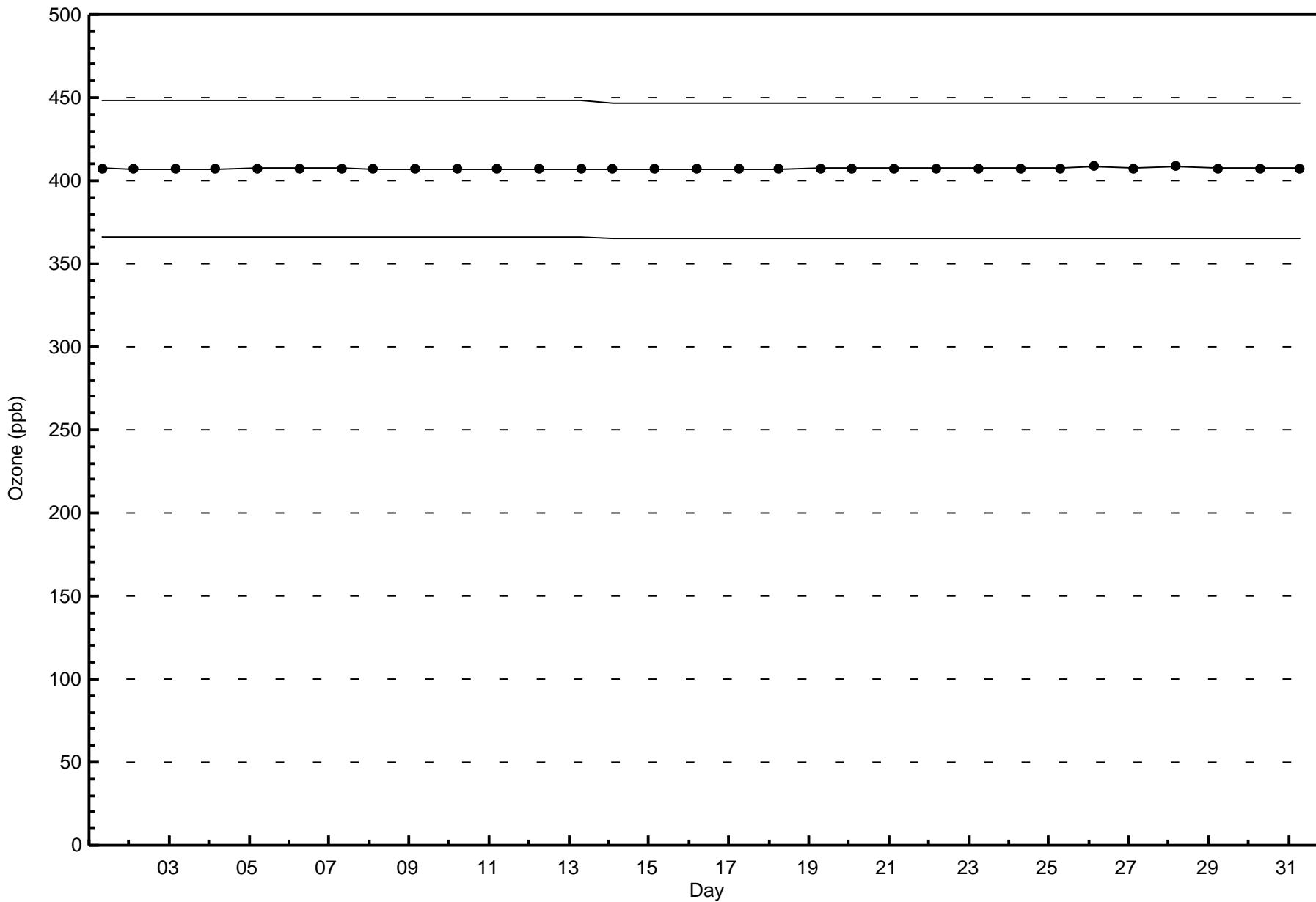


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Fort McKay South (AMS 13)







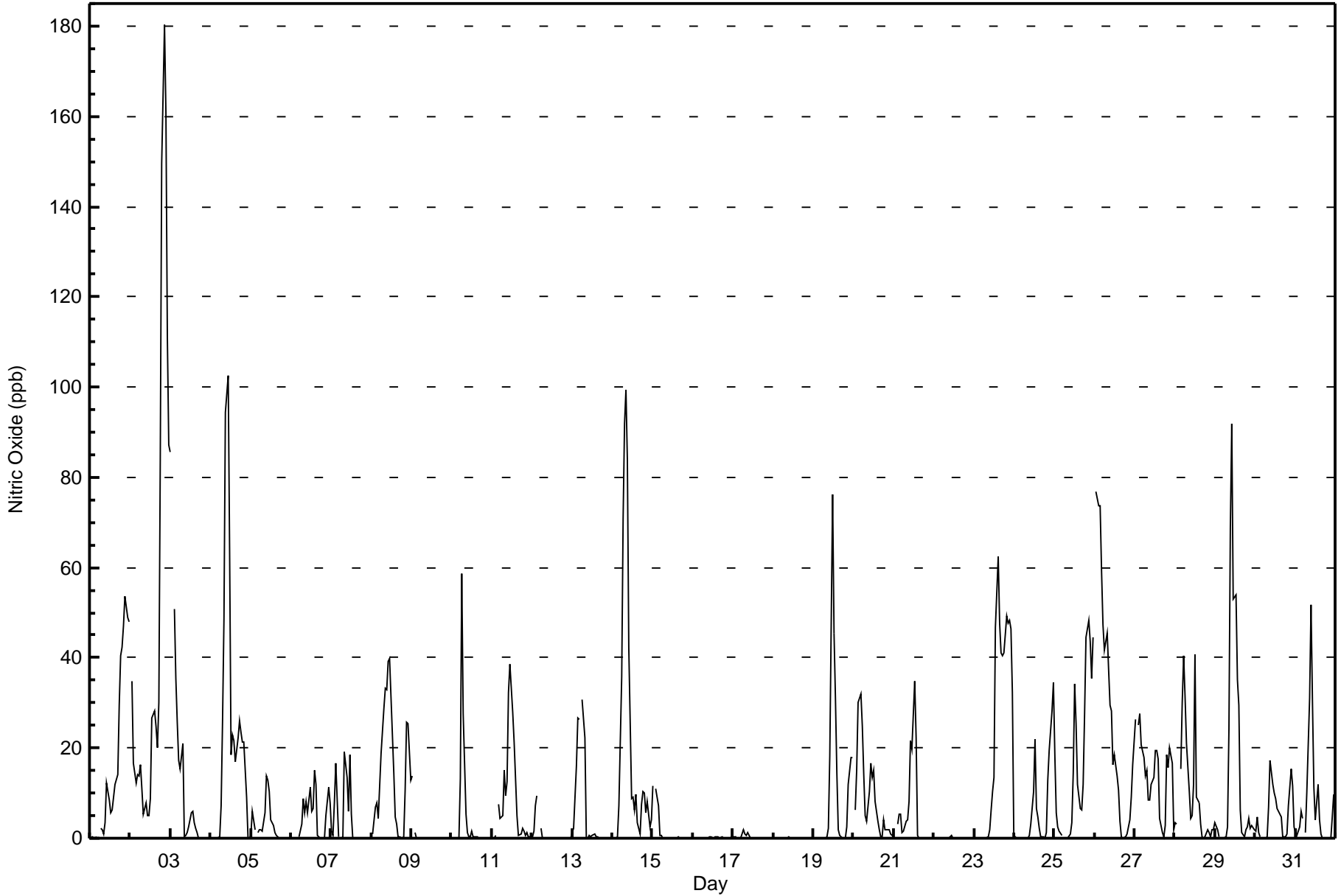


Maximum Value: 180 ppb on Dec 2 21:00		Maximum Daily Average: 45.8 ppb on Dec 2		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 18 19:00		Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Data: 708																																													
Maximum Diurnal Average: 17.0 ppb at hour 11		Minimum Diurnal Average: 3.7 ppb at hour 17		Hours of Missing Data: 36																																													
Monthly Average: 10.5 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 2 Q <sub>3</sub> = 13 P <sub>90</sub> = 32 P <sub>99</sub> = 92		Hours of Calibration: 36																																													
				Percent Operational Time: 100.0																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	2	2	1	4	12	8	6	6	9	12	14	30	40	42	47	54	49	48	16.8	54																							
2-Dec	Z	35	17	12	14	14	16	11	5	8	5	5	9	27	28	25	20	30	84	150	180	161	111	87	45.8	180																							
3-Dec	86	Z	51	35	26	17	15	21	0	1	1	2	6	6	4	2	1	0	0	0	0	0	0	0	11.9	86																							
4-Dec	0	0	Z	0	0	0	7	26	48	95	103	63	19	23	22	17	22	26	23	21	21	9	0	0	23.8	103																							
5-Dec	1	6	2	Z	1	2	2	2	6	14	13	10	4	3	1	1	0	0	0	0	0	0	0	0	2.9	14																							
6-Dec	0	0	0	0	Z	0	3	9	6	8	6	11	6	7	15	12	1	0	0	0	0	5	11	8	4.7	15																							
7-Dec	1	1	8	17	0	Z	0	0	19	13	6	19	5	0	0	0	0	0	0	0	0	0	0	0	3.9	19																							
8-Dec	Z	1	7	8	4	12	19	29	33	33	39	40	31	14	5	3	0	0	0	0	11	26	26	13	15.4	40																							
9-Dec	14	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	14																							
10-Dec	0	0	Z	0	0	13	59	27	5	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4.8	59																							
11-Dec	0	0	0	Z	7	4	5	15	9	12	32	38	28	21	13	5	1	1	2	2	1	1	0	0	8.7	38																							
12-Dec	0	1	7	9	Z	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	9																							
13-Dec	1	2	16	27	26	Z	31	22	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	5.6	31																							
14-Dec	Z	0	0	0	7	36	71	92	99	84	42	9	9	6	10	3	1	8	10	10	6	8	3	4	22.5	99																							
15-Dec	11	Z	11	7	1	1	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	1.8	11																							
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
17-Dec	0	0	0	Z	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2																							
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
19-Dec	0	0	0	0	0	Z	0	0	0	2	18	76	46	31	14	2	1	0	0	0	3	12	18	18	10.5	76																							
20-Dec	Z	6	15	30	32	25	14	5	4	10	17	14	15	8	4	2	0	0	4	2	2	2	1	1	9.2	32																							
21-Dec	1	Z	3	5	5	1	1	4	4	8	22	20	35	22	1	0	0	0	0	0	0	0	0	0	5.8	35																							
22-Dec	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
23-Dec	0	0	0	Z	0	0	0	0	0	2	6	10	13	47	62	48	41	41	41	49	48	48	46	32	23.3	62																							
24-Dec	1	0	0	0	Z	0	0	0	0	1	3	10	22	7	5	2	0	0	0	1	13	19	28	35	6.4	35																							
25-Dec	19	6	2	2	0	Z	0	0	0	1	4	14	34	25	12	7	6	12	27	44	48	44	36	45	16.9	48																							
26-Dec	Z	77	74	74	59	48	42	46	37	29	28	16	19	14	11	4	0	0	0	1	3	4	9	16	26.5	77																							
27-Dec	26	Z	25	28	21	18	14	15	9	8	12	13	19	19	18	4	1	0	3	18	16	20	17	2	14.2	28																							
28-Dec	3	3	Z	15	30	41	31	21	10	4	5	12	41	9	8	3	0	0	0	2	1	0	2	2	10.7	41																							
29-Dec	4	2	0	Z	0	0	0	2	24	69	92	53	54	35	29	6	1	0	2	3	4	2	3	2	16.9	92																							
30-Dec	2	5	1	0	Z	0	0	0	7	17	12	10	9	7	6	5	0	0	0	1	7	15	12	2	5.2	17																							
31-Dec	1	1	3	6	4	Z	1	10	31	52	30	11	4	12	4	1	0	0	0	0	0	0	5	10	8.1	52																							
																								6.6	5.6	9.4	10.6	9.2	9.4	10.9	12.0	12.0	16.0	17.0	15.6	14.1	11.3	9.1	5.3	3.7	4.8	7.7	11.2	13.3	13.9	12.1	10.5	Diurnal Average	
																								86	77	74	74	59	48	71	92	99	95	103	76	54	47	62	48	41	41	84	150	180	161	111	87	Diurnal Maximum	
Z - zerospan		C - Calibration																																															



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Fort McKay South - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	589	83.19	83.19
21 - 40	66	9.32	92.51
41 - 80	40	5.65	98.16
81 - 159	11	1.55	99.72
> 159	2	0.28	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort McKay South - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	39	42	6	4	3	5	16	51	116	72	45	61	45	27	31	17	580
21 - 40	3	0	2	0	0	1	3	11	13	12	4	5	2	2	1	3	62
11 - 80	2	0	1	1	0	0	1	6	4	11	10	1	1	0	1	1	40
81 - 159	0	0	0	0	0	0	0	0	3	2	3	1	1	0	1	0	11
> 159	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
<b>Totals</b>	44	42	9	5	3	6	20	68	136	97	62	69	50	29	34	21	695

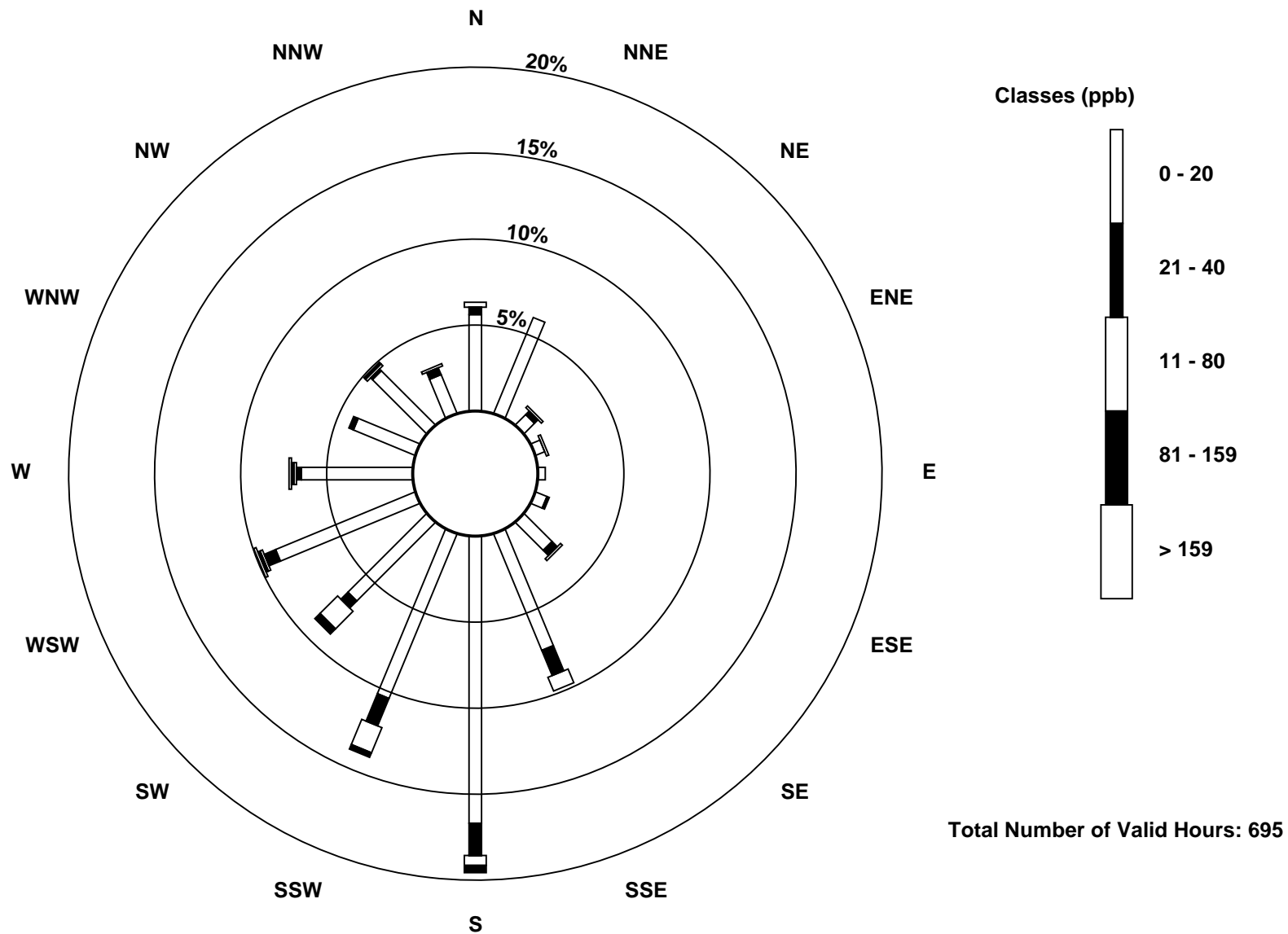
Total Number of Valid Hours: 695

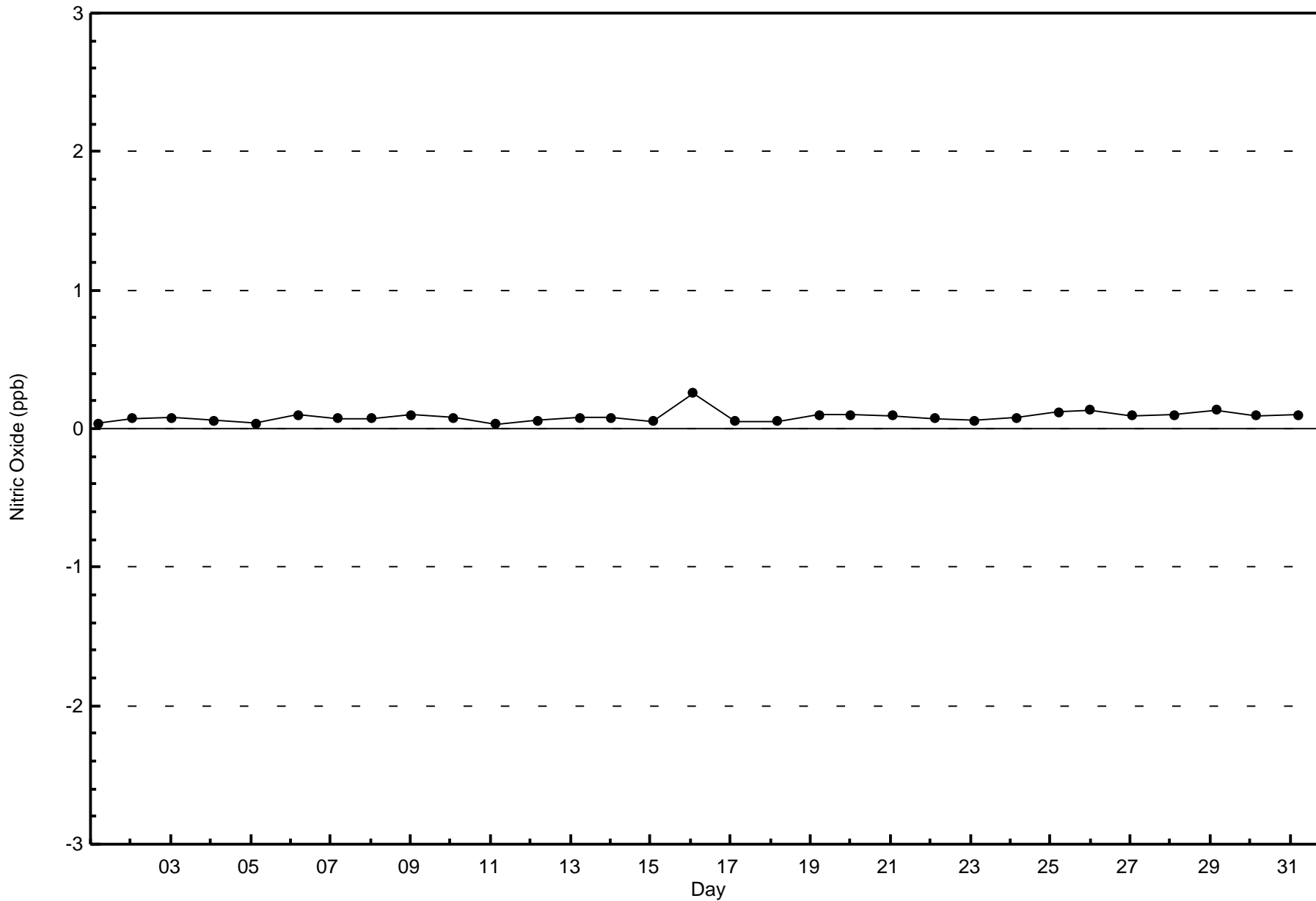
Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Fort McKay South (AMS 13)

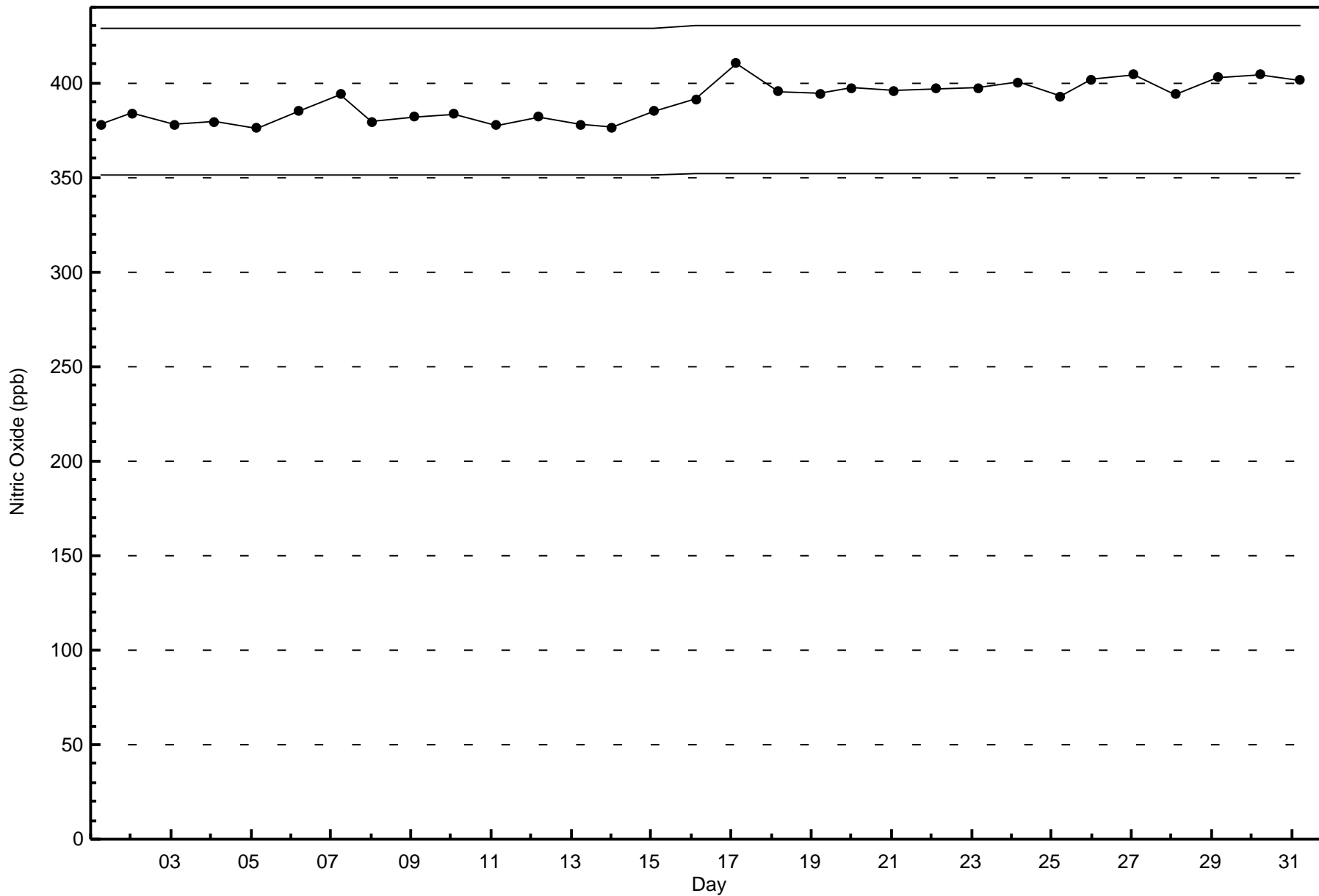






Wood Buffalo Environmental Association  
Span Responses

Nitric Oxide (NO) - ppb  
Fort McKay South - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Fort McKay South - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 40 ppb on Dec 23 15:00	Maximum Daily Average: 26.3 ppb on Dec 27		Hours of Data:	708
Minimum Value: 0 ppb on Dec 13 20:00	Minimum Daily Average: 2.5 ppb on Dec 22		Hours of Missing Data:	36
Maximum Diurnal Average: 16.7 ppb at hour 3	Minimum Diurnal Average: 12.6 ppb at hour 18		Hours of Calibration:	36
Monthly Average: 14.8 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 5 Median = 15 Q <sub>3</sub> = 23 P <sub>90</sub> = 28 P <sub>99</sub> = 37		Percent Operational Time:	100.0

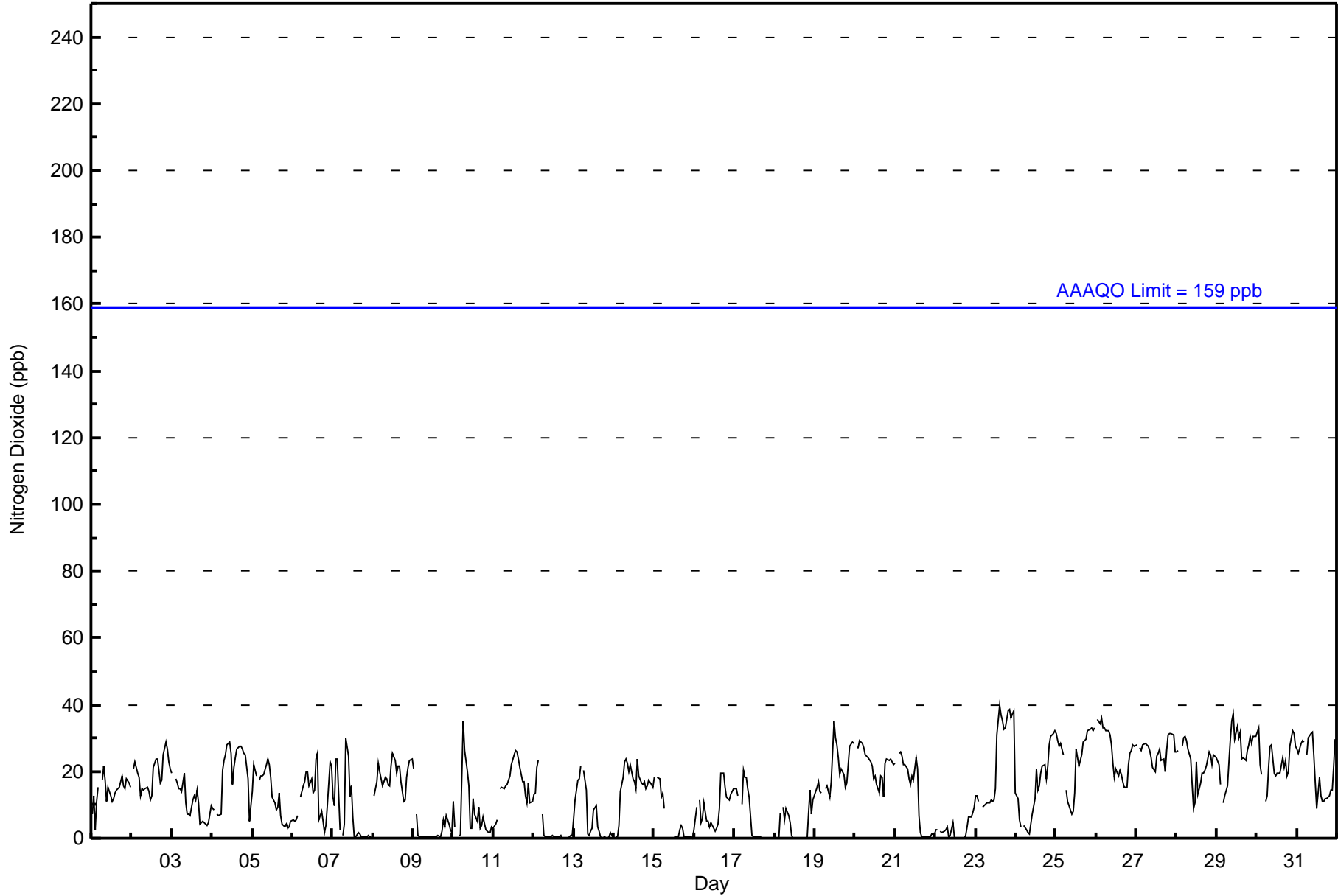
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	7	13	3	11	15	Z	18	22	17	11	15	13	11	12	14	14	15	17	19	16	15	18	17	15	14.2	22																							
2-Dec	Z	21	23	19	18	13	15	14	15	15	14	11	13	21	24	24	20	17	18	25	29	27	23	21	19.0	29																							
3-Dec	20	Z	18	17	15	15	14	19	11	7	7	7	11	13	11	14	11	4	5	5	4	4	5	10	10.7	20																							
4-Dec	9	8	Z	7	7	7	20	24	25	28	29	25	16	21	24	27	28	28	27	26	25	18	5	10	19.2	29																							
5-Dec	14	22	19	Z	17	19	19	19	22	24	22	18	12	10	8	10	14	7	4	3	4	3	3	5	13.0	24																							
6-Dec	6	5	6	7	Z	12	16	17	20	20	16	18	14	14	24	25	6	8	5	2	4	10	23	22	12.9	25																							
7-Dec	12	10	24	24	3	Z	1	4	30	25	12	16	6	1	1	2	1	1	1	1	0	1	0	1	7.5	30																							
8-Dec	Z	13	17	22	20	18	16	18	18	16	16	22	25	23	20	21	22	17	11	11	18	21	23	24	18.8	25																							
9-Dec	21	Z	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	5	4	7	4	2	2	2.7	21																							
10-Dec	11	3	Z	1	1	18	35	26	20	16	3	3	12	7	5	9	3	4	7	2	2	2	2	3	8.5	35																							
11-Dec	3	4	5	Z	15	15	15	16	16	17	19	22	25	26	26	24	21	17	17	13	11	17	11	11	15.9	26																							
12-Dec	13	14	21	24	Z	7	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	1	1	3.8	24																							
13-Dec	6	12	17	18	21	Z	20	15	1	1	2	3	8	10	3	2	1	0	0	0	0	1	2	1	6.2	21																							
14-Dec	Z	0	1	4	14	18	23	24	23	20	22	18	17	15	24	19	17	16	17	15	16	17	16	15	16.0	24																							
15-Dec	18	Z	18	18	12	14	9	C	C	C	C	C	0	0	0	2	4	3	0	0	0	0	0	0	5.6	18																							
16-Dec	3	10	Z	12	5	6	10	5	5	4	5	4	2	3	4	9	20	19	15	12	12	12	13	15	8.8	20																							
17-Dec	15	15	13	Z	10	20	18	18	15	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6.1	20																							
18-Dec	0	0	0	8	Z	10	6	9	7	5	1	0	0	0	0	0	0	0	0	0	8	15	7	12	3.7	15																							
19-Dec	14	15	17	14	13	Z	15	16	14	12	17	35	30	28	24	19	21	19	15	16	22	28	29	28	20.1	35																							
20-Dec	Z	27	27	29	29	27	25	25	24	23	22	18	19	16	14	19	18	12	22	24	23	24	23	22	22.2	29																							
21-Dec	23	Z	25	26	25	22	22	21	18	16	19	17	24	21	7	2	1	0	0	0	0	0	1	1	12.6	26																							
22-Dec	3	3	Z	2	2	2	2	4	1	1	5	0	0	0	0	0	0	0	1	3	6	6	8	10	2.5	10																							
23-Dec	13	13	11	Z	9	10	10	11	11	11	11	11	15	31	40	37	35	33	33	38	39	36	37	38	23.2	40																							
24-Dec	13	12	6	4	Z	4	3	2	1	4	7	12	21	14	16	19	22	22	18	22	28	30	31	32	14.9	32																							
25-Dec	31	29	28	28	25	Z	14	11	10	7	8	14	27	24	22	25	29	29	30	32	33	33	32	33	24.1	33																							
26-Dec	Z	36	34	36	33	33	32	32	31	28	23	18	21	19	20	19	17	15	15	22	25	26	28	28	25.7	36																							
27-Dec	28	Z	27	26	28	29	28	28	26	24	21	20	24	25	27	23	24	20	26	31	31	31	31	26	26.3	31																							
28-Dec	26	26	Z	28	30	30	29	27	24	16	9	11	23	13	16	19	20	20	22	26	25	22	25	25	22.2	30																							
29-Dec	24	22	16	Z	11	13	16	23	30	35	37	30	34	30	32	24	24	23	26	28	30	28	30	31	25.9	37																							
30-Dec	32	33	22	19	Z	11	13	21	28	28	19	19	20	20	20	24	21	23	19	20	28	32	31	28	23.0	33																							
31-Dec	27	26	29	29	29	Z	25	30	31	32	24	17	9	18	13	11	11	12	12	13	14	14	22	30	20.7	32																							
																								15.0	15.0	16.7	16.6	15.6	14.9	15.8	16.6	16.4	15.3	13.5	13.4	14.2	14.1	14.1	14.4	13.7	12.6	12.6	13.2	14.9	15.5	15.5	16.0	Diurnal Average	
																								32	36	34	36	33	33	35	32	31	35	37	35	34	31	40	37	35	33	33	38	39	36	37	38	Diurnal Maximum	

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay South - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	480	67.80	67.80
21 - 40	228	32.20	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay South - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	34	42	4	5	3	6	14	35	69	54	38	55	40	27	30	15	471
21 - 40	10	0	5	0	0	0	6	33	67	43	24	14	10	2	4	6	224
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
<b>Totals</b>	44	42	9	5	3	6	20	68	136	97	62	69	50	29	34	21	695

Total Number of Valid Hours: 695

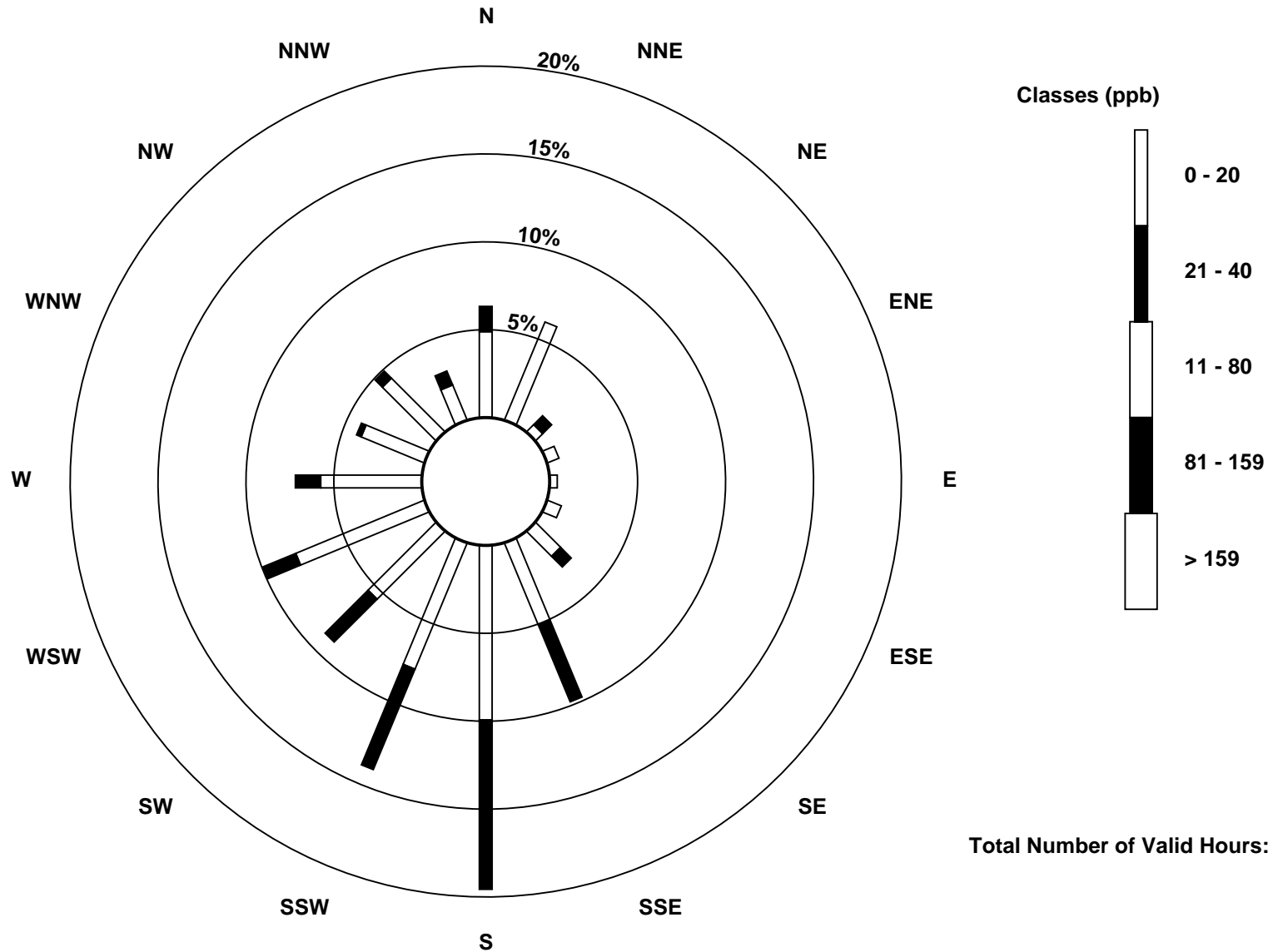
Total Number of Hours: 744

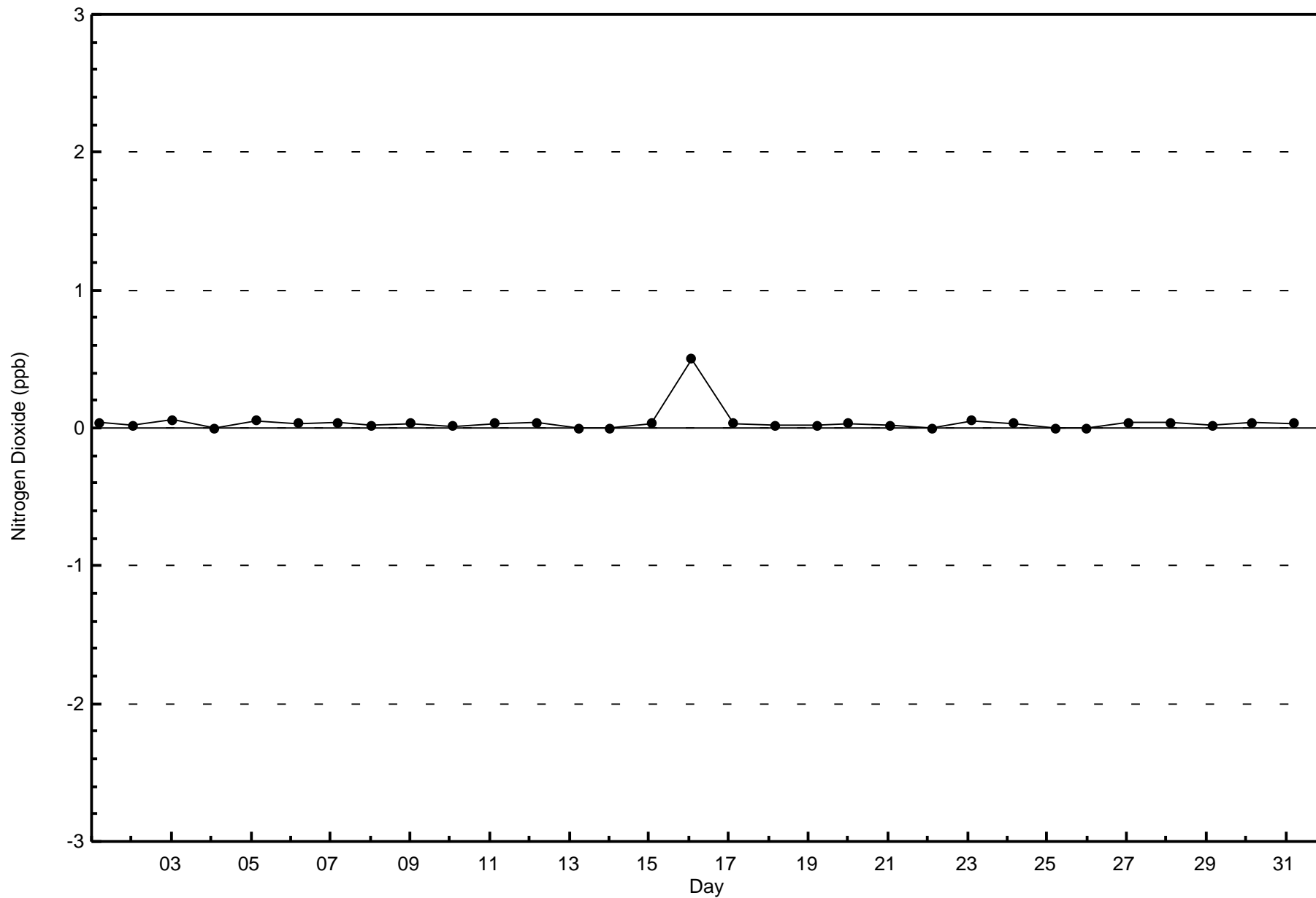


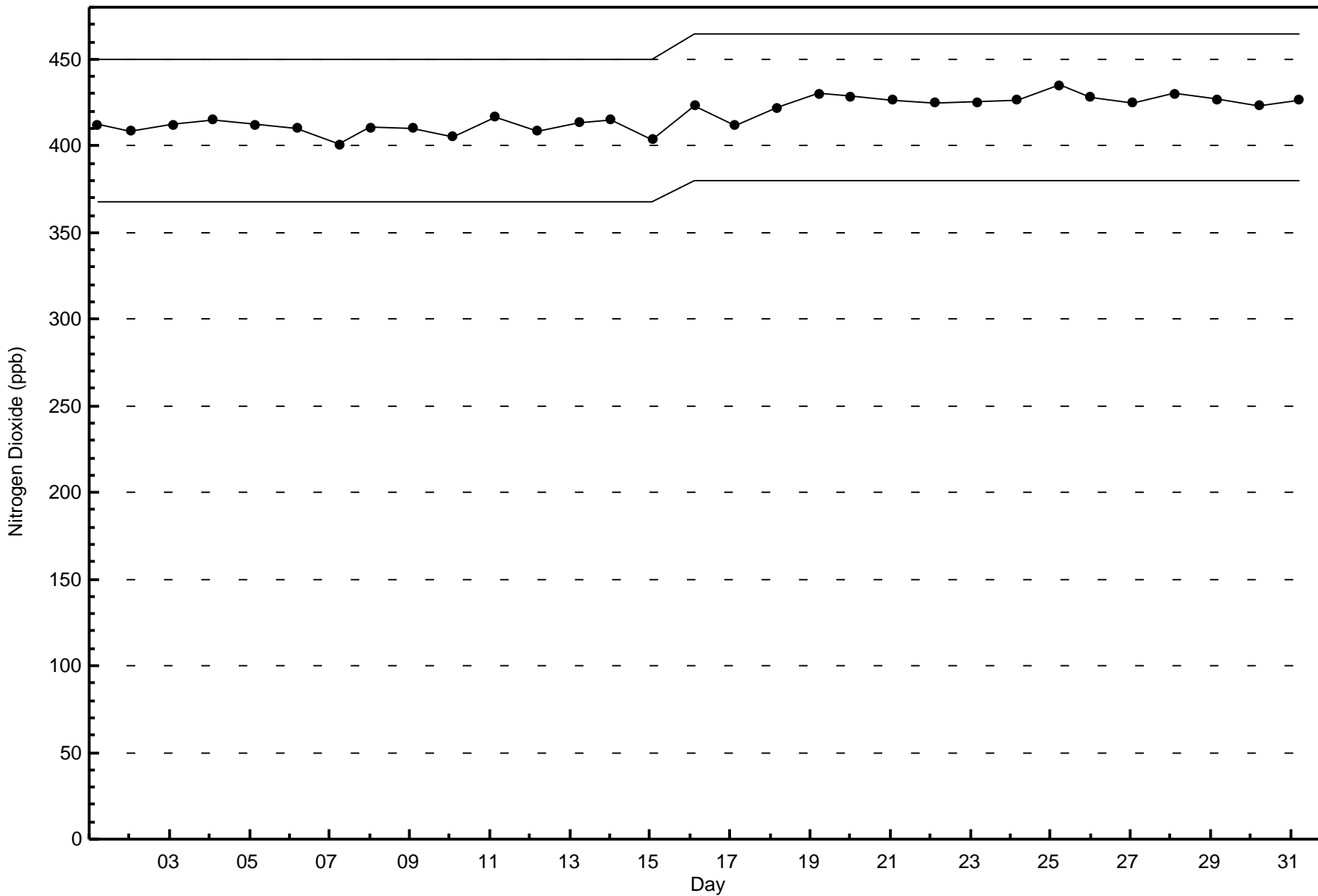


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay South (AMS 13)





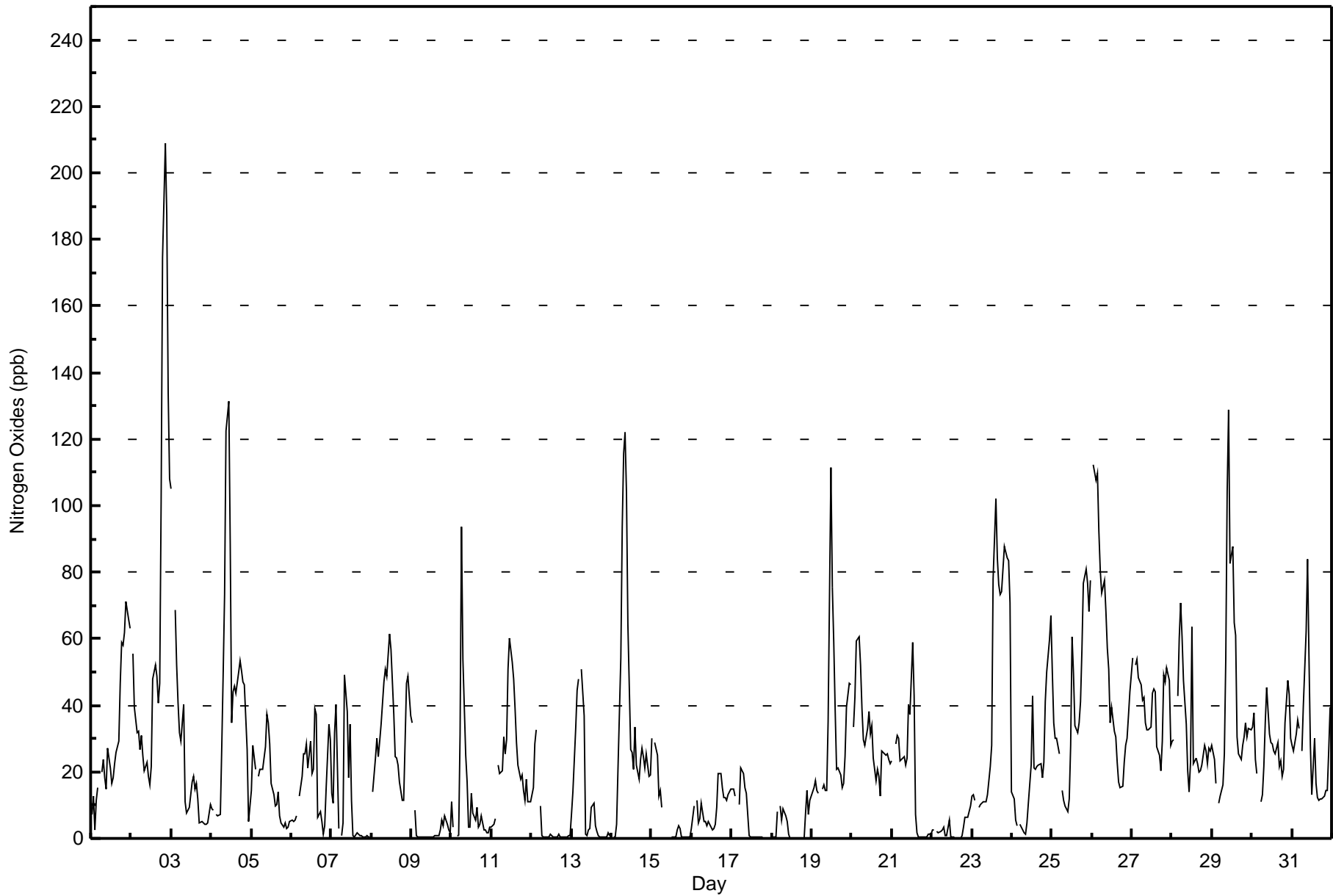




**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay South - December 2017**

Maximum Value: 209 ppb on Dec 2 21:00		Maximum Daily Average: 64.8 ppb on Dec 2		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 18 18:00		Minimum Daily Average: 2.6 ppb on Dec 22		Hours of Data: 708																																													
Maximum Diurnal Average: 31.2 ppb at hour 10		Minimum Diurnal Average: 17.4 ppb at hour 17		Hours of Missing Data: 36																																													
Monthly Average: 25.3 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 5 Median = 20 Q <sub>3</sub> = 34 P <sub>90</sub> = 58 P <sub>99</sub> = 119		Hours of Calibration: 36																																													
				Percent Operational Time: 100.0																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	7	13	3	11	15	Z	20	24	18	15	27	21	17	18	23	26	29	47	59	58	62	71	66	63	31.0	71																							
2-Dec	Z	56	39	32	32	27	31	25	20	23	19	16	22	48	52	49	40	47	101	174	209	187	134	108	64.8	209																							
3-Dec	105	Z	68	52	41	32	29	40	11	8	9	9	17	19	15	17	12	4	5	5	4	4	5	10	22.6	105																							
4-Dec	9	8	Z	7	7	7	28	50	73	123	131	89	35	44	46	44	50	54	50	47	46	27	5	10	43.0	131																							
5-Dec	15	28	21	Z	19	21	21	21	28	37	35	28	17	13	10	14	14	7	4	3	5	3	3	5	15.9	37																							
6-Dec	5	5	6	7	Z	13	19	26	26	28	21	29	20	21	39	37	6	8	5	1	4	15	34	30	17.6	39																							
7-Dec	14	11	32	40	3	Z	1	5	49	38	18	34	12	1	1	2	1	1	1	1	1	1	0	1	11.5	49																							
8-Dec	Z	14	24	30	25	29	34	47	51	49	55	62	57	37	25	24	22	17	11	12	29	47	49	37	34.2	62																							
9-Dec	35	Z	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	6	4	7	4	3	2	3.4	35																							
10-Dec	11	3	Z	1	1	32	94	54	25	17	3	3	14	8	5	9	3	4	7	3	2	2	2	3	13.3	94																							
11-Dec	3	4	6	Z	22	19	20	31	26	30	51	60	53	48	39	29	22	18	19	14	11	18	11	11	24.6	60																							
12-Dec	13	15	28	33	Z	10	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	1	1	4.8	33																							
13-Dec	7	14	33	44	48	Z	51	37	1	1	3	3	9	10	4	2	1	0	0	0	0	1	2	1	11.9	51																							
14-Dec	Z	0	1	4	21	54	94	116	122	104	64	27	26	21	33	22	18	24	27	25	21	25	19	19	38.5	122																							
15-Dec	30	Z	29	25	13	14	9	C	C	C	C	C	1	0	0	3	4	3	0	0	0	0	0	0	7.4	30																							
16-Dec	3	10	Z	12	5	6	10	5	5	4	5	4	2	3	4	9	20	19	15	12	12	12	13	15	8.9	20																							
17-Dec	15	15	13	Z	10	21	20	19	15	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6.4	21																							
18-Dec	0	0	0	8	Z	10	6	9	7	5	1	0	0	0	0	0	0	0	0	0	8	15	7	12	3.8	15																							
19-Dec	14	15	17	14	13	Z	15	16	14	14	35	111	75	59	38	21	21	19	15	16	25	40	47	46	30.6	111																							
20-Dec	Z	33	42	59	61	52	39	30	28	33	38	31	34	24	17	21	19	13	26	26	25	26	24	23	31.4	61																							
21-Dec	23	Z	29	31	30	23	24	25	22	24	40	37	59	43	7	2	0	0	0	0	0	0	1	1	18.4	59																							
22-Dec	2	3	Z	2	2	2	3	4	1	1	5	0	0	0	0	0	0	0	1	3	6	6	8	10	2.6	10																							
23-Dec	13	13	11	Z	9	10	10	11	11	13	18	22	28	78	102	85	76	73	74	88	86	84	84	71	46.5	102																							
24-Dec	14	12	6	4	Z	4	3	2	1	5	11	22	43	21	21	22	22	18	23	41	50	60	67	67	21.4	67																							
25-Dec	50	35	30	30	25	Z	14	11	10	8	12	28	61	49	34	32	35	41	57	77	81	77	68	78	41.0	81																							
26-Dec	Z	112	108	110	92	80	74	78	68	57	51	35	39	32	31	23	17	15	16	23	28	30	37	44	52.2	112																							
27-Dec	54	Z	52	54	48	46	41	43	35	32	33	33	44	45	44	28	25	20	29	49	47	51	47	28	40.4	54																							
28-Dec	29	29	Z	43	60	71	60	47	34	20	14	23	64	22	24	23	20	20	22	28	26	23	27	26	32.9	71																							
29-Dec	28	24	17	Z	11	13	16	25	54	104	129	83	88	65	61	30	25	24	28	30	35	31	33	33	42.8	129																							
30-Dec	33	38	24	20	Z	11	13	21	35	45	31	29	28	26	26	29	22	23	19	21	35	48	43	30	28.2	48																							
31-Dec	28	26	31	35	33	Z	26	40	62	84	55	28	13	30	17	12	11	12	12	13	15	15	26	40	28.9	84																							
																								21.6	20.6	26.1	27.3	24.9	24.3	26.7	28.7	28.4	31.2	30.5	29.0	28.3	25.4	23.2	19.7	17.4	17.4	20.3	24.4	28.1	29.4	27.7	26.5	Diurnal Average	
																								105	112	108	110	92	80	94	116	122	123	131	111	88	78	102	85	76	73	101	174	209	187	134	108	Diurnal Maximum	
Z - zerospan																								C - Calibration																									





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort McKay South - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	365	51.55	51.55
21 - 40	203	28.67	80.23
41 - 80	108	15.25	95.48
81 - 159	28	3.95	99.44
> 159	3	0.42	99.86

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay South - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	38	4	4	2	3	7	10	43	43	31	50	36	27	25	10	361
21 - 40	11	4	2	0	1	3	7	39	66	23	13	10	8	0	5	6	198
11 - 80	3	0	3	1	0	0	6	14	24	25	8	7	4	2	2	5	104
81 - 159	2	0	0	0	0	0	0	5	3	6	9	1	0	0	2	0	28
> 159	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3
<b>Totals</b>	44	42	9	5	3	6	20	68	136	97	61	69	50	29	34	21	694

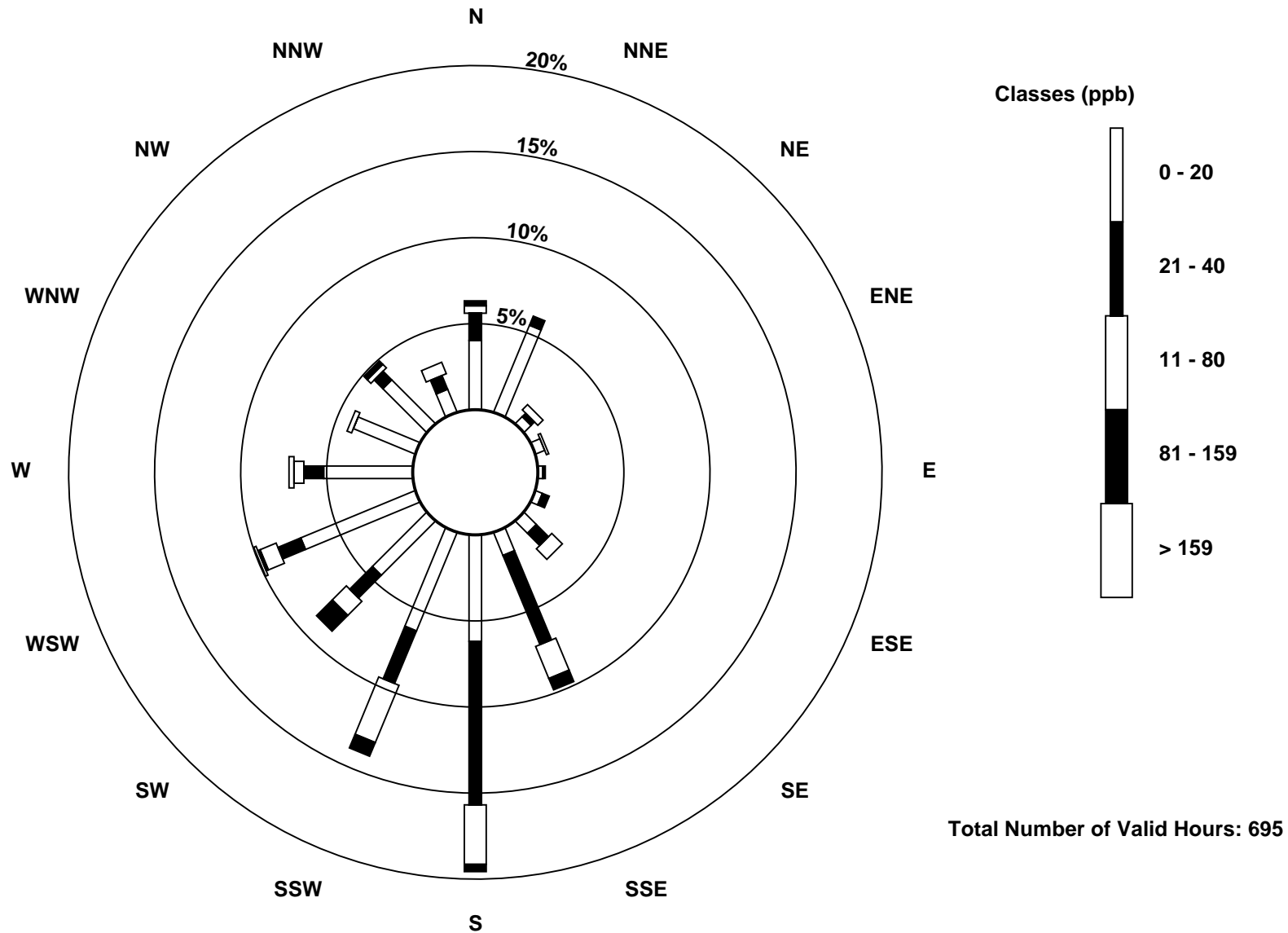
Total Number of Valid Hours: 695

Total Number of Hours: 744

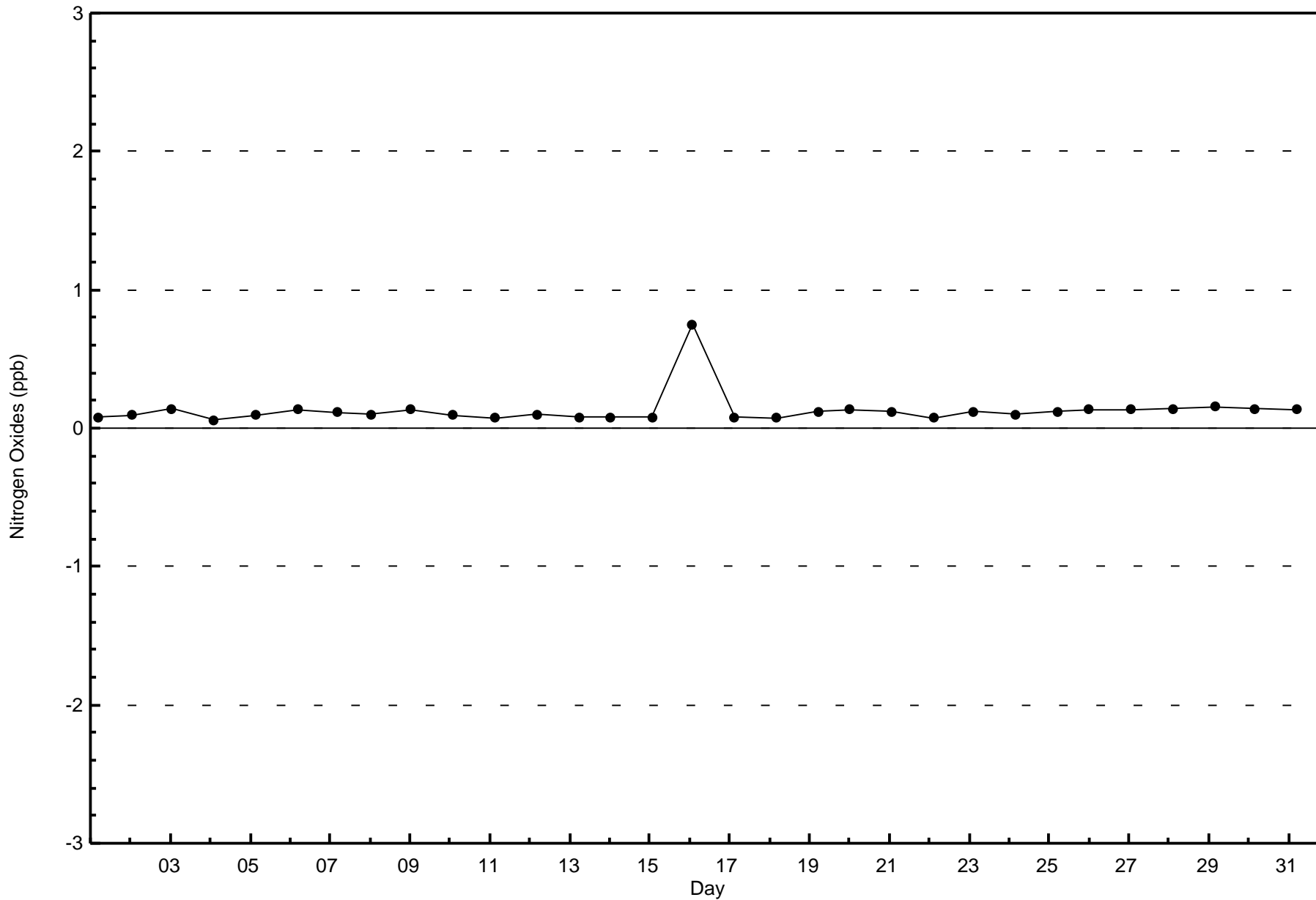


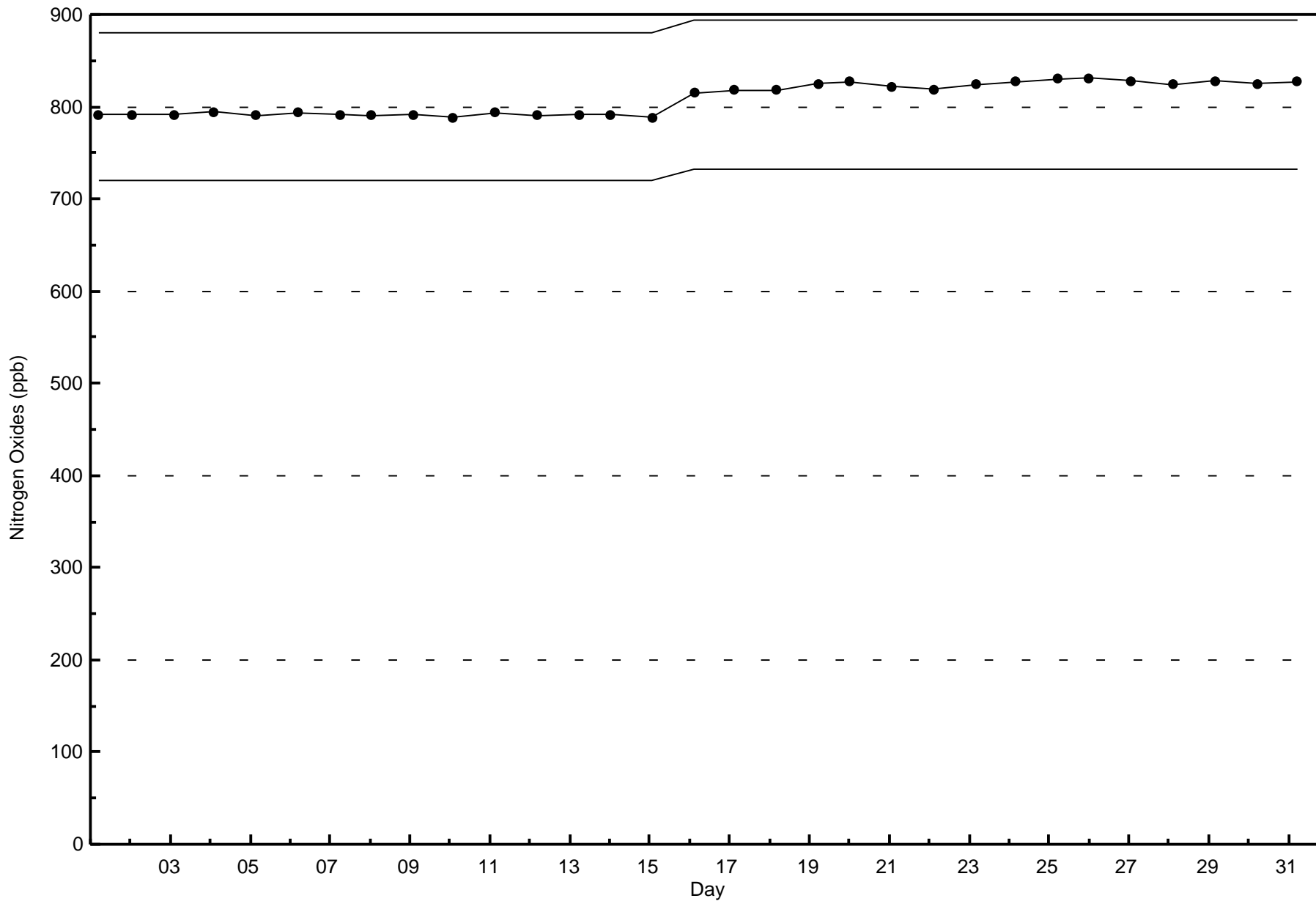
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort McKay South (AMS 13)











Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) - µg/m<sup>3</sup>

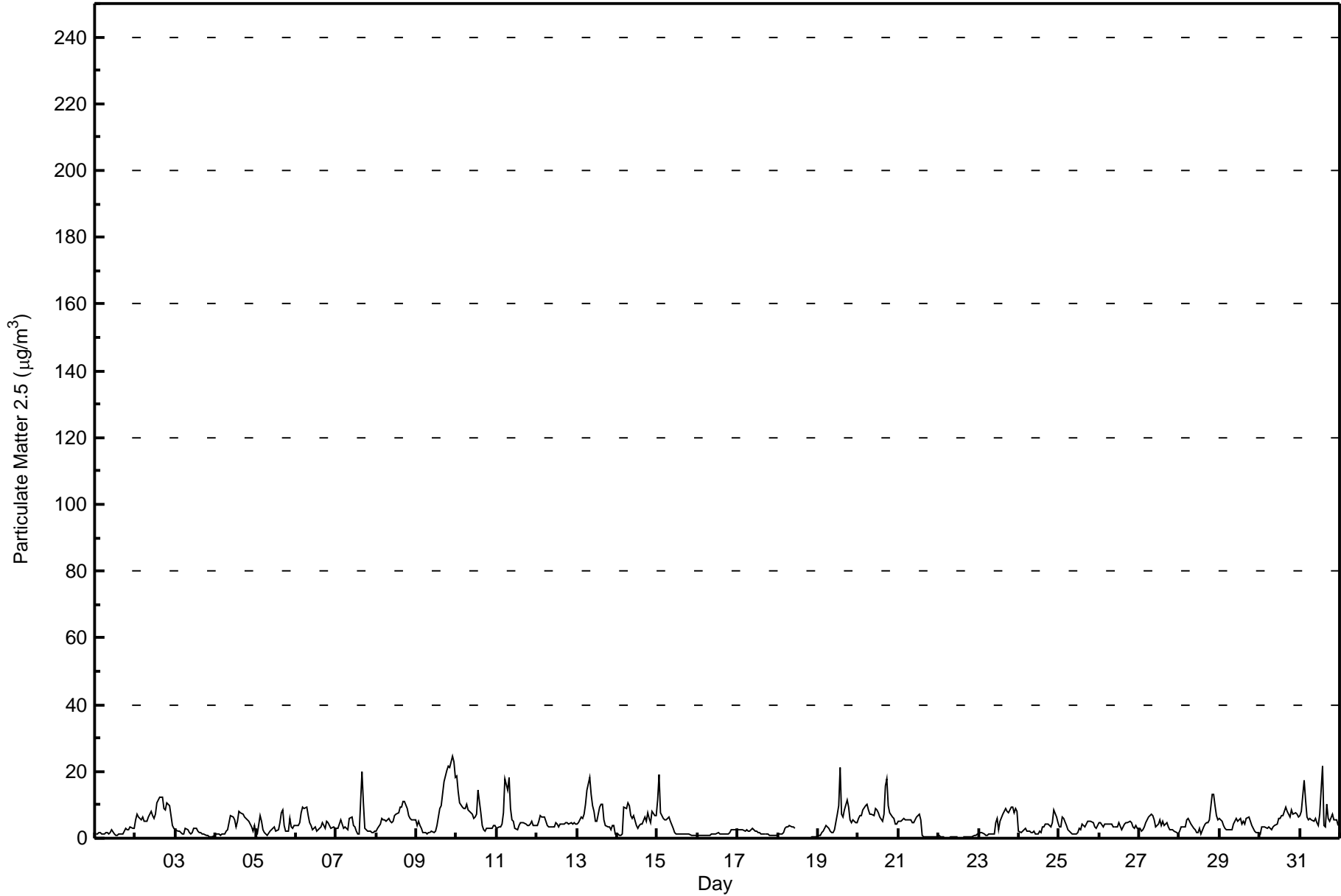
Fort McKay South - December 2017

Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																														
Maximum Value: 24.6 µg/m <sup>3</sup> on Dec 9 22:00		Maximum Daily Average: 9.3 µg/m <sup>3</sup> on Dec 9																																														
Minimum Value: 0.0 µg/m <sup>3</sup> on Dec 18 18:00		Hours of Data: 737																																														
Maximum Diurnal Average: 5.8 µg/m <sup>3</sup> at hour 17		Hours of Missing Data: 7																																														
Monthly Average: 4.53 µg/m <sup>3</sup>		Hours of Calibration: 1																																														
Minimum Daily Average: 0.4 µg/m <sup>3</sup> on Dec 22		Percent Operational Time: 99.2																																														
Minimum Diurnal Average: 3.7 µg/m <sup>3</sup> at hour 1		Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 1.1 Q <sub>1</sub> = 1.9 Median = 3.7 Q <sub>3</sub> = 5.9 P <sub>90</sub> = 8.8 P <sub>99</sub> = 19.6																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	1.2	1.2	1.8	1.6	1.4	1.5	1.7	1.8	1.4	1.7	2.4	1.3	0.8	0.9	1.1	1.2	1.5	2.0	3.1	2.7	2.4	3.3	3.0	2.9	1.8	3.3																						
2-Dec	5.5	7.1	6.4	5.6	6.4	5.1	5.3	5.1	6.2	8.2	6.6	6.0	7.2	10.8	12.1	12.2	12.2	9.1	8.4	10.6	9.7	6.8	3.9	3.0	7.5	12.2																						
3-Dec	2.5	2.3	2.0	1.5	1.1	1.4	2.9	2.6	1.7	1.1	1.5	2.9	2.9	2.2	1.8	1.6	1.1	1.1	0.9	0.6	0.5	0.4	0.5	0.9	1.6	2.9																						
4-Dec	1.1	1.3	1.1	1.0	1.1	1.3	2.2	2.6	4.6	6.9	6.4	5.7	3.3	4.9	8.0	7.8	7.1	6.5	6.1	5.4	4.9	3.4	1.9	3.6	4.1	8.0																						
5-Dec	1.4	1.3	6.6	4.9	2.4	1.7	1.3	1.0	2.1	2.5	3.0	3.2	2.3	2.6	4.5	7.5	8.6	4.0	2.3	2.1	6.0	3.5	3.0	3.8	3.4	8.6																						
6-Dec	3.7	3.8	4.8	7.7	9.5	9.1	9.1	6.8	4.9	4.0	2.6	3.2	2.3	2.4	3.0	3.5	4.5	3.1	4.9	4.7	3.7	3.1	3.4	2.9	4.6	9.5																						
7-Dec	3.1	3.1	4.4	5.5	3.2	3.3	2.8	2.4	6.1	6.2	3.9	3.3	2.1	1.1	1.5	20.1	10.5	2.8	2.5	2.1	2.0	1.8	1.8	2.2	4.1	20.1																						
8-Dec	2.1	2.8	4.3	5.9	5.6	5.7	5.3	5.8	5.2	4.6	4.9	6.8	7.2	7.7	9.2	9.3	10.9	10.9	8.9	6.8	5.8	5.6	5.5	5.4	6.3	10.9																						
9-Dec	4.0	5.0	3.7	2.9	1.8	1.7	1.5	1.5	1.8	2.1	1.9	2.3	4.0	6.5	8.8	9.9	17.1	18.8	20.4	21.4	21.3	24.6	22.8	18.1	9.3	24.6																						
10-Dec	18.8	14.0	10.6	9.2	9.0	8.8	10.2	8.6	7.8	7.3	6.1	6.2	7.2	14.4	7.5	3.9	2.4	2.3	2.8	3.0	3.0	3.2	3.6	3.7	7.2	18.8																						
11-Dec	3.0	3.2	3.2	4.4	7.7	18.0	14.4	18.0	9.0	5.6	5.0	3.2	2.7	3.6	4.6	4.8	4.8	4.4	3.9	3.6	4.0	5.0	4.0	3.7	6.0	18.0																						
12-Dec	4.0	5.1	6.7	6.2	6.5	5.2	3.9	3.6	3.3	3.5	3.4	4.5	4.1	3.6	4.2	4.2	4.4	4.5	4.7	4.1	4.5	4.4	4.6	4.2	4.5	6.7																						
13-Dec	4.2	4.8	6.3	5.9	7.4	10.0	14.4	18.3	13.1	10.0	8.2	5.2	4.9	9.2	10.1	10.4	5.6	3.8	3.5	3.3	2.6	3.7	3.6	1.2	7.1	18.3																						
14-Dec	1.1	0.8	0.9	1.4	9.2	8.9	10.7	9.7	7.0	5.9	7.0	3.7	3.1	3.7	4.1	4.4	6.4	5.1	7.6	6.1	4.5	7.9	7.0	7.0	5.5	10.7																						
15-Dec	11.5	18.9	7.6	6.1	5.4	5.4	5.8	6.2	5.2	2.8	1.8	1.4	1.4	1.1	1.2	1.2	1.3	1.3	1.3	1.1	1.1	1.0	0.9	0.9	3.8	18.9																						
16-Dec	1.0	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.3	1.5	1.3	1.1	1.1	1.4	1.4	1.2	1.8	2.6	2.5	2.6	2.7	1.4	2.7																						
17-Dec	2.5	2.5	2.5	2.7	2.1	2.4	2.1	2.3	2.7	3.1	2.3	1.9	1.7	1.6	1.4	1.3	1.3	1.2	1.1	1.0	1.0	0.9	0.9	1.0	1.8	3.1																						
18-Dec	1.2	1.2	1.1	1.7	2.9	3.2	3.5	3.8	3.6	3.2	2.9	C	UO	UO	UO	0.1	0.0	0.0	0.0	0.1	0.5	0.6	0.4	0.6	1.5	3.8																						
19-Dec	0.7	0.8	1.5	2.0	3.1	3.6	2.9	2.1	1.7	1.5	2.7	7.2	9.6	21.3	7.0	6.2	8.4	11.6	9.1	5.7	4.8	5.3	4.8	4.5	5.4	21.3																						
20-Dec	5.9	6.9	6.9	8.6	9.8	10.1	8.4	7.3	7.3	7.0	8.9	8.4	7.7	6.4	4.9	7.1	15.5	17.8	9.5	7.7	6.4	5.8	4.2	4.4	8.0	17.8																						
21-Dec	5.0	5.0	5.4	5.7	5.7	5.4	5.5	5.4	4.7	4.5	5.7	6.3	7.3	5.5	0.8	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.4	3.4	7.3																						
22-Dec	0.7	0.5	0.4	0.2	0.2	0.2	0.1	0.2	0.4	0.3	0.4	0.6	UO	UO	UO	0.3	0.3	0.3	0.3	0.6	0.4	0.7	1.0	1.1	0.4	1.1																						
23-Dec	1.3	1.5	1.8	1.4	1.0	1.0	1.4	1.4	1.4	1.3	4.8	5.9	2.4	5.1	7.3	8.0	8.7	7.9	7.8	9.2	9.2	7.6	8.9	8.1	4.8	9.2																						
24-Dec	1.9	1.5	2.3	2.7	2.8	2.2	2.3	1.8	1.6	2.2	1.3	1.2	2.3	1.9	3.4	3.3	4.3	4.3	4.0	3.6	4.6	8.5	6.6	4.8	3.1	8.5																						
25-Dec	3.5	3.3	6.4	5.9	3.8	2.6	1.9	1.6	1.4	1.3	1.2	1.8	2.8	2.7	4.1	3.5	4.3	5.1	4.9	5.3	4.5	3.6	3.1	3.6	3.4	6.4																						
26-Dec	4.5	4.8	3.6	4.2	4.3	4.2	4.2	4.2	3.4	3.5	3.2	3.5	4.6	2.7	3.3	4.4	4.7	4.6	5.2	4.5	3.3	3.1	4.0	3.1	4.0	5.2																						
27-Dec	3.2	2.0	2.6	3.2	4.8	6.2	6.6	7.1	6.7	5.4	3.5	4.2	5.5	3.9	4.9	3.8	4.8	3.2	2.4	2.4	2.7	2.1	1.5	1.3	3.9	7.1																						
28-Dec	2.2	3.3	3.3	3.5	5.3	5.9	4.9	4.1	3.2	2.6	1.7	1.8	3.0	1.1	3.4	4.2	4.6	4.7	5.5	13.0	13.0	9.8	6.9	5.5	4.9	13.0																						
29-Dec	6.1	5.0	3.9	2.9	2.5	2.4	2.4	2.6	4.1	5.3	5.7	5.2	5.8	4.3	5.0	4.3	6.1	6.3	5.2	3.6	2.8	1.9	1.9	1.5	4.0	6.3																						
30-Dec	1.5	3.4	3.3	3.2	2.8	3.2	2.8	2.7	3.2	3.8	4.1	5.8	6.1	6.7	6.8	9.3	8.0	7.2	6.2	8.4	7.4	7.6	7.3	6.4	5.3	9.3																						
31-Dec	6.7	8.1	17.6	11.2	6.5	5.5	5.9	5.5	5.3	6.1	4.5	3.7	7.2	21.6	3.8	3.3	10.2	6.0	5.0	7.4	5.3	5.3	5.7	4.0	7.1	21.6																						
																								3.7	4.0	4.3	4.2	4.4	4.7	4.8	4.8	4.2	4.0	3.8	3.9	4.2	5.5	4.8	5.2	5.8	5.2	4.8	4.9	4.7	4.6	4.2	3.8	Diurnal Average
																								18.8	18.9	17.6	11.2	9.8	18.0	14.4	18.3	13.1	10.0	8.9	8.4	9.6	21.6	12.1	20.1	17.1	18.8	20.4	21.4	21.3	24.6	22.8	18.1	Diurnal Maximum
C - Calibration																																																
UO - Unstable Operation																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort McKay South - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	456	61.87	61.87
6 - 15	195	26.46	88.33
16 - 25	19	2.58	90.91
26 - 80	0	0.00	90.91
> 81.0	0	0.00	90.91

Total Number of Valid Hours: 737

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Fort McKay South - December 2017**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	27	24	5	4	1	2	13	47	82	65	53	49	35	14	15	12	448
6 - 15	10	8	4	0	1	3	7	21	57	34	9	15	7	4	4	7	191
16 - 25	0	0	0	0	0	0	0	2	7	2	2	2	0	0	0	2	17
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
<b>Totals</b>	37	32	9	4	2	5	20	70	146	101	64	66	42	18	19	21	656

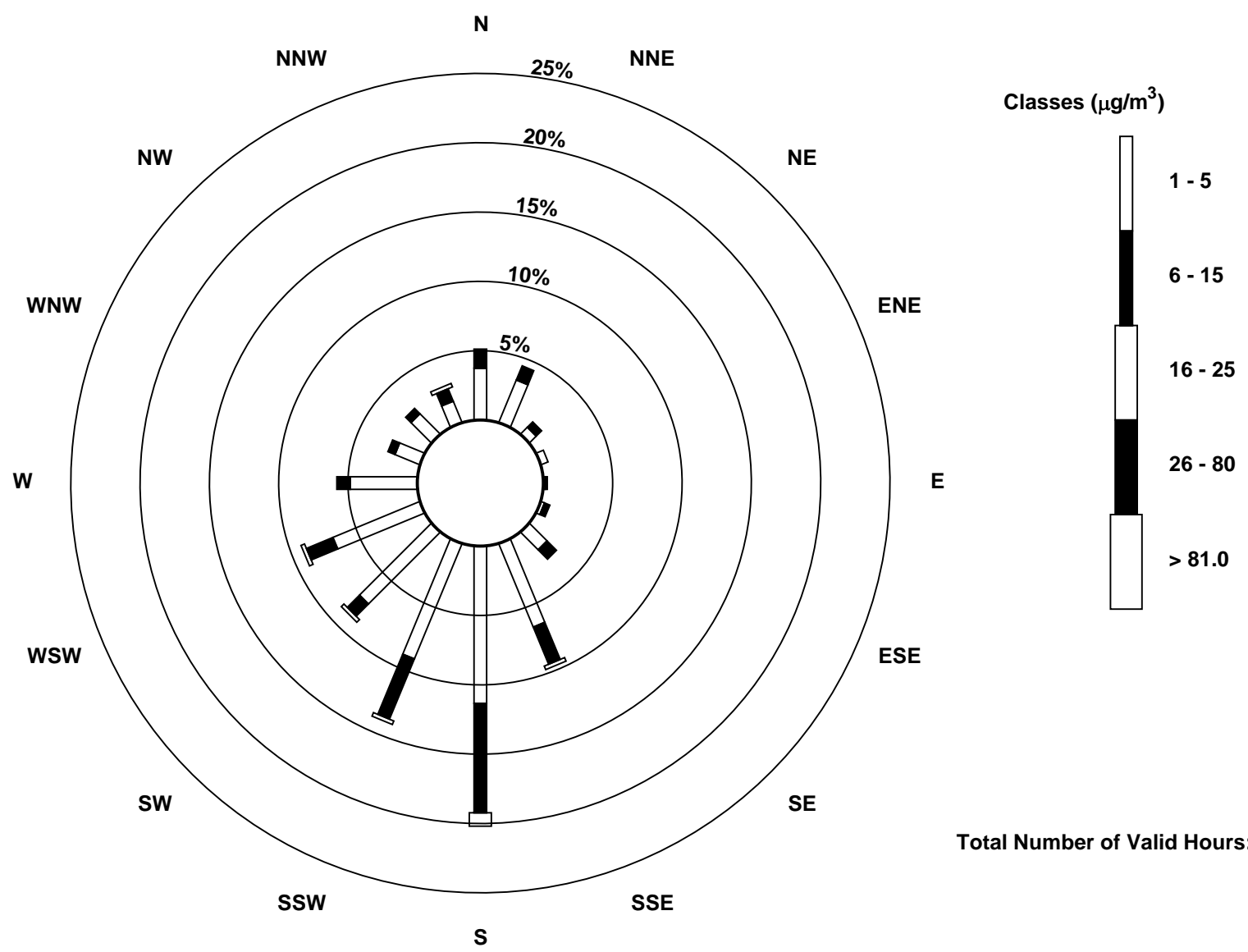
Total Number of Valid Hours: 723

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort McKay South (AMS 13)





**Wood Buffalo Environmental Association**

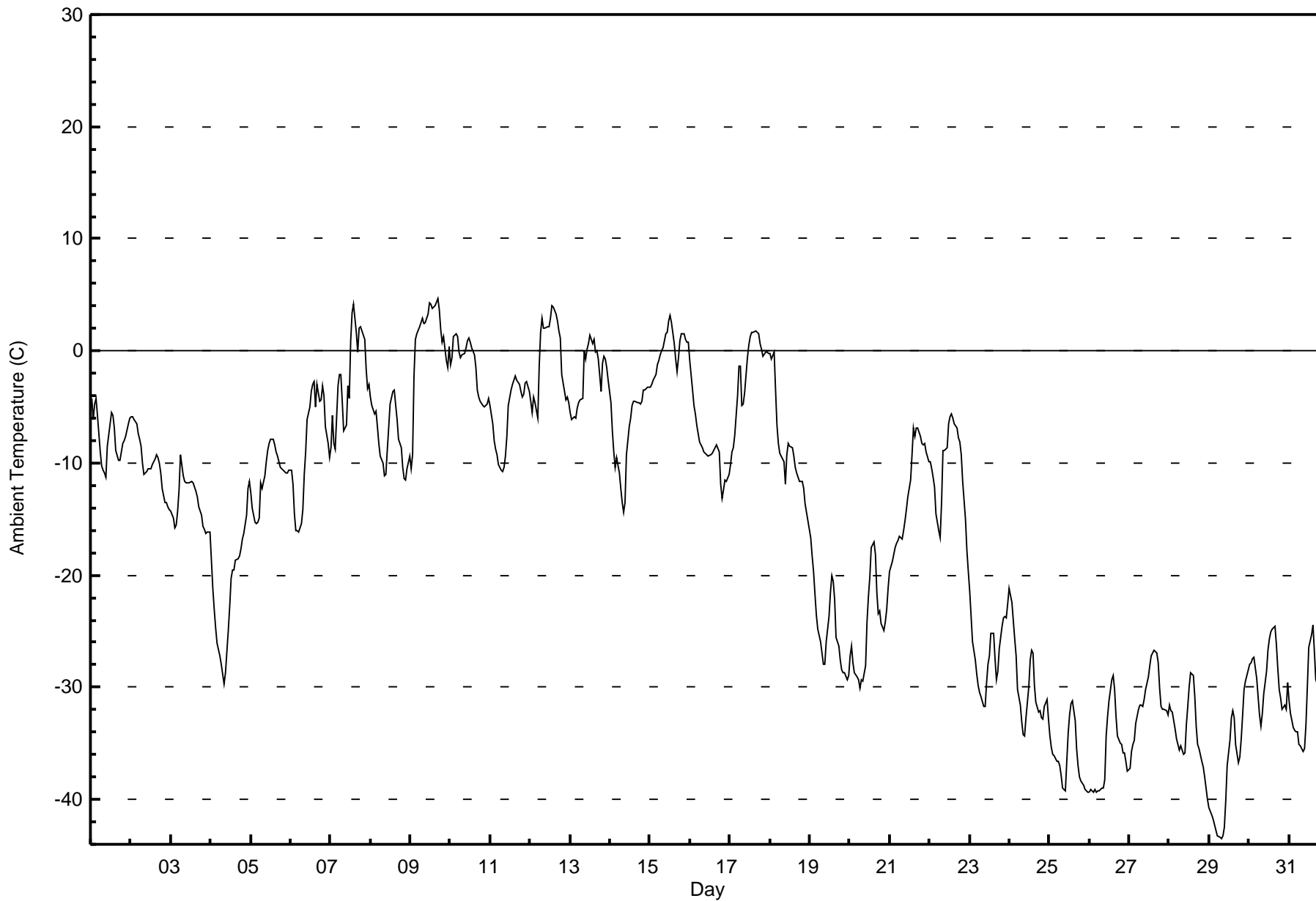
**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**Fort McKay South - December 2017**

Maximum Value: 4.7 C on Dec 9 17:00		Maximum Daily Average: 1.1 C on Dec 9		Hours in Service: 744																						
Minimum Value: -43.5 C on Dec 29 08:00		Minimum Daily Average: -37.4 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -12.0 C at hour 15		Minimum Diurnal Average: -17.9 C at hour 8		Hours of Missing Data: 0																						
Monthly Average: -15.54 C		Percentiles: P <sub>1</sub> = -41.8 P <sub>10</sub> = -34.3 Q <sub>1</sub> = -28.5 Median = -11.3 Q <sub>3</sub> = -4.7 P <sub>90</sub> = 0.1 P <sub>99</sub> = 3.8		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.2	-6.2	-4.7	-4.2	-5.7	-9.0	-10.2	-10.7	-10.9	-11.3	-8.5	-6.4	-5.5	-5.8	-6.9	-8.8	-9.8	-9.8	-9.1	-8.2	-7.9	-7.6	-6.5	-5.9	-7.7	-4.2
2-Dec	-5.9	-5.9	-6.2	-6.5	-7.4	-7.9	-8.5	-10.0	-11.1	-10.8	-10.5	-10.5	-10.5	-10.2	-9.6	-9.2	-9.5	-10.0	-10.9	-12.3	-13.6	-13.5	-13.9	-14.2	-9.9	-5.9
3-Dec	-14.2	-14.9	-15.8	-15.5	-14.3	-12.4	-9.3	-11.1	-11.6	-11.8	-11.7	-11.7	-11.6	-11.7	-12.1	-12.5	-13.1	-13.9	-14.7	-15.6	-16.0	-16.3	-16.1	-16.2	-13.5	-9.3
4-Dec	-18.6	-21.2	-23.1	-24.6	-26.1	-27.2	-27.9	-28.8	-29.7	-28.6	-24.9	-22.8	-20.2	-19.6	-19.6	-18.7	-18.5	-18.2	-17.6	-16.8	-16.3	-14.6	-12.3	-11.6	-21.1	-11.6
5-Dec	-12.7	-14.1	-15.3	-15.4	-15.3	-14.9	-11.7	-12.3	-11.2	-9.9	-8.8	-8.2	-7.8	-7.9	-8.4	-9.0	-9.4	-9.9	-10.4	-10.7	-10.8	-10.9	-10.9	-10.6	-11.1	-7.8
6-Dec	-10.7	-11.9	-14.5	-16.1	-16.0	-16.2	-15.4	-14.1	-11.0	-9.0	-6.1	-5.0	-3.6	-2.9	-2.7	-5.0	-3.0	-4.5	-4.3	-3.1	-4.0	-6.7	-8.3	-9.5	-8.5	-2.7
7-Dec	-8.6	-5.7	-8.3	-8.7	-3.1	-2.1	-2.1	-4.5	-7.1	-6.6	-3.2	-4.2	0.9	3.5	4.1	1.7	-0.1	2.0	2.1	1.8	1.0	-1.6	-3.4	-3.0	-2.3	4.1
8-Dec	-4.1	-4.9	-5.7	-5.4	-6.8	-8.2	-9.3	-10.1	-11.1	-11.1	-8.9	-6.9	-4.8	-3.6	-3.5	-4.8	-6.1	-7.8	-8.7	-10.4	-11.4	-11.5	-10.5	-9.4	-7.7	-3.5
9-Dec	-10.5	-9.2	-2.2	1.0	1.5	2.1	2.5	3.0	2.4	2.6	3.2	4.2	4.1	3.8	3.9	4.0	4.7	3.7	2.0	0.8	1.3	-0.9	-1.5	0.4	1.1	4.7
10-Dec	-1.2	-0.5	1.3	1.5	1.2	-0.1	-0.6	-0.3	-0.2	0.3	0.9	1.2	0.8	0.3	-0.4	-1.4	-3.5	-4.1	-4.5	-4.8	-5.0	-4.8	-4.7	-4.3	-1.4	1.5
11-Dec	-4.8	-6.5	-8.1	-8.8	-9.3	-10.1	-10.6	-10.8	-10.4	-9.4	-7.6	-4.9	-3.4	-3.0	-2.6	-2.2	-2.6	-3.0	-3.7	-4.1	-3.8	-2.8	-2.8	-3.6	-5.8	-2.2
12-Dec	-4.5	-5.5	-4.1	-4.6	-6.0	-1.3	1.7	2.9	2.0	2.0	2.2	2.2	2.9	4.0	3.9	3.3	2.6	1.8	1.1	-2.1	-3.6	-4.4	-4.1	-4.6	-0.5	4.0
13-Dec	-5.5	-6.1	-5.9	-6.0	-5.1	-4.7	-4.4	-4.3	0.0	-0.7	0.2	0.7	1.4	0.7	1.0	-0.1	0.0	-0.8	-3.6	-1.1	-0.5	-0.8	-1.5	-2.6	-2.1	1.4
14-Dec	-4.6	-7.1	-9.0	-10.4	-9.5	-10.9	-12.2	-13.5	-14.4	-13.5	-9.3	-6.8	-6.1	-4.9	-4.4	-4.5	-4.6	-4.6	-4.8	-4.5	-3.5	-3.5	-3.2	-3.2	-7.2	-3.2
15-Dec	-3.2	-3.0	-2.7	-2.2	-1.2	-0.8	-0.3	0.0	0.3	1.5	1.7	2.7	3.2	2.6	0.7	-0.8	-1.9	-0.6	0.9	1.5	1.5	1.1	0.8	0.7	0.1	3.2
16-Dec	-0.9	-3.5	-4.9	-5.6	-6.6	-7.4	-8.2	-8.6	-8.9	-9.2	-9.3	-9.4	-9.3	-9.1	-8.8	-8.7	-8.4	-9.0	-11.8	-13.2	-12.4	-11.6	-11.7	-11.1	-8.6	-0.9
17-Dec	-10.2	-8.9	-8.7	-7.6	-4.0	-1.4	-1.4	-4.8	-4.7	-3.7	-0.6	0.6	1.3	1.6	1.7	1.8	1.7	1.5	0.7	0.1	-0.5	-0.1	-0.1	-0.2	-1.9	1.8
18-Dec	-0.3	-0.8	-0.1	-3.5	-6.7	-8.3	-9.1	-9.4	-9.9	-11.8	-9.2	-8.2	-8.5	-8.7	-9.4	-10.4	-10.9	-11.3	-11.6	-11.6	-12.2	-13.7	-14.5	-15.2	-9.0	-0.1
19-Dec	-16.6	-18.3	-19.6	-21.7	-23.6	-24.8	-25.9	-26.9	-28.0	-27.9	-25.9	-23.7	-21.5	-20.0	-20.5	-22.2	-25.5	-26.4	-27.6	-28.4	-28.6	-28.7	-29.3	-28.9	-24.6	-16.6
20-Dec	-27.2	-26.3	-27.8	-28.7	-29.1	-29.3	-30.1	-29.3	-29.4	-28.1	-24.2	-21.9	-20.1	-17.6	-17.0	-18.2	-21.6	-23.4	-23.2	-24.3	-24.9	-24.1	-23.1	-21.2	-24.6	-17.0
21-Dec	-19.7	-18.8	-18.2	-17.6	-17.1	-16.9	-16.5	-16.8	-16.1	-15.1	-14.2	-13.1	-11.5	-9.3	-6.9	-7.6	-6.8	-6.9	-7.6	-8.2	-8.4	-8.3	-9.0	-9.9	-12.5	-6.8
22-Dec	-9.9	-10.5	-11.2	-12.1	-14.5	-16.1	-16.7	-13.5	-8.9	-8.9	-8.6	-6.5	-5.9	-5.6	-6.0	-6.4	-6.9	-7.7	-8.1	-9.2	-11.6	-15.1	-17.8	-19.6	-10.7	-5.6
23-Dec	-21.5	-23.7	-25.9	-27.6	-28.8	-29.9	-30.5	-30.9	-31.7	-31.8	-29.6	-27.9	-27.2	-25.2	-25.1	-27.5	-29.3	-28.6	-26.5	-24.5	-23.9	-23.7	-23.8	-22.5	-27.0	-21.5
24-Dec	-21.2	-22.4	-24.0	-25.7	-27.2	-30.1	-31.6	-33.1	-34.2	-34.3	-32.7	-29.9	-27.6	-26.7	-26.9	-29.8	-31.4	-32.2	-32.1	-32.7	-32.9	-31.7	-31.1	-32.9	-29.8	-21.2
25-Dec	-34.3	-35.4	-35.9	-36.1	-36.7	-36.6	-37.0	-37.9	-39.0	-39.2	-36.6	-34.1	-32.4	-31.5	-31.2	-33.0	-35.4	-37.0	-37.9	-38.3	-38.8	-39.1	-39.2	-39.4	-36.3	-31.2
26-Dec	-39.4	-39.0	-39.3	-39.1	-39.4	-39.2	-39.2	-39.0	-39.0	-38.2	-34.4	-32.6	-31.2	-29.3	-28.9	-30.2	-32.6	-34.3	-35.0	-35.1	-35.8	-35.8	-36.6	-37.4	-35.8	-28.9
27-Dec	-37.2	-35.7	-35.1	-34.8	-33.2	-32.0	-31.5	-31.5	-31.7	-31.1	-30.1	-29.1	-28.1	-27.2	-26.9	-26.6	-26.9	-27.9	-30.1	-31.7	-32.0	-32.0	-32.0	-32.5	-31.1	-26.6
28-Dec	-31.6	-32.1	-32.2	-33.7	-34.5	-35.0	-35.6	-35.2	-36.0	-35.9	-33.4	-31.7	-29.9	-28.6	-29.0	-30.9	-33.5	-35.0	-35.5	-36.6	-37.1	-38.0	-38.9	-40.0	-34.2	-28.6
29-Dec	-40.7	-41.3	-41.8	-42.3	-42.8	-43.3	-43.4	-43.5	-43.3	-42.6	-40.1	-37.0	-34.7	-32.7	-32.1	-32.7	-35.1	-36.7	-36.2	-34.6	-32.5	-30.2	-29.5	-28.4	-37.4	-28.4
30-Dec	-28.0	-27.8	-27.5	-27.3	-29.2	-30.8	-32.4	-33.4	-32.3	-30.5	-28.6	-26.7	-25.7	-25.1	-24.8	-24.6	-26.1	-28.3	-30.2	-30.9	-32.0	-31.6	-31.9	-29.5	-29.0	-24.6
31-Dec	-31.1	-32.3	-33.6	-33.9	-34.0	-34.0	-35.1	-35.3	-35.7	-35.5	-33.4	-29.9	-26.5	-25.3	-24.5	-26.8	-29.3	-29.7	-30.6	-32.0	-32.4	-32.5	-33.4	-34.4	-31.7	-24.5
	-15.6	-16.1	-16.5	-16.9	-17.1	-17.4	-17.5	-17.9	-17.8	-17.4	-15.6	-14.1	-12.9	-12.1	-12.0	-13.0	-14.0	-14.6	-15.1	-15.5	-15.8	-16.0	-16.2	-16.2		Diurnal Average
	-0.3	-0.5	1.3	1.5	1.5	2.1	2.5	3.0	2.4	2.6	3.2	4.2	4.1	4.0	4.1	4.0	4.7	3.7	2.1	1.8	1.5	1.1	0.8	0.7		Diurnal Maximum







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Fort McKay South - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	269	36.16	36.16
-20 - 0	397	53.36	89.52
0 - 10	78	10.48	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

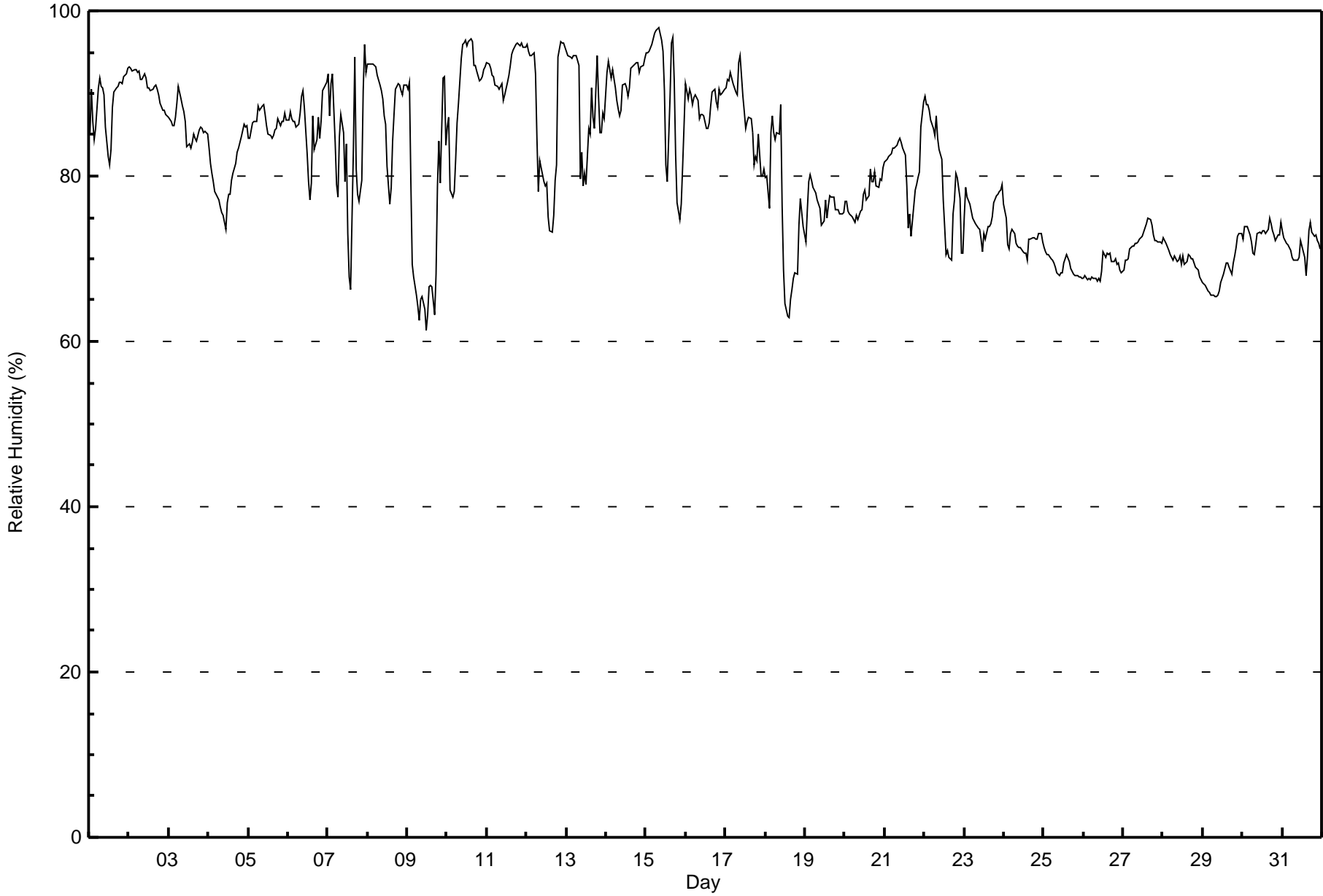
**Fort McKay South - December 2017**

Maximum Value: 98 % on Dec 15 09:00      Maximum Daily Average: 93.2 % on Dec 11																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																																																																			
Minimum Value: 61 % on Dec 9 12:00      Minimum Daily Average: 68.2 % on Dec 29 Maximum Diurnal Average: 83.5 % at hour 2      Minimum Diurnal Average: 77.5 % at hour 14 Monthly Average: 81.0 %      Percentiles: P <sub>1</sub> = 64 P <sub>10</sub> = 69 Q <sub>1</sub> = 73 Median = 81 O <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 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-Dec	85	91	87	84	86	91	92	91	91	90	86	82	81	83	88	90	91	91	91	91	91	92	92	93	88.8	93																																																																																												
2-Dec	93	93	93	93	93	93	93	92	92	92	92	91	91	90	91	91	91	91	90	89	88	88	87	87	90.9	93																																																																																												
3-Dec	87	87	86	86	87	89	91	89	89	88	87	84	84	83	84	85	85	84	86	86	86	85	85	85	86.1	91																																																																																												
4-Dec	83	82	80	79	78	77	77	76	76	75	74	77	78	79	80	82	83	83	84	85	86	86	86	86	80.2	86																																																																																												
5-Dec	85	85	86	87	87	87	88	88	88	89	87	86	85	85	84	85	86	86	87	86	87	87	88	87	86.4	89																																																																																												
6-Dec	87	88	87	87	87	86	86	88	90	90	88	83	79	77	79	87	83	84	87	85	87	90	91	91	86.1	91																																																																																												
7-Dec	92	87	91	92	84	79	77	85	87	85	79	84	73	68	66	83	94	81	78	77	79	90	96	93	83.5	96																																																																																												
8-Dec	94	94	94	94	93	93	92	91	90	89	87	86	81	77	79	84	87	90	91	91	90	90	91	91	89.2	94																																																																																												
9-Dec	90	91	80	69	68	66	64	63	65	65	64	61	63	67	67	67	63	68	79	84	79	92	92	84	72.9	92																																																																																												
10-Dec	86	87	78	77	78	82	86	89	94	96	96	96	96	96	97	96	93	93	93	91	92	92	93	93	90.5	97																																																																																												
11-Dec	94	94	93	92	92	91	91	91	91	91	89	90	91	92	93	95	95	96	96	96	96	96	96	96	93.2	96																																																																																												
12-Dec	96	95	95	95	95	92	85	78	82	81	79	79	79	75	73	73	75	80	81	94	96	96	96	96	86.1	96																																																																																												
13-Dec	95	95	94	94	95	95	95	93	80	83	79	80	79	86	85	91	87	86	95	89	85	85	88	87	88.3	95																																																																																												
14-Dec	93	94	93	92	93	91	89	88	87	88	91	91	91	90	91	93	93	94	94	94	93	93	93	94	91.7	94																																																																																												
15-Dec	95	95	95	96	97	97	98	98	98	96	95	90	81	79	90	96	97	92	83	77	75	77	81	86	90.1	98																																																																																												
16-Dec	91	89	90	90	89	89	90	89	87	87	87	87	86	86	86	88	90	90	89	88	90	90	90	91	88.8	91																																																																																												
17-Dec	91	92	92	92	91	91	90	90	94	95	90	88	86	87	87	87	85	81	82	82	85	80	80	81	87.4	95																																																																																												
18-Dec	80	80	76	85	87	85	84	85	85	89	76	69	65	63	63	65	66	68	68	68	74	77	76	74	75.4	89																																																																																												
19-Dec	72	76	79	80	80	79	78	77	77	76	74	75	77	75	76	78	78	77	76	76	76	75	75	76	76.5	80																																																																																												
20-Dec	77	77	76	75	75	75	74	75	75	76	76	78	78	77	78	81	79	79	81	79	79	80	79	81	77.5	81																																																																																												
21-Dec	82	82	82	82	83	83	83	84	84	85	84	83	82	79	74	75	73	75	78	79	80	80	86	89	81.2	89																																																																																												
22-Dec	90	89	89	88	87	86	85	87	85	83	82	77	74	71	71	70	70	75	77	80	80	77	71	71	79.7	90																																																																																												
23-Dec	75	79	78	77	76	75	75	74	74	74	72	71	73	72	74	74	74	75	77	78	78	78	79	79	75.3	79																																																																																												
24-Dec	77	75	72	71	73	74	73	72	72	71	71	71	71	71	70	72	72	73	73	72	72	73	72	72	72.3	77																																																																																												
25-Dec	71	71	71	71	70	70	70	69	68	68	68	68	69	70	71	70	69	68	68	68	68	68	68	68	69.1	71																																																																																												
26-Dec	68	68	67	68	67	68	68	68	67	68	67	68	71	70	71	71	71	70	70	70	69	69	69	68	68.7	71																																																																																												
27-Dec	69	70	70	70	71	72	72	72	72	72	72	73	73	74	74	75	75	74	73	72	72	72	72	72	72.1	75																																																																																												
28-Dec	73	72	72	71	71	70	70	70	70	70	69	70	69	70	71	70	70	70	69	69	69	69	68	67	70.0	73																																																																																												
29-Dec	67	67	67	66	66	66	66	65	65	66	66	67	68	69	69	69	69	68	69	70	71	73	73	73	68.2	73																																																																																												
30-Dec	72	74	74	74	73	72	71	70	72	73	73	73	73	73	73	74	75	74	73	73	72	73	74	74	73.0	75																																																																																												
31-Dec	73	72	72	72	71	71	70	70	70	70	70	72	72	70	68	70	73	74	73	73	73	72	72	71	71.5	74																																																																																												
																			83.3				83.5				82.5				82.2				82.0				81.7				81.3				81.2				81.1				81.3				79.8				79.0				78.1				77.5				78.1				80.2				80.4				80.4				81.0				81.0				81.2				82.1				82.5				82.4				Diurnal Average			
																			96				95				95				96				97				97				98				98				98				98				96				96				96				97				96				96				97				96				96				96				96				96				96				Diurnal Maximum							



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Fort McKay South - December 2017**





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Fort McKay South - December 2017

Maximum Speed: 23 km/h on Dec 24 03:00	Maximum Daily Speed Average: 8.8 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 28 12:00	Minimum Daily Speed Average: 0.6 km/h on Dec 2	Hours of Data: 730
Maximum Diurnal Speed Average: 2.6 km/h at hour 10	Minimum Diurnal Speed Average: 0.8 km/h at hour 1	Hours of Missing Data: 14
Monthly Average Velocity: 1.6 km/h 229.4 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 4 Q <sub>3</sub> = 7 P <sub>90</sub> = 9 P <sub>99</sub> = 18	Percent Operational Time: 98.1

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW5	SSW4	SW7	SW6	SSW3	SSE2	SE1	SSE2	SSW2	SSE1	SSE6	SSE9	S8	S4	SW2	SSW3	S4	SSW3	SW2	W1	S4	S5	S4	ENE1	S3.3	SSE9
2-Dec	NNE2	N2	NE1	NW2	N2	NNW2	N3	N4	N4	N4	NNE3	NNE3	SE3	SE4	SE3	S3	S3	W1	WSW2	W1	W1	WSW1	SW1	S0	N0.6	N4
3-Dec	NW1	SW2	NNW1	SSW2	SW1	W3	W1	NNW8	N10	N8	N7	N9	N7	N6	N5	N5	NNE6	NNE5	NNE3	WNW2	NW2	WSW2	NNE2	N3	N3.4	N10
4-Dec	NNW2	W1	SW2	WSW3	WSW3	SW2	WSW2	WSW2	SSW3	SSW3	S4	SSE6	S7	SSE5	SSE6	S3	NE1	N1	NNW2	NW1	SSW0	SSE7	S13	SSW8	S2.7	S13
5-Dec	SW8	SW4	S6	S6	S5	NW2	NW3	NNE1	N7	N6	N5	N8	N7	NNE8	NNE10	NNE10	NNE8	NNE8	NNE7	NNE6	NNE3	NNE1	SSE2	SSE6	N2.7	NNE10
6-Dec	SSE6	S3	SSW3	SSW5	SSW4	SSW4	S4	SSW5	S6	S7	S8	SSE10	S11	SSE7	SSW5	SSE5	SW8	SSE7	SW8	WSW10	SW8	SSW6	S5	SSE6	S5.7	S11
7-Dec	SSW7	S6	SSE6	S5	WSW6	W6	WSW3	S5	SSE7	S3	SSW5	SSE2	WNW5	W14	W9	NNW3	WNW3	W8	W9	W7	WNW7	WSW2	SW4	SW6	WSW4.1	W14
8-Dec	S5	S6	SSE3	S4	S2	SSW3	NW1	WSW2	S3	SSW3	S4	SSE6	SSE9	SSE9	S9	S8	S8	S8	S3	SSW4	SSW3	SSW5	S5	S4	S4.6	S9
9-Dec	S5	S9	WSW9	W11	W14	W18	W18	WSW15	WSW11	WSW19	WSW18	WSW9	WSW5	WSW9	WSW11	SW8	WSW8	SSW5	S4	SSW6	NNW3	SW2	S5	SW8	WSW8.5	WSW19
10-Dec	S5	WSW8	WSW10	W12	WSW8	S5	SSE4	NE1	E1	S2	NW3	NW6	NNW11	NNW9	NNE8	NNE9	NE9	NNE6	NNE6	NE4	NE2	ENE2	SE2	S3	NW1.6	W12
11-Dec	NW1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	S6	S4	SSW3	SSW2	S5	S4	S6	S6	S3	----	S6
12-Dec	N1	SSW5	S5	S5	S7	WSW6	W15	W10	W9	W13	W15	NW6	WSW5	WSW7	W10	NW12	NW10	WNW9	WNW6	SW4	SW4	SSW3	SW3	SSW2	W5.5	WSW15
13-Dec	SSE4	S4	SSE3	S3	S5	S5	SSE4	WSW5	WNW6	W9	WSW3	WNW6	N8	NNW9	NNE2	SSW3	WNW5	WNW4	SW3	W7	WNW6	WNW5	NE4	ENE2	W2.0	W9
14-Dec	SW1	WSW3	SW4	SW2	SW2	SSW1	SW1	SW3	SW3	SSW4	S6	SSE5	SSE6	SSE6	SSE1	N2	WNW2	NNW2	SSE4	SW4	SW2	S3	SSW3	N2	SSW2.0	SSE6
15-Dec	NNW3	S4	SE2	S4	SE1	SSE5	S5	SSE5	SSW4	WSW7	S6	WSW6	WNW6	WNW5	SSW4	SSW6	S4	SW5	SW7	SW7	W7	WSW5	WSW6	WSW10	SW3.8	WSW10
16-Dec	N11	NNE16	NNE14	NNE12	NNE12	NNE10	NNE8	NNE6	ENE3	ESE3	ESE4	SE5	SE4	SE2	E2	SE1	S3	NNE1	W2	SW3	SSW4	S5	S3	SSW4	NNE2.7	NNE16
17-Dec	SW3	WSW2	SSW3	S4	S9	S8	S7	N4	SSE3	SSW2	WSW10	WSW12	WSW11	WSW10	WSW9	WSW7	W8	WNW8	WNW7	WNW7	W4	W6	W6	W8	WSW5.2	WSW12
18-Dec	W7	W7	W7	N17	NNE17	NNE15	NNE12	NNE9	N8	SW1	NW11	NW13	NW18	NW16	NW17	NW10	NW8	WNW8	WNW9	WNW9	N10	N12	N9	NNE9	NNW8.8	NW18
19-Dec	N9	N6	NNE4	NNW2	W2	WSW3	WSW3	SW2	SW2	SW2	S1	SSE5	SSE7	SSE8	SSE8	SSW6	SSW4	SSW2	SSW3	SSW4	SSW4	SW3	S5	S5	SSW1.9	N9
20-Dec	S4	SSW3	SSW4	SSW4	S3	S4	SSW4	SSW5	S4	S5	SSE7	SSE8	SSE11	S14	SSE10	S8	S6	S5	S5	S5	S7	S6	S4	S4	S5.6	SSE14
21-Dec	S4	S2	SSW1	S3	NE1	NNW1	SSW1	SW1	SSW2	S2	ESE1	ESE1	SSE4	WNW2	NW7	WNW7	W8	WNW7	W7	WNW6	W7	W6	NW2	ESE2	W2.1	W8
22-Dec	E2	ENE2	NNE3	SSW2	NW2	NW0	S2	WSW7	WSW6	WSW6	NNW3	WNW6	WNW8	NW8	NW8	NW9	WNW6	W4	NW4	N14	NNE16	NNE19	N17	N11	NNW4.5	NNE19
23-Dec	N8	NNW4	W2	WSW3	WSW1	WSW2	SW1	NW1	NW1	NNW2	N2	ESE2	NNE3	SE4	N4	SW3	SW2	SSW3	SSW3	SSW3	SSW1	NW1	N6	N9	NW1.0	N9
24-Dec	NNE17	NNE20	N23	N15	NNW5	W3	WSW2	WSW3	WSW2	WSW3	SW2	SSE2	SE5	SSE8	SE4	SW2	SW3	W1	WSW2	W2	NW2	WSW2	NNW1	WNW2	N2.3	N23
25-Dec	NNW2	N2	N3	NNW3	NW4	WSW2	W3	WSW2	SW1	SSW2	S0	SE3	SSE7	SSE9	SSE7	S3	SSW2	SSW2	SSW2	SSW2	SW2	SW3	SW3	SW2	SSW1.4	SSE9
26-Dec	SSW3	SW2	SW2	SSW2	SSW3	SSW3	SSW2	SW2	SSW2	SSW3	S4	SSE6	SSE6	SSE8	SSE7	S3	SSW1	SSW2	S3	SSW3	WSW2	WSW2	WSW3	SW3	S2.8	SSE8
27-Dec	SSW3	SSW2	S3	S4	S4	S4	SSW2	SSW2	S4	S5	SSE4	SSE7	SE7	SE7	SSE7	SSE5	S3	S3	SW2	W1	WSW1	SSW3	S3	S3	S3.4	SE7
28-Dec	S4	S3	SSW1	NNW2	WSW2	WSW2	WSW1	W1	SSW1	SSW2	SSW1	SSE0	NE3	N3	NNE4	WSW0	WSW3	NW2	W2	WSW3	WSW1	WSW1	WSW2	W1	WSW0.9	SSW4
29-Dec	W1	W1	WSW1	S1	SSW1	SSW1	S2	SW1	SW2	SW2	S5	SSE3	SSE7	SSE8	SSE7	S6	S4	SSW4	SW2	S4	S5	SSE5	S3	S5	S3.0	SSE8
30-Dec	S3	SSE4	SSE4	SSE4	S3	SSW3	SW2	SW2	SW2	SSW2	S4	SE5	SE7	SE8	SSE7	S5	S2	SSW4	SSW4	S3	S5	S4	S7	S9	S3.9	S9
31-Dec	S7	S5	S5	SSW5	S4	S3	S4	S2	SSW1	SW2	S5	S5	S8	SSE7	S6	S7	S7	SSW5	SSW4	S5	S5	SSW1	S4	S6	S4.6	S8

SW0.8 SW1.0SW1.1WSW1.3WSW1.6 SW1.9WSW1.9WSW1.7WSW1.5WSW2.6 SW2.4SSW1.6 S1.9SSW2.0SSW1.4 SW1.8WSW2.1WSW1.8WSW2.1WSW2.3WSW1.6 SW1.5SSW1.5SSW1.8 NNE17 NNE20 N23 N17 NNE17 W18WSW18WSW15WSW11WSW19WSW18 NW13 NW18 NW16 NW17 NW12 NW10 WNW9 NW9 N14 NNE16 NNE19 N17 N11	Diurnal Average	Diurnal Maximum
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AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Fort McKay South - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 12 07:00	Hours in Service: 744 Hours of Data: 730 Hours of Missing Data: 14 Hours of Calibration: 0 Percent Operational Time: 98.1
Minimum Value: 0 km/h on Dec 25 17:00	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5	

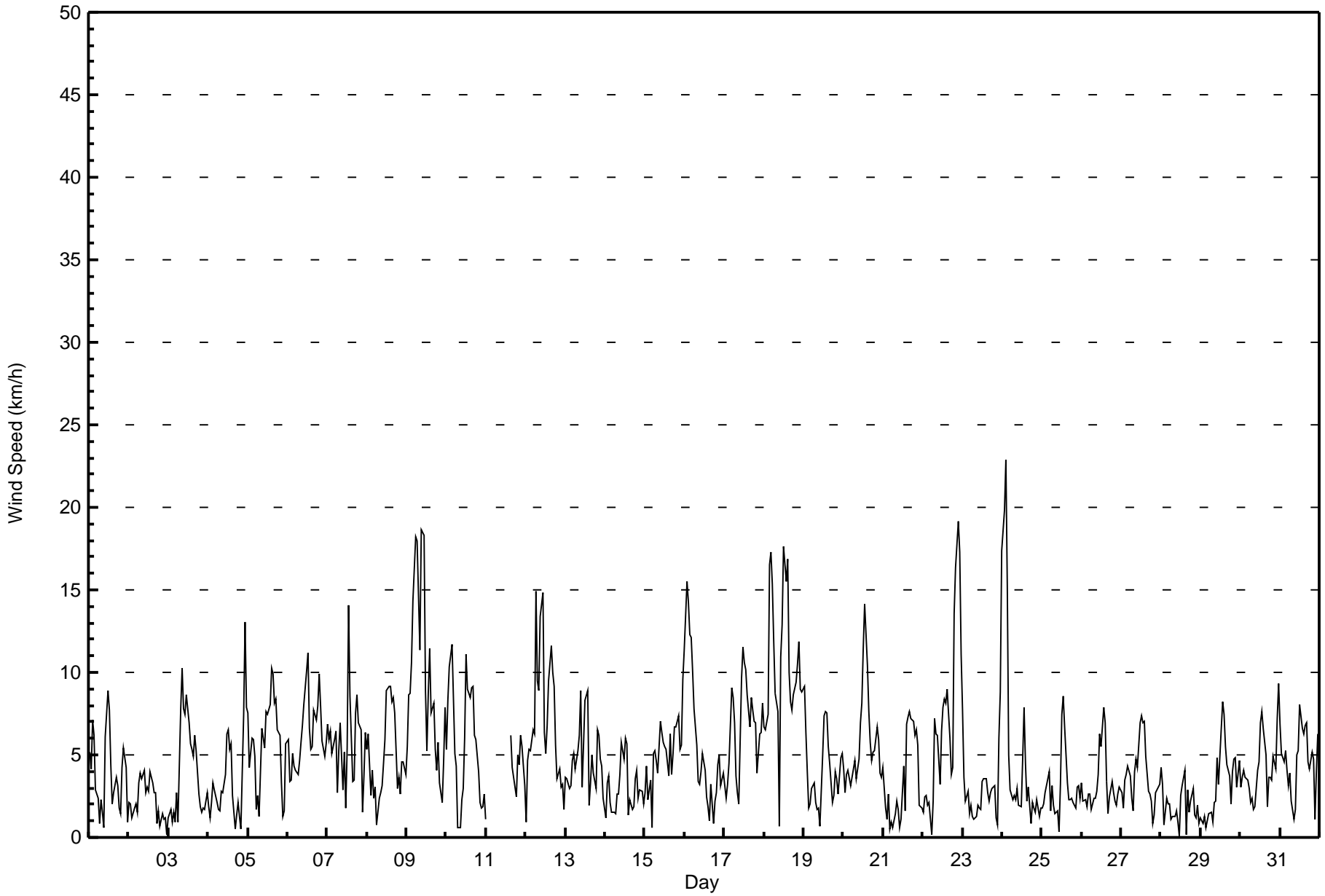
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	1	2	3	1	2	1	2	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	3
2-Dec	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
3-Dec	1	1	1	1	1	1	1	3	2	1	2	2	2	2	1	1	1	2	1	0	1	1	1	1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

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Fort McKay South - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort McKay South - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	476	65.21	65.21
6 - 11	218	29.86	95.07
12 - 19	34	4.66	99.73
20 - 28	2	0.27	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 730

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort McKay South - December 2017**

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	18	17	8	5	3	6	16	29	111	96	54	44	22	10	19	18	476
6 - 11	21	17	1	0	0	0	4	40	37	6	11	25	23	19	10	4	218
12 - 19	4	11	0	0	0	0	0	1	1	0	0	6	6	0	5	0	34
20 - 28	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	44	46	9	5	3	6	20	70	149	102	65	75	51	29	34	22	730

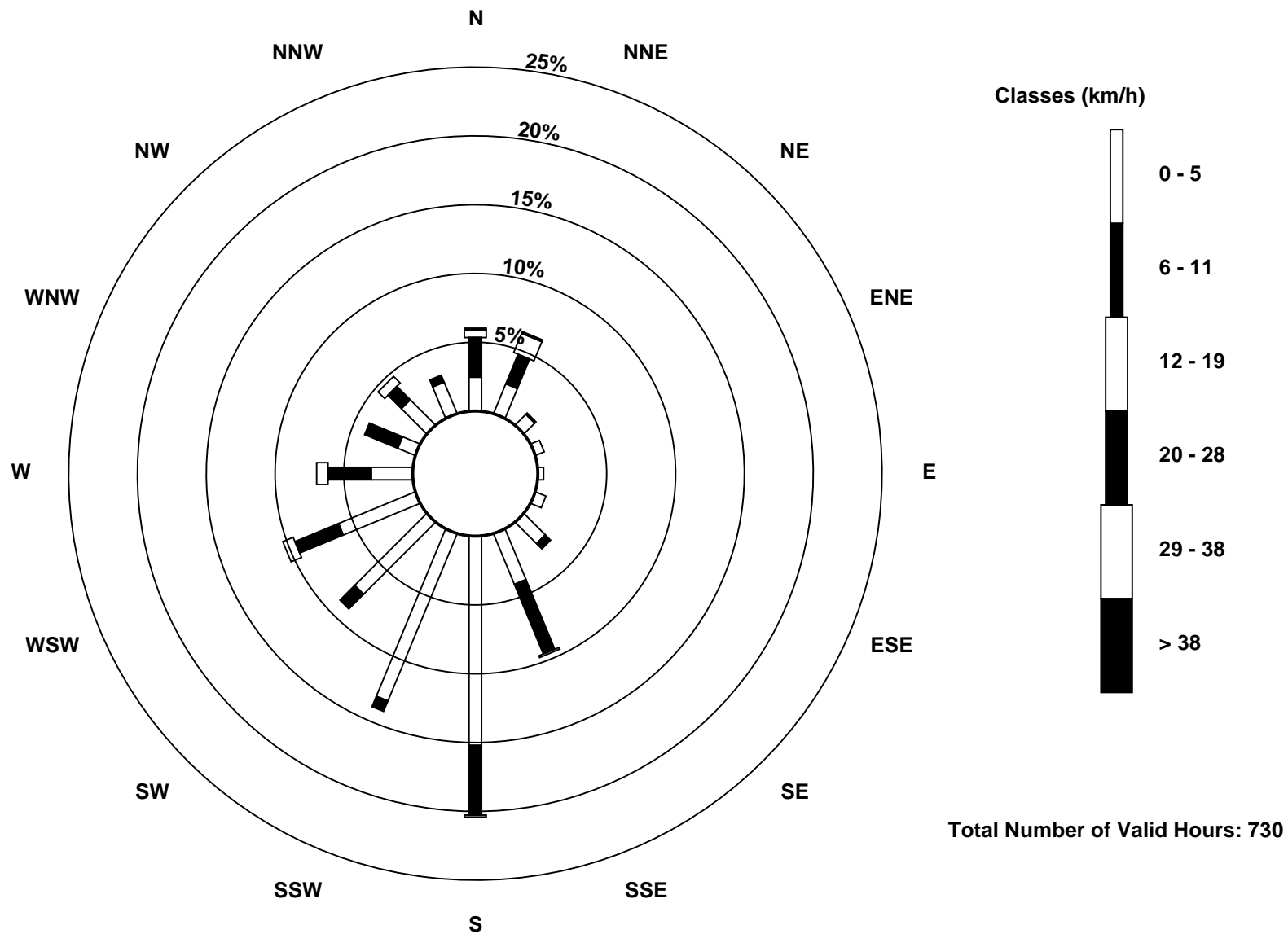
Total Number of Valid Hours: 730

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Fort McKay South (AMS 13)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Fort McKay South - December 2017**

Direction of Maximum Speed: 11 deg on Dec 24 03:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 337.3 deg on Dec 18	Hours of Data: 730
Direction of Minimum Speed: 159 deg on Dec 28 12:00	Hours of Missing Data: 14
Direction of Minimum Daily Speed Average: 0.6 deg on Dec 2	Percent Operational Time: 98.1
Monthly Average Direction: 229.6 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	217	200	224	233	200	158	131	149	209	153	161	164	173	181	215	199	186	194	222	260	187	182	182	58	189.9
2-Dec	19	8	46	312	352	346	6	4	3	356	21	16	139	144	143	186	187	260	254	277	277	238	220	186	5.8
3-Dec	322	232	328	210	223	264	267	345	352	358	3	8	9	3	6	7	30	12	12	288	321	254	16	356	355.5
4-Dec	331	271	215	247	242	218	248	242	192	213	175	153	181	160	166	177	48	358	346	309	203	166	181	194	189.4
5-Dec	230	220	191	174	188	309	313	21	6	4	352	357	352	12	25	17	24	22	27	33	13	32	168	153	11.1
6-Dec	167	187	193	193	194	202	190	193	177	184	172	157	172	166	197	164	223	159	222	245	236	200	171	167	188.9
7-Dec	210	186	166	184	245	263	244	178	165	187	204	148	287	269	280	341	298	275	269	263	285	246	227	232	241.5
8-Dec	173	173	161	173	189	194	325	243	191	202	176	166	151	157	171	177	181	190	190	203	209	197	184	189	179.0
9-Dec	186	173	255	265	262	261	259	257	251	258	257	258	245	250	252	233	241	208	181	194	346	219	169	235	246.4
10-Dec	173	240	254	260	244	189	157	35	83	175	307	306	333	341	17	22	39	33	20	42	55	61	128	178	321.3
11-Dec	321	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	180	187	202	199	190	186	185	176	187	--
12-Dec	5	194	172	177	182	237	259	272	273	266	268	312	256	256	267	312	311	303	303	226	236	212	230	203	263.3
13-Dec	163	173	160	179	169	176	165	247	284	263	238	301	349	342	18	205	282	297	214	263	284	297	46	62	265.1
14-Dec	222	238	225	233	216	204	223	230	232	193	181	154	163	158	163	2	292	348	166	217	226	189	201	10	198.0
15-Dec	339	181	141	181	145	159	186	166	197	239	178	248	295	292	203	196	188	232	232	223	267	258	257	251	224.4
16-Dec	359	19	14	16	14	13	18	32	63	116	114	142	133	138	96	146	190	33	281	216	193	188	189	194	33.1
17-Dec	215	238	207	189	188	189	190	11	163	210	250	251	242	249	253	254	270	284	302	294	270	271	266	259	246.8
18-Dec	273	260	278	7	15	13	25	16	10	235	315	318	316	322	319	313	315	297	305	302	0	11	4	17	337.3
19-Dec	11	354	12	342	270	247	252	236	227	220	180	154	157	159	155	193	193	205	201	204	201	227	177	187	191.8
20-Dec	186	213	197	192	190	184	193	192	188	186	157	148	153	169	166	185	188	183	180	178	183	183	182	189	177.0
21-Dec	178	184	201	173	36	345	207	217	197	171	115	105	147	286	304	302	281	283	276	283	274	272	321	116	266.2
22-Dec	98	69	28	199	308	305	188	247	239	258	327	288	289	304	304	305	293	268	305	9	19	17	8	357	332.1
23-Dec	359	337	278	237	248	242	230	317	310	334	7	108	16	137	2	228	224	201	193	200	198	326	355	359	322.0
24-Dec	13	13	11	11	331	280	251	246	239	244	228	156	141	147	141	214	228	271	239	274	320	252	343	302	357.0
25-Dec	337	2	352	346	323	244	271	258	216	206	191	145	151	147	150	182	207	203	213	211	233	220	219	217	196.9
26-Dec	197	214	219	213	192	209	204	214	193	192	186	150	147	147	152	179	195	203	189	208	240	241	244	228	186.4
27-Dec	209	202	190	186	188	185	195	204	187	186	166	151	146	144	147	167	176	188	217	276	240	205	185	191	175.9
28-Dec	191	189	208	339	249	241	239	262	193	210	213	159	48	11	25	240	252	310	270	248	242	255	245	276	252.8
29-Dec	261	266	247	186	197	206	186	214	225	222	182	166	150	147	151	188	190	192	230	183	181	166	170	169	177.9
30-Dec	170	159	167	161	174	197	215	232	225	201	187	140	145	143	148	169	175	204	198	178	182	185	185	182	173.9
31-Dec	182	182	175	193	185	175	188	185	196	218	178	187	176	148	176	183	184	192	193	170	177	208	176	173	180.2

229.7 219.1 239.4 239.1 237.3 232.9 236.8 254.7 240.4 238.7 222.9 197.3 187.4 193.1 209.7 228.6 242.6 251.1 249.2 244.9 254.3 224.4 202.2 211.3  
 Diurnal Average

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

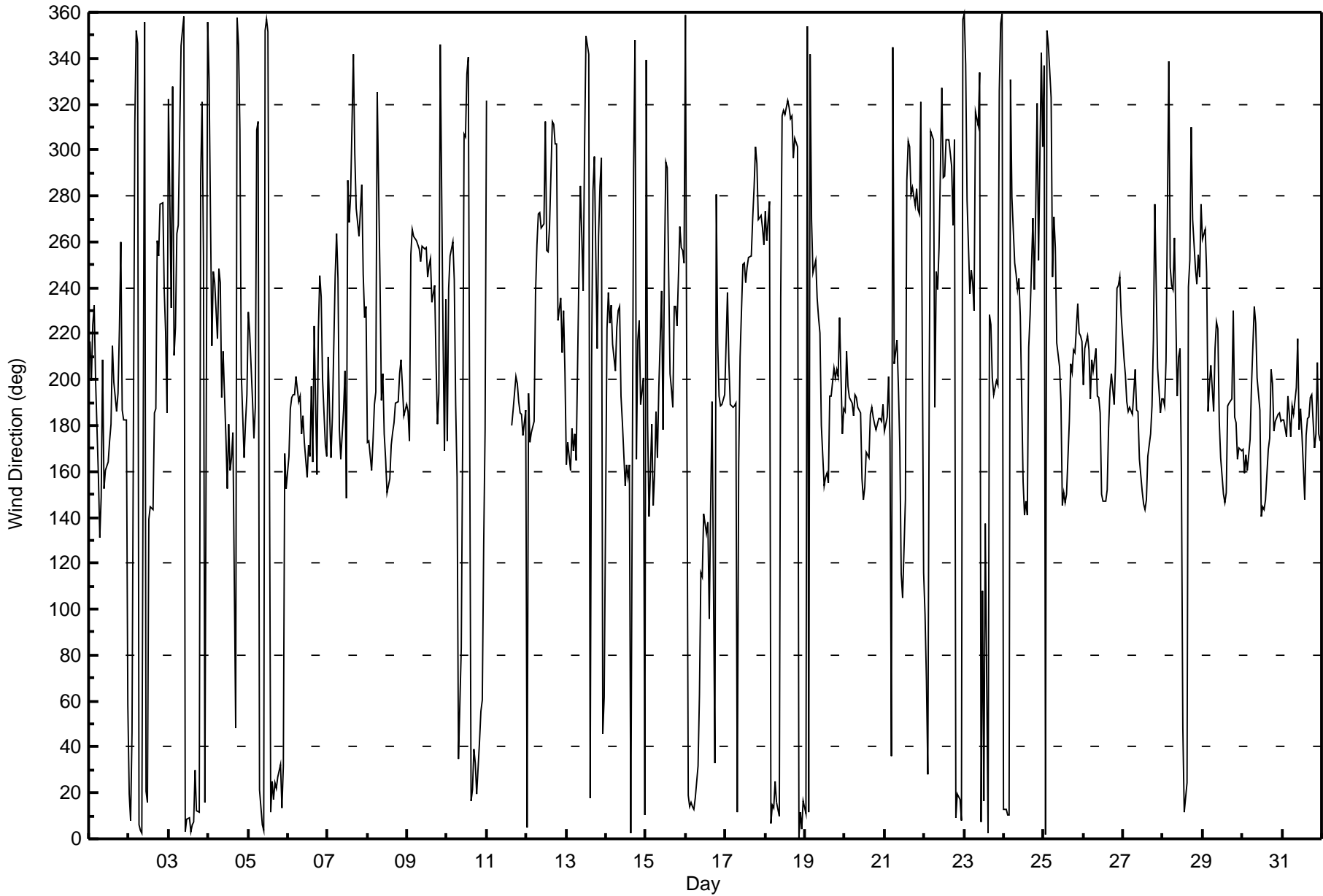
**Wind Direction (WD) - deg**  
**Fort McKay South - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 100 deg on Dec 10 08:00	Hours of Data: 730
Minimum Value: 3 deg on Dec 25 14:00	Hours of Missing Data: 14
Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 11 Q <sub>1</sub> = 15 Median = 23 Q <sub>3</sub> = 41 P <sub>90</sub> = 66 P <sub>99</sub> = 94	Hours of Calibration: 0
	Percent Operational Time: 98.1

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	23	31	21	31	75	60	92	71	87	94	29	9	8	11	23	27	18	12	19	58	38	11	27	77	94
2-Dec	47	47	68	73	77	48	18	13	16	14	23	16	48	7	10	21	16	69	29	76	51	60	58	93	93
3-Dec	73	55	84	44	72	49	97	21	15	14	13	12	13	13	8	11	18	18	27	36	49	23	44	21	97
4-Dec	30	51	39	13	13	44	40	50	23	24	20	6	17	23	16	28	95	52	28	70	89	19	11	17	95
5-Dec	21	29	30	28	46	82	62	85	11	15	18	13	15	17	15	14	15	17	18	21	38	77	77	12	85
6-Dec	22	15	15	12	14	17	17	15	18	14	10	12	8	18	18	18	30	25	38	13	14	27	15	16	38
7-Dec	29	29	12	46	44	47	88	27	18	79	30	81	82	23	26	50	52	25	19	23	27	70	17	32	88
8-Dec	14	17	71	37	20	20	94	40	49	52	18	15	5	7	7	11	8	12	64	24	35	26	20	28	94
9-Dec	16	13	46	28	22	19	20	27	29	18	23	39	48	22	34	30	29	49	60	21	73	68	59	46	73
10-Dec	30	21	16	18	36	41	56	100	89	58	62	31	17	16	16	14	19	17	19	24	56	58	45	40	100
11-Dec	73	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	12	19	25	52	17	13	17	43	54	73
12-Dec	97	41	56	26	17	56	19	43	33	22	22	74	52	26	21	22	20	17	56	29	26	36	32	85	97
13-Dec	49	41	61	43	28	38	45	60	71	18	72	48	27	14	85	33	28	46	36	17	18	45	42	51	85
14-Dec	64	17	20	43	66	72	67	27	22	19	10	20	10	14	70	56	63	52	26	26	67	61	26	69	72
15-Dec	47	18	44	29	86	25	17	9	34	24	25	31	30	28	48	9	20	32	25	26	32	29	22	19	86
16-Dec	54	15	13	13	13	15	13	15	34	23	28	19	24	30	46	50	28	89	52	29	12	10	17	12	89
17-Dec	18	18	23	12	12	15	11	55	66	48	22	24	22	26	23	22	23	29	21	19	32	32	33	22	66
18-Dec	23	21	28	27	15	12	15	16	17	83	36	21	19	21	19	20	22	24	21	22	32	14	16	13	83
19-Dec	12	15	17	39	36	25	16	34	34	46	83	17	12	16	14	12	8	21	12	11	13	52	20	10	83
20-Dec	16	22	25	29	28	14	9	11	10	10	9	8	7	7	8	10	8	15	12	14	11	11	19	31	31
21-Dec	21	53	65	23	73	82	91	42	40	84	85	42	19	79	21	20	23	26	22	20	18	16	80	94	94
22-Dec	83	64	37	73	55	92	21	12	24	32	45	24	25	23	23	22	23	20	34	24	15	15	14	14	92
23-Dec	17	26	41	26	22	28	38	38	50	16	31	32	53	37	29	17	40	23	20	24	80	84	18	15	84
24-Dec	14	12	13	12	23	15	29	19	18	19	38	30	28	5	20	33	25	52	51	68	79	33	74	40	79
25-Dec	40	37	22	23	18	53	12	30	40	49	73	29	4	3	5	13	8	18	19	41	38	22	15	28	73
26-Dec	18	17	16	21	40	21	20	19	14	10	7	15	6	6	6	32	24	17	11	29	38	20	32	14	40
27-Dec	28	66	17	15	24	20	33	61	17	12	16	8	8	8	7	12	26	11	33	68	22	23	16	19	68
28-Dec	20	26	60	18	35	26	48	63	42	49	57	86	15	22	18	93	19	46	23	12	20	31	35	43	93
29-Dec	54	40	31	65	51	31	54	55	23	22	23	78	6	4	7	11	14	14	57	12	9	14	24	12	78
30-Dec	17	20	21	17	15	12	18	10	24	26	12	28	9	9	12	15	39	12	14	11	13	14	12	7	39
31-Dec	9	14	14	11	16	23	13	19	65	44	19	9	14	8	9	9	9	13	21	12	12	74	13	7	74
	97	66	84	73	86	92	97	100	89	94	85	86	82	79	85	93	95	89	64	76	89	84	80	94	

Diurnal Maximum

AF - Analyzer Failure





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay South	Station number:	AMS 13
Calibration Date:	December 15, 2017	Last Cal Date:	November 8, 2017
Start time (MST):	7:30	End time (MST):	11:56
Reason:	Cylinder Change		

### Calibration Standards

Cal Gas Concentration	<u>49.6</u>	ppm	Cal Gas Exp Date	August 18, 2020
Cal Gas Cylinder #	<u>LL84138</u>			
Calibrator Make/Model	API T700		Serial Number	2448
ZAG Make/Model	API 701		Serial Number	5613

### Analyzer Information

Analyzer make: API T100

Analyzer serial #: 599

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 1000 ppb		HVPS voltage	524	524
Calculated slope	0.998496	1.001638	Lamp voltage	1847	1847
Calculated intercept	3.156279	2.907625	Pressure	25.6	25.6
Analyzer Background	37.6	37.6	Flow	660	660
Analyzer Coefficient	1.046	1.046	Lamp Ratio	62.4	62.4

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.0	-0.1	----
as found span	4933	77.7	769.1	764.6	1.006
calibrator zero	5009	0.0	0.0	0.1	----
high point	4933	77.7	769.1	766.4	1.004
second point	4978	38.9	384.6	379.7	1.013
third point	4997	19.6	193.8	187.5	1.034
as left zero	5009	0.0	0.0	0.2	----
as left span	4933	77.7	769.1	764.2	1.006
Average Correction Factor					1.017
Corrected As found	764.70	Previous response	767.14	*% change	0.3%

\* = > +/-5% change initiates investigation

Notes:

No maintenance or adjustments done

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

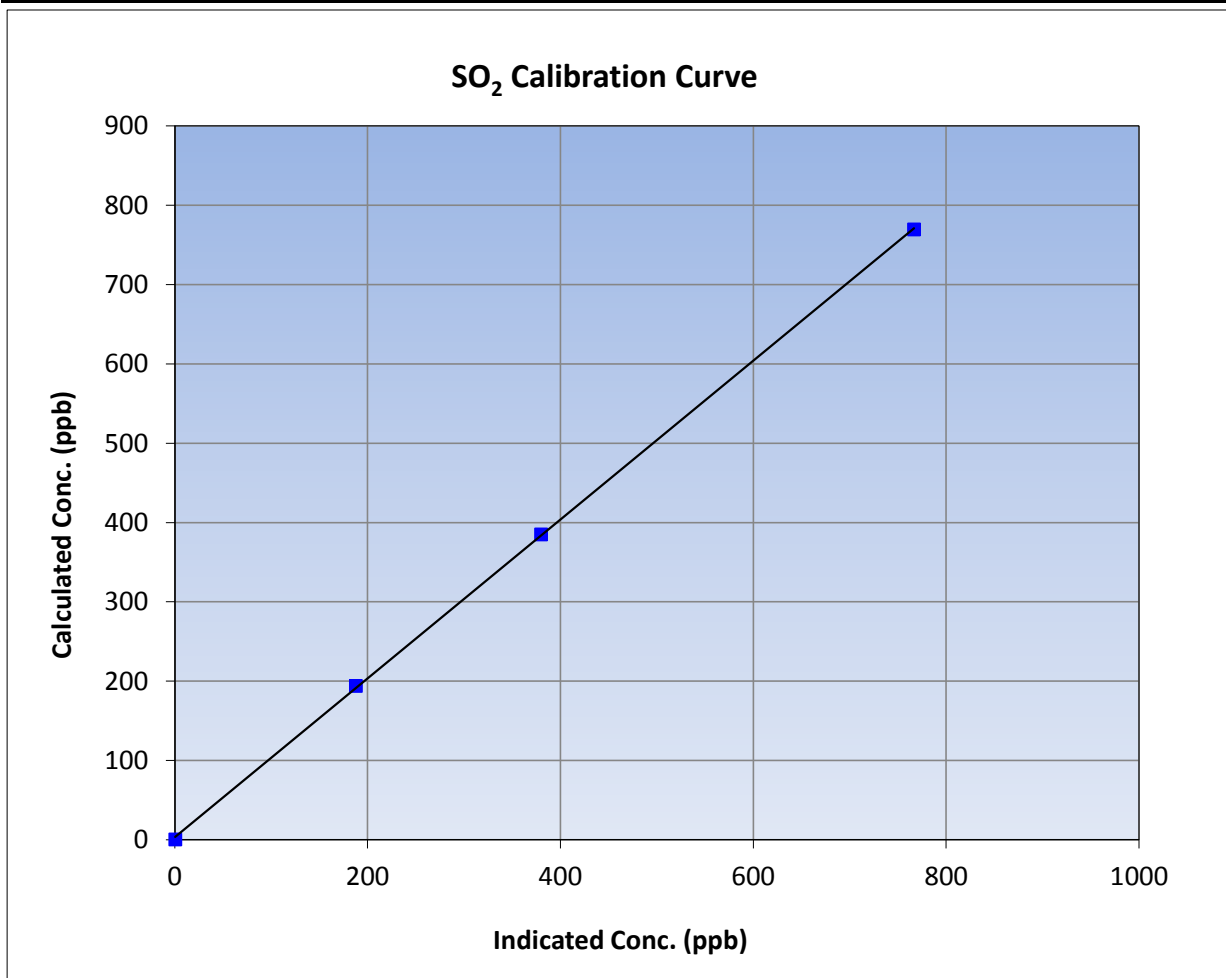
Version-03-2017

### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 8, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:30	End Time (MST)	12:53
Analyzer make	API T100	Analyzer serial #	599

### Calibration Data

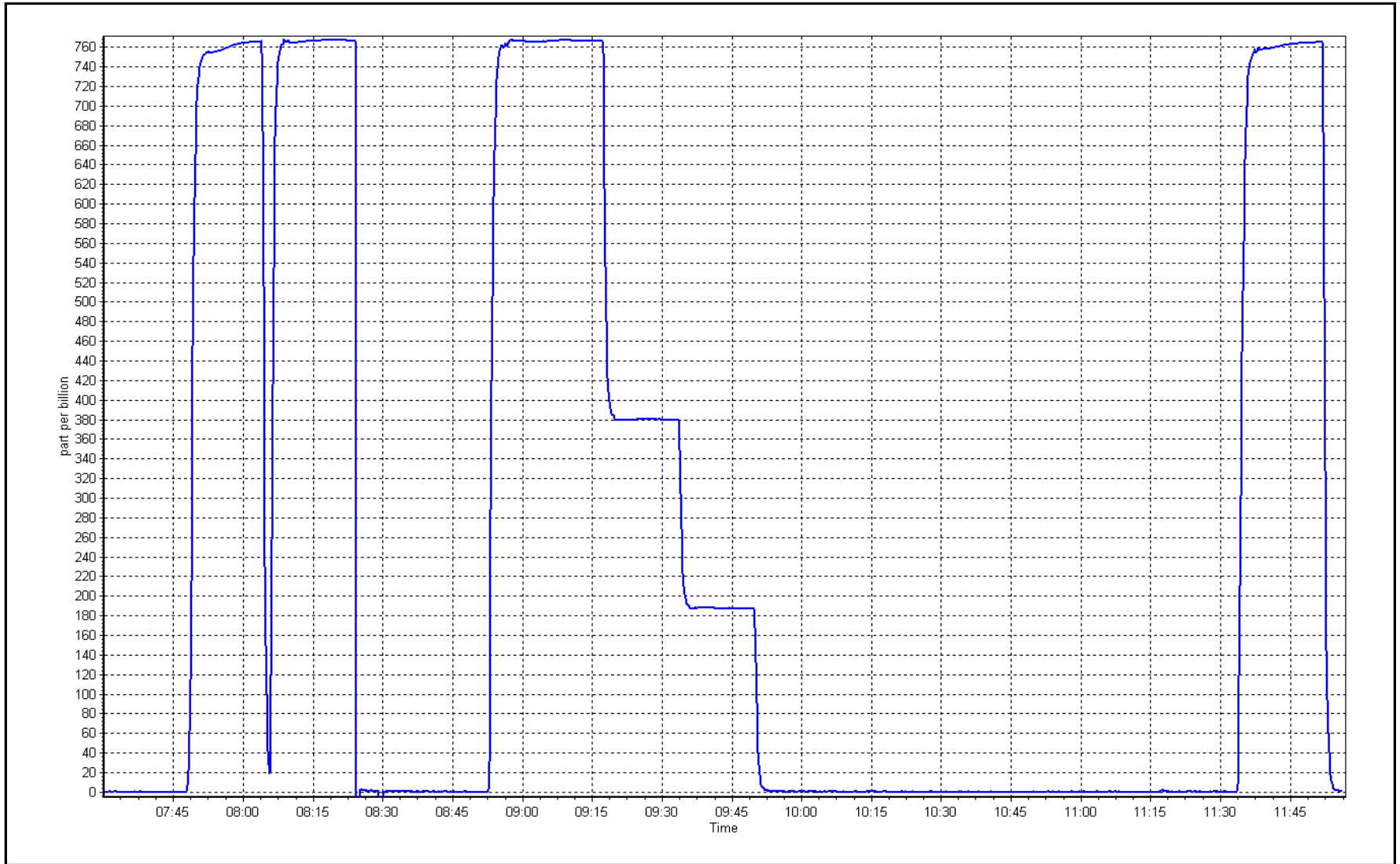
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999931	≥0.995
769.1	766.4	1.0036	Slope	1.001638	0.90 - 1.10
384.6	379.7	1.0129	Intercept	2.907625	+/-30
193.8	187.5	1.0335			



SO2 Calibration Plot

Date: December 15, 2017

Location: Fort McKay South







# Wood Buffalo Environmental Association

## TRS Calibration Report

Version-11-2017

### Station Information

Station Name:	Fort McKay South	Station number:	AMS 13
Calibration Date:	December 13, 2017	Last Cal Date:	November 15, 2017
Start time (MST):	8:10	End time (MST):	11:14
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	5	ppm	Cal Gas Exp Date	February 28, 2020
Cal Gas Cylinder #	LL119516			
Calibrator Make/Model	API T700P		Serial Number	2448
ZAG Make/Model	API 701		Serial Number	5613

### Analyzer Information

Analyzer make:	Thermo 43i-LTE	Analyzer serial #:	1218153359
Converter Make:	CDN-101	Converter serial #:	456

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-726.7	-726.7
Calculated slope	0.988367	0.992402	Lamp voltage	1014	1014
Calculated intercept	0.342097	0.396961	Pressure	689.0	689.0
Analyzer Background	1.97	1.97	Flow	0.445	0.445
Analyzer Coefficient	0.958	0.958	Intensity	90	90
			Converter temp	800	800

### TRS Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5011	0.0	0.0	0.0	----
as found span	4924	80.2	80.1	80.6	0.994
calibrator zero	5000	0.0	0.0	-0.2	----
high point	4924	80.2	80.1	80.4	0.997
second point	4977	40.2	40.1	40.0	1.002
third point	4997	20.0	19.9	19.4	1.027
as left zero	5000	0.0	0.0	0.0	----
as left span	4924	80.0	79.9	80.5	0.993
SO2 Scrubber Check	4937	777.0	800.0	0.4	----
Date of last scrubber change:		15-Nov-17	Average Correction Factor		1.009
Corrected As found	80.60	Previous response	80.73	*% change	0.2%

\* = > +/-5% change initiates investigation

#### Notes:

No adjustments or maintenance done, Scrubber checked after as founds

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## TRS Calibration Summary

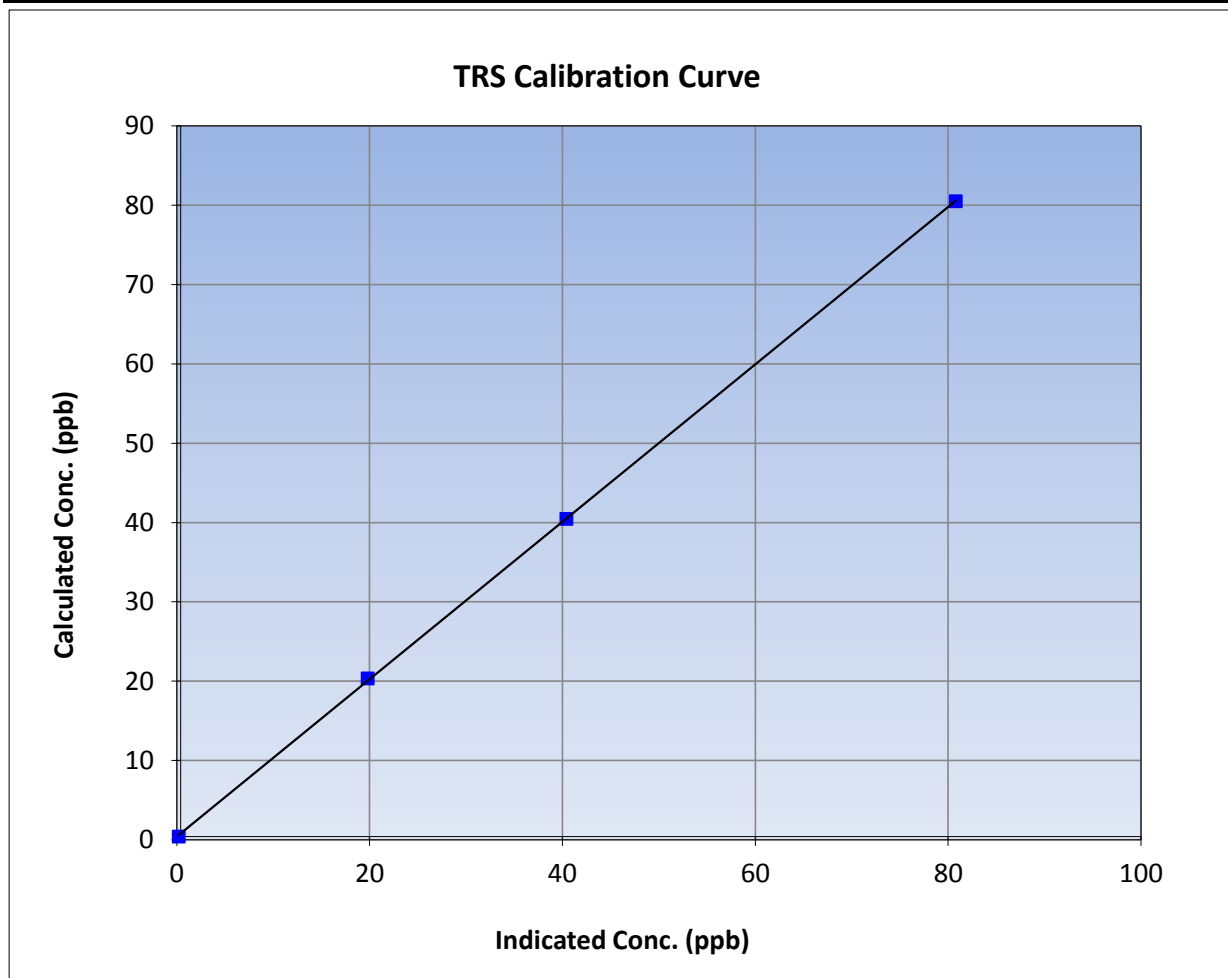
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 15, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:10	End Time (MST)	11:14
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1218153359

### Calibration Data

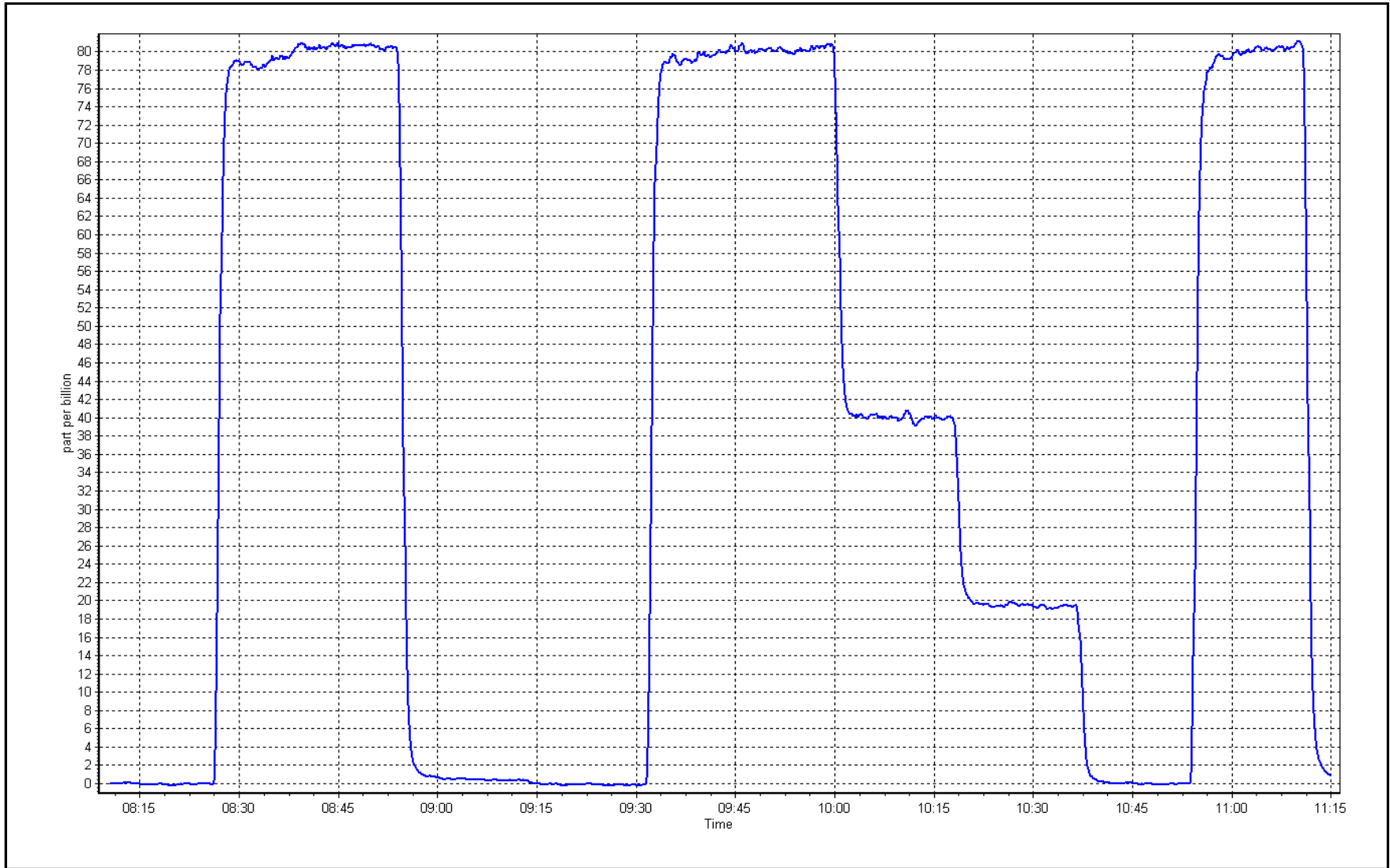
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.2	----	Correlation Coefficient	0.999965	≥0.995
80.1	80.4	0.9967			
40.1	40.0	1.0016	Slope	0.992402	0.90 - 1.10
19.9	19.4	1.0274			
			Intercept	0.396961	+/-3



TRS Calibration Plot

Date: December 13, 2017

Location: Fort McKay South





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay South	Station number:	AMS 13
Calibration Date:	December 15, 2017	Last Cal Date:	November 8, 2017
Start time (MST):	7:30	End time (MST):	11:54
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL84138	Cal Gas Expiry Date	August-18-20
CH4 Cal Gas Conc.	<u>511.0</u> ppm	CH4 Equiv Conc.	1066.5 ppm
C3H8 Cal Gas Conc.	<u>202.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	2448
ZAG Make/Model	Teledyne API 701	Serial Number	5613

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1505164380
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-304.2
Calculated slope	0.995644	Sample pressure	9.2
Calculated intercept	0.064978	Fuel pressure	23.1
Analyzer Background	3.014	Air pressure	34.3
Analyzer Coefficient	1.470	Flame temperature	152.1
			<u>Finish</u>

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.00	-0.16	----
as found span	4933	77.7	16.54	16.09	1.028
calibrator zero	5009	0.0	0.00	-0.01	----
high point	4933	77.7	16.54	16.54	1.000
second point	4978	38.9	8.27	8.21	1.007
third point	4997	19.6	4.17	4.03	1.034
as left zero	5009	0.0	0.00	-0.03	----
as left span	4933	77.7	16.54	16.62	0.995
Average Correction Factor					1.014
Corrected As found	16.25	Previous response	16.55	*% change	1.8%

\* = > +/-5% change initiates investigation

Notes: zero and span adjusted, No maintenance done

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## THC Calibration Summary

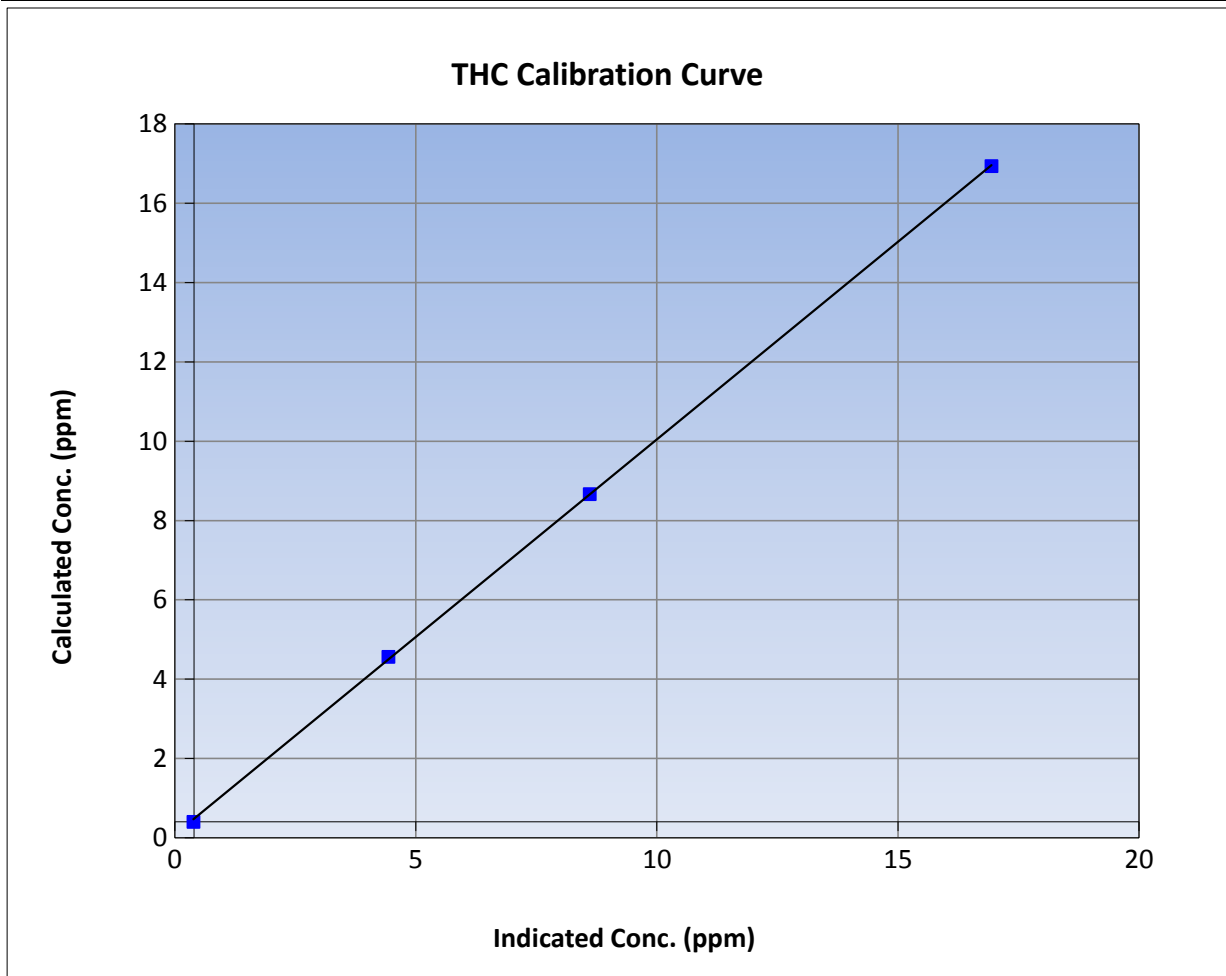
Version-03-2017

### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 8, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:30	End Time (MST)	11:54
Analyzer make	Thermo 51i-LT	Analyzer serial #	1505164380

### Calibration Data

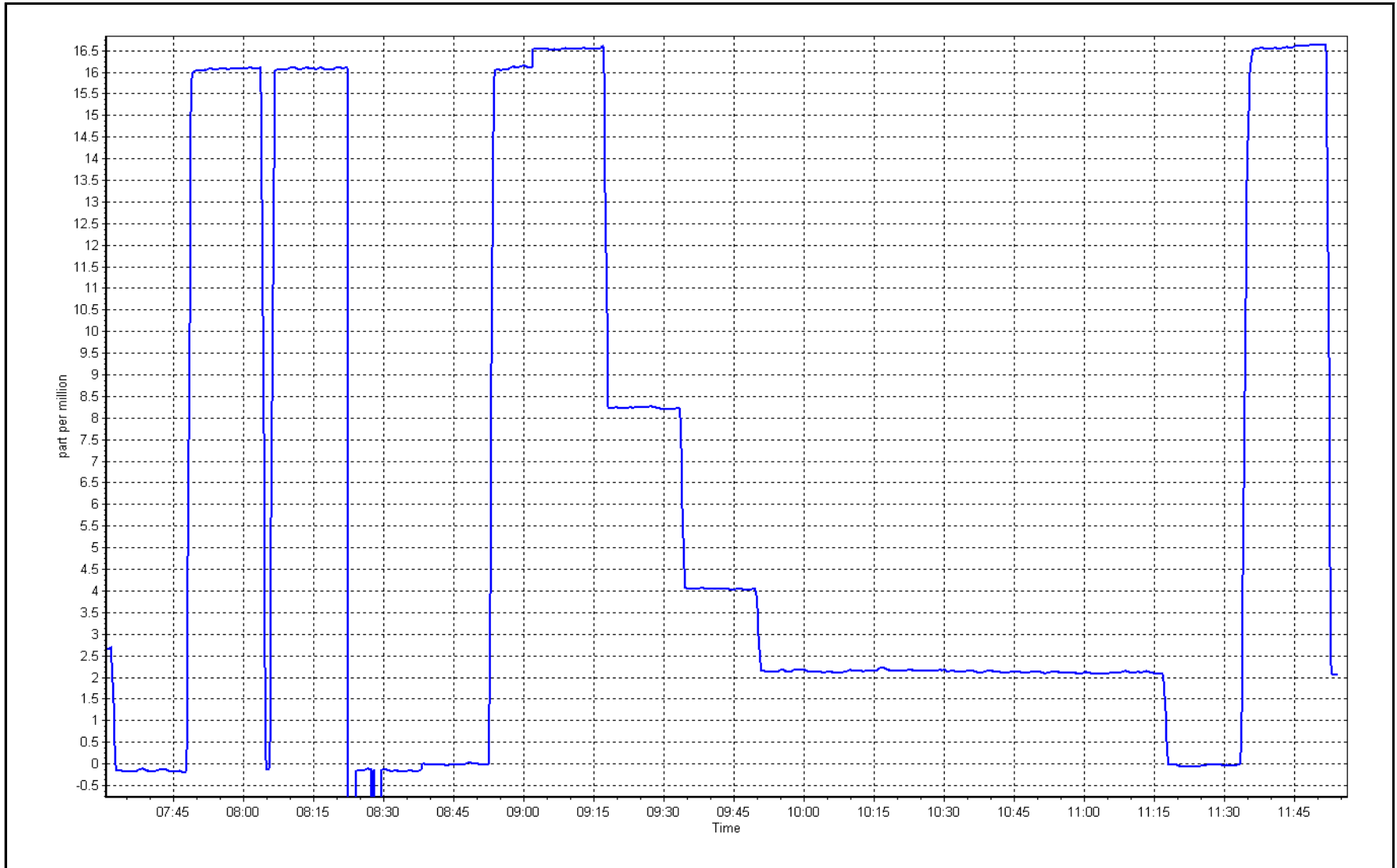
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999930	≥0.995
16.5	16.5	0.9999			
8.3	8.2	1.0072	Slope	0.996920	0.90 - 1.10
4.2	4.0	1.0340			
			Intercept	0.073223	+/-1.5



THC Calibration Plot

Date: December 15, 2017

Location: Fort McKay South







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

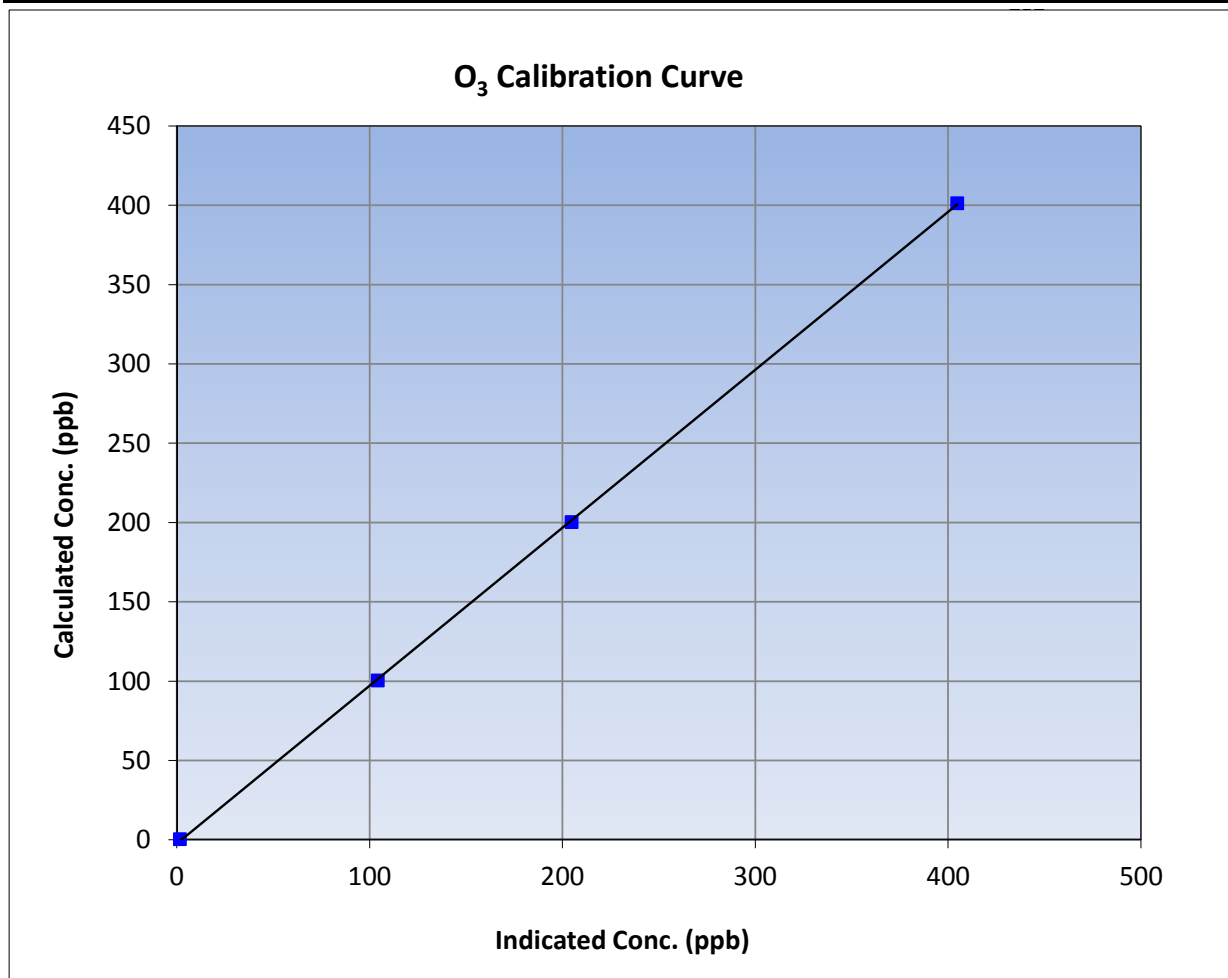
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 13, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	11:11	End Time (MST)	13:34
Analyzer make	API T400	Analyzer serial #	825

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	1.3	----	Correlation Coefficient	0.999955	≥0.995
401.0	404.4	0.9916			
200.0	204.4	0.9785	Slope	0.995849	0.90 - 1.10
100.0	103.8	0.9634			
			Intercept	-2.484139	+/- 10

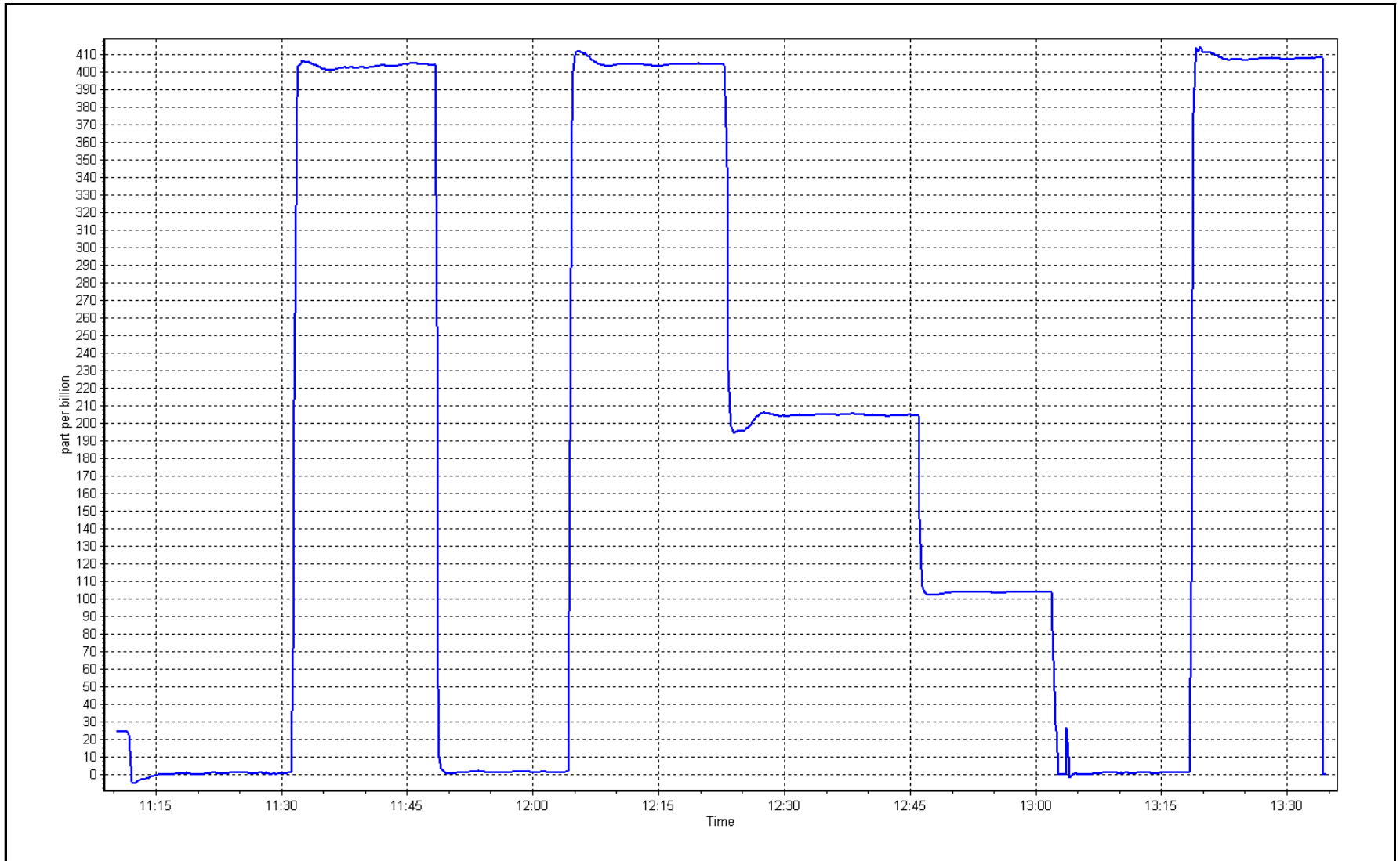




O<sub>3</sub> Calibration Plot

Date: December 13, 2017

Location: Fort McKay South





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort McKay South	Station number:	AMS 13
Calibration Date:	December 15, 2017	Last Cal Date:	November 8, 2017
Start time (MST):	7:30	End time (MST):	11:55
Reason:	Cylinder Change		

### Calibration Standards

NO Gas Cylinder #	LL84138	Cal Gas Expiry Date	August 18, 2020
NOX Cal Gas Conc.	<u>51.6</u> ppb	NO Cal Gas Conc.	<u>51.6</u> ppb
Calibrator Model	API T700	Serial Number	2448
ZAG make/model	API T701	Serial Number	5613

### Analyzer Information

Analyzer make:	Thermo 42i	Analyzer serial #:	1410661329	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
NO coefficient	1.030	1.069	NOX Range (ppb)	0 - 1000 ppb
NOX coefficient	1.000	1.000	PMT Temperature	-2.7 -2.7
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	174.6 174.6
NO bkgrnd	7.6	8.0	Sample Flow	0.888 0.888
NOX bkgrnd	7.7	8.0	PMT Voltage	-827.7 -827.7

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	1.006565	0.998977
NO <sub>x</sub> Cal Offset	2.482708	1.784562
NO Cal Slope	1.006147	0.998631
NO Cal Offset	2.400750	2.005015
NO <sub>2</sub> Cal Slope	1.001569	1.000498
NO <sub>2</sub> Cal Offset	1.313123	1.262336



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.0	0.0	0.0	0.2	0.1	0.1	----	----
as found span	4932	77.7	800.3	800.3	0.0	774.4	773.2	1.2	1.0335	1.0351
calibrator zero	5009	0.0	0.0	0.0	0.0	0.3	0.2	0.2	----	----
high point	4932	77.7	800.3	800.3	0.0	800.1	800.2	-0.1	1.0003	1.0001
second point	4978	38.9	400.1	400.1	0.0	398.5	398.4	0.1	1.0040	1.0043
third point	4997	19.6	201.6	201.6	0.0	197.4	197.1	0.3	1.0213	1.0228
as left zero	5009	0.0	0.0	0.0	0.0	0.3	0.2	0.0	----	----
as left span	4932	77.7	800.3	393.7	406.6	810.5	390.0	420.5	0.9874	1.0095
<b>Average Correction Factor</b>									<b>1.0085</b>	<b>1.0091</b>

Corrected As found	NO <sub>x</sub> = 774.2 ppb	NO = 773.1 ppb		*Percent Change	NO <sub>x</sub> = 2.4%
Previous Response	NO <sub>x</sub> = 792.6 ppb	NO = 793.0 ppb		*Percent Change	NO = 2.6%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	796.3	796.8	-0.4	1.0050	1.0044	----	----
1st NO2 (400 ppb O3)	393.7	403.1	796.0	393.7	402.3	1.0054	----	1.0020	99.8%
2nd NO2 (200 ppb O3)	592.5	204.3	794.8	592.5	202.4	1.0069	----	1.0094	99.1%
3rd NO2 (100 ppb O3)	694.3	102.5	793.9	694.3	99.6	1.0081	----	1.0291	97.2%
2nd NO ref point	----	0.0	791.3	792.3	-1.1	1.0114	1.0101	----	----
<b>Average Correction Factor</b>						<b>1.0080</b>	<b>1.0073</b>	<b>1.0135</b>	<b>98.7%</b>

Notes:

No maintenance done; span adjusted

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

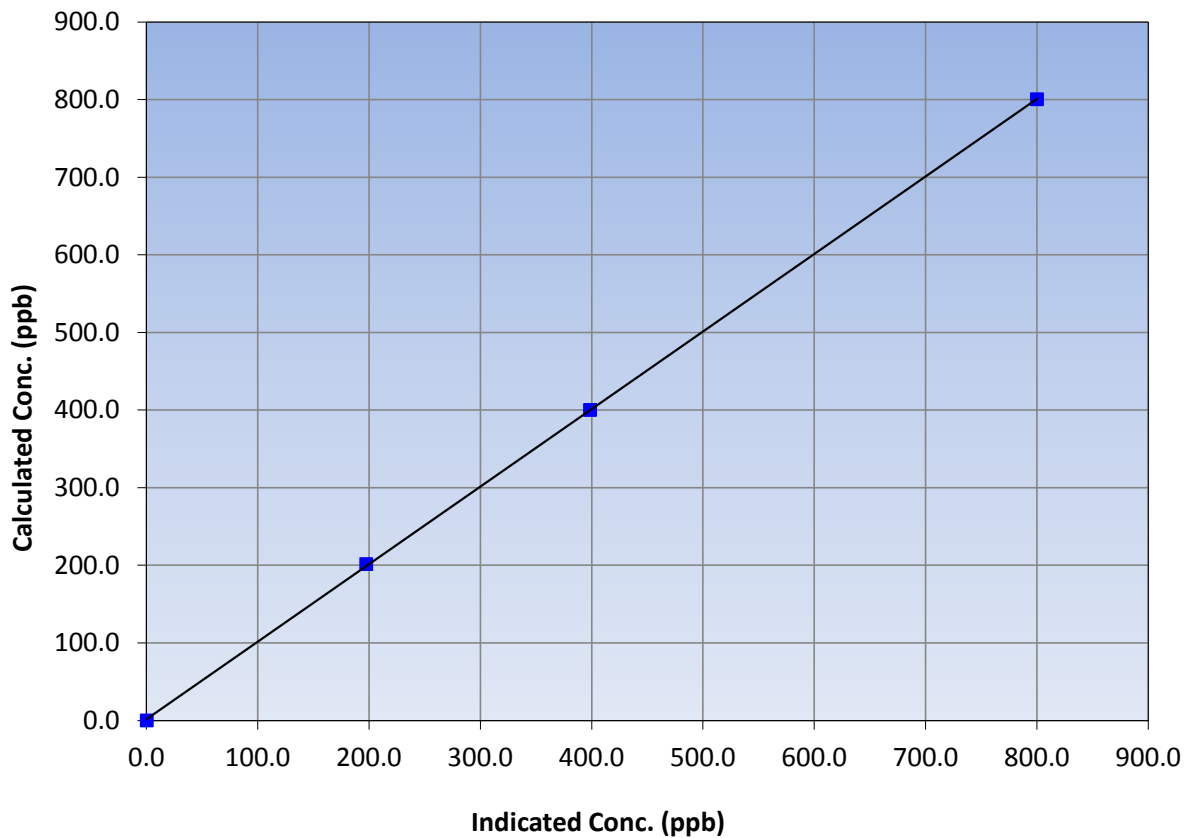
### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 8, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:30	End Time (MST)	11:55
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.3	----	Correlation Coefficient	≥0.995	
800.3	800.1	1.0003			
400.1	398.5	1.0040			
201.6	197.4	1.0213			
			Slope	0.998977	0.90 - 1.10
			Intercept	1.784562	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

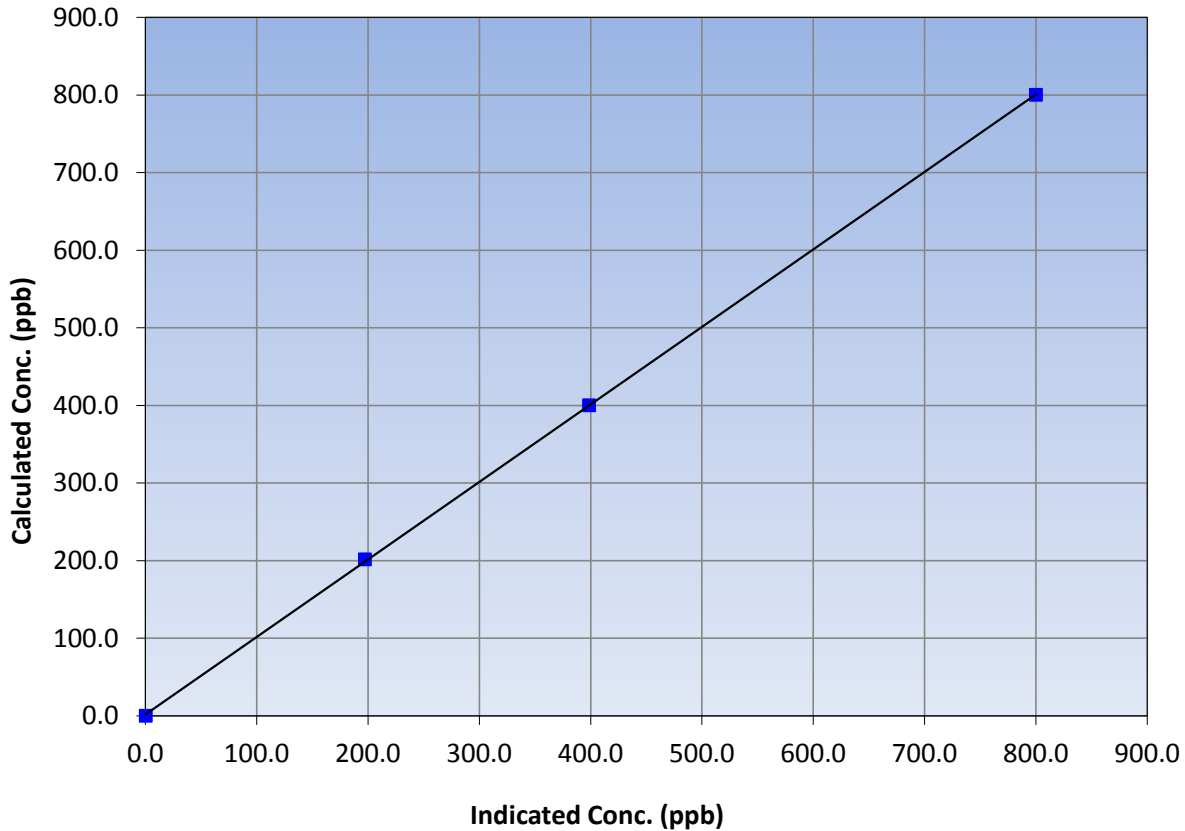
### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 8, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:30	End Time (MST)	11:55
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.2	----	Correlation Coefficient	≥0.995	
800.3	800.2	1.0001			
400.1	398.4	1.0043			
201.6	197.1	1.0228			
			Slope	0.998631	0.90 - 1.10
			Intercept	2.005015	+/-20

**NO Calibration Curve**





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

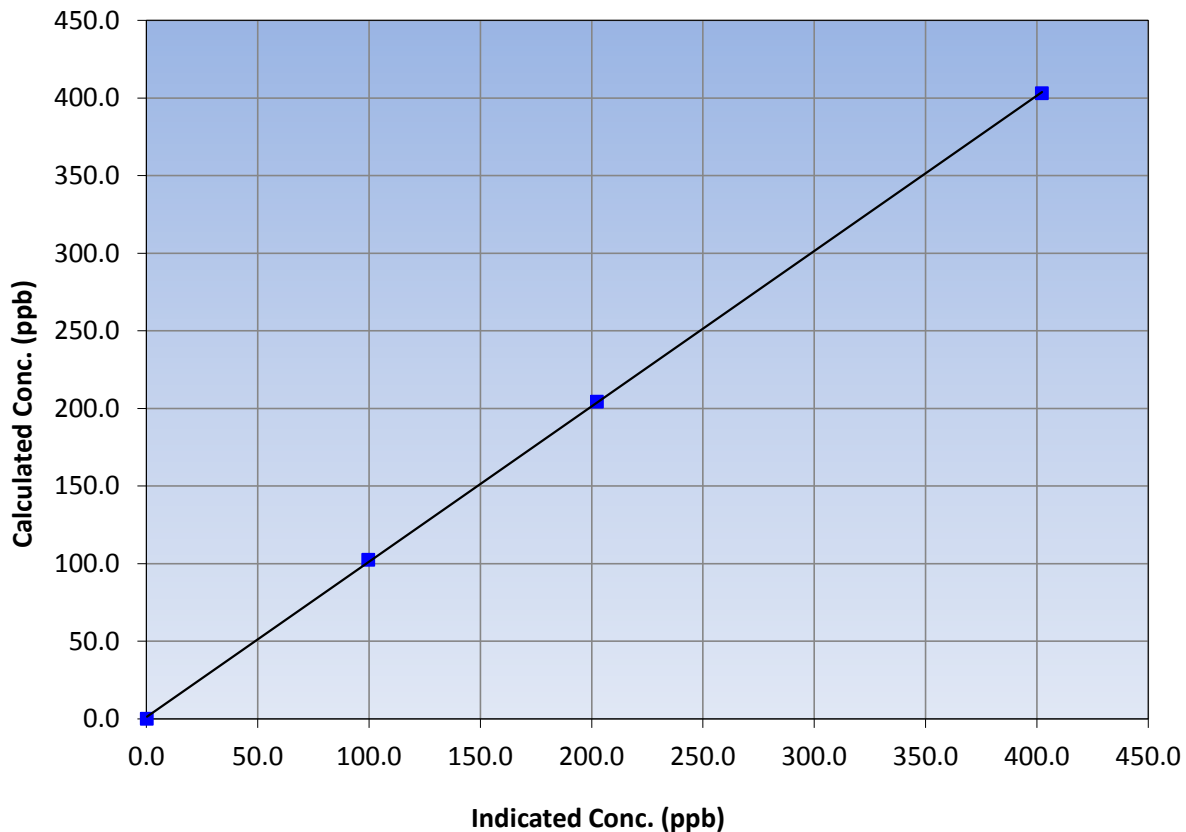
### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 8, 2017
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:30	End Time (MST)	11:55
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.2	----	Correlation Coefficient	≥0.995	
403.1	402.3	1.0020			
204.3	202.4	1.0094			
102.5	99.6	1.0291			
			Slope	1.000498	0.90 - 1.10
			Intercept	1.262336	+/-20

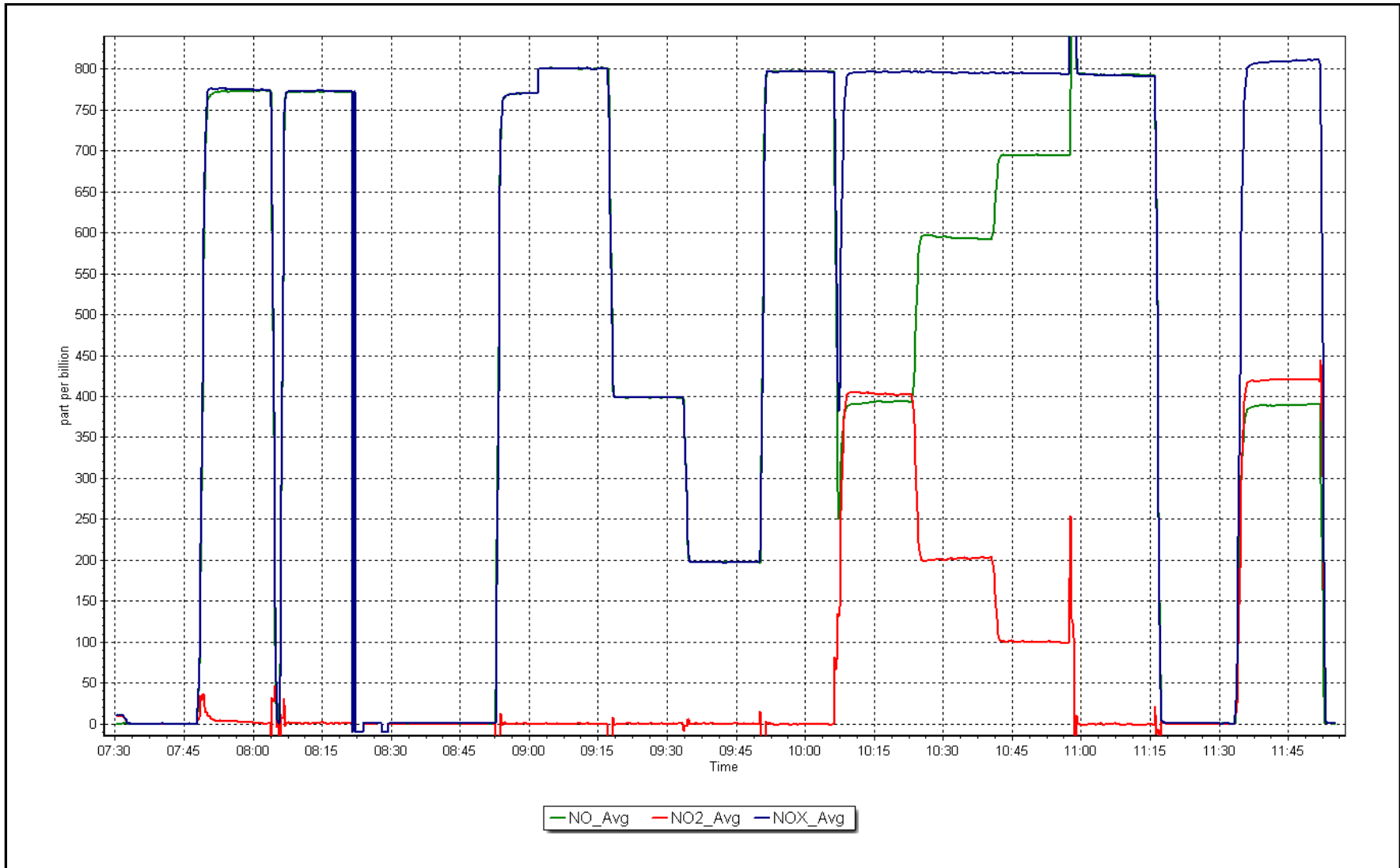
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: December 15, 2017

Location: Fort McKay South





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Fort McKay South	Station number:	AMS 13
Calibration Date:	December 18, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	10:49	End time (MST):	11:52
Sharp Model:	5030	S/N:	E-803
Particulate Fraction:	PM2.5	C14 Source S/N:	406
Flow Meter Make/Model:	Delta Cal	S/N:	1450
Temp/RH standard:	Delta Cal	S/N:	1450

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	-7	-8	-7	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	970	967	970	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1005	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	2.8	-----	0	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Concentration zero	1.5	-----	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"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date: <u>October 6, 2017</u>	
	Flow w/o adaptor: _____	Flow w/ adaptor: _____	
<b>(Limit) 0.4 LPM</b>			
<u>Adjusted</u>	<b>Current Test</b>	<b>Previous Test</b>	<b>% Change</b>
<input type="checkbox"/>	Foil S/N: _____	Foil S/N: <u>5872</u>	
	Null Foil Mass: _____	Null Foil Mass: <u>1337</u>	
Foil Calibration	Foil Mass: _____	Foil Mass: <u>October 6, 2017</u>	
	Calibration Date: _____	Calibration Date: _____	
<b>(Limit) +/- 5% of previous</b>	Correction Factor: <u>7120</u>	Correction Factor: <u>7000</u>	1.71%

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
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%
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes: Nephelometer and concentration zero adjusted; cyclone head cleaned

Calibration by: Melissa Lemay





## WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

### CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 14  
ANZAC  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100	12	0	2	0
TRS(ppb) Average	708	36	36	100	1	0	0	0
THC(ppm) Average	680	34	64	95.97	2.2	-	2.1	-
NMHC(ppm) Average	680	34	64	95.97	0.151	-	0.014	-
CH4(ppm) Average	680	34	64	95.97	2.2	-	2.1	-
NO2(ppb) Average	708	36	36	100	25	0	9	-
NO(ppb) Average	708	36	36	100	15	-	2	-
NOX(ppb) Average	708	36	36	100	35	-	10	-
O3(ppb) Average	709	35	35	100	44	0	42	-
PM2.5(ug/m3) Average	741	3	3	100	62	-	7.9	0
AT 2m(C) Average	744	0	0	100	6.2	-	4.2	-
RH(%) Average	744	0	0	100	98	-	90	-
Leaf Wetness (% of range) Average	744	0	0	100	90	-	18	-
WS(km/h) Average	740	0	4	99.46	25	-	18	-
WD(deg) Average	740	0	4	99.46	-	-	-	-
PC(mm) Total	744	0	0	100	0.8	-	2.5	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	708	0.5	1	-	0	0	0	0	0	1	12
TRS(ppb) Average	708	0.2	0	-	0	0	0	0	0	0	1
THC(ppm) Average	680	1.98	0	-	1.9	1.9	1.9	2	2	2	2.2
NMHC (ppm) Average	680	0.002	0.011	-	0	0	0	0	0	0	0.151
CH4(ppm) Average	680	1.98	0	-	1.9	1.9	1.9	2	2	2	2.2
NO2(ppb) Average	708	3.5	4	-	0	1	1	2	5	8	25
NO(ppb) Average	708	0.5	1	-	0	0	0	0	0	1	15
NOX(ppb) Average	708	3.9	4	-	0	1	1	2	5	10	35
O3(ppb) Average	709	31.2	7	-	4	21	27	33	37	39	44
PM2.5(ug/m3) Average	741	3.12	4	-	0.1	0.8	1.1	2	3.6	5.9	62
Temperature 2 m (C) Average	744	-11.73	12.5	-	-36.1	-30.4	-24.7	-8.8	-0.8	2.5	6.2
Relative Humidity (%) Average	744	76.9	10	-	48	65	71	76	85	91	98
Leaf Wetness (% of range) Average	744	1.8	7	-	0	0	0	1	1	2	90
Wind Speed 20 m (km/h) Average	740	10.7	5	-	0	4	6	10	15	18	25
Wind Direction 20 m (deg) Average	740	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	744	-	-	7.62	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
CH4, NMHC, THC	25 Dec 2017 21:00	26 Dec 2017 11:00	15	Analyzer Failure - Hydrogen generator failure
CH4, NMHC, THC	26 Dec 2017 12:00	26 Dec 2017 12:00	1	Maintenance - reset hydrogen generator
CH4, NMHC, THC	28 Dec 2017 23:00	29 Dec 2017 11:00	13	Analyzer Failure - Hydrogen generator failure
CH4, NMHC, THC	29 Dec 2017 12:00	29 Dec 2017 12:00	1	Maintenance - reinitiated daily QA check
Wind Speed, Wind Direction	23 Dec 2017 09:00	23 Dec 2017 10:00	2	Flat line in sensor output signal
Wind Speed, Wind Direction	26 Dec 2017 19:00	26 Dec 2017 19:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	30 Dec 2017 22:00	30 Dec 2017 22:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Anzac - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 12 ppb on Dec 5 15:00	Maximum Daily Average: 2.1 ppb on Dec 5		Hours of Data:	708
Minimum Value: 0 ppb on Dec 2 05:00	Minimum Daily Average: 0.0 ppb on Dec 22		Hours of Missing Data:	36
Maximum Diurnal Average: 1.2 ppb at hour 17	Minimum Diurnal Average: 0.2 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 0.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 5		Percent Operational Time:	100.0

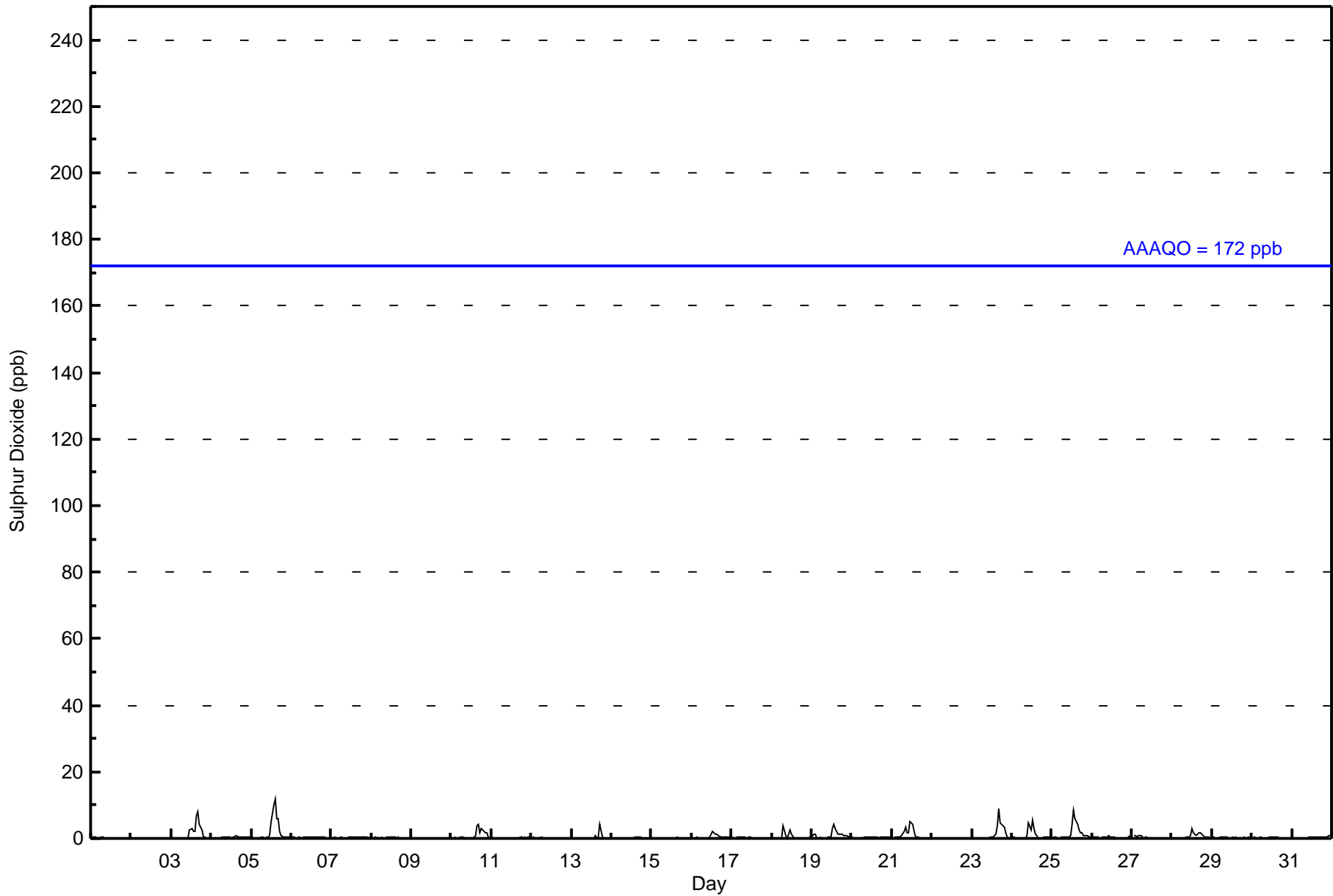
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	3	3	2	2	7	8	4	2	1	0	0	0	0	1.4	8
4-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	Z	0	0	0	0	0	0	0	1	5	10	12	6	6	2	1	0	0	0	0	0	0	2.1	12
6-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0.3	1
8-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	4	4	2	3	2	2	2	1	0	0.9	4
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	1	4	0	0	0	0	0	0	0.3	4
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	0	0	0	0	0	0	0.5	2
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	Z	0	0	0	4	1	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0.5	4
19-Dec	1	1	1	0	Z	0	0	0	0	0	0	3	4	3	2	1	1	1	1	1	1	1	0	0	1.0	4
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	Z	0	0	0	0	0	1	2	3	2	2	5	4	2	0	0	0	0	0	0	0	0	0	0	1.1	5
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	0	1	4	9	5	4	3	1	0	0	0	0	1.3	9
24-Dec	1	0	0	Z	0	0	0	0	0	1	5	2	5	3	1	1	0	0	0	0	0	0	0	0	0.9	5
25-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	4	8	6	4	3	2	2	1	1	1	1	1	1.6	8
26-Dec	1	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
27-Dec	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	3	2	1	1	2	2	1	1	0	0	0	0	0.6	3
29-Dec	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0.3	1
																								Diurnal Average		
																								Diurnal Maximum		

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	707	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Anzac - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	11	0	1	1	0	6	19	40	15	32	26	22	97	284	96	53	703
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
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	97	284	96	54	704

Total Number of Valid Hours: 704

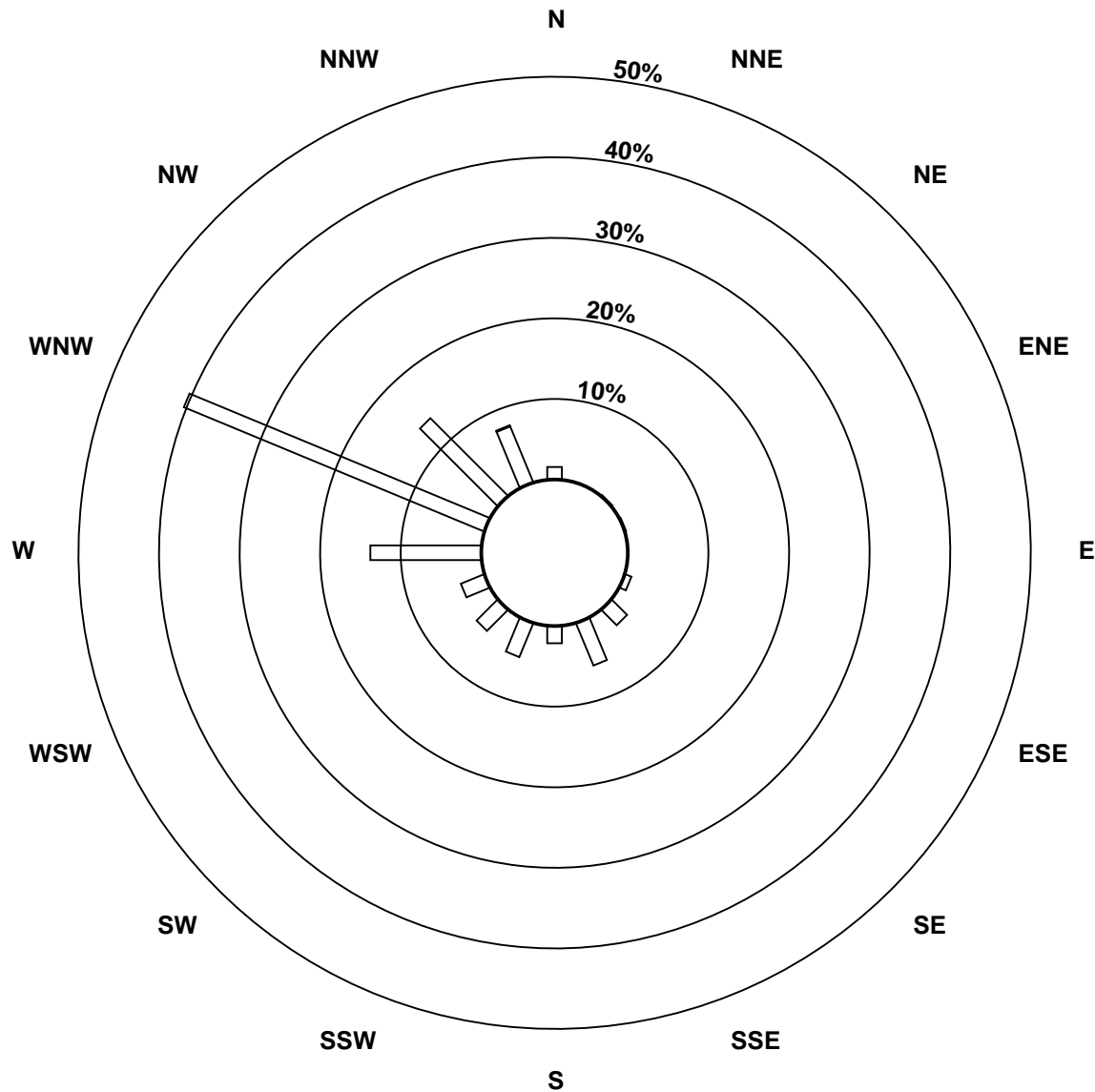
Total Number of Hours: 744



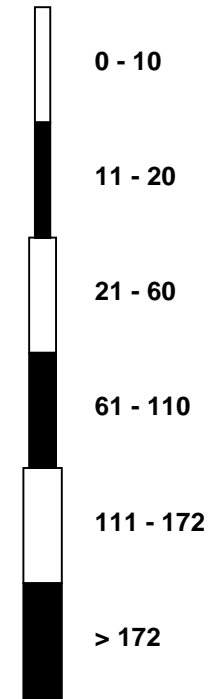


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

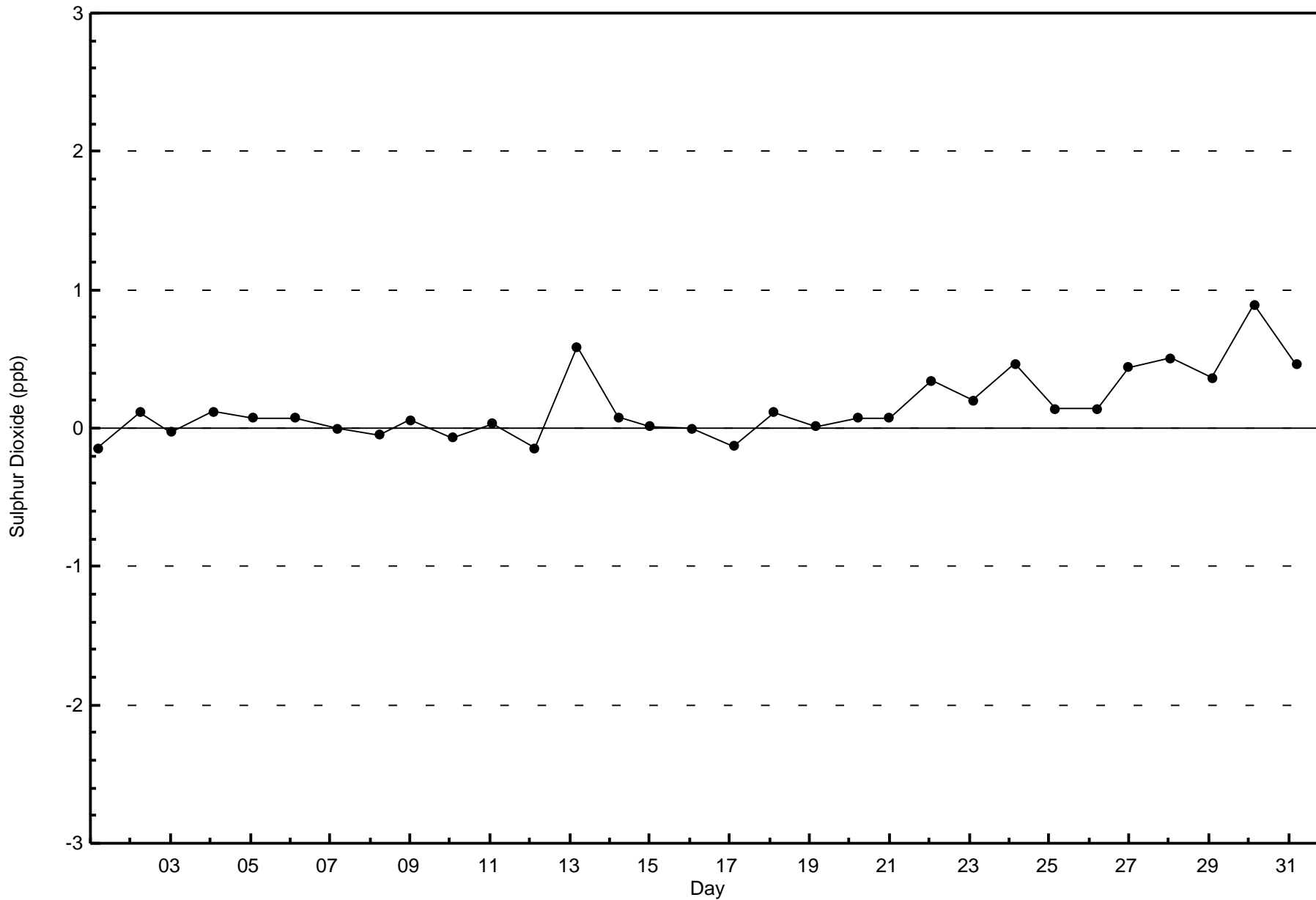
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Anzac (AMS 14)

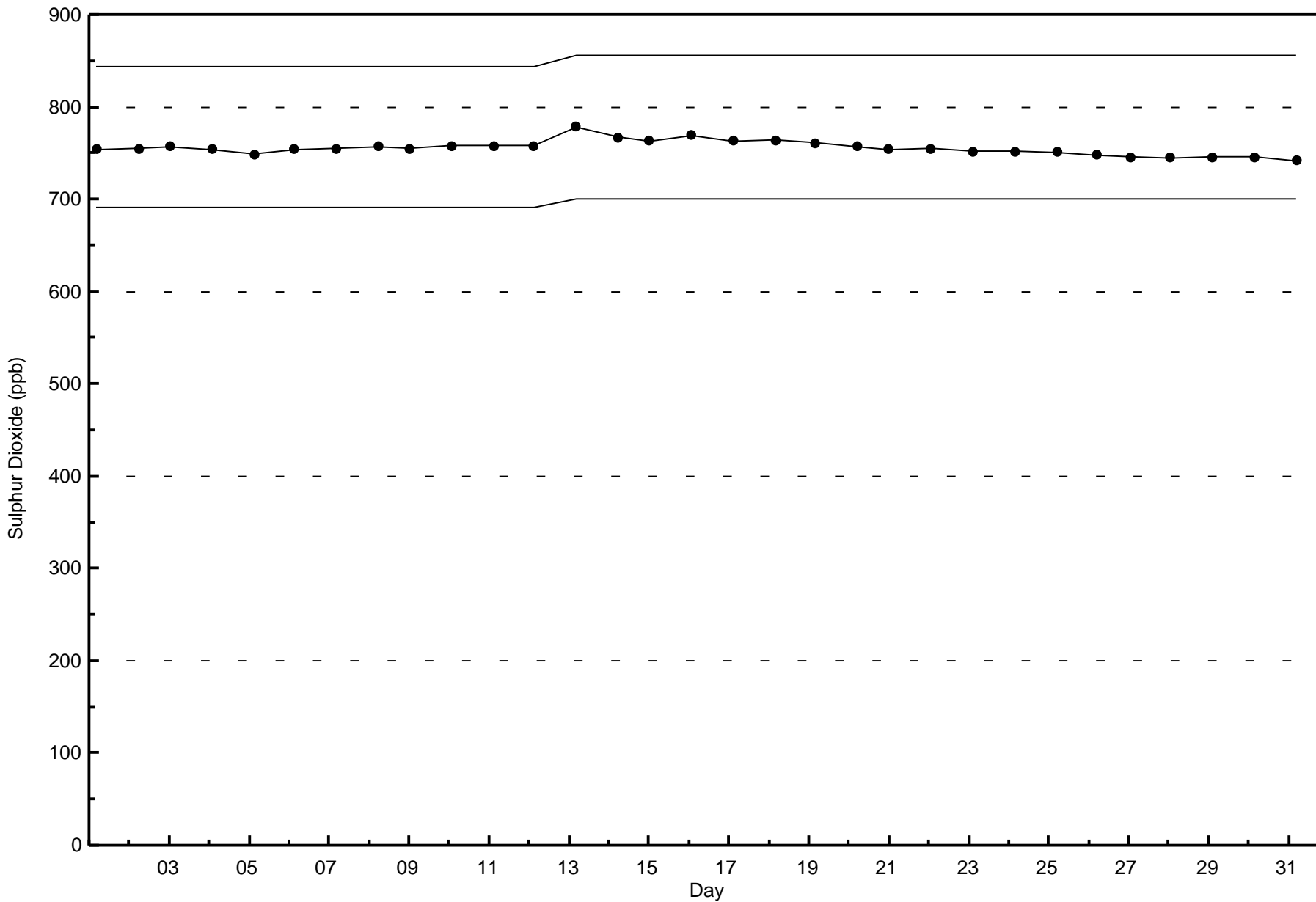


Classes (ppb)



Total Number of Valid Hours: 704







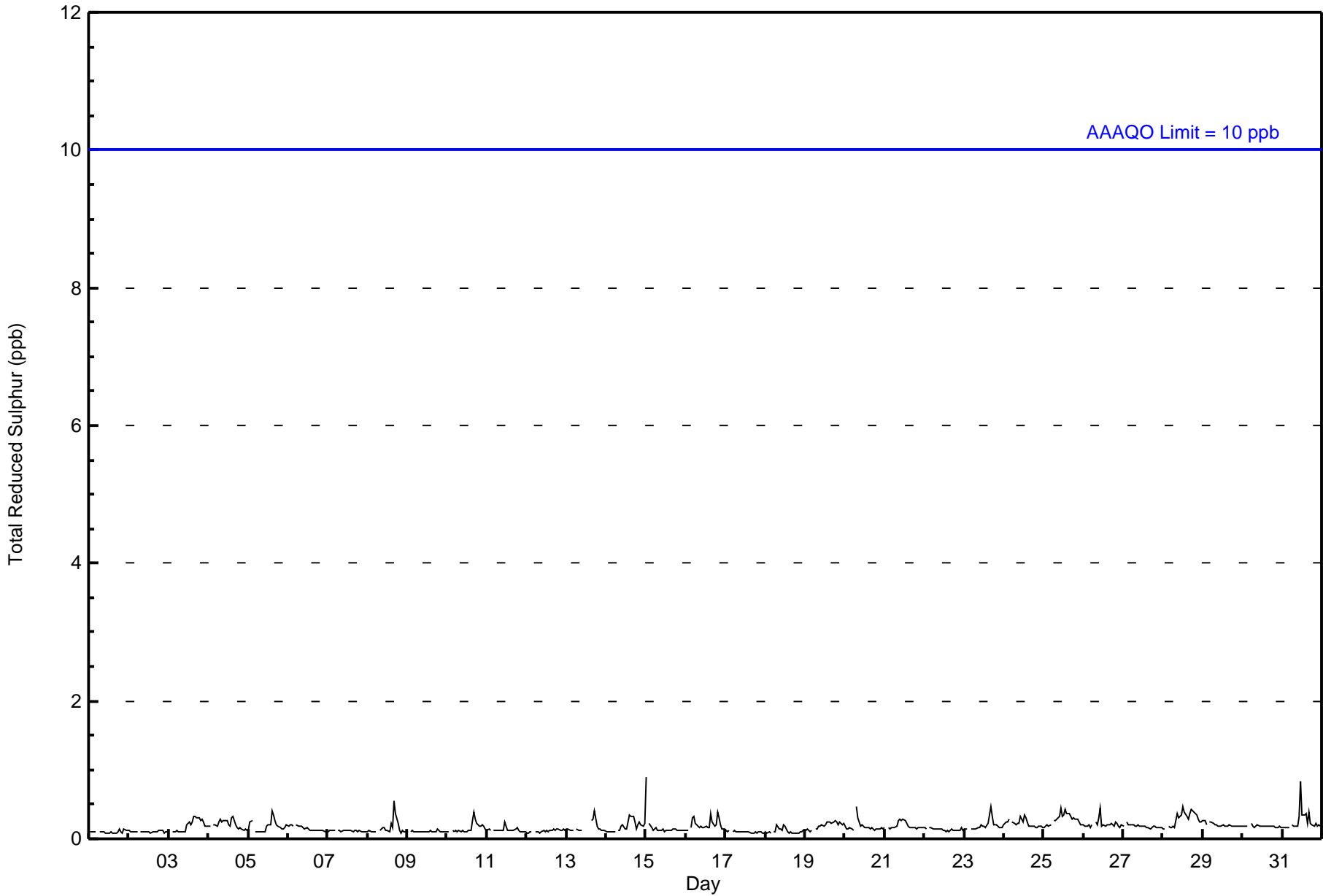
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Total Reduced Sulphur (TRS) - ppb**

**Anzac - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744										Daily Average		Daily Maximum																											
Maximum Value: 1 ppb on Dec 15 01:00										Maximum Daily Average: 0.3 ppb on Dec 28										Hours of Data: 708																													
Minimum Value: 0 ppb on Dec 17 17:00										Minimum Daily Average: 0.1 ppb on Dec 17										Hours of Missing Data: 36																													
Maximum Diurnal Average: 0.2 ppb at hour 17										Minimum Diurnal Average: 0.1 ppb at hour 5										Hours of Calibration: 36																													
Monthly Average: 0.2 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0										Percent Operational Time: 100.0																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
2-Dec	0	0	0	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-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
8-Dec	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	0.2	1																						
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
13-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0																						
14-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
15-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																						
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
20-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
26-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
31-Dec	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	0.3	1																						
																								0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	Diurnal Average	
																								1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	Diurnal Maximum	
Z - zerospan C - Calibration																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																																																	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Anzac - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	11	0	1	1	0	6	19	41	16	32	23	24	101	284	92	53	704
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	11	0	1	1	0	6	19	41	16	32	23	24	101	284	92	53	704

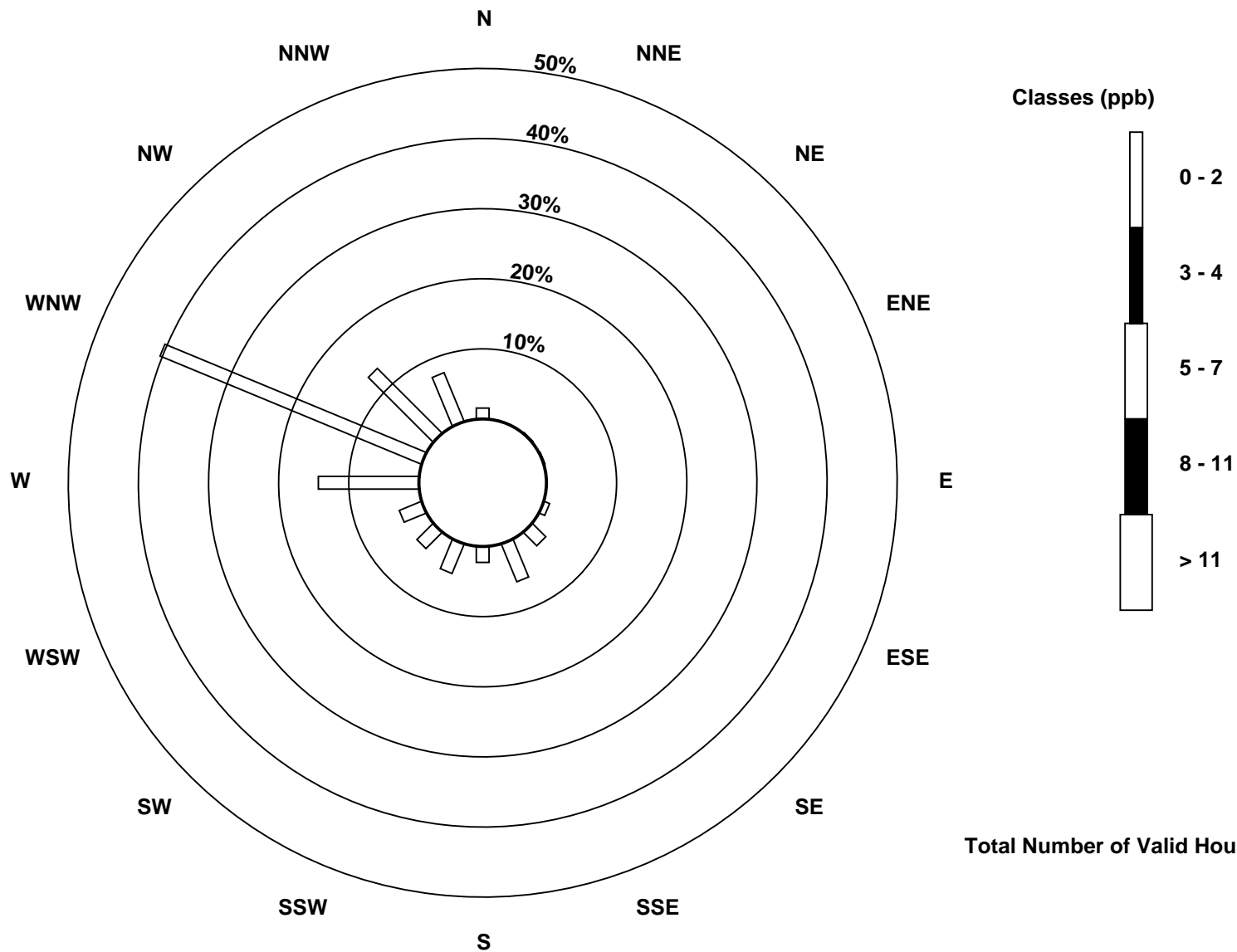
Total Number of Valid Hours: 704

Total Number of Hours: 744



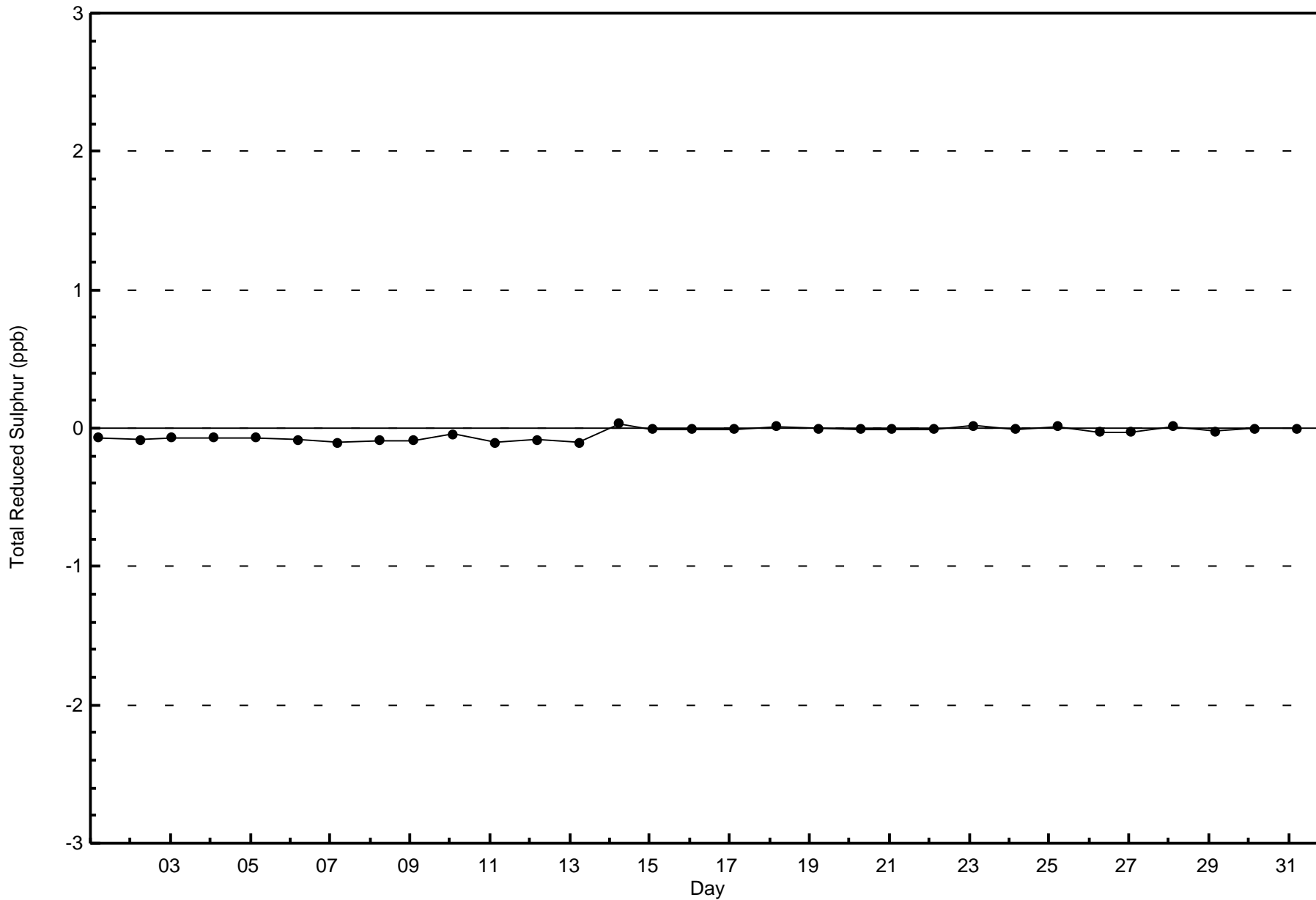
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

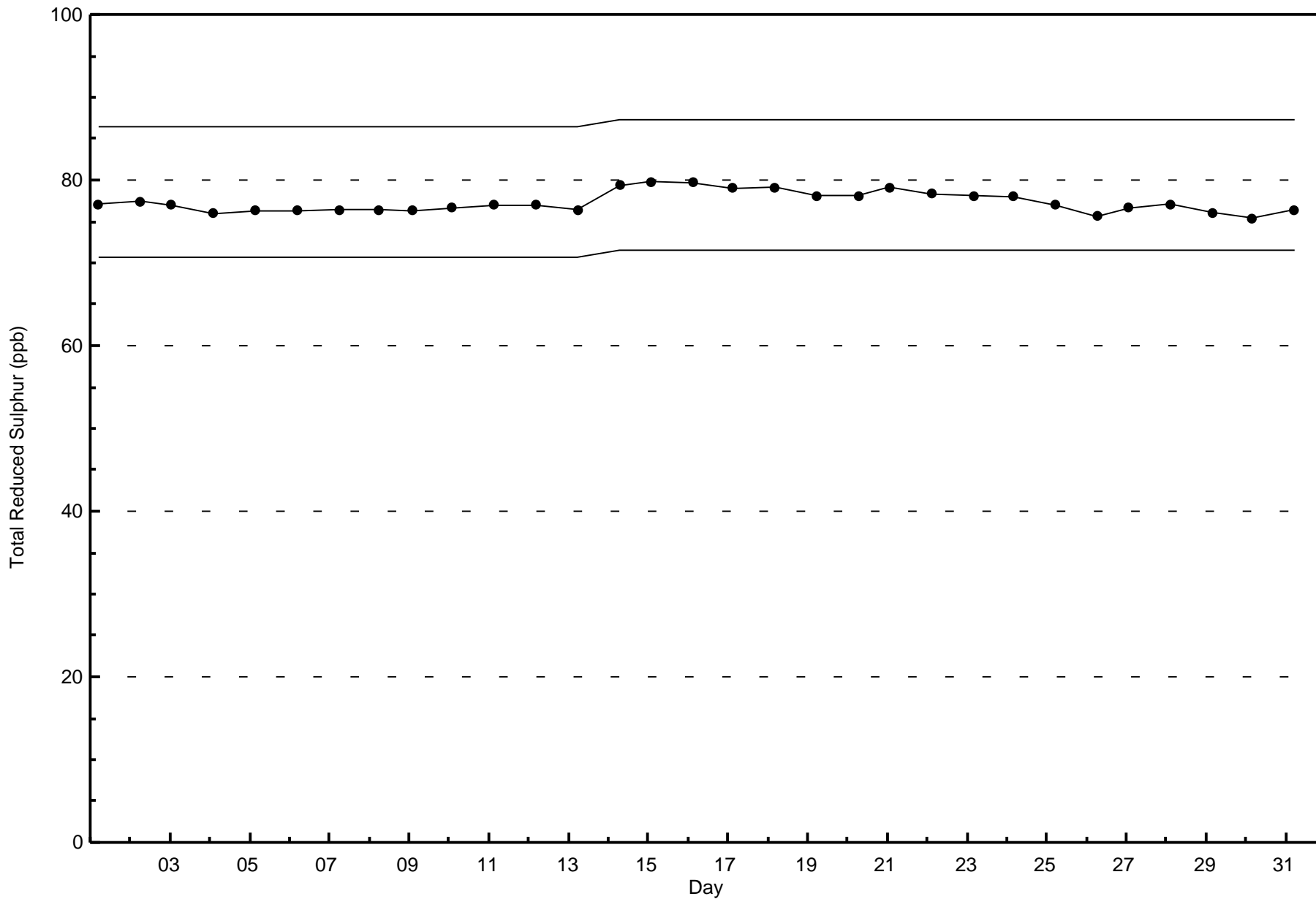
Total Reduced Sulphur (TRS) - ppb  
Anzac (AMS 14)



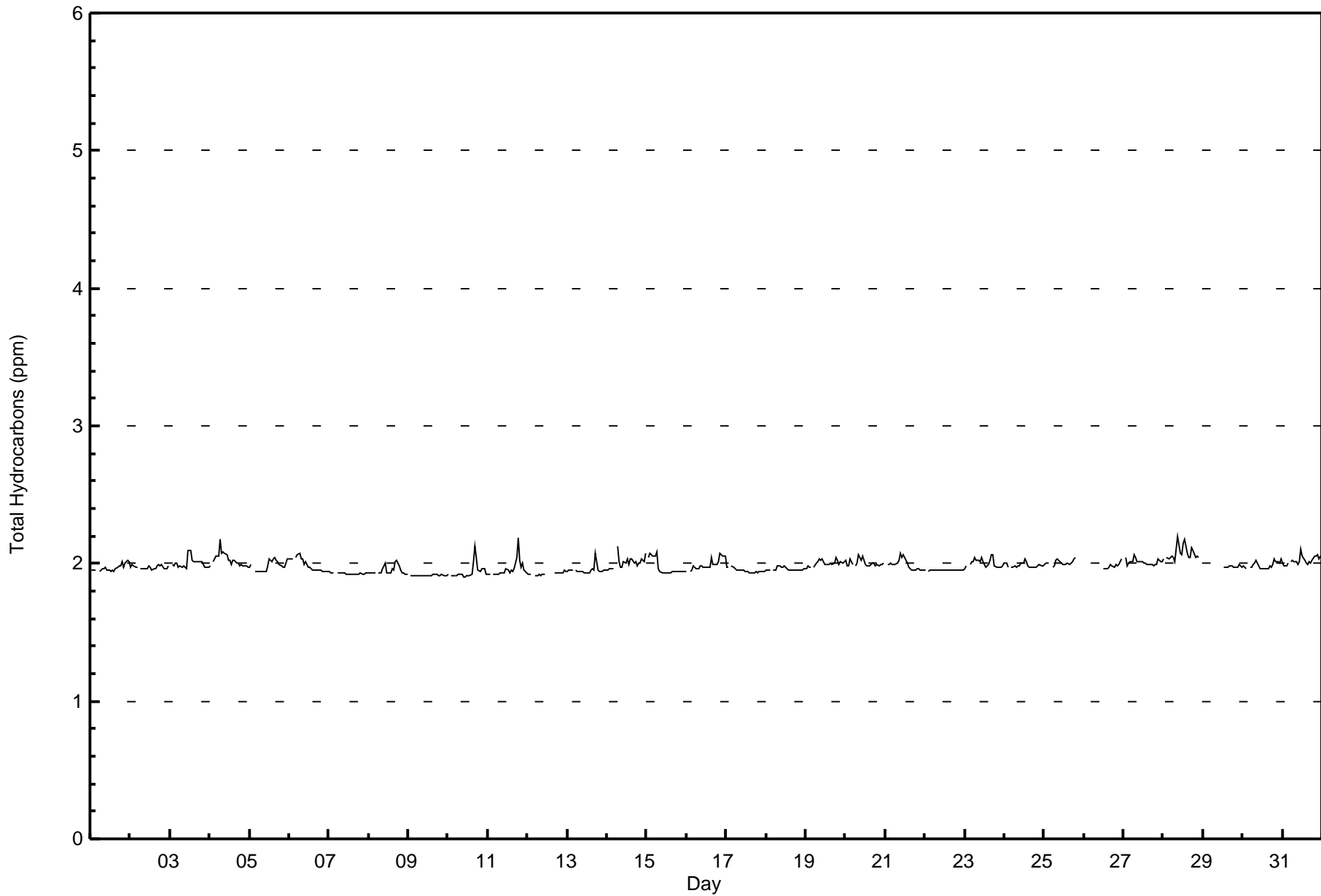
Total Number of Valid Hours: 704













**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Anzac - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	633	93.09	93.09
2.1 - 3.0	47	6.91	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 680

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Anzac - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	11	0	1	1	0	6	18	38	10	25	22	19	90	260	82	46	629
2.1 - 3.0	0	0	0	0	0	0	1	2	5	7	4	3	3	8	8	6	47
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
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	93	268	90	52	676

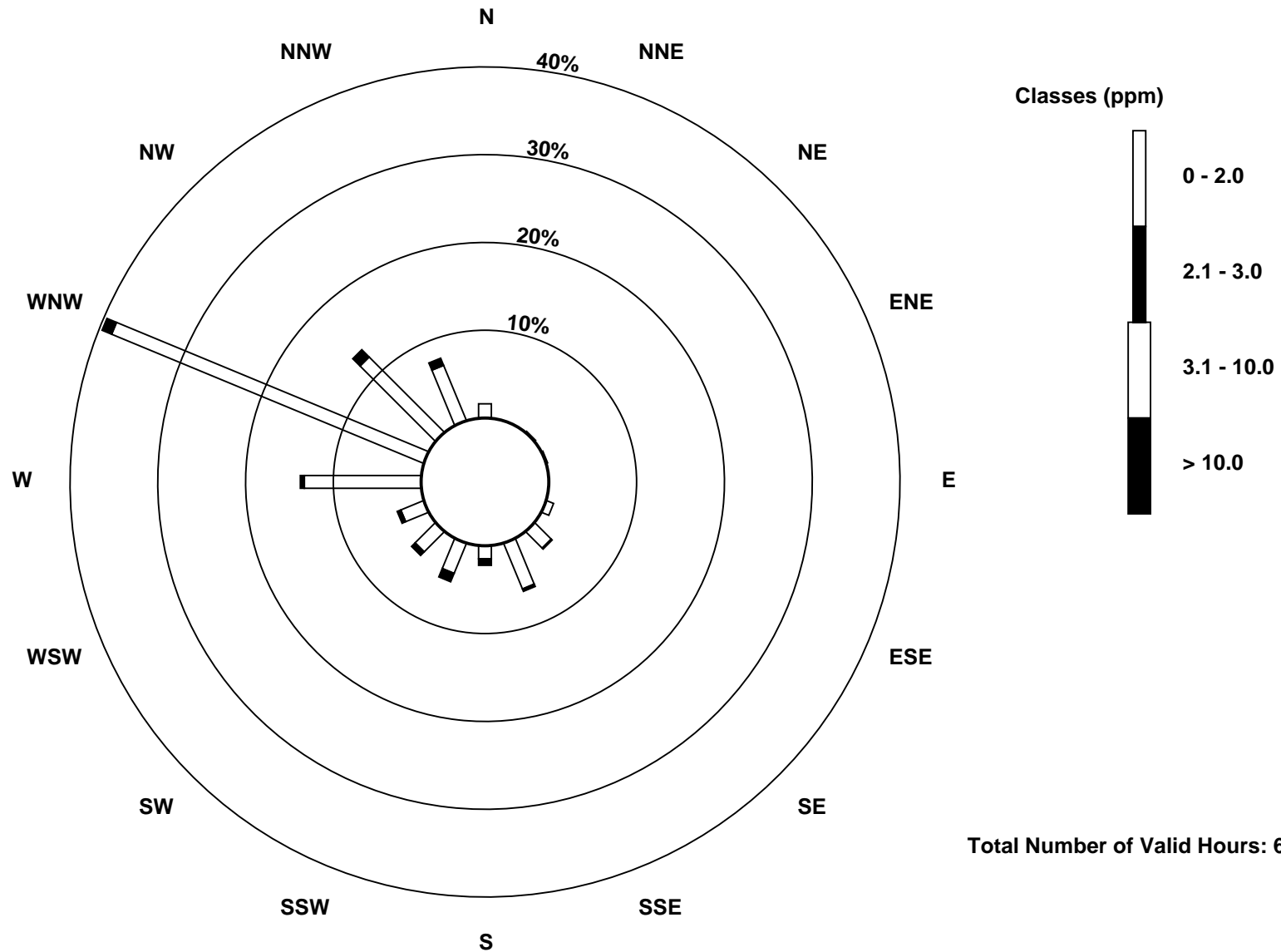
Total Number of Valid Hours: 676

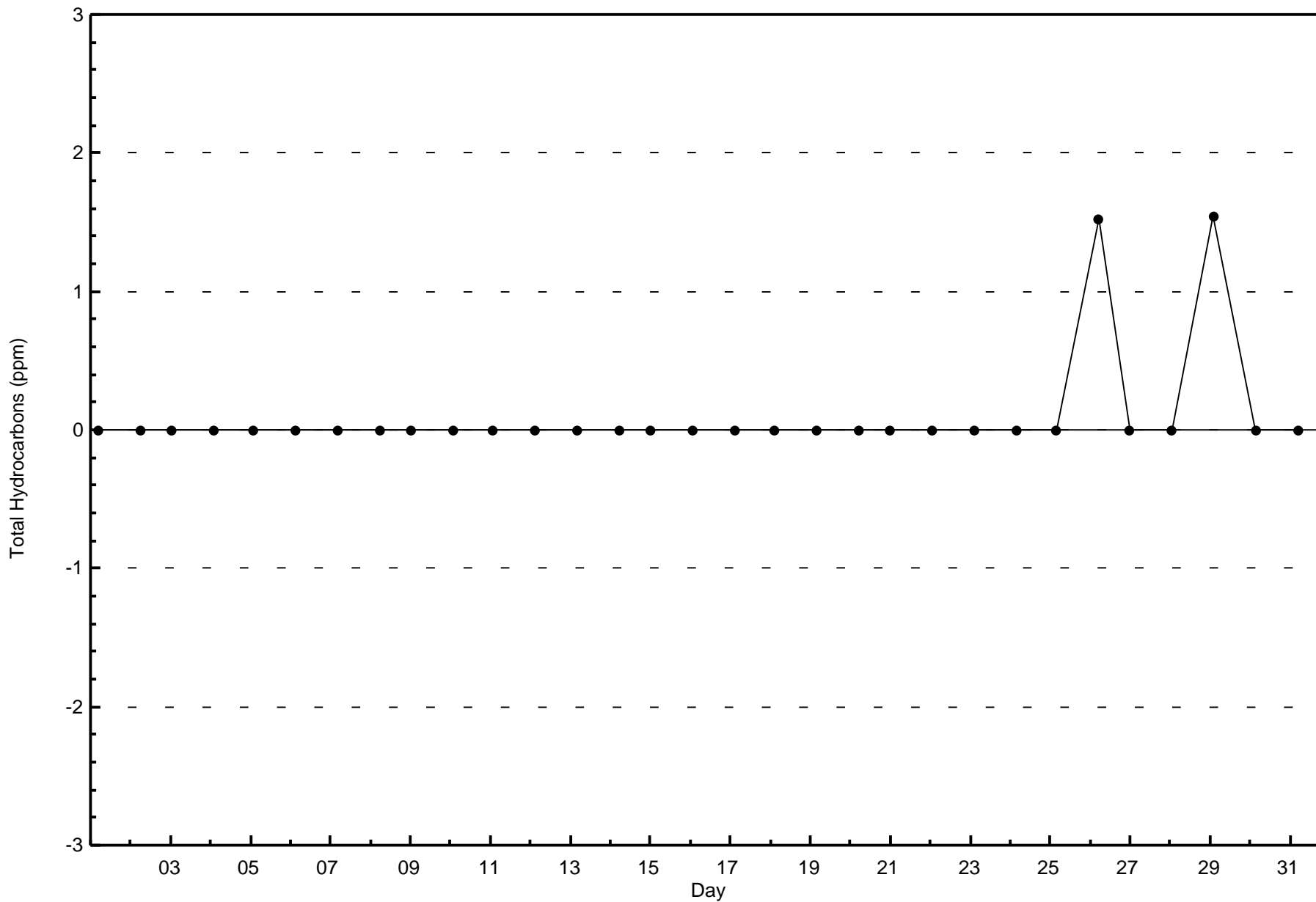
Total Number of Hours: 744



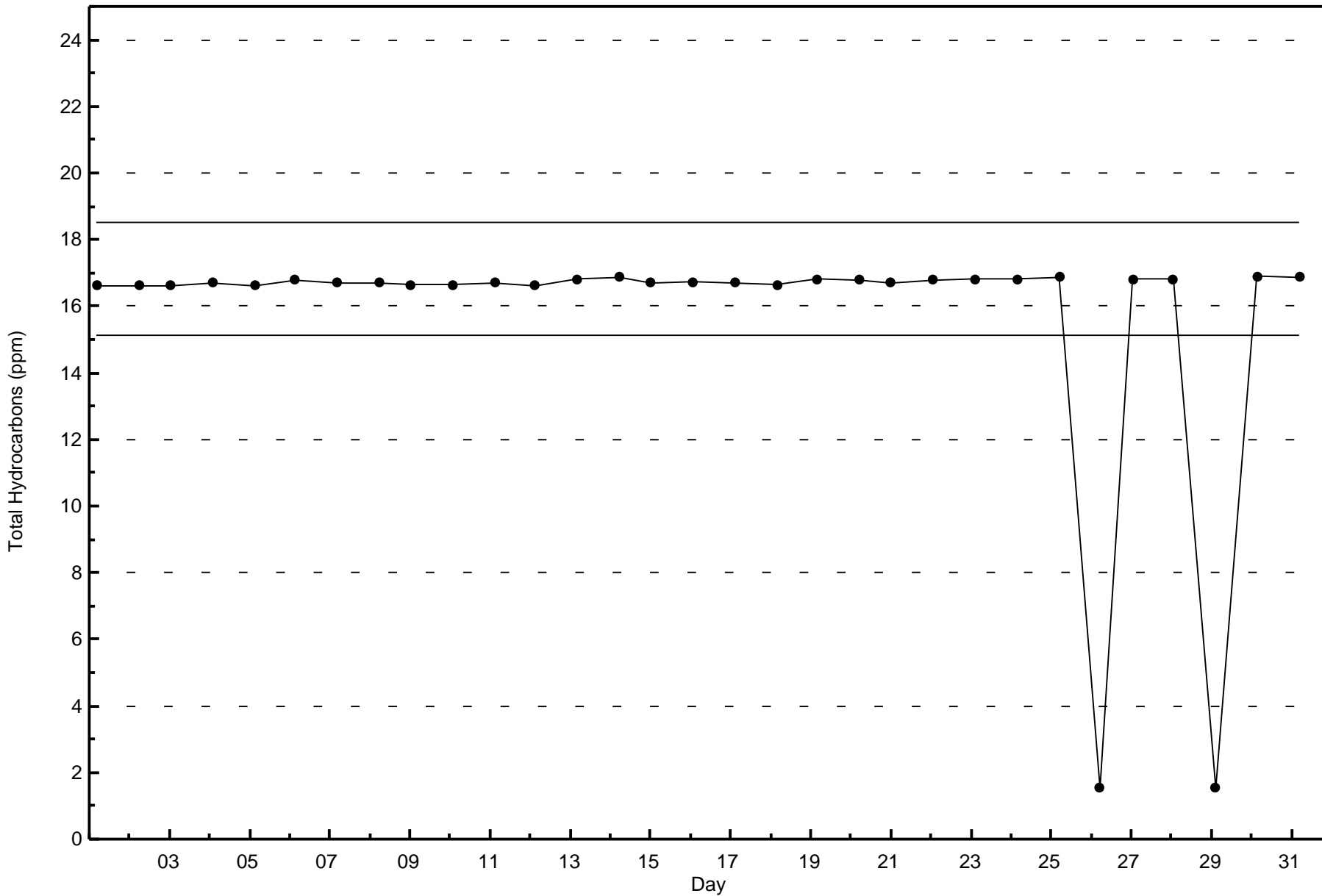
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Anzac (AMS 14)







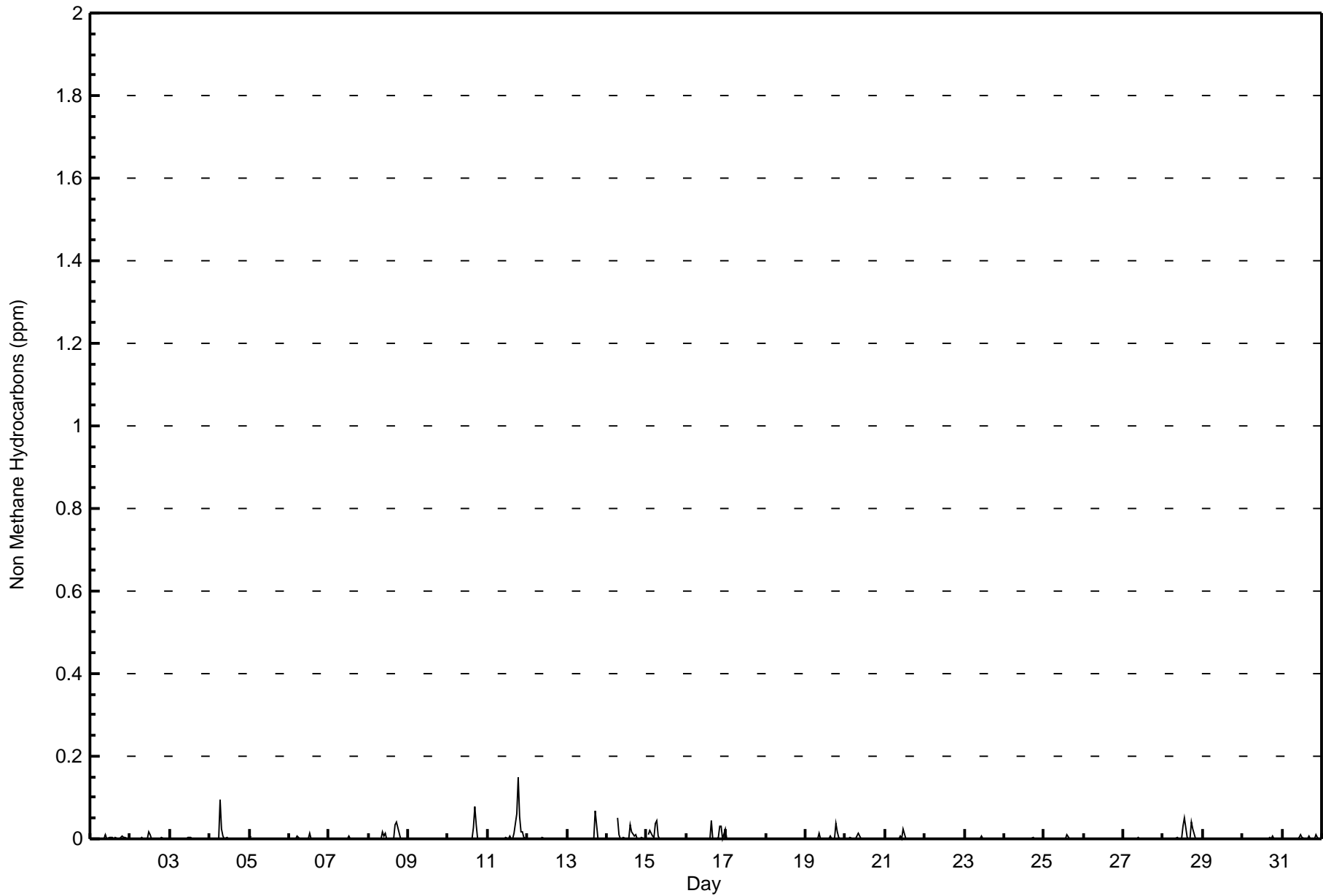




Summary of Hour Averages

Anzac - December 2017

Maximum Value: 0.151 ppm on Dec 11 19:00		Maximum Daily Average: 0.014 ppm on Dec 11		Hours in Service: 744																									
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 9		Hours of Data: 680																									
Maximum Diurnal Average: 0.008 ppm at hour 18		Minimum Diurnal Average: 0.000 ppm at hour 1		Hours of Missing Data: 64																									
Monthly Average: 0.002 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0		Hours of Calibration: 34																									
				Percent Operational Time: 96.0																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.009	0.000	0.002	0.003	0.004	0.001	0.004	0.001	0.000	0.005	0.008	0.003	0.002	0.001	0.000	0.002	0.009			
2-Dec	0.000	0.001	0.000	0.000	0.000	Z	0.000	0.003	0.000	0.000	0.000	0.017	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.001	0.017			
3-Dec	Z	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	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	0.004			
4-Dec	0.000	Z	0.000	0.000	0.001	0.000	0.000	0.096	0.025	0.008	0.000	0.002	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.096			
5-Dec	0.000	0.007	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	0.007			
6-Dec	0.000	0.000	0.000	Z	0.001	0.006	0.000	0.001	0.001	0.001	0.000	0.001	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.013			
7-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005			
8-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.018	0.007	0.014	0.000	0.000	0.000	0.000	0.000	0.034	0.040	0.013	0.000	0.000	0.000	0.000	0.001	0.005	0.040			
9-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
10-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.079	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.079			
11-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.006	0.000	0.001	0.014	0.060	0.151	0.054	0.017	0.018	0.005	0.001	0.014	0.151			
12-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.001	0.000	0.002	0.000	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002			
13-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.067				
14-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.050	0.111	0.001	0.002	0.002	0.000	0.000	0.001	0.035	0.017	0.006	0.010	0.000	0.000	0.000	0.004	0.000	0.001	0.006	0.050			
15-Dec	Z	0.010	0.021	0.007	0.005	0.038	0.045	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	0.006	0.045			
16-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.001	0.000	0.000	0.003	0.032	0.030	0.000	0.025	0.006	0.044			
17-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
18-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
19-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.038	0.018	0.002	0.001	0.000	0.000	0.003	0.038			
20-Dec	0.001	0.000	0.000	0.002	0.001	Z	0.000	0.008	0.014	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.014			
21-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.008	0.000	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.025			
22-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001			
23-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006			
24-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003			
25-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.001	AF	AF	AF	AF	0.001	0.011			
26-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	--	0.001			
27-Dec	Z	0.000	0.000	0.001	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	0.004			
28-Dec	0.002	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.032	0.051	0.002	0.000	0.000	0.041	0.025	0.001	0.000	0.000	AF	AF	0.007	0.051			
29-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	--	0.000			
30-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.005	0.000	0.000	0.000	0.001	0.000	0.000	0.005			
31-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.001	0.000	0.000	0.000	0.002	0.010	0.005	0.000	0.000	0.000	0.005	0.000	0.001	0.000	0.009	0.002	0.000	0.000	0.001	0.010			
																								Diurnal Average					
																								Diurnal Maximum					
Z - zerospan																								C - Calibration		M - Maintenance		AF - Analyzer Failure	





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Anzac - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	622	91.47	91.47
0.006 - 0.05	53	7.79	99.26
0.06 - 0.1	4	0.59	99.85
> 0.1	1	0.15	100.00

Total Number of Valid Hours: 680

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Anzac - December 2017**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	11	0	1	1	0	4	17	30	11	22	23	20	87	258	85	48	618
0.006 - 0.05	0	0	0	0	0	2	2	10	4	8	3	2	5	9	5	3	53
0.06 - 0.1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	4
> 0.1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	93	268	90	52	676

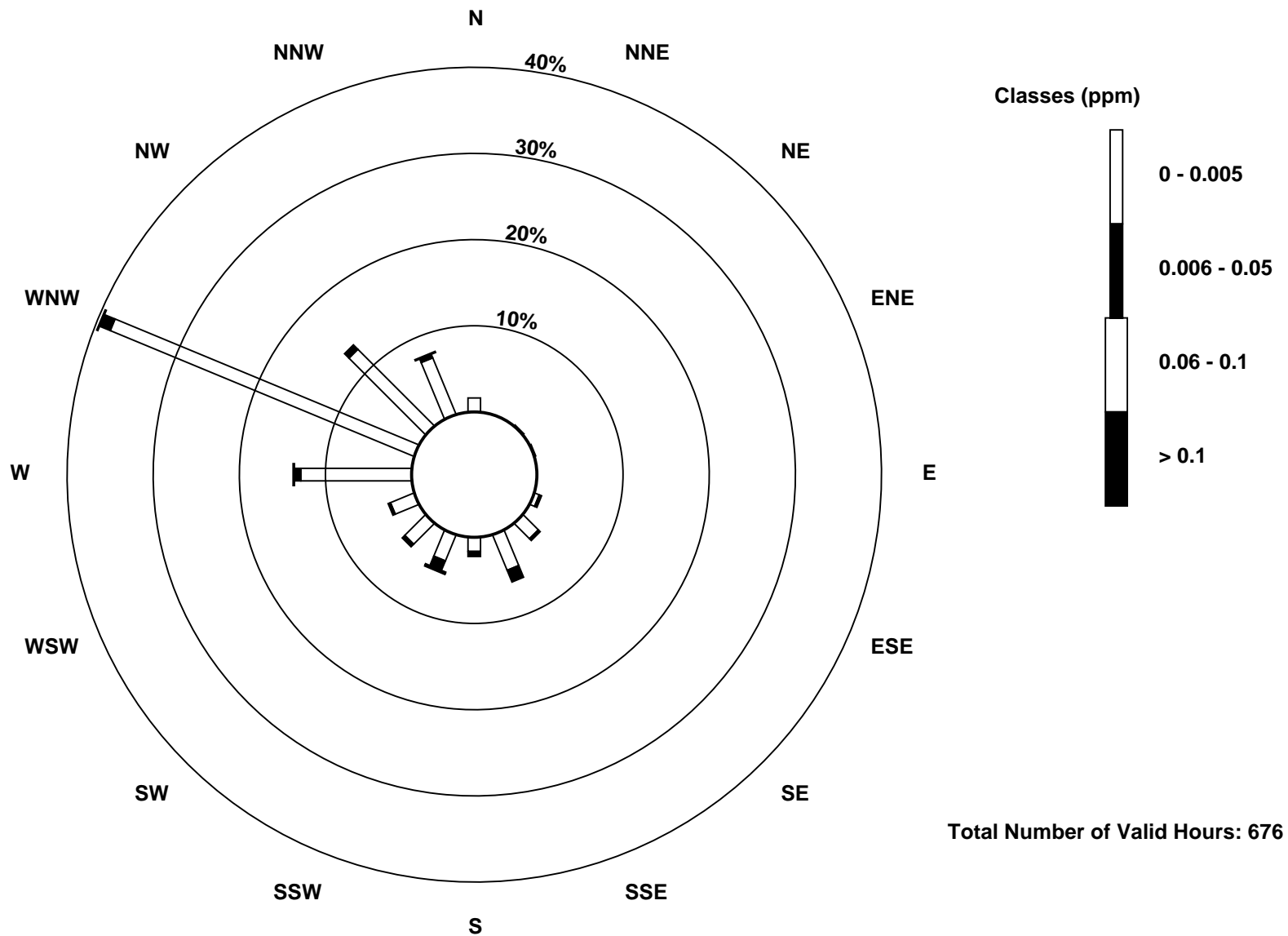
Total Number of Valid Hours: 676

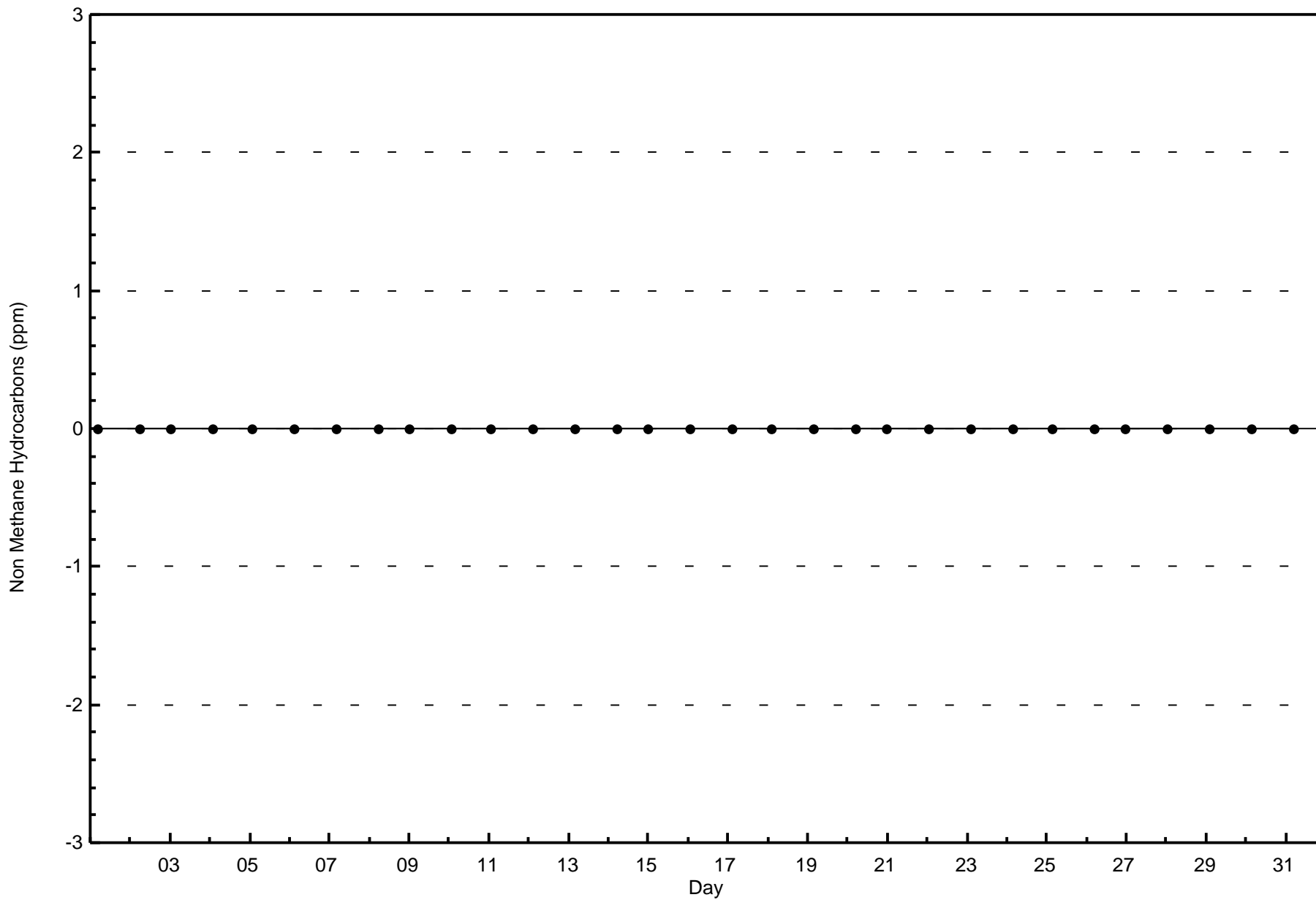
Total Number of Hours: 744

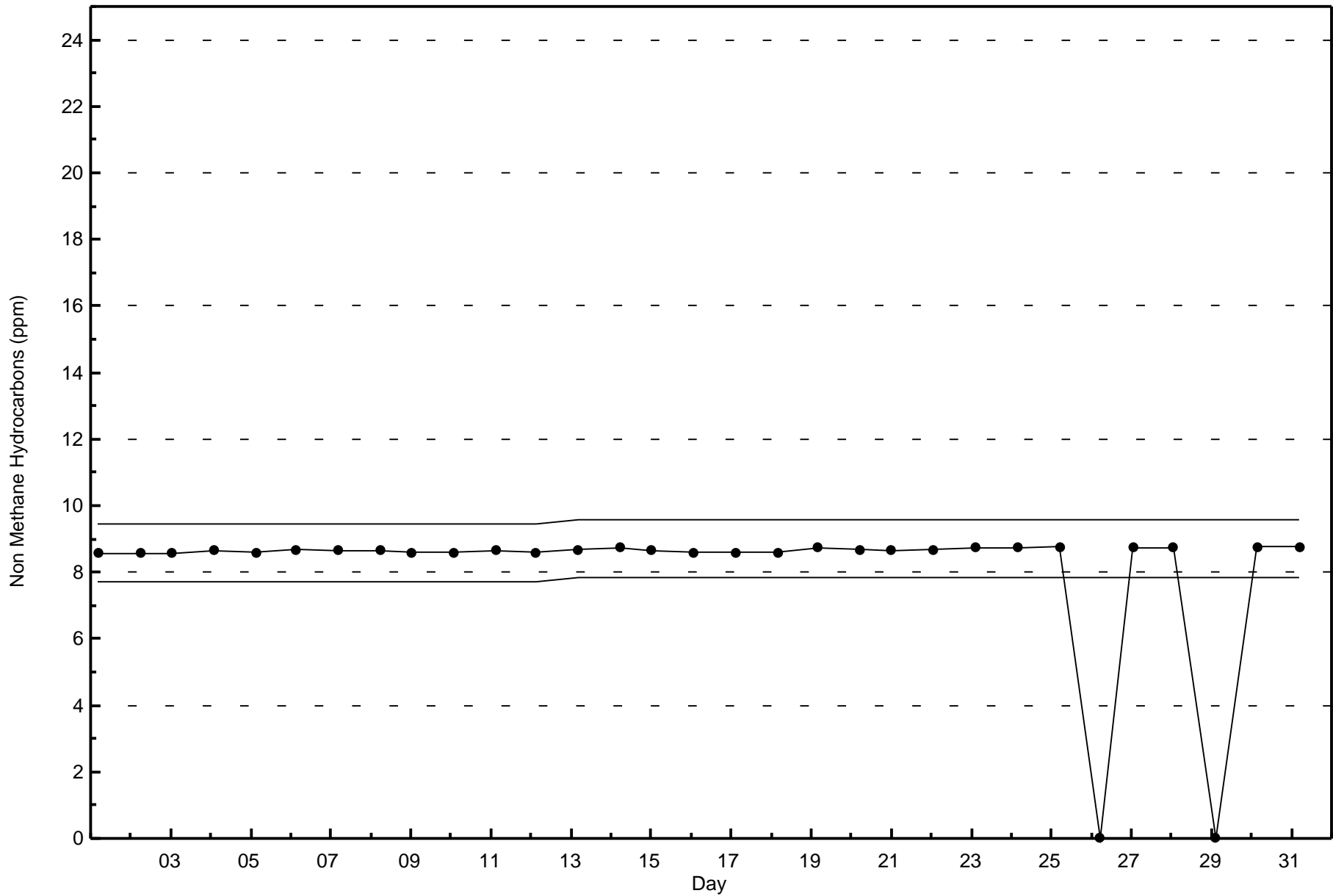


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Non Methane Hydrocarbons (NMHC) - ppm  
Anzac (AMS 14)







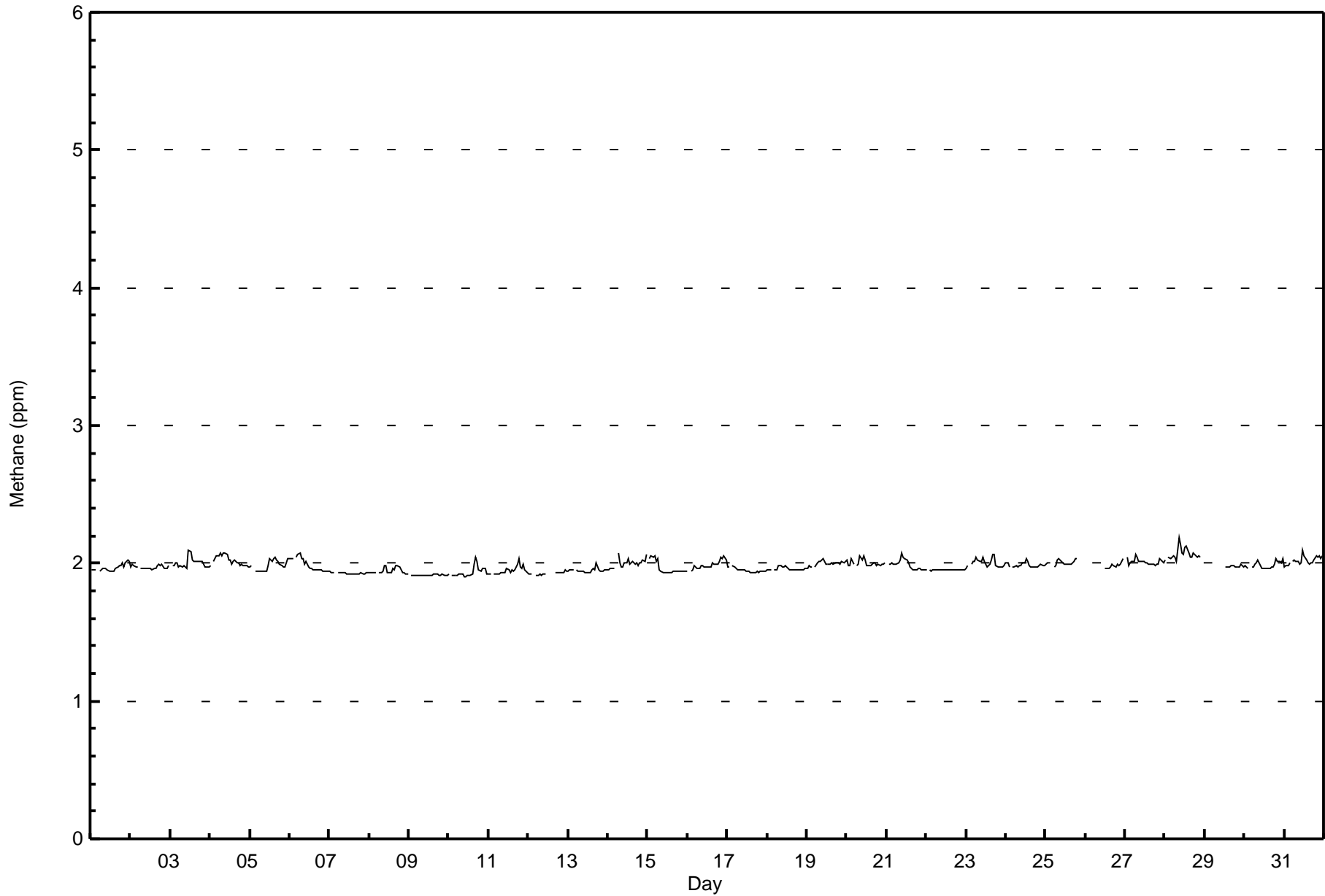






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Methane (CH<sub>4</sub>) - ppm**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Anzac - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	643	94.56	94.56
2.1 - 3.0	37	5.44	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 680

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Anzac - December 2017**

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	0	1	1	0	6	18	38	12	30	22	19	90	261	83	47	639
2.1 - 3.0	0	0	0	0	0	0	1	2	3	2	4	3	3	7	7	5	37
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
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	93	268	90	52	676

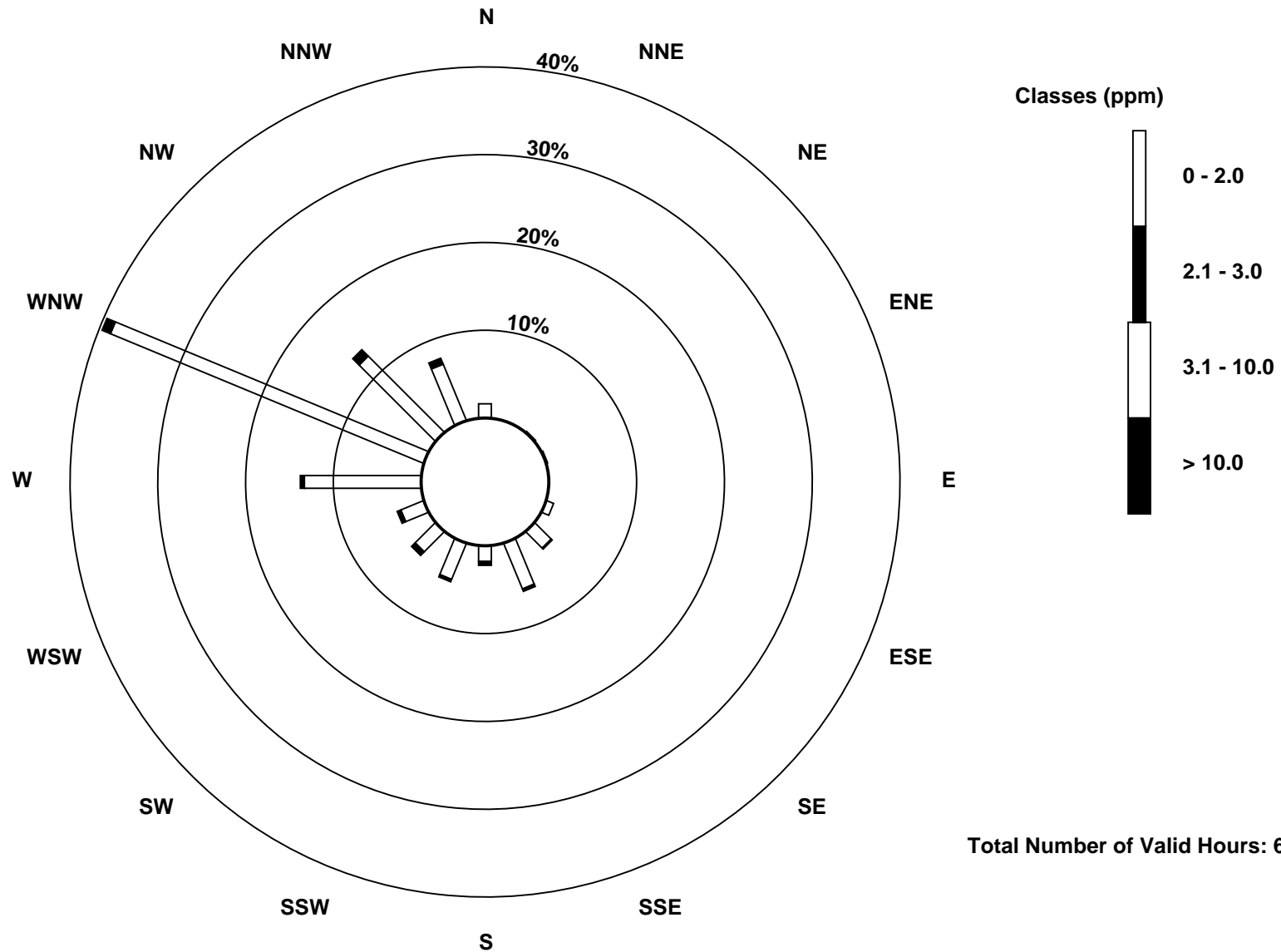
Total Number of Valid Hours: 676

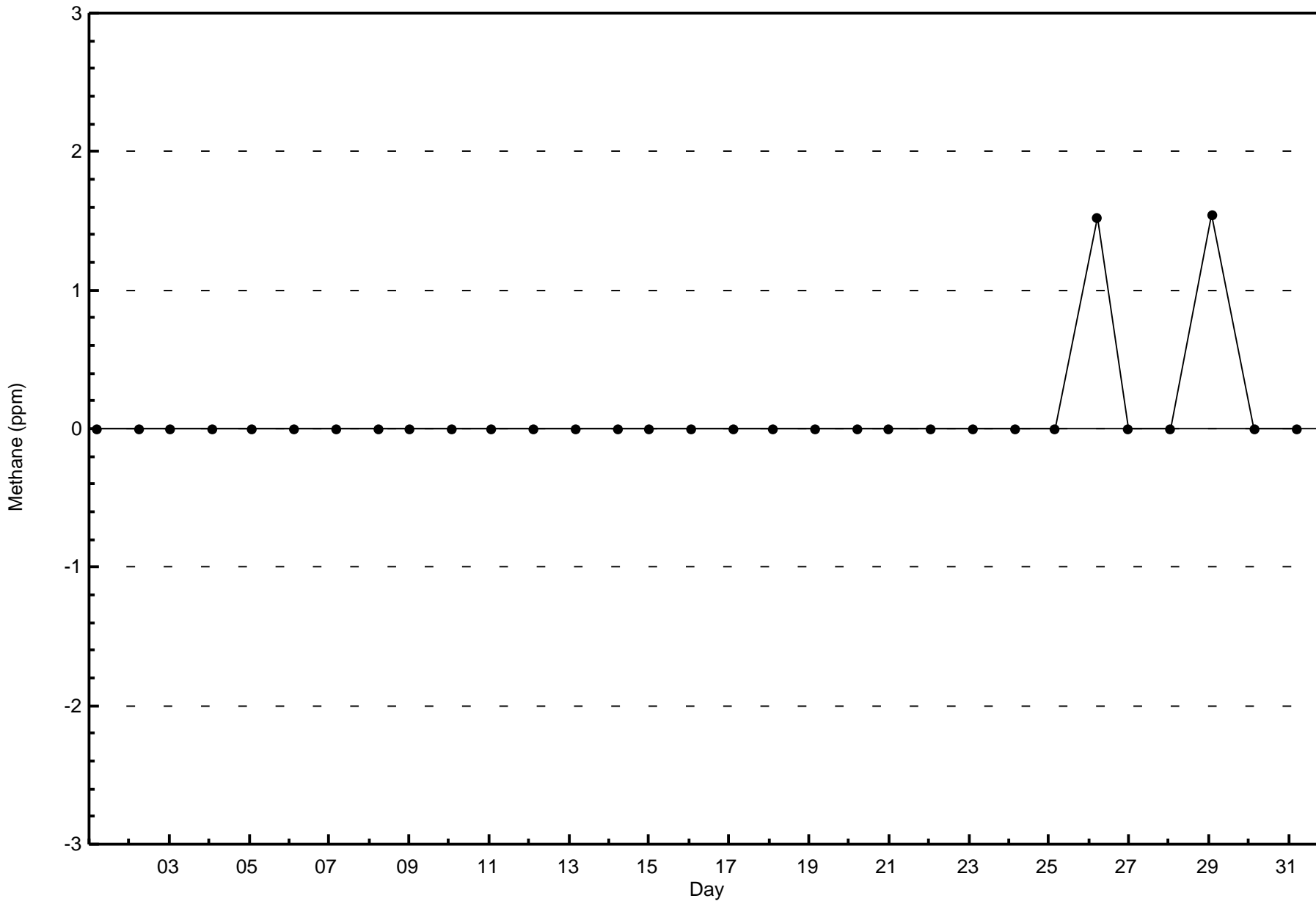
Total Number of Hours: 744

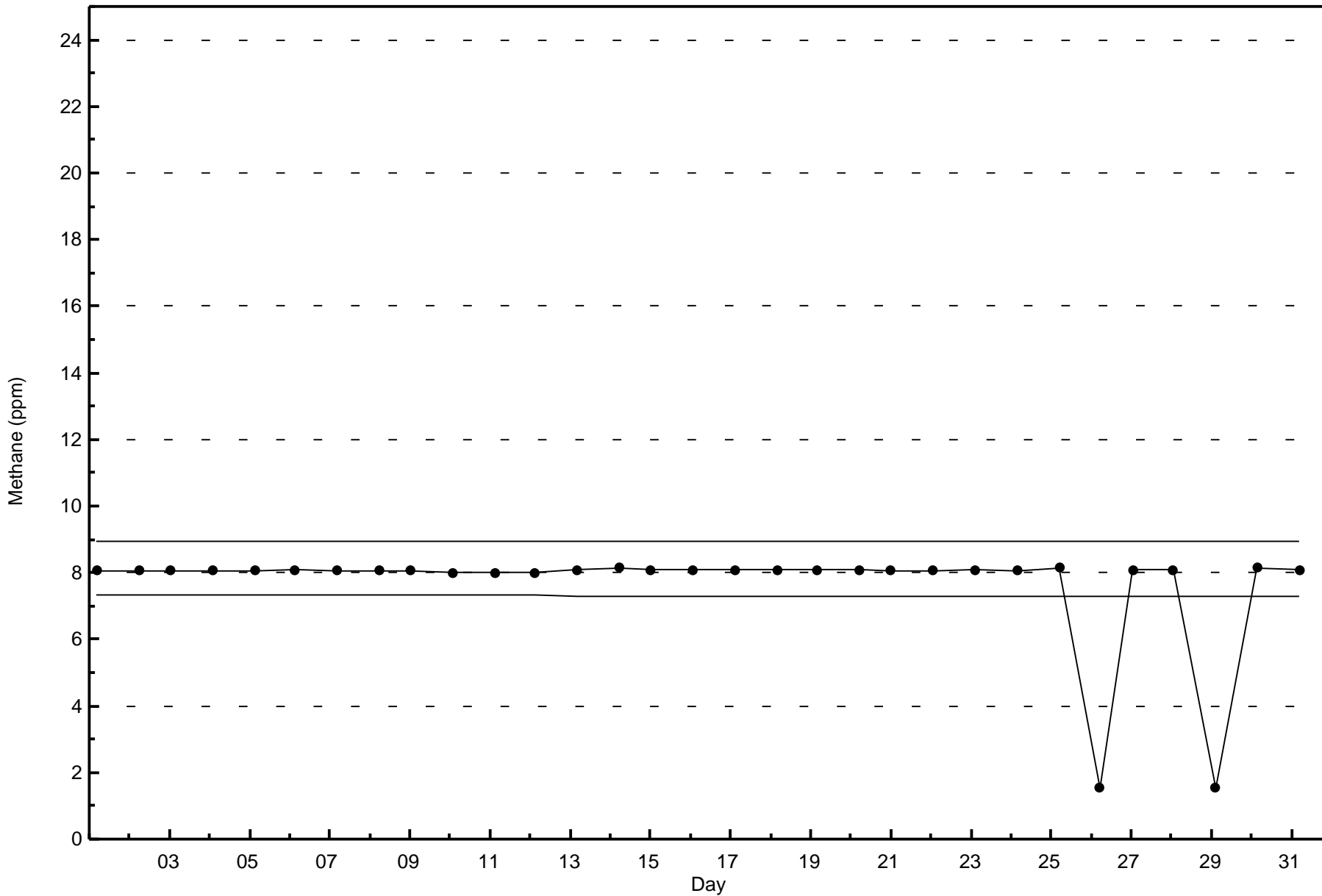


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Anzac (AMS 14)









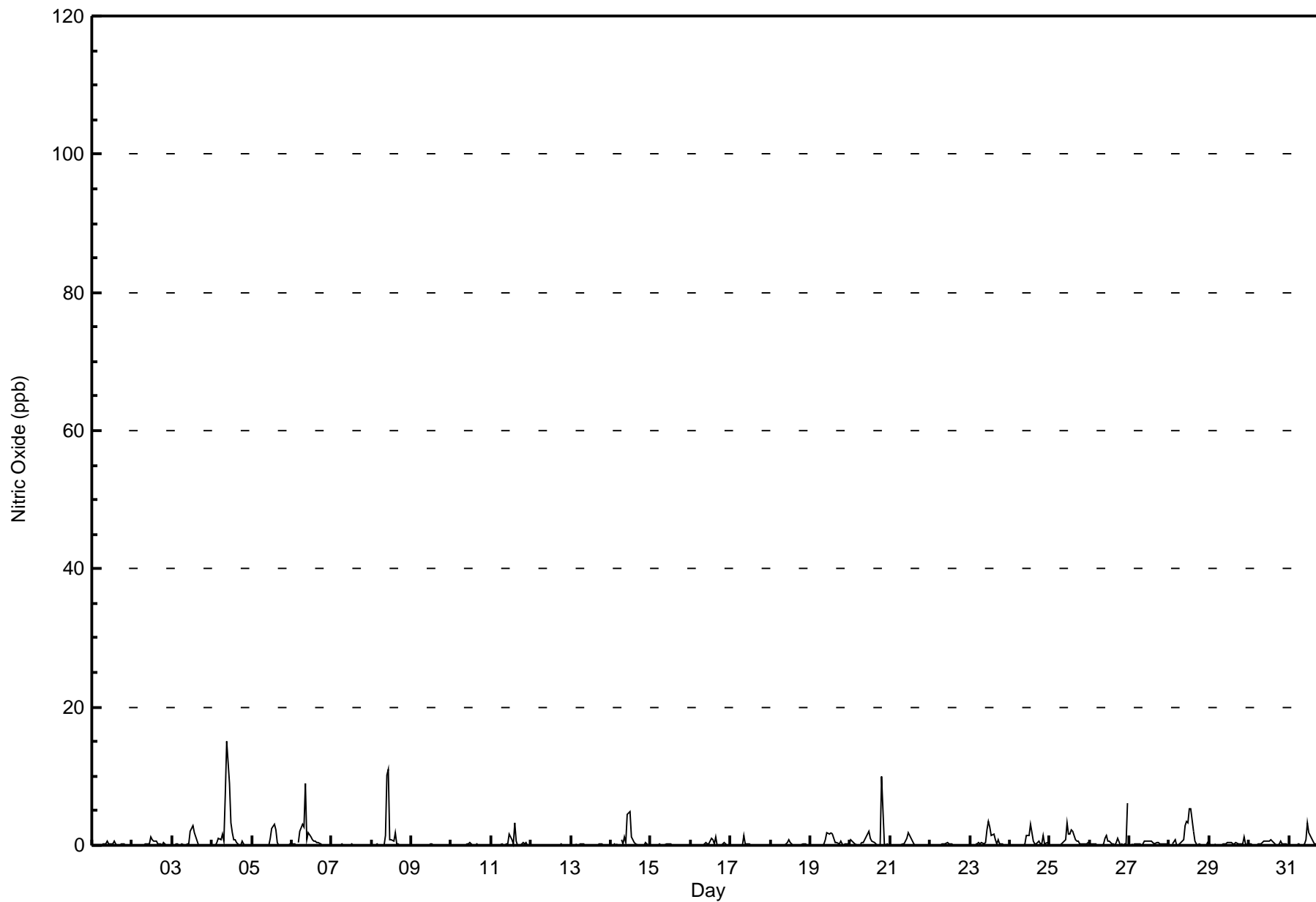
Maximum Value: 15 ppb on Dec 4 10:00																	Maximum Daily Average: 1.9 ppb on Dec 4																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 3 23:00																	Minimum Daily Average: 0.1 ppb on Dec 9																	Hours of Data: 708	
Maximum Diurnal Average: 1.5 ppb at hour 11																	Minimum Diurnal Average: 0.1 ppb at hour 3																	Hours of Missing Data: 36	
Monthly Average: 0.5 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 7																	Hours of Calibration: 36	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	0	0	0	0	Z	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1									
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1									
3-Dec	Z	0	0	0	0	0	0	0	0	0	2	3	2	1	1	0	0	0	0	0	0	0	0	0.4	3										
4-Dec	0	Z	0	1	1	1	2	1	7	15	9	3	2	1	1	0	0	0	1	0	0	0	0	1.9	15										
5-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	2	3	2	1	0	0	0	0	0	0	0	0.5	3										
6-Dec	0	0	0	Z	0	2	3	3	9	1	2	1	1	1	1	0	0	0	0	0	0	0	0	1.1	9										
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
8-Dec	0	0	0	0	0	Z	0	0	1	10	11	1	1	1	2	0	0	0	0	0	0	0	0	1.2	11										
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	2	1	0	3	1	0	0	0	0	0	0	0	0.4	3										
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0.1	0										
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
14-Dec	0	0	0	0	0	Z	1	0	1	0	5	5	1	1	0	0	0	0	0	0	0	0	0	0.7	5										
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0.2	1										
17-Dec	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1										
18-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1										
19-Dec	0	0	0	0	Z	0	0	0	0	1	2	2	2	2	1	0	0	0	1	0	0	0	0	0.5	2										
20-Dec	1	1	0	0	0	Z	0	0	0	1	2	2	1	1	0	0	0	0	0	10	0	0	0	0.9	10										
21-Dec	Z	0	0	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0.3	2										
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
23-Dec	0	0	Z	0	0	0	0	0	0	0	2	3	3	1	2	1	0	1	0	0	0	0	0	0.7	3										
24-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	3	2	1	0	0	1	0	0	1	0	0	0.5	3										
25-Dec	0	0	0	0	Z	0	0	0	0	1	3	2	2	2	1	1	1	1	0	0	0	0	0	0.7	3										
26-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0.6	6										
27-Dec	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1										
28-Dec	0	Z	0	1	0	0	0	0	1	3	3	3	5	5	2	1	0	0	0	0	0	0	0	1.2	5										
29-Dec	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	1										
30-Dec	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0.3	1										
31-Dec	0	0	0	0	Z	0	0	0	0	0	1	3	2	1	1	0	0	0	0	0	0	0	0	0.4	3										
																	0.1 0.1 0.1 0.1 0.1 0.2 0.3 0.2 0.8 1.3 1.5 1.3 1.2 0.9 0.7 0.3 0.2 0.2 0.1 0.4 0.1 0.1 0.1 0.3																	Diurnal Average	
																	1 1 0 1 1 2 3 3 9 15 11 5 5 5 3 1 1 1 1 10 1 1 0 6																	Diurnal Maximum	
Z - zerospan		C - Calibration																																	





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	11	0	1	1	0	6	19	40	15	32	26	22	97	284	96	54	704
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
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	97	284	96	54	704

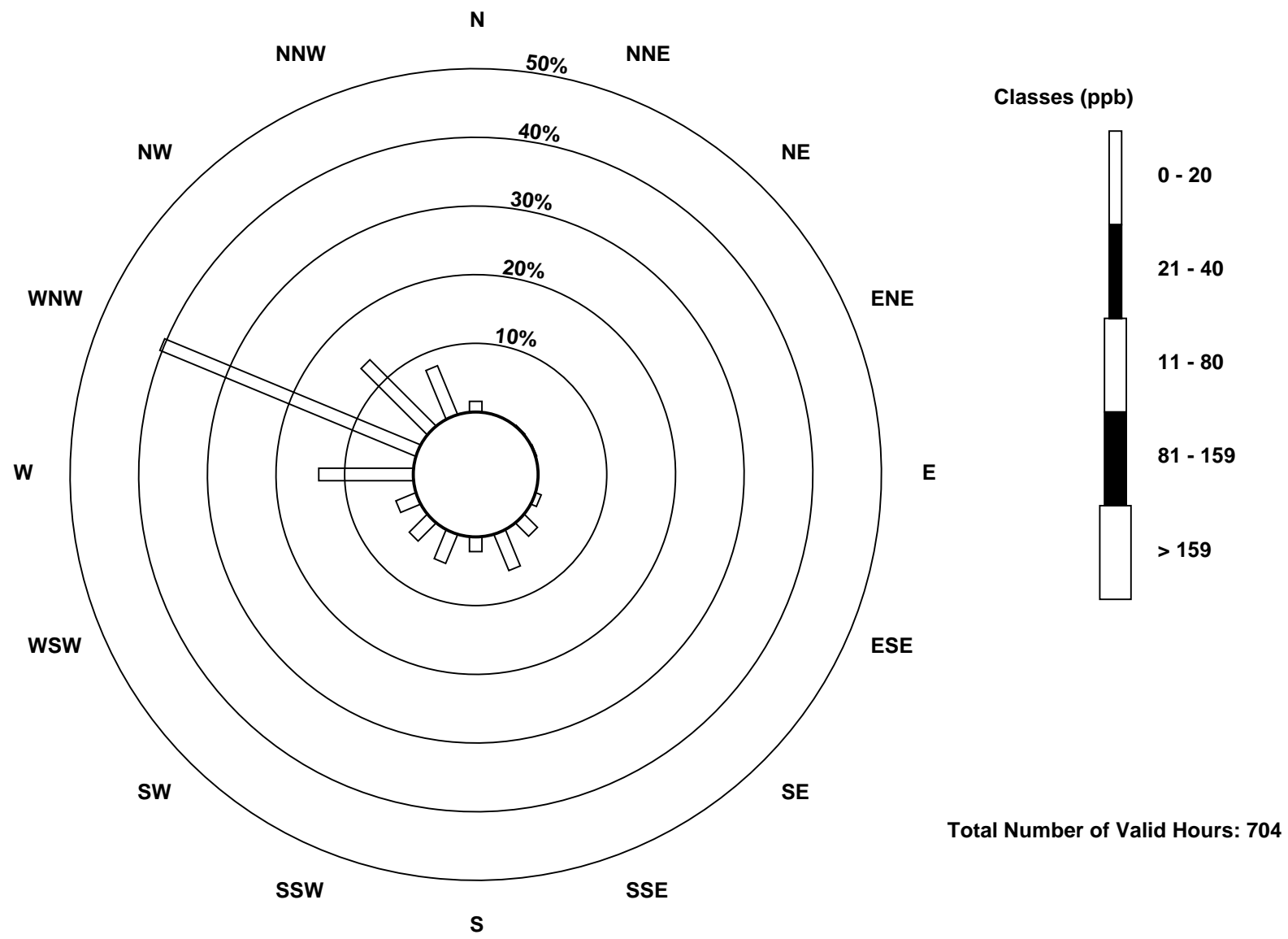
Total Number of Valid Hours: 704

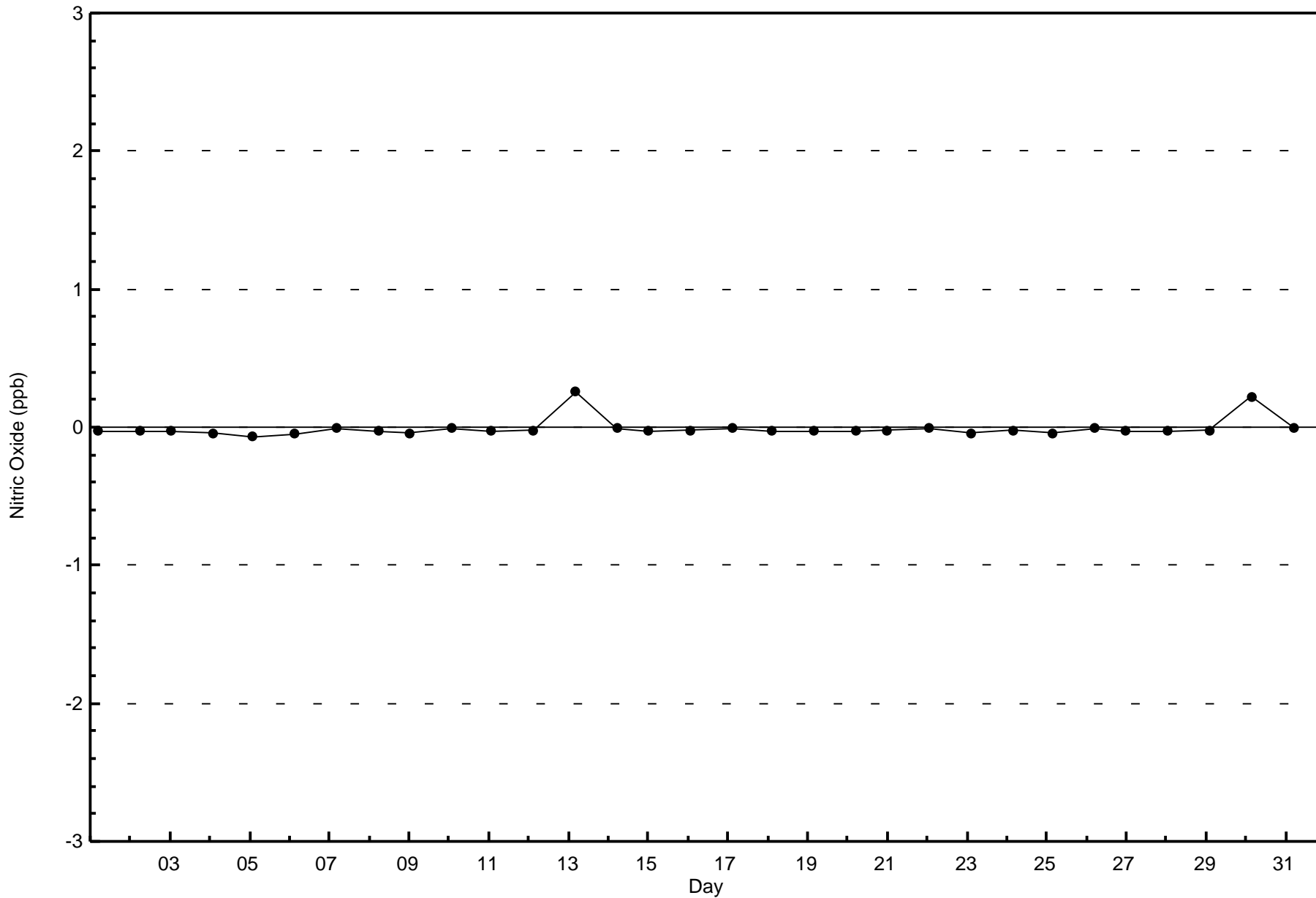
Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Anzac (AMS 14)

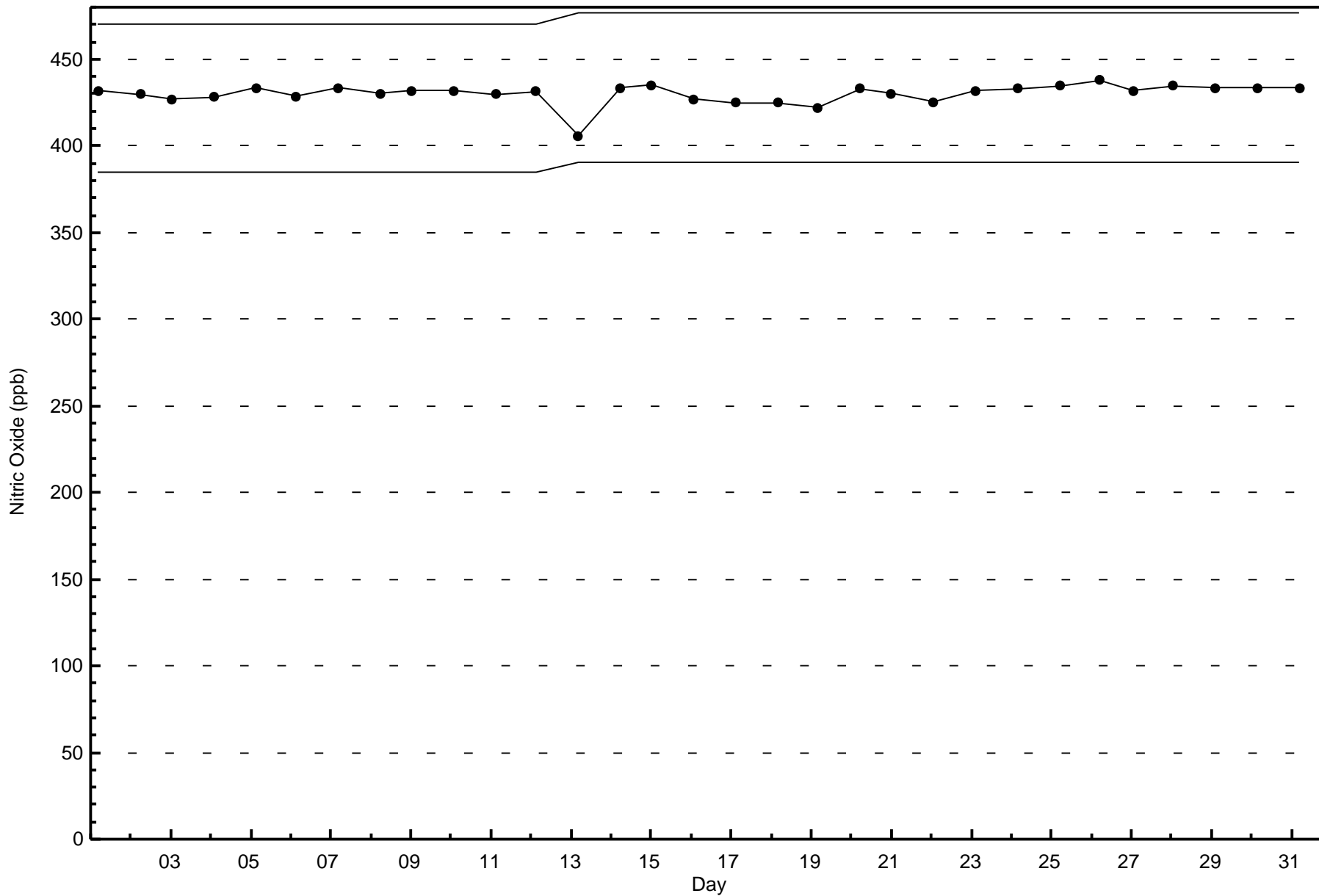






Wood Buffalo Environmental Association  
Span Responses

Nitric Oxide (NO) - ppb  
Anzac - December 2017





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

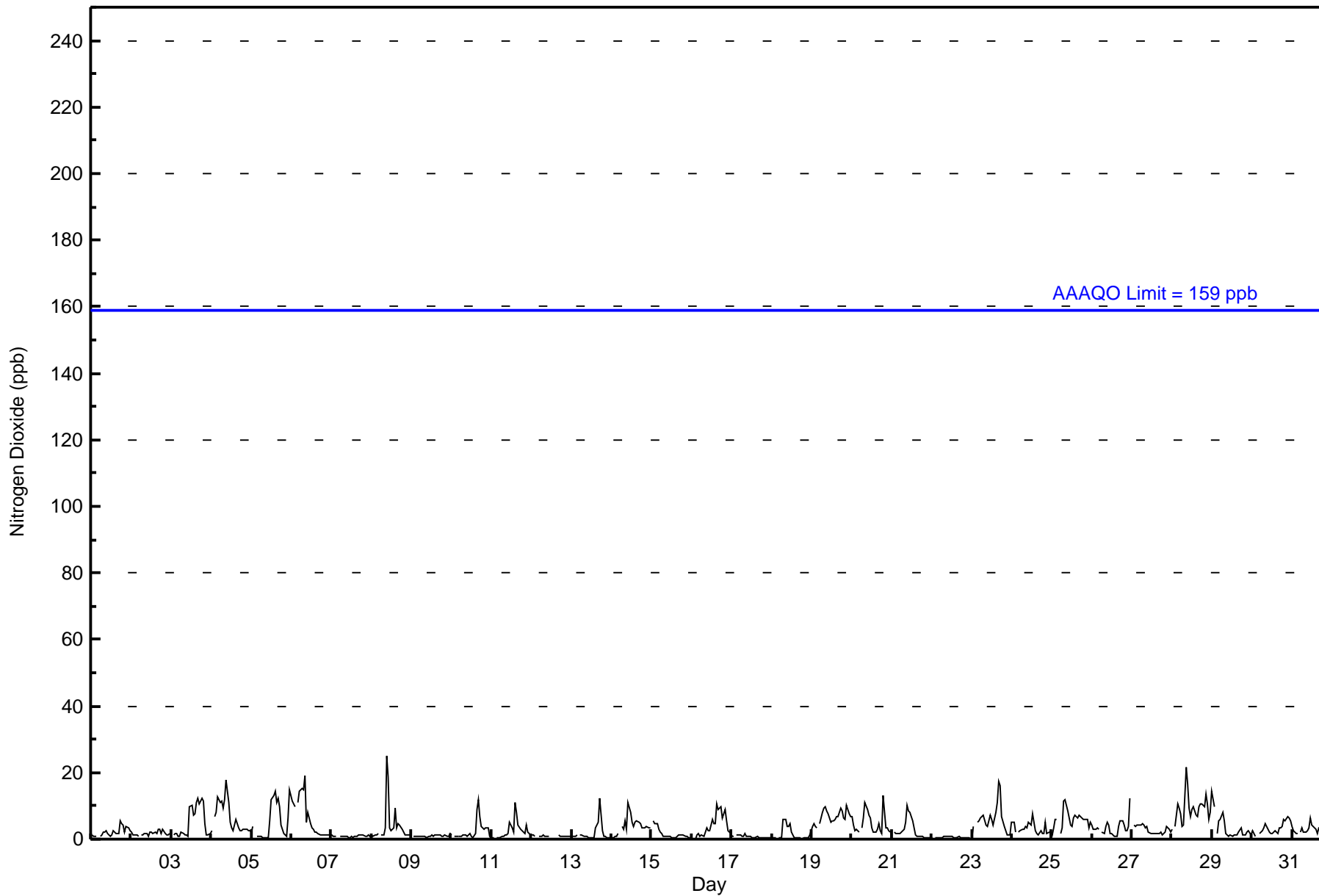
## Anzac - December 2017

Number of Exceedences (AAAQO):		1-hr: 0    24-hr: 0		Hours in Service:		744																																											
Maximum Value: 25 ppb on Dec 8 10:00		Maximum Daily Average: 9.1 ppb on Dec 28		Hours of Data:		708																																											
Minimum Value: 0 ppb on Dec 16 03:00		Minimum Daily Average: 0.6 ppb on Dec 22		Hours of Missing Data:		36																																											
Maximum Diurnal Average: 4.8 ppb at hour 10		Minimum Diurnal Average: 2.4 ppb at hour 23		Hours of Calibration:		36																																											
Monthly Average: 3.5 ppb		Percentiles: P <sub>1</sub> = 0   P <sub>10</sub> = 1   Q <sub>1</sub> = 1   Median = 2   O <sub>3</sub> = 5   P <sub>90</sub> = 8   P <sub>99</sub> = 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-Dec	1	1	1	1	Z	1	1	2	2	2	2	1	1	3	2	2	2	5	5	4	2	4	3	3	2.2	5																							
2-Dec	2	1	1	1	1	Z	1	1	2	2	1	2	2	2	2	2	3	3	2	3	2	1	1	2	1.7	3																							
3-Dec	Z	1	2	2	1	1	2	2	1	1	1	10	10	7	8	11	12	11	12	12	5	1	1	2	5.0	12																							
4-Dec	3	Z	7	8	13	11	11	9	12	18	11	5	4	2	4	6	4	3	3	3	3	3	3	3	6.4	18																							
5-Dec	2	4	Z	1	1	1	1	1	0	0	0	6	12	13	14	11	12	10	4	2	1	1	6	15	5.1	15																							
6-Dec	12	10	10	Z	11	15	15	15	19	5	8	5	3	3	2	2	2	1	1	1	1	1	1	1	6.3	19																							
7-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1																							
8-Dec	1	1	1	1	2	Z	1	1	3	25	19	3	3	3	9	3	5	4	3	2	1	1	1	1	4.2	25																							
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.0	2																							
10-Dec	1	Z	1	1	1	1	1	1	1	1	1	2	1	1	2	9	12	7	4	3	3	4	3	1	2.6	12																							
11-Dec	1	0	Z	0	1	1	1	1	1	1	2	5	4	2	11	8	4	3	3	2	2	4	2	1	2.6	11																							
12-Dec	1	1	1	Z	1	1	1	1	1	1	1	C	C	C	C	C	1	1	1	1	1	1	1	1	1.0	1																							
13-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	0	1	4	4	5	12	3	1	1	1	1	1	1.8	12																							
14-Dec	1	1	1	1	2	Z	4	3	5	3	11	8	5	4	5	5	5	5	4	4	4	4	3	3	3.9	11																							
15-Dec	Z	6	5	5	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.5	6																							
16-Dec	0	Z	0	1	2	1	1	1	2	4	3	3	6	5	5	11	9	10	7	8	9	6	2	2	4.1	11																							
17-Dec	1	1	Z	1	1	1	1	1	2	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0.8	2																							
18-Dec	1	1	0	Z	1	0	1	6	6	4	4	4	5	2	0	0	0	0	0	0	1	1	0	1	1.5	6																							
19-Dec	4	5	4	3	Z	5	8	9	10	8	8	5	5	6	6	7	7	9	9	7	6	10	8	7	6.7	10																							
20-Dec	7	4	3	3	2	Z	3	6	11	9	7	6	3	2	2	3	5	3	2	13	3	3	3	2	4.6	13																							
21-Dec	Z	2	2	2	2	2	2	3	5	10	8	8	6	3	1	1	1	1	1	1	0	0	1	0	2.7	10																							
22-Dec	1	Z	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0	0	0.6	1																							
23-Dec	0	4	Z	5	6	7	7	7	4	4	6	7	6	4	8	11	17	16	7	4	3	1	1	1	5.9	17																							
24-Dec	5	5	2	Z	2	3	3	3	4	3	5	4	8	5	3	2	1	2	2	2	5	2	2	2	3.2	8																							
25-Dec	1	3	6	6	Z	2	3	12	12	8	6	4	4	6	7	7	7	7	6	6	6	6	4	5	5.8	12																							
26-Dec	4	3	3	3	3	Z	2	2	4	5	4	2	2	1	1	1	4	5	5	4	2	3	4	12	3.4	12																							
27-Dec	Z	4	4	4	4	4	5	4	3	4	2	2	2	2	2	2	2	2	1	2	2	4	3	2	2.8	5																							
28-Dec	3	Z	4	10	9	8	4	4	22	16	9	7	9	10	7	7	10	11	11	10	14	10	6	8	9.1	22																							
29-Dec	15	10	Z	2	6	6	8	5	2	1	1	1	1	1	1	1	2	3	1	1	1	2	3	1	3.3	15																							
30-Dec	2	2	1	Z	2	2	3	3	5	4	2	2	2	2	2	2	3	4	4	6	6	7	7	5	3.3	7																							
31-Dec	4	2	2	2	Z	2	3	2	2	2	3	6	4	3	3	2	3	4	4	4	4	3	4	2	2	3.0	6																						
																								2.8	2.9	2.4	2.6	3.0	3.0	3.2	3.6	4.7	4.8	4.2	3.7	3.6	3.2	3.8	4.1	4.6	4.7	3.4	3.5	2.9	2.8	2.4	2.8	Diurnal Average	
																								15	10	10	10	13	15	15	15	22	25	19	10	12	13	14	11	17	16	12	13	14	10	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 (NO<sub>2</sub>) - ppb**  
**Anzac - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	706	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: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	11	0	1	1	0	6	19	40	15	32	26	22	96	283	96	54	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	1	1	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
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	97	284	96	54	704

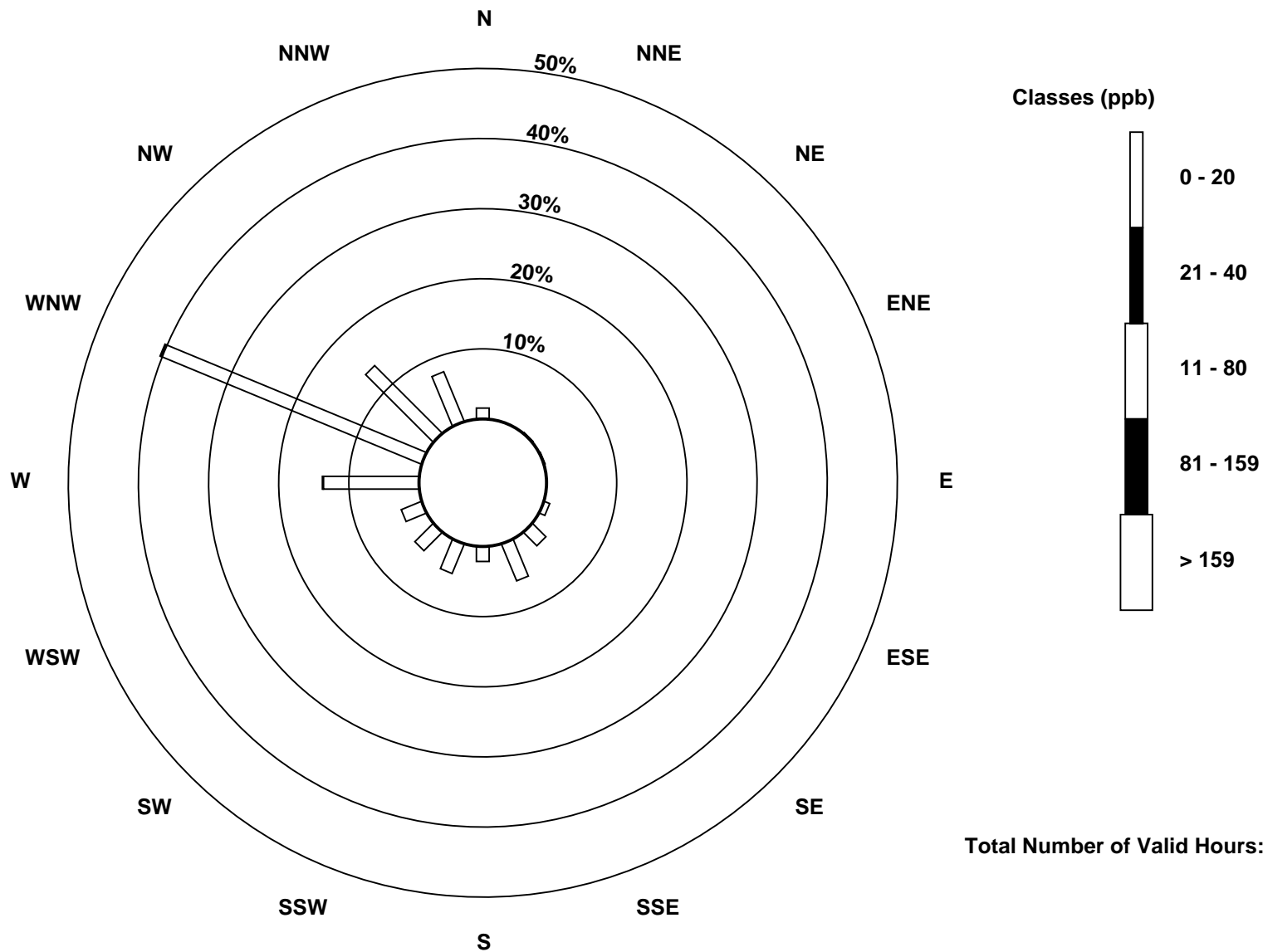
Total Number of Valid Hours: 704

Total Number of Hours: 744

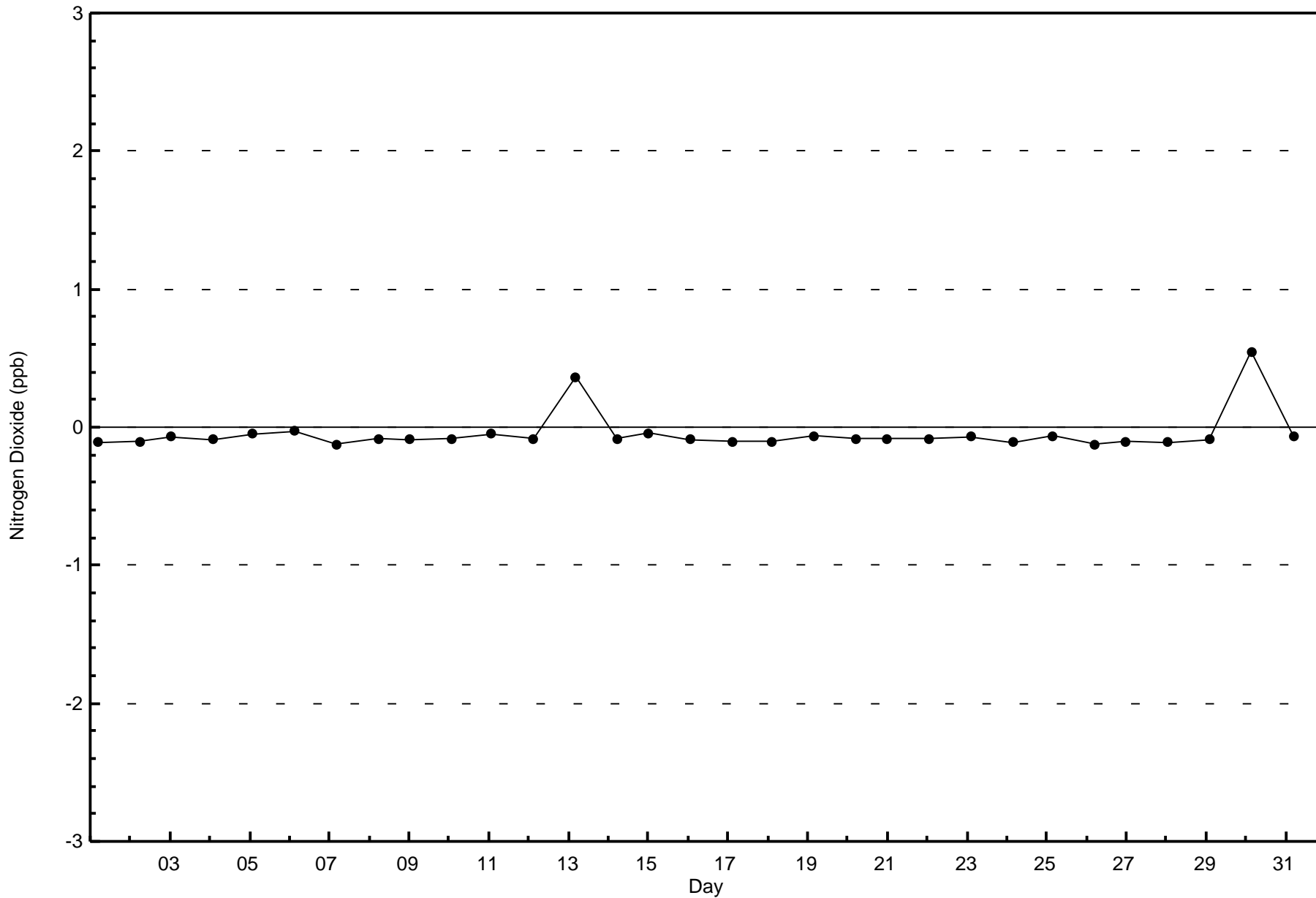


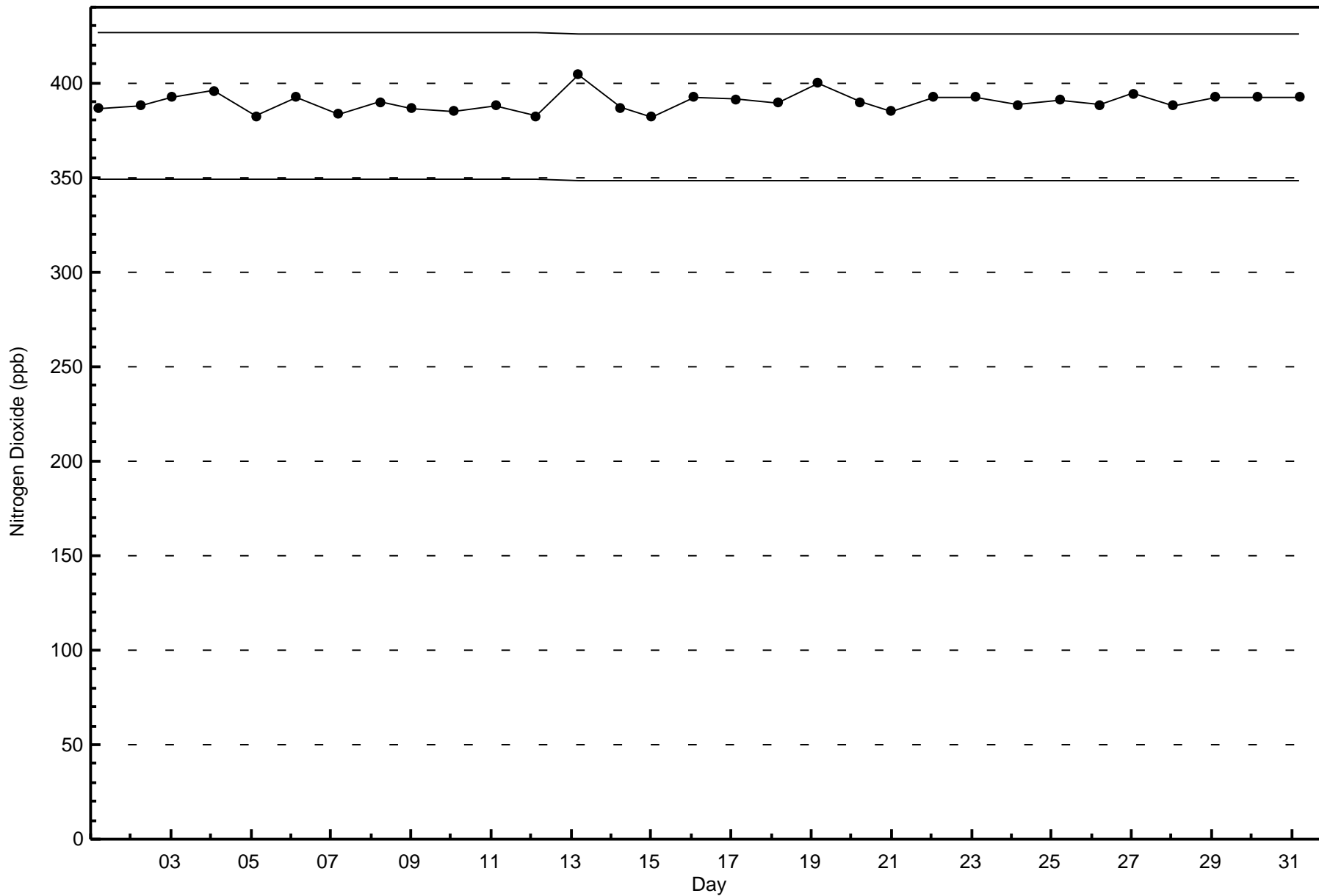
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Anzac (AMS 14)



Total Number of Valid Hours: 704







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

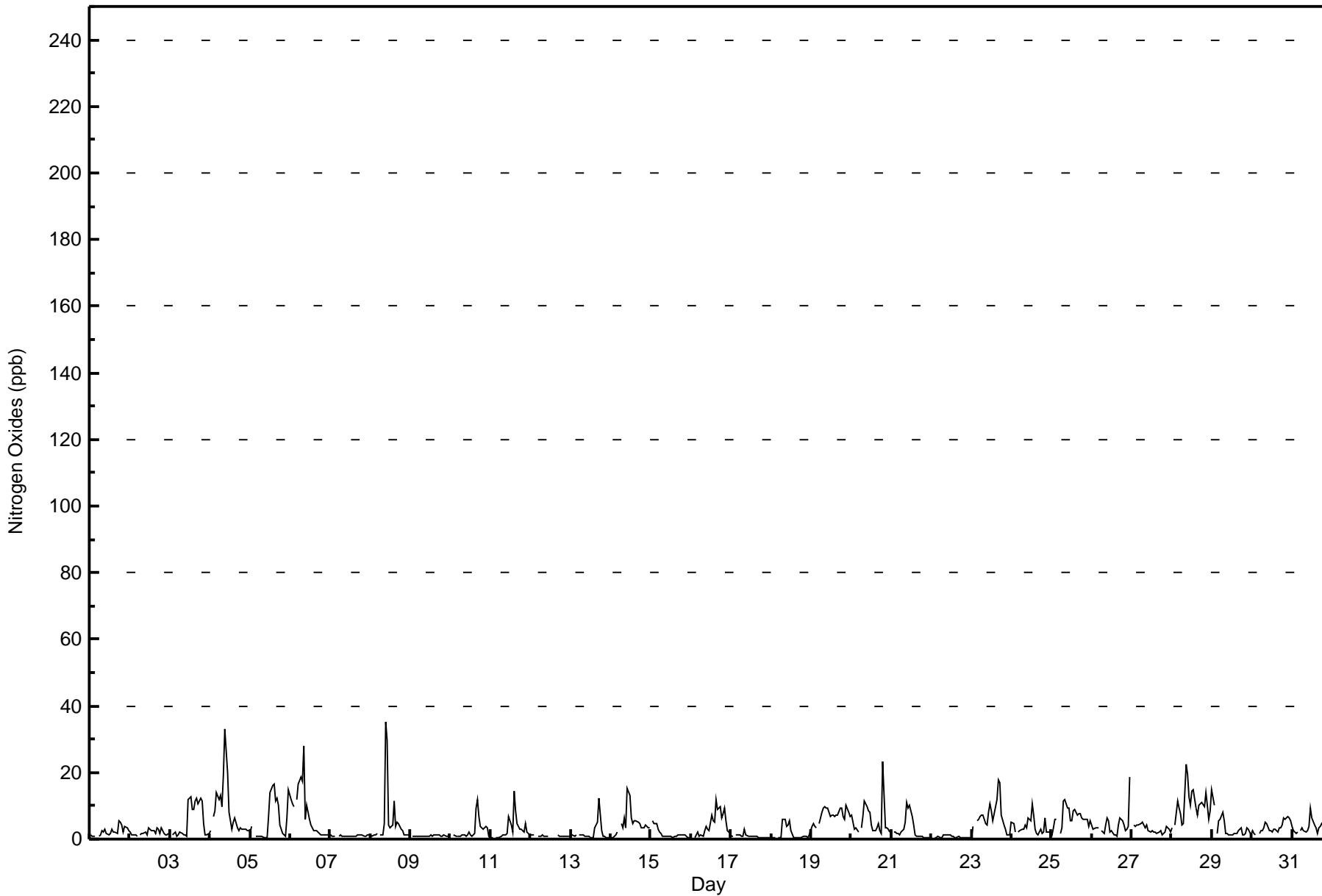
Anzac - December 2017

Maximum Value: 35 ppb on Dec 8 10:00														Maximum Daily Average: 10.2 ppb on Dec 28														Hours in Service: 744	
Minimum Value: 0 ppb on Dec 18 19:00														Minimum Daily Average: 0.7 ppb on Dec 22														Hours of Data: 708	
Maximum Diurnal Average: 6.0 ppb at hour 10														Minimum Diurnal Average: 2.5 ppb at hour 23														Hours of Missing Data: 36	
Monthly Average: 3.9 ppb														Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 5 P <sub>90</sub> = 10 P <sub>99</sub> = 19														Hours of Calibration: 36	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	1	1	1	1	Z	1	1	3	2	3	2	1	2	3	2	2	2	5	5	4	2	4	3	3	2.4	5			
2-Dec	2	1	1	1	1	Z	1	2	2	2	1	3	3	3	3	2	3	3	2	3	2	1	1	2	1.9	3			
3-Dec	Z	1	2	2	1	1	2	2	1	1	1	12	13	9	9	12	12	11	12	12	5	1	1	2	5.4	13			
4-Dec	3	Z	7	8	14	12	13	10	19	33	20	8	5	3	5	6	3	3	3	3	3	3	3	3	8.3	33			
5-Dec	2	4	Z	1	1	1	1	1	1	0	1	7	14	16	16	11	12	10	4	2	1	1	6	15	5.6	16			
6-Dec	12	11	10	Z	12	17	19	17	28	6	10	6	4	3	3	3	2	1	1	1	1	1	1	1	7.4	28			
7-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1			
8-Dec	1	1	1	1	2	Z	1	1	5	35	30	4	3	4	11	4	5	5	3	2	1	1	1	1	5.4	35			
9-Dec	Z	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			
10-Dec	1	Z	1	1	1	1	1	1	1	1	1	2	1	1	2	9	12	7	4	3	3	4	3	1	2.7	12			
11-Dec	1	1	Z	1	1	1	1	1	1	1	2	7	4	2	14	8	5	3	3	3	2	4	2	1	3.0	14			
12-Dec	1	1	1	Z	1	1	1	1	1	1	1	C	C	C	C	C	1	1	1	1	1	1	1	1	1.0	1			
13-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	0	0	4	4	5	12	3	1	1	1	1	1	1.9	12			
14-Dec	0	1	1	1	2	Z	5	3	7	3	15	13	6	5	6	6	5	5	4	3	3	4	3	3	4.5	15			
15-Dec	Z	6	5	5	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.6	6			
16-Dec	0	Z	0	1	2	1	1	1	2	4	3	3	7	5	5	12	9	10	7	8	9	6	2	2	4.4	12			
17-Dec	1	1	Z	1	1	1	1	1	3	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0.9	3			
18-Dec	1	0	0	Z	1	0	1	6	6	4	4	6	3	0	0	0	0	0	0	1	1	1	0	1	1.6	6			
19-Dec	4	5	4	3	Z	5	8	9	10	9	9	7	7	7	7	7	7	10	9	7	6	10	8	7	7.2	10			
20-Dec	7	5	3	3	2	Z	3	7	11	10	9	8	4	3	3	3	5	3	2	23	3	4	3	2	5.5	23			
21-Dec	Z	2	2	2	2	1	2	3	5	11	9	10	7	4	1	1	1	1	1	1	0	0	0	0	2.9	11			
22-Dec	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0	0	0.7	1			
23-Dec	0	4	Z	5	6	7	7	7	5	4	8	11	9	6	10	12	18	17	7	4	3	1	1	1	6.6	18			
24-Dec	5	5	2	Z	2	3	3	3	4	3	6	6	11	7	3	2	1	3	2	2	6	2	2	2	3.7	11			
25-Dec	1	3	6	6	Z	2	3	12	12	9	9	6	6	9	9	7	8	7	6	6	6	6	4	6	6.5	12			
26-Dec	4	3	3	4	3	Z	2	2	4	6	6	2	2	1	1	1	4	6	5	4	2	3	4	19	4.1	19			
27-Dec	Z	4	4	4	4	5	5	4	3	4	3	2	2	2	2	2	2	3	1	2	2	4	3	2	3.1	5			
28-Dec	3	Z	4	11	10	8	4	5	22	19	13	10	14	15	9	7	10	11	11	10	14	10	6	8	10.2	22			
29-Dec	15	10	Z	2	5	6	8	5	2	2	1	1	1	2	2	2	3	3	1	1	2	4	3	1	3.6	15			
30-Dec	2	2	1	Z	2	3	3	3	5	4	3	3	2	3	3	2	3	4	4	7	6	7	7	5	3.6	7			
31-Dec	4	2	2	2	Z	2	4	2	2	3	4	10	6	4	3	2	3	4	5	4	4	4	2	2	3.5	10			
2.9 3.0 2.5 2.7 3.1 3.2 3.4 3.8 5.5 6.0 5.7 5.1 4.8 4.0 4.5 4.4 4.7 4.9 3.6 3.9 3.1 3.0 2.5 3.1																								Diurnal Average					
15 11 10 11 14 17 19 17 28 35 30 13 14 16 16 12 18 17 12 23 14 10 8 19																								Diurnal Maximum					
Z - zerospan		C - Calibration																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	702	99.15	99.15
21 - 40	6	0.85	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	11	0	1	1	0	6	19	40	15	31	25	21	95	283	96	54	698
21 - 40	0	0	0	0	0	0	0	0	0	1	1	1	2	1	0	0	6
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
<b>Totals</b>	11	0	1	1	0	6	19	40	15	32	26	22	97	284	96	54	704

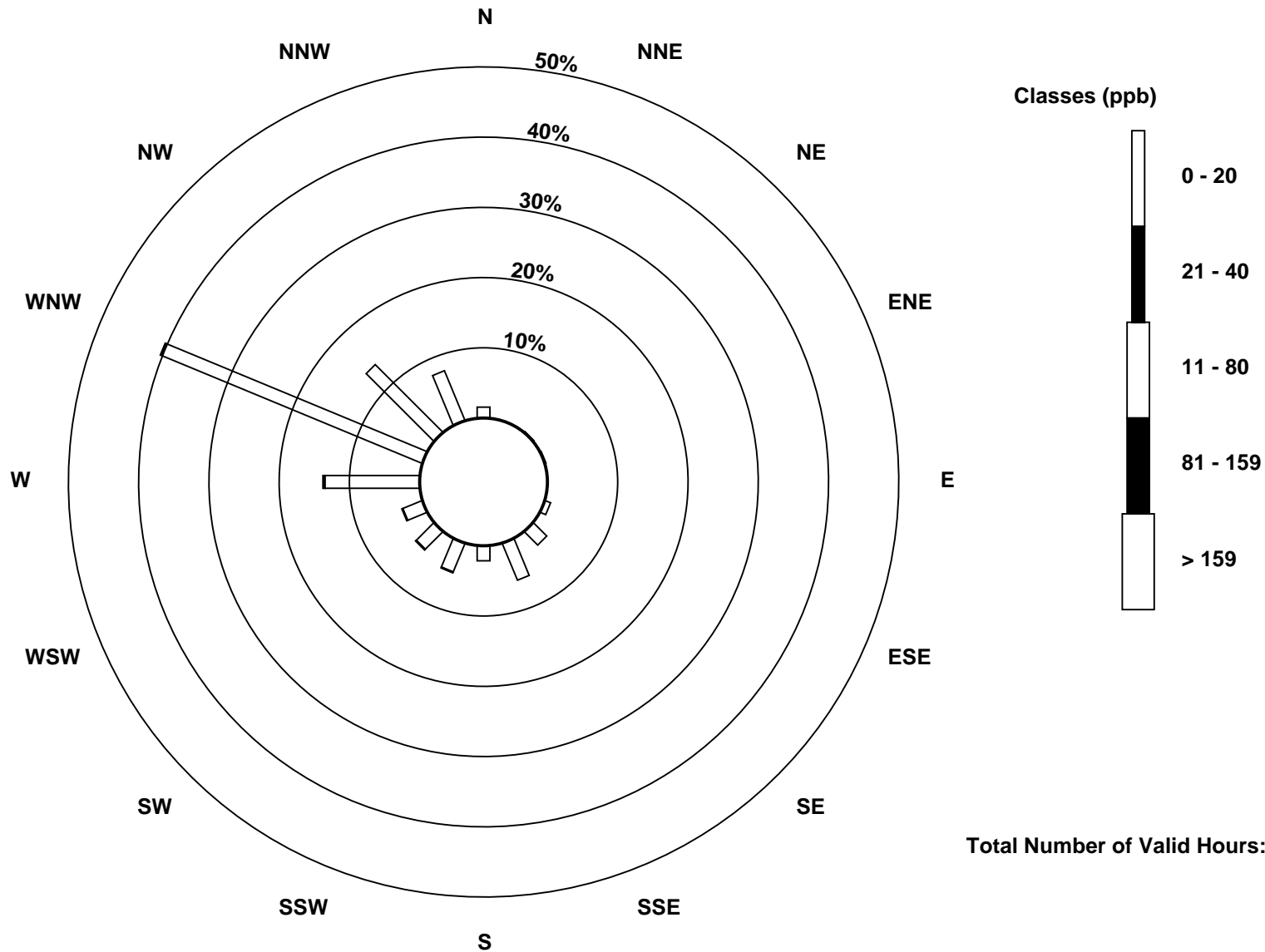
Total Number of Valid Hours: 704

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

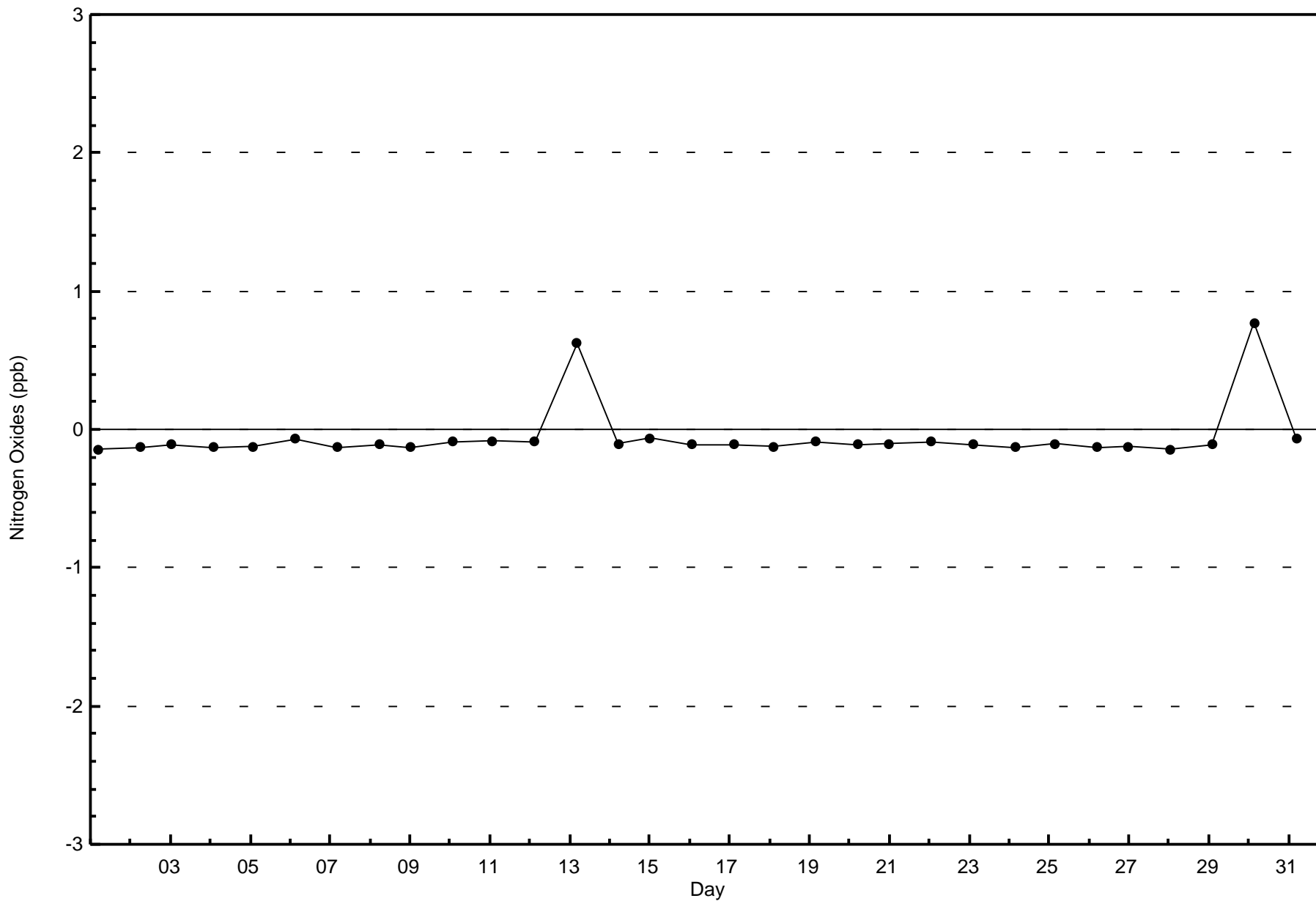
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Anzac (AMS 14)

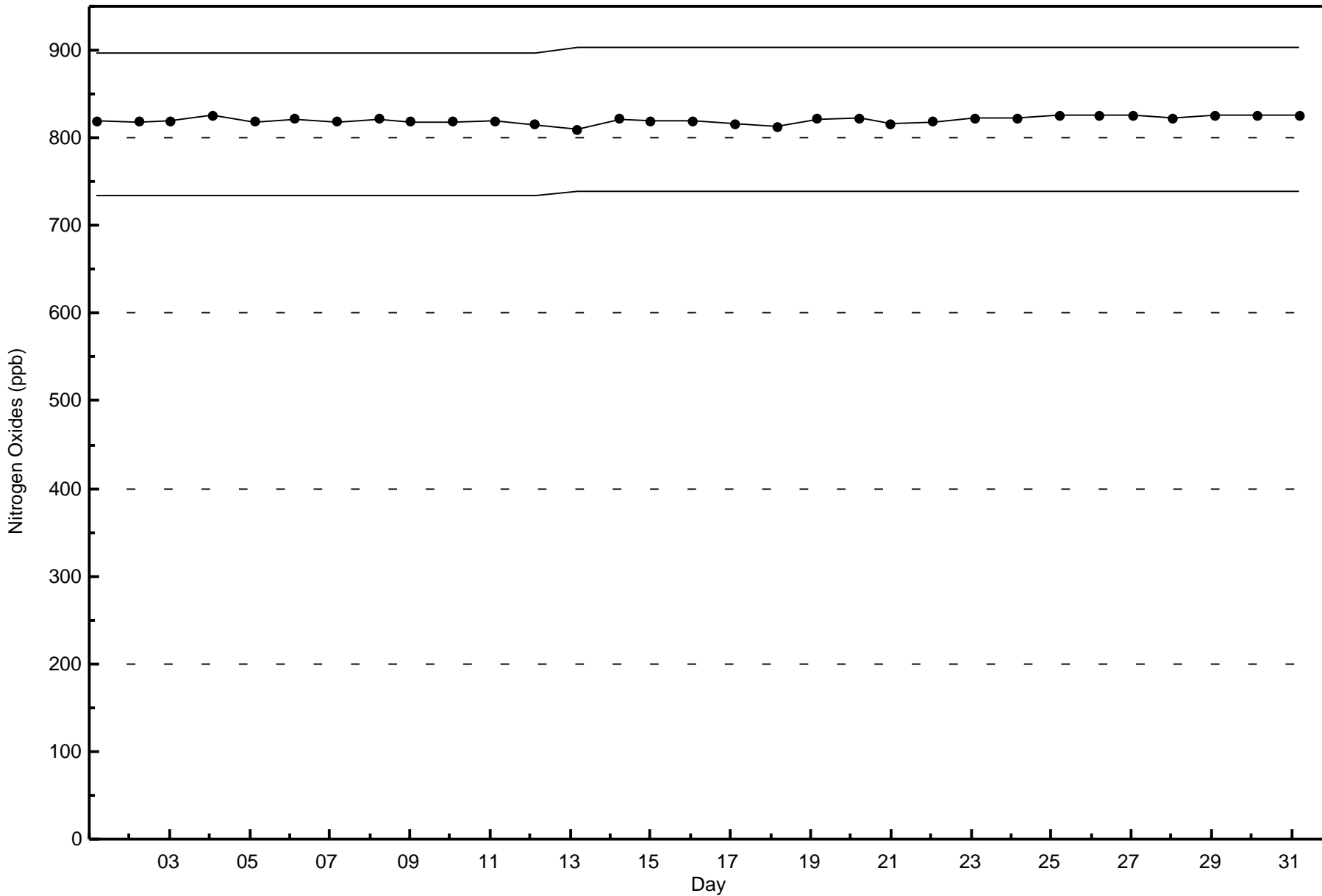




Wood Buffalo Environmental Association  
Zero Responses

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Anzac - December 2017







# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Ozone (O<sub>3</sub>) - ppb

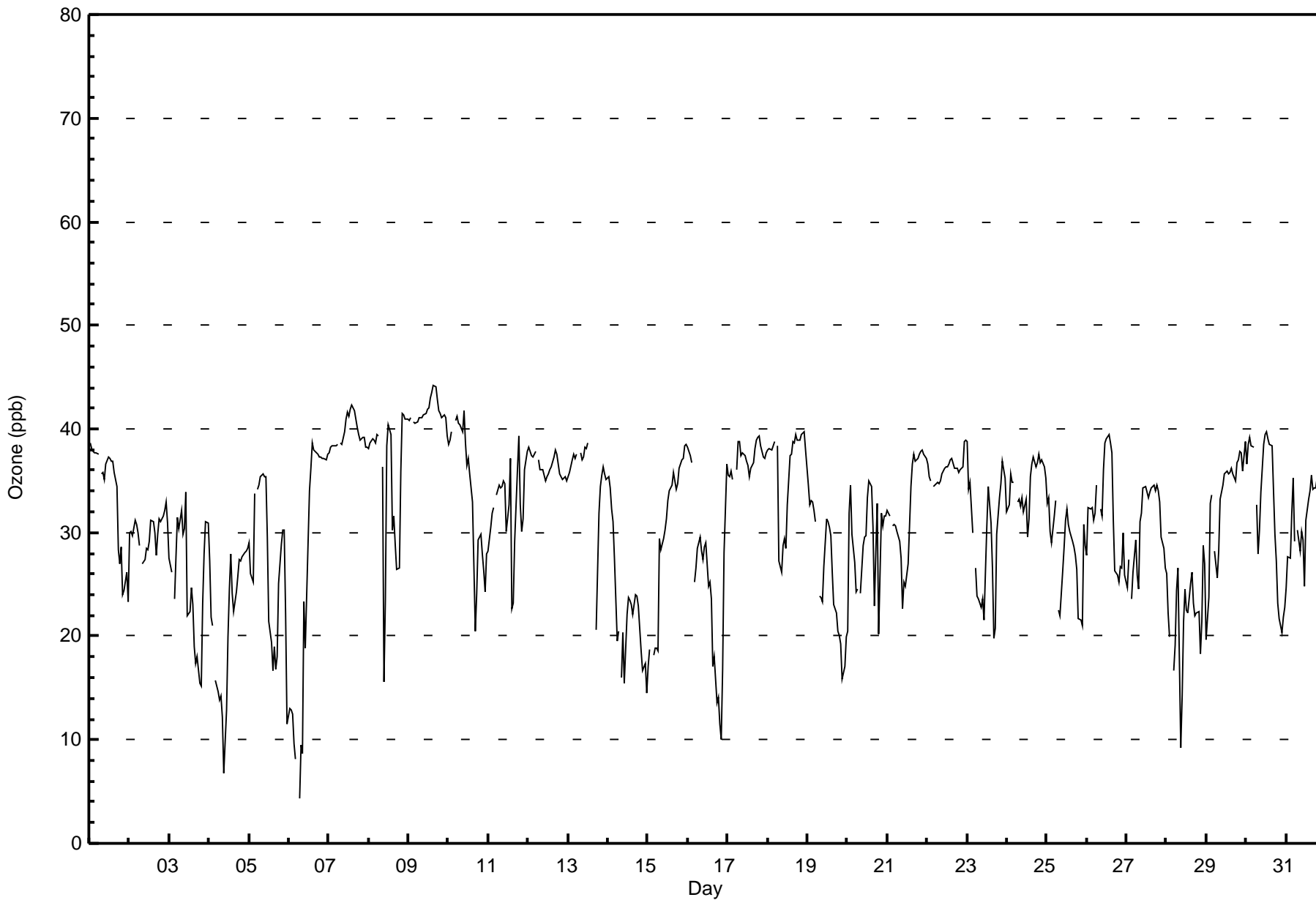
## Anzac - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 44 ppb on Dec 9 16:00										Maximum Daily Average: 41.6 ppb on Dec 9										Hours of Data: 709						
Minimum Value: 4 ppb on Dec 6 07:00										Minimum Daily Average: 21.6 ppb on Dec 4										Hours of Missing Data: 35						
Maximum Diurnal Average: 33.3 ppb at hour 14										Minimum Diurnal Average: 29.0 ppb at hour 9										Hours of Calibration: 35						
Monthly Average: 31.2 ppb										Percentiles: P <sub>1</sub> = 9 P <sub>10</sub> = 21 O <sub>1</sub> = 27 Median = 33 O <sub>3</sub> = 37 P <sub>90</sub> = 39 P <sub>99</sub> = 42										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	39	38	38	38	38	38	Z	36	36	35	37	37	37	37	37	36	34	28	27	29	24	24	26	23	33.5	39
2-Dec	30	30	30	31	31	30	29	Z	27	27	28	28	29	31	31	30	28	30	31	31	32	32	33	31	30.0	33
3-Dec	28	26	Z	24	28	31	30	32	30	30	34	22	22	25	23	19	17	18	15	15	23	28	31	31	25.4	34
4-Dec	27	22	21	Z	16	15	14	14	12	7	13	20	25	28	24	22	24	26	27	27	28	28	28	28	21.6	28
5-Dec	29	26	25	34	Z	34	35	35	36	35	35	30	21	19	17	19	17	18	25	29	30	30	22	11	26.7	36
6-Dec	13	13	12	10	8	Z	4	10	9	23	19	29	34	36	39	38	38	38	37	37	37	37	37	38	25.9	39
7-Dec	38	38	38	38	38	39	Z	39	38	40	41	42	41	42	42	42	41	40	40	39	39	39	38	38	39.6	42
8-Dec	38	39	39	39	39	40	39	Z	36	16	23	38	40	39	30	32	29	26	27	36	42	41	41	41	35.2	42
9-Dec	41	41	Z	41	41	41	41	41	41	41	41	42	42	43	44	44	44	43	42	41	41	41	41	39	41.6	44
10-Dec	39	39	40	Z	41	41	41	40	40	42	39	36	37	36	33	27	20	24	29	30	28	26	24	28	33.9	42
11-Dec	28	30	32	32	Z	34	35	34	34	35	35	30	33	37	23	23	29	36	39	33	30	31	36	38	32.5	39
12-Dec	38	38	37	37	38	Z	37	36	36	36	35	35	36	36	36	37	38	38	37	36	35	35	35	35	36.4	38
13-Dec	35	36	37	38	37	38	Z	38	37	37	38	38	39	C	C	C	C	21	32	34	35	36	36	35	35.6	39
14-Dec	35	34	32	31	28	19	21	Z	16	20	15	22	24	23	23	22	24	24	23	21	19	17	17	15	22.8	35
15-Dec	17	19	Z	18	19	19	19	29	28	29	30	31	33	34	35	36	35	34	35	36	37	37	38	39	29.9	39
16-Dec	38	37	37	Z	25	27	28	30	28	27	29	29	25	25	24	17	18	14	14	12	10	17	28	37	25.0	38
17-Dec	36	35	36	35	Z	36	39	39	37	38	37	37	36	35	36	37	38	39	39	39	38	37	37	38	37.2	39
18-Dec	38	38	38	38	39	Z	38	27	26	29	29	29	33	37	38	39	39	40	39	39	39	40	40	38	36.0	40
19-Dec	35	33	33	33	32	31	Z	24	24	23	27	31	31	30	30	26	23	22	20	20	19	16	17	20	26.1	35
20-Dec	21	32	35	30	27	24	25	Z	24	29	30	30	33	35	35	30	23	28	33	20	32	31	32	32	29.0	35
21-Dec	32	32	Z	31	31	31	30	29	28	23	25	25	27	31	34	37	37	37	37	38	38	38	38	37	32.3	38
22-Dec	37	35	35	Z	34	35	35	35	35	36	36	36	36	37	37	37	36	36	36	36	36	36	39	39	36.1	39
23-Dec	39	34	35	30	Z	27	24	24	23	24	22	26	31	34	31	27	20	21	30	33	35	37	36	35	29.3	39
24-Dec	32	33	36	35	35	Z	33	33	33	33	32	33	30	31	35	37	37	36	37	38	37	37	36	35	34.5	38
25-Dec	33	33	30	29	32	33	Z	22	22	26	29	31	32	31	30	29	29	28	26	22	22	21	31	29	28.2	33
26-Dec	28	32	32	32	31	32	35	Z	32	32	36	39	39	39	39	38	31	26	26	25	27	27	30	26	31.9	39
27-Dec	25	27	Z	24	26	29	26	25	31	32	34	34	34	33	34	34	35	34	35	34	33	30	29	27	30.6	35
28-Dec	26	22	20	Z	17	19	24	27	9	14	21	25	23	22	25	26	23	22	22	22	18	21	29	27	22.0	29
29-Dec	20	24	33	34	Z	28	26	28	33	34	35	36	36	36	36	36	36	35	37	37	38	38	36	39	33.4	39
30-Dec	37	39	39	38	38	Z	33	28	30	34	39	39	40	39	39	38	34	30	27	23	22	20	22	23	32.6	40
31-Dec	25	28	28	32	35	29	Z	30	28	30	29	25	31	33	34	35	34	34	34	36	39	36	37	36	32.1	39
31.4 31.7 32.6 32.0 30.9 30.7 29.5 30.2 29.0 29.6 30.8 31.8 32.6 33.3 32.4 31.7 30.4 29.8 30.9 30.6 31.0 31.2 32.3 31.8																								Diurnal Average		
41 41 40 41 41 41 41 41 41 41 42 41 42 42 43 44 44 44 43 42 41 42 41 41																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Anzac - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	67	9.45	9.45
21 - 50	642	90.55	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Anzac - December 2017**

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	0	0	0	0	0	3	11	4	9	5	3	5	8	9	6	66
21 - 50	8	0	1	1	0	6	15	30	12	24	19	19	96	279	81	48	639
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
<b>Totals</b>	11	0	1	1	0	6	18	41	16	33	24	22	101	287	90	54	705

Total Number of Valid Hours: 705

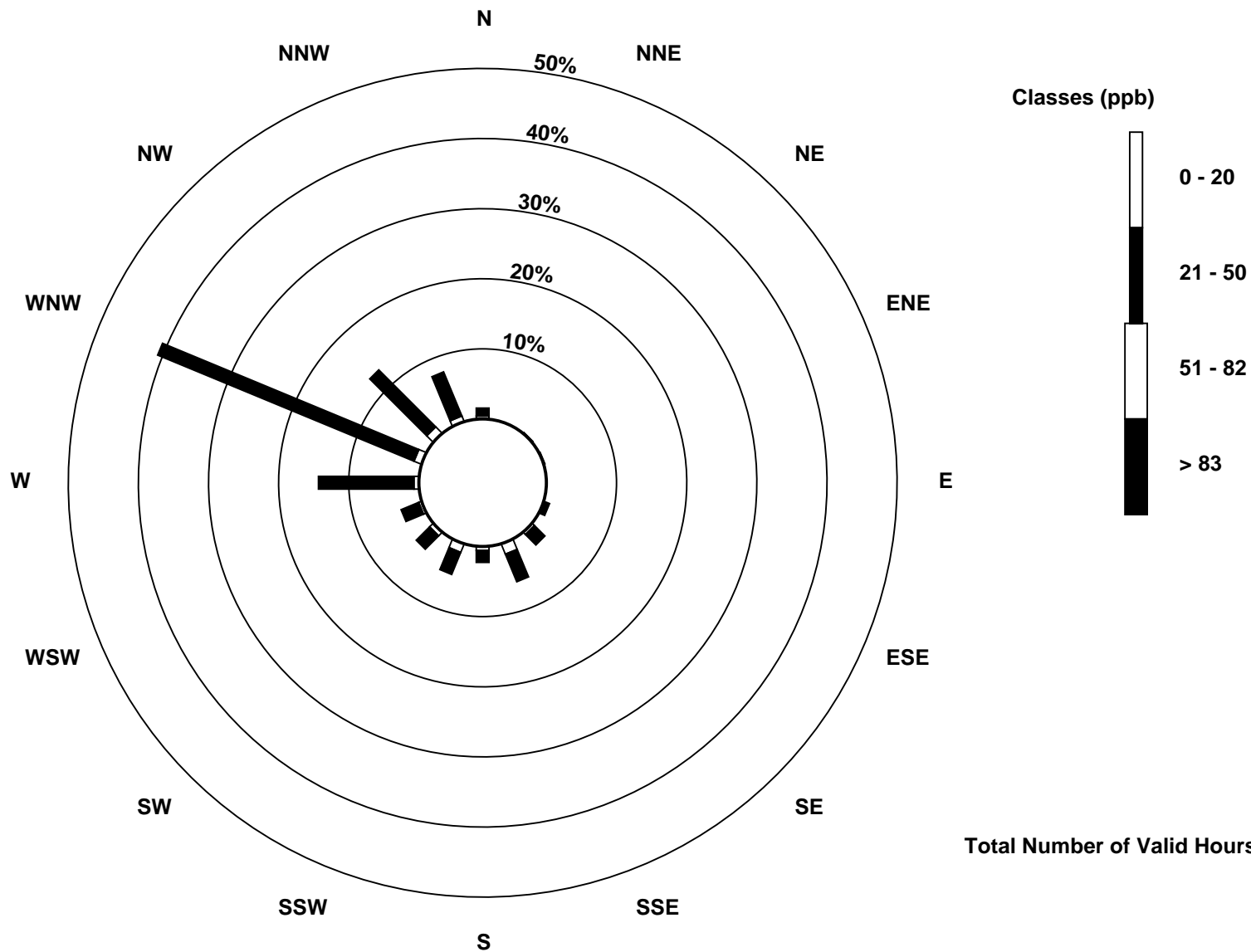
Total Number of Hours: 744

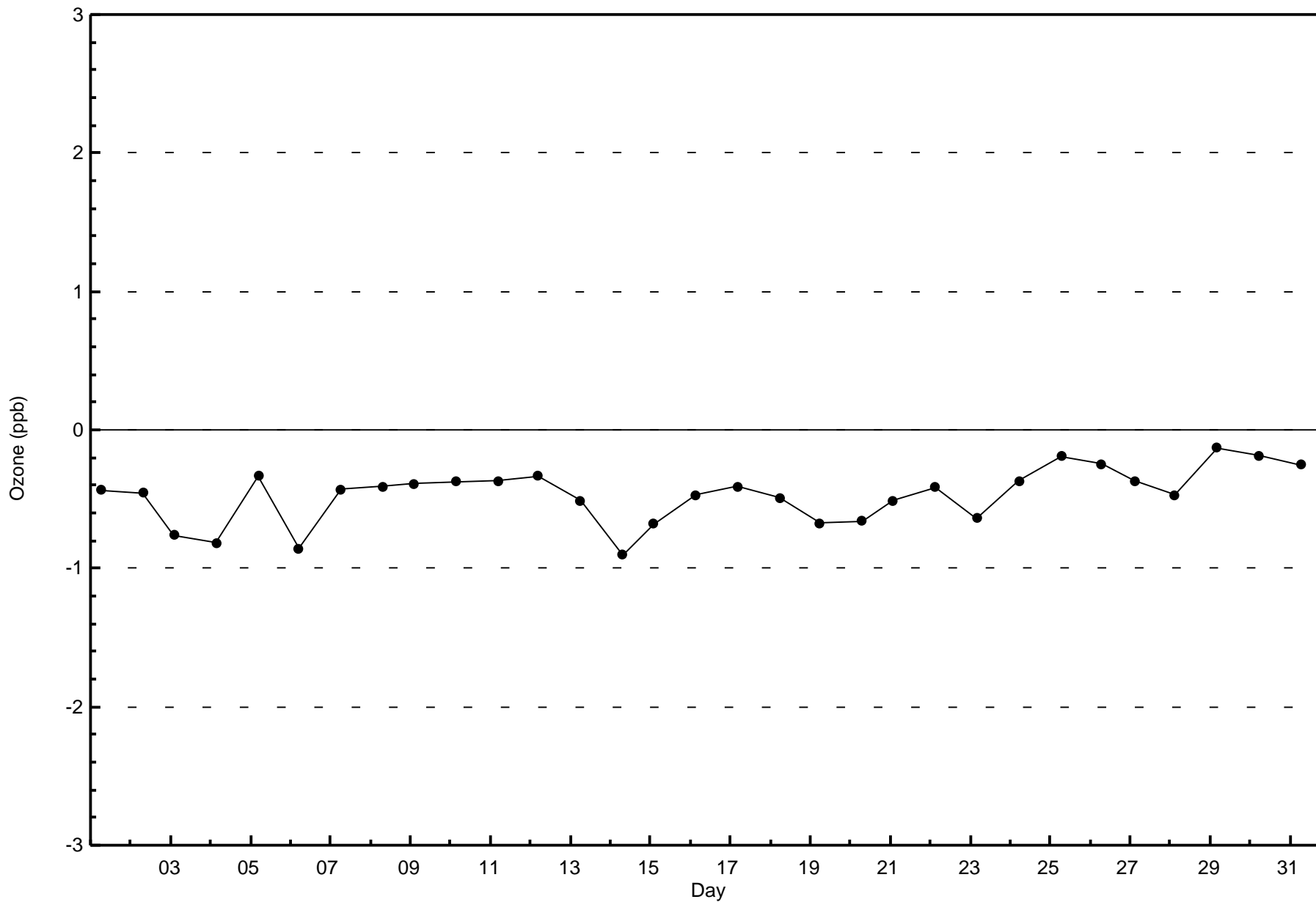




Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Anzac (AMS 14)

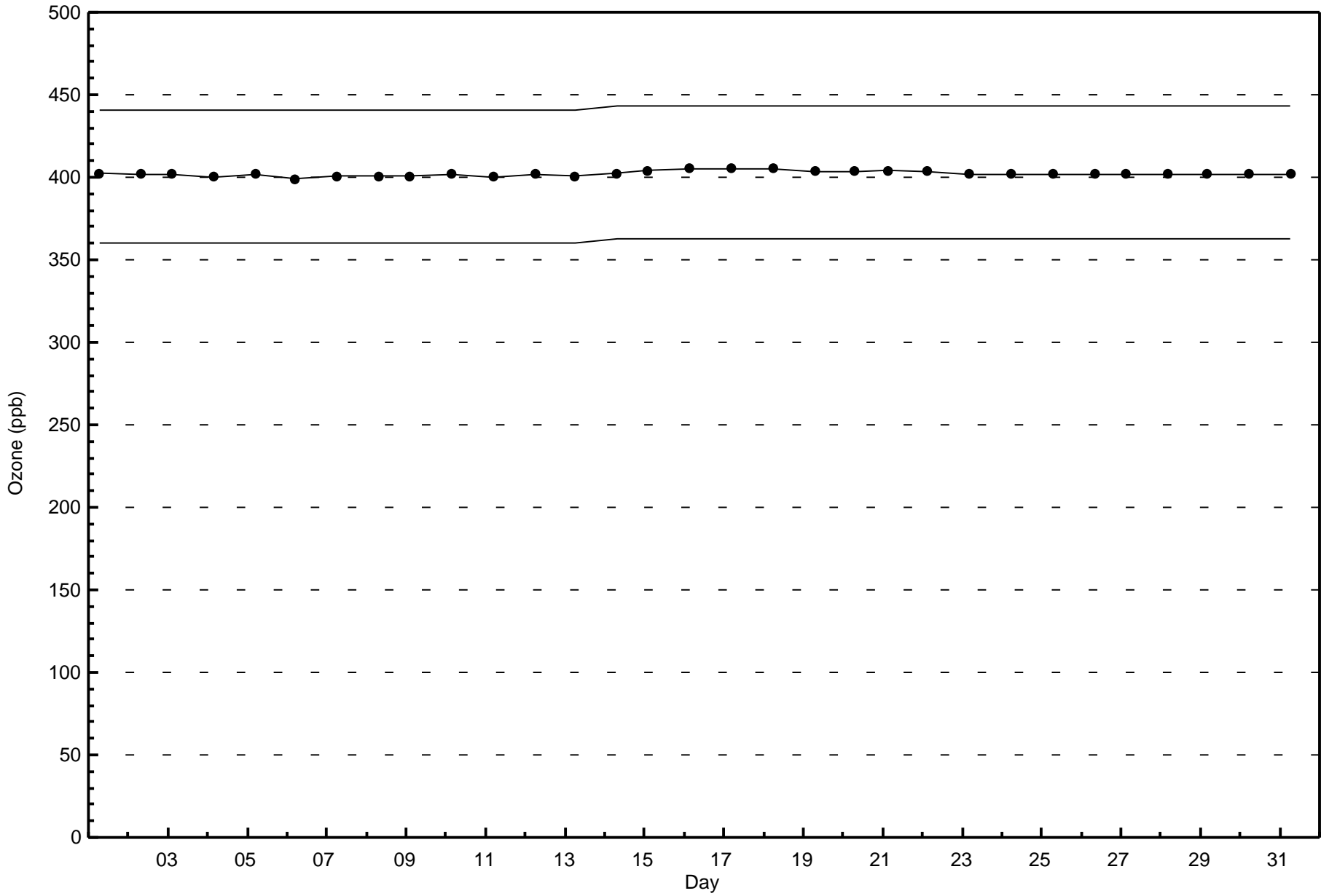






Wood Buffalo Environmental Association  
Span Responses

Ozone (O<sub>3</sub>) - ppb  
Anzac - December 2017



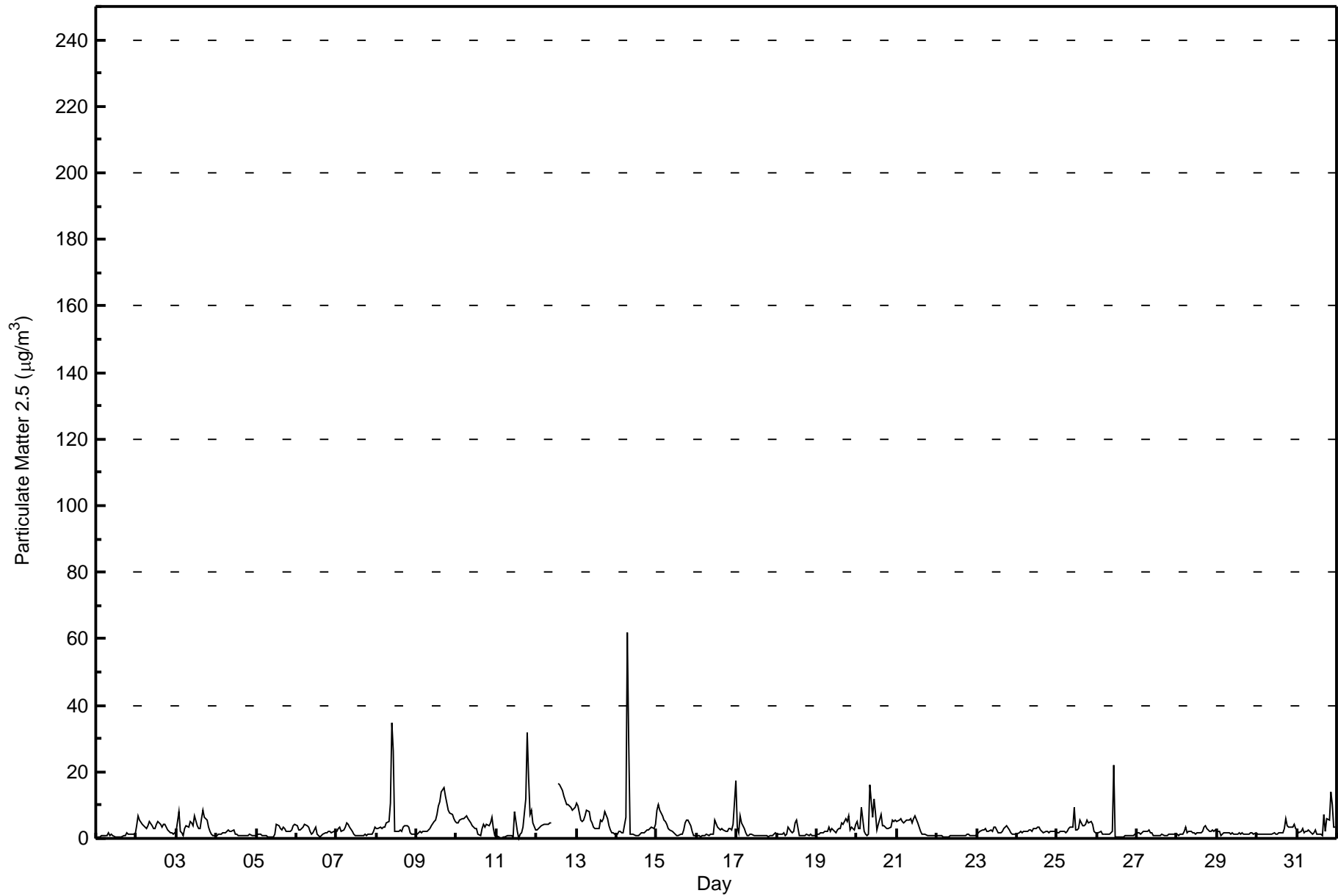


Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																														
Maximum Value: 62.0 µg/m <sup>3</sup> on Dec 14 07:00		Maximum Daily Average: 7.9 µg/m <sup>3</sup> on Dec 12																																														
Minimum Value: 0.1 µg/m <sup>3</sup> on Dec 11 03:00		Hours of Data: 741																																														
Maximum Diurnal Average: 4.5 µg/m <sup>3</sup> at hour 7		Hours of Missing Data: 3																																														
Monthly Average: 3.12 µg/m <sup>3</sup>		Hours of Calibration: 3																																														
Minimum Daily Average: 0.8 µg/m <sup>3</sup> on Dec 22		Percent Operational Time: 100.0																																														
Minimum Diurnal Average: 2.4 µg/m <sup>3</sup> at hour 5		Percentiles: P <sub>1</sub> = 0.4 P <sub>10</sub> = 0.8 Q <sub>1</sub> = 1.1 Median = 2.0 Q <sub>3</sub> = 3.6 P <sub>90</sub> = 5.9 P <sub>99</sub> = 14.8																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0.3	0.3	0.4	0.8	0.9	0.9	0.8	1.9	1.1	1.3	0.7	0.4	0.4	0.5	0.5	0.4	0.8	0.9	1.9	1.1	1.1	1.2	1.2	1.4	0.9	1.9																						
2-Dec	3.8	6.9	5.7	4.4	3.8	3.4	3.2	3.7	5.1	3.9	3.0	2.9	4.1	5.2	4.4	3.4	4.2	4.1	3.4	2.7	1.9	1.8	1.4	1.9	3.7	6.9																						
3-Dec	2.0	7.8	2.2	1.7	1.0	3.0	3.8	3.5	5.1	4.6	3.8	6.7	4.0	3.0	3.0	5.9	8.5	6.3	5.7	3.2	2.0	1.2	0.8	0.9	3.7	8.5																						
4-Dec	1.0	1.2	1.3	1.4	1.6	1.7	2.3	2.4	2.0	2.0	2.7	1.4	1.1	0.9	1.0	1.0	1.0	0.9	1.0	1.3	0.9	0.9	0.9	0.9	1.4	2.7																						
5-Dec	1.0	1.1	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.6	0.4	1.3	4.1	3.7	2.9	2.6	3.5	3.0	2.3	2.0	2.0	2.3	3.6	4.1	1.9	4.1																						
6-Dec	3.7	2.7	2.7	3.0	3.2	4.0	3.6	3.3	2.1	1.1	1.8	3.6	1.4	1.0	0.6	0.8	1.5	1.6	1.8	2.1	2.2	1.9	2.0	2.1	2.3	4.0																						
7-Dec	2.2	2.9	3.4	2.3	2.5	3.6	4.8	4.2	3.2	2.0	1.2	0.9	0.9	0.7	0.9	0.9	1.0	1.3	1.0	1.4	1.5	1.5	2.3	3.3	2.1	4.8																						
8-Dec	3.1	3.1	3.3	3.0	3.4	3.5	4.6	5.1	10.4	34.9	26.4	2.2	2.0	2.1	2.4	2.1	3.5	3.7	3.6	3.5	1.5	1.2	1.1	1.1	5.4	34.9																						
9-Dec	1.5	1.7	2.0	1.8	2.2	2.1	2.2	2.6	2.9	3.7	5.1	5.4	7.3	9.7	10.9	14.1	15.3	12.8	10.4	8.5	7.4	7.0	6.0	4.9	6.2	15.3																						
10-Dec	4.5	4.7	5.4	5.7	6.1	6.2	6.6	6.1	4.5	3.8	3.3	3.1	3.1	1.4	0.8	2.9	4.1	3.5	4.1	3.6	4.6	6.3	3.1	0.7	4.1	6.6																						
11-Dec	0.7	0.3	0.1	0.1	0.5	0.6	0.6	0.6	0.8	0.9	0.5	8.1	2.2	0.2	1.2	1.7	3.4	11.9	31.9	18.2	7.3	8.3	4.7	2.6	4.5	31.9																						
12-Dec	2.7	3.0	3.3	3.9	4.2	4.1	4.2	4.4	4.7	4.8	C	C	C	16.7	15.9	14.4	12.6	11.3	10.1	10.0	9.3	8.3	8.9	9.1	7.9	16.7																						
13-Dec	10.7	9.8	5.6	5.0	5.4	6.9	8.3	8.2	5.7	4.6	3.6	3.1	3.0	3.0	5.7	5.3	6.1	7.9	5.8	3.7	2.5	1.7	1.7	1.3	5.2	10.7																						
14-Dec	1.3	2.3	2.1	1.6	1.9	6.4	62.0	28.4	1.3	1.2	1.4	1.0	1.0	1.0	1.3	1.7	1.7	2.0	2.7	2.7	3.0	3.4	3.2	4.2	5.8	62.0																						
15-Dec	8.3	10.2	8.6	6.6	5.4	5.0	4.4	2.8	2.4	2.0	1.7	1.4	1.0	1.0	1.2	1.2	2.7	4.7	5.5	5.5	4.0	2.3	1.0	0.9	3.7	10.2																						
16-Dec	0.8	0.7	0.6	0.7	0.9	0.9	1.1	1.0	1.1	1.1	1.1	5.6	3.6	2.9	2.5	2.8	2.4	1.9	2.3	3.1	3.0	2.6	4.2	17.3	2.7	17.3																						
17-Dec	3.3	1.8	6.9	4.8	3.1	1.6	1.0	1.1	1.1	1.2	1.0	1.0	1.1	1.0	0.7	0.8	0.8	0.8	0.7	0.6	0.8	1.0	1.3	1.5	1.6	6.9																						
18-Dec	1.2	1.1	1.2	1.3	1.8	0.9	1.1	3.6	2.3	1.8	1.9	4.5	5.7	0.7	0.7	0.7	0.8	0.8	1.1	1.0	1.2	1.0	1.0	1.1	1.6	5.7																						
19-Dec	1.1	1.3	1.5	1.6	1.8	1.9	2.0	3.5	2.3	2.8	2.5	1.8	2.5	3.0	3.0	4.5	4.3	5.8	5.0	6.8	2.7	3.4	2.5	4.0	3.0	6.8																						
20-Dec	5.2	3.1	3.0	9.2	2.0	1.4	1.0	1.2	16.0	6.4	11.7	7.7	2.7	4.3	7.2	3.9	3.8	3.5	3.0	2.8	3.6	5.4	5.1	5.5	4.9	16.0																						
21-Dec	5.2	5.4	6.1	5.2	4.7	5.0	5.3	5.6	5.8	4.7	5.8	6.8	4.8	3.2	2.3	1.4	1.1	1.1	1.0	0.9	0.8	0.8	0.7	0.7	3.5	6.8																						
22-Dec	0.7	0.8	0.9	0.8	0.6	0.6	0.5	0.6	0.9	0.9	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.8	1.1	1.1	0.9	0.8	0.8	0.9	0.8	1.1																						
23-Dec	1.1	1.6	2.1	2.4	2.4	3.0	2.0	2.0	2.4	2.3	3.6	3.3	2.5	1.5	1.7	2.1	3.0	3.6	4.0	2.4	1.7	1.2	1.1	1.1	2.2	4.0																						
24-Dec	1.5	1.8	2.0	1.9	2.0	1.9	2.1	2.5	2.5	2.3	3.2	2.8	3.5	3.4	2.5	2.1	1.6	2.0	2.2	1.6	1.9	2.0	1.9	2.4	2.2	3.5																						
25-Dec	1.8	1.8	2.1	2.2	2.0	1.8	1.9	3.0	3.4	3.4	9.5	2.3	2.5	2.8	5.5	3.9	3.8	4.3	5.4	4.7	5.0	4.3	2.3	1.7	3.4	9.5																						
26-Dec	1.9	1.8	2.0	1.4	1.4	1.2	1.2	1.1	1.5	2.0	22.1	0.6	0.6	0.5	0.5	0.6	0.6	0.9	0.9	0.9	0.8	0.9	1.1	1.1	2.0	22.1																						
27-Dec	1.9	1.9	1.4	1.7	2.1	2.1	2.0	2.6	1.8	1.8	0.8	1.0	0.8	0.9	0.9	1.4	1.0	1.0	1.0	1.1	1.4	1.3	1.3	1.2	1.4	2.6																						
28-Dec	1.1	1.0	1.1	1.4	2.1	3.5	1.7	2.1	2.1	1.7	1.6	1.4	1.7	1.8	1.5	2.2	3.3	3.8	2.9	2.2	2.1	2.5	2.3	2.4	2.1	3.8																						
29-Dec	2.0	2.0	1.0	1.1	1.5	1.7	1.8	1.8	1.3	1.5	1.3	1.1	1.3	1.7	1.4	1.9	1.3	1.2	1.1	1.4	1.8	1.5	1.4	1.6	1.5	2.0																						
30-Dec	1.2	1.2	1.1	1.1	1.2	1.4	1.2	1.3	1.5	1.2	1.6	1.4	1.4	1.5	1.5	1.8	2.8	5.9	3.9	3.3	3.4	3.2	4.4	2.8	2.1	5.9																						
31-Dec	2.4	1.9	2.0	2.9	1.9	2.1	2.2	2.6	1.9	1.4	1.6	2.6	1.5	1.1	1.1	1.0	7.4	2.0	6.0	5.4	14.1	10.3	3.4	3.4	3.4	14.1																						
																								2.6	2.8	2.6	2.6	2.4	2.7	4.5	3.7	3.2	3.5	4.2	2.9	2.4	2.6	2.8	2.9	3.5	3.7	4.3	3.5	3.1	2.9	2.5	2.8	Diurnal Average
																								10.7	10.2	8.6	9.2	6.1	6.9	62.0	28.4	16.0	34.9	26.4	8.1	7.3	16.7	15.9	14.4	15.3	12.8	31.9	18.2	14.1	10.3	8.9	17.3	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Anzac - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Anzac - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	524	70.72	70.72
6 - 15	78	10.53	81.24
16 - 25	6	0.81	82.05
26 - 80	5	0.67	82.73
> 81.0	0	0.00	82.73

Total Number of Valid Hours: 741

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Anzac - December 2017**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	9	0	1	1	0	6	14	32	14	22	20	18	72	192	70	50	521
6 - 15	0	0	0	0	0	0	2	5	2	5	3	4	13	32	8	4	78
16 - 25	0	0	0	0	0	0	0	0	0	2	0	0	0	3	1	0	6
26 - 80	0	0	0	0	0	0	1	0	0	1	1	0	2	0	0	0	5
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	9	0	1	1	0	6	17	37	16	30	24	22	87	227	79	54	610

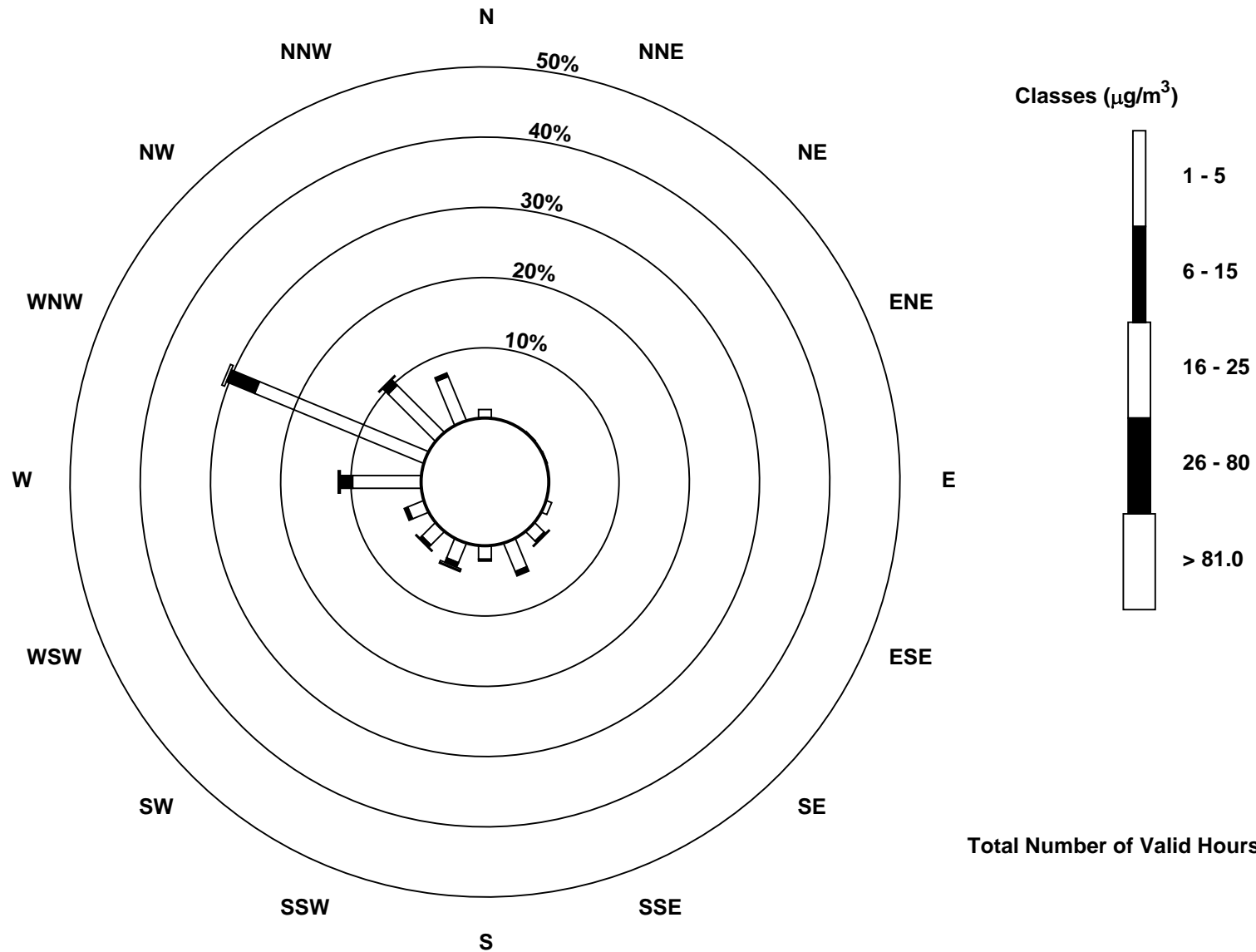
Total Number of Valid Hours: 737

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

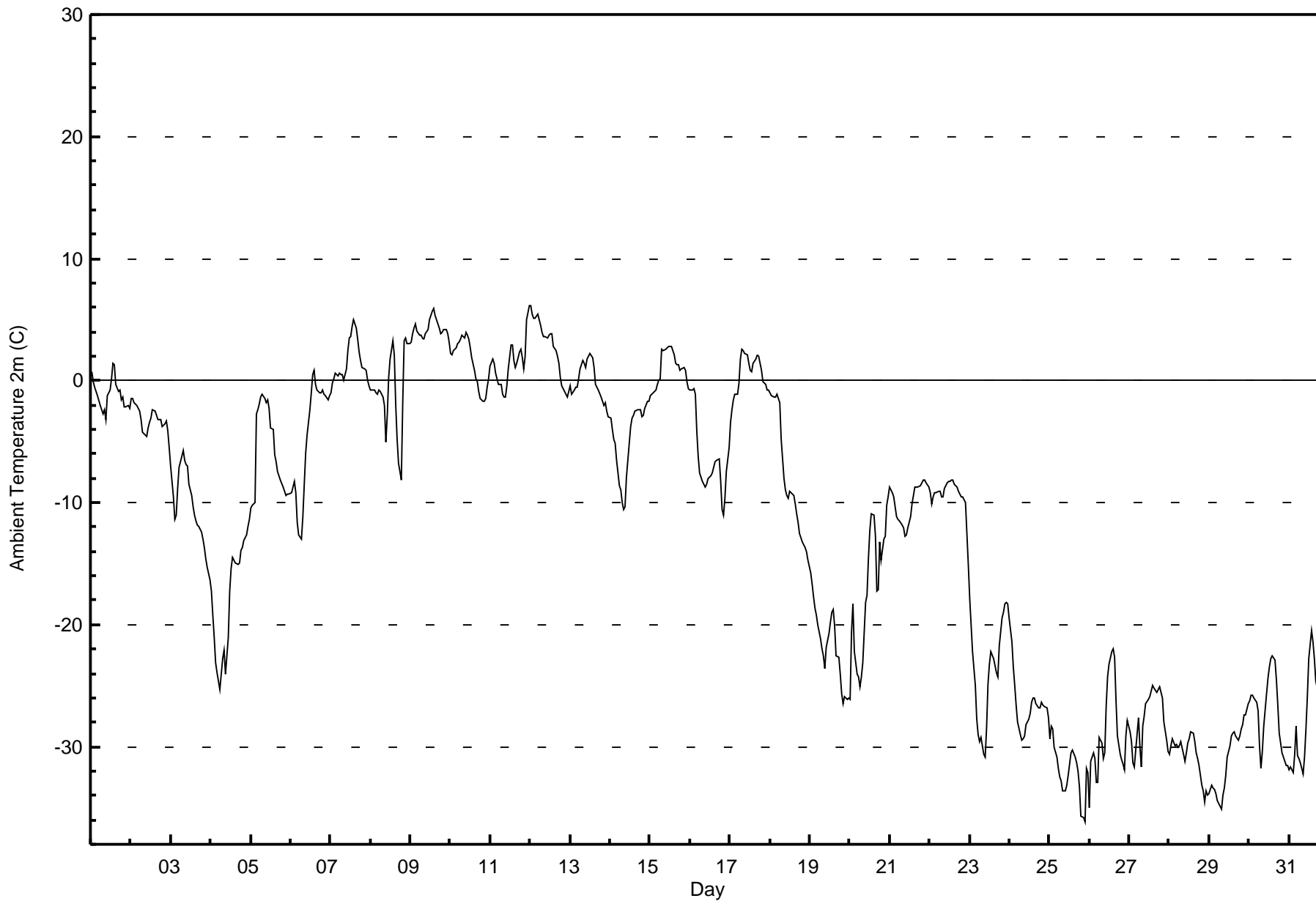
Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Anzac (AMS 14)







Maximum Value: 6.2 C on Dec 12 00:00																				Maximum Daily Average: 4.2 C on Dec 9					Hours in Service: 744				
Minimum Value: -36.1 C on Dec 25 22:00																				Minimum Daily Average: -32.0 C on Dec 25					Hours of Data: 744				
Maximum Diurnal Average: -9.6 C at hour 14																				Minimum Diurnal Average: -13.1 C at hour 9					Hours of Missing Data: 0				
Monthly Average: -11.73 C																				Percentiles: P <sub>1</sub> = -34.5 P <sub>10</sub> = -30.4 Q <sub>1</sub> = -24.7 Median = -8.8 Q <sub>3</sub> = -0.8 P <sub>90</sub> = 2.5 P <sub>99</sub> = 5.2					Hours of Calibration: 0				
																				Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0.8	-0.1	-0.5	-0.9	-1.3	-2.1	-2.4	-2.7	-2.4	-3.2	-1.3	-0.7	0.1	1.5	1.3	-0.4	-0.9	-0.8	-1.5	-1.3	-2.1	-2.2	-2.1	-2.2	-1.1	1.5			
2-Dec	-1.5	-1.5	-1.8	-2.1	-2.2	-2.5	-3.2	-4.2	-4.3	-4.6	-3.9	-3.4	-3.1	-2.4	-2.5	-2.9	-3.2	-3.2	-3.2	-3.7	-3.5	-3.4	-4.1	-5.5	-3.2	-1.5			
3-Dec	-7.0	-9.5	-11.4	-11.0	-8.9	-7.2	-6.7	-5.7	-6.6	-6.8	-7.0	-8.6	-9.4	-10.3	-11.0	-11.5	-11.8	-12.0	-12.4	-13.0	-13.7	-14.6	-15.3	-16.3	-10.3	-5.7			
4-Dec	-17.2	-19.2	-21.1	-23.2	-24.0	-25.3	-24.1	-22.8	-22.1	-24.0	-21.0	-17.3	-15.5	-14.5	-14.8	-15.0	-15.1	-14.9	-14.0	-13.7	-13.1	-12.6	-12.0	-11.3	-17.8	-11.3			
5-Dec	-10.5	-10.2	-10.0	-2.7	-2.4	-1.9	-1.4	-1.1	-1.4	-1.8	-1.6	-2.3	-3.9	-4.0	-6.0	-6.7	-7.5	-7.8	-8.2	-8.8	-9.0	-9.4	-9.3	-9.3	-5.7	-1.1			
6-Dec	-9.2	-8.7	-8.3	-9.2	-11.6	-12.7	-13.0	-11.1	-8.5	-6.0	-4.4	-2.4	-1.0	0.5	0.8	-0.3	-0.8	-1.0	-1.0	-0.8	-1.1	-1.2	-1.6	-1.2	-4.7	0.8			
7-Dec	-1.0	-0.2	0.2	0.6	0.4	0.6	0.5	0.4	0.1	1.0	2.5	3.5	3.6	4.4	5.0	4.4	3.4	2.3	1.6	1.0	1.0	0.8	0.1	-0.4	1.5	5.0			
8-Dec	-0.8	-0.8	-0.8	-1.0	-1.1	-0.8	-0.9	-1.4	-2.1	-5.0	-2.8	0.2	1.8	3.3	2.1	-1.9	-4.8	-6.8	-8.2	-1.8	3.2	3.5	3.0	3.1	-0.9	3.5			
9-Dec	3.1	3.9	4.3	4.6	4.1	3.7	3.7	3.5	3.4	3.9	4.2	5.0	5.3	5.7	5.9	5.3	4.6	4.4	3.8	3.9	4.2	4.2	3.9	3.1	4.2	5.9			
10-Dec	2.2	2.1	2.4	2.7	3.0	3.2	3.4	3.7	3.4	4.0	3.8	3.4	2.6	1.9	0.8	0.2	-0.1	-0.8	-1.5	-1.6	-1.7	-1.5	-0.5	0.1	1.5	4.0			
11-Dec	1.2	1.7	1.4	0.6	0.2	-0.3	-0.3	-1.1	-1.3	-1.3	-0.4	1.0	2.9	2.9	1.7	1.1	1.4	2.3	2.6	1.8	0.9	2.0	5.0	6.2	1.3	6.2			
12-Dec	6.2	5.5	5.1	5.1	5.5	5.0	4.5	4.0	3.6	3.6	3.5	3.7	3.8	3.8	2.9	2.4	2.0	1.4	0.3	-0.4	-0.9	-1.2	-1.3	-0.9	2.8	6.2			
13-Dec	-0.5	-1.1	-0.8	-0.5	-0.5	0.2	0.9	1.7	1.4	1.0	1.7	2.0	2.2	1.9	1.1	-0.3	-0.5	-0.8	-1.4	-1.7	-2.1	-1.8	-2.5	-2.9	-0.1	2.2			
14-Dec	-3.1	-4.0	-4.8	-5.1	-6.6	-8.7	-9.0	-10.0	-10.5	-10.4	-7.9	-5.2	-3.8	-3.1	-2.9	-2.5	-2.4	-2.4	-2.4	-2.9	-2.9	-2.3	-1.6	-1.7	-4.8	-1.6			
15-Dec	-1.2	-1.1	-1.0	-0.8	-0.3	0.0	0.2	2.6	2.4	2.6	2.7	2.8	2.8	2.8	2.1	1.4	1.3	1.3	0.8	0.9	1.1	0.9	-0.1	-0.7	1.0	2.8			
16-Dec	-0.8	-0.8	-0.7	-1.1	-4.1	-6.2	-7.6	-8.3	-8.5	-8.7	-8.6	-8.0	-7.8	-7.6	-7.1	-6.7	-6.6	-6.4	-8.3	-10.6	-11.0	-9.6	-7.5	-5.5	-6.6	-0.7			
17-Dec	-3.4	-2.4	-1.6	-1.1	-1.1	-0.2	1.8	2.6	2.5	2.2	2.1	1.5	0.8	0.8	1.4	1.7	2.1	1.9	1.4	0.8	-0.1	-0.3	-0.7	-0.8	0.5	2.6			
18-Dec	-1.0	-1.2	-1.3	-1.3	-1.1	-1.4	-1.8	-4.8	-8.0	-9.0	-9.5	-9.7	-9.1	-9.2	-9.5	-10.1	-10.9	-11.6	-12.5	-13.2	-13.4	-13.7	-14.0	-14.8	-8.0	-1.0			
19-Dec	-15.8	-16.6	-17.7	-18.6	-19.2	-20.0	-21.1	-22.0	-22.5	-23.6	-21.9	-20.7	-19.7	-19.0	-18.8	-20.1	-22.6	-22.7	-24.0	-25.7	-26.5	-25.8	-26.2	-26.0	-21.5	-15.8			
20-Dec	-26.1	-20.6	-18.3	-22.3	-24.1	-24.3	-25.0	-24.2	-23.2	-18.2	-17.6	-14.6	-12.3	-10.9	-11.0	-12.8	-17.2	-17.1	-13.2	-14.7	-13.0	-12.8	-10.2	-9.5	-17.2	-9.5			
21-Dec	-8.7	-9.2	-9.5	-10.3	-11.1	-11.4	-11.5	-11.8	-12.1	-12.8	-12.6	-12.1	-11.2	-10.1	-9.4	-8.7	-8.7	-8.8	-8.6	-8.4	-8.2	-8.1	-8.4	-8.7	-10.0	-8.1			
22-Dec	-9.2	-10.2	-9.5	-9.2	-9.2	-9.0	-9.0	-9.5	-9.5	-8.9	-8.3	-8.2	-8.3	-8.1	-8.2	-8.5	-8.8	-9.1	-9.3	-9.6	-9.6	-10.0	-12.5	-15.0	-9.4	-8.1			
23-Dec	-17.9	-20.0	-22.2	-24.9	-27.7	-29.0	-29.6	-29.3	-30.6	-30.9	-28.5	-24.8	-23.3	-22.3	-22.8	-23.4	-23.9	-24.3	-21.7	-19.5	-19.0	-18.3	-18.1	-18.3	-23.8	-17.9			
24-Dec	-19.4	-21.4	-23.5	-25.0	-26.6	-27.9	-29.0	-29.5	-29.3	-29.1	-28.3	-27.7	-27.2	-26.4	-26.0	-26.0	-26.5	-26.9	-26.8	-26.4	-26.6	-26.7	-26.8	-27.7	-26.5	-19.4			
25-Dec	-29.3	-28.3	-28.6	-30.0	-30.8	-31.8	-32.4	-32.8	-33.6	-33.6	-33.2	-32.3	-31.4	-30.5	-30.3	-30.8	-31.3	-32.0	-33.2	-35.7	-35.9	-36.1	-31.7	-32.1	-32.0	-28.3			
26-Dec	-34.9	-31.2	-30.5	-31.0	-33.0	-32.9	-29.3	-29.7	-30.9	-30.5	-26.7	-24.3	-23.2	-22.2	-22.0	-22.7	-26.3	-29.1	-30.7	-31.1	-31.4	-31.9	-29.1	-27.9	-28.9	-22.0			
27-Dec	-28.8	-29.6	-31.3	-31.7	-30.3	-27.7	-30.0	-31.6	-28.4	-27.5	-26.5	-26.1	-25.8	-25.5	-25.0	-25.2	-25.5	-25.3	-25.1	-25.5	-26.0	-27.9	-29.4	-30.4	-27.8	-25.0			
28-Dec	-30.6	-30.0	-29.4	-29.9	-29.8	-30.1	-29.9	-29.6	-30.6	-31.2	-30.5	-29.7	-29.3	-28.8	-28.9	-29.6	-30.5	-31.0	-31.5	-33.2	-33.6	-34.6	-33.6	-34.0	-30.8	-28.8			
29-Dec	-33.8	-33.2	-33.4	-33.5	-33.9	-34.4	-34.9	-35.2	-34.0	-33.4	-32.3	-30.8	-29.9	-29.1	-28.9	-28.7	-29.1	-29.4	-29.1	-28.6	-28.2	-27.4	-27.4	-26.5	-31.1	-26.5			
30-Dec	-26.3	-25.8	-25.7	-26.0	-26.4	-27.0	-30.0	-31.8	-30.4	-28.4	-25.6	-24.4	-23.5	-22.8	-22.6	-23.0	-24.5	-26.6	-28.9	-29.7	-30.5	-31.2	-31.5	-31.5	-27.2	-22.6			
31-Dec	-31.9	-31.7	-32.1	-30.6	-28.3	-30.7	-31.0	-31.3	-32.2	-30.9	-28.6	-25.9	-22.8	-20.4	-21.4	-22.8	-24.6	-25.2	-25.9	-25.2	-23.5	-24.1	-20.8	-22.1	-26.8	-20.4			
																								Diurnal Average					
																								Diurnal Maximum					





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Anzac - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	240	32.26	32.26
-20 - 0	350	47.04	79.30
0 - 10	154	20.70	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

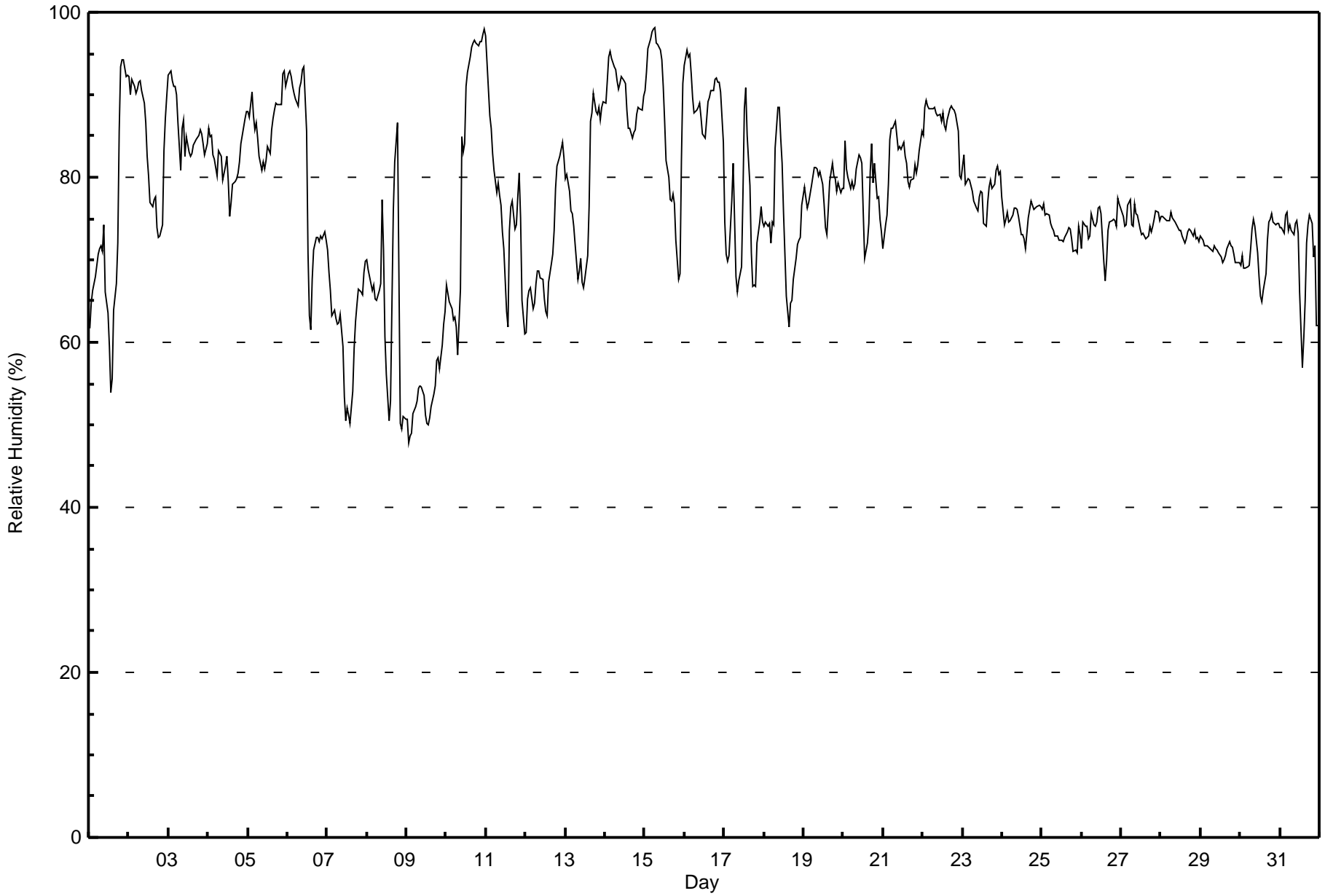
**Anzac - December 2017**

Maximum Value: 98 % on Dec 15 07:00																		Maximum Daily Average: 90.0 % on Dec 16																		Hours in Service: 744													
Minimum Value: 48 % on Dec 9 02:00																		Minimum Daily Average: 53.8 % on Dec 9																		Hours of Data: 744													
Maximum Diurnal Average: 78.4 % at hour 10																		Minimum Diurnal Average: 71.9 % at hour 14																		Hours of Missing Data: 0													
Monthly Average: 76.9 %																		Percentiles: P <sub>1</sub> = 50 P <sub>10</sub> = 65 Q <sub>1</sub> = 71 Median = 76 O <sub>3</sub> = 85 P <sub>90</sub> = 91 P <sub>99</sub> = 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-Dec	62	65	66	67	68	71	71	72	71	74	66	64	60	54	56	64	67	72	86	93	94	94	92	92	72.5	94																							
2-Dec	92	90	92	91	90	91	92	92	91	89	87	82	80	77	76	77	78	74	73	73	74	83	87	90	84.2	92																							
3-Dec	92	93	92	91	91	90	87	81	86	87	83	85	83	83	83	84	84	85	85	86	85	84	83	84	86.0	93																							
4-Dec	86	85	85	83	82	80	83	83	82	80	81	83	80	75	77	79	80	80	82	84	86	87	88	82.1	88																								
5-Dec	88	87	90	87	86	87	85	83	81	82	81	82	84	83	86	87	88	89	89	89	89	92	93	91	86.6	93																							
6-Dec	93	93	92	91	90	89	89	91	91	93	93	86	71	63	61	68	71	73	73	72	73	73	72	80.6	93																								
7-Dec	71	68	66	63	64	63	62	62	63	60	53	51	52	51	50	54	59	63	65	66	66	66	69	70	61.6	71																							
8-Dec	70	69	67	66	67	65	65	66	67	77	71	61	56	50	53	64	76	82	87	68	50	49	51	51	64.6	87																							
9-Dec	51	48	49	49	51	52	53	54	55	55	54	51	50	50	51	52	54	55	58	58	57	60	62	64	53.8	64																							
10-Dec	67	66	65	64	63	63	62	58	66	85	83	84	91	93	95	96	96	97	96	96	96	96	97	98	82.2	98																							
11-Dec	97	91	87	86	83	81	78	79	78	77	73	71	64	62	73	76	77	74	74	78	81	75	65	61	76.7	97																							
12-Dec	61	65	66	67	64	65	67	69	69	68	68	65	64	63	67	70	71	73	79	81	83	83	84	82	70.6	84																							
13-Dec	80	80	78	76	76	74	72	68	69	70	67	67	68	71	76	87	88	90	88	88	88	87	88	89	78.5	90																							
14-Dec	89	92	95	95	94	93	93	92	91	91	92	92	91	88	86	86	85	85	86	88	89	88	88	90	89.9	95																							
15-Dec	91	93	96	97	98	98	98	96	96	95	94	91	87	82	80	77	77	78	77	72	68	68	82	91	86.8	98																							
16-Dec	93	95	95	95	92	90	88	88	89	89	87	85	85	87	89	90	91	90	92	92	92	92	90	84	90.0	95																							
17-Dec	74	71	70	70	77	82	75	68	66	67	69	78	88	91	85	79	71	67	67	67	72	75	77	75	74.2	91																							
18-Dec	74	75	74	74	72	75	74	84	88	88	85	82	76	66	64	62	65	65	68	70	72	72	73	77	73.9	88																							
19-Dec	79	77	76	77	78	79	81	81	81	80	81	79	77	74	73	76	80	82	80	80	78	79	78	79	78.5	82																							
20-Dec	79	84	81	80	79	79	79	79	81	83	82	82	76	70	72	74	81	84	79	82	77	78	75	73	78.7	84																							
21-Dec	71	74	75	79	85	86	86	87	85	83	84	83	84	83	82	79	79	80	80	82	80	82	83	86	81.6	87																							
22-Dec	85	88	89	89	88	88	88	89	88	87	88	87	88	86	86	87	88	89	88	88	88	86	80	80	87.0	89																							
23-Dec	81	83	79	80	80	79	78	77	76	76	78	78	74	74	77	79	80	79	79	81	81	80	81	78.7	83																								
24-Dec	78	74	75	76	75	75	75	76	76	75	73	73	73	71	73	75	77	77	76	76	76	77	77	75.2	78																								
25-Dec	76	77	75	76	75	74	74	74	73	73	72	72	72	72	73	73	74	74	73	71	71	71	74	73	73.4	77																							
26-Dec	71	75	74	74	73	73	76	74	74	75	76	76	76	70	68	70	74	75	75	75	75	74	78	77	73.9	78																							
27-Dec	76	75	74	74	77	77	74	74	77	76	75	74	73	73	73	73	74	73	74	75	76	76	75	74.6	77																								
28-Dec	75	75	75	75	75	75	76	75	75	74	74	74	74	73	72	72	73	74	74	73	74	72	73	72	73.9	76																							
29-Dec	73	72	72	72	72	72	71	71	72	71	71	71	70	70	70	71	71	72	72	72	71	70	70	70	71.1	73																							
30-Dec	69	70	69	69	69	69	71	74	75	74	71	68	66	65	66	68	72	75	75	76	75	74	74	74	71.2	76																							
31-Dec	74	74	73	75	76	74	74	74	73	74	75	73	66	57	61	65	72	74	75	74	70	72	62	62	70.8	76																							
																								78.0	78.2	77.9	77.7	77.7	77.7	77.3	77.1	77.6	78.4	77.1	75.8	74.2	71.9	72.5	74.6	76.4	77.4	78.1	78.1	77.5	77.9	78.1	78.3	Diurnal Average	
																								97	95	96	97	98	98	98	96	96	95	94	92	91	93	95	96	96	96	97	96	96	96	96	98	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Anzac - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	42	5.65	5.65
60 - 80	429	57.66	63.31
80 - 100	273	36.69	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Leaf Wetness (SW) - %**

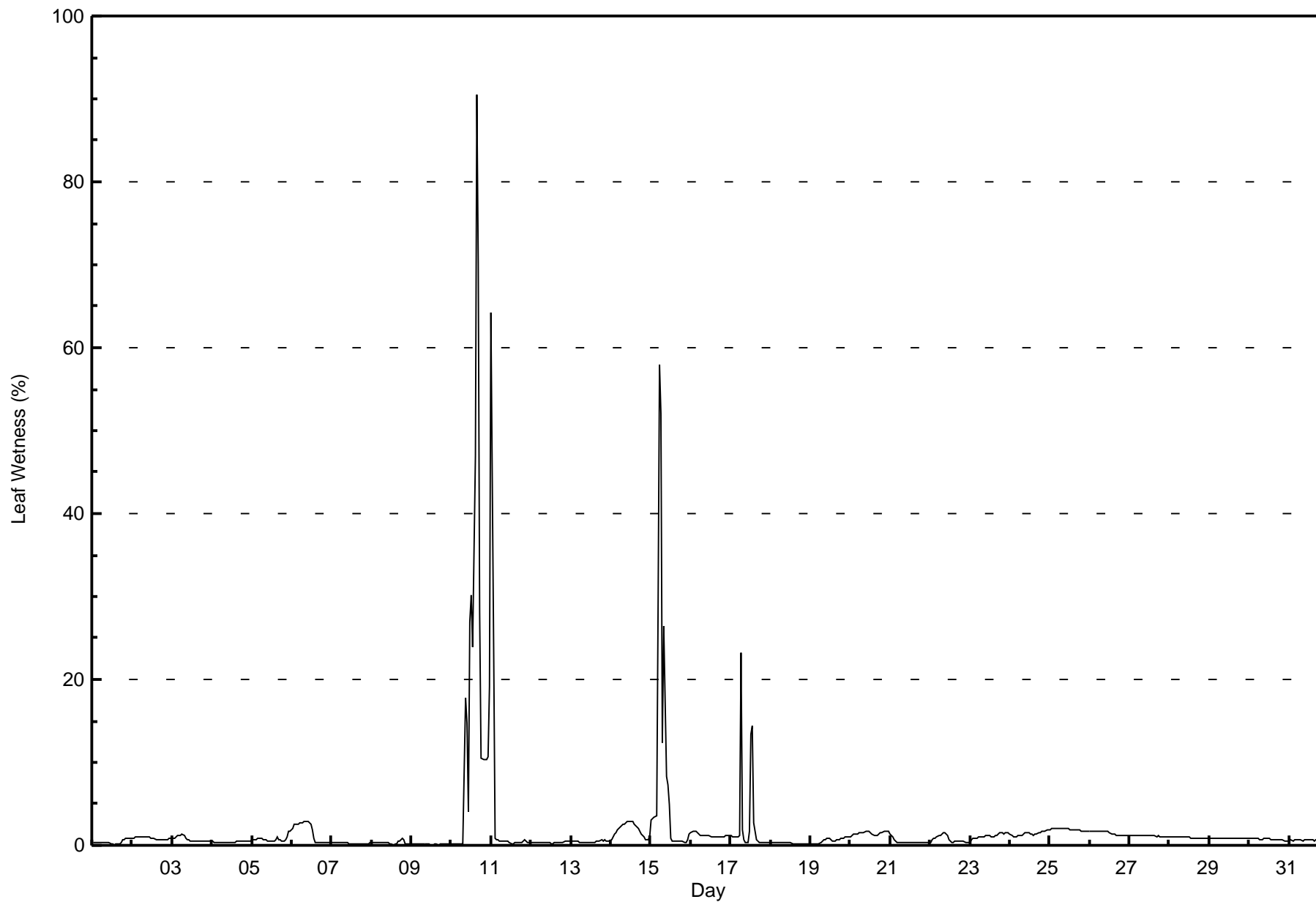
**Anzac - December 2017**

Maximum Value: 90 % on Dec 10 16:00																	Maximum Daily Average: 17.8 % on Dec 10										Hours in Service: 744																																					
Minimum Value: 0 % on Dec 8 14:00																	Minimum Daily Average: 0.1 % on Dec 9										Hours of Data: 744																																					
Maximum Diurnal Average: 3.6 % at hour 16																	Minimum Diurnal Average: 0.9 % at hour 3										Hours of Missing Data: 0																																					
Monthly Average: 1.8 %																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 15										Hours of Calibration: 0																																					
																	Percent Operational Time: 100.0																																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																								
1-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.4	1																																						
2-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																																						
3-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0.7	1																																						
4-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1																																						
5-Dec	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	2	2	0.8	2																																						
6-Dec	2	2	2	2	3	3	3	3	3	3	3	2	1	0	0	0	0	0	0	0	0	0	0	0	1.6	3																																						
7-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																																						
8-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0.3	1																																						
9-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																																						
10-Dec	0	0	0	0	0	0	0	0	18	15	4	27	30	24	47	90	70	28	10	10	10	10	11	19	17.8	90																																						
11-Dec	64	23	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4.0	64																																						
12-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1																																						
13-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0.4	1																																						
14-Dec	1	1	1	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	1	1	1	1	1	1	1.9	3																																						
15-Dec	3	3	3	4	29	58	52	12	26	8	7	5	1	1	1	1	0	1	0	0	0	1	1	1	9.1	58																																						
16-Dec	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2																																						
17-Dec	1	1	1	1	1	1	23	2	1	0	0	2	13	14	3	1	0	0	0	0	0	0	0	0	2.9	23																																						
18-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																																						
19-Dec	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0.6	1																																						
20-Dec	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	2	2	1.5	2																																						
21-Dec	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																																						
22-Dec	0	1	1	1	1	1	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2																																						
23-Dec	0	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																																						
24-Dec	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	2	2	2	2	2	1.4	2																																						
25-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.9	2																																						
26-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.5	2																																						
27-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1																																						
28-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																																						
29-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																																						
30-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																																						
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1																																						
2.9																	1.6		0.9		1.0		1.8		2.7		3.3		1.3		2.3		1.6		1.2		1.9		2.2		1.9		2.3		3.6		3.0		1.6		1.1		1.0		1.0		1.0		1.1		1.4		Diurnal Average	
64																	23		3		4		29		58		52		12		26		15		7		27		30		24		47		90		70		28		10		10		10		10		11		19		Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Leaf Wetness (SW) - %**  
**Anzac - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Leaf Wetness (SW) - %  
Anzac - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	153	20.56	20.56
0.4 - 0.5	142	19.09	39.65
0.6 - 0.7	84	11.29	50.94
0.8 - 1.4	227	30.51	81.45
1.5 - 10	101	13.58	95.03
> 10	25	3.36	98.39

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Speed (WS) - km/h**  
**Anzac - December 2017**

Maximum Speed: 25 km/h on Dec 17 17:00	Maximum Daily Speed Average: 17.5 km/h on Dec 7	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 30 18:00	Minimum Daily Speed Average: 2.2 km/h on Dec 14	Hours of Data: 740
Maximum Diurnal Speed Average: 10.5 km/h at hour 10	Minimum Diurnal Speed Average: 6.6 km/h at hour 18	Hours of Missing Data: 4
Monthly Average Velocity: 8.4 km/h 291.3 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 10 Q <sub>3</sub> = 15 P <sub>90</sub> = 18 P <sub>99</sub> = 23	Percent Operational Time: 99.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	W16	W19	W16	W15	W16	WNW15	W13	WSW11	W11	W10	W11	WNW9	WNW9	W7	SW9	SSW8	S4	WSW2	WNW4	SSW3	SSE3	S5	S4	NW1	W8.2	W19
2-Dec	WNW9	WNW12	WNW12	WNW12	WNW13	WNW9	WNW10	W9	WNW10	WNW8	WNW10	W8	WNW8	WNW12	W12	WNW9	W7	W6	W6	W6	WSW8	W10	SW5	WSW4	WNW8.7	WNW13
3-Dec	W4	SSW4	S6	SSW5	SSW8	SW10	WSW8	W15	WNW15	WNW16	NW18	NNW15	NNW14	NNW11	NNW9	NNW8	NW6	NW7	NW7	NNW7	NNW9	NNW8	NNW7	NW5	WNW6.6	NW18
4-Dec	NW6	WNW6	NW7	NNW6	NW3	W3	W4	WNW4	WNW3	WSW3	SSW2	SE2	SSE4	SE6	SE8	SE9	SSE12	SSE14	SSE13	SE12	SE10	SSE11	SSE12	SSE12	SSE3.7	SSE14
5-Dec	SE6	ESE5	W7	WNW16	WNW16	WNW16	WNW19	WNW19	NW18	NW17	NW19	NNW18	NNW16	NW15	NNW15	N13	N10	NNW7	N7	N7	N8	N4	NW4	WNW5	WNW10.2	WNW19
6-Dec	WNW6	W3	SSW3	S3	SW4	WSW6	SW5	WSW6	SW7	SW6	SW3	SSW6	SW7	W10	W15	W17	W17	WNW16	WNW15	WNW19	WNW18	WNW17	WNW16	WNW14	W8.8	WNW19
7-Dec	WNW14	WNW15	WNW16	WNW20	WNW19	WNW21	WNW20	WNW22	WNW21	WNW22	WNW20	WNW19	WNW19	WNW19	WNW18	WNW17	WNW16	WNW15	WNW14	WNW15	WNW15	WNW14	WNW14	WNW13	WNW17.5	WNW22
8-Dec	W11	WNW11	W10	W9	WNW9	WNW11	WNW12	WNW11	WNW8	W5	W6	WNW10	WNW10	WSW3	SSE5	SE3	ESE3	SSE5	S4	W11	W17	W18	W16	W15	W7.9	W18
9-Dec	W18	W18	W22	W23	WNW20	WNW21	WNW22	WNW22	WNW22	WNW24	WNW21	WNW17	WNW14	WNW13	WNW17	WNW16	W15	W14	WNW11	W12	W11	W15	W13	NW10	WNW17.1	WNW24
10-Dec	W10	W10	W10	WNW11	WNW12	WNW12	WNW11	W12	W9	WNW11	WNW9	NW14	NW19	NW25	NW21	NNW18	NW16	NNW14	NNW10	NW8	WNW4	WNW5	W5	WNW4	WNW10.9	NW25
11-Dec	WNW10	WNW12	WNW15	WNW13	WNW12	WNW12	WNW12	W11	W10	W10	W8	WSW5	W7	W5	SW5	SSW4	SSW8	SSW11	SSW10	SSW7	SW4	W7	W12	W17	W7.9	W17
12-Dec	W15	W15	W16	W16	WNW16	WNW15	WNW15	W16	WNW15	WNW18	WNW18	WNW16	WNW17	NW16	WNW15	WNW15	WNW14	WNW13	WNW14	WNW13	WNW13	WNW11	WNW11	WNW10	WNW14.6	WNW18
13-Dec	WNW12	WNW10	W10	W9	W8	W9	W11	WNW16	WNW21	WNW17	WNW20	NW19	NW19	NW18	NNW21	NNW18	NW13	WNW9	WNW12	WNW14	WNW13	WNW16	WNW14	WNW12	WNW13.5	NNW21
14-Dec	NW11	NW9	WNW5	WNW7	W4	WSW4	SW6	SE2	SSE5	SSE6	SSE7	SSE6	SSE6	SE6	SSE7	SSE6	SE8	SSE7	SE6	SE4	SSE6	NW4	N2	SE4	S2.2	NW11
15-Dec	SSE5	SSE3	SSE5	SSE6	S6	S6	SSW6	WNW16	WNW15	WNW18	WNW18	WNW20	WNW21	WNW20	WNW17	WNW15	WNW14	WNW16	WNW17	W18	W18	W17	WNW14	WNW14	WNW11.2	WNW21
16-Dec	WNW16	WNW15	WNW14	NW14	NNW18	NNW15	NNW13	NNW9	NW7	WNW6	W2	SE4	SSE5	SSE5	ESE4	SSE5	SSE5	SE3	SSE4	SSE4	SSW5	SSW7	SSW8	SSW11	WNW3.7	NNW18
17-Dec	SSW16	SSW15	SSW15	SW14	SW13	SW16	WSW17	WSW18	W18	W18	W21	WNW22	WNW21	WNW20	WNW22	WNW20	WNW25	WNW24	WNW23	WNW18	WNW16	WNW13	WNW12	WNW13	W14.9	WNW25
18-Dec	WNW13	WNW16	WNW18	WNW17	WNW20	WNW19	WNW17	NNW17	NNW16	NNW12	NW15	NW16	NW21	NW21	NW23	NW23	NW19	NW21	NW19	NW16	WNW18	NW18	NW18	NNW15	NW17.2	NW23
19-Dec	NNW15	NNW13	NNW13	NNW11	NNW10	NNW9	NW8	NW6	WNW6	WNW5	W5	W4	ENE2	NNW2	NE1	SSE2	SSE4	SSE6	S6	SSW5	SSW3	SSW5	SW5	W5	NW3.2	NNW15
20-Dec	WNW6	WNW10	WNW8	WSW5	ESE3	SSE3	NNW1	WSW4	WNW7	W10	WSW6	SW6	WSW2	SW6	SSW7	S6	SSW6	SSW7	SSW9	SSW9	SSW11	SW9	WSW9	SW7	SW5.0	SSW11
21-Dec	W12	WNW11	WNW14	WNW15	NW13	NW13	NW13	NW12	NW15	NW16	NNW12	NW11	NW13	NW14	NW12	NW13	WNW14	WNW14	WNW16	WNW17	NW18	NW19	NW19	NW15	NW13.8	NW19
22-Dec	NW13	WNW10	WNW11	WNW13	WNW14	WNW13	WNW12	WNW13	WNW14	WNW18	WNW17	WNW18	WNW18	WNW19	WNW17	WNW16	WNW15	WNW15	WNW15	WNW15	NW13	NNW16	N15	N14	WNW13.9	WNW19
23-Dec	N11	NNW10	NW8	WNW5	WNW6	WNW4	W3	WSW1	AF	AF	WNW3	WNW5	WNW7	WNW9	NW10	NW10	NW9	WNW8	WNW11	WNW14	WNW13	WNW13	NW13	NW13	WNW8.0	WNW14
24-Dec	NNW19	NNW19	NNW18	NNW15	NNW20	NNW17	NW14	NW11	NW14	NW16	NW18	NW18	NW12	NW10	NW11	NW10	NW9	WNW7	WNW9	WNW10	WNW8	WNW8	WNW8	WNW6	WNW12.3	NNW20
25-Dec	NW7	NNW10	NNW9	N9	NNW10	NNW9	NW10	WNW8	WNW7	WNW8	WNW8	WNW8	WNW9	WNW9	WNW9	WNW7	W6	W6	WSW4	WSW4	W5	WNW6	WNW9	W6	WNW6.8	NW10
26-Dec	WNW6	WNW8	W7	W7	WNW6	WNW7	WNW9	WNW7	WNW7	WNW9	WNW9	WNW9	WNW10	WNW9	WNW9	NW7	SW1	SSW4	AF	W4	W2	WNW4	W6	W6	WNW6.3	WNW10
27-Dec	WNW6	W5	NW2	WNW2	WNW6	W8	W6	WNW5	WNW8	WNW8	WNW11	WNW13	WNW13	WNW12	WNW14	WNW11	W10	W8	WNW10	WNW8	WNW7	WNW5	WNW4	NW6	WNW7.7	WNW14
28-Dec	W3	WSW4	NW3	NW4	NW6	NW7	NW7	W8	WNW10	WNW10	NW11	NW10	NW11	NW12	NNW13	NNW11	NW10	NNW11	NW6	NNW7	NNW6	NNW8	NW8	WNW8	NW7.7	NNW13
29-Dec	NW9	NW11	NW11	NW10	NW11	NW10	NNW9	NW8	WNW12	WNW12	WNW12	WNW12	WNW12	WNW11	NW10	WNW10	WNW9	WNW10	WNW11	WNW11	WNW10	WNW9	W8	WNW8	WNW9.9	WNW12
30-Dec	WNW6	WNW7	WNW8	WNW8	WNW7	WNW6	W3	W5	WNW8	WNW8	WNW11	WNW11	WNW10	WNW8	WNW8	NW6	NW4	W0	SW2	SW3	SSW3	AF	S2	SSW3	WNW5.4	WNW11
31-Dec	SSE3	SSE4	SSE7	SSE9	S12	S8	SW6	S7	SSE6	SE4	SSE4	SSE5	S6	SE6	ESE6	ESE5	SE7	SSE8	S10	S11	S9	SW7	WSW15	SW12	S6.3	WSW15

WNW7.8	WNW8.2	WNW8.3	WNW8.6	WNW8.5	WNW8.8	WNW9.2	WNW9.6	WNW10.3	WNW10.5	WNW10.2	WNW9.6	WNW9.7	WNW9.5	WNW8.9	WNW7.8	WNW6.7	WNW6.6	WNW6.8	WNW7.1	WNW7.1	WNW8.1	WNW7.6	WNW6.7	WNW6.7	WNW6.7	Diurnal Average
NNW19	W19	W22	W23	WNW20	WNW21	WNW22	WNW22	WNW22	WNW24	WNW22	WNW22	WNW21	NW25	NW23	NW23	WNW25	WNW24	WNW23	WNW19	WNW18	NW19	NW19	W17	W17	W17	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

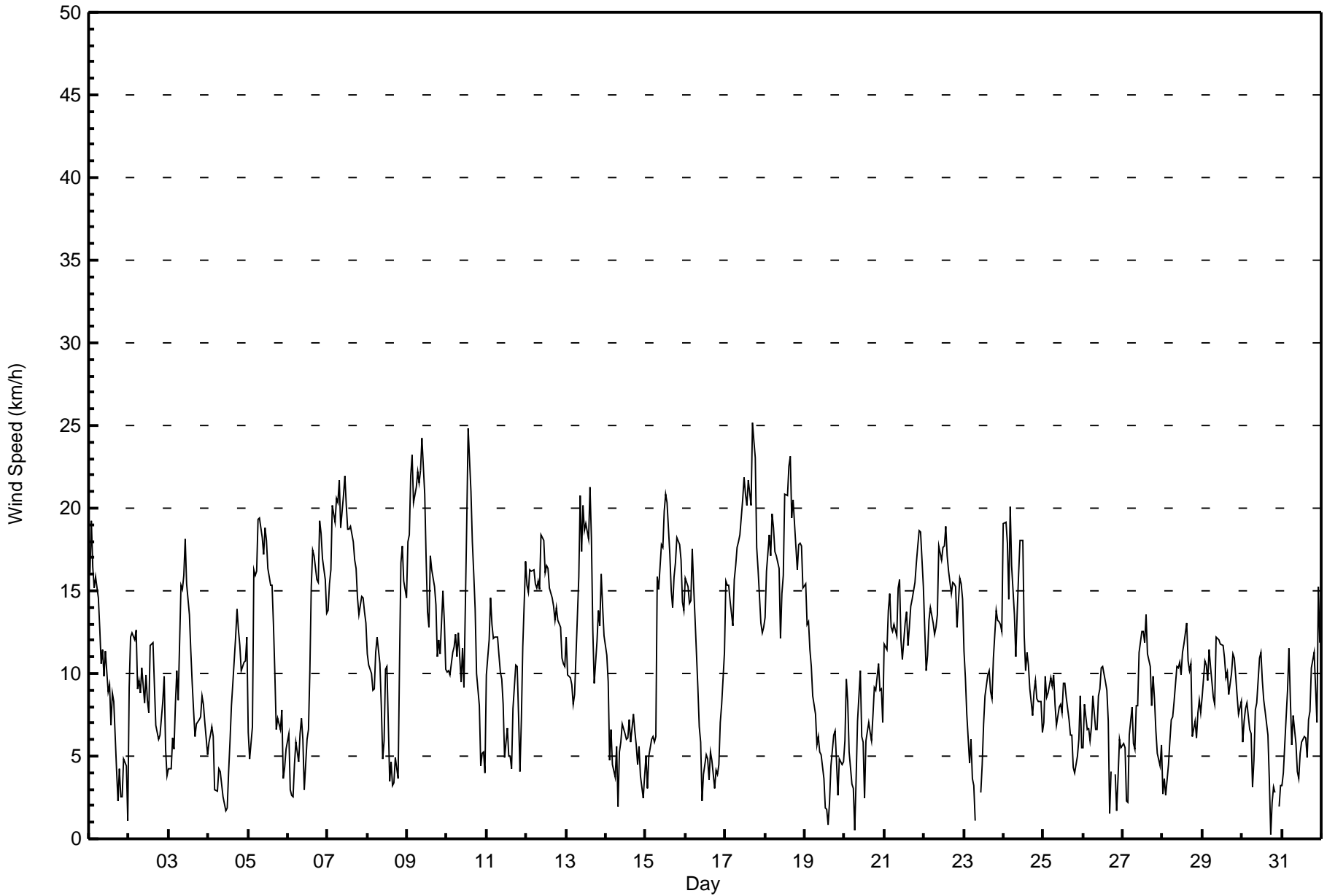
**Wind Speed (WS) - km/h**  
**Anzac - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Dec 17 17:00 Minimum Value: 1 km/h on Dec 30 19:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 7																	Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 0 Percent Operational Time: 99.5								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	6	6	5	5	5	4	3	3	3	3	4	2	3	2	2	1	2	1	1	1	1	1	1	2	6
2-Dec	3	4	3	3	3	3	2	2	3	2	3	3	3	3	3	3	2	2	2	2	2	4	1	1	4
3-Dec	1	1	1	1	2	2	2	5	5	4	5	3	3	3	3	2	2	2	2	2	2	2	1	5	
4-Dec	1	1	1	1	2	1	1	1	1	1	1	1	2	2	3	3	3	3	3	3	2	2	2	3	3
5-Dec	3	1	5	4	5	4	5	6	5	4	5	5	4	5	4	3	3	1	2	2	3	1	2	1	6
6-Dec	2	1	1	1	1	1	1	1	1	1	2	2	3	6	5	5	5	5	4	5	5	5	4	4	6
7-Dec	4	4	5	5	5	5	6	5	5	5	6	6	5	5	5	5	4	4	4	4	4	4	3	3	6
8-Dec	3	2	2	2	2	3	3	2	2	2	2	4	3	1	2	2	1	2	2	6	4	5	4	5	6
9-Dec	5	5	6	7	6	6	6	6	6	7	6	5	4	4	5	5	5	4	3	3	3	4	5	4	7
10-Dec	3	4	3	4	3	3	3	4	3	4	3	5	5	7	6	4	4	3	3	2	1	1	1	2	7
11-Dec	3	3	4	4	3	3	4	3	3	3	2	1	2	2	2	1	3	3	2	2	2	2	4	4	4
12-Dec	5	4	4	5	5	4	4	4	4	5	5	5	4	4	4	4	4	4	4	3	3	3	2	3	5
13-Dec	3	3	3	3	3	2	3	5	6	5	6	6	6	5	6	4	4	2	3	4	3	4	4	3	6
14-Dec	3	3	1	2	1	1	1	1	1	1	1	2	1	1	2	2	2	2	1	1	2	2	1	1	3
15-Dec	1	1	1	1	1	1	1	6	4	5	5	6	6	5	5	4	4	5	5	6	6	5	5	4	6
16-Dec	5	5	4	5	4	4	3	2	2	1	2	1	2	1	1	1	2	1	1	1	1	2	2	4	5
17-Dec	4	4	4	4	4	4	5	6	6	6	7	7	7	6	6	7	9	6	7	5	4	4	4	4	9
18-Dec	4	4	5	5	6	5	5	4	4	3	4	4	6	6	7	6	6	5	5	5	5	5	5	4	7
19-Dec	4	3	3	3	2	3	1	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4
20-Dec	1	2	3	1	1	1	1	1	2	2	1	2	2	2	2	1	1	2	3	2	2	2	2	2	3
21-Dec	4	3	4	4	3	3	3	3	4	4	3	3	3	3	3	3	4	4	4	5	5	5	5	3	5
22-Dec	4	3	3	4	3	3	3	4	4	5	5	5	5	5	5	4	5	4	4	4	4	4	4	4	5
23-Dec	3	2	2	1	1	2	2	1	AF	AF	1	1	2	2	3	2	2	2	3	4	3	3	4	3	4
24-Dec	5	5	4	3	4	4	3	3	4	4	4	5	3	4	3	3	2	2	2	3	2	2	2	1	5
25-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	1	2	1	1	1	2	2	1	3
26-Dec	1	2	2	2	1	2	2	2	1	2	2	3	3	2	1	1	1	AF	1	2	2	1	1	3	
27-Dec	1	2	1	1	2	2	2	2	2	2	3	3	4	3	4	3	4	3	2	2	2	1	1	1	4
28-Dec	1	1	1	1	1	1	2	2	3	2	3	3	4	3	3	2	2	2	2	2	2	2	2	2	4
29-Dec	2	3	2	2	3	3	1	1	3	3	3	3	3	3	3	2	2	3	2	3	2	2	3	3	3
30-Dec	2	2	2	3	2	2	1	1	2	2	3	3	3	2	2	1	1	1	1	1	1	AF	1	1	3
31-Dec	1	2	1	1	1	2	2	2	1	1	1	1	2	2	2	1	2	2	2	2	2	4	6	5	6
Diurnal Maximum																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Anzac - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	130	17.57	17.57
6 - 11	307	41.49	59.05
12 - 19	263	35.54	94.59
20 - 28	40	5.41	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 740

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Anzac - December 2017**

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	0	1	1	0	5	8	21	6	13	10	14	20	18	9	2	130
6 - 11	6	0	0	0	0	1	10	17	10	17	12	7	46	116	38	27	307
12 - 19	3	0	0	0	0	0	1	4	1	3	4	3	36	137	44	27	263
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	3	28	7	2	40
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
<b>Totals</b>	11	0	1	1	0	6	19	42	17	33	26	24	105	299	98	58	740

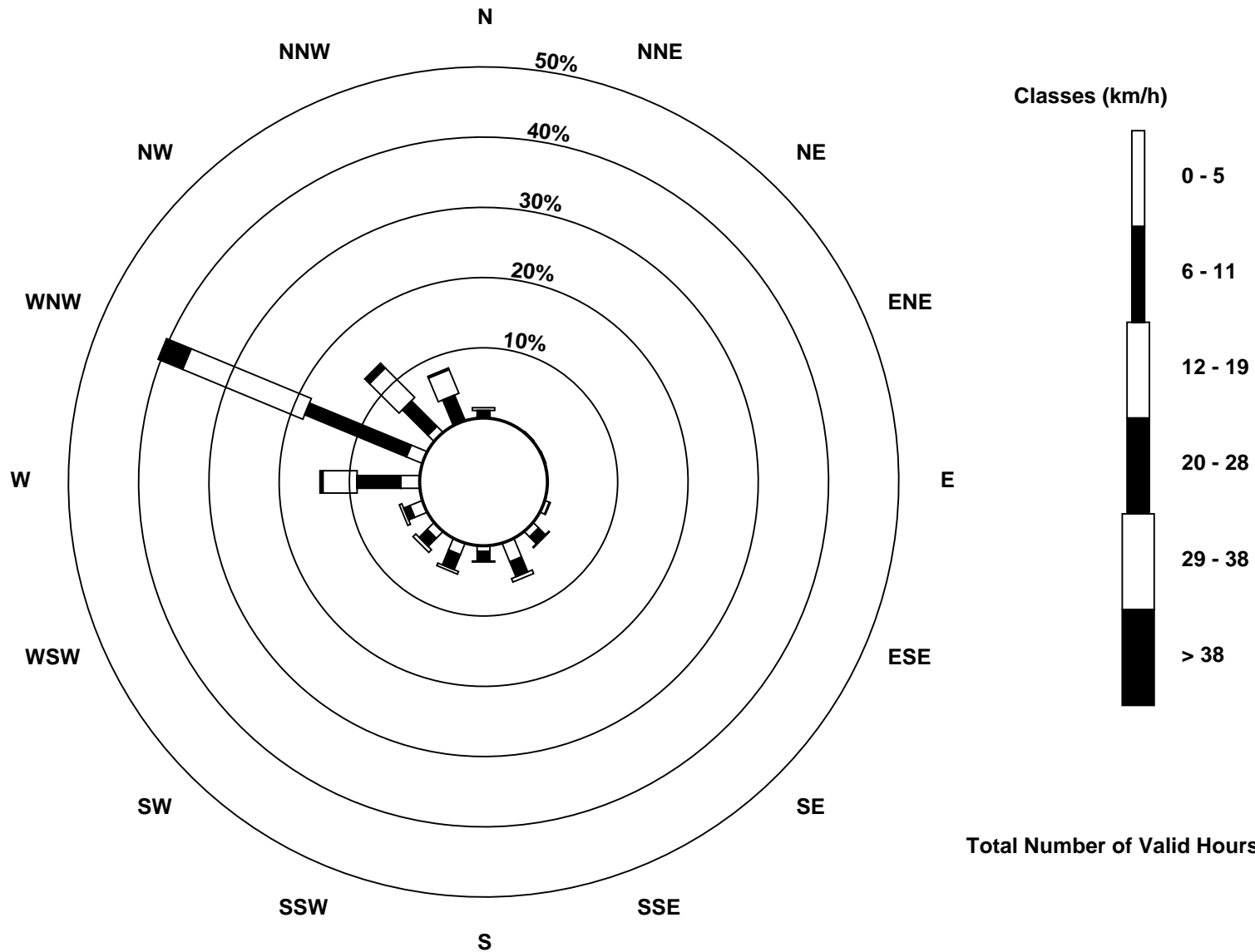
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Anzac (AMS 14)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Anzac - December 2017**

Direction of Maximum Speed: 298 deg on Dec 17 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 294.1 deg on Dec 7	Hours of Data: 740
Direction of Minimum Speed: 263 deg on Dec 30 18:00	Hours of Missing Data: 4
Direction of Minimum Daily Speed Average: 2.2 deg on Dec 14	Percent Operational Time: 99.5
Monthly Average Direction: 290.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	265	274	270	273	281	287	274	257	263	265	262	284	285	269	227	211	190	243	296	202	155	176	188	314	263.4
2-Dec	287	286	292	295	297	302	287	279	288	293	290	281	284	284	281	284	276	266	270	261	243	268	232	246	281.4
3-Dec	273	199	183	193	213	222	240	281	286	292	319	340	340	342	337	339	325	313	323	332	348	347	342	319	307.0
4-Dec	304	299	317	327	314	280	279	296	283	244	200	144	147	143	134	138	147	152	148	144	141	148	150	149	158.4
5-Dec	144	112	266	292	291	292	297	301	312	313	323	337	334	325	340	350	350	336	11	357	352	354	314	291	319.4
6-Dec	283	260	201	180	215	255	227	255	230	214	214	193	214	270	279	276	281	285	290	292	291	291	292	297	272.9
7-Dec	293	290	289	294	292	294	295	293	293	294	296	301	302	299	296	298	295	294	293	288	291	295	289	283	294.1
8-Dec	280	284	278	279	283	287	284	293	302	272	264	286	287	248	165	125	110	168	174	272	276	280	275	278	276.2
9-Dec	275	277	279	280	283	286	285	288	291	291	290	287	286	297	285	282	279	279	284	277	270	277	279	317	284.2
10-Dec	270	275	281	283	287	283	282	279	276	283	296	305	311	317	326	329	326	340	341	314	302	285	276	292	302.9
11-Dec	302	291	293	292	293	295	289	276	280	281	280	240	268	275	215	213	195	207	207	195	225	270	261	261	266.8
12-Dec	275	277	277	275	286	283	285	278	288	289	289	291	297	304	295	296	303	301	294	293	296	294	285	294	289.0
13-Dec	290	284	278	278	272	275	275	282	291	288	296	308	317	322	338	338	323	294	295	296	300	299	299	301	300.7
14-Dec	313	306	298	302	259	238	236	143	165	155	162	160	152	125	148	152	133	163	126	134	167	316	8	139	177.0
15-Dec	147	162	159	167	174	172	192	283	290	292	296	292	294	295	296	292	289	289	284	279	270	278	290	285	281.4
16-Dec	290	289	293	310	343	331	330	327	305	290	269	144	150	167	106	160	160	143	152	168	203	205	206	202	282.6
17-Dec	197	195	205	216	215	222	240	257	262	275	275	284	285	283	291	292	298	299	298	302	296	287	290	294	270.9
18-Dec	299	299	295	293	284	289	301	343	336	338	321	321	321	323	320	324	326	320	318	310	302	305	313	335	313.8
19-Dec	344	342	342	346	345	339	324	308	289	293	273	270	62	328	38	167	160	166	171	193	200	210	229	260	313.1
20-Dec	291	293	292	244	106	152	329	249	282	280	238	232	250	215	200	169	196	201	204	192	212	215	239	234	231.4
21-Dec	274	284	287	300	307	309	319	316	325	326	327	320	312	315	306	305	299	297	296	299	310	316	316	313	307.9
22-Dec	304	289	286	287	296	293	293	292	290	293	292	292	292	295	297	297	295	297	296	294	306	335	2	3	300.7
23-Dec	351	336	326	291	290	290	279	254	AF	AF	286	286	282	303	304	312	307	288	293	293	290	302	304	312	303.6
24-Dec	346	348	346	336	332	329	317	307	312	316	319	325	316	306	312	308	307	298	296	299	298	287	296	297	319.7
25-Dec	323	345	347	351	336	335	322	294	288	289	294	298	290	297	295	284	281	279	242	244	274	292	289	277	303.4
26-Dec	285	289	280	281	292	288	301	289	290	286	293	297	296	294	296	322	233	211	AF	262	270	286	279	278	288.5
27-Dec	289	276	313	291	302	276	269	288	292	283	296	293	292	291	294	302	279	278	285	287	290	292	303	320	290.2
28-Dec	274	253	315	310	304	304	304	276	299	299	307	309	311	318	327	330	324	336	307	338	338	330	326	302	313.2
29-Dec	312	310	316	316	325	326	327	315	294	296	294	293	291	289	304	294	283	289	293	284	287	291	273	294	299.7
30-Dec	282	297	301	294	301	284	280	281	288	290	298	297	298	291	295	315	312	263	234	234	213	AF	176	192	288.9
31-Dec	150	159	165	164	170	181	226	186	147	143	156	157	171	132	109	114	146	156	172	181	181	217	240	220	175.2

291.4 290.5 288.8 288.6 291.9 288.6 288.3 287.9 290.8 291.4 294.2 297.4 298.4 299.9 301.0 301.3 293.3 285.4 284.6 282.0 283.0 288.2 286.5 287.7  
 Diurnal Average

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





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

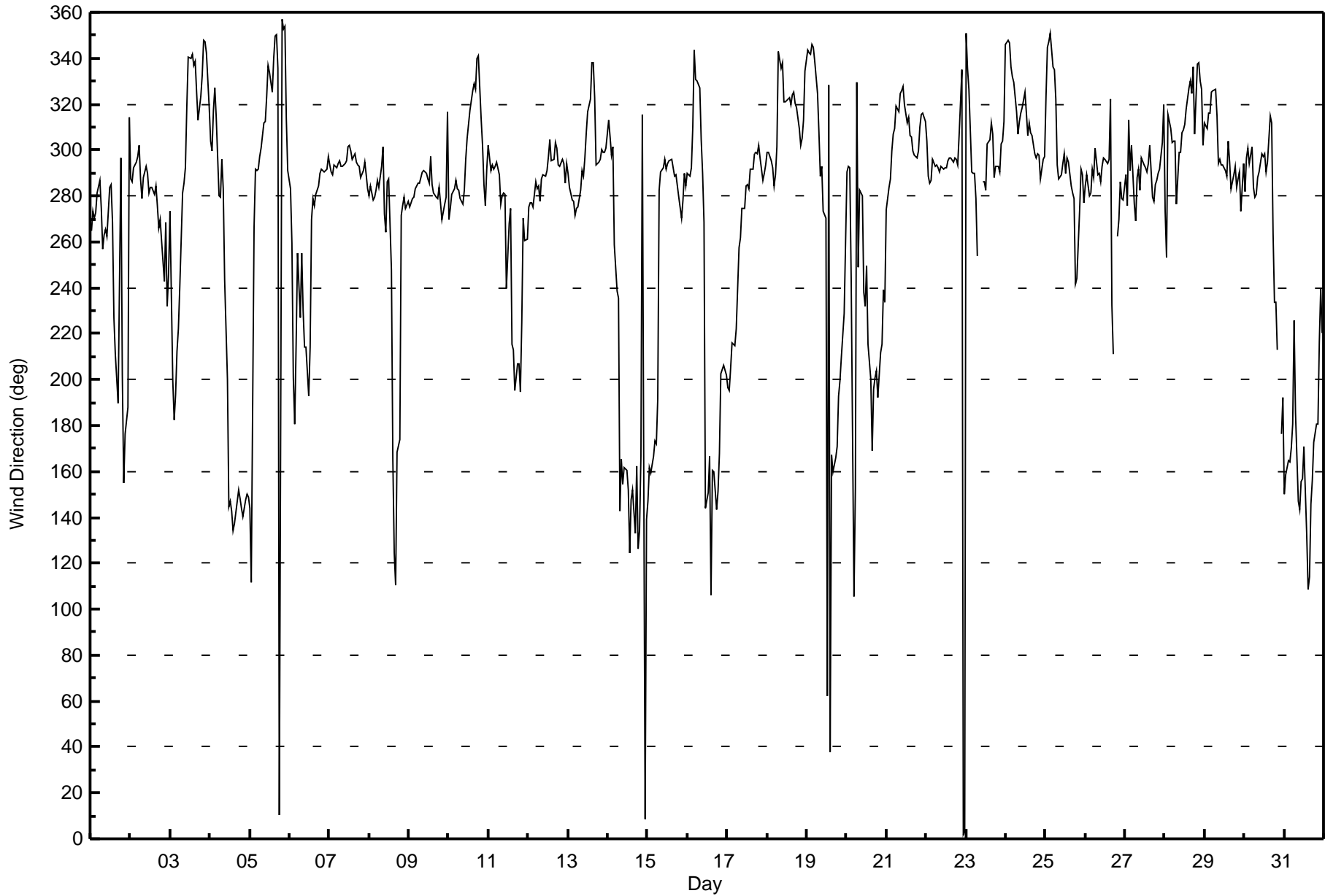
**Wind Direction (WD) - deg**  
**Anzac - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 93 deg on Dec 20 07:00																	Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 0 Percent Operational Time: 99.5								
Minimum Value: 6 deg on Dec 31 05:00																									
Percentiles: P <sub>1</sub> = 10 P <sub>10</sub> = 14 Q <sub>1</sub> = 16 Median = 18 Q <sub>3</sub> = 21 P <sub>90</sub> = 25 P <sub>99</sub> = 69																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	25	23	22	23	23	20	21	16	18	22	24	20	19	23	19	16	32	54	21	43	22	26	17	69	69
2-Dec	24	20	19	18	17	20	20	20	19	18	20	26	24	20	19	18	22	20	22	18	18	24	19	21	26
3-Dec	21	15	13	15	14	13	23	21	21	20	18	14	14	16	19	21	25	14	16	14	14	17	14	18	25
4-Dec	15	15	13	10	17	14	16	16	25	17	31	43	21	21	16	16	15	14	16	16	15	15	14	14	43
5-Dec	22	26	56	19	19	19	18	19	17	17	14	16	15	17	15	15	14	16	19	19	18	23	29	20	56
6-Dec	19	34	33	30	28	12	21	13	12	15	70	17	51	26	19	19	18	19	19	18	18	19	18	17	70
7-Dec	19	19	19	19	19	18	18	18	18	18	18	18	19	18	18	18	18	17	19	18	19	18	18	17	19
8-Dec	16	15	15	14	16	16	16	19	17	28	14	17	17	47	27	27	23	30	26	29	20	21	23	23	47
9-Dec	21	20	20	21	20	21	20	21	18	19	19	20	21	20	20	20	21	20	20	23	22	22	27	31	31
10-Dec	22	21	21	22	21	18	19	20	25	26	22	20	17	16	14	14	14	13	17	15	20	18	17	32	32
11-Dec	19	19	19	20	19	19	19	16	18	19	16	28	21	26	32	22	20	15	14	18	46	19	22	20	46
12-Dec	22	21	18	21	22	18	20	19	18	19	19	20	18	15	18	17	17	17	18	18	18	17	16	16	22
13-Dec	18	16	19	19	19	19	22	23	19	20	18	17	17	16	15	15	18	18	17	17	17	17	17	17	23
14-Dec	16	18	22	19	23	13	15	60	19	9	11	12	20	17	17	18	19	17	17	25	11	58	57	21	60
15-Dec	19	46	22	11	10	17	29	23	21	19	20	19	19	17	17	18	18	20	21	22	23	21	22	22	46
16-Dec	20	21	20	29	16	14	15	15	22	17	62	30	29	22	38	23	21	26	22	18	12	12	16	17	62
17-Dec	16	17	18	19	18	16	21	21	25	22	23	21	21	22	20	20	19	19	18	19	17	20	21	20	25
18-Dec	21	18	18	19	20	19	22	19	16	17	15	15	16	18	16	16	16	15	16	20	17	17	16	17	22
19-Dec	15	14	13	15	14	16	14	15	15	16	21	31	55	55	73	56	19	9	10	13	23	14	26	15	73
20-Dec	14	12	16	26	28	25	93	24	14	16	19	26	64	23	27	16	14	14	25	18	15	12	19	21	93
21-Dec	24	17	19	15	16	15	15	15	15	13	14	16	16	16	18	18	17	17	17	18	18	16	16	16	24
22-Dec	17	18	20	20	17	17	18	19	19	18	21	19	19	16	18	17	20	19	19	17	18	26	16	16	26
23-Dec	13	12	14	18	12	19	16	29	AF	AF	42	12	14	20	24	16	14	14	17	17	18	19	16	17	42
24-Dec	15	16	16	13	12	13	14	16	15	15	14	13	16	18	16	16	15	14	15	16	16	16	16	16	18
25-Dec	15	14	13	15	12	12	17	16	18	18	17	18	14	20	17	17	14	17	23	26	15	15	16	13	26
26-Dec	17	16	18	17	14	17	16	20	14	14	16	17	17	17	17	14	73	16	AF	17	73	14	14	14	73
27-Dec	16	15	48	50	17	17	11	17	16	20	15	17	18	19	16	17	25	21	19	19	14	13	17	10	50
28-Dec	38	11	30	24	11	11	22	15	15	17	18	20	18	18	13	12	12	13	22	16	17	12	12	18	38
29-Dec	12	15	14	15	12	12	9	17	16	16	17	17	17	20	21	17	17	16	14	15	16	18	20	18	21
30-Dec	20	21	19	20	19	22	27	16	16	15	16	16	17	14	14	18	23	87	24	23	24	AF	58	17	87
31-Dec	16	23	9	8	6	25	25	15	12	21	22	15	14	23	17	20	16	13	9	12	14	26	26	28	28
Diurnal Maximum																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Anzac - December 2017**





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Precipitation (PC) - mm**

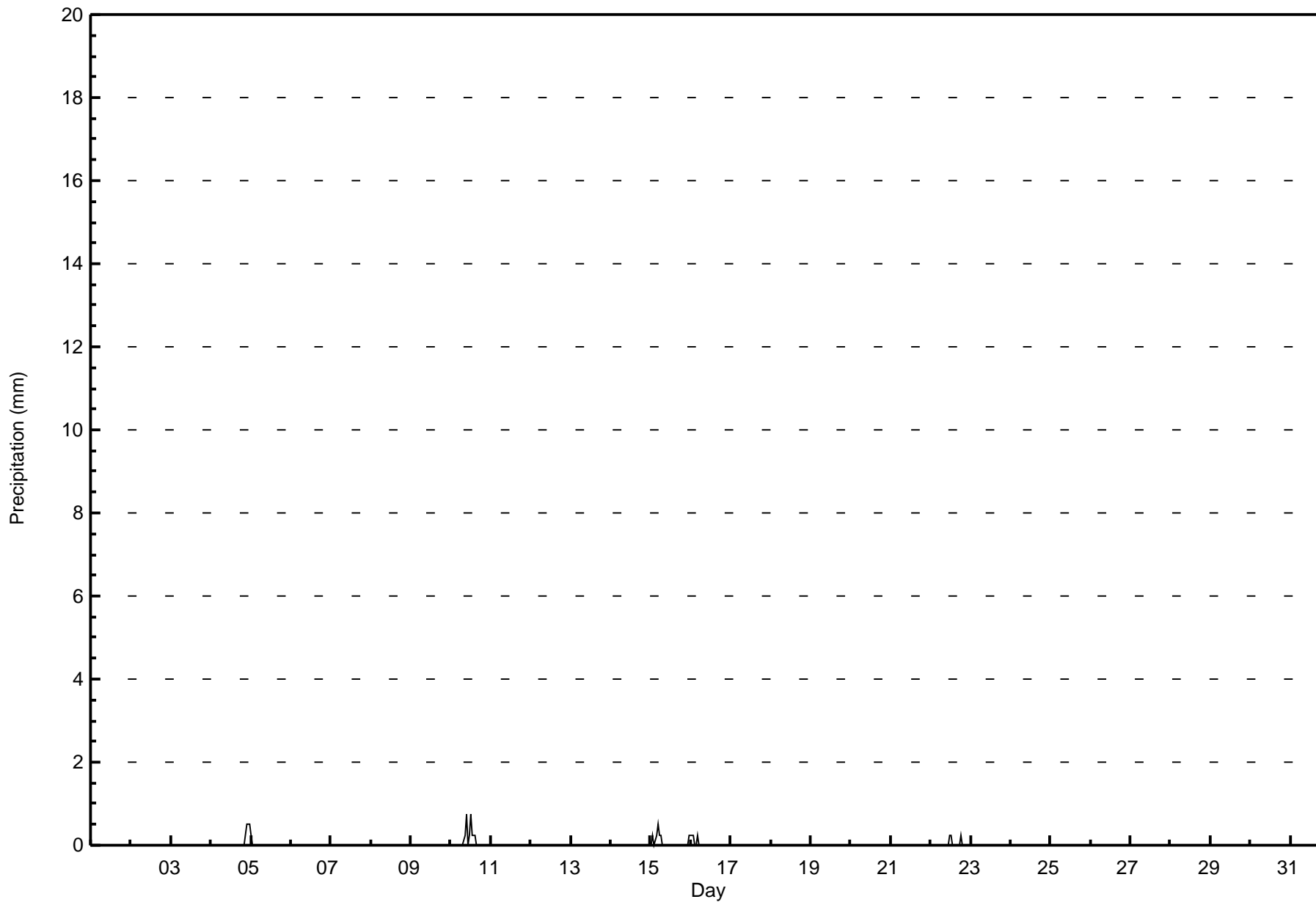
**Anzac - December 2017**

Maximum Value: 0.8 mm on Dec 10 10:00		Maximum Daily Total: 2.5 mm on Dec 10		Hours in Service: 744																							
Minimum Value: 0.0 mm on Dec 1 01:00		Minimum Daily Total: 0.0 mm on Dec 1		Hours of Data: 744																							
Maximum Diurnal Total: 1.0 mm at hour 13		Minimum Diurnal Total: 0.0 mm at hour 3		Hours of Missing Data: 0																							
Monthly Total: 7.62 mm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.0	0.0
5-Dec	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.0	0.3	0.8	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
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Dec	0.0	0.3	0.0	0.3	0.5	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	0.0	0.0	0.3	0.0
16-Dec	0.3	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	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
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.5	0.5	0.0	0.3	0.8	0.3	0.3	0.0	0.3	0.8	0.0	0.5	1.0	0.3	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.5	0.5	0.8	Diurnal Average	
		0.3	0.3	0.0	0.3	0.5	0.3	0.3	0.0	0.3	0.8	0.0	0.3	0.8	0.3	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.5	0.5	0.5	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Anzac - December 2017**







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

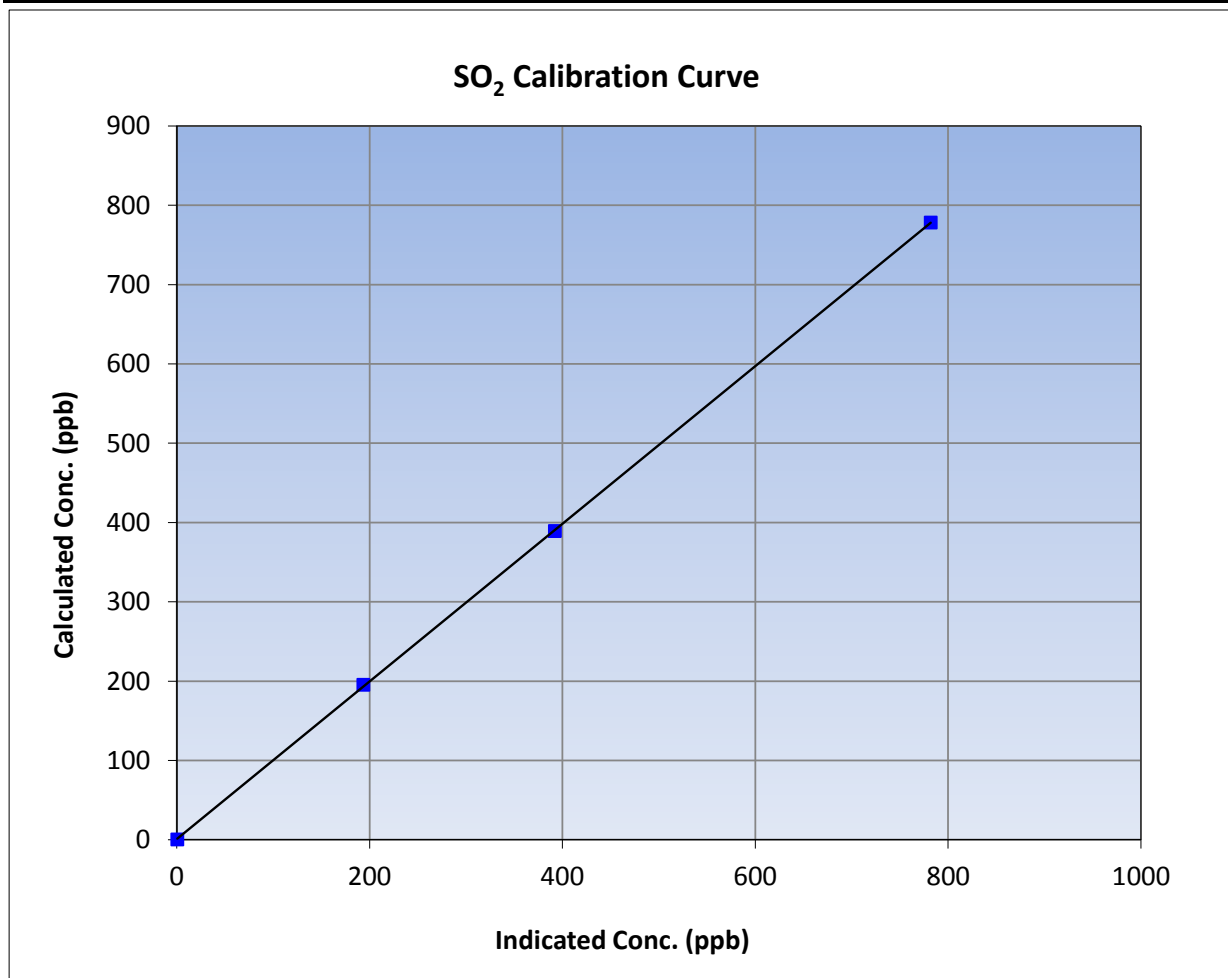
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:47
Analyzer make	Thermo 43i	Analyzer serial #	1152430005

### Calibration Data

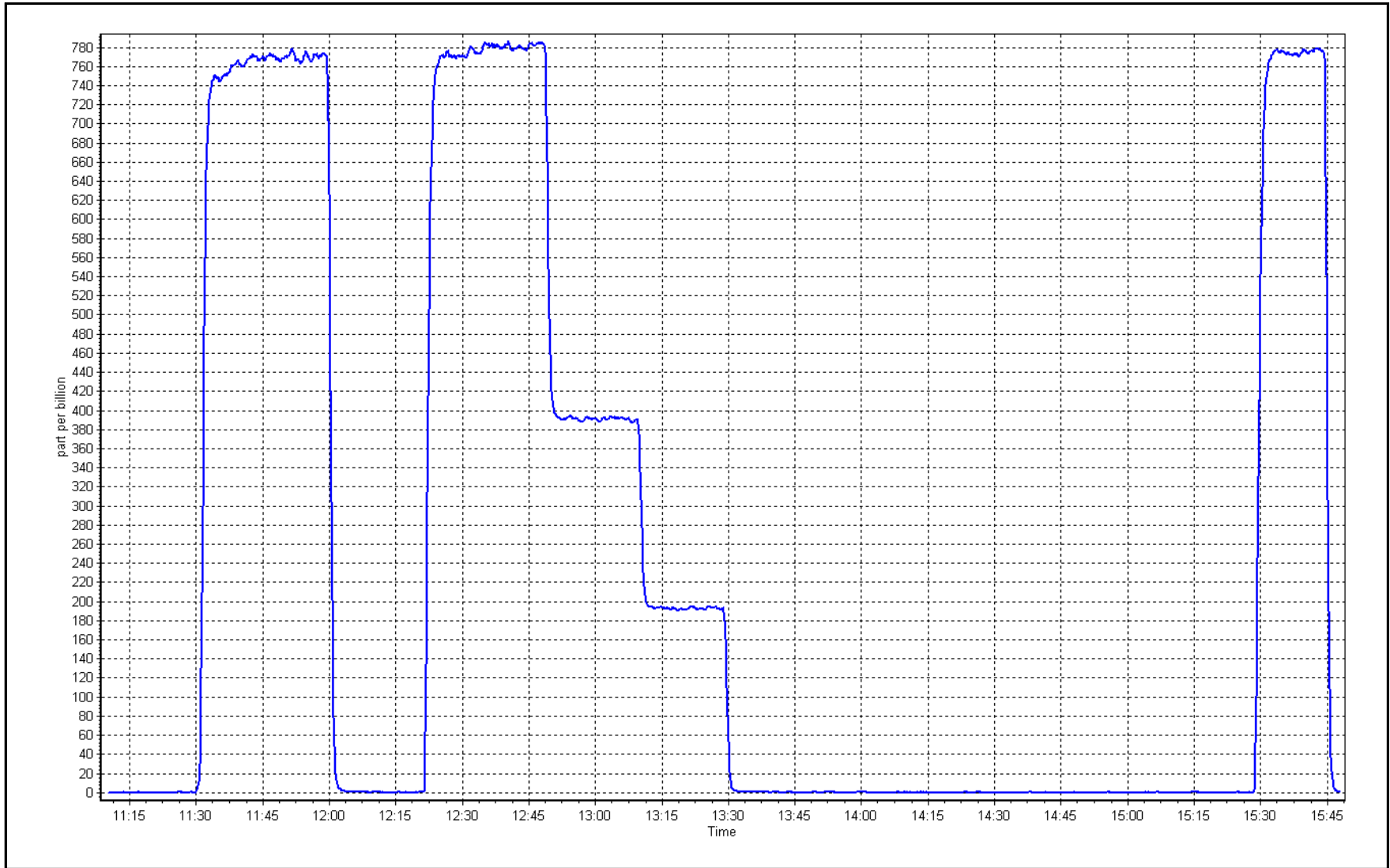
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.2	----	Correlation Coefficient	≥0.995
777.8	781.6	0.9951		
388.9	391.9	0.9925	Slope	0.90 - 1.10
195.0	193.1	1.0096		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 12, 2017

Location: Anzac









# Wood Buffalo Environmental Association

## TRS Calibration Summary

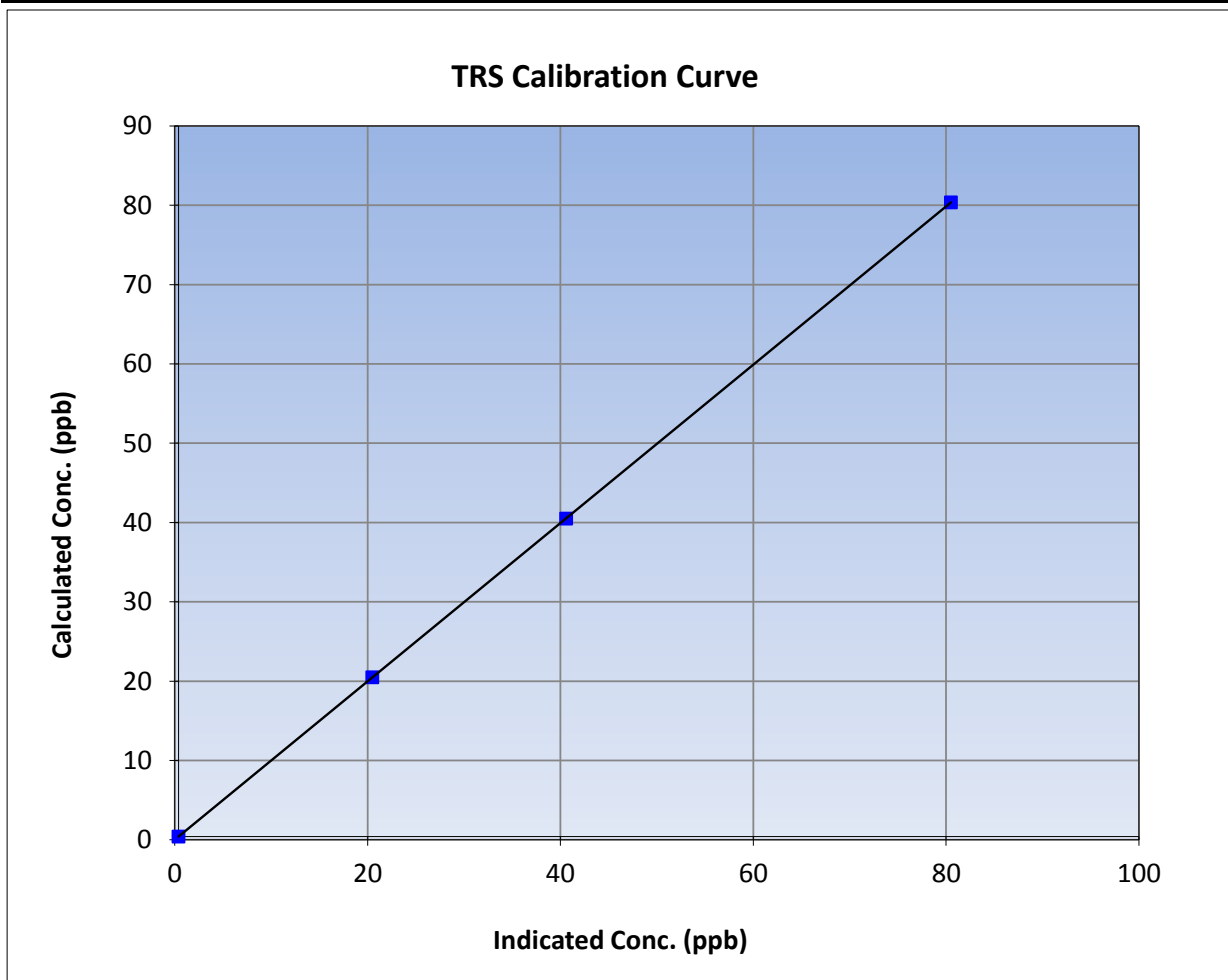
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 14, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:27	End Time (MST)	13:40
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1300156232

### Calibration Data

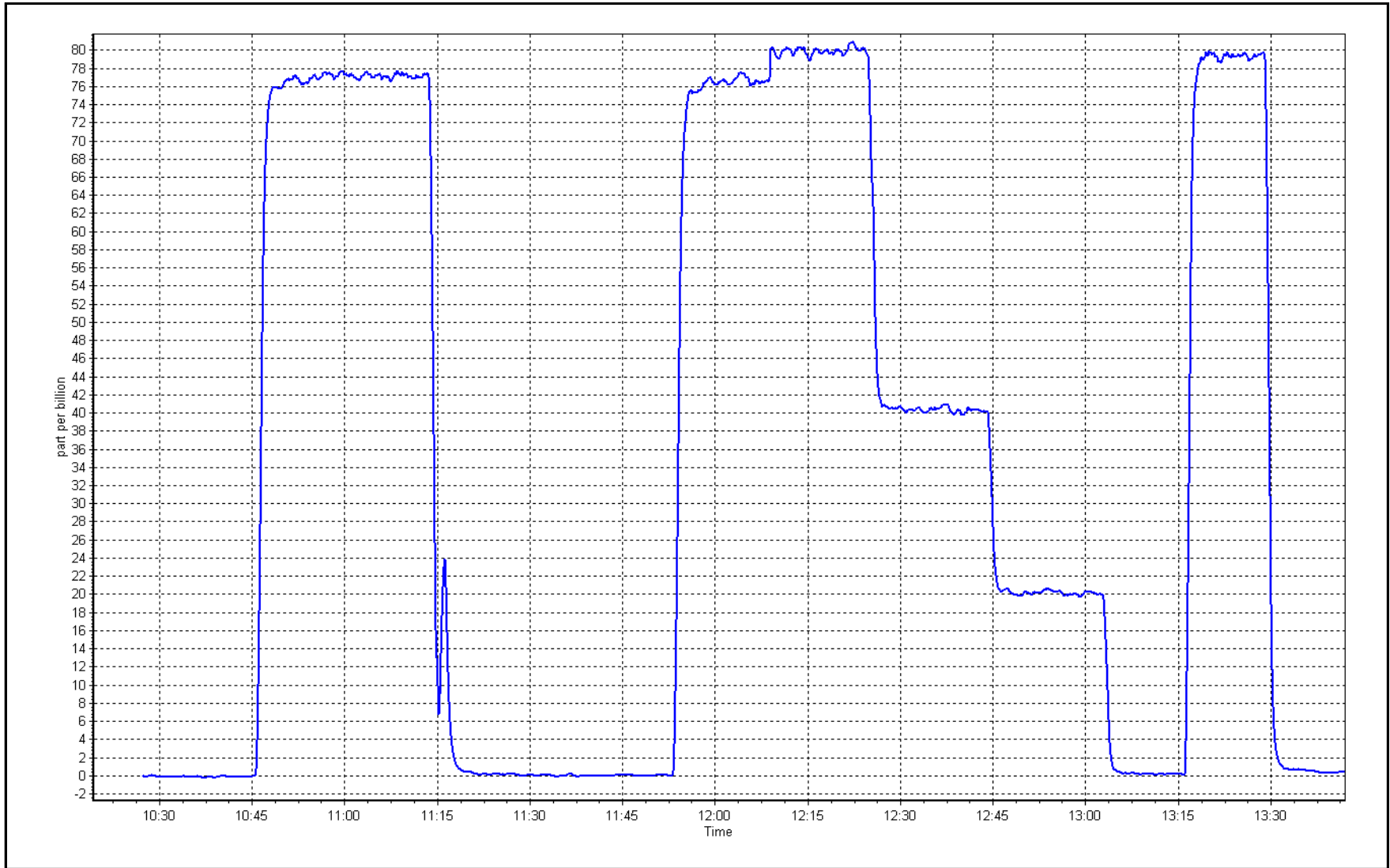
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999999	≥0.995
80.0	80.1	0.9984			
40.1	40.2	0.9975	Slope	0.998223	0.90 - 1.10
20.1	20.1	0.9998			
			Intercept	0.003603	+/-3



TRS Calibration Plot

Date: December 13, 2017

Location: Anzac





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Anzac	Station number:	AMS 14
Calibration Date:	December 12, 2017	Last Cal Date:	November 2, 2017
Start time (MST):	11:10	End time (MST):	15:46
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000647	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>513.0</u> ppm	CH4 Equiv Conc.	1060.3 ppm
C3H8 Cal Gas Conc.	<u>199.0</u> ppm	Station temp.	22 Deg C
Calibrator Model	Teledyne API T700	Serial Number	2659
ZAG make/model	Teledyne API 701	Serial Number	4764

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1218153355

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	74.9	74.9
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
CH4 SP Ratio	0.000203	0.000203	Flame Temp	405.0	405.0
CH4 Retention time	11.6	11.6	Carrier Pressure	33.3	33.3
NMHC SP Ratio	3.89E-05	3.92E-05	Fuel Pressure	47.9	47.9
NMHC Peak Area	222680	221091	Air Pressure	36.6	36.6

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	0.997734	0.999634
THC Cal Offset	0.028157	0.023426
CH4 Cal Slope	0.996951	0.998258
CH4 Cal Offset	0.029640	0.027040
NMHC Cal Slope	0.998606	1.000896
NMHC Cal Offset	-0.001776	-0.003533

Notes: Sample inlet filter replaced after as founds. Span adjusted

Calibration Performed By:

Ryan Power



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5005	0.0	0.00	0.00	----
as found span	4932	79.4	16.80	16.62	1.010
calibrator zero	5005	0.0	0.00	0.00	----
high point	4932	79.4	16.80	16.79	1.001
second point	4972	39.7	8.40	8.38	1.002
third point	4992	19.9	4.21	4.15	1.014
as left zero	5005	0.0	0.00	0.00	----
as left span	4931	79.3	16.78	16.81	0.998
Average Correction Factor					1.005
Corrected As found	16.62	Prev response	16.81	*% change	1.1%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5005	0	0.00	0.00	----
as found span	4932	79.4	8.67	8.58	1.011
calibrator zero	5005	0	0.00	0.00	----
high point	4932	79.4	8.67	8.66	1.001
second point	4972	39.7	4.34	4.35	0.997
third point	4992	19.9	2.17	2.17	1.002
as left zero	5005	0	0.00	0.00	----
as left span	4931	79.3	8.66	8.67	1.000
Average Correction Factor					1.000
Corrected As found	8.58	Prev response	8.68	*% change	1.2%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5005	0.0	0.00	0.00	----
as found span	4932	79.4	8.13	8.05	1.010
calibrator zero	5005	0.0	0.00	0.00	----
high point	4932	79.4	8.13	8.13	1.000
second point	4972	39.7	4.06	4.03	1.007
third point	4992	19.9	2.04	1.98	1.027
as left zero	5005	0.0	0.00	0.00	----
as left span	4931	79.3	8.12	8.14	0.997
Average Correction Factor					1.011
Corrected As found	8.05	Prev response	8.12	*% change	1.0%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## THC Calibration Summary

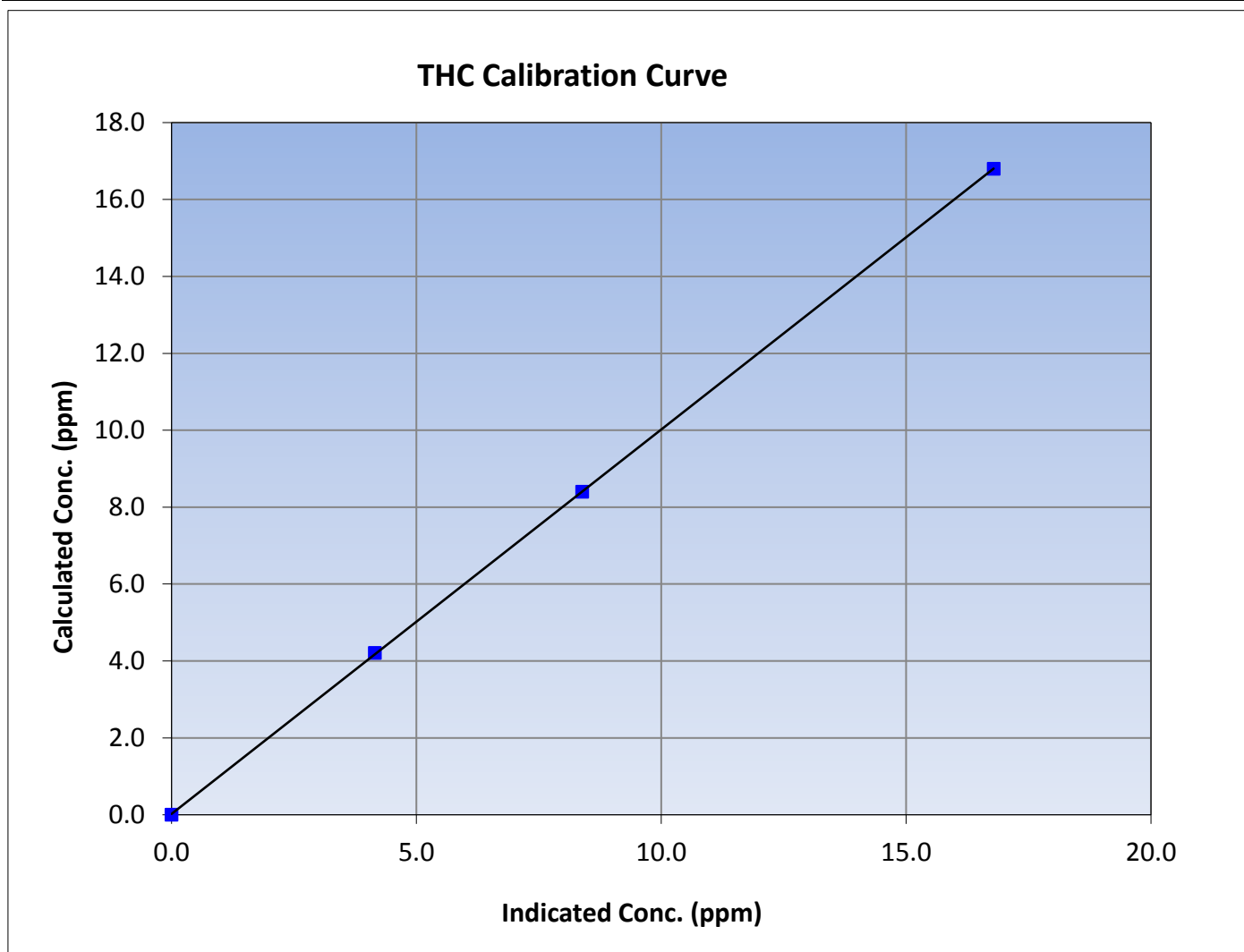
Version-02-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:46
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999988	$\geq 0.995$			
16.80	16.79	1.0007						
8.40	8.38	1.0018				Slope	0.999634	0.90 - 1.10
4.21	4.15	1.0137						
			Intercept	0.023426	$\pm 0.5$			





# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

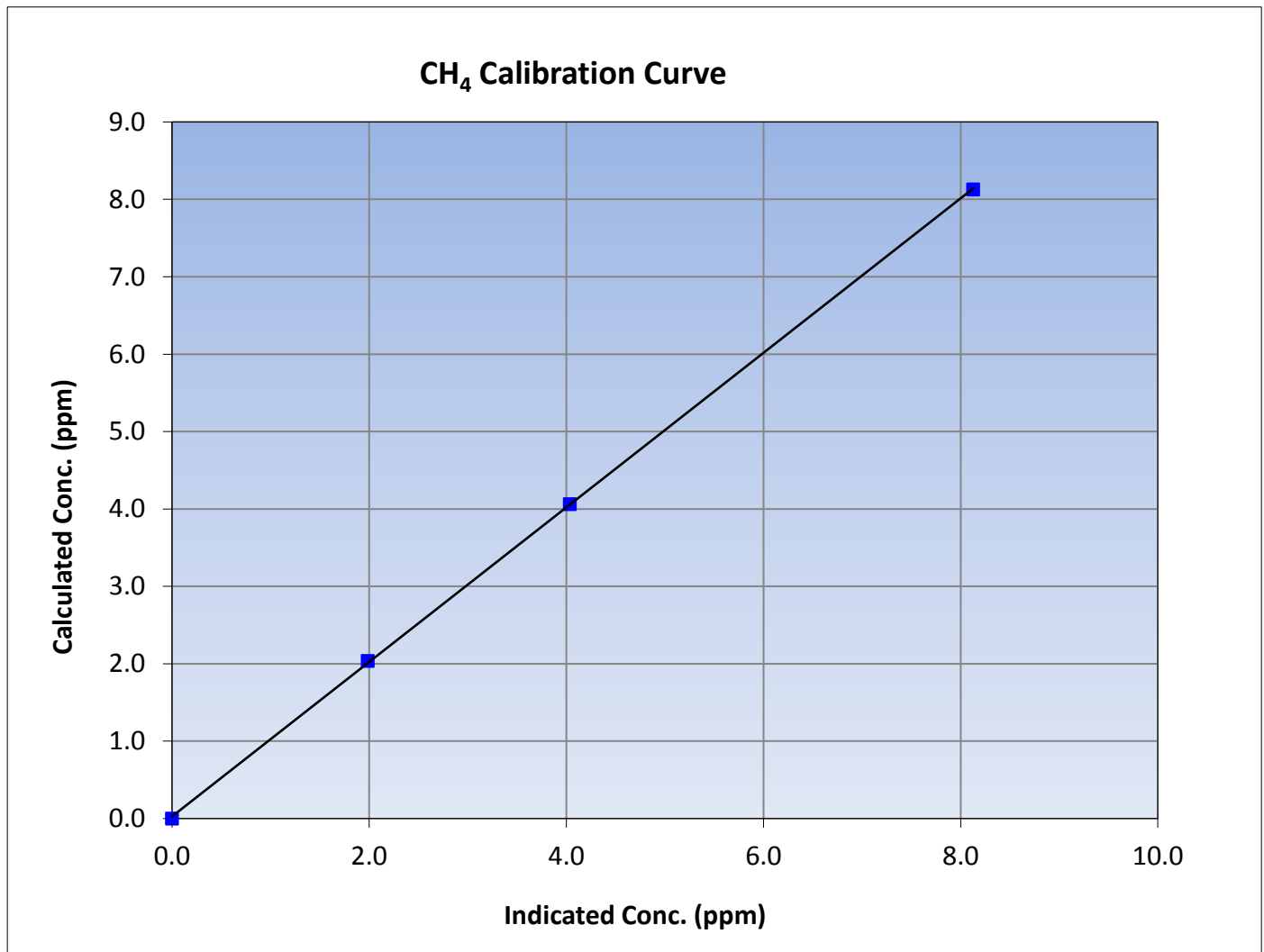
Version-02-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:46
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>
0.00	0.00	----	Correlation Coefficient	0.999949	$\geq 0.995$
8.13	8.13	1.0001			
4.06	4.03	1.0074			
2.04	1.98	1.0267			
			Slope	0.998258	0.90 - 1.10
			Intercept	0.027040	+/-0.5





# Wood Buffalo Environmental Association

## NMHC Calibration Summary

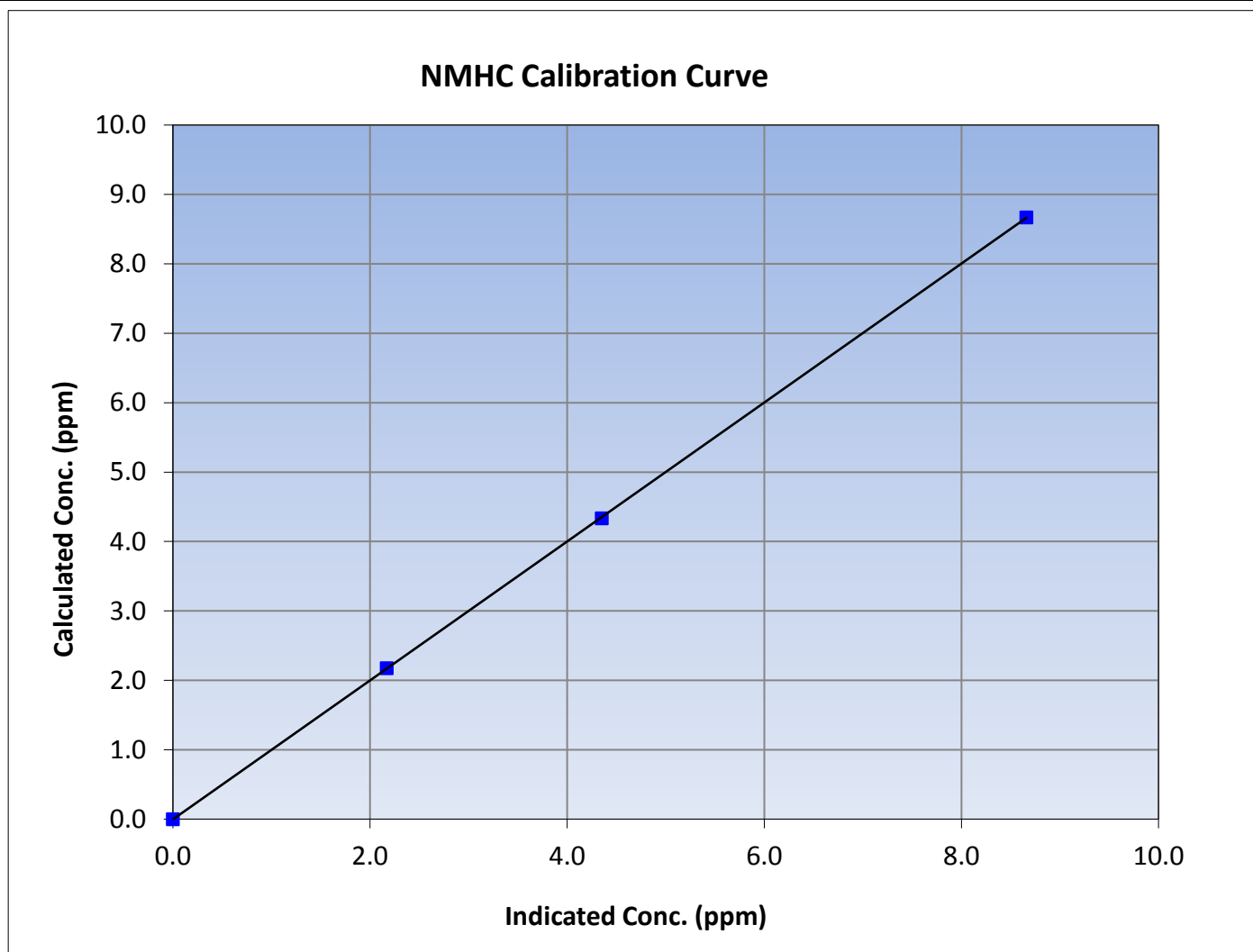
Version-02-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:46
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>
0.00	0.00	----	Correlation Coefficient	0.999992	$\geq 0.995$
8.67	8.66	1.0012			
4.34	4.35	0.9966			
2.17	2.17	1.0018			
			Slope	1.000896	0.90 - 1.10
			Intercept	-0.003533	+/-0.5



NMHC Calibration Plot

Date: December 12, 2017

Location: Anzac









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

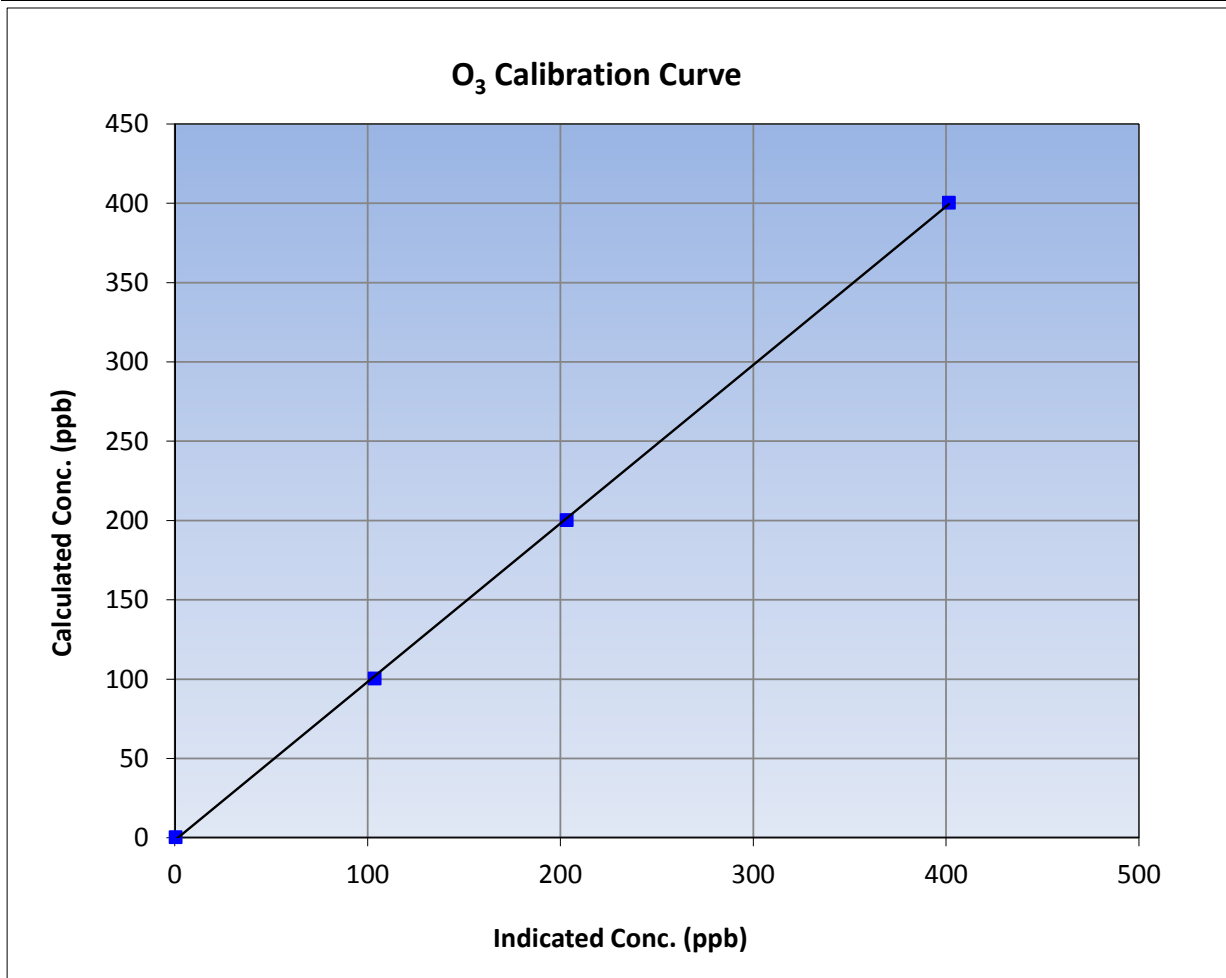
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 3, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	13:30	End Time (MST)	16:55
Analyzer make	Thermo 49i	Analyzer serial #	1426262595

### Calibration Data

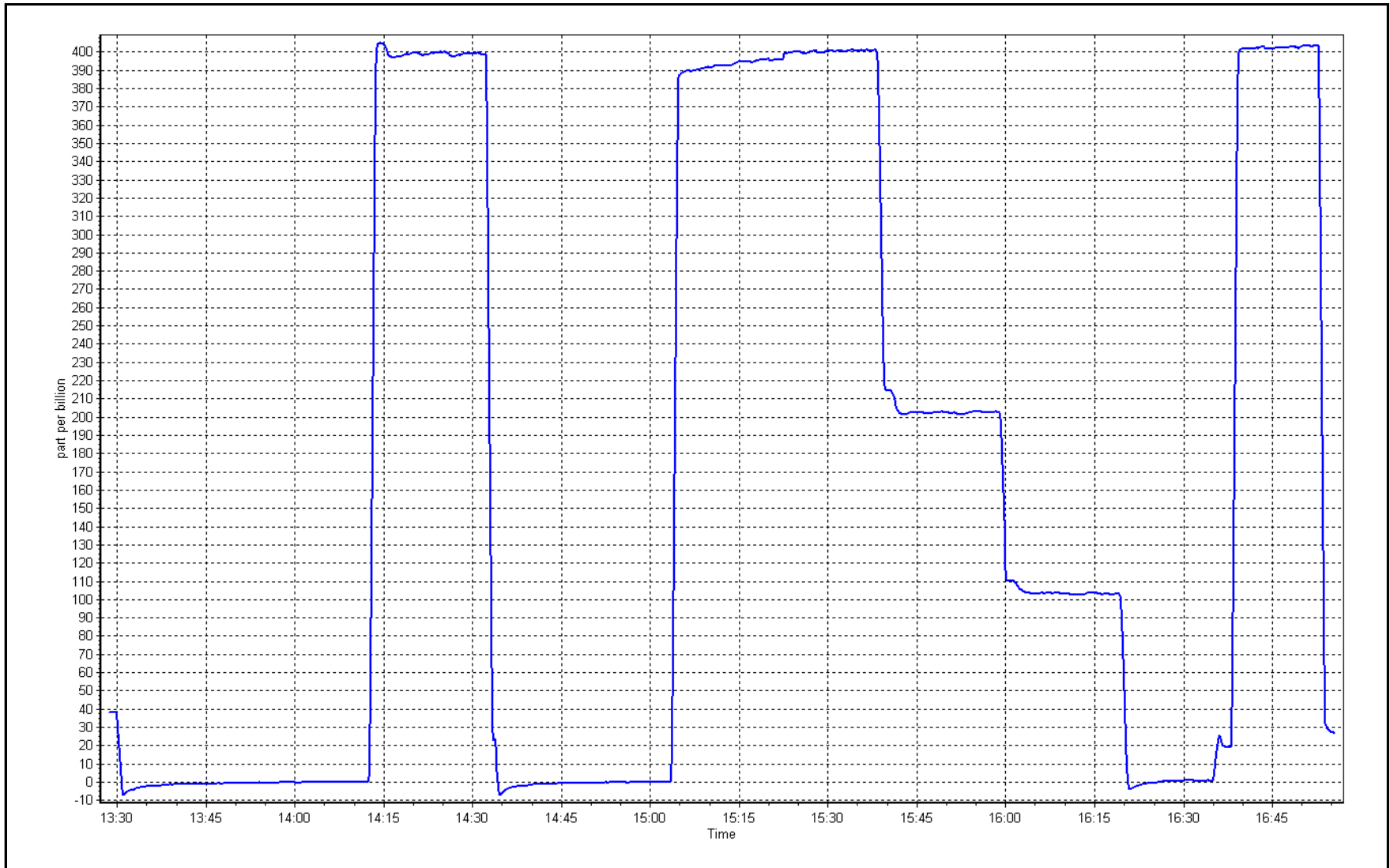
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999921	≥0.995
400.0	401.1	0.9973			
200.0	202.8	0.9862	Slope	0.999122	0.90 - 1.10
100.0	103.3	0.9681			
			Intercept	-1.644717	+/- 10



O<sub>3</sub> Calibration Plot

Date: December 13, 2017

Location: Anzac





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Anzac	Station number:	AMS 14
Calibration Date:	December 12, 2017	Last Cal Date:	November 2, 2017
Start time (MST):	11:10	End time (MST):	15:49
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000647	Cal Gas Expiry Date	November 4, 2019
NOX Cal Gas Conc.	<u>50.5</u> ppb	NO Cal Gas Conc.	<u>50.5</u> ppb
Calibrator Model	Teledyne API T700	Serial Number	2659
ZAG make/model	Teledyne API 701	Serial Number	4764

### Analyzer Information

Analyzer make:	Thermo 42i	Analyzer serial #:	1426262592	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
NO coefficient	0.939	0.939	NOX Range (ppb)	0 - 1000 ppb
NOX coefficient	1.001	1.001	PMT Temperature	-2.9 -3.0
NO2 coefficient	1.000	1.000	Reaction cell Press	150.6 148.2
NO bkgrnd	3.7	3.7	Sample Flow	0.836 0.819
NOX bkgrnd	3.8	3.8	PMT Voltage	-807.7 -808.1

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.996401	0.998254
NO <sub>x</sub> Cal Offset	0.863529	0.587025
NO Cal Slope	0.996342	0.998129
NO Cal Offset	0.884119	0.805478
NO <sub>2</sub> Cal Slope	0.998267	0.997376
NO <sub>2</sub> Cal Offset	-1.355427	-0.710609



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as found span	4932	79.4	800.1	800.1	0.0	801.4	800.8	0.6	0.9984	0.9991
calibrator zero	5005	0.0	0.0	0.0	0.0	0.1	0.1	0.0	----	----
high point	4933	79.4	800.0	800.0	0.0	800.4	800.5	-0.1	0.9994	0.9993
second point	4972	39.7	400.0	400.0	0.0	401.9	401.3	0.5	0.9954	0.9968
third point	4992	19.9	200.5	200.5	0.0	198.2	198.0	0.2	1.0117	1.0127
as left zero	5005	0.0	0.0	0.0	0.0	0.1	0.2	-0.1	----	----
as left span	4931	79.3	799.3	393.8	405.5	809.8	395.6	414.1	0.9870	0.9954
<b>Average Correction Factor</b>									<b>1.0022</b>	<b>1.0030</b>

Corrected As found	NO <sub>x</sub> = 801.4 ppb	NO = 800.8 ppb		*Percent Change	NO <sub>x</sub> = 0.1%
Previous Response	NO <sub>x</sub> = 802.1 ppb	NO = 802.2 ppb		*Percent Change	NO = 0.2%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	797.2	795.2	2.0	1.0035	1.0060	----	----
1st NO2 (400 ppb O3)	393.8	401.4	796.7	393.8	402.9	1.0041	----	0.9963	100.4%
2nd NO2 (200 ppb O3)	595.5	199.7	796.5	595.5	201.0	1.0043	----	0.9935	100.7%
3rd NO2 (100 ppb O3)	693.0	102.2	797.0	693.0	104.1	1.0037	----	0.9817	101.9%
2nd NO ref point	----	0.0	796.5	794.5	2.0	1.0043	1.0069	----	----
<b>Average Correction Factor</b>						<b>1.0041</b>	<b>1.0064</b>	<b>0.9905</b>	<b>101.0%</b>

**Notes:** Sample inlet filter replaced after as founds. Zero and span adjusted. Pump changed after As Found.

Calibration Performed By: Ryan Power



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

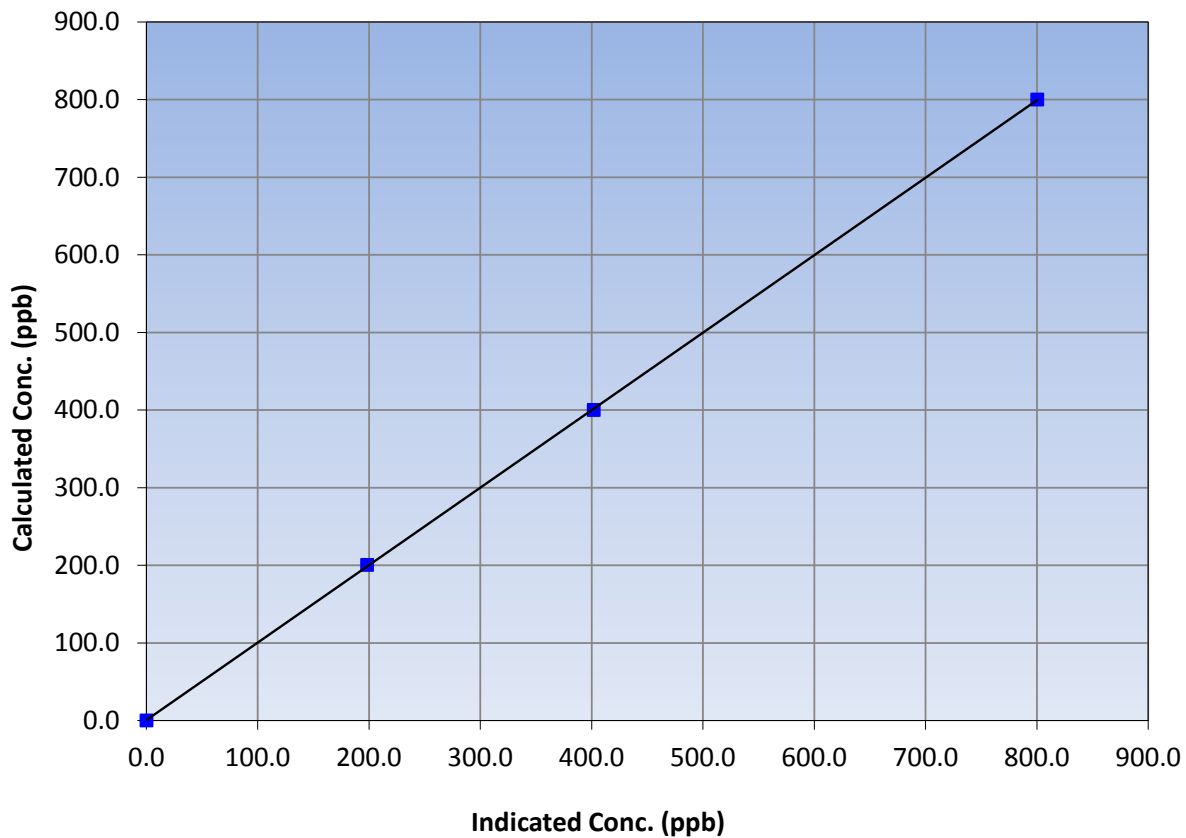
### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:49
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.1	----	Correlation Coefficient	≥0.995	
800.0	800.4	0.9994			
400.0	401.9	0.9954			
200.5	198.2	1.0117			
			Slope	0.998254	0.90 - 1.10
			Intercept	0.587025	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

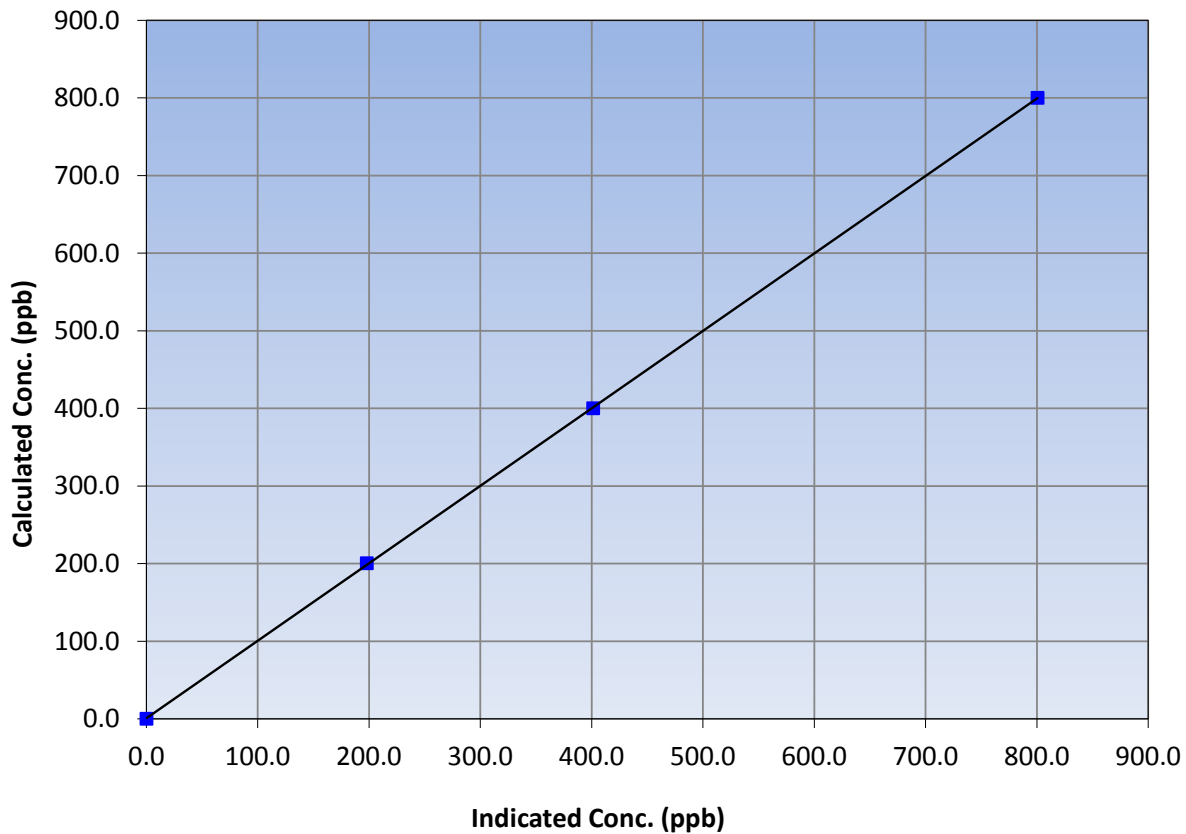
### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:49
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.1	----	Correlation Coefficient	0.999980	≥0.995
800.0	800.5	0.9993			
400.0	401.3	0.9968	Slope	0.998129	0.90 - 1.10
200.5	198.0	1.0127			
			Intercept	0.805478	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

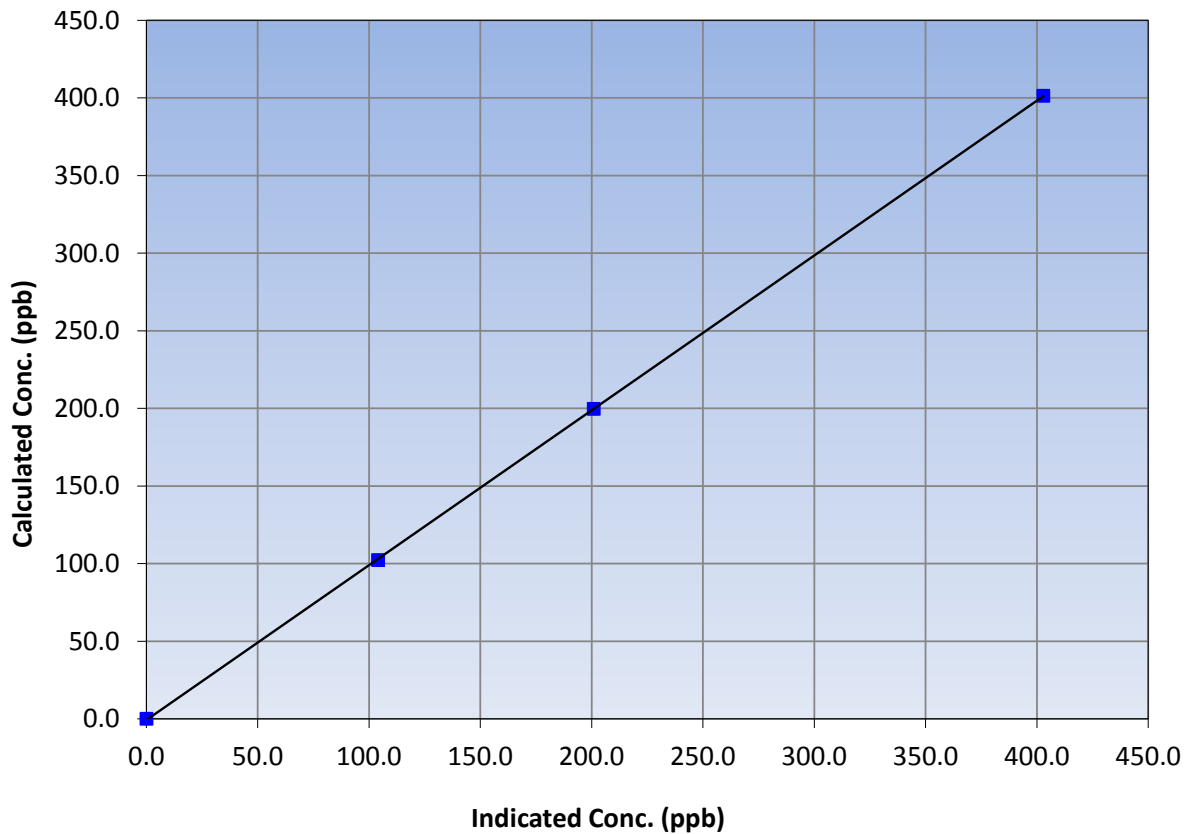
### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 2, 2017
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:10	End Time (MST)	15:49
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
401.4	402.9	0.9963			
199.7	201.0	0.9935			
102.2	104.1	0.9817			
			Slope	0.997376	0.90 - 1.10
			Intercept	-0.710609	+/-20

NO<sub>2</sub> Calibration Curve

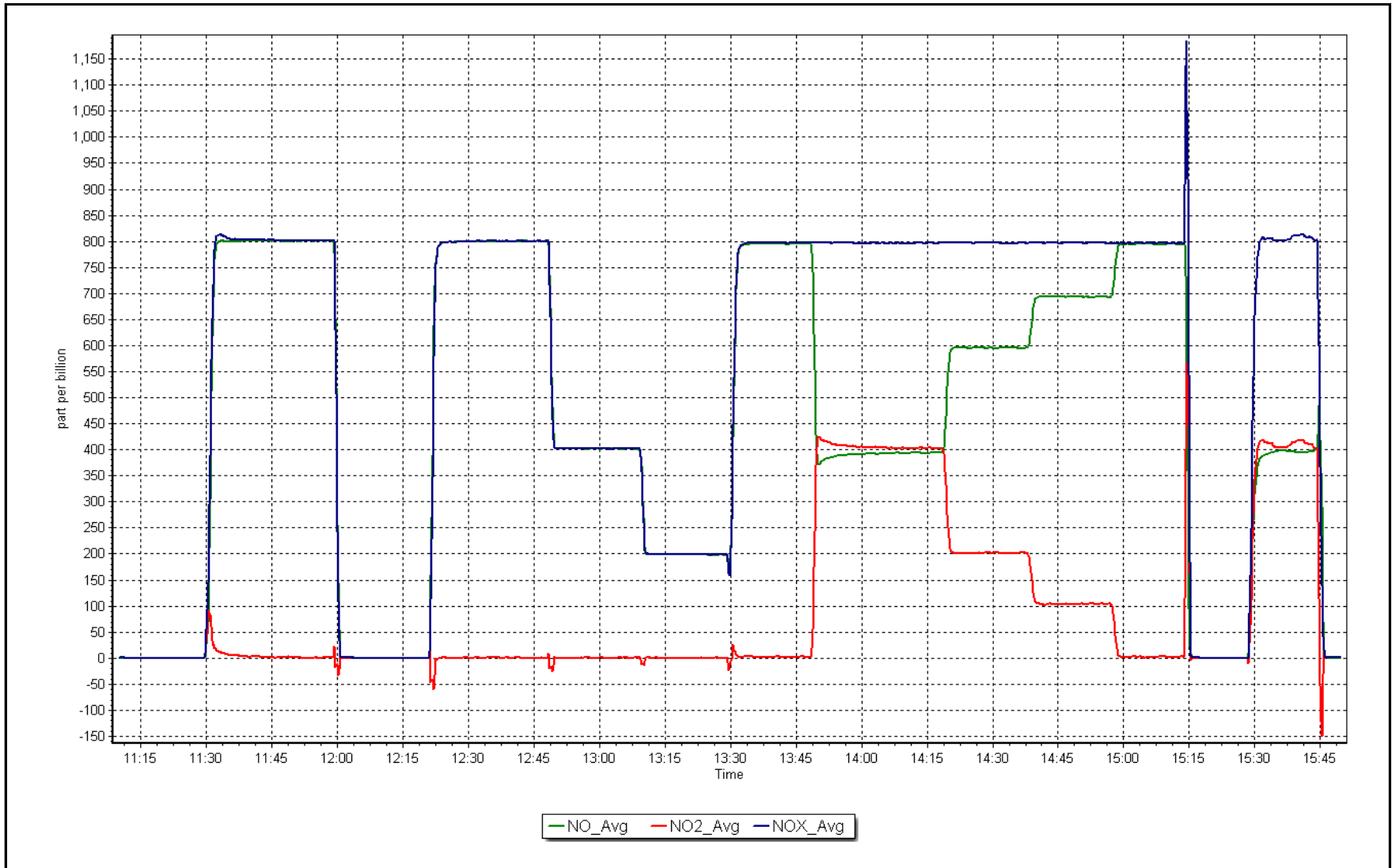




NO<sub>x</sub> Calibration Plot

Date: December 12, 2017

Location: Anzac





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Anzac	Station number:	AMS 14
Calibration Date:	December 12, 2017	Last Cal Date:	November 6, 2017
Start time (MST):	10:25	End time (MST):	12:17
Sharp Model:	5030	S/N:	E1093
Particulate Fraction:	PM2.5	C14 Source S/N:	4933
Flow Meter Make/Model:	Delta cal	S/N:	1019
Temp/RH standard:	NA	S/N:	NA

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b><i>(Limits)</i></b>
T1 (°C)	3	3.2	3	<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
P3 (hPa)	947	947	947	<input type="checkbox"/>	<b><i>+/- 13 hPa</i></b>
flow (LPH)	1000	1000	1000	<input type="checkbox"/>	<b><i>+/- 50 LPH</i></b>
Nephelometer zero	-0.5	-----	0.3	<input checked="" type="checkbox"/>	<b><i>+/- 0.5 ug/m3</i></b>
Instrument Clock:	Verified	<input type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check:	<u>December 12, 2017</u>	Last Cal Date:	<u>September 7, 2017</u>
	Flow w/o adaptor:	<u>16.67</u>	Flow w/ adaptor:	<u>16.6</u>

***(Limit) 0.4 LPM***

<u>Adjusted</u>	<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
<input type="checkbox"/>	Foil S/N: <u>2520</u>	Foil S/N: <u>2520</u>	
Foil Calibration	Foil Mass: <u>1278</u>	Foil Mass: <u>1278</u>	
	Calibration Date: <u>December 12, 2017</u>	Calibration Date: <u>September 7, 2017</u>	
<b><i>(Limit) +/- 5% of previous</i></b>	Correction Factor: <u>7010</u>	Correction Factor: <u>7068</u>	<b><i>-0.82%</i></b>

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b><i>(Limits)</i></b>
T2 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
T3 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
T4 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
RH (%)				<input type="checkbox"/>	<b><i>+/- 10%</i></b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes: Cyclone head cleaned. Neph zeroed, quarterly testing carried out

Calibration by: Ryan Power



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 15  
HORIZON  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - HORIZON (AMS 15)  
 DECEMBER 2017

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
SO <sub>2</sub> (ppb) Average	708	36	36	100	4	0	1	0
TRS (ppb) Average	708	35	36	99.87	2	0	1	0
THC (ppm) Average	706	36	38	99.73	9.3	-	3	-
NO <sub>2</sub> (ppb) Average	708	36	36	100	45	0	20	-
NO (ppb) Average	708	36	36	100	211	-	24	-
NO <sub>X</sub> (ppb) Average	708	36	36	100	257	-	44	-
PM <sub>2.5</sub> (ug/m <sup>3</sup> ) Average	743	1	1	100	46.6	-	12.1	0
Temperature 2 m (C) Average	744	0	0	100	5.1	-	2.4	-
Wind Speed 10 m (km/h) Average	706	0	38	94.89	28	-	16	-
Wind Direction 10 m (deg) Average	706	0	38	94.89	-	-	-	-
Precipitation (mm) Total	744	0	0	100	2.8	-	8.4	-
Relative Humidity (%) Average	744	0	0	100	99	-	93	-
Global Solar Radiation (W/m <sup>2</sup> ) Average	744	0	0	100	217	-	31	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - HORIZON (AMS 15)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.4	0	-	0	0	0	0	1	1	4
TRS (ppb) Average	708	0.3	0	-	0	0	0	0	0	1	2
THC (ppm) Average	706	2.34	0.4	-	2	2.1	2.1	2.2	2.4	2.7	9.3
NO2 (ppb) Average	708	8.9	10	-	0	0	1	5	15	24	45
NO (ppb) Average	708	2.5	11	-	0	0	0	0	1	5	211
NOX (ppb) Average	708	11.4	18	-	0	0	1	5	17	28	257
PM2.5 (ug/m3) Average	743	4.29	4	-	1.1	1.6	2.2	3.2	5.1	7.3	46.6
Temperature 2 m (C) Average	744	-14.15	12.4	-	-40.4	-31	-26.5	-11.3	-3.2	0.8	5.1
Wind Speed 10 m (km/h) Average	706	8.4	5	-	0	3	5	7	11	16	28
Wind Direction 10 m (deg) Average	706	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	744	-	-	15.24	-	-	-	-	-	-	-
Relative Humidity (%) Average	744	79	10	-	51	67	72	78	88	92	99
Global Solar Radiation (W/m2) Average	744	15.2	34	-	0	0	0	0	11	58	217

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -HORIZON (AMS 15)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS	30 Dec 2017 07:00	30 Dec 2017 07:00	1	Maintenance - reinitiate daily QA check
THC	13 Dec 2017 14:00	13 Dec 2017 15:00	2	Maintenance - replaced fuel gas
Wind Speed, Wind Direction	02 Dec 2017 14:00	02 Dec 2017 15:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	03 Dec 2017 21:00	03 Dec 2017 21:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	10 Dec 2017 15:00	11 Dec 2017 21:00	31	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	15 Dec 2017 07:00	15 Dec 2017 09:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	21 Dec 2017 03:00	21 Dec 2017 03:00	1	Flat line in sensor output signal -sensor frozen



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Sulphur Dioxide (SO<sub>2</sub>) - ppb

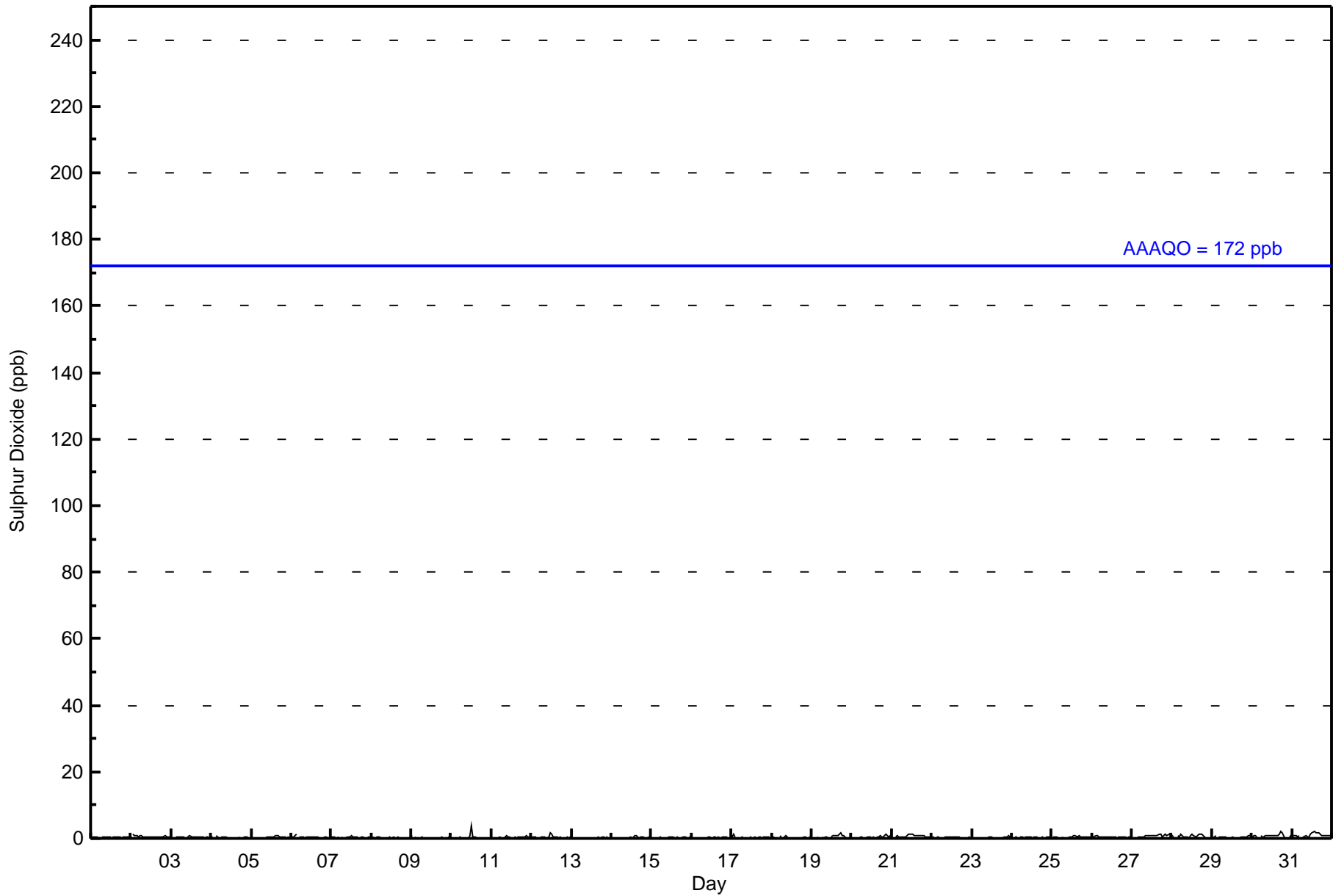
## Horizon - December 2017

Number of Exceedences (AAAQO):		1-hr: 0    24-hr: 0		Hours in Service:		744																																												
Maximum Value: 4 ppb on Dec 10 13:00		Maximum Daily Average: 1.0 ppb on Dec 31		Hours of Data:		708																																												
Minimum Value: 0 ppb on Dec 4 19:00		Minimum Daily Average: 0.1 ppb on Dec 13		Hours of Missing Data:		36																																												
Maximum Diurnal Average: 0.6 ppb at hour 13		Minimum Diurnal Average: 0.2 ppb at hour 8		Hours of Calibration:		36																																												
Monthly Average: 0.4 ppb		Percentiles: P <sub>1</sub> = 0   P <sub>10</sub> = 0   Q <sub>1</sub> = 0   Median = 0   Q <sub>3</sub> = 1   P <sub>90</sub> = 1   P <sub>99</sub> = 2		Percent Operational Time:		100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0.4	1																								
2-Dec	Z	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0.5	1																								
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																								
4-Dec	0	0	Z	1	0	0	0	0	1	0	0	C	C	C	C	C	0	0	0	0	0	1	0	0	0.3	1																								
5-Dec	0	0	0	Z	0	0	0	0	0	0	1	C	0	1	1	1	1	0	0	0	0	0	0	0	0.3	1																								
6-Dec	0	0	1	1	Z	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																								
7-Dec	0	0	0	0	0	Z	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1																								
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1																								
9-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1																								
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0.3	4																								
11-Dec	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0.3	1																								
12-Dec	0	0	0	1	Z	0	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2																								
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	0.2	1																								
15-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
17-Dec	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																								
18-Dec	0	0	0	0	Z	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	2	1	1	0	0	0	0.4	2																								
20-Dec	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0.3	1																								
21-Dec	1	Z	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																								
22-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1																								
23-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0.2	1																								
24-Dec	0	0	1	1	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																								
25-Dec	0	0	1	0	0	Z	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0.4	1																								
26-Dec	Z	0	1	1	1	0	0	1	0	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0.4	1																								
27-Dec	0	Z	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																								
28-Dec	1	1	Z	1	0	1	1	1	1	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0.6	1																								
29-Dec	0	1	1	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.4	1																								
30-Dec	1	1	1	1	Z	1	1	0	1	1	1	1	1	1	1	1	1	2	2	1	0	0	0	1	0.7	2																								
31-Dec	1	1	1	1	1	Z	0	0	1	0	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1.0	2																								
																								0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.3	0.4	0.5	0.6	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.4	Diurnal Average		
																								1	1	1	1	1	1	1	1	1	1	1	2	4	2	2	2	2	2	2	2	1	1	1	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 (SO<sub>2</sub>) - ppb**  
**Horizon - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Horizon - December 2017**

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

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Horizon - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	12	21	44	17	5	9	16	36	108	167	96	42	22	28	37	11	671
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
<b>Totals</b>	12	21	44	17	5	9	16	36	108	167	96	42	22	28	37	11	671

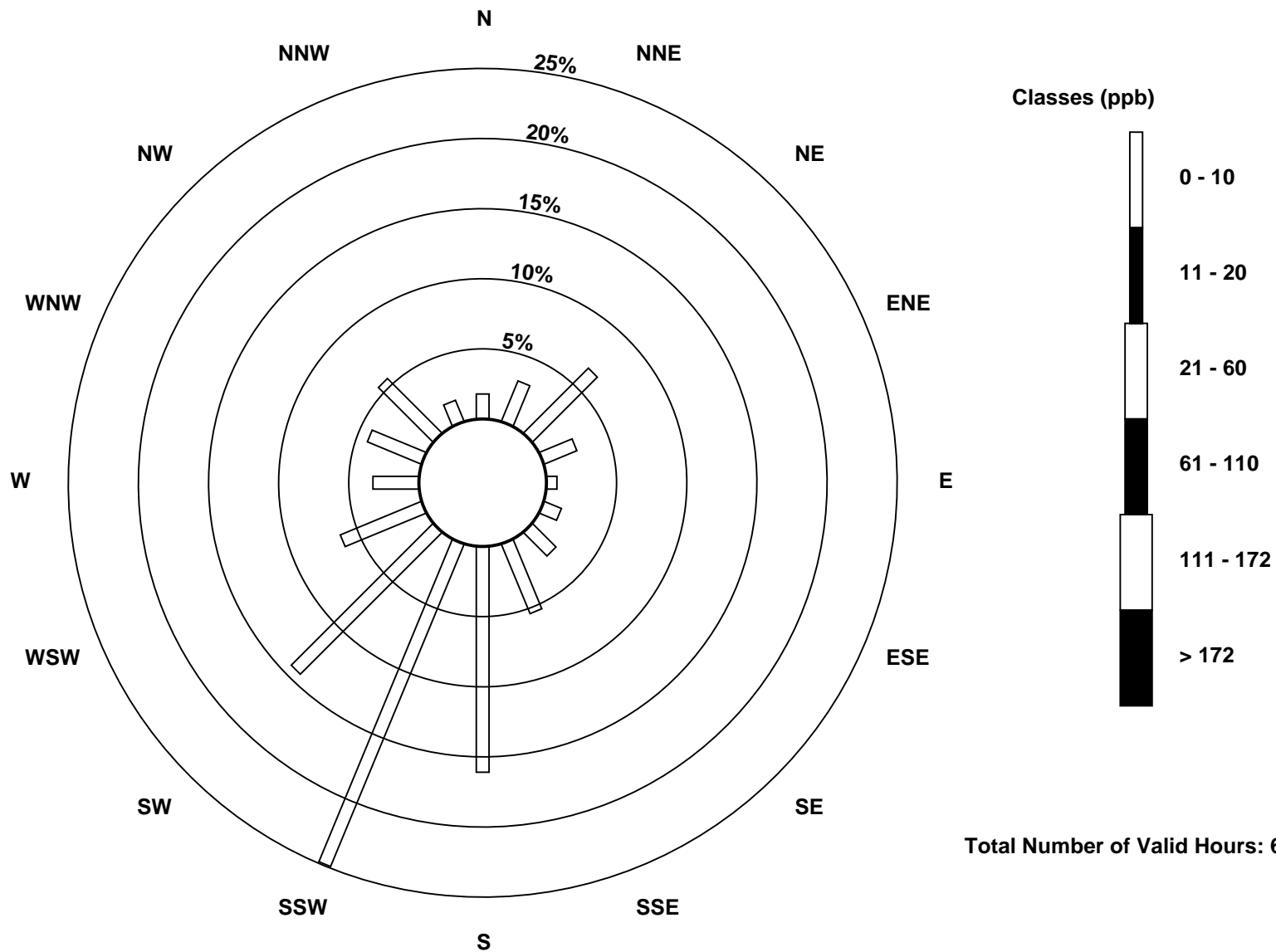
Total Number of Valid Hours: 671

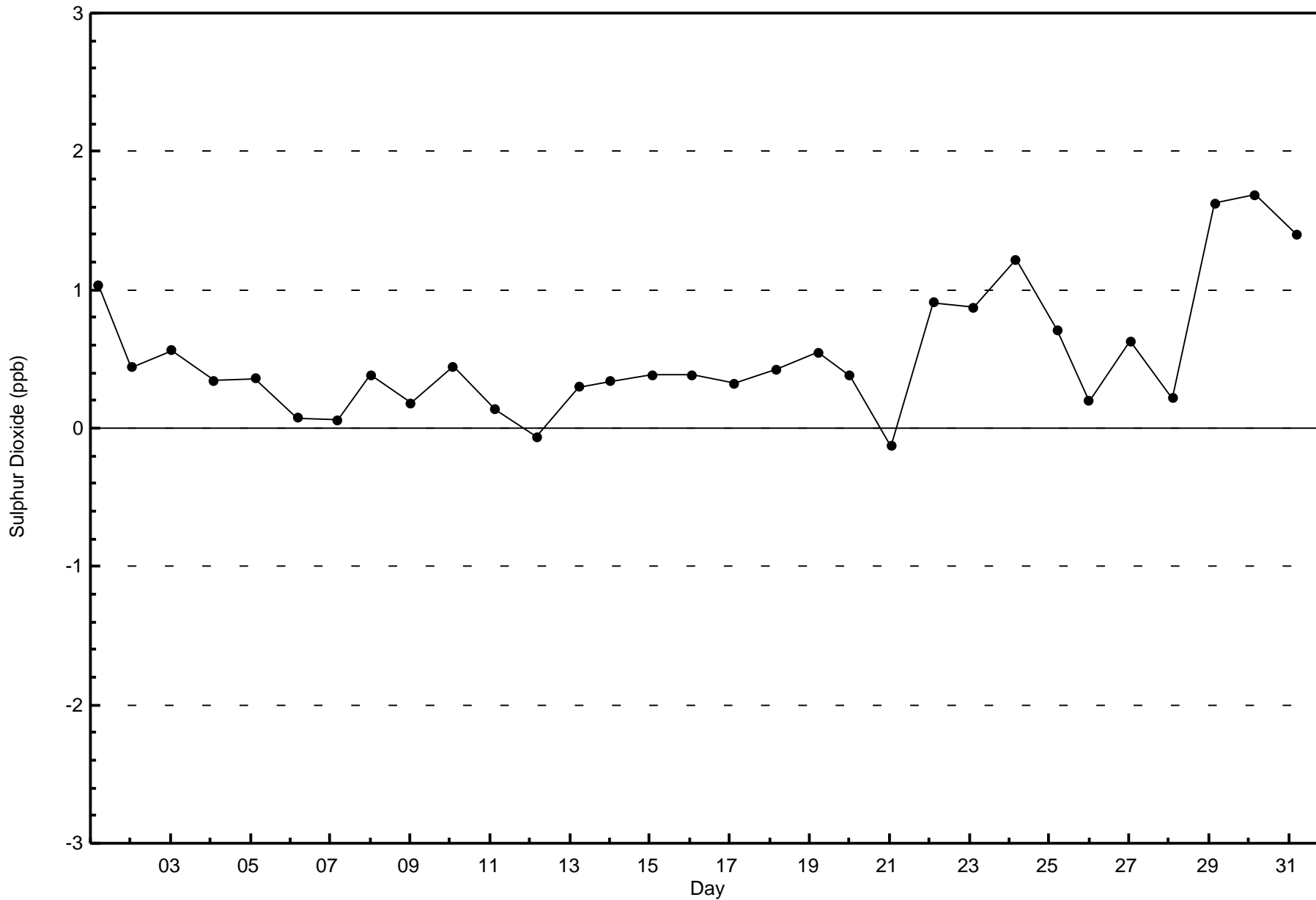
Total Number of Hours: 744

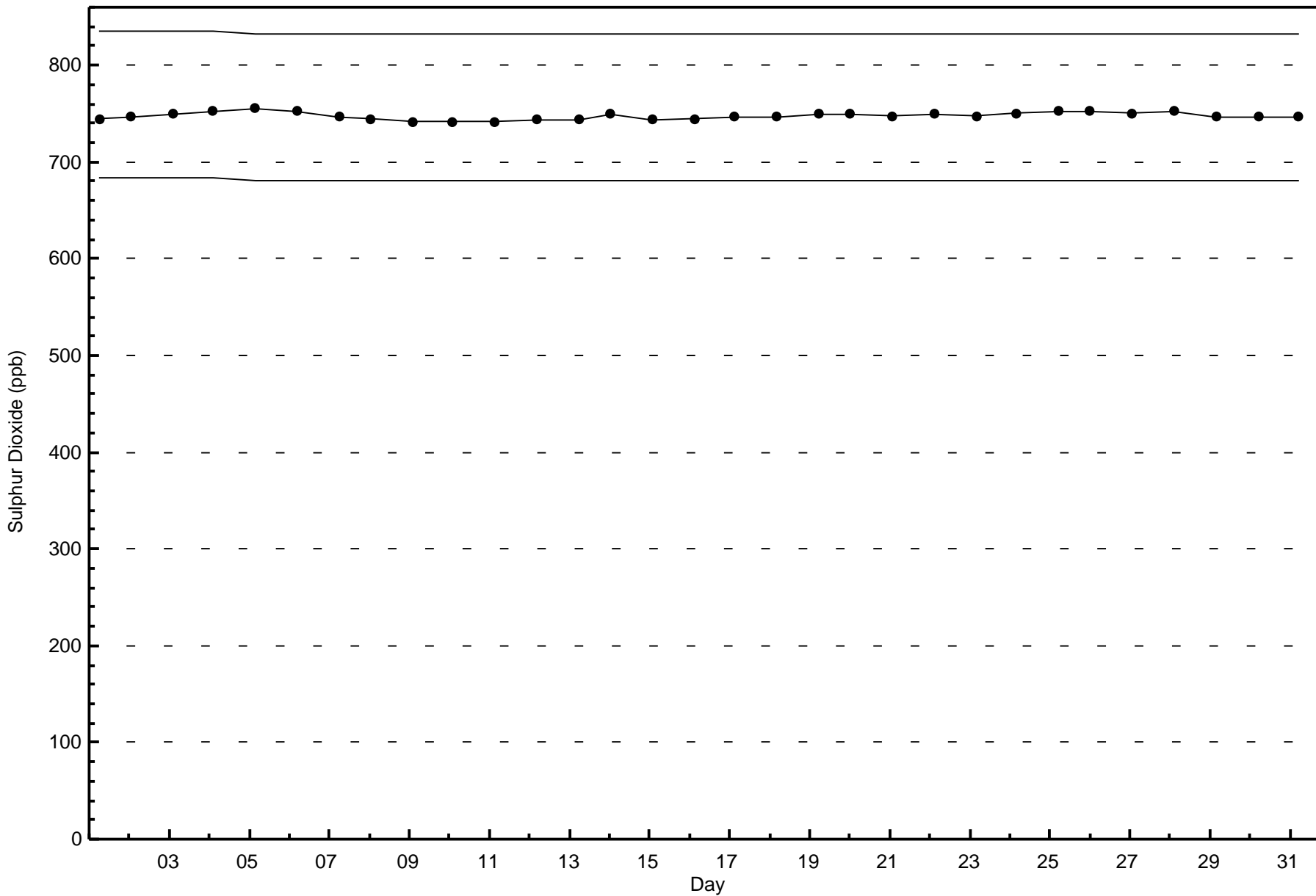


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Horizon (AMS 15)









# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Total Reduced Sulphur (TRS) - ppb

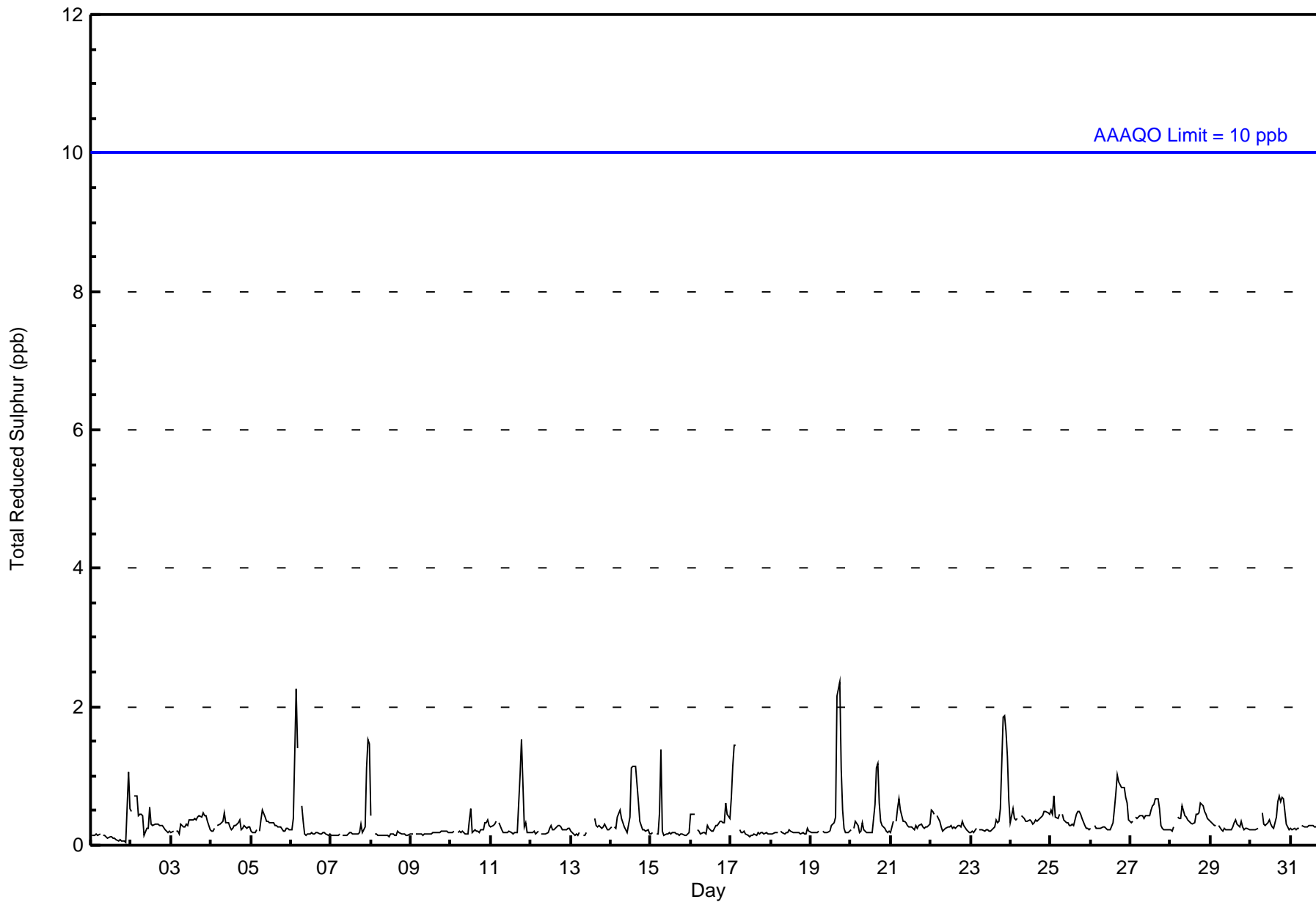
## Horizon - December 2017

Number of Exceedences (AAAQO):		1-hr: 0    24-hr: 0		Hours in Service: 744																																													
Maximum Value: 2 ppb on Dec 19 18:00		Maximum Daily Average: 0.5 ppb on Dec 23		Hours of Data: 708																																													
Minimum Value: 0 ppb on Dec 1 22:00		Minimum Daily Average: 0.2 ppb on Dec 8		Hours of Missing Data: 36																																													
Maximum Diurnal Average: 0.4 ppb at hour 18		Minimum Diurnal Average: 0.2 ppb at hour 10		Hours of Calibration: 35																																													
Monthly Average: 0.3 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 1		Percent Operational Time: 99.9																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1																							
2-Dec	0	Z	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
5-Dec	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
6-Dec	0	0	1	2	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2																							
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0.3	2																							
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0.3	2																							
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
13-Dec	0	0	0	0	0	0	Z	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0																							
14-Dec	0	Z	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1																							
15-Dec	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1																							
17-Dec	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	1	1	0	0	0	0.4	2																							
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0.3	1																							
21-Dec	0	0	Z	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
22-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	1	1	0.5	2																							
24-Dec	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																							
25-Dec	1	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																							
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0.5	1																							
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0.4	1																							
28-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.4	1																							
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
30-Dec	0	0	0	0	0	Z	M	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0.4	1																							
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
																								0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.3	Diurnal Average
																								1	1	1	2	1	1	1	1	1	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	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**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Horizon - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	11	21	45	17	5	9	17	37	111	164	98	39	23	29	36	10	672
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
<b>Totals</b>	11	21	45	17	5	9	17	37	111	164	98	39	23	29	36	10	672

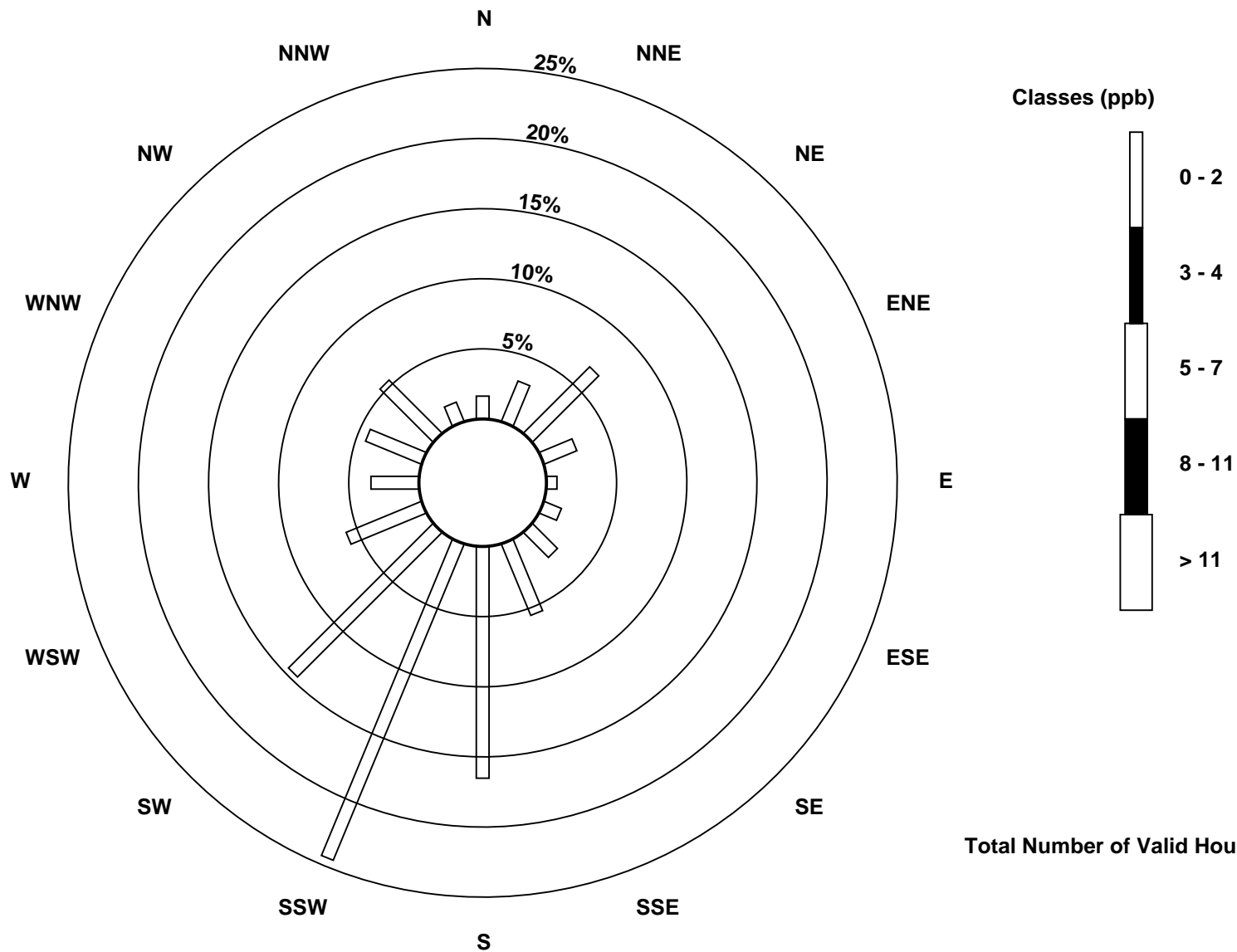
Total Number of Valid Hours: 672

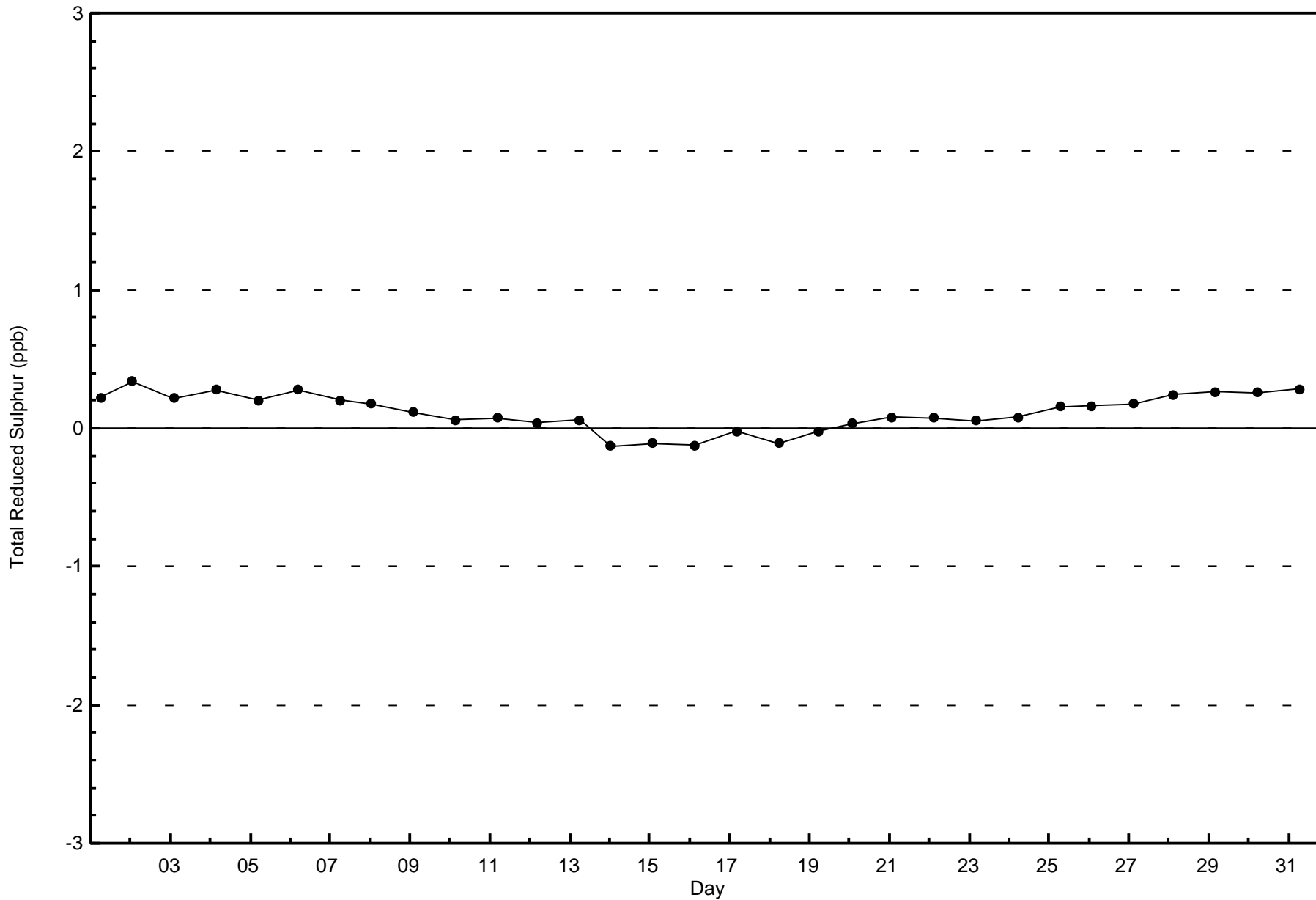
Total Number of Hours: 744

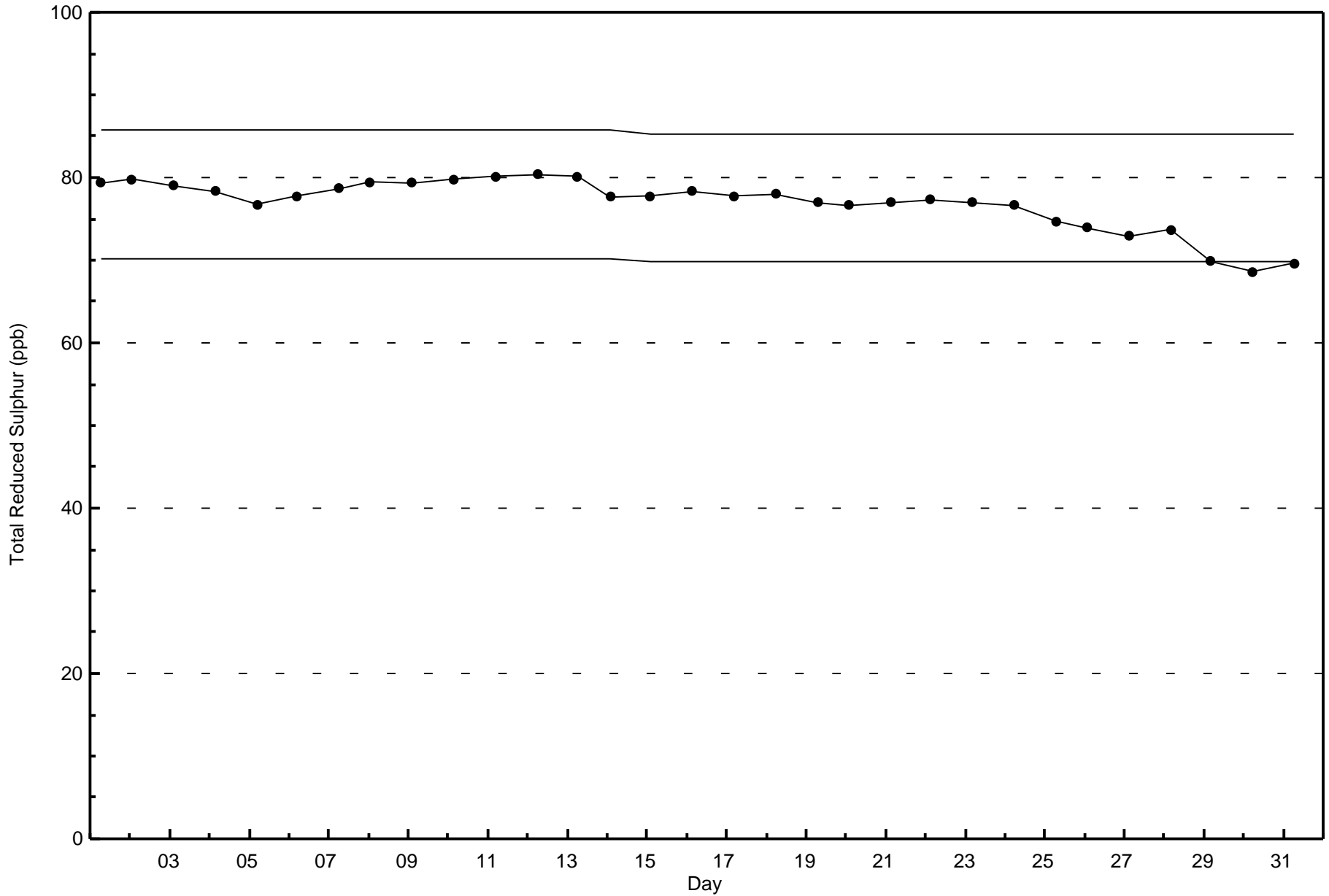


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

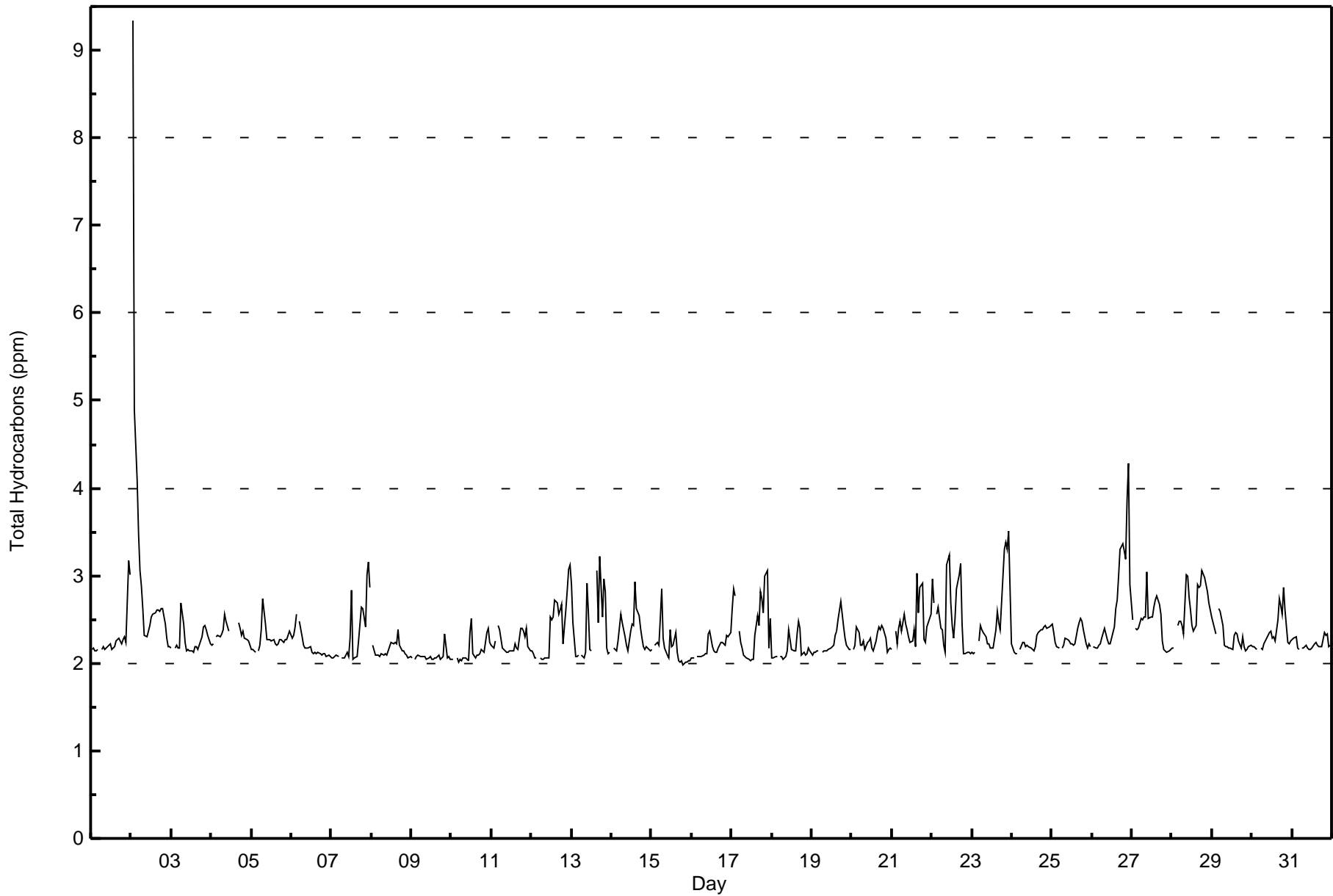
Total Reduced Sulphur (TRS) - ppb  
Horizon (AMS 15)













**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Horizon - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	21	2.97	2.97
2.1 - 3.0	659	93.34	96.32
3.1 - 10.0	26	3.68	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Horizon - December 2017**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	1	0	0	0	0	0	4	4	4	5	3	0	0	0	21
2.1 - 3.0	10	19	41	16	5	9	14	36	101	160	91	36	16	24	34	10	622
3.1 - 10.0	2	2	2	1	0	0	2	0	3	3	1	1	3	3	3	0	26
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	21	44	17	5	9	16	36	108	167	96	42	22	27	37	10	669

Total Number of Valid Hours: 669

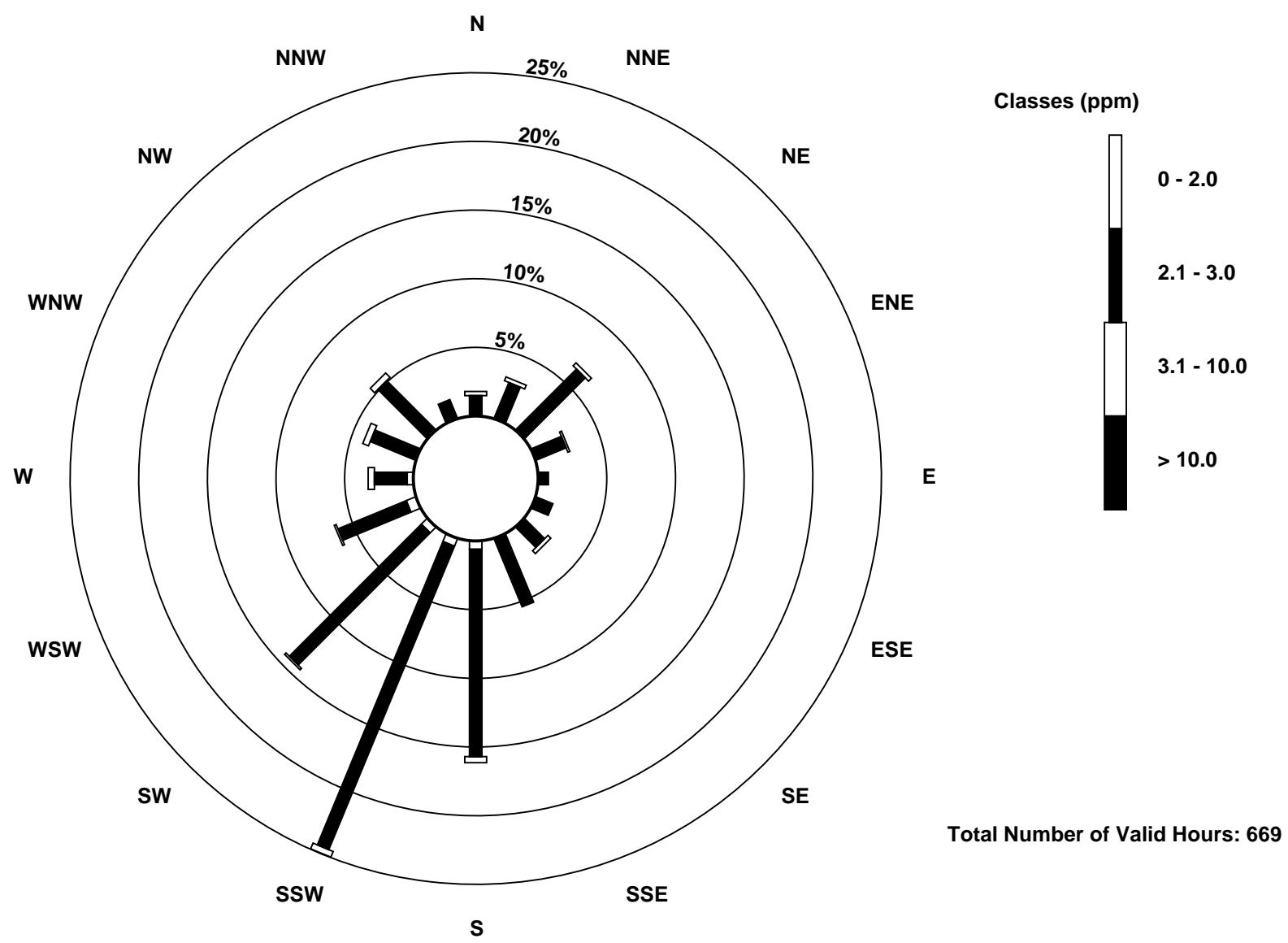
Total Number of Hours: 744

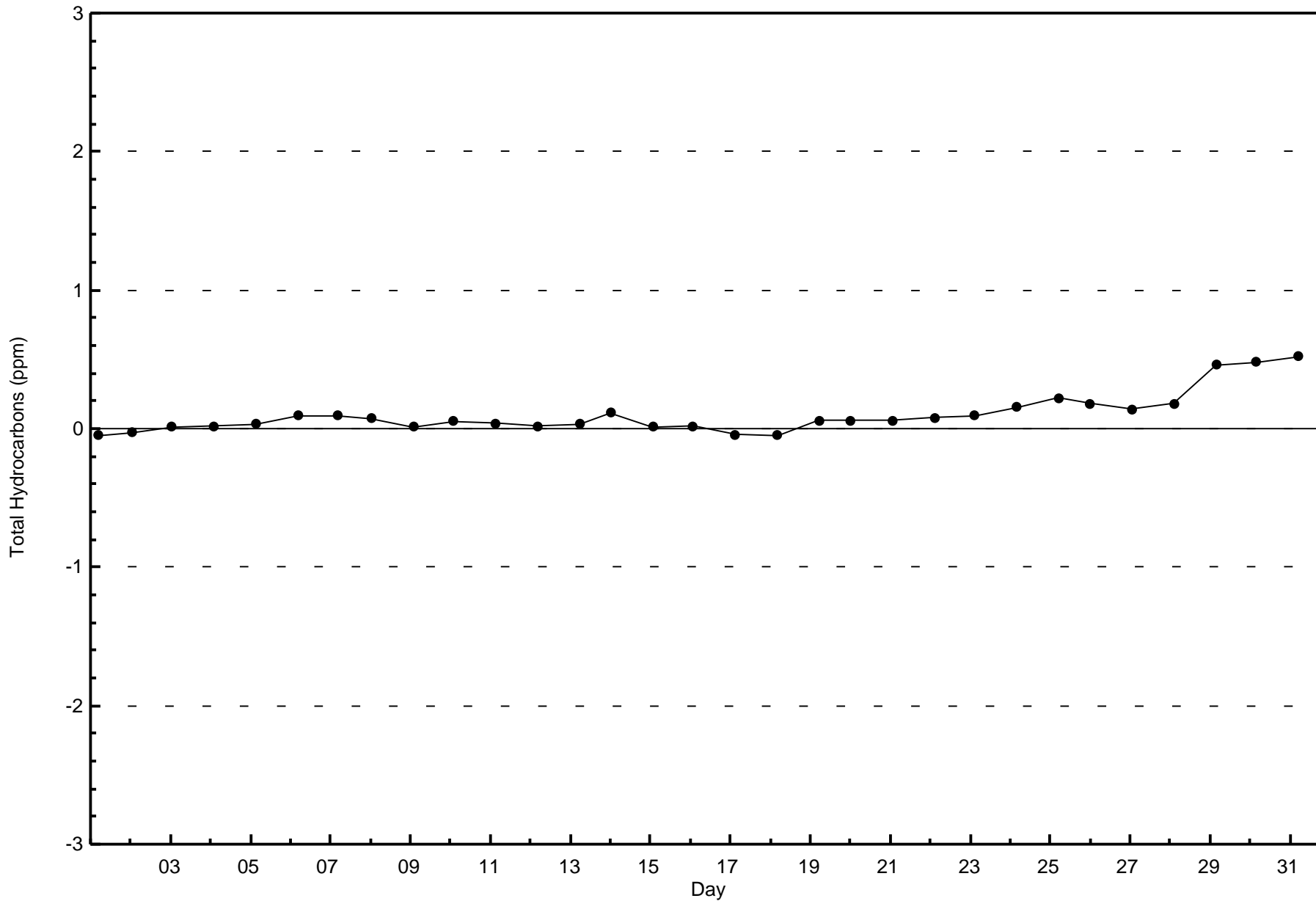


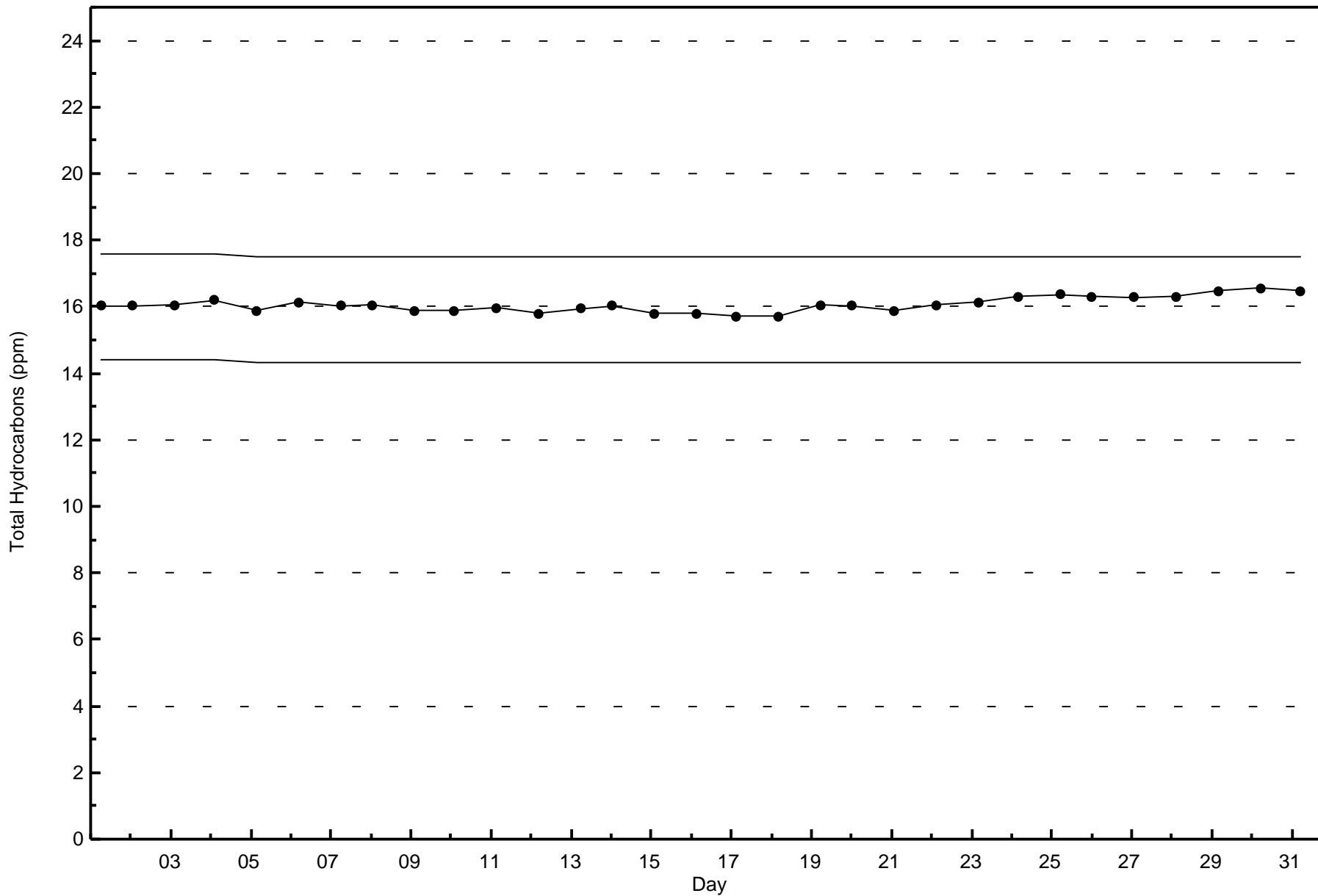


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Horizon (AMS 15)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitric Oxide (NO) - ppb

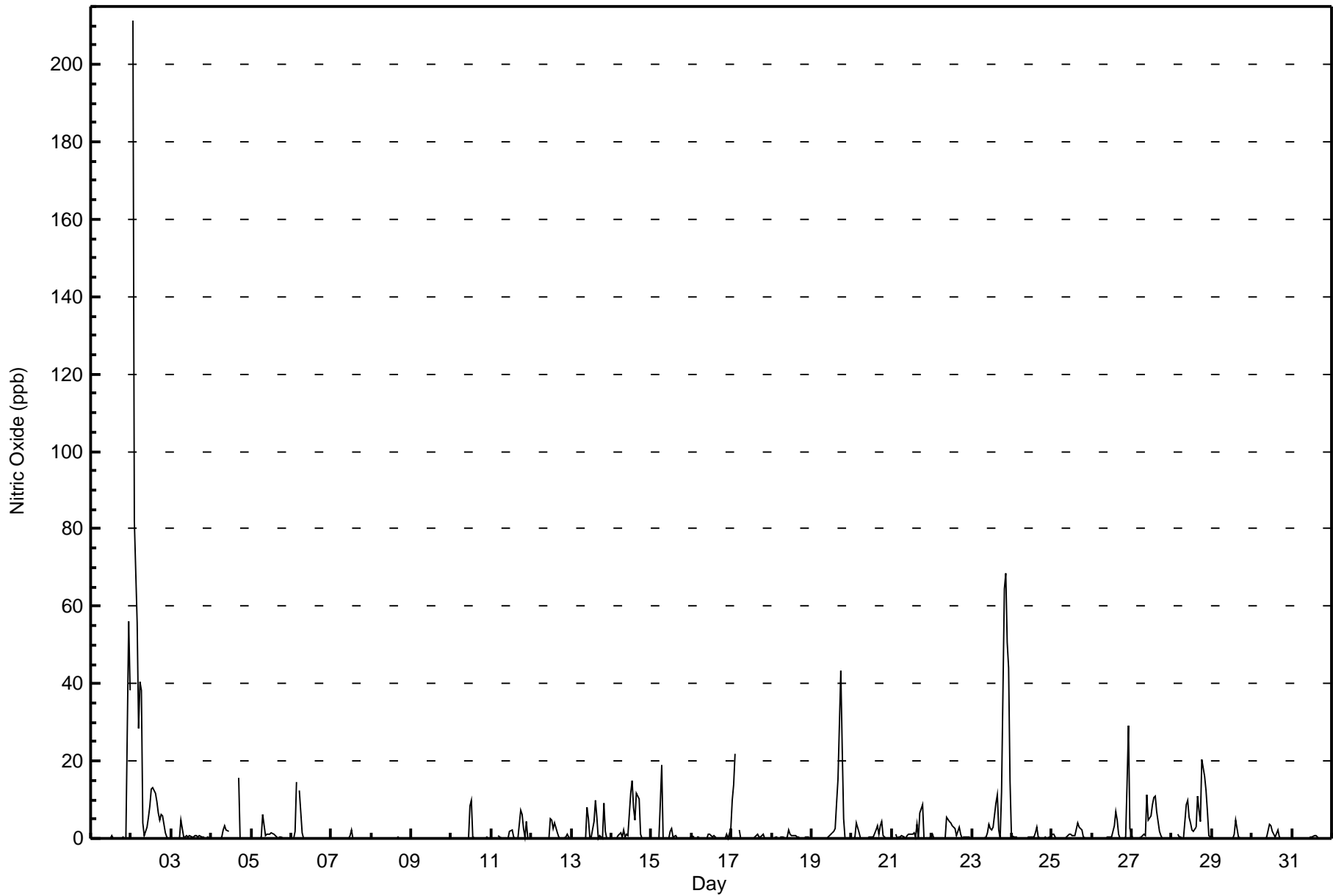
Horizon - December 2017

Maximum Value: 211 ppb on Dec 2 02:00																		Maximum Daily Average: 23.9 ppb on Dec 2																		Hours in Service: 744	
Minimum Value: 0 ppb on Dec 7 04:00																		Minimum Daily Average: 0.0 ppb on Dec 8																		Hours of Data: 708	
Maximum Diurnal Average: 8.8 ppb at hour 2																		Minimum Diurnal Average: 0.5 ppb at hour 9																		Hours of Missing Data: 36	
Monthly Average: 2.5 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 5 P <sub>99</sub> = 48																		Hours of Calibration: 36	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	56	38	4.2	56											
2-Dec	Z	211	82	56	28	40	38	4	1	3	6	8	13	13	12	9	7	5	6	6	1	0	0	0	23.9	211											
3-Dec	0	Z	0	0	0	0	5	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	0	0	0.5	5											
4-Dec	0	0	Z	0	0	0	0	2	3	2	2	C	C	C	C	C	16	0	0	0	0	0	0	0	1.5	16											
5-Dec	0	0	0	Z	0	0	0	6	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0.7	6											
6-Dec	0	0	2	14	Z	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	14											
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0.1	2											
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0											
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	9	10	0	0	0	0	0	0	0	0	0	0	0	0.9	10											
11-Dec	0	0	0	Z	1	0	0	0	0	0	0	2	2	0	0	0	0	7	6	3	0	4	0	0	1.2	7											
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	5	5	2	4	1	0	0	0	0	1	0	0	0	0.9	5											
13-Dec	0	0	0	0	0	Z	0	0	0	8	5	0	0	4	10	5	0	1	0	9	2	0	0	0	2.0	10											
14-Dec	Z	0	0	0	1	1	1	2	0	1	1	12	15	8	5	12	10	1	0	0	0	0	0	0	3.0	15											
15-Dec	0	Z	0	0	0	9	19	0	0	0	0	2	3	0	1	0	0	0	0	0	0	0	0	0	1.5	19											
16-Dec	1	1	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	2	0.4	2											
17-Dec	10	14	22	Z	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	2.3	22											
18-Dec	0	0	0	0	Z	0	0	0	0	0	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2											
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	2	2	3	9	15	43	23	5	0	0	0	0	4.6	43											
20-Dec	Z	0	0	4	1	0	0	0	0	0	0	0	0	0	2	3	1	3	4	1	0	0	0	0	1.0	4											
21-Dec	0	Z	1	0	0	0	1	0	0	1	1	1	1	2	0	3	0	7	9	0	0	0	0	0	1.2	9											
22-Dec	1	0	Z	0	0	0	0	0	0	6	4	4	3	3	3	1	3	1	0	0	0	0	0	0	1.3	6											
23-Dec	0	0	0	Z	0	0	0	0	0	1	4	3	2	3	9	11	2	0	12	65	69	51	44	15	12.6	69											
24-Dec	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0.4	3											
25-Dec	1	1	0	0	0	Z	0	0	0	1	1	1	1	1	1	4	3	3	2	0	0	0	0	0	0.9	4											
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	3	7	5	1	0	0	0	0	0	14	29	2	2.8	29											
27-Dec	0	Z	0	0	0	0	1	1	1	11	5	6	9	11	11	7	2	1	0	0	0	0	0	0	2.8	11											
28-Dec	0	0	Z	1	0	1	0	0	9	10	5	4	2	2	3	11	7	4	20	16	12	7	1	0	5.1	20											
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	5	3	0	0	0	0	0	0	0	0	0.4	5											
30-Dec	0	0	0	0	Z	0	0	0	0	1	4	3	2	1	0	2	1	0	0	0	0	0	0	0	0.6	4											
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.1	1											
0.6 8.8 4.2 3.0 1.3 2.6 2.2 0.6 0.5 1.5 1.4 2.2 2.6 2.1 2.6 3.1 2.3 2.5 2.8 3.5 2.8 2.6 4.3 1.9																		Diurnal Average																			
10 211 82 56 28 40 38 6 9 11 6 12 15 13 12 12 16 43 23 65 69 51 56 38																		Diurnal Maximum																			
Z - zerospan		C - Calibration																																			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	692	97.74	97.74
21 - 40	7	0.99	98.73
41 - 80	7	0.99	99.72
81 - 159	1	0.14	99.86
> 159	1	0.14	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	9	19	42	16	5	9	15	36	108	162	96	41	21	28	37	11	655
21 - 40	2	1	0	0	0	0	0	0	0	2	0	1	1	0	0	0	7
11 - 80	0	1	2	0	0	0	1	0	0	3	0	0	0	0	0	0	7
81 - 159	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
> 159	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<b>Totals</b>	12	21	44	17	5	9	16	36	108	167	96	42	22	28	37	11	671

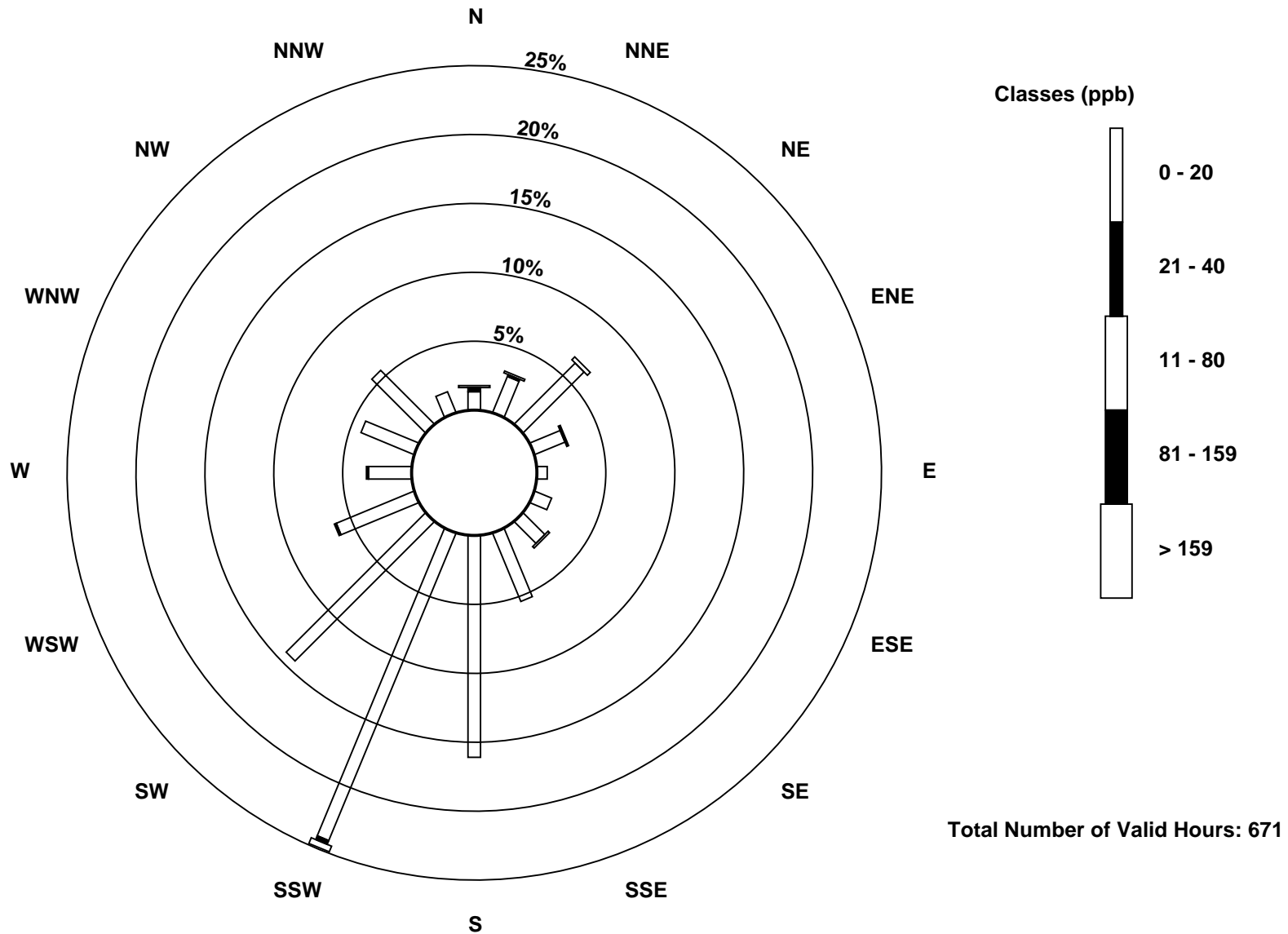
Total Number of Valid Hours: 671

Total Number of Hours: 744

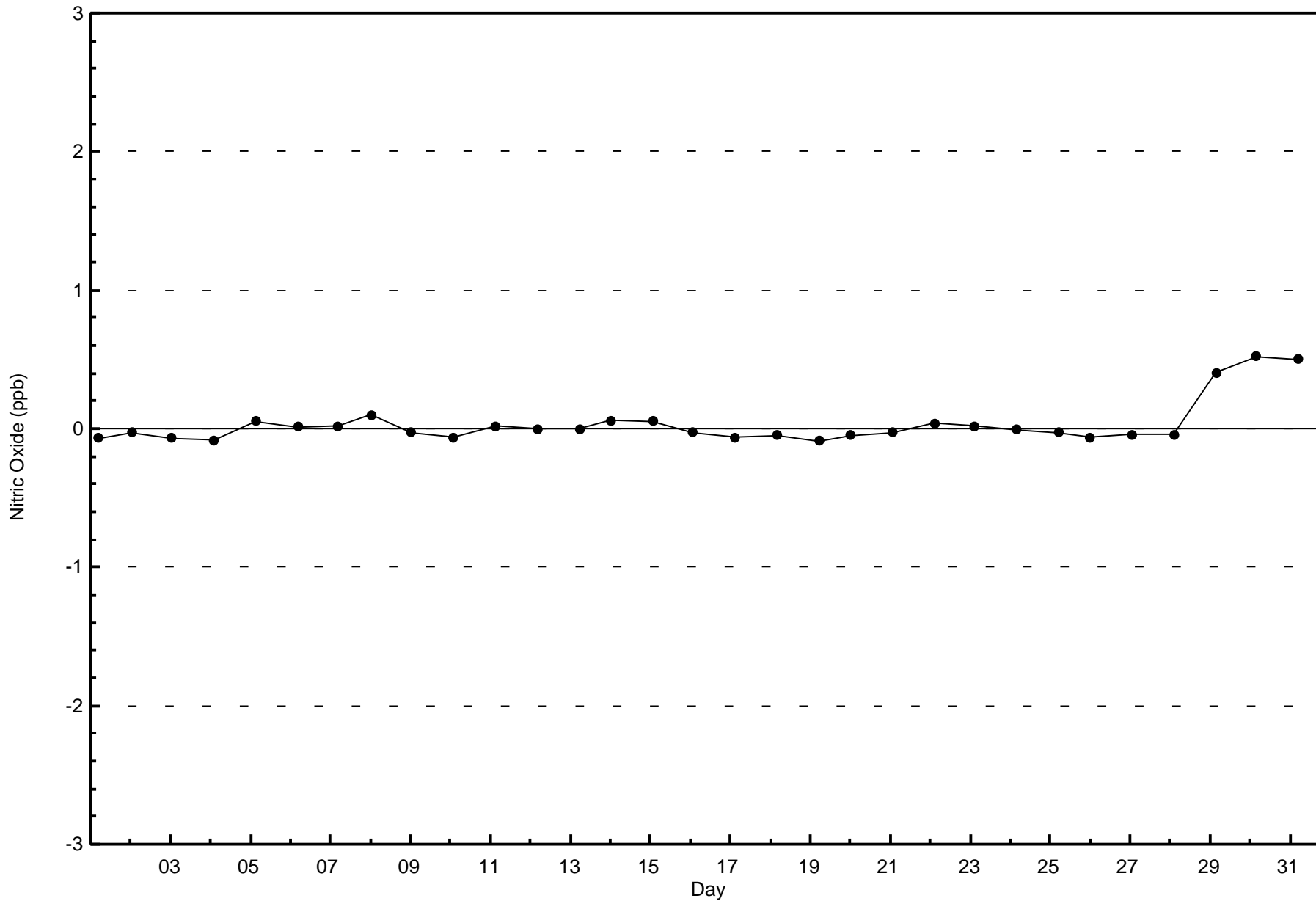


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Horizon (AMS 15)



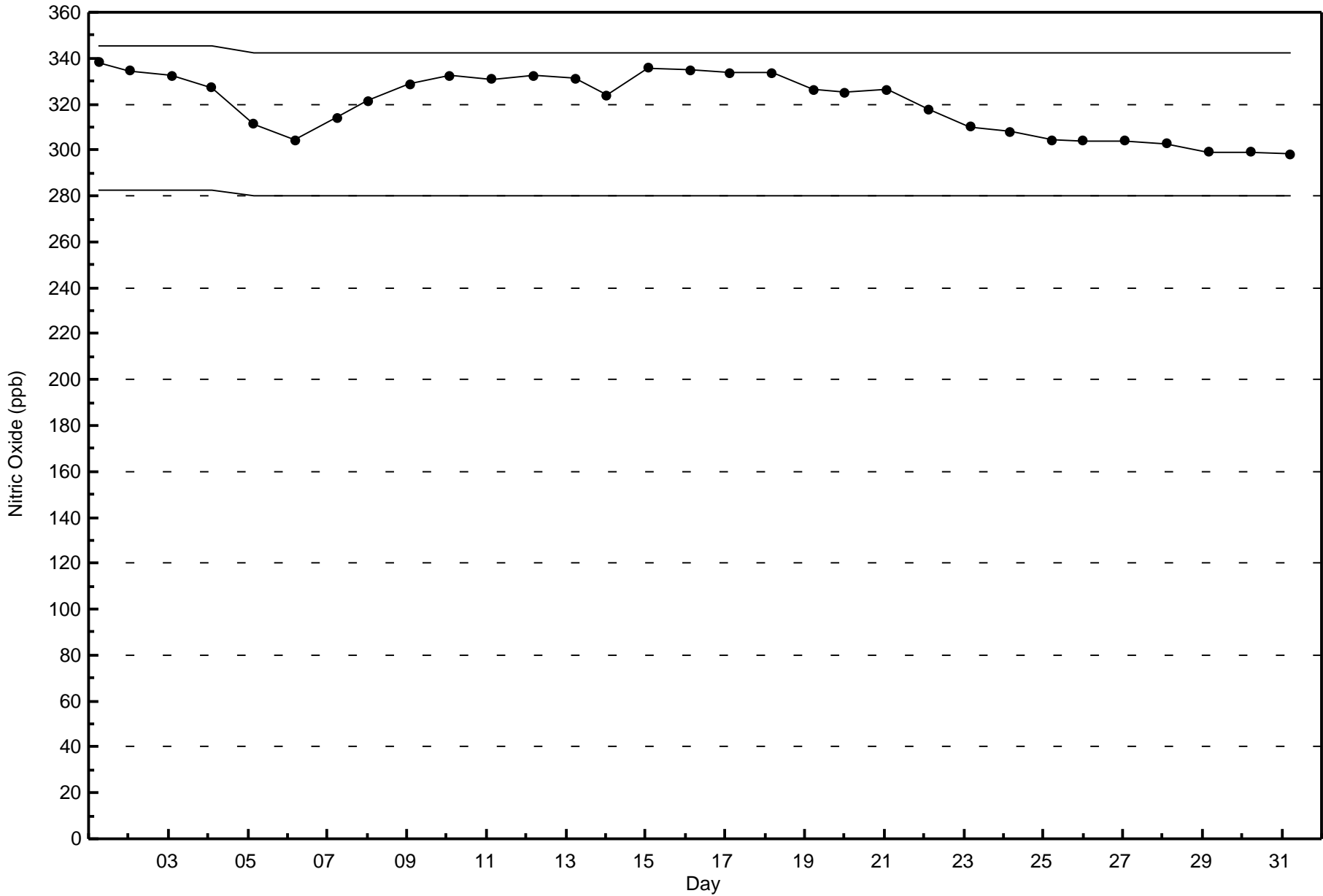






Wood Buffalo Environmental Association  
Span Responses

Nitric Oxide (NO) - ppb  
Horizon - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Horizon - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 45 ppb on Dec 2 02:00	Maximum Daily Average: 19.7 ppb on Dec 2
Minimum Value: 0 ppb on Dec 13 05:00	Hours of Data: 708
Maximum Diurnal Average: 15.3 ppb at hour 18	Hours of Missing Data: 36
Monthly Average: 8.9 ppb	Hours of Calibration: 36
Minimum Daily Average: 0.5 ppb on Dec 9	Percent Operational Time: 100.0
Minimum Diurnal Average: 5.2 ppb at hour 11	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 5 O <sub>3</sub> = 15 P <sub>90</sub> = 24 P <sub>99</sub> = 35	

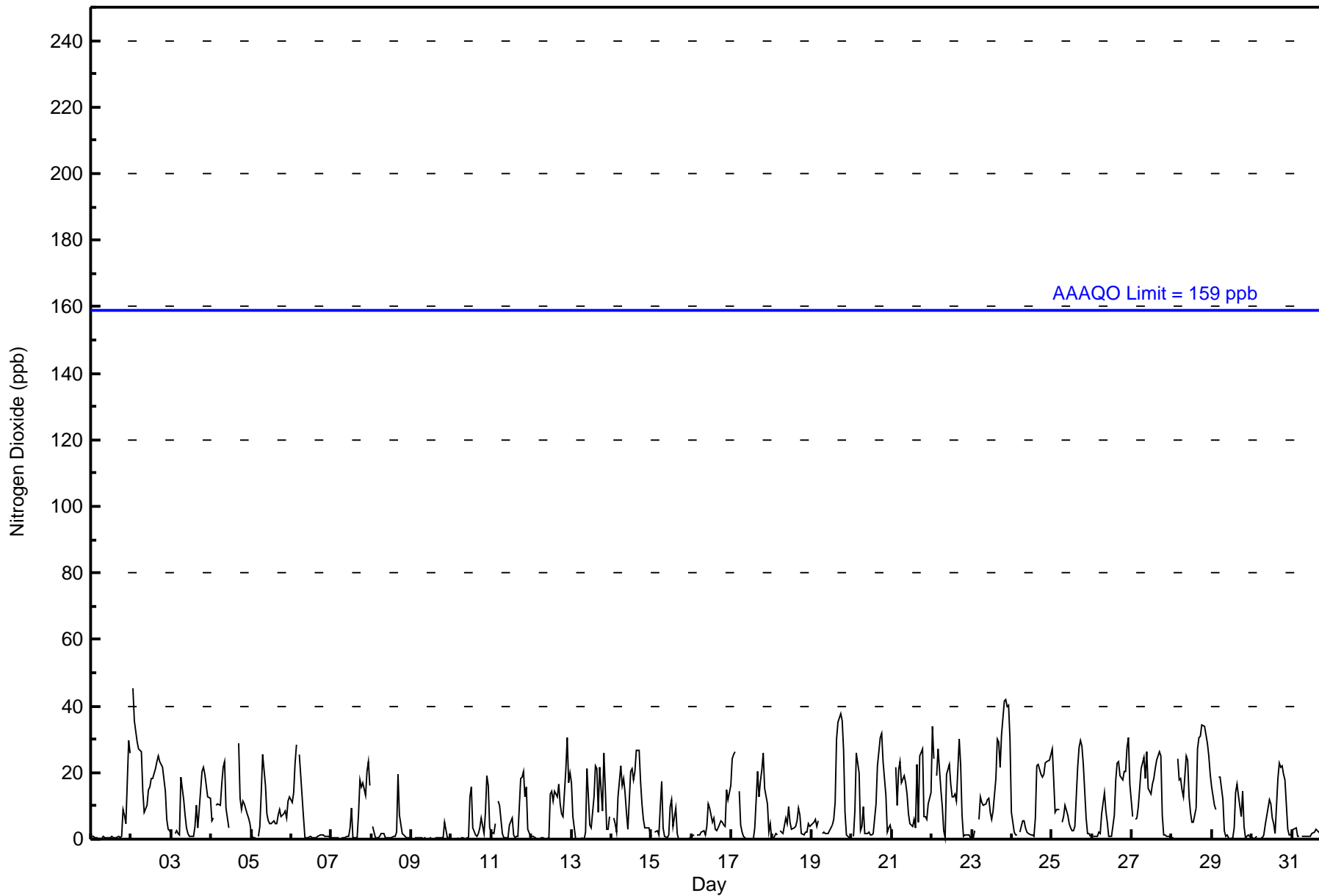
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	1	1	1	1	1	Z	1	1	1	0	1	0	1	1	0	1	1	1	1	9	7	5	30	26	3.8	30																							
2-Dec	Z	45	36	29	27	27	26	15	8	10	15	16	18	18	21	24	25	23	23	22	15	6	3	3	19.7	45																							
3-Dec	2	Z	2	3	2	1	19	12	7	4	2	1	1	1	4	10	4	9	20	22	19	16	13	12	7.9	22																							
4-Dec	6	6	Z	10	11	10	17	22	24	9	4	C	C	C	C	C	29	12	9	12	11	8	6	5	11.6	29																							
5-Dec	2	1	0	Z	1	4	14	25	16	8	5	5	5	5	5	5	7	9	7	8	9	6	12	13	7.4	25																							
6-Dec	11	14	23	28	Z	25	13	6	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	5.7	28																							
7-Dec	0	0	0	0	0	Z	0	0	0	1	1	4	10	0	0	0	8	18	16	17	13	20	23	16	6.5	23																							
8-Dec	Z	4	0	0	0	1	2	2	0	1	1	0	1	1	1	2	20	7	2	1	1	1	0	0	2.0	20																							
9-Dec	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	0	0.5	5																							
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	13	16	3	1	1	2	3	6	2	8	19	16	4	4.2	19																							
11-Dec	2	2	5	Z	11	10	2	1	0	0	1	4	6	1	1	1	1	18	19	20	13	16	3	1	6.0	20																							
12-Dec	1	1	1	1	Z	0	1	0	0	0	1	14	15	11	15	13	17	10	8	7	21	30	17	20	8.7	30																							
13-Dec	17	7	0	0	0	Z	0	0	2	21	13	4	4	13	22	21	8	21	9	26	15	3	3	7	9.4	26																							
14-Dec	Z	6	5	2	13	22	16	18	14	8	3	20	21	18	20	27	27	17	11	6	4	3	3	1	12.4	27																							
15-Dec	1	Z	2	3	1	10	17	3	1	0	1	10	12	4	9	2	0	0	0	0	0	0	0	0	3.4	17																							
16-Dec	1	1	Z	1	1	1	2	3	1	4	11	9	5	6	3	3	4	6	5	4	4	15	12	16	5.1	16																							
17-Dec	24	25	26	Z	14	4	2	1	0	0	0	0	0	0	3	20	13	18	21	26	15	11	2	5	10.0	26																							
18-Dec	0	0	2	1	Z	3	2	2	6	5	10	5	3	3	4	6	9	7	2	1	2	2	5	4	3.6	10																							
19-Dec	5	5	6	4	5	Z	2	2	2	2	2	3	4	6	11	30	35	38	36	27	8	1	0	0	10.2	38																							
20-Dec	Z	1	8	26	20	3	4	10	2	2	2	1	1	2	10	22	26	31	32	23	13	2	3	4	10.8	32																							
21-Dec	2	Z	22	10	21	23	17	19	17	14	8	5	4	6	3	23	5	25	27	7	7	6	11	14	12.8	27																							
22-Dec	34	24	Z	19	27	15	10	2	0	20	22	17	13	13	14	11	30	22	7	1	1	1	1	0	13.3	34																							
23-Dec	1	1	2	Z	6	13	11	10	11	12	12	8	6	9	18	30	29	22	32	42	42	40	40	30	18.5	42																							
24-Dec	8	2	1	1	Z	2	6	6	4	2	2	1	1	1	6	22	23	20	19	20	23	23	24	26	10.5	26																							
25-Dec	27	18	8	9	9	Z	5	7	10	7	5	3	3	2	4	22	28	30	28	22	6	2	2	1	11.1	30																							
26-Dec	Z	1	1	1	2	2	8	14	9	5	1	1	1	7	18	23	24	19	18	20	21	28	30	17	11.6	30																							
27-Dec	7	Z	6	6	10	21	23	25	18	26	15	14	17	18	21	24	26	25	7	1	1	1	1	1	13.6	26																							
28-Dec	1	1	Z	24	18	18	15	13	25	24	13	8	5	5	9	27	31	31	34	34	31	29	25	20	19.1	34																							
29-Dec	16	10	9	Z	19	19	12	3	1	1	1	0	0	3	14	16	13	7	14	4	0	1	1	0	7.1	19																							
30-Dec	0	0	0	1	Z	0	1	1	4	7	12	11	6	5	2	18	23	22	22	20	18	3	1	1	7.7	23																							
31-Dec	3	3	3	1	1	Z	1	1	1	1	1	1	2	2	3	3	2	2	2	5	6	6	2	2	2.2	6																							
																								6.6	6.9	6.5	7.0	8.5	9.4	7.9	7.2	6.0	6.3	5.2	6.0	6.0	5.5	8.1	13.5	15.1	15.3	14.0	13.2	11.0	9.8	9.3	8.0	Diurnal Average	
																								34	45	36	29	27	27	26	25	25	26	22	20	21	18	22	30	35	38	36	42	42	40	40	30	Diurnal Maximum	

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	598	84.46	84.46
21 - 40	107	15.11	99.58
41 - 80	3	0.42	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	9	17	40	14	3	7	8	27	91	145	84	37	21	19	31	10	563
21 - 40	2	4	4	3	2	2	8	9	17	20	12	5	1	9	6	1	105
11 - 80	1	0	0	0	0	0	0	0	0	2	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
<b>Totals</b>	12	21	44	17	5	9	16	36	108	167	96	42	22	28	37	11	671

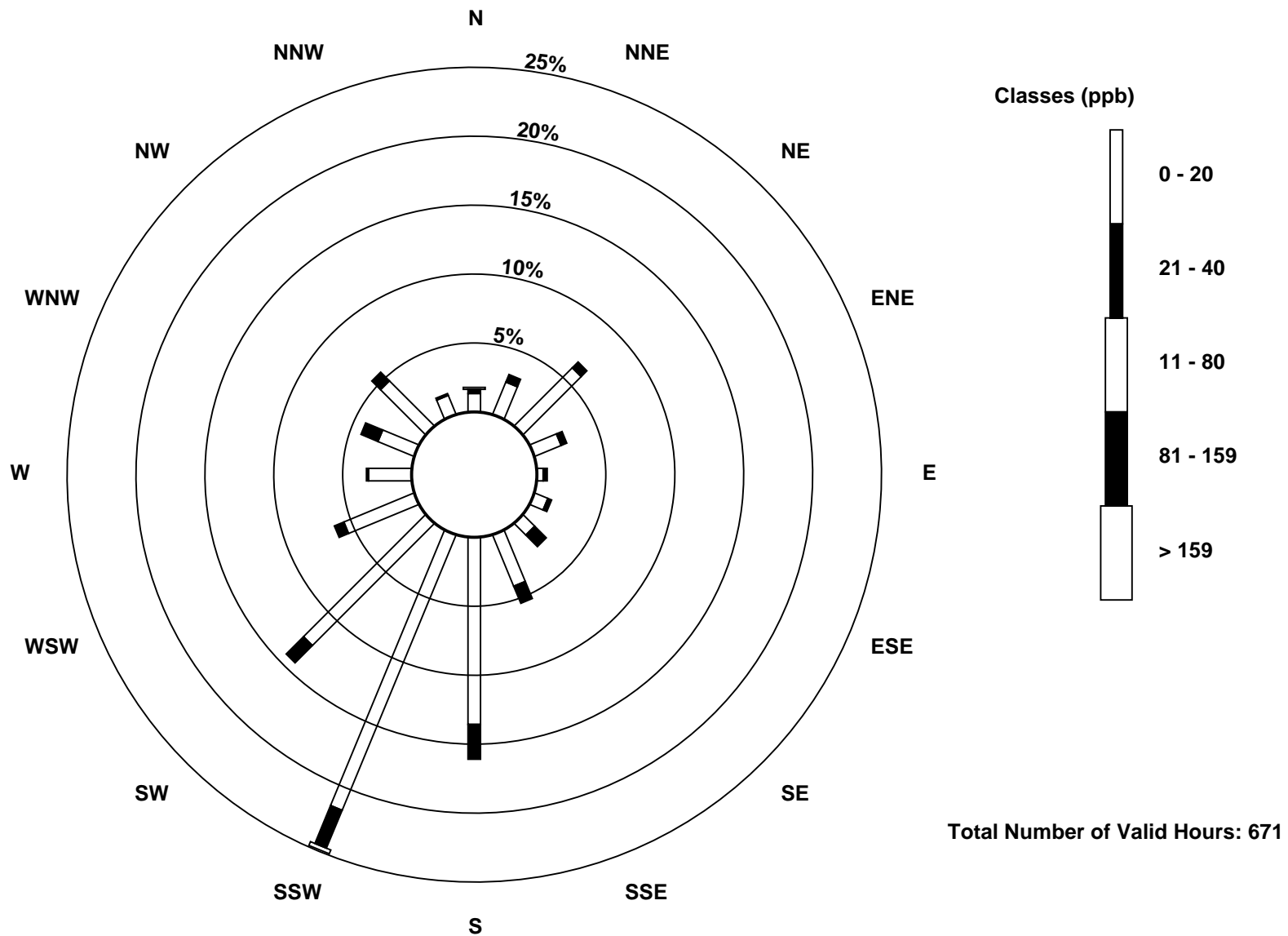
Total Number of Valid Hours: 671

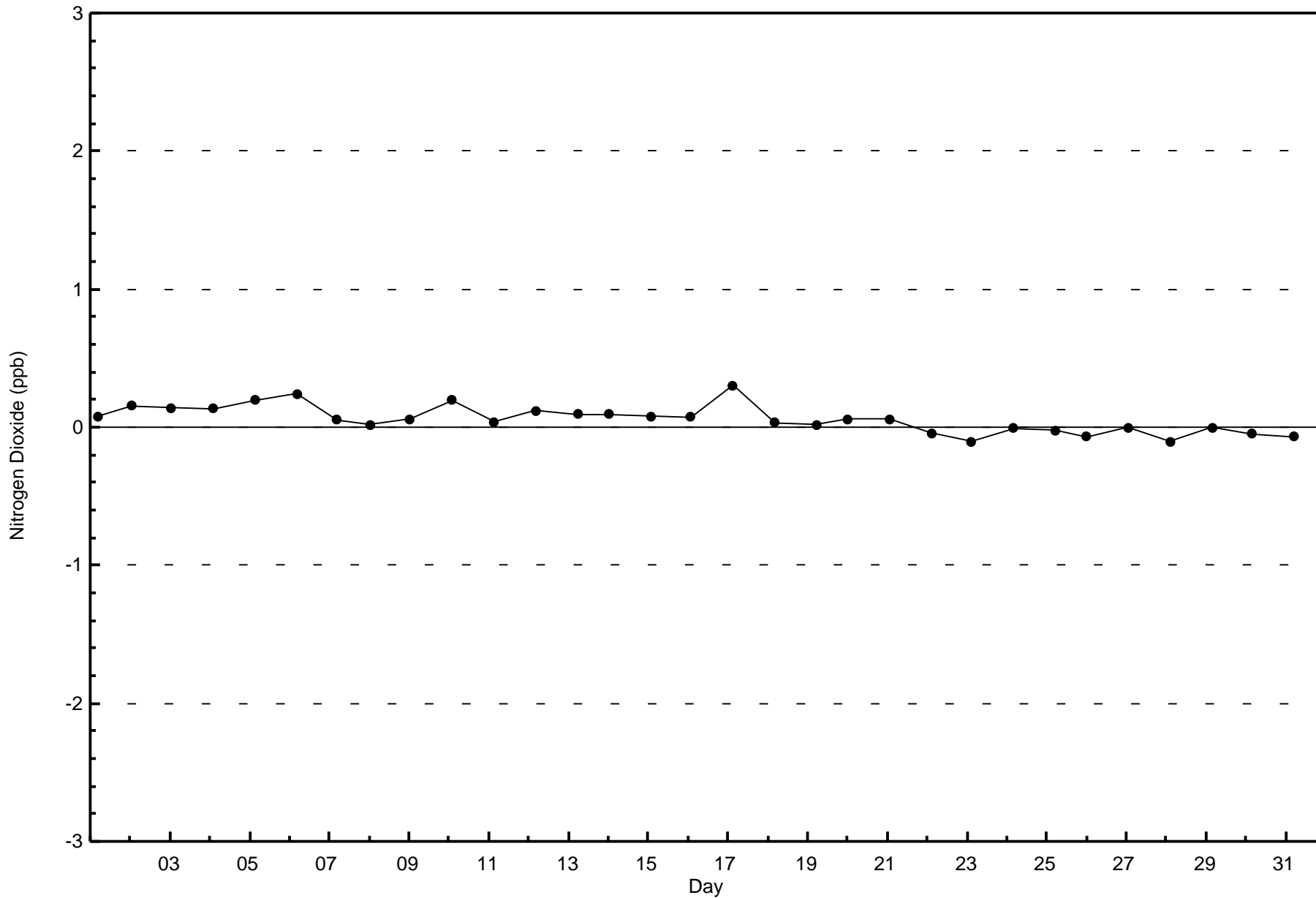
Total Number of Hours: 744



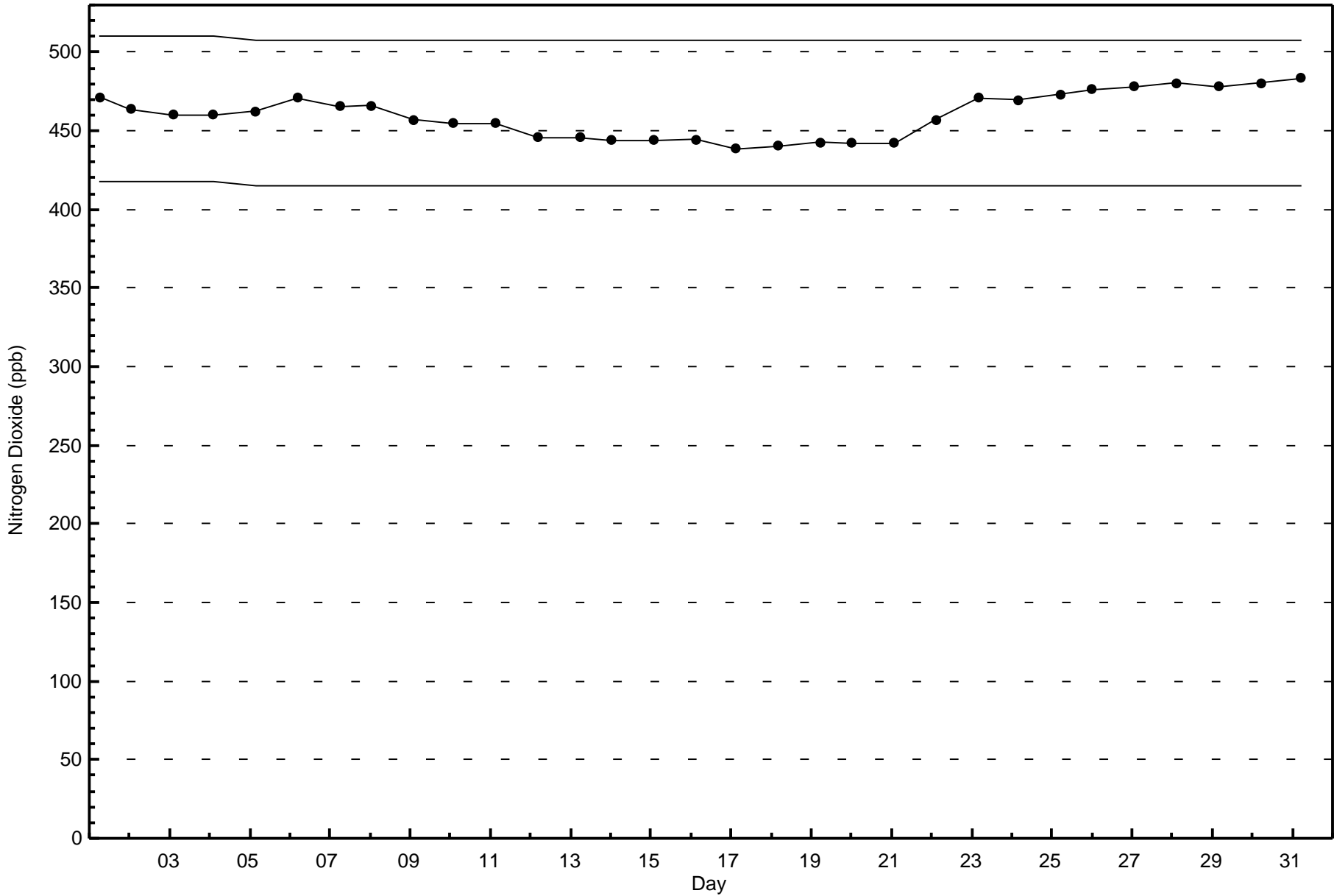
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Horizon (AMS 15)











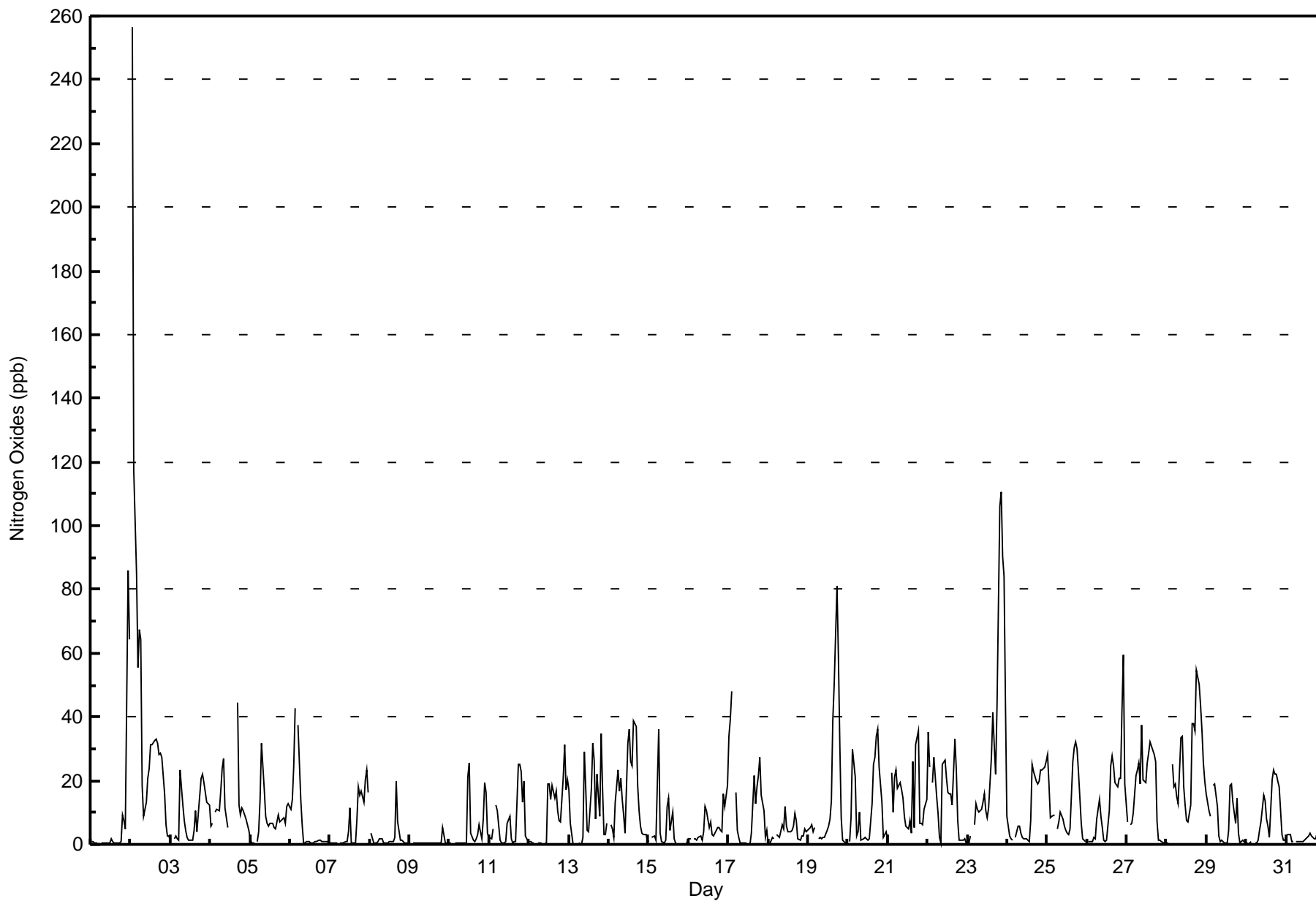
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

Horizon - December 2017

Maximum Value: 257 ppb on Dec 2 02:00		Maximum Daily Average: 43.6 ppb on Dec 2		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 15 23:00		Minimum Daily Average: 0.6 ppb on Dec 9		Hours of Data: 708																							
Maximum Diurnal Average: 17.8 ppb at hour 18		Minimum Diurnal Average: 6.5 ppb at hour 9		Hours of Missing Data: 36																							
Monthly Average: 11.4 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 5 Q <sub>3</sub> = 17 P <sub>90</sub> = 28 P <sub>99</sub> = 85		Hours of Calibration: 36																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1	1	1	1	1	Z	1	1	1	1	1	0	2	1	0	0	1	1	1	9	7	5	86	64	8.0	86	
2-Dec	Z	257	118	85	55	67	64	19	9	13	21	24	31	31	33	33	32	28	29	27	16	6	3	3	43.6	257	
3-Dec	1	Z	2	3	2	1	23	12	8	4	2	1	1	1	4	11	4	10	21	22	20	16	13	13	8.5	23	
4-Dec	6	6	Z	10	11	10	17	24	27	12	5	C	C	C	C	C	45	12	9	12	11	8	6	5	13.1	45	
5-Dec	2	0	0	Z	1	4	14	32	17	9	7	6	6	7	5	5	7	9	7	8	9	6	12	13	8.0	32	
6-Dec	11	14	25	43	Z	38	14	6	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	7.1	43	
7-Dec	0	0	0	0	0	Z	0	0	0	1	1	4	12	0	0	0	8	18	16	17	13	20	23	16	6.6	23	
8-Dec	Z	4	0	0	0	1	2	2	0	1	1	0	1	1	1	2	20	7	2	1	1	1	0	0	2.1	20	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	1	1	0	0.6	5	
10-Dec	0	0	Z	0	0	0	0	1	0	0	1	21	26	4	1	1	2	3	6	2	8	20	16	4	5.1	26	
11-Dec	2	2	5	Z	12	10	2	0	0	0	1	6	9	2	0	1	1	25	25	23	13	20	3	1	7.1	25	
12-Dec	1	1	1	1	Z	0	0	0	0	0	1	19	19	14	18	14	17	11	8	7	21	31	17	20	9.6	31	
13-Dec	17	7	0	0	0	Z	0	0	2	29	18	4	4	17	32	27	8	22	9	35	17	3	3	7	11.3	35	
14-Dec	Z	6	5	2	13	23	17	21	14	9	3	32	36	26	25	39	37	18	11	6	4	3	3	1	15.4	39	
15-Dec	1	Z	2	3	1	19	36	3	1	0	1	12	15	4	10	2	0	0	0	0	0	0	0	0	4.9	36	
16-Dec	2	2	Z	2	2	1	2	3	1	4	12	11	5	7	3	3	4	5	5	4	4	16	12	19	5.5	19	
17-Dec	34	39	48	Z	16	4	2	1	0	0	0	0	0	4	21	13	18	21	27	15	11	2	4	12.3	48		
18-Dec	0	0	2	2	Z	3	3	2	6	5	12	6	4	4	5	6	10	7	2	1	3	3	5	4	4.0	12	
19-Dec	5	5	6	4	5	Z	2	2	2	2	2	4	6	8	14	39	50	81	59	32	8	1	0	0	14.7	81	
20-Dec	Z	1	8	30	21	3	4	10	2	2	2	2	1	2	13	25	27	34	36	24	13	2	3	4	11.7	36	
21-Dec	2	Z	23	10	21	24	18	19	17	14	9	6	5	7	4	26	5	31	36	7	7	6	11	14	14.0	36	
22-Dec	35	24	Z	19	27	15	10	2	0	25	27	21	16	16	16	12	33	23	8	1	1	1	2	0	14.6	35	
23-Dec	1	0	2	Z	6	13	11	10	11	13	16	11	8	11	28	41	31	22	43	106	111	90	84	45	31.1	111	
24-Dec	9	2	2	2	Z	2	6	6	4	2	2	2	1	1	8	25	23	20	19	20	23	24	24	26	10.9	26	
25-Dec	28	19	8	9	9	Z	5	7	10	8	6	4	3	3	5	26	30	32	30	23	6	2	2	1	12.0	32	
26-Dec	Z	1	1	1	2	2	8	14	9	5	1	1	1	10	25	28	24	19	18	21	21	42	60	19	14.4	60	
27-Dec	7	Z	6	7	10	22	23	25	19	37	20	19	25	29	32	31	28	26	7	1	1	1	1	1	16.5	37	
28-Dec	1	1	Z	25	18	19	15	13	34	34	18	12	7	7	12	38	38	36	54	50	44	36	25	20	24.2	54	
29-Dec	16	10	9	Z	19	19	12	3	1	1	1	0	1	4	19	19	13	7	14	4	0	1	1	0	7.6	19	
30-Dec	0	0	0	1	Z	0	1	1	4	7	16	14	8	6	2	20	23	22	22	20	18	3	1	1	8.3	23	
31-Dec	2	3	3	1	1	Z	1	1	1	1	1	1	2	3	4	3	2	2	2	5	6	6	2	2	2.3	6	
		7.1	15.6	10.7	10.0	9.8	12.0	10.1	7.8	6.5	7.8	6.7	8.2	8.6	7.6	10.8	16.6	17.4	17.8	16.8	16.6	13.8	12.4	13.6	9.9	Diurnal Average	
		35	257	118	85	55	67	64	32	34	37	27	32	36	31	33	41	50	81	59	106	111	90	86	64	Diurnal Maximum	
Z - zerospan		C - Calibration																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	573	80.93	80.93
21 - 40	109	15.40	96.33
41 - 80	17	2.40	98.73
81 - 159	7	0.99	99.72
> 159	1	0.14	99.86

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Horizon - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	7	15	40	14	2	6	8	23	89	141	83	37	20	18	30	10	543
21 - 40	2	4	1	2	3	3	6	12	17	18	11	4	1	10	7	1	102
11 - 80	2	1	1	0	0	0	1	1	2	5	2	1	1	0	0	0	17
81 - 159	0	1	2	1	0	0	1	0	0	2	0	0	0	0	0	0	7
> 159	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<b>Totals</b>	12	21	44	17	5	9	16	36	108	166	96	42	22	28	37	11	670

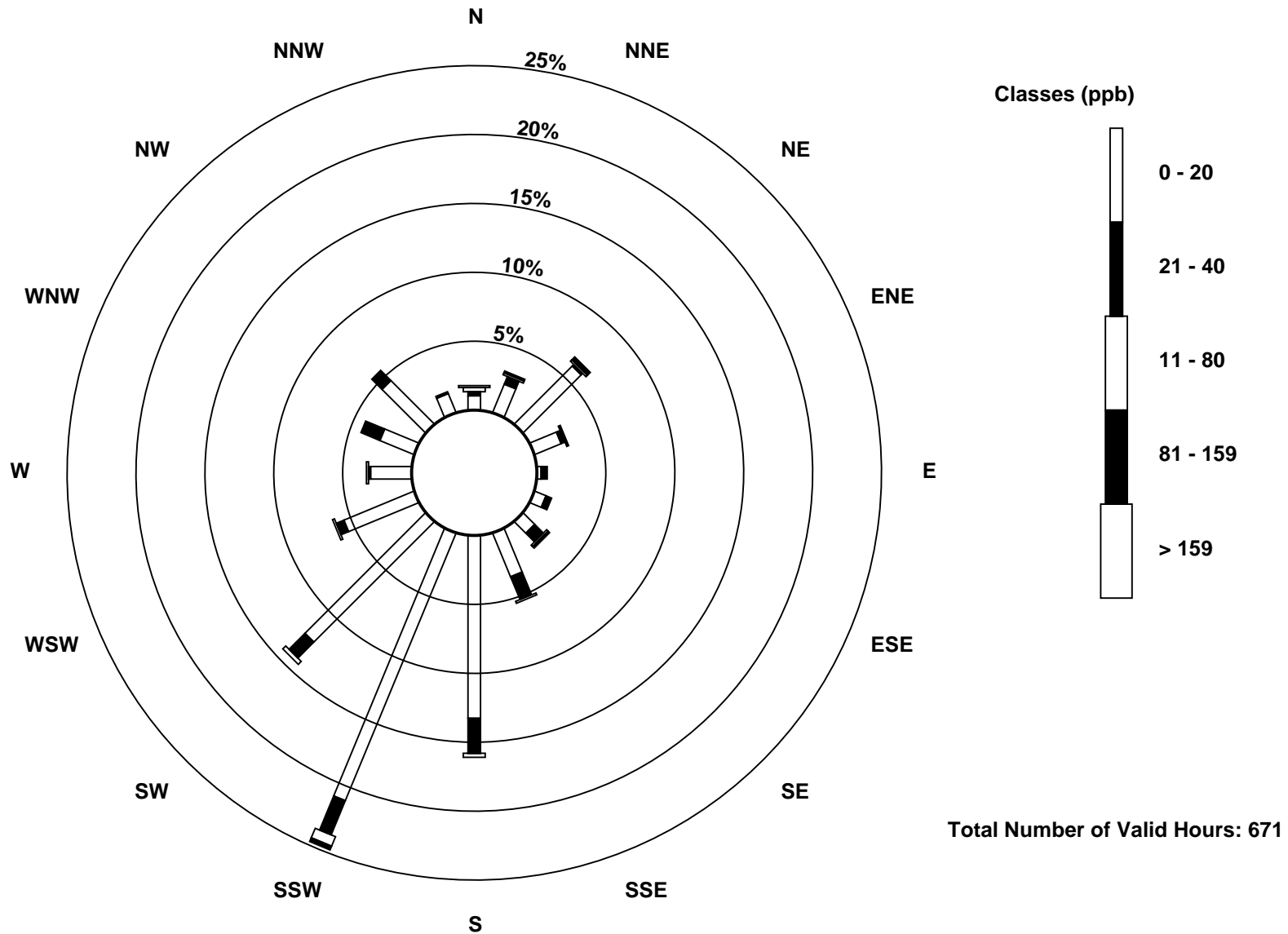
Total Number of Valid Hours: 671

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

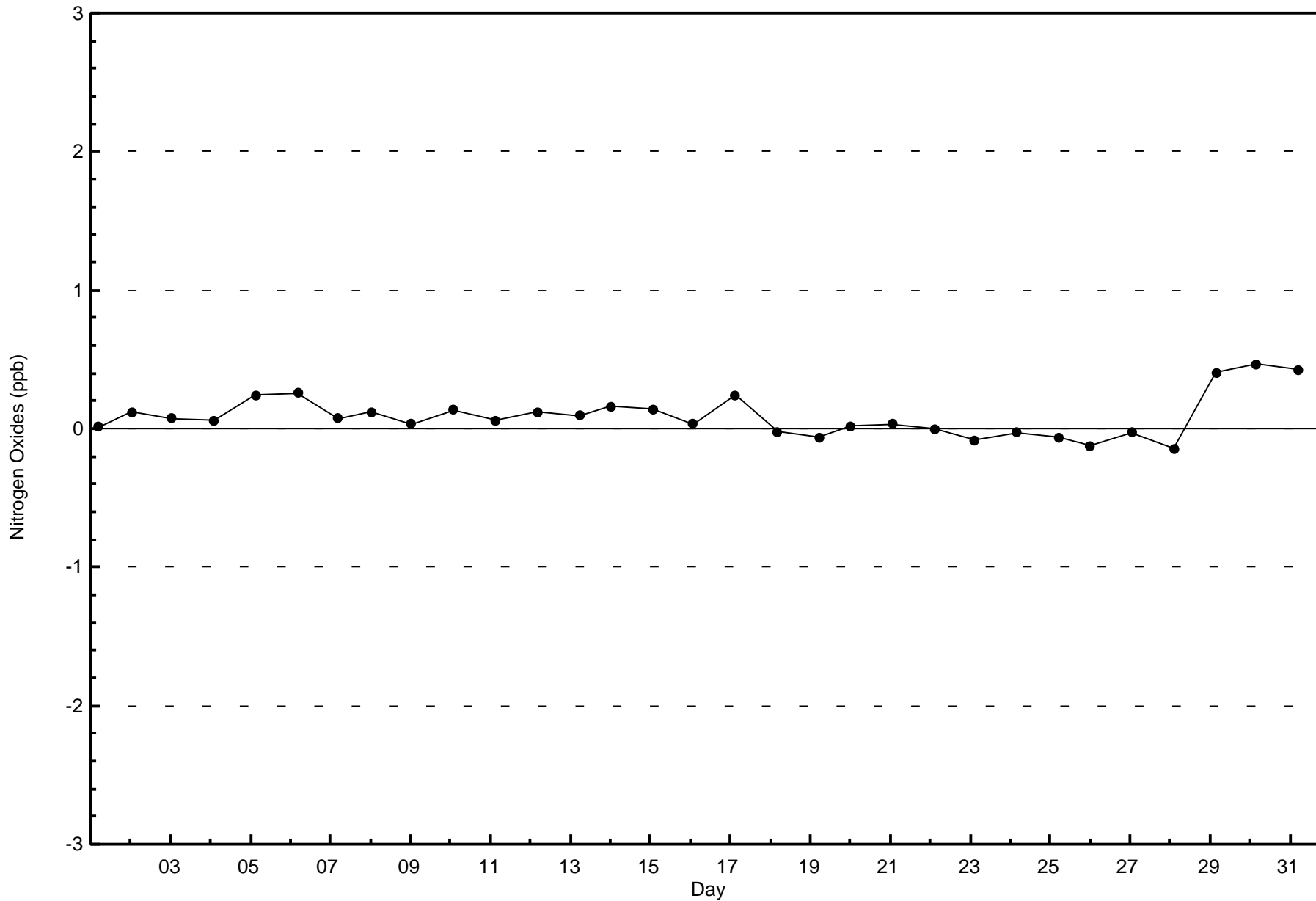
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Horizon (AMS 15)





Wood Buffalo Environmental Association  
Zero Responses

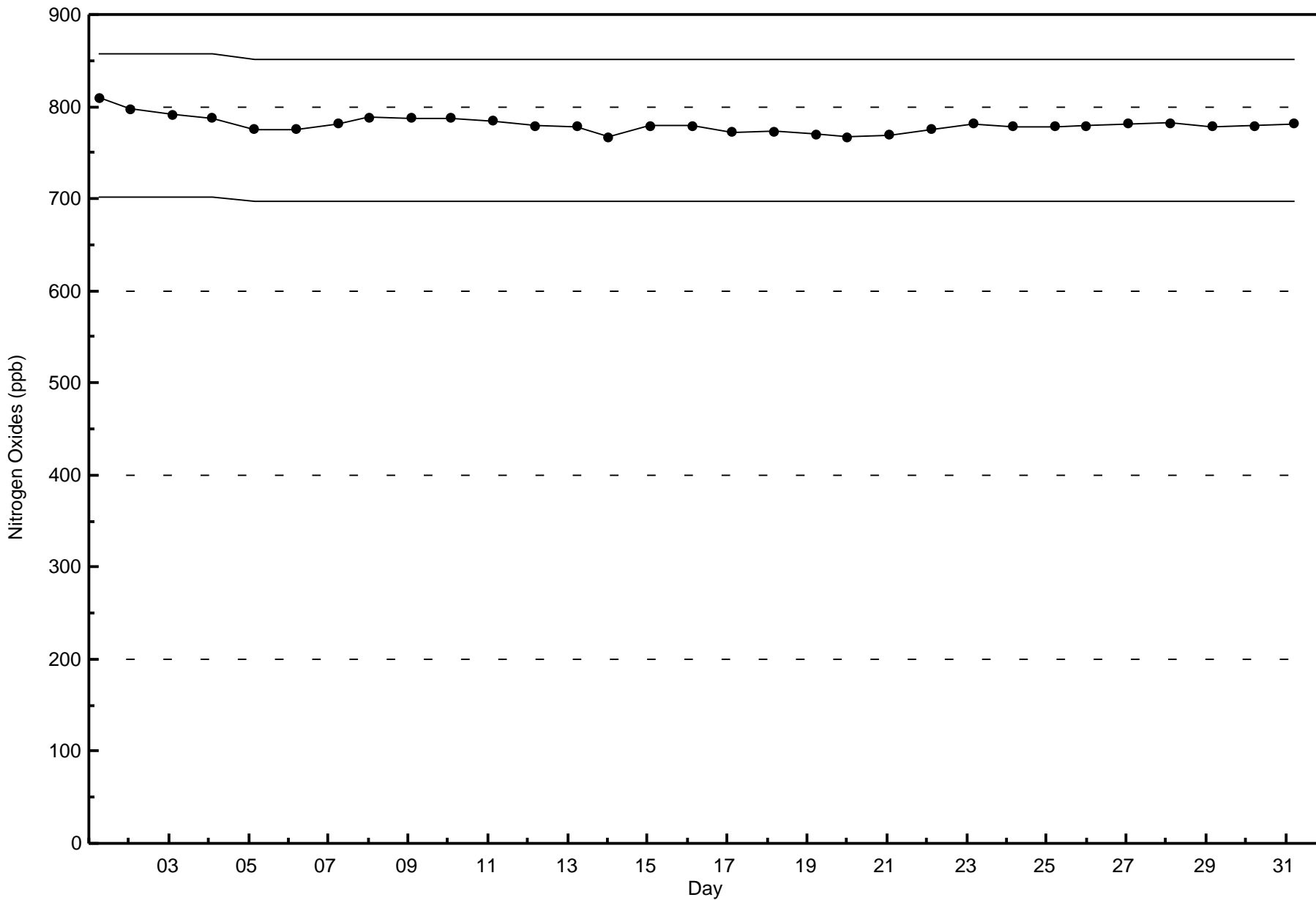
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Horizon - December 2017





**Wood Buffalo Environmental Association**  
**Span Responses**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Horizon - December 2017**



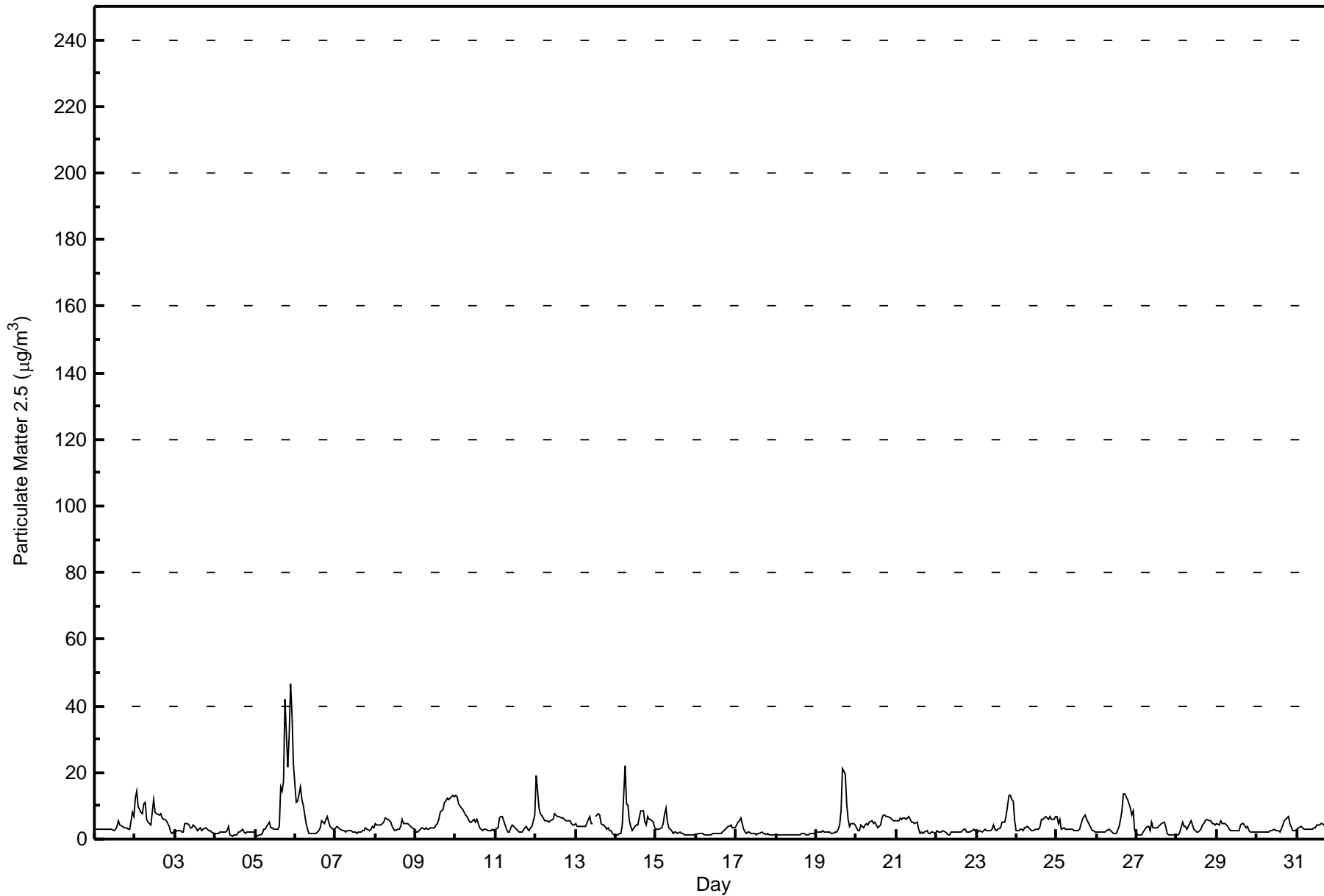




Summary of Hour Averages

Horizon - December 2017

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 46.6 µg/m <sup>3</sup> on Dec 5 22:00 Minimum Value: 1.1 µg/m <sup>3</sup> on Dec 5 02:00 Maximum Diurnal Average: 5.9 µg/m <sup>3</sup> at hour 19 Monthly Average: 4.29 µg/m <sup>3</sup>		Maximum Daily Average: 12.1 µg/m <sup>3</sup> on Dec 5 Minimum Daily Average: 1.4 µg/m <sup>3</sup> on Dec 18 Minimum Diurnal Average: 3.2 µg/m <sup>3</sup> at hour 11 Percentiles: P <sub>1</sub> = 1.1 P <sub>10</sub> = 1.6 Q <sub>1</sub> = 2.2 Median = 3.2 Q <sub>3</sub> = 5.1 P <sub>90</sub> = 7.3 P <sub>99</sub> = 21.4		Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 1 Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3.0	3.1	3.0	3.0	3.2	3.2	3.1	3.0	3.0	2.9	2.8	2.6	2.9	3.8	5.4	4.4	3.6	3.4	3.2	3.3	3.0	2.8	8.2	6.7	3.6	8.2
2-Dec	12.5	14.6	9.6	8.2	7.5	10.5	10.9	5.7	5.0	4.4	8.1	11.7	8.0	7.5	7.3	7.5	6.4	5.9	5.9	5.4	3.7	2.1	1.8	2.3	7.2	14.6
3-Dec	2.2	2.4	2.3	2.4	2.1	2.3	4.7	4.7	4.1	3.3	3.6	4.2	3.4	2.6	2.8	3.3	2.7	2.8	3.5	2.9	2.6	2.7	2.3	1.9	3.0	4.7
4-Dec	1.6	1.6	1.7	2.0	2.0	2.0	2.2	2.7	3.6	1.4	1.1	1.1	1.2	1.2	2.0	2.2	2.9	2.2	1.9	2.3	2.3	2.1	2.0	2.0	2.0	3.6
5-Dec	2.0	1.1	1.1	1.2	1.6	2.9	3.0	3.7	5.2	3.2	3.2	3.2	3.0	3.2	3.8	15.6	14.5	17.5	41.9	21.7	31.1	46.6	37.7	22.4	12.1	46.6
6-Dec	11.0	11.5	13.5	15.5	12.1	10.1	4.7	2.8	1.7	1.5	1.5	1.6	1.8	2.0	2.7	3.4	5.7	4.9	5.9	6.8	5.0	3.9	2.8	2.9	5.6	15.5
7-Dec	3.5	3.6	3.5	3.1	2.5	2.5	2.2	2.4	2.6	2.4	2.2	2.2	2.1	1.8	2.1	2.2	2.4	2.7	3.3	2.8	2.7	3.1	3.7	3.6	2.7	3.7
8-Dec	4.7	4.4	4.1	4.3	4.5	5.0	6.3	6.1	5.6	5.3	3.8	3.0	2.6	2.8	3.0	4.0	5.9	4.8	4.5	4.5	4.3	3.8	3.3	2.9	4.3	6.3
9-Dec	2.3	2.3	2.6	3.0	3.3	3.2	3.2	3.1	3.0	3.4	3.2	3.6	4.0	4.7	6.0	8.2	9.1	11.1	11.4	12.1	11.9	12.7	13.3	12.8	6.4	13.3
10-Dec	13.3	12.7	10.7	9.5	9.1	8.0	7.3	6.7	5.2	4.9	5.3	6.1	5.3	6.1	3.5	2.9	2.7	2.8	2.8	2.5	2.7	2.7	2.8	2.6	5.8	13.3
11-Dec	2.8	3.6	6.5	6.7	6.8	5.4	3.1	2.2	2.1	3.2	4.1	3.8	2.9	2.4	2.2	2.2	2.3	3.5	3.7	3.1	2.6	3.3	4.0	7.1	3.7	7.1
12-Dec	19.1	14.5	9.2	7.7	6.5	5.7	5.6	5.4	5.2	5.4	5.9	7.7	7.2	6.8	6.7	6.6	6.2	6.0	5.7	5.6	5.3	4.7	4.2	4.4	7.0	19.1
13-Dec	4.5	4.0	3.9	3.9	3.6	3.7	4.0	6.0	6.6	4.7	4.9	C	6.6	7.5	7.3	4.8	4.1	4.3	3.1	3.4	2.7	2.7	1.7	1.5	4.3	7.5
14-Dec	1.4	1.5	1.7	1.7	4.4	22.0	10.4	10.2	5.7	4.0	2.4	3.6	4.2	4.2	6.3	8.3	8.4	5.2	4.3	6.8	6.0	5.9	5.2	3.4	5.7	22.0
15-Dec	3.1	3.0	3.1	3.6	4.5	7.5	9.4	5.0	3.5	2.4	1.8	2.1	2.0	1.8	1.9	1.7	1.7	1.2	1.3	1.3	1.2	1.2	1.1	1.2	2.8	9.4
16-Dec	1.4	1.5	1.6	1.8	1.8	1.4	1.4	1.4	1.3	1.4	1.7	1.8	1.6	1.6	1.6	1.8	2.1	3.1	3.3	3.8	3.7	4.4	3.6	3.6	2.2	4.4
17-Dec	4.2	5.1	5.7	6.2	3.1	2.0	1.8	2.1	2.1	1.9	1.8	1.6	1.4	1.5	1.7	2.0	1.7	1.8	1.5	1.6	1.5	1.4	1.1	1.2	2.3	6.2
18-Dec	1.1	1.1	1.3	1.3	1.4	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.7	1.6	1.3	1.4	1.6	1.6	1.6	1.7	1.4	1.7
19-Dec	2.0	2.1	2.2	2.2	2.4	2.2	2.1	2.1	2.0	1.9	1.9	2.0	2.3	2.9	4.3	8.5	21.2	19.3	10.6	6.0	3.7	4.7	4.6	4.1	4.9	21.2
20-Dec	3.3	2.5	2.7	4.2	3.5	4.0	4.5	4.3	5.2	5.3	4.7	5.1	4.4	3.3	4.3	6.3	7.3	7.0	6.8	6.9	6.3	5.9	5.5	5.4	4.9	7.3
21-Dec	5.6	5.7	6.3	5.9	6.3	6.2	6.0	6.9	6.1	5.3	5.0	4.5	4.9	2.9	1.6	2.2	1.5	2.2	2.5	1.7	1.7	2.2	2.0	1.8	4.0	6.9
22-Dec	2.5	2.2	2.0	2.2	2.7	2.2	1.9	1.4	1.3	2.3	2.3	2.3	2.1	2.1	2.1	2.1	3.0	2.8	2.1	2.1	2.1	2.4	2.8	2.4	2.2	3.0
23-Dec	2.2	1.9	2.5	2.1	2.7	3.0	2.5	2.4	2.5	3.0	4.1	3.0	2.4	2.9	3.3	5.2	5.3	4.9	7.3	13.3	12.9	11.8	11.3	5.7	4.9	13.3
24-Dec	2.5	2.4	2.9	2.8	2.7	3.3	3.9	3.2	2.8	2.7	2.6	2.8	2.9	3.1	3.9	5.9	6.1	6.7	6.5	6.0	6.8	6.1	5.8	6.7	4.2	6.8
25-Dec	6.8	4.5	5.9	3.0	3.3	3.0	2.8	2.9	3.0	3.2	2.6	2.4	2.4	2.4	3.1	5.7	6.6	7.1	6.1	4.9	3.2	2.8	2.5	2.2	3.8	7.1
26-Dec	2.2	2.1	2.1	1.9	2.0	1.9	2.4	2.9	2.4	2.1	1.6	1.6	1.7	3.7	5.9	8.4	13.5	13.5	12.0	10.6	9.4	7.4	8.5	2.4	5.1	13.5
27-Dec	1.3	1.1	1.3	1.5	2.0	3.4	3.6	3.7	2.7	4.9	3.4	3.5	3.6	3.9	4.4	4.8	5.1	3.7	1.6	1.4	1.4	1.4	1.4	1.4	2.8	5.1
28-Dec	1.3	1.2	2.2	5.1	3.7	3.6	3.2	3.8	5.4	4.1	2.8	2.5	2.3	2.3	2.9	4.1	4.6	5.6	6.1	5.5	5.6	4.8	4.6	4.1	3.8	6.1
29-Dec	4.5	4.4	5.5	4.8	4.6	4.6	3.9	2.8	2.6	2.5	2.5	2.4	2.4	2.7	4.0	4.5	4.5	3.5	3.8	2.6	2.1	2.2	2.1	2.1	3.4	5.5
30-Dec	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.4	2.6	2.8	2.7	2.4	2.4	2.1	4.2	5.7	5.9	6.1	6.9	4.7	2.6	2.4	2.4	3.1	6.9
31-Dec	2.9	3.3	3.7	3.3	3.2	2.9	3.0	3.0	2.8	3.0	3.4	3.6	4.1	4.2	4.8	4.5	4.3	4.5	4.5	3.9	3.9	3.4	2.9	2.7	3.6	4.8
4.3 4.1 4.1 4.1 3.9 4.5 4.1 3.8 3.5 3.2 3.2 3.3 3.2 3.3 3.7 4.8 5.6 5.5 5.9 5.3 5.1 5.3 5.1 4.1																								Diurnal Average		
19.1 14.6 13.5 15.5 12.1 22.0 10.9 10.2 6.6 5.4 8.1 11.7 8.0 7.5 7.3 15.6 21.2 19.3 41.9 21.7 31.1 46.6 37.7 22.4																								Diurnal Maximum		
C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Horizon - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	582	78.33	78.33
6 - 15	148	19.92	98.25
16 - 25	9	1.21	99.46
26 - 80	4	0.54	100.00
> 81.0	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Horizon - December 2017**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	8	16	38	14	3	10	10	24	95	132	86	32	19	24	29	11	551
6 - 15	4	7	6	3	1	0	6	12	22	35	16	11	4	5	8	1	141
16 - 25	0	0	2	0	1	0	0	1	1	4	0	0	0	0	0	0	9
26 - 80	0	0	1	0	0	0	1	0	1	1	0	0	0	0	0	0	4
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	23	47	17	5	10	17	37	119	172	102	43	23	29	37	12	705

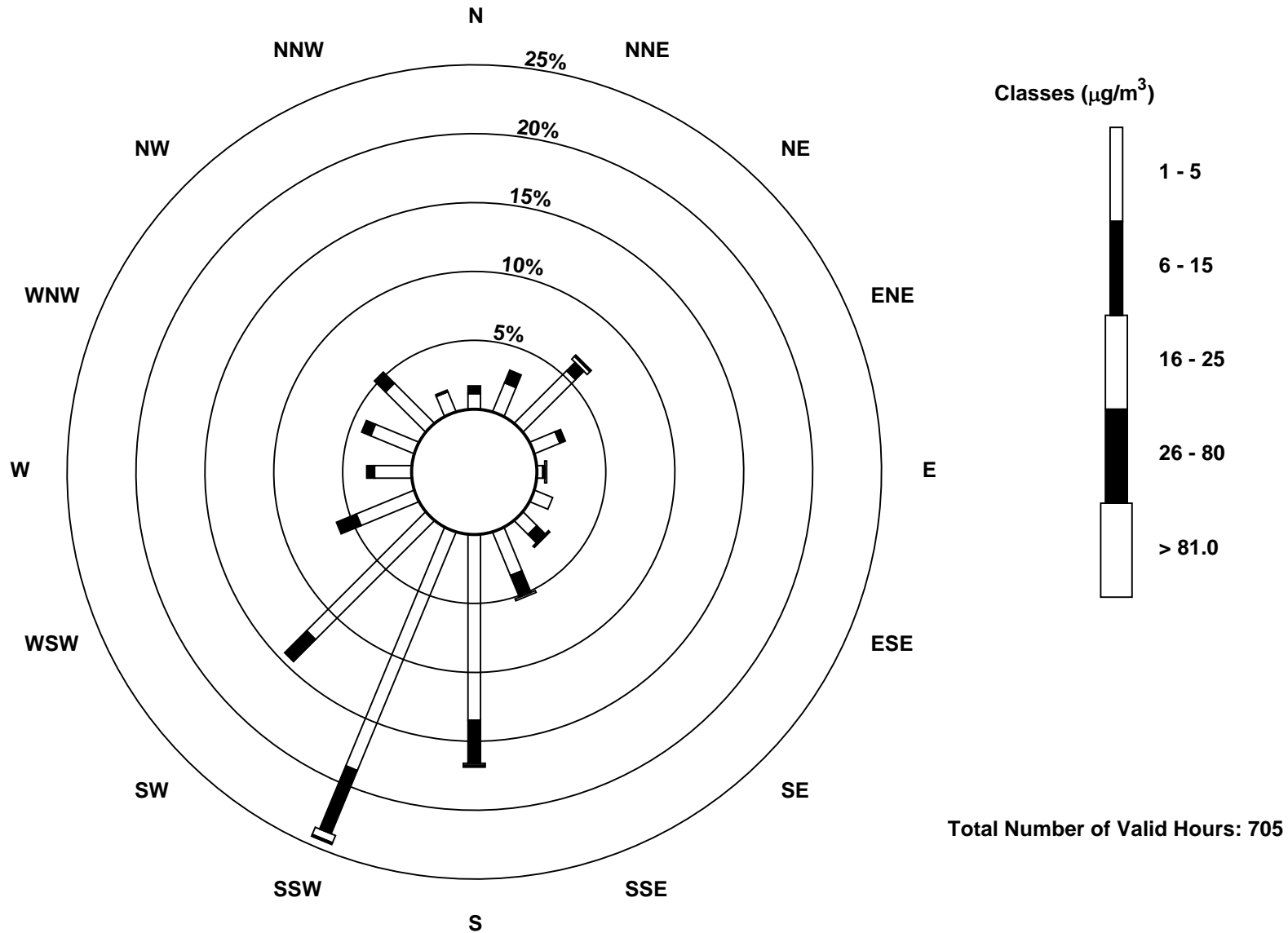
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Horizon (AMS 15)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

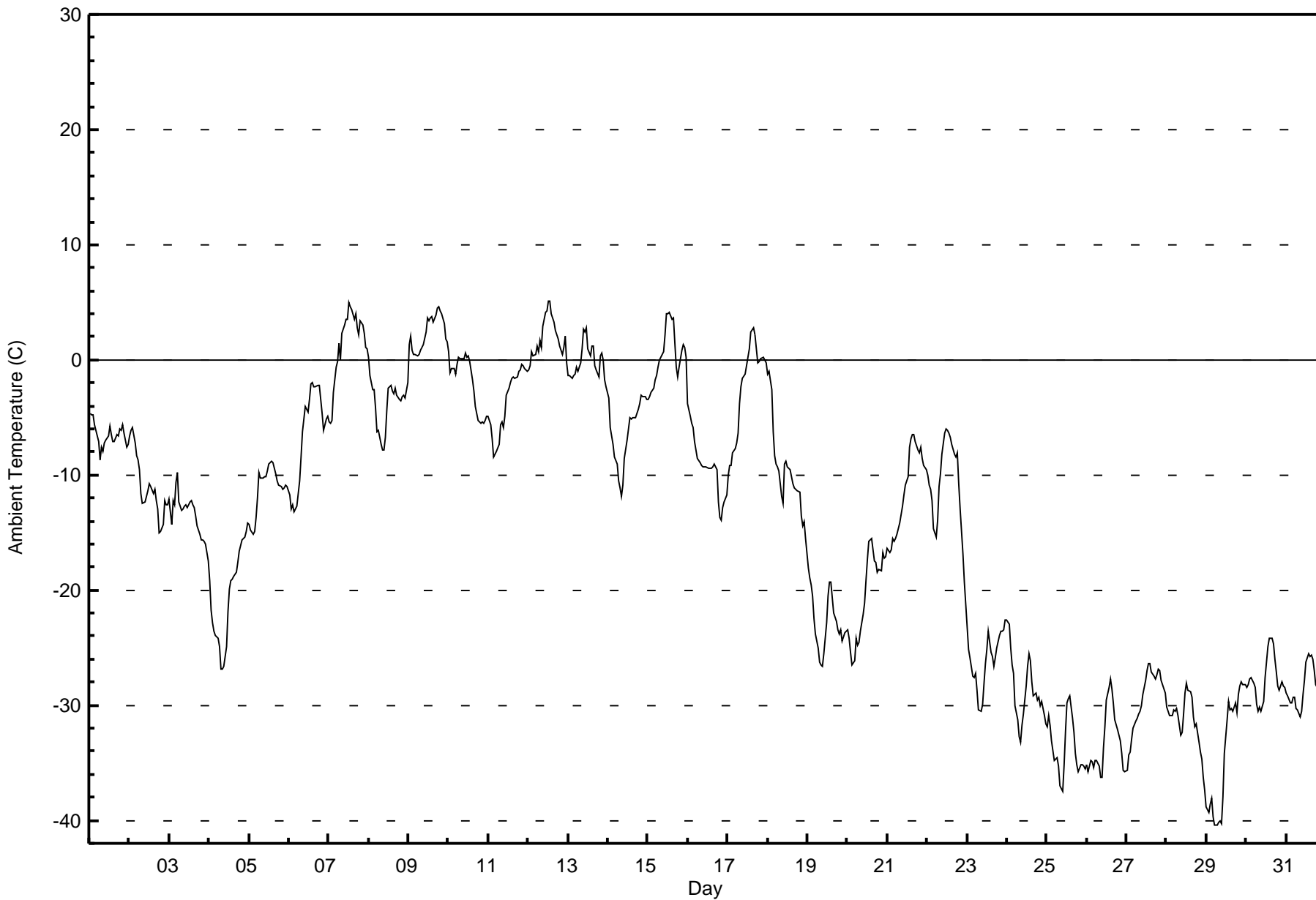
**Horizon - December 2017**

<b>Maximum Value: 5.1 C on Dec 12 13:00</b> <b>Maximum Daily Average: 2.4 C on Dec 9</b>																						<b>Hours in Service: 744</b> <b>Hours of Data: 744</b>				
<b>Minimum Value: -40.4 C on Dec 29 06:00</b> <b>Minimum Daily Average: -34.3 C on Dec 29</b> <b>Maximum Diurnal Average: -11.6 C at hour 14</b> <b>Minimum Diurnal Average: -16.0 C at hour 8</b> <b>Monthly Average: -14.15 C</b> <b>Percentiles: P<sub>1</sub> = -38.8 P<sub>10</sub> = -31.0 Q<sub>1</sub> = -26.5 Median = -11.3 Q<sub>3</sub> = -3.2 P<sub>90</sub> = 0.8 P<sub>99</sub> = 4.2</b>																						<b>Hours of Missing Data: 0</b> <b>Hours of Calibration: 0</b> <b>Percent Operational Time: 100.0</b>				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.7	-4.8	-4.8	-5.6	-6.2	-7.1	-8.7	-7.6	-8.0	-7.2	-7.0	-6.6	-5.8	-6.5	-7.1	-7.0	-6.4	-6.7	-6.0	-6.2	-5.7	-6.4	-7.6	-7.4	-6.5	-4.7
2-Dec	-6.6	-6.2	-5.9	-7.2	-8.3	-8.7	-9.5	-11.7	-12.5	-12.3	-11.8	-11.4	-10.8	-11.0	-11.6	-11.2	-12.2	-12.9	-15.0	-14.9	-14.3	-12.2	-12.6	-12.6	-11.0	-5.9
3-Dec	-12.1	-14.3	-12.2	-12.6	-10.7	-9.7	-12.4	-13.0	-12.9	-12.7	-12.6	-12.8	-12.4	-12.2	-12.6	-12.8	-13.5	-14.5	-15.2	-15.6	-15.7	-15.8	-16.0	-17.4	-13.4	-9.7
4-Dec	-19.2	-21.7	-22.9	-23.5	-23.9	-24.1	-24.9	-26.8	-26.9	-26.7	-24.9	-21.9	-19.9	-19.2	-19.1	-18.8	-18.5	-17.6	-16.6	-16.2	-15.6	-15.3	-14.9	-14.1	-20.6	-14.1
5-Dec	-14.3	-14.8	-15.1	-14.9	-13.7	-11.9	-9.7	-10.2	-10.2	-10.1	-10.2	-9.7	-9.0	-8.8	-9.0	-9.4	-9.9	-10.5	-10.9	-11.1	-11.2	-11.1	-10.9	-11.0	-11.2	-8.8
6-Dec	-11.7	-13.0	-12.6	-13.2	-12.9	-12.7	-10.5	-8.5	-6.3	-5.1	-4.1	-4.6	-3.4	-2.1	-1.9	-2.4	-2.4	-2.2	-2.3	-3.4	-4.7	-6.1	-5.1	-5.0	-6.5	-1.9
7-Dec	-5.4	-5.5	-5.3	-2.8	-0.7	-0.1	1.4	0.0	2.3	3.0	3.5	3.6	5.0	4.6	4.3	3.6	4.0	2.7	2.1	3.4	3.0	2.2	1.0	1.0	1.3	5.0
8-Dec	0.2	-1.4	-2.5	-2.6	-4.1	-6.3	-6.1	-7.4	-7.9	-7.9	-6.7	-4.4	-2.4	-2.3	-2.7	-2.9	-2.4	-3.0	-3.5	-3.6	-3.2	-3.1	-3.3	-1.9	-3.8	0.2
9-Dec	1.3	2.1	0.8	0.5	0.4	0.4	0.4	0.9	1.1	1.3	2.4	3.7	3.3	3.7	3.8	3.3	3.8	4.4	4.6	4.2	4.0	3.2	1.8	1.5	2.4	4.6
10-Dec	0.7	-1.1	-0.7	-0.7	-1.3	-0.4	0.2	0.1	0.1	0.2	0.6	0.2	0.3	-0.1	-1.8	-2.8	-4.1	-4.6	-5.2	-5.5	-5.4	-5.5	-5.3	-4.9	-2.0	0.7
11-Dec	-5.0	-5.6	-6.9	-8.5	-8.1	-8.0	-7.3	-5.7	-5.4	-5.9	-4.9	-3.1	-2.5	-2.0	-1.7	-1.5	-1.7	-1.5	-0.9	-0.9	-0.4	-0.5	-0.8	-1.0	-3.7	-0.4
12-Dec	-0.8	-0.5	0.7	0.4	0.4	1.2	0.7	1.7	1.1	2.9	4.1	4.2	5.1	5.1	4.0	3.2	2.5	2.1	1.8	1.2	0.5	1.0	2.1	-0.3	1.9	5.1
13-Dec	-1.3	-1.4	-1.6	-1.4	-1.2	-0.6	-1.0	-0.3	0.9	2.6	2.5	2.8	1.0	0.4	1.2	1.1	-0.5	-0.9	-1.5	0.3	0.5	0.0	-1.7	-2.3	-0.1	2.8
14-Dec	-3.3	-5.9	-6.6	-7.3	-8.5	-9.0	-10.6	-11.1	-11.8	-10.9	-8.6	-7.0	-6.0	-5.0	-5.1	-5.0	-5.0	-4.7	-4.3	-3.8	-3.1	-3.2	-3.2	-3.5	-6.4	-3.1
15-Dec	-3.4	-3.2	-2.9	-2.5	-1.8	-1.3	-0.7	-0.1	0.2	0.8	2.1	4.0	4.0	4.1	3.5	3.6	1.5	-0.6	-1.4	-0.6	0.8	1.4	1.1	0.3	0.4	4.1
16-Dec	-3.8	-5.0	-5.6	-5.9	-7.1	-7.9	-8.6	-9.0	-9.2	-9.3	-9.3	-9.4	-9.4	-9.4	-9.4	-9.4	-9.1	-9.5	-12.4	-13.7	-13.9	-12.8	-12.3	-11.7	-9.3	-3.8
17-Dec	-10.0	-9.2	-9.2	-8.1	-7.7	-7.2	-6.3	-3.8	-2.3	-1.6	-1.3	-0.5	0.3	1.0	2.4	2.8	2.1	1.0	-0.3	-0.1	0.1	0.2	0.0	-0.2	-2.4	2.8
18-Dec	-1.2	-1.0	-2.5	-6.2	-8.3	-9.1	-9.3	-9.7	-11.9	-12.4	-9.0	-8.8	-9.3	-9.5	-10.2	-10.8	-11.1	-11.2	-11.3	-11.5	-13.6	-14.4	-14.1	-15.5	-9.7	-1.0
19-Dec	-18.1	-18.9	-19.6	-20.6	-22.5	-23.8	-25.1	-26.3	-26.4	-26.6	-25.5	-22.8	-20.6	-19.2	-19.3	-20.7	-22.0	-22.7	-23.5	-23.8	-23.5	-24.4	-23.7	-23.6	-22.6	-18.1
20-Dec	-23.5	-24.2	-25.5	-26.5	-26.1	-24.2	-24.8	-24.5	-23.5	-22.2	-21.1	-19.2	-17.4	-15.8	-15.6	-16.5	-17.5	-17.5	-18.4	-18.2	-18.4	-16.7	-17.3	-17.1	-20.5	-15.6
21-Dec	-16.3	-16.8	-16.5	-15.6	-15.8	-15.5	-15.2	-14.1	-13.4	-12.7	-11.7	-10.8	-10.1	-7.5	-6.9	-6.5	-6.4	-7.1	-7.8	-8.1	-7.5	-8.6	-9.2	-9.5	-11.2	-6.4
22-Dec	-10.1	-10.9	-11.3	-12.3	-14.7	-15.4	-13.9	-11.0	-10.0	-8.2	-6.4	-6.0	-6.1	-6.3	-6.8	-7.4	-8.2	-8.4	-8.1	-10.7	-13.0	-16.8	-19.3	-21.2	-10.9	-6.0
23-Dec	-23.1	-25.1	-26.0	-27.5	-27.6	-27.2	-28.7	-30.4	-30.5	-29.9	-28.1	-26.4	-25.2	-23.5	-25.4	-25.8	-26.6	-25.9	-25.0	-23.9	-23.6	-23.5	-23.5	-22.6	-26.0	-22.6
24-Dec	-22.6	-22.9	-25.0	-26.5	-27.3	-30.0	-31.3	-32.8	-33.2	-31.8	-30.7	-28.3	-26.6	-25.5	-26.2	-27.9	-29.1	-29.0	-29.6	-29.3	-30.0	-29.7	-30.8	-31.6	-28.7	-22.6
25-Dec	-31.8	-30.8	-31.7	-33.1	-34.8	-34.7	-34.5	-35.3	-37.0	-37.5	-35.2	-32.2	-29.9	-29.4	-29.2	-31.2	-32.3	-34.1	-35.1	-35.8	-35.1	-35.2	-35.3	-35.5	-33.6	-29.2
26-Dec	-35.2	-35.7	-34.8	-35.0	-35.4	-34.8	-34.7	-35.3	-36.3	-36.3	-33.7	-31.8	-29.6	-28.4	-27.7	-28.5	-29.8	-31.3	-32.1	-32.6	-33.1	-34.2	-35.7	-35.8	-33.2	-27.7
27-Dec	-35.7	-34.3	-34.0	-33.0	-31.9	-31.4	-31.2	-30.8	-30.5	-30.0	-29.1	-27.8	-26.9	-26.3	-26.3	-27.2	-27.5	-27.8	-27.3	-26.9	-27.0	-27.9	-28.6	-29.0	-29.5	-26.3
28-Dec	-30.2	-30.5	-30.9	-31.0	-30.4	-30.5	-30.3	-30.9	-32.7	-32.3	-30.8	-29.0	-28.0	-28.6	-28.8	-29.4	-31.0	-31.8	-31.6	-33.2	-34.1	-34.7	-36.3	-37.3	-31.4	-28.0
29-Dec	-38.8	-39.4	-38.6	-38.1	-39.7	-40.4	-40.4	-40.2	-40.0	-40.3	-37.9	-34.2	-31.3	-29.7	-30.5	-30.2	-30.5	-29.8	-30.7	-29.1	-28.3	-28.0	-28.2	-28.2	-34.3	-28.0
30-Dec	-28.4	-28.2	-27.7	-27.6	-28.1	-28.5	-29.9	-30.5	-30.2	-30.6	-29.7	-27.6	-26.2	-24.9	-24.2	-24.2	-24.7	-26.0	-27.1	-28.4	-28.7	-28.0	-28.4	-28.5	-27.8	-24.2
31-Dec	-29.0	-29.1	-29.8	-29.8	-29.3	-29.4	-30.3	-30.4	-31.0	-30.6	-29.0	-27.8	-26.2	-25.5	-25.7	-25.7	-26.0	-27.0	-28.2	-28.7	-28.6	-28.3	-27.6	-27.8	-28.4	-25.5
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Horizon - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	258	34.68	34.68
-20 - 0	383	51.48	86.16
0 - 10	103	13.84	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Precipitation (PC) - mm**

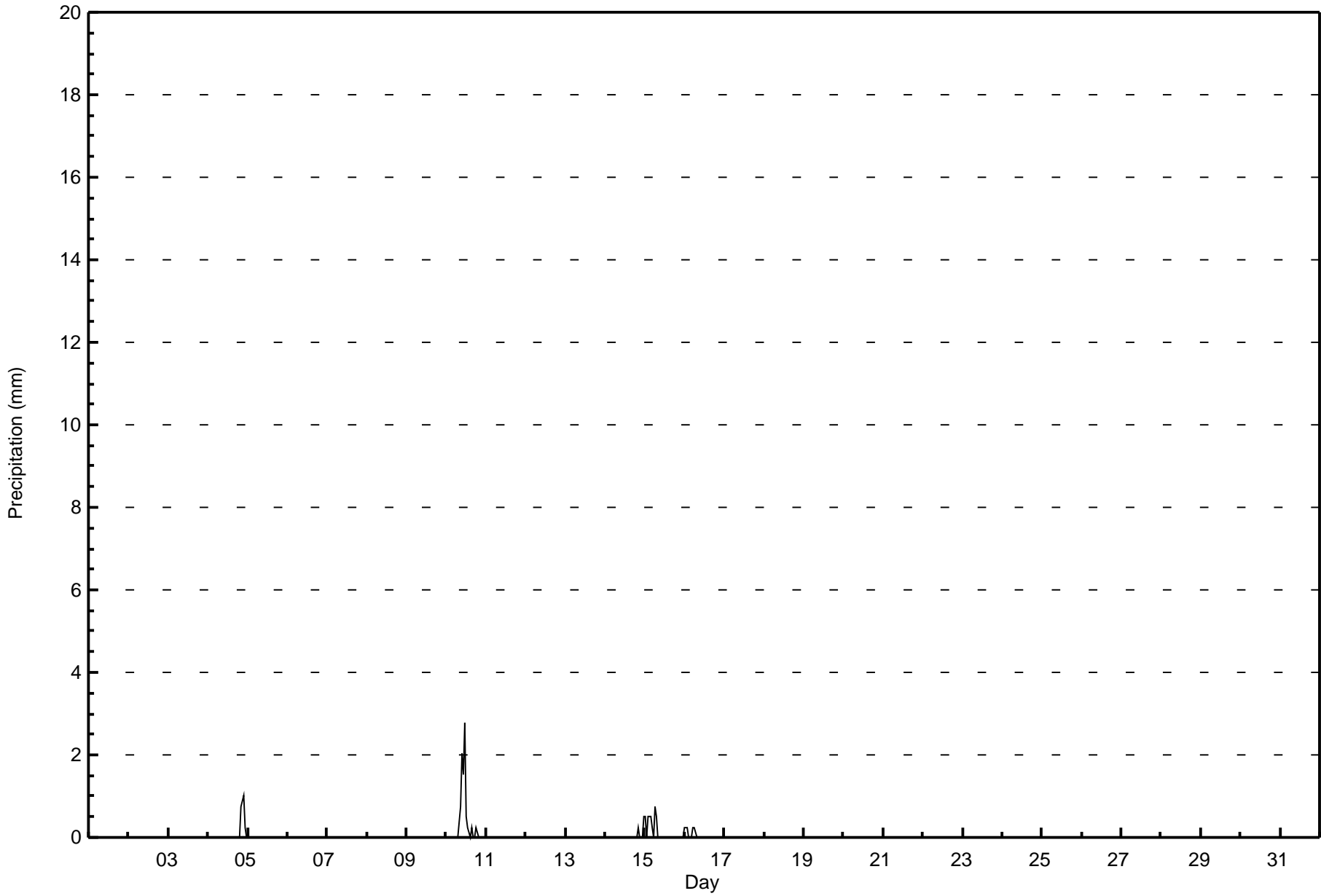
**Horizon - December 2017**

Maximum Value: 2.8 mm on Dec 10 12:00		Maximum Daily Total: 8.4 mm on Dec 10		Hours in Service: 744																							
Minimum Value: 0.0 mm on Dec 1 01:00		Minimum Daily Total: 0.0 mm on Dec 1		Hours of Data: 744																							
Maximum Diurnal Total: 2.8 mm at hour 12		Minimum Diurnal Total: 0.0 mm at hour 15		Hours of Missing Data: 0																							
Monthly Total: 15.24 mm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.8		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	0.3	0.0	0.0	0.0
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.0	1.5	2.8	0.5	0.3	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.0
15-Dec	0.5	0.0	0.5	0.5	0.3	0.0	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Dec	0.3	0.3	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	0.0	0.0	0.0	0.0
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.8	0.3	0.5	0.5	0.3	0.3	1.0	0.5	0.8	2.0	1.5	2.8	0.5	0.3	0.0	0.3	0.0	0.0	0.3	0.0	1.0	1.0	0.3	0.5	Diurnal Average	
		0.5	0.3	0.5	0.5	0.3	0.3	0.8	0.5	0.8	2.0	1.5	2.8	0.5	0.3	0.0	0.3	0.0	0.0	0.3	0.0	0.8	1.0	0.3	0.5	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

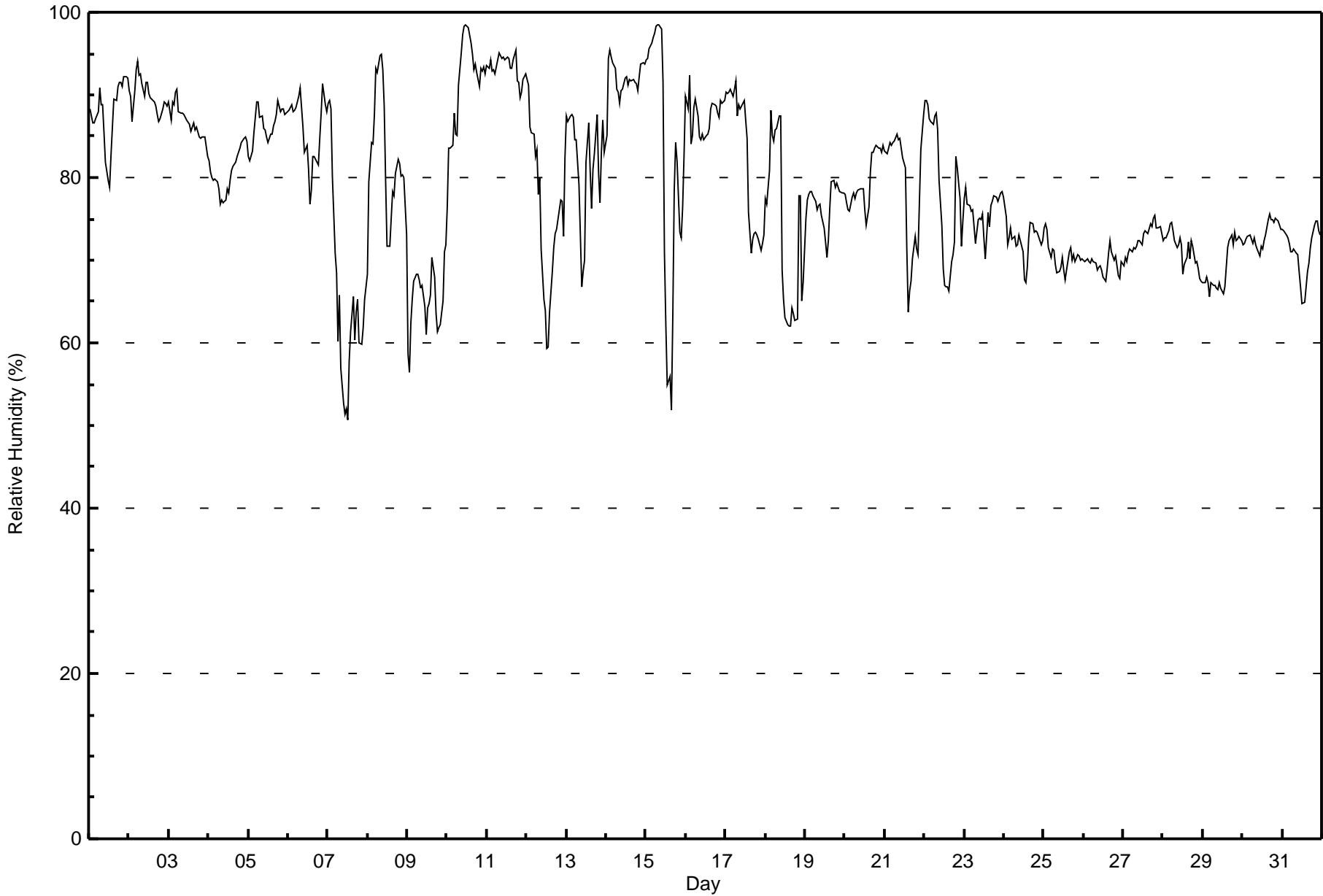
**Horizon - December 2017**

Maximum Value: 99 % on Dec 15 09:00																	Maximum Daily Average: 93.3 % on Dec 11																	Hours in Service: 744								
Minimum Value: 51 % on Dec 7 13:00																	Minimum Daily Average: 65.1 % on Dec 9																	Hours of Data: 744								
Maximum Diurnal Average: 81.7 % at hour 6																	Minimum Diurnal Average: 74.6 % at hour 14																	Hours of Missing Data: 0								
Monthly Average: 79.0 %																	Percentiles: P <sub>1</sub> = 56 P <sub>10</sub> = 67 Q <sub>1</sub> = 72 Median = 78 O <sub>3</sub> = 88 P <sub>90</sub> = 92 P <sub>99</sub> = 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-Dec	88	88	87	87	87	88	91	89	89	85	82	80	79	83	86	90	89	91	91	91	91	92	92	92	87.8	92																
2-Dec	90	90	87	91	93	94	92	93	91	90	91	91	90	90	89	89	89	88	87	87	88	89	89	89	89.9	94																
3-Dec	89	87	89	89	90	91	88	88	88	88	87	87	86	86	86	87	86	86	85	85	85	85	85	83	86.8	91																
4-Dec	82	81	80	80	80	79	79	77	77	77	77	79	78	80	81	81	82	83	83	84	84	85	85	84	80.7	85																
5-Dec	83	82	83	86	87	89	89	87	87	86	86	85	84	85	85	86	87	88	89	88	88	88	88	88	86.4	89																
6-Dec	88	88	89	88	88	88	90	91	88	86	83	84	81	77	78	83	82	82	82	85	88	91	89	88	85.7	91																
7-Dec	89	89	88	80	71	68	60	66	57	53	51	52	51	58	61	66	60	64	65	60	60	62	65	67	65.1	89																
8-Dec	68	79	84	84	88	93	93	95	95	93	89	80	72	72	75	78	78	81	82	82	80	80	80	73	82.2	95																
9-Dec	59	56	62	65	67	68	68	68	67	67	64	61	64	65	66	70	68	64	61	62	62	65	71	72	65.1	72																
10-Dec	76	84	84	84	88	85	85	91	95	97	98	98	98	98	96	95	93	94	93	91	93	93	93	92	91.5	98																
11-Dec	94	93	94	93	93	93	94	95	95	94	95	94	95	94	93	93	94	95	92	91	90	90	92	92	93.3	95																
12-Dec	92	91	86	85	85	83	83	78	80	71	65	64	59	60	64	69	71	73	74	75	77	77	73	82	75.8	92																
13-Dec	88	87	88	88	87	85	85	79	73	67	69	70	82	87	81	76	81	83	88	81	77	83	87	83	81.3	88																
14-Dec	85	94	96	95	94	93	91	90	89	91	91	92	92	91	92	92	92	92	91	91	92	94	94	94	91.9	96																
15-Dec	94	94	96	96	97	97	98	98	99	98	92	71	62	55	56	52	63	79	84	82	73	73	76	83	82.1	99																
16-Dec	90	88	92	84	85	89	90	87	85	85	85	85	85	85	86	88	89	89	89	88	87	89	89	89	87.4	92																
17-Dec	90	90	90	91	90	91	92	87	89	88	89	89	87	85	76	71	72	73	73	73	73	71	72	73	82.3	92																
18-Dec	77	77	81	88	85	84	86	86	87	87	69	65	63	62	62	62	64	64	63	63	78	78	65	67	73.5	88																
19-Dec	75	77	78	78	78	78	77	76	77	77	75	74	72	70	72	76	80	80	79	79	79	78	78	78	76.8	80																
20-Dec	78	77	76	76	78	78	77	78	78	79	79	79	76	74	77	81	83	83	84	84	84	84	83	84	79.5	84																
21-Dec	83	83	84	84	84	84	84	85	85	85	84	82	81	71	64	66	67	70	73	71	71	77	83	88	78.8	88																
22-Dec	89	89	89	87	87	86	87	88	86	80	74	69	67	67	66	70	71	72	83	81	77	72	75	75	78.3	89																
23-Dec	78	79	77	77	76	76	74	72	75	75	75	76	73	70	76	74	77	77	78	78	77	78	78	78	75.9	79																
24-Dec	78	75	72	73	74	72	73	72	72	73	72	71	68	67	69	73	75	74	73	74	73	73	72	72	72.5	78																
25-Dec	74	74	74	72	70	71	71	70	69	69	69	70	69	68	69	71	72	70	71	70	71	71	70	70	70.5	74																
26-Dec	70	70	70	70	70	70	70	70	69	69	69	69	68	68	69	71	72	71	70	71	69	68	68	70	69.6	72																
27-Dec	69	70	70	71	71	71	71	71	71	72	72	72	72	73	74	73	74	74	75	75	74	74	74	73	72.6	75																
28-Dec	72	73	73	74	74	75	74	72	72	72	73	72	68	70	70	72	70	72	72	70	70	69	68	67	71.3	75																
29-Dec	67	67	68	67	66	67	67	67	67	66	67	67	66	67	69	72	72	73	72	73	72	73	73	72	69.1	73																
30-Dec	72	72	72	73	73	72	72	73	72	71	71	72	71	72	73	75	76	75	75	75	75	75	74	74	73.1	76																
31-Dec	74	74	73	73	72	71	71	71	71	71	69	67	65	65	67	69	70	72	73	74	75	75	74	73	71.0	75																
																	80.7	81.3	81.6	81.5	81.6	81.7	81.4	81.0	80.4	79.4	77.8	76.3	75.0	74.6	75.1	76.3	77.4	78.3	78.6	78.5	78.7	79.2	79.1	79.6	Diurnal Average	
																	94	94	96	96	97	97	98	98	99	98	98	98	98	98	96	95	94	95	93	91	93	94	94	94	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Horizon - December 2017**

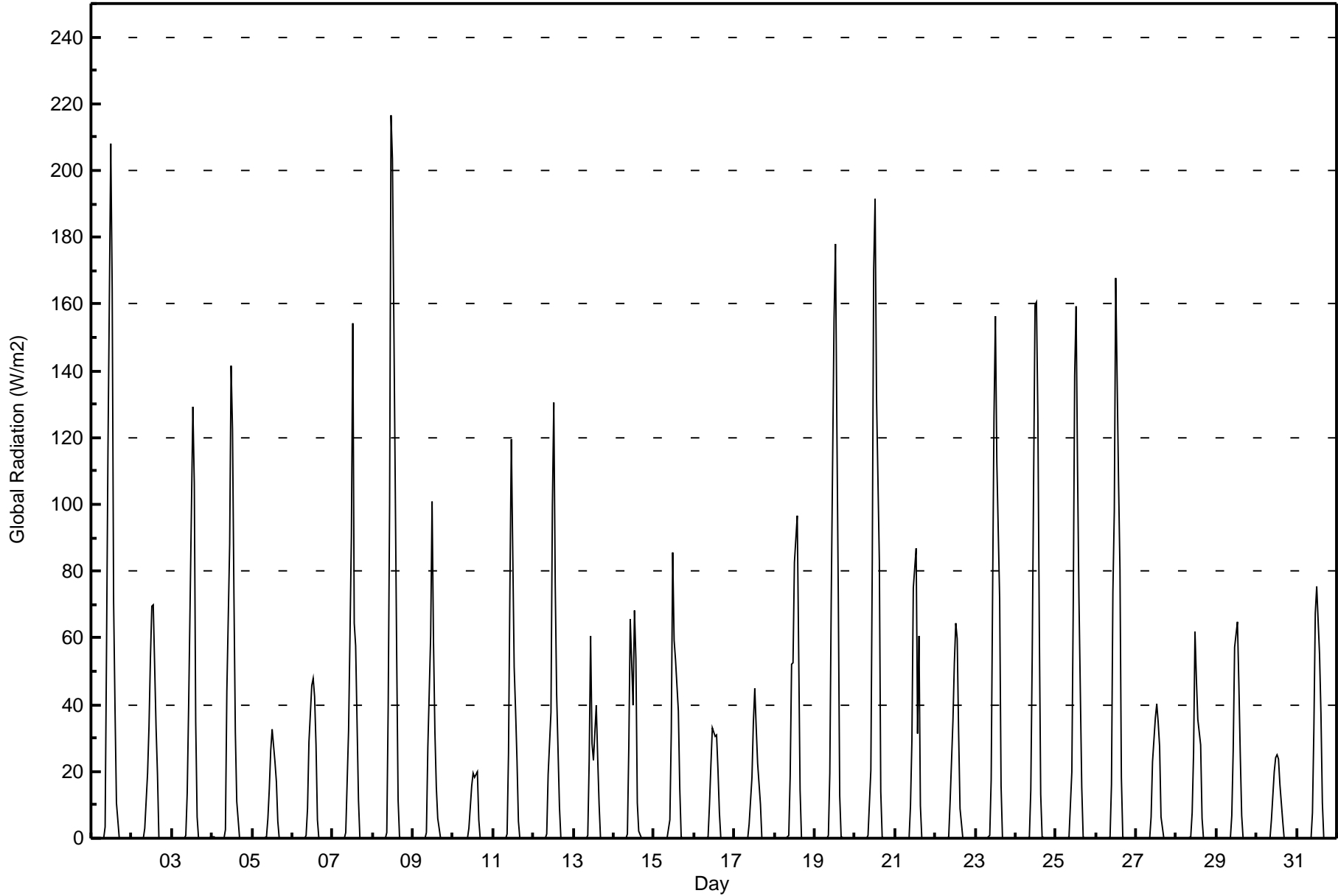
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	15	2.02	2.02
60 - 80	390	52.42	54.44
80 - 100	339	45.56	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 217 W/m2 on Dec 8 12:00																			Maximum Daily Average: 30.5 W/m2 on Dec 8						Hours in Service: 744																						
Minimum Value: 0 W/m2 on Dec 1 01:00																			Minimum Daily Average: 3.8 W/m2 on Dec 10						Hours of Data: 744																						
Maximum Diurnal Average: 93.9 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 20						Hours of Missing Data: 0																						
Monthly Average: 15.2 W/m2																			Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 11 P <sub>90</sub> = 58 P <sub>99</sub> = 165						Hours of Calibration: 0																						
																									Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	0	0	0	0	0	0	0	0	3	57	116	208	164	71	39	11	0	0	0	0	0	0	0	0	27.9	208																					
2-Dec	0	0	0	0	0	0	0	0	3	19	34	54	70	70	33	19	0	0	0	0	0	0	0	0	12.6	70																					
3-Dec	0	0	0	0	0	0	0	0	1	14	39	69	129	106	35	6	0	0	0	0	0	0	0	0	16.7	129																					
4-Dec	0	0	0	0	0	0	0	0	2	44	88	141	123	73	32	11	0	0	0	0	0	0	0	0	21.5	141																					
5-Dec	0	0	0	0	0	0	0	0	0	6	15	26	33	23	17	5	0	0	0	0	0	0	0	0	5.2	33																					
6-Dec	0	0	0	0	0	0	0	0	1	9	29	46	48	42	28	5	0	0	0	0	0	0	0	0	8.7	48																					
7-Dec	0	0	0	0	0	0	0	0	2	32	60	91	154	64	58	12	0	0	0	0	0	0	0	0	19.7	154																					
8-Dec	0	0	0	0	0	0	0	0	2	40	100	217	203	105	55	11	0	0	0	0	0	0	0	0	30.5	217																					
9-Dec	0	0	0	0	0	0	0	0	2	27	61	101	59	32	15	6	0	0	0	0	0	0	0	0	12.6	101																					
10-Dec	0	0	0	0	0	0	0	0	0	3	9	16	19	18	20	6	0	0	0	0	0	0	0	0	3.8	20																					
11-Dec	0	0	0	0	0	0	0	0	1	25	75	120	51	38	23	5	0	0	0	0	0	0	0	0	14.2	120																					
12-Dec	0	0	0	0	0	0	0	0	1	19	38	100	131	76	43	9	0	0	0	0	0	0	0	0	17.4	131																					
13-Dec	0	0	0	0	0	0	0	0	1	23	60	28	23	40	24	10	0	0	0	0	0	0	0	0	8.8	60																					
14-Dec	0	0	0	0	0	0	0	0	1	27	66	40	68	54	11	2	0	0	0	0	0	0	0	0	11.2	68																					
15-Dec	0	0	0	0	0	0	0	0	0	6	32	85	59	54	38	15	0	0	0	0	0	0	0	0	12.0	85																					
16-Dec	0	0	0	0	0	0	0	0	0	10	22	33	30	31	20	7	0	0	0	0	0	0	0	0	6.4	33																					
17-Dec	0	0	0	0	0	0	0	0	0	4	18	35	45	33	23	10	0	0	0	0	0	0	0	0	7.0	45																					
18-Dec	0	0	0	0	0	0	0	0	1	19	52	53	83	97	56	14	0	0	0	0	0	0	0	0	15.6	97																					
19-Dec	0	0	0	0	0	0	0	0	1	19	71	155	178	123	73	13	0	0	0	0	0	0	0	0	26.4	178																					
20-Dec	0	0	0	0	0	0	0	0	1	20	83	170	192	132	83	14	0	0	0	0	0	0	0	0	29.0	192																					
21-Dec	0	0	0	0	0	0	0	0	0	10	29	75	87	32	60	10	0	0	0	0	0	0	0	0	12.6	87																					
22-Dec	0	0	0	0	0	0	0	0	0	11	35	52	65	60	32	9	0	0	0	0	0	0	0	0	11.0	65																					
23-Dec	0	0	0	0	0	0	0	0	1	17	73	126	156	113	72	16	0	0	0	0	0	0	0	0	23.9	156																					
24-Dec	0	0	0	0	0	0	0	0	1	14	55	160	160	126	64	13	0	0	0	0	0	0	0	0	24.7	160																					
25-Dec	0	0	0	0	0	0	0	0	0	20	70	139	159	112	72	15	0	0	0	0	0	0	0	0	24.5	159																					
26-Dec	0	0	0	0	0	0	0	0	1	16	74	98	168	107	81	18	0	0	0	0	0	0	0	0	23.4	168																					
27-Dec	0	0	0	0	0	0	0	0	0	6	23	36	40	35	28	6	0	0	0	0	0	0	0	0	7.3	40																					
28-Dec	0	0	0	0	0	0	0	0	0	8	26	62	47	35	28	6	0	0	0	0	0	0	0	0	8.8	62																					
29-Dec	0	0	0	0	0	0	0	0	0	7	26	57	65	46	25	7	0	0	0	0	0	0	0	0	9.7	65																					
30-Dec	0	0	0	0	0	0	0	0	0	6	20	24	25	24	16	5	0	0	0	0	0	0	0	0	5.0	25																					
31-Dec	0	0	0	0	0	0	0	0	0	8	33	68	76	55	37	10	0	0	0	0	0	0	0	0	11.9	76																					
0.0																			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	17.7	49.4	86.6	93.9	65.4	40.0	9.9	0.1	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	3	57	116	217	203	132	83	19	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Horizon - December 2017

Maximum Speed: 28 km/h on Dec 18 13:00	Maximum Daily Speed Average: 14.5 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 2 04:00	Minimum Daily Speed Average: 0.6 km/h on Dec 2	Hours of Data: 706
Maximum Diurnal Speed Average: 5.5 km/h at hour 18	Minimum Diurnal Speed Average: 3.3 km/h at hour 15	Hours of Missing Data: 38
Monthly Average Velocity: 4.2 km/h 227.7 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 11 P <sub>90</sub> = 16 P <sub>99</sub> = 24	Percent Operational Time: 94.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW15	SW17	SW19	SW18	SW14	SSW13	SSW15	SW16	SW12	SW15	SSW11	SSW15	SSW15	SSW13	SSW9	SSW14	SSW13	SSW9	S11	SSW11	SW12	WSW3	NNE2	W2	SW11.6	SW19
2-Dec	NW4	N2	ENE5	NE0	NNE2	N4	N4	NNE8	NE6	N4	NNE3	SSE1	SW4	AF	AF	WSW1	SW4	SSW4	SW4	S2	WSW6	SW5	SW4	SSW4	WNW0.6	NNE8
3-Dec	SW4	S3	SSW8	S8	S6	SSW3	NNE7	NNE6	NE5	NE6	NE6	NE4	NE4	E3	ENE3	NE6	ENE4	ESE3	SSE2	AF	S2	ENE5	ENE5	E2.1	SSW8	
4-Dec	NE4	SE3	S3	SSW5	SSW5	SSW5	SSW4	SW4	SW5	SSW5	S6	S6	SSW7	S7	S6	S5	SSW4	SW4	SW4	SW4	SW5	SW5	SW7	SW9	SSW4.5	SW9
5-Dec	SSW12	SSW14	SSW14	SSE7	S7	NW5	NNE3	NNE7	NNE7	NE9	NE8	NE4	NE5	ENE6	ENE9	NE8	NE10	NE7	NE6	E4	SE3	SSW3	S5	SSE6	E2.2	SSW14
6-Dec	S7	S8	S8	S9	S8	S8	S8	S7	SSW17	SW17	SW17	SSW16	SSW15	SW13	SW12	SW15	SW18	WSW20	WSW14	SW11	SW9	SW7	SW8	SSW7	SSW10.7	WSW20
7-Dec	SW10	S8	SSW8	SW8	WSW12	WSW16	WSW13	SW10	W14	WNW14	WNW14	WNW16	W16	WSW16	SW8	WSW7	WNW12	NW7	WNW10	NW16	NW22	NW15	NW10	W6	W10.0	NW22
8-Dec	WNW2	S8	S10	S8	S5	SSW6	SSE4	S5	SSW7	SSW8	S8	S8	S10	SSW12	SSW15	SSW17	S15	SSW17	SSW15	S14	S14	S13	SSW13	SW11	SSW9.9	SSW17
9-Dec	W16	W19	WSW20	WSW21	WSW25	WSW24	WSW25	WSW28	SW11	SW13	SW13	W10	S4	SW10	SW9	SW8	WSW19	WSW19	W15	W21	WNW16	WSW13	SE6	SW10	WSW14.5	WSW28
10-Dec	SW11	SW10	SW12	SSW5	SSW7	SSW5	S5	S5	SSW6	SW8	WSW5	N6	N8	NNE6	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	---	SW12
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SSW18	SSW16	SSW15	---	SSW18
12-Dec	SSW15	SW14	SSW10	SSW13	SW11	WSW16	WSW20	WSW16	W10	W20	W18	NW10	NW7	WNW11	NW15	NW20	NW21	WNW22	NW19	NW13	NW8	NNW6	NW14	W2	W10.7	WNW22
13-Dec	SW6	SSW7	SSW8	S7	SSW9	SW11	SW12	WSW18	WNW13	NW15	NNW13	NW20	NNE11	NNW6	WNW4	W8	WNW7	WNW11	WSW8	WNW7	N10	N6	ENE6	ESE3	W5.1	NW20
14-Dec	SE3	SW3	SSW7	SSW6	SSW6	SSW5	SSW6	SSW6	S4	S6	SSW8	SSW5	S6	S6	SSW7	SSW5	WSW3	SW6	SSW7	SW11	SSW10	SSE5	SSW4	SSW5	SSW5.5	SW11
15-Dec	SSW4	SW5	SSW6	S7	SSW10	S7	AF	AF	AF	SW12	WSW12	WNW16	WNW19	WNW20	WSW8	W12	S7	S8	SSW10	SW11	W11	W8	WSW10	W5	WSW7.8	WNW20
16-Dec	NE16	NE13	NE8	NE10	NE9	NE7	ENE7	ENE6	ENE6	SE4	SE4	SSE6	SSE5	SE4	SE4	SE4	SSW3	SE1	SSW2	SW3	SW4	SSW8	SSW8	SSW7	E2.4	NE16
17-Dec	SW6	SSW5	SSW8	SSW5	SSW5	S4	SSW7	SW13	WSW12	SW8	SW13	SW14	SW13	WSW12	W12	WNW18	WNW24	WNW18	WNW12	WNW10	W14	W16	W14	W12	WSW9.5	WNW24
18-Dec	SW7	SW9	N7	NNE14	NE15	NE12	NE11	NE9	NE3	WSW5	NW18	NW26	NW28	NW26	NW22	NW25	NW23	NW16	NW21	NNW22	NE11	NE9	NNW18	NNE9	NNW11.6	NW28
19-Dec	NE6	ENE5	NE4	NE5	NE4	SW1	WSW5	WSW6	WSW6	SW8	SW7	SSW7	SSW9	SSW8	S8	S8	SSW10	SSW10	SSW9	SSW12	SW13	SW9	SW8	S6	SSW4.9	SW13
20-Dec	S8	S5	SSE5	SSE6	S9	S10	S8	S8	SSW13	S12	S14	SSW18	SSW18	SSW15	S11	S9	SSW11	SSW10	S10	S9	SSW13	SSW15	SSW9	S5	S10.2	SSW18
21-Dec	SW5	NE1	AF	S1	WSW0	SSE1	SSW3	SSE5	SSW5	SSW5	SW5	SSW7	SSW6	NNW17	NW14	WNW11	WNW16	WNW14	NW14	NW13	NW13	NNW4	SSE3	SSE4	WNW4.4	NNW17
22-Dec	ESE7	E5	ESE4	SSW5	SW3	SW7	W8	WSW9	SW9	W12	WNW13	NW14	WNW18	WNW18	NW17	NW17	NW11	NW12	NNW12	NE17	NE15	NE15	NE15	NNE13	NW5.6	WNW18
23-Dec	NE6	NNW3	N2	SSW3	SW5	SSW5	SSW5	SW2	NNE4	NNE4	ENE2	ESE2	NNE1	SSE2	E4	SW7	SW5	S5	SSE5	SSW5	SSW3	SE2	NE5	NE11	SSE0.7	NE11
24-Dec	NE11	NE12	NE15	NNE12	NNE6	ESE1	SW4	SW4	SW6	SW6	SW6	SSW6	S5	S5	ESE2	SSE5	SSW7	SSW7	SSE4	SSW4	ENE4	SSW3	E2	ENE4	SE1.0	NE15
25-Dec	NE6	NNE6	NNE6	NE3	NNW2	NNW4	NW3	WSW4	SW7	SW8	SW6	SW4	SSW6	S7	S5	SSE6	SSE7	S5	S5	SSW7	SSW8	SSW8	SSW9	S9	SSW3.3	SSW9
26-Dec	S10	S8	S9	SSW9	S8	S9	S7	S7	S6	S8	S6	S7	S5	SSE4	SSE3	SE4	S4	S4	S4	SSW3	SW2	S3	WSW1	SW7	S5.5	S10
27-Dec	SSW5	S7	S4	S5	SE2	S2	SE1	SSW4	SSW5	SSE4	S5	S5	SSE5	SSE5	SSE4	SE1	WSW1	SW6	SW8	WSW9	SW7	SSW6	SSW6	SSW6	SSW4.4	WSW9
28-Dec	SSW5	S1	NNE3	NNE5	N5	N6	NNW4	NW1	S3	SE2	ESE2	SSE2	SSW3	ENE2	ESE3	ESE3	S4	SE2	SE4	SSW4	SW4	SSW3	SW2	S2	SSE0.6	N6
29-Dec	SSE3	SSE4	SSE4	SW5	SW6	SW7	SSW7	SSW8	SSW8	S4	SSW6	S6	S6	SSE5	SSE5	S6	S8	SSW8	SSE5	S8	S8	S7	S7	S8	S5.8	SSW8
30-Dec	S8	S7	S6	SSE5	S7	S7	S6	S6	SSW5	SSW5	SSW6	S4	SSW6	S4	S5	SSE4	SE5	S7	SSW7	SSW6	SSW7	SSW11	SSW11	SSW11	S6.3	SSW11
31-Dec	SSW11	SSW12	SSW12	SSW13	SSW14	SSW14	SSW12	SSW11	SSW10	SSW10	SSW11	SSW11	SSW9	S8	SSW8	SSW11	SSW10	SW10	SSW9	SSW9	SSW10	SSW13	SSW13	SSW15	SSW11.1	SSW15

SSW3.5	SSW3.9	SSW4.0	SSW3.6	SSW4.1	SW4.5	SW4.3	SW5.0	SW4.9	SW5.3	SW5.1	WSW4.6	SW4.4	WSW4.3	SW3.3	WSW4.2	WSW5.5	WSW5.5	WSW4.5	WSW4.8	WSW4.4	SW4.2	SW3.4	SSW3.8	Diurnal Average
NE16	W19	WSW20	WSW21	WSW25	WSW24	WSW25	WSW28	SSW17	W20	W18	NW26	NW28	NW26	NW22	NW25	WNW24	WNW22	NW21	NNW22	NW22	SSW18	NNW18	SSW15	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**  
**Horizon - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 10 km/h on Dec 21 14:00	Hours of Data: 706
Minimum Value: 0 km/h on Dec 28 20:00	Hours of Missing Data: 38
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6	Hours of Calibration: 0
	Percent Operational Time: 94.9

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

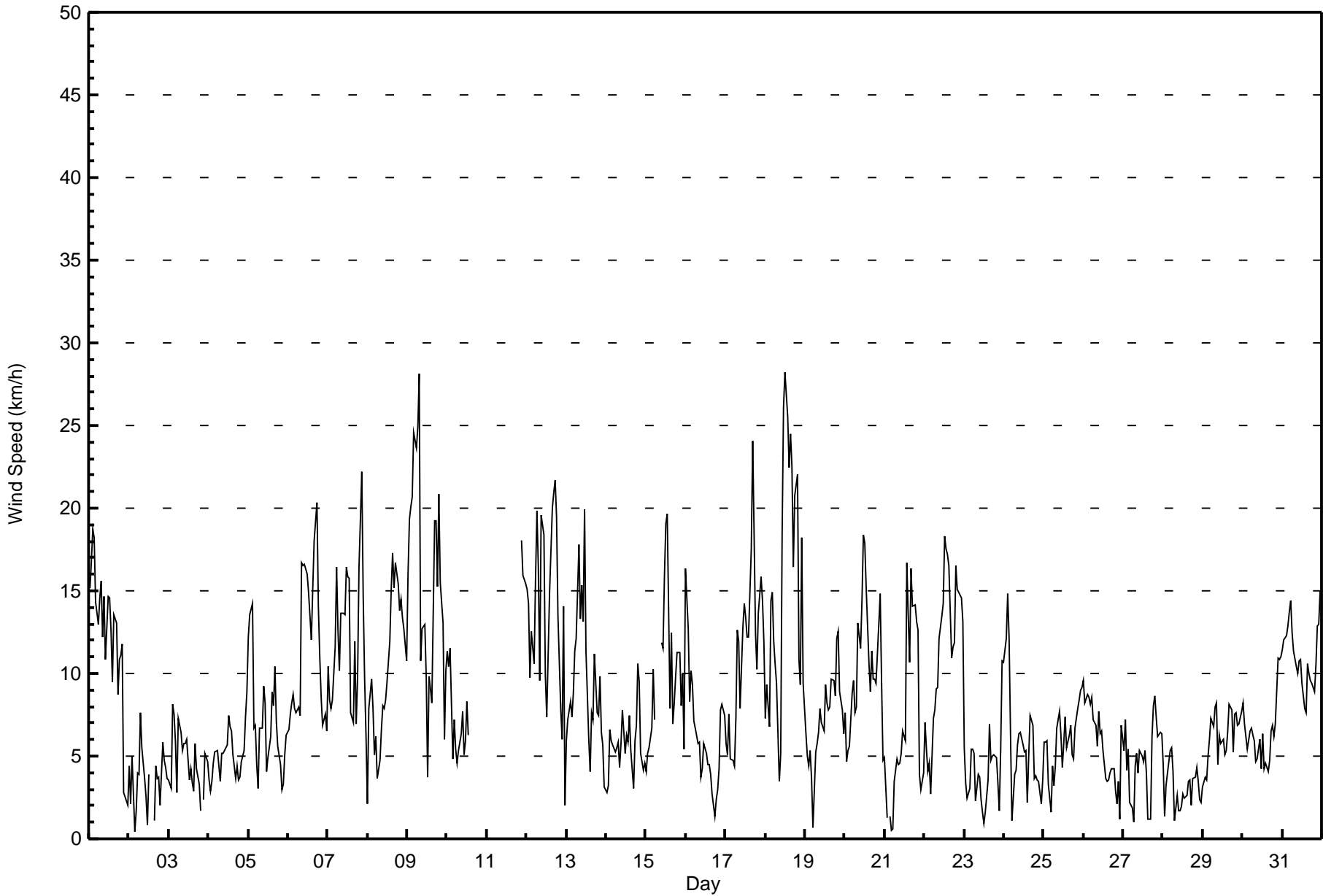
Diurnal Maximum

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Horizon - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Horizon - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	239	33.85	33.85
6 - 11	293	41.50	75.35
12 - 19	149	21.10	96.46
20 - 28	25	3.54	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Horizon - December 2017**

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	9	13	11	5	9	16	31	40	44	31	10	3	2	4	5	239
6 - 11	6	11	24	6	0	1	1	6	73	86	47	10	6	8	6	2	293
12 - 19	0	3	10	0	0	0	0	0	6	42	24	15	12	16	17	4	149
20 - 28	0	0	0	0	0	0	0	0	0	0	0	8	2	3	11	1	25
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
<b>Totals</b>	12	23	47	17	5	10	17	37	119	172	102	43	23	29	38	12	706

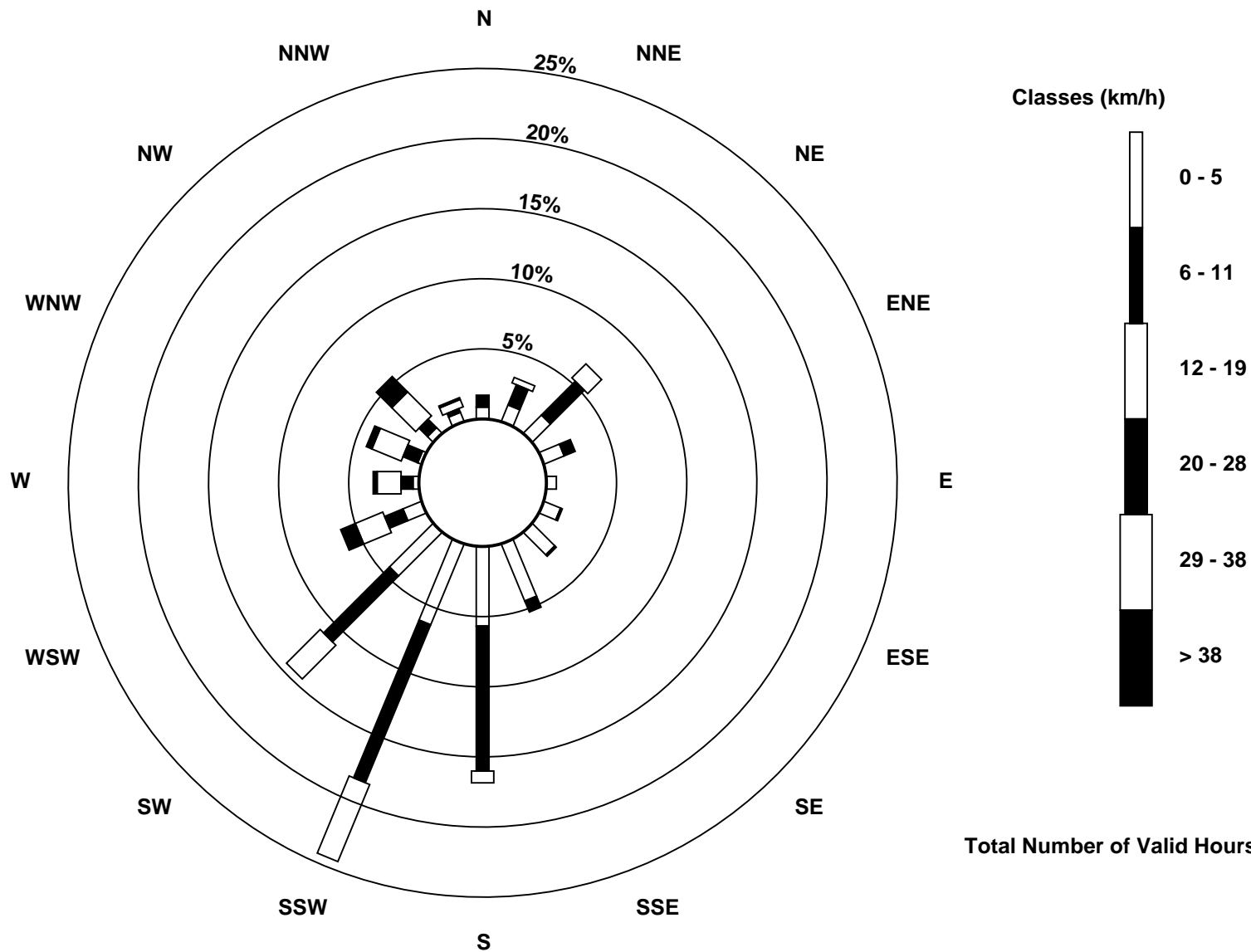
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Horizon (AMS 15)



Total Number of Valid Hours: 706



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Horizon - December 2017**

Direction of Maximum Speed: 318 deg on Dec 18 13:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 248.8 deg on Dec 9		Hours of Data:	706
Direction of Minimum Speed: 49 deg on Dec 2 04:00		Hours of Missing Data:	38
Direction of Minimum Daily Speed Average: 0.6 deg on Dec 2		Percent Operational Time:	94.9
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-Dec	228	226	228	234	227	211	199	216	215	220	212	210	211	208	200	201	208	197	189	195	214	250	24	270	214.3
2-Dec	314	355	71	49	32	357	10	33	40	356	18	153	217	AF	AF	247	216	208	214	178	240	234	234	203	293.3
3-Dec	228	174	192	189	186	197	31	32	50	35	50	44	39	52	82	74	44	74	120	157	AF	191	66	77	80.6
4-Dec	36	144	176	198	207	207	203	216	215	205	190	190	192	179	176	171	211	226	214	225	222	224	223	226	202.4
5-Dec	201	201	210	150	181	307	20	31	13	34	53	48	41	60	57	56	56	52	52	90	141	194	170	164	92.7
6-Dec	176	181	174	184	172	179	179	188	213	215	214	199	213	223	226	236	233	246	244	231	217	228	215	205	213.7
7-Dec	214	189	195	227	251	256	255	233	259	284	286	287	273	253	223	245	295	304	303	311	308	315	310	277	271.4
8-Dec	299	190	191	183	187	208	152	187	195	193	187	188	181	196	197	197	185	196	194	188	183	184	200	226	192.6
9-Dec	264	264	256	257	249	255	253	251	216	214	224	260	174	218	215	232	252	257	263	266	283	252	145	214	248.8
10-Dec	229	214	218	206	199	199	174	175	207	226	242	0	360	31	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	204	202	208	--
12-Dec	211	225	203	206	235	253	243	246	261	265	272	315	315	283	315	324	307	303	314	311	312	346	311	269	278.1
13-Dec	221	192	213	191	205	214	215	240	286	312	335	323	14	336	297	281	286	303	244	287	351	360	76	122	280.6
14-Dec	133	217	202	194	202	197	192	195	186	178	202	196	178	180	205	209	237	224	208	216	206	164	198	196	198.3
15-Dec	212	219	208	178	203	171	AF	AF	AF	227	248	293	292	288	253	259	187	181	206	226	263	264	251	260	244.2
16-Dec	37	36	35	36	38	56	67	60	58	130	129	151	166	135	139	146	207	143	213	225	220	212	204	210	88.0
17-Dec	226	211	203	210	196	189	205	226	241	218	223	228	222	243	269	295	297	297	300	282	281	275	271	271	257.2
18-Dec	236	236	3	32	42	46	44	38	55	243	314	315	318	320	322	312	311	320	322	328	40	41	343	21	335.5
19-Dec	56	64	54	43	56	236	247	244	237	228	219	197	199	192	173	171	193	202	205	212	216	224	228	189	203.4
20-Dec	182	174	149	164	178	182	178	179	198	180	188	198	200	195	181	176	192	192	191	184	193	193	197	180	187.6
21-Dec	225	40	AF	181	243	166	205	150	211	210	215	201	197	329	320	290	285	290	305	320	319	338	160	159	285.0
22-Dec	112	94	115	201	221	226	263	248	221	279	288	306	301	303	306	308	305	310	347	44	49	44	35	28	322.6
23-Dec	43	344	352	200	230	202	213	216	16	20	67	108	27	165	81	218	216	182	154	201	192	125	38	36	161.4
24-Dec	41	35	36	32	27	123	221	219	224	220	214	195	190	190	119	149	208	202	160	209	64	211	89	59	132.0
25-Dec	38	23	19	50	329	336	321	238	236	221	215	216	197	191	174	155	167	189	191	195	209	202	200	191	201.1
26-Dec	190	187	182	192	186	181	174	179	173	185	181	191	179	163	153	139	173	190	187	202	223	185	246	218	184.5
27-Dec	198	191	180	185	146	175	132	202	196	167	177	189	158	163	166	144	244	218	234	238	234	211	199	201	197.4
28-Dec	210	190	22	31	1	352	342	321	176	144	109	162	209	72	115	106	188	142	126	205	221	201	225	178	159.9
29-Dec	165	167	158	230	225	221	210	202	205	189	193	190	178	167	152	170	178	203	162	186	188	176	178	186	188.6
30-Dec	190	188	185	168	180	187	181	185	194	193	198	170	194	176	172	156	140	179	200	205	200	202	198	201	188.0
31-Dec	198	194	201	197	195	196	198	197	201	203	198	199	201	188	195	209	213	218	207	207	208	202	207	204	201.4

208.8 204.5 200.5 198.9 209.9 218.5 218.5 220.5 221.8 227.9 231.4 242.9 235.6 241.6 232.0 242.2 247.6 246.8 243.7 245.2 243.7 223.3 223.9 208.4  
 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**

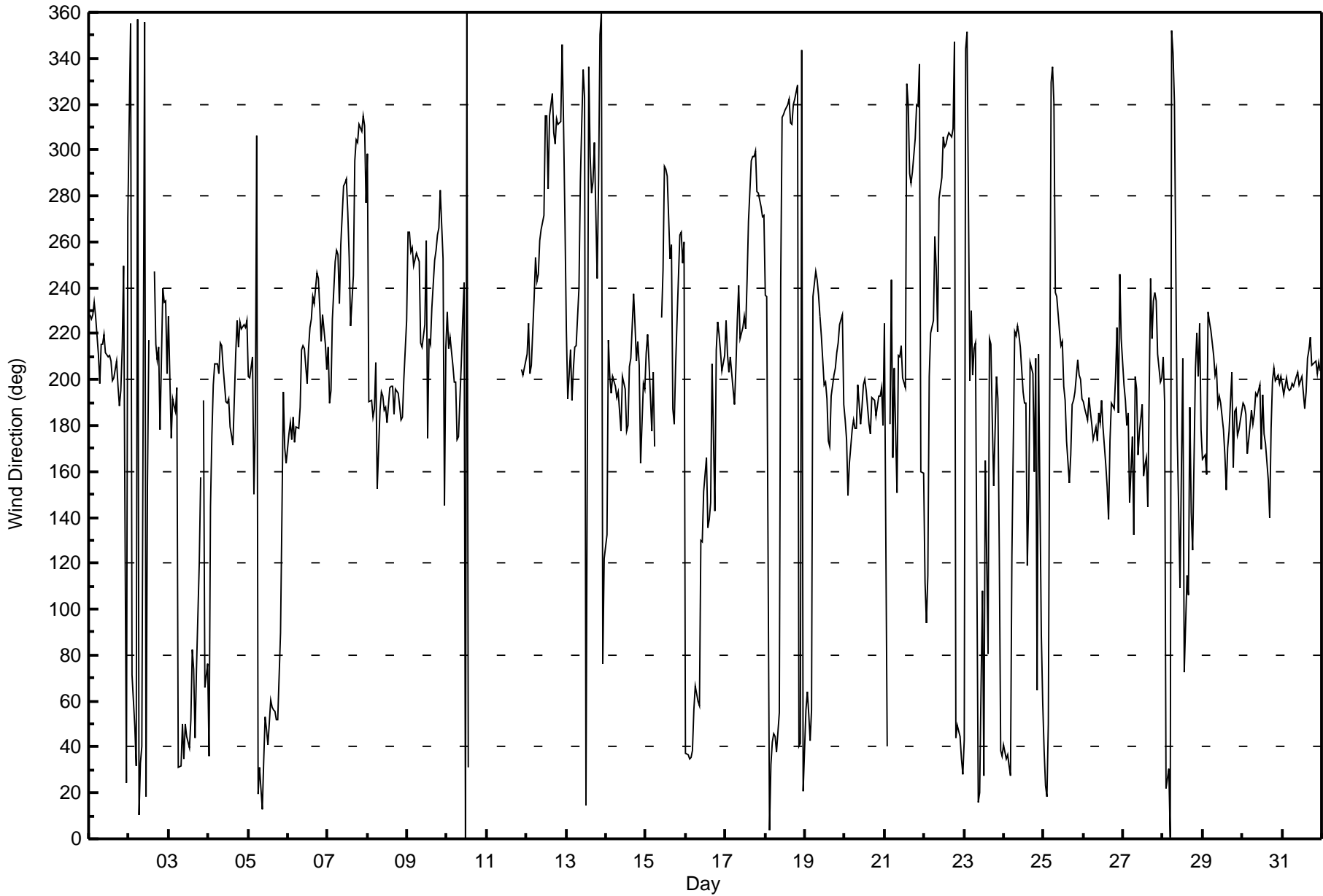
**Wind Direction (WD) - deg**  
**Horizon - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 88 deg on Dec 21 05:00		Hours in Service: 744 Hours of Data: 706 Hours of Missing Data: 38 Hours of Calibration: 0 Percent Operational Time: 94.9																							
Minimum Value: 6 deg on Dec 22 17:00																									
Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 10 Q <sub>1</sub> = 13 Median = 16 Q <sub>3</sub> = 24 P <sub>90</sub> = 47 P <sub>99</sub> = 82																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	11	11	12	12	14	19	10	13	15	14	13	11	13	13	15	14	13	13	11	11	13	65	77	71	77
2-Dec	22	56	19	72	81	17	20	12	16	24	28	84	24	AF	AF	71	16	63	43	46	11	13	15	13	84
3-Dec	30	22	9	9	26	65	17	25	22	20	14	18	29	20	17	22	16	28	36	24	AF	42	23	12	65
4-Dec	24	47	26	14	7	10	13	41	8	16	13	15	14	16	15	18	22	20	25	20	18	13	15	17	47
5-Dec	17	18	14	25	25	34	72	29	19	17	21	31	28	20	15	15	16	19	16	19	35	31	17	16	72
6-Dec	19	9	14	11	13	15	15	19	12	11	14	12	14	11	14	10	10	12	13	12	17	32	24	28	32
7-Dec	14	16	16	34	18	15	26	27	26	21	16	15	15	15	26	24	19	30	17	18	7	12	20	19	34
8-Dec	81	23	16	20	33	21	48	15	9	16	17	16	15	14	12	12	14	13	13	15	13	13	14	31	81
9-Dec	16	15	13	12	11	13	12	12	49	24	21	55	82	26	30	29	14	16	16	15	22	52	38	37	82
10-Dec	10	15	13	58	15	31	27	23	15	19	30	21	22	20	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	58
11-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	14	14	14	14
12-Dec	11	12	38	16	30	12	11	37	23	15	13	34	51	19	19	8	9	7	9	17	24	30	9	79	79
13-Dec	23	20	13	20	16	18	13	12	63	11	11	11	31	29	75	15	28	17	14	14	42	38	21	39	75
14-Dec	58	58	7	14	13	13	19	20	12	19	15	17	17	19	17	23	49	19	13	13	16	19	26	18	58
15-Dec	18	19	27	19	16	17	AF	AF	AF	10	25	14	13	19	30	18	32	12	15	15	17	14	14	72	72
16-Dec	19	18	18	18	20	17	13	15	19	23	31	22	25	22	21	21	23	83	39	27	17	11	12	13	83
17-Dec	16	24	11	14	24	15	12	13	13	17	14	12	13	16	17	12	11	11	15	19	16	14	14	14	24
18-Dec	11	12	62	18	17	17	17	18	65	34	9	8	7	9	9	11	9	9	10	27	19	21	13	39	65
19-Dec	16	13	24	16	27	79	15	10	14	10	14	15	13	17	14	11	10	10	9	9	10	16	17	15	79
20-Dec	16	26	16	20	15	11	11	11	13	13	15	13	14	14	15	13	9	15	10	11	11	13	29	44	44
21-Dec	21	80	AF	79	88	87	20	21	12	12	12	17	16	49	17	22	16	10	13	8	8	48	52	45	88
22-Dec	22	26	24	24	71	22	15	11	11	20	12	11	8	8	9	7	6	7	29	17	18	20	20	18	71
23-Dec	59	31	45	71	9	13	9	66	24	29	27	60	88	62	58	12	29	10	19	21	32	55	23	18	88
24-Dec	16	17	17	15	11	80	18	21	11	9	11	23	17	17	56	27	11	11	48	47	21	40	65	20	80
25-Dec	14	14	17	66	48	28	35	18	14	12	16	19	13	13	14	9	8	16	12	12	10	11	11	10	66
26-Dec	8	10	8	9	9	8	11	11	16	10	13	16	18	29	27	26	22	15	19	48	58	51	63	12	63
27-Dec	12	8	32	13	60	45	72	23	21	31	19	26	22	14	20	86	63	17	9	8	15	15	8	9	86
28-Dec	54	84	24	15	17	11	25	76	79	55	64	66	24	45	22	17	25	63	27	17	12	25	76	29	84
29-Dec	33	28	19	9	8	8	10	11	13	25	12	16	14	16	12	14	8	20	34	12	14	16	15	15	34
30-Dec	15	18	27	18	11	8	7	10	7	11	16	29	19	22	21	26	26	18	9	12	15	11	10	11	29
31-Dec	11	10	11	10	12	12	11	12	13	13	14	14	15	16	13	14	14	9	11	10	11	13	14	14	16
81 84 62 79 88 87 72 76 79 55 64 84 88 62 75 86 63 83 48 48 58 65 77 79																									
Diurnal Maximum																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Horizon - December 2017**







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Horizon	Station number:	AMS 15
Calibration Date:	December 4, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:09	End time (MST):	15:21
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>50.9</u>	ppm	Cal Gas Exp Date	May 22, 2020
Cal Gas Cylinder #	<u>EY0000368</u>			
Calibrator Make/Model	Teledyne API T700		Serial Number	1223
ZAG Make/Model	Teledyne API 701		Serial Number	1004

### Analyzer Information

Analyzer make: Thermo 43i

Analyzer serial #: 710321322

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 1000 ppb		PMT voltage	-622	-622
Calculated slope	1.001737	0.999732	Lamp voltage	878	876
Calculated intercept	-1.600325	-0.259327	Pressure	715.1	714.8
Analyzer Background	19.0	19.4	Flow	0.557	0.557
Analyzer Coefficient	0.956	0.954	Intensity	90	90

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5080	0.0	0.0	0.5	----
as found span	5012	75.8	758.3	757.9	1.001
calibrator zero	5080	0.0	0.0	0.1	----
high point	5012	75.8	758.3	759.1	0.999
second point	5045	37.8	378.5	377.8	1.002
third point	5070	18.8	188.0	189.3	0.993
as left zero	5080	0.0	0.0	0.2	----
as left span	5012	75.8	758.3	759.8	0.998
Average Correction Factor					0.998
Corrected As found	757.40	Previous response	758.61	*% change	0.2%

\* = > +/-5% change initiates investigation

#### Notes:

Sample inlet filter replaced after as founds. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

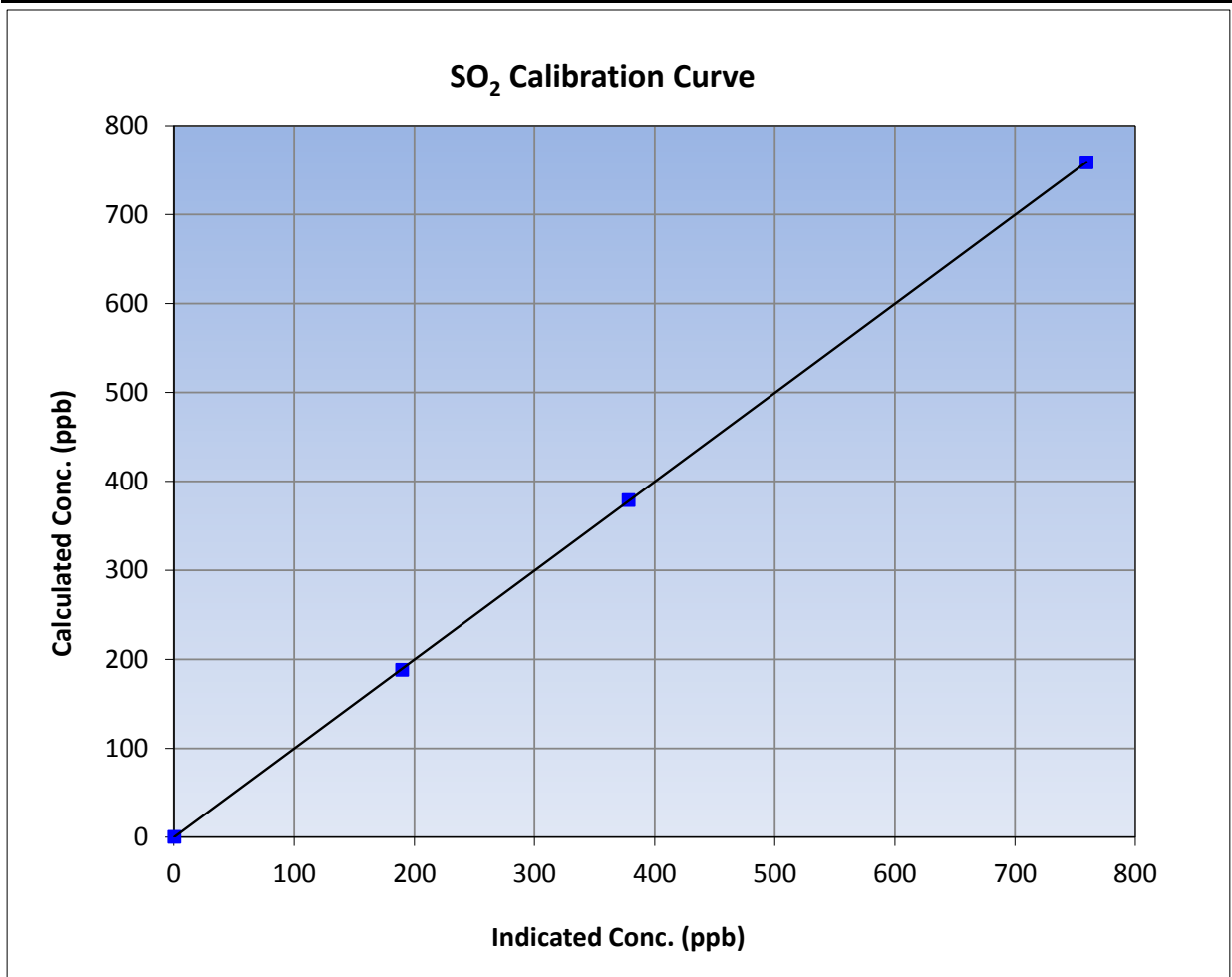
Version-03-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 13, 2017
Station Name	Horizon	Station Number	AMS 15
Start Time (MST)	11:09	End Time (MST)	15:21
Analyzer make	Thermo 43i	Analyzer serial #	710321322

### Calibration Data

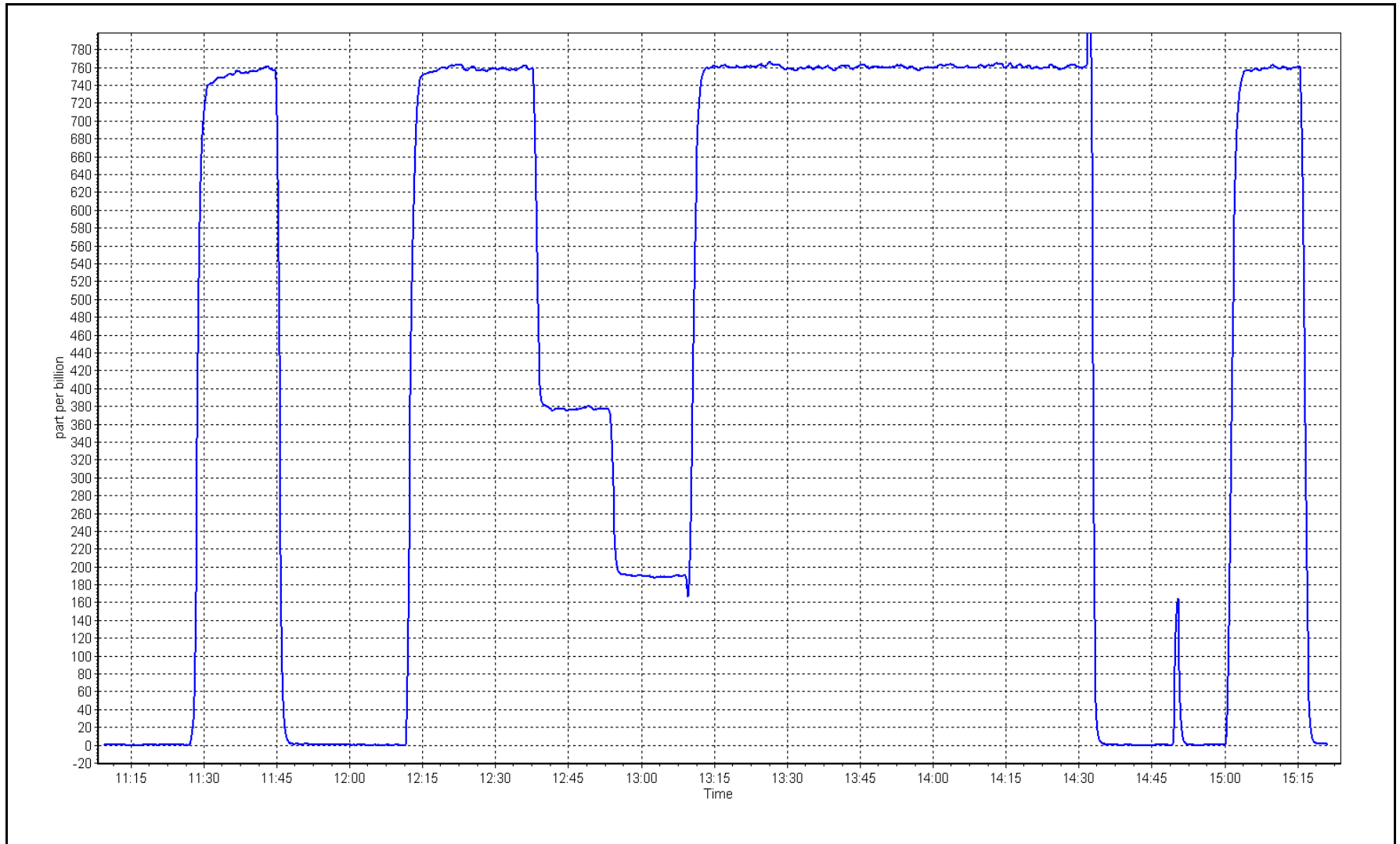
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999993	≥0.995
758.3	759.1	0.9990	Slope	0.999732	0.90 - 1.10
378.5	377.8	1.0019	Intercept	-0.259327	+/-30
188.0	189.3	0.9934			



SO2 Calibration Plot

Date: December 4, 2017

Location: Horizon





# Wood Buffalo Environmental Association

## TRS Calibration Report

Version-11-2017

### Station Information

Station Name:	Horizon	Station number:	AMS 15
Calibration Date:	December 13, 2017	Last Cal Date:	November 22, 2017
Start time (MST):	10:15	End time (MST):	13:42
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>4.95</u>	ppm	Cal Gas Exp Date	February 19, 2019
Cal Gas Cylinder #	<u>LL119538</u>			
Calibrator Make/Model	API T700		Serial Number	1223
ZAG Make/Model	API T701		Serial Number	1004

### Analyzer Information

Analyzer make: Thermo 43i-TLE		Analyzer serial #: 11516680032		
Converter Make: CDN-101		Converter serial #: 531		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-685
Calculated slope	0.998303	1.000396	Lamp voltage	990
Calculated intercept	-0.363049	-0.173918	Pressure	671.2
Analyzer Background	2.42	2.53	Flow	0.422
Analyzer Coefficient	1.153	1.133	Intensity	91
			Converter temp	800

### TRS Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5070	0.0	0.0	0.1	----
as found span	5006	80.5	78.3	80.1	0.978
calibrator zero	5070	0.0	0.0	0.0	----
high point	4999	80.6	78.5	78.6	0.999
second point	5042	40.1	39.1	39.3	0.994
third point	5068	20.0	19.5	19.8	0.983
as left zero	5070	0.0	0.0	0.0	----
as left span	4990	80.6	78.7	78.1	1.007
SO2 Scrubber Check	5005	78.1	768.2	0.8	----
Date of last scrubber change:		22-Nov-17	Average Correction Factor		0.992
Corrected As found	80.00	Previous response	78.84	*% change	-1.5%

\* = > +/-5% change initiates investigation

Notes:

Changed inlet filter after asfinds. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## TRS Calibration Summary

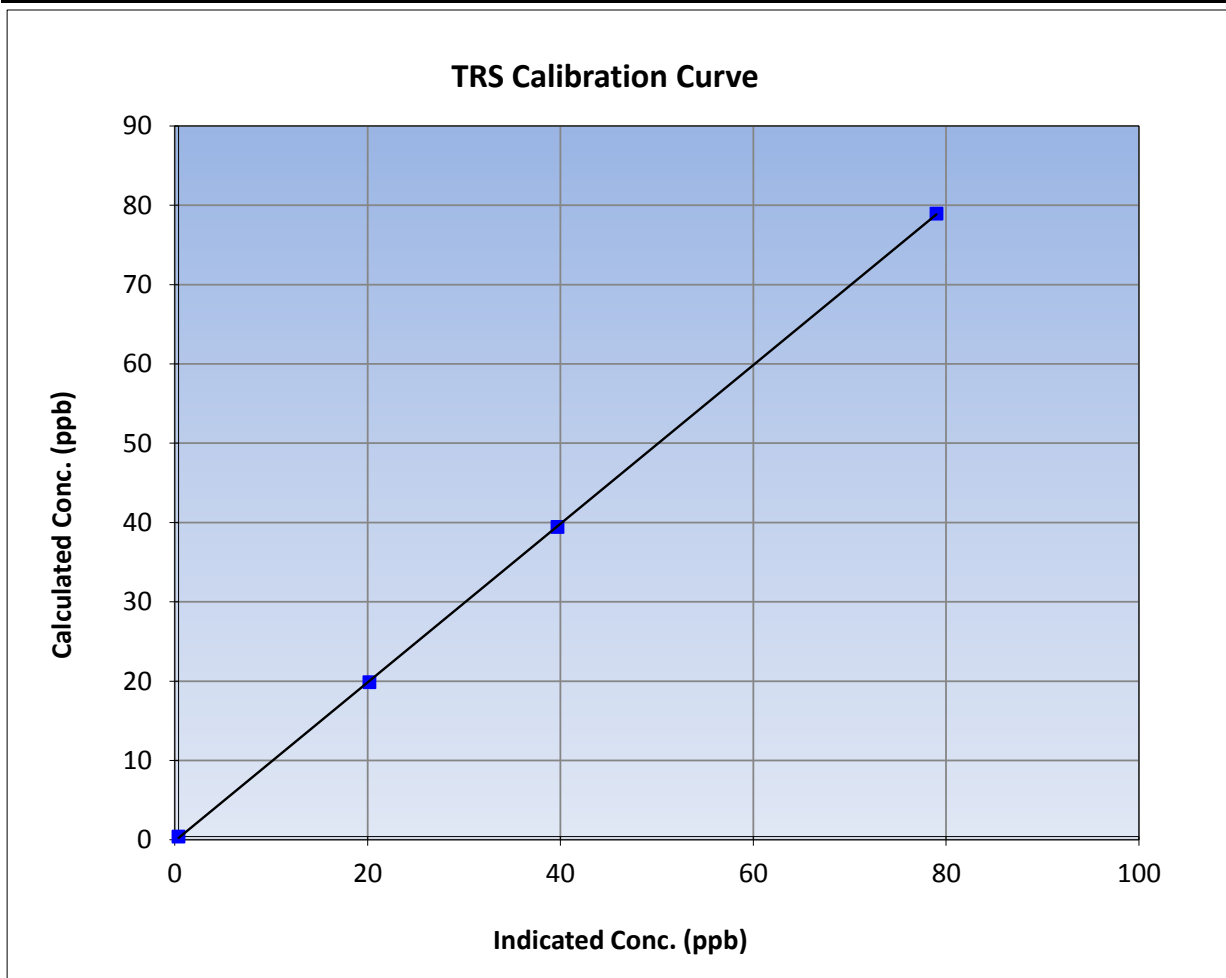
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 22, 2017
Station Name	Horizon	Station Number	AMS 15
Start Time (MST)	10:15	End Time (MST)	13:42
Analyzer make	Thermo 43i-TLE	Analyzer serial #	11516680032

### Calibration Data

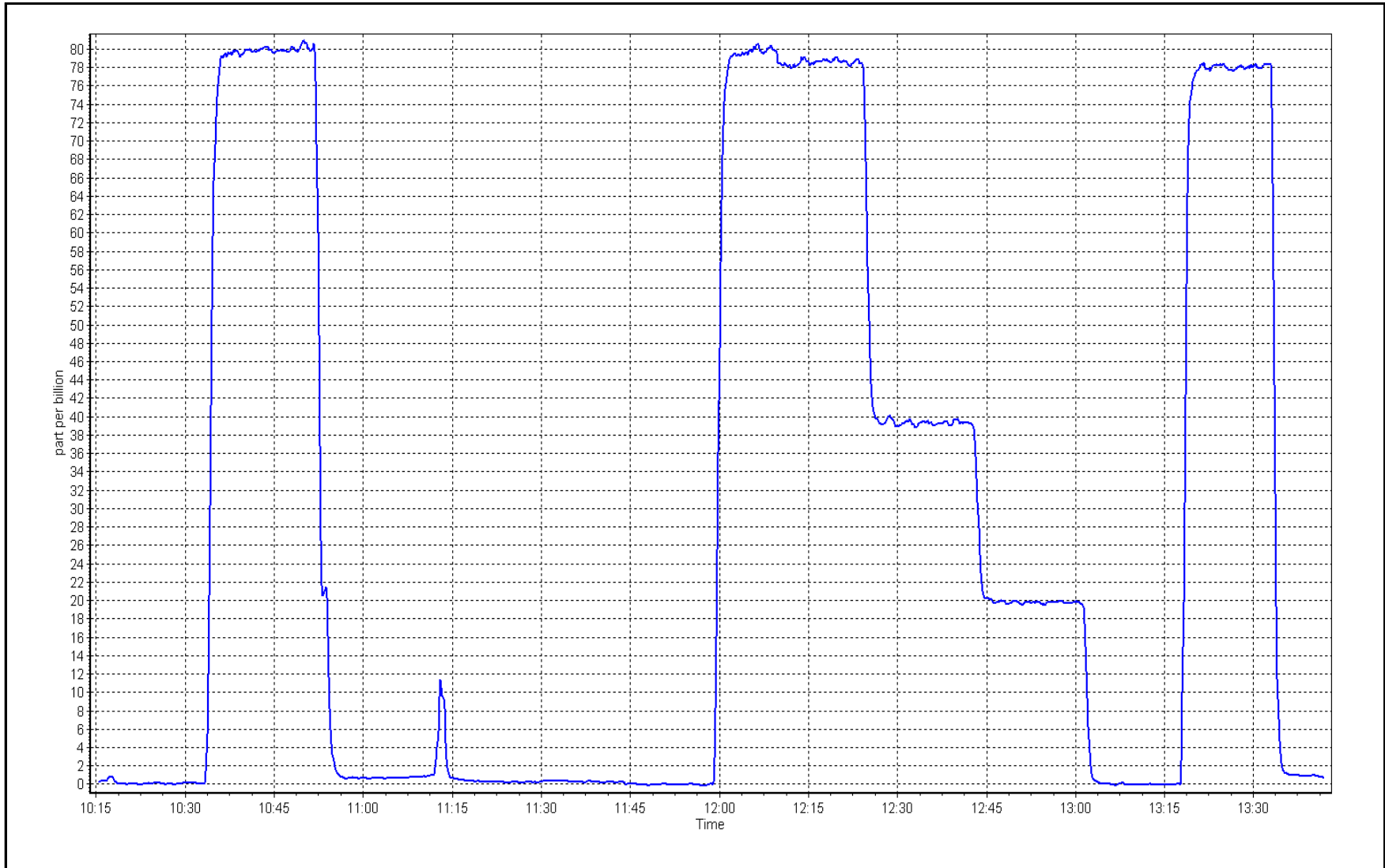
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999978	≥0.995
78.5	78.6	0.9993			
39.1	39.3	0.9938	Slope	1.000396	0.90 - 1.10
19.5	19.8	0.9827			
			Intercept	-0.173918	+/-3



TRS Calibration Plot

Date: December 13, 2017

Location: Horizon





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Horizon	Station number:	AMS 15
Calibration Date:	December 4, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:09	End time (MST):	15:17
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000368	Cal Gas Expiry Date	May 22, 2020
CH4 Cal Gas Conc.	<u>506.0</u> ppm	CH4 Equiv Conc.	1067.0 ppm
C3H8 Cal Gas Conc.	<u>204.0</u> ppm	Station temp.	Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG Make/Model	Teledyne API 701	Serial Number	1004

### Analyzer Information

Analyzer make:	Thermo 51-LT	Analyzer serial #:	1327059295	
	<b><u>Start</u></b>	<b><u>Finish</u></b>	<b><u>Start</u></b>	<b><u>Finish</u></b>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-300	-300
Calculated slope	1.003073	Sample pressure	8.8	8.8
Calculated intercept	-0.025381	Fuel pressure	26.3	26.3
Analyzer Background	2.28	Air pressure	38.0	38.0
Analyzer Coefficient	3.235	Flame temperature	155.8	155.8

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5080	0.0	0.00	0.00	----
as found span	5008	75.8	15.91	16.12	0.987
calibrator zero	5080	0.0	0.00	0.00	----
high point	5008	75.8	15.91	15.84	1.004
second point	5040	37.8	7.94	7.97	0.997
third point	5070	18.8	3.94	4.00	0.985
as left zero	5080	0.0	0.00	0.07	----
as left span	5008	75.8	15.91	15.94	0.998
Average Correction Factor					0.995
Corrected As found	16.12	Previous response	15.89	*% change	-1.4%

\* = > +/-5% change initiates investigation

Notes:

Sample inlet filter replaced after as founds. Adjusted the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## THC Calibration Summary

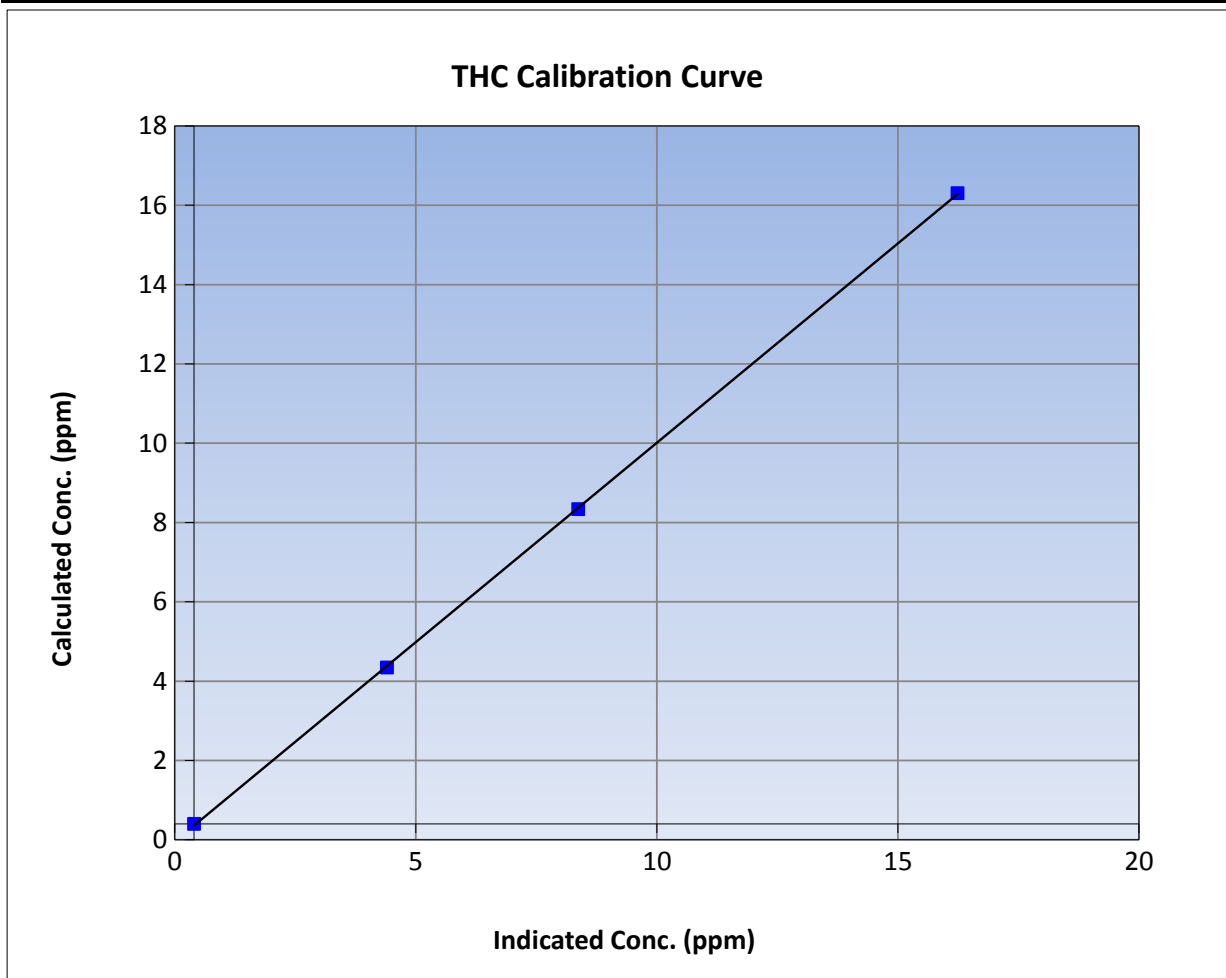
Version-03-2017

### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 13, 2017
Station Name	Horizon	Station Number	AMS 15
Start Time (MST)	8:47	End Time (MST)	15:17
Analyzer make	Thermo 51-LT	Analyzer serial #	1327059295

### Calibration Data

Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999966	≥0.995
15.9	15.8	1.0044			
7.9	8.0	0.9967	Slope	1.005507	0.90 - 1.10
3.9	4.0	0.9852			
			Intercept	-0.042055	+/-1.5

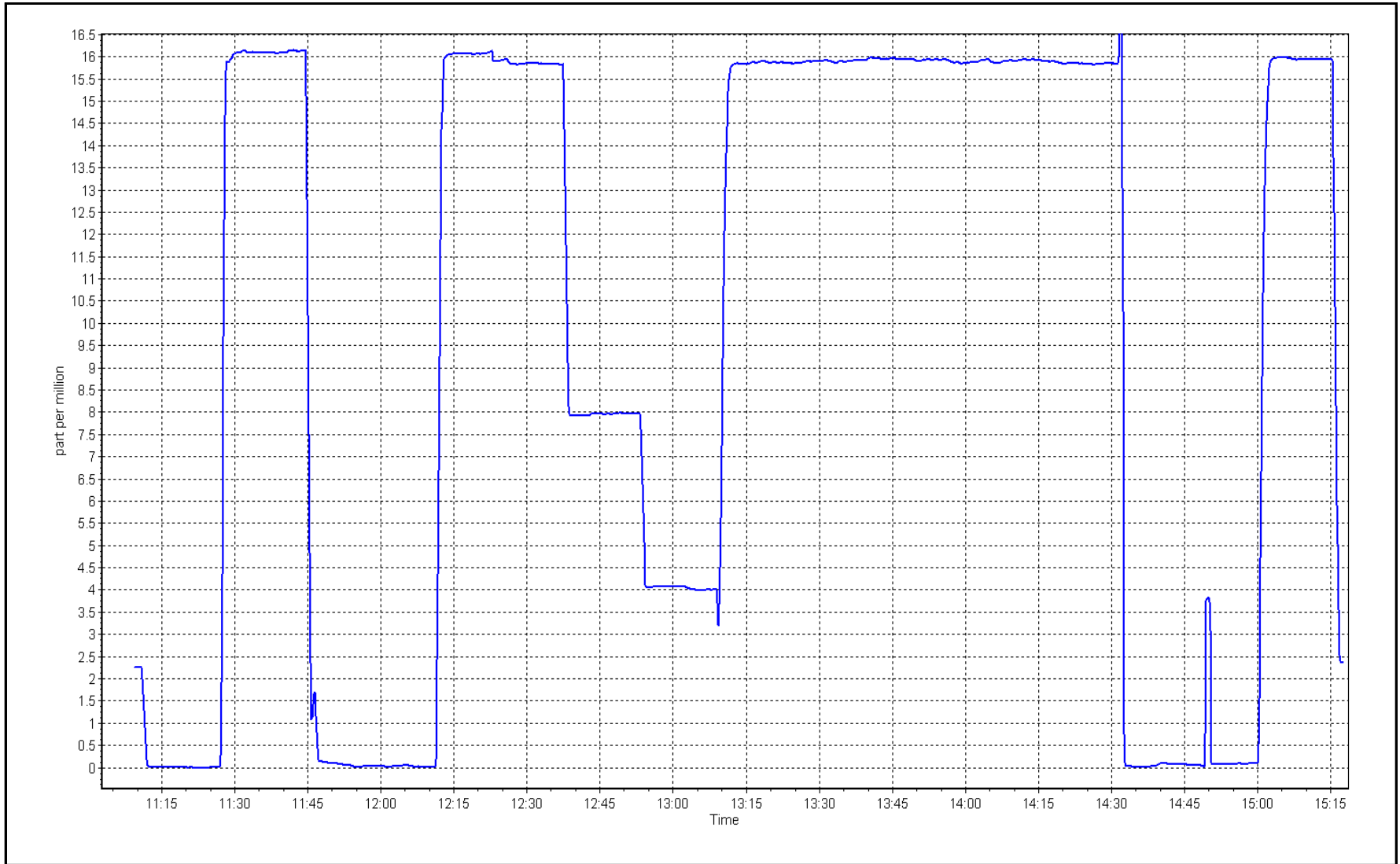




THC Calibration Plot

Date: December 4, 2017

Location: Horizon





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Horizon	Station number:	AMS 15
Calibration Date:	December 4, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	11:09	End time (MST):	15:19
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000368	Cal Gas Expiry Date	May 22, 2020
NOX Cal Gas Conc.	<u>52.6</u> ppb	NO Cal Gas Conc.	<u>52.6</u> ppb
Calibrator Model	Teledyne API T700	Serial Number	1223
ZAG make/model	Teledyne API 701	Serial Number	1004

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 710321429		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.184	1.172	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	1.000	1.000	PMT Temperature	-2.8	-2.9
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	183.0	182.1
NO bkgrnd	13.8	13.6	Sample Flow	0.637	0.623
NOX bkgrnd	14.0	13.8	PMT Voltage	-778.5	-778.5

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	1.002858	1.009428
NO <sub>x</sub> Cal Offset	-0.666909	-0.744021
NO Cal Slope	1.003589	1.007982
NO Cal Offset	-0.766534	-0.706096
NO <sub>2</sub> Cal Slope	0.997262	0.999959
NO <sub>2</sub> Cal Offset	0.485938	-0.566601



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5080	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	----	----
as found span	5010	75.8	784.0	784.0	0.0	787.9	790.1	-2.2	0.9950	0.9922
calibrator zero	5080	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	----	----
high point	5012	75.8	783.7	783.7	0.0	777.3	778.3	-0.9	1.0082	1.0069
second point	5040	37.8	391.6	391.6	0.0	387.1	388.0	-0.9	1.0115	1.0092
third point	5070	18.8	194.3	194.3	0.0	195.4	195.2	0.2	0.9945	0.9955
as left zero	5080	0.0	0.0	0.0	0.0	1.3	1.4	0.0	----	----
as left span	5012	75.8	783.7	319.9	463.8	770.7	314.8	455.9	1.0168	1.0162
<b>Average Correction Factor</b>									<b>1.0047</b>	<b>1.0039</b>

Corrected As found	NO <sub>x</sub> = 788.0 ppb	NO = 790.1 ppb		*Percent Change	NO <sub>x</sub> = -0.7%
Previous Response	NO <sub>x</sub> = 782.4 ppb	NO = 781.9 ppb		*Percent Change	NO = -1.0%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	776.7	775.3	1.4	1.0090	1.0108	----	----
1st NO2 (400 ppb O3)	319.9	455.4	775.4	319.9	455.6	1.0106	----	0.9996	100.0%
2nd NO2 (200 ppb O3)	542.9	232.4	776.3	542.9	233.4	1.0095	----	0.9957	100.4%
3rd NO2 (100 ppb O3)	654.5	120.8	776.6	654.5	122.0	1.0091	----	0.9902	101.0%
2nd NO ref point	----	0.0	775.0	774.3	0.7	1.0112	1.0121	----	----
<b>Average Correction Factor</b>						<b>1.0101</b>	<b>1.0114</b>	<b>0.9951</b>	<b>100.5%</b>

Notes: Changed inlet filter after as founds. Adjusted span only.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

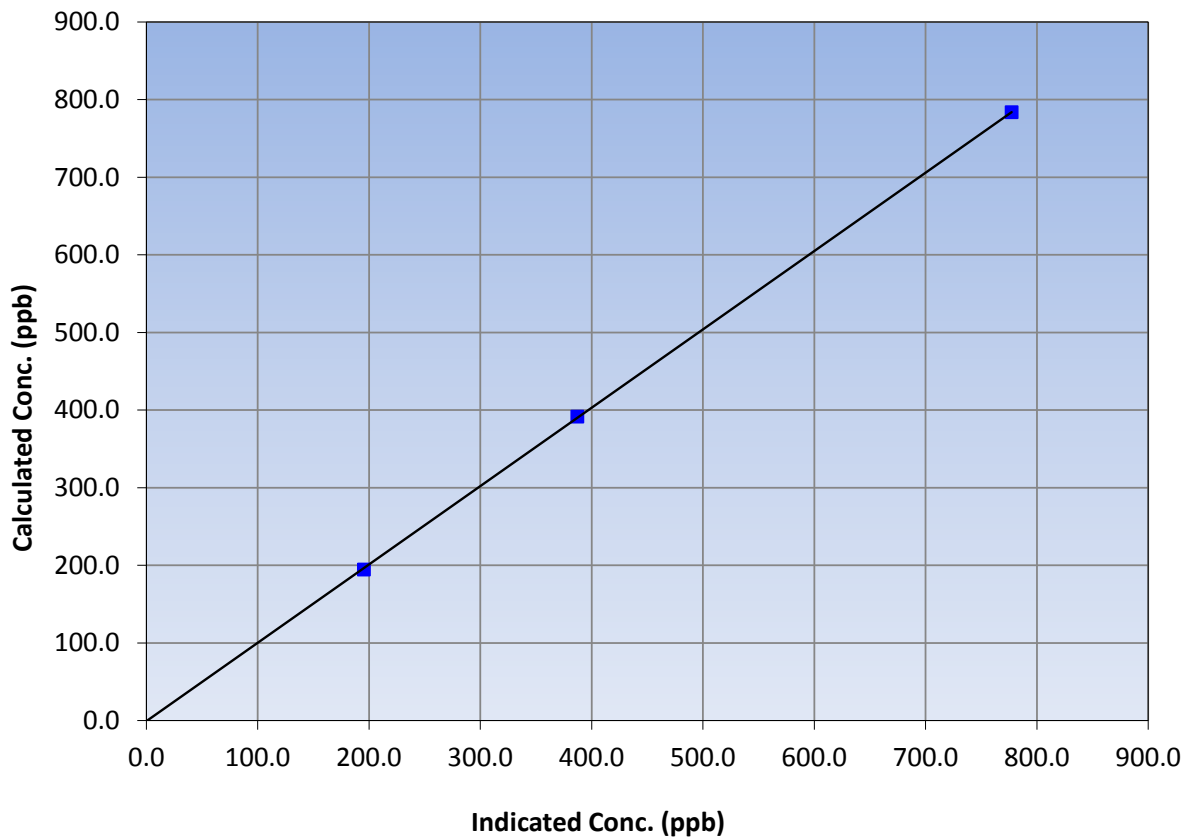
### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 13, 2017
Station Name	Horizon	Station Number	AMS 15
Start Time (MST)	11:09	End Time (MST)	15:19
Analyzer make	Thermo 42i	Analyzer serial #	710321429

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
783.7	777.3	1.0082			
391.6	387.1	1.0115			
194.3	195.4	0.9945			
			Slope	1.009428	0.90 - 1.10
			Intercept	-0.744021	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

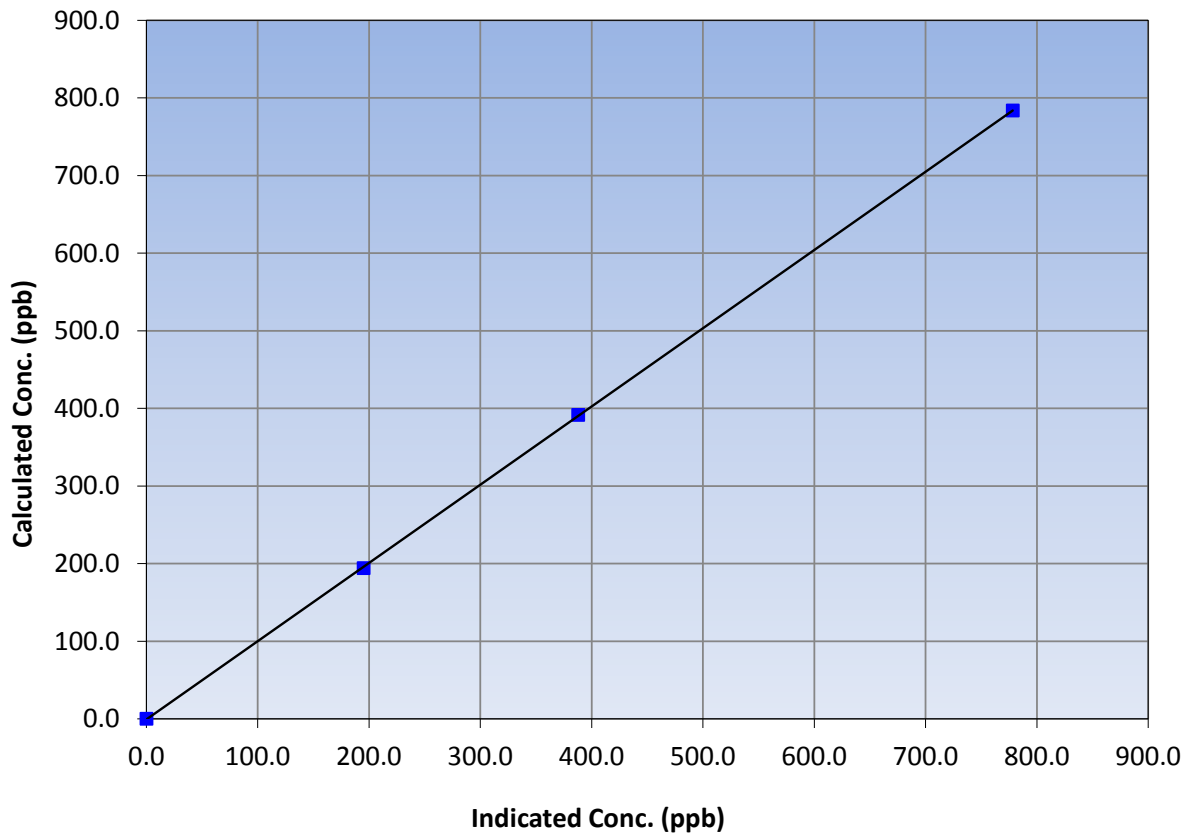
### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 13, 2017
Station Name	Horizon	Station Number	AMS 15
Start Time (MST)	11:09	End Time (MST)	15:19
Analyzer make	Thermo 42i	Analyzer serial #	710321429

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
783.7	778.3	1.0069			
391.6	388.0	1.0092			
194.3	195.2	0.9955			
			Slope	1.007982	0.90 - 1.10
			Intercept	-0.706096	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

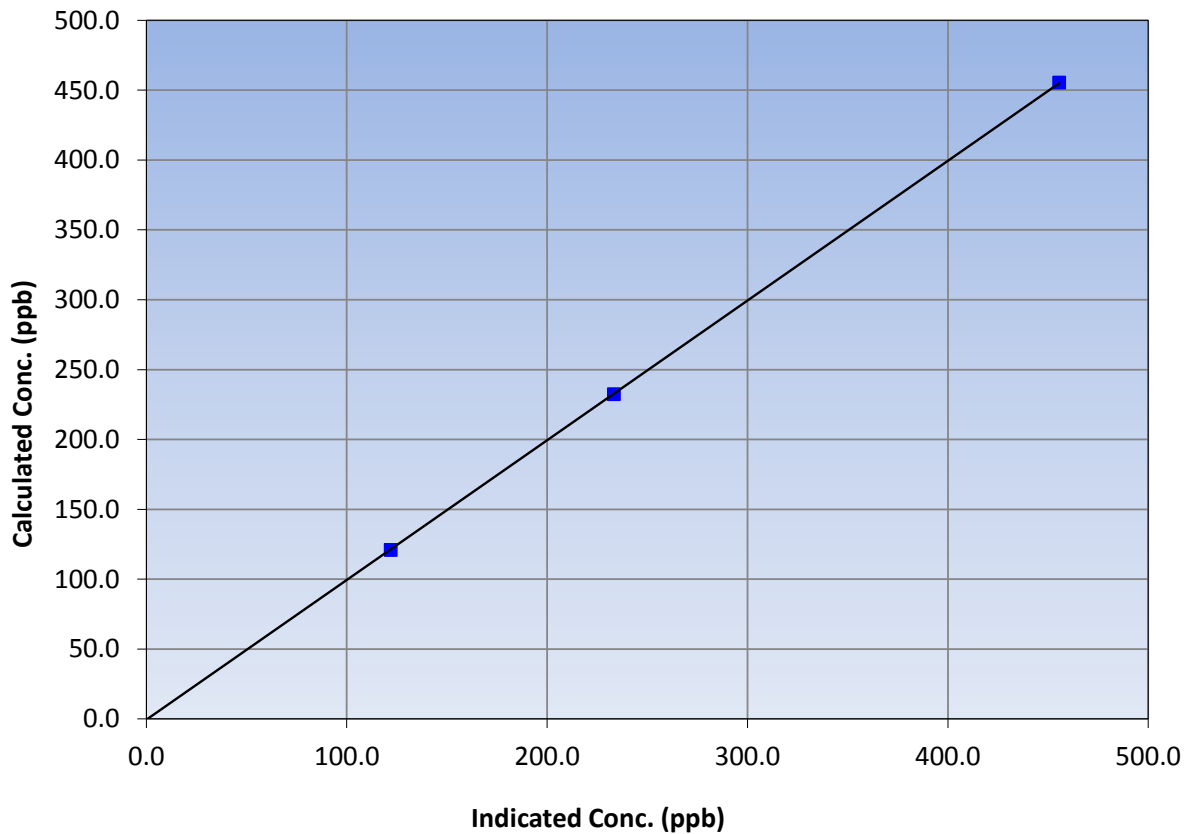
### Station Information

Calibration Date	December 4, 2017	Previous Calibration	November 13, 2017
Station Name	Horizon	Station Number	AMS 15
Start Time (MST)	11:09	End Time (MST)	15:19
Analyzer make	Thermo 42i	Analyzer serial #	710321429

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
455.4	455.6	0.9996			
232.4	233.4	0.9957			
120.8	122.0	0.9902			
			Slope	0.999959	0.90 - 1.10
			Intercept	-0.566601	+/-20

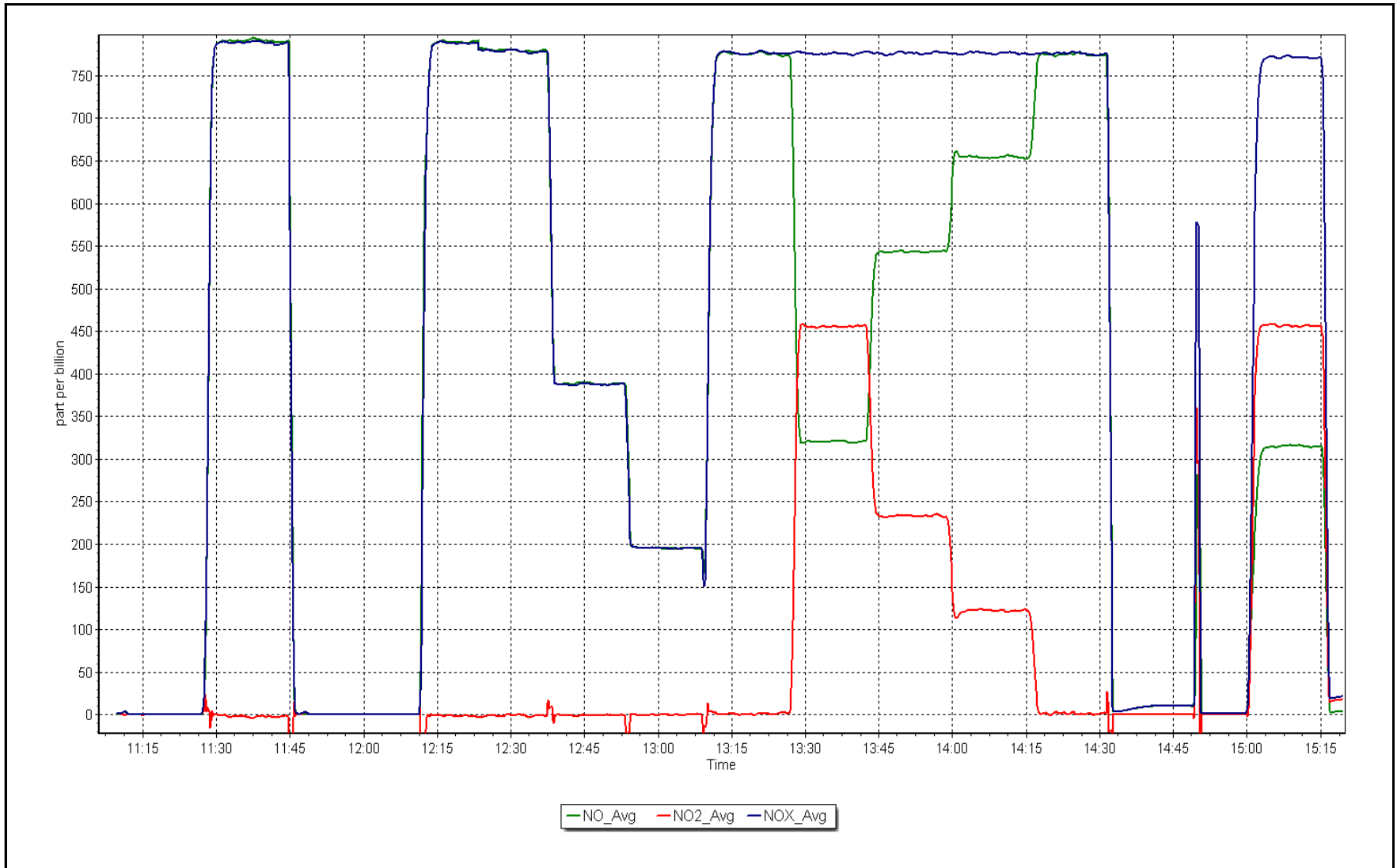
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: December 4, 2017

Location: Horizon





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Horizon	Station number:	AMS 15
Calibration Date:	December 13, 2017	Last Cal Date:	November 22, 2017
Start time (MST):	10:45	End time (MST):	11:50
Sharp Model:	5030	S/N:	E-2020
Particulate Fraction:	PM2.5	C14 Source S/N:	7409
Flow Meter Make/Model:	DeltaCal	S/N:	628
Temp/RH standard:		S/N:	

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	2	3.2	3	<input checked="" type="checkbox"/>	+/- 2 °C
P3 (hPa)	977	978	977	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	992.4	1000	<input checked="" type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.5	-----	0.1	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Concentration zero	0.1	-----	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"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check:	<u>December 13, 2017</u>	Last Cal Date:	<u>September 18, 2017</u>
	Flow w/o adaptor:	<u>16.64</u>	Flow w/ adaptor:	<u>16.54</u>

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>2022</u>	
Foil Mass: _____	Foil Mass: <u>1507</u>	
Calibration Date: _____	Calibration Date: <u>22-Nov-17</u>	
Correction Factor: _____	Correction Factor: <u>7137</u>	---

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
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%
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes: Cleaned cyclone head. Adjusted T1 and flow. Zeroed the concentration and the nephelometer.

Calibration by: Jayme Marcoux





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 16  
MUSKEG RIVER  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MUSKEG RIVER (AMS 16)  
 DECEMBER 2017

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	695	36	49	98.25	20	0	8	0
THC (ppm) Average	644	34	100	91.13	5.4	-	3.2	-
NO2 (ppb) Average	695	36	49	98.25	53	0	27	-
NO (ppb) Average	695	36	49	98.25	117	-	26	-
NOX (ppb) Average	695	36	49	98.25	170	-	53	-
PM2.5 (ug/m3) Average	731	1	13	98.39	39.9	-	15.2	0
Temperature 2 m (C) Average	735	0	9	98.79	3.2	-	0.1	-
Relative Humidity (%) Average	735	0	9	98.79	99	-	95	-
Barometric Pressure (inHg) Average	743	0	1	99.87	29.8	-	29.7	-
Wind Speed 10 m (km/h) Average	738	0	6	99.19	24	-	16	-
Wind Direction 10 m (deg) Average	738	0	6	99.19	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MUSKEG RIVER (AMS 16)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	695	0.9	2	-	0	0	0	0	1	2	20
THC (ppm) Average	644	2.49	0.4	-	2	2.2	2.3	2.4	2.6	2.8	5.4
NO2 (ppb) Average	695	17.3	10	-	0	4	9	16	25	31	53
NO (ppb) Average	695	6.8	12	-	0	0	0	2	8	19	117
NOX (ppb) Average	695	24.1	20	-	0	5	11	19	33	48	170
PM2.5 (ug/m3) Average	731	5.84	5.6	-	0.2	1.2	2.6	4.4	7	11.6	39.9
Temperature 2 m (C) Average	735	-14.84	11.8	-	-43.5	-31.3	-26.8	-11.2	-4.6	-1.2	3.2
Relative Humidity (%) Average	735	83.6	8	-	65	74	77	84	91	94	99
Barometric Pressure (inHg) Average	743	29.04	0.4	-	28.2	28.6	28.8	29	29.3	29.6	29.8
Wind Speed 10 m (km/h) Average	738	7.2	5	-	0	2	3	6	10	15	24
Wind Direction 10 m (deg) Average	738	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -MUSKEG RIVER (AMS 16)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	02 Dec 2017 15:00	02 Dec 2017 17:00	3	Station power failure
NO2, NO, NOX, SO2	26 Dec 2017 02:00	26 Dec 2017 11:00	10	Station power failure
PM2.5	26 Dec 2017 02:00	26 Dec 2017 10:00	9	Station power failure
THC	26 Dec 2017 02:00	28 Dec 2017 12:00	59	Station power failure
THC	28 Dec 2017 13:00	28 Dec 2017 16:00	4	Maintenance to relight FID
Temperature, Relative Humidity	26 Dec 2017 04:00	26 Dec 2017 12:00	9	Station power failure
Barometric Pressure	12 Dec 2017 12:00	12 Dec 2017 12:00	1	DAS collection error
Wind Speed, Wind Direction	28 Dec 2017 21:00	29 Dec 2017 00:00	4	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Dec 2017 02:00	29 Dec 2017 03:00	2	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

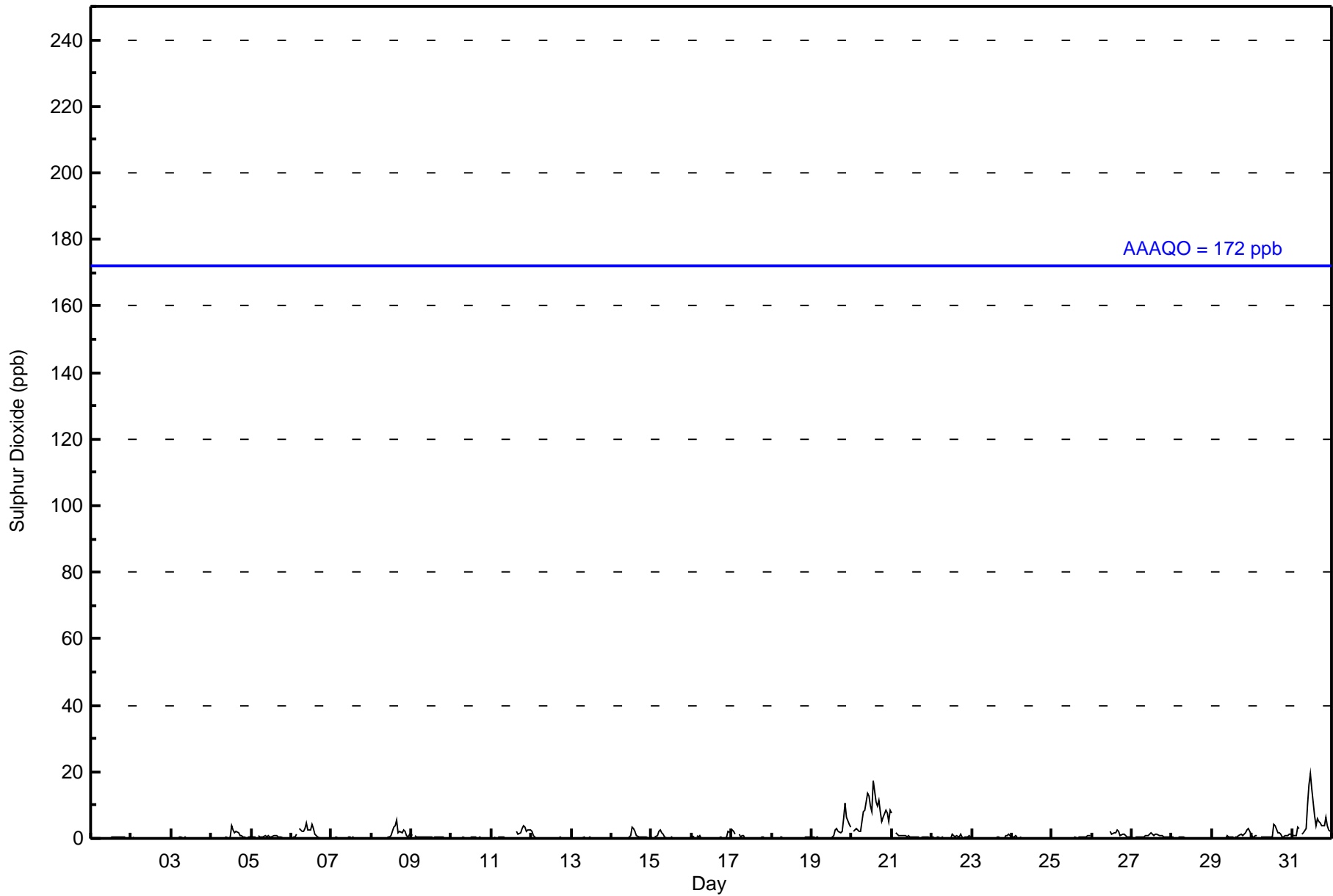
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Muskeg River - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																						
Maximum Value: 20 ppb on Dec 31 12:00										Maximum Daily Average: 7.6 ppb on Dec 20																																						
Minimum Value: 0 ppb on Dec 2 05:00										Minimum Daily Average: 0.1 ppb on Dec 2																																						
Maximum Diurnal Average: 1.6 ppb at hour 14										Minimum Diurnal Average: 0.4 ppb at hour 2																																						
Monthly Average: 0.9 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 11																																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	PF	PF	PF	0	0	0	0	0	0	0	0.1	0																						
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
4-Dec	0	0	Z	0	0	0	0	0	0	1	0	0	4	2	2	2	2	1	1	0	0	0	0	0	0.7	4																						
5-Dec	1	0	1	Z	1	0	0	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0.5	1																						
6-Dec	0	0	1	1	Z	3	2	2	3	5	2	3	4	3	1	1	0	0	0	0	0	0	0	0	1.4	5																						
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																						
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	4	4	6	2	2	2	3	2	1	0	2	1.3	6																						
9-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
11-Dec	0	0	0	Z	1	0	0	0	0	0	C	C	C	C	C	2	1	2	3	4	3	2	2	2	1.4	4																						
12-Dec	2	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	2																						
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
14-Dec	Z	0	0	0	0	0	0	0	0	0	1	3	3	2	1	1	1	0	0	1	0	0	0	0	0.6	3																						
15-Dec	0	Z	1	1	2	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3																						
16-Dec	1	0	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0.4	2																						
17-Dec	3	2	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3																						
18-Dec	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1																						
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	3	3	2	2	2	2	6	11	6	4	3	2.0	11																						
20-Dec	Z	2	3	3	2	2	5	8	8	14	13	10	8	17	11	10	12	8	5	6	9	8	5	8	7.6	17																						
21-Dec	7	Z	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.9	7																						
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	1	1	0	0	0.4	1																						
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	0.2	1																						
24-Dec	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																						
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0.3	1																						
26-Dec	Z	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	2	1	2	2	3	2	1	1	1	1	0	0	0	--	3																						
27-Dec	0	Z	0	0	0	0	1	1	1	1	1	2	1	1	1	1	1	1	1	0	0	0	0	0	0.7	2																						
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
29-Dec	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	2	3	3	1	0.7	3																						
30-Dec	0	0	1	1	Z	1	0	0	0	0	0	0	4	4	2	2	1	1	0	1	1	1	1	1	1.0	4																						
31-Dec	1	1	1	4	3	Z	1	2	3	10	16	20	15	7	4	6	5	5	4	4	6	4	2	2	5.5	20																						
																								0.7	0.4	0.5	0.6	0.5	0.6	0.5	0.6	0.6	1.1	1.3	1.4	1.4	1.6	1.3	1.3	1.1	0.9	0.8	1.0	1.3	1.0	0.9	0.9	Diurnal Average
																								7	2	3	4	3	3	5	8	8	14	16	20	15	17	11	10	12	8	5	6	11	8	5	8	Diurnal Maximum
Z - zerospan C - Calibration PF - Power Failure																																																
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																																																



Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Muskeg River - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	686	98.71	98.71
11 - 20	9	1.29	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 695

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 10	8	19	55	22	10	19	12	36	168	174	59	26	24	19	23	6	680
11 - 20	0	0	0	0	0	0	0	0	4	3	2	0	0	0	0	0	9
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
<b>Totals</b>	<b>8</b>	<b>19</b>	<b>55</b>	<b>22</b>	<b>10</b>	<b>19</b>	<b>12</b>	<b>36</b>	<b>172</b>	<b>177</b>	<b>61</b>	<b>26</b>	<b>24</b>	<b>19</b>	<b>23</b>	<b>6</b>	<b>689</b>

Total Number of Valid Hours: 689

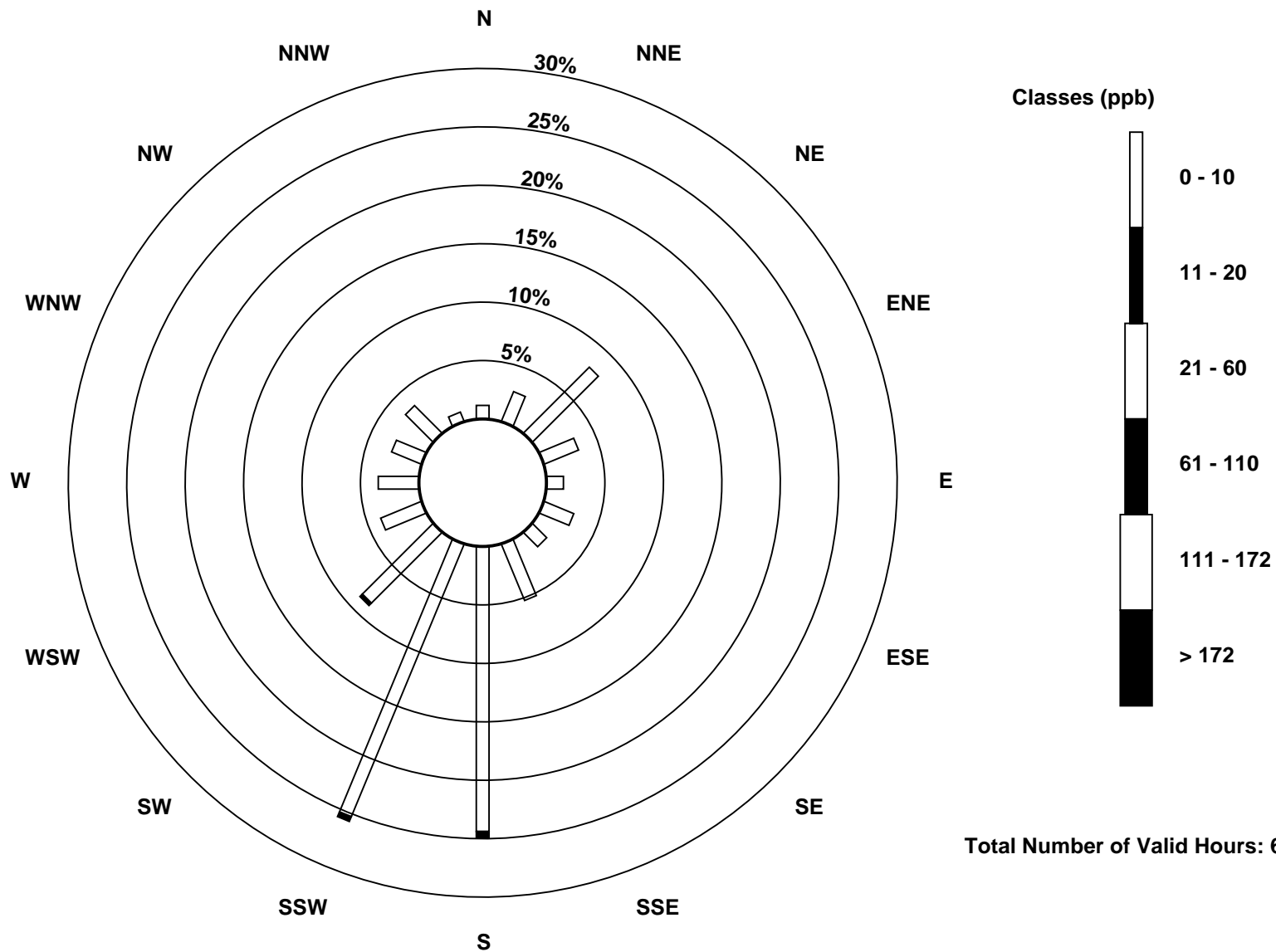
Total Number of Hours: 744

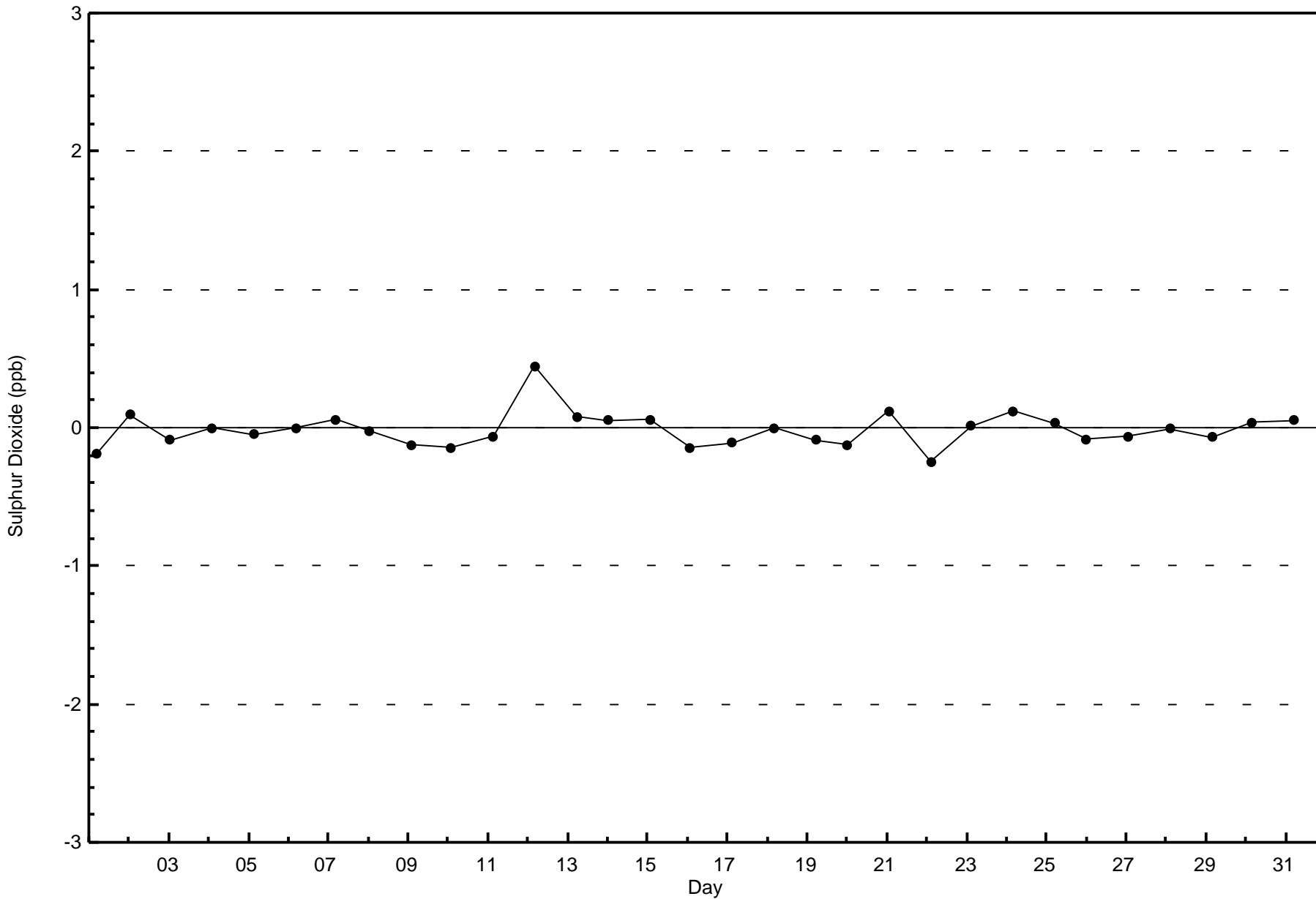




Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Muskeg River (AMS 16)

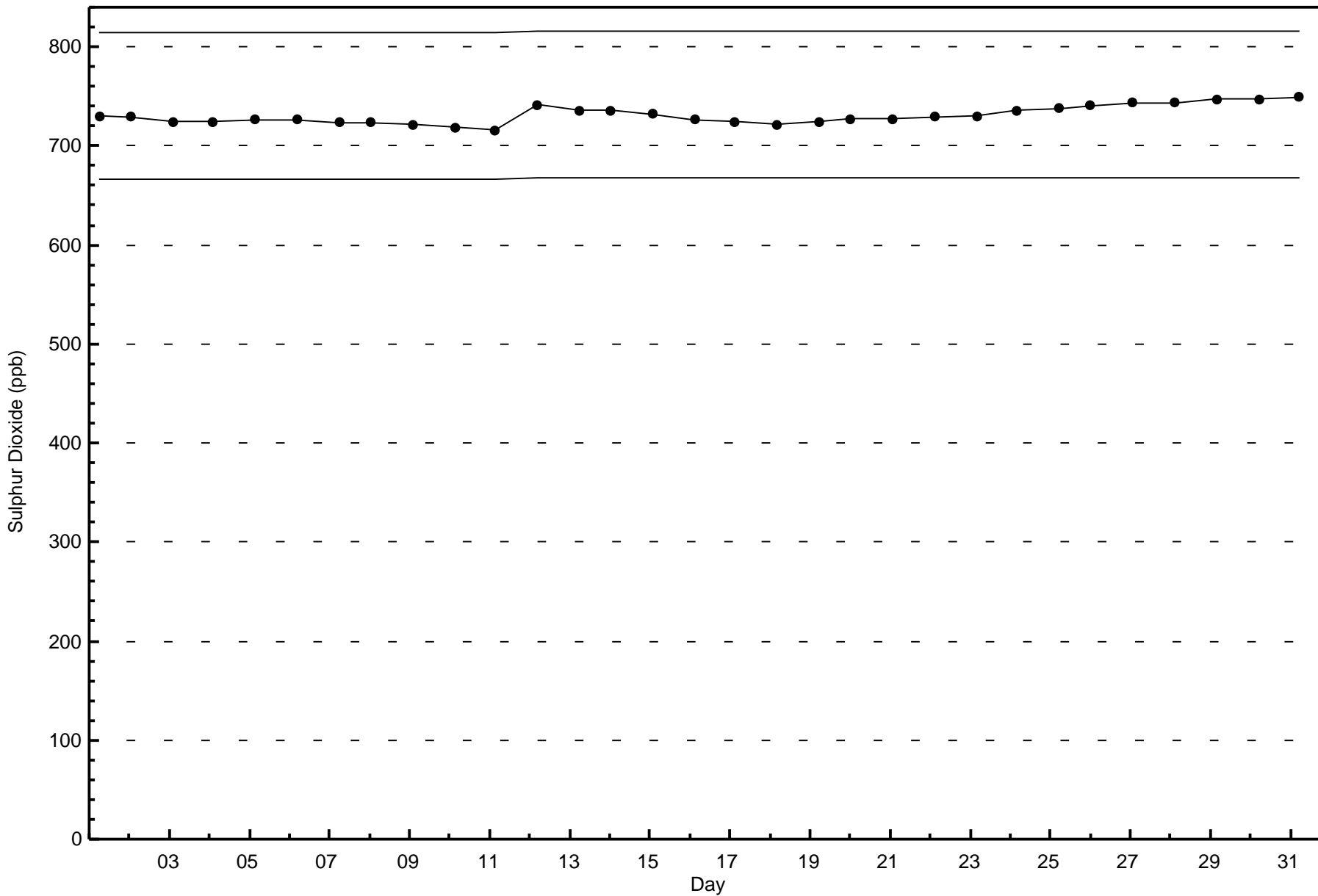






Wood Buffalo Environmental Association  
Span Responses

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Muskeg River - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

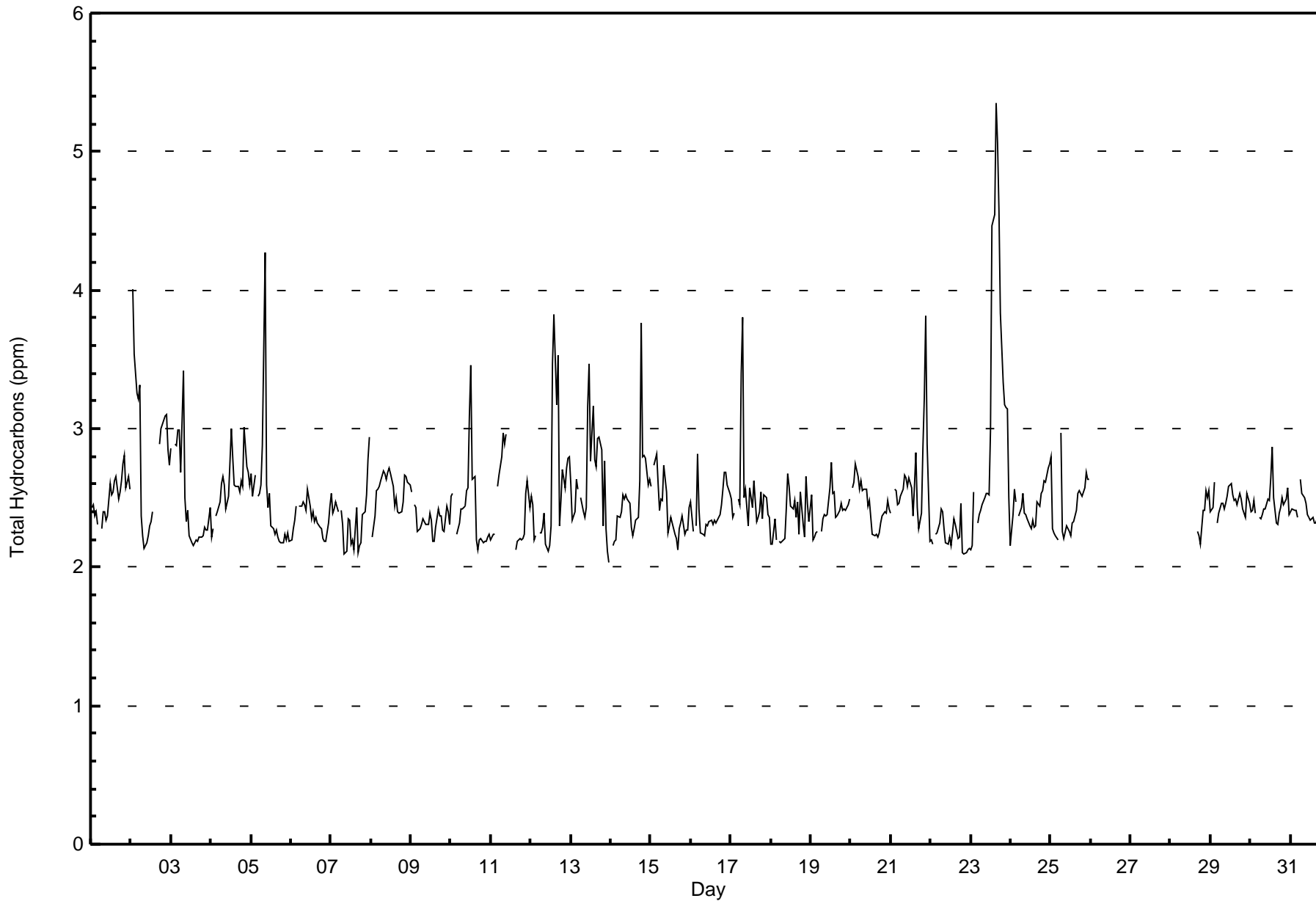
Muskeg River - December 2017

Maximum Value: 5.4 ppm on Dec 23 16:00																				Maximum Daily Average: 3.2 ppm on Dec 23					Hours in Service: 744				
Minimum Value: 2.0 ppm on Dec 14 00:00																				Minimum Daily Average: 2.2 ppm on Dec 22					Hours of Data: 644				
Maximum Diurnal Average: 2.6 ppm at hour 22																				Minimum Diurnal Average: 2.4 ppm at hour 2					Hours of Missing Data: 100				
Monthly Average: 2.49 ppm																				Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.3 Median = 2.4 Q <sub>3</sub> = 2.6 P <sub>90</sub> = 2.8 P <sub>99</sub> = 4.1					Hours of Calibration: 34				
																									Percent Operational Time: 91.1				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	2.4	2.5	2.4	2.4	2.3	Z	2.3	2.4	2.4	2.3	2.4	2.6	2.5	2.5	2.6	2.7	2.5	2.5	2.6	2.7	2.8	2.6	2.7	2.6	2.5	2.8			
2-Dec	Z	4.0	3.5	3.3	3.2	3.3	2.4	2.2	2.1	2.2	2.2	2.3	2.3	2.4	PF	PF	PF	2.9	3.0	3.0	3.1	3.1	2.9	2.7	2.8	4.0			
3-Dec	2.9	Z	2.9	2.9	3.0	3.0	2.7	3.4	2.5	2.3	2.4	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	2.5	3.4			
4-Dec	2.2	2.3	Z	2.4	2.4	2.5	2.6	2.7	2.6	2.4	2.5	2.8	3.0	2.8	2.6	2.6	2.6	2.5	2.6	2.6	3.0	2.7	2.7	2.6	2.6	3.0			
5-Dec	2.7	2.5	2.7	Z	2.5	2.5	2.6	2.9	4.3	2.6	2.4	2.5	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5	4.3			
6-Dec	2.2	2.3	2.3	2.4	Z	2.4	2.4	2.5	2.5	2.4	2.6	2.4	2.3	2.4	2.3	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.4	2.4	2.6			
7-Dec	2.5	2.4	2.4	2.5	2.4	Z	2.4	2.3	2.1	2.1	2.3	2.3	2.2	2.2	2.1	2.4	2.1	2.2	2.2	2.4	2.4	2.5	2.8	2.9	2.4	2.9			
8-Dec	Z	2.2	2.4	2.6	2.6	2.6	2.6	2.7	2.7	2.6	2.7	2.7	2.7	2.6	2.4	2.5	2.4	2.4	2.4	2.5	2.7	2.6	2.6	2.6	2.6	2.7			
9-Dec	2.5	Z	2.5	2.4	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.3	2.2	2.2	2.3	2.4	2.4	2.4	2.3	2.3	2.4	2.4	2.3	2.3	2.5			
10-Dec	2.5	2.5	Z	2.2	2.3	2.3	2.4	2.4	2.4	2.6	2.6	3.1	3.5	2.6	2.7	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	3.5			
11-Dec	2.2	2.2	2.2	Z	2.6	2.7	2.8	3.0	2.9	3.0	C	C	C	C	C	2.1	2.2	2.2	2.2	2.2	2.2	2.5	2.6	2.4	2.5	3.0			
12-Dec	2.5	2.5	2.2	2.2	Z	2.2	2.2	2.3	2.4	2.2	2.1	2.2	2.3	3.5	3.8	3.2	3.5	2.3	2.5	2.7	2.6	2.7	2.8	2.8	2.6	3.8			
13-Dec	2.6	2.3	2.4	2.6	2.6	Z	2.5	2.4	2.4	2.4	3.2	3.5	2.8	3.2	2.8	2.7	2.9	2.9	2.8	2.3	2.8	2.3	2.1	2.0	2.6	3.5			
14-Dec	Z	2.2	2.2	2.2	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.3	2.2	2.3	2.3	2.3	2.4	2.6	3.8	2.8	2.8	2.8	2.6	2.6	2.5	3.8			
15-Dec	2.6	Z	2.7	2.8	2.6	2.4	2.5	2.5	2.7	2.5	2.2	2.3	2.4	2.3	2.2	2.2	2.1	2.3	2.3	2.4	2.2	2.3	2.3	2.4	2.4	2.8			
16-Dec	2.5	2.3	Z	2.3	2.8	2.4	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.6	2.7	2.7	2.6	2.5	2.4	2.8			
17-Dec	2.5	2.4	2.4	Z	2.5	2.5	3.4	3.8	2.5	2.6	2.3	2.6	2.5	2.4	2.6	2.3	2.4	2.4	2.5	2.3	2.5	2.5	2.4	2.4	2.5	3.8			
18-Dec	2.2	2.2	2.3	2.2	Z	2.2	2.2	2.2	2.2	2.4	2.7	2.6	2.4	2.4	2.5	2.4	2.5	2.2	2.5	2.3	2.2	2.7	2.5	2.3	2.4	2.7			
19-Dec	2.5	2.2	2.2	2.2	2.3	Z	2.3	2.4	2.4	2.4	2.4	2.6	2.8	2.5	2.5	2.4	2.4	2.4	2.5	2.4	2.4	2.4	2.4	2.5	2.4	2.8			
20-Dec	Z	2.6	2.6	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.4	2.5	2.4	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.5	2.4	2.7			
21-Dec	2.4	Z	2.6	2.6	2.4	2.5	2.5	2.6	2.7	2.6	2.6	2.6	2.6	2.4	2.6	2.8	2.4	2.3	2.4	2.9	3.2	3.8	2.9	2.2	2.6	3.8			
22-Dec	2.2	2.2	Z	2.2	2.2	2.3	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.5	2.1	2.1	2.1	2.1	2.1	2.2	2.5		
23-Dec	2.1	2.2	2.5	Z	2.3	2.4	2.4	2.5	2.5	2.5	2.5	3.0	4.5	4.5	5.4	5.1	4.6	3.8	3.3	3.2	3.1	3.1	2.5	2.5	3.2	5.4			
24-Dec	2.2	2.4	2.6	2.5	Z	2.4	2.4	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.4	2.5	2.6	2.6	2.7	2.7	2.4	2.7			
25-Dec	2.8	2.3	2.2	2.2	2.2	Z	3.0	2.3	2.2	2.3	2.3	2.3	2.2	2.3	2.3	2.4	2.5	2.6	2.5	2.5	2.6	2.7	2.6	2.6	2.4	3.0			
26-Dec	Z	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	--	--		
27-Dec	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	--	--		
28-Dec	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	M	M	M	M	2.3	2.2	2.2	2.4	2.4	2.6	2.5	2.6	--	2.6			
29-Dec	2.4	2.4	2.6	Z	2.3	2.4	2.5	2.5	2.4	2.5	2.5	2.6	2.6	2.5	2.5	2.5	2.4	2.5	2.5	2.4	2.4	2.4	2.5	2.5	2.5	2.6			
30-Dec	2.4	2.4	2.5	2.4	Z	2.4	2.3	2.4	2.4	2.4	2.5	2.5	2.6	2.9	2.5	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.4	2.5	2.9			
31-Dec	2.4	2.4	2.4	2.4	2.4	Z	2.6	2.5	2.5	2.5	2.4	2.4	2.3	2.4	2.3	2.3	2.4	2.4	2.4	2.4	2.3	2.4	2.9	2.7	2.4	2.9			
																								Diurnal Average					
																								Diurnal Maximum					
Z - zerospan																								C - Calibration		M - Maintenance		PF - Power Failure	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Muskeg River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Muskeg River - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	1	0.16	0.16
2.1 - 3.0	610	94.72	94.88
3.1 - 10.0	33	5.12	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 644

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Muskeg River - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2.1 - 3.0	4	17	51	18	7	17	12	28	147	161	59	23	22	17	20	1	604
3.1 - 10.0	3	0	2	2	0	2	0	2	5	3	1	1	2	2	3	5	33
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>7</b>	<b>17</b>	<b>53</b>	<b>21</b>	<b>7</b>	<b>19</b>	<b>12</b>	<b>30</b>	<b>152</b>	<b>164</b>	<b>60</b>	<b>24</b>	<b>24</b>	<b>19</b>	<b>23</b>	<b>6</b>	<b>638</b>

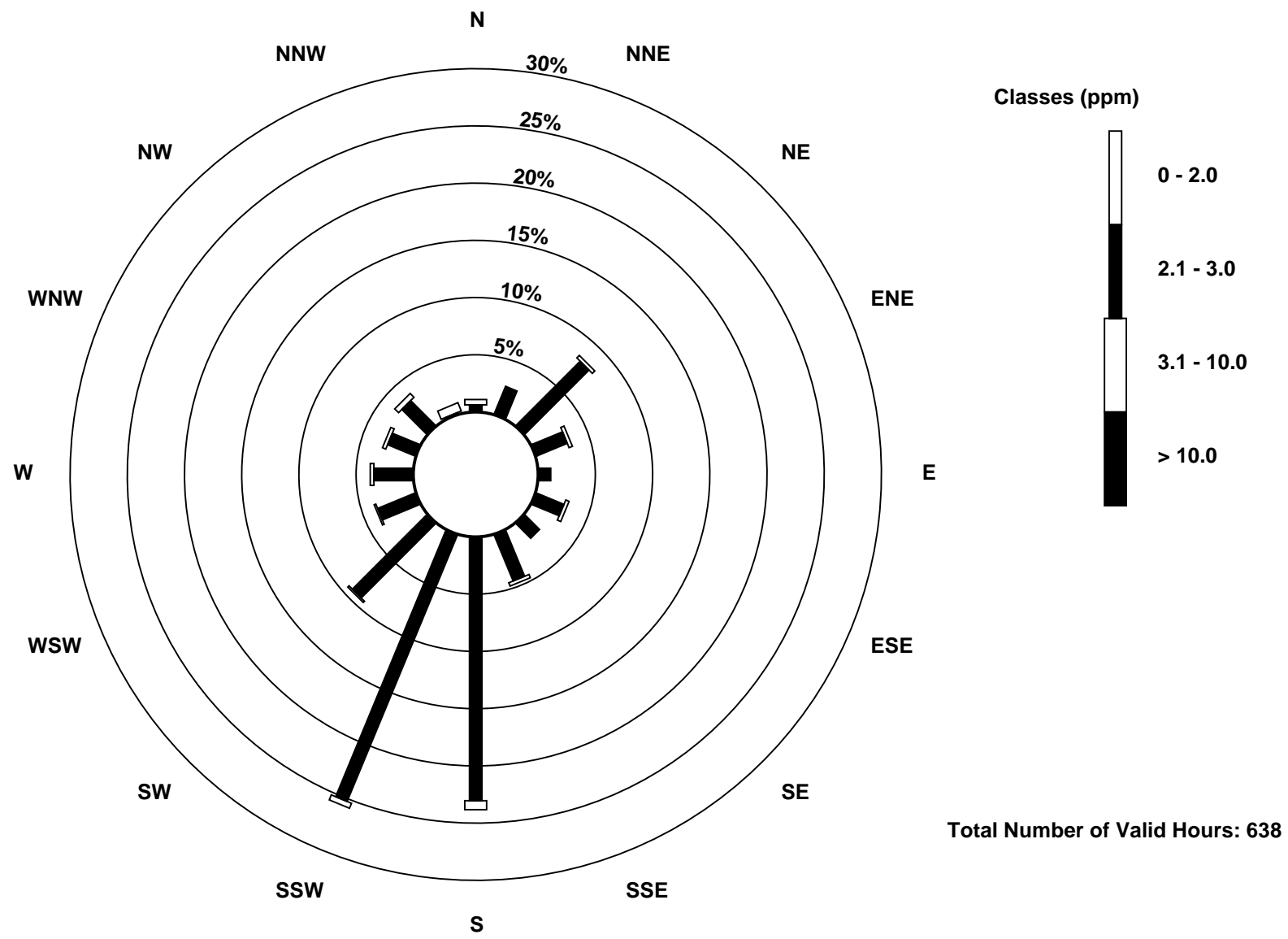
Total Number of Valid Hours: 638

Total Number of Hours: 744

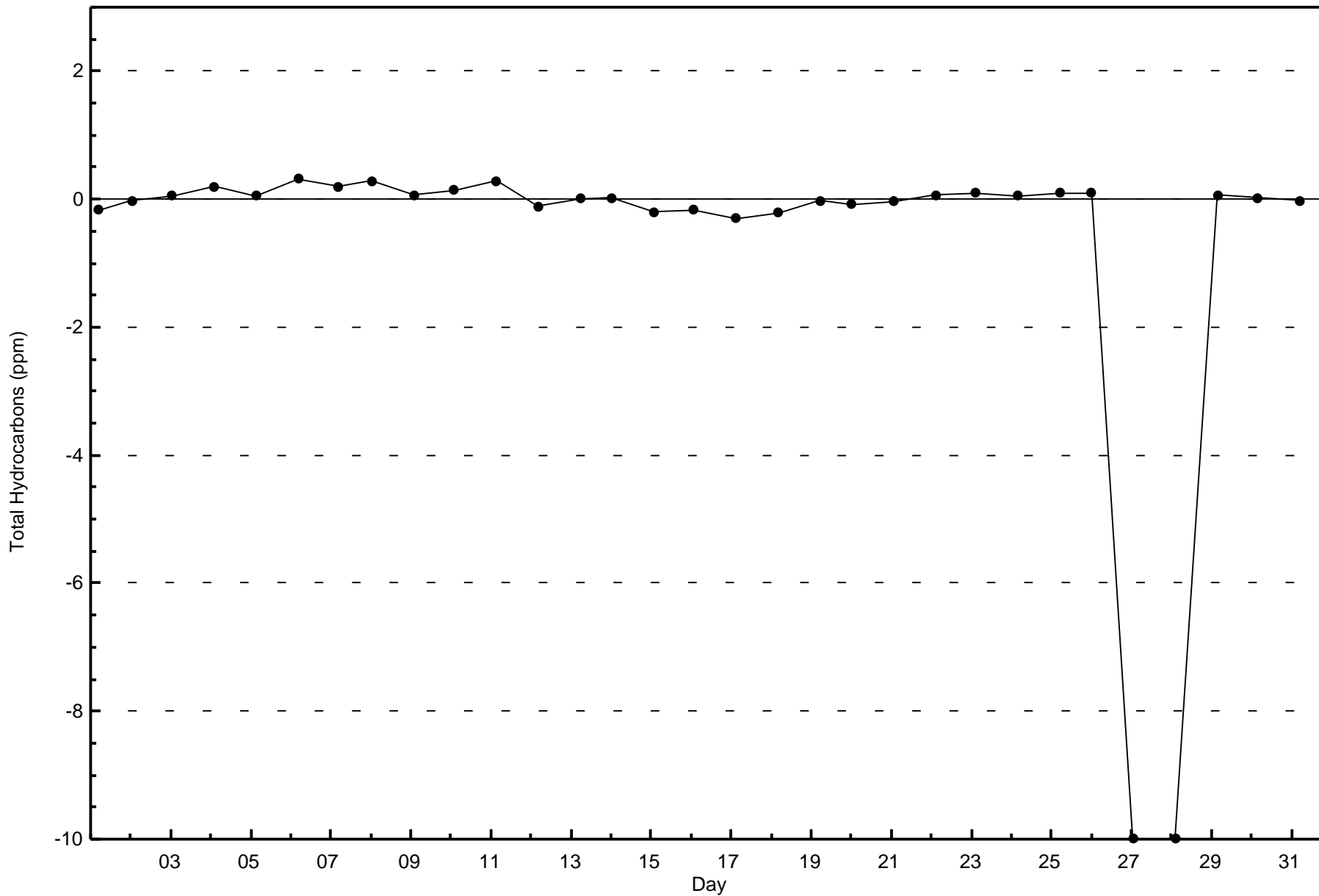


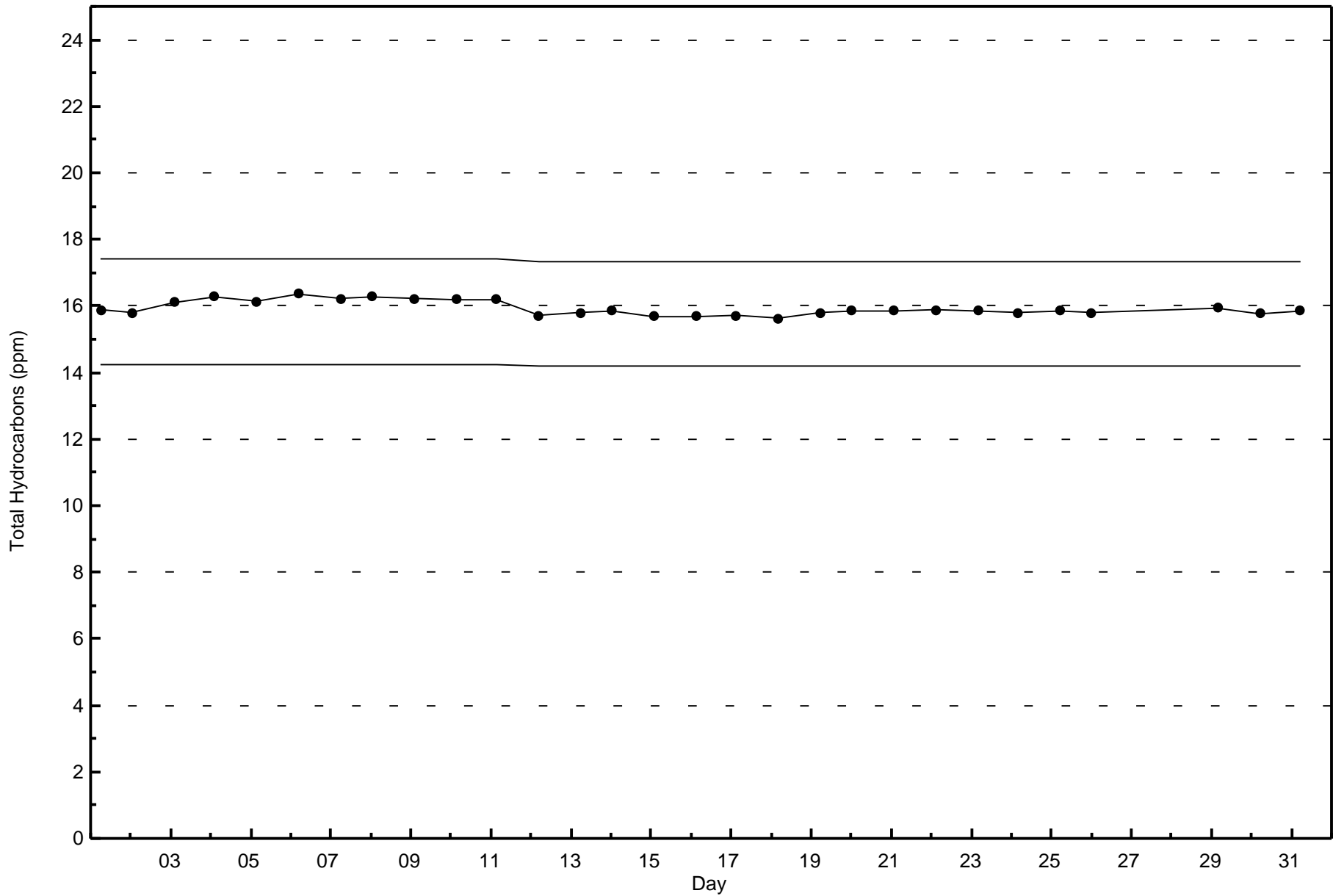
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Muskeg River (AMS 16)









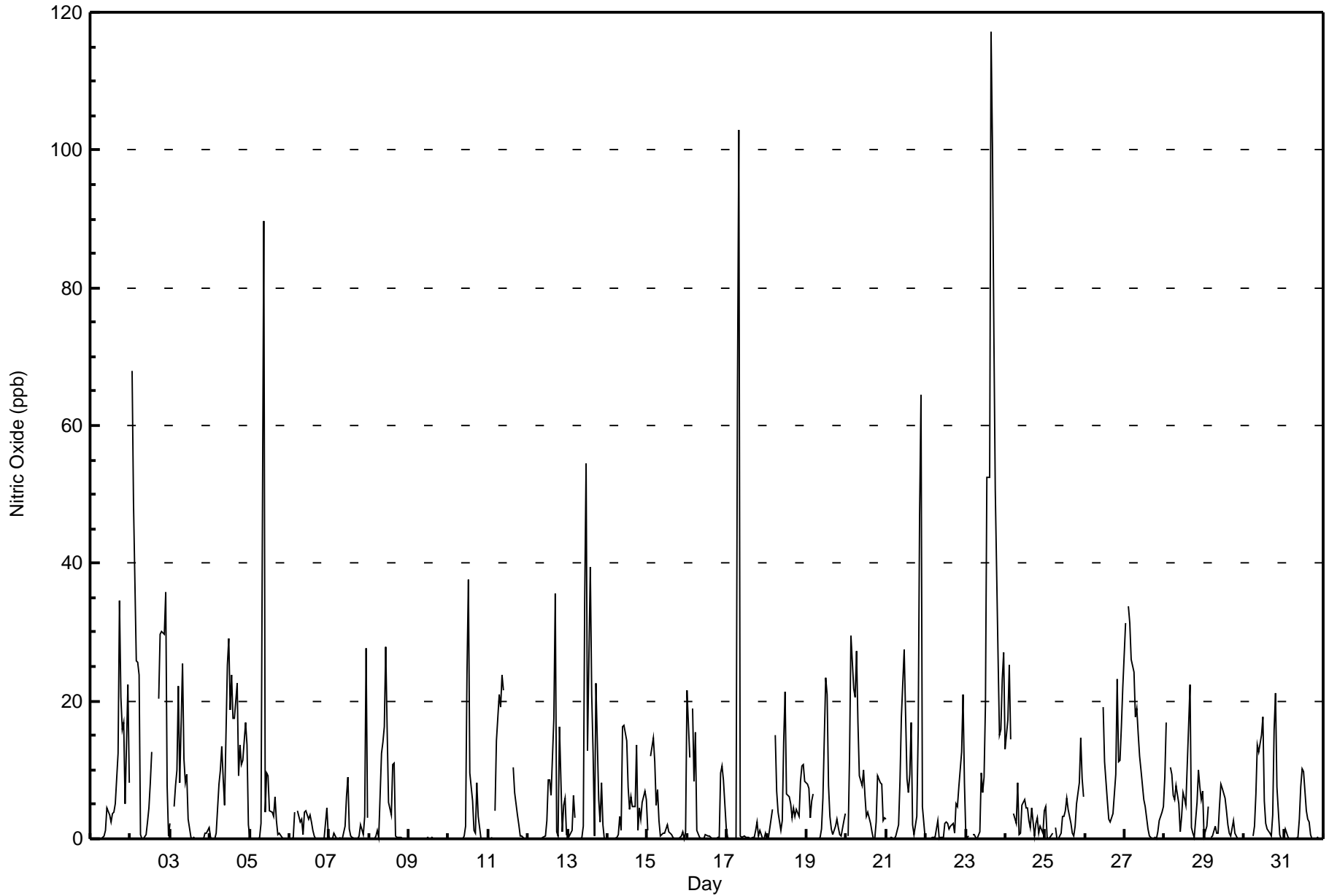


Maximum Value: 117 ppb on Dec 23 16:00		Maximum Daily Average: 26.2 ppb on Dec 23		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 1 04:00		Minimum Daily Average: 0.0 ppb on Dec 9		Hours of Data: 695																																													
Maximum Diurnal Average: 11.3 ppb at hour 12		Minimum Diurnal Average: 3.7 ppb at hour 1		Hours of Missing Data: 49																																													
Monthly Average: 6.8 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 2 Q <sub>3</sub> = 8 P <sub>90</sub> = 19 P <sub>99</sub> = 63		Hours of Calibration: 36																																													
				Percent Operational Time: 98.3																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	0	0	0	1	4	4	2	4	4	5	12	35	20	16	17	5	22	8	7.0	35																							
2-Dec	Z	68	49	26	26	24	1	0	0	1	2	5	8	13	PF	PF	PF	20	30	30	30	36	8	0	18.8	68																							
3-Dec	2	Z	5	8	10	22	8	25	12	8	9	3	0	0	0	0	0	0	0	0	0	1	1	2	5.0	25																							
4-Dec	0	0	Z	0	1	8	10	13	9	5	25	29	19	24	18	18	23	9	14	11	11	17	14	2	12.1	29																							
5-Dec	0	0	0	Z	0	0	0	2	90	4	10	9	4	4	3	6	3	1	1	0	0	0	0	0	5.9	90																							
6-Dec	0	0	0	4	Z	4	2	3	1	4	4	3	4	2	1	0	0	0	0	0	0	0	5	1	1.6	5																							
7-Dec	0	0	0	1	0	Z	0	0	0	2	6	9	1	0	0	0	0	0	0	2	1	3	28	3	2.5	28																							
8-Dec	Z	0	0	0	0	1	0	12	14	16	28	16	5	3	11	11	0	0	0	0	0	0	0	0	5.2	28																							
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
10-Dec	0	0	Z	0	0	0	0	0	0	0	2	24	38	9	6	1	1	8	3	0	0	0	0	0	4.0	38																							
11-Dec	0	0	0	Z	4	14	21	19	24	22	C	C	C	C	C	10	7	3	2	0	0	0	0	0	7.1	24																							
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	3	9	9	6	17	36	1	0	16	1	5	6	1	4.8	36																							
13-Dec	1	0	1	6	3	Z	0	0	0	2	35	55	13	39	21	12	0	23	6	2	8	2	0	0	10.0	55																							
14-Dec	Z	0	0	0	0	0	1	3	1	16	16	14	7	4	6	5	5	14	1	4	3	5	7	6	5.2	16																							
15-Dec	1	Z	12	15	11	5	7	3	0	1	1	1	2	1	1	0	0	0	0	0	0	1	0	1	2.8	15																							
16-Dec	22	12	Z	19	8	15	1	0	0	0	0	1	0	0	0	0	0	0	0	0	10	11	9	2	4.8	22																							
17-Dec	0	0	0	Z	0	0	64	103	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	1	7.6	103																							
18-Dec	0	0	3	4	Z	15	7	4	1	3	14	21	7	6	5	3	4	3	4	3	8	11	11	8	6.4	21																							
19-Dec	8	7	3	5	7	Z	0	0	0	2	6	23	21	8	3	2	1	2	3	2	1	0	3	4	4.7	23																							
20-Dec	Z	0	12	29	22	21	27	17	9	8	10	6	3	4	2	1	0	0	2	9	8	8	3	3	8.9	29																							
21-Dec	3	Z	0	0	0	0	0	2	8	18	23	27	9	7	9	17	2	1	3	16	47	64	5	0	11.3	64																							
22-Dec	0	0	Z	0	0	0	1	3	0	0	0	2	2	2	1	2	2	1	5	5	8	13	21	8	3.4	21																							
23-Dec	0	0	0	Z	1	1	0	0	1	10	7	9	19	52	52	117	100	73	51	26	15	16	23	27	26.2	117																							
24-Dec	13	17	25	14	Z	4	2	8	1	1	5	6	4	4	3	2	4	0	2	3	1	2	1	4	5.5	25																							
25-Dec	5	0	0	0	1	Z	2	0	0	1	3	3	4	6	4	2	1	0	2	5	8	15	9	6	3.3	15																							
26-Dec	Z	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	19	11	5	3	2	3	4	9	23	11	11	16	22	--	23																							
27-Dec	31	Z	34	31	26	24	18	19	15	12	10	6	5	3	1	0	0	0	0	0	1	3	4	5	10.8	34																							
28-Dec	9	17	Z	10	9	6	6	8	5	1	3	7	6	5	17	22	2	1	0	5	10	8	6	7	7.3	22																							
29-Dec	0	2	5	Z	0	0	2	1	1	5	8	7	6	4	2	1	1	3	1	0	0	0	0	0	2.1	8																							
30-Dec	0	0	0	0	Z	0	2	6	14	13	15	18	5	2	1	1	0	4	16	21	8	1	0	0	5.5	21																							
31-Dec	0	1	0	0	0	Z	0	0	0	3	8	10	10	4	3	3	1	0	0	0	0	0	0	0	1.9	10																							
																								3.7	5.0	6.0	7.0	5.2	6.9	6.1	8.4	6.9	5.2	8.8	11.3	7.5	7.6	6.4	8.7	6.9	6.7	5.8	6.5	6.7	7.6	6.4	3.9	Diurnal Average	
																								31	68	49	31	26	24	64	103	90	22	35	55	38	52	52	117	100	73	51	30	47	64	28	27	Diurnal Maximum	
Z - zerospan																								C - Calibration				PF - Power Failure																					



Wood Buffalo Environmental Association  
Hourly Averages

Nitric Oxide (NO) - ppb  
Muskeg River - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	630	90.65	90.65
21 - 40	51	7.34	97.99
41 - 80	10	1.44	99.42
81 - 159	4	0.58	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 695

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	4	16	52	20	10	18	11	31	158	164	56	25	23	16	19	1	624
21 - 40	3	3	3	2	0	0	1	3	12	11	5	1	0	1	4	2	51
41 - 80	0	0	0	0	0	1	0	2	2	0	0	0	1	1	0	3	10
81 - 159	1	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	4
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>8</b>	<b>19</b>	<b>55</b>	<b>22</b>	<b>10</b>	<b>19</b>	<b>12</b>	<b>36</b>	<b>172</b>	<b>177</b>	<b>61</b>	<b>26</b>	<b>24</b>	<b>19</b>	<b>23</b>	<b>6</b>	<b>689</b>

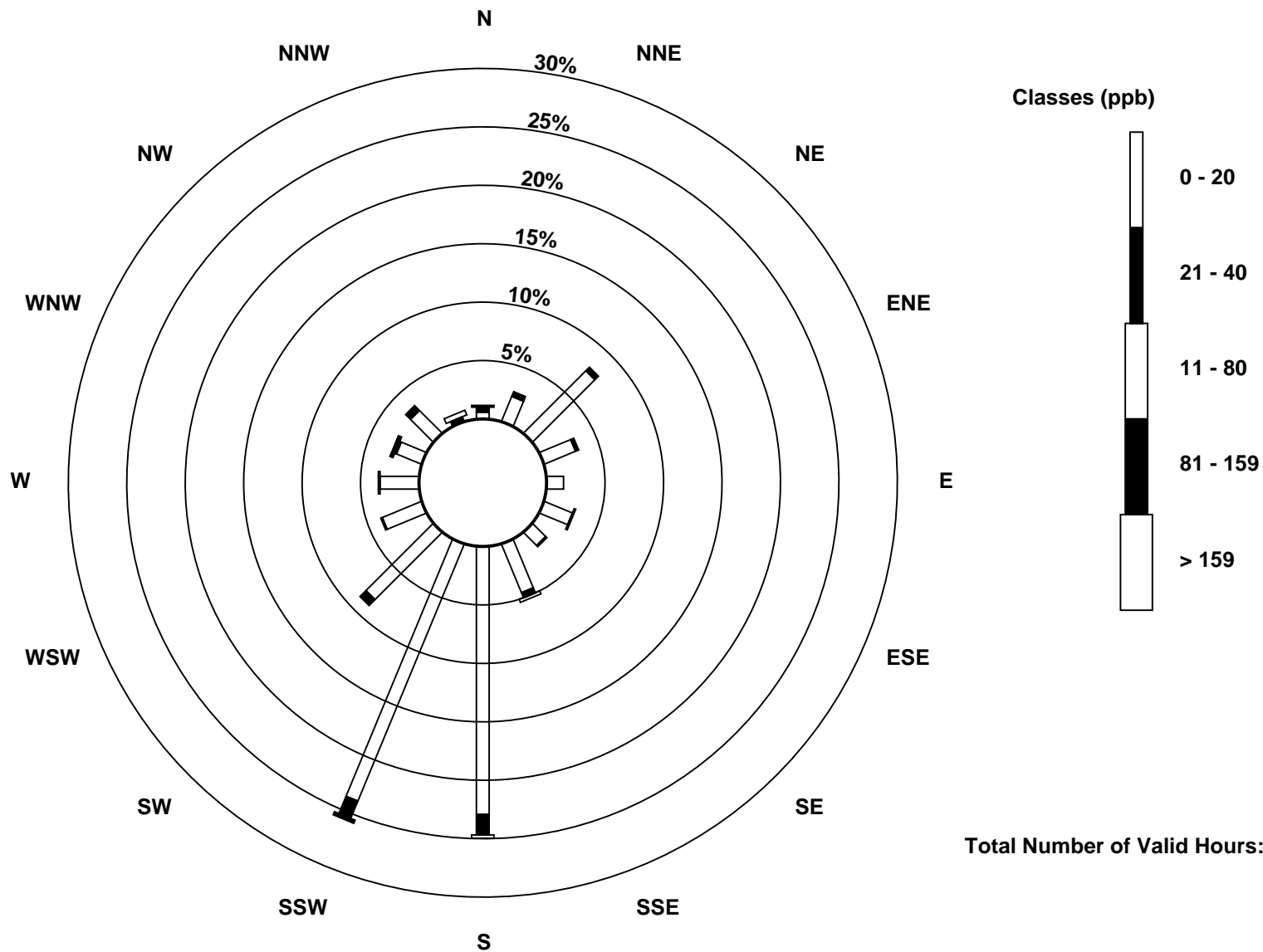
Total Number of Valid Hours: 689

Total Number of Hours: 744

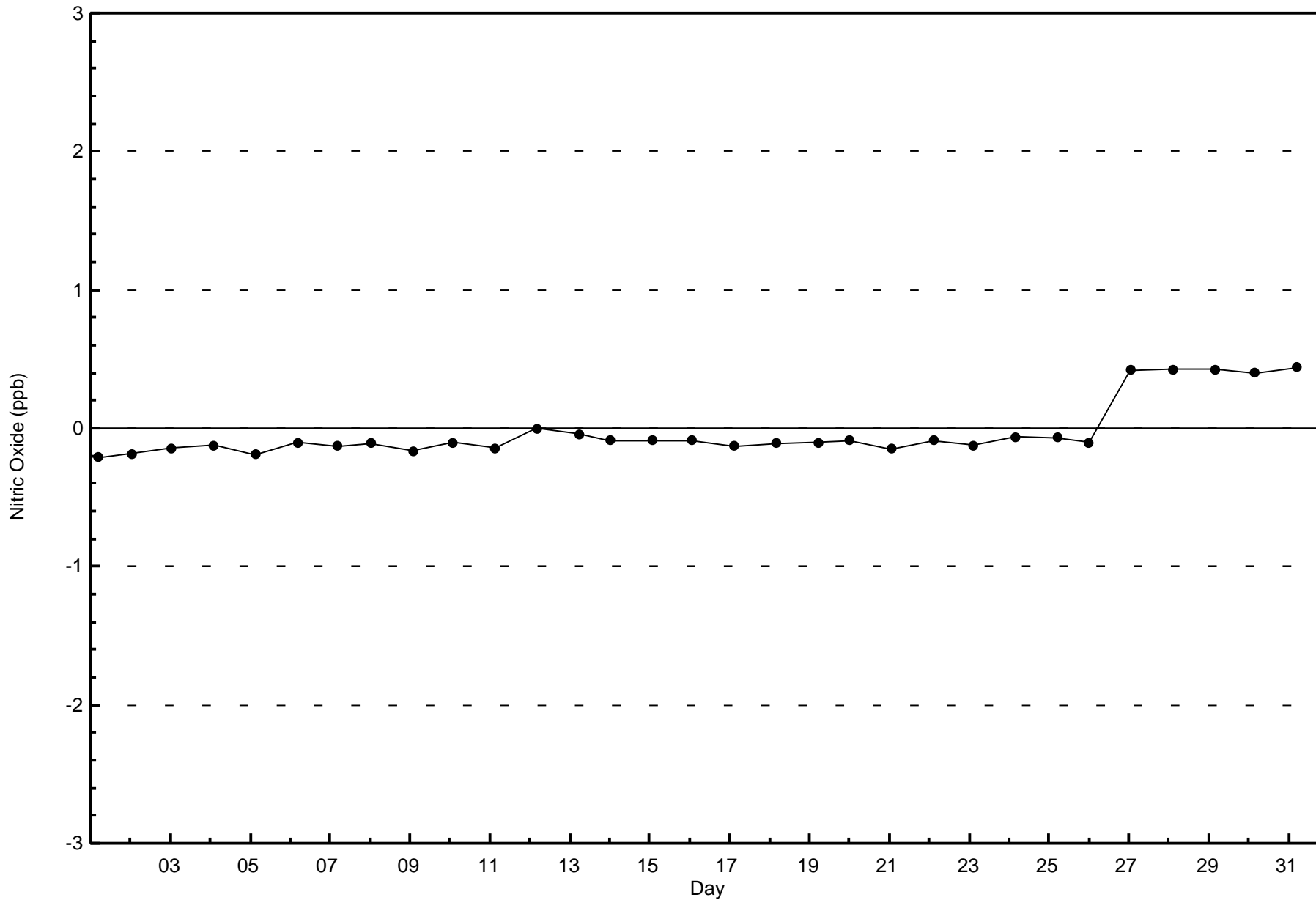


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

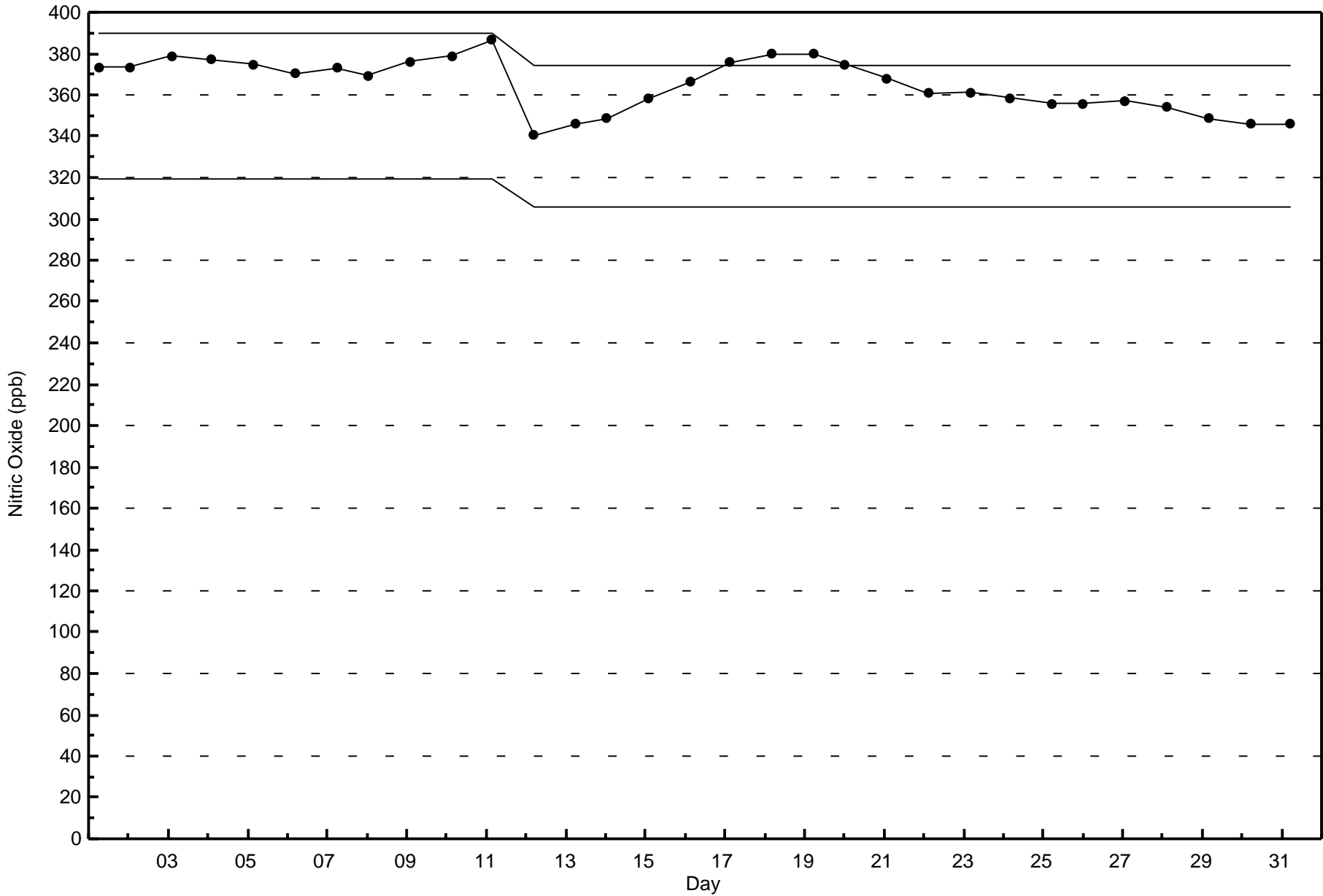
Nitric Oxide (NO) - ppb  
Muskeg River (AMS 16)



Total Number of Valid Hours: 689









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

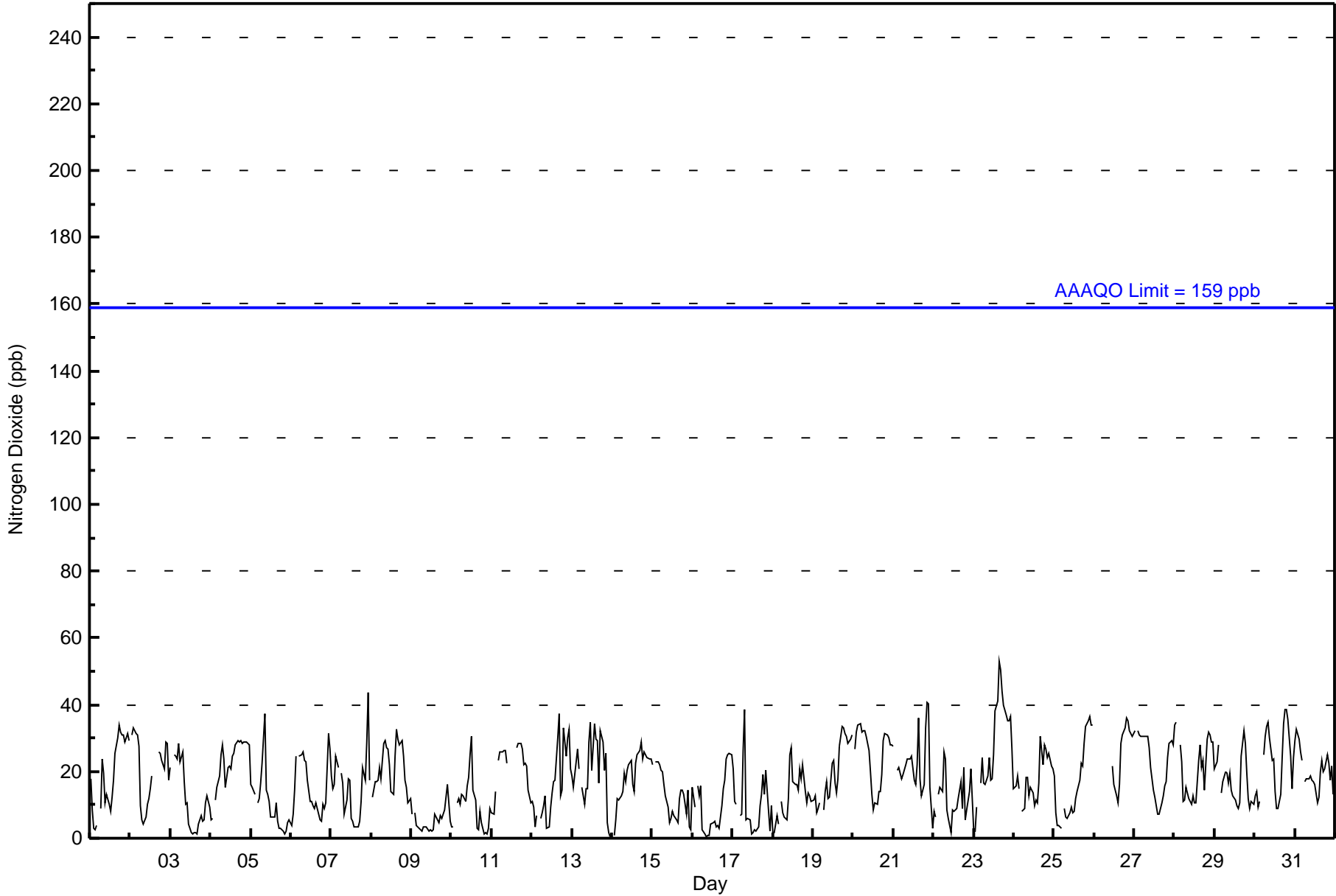
Muskeg River - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 53 ppb on Dec 23 16:00										Maximum Daily Average: 27.2 ppb on Dec 23										Hours of Data: 695																													
Minimum Value: 0 ppb on Dec 16 09:00										Minimum Daily Average: 5.4 ppb on Dec 9										Hours of Missing Data: 49																													
Maximum Diurnal Average: 21.8 ppb at hour 20										Minimum Diurnal Average: 12.6 ppb at hour 13										Hours of Calibration: 36																													
Monthly Average: 17.3 ppb										Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 9 Median = 16 Q <sub>3</sub> = 25 P <sub>90</sub> = 31 P <sub>99</sub> = 40										Percent Operational Time: 98.3																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	18	9	3	3	4	Z	9	24	19	11	13	10	8	12	17	26	30	34	32	31	31	29	32	29	18.8	34																							
2-Dec	Z	31	33	31	31	28	10	6	4	6	10	12	15	19	PF	PF	PF	26	26	23	21	29	28	17	20.2	33																							
3-Dec	21	Z	25	24	24	29	23	26	17	10	11	4	2	1	2	2	1	4	7	5	5	11	13	9	11.9	29																							
4-Dec	5	6	Z	12	15	19	25	28	24	15	21	22	21	25	26	28	29	29	29	29	29	28	28	28	22.6	29																							
5-Dec	16	15	13	Z	11	12	17	22	37	14	13	11	7	6	6	10	5	3	3	2	1	2	5	6	10.3	37																							
6-Dec	4	7	14	25	Z	25	25	26	23	23	17	11	11	10	9	11	9	6	5	10	9	11	31	27	15.1	31																							
7-Dec	19	15	16	25	21	Z	19	17	7	12	18	17	6	5	3	4	3	5	11	21	17	29	44	17	15.2	44																							
8-Dec	Z	12	17	17	18	21	18	29	29	27	27	22	14	13	25	33	30	28	29	25	18	15	11	12	21.2	33																							
9-Dec	7	Z	8	4	4	3	2	3	3	3	2	2	2	2	7	7	5	7	6	7	9	16	11	5	5.4	16																							
10-Dec	3	3	Z	11	12	10	13	13	11	16	18	25	31	14	12	3	3	8	5	1	2	1	3	9	9.8	31																							
11-Dec	8	7	14	Z	23	26	26	26	26	23	C	C	C	C	C	27	28	28	27	22	23	22	14	11	21.1	28																							
12-Dec	11	9	3	7	Z	6	8	10	13	3	3	9	14	17	17	30	37	13	14	33	25	30	33	21	15.9	37																							
13-Dec	19	15	23	27	21	Z	15	10	15	15	29	35	20	34	30	29	16	32	29	21	26	5	2	1	20.3	35																							
14-Dec	Z	1	6	12	12	13	14	19	17	20	22	23	16	14	23	25	26	29	24	26	25	24	24	24	19.0	29																							
15-Dec	22	Z	23	23	22	21	20	16	13	10	5	6	8	7	5	5	12	15	14	13	7	14	3	2	12.4	23																							
16-Dec	15	9	Z	16	13	16	3	1	0	1	1	4	5	5	3	4	3	10	15	17	24	25	26	25	10.4	26																							
17-Dec	21	11	10	Z	7	7	26	38	5	6	5	1	2	3	2	4	10	13	19	13	20	8	2	10	10.7	38																							
18-Dec	2	2	7	4	Z	11	8	6	6	12	25	27	17	16	16	14	21	18	22	14	11	14	13	11	12.8	27																							
19-Dec	11	13	8	9	11	Z	8	14	17	12	12	22	23	16	14	18	27	34	33	31	31	29	30	31	19.7	34																							
20-Dec	Z	27	32	34	34	32	32	32	31	26	20	13	8	11	10	14	14	19	29	31	31	30	28	28	24.6	34																							
21-Dec	27	Z	20	21	19	18	19	22	24	24	24	25	17	16	22	36	18	13	16	33	41	40	15	3	22.3	41																							
22-Dec	8	6	Z	13	15	14	26	24	9	6	2	9	8	8	9	12	17	9	21	6	9	14	21	12	12.0	26																							
23-Dec	2	2	9	Z	17	24	16	16	19	24	18	18	25	38	41	53	50	44	40	37	35	35	36	27	27.2	53																							
24-Dec	15	16	19	15	Z	8	9	18	18	13	15	13	10	12	11	17	30	22	28	27	24	25	22	21	17.7	30																							
25-Dec	19	8	4	4	3	Z	9	6	6	8	10	8	8	12	14	18	22	22	29	34	35	36	34	34	16.5	36																							
26-Dec	Z	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	22	16	13	11	16	28	31	33	36	35	32	31	30	--	36																							
27-Dec	32	Z	32	31	31	30	31	30	30	27	21	15	12	10	7	7	11	13	16	17	24	29	29	28	22.3	32																							
28-Dec	34	35	Z	28	23	11	11	15	12	11	10	13	11	11	23	28	21	23	14	30	32	31	29	29	21.1	35																							
29-Dec	21	23	28	Z	14	17	20	20	17	20	15	13	11	10	9	11	25	32	28	19	12	9	11	10	17.0	32																							
30-Dec	13	14	9	11	Z	25	31	33	35	30	23	24	14	9	9	13	24	34	39	39	35	25	15	24	22.9	39																							
31-Dec	29	33	30	26	23	Z	17	18	18	19	18	17	16	10	12	20	23	20	21	25	22	17	22	13	20.3	33																							
																								15.4	13.1	16.2	17.2	17.0	17.6	16.9	19.0	16.8	14.8	14.7	15.1	12.6	12.6	13.6	17.4	19.3	20.0	21.4	21.8	21.5	21.5	20.7	17.8	Diurnal Average	
																								34	35	33	34	34	32	32	38	37	30	29	35	31	38	41	53	50	44	40	39	41	40	44	34	Diurnal Maximum	
Z - zerospan C - Calibration PF - Power Failure																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																																																	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Muskeg River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	424	61.01	61.01
21 - 40	265	38.13	99.14
41 - 80	6	0.86	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 695

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	3	17	51	18	9	12	9	17	92	89	44	20	19	13	11	0	424
21 - 40	5	2	4	4	1	6	3	18	80	86	17	6	5	6	11	5	259
11 - 80	0	0	0	0	0	1	0	1	0	2	0	0	0	0	1	1	6
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
<b>Totals</b>	<b>8</b>	<b>19</b>	<b>55</b>	<b>22</b>	<b>10</b>	<b>19</b>	<b>12</b>	<b>36</b>	<b>172</b>	<b>177</b>	<b>61</b>	<b>26</b>	<b>24</b>	<b>19</b>	<b>23</b>	<b>6</b>	<b>689</b>

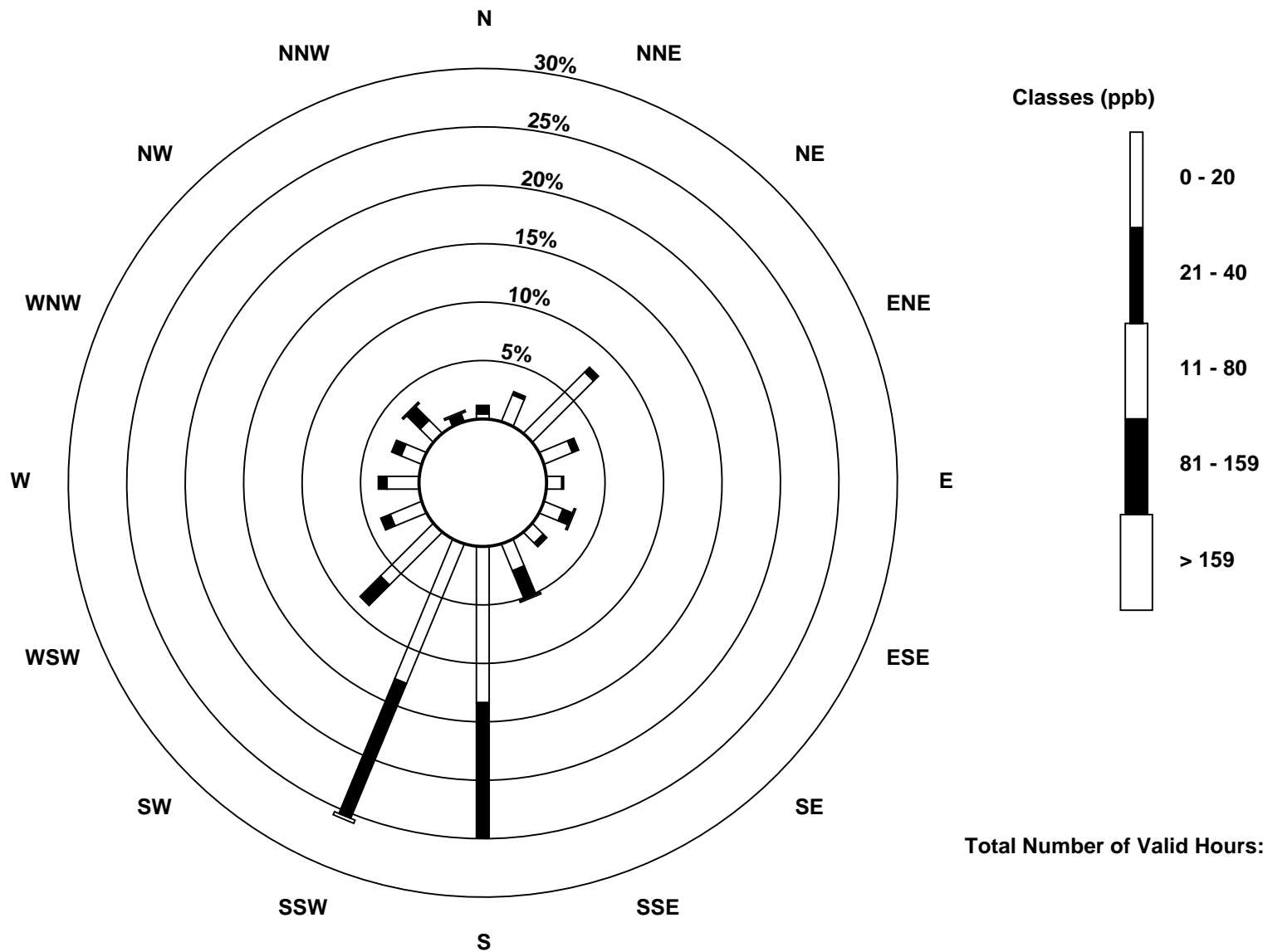
Total Number of Valid Hours: 689

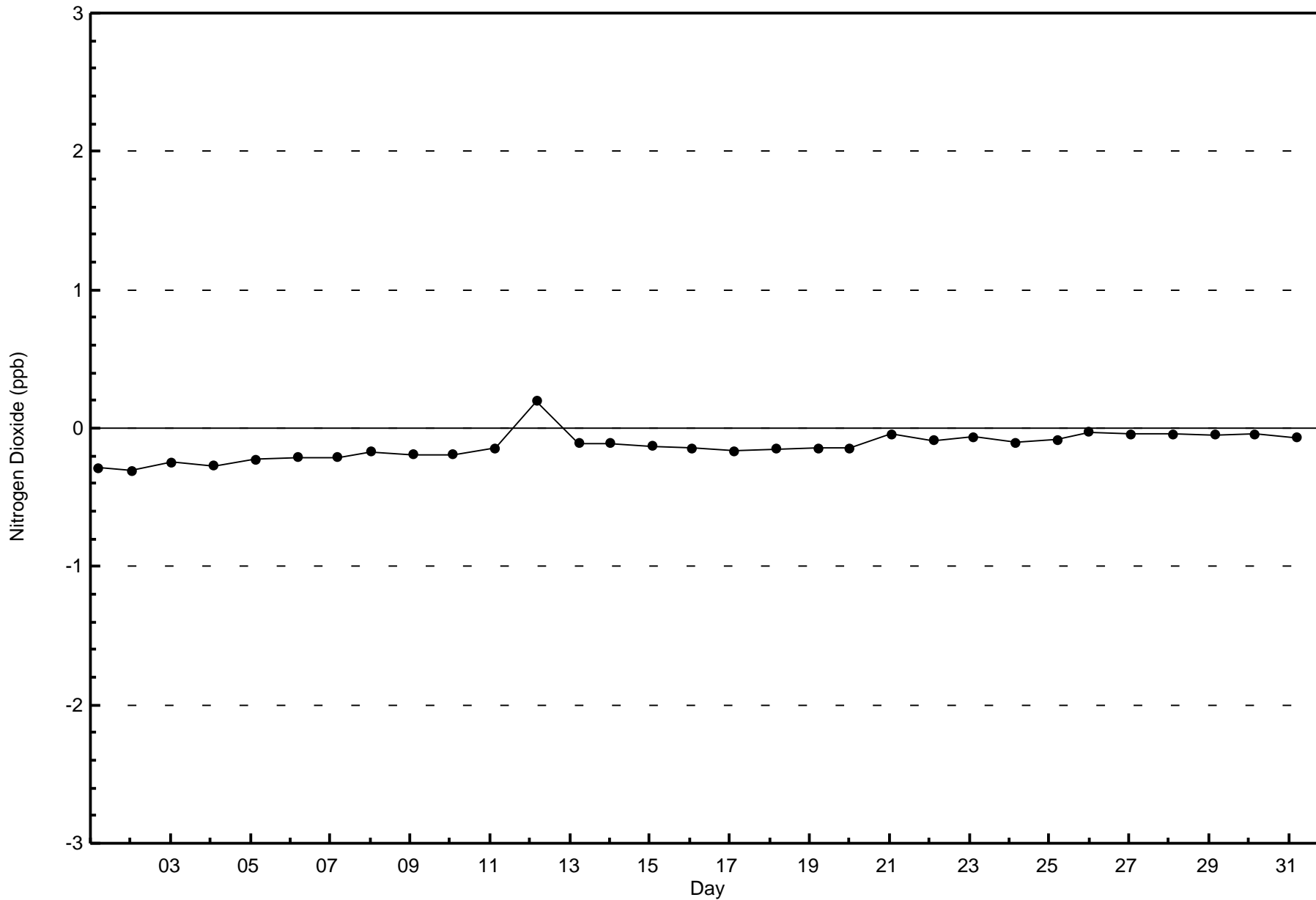
Total Number of Hours: 744

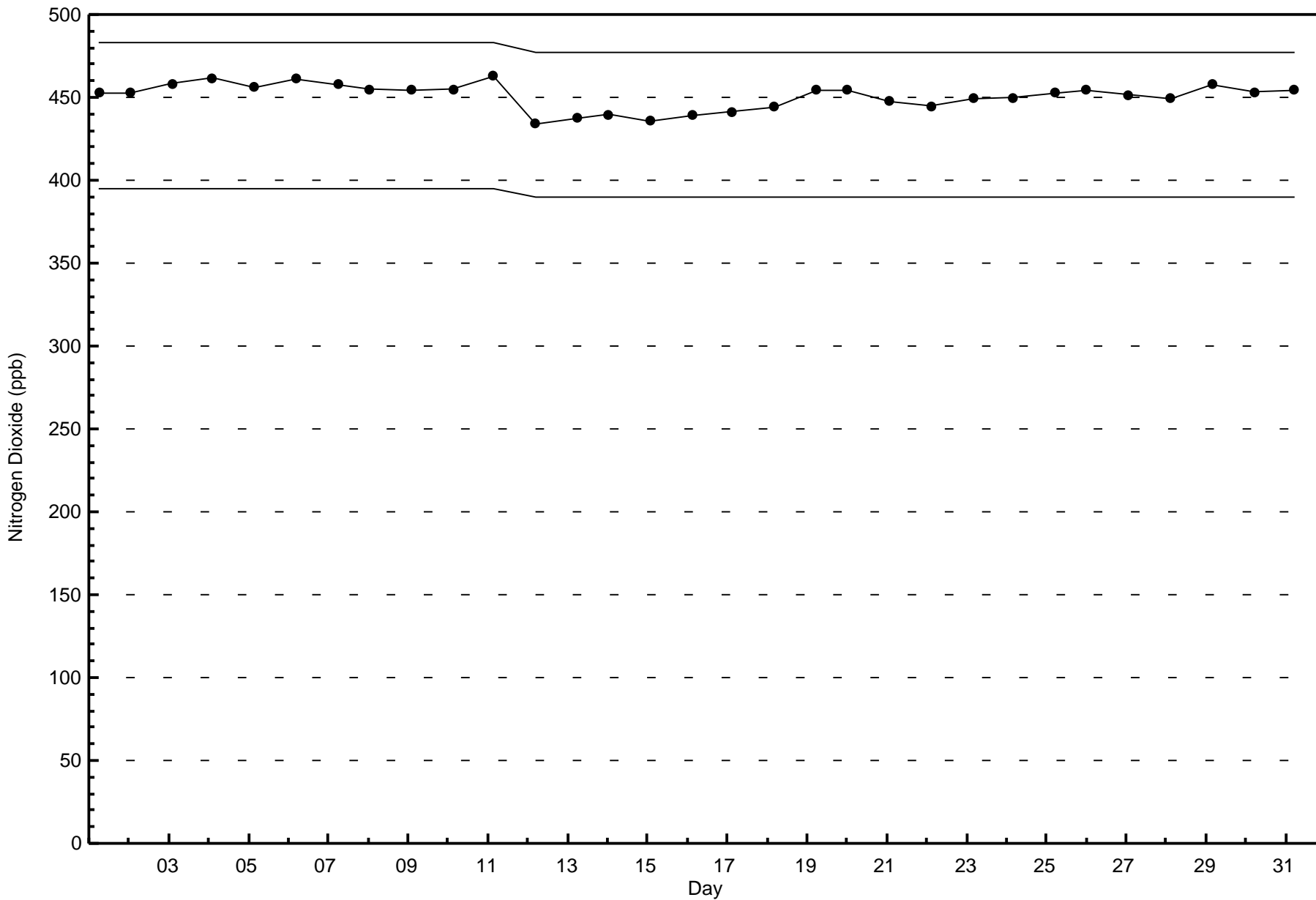


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Muskeg River (AMS 16)











**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

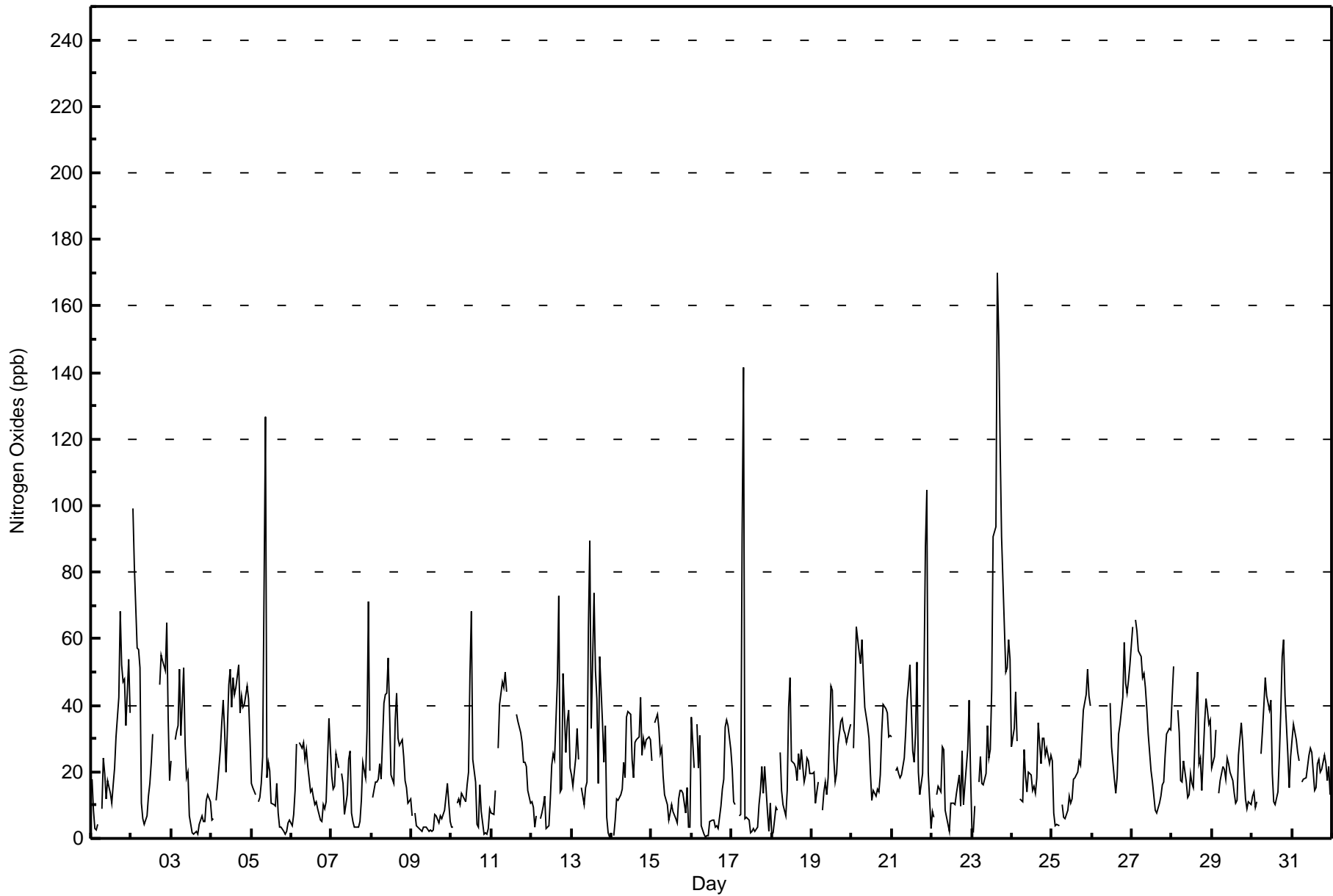
**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Muskeg River - December 2017**

Maximum Value: 170 ppb on Dec 23 16:00		Maximum Daily Average: 53.4 ppb on Dec 23		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 16 09:00		Minimum Daily Average: 5.4 ppb on Dec 9		Hours of Data: 695																																													
Maximum Diurnal Average: 29.1 ppb at hour 22		Minimum Diurnal Average: 18.2 ppb at hour 2		Hours of Missing Data: 49																																													
Monthly Average: 24.1 ppb		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 5 Q <sub>1</sub> = 11 Median = 19 O <sub>3</sub> = 33 P <sub>90</sub> = 48 P <sub>99</sub> = 97		Hours of Calibration: 36																																													
				Percent Operational Time: 98.3																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	18	9	3	2	4	Z	9	24	20	12	17	14	11	16	21	31	43	68	52	47	48	34	54	38	25.8	68																							
2-Dec	Z	99	82	57	57	51	10	6	4	7	13	16	23	31	PF	PF	PF	46	55	53	51	65	36	18	39.0	99																							
3-Dec	23	Z	30	32	34	51	31	51	28	18	20	7	2	1	2	2	1	4	7	5	5	11	13	11	17.0	51																							
4-Dec	5	6	Z	12	16	27	35	41	32	20	46	51	39	48	43	46	52	38	43	39	40	46	42	30	34.7	52																							
5-Dec	16	15	13	Z	11	12	17	25	127	18	23	20	11	10	10	16	8	3	4	2	1	2	5	5	16.3	127																							
6-Dec	4	7	14	28	Z	29	27	29	24	27	22	14	15	12	10	11	9	6	5	10	9	11	36	27	16.7	36																							
7-Dec	19	15	16	26	21	Z	19	17	7	13	24	26	7	5	3	4	3	5	11	23	18	32	71	20	17.7	71																							
8-Dec	Z	12	17	17	18	22	18	41	43	43	54	38	19	17	35	44	30	28	30	25	17	15	11	12	26.4	54																							
9-Dec	7	Z	8	4	3	2	2	3	3	3	2	3	2	3	7	7	5	7	6	7	9	16	11	5	5.4	16																							
10-Dec	3	3	Z	11	12	10	13	13	11	16	20	49	68	24	17	4	3	16	8	1	1	1	3	9	13.8	68																							
11-Dec	8	7	14	Z	27	40	47	45	50	44	C	C	C	C	C	37	35	32	29	23	23	22	14	11	28.2	50																							
12-Dec	11	9	3	7	Z	6	8	10	13	3	4	12	22	25	24	48	73	14	15	49	26	35	38	21	20.7	73																							
13-Dec	19	16	24	33	24	Z	15	10	15	17	63	89	33	74	51	42	17	55	35	23	34	6	2	1	30.3	89																							
14-Dec	Z	1	6	12	12	13	15	23	18	36	38	37	24	18	29	30	31	42	25	30	28	30	31	30	24.2	42																							
15-Dec	23	Z	35	37	33	25	27	19	13	10	6	7	10	8	6	5	12	14	14	13	7	15	3	3	15.1	37																							
16-Dec	37	21	Z	35	21	31	4	1	0	1	1	5	5	6	3	4	3	10	15	18	33	36	34	27	15.2	37																							
17-Dec	21	11	10	Z	7	7	91	141	6	6	6	2	2	3	2	4	10	14	22	14	22	8	2	10	18.3	141																							
18-Dec	1	2	10	8	Z	26	15	10	7	14	39	48	23	22	21	17	25	21	27	17	19	24	23	20	19.2	48																							
19-Dec	19	20	11	14	17	Z	8	14	17	13	18	46	44	24	17	19	28	35	36	33	31	29	32	34	24.4	46																							
20-Dec	Z	27	43	64	56	52	60	49	40	34	30	20	11	15	13	15	14	19	32	40	39	38	31	31	33.5	64																							
21-Dec	30	Z	20	21	19	18	19	24	32	42	46	52	26	23	31	53	20	13	19	49	88	105	20	3	33.7	105																							
22-Dec	8	6	Z	13	16	14	27	26	9	6	2	11	11	11	10	14	19	10	26	10	16	27	42	20	15.4	42																							
23-Dec	2	2	10	Z	17	25	17	16	20	34	24	27	44	91	94	170	151	118	91	64	50	51	60	54	53.4	170																							
24-Dec	28	33	44	29	Z	12	11	26	19	14	20	19	14	16	13	18	35	23	30	30	25	27	22	25	23.2	44																							
25-Dec	23	8	4	4	4	Z	10	6	6	8	13	11	12	18	18	20	23	22	30	39	43	51	43	40	19.8	51																							
26-Dec	Z	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	41	27	18	14	19	31	34	43	59	46	43	47	52	--	59																						
27-Dec	63	Z	66	62	56	55	48	49	46	39	31	20	17	13	9	8	10	13	16	17	25	31	33	33	33.0	66																							
28-Dec	43	52	Z	39	32	18	17	23	17	12	13	19	17	15	40	50	23	24	15	35	42	39	34	36	28.4	52																							
29-Dec	21	25	33	Z	14	17	22	21	18	24	22	20	17	14	11	11	25	35	29	20	12	9	11	10	19.1	35																							
30-Dec	13	14	9	11	Z	25	32	40	48	43	38	41	19	11	10	14	25	38	55	60	43	25	15	24	28.5	60																							
31-Dec	30	34	30	26	23	Z	17	18	18	22	25	27	26	14	15	23	24	20	21	25	23	17	22	13	22.2	34																							
																								19.1	18.2	22.1	24.2	22.2	24.5	23.0	27.4	23.7	20.0	23.5	26.4	20.1	20.2	20.0	26.1	26.3	26.6	27.2	28.4	28.2	29.1	27.1	21.7	Diurnal Average	
																								63	99	82	64	57	55	91	141	127	44	63	89	68	91	94	170	151	118	91	64	88	105	71	54	Diurnal Maximum	
Z - zerospan																								C - Calibration				PF - Power Failure																					



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Muskeg River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	368	52.95	52.95
21 - 40	216	31.08	84.03
41 - 80	97	13.96	97.99
81 - 159	13	1.87	99.86
> 159	1	0.14	100.00

Total Number of Valid Hours: 695

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Muskeg River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	1	6	44	18	8	12	9	16	86	77	38	19	16	12	6	0	368
21 - 40	3	11	8	2	2	5	1	12	54	73	14	5	7	4	9	1	211
11 - 80	3	2	3	2	0	1	2	6	30	25	9	2	0	1	8	2	96
81 - 159	1	0	0	0	0	1	0	2	2	1	0	0	1	2	0	3	13
> 159	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
<b>Totals</b>	<b>8</b>	<b>19</b>	<b>55</b>	<b>22</b>	<b>10</b>	<b>19</b>	<b>12</b>	<b>36</b>	<b>172</b>	<b>177</b>	<b>61</b>	<b>26</b>	<b>24</b>	<b>19</b>	<b>23</b>	<b>6</b>	<b>689</b>

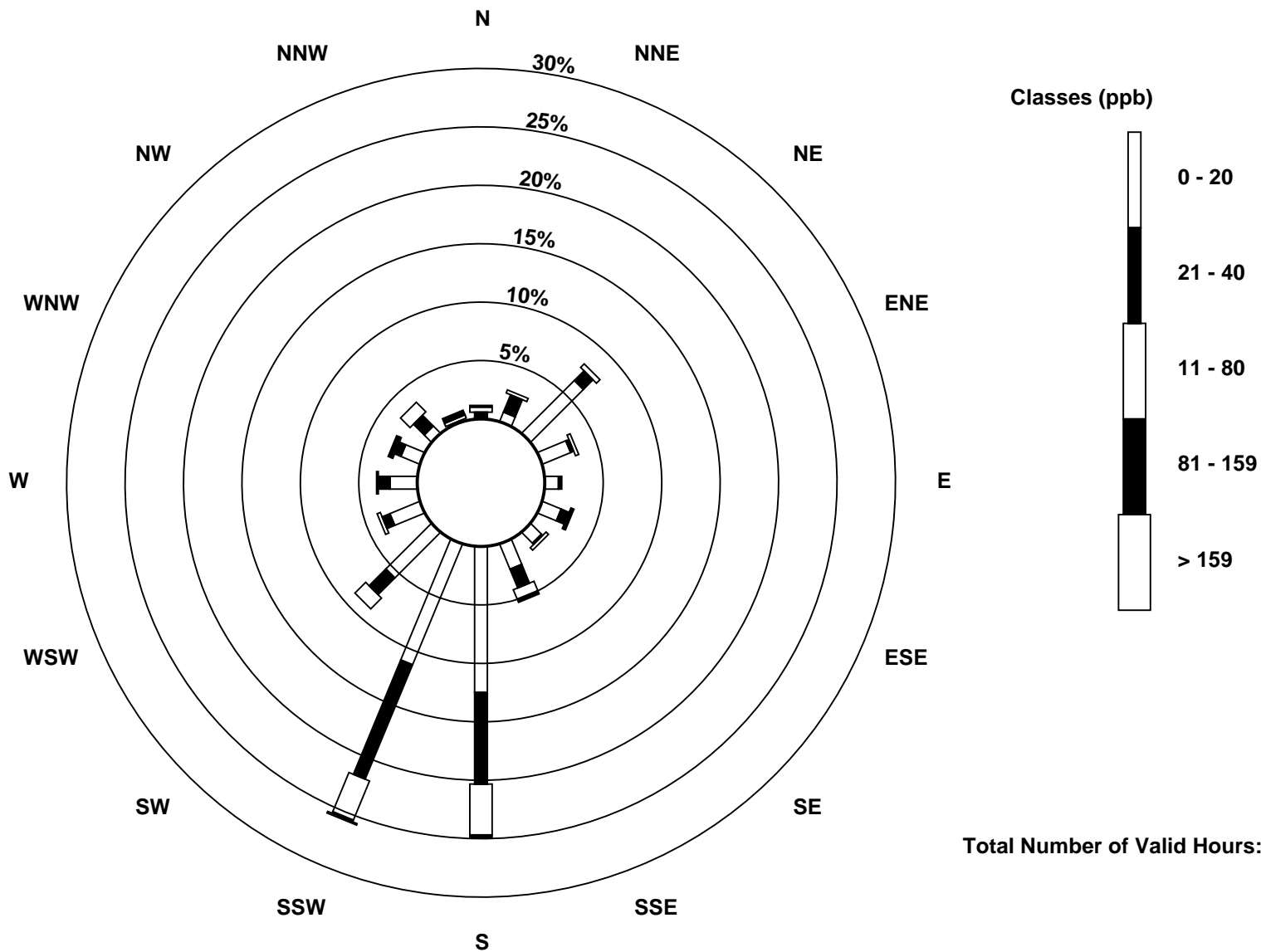
Total Number of Valid Hours: 689

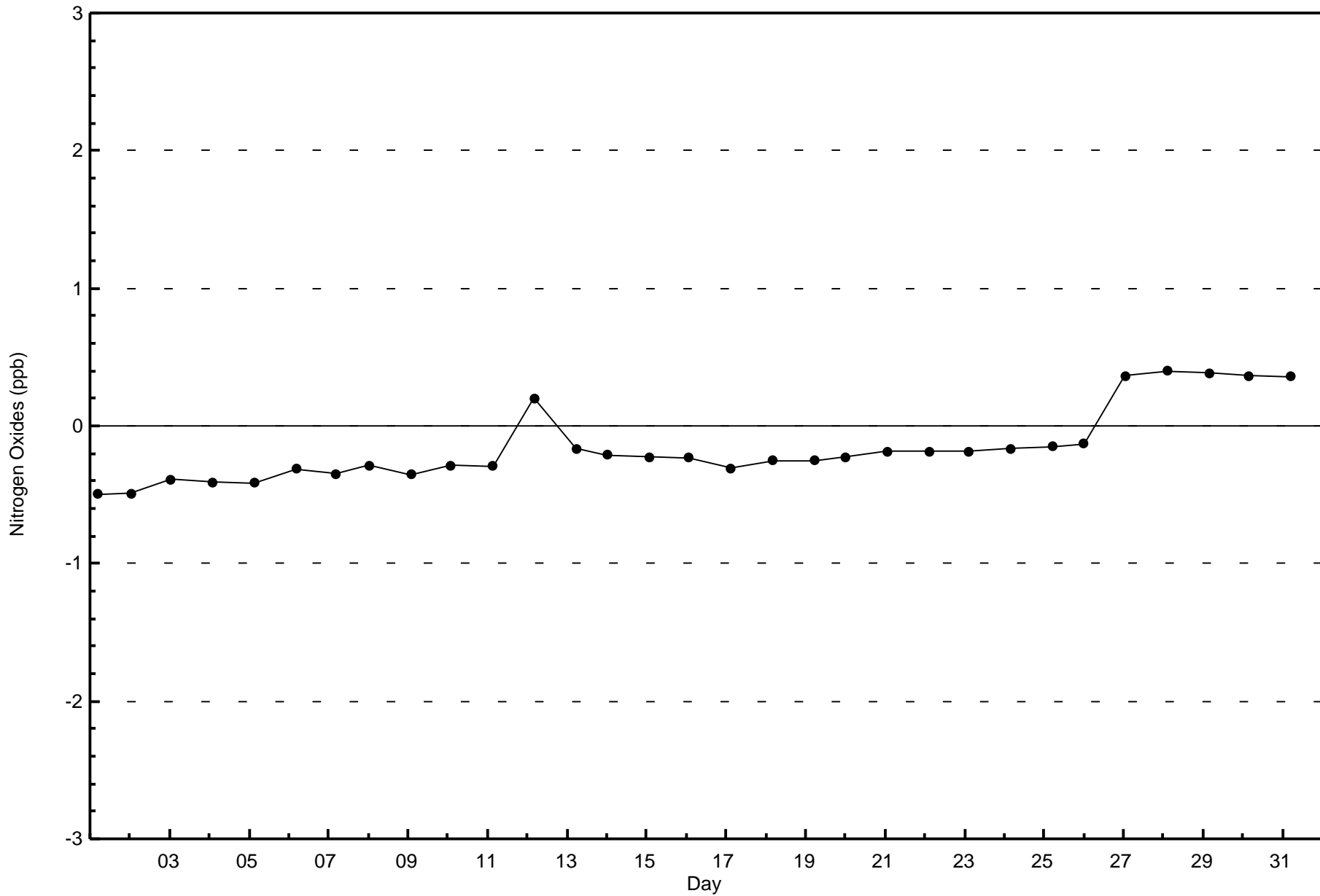
Total Number of Hours: 744

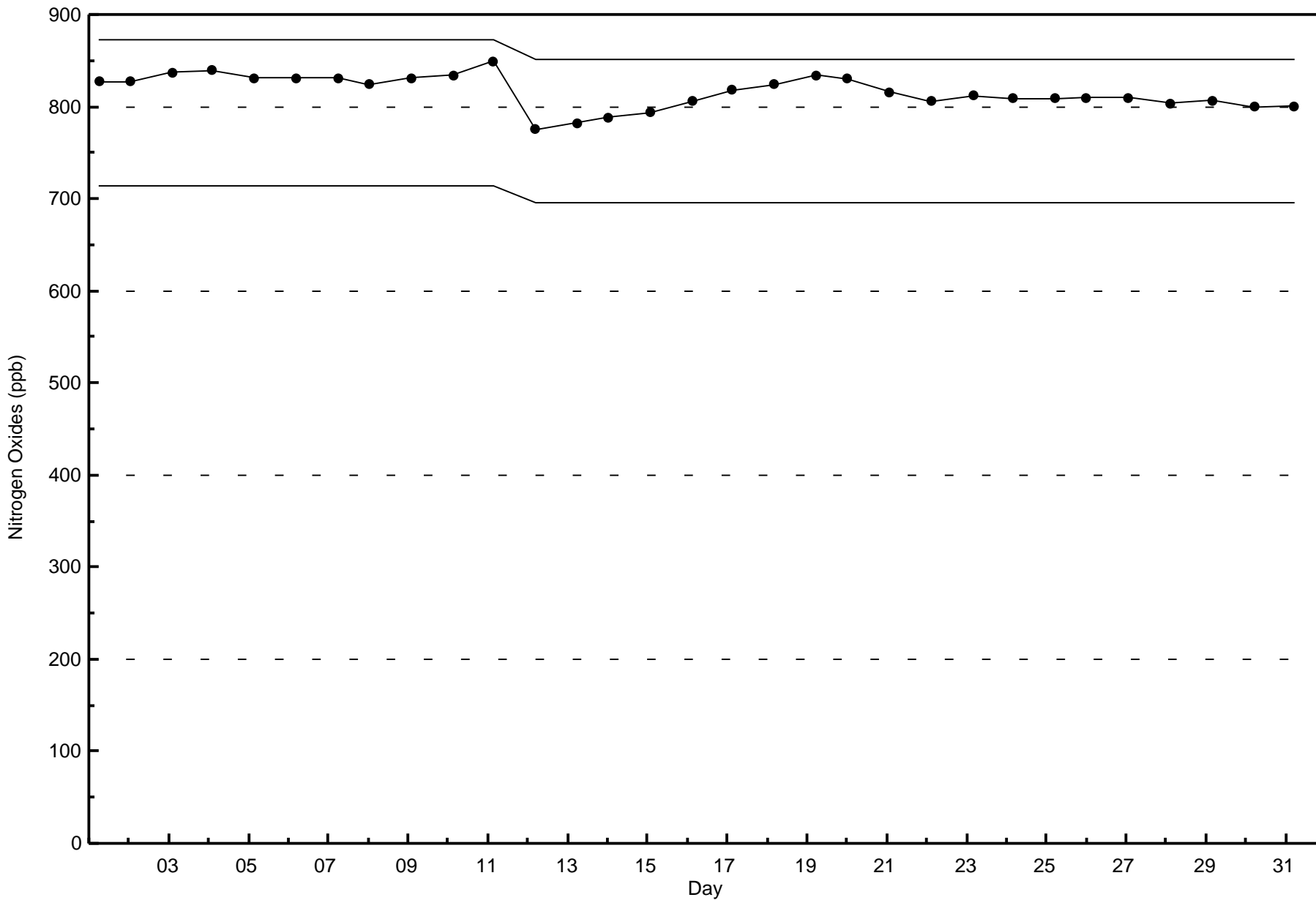


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Muskeg River (AMS 16)









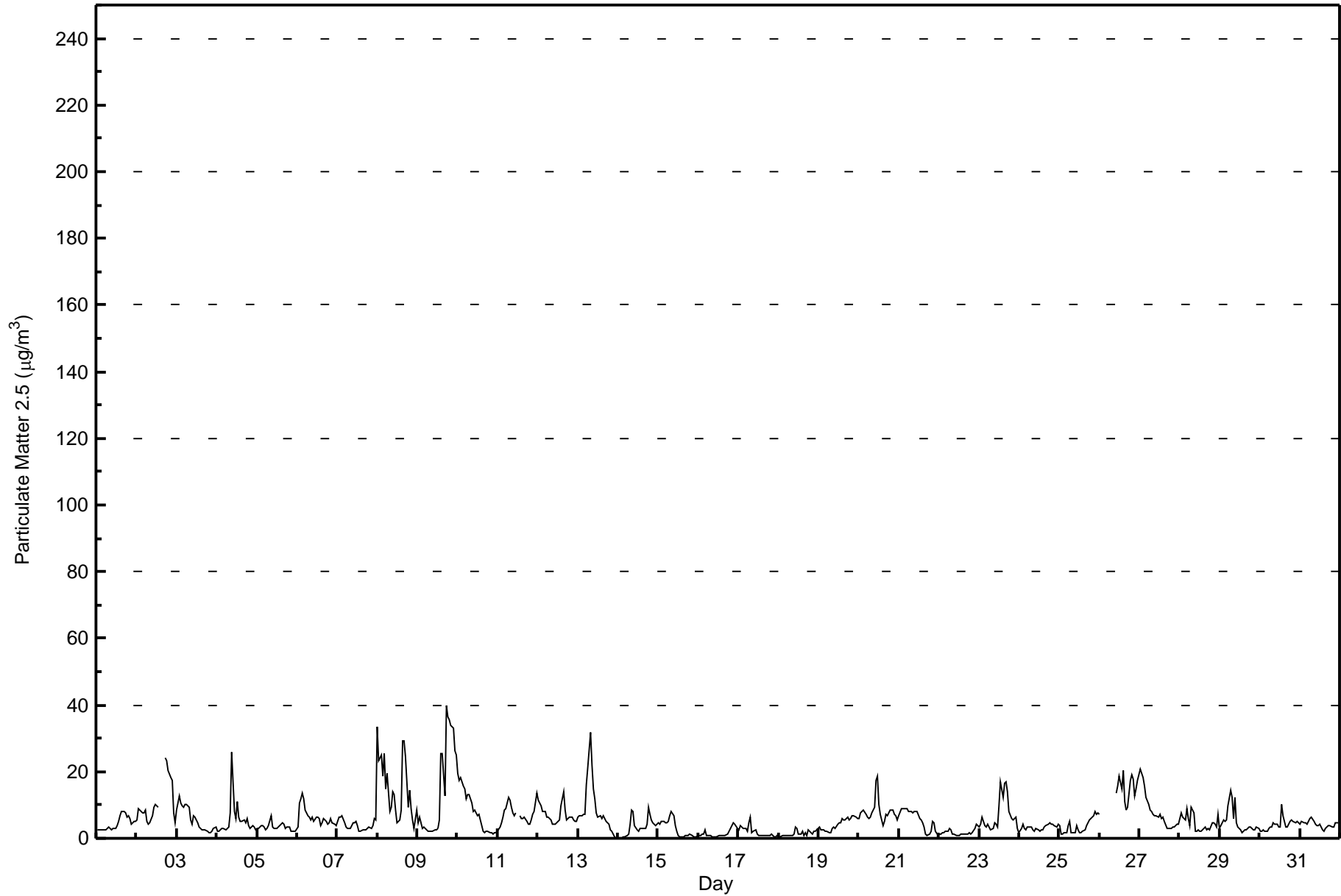
Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 39.9 µg/m <sup>3</sup> on Dec 9 18:00 Minimum Value: 0.2 µg/m <sup>3</sup> on Dec 14 02:00 Maximum Diurnal Average: 6.6 µg/m <sup>3</sup> at hour 18 Monthly Average: 5.84 µg/m <sup>3</sup>		Maximum Daily Average: 15.2 µg/m <sup>3</sup> on Dec 8 Minimum Daily Average: 1.5 µg/m <sup>3</sup> on Dec 18 Minimum Diurnal Average: 4.9 µg/m <sup>3</sup> at hour 13 Percentiles: P <sub>1</sub> = 0.4 P <sub>10</sub> = 1.2 Q <sub>1</sub> = 2.6 Median = 4.4 Q <sub>3</sub> = 7.0 P <sub>90</sub> = 11.6 P <sub>99</sub> = 30.5		Hours in Service: 744 Hours of Data: 731 Hours of Missing Data: 13 Hours of Calibration: 1 Percent Operational Time: 98.4																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.5	2.6	2.4	2.4	2.7	2.7	3.2	3.4	3.0	2.7	2.9	3.1	3.8	5.0	6.6	7.9	7.9	7.7	6.4	6.6	5.9	4.2	5.0	4.9	4.4	7.9
2-Dec	5.5	8.7	8.4	7.8	7.7	8.4	5.0	4.2	4.8	6.8	9.4	10.3	9.5	9.3	PF	PF	PF	24.0	23.2	20.2	18.4	17.4	7.8	4.7	10.5	24.0
3-Dec	8.3	12.6	10.4	9.8	9.5	10.3	10.1	9.2	5.4	4.2	6.7	6.5	4.5	3.3	3.0	2.6	2.4	2.4	2.3	1.9	1.7	2.0	2.8	3.3	5.6	12.6
4-Dec	2.0	2.2	2.6	2.8	3.0	2.7	3.1	3.2	7.8	26.0	7.9	6.0	11.1	6.4	5.1	4.9	5.3	4.6	6.1	3.8	3.1	3.9	3.3	2.7	5.4	26.0
5-Dec	2.9	3.1	3.8	3.9	3.3	2.7	2.8	3.7	6.9	3.6	3.0	3.1	2.9	3.8	4.1	4.7	4.2	3.1	3.4	3.2	2.2	2.0	2.0	2.0	3.3	6.9
6-Dec	3.3	10.4	11.8	13.6	11.8	8.7	6.9	6.3	5.6	6.3	5.2	6.5	6.5	5.8	3.8	4.6	6.0	5.0	4.4	4.7	5.8	4.6	4.4	4.0	6.5	13.6
7-Dec	5.1	6.4	6.2	6.6	4.6	3.4	3.1	2.8	2.8	4.5	4.8	4.9	3.9	2.3	1.9	2.4	2.5	2.6	3.0	3.3	3.1	3.8	5.7	5.5	4.0	6.6
8-Dec	33.6	23.3	25.0	18.4	25.5	14.8	19.5	8.0	9.5	13.9	13.2	8.6	4.7	5.7	8.3	29.3	29.4	24.6	9.4	14.5	9.1	5.5	2.9	8.4	15.2	33.6
9-Dec	4.6	6.2	4.5	2.8	3.3	2.4	2.0	2.1	2.0	2.1	2.3	2.3	2.8	5.6	25.6	25.4	12.7	39.9	36.3	35.7	33.7	32.9	26.1	24.9	14.1	39.9
10-Dec	19.6	17.4	18.2	15.5	14.8	11.9	13.3	13.2	10.4	8.3	8.3	7.4	6.9	7.1	3.6	2.0	1.9	2.0	2.0	1.8	1.6	1.4	1.6	1.8	8.0	19.6
11-Dec	2.2	3.2	4.7	6.2	8.3	8.8	12.4	11.5	9.3	7.6	6.8	7.4	C	6.7	6.1	6.1	6.4	5.2	4.1	4.4	5.4	7.3	8.2	13.7	7.0	13.7
12-Dec	11.6	10.6	9.8	8.2	8.2	6.3	6.4	6.0	5.7	4.4	4.0	4.6	4.9	5.4	9.8	13.8	8.4	5.5	5.7	6.5	6.3	5.5	5.0	4.9	7.0	13.8
13-Dec	6.2	6.6	7.0	7.4	7.1	16.0	21.0	31.6	21.9	14.8	11.9	7.7	6.5	6.9	6.1	6.7	6.1	4.9	4.1	2.6	2.3	1.2	0.3	0.2	8.6	31.6
14-Dec	0.2	0.2	0.2	0.5	0.6	0.7	1.5	4.4	8.4	8.1	3.8	2.4	2.1	2.8	2.9	2.8	3.1	4.1	9.4	7.0	5.6	4.8	3.7	4.2	3.5	9.4
15-Dec	4.6	4.4	5.0	5.2	4.6	4.8	5.2	6.8	8.0	6.6	3.8	2.1	1.1	0.4	0.4	0.3	0.7	0.9	0.9	1.2	0.7	0.6	0.5	0.5	2.9	8.0
16-Dec	1.0	0.7	1.1	1.2	2.5	1.0	0.7	0.7	0.5	0.5	0.5	0.6	0.8	0.9	0.7	0.7	0.8	1.4	2.2	2.8	3.9	4.5	4.0	3.0	1.5	4.5
17-Dec	2.4	3.9	3.2	2.8	2.9	2.1	4.8	6.3	1.8	2.2	2.3	1.3	1.0	0.9	0.7	0.7	0.8	0.7	0.9	0.8	1.1	0.6	0.5	0.7	1.9	6.3
18-Dec	0.5	0.5	0.9	0.9	0.9	0.8	1.0	1.0	0.7	1.2	3.3	2.9	1.2	1.2	2.0	0.9	1.8	0.7	2.5	1.8	1.1	2.2	2.3	2.7	1.5	3.3
19-Dec	3.2	2.6	2.5	2.6	2.3	2.3	1.8	1.9	3.1	3.4	3.1	4.1	4.7	4.7	5.8	5.5	5.6	6.2	5.5	5.9	6.7	6.8	6.2	6.1	4.3	6.8
20-Dec	6.0	7.7	8.1	8.5	7.4	6.2	5.9	6.2	7.4	9.2	17.3	18.7	10.1	7.1	3.7	5.2	7.0	6.8	7.4	8.3	8.6	7.2	6.6	5.6	8.0	18.7
21-Dec	6.7	9.0	8.9	8.9	8.9	8.7	8.3	8.0	7.7	8.0	8.2	8.1	5.8	5.6	4.5	3.2	1.3	0.9	1.1	2.0	5.0	4.6	2.0	0.8	5.7	9.0
22-Dec	1.2	1.3	1.7	1.7	1.9	2.1	3.1	2.5	1.5	1.1	0.7	1.0	1.0	1.4	1.1	1.2	1.4	1.1	1.5	1.2	1.9	2.9	4.3	3.8	1.8	4.3
23-Dec	3.3	4.1	6.2	3.8	3.3	4.2	3.6	2.7	2.9	4.6	4.1	3.3	9.9	17.1	12.3	16.3	16.8	14.1	8.1	5.8	5.7	5.9	6.5	2.8	7.0	17.1
24-Dec	1.7	2.9	4.3	3.1	2.5	3.3	3.2	3.5	2.7	2.2	2.8	2.6	2.2	2.4	2.7	3.5	3.8	4.1	4.5	4.2	4.1	3.9	3.6	4.2	3.2	4.5
25-Dec	3.7	1.3	1.3	1.6	1.6	3.8	5.2	1.7	1.6	1.6	4.0	2.4	1.7	1.6	2.0	2.6	3.8	4.8	5.6	6.1	7.0	7.9	7.1	7.6	3.7	7.9
26-Dec	7.2	PF	PF	PF	PF	PF	PF	PF	PF	PF	13.7	15.7	18.8	14.7	20.3	11.1	8.7	9.1	17.6	18.9	18.0	12.5	15.0	17.4	--	20.3
27-Dec	20.6	19.5	18.0	15.6	12.4	10.0	8.4	8.1	7.2	6.9	6.6	6.2	7.4	6.0	6.4	5.0	3.1	2.8	2.9	2.8	3.6	3.2	4.1	4.2	8.0	20.6
28-Dec	6.0	7.8	6.6	5.5	8.7	6.1	3.8	9.2	7.5	1.9	2.0	2.4	2.0	1.9	2.9	3.5	2.7	2.9	2.5	4.5	4.5	4.4	3.6	7.1	4.6	9.2
29-Dec	3.2	4.8	5.5	5.2	5.5	9.6	14.3	12.5	5.8	12.3	4.7	3.5	2.4	1.8	2.0	2.6	2.7	3.4	3.3	3.0	2.5	2.5	3.4	2.9	5.0	14.3
30-Dec	2.0	2.3	2.7	2.3	2.2	2.9	3.3	3.4	4.6	4.2	4.2	3.5	3.3	10.2	6.8	3.3	3.4	4.2	5.2	5.4	5.0	4.8	5.1	4.5	4.1	10.2
31-Dec	4.4	5.0	4.6	4.7	4.2	5.0	5.8	6.2	5.3	4.4	3.7	3.7	4.4	2.6	2.3	3.0	3.5	4.0	3.8	3.4	3.3	4.5	4.6	4.6	4.2	6.2
																								Diurnal Average		
																								Diurnal Maximum		
6.0 6.4 6.5 6.0 6.1 5.8 6.3 6.3 5.7 6.1 5.6 5.3 4.9 5.1 5.5 6.1 5.5 6.6 6.3 6.3 6.0 5.7 5.1 5.3 33.6 23.3 25.0 18.4 25.5 16.0 21.0 31.6 21.9 26.0 17.3 18.7 18.8 17.1 25.6 29.3 29.4 39.9 36.3 35.7 33.7 32.9 26.1 24.9																										
C - Calibration PF - Power Failure Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																										





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Muskeg River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Muskeg River - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	400	54.72	54.72
6 - 15	227	31.05	85.77
16 - 25	35	4.79	90.56
26 - 80	12	1.64	92.20
> 81.0	0	0.00	92.20

Total Number of Valid Hours: 731

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Muskeg River - December 2017**

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	3	14	44	17	10	13	6	19	98	84	36	15	9	11	13	3	395
6 - 15	5	5	4	3	1	2	4	13	70	73	23	5	5	5	5	3	226
16 - 25	0	0	0	0	0	1	0	2	12	17	3	0	0	0	0	0	35
26 - 80	0	0	0	0	0	0	0	1	2	7	1	1	0	0	0	0	12
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	8	19	48	20	11	16	10	35	182	181	63	21	14	16	18	6	668

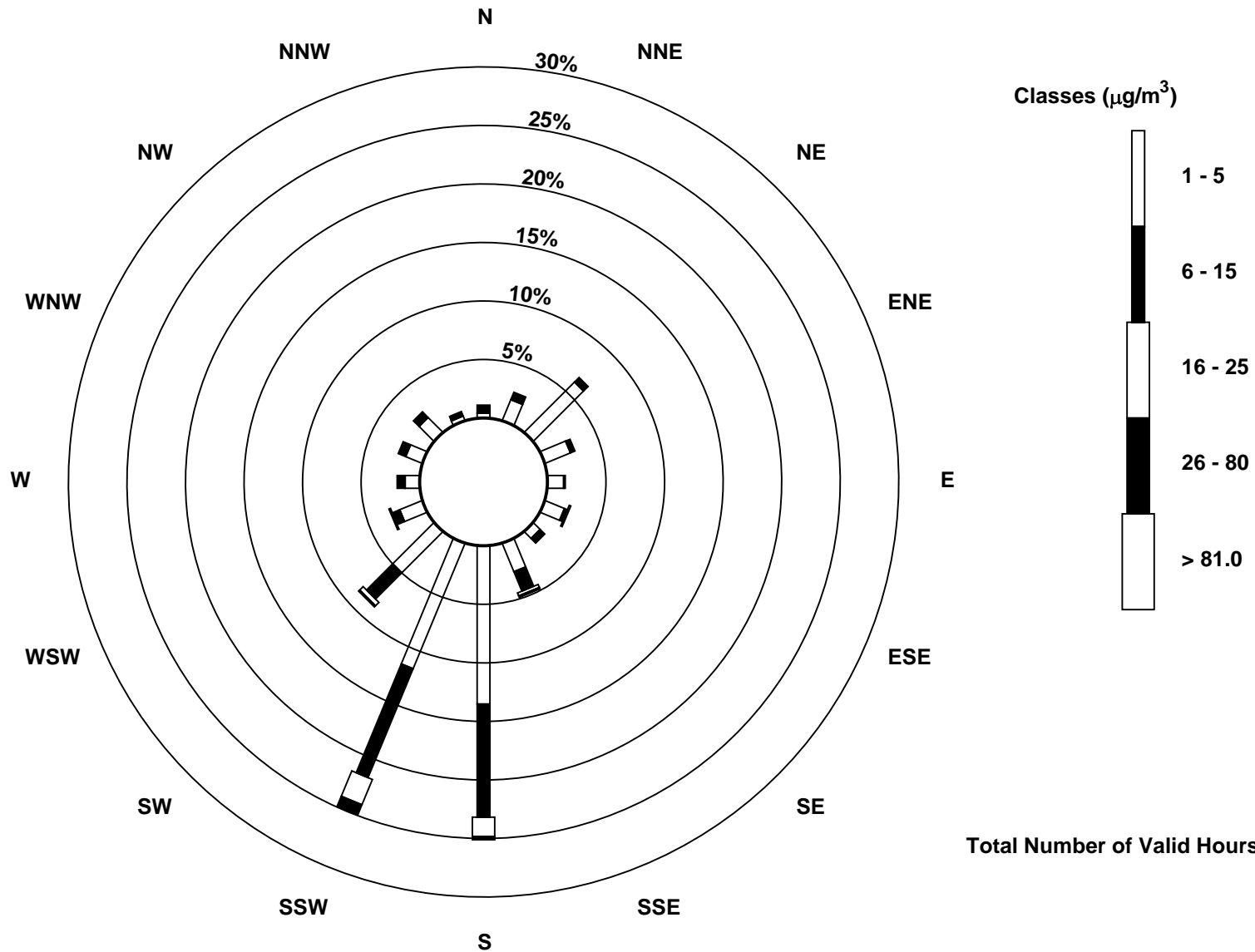
Total Number of Valid Hours: 725

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Muskeg River (AMS 16)



Total Number of Valid Hours: 725



Wood Buffalo Environmental Association

Summary of Hour Averages

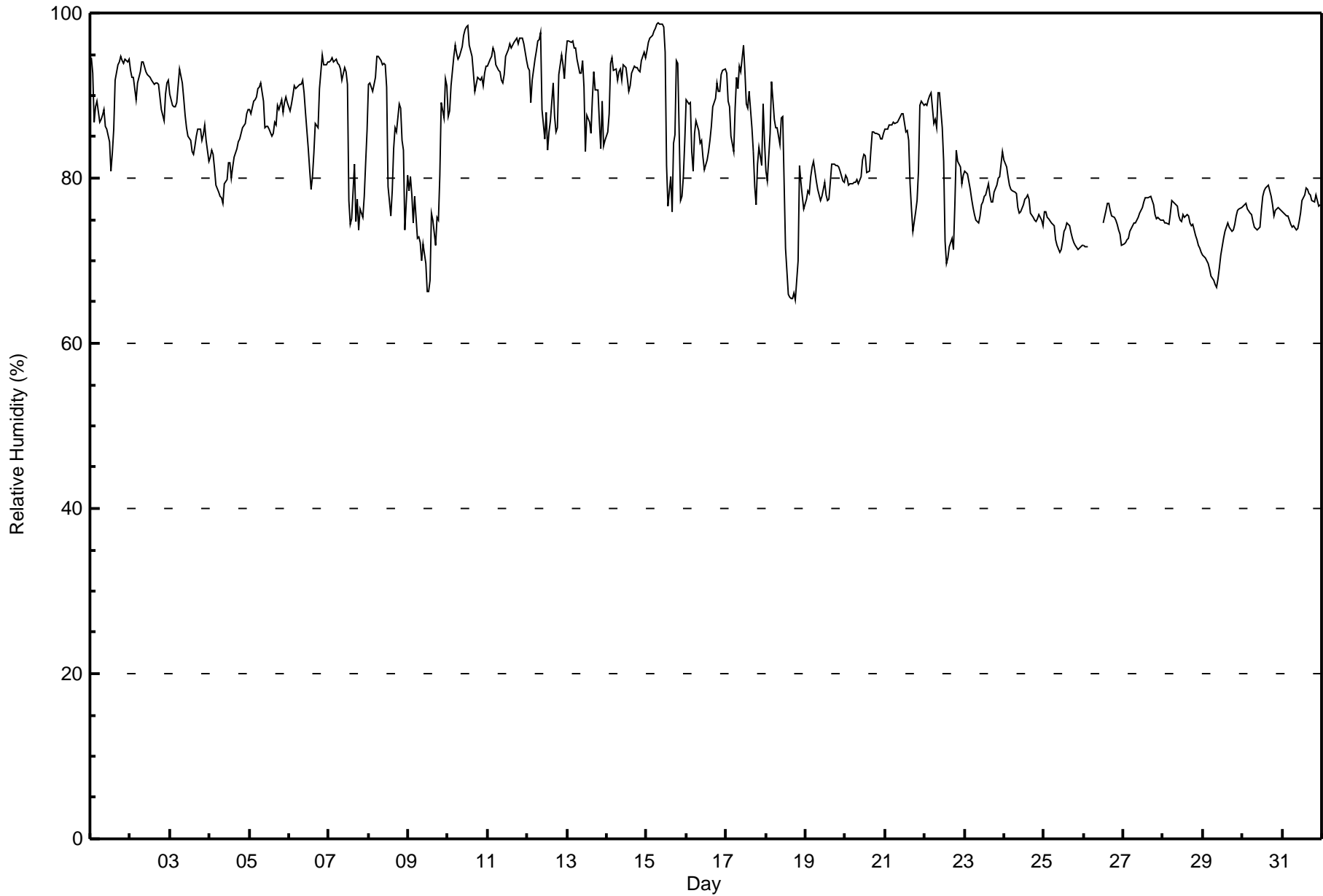
Relative Humidity (RH) - %  
Muskeg River - December 2017

Maximum Value: 99 % on Dec 15 08:00																		Maximum Daily Average: 94.9 % on Dec 11																		Hours in Service: 744																																																																																	
Minimum Value: 65 % on Dec 18 19:00																		Minimum Daily Average: 71.7 % on Dec 29																		Hours of Data: 735																																																																																	
Maximum Diurnal Average: 85.3 % at hour 7																		Minimum Diurnal Average: 80.4 % at hour 14																		Hours of Missing Data: 9																																																																																	
Monthly Average: 83.6 %																		Percentiles: P <sub>1</sub> = 66 P <sub>10</sub> = 74 Q <sub>1</sub> = 77 Median = 84 Q <sub>3</sub> = 91 P <sub>90</sub> = 94 P <sub>99</sub> = 98																		Hours of Calibration: 0																																																																																	
																																				Percent Operational Time: 98.8																																																																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																																																																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																																																																													
1-Dec	95	93	87	89	89	87	87	88	88	86	86	84	81	83	86	92	94	94	95	94	94	94	94	94	89.7	95																																																																																											
2-Dec	93	92	92	89	92	92	93	94	94	93	92	92	92	92	91	92	92	91	90	88	87	90	92	92	91.6	94																																																																																											
3-Dec	90	89	89	89	89	91	93	91	90	88	86	85	85	83	83	84	85	86	86	85	85	87	85	82	86.8	93																																																																																											
4-Dec	83	83	83	81	79	78	78	78	77	79	80	82	82	80	81	83	84	84	85	85	86	87	88	88	82.2	88																																																																																											
5-Dec	88	88	89	89	90	91	91	92	89	86	86	86	86	85	85	87	87	89	88	90	88	89	90	89	88.3	92																																																																																											
6-Dec	88	89	90	91	91	91	91	91	92	90	88	84	81	79	80	83	87	86	91	93	95	94	94	94	88.9	95																																																																																											
7-Dec	94	94	94	94	94	94	94	93	92	93	93	91	77	74	75	82	75	77	74	76	75	78	82	86	85.5	94																																																																																											
8-Dec	91	92	91	91	92	95	95	94	94	94	94	91	79	75	78	84	86	86	89	89	85	83	74	80	87.5	95																																																																																											
9-Dec	78	80	78	75	78	73	73	72	70	72	70	66	66	68	76	75	72	75	75	80	89	87	92	91	76.3	92																																																																																											
10-Dec	87	88	91	95	96	95	94	95	96	97	98	98	99	96	95	93	90	91	92	92	92	91	93	94	93.7	99																																																																																											
11-Dec	94	94	95	96	95	94	93	93	92	91	92	95	96	96	96	96	96	97	96	97	97	97	96	94	94.9	97																																																																																											
12-Dec	93	93	89	92	94	96	97	97	98	88	85	88	83	86	87	91	88	86	86	93	95	94	92	95	91.0	98																																																																																											
13-Dec	97	97	96	97	96	96	94	93	93	94	91	83	88	87	85	90	93	91	91	87	84	89	84	85	90.7	97																																																																																											
14-Dec	86	88	94	95	93	93	92	93	93	92	94	93	92	91	91	93	94	93	93	93	93	94	95	95	92.6	95																																																																																											
15-Dec	95	96	97	97	98	98	99	99	99	99	98	95	82	77	80	76	84	85	94	94	77	78	80	84	90.1	99																																																																																											
16-Dec	90	89	89	83	81	85	87	86	84	85	82	81	82	83	85	86	89	90	92	90	91	93	93	93	87.0	93																																																																																											
17-Dec	93	89	89	85	83	89	92	91	94	93	96	93	89	88	91	86	83	79	77	82	84	81	89	84	87.5	96																																																																																											
18-Dec	81	80	85	92	89	87	86	86	84	87	87	79	72	66	66	65	65	66	65	70	81	80	78	76	78.1	92																																																																																											
19-Dec	77	79	78	80	81	82	80	79	78	77	78	79	78	77	78	79	82	82	81	81	81	81	80	79	79.5	82																																																																																											
20-Dec	80	80	79	79	79	80	80	80	79	80	82	83	83	81	81	83	86	86	85	85	85	85	85	85	82.1	86																																																																																											
21-Dec	86	86	86	86	86	87	87	87	87	88	88	88	86	86	85	79	76	74	76	77	81	89	89	89	84.5	89																																																																																											
22-Dec	89	89	90	90	90	87	87	86	90	90	86	82	72	70	70	72	73	71	77	83	82	81	79	80	82.0	90																																																																																											
23-Dec	81	81	80	79	77	76	76	75	75	75	77	77	78	78	79	78	77	77	78	79	80	80	82	83	78.3	83																																																																																											
24-Dec	82	81	80	79	79	78	78	78	76	76	76	77	77	78	78	77	76	75	75	75	75	76	75	74	77.2	82																																																																																											
25-Dec	76	76	75	75	75	74	74	72	72	71	71	72	74	74	75	74	73	73	72	72	71	71	72	72	73.2	76																																																																																											
26-Dec	72	72	72	PF	PF	PF	PF	PF	PF	PF	PF	PF	75	76	77	77	76	75	75	75	74	74	73	72	--	77																																																																																											
27-Dec	72	72	72	73	74	74	75	75	75	75	76	76	77	78	78	78	78	77	77	76	75	75	75	75	75.3	78																																																																																											
28-Dec	75	75	75	74	76	77	77	77	77	75	75	75	76	75	76	75	75	74	74	73	73	72	72	71	74.7	77																																																																																											
29-Dec	71	70	70	70	69	68	68	67	67	68	69	71	73	74	74	75	74	74	74	74	75	76	76	76	71.7	76																																																																																											
30-Dec	77	77	77	76	76	76	75	74	74	74	74	74	76	78	79	79	79	78	78	77	75	76	76	76	76.3	79																																																																																											
31-Dec	76	76	76	75	75	74	74	74	74	74	75	76	77	78	79	79	78	78	77	77	78	77	77	77	76.2	79																																																																																											
																		84.8				84.7				84.8				85.2				85.2				85.3				85.3				85.0				84.7				84.4				84.2				83.4				81.1				80.4				81.2				82.0				82.1				81.9				82.5				83.3				83.4				83.9				83.9				84.1				Diurnal Average			
																		97				97				97				98				98				99				99				99				99				99				99				98				98				99				96				96				96				96				97				96				97				97				96				95				Diurnal Maximum			
PF - Power Failure																																																																																																																					



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Muskeg River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Muskeg River - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	292	39.73	39.73
80 - 100	443	60.27	100.00

Total Number of Valid Hours: 735

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Ambient Temperature (AT) - C**  
**Muskeg River - December 2017**

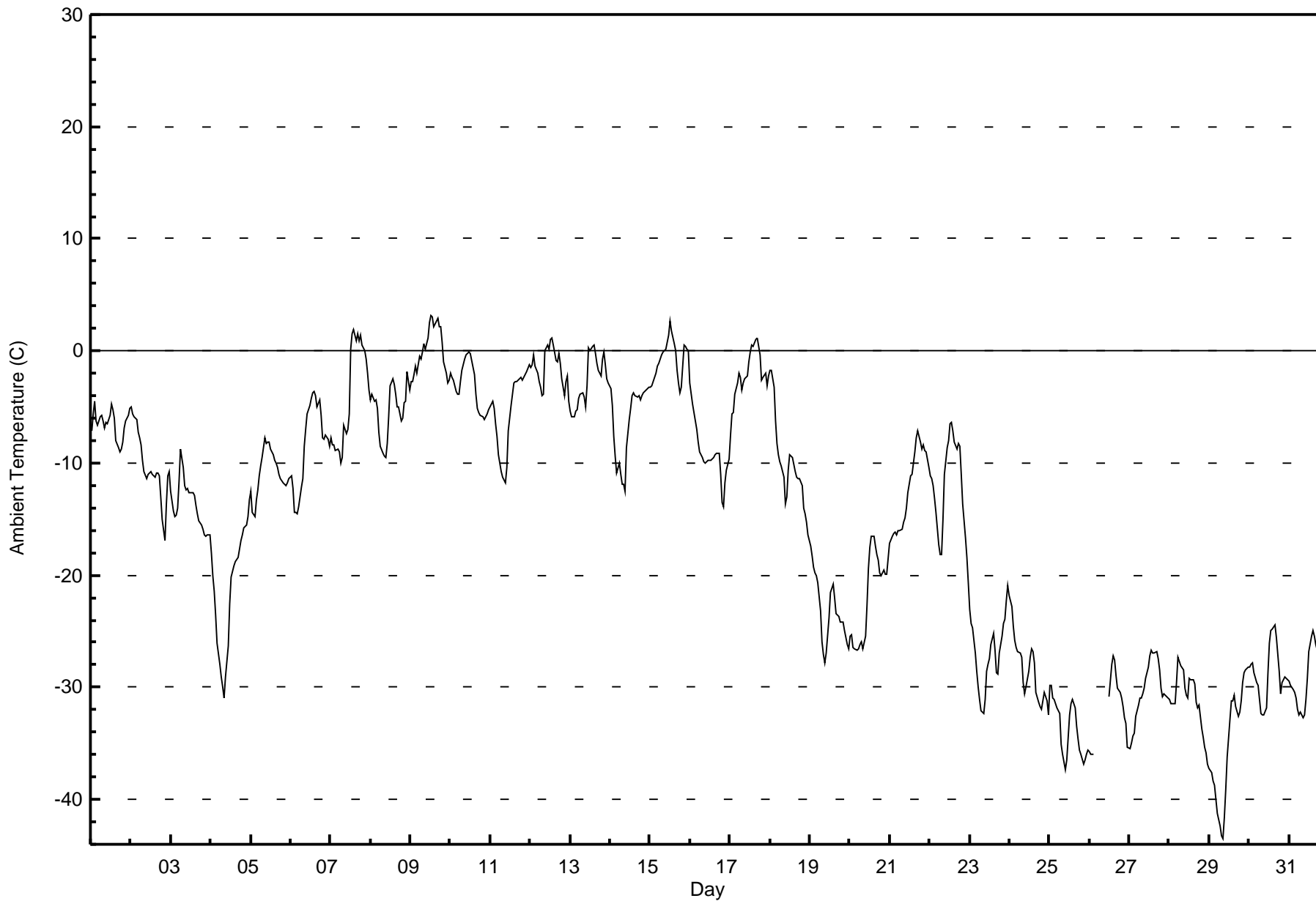
Maximum Value: 3.2 C on Dec 9 13:00		Maximum Daily Average: 0.1 C on Dec 9		Hours in Service: 744																							
Minimum Value: -43.5 C on Dec 29 09:00		Minimum Daily Average: -35.3 C on Dec 29		Hours of Data: 735																							
Maximum Diurnal Average: -12.5 C at hour 14		Minimum Diurnal Average: -16.6 C at hour 8		Hours of Missing Data: 9																							
Monthly Average: -14.84 C		Percentiles: P <sub>1</sub> = -38.7 P <sub>10</sub> = -31.3 Q <sub>1</sub> = -26.8 Median = -11.2 Q <sub>3</sub> = -4.6 P <sub>90</sub> = -1.2 P <sub>99</sub> = 1.9		Hours of Calibration: 0																							
				Percent Operational Time: 98.8																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-7.1	-5.6	-4.5	-6.3	-6.6	-5.8	-5.8	-6.3	-6.8	-6.4	-6.5	-5.7	-4.8	-5.2	-6.0	-8.0	-8.6	-9.0	-8.7	-8.1	-6.9	-6.2	-5.7	-5.1	-6.5	-4.5	
2-Dec	-5.0	-5.7	-5.9	-6.1	-7.3	-7.8	-8.4	-9.8	-10.8	-11.4	-11.0	-10.9	-10.7	-11.0	-11.2	-10.8	-10.9	-11.2	-13.0	-15.1	-16.9	-13.7	-11.2	-10.8	-10.3	-5.0	
3-Dec	-12.6	-14.3	-14.7	-14.6	-14.0	-11.7	-8.8	-10.4	-12.0	-12.3	-12.2	-12.6	-12.7	-12.7	-12.9	-13.8	-14.5	-15.2	-15.6	-15.9	-16.4	-16.5	-16.4	-16.4	-13.7	-8.8	
4-Dec	-18.0	-20.1	-21.5	-23.5	-26.1	-27.9	-29.1	-30.0	-30.9	-29.1	-26.3	-22.6	-20.2	-19.7	-19.2	-18.8	-18.4	-17.7	-16.9	-16.4	-15.8	-15.6	-14.8	-13.3	-21.3	-13.3	
5-Dec	-12.6	-14.5	-14.8	-13.2	-12.4	-11.1	-10.2	-9.6	-7.8	-8.3	-8.2	-8.2	-8.7	-9.3	-9.7	-10.0	-10.4	-11.1	-11.4	-11.7	-11.9	-12.0	-11.8	-11.5	-10.8	-7.8	
6-Dec	-11.1	-12.2	-14.3	-14.4	-14.6	-13.9	-12.2	-11.4	-8.5	-7.0	-5.7	-4.9	-4.3	-3.7	-3.6	-4.0	-4.9	-4.4	-5.7	-7.7	-7.9	-7.5	-7.9	-8.5	-8.3	-3.6	
7-Dec	-7.7	-8.4	-8.4	-8.9	-8.7	-9.0	-10.0	-9.5	-6.6	-7.4	-7.0	-5.7	0.1	1.5	1.9	0.9	1.5	0.9	1.4	0.5	0.0	-0.8	-2.0	-3.4	-3.9	1.9	
8-Dec	-4.4	-3.9	-4.5	-4.4	-5.1	-7.3	-8.6	-9.1	-9.4	-9.5	-8.2	-5.9	-3.2	-2.5	-3.0	-3.9	-5.0	-4.9	-6.2	-6.0	-4.6	-4.5	-1.8	-3.5	-5.4	-1.8	
9-Dec	-2.8	-2.7	-2.2	-1.3	-2.0	-0.5	-0.7	-0.2	0.7	0.2	1.2	2.6	3.2	3.1	2.1	2.4	2.9	2.1	2.1	0.8	-1.0	-2.0	-2.9	-2.6	0.1	3.2	
10-Dec	-1.9	-2.4	-2.6	-3.7	-3.8	-3.8	-2.8	-1.8	-0.7	-0.3	-0.2	-0.1	-0.2	-0.9	-2.0	-3.8	-5.1	-5.4	-5.7	-5.9	-6.1	-5.9	-5.6	-5.3	-3.2	-0.1	
11-Dec	-5.0	-4.5	-5.1	-6.5	-7.7	-9.2	-10.7	-11.3	-11.6	-11.7	-10.4	-7.1	-4.9	-3.8	-2.9	-2.7	-2.7	-2.5	-2.4	-2.6	-2.3	-2.1	-1.8	-1.2	-5.5	-1.2	
12-Dec	-1.5	-1.3	-0.3	-1.4	-2.0	-2.7	-3.3	-4.0	-3.9	0.1	0.6	0.1	1.1	1.2	0.5	-0.8	-1.0	-0.3	-1.1	-2.5	-4.0	-2.8	-2.2	-4.4	-1.5	1.2	
13-Dec	-5.4	-5.8	-5.8	-5.3	-5.3	-4.3	-3.9	-3.7	-4.1	-5.0	-3.1	0.3	0.0	0.3	0.5	-0.2	-1.2	-1.7	-2.2	-0.7	-0.1	-1.2	-2.5	-2.9	-2.6	0.5	
14-Dec	-3.4	-4.8	-7.6	-9.4	-10.9	-10.0	-11.1	-11.9	-11.9	-12.5	-8.6	-6.1	-5.1	-4.0	-3.7	-4.0	-4.1	-4.0	-4.4	-3.9	-3.7	-3.6	-3.4	-3.2	-6.5	-3.2	
15-Dec	-3.2	-3.1	-2.7	-1.9	-1.4	-1.1	-0.7	-0.3	-0.2	0.2	0.8	1.4	2.7	1.7	0.6	0.0	-1.7	-2.9	-3.7	-3.2	0.5	0.4	0.2	0.0	-0.7	2.7	
16-Dec	-2.9	-4.8	-5.6	-6.3	-7.0	-8.2	-9.0	-9.5	-9.9	-10.0	-9.9	-9.8	-9.7	-9.7	-9.5	-9.3	-9.2	-9.1	-11.1	-13.6	-13.9	-11.8	-10.6	-9.6	-9.1	-2.9	
17-Dec	-7.5	-5.6	-5.5	-3.9	-2.8	-2.0	-2.3	-3.5	-2.9	-2.5	-2.2	-1.0	0.0	0.5	0.4	1.0	1.1	0.5	-0.3	-2.6	-2.4	-2.0	-3.1	-2.2	-2.1	1.1	
18-Dec	-1.8	-1.7	-3.2	-6.3	-8.3	-9.3	-9.9	-10.2	-11.3	-13.6	-13.0	-10.7	-9.3	-9.5	-10.1	-10.7	-11.2	-11.4	-11.4	-12.0	-14.0	-14.6	-15.3	-16.4	-10.2	-1.7	
19-Dec	-17.4	-18.2	-19.3	-19.9	-20.1	-20.6	-23.2	-25.9	-27.0	-27.8	-27.0	-23.8	-21.6	-21.2	-20.8	-22.0	-23.4	-23.7	-24.2	-24.2	-24.2	-25.0	-26.2	-26.6	-23.0	-17.4	
20-Dec	-25.4	-25.3	-26.4	-26.6	-26.7	-26.6	-26.2	-25.9	-26.6	-25.4	-22.7	-19.4	-17.5	-16.6	-16.6	-17.5	-18.1	-18.7	-19.8	-20.0	-19.6	-19.9	-20.0	-18.5	-21.9	-16.6	
21-Dec	-17.2	-16.5	-16.3	-16.1	-16.4	-16.0	-16.0	-16.0	-15.3	-14.9	-14.0	-12.6	-11.2	-11.0	-10.1	-9.0	-7.8	-7.1	-8.1	-8.7	-8.3	-8.8	-9.0	-10.4	-12.4	-7.1	
22-Dec	-11.1	-11.4	-12.0	-13.1	-14.4	-17.3	-18.2	-18.2	-15.0	-11.1	-8.7	-8.1	-6.5	-6.4	-7.1	-8.1	-8.8	-8.2	-8.5	-11.0	-13.6	-16.6	-18.4	-20.7	-12.2	-6.4	
23-Dec	-23.0	-24.3	-24.6	-26.9	-28.6	-30.0	-31.0	-32.1	-32.4	-31.1	-28.6	-27.9	-27.5	-26.2	-25.2	-26.7	-28.7	-28.9	-27.0	-25.5	-24.4	-24.0	-22.3	-20.9	-27.0	-20.9	
24-Dec	-21.8	-22.8	-24.6	-25.8	-26.5	-26.8	-27.0	-27.3	-29.6	-30.6	-29.9	-28.6	-27.3	-26.6	-26.8	-27.8	-30.5	-31.3	-31.7	-31.9	-31.2	-30.4	-31.2	-32.4	-28.3	-21.8	
25-Dec	-29.9	-29.8	-30.9	-31.1	-31.8	-32.1	-32.3	-35.1	-36.0	-37.3	-36.5	-34.4	-32.5	-31.5	-31.0	-31.8	-33.4	-34.6	-35.6	-36.0	-36.9	-36.5	-36.0	-35.6	-33.7	-29.8	
26-Dec	-35.7	-36.0	-35.9	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	-30.8	-27.9	-27.2	-27.6	-28.9	-30.1	-30.4	-31.0	-31.7	-32.7	-33.3	-35.4	--	-27.2
27-Dec	-35.5	-35.0	-34.4	-34.1	-32.5	-31.6	-31.0	-31.0	-30.5	-30.0	-29.2	-28.2	-27.1	-26.7	-26.9	-27.0	-26.8	-27.5	-28.5	-30.1	-30.9	-30.5	-30.9	-31.0	-30.3	-26.7	
28-Dec	-31.1	-31.4	-31.4	-31.4	-29.6	-27.3	-27.7	-28.0	-28.5	-30.1	-30.7	-30.9	-29.2	-29.3	-29.3	-29.7	-31.3	-31.8	-31.6	-33.7	-34.4	-35.4	-35.9	-36.9	-31.1	-27.3	
29-Dec	-37.2	-37.7	-38.3	-38.7	-39.9	-41.3	-42.3	-43.2	-43.5	-41.6	-39.1	-36.2	-32.9	-31.2	-31.2	-30.7	-31.7	-32.6	-32.2	-31.2	-29.5	-28.8	-28.5	-28.2	-35.3	-28.2	
30-Dec	-28.1	-27.9	-27.8	-28.7	-29.5	-29.9	-31.1	-32.3	-32.5	-32.5	-31.9	-28.6	-26.0	-24.9	-24.8	-24.5	-25.5	-27.0	-28.6	-30.5	-29.6	-29.1	-29.3	-29.4	-28.8	-24.5	
31-Dec	-29.5	-29.9	-30.2	-30.5	-31.0	-31.9	-32.5	-32.2	-32.7	-32.4	-31.0	-29.3	-26.9	-25.4	-25.0	-25.4	-26.2	-26.7	-27.8	-28.1	-27.0	-27.7	-28.9	-28.7	-29.0	-25.0	
		-14.7	-15.1	-15.5	-15.3	-15.8	-15.9	-16.2	-16.6	-16.6	-16.4	-15.3	-13.8	-13.0	-12.5	-12.6	-13.1	-13.7	-14.0	-14.5	-15.1	-15.1	-15.1	-15.3	Diurnal Average		
		-1.5	-1.3	-0.3	-1.3	-1.4	-0.5	-0.7	-0.2	0.7	0.2	1.2	2.6	3.2	3.1	2.1	2.4	2.9	2.1	2.1	0.8	0.5	0.4	0.2	0.0	Diurnal Maximum	
PF - Power Failure																											





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Muskeg River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Muskeg River - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	252	34.29	34.29
-20 - 0	437	59.46	93.74
0 - 10	46	6.26	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 735

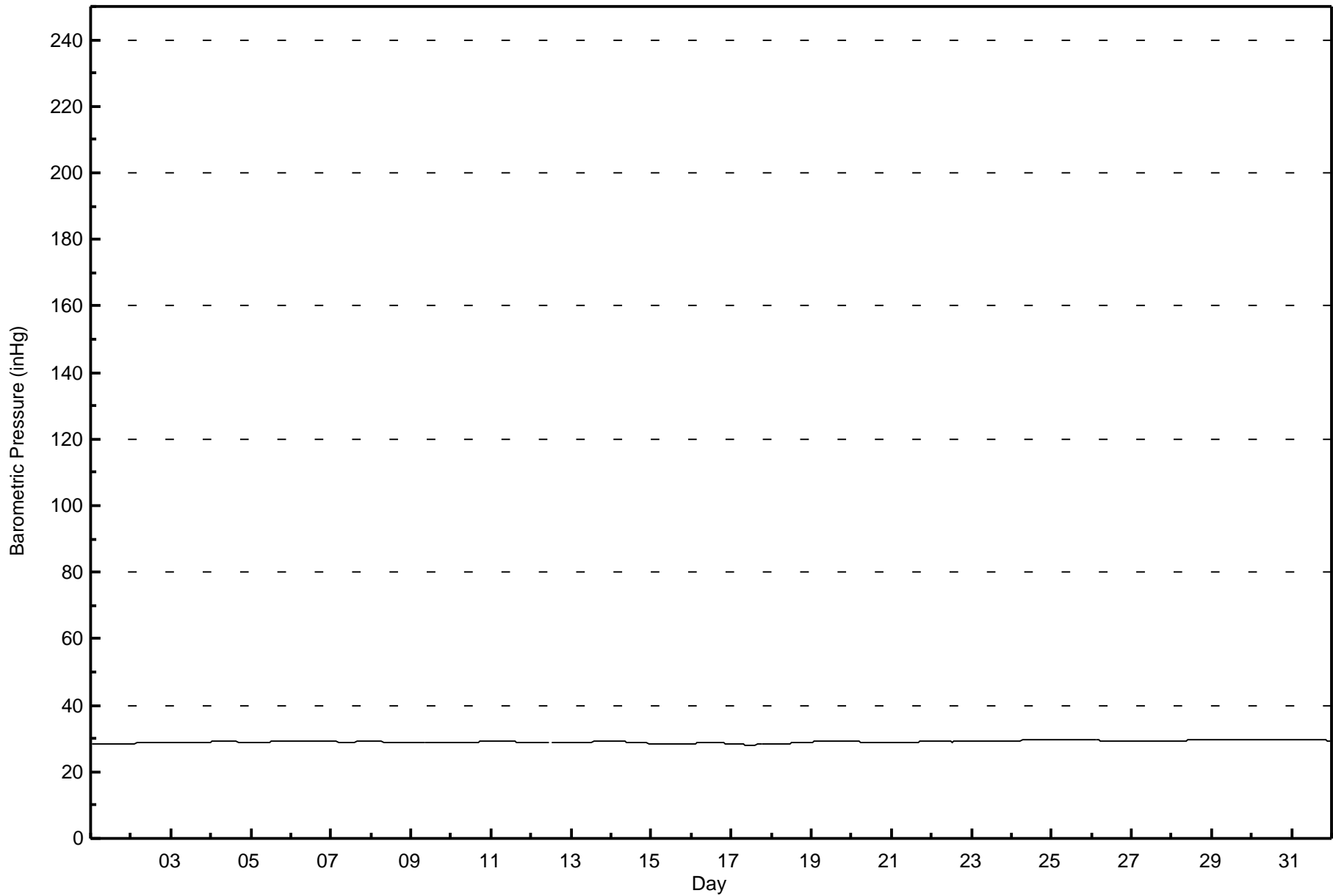
Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Barometric Pressure (BP) - inHg**  
**Muskeg River - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Muskeg River - December 2017

Maximum Speed: 24 km/h on Dec 24 03:00	Maximum Daily Speed Average: 10.8 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 29 01:00	Minimum Daily Speed Average: 0.7 km/h on Dec 2	Hours of Data: 738
Maximum Diurnal Speed Average: 3.4 km/h at hour 18	Minimum Diurnal Speed Average: 1.4 km/h at hour 23	Hours of Missing Data: 6
Monthly Average Velocity: 2.1 km/h 204.4 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 6 Q <sub>3</sub> = 10 P <sub>90</sub> = 15 P <sub>99</sub> = 22	Percent Operational Time: 99.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S6	SW11	SW19	SSW7	S11	SSW15	SSW16	SSW13	SW16	SSW18	SSW11	SSW9	SSW8	S5	SSW8	SSW6	S6	S7	SSW6	SSW9	S9	S8	SW5	WSW6	SSW9.4	SW19
2-Dec	WNW4	WNW4	W2	NE4	ENE1	ENE2	ENE8	NE10	NE11	E6	SE2	WSW3	SW4	W2	SSE2	SSE2	SSW4	SSW3	SSE2	SSW3	S4	SW7	SSW3	S2	ESE0.7	NE11
3-Dec	W2	SSE4	SSE2	SSE3	S5	WSW5	WSW5	N12	NNE16	NE14	NNE14	NE12	ENE8	ENE8	NE9	NE14	ENE8	SE1	ENE2	ESE3	ESE1	ENE1	NE10	NE9	NE4.9	NNE16
4-Dec	ENE8	E7	E4	E1	S1	SSW4	S4	SE3	SSE5	SSW5	SSW3	S4	SSW6	SSW6	SSW4	SSW3	SW3	SSW4	SW3	WSW3	SW4	SSW4	SW6	SW9	S3.1	SW9
5-Dec	SSW11	SSW8	SW11	S8	S5	SE6	ESE2	NE3	N7	NE13	NE15	NE15	NE17	NE17	NE18	NE18	NE18	NE15	NE17	NE11	ENE4	S2	SSW4	S6	ENE5.9	NE18
6-Dec	S8	SSW6	S7	SSW8	S8	S9	S7	S9	SSW12	SSW10	SSW12	S11	S11	S9	SSW11	SSW12	SSW11	SW9	SSE4	SSW7	SSW8	S10	S9	SSW8	SSW8.7	SSW12
7-Dec	SSW9	S7	SSE8	S7	S7	S6	SSE8	SW13	SSW10	SSE6	SSE5	SW8	WSW11	SW9	WSW10	SW8	W16	W14	W13	W9	WNW11	NW10	NW8	SW9	SW6.5	W16
8-Dec	SSW8	SSW8	S6	S7	SSW6	S5	ESE5	S7	SSW7	SSW5	S6	S8	S7	SSW8	S10	S13	SSW12	SSW12	SSW13	SSW12	SSW11	SW16	SW21	SSW16	SSW9.1	SW21
9-Dec	SSW16	S12	S10	SSW10	S10	SSW10	SW8	WSW15	WSW11	SSW9	SW17	WSW13	SSW8	SW10	SW12	SW9	WSW13	SSW8	SSW7	SSW7	SSE4	WSW6	SSW5	SSW10	SSW9.3	SW17
10-Dec	SW12	SSW9	SSW5	S5	S7	S7	S6	S6	S6	SSW6	SSW3	NW6	NNW12	NNE17	NNE14	NE18	NE18	NE11	ENE8	E3	ESE5	S1	SE3	SSE2	ENE1.6	NE18
11-Dec	W3	S3	S5	SSW4	SSW4	SSW3	S5	S5	SSE4	SE3	SE3	SSE3	S4	S5	S6	S8	SSW8	SSW8	SSW9	SSW11	SSW11	SSW9	SSW9	SSW11	SSW5.6	SSW11
12-Dec	SW11	SW12	SW19	SW12	SW9	S8	S7	S5	SW5	W16	WSW6	W4	WNW4	WSW6	W4	NW4	NW7	WNW13	WNW8	NW7	W7	WNW11	WNW5	SSW5	WSW6.2	SW19
13-Dec	SSW7	S5	SSW7	S7	S8	S7	S9	S9	SSW6	SSE4	NNW5	NNW11	NNE14	N14	N9	SW5	WSW7	WNW7	WNW9	W10	N10	NE13	NE15	ENE6	NW1.1	NE15
14-Dec	E4	ESE4	SSW5	S6	SSE4	SSE5	S7	S6	SSW5	SSW6	SSW7	S8	S6	S7	SW4	SSE2	WSW5	SSW5	SSW9	SW7	SSE5	SW4	SW4	S4.8	SSW9	
15-Dec	SSW3	SSW5	SSW6	S7	SSW7	SSE5	SSW7	SSW8	SW9	SW10	SW9	SW11	WNW9	WNW6	WSW4	WSW8	SW12	SSW8	SSW8	WSW12	W18	W11	W12	W11	SW7.4	W18
16-Dec	NNE23	NE20	NNE22	NNE21	N20	NE20	NE18	ENE14	ENE9	ESE4	SE5	SE5	SSE6	SE3	SE4	SE3	S2	SSE1	SSE2	S4	SSW7	SSW6	SSW6	S7	ENE5.8	NNE23
17-Dec	SSW7	SSW8	S9	S12	SSW11	SSW10	S2	WNW4	SW11	SW8	SW9	WSW17	WSW20	WSW18	WSW12	W12	WNW15	NW15	NW13	WNW6	W7	WSW6	S6	W8	WSW8.0	WSW20
18-Dec	W14	W16	NNE12	NE23	NE21	NE23	NE19	NE18	NE13	S2	SSW3	NW7	NW15	NW18	NW16	NW19	NW17	NW17	NW14	N14	NE19	NNE18	NNE18	NE18	N10.8	NE23
19-Dec	NNE18	NE16	NE15	NE16	NE12	ENE8	SSE1	SSW3	SW3	SSW5	SSW5	SSW4	SSW6	SSW7	S8	S8	S8	SSW8	SSW8	SSW9	SSW7	S6	S4	SSW6	SE2.1	NNE18
20-Dec	S6	S5	SSE6	S4	S6	SSW7	S8	S9	S9	S8	S9	S10	S11	S13	S12	S11	SSW10	SSW10	SSW7	SSW10	SSW10	SW8	SW8	SSW6	S8.4	S13
21-Dec	SSW7	SW1	SSW3	SSW3	SW2	SW2	SSW2	S1	SSW2	SSW3	SW4	SW4	SW5	SW7	NW6	NW7	WNW12	WNW15	WNW10	NW11	NNW8	NNW5	NE4	ESE6	W3.2	WNW15
22-Dec	ESE5	E4	ESE4	S3	SW4	S3	S5	SSW7	SSW6	SW6	W7	W8	NW16	NW16	WNW14	NW14	NW13	NW15	NNW14	NE21	NE22	NE18	NE20	NE18	NNW4.5	NE22
23-Dec	ENE11	ENE7	E2	S2	S2	SSE2	ESE2	E2	ENE2	E0	S1	SSW2	S1	ESE1	SSW5	SSW3	SSE4	SSE4	S3	S2	ESE3	NE10	NNE23	E1.9	NNE23	
24-Dec	NE22	NNE22	NNE24	NE16	NE15	NE11	NE8	NNE3	S0	S2	SSE2	S3	SSW2	S2	SE2	SSW3	SSW3	SSE2	SSE2	ESE1	SSW1	SE1	ENE0	NE4.2	NNE24	
25-Dec	NE10	ENE11	ENE11	NE13	NE15	NE12	NNE5	S1	S0	S1	SSW2	SSW3	SSW2	S3	S3	S3	S3	S3	S3	S3	S3	SSW3	SSW3	S3	E2.1	NE15
26-Dec	S4	S4	S4	S3	S3	S3	SSE2	S3	S3	S3	S3	S2	S2	S3	SSW3	SSW3	SSW3	S2	S4	SSE2	S2	S2	SSW2	SSW4	S2.8	S4
27-Dec	SSW3	SSW2	SSW2	SSW3	S2	SSW2	S2	SSW3	SW2	S2	SSW3	S4	S5	S5	S4	S4	S3	S4	S3	S4	S3	SSE3	SSE3	SSE2	S2.9	S5
28-Dec	SSE1	SSE1	SE1	E0	NNE6	NE11	NE10	N8	NNE7	E0	E0	SSW1	WSW1	ENE2	WSW1	S1	ESE1	ESE1	ESE0	ESE1	AF	AF	AF	AF	NE1.9	NE11
29-Dec	ESE0	AF	AF	SW1	S1	SSW2	SSW3	SSW1	SSW2	SSW2	S3	SSW1	SSW3	S2	S4	S4	SSW5	S4	S3	S4	S4	S4	S4	S4	S2.7	SSW5
30-Dec	SSW4	S4	S4	S4	S3	S3	S3	S2	S2	S2	S3	S1	SSW3	S4	SSW3	S3	S4	S3	S3	S5	S6	S6	S6	S6	S3.6	S6
31-Dec	S5	S4	SSW3	S5	S4	SSW3	SSW4	SSW4	SW4	SSW4	SSW4	SW7	SW7	SW7	SW7	SSW7	SSW7	SSW8	SSW8	SSW9	SSW8	SW8	SSW6	SSW6	SSW5.8	SSW9

S1.6	S1.9	S1.9	SE2.2	SSE2.2	SSE2.3	SSE2.6	S2.1	SSW2.5	SSW3.2	SSW3.1	SW3.0	SW2.7	SW2.4	SW2.3	SW2.2	SSW3.1	SSW3.4	SSW2.4	SW2.5	SW2.1	SW2.1	SSW1.4	SSW2.0	Diurnal Average	
NNE23	NNE22	NNE24	NE23	NE21	NE23	NE19	NE18	SW16	SSW18	SW17	WSW17	WSW20	NW18	NE18	NW19	NE18	NW17	NE17	NE21	NE22	NE18	SW21	NNE23	Diurnal Maximum	

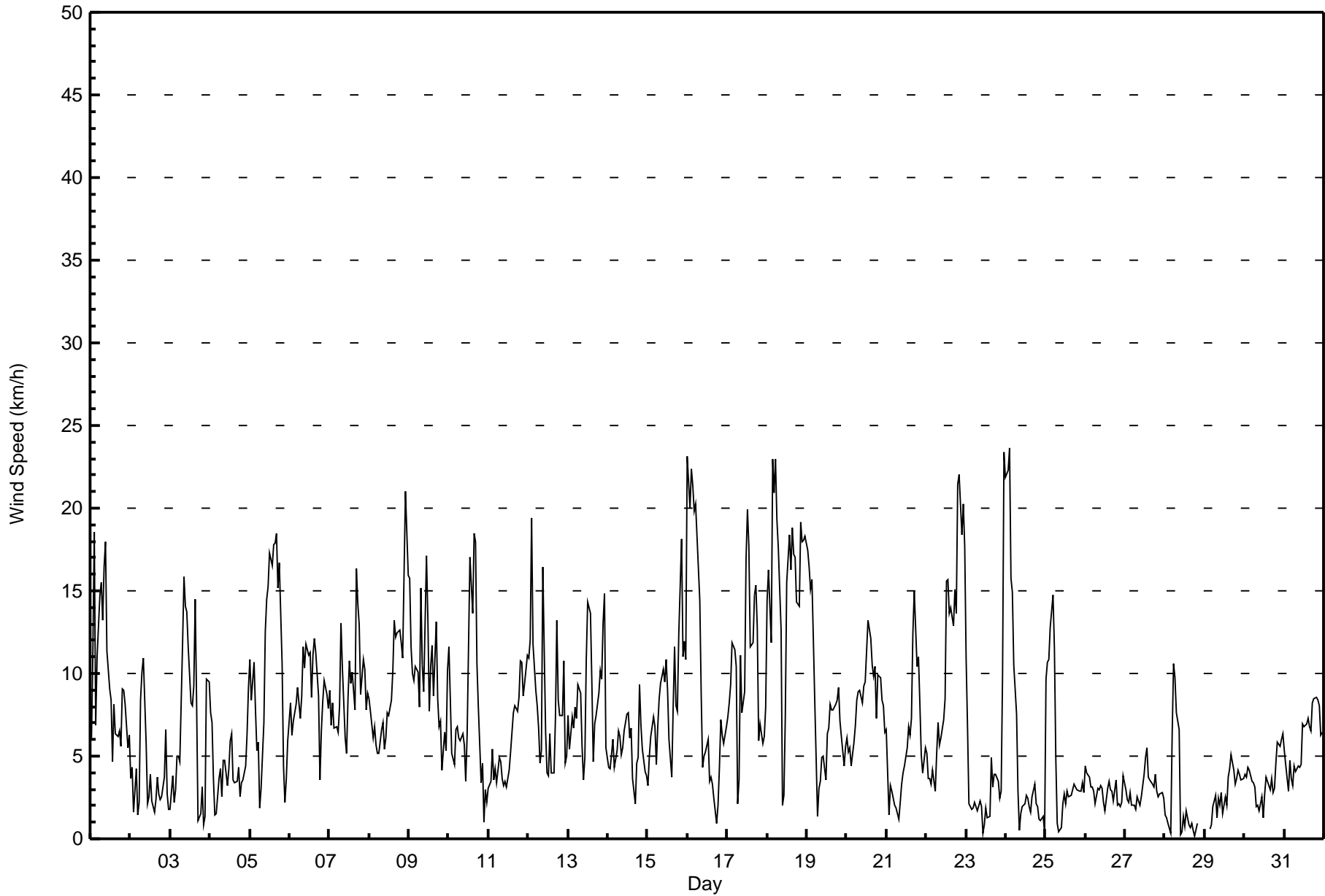
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Muskeg River - December 2017**

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





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Muskeg River - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	330	44.72	44.72
6 - 11	277	37.53	82.25
12 - 19	113	15.31	97.56
20 - 28	18	2.44	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 738

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Muskeg River - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 5	0	2	3	8	11	19	13	36	117	78	21	8	6	5	1	2	330
6 - 11	4	2	13	14	1	1	1	5	72	94	31	10	9	9	9	2	277
12 - 19	3	10	33	1	0	0	0	0	5	13	11	7	9	6	13	2	113
20 - 28	1	6	9	0	0	0	0	0	0	0	1	1	0	0	0	0	18
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
<b>Totals</b>	<b>8</b>	<b>20</b>	<b>58</b>	<b>23</b>	<b>12</b>	<b>20</b>	<b>14</b>	<b>41</b>	<b>194</b>	<b>185</b>	<b>64</b>	<b>26</b>	<b>24</b>	<b>20</b>	<b>23</b>	<b>6</b>	<b>738</b>

Total Number of Valid Hours: 738

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Muskeg River - December 2017**

Direction of Maximum Speed: 26 deg on Dec 24 03:00 Direction of Maximum Daily Speed Average: 4.3 deg on Dec 18	Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Percent Operational Time: 99.2
Direction of Minimum Speed: 109 deg on Dec 29 01:00 Direction of Minimum Daily Speed Average: 0.7 deg on Dec 2	
Monthly Average Direction: 206.2 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	191	232	236	204	180	207	211	207	214	212	212	201	198	191	205	192	176	186	198	211	180	187	217	244	206.7
2-Dec	285	286	277	34	74	72	59	50	56	79	137	239	233	280	159	157	197	199	152	195	188	226	199	174	115.6
3-Dec	260	158	168	150	171	241	253	4	27	37	32	55	67	62	45	54	59	137	72	114	106	65	51	43	49.2
4-Dec	69	100	101	81	186	206	187	141	162	203	193	189	201	204	195	205	224	211	215	240	222	202	218	222	190.6
5-Dec	207	209	216	186	178	129	120	36	6	46	45	36	46	49	47	43	44	49	47	55	78	176	196	173	58.0
6-Dec	172	193	173	193	186	185	188	178	193	201	212	190	182	191	195	200	212	225	164	200	201	191	186	211	193.8
7-Dec	197	169	164	178	170	175	162	216	206	164	155	215	242	218	250	232	268	263	278	267	290	306	317	223	230.2
8-Dec	192	201	191	190	202	174	123	171	205	194	191	191	188	193	191	188	192	193	203	209	201	221	229	209	198.8
9-Dec	198	179	190	206	183	206	214	247	238	212	232	241	200	215	222	215	245	193	206	192	151	246	195	201	213.0
10-Dec	231	209	212	180	178	176	170	172	190	210	196	322	346	19	20	47	43	53	59	95	112	178	140	165	73.9
11-Dec	281	183	191	200	212	197	189	186	167	127	129	167	188	175	189	187	195	196	203	203	211	206	210	212	195.9
12-Dec	214	216	230	222	222	175	181	181	229	266	245	275	285	240	265	304	305	302	291	323	277	299	294	207	250.6
13-Dec	211	189	202	176	175	175	189	179	213	168	334	345	18	352	351	236	246	302	289	279	6	48	52	68	309.8
14-Dec	96	111	193	179	160	158	174	190	193	197	198	185	187	186	191	218	167	250	200	211	218	158	225	226	189.2
15-Dec	208	197	212	182	206	167	203	209	215	214	229	236	287	283	253	243	221	207	194	239	267	270	261	273	233.5
16-Dec	30	45	31	32	11	36	54	59	72	118	124	134	149	139	131	137	186	148	164	184	192	196	192	180	58.5
17-Dec	196	198	187	186	192	205	186	288	236	219	221	243	244	248	241	259	295	305	312	299	271	240	191	269	242.1
18-Dec	274	269	23	48	46	44	48	51	51	179	206	325	323	326	325	316	315	316	323	359	41	25	30	35	4.3
19-Dec	24	34	52	52	50	57	161	209	216	200	199	196	212	198	180	178	187	202	197	198	204	180	176	194	142.8
20-Dec	183	185	167	177	189	197	188	187	187	190	188	182	183	184	179	187	194	196	193	200	208	216	215	209	191.1
21-Dec	213	223	202	208	220	218	193	185	192	204	220	228	218	229	306	311	289	297	284	322	333	345	45	105	274.2
22-Dec	113	100	104	181	227	177	175	192	211	234	262	280	305	305	301	304	310	304	335	49	46	41	34	37	345.7
23-Dec	58	57	83	186	179	178	158	115	82	65	84	177	201	174	103	213	192	168	154	189	186	111	42	31	84.4
24-Dec	40	29	26	34	48	42	44	29	180	187	160	162	186	196	174	142	200	206	152	157	110	198	125	64	45.2
25-Dec	40	58	62	55	51	38	21	182	171	183	204	206	213	185	189	175	180	182	183	186	183	196	193	191	80.6
26-Dec	184	191	189	184	180	177	168	190	189	183	170	182	173	188	210	198	205	183	184	148	174	172	207	203	186.1
27-Dec	209	204	200	212	180	198	182	203	218	191	193	188	187	184	184	176	176	176	183	184	170	157	159	156	185.7
28-Dec	148	149	129	96	32	35	39	7	20	91	98	212	248	70	255	188	115	103	107	108	AF	AF	AF	AF	38.2
29-Dec	109	AF	AF	215	191	196	198	196	204	193	190	197	200	187	186	186	192	181	190	187	181	178	182	190	188.8
30-Dec	197	190	181	175	183	191	184	182	183	185	186	170	192	184	192	180	175	190	177	184	182	187	184	181	184.0
31-Dec	177	191	200	190	190	195	204	204	215	203	204	225	224	220	217	208	203	210	213	204	205	215	210	192	206.7

181.3 171.3 173.5 142.8 148.0 146.8 155.1 180.0 196.2 197.8 204.0 222.8 232.9 232.6 228.3 220.2 242.2 246.1 239.1 220.4 214.5 220.2 201.1 197.9  
 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**

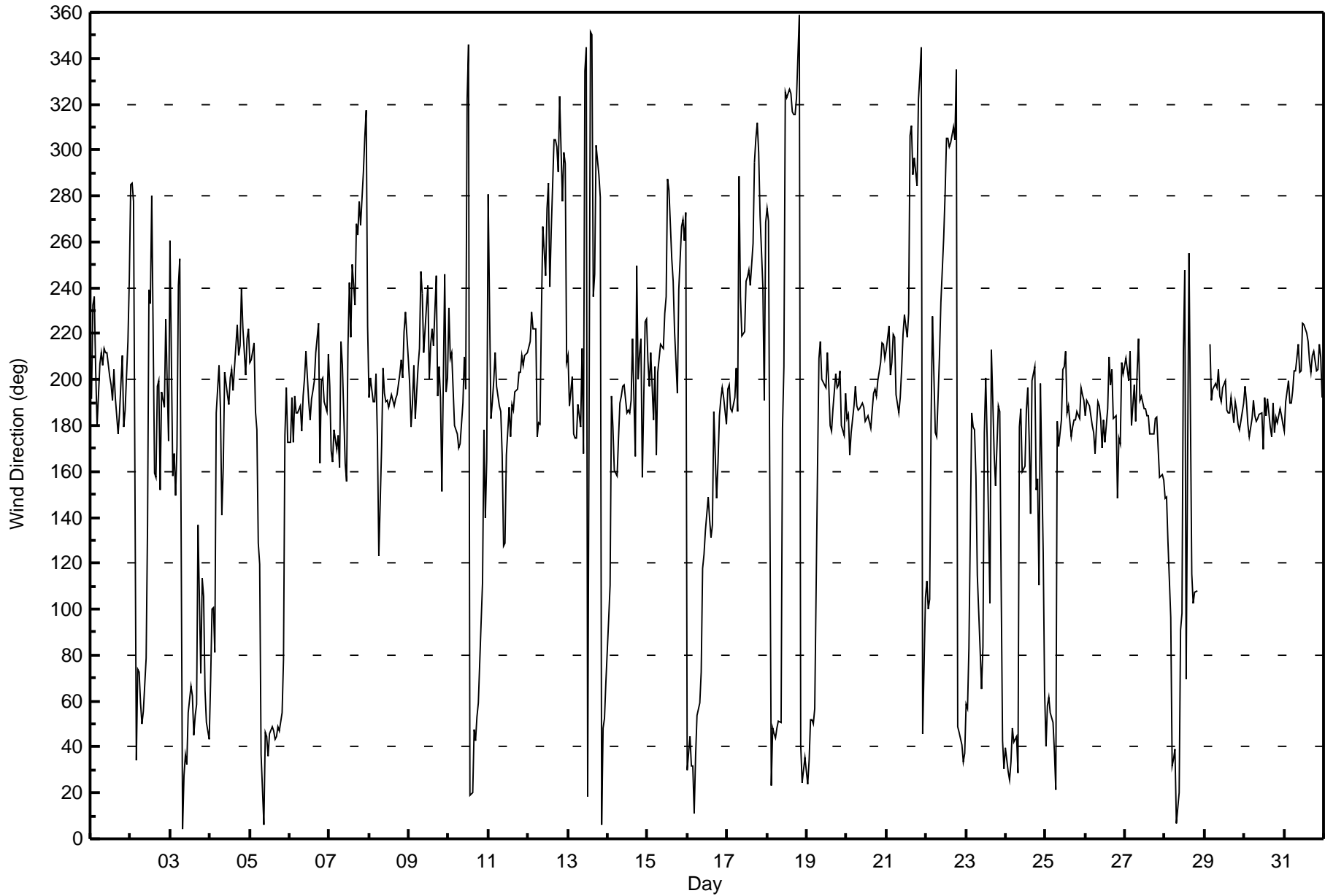
**Wind Direction (WD) - deg**  
**Muskeg River - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 93 deg on Dec 3 22:00	Hours of Data: 738
Minimum Value: 5 deg on Dec 25 04:00	Hours of Missing Data: 6
Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 10 Q <sub>1</sub> = 13 Median = 17 Q <sub>3</sub> = 25 P <sub>90</sub> = 43 P <sub>99</sub> = 79	Hours of Calibration: 0
	Percent Operational Time: 99.2

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	30	32	11	33	28	23	15	18	13	17	18	22	27	25	15	13	12	18	15	11	12	12	34	17	34
2-Dec	49	42	90	40	72	61	14	11	14	21	54	29	22	22	19	27	26	56	69	57	21	14	32	37	90
3-Dec	68	40	40	18	15	38	48	21	14	18	15	14	17	15	12	13	46	89	78	30	71	93	26	27	93
4-Dec	27	15	57	45	39	13	24	10	25	13	16	16	20	20	19	22	27	19	25	18	32	22	17	14	57
5-Dec	19	23	16	32	35	30	80	55	37	14	12	17	8	7	7	10	6	11	8	21	39	39	27	13	80
6-Dec	15	12	17	15	10	12	15	12	17	20	17	18	14	18	15	15	26	32	51	31	18	15	12	18	51
7-Dec	18	14	15	24	28	24	16	12	14	17	17	19	23	28	31	24	6	7	10	19	17	9	24	10	31
8-Dec	13	14	22	14	17	26	22	30	12	13	17	17	17	18	19	12	14	15	13	23	21	24	18	16	30
9-Dec	14	19	16	20	29	24	25	11	49	51	7	13	31	14	9	21	21	16	18	20	43	34	43	35	51
10-Dec	9	25	25	18	22	14	21	18	15	19	37	33	23	20	22	14	7	15	18	27	23	52	16	44	52
11-Dec	34	38	19	37	38	17	11	13	12	11	10	16	17	16	18	13	14	15	13	15	14	18	15	18	38
12-Dec	19	19	12	17	50	28	35	43	33	13	40	69	60	21	41	37	26	11	14	12	16	14	38	40	69
13-Dec	12	22	17	21	23	20	20	27	69	54	51	29	30	14	30	13	28	23	25	22	39	28	10	40	69
14-Dec	30	43	19	13	28	25	10	12	15	15	18	14	16	17	19	35	62	53	20	18	18	22	15	19	62
15-Dec	24	18	21	16	21	30	20	17	14	21	12	17	23	40	40	41	11	15	20	7	13	11	9	44	44
16-Dec	15	10	10	10	15	16	6	11	17	27	20	21	16	20	18	22	32	88	46	27	12	12	17	13	88
17-Dec	18	19	15	15	16	19	79	59	10	29	19	8	7	8	9	9	19	13	15	20	43	33	15	42	79
18-Dec	10	10	57	9	11	10	9	7	15	71	40	44	19	19	19	15	14	14	19	41	14	16	18	14	71
19-Dec	12	13	12	11	18	25	66	21	17	13	11	17	13	19	12	9	13	11	15	14	13	14	25	14	66
20-Dec	12	22	13	21	19	15	13	11	10	10	14	16	16	14	12	12	14	15	15	13	14	12	13	20	22
21-Dec	15	75	23	29	29	30	56	71	58	14	18	13	12	11	24	18	12	11	8	17	14	46	60	23	75
22-Dec	18	21	15	21	17	31	8	10	23	35	11	21	12	13	10	12	13	13	26	10	10	18	13	14	35
23-Dec	19	26	58	35	21	12	24	28	6	13	65	66	78	70	62	12	21	10	14	22	40	30	22	14	78
24-Dec	12	14	14	16	12	21	23	44	57	15	26	26	23	27	16	24	13	18	21	38	47	62	22	70	70
25-Dec	25	10	10	5	7	20	54	19	10	53	16	20	17	18	13	7	7	8	7	11	9	12	14	10	54
26-Dec	8	12	12	13	10	15	12	13	13	14	11	18	13	22	20	16	15	21	12	12	10	20	8	11	22
27-Dec	11	13	12	14	15	13	11	19	12	17	17	17	17	16	15	14	12	11	13	17	9	8	10	7	19
28-Dec	10	21	9	59	23	19	16	18	25	65	58	18	67	73	53	38	38	62	86	54	AF	AF	AF	AF	86
29-Dec	36	AF	AF	7	14	16	15	12	11	9	12	15	18	18	10	14	14	12	14	14	15	15	14	17	36
30-Dec	19	23	13	11	10	11	11	12	12	8	27	24	19	19	18	17	19	13	7	10	11	12	11	11	27
31-Dec	11	13	19	15	15	15	15	16	13	17	19	10	12	13	13	14	16	14	13	14	16	10	14	15	19
	68	75	90	59	72	61	80	71	69	71	65	69	78	73	62	41	62	89	86	57	71	93	60	70	

Diurnal Maximum

AF - Analyzer Failure





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Muskeg River	Station number:	AMS 16
Calibration Date:	December 11, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	10:35	End time (MST):	15:02
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>48.2</u>	ppm	Cal Gas Exp Date	November 4, 2017
Cal Gas Cylinder #	<u>EY0000638</u>			
Calibrator Make/Model	API T700		Serial Number	493
ZAG Make/Model	API 701		Serial Number	2155

### Analyzer Information

Analyzer make:	Thermo 43i	Analyzer serial #:	1118148498		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
Analyzer Range	0 - 1000 ppb	PMT voltage	-710.0	-710.0	
Calculated slope	0.998216	0.993831	Lamp voltage	830	830
Calculated intercept	0.944327	4.125354	Pressure	717.4	715.9
Analyzer Background	8.8	8.8	Flow	0.440	0.439
Analyzer Coefficient	1.036	1.042	Intensity	90	91

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4998	0.0	0.0	0.2	----
as found span	4930	76.6	737.5	727.2	1.014
calibrator zero	4998	0.0	0.0	0.2	----
high point	4932	76.6	737.2	740.3	0.996
second point	4972	38.5	370.4	364.5	1.016
third point	4993	19.4	186.6	180.5	1.034
as left zero	4998	0.0	0.0	0.2	----
as left span	4930	76.6	737.5	743.1	0.992
Average Correction Factor					1.015
Corrected As found	727.00	Previous response	737.82	*% change	1.5%

\* = > +/-5% change initiates investigation

#### Notes:

Changed inlet filter after as founds. Adjusted the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

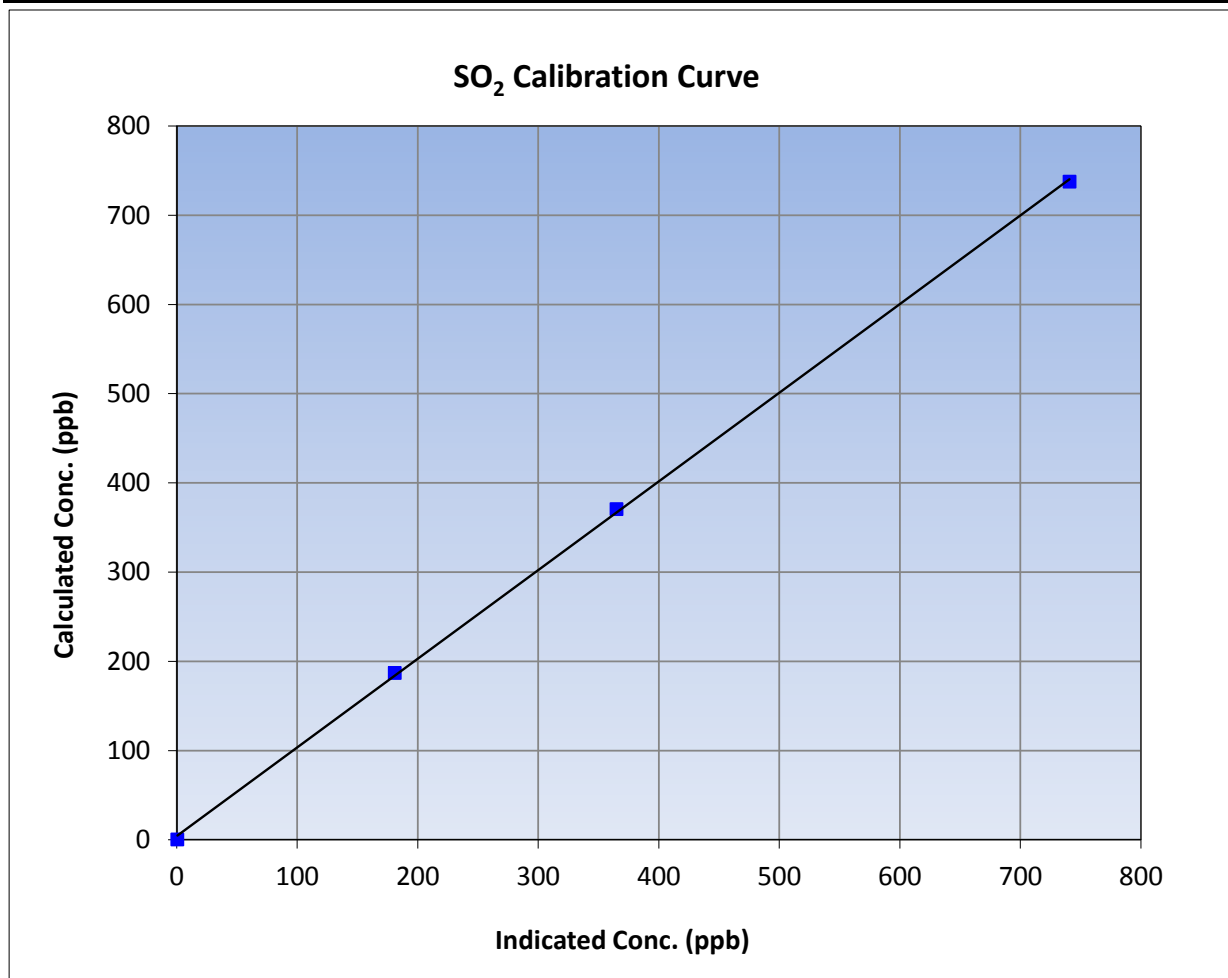
Version-03-2017

### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 7, 2017
Station Name	Muskeg River	Station Number	AMS 16
Start Time (MST)	10:35	End Time (MST)	14:10
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

### Calibration Data

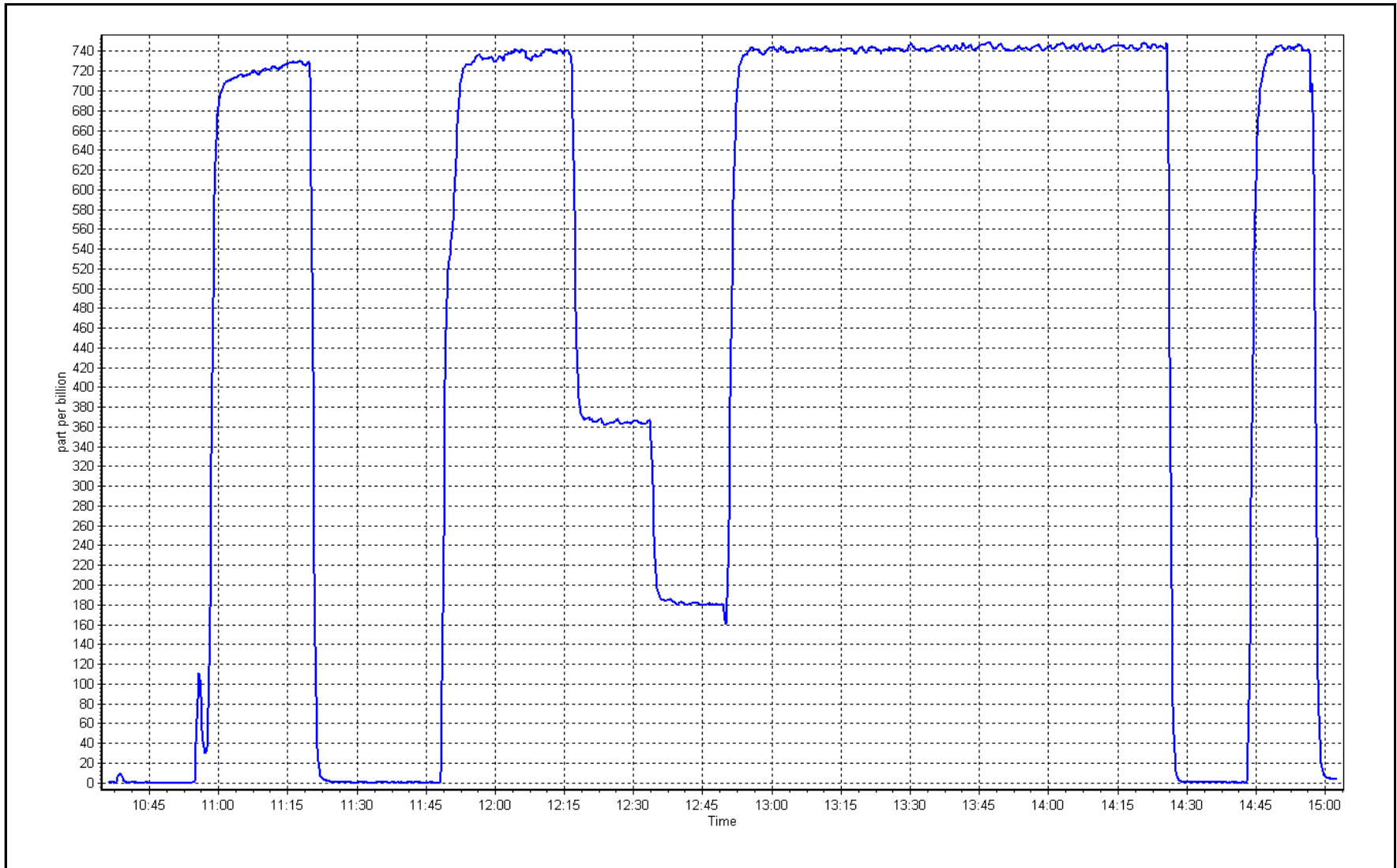
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.2	----	Correlation Coefficient	0.999828	
737.2	740.3	0.9958			≥0.995
370.4	364.5	1.0161	Slope	0.993831	
186.6	180.5	1.0335			0.90 - 1.10
			Intercept	4.125354	+/-30



SO2 Calibration Plot

Date: December 11, 2017

Location: Muskeg River







# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Muskeg River	Station number:	AMS 16
Calibration Date:	December 11, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	10:35	End time (MST):	14:58
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000638	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>502.0</u> ppm	CH4 Equiv Conc.	1035.5 ppm
C3H8 Cal Gas Conc.	<u>194.0</u> ppm	Station temp.	23 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	2155

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1218153458
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-288
Calculated slope	1.001267	Sample pressure	8.2
Calculated intercept	0.051812	Fuel pressure	24.2
Analyzer Background	2.44	Air pressure	34.9
Analyzer Coefficient	4.748	Flame temperature	157.5
			<u>Finish</u>

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4998	0.0	0.00	0.30	----
as found span	4930	76.6	15.84	16.25	0.975
calibrator zero	4998	0.0	0.00	-0.01	----
high point	4930	76.6	15.84	15.80	1.003
second point	4970	38.5	7.96	7.87	1.011
third point	4991	19.4	4.01	3.91	1.026
as left zero	4998	0.0	0.00	-0.07	----
as left span	4930	76.6	15.84	15.80	1.003
Average Correction Factor					1.013
Corrected As found	15.96	Previous response	15.77	*% change	-1.2%

\* = > +/-5% change initiates investigation

Notes: Changed inlet filter after asfound. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## THC Calibration Summary

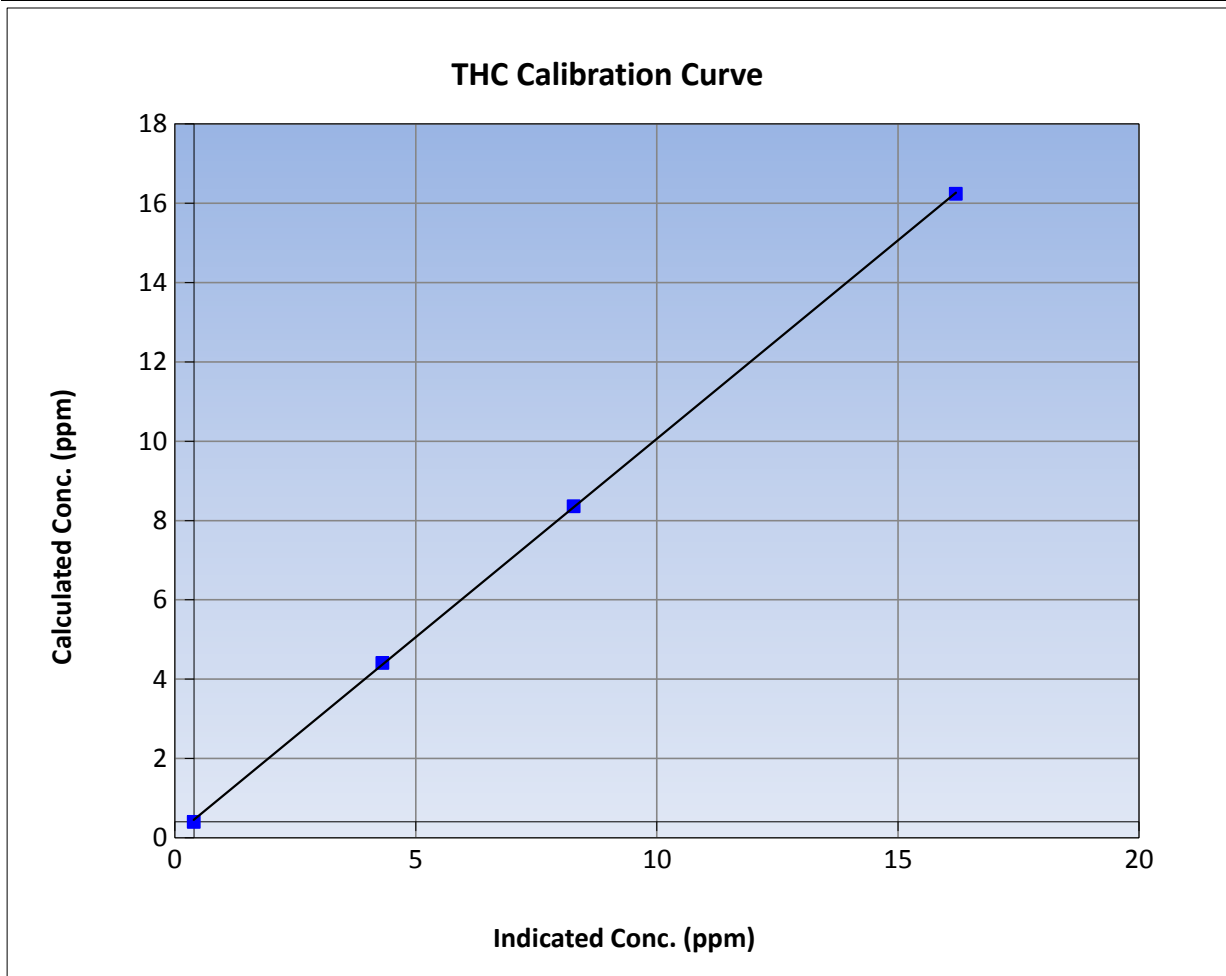
Version-03-2017

### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 7, 2017
Station Name	Muskeg River	Station Number	AMS 16
Start Time (MST)	8:37	End Time (MST)	14:58
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

### Calibration Data

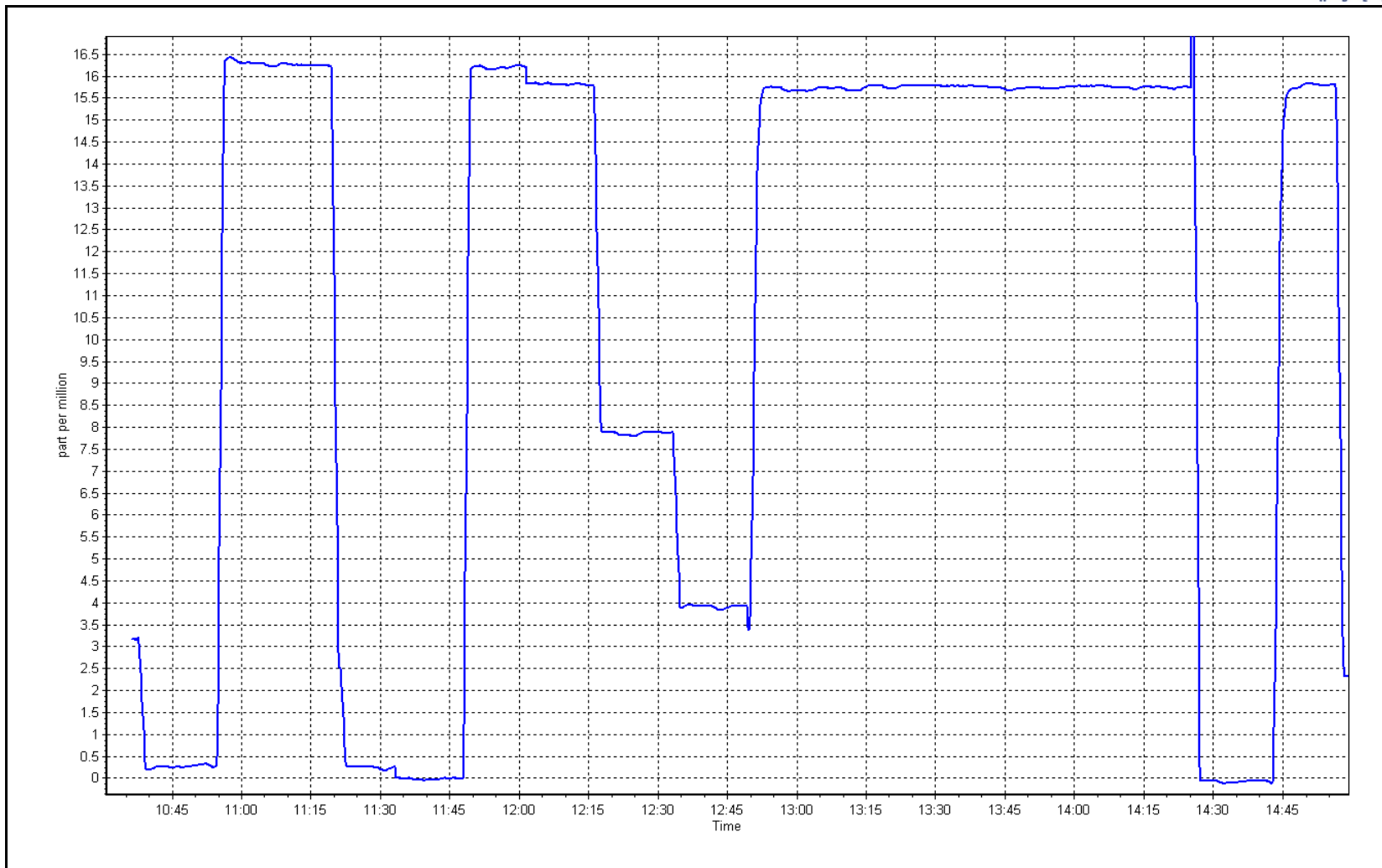
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999958	≥0.995
15.8	15.8	1.0025			
8.0	7.9	1.0112	Slope	1.000713	0.90 - 1.10
4.0	3.9	1.0259			
			Intercept	0.053878	+/-1.5



THC Calibration Plot

Date: December 11, 2017

Location: Muskeg River







# Wood Buffalo Environmental Association

## THC Calibration Summary

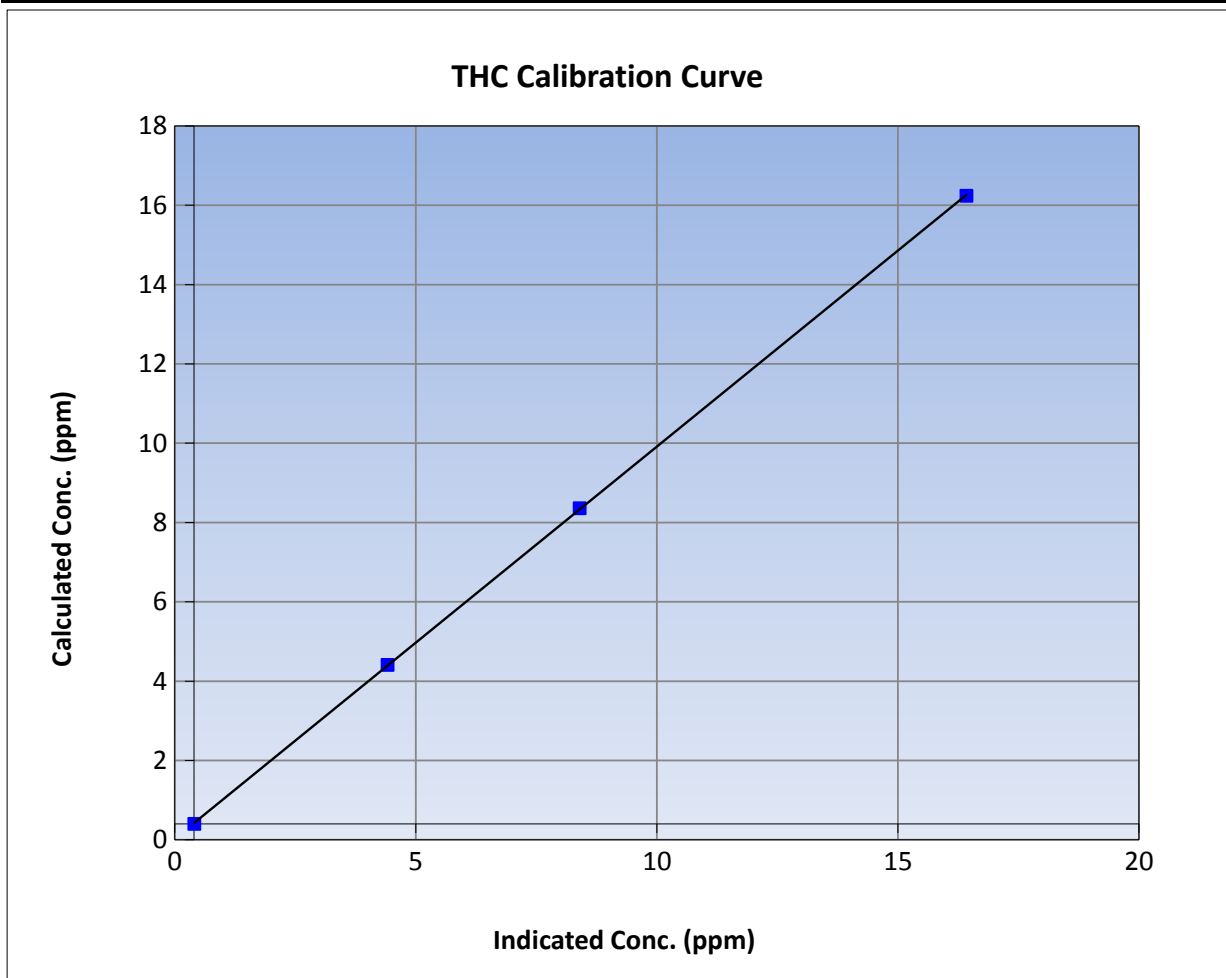
Version-03-2017

### Station Information

Calibration Date	December 28, 2017	Previous Calibration	December 11, 2017
Station Name	Muskeg River	Station Number	AMS 16
Start Time (MST)	11:35	End Time (MST)	14:00
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

### Calibration Data

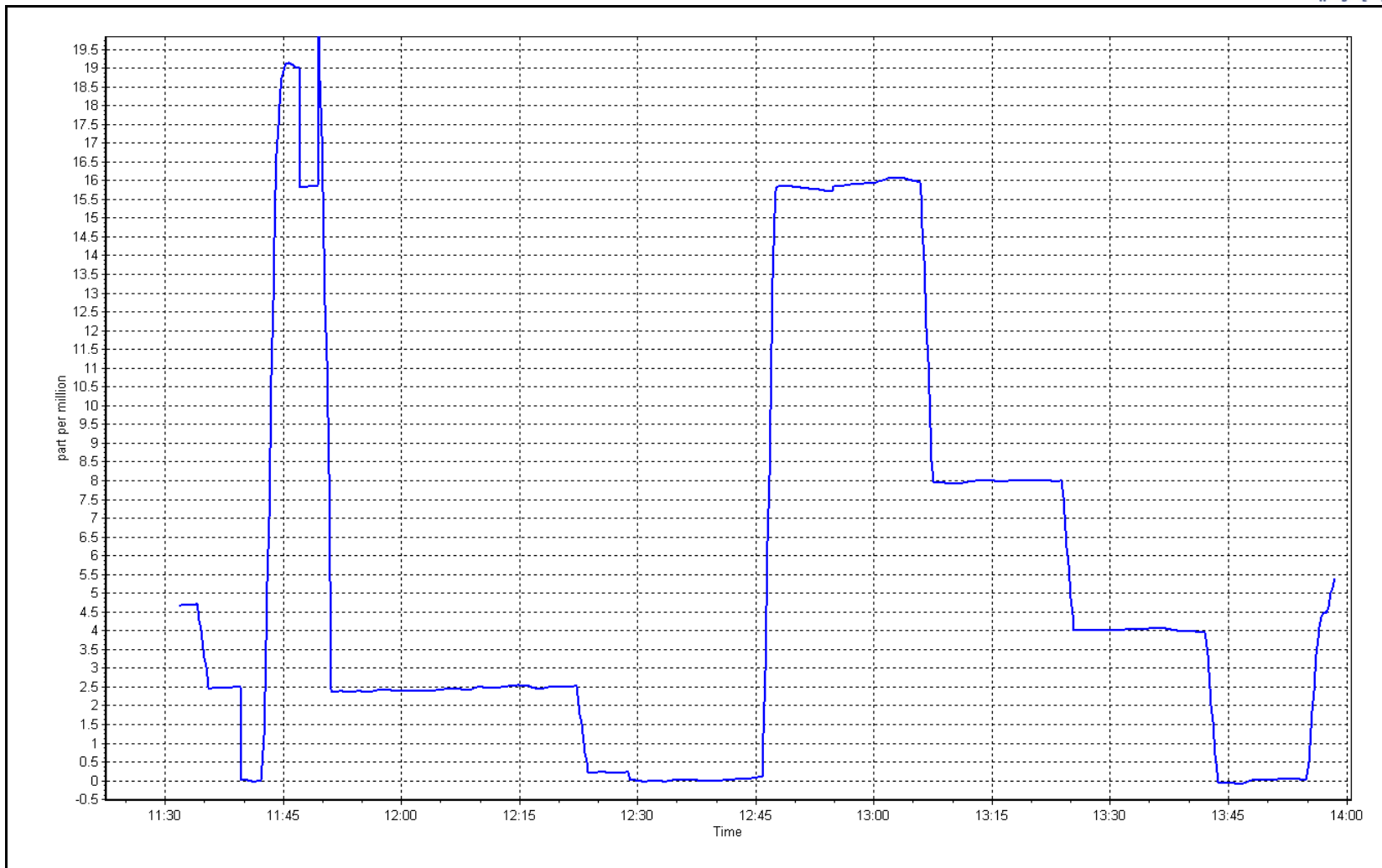
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999984	≥0.995
15.8	16.0	0.9889			
8.0	8.0	0.9947	Slope	0.988750	0.90 - 1.10
4.0	4.0	0.9991			
			Intercept	0.021412	+/-1.5



THC Calibration Plot

Date: December 28, 2017

Location: Muskeg River





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Muskeg River	Station number:	AMS 16
Calibration Date:	December 11, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	10:35	End time (MST):	15:00
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000638	Cal Gas Expiry Date	November-04-19
NOX Cal Gas Conc.	<u>52.4</u> ppb	NO Cal Gas Conc.	<u>52.4</u> ppb
Calibrator Model	API T700	Serial Number	493
ZAG make/model	API T701	Serial Number	2155

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 1426262593		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.044	1.014	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	0.997	0.997	PMT Temperature	-3.1	-3.1
NO2 coefficient	1.000	1.000	Reaction cell Press	161.9	159.8
NO bkgrnd	8.9	8.6	Sample Flow	0.981	0.970
NOX bkgrnd	9.4	9.0	PMT Voltage	-744.8	-744.8

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	1.001921	1.005395
NO <sub>x</sub> Cal Offset	-0.021045	-4.075505
NO Cal Slope	1.000622	1.008145
NO Cal Offset	0.259922	-3.637291
NO <sub>2</sub> Cal Slope	0.998603	0.979799
NO <sub>2</sub> Cal Offset	1.669938	-0.200722



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Dilution flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4998	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.2	----	----
as found span	4930	76.6	801.7	801.7	0.0	839.9	832.2	7.7	0.9545	0.9634
calibrator zero	4998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	4933	76.6	801.2	801.2	0.0	798.8	796.4	2.4	1.0030	1.0061
second point	4970	38.5	402.8	402.8	0.0	406.9	405.2	1.7	0.9899	0.9941
third point	4993	19.4	202.8	202.8	0.0	209.8	208.3	1.5	0.9667	0.9736
as left zero	4998	0.0	0.0	0.0	0.0	0.6	0.6	0.0	----	----
as left span	4930	76.6	801.7	345.7	456.0	772.4	337.0	435.4	1.0379	1.0258
<b>Average Correction Factor</b>									<b>0.9865</b>	<b>0.9913</b>

Corrected As found	NO <sub>x</sub> = 840.2 ppb	NO = 832.3 ppb		*Percent Change	NO <sub>x</sub> = -4.8%
Previous Response	NO <sub>x</sub> = 800.2 ppb	NO = 801.0 ppb		*Percent Change	NO = -3.8%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	773.7	773.0	0.7	1.0356	1.0365	----	----
1st NO2 (400 ppb O3)	345.7	427.3	781.7	345.7	436.0	1.0250	----	0.9800	102.0%
2nd NO2 (200 ppb O3)	555.8	217.2	778.4	555.8	222.6	1.0293	----	0.9757	102.5%
3rd NO2 (100 ppb O3)	661.8	111.2	775.3	661.8	113.5	1.0334	----	0.9797	102.1%
2nd NO ref point	----	0.0	773.7	773.0	0.7	1.0356	1.0365	----	----
<b>Average Correction Factor</b>						<b>1.0308</b>	<b>1.0365</b>	<b>0.9785</b>	<b>102.2%</b>

Notes: Changed inlet filter after asfinds. Adjusted the zero an the span.

Calibration Performed By: Jayme Marcoux





# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

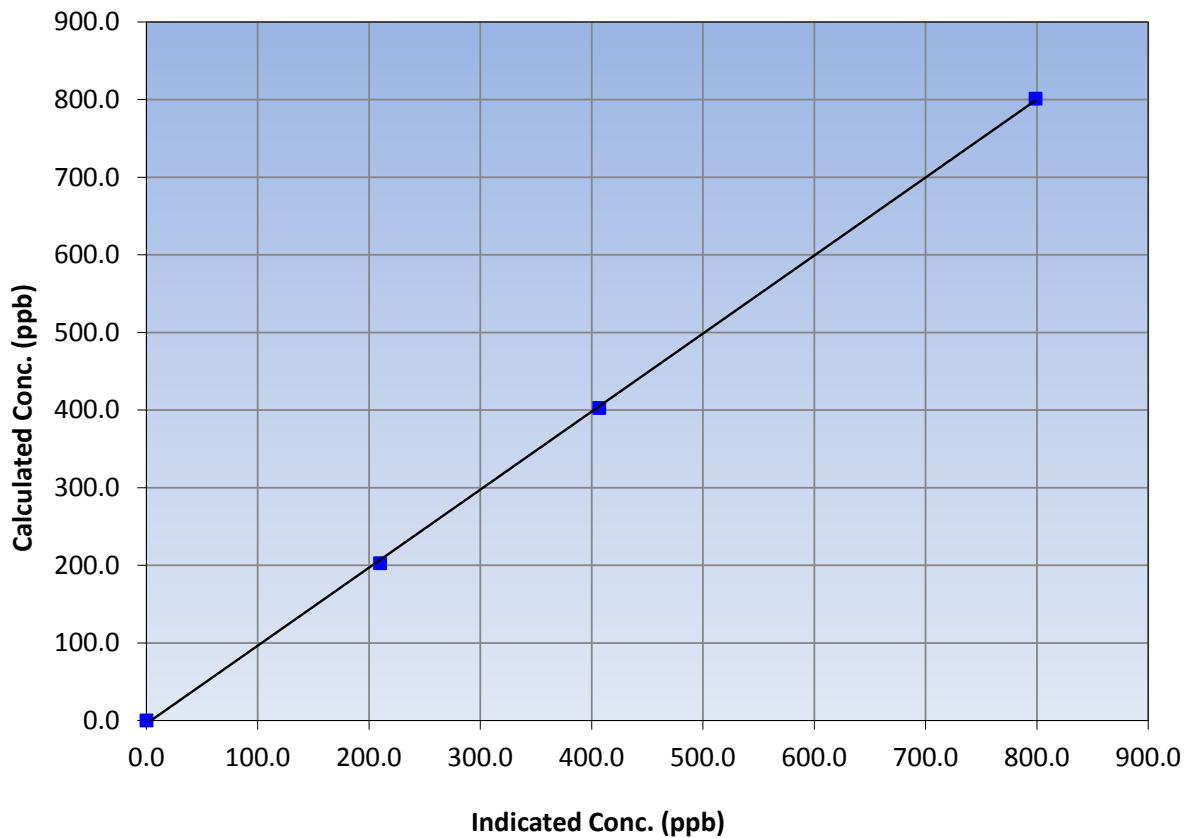
### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 7, 2017
Station Name	Muskeg River	Station Number	AMS 16
Start Time (MST)	10:35	End Time (MST)	15:00
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
801.2	798.8	1.0030			
402.8	406.9	0.9899			
202.8	209.8	0.9667			
			Slope	1.005395	0.90 - 1.10
			Intercept	-4.075505	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

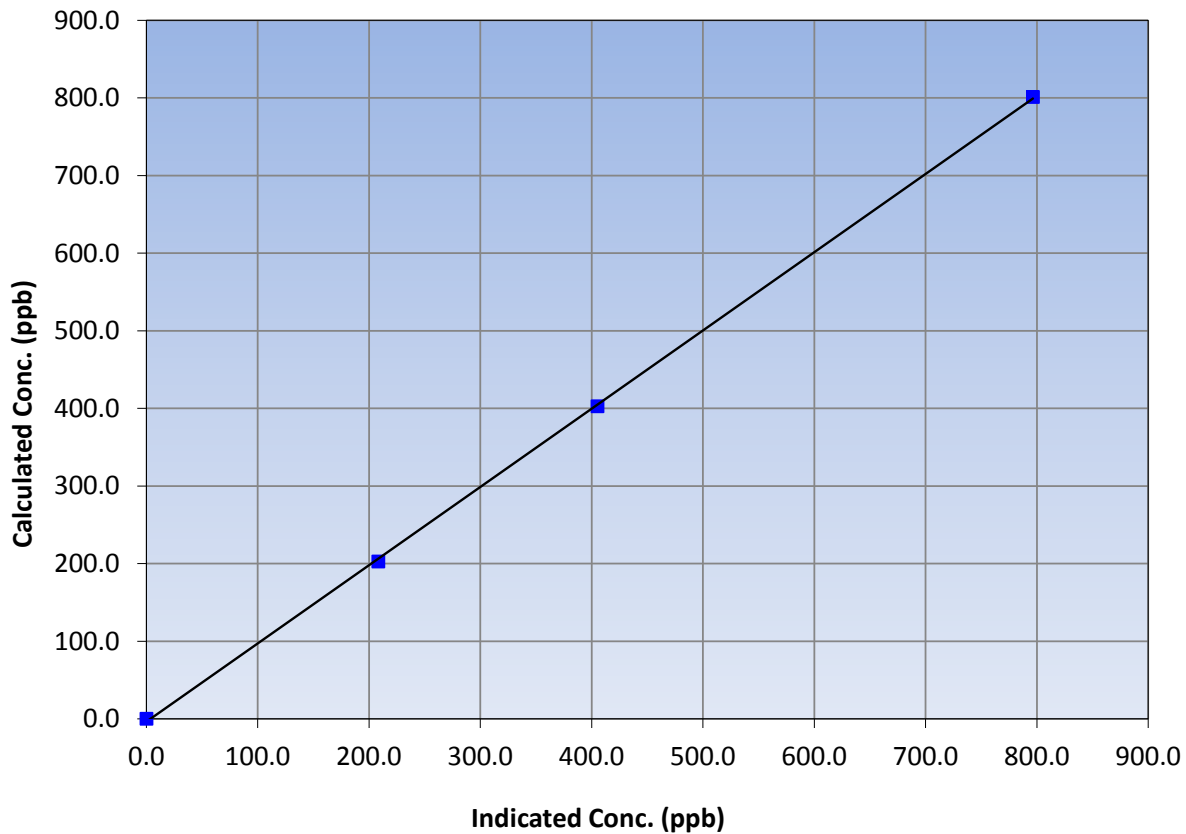
### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 7, 2017
Station Name	Muskeg River	Station Number	AMS 16
Start Time (MST)	10:35	End Time (MST)	15:00
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	≥0.995	
801.2	796.4	1.0061			
402.8	405.2	0.9941			
202.8	208.3	0.9736			
			Slope	1.008145	0.90 - 1.10
			Intercept	-3.637291	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

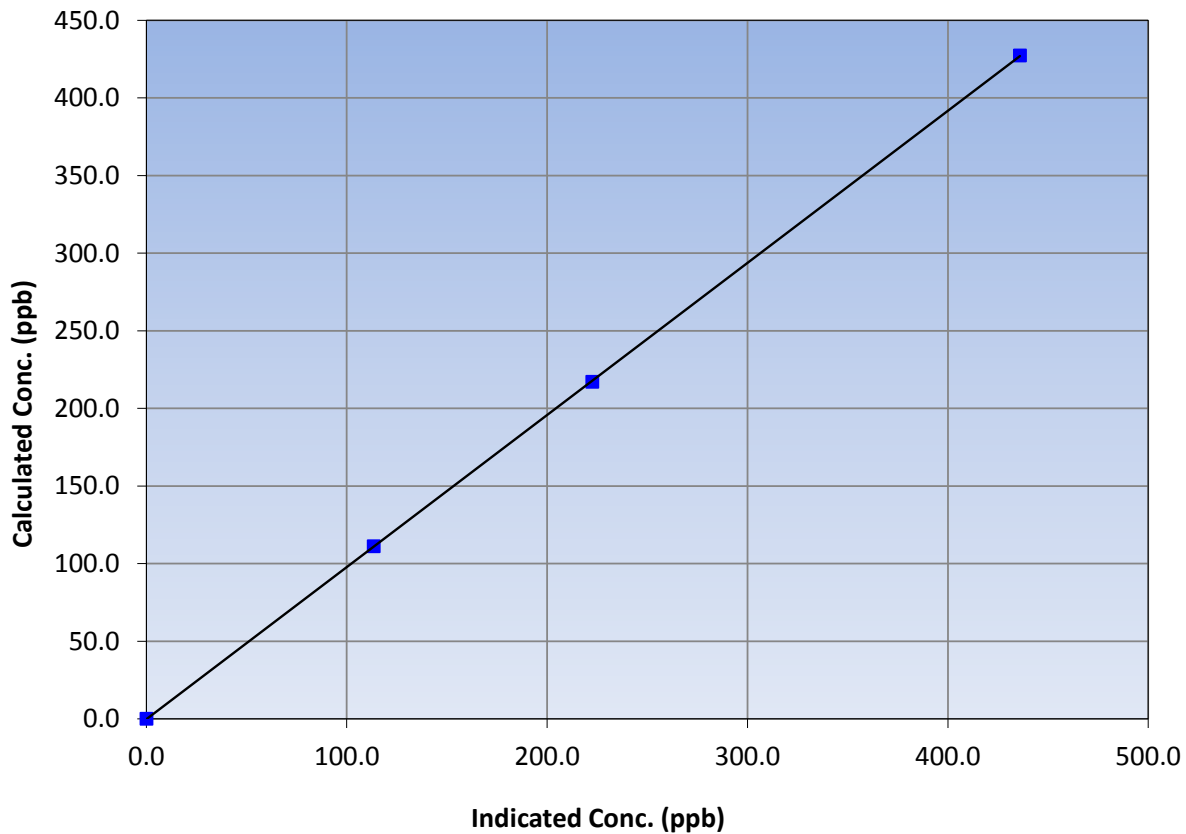
### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 7, 2017
Station Name	Muskeg River	Station Number	AMS 16
Start Time (MST)	10:35	End Time (MST)	15:00
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
427.3	436.0	0.9800			
217.2	222.6	0.9757			
111.2	113.5	0.9797			
			Slope	0.979799	0.90 - 1.10
			Intercept	-0.200722	+/-20

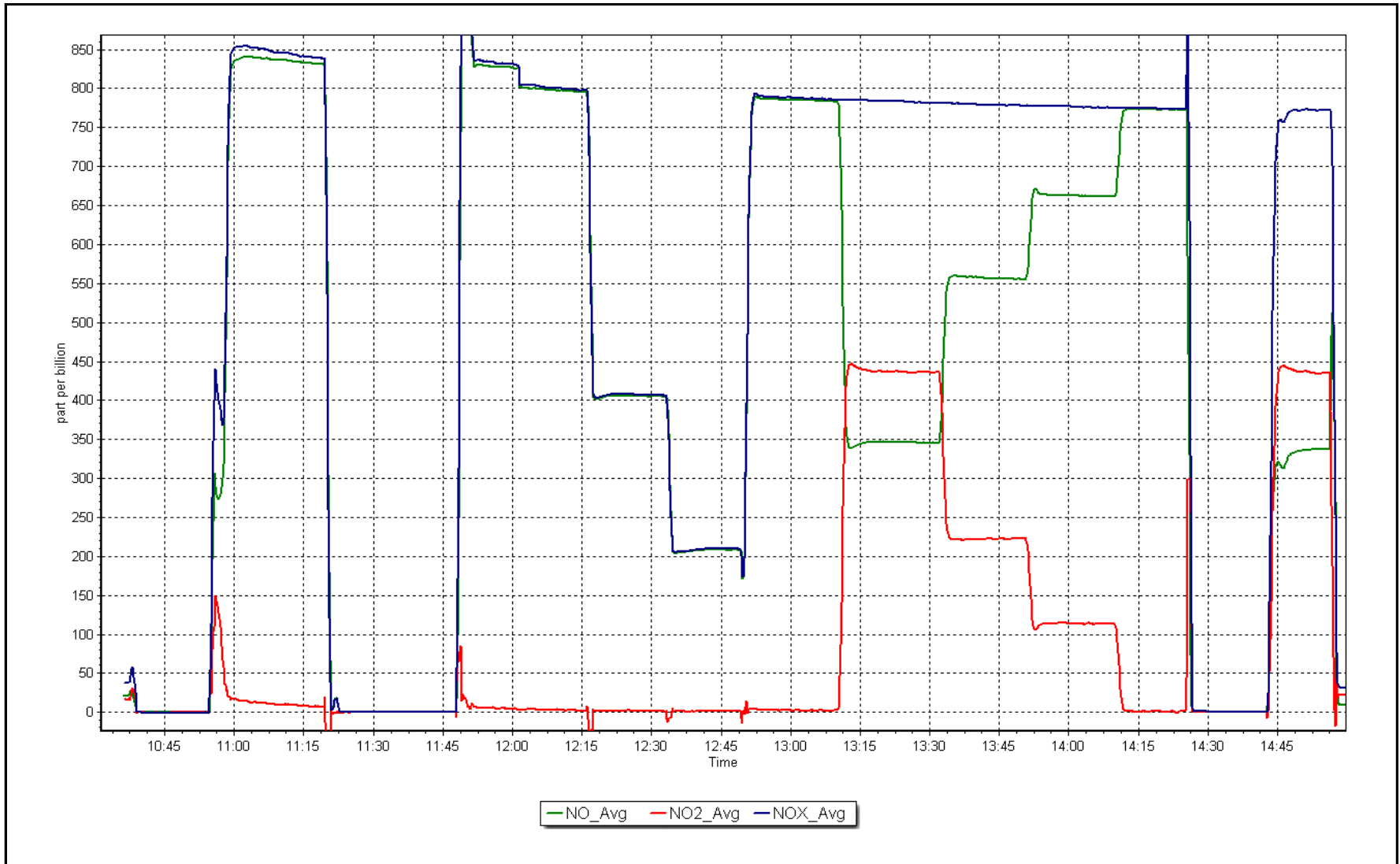
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 11, 2017

Location: Muskeg River





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Muskeg River	Station number:	AMS 16
Calibration Date:	December 11, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	12:00	End time (MST):	12:46
Sharp Model:	Sharp 5030	S/N:	E-798
Particulate Fraction:	PM2.5	C14 Source S/N:	4142
Flow Meter Make/Model:	DeltaCal	S/N:	628
Temp/RH standard:		S/N:	

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	-3	-4	-4	<input checked="" type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	985	985	985	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	1015	1000	<input checked="" type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	0.5	-----	0	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Concentration zero	0.1	-----	0	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input type="checkbox"/>	PM2.5 Cyclone	<input type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check:	_____	Last Cal Date:	November 7, 2017
	Flow w/o adaptor:	16.6	Flow w/ adaptor:	16.55

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

	<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N:	_____	8075	
Foil Mass:	_____	1259	
Calibration Date:	_____	02-Oct-17	
Correction Factor:	7120	7000	1.71%

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)				<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:		November 7, 2017			
Date Pump Rebuilt/Replaced:					

Notes: Cleaned Cylcone head. Adjusted T1 and flow. Zeroed Nephelometer and Concentration.

Calibration by: Jayme Marcoux



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 17  
WAPASU  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)  
 DECEMBER 2017

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	38	39	99.87	43	0	15	0
H2S (ppb) Average	709	34	35	99.87	1	0	1	0
THC (ppm) Average	705	38	39	99.87	2.7	-	2.4	-
O3 (ppb) Average	668	33	76	94.22	41	0	38	-
NO2 (ppb) Average	702	38	42	99.46	30	0	15	-
NO (ppb) Average	702	38	42	99.46	15	-	3	-
NOX (ppb) Average	702	38	42	99.46	38	-	18	-
PM2.5 (ug/m3) Average	734	1	10	98.79	39.3	-	15.2	0
Temperature 2 m (C) Average	744	0	0	100	2.6	-	0.6	-
Relative Humidity (%) Average	744	0	0	100	100	-	95	-
Precipitation (mm) Total	611	0	133	82.12	2.9	-	12	-
Wind Speed 10 m (km/h) Average	701	0	43	94.22	15	-	11	-
Wind Direction 10 m (deg) Average	701	0	43	94.22	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)  
 DECEMBER 2017

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	2.6	5	-	0	0	0	1	3	8	43
H2S (ppb) Average	709	0.3	0	-	0	0	0	0	0	1	1
THC (ppm) Average	705	2.2	0.1	-	2	2.1	2.1	2.2	2.2	2.4	2.7
O3 (ppb) Average	668	25.7	7	-	1	16	21	26	31	35	41
NO2 (ppb) Average	702	6.3	5	-	0	1	2	5	10	13	30
NO (ppb) Average	702	0.5	1	-	0	0	0	0	0	1	15
NOX (ppb) Average	702	6.9	6	-	0	1	2	6	11	14	38
PM2.5 (ug/m3) Average	734	4.58	4.5	-	0.1	1.1	1.6	3	6	9.7	39.3
Temperature 2 m (C) Average	744	-14.25	11.8	-	-40.8	-31.5	-25.6	-11.3	-3.6	-0.8	2.6
Relative Humidity (%) Average	744	84.2	8	-	68	73	76	85	92	95	100
Precipitation (mm) Total	611	-	-	40.33	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	701	6.5	3	-	0	3	4	6	8	11	15
Wind Direction 10 m (deg) Average	701	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	06 Dec 2017 13:00	06 Dec 2017 13:00	1	Maintenance - reinitiated daily QA check
O3	19 Dec 2017 12:00	19 Dec 2017 12:00	1	Maintenance - reinitiated daily QA check
O3	20 Dec 2017 13:00	20 Dec 2017 13:00	1	Maintenance - Station operator on site
O3	20 Dec 2017 15:00	20 Dec 2017 18:00	4	Unstable operation - excessive baseline drift
O3	21 Dec 2017 10:00	21 Dec 2017 12:00	3	Unstable operation - excessive baseline drift
O3	23 Dec 2017 10:00	23 Dec 2017 10:00	1	Maintenance - reinitiated daily QA check
O3	29 Dec 2017 07:00	30 Dec 2017 06:00	24	Unstable operation - excessive baseline drift
O3	30 Dec 2017 07:00	30 Dec 2017 14:00	8	Maintenance - analyzer replacement
NO2, NO, NOX	01 Dec 2017 09:00	01 Dec 2017 10:00	2	Maintenace - reinitiated calibration points
NO2, NO, NOX	20 Dec 2017 13:00	20 Dec 2017 13:00	1	Unstable operation
PM2.5	23 Dec 2017 05:00	23 Dec 2017 11:00	7	Unstable operation - excessive baseline drift
PM2.5	24 Dec 2017 21:00	24 Dec 2017 22:00	2	Unstable operation - excessive baseline drift
PC	01 Dec 2017 01:00	06 Dec 2017 13:00	133	Analyzer Failure - inconsistent response
Wind Speed, Wind Direction	02 Dec 2017 08:00	02 Dec 2017 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	23 Dec 2017 03:00	23 Dec 2017 22:00	20	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	24 Dec 2017 17:00	24 Dec 2017 18:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	25 Dec 2017 16:00	25 Dec 2017 17:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	26 Dec 2017 23:00	26 Dec 2017 23:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	27 Dec 2017 01:00	27 Dec 2017 11:00	11	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	28 Dec 2017 03:00	28 Dec 2017 04:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Dec 2017 06:00	29 Dec 2017 08:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	30 Dec 2017 16:00	30 Dec 2017 16:00	1	Flat line in sensor output signal -sensor frozen

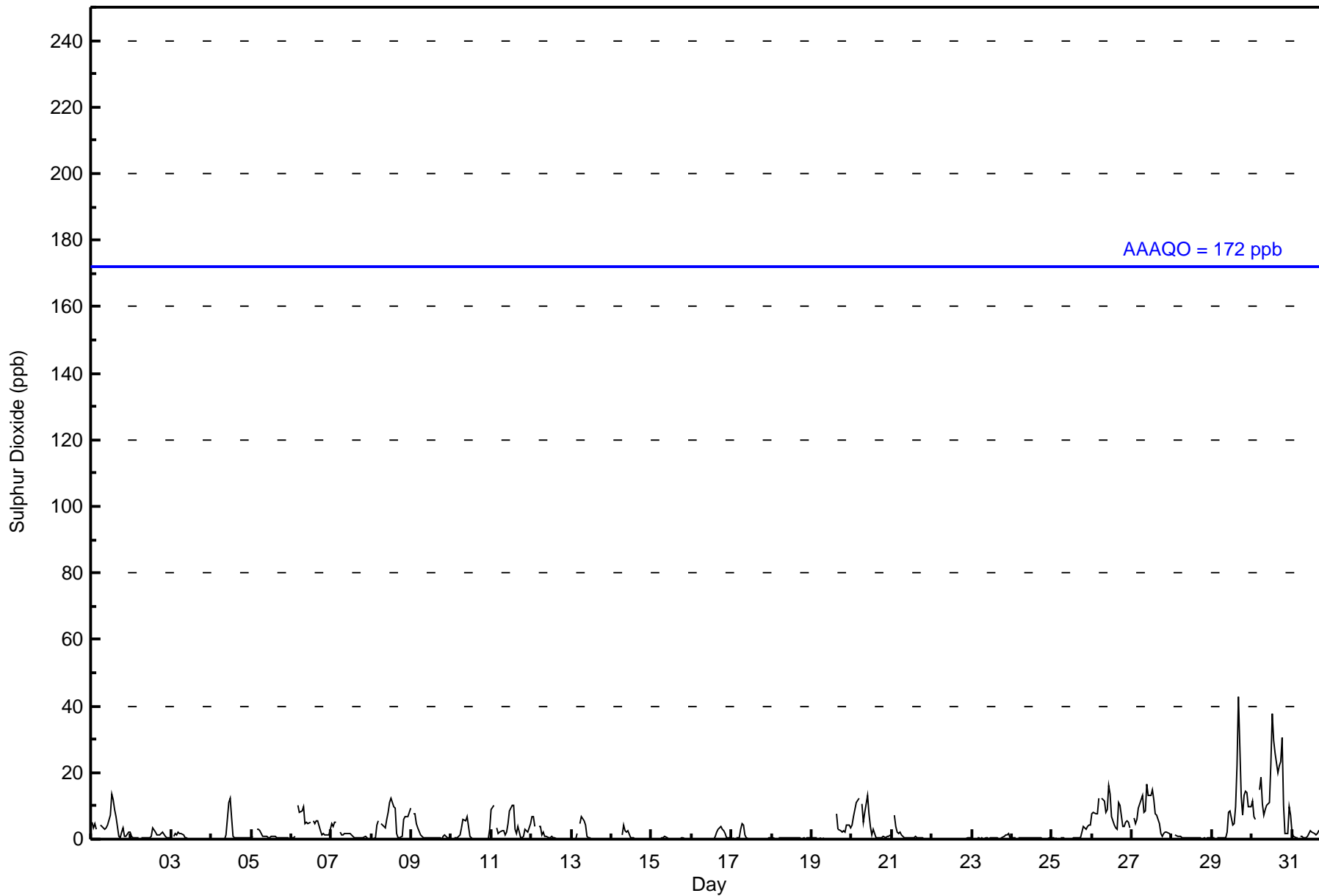


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 43 ppb on Dec 29 17:00										Maximum Daily Average: 15.1 ppb on Dec 30										Hours of Data: 705						
Minimum Value: 0 ppb on Dec 12 20:00										Minimum Daily Average: 0.1 ppb on Dec 22										Hours of Missing Data: 39						
Maximum Diurnal Average: 4.0 ppb at hour 13										Minimum Diurnal Average: 1.6 ppb at hour 21										Hours of Calibration: 38						
Monthly Average: 2.6 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 3 P <sub>90</sub> = 8 P <sub>99</sub> = 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-Dec	5	3	5	3	Z	4	4	4	3	3	4	7	14	12	9	7	1	1	2	3	1	1	2	2	4.3	14
2-Dec	1	0	0	0	0	Z	0	0	0	0	0	1	1	3	2	1	1	1	2	2	1	1	0	0	0.9	3
3-Dec	Z	1	2	1	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
4-Dec	0	Z	0	0	0	0	0	0	0	1	11	12	6	1	1	0	0	0	0	0	0	0	0	0	1.6	12
5-Dec	0	1	Z	3	3	3	2	1	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0.9	3
6-Dec	0	0	1	Z	10	8	9	10	5	5	4	5	M	6	5	5	5	3	1	2	1	1	1	3	4.1	10
7-Dec	5	4	5	5	Z	2	1	1	2	1	2	2	1	1	0	1	0	0	0	0	1	0	0	0	1.6	5
8-Dec	0	0	0	4	5	Z	5	4	3	6	8	11	12	10	9	2	0	0	1	6	7	7	7	10	5.1	12
9-Dec	Z	8	7	5	3	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1.4	8
10-Dec	0	Z	1	1	1	1	4	6	6	7	4	1	0	0	0	0	0	0	0	0	0	0	0	3	1.5	7
11-Dec	9	10	Z	3	2	2	3	2	1	2	5	8	10	10	3	2	4	0	0	1	3	2	2	5	3.9	10
12-Dec	7	7	4	Z	4	4	1	2	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1.5	7
13-Dec	0	0	0	2	Z	5	7	6	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	7
14-Dec	0	0	0	0	0	Z	1	4	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4
15-Dec	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	4	3	3	2	1	1	0	0.9	4
17-Dec	0	0	Z	0	0	3	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	5
18-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	Z	0	0	0	C	C	C	C	C	C	C	8	3	3	2	2	2	4	4	3	--	8
20-Dec	4	7	9	11	12	Z	11	5	8	13	7	4	1	3	0	0	1	1	0	1	0	1	1	1	4.4	13
21-Dec	Z	7	4	2	2	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1.0	7
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	0.4	2
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	3	4	4	4	1.1	4
26-Dec	8	8	8	7	12	Z	12	12	8	9	16	14	7	4	3	3	11	10	4	4	5	6	5	3	7.8	16
27-Dec	Z	6	4	6	9	12	13	8	8	16	13	13	15	12	8	7	5	2	1	2	2	2	2	1	7.3	16
28-Dec	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
29-Dec	0	0	Z	0	0	0	0	0	0	2	8	8	4	5	10	22	43	13	7	13	15	14	10	10	8.1	43
30-Dec	12	7	6	Z	15	19	10	7	9	10	11	22	38	30	26	20	22	23	30	10	2	2	10	7	15.1	38
31-Dec	2	1	1	1	Z	1	1	1	1	1	2	3	2	2	1	2	2	3	2	2	1	2	1	1	1.5	3
2.2 2.8 2.3 2.2 3.3 2.7 3.0 2.6 2.3 2.8 3.4 3.8 4.0 3.4 2.7 2.8 3.4 2.2 2.0 1.9 1.6 1.6 1.8 1.9																								Diurnal Average		
12 10 9 11 15 19 13 12 9 16 16 22 38 30 26 22 43 23 30 13 15 14 10 10																								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 (SO<sub>2</sub>) - ppb  
Wapasu - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	664	94.18	94.18
11 - 20	32	4.54	98.72
21 - 60	9	1.28	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Wapasu - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	86	47	7	3	3	3	6	102	146	56	51	31	26	19	17	25	628
11 - 20	0	0	0	0	0	0	0	15	8	4	0	0	0	0	0	0	27
21 - 60	0	0	0	0	0	0	0	4	5	0	0	0	0	0	0	0	9
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	86	47	7	3	3	3	6	121	159	60	51	31	26	19	17	25	664

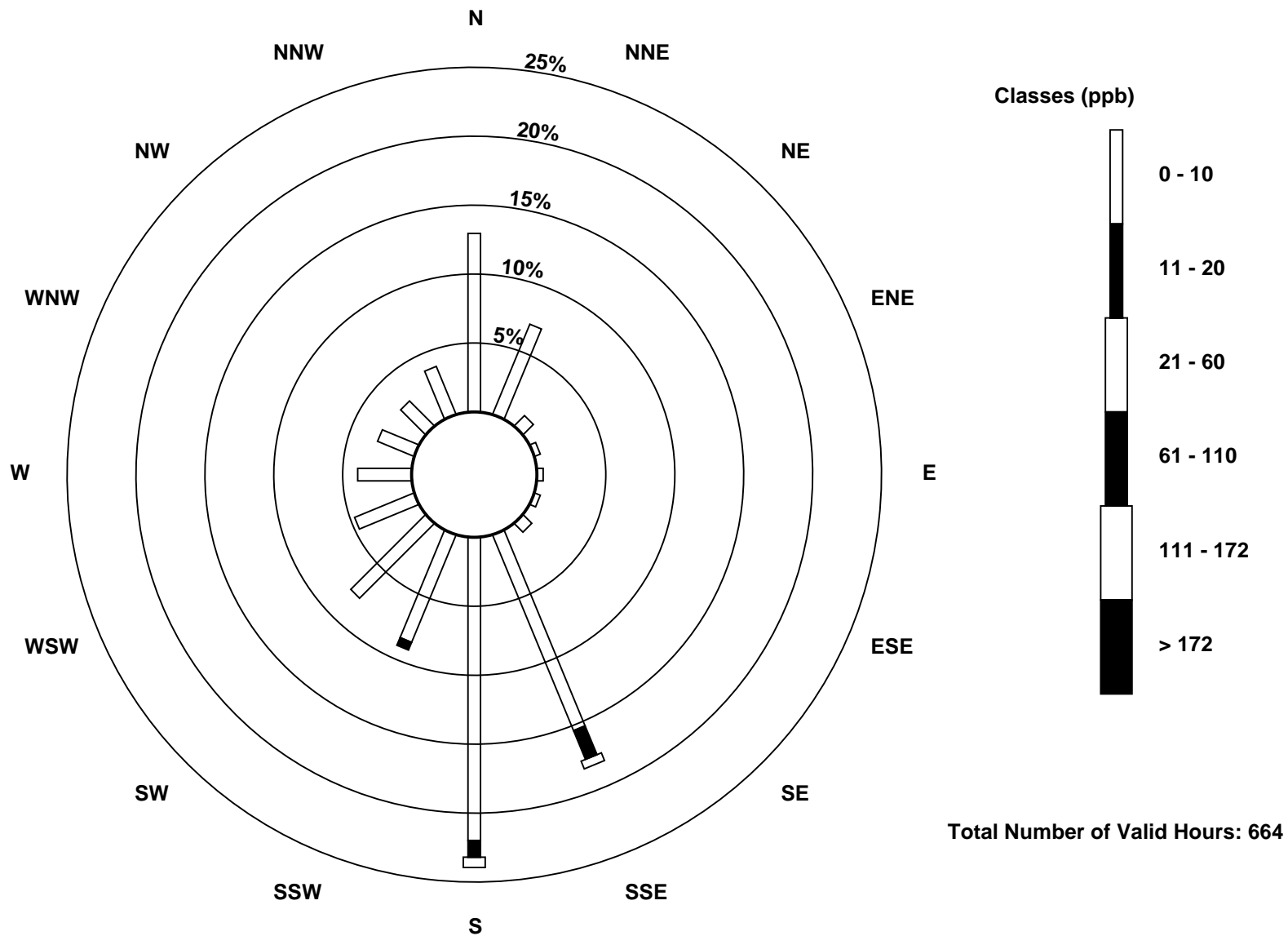
Total Number of Valid Hours: 664

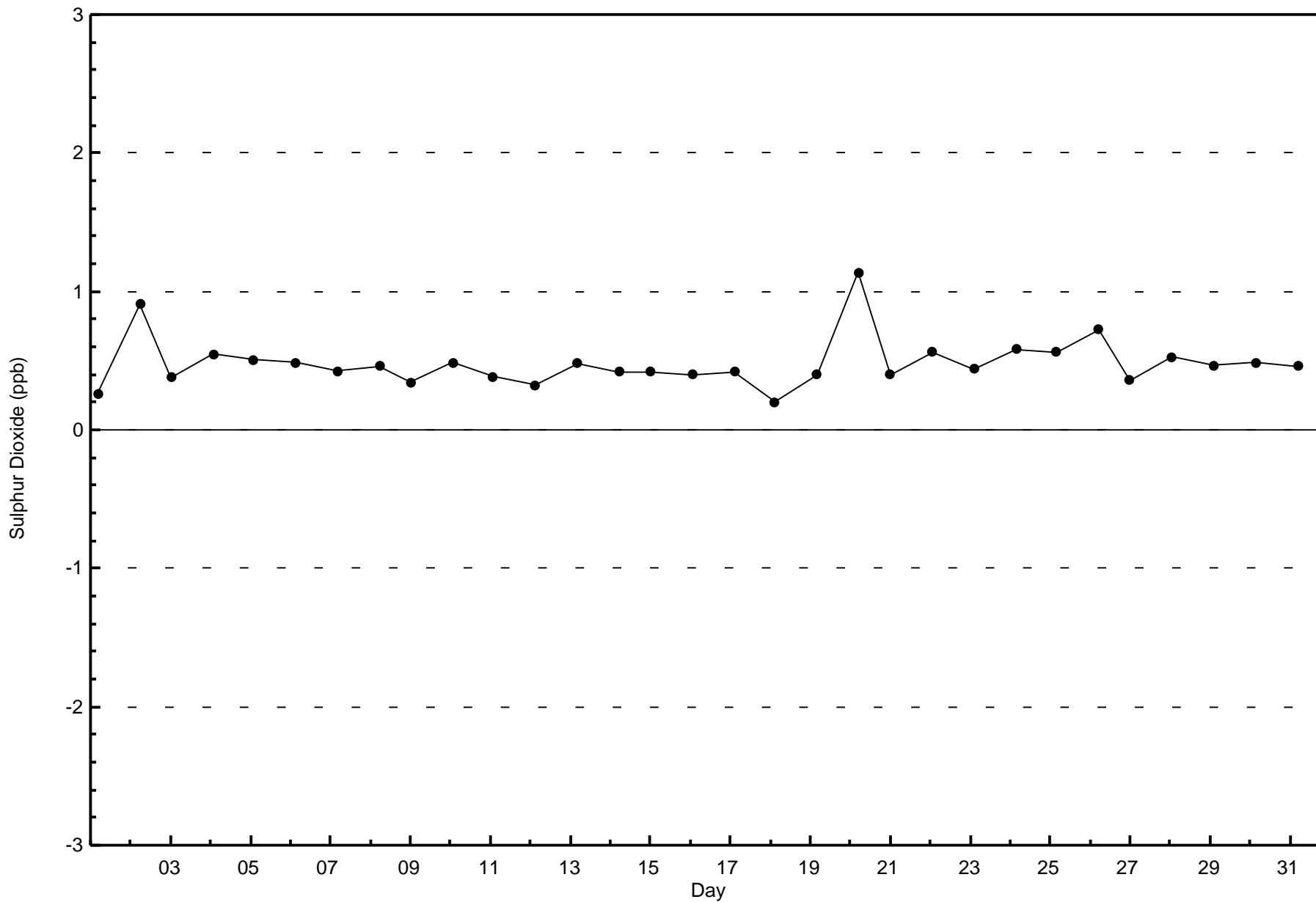
Total Number of Hours: 744

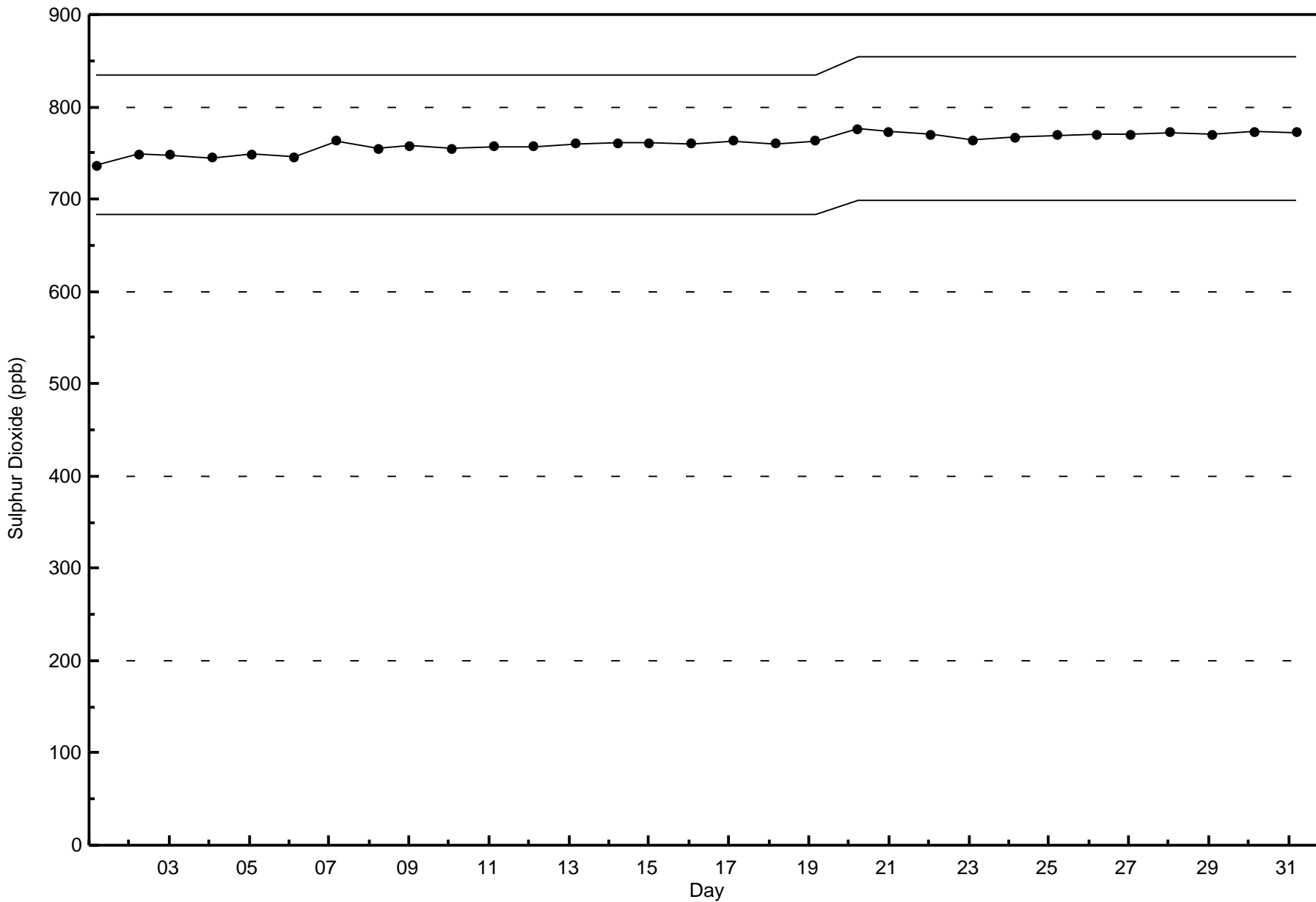


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Wapasu (AMS 17)











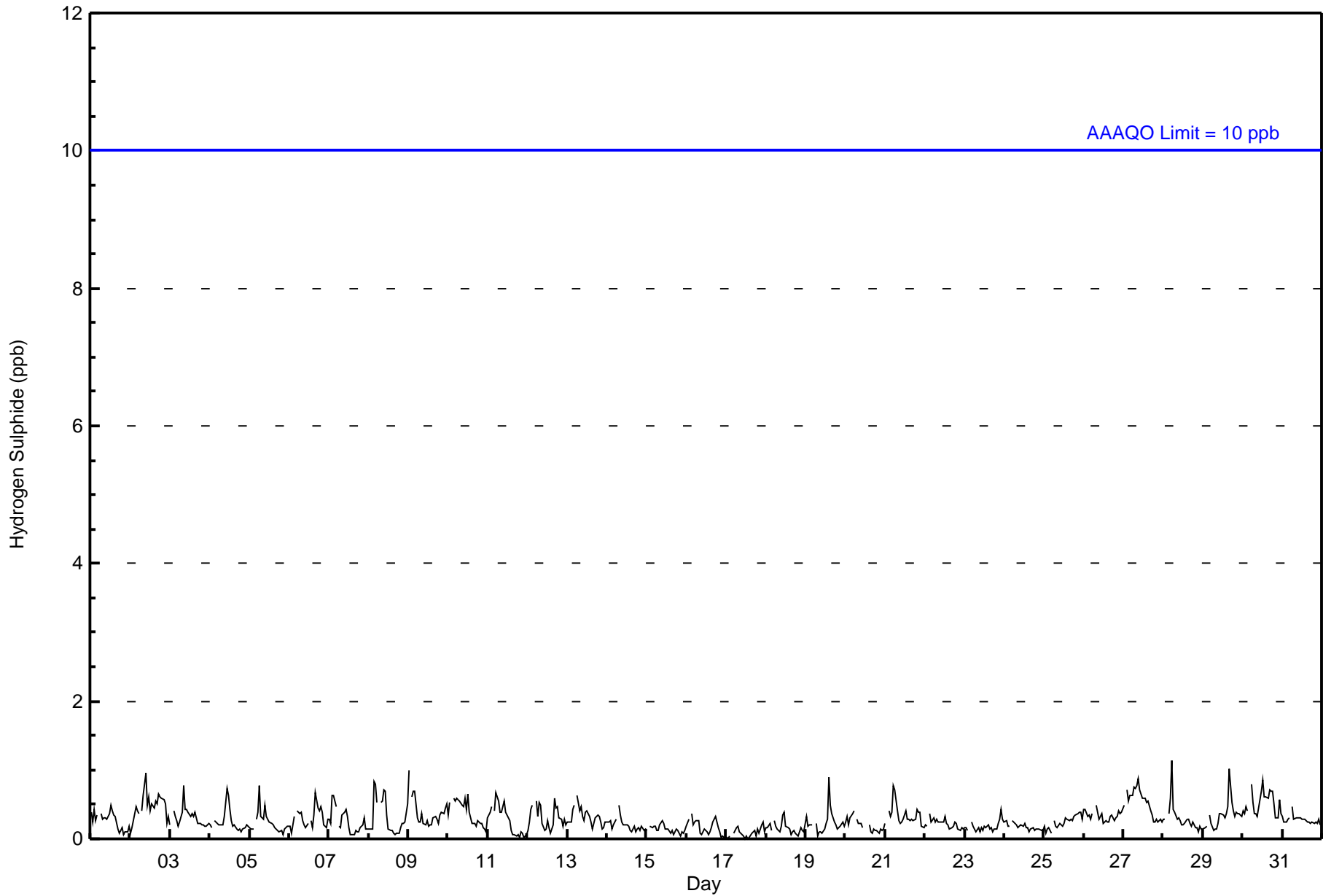
Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb

Wapasu - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744										Daily Average		Daily Maximum					
Maximum Value: 1 ppb on Dec 28 06:00										Maximum Daily Average: 0.5 ppb on Dec 30										Hours of Data: 709		Hours of Missing Data: 35					
Minimum Value: 0 ppb on Dec 17 02:00										Minimum Daily Average: 0.1 ppb on Dec 17										Hours of Calibration: 34		Percent Operational Time: 99.9					
Maximum Diurnal Average: 0.4 ppb at hour 6										Minimum Diurnal Average: 0.2 ppb at hour 24																	
Monthly Average: 0.3 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 1																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
2-Dec	0	0	0	0	0	0	Z	0	1	1	0	1	0	1	0	1	1	1	1	1	1	1	0	0	0.5	1	
3-Dec	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
4-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
5-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	1	0	0	0	0	0	0	0	0.3	1	
7-Dec	0	0	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
8-Dec	0	0	0	1	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1	
9-Dec	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
10-Dec	0	1	Z	1	1	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
11-Dec	0	0	0	Z	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
12-Dec	0	0	0	0	Z	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1	
13-Dec	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
14-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1	
20-Dec	0	0	0	0	0	0	Z	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0	
21-Dec	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
26-Dec	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	
27-Dec	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1	
28-Dec	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	
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1	
30-Dec	0	0	0	0	Z	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0.5	1	
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
0.3 0.2 0.3 0.4 0.4 0.4 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2																								Diurnal Average		Diurnal Maximum	
1 1																											
Z - zerospan C - Calibration M - Maintenance																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																											





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Wapasu - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	87	46	11	2	3	2	7	122	156	62	53	31	26	19	17	25	669
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
<b>Totals</b>	87	46	11	2	3	2	7	122	156	62	53	31	26	19	17	25	669

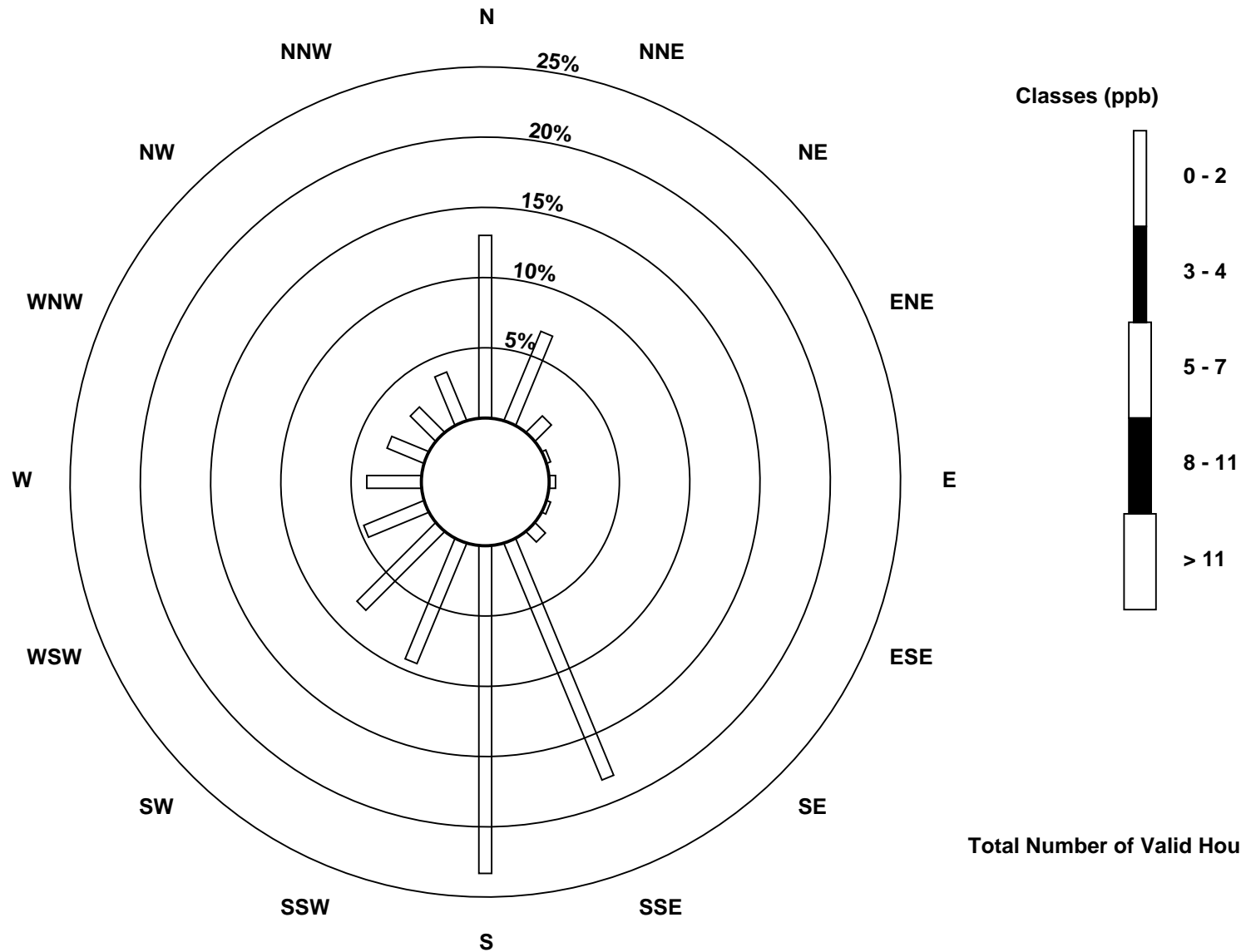
Total Number of Valid Hours: 669

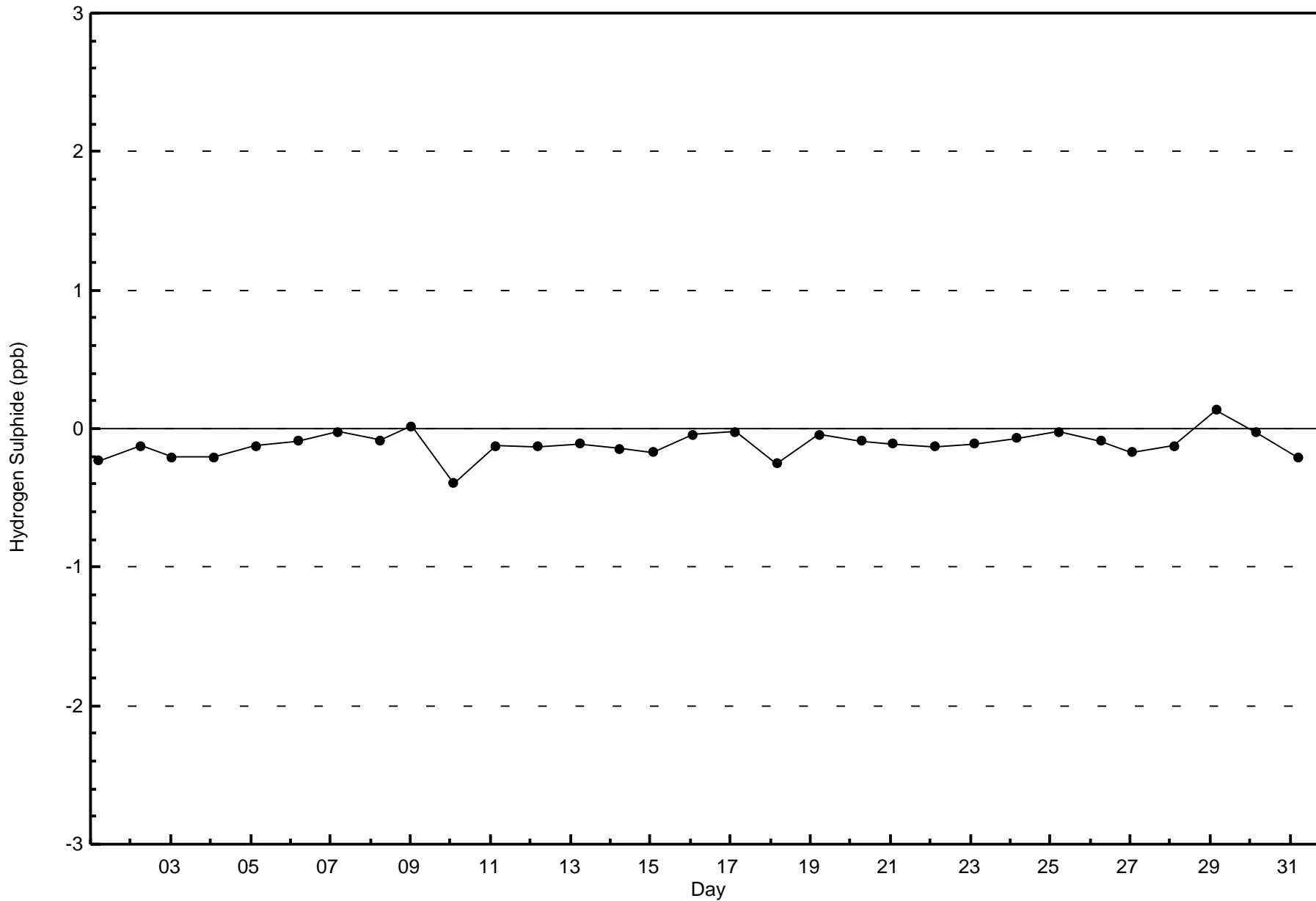
Total Number of Hours: 744

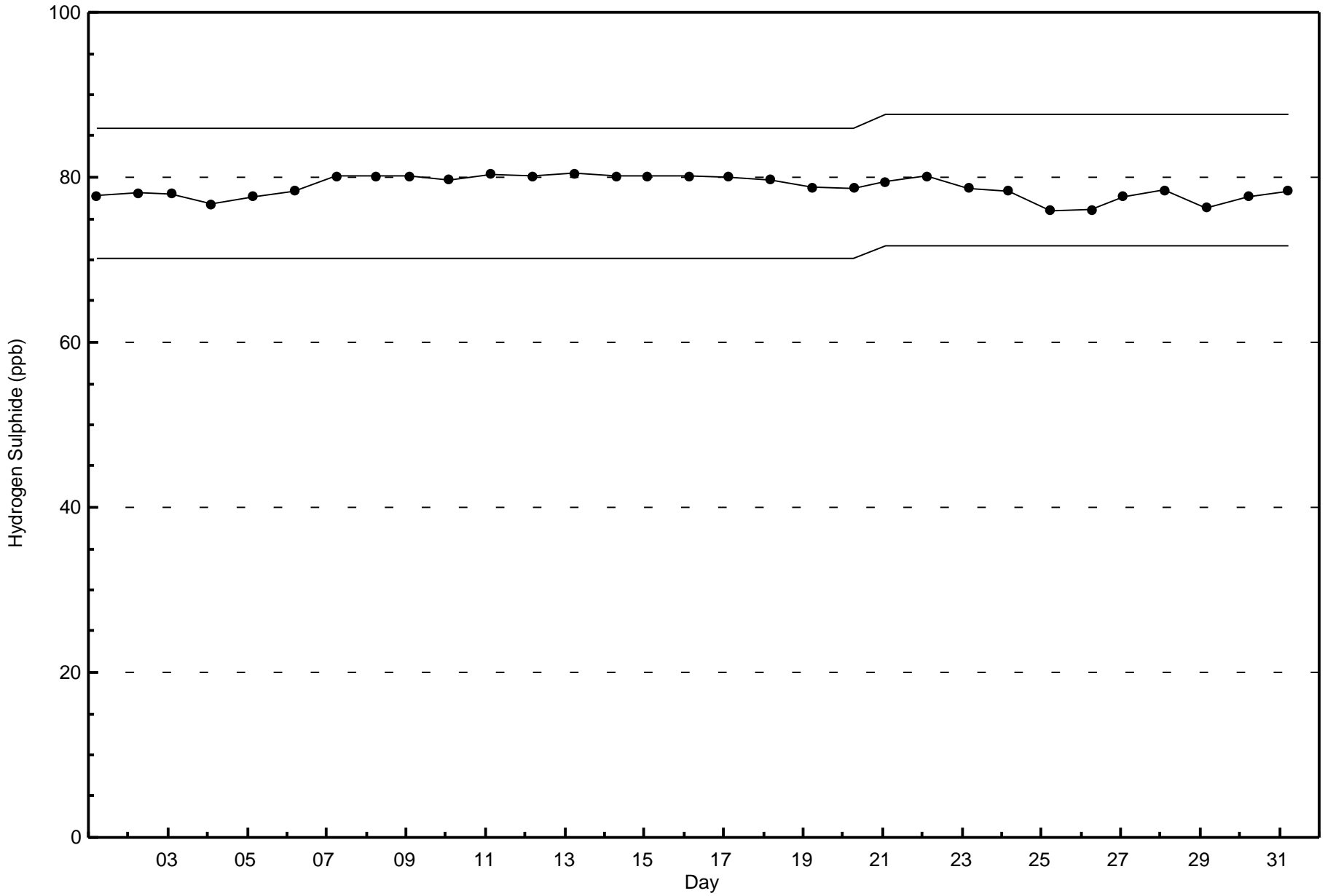


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Wapasu (AMS 17)

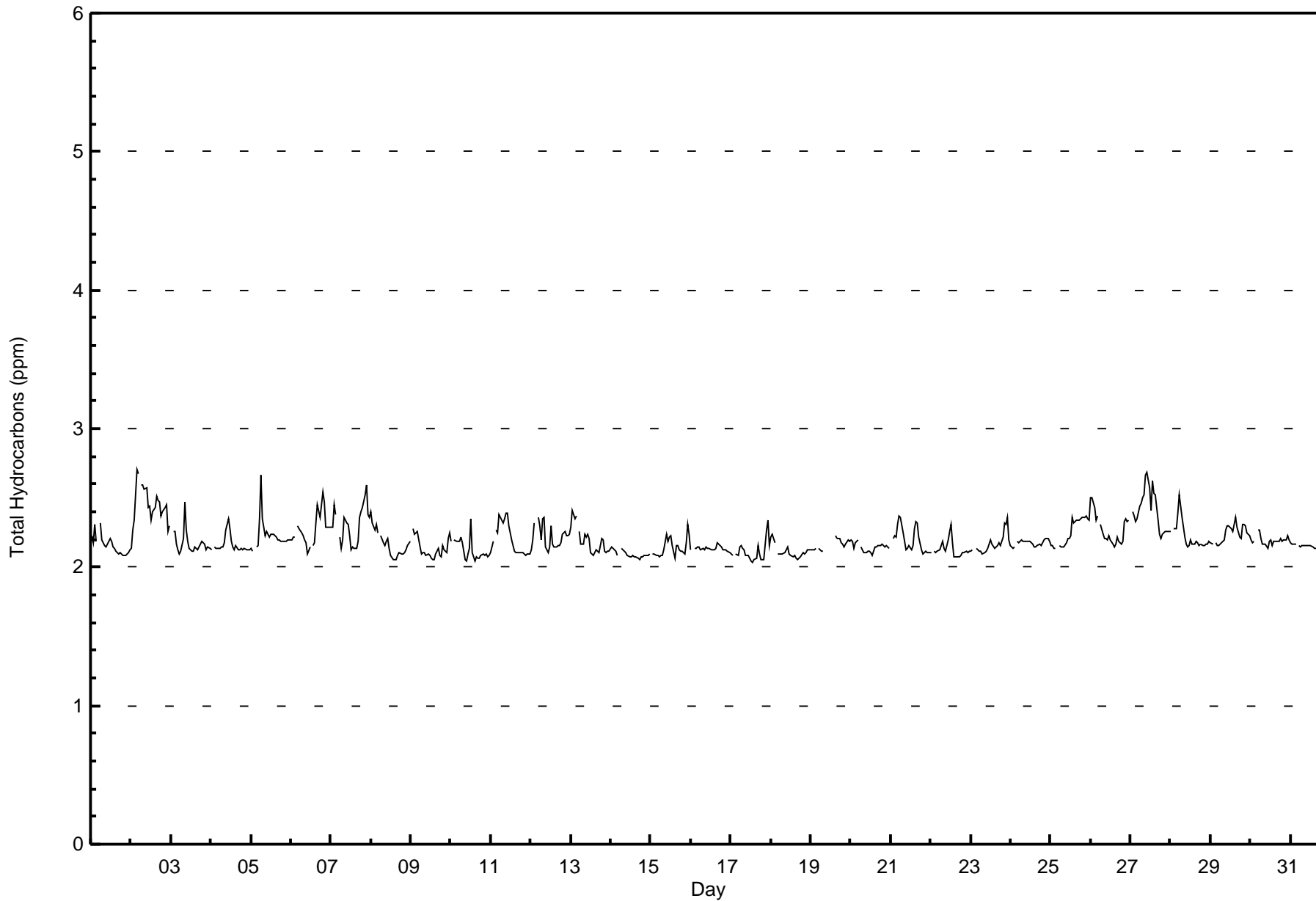














**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Wapasu - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	5	0.71	0.71
2.1 - 3.0	700	99.29	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Wapasu - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	1	0	0	0	0	0	0	0	0	1	0	2	0	0	1	0	5
2.1 - 3.0	85	47	7	3	3	3	6	121	159	59	51	29	26	19	16	25	659
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
<b>Totals</b>	86	47	7	3	3	3	6	121	159	60	51	31	26	19	17	25	664

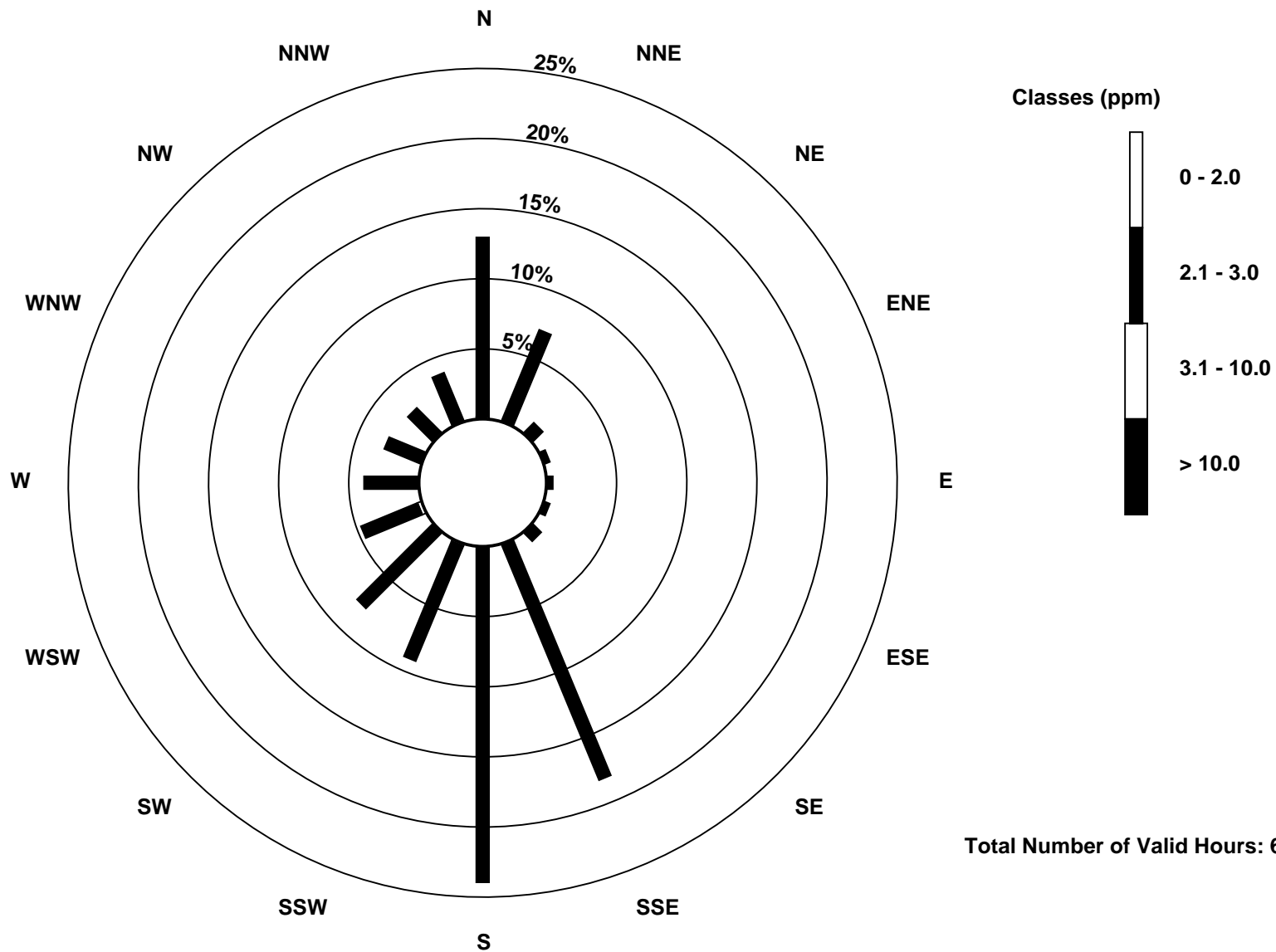
Total Number of Valid Hours: 664

Total Number of Hours: 744

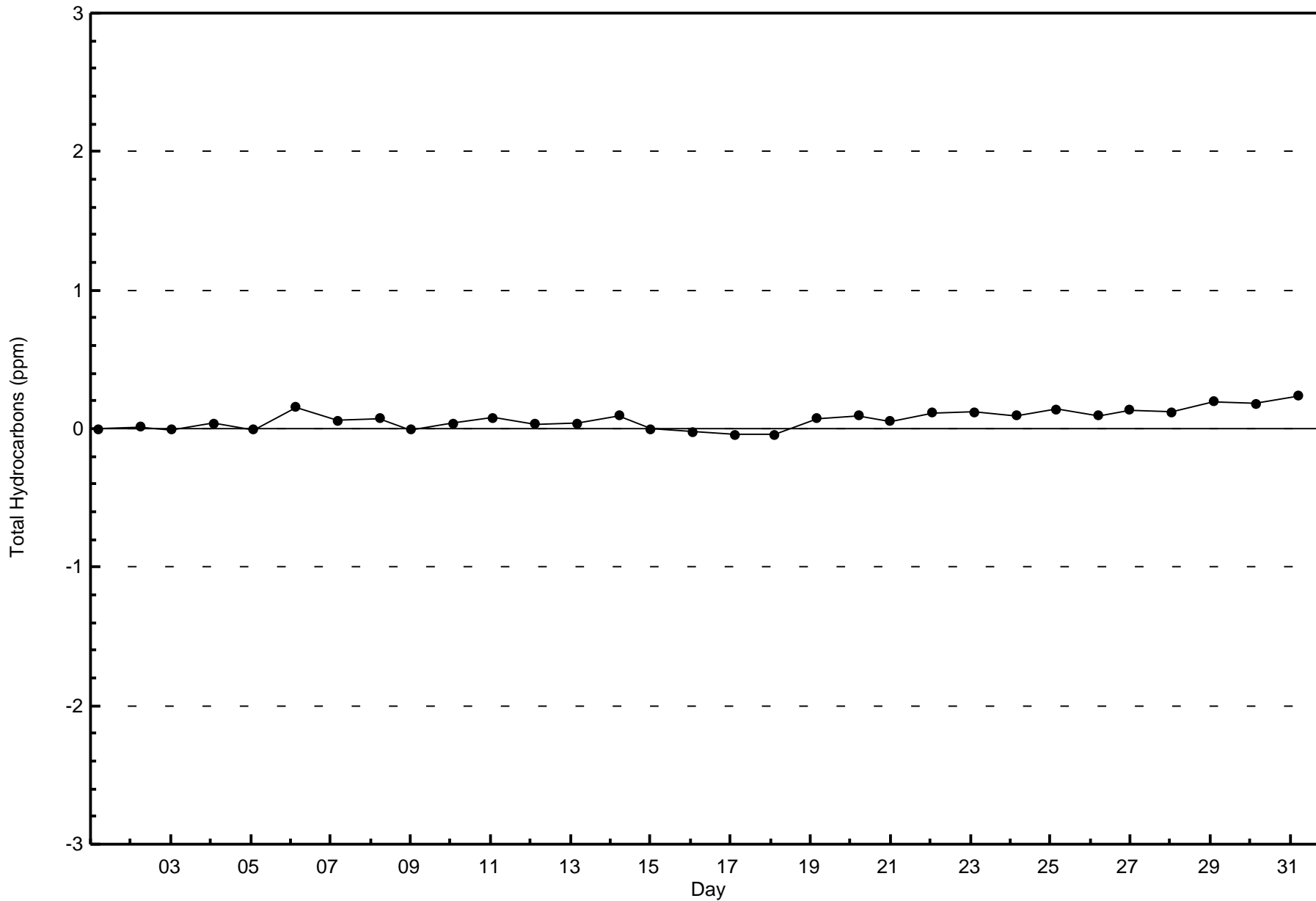


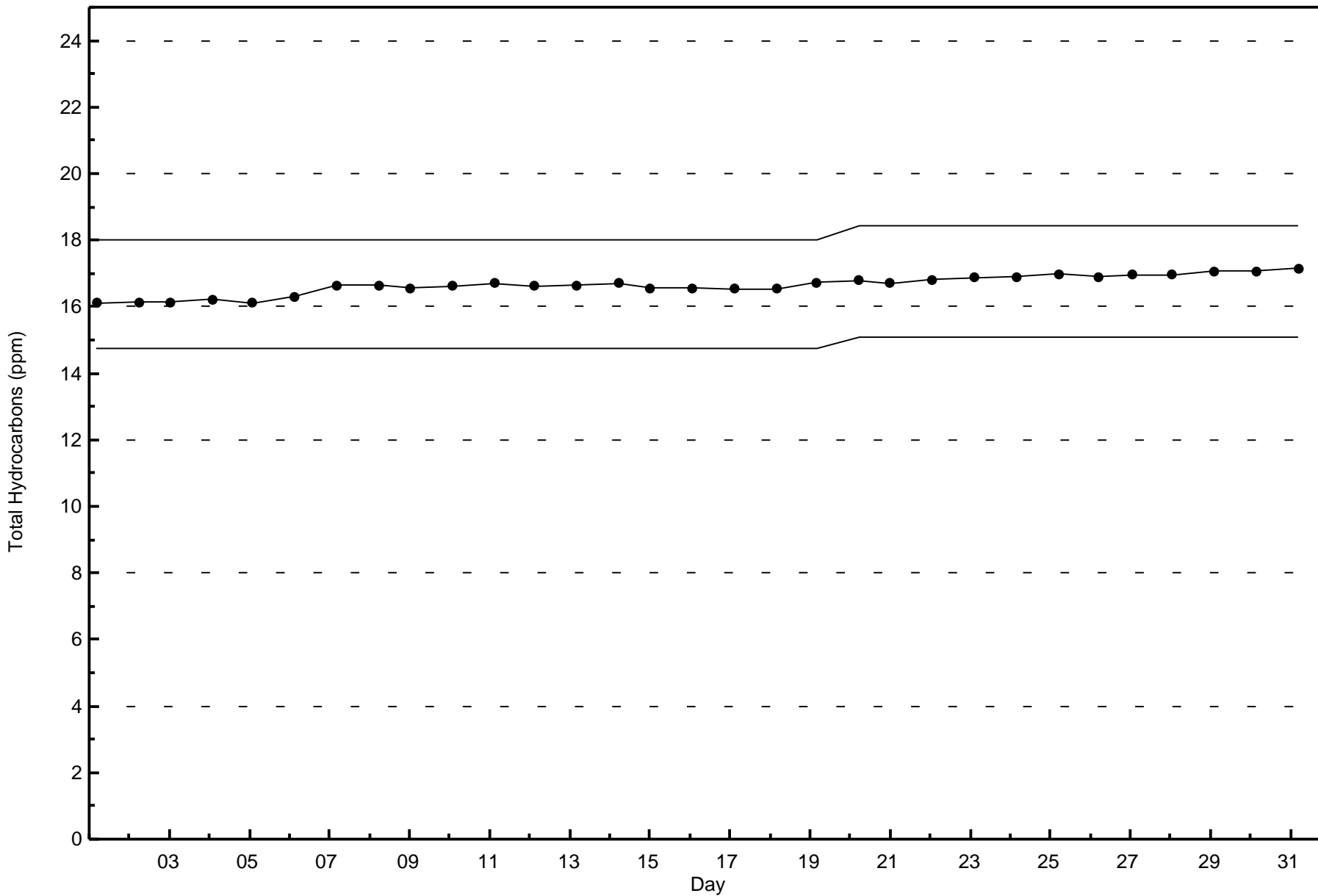
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Wapasu (AMS 17)



Total Number of Valid Hours: 664







# Wood Buffalo Environmental Association

## Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

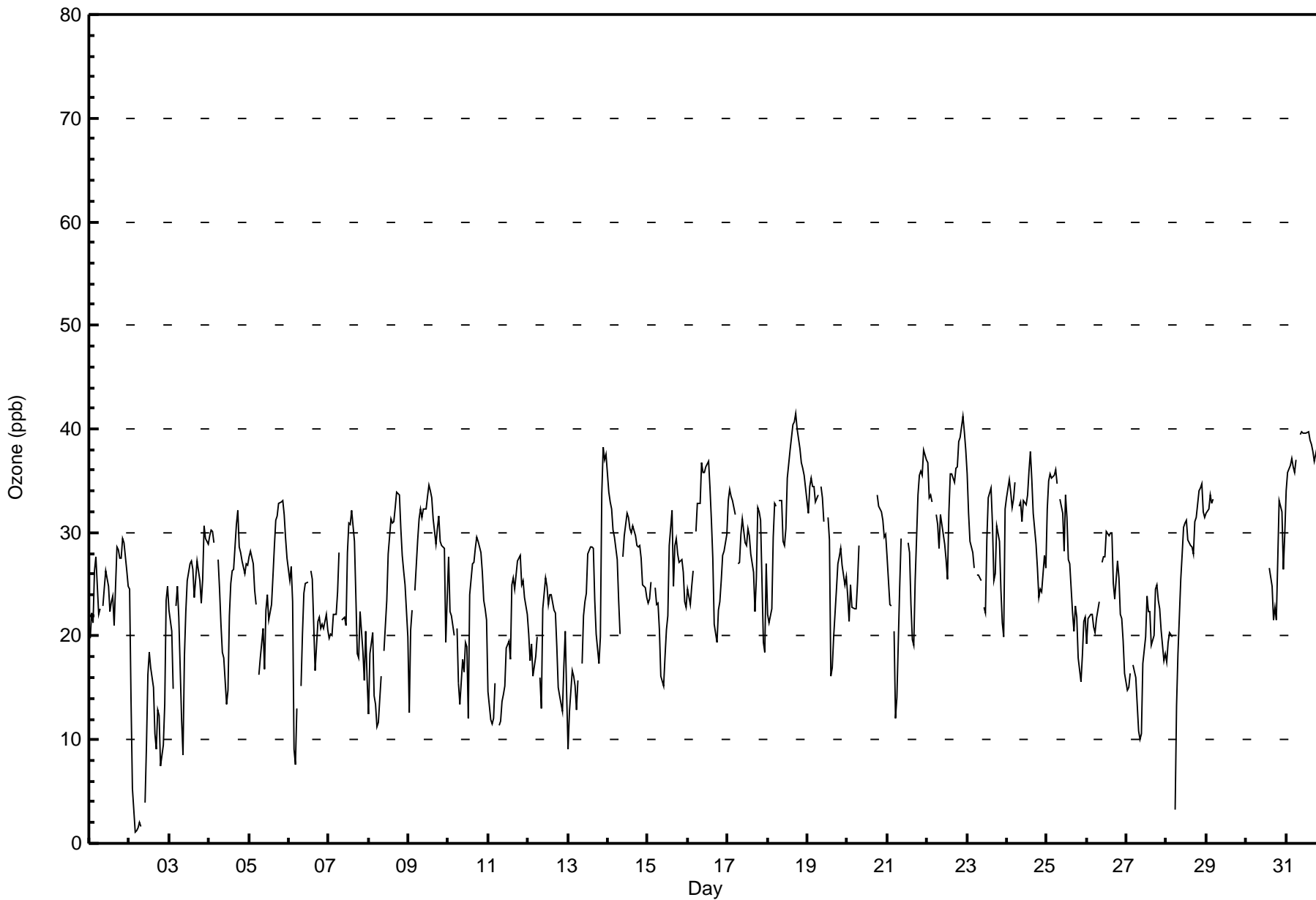
Wapasu - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 41 ppb on Dec 18 18:00 Maximum Daily Average: 37.6 ppb on Dec 31		Hours in Service: 744 Hours of Data: 668 Hours of Missing Data: 76 Hours of Calibration: 33 Percent Operational Time: 94.2																										
Minimum Value: 1 ppb on Dec 2 04:00 Maximum Diurnal Average: 28.7 ppb at hour 14 Monthly Average: 25.7 ppb		Minimum Daily Average: 11.1 ppb on Dec 2 Minimum Diurnal Average: 21.0 ppb at hour 8 Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 16 Q <sub>1</sub> = 21 Median = 26 Q <sub>3</sub> = 31 P <sub>90</sub> = 35 P <sub>99</sub> = 40																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	20	22	21	26	28	22	23	Z	23	25	26	25	22	23	24	21	29	28	27	28	29	29	26	25	24.9	29		
2-Dec	25	14	5	1	1	1	2	2	Z	4	9	16	18	17	15	11	9	13	12	7	9	13	23	25	11.1	25		
3-Dec	23	21	15	Z	23	25	22	12	9	18	22	25	27	27	26	24	25	27	25	23	26	31	29	29	23.2	31		
4-Dec	30	30	30	29	Z	27	25	21	18	18	13	15	22	25	26	26	31	32	29	28	27	26	27	27	25.4	32		
5-Dec	28	28	27	24	23	Z	16	18	21	17	22	24	22	23	26	29	31	32	33	33	33	32	29	27	26.0	33		
6-Dec	25	27	23	9	8	13	Z	15	20	24	25	25	M	26	25	21	17	21	22	21	21	21	22	21	20.6	27		
7-Dec	20	20	20	22	22	24	28	Z	22	22	21	28	31	31	32	29	24	18	18	22	19	16	20	16	22.8	32		
8-Dec	12	18	20	14	13	11	12	16	Z	19	21	23	28	31	31	31	32	34	34	30	28	26	25	20	23.1	34		
9-Dec	13	21	23	Z	24	29	31	32	31	32	32	34	35	34	33	31	29	30	32	29	29	28	19	24	28.5	35		
10-Dec	28	22	22	20	Z	21	15	13	18	17	19	19	12	24	27	27	29	30	29	28	26	23	23	22	22.3	30		
11-Dec	15	12	12	12	15	Z	11	12	14	14	15	19	20	18	25	26	25	27	27	28	25	25	24	22	19.2	28		
12-Dec	20	18	19	16	18	20	Z	16	13	23	26	25	23	24	24	23	22	19	15	14	13	17	20	14	19.2	26		
13-Dec	9	13	17	16	15	13	16	Z	17	22	23	24	28	29	29	28	24	20	17	20	34	38	37	38	22.9	38		
14-Dec	34	33	32	30	29	27	23	20	Z	28	30	32	32	30	30	31	30	29	29	29	27	25	25	24	28.6	34		
15-Dec	23	24	25	Z	25	23	23	21	16	15	18	21	22	29	32	25	29	29	28	27	27	26	23	23	24.1	32		
16-Dec	24	23	25	26	Z	30	33	33	37	36	36	36	37	34	31	27	21	19	23	23	25	28	28	30	29.0	37		
17-Dec	33	34	33	33	32	Z	27	27	30	31	29	29	30	30	28	26	22	26	32	32	31	19	18	27	28.7	34		
18-Dec	22	21	23	30	33	33	Z	33	33	29	29	30	35	38	39	40	41	41	40	38	37	36	35	34	33.5	41		
19-Dec	32	34	35	34	34	33	34	Z	34	33	31	M	32	29	16	17	20	25	27	28	28	27	25	26	28.9	35		
20-Dec	24	21	25	23	23	23	25	29	C	C	C	C	M	33	UO	UO	UO	UO	34	32	32	31	30	30	--	34		
21-Dec	28	23	23	Z	20	12	14	25	29	UO	UO	UO	29	28	23	20	19	25	34	36	36	36	38	37	26.7	38		
22-Dec	37	33	34	33	Z	32	31	29	32	31	29	27	25	32	36	36	35	36	36	39	39	41	40	38	33.9	41		
23-Dec	36	32	29	28	27	Z	26	26	25	M	23	22	29	33	34	31	25	26	31	29	24	21	20	32	27.7	36		
24-Dec	33	35	34	32	33	35	Z	33	33	31	33	33	34	36	38	35	32	29	27	24	25	24	28	27	31.4	38		
25-Dec	32	35	36	35	36	36	35	Z	33	32	28	34	31	27	27	22	20	23	22	18	16	18	21	22	27.8	36		
26-Dec	19	22	22	22	21	20	22	23	Z	27	28	28	30	30	30	30	25	24	27	26	22	22	20	16	24.1	30		
27-Dec	15	15	16	Z	17	16	13	11	10	11	17	20	24	22	22	19	20	25	25	24	23	21	18	18	18.3	25		
28-Dec	18	19	20	20	Z	3	13	18	25	28	30	31	31	29	29	29	28	31	31	34	34	35	32	31	26.1	35		
29-Dec	32	32	34	33	33	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	34		
30-Dec	UO	UO	UO	UO	UO	UO	M	M	M	M	M	M	M	M	M	M	27	25	21	23	22	27	33	32	26	30	--	33
31-Dec	34	36	36	37	36	36	37	Z	39	40	40	40	40	40	40	39	38	38	37	38	39	39	38	36	34	37.6	40	
24.7 24.6 24.6 24.3 23.6 22.6 22.3 21.0 24.3 24.1 25.1 26.3 27.7 28.7 28.4 26.8 26.0 26.9 27.5 27.2 27.3 26.8 26.3 26.2																								Diurnal Average				
37 36 36 37 36 36 37 33 39 40 40 40 40 40 40 39 40 41 41 40 39 39 41 40 38																								Diurnal Maximum				
Z - zerospan      C - Calibration      M - Maintenance      UO - Unstable Operation																												
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																												



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Wapasu - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	152	22.75	22.75
21 - 50	516	77.25	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 668

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Wapasu - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	7	2	1	1	1	0	1	33	31	17	15	4	8	6	6	4	137
21 - 50	79	44	8	2	2	3	6	78	101	44	39	27	18	13	11	19	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
<b>Totals</b>	86	46	9	3	3	3	7	111	132	61	54	31	26	19	17	23	631

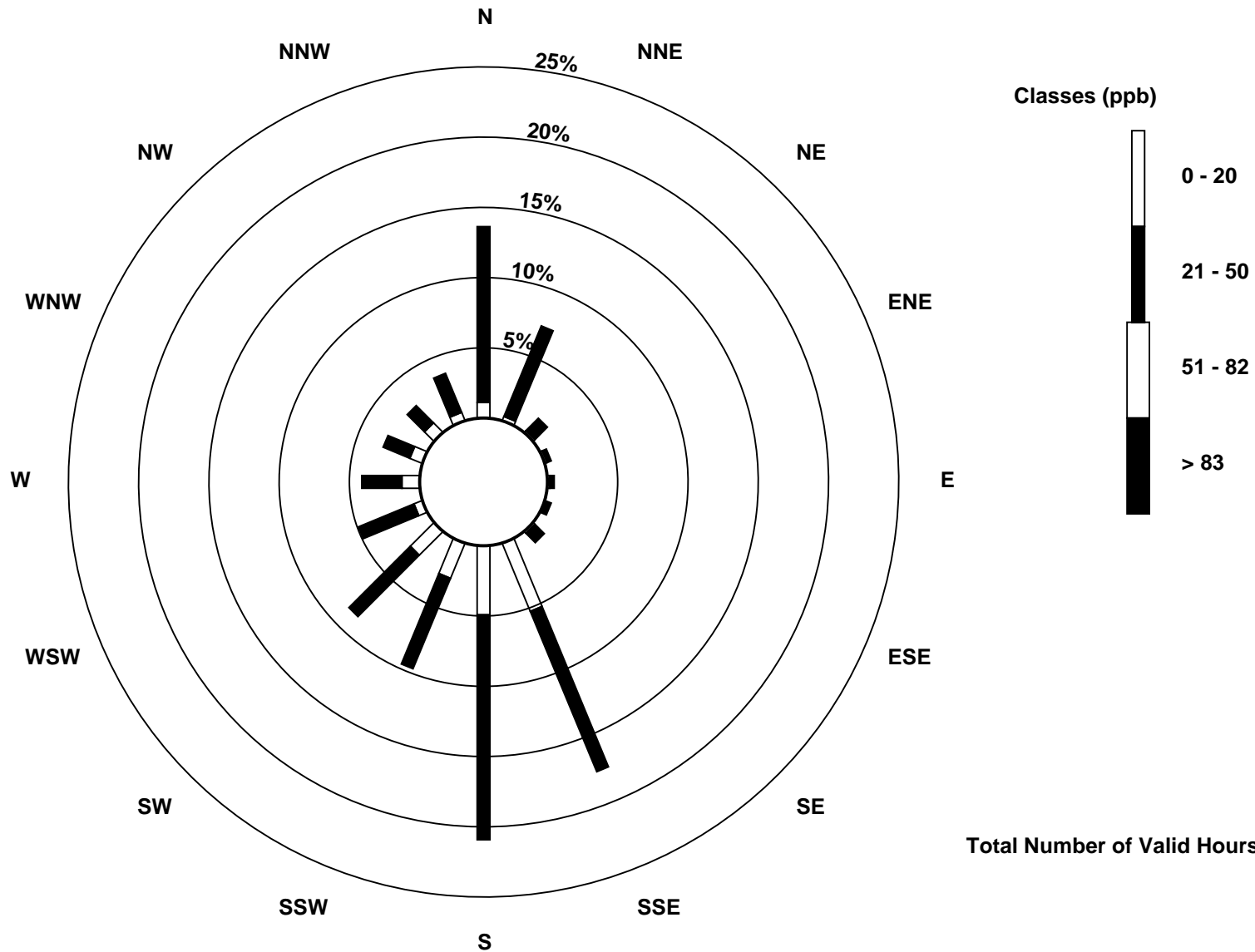
Total Number of Valid Hours: 631

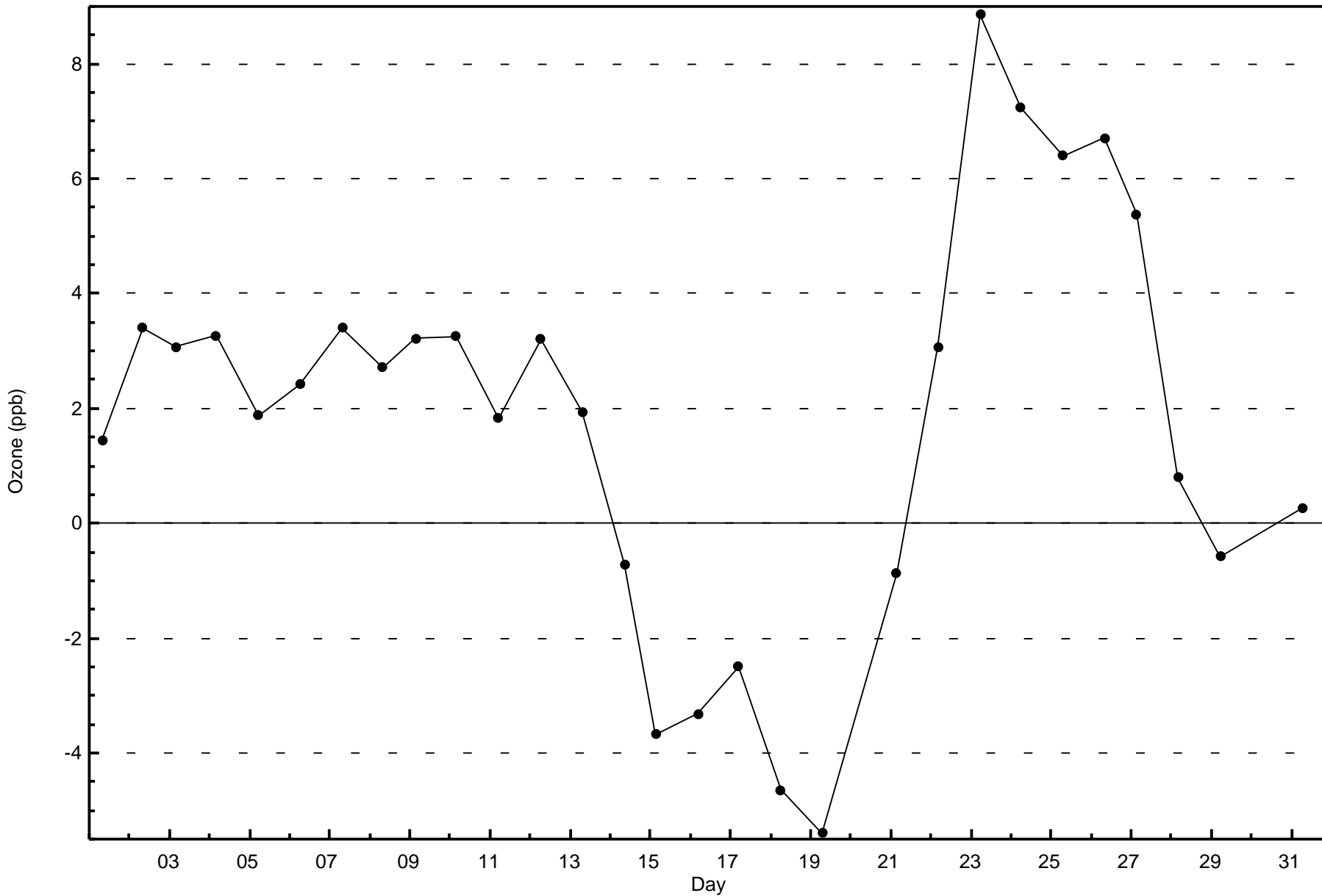
Total Number of Hours: 744

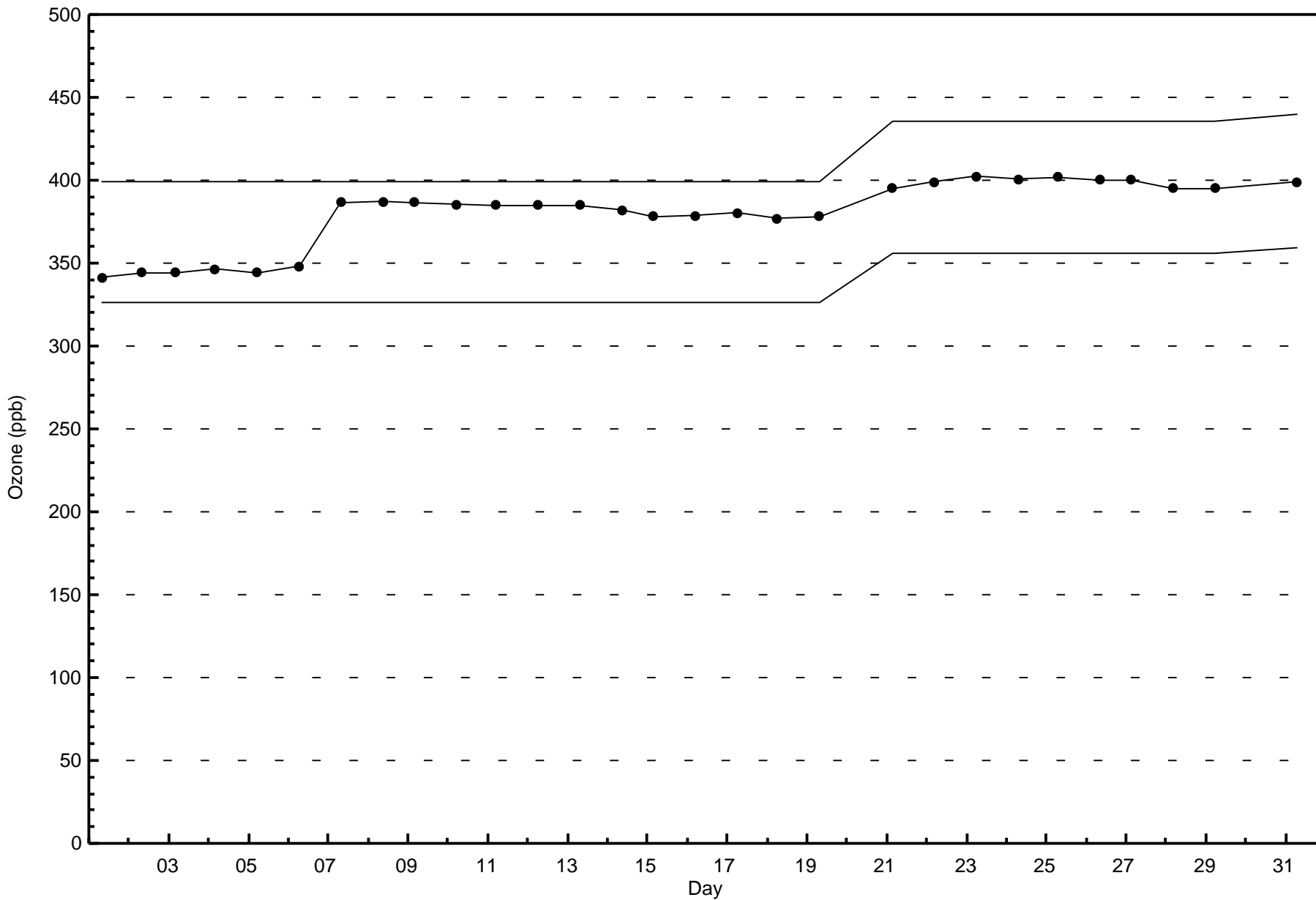


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Wapasu (AMS 17)







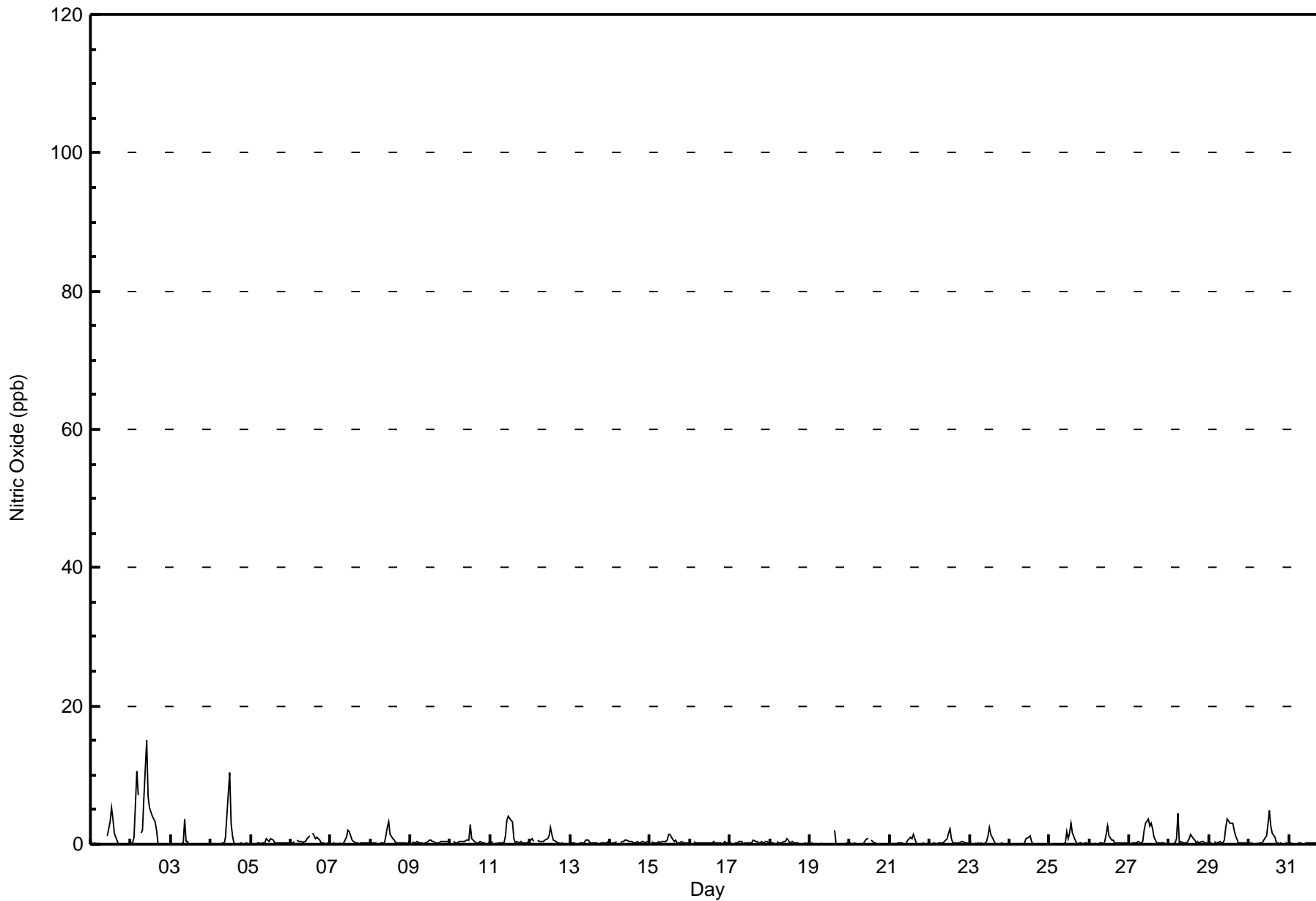


Maximum Value: 15 ppb on Dec 2 10:00																		Maximum Daily Average: 3.1 ppb on Dec 2						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 1 02:00																		Minimum Daily Average: 0.1 ppb on Dec 31						Hours of Data: 702		
Maximum Diurnal Average: 1.8 ppb at hour 12																		Minimum Diurnal Average: 0.1 ppb at hour 23						Hours of Missing Data: 42		
Monthly Average: 0.5 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 7						Hours of Calibration: 38		
																		Percent Operational Time: 99.5								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	M	M	1	3	5	4	2	1	0	0	0	0	0	0	0	0	0.8	5
2-Dec	0	0	1	11	7	Z	2	2	7	15	7	5	5	4	3	2	0	0	0	0	0	0	0	0	3.1	15
3-Dec	Z	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	4
4-Dec	0	Z	0	0	0	0	0	0	0	1	7	10	3	1	0	0	0	0	0	0	0	0	0	0	1.0	10
5-Dec	0	0	Z	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Dec	0	0	0	Z	1	0	0	0	0	0	1	1	M	2	1	1	1	1	0	0	0	0	0	0	0.5	2
7-Dec	0	0	0	0	Z	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.4	2
8-Dec	0	0	0	0	0	Z	0	0	0	1	2	3	1	1	1	0	0	0	0	0	0	0	0	1	0.6	3
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0.4	3
11-Dec	0	0	Z	0	0	0	0	0	0	1	3	4	3	3	1	0	0	0	0	0	0	0	0	0	0.9	4
12-Dec	1	1	0	Z	1	0	0	0	0	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0.5	2
13-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
14-Dec	0	0	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
15-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0.4	1
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	0	0	0	Z	0	0	0	C	C	C	C	C	C	C	C	2	0	0	0	0	0	0	0	--	2
20-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	UO	1	0	0	0	0	0	0	0	0	0	0	0.2	1
21-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1
22-Dec	0	Z	0	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0.4	2
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	3	1	1	0	0	0	0	0	0	0	0	0	0.4	3
24-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
25-Dec	0	0	0	0	Z	0	0	0	0	0	2	1	2	3	2	1	0	0	0	0	0	0	0	0	0.5	3
26-Dec	0	0	0	0	0	Z	0	0	0	0	2	3	1	1	1	0	0	0	0	0	0	0	0	0	0.4	3
27-Dec	Z	0	0	0	0	0	0	0	0	2	3	4	3	3	2	1	0	0	0	0	0	0	0	0	0.9	4
28-Dec	0	Z	0	0	1	4	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	4
29-Dec	0	0	Z	0	0	0	0	0	0	1	2	4	3	3	3	2	1	0	0	0	0	0	0	0	1.0	4
30-Dec	0	0	0	Z	0	0	0	0	0	1	1	3	5	3	2	1	0	0	0	0	0	0	0	0	0.7	5
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
																		Diurnal Average		Diurnal Maximum						
																		0.2		0.2						
																		1		1						
Z - zerospan																		C - Calibration		M - Maintenance		UO - Unstable Operation				



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	702	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: 702

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	86	47	7	3	3	3	6	121	156	60	51	31	26	19	17	25	661
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
<b>Totals</b>	86	47	7	3	3	3	6	121	156	60	51	31	26	19	17	25	661

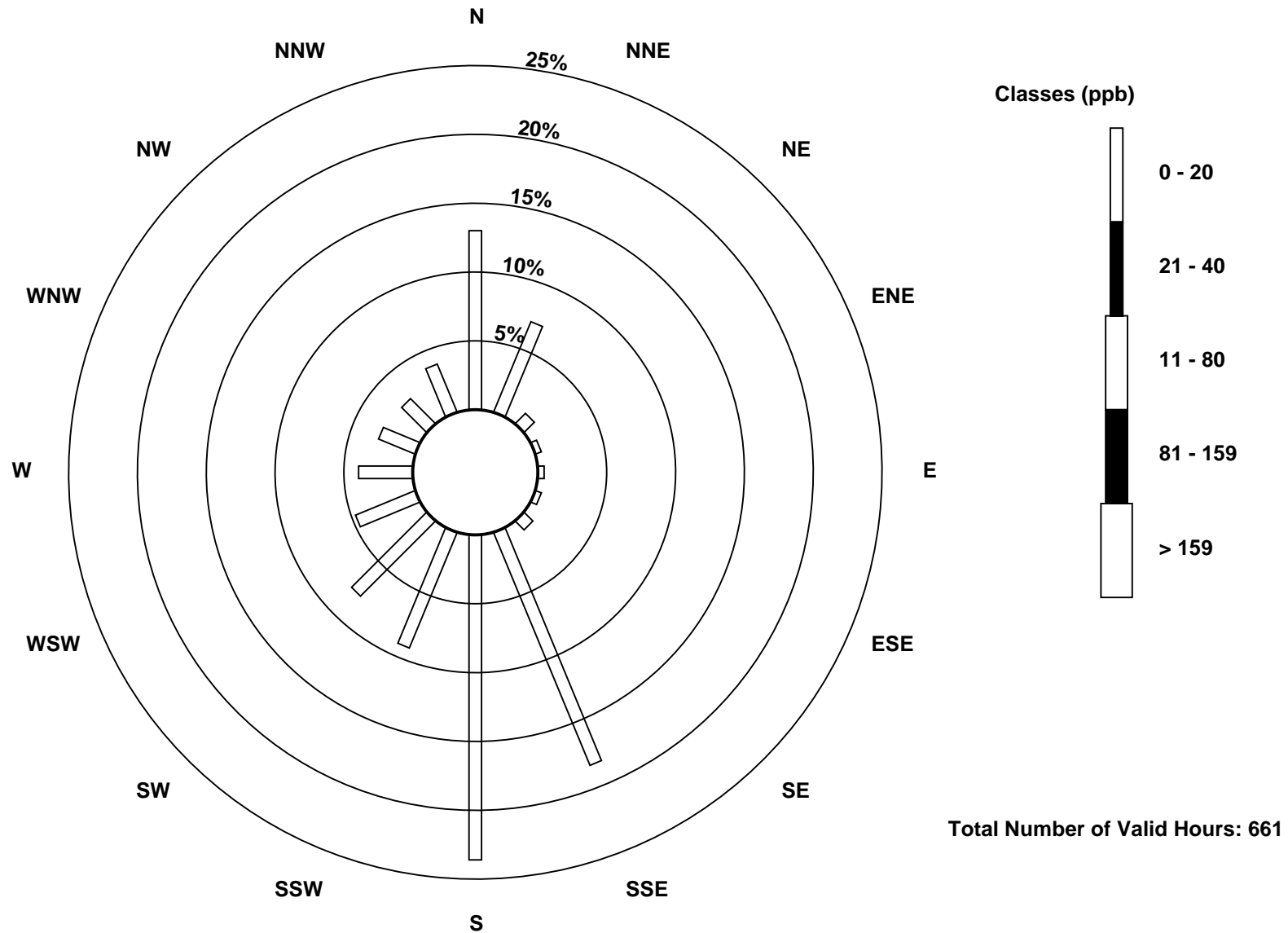
Total Number of Valid Hours: 661

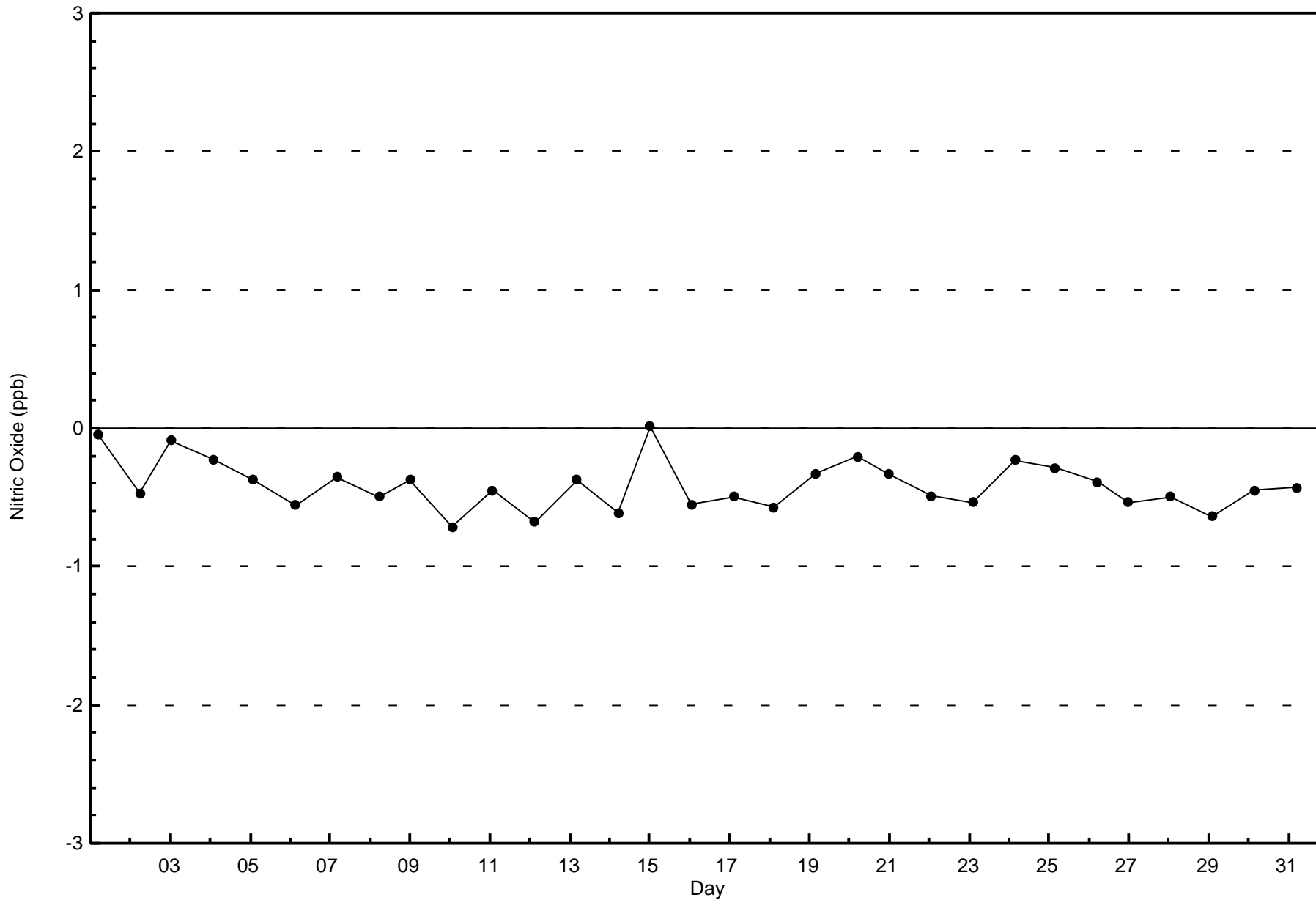
Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Wapasu (AMS 17)

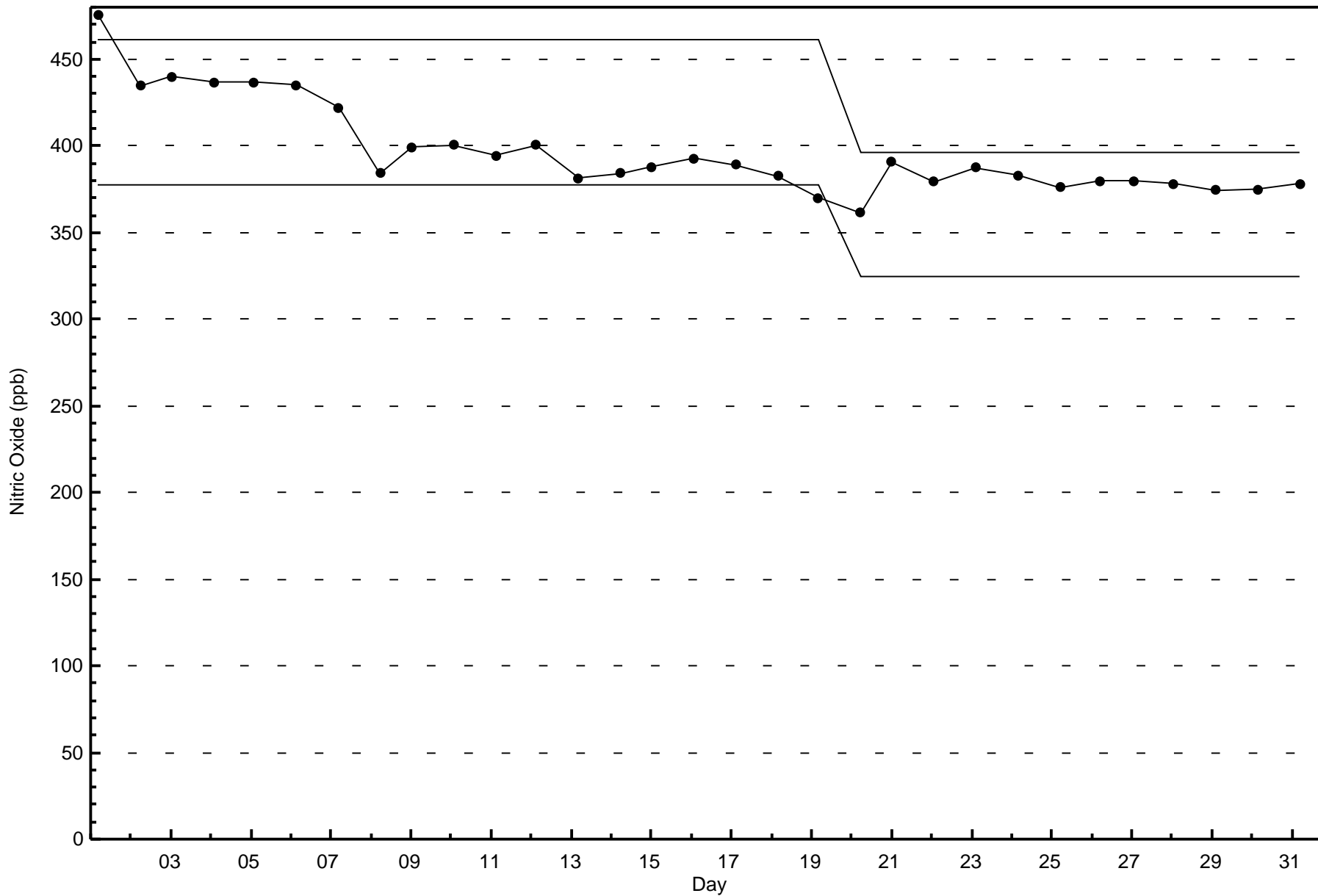






Wood Buffalo Environmental Association  
Span Responses

Nitric Oxide (NO) - ppb  
Wapasu - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Wapasu - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 30 ppb on Dec 28 06:00	Maximum Daily Average: 15.2 ppb on Dec 2
Minimum Value: 0 ppb on Dec 16 12:00	Hours of Data: 702
Maximum Diurnal Average: 7.9 ppb at hour 5	Hours of Missing Data: 42
Monthly Average: 6.3 ppb	Hours of Calibration: 38
Minimum Daily Average: 2.0 ppb on Dec 31	Percent Operational Time: 99.5
Minimum Diurnal Average: 4.9 ppb at hour 15	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 5 Q <sub>3</sub> = 10 P <sub>90</sub> = 13 P <sub>99</sub> = 21	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	12	9	14	9	Z	13	10	12	M	M	7	11	14	13	11	13	4	3	4	4	2	2	4	6	8.2	14
2-Dec	4	13	22	27	24	Z	18	16	19	20	12	11	11	11	14	19	21	17	14	15	16	15	7	6	15.2	27
3-Dec	Z	6	14	9	7	5	6	14	21	10	6	2	1	1	2	3	1	3	4	3	3	1	3	2	5.5	21
4-Dec	1	Z	1	1	1	1	1	1	1	7	16	15	8	5	3	2	2	2	2	2	2	3	2	2	3.5	16
5-Dec	2	2	Z	5	6	9	11	8	8	13	7	5	6	5	3	2	1	1	1	1	1	1	2	2	4.3	13
6-Dec	3	2	4	Z	21	14	11	14	8	6	11	6	M	6	8	13	19	14	11	12	10	8	7	8	9.7	21
7-Dec	11	11	13	12	Z	10	7	8	12	11	10	8	6	6	8	12	17	18	13	17	20	12	7	7	11.1	20
8-Dec	9	8	8	16	16	Z	16	12	10	11	11	10	5	4	4	2	1	1	2	6	8	9	10	15	8.4	16
9-Dec	Z	17	14	11	12	6	4	3	3	3	3	3	3	3	3	4	6	4	4	6	6	4	5	6	5.9	17
10-Dec	5	Z	5	5	6	7	13	16	13	14	11	8	17	8	3	3	0	0	0	0	0	1	1	3	6.0	17
11-Dec	11	13	Z	11	8	12	11	10	9	10	11	10	11	12	5	3	5	1	1	2	4	4	4	7	7.6	13
12-Dec	10	13	12	Z	12	10	7	13	14	9	5	5	7	5	5	7	11	11	9	11	10	7	9	9	9.1	14
13-Dec	7	9	7	9	Z	17	14	13	15	11	10	11	5	3	3	2	3	6	11	12	2	1	3	2	7.7	17
14-Dec	4	4	2	1	1	Z	8	11	6	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	2.3	11
15-Dec	Z	1	1	1	1	1	1	1	3	4	3	4	5	4	1	6	4	3	3	3	3	7	9	10	3.4	10
16-Dec	4	Z	1	2	1	3	3	4	0	1	0	0	0	1	2	4	7	9	7	4	3	1	1	1	2.5	9
17-Dec	1	1	Z	1	3	9	9	9	5	3	3	2	1	1	2	3	8	7	1	1	1	13	16	6	4.5	16
18-Dec	10	11	8	Z	1	1	0	0	1	4	6	3	2	3	1	0	0	0	1	2	2	2	2	3	2.8	11
19-Dec	6	4	3	2	Z	2	2	1	C	C	C	C	C	C	C	18	14	10	7	6	5	8	9	8	--	18
20-Dec	9	13	10	12	13	Z	11	6	8	7	6	3	UO	3	1	1	2	1	1	2	2	2	3	3	5.3	13
21-Dec	Z	9	8	8	11	17	17	8	3	1	2	5	5	5	10	14	15	12	5	2	2	4	2	2	7.2	17
22-Dec	1	Z	2	2	2	4	5	7	5	6	8	9	13	7	2	1	2	1	1	1	1	1	0	0	3.5	13
23-Dec	0	1	Z	1	1	1	1	1	0	1	2	3	8	5	4	4	4	4	3	4	8	8	15	6	3.6	15
24-Dec	3	1	1	Z	1	1	3	4	3	6	5	5	5	3	1	2	2	2	2	2	3	3	4	3	2.7	6
25-Dec	2	1	1	1	Z	1	1	1	1	1	7	3	4	8	8	9	9	9	9	13	16	14	11	10	6.0	16
26-Dec	13	12	11	10	12	Z	11	9	7	7	8	8	5	4	4	3	7	8	4	4	7	9	10	10	7.8	13
27-Dec	Z	12	10	11	13	13	14	14	15	18	14	12	10	11	9	11	9	6	5	7	7	8	10	11	10.9	18
28-Dec	11	Z	8	7	16	30	17	11	4	1	1	1	3	4	4	4	3	2	1	1	1	1	3	4	5.9	30
29-Dec	2	2	Z	1	1	1	1	2	3	7	9	9	8	10	13	18	29	13	8	12	13	12	10	9	8.3	29
30-Dec	9	6	7	Z	12	14	9	9	11	8	8	12	15	11	11	11	14	13	14	9	2	3	9	7	9.7	15
31-Dec	3	2	1	1	Z	3	2	2	1	1	2	2	2	1	2	2	2	2	2	2	2	3	3	4	2.0	4

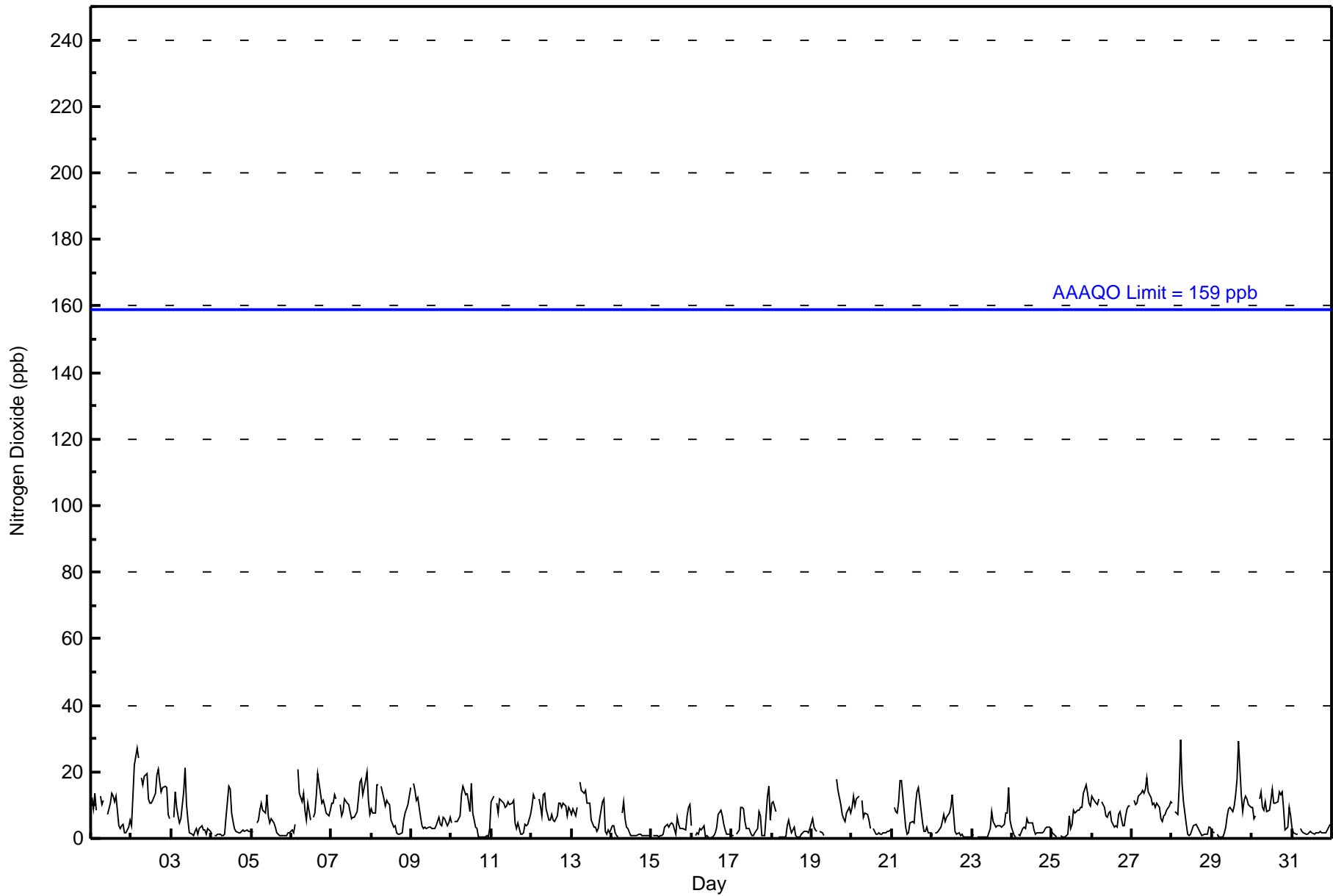
5.8	6.9	7.1	6.7	7.9	7.8	7.8	7.6	7.2	7.0	6.8	6.2	6.4	5.4	4.9	6.1	7.1	5.9	5.0	5.2	5.1	5.6	6.0	5.5	Diurnal Average	
13	17	22	27	24	30	18	16	21	20	16	15	17	13	14	19	29	17	18	15	17	20	16	15	Diurnal Maximum	

Z - zerospan      C - Calibration      M - Maintenance      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	694	98.86	98.86
21 - 40	8	1.14	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: 702

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Wapasu - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	84	47	7	3	3	3	6	121	153	60	51	31	24	19	16	25	653
21 - 40	2	0	0	0	0	0	0	0	3	0	0	0	2	0	1	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
<b>Totals</b>	86	47	7	3	3	3	6	121	156	60	51	31	26	19	17	25	661

Total Number of Valid Hours: 661

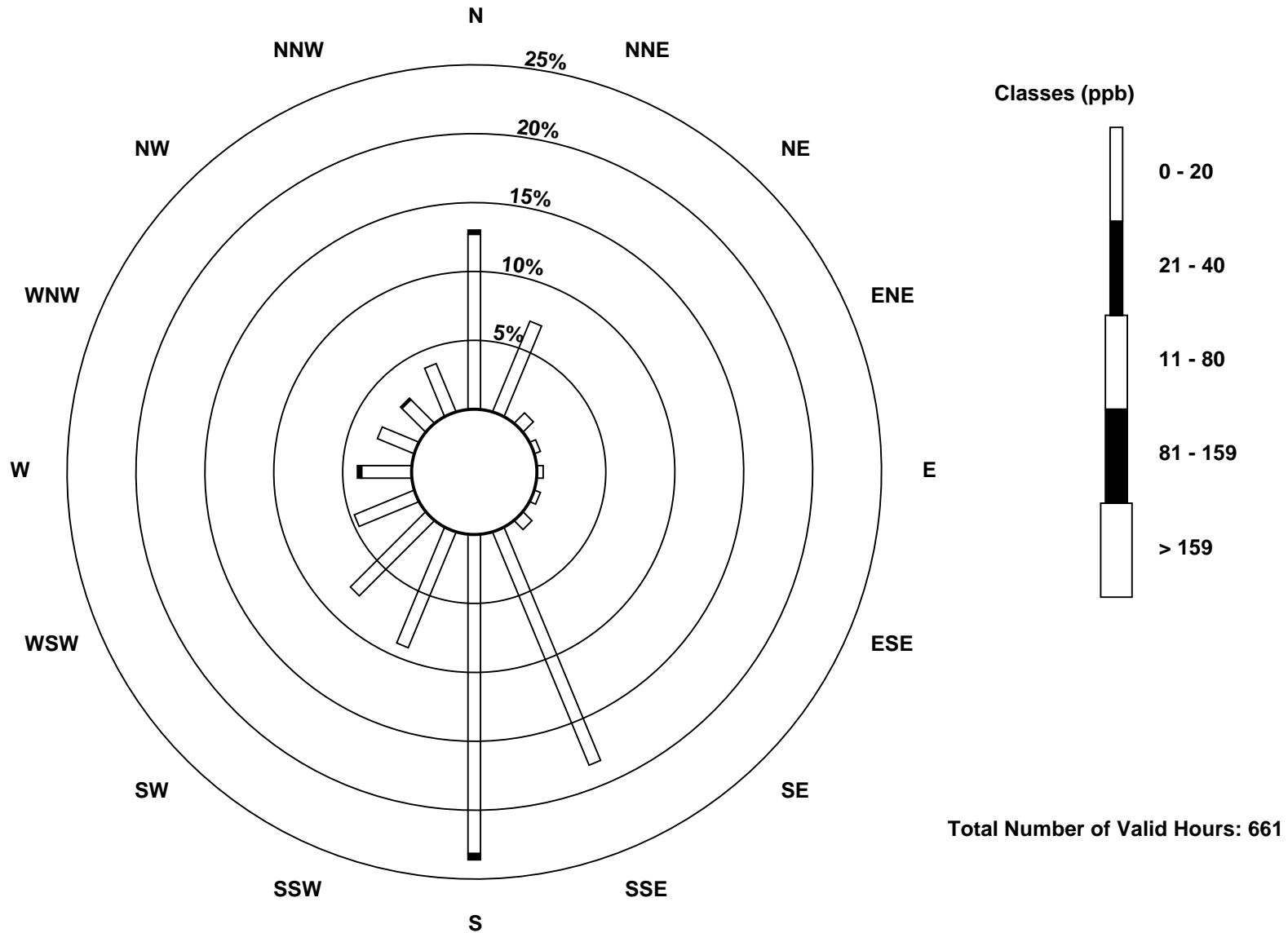
Total Number of Hours: 744

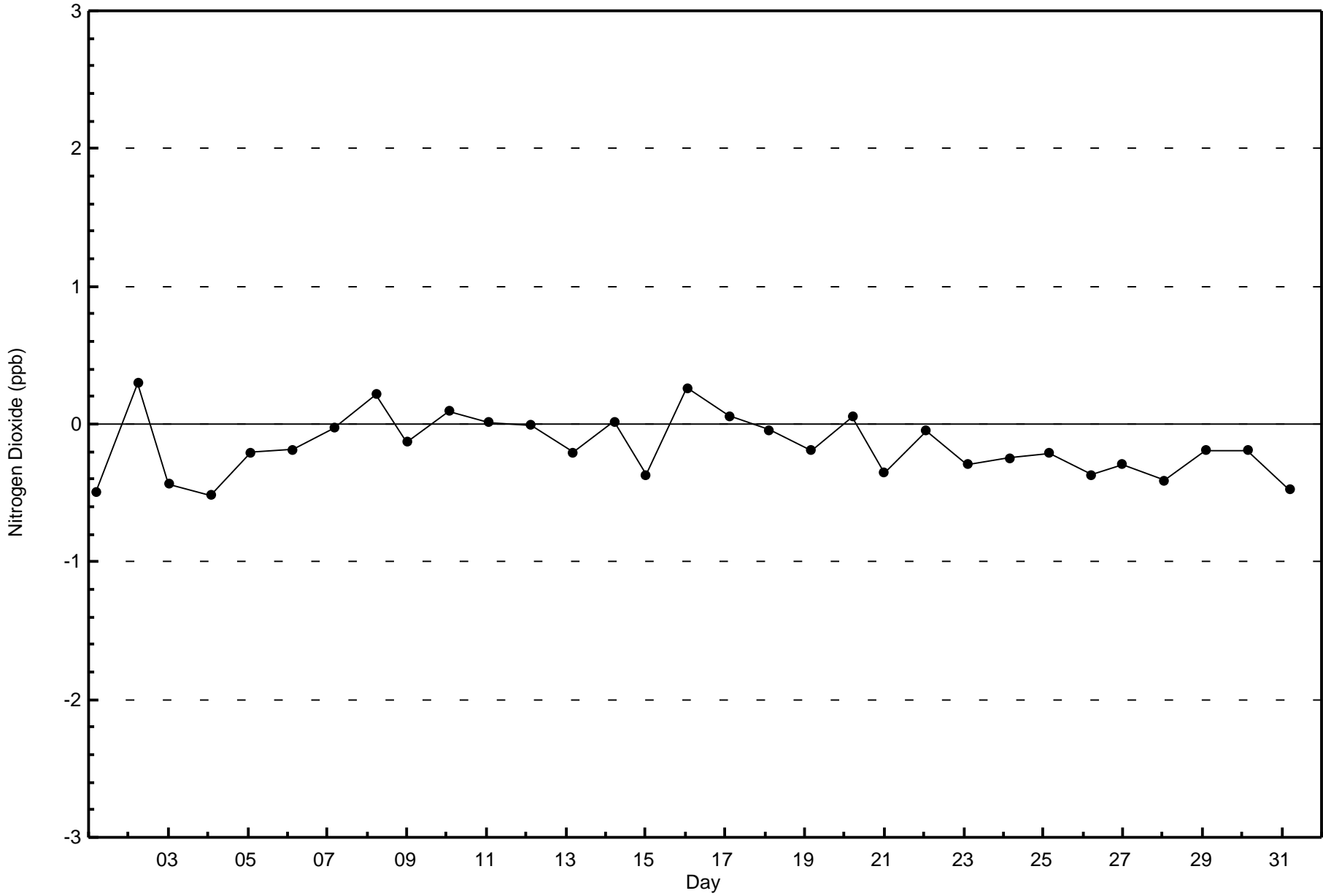


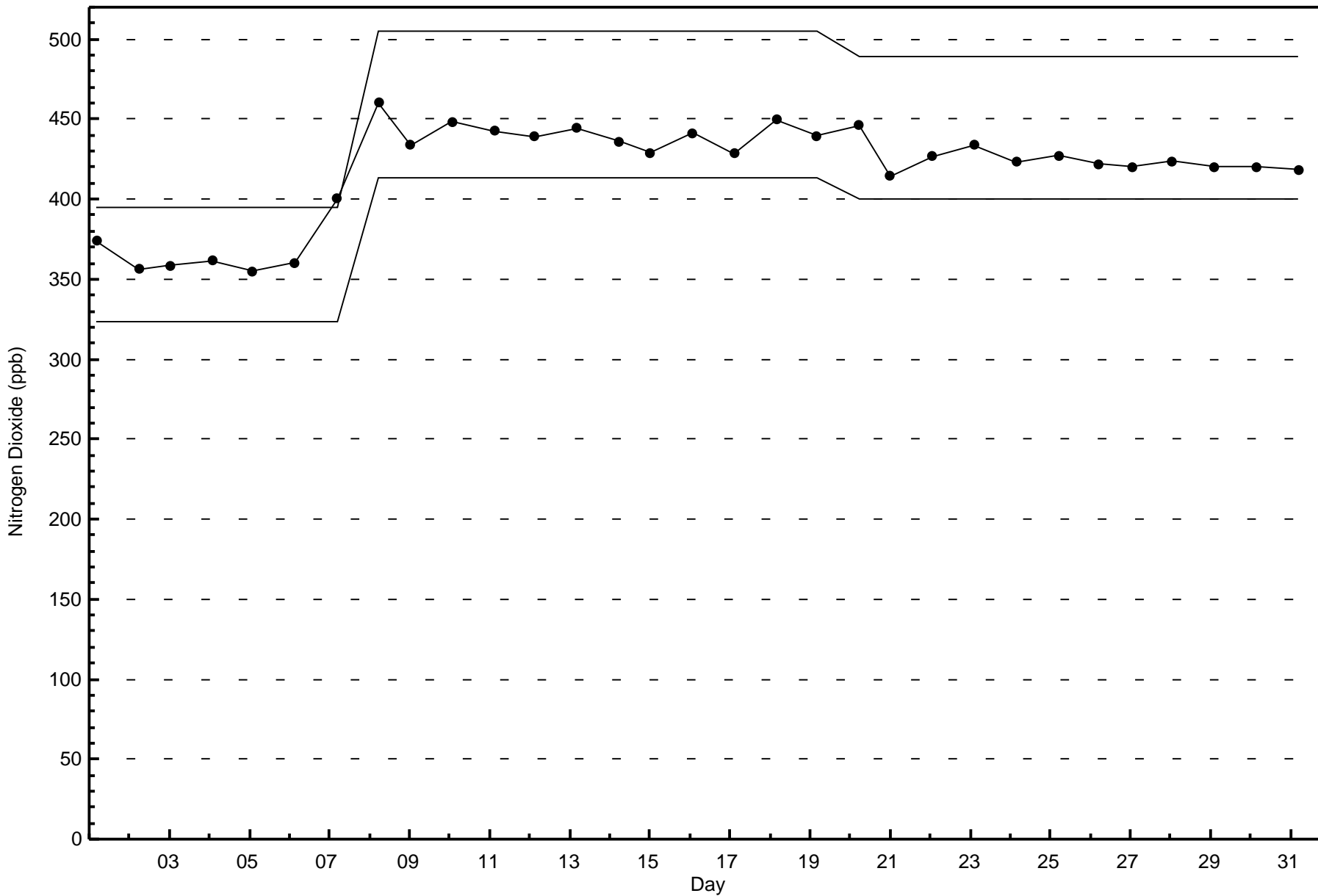


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Wapasu (AMS 17)







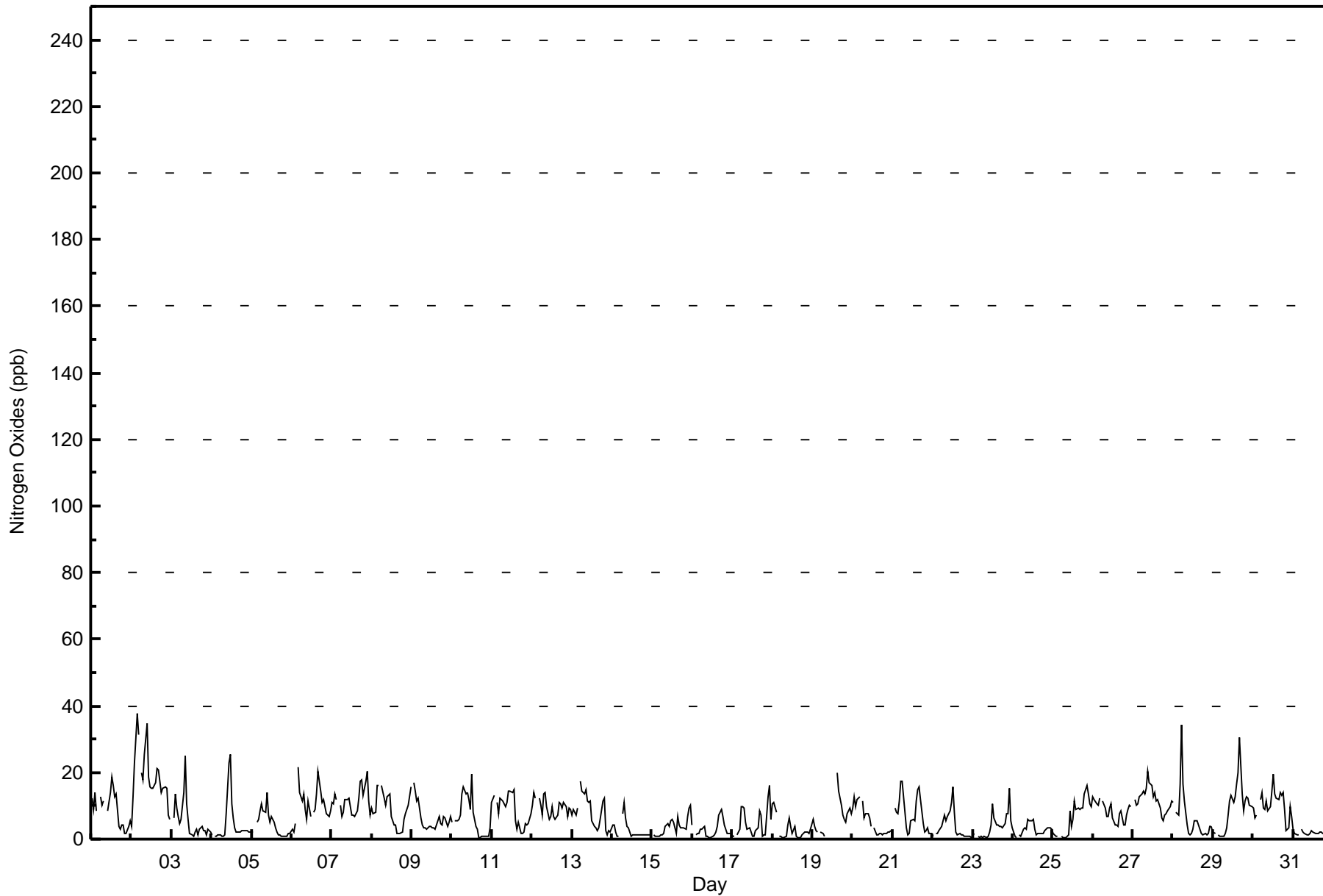


Maximum Value: 38 ppb on Dec 2 04:00																		Maximum Daily Average: 18.3 ppb on Dec 2						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 16 12:00																		Minimum Daily Average: 2.1 ppb on Dec 31						Hours of Data: 702		
Maximum Diurnal Average: 8.4 ppb at hour 5																		Minimum Diurnal Average: 5.2 ppb at hour 19						Hours of Missing Data: 42		
Monthly Average: 6.9 ppb																		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 6 O <sub>3</sub> = 11 P <sub>90</sub> = 14 P <sub>99</sub> = 25						Hours of Calibration: 38		
																								Percent Operational Time: 99.5		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	12	9	14	8	Z	13	10	12	M	M	8	14	19	16	13	13	4	3	4	4	2	2	4	6	9.0	19
2-Dec	4	13	23	38	31	Z	20	18	26	35	19	16	15	15	17	21	21	17	14	15	16	15	7	6	18.3	38
3-Dec	Z	6	14	9	7	5	6	14	25	11	6	2	1	1	2	3	1	3	4	3	3	1	3	2	5.7	25
4-Dec	1	Z	1	1	1	1	1	1	1	8	23	25	11	6	3	2	2	2	2	2	2	3	2	2	4.6	25
5-Dec	2	2	Z	5	6	9	11	8	8	14	7	5	7	5	3	2	1	1	1	1	1	1	2	2	4.5	14
6-Dec	3	2	5	Z	21	14	11	14	9	6	12	7	M	8	9	14	20	14	11	12	10	8	7	8	10.2	21
7-Dec	11	11	13	12	Z	10	7	8	12	12	12	10	7	7	8	12	17	18	13	17	20	12	7	7	11.5	20
8-Dec	9	8	8	16	16	Z	16	12	10	13	13	13	7	4	4	2	2	2	2	6	8	9	10	16	8.9	16
9-Dec	Z	17	14	12	12	7	4	3	3	3	4	4	3	3	3	4	7	5	4	7	6	4	5	7	6.2	17
10-Dec	5	Z	6	5	6	7	14	16	13	14	12	9	19	8	4	3	1	1	1	1	1	1	1	3	6.5	19
11-Dec	11	13	Z	11	8	12	11	11	10	11	14	14	14	15	5	3	5	2	2	2	5	4	4	7	8.5	15
12-Dec	10	14	12	Z	12	10	7	14	14	10	6	7	10	7	6	7	11	11	9	11	10	7	9	9	9.6	14
13-Dec	7	9	7	9	Z	17	14	14	15	11	11	11	6	4	4	2	3	6	11	12	2	1	3	2	7.9	17
14-Dec	4	4	2	1	1	Z	8	11	6	4	4	1	1	1	1	1	1	1	1	1	1	1	1	1	2.7	11
15-Dec	Z	1	1	1	1	1	1	2	4	5	4	5	6	5	2	7	4	3	3	3	3	7	9	10	3.8	10
16-Dec	4	Z	1	2	2	3	3	4	1	1	1	0	1	1	2	4	7	9	7	4	3	2	2	1	2.8	9
17-Dec	1	1	Z	1	3	10	10	9	5	3	3	2	1	1	2	3	8	7	1	1	1	13	16	6	4.8	16
18-Dec	11	11	8	Z	1	1	1	1	1	4	6	4	2	4	1	1	1	0	1	2	2	2	2	3	3.0	11
19-Dec	6	4	2	2	Z	2	2	1	C	C	C	C	C	C	C	20	14	10	7	6	5	8	10	8	--	20
20-Dec	9	13	10	12	13	Z	11	7	8	8	6	4	UO	3	1	1	2	1	1	2	2	2	2	3	5.5	13
21-Dec	Z	9	8	8	11	17	17	8	3	1	2	5	6	5	12	15	16	12	5	2	2	4	2	2	7.5	17
22-Dec	1	Z	2	2	2	4	5	7	5	7	9	11	15	8	2	1	2	1	1	1	1	1	1	1	3.9	15
23-Dec	1	2	Z	1	1	1	1	1	1	1	2	4	11	6	4	4	4	4	3	5	8	8	15	6	3.9	15
24-Dec	3	1	1	Z	1	1	3	4	3	6	6	6	3	1	2	2	2	2	2	2	3	3	4	3	2.8	6
25-Dec	2	1	1	1	Z	1	0	1	1	1	9	4	6	11	9	9	9	9	9	14	16	14	11	10	6.5	16
26-Dec	13	12	11	10	12	Z	11	9	7	7	9	11	6	4	4	4	7	8	4	4	7	9	10	10	8.3	13
27-Dec	Z	12	10	11	13	14	14	14	15	20	17	16	13	14	11	12	9	6	5	7	8	9	10	11	11.8	20
28-Dec	11	Z	8	7	17	34	17	11	4	2	1	2	3	5	5	4	3	2	1	2	1	2	4	4	6.5	34
29-Dec	2	2	Z	1	1	1	1	2	4	7	12	13	11	13	16	20	30	13	8	12	13	12	10	10	9.3	30
30-Dec	9	6	7	Z	12	14	9	9	11	8	10	14	19	13	12	12	14	13	14	9	3	3	10	7	10.4	19
31-Dec	3	2	1	1	Z	3	2	2	1	1	2	2	2	2	2	2	2	2	2	1	2	3	3	4	2.1	4
6.0 7.1 7.3 7.2 8.4 8.1 8.0 7.9 7.8 8.0 8.3 8.1 8.1 6.7 5.7 6.7 7.3 6.1 5.2 5.4 5.2 5.7 6.1 5.7																		Diurnal Average								
13 17 23 38 31 34 20 18 26 35 23 25 19 16 17 21 30 17 18 15 17 20 16 16																		Diurnal Maximum								
Z - zerospan			C - Calibration					M - Maintenance					UO - Unstable Operation													



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Wapasu - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	689	98.15	98.15
21 - 40	13	1.85	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: 702

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Wapasu - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	84	47	6	3	2	3	6	119	153	59	51	31	24	19	16	25	648
21 - 40	2	0	1	0	1	0	0	2	3	1	0	0	2	0	1	0	13
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
<b>Totals</b>	86	47	7	3	3	3	6	121	156	60	51	31	26	19	17	25	661

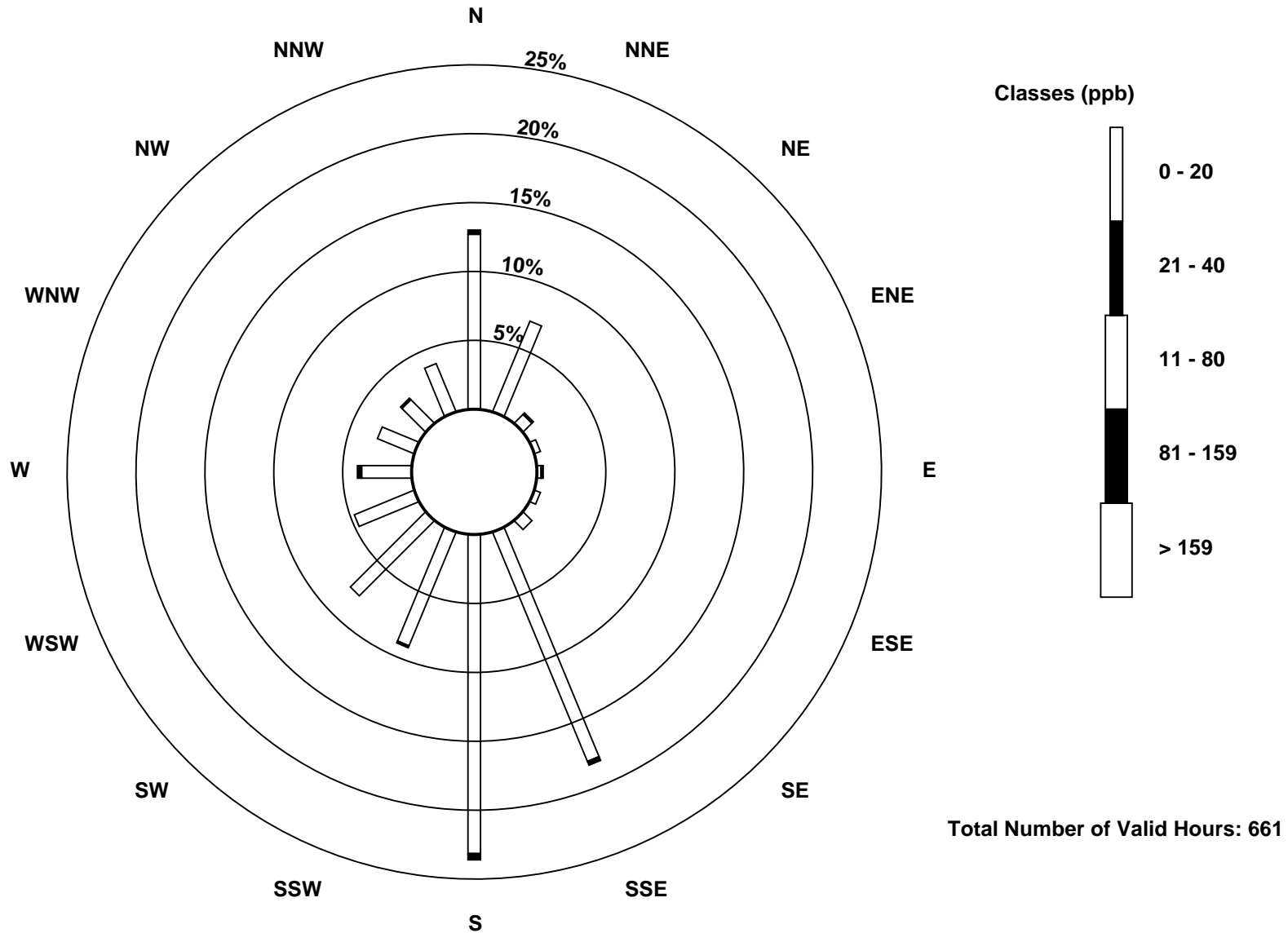
Total Number of Valid Hours: 661

Total Number of Hours: 744

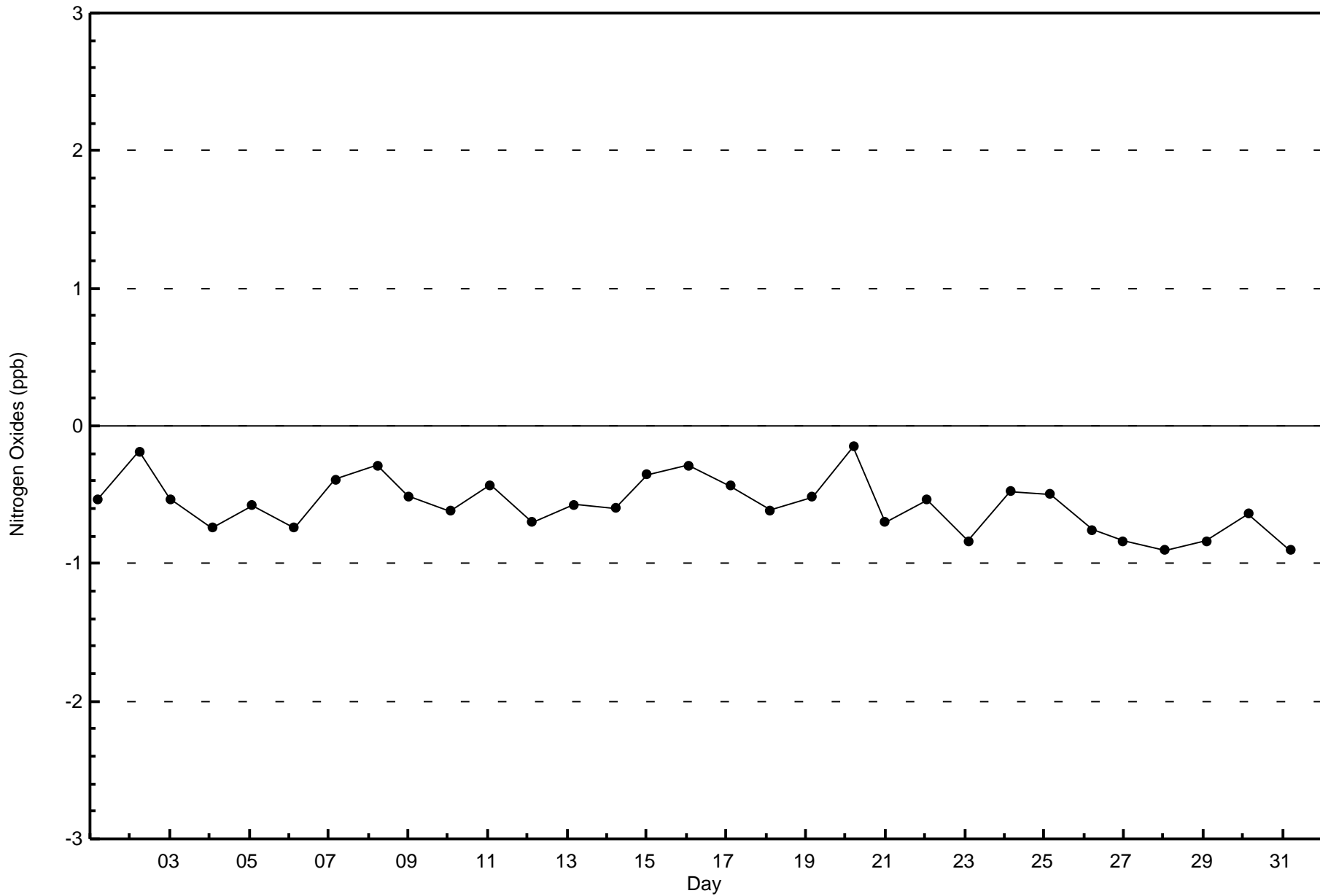


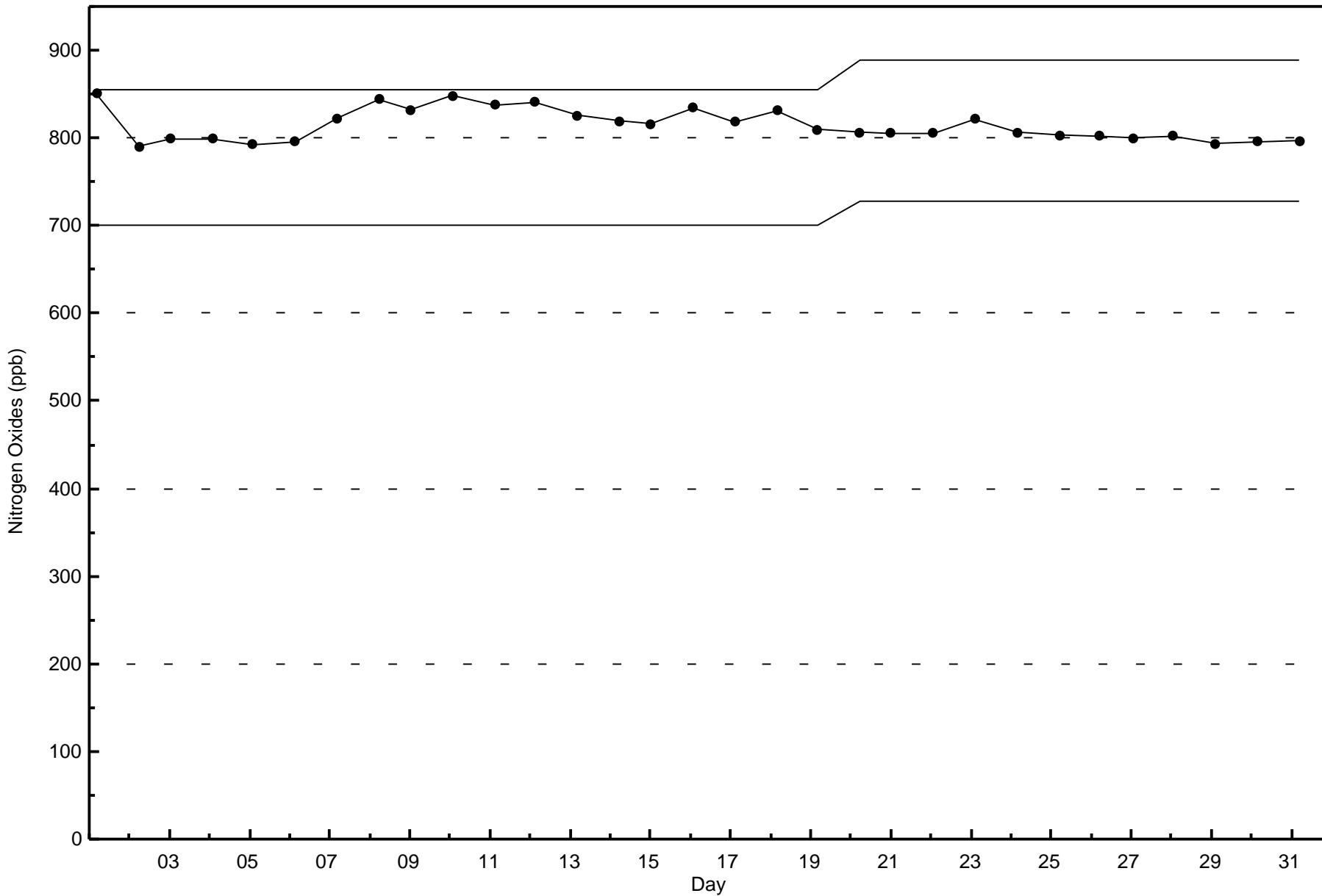
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Wapasu (AMS 17)









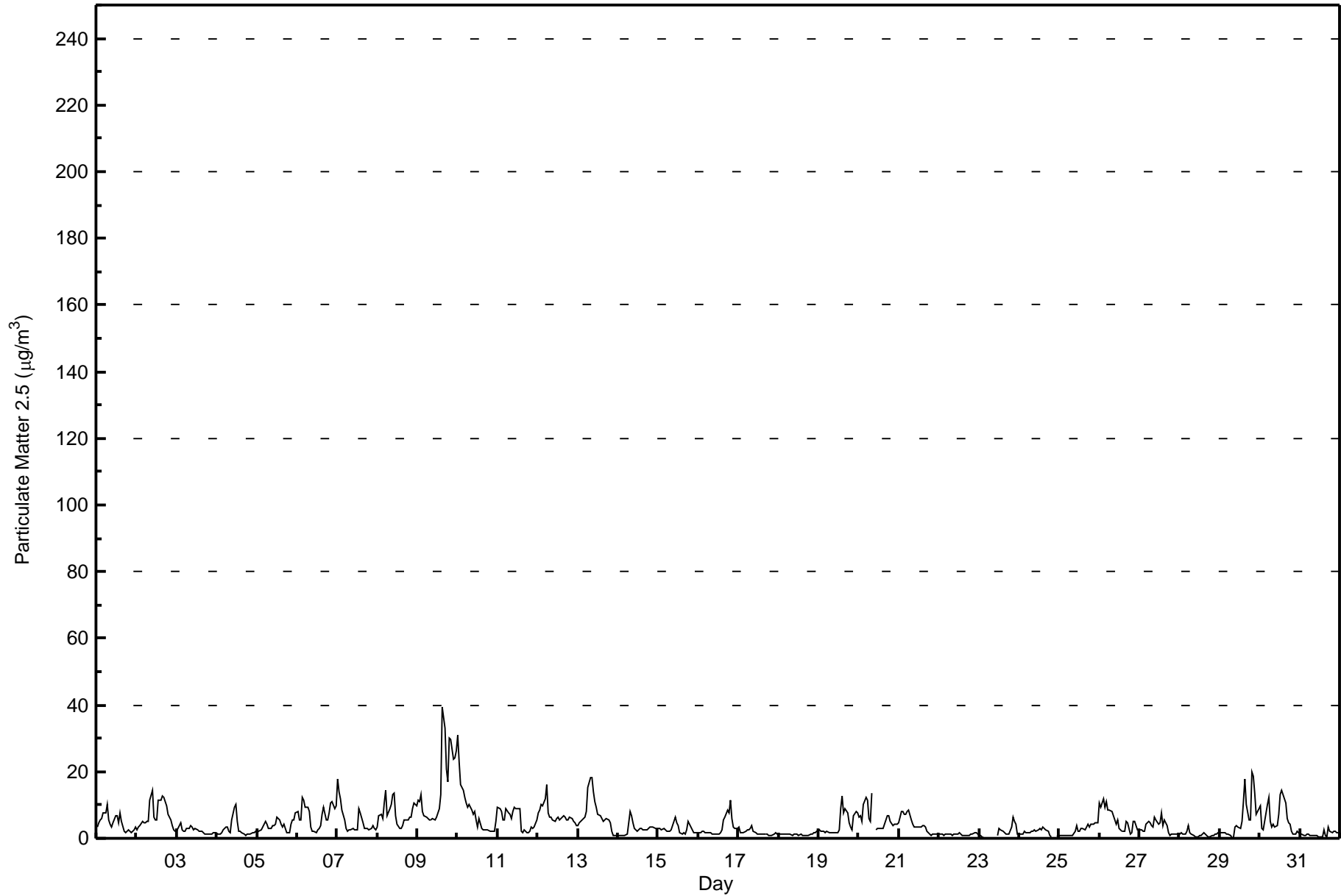


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 39.3 µg/m <sup>3</sup> on Dec 9 16:00 Minimum Value: 0.1 µg/m <sup>3</sup> on Dec 23 04:00 Maximum Diurnal Average: 5.5 µg/m <sup>3</sup> at hour 6 Monthly Average: 4.58 µg/m <sup>3</sup>		Maximum Daily Average: 15.2 µg/m <sup>3</sup> on Dec 9 Minimum Daily Average: 1.1 µg/m <sup>3</sup> on Dec 22 Minimum Diurnal Average: 3.7 µg/m <sup>3</sup> at hour 19 Percentiles: P <sub>1</sub> = 0.5 P <sub>10</sub> = 1.1 Q <sub>1</sub> = 1.6 Median = 3.0 Q <sub>3</sub> = 6.0 P <sub>90</sub> = 9.7 P <sub>99</sub> = 22.2		Hours in Service: 744 Hours of Data: 734 Hours of Missing Data: 10 Hours of Calibration: 1 Percent Operational Time: 98.8																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	3.4	4.5	5.5	5.9	7.7	7.7	10.0	5.7	4.3	3.4	4.7	6.7	6.8	4.5	7.8	5.1	2.1	1.9	2.0	2.3	2.0	1.9	2.5	3.3	4.7	10.0																						
2-Dec	2.6	3.3	3.8	4.9	4.7	4.8	5.1	5.0	11.4	14.4	6.3	5.5	5.6	11.3	11.3	12.5	12.4	10.9	9.7	7.4	5.7	3.7	2.5	2.2	7.0	14.4																						
3-Dec	2.2	3.7	4.8	2.6	2.3	2.2	3.0	3.0	3.7	3.2	2.5	2.8	2.4	2.1	1.9	2.0	1.6	1.4	1.2	1.1	1.1	1.1	1.5	1.7	2.3	4.8																						
4-Dec	1.3	1.1	1.3	1.6	2.6	3.4	3.2	2.2	1.5	5.3	9.3	10.2	5.1	2.3	2.0	1.8	1.4	1.0	1.1	1.2	1.3	1.6	1.8	2.0	2.7	10.2																						
5-Dec	1.7	1.9	2.4	3.4	4.4	5.0	4.3	3.0	2.8	3.8	3.7	4.0	6.3	5.7	4.1	3.4	4.2	2.9	1.9	1.7	4.1	5.5	5.3	7.8	3.9	7.8																						
6-Dec	7.9	5.6	5.4	12.5	11.5	9.1	9.2	7.9	3.2	2.0	2.3	1.9	2.5	3.0	3.9	7.1	9.5	5.6	5.3	7.7	10.6	10.9	8.9	9.7	6.8	12.5																						
7-Dec	17.9	14.0	12.0	8.5	5.5	3.0	2.3	2.4	2.8	2.9	2.7	2.4	2.6	9.1	7.5	4.9	3.0	2.9	2.9	2.7	2.9	3.8	2.8	2.4	5.2	17.9																						
8-Dec	3.4	6.8	7.4	5.9	10.4	14.2	6.8	9.1	10.2	13.3	13.6	6.8	4.1	2.8	3.0	3.7	5.4	5.6	5.6	6.3	6.2	8.9	10.7	9.8	7.5	14.2																						
9-Dec	11.5	11.1	13.3	7.9	6.8	6.4	6.0	5.4	5.5	6.1	5.4	6.3	7.7	9.0	13.3	39.3	33.0	20.8	16.9	29.9	29.7	23.6	24.0	26.1	15.2	39.3																						
10-Dec	30.8	22.7	16.1	14.4	12.3	10.4	9.2	10.3	8.6	7.4	8.0	5.3	3.4	6.0	3.1	2.6	2.6	2.4	2.4	2.3	2.3	2.2	2.1	5.1	8.0	30.8																						
11-Dec	9.5	8.8	8.0	5.4	5.7	8.8	7.8	7.2	6.0	7.9	9.3	9.0	9.0	8.9	2.1	1.9	2.7	1.8	1.7	2.2	3.2	3.1	3.3	5.6	5.8	9.5																						
12-Dec	7.5	8.3	10.1	9.8	11.7	16.2	7.7	6.5	6.2	5.5	4.9	5.9	6.2	5.6	6.0	6.6	6.3	5.5	5.7	6.4	6.1	5.1	4.7	4.0	7.0	16.2																						
13-Dec	3.9	4.8	5.4	6.1	6.4	8.2	15.2	18.0	18.3	14.2	10.9	9.3	7.2	6.6	6.1	5.1	5.4	5.9	5.6	4.5	2.1	0.9	0.9	0.9	7.2	18.3																						
14-Dec	1.0	0.9	0.9	0.9	0.9	1.4	4.7	7.9	6.8	4.5	3.1	2.3	2.6	3.0	2.8	2.7	2.6	2.6	2.8	3.2	3.5	3.2	3.2	3.0	2.9	7.9																						
15-Dec	3.0	2.9	2.7	2.9	2.7	2.1	2.2	2.2	2.5	5.2	6.5	4.5	3.8	1.9	1.3	1.6	1.4	2.6	5.1	4.1	2.5	1.8	1.8	1.8	2.9	6.5																						
16-Dec	1.9	1.6	2.2	2.0	1.7	1.8	1.8	1.7	1.2	1.2	1.2	1.4	1.4	1.5	2.8	5.4	6.3	8.4	7.8	11.2	5.9	3.2	3.0	3.0	3.3	11.2																						
17-Dec	3.2	1.8	1.8	1.9	2.0	2.7	2.5	3.2	3.6	2.3	1.8	1.3	1.3	1.2	1.1	1.1	1.2	1.2	1.0	1.0	1.4	1.6	1.1	1.1	1.8	3.6																						
18-Dec	1.3	1.3	1.5	1.3	1.2	1.2	1.2	1.1	1.1	1.2	1.4	1.1	1.0	1.2	0.9	0.9	0.9	0.9	1.0	1.3	1.4	1.6	1.8	2.1	1.3	2.1																						
19-Dec	2.3	2.2	2.1	2.0	1.9	1.9	1.9	1.7	1.7	1.7	1.5	1.9	2.4	9.1	12.5	7.8	9.1	7.6	4.6	3.3	2.7	6.9	8.0	7.8	4.4	12.5																						
20-Dec	6.5	6.8	5.3	10.2	12.1	11.3	5.8	5.0	13.4	C	2.7	2.8	2.9	3.0	2.8	4.4	5.7	6.7	6.7	5.3	3.8	4.0	4.1	4.1	5.9	13.4																						
21-Dec	4.8	8.2	7.9	7.3	7.3	7.8	8.4	5.7	4.1	3.3	3.3	3.6	3.5	3.3	3.8	3.7	3.4	2.2	1.3	1.0	1.1	1.2	1.1	1.1	4.1	8.4																						
22-Dec	1.1	1.1	1.1	1.1	1.1	1.3	1.2	1.2	1.0	1.1	1.1	1.3	1.5	1.1	0.9	0.8	0.9	0.8	0.8	1.1	1.2	1.5	1.8	1.3	1.1	1.8																						
23-Dec	1.0	0.8	0.5	0.1	UO	UO	UO	UO	UO	UO	UO	0.7	2.9	2.4	2.2	1.8	1.1	1.1	1.4	3.5	6.5	5.0	4.1	1.5	--	6.5																						
24-Dec	1.3	1.1	1.5	2.2	1.7	1.5	1.9	2.1	2.3	2.5	2.2	2.6	2.8	2.4	3.3	3.1	2.7	1.9	0.9	0.4	UO	UO	0.9	0.3	1.9	3.3																						
25-Dec	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	2.0	3.7	2.2	1.9	2.9	2.8	2.4	3.6	4.4	3.4	4.2	4.2	4.8	4.5	4.8	2.4	4.8																						
26-Dec	10.5	9.5	12.0	9.5	11.0	8.4	8.3	7.9	6.8	5.3	4.3	5.3	3.1	2.2	2.0	2.1	5.3	4.6	1.4	1.5	5.2	5.3	3.9	2.6	5.8	12.0																						
27-Dec	2.5	2.7	2.0	2.3	4.1	5.0	4.7	4.0	3.5	6.2	5.6	4.1	4.7	7.7	3.8	5.5	3.8	1.6	0.8	1.2	1.2	1.2	1.3	1.3	3.4	7.7																						
28-Dec	1.5	1.6	1.4	1.1	1.9	3.9	1.8	1.4	0.9	0.6	0.5	0.6	0.9	1.0	1.6	1.1	0.8	0.6	0.4	0.7	1.0	1.3	1.5	1.7	1.2	3.9																						
29-Dec	1.6	1.6	1.6	1.5	1.4	1.3	0.9	0.2	0.3	3.4	3.8	3.5	2.8	5.1	10.8	18.0	10.2	5.5	5.5	19.7	18.8	13.5	7.2	8.7	6.1	19.7																						
30-Dec	10.0	3.1	2.5	5.1	10.4	12.3	5.3	3.6	4.4	3.4	3.7	7.1	13.2	14.3	13.3	10.7	6.1	4.6	4.2	2.2	1.4	1.2	2.2	1.5	6.1	14.3																						
31-Dec	1.2	1.1	1.0	0.9	1.1	1.2	1.0	0.8	0.8	0.7	0.7	0.6	0.6	0.6	2.4	0.9	0.5	3.3	2.1	1.5	2.0	2.1	1.8	1.8	1.3	3.3																						
																								5.1	4.7	4.7	4.6	5.2	5.5	4.8	4.5	4.6	4.6	4.4	4.0	4.0	4.5	4.6	5.5	5.0	4.2	3.7	4.6	4.7	4.4	4.0	4.2	Diurnal Average
																								30.8	22.7	16.1	14.4	12.3	16.2	15.2	18.0	18.3	14.4	13.6	10.2	13.2	14.3	13.3	39.3	33.0	20.8	16.9	29.9	29.7	23.6	24.0	26.1	Diurnal Maximum
C - Calibration																								UO - Unstable Operation																								
Alberta Ambient Air Quality Objectives (AAAQO):																								24-hr 30 µg/m <sup>3</sup>																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Wapasu - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Wapasu - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	461	62.81	62.81
6 - 15	192	26.16	88.96
16 - 25	13	1.77	90.74
26 - 80	6	0.82	91.55
> 81.0	0	0.00	91.55

Total Number of Valid Hours: 734

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Wapasu - December 2017**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	73	32	9	3	0	3	4	79	95	29	28	18	22	13	9	17	434
6 - 15	8	0	1	0	1	0	0	44	56	28	26	8	3	3	2	8	188
16 - 25	0	0	0	0	0	0	0	1	7	1	2	2	0	0	0	0	13
26 - 80	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	6
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	81	32	10	3	1	3	4	124	158	60	57	31	25	16	11	25	641

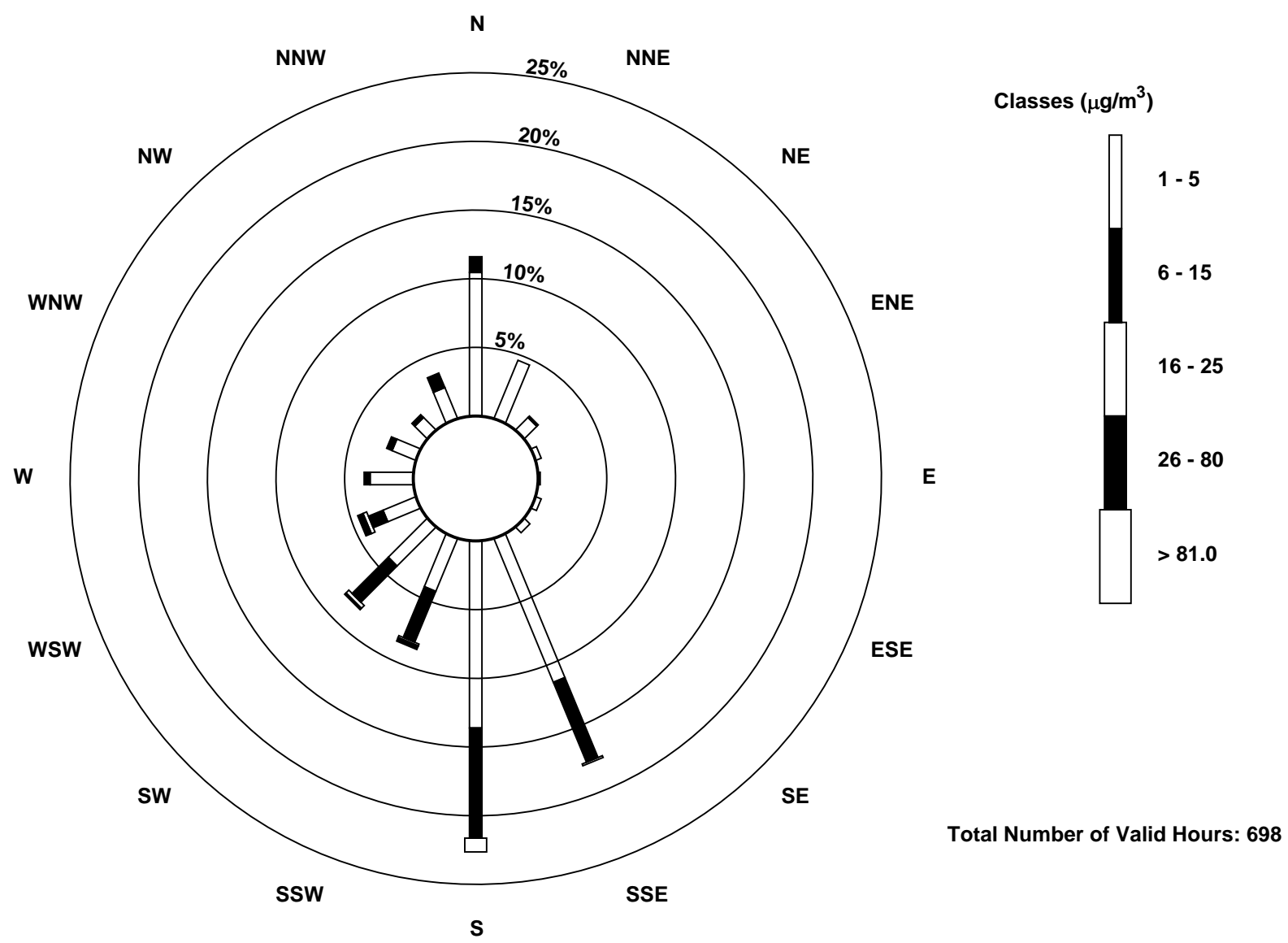
Total Number of Valid Hours: 698

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Wapasu (AMS 17)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**Wapasu - December 2017**

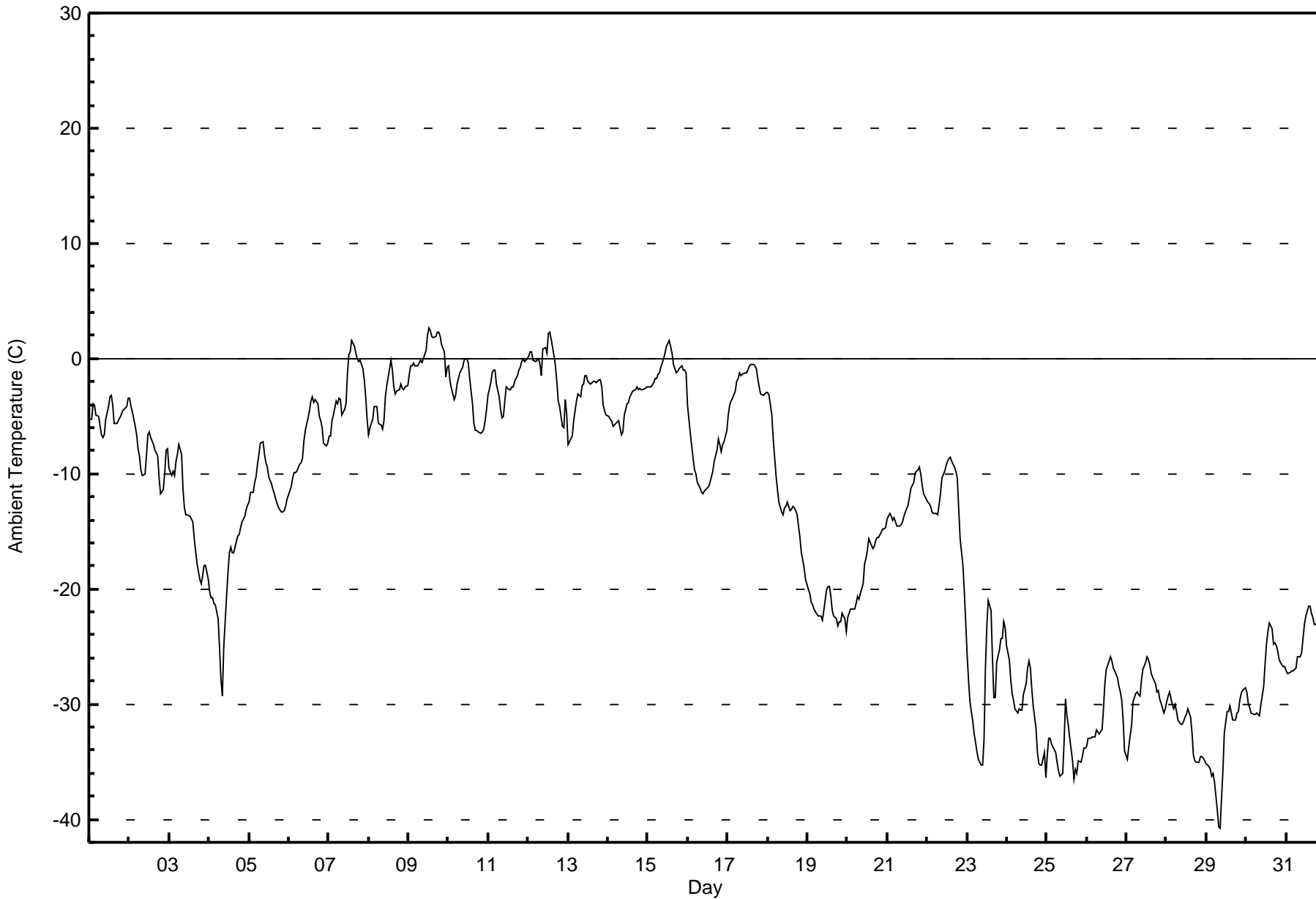
<b>Maximum Value: 2.6 C on Dec 9 13:00</b>		<b>Maximum Daily Average: 0.6 C on Dec 9</b>		<b>Hours in Service: 744</b>																																												
<b>Minimum Value: -40.8 C on Dec 29 09:00</b>		<b>Minimum Daily Average: -34.1 C on Dec 25</b>		<b>Hours of Data: 744</b>																																												
<b>Maximum Diurnal Average: -12.1 C at hour 14</b>		<b>Minimum Diurnal Average: -15.8 C at hour 9</b>		<b>Hours of Missing Data: 0</b>																																												
<b>Monthly Average: -14.25 C</b>		<b>Percentiles: P<sub>1</sub> = -36.2 P<sub>10</sub> = -31.5 Q<sub>1</sub> = -25.6 Median = -11.3 Q<sub>3</sub> = -3.6 P<sub>90</sub> = -0.8 P<sub>99</sub> = 2.0</b>		<b>Hours of Calibration: 0</b>																																												
				<b>Percent Operational Time: 100.0</b>																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-5.2	-5.3	-3.9	-4.1	-4.9	-5.0	-5.9	-6.6	-6.8	-6.6	-5.2	-4.2	-3.3	-3.2	-4.1	-5.6	-5.7	-5.4	-5.1	-4.8	-4.6	-4.4	-4.2	-3.4	-4.9	-3.2																						
2-Dec	-3.5	-4.2	-4.7	-5.8	-6.7	-7.9	-8.4	-9.6	-10.1	-10.0	-8.4	-6.7	-6.4	-6.8	-7.4	-8.0	-8.1	-8.5	-10.4	-11.8	-11.4	-10.0	-8.0	-7.8	-7.9	-3.5																						
3-Dec	-9.5	-10.2	-9.8	-10.1	-8.9	-8.3	-7.5	-8.4	-11.4	-13.0	-13.5	-13.5	-13.7	-13.9	-14.2	-15.6	-16.8	-17.9	-19.2	-19.6	-18.8	-18.0	-17.9	-19.2	-13.7	-7.5																						
4-Dec	-20.3	-20.8	-20.8	-21.2	-21.3	-22.6	-25.2	-27.8	-29.3	-25.1	-20.6	-18.5	-16.9	-16.4	-16.9	-16.9	-15.8	-15.4	-15.3	-14.7	-14.2	-13.7	-13.0	-12.7	-19.0	-12.7																						
5-Dec	-12.4	-11.6	-11.6	-10.7	-10.2	-9.2	-8.3	-7.4	-7.2	-8.3	-9.1	-9.4	-10.3	-10.9	-11.4	-11.7	-12.2	-12.7	-13.0	-13.3	-13.4	-13.2	-12.9	-12.2	-10.9	-7.2																						
6-Dec	-11.5	-11.1	-10.5	-10.0	-9.9	-9.8	-9.2	-9.0	-8.7	-7.2	-6.2	-5.2	-4.5	-3.7	-3.3	-3.8	-3.6	-3.9	-5.0	-5.4	-6.0	-7.3	-7.5	-7.3	-7.1	-3.3																						
7-Dec	-6.8	-6.7	-5.3	-4.9	-3.6	-3.9	-3.4	-3.6	-4.9	-4.4	-3.9	-1.3	0.3	0.5	1.6	1.1	0.5	-0.1	-0.3	-0.1	-0.8	-1.8	-3.3	-5.3	-2.5	1.6																						
8-Dec	-6.7	-6.0	-5.2	-4.1	-4.1	-4.1	-5.6	-5.8	-6.1	-5.4	-3.3	-2.3	-1.7	-0.1	-0.9	-2.4	-3.0	-2.8	-2.7	-2.2	-2.6	-2.7	-2.5	-2.4	-3.5	-0.1																						
9-Dec	-1.4	-0.6	-0.6	-0.4	-0.6	-0.6	-0.4	-0.2	-0.4	0.0	0.7	2.1	2.6	2.4	1.9	1.8	1.9	2.2	2.3	2.0	1.2	0.6	-1.7	-0.8	0.6	2.6																						
10-Dec	-0.7	-2.0	-2.6	-3.5	-3.2	-2.3	-1.7	-1.3	-0.7	-0.2	0.0	-0.1	-0.4	-1.7	-3.9	-5.7	-6.2	-6.2	-6.3	-6.5	-6.4	-6.1	-5.4	-4.4	-3.2	0.0																						
11-Dec	-3.2	-2.0	-1.2	-1.0	-1.0	-2.2	-3.3	-4.4	-5.2	-5.0	-3.6	-2.4	-2.7	-2.7	-2.5	-2.4	-2.0	-1.5	-0.9	-0.8	-0.2	-0.1	-0.3	0.0	-2.1	0.0																						
12-Dec	0.2	0.5	0.6	-0.2	-0.3	-0.2	0.0	-0.6	-1.4	0.8	1.0	0.5	2.2	2.3	1.7	0.2	-0.6	-2.0	-3.7	-4.2	-5.9	-6.0	-3.5	-4.8	-1.0	2.3																						
13-Dec	-7.5	-7.3	-6.7	-5.4	-4.5	-3.7	-3.1	-3.4	-2.4	-2.2	-1.4	-1.4	-1.9	-2.2	-2.1	-1.9	-1.9	-2.1	-1.9	-1.9	-2.5	-4.0	-4.5	-4.9	-3.4	-1.4																						
14-Dec	-5.1	-5.2	-5.4	-5.9	-5.8	-5.5	-5.4	-6.0	-6.6	-6.4	-4.9	-4.0	-3.8	-3.3	-3.1	-2.9	-2.7	-2.5	-2.7	-2.6	-2.7	-2.6	-2.5	-2.5	-4.2	-2.5																						
15-Dec	-2.5	-2.5	-2.4	-2.1	-1.7	-1.7	-1.4	-1.3	-0.8	0.0	0.5	1.1	1.4	1.6	0.4	-0.5	-0.8	-1.2	-1.1	-0.9	-0.6	-1.0	-1.1	-1.3	-0.8	1.6																						
16-Dec	-4.0	-6.5	-7.6	-8.7	-9.7	-10.0	-10.7	-11.2	-11.6	-11.7	-11.5	-11.3	-11.1	-10.7	-10.3	-9.8	-8.9	-7.9	-7.0	-7.5	-8.1	-7.4	-7.2	-6.3	-9.0	-4.0																						
17-Dec	-4.9	-4.0	-3.7	-3.4	-2.8	-1.9	-1.7	-1.3	-1.4	-1.3	-1.3	-1.2	-0.9	-0.6	-0.5	-0.5	-0.6	-0.8	-1.7	-2.5	-3.1	-3.2	-3.1	-2.9	-2.1	-0.5																						
18-Dec	-3.0	-3.2	-4.9	-7.0	-8.6	-10.1	-11.4	-12.5	-13.3	-13.6	-13.0	-12.8	-12.5	-13.1	-13.0	-12.8	-12.9	-13.2	-13.5	-15.5	-16.9	-17.5	-18.2	-19.2	-12.2	-3.0																						
19-Dec	-20.0	-20.4	-21.2	-21.4	-21.7	-22.0	-22.3	-22.4	-22.4	-22.7	-21.9	-20.0	-19.8	-19.7	-20.6	-21.8	-22.3	-22.6	-23.2	-22.8	-22.8	-22.2	-22.6	-23.7	-21.8	-19.7																						
20-Dec	-22.5	-22.1	-21.7	-21.8	-21.7	-21.2	-20.6	-20.9	-20.4	-19.5	-17.8	-17.4	-16.6	-15.6	-16.2	-16.5	-16.2	-15.8	-15.5	-15.5	-15.0	-14.7	-14.8	-14.7	-18.1	-14.7																						
21-Dec	-13.9	-13.4	-13.7	-14.0	-13.8	-14.2	-14.5	-14.5	-14.4	-14.2	-13.7	-13.3	-12.7	-12.0	-11.3	-11.0	-10.7	-9.9	-9.6	-9.4	-10.0	-11.0	-11.8	-12.2	-12.5	-9.4																						
22-Dec	-12.5	-12.6	-12.9	-13.3	-13.5	-13.5	-13.5	-12.7	-11.7	-10.5	-9.8	-9.4	-8.9	-8.7	-8.6	-8.9	-9.4	-9.7	-10.4	-13.1	-15.6	-18.0	-20.3	-23.0	-12.5	-8.6																						
23-Dec	-25.7	-28.0	-29.8	-31.5	-32.6	-33.4	-34.1	-34.8	-35.3	-35.3	-33.1	-26.9	-23.2	-21.0	-21.8	-26.0	-29.4	-29.5	-26.4	-25.3	-24.3	-24.3	-22.8	-23.3	-28.2	-21.0																						
24-Dec	-24.9	-26.1	-27.8	-29.0	-29.7	-30.4	-30.8	-30.5	-30.5	-30.5	-29.2	-28.2	-26.9	-26.3	-26.9	-28.7	-30.1	-32.2	-34.2	-35.2	-35.3	-35.3	-34.2	-36.4	-30.4	-24.9																						
25-Dec	-34.4	-33.0	-33.0	-33.5	-34.0	-34.2	-35.0	-35.7	-36.2	-36.0	-33.2	-29.5	-31.0	-31.9	-33.0	-35.0	-36.5	-35.6	-36.0	-34.9	-35.0	-34.6	-33.8	-33.8	-34.1	-29.5																						
26-Dec	-33.7	-33.0	-32.9	-32.9	-32.8	-32.9	-32.3	-32.5	-32.4	-32.2	-30.4	-28.2	-27.0	-26.3	-25.9	-26.3	-26.9	-27.1	-27.7	-28.5	-29.0	-29.6	-31.4	-34.1	-30.2	-25.9																						
27-Dec	-34.8	-33.7	-32.8	-31.8	-29.8	-29.1	-28.9	-29.1	-29.3	-28.0	-27.0	-26.3	-25.9	-26.2	-26.6	-27.4	-28.0	-28.2	-28.9	-28.9	-29.5	-29.9	-30.8	-30.4	-29.2	-25.9																						
28-Dec	-29.8	-29.3	-28.9	-30.1	-30.5	-30.1	-30.7	-31.4	-31.7	-31.8	-31.5	-31.1	-30.9	-30.5	-31.1	-32.5	-34.5	-35.0	-35.1	-35.0	-34.6	-34.6	-34.7	-34.9	-32.1	-28.9																						
29-Dec	-35.1	-35.4	-35.7	-36.2	-36.1	-36.7	-39.1	-40.6	-40.8	-38.2	-35.8	-32.5	-30.6	-30.6	-30.2	-30.7	-31.3	-31.4	-30.8	-30.6	-29.6	-29.1	-28.9	-28.5	-33.5	-28.5																						
30-Dec	-28.9	-29.9	-30.3	-30.8	-30.8	-30.9	-30.7	-30.8	-31.0	-30.0	-28.5	-26.5	-24.8	-23.7	-23.0	-23.4	-24.8	-24.7	-24.9	-25.4	-26.1	-26.6	-26.8	-26.7	-27.5	-23.0																						
31-Dec	-27.1	-27.4	-27.2	-27.1	-27.1	-26.9	-26.9	-25.9	-25.9	-25.5	-24.3	-23.1	-22.3	-21.5	-21.6	-22.2	-22.5	-23.1	-23.1	-22.7	-22.9	-23.2	-23.8	-24.6	-24.5	-21.5																						
																								-14.6	-14.6	-14.7	-14.9	-14.9	-15.0	-15.2	-15.6	-15.8	-15.3	-14.2	-13.0	-12.4	-12.1	-12.4	-13.2	-13.6	-13.8	-14.0	-14.2	-14.4	-14.6	-14.6	-15.0	Diurnal Average
																								0.2	0.5	0.6	-0.2	-0.3	-0.2	0.0	-0.2	-0.4	0.8	1.0	2.1	2.6	2.4	1.9	1.8	1.9	2.2	2.3	2.0	1.2	0.6	-0.3	0.0	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Wapasu - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	258	34.68	34.68
-20 - 0	450	60.48	95.16
0 - 10	36	4.84	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

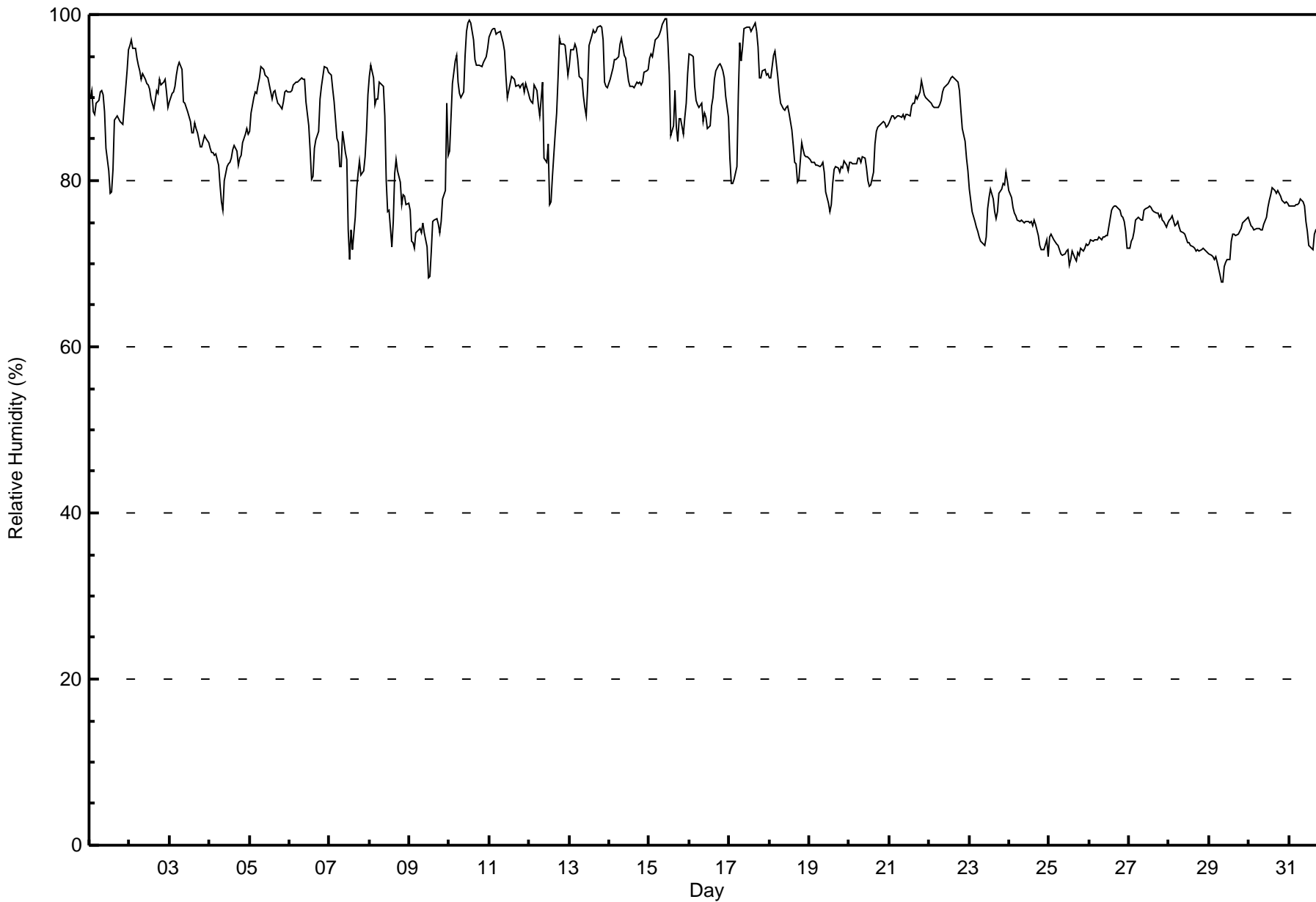
**Wapasu - December 2017**

Maximum Value: 100 % on Dec 15 11:00																			Maximum Daily Average: 94.6 % on Dec 13						Hours in Service: 744																			
Minimum Value: 68 % on Dec 29 08:00																			Minimum Daily Average: 71.7 % on Dec 25						Hours of Data: 744																			
Maximum Diurnal Average: 85.2 % at hour 2																			Minimum Diurnal Average: 82.3 % at hour 14						Hours of Missing Data: 0																			
Monthly Average: 84.2 %																			Percentiles: P <sub>1</sub> = 70 P <sub>10</sub> = 73 Q <sub>1</sub> = 76 Median = 85 Q <sub>3</sub> = 92 P <sub>90</sub> = 95 P <sub>99</sub> = 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-Dec	90	91	88	88	89	90	91	91	90	88	84	81	78	79	81	87	88	88	87	87	87	89	93	96	87.6	96																		
2-Dec	96	97	96	96	95	94	93	92	93	92	92	92	91	90	89	90	91	91	92	91	92	92	91	89	92.3	97																		
3-Dec	90	90	91	91	93	94	94	93	89	89	89	88	87	86	86	87	86	86	84	84	85	85	85	85	88.2	94																		
4-Dec	84	83	83	83	83	82	79	77	76	80	82	82	83	84	84	84	82	83	83	85	86	86	86	86	82.6	86																		
5-Dec	86	88	90	91	91	92	92	94	93	93	93	92	91	90	91	91	90	89	89	89	91	91	91	91	90.7	94																		
6-Dec	91	91	92	92	92	92	92	92	92	92	89	87	84	80	81	84	85	86	90	91	93	94	94	93	89.4	94																		
7-Dec	93	93	91	89	85	85	82	82	86	83	83	74	70	74	72	76	79	81	82	81	81	83	86	90	82.5	93																		
8-Dec	93	94	92	89	90	90	92	92	91	88	80	76	76	72	75	81	83	81	80	77	78	78	77	77	83.4	94																		
9-Dec	76	73	73	72	74	74	74	74	75	74	72	68	68	72	75	75	75	75	74	75	78	79	89	83	74.9	89																		
10-Dec	84	88	92	94	95	92	90	90	91	95	98	99	99	99	97	95	94	94	94	94	94	95	95	96	93.9	99																		
11-Dec	97	98	98	98	98	98	98	97	97	96	92	90	92	93	92	92	91	92	91	92	92	91	92	90	94.0	98																		
12-Dec	90	89	89	92	91	89	88	90	92	83	82	84	77	78	80	86	88	92	97	96	96	96	95	93	88.9	97																		
13-Dec	94	96	96	96	96	95	93	92	90	89	88	91	96	97	98	98	98	99	99	99	97	92	91	91	94.6	99																		
14-Dec	92	93	94	95	95	95	96	97	96	95	95	92	91	91	91	91	92	92	92	91	92	93	93	93	93.2	97																		
15-Dec	95	95	95	97	97	97	98	98	99	99	100	97	93	85	87	91	86	85	87	88	86	88	89	93	92.7	100																		
16-Dec	95	95	95	91	90	89	89	89	87	88	88	86	87	89	90	92	93	94	94	94	93	92	90	88	90.8	95																		
17-Dec	83	80	80	80	82	90	97	94	96	98	98	98	98	98	98	99	98	96	92	92	93	93	93	93	92.5	99																		
18-Dec	92	92	95	96	94	92	91	89	89	89	89	89	88	86	84	82	82	80	80	84	84	83	83	83	87.4	96																		
19-Dec	83	82	82	82	82	82	82	82	82	81	79	77	76	77	80	81	82	82	81	82	82	82	82	81	81.0	83																		
20-Dec	82	82	82	82	82	83	83	82	83	83	81	80	79	80	81	84	86	86	87	87	87	87	86	87	83.4	87																		
21-Dec	87	88	88	87	88	88	88	88	88	87	88	88	88	89	89	89	90	90	91	92	91	90	90	90	88.8	92																		
22-Dec	89	89	89	89	89	89	89	90	91	91	92	92	92	92	93	92	92	92	91	88	86	85	83	81	89.4	93																		
23-Dec	79	78	76	75	74	74	73	73	72	72	73	77	78	79	78	76	75	76	79	79	80	79	81	80	76.5	81																		
24-Dec	79	78	77	76	76	75	75	75	75	75	75	75	75	75	75	75	73	72	72	72	72	73	71	71	74.6	79																		
25-Dec	73	74	73	73	72	72	72	71	71	71	72	72	70	71	72	71	70	71	71	72	71	72	72	72	71.7	74																		
26-Dec	72	73	73	73	73	73	73	73	73	73	73	73	74	76	77	77	77	77	76	76	76	75	74	72	74.3	77																		
27-Dec	72	73	73	74	75	76	75	75	75	76	77	77	77	77	76	76	76	76	76	76	75	75	74	75	75.3	77																		
28-Dec	75	75	76	75	75	75	74	74	74	74	73	72	72	72	72	72	72	72	71	72	72	72	71	71	73.1	76																		
29-Dec	71	71	71	71	71	70	69	68	68	70	70	71	71	73	74	74	73	74	74	74	75	75	75	76	71.9	76																		
30-Dec	75	75	74	74	74	74	74	74	74	75	76	77	78	78	79	79	78	79	78	78	78	77	77	77	76.4	79																		
31-Dec	77	77	77	77	77	77	77	78	77	77	75	74	72	72	72	74	74	74	75	74	73	73	74	74	75.0	78																		
																			85.0	85.2	85.2	85.1	85.0	85.0	85.0	84.7	84.7	84.4	83.7	83.0	82.4	82.3	82.8	83.9	84.0	83.9	84.2	84.2	84.3	84.3	84.7	84.4	Diurnal Average	
																			97	98	98	98	98	98	98	98	99	99	100	99	99	99	98	99	98	98	99	99	97	96	95	96	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Wapasu - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	271	36.42	36.42
80 - 100	473	63.58	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

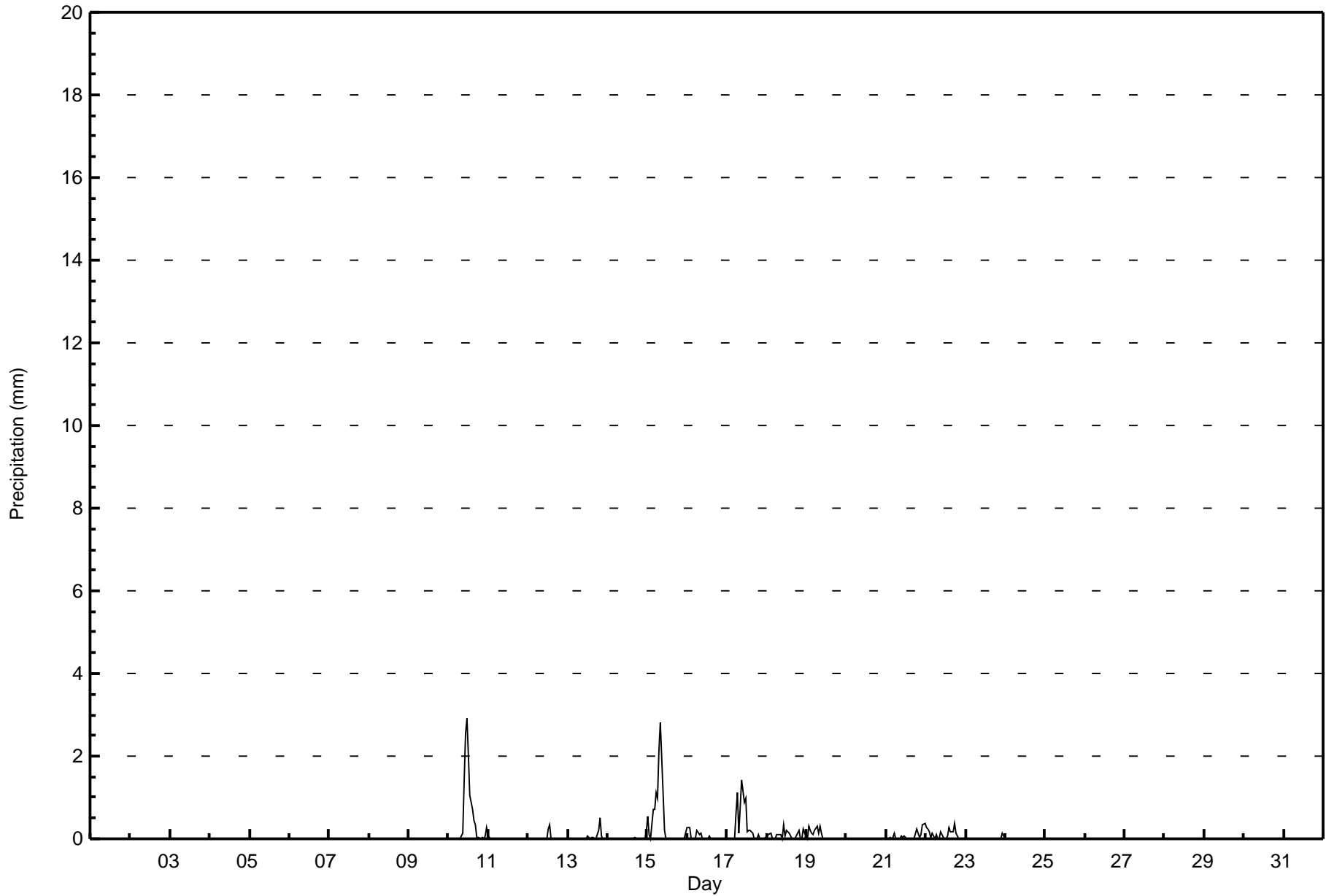
Wapasu - December 2017

Maximum Value: 2.9 mm on Dec 10 12:00																				Maximum Daily Total: 12.0 mm on Dec 10					Hours in Service: 744				
Minimum Value: 0.0 mm on Dec 6 14:00																				Minimum Daily Total: 0.0 mm on Dec 7					Hours of Data: 611				
Maximum Diurnal Total: 4.3 mm at hour 10																				Minimum Diurnal Total: 0.1 mm at hour 22					Hours of Missing Data: 133				
Monthly Total: 40.33 mm																				Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.1 P <sub>99</sub> = 1.1					Hours of Calibration: 0				
																									Percent Operational Time: 82.1				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--			
6-Dec	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	0.0	0.0	0.0	0.0	--	0.0			
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.4	2.5	2.9	2.0	1.1	0.7	0.4	0.3	0.1	0.1	0.0	0.1	0.0	0.1	0.3	12.0			
11-Dec	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1			
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3			
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.5	0.1	0.0	0.0	0.0	0.9	0.5			
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2			
15-Dec	0.6	0.1	0.0	0.7	0.7	1.1	1.0	2.2	2.8	1.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	10.5	2.8			
16-Dec	0.3	0.3	0.0	0.0	0.0	0.0	0.2	0.1	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	0.0	0.0	0.0	1.0	0.3			
17-Dec	0.0	0.0	0.0	0.0	0.0	0.6	1.1	0.1	0.8	1.4	0.9	1.0	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	6.8	1.4			
18-Dec	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.3	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.2	0.1	2.1	0.3			
19-Dec	0.0	0.3	0.2	0.1	0.1	0.2	0.3	0.2	0.3	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	1.9	0.3			
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
21-Dec	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.3	0.4	1.7	0.4			
22-Dec	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.3	0.2	0.2	0.4	0.1	0.1	0.0	0.0	0.0	0.0	2.4	0.4			
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1			
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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					
1.2 1.0 0.6 0.9 1.0 2.1 2.8 2.6 4.2 4.3 4.0 4.1 2.7 1.9 1.3 0.8 0.6 0.4 0.7 1.0 0.2 0.1 0.8 1.2																													
0.6 0.3 0.2 0.7 0.7 1.1 1.1 2.2 2.8 1.4 2.5 2.9 2.0 1.1 0.7 0.4 0.3 0.4 0.2 0.5 0.1 0.1 0.3 0.4																													
AF - Analyzer Failure																													



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Speed (WS) - km/h**  
**Wapasu - December 2017**

Maximum Speed: 15 km/h on Dec 13 22:00	Maximum Daily Speed Average: 9.6 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 30 17:00	Minimum Daily Speed Average: 0.2 km/h on Dec 10	Hours of Data: 701
Maximum Diurnal Speed Average: 2.6 km/h at hour 13	Minimum Diurnal Speed Average: 1.4 km/h at hour 9	Hours of Missing Data: 43
Monthly Average Velocity: 1.9 km/h 210.9 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 4 Median = 6 Q <sub>3</sub> = 8 P <sub>90</sub> = 11 P <sub>99</sub> = 15	Percent Operational Time: 94.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	SSW8	SSW7	SW12	SW12	SW12	SW11	SSW9	S8	S7	S9	SSW9	SSW10	SSW9	SSW7	S6	S7	S8	S7	S7	S5	S5	S5	SSW4	SSW7.5	SW12			
2-Dec	WSW7	W5	W5	NW4	W1	NE2	ENE2	AF	NE2	E3	SSE3	SW5	SW8	SW9	SW6	SSW5	S5	SSW5	S4	S5	SSW6	SSW6	SW9	SW7	SSW3.5	SW9		
3-Dec	S5	S5	S5	S5	S6	S6	SW4	NW5	N9	N9	N9	N11	N11	N10	N7	N6	NNE5	NNE5	NE2	N3	NNE3	N7	N9	N7	N3.3	N11		
4-Dec	NNE7	NE6	NNE5	NNE5	NE4	ESE3	SSE3	SE3	SE4	SSE6	SSE5	SSE5	S4	S5	SSE6	SSE8	SSE10	SSE12	SSE13	SSE13	SSE14	SSE14	SSE15	SSE14	SSE5.8	SSE15		
5-Dec	S11	S10	SSW8	S8	S7	S4	S2	NNW4	N8	N12	N14	N13	N12	N12	N9	NNE7	NNE7	NNE6	NE7	NE6	NE2	SW2	SSE4	SSE5	NNE2.3	N14		
6-Dec	S5	S6	S7	S7	S7	SSE7	S7	S8	S8	S8	S9	S9	S9	SSW8	SSW8	SSW8	SW10	SW10	SSW6	SSW6	SSW6	S6	S6	S6	S7.1	SW10		
7-Dec	S6	S6	SSW7	SW8	SW11	SW9	SW7	SW8	SSW7	SSW6	S5	SW8	SW9	WSW9	W10	W7	W6	W5	W5	W5	W5	WNW4	WNW4	S3	SW5.8	SW11		
8-Dec	SSE6	SSE7	S6	SSE6	SSE6	SSE6	SSE6	SSE7	SSE8	SSE7	SSE7	S7	SSE8	SSE8	S8	S10	S12	S11	SSW10	S10	S9	SSW9	SSW10	SSW11	S7.8	S12		
9-Dec	SW12	SSW9	SSW8	SW8	SW12	SW12	SW10	SW9	SW10	SW12	SW10	WSW11	WSW11	SW8	SW11	SW10	SW10	WSW10	WSW10	WSW11	WSW10	WSW7	SW5	S4	SSW6	SW9.1	SW12	
10-Dec	SSW6	S5	SSE5	SSE5	SSE6	S6	SSE6	S6	S7	SSW7	SW5	NW5	NNW10	NNW15	N13	N12	NNE7	NNE7	NNE5	ENE3	WSW2	SE4	SSE4	SSE6	ESE0.2	NNW15		
11-Dec	S5	SSW5	SW6	SW4	SW5	S4	S4	SSE5	S4	S5	S5	S5	S6	S6	S7	S7	S8	S9	S9	SSE9	S8	S10	S9	SSW8	S6.2	S10		
12-Dec	SSW8	SW11	SW9	SSW7	SSW8	SSW7	SSW7	SSW6	S5	WSW9	SW8	SW5	SW3	WNW3	NW4	NNW7	N8	NNW4	WSW3	NW3	W2	W3	WNW4	SW1	WSW3.7	SW11		
13-Dec	SSE4	SSE5	SSE5	SSE5	SSE7	S6	S8	S7	SW8	WSW6	NNW6	N10	NNW13	NNW15	N10	NNE2	WNW2	WNW3	WNW6	NW8	N13	N15	N15	N12	NNW3.2	N15		
14-Dec	N7	N4	E1	SE3	SSE3	SSW4	S6	S8	S8	S8	SSE8	S10	S10	S10	SSE11	S8	SSE9	SSE8	SSE10	S9	SSE8	SSE7	SSE6	SSE7	SSE6.2	SSE11		
15-Dec	SSE7	SSE9	S10	S8	S8	S9	S8	S7	SSW6	SW8	WSW10	WSW10	W9	WNW9	WNW5	WSW5	SW8	SW11	WSW10	WSW10	WSW10	W8	W4	WNW6	SW6.1	SW11		
16-Dec	N15	N14	N12	N13	N9	NNW12	NNW12	N11	N9	NNE6	NNE6	ESE2	S3	S4	SSE5	S5	S5	S4	S5	SSE6	SSE9	S9	S9	S11	N1.7	N15		
17-Dec	S12	S13	S10	S11	SSW11	SW15	SW11	SW12	WSW14	WSW11	WSW11	WSW11	WSW13	WSW13	W10	W8	WNW7	WNW8	NW9	WNW6	W4	WSW6	WSW6	W6	WSW7.9	SW15		
18-Dec	W7	WSW7	NNW8	N10	N10	N12	NNE11	NNE10	N8	N6	NNW9	NW8	NNW13	NNW14	NW10	NW10	NW11	NW12	NNW13	N13	N14	N14	N12	N11	NNW9.6	N14		
19-Dec	NNW12	N13	N10	N9	N8	N7	N4	N3	NNE4	NE3	SE3	SSW3	SW5	SW7	SSW6	S5	S7	S7	S6	S6	S6	S6	S4	SSE5	WNW0.5	N13		
20-Dec	SSE5	SSE6	SSE5	SSE5	SSE6	SSE6	SSE6	S6	S7	S7	S6	SSW8	S7	S7	S8	S8	S8	S8	S8	S7	S7	S7	S7	S6	S6.6	S8		
21-Dec	SSW6	SW8	W3	NNW3	N4	NNW5	N8	N10	N10	NNE7	N7	NNW5	W3	WSW4	W4	NW4	W3	NNW7	NNW6	NNW11	NNW11	N10	N7	N4	NNW4.7	NNW11		
22-Dec	NNE2	NE2	ESE1	SSE2	SSE3	SW3	SSW2	SW3	SW5	WSW6	W5	W5	WNW6	WNW5	WNW5	NW6	WNW6	NW5	N7	NNE8	NNE9	NNE8	N7	NNE5	NW2.4	NNE9		
23-Dec	ENE2	E3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	N8	N10	----	N10
24-Dec	NNE9	N10	N10	N9	N8	N7	N6	N9	N10	N7	N7	N6	N5	N5	NW4	NW2	AF	AF	SSE2	SE2	SE1	NNE2	NNE3	NNE2	N5.1	N10		
25-Dec	NNE4	NE4	NNE4	NNE5	NNE5	NNE6	NNE4	NNE3	NNE3	NNE3	NNE2	NW1	W1	SW3	SSW2	AF	AF	SSE2	SSE4	SSE4	SSE4	SSE4	S4	SSE4	ENE1.1	NNE6		
26-Dec	SSE4	SSE4	SSE4	SSE4	SSE4	SSE5	SSE4	SSE4	SSE4	SSE4	SSE4	SSE4	SSE3	SSE3	SSE3	S3	SSE3	SSE3	SSE3	SSE4	SSE4	SSE4	AF	SE3	SSE3.7	SSE5		
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	S0	SSW3	SSW3	SSW2	S3	S3	S3	S3	SSE3	SSE3	SSE3	SSE4	SE4	----	SSE4	
28-Dec	SSE3	SSE3	AF	AF	N2	N4	NNE4	NNE4	NNE5	NNE4	NNE4	N5	N6	NNW6	N5	N2	NNE2	N2	NNE1	NNE3	N3	N4	N6	N4	N3.1	NNW6		
29-Dec	N4	N5	N5	NNE4	NNE4	AF	AF	AF	SSE3	SSE3	S3	S2	S2	S2	S2	S3	S4	S3	S4	S4	S3	S3	S3	S2	SSE1.2	N5		
30-Dec	S3	SSE3	SSE4	SSE4	SSE4	SSE4	SSE4	SSE4	SSE3	SSE4	SSE4	SSE1	S1	S0	S1	AF	SSE0	SSE2	SSE3	SSE3	SSE4	S4	SSE4	S4	SSE2.9	SSE4		
31-Dec	SSE4	SSE4	SSE4	S4	S4	SSW5	SSW5	SSW5	S5	S6	SSW7	SSW7	SSW7	SSW6	SSW6	S6	S7	S8	S8	SSW8	SSW8	SSW9	SSW9	SSW8	S6.1	SSW9		

S1.9	S2.1	SSW2.1	SSW1.9	SSW2.1	SSW2.3	SSW2.1	SSW1.8	SSW1.4	SSW1.8	SW1.8	WSW2.4	WSW2.6	W2.6	WSW2.3	SW2.2	SSW2.5	SSW2.5	SSW2.5	SSW2.1	SSW1.9	SSW1.7	SSW1.5	S1.9	Diurnal Average	
N15	N14	N12	N13	SW12	SW15	NNW12	SW12	WSW14	N12	N14	N13	NNW13	NNW15	N13	N12	S12	NW12	SSE13	N13	SSE14	N15	SSE15	SSE14	Diurnal Maximum	

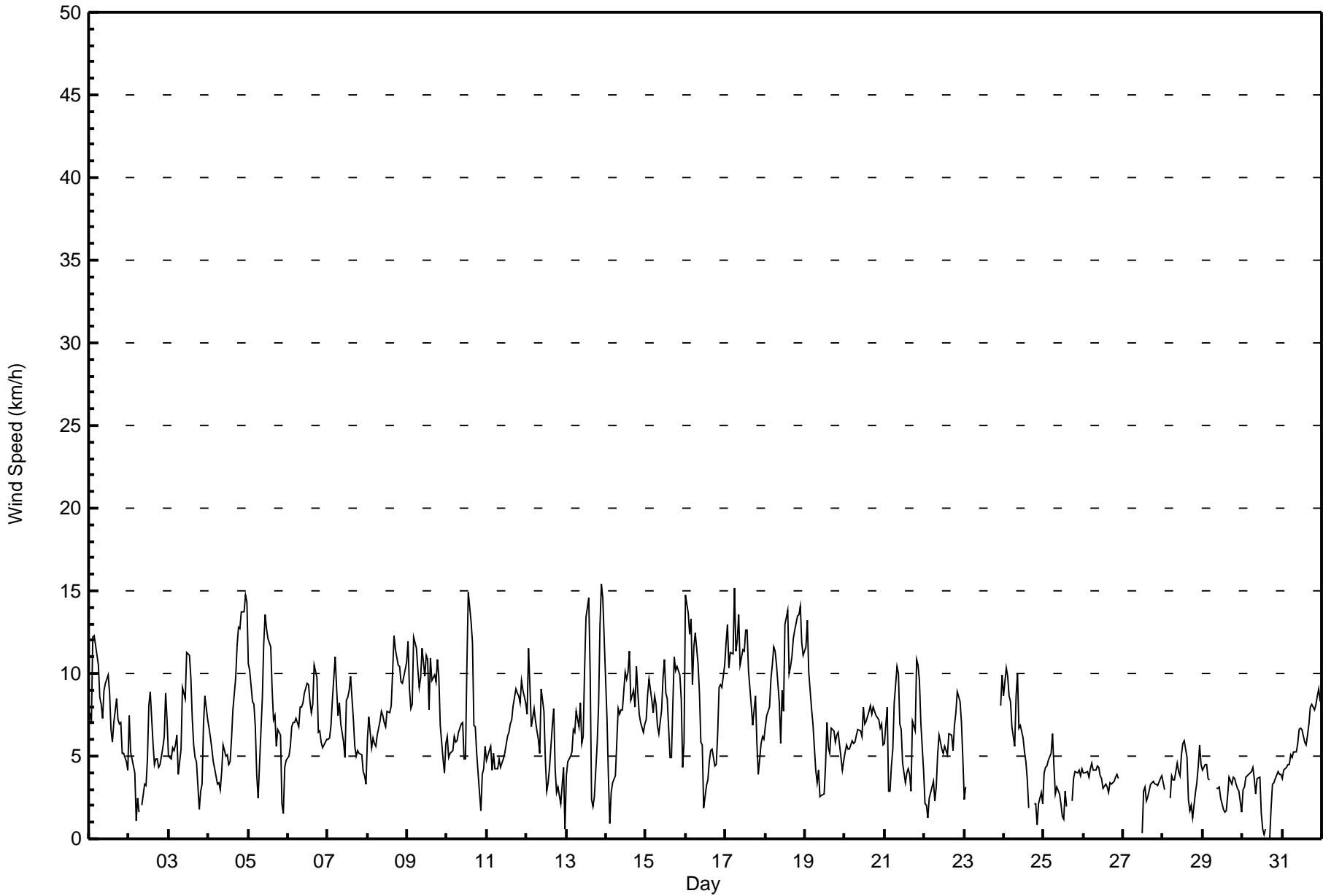
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Wapasu - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Wapasu - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	296	42.23	42.23
6 - 11	352	50.21	92.44
12 - 19	53	7.56	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: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Wapasu - December 2017**

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	19	32	8	3	3	3	7	81	62	16	15	4	17	10	10	6	296
6 - 11	51	17	3	0	0	0	0	40	100	50	34	23	9	9	6	10	352
12 - 19	21	0	0	0	0	0	0	7	3	0	8	4	0	0	1	9	53
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
<b>Totals</b>	91	49	11	3	3	3	7	128	165	66	57	31	26	19	17	25	701

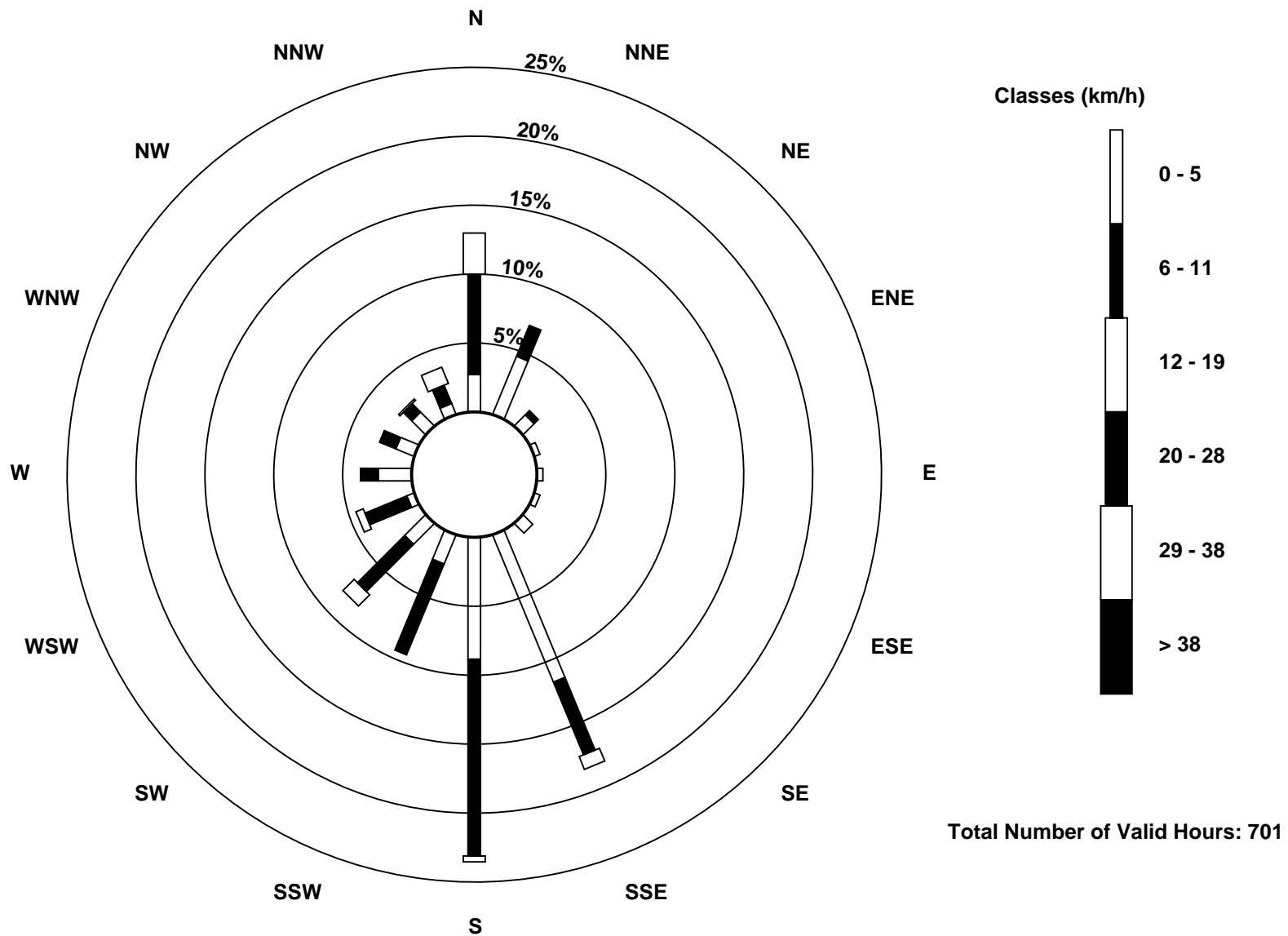
Total Number of Valid Hours: 701

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Wapasu (AMS 17)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Wapasu - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 5 km/h on Dec 13 15:00	Hours of Data: 701
Minimum Value: 0 km/h on Dec 30 17:00	Hours of Missing Data: 43
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 O <sub>1</sub> = 1 Median = 2 O <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 4	Hours of Calibration: 0
	Percent Operational Time: 94.2

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

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Wapasu - December 2017**

Direction of Maximum Speed: 359 deg on Dec 13 22:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 345.1 deg on Dec 18	Hours of Data: 701
Direction of Minimum Speed: 162 deg on Dec 30 17:00	Hours of Missing Data: 43
Direction of Minimum Daily Speed Average: 0.2 deg on Dec 10	Percent Operational Time: 94.2
Monthly Average Direction: 217.4 deg	

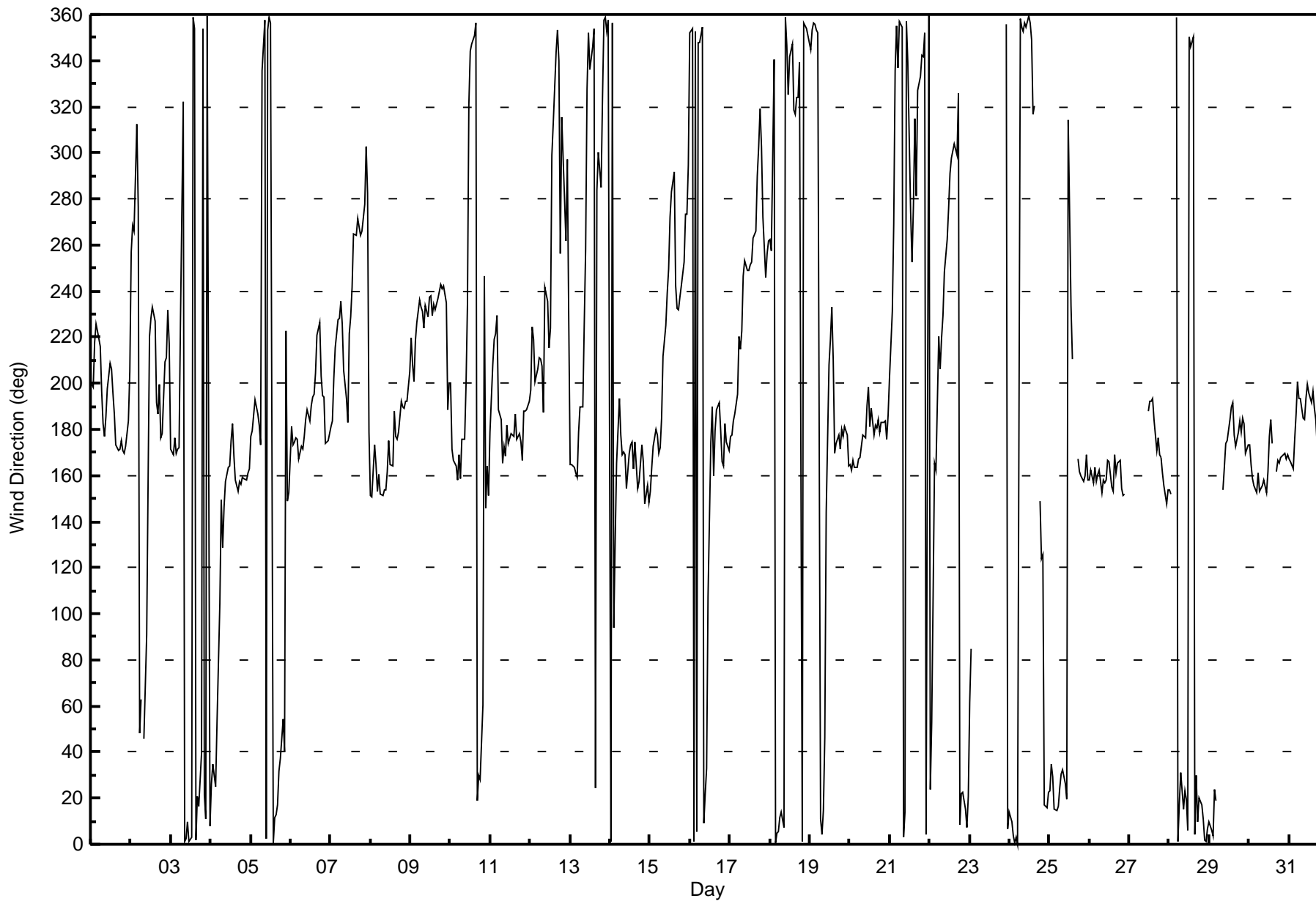
Day	Hourly Period Ending At (MST)																								Daily Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	200	198	218	226	223	216	197	183	177	185	198	209	206	196	187	174	171	171	175	171	170	173	184	205	195.5	
2-Dec	257	268	266	313	276	48	63	AF	46	91	157	221	228	233	227	192	187	199	177	178	209	211	232	217	220.8	
3-Dec	171	169	176	170	171	172	226	322	1	2	10	1	3	359	354	2	21	16	40	354	21	11	359	8	5.7	
4-Dec	26	34	30	25	53	104	150	129	146	158	163	164	175	182	168	158	153	158	156	160	159	158	161	163	149.5	
5-Dec	177	179	193	190	187	182	173	335	358	3	353	359	356	0	11	13	17	32	37	55	40	223	149	153	15.7	
6-Dec	181	173	174	176	175	167	172	172	177	184	189	184	191	194	195	205	221	227	203	195	194	174	175	178	187.9	
7-Dec	181	183	202	215	227	229	236	225	206	193	183	221	229	241	265	264	271	268	264	266	277	302	283	179	232.5	
8-Dec	151	151	174	164	153	161	152	151	153	154	161	175	165	164	188	177	176	179	192	190	189	192	192	205	174.0	
9-Dec	219	208	201	219	227	236	233	232	224	234	229	237	238	230	234	232	236	240	243	241	242	235	189	200	229.3	
10-Dec	200	171	167	164	158	169	159	176	176	199	234	321	344	347	351	356	19	30	28	60	247	146	164	152	116.0	
11-Dec	179	208	219	221	230	189	184	165	173	169	182	174	178	178	177	187	176	178	175	167	188	188	188	192	184.8	
12-Dec	197	224	219	201	206	211	211	208	187	242	235	215	224	299	313	343	353	340	256	316	280	262	297	227	238.6	
13-Dec	165	165	163	161	159	179	190	189	225	258	328	352	337	346	354	24	284	300	285	324	358	359	353	357	330.8	
14-Dec	1	356	94	132	165	193	178	169	170	169	154	170	173	175	163	175	154	158	165	173	166	148	156	148	163.7	
15-Dec	153	164	173	180	178	170	172	185	212	225	239	250	272	283	291	242	232	232	237	242	253	274	273	295	225.2	
16-Dec	352	354	1	353	6	348	348	355	9	22	33	108	174	190	160	179	189	191	179	166	164	183	175	171	5.8	
17-Dec	177	178	183	187	195	220	215	223	247	253	249	249	251	253	263	266	290	303	319	303	272	246	256	262	237.5	
18-Dec	263	258	341	1	5	5	12	14	7	359	347	325	342	347	319	316	324	324	339	1	356	355	354	351	345.1	
19-Dec	345	353	356	356	353	352	11	4	14	46	144	208	219	233	210	170	174	178	171	180	177	181	177	164	286.4	
20-Dec	165	162	167	164	163	167	168	173	178	176	190	198	181	189	178	182	181	185	179	183	183	184	176	186	178.3	
21-Dec	203	231	269	336	355	337	357	354	3	14	357	339	275	253	277	315	281	327	333	342	342	352	4	360	335.4	
22-Dec	24	53	108	165	162	220	206	220	229	248	262	276	291	297	301	304	299	326	9	22	23	16	7	20	320.9	
23-Dec	62	85	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	356	7	--
24-Dec	14	10	4	0	3	0	358	355	353	356	354	360	356	349	317	321	AF	AF	AF	149	124	126	17	16	22	1.3
25-Dec	23	35	29	15	14	16	24	30	32	26	19	315	275	233	211	AF	AF	167	162	160	158	160	169	158	57.1	
26-Dec	158	162	157	163	158	160	162	153	158	157	158	166	166	155	153	169	161	165	167	154	152	152	AF	144	158.6	
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	188	192	192	193	184	171	176	169	167	161	155	147	154	--	
28-Dec	154	152	AF	AF	359	1	18	31	15	23	20	6	350	346	350	4	30	10	20	17	11	2	1	7	9.4	
29-Dec	10	6	4	24	19	AF	AF	AF	154	164	174	175	184	190	191	177	172	179	184	179	185	182	170	173	164.1	
30-Dec	173	165	159	155	152	161	153	154	156	158	153	162	177	184	174	AF	162	167	166	168	168	170	167	169	161.9	
31-Dec	167	166	163	175	187	201	193	194	185	184	193	199	196	192	197	189	184	173	183	192	197	202	202	201	189.8	

191.1 189.3 196.7 196.6 194.4 205.6 195.2 200.2 203.9 208.9 225.2 239.4 251.8 260.4 247.0 225.5 207.3 209.7 200.5 194.7 199.9 199.9 202.5 185.0

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 (WD) - deg**  
**Wapasu - December 2017**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 90 deg on Dec 13 00:00			Hours of Data:	701
Minimum Value: 5 deg on Dec 27 00:00			Hours of Missing Data:	43
			Hours of Calibration:	0
			Percent Operational Time:	94.2
Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 14 Q <sub>1</sub> = 18 Median = 23 Q <sub>3</sub> = 28 P <sub>90</sub> = 30 P <sub>99</sub> = 65				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	29	29	21	19	19	27	27	28	26	26	28	24	24	25	27	21	22	21	18	18	17	16	21	30	30
2-Dec	24	28	31	55	65	28	24	AF	36	30	17	22	15	14	23	23	21	22	9	18	24	23	14	21	65
3-Dec	12	14	17	13	19	23	54	31	26	22	29	24	25	23	21	23	26	24	46	30	22	27	25	26	54
4-Dec	27	23	24	27	27	21	20	10	11	12	18	20	26	28	25	20	18	20	19	20	19	19	23	26	28
5-Dec	28	28	29	29	26	22	24	25	23	27	21	25	22	23	26	30	30	30	25	23	53	56	19	14	56
6-Dec	28	24	25	22	24	18	22	22	27	29	30	29	28	28	27	25	20	17	22	23	21	16	12	16	30
7-Dec	16	23	22	20	23	24	21	24	25	23	23	17	14	22	25	29	33	34	36	34	33	36	30	35	36
8-Dec	10	8	16	16	15	14	9	10	8	8	16	24	20	21	27	26	27	27	27	28	26	29	28	28	29
9-Dec	20	25	29	38	15	14	15	17	16	14	16	17	20	21	14	17	15	16	16	17	31	38	38	24	38
10-Dec	18	24	13	9	14	19	16	24	24	26	35	30	18	18	20	24	31	27	34	37	59	14	20	14	59
11-Dec	21	24	24	34	19	21	19	12	14	14	22	21	23	26	28	28	24	26	25	21	28	30	25	27	34
12-Dec	27	18	21	23	23	27	33	23	26	20	26	41	38	32	36	18	20	39	41	36	51	46	36	90	90
13-Dec	24	16	18	15	13	28	27	26	23	30	29	21	16	17	27	59	35	44	30	22	26	23	20	21	59
14-Dec	23	33	76	15	23	31	25	24	24	22	18	26	25	27	22	29	23	26	22	26	24	21	20	20	76
15-Dec	18	21	26	28	29	24	26	28	30	21	16	18	28	27	39	26	16	13	16	18	23	27	34	40	40
16-Dec	21	21	25	23	27	18	17	23	28	29	30	65	29	32	24	25	26	30	26	20	21	31	29	24	65
17-Dec	27	26	30	29	29	23	25	22	19	20	19	19	20	21	24	25	26	25	22	28	31	17	22	27	31
18-Dec	23	22	24	24	28	26	29	29	26	23	19	23	19	20	22	22	20	18	25	25	22	22	20	19	29
19-Dec	15	20	22	21	20	22	25	31	28	41	19	35	22	13	28	20	23	26	18	22	23	21	22	10	41
20-Dec	15	18	18	15	13	16	18	22	23	20	30	27	28	28	29	29	29	29	27	27	28	28	25	27	30
21-Dec	28	16	39	35	25	14	23	22	26	28	21	24	34	22	28	27	35	27	16	16	16	20	24	29	39
22-Dec	31	25	44	64	25	19	29	24	15	18	25	27	29	26	25	24	26	20	37	30	30	32	28	30	64
23-Dec	14	19	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	23	28
24-Dec	29	28	26	25	25	24	22	20	20	22	22	22	26	20	24	51	AF	AF	AF	20	17	80	21	18	80
25-Dec	20	21	23	27	28	27	27	23	18	17	26	27	35	15	16	AF	AF	13	7	9	8	9	16	11	35
26-Dec	12	13	12	15	13	14	15	11	9	9	15	19	17	16	14	14	16	17	17	12	9	8	AF	5	19
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	65	26	29	25	25	23	22	16	15	10	9	8	8	65
28-Dec	8	7	AF	AF	24	24	27	26	29	29	28	26	21	17	19	23	15	18	21	25	29	25	24	28	29
29-Dec	27	27	27	27	29	AF	AF	AF	14	25	15	18	19	19	20	22	19	23	26	24	26	23	20	16	29
30-Dec	20	17	15	9	8	10	10	10	9	13	16	12	23	13	70	AF	60	12	17	16	16	14	14	15	70
31-Dec	16	16	19	24	28	26	27	28	27	28	28	29	30	30	28	28	30	25	29	30	29	28	26	28	30
	31	33	76	64	65	31	54	31	36	41	35	65	38	32	70	59	60	44	46	37	80	56	38	90	

Diurnal Maximum

AF - Analyzer Failure







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

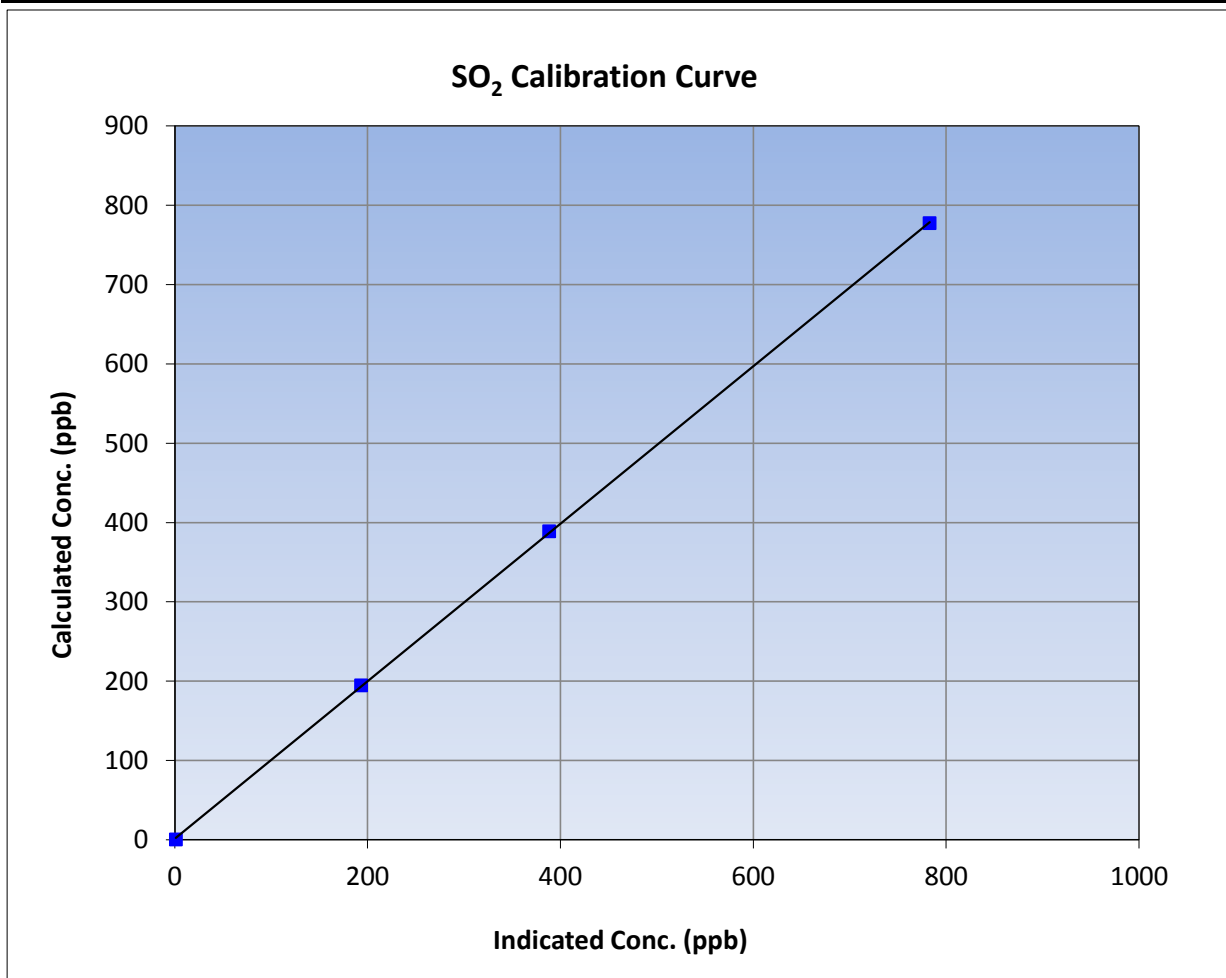
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 14, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	7:00	End Time (MST)	14:26
Analyzer make	Routine	Analyzer serial #	1218153459

### Calibration Data

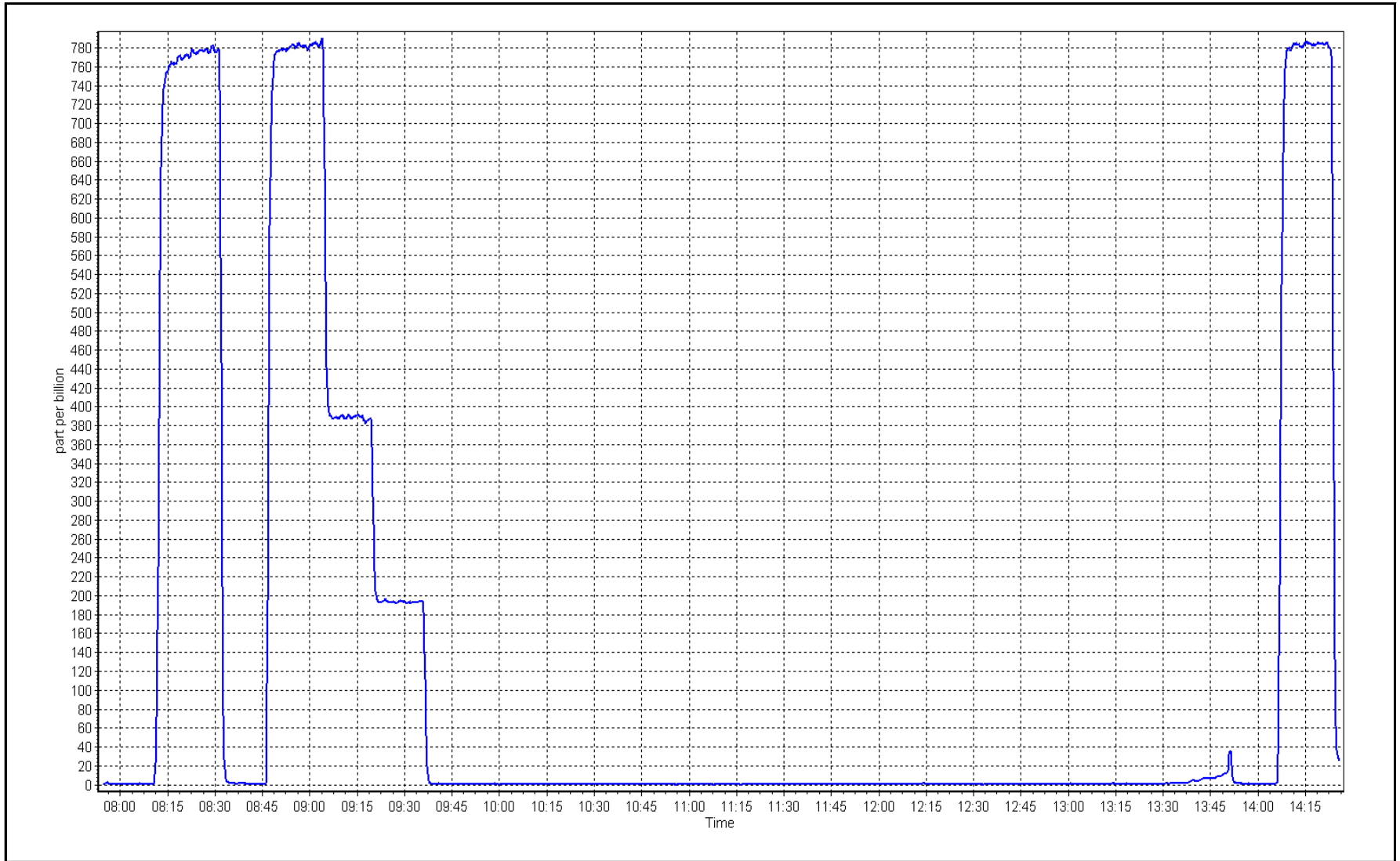
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>
0.0	0.7	----	Correlation Coefficient	≥0.995
777.0	782.5	0.9930		
388.5	388.0	1.0014	Slope	0.90 - 1.10
194.3	193.0	1.0065		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 19, 2017

Location: Wapasu





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-11-2017

### Station Information

Station Name:	Wapasu	Station number:	AMS 17
Calibration Date:	December 20, 2017	Last Cal Date:	November 24, 2017
Start time (MST):	11:00	End time (MST):	13:32
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.10</u>	ppm	Cal Gas Exp Date	September 9, 2017
Cal Gas Cylinder #	<u>CC107167</u>			
Calibrator Make/Model	API T700		Serial Number	3252
ZAG Make/Model	API T701		Serial Number	4427

### Analyzer Information

Analyzer make:	Thermo 450i	Analyzer serial #:	1218153583		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
Analyzer Range	0 - 100 ppb	PMT voltage	-627.2	-627.2	
Calculated slope	0.990011	0.988097	Lamp voltage	822	822
Calculated intercept	0.066787	0.102975	Pressure	554.3	554.3
Analyzer Background	11.0	11.0	Flow	0.987	0.987
Analyzer Coefficient	0.988	0.988	Intensity	91	91
			Converter temp	340.0	340.0

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	-0.2	----
as found span	4926	78.4	79.9	80.3	0.995
calibrator zero	5000	0.0	0.0	0.0	----
high point	4926	78.4	79.9	80.7	0.990
second point	4964	39.2	40.0	40.6	0.984
third point	4985	19.7	20.1	19.9	1.009
as left zero	5000	0.0	0.0	0.3	----
as left span	4926	78.4	79.9	81.0	0.986
SO2 Scrubber Check	5011	79.4	783.0	-0.1	----
Date of last scrubber change:		24-Nov-17	Average Correction Factor		0.994
Corrected As found	80.50	Previous response	80.64	*% change	0.2%

\* = > +/-5% change initiates investigation

Notes:

SO2 scrubber checked after as founds, no maintenance or adjustments done

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

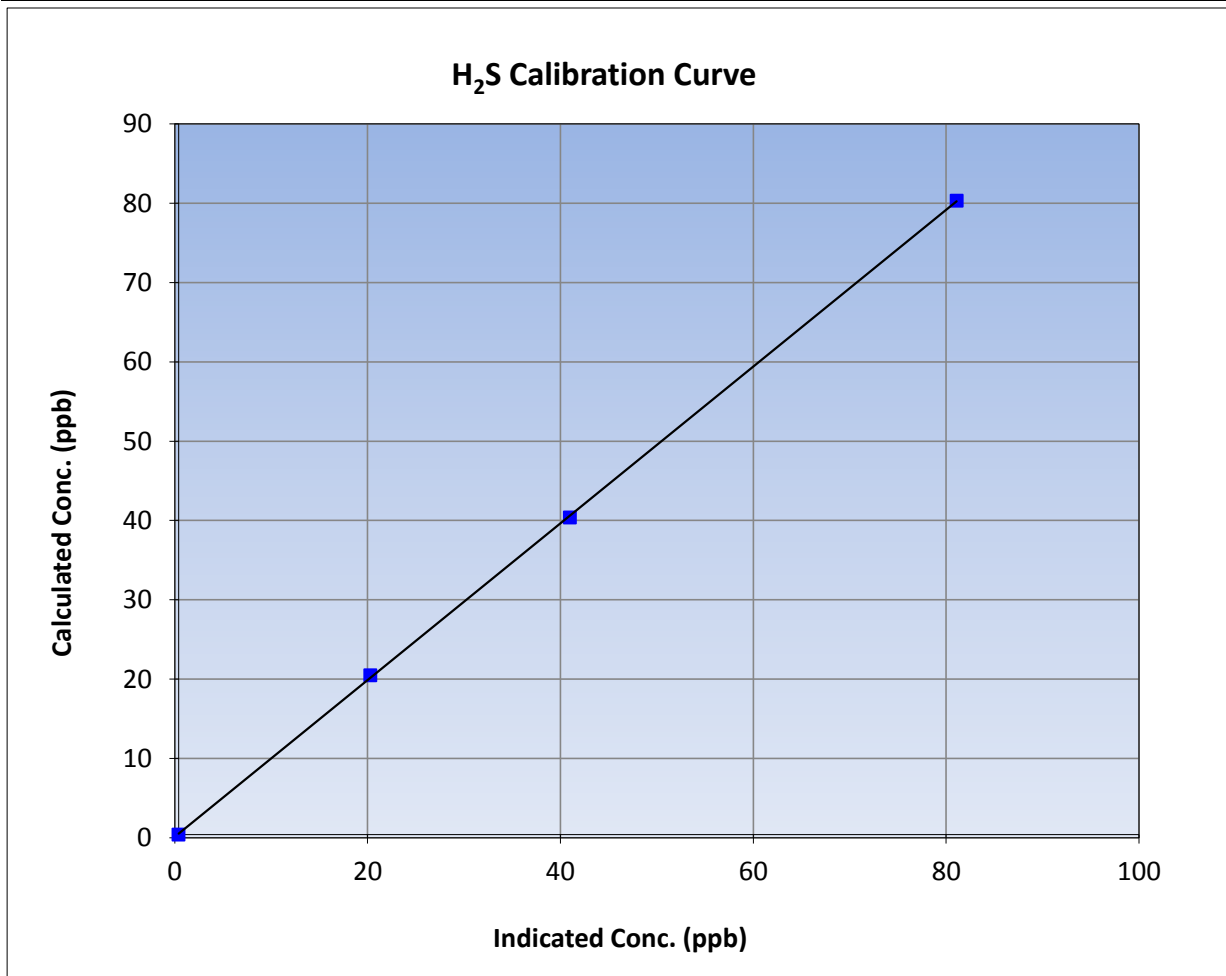
Version-03-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 24, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	11:00	End Time (MST)	13:32
Analyzer make	Thermo 450i	Analyzer serial #	1218153583

### Calibration Data

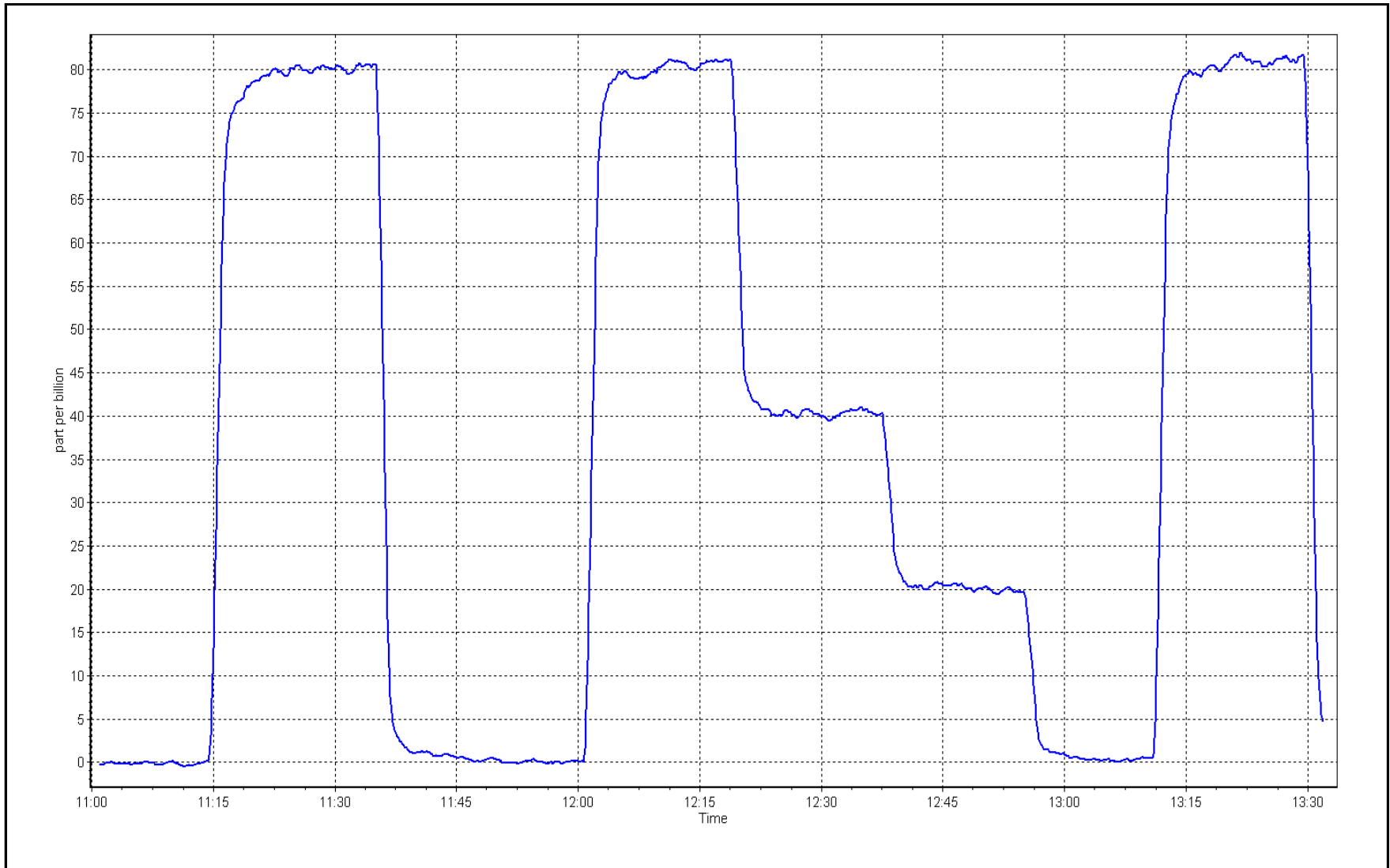
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.0	----	Correlation Coefficient	≥0.995
79.9	80.7	0.9901		
40.0	40.6	0.9842	Slope	0.90 - 1.10
20.1	19.9	1.0088		
			Intercept	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 20, 2017

Location: Wapasu





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Wapasu	Station number:	AMS 17
Calibration Date:	December 19, 2017	Last Cal Date:	November 14, 2017
Start time (MST):	7:55	End time (MST):	14:25
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000753	Cal Gas Expiry Date	2/22/2020
CH4 Cal Gas Conc.	<u>505.0</u> ppm	CH4 Equiv Conc.	1055.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	3252
ZAG Make/Model	API T701	Serial Number	4427

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1218153352
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-296.8
Calculated slope	0.999361	Sample pressure	8.5
Calculated intercept	-0.069120	Fuel pressure	24.8
Analyzer Background	4.355	Air pressure	40.3
Analyzer Coefficient	2.840	Flame temperature	160.3

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.00	-0.03	----
as found span	4926	78.4	16.53	16.68	0.991
calibrator zero	5000	0.0	0.00	0.04	----
high point	4926	78.4	16.53	16.73	0.988
second point	4965	39.2	8.26	8.20	1.008
third point	4985	19.6	4.13	4.17	0.991
as left zero	5000	0.0	0.00	0.08	----
as left span	4926	78.4	16.53	16.73	0.988
Average Correction Factor					0.996
Corrected As found	16.71	Previous response	16.61	*% change	-0.6%

\* = > +/-5% change initiates investigation

Notes: No maintenance or adjustments done

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## THC Calibration Summary

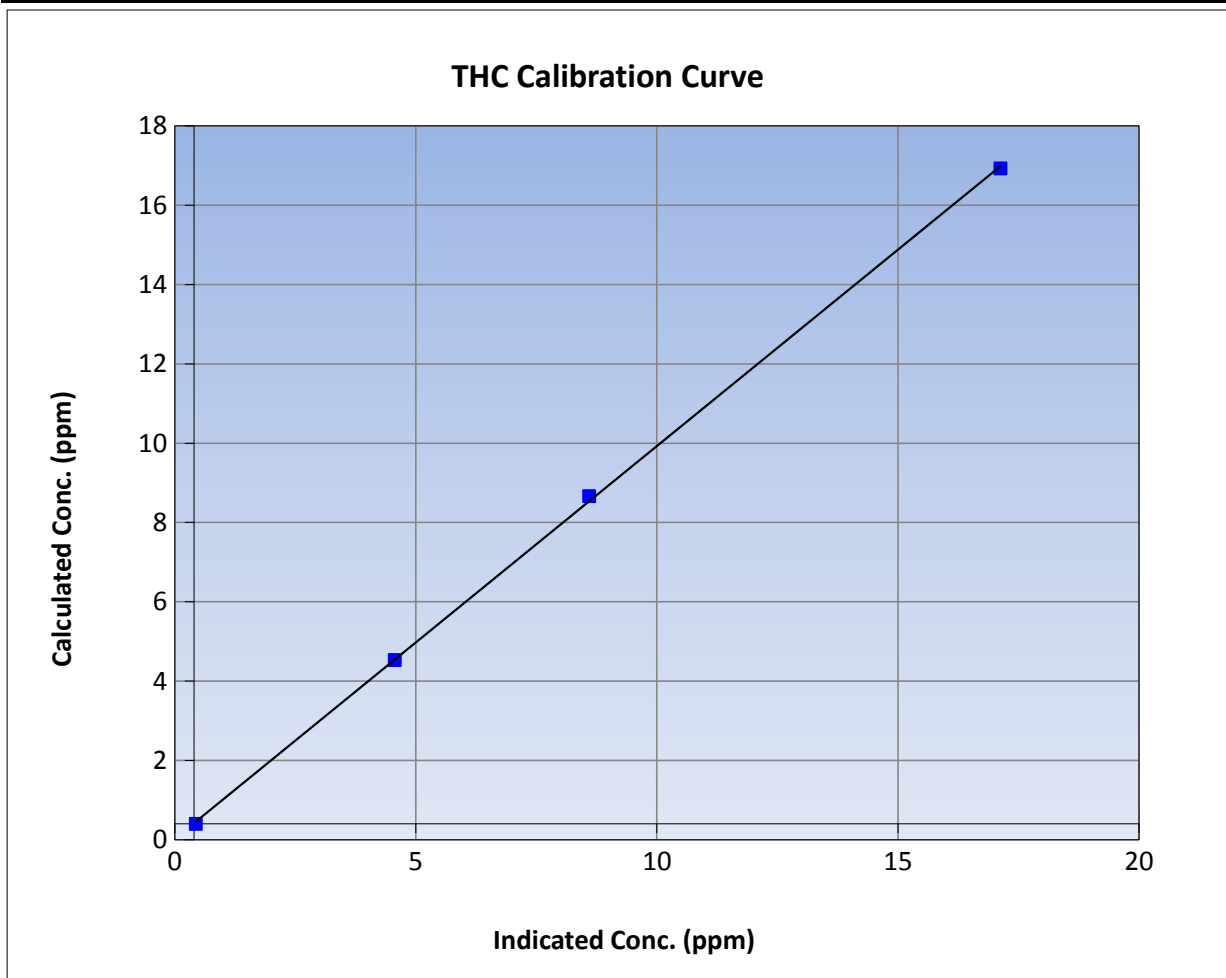
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 14, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	7:55	End Time (MST)	14:25
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352

### Calibration Data

Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999848	≥0.995
16.5	16.7	0.9879			
8.3	8.2	1.0078	Slope	0.990530	0.90 - 1.10
4.1	4.2	0.9908			
			Intercept	0.014965	+/-1.5

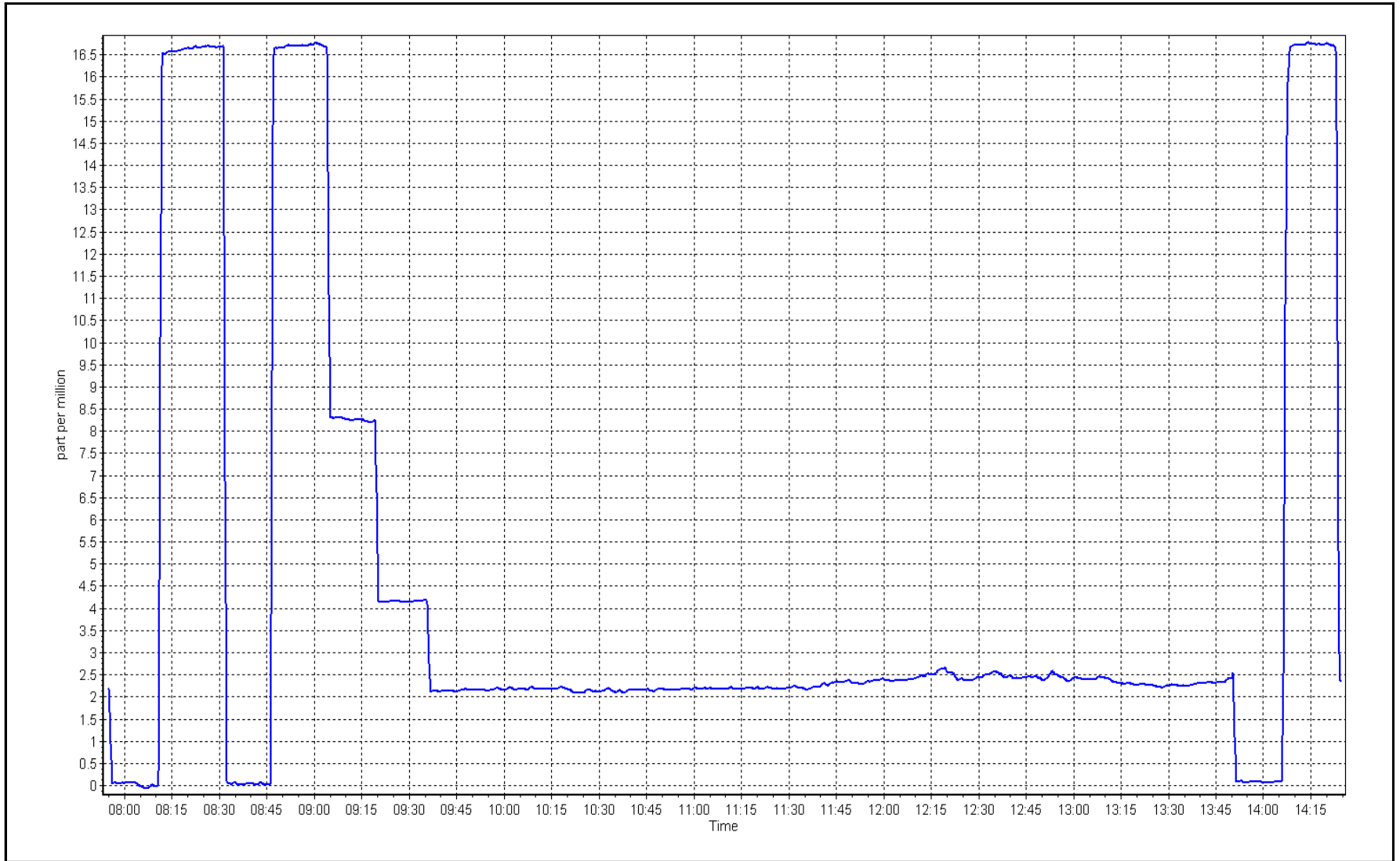




THC Calibration Plot

Date: December 19, 2017

Location: Wapasu







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

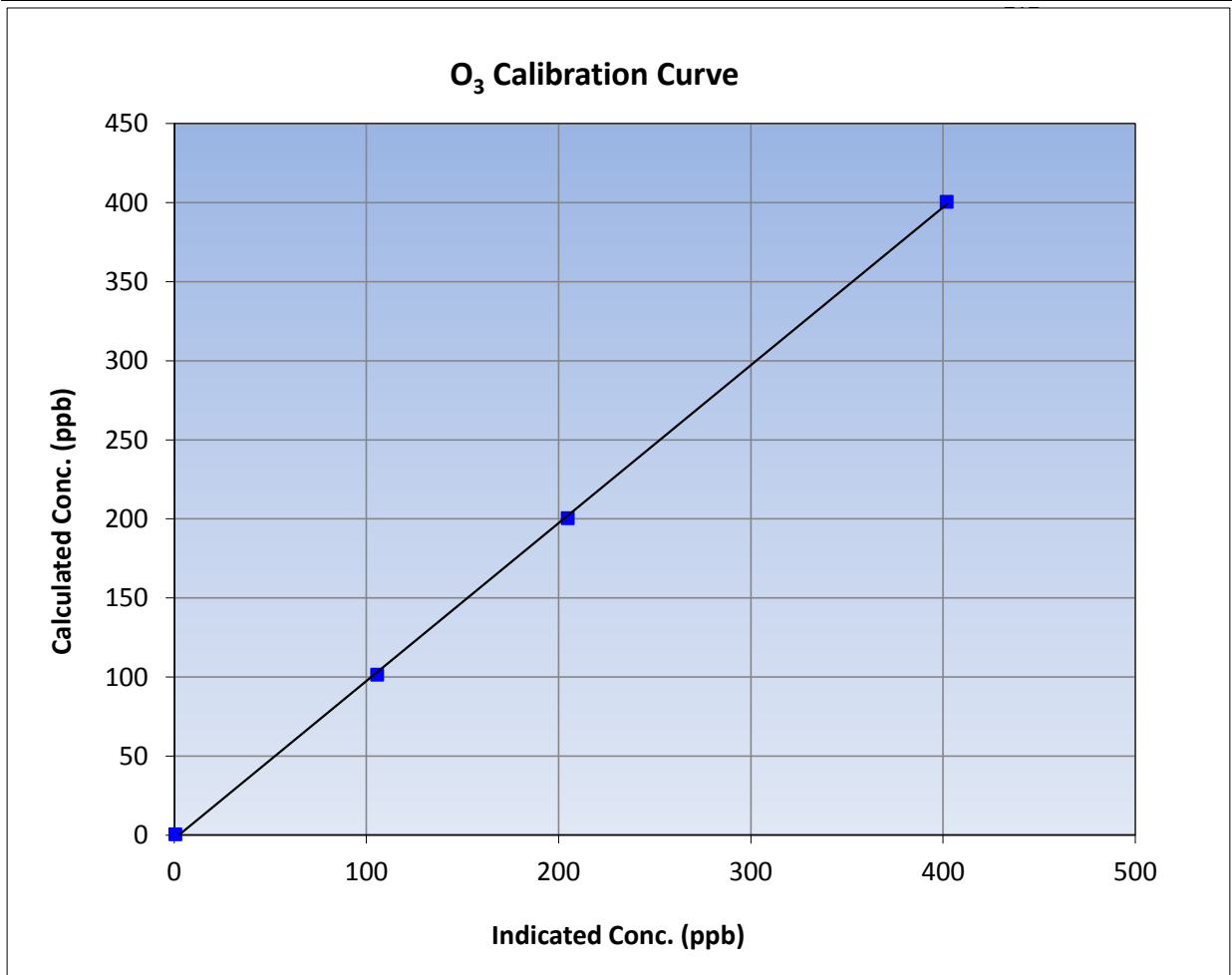
Version-03-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 22, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	11:01
Analyzer make	Teledyne T400	Analyzer serial #	824

### Calibration Data

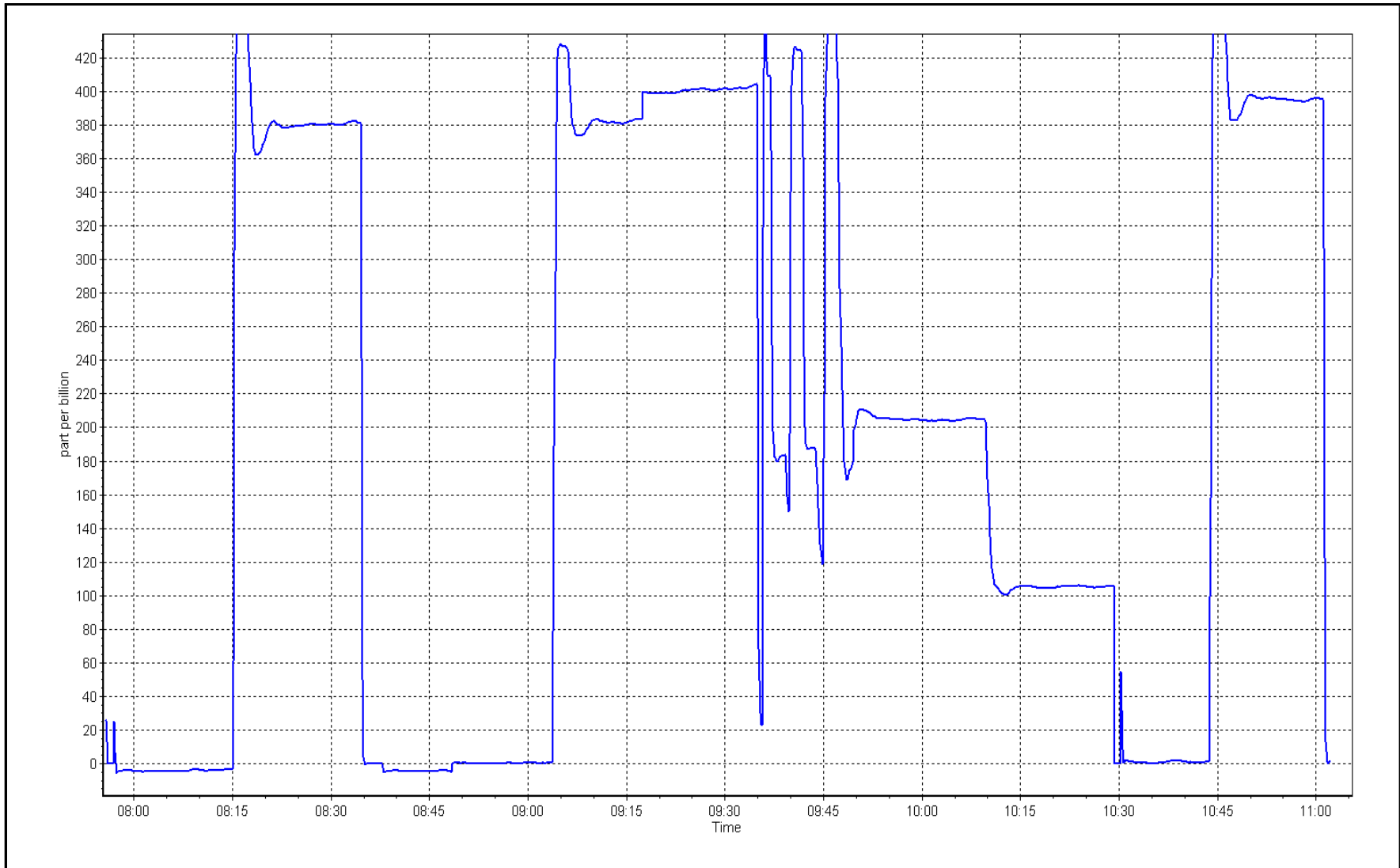
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.3	----	Correlation Coefficient	0.999856	≥0.995
400.0	401.5	0.9963			
200.0	204.5	0.9780	Slope	0.998895	0.90 - 1.10
101.0	105.2	0.9601			
			Intercept	-2.428407	+/- 10



O<sub>3</sub> Calibration Plot

Date: December 20, 2017

Location: Wapasu







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

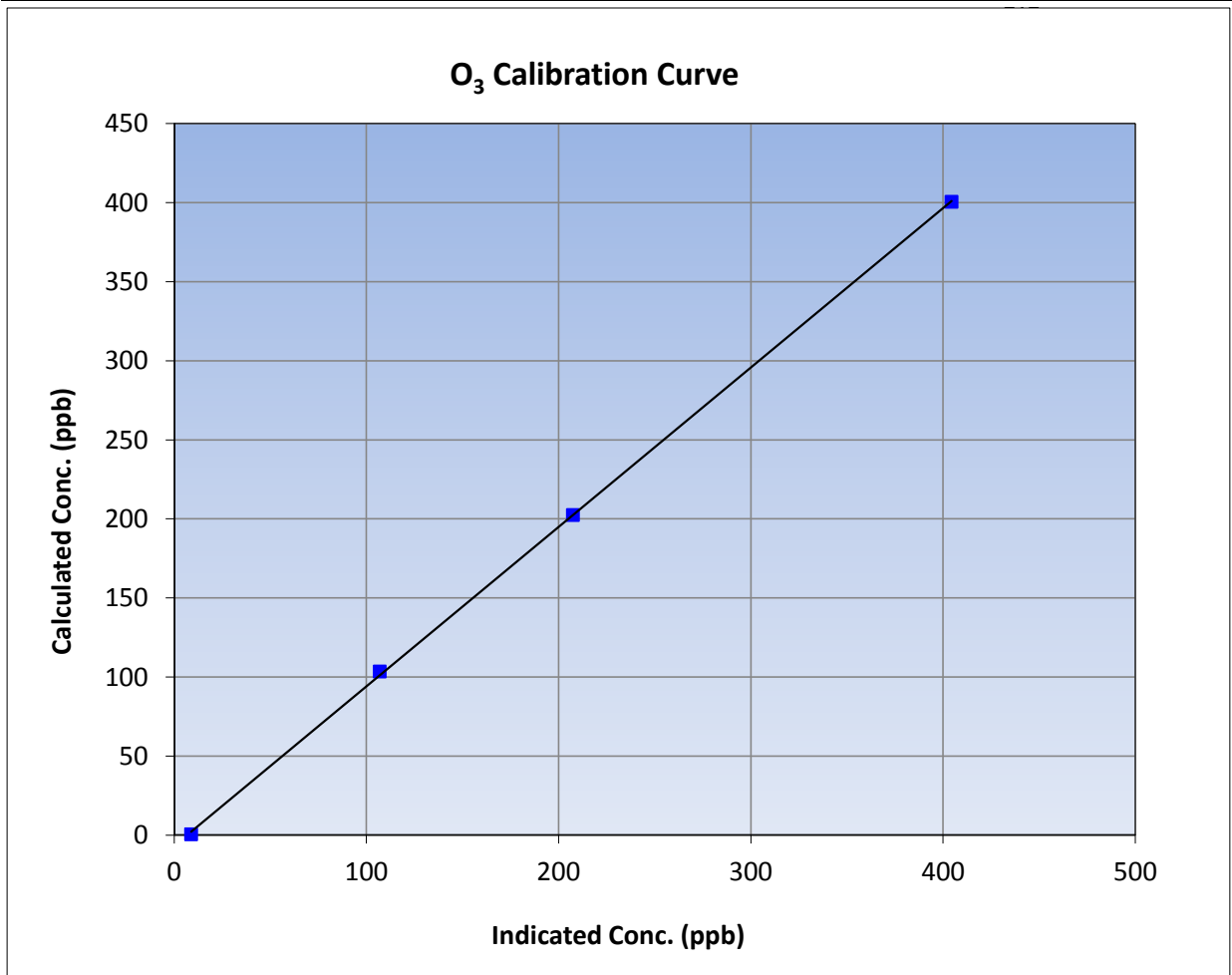
Version-03-2017

### Station Information

Calibration Date	December 30, 2017	Previous Calibration	December 20, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	11:25
Analyzer make	Teledyne T400	Analyzer serial #	824

### Calibration Data

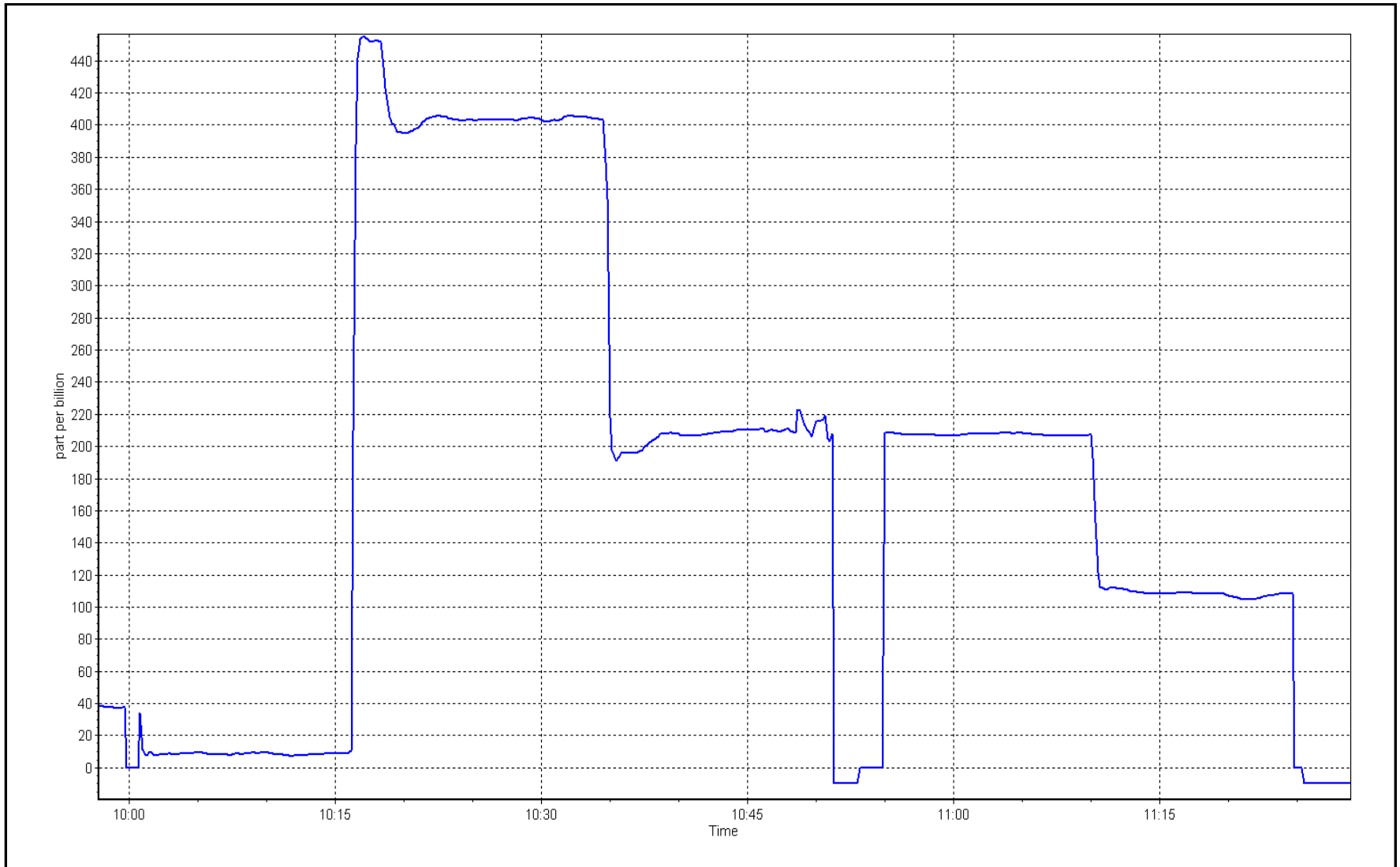
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	8.5	----	Correlation Coefficient	≥0.995	
400.0	404.1	0.9899			
202.0	207.1	0.9754			
103.0	106.6	0.9662			
			Slope	1.008146	0.90 - 1.10
			Intercept	-6.804190	+/- 10



O<sub>3</sub> Calibration Plot

Date: December 30, 2017

Location: Wapasu









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

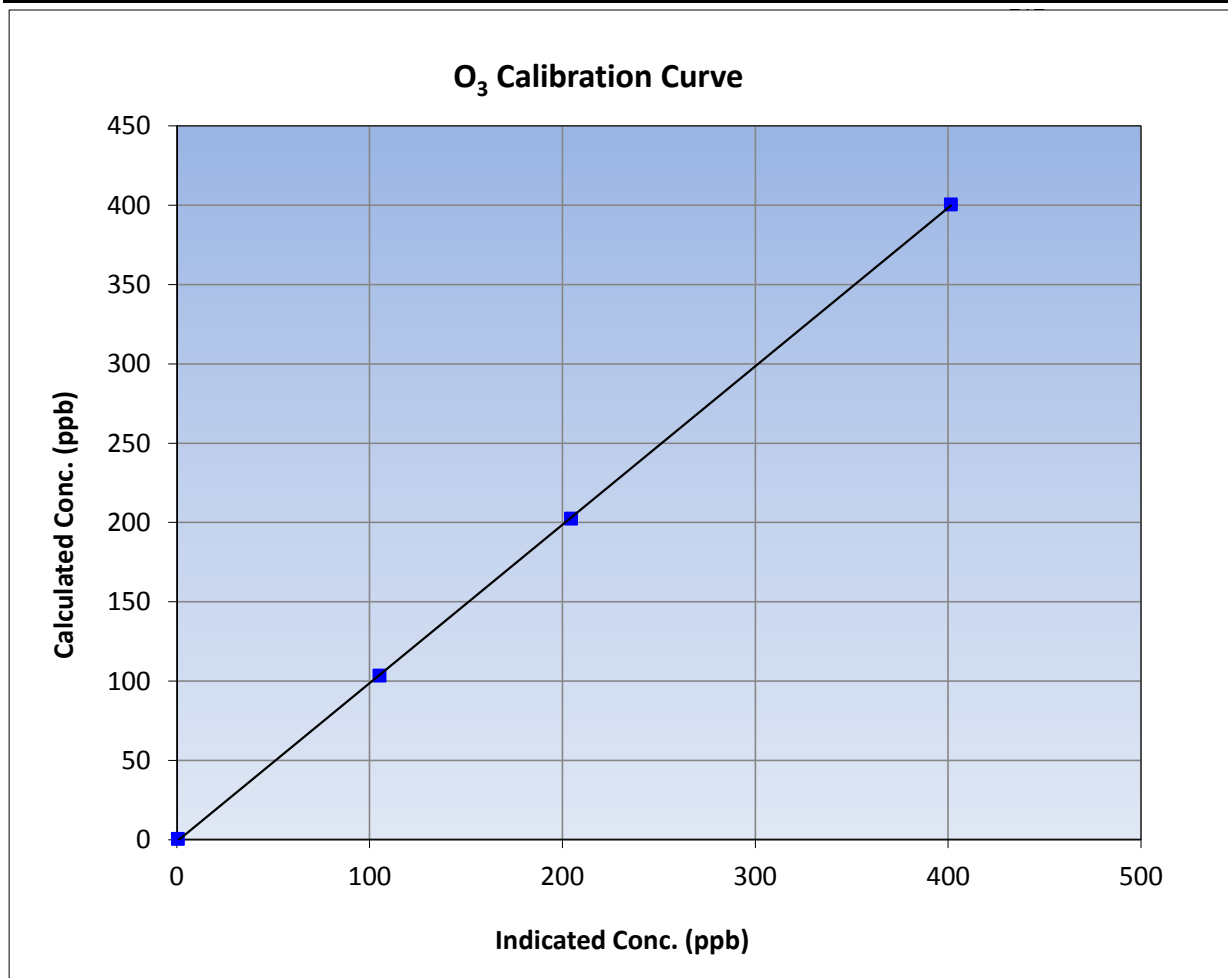
Version-03-2017

### Station Information

Calibration Date	December 30, 2017	Previous Calibration	
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:30	End Time (MST)	13:26
Analyzer make	Teledyne T400	Analyzer serial #	2962

### Calibration Data

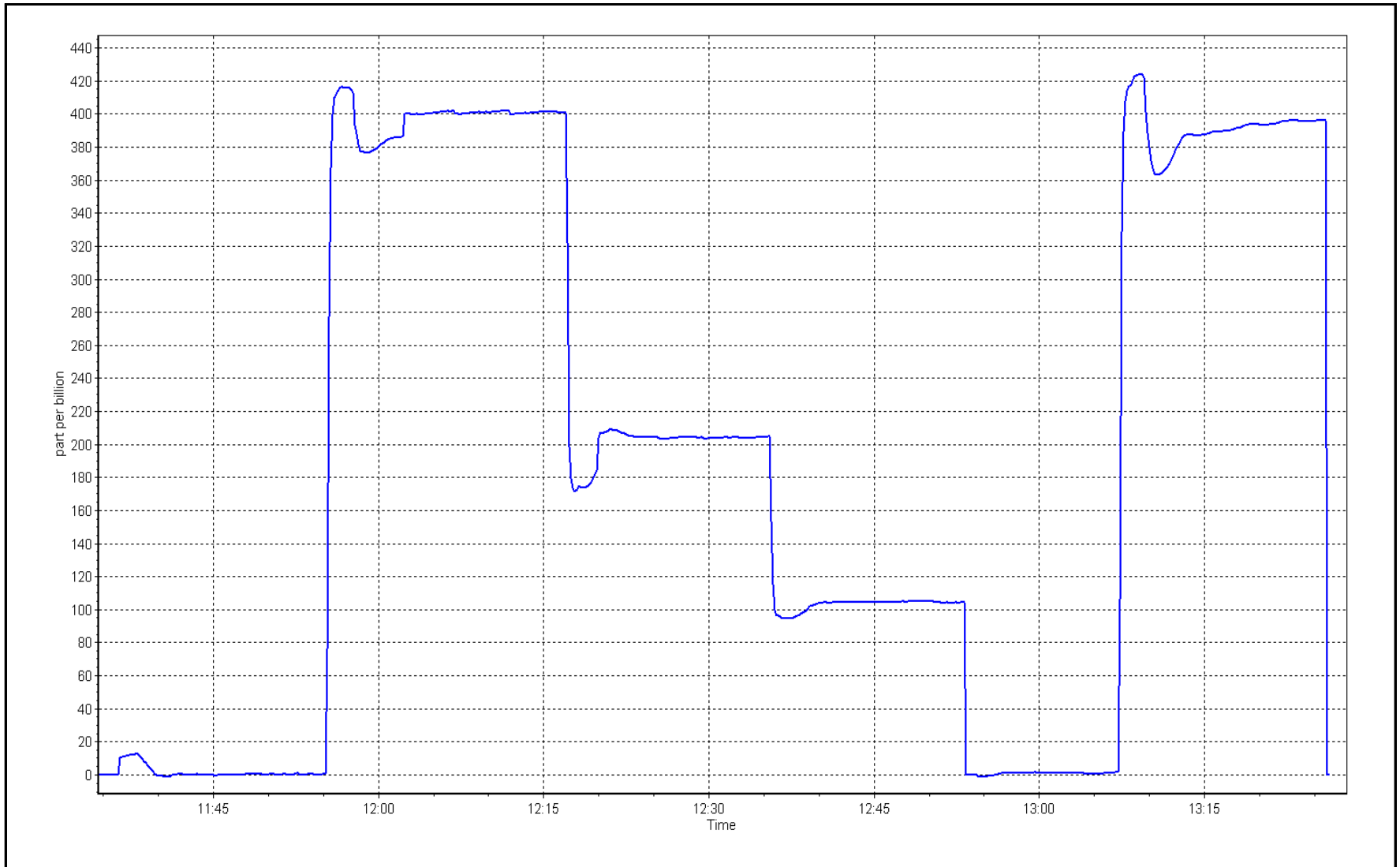
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.3	----	Correlation Coefficient	0.999980	≥0.995
400.0	401.1	0.9973			
202.0	204.1	0.9897	Slope	0.998657	0.90 - 1.10
103.0	104.8	0.9828			
			Intercept	-1.086439	+/- 10



O<sub>3</sub> Calibration Plot

Date: December 30, 2017

Location: Wapasu





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Wapasu	Station number:	AMS 17
Calibration Date:	December 19, 2017	Last Cal Date:	November 14, 2017
Start time (MST):	7:55	End time (MST):	14:24
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000753	Cal Gas Expiry Date	2/22/2020
NOX Cal Gas Conc.	<u>51.0</u> ppb	NO Cal Gas Conc.	<u>51.0</u> ppb
Calibrator Model	API T700	Serial Number	3252
ZAG make/model	API T701	Serial Number	4427

### Analyzer Information

Analyzer make: API T200		Analyzer serial #: 722	
	<u>Start</u>	<u>Finish</u>	
NO coefficient	0.924	0.924	NOX Range (ppb) 0 - 1000 ppb
NOX coefficient	0.926	0.926	PMT Temperature 7.0 7.0
NO2 coefficient	1.000	1.000	Reaction cell Press 3.3 3.3
NO bkgrnd	0.8	0.8	Sample Flow 446 446
NOX bkgrnd	1.6	1.6	HVPS Voltage 781 781

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.996075	0.983618
NO <sub>x</sub> Cal Offset	1.970262	3.050189
NO Cal Slope	0.999286	0.988324
NO Cal Offset	1.795797	2.628054
NO <sub>2</sub> Cal Slope	1.013435	1.035071
NO <sub>2</sub> Cal Offset	0.088680	-2.969159



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
as found span	4926	78.4	799.0	799.0	0.0	809.6	806.3	3.4	0.9869	0.9909
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	0.1	-0.3	----	----
high point	4926	78.4	799.0	799.0	0.0	810.8	807.3	3.4	0.9854	0.9897
second point	4965	39.2	399.5	399.5	0.0	401.0	399.6	1.3	0.9963	0.9998
third point	4985	19.6	199.7	199.7	0.0	197.5	197.1	0.4	1.0113	1.0134
as left zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.2	----	----
as left span	4926	78.4	799.0	361.2	437.8	787.0	351.7	434.6	1.0152	1.0270
<b>Average Correction Factor</b>									0.9977	1.0009

Corrected As found    NO<sub>x</sub> = 810.1 ppb  
 Previous Response    NO<sub>x</sub> = 800.2 ppb

NO = 806.7 ppb  
 NO = 797.8 ppb

\*Percent Change    NO<sub>x</sub> = -1.2%  
 \*Percent Change    NO = -1.1%  
 \* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	808.5	805.9	2.6	0.9882	0.9914	----	----
1st NO2 (400 ppb O3)	361.2	444.7	791.8	361.2	430.5	1.0091	----	1.0330	96.8%
2nd NO2 (200 ppb O3)	601.1	204.8	804.4	601.1	203.3	0.9933	----	1.0074	99.3%
3rd NO2 (100 ppb O3)	677.0	128.9	807.0	677.0	130.0	0.9901	----	0.9915	100.9%
2nd NO ref point	----	0.0	802.7	800.3	2.4	0.9954	0.9983	----	----
<b>Average Correction Factor</b>						0.9969	0.9949	1.0106	99.0%

Notes:

no maintenance or adjustments done, @nd NO ref point used due instability during the GPT

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

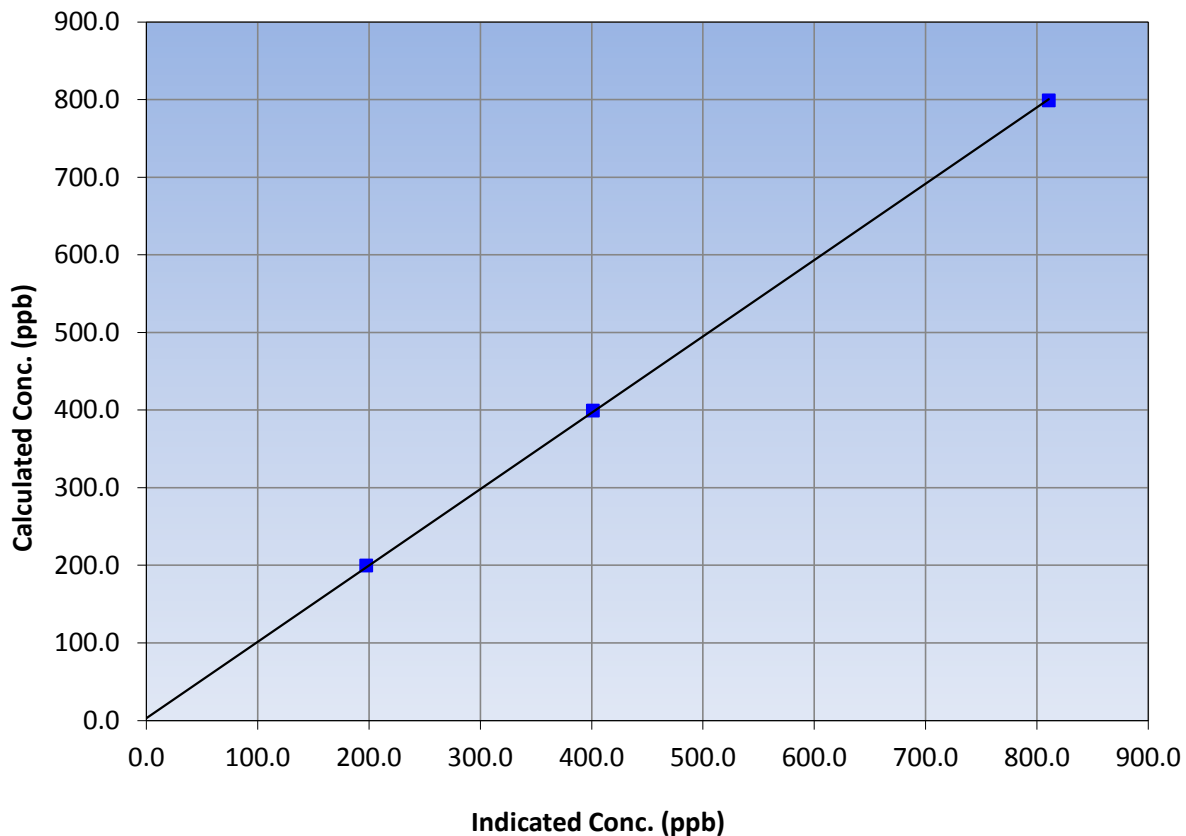
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 14, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	7:55	End Time (MST)	14:24
Analyzer make	API T200	Analyzer serial #	722

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.2	----	Correlation Coefficient	≥0.995	
799.0	810.8	0.9854			
399.5	401.0	0.9963			
199.7	197.5	1.0113			
			Slope	0.983618	0.90 - 1.10
			Intercept	3.050189	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

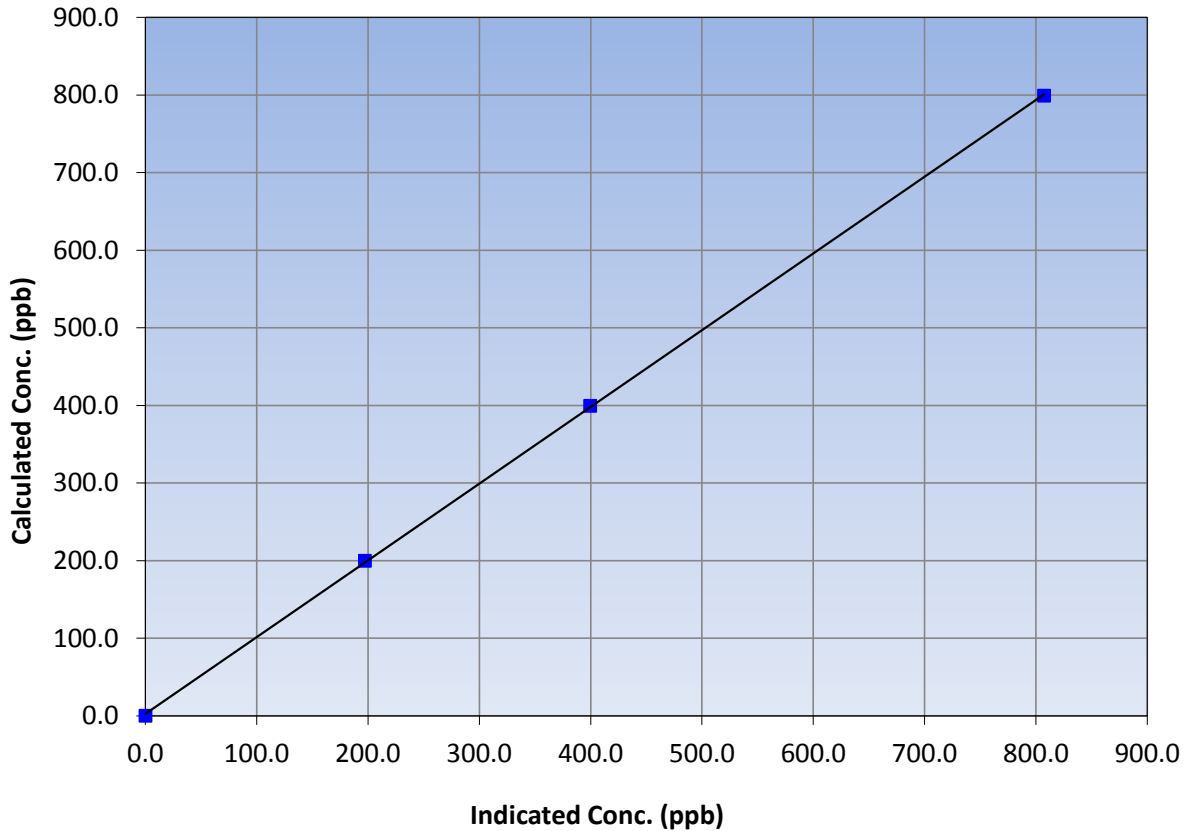
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 14, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	7:55	End Time (MST)	14:24
Analyzer make	API T200	Analyzer serial #	722

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.1	----	Correlation Coefficient	0.999946	≥0.995
799.0	807.3	0.9897			
399.5	399.6	0.9998	Slope	0.988324	0.90 - 1.10
199.7	197.1	1.0134			
			Intercept	2.628054	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

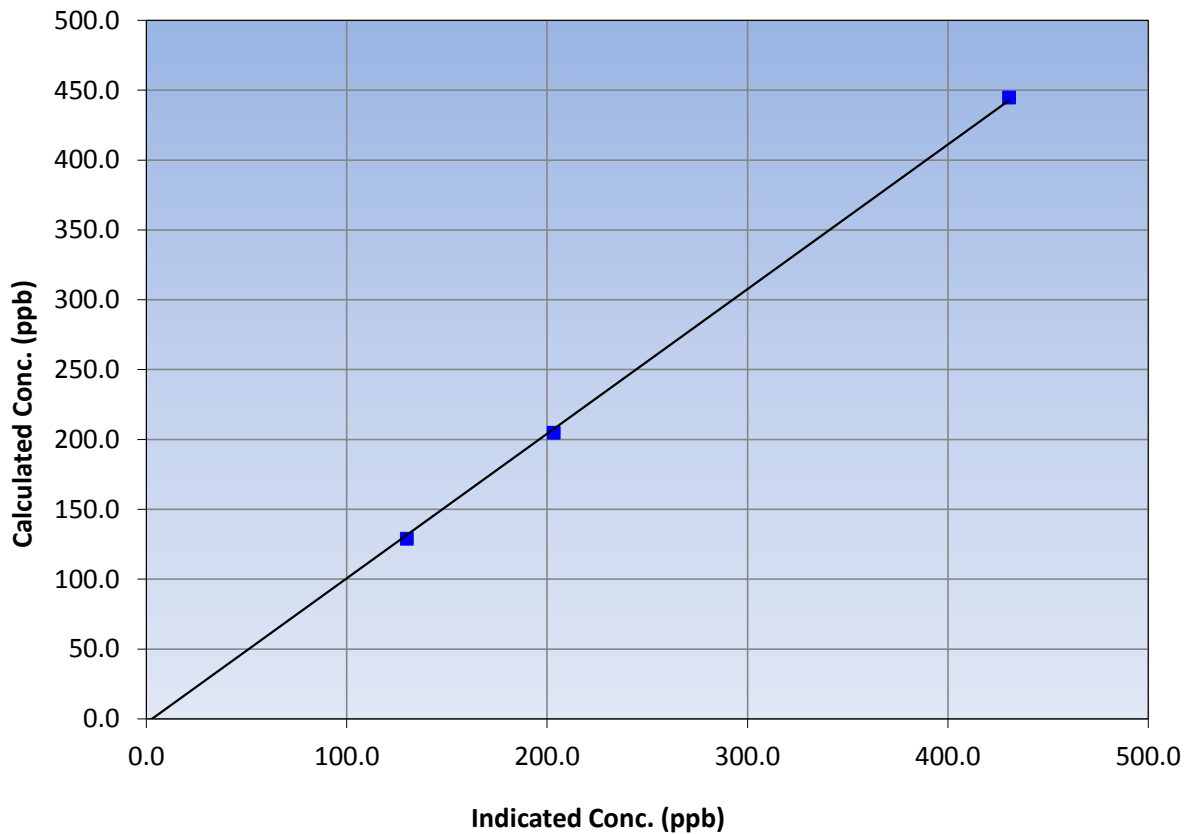
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 14, 2017
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	7:55	End Time (MST)	14:24
Analyzer make	API T200	Analyzer serial #	722

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.3	----	Correlation Coefficient	≥0.995	
444.7	430.5	1.0330			
204.8	203.3	1.0074			
128.9	130.0	0.9915			
			Slope	1.035071	0.90 - 1.10
			Intercept	-2.969159	+/-20

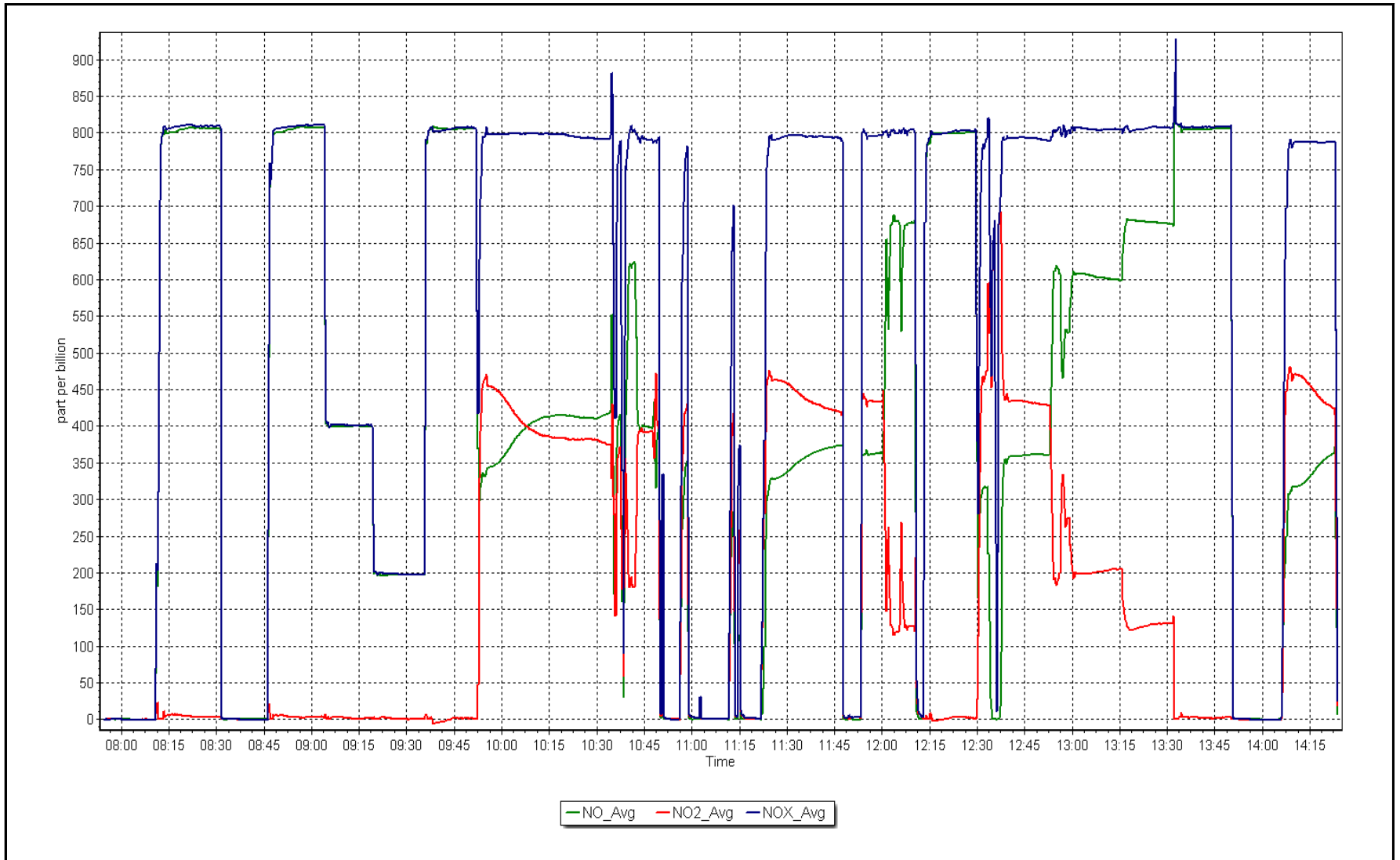
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: December 19, 2017

Location: Wapasu







# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Wapasu	Station number:	AMS 17
Calibration Date:	December 20, 2017	Last Cal Date:	November 16, 2017
Start time (MST):	9:13	End time (MST):	10:03
Sharp Model:	5030	S/N:	CM-2390
Particulate Fraction:	PM2.5	C14 Source S/N:	10391
Flow Meter Make/Model:	Delta Cal	S/N:	1450
Temp/RH standard:	Delta Cal	S/N:	1450

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b><i>(Limits)</i></b>
T1 (°C)	-18	-19	-18	<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
P3 (hPa)	953	950	953	<input type="checkbox"/>	<b><i>+/- 13 hPa</i></b>
flow (LPH)	1000	1020	1000	<input type="checkbox"/>	<b><i>+/- 50 LPH</i></b>
Nephelometer zero	-0.2	-----	-0.2	<input type="checkbox"/>	<b><i>+/- 0.5 ug/m3</i></b>
Concentration zero	-0.2	-----	-0.2	<input type="checkbox"/>	<b><i>+/- 0.5 ug/m3</i></b>
Instrument Clock:	Verified	<input type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test: Date of check: \_\_\_\_\_ Last Cal Date: October 30, 2017  
 Flow w/o adaptor: \_\_\_\_\_ Flow w/ adaptor: \_\_\_\_\_

***(Limit) 0.4 LPM***

Adjusted

Foil Calibration

***(Limit) +/- 5% of previous***

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>2519</u>	
Foil Mass: _____	Foil Mass: <u>1326</u>	
Calibration Date: _____	Calibration Date: <u>30/10/2017</u>	
Correction Factor: _____	Correction Factor: <u>7090</u>	<u>---</u>

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b><i>(Limits)</i></b>
T2 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
T3 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
T4 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
RH (%)				<input type="checkbox"/>	<b><i>+/- 10%</i></b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes:

No adjustments done. Cyclone head cleaned

Calibration by: Melissa Lemay



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 18  
STONY MOUNTAIN  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	707	37	37	100	5	0	1	0
TRS(ppb) Average	709	35	35	100	1	0	0	0
THC(ppm) Average	706	37	38	99.87	2.1	-	2	-
NMHC(ppm) Average	706	37	38	99.87	0.065	-	0.008	-
CH4(ppm) Average	706	37	38	99.87	2.1	-	2	-
O3 (ppb) Average	709	35	35	100	46	0	43	-
NO2 (ppb) Average	707	37	37	100	8	0	2	-
NO (ppb) Average	707	37	37	100	3	-	0	-
NOX (ppb) Average	707	37	37	100	8	-	2	-
PM2.5 (ug/m3) Average	742	2	2	100	17.3	-	7.3	0
Wind Speed 10 m (km/h) Average	744	0	0	100	21	-	17	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	0	-	-
Temperature 2 m (C) Average	744	0	0	100	7.7	-	4.9	-
Relative Humidity (%) Average	744	0	0	100	100	-	90.0	-
Precipitation (mm) Total	744	0	0	100	1.9	-	4.4	-
Leaf Wetness (% of range) Average	744	0	0	100	41	-	11.0	-
Global Solar Radiation (W/m2) Average	744	0	0	100	295	-	46.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.4	1	-	0	0	0	0	0	1	5
TRS (ppb) Average	709	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	706	1.92	0	-	1.9	1.9	1.9	1.9	1.9	2	2.1
NMHC(ppm) Average	706	0.001	0.005	-	0	0	0	0	0	0	0.065
CH4(ppm) Average	706	1.92	0	-	1.9	1.9	1.9	1.9	1.9	1.9	2.1
O3 (ppb) Average	709	34.9	4	-	19	29	32	35	38	41	46
NO2 (ppb) Average	707	1.2	1	-	0	0	1	1	2	3	8
NO (ppb) Average	707	0	0	-	0	0	0	0	0	0	3
NOX (ppb) Average	707	1.2	1	-	0	0	1	1	1	3	8
PM2.5 (ug/m3) Average	742	3.18	2.3	-	0.4	1.3	1.7	2.4	4	5.6	17.3
Wind Speed 10 m (km/h) Average	744	10.4	4	-	0	5	7	10	13	16	21
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-10.48	11.8	-	-34.3	-28.3	-21.9	-6.9	-0.3	2.4	7.7
Relative Humidity (%) Average	744	75.5	12	-	35	61	70	76	83	89	100
Precipitation (mm) Total	744	-	-	12.71	-	-	-	-	-	-	-
Surface Wetness (% of range) Average	744	3.1	3	-	1	2	2	2	3	4	41
Global Solar Radiation (W/m2) Average	744	27.6	56	-	0	0	0	1	23	117	295

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	18 Dec 2017 14:00	18 Dec 2017 14:00	1	Maintenance - replaced fuel cylinder



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Stony Mountain - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 5 ppb on Dec 28 13:00	Maximum Daily Average: 1.3 ppb on Dec 24		Hours of Data:	707
Minimum Value: 0 ppb on Dec 9 03:00	Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Missing Data:	37
Maximum Diurnal Average: 0.6 ppb at hour 20	Minimum Diurnal Average: 0.3 ppb at hour 16		Hours of Calibration:	37
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 4		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0.4	1
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	0.5	2
6-Dec	0	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Dec	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	1	2	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	Z	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	1	1	--	1
21-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0	0	0.4	2
24-Dec	0	0	2	1	Z	1	2	2	2	4	4	3	2	1	1	0	0	0	0	0	0	1	0	0	1.3	4
25-Dec	0	0	0	0	0	Z	0	0	1	2	1	0	0	1	1	1	2	2	2	2	1	1	0	0	0.9	2
26-Dec	Z	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	2	5	4	2	2	3	1.1	5
27-Dec	3	Z	2	2	4	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	5
28-Dec	0	0	Z	0	0	0	0	1	1	1	1	2	5	3	1	0	0	0	0	0	1	1	1	1	1.0	5
29-Dec	1	1	2	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	0.5	2
0.4 0.3 0.5 0.4 0.5 0.5 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.3 0.3 0.3 0.3 0.5 0.6 0.5 0.4 0.4 0.4																								Diurnal Average		
3 1 2 2 4 5 3 2 2 2 4 4 5 3 1 1 2 2 2 5 4 2 2 3																								Diurnal Maximum		

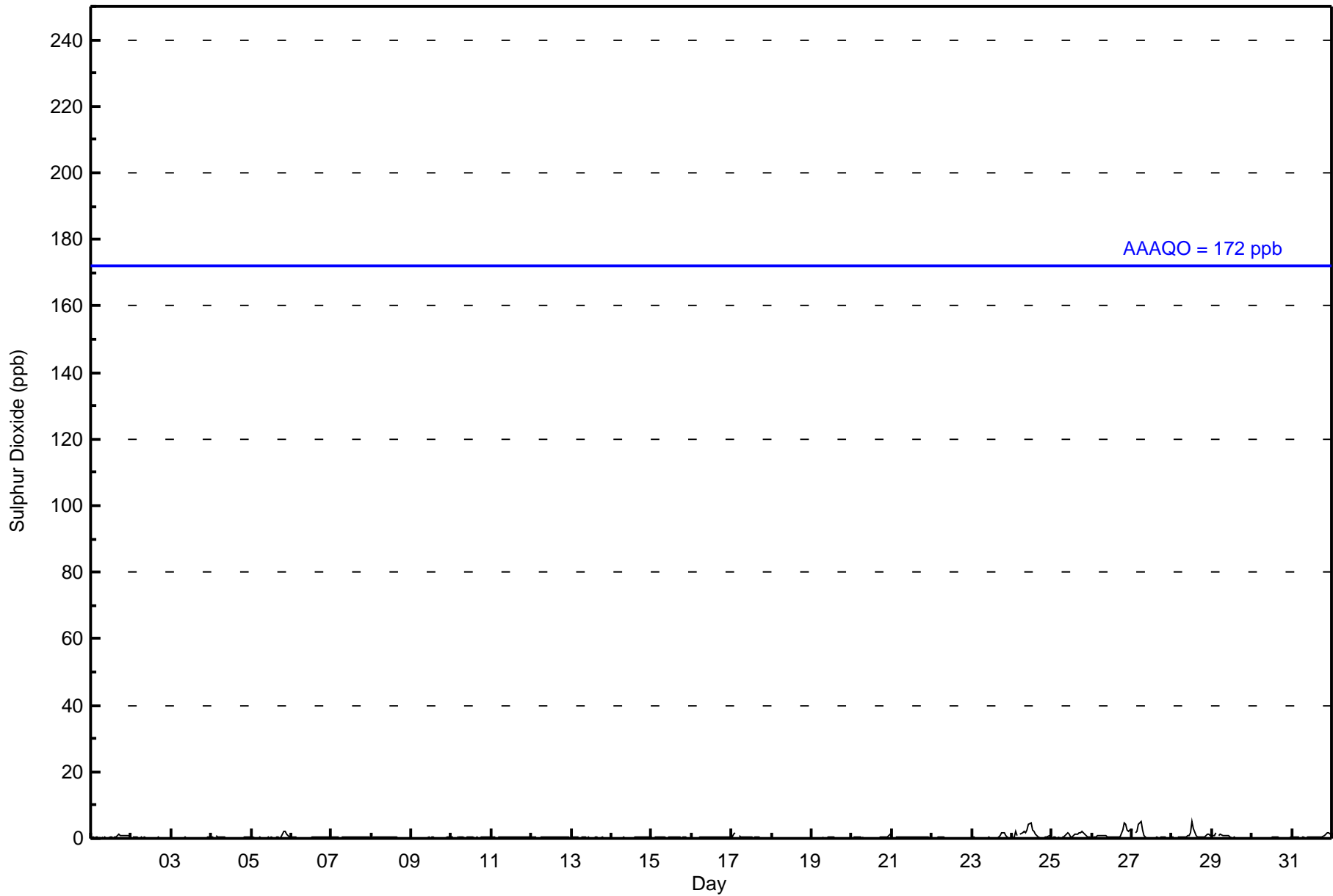
Z - zerospan C - Calibration

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



Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Stony Mountain - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	707	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Stony Mountain - December 2017**

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	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707

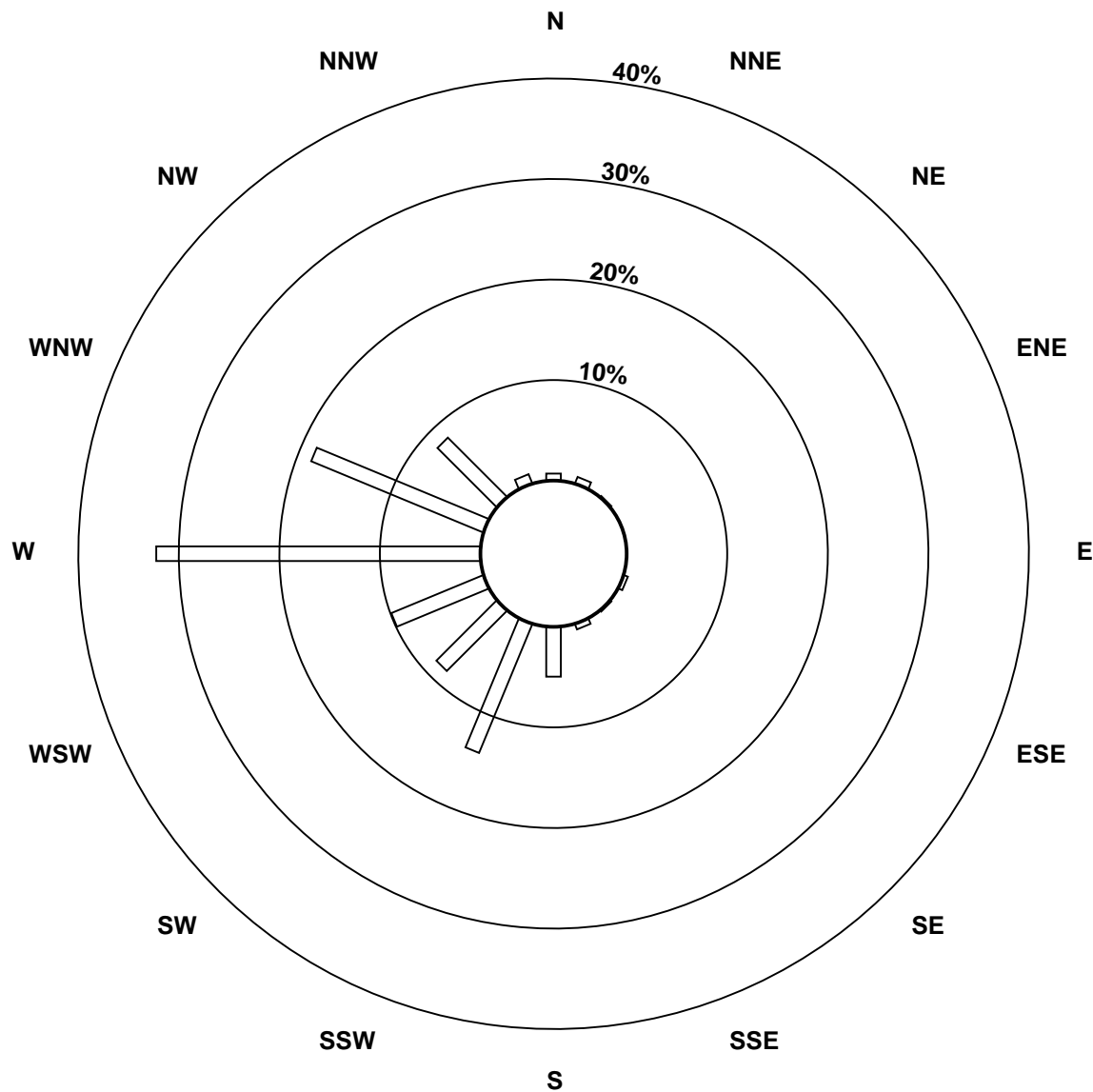
Total Number of Valid Hours: 707

Total Number of Hours: 744

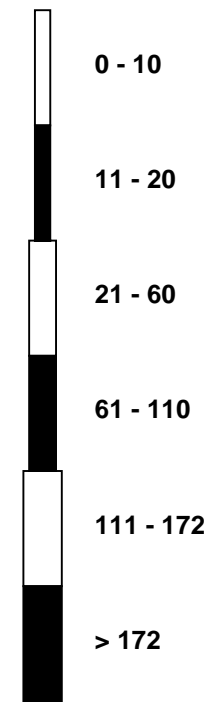


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

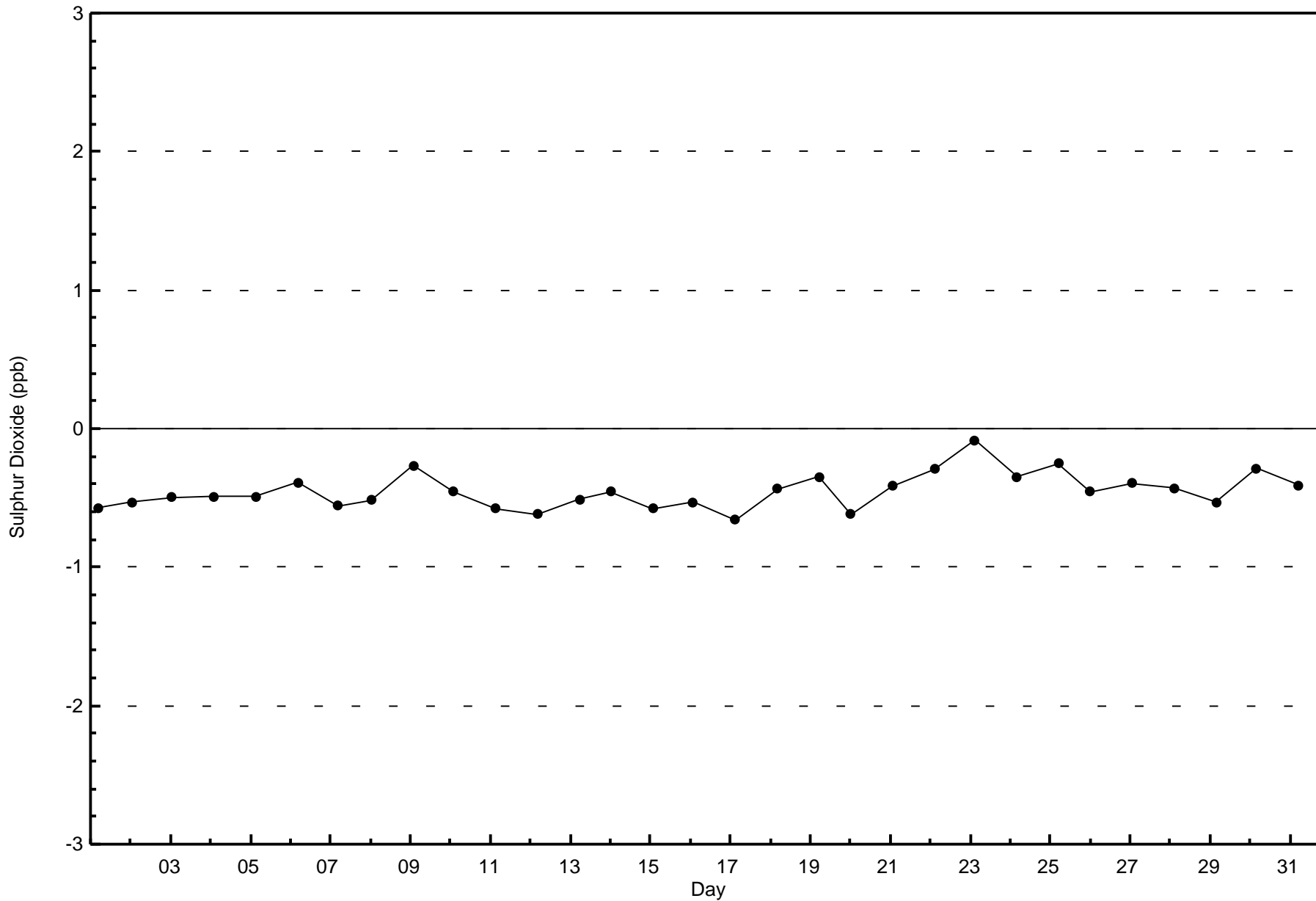
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Stony Mountain (AMS 18)

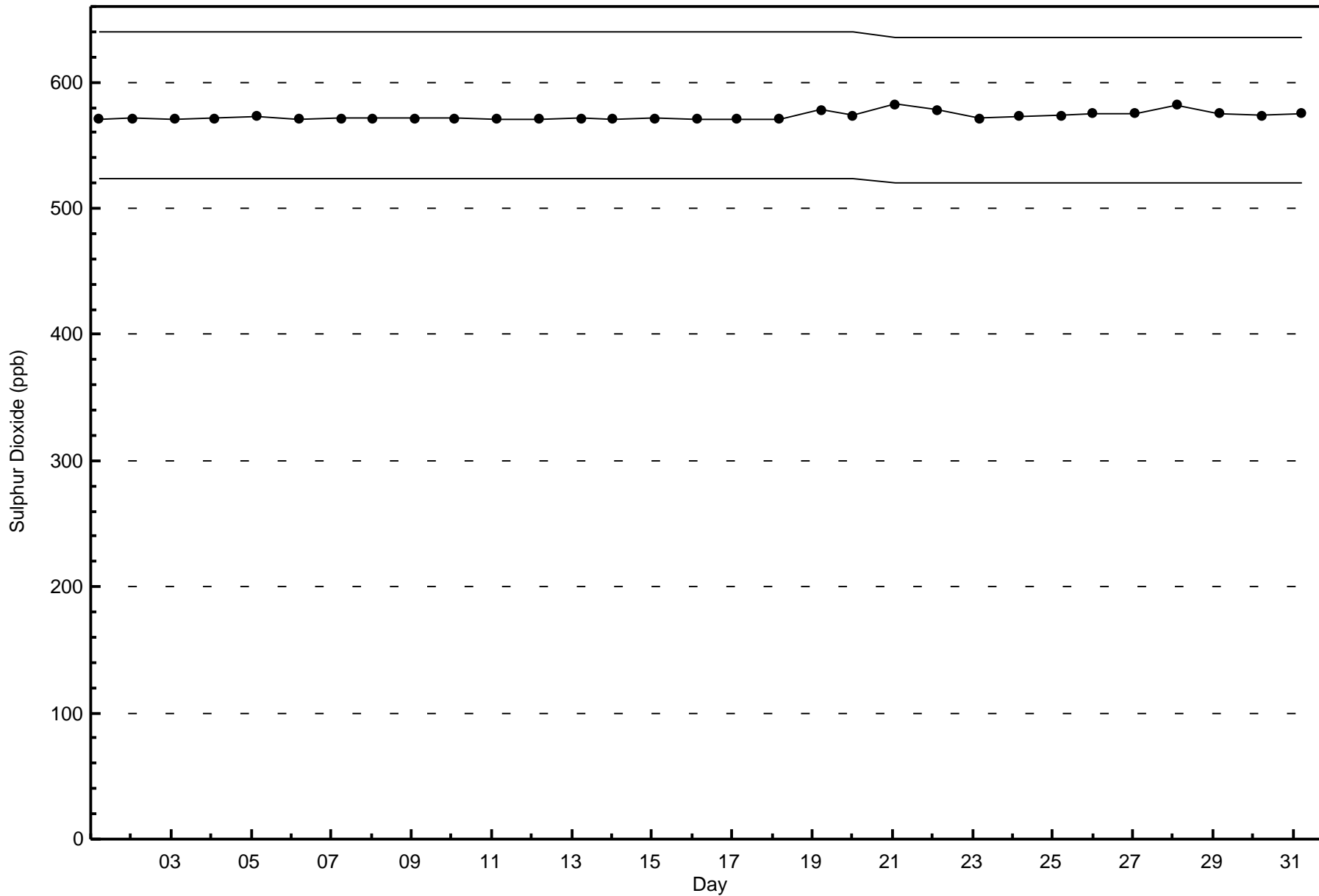


Classes (ppb)



Total Number of Valid Hours: 707







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

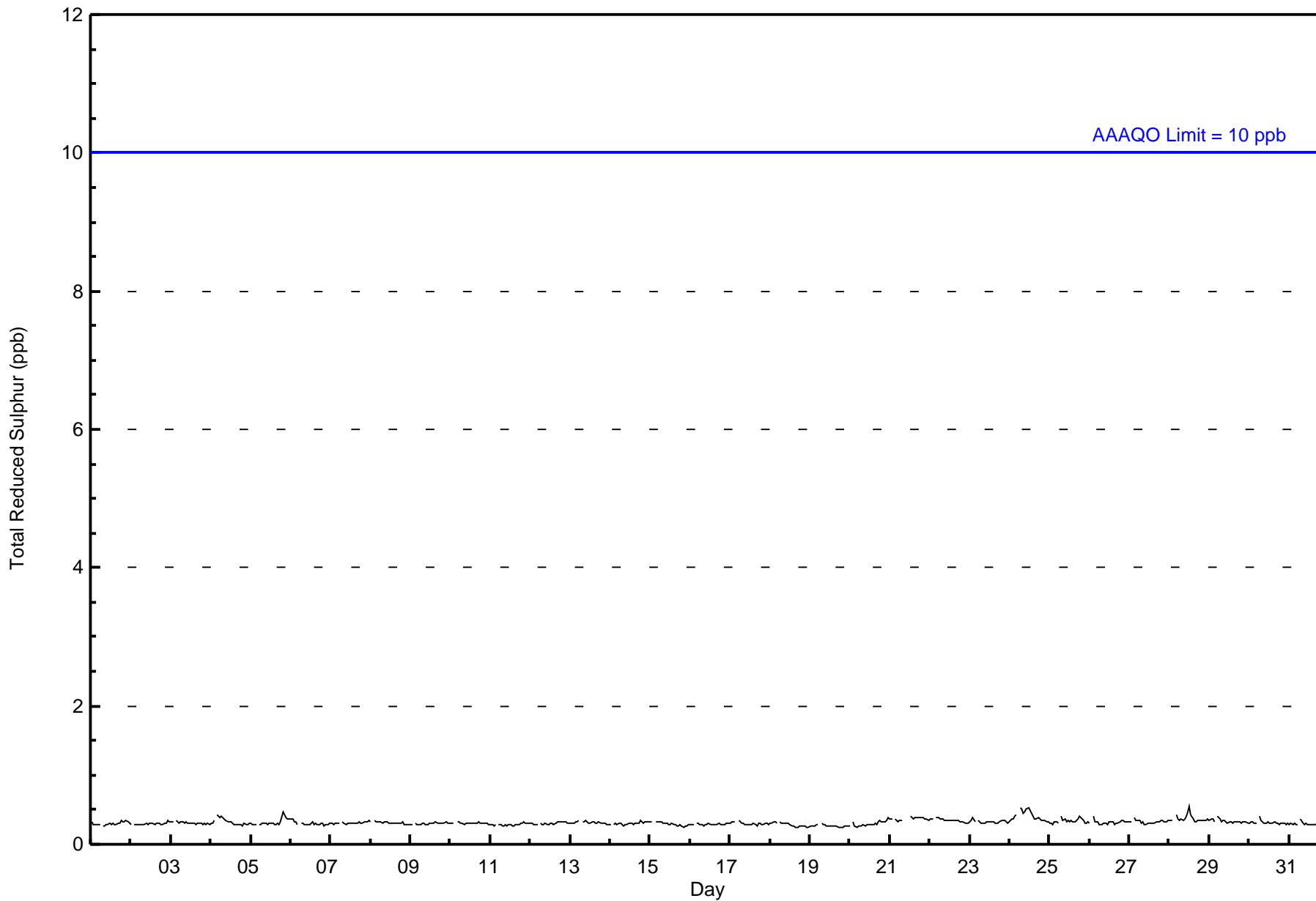
Stony Mountain - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 1 ppb on Dec 28 13:00      Maximum Daily Average: 0.4 ppb on Dec 24																	Hours in Service: 744 Hours of Data: 709 Hours of Missing Data: 35 Hours of Calibration: 35 Percent Operational Time: 100.0										
Minimum Value: 0 ppb on Dec 19 18:00      Minimum Daily Average: 0.3 ppb on Dec 19 Maximum Diurnal Average: 0.3 ppb at hour 7      Minimum Diurnal Average: 0.3 ppb at hour 16 Monthly Average: 0.3 ppb      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	0	Z	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
28-Dec	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	0.4	1
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
0.3 0.3																								Diurnal Average			
0 0 0 0 0 0 0 1 1 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0																								Diurnal Maximum			
Z - zerospan      C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Reduced Sulphur (TRS) - ppb**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	5	4	1	0	0	3	1	4	35	103	62	69	228	127	59	8	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	5	4	1	0	0	3	1	4	35	103	62	69	228	127	59	8	709

Total Number of Valid Hours: 709

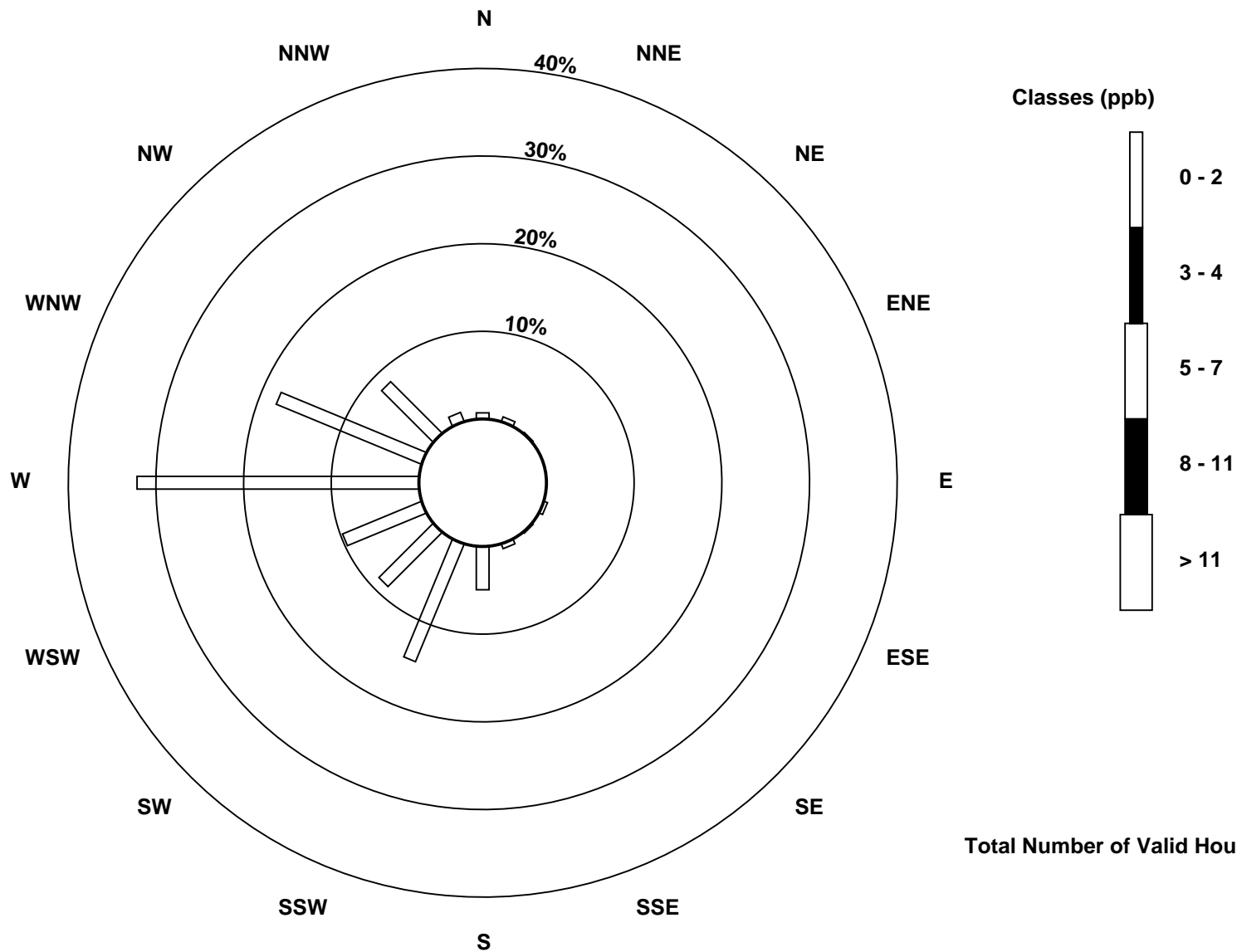
Total Number of Hours: 744



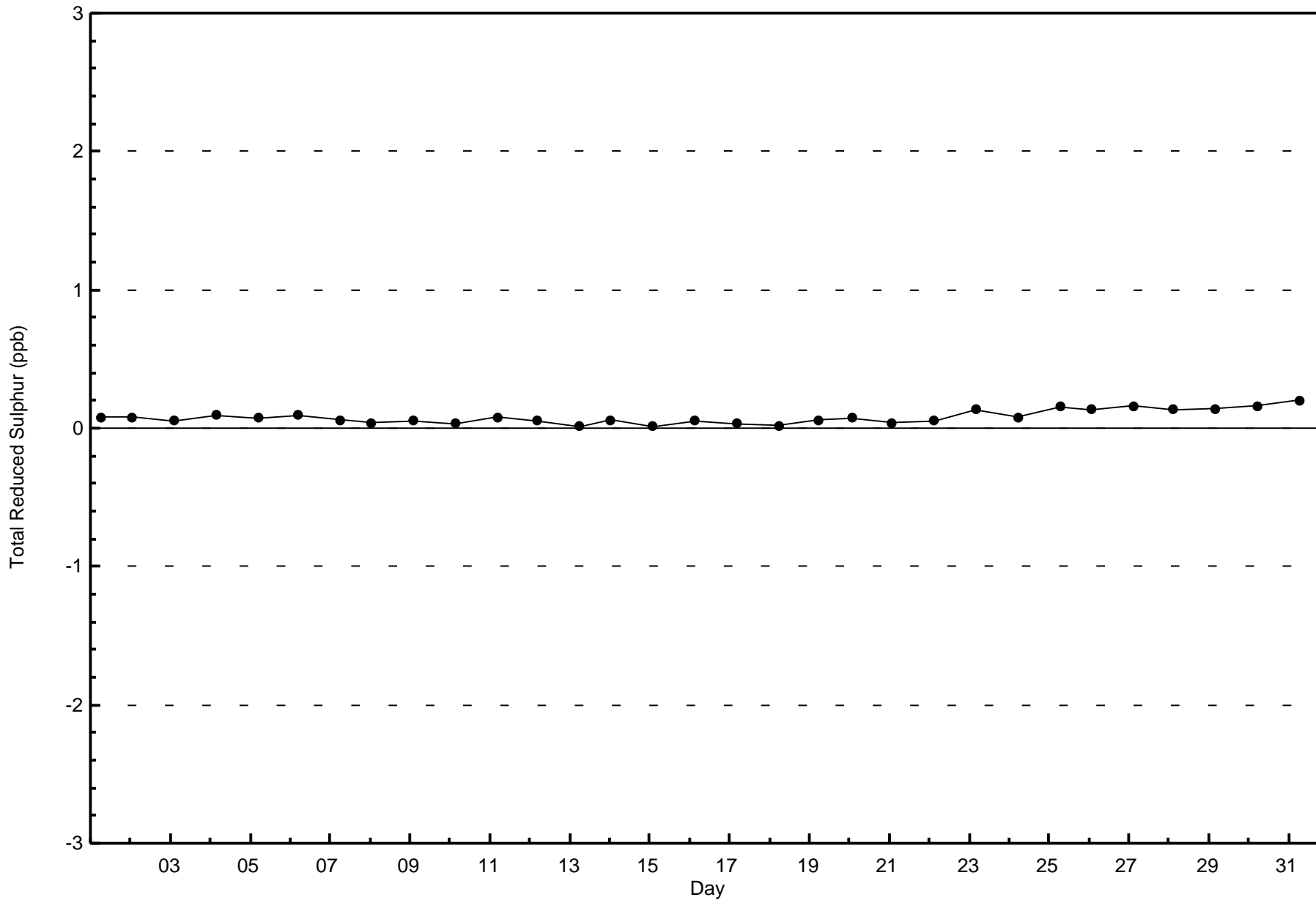


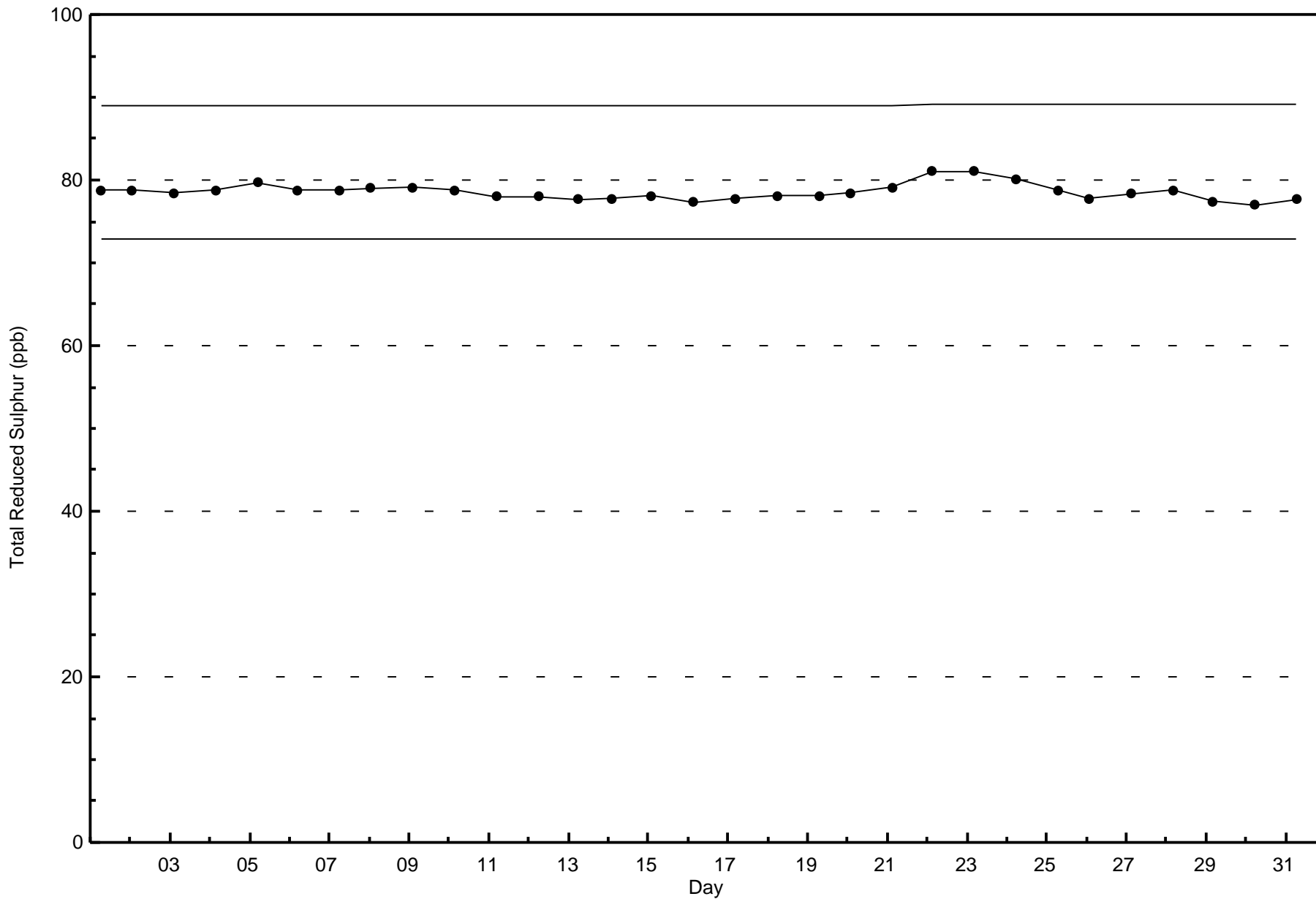
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Reduced Sulphur (TRS) - ppb  
Stony Mountain (AMS 18)



Total Number of Valid Hours: 709







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

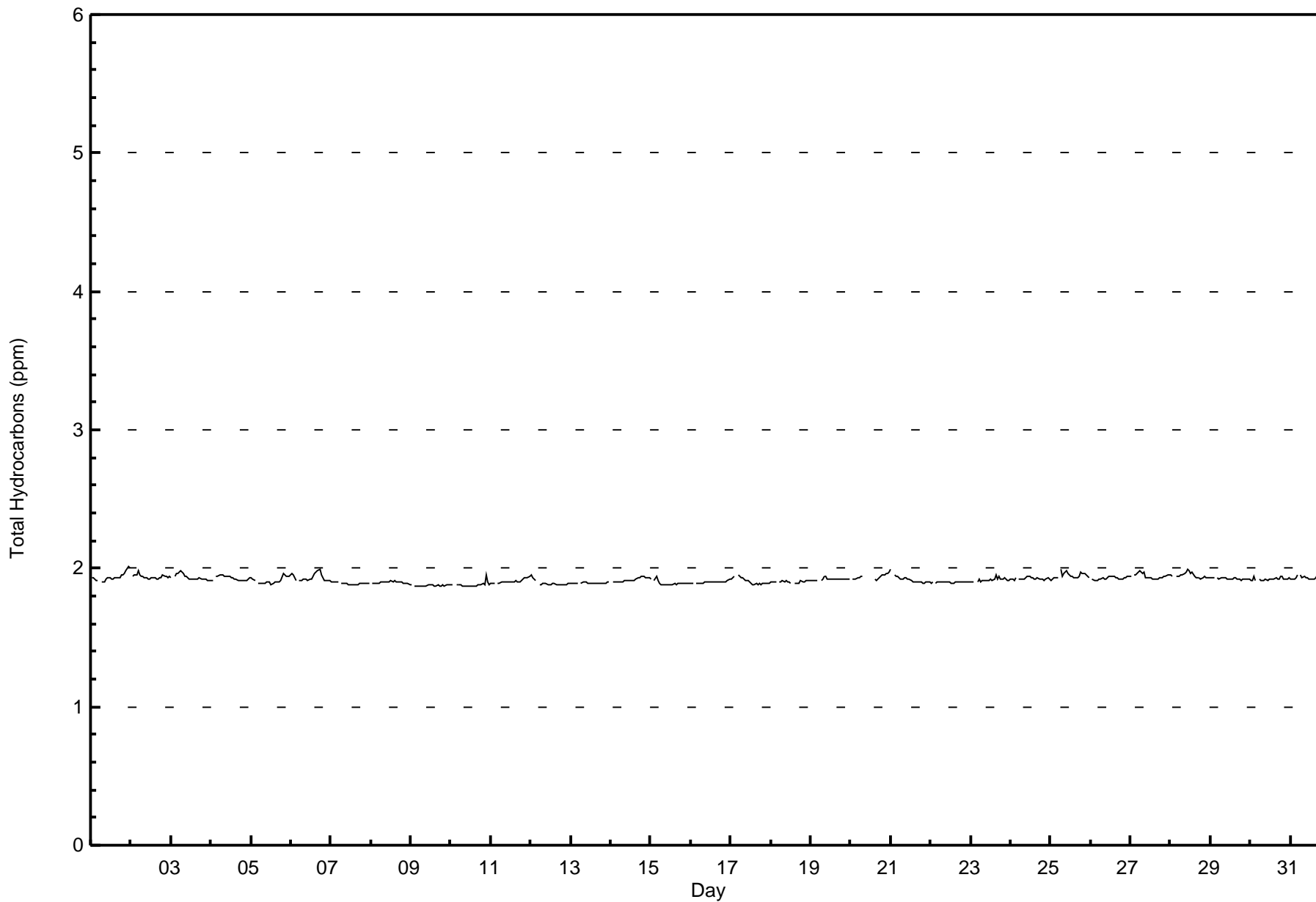
**Total Hydrocarbons (THC) - ppm**  
**Stony Mountain - December 2017**

Maximum Value: 2.1 ppm on Dec 31 23:00		Maximum Daily Average: 2.0 ppm on Dec 31		Hours in Service: 744																								
Minimum Value: 1.9 ppm on Dec 10 10:00		Minimum Daily Average: 1.9 ppm on Dec 9		Hours of Data: 706																								
Maximum Diurnal Average: 1.9 ppm at hour 23		Minimum Diurnal Average: 1.9 ppm at hour 13		Hours of Missing Data: 38																								
Monthly Average: 1.92 ppm		Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 1.9 Q <sub>3</sub> = 1.9 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.0		Hours of Calibration: 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-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	
2-Dec	Z	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	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0
3-Dec	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
4-Dec	1.9	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	2.0
5-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0
6-Dec	2.0	2.0	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	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
7-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
8-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
9-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
10-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
11-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
12-Dec	2.0	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	2.0
13-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
14-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
15-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
16-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
17-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
18-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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
19-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
20-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	--	2.0	
21-Dec	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
22-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
23-Dec	1.9	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	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
24-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
25-Dec	1.9	1.9	1.9	1.9	1.9	Z	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	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0
26-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
27-Dec	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	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	2.0
28-Dec	2.0	1.9	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
29-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
31-Dec	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	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
																								Diurnal Average				
																								Diurnal Maximum				
Z - zerospan                      C - Calibration                      M - Maintenance																												



Wood Buffalo Environmental Association  
Hourly Averages

Total Hydrocarbons (THC) - ppm  
Stony Mountain - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	700	99.15	99.15
2.1 - 3.0	6	0.85	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Stony Mountain - December 2017**

<b>Concentration</b> <b>Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	5	5	1	0	0	3	1	4	31	96	60	70	228	130	59	7	700
2.1 - 3.0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	6
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
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	130	59	7	706

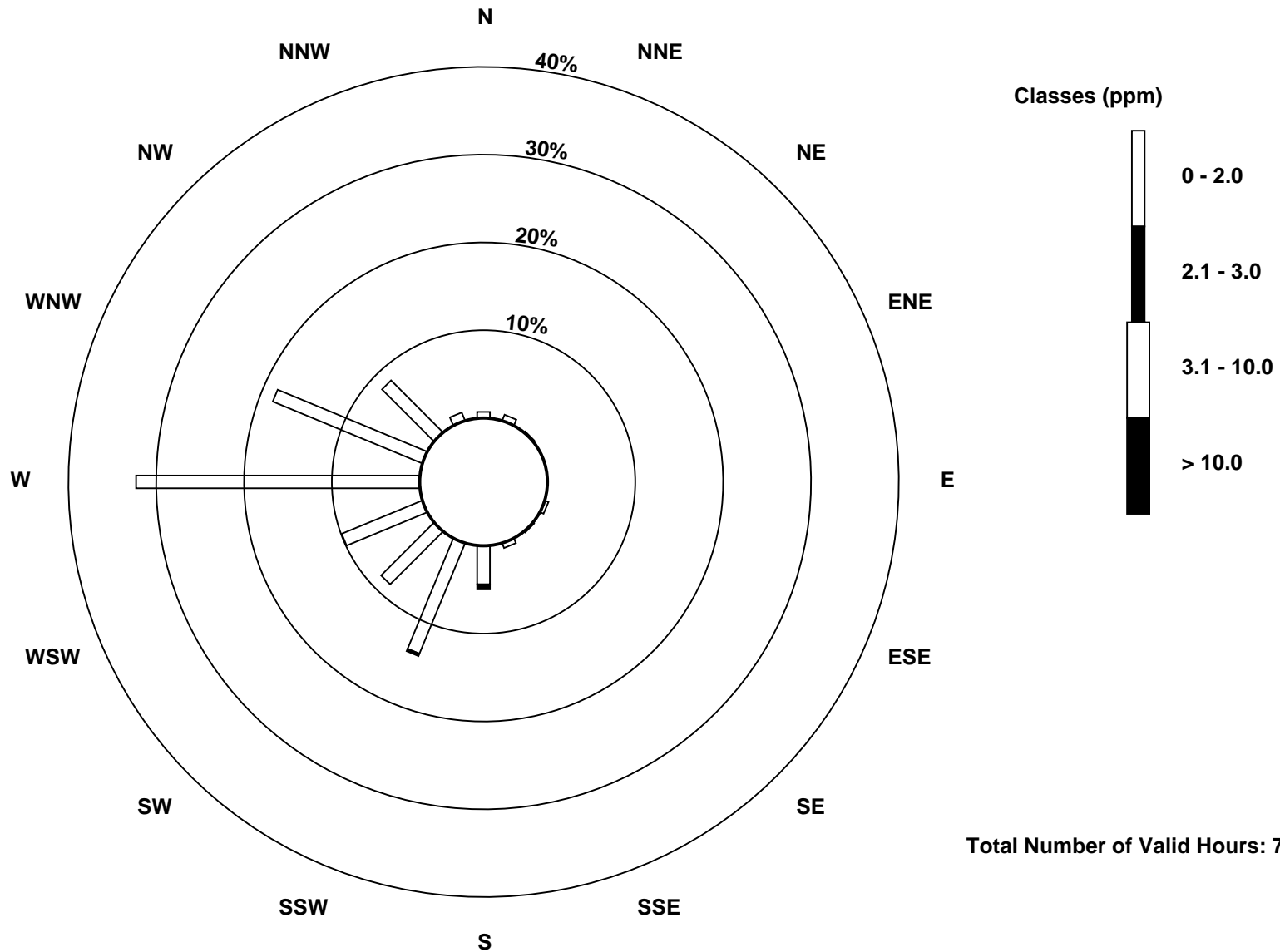
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Stony Mountain (AMS 18)



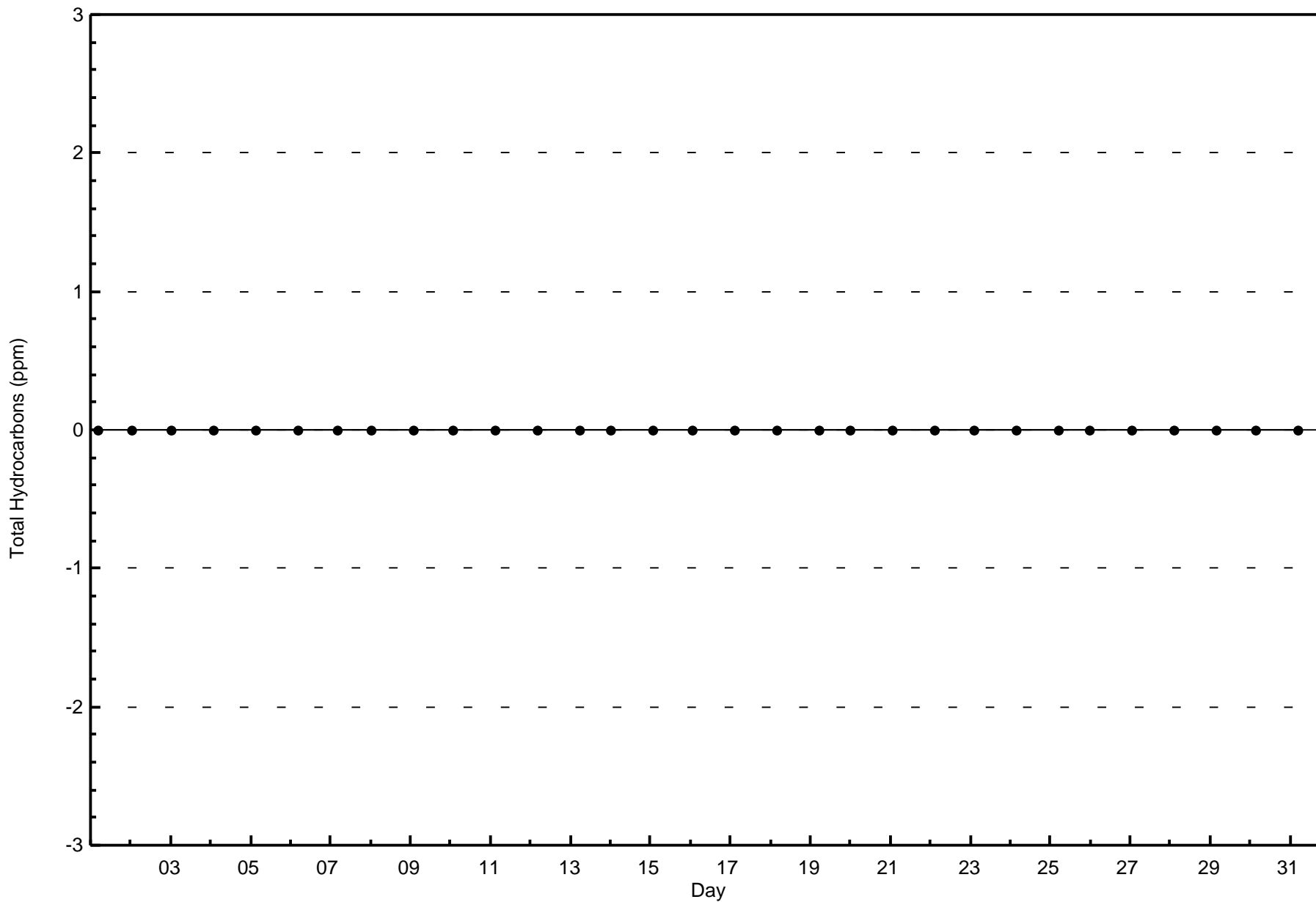
Total Number of Valid Hours: 706





Wood Buffalo Environmental Association  
Zero Responses

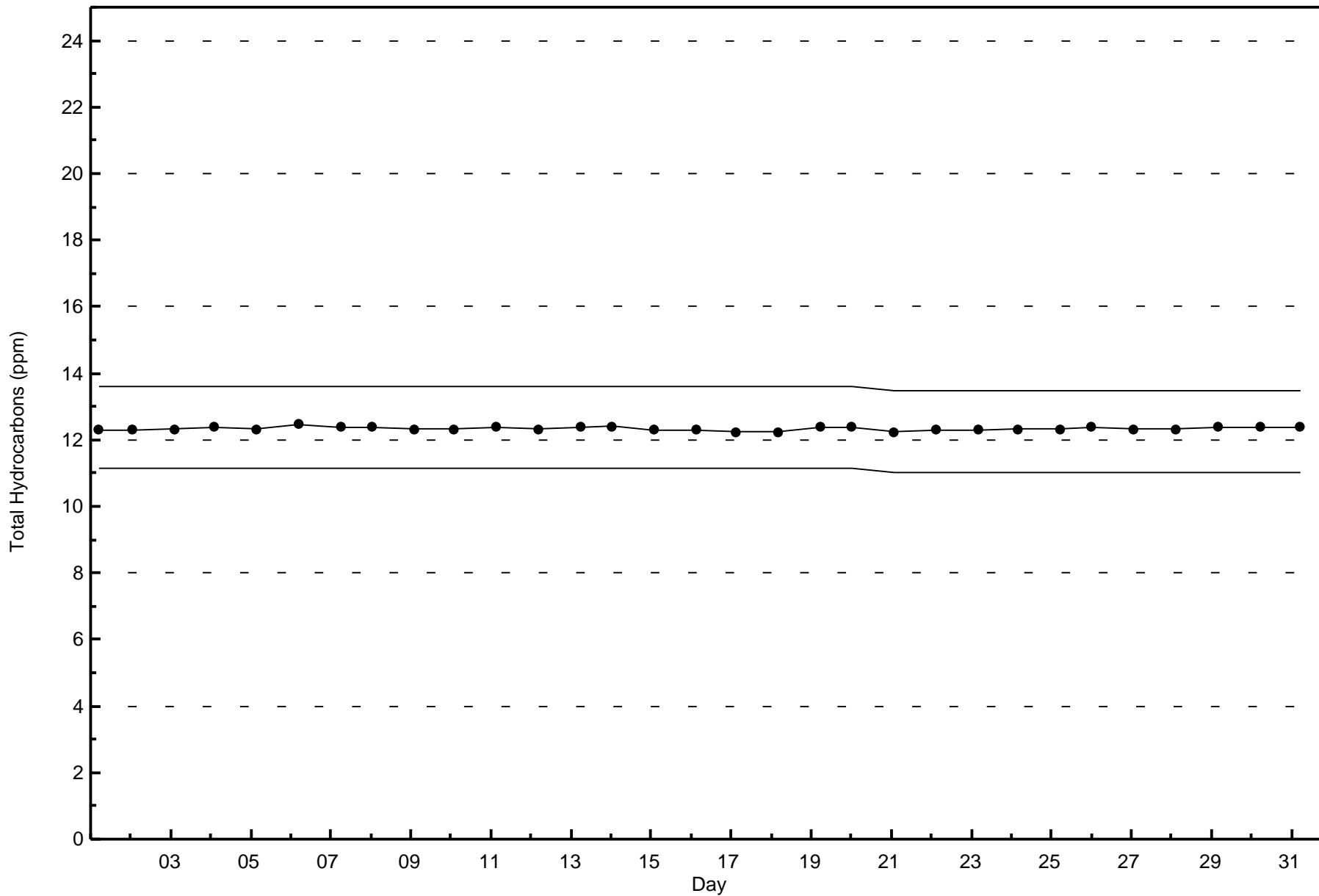
Total Hydrocarbons (THC) - ppm  
Stony Mountain - December 2017





**Wood Buffalo Environmental Association**  
**Span Responses**

**Total Hydrocarbons (THC) - ppm**  
**Stony Mountain - December 2017**



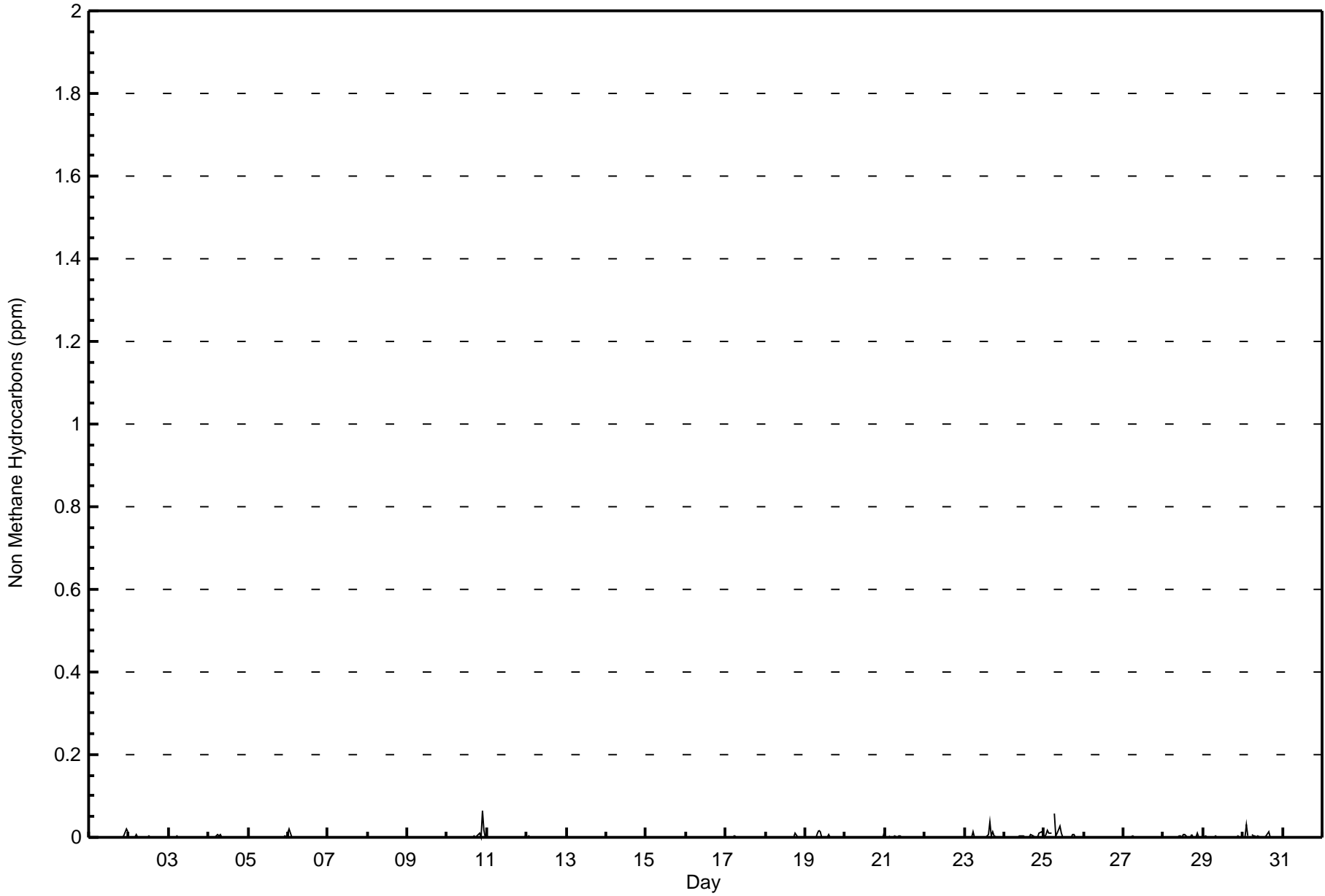


Maximum Value: 0.065 ppm on Dec 10 22:00																				Maximum Daily Average: 0.008 ppm on Dec 25					Hours in Service:	744																					
Minimum Value: 0.000 ppm on Dec 1 01:00																				Minimum Daily Average: 0.000 ppm on Dec 7					Hours of Data:	706																					
Maximum Diurnal Average: 0.003 ppm at hour 22																				Minimum Diurnal Average: 0.000 ppm at hour 12					Hours of Missing Data:	38																					
Monthly Average: 0.001 ppm																				Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0					Hours of Calibration:	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-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.004	0.020	0.015	0.002	0.020																				
2-Dec	Z	0.001	0.002	0.002	0.007	0.001	0.000	0.000	0.001	0.001	0.000	0.000	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	0.001	0.007																				
3-Dec	0.000	Z	0.000	0.001	0.001	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.003																					
4-Dec	0.000	0.000	Z	0.000	0.000	0.007	0.004	0.006	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.007																					
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.002	0.001	0.000	0.002																					
6-Dec	0.020	0.009	0.001	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	0.001	0.020																					
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
8-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
9-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
10-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.005	0.011	0.001	0.065	0.019	0.001	0.005	0.065																					
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002																					
12-Dec	0.001	0.002	0.001	0.000	Z	0.000	0.001	0.001	0.000	0.001	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	0.002																					
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001																					
14-Dec	Z	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001																					
15-Dec	0.000	Z	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001																					
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
17-Dec	0.000	0.000	0.000	Z	0.003	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003																					
18-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	M	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.001	0.011																					
19-Dec	0.000	0.001	0.000	0.000	0.000	Z	0.000	0.009	0.017	0.013	0.001	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.017																					
20-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.005	--	0.005																					
21-Dec	0.022	Z	0.003	0.001	0.001	0.001	0.002	0.000	0.003	0.004	0.002	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	0.002	0.022																					
22-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
23-Dec	0.000	0.000	0.000	Z	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.006	0.036	0.003	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.003	0.036																					
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.004	0.003	0.004	0.000	0.001	0.000	0.001	0.007	0.002	0.001	0.001	0.001	0.010	0.012	0.008	0.002	0.012																					
25-Dec	0.001	0.008	0.016	0.010	0.012	Z	0.057	0.005	0.010	0.027	0.009	0.002	0.002	0.001	0.001	0.000	0.001	0.007	0.007	0.000	0.000	0.000	0.000	0.000	0.008	0.057																					
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
27-Dec	0.000	Z	0.000	0.000	0.001	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002																					
28-Dec	0.000	0.000	Z	0.000	0.000	0.001	0.001	0.001	0.001	0.003	0.003	0.001	0.006	0.005	0.000	0.001	0.002	0.007	0.000	0.001	0.009	0.002	0.001	0.001	0.002	0.009																					
29-Dec	0.001	0.002	0.000	Z	0.000	0.000	0.000	0.003	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.003																					
30-Dec	0.000	0.000	0.030	0.003	Z	0.006	0.003	0.002	0.000	0.003	0.001	0.000	0.000	0.001	0.003	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.030																					
31-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000																					
																								Diurnal Average		0.002	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.000	0.001	0.002	0.000	0.001	0.001	0.000	0.000	0.003	0.002	0.001	
																								Diurnal Maximum		0.022	0.009	0.030	0.010	0.012	0.013	0.057	0.009	0.017	0.027	0.009	0.004	0.006	0.036	0.007	0.014	0.011	0.011	0.009	0.065	0.020	0.015
Z - zerospan                      C - Calibration                      M - Maintenance																																															



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	667	94.48	94.48
0.006 - 0.05	37	5.24	99.72
0.06 - 0.1	2	0.28	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Stony Mountain - December 2017**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	4	5	1	0	0	3	1	4	35	96	58	69	225	110	49	7	667
0.006 - 0.05	1	0	0	0	0	0	0	0	0	2	2	1	3	19	9	0	37
0.06 - 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	130	59	7	706

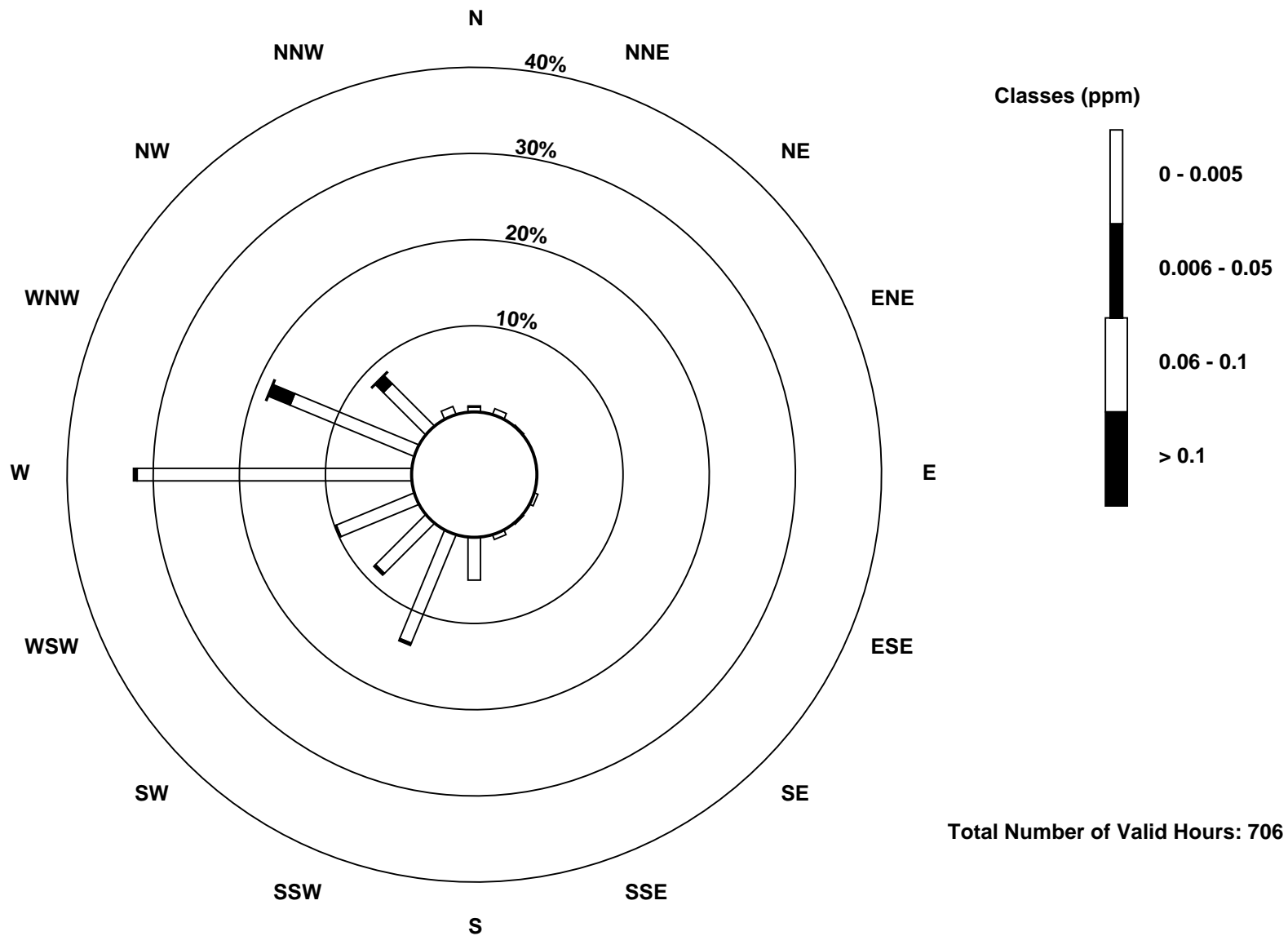
Total Number of Valid Hours: 706

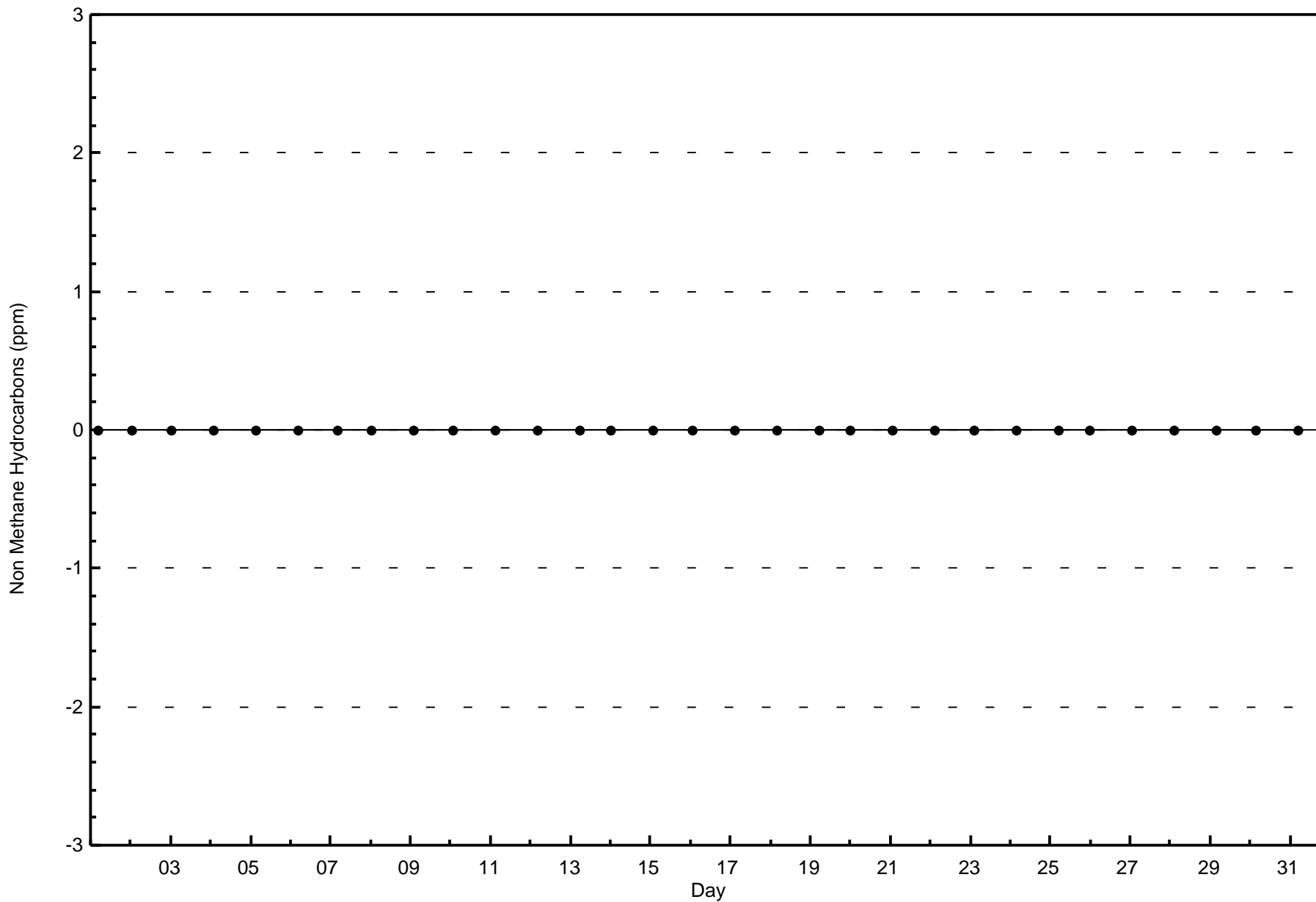
Total Number of Hours: 744



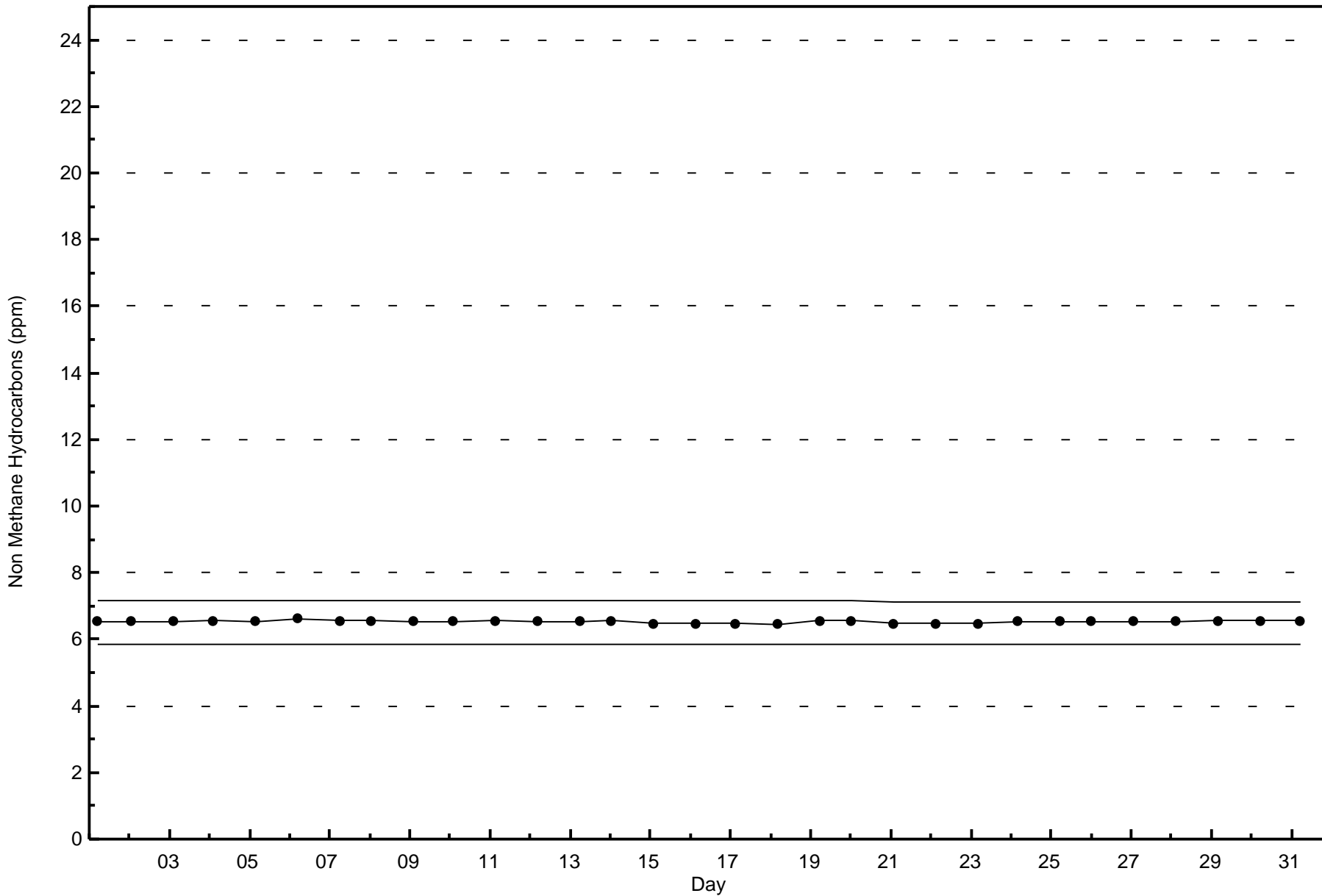
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Non Methane Hydrocarbons (NMHC) - ppm  
Stony Mountain (AMS 18)











Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH<sub>4</sub>) - ppm

Stony Mountain - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2.1 ppm on Dec 31 23:00	Maximum Daily Average: 2.0 ppm on Dec 31		Hours of Data:	706
Minimum Value: 1.9 ppm on Dec 10 10:00	Minimum Daily Average: 1.9 ppm on Dec 10		Hours of Missing Data:	38
Maximum Diurnal Average: 1.9 ppm at hour 24	Minimum Diurnal Average: 1.9 ppm at hour 13		Hours of Calibration:	37
Monthly Average: 1.92 ppm	Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 1.9 Q <sub>3</sub> = 1.9 P <sub>90</sub> = 1.9 P <sub>99</sub> = 2.0		Percent Operational Time:	99.9

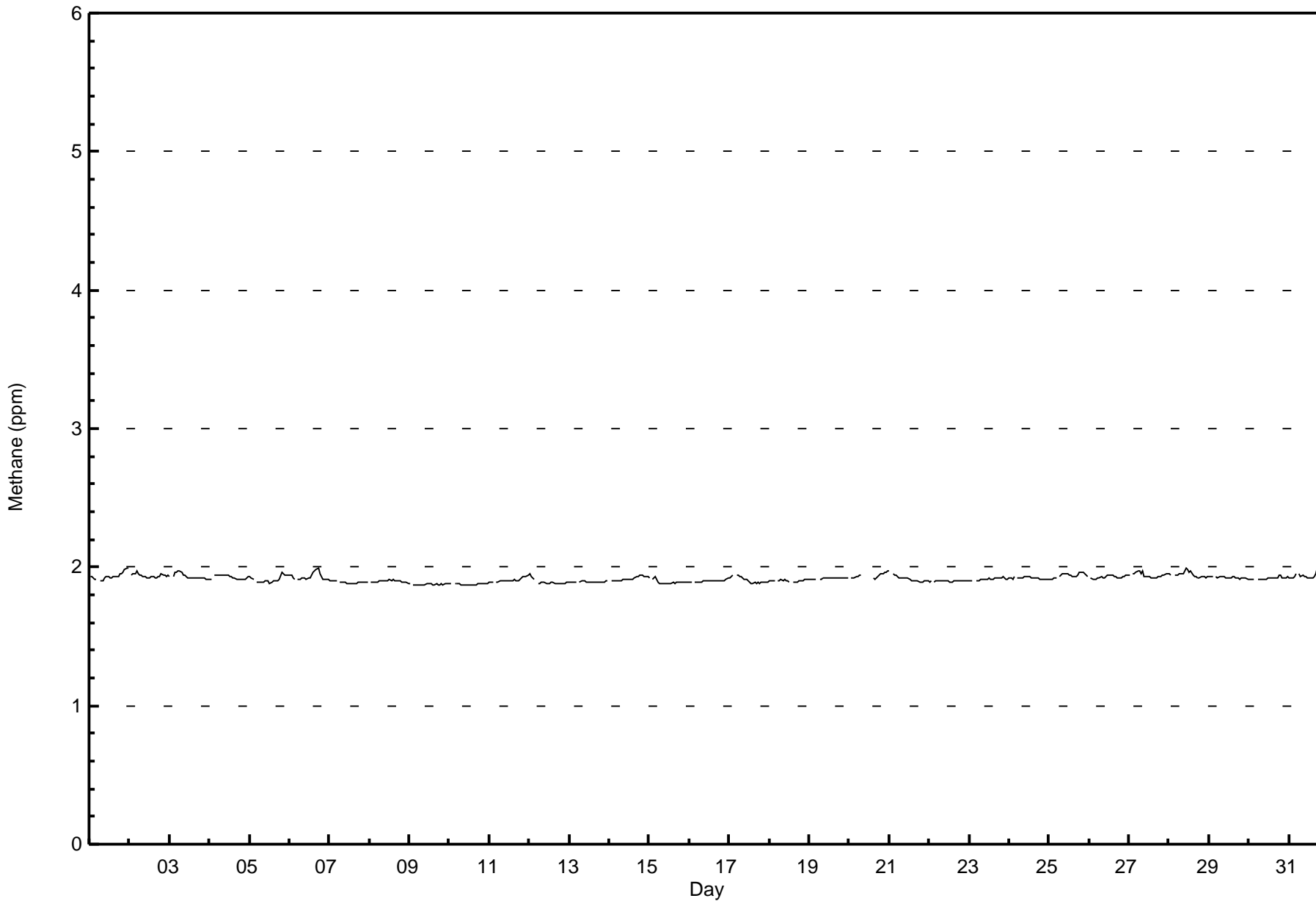
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																												
1-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0																									
2-Dec	Z	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	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
3-Dec	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
4-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
5-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0																								
6-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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																								
7-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
8-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
9-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
10-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
11-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
12-Dec	2.0	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	2.0																								
13-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
14-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
15-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
16-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
17-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
18-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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																								
19-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
20-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	--	2.0																									
21-Dec	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
22-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
23-Dec	1.9	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																								
24-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
25-Dec	1.9	1.9	1.9	1.9	1.9	Z	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	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0																								
26-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
27-Dec	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	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	2.0																								
28-Dec	2.0	1.9	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
29-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
31-Dec	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	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	Diurnal Average	
																								2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	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

Methane (CH<sub>4</sub>) - ppm  
Stony Mountain - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	700	99.15	99.15
2.1 - 3.0	6	0.85	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Stony Mountain - December 2017**

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	5	1	0	0	3	1	4	31	96	60	70	228	130	59	7	700
2.1 - 3.0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	6
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
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	130	59	7	706

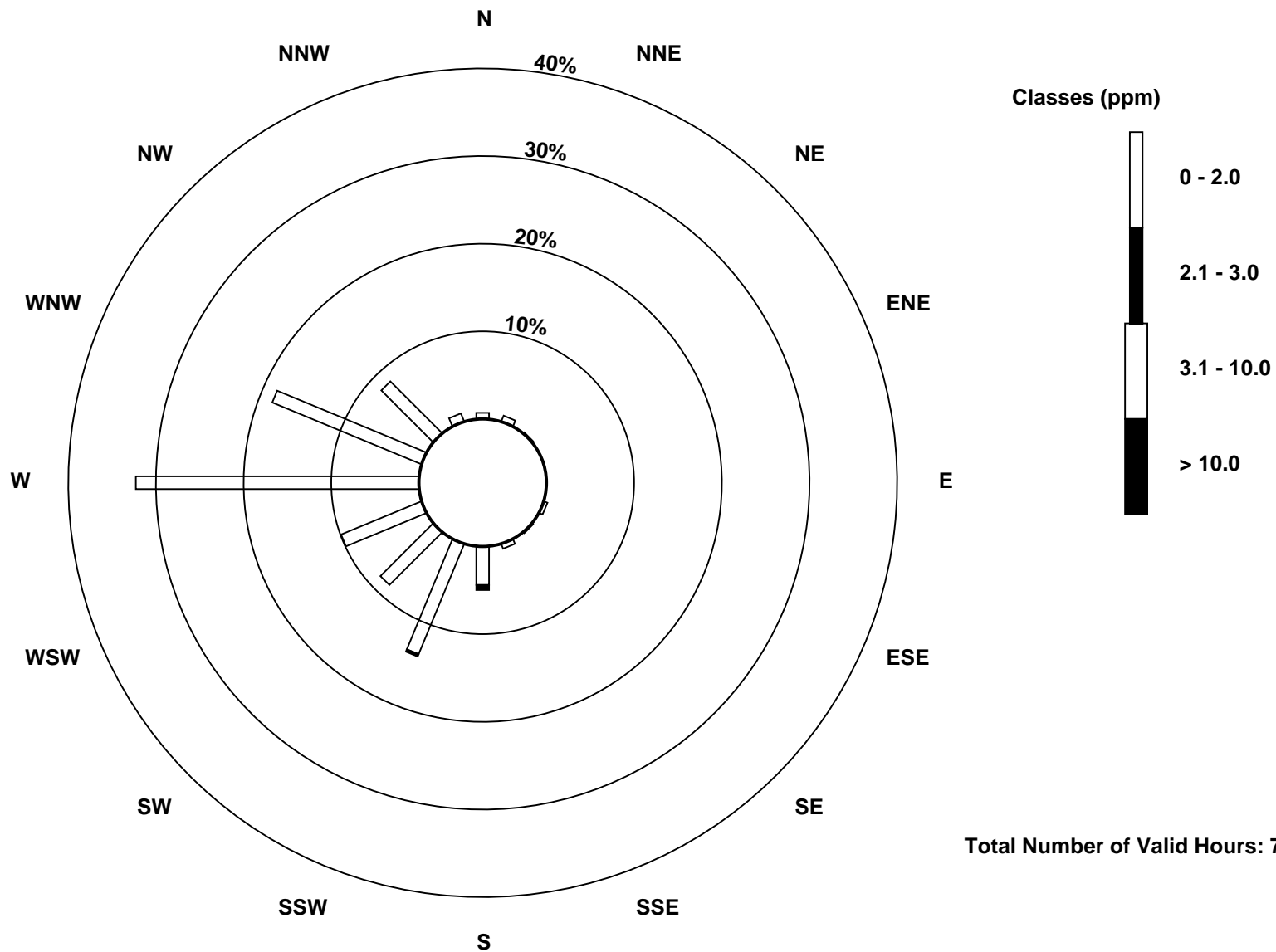
Total Number of Valid Hours: 706

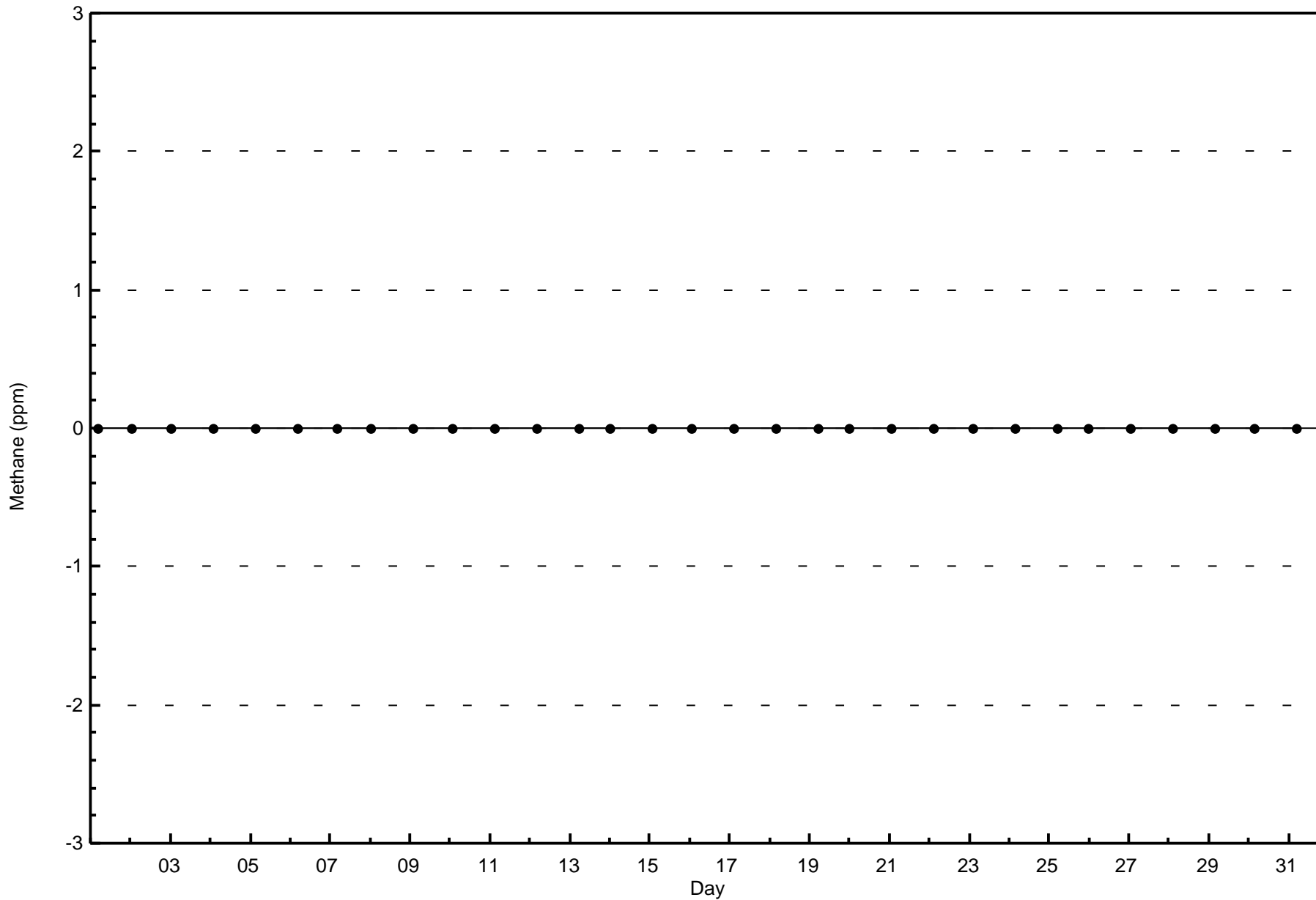
Total Number of Hours: 744

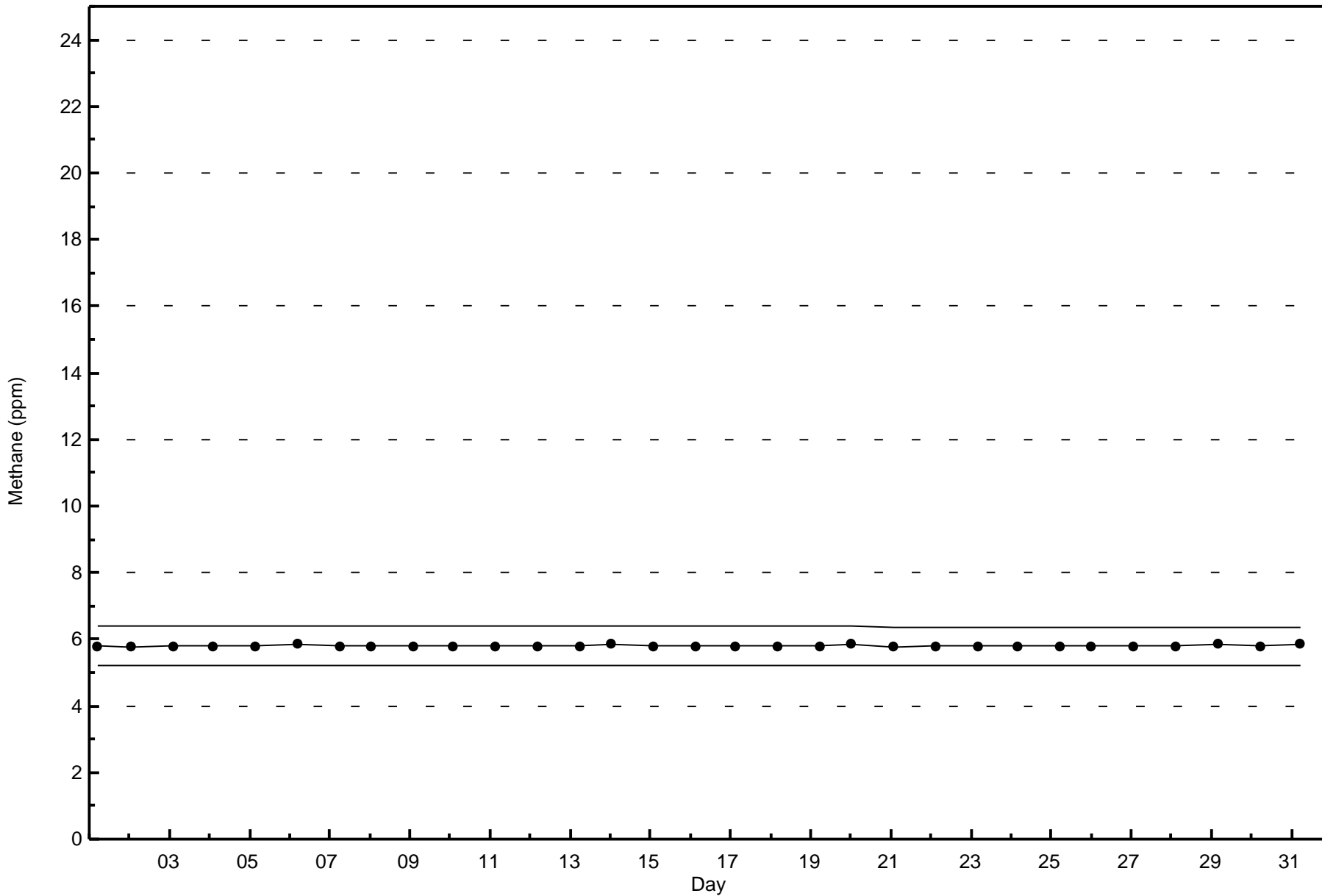


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Stony Mountain (AMS 18)









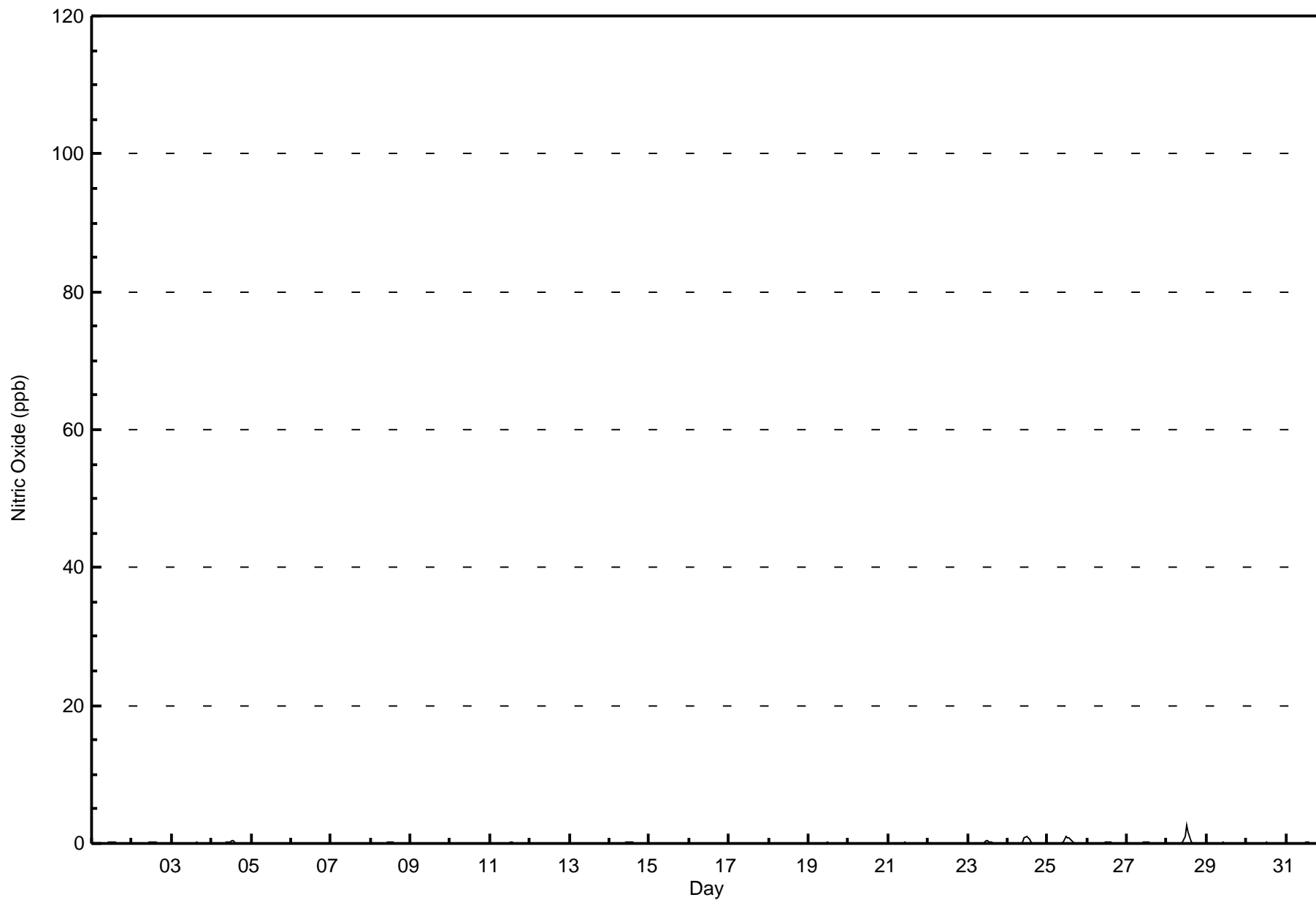


Maximum Value: 3 ppb on Dec 28 13:00																	Maximum Daily Average: 0.3 ppb on Dec 28																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 1 04:00																	Minimum Daily Average: 0.0 ppb on Dec 18																	Hours of Data: 707	
Maximum Diurnal Average: 0.2 ppb at hour 13																	Minimum Diurnal Average: 0.0 ppb at hour 19																	Hours of Missing Data: 37	
Monthly Average: 0.0 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1																	Hours of Calibration: 37	
																	Percent Operational Time: 100.0																		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0								
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0								
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0								
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
20-Dec	Z	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	--	0								
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0								
24-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1								
25-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1								
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
28-Dec	0	0	Z	0	0	0	0	0	0	1	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3								
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0								
																								Diurnal Average											
																								Diurnal Maximum											
Z - zerospan C - Calibration																																			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707

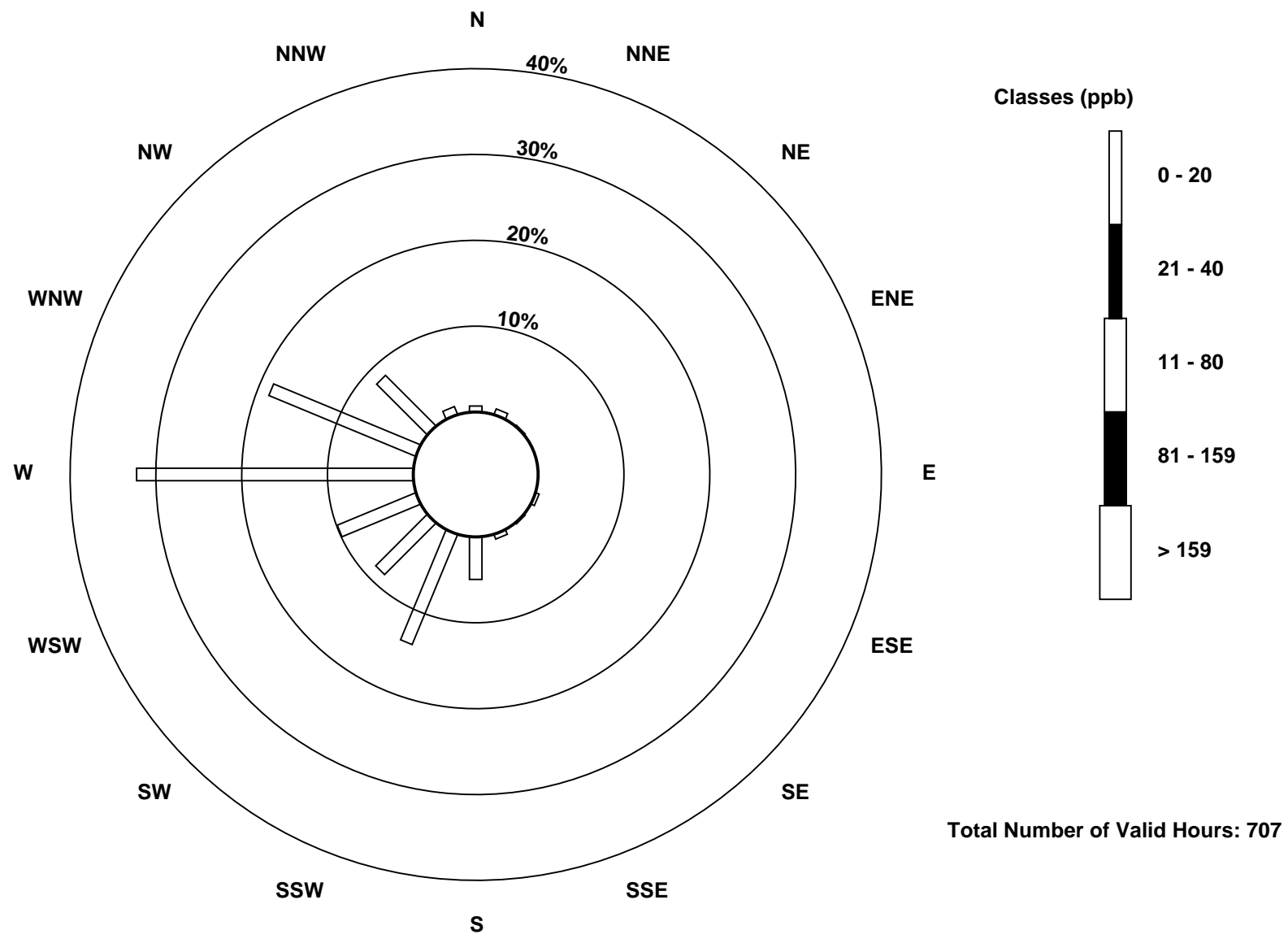
Total Number of Valid Hours: 707

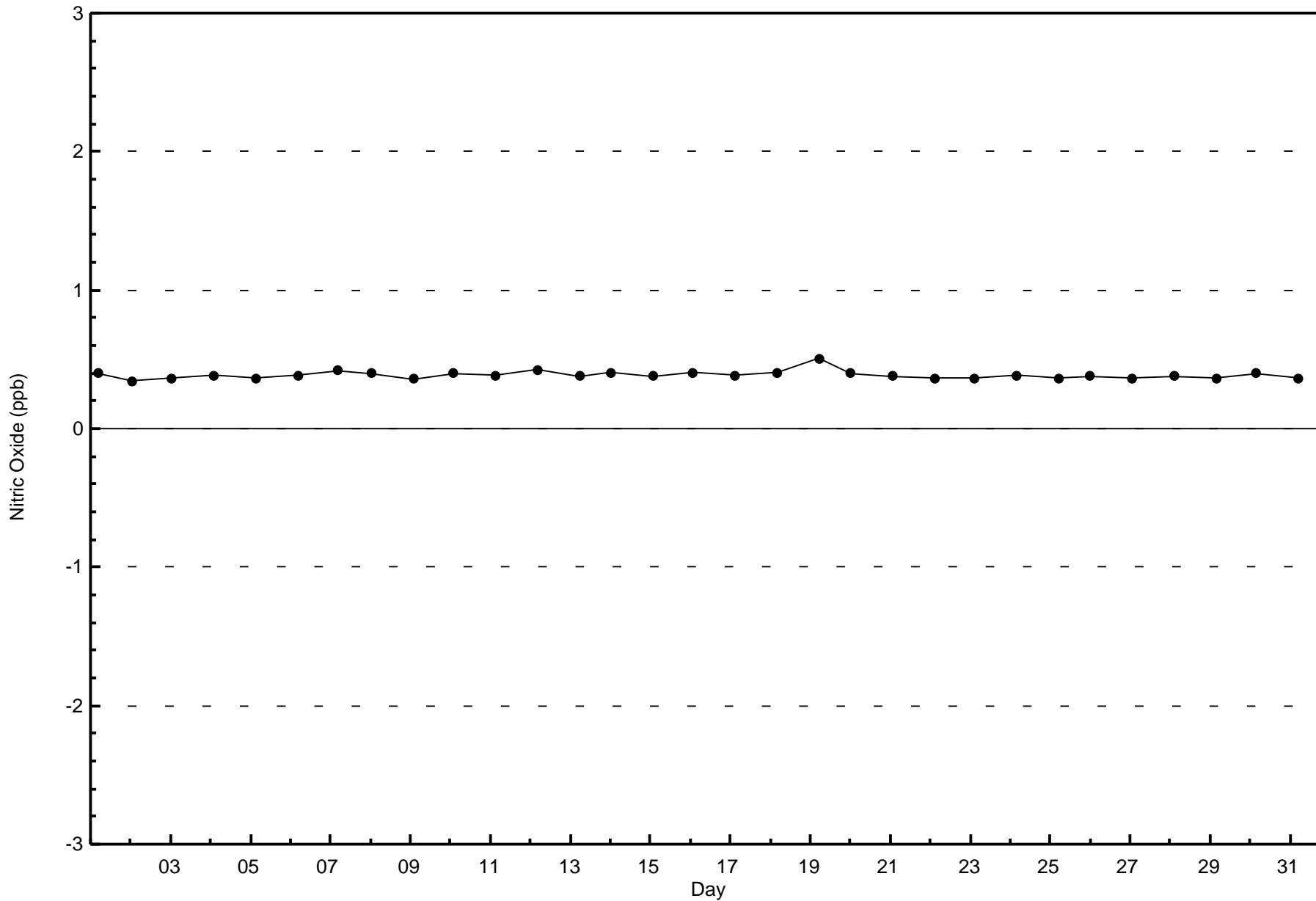
Total Number of Hours: 744

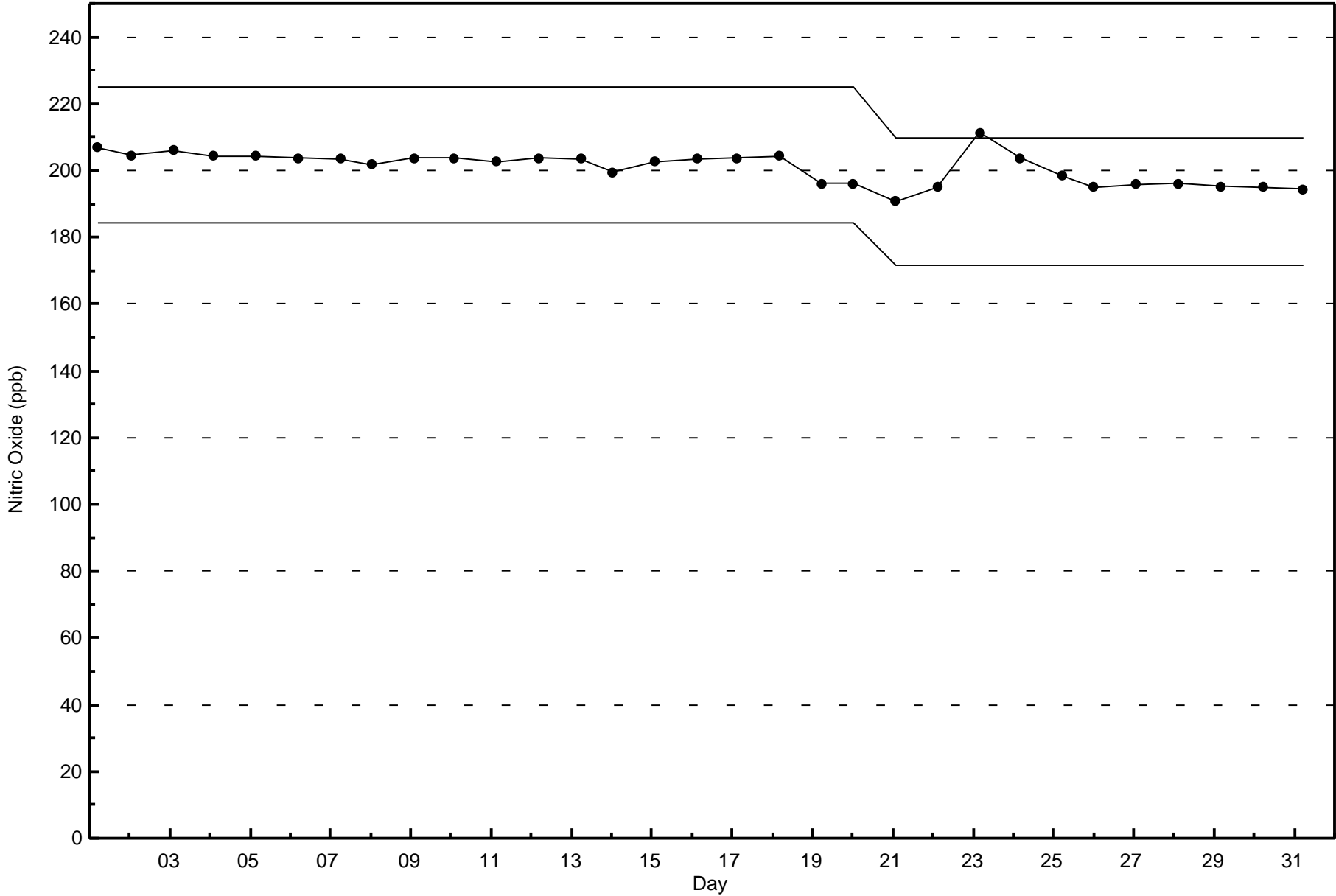


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Stony Mountain (AMS 18)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Stony Mountain - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 8 ppb on Dec 21 01:00	Maximum Daily Average: 2.3 ppb on Dec 1		Hours of Data:	707
Minimum Value: 0 ppb on Dec 5 13:00	Minimum Daily Average: 0.3 ppb on Dec 22		Hours of Missing Data:	37
Maximum Diurnal Average: 1.6 ppb at hour 20	Minimum Diurnal Average: 0.9 ppb at hour 16		Hours of Calibration:	37
Monthly Average: 1.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 6		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	1	1	1	Z	1	1	1	1	2	2	1	1	2	3	3	3	3	4	4	5	6	5	2.3	6
2-Dec	Z	2	3	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3	2	2	2	2	1.7	3
3-Dec	2	Z	2	2	2	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	3
4-Dec	1	1	Z	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	2	2	1.3	3
5-Dec	2	2	1	Z	1	1	1	1	0	0	0	0	0	0	0	1	1	0	2	7	7	5	4	3	1.7	7
6-Dec	2	3	2	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1.2	3
7-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
8-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1.2	2
9-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
10-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.8	1
11-Dec	0	0	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.1	2
12-Dec	2	2	2	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
13-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	0	0	1	1	0	0	1	0	0	0	0	0	0.6	1
14-Dec	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1.3	2
15-Dec	2	Z	2	2	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	0	0.7	2
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	2	0.5	2
17-Dec	2	3	4	Z	4	3	2	2	2	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1.3	4
18-Dec	1	1	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	0	0	0	0	Z	1	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0.5	1
20-Dec	Z	1	1	1	1	1	1	1	C	C	C	C	C	C	1	1	1	2	3	4	4	4	6	8	--	8
21-Dec	8	Z	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1.3	8
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
23-Dec	1	1	1	Z	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	1	1	1	0	1.5	2
24-Dec	1	1	2	4	Z	2	2	2	2	3	4	4	3	2	2	1	1	0	0	0	0	1	2	0	1.6	4
25-Dec	0	1	1	1	1	Z	1	1	2	3	3	3	3	3	3	3	3	3	5	4	2	1	1	1	2.1	5
26-Dec	Z	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	3	3	4	1.3	4
27-Dec	4	Z	4	4	7	8	5	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2.1	8
28-Dec	1	1	Z	1	1	1	2	2	2	2	3	3	6	5	2	1	1	1	1	1	1	2	2	1	1.7	6
29-Dec	2	2	2	Z	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0.9	2
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	1	1	0.5	1
31-Dec	1	1	1	1	1	Z	1	1	1	1	1	0	1	1	1	1	1	2	3	3	3	3	4	4	1.4	4
	1.4	1.1	1.4	1.3	1.5	1.4	1.1	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.9	0.9	0.9	1.0	1.3	1.6	1.5	1.4	1.5	1.5	Diurnal Average	
	8	3	4	4	7	8	5	2	2	3	4	4	6	5	3	3	3	3	5	7	7	5	6	8	Diurnal Maximum	

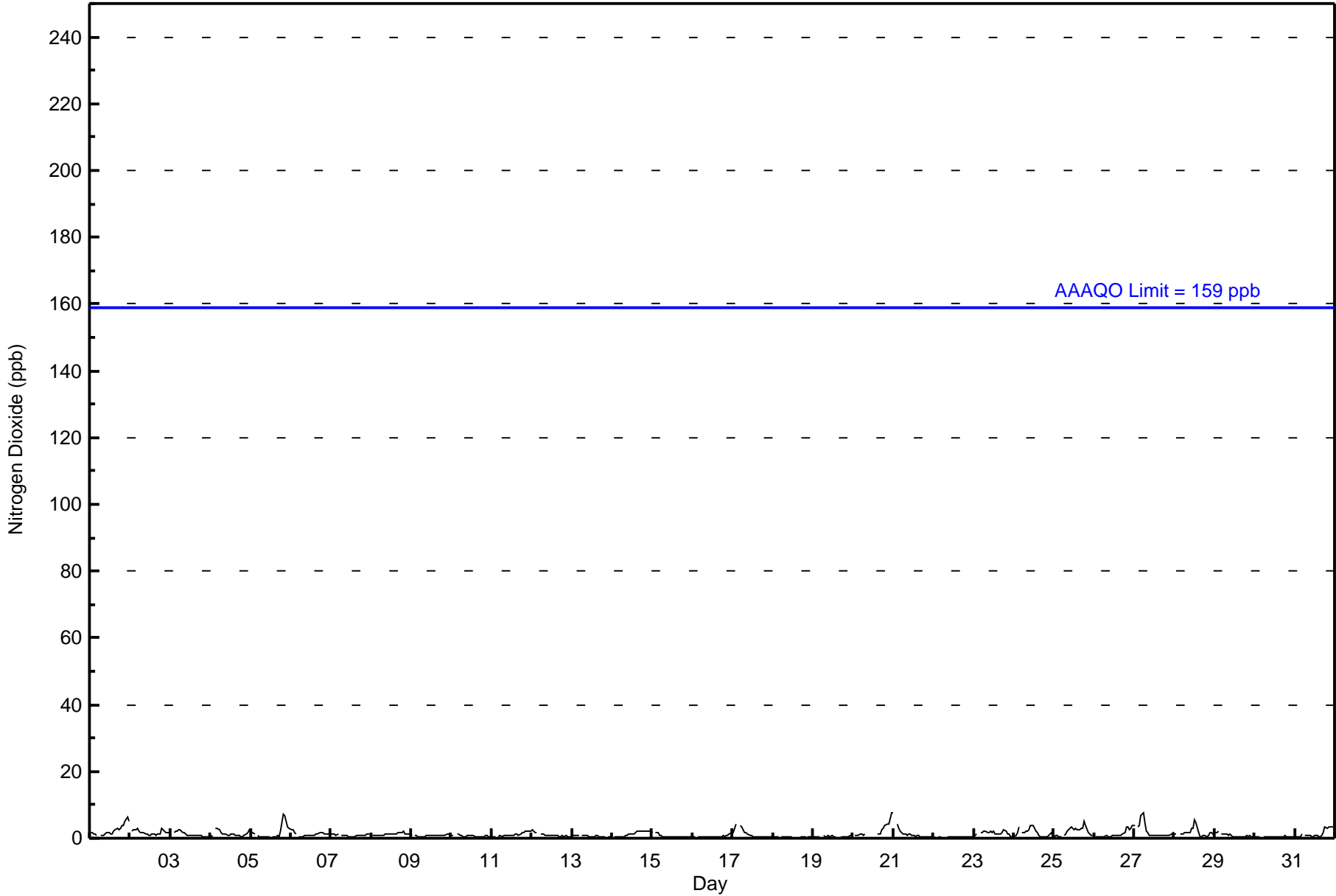
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

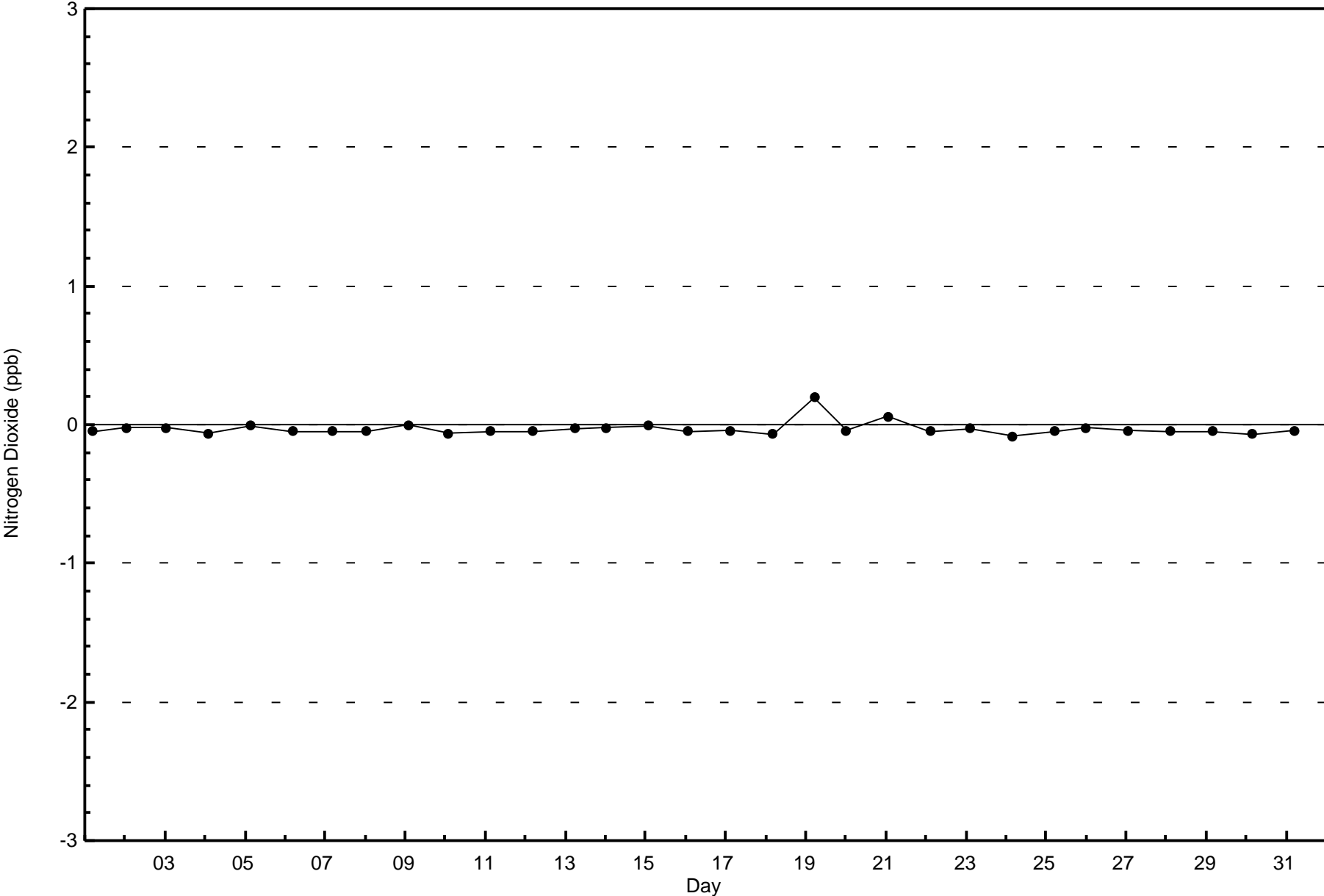
**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Stony Mountain - December 2017**

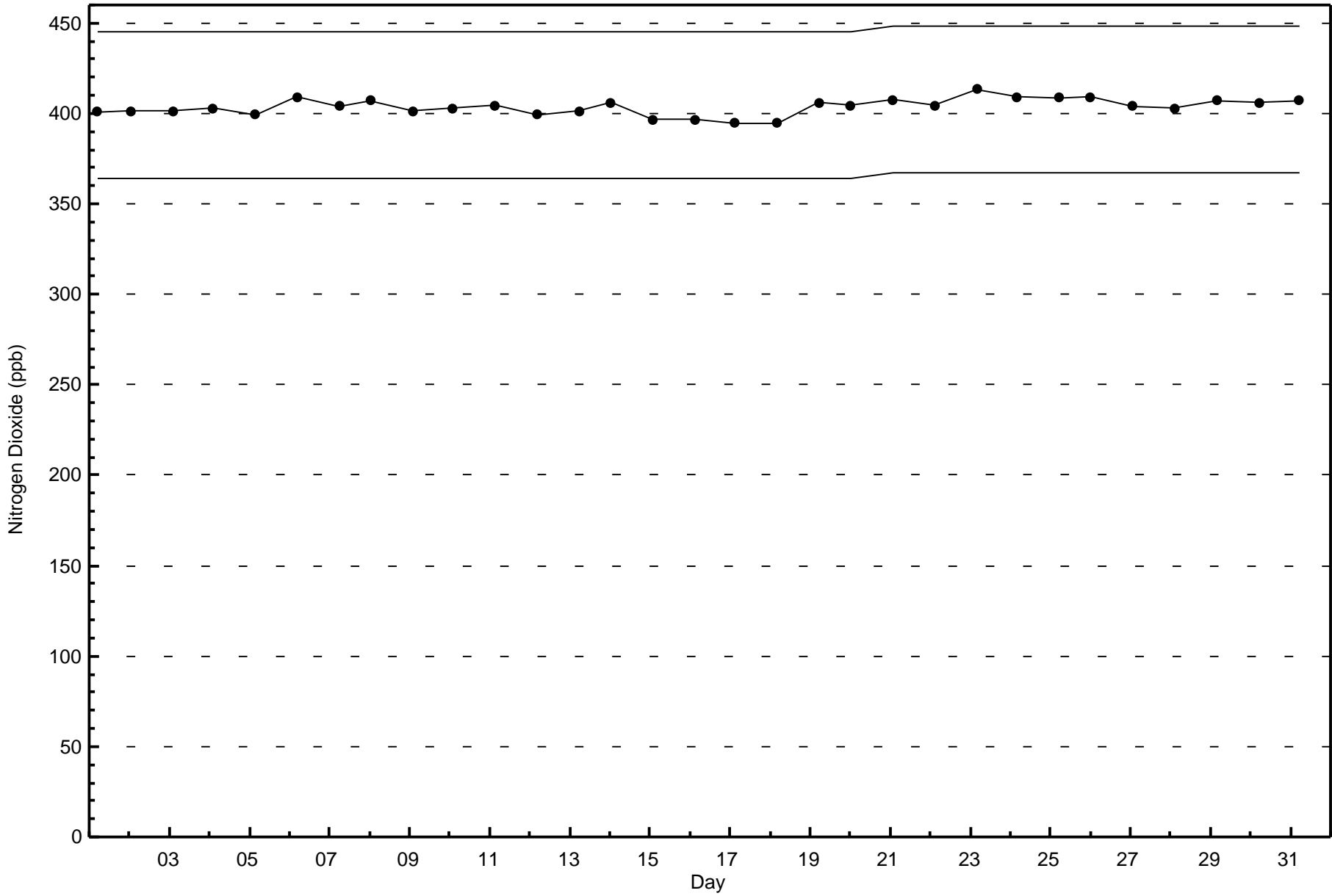
<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707

Total Number of Valid Hours: 707

Total Number of Hours: 744









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

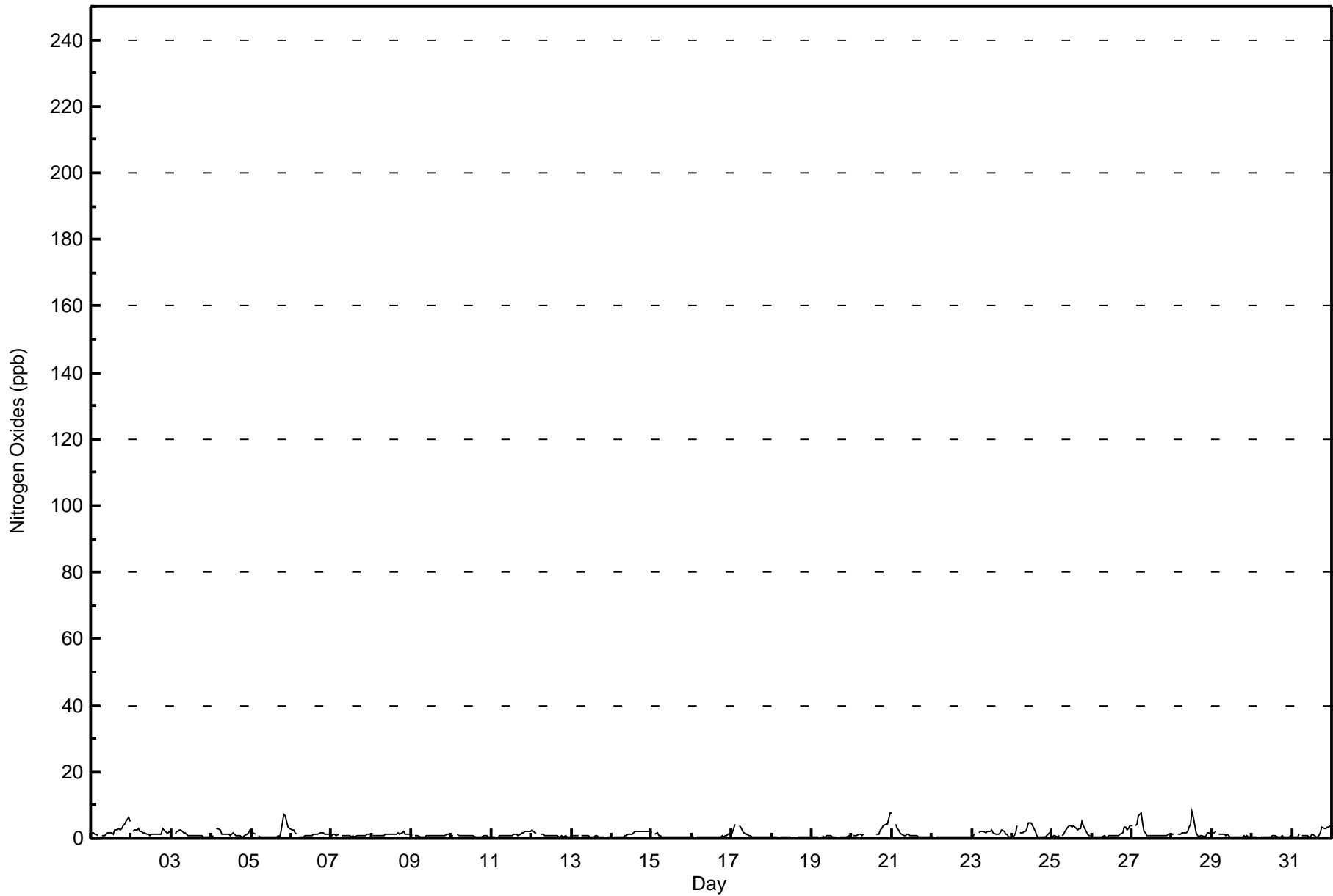
Stony Mountain - December 2017

Maximum Value: 8 ppb on Dec 28 13:00																	Maximum Daily Average: 2.4 ppb on Dec 1																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 19 17:00																	Minimum Daily Average: 0.3 ppb on Dec 22																	Hours of Data: 707	
Maximum Diurnal Average: 1.6 ppb at hour 20																	Minimum Diurnal Average: 0.9 ppb at hour 16																	Hours of Missing Data: 37	
Monthly Average: 1.2 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 7																	Hours of Calibration: 37	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	2	2	1	1	1	Z	1	1	1	1	2	2	2	1	2	3	3	3	3	4	4	5	6	5	2.4	6									
2-Dec	Z	2	3	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3	2	2	2	2	1.8	3									
3-Dec	2	Z	1	2	2	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	3									
4-Dec	1	1	Z	3	3	2	1	1	1	1	1	1	1	2	1	1	1	1	0	0	1	1	2	2	1.4	3									
5-Dec	2	2	1	Z	1	1	1	0	0	0	0	0	0	0	0	1	1	0	2	7	7	5	4	3	1.7	7									
6-Dec	2	2	2	1	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1.2	2									
7-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1									
8-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	1	1	1	1	1.2	2									
9-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1									
10-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0.7	1									
11-Dec	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.1	2									
12-Dec	2	2	2	2	Z	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1.0	2									
13-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0.6	1									
14-Dec	Z	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1.4	2									
15-Dec	2	Z	1	2	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	1	0	0	0.7	2									
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	2	0.5	2									
17-Dec	2	3	4	Z	4	3	2	2	1	1	1	1	0	0	1	1	1	1	0	0	0	0	0	1	1.4	4									
18-Dec	1	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1									
19-Dec	0	0	0	0	0	Z	1	0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	1	1	0.5	1									
20-Dec	Z	1	1	1	1	1	1	1	C	C	C	C	C	C	1	1	1	2	3	4	4	4	6	8	--	8									
21-Dec	8	Z	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1.3	8									
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
23-Dec	1	1	1	Z	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	1	1	1	0	1.6	2									
24-Dec	0	1	2	4	Z	2	2	2	2	3	4	5	4	3	2	1	1	0	0	0	1	2	0	0	1.8	5									
25-Dec	0	1	1	1	1	Z	1	1	2	3	4	4	3	4	3	3	3	3	5	4	2	1	1	1	2.2	5									
26-Dec	Z	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	2	3	3	3	3	4	1.3	4									
27-Dec	4	Z	4	4	7	8	5	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.2	8									
28-Dec	1	1	Z	1	1	1	2	2	2	2	3	4	8	6	2	1	0	1	1	1	1	1	2	1	2.0	8									
29-Dec	2	2	2	Z	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	0	0.9	2									
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	1	1	0.5	1									
31-Dec	1	1	1	1	1	Z	1	1	1	1	1	0	1	1	1	1	1	2	3	3	3	3	3	4	1.4	4									
1.4																	1.1																	Diurnal Average	
8																	3																	Diurnal Maximum	
1.4																	1.3																		
1.5																	1.4																		
1.4																	1.1																		
1.1																	1.0																		
1.0																	1.0																		
1.1																	1.1																		
1.2																	1.2																		
1.2																	1.3																		
1.2																	1.2																		
1.0																	0.9																		
0.9																	0.9																		
1.0																	1.3																		
1.3																	1.6																		
1.5																	1.4																		
1.4																	1.5																		
1.5																	1.5																		
Z - zerospan																								C - Calibration											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Stony Mountain - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	5	5	1	0	0	3	1	4	35	98	60	70	228	131	59	7	707

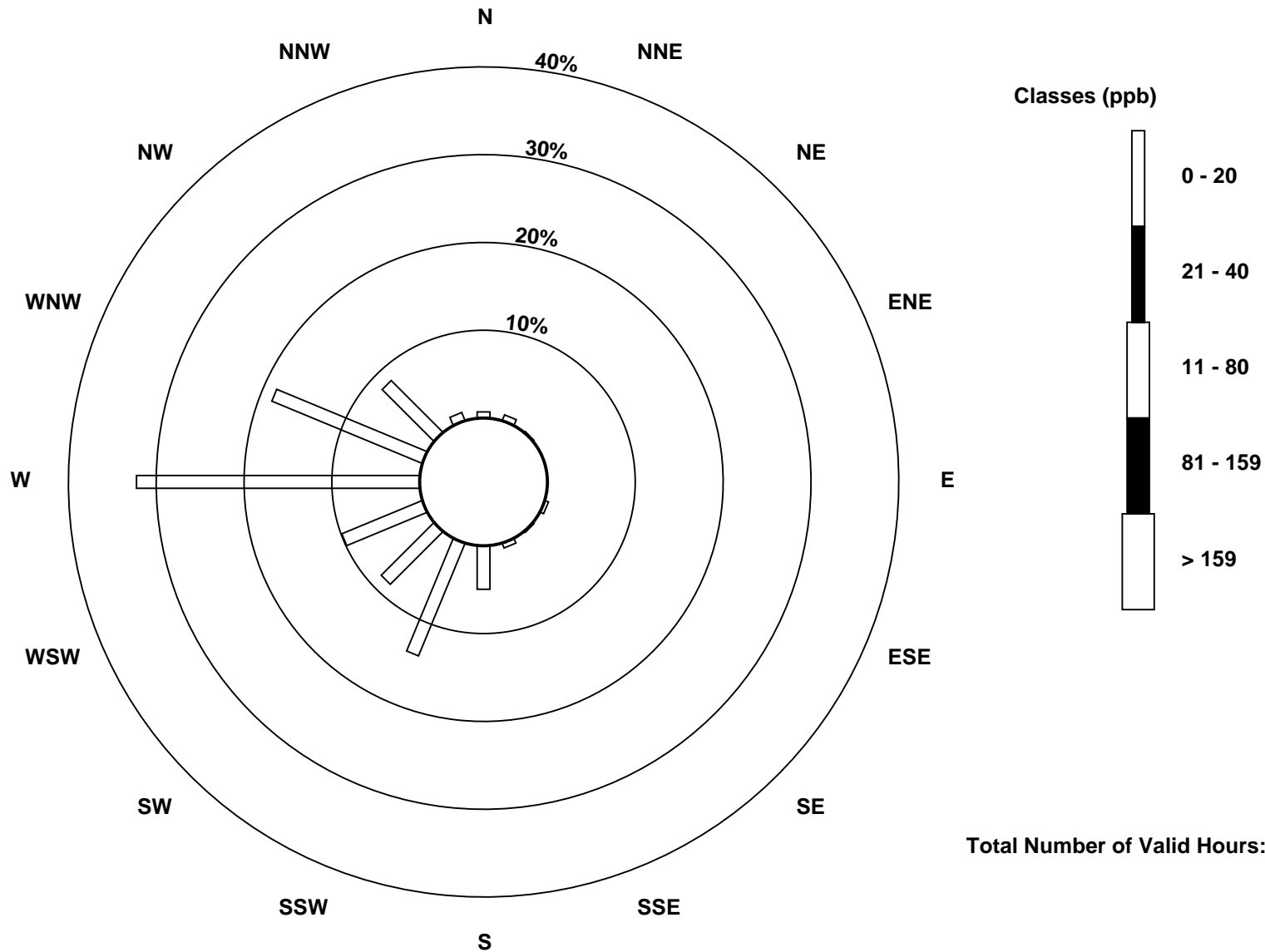
Total Number of Valid Hours: 707

Total Number of Hours: 744

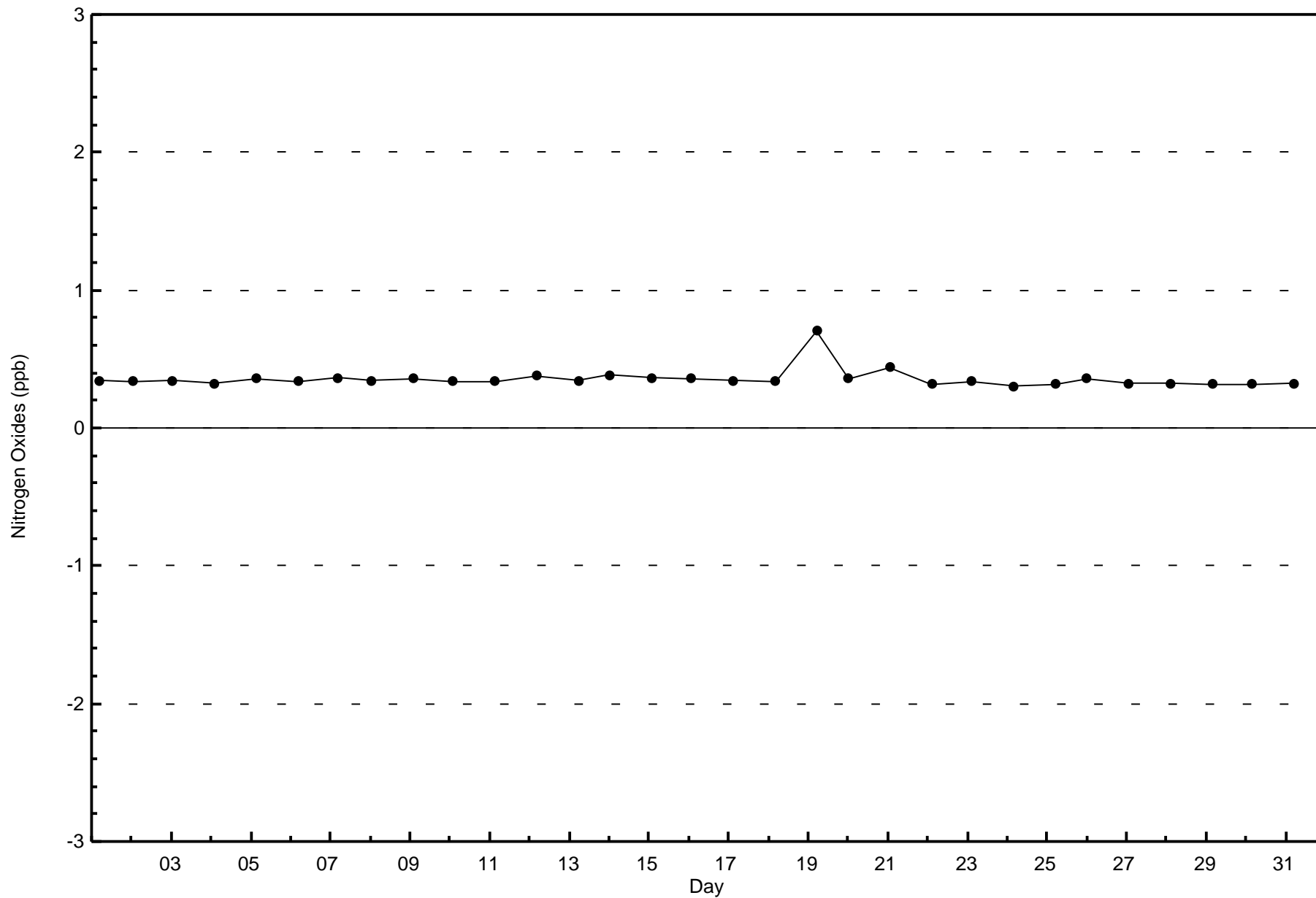


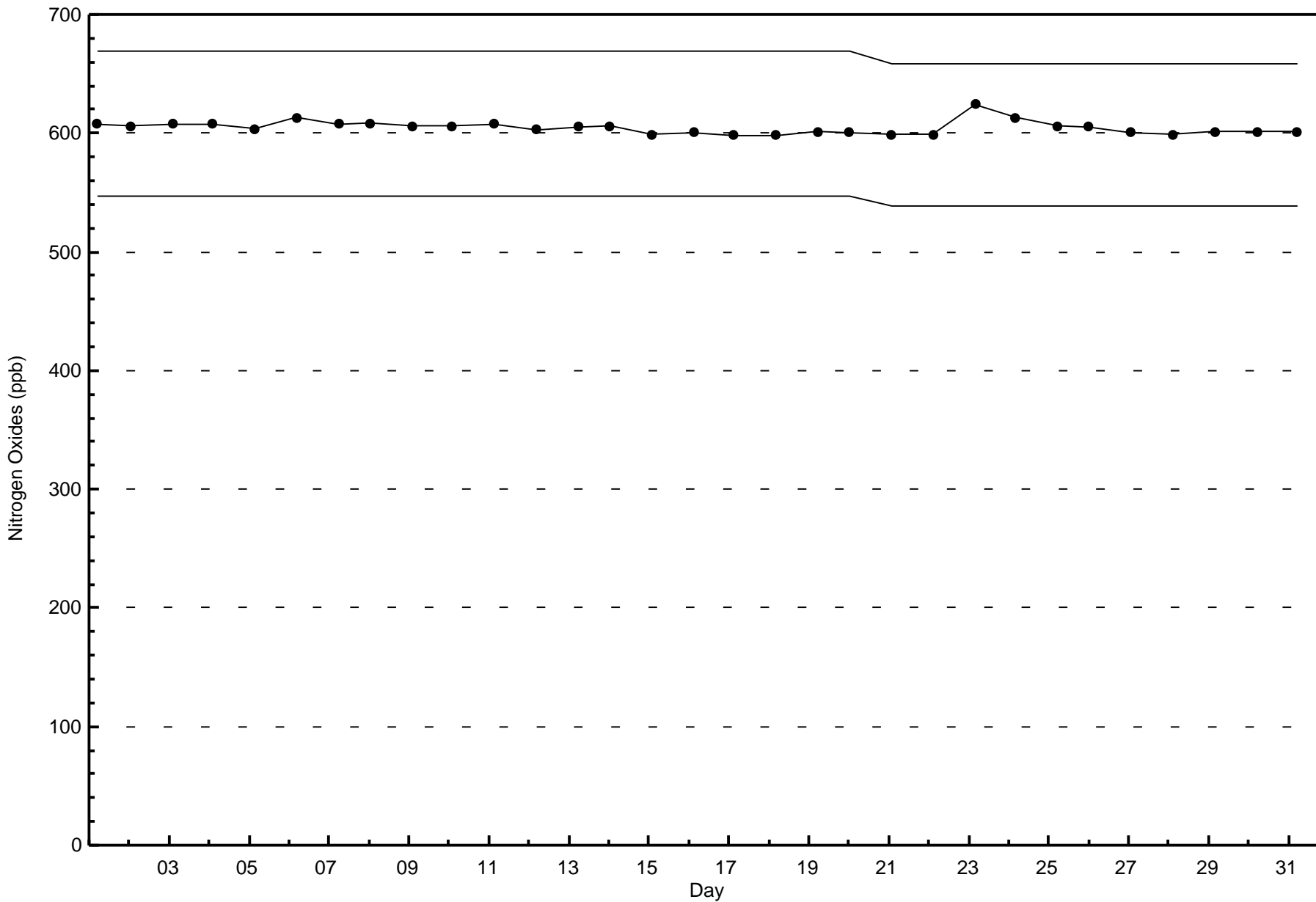
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Stony Mountain (AMS 18)



Total Number of Valid Hours: 707





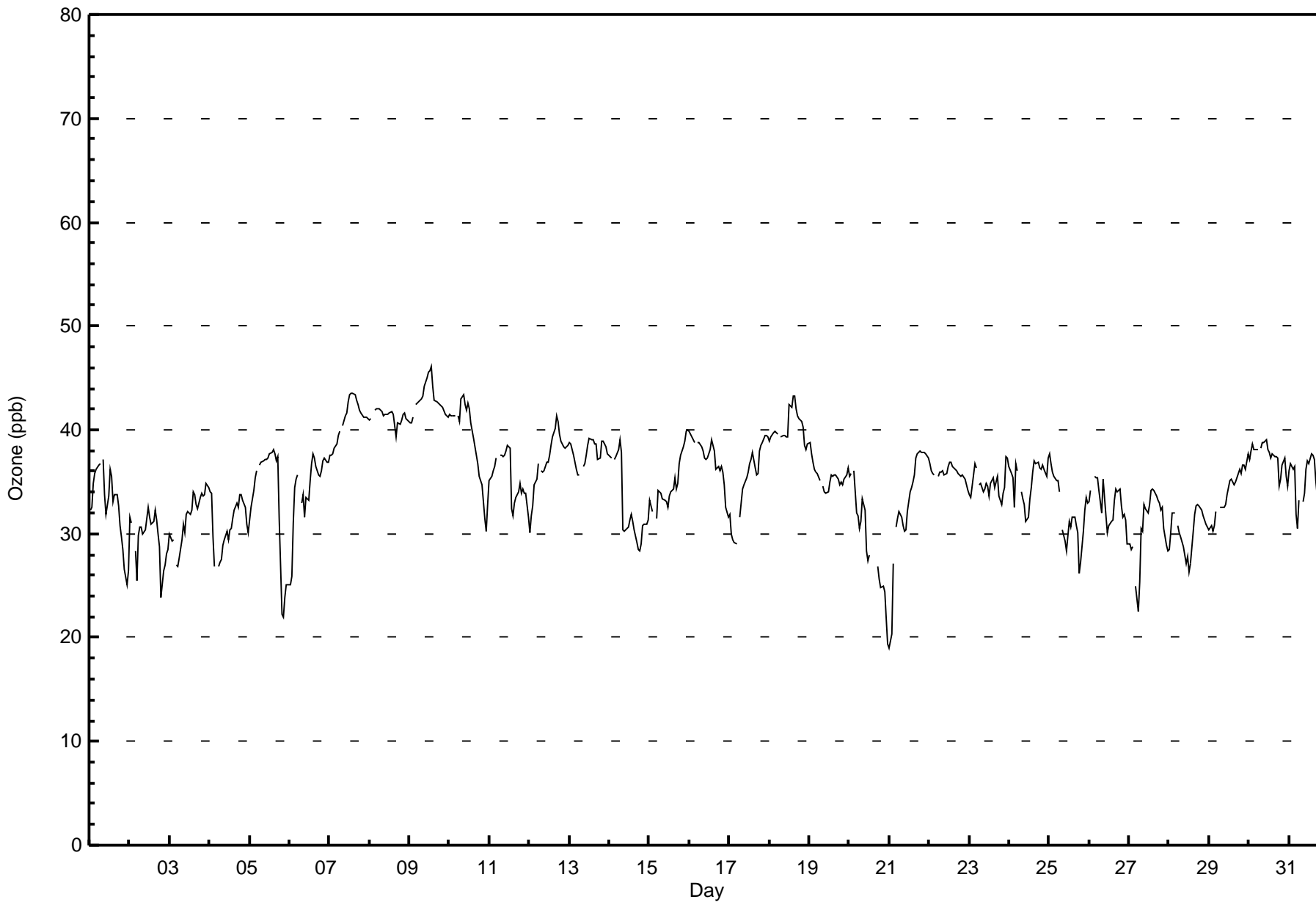


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0		Hours in Service: 744																								
Maximum Value: 46 ppb on Dec 9 14:00		Maximum Daily Average: 42.9 ppb on Dec 9																								
Minimum Value: 19 ppb on Dec 21 01:00		Hours of Data: 709																								
Maximum Diurnal Average: 36.2 ppb at hour 16		Hours of Missing Data: 35																								
Monthly Average: 34.9 ppb		Hours of Calibration: 35																								
		Percent Operational Time: 100.0																								
		Minimum Daily Average: 29.0 ppb on Dec 20																								
		Minimum Diurnal Average: 33.9 ppb at hour 24																								
		Percentiles: P <sub>1</sub> = 24 P <sub>10</sub> = 29 Q <sub>1</sub> = 32 Median = 35 Q <sub>3</sub> = 38 P <sub>90</sub> = 41 P <sub>99</sub> = 43																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	32	33	35	36	36	37	37	Z	37	34	32	34	36	36	33	34	34	33	31	30	29	27	25	26	32.8	37
2-Dec	32	31	Z	28	25	30	31	31	30	30	31	33	32	31	31	32	31	30	29	24	26	27	28	29	29.6	33
3-Dec	30	29	29	Z	27	27	28	29	31	30	32	32	32	34	34	33	32	34	34	34	34	35	34	31.6	35	
4-Dec	34	34	30	27	Z	27	27	28	29	29	30	29	30	31	32	32	33	33	34	34	33	32	31	30	30.8	34
5-Dec	31	33	34	35	36	Z	37	37	37	37	37	37	38	38	38	38	37	37	31	22	22	24	25	25	33.3	38
6-Dec	25	26	31	34	35	36	Z	33	34	32	34	33	35	37	38	37	36	36	36	36	37	37	37	37	34.4	38
7-Dec	38	38	38	38	39	39	40	Z	40	41	42	43	43	44	44	43	43	42	42	42	41	41	41	41	41.0	44
8-Dec	41	41	Z	42	42	42	42	42	41	42	42	42	42	42	42	40	39	41	41	41	41	42	41	41	41.3	42
9-Dec	41	41	41	Z	42	43	43	43	43	44	45	46	46	46	44	43	43	43	42	42	42	41	41	41	42.9	46
10-Dec	41	41	41	41	Z	41	41	43	43	42	42	43	42	41	39	38	38	37	36	35	33	32	30	33	38.8	43
11-Dec	35	35	36	36	37	Z	38	38	37	38	38	39	38	32	32	33	34	34	35	34	34	34	34	32	35.3	39
12-Dec	30	32	33	35	35	37	Z	36	36	36	37	37	38	38	39	40	41	41	40	39	38	38	38	38	37.1	41
13-Dec	39	39	38	37	36	36	36	Z	36	37	38	39	39	39	39	39	39	37	37	39	39	39	38	38	37.8	39
14-Dec	37	37	Z	37	37	38	39	38	30	30	30	31	31	32	31	30	29	28	28	29	31	31	31	31	32.6	39
15-Dec	33	33	32	Z	31	34	34	34	33	33	33	33	34	34	34	35	34	35	37	38	38	39	40	40	34.9	40
16-Dec	40	39	39	39	Z	39	39	38	38	37	37	37	38	39	39	38	36	36	36	37	36	35	33	32	37.2	40
17-Dec	32	30	29	29	29	Z	32	33	34	35	35	36	37	37	38	36	36	36	38	38	39	39	40	39	35.1	40
18-Dec	39	39	40	40	40	40	Z	39	39	39	39	39	42	42	43	43	42	41	41	41	40	38	38	39	40.3	43
19-Dec	39	38	37	36	36	36	35	Z	35	34	34	34	35	36	36	36	36	35	35	35	35	35	36	36	35.6	39
20-Dec	36	36	Z	36	32	32	30	31	33	32	28	27	28	C	C	C	C	27	26	25	25	24	22	19	29.0	36
21-Dec	19	20	27	Z	31	32	32	32	31	30	30	32	34	34	35	36	37	38	38	38	38	38	37	32.9	38	
22-Dec	37	36	36	36	Z	35	36	36	36	36	36	36	37	37	36	36	36	36	36	35	36	35	34	34	35.9	37
23-Dec	34	34	35	37	36	Z	35	35	34	34	35	35	34	35	35	34	35	36	34	33	34	34	37	37	34.8	37
24-Dec	36	36	35	33	37	36	Z	34	33	33	31	32	33	34	36	37	37	37	36	36	37	36	36	37	35.1	37
25-Dec	38	37	36	35	35	35	34	Z	30	29	28	30	31	31	32	32	31	30	26	27	30	32	33	33	32.0	38
26-Dec	33	34	Z	35	35	35	34	32	35	34	32	30	31	31	31	33	34	34	34	33	32	32	31	29	32.9	35
27-Dec	29	29	29	Z	25	22	25	31	30	33	32	32	33	34	34	34	34	33	33	32	33	30	29	28	30.6	34
28-Dec	28	30	32	32	Z	31	30	30	29	28	27	28	26	27	30	32	33	33	33	32	32	31	31	31	30.2	33
29-Dec	30	31	30	31	32	Z	33	33	33	33	33	33	34	35	35	35	35	36	36	36	37	37	36	38	34.0	38
30-Dec	37	38	39	38	38	38	Z	38	39	39	39	38	38	37	38	37	37	37	35	35	37	37	36	35	37.4	39
31-Dec	36	37	36	37	32	31	33	Z	33	34	36	37	37	38	38	37	35	34	32	33	32	31	30	29	34.2	38
																								Diurnal Average		
																								Diurnal Maximum		
34.3 34.3 34.5 35.4 34.6 34.9 34.6 34.9 34.9 34.7 34.7 35.0 35.6 36.0 36.2 36.2 35.9 35.4 34.8 34.3 34.5 34.3 34.0 33.9																										
41 41 41 42 42 43 43 43 43 44 45 46 46 46 44 43 43 43 42 42 42 42 41 41																										
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	3	0.42	0.42
21 - 50	706	99.58	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Stony Mountain - December 2017**

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	0	3	0	0	0	0	0	3
21 - 50	4	5	1	0	0	3	1	4	34	95	63	71	227	130	61	7	706
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
<b>Totals</b>	4	5	1	0	0	3	1	4	34	98	63	71	227	130	61	7	709

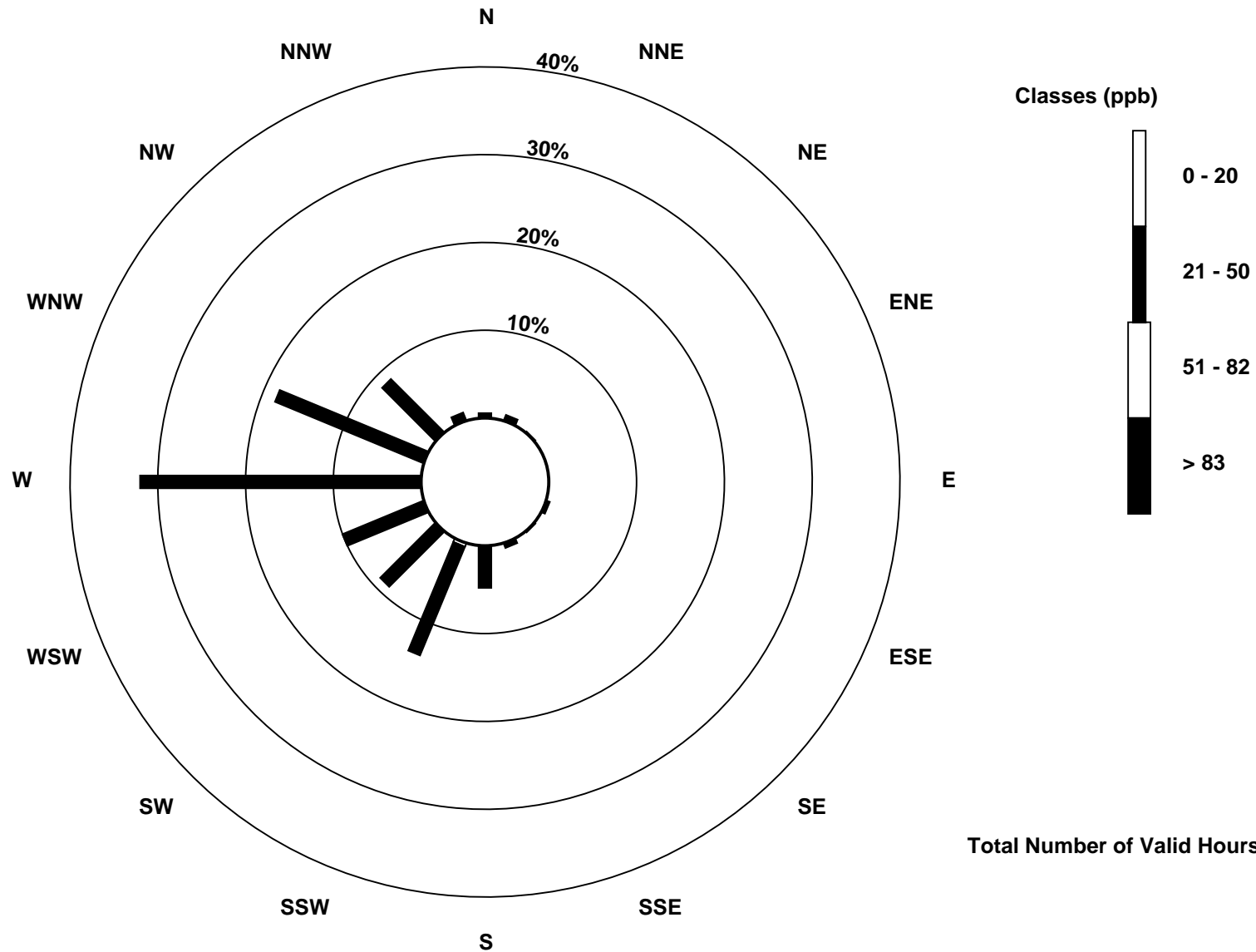
Total Number of Valid Hours: 709

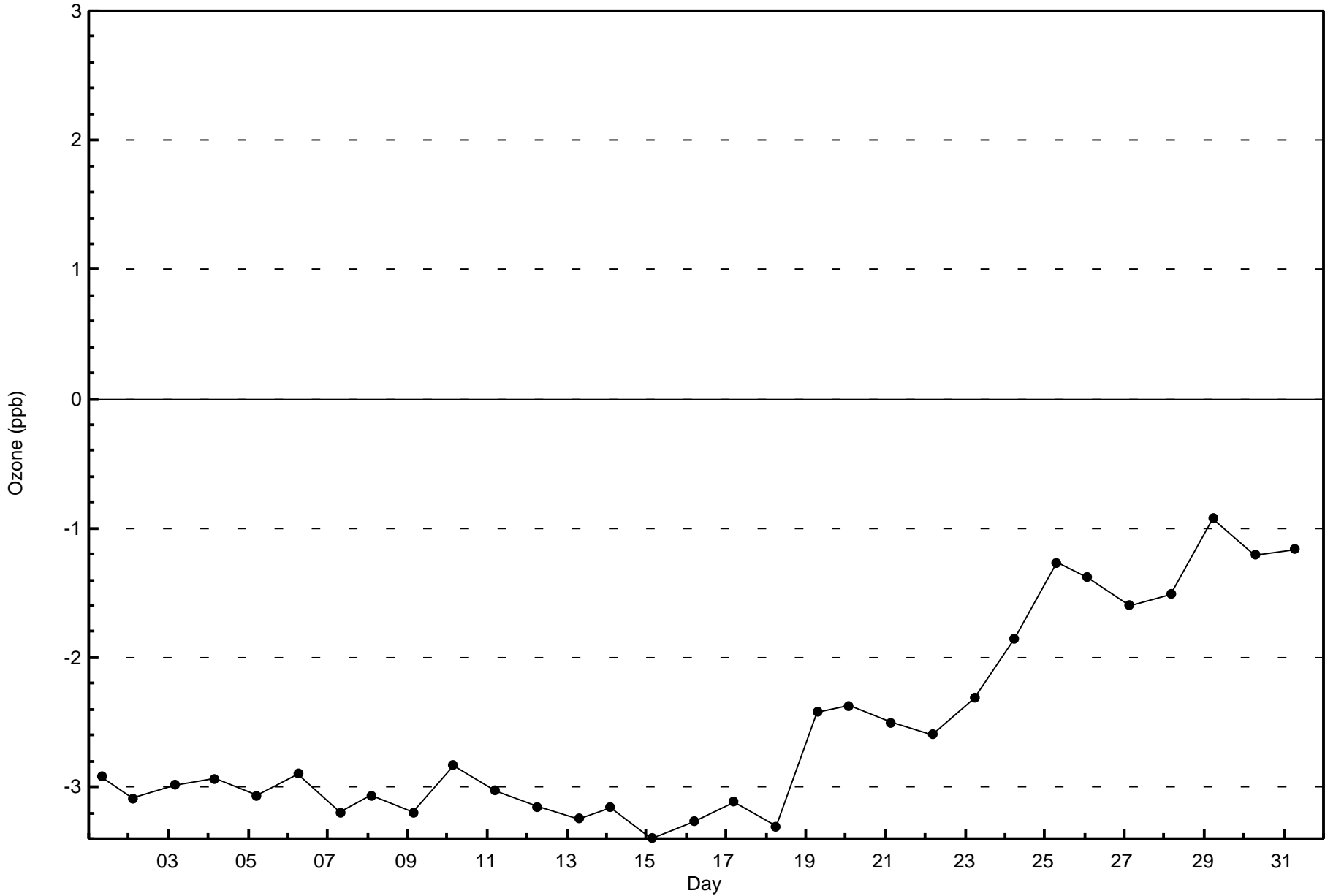
Total Number of Hours: 744

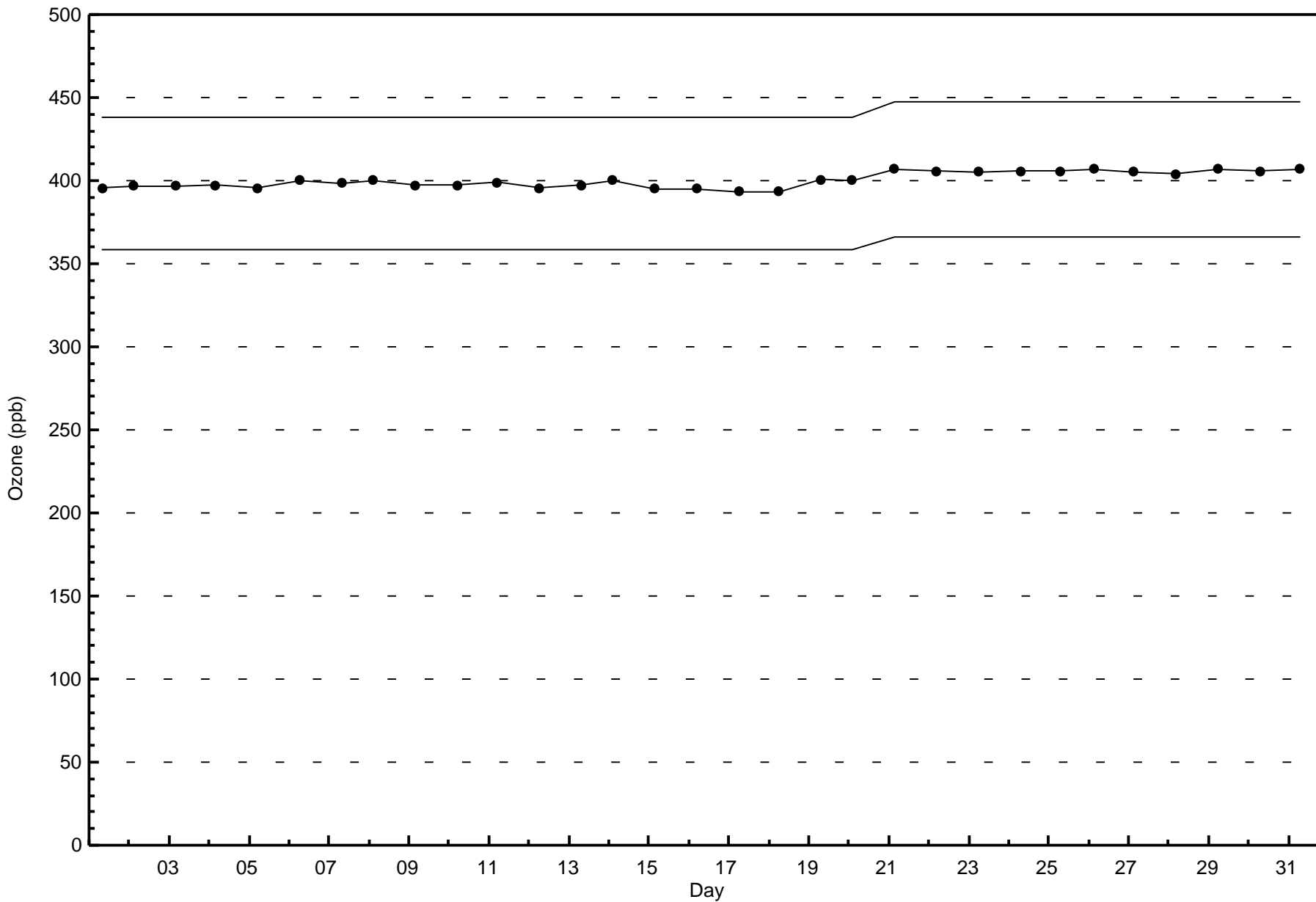


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Stony Mountain (AMS 18)







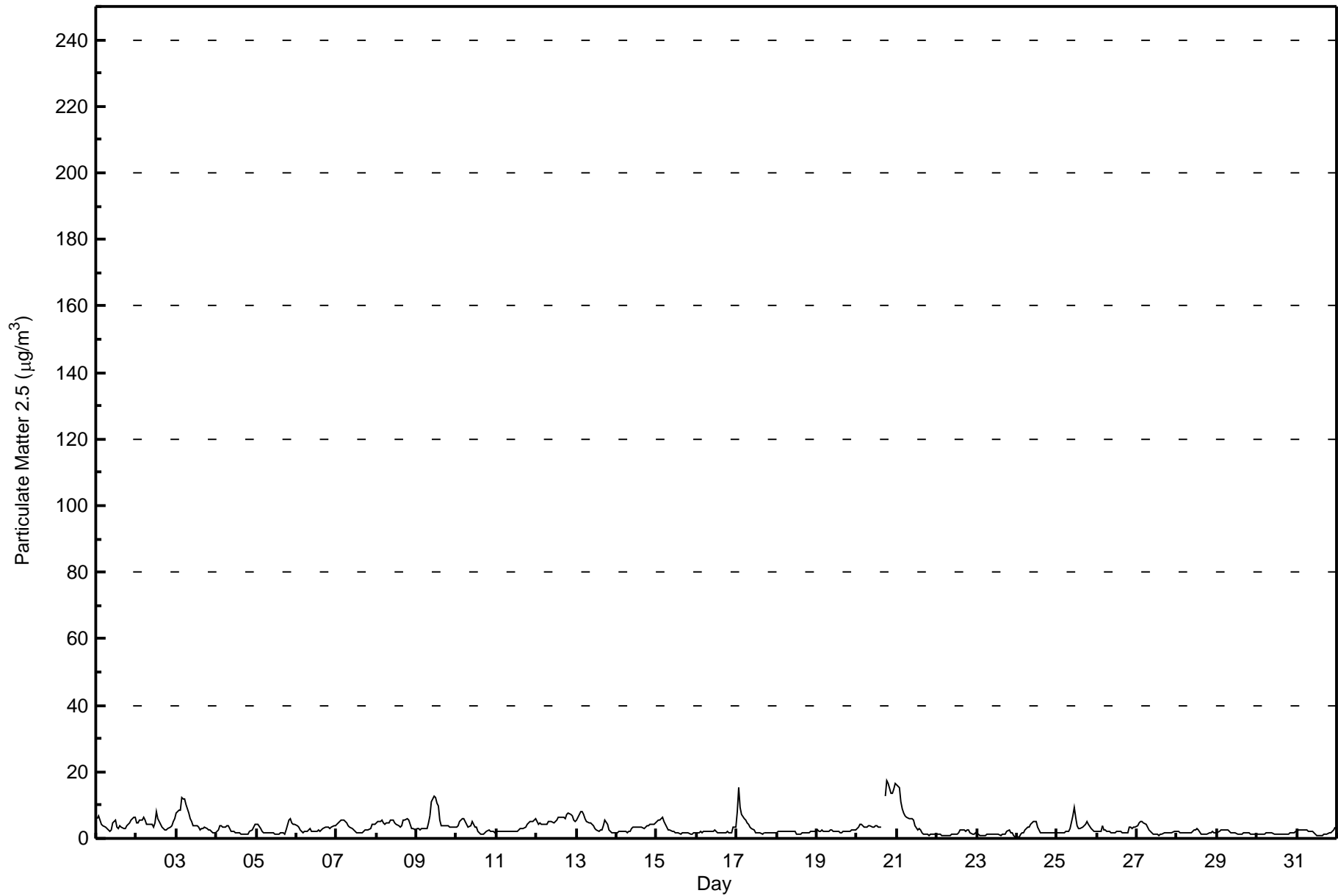


Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																															
Maximum Value: 17.3 µg/m <sup>3</sup> on Dec 20 19:00		Maximum Daily Average: 7.3 µg/m <sup>3</sup> on Dec 20																																															
Minimum Value: 0.4 µg/m <sup>3</sup> on Dec 24 01:00		Hours of Data: 742																																															
Maximum Diurnal Average: 4.1 µg/m <sup>3</sup> at hour 2		Hours of Missing Data: 2																																															
Monthly Average: 3.18 µg/m <sup>3</sup>		Hours of Calibration: 2																																															
Minimum Daily Average: 1.2 µg/m <sup>3</sup> on Dec 23		Percent Operational Time: 100.0																																															
Minimum Diurnal Average: 2.2 µg/m <sup>3</sup> at hour 16		Percentiles: P <sub>1</sub> = 0.9 P <sub>10</sub> = 1.3 Q <sub>1</sub> = 1.7 Median = 2.4 Q <sub>3</sub> = 4.0 P <sub>90</sub> = 5.6 P <sub>99</sub> = 14.4																																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	5.7	6.8	5.3	4.1	3.8	3.2	2.8	2.6	2.3	2.7	4.6	5.5	3.4	2.8	3.6	3.4	2.9	2.8	3.8	4.1	4.6	5.4	6.3	6.2	4.1	6.8																							
2-Dec	4.5	4.5	5.3	5.4	6.3	5.4	4.3	4.2	4.4	4.1	3.4	4.7	7.9	6.1	4.4	3.4	3.1	2.7	2.5	2.9	3.4	3.8	5.2	5.8	4.5	7.9																							
3-Dec	7.8	8.6	8.5	12.4	11.8	11.7	10.2	7.5	6.0	5.2	3.8	3.9	3.9	3.5	2.7	2.9	3.1	3.3	3.0	2.5	2.5	2.3	1.7	1.7	5.4	12.4																							
4-Dec	2.2	2.5	3.6	3.8	3.2	3.2	3.8	4.0	3.0	2.3	1.9	1.8	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.5	2.3	2.6	3.3	4.1	2.5	4.1																							
5-Dec	4.4	4.1	3.0	2.2	1.9	1.8	1.7	1.7	1.7	1.6	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.4	2.4	5.6	5.8	4.7	4.2	4.0	2.6	5.8																							
6-Dec	3.7	3.4	2.7	2.1	1.8	2.1	2.2	2.4	2.9	2.0	2.0	2.1	2.3	2.4	2.3	2.4	2.8	3.2	3.6	3.5	2.9	3.2	3.6	3.7	2.7	3.7																							
7-Dec	4.4	4.7	5.0	5.4	5.7	5.3	4.6	4.0	3.5	2.9	2.5	2.0	1.7	1.6	1.6	1.7	1.9	2.4	2.7	2.7	3.1	4.3	4.1	4.3	3.4	5.7																							
8-Dec	4.8	5.2	5.2	5.4	4.5	4.2	4.5	4.7	5.4	5.7	5.5	4.8	4.1	3.7	3.2	3.8	5.3	5.3	5.9	5.4	4.1	3.1	2.8	2.6	4.5	5.9																							
9-Dec	3.0	2.8	2.7	2.9	2.8	2.8	3.1	4.5	6.9	11.1	12.8	12.3	10.6	9.8	5.7	3.7	3.9	3.8	3.8	3.8	3.3	3.5	3.4	3.5	5.3	12.8																							
10-Dec	3.5	4.0	5.2	5.8	6.0	5.1	4.2	3.2	3.8	4.9	4.3	3.6	3.3	2.2	1.3	1.1	1.2	1.7	2.0	2.5	2.1	2.1	2.0	1.7	3.2	6.0																							
11-Dec	2.0	2.2	2.2	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.3	2.8	3.0	3.1	3.4	4.3	4.6	5.2	5.0	5.2	5.8	3.0	5.8																							
12-Dec	5.2	4.3	4.8	4.4	4.3	4.3	4.4	5.0	5.1	5.0	4.8	5.0	5.6	6.5	6.2	6.4	6.3	6.1	7.1	7.6	7.4	6.9	5.4	4.9	5.5	7.6																							
13-Dec	5.5	6.4	7.8	8.2	7.3	6.1	5.1	4.7	4.6	4.2	3.8	3.1	2.4	2.3	2.4	2.6	3.8	5.4	4.1	2.6	2.0	1.8	1.6	1.5	4.1	8.2																							
14-Dec	1.9	2.1	2.2	2.1	2.1	2.0	1.9	1.9	2.1	2.8	3.2	3.5	3.4	3.3	3.2	3.4	3.2	3.5	3.9	3.9	4.4	4.2	4.4	4.6	3.0	4.6																							
15-Dec	4.9	5.7	5.4	6.2	5.3	4.1	3.4	2.5	2.5	2.3	2.0	1.6	1.6	1.5	1.5	1.5	1.7	1.6	1.6	1.5	1.5	1.6	1.7	1.7	2.7	6.2																							
16-Dec	1.8	1.8	1.9	1.9	2.0	2.1	2.1	2.0	2.0	2.0	2.1	2.4	1.7	1.6	1.8	1.7	1.7	1.8	1.9	1.6	1.6	1.8	3.4	3.5	2.0	3.5																							
17-Dec	8.2	15.2	9.5	7.1	6.0	5.6	4.8	4.1	3.4	3.0	2.4	1.8	1.5	1.6	1.6	1.5	1.5	1.6	1.7	1.9	1.8	1.8	1.7	1.7	3.8	15.2																							
18-Dec	1.8	2.0	2.2	2.2	1.9	1.9	2.0	2.2	2.2	2.1	1.9	2.0	1.3	1.3	1.4	1.6	1.7	1.7	1.7	1.9	2.1	2.0	2.2	2.2	1.9	2.2																							
19-Dec	2.4	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.5	2.5	2.2	2.1	2.0	2.0	1.8	1.9	2.1	2.0	2.0	2.0	2.0	2.3	2.5	2.5	2.2	2.5																							
20-Dec	3.0	3.5	4.3	4.3	3.5	3.5	3.3	3.9	3.7	3.5	3.6	4.0	3.8	3.3	3.6	C	C	12.5	17.3	16.3	13.5	13.5	14.8	16.6	7.3	17.3																							
21-Dec	16.0	15.4	11.0	8.8	7.6	6.7	6.4	6.1	6.1	6.0	5.5	4.0	2.6	2.8	2.4	1.9	1.4	1.3	1.1	1.0	1.1	1.1	1.1	1.1	4.9	16.0																							
22-Dec	1.1	1.1	1.1	1.0	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.7	2.5	2.7	2.6	2.3	2.5	2.4	1.8	1.4	1.1	1.6	1.5	2.7																						
23-Dec	1.3	1.3	0.8	0.6	0.9	1.0	1.1	1.1	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.1	1.1	1.2	2.0	2.7	1.8	1.7	0.8	0.5	1.2	2.7																							
24-Dec	0.4	0.5	1.5	1.6	1.8	2.5	3.2	3.6	4.0	4.6	5.2	5.2	3.5	2.6	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	2.3	5.2																							
25-Dec	1.7	1.7	1.8	1.8	1.9	2.0	2.0	2.2	2.9	6.7	9.2	6.5	4.0	3.2	2.9	3.3	3.9	4.1	5.2	4.0	3.0	2.5	2.2	1.9	3.4	9.2																							
26-Dec	2.2	2.0	2.1	3.6	2.5	2.7	2.2	1.9	1.8	1.6	1.7	1.8	2.0	1.9	1.9	1.7	1.7	1.8	1.9	3.2	3.6	3.1	3.2	3.5	2.3	3.6																							
27-Dec	3.9	4.8	5.0	5.1	4.6	4.1	3.5	2.5	2.3	1.6	1.4	1.3	1.2	1.0	1.1	1.4	1.6	1.8	1.9	1.7	1.7	1.8	2.0	2.1	2.5	5.1																							
28-Dec	2.2	2.3	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.6	2.4	3.1	2.6	1.1	1.1	1.3	1.3	1.4	1.7	1.8	2.1	1.6	1.8	1.9	3.1																							
29-Dec	1.7	2.0	2.6	2.7	2.7	2.5	2.4	2.0	1.9	1.7	1.7	1.6	1.5	1.2	1.2	1.3	1.5	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.8	2.7																							
30-Dec	1.3	1.3	1.3	1.4	1.4	1.6	1.5	1.5	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.9	2.0	1.5	2.0																							
31-Dec	2.1	2.4	2.5	2.3	2.4	2.4	2.4	2.2	2.3	1.9	1.6	1.2	1.0	0.9	0.7	0.9	1.1	1.3	1.5	1.5	1.6	2.1	2.7	3.4	1.9	3.4																							
																								3.7	4.1	3.9	3.9	3.7	3.4	3.2	3.1	3.1	3.3	3.3	3.1	2.8	2.6	2.3	2.2	2.4	2.8	3.2	3.3	3.1	3.1	3.2	3.4	Diurnal Average	
																								16.0	15.4	11.0	12.4	11.8	11.7	10.2	7.5	6.9	11.1	12.8	12.3	10.6	9.8	6.2	6.4	6.3	12.5	17.3	16.3	13.5	13.5	14.8	16.6	Diurnal Maximum	
C - Calibration				Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																													



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Stony Mountain - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	649	87.47	87.47
6 - 15	74	9.97	97.44
16 - 25	4	0.54	97.98
26 - 80	0	0.00	97.98
> 81.0	0	0.00	97.98

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Stony Mountain - December 2017**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	3	3	0	0	0	3	1	3	30	80	59	73	212	113	61	8	649
6 - 15	0	1	1	0	0	0	0	0	2	20	6	3	25	16	0	0	74
16 - 25	0	0	0	0	0	0	0	0	1	3	0	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
<b>Totals</b>	3	4	1	0	0	3	1	3	33	103	65	76	237	129	61	8	727

Total Number of Valid Hours: 742

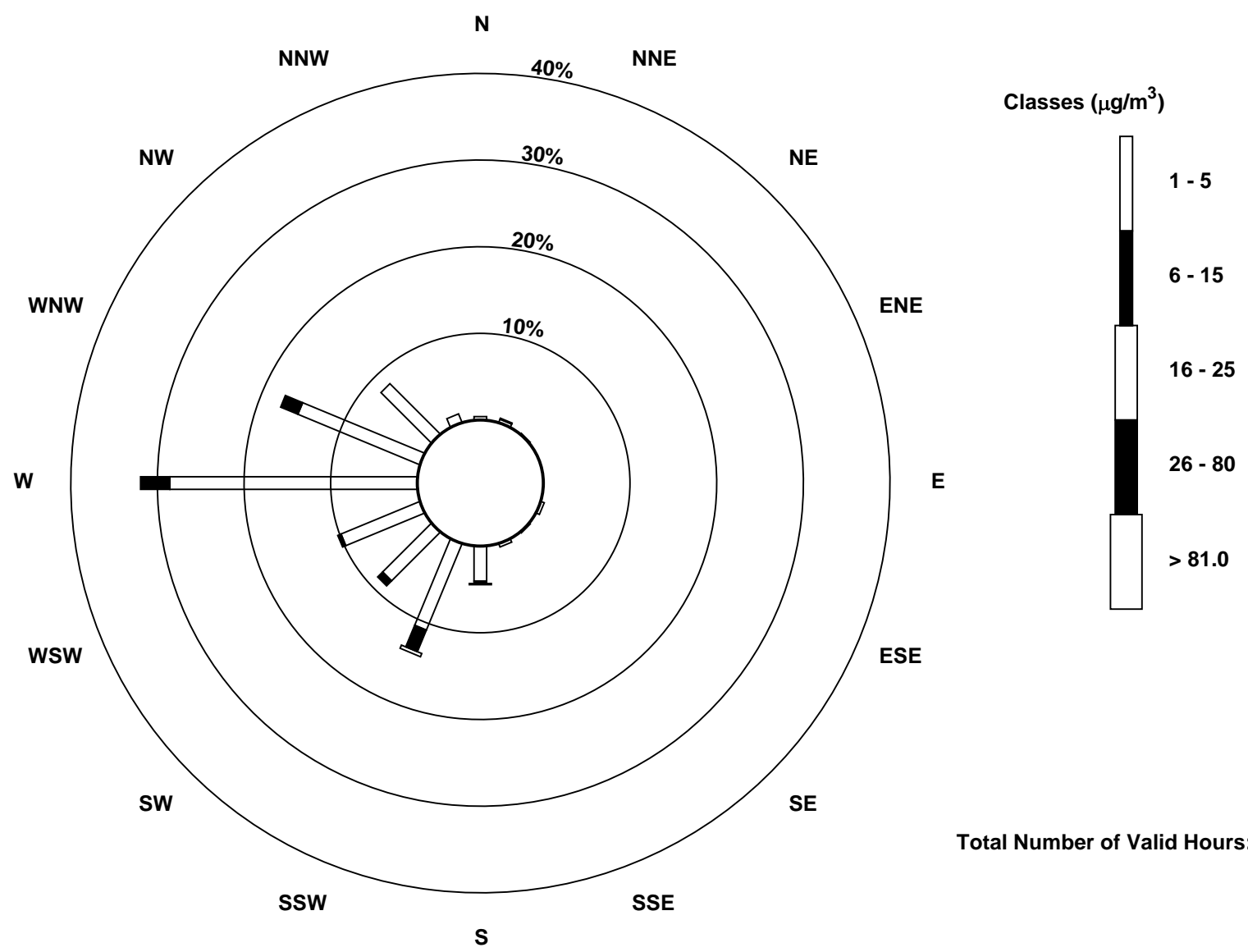
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Stony Mountain (AMS 18)



Total Number of Valid Hours: 742

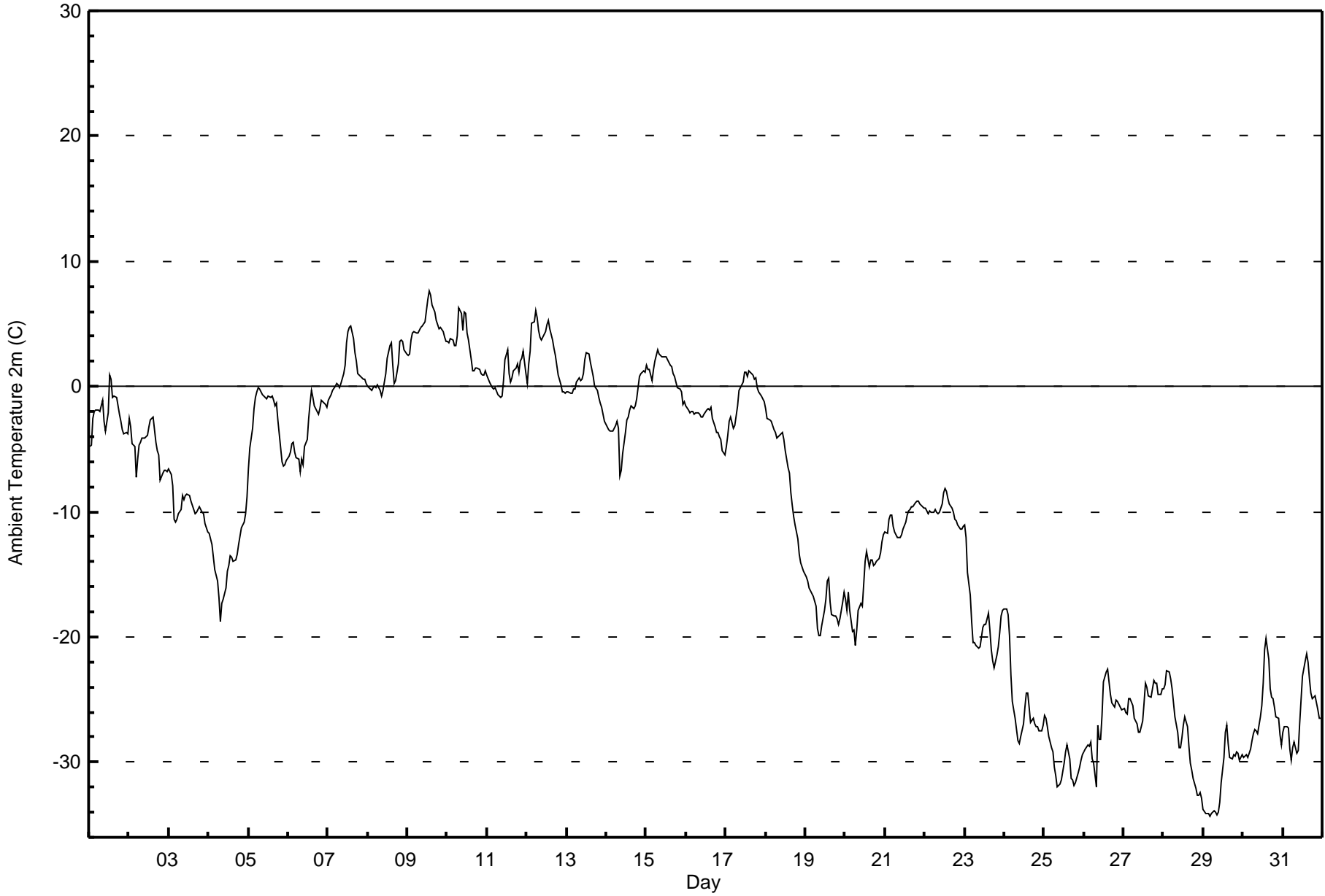


Maximum Value: 7.7 C on Dec 9 14:00		Maximum Daily Average: 4.9 C on Dec 9		Hours in Service: 744																							
Minimum Value: -34.3 C on Dec 29 05:00		Minimum Daily Average: -31.4 C on Dec 29		Hours of Data: 744																							
Maximum Diurnal Average: -8.7 C at hour 14		Minimum Diurnal Average: -11.4 C at hour 10		Hours of Missing Data: 0																							
Monthly Average: -10.48 C		Percentiles: P <sub>1</sub> = -34.0 P <sub>10</sub> = -28.3 Q <sub>1</sub> = -21.9 Median = -6.9 Q <sub>3</sub> = -0.3 P <sub>90</sub> = 2.4 P <sub>99</sub> = 6.0		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-4.8	-4.6	-2.6	-2.0	-1.9	-1.9	-2.0	-1.5	-1.1	-2.8	-3.6	-2.1	0.9	0.6	-0.8	-0.8	-0.9	-1.5	-2.3	-2.8	-3.4	-3.7	-3.7	-3.8	-2.2	0.9	
2-Dec	-2.6	-3.2	-4.6	-4.8	-7.2	-5.8	-4.7	-4.5	-4.1	-4.1	-4.0	-3.9	-3.3	-2.7	-2.4	-3.5	-4.4	-5.1	-5.5	-7.5	-6.9	-6.7	-6.7	-6.8	-4.8	-2.4	
3-Dec	-6.6	-7.0	-7.9	-10.6	-10.8	-10.6	-10.1	-9.8	-8.7	-9.0	-8.7	-8.6	-8.7	-9.2	-9.5	-9.8	-10.1	-10.0	-9.6	-9.8	-10.0	-10.1	-10.9	-11.6	-9.5	-6.6	
4-Dec	-11.7	-12.1	-12.7	-13.6	-14.6	-15.5	-16.9	-18.8	-17.3	-17.0	-16.1	-14.8	-14.3	-13.5	-13.7	-13.9	-13.8	-13.5	-12.6	-11.9	-11.3	-10.8	-10.1	-8.8	-13.7	-8.8	
5-Dec	-6.5	-4.9	-3.3	-1.7	-0.9	-0.4	-0.1	-0.2	-0.6	-0.8	-0.9	-0.9	-0.8	-0.9	-0.8	-1.1	-1.5	-1.3	-2.7	-4.8	-6.0	-6.3	-6.2	-5.9	-2.5	-0.1	
6-Dec	-5.6	-5.2	-4.5	-4.4	-5.3	-5.7	-5.8	-6.8	-5.8	-6.3	-4.7	-4.2	-2.5	-1.3	-0.3	-0.9	-1.5	-2.0	-2.2	-1.7	-1.1	-1.3	-1.4	-1.7	-3.4	-0.3	
7-Dec	-1.1	-0.9	-0.6	-0.3	0.1	0.3	0.2	-0.1	0.2	1.1	1.7	3.5	4.4	4.8	4.9	3.8	2.7	2.1	1.0	0.9	0.7	0.6	0.6	0.2	1.3	4.9	
8-Dec	0.0	-0.1	-0.3	-0.1	0.0	-0.1	0.2	-0.3	-0.8	-0.3	0.4	1.1	2.3	3.2	3.5	1.7	0.3	0.5	1.8	3.6	3.7	3.6	2.9	2.6	1.2	3.7	
9-Dec	2.4	2.6	3.7	4.3	4.4	4.3	4.3	4.4	4.7	4.9	5.1	6.1	6.9	7.7	7.3	6.6	6.0	5.3	4.9	4.6	4.7	4.4	3.9	3.6	4.9	7.7	
10-Dec	3.6	3.5	3.8	3.7	3.3	3.3	4.0	6.3	5.8	4.5	5.9	5.8	4.3	3.7	2.2	1.3	1.2	1.5	1.4	1.4	1.1	0.9	0.9	1.2	3.1	6.3	
11-Dec	0.9	0.4	0.2	-0.1	-0.2	-0.1	-0.6	-0.8	-0.9	-0.7	0.5	2.1	2.9	1.0	0.3	0.7	1.2	1.5	1.8	1.1	2.1	2.3	2.8	1.1	0.8	2.9	
12-Dec	0.2	1.8	2.8	5.0	5.2	6.0	5.5	4.5	3.9	3.7	4.2	4.4	4.9	5.2	4.6	3.8	3.1	2.5	1.7	0.9	0.2	-0.4	-0.5	-0.5	3.0	6.0	
13-Dec	-0.4	-0.4	-0.6	-0.5	-0.2	-0.1	0.3	0.7	0.5	0.5	1.1	2.1	2.7	2.6	1.9	1.4	0.8	0.0	-0.3	-0.9	-1.3	-1.6	-2.2	-2.8	0.1	2.7	
14-Dec	-3.2	-3.5	-3.6	-3.6	-3.5	-3.1	-2.7	-3.3	-7.1	-6.7	-5.3	-3.6	-2.6	-2.4	-1.9	-1.6	-1.8	-1.5	-1.0	-1.0	0.8	1.1	1.2	1.1	-2.4	1.2	
15-Dec	1.7	1.4	1.3	0.5	1.4	2.0	2.5	2.9	2.6	2.3	2.4	2.4	2.2	1.7	1.6	1.0	0.8	0.3	-0.1	-0.2	-0.4	-1.5	-1.2	1.2	2.9		
16-Dec	-1.6	-1.9	-2.1	-2.0	-2.0	-2.2	-2.1	-2.1	-2.2	-2.4	-2.4	-2.2	-1.9	-1.8	-1.8	-1.6	-2.5	-3.2	-3.7	-3.7	-4.1	-4.2	-5.1	-5.5	-2.7	-1.6	
17-Dec	-4.7	-3.9	-2.8	-2.4	-3.3	-3.1	-2.3	-1.6	-0.3	-0.1	0.4	1.1	1.1	0.9	1.3	1.0	0.9	0.6	0.7	-0.1	-0.5	-0.8	-0.9	-1.2	-0.8	1.3	
18-Dec	-1.8	-2.5	-2.6	-2.7	-3.1	-3.4	-3.7	-4.1	-3.9	-3.7	-3.7	-4.2	-5.1	-6.5	-6.9	-8.5	-9.5	-10.4	-11.1	-12.2	-13.4	-14.1	-14.5	-14.7	-6.9	-1.8	
19-Dec	-15.2	-15.6	-16.0	-16.3	-16.5	-16.8	-17.6	-19.4	-19.8	-19.9	-19.1	-17.9	-17.0	-15.5	-15.3	-17.2	-18.2	-18.3	-18.3	-18.5	-18.9	-18.5	-17.2	-16.4	-17.5	-15.2	
20-Dec	-17.0	-17.8	-16.4	-17.9	-19.6	-19.5	-20.7	-19.5	-17.9	-17.3	-17.6	-15.8	-14.0	-13.2	-14.4	-13.8	-13.8	-14.2	-14.2	-13.9	-13.7	-13.3	-12.4	-11.8	-15.8	-11.8	
21-Dec	-11.7	-11.7	-10.7	-10.3	-10.3	-11.2	-11.6	-12.0	-12.1	-12.1	-11.9	-11.4	-10.8	-10.3	-10.0	-9.8	-9.6	-9.6	-9.2	-9.1	-9.2	-9.3	-9.5	-9.7	-10.5	-9.1	
22-Dec	-9.7	-9.9	-10.2	-10.0	-10.0	-10.0	-9.8	-10.0	-10.2	-10.0	-9.4	-8.5	-8.1	-8.4	-8.9	-9.4	-9.7	-10.0	-10.6	-10.7	-11.1	-11.4	-11.4	-11.2	-9.9	-8.1	
23-Dec	-11.0	-12.0	-14.9	-16.6	-18.8	-20.4	-20.4	-20.7	-20.9	-20.8	-20.0	-19.2	-18.9	-18.9	-18.1	-19.5	-21.1	-21.9	-22.4	-21.5	-20.8	-19.7	-18.3	-17.9	-19.0	-11.0	
24-Dec	-17.8	-17.8	-18.2	-19.9	-23.0	-25.2	-26.5	-27.4	-28.3	-28.5	-27.9	-27.0	-25.6	-24.5	-24.5	-25.6	-26.8	-26.5	-26.9	-27.1	-27.2	-27.5	-27.5	-27.1	-25.2	-17.8	
25-Dec	-26.2	-26.5	-27.2	-28.0	-28.8	-29.2	-30.4	-31.1	-31.9	-31.8	-31.4	-30.8	-30.1	-29.2	-28.7	-29.7	-31.3	-31.4	-31.8	-31.7	-30.9	-30.4	-29.8	-29.4	-29.9	-26.2	
26-Dec	-29.2	-29.0	-28.6	-28.7	-28.4	-29.7	-30.1	-31.9	-27.1	-28.1	-28.1	-26.2	-23.6	-22.8	-22.6	-23.6	-24.5	-25.3	-25.6	-25.1	-25.1	-25.3	-25.6	-25.8	-26.7	-22.6	
27-Dec	-25.7	-26.0	-26.1	-25.0	-25.0	-25.5	-26.5	-26.8	-27.0	-27.6	-27.7	-26.7	-25.3	-23.7	-24.0	-24.7	-24.9	-24.1	-23.5	-23.7	-23.7	-24.6	-24.6	-24.1	-25.3	-23.5	
28-Dec	-24.2	-23.8	-22.7	-22.8	-23.3	-24.1	-25.2	-26.3	-27.6	-28.9	-28.8	-28.1	-27.0	-26.4	-27.1	-28.7	-30.0	-30.7	-31.3	-32.1	-32.6	-32.7	-32.5	-32.9	-27.9	-22.7	
29-Dec	-33.8	-34.0	-34.1	-34.1	-34.3	-34.1	-33.9	-34.0	-34.3	-34.0	-33.2	-31.6	-29.6	-27.6	-27.0	-28.5	-29.7	-29.7	-29.4	-29.5	-29.2	-29.3	-29.9	-29.4	-31.4	-27.0	
30-Dec	-29.7	-29.5	-29.4	-29.6	-28.9	-28.3	-27.7	-27.4	-27.5	-27.7	-26.4	-25.4	-23.7	-21.1	-20.1	-21.8	-24.1	-24.8	-24.9	-25.6	-26.4	-26.5	-27.8	-28.7	-26.4	-20.1	
31-Dec	-27.7	-27.2	-27.2	-27.2	-28.9	-29.9	-28.9	-28.4	-29.3	-29.1	-27.0	-25.0	-23.1	-21.9	-21.4	-22.0	-23.4	-24.5	-24.9	-24.7	-25.2	-25.9	-26.5	-26.5	-26.1	-21.4	
		-10.3	-10.4	-10.3	-10.4	-10.8	-11.0	-11.1	-11.3	-11.3	-11.4	-10.8	-10.0	-9.1	-8.7	-8.8	-9.5	-10.2	-10.5	-10.7	-10.9	-10.9	-11.0	-11.1	-11.1	Diurnal Average	
		3.6	3.5	3.8	5.0	5.2	6.0	5.5	6.3	5.8	4.9	5.9	6.1	6.9	7.7	7.3	6.6	6.0	5.3	4.9	4.6	4.7	4.4	3.9	3.6	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 2m (AT 2m) - C**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Stony Mountain - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	200	26.88	26.88
-20 - 0	377	50.67	77.55
0 - 10	167	22.45	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

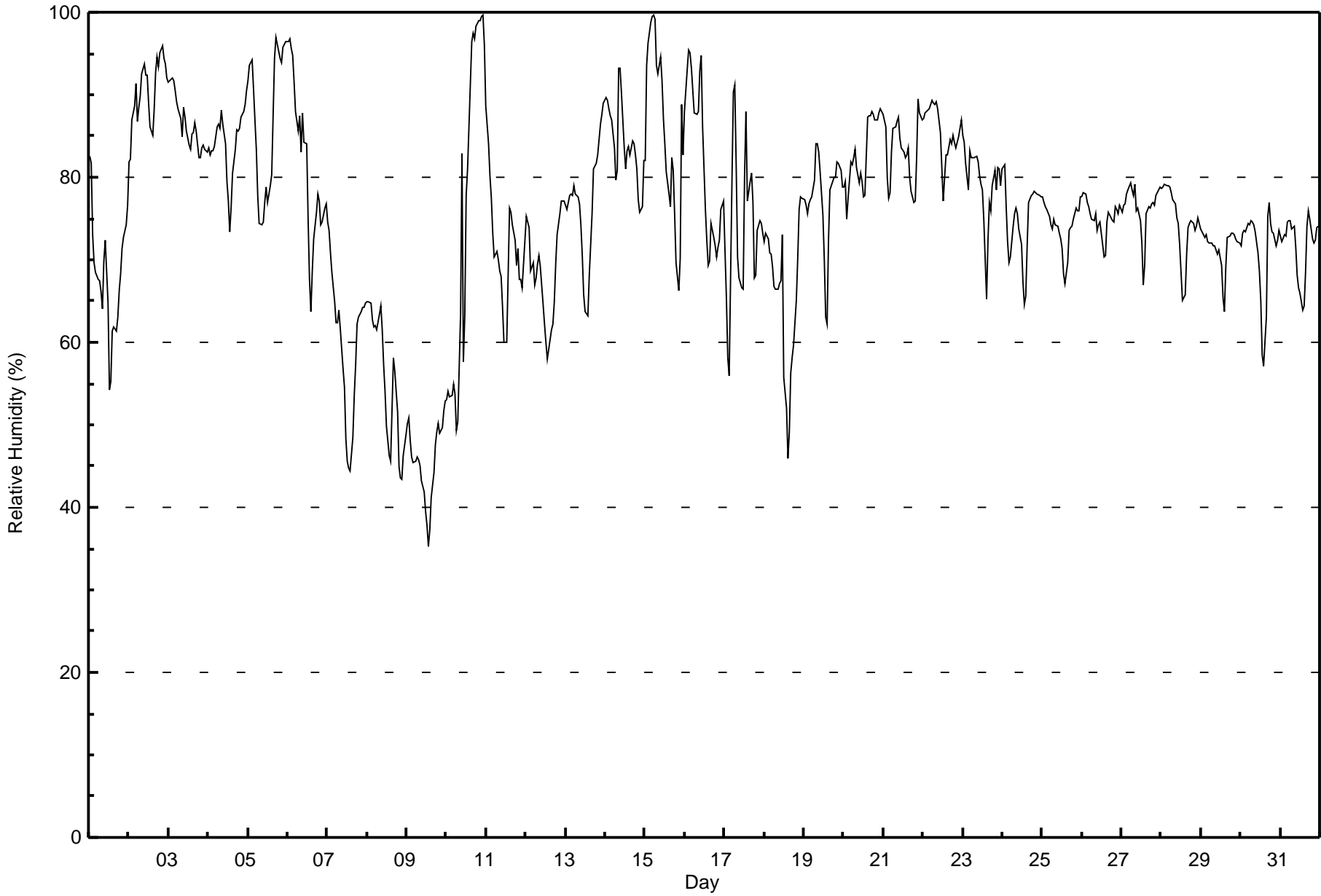
**Stony Mountain - December 2017**

Maximum Value: 100 % on Dec 15 06:00																			Maximum Daily Average: 90.3 % on Dec 2						Hours in Service: 744																								
Minimum Value: 35 % on Dec 9 14:00																			Minimum Daily Average: 45.6 % on Dec 9						Hours of Data: 744																								
Maximum Diurnal Average: 78.9 % at hour 2																			Minimum Diurnal Average: 68.4 % at hour 14						Hours of Missing Data: 0																								
Monthly Average: 75.5 %																			Percentiles: P <sub>1</sub> = 43 P <sub>10</sub> = 61 Q <sub>1</sub> = 70 Median = 76 Q <sub>3</sub> = 83 P <sub>90</sub> = 89 P <sub>99</sub> = 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-Dec	83	82	73	70	68	68	68	66	64	70	72	65	54	55	61	62	61	63	66	68	71	73	74	77	68.1	83																							
2-Dec	82	82	87	89	91	87	89	90	92	94	92	92	89	86	85	88	93	95	93	95	96	94	94	92	90.3	96																							
3-Dec	91	92	92	92	91	89	88	87	85	88	87	86	84	83	85	86	87	86	82	82	84	84	83	83	86.6	92																							
4-Dec	84	83	83	83	84	86	86	86	88	86	84	79	77	73	76	81	83	86	86	86	87	88	89	91	84.0	91																							
5-Dec	92	94	94	91	87	83	78	74	74	75	77	79	77	79	80	87	94	97	96	94	94	96	96	96	86.9	97																							
6-Dec	96	97	96	95	91	88	86	87	83	88	84	84	75	68	64	69	73	76	78	77	74	75	76	77	81.5	97																							
7-Dec	75	73	71	68	65	62	62	64	62	57	55	48	46	45	44	49	54	57	62	63	64	64	64	65	59.9	75																							
8-Dec	65	65	65	63	62	62	62	63	64	61	57	54	50	46	46	52	58	56	51	45	44	43	46	49	55.4	65																							
9-Dec	50	51	48	46	45	46	46	46	45	43	42	39	38	35	37	41	44	48	49	50	49	50	52	53	45.6	53																							
10-Dec	53	54	53	54	55	54	49	50	63	83	58	63	78	81	91	97	97	97	98	99	99	100	100	96	75.9	100																							
11-Dec	89	84	80	77	73	70	71	70	69	68	64	60	60	68	76	76	74	72	69	71	68	68	67	72	71.6	89																							
12-Dec	75	75	74	69	70	67	68	69	70	69	65	62	60	58	59	62	62	65	70	73	76	77	77	77	68.7	77																							
13-Dec	77	76	78	78	78	79	78	78	77	74	70	66	64	63	68	72	76	81	82	83	85	86	88	89	76.8	89																							
14-Dec	90	89	88	87	87	84	80	81	93	93	90	84	81	83	84	83	84	83	81	77	76	77	82	82	84.2	93																							
15-Dec	82	93	96	99	100	100	99	93	93	95	92	87	84	81	78	76	82	81	76	70	66	70	89	83	86.0	100																							
16-Dec	88	93	95	95	93	91	88	88	88	93	95	86	76	72	69	70	74	73	72	70	72	72	76	77	81.9	95																							
17-Dec	71	65	58	56	80	90	91	81	70	68	67	66	80	88	77	79	80	77	68	68	74	75	74	73	74.1	91																							
18-Dec	72	73	73	71	71	69	67	67	66	67	67	73	56	52	46	49	56	58	60	65	70	76	78	77	65.8	78																							
19-Dec	77	77	76	77	77	78	80	84	84	83	81	75	70	63	62	72	79	79	80	80	82	82	81	79	77.4	84																							
20-Dec	79	79	75	77	82	82	82	83	81	79	81	80	78	78	87	87	88	88	88	87	87	88	88	88	83.0	88																							
21-Dec	88	86	80	77	78	83	86	86	87	87	85	84	83	82	83	84	80	78	77	77	82	89	88	87	83.2	89																							
22-Dec	87	88	88	88	88	89	89	89	89	88	85	81	77	80	83	83	85	84	85	84	84	85	86	87	85.5	89																							
23-Dec	85	84	82	79	83	82	82	82	82	80	79	78	75	65	72	77	76	79	81	78	81	81	79	79	79.4	85																							
24-Dec	81	82	76	72	70	74	74	76	76	74	72	67	65	66	72	77	78	78	78	78	78	78	78	78	74.6	82																							
25-Dec	78	77	76	76	75	74	74	75	74	74	73	73	71	68	67	70	74	74	74	75	76	76	76	78	74.1	78																							
26-Dec	78	78	78	77	76	76	75	75	76	74	74	75	73	70	71	75	76	75	75	75	76	76	76	77	75.2	78																							
27-Dec	76	77	77	78	78	79	78	78	79	76	76	75	72	67	69	76	76	76	77	77	77	78	78	79	76.2	79																							
28-Dec	79	79	79	79	79	79	78	77	77	75	74	72	68	65	66	71	74	74	75	74	74	74	75	74	74.7	79																							
29-Dec	74	73	73	73	72	72	72	72	72	71	71	71	69	65	64	69	73	73	73	73	73	73	72	72	71.5	74																							
30-Dec	72	73	74	73	74	74	75	75	74	73	71	69	65	59	57	63	75	77	74	73	73	72	72	74	71.3	77																							
31-Dec	73	72	73	73	75	75	75	74	74	71	68	67	66	64	64	68	74	76	75	73	72	72	74	74	71.7	76																							
																								78.7	78.9	77.8	76.8	77.4	77.0	76.6	76.3	76.6	76.9	74.6	72.4	69.9	68.4	68.8	72.2	75.5	76.1	75.8	75.8	76.1	77.1	78.2	78.5	Diurnal Average	
																								96	97	96	99	100	100	99	93	93	95	95	92	89	88	91	97	97	97	98	99	99	100	100	96	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Stony Mountain - December 2017**

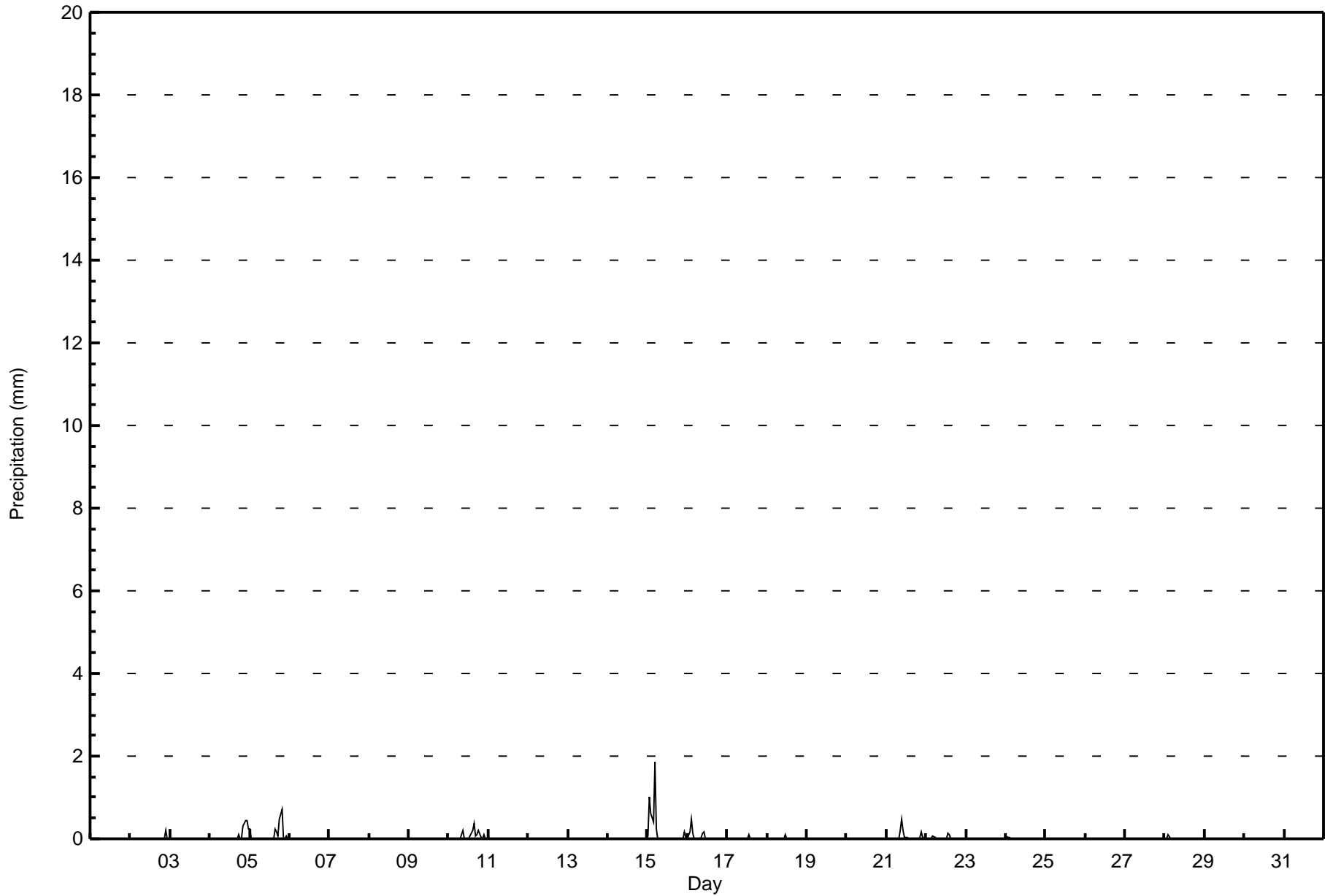






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Stony Mountain - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	733	98.52	98.52
0.4 - 0.5	7	0.94	99.46
0.6 - 0.7	2	0.27	99.73
0.8 - 1.4	1	0.13	99.87
1.5 - 10	1	0.13	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Leaf Wetness (LW) - %**

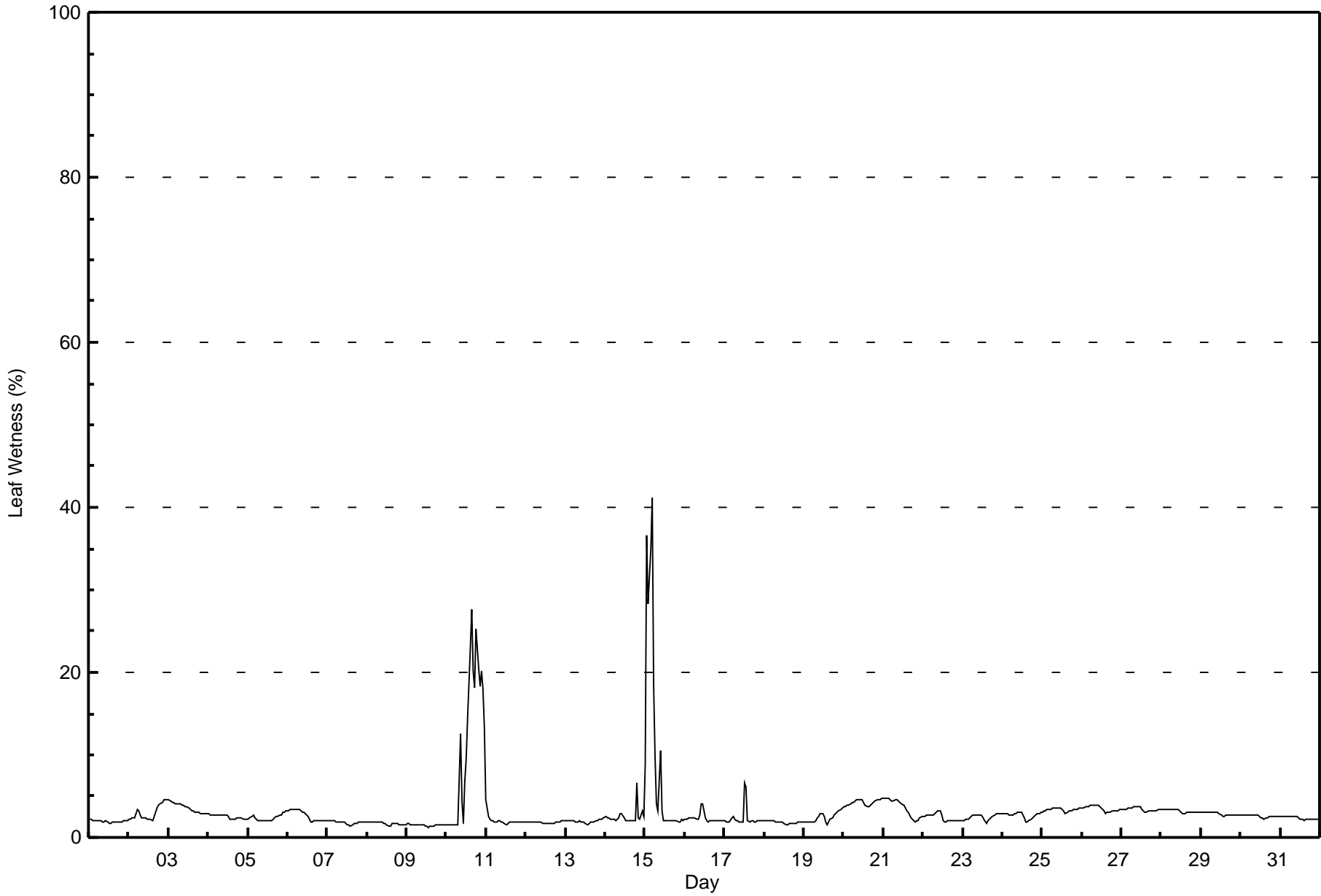
**Stony Mountain - December 2017**

Maximum Value: 41 % on Dec 15 05:00														Maximum Daily Average: 11.1 % on Dec 10														Hours in Service: 744	
Minimum Value: 1 % on Dec 9 14:00														Minimum Daily Average: 1.5 % on Dec 9														Hours of Data: 744	
Maximum Diurnal Average: 3.9 % at hour 5														Minimum Diurnal Average: 2.7 % at hour 8														Hours of Missing Data: 0	
Monthly Average: 3.1 %														Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 21														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	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			
2-Dec	2	2	2	2	3	3	3	3	2	2	2	2	2	2	3	3	4	4	4	4	5	5	5	3.0	5				
3-Dec	5	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3.6	5				
4-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2.5	3				
5-Dec	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2.4	3				
6-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2.7	3				
7-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	1.8	2				
8-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1.7	2				
9-Dec	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	1	2	2	1.5	2				
10-Dec	2	2	2	2	2	2	2	2	13	4	2	7	10	14	23	28	20	18	25	20	18	20	18	11.1	28				
11-Dec	5	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	5				
12-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2				
13-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	2				
14-Dec	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	7	2	2	3	2.5	7				
15-Dec	9	37	28	35	41	18	10	4	3	11	3	2	2	2	2	2	2	2	2	2	2	2	2	9.4	41				
16-Dec	2	2	2	2	2	2	2	2	2	3	4	4	2	2	2	2	2	2	2	2	2	2	2	2.3	4				
17-Dec	2	2	2	2	2	3	2	2	2	2	2	7	6	2	2	2	2	2	2	2	2	2	2	2.4	7				
18-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2				
19-Dec	2	2	2	2	2	2	2	2	3	3	3	3	2	2	2	2	2	2	3	3	3	3	3	2.4	4				
20-Dec	4	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	5	5	5	4.2	5				
21-Dec	5	5	5	5	5	4	4	5	4	4	4	4	4	4	3	3	3	2	2	2	2	2	2	3.6	5				
22-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2.4	3				
23-Dec	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3	3	3	3	2.5	3				
24-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3	2.7	3				
25-Dec	3	3	3	3	3	3	3	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3.4	4				
26-Dec	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3.5	4				
27-Dec	3	3	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3.4	4				
28-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3.2	3				
29-Dec	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				
30-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2.6	3				
31-Dec	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	3				
2.9														3.7														Diurnal Average	
9														37														Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Leaf Wetness (LW) - %**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (LW) - %**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	0	0.00	0.00
0.4 - 0.5	0	0.00	0.00
0.6 - 0.7	0	0.00	0.00
0.8 - 1.4	10	1.34	1.34
1.5 - 10	711	95.56	96.91
> 10	18	2.42	99.33

Total Number of Valid Hours: 744

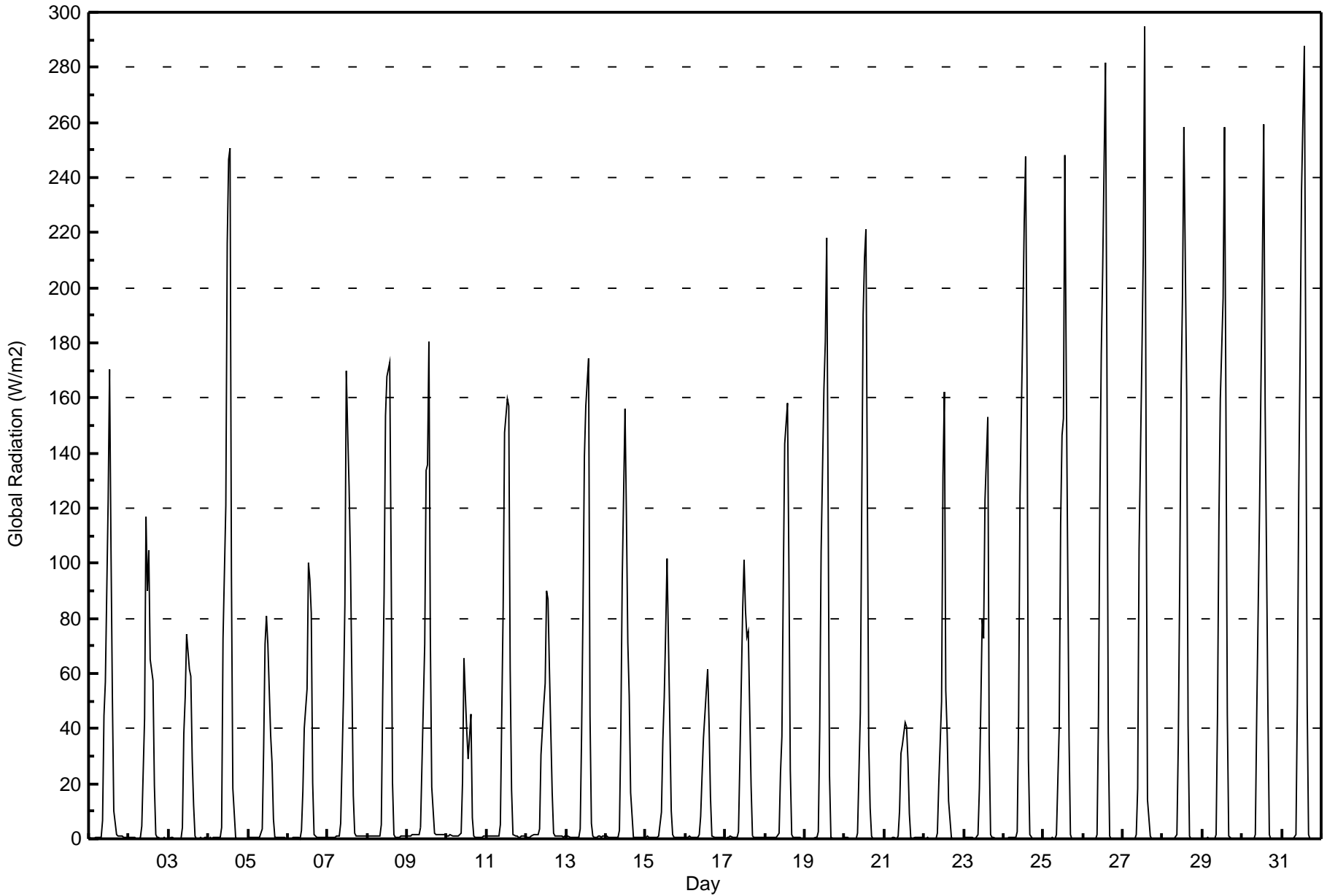
Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Global Radiation (GR) - W/m2**  
**Stony Mountain - December 2017**

Maximum Value: 295 W/m2 on Dec 27 14:00		Maximum Daily Average: 46.1 W/m2 on Dec 31		Hours in Service: 744																						
Minimum Value: 0 W/m2 on Dec 3 05:00		Minimum Daily Average: 8.4 W/m2 on Dec 21		Hours of Data: 744																						
Maximum Diurnal Average: 154.8 W/m2 at hour 14		Minimum Diurnal Average: 0.4 W/m2 at hour 23		Hours of Missing Data: 0																						
Monthly Average: 27.6 W/m2		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 23 P <sub>90</sub> = 117 P <sub>99</sub> = 243		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	1	0	0	7	45	57	123	170	106	52	10	2	1	1	1	1	0	0	0	24.1	170
2-Dec	1	0	0	0	0	0	0	0	4	44	117	90	105	65	58	19	1	0	0	0	0	0	0	0	21.2	117
3-Dec	0	0	1	0	0	0	0	0	4	38	52	74	62	59	29	12	1	0	0	0	0	0	0	0	13.9	74
4-Dec	0	0	0	0	1	0	0	0	4	73	121	216	247	250	96	18	0	0	0	0	0	0	0	0	42.8	250
5-Dec	0	0	0	1	1	1	0	0	4	33	71	81	71	38	27	7	1	0	1	1	1	0	0	0	14.1	81
6-Dec	0	0	0	0	1	0	0	0	3	18	40	54	100	94	82	20	1	0	0	0	0	0	0	0	17.4	100
7-Dec	0	0	0	0	0	1	1	1	6	52	85	170	147	128	100	16	2	1	1	1	1	1	1	1	29.9	170
8-Dec	1	1	1	1	1	1	1	1	5	52	89	154	168	173	102	21	1	0	0	1	1	1	1	1	32.4	173
9-Dec	1	1	1	1	1	1	1	1	4	26	71	134	136	180	74	19	2	2	1	1	1	1	1	1	27.7	180
10-Dec	1	1	1	1	1	1	1	1	2	21	65	52	39	29	45	8	1	1	1	1	1	0	1	1	11.5	65
11-Dec	1	1	1	1	1	1	1	1	5	45	84	148	160	157	62	18	2	1	1	1	1	1	1	1	28.9	160
12-Dec	0	1	1	1	1	1	2	1	4	30	49	56	90	87	62	17	2	1	1	1	1	1	1	1	17.1	90
13-Dec	1	1	1	0	1	1	1	1	4	38	84	139	157	174	45	5	1	0	1	1	1	1	1	1	27.4	174
14-Dec	1	1	1	0	0	0	0	0	3	39	94	156	117	71	52	17	1	0	0	0	0	0	0	0	23.2	156
15-Dec	1	1	1	1	1	1	1	1	1	10	36	52	75	102	42	10	2	1	1	1	1	1	1	1	14.1	102
16-Dec	1	1	1	1	1	0	0	0	1	8	23	36	53	61	42	15	1	1	1	0	0	0	0	0	10.4	61
17-Dec	0	0	0	1	1	1	1	0	2	29	83	101	83	73	75	19	1	1	1	1	0	1	0	0	19.8	101
18-Dec	1	0	0	0	1	1	1	0	2	24	37	93	144	158	99	25	1	0	0	0	0	0	0	0	24.5	158
19-Dec	0	0	0	0	0	0	1	1	3	40	104	163	180	218	123	23	1	0	0	0	0	0	0	0	35.7	218
20-Dec	1	0	0	0	0	0	0	0	2	46	122	190	211	221	34	11	1	0	0	0	0	0	0	0	35.0	221
21-Dec	0	0	0	0	0	0	0	0	1	10	31	34	42	41	29	9	0	0	0	0	0	0	0	0	8.4	42
22-Dec	0	0	0	0	0	0	0	0	2	20	50	132	162	54	38	14	1	0	0	0	0	0	0	0	19.8	162
23-Dec	0	0	0	1	1	0	0	0	1	18	48	80	73	123	153	34	1	0	0	0	0	0	0	0	22.3	153
24-Dec	0	0	0	0	1	1	1	0	2	44	125	188	224	248	169	29	1	0	0	0	0	0	0	0	43.1	248
25-Dec	0	0	0	0	0	0	0	0	2	40	114	146	153	248	170	37	1	0	0	0	0	0	0	0	38.0	248
26-Dec	0	0	0	0	0	0	0	0	2	44	123	176	206	282	178	39	1	0	0	0	0	0	0	0	43.8	282
27-Dec	0	0	0	0	0	0	0	0	1	18	105	175	212	295	143	14	1	0	0	0	0	0	0	0	40.3	295
28-Dec	0	0	0	0	0	0	0	0	2	34	92	163	197	258	161	41	1	0	0	0	0	0	0	0	39.6	258
29-Dec	0	0	0	0	0	0	0	0	2	45	115	160	196	258	158	45	1	0	0	0	0	0	0	0	40.9	258
30-Dec	0	0	0	0	0	0	0	0	1	45	119	164	207	259	157	46	1	0	0	0	0	0	0	0	41.7	259
31-Dec	0	0	0	0	0	0	0	0	2	49	126	179	236	288	176	50	1	0	0	0	0	0	0	0	46.1	288
		0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	2.8	34.8	81.6	125.1	142.7	154.8	91.4	21.5	1.2	0.4	0.4	0.4	0.4	0.4	0.4	Diurnal Average	
		1	1	1	1	1	1	2	1	7	73	126	216	247	295	178	50	2	2	1	1	1	1	1	Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2**  
**Stony Mountain - December 2017**

<b>Concentration Ranges (W/m2)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	554	74.46	74.46
21 - 100	107	14.38	88.84
101 - 300	83	11.16	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Stony Mountain - December 2017

Maximum Speed: 21 km/h on Dec 10 14:00	Maximum Daily Speed Average: 16.6 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 23 11:00	Minimum Daily Speed Average: 4.1 km/h on Dec 23	Hours of Data: 744
Maximum Diurnal Speed Average: 9.2 km/h at hour 11	Minimum Diurnal Speed Average: 7.0 km/h at hour 17	Hours of Missing Data: 0
Monthly Average Velocity: 8.3 km/h 257.0 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 5 Q <sub>1</sub> = 7 Median = 10 Q <sub>3</sub> = 13 P <sub>90</sub> = 16 P <sub>99</sub> = 19	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SSW12	SSW12	SW15	SW14	SW13	SW13	SW13	SW13	SW12	SSW12	SSW13	SSW11	SSW11	SSW7	S8	S11	S12	S13	SSW10	SSW10	SSW10	SSW10	SSW12	SW11	SSW11.1	SW15	
2-Dec	WSW11	WSW10	WSW8	WSW7	SW8	WSW11	W14	WSW10	W9	W11	W10	W8	W6	WSW6	W6	W7	SW5	SW7	SW7	SSW10	SSW10	SSW10	SSW10	SSW9	WSW8.0	W14	
3-Dec	WSW8	SW7	SW8	SSW12	SSW11	SSW10	SSW11	SW10	W13	W12	WNW12	WNW11	WNW11	WNW10	W9	W7	WNW7	WNW8	WNW8	NW7	NW4	WNW5	NW6	NW5	W6.9	W13	
4-Dec	NW4	NW5	NW5	NW4	NW3	WNW2	WNW4	WSW1	W4	WSW3	SW2	S3	S6	SSW7	S7	S8	S8	SSE9	S12	S13	S14	S15	SSW14	SSW12	SSW4.7	S15	
5-Dec	SW11	WSW16	W15	W15	W17	W17	W19	WNW18	WNW18	WNW17	WNW17	WNW17	WNW16	WNW16	WNW15	NW12	NW8	NW7	NNE9	NE8	NNE7	N6	NW3	NW2	WNW10.9	W19	
6-Dec	NW2	WNW4	WNW6	WNW6	W8	WSW9	SW8	SSW8	SSW10	SSW10	SSW10	SSW11	SW10	SW11	WSW12	WSW12	WSW13	WSW16	WSW16	W18	W16	W15	W16	W17	WSW9.9	W18	
7-Dec	W17	W14	W17	W17	W18	W18	W19	W19	W18	W19	W18	W16	W15	W13	W13	W11	W13	W14	W11	W12	W14	W15	W15	W13	W15.3	W19	
8-Dec	WSW15	W13	W12	W13	W14	W15	W14	WNW11	W12	W13	W15	W12	WSW9	WSW10	WSW8	SSW6	SSW9	SW11	SW13	WSW17	WSW18	W21	W19	W19	WSW12.7	W21	
9-Dec	W19	W17	W19	W18	W18	W17	W17	W18	W18	W18	W17	W17	W15	W15	W18	W17	W16	W16	W15	W16	W16	W14	W12	W15	W16.6	W19	
10-Dec	W15	WSW16	W14	W15	W14	WSW14	WSW14	W17	WSW16	SW11	WSW16	W20	W20	WNW21	WNW21	WNW17	WNW13	WNW13	WNW13	WNW10	WNW10	NW7	WNW6	WNW4	WNW9	W13.0	WNW21
11-Dec	W10	W11	W13	W13	W14	WSW15	W14	W13	W11	W10	W10	WSW10	WSW7	S10	SSW12	SSW11	SSW13	SSW15	SSW15	SSW14	SSW13	SW13	SW12	SSW12	SW10.5	WSW15	
12-Dec	SSW15	SW13	SW14	WSW18	W15	W18	W13	W12	W13	W14	W13	W13	W14	WNW13	WNW14	WNW13	WNW17	WNW16	WNW13	WNW12	WNW11	W11	W12	W13	W12.6	W18	
13-Dec	W13	W13	W13	W12	W13	W13	W12	WSW14	WSW15	W15	W14	WNW16	WNW17	NW14	NW11	NW10	NW11	NW8	WNW8	WNW11	WNW9	W12	W12	WNW11	W11.6	WNW17	
14-Dec	W10	W12	W13	W11	W9	W8	W9	SW6	SSW9	SSW11	SSW12	SSW13	SSW12	SSW12	S13	SSW13	SSW12	SSW13	SSW14	SW13	SW12	WSW12	W12	WSW10	SW9.5	SSW14	
15-Dec	WSW8	W10	W6	SSW4	WSW9	WSW9	WSW12	W15	W16	W15	W16	W17	W16	W16	W17	W16	W14	W15	W16	WSW16	WSW17	W16	WSW14	W16	W13.4	W17	
16-Dec	W14	W13	W14	W14	W14	W14	W15	W13	W10	WNW9	W9	WSW8	WSW11	WSW12	WSW13	SW11	SW10	SW12	SW13	SW14	SSW12	SSW12	SSW13	S12	WSW10.8	W15	
17-Dec	S14	S14	SSW16	SSW16	SSW16	SSW17	SSW15	SSW16	SW17	SW17	SW17	WSW17	W17	W18	W15	WSW15	WSW15	WSW14	W16	W13	W12	W12	W12	WSW10	SW12.9	W18	
18-Dec	WSW13	W12	W11	W11	WSW11	WSW13	W13	W13	W14	W15	W16	WNW16	WNW16	WNW13	WNW16	WNW15	WNW13	WNW12	WNW12	WNW13	NW8	NW9	NW10	NW9	WNW11.9	WNW16	
19-Dec	NW8	NW9	NW10	NW7	NW6	NW6	WNW5	WNW2	NW4	WNW4	W5	W4	W2	W4	W3	SW3	SSW5	SW6	SW7	SW7	SW8	SW11	SW10	WSW9	W4.8	SW11	
20-Dec	WSW8	WSW7	WSW7	SW6	SSW8	SSW7	SSW7	SSW10	SW7	SW6	SSW8	SSW9	SSW6	SSW8	S10	S13	SSW15	SSW16	S15	SSW16	SSW16	SSW15	SSW15	SSW15	SSW10.0	SSW16	
21-Dec	SSW13	SSW12	WSW11	W12	W11	WNW10	WNW10	WNW10	WNW8	WNW9	WNW10	NW10	NW10	NW10	NW8	WNW9	NW9	WNW10	WNW11	W11	W12	WNW13	WNW12	WNW12	WNW9.2	SSW13	
22-Dec	WNW11	W10	W10	W11	W11	W9	WNW12	WNW12	W10	W11	W14	W14	W16	W15	W14	W13	W11	W12	W12	WNW12	WNW11	WNW10	W10	WNW9	W11.6	W16	
23-Dec	NW7	N9	N8	NNW5	NNE4	N2	NNE0	SE2	ESE2	ESE2	ESE0	NNE2	N2	NNW4	WNW3	WNW4	NW5	NW6	WNW7	W10	W12	W13	W12	W11	WNW4.1	W13	
24-Dec	WNW10	NW7	NNW8	NNW11	NNW12	NNW9	NNW8	NNW7	NW5	WNW6	WNW8	WNW10	NW8	NW8	WNW8	NW6	WNW5	WNW7	WNW7	W6	WNW6	WNW6	WNW6	WNW6	NW7.2	NNW12	
25-Dec	WNW5	NW4	NW3	NW4	NW2	NW1	NW1	NW3	NW2	WNW4	WNW5	WNW6	WNW5	WNW5	WNW4	WNW4	WNW4	WNW4	WNW6	W6	W8	W9	W10	W9	WNW4.5	W10	
26-Dec	W9	WSW8	WSW6	WSW7	SW7	SW8	SW6	SW6	WSW9	WSW7	SSW6	S4	SSW3	S5	S5	SSW5	SSW8	SSW10	SSW11	SSW11	SSW11	SSW12	SSW10	SSW10	SW7.0	SSW12	
27-Dec	SSW9	SW9	SW6	W9	W9	W8	W8	W8	W9	W10	WNW11	W8	WSW7	W7	WSW6	SW6	SW7	W10	WSW6	WSW6	WSW6	SSW5	SSW7	SSW6	WSW6.8	WNW11	
28-Dec	SSW6	SW7	WSW8	W9	W8	WNW7	WNW7	WNW7	WNW7	WNW7	NW8	NW7	NW6	NW7	NW7	WNW6	NW5	WNW5	NW4	NW4	WNW4	W5	W6	WNW6	WNW5.5	W9	
29-Dec	WNW5	NW6	NW6	WNW7	WNW8	WNW7	WNW6	WNW5	WNW6	WNW7	WNW8	WNW7	WNW7	W6	W5	W6	W8	W10	W9	W9	W10	W7	W6	W6	WNW6.7	W10	
30-Dec	SW6	SW6	W3	WSW4	WSW4	W4	W5	WNW6	W6	W5	W6	WNW6	WNW4	WNW3	WNW2	W2	SW3	WSW3	SW5	SW6	SW8	SW8	SSW7	SSW7	WSW4.3	SW8	
31-Dec	SSW8	SSW8	SSW8	SSW9	SSW10	S9	S11	SSW12	S10	S12	S13	S13	S10	S12	S10	SSE10	SSE10	SSE12	S15	S18	S18	S17	SSW13	SSW15	S11.6	S18	

WSW8.6	WSW8.3	W8.5	W8.6	WSW8.8	WSW8.9	W8.8	W8.8	W9.0	W8.8	W9.2	W8.8	W8.3	W8.1	W7.7	WSW7.0	WSW7.0	WSW7.7	WSW7.7	WSW8.3	WSW8.3	WSW8.7	WSW8.7	WSW8.5	Diurnal Average
W19	W17	W19	W18	W18	W18	W19	W19	W18	W19	W18	W20	W20	WNW21	WNW21	WNW17	WNW17	SSW16	W16	W18	S18	W21	W19	W19	Diurnal Maximum

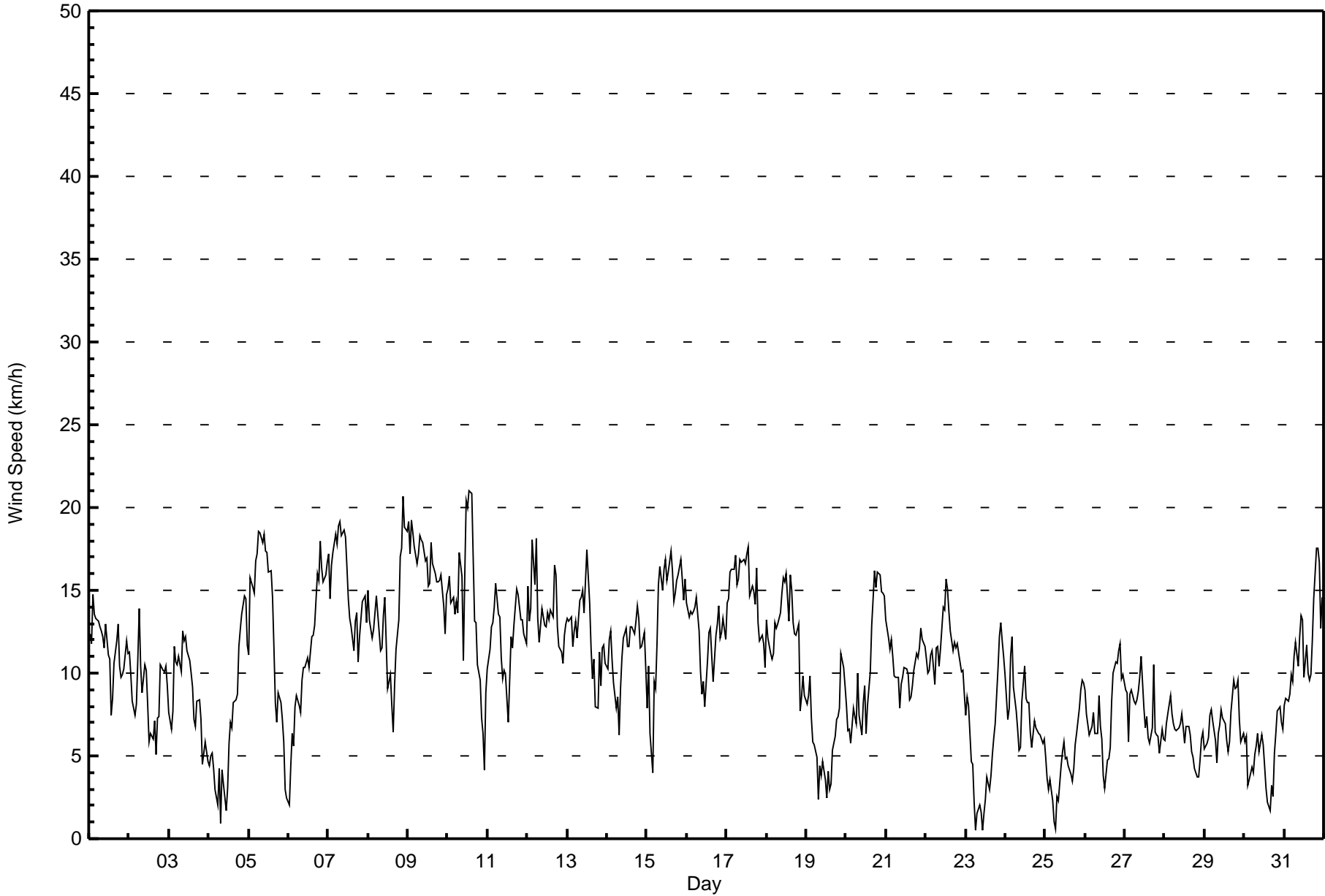
All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Stony Mountain - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Stony Mountain - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	94	12.63	12.63
6 - 11	333	44.76	57.39
12 - 19	312	41.94	99.33
20 - 28	5	0.67	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Stony Mountain - December 2017**

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	3	0	0	0	3	1	0	4	5	5	5	13	27	23	3	94
6 - 11	3	2	1	0	0	0	0	3	13	53	39	39	71	67	37	5	333
12 - 19	0	0	0	0	0	0	0	1	19	46	21	32	154	36	2	1	312
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	3	2	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
<b>Totals</b>	5	5	1	0	0	3	1	4	36	104	65	76	241	132	62	9	744

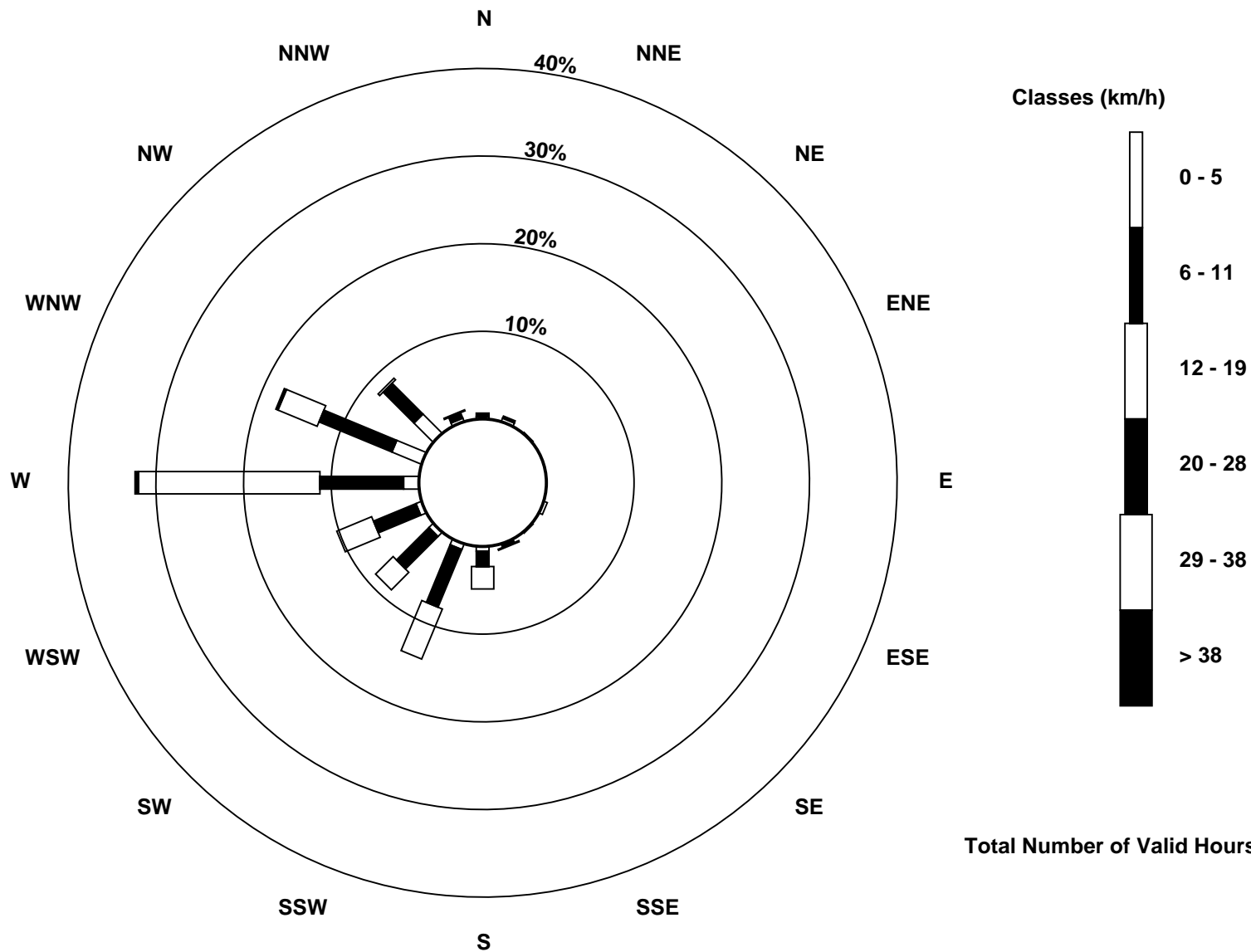
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

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 - December 2017**

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

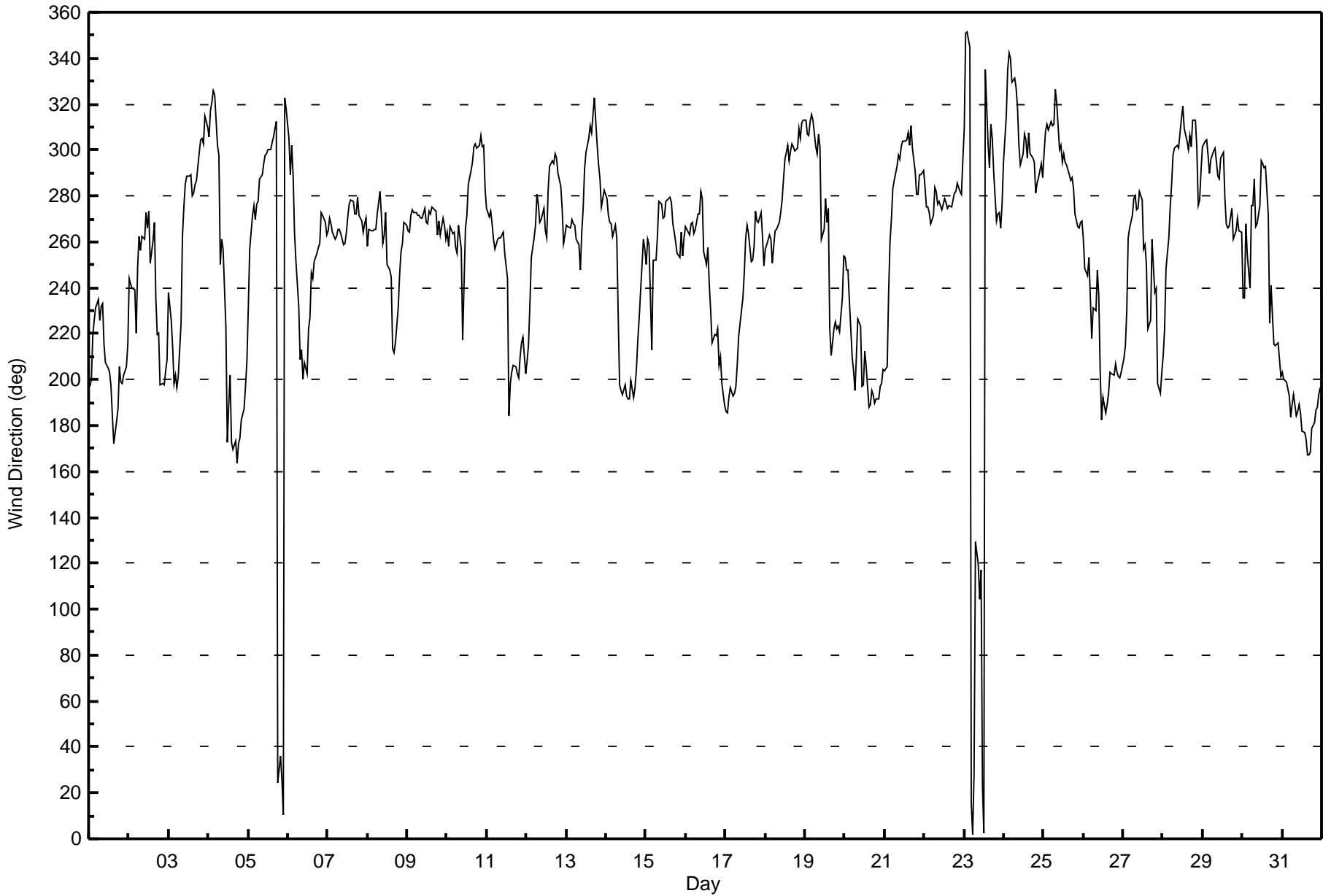
**Wind Direction (WD) - deg**  
**Stony Mountain - December 2017**

Direction of Maximum Speed: 285 deg on Dec 10 14:00															Hours in Service: 744	
Direction of Maximum Daily Speed Average: 270.0 deg on Dec 9															Hours of Data: 744	
Direction of Minimum Speed: 117 deg on Dec 23 11:00															Hours of Missing Data: 0	
Direction of Minimum Daily Speed Average: 4.1 deg on Dec 23															Percent Operational Time: 100.0	
Monthly Average Direction: 265.3 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-Dec	197	200	219	226	232	235	226	232	233	216	207	205	203	197	184	172	182	187	206	199	198	202	205	216	208.8
2-Dec	244	242	240	239	220	249	263	256	262	261	272	266	273	251	260	268	236	219	220	198	199	198	204	209	239.2
3-Dec	238	226	214	198	202	197	202	225	262	275	285	288	289	289	280	281	285	287	299	305	305	303	315	310	262.0
4-Dec	306	317	321	326	324	302	298	250	261	257	223	173	189	202	173	169	173	164	172	174	183	187	197	208	198.7
5-Dec	231	257	271	276	270	277	277	287	289	294	298	299	300	300	303	306	310	312	24	36	26	10	323	318	293.3
6-Dec	305	289	302	289	263	252	232	209	213	200	207	203	222	227	247	244	251	255	258	259	273	272	269	263	248.8
7-Dec	265	270	268	264	261	262	266	265	264	259	260	264	271	276	278	278	272	272	280	271	269	264	268	270	267.4
8-Dec	258	266	265	265	265	266	272	282	272	259	263	273	250	248	245	213	212	216	231	246	256	260	268	267	257.3
9-Dec	265	264	271	274	273	273	271	272	270	270	275	268	268	274	272	275	274	273	263	269	263	270	267	261	270.0
10-Dec	264	258	267	264	264	258	255	267	257	217	242	266	272	285	291	295	301	302	301	302	306	302	302	283	273.6
11-Dec	275	271	273	268	261	257	261	262	262	263	264	255	244	184	198	203	206	206	203	201	210	216	219	203	235.3
12-Dec	208	215	233	253	262	267	281	276	268	270	275	265	262	283	293	295	294	299	297	290	285	275	259	263	269.7
13-Dec	268	267	266	270	268	267	261	258	248	264	275	292	299	305	311	308	315	323	302	293	288	275	279	283	280.8
14-Dec	279	271	268	268	262	267	261	228	197	196	194	198	193	192	191	199	192	197	205	217	227	239	261	257	224.6
15-Dec	250	261	259	213	252	252	252	262	278	276	270	271	278	278	279	277	268	264	260	255	253	264	254	262	264.9
16-Dec	266	264	263	268	268	263	266	272	272	282	279	255	250	257	241	230	216	220	219	222	206	210	198	189	245.2
17-Dec	186	185	192	196	193	194	197	207	219	225	235	247	262	267	264	251	252	258	273	269	269	273	262	250	233.5
18-Dec	257	259	263	261	251	258	265	265	269	273	278	287	296	302	295	300	303	302	299	301	309	305	312	313	283.5
19-Dec	313	307	306	313	315	313	301	298	307	301	261	266	279	269	275	222	210	222	225	222	223	221	236	254	266.3
20-Dec	253	248	247	235	210	204	195	210	226	223	197	198	212	206	188	189	195	193	190	192	192	197	198	204	203.5
21-Dec	204	205	238	260	270	283	287	293	298	296	301	304	304	305	308	302	311	301	290	281	280	290	289	291	282.8
22-Dec	284	275	275	273	268	272	284	282	277	278	274	276	279	277	275	276	275	279	281	282	286	282	281	296	278.3
23-Dec	309	351	352	345	15	2	28	129	119	105	117	22	3	335	303	292	311	305	291	269	272	273	266	277	301.3
24-Dec	295	315	335	342	340	330	332	327	318	302	294	299	307	304	297	307	299	296	294	281	286	288	294	288	309.0
25-Dec	299	308	311	309	313	311	311	326	321	300	302	295	298	295	294	290	287	288	283	272	266	266	269	269	287.5
26-Dec	261	248	245	253	235	218	231	230	247	237	205	182	192	185	189	194	203	203	202	207	203	202	201	203	216.1
27-Dec	209	215	230	262	266	272	279	280	274	275	282	278	257	259	250	222	226	261	249	238	240	198	194	203	250.6
28-Dec	210	222	248	262	275	285	298	301	302	301	308	314	319	309	304	300	307	302	313	313	301	276	278	291	289.0
29-Dec	301	304	304	298	290	296	300	301	295	289	287	297	299	279	268	266	266	274	261	263	265	270	265	264	282.2
30-Dec	235	235	268	254	240	276	276	288	267	268	276	295	294	292	293	272	224	241	228	216	215	216	209	202	248.0
31-Dec	203	200	199	196	193	184	189	194	184	186	189	186	178	177	174	167	167	168	179	181	187	188	193	196	185.5

252.2 254.2 260.4 261.2 258.3 258.3 260.1 260.7 260.8 259.4 261.3 264.3 267.6 266.9 264.5 258.4 253.6 252.8 250.6 247.4 246.9 247.9 248.7 250.5  
 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 - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 69 deg on Dec 23 07:00 Minimum Value: 11 deg on Dec 25 07:00 Percentiles: P <sub>1</sub> = 13 P <sub>10</sub> = 17 Q <sub>1</sub> = 20 Median = 22 Q <sub>3</sub> = 24 P <sub>90</sub> = 26 P <sub>99</sub> = 35																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	18	19	21	21	24	24	22	25	28	28	19	19	20	19	20	18	17	19	23	17	18	18	17	20	28
2-Dec	26	23	27	28	23	28	23	22	21	23	22	25	31	27	26	20	31	22	28	18	19	18	18	19	31
3-Dec	25	22	28	18	17	16	17	27	22	21	22	21	23	22	24	23	20	23	21	23	28	31	26	23	31
4-Dec	23	26	26	26	25	22	20	45	20	26	37	32	28	26	23	22	19	20	19	20	20	19	20	23	45
5-Dec	25	24	22	23	22	25	24	23	23	22	24	23	23	24	25	26	26	29	26	21	21	30	30	30	30
6-Dec	30	20	21	21	21	23	27	23	23	17	18	18	23	23	22	24	23	22	21	21	22	23	21	21	30
7-Dec	21	22	22	21	21	22	21	23	21	19	21	21	21	22	21	20	21	23	21	21	20	22	21	21	23
8-Dec	21	21	19	19	20	19	23	21	20	20	22	20	25	25	28	27	19	19	26	25	23	22	21	20	28
9-Dec	20	22	21	20	20	20	22	21	21	22	21	22	22	22	21	21	21	20	21	21	21	20	20	20	22
10-Dec	20	20	20	18	18	21	23	26	26	22	27	25	24	25	23	20	23	21	21	22	21	19	22	20	27
11-Dec	21	21	21	22	21	22	21	21	21	19	22	21	28	20	21	20	19	18	18	18	20	25	21	19	28
12-Dec	19	24	28	25	25	23	22	22	20	20	21	23	22	22	21	22	21	21	23	21	22	21	21	21	28
13-Dec	21	20	21	21	20	22	20	24	25	23	25	25	26	27	26	26	31	29	20	20	21	20	20	31	
14-Dec	21	21	19	22	25	23	19	30	16	16	18	18	19	18	19	20	19	19	22	25	26	25	27	30	
15-Dec	26	26	25	30	22	23	25	25	24	24	24	24	26	24	24	24	23	23	22	25	23	25	24	25	30
16-Dec	24	22	24	22	23	23	23	23	25	23	23	27	25	24	25	23	21	22	23	21	20	21	19	18	27
17-Dec	19	19	20	20	20	21	19	21	23	25	26	26	25	25	25	25	25	23	24	23	24	23	24	24	26
18-Dec	23	24	24	24	25	24	23	24	23	24	24	24	24	24	23	24	23	22	22	22	26	22	26	28	28
19-Dec	29	26	23	27	27	26	21	20	16	19	25	26	40	26	24	23	16	18	21	25	22	19	23	23	40
20-Dec	24	20	23	24	16	15	15	16	22	27	15	17	26	23	18	18	17	18	18	18	18	19	20	20	27
21-Dec	19	19	25	24	23	20	22	20	19	18	21	20	21	23	24	20	27	23	23	23	23	21	22	22	27
22-Dec	21	22	21	21	21	24	22	24	23	24	23	23	24	23	25	23	24	23	22	20	22	23	22	21	25
23-Dec	25	31	26	29	19	21	69	28	28	30	44	53	39	28	21	14	14	17	20	22	20	21	21	69	
24-Dec	23	29	29	27	27	28	26	25	23	20	19	19	21	21	20	18	15	16	16	17	17	16	16	16	29
25-Dec	17	12	13	15	16	15	11	11	12	11	17	19	23	22	21	17	14	16	17	17	19	22	24	24	24
26-Dec	23	24	26	24	25	20	28	25	26	28	22	21	36	19	18	16	17	16	17	19	17	16	16	16	36
27-Dec	16	18	27	20	24	20	18	17	21	24	20	24	24	28	28	22	29	23	27	26	27	16	15	19	29
28-Dec	16	21	28	22	21	22	17	16	19	18	21	24	28	27	25	17	16	16	16	15	14	18	19	17	28
29-Dec	14	13	13	14	18	17	15	14	14	17	18	17	19	24	23	19	17	17	20	19	20	19	20	18	24
30-Dec	24	20	22	29	20	26	23	21	23	20	20	18	21	25	27	28	13	29	17	15	16	16	15	12	29
31-Dec	12	13	17	16	17	18	20	19	20	20	21	20	24	25	25	24	22	20	19	18	20	19	22	21	25
Diurnal Maximum																									





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Stony Mountain	Station number:	AMS 18
Calibration Date:	December 20, 2017	Last Cal Date:	November 16, 2017
Start time (MST):	8:45	End time (MST):	13:15
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>49.4</u>	ppm	Cal Gas Exp Date	February 16, 2019
Cal Gas Cylinder #	<u>LL110090</u>			
Calibrator Make/Model	API T700		Serial Number	1222
ZAG Make/Model	API 701		Serial Number	5610

### Analyzer Information

Analyzer make: Thermo 43i

Analyzer serial #: JC1501301453

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 1000 ppb		PMT voltage	-601	-602
Calculated slope	0.991989	0.995373	Lamp voltage	901	900
Calculated intercept	1.243479	0.925649	Pressure	666.9	659.3
Analyzer Background	21.0	21.2	Flow	0.371	0.368
Analyzer Coefficient	0.888	0.888	Intensity	86	86

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.0	-0.5	----
as found span	4955	59.1	582.3	581.8	1.001
calibrator zero	4984	0.0	0.0	-0.3	----
high point	4955	59.1	582.3	584.4	0.996
second point	4988	29.6	291.4	291.4	1.000
third point	5000	14.8	145.8	145.0	1.005
as left zero	5010	0.0	0.0	-0.1	----
as left span	4844	59.1	595.4	584.6	1.019

Average Correction Factor				1.001
Corrected As found	582.30	Previous response	585.72	*% change 0.6%

\* = > +/-5% change initiates investigation

Notes:

No adjustments needed.

Calibration Performed By: Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

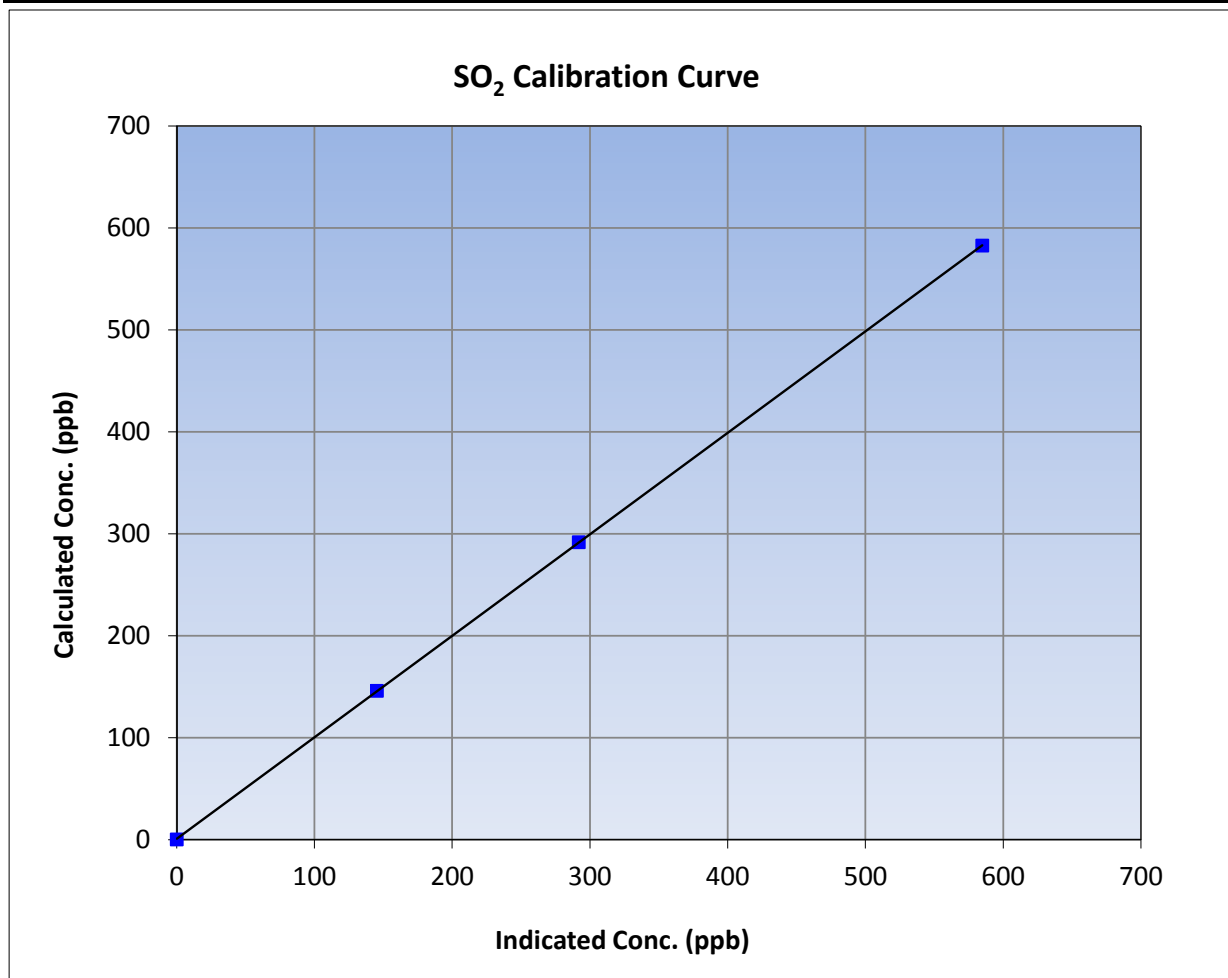
Version-03-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 16, 2017
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:45	End Time (MST)	13:15
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301453

### Calibration Data

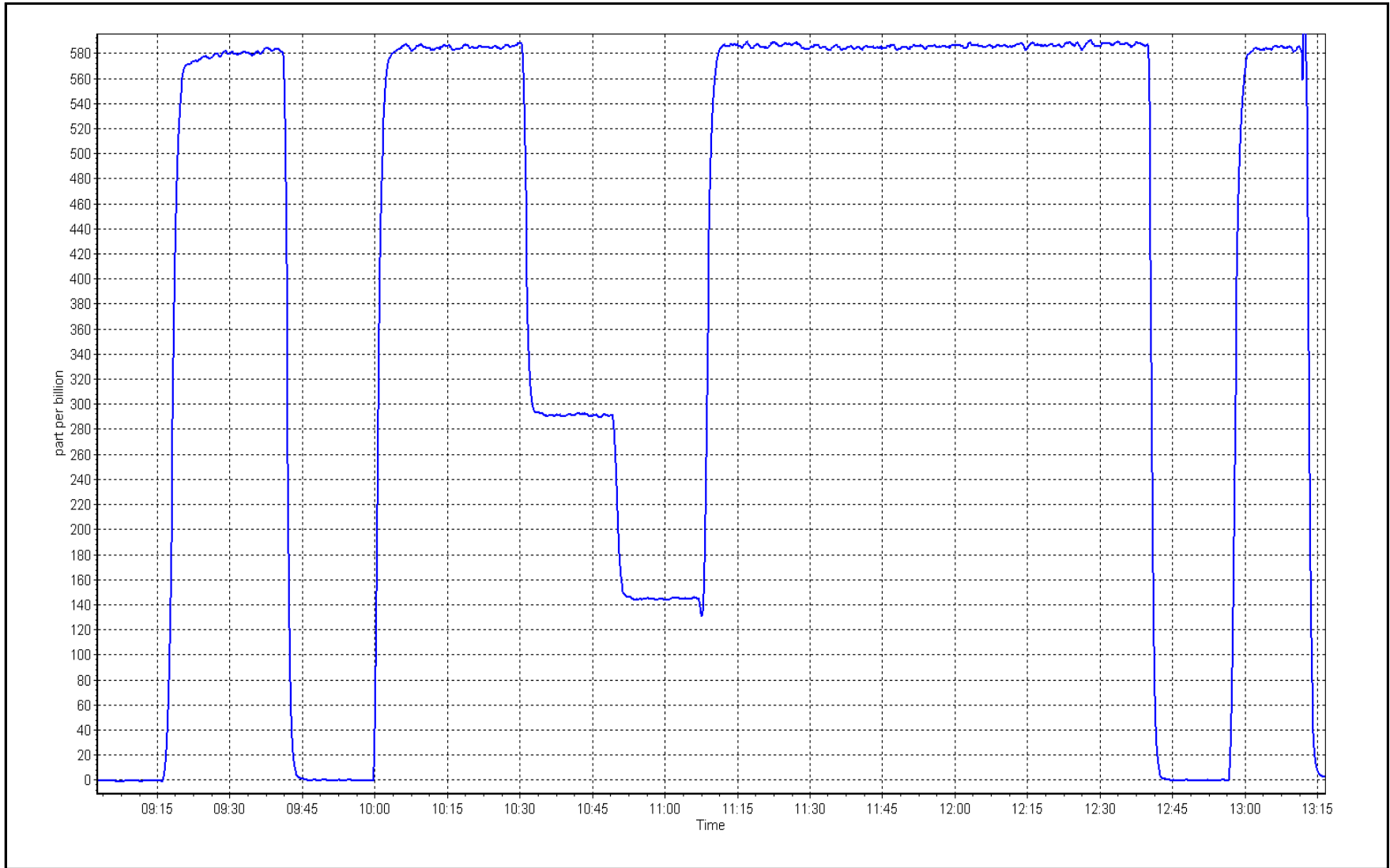
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.3	----	Correlation Coefficient	0.999995	≥0.995
582.3	584.4	0.9963			
291.4	291.4	1.0001	Slope	0.995373	0.90 - 1.10
145.8	145.0	1.0055			
			Intercept	0.925649	+/-30



SO2 Calibration Plot

Date: 20-Dec

Location: Stony Mountain







# Wood Buffalo Environmental Association

## TRS Calibration Summary

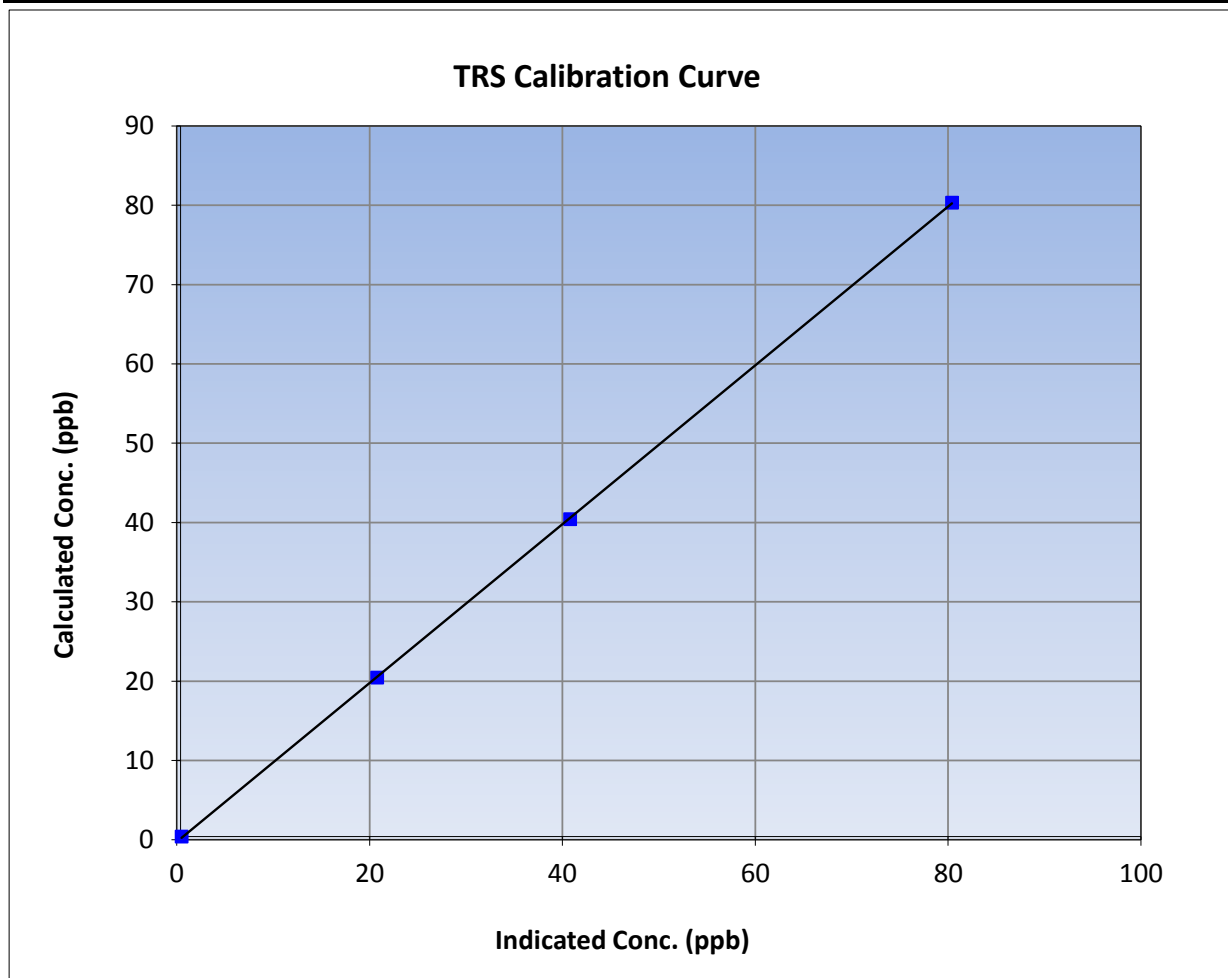
Version-03-2017

### Station Information

Calibration Date	December 21, 2017	Previous Calibration	November 17, 2017
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:44	End Time (MST)	11:37
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1336160090

### Calibration Data

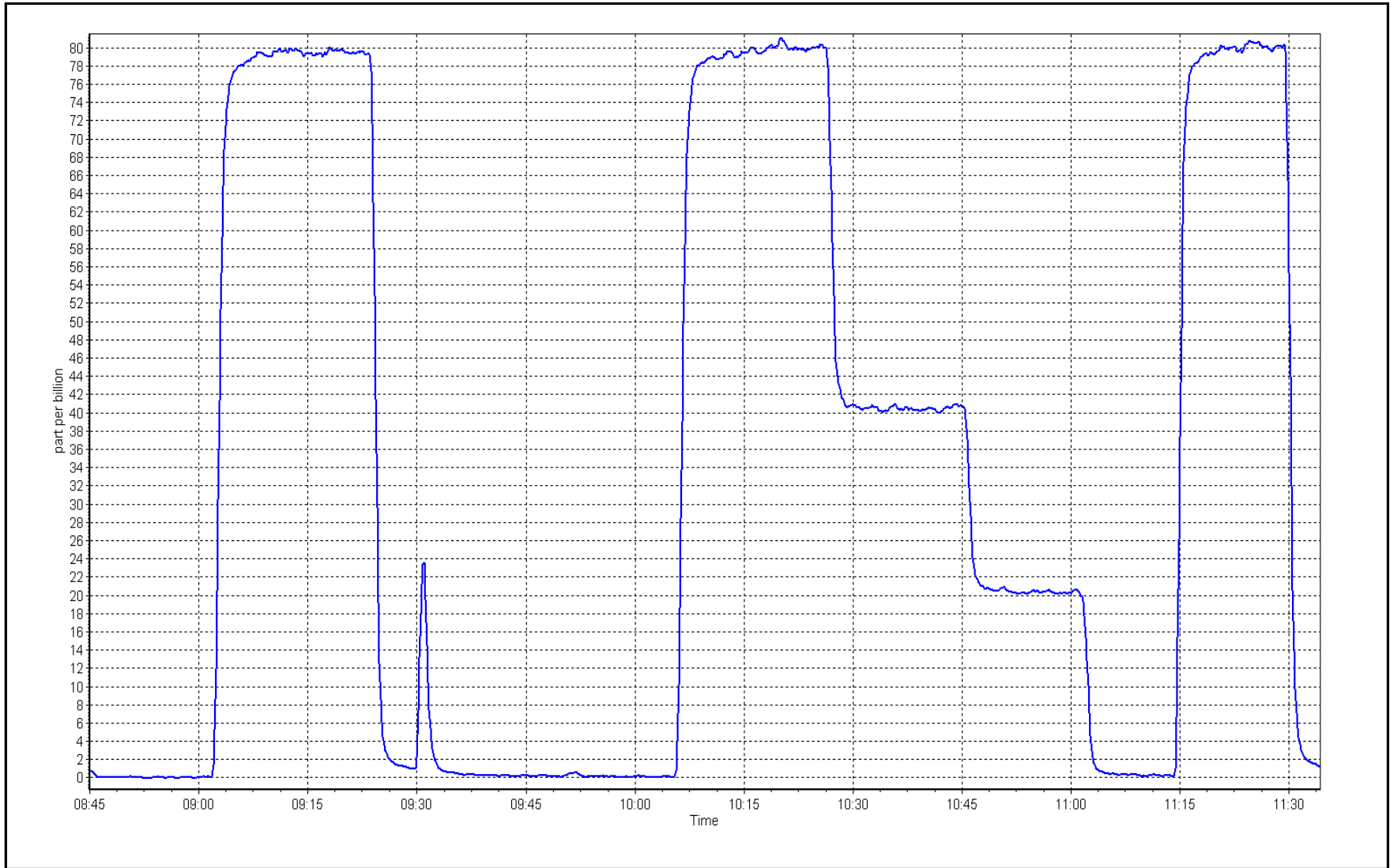
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.1	----	Correlation Coefficient	≥0.995
80.0	80.0	0.9995		
40.0	40.4	0.9907	Slope	0.90 - 1.10
20.1	20.4	0.9832		
			Intercept	+/-3



TRS Calibration Plot

Date: 21-Dec

Location: Stony Mountain





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Stony Mountain	Station number:	AMS 18
Calibration Date:	December 20, 2017	Last Cal Date:	December 18, 2017
Start time (MST):	8:45	End time (MST):	13:15
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL110090	Cal Gas Expiry Date	February 16, 2019
CH4 Cal Gas Conc.	<u>491.0</u> ppm	CH4 Equiv Conc.	1041.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	23 Deg C
Calibrator Model	API 700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1505164831

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.3	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.0
CH4 SP Ratio	0.000202	0.000201	Flame Temp	405.0	405.0
CH4 Retention time	11.8	11.8	Carrier Pressure	31.5	31.5
NMHC SP Ratio	4.52E-05	4.46E-05	Fuel Pressure	44.3	44.3
NMHC Peak Area	143339	145189	Air Pressure	34.5	34.4

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	1.000887	1.000015
THC Cal Offset	0.028323	0.030728
CH4 Cal Slope	1.003386	1.001926
CH4 Cal Offset	0.012685	0.016102
NMHC Cal Slope	0.998666	0.999852
NMHC Cal Offset	0.015636	0.013034

Notes:

Span adjusted.

Calibration Performed By:

Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5009	0.0	0.00	0.00	----
as found span	4955	59.1	12.27	12.37	0.992
calibrator zero	5009	0.0	0.00	0.00	----
high point	4955	59.1	12.27	12.26	1.001
second point	4986	29.6	6.14	6.08	1.010
third point	5001	14.8	3.07	3.02	1.016
as left zero	5011	0.0	0.00	0.00	----
as left span	4843	59.1	12.55	12.26	1.024
Average Correction Factor					1.009
Corrected As found	12.37	Prev response	12.23	*% change	-1.1%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5009	0	0.00	0.00	----
as found span	4955	59.1	6.48	6.56	0.989
calibrator zero	5009	0	0.00	0.00	----
high point	4955	59.1	6.48	6.48	1.000
second point	4986	29.6	3.25	3.22	1.009
third point	5001	14.8	1.62	1.60	1.012
as left zero	5011	0.0	0.00	0.00	----
as left span	4843	59.1	6.63	6.49	1.022
Average Correction Factor					1.007
Corrected As found	6.56	Prev response	6.48	*% change	-1.2%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5009	0.0	0.00	0.00	----
as found span	4955	59.1	5.79	5.81	0.996
calibrator zero	5009	0.0	0.00	0.00	----
high point	4955	59.1	5.79	5.77	1.003
second point	4986	29.6	2.90	2.86	1.012
third point	5001	14.8	1.45	1.42	1.022
as left zero	5011	0.0	0.00	0.00	----
as left span	4843	59.1	5.92	5.77	1.026
Average Correction Factor					1.012
Corrected As found	5.81	Prev response	5.76	*% change	-0.9%

\* = > +/-5% change initiates investigation





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Stony Mountain	Station number:	AMS 18
Calibration Date:	December 20, 2017	Last Cal Date:	November 17, 2017
Start time (MST):	14:58	End time (MST):	16:31
Sharp Model:	Thermo 5030 SHARP	S/N:	E-1107
Particulate Fraction:	PM2.5	C14 Source S/N:	4965
Flow Meter Make/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>	<b>(Limits)</b>
T1 (°C)	-13	-12.9	-13	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	933	929.7	933	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	991.8	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.7	-----	-0.3	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Concentration zero	1.5	-----	-0.5	<input checked="" type="checkbox"/>	+/- 0.5 ug/m3
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date: <u>November 17, 2017</u>
	Flow w/o adaptor: _____	Flow w/ adaptor: <u>16.49</u>

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: <u>8066</u>	
Foil Mass: _____	Foil Mass: <u>1210</u>	
Calibration Date: _____	Calibration Date: <u>November 17, 2017</u>	
Correction Factor: _____	Correction Factor: <u>6865</u>	---

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
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%
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes:

Neph zero and conc zero adjusted.

Calibration by: Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Stony Mountain	Station number:	AMS 18
Calibration Date:	December 20, 2017	Last Cal Date:	November 16, 2017
Start time (MST):	8:45	End time (MST):	13:15
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL110090	Cal Gas Expiry Date	February 16, 2019
NOX Cal Gas Conc.	<u>50.9</u> ppb	NO Cal Gas Conc.	<u>50.9</u> ppb
Calibrator Model	API T700	Serial Number	1222
ZAG make/model	Teledyne API T701	Serial Number	5610

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 1336160088		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	0.950	0.950	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	0.999	0.999	PMT Temperature	-2.7	-2.7
NO <sub>2</sub> coefficient	0.999	0.999	Reaction cell Press	197.5	196.6
NO bkgrnd	1.7	1.7	Sample Flow	0.722	0.717
NOX bkgrnd	1.8	1.8	PMT Voltage	-850.3	-850.3

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.997306	0.997526
NO <sub>x</sub> Cal Offset	0.811282	0.130115
NO Cal Slope	0.995689	0.996165
NO Cal Offset	1.011831	0.089951
NO <sub>2</sub> Cal Slope	0.996488	0.995097
NO <sub>2</sub> Cal Offset	0.237434	0.091862



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5010	0.0	0.0	0.0	0.0	0.3	0.4	0.0	----	----
as found span	4955	59.1	599.9	599.9	0.0	603.4	603.7	-0.3	0.9943	0.9938
calibrator zero	5009	0.0	0.0	0.0	0.0	0.5	0.5	0.0	----	----
high point	4955	59.1	599.9	599.9	0.0	601.5	602.4	-1.1	0.9974	0.9959
second point	4985	29.6	300.5	300.5	0.0	301.1	301.4	-0.3	0.9978	0.9969
third point	5000	14.8	150.2	150.2	0.0	149.6	150.0	-0.4	1.0041	1.0015
as left zero	5010	0.0	0.0	0.0	0.0	0.5	0.5	0.0	----	----
as left span	4844	59.1	613.5	196.2	417.3	604.1	191.5	412.6	1.0156	1.0245
<b>Average Correction Factor</b>									<b>0.9998</b>	<b>0.9981</b>

Corrected As found	NO <sub>x</sub> = 603.1 ppb	NO = 603.3 ppb		*Percent Change	NO <sub>x</sub> = -0.4%
Previous Response	NO <sub>x</sub> = 600.8 ppb	NO = 601.5 ppb		*Percent Change	NO = -0.3%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	605.7	603.9	1.8	0.9905	0.9935	----	----
1st NO2 (400 ppb O3)	196.2	407.7	605.8	196.2	409.6	0.9903	----	0.9954	100.5%
2nd NO2 (200 ppb O3)	327.2	276.7	605.3	327.2	278.1	0.9912	----	0.9950	100.5%
3rd NO2 (100 ppb O3)	462.5	141.4	604.3	462.5	141.8	0.9928	----	0.9972	100.3%
2nd NO ref point	----	0.0	605.4	603.6	1.8	0.9910	0.9939	----	----
<b>Average Correction Factor</b>						<b>0.9913</b>	<b>0.9937</b>	<b>0.9958</b>	<b>100.4%</b>

Notes:

No adjustments required.

Calibration Performed By:                      Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

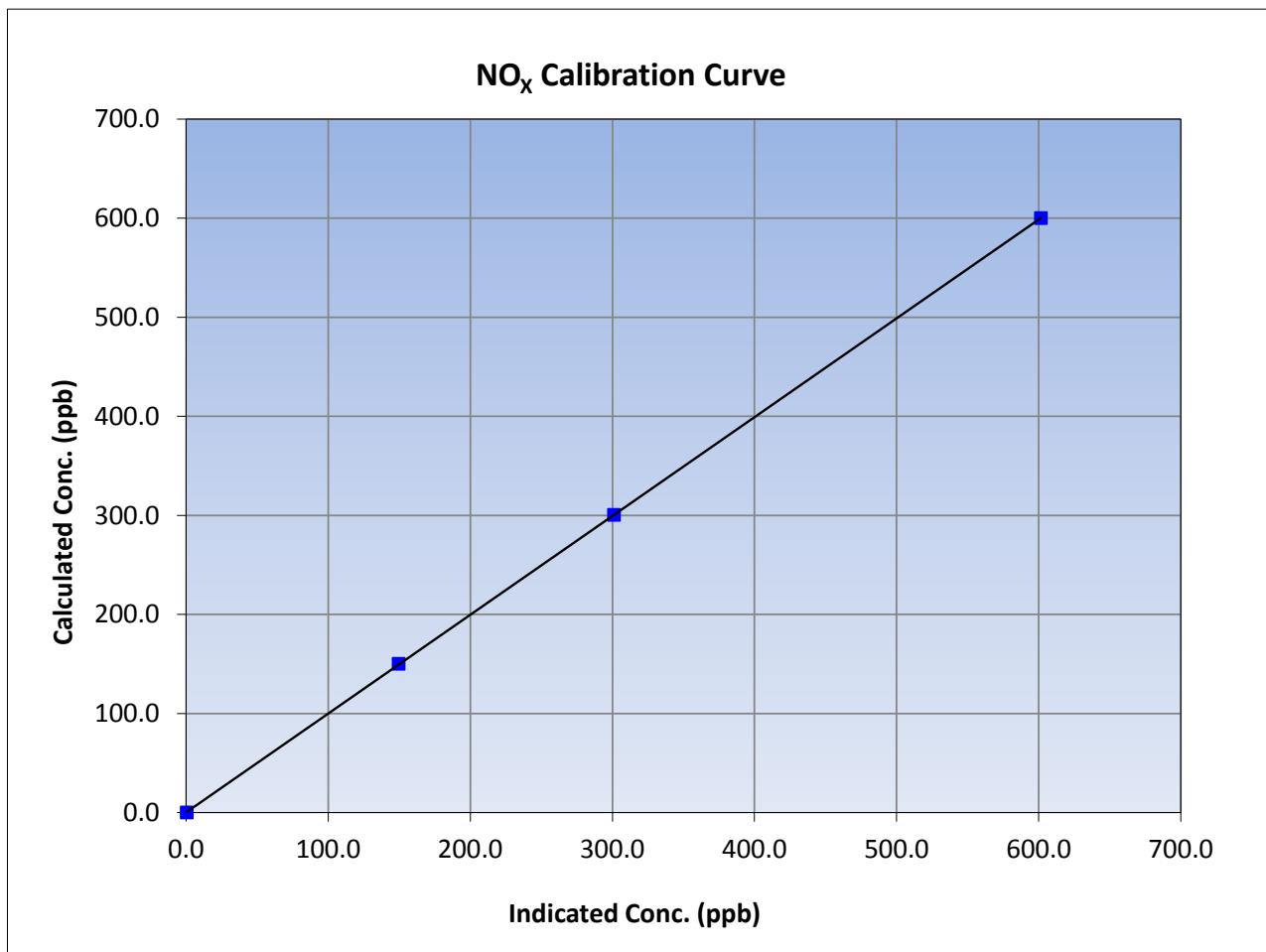
Version-03-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 16, 2017
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:45	End Time (MST)	13:15
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.5	----	Correlation Coefficient	≥0.995	
599.9	601.5	0.9974			
300.5	301.1	0.9978			
150.2	149.6	1.0041			
			Slope	0.997526	0.90 - 1.10
			Intercept	0.130115	+/-20





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

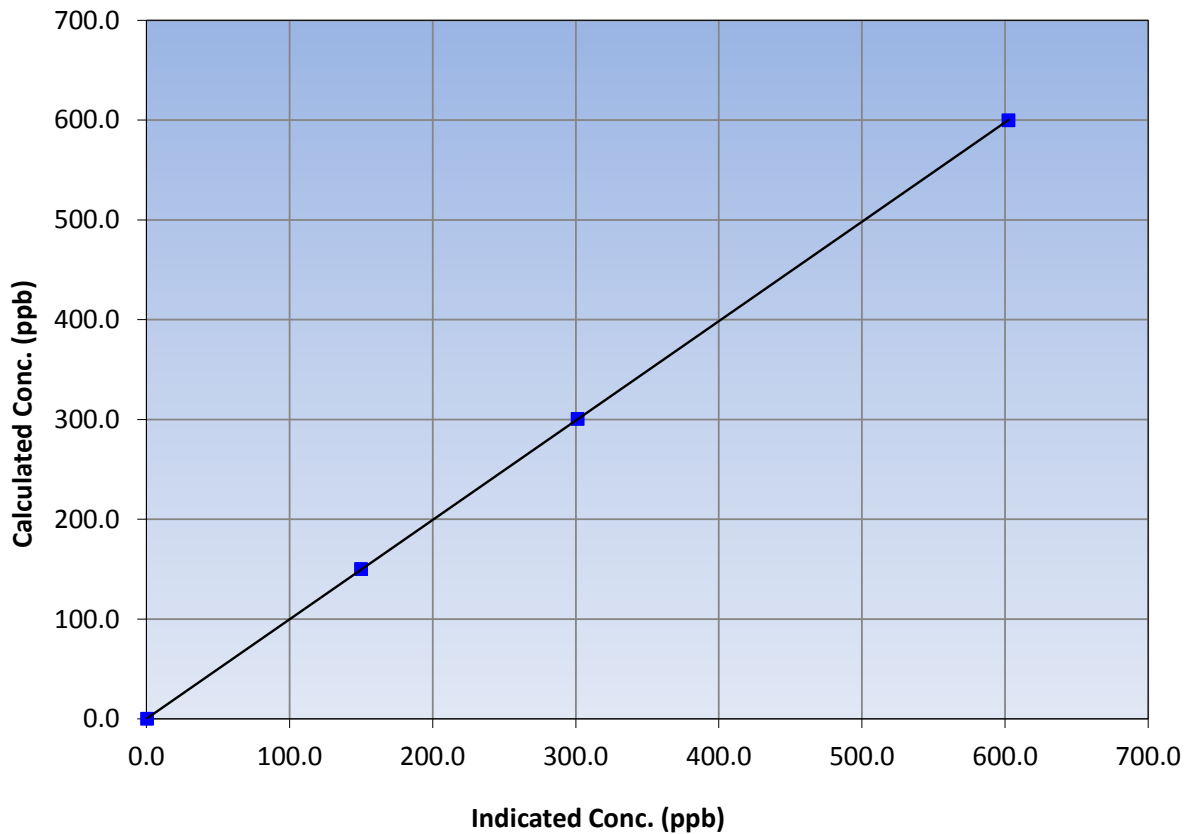
### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 16, 2017
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:45	End Time (MST)	13:15
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.5	----	Correlation Coefficient	≥0.995	
599.9	602.4	0.9959			
300.5	301.4	0.9969			
150.2	150.0	1.0015			
			Slope	0.996165	0.90 - 1.10
			Intercept	0.089951	+/-20

**NO Calibration Curve**





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

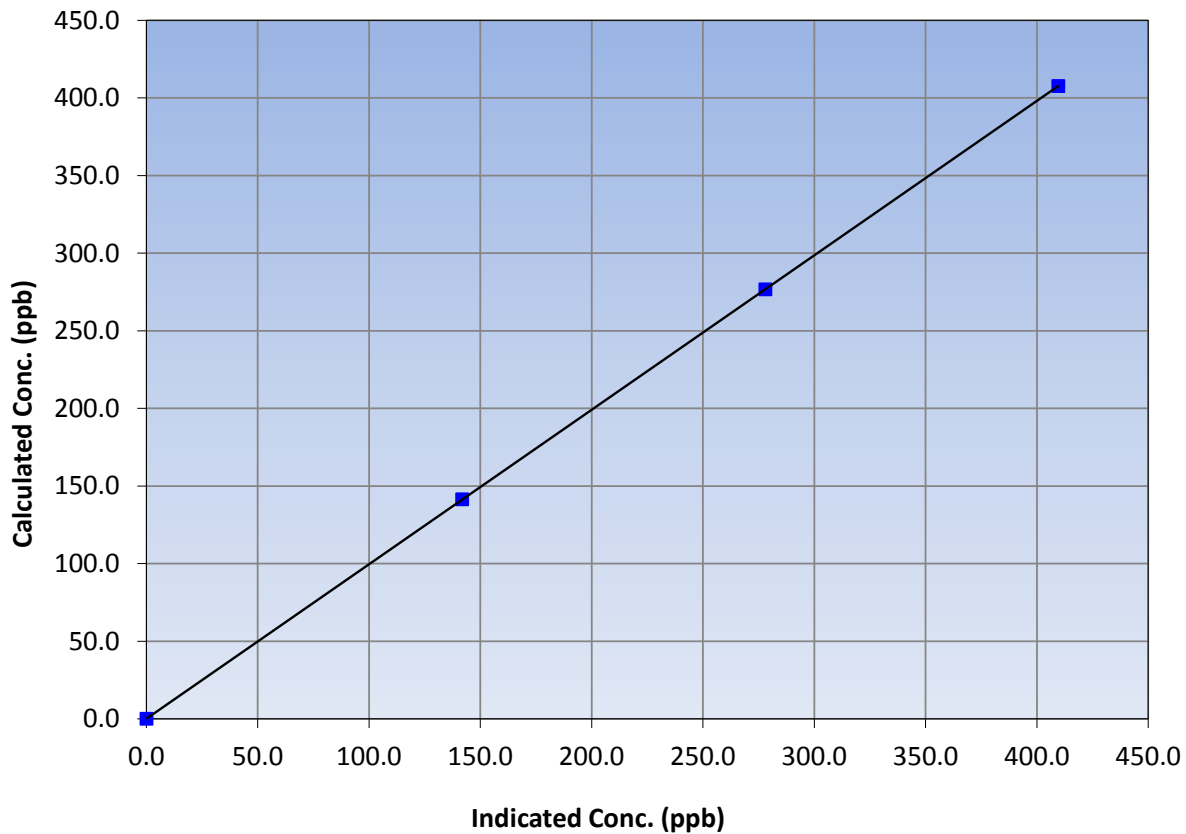
### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 16, 2017
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:45	End Time (MST)	13:15
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
407.7	409.6	0.9954			
276.7	278.1	0.9950			
141.4	141.8	0.9972			
			Slope	0.995097	0.90 - 1.10
			Intercept	0.091862	+/-20

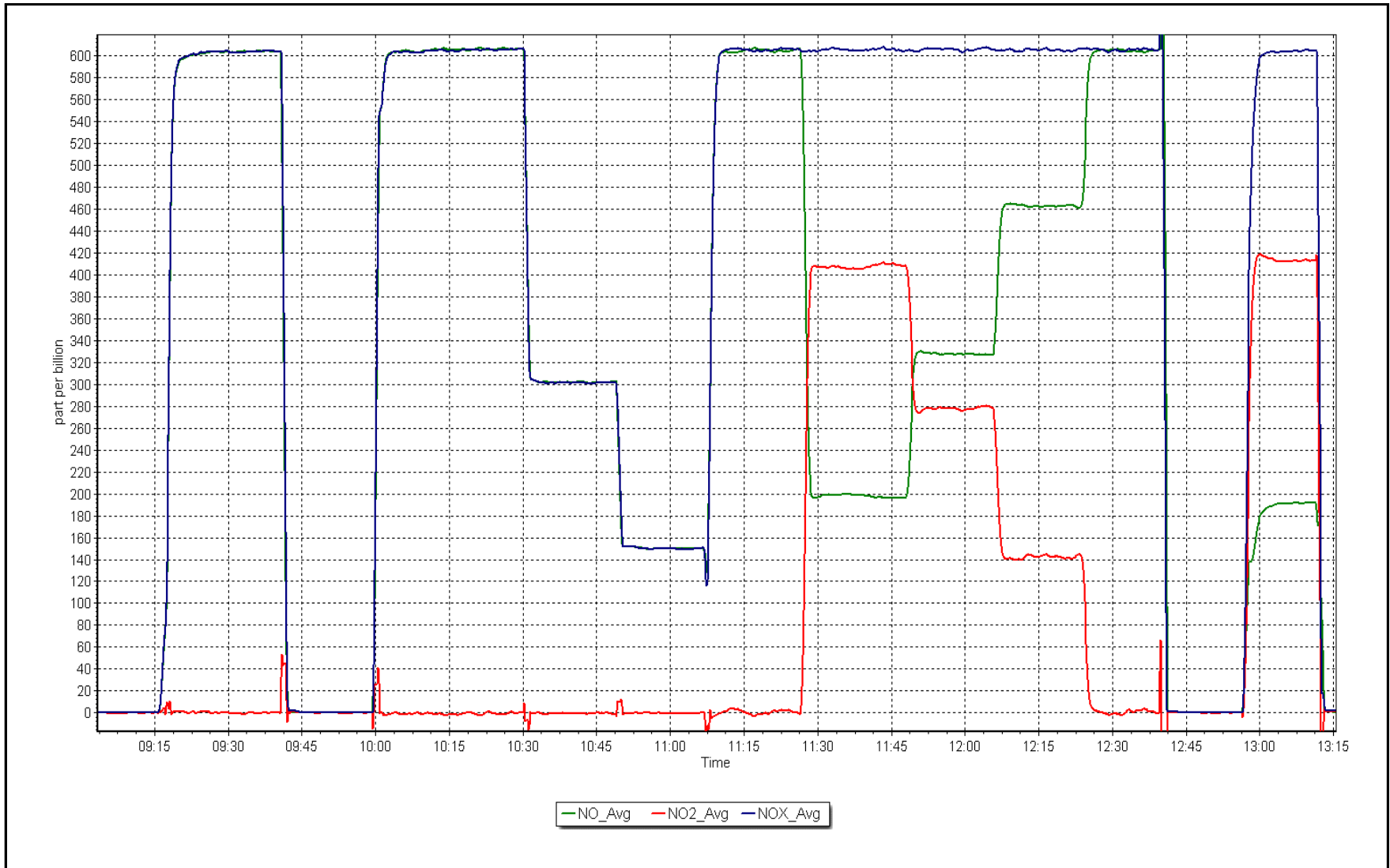
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: 20-Dec

Location: Stony Mountain









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

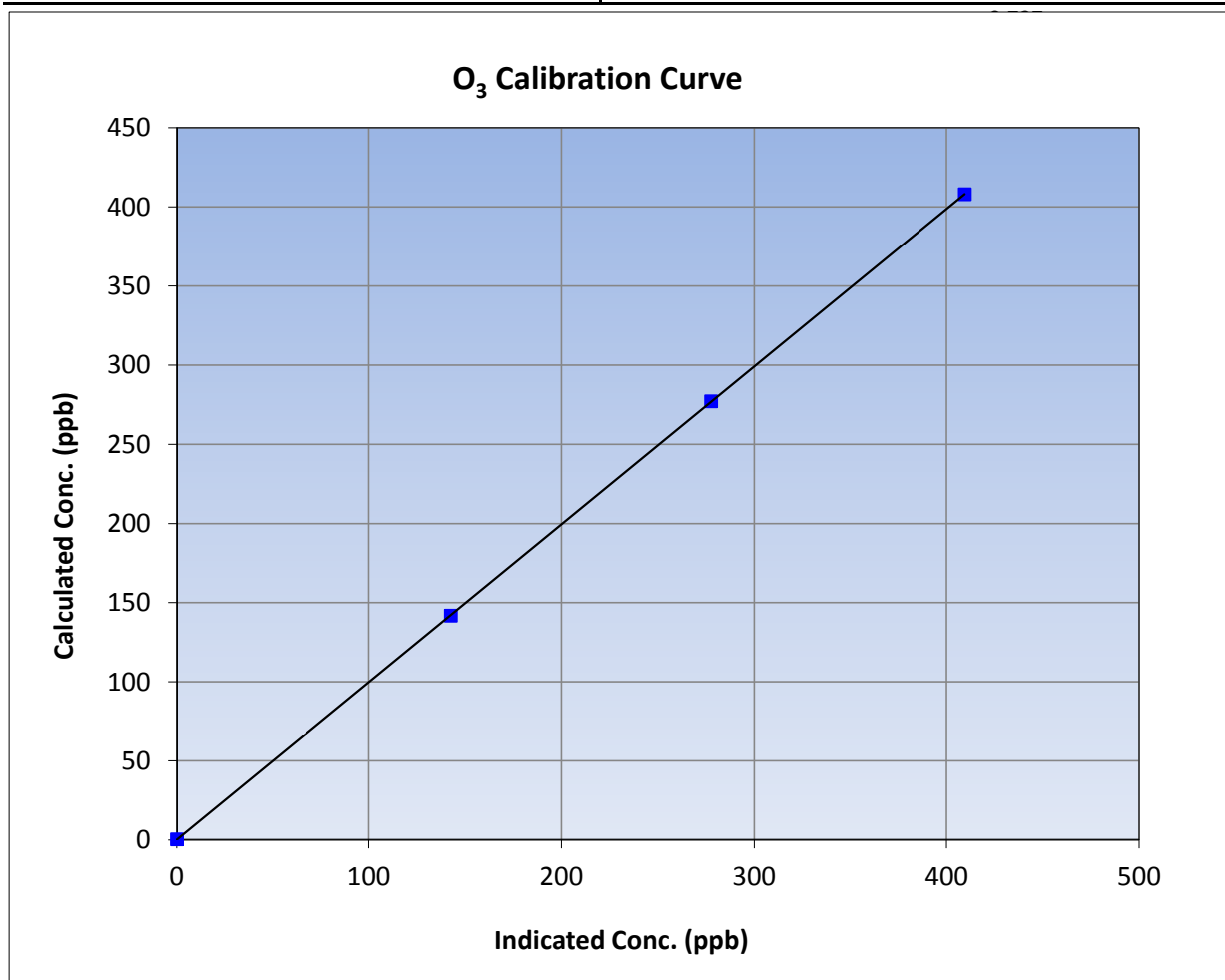
Version-03-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 17, 2017
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	13:15	End Time (MST)	16:30
Analyzer make	Thermo 49i	Analyzer serial #	1501663733

### Calibration Data

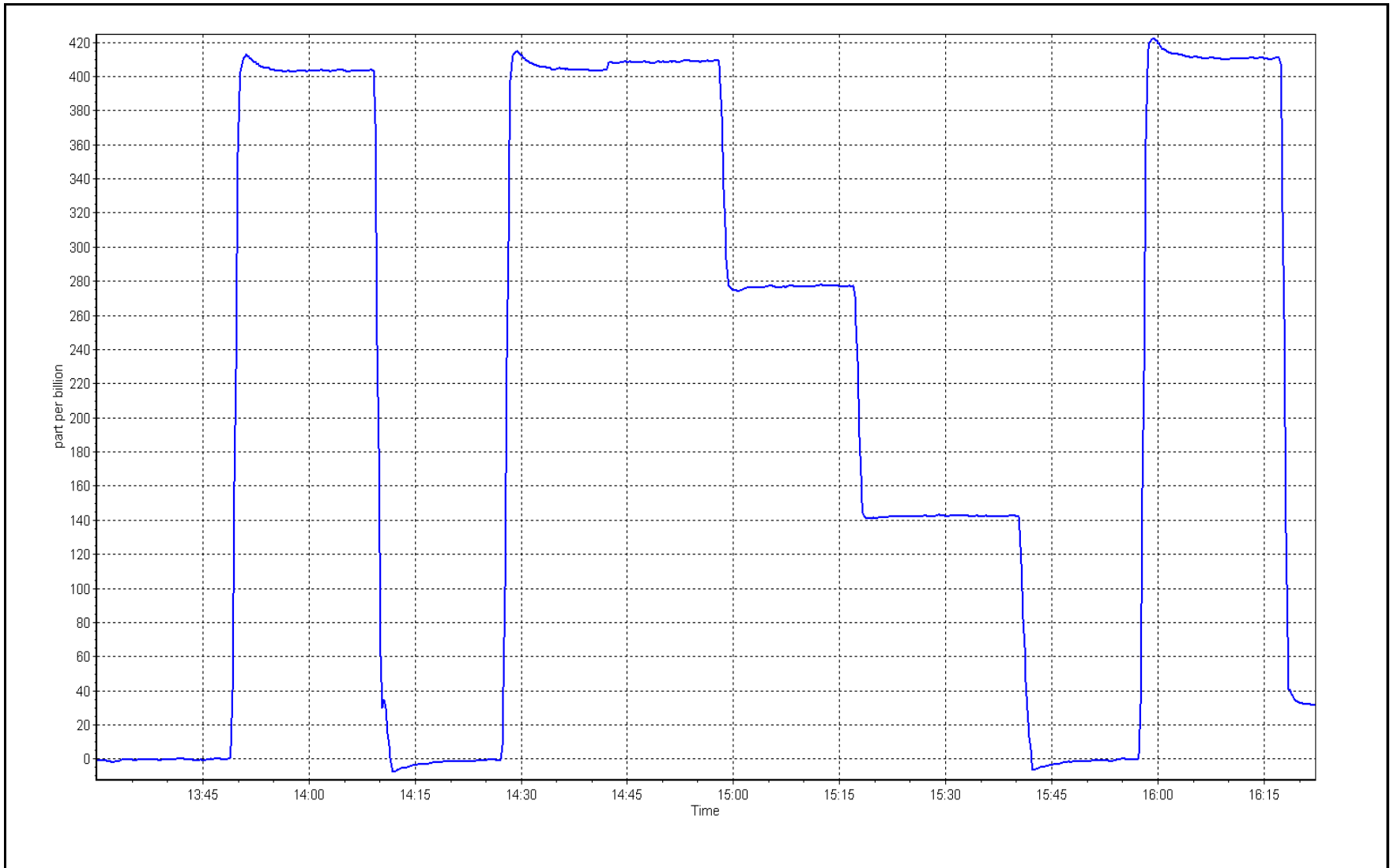
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.3	----	Correlation Coefficient	0.999996	<b>≥0.995</b>
407.7	409.1	0.9966	Slope	0.996462	<b>0.90 - 1.10</b>
276.7	277.3	0.9978	Intercept	0.082670	<b>+/- 10</b>
141.4	142.3	0.9937			



O<sub>3</sub> Calibration Plot

Date: 20-Dec

Location: Stony Mountain





## WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 19  
FIREBAG  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100	106	0	23	0
H2S (ppb) Average	709	35	35	100	13	1	2	0
THC (ppm) Average	698	36	46	98.66	2.9	-	2.5	-
NO2 (ppb) Average	708	36	36	100	31	0	15	-
NO (ppb) Average	708	36	36	100	13	-	3	-
NOX (ppb) Average	708	36	36	100	38	-	18	-
Temperature 2 m (C) Average	744	0	0	100	1.9	-	0	-
Relative Humidity (%) Average	744	0	0	100	100	-	94	-
Wind Speed 10 m (km/h) Average	697	0	47	93.68	26	-	19	-
Wind Direction 10 m (deg) Average	697	0	47	93.68	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	3.2	7	-	0	0	0	1	3	10	106
H2S (ppb) Average	709	0.3	1	-	0	0	0	0	0	1	13
THC (ppm) Average	698	2.2	0.1	-	2	2.1	2.1	2.2	2.3	2.3	2.9
NO2 (ppb) Average	708	6	6	-	0	0	1	4	9	14	31
NO (ppb) Average	708	0.7	1	-	0	0	0	0	0	2	13
NOX (ppb) Average	708	6.7	7	-	0	0	2	5	10	16	38
Temperature 2 m (C) Average	744	-14.47	11.6	-	-38	-31.9	-25.1	-11.4	-3.7	-1.2	1.9
Relative Humidity (%) Average	744	84.2	8	-	69	73	77	85	91	95	100
Wind Speed 10 m (km/h) Average	697	10	6	-	1	2	5	10	14	18	26
	6	697	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	24 Dec 2017 06:00	24 Dec 2017 09:00	4	Unstable Operation - station temperature fluctuations
THC	29 Dec 2017 01:00	29 Dec 2017 03:00	3	Unstable Operation - station temperature fluctuations
THC	29 Dec 2017 05:00	29 Dec 2017 07:00	3	Unstable Operation - station temperature fluctuations
Wind Speed, Wind Direction	02 Dec 2017 08:00	02 Dec 2017 08:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	23 Dec 2017 05:00	23 Dec 2017 05:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	23 Dec 2017 07:00	23 Dec 2017 08:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	26 Dec 2017 09:00	26 Dec 2017 09:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	26 Dec 2017 13:00	26 Dec 2017 16:00	4	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	26 Dec 2017 22:00	27 Dec 2017 11:00	14	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	27 Dec 2017 23:00	28 Dec 2017 04:00	6	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	29 Dec 2017 07:00	29 Dec 2017 08:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	30 Dec 2017 00:00	30 Dec 2017 00:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	30 Dec 2017 05:00	30 Dec 2017 17:00	13	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	30 Dec 2017 19:00	30 Dec 2017 19:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	30 Dec 2017 21:00	30 Dec 2017 21:00	1	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Firebag - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 106 ppb on Dec 30 20:00	Maximum Daily Average: 22.7 ppb on Dec 30
Minimum Value: 0 ppb on Dec 19 04:00	Hours of Data: 708
Maximum Diurnal Average: 5.0 ppb at hour 20	Hours of Missing Data: 36
Monthly Average: 3.2 ppb	Hours of Calibration: 36
Minimum Daily Average: 0.1 ppb on Dec 18	Percent Operational Time: 100.0
Minimum Diurnal Average: 1.8 ppb at hour 21	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 3 P <sub>90</sub> = 10 P <sub>99</sub> = 29	

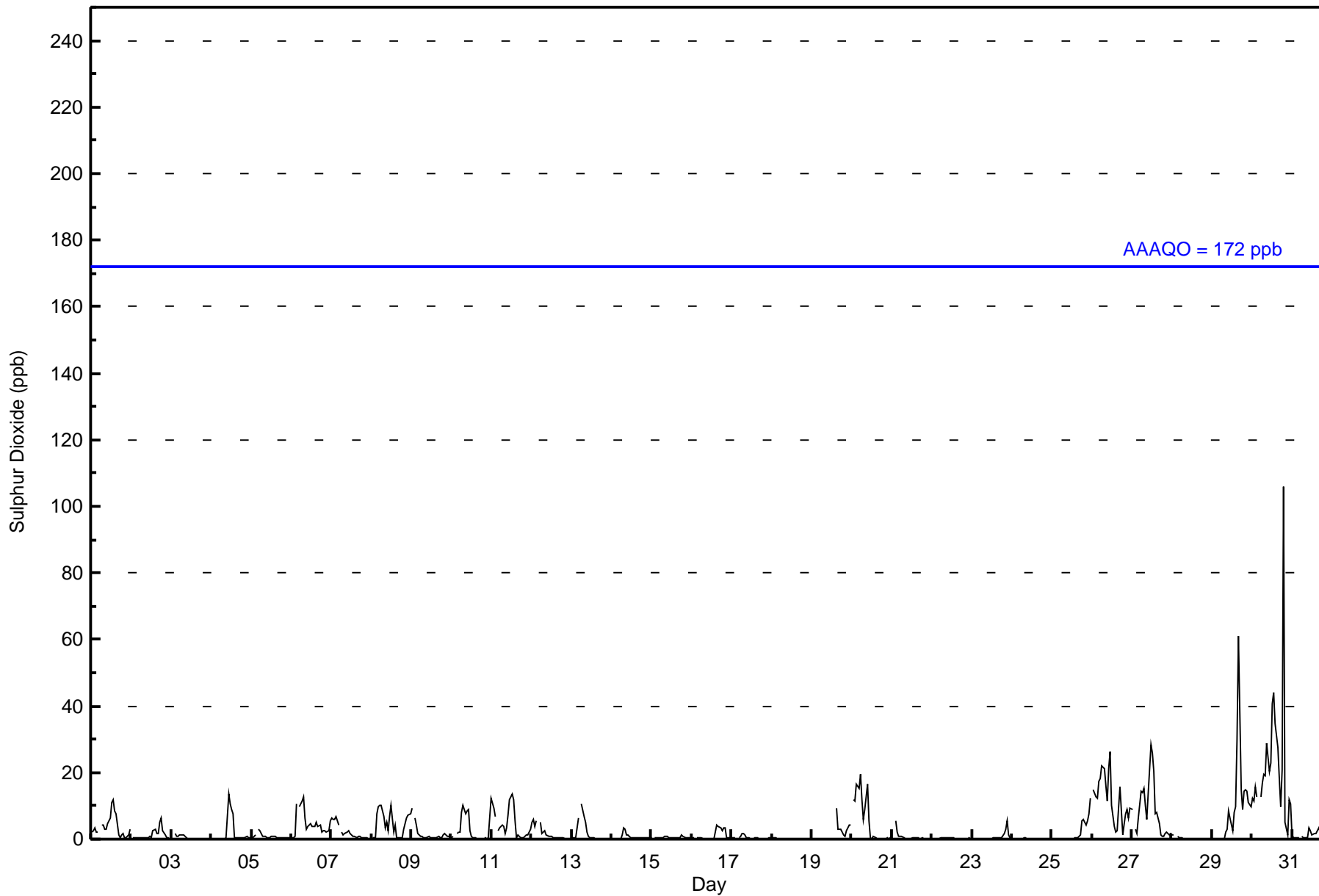
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	3	3	2	2	Z	4	4	3	3	5	7	11	12	8	8	1	0	1	2	0	0	1	3	3.7	12
2-Dec	Z	1	0	0	0	0	0	0	0	0	0	1	0	2	3	2	2	5	6	3	1	0	0	0	1.3	6
3-Dec	0	Z	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
4-Dec	0	0	Z	0	0	0	0	0	0	0	14	11	9	7	1	0	0	0	0	0	0	1	1	1	2.0	14
5-Dec	0	1	1	Z	3	3	2	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.8	3
6-Dec	0	0	1	11	Z	10	12	13	6	3	4	5	4	4	4	5	4	4	2	2	3	2	3	6	4.6	13
7-Dec	6	6	6	7	4	Z	2	1	2	2	3	2	1	1	1	1	1	1	1	0	1	0	0	0	2.1	7
8-Dec	Z	0	1	8	10	10	10	7	3	5	3	7	10	2	4	1	0	0	0	3	5	7	7	8	4.8	10
9-Dec	9	Z	6	4	2	1	1	1	0	0	1	1	1	1	0	0	1	1	0	1	2	1	1	1	1.5	9
10-Dec	0	1	Z	2	2	2	8	10	8	9	9	2	1	0	0	0	0	0	0	0	0	0	0	6	2.7	10
11-Dec	12	9	7	Z	2	3	4	4	2	3	7	12	14	12	5	1	1	0	0	1	1	1	1	3	4.6	14
12-Dec	5	6	4	6	Z	5	2	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1.7	6
13-Dec	0	0	0	4	6	Z	11	7	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	11
14-Dec	Z	0	0	0	0	0	1	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4
15-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	1	1	0	0	0.5	1
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	4	4	3	3	4	3	1	0	0	1.1	4
17-Dec	0	0	0	Z	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	9	3	3	2	1	1	3	4	4	1.7	9
20-Dec	Z	12	11	16	15	20	12	6	9	16	5	0	0	1	0	0	0	0	0	0	0	0	0	0	5.5	20
21-Dec	1	Z	5	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	6	1	0	0.7	6
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	6	6	4	6	8	2.0	12
26-Dec	Z	15	13	12	17	18	22	21	16	12	21	26	10	4	2	2	9	16	1	5	8	9	6	9	12.0	26
27-Dec	9	Z	3	2	6	14	14	15	10	6	14	29	26	21	8	8	5	1	1	1	2	2	1	1	8.6	29
28-Dec	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
29-Dec	0	0	0	Z	0	0	0	0	2	3	9	6	3	8	10	30	61	15	9	15	15	15	11	10	9.6	61
30-Dec	12	11	16	13	Z	13	17	20	19	29	20	23	41	44	35	28	18	10	21	106	5	1	12	11	22.7	106
31-Dec	1	1	0	0	0	Z	1	1	1	1	3	3	1	2	2	3	3	2	2	2	1	1	1	1	1.4	3
																								Diurnal Average		
																								Diurnal Maximum		

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



Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Firebag - December 2017







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	642	90.68	90.68
11 - 20	49	6.92	97.60
21 - 60	15	2.12	99.72
61 - 110	2	0.28	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Firebag - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	97	8	1	0	0	1	1	17	30	90	107	61	54	40	30	79	616
11 - 20	0	0	0	0	0	0	0	0	0	15	23	0	0	0	0	0	38
21 - 60	0	0	0	0	0	0	0	0	1	1	6	0	0	0	0	0	8
61 - 110	0	0	0	0	0	0	0	0	0	1	1	0	0	0	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
<b>Totals</b>	97	8	1	0	0	1	1	17	31	107	137	61	54	40	30	79	664

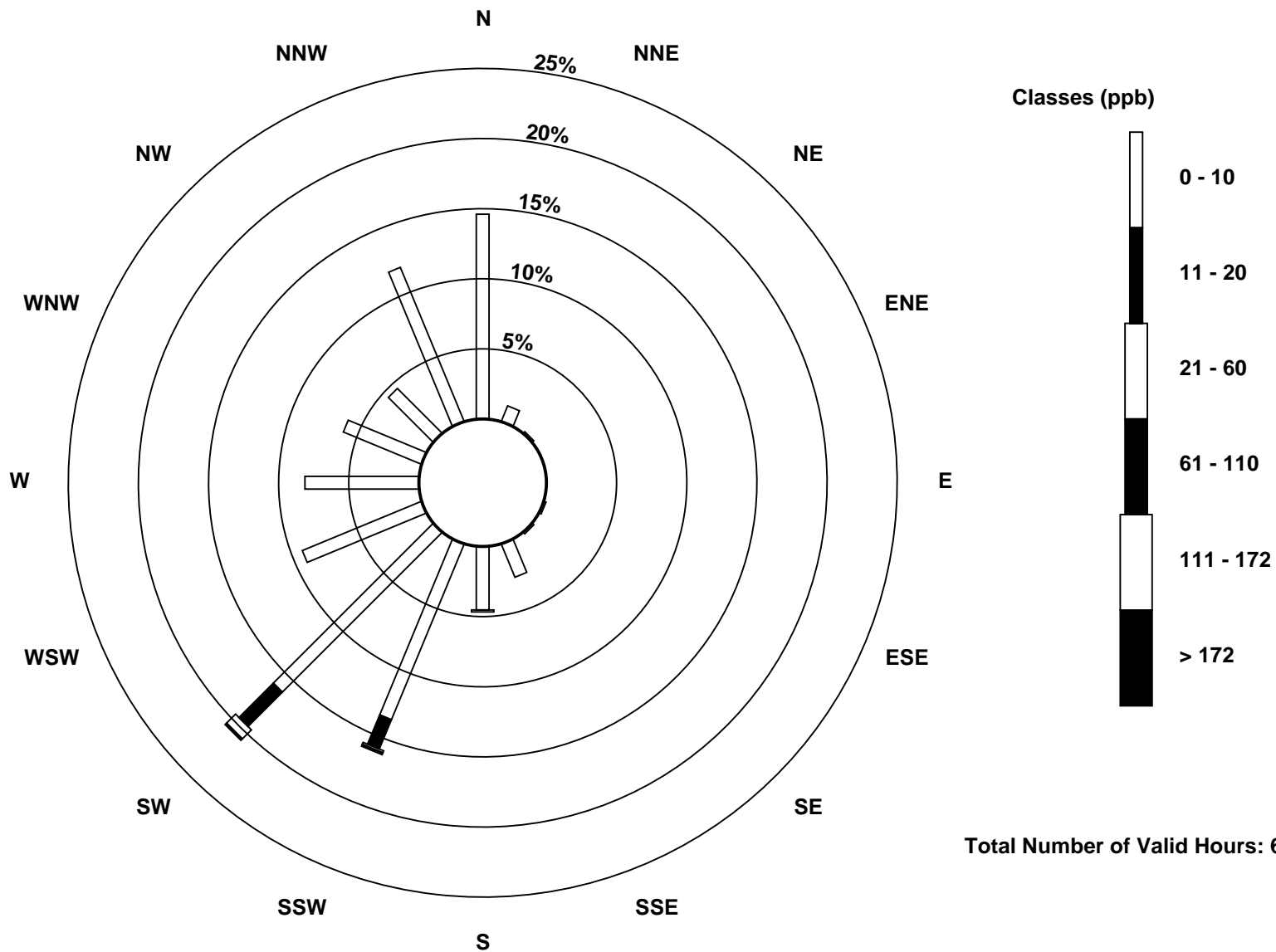
Total Number of Valid Hours: 664

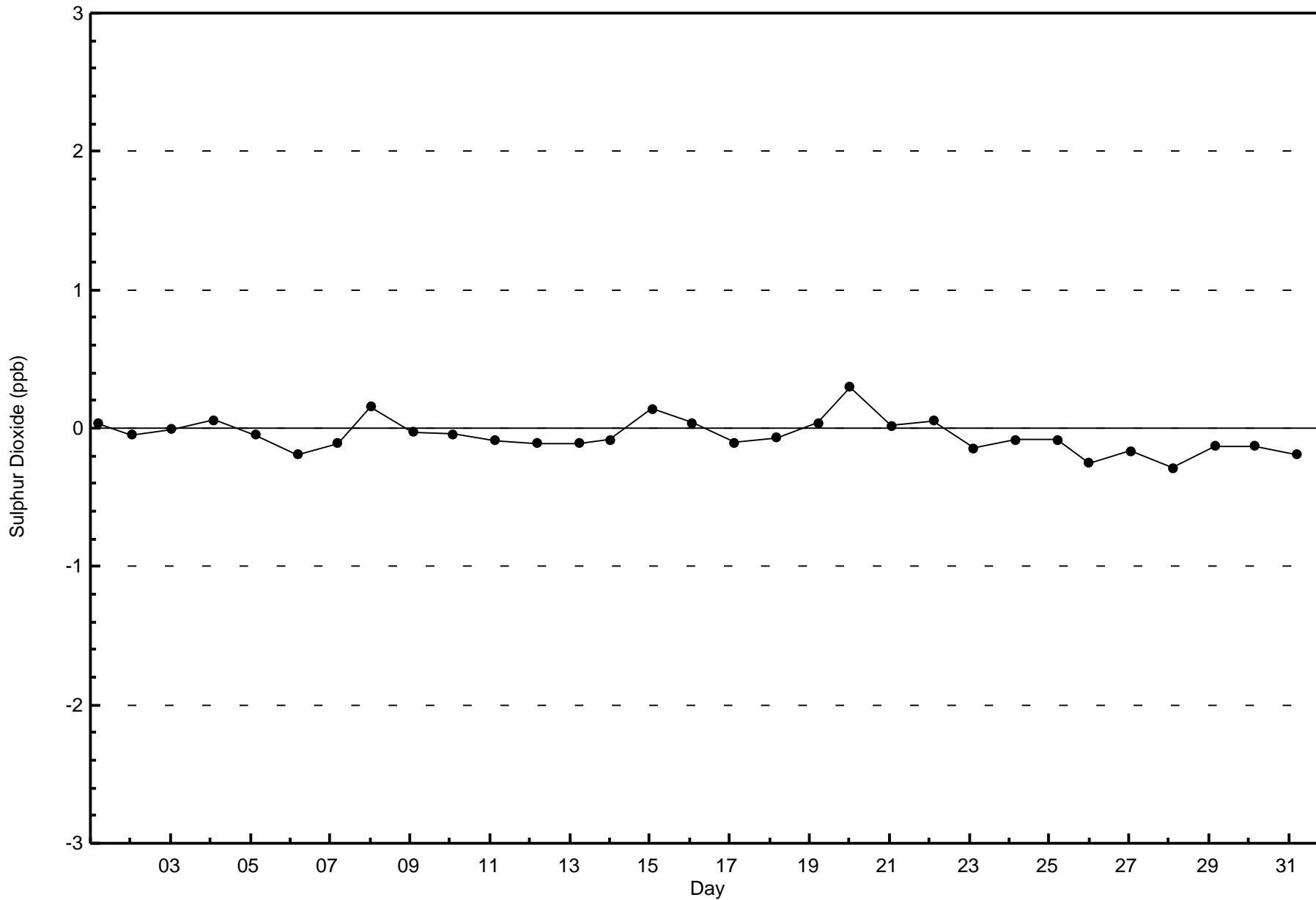
Total Number of Hours: 744

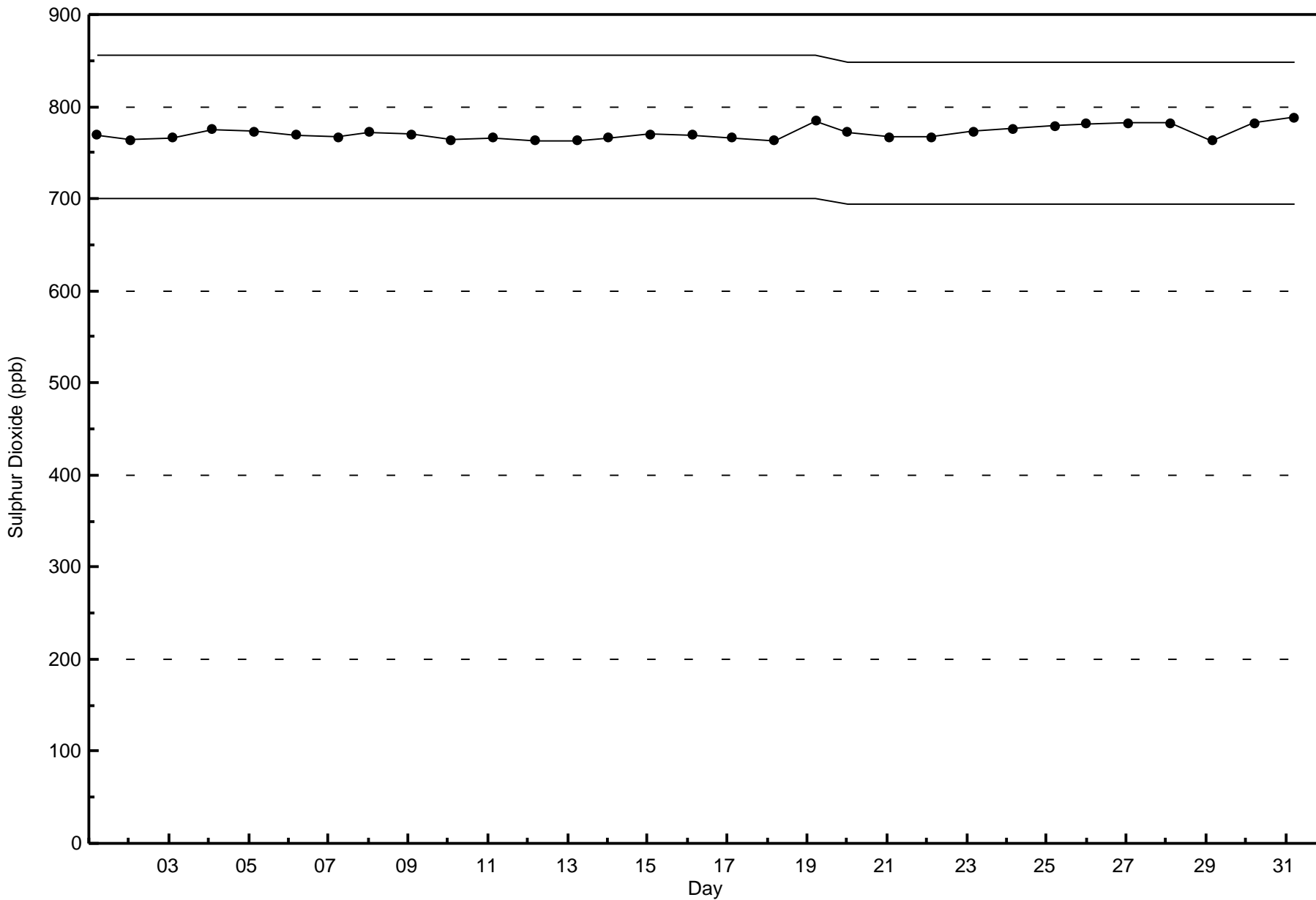


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Firebag (AMS 19)









Number of Exceedences (AAAQO):	1-hr: 1	24-hr: 0	Hours in Service:	744
Maximum Value: 13 ppb on Dec 30 20:00	Maximum Daily Average: 2.4 ppb on Dec 30		Hours of Data:	709
Minimum Value: 0 ppb on Dec 26 16:00	Minimum Daily Average: 0.1 ppb on Dec 16		Hours of Missing Data:	35
Maximum Diurnal Average: 0.6 ppb at hour 20	Minimum Diurnal Average: 0.2 ppb at hour 23		Hours of Calibration:	35
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 3		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0.4	1
3-Dec	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	0.3	1
4-Dec	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	0.3	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	Z	0	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-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Dec	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	0	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
26-Dec	1	Z	1	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
27-Dec	1	1	Z	0	0	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	5	3	1	1	1	1	1	1	1	0.7	5
30-Dec	1	1	1	1	1	Z	1	2	2	3	2	2	4	5	4	3	2	1	1	13	3	1	1	1	1	2.4	13
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.3	0.3	0.6	0.3	0.2	0.2	0.3	Diurnal Average	
1	1	1	1	1	1	1	1	2	2	3	2	2	4	5	4	3	5	3	1	13	3	1	1	1	Diurnal Maximum	

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





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	700	98.73	98.73
3 - 4	6	0.85	99.58
5 - 7	2	0.28	99.86
8 - 11	0	0.00	99.86
> 11	1	0.14	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Firebag - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	98	9	1	0	0	1	1	18	29	107	137	63	53	40	29	77	663
3 - 4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
5 - 7	0	0	0	0	0	0	0	0	0	0	1	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	1	0	0	0	0	0	0	1
<b>Totals</b>	98	9	1	0	0	1	1	18	29	108	139	63	53	40	29	77	666

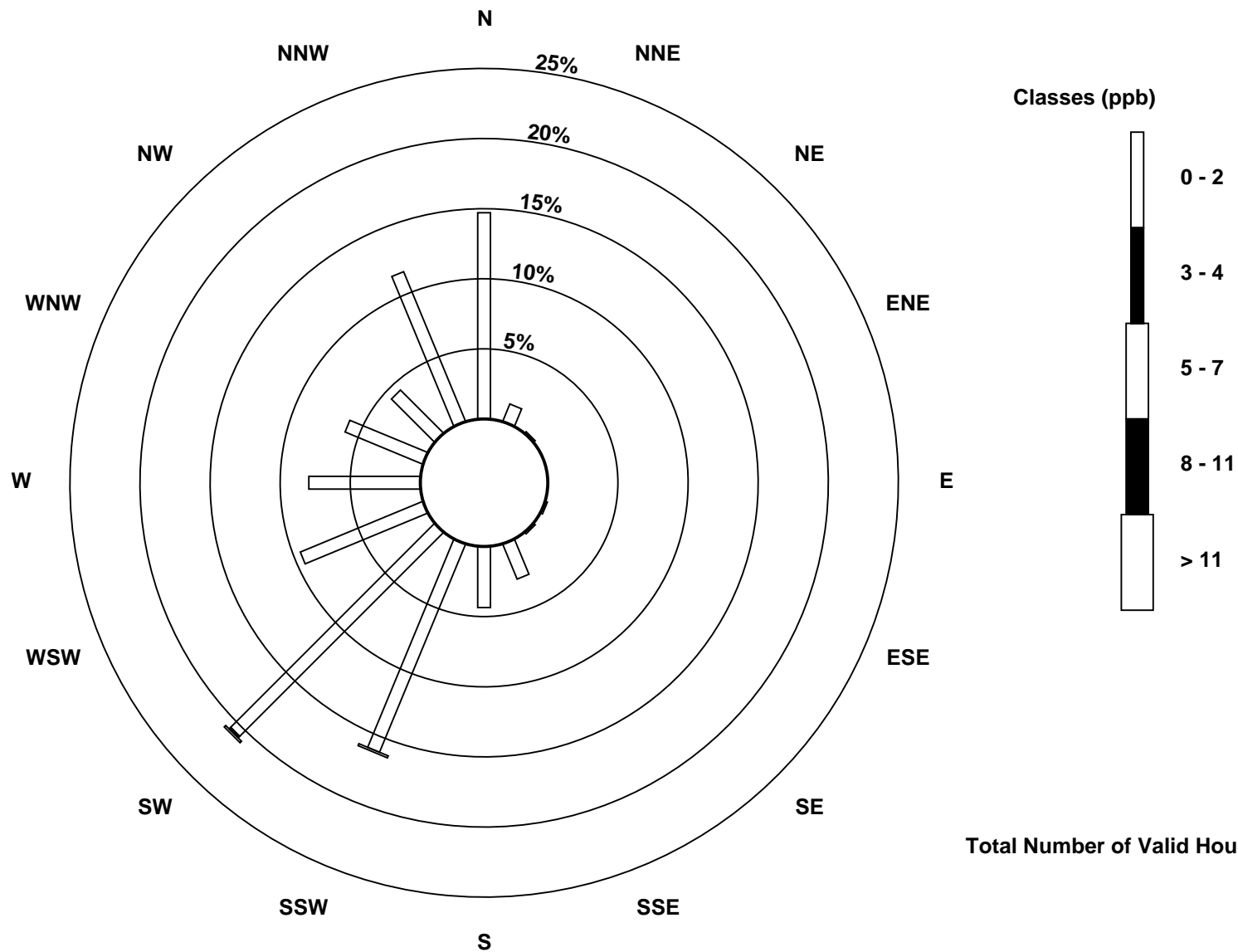
Total Number of Valid Hours: 666

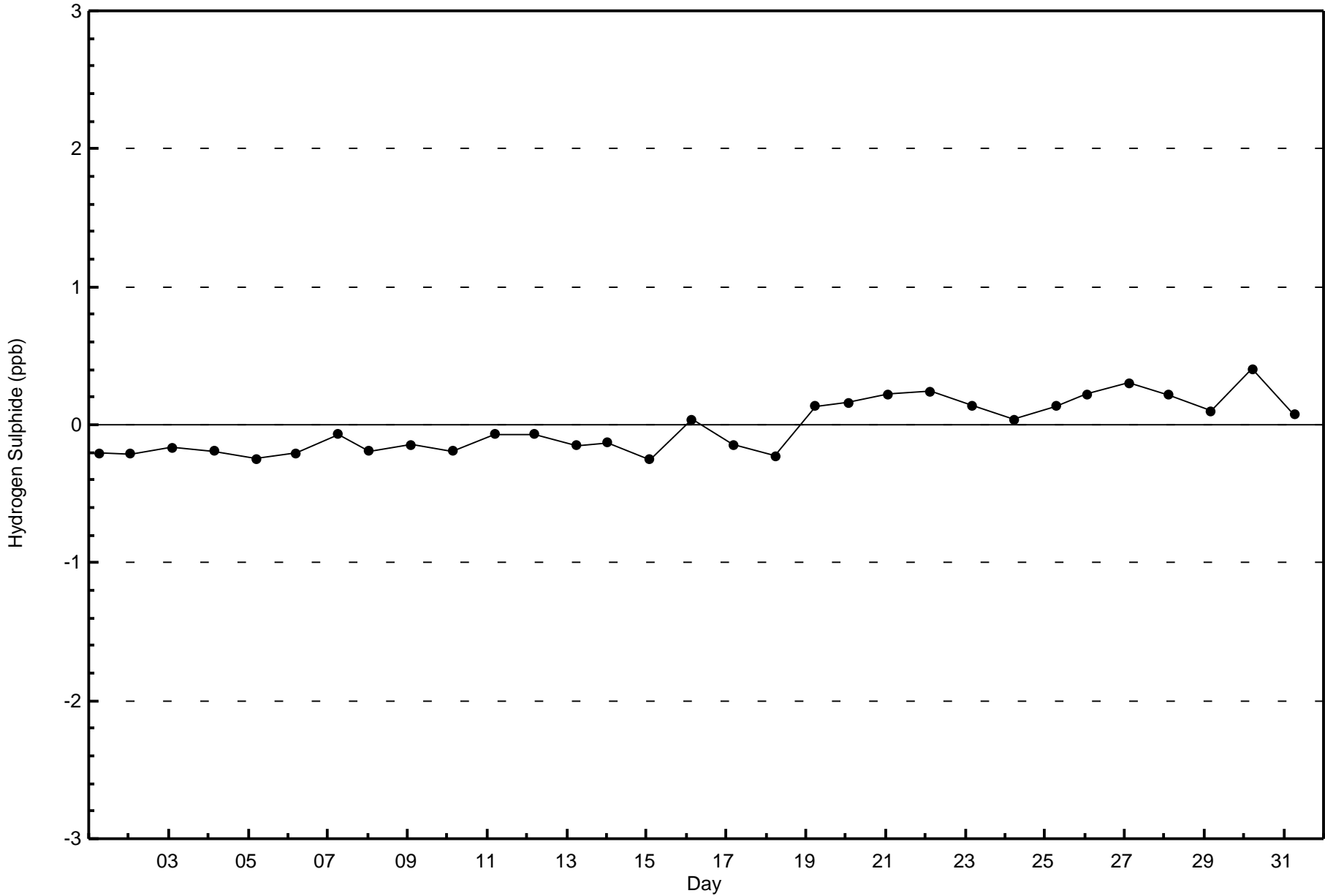
Total Number of Hours: 744

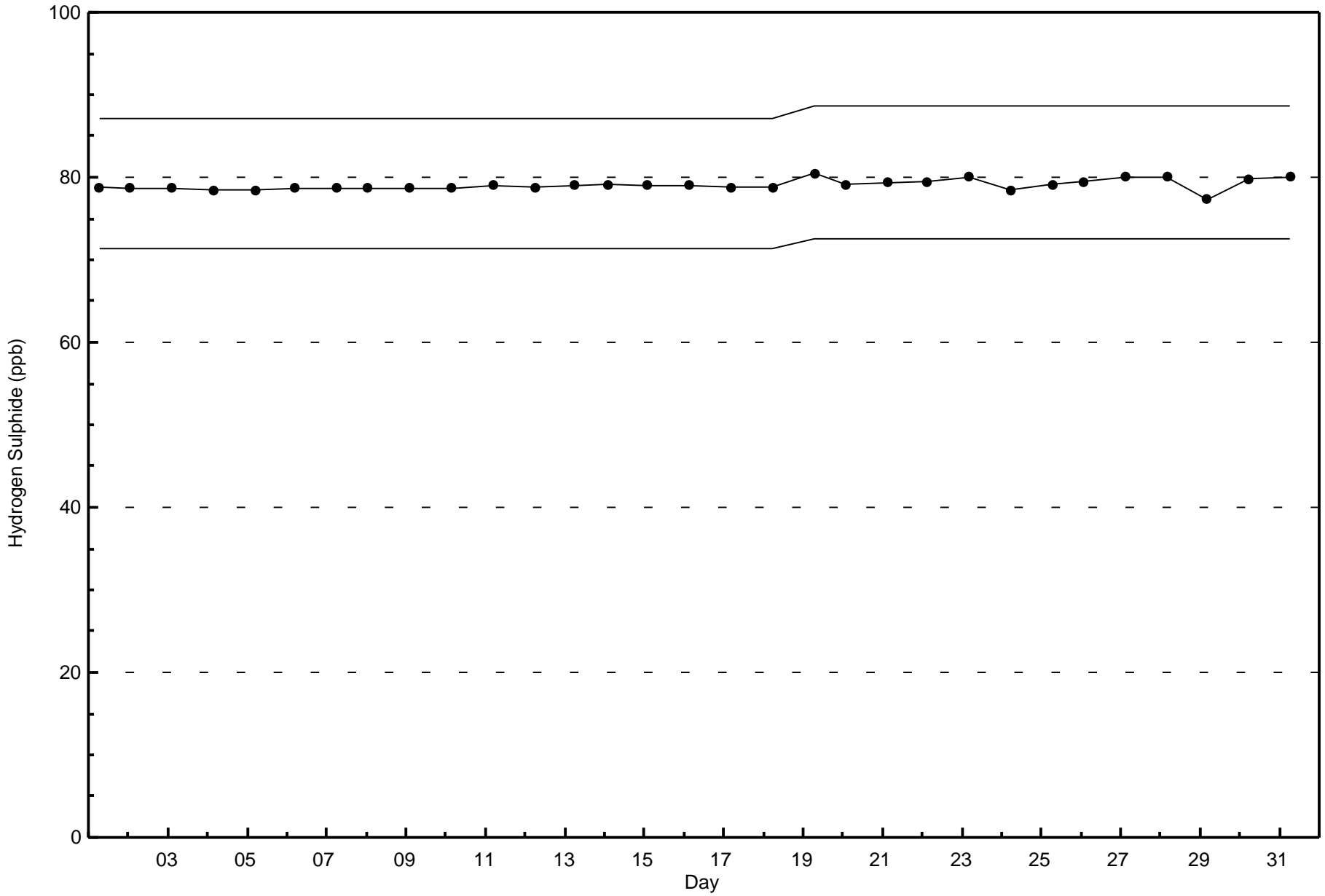


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Firebag (AMS 19)





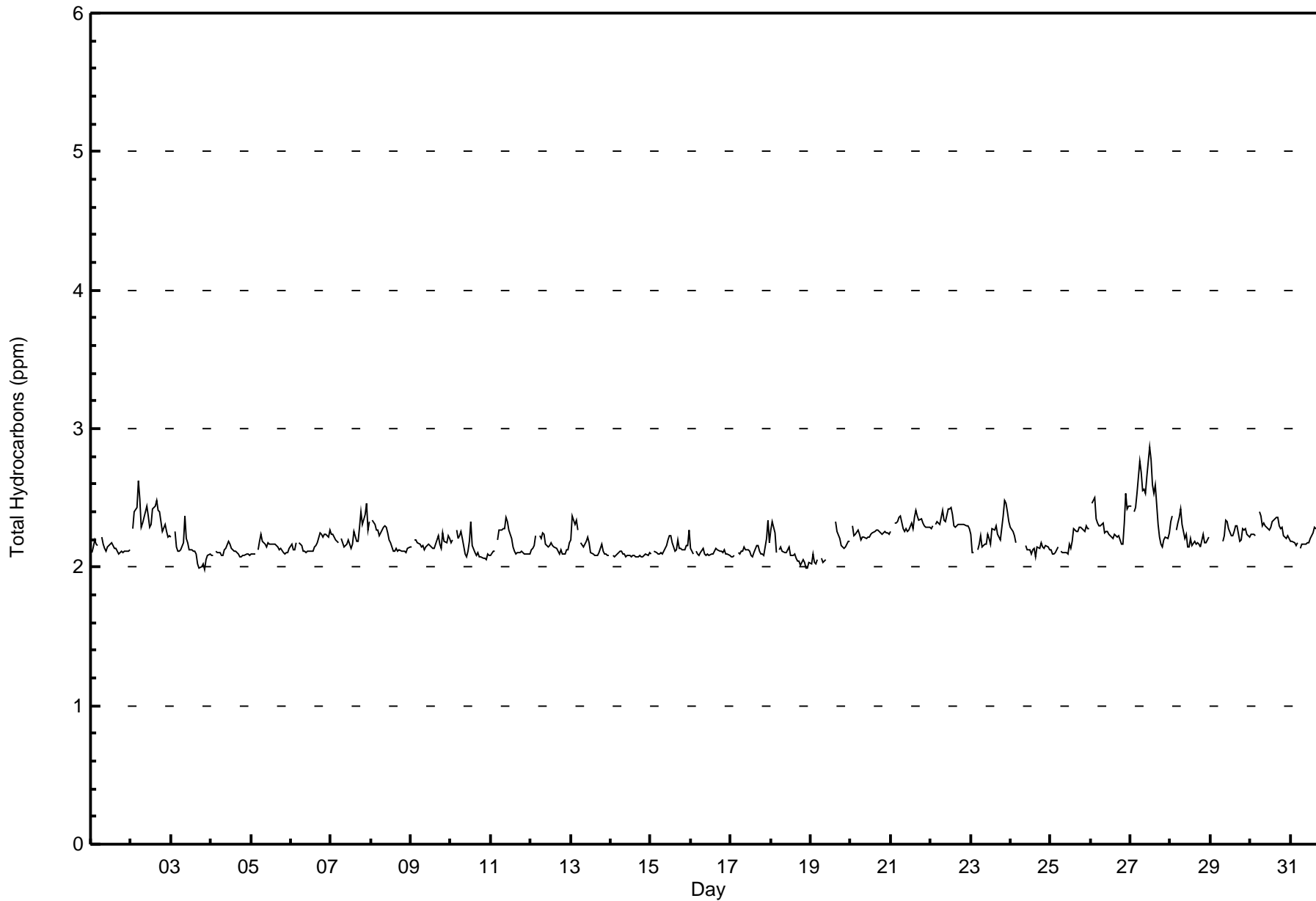






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Firebag - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Firebag - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	17	2.44	2.44
2.1 - 3.0	681	97.56	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 698

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Firebag - December 2017**

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	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	17
2.1 - 3.0	90	8	1	0	0	1	1	17	31	107	137	61	54	40	28	62	638
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
<b>Totals</b>	93	8	1	0	0	1	1	17	31	107	137	61	54	40	30	74	655

Total Number of Valid Hours: 655

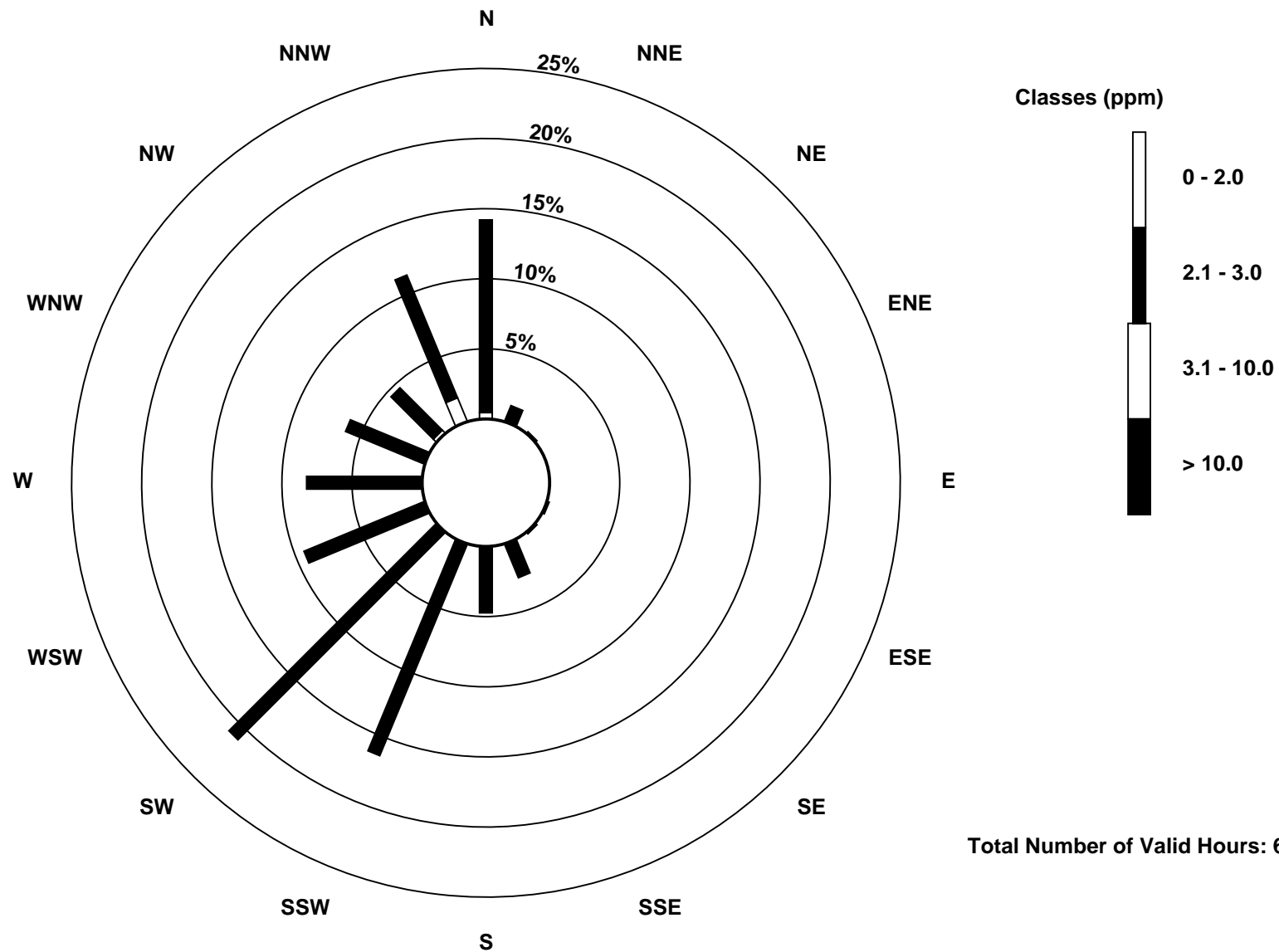
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2017

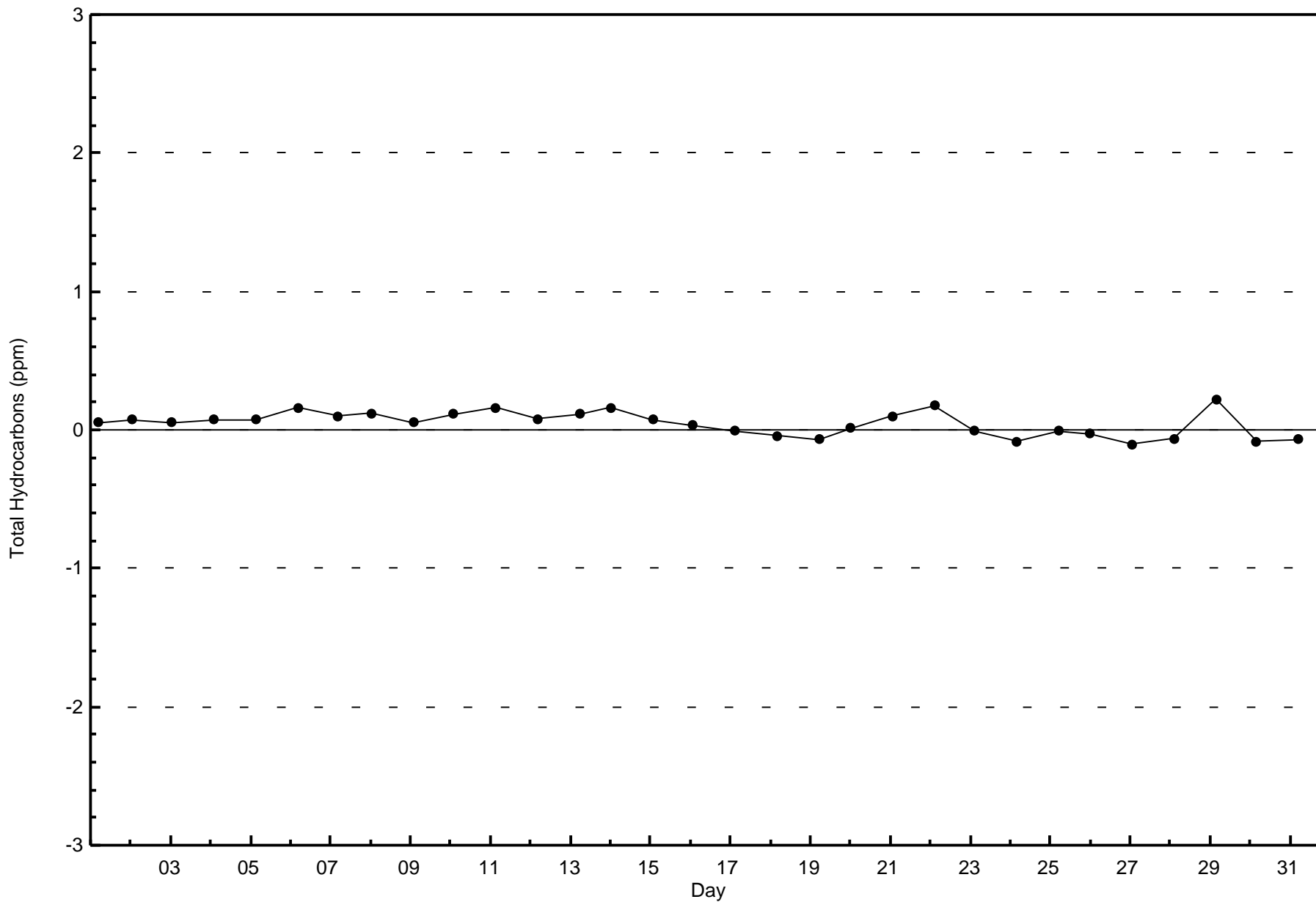
Total Hydrocarbons (THC) - ppm  
Firebag (AMS 19)

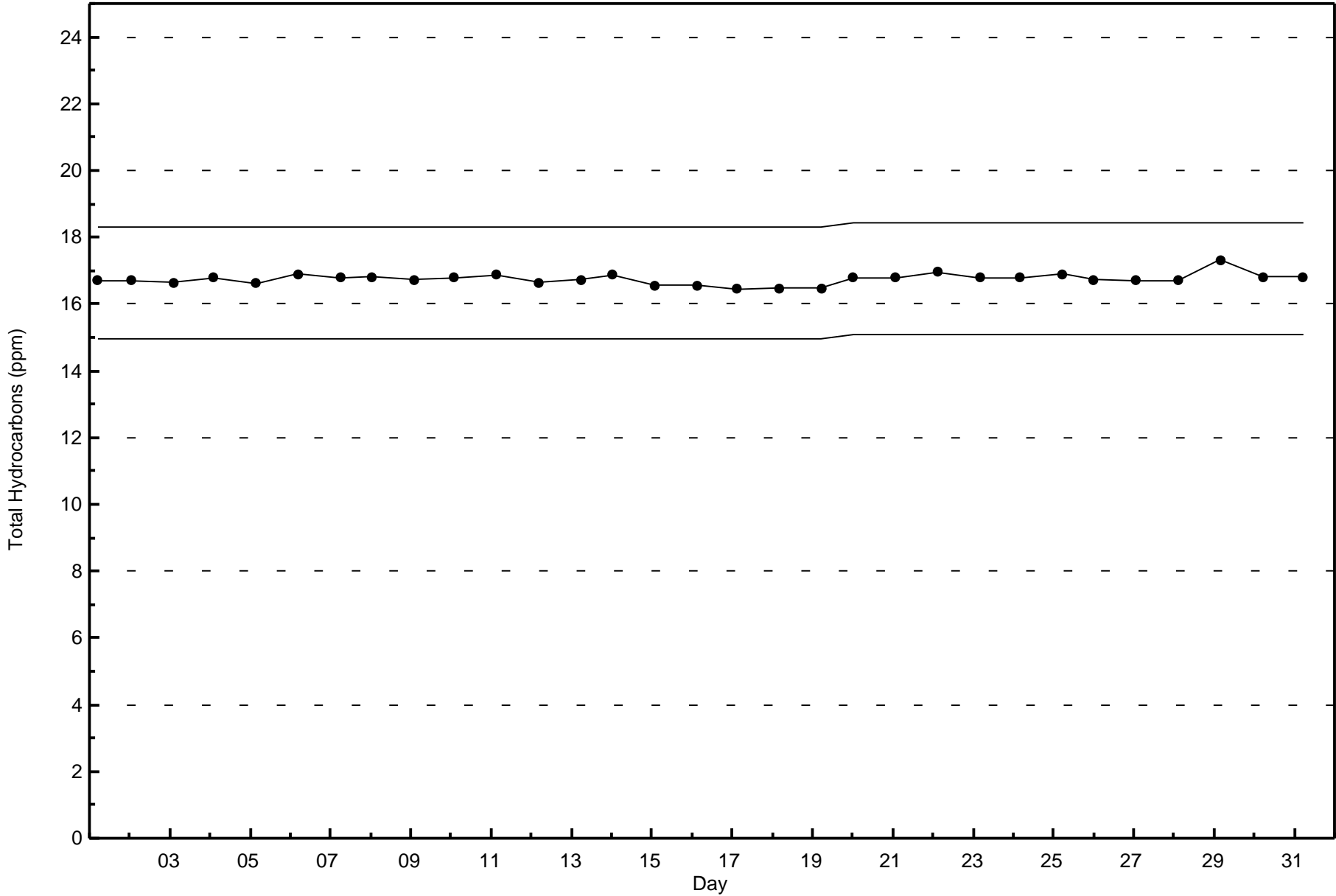




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Firebag - December 2017







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

Firebag - December 2017

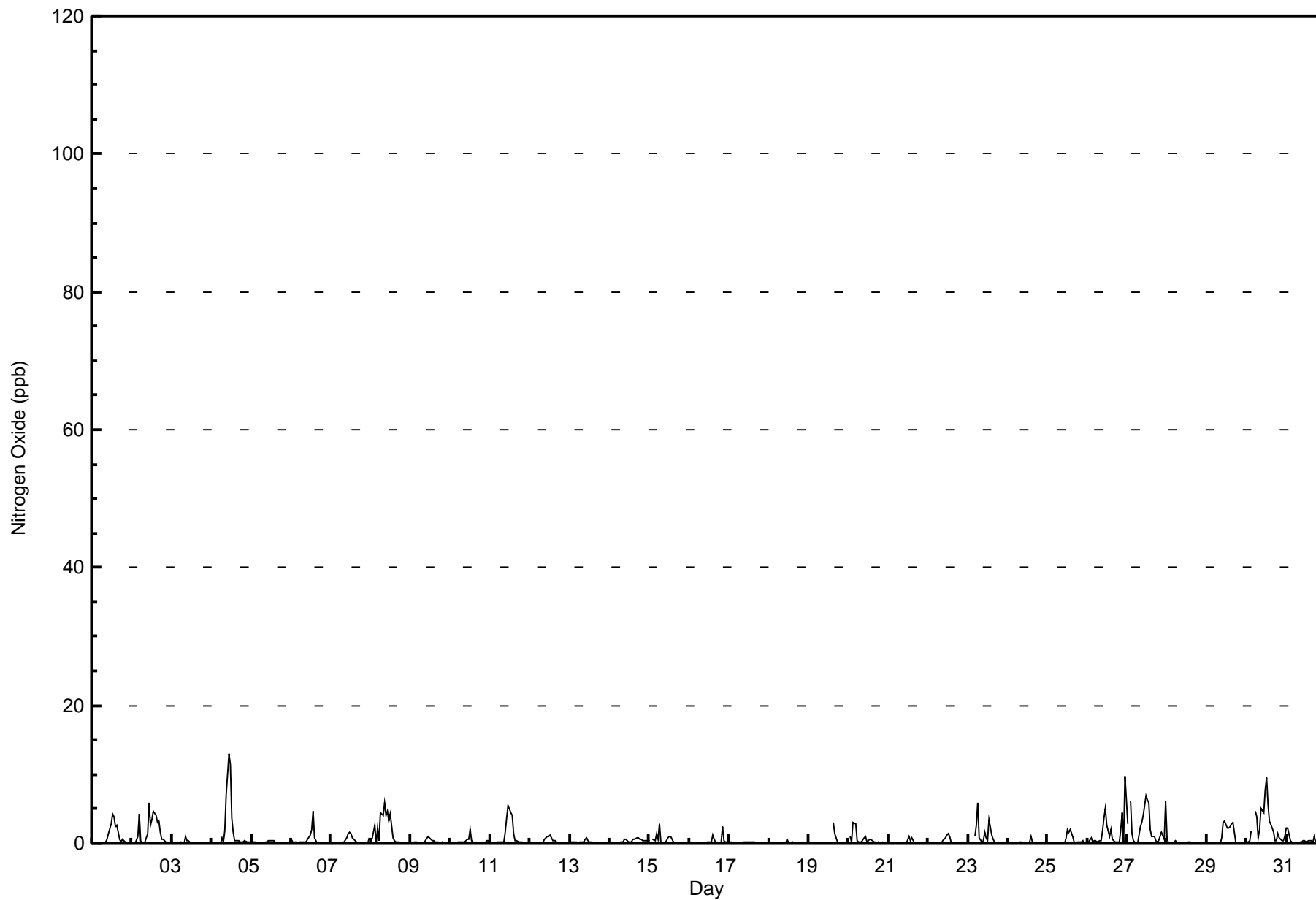
Maximum Value: 13 ppb on Dec 4 11:00																	Maximum Daily Average: 2.5 ppb on Dec 30																	Hours in Service: 744			
Minimum Value: 0 ppb on Dec 28 19:00																	Minimum Daily Average: 0.1 ppb on Dec 18																	Hours of Data: 708			
Maximum Diurnal Average: 2.0 ppb at hour 12																	Minimum Diurnal Average: 0.1 ppb at hour 23																	Hours of Missing Data: 36			
Monthly Average: 0.7 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 2 P <sub>99</sub> = 7																	Hours of Calibration: 36			
																	Percent Operational Time: 100.0																				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	0	0	0	0	0	Z	0	0	0	1	1	3	4	4	2	3	1	0	1	0	0	0	0	0	0	0.9	4										
2-Dec	Z	0	0	1	4	0	0	0	0	1	6	3	3	5	4	3	3	2	1	1	0	0	0	0	1.6	6											
3-Dec	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1											
4-Dec	0	0	Z	0	0	0	1	0	2	7	13	11	4	2	0	0	0	0	0	0	0	0	0	0	1.9	13											
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
6-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	2	5	1	0	0	0	0	0	0	0	0	0	0.5	5											
7-Dec	0	0	0	0	0	Z	0	0	0	1	1	2	2	1	1	0	0	0	0	0	0	0	0	1	0.4	2											
8-Dec	Z	1	3	0	2	0	4	4	6	4	5	3	4	1	0	0	0	0	0	0	0	0	0	0	1.7	6											
9-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1											
10-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0.3	2											
11-Dec	0	0	0	Z	0	0	0	0	0	2	4	5	5	4	1	0	0	0	0	0	0	0	0	0	1.0	5											
12-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1											
13-Dec	0	0	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1											
14-Dec	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0.4	1											
15-Dec	0	Z	1	0	1	1	3	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	3											
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0.3	2											
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1											
19-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	3	1	0	0	0	0	0	0	0	0.3	3											
20-Dec	Z	1	0	3	3	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.6	3											
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0.2	1											
22-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1											
23-Dec	0	0	0	Z	1	3	6	1	0	0	2	1	0	4	1	1	0	0	0	0	0	0	0	0	0.9	6											
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	1											
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	2	2	2	1	0	0	0	0	0	0	0	0	0.4	2											
26-Dec	Z	0	1	0	0	0	0	0	0	2	4	5	3	1	2	1	0	0	0	0	2	4	0	10	1.6	10											
27-Dec	3	Z	6	1	0	0	0	1	2	3	4	7	6	6	2	1	1	0	0	0	1	2	1	6	2.4	7											
28-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1											
29-Dec	0	0	0	Z	0	0	0	0	0	1	3	3	2	2	2	3	3	0	0	0	0	0	0	0	0.9	3											
30-Dec	0	0	0	2	Z	5	4	1	2	5	4	8	10	6	3	2	2	0	0	1	1	0	0	1	2.5	10											
31-Dec	2	2	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.4	2											
																	Diurnal Average				Diurnal Maximum																
																	0.3				3																
																	0.2				2																
																	0.5				6																
																	0.4				3																
																	0.6				4																
																	0.5				5																
																	0.7				6																
																	0.3				4																
																	0.5				6																
																	1.0				7																
																	1.9				13																
																	2.0				11																
																	1.9				10																
																	1.6				6																
																	1.0				4																
																	0.7				3																
																	0.5				3																
																	0.2				2																
																	0.2				1																
																	0.2				1																
																	0.3				2																
																	0.3				4																
																	0.1				1																
																	0.7				10																

Z - zerospan C - Calibration



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxide (NO) - ppb**  
**Firebag - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	97	8	1	0	0	1	1	17	31	107	137	61	54	40	30	79	664
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
<b>Totals</b>	97	8	1	0	0	1	1	17	31	107	137	61	54	40	30	79	664

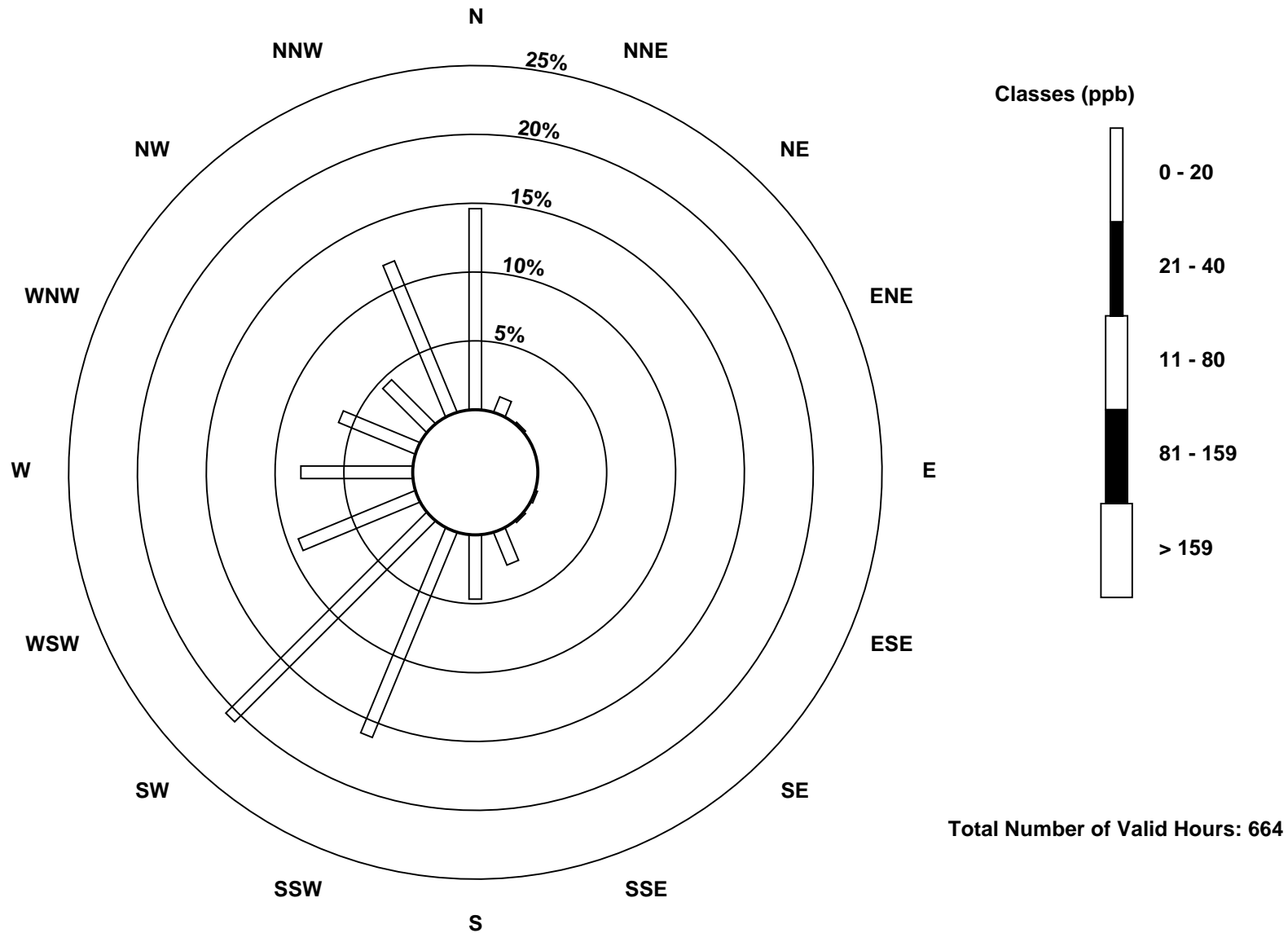
Total Number of Valid Hours: 664

Total Number of Hours: 744

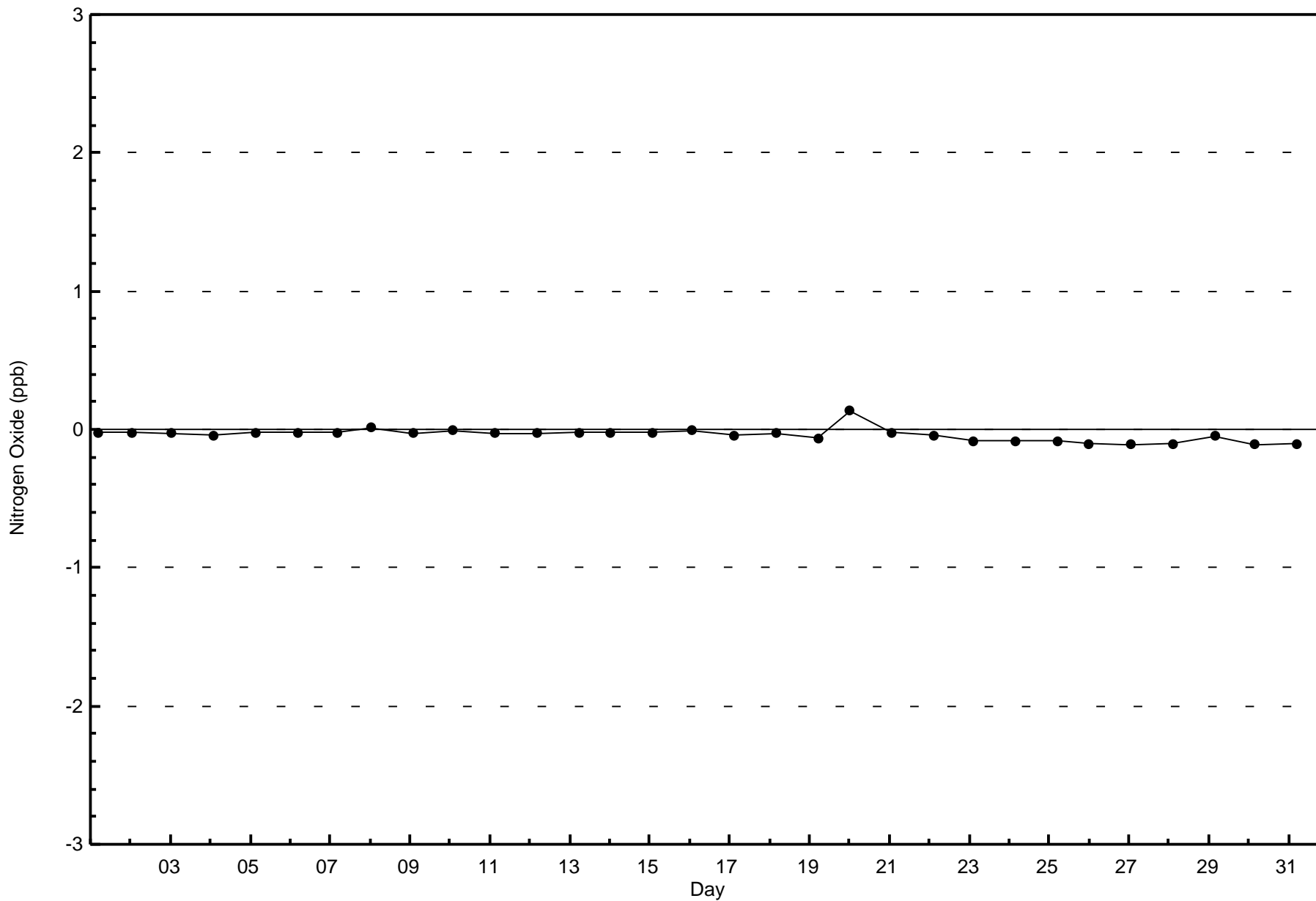


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxide (NO) - ppb  
Firebag (AMS 19)



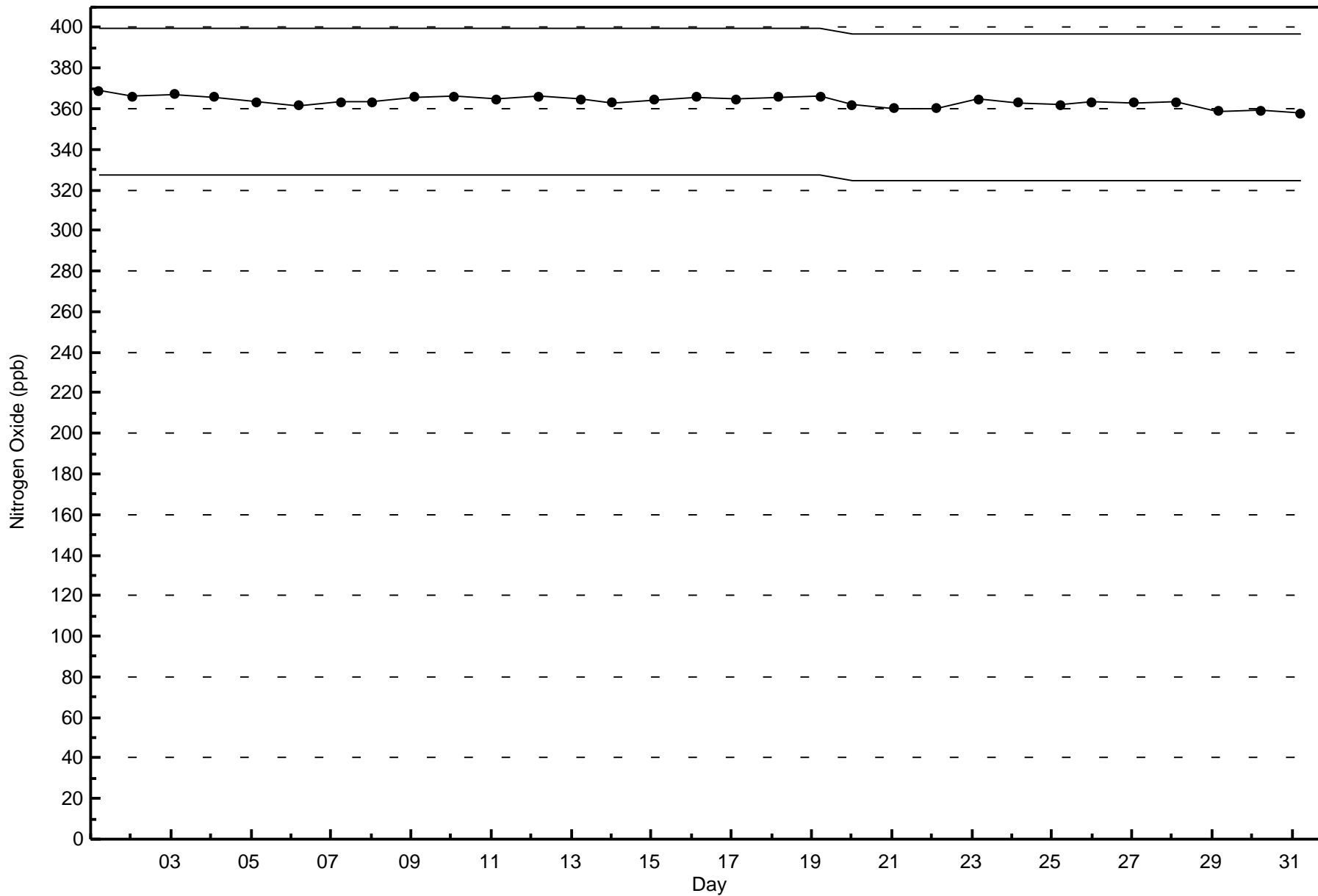






Wood Buffalo Environmental Association  
Span Responses

Nitrogen Oxide (NO) - ppb  
Firebag - December 2017





Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 31 ppb on Dec 29 17:00	Maximum Daily Average: 15.3 ppb on Dec 30		Hours of Data:	708
Minimum Value: 0 ppb on Dec 3 14:00	Minimum Daily Average: 1.4 ppb on Dec 24		Hours of Missing Data:	36
Maximum Diurnal Average: 9.1 ppb at hour 6	Minimum Diurnal Average: 4.4 ppb at hour 15		Hours of Calibration:	36
Monthly Average: 6.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 4 Q <sub>3</sub> = 9 P <sub>90</sub> = 14 P <sub>99</sub> = 27		Percent Operational Time:	100.0

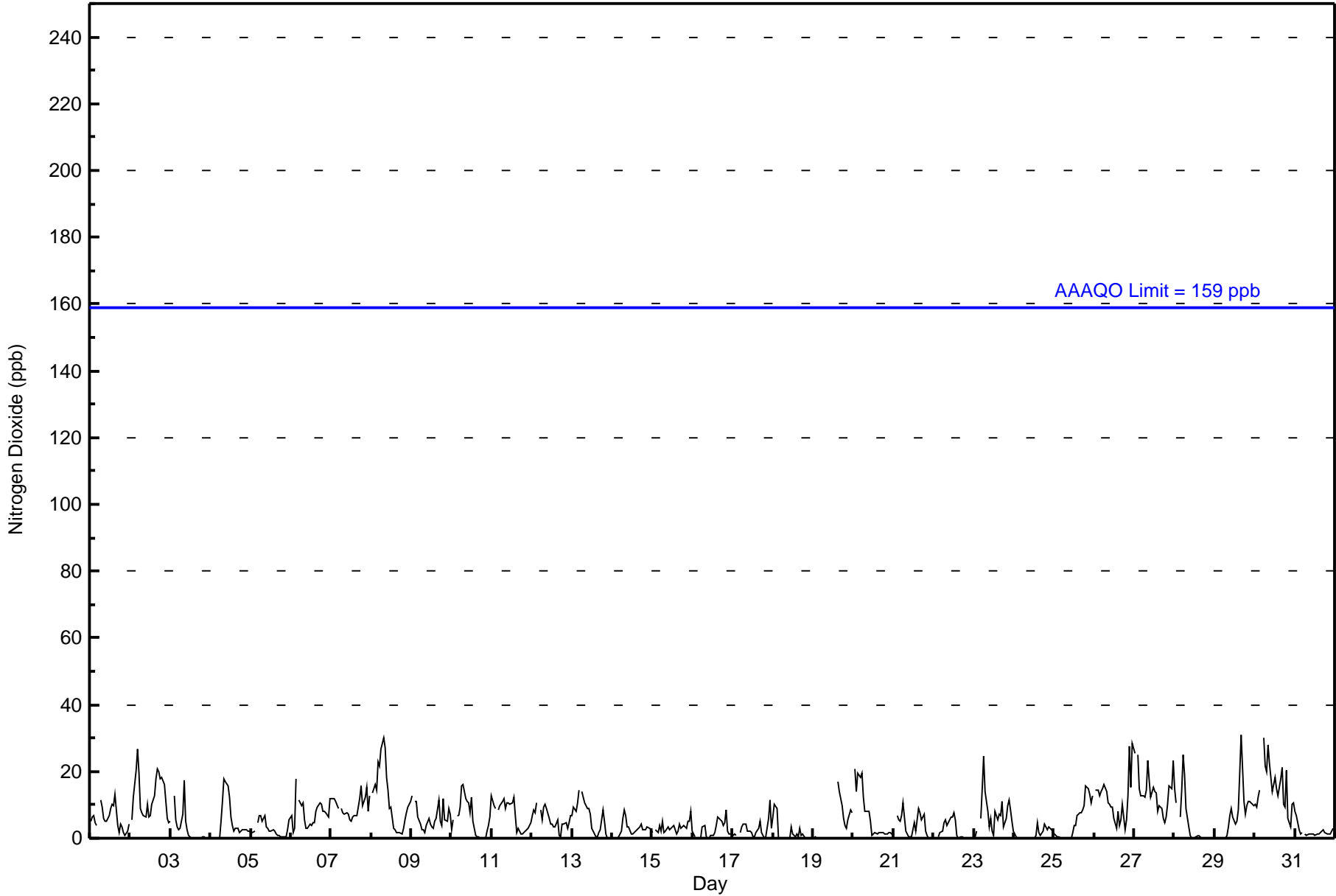
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	5	7	7	5	4	Z	11	10	6	5	5	7	9	10	10	13	4	2	4	3	2	1	2	4	5.9	13																							
2-Dec	Z	6	12	21	27	19	9	8	7	6	10	6	7	10	13	18	21	20	18	18	16	11	6	5	12.7	27																							
3-Dec	5	Z	13	6	3	3	3	7	17	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2.9	17																							
4-Dec	0	0	Z	0	0	0	5	11	18	17	16	12	6	4	2	3	3	2	2	2	3	3	2	2	4.9	18																							
5-Dec	2	2	2	Z	5	7	7	5	7	4	3	2	2	2	2	1	1	1	1	1	0	1	3	6	2.8	7																							
6-Dec	7	2	3	18	Z	12	10	11	6	3	3	4	4	5	5	8	9	11	10	8	8	8	6	12	7.4	18																							
7-Dec	12	12	12	11	9	Z	9	8	7	8	7	6	5	6	7	7	10	12	16	10	12	15	8	13	9.5	16																							
8-Dec	Z	13	16	14	23	22	27	30	27	18	14	9	9	3	3	2	2	2	1	3	5	8	9	11	11.8	30																							
9-Dec	13	Z	11	11	6	4	3	2	2	4	6	4	3	3	5	6	11	5	4	12	6	5	9	7	6.2	13																							
10-Dec	3	5	Z	7	7	9	16	16	12	11	11	8	12	5	1	0	0	0	0	0	0	2	4	6	5.9	16																							
11-Dec	13	10	9	Z	9	10	11	12	9	11	11	10	11	12	7	2	3	1	1	2	2	2	3	5	7.1	13																							
12-Dec	7	8	8	10	Z	8	5	9	10	9	6	4	4	4	4	6	1	0	4	4	5	3	5	7	5.7	10																							
13-Dec	7	9	8	11	14	Z	14	11	10	9	9	7	3	1	1	0	2	3	8	5	1	0	0	0	5.8	14																							
14-Dec	Z	0	0	0	1	2	6	8	7	4	3	1	1	2	2	2	4	4	3	3	3	4	3	3	2.8	8																							
15-Dec	2	Z	3	2	4	2	5	2	2	3	3	3	3	4	1	2	4	3	4	4	3	5	5	8	3.3	8																							
16-Dec	2	0	Z	0	0	0	4	4	0	0	0	1	1	2	4	6	6	5	4	5	9	2	1	1	2.5	9																							
17-Dec	1	1	1	Z	2	3	4	4	4	2	2	2	1	1	2	3	5	2	1	0	0	6	12	3	2.6	12																							
18-Dec	6	10	9	0	Z	0	0	0	0	0	0	3	1	0	1	0	3	1	1	0	0	0	0	0	1.7	10																							
19-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	17	14	10	6	4	3	6	9	8	4.3	17																							
20-Dec	Z	21	14	20	18	19	12	8	8	8	5	1	1	2	1	2	2	2	2	1	1	2	2	1	6.6	21																							
21-Dec	2	Z	7	6	5	7	10	2	1	1	0	0	5	2	5	9	8	6	7	2	1	0	0	0	3.7	10																							
22-Dec	0	0	Z	0	2	2	5	6	4	5	6	6	8	6	1	0	1	1	0	0	0	0	0	0	2.3	8																							
23-Dec	0	0	2	Z	6	15	25	14	8	3	6	2	1	8	5	7	7	11	3	6	10	12	9	5	7.2	25																							
24-Dec	2	0	0	0	Z	0	0	0	0	0	0	0	0	1	5	2	1	2	4	3	3	3	2	2	1.4	5																							
25-Dec	1	1	0	0	0	Z	0	0	0	0	0	2	4	4	7	8	8	9	10	16	15	13	11	13	5.3	16																							
26-Dec	Z	14	14	13	14	15	16	14	11	10	10	9	6	3	8	4	6	10	3	5	13	27	15	28	11.6	28																							
27-Dec	25	Z	25	15	13	13	12	14	23	18	12	15	14	14	8	10	9	6	5	6	10	16	15	23	14.0	25																							
28-Dec	15	11	Z	6	15	25	19	9	3	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	4.6	25																							
29-Dec	0	0	0	Z	0	0	0	1	4	7	9	6	4	5	8	19	31	11	7	10	11	11	11	10	7.2	31																							
30-Dec	10	9	12	15	Z	30	22	20	28	22	14	16	18	15	13	18	21	10	9	20	6	3	10	10	15.3	30																							
31-Dec	8	7	3	1	2	Z	1	1	1	1	1	1	1	1	1	2	2	3	2	1	1	1	2	3	2.1	8																							
																								5.7	5.7	7.3	7.4	7.2	9.1	8.7	8.0	7.8	6.3	5.8	5.0	4.9	4.5	4.4	5.7	6.3	4.9	4.5	5.0	4.8	5.5	5.3	6.3	Diurnal Average	
																								25	21	25	21	27	30	27	30	28	22	16	16	18	15	13	19	31	20	18	20	16	27	15	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 (NO<sub>2</sub>) - ppb  
Firebag - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	685	96.75	96.75
21 - 40	23	3.25	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Firebag - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	97	8	1	0	0	1	1	17	29	104	134	61	54	39	29	78	653
21 - 40	0	0	0	0	0	0	0	0	2	3	3	0	0	1	1	1	11
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
<b>Totals</b>	97	8	1	0	0	1	1	17	31	107	137	61	54	40	30	79	664

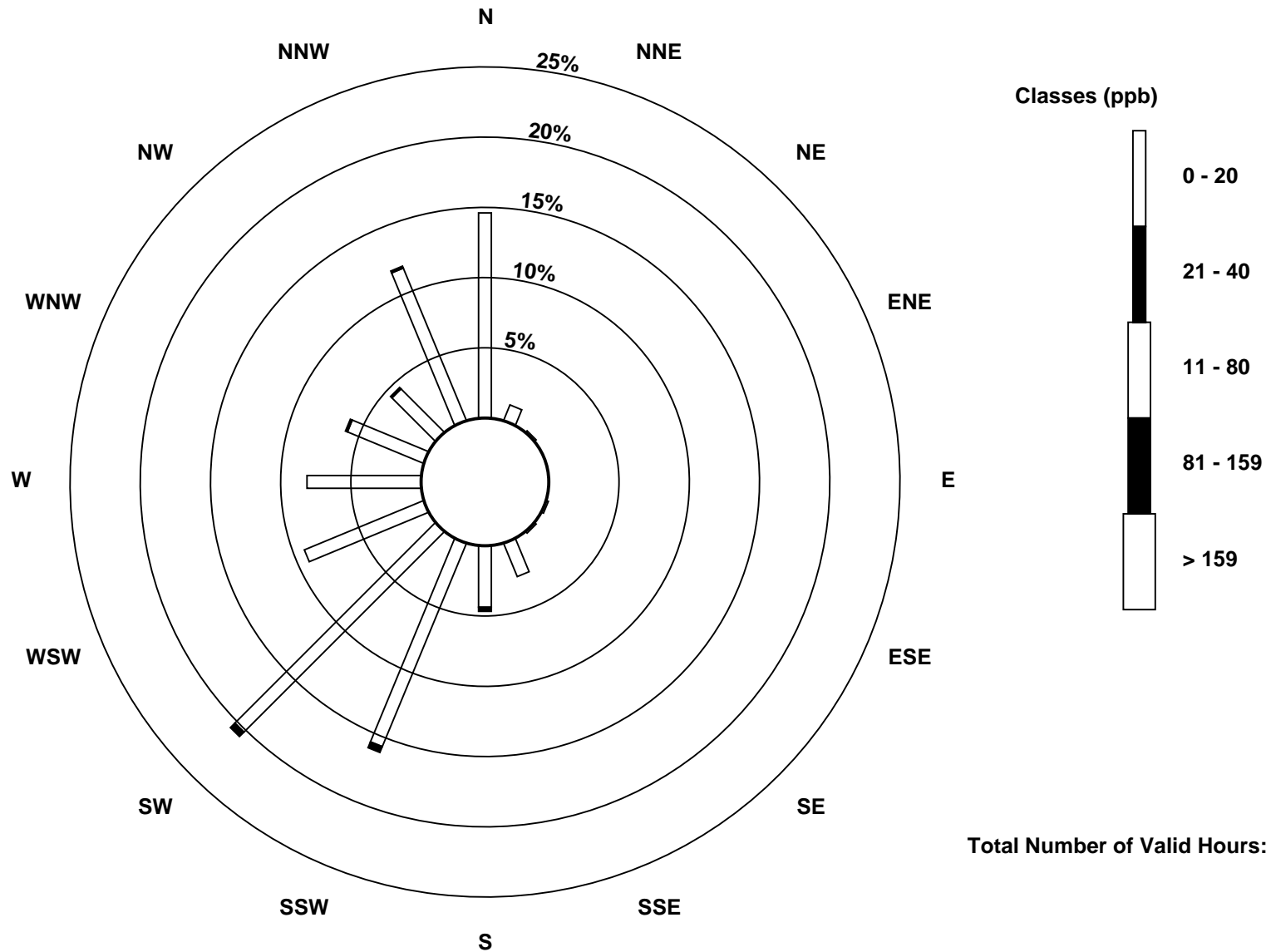
Total Number of Valid Hours: 664

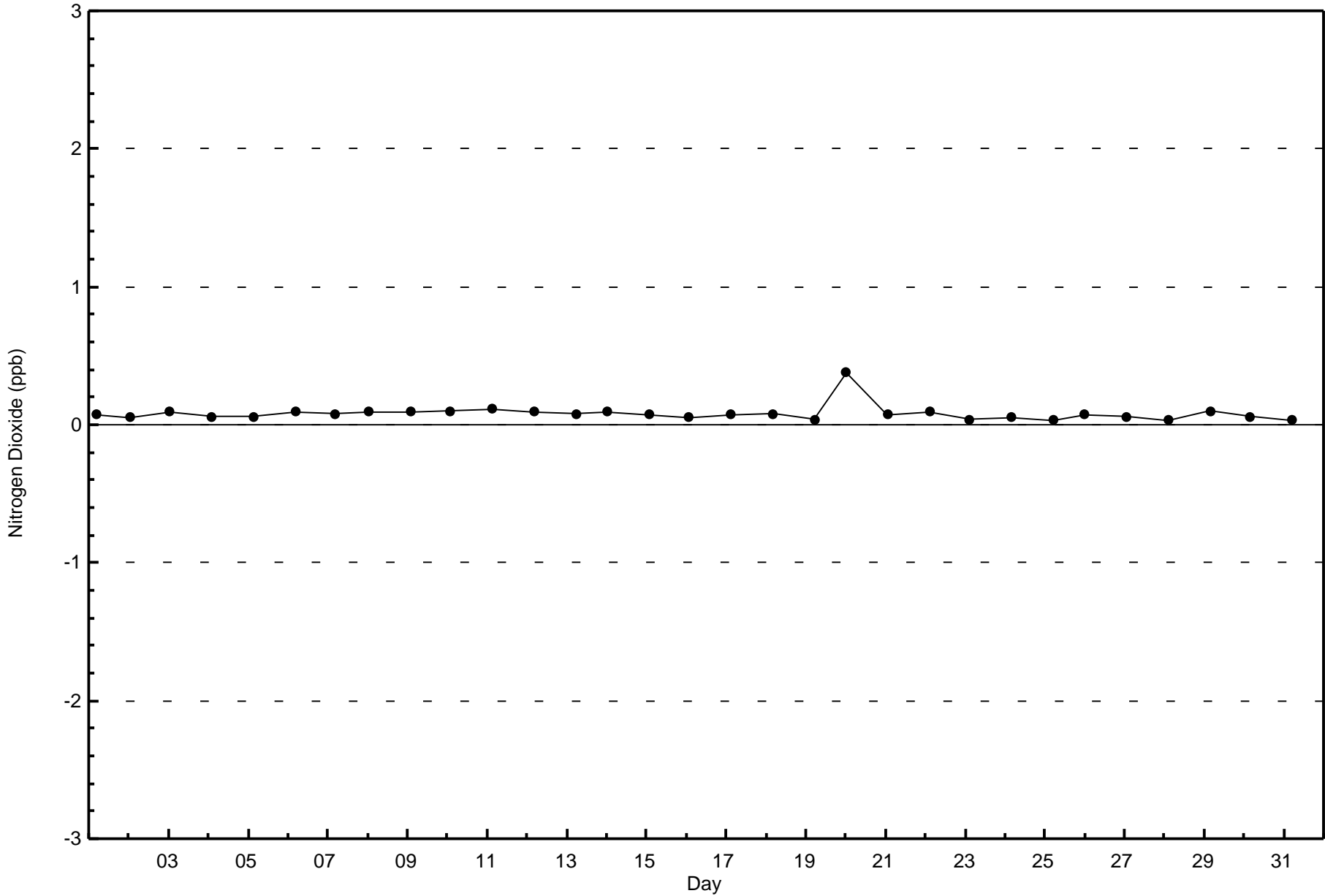
Total Number of Hours: 744



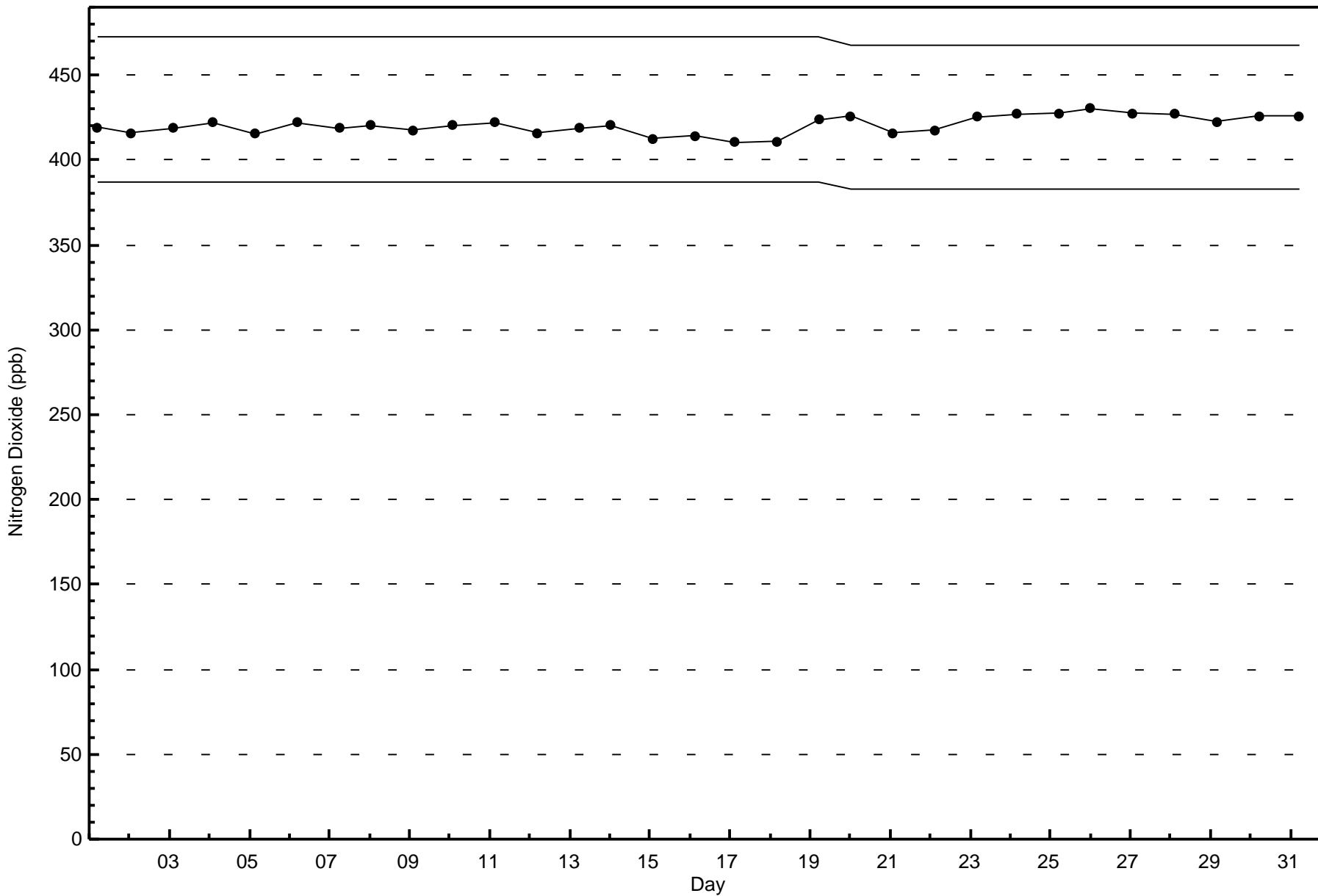
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Firebag (AMS 19)











Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

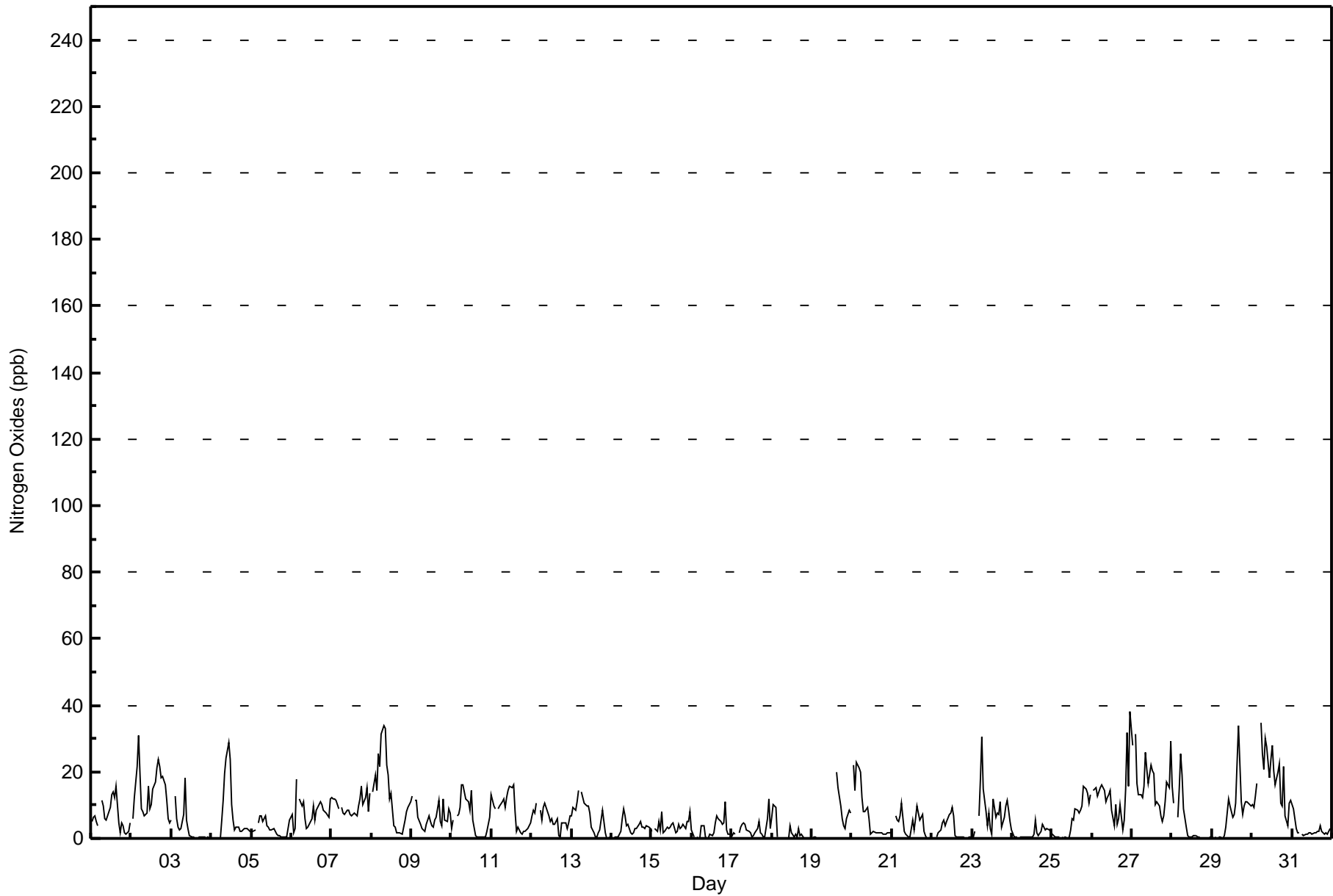
Firebag - December 2017

Maximum Value: 38 ppb on Dec 27 00:00																			Maximum Daily Average: 17.8 ppb on Dec 30						Hours in Service: 744	
Minimum Value: 0 ppb on Dec 18 07:00																			Minimum Daily Average: 1.5 ppb on Dec 24						Hours of Data: 708	
Maximum Diurnal Average: 9.5 ppb at hour 6																			Minimum Diurnal Average: 4.7 ppb at hour 19						Hours of Missing Data: 36	
Monthly Average: 6.7 ppb																			Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 2 Median = 5 Q <sub>3</sub> = 10 P <sub>90</sub> = 16 P <sub>99</sub> = 31						Hours of Calibration: 36	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	5	7	7	5	4	Z	11	10	6	6	7	9	13	14	12	16	4	2	5	4	2	1	2	4	6.8	16
2-Dec	Z	6	12	21	31	20	9	8	7	8	16	9	10	15	17	21	24	22	18	19	16	11	6	5	14.4	31
3-Dec	6	Z	13	6	3	3	3	7	18	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	3.1	18
4-Dec	0	0	Z	0	0	0	6	11	19	24	29	24	10	5	3	3	3	2	2	3	3	3	3	2	6.8	29
5-Dec	2	2	2	Z	5	7	7	5	7	4	3	2	2	3	2	1	1	1	1	1	1	1	3	6	2.9	7
6-Dec	7	2	3	18	Z	12	10	11	6	3	4	5	6	10	5	8	9	11	10	8	8	8	6	12	7.9	18
7-Dec	12	12	12	11	9	Z	9	8	7	8	9	7	7	7	7	7	10	12	16	10	12	15	8	13	10.0	16
8-Dec	Z	14	19	14	25	22	31	34	33	22	19	12	14	4	3	2	2	2	1	3	5	8	9	11	13.5	34
9-Dec	13	Z	12	11	7	4	3	2	2	4	7	5	4	4	6	6	12	5	4	12	6	5	9	7	6.5	13
10-Dec	3	5	Z	7	7	9	16	16	12	12	11	9	14	5	1	0	0	0	0	0	0	2	4	6	6.2	16
11-Dec	13	10	9	Z	9	10	11	12	9	12	14	16	15	16	8	2	4	2	1	2	2	2	3	5	8.1	16
12-Dec	7	9	8	10	Z	9	5	9	11	9	7	5	6	4	4	6	1	1	5	4	5	3	5	7	6.0	11
13-Dec	7	9	8	11	15	Z	14	11	10	10	10	7	3	2	1	0	2	3	9	5	1	0	0	0	6.0	15
14-Dec	Z	0	0	0	1	2	6	9	7	4	4	2	1	2	3	3	4	5	3	3	3	4	3	3	3.2	9
15-Dec	2	Z	3	2	5	3	8	2	2	3	3	4	4	5	2	2	4	3	4	4	3	5	5	8	3.8	8
16-Dec	2	0	Z	0	0	0	4	4	0	0	0	1	1	2	5	7	6	5	4	5	11	2	1	1	2.7	11
17-Dec	1	1	1	Z	2	3	4	5	4	2	2	2	1	1	2	3	5	2	1	0	0	6	12	3	2.7	12
18-Dec	7	10	9	0	Z	0	0	0	0	0	0	4	2	0	1	0	3	1	1	0	0	0	0	0	1.8	10
19-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	20	15	10	6	4	3	6	9	8	4.5	20
20-Dec	Z	22	14	23	21	20	12	8	8	9	6	1	2	2	2	2	2	2	2	1	1	2	2	2	7.2	23
21-Dec	2	Z	7	5	5	7	10	2	1	1	1	1	6	3	6	10	8	6	7	2	1	0	0	0	3.9	10
22-Dec	0	0	Z	0	2	2	5	6	4	5	7	8	9	7	1	0	1	1	0	0	0	0	0	0	2.6	9
23-Dec	1	0	2	Z	7	18	31	15	8	4	7	3	1	12	7	8	7	11	3	6	10	12	9	5	8.0	31
24-Dec	2	0	0	0	Z	0	0	0	0	0	0	0	0	1	6	2	1	2	4	3	3	3	2	2	1.5	6
25-Dec	1	1	0	0	0	Z	0	0	0	0	0	2	6	6	9	8	8	9	10	16	15	13	11	13	5.6	16
26-Dec	Z	15	15	13	14	15	16	15	11	12	13	14	8	4	10	4	6	10	3	6	15	32	15	38	13.3	38
27-Dec	28	Z	31	16	13	13	12	16	26	21	16	22	20	19	10	11	10	7	5	7	11	17	15	29	16.4	31
28-Dec	16	11	Z	6	15	25	19	9	3	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	4.8	25
29-Dec	0	0	0	Z	0	0	0	1	3	8	12	10	6	7	11	22	34	11	7	10	11	11	11	10	8.1	34
30-Dec	10	9	13	16	Z	35	25	21	30	27	18	24	28	20	16	20	23	11	10	21	7	4	11	11	17.8	35
31-Dec	10	9	3	2	2	Z	1	1	1	1	2	2	1	2	2	2	2	4	2	1	2	1	2	3	2.5	10
																			6.1 6.0 7.9 7.7 7.7 9.5 9.4 8.3 8.3 7.3 7.7 7.0 6.7 6.1 5.4 6.4 6.8 5.1 4.7 5.2 5.1 5.8 5.4 7.0						Diurnal Average	
																			28 22 31 23 31 35 31 34 33 27 29 24 28 20 17 22 34 22 18 21 16 32 15 38						Diurnal Maximum	
Z - zerospan		C - Calibration																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Firebag - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	670	94.63	94.63
21 - 40	38	5.37	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Firebag - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	97	8	1	0	0	1	1	17	27	97	132	61	54	39	29	78	642
21 - 40	0	0	0	0	0	0	0	0	4	10	5	0	0	1	1	1	22
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
<b>Totals</b>	97	8	1	0	0	1	1	17	31	107	137	61	54	40	30	79	664

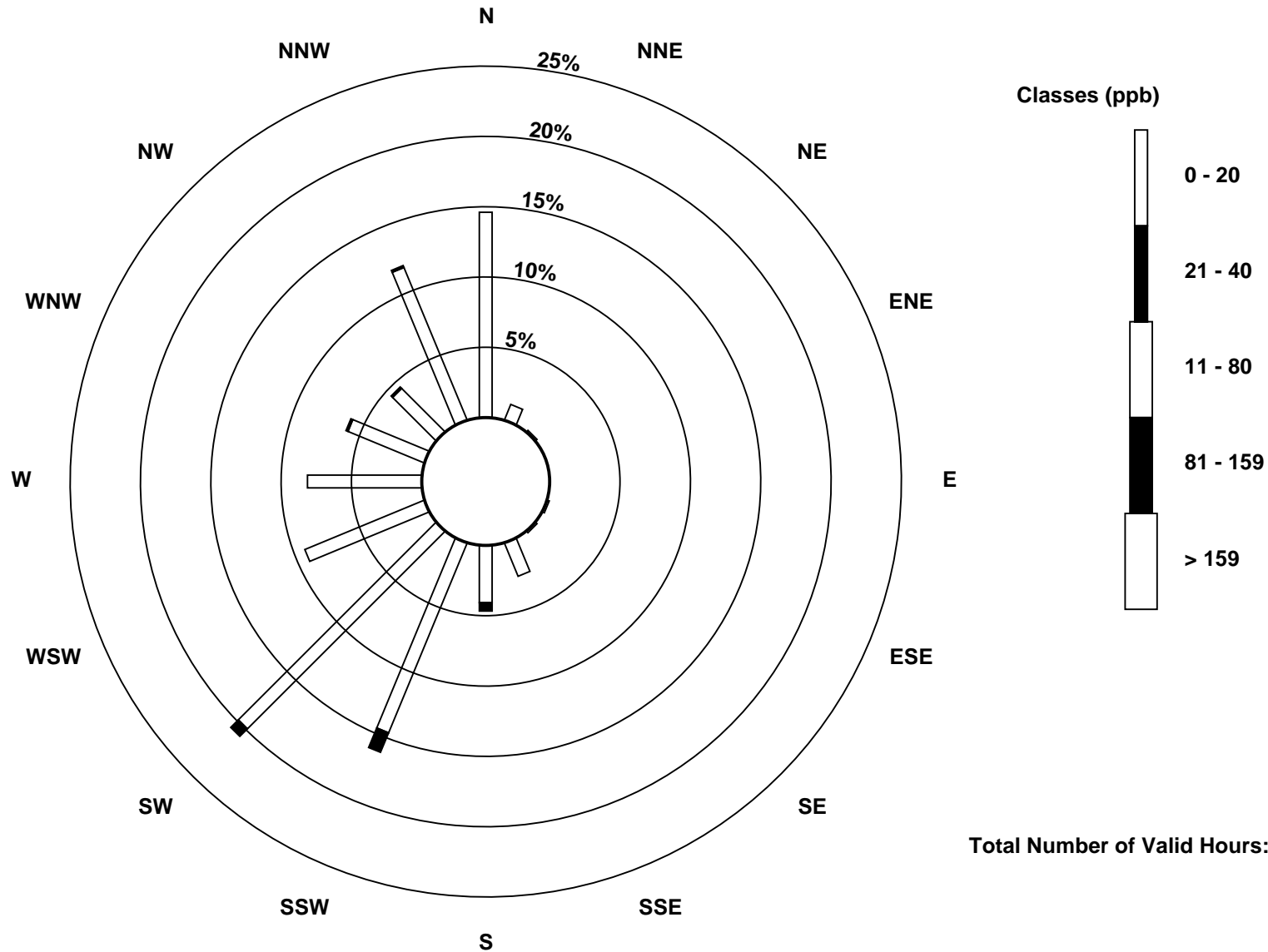
Total Number of Valid Hours: 664

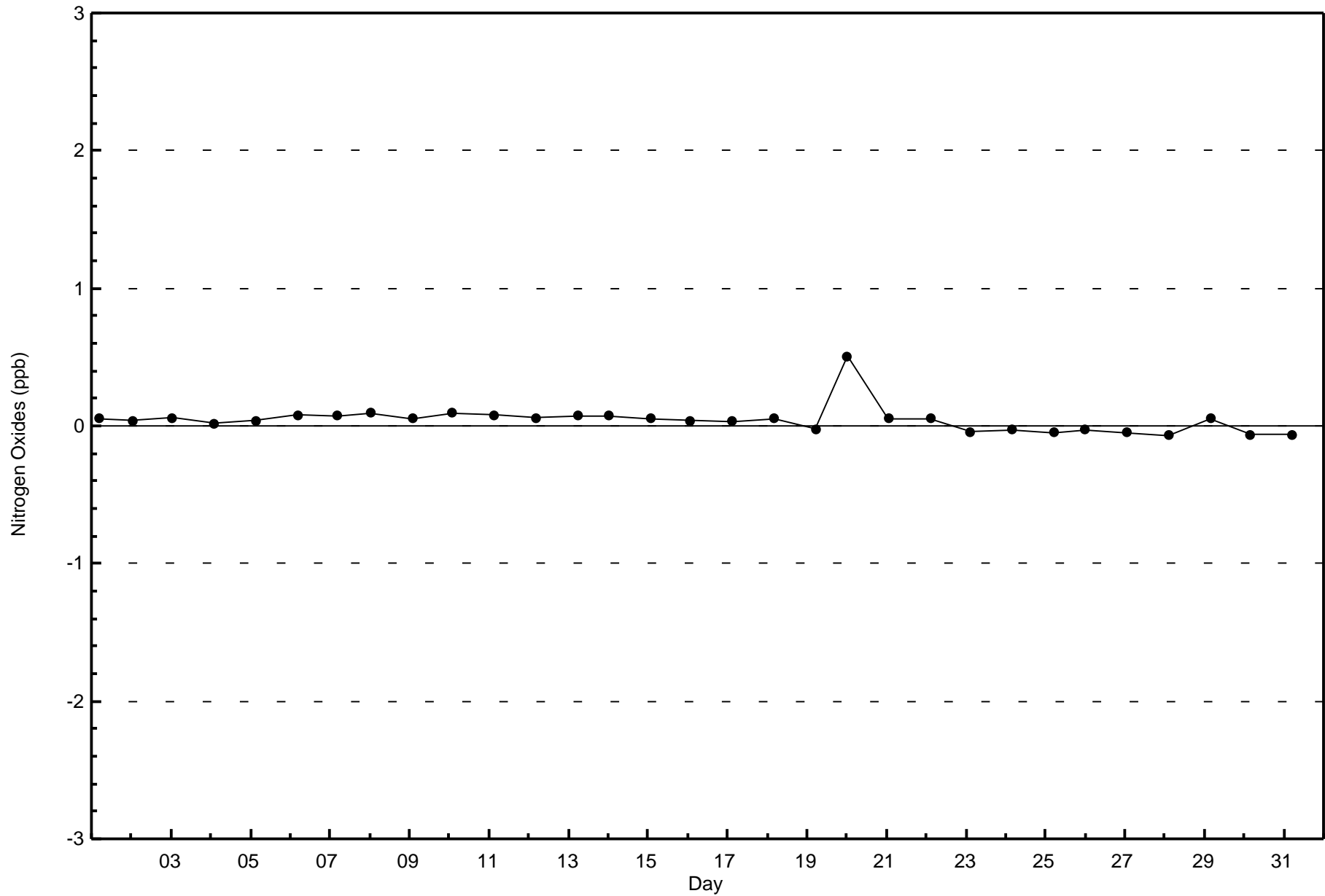
Total Number of Hours: 744

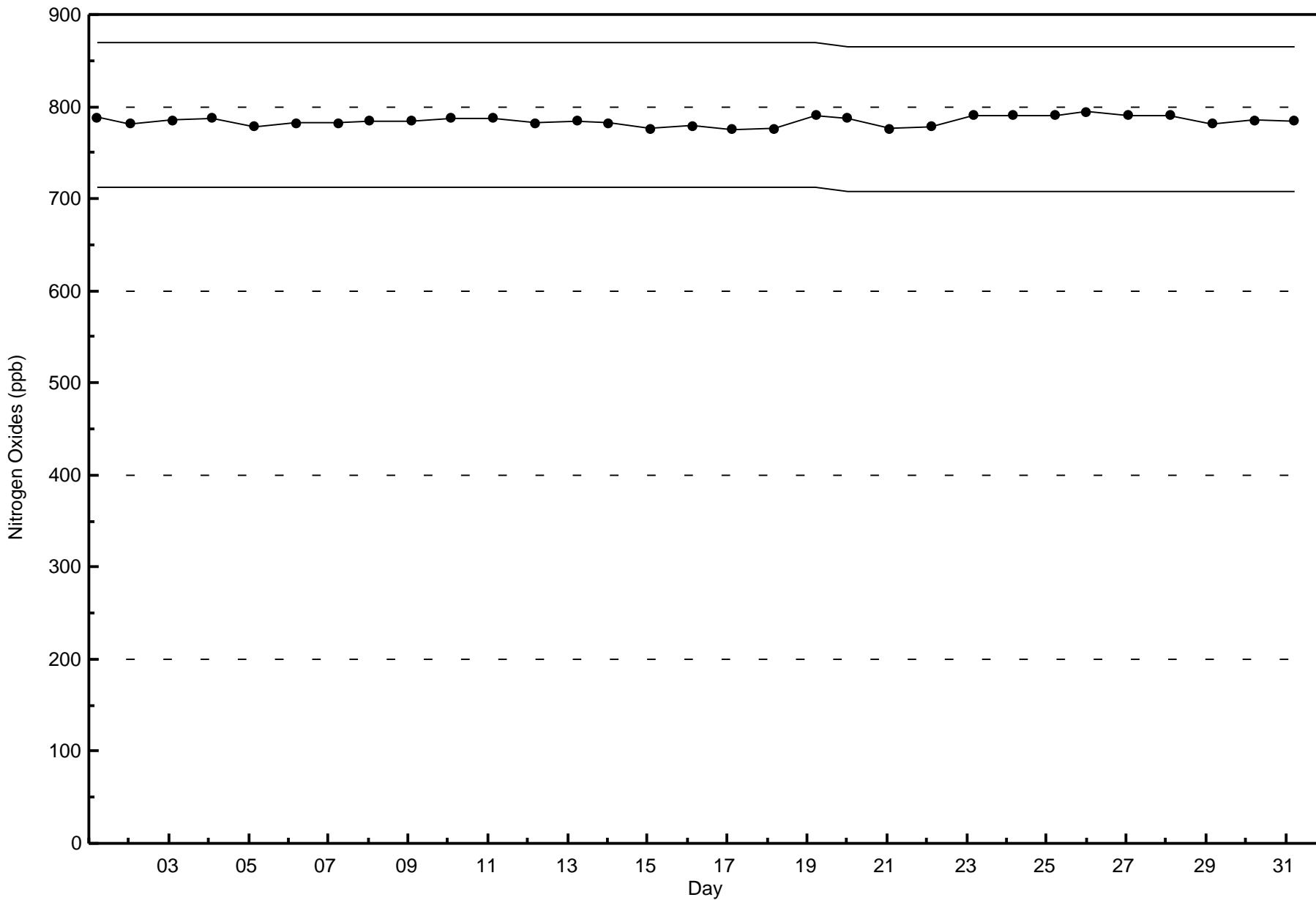


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Firebag (AMS 19)











**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

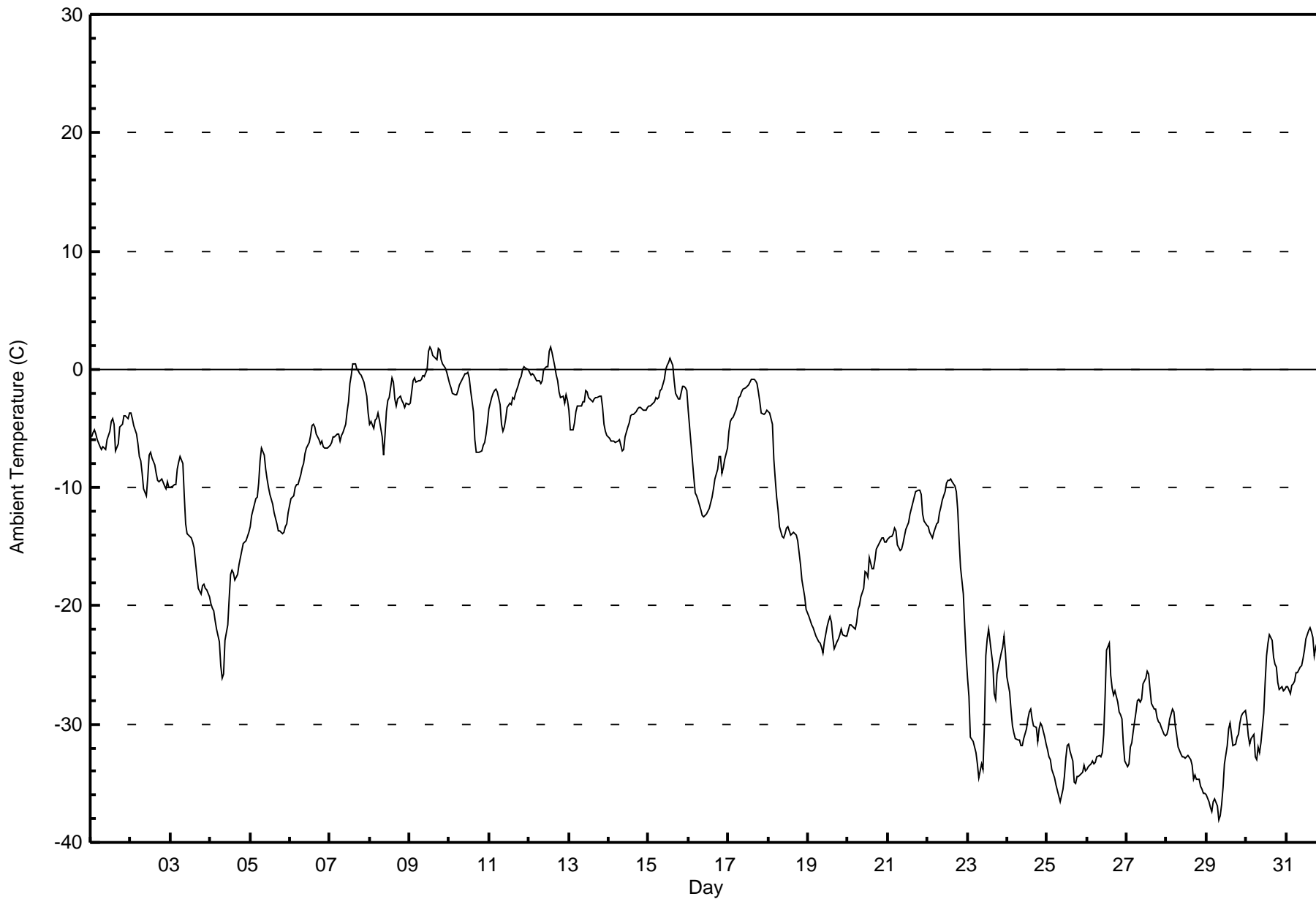
**Firebag - December 2017**

Maximum Value: 1.9 C on Dec 12 14:00      Maximum Daily Average: 0.0 C on Dec 9																						Hours in Service:	744			
Minimum Value: -38.0 C on Dec 29 08:00      Minimum Daily Average: -34.0 C on Dec 25																						Hours of Data:	744			
Maximum Diurnal Average: -12.7 C at hour 14      Minimum Diurnal Average: -15.7 C at hour 9																						Hours of Missing Data:	0			
Monthly Average: -14.47 C      Percentiles: P <sub>1</sub> = -36.5 P <sub>10</sub> = -31.9 Q <sub>1</sub> = -25.1 Median = -11.4 Q <sub>3</sub> = -3.7 P <sub>90</sub> = -1.2 P <sub>99</sub> = 1.4																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.7	-5.4	-5.1	-5.5	-5.9	-6.6	-6.8	-6.5	-6.6	-6.8	-5.9	-5.2	-4.4	-4.2	-4.7	-6.9	-6.3	-4.9	-4.8	-4.6	-3.9	-4.0	-4.1	-3.7	-5.3	-3.7
2-Dec	-3.7	-4.2	-4.8	-5.5	-6.3	-7.3	-7.7	-8.8	-10.1	-10.7	-9.1	-7.2	-7.0	-7.4	-8.1	-8.8	-9.4	-9.5	-9.3	-9.2	-9.9	-10.1	-9.6	-10.0	-8.1	-3.7
3-Dec	-10.0	-9.9	-9.8	-9.8	-8.4	-7.8	-7.4	-7.9	-10.7	-13.0	-13.9	-14.0	-14.2	-14.6	-15.1	-16.2	-17.5	-18.5	-19.0	-18.3	-18.2	-18.5	-18.6	-19.2	-13.8	-7.4
4-Dec	-19.8	-20.1	-20.5	-21.2	-21.9	-23.0	-25.0	-26.1	-25.8	-22.9	-21.6	-19.4	-17.4	-17.0	-17.2	-17.8	-17.3	-16.5	-15.9	-15.3	-14.7	-14.4	-14.1	-13.8	-19.1	-13.8
5-Dec	-13.3	-12.3	-11.4	-10.9	-10.8	-9.6	-7.7	-6.7	-7.3	-8.4	-9.3	-9.9	-10.6	-11.4	-12.2	-12.6	-13.0	-13.7	-13.6	-13.9	-13.8	-13.3	-13.0	-12.1	-11.3	-6.7
6-Dec	-10.9	-10.8	-10.7	-9.9	-9.7	-9.7	-9.0	-8.4	-8.0	-7.1	-6.7	-6.1	-5.6	-4.8	-4.7	-4.9	-5.4	-5.9	-6.3	-6.1	-6.6	-6.7	-6.7	-6.5	-7.4	-4.7
7-Dec	-6.4	-6.2	-5.7	-5.7	-5.4	-5.5	-6.1	-5.6	-5.3	-4.7	-3.6	-2.7	-1.2	-0.5	0.4	0.5	0.0	-0.2	-0.3	-0.5	-1.0	-1.7	-2.3	-3.7	-3.1	0.5
8-Dec	-4.6	-4.4	-5.0	-4.3	-4.2	-3.7	-4.3	-5.7	-7.3	-5.6	-3.6	-2.6	-2.4	-0.8	-1.1	-2.5	-3.2	-2.5	-2.3	-2.6	-2.9	-3.2	-2.9	-2.9	-3.5	-0.8
9-Dec	-2.9	-1.9	-1.0	-0.7	-1.1	-0.9	-0.9	-0.8	-0.5	-0.6	-0.1	1.5	1.9	1.6	1.2	1.1	0.8	1.7	1.6	0.8	0.4	0.2	-0.2	-0.7	0.0	1.9
10-Dec	-1.2	-1.6	-2.1	-2.2	-2.2	-1.8	-1.4	-1.1	-0.6	-0.4	-0.3	-0.2	-0.7	-1.7	-3.5	-5.9	-7.0	-7.0	-7.1	-6.9	-6.4	-6.2	-5.5	-4.5	-3.2	-0.2
11-Dec	-3.4	-2.4	-2.1	-1.9	-1.7	-1.9	-3.0	-4.6	-5.2	-4.9	-4.2	-3.2	-2.9	-2.9	-2.4	-2.6	-2.0	-1.3	-0.8	-0.6	0.0	0.2	0.1	0.0	-2.2	0.2
12-Dec	-0.2	-0.5	-0.4	-0.5	-0.9	-0.9	-1.0	-1.2	-1.0	0.0	0.3	0.2	1.5	1.9	1.4	0.2	-0.5	-1.0	-1.9	-2.4	-2.3	-2.9	-2.1	-2.6	-0.7	1.9
13-Dec	-3.4	-5.1	-5.2	-4.5	-3.6	-3.1	-3.0	-3.1	-2.7	-2.8	-1.8	-2.0	-2.3	-2.6	-2.7	-2.5	-2.4	-2.4	-2.3	-2.3	-3.3	-4.6	-5.2	-5.6	-3.3	-1.8
14-Dec	-5.9	-6.0	-6.0	-6.1	-6.2	-6.0	-5.9	-6.5	-6.9	-6.8	-5.7	-4.9	-4.5	-3.9	-3.8	-3.9	-3.6	-3.3	-3.2	-3.3	-3.4	-3.5	-3.5	-3.3	-4.8	-3.2
15-Dec	-3.1	-3.1	-3.0	-2.7	-2.4	-2.5	-2.4	-1.8	-1.6	-0.9	0.0	0.3	0.6	1.0	0.3	-1.0	-2.0	-2.3	-2.5	-2.6	-1.4	-1.5	-1.5	-1.8	-1.6	1.0
16-Dec	-3.5	-6.3	-7.8	-9.2	-10.4	-10.7	-11.1	-11.9	-12.3	-12.5	-12.4	-12.2	-11.8	-11.3	-10.8	-10.1	-9.3	-8.4	-7.4	-7.4	-8.8	-8.4	-7.6	-6.6	-9.5	-3.5
17-Dec	-5.2	-4.4	-4.2	-4.1	-3.5	-3.0	-2.4	-2.2	-1.9	-1.6	-1.6	-1.4	-1.3	-1.1	-0.9	-0.9	-1.0	-1.2	-1.9	-2.8	-3.7	-3.8	-3.7	-3.5	-2.6	-0.9
18-Dec	-3.5	-3.7	-4.6	-7.6	-9.2	-10.9	-11.9	-13.2	-14.1	-14.2	-13.9	-13.4	-13.4	-14.0	-13.9	-13.7	-13.8	-14.0	-14.5	-16.6	-17.9	-18.5	-19.3	-20.4	-12.9	-3.5
19-Dec	-20.9	-21.2	-21.6	-21.9	-22.2	-22.6	-23.0	-23.2	-23.5	-24.0	-23.0	-21.8	-21.2	-20.9	-21.4	-22.7	-23.6	-23.0	-22.7	-22.4	-21.9	-22.5	-22.5	-22.6	-22.4	-20.9
20-Dec	-22.0	-21.6	-21.6	-21.7	-22.0	-21.4	-20.3	-19.9	-19.3	-18.6	-17.1	-17.2	-17.5	-16.0	-16.8	-16.8	-16.1	-15.2	-15.0	-14.7	-14.3	-14.3	-14.6	-14.6	-17.9	-14.3
21-Dec	-14.4	-14.2	-14.1	-13.9	-13.4	-13.7	-14.8	-15.3	-15.3	-14.7	-14.1	-13.6	-12.9	-12.3	-11.8	-11.3	-10.8	-10.4	-10.2	-10.2	-10.6	-12.3	-12.8	-13.2	-12.9	-10.2
22-Dec	-13.3	-13.8	-14.0	-14.2	-13.7	-13.0	-12.9	-12.2	-11.7	-11.0	-10.4	-9.7	-9.4	-9.4	-9.3	-9.5	-9.9	-10.3	-11.8	-14.5	-16.7	-19.0	-21.8	-24.2	-13.2	-9.3
23-Dec	-26.1	-27.7	-31.1	-31.4	-32.0	-32.4	-33.3	-34.5	-33.4	-33.9	-30.2	-24.2	-22.9	-21.9	-24.0	-24.9	-27.4	-27.9	-25.8	-24.6	-23.9	-23.6	-22.6	-24.0	-27.6	-21.9
24-Dec	-26.0	-27.3	-28.8	-30.1	-30.7	-31.2	-31.4	-31.4	-31.8	-31.8	-31.2	-30.4	-29.5	-28.9	-28.7	-29.5	-30.1	-30.2	-31.5	-30.4	-29.9	-30.2	-31.1	-31.7	-30.2	-26.0
25-Dec	-32.1	-32.8	-33.0	-33.8	-34.6	-35.1	-35.6	-36.1	-36.5	-35.4	-34.4	-32.9	-31.8	-31.7	-32.3	-33.2	-34.9	-35.0	-34.4	-34.4	-34.2	-34.1	-33.5	-34.0	-34.0	-31.7
26-Dec	-33.8	-33.6	-33.4	-33.2	-33.3	-33.2	-32.8	-32.7	-32.7	-32.4	-30.8	-27.6	-23.8	-23.2	-25.9	-27.0	-27.5	-27.2	-28.1	-28.9	-29.2	-29.5	-31.6	-33.1	-30.2	-23.2
27-Dec	-33.6	-33.4	-32.0	-31.6	-30.7	-28.9	-28.1	-28.0	-28.2	-28.0	-26.6	-26.1	-25.5	-25.7	-27.0	-28.3	-28.7	-28.7	-29.4	-29.8	-29.9	-30.3	-30.9	-31.0	-29.2	-25.5
28-Dec	-30.8	-30.4	-29.6	-28.8	-29.0	-30.1	-31.0	-31.9	-32.6	-32.8	-32.8	-32.9	-32.8	-32.7	-33.0	-33.5	-34.6	-34.3	-34.6	-34.7	-35.2	-35.4	-35.8	-35.9	-32.7	-28.8
29-Dec	-36.0	-36.5	-37.0	-37.4	-36.5	-36.3	-37.0	-38.0	-37.8	-36.7	-35.4	-33.4	-31.8	-30.4	-30.0	-30.8	-31.9	-31.7	-31.1	-30.9	-29.9	-29.4	-29.1	-28.8	-33.5	-28.8
30-Dec	-29.7	-31.0	-31.6	-31.2	-30.9	-32.8	-33.0	-31.9	-32.4	-31.6	-29.0	-26.5	-24.2	-23.1	-22.5	-23.0	-24.3	-24.9	-25.2	-26.5	-27.0	-26.9	-27.2	-27.1	-28.1	-22.5
31-Dec	-26.9	-26.8	-27.4	-26.7	-26.6	-26.3	-25.6	-25.6	-25.2	-25.0	-24.5	-23.8	-22.8	-22.1	-21.9	-22.2	-22.7	-24.2	-23.5	-22.7	-23.0	-23.4	-24.1	-24.8	-24.5	-21.9
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Firebag - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Firebag - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	260	34.95	34.95
-20 - 0	455	61.16	96.10
0 - 10	29	3.90	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

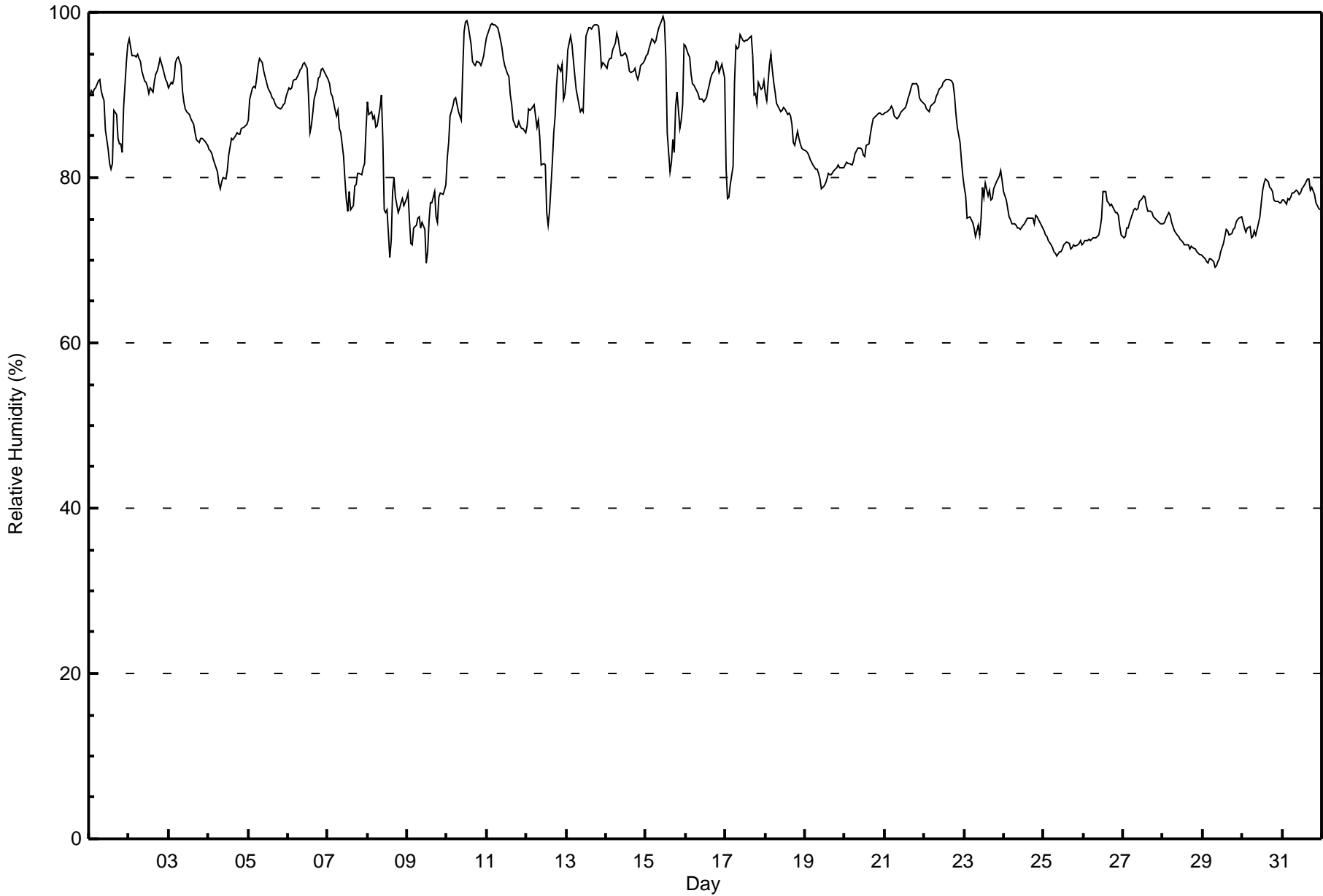
**Firebag - December 2017**

Maximum Value: 100 % on Dec 15 11:00																			Maximum Daily Average: 94.4 % on Dec 13						Hours in Service: 744		
Minimum Value: 69 % on Dec 29 08:00																			Minimum Daily Average: 71.8 % on Dec 25						Hours of Data: 744		
Maximum Diurnal Average: 85.0 % at hour 7																			Minimum Diurnal Average: 83.4 % at hour 15						Hours of Missing Data: 0		
Monthly Average: 84.2 %																			Percentiles: P <sub>1</sub> = 70 P <sub>10</sub> = 73 Q <sub>1</sub> = 77 Median = 85 Q <sub>3</sub> = 91 P <sub>90</sub> = 95 P <sub>99</sub> = 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-Dec	90	91	90	91	91	92	92	91	90	89	86	83	82	81	82	88	88	85	84	84	83	88	94	96	87.9	96	
2-Dec	97	96	95	95	95	95	94	94	93	92	92	91	90	91	90	92	92	93	94	94	93	92	92	91	93.0	97	
3-Dec	91	92	91	92	94	94	95	94	91	89	88	88	88	87	87	86	85	85	84	85	85	85	84	84	88.5	95	
4-Dec	83	83	83	82	82	81	79	79	79	80	80	81	83	84	85	85	85	85	85	85	86	86	86	86	83.1	86	
5-Dec	87	89	91	91	91	92	94	94	94	93	92	91	91	90	90	89	89	89	89	89	88	88	89	90	90.4	94	
6-Dec	91	91	91	92	92	92	93	93	93	94	94	93	90	85	86	88	89	91	92	92	93	93	93	92	91.3	94	
7-Dec	92	91	90	90	88	87	88	86	85	82	80	77	76	78	76	77	79	79	81	81	80	81	82	86	83.1	92	
8-Dec	89	88	88	87	87	86	86	88	90	85	76	76	76	70	72	78	80	78	76	76	77	77	77	78	80.9	90	
9-Dec	78	75	72	72	74	74	75	75	74	75	74	70	71	75	77	77	78	75	75	78	78	78	78	79	75.3	79	
10-Dec	82	84	87	89	89	90	89	88	87	93	98	99	99	98	96	94	94	93	94	94	94	94	95	96	92.3	99	
11-Dec	97	98	99	99	98	98	98	97	97	96	94	94	93	92	90	89	87	86	86	87	86	86	86	85	92.4	99	
12-Dec	86	88	88	88	89	88	86	87	85	82	82	82	76	74	76	82	85	87	91	94	93	94	90	90	85.9	94	
13-Dec	92	95	97	96	94	92	91	89	88	88	88	93	97	98	98	98	98	99	98	98	96	93	94	94	94.4	99	
14-Dec	93	94	94	94	95	96	97	97	96	95	95	95	94	93	93	93	93	92	92	92	93	93	94	94	94.2	97	
15-Dec	95	95	96	97	97	96	97	97	97	98	99	100	99	95	85	81	82	85	83	89	90	86	87	89	96	92.1	100
16-Dec	96	95	95	93	91	91	91	90	89	89	89	89	90	90	91	92	93	93	94	94	93	93	94	92	92.0	96	
17-Dec	81	78	78	79	81	91	96	96	96	97	97	96	97	97	97	97	95	90	90	89	92	91	91	92	90.9	97	
18-Dec	90	89	94	95	93	92	90	89	88	88	88	88	88	88	88	87	86	84	84	86	85	84	84	83	88.0	95	
19-Dec	83	83	83	82	82	82	81	81	81	80	79	79	79	80	80	80	80	81	81	81	82	81	81	81	81.0	83	
20-Dec	82	82	82	82	82	82	83	83	84	84	83	83	83	84	84	85	86	87	87	88	88	88	88	88	84.4	88	
21-Dec	88	88	88	88	89	88	87	87	87	88	88	88	88	89	90	90	91	91	91	91	91	90	89	89	89.0	91	
22-Dec	89	88	88	88	89	89	89	90	90	91	91	91	92	92	92	92	92	91	90	88	86	84	82	80	88.9	92	
23-Dec	79	78	75	75	75	75	74	73	74	73	75	79	78	79	78	78	77	78	79	79	80	80	81	80	77.2	81	
24-Dec	78	77	76	75	75	74	74	74	74	74	74	74	74	75	75	75	75	74	75	75	75	74	74	74	74.9	78	
25-Dec	74	73	73	72	72	71	71	71	71	71	71	71	72	72	72	72	71	72	72	72	72	72	72	72	71.8	74	
26-Dec	72	72	72	73	72	73	73	73	73	73	74	75	78	78	77	77	77	77	76	76	76	75	74	73	74.5	78	
27-Dec	73	73	74	74	75	76	76	76	76	76	77	77	78	78	77	76	76	76	75	75	75	75	74	74	75.5	78	
28-Dec	74	75	75	76	75	75	74	74	73	73	73	72	72	72	72	72	71	72	71	71	71	71	71	71	72.7	76	
29-Dec	71	70	70	70	70	70	70	69	69	70	70	71	72	73	74	74	73	73	74	74	75	75	75	75	71.9	75	
30-Dec	75	74	73	74	74	73	73	73	73	74	75	77	78	79	80	80	79	79	78	77	77	77	77	77	76.1	80	
31-Dec	77	77	77	77	77	78	78	78	78	78	78	78	79	79	80	80	80	78	79	78	77	77	76	76	78.0	80	
	84.7	84.6	84.7	84.7	84.8	84.9	85.0	84.7	84.4	84.2	83.8	83.9	83.8	83.5	83.4	84.0	84.2	83.8	84.1	84.3	84.0	84.0	84.0	84.4	Diurnal Average		
	97	98	99	99	98	98	98	97	98	99	100	99	99	98	98	98	98	98	98	98	96	94	95	96	Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Firebag - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Firebag - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	275	36.96	36.96
80 - 100	469	63.04	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Firebag - December 2017

Maximum Speed: 26 km/h on Dec 13 21:00	Maximum Daily Speed Average: 15.2 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 30 04:00	Minimum Daily Speed Average: 1.3 km/h on Dec 29	Hours of Data: 697
Maximum Diurnal Speed Average: 6.1 km/h at hour 13	Minimum Diurnal Speed Average: 4.4 km/h at hour 20	Hours of Missing Data: 47
Monthly Average Velocity: 5.1 km/h 259.7 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 10 Q <sub>3</sub> = 14 P <sub>90</sub> = 18 P <sub>99</sub> = 23	Percent Operational Time: 93.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SW17	SW17	SW19	WSW19	WSW19	SW18	SW20	SW20	SW18	SW18	SW21	SW20	SW16	SW13	SW10	S10	SSW14	SSW15	SSW14	SSW12	SSW10	SSW11	SW9	WSW8	SW14.9	SW21	
2-Dec	W10	W11	W9	NNW10	NW5	N5	N4	AF	WNW5	NNW3	SW3	WSW7	WSW11	WSW14	WSW11	SW9	SSW7	SSW9	SW8	SW9	SW9	WSW10	SW11	SW10	WSW7.0	WSW14	
3-Dec	SW9	SSW10	SSW11	SW9	SSW11	SSW11	SW9	W9	N14	N17	N16	N18	N16	N14	N10	N10	NNW9	NNW10	NNW7	NNW10	NNW11	N15	NNW17	N15	NNW7.0	N18	
4-Dec	N14	N12	N11	N10	N7	N3	SW3	W2	WSW3	SSW4	SSW6	SSW5	SSW5	SSW7	S8	SSE8	SSE11	SSE14	SSE17	SSE19	SSE21	SSE22	SSE23	SSE22	S5.5	SSE23	
5-Dec	S18	SSW18	SSW17	SW17	SW12	WSW9	NNW10	NNW13	NNW17	NNW19	NNW21	NNW20	NNW21	NNW16	N15	N12	N12	N9	NNE9	NNE9	N3	NNW4	W3	SSW3	NW6.2	NNW21	
6-Dec	SSW4	SW6	SSW9	SSW9	SSW10	SSW9	SW9	SSW11	SSW13	SSW13	SW15	SSW15	SSW17	SW16	SW18	SW17	SW13	WSW10	SW11	SW12	SW11	SW11	SW11	SW12	SW11.6	SW18	
7-Dec	SW12	SW12	WSW14	WSW14	WSW13	WSW13	WSW11	WSW14	WSW15	WSW14	WSW14	WSW14	WSW14	W14	NNW15	NNW15	NNW14	NNW14	NNW15	NNW13	NNW14	NNW11	NNW9	SW7	W12.0	WSW15	
8-Dec	SW7	S6	SSW8	SW10	SW4	SW5	SSW5	S4	S5	S6	S7	SSW11	S11	S11	SSW14	SSW18	SSW22	SSW22	SSW24	SW19	SW20	SW17	SW15	SW18	SSW11.6	SSW24	
9-Dec	SW19	WSW21	WSW20	W18	W16	W15	W14	W17	W18	W16	W13	W17	W16	WSW14	WSW12	WSW13	WSW14	W18	W18	W13	W12	W10	W9	SW9	W14.9	WSW21	
10-Dec	SW11	SW7	WSW9	WSW9	WSW8	SW10	SW8	SW10	SW15	SW14	WSW9	NNW9	NNW16	N22	N22	N22	NNW14	N15	N11	N6	NW3	S3	S5	SSW7	WNW5.0	N22	
11-Dec	SW8	WSW8	WSW10	WSW7	WSW7	WSW9	SW9	SW8	SW7	SW7	SW9	SW9	SW10	SSW12	SSW12	SSW15	SSW14	SSW18	SSW17	SSW16	SSW19	SW20	SW22	SW19	SW11.9	SW22	
12-Dec	SW19	SW15	WSW17	WSW19	WSW18	WSW14	WSW13	WSW14	WSW13	WSW15	W13	W10	WNW9	NW10	NNW16	NNW16	NNW17	NNW13	NNW10	NW11	NW12	WNW11	WNW13	WNW7	W10.7	WSW19	
13-Dec	WSW6	SW7	SW7	SW9	SW10	SW12	SW16	SW18	WSW16	NNW13	NNW13	NNW19	NNW16	NNW17	NNW16	NNW9	NW8	NW10	NNW13	NNW17	N26	N23	NNW15	NNW18	NW9.0	N26	
14-Dec	NNW13	N8	NW5	NNW3	SW3	SW7	SSW10	S12	S12	SSW11	SSE9	S13	S16	S16	SSE16	SSE16	SSE13	SSE14	S16	S15	S11	SSE9	SSE11	SE10	S8.3	S16	
15-Dec	SSE11	SSE13	S16	S17	S15	S13	S13	SSW14	SW13	WSW13	W17	W18	W17	WNW16	NNW17	NNW12	W14	WSW16	WSW15	WSW13	W17	W16	NNW13	WNW9	WSW10.4	W18	
16-Dec	NNW18	N17	N18	NNW20	N19	N15	NNW12	NNW13	N14	N12	N8	ESE1	SW7	SSW7	S7	SSW9	SW10	SW9	SW8	SSW9	S11	S15	SSW15	SSW18	NW3.6	NNW20	
17-Dec	SSW23	S24	SSW24	SSW26	SSW21	SW22	SW20	SW17	WSW20	W19	W19	W19	W24	W23	W22	W17	WNW16	WNW18	NW16	NW13	WNW9	W12	W11	W11	WSW14.7	SSW26	
18-Dec	W13	W16	NW13	N15	N15	N14	N17	N18	N13	NNW11	NNW12	NW14	NNW19	NNW19	NW15	NW14	NW16	NW18	NNW20	N23	N23	N22	NNW21	NNW15	NNW15.2	N23	
19-Dec	NNW16	NNW17	NNW17	N16	N14	N15	N10	N9	NNW6	NNW5	NW2	WNW4	WSW5	SW7	SW7	SSW7	SSW9	SW12	SW11	SW10	SW11	SW8	WSW7	SW6	WNW4.3	NNW17	
20-Dec	SSW6	SSW5	SW5	SSW4	SSW5	SW6	SSW6	SW7	SW9	SW8	SW8	SW9	SSW9	SSW9	SSW10	SSW10	SSW10	SSW11	SSW11	SSW11	SSW10	SW9	SSW9	SSW8	SSW8.0	SSW11	
21-Dec	SW7	WSW7	WNW4	NNW4	N7	N8	N10	N10	N10	N10	N9	NNW7	NW5	WNW5	WNW7	NW8	NW7	NW8	NNW8	NNW10	NNW11	N10	NNW10	NNW7	NNW6.8	NNW11	
22-Dec	NNW5	N4	N2	W3	W3	W6	W6	W6	W7	W9	W8	WNW8	WNW8	WNW8	NW9	NW9	NNW7	NNW10	N10	NNE10	N10	N10	N7	N5	NW5.4	N10	
23-Dec	NNE3	NE3	NNE2	NNE2	AF	NNE2	AF	AF	N1	N3	N3	N2	NW2	WNW2	NW3	WNW2	NW2	W2	WSW3	WSW3	W2	WNW3	NNW8	N10	NNW2.2	N10	
24-Dec	N10	N9	N10	N7	N7	N7	NNW7	NNW7	NNW7	NNW7	NNW6	NNW7	NNW7	NNW6	NNW5	NW4	WNW4	WNW3	WNW4	NNW3	NNW4	N5	NNW4	N5	NNW5.7	N10	
25-Dec	N5	N5	N5	N6	N6	N6	N6	N4	N5	N5	N4	NNW4	NW4	W4	W3	WSW2	WSW2	WSW3	SW4	SW3	SW3	SW3	SW4	SW3	NW2.3	N6	
26-Dec	SW3	SW2	SW2	SW3	SW2	SW3	SW2	SW2	AF	SSW1	SW1	SW2	AF	AF	AF	AF	SW2	SW3	SW2	SW2	SSW2	AF	AF	AF	----	SW3	
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	S1	SSW2	SW2	SW2	SW2	SW3	SSW3	SW2	SSW2	SSW1	SSW2	AF	AF	----	SW3	
28-Dec	AF	AF	AF	AF	NNW1	NNW1	N1	N2	N2	N2	N2	N2	NNW2	NNW2	NNW2	NNW1	N1	N2	NNW1	N2	N2	N2	N2	N2	N1.5	NNW2	
29-Dec	N2	NNW2	NNW2	N1	N1	N1	AF	AF	WSW1	WSW1	WSW2	WSW2	WSW2	WSW2	SW2	SW2	SW2	SW2	SW2	SW2	SW3	SW2	SW2	SW2	AF	WSW1.3	SW3
30-Dec	SW1	SW1	SSW1	SSW1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	SW1	AF	SSW1	AF	SSW2	SSW2	SSW2	----	SSW2
31-Dec	SSW2	SSW2	SSW2	SSW3	SSW3	SSW3	SW3	SW3	SSW4	SSW4	SSW5	SSW5	SSW5	SSW5	SSW5	SSW6	SSW7	S7	S8	SSW9	SSW9	SSW9	SSW11	SSW12	SSW5.4	SSW12	

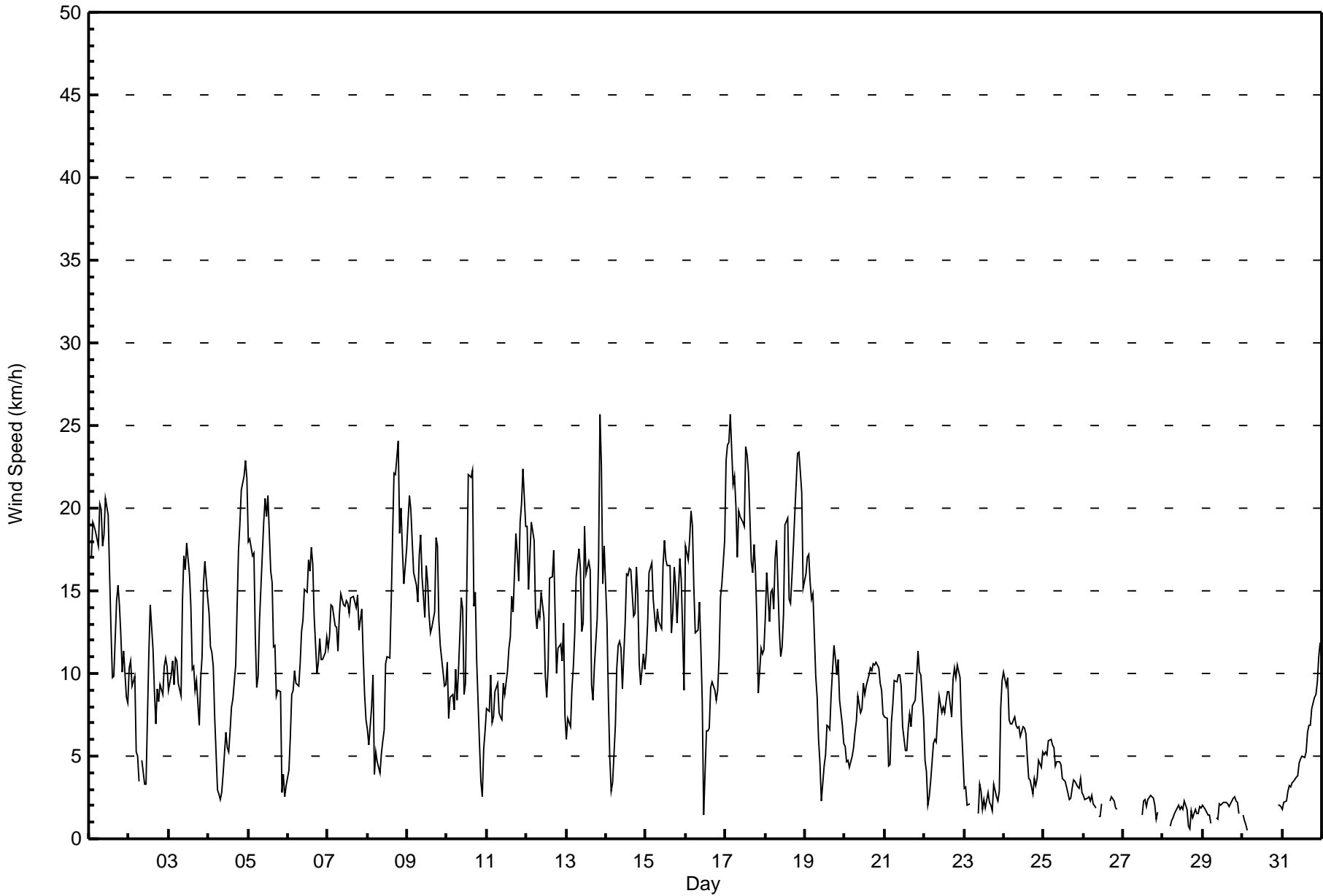
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SSW23	S24	SSW24	SSW26	SSW21	SW22	SW20	SW20	WSW20	W19	SW21	SW20	W24	W23	W22	N22	SSW22	SSW22	SSW24	N23	N26	N23	SSE23	SSE22	Diurnal Maximum

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**  
**Firebag - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Firebag - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	189	27.12	27.12
6 - 11	243	34.86	61.98
12 - 19	224	32.14	94.12
20 - 28	41	5.88	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 697

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Firebag - December 2017**

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	35	6	1	0	0	1	0	0	5	36	44	13	8	11	10	19	189
6 - 11	35	3	0	0	0	0	1	6	12	44	56	22	15	14	10	25	243
12 - 19	28	0	0	0	0	0	0	8	13	25	35	30	29	16	11	29	224
20 - 28	7	0	0	0	0	0	0	4	1	7	9	3	3	0	0	7	41
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
<b>Totals</b>	105	9	1	0	0	1	1	18	31	112	144	68	55	41	31	80	697

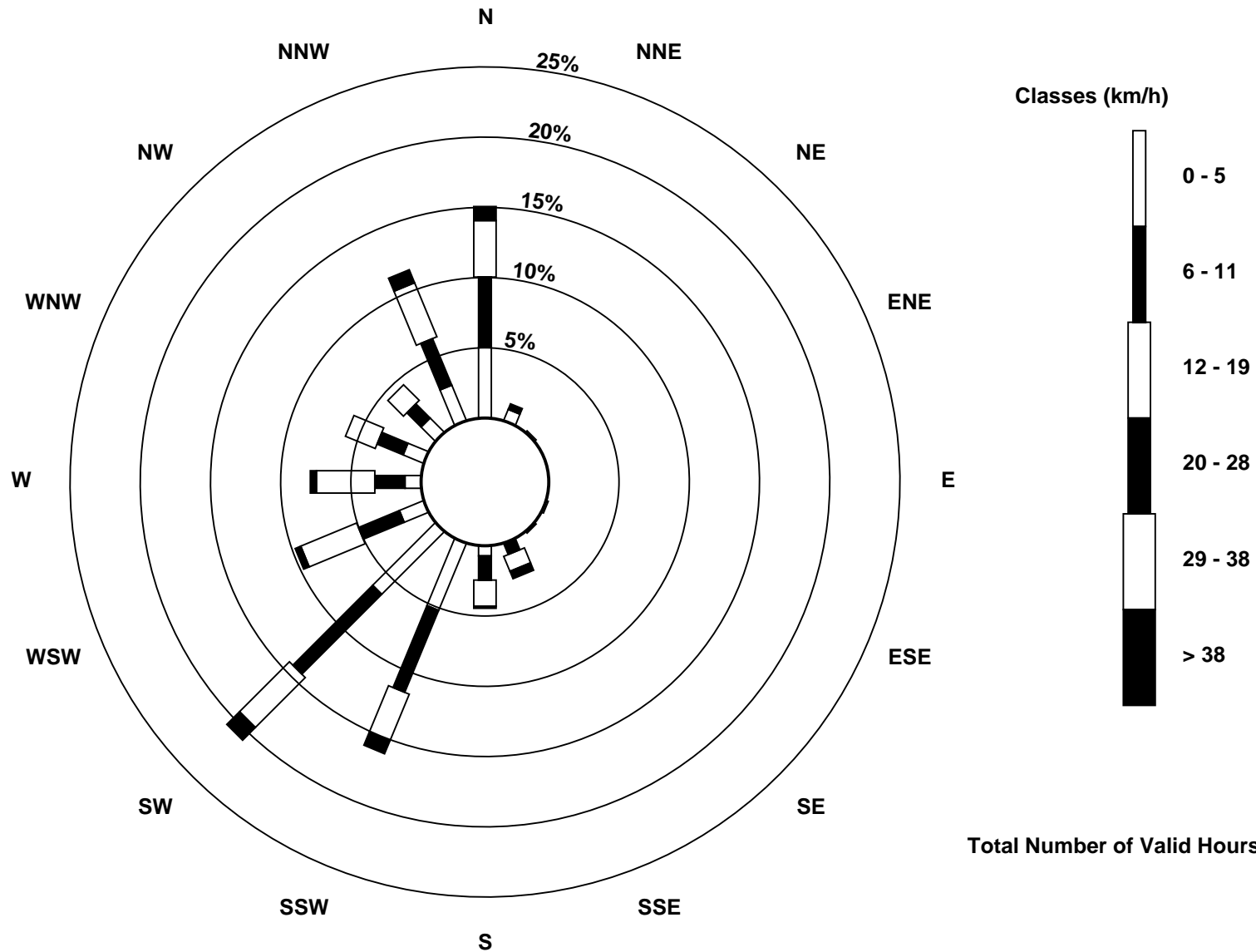
Total Number of Valid Hours: 697

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Firebag (AMS 19)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Firebag - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Dec 13 21:00	Hours in Service: 744 Hours of Data: 697 Hours of Missing Data: 47 Hours of Calibration: 0 Percent Operational Time: 93.7
Minimum Value: 0 km/h on Dec 23 17:00	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 4	

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

Diurnal Maximum

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Firebag - December 2017**

Direction of Maximum Speed: 351 deg on Dec 13 21:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 336.4 deg on Dec 18	Hours of Data: 697
Direction of Minimum Speed: 211 deg on Dec 30 04:00	Hours of Missing Data: 47
Direction of Minimum Daily Speed Average: 1.3 deg on Dec 29	Percent Operational Time: 93.7
Monthly Average Direction: 272.1 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	226	228	229	238	243	231	226	223	224	221	224	227	226	230	222	178	194	208	206	199	206	210	223	238	221.8
2-Dec	259	272	275	293	309	354	11	AF	282	329	233	248	241	243	248	224	207	212	226	221	236	237	233	229	248.6
3-Dec	223	213	212	215	208	207	220	276	354	357	0	355	354	355	350	353	345	344	334	330	342	349	347	349	330.5
4-Dec	351	357	352	353	356	3	234	261	250	201	212	200	205	192	185	166	161	162	163	158	164	163	163	168	170.5
5-Dec	177	193	210	226	232	256	291	327	339	344	335	343	347	348	360	0	1	8	15	27	355	301	281	210	321.4
6-Dec	203	222	210	212	209	210	215	211	209	211	218	212	206	222	227	228	232	240	226	234	224	224	221	223	219.4
7-Dec	219	231	238	240	245	251	243	242	240	244	247	248	252	265	282	290	288	289	287	285	287	296	291	224	259.9
8-Dec	223	191	211	226	228	223	197	182	183	176	190	204	185	178	203	195	198	203	213	218	226	221	225	232	208.2
9-Dec	234	249	257	261	268	271	269	267	268	265	259	261	260	246	253	254	255	269	267	259	272	268	261	236	259.7
10-Dec	234	233	241	242	237	221	219	223	216	226	252	319	345	351	354	355	345	359	1	1	316	177	184	200	295.9
11-Dec	222	242	244	237	254	246	230	229	234	230	229	221	215	213	202	205	204	204	211	206	213	216	222	223	219.5
12-Dec	228	231	241	243	241	246	250	239	247	256	260	276	294	318	333	337	340	338	295	309	318	284	292	283	275.2
13-Dec	250	229	224	230	217	215	216	225	250	284	320	346	337	338	338	341	305	309	301	318	351	352	346	341	306.4
14-Dec	341	356	321	348	236	216	208	191	191	201	160	185	187	184	165	167	151	148	170	171	173	148	154	145	176.1
15-Dec	152	164	174	185	179	189	181	204	226	247	259	267	278	288	296	285	259	249	248	257	265	281	295	287	242.4
16-Dec	346	360	356	346	350	350	329	338	353	360	3	111	217	212	172	197	220	228	225	202	179	189	198	199	305.0
17-Dec	192	189	193	200	206	225	228	228	258	266	265	263	267	268	277	281	293	303	311	306	283	275	269	269	249.9
18-Dec	278	278	310	358	2	1	2	0	353	342	336	321	333	335	313	313	323	318	330	351	349	349	346	345	336.4
19-Dec	345	342	347	351	350	354	359	357	341	345	305	292	250	226	227	195	198	215	216	217	220	226	241	225	299.2
20-Dec	207	206	214	212	209	214	213	217	223	220	214	218	211	205	200	207	209	212	210	212	211	214	212	211	211.6
21-Dec	225	250	291	336	357	357	350	350	355	360	353	342	310	289	289	317	306	318	333	340	341	349	348	338	332.3
22-Dec	339	1	1	265	261	265	267	268	263	266	280	294	301	301	304	309	327	331	4	12	8	4	3	11	318.4
23-Dec	23	34	22	21	AF	24	AF	AF	352	353	360	358	323	301	318	295	317	270	255	246	259	282	348	5	339.0
24-Dec	5	5	2	358	358	355	347	347	337	344	339	345	347	343	327	313	296	294	299	332	329	355	347	357	345.8
25-Dec	3	9	8	1	358	2	3	359	355	351	351	335	306	280	267	254	237	237	228	222	222	219	222	223	325.1
26-Dec	220	221	214	222	221	218	217	221	AF	209	220	218	AF	AF	AF	AF	217	222	217	218	213	AF	AF	AF	--
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	191	199	217	230	225	214	208	214	213	208	212	AF	AF	--
28-Dec	AF	AF	AF	AF	338	344	358	11	1	353	350	353	340	331	338	335	352	351	348	353	353	353	351	349	349.4
29-Dec	352	347	347	350	1	355	AF	AF	243	249	244	246	246	240	229	225	219	226	228	229	225	227	225	AF	250.2
30-Dec	215	214	213	211	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	216	AF	210	AF	211	213	202	--
31-Dec	196	195	197	208	210	209	216	218	210	208	209	213	209	204	205	200	195	176	190	195	204	210	211	209	203.5

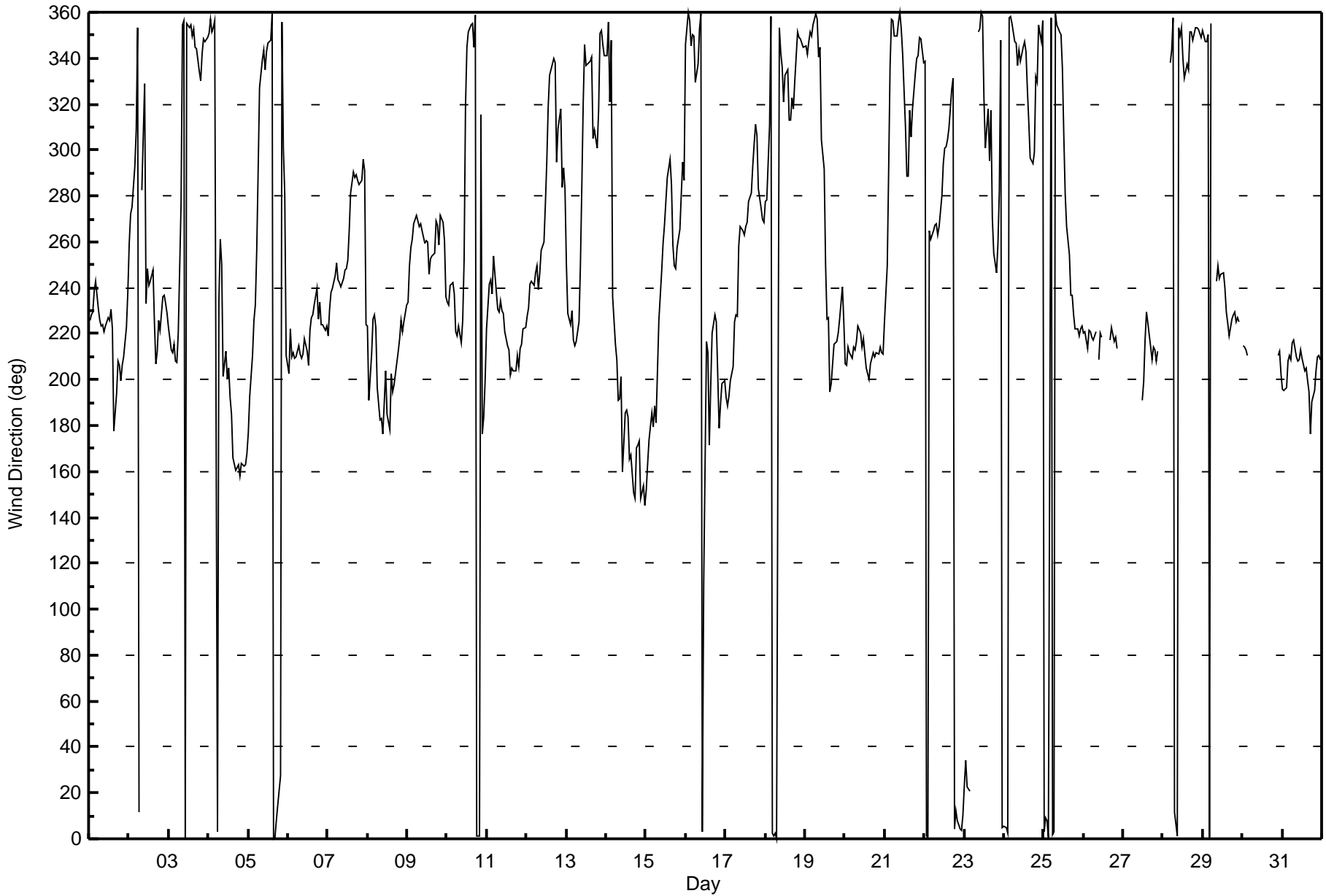
246.0 247.2 250.4 255.7 257.2 255.9 251.0 254.4 265.3 272.1 271.7 272.7 272.0 273.4 273.8 263.1 255.7 256.2 252.0 254.7 261.0 257.8 256.4 244.3  
 Diurnal Average

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**  
**Firebag - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Firebag - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 71 deg on Dec 16 12:00	Hours in Service: 744 Hours of Data: 697 Hours of Missing Data: 47 Hours of Calibration: 0 Percent Operational Time: 93.7
Minimum Value: 4 deg on Dec 1 20:00	
Percentiles: P <sub>1</sub> = 5 P <sub>10</sub> = 7 Q <sub>1</sub> = 8 Median = 10 Q <sub>3</sub> = 12 P <sub>90</sub> = 15 P <sub>99</sub> = 43	

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	7	8	8	11	8	7	9	7	7	8	8	8	7	14	10	8	7	5	4	7	5	12	9	14	
2-Dec	12	11	16	11	21	29	11	AF	9	35	60	11	8	7	10	10	10	7	7	6	7	6	7	9	60
3-Dec	13	8	6	6	7	8	14	30	17	13	12	13	12	11	11	10	9	8	8	10	10	9	10	10	30
4-Dec	11	10	10	12	12	22	31	10	25	10	7	12	16	7	12	8	8	8	8	9	8	8	8	9	31
5-Dec	9	10	10	8	8	16	11	13	13	12	11	13	12	11	12	14	14	12	12	12	57	15	33	17	57
6-Dec	11	10	7	7	6	7	10	9	7	8	8	8	7	12	7	7	8	11	8	8	8	8	7	8	12
7-Dec	8	8	6	7	10	8	8	8	7	7	7	7	8	11	11	9	9	9	9	9	9	9	16	27	27
8-Dec	8	25	21	8	14	11	22	16	13	15	18	9	8	8	11	7	6	8	8	9	8	10	11	9	25
9-Dec	9	9	10	9	10	10	10	9	10	11	10	9	10	9	10	10	9	10	9	9	12	9	8	11	12
10-Dec	8	8	12	7	18	8	10	9	8	9	27	13	13	11	12	14	14	12	11	15	25	33	11	9	33
11-Dec	10	12	9	11	12	9	6	6	6	6	7	8	9	8	7	9	8	7	8	8	8	9	8	9	12
12-Dec	8	11	7	7	10	7	8	9	12	11	12	10	19	13	10	14	10	12	13	11	15	9	11	14	19
13-Dec	14	11	8	10	15	10	8	12	12	11	16	11	12	12	11	16	13	12	10	12	14	12	12	11	16
14-Dec	12	12	22	30	66	14	9	7	10	10	16	10	8	8	11	9	15	13	8	10	13	17	16	17	66
15-Dec	9	8	10	7	10	8	13	9	12	9	10	9	11	10	11	9	9	7	8	10	10	12	12	15	15
16-Dec	20	12	11	11	10	10	11	11	11	12	12	71	15	14	10	11	18	9	12	13	10	11	7	9	71
17-Dec	8	10	7	7	8	11	9	10	14	10	10	10	10	10	11	11	11	15	11	12	12	11	12	10	15
18-Dec	9	10	26	14	14	13	14	16	12	10	11	14	12	13	12	11	11	12	18	12	11	11	10	10	26
19-Dec	10	11	12	12	12	12	12	10	10	18	29	13	19	9	9	10	7	7	7	7	8	8	10	12	29
20-Dec	8	8	8	17	8	7	7	8	7	7	8	8	10	7	6	8	8	8	7	8	8	8	7	8	17
21-Dec	12	10	20	12	12	12	11	11	13	14	11	11	17	13	12	12	12	16	11	12	12	11	10	10	20
22-Dec	12	10	47	24	6	9	10	9	9	9	11	13	11	12	11	12	14	10	18	13	12	13	11	13	47
23-Dec	13	7	15	15	AF	6	AF	AF	11	9	8	9	25	21	17	11	7	32	9	11	15	23	13	13	32
24-Dec	15	13	15	12	12	11	10	12	11	10	10	12	12	10	12	11	17	8	19	8	7	11	6	9	19
25-Dec	11	9	11	12	11	12	12	11	10	10	10	10	15	12	10	10	9	6	10	7	8	6	6	10	15
26-Dec	8	8	5	6	6	7	8	7	AF	42	40	11	AF	AF	AF	AF	7	8	7	6	7	AF	AF	AF	42
27-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	6	6	10	9	6	9	10	9	8	8	6	AF	AF	10
28-Dec	AF	AF	AF	AF	5	7	10	8	12	10	10	12	11	10	10	12	11	9	10	10	9	10	11	9	12
29-Dec	9	10	9	9	12	9	AF	AF	16	6	8	8	9	9	10	7	9	10	8	8	10	9	10	AF	16
30-Dec	6	55	41	58	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	7	AF	6	AF	7	8	6	58
31-Dec	5	5	5	8	7	8	9	9	8	8	8	9	9	10	10	8	10	8	9	7	9	9	9	8	10
	20	55	47	58	66	29	31	30	25	42	60	71	25	21	17	16	18	32	19	15	57	33	33	27	
	Diurnal Maximum																								

AF - Analyzer Failure



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-11-2017

### Station Information

Station Name:	Firebag	Station number:	AMS 19
Calibration Date:	December 18, 2017	Last Cal Date:	November 15, 2017
Start time (MST):	11:28	End time (MST):	14:36
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.30</u>	ppm	Cal Gas Exp Date	February 13, 2017
Cal Gas Cylinder #	<u>LL77486</u>			
Calibrator Make/Model	API T700		Serial Number	996
ZAG Make/Model	API 701		Serial Number	201

### Analyzer Information

Analyzer make:	Thermo 450i	Analyzer serial #:	815129098	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb	PMT voltage	-574	-574
Calculated slope	1.000825	Lamp voltage	936	934
Calculated intercept	-0.273100	Pressure	549.1	550.6
Analyzer Background	14.4	Flow	0.945	0.961
Analyzer Coefficient	1.155	Intensity	85	85
		Converter temp	337	336.2

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	-0.3	----
as found span	4936	75.6	80.0	79.3	1.008
calibrator zero	5000	0.0	0.0	0.2	----
high point	4936	75.6	80.0	80.0	0.999
second point	4973	37.8	40.0	40.8	0.980
third point	4993	19.0	20.1	20.7	0.971
as left zero	5000	0.0	0.0	0.4	----
as left span	4936	75.6	80.0	79.9	1.001
SO2 Scrubber Check	4932	79.8	796.1	0.1	----
Date of last scrubber change:		14-Nov-17	Average Correction Factor		0.983
Corrected As found	79.60	Previous response	80.16	*% change	0.7%

\* = > +/-5% change initiates investigation

#### Notes:

Inlet filter changed out. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

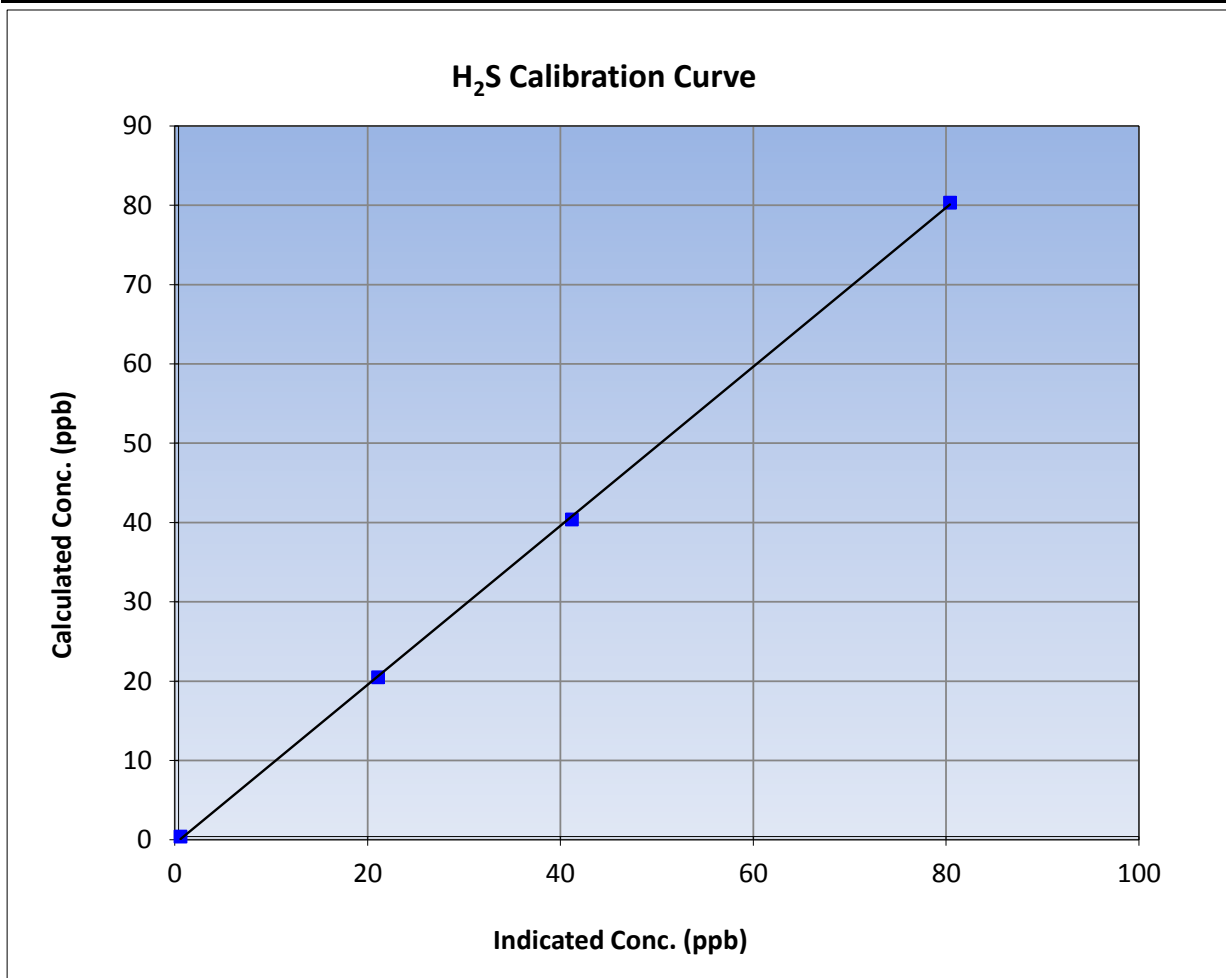
Version-03-2017

### Station Information

Calibration Date	December 18, 2017	Previous Calibration	November 15, 2017
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	11:28	End Time (MST)	14:36
Analyzer make	Thermo 450i	Analyzer serial #	815129098

### Calibration Data

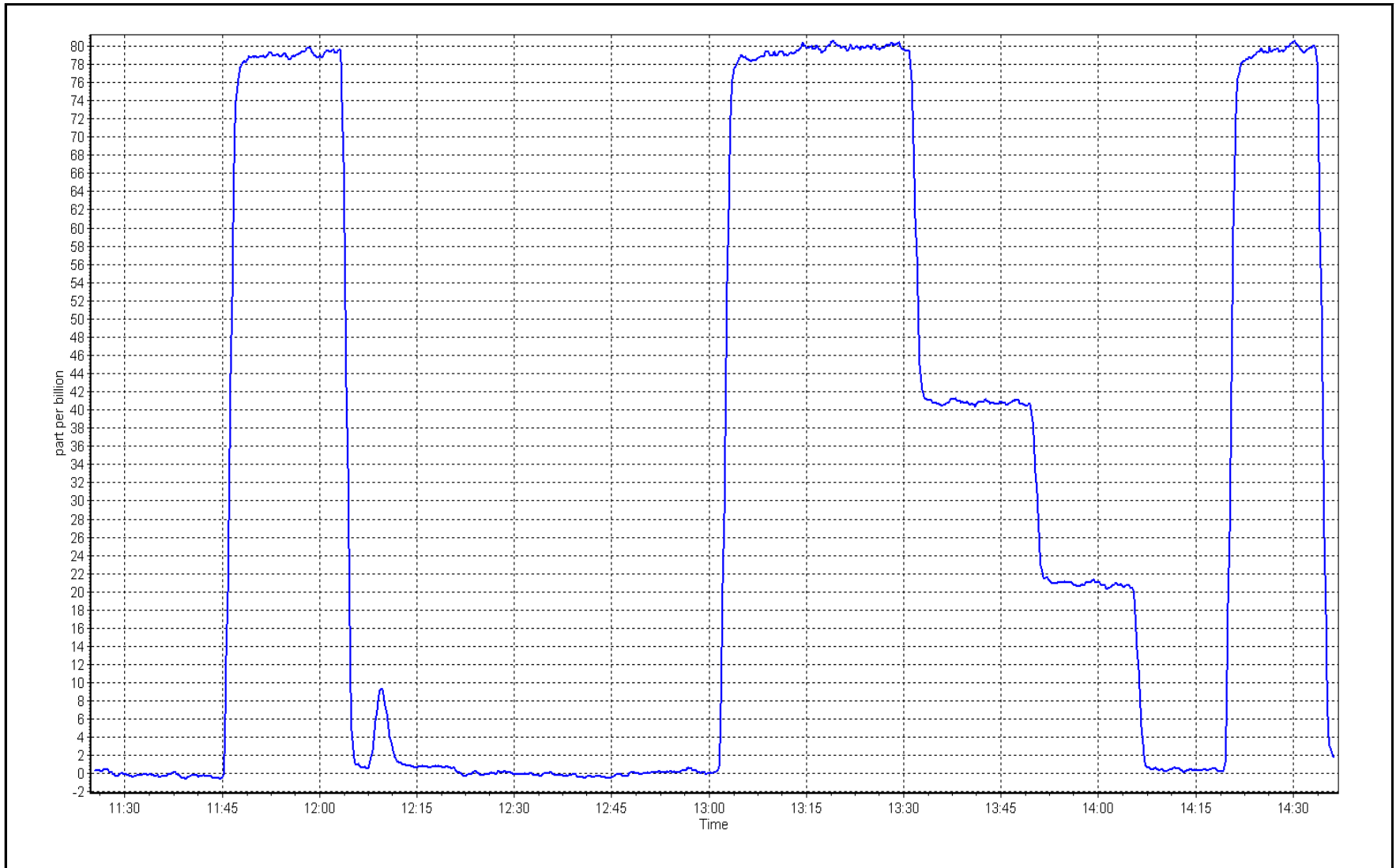
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.2	----	Correlation Coefficient	0.999899	≥0.995
80.0	80.0	0.9994			
40.0	40.8	0.9799	Slope	1.002705	0.90 - 1.10
20.1	20.7	0.9706			
			Intercept	-0.514850	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 18, 2017

Location: Firebag







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

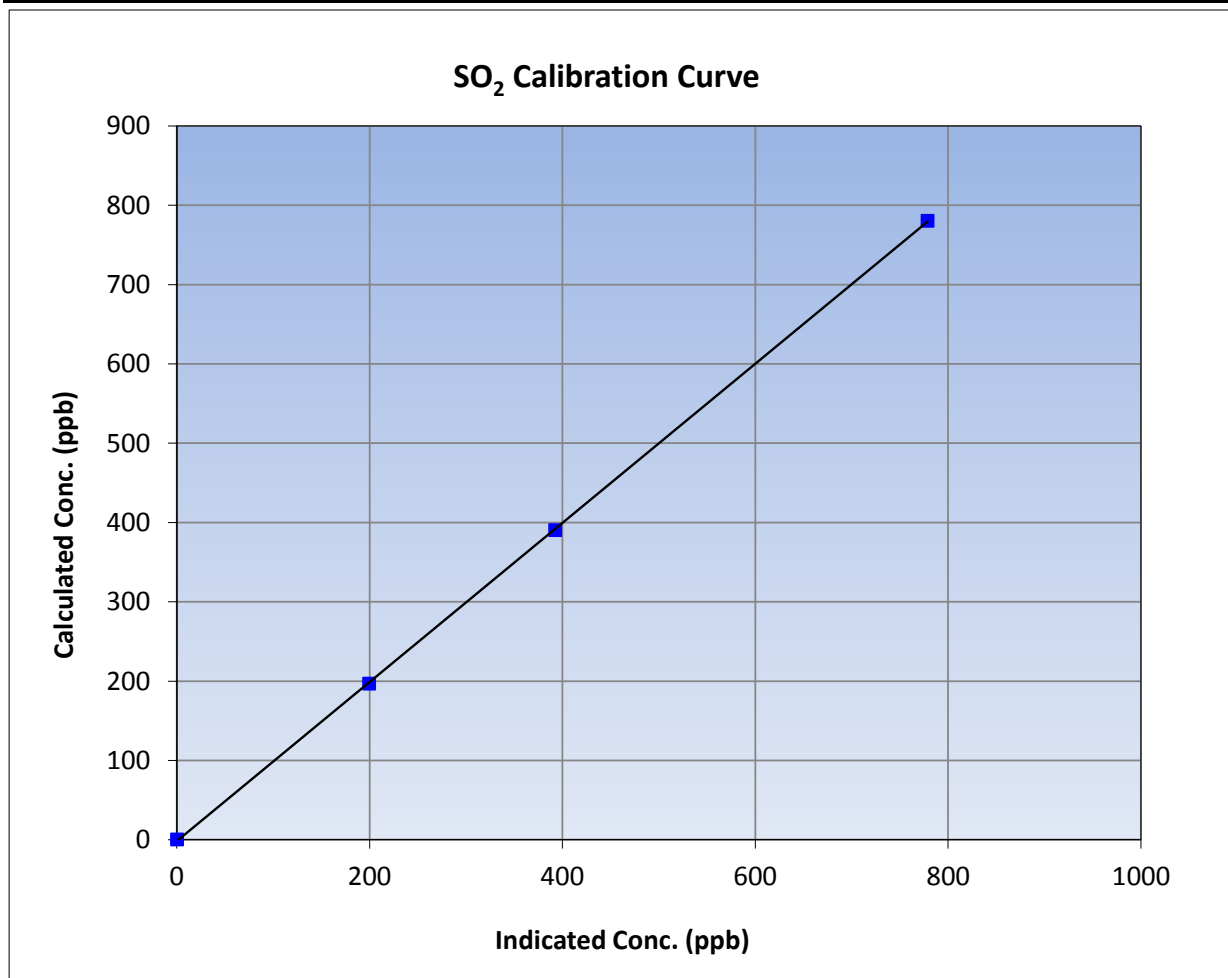
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 3, 2017
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:07	End Time (MST)	14:25
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

### Calibration Data

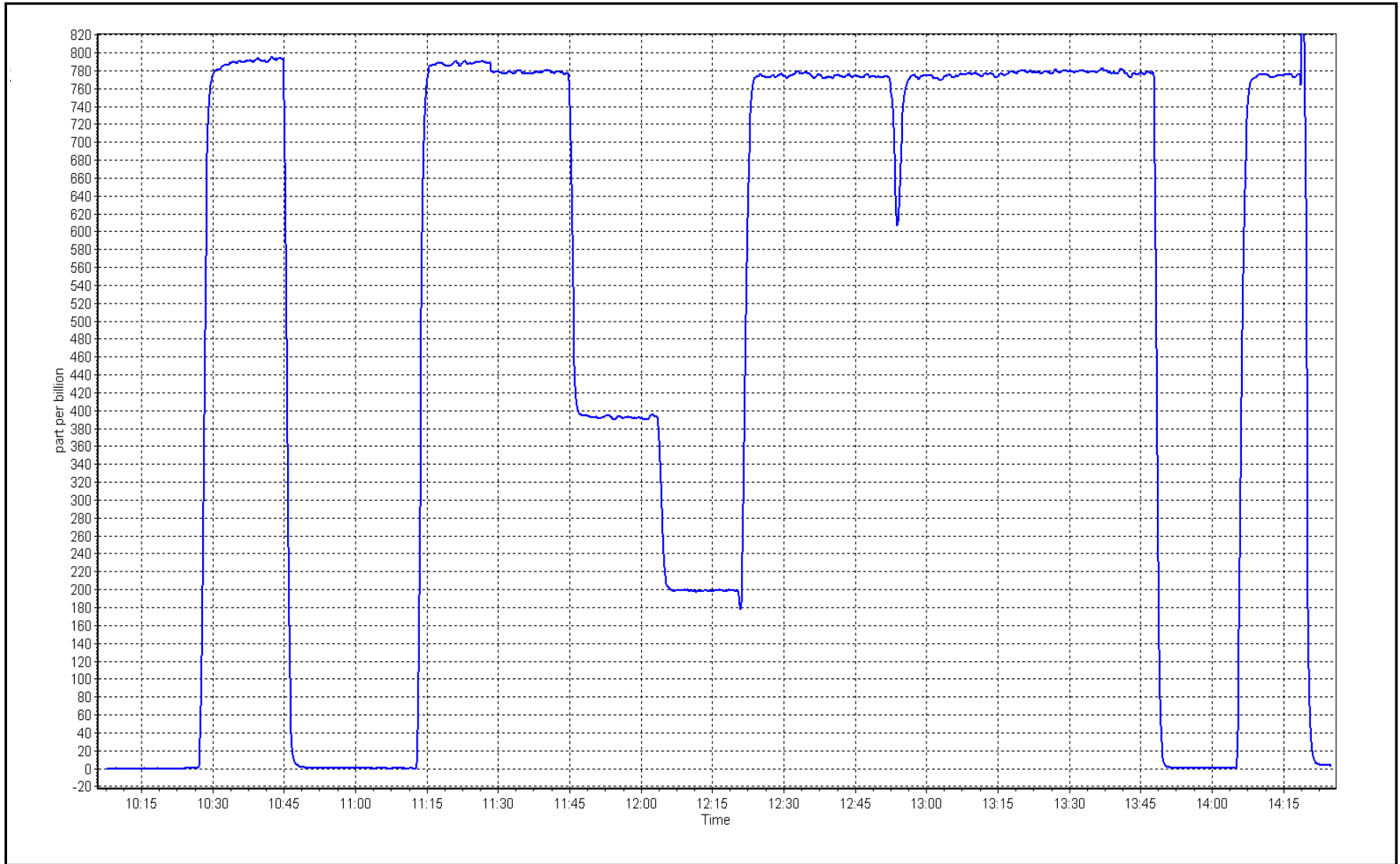
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999975	≥0.995
780.2	778.4	1.0023			
390.1	392.0	0.9951	Slope	1.003213	0.90 - 1.10
196.5	199.1	0.9870			
			Intercept	-1.776478	+/-30



SO2 Calibration Plot

Date: December 19, 2017

Location: Firebag





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Firebag	Station number:	AMS 19
Calibration Date:	December 19, 2017	Last Cal Date:	November 3, 2017
Start time (MST):	10:07	End time (MST):	14:21
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000652	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>513.0</u> ppm	CH4 Equiv Conc.	1057.5 ppm
C3H8 Cal Gas Conc.	<u>198.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	996
ZAG Make/Model	API 701	Serial Number	201

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1336160089
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-304
Calculated slope	1.003970	Sample pressure	8.5
Calculated intercept	-0.089380	Fuel pressure	23.0
Analyzer Background	1.58	Air pressure	34.9
Analyzer Coefficient	3.581	Flame temperature	156.0
			<u>Finish</u>

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4999	0.0	0.00	-0.13	----
as found span	4930	79.8	16.84	16.45	1.024
calibrator zero	4999	0.0	0.00	-0.01	----
high point	4929	79.8	16.85	16.89	0.998
second point	4972	39.9	8.42	8.51	0.990
third point	4991	20.1	4.24	4.35	0.976
as left zero	4999	0.0	0.00	0.06	----
as left span	4930	79.8	16.84	16.79	1.003
Average Correction Factor					0.988
Corrected As found	16.58	Previous response	16.87	*% change	1.7%

\* = > +/-5% change initiates investigation

Notes:

Changed inlet filter. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## THC Calibration Summary

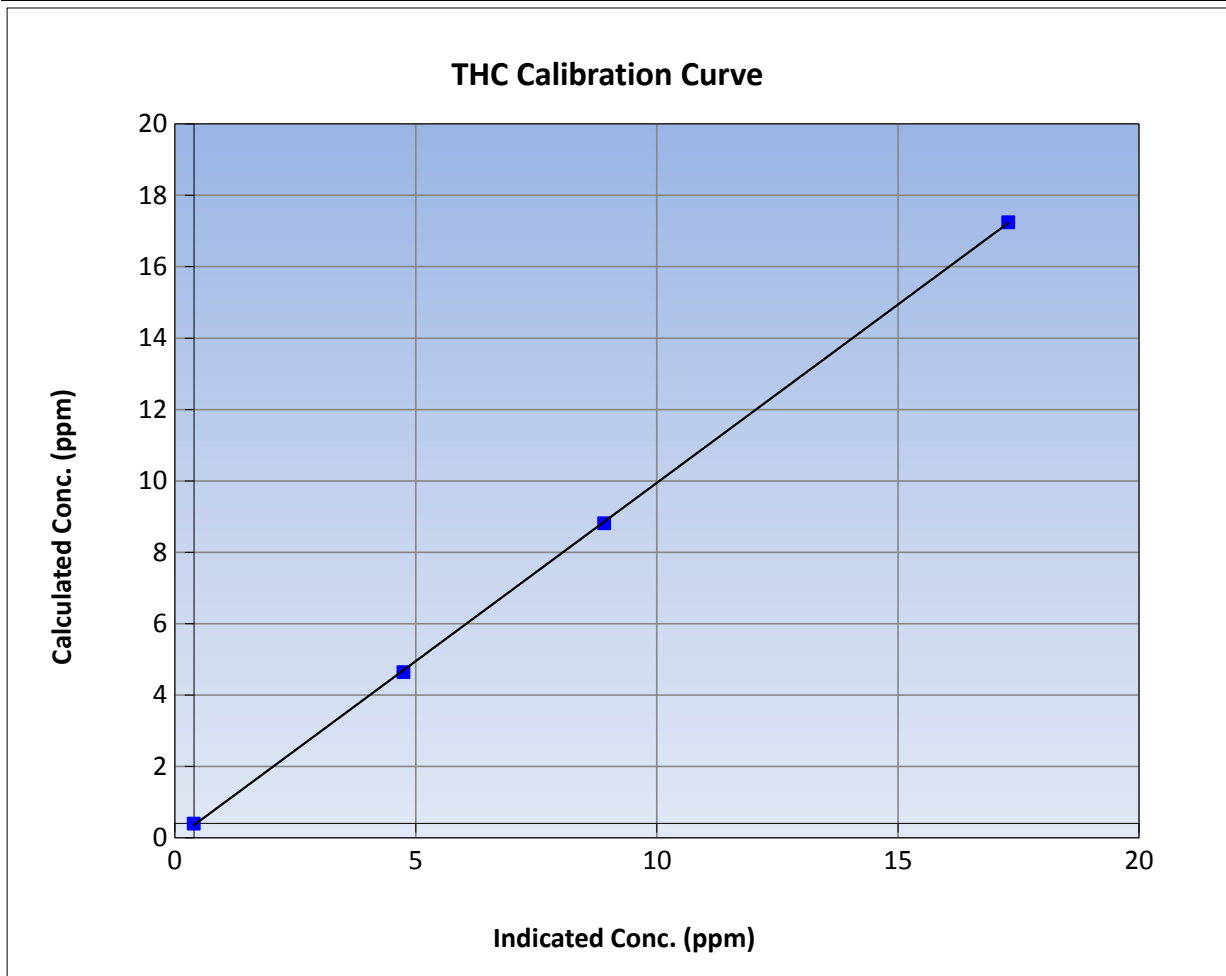
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 3, 2017
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:47	End Time (MST)	14:21
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

### Calibration Data

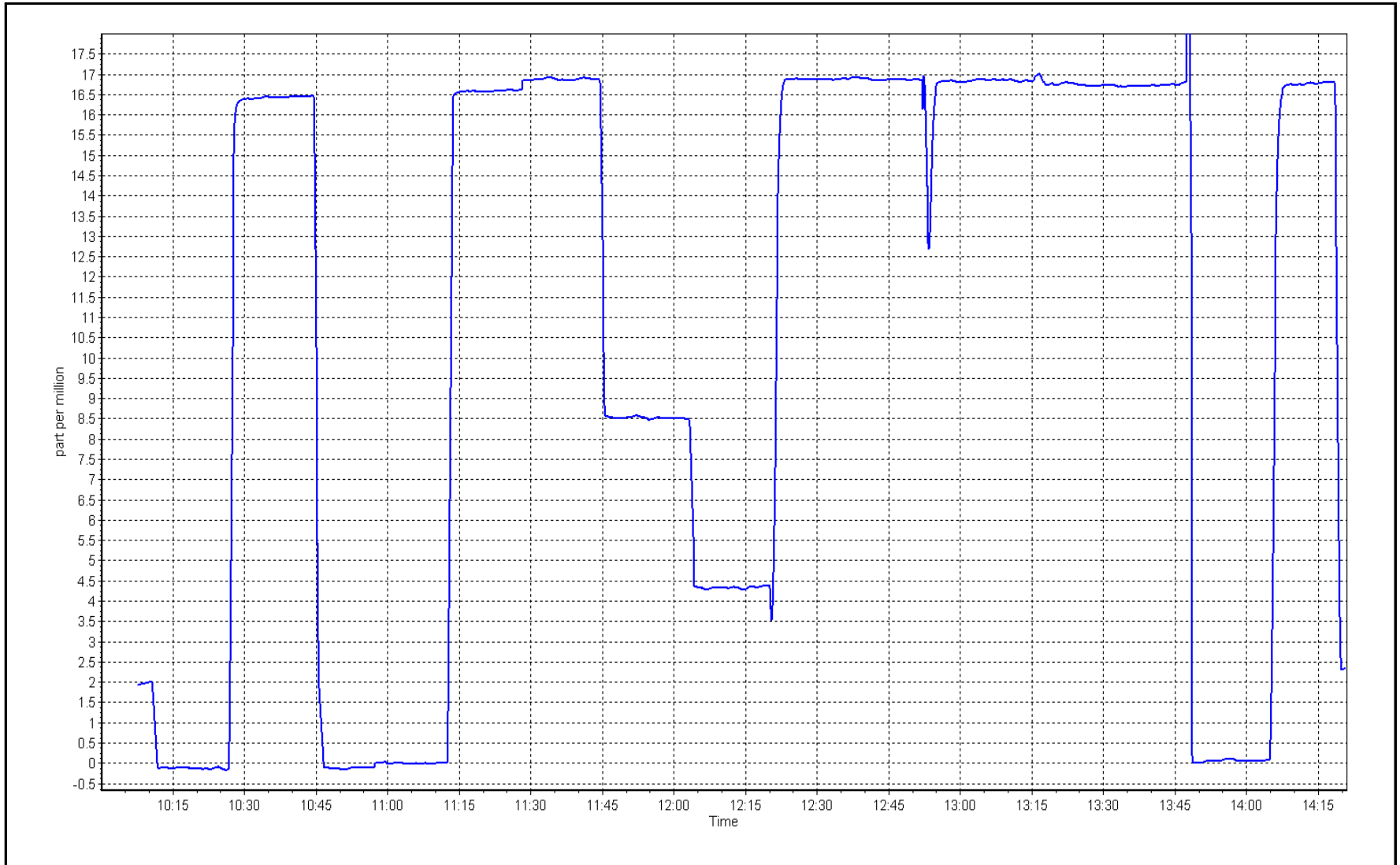
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999955	
16.8	16.9	0.9976			≥0.995
8.4	8.5	0.9897	Slope	0.998738	
4.2	4.3	0.9762			0.90 - 1.10
			Intercept	-0.047147	+/-1.5



THC Calibration Plot

Date: December 19, 2017

Location: Firebag







# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Firebag	Station number:	AMS 19
Calibration Date:	December 19, 2017	Last Cal Date:	November 3, 2017
Start time (MST):	10:07	End time (MST):	14:23
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000652	Cal Gas Expiry Date	November 4, 2019
NOX Cal Gas Conc.	<u>50.2</u> ppb	NO Cal Gas Conc.	<u>50.2</u> ppb
Calibrator Model	API T700	Serial Number	996
ZAG make/model	API T701H	Serial Number	201

### Analyzer Information

Analyzer make:	Thermo 42i	Analyzer serial #:	1410661309		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
NO coefficient	0.924	0.924	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	1.000	1.000	PMT Temperature	-2.8	-3.0
NO2 coefficient	1.000	1.000	Reaction cell Press	162.7	161.4
NO bkgrnd	3.9	3.9	Sample Flow	0.638	0.626
NOX bkgrnd	3.9	3.9	PMT Voltage	-780.7	-780.3

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	1.000803	1.001750
NO <sub>x</sub> Cal Offset	-2.016097	-1.147383
NO Cal Slope	0.999650	1.002145
NO Cal Offset	-1.835260	-1.385906
NO <sub>2</sub> Cal Slope	1.001244	1.000846
NO <sub>2</sub> Cal Offset	0.115049	-0.457906



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4999	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
as found span	4930	79.8	799.6	799.6	0.0	798.9	798.6	0.3	1.0009	1.0013
calibrator zero	4999	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
high point	4929	79.8	799.8	799.8	0.0	798.9	798.6	0.3	1.0011	1.0015
second point	4971	39.9	399.7	399.7	0.0	400.9	401.3	-0.4	0.9971	0.9961
third point	4991	20.1	201.4	201.4	0.0	203.2	203.6	-0.3	0.9909	0.9890
as left zero	4999	0.0	0.0	0.0	0.0	0.2	0.1	0.1	----	----
as left span	4929	79.8	799.8	367.2	432.6	782.4	360.3	422.1	1.0222	1.0192
<b>Average Correction Factor</b>									<b>0.9964</b>	<b>0.9955</b>

Corrected As found	NO <sub>x</sub> = 798.9 ppb	NO = 798.7 ppb		*Percent Change	NO <sub>x</sub> = 0.3%
Previous Response	NO <sub>x</sub> = 801.0 ppb	NO = 801.7 ppb		*Percent Change	NO = 0.4%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	791.1	790.1	1.0	1.0110	1.0123	----	----
1st NO2 (400 ppb O3)	367.2	422.9	790.2	367.2	423.0	1.0121	----	0.9998	100.0%
2nd NO2 (200 ppb O3)	576.3	213.8	789.9	576.3	213.7	1.0125	----	1.0005	100.0%
3rd NO2 (100 ppb O3)	681.5	108.6	791.2	681.5	109.7	1.0108	----	0.9900	101.0%
2nd NO ref point	----	0.0	790.6	789.7	0.9	1.0116	1.0128	----	----
<b>Average Correction Factor</b>						<b>1.0118</b>	<b>1.0125</b>	<b>0.9967</b>	<b>100.3%</b>

Notes: Changed inlet filter after asfound. No adjustments made.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

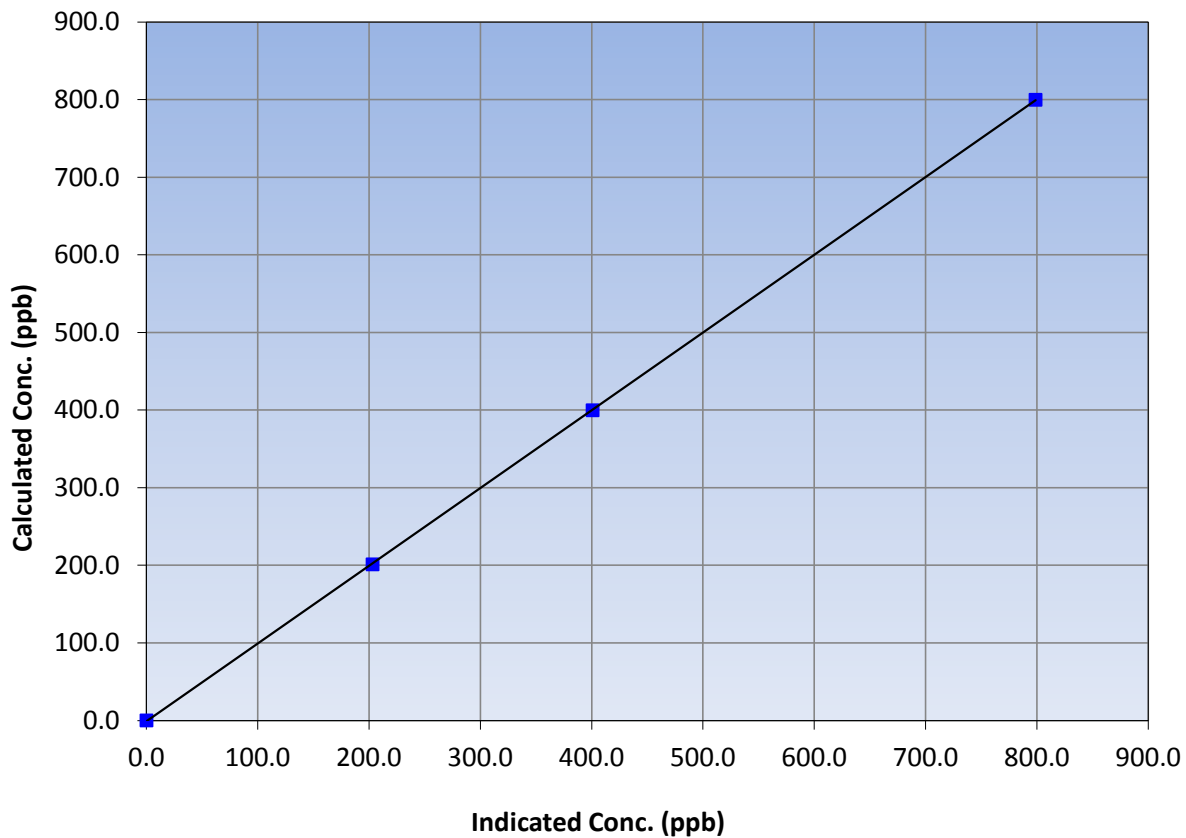
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 3, 2017
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:07	End Time (MST)	14:23
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
799.8	798.9	1.0011			
399.7	400.9	0.9971			
201.4	203.2	0.9909			
			Slope	1.001750	0.90 - 1.10
			Intercept	-1.147383	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

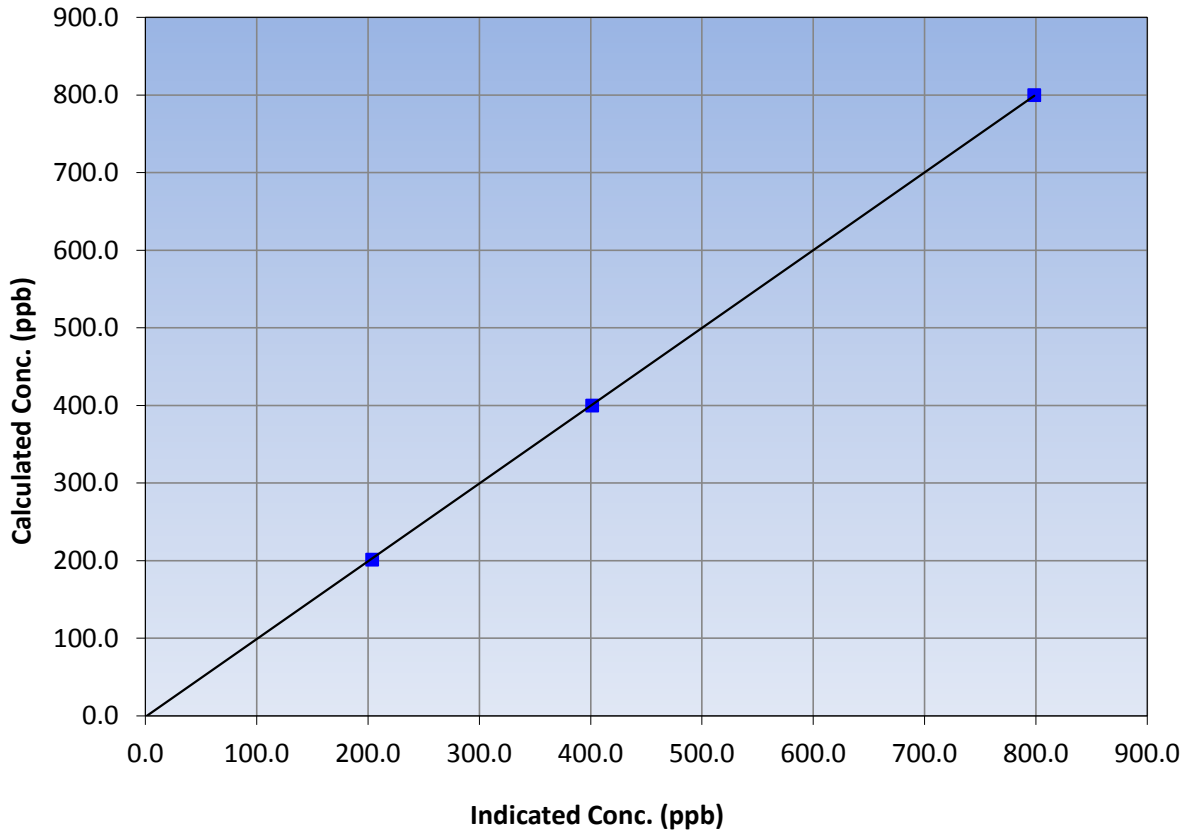
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 3, 2017
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:07	End Time (MST)	14:23
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
799.8	798.6	1.0015			
399.7	401.3	0.9961			
201.4	203.6	0.9890			
			Slope	1.002145	0.90 - 1.10
			Intercept	-1.385906	+/-20

**NO Calibration Curve**





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

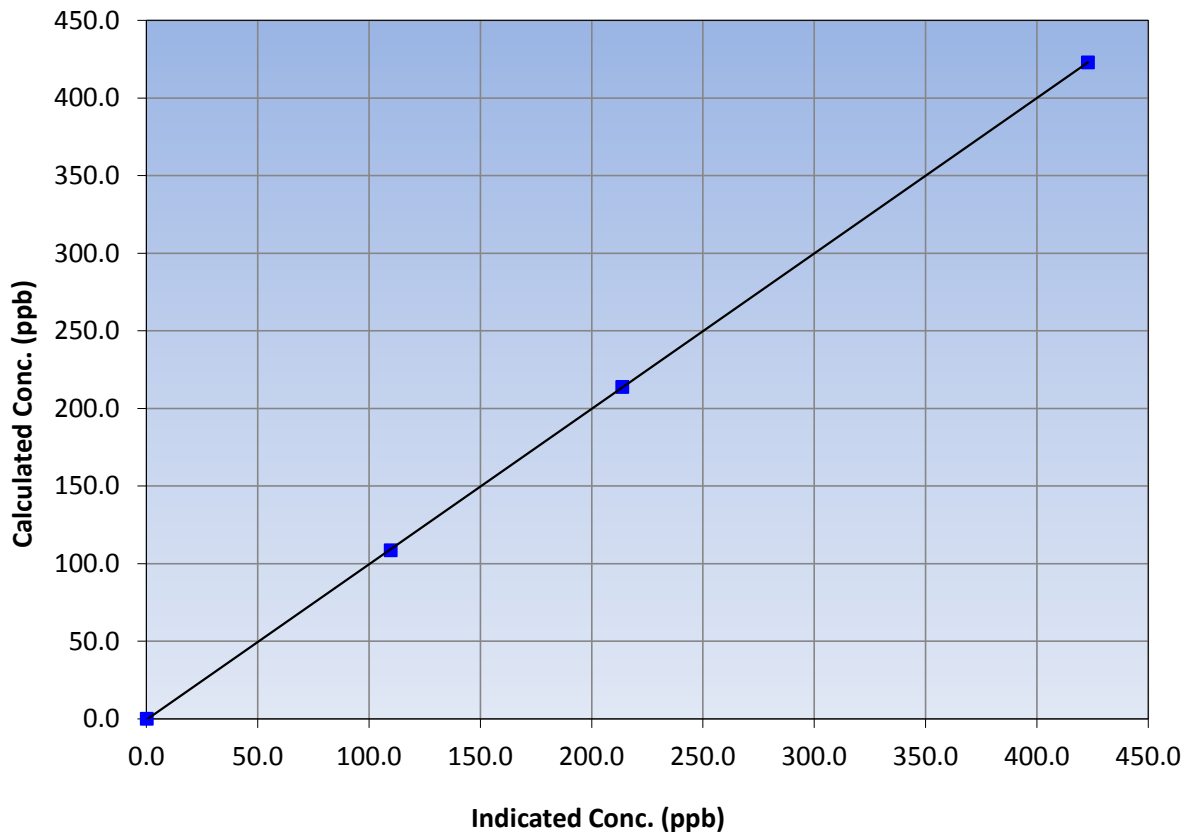
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 3, 2017
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:07	End Time (MST)	14:23
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.1	----	Correlation Coefficient	≥0.995	
422.9	423.0	0.9998			
213.8	213.7	1.0005			
108.6	109.7	0.9900			
			Slope	1.000846	0.90 - 1.10
			Intercept	-0.457906	+/-20

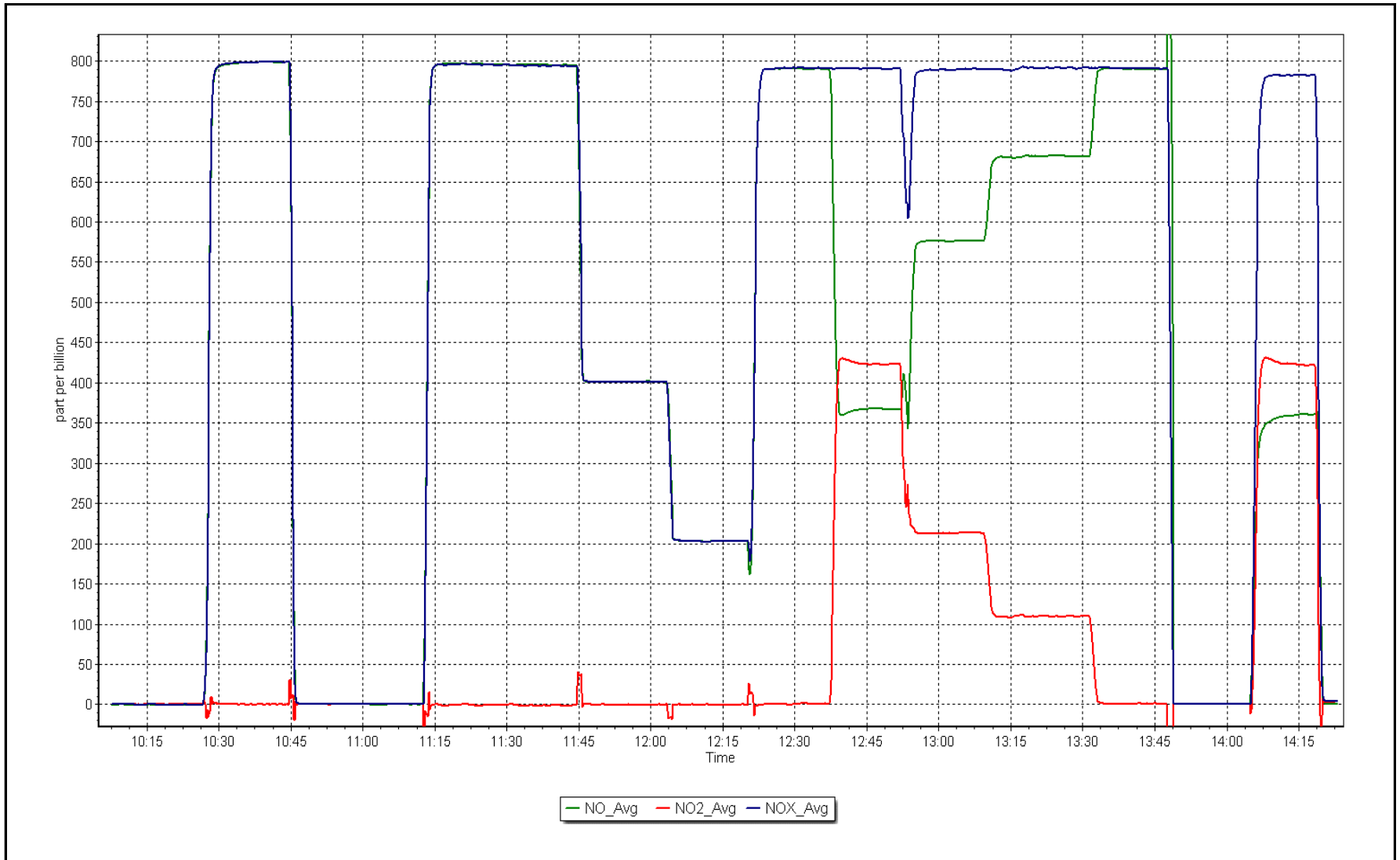
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 19, 2017

Location: Firebag





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 20  
MACKAY RIVER  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MACKAY RIVER (AMS 20)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	36	37	99.87	15	0	3	0
H2S (ppb) Average	709	35	35	100	2	0	1	0
THC (ppm) Average	677	35	67	95.7	2.7	-	2.4	-
NO2 (ppb) Average	707	36	37	99.87	28	0	8	-
NO (ppb) Average	707	36	37	99.87	78	-	15	-
NOX (ppb) Average	707	36	37	99.87	98	-	23	-
Temperature 2 m (C) Average	744	0	0	100	3.9	-	1	-
Relative Humidity (%) Average	744	0	0	100	99	-	92	-
Precipitation (mm) Total	561	0	183	75.4	1.2	-	5.2	-
Wind Speed 10 m (km/h) Average	736	0	8	98.92	17	-	10	-
Wind Direction 10 m (deg) Average	736	0	8	98.92	-	-	-	-

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



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MACKAY RIVER (AMS 20)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.5	1	-	0	0	0	0	0	1	15
H2S (ppb) Average	709	0.3	0	-	0	0	0	0	0	1	2
THC (ppm) Average	677	2.27	0.1	-	2.1	2.2	2.2	2.3	2.3	2.4	2.7
NO2 (ppb) Average	707	2.2	4	-	0	0	1	1	2	6	28
NO (ppb) Average	707	0.9	5	-	0	0	0	0	0	1	78
NOX (ppb) Average	707	3	8	-	0	0	1	1	2	7	98
Temperature 2 m (C) Average	744	-13.06	12.7	-	-38.8	-32.1	-25.3	-8.9	-2.1	0.8	3.9
Relative Humidity (%) Average	744	81	8	-	59	70	74	81	88	93	99
Precipitation (mm) Total	561	-	-	14.89	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	736	6	3	-	0	2	4	6	8	10	17
Wind Direction 10 m (deg) Average	736	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -MACKAY RIVER (AMS 20)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NOX, SO2, THC	31 Dec 2017 12:00	31 Dec 2017 12:00	1	Maintenance - reinitiated daily QA check
THC	30 Dec 2017 05:00	31 Dec 2017 11:00	31	Unstable operation - excessive baseline drift
Precipitation Collector	01 Dec 2017 01:00	08 Dec 2017 15:00	183	Analyzer Failure - inconsistent response
Wind Speed, Wind Direction	11 Dec 2017 04:00	11 Dec 2017 11:00	8	Flat line in sensor output signal -sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Mackay River - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 15 ppb on Dec 23 08:00	Maximum Daily Average: 3.5 ppb on Dec 23		Hours of Data:	707
Minimum Value: 0 ppb on Dec 2 17:00	Minimum Daily Average: 0.1 ppb on Dec 29		Hours of Missing Data:	37
Maximum Diurnal Average: 1.2 ppb at hour 13	Minimum Diurnal Average: 0.1 ppb at hour 4		Hours of Calibration:	36
Monthly Average: 0.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 8		Percent Operational Time:	99.9

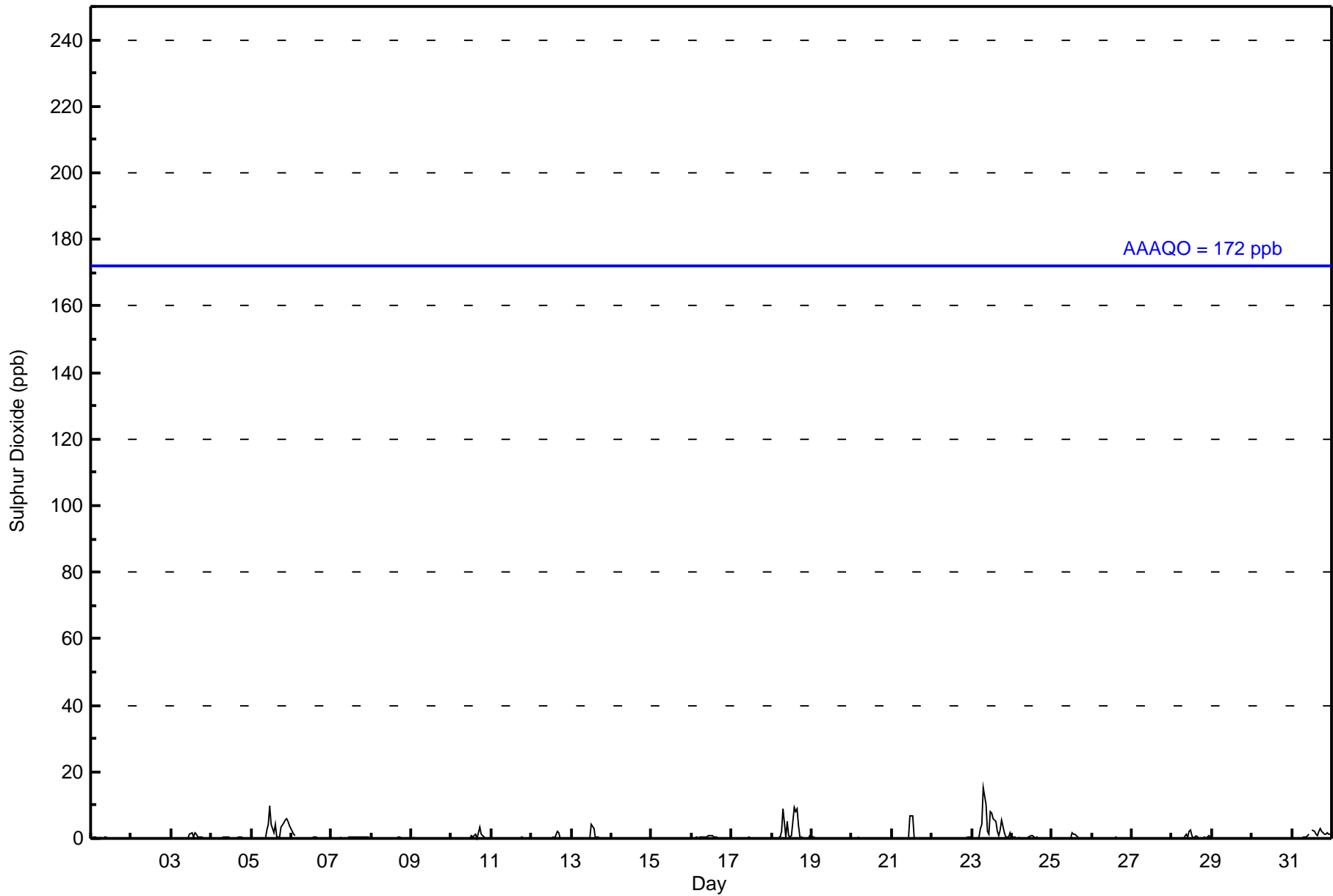
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
3-Dec	Z	0	0	0	0	0	0	0	0	0	1	2	0	2	1	0	0	0	0	0	0	0	0	0	0.4	2	
4-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
5-Dec	0	0	Z	0	0	0	0	0	0	2	4	10	4	2	4	1	0	1	4	5	6	6	5	4	2.5	10	
6-Dec	2	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	2	
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
8-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1	
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	1	0	2	4	1	0	0	0	0	0	0	0.5	4	
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0.3	2	
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	4	3	0	0	1	0	0	0	0	0	0	0	0	0.5	4	
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1	
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	0	0	0	Z	0	0	2	9	0	5	1	1	1	9	8	9	4	0	0	0	0	0	0	1	2.3	9	
19-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
21-Dec	Z	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0.7	7	
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1	
23-Dec	0	0	Z	0	0	3	4	15	10	2	1	8	8	6	5	2	1	3	5	1	1	0	0	2	3.5	15	
24-Dec	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0.3	2	
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
28-Dec	0	Z	0	0	0	0	0	0	1	0	2	3	1	0	1	0	0	0	0	0	0	0	1	0	0.5	3	
29-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
31-Dec	0	0	0	0	Z	0	0	0	1	1	1	M	3	2	1	1	2	3	2	1	1	2	1	1	1.1	3	
	0.2	0.2	0.2	0.1	0.1	0.3	0.3	0.9	0.5	0.5	0.4	1.1	1.2	0.9	0.9	0.7	0.5	0.5	0.5	0.4	0.3	0.4	0.4	0.4	Diurnal Average		
	2	1	1	0	0	3	4	15	10	5	4	10	8	9	8	9	4	4	4	5	5	6	6	5	4	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 (SO<sub>2</sub>) - ppb**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Mackay River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	706	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mackay River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 10	6	20	2	0	3	3	20	33	92	86	73	95	137	80	41	7	698
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
<b>Totals</b>	<b>6</b>	<b>20</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>21</b>	<b>33</b>	<b>92</b>	<b>86</b>	<b>73</b>	<b>95</b>	<b>137</b>	<b>80</b>	<b>41</b>	<b>7</b>	<b>699</b>

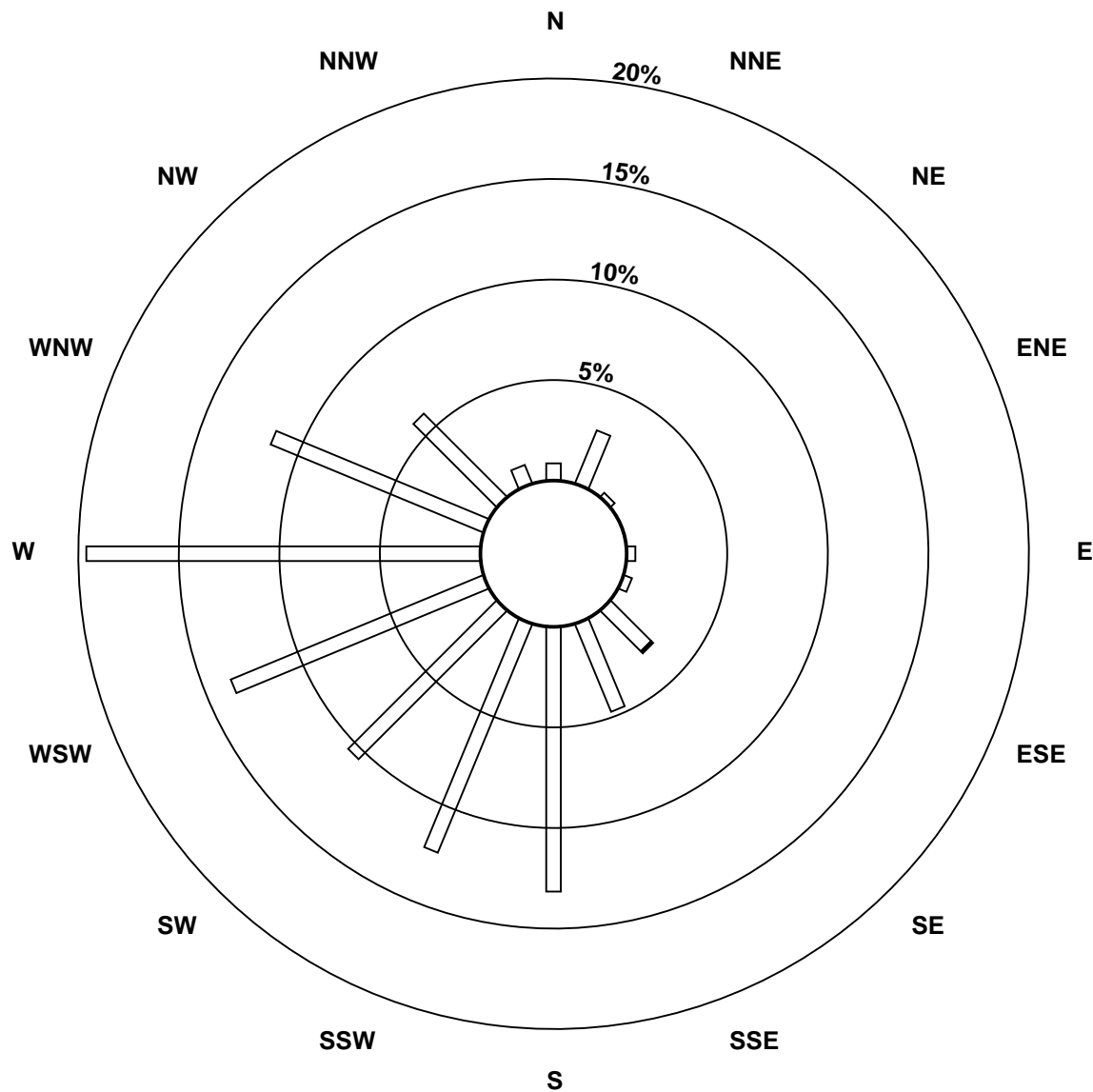
Total Number of Valid Hours: 699

Total Number of Hours: 744

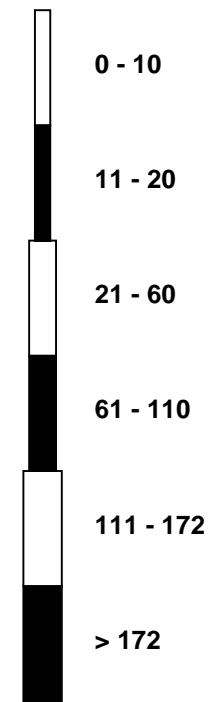


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

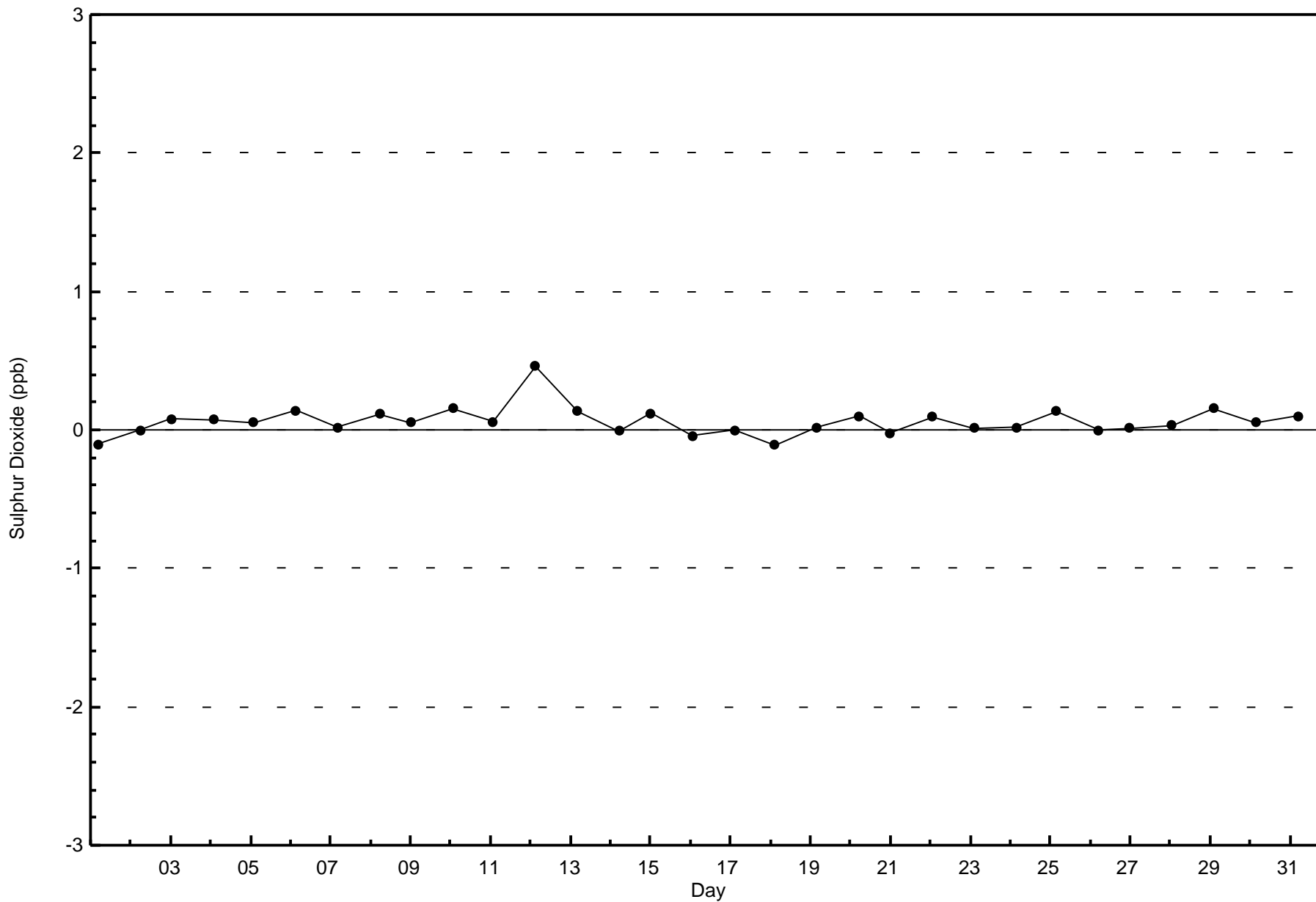
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mackay River (AMS 20)



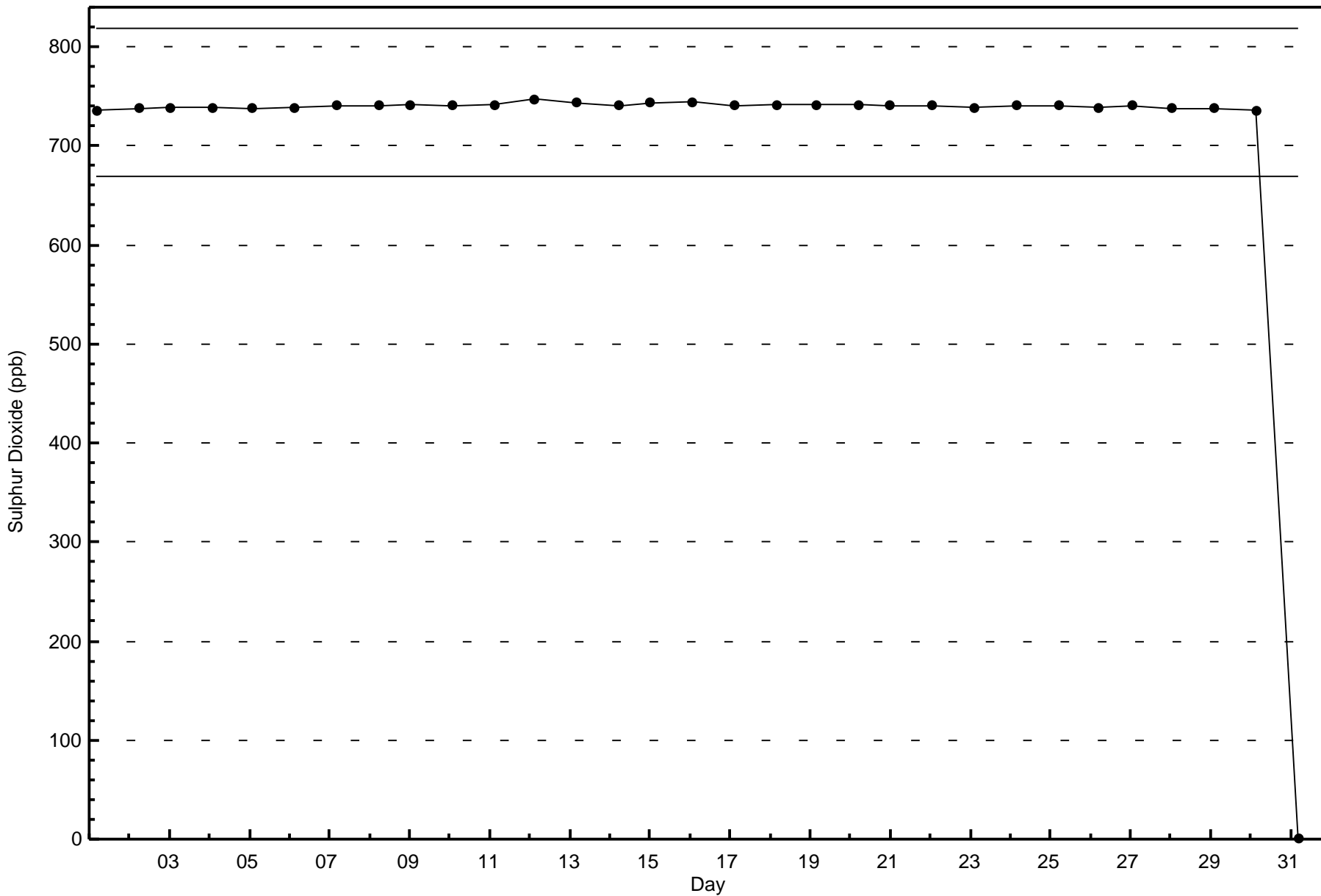
Classes (ppb)



Total Number of Valid Hours: 699





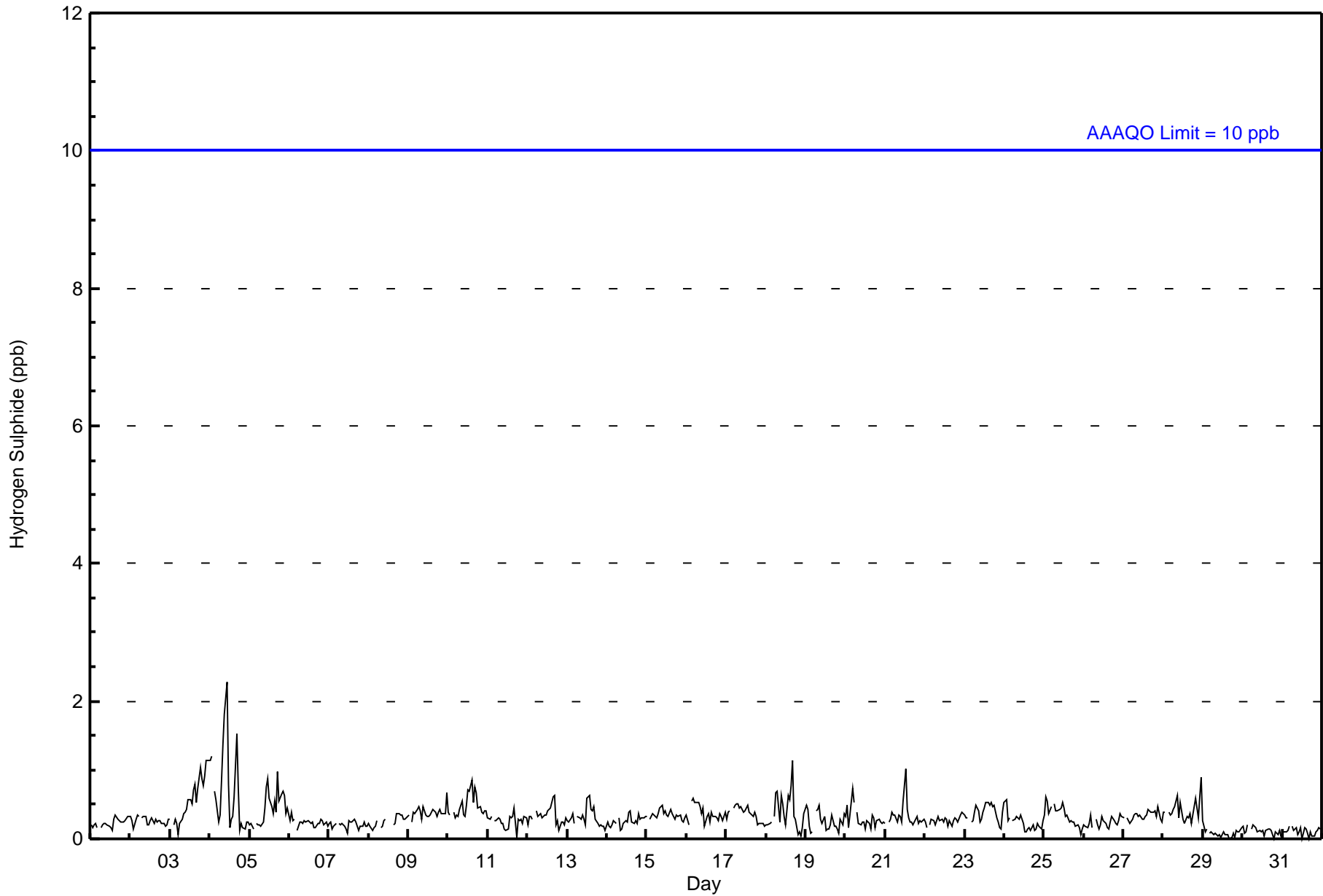






Wood Buffalo Environmental Association  
Hourly Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mackay River - December 2017





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mackay River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mackay River - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	7	20	2	0	3	3	21	34	92	87	72	96	138	79	41	7	702
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	7	20	2	0	3	3	21	34	92	87	72	96	138	79	41	7	702

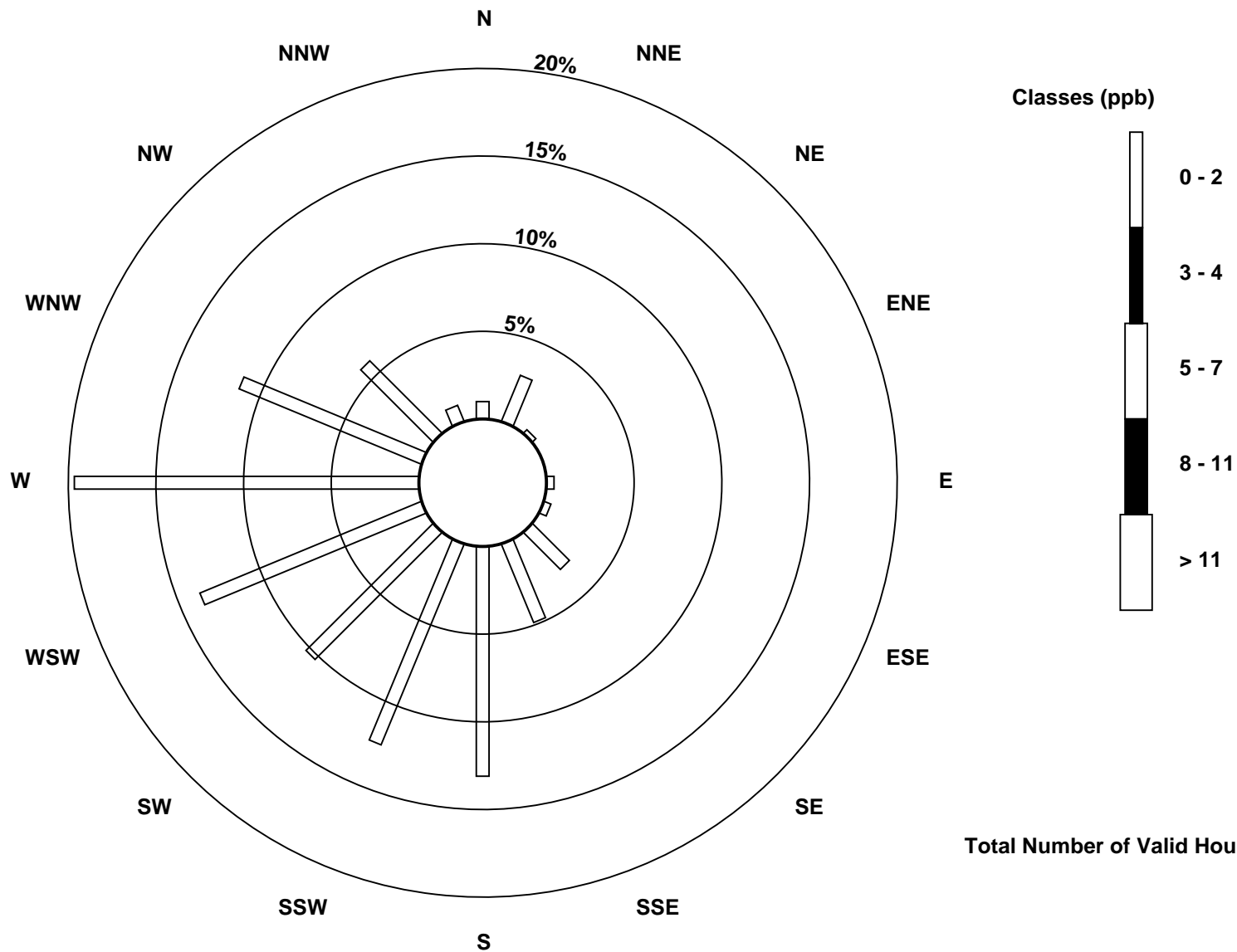
Total Number of Valid Hours: 702

Total Number of Hours: 744

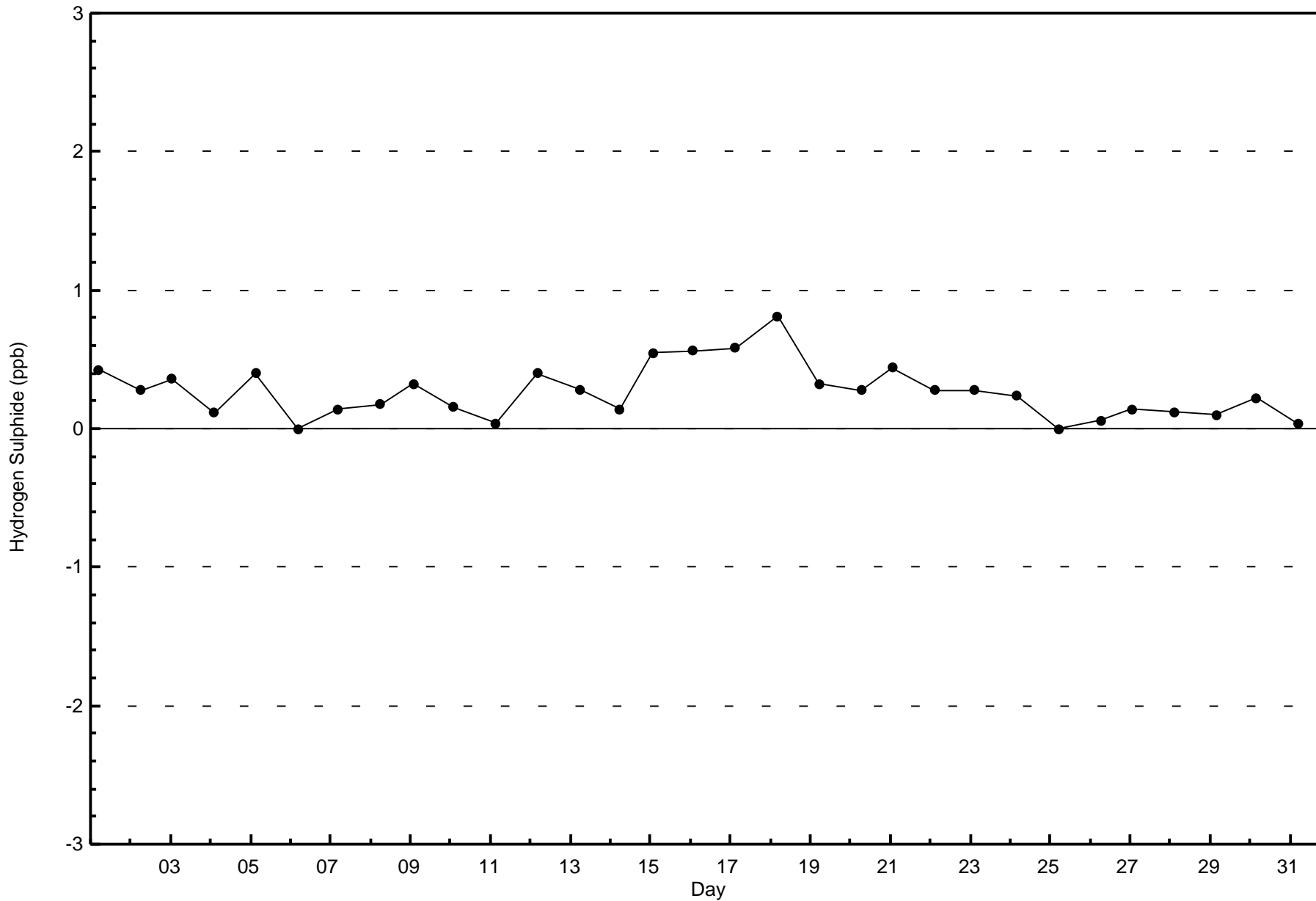


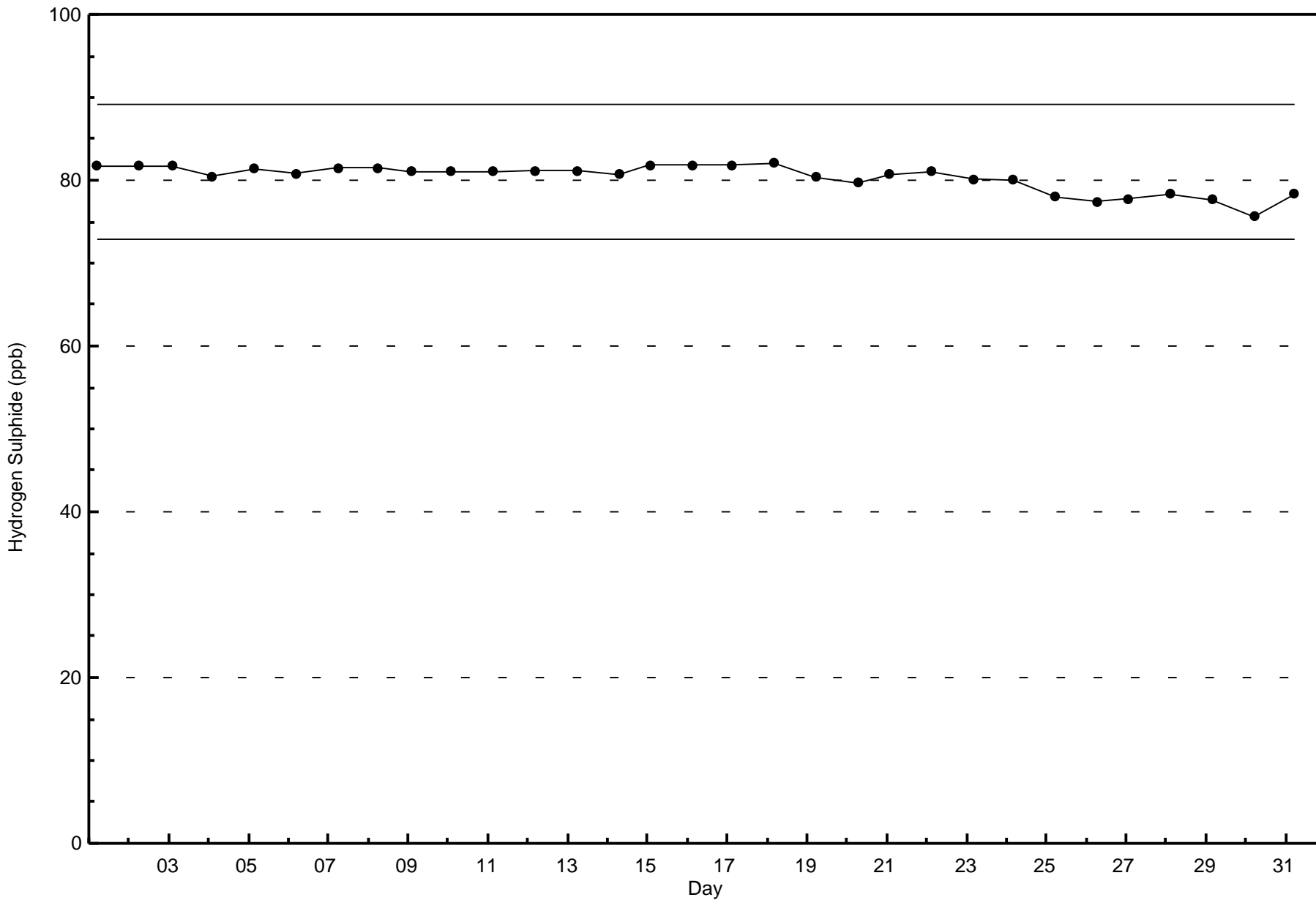
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mackay River (AMS 20)



Total Number of Valid Hours: 702





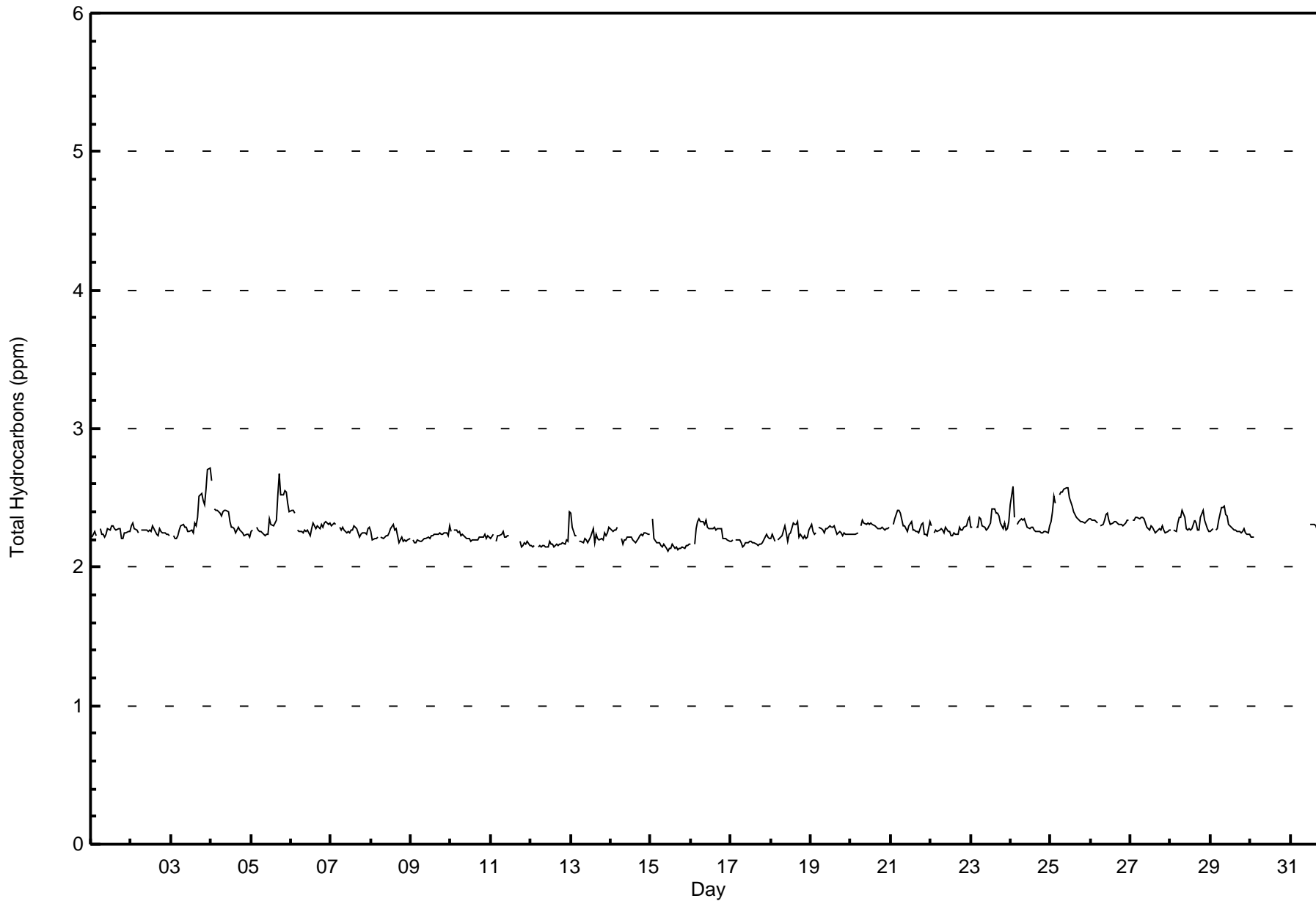






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mackay River - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	677	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: 677

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mackay River - December 2017**

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	6	20	2	0	3	3	21	31	75	83	65	95	137	80	41	7	669
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
<b>Totals</b>	6	20	2	0	3	3	21	31	75	83	65	95	137	80	41	7	669

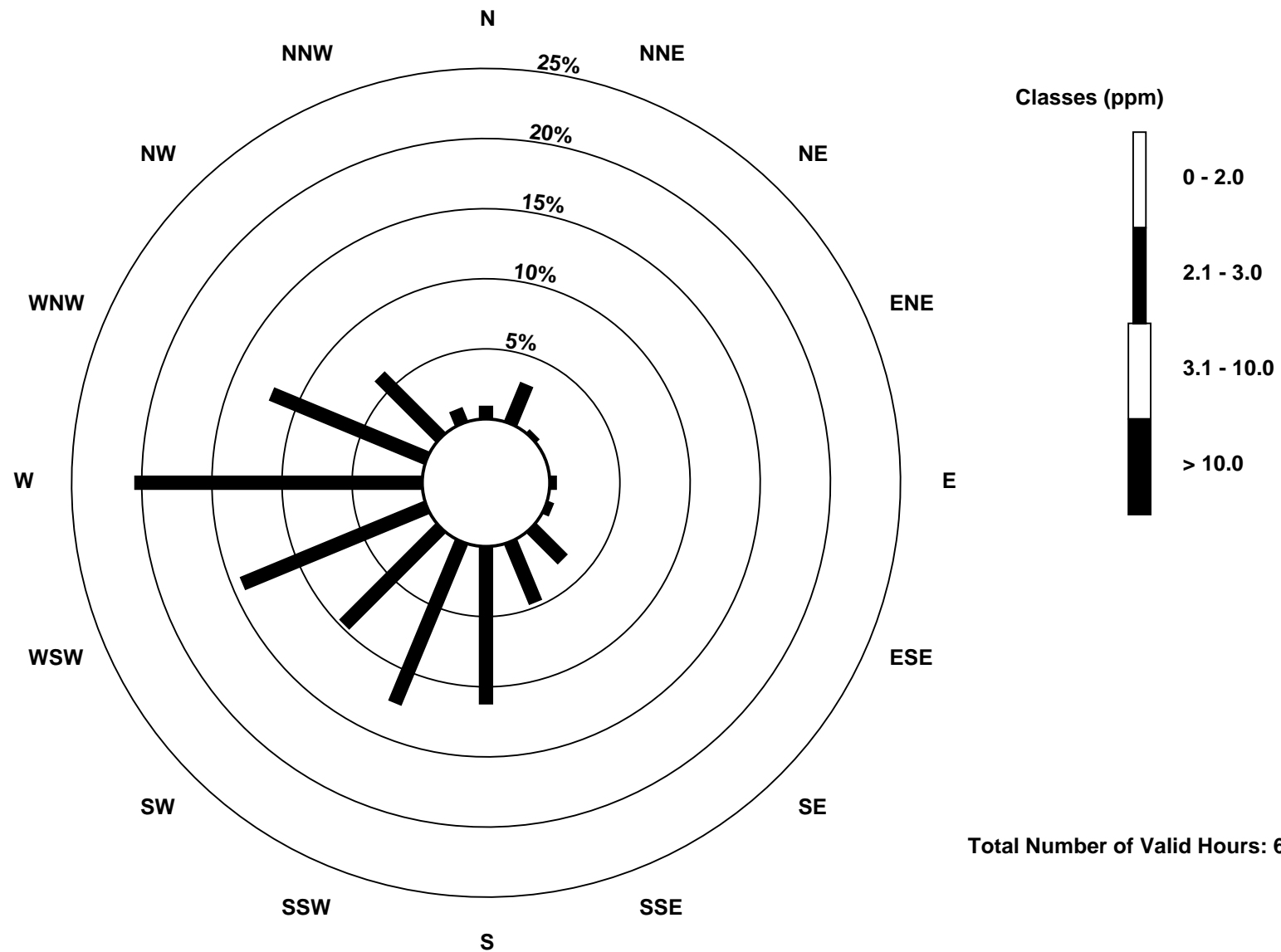
Total Number of Valid Hours: 669

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Mackay River (AMS 20)

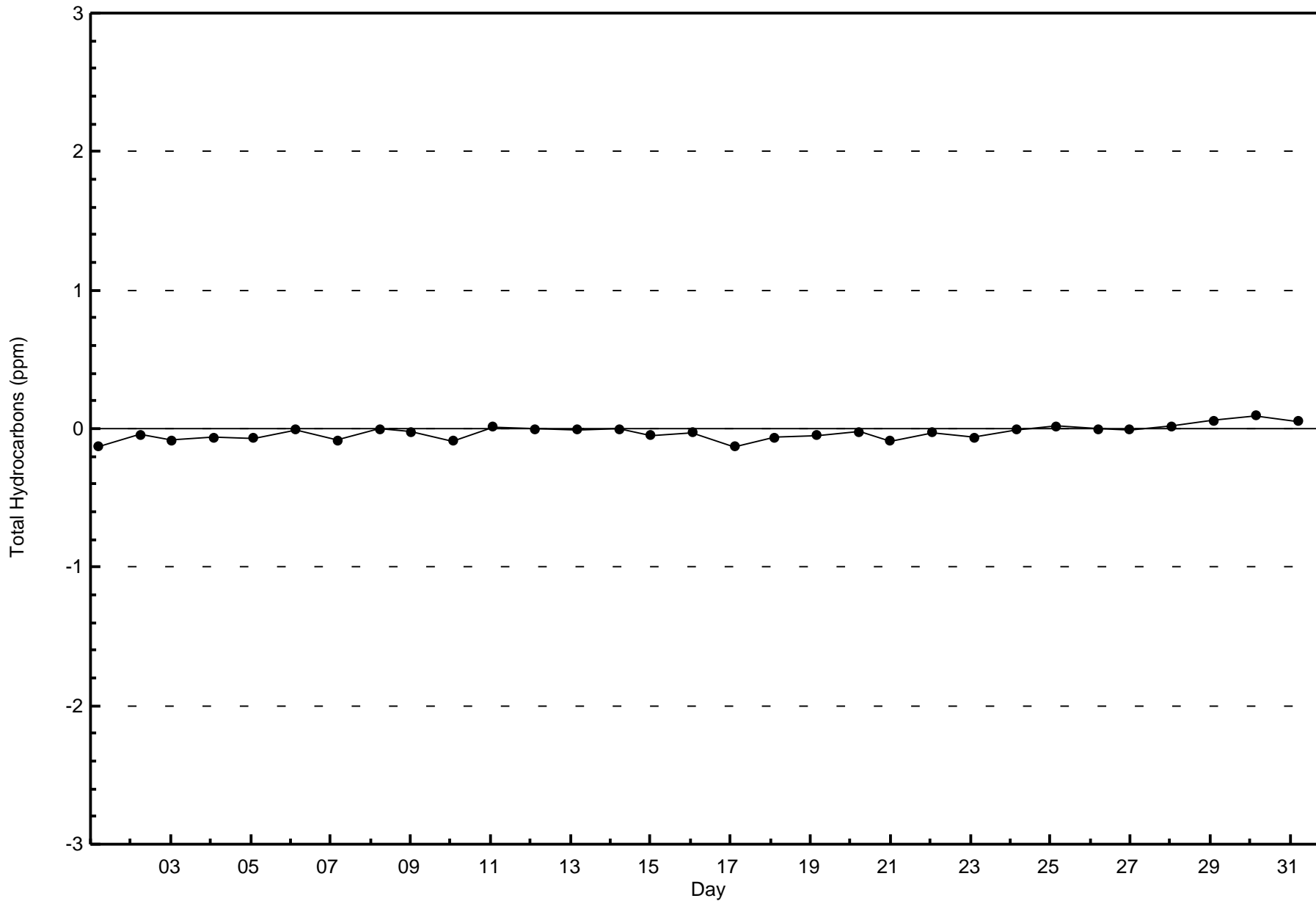


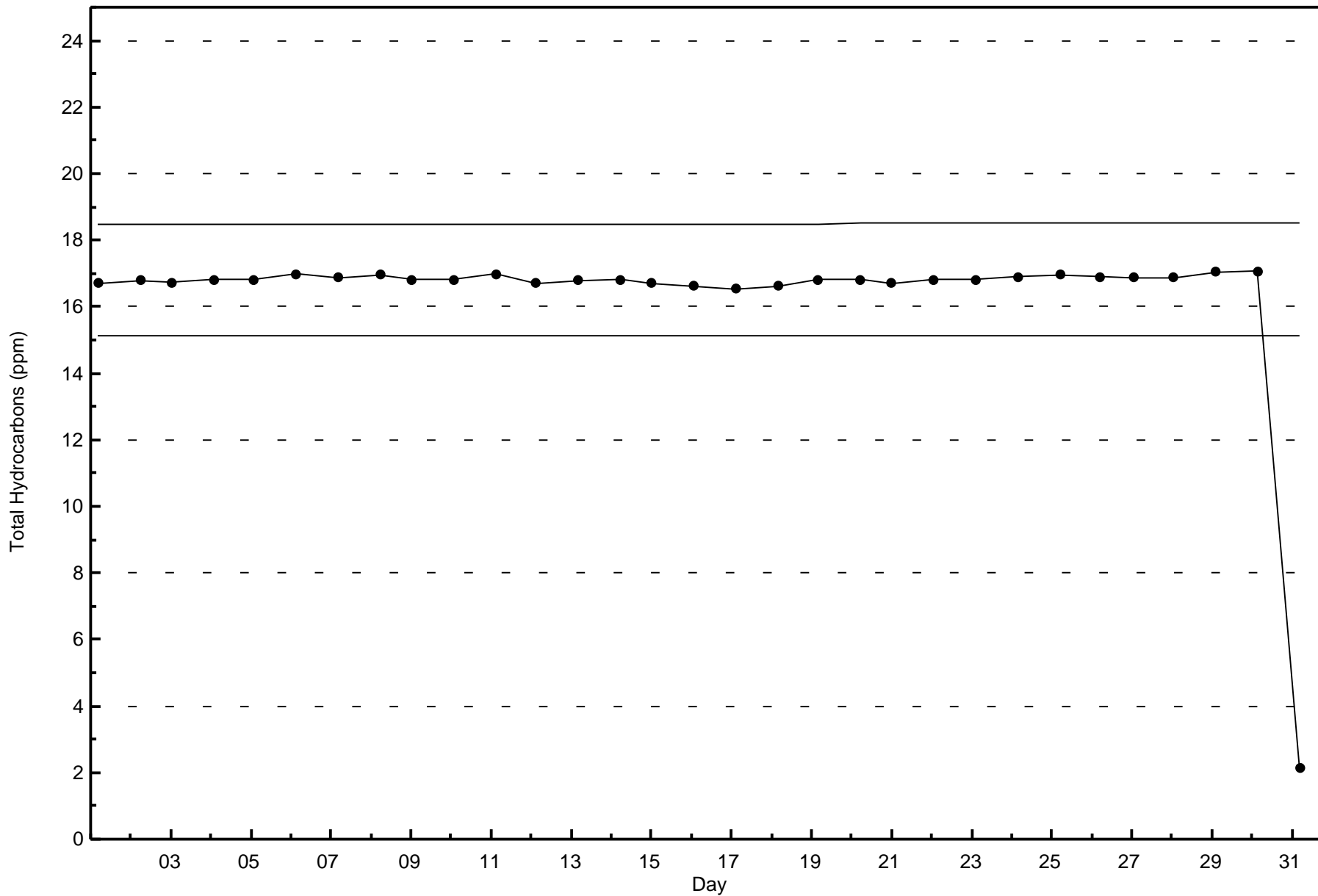
Total Number of Valid Hours: 669



Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Mackay River - December 2017







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb  
Mackay River - December 2017

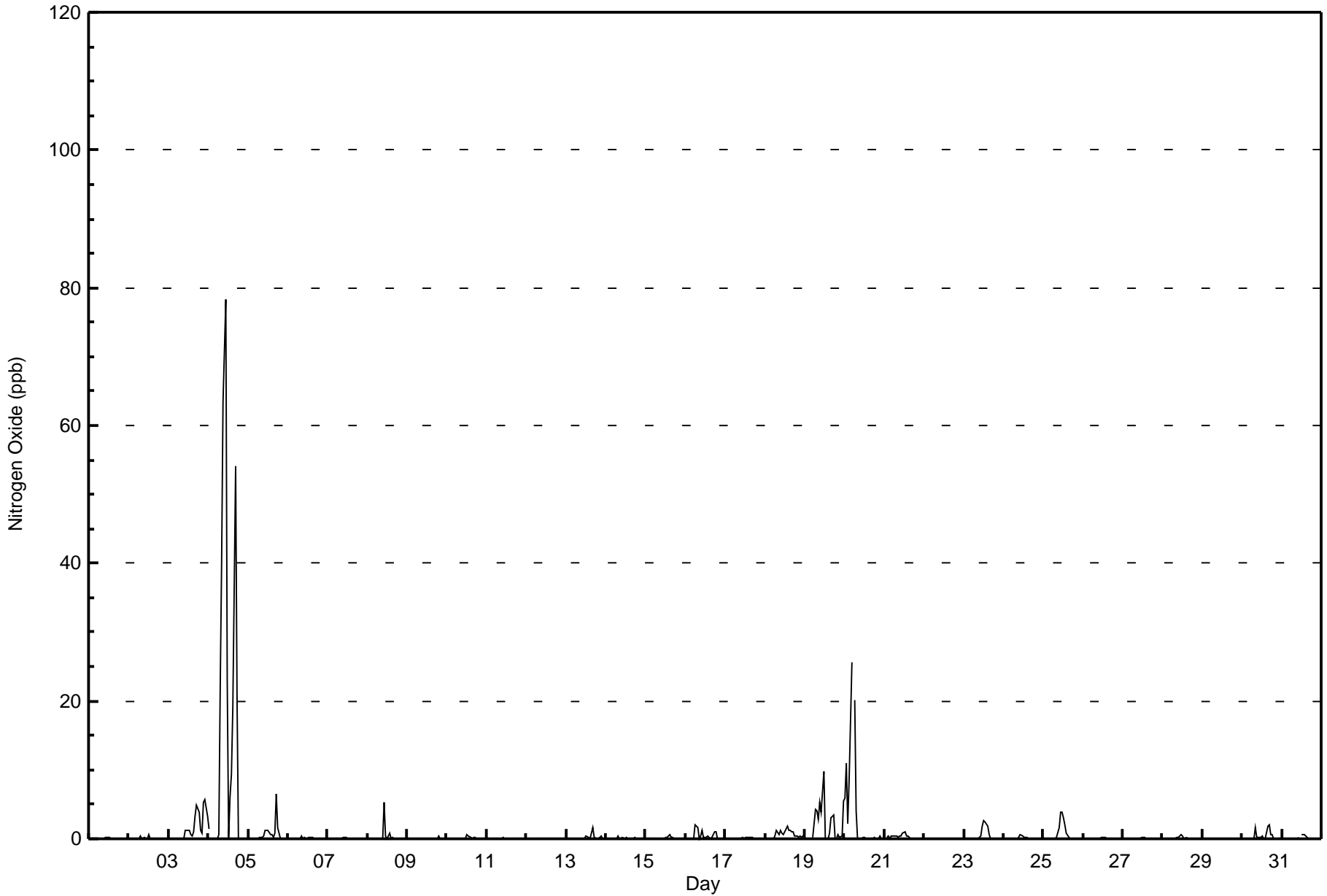
Maximum Value: 78 ppb on Dec 4 11:00																		Maximum Daily Average: 14.8 ppb on Dec 4																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 1 02:00																		Minimum Daily Average: 0.0 ppb on Dec 22																		Hours of Data: 707			
Maximum Diurnal Average: 3.2 ppb at hour 11																		Minimum Diurnal Average: 0.0 ppb at hour 6																		Hours of Missing Data: 37			
Monthly Average: 0.9 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 22																		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-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0												
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1												
3-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	3	5	4	1	1	5	6	3	1.5	6													
4-Dec	2	Z	0	0	0	0	1	22	40	63	78	23	0	6	9	19	54	21	0	0	0	0	0	0	14.8	78													
5-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	1	6	2	0	0	0	0	0	0.7	6													
6-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
8-Dec	0	0	0	0	0	Z	0	0	0	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	5													
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1													
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0.0	0													
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0.2	2													
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
15-Dec	Z	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													
16-Dec	0	Z	0	0	0	0	2	2	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0.4	2													
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0													
18-Dec	0	0	0	Z	0	0	0	1	1	1	1	1	1	2	1	1	1	1	1	0	0	0	0	0	0.6	2													
19-Dec	0	0	0	0	Z	0	4	4	3	5	4	10	0	0	0	1	3	3	0	0	1	0	0	6	1.9	10													
20-Dec	6	11	2	8	26	Z	20	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.4	26													
21-Dec	Z	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													
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	2	3	2	2	1	0	0	0	0	0	0	0	0	0.4	3													
24-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1													
25-Dec	0	0	0	0	Z	0	0	0	0	2	4	4	3	2	1	0	0	0	0	0	0	0	0	0	0.7	4													
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
27-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1													
29-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
30-Dec	0	0	0	Z	0	0	0	0	2	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	0.3	2													
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	M	1	1	0	0	0	0	0	0	0	0	0	0	0.1	1													
																		0.3				Diurnal Average																	
																		6				Diurnal Maximum																	
Z - zerospan																		C - Calibration				M - Maintenance																	





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxide (NO) - ppb**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Mackay River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	699	98.87	98.87
21 - 40	5	0.71	99.58
41 - 80	3	0.42	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Mackay River - December 2017**

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	20	2	0	3	3	17	30	91	86	73	95	137	80	41	7	691
21 - 40	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	5
11 - 80	0	0	0	0	0	0	2	1	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
<b>Totals</b>	6	20	2	0	3	3	21	33	92	86	73	95	137	80	41	7	699

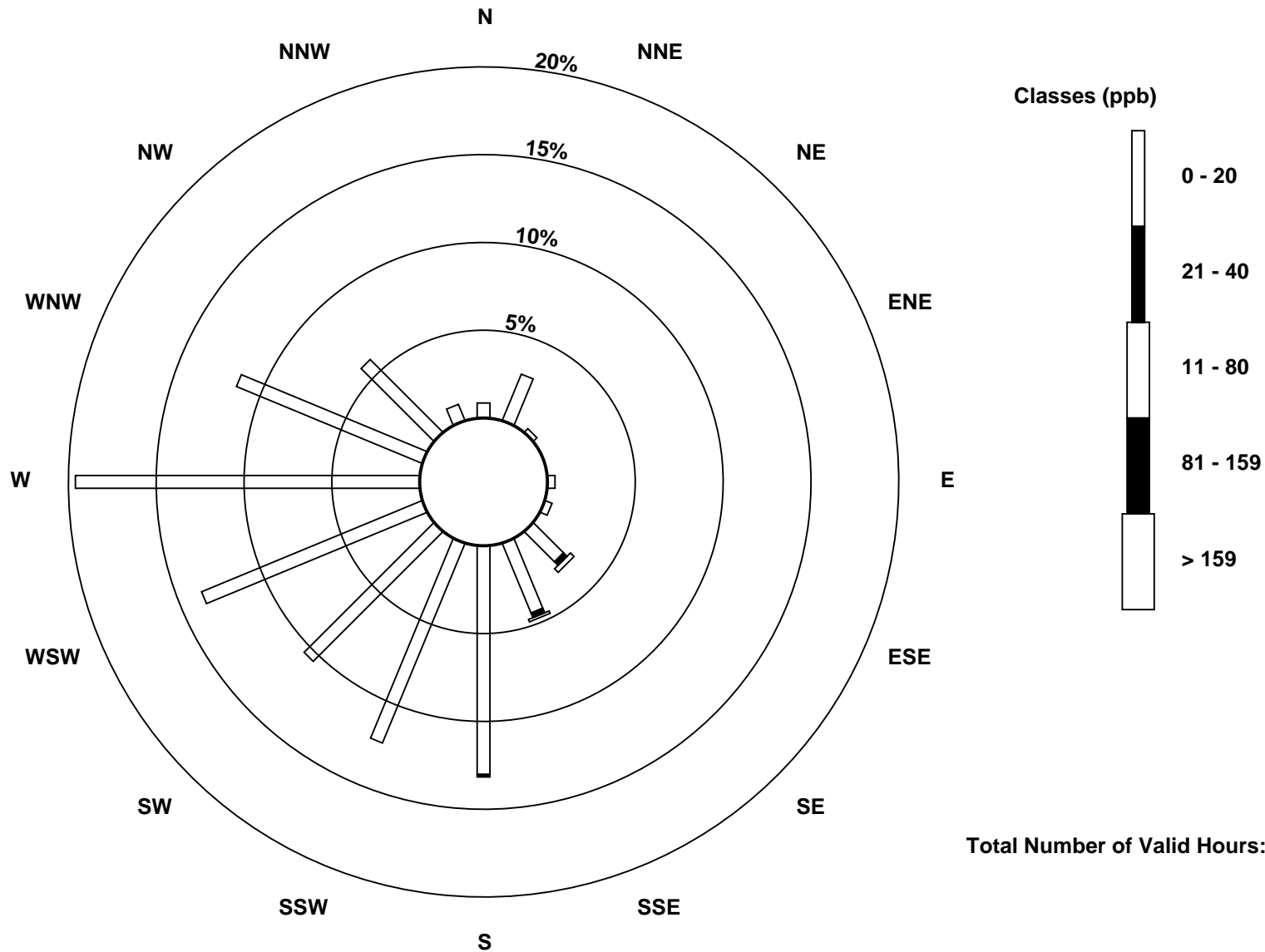
Total Number of Valid Hours: 699

Total Number of Hours: 744

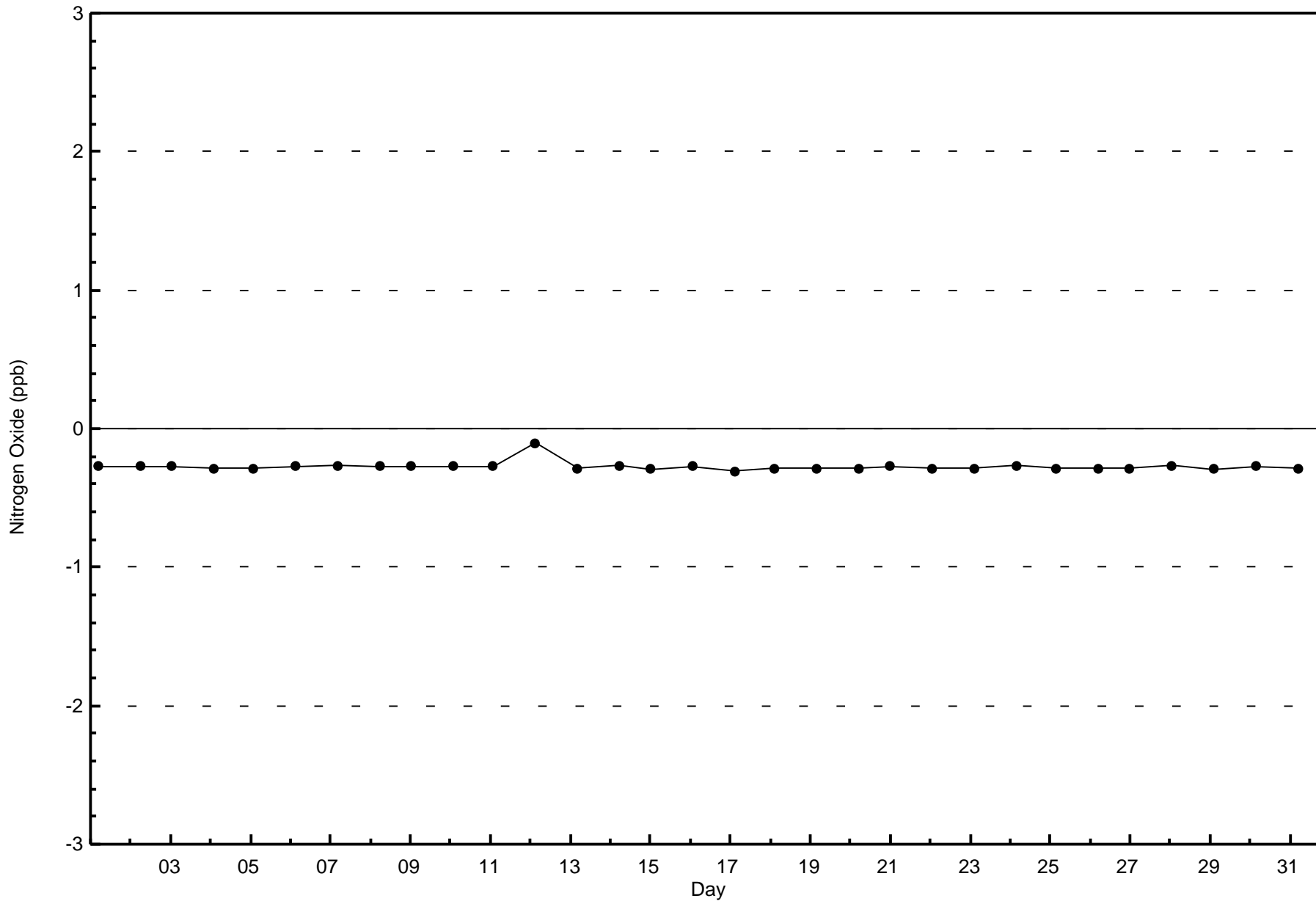


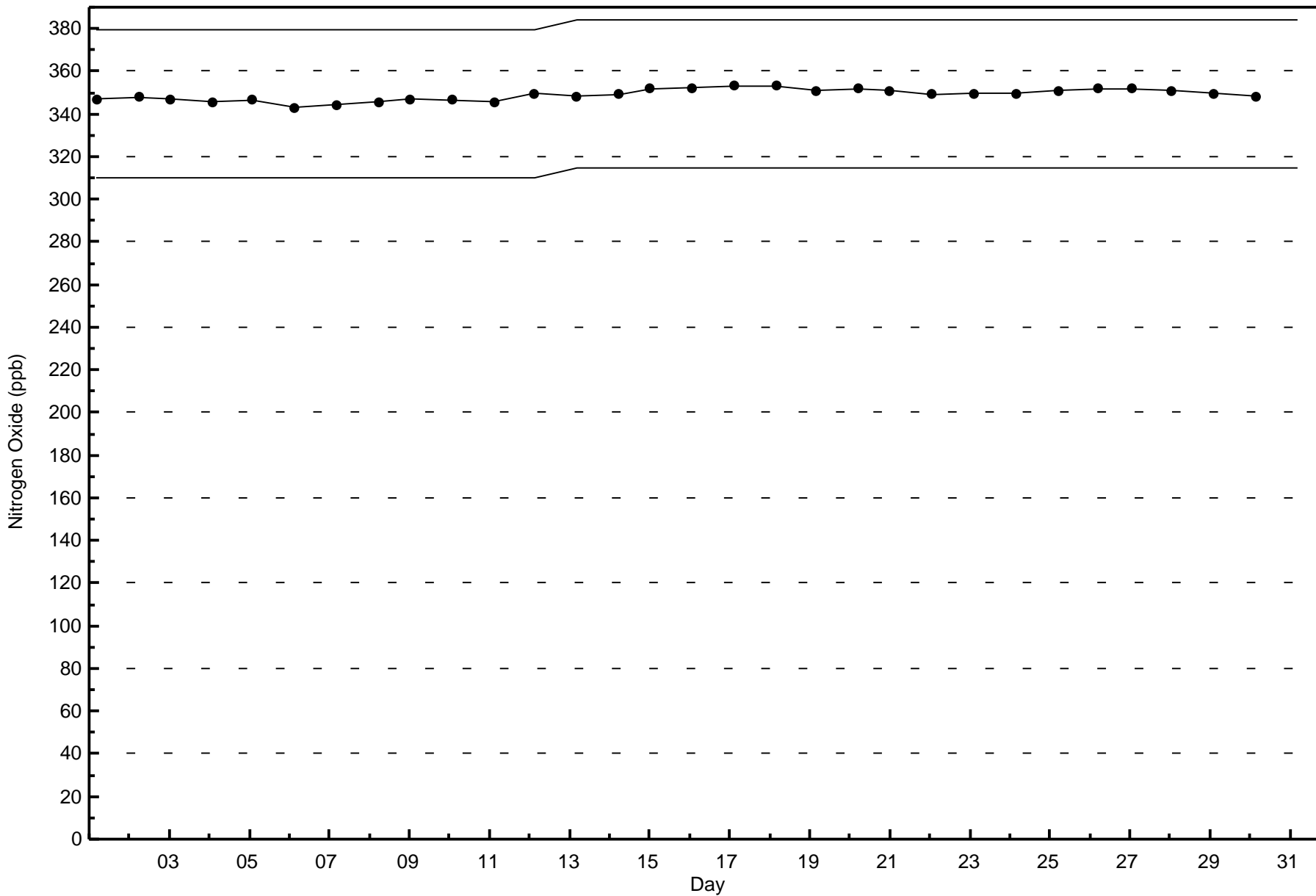
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxide (NO) - ppb  
Mackay River (AMS 20)



Total Number of Valid Hours: 699







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

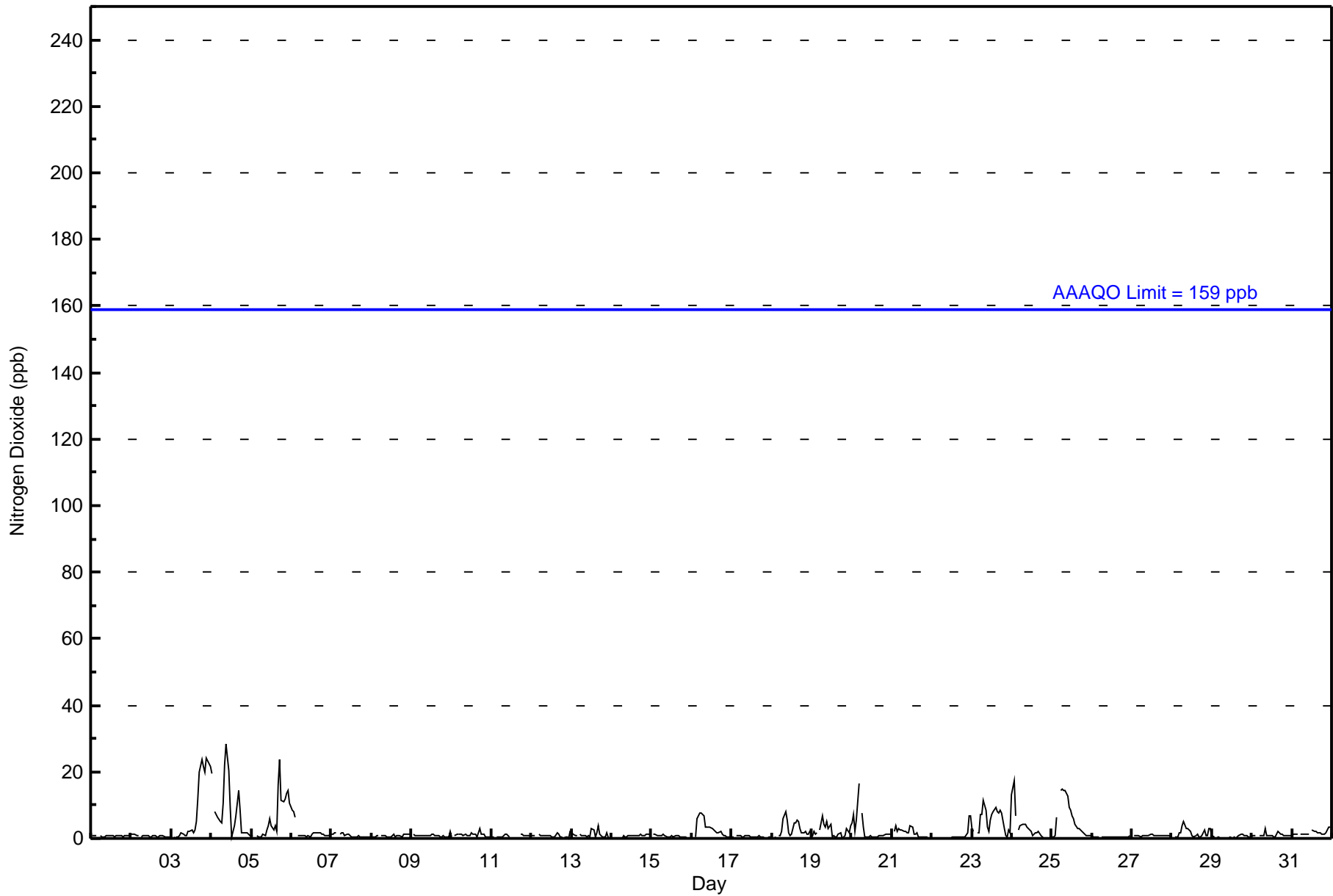
**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Mackay River - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 28 ppb on Dec 4 10:00										Maximum Daily Average: 8.2 ppb on Dec 3										Hours of Data: 707							
Minimum Value: 0 ppb on Dec 12 23:00										Minimum Daily Average: 0.5 ppb on Dec 29										Hours of Missing Data: 37							
Maximum Diurnal Average: 2.9 ppb at hour 18										Minimum Diurnal Average: 1.6 ppb at hour 13										Hours of Calibration: 36							
Monthly Average: 2.2 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 O <sub>3</sub> = 2 P <sub>90</sub> = 6 P <sub>99</sub> = 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-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
2-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
3-Dec	Z	0	0	0	1	1	2	1	1	1	2	2	3	2	2	5	12	20	24	21	20	24	23	22	8.2	24	
4-Dec	20	Z	8	7	6	5	5	10	22	28	20	9	1	2	4	7	14	8	2	2	2	1	1	1	8.1	28	
5-Dec	1	1	Z	1	1	1	1	1	1	1	3	4	6	4	3	4	2	16	24	11	11	12	14	14	11	6.3	24
6-Dec	8	8	6	Z	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1.9	8	
7-Dec	1	1	2	2	Z	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.9	2	
8-Dec	0	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0.9	2	
10-Dec	1	Z	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	3	1	1	1	1	1	0	1.1	3	
11-Dec	0	0	Z	0	0	0	0	1	1	1	1	1	C	C	C	C	C	1	1	1	1	1	1	1	0.8	1	
12-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	2	1	1	0	0	0	0	0	2	0.8	2	
13-Dec	2	1	1	1	Z	1	1	1	1	1	1	3	2	0	2	4	1	1	1	0	2	0	0	0	1.1	4	
14-Dec	0	0	0	0	0	Z	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
15-Dec	Z	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0.7	1	
16-Dec	0	Z	0	6	7	8	8	7	3	3	3	3	3	2	2	2	2	2	1	1	1	1	1	1	2.9	8	
17-Dec	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0.5	1	
18-Dec	0	0	0	Z	1	1	2	6	8	6	2	1	1	5	5	6	5	3	2	2	2	1	1	2	2.7	8	
19-Dec	1	2	1	2	Z	2	7	4	3	5	3	4	1	1	1	1	1	2	0	0	1	3	2	4	2.2	7	
20-Dec	5	7	2	5	16	Z	8	3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.6	16	
21-Dec	Z	2	4	2	3	3	3	2	2	2	2	4	4	1	1	2	1	1	0	1	1	1	0	0	1.7	4	
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	7	7	0.9	7	
23-Dec	3	2	Z	2	2	7	7	11	8	3	2	6	7	8	9	8	8	9	8	3	1	1	2	2	5.1	11	
24-Dec	13	17	7	Z	3	4	4	4	4	4	3	2	1	1	2	2	2	1	0	0	0	0	0	0	3.3	17	
25-Dec	0	1	1	6	Z	14	15	14	15	13	9	8	7	6	4	3	3	3	2	2	1	1	1	1	5.6	15	
26-Dec	1	1	1	1	1	Z	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	
27-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
28-Dec	1	Z	1	1	2	2	4	5	3	3	3	2	1	1	1	1	0	1	1	3	1	1	3	3	1.8	5	
29-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	1	
30-Dec	1	1	1	Z	1	1	1	1	3	1	1	1	1	1	0	2	2	1	1	1	1	1	1	1	1.0	3	
31-Dec	1	1	1	1	Z	1	1	1	1	1	1	M	2	2	2	2	2	2	1	1	2	3	3	3	1.7	3	
2.5 2.1 1.6 1.7 2.0 2.3 2.5 2.8 2.9 2.7 2.2 2.0 1.6 1.7 1.6 1.8 2.9 2.9 2.2 1.9 1.8 2.1 2.3 2.3																								Diurnal Average			
20 17 8 7 16 14 15 14 22 28 20 9 7 8 9 8 16 24 24 21 20 24 23 22																								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 (NO<sub>2</sub>) - ppb  
Mackay River - December 2017







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Mackay River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	699	98.87	98.87
21 - 40	8	1.13	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Mackay River - December 2017**

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	18	2	0	3	3	18	33	92	86	73	95	137	80	40	6	691
21 - 40	1	2	0	0	0	0	3	0	0	0	0	0	0	0	1	1	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
<b>Totals</b>	6	20	2	0	3	3	21	33	92	86	73	95	137	80	41	7	699

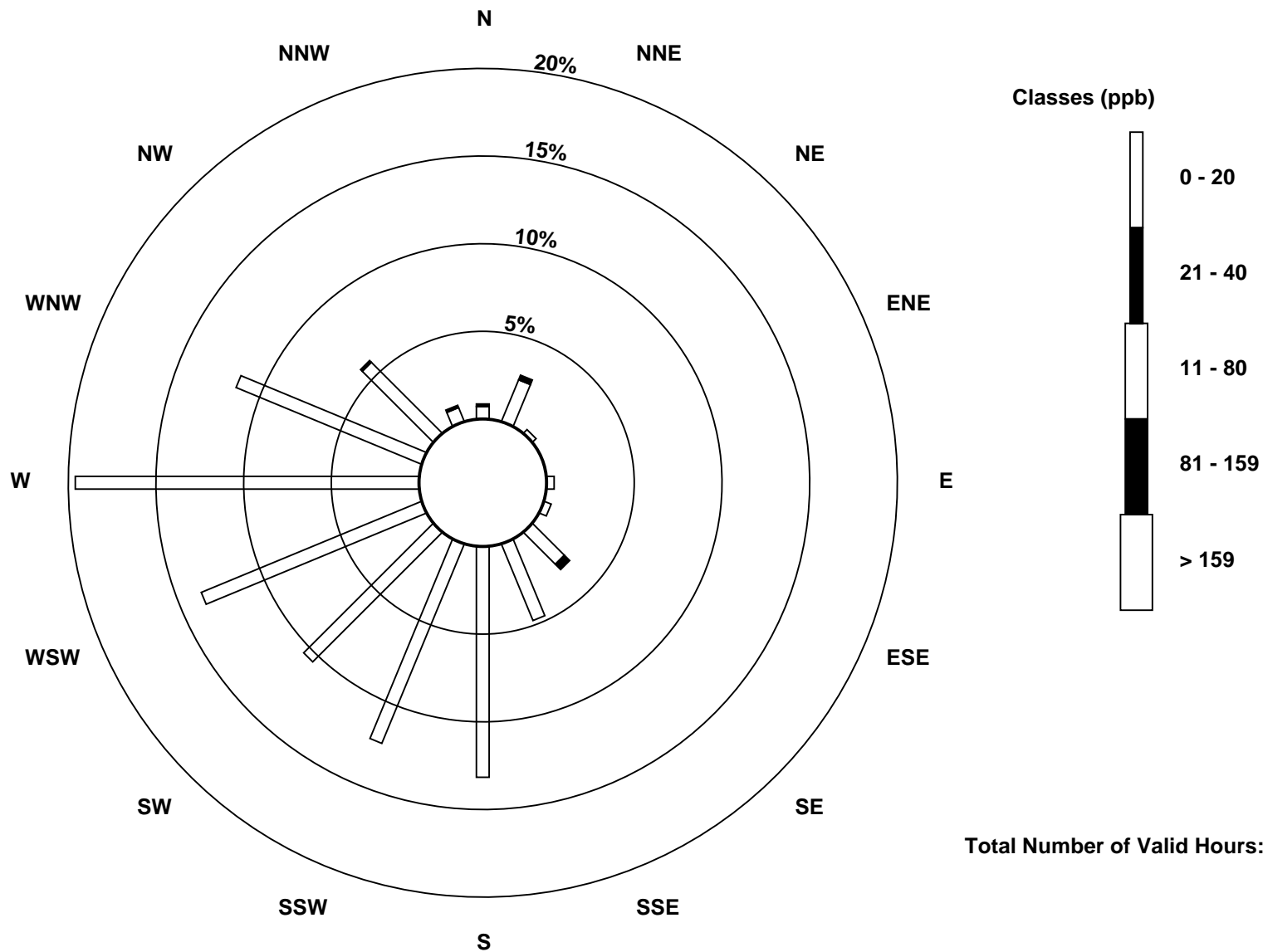
Total Number of Valid Hours: 699

Total Number of Hours: 744

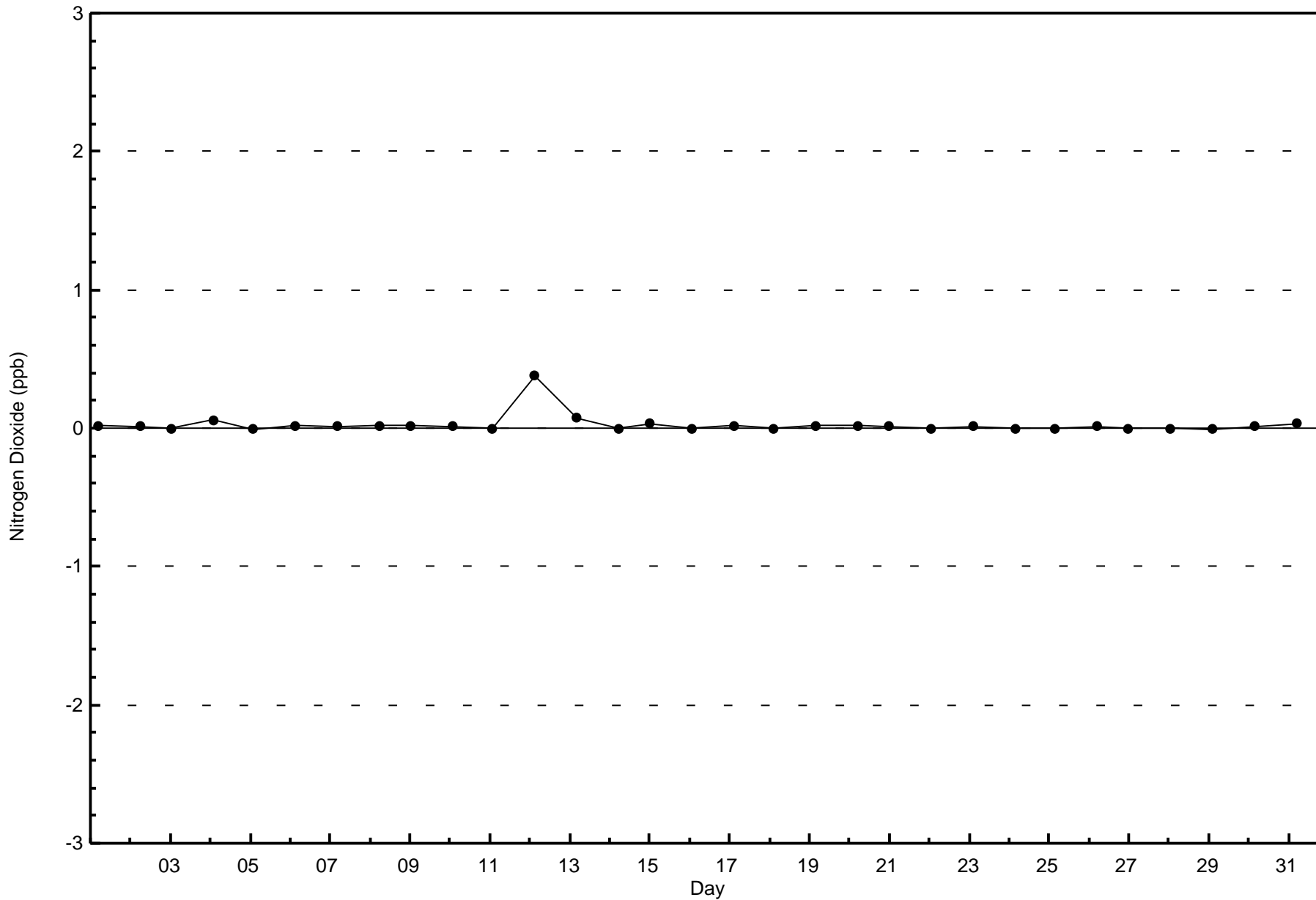


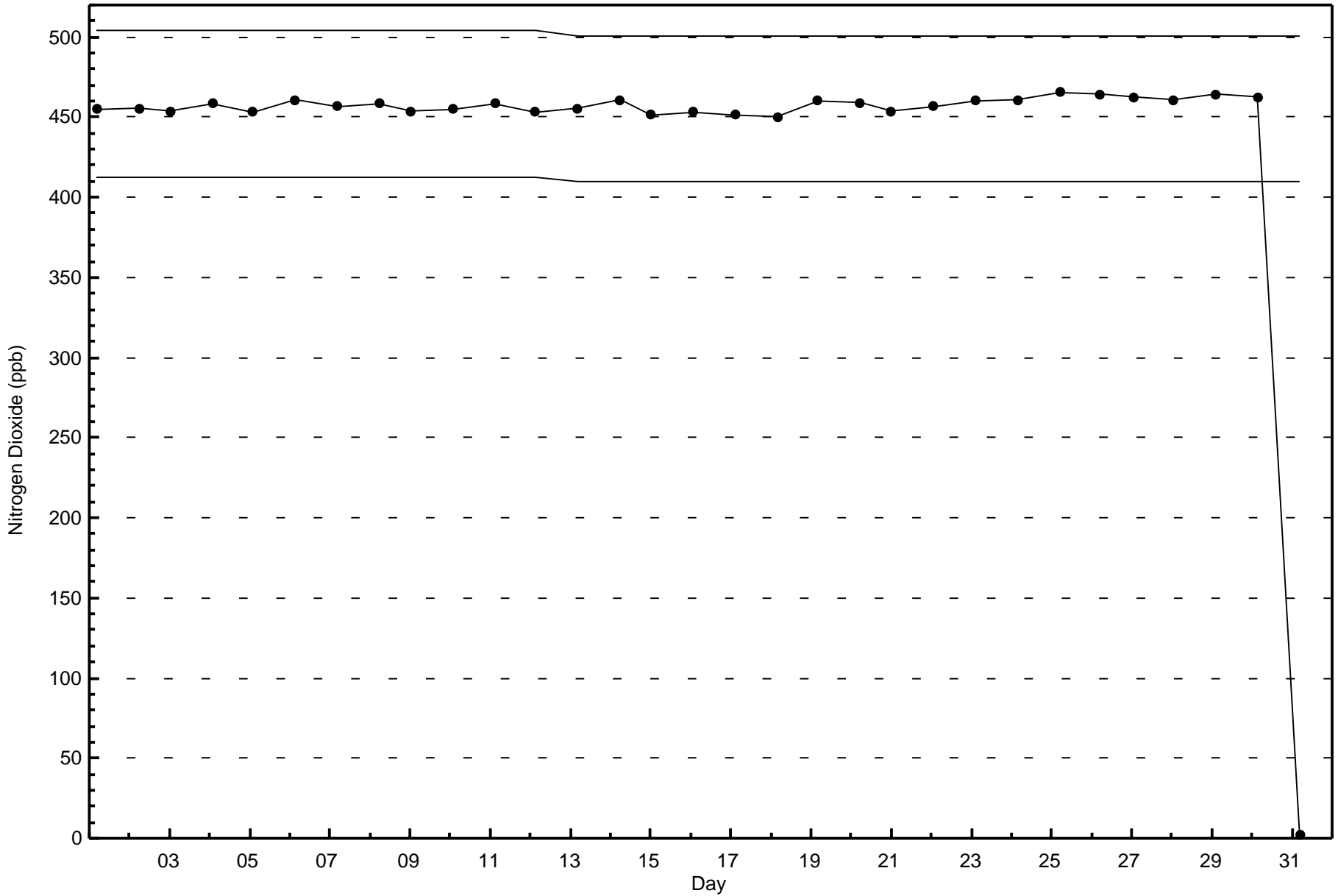
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Mackay River (AMS 20)



Total Number of Valid Hours: 699







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

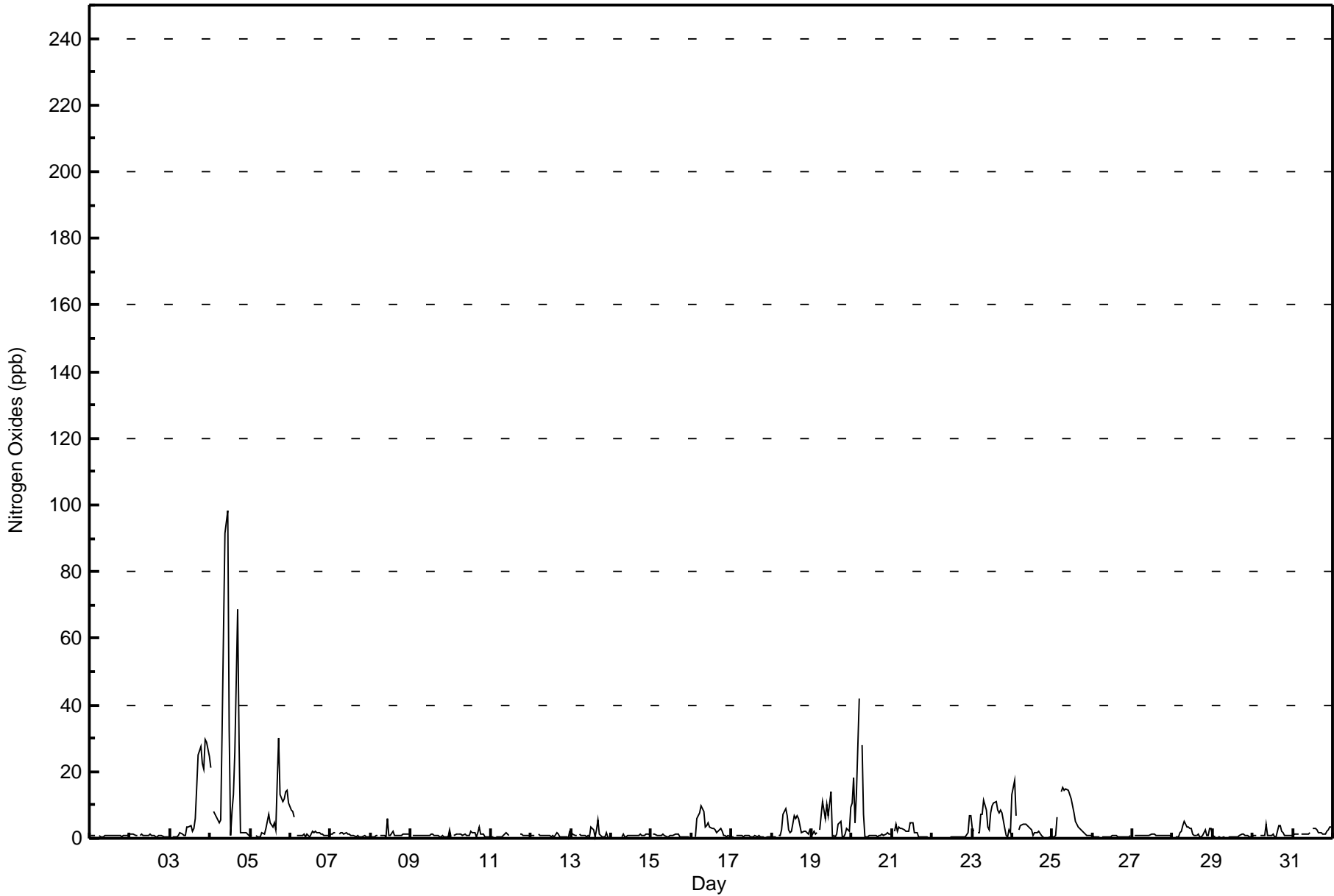
**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Mackay River - December 2017**

Maximum Value: 98 ppb on Dec 4 11:00																	Maximum Daily Average: 22.8 ppb on Dec 4																	Hours in Service: 744															
Minimum Value: 0 ppb on Dec 14 04:00																	Minimum Daily Average: 0.5 ppb on Dec 29																	Hours of Data: 707															
Maximum Diurnal Average: 5.4 ppb at hour 11																	Minimum Diurnal Average: 1.8 ppb at hour 3																	Hours of Missing Data: 37															
Monthly Average: 3.0 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 O <sub>3</sub> = 2 P <sub>90</sub> = 7 P <sub>99</sub> = 32																	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-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																							
2-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																							
3-Dec	Z	0	0	0	1	1	2	1	1	1	3	3	4	2	3	6	15	25	28	23	21	30	29	25	9.7	30																							
4-Dec	21	Z	8	7	6	5	5	32	62	92	98	33	1	8	13	26	68	29	2	2	2	1	1	1	22.8	98																							
5-Dec	1	1	Z	1	1	0	1	2	1	3	5	7	5	3	5	3	17	30	13	11	12	14	14	11	6.9	30																							
6-Dec	8	8	6	Z	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	2.0	8																							
7-Dec	1	1	1	2	Z	1	2	2	1	2	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1.0	2																							
8-Dec	0	0	1	1	1	Z	1	1	1	1	6	1	1	2	1	1	1	1	1	1	1	1	1	1	1.1	6																							
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0.9	2																							
10-Dec	0	Z	1	1	1	1	1	1	1	1	1	2	2	2	0	2	3	1	1	1	1	1	1	0	1.1	3																							
11-Dec	0	0	Z	0	0	0	0	1	1	2	1	1	C	C	C	C	C	1	1	1	1	1	1	1	0.8	2																							
12-Dec	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	2	1	0	0	0	0	0	0	2	0.8	2																							
13-Dec	2	1	1	1	Z	1	1	1	1	1	1	3	3	0	2	5	1	1	1	1	2	0	0	0	1.3	5																							
14-Dec	0	0	0	0	0	Z	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																							
15-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.8	1																							
16-Dec	0	Z	0	6	7	8	10	8	3	4	5	4	3	3	3	2	2	3	2	1	1	1	1	1	3.3	10																							
17-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.6	1																							
18-Dec	0	0	0	Z	1	1	3	7	9	7	2	2	2	7	6	7	6	4	2	2	2	2	1	2	3.3	9																							
19-Dec	1	2	1	2	Z	3	11	8	6	10	7	14	1	1	1	4	5	0	0	1	3	2	9	4.1	14																								
20-Dec	11	18	5	14	42	Z	28	7	0	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	6.0	42																							
21-Dec	Z	2	4	2	3	3	3	3	2	2	2	5	5	2	2	2	1	1	0	1	1	1	0	0	1.9	5																							
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	7	0.9	7																							
23-Dec	3	2	Z	2	2	7	7	11	8	3	3	7	10	11	11	8	8	9	8	3	1	1	2	2	5.6	11																							
24-Dec	13	17	7	Z	3	4	4	4	4	4	3	2	1	2	2	2	2	1	0	0	0	0	0	0	3.3	17																							
25-Dec	0	1	1	6	Z	14	15	14	15	14	13	12	10	8	5	3	3	3	2	2	1	1	1	1	6.3	15																							
26-Dec	1	1	1	1	1	Z	1	1	0	0	0	1	1	1	1	1	1	1	1	0	0	0	1	1	0.6	1																							
27-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																							
28-Dec	1	Z	1	1	2	2	4	5	3	3	3	3	1	1	1	0	1	1	3	1	1	3	3	3	1.9	5																							
29-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0.5	1																							
30-Dec	1	1	1	Z	1	1	1	1	4	1	1	1	1	1	0	4	4	2	2	1	1	1	1	1	1.4	4																							
31-Dec	1	1	1	1	Z	1	1	1	1	1	2	M	3	3	3	2	2	2	1	1	2	3	3	3	1.8	3																							
																								2.8	2.5	1.8	2.0	3.1	2.3	3.4	3.9	4.4	5.1	5.4	3.5	2.1	2.3	2.2	2.7	5.1	4.2	2.4	2.0	1.8	2.3	2.5	2.6	Diurnal Average	
																								21	18	8	14	42	14	28	32	62	92	98	33	10	11	13	26	68	30	28	23	21	30	29	25	Diurnal Maximum	
Z - zerospan                      C - Calibration                      M - Maintenance																																																	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Mackay River - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	688	97.31	97.31
21 - 40	14	1.98	99.29
41 - 80	3	0.42	99.72
81 - 159	2	0.28	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Mackay River - December 2017**

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	18	2	0	3	3	16	29	90	86	73	95	137	79	40	5	680
21 - 40	2	2	0	0	0	0	2	2	2	0	0	0	0	1	1	2	14
11 - 80	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	3
81 - 159	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	6	20	2	0	3	3	21	33	92	86	73	95	137	80	41	7	699

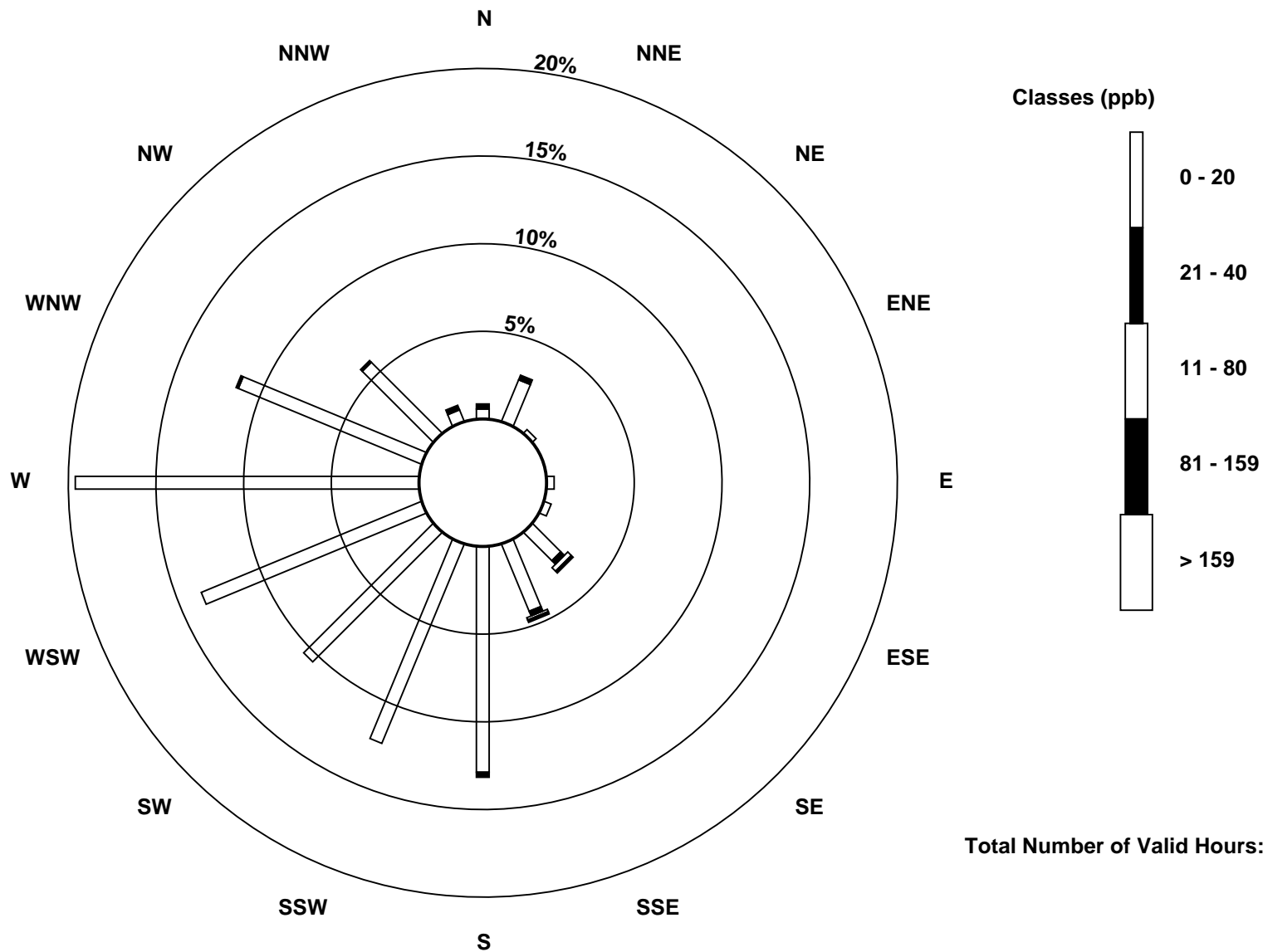
Total Number of Valid Hours: 699

Total Number of Hours: 744

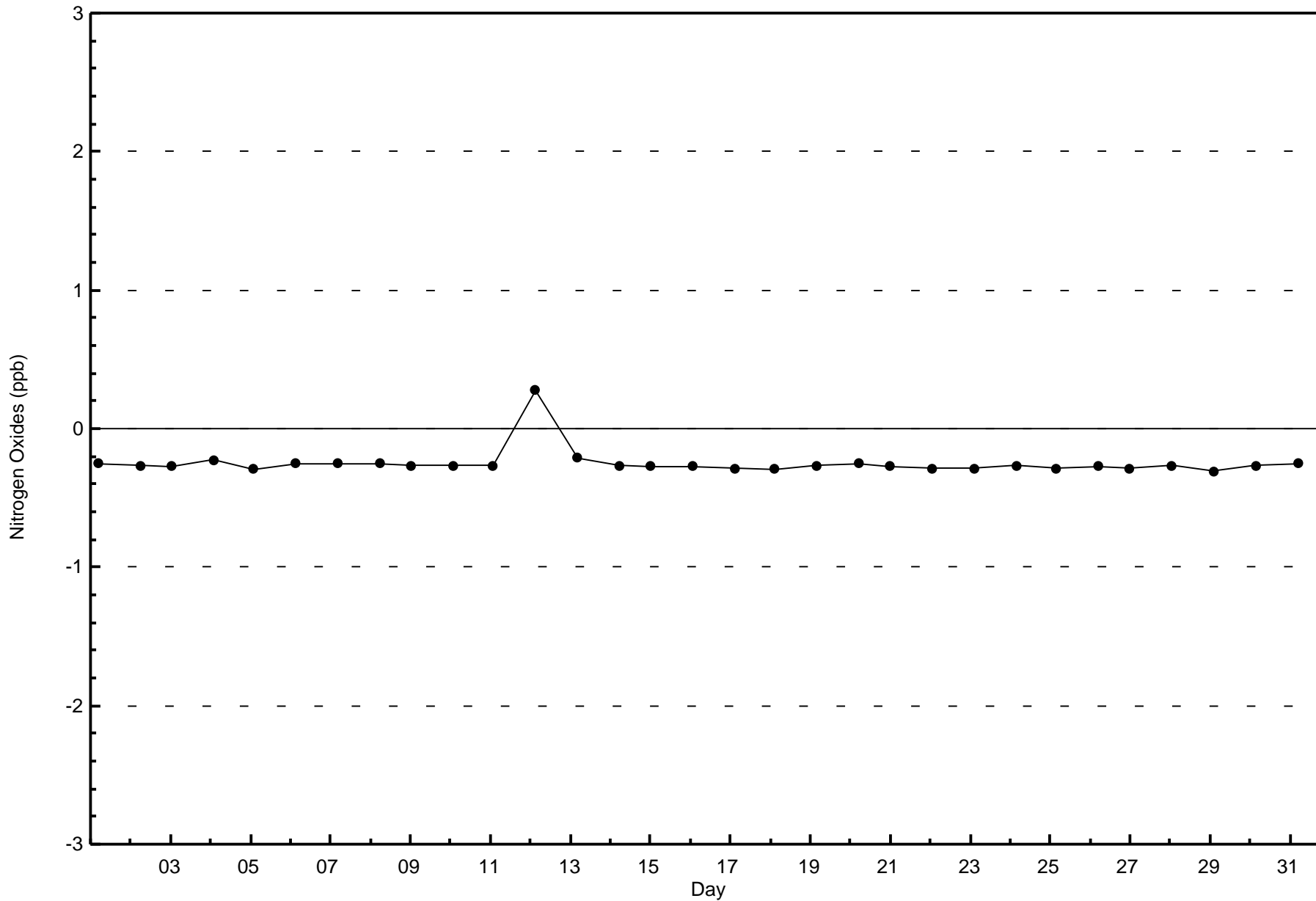


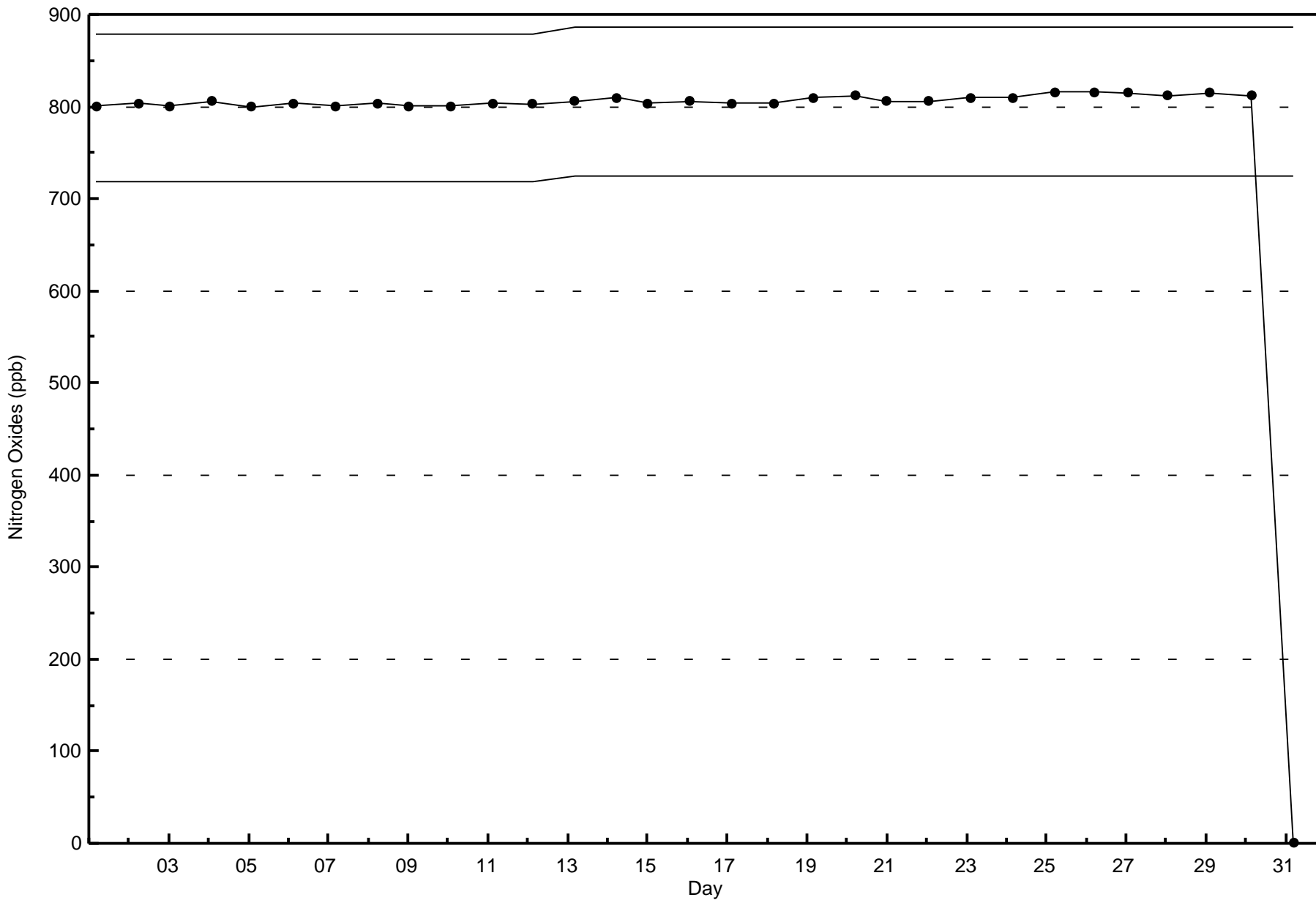
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Mackay River (AMS 20)



Total Number of Valid Hours: 699







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

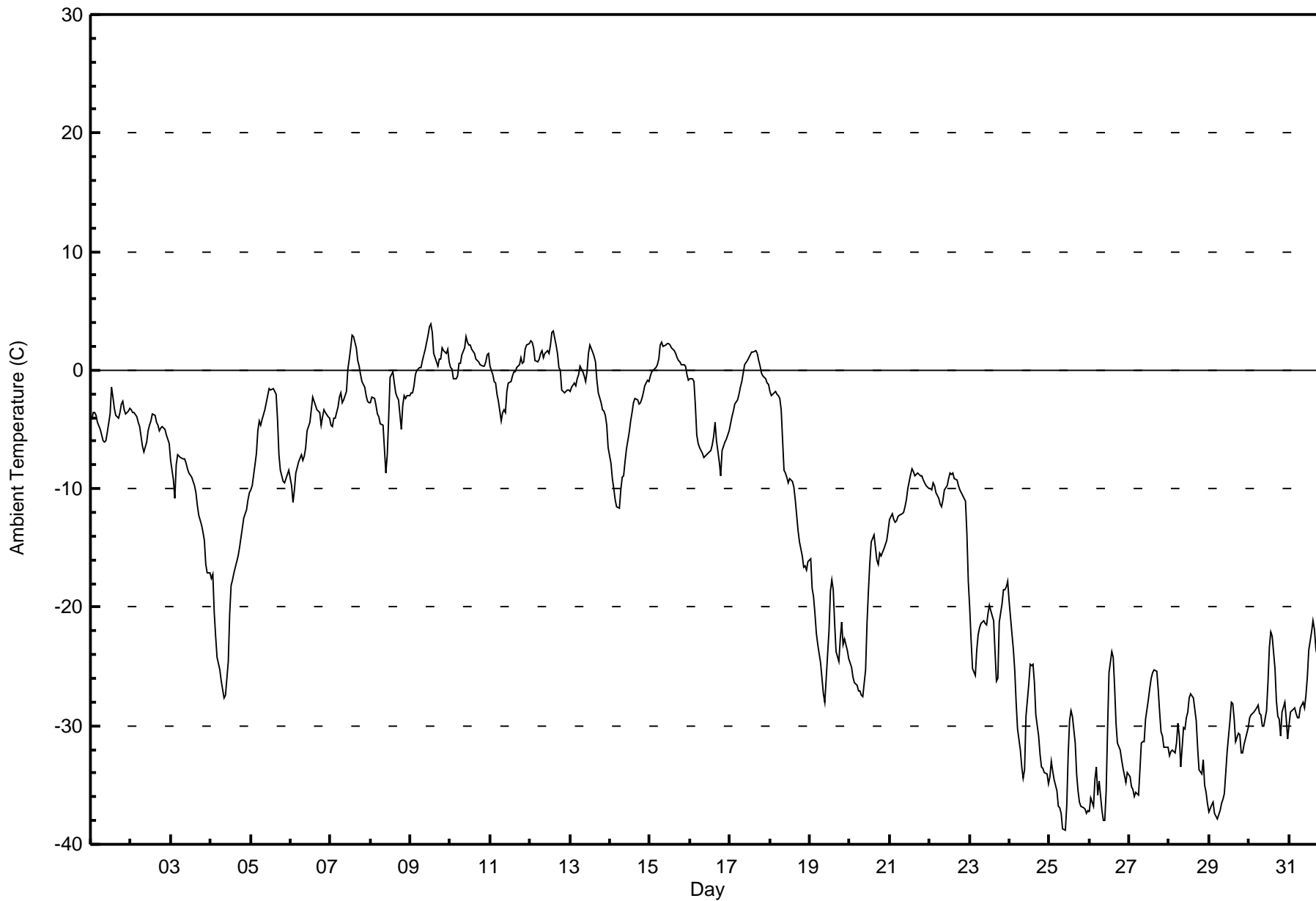
**Ambient Temperature (AT) - C**  
**Mackay River - December 2017**

Maximum Value: 3.9 C on Dec 9 13:00      Maximum Daily Average: 1.0 C on Dec 9		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: -38.8 C on Dec 25 10:00 Maximum Diurnal Average: -10.1 C at hour 14 Monthly Average: -13.06 C		Minimum Daily Average: -35.0 C on Dec 25 Minimum Diurnal Average: -14.7 C at hour 9 Percentiles: P <sub>1</sub> = -37.4 P <sub>10</sub> = -32.1 Q <sub>1</sub> = -25.3 Median = -8.9 Q <sub>3</sub> = -2.1 P <sub>90</sub> = 0.8 P <sub>99</sub> = 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-Dec	-4.1	-3.5	-3.6	-3.8	-4.3	-5.0	-5.4	-6.0	-6.1	-6.0	-5.2	-3.7	-1.4	-2.2	-3.2	-3.8	-4.1	-3.6	-2.8	-2.6	-3.3	-3.7	-3.5	-3.2	-3.9	-1.4
2-Dec	-3.3	-3.5	-3.6	-3.9	-4.4	-4.8	-5.6	-6.4	-6.9	-6.1	-5.2	-4.7	-4.2	-3.7	-3.8	-4.4	-4.7	-5.1	-4.9	-4.7	-5.0	-5.4	-5.8	-6.2	-4.8	-3.3
3-Dec	-7.7	-9.3	-10.8	-8.0	-7.2	-7.3	-7.3	-7.5	-7.5	-7.9	-8.3	-8.7	-9.1	-9.4	-9.7	-10.3	-11.4	-12.2	-13.1	-13.6	-14.4	-16.3	-17.1	-17.0	-10.5	-7.2
4-Dec	-17.5	-17.2	-20.4	-22.5	-24.2	-25.3	-26.2	-27.0	-27.6	-27.4	-24.5	-20.5	-18.2	-17.7	-17.1	-16.7	-15.7	-15.0	-14.2	-13.3	-12.5	-11.8	-11.0	-10.4	-18.9	-10.4
5-Dec	-10.1	-9.8	-8.0	-7.0	-5.2	-4.3	-4.6	-4.1	-3.3	-2.7	-2.2	-1.6	-1.6	-1.6	-1.8	-2.0	-4.2	-7.1	-8.5	-9.4	-9.5	-9.2	-8.8	-8.5	-5.6	-1.6
6-Dec	-9.8	-11.2	-10.1	-8.7	-8.3	-7.8	-7.1	-7.6	-7.2	-6.6	-5.1	-4.5	-3.4	-2.3	-2.6	-3.0	-3.3	-3.6	-4.6	-3.9	-3.3	-3.6	-3.9	-4.1	-5.6	-2.3
7-Dec	-4.6	-4.7	-4.0	-4.0	-3.1	-2.3	-2.0	-2.8	-2.5	-1.8	0.1	1.0	1.9	2.9	2.8	1.8	0.8	0.3	-0.4	-0.9	-1.5	-2.1	-2.6	-2.8	-1.3	2.9
8-Dec	-2.7	-2.3	-2.4	-3.0	-3.7	-3.9	-4.5	-4.6	-6.7	-8.6	-7.1	-4.1	-0.6	-0.1	-1.0	-1.9	-2.3	-2.6	-4.9	-3.0	-2.2	-2.4	-2.2	-2.2	-3.3	-0.1
9-Dec	-1.9	-1.9	-1.4	-0.4	0.0	0.2	0.2	0.8	1.3	1.8	2.9	3.7	3.9	3.2	1.4	1.1	0.4	0.9	0.9	1.9	1.7	1.4	1.8	0.7	1.0	3.9
10-Dec	0.2	0.1	-0.7	-0.7	-0.4	0.5	0.6	1.3	1.9	2.8	2.3	2.2	2.1	1.7	1.4	0.9	0.8	0.7	0.4	0.4	0.3	0.7	1.3	1.4	0.9	2.8
11-Dec	0.4	-0.4	-0.9	-1.1	-2.1	-2.6	-4.3	-3.6	-3.3	-3.6	-1.8	-1.0	-1.0	-0.5	-0.2	-0.1	0.2	0.5	1.0	0.6	0.7	1.7	2.1	2.2	-0.7	2.2
12-Dec	2.5	2.4	1.9	0.8	0.7	0.9	1.4	1.6	1.0	1.3	1.6	1.4	2.1	3.2	3.3	2.1	1.4	0.2	-0.1	-1.7	-2.0	-1.8	-1.7	-1.7	0.9	3.3
13-Dec	-1.8	-1.4	-1.1	-1.3	-0.7	-0.3	0.3	-0.1	-0.5	-0.9	-0.1	1.4	2.1	1.6	1.2	0.7	-0.9	-1.9	-2.7	-3.4	-3.4	-3.8	-4.7	-6.6	-1.2	2.1
14-Dec	-7.9	-9.2	-10.0	-10.9	-11.5	-11.7	-10.1	-9.0	-8.9	-7.8	-6.7	-5.2	-4.3	-3.5	-2.8	-2.4	-2.5	-2.9	-2.7	-2.4	-1.9	-1.3	-0.8	-1.0	-5.7	-0.8
15-Dec	-0.5	-0.1	-0.1	0.2	0.5	0.9	2.2	2.3	2.0	2.1	2.2	2.2	2.1	1.8	1.6	1.4	1.1	0.8	0.7	0.4	0.4	0.3	-0.3	-0.8	1.0	2.3
16-Dec	-0.7	-0.7	-0.9	-3.0	-5.5	-6.2	-6.5	-7.0	-7.3	-7.2	-7.1	-7.1	-6.8	-6.3	-5.6	-4.5	-5.9	-7.7	-8.9	-6.8	-6.4	-6.1	-5.8	-5.1	-5.6	-0.7
17-Dec	-4.5	-3.9	-3.5	-2.9	-2.6	-2.1	-1.4	-1.0	-0.3	0.4	0.8	1.1	1.3	1.5	1.5	1.6	1.4	0.8	0.3	-0.3	-0.5	-0.7	-1.1	-1.2	-0.6	1.6
18-Dec	-1.8	-2.1	-1.9	-1.9	-2.0	-2.1	-2.4	-3.4	-8.4	-8.7	-9.1	-9.5	-9.2	-9.4	-9.8	-10.9	-12.2	-13.6	-14.5	-15.6	-16.6	-16.5	-16.9	-16.2	-8.9	-1.8
19-Dec	-15.9	-18.4	-19.1	-20.5	-22.3	-23.1	-24.7	-26.0	-27.3	-28.0	-26.0	-22.0	-18.6	-17.7	-18.5	-21.4	-23.7	-24.6	-22.7	-21.2	-23.1	-22.7	-23.7	-24.3	-22.3	-15.9
20-Dec	-24.7	-25.0	-25.9	-26.4	-26.6	-27.1	-27.0	-27.4	-27.5	-25.3	-21.4	-18.6	-16.2	-14.4	-13.9	-15.0	-16.1	-16.4	-15.4	-15.6	-15.1	-14.8	-14.4	-13.6	-20.2	-13.6
21-Dec	-12.6	-12.1	-12.6	-12.9	-12.7	-12.4	-12.3	-12.1	-12.0	-11.5	-10.9	-10.0	-8.8	-8.4	-8.5	-8.9	-8.8	-8.7	-8.9	-9.0	-9.3	-9.5	-9.8	-10.0	-10.5	-8.4
22-Dec	-10.0	-10.1	-9.5	-9.8	-10.3	-10.8	-11.3	-11.5	-10.9	-10.1	-9.8	-9.2	-8.7	-8.8	-8.7	-9.1	-9.3	-9.8	-10.1	-10.3	-10.6	-11.0	-13.8	-17.8	-10.5	-8.7
23-Dec	-20.1	-22.8	-25.2	-25.7	-23.7	-22.3	-21.7	-21.3	-21.1	-21.3	-21.5	-20.6	-19.8	-20.4	-21.2	-23.8	-26.3	-26.0	-21.3	-19.7	-18.6	-18.5	-18.3	-17.9	-21.6	-17.9
24-Dec	-19.4	-22.2	-23.6	-25.2	-28.0	-30.2	-32.0	-33.5	-34.5	-33.7	-29.2	-26.5	-24.8	-24.9	-24.8	-26.3	-29.0	-30.8	-32.5	-33.4	-33.5	-34.0	-34.0	-34.9	-29.2	-19.4
25-Dec	-34.3	-33.0	-33.8	-34.6	-35.5	-36.8	-36.9	-37.4	-38.7	-38.8	-36.7	-32.4	-29.6	-28.7	-29.2	-31.4	-34.1	-35.5	-36.5	-36.8	-37.0	-37.1	-37.4	-37.2	-35.0	-28.7
26-Dec	-37.2	-36.1	-36.8	-34.6	-33.5	-35.9	-34.6	-37.1	-38.0	-38.0	-35.5	-30.3	-25.5	-23.8	-24.3	-26.7	-29.8	-31.5	-32.1	-32.9	-33.6	-34.2	-34.8	-33.9	-33.0	-23.8
27-Dec	-34.3	-35.1	-35.4	-35.9	-35.6	-35.8	-33.7	-31.5	-31.3	-31.3	-29.4	-27.8	-26.9	-26.1	-25.6	-25.3	-25.4	-26.9	-28.9	-30.5	-30.9	-31.8	-31.8	-31.8	-30.8	-25.3
28-Dec	-32.5	-32.1	-32.0	-32.3	-31.5	-29.7	-30.9	-33.4	-30.2	-30.3	-29.4	-28.9	-27.6	-27.3	-27.7	-28.6	-29.6	-31.9	-33.7	-34.0	-32.9	-35.0	-35.6	-36.6	-31.4	-27.3
29-Dec	-37.3	-36.7	-36.5	-37.4	-37.6	-37.8	-37.2	-36.6	-36.2	-35.8	-33.9	-32.1	-29.6	-28.1	-28.1	-29.5	-31.3	-30.6	-30.8	-32.2	-32.3	-31.6	-31.1	-30.2	-33.4	-28.1
30-Dec	-29.3	-29.0	-29.0	-28.9	-28.5	-28.2	-28.9	-29.1	-30.0	-30.0	-28.8	-26.4	-23.4	-22.1	-22.4	-25.2	-27.8	-29.2	-29.5	-30.8	-28.9	-28.1	-29.5	-31.1	-28.1	-22.1
31-Dec	-29.9	-28.9	-28.6	-28.5	-28.9	-29.3	-29.3	-28.5	-28.0	-28.5	-27.4	-25.8	-23.7	-22.1	-21.2	-21.8	-23.3	-22.7	-23.0	-23.8	-24.2	-24.3	-24.7	-25.1	-25.9	-21.2
	-13.3	-13.6	-13.9	-14.0	-14.2	-14.3	-14.3	-14.5	-14.7	-14.5	-13.3	-11.9	-10.6	-10.1	-10.3	-11.1	-12.1	-12.8	-13.0	-13.2	-13.2	-13.3	-13.5	-13.8	Diurnal Average	
	2.5	2.4	1.9	0.8	0.7	0.9	2.2	2.3	2.0	2.8	2.9	3.7	3.9	3.2	3.3	2.1	1.4	0.9	1.0	1.9	1.7	1.7	2.1	2.2	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Mackay River - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	248	33.33	33.33
-20 - 0	386	51.88	85.22
0 - 10	110	14.78	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) - %  
Mackay River - December 2017**

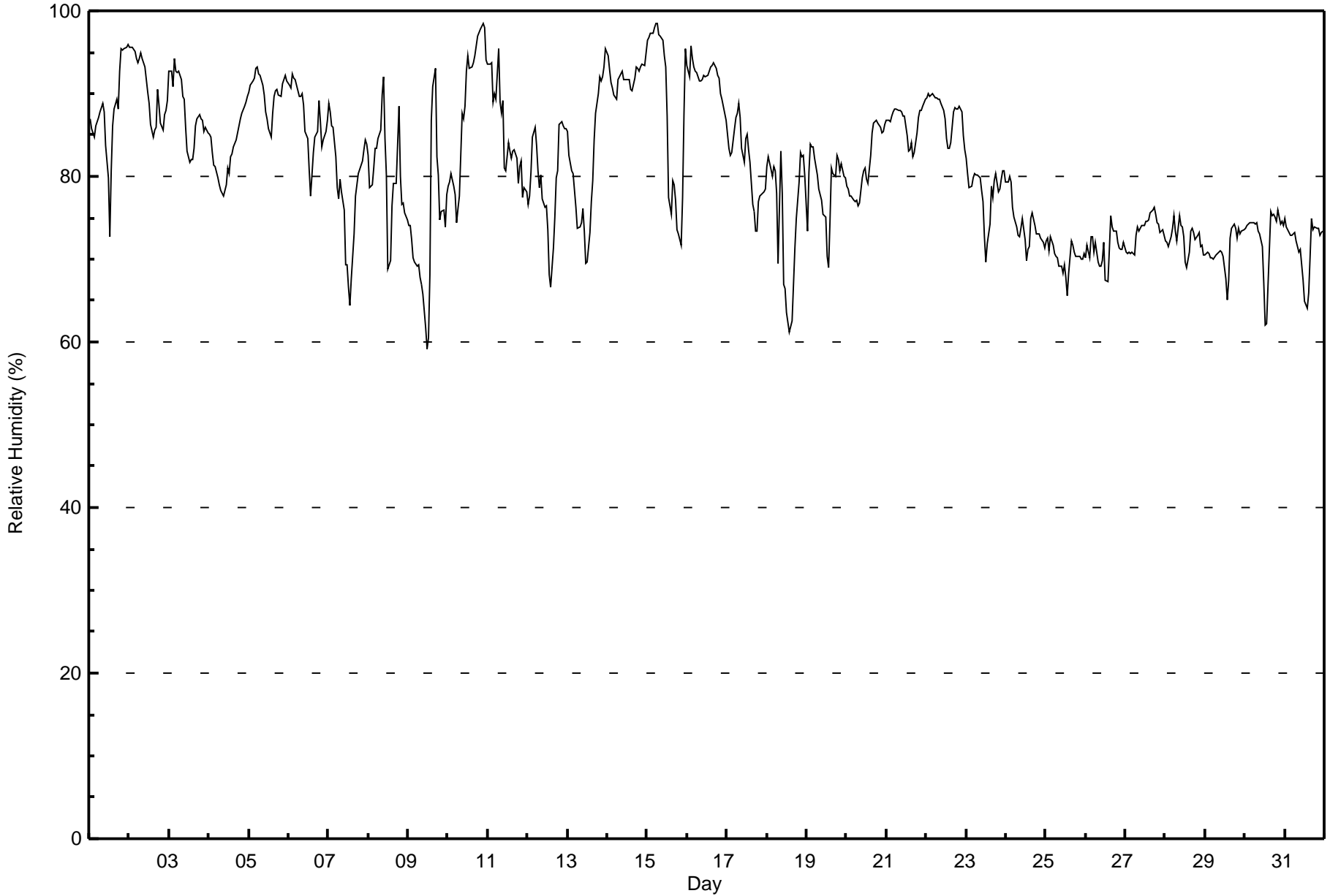
Maximum Value: 99 % on Dec 15 06:00      Maximum Daily Average: 92.1 % on Dec 14																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 59 % on Dec 9 12:00      Minimum Daily Average: 70.2 % on Dec 25 Maximum Diurnal Average: 82.8 % at hour 1      Minimum Diurnal Average: 75.6 % at hour 14 Monthly Average: 81.0 %      Percentiles: P <sub>1</sub> = 62 P <sub>10</sub> = 70 Q <sub>1</sub> = 74 Median = 81 O <sub>3</sub> = 88 P <sub>90</sub> = 93 P <sub>99</sub> = 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-Dec	87	86	85	85	86	87	88	88	89	88	84	80	73	81	86	88	89	88	93	95	95	95	96	96	87.8	96
2-Dec	96	96	96	95	94	94	94	95	94	93	92	90	89	86	85	86	86	90	89	86	86	87	88	89	90.6	96
3-Dec	93	93	91	94	93	93	93	92	90	89	86	83	82	82	83	83	86	87	87	87	87	85	86	85	87.8	94
4-Dec	85	85	83	81	81	80	79	78	78	79	81	80	82	83	84	84	85	86	86	87	88	88	89	90	83.1	90
5-Dec	90	91	92	92	93	93	92	92	91	90	88	87	86	85	88	90	90	91	90	90	91	92	92	91	90.2	93
6-Dec	91	91	92	92	92	91	90	90	90	89	85	85	81	78	80	83	85	85	89	87	84	84	85	87	86.8	92
7-Dec	89	88	86	86	82	79	77	80	78	76	69	69	67	64	68	73	78	79	80	81	82	83	84	84	78.4	89
8-Dec	83	79	79	81	83	83	85	86	90	92	85	80	69	70	76	79	79	79	89	80	77	77	76	75	80.4	92
9-Dec	74	74	72	70	70	69	69	68	67	66	62	59	61	68	87	91	93	82	80	75	76	76	74	78	73.3	93
10-Dec	79	79	80	79	78	74	76	78	88	87	88	93	95	93	93	94	95	96	97	98	98	98	98	94	88.6	98
11-Dec	94	93	94	89	90	89	95	89	88	89	81	81	84	83	82	83	83	82	79	81	82	77	79	78	85.3	95
12-Dec	77	78	80	85	86	84	81	79	80	77	76	76	74	68	67	71	75	80	81	86	87	86	86	86	79.4	87
13-Dec	85	82	81	80	78	76	74	74	74	76	73	70	70	73	77	80	84	88	90	92	92	92	93	95	81.3	95
14-Dec	95	93	91	91	90	89	92	92	92	93	92	92	92	92	91	90	92	93	93	93	93	94	93	95	92.1	95
15-Dec	96	97	97	97	98	99	98	97	97	96	95	93	87	77	75	79	79	77	74	73	72	77	88	95	88.1	99
16-Dec	93	92	96	94	93	93	92	92	92	92	92	92	92	93	93	93	94	93	92	92	90	89	88	87	92.1	96
17-Dec	85	83	82	83	86	87	88	89	87	83	82	84	85	83	82	77	76	73	73	77	78	78	78	78	81.6	89
18-Dec	81	82	81	80	81	81	78	69	83	78	67	66	63	61	62	63	67	71	75	79	83	82	83	80	74.9	83
19-Dec	73	80	84	84	84	82	80	78	78	77	75	75	70	69	75	81	80	80	83	82	81	82	80	80	78.9	84
20-Dec	79	79	78	78	77	77	77	77	77	80	81	81	80	79	83	85	86	87	87	86	86	85	85	86	81.4	87
21-Dec	87	87	87	87	88	88	88	88	88	88	87	87	85	83	83	84	82	83	85	87	88	88	88	89	86.5	89
22-Dec	90	90	90	90	90	90	90	89	89	89	88	87	85	83	83	84	88	88	88	88	89	88	85	83	87.6	90
23-Dec	82	80	79	79	80	80	80	80	80	78	77	73	70	72	74	79	77	79	80	78	78	80	81	81	78.2	82
24-Dec	79	79	80	79	76	75	74	73	73	74	75	72	70	71	71	75	76	74	73	73	73	73	72	71	74.2	80
25-Dec	72	73	71	73	72	71	70	70	69	69	68	69	68	66	68	72	72	71	70	70	70	70	70	71	70.2	73
26-Dec	70	72	70	73	73	71	72	70	69	69	70	72	67	67	71	75	74	73	73	72	71	71	71	72	71.3	75
27-Dec	71	71	71	71	71	71	73	74	73	74	74	74	75	75	75	76	76	76	75	74	74	73	73	73	73.4	76
28-Dec	72	72	72	73	74	75	73	72	75	74	74	73	70	69	71	73	74	73	72	73	73	71	72	70	72.5	75
29-Dec	70	71	71	70	70	70	71	71	71	71	71	70	68	65	68	73	74	74	74	72	74	73	73	74	71.1	74
30-Dec	74	74	74	74	74	74	74	74	73	73	71	67	62	62	67	76	75	75	75	75	76	74	75	74	72.7	76
31-Dec	75	74	73	73	73	73	73	72	71	71	69	68	65	64	66	70	75	74	74	74	74	73	73	73	71.7	75
																			82.8 82.7 82.5 82.5 82.4 81.8 81.8 81.1 81.7 81.3 79.2 78.4 76.2 75.6 77.8 80.3 81.4 81.6 82.2 82.1 82.1 82.1 82.4 82.6				Diurnal Average			
																			96 97 97 97 98 99 98 97 97 96 95 93 95 93 93 94 95 96 97 98 98 98 98 96				Diurnal Maximum			





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Mackay River - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	1	0.13	0.13
60 - 80	350	47.04	47.18
80 - 100	393	52.82	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

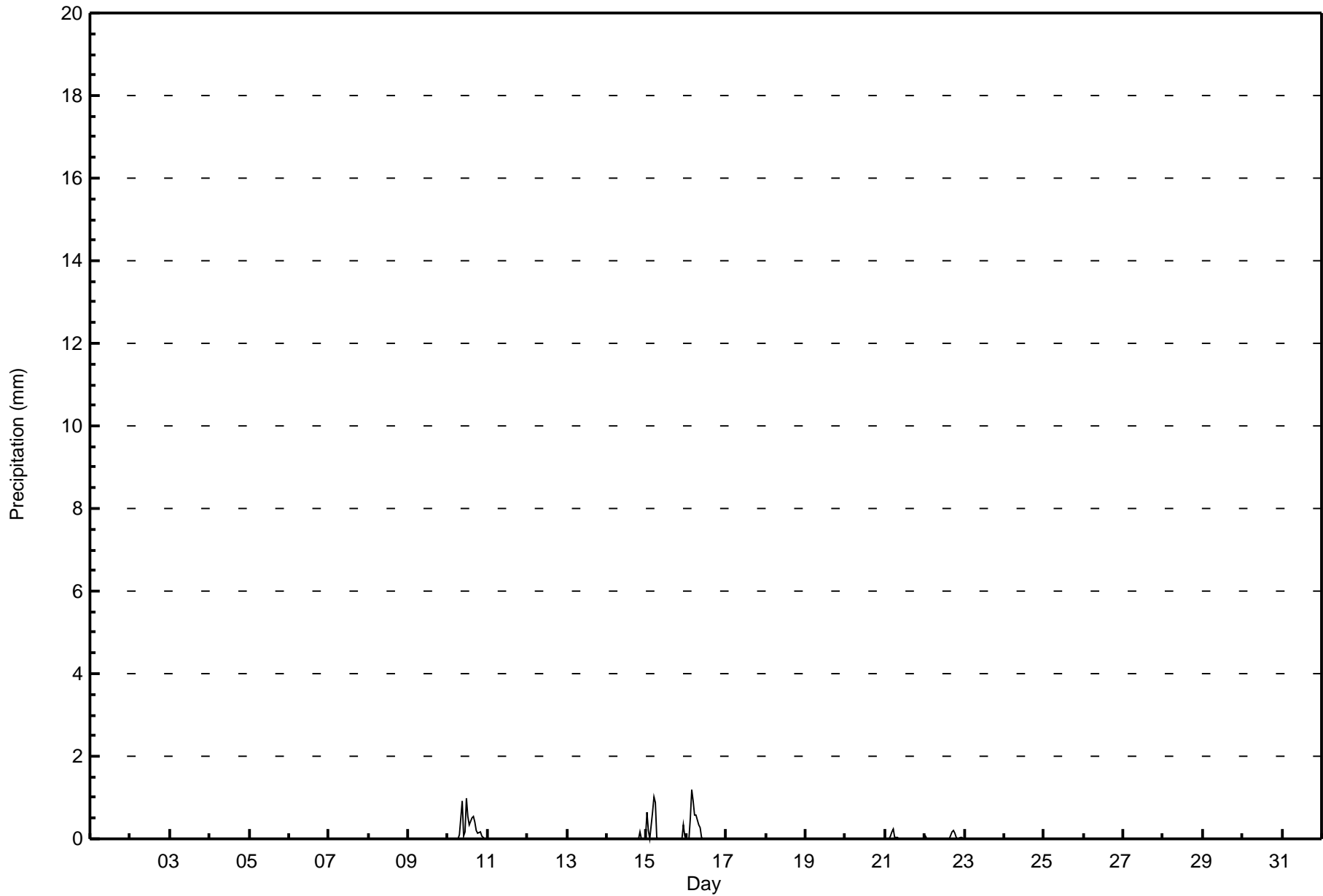
Mackay River - December 2017

Maximum Value: 1.2 mm on Dec 16 04:00																				Maximum Daily Total: 5.2 mm on Dec 10					Hours in Service: 744		
Minimum Value: 0.0 mm on Dec 8 16:00																				Minimum Daily Total: 0.0 mm on Dec 9					Hours of Data: 561		
Maximum Diurnal Total: 2.1 mm at hour 5																				Minimum Diurnal Total: 0.1 mm at hour 22					Hours of Missing Data: 183		
Monthly Total: 14.89 mm																				Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.9					Hours of Calibration: 0		
																									Percent Operational Time: 75.4		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
2-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
3-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
4-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
5-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
6-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
7-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
8-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.1	0.2	1.0	0.5	0.3	0.5	0.5	0.4	0.2	0.1	0.2	0.1	0.1	0.0	0.0	5.2	1.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.2	0.2	0.2
15-Dec	0.7	0.2	0.0	0.6	1.0	0.9	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	0.3	0.1	3.8	1.0	
16-Dec	0.0	0.0	0.5	1.2	0.9	0.6	0.6	0.3	0.3	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	4.4	1.2	
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
21-Dec	0.0	0.0	0.0	0.1	0.2	0.3	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	0.6	0.3	
22-Dec	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	0.2	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.7	0.2		
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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			
AF - Analyzer Failure																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Mackay River - December 2017**

<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	546	97.33	97.33
0.4 - 0.5	5	0.89	98.22
0.6 - 0.7	4	0.71	98.93
0.8 - 1.4	6	1.07	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 561

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Mackay River - December 2017

Maximum Speed: 17 km/h on Dec 18 11:00	Maximum Daily Speed Average: 9.8 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 25 06:00	Minimum Daily Speed Average: 0.4 km/h on Dec 23	Hours of Data: 736
Maximum Diurnal Speed Average: 5.1 km/h at hour 14	Minimum Diurnal Speed Average: 3.3 km/h at hour 17	Hours of Missing Data: 8
Monthly Average Velocity: 3.9 km/h 249.8 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 4 Median = 6 Q <sub>3</sub> = 8 P <sub>90</sub> = 10 P <sub>99</sub> = 14	Percent Operational Time: 98.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW8	WSW9	WSW10	WSW9	SW8	SW6	SSW8	SSW8	SW8	SW6	SSW6	SSW5	SW5	S5	S7	S6	S6	SSW7	SSW11	S8	S5	SSW4	SW4	WSW4	SSW6.4	SSW11
2-Dec	W5	W4	W4	W5	W3	W3	WSW3	WSW4	WSW3	WSW4	WSW4	W4	W4	W5	WSW5	WSW6	WSW5	SSW4	SW5	WSW5	WSW5	SW4	SW4	SW5	WSW4.1	WSW6
3-Dec	SSW6	S5	S5	S6	SSW6	SW6	W5	WNW6	WNW8	WNW7	WNW10	NW8	NW7	WNW7	NW7	NNW6	N4	NNW5	N4	NNE4	N3	NNW2	NW1	SE1	WNW3.0	WNW10
4-Dec	WNW2	NW3	SW0	SSW1	SW1	S1	SE2	SSE2	SE2	SE2	SSE3	S4	SSW5	SSE6	SSE6	SSE7	SE7	SE7	SE7	SSE7	SSE6	SSE6	S7	SSW6	SSE3.6	SE7
5-Dec	WSW5	W8	W11	W8	W7	W8	W10	WNW10	WNW11	WNW10	NW11	NW11	NW12	NW14	NW11	NNW8	NNE6	NNE7	NNE6	NNE6	ESE3	SE2	SSW4	SSW6	WNW5.6	NW14
6-Dec	S5	SSW5	SW5	WSW5	SW5	SW5	SSW6	SSW8	S6	SSW7	SSW6	SSW7	SSW6	SW6	SW8	SW8	SW8	WSW5	W6	W8	W8	WSW7	WSW5	WSW5	SW5.7	SW8
7-Dec	WSW6	WSW8	W8	W7	W10	W10	W10	W10	W10	W8	W11	W11	W10	W9	W9	W8	W8	W9	W8	W7	W7	WSW6	WSW7	W6	W8.3	W11
8-Dec	WSW6	WSW8	WSW5	WSW6	WSW5	WSW6	WSW4	SW6	SSE3	S3	S3	SSW4	SSW5	SSW5	S6	SSW7	SSW8	SSW7	SW4	SW7	WSW7	WSW7	WSW8	W7	SW5.0	SSW8
9-Dec	W7	W7	W6	WSW7	WSW8	WSW8	WSW9	WSW9	WSW9	WSW8	W9	W9	WNW7	WNW5	W3	SW2	WSW3	W4	WSW5	W6	W8	WSW7	WSW7	WNW7	W6.5	WSW9
10-Dec	W7	WSW6	WSW5	WSW6	WSW6	SW6	SSW5	SW5	SW6	WSW6	WNW7	WNW14	WNW14	WNW15	NW15	WNW13	NW11	NW8	WNW4	WNW3	WSW2	SSW3	WSW4	W7	W6.4	WNW15
11-Dec	WSW6	WSW6	WSW5	AF	AF	AF	AF	AF	AF	AF	AF	SSW6	S7	SSW8	S8	S8	S9	SSW10	SSW9	SSW7	SSW7	SW7	SSW7	SW6	----	SSW10
12-Dec	WSW7	WSW7	W7	W7	W6	W8	W8	W7	W8	W10	W8	W7	W8	WNW10	WNW9	WNW7	WNW9	WNW8	WNW8	W5	W5	W5	W5	W6	W7.2	WNW10
13-Dec	W6	W7	W7	WSW6	WSW7	WSW7	WSW9	W10	W10	W10	WNW9	WNW9	NW14	NW14	NNW12	NW11	WNW6	WNW7	W6	W6	W7	WNW7	W5	W3	WNW7.3	NW14
14-Dec	W2	S2	SSE3	SSW2	SSE2	S4	S6	S6	S6	S7	S7	S6	S7	S8	SSE5	SSE3	SSE4	S5	S4	SSW4	SW4	SSW4	S3	S3	S4.3	S8
15-Dec	SSW3	SW3	S5	SSW7	SSW6	SW6	WSW8	W10	W9	W10	W10	W10	WNW11	WNW12	WNW11	W9	W9	WSW10	WSW9	WSW8	W10	W10	W10	W8	W7.7	WNW12
16-Dec	W8	W9	WNW9	N8	NNE6	NE4	NE3	E3	E3	SE3	SSE5	SE5	SSE5	SSE5	S6	SW4	S6	S5	S6	S8	S8	S10	S10	S11	S2.8	S11
17-Dec	S11	SSW11	S11	S10	S9	SSW9	SSW10	SSW9	SW7	WSW8	W10	W11	W12	W12	W11	WNW14	WNW11	WNW13	WNW11	W9	W7	W7	W7	W9	WSW7.8	WNW14
18-Dec	W6	W6	W8	W9	WNW9	WNW10	NW10	NW16	NNE7	NW13	NW17	NW15	WNW14	NW14	NW13	NW14	NW10	WNW8	WNW8	WNW7	WNW6	WNW8	WNW7	NW8	WNW9.8	NW17
19-Dec	NW10	WNW3	W4	W3	WNW3	NW2	NNE0	SE2	SSE2	SE2	SSE2	S3	SSW4	SSW4	SW4	S3	S4	S5	SSW8	SSW7	SW4	W4	W3	SSW5	SW2.4	NW10
20-Dec	S4	SSW3	SW3	S3	SSE3	SSE3	S4	SSE3	SSE4	S6	S5	S7	S7	SSW7	SSW6	S6	S6	S7	S7	S7	S8	S6	SSW7	SSW6	S5.2	S8
21-Dec	WSW4	W6	WNW5	W4	WNW5	WNW7	WNW6	WNW7	WNW7	WNW7	WNW9	NW9	NW12	WNW9	WNW10	WNW8	WNW10	WNW9	W9	WNW10	WNW9	WNW7	W7	W6	WNW7.4	NW12
22-Dec	W7	WSW5	W6	WSW6	WSW6	WSW6	WSW5	WSW6	W8	WSW7	W7	W7	W9	WNW8	W6	W7	WNW8	W9	W9	W8	WNW7	NNW6	NNE10	NNE7	W5.8	NNE10
23-Dec	NNE5	NNE2	SW1	SE2	SSE3	SE4	SE5	SE4	ESE4	E3	NNE3	NNE5	NNE2	N4	W2	SW1	S2	WSW3	W4	WSW5	W5	W4	WNW5	NW7	WNW0.4	NW7
24-Dec	NNE10	NNE9	N9	N5	NNE3	S0	SSE1	S1	W2	W3	WNW4	WNW4	WNW7	WNW6	W4	W3	S1	SSE2	S1	SW3	SW1	SSW0	S1	SE1	NW1.5	NNE10
25-Dec	SE0	E0	NNE1	NNE3	NNE1	WSW0	S1	SSE1	SSE1	SSE1	SW0	SW4	WSW5	WSW4	WSW3	SSW2	SSW2	SSW3	SW3	SSW3	SSW4	SSW4	SW4	SW4	SW1.7	WSW5
26-Dec	SW4	SW5	SW4	SW5	SW4	SW4	SW4	SSE2	SE2	SE3	SSW3	SW3	WSW4	SW4	SSW4	S5	S4	SSW4	SSW3	SSW3	SSE1	SSW1	WSW2	W2	SSW3.0	SW5
27-Dec	SW2	WSW1	SSW1	W1	SW2	W1	W2	W3	SW3	WSW4	WSW4	WSW5	WSW5	WSW7	WSW6	WSW6	WSW5	SW4	SW4	SW4	SSW4	S3	S4	SSE2	SW3.2	WSW7
28-Dec	SE2	SE1	S1	W2	NW3	NNW4	NW3	WNW3	NW5	WNW5	NW6	WNW6	WNW6	WNW8	NW7	NW5	NW5	NW4	WNW2	NW4	NW6	NW3	WNW4	W2	NW3.7	WNW8
29-Dec	WSW3	WSW2	W2	W1	W2	WSW2	W3	W3	W4	W4	W3	W4	WSW4	WSW4	WSW4	SW4	SW4	SW5	SW5	SSW4	SW5	S3	SSW4	SW4	WSW3.2	SW5
30-Dec	WSW4	SW5	SSW4	SW4	SW3	SW3	SW3	SW4	SSE2	S3	SSW4	SW4	SW3	SW4	SW3	S3	SSE3	SSW5	S4	S5	S7	S7	S5	S5	SSW3.8	S7
31-Dec	S7	S7	S9	S9	S9	S6	S7	S9	S11	SSW10	S10	S10	SSW10	S9	SSW7	SSW6	S6	S9	S9	SSW11	SSW10	SSW11	SSW11	SSW11	S8.9	S11

WSW3.3WSW4.0WSW3.8WSW3.7WSW3.5WSW3.6WSW3.7WSW3.8WSW3.4WSW4.0 W4.4 W4.7 W5.1 W5.1 W4.6WSW3.9WSW3.3WSW3.8WSW4.0WSW4.0WSW4.1WSW3.8WSW3.9WSW3.8 S11 SSW11 SSW11 S10 W10WNW10 W10 NW16 S11 NW13 NW17 NW15WNW14WNW15 NW15WNW14WNW11WNW13 SSW11 SSW11 SSW10 SSW11 SSW11 SSW11

Diurnal Average  
Diurnal Maximum

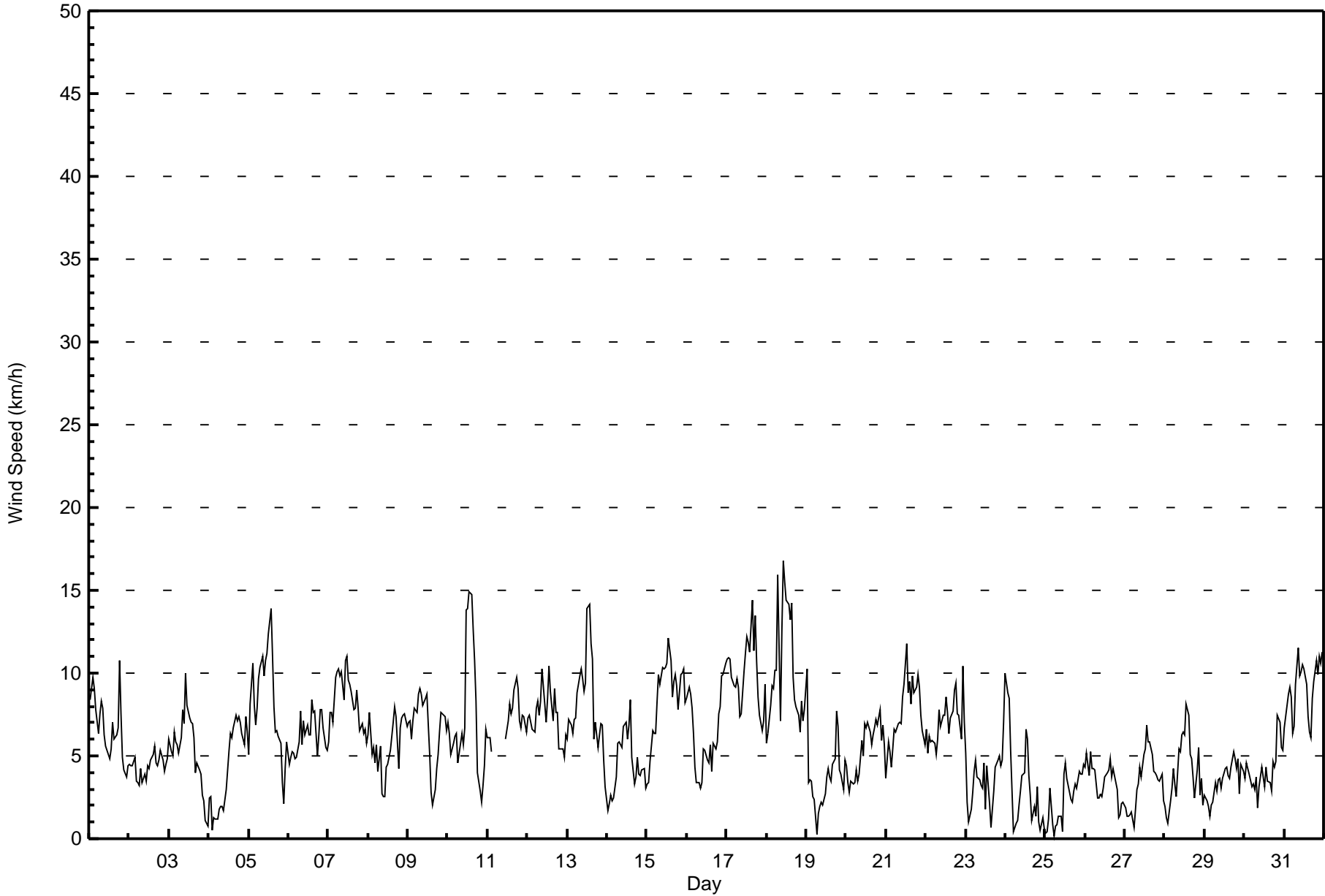
AF - Analyzer Failure

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Mackay River - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Mackay River - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	339	46.06	46.06
6 - 11	373	50.68	96.74
12 - 19	24	3.26	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 736

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Mackay River - December 2017**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	11	2	0	3	3	19	28	41	42	60	51	44	16	11	3	339
6 - 11	2	10	0	0	0	0	3	6	57	49	18	51	99	57	18	3	373
12 - 19	0	0	0	0	0	0	0	0	0	0	0	0	2	8	13	1	24
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
<b>Totals</b>	7	21	2	0	3	3	22	34	98	91	78	102	145	81	42	7	736

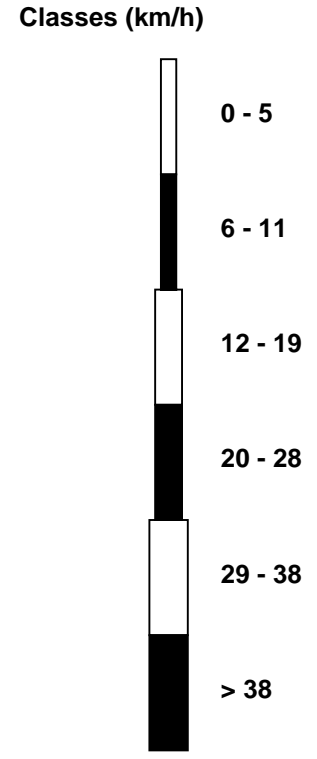
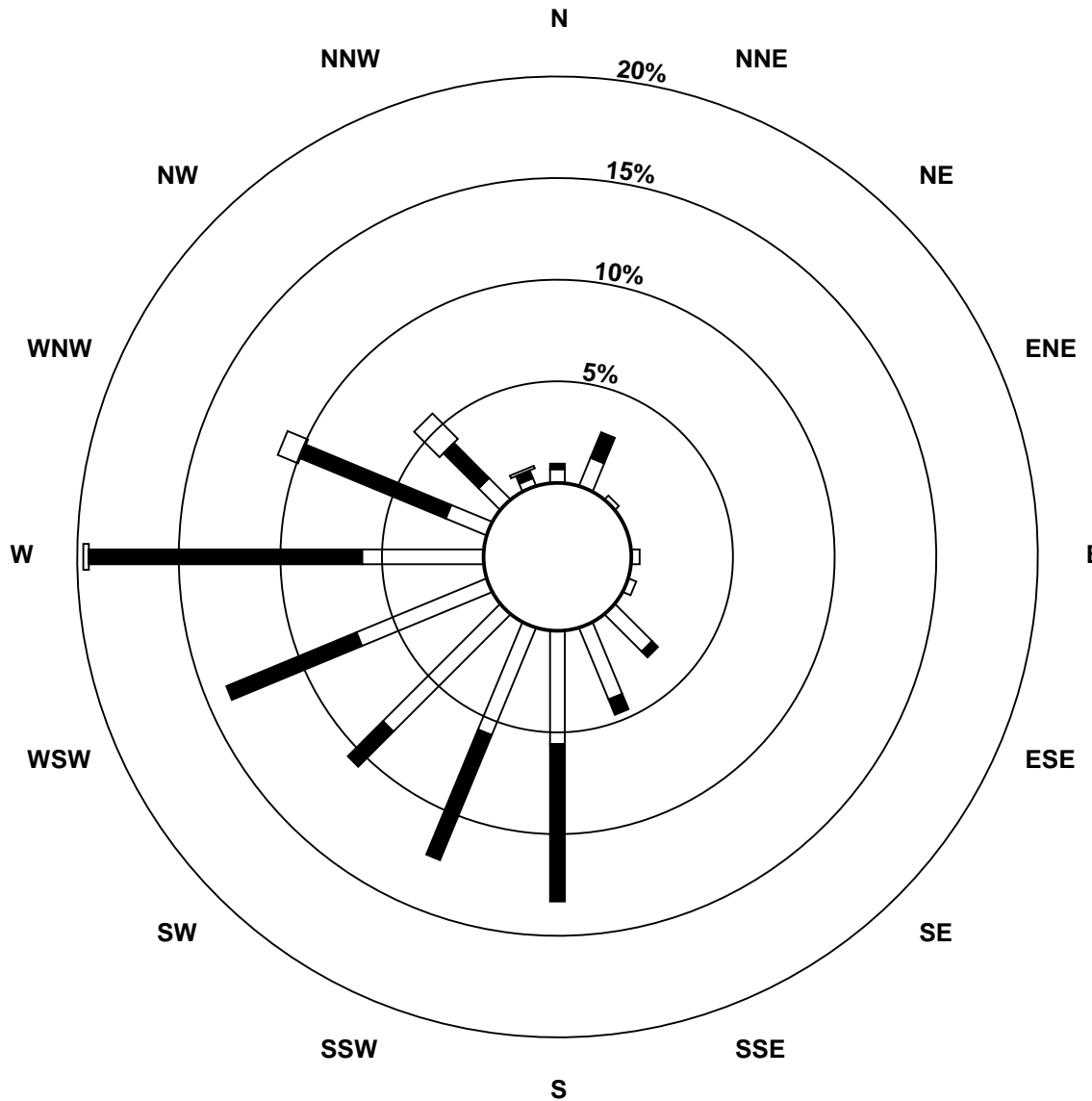
Total Number of Valid Hours: 736

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Mackay River (AMS 20)



Total Number of Valid Hours: 736



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Mackay River - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 17 16:00 Minimum Value: 0 km/h on Dec 4 09:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 O <sub>1</sub> = 1 Median = 2 O <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 5																	Hours in Service: 744 Hours of Data: 736 Hours of Missing Data: 8 Hours of Calibration: 0 Percent Operational Time: 98.9									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	4	3	3	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	1	2	1	2	4	
2-Dec	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	1	2	2	2	1	1	1	2	
3-Dec	1	1	1	2	2	2	2	2	3	2	3	3	2	2	2	2	1	1	1	1	1	1	1	3		
4-Dec	2	2	1	1	1	1	1	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	
5-Dec	2	3	4	4	3	3	4	4	4	3	3	3	4	4	3	2	2	2	2	2	1	1	2	4		
6-Dec	1	1	1	2	1	1	1	2	2	2	2	2	2	2	3	2	3	2	2	3	3	3	3	3	3	
7-Dec	2	3	3	3	4	4	4	4	4	3	4	4	4	3	3	3	3	3	3	3	3	2	2	2	4	
8-Dec	2	3	2	2	1	2	2	2	1	1	1	1	1	1	2	2	2	2	1	2	3	3	3	3	3	
9-Dec	3	3	2	3	3	3	3	4	4	3	4	3	3	2	1	1	1	1	2	2	3	3	3	2	4	
10-Dec	3	2	2	2	2	3	1	2	3	2	3	5	5	5	5	4	3	3	2	1	1	1	2	5		
11-Dec	2	2	2	AF	AF	AF	AF	AF	AF	AF	AF	2	2	2	2	2	2	3	3	2	2	2	2	3		
12-Dec	3	3	3	2	3	3	3	3	3	4	3	3	4	3	3	3	3	2	3	2	2	2	2	4		
13-Dec	2	3	3	2	3	3	4	4	4	4	3	3	5	4	4	4	2	2	2	2	2	2	1	5		
14-Dec	1	1	0	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2		
15-Dec	1	1	1	2	2	2	4	4	4	4	4	4	4	4	4	3	4	4	4	3	4	4	4	4		
16-Dec	3	4	3	3	2	2	1	1	1	2	2	1	1	1	1	1	2	1	1	1	2	2	2	4		
17-Dec	3	3	3	3	2	3	2	2	2	3	5	5	5	5	5	6	5	5	4	3	3	3	3	6		
18-Dec	2	2	3	4	3	3	4	6	3	6	5	5	5	5	5	4	3	3	3	2	2	2	2	6		
19-Dec	3	1	1	1	2	1	1	1	0	1	1	1	1	1	1	1	1	1	2	2	1	1	1	3		
20-Dec	1	1	1	1	1	1	1	0	1	1	1	2	2	2	2	1	1	1	2	1	2	1	2	2		
21-Dec	1	2	2	1	2	2	2	2	2	2	2	3	4	3	3	3	3	3	4	4	3	3	3	4		
22-Dec	2	2	2	2	2	2	2	2	3	3	3	3	4	3	2	3	3	4	3	3	3	3	4	4		
23-Dec	2	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	2	2	2	2	2	2	2		
24-Dec	3	3	3	1	1	1	1	1	1	1	1	2	2	2	2	1	1	0	1	1	1	1	1	3		
25-Dec	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2		
26-Dec	1	1	1	2	2	2	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2		
27-Dec	1	1	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	1	1	1	1	1	1	3		
28-Dec	1	1	1	1	1	1	1	1	2	2	2	3	2	2	2	1	1	1	1	2	2	2	1	3		
29-Dec	1	1	1	1	1	1	2	2	2	2	1	1	2	2	2	1	1	2	2	1	1	1	2	2		
30-Dec	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	1	2		
31-Dec	2	2	2	2	2	2	2	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3	4	4		
																	Diurnal Maximum									
AF - Analyzer Failure																										



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

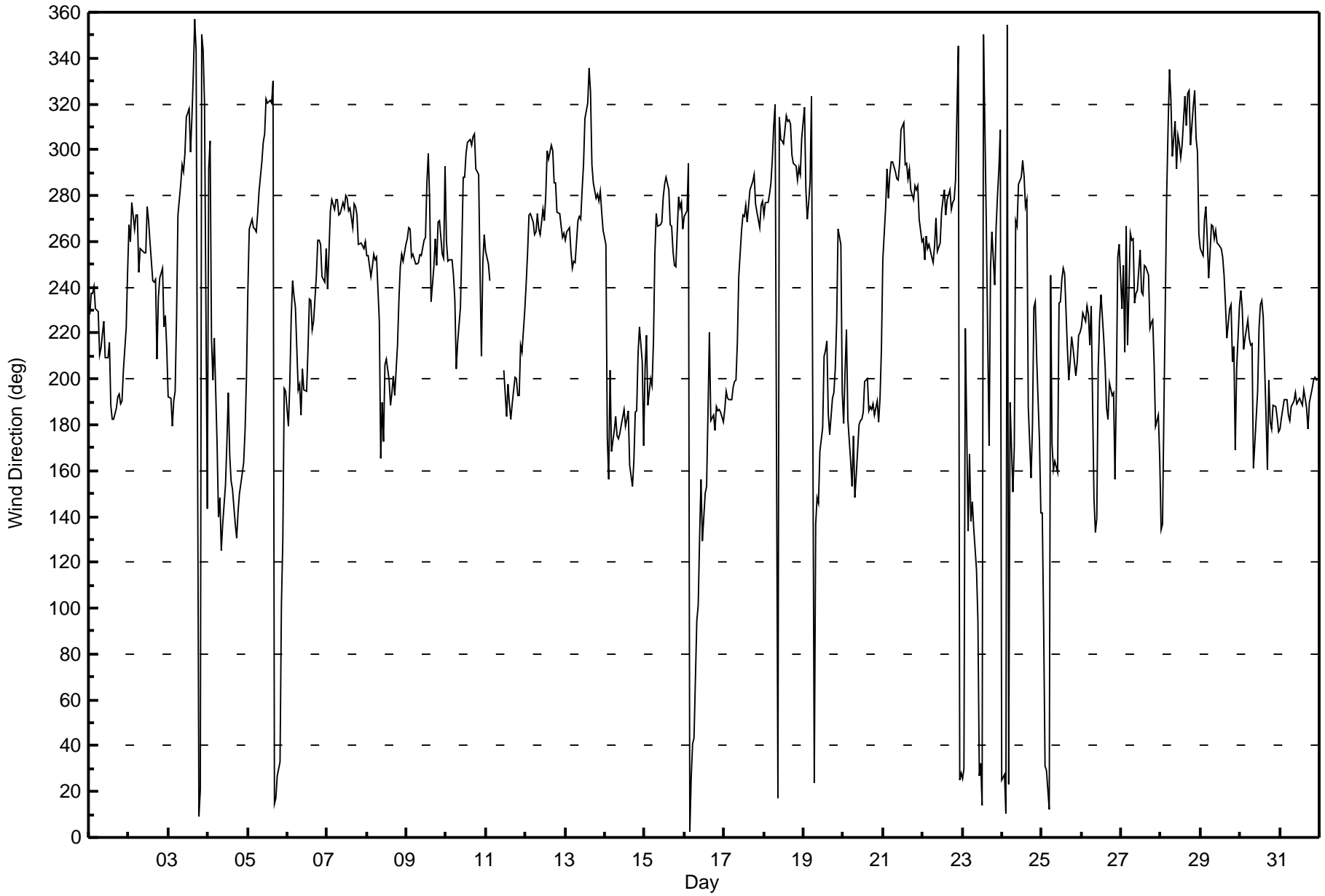
**Wind Direction (WD) - deg**  
**Mackay River - December 2017**

Direction of Maximum Speed: 304 deg on Dec 18 11:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 303.0 deg on Dec 18	Hours of Data: 736
Direction of Minimum Speed: 245 deg on Dec 25 06:00	Hours of Missing Data: 8
Direction of Minimum Daily Speed Average: 0.4 deg on Dec 23	Percent Operational Time: 98.9
Monthly Average Direction: 249.3 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-Dec	228	237	237	241	230	229	210	213	220	225	210	209	216	188	182	183	188	192	193	189	191	204	222	246	212.8
2-Dec	267	260	277	266	272	272	247	257	256	255	255	275	269	260	243	242	243	208	235	244	248	223	228	214	250.1
3-Dec	192	191	179	190	195	227	272	285	294	291	298	314	318	299	314	333	357	343	9	21	350	344	320	143	290.9
4-Dec	292	304	218	199	218	172	140	148	125	137	154	172	194	167	155	152	137	131	142	150	154	164	177	201	161.4
5-Dec	239	265	270	266	266	264	272	282	295	303	307	322	320	322	320	330	14	17	27	33	102	130	196	195	301.1
6-Dec	179	198	227	243	236	231	195	198	184	205	195	195	213	235	234	222	225	245	260	260	259	245	242	257	225.1
7-Dec	239	256	273	278	274	279	278	271	272	277	275	280	279	273	275	266	276	275	271	259	259	258	257	260	270.7
8-Dec	254	254	245	249	255	252	254	225	166	190	173	206	209	199	189	194	201	193	215	235	249	254	251	259	228.1
9-Dec	261	266	266	253	254	250	250	251	254	254	261	262	286	299	278	234	249	261	249	269	269	255	253	293	261.1
10-Dec	260	251	252	252	245	234	204	216	231	258	288	288	298	303	304	302	306	307	292	289	247	210	251	263	276.6
11-Dec	255	250	243	AF	AF	AF	AF	AF	AF	AF	AF	204	183	198	189	183	189	201	200	193	193	214	212	230	--
12-Dec	242	255	272	272	269	263	264	272	265	263	274	269	280	300	296	302	299	285	285	273	272	266	262	264	274.5
13-Dec	261	264	266	255	248	251	251	269	271	270	283	293	314	320	336	325	293	285	279	280	278	282	273	265	284.0
14-Dec	259	175	156	204	168	177	184	175	174	176	180	187	179	183	186	162	153	164	185	186	211	223	207	171	182.5
15-Dec	205	219	188	200	197	216	254	272	267	267	269	279	285	288	282	267	267	256	250	249	279	275	277	265	261.7
16-Dec	271	274	294	2	26	41	43	95	101	131	156	129	150	153	185	220	182	184	177	188	186	187	186	181	184.5
17-Dec	187	195	191	191	191	197	199	200	216	245	265	272	271	276	268	282	284	286	289	277	273	266	276	277	248.0
18-Dec	272	277	277	281	286	296	311	320	17	314	304	304	303	315	312	313	311	298	294	293	287	292	289	305	303.0
19-Dec	318	282	270	277	286	323	24	137	148	146	168	179	210	212	217	185	176	191	194	204	225	266	259	194	223.3
20-Dec	181	203	221	182	164	153	175	148	158	180	182	182	185	199	200	186	188	187	189	184	190	181	192	213	185.9
21-Dec	252	274	292	279	289	295	295	290	287	287	294	309	312	293	294	287	292	283	279	285	282	284	270	260	288.0
22-Dec	261	252	262	257	258	253	251	258	270	256	259	273	278	282	272	278	282	274	277	278	287	345	25	28	277.9
23-Dec	26	30	222	134	167	138	146	135	117	95	27	33	14	350	268	218	171	249	264	241	266	280	292	309	288.5
24-Dec	25	27	10	355	23	190	151	170	269	267	285	288	295	289	275	278	188	157	179	231	234	209	174	142	323.5
25-Dec	141	93	31	29	12	245	171	160	164	159	233	234	243	249	246	213	200	208	219	213	201	207	219	220	218.2
26-Dec	223	229	225	232	228	215	232	147	133	139	205	226	237	217	205	187	182	198	193	194	156	197	253	259	209.6
27-Dec	231	250	212	267	215	264	261	261	233	237	239	256	238	237	250	249	245	222	225	226	206	179	184	165	232.5
28-Dec	134	137	186	281	311	335	322	297	312	292	306	303	297	302	324	311	324	326	302	319	326	305	299	263	308.6
29-Dec	257	254	270	275	261	244	268	266	261	265	259	259	257	253	245	232	218	230	232	207	214	169	204	232	240.5
30-Dec	239	230	213	218	226	218	215	216	161	172	195	222	233	235	227	184	161	199	181	178	189	188	183	177	201.6
31-Dec	178	183	191	191	191	184	182	188	190	194	189	191	192	188	195	192	187	178	190	196	200	201	200	200	191.2

245.5 246.4 249.1 248.1 244.0 244.6 242.7 245.7 246.6 251.2 260.6 264.0 269.1 270.2 263.5 258.6 248.7 243.5 238.2 237.4 240.8 238.6 237.3 240.4  
 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**  
**Mackay River - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Dec 19 07:00 Minimum Value: 11 deg on Dec 3 03:00 Percentiles: P <sub>1</sub> = 13 P <sub>10</sub> = 18 Q <sub>1</sub> = 22 Median = 29 O <sub>3</sub> = 42 P <sub>90</sub> = 48 P <sub>99</sub> = 75																			Hours in Service: 744 Hours of Data: 736 Hours of Missing Data: 8 Hours of Calibration: 0 Percent Operational Time: 98.9							
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	31	38	38	41	34	27	22	22	24	25	21	26	29	33	18	19	15	21	16	18	21	36	25	41	41	
2-Dec	47	43	41	45	39	42	40	41	34	40	50	46	44	52	47	44	37	20	38	51	48	23	25	26	52	
3-Dec	14	16	11	17	22	46	45	35	25	32	25	23	24	23	21	29	23	21	22	21	30	26	60	64	64	
4-Dec	59	63	72	38	60	40	23	38	24	38	29	32	28	23	25	25	22	22	24	27	26	25	23	33	72	
5-Dec	44	47	47	48	41	47	42	36	26	25	23	20	20	19	18	22	27	21	22	24	45	57	34	23	57	
6-Dec	18	20	28	36	29	25	26	19	21	23	23	18	24	35	35	30	30	41	37	42	44	44	44	43	44	
7-Dec	44	45	39	35	40	33	38	41	40	40	40	33	40	46	39	40	37	35	40	52	46	44	47	49	52	
8-Dec	49	42	43	43	35	39	50	28	37	38	43	22	23	20	16	17	18	18	27	31	42	44	48	48	50	
9-Dec	48	46	40	49	48	44	45	47	52	53	47	47	34	25	40	40	35	32	36	42	42	44	45	40	53	
10-Dec	45	41	40	45	43	34	25	35	34	48	36	29	27	23	22	23	23	23	27	27	37	31	44	42	48	
11-Dec	45	46	39	AF	AF	AF	AF	AF	AF	AF	AF	22	21	17	18	20	18	21	23	19	18	24	20	35	46	
12-Dec	41	52	44	39	40	41	44	44	45	45	48	41	40	25	30	23	22	25	30	41	42	43	50	49	52	
13-Dec	46	44	46	46	39	47	46	45	46	45	38	25	26	19	22	20	24	24	34	29	36	29	30	19	47	
14-Dec	59	34	27	30	30	25	15	15	16	19	23	19	24	21	19	29	24	24	16	18	26	24	32	28	59	
15-Dec	37	27	22	21	19	29	45	45	43	45	49	42	32	29	36	47	47	50	48	52	42	43	41	49	52	
16-Dec	46	49	25	42	27	28	29	29	39	33	23	21	25	26	17	39	18	16	13	16	16	18	19	22	49	
17-Dec	22	23	21	21	18	19	18	19	26	49	50	48	43	41	48	34	39	32	29	40	44	48	38	33	50	
18-Dec	48	41	37	34	30	27	25	29	25	25	22	24	25	21	23	20	20	22	24	21	22	25	24	27	48	
19-Dec	21	29	29	36	77	53	98	35	24	15	23	47	28	35	24	20	12	15	13	16	31	28	26	26	98	
20-Dec	21	21	24	25	25	19	19	14	19	13	15	18	21	26	20	13	13	15	16	14	16	18	18	25	26	
21-Dec	41	42	25	38	29	22	22	23	27	29	24	23	20	27	23	26	26	31	36	29	32	34	45	43	45	
22-Dec	44	51	44	48	47	47	42	46	42	43	50	44	44	35	41	35	28	37	38	36	32	52	22	23	52	
23-Dec	23	38	75	44	19	21	22	26	22	27	24	24	82	50	39	54	36	42	47	43	49	46	24	26	82	
24-Dec	27	24	21	21	33	78	41	41	23	23	27	31	30	32	41	41	57	30	40	24	68	87	48	71	87	
25-Dec	60	32	40	16	41	87	39	26	33	19	55	22	45	54	39	22	24	22	18	22	19	18	19	18	87	
26-Dec	20	20	19	23	33	25	27	23	21	12	37	32	30	24	23	14	17	14	26	21	57	54	39	32	57	
27-Dec	29	53	45	43	47	87	63	68	47	40	56	47	41	36	48	46	45	25	19	18	20	24	16	33	87	
28-Dec	16	13	40	20	20	15	15	24	26	21	23	33	30	24	21	22	14	14	24	27	16	20	21	27	40	
29-Dec	29	51	40	41	41	34	57	70	51	53	45	44	42	48	50	34	19	26	29	19	21	49	29	34	70	
30-Dec	47	32	28	30	41	32	48	23	27	21	20	31	52	30	25	25	21	20	26	16	13	15	15	12	52	
31-Dec	15	17	17	18	19	19	19	21	20	19	21	22	20	22	22	18	17	23	19	22	21	21	23	23	23	
																			60 63 75 49 77 87 98 70 52 53 56 48 82 54 50 54 57 50 48 52 68 87 60 71							
																			Diurnal Maximum							
AF - Analyzer Failure																										





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

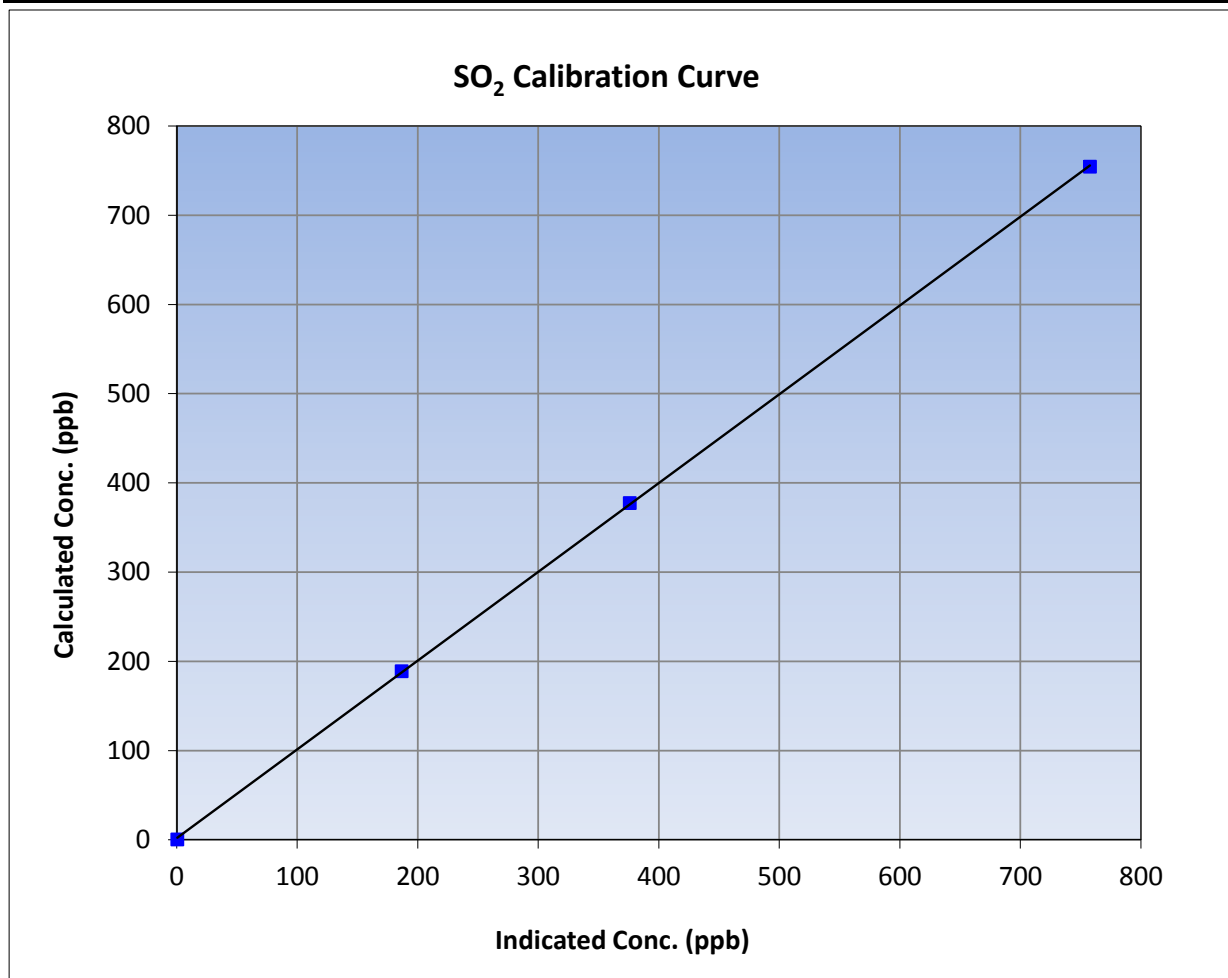
Version-03-2017

### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 13, 2017
Station Name	MacKay River	Station Number	AMS 20
Start Time (MST)	12:40	End Time (MST)	16:43
Analyzer make	Thermo 43i	Analyzer serial #	1501301450

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999970	≥0.995
754.2	757.3	0.9959			
377.2	375.6	1.0041	Slope	0.995088	0.90 - 1.10
188.6	186.3	1.0122			
			Intercept	1.776736	+/-30

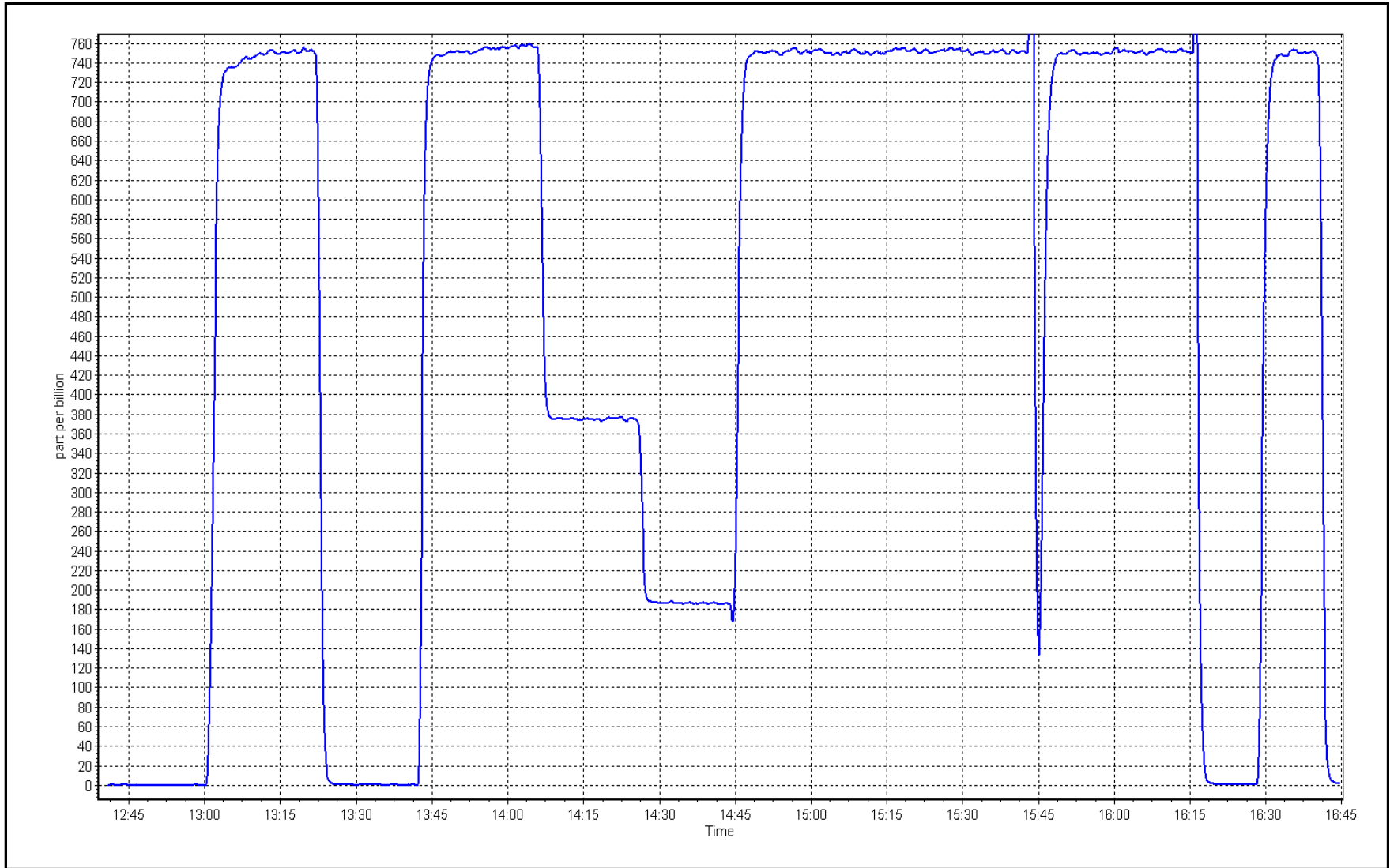




SO2 Calibration Plot

Date: December 11, 2017

Location: MacKay River





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-06-2017

### Station Information

Station Name:	MacKay River	Station number:	AMS 20
Calibration Date:	December 8, 2017	Last Cal Date:	November 9, 2017
Start time (MST):	10:50	End time (MST):	14:25
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.35</u>	ppm	Cal Gas Exp Date	February 13, 2018
Cal Gas Cylinder #	<u>LL119508</u>			
Calibrator Make/Model	Teledyne API T700		Serial Number	1220
ZAG Make/Model	Teledyne API 701		Serial Number	4766

### Analyzer Information

Analyzer make: Teledyne API T101

Analyzer serial #: 196

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	505	505
Calculated slope	0.998751	1.002832	Lamp voltage	2254	2255
Calculated intercept	0.154723	-0.064358	Pressure	17.6	17.6
Analyzer Background	31.6	31.6	Flow	0.445	0.443
Analyzer Coefficient	0.964	0.959	Intensity	56	56

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5005	0.0	0.0	0.4	----
as found span	4935	75.6	80.7	81.7	0.988
calibrator zero	5005	0.0	0.0	0.3	----
high point	4935	75.6	80.7	80.7	1.000
second point	4975	37.9	40.4	40.2	1.006
third point	4995	19.0	20.3	20.1	1.009
as left zero	5005	0.0	0.0	0.0	----
as left span	4935	75.6	80.7	80.1	1.008

SO<sub>2</sub> Scrubber Check

				Average Correction Factor	1.005
Corrected As found	81.30	Previous response	80.67	*% change	-0.8%

\* = > +/-5% change initiates investigation

Notes:

Span adjusted.

Calibration Performed By:

Devin Russell



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

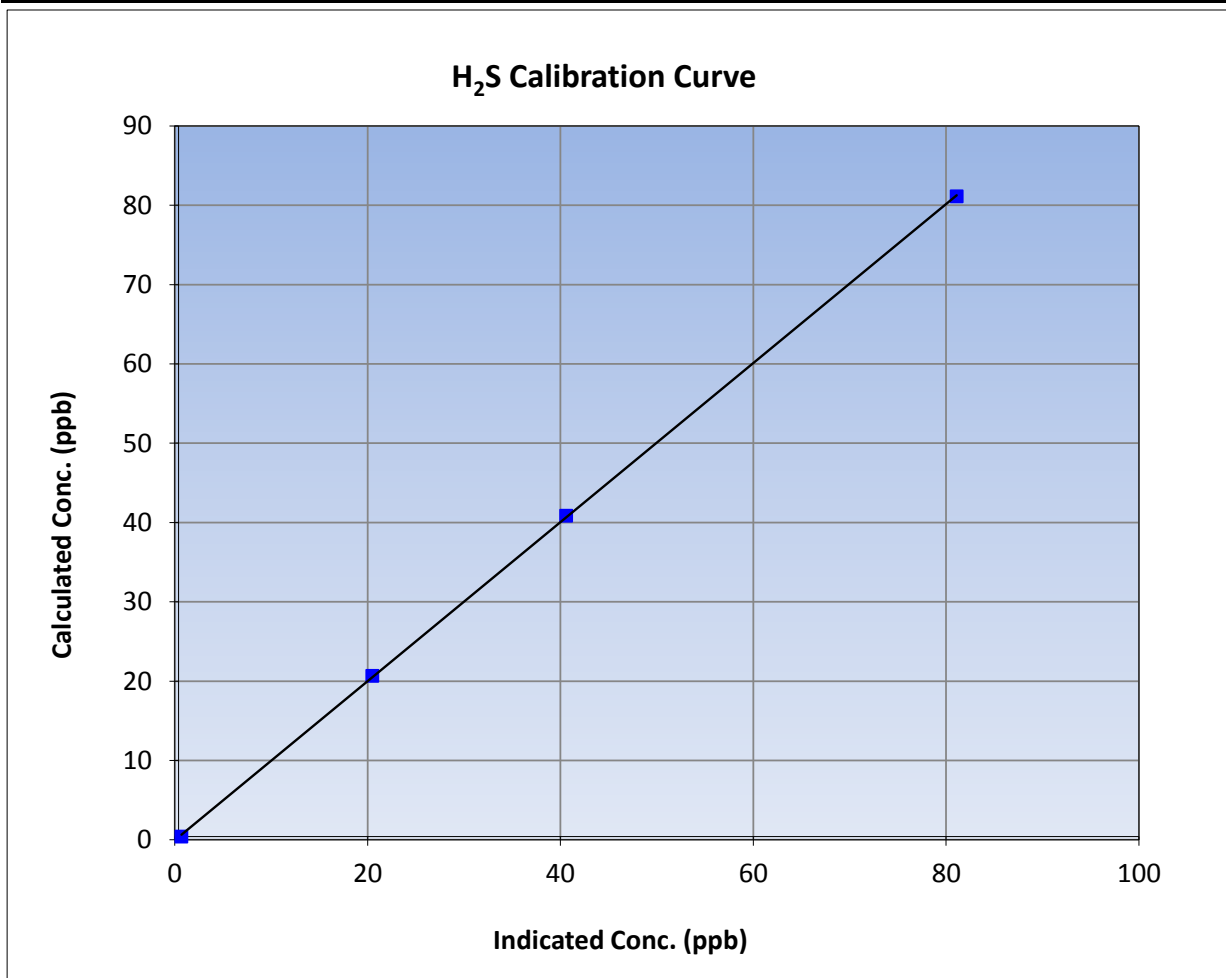
Version-03-2017

### Station Information

Calibration Date	December 8, 2017	Previous Calibration	November 9, 2017
Station Name	MacKay River	Station Number	AMS 20
Start Time (MST)	10:50	End Time (MST)	14:25
Analyzer make	Teledyne API T101	Analyzer serial #	196

### Calibration Data

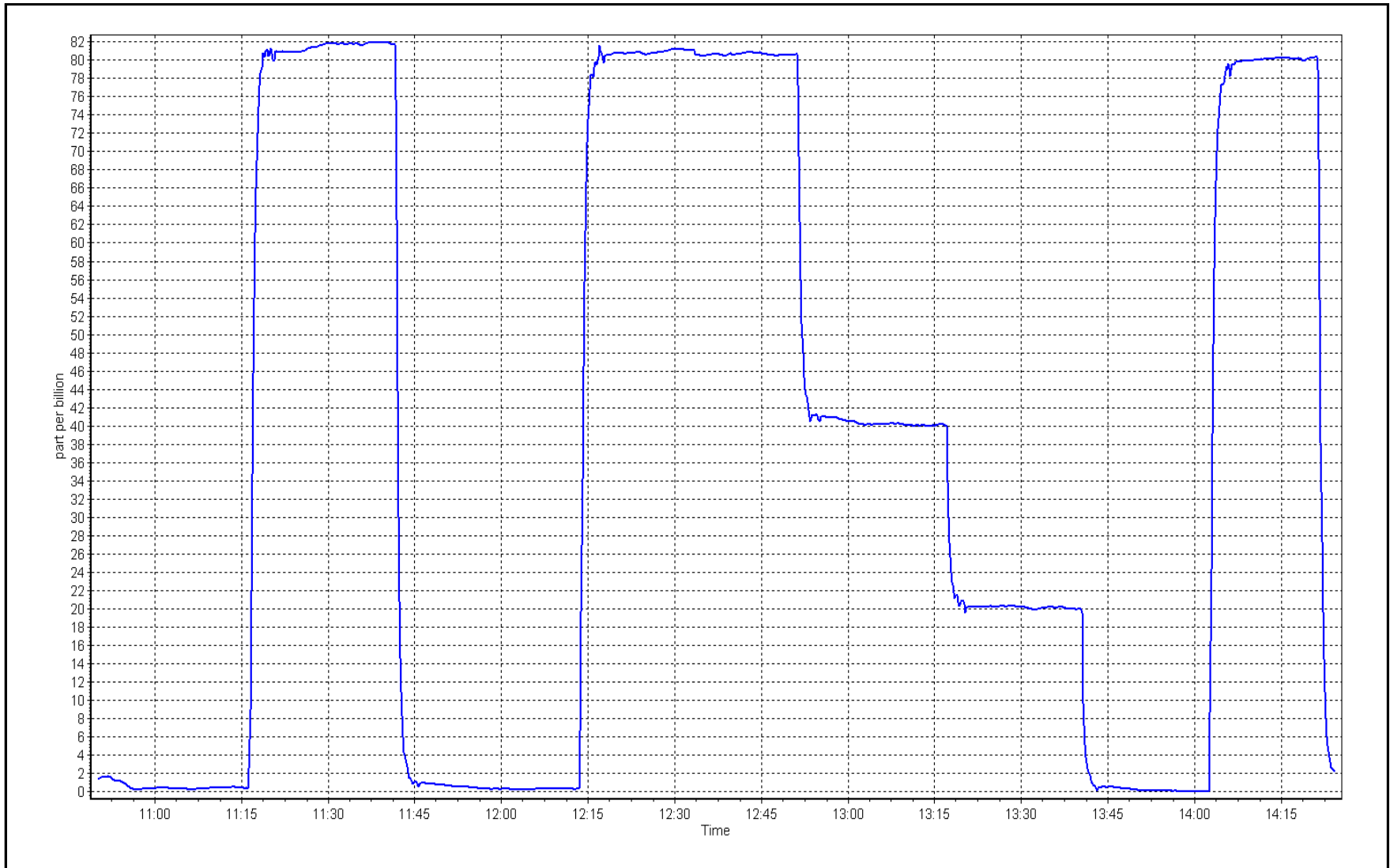
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.3	----	Correlation Coefficient	0.999958	
80.7	80.7	1.0003			≥0.995
40.4	40.2	1.0062	Slope	1.002832	
20.3	20.1	1.0086			0.90 - 1.10
			Intercept	-0.064358	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 8, 2017

Location: MacKay River





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	MacKay River	Station number:	AMS 20
Calibration Date:	December 11, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	12:40	End time (MST):	16:43
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000657	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>513.0</u> ppm	CH4 Equiv Conc.	1060.3 ppm
C3H8 Cal Gas Conc.	<u>199.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	1220
ZAG Make/Model	Teledyne API 701	Serial Number	4766

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1501663727
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-298
Calculated slope	1.000779	Sample pressure	8.6
Calculated intercept	0.011404	Fuel pressure	23.9
Analyzer Background	2.410	Air pressure	34.3
Analyzer Coefficient	4.359	Flame temperature	148.0

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5005	0.0	0.00	0.01	----
as found span	4930	78.7	16.66	16.80	0.992
calibrator zero	5005	0.0	0.00	-0.02	----
high point	4930	78.7	16.66	16.72	0.996
second point	4975	39.4	8.33	8.36	0.996
third point	4995	19.7	4.17	4.13	1.010
as left zero	5005	0.0	0.00	-0.07	----
as left span	4930	78.7	16.66	16.57	1.006
Average Correction Factor					1.001
Corrected As found	16.79	Previous response	16.63	*% change	-0.9%

\* = > +/-5% change initiates investigation

Notes: Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By: Asad Hidayat



# Wood Buffalo Environmental Association

## THC Calibration Summary

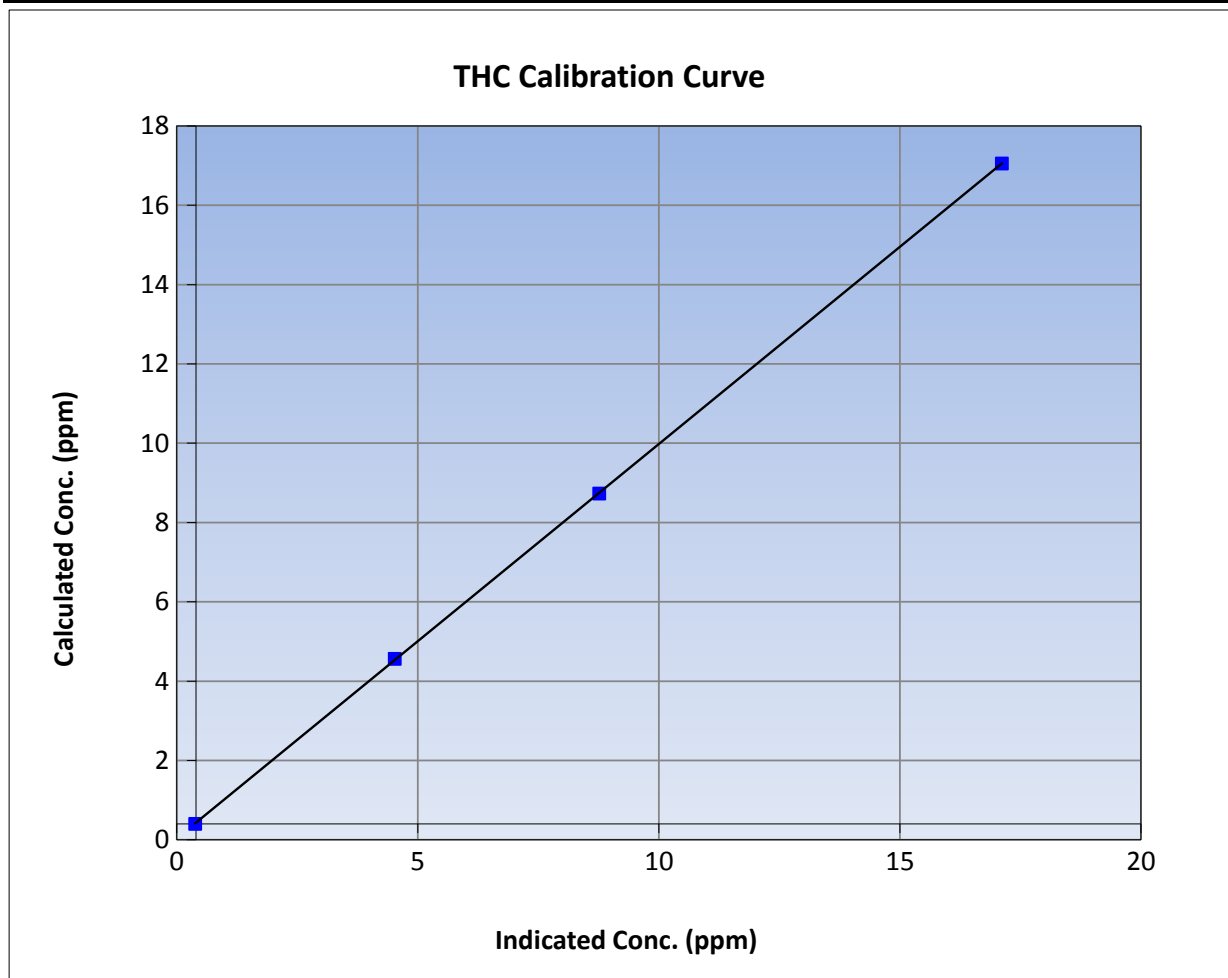
Version-03-2017

### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 13, 2017
Station Name	MacKay River	Station Number	AMS 20
Start Time (MST)	12:40	End Time (MST)	16:43
Analyzer make	Thermo 51i-LT	Analyzer serial #	1501663727

### Calibration Data

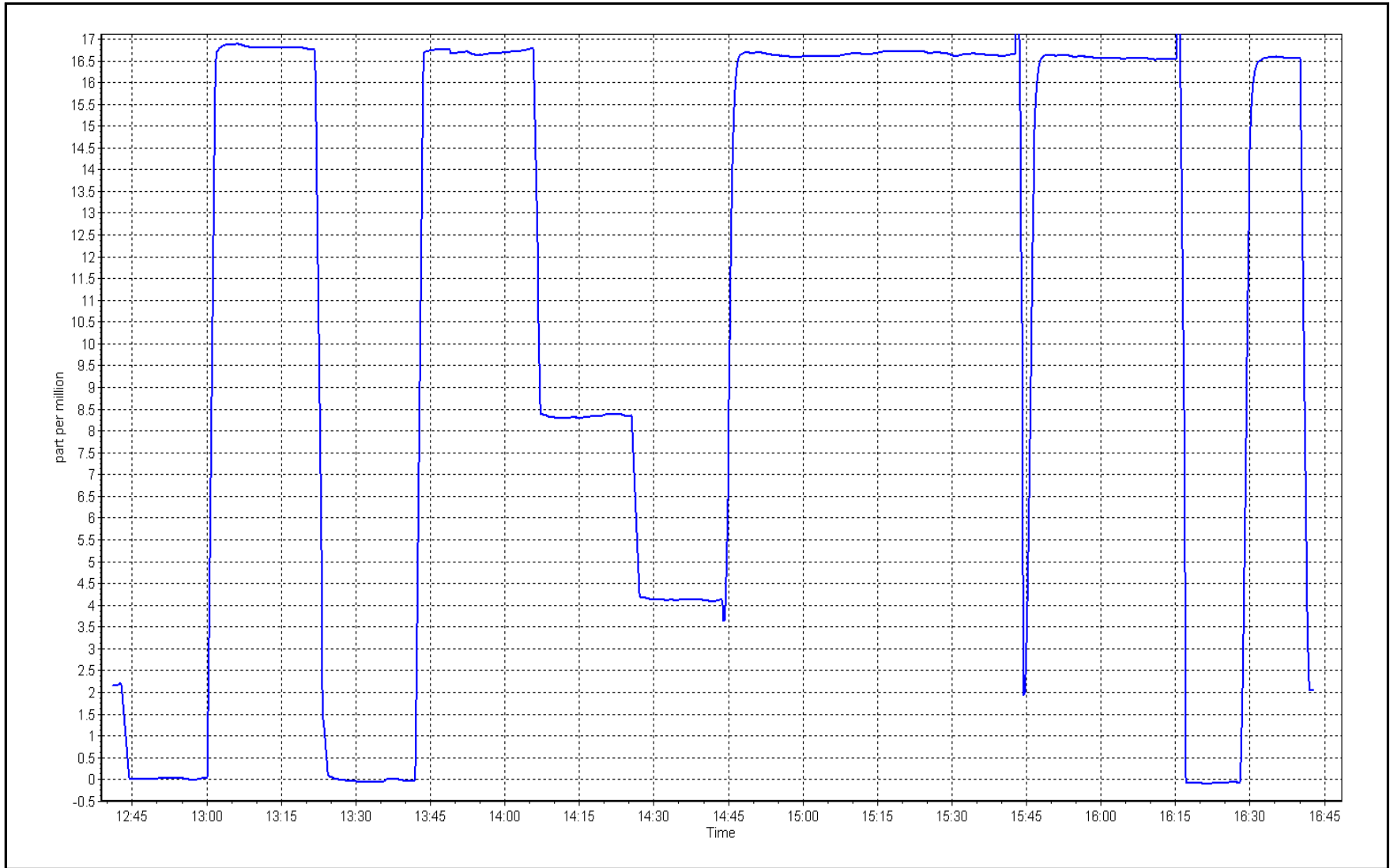
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999990	≥0.995
16.7	16.7	0.9965			
8.3	8.4	0.9964	Slope	0.994549	0.90 - 1.10
4.2	4.1	1.0097			
			Intercept	0.031839	+/-1.5



THC Calibration Plot

Date: December 11, 2017

Location: MacKay River





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	MacKay River	Station number:	AMS 20
Calibration Date:	December 11, 2017	Last Cal Date:	November 13, 2017
Start time (MST):	12:40	End time (MST):	16:43
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000657	Cal Gas Expiry Date	November 4, 2019
NOX Cal Gas Conc.	<u>50.9</u> ppb	NO Cal Gas Conc.	<u>50.9</u> ppb
Calibrator Model	Teledyne API T700	Serial Number	1220
ZAG make/model	Teledyne API 701	Serial Number	4766

### Analyzer Information

Analyzer make:	Thermo 42i	Analyzer serial #:	1505164379	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
NO coefficient	1.066	1.076	NOX Range (ppb)	0 - 1000 ppb
NOX coefficient	0.999	0.996	PMT Temperature	-3.0 -3.0
NO2 coefficient	0.995	0.995	Reaction cell Press	169.3 167.8
NO bkgrnd	3.1	3.1	Sample Flow	0.831 0.829
NOX bkgrnd	3.1	3.2	PMT Voltage	-767.4 -767.4

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.999313	0.995732
NO <sub>x</sub> Cal Offset	0.758279	0.914183
NO Cal Slope	0.999403	0.993502
NO Cal Offset	1.601182	1.571611
NO <sub>2</sub> Cal Slope	0.992583	0.990099
NO <sub>2</sub> Cal Offset	-0.033510	0.484667





# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5005	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	----	----
as found span	4930	78.7	799.8	799.8	0.0	795.5	794.4	2.1	1.0054	1.0068
calibrator zero	5005	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	4930	78.7	799.8	799.8	0.0	802.7	804.2	-1.4	0.9964	0.9945
second point	4975	39.4	399.9	399.9	0.0	400.3	400.1	0.2	0.9991	0.9996
third point	4995	19.7	200.0	200.0	0.0	199.1	198.3	0.9	1.0043	1.0084
as left zero	5005	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
as left span	4930	78.7	799.8	350.6	449.2	799.3	349.0	450.3	1.0006	1.0046
<b>Average Correction Factor</b>									<b>0.9999</b>	<b>1.0008</b>

Corrected As found	NO <sub>x</sub> = 795.8 ppb	NO = 794.7 ppb		*Percent Change	NO <sub>x</sub> = 0.5%
Previous Response	NO <sub>x</sub> = 799.6 ppb	NO = 798.7 ppb		*Percent Change	NO = 0.5%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	799.5	798.9	0.5	1.0003	1.0011	----	----
1st NO2 (400 ppb O3)	350.6	448.3	803.0	350.6	452.4	0.9960	----	0.9909	100.9%
2nd NO2 (200 ppb O3)	569.4	229.5	800.9	569.4	231.5	0.9986	----	0.9914	100.9%
3rd NO2 (100 ppb O3)	680.9	118.0	798.8	680.9	117.9	1.0012	----	1.0008	99.9%
2nd NO ref point	----	0.0	797.5	797.1	0.4	1.0029	1.0034	----	----
<b>Average Correction Factor</b>						<b>0.9997</b>	<b>1.0022</b>	<b>0.9944</b>	<b>100.6%</b>

Notes: Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By: Asad Hidayat



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

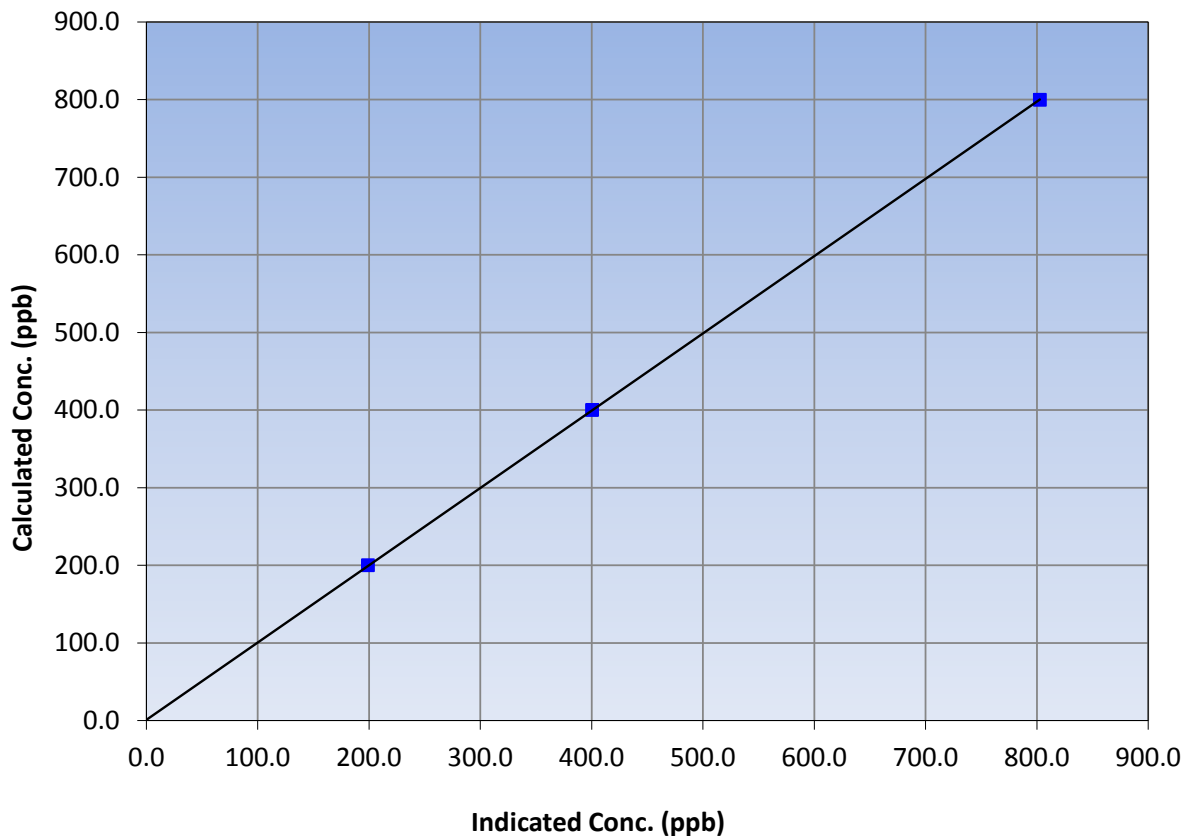
### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 13, 2017
Station Name	Mackay River	Station Number	AMS 20
Start Time (MST)	12:40	End Time (MST)	16:43
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
799.8	802.7	0.9964			
399.9	400.3	0.9991			
200.0	199.1	1.0043			
			Slope	0.995732	0.90 - 1.10
			Intercept	0.914183	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

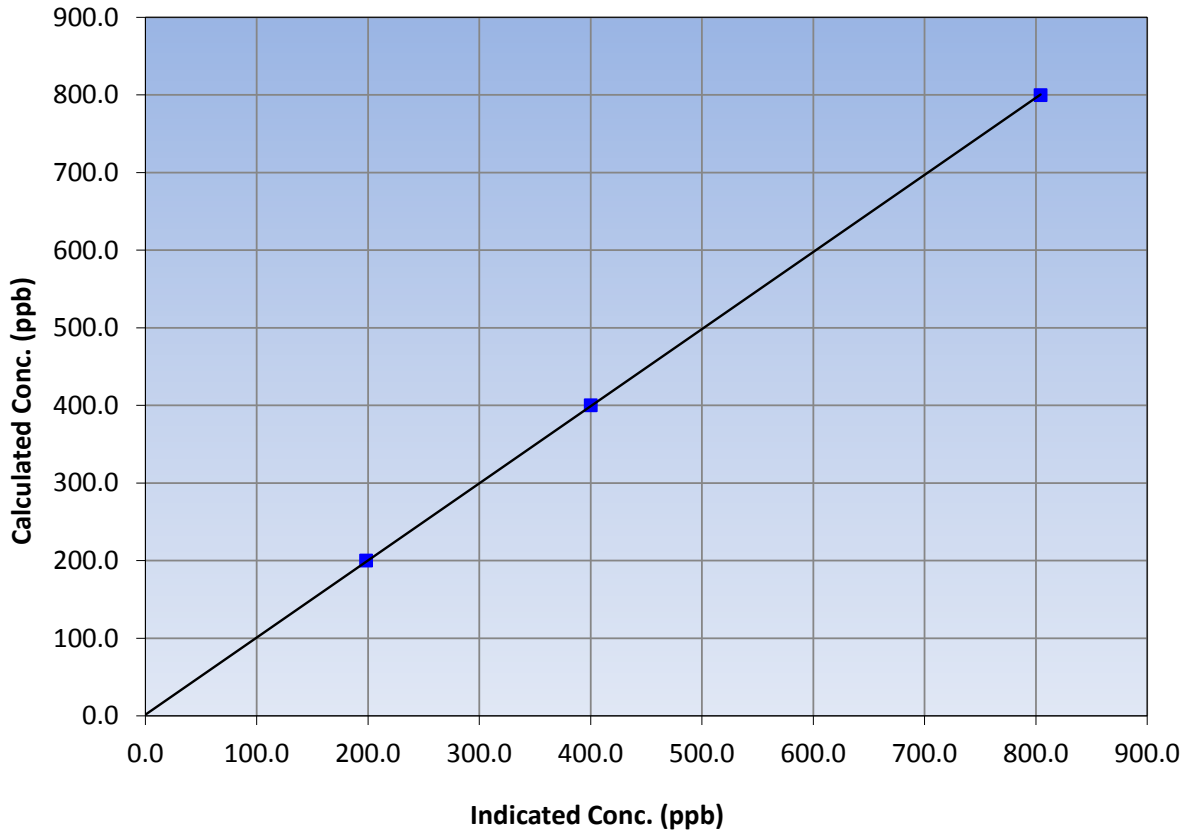
### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 13, 2017
Station Name	Mackay River	Station Number	AMS 20
Start Time (MST)	12:40	End Time (MST)	16:43
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
799.8	804.2	0.9945			
399.9	400.1	0.9996			
200.0	198.3	1.0084			
			Slope	0.993502	0.90 - 1.10
			Intercept	1.571611	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

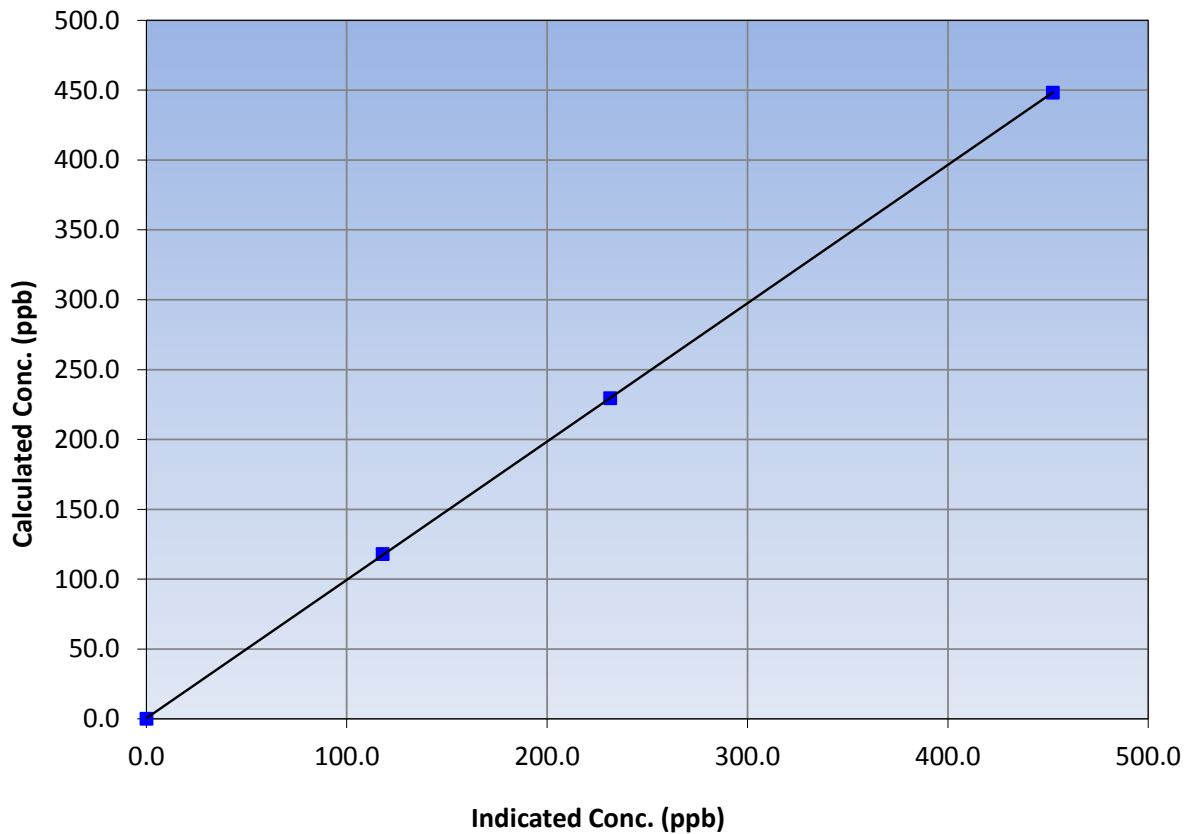
### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 13, 2017
Station Name	MackKay River	Station Number	AMS 20
Start Time (MST)	12:40	End Time (MST)	16:43
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
448.3	452.4	0.9909			
229.5	231.5	0.9914			
118.0	117.9	1.0008			
			Slope	0.990099	0.90 - 1.10
			Intercept	0.484667	+/-20

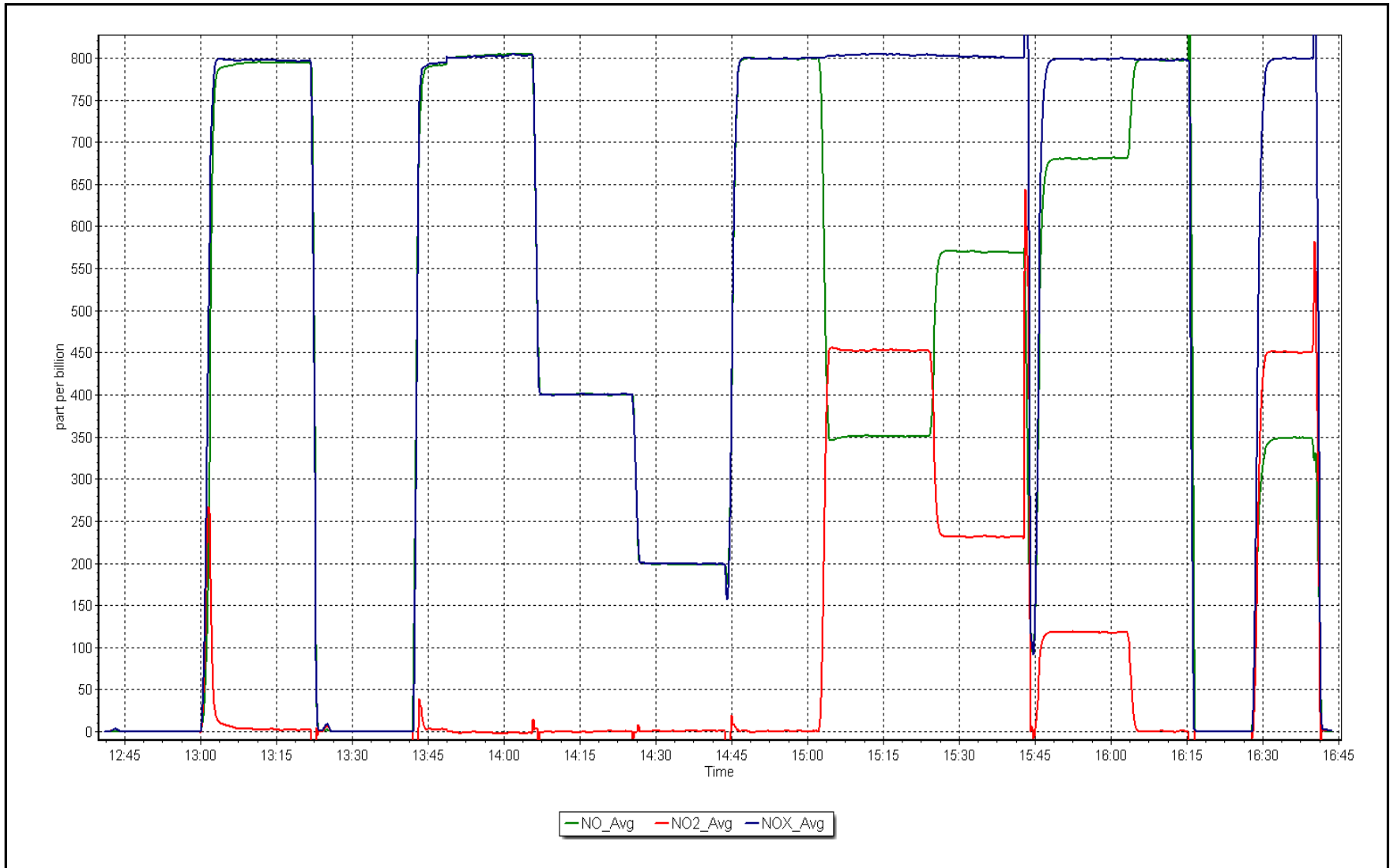
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 11, 2017

Location: MacKay River





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 21  
CONKLIN COMMUNITY  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN (AMS 21)  
 DECEMBER 2017

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	659	34	85	93.15	6	0	1	0
TRS(ppb) Average	660	33	84	93.15	1	0	0	0
THC(ppm) Average	664	32	80	93.55	2.2	-	2.1	-
NMHC(ppm) Average	664	32	80	93.55	0.101	-	0.007	-
CH4(ppm) Average	664	32	80	93.55	2.2	-	2.1	-
O3 (ppb) Average	660	33	84	93.15	47	0	43	-
NO2 (ppb) Average	659	34	85	93.15	13	0	5	-
NO (ppb) Average	659	34	85	93.15	9	-	1	-
NOX (ppb) Average	659	34	85	93.15	17	-	6	-
PM2.5 (ug/m3) Average	734	1	10	98.79	17.5	-	6.6	0
Wind Speed 10 m (km/h) Average	743	0	1	99.87	20	-	13	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100	7.5	-	5.1	-
Relative Humidity (%) Average	744	0	0	100	97	-	87.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN (AMS 21)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	659	0.2	0	-	0	0	0	0	0	0	0	6
TRS (ppb) Average	660	0.3	0	-	0	0	0	0	0	0	0	1
THC (ppm) Average	664	1.95	0.1	-	1.9	1.9	1.9	1.9	2	2	2	2.2
NMHC(ppm) Average	664	0.001	0.006	-	0	0	0	0	0	0	0	0.101
CH4(ppm) Average	664	1.95	0.1	-	1.9	1.9	1.9	1.9	2	2	2	2.2
O3 (ppb) Average	660	33.6	6	-	12	24	30	34	38	41	47	47
NO2 (ppb) Average	659	2.8	2	-	0	1	1	2	4	5	13	13
NO (ppb) Average	659	0.6	1	-	0	0	0	0	1	1	9	9
NOX (ppb) Average	659	3.3	3	-	0	1	2	2	4	7	17	17
PM2.5 (ug/m3) Average	734	2.79	2.3	-	0.3	0.7	1.1	2	3.8	6.1	17.5	17.5
Wind Speed 10 m (km/h) Average	743	7.6	4	-	0	2	5	7	10	13	20	20
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-10.89	12.6	-	-36.2	-30.8	-22.8	-7.8	-0.3	2.8	7.5	7.5
Relative Humidity (%) Average	744	73.5	11	-	37	59	68	74	81	87	97	97



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN (AMS 21)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	19 Dec 2017 10:00	21 Dec 2017 12:00	51	Analyzer Failure - Sample Manifold Broken
PM2.5	25 Dec 2017 09:00	25 Dec 2017 09:00	1	Unstable operation - excessive baseline drift
PM2.5	28 Dec 2017 18:00	28 Dec 2017 21:00	4	Unstable operation - excessive baseline drift
PM2.5	29 Dec 2017 02:00	29 Dec 2017 05:00	4	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	04 Dec 2017 08:00	04 Dec 2017 08:00	1	Flat line in sensor output signal - Sensor frozen



Summary of Hour Averages

Conklin - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 6 ppb on Dec 28 14:00	Maximum Daily Average: 1.1 ppb on Dec 24		Hours of Data:	659
Minimum Value: 0 ppb on Dec 3 17:00	Minimum Daily Average: 0.0 ppb on Dec 15		Hours of Missing Data:	85
Maximum Diurnal Average: 0.4 ppb at hour 13	Minimum Diurnal Average: 0.1 ppb at hour 18		Hours of Calibration:	34
Monthly Average: 0.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 2		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-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.3	1
2-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Dec	0	Z	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
5-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	0.3	2
6-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.1	0
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	Z	0	0	0	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
21-Dec	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
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1
24-Dec	0	0	2	Z	0	0	1	1	2	2	3	5	3	2	2	1	0	0	0	0	0	0	0	0	1.1	5
25-Dec	0	0	0	0	Z	0	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0.3	1
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0.2	1
27-Dec	Z	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	5	6	1	0	0	0	0	0	0	0	0	0	0.7	6
29-Dec	0	0	Z	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	1
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1

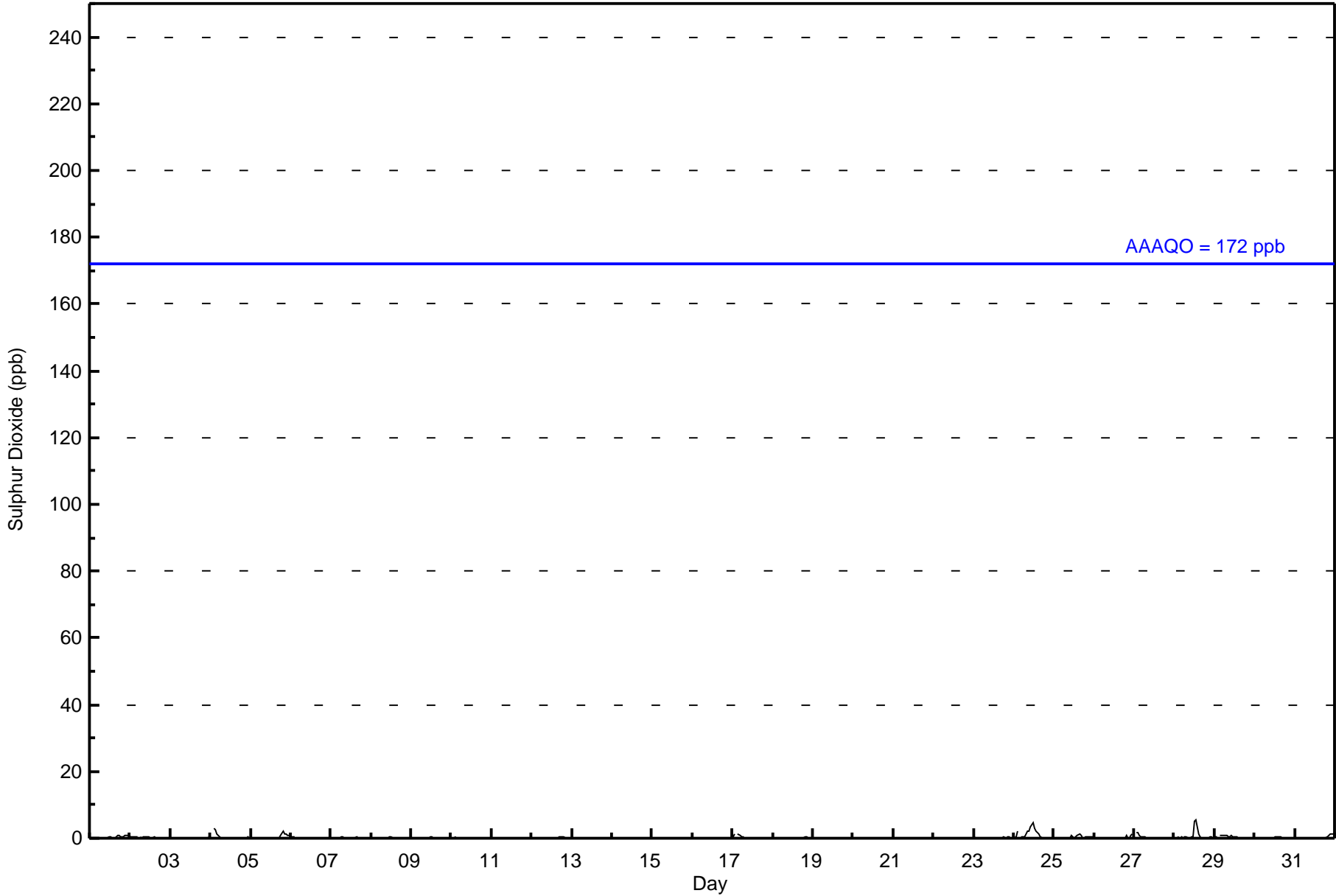
0.1	0.2	0.4	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
1	2	3	2	1	1	1	1	1	2	2	3	5	5	6	2	1	1	1	1	1	2	1	1	1	1	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	659	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: 659

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Conklin - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	13	10	5	2	2	3	8	18	30	79	88	38	38	110	128	86	658
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
<b>Totals</b>	13	10	5	2	2	3	8	18	30	79	88	38	38	110	128	86	658

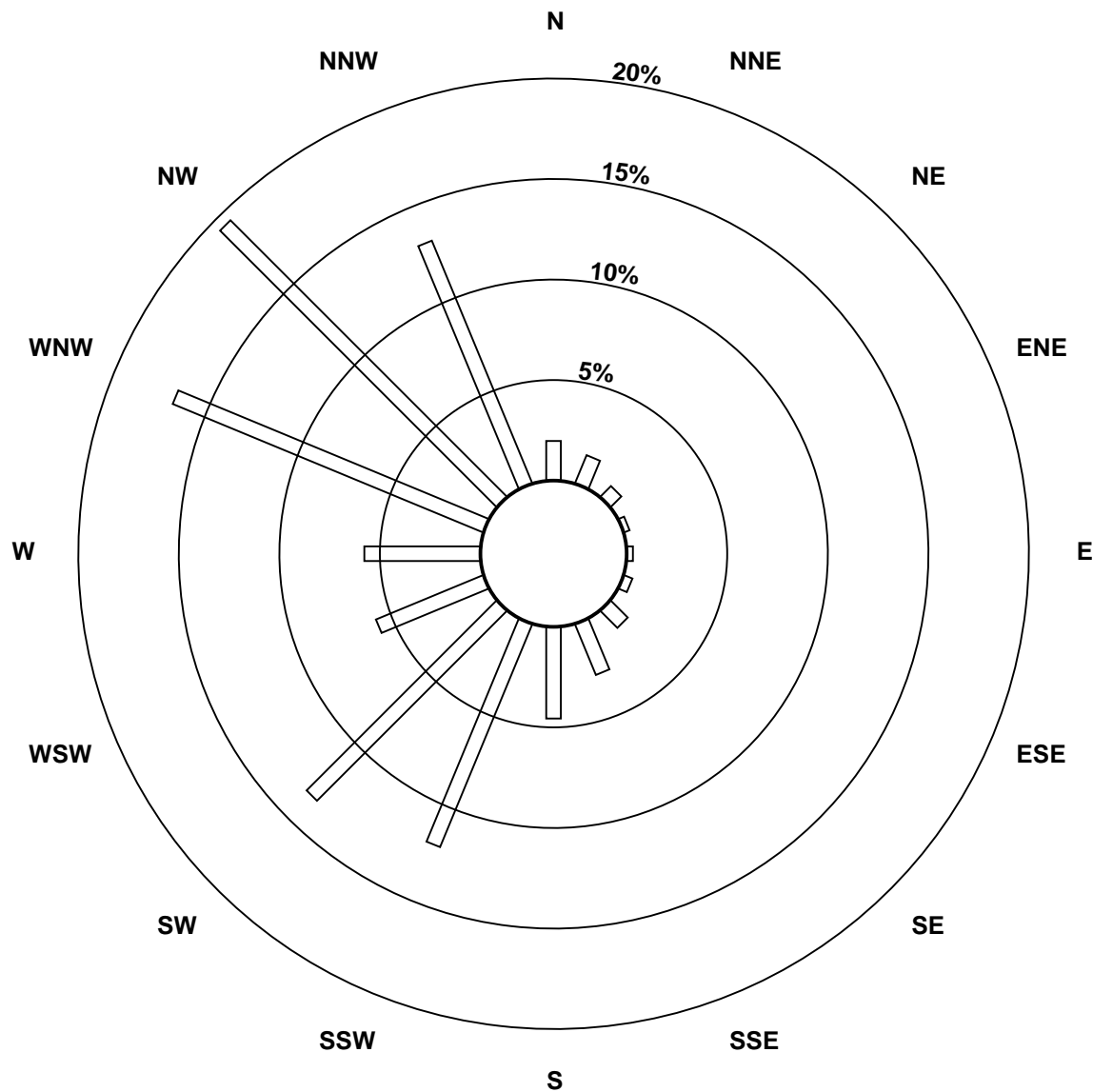
Total Number of Valid Hours: 658

Total Number of Hours: 744

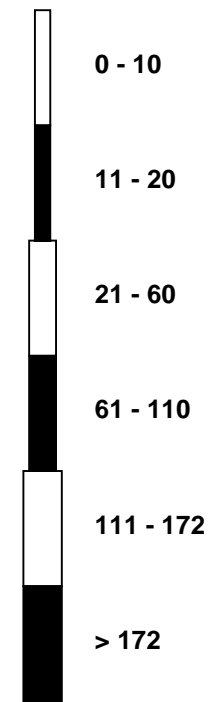


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

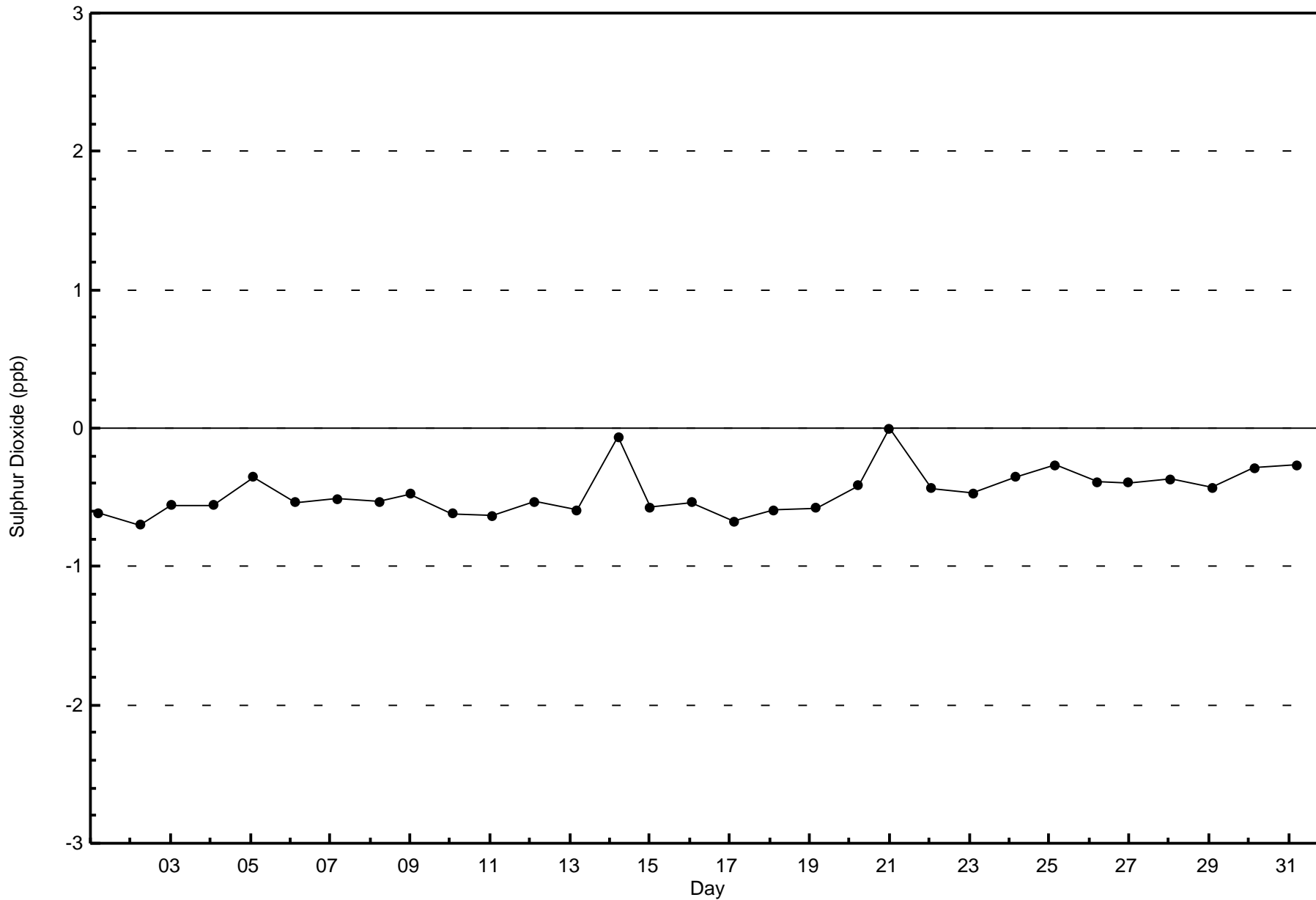
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Conklin (AMS 21)

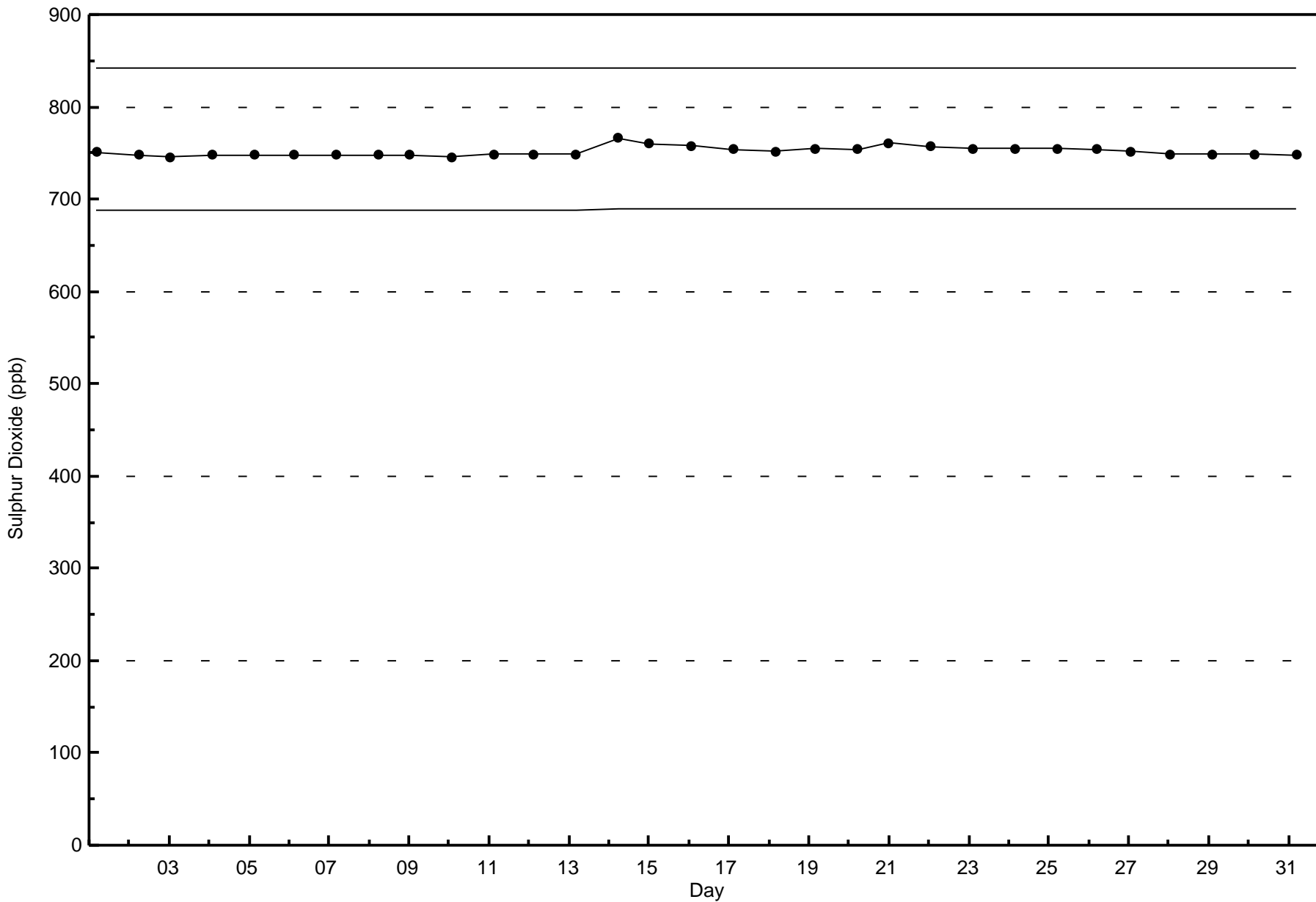


Classes (ppb)



Total Number of Valid Hours: 658









Summary of Hour Averages

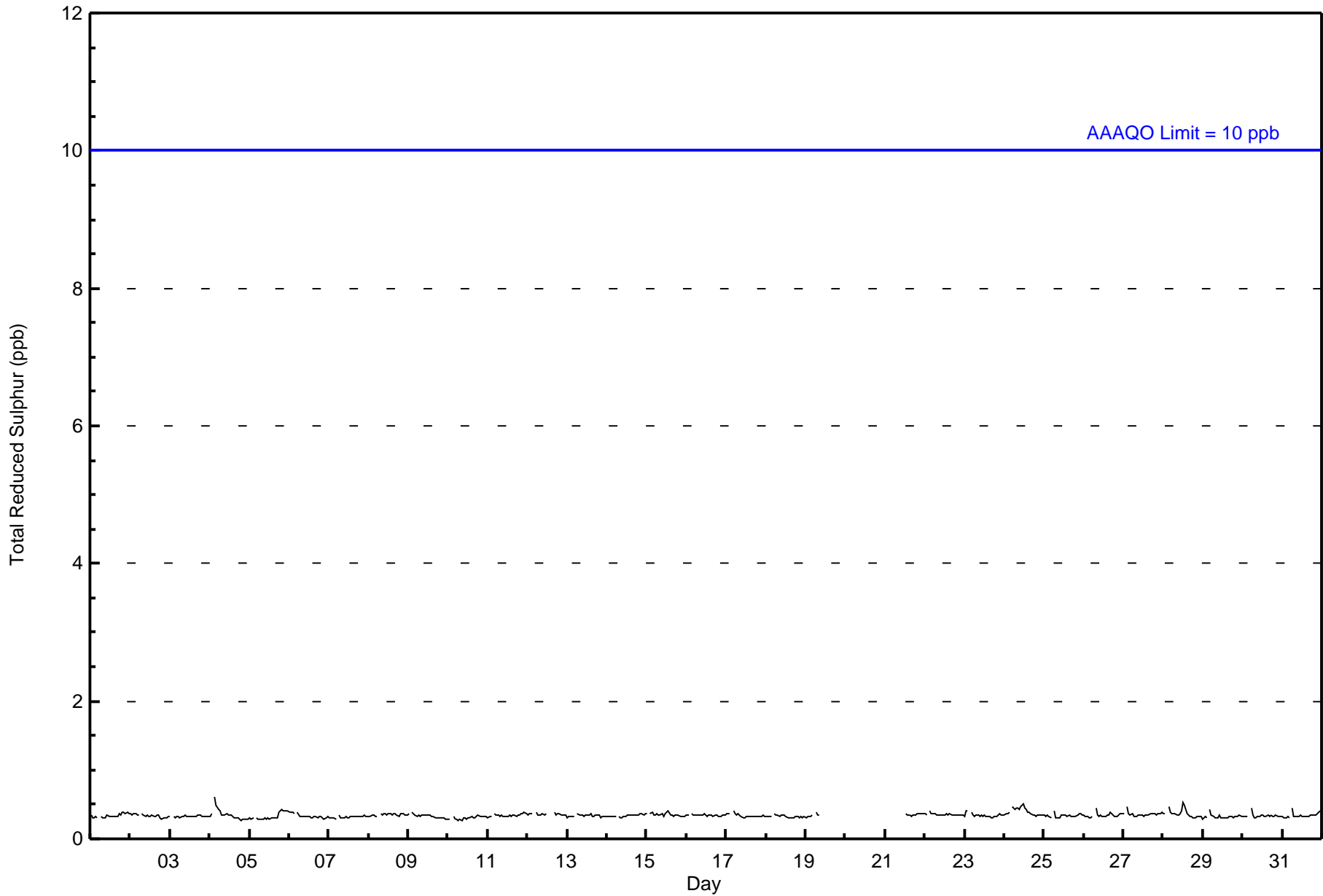
Conklin - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 1 ppb on Dec 4 04:00      Maximum Daily Average: 0.4 ppb on Dec 24												Hours in Service: 744 Hours of Data: 660 Hours of Missing Data: 84 Hours of Calibration: 33 Percent Operational Time: 93.2														
Minimum Value: 0 ppb on Dec 4 20:00      Minimum Daily Average: 0.3 ppb on Dec 10 Maximum Diurnal Average: 0.4 ppb at hour 4      Minimum Diurnal Average: 0.3 ppb at hour 17 Monthly Average: 0.3 ppb      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
4-Dec	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0.4	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	Z	0	0	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
21-Dec	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
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
26-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
0.3 0.3 0.3 0.4 0.3 0.4 0.4 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 0.3																								Diurnal Average		
0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0																								Diurnal Maximum		
Z - zerospan      C - Calibration      AF - Analyzer Failure Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Reduced Sulphur (TRS) - ppb**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	660	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: 660

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2	15	9	4	2	2	4	8	17	29	81	87	37	40	111	124	89	659
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
<b>Totals</b>	15	9	4	2	2	4	8	17	29	81	87	37	40	111	124	89	659

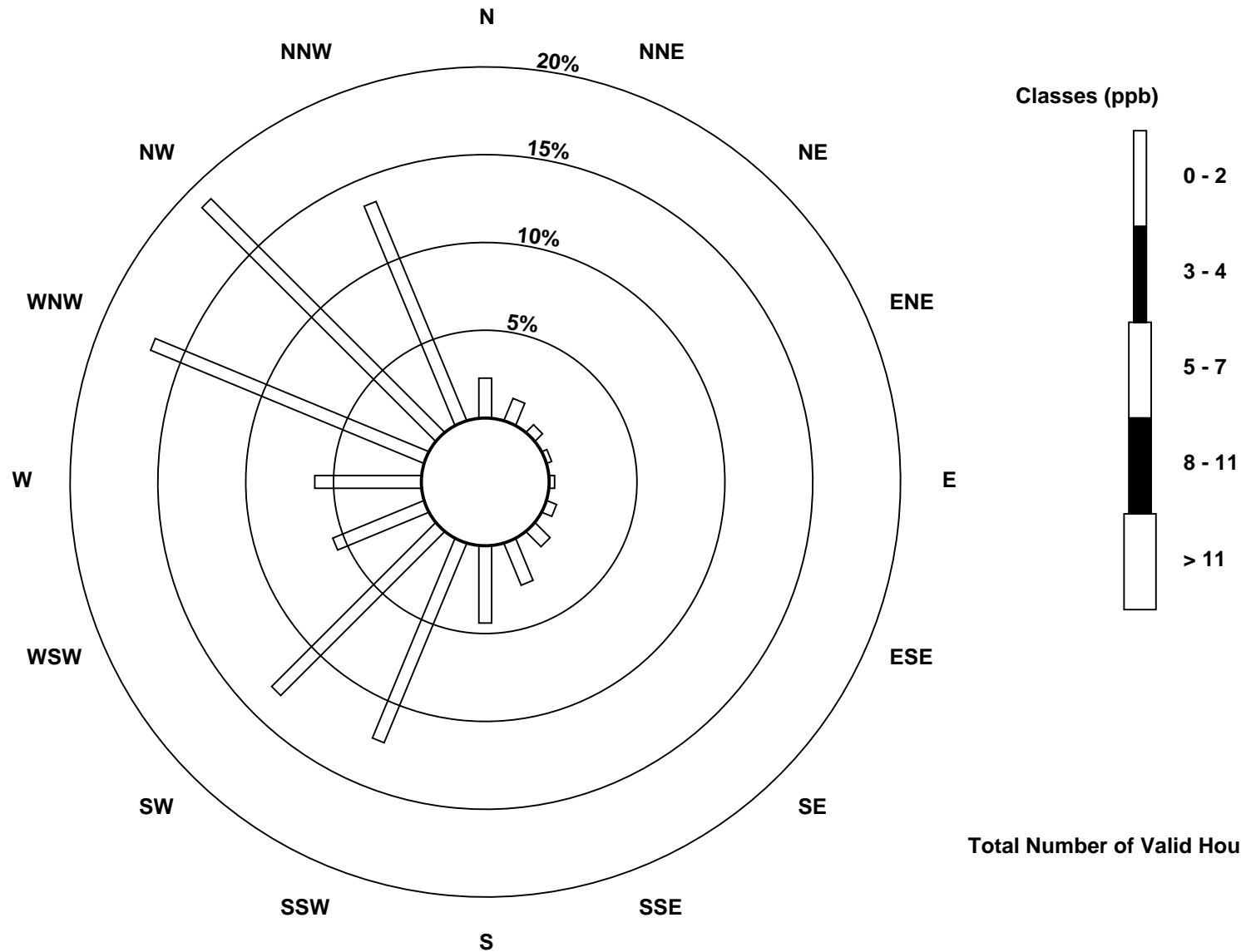
Total Number of Valid Hours: 659

Total Number of Hours: 744

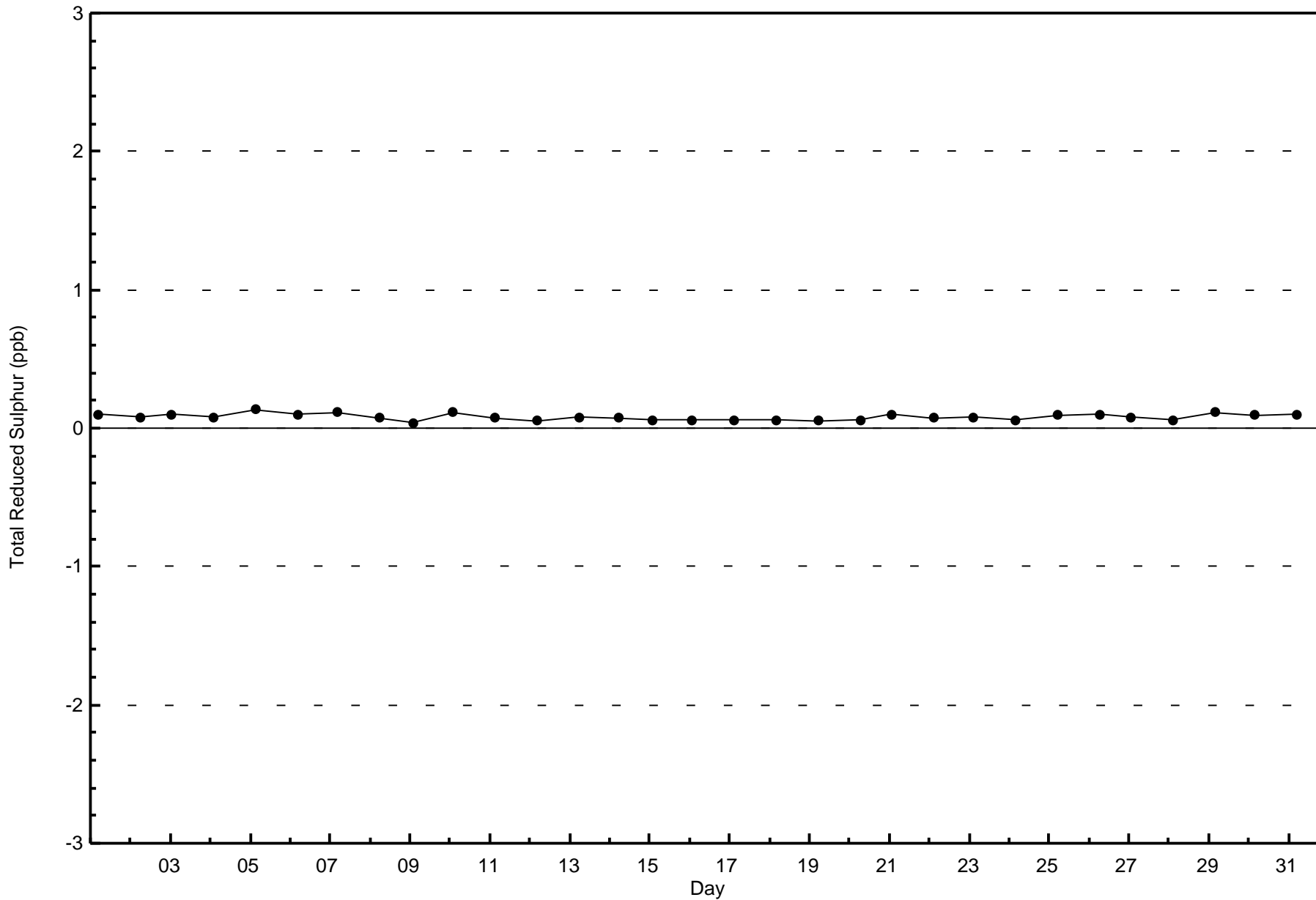


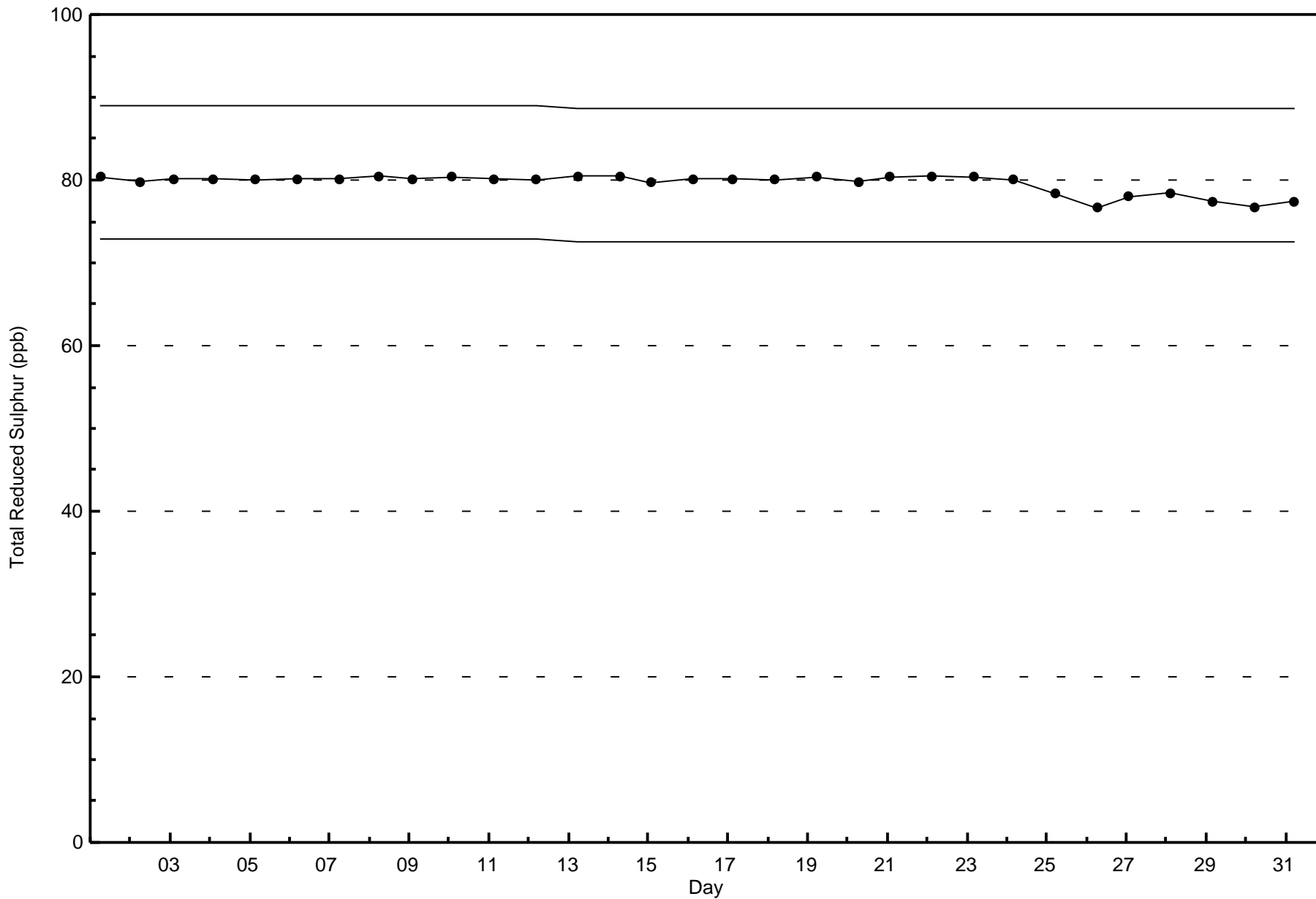
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Reduced Sulphur (TRS) - ppb  
Conklin (AMS 21)



Total Number of Valid Hours: 659







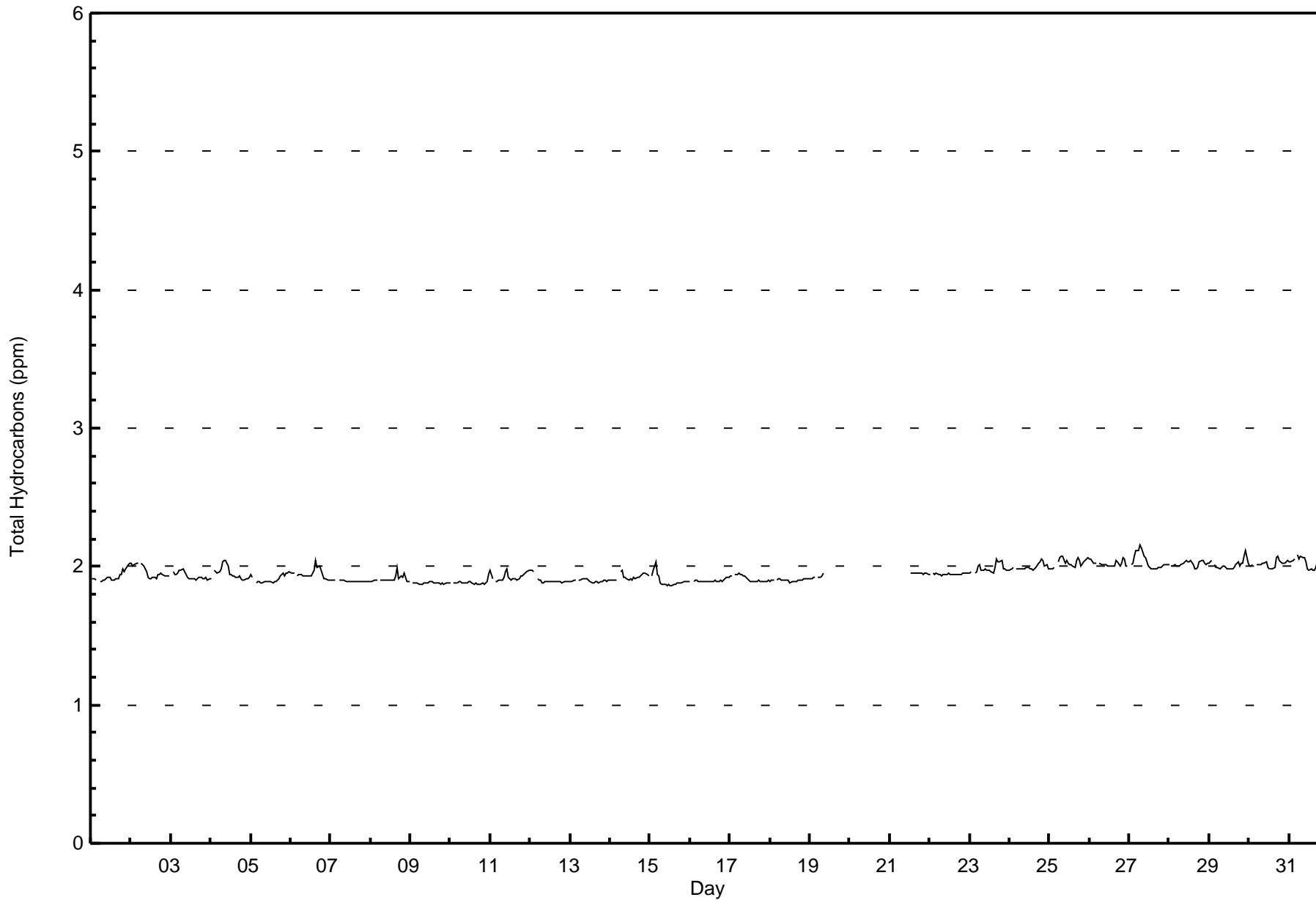
Maximum Value: 2.2 ppm on Dec 31 22:00																								Maximum Daily Average: 2.1 ppm on Dec 31																								Hours in Service: 744	
Minimum Value: 1.9 ppm on Dec 15 11:00																								Minimum Daily Average: 1.9 ppm on Dec 9																								Hours of Data: 664	
Maximum Diurnal Average: 2.0 ppm at hour 23																								Minimum Diurnal Average: 1.9 ppm at hour 14																								Hours of Missing Data: 80	
Monthly Average: 1.95 ppm																								Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 1.9 Q <sub>3</sub> = 2.0 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.1																								Hours of Calibration: 32	
																								Percent Operational Time: 93.6																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	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	2.0	2.0	2.0	2.0	1.9	2.0																							
2-Dec	2.0	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	2.0	2.0																						
3-Dec	Z	2.0	1.9	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																						
4-Dec	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																						
5-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	1.9	2.0																							
6-Dec	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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																						
7-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
8-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	2.0	2.0																						
9-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
10-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
11-Dec	2.0	1.9	Z	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	1.9	1.9	2.0	2.0	2.0	1.9	2.0	2.0																						
12-Dec	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																						
13-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
14-Dec	1.9	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	2.0	1.9	1.9	1.9	2.0	2.0																						
15-Dec	Z	1.9	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	2.0																						
16-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
17-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
18-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
19-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																						
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF																						
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	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																						
22-Dec	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	2.0	1.9	2.0	2.0	2.0	2.0	2.0																						
23-Dec	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																						
24-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.1																						
25-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1																						
26-Dec	2.1	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.1	2.1																						
27-Dec	Z	2.0	2.0	2.1	2.1	2.1	2.2	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	2.2																						
28-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
29-Dec	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	2.1	2.1	2.0	2.0	2.1	2.1																						
30-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1																						
31-Dec	2.0	2.0	2.0	2.1	Z	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	2.1	2.1	2.2	2.2	2.2	2.2	2.2																						
																								Diurnal Average																									
																								Diurnal Maximum																									
Z - zerospan                      C - Calibration                      AF - Analyzer Failure																																																	





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Conklin - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	629	94.73	94.73
2.1 - 3.0	35	5.27	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Conklin - December 2017**

<b>Concentration</b> <b>Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	13	10	5	2	2	2	7	14	21	67	85	38	38	109	127	88	628
2.1 - 3.0	0	0	0	0	0	1	1	4	9	12	3	0	0	1	2	2	35
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
<b>Totals</b>	13	10	5	2	2	3	8	18	30	79	88	38	38	110	129	90	663

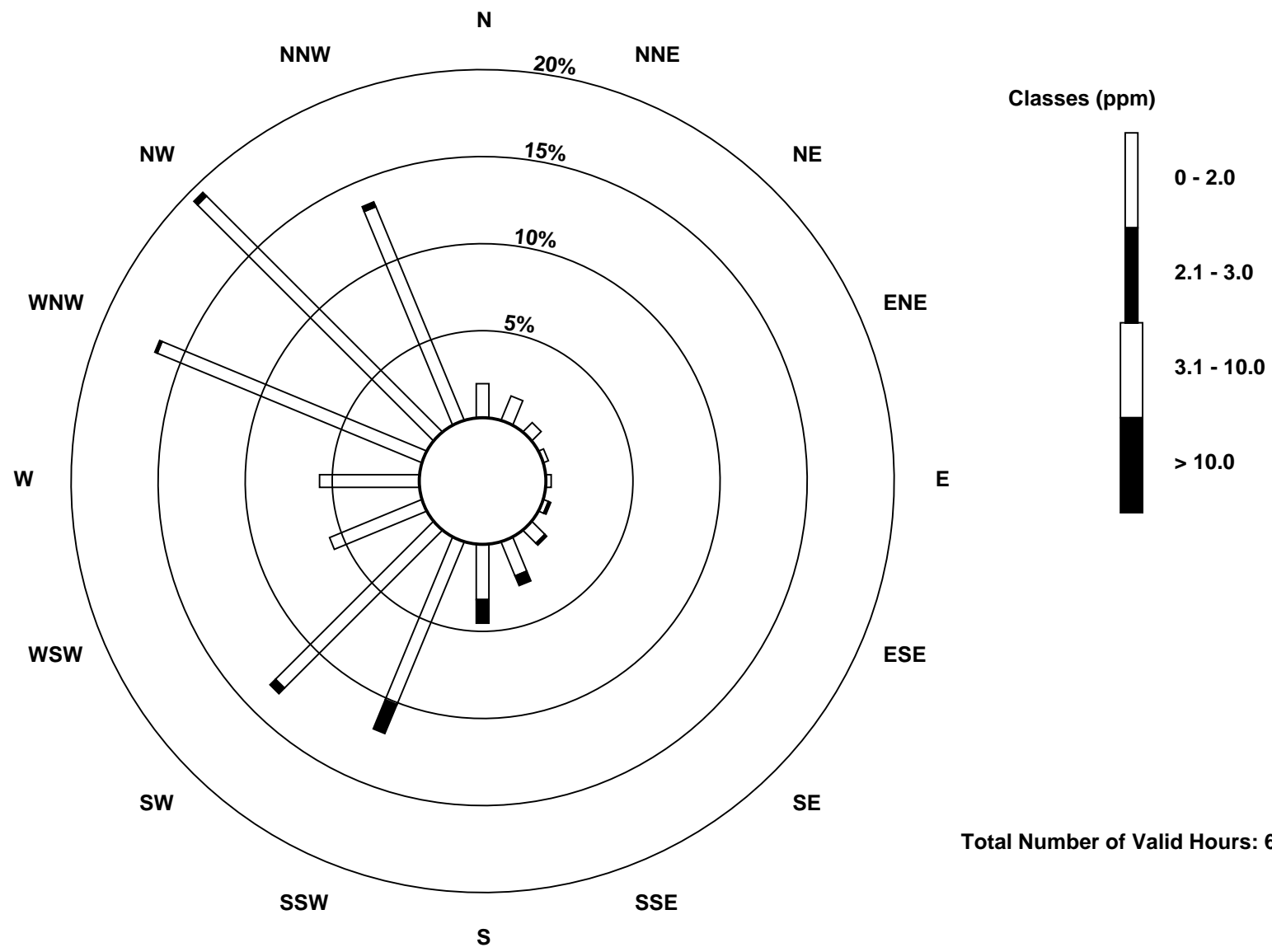
Total Number of Valid Hours: 663

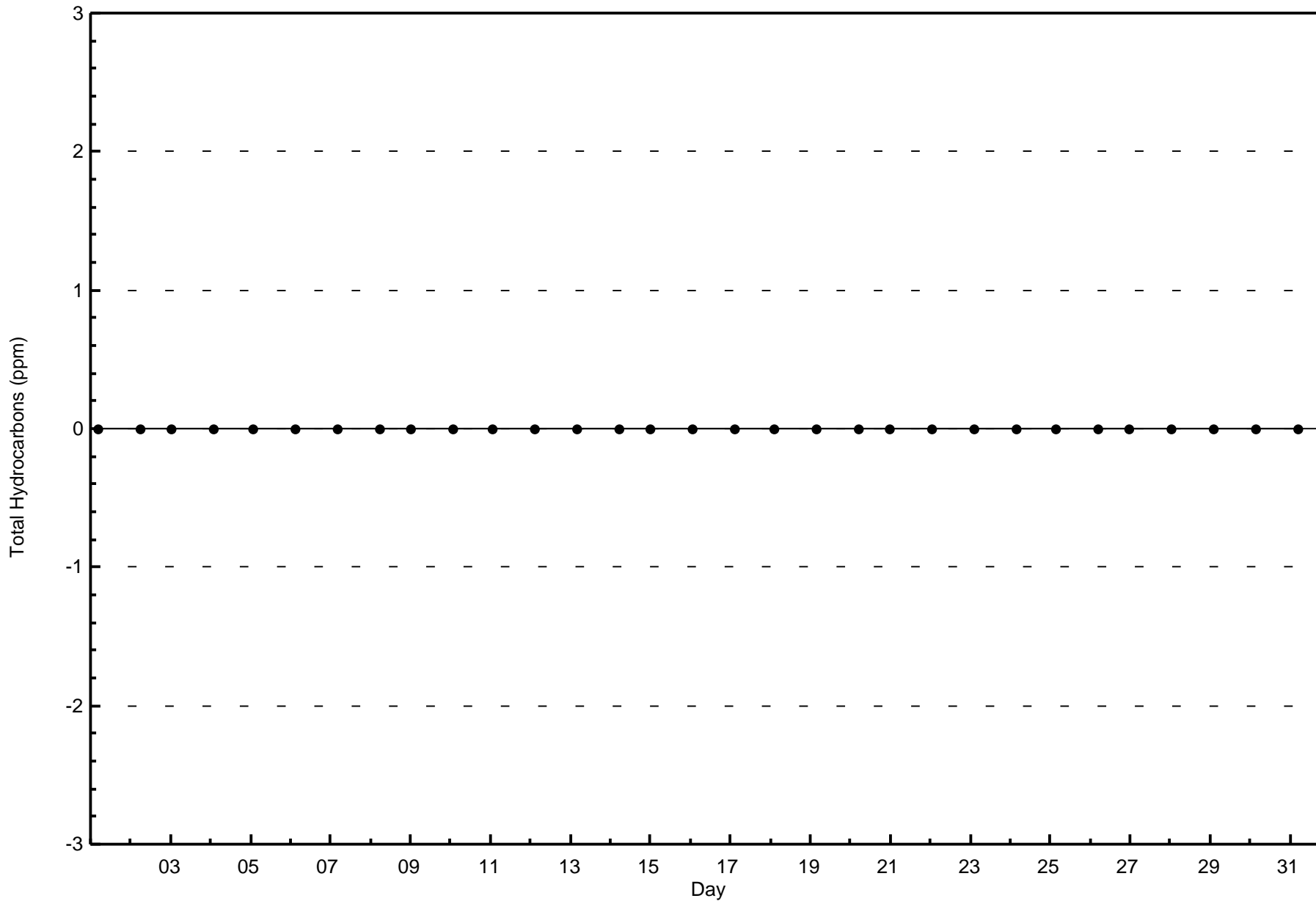
Total Number of Hours: 744

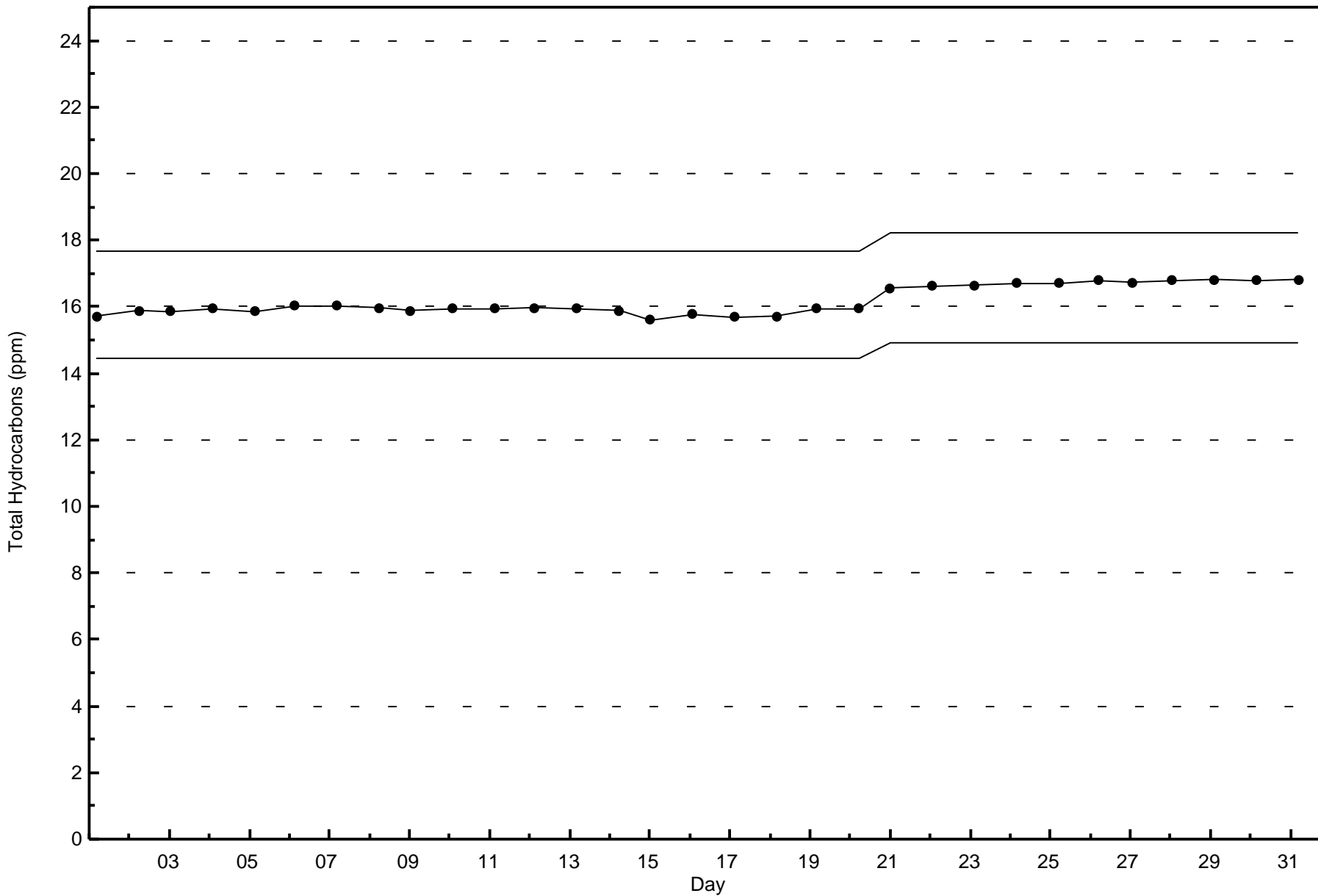


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

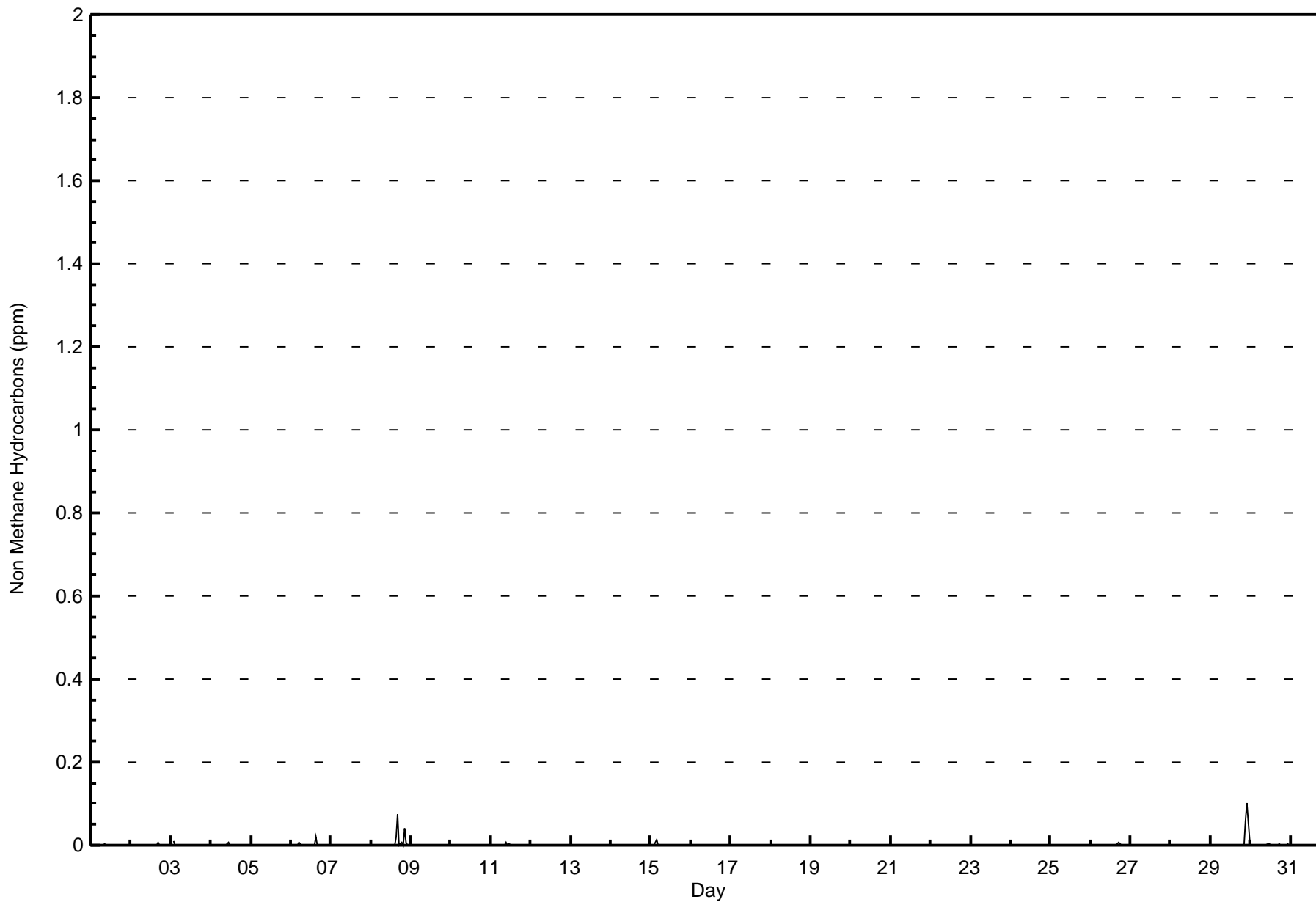
Total Hydrocarbons (THC) - ppm  
Conklin (AMS 21)















**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Conklin - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	649	97.74	97.74
0.006 - 0.05	12	1.81	99.55
0.06 - 0.1	3	0.45	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Conklin - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 0.005	13	10	5	2	2	3	8	18	29	70	83	38	38	110	129	90	648
0.006 - 0.05	0	0	0	0	0	0	0	0	1	7	4	0	0	0	0	0	12
0.06 - 0.1	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	10	5	2	2	3	8	18	30	79	88	38	38	110	129	90	663

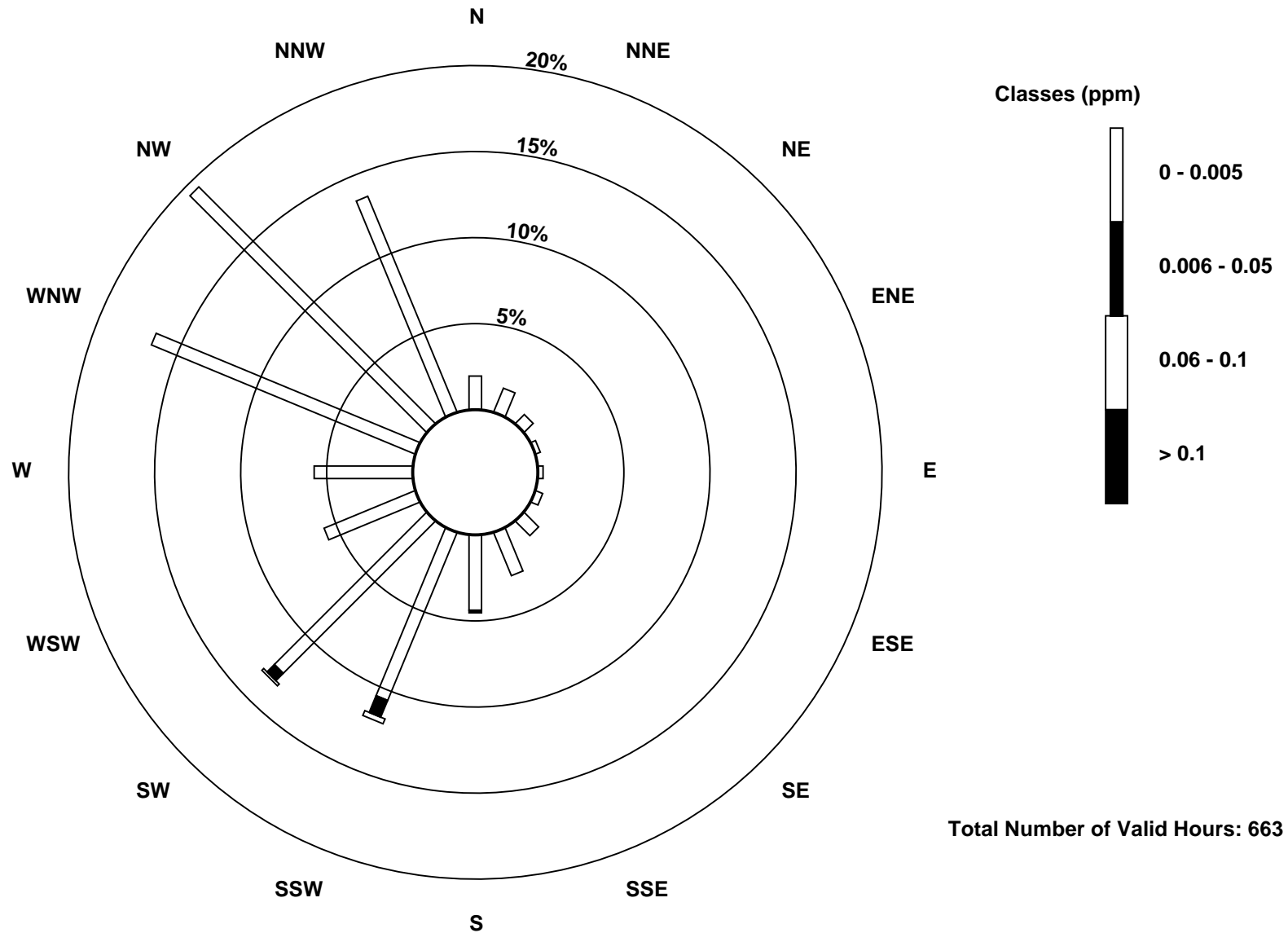
Total Number of Valid Hours: 663

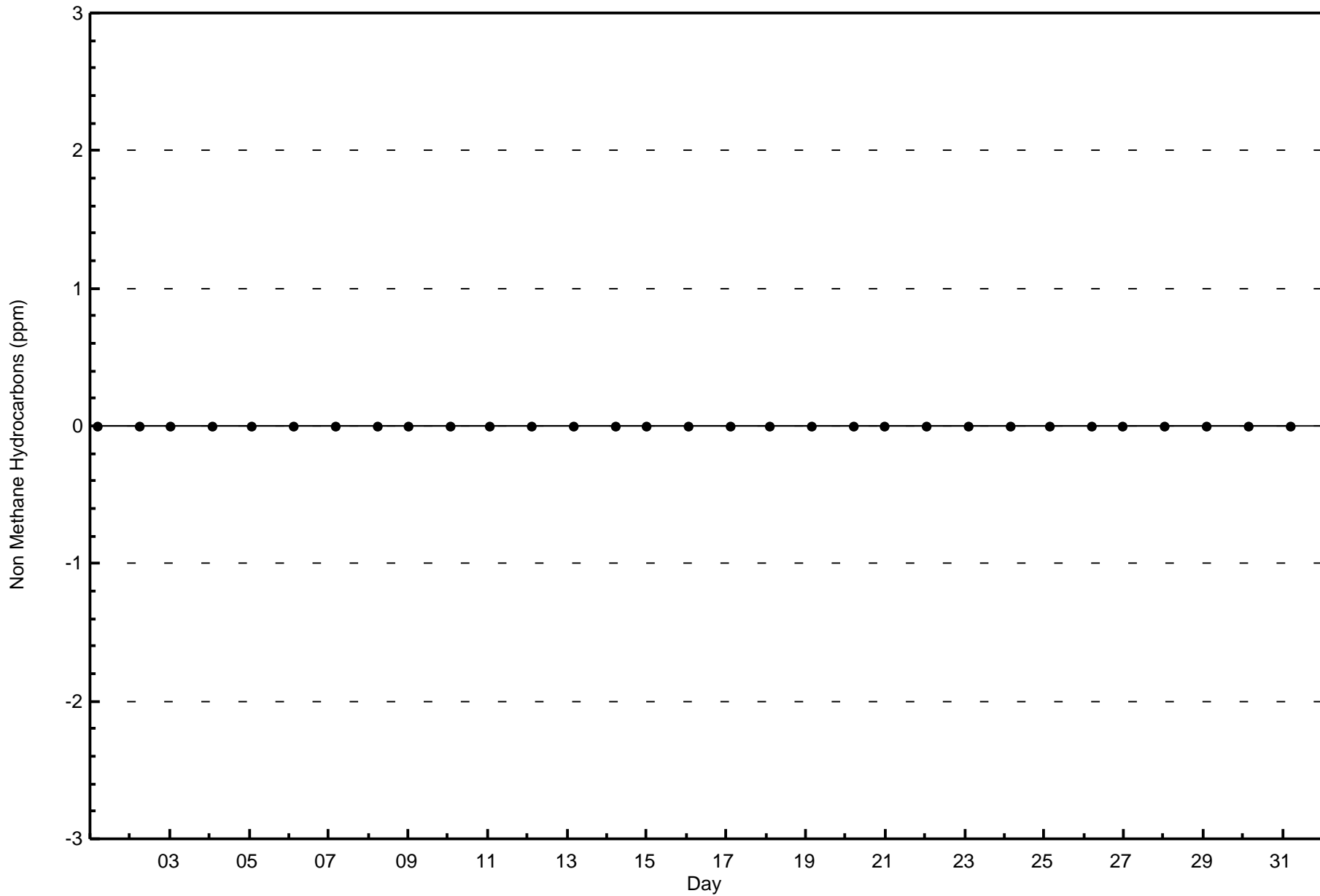
Total Number of Hours: 744

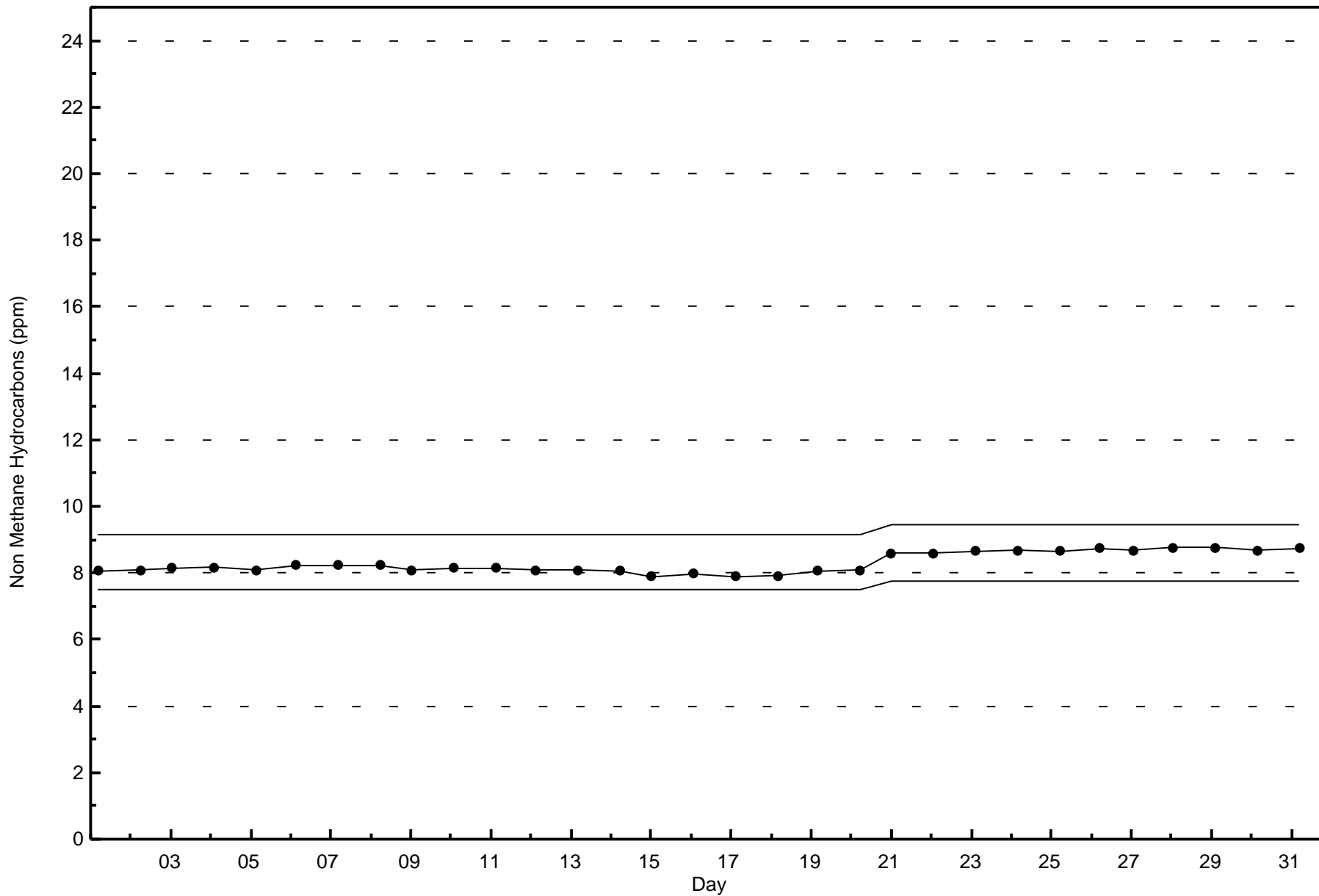


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Non Methane Hydrocarbons (NMHC) - ppm  
Conklin (AMS 21)









Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH<sub>4</sub>) - ppm

Conklin - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2.2 ppm on Dec 31 22:00	Maximum Daily Average: 2.1 ppm on Dec 31		Hours of Data:	664
Minimum Value: 1.9 ppm on Dec 15 11:00	Minimum Daily Average: 1.9 ppm on Dec 9		Hours of Missing Data:	80
Maximum Diurnal Average: 2.0 ppm at hour 24	Minimum Diurnal Average: 1.9 ppm at hour 14		Hours of Calibration:	32
Monthly Average: 1.95 ppm	Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 1.9 Q <sub>3</sub> = 2.0 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.1		Percent Operational Time:	93.6

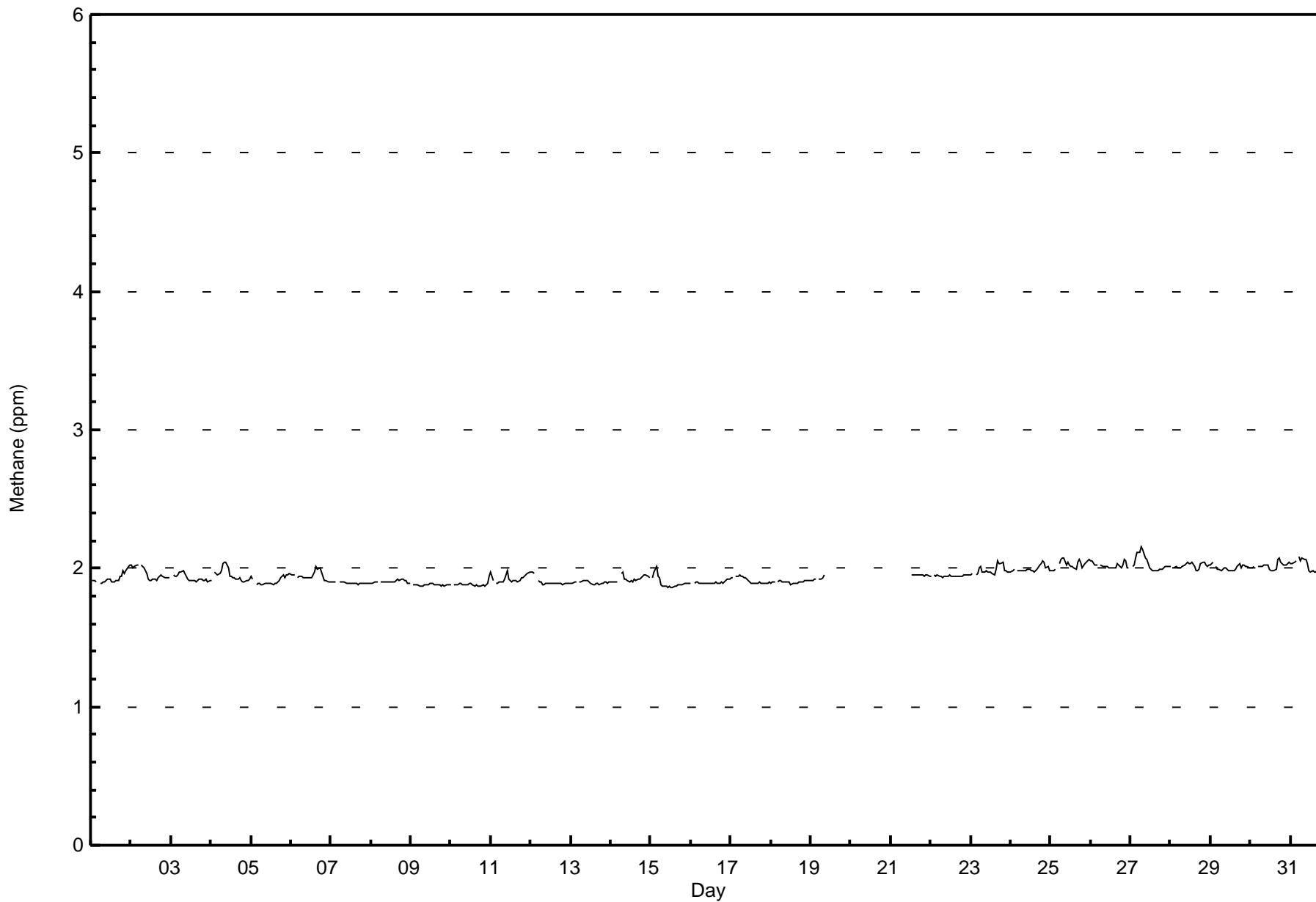
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	
2-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	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	2.0	2.0
3-Dec	Z	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
4-Dec	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
5-Dec	1.9	1.9	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	2.0	2.0	2.0	1.9	2.0
6-Dec	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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
7-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
8-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
9-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
10-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
11-Dec	2.0	1.9	Z	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	1.9	1.9	2.0	2.0	2.0	1.9	2.0	
12-Dec	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
13-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
14-Dec	1.9	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	2.0	1.9	1.9	1.9	2.0	
15-Dec	Z	1.9	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	2.0
16-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
17-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
18-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
19-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1.9
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2.0
22-Dec	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	2.0	1.9	2.0	2.0	2.0	2.0
23-Dec	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
24-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.1
25-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1
26-Dec	2.1	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.1	2.1
27-Dec	Z	2.0	2.0	2.1	2.1	2.1	2.2	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	2.2
28-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
29-Dec	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
30-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
31-Dec	2.0	2.0	2.0	2.1	Z	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	2.1	2.1	2.2	2.2	2.2	2.2	2.2
																								Diurnal Average			
																								Diurnal Maximum			

Z - zerospan      C - Calibration      AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Methane (CH<sub>4</sub>) - ppm**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Conklin - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	631	95.03	95.03
2.1 - 3.0	33	4.97	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Conklin - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	13	10	5	2	2	2	7	14	21	69	85	38	38	109	127	88	630
2.1 - 3.0	0	0	0	0	0	1	1	4	9	10	3	0	0	1	2	2	33
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
<b>Totals</b>	13	10	5	2	2	3	8	18	30	79	88	38	38	110	129	90	663

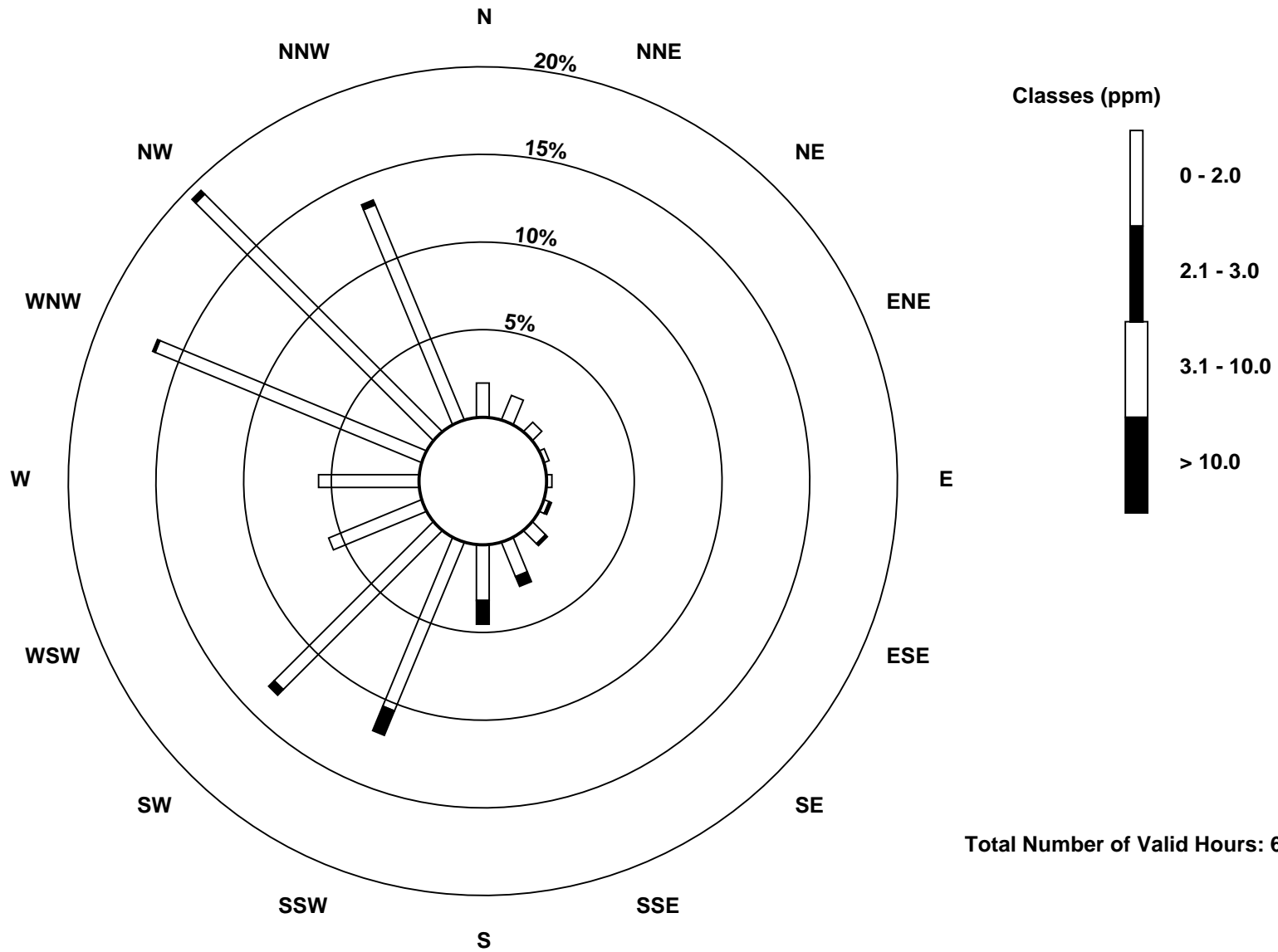
Total Number of Valid Hours: 663

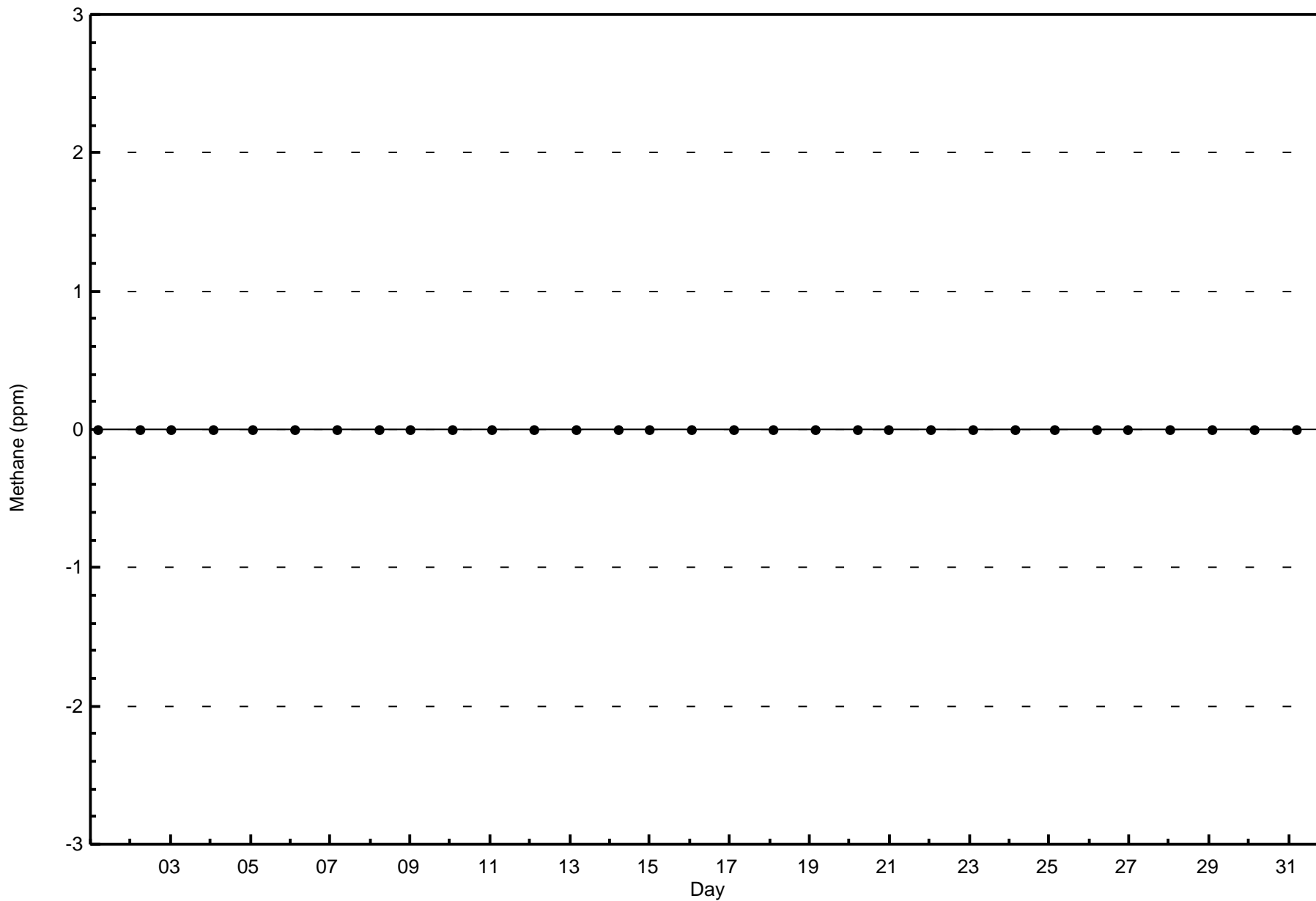
Total Number of Hours: 744

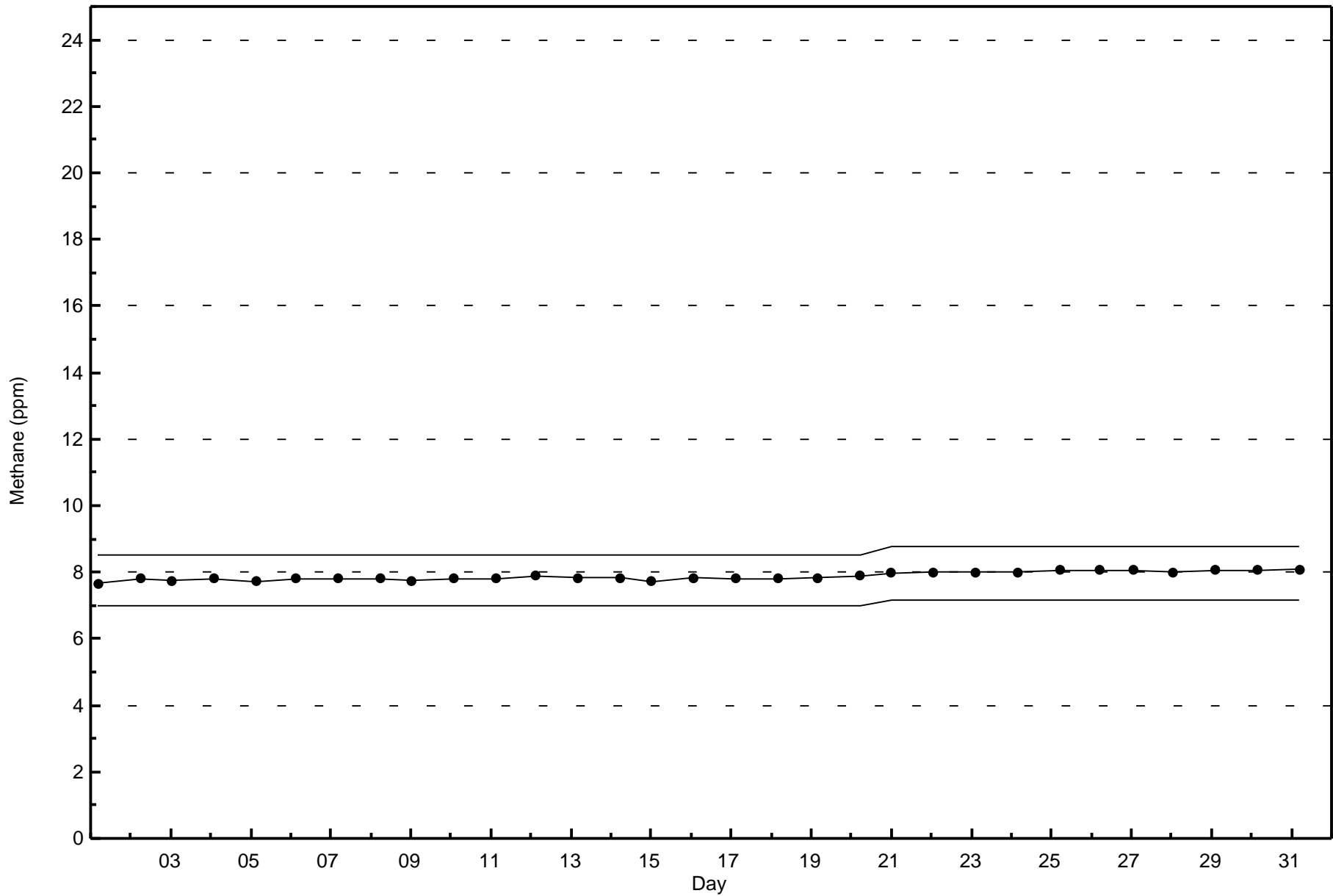


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Conklin (AMS 21)







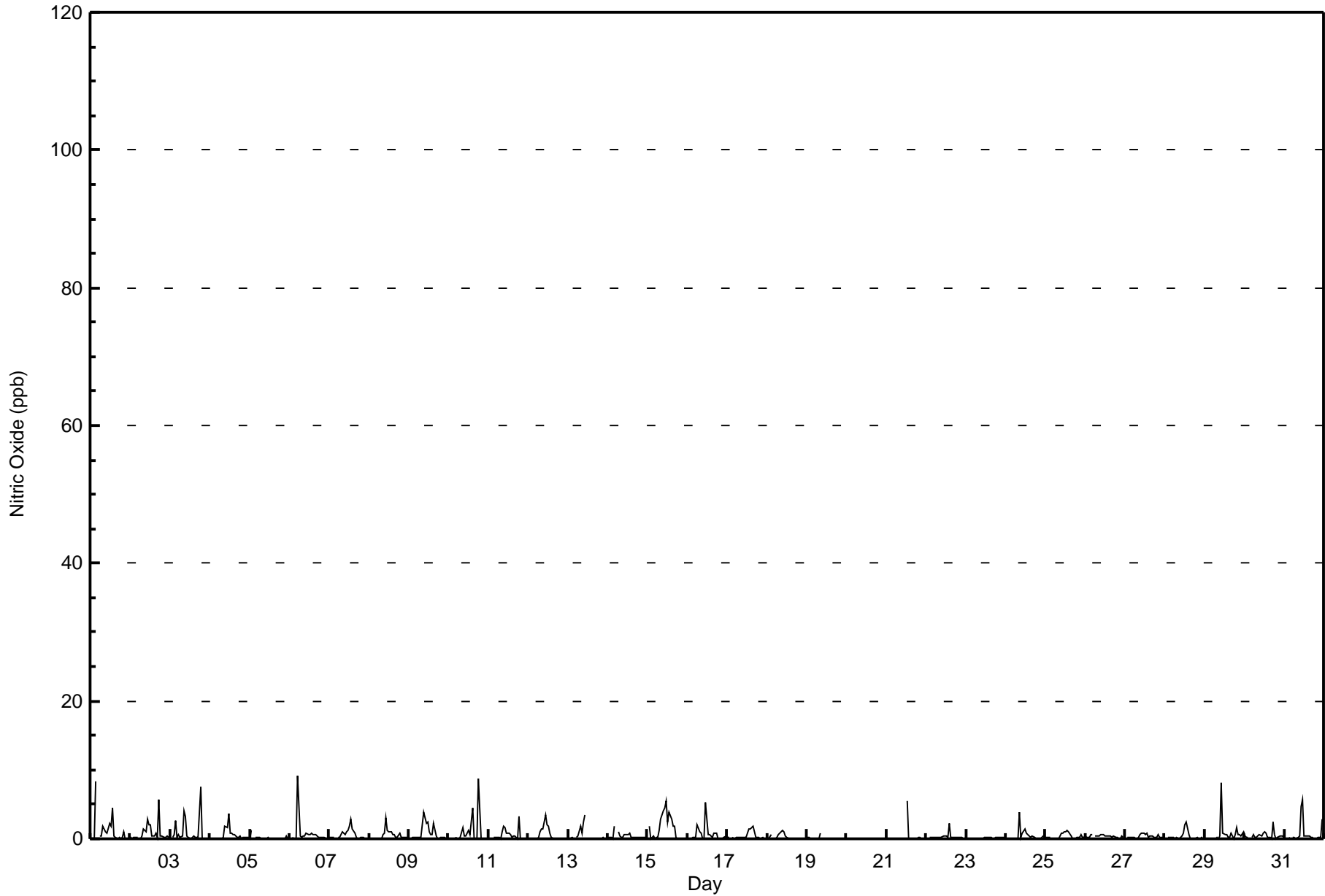


Maximum Value: 9 ppb on Dec 6 06:00																	Maximum Daily Average: 1.5 ppb on Dec 15																	Hours in Service: 744														
Minimum Value: 0 ppb on Dec 3 20:00																	Minimum Daily Average: 0.1 ppb on Dec 23																	Hours of Data: 659														
Maximum Diurnal Average: 1.6 ppb at hour 11																	Minimum Diurnal Average: 0.1 ppb at hour 1																	Hours of Missing Data: 85														
Monthly Average: 0.6 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 6																	Hours of Calibration: 34														
																																		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-Dec	0	0	0	8	Z	0	0	2	1	1	1	2	2	5	0	0	0	0	0	0	1	0	0	0	1.1	8																						
2-Dec	0	0	0	0	0	Z	0	0	1	1	3	2	2	0	0	1	0	6	0	0	0	0	0	0	0.8	6																						
3-Dec	Z	0	1	3	0	1	0	0	4	3	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0.9	8																						
4-Dec	0	Z	0	0	0	0	0	0	0	2	2	4	1	1	1	1	0	0	0	0	0	0	0	0	0.5	4																						
5-Dec	0	1	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																						
6-Dec	0	0	0	Z	0	9	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.7	9																						
7-Dec	0	0	0	0	Z	0	0	1	1	1	1	1	2	3	1	1	0	0	0	0	0	0	0	0	0.6	3																						
8-Dec	0	0	0	0	0	Z	0	0	1	1	3	1	1	1	1	1	0	0	1	0	0	0	0	0	0.5	3																						
9-Dec	Z	0	0	0	0	0	0	0	2	4	2	2	1	1	1	2	0	0	0	0	0	0	0	0	0.7	4																						
10-Dec	0	Z	0	0	0	0	0	0	2	0	0	1	1	1	5	0	0	0	9	0	0	0	0	0	0.8	9																						
11-Dec	0	0	Z	0	0	0	0	0	1	2	2	1	1	1	0	0	0	0	3	0	0	0	0	0	0.5	3																						
12-Dec	0	0	0	Z	0	0	0	1	1	1	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0.6	3																						
13-Dec	0	0	0	0	Z	0	0	2	1	2	4	C	C	C	C	C	0	0	0	0	0	0	0	0	0.5	4																						
14-Dec	0	0	0	0	2	Z	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	2																						
15-Dec	Z	2	0	0	0	0	0	1	3	4	5	5	2	4	3	2	2	0	0	0	0	0	0	0	1.5	5																						
16-Dec	0	Z	0	0	0	0	2	1	1	0	0	5	1	1	0	0	1	1	0	0	0	0	0	0	0.6	5																						
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	2	1	0	0	0	0	0	0	0	0.4	2																						
18-Dec	0	0	1	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																						
19-Dec	0	0	0	0	Z	0	0	0	1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	1																						
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																						
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	5	0	0	0	0	0	0	0	0	0	0	0	--	5																						
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0.3	2																						
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
24-Dec	0	0	0	Z	0	0	0	0	4	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	4																						
25-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0.4	1																						
26-Dec	0	0	0	1	1	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
27-Dec	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0.3	1																						
28-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	2	3	1	0	0	0	0	0	0	0	0	0	0.4	3																						
29-Dec	0	0	Z	0	0	0	0	0	0	0	8	1	1	1	0	0	1	0	1	2	1	1	0	1	0.7	8																						
30-Dec	0	0	0	Z	0	1	0	0	0	1	0	1	1	1	0	0	0	3	1	0	0	0	0	0	0.5	3																						
31-Dec	0	0	0	0	Z	0	0	0	0	0	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0.7	6																						
																								0.1	0.2	0.1	0.6	0.2	0.5	0.2	0.4	0.9	1.0	1.6	1.5	1.1	1.0	0.8	0.5	0.3	0.4	0.8	0.2	0.2	0.2	0.2	0.2	Diurnal Average
																								0	2	1	8	2	9	2	2	4	4	8	6	5	5	5	2	2	6	9	2	1	1	0	3	Diurnal Maximum
Z - zerospan                      C - Calibration                      AF - Analyzer Failure																																																



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	659	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: 659

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	13	10	5	2	2	3	8	18	30	79	88	38	38	110	128	86	658
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
<b>Totals</b>	<b>13</b>	<b>10</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>8</b>	<b>18</b>	<b>30</b>	<b>79</b>	<b>88</b>	<b>38</b>	<b>38</b>	<b>110</b>	<b>128</b>	<b>86</b>	<b>658</b>

Total Number of Valid Hours: 658

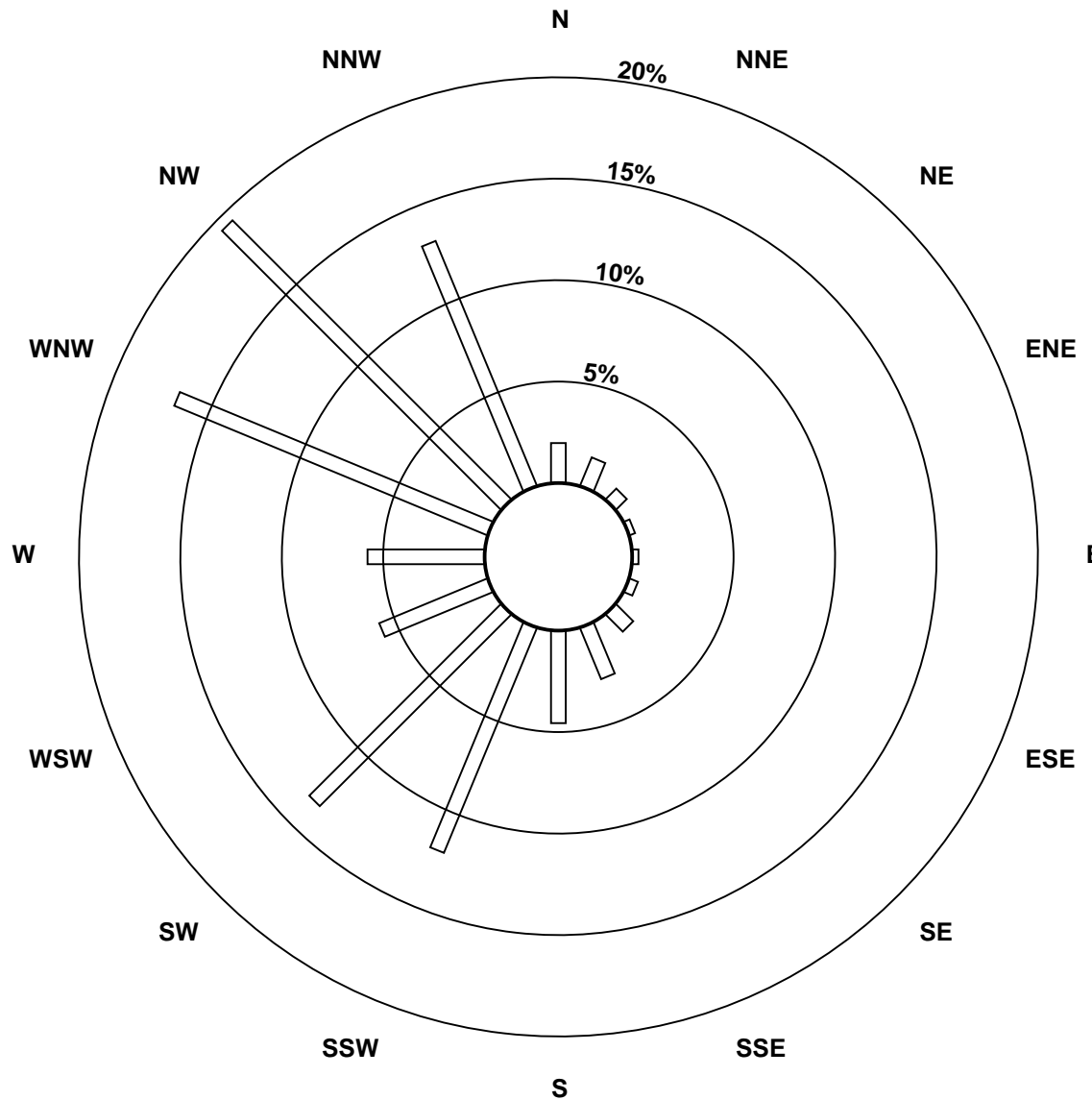
Total Number of Hours: 744



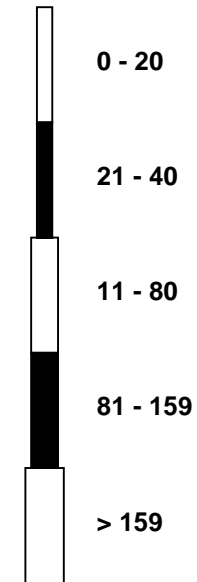


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

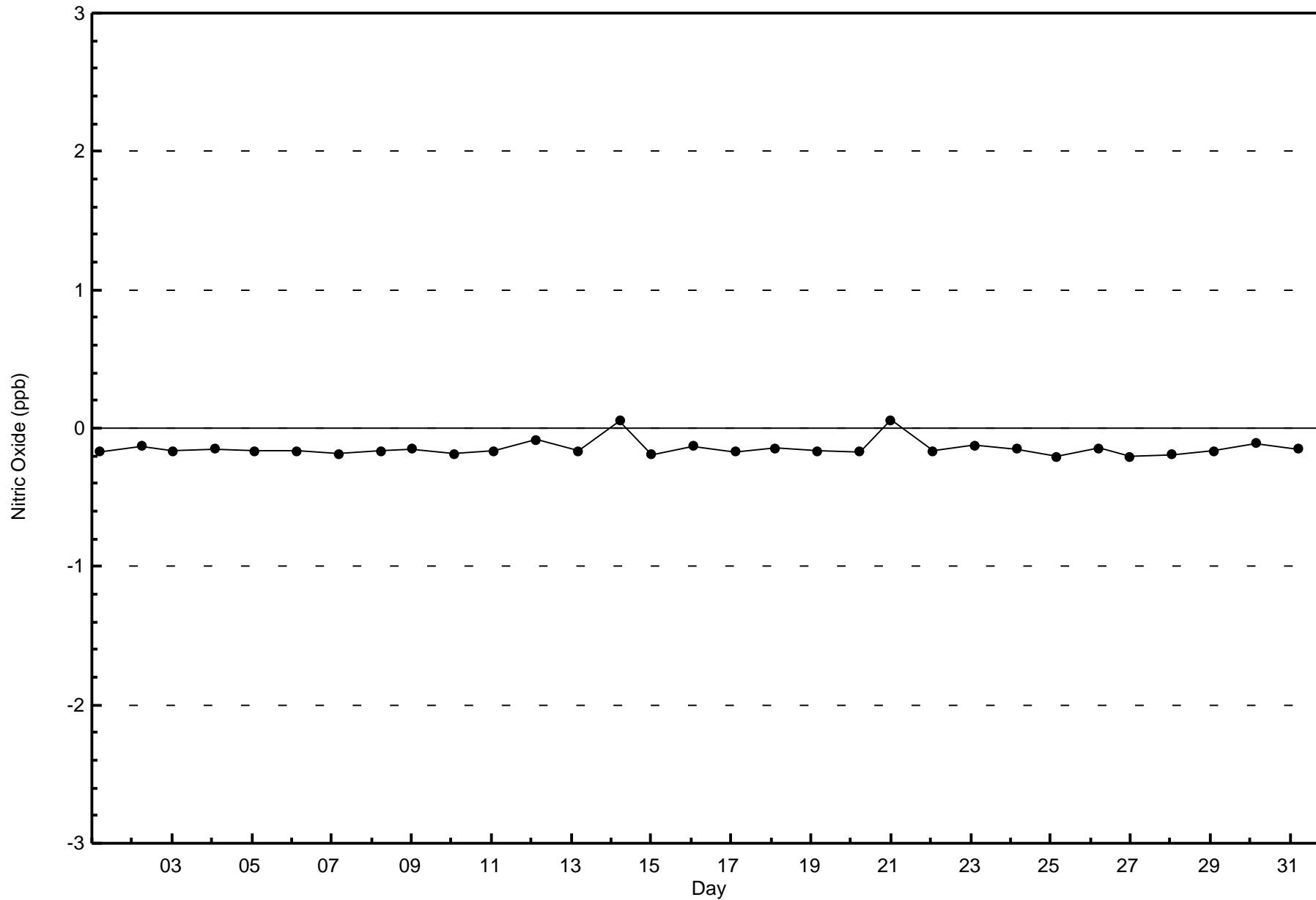
Nitric Oxide (NO) - ppb  
Conklin (AMS 21)



Classes (ppb)



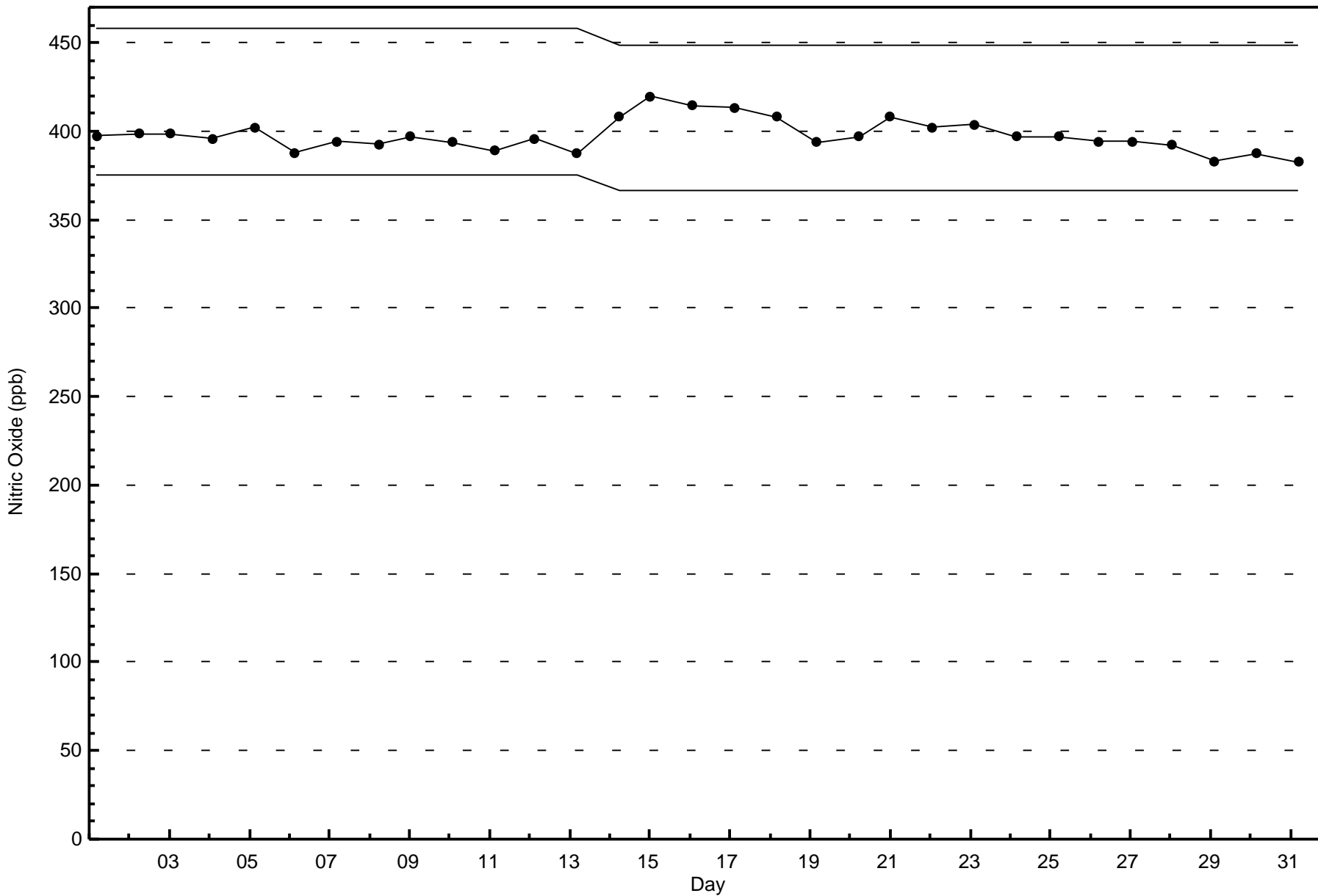
Total Number of Valid Hours: 658





**Wood Buffalo Environmental Association**  
**Span Responses**

**Nitric Oxide (NO) - ppb**  
**Conklin - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

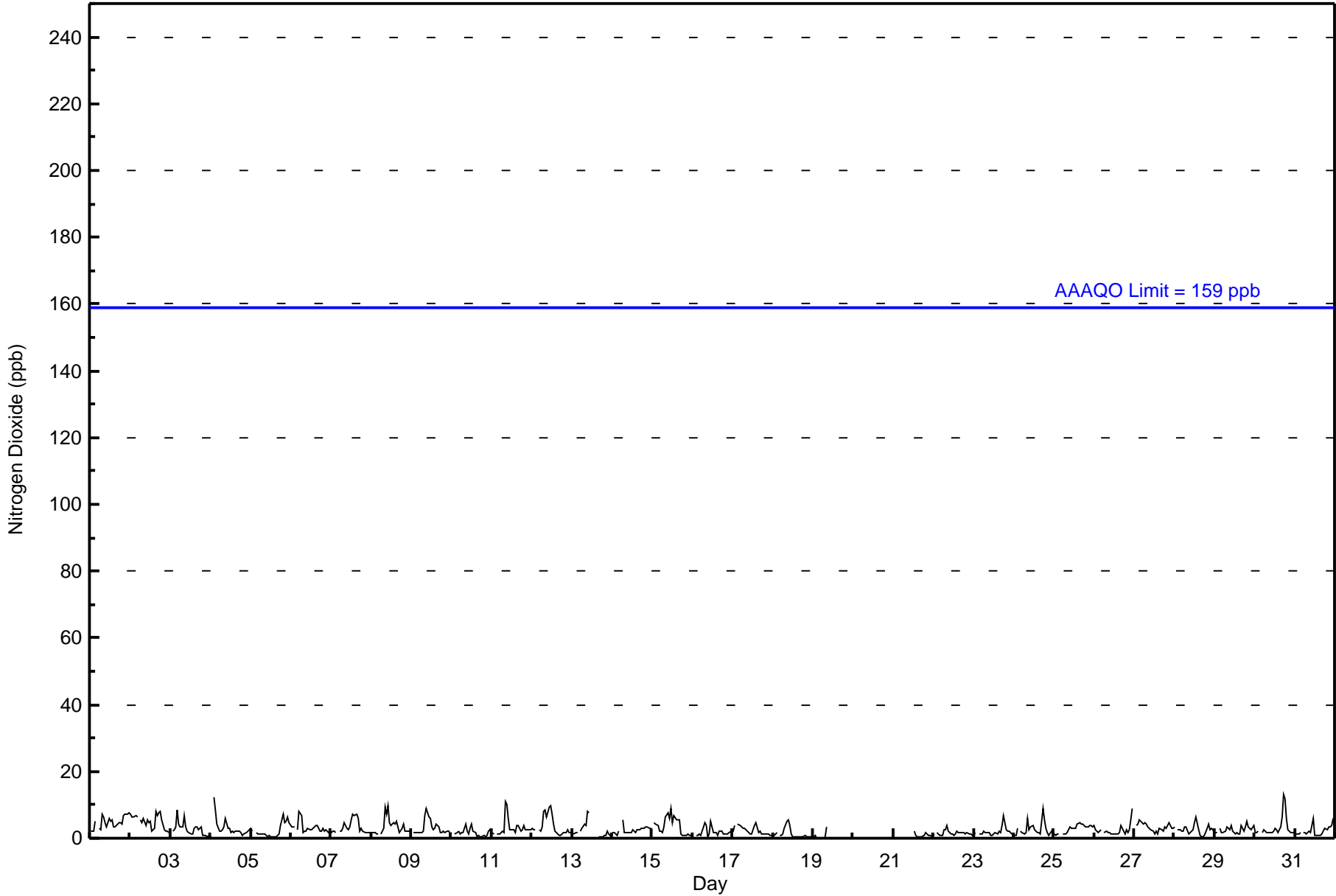
# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

## Conklin - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 13 ppb on Dec 30 18:00	Maximum Daily Average: 5.2 ppb on Dec 2		Hours of Data:	659
Minimum Value: 0 ppb on Dec 19 04:00	Minimum Daily Average: 1.3 ppb on Dec 18		Hours of Missing Data:	85
Maximum Diurnal Average: 4.2 ppb at hour 9	Minimum Diurnal Average: 2.0 ppb at hour 1		Hours of Calibration:	34
Monthly Average: 2.8 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 10		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-Dec	2	2	2	5	Z	3	3	7	6	5	3	6	5	5	3	3	4	5	5	4	7	7	7	8	4.7	8
2-Dec	7	6	6	7	7	Z	5	5	6	4	5	5	5	2	3	8	7	8	8	5	3	2	2	2	5.2	8
3-Dec	Z	2	2	4	9	4	4	4	7	3	2	2	1	1	3	3	3	3	4	1	1	1	1	1	2.7	9
4-Dec	0	Z	12	8	4	2	2	3	4	6	3	3	2	2	2	2	2	2	2	1	1	2	2	3	3.0	12
5-Dec	3	2	Z	2	1	1	1	1	1	1	1	1	0	1	0	0	1	1	4	7	5	5	6	5	2.2	7
6-Dec	4	3	3	Z	3	8	7	2	2	2	3	2	2	3	4	4	4	2	2	3	2	2	2	2	3.1	8
7-Dec	2	2	2	2	Z	2	2	3	5	3	3	3	6	7	7	7	6	2	3	2	2	2	2	2	3.3	7
8-Dec	2	2	2	1	1	Z	1	3	9	7	10	5	4	5	4	5	3	2	3	4	2	2	2	2	3.5	10
9-Dec	Z	2	2	2	2	2	2	2	7	9	6	6	4	3	3	4	3	2	2	2	2	2	2	1	3.0	9
10-Dec	2	Z	1	2	2	1	2	2	4	2	1	3	4	2	2	1	1	1	0	1	1	1	2	3	1.7	4
11-Dec	2	1	Z	1	1	1	2	2	11	10	6	3	2	3	2	4	4	2	3	4	3	3	3	3	3.2	11
12-Dec	3	3	3	Z	2	2	4	8	8	6	9	10	7	4	2	1	1	1	1	2	2	3	2	2	3.7	10
13-Dec	1	1	2	2	Z	2	3	4	4	8	8	C	C	C	C	C	0	0	1	1	1	2	1	1	2.3	8
14-Dec	2	2	1	1	2	Z	5	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	2.4	5
15-Dec	Z	5	4	4	2	2	2	3	6	8	6	9	5	7	5	5	5	1	1	1	1	1	1	1	3.7	9
16-Dec	1	Z	1	1	1	1	2	5	4	1	1	5	2	2	2	1	2	2	1	1	1	1	2	2	1.8	5
17-Dec	2	4	Z	4	4	3	3	3	2	2	1	1	3	4	5	2	2	1	1	1	1	1	1	1	2.3	5
18-Dec	1	1	2	Z	1	1	1	3	5	5	4	1	1	0	0	0	0	0	0	1	1	0	0	0	1.3	5
19-Dec	0	1	0	0	Z	0	0	0	3	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	3
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2	1	1	0	1	1	1	2	1	1	1	1	--	2
22-Dec	1	Z	2	1	1	1	3	3	4	2	1	1	1	1	2	2	2	2	2	1	2	1	1	1	1.6	4
23-Dec	1	2	Z	1	1	1	2	2	2	2	1	1	1	2	1	2	2	4	7	3	2	2	2	1	1.9	7
24-Dec	1	1	3	Z	2	2	1	2	6	3	4	4	3	2	2	2	1	9	5	3	2	1	2	2	2.7	9
25-Dec	1	1	1	1	Z	1	1	1	2	3	3	3	3	3	4	5	4	4	4	3	3	4	4	4	2.8	5
26-Dec	4	3	2	2	3	Z	2	2	2	2	1	1	1	1	2	4	3	1	3	2	3	5	9	2.5	9	
27-Dec	Z	4	4	5	5	4	5	4	3	3	2	2	1	2	1	3	3	2	3	3	4	5	3	3	3.2	5
28-Dec	3	Z	2	3	2	2	3	3	1	2	2	2	5	6	3	1	1	1	1	3	4	3	3	3	2.5	6
29-Dec	2	2	Z	3	2	2	2	4	3	3	4	2	1	2	1	1	4	2	3	5	3	3	2	4	2.6	5
30-Dec	2	2	2	Z	2	3	2	2	2	2	2	2	3	3	2	3	7	13	12	6	3	2	2	2	3.4	13
31-Dec	1	1	1	2	Z	2	2	1	2	2	4	6	1	1	1	1	1	2	3	3	3	4	4	6	2.2	6
																								Diurnal Average		
																								Diurnal Maximum		

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





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	659	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: 659

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	13	10	5	2	2	3	8	18	30	79	88	38	38	110	128	86	658
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
<b>Totals</b>	13	10	5	2	2	3	8	18	30	79	88	38	38	110	128	86	658

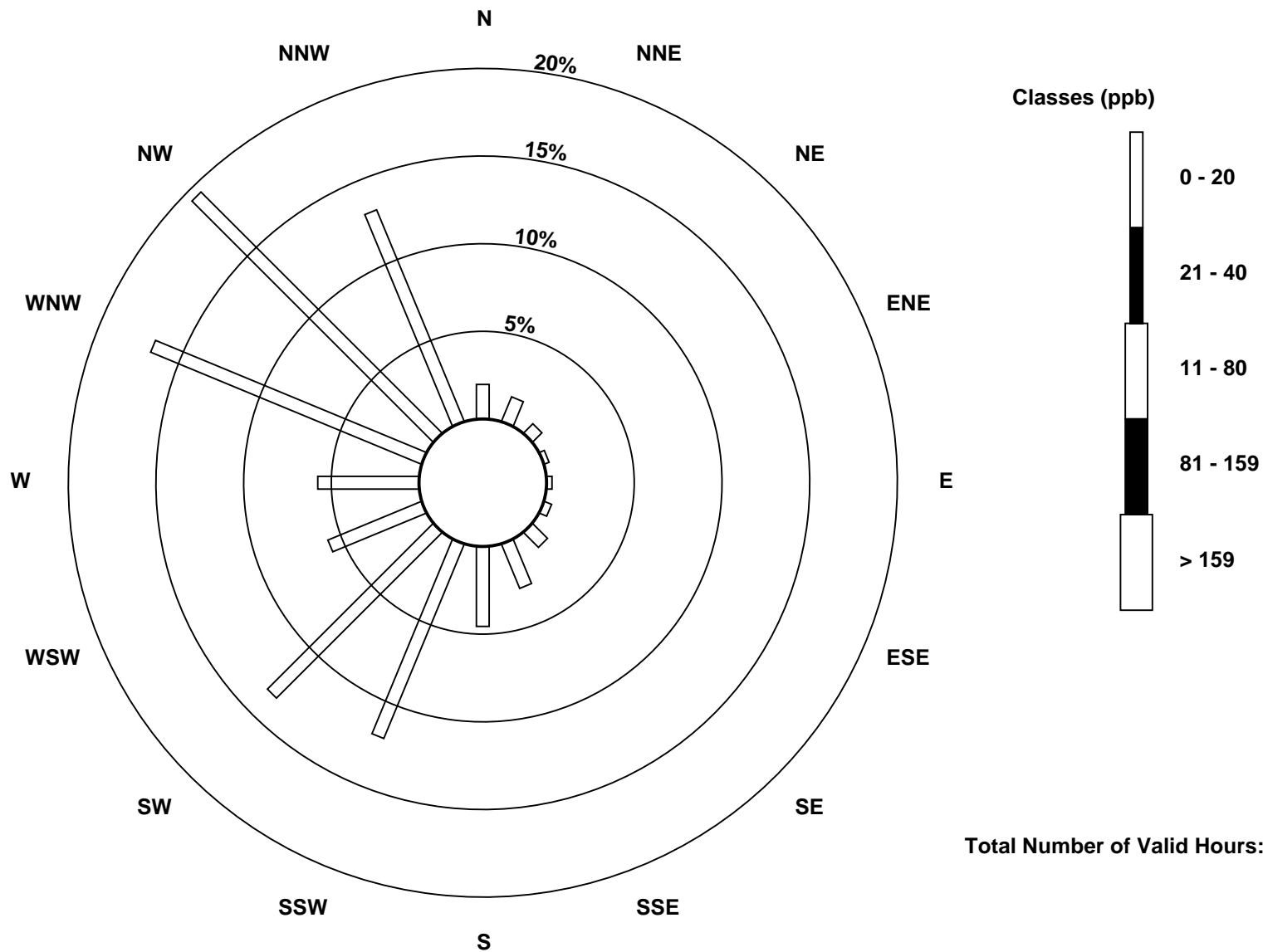
Total Number of Valid Hours: 658

Total Number of Hours: 744



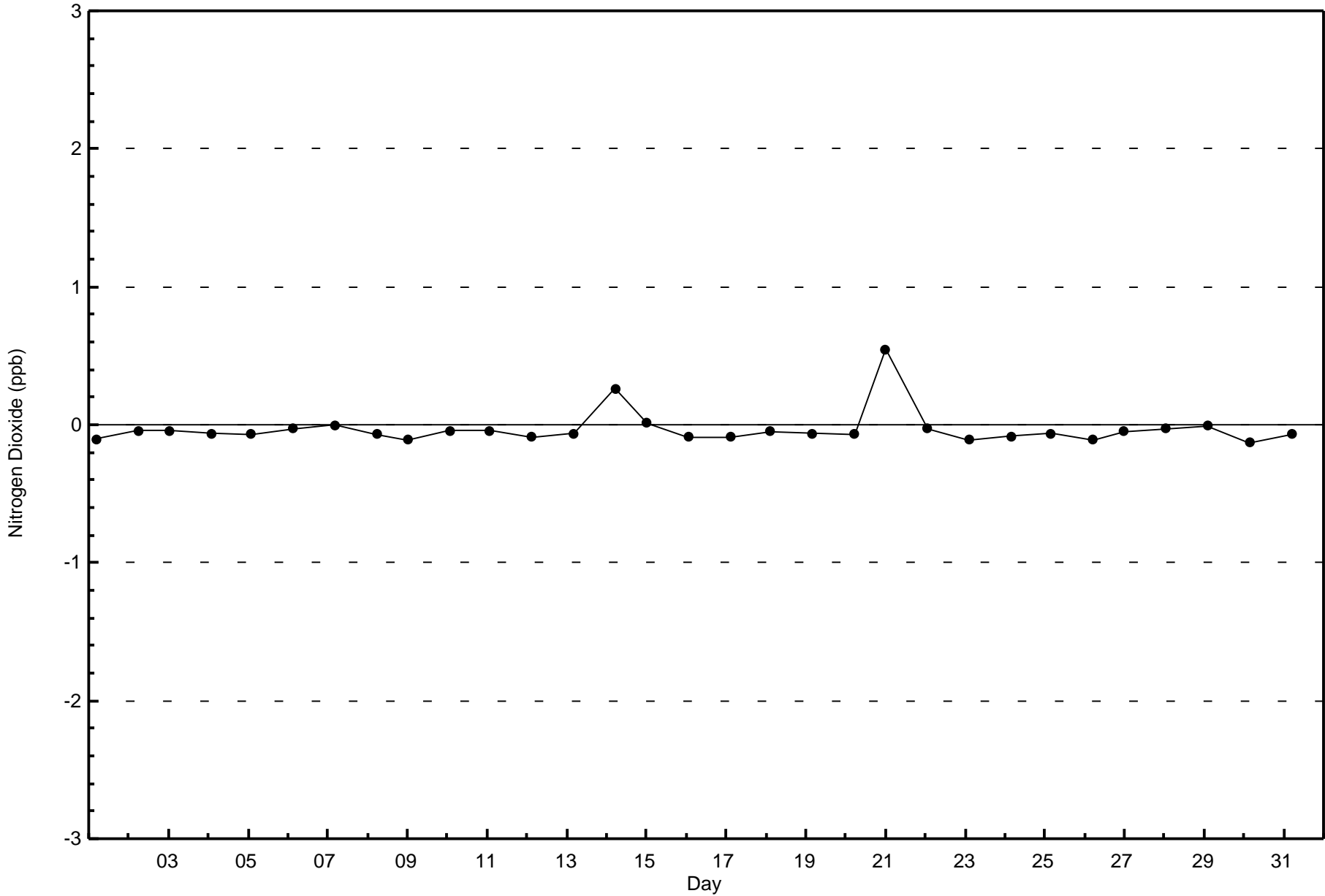
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

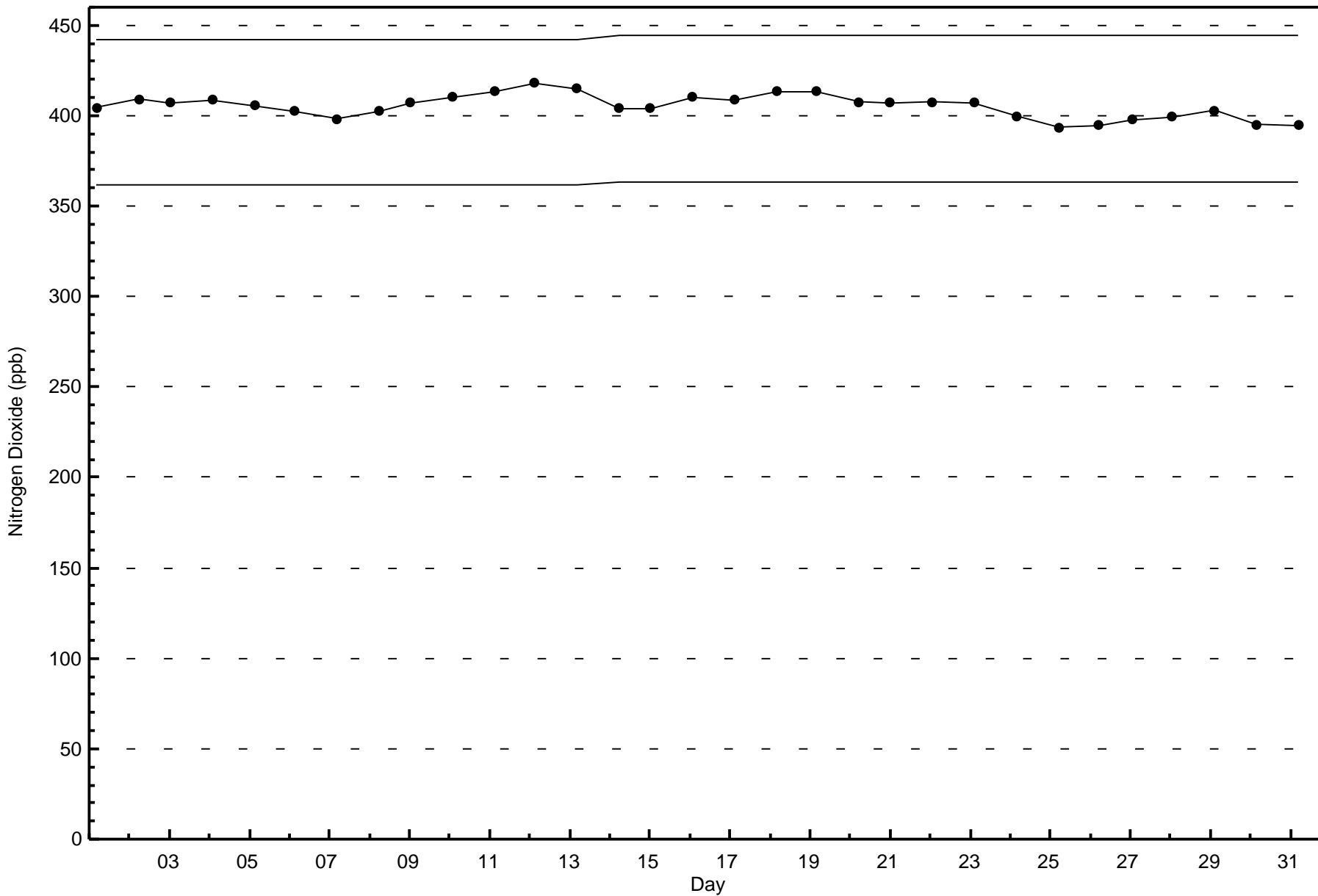
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Conklin (AMS 21)



Total Number of Valid Hours: 658









# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Oxides (NO<sub>x</sub>) - ppb

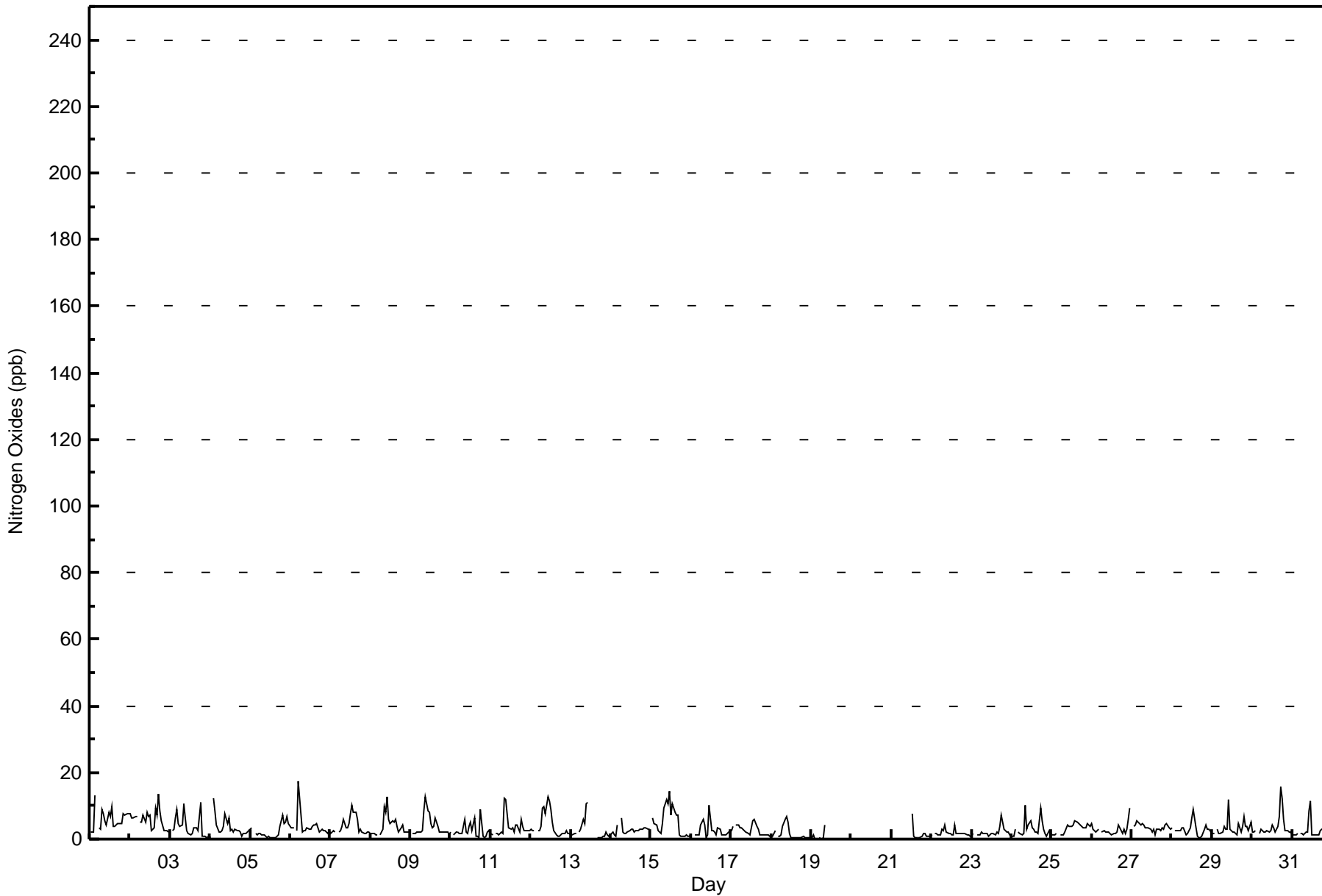
## Conklin - December 2017

Maximum Value: 17 ppb on Dec 6 06:00																		Maximum Daily Average: 6.0 ppb on Dec 2						Hours in Service: 744																									
Minimum Value: 0 ppb on Dec 19 04:00																		Minimum Daily Average: 1.5 ppb on Dec 18						Hours of Data: 659																									
Maximum Diurnal Average: 5.2 ppb at hour 9																		Minimum Diurnal Average: 2.1 ppb at hour 1						Hours of Missing Data: 85																									
Monthly Average: 3.3 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 O <sub>3</sub> = 4 P <sub>90</sub> = 7 P <sub>99</sub> = 13						Hours of Calibration: 34																									
																		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-Dec	2	2	2	13	Z	4	3	9	8	5	4	8	7	10	4	4	5	5	5	4	8	7	8	8	5.8	13																							
2-Dec	7	7	7	7	7	Z	5	5	7	5	8	7	7	2	3	9	7	13	8	6	3	2	3	2	6.0	13																							
3-Dec	Z	2	3	6	9	5	4	4	11	6	2	2	1	2	3	4	3	3	11	1	1	1	0	1	3.7	11																							
4-Dec	0	Z	12	8	4	2	2	3	4	8	4	6	2	3	2	3	2	2	2	1	2	2	2	3	3.5	12																							
5-Dec	3	3	Z	2	1	2	2	1	1	1	1	1	0	1	0	0	1	1	4	7	5	5	7	5	2.3	7																							
6-Dec	4	3	3	Z	3	17	7	2	3	3	4	3	3	4	4	4	4	2	3	3	2	3	2	2	3.8	17																							
7-Dec	2	2	2	2	Z	2	2	4	6	3	4	5	8	10	8	8	6	2	3	2	2	2	2	2	3.8	10																							
8-Dec	2	2	2	1	1	Z	1	3	10	8	13	6	5	5	5	6	4	2	4	4	2	2	2	2	4.0	13																							
9-Dec	Z	2	2	2	2	2	2	2	9	13	9	8	5	3	4	7	4	2	2	2	2	2	2	1	3.8	13																							
10-Dec	2	Z	1	2	2	2	2	2	6	2	2	4	5	3	6	1	1	1	9	1	1	1	2	3	2.5	9																							
11-Dec	1	1	Z	2	1	1	2	2	12	12	8	3	3	3	2	4	4	2	6	4	3	3	3	3	3.7	12																							
12-Dec	3	3	3	Z	2	2	4	9	10	8	13	12	9	5	2	1	1	1	1	2	2	3	2	2	4.3	13																							
13-Dec	1	1	2	1	Z	2	3	6	5	11	11	C	C	C	C	C	0	0	0	1	1	2	1	1	2.8	11																							
14-Dec	2	2	1	1	4	Z	6	2	2	2	2	3	3	2	3	3	3	3	3	3	3	3	3	3	2.7	6																							
15-Dec	Z	7	4	4	2	2	2	5	9	12	10	14	7	11	8	7	7	1	1	1	1	1	1	1	5.2	14																							
16-Dec	1	Z	1	1	1	1	4	6	4	0	1	10	2	3	2	1	3	3	1	1	1	1	2	2	2.4	10																							
17-Dec	2	4	Z	4	4	4	3	3	3	2	2	1	3	5	6	4	3	1	1	1	1	1	1	1	2.7	6																							
18-Dec	1	1	2	Z	1	1	1	4	6	7	5	2	1	0	0	0	0	0	0	1	1	0	0	0	1.5	7																							
19-Dec	1	1	0	0	Z	0	0	0	4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	4																							
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--																							
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	8	1	1	0	0	1	1	2	2	1	1	1	--	8																							
22-Dec	1	Z	2	1	1	1	3	3	4	2	2	2	1	1	4	2	2	2	2	1	2	1	1	1	1.9	4																							
23-Dec	1	2	Z	1	1	1	2	2	2	2	1	1	2	2	1	2	2	4	7	3	2	2	2	1	2.0	7																							
24-Dec	1	1	3	Z	2	2	1	2	10	3	4	5	3	3	2	2	2	9	5	3	2	1	2	2	3.1	10																							
25-Dec	1	1	1	2	Z	1	1	1	2	4	4	4	4	4	5	5	5	4	4	3	4	5	4	4	3.2	5																							
26-Dec	4	3	2	3	3	Z	2	3	2	2	2	2	1	1	2	2	4	4	2	3	2	3	6	9	2.9	9																							
27-Dec	Z	4	4	5	5	4	5	4	4	4	3	3	2	3	1	3	3	3	3	3	4	5	3	3	3.6	5																							
28-Dec	3	Z	3	3	2	2	3	4	1	2	3	3	7	9	3	1	1	1	1	3	4	3	3	3	2.9	9																							
29-Dec	2	2	Z	3	2	2	2	4	3	3	12	3	2	2	2	1	5	2	4	7	4	4	3	5	3.3	12																							
30-Dec	2	2	3	Z	2	3	2	2	2	3	2	3	4	3	2	4	7	16	12	6	3	2	2	2	3.9	16																							
31-Dec	1	1	1	2	Z	2	2	1	2	2	8	11	1	1	1	1	1	2	3	3	3	4	4	9	3.0	11																							
																								2.1	2.4	2.8	3.2	2.8	2.7	2.8	3.3	5.2	4.8	5.1	4.9	3.8	3.7	3.2	3.2	3.1	3.2	3.8	2.8	2.4	2.5	2.6	2.8	Diurnal Average	
																								7	7	12	13	9	17	7	9	12	13	13	14	9	11	8	9	7	16	12	7	8	7	8	9	Diurnal Maximum	
Z - zerospan																								C - Calibration						AF - Analyzer Failure																			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	659	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: 659

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	13	10	5	2	2	3	8	18	30	79	88	38	38	110	128	86	658
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
<b>Totals</b>	<b>13</b>	<b>10</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>8</b>	<b>18</b>	<b>30</b>	<b>79</b>	<b>88</b>	<b>38</b>	<b>38</b>	<b>110</b>	<b>128</b>	<b>86</b>	<b>658</b>

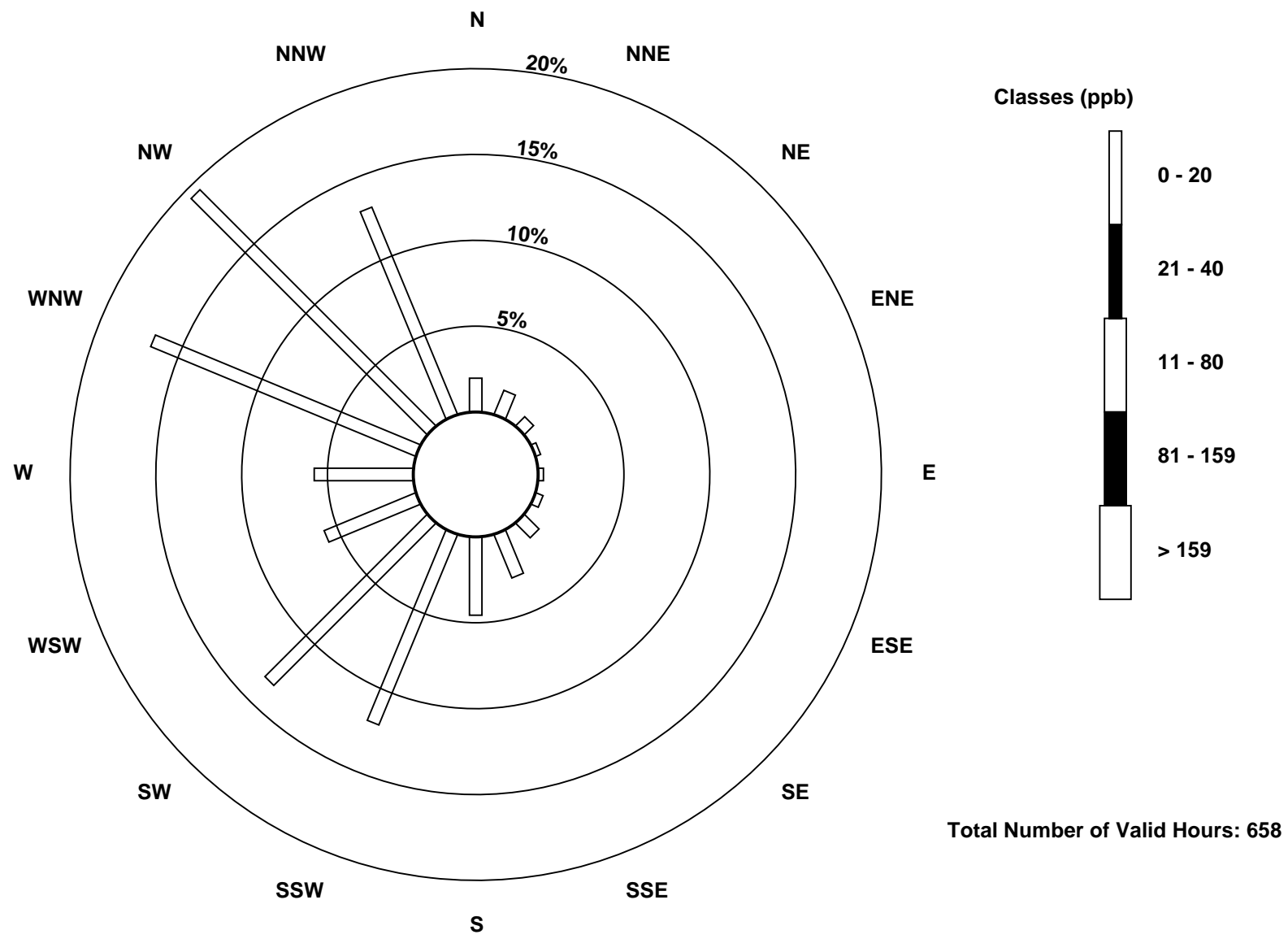
Total Number of Valid Hours: 658

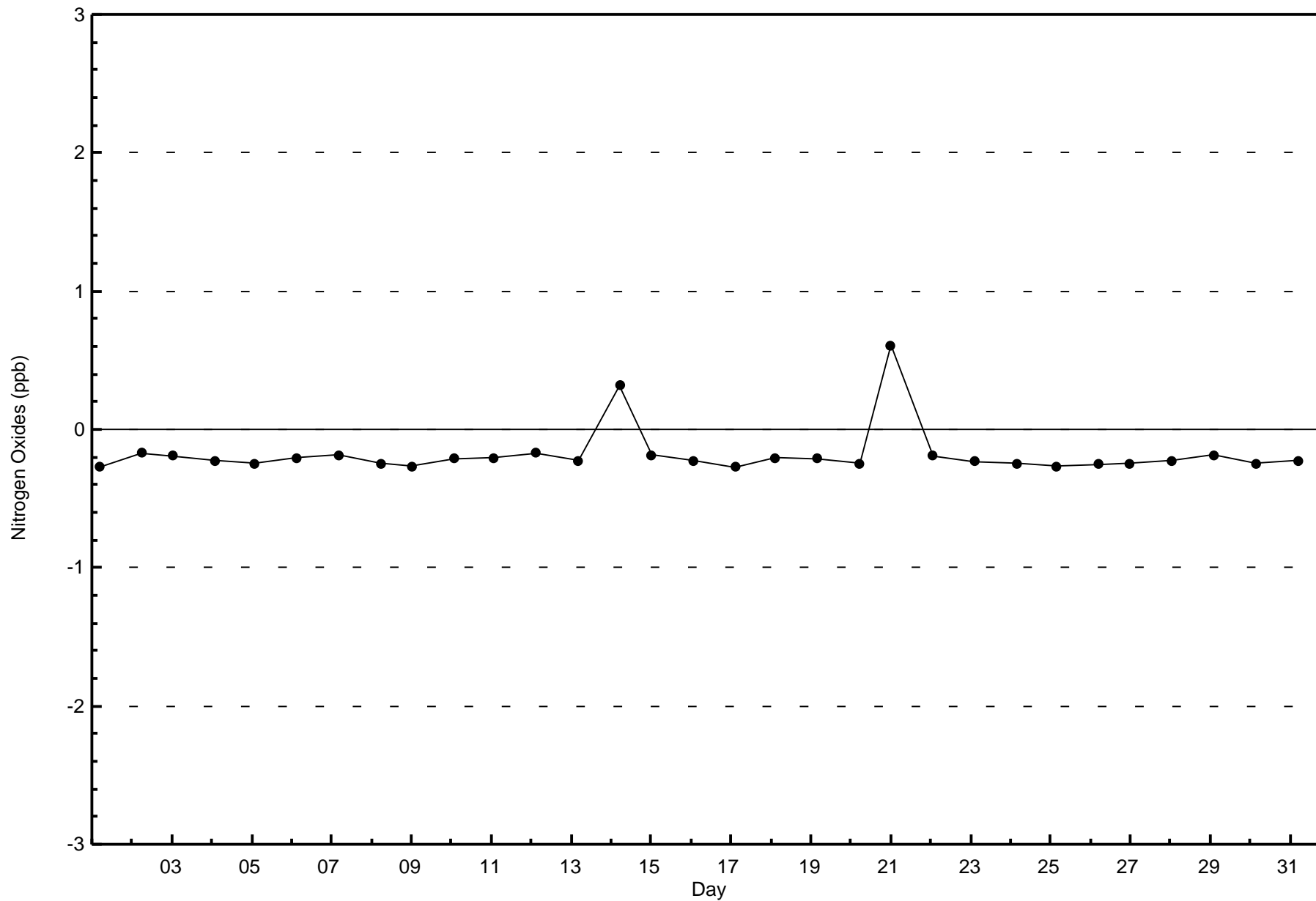
Total Number of Hours: 744



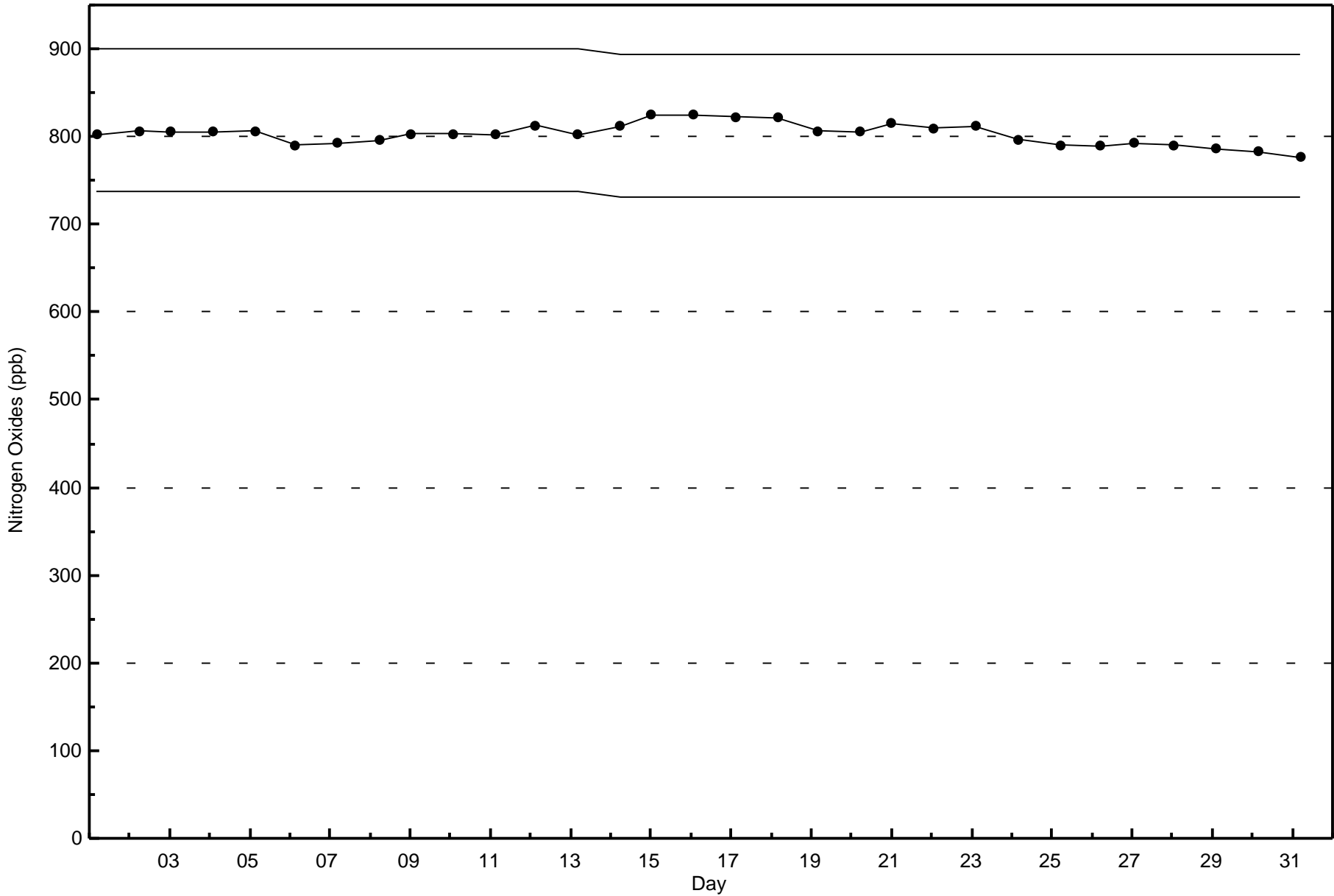
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Conklin (AMS 21)











Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

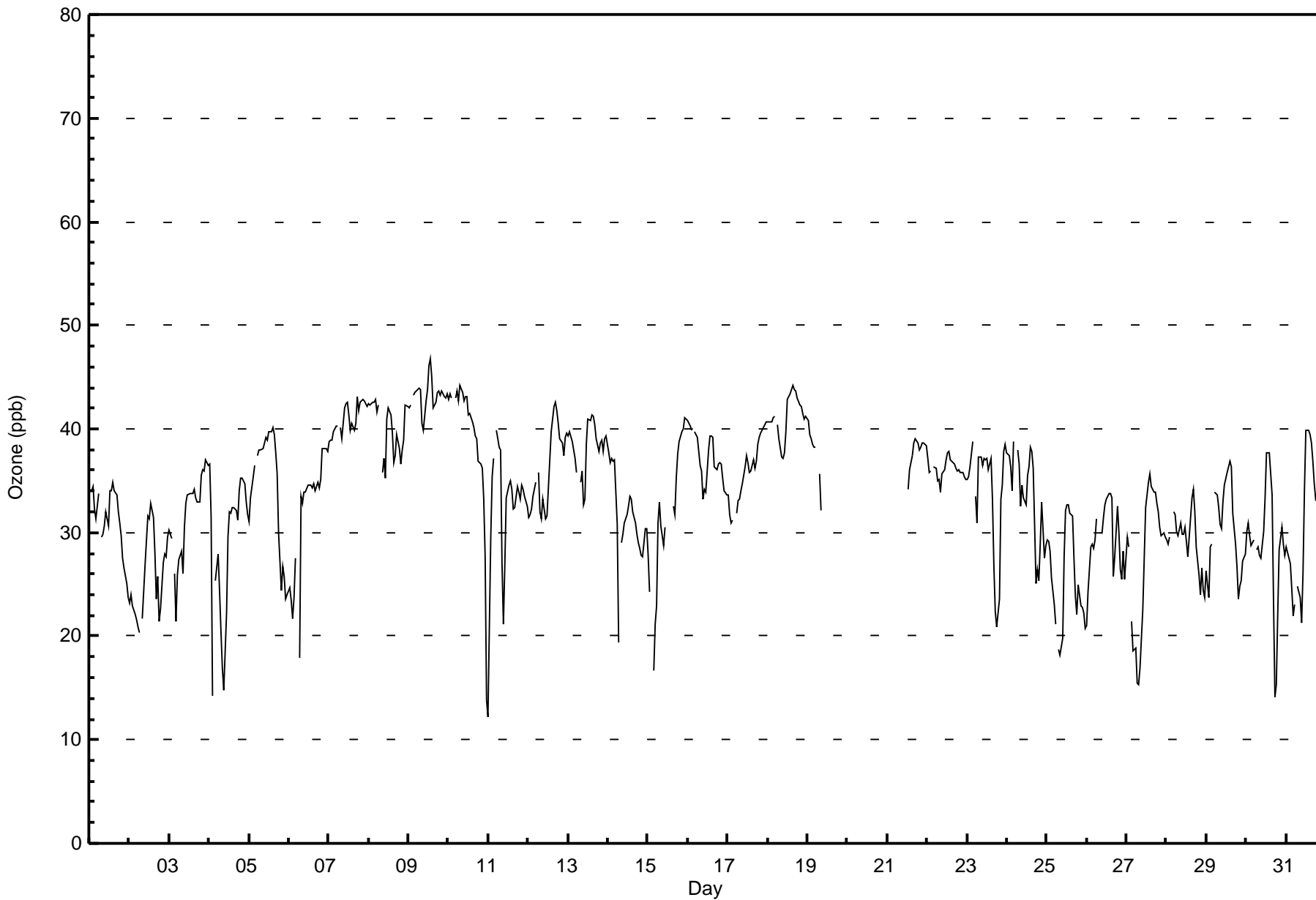
Conklin - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 47 ppb on Dec 9 14:00										Maximum Daily Average: 43.3 ppb on Dec 9										Hours of Data: 660						
Minimum Value: 12 ppb on Dec 11 01:00										Minimum Daily Average: 25.6 ppb on Dec 25										Hours of Missing Data: 84						
Maximum Diurnal Average: 37.0 ppb at hour 15										Minimum Diurnal Average: 31.0 ppb at hour 9										Hours of Calibration: 33						
Monthly Average: 33.6 ppb										Percentiles: P <sub>1</sub> = 14 P <sub>10</sub> = 24 Q <sub>1</sub> = 30 Median = 34 Q <sub>3</sub> = 38 P <sub>90</sub> = 41 P <sub>99</sub> = 44										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-Dec	34	34	34	32	31	34	Z	30	30	31	32	31	34	34	35	34	34	32	31	30	27	27	25	24	31.2	35
2-Dec	23	24	23	22	22	21	20	Z	22	27	29	32	31	33	31	28	24	26	21	23	27	28	28	30	25.8	33
3-Dec	30	29	Z	26	21	26	27	28	26	31	33	34	34	34	34	34	33	33	33	36	36	36	37	36	31.6	37
4-Dec	37	32	14	Z	25	28	24	20	17	15	22	30	32	32	32	32	31	34	35	35	35	33	32	28.7	37	
5-Dec	31	33	35	37	Z	37	38	38	38	39	39	39	40	40	40	39	38	36	30	24	27	26	24	34.4	40	
6-Dec	25	23	22	24	28	Z	18	34	33	34	34	35	35	35	34	35	34	35	34	35	38	38	38	38	32.0	38
7-Dec	39	39	39	40	40	40	Z	40	39	42	42	43	41	40	40	40	41	43	42	43	43	43	42	42	41.0	43
8-Dec	42	42	43	43	43	42	42	Z	36	37	35	41	42	41	40	37	37	39	38	37	38	39	42	42	39.9	43
9-Dec	42	42	Z	43	44	44	44	44	41	40	43	44	46	47	45	42	43	44	44	43	44	43	43	43	43.3	47
10-Dec	43	43	43	Z	43	44	43	44	44	43	43	43	41	41	41	40	39	39	37	37	36	33	28	14	39.2	44
11-Dec	12	30	35	37	Z	40	38	38	27	21	27	33	35	35	34	32	32	34	34	33	35	34	33	32	32.3	40
12-Dec	31	32	32	34	35	Z	36	32	31	33	31	32	34	37	40	42	43	42	41	39	39	37	39	40	36.1	43
13-Dec	39	40	39	38	37	36	Z	35	36	33	33	38	41	41	41	41	40	39	38	39	39	38	39	39	38.2	41
14-Dec	38	37	37	37	37	31	19	Z	29	30	31	32	33	34	33	32	31	30	29	29	28	28	30	30	31.4	38
15-Dec	28	24	Z	17	21	23	31	33	31	29	30	C	C	C	C	33	32	35	38	39	40	40	41	41	31.8	41
16-Dec	41	40	40	Z	40	40	39	36	36	33	34	34	38	39	39	39	36	36	37	37	37	35	34	34	37.1	41
17-Dec	34	32	31	31	Z	32	33	33	34	35	36	37	37	36	36	37	36	37	39	39	40	40	40	41	35.9	41
18-Dec	41	41	41	41	41	Z	40	39	37	37	38	40	43	43	44	44	44	44	43	42	42	41	41	41	41.2	44
19-Dec	41	39	39	39	38	38	Z	36	32	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	41
20-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
21-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	34	36	37	37	39	39	39	38	38	39	39	38	--	39
22-Dec	37	36	36	Z	36	36	35	35	34	36	36	37	38	38	37	37	37	36	36	36	36	36	35	35	36.1	38
23-Dec	35	35	36	39	Z	33	31	37	37	36	37	37	37	37	36	37	33	27	22	21	24	33	35	38	33.8	39
24-Dec	38	37	36	34	39	Z	38	37	32	35	33	33	36	36	38	38	36	25	26	25	29	33	28	29	33.5	39
25-Dec	29	29	28	26	23	21	Z	19	18	20	28	32	33	33	32	32	27	24	22	25	23	23	22	21	25.6	33
26-Dec	21	24	29	29	28	29	31	Z	30	30	32	33	33	34	34	33	26	28	33	30	26	25	28	25	29.2	34
27-Dec	30	29	Z	21	19	19	15	15	17	20	23	32	34	35	36	34	34	34	33	32	31	30	30	30	27.4	36
28-Dec	29	29	30	Z	32	32	30	30	31	30	30	30	29	28	31	33	34	32	29	26	24	27	24	24	29.3	34
29-Dec	26	24	29	29	Z	34	34	32	31	30	33	35	36	36	37	36	32	29	27	24	25	25	27	28	30.3	37
30-Dec	30	31	30	29	29	Z	28	29	28	28	30	33	38	38	38	34	23	14	15	22	28	30	29	28	28.8	38
31-Dec	29	28	27	25	22	23	Z	25	24	21	26	34	40	40	39	39	37	35	33	34	35	33	32	29	30.8	40
32.9 33.1 33.1 32.1 32.3 32.6 32.0 32.7 31.0 31.2 32.9 35.3 36.5 36.8 37.0 36.2 34.5 33.5 32.9 32.9 33.7 33.6 33.5 32.7																								Diurnal Average		
43 43 43 43 44 44 44 44 44 43 43 44 46 47 45 44 44 44 44 44 43 44 43 43 43																								Diurnal Maximum		
Z - zerospan C - Calibration AF - Analyzer Failure																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	21	3.18	3.18
21 - 50	639	96.82	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 660

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Conklin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	0	1	0	0	0	0	1	3	4	6	2	0	1	0	1	1	20
21 - 50	15	7	5	2	2	4	6	14	25	74	85	39	39	109	124	89	639
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
<b>Totals</b>	15	8	5	2	2	4	7	17	29	80	87	39	40	109	125	90	659

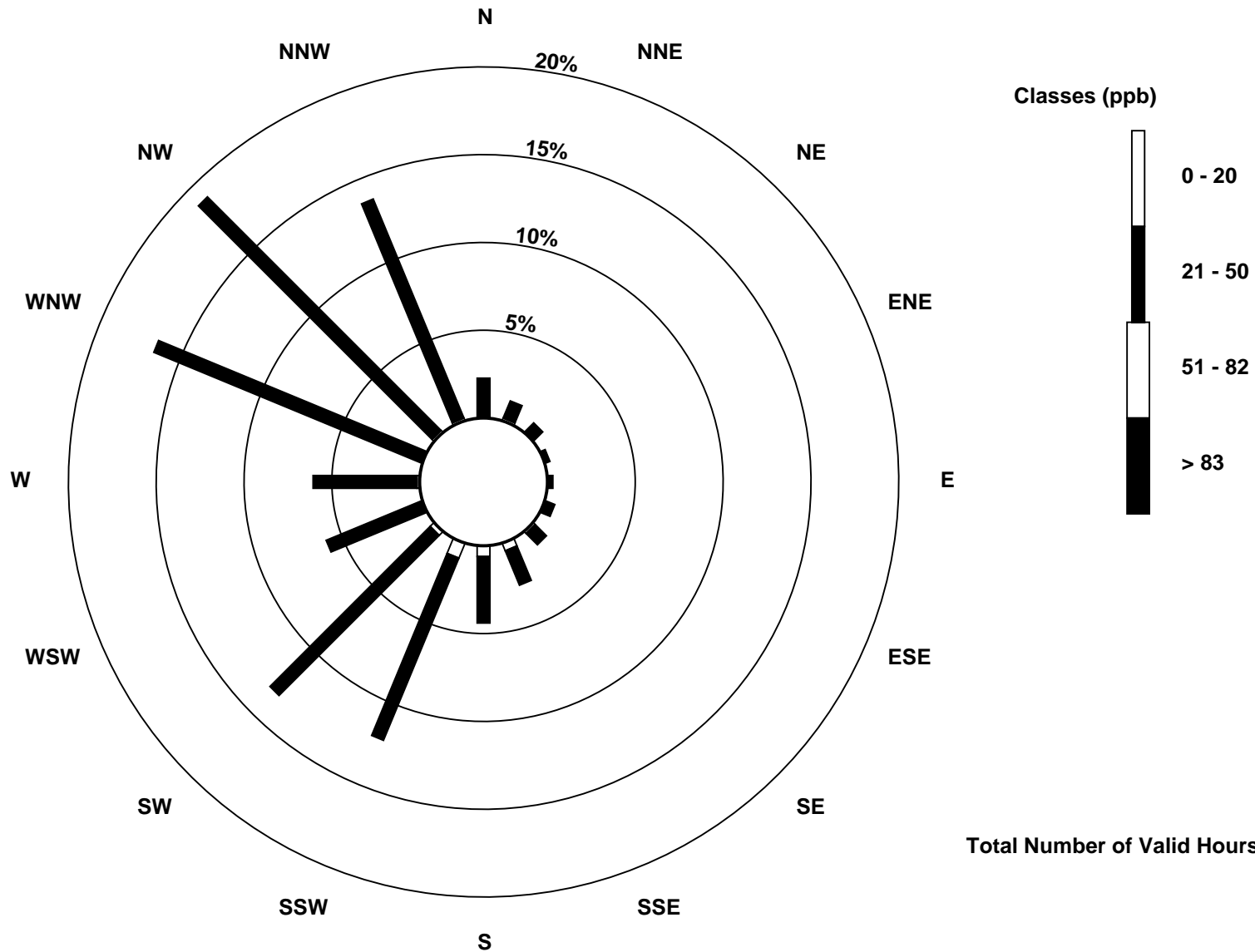
Total Number of Valid Hours: 659

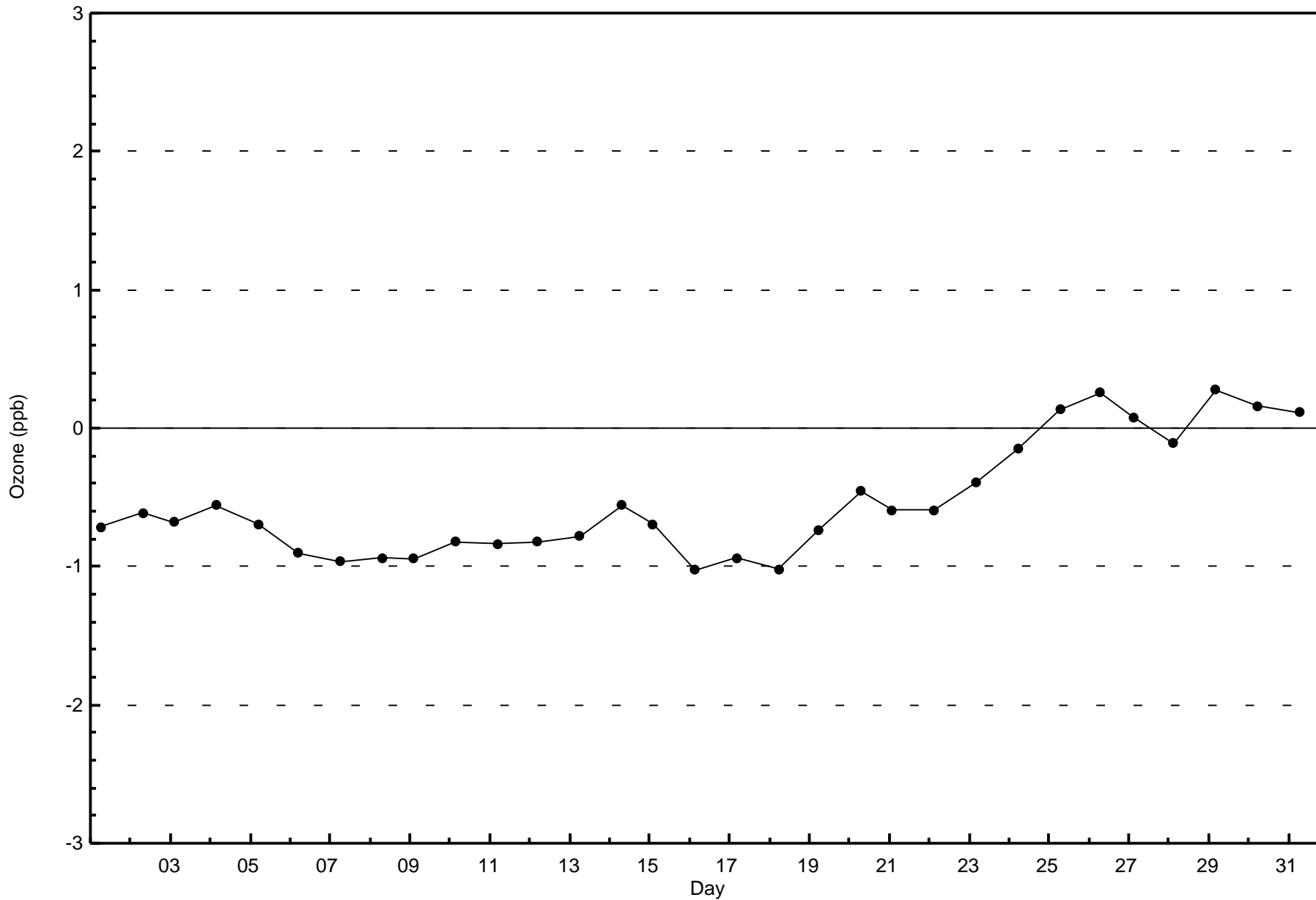
Total Number of Hours: 744

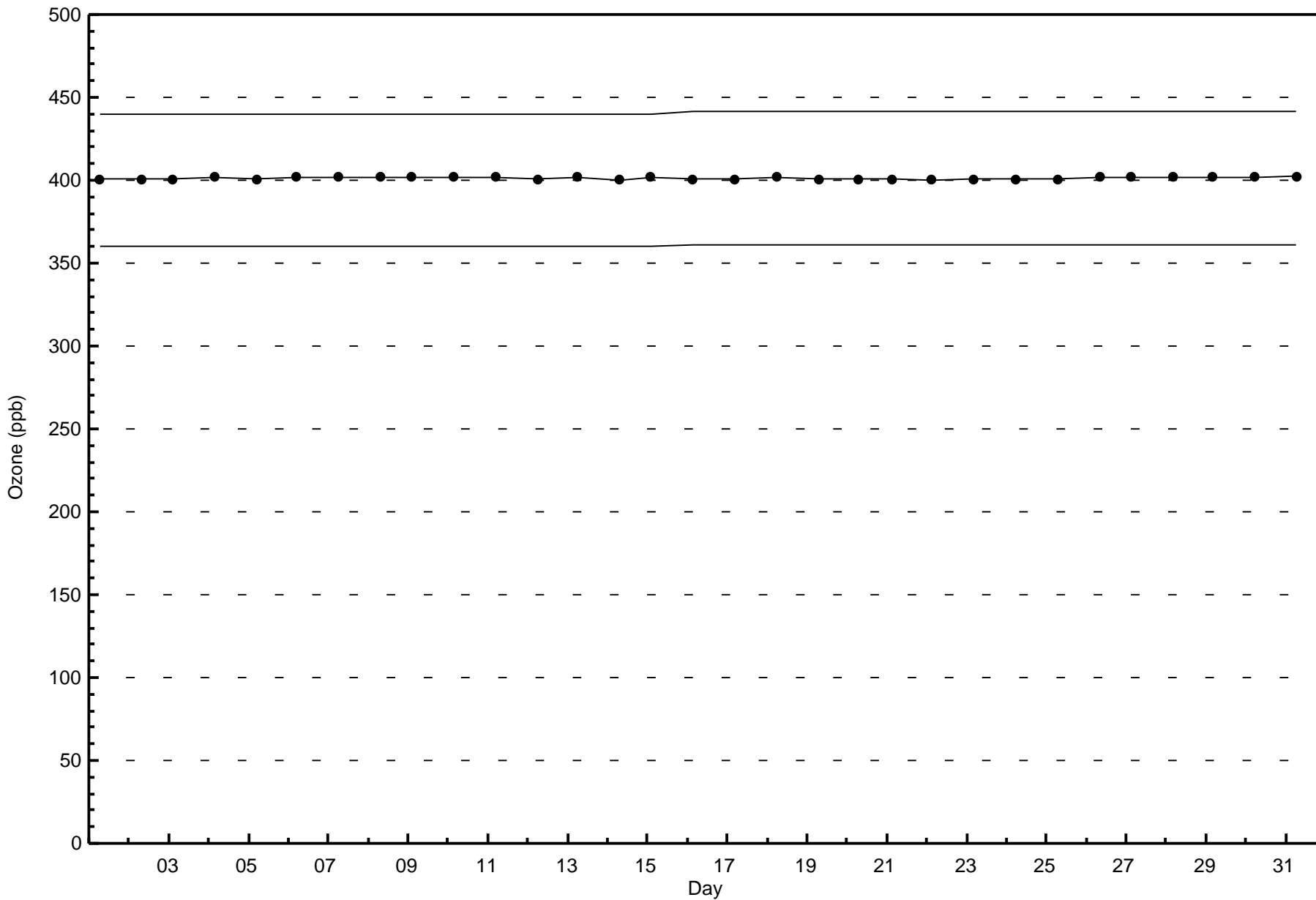


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Conklin (AMS 21)











Summary of Hour Averages

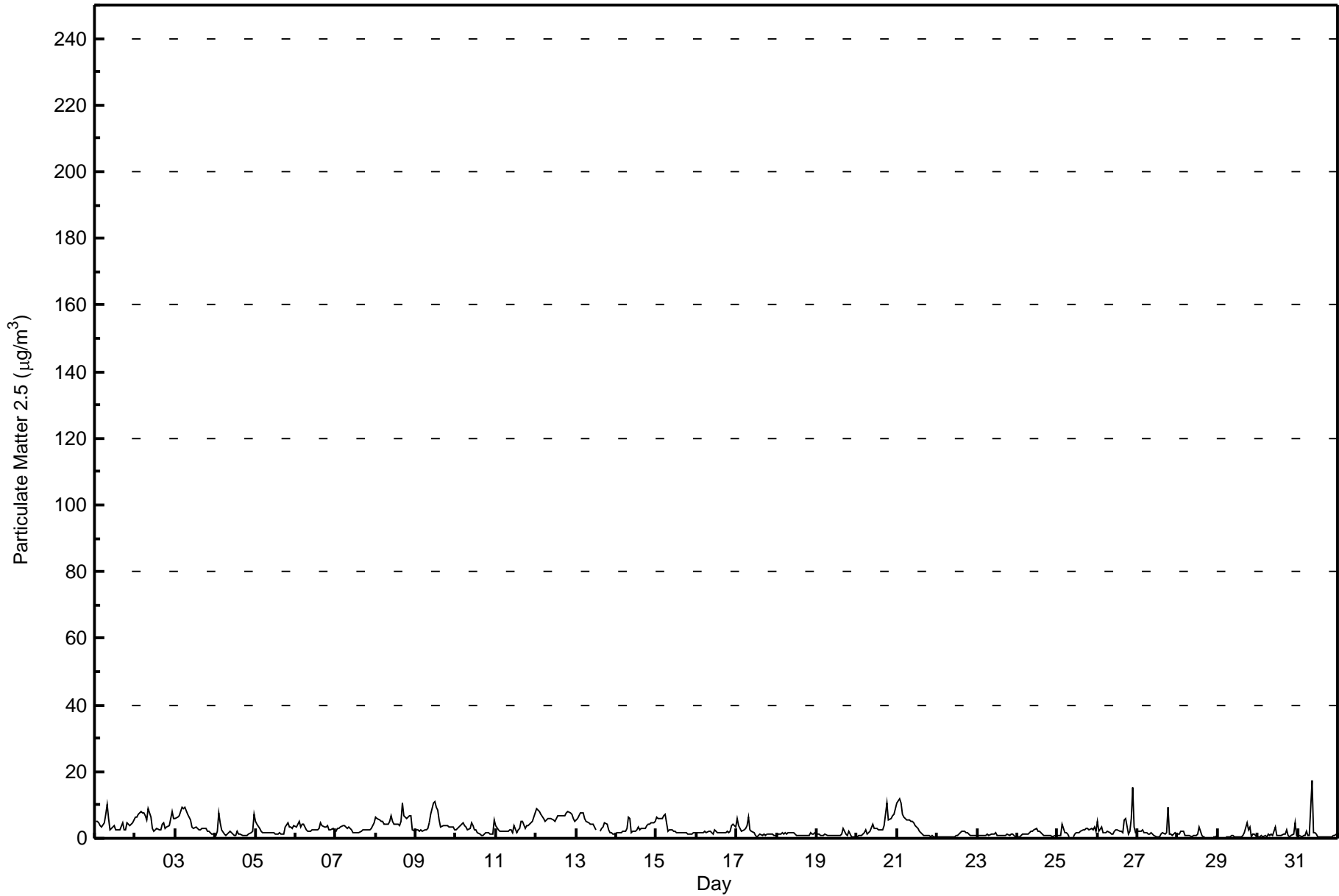
Conklin - December 2017

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 17.5 µg/m <sup>3</sup> on Dec 31 09:00 Maximum Daily Average: 6.6 µg/m <sup>3</sup> on Dec 12		Hours in Service: 744 Hours of Data: 734 Hours of Missing Data: 10 Hours of Calibration: 1 Percent Operational Time: 98.8																																														
Minimum Value: 0.3 µg/m <sup>3</sup> on Dec 29 07:00 Maximum Diurnal Average: 3.5 µg/m <sup>3</sup> at hour 3 Monthly Average: 2.79 µg/m <sup>3</sup>		Minimum Daily Average: 1.0 µg/m <sup>3</sup> on Dec 22 Minimum Diurnal Average: 2.0 µg/m <sup>3</sup> at hour 15 Percentiles: P <sub>1</sub> = 0.4 P <sub>10</sub> = 0.7 Q <sub>1</sub> = 1.1 Median = 2.0 Q <sub>3</sub> = 3.8 P <sub>90</sub> = 6.1 P <sub>99</sub> = 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-Dec	4.9	5.3	4.6	4.0	3.2	4.8	7.3	10.1	6.0	2.7	2.9	3.8	2.7	2.4	2.4	2.7	4.7	2.3	2.6	4.5	4.2	4.0	4.5	5.6	4.3	10.1																						
2-Dec	6.2	6.4	7.3	7.9	7.7	7.5	6.6	5.3	8.7	6.2	3.1	2.2	2.3	2.8	2.7	2.7	4.1	4.5	3.0	3.3	3.8	5.8	8.2	6.1	5.2	8.7																						
3-Dec	5.8	6.5	6.6	8.0	9.2	9.1	9.4	7.3	6.3	5.3	3.5	3.2	3.4	3.1	2.7	2.4	2.8	2.8	2.8	2.3	2.0	1.8	1.5	1.1	4.5	9.4																						
4-Dec	0.9	1.9	7.7	4.6	2.4	1.1	1.0	1.2	1.5	2.3	1.1	0.8	0.7	1.9	1.2	1.2	0.9	0.8	0.7	0.7	1.3	1.8	2.2	7.1	2.0	7.7																						
5-Dec	5.1	4.3	2.8	2.0	1.7	1.7	1.8	1.8	1.8	1.7	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.3	3.3	4.8	3.6	3.3	2.8	3.7	2.4	5.1																						
6-Dec	3.5	4.1	4.9	3.5	4.2	4.1	2.5	2.1	2.1	2.2	2.4	2.4	2.6	2.7	2.9	4.6	3.6	3.4	3.4	3.8	2.7	2.5	2.9	2.3	3.1	4.9																						
7-Dec	2.3	2.9	3.0	3.2	3.9	3.7	3.2	3.0	3.3	2.5	1.7	1.5	1.5	1.7	1.8	1.9	2.5	2.4	2.5	2.5	2.4	2.8	4.0	4.7	2.7	4.7																						
8-Dec	6.3	5.8	5.5	5.2	5.0	4.4	4.2	4.4	5.0	6.6	5.0	4.3	4.3	4.0	3.8	5.2	10.5	6.8	6.1	6.2	6.7	6.8	2.6	2.1	5.3	10.5																						
9-Dec	2.4	2.4	2.1	2.5	2.3	2.5	2.4	3.1	4.6	7.3	10.6	10.9	9.2	8.3	5.6	3.5	3.7	3.9	3.9	3.7	3.3	3.3	3.3	2.6	4.5	10.9																						
10-Dec	2.4	2.8	3.3	4.3	4.5	3.9	3.3	2.7	3.2	4.8	3.7	2.7	2.4	1.9	1.3	0.9	0.9	1.2	1.7	1.8	1.4	1.1	1.2	5.4	2.6	5.4																						
11-Dec	4.0	2.5	2.1	2.0	2.1	2.1	2.2	2.0	2.5	2.6	1.8	3.6	1.6	2.4	2.8	5.2	5.2	2.9	3.7	3.8	4.2	4.7	5.2	7.8	3.3	7.8																						
12-Dec	9.1	8.4	8.0	7.3	6.1	5.3	5.4	6.0	5.9	5.8	5.6	5.1	5.9	6.9	6.8	6.6	6.8	6.7	7.6	8.0	7.7	7.1	5.8	5.0	6.6	9.1																						
13-Dec	5.6	6.0	7.8	7.8	7.4	6.1	5.2	4.6	4.3	4.1	4.3	3.3	2.6	C	2.3	2.9	3.3	4.6	4.2	2.5	1.7	1.6	1.2	1.5	4.1	7.8																						
14-Dec	1.7	1.7	1.8	1.9	2.2	2.3	2.9	6.3	5.8	1.9	2.2	2.3	2.5	3.3	2.7	3.0	2.9	3.0	3.7	4.1	4.3	4.5	4.5	5.0	3.2	6.3																						
15-Dec	6.3	6.1	6.0	5.7	6.6	7.4	4.5	2.3	2.5	2.4	2.2	2.0	1.8	1.8	1.6	1.6	1.5	1.6	1.5	1.4	1.3	1.4	1.7	1.8	3.0	7.4																						
16-Dec	1.7	1.7	1.7	1.6	1.9	2.0	1.9	2.0	1.9	1.5	1.4	2.3	1.8	1.5	1.7	1.7	1.7	1.9	2.3	1.9	2.1	3.7	4.1	3.5	2.1	4.1																						
17-Dec	5.8	3.9	2.9	2.3	2.7	3.2	3.7	6.4	2.4	2.0	1.6	1.0	0.6	1.0	1.1	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.1	2.1	6.4																						
18-Dec	1.0	1.1	1.3	1.5	1.5	1.5	1.4	1.6	1.7	1.6	1.5	1.3	1.0	1.0	1.0	1.0	0.9	0.9	0.9	1.0	1.6	1.3	1.2	1.7	1.3	1.7																						
19-Dec	1.4	1.1	0.9	0.8	0.8	1.1	0.9	0.9	1.0	0.7	0.8	0.9	0.8	0.9	0.9	1.2	3.0	1.2	0.9	2.0	1.1	0.4	0.5	0.6	1.0	3.0																						
20-Dec	0.6	0.7	0.9	0.7	1.7	2.6	1.2	1.7	2.0	4.2	2.8	2.8	3.0	2.7	2.7	2.4	3.8	7.2	10.4	5.7	5.8	6.8	7.4	8.8	3.7	10.4																						
21-Dec	10.7	11.7	10.5	7.2	6.4	6.0	5.6	5.3	5.1	5.1	4.8	3.7	2.8	2.0	1.6	1.2	0.9	0.7	0.7	0.7	0.6	0.6	0.6	0.6	4.0	11.7																						
22-Dec	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7	1.1	1.8	1.9	2.0	1.7	1.5	1.4	1.1	1.0	1.1	1.0	1.0	2.0																						
23-Dec	0.7	0.8	0.9	0.9	0.8	0.7	1.2	1.0	1.1	1.5	1.1	1.8	0.9	0.9	0.9	0.9	0.8	0.7	1.4	0.9	1.4	1.1	0.6	0.5	1.0	1.8																						
24-Dec	0.4	0.5	1.0	1.1	1.2	1.4	1.5	1.5	2.0	2.0	2.5	3.1	2.1	2.0	1.5	1.2	1.0	1.0	0.7	0.7	0.6	0.7	0.8	1.3	3.1																							
25-Dec	0.9	0.6	0.8	4.2	1.9	1.7	1.2	0.5	UO	0.5	1.4	1.5	1.6	1.7	2.0	2.4	2.5	2.9	2.9	2.3	3.1	2.5	3.5	2.1	2.0	4.2																						
26-Dec	5.1	2.2	3.4	1.6	1.7	1.9	2.0	1.6	1.1	1.2	2.0	2.4	2.5	2.0	2.0	1.8	5.4	6.1	1.2	2.0	5.9	15.4	3.5	1.8	3.2	15.4																						
27-Dec	2.1	2.1	2.2	2.7	1.8	1.7	1.5	1.4	1.5	1.5	1.0	0.3	0.4	0.6	1.2	1.7	1.2	1.9	9.3	1.2	1.2	0.9	1.5	1.3	1.8	9.3																						
28-Dec	1.2	1.3	2.2	1.9	1.0	0.9	0.9	0.8	0.6	0.7	0.8	0.7	1.5	3.3	0.9	0.4	0.3	UO	UO	UO	UO	0.5	0.5	0.5	1.0	3.3																						
29-Dec	1.1	UO	UO	UO	UO	0.4	0.3	0.3	0.7	0.7	0.6	0.4	0.4	0.5	0.5	0.8	1.9	4.7	2.6	3.4	0.6	1.1	1.2	0.6	1.1	4.7																						
30-Dec	0.6	0.3	0.8	0.5	0.9	0.5	1.2	1.0	1.1	0.7	3.3	0.7	0.7	0.9	1.0	1.1	1.1	2.7	0.8	0.5	0.8	1.1	4.7	0.7	1.2	4.7																						
31-Dec	0.7	0.6	0.6	0.7	0.7	2.0	0.8	0.7	17.5	1.6	1.8	1.4	0.6	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.4	0.6	0.9	1.1	1.5	17.5																						
																								3.3	3.2	3.5	3.3	3.1	3.0	2.8	2.9	3.5	2.7	2.6	2.4	2.1	2.2	2.0	2.2	2.7	2.8	2.9	2.6	2.6	2.9	2.7	2.8	Diurnal Average
																								10.7	11.7	10.5	8.0	9.2	9.1	9.4	10.1	17.5	7.3	10.6	10.9	9.2	8.3	6.8	6.6	10.5	7.2	10.4	8.0	7.7	15.4	8.2	8.8	Diurnal Maximum
C - Calibration																																																
UO - Unstable Operation																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Conklin - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Conklin - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	484	65.94	65.94
6 - 15	97	13.22	79.16
16 - 25	1	0.14	79.29
26 - 80	0	0.00	79.29
> 81.0	0	0.00	79.29

Total Number of Valid Hours: 734

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Conklin - December 2017**

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	8	4	3	2	2	2	4	8	21	57	68	31	40	87	90	56	483
6 - 15	0	1	0	0	0	1	2	0	4	16	28	11	1	8	25	0	97
16 - 25	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	8	5	3	2	2	3	6	8	26	73	96	42	41	95	115	56	581

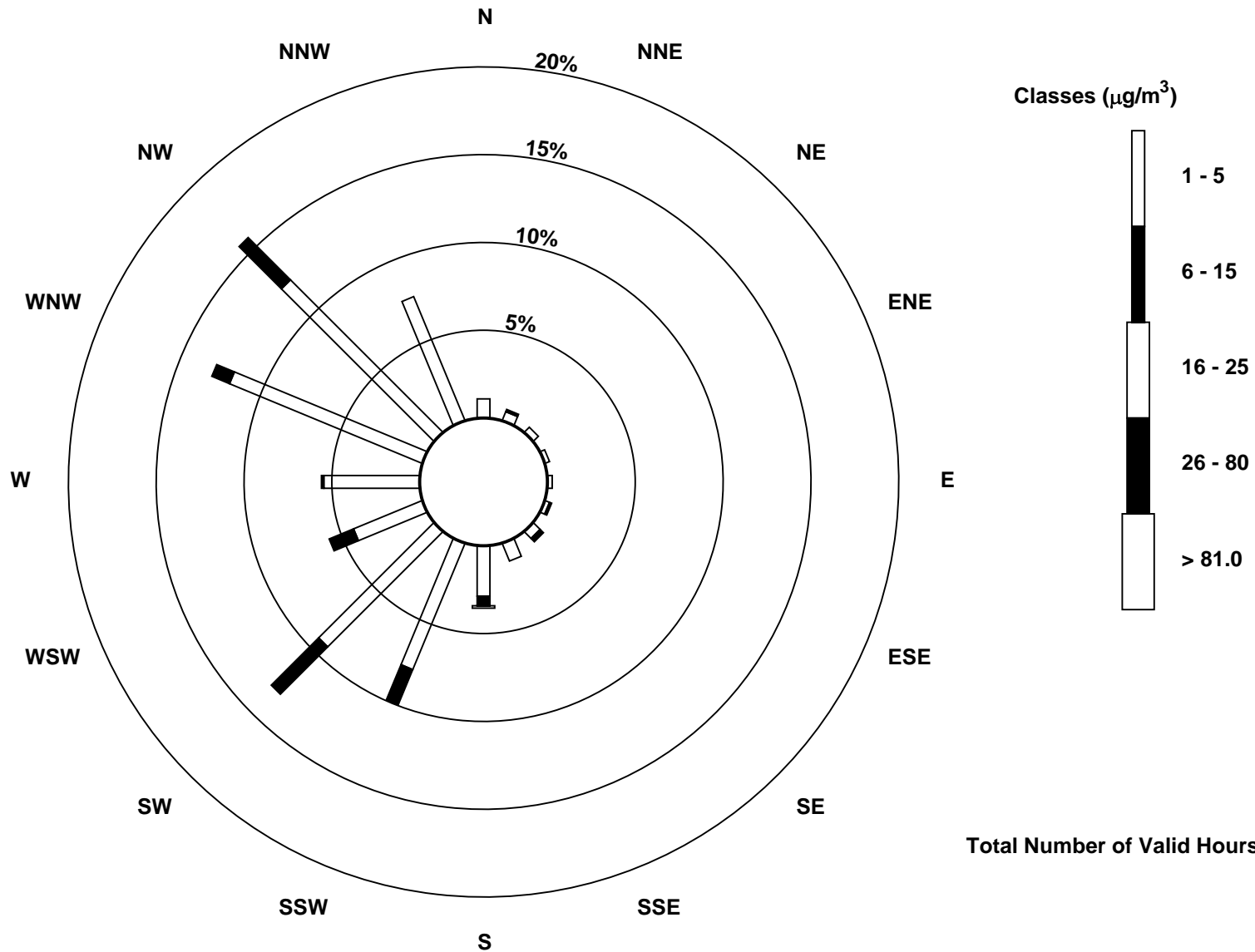
Total Number of Valid Hours: 733

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Conklin (AMS 21)



Total Number of Valid Hours: 733



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

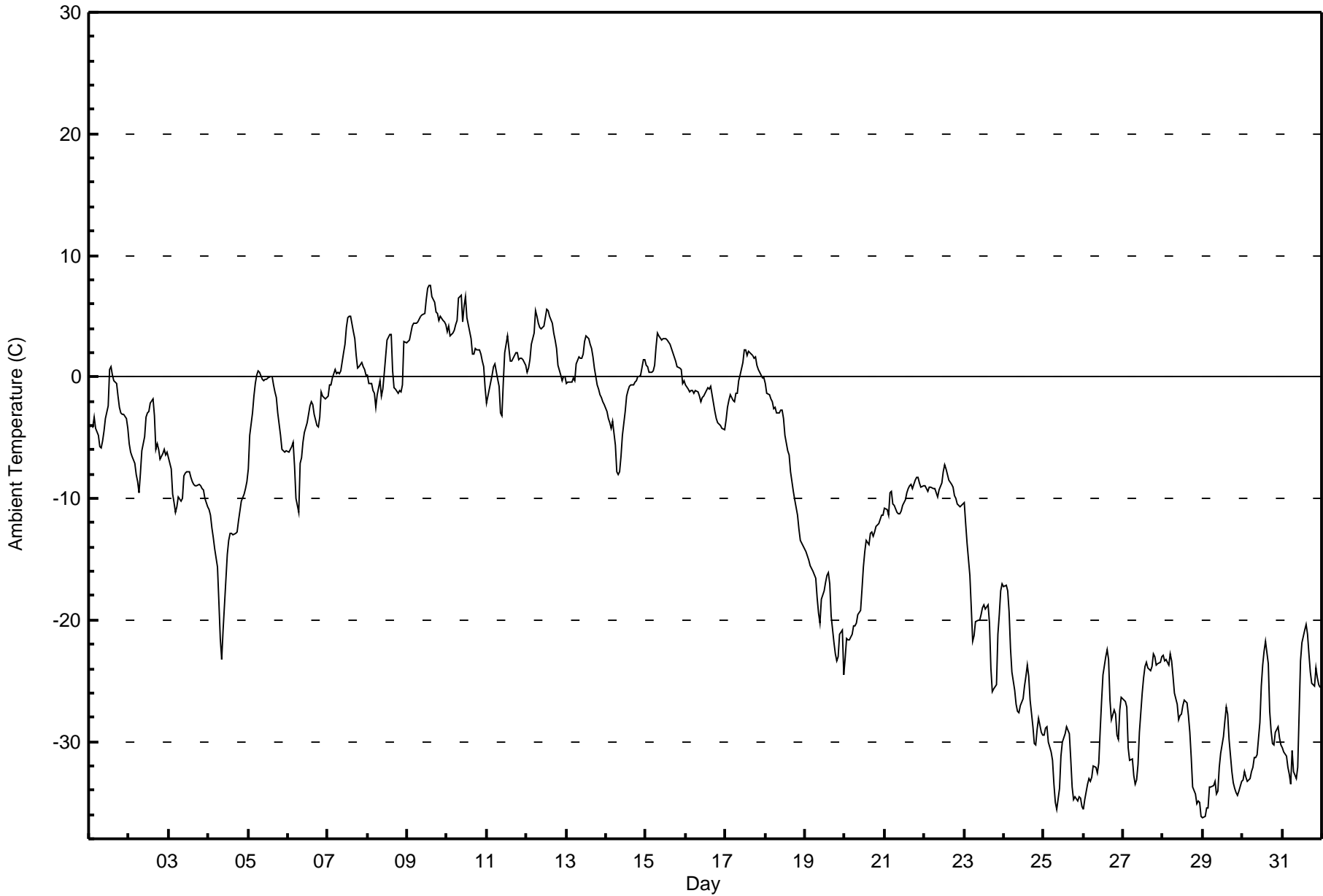
**Conklin - December 2017**

Maximum Value: 7.5 C on Dec 9 14:00		Maximum Daily Average: 5.1 C on Dec 9		Hours in Service: 744																							
Minimum Value: -36.2 C on Dec 29 01:00		Minimum Daily Average: -32.8 C on Dec 29		Hours of Data: 744																							
Maximum Diurnal Average: -8.4 C at hour 15		Minimum Diurnal Average: -12.3 C at hour 9		Hours of Missing Data: 0																							
Monthly Average: -10.89 C		Percentiles: P <sub>1</sub> = -35.4 P <sub>10</sub> = -30.8 Q <sub>1</sub> = -22.8 Median = -7.8 Q <sub>3</sub> = -0.3 P <sub>90</sub> = 2.8 P <sub>99</sub> = 6.3		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-4.1	-4.0	-4.1	-3.3	-4.2	-4.8	-5.7	-5.9	-5.3	-4.5	-3.4	-2.4	0.6	0.8	0.1	-0.3	-0.6	-1.5	-2.5	-3.0	-3.1	-3.1	-3.4	-4.2	-3.0	0.8	
2-Dec	-5.5	-6.2	-6.6	-7.2	-8.0	-8.6	-9.5	-7.9	-6.1	-4.9	-3.3	-3.0	-2.9	-2.1	-1.8	-3.2	-5.9	-5.5	-6.0	-6.8	-6.3	-6.0	-6.4	-6.2	-5.7	-1.8	
3-Dec	-6.6	-7.5	-9.7	-10.4	-11.1	-10.7	-9.9	-10.2	-10.0	-8.1	-7.9	-7.8	-7.8	-8.3	-8.6	-8.8	-8.9	-8.9	-8.8	-8.9	-9.2	-9.3	-10.0	-10.6	-9.1	-6.6	
4-Dec	-10.9	-11.3	-12.4	-13.2	-14.2	-15.6	-18.6	-21.6	-23.3	-20.8	-16.7	-14.6	-13.4	-12.9	-12.8	-13.0	-12.9	-12.7	-11.8	-11.0	-10.3	-9.6	-9.1	-8.6	-13.8	-8.6	
5-Dec	-7.6	-4.8	-2.9	-1.5	-0.5	0.2	0.5	0.4	-0.1	-0.3	-0.2	-0.1	0.0	0.0	-0.7	-1.2	-1.7	-3.0	-4.8	-6.0	-6.1	-6.2	-6.0	-2.2	0.5		
6-Dec	-6.2	-6.0	-5.7	-5.4	-7.4	-10.0	-11.1	-7.1	-6.6	-5.4	-4.6	-3.7	-3.0	-2.4	-2.1	-2.3	-3.0	-4.0	-4.1	-3.3	-1.3	-1.6	-1.8	-1.7	-4.6	-1.3	
7-Dec	-1.5	-0.7	-0.7	0.0	0.6	0.2	0.4	0.3	0.5	2.0	2.7	4.0	4.9	5.0	5.0	3.7	3.1	1.7	0.7	0.9	1.2	0.9	0.6	0.2	1.5	5.0	
8-Dec	0.2	-0.5	-0.6	-1.1	-1.4	-2.5	-1.4	-0.3	-1.6	-1.0	0.3	1.6	3.0	3.5	3.5	0.5	-0.9	-1.0	-1.3	-1.2	-1.3	-0.6	3.0	2.8	0.1	3.5	
9-Dec	2.9	3.1	3.6	4.2	4.5	4.4	4.6	4.8	5.0	5.1	5.3	6.3	7.3	7.5	7.5	6.6	6.1	5.4	5.2	4.7	4.9	4.7	4.5	4.3	5.1	7.5	
10-Dec	3.7	4.2	3.4	3.6	3.8	4.4	4.7	6.5	6.7	4.5	5.8	6.6	4.9	4.3	3.1	1.9	1.9	2.3	2.2	2.2	1.9	1.3	0.9	-0.9	3.5	6.7	
11-Dec	-2.2	-1.0	-0.4	0.2	0.8	1.1	-0.2	-0.7	-2.9	-3.2	-0.4	2.0	3.4	2.4	1.3	1.3	1.6	2.1	1.9	1.4	1.6	1.6	1.4	1.0	0.6	3.4	
12-Dec	0.4	0.8	1.5	2.7	3.6	5.4	5.0	4.4	4.0	4.0	4.2	4.8	5.6	5.4	5.0	4.4	3.6	3.1	2.3	1.0	0.2	-0.3	0.1	0.1	3.0	5.6	
13-Dec	-0.6	-0.4	-0.4	-0.4	-0.1	-0.3	1.0	1.6	1.5	1.5	1.8	2.9	3.3	3.1	2.7	2.3	1.7	0.8	-0.6	-1.1	-1.4	-1.7	-2.0	-2.3	0.5	3.3	
14-Dec	-2.9	-3.4	-3.7	-4.2	-3.6	-5.6	-7.8	-8.0	-7.8	-6.5	-4.8	-2.9	-1.6	-1.2	-0.7	-0.7	-0.6	-0.5	-0.3	0.0	0.1	0.2	1.4	1.4	-2.7	1.4	
15-Dec	1.0	0.9	0.4	0.4	0.5	0.9	2.5	3.6	3.3	3.1	3.2	3.2	3.2	3.0	2.7	2.4	2.0	1.7	1.3	0.8	0.7	0.6	-0.6	-0.3	1.7	3.6	
16-Dec	-0.6	-1.0	-1.2	-1.2	-1.1	-1.3	-1.1	-1.2	-1.5	-2.0	-1.7	-1.6	-1.1	-0.9	-1.0	-0.8	-1.5	-2.8	-3.4	-3.7	-3.8	-4.0	-4.2	-4.4	-2.0	-0.6	
17-Dec	-3.6	-2.5	-2.0	-1.4	-2.0	-2.1	-1.4	-1.3	-0.3	0.2	1.1	2.2	2.2	1.8	2.1	1.9	1.7	1.6	1.7	0.9	0.6	0.1	-0.1	-0.1	0.1	2.2	
18-Dec	-0.5	-1.3	-1.5	-1.8	-2.0	-2.6	-2.5	-3.0	-3.0	-2.7	-2.7	-3.4	-4.8	-6.1	-6.4	-7.9	-8.6	-9.4	-10.1	-11.4	-12.5	-13.4	-13.6	-14.0	-6.1	-0.5	
19-Dec	-14.3	-14.7	-15.1	-15.5	-15.7	-16.0	-16.6	-18.2	-19.4	-20.2	-18.3	-17.6	-16.9	-16.3	-16.2	-17.0	-19.7	-21.9	-22.7	-23.4	-23.1	-21.2	-20.8	-24.5	-18.5	-14.3	
20-Dec	-23.1	-21.5	-21.6	-21.7	-21.2	-20.4	-20.5	-20.2	-19.5	-19.2	-17.5	-15.6	-14.4	-13.5	-13.8	-12.9	-12.7	-13.1	-12.8	-12.3	-12.0	-11.8	-11.4	-11.3	-16.4	-11.3	
21-Dec	-10.8	-10.9	-11.4	-9.5	-9.4	-10.5	-10.6	-11.2	-11.3	-11.3	-11.0	-10.6	-10.1	-9.6	-9.2	-9.0	-8.8	-9.2	-8.5	-8.3	-8.3	-8.7	-9.0	-9.0	-9.8	-8.3	
22-Dec	-9.0	-9.2	-9.5	-9.1	-9.1	-9.2	-9.1	-9.6	-9.9	-9.3	-8.7	-7.8	-7.2	-7.6	-8.0	-8.5	-8.8	-9.1	-9.8	-10.0	-10.5	-10.7	-10.6	-10.4	-9.2	-7.2	
23-Dec	-10.3	-12.1	-13.6	-16.3	-19.0	-21.7	-21.2	-20.1	-20.1	-20.0	-19.5	-18.9	-18.8	-19.1	-18.8	-20.3	-23.9	-25.9	-25.7	-25.4	-21.1	-19.6	-17.5	-17.0	-19.4	-10.3	
24-Dec	-17.3	-17.2	-17.6	-19.3	-22.3	-24.3	-25.7	-26.9	-27.5	-27.7	-27.0	-26.4	-25.4	-24.6	-23.7	-24.6	-26.6	-28.7	-30.2	-30.2	-29.0	-28.1	-29.3	-29.5	-25.4	-17.2	
25-Dec	-29.5	-28.9	-28.8	-30.0	-30.8	-31.5	-33.5	-35.0	-35.5	-33.8	-31.3	-30.1	-29.7	-29.3	-28.8	-29.3	-31.4	-33.7	-34.8	-34.5	-34.9	-34.5	-34.7	-35.4	-32.1	-28.8	
26-Dec	-35.5	-34.8	-33.5	-33.1	-33.3	-32.9	-32.1	-32.1	-32.6	-31.8	-29.2	-26.7	-24.5	-23.0	-22.4	-23.2	-26.6	-28.2	-27.4	-27.7	-29.5	-29.8	-27.3	-26.4	-29.3	-22.4	
27-Dec	-26.6	-26.7	-27.2	-30.6	-31.5	-31.4	-32.8	-33.5	-33.2	-31.9	-29.3	-26.0	-24.7	-23.9	-23.5	-23.9	-24.2	-23.9	-22.8	-23.0	-23.7	-23.6	-23.5	-23.0	-26.9	-22.8	
28-Dec	-22.9	-23.3	-23.3	-23.7	-22.8	-23.4	-24.7	-26.0	-27.0	-28.2	-27.9	-27.7	-27.0	-26.6	-26.8	-27.9	-29.2	-31.3	-33.7	-34.4	-35.1	-34.9	-35.0	-36.1	-28.3	-22.8	
29-Dec	-36.2	-36.2	-35.5	-35.5	-33.8	-33.7	-33.6	-33.3	-34.3	-34.0	-32.1	-31.0	-29.6	-28.3	-27.2	-27.7	-29.9	-32.4	-33.4	-33.9	-34.2	-34.4	-34.0	-33.3	-32.8	-27.2	
30-Dec	-33.1	-32.5	-32.9	-33.3	-33.1	-32.5	-32.1	-31.4	-31.3	-31.1	-28.4	-25.5	-23.7	-22.6	-21.7	-23.6	-27.5	-29.2	-30.1	-30.2	-29.2	-28.8	-29.7	-30.3	-29.3	-21.7	
31-Dec	-30.5	-30.8	-31.2	-32.1	-32.7	-33.4	-30.7	-32.5	-33.0	-32.1	-27.8	-23.4	-21.9	-20.9	-20.3	-21.2	-22.7	-24.3	-25.2	-25.5	-24.0	-24.8	-25.3	-25.6	-27.2	-20.3	
		-11.1	-11.0	-11.1	-11.3	-11.5	-11.9	-12.1	-12.1	-12.3	-11.9	-10.6	-9.5	-8.7	-8.5	-8.4	-9.1	-10.1	-11.0	-11.4	-11.7	-11.6	-11.5	-11.4	-11.7	Diurnal Average	
		3.7	4.2	3.6	4.2	4.5	5.4	5.0	6.5	6.7	5.1	5.8	6.6	7.3	7.5	7.5	6.6	6.1	5.4	5.2	4.7	4.9	4.7	4.5	4.3	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Conklin - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	218	29.30	29.30
-20 - 0	354	47.58	76.88
0 - 10	172	23.12	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

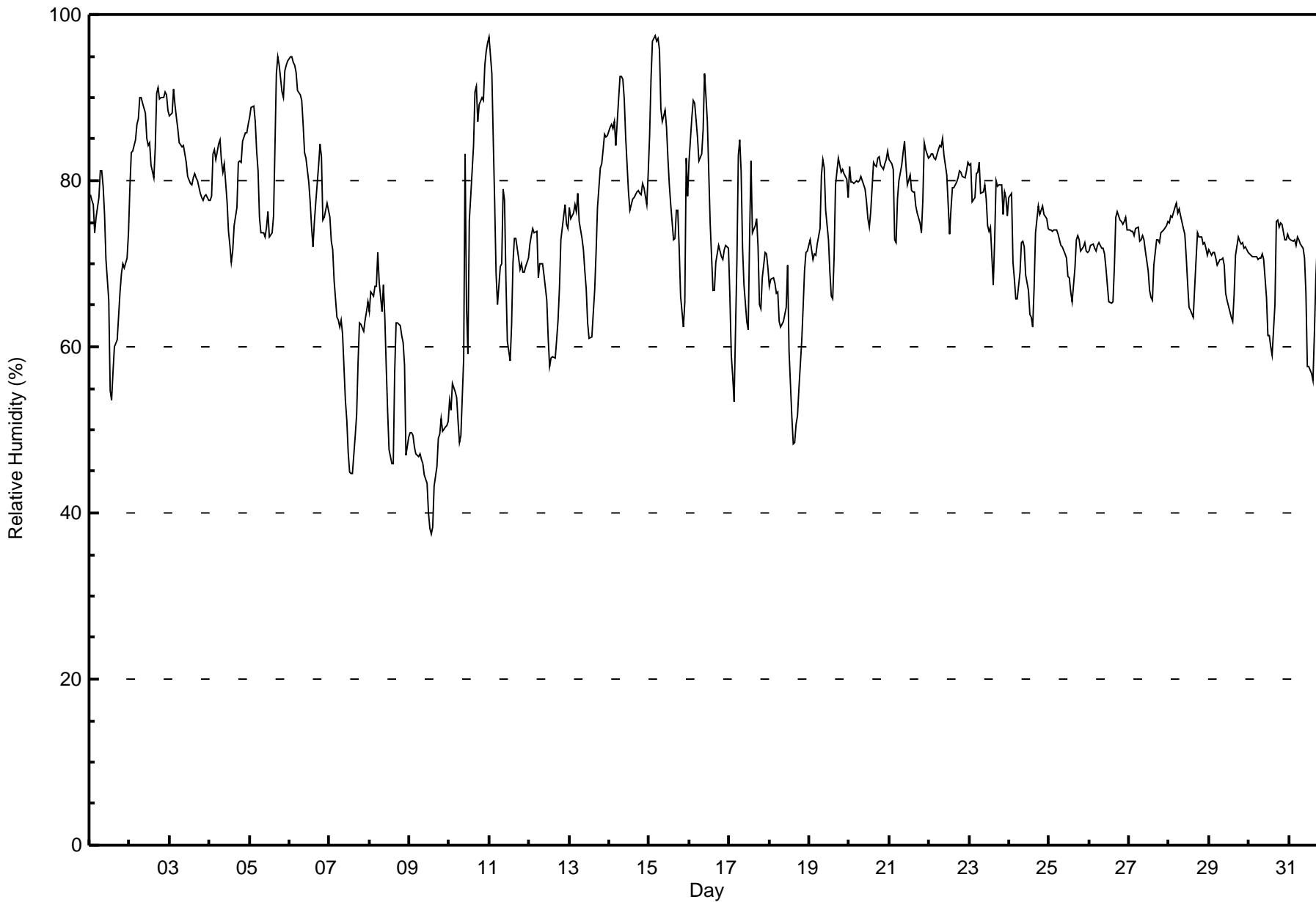
**Conklin - December 2017**

Maximum Value: 97 % on Dec 15 04:00																			Maximum Daily Average: 86.8 % on Dec 2						Hours in Service: 744	
Minimum Value: 37 % on Dec 9 14:00																			Minimum Daily Average: 46.4 % on Dec 9						Hours of Data: 744	
Maximum Diurnal Average: 76.7 % at hour 2																			Minimum Diurnal Average: 66.3 % at hour 15						Hours of Missing Data: 0	
Monthly Average: 73.5 %																			Percentiles: P <sub>1</sub> = 45 P <sub>10</sub> = 59 Q <sub>1</sub> = 68 Median = 74 O <sub>3</sub> = 81 P <sub>90</sub> = 87 P <sub>99</sub> = 95						Hours of Calibration: 0	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	78	78	77	74	76	78	81	81	79	76	71	66	55	54	57	60	61	64	67	69	70	70	71	74	70.1	81
2-Dec	79	83	84	85	87	88	90	90	89	88	85	84	85	82	80	84	91	91	90	90	90	91	90	89	86.8	91
3-Dec	88	88	91	89	88	86	85	84	84	83	82	80	80	79	80	81	80	80	79	78	78	78	78	78	82.4	91
4-Dec	78	78	83	84	83	84	85	82	81	82	77	74	72	70	72	75	77	82	82	82	85	86	86	87	80.3	87
5-Dec	88	89	89	87	84	81	76	74	74	73	74	76	73	74	76	84	93	95	94	91	90	93	94	94	84.0	95
6-Dec	95	95	94	94	93	91	90	90	87	83	83	80	77	74	72	75	78	82	84	83	75	76	77	76	83.5	95
7-Dec	76	73	72	68	64	63	62	63	62	54	51	47	45	45	45	49	52	58	63	63	62	63	64	65	59.5	76
8-Dec	64	67	66	67	67	71	68	64	67	64	58	52	48	46	46	57	63	63	62	61	61	58	47	49	59.8	71
9-Dec	50	50	49	48	47	47	47	46	46	45	44	40	38	37	38	43	46	49	49	51	50	50	50	51	46.4	51
10-Dec	54	52	56	55	54	51	48	49	59	83	65	59	75	78	84	91	91	87	89	90	90	94	96	97	72.8	97
11-Dec	97	93	85	77	69	65	70	70	79	78	68	61	58	63	70	73	73	71	69	70	69	69	70	71	72.4	97
12-Dec	72	73	74	74	74	68	70	70	70	69	66	61	58	59	59	59	61	63	67	73	76	77	75	74	68.4	77
13-Dec	77	75	76	77	76	78	75	73	72	69	67	63	61	61	64	67	71	77	82	82	84	86	85	85	74.3	86
14-Dec	86	87	86	87	84	90	92	93	92	90	85	79	76	77	78	78	79	79	78	78	80	79	77	81	83.0	93
15-Dec	85	92	97	97	97	97	96	89	87	89	86	83	79	77	73	73	76	76	72	66	62	65	83	78	82.4	97
16-Dec	82	88	90	89	87	85	82	83	86	93	90	87	75	71	67	67	70	72	71	71	71	72	72	72	78.9	93
17-Dec	66	59	56	53	71	83	85	81	72	68	63	62	73	82	74	75	75	72	65	65	68	71	71	69	70.0	85
18-Dec	67	68	68	68	66	67	63	62	63	64	65	70	59	51	48	49	51	52	55	61	65	69	71	71	62.3	71
19-Dec	73	72	71	71	71	72	74	81	82	81	76	73	69	66	66	71	79	83	82	81	81	81	80	78	75.6	83
20-Dec	82	80	80	80	80	80	80	80	80	79	77	75	74	76	82	82	82	83	83	82	81	82	83	84	80.3	84
21-Dec	83	82	81	73	73	78	80	82	83	85	82	80	81	79	79	79	77	76	75	74	78	85	84	83	79.5	85
22-Dec	83	83	83	83	83	84	84	84	85	83	81	77	74	77	79	79	80	80	81	81	80	80	81	82	81.1	85
23-Dec	82	82	77	78	81	81	82	78	79	79	78	75	74	74	67	73	80	79	80	79	76	79	78	76	77.8	82
24-Dec	78	78	70	68	66	66	69	72	73	72	69	67	64	64	62	67	74	77	76	76	77	76	75	74	71.3	78
25-Dec	74	74	74	74	74	73	73	72	72	71	71	69	68	67	65	70	73	73	73	71	72	73	72	71	71.6	74
26-Dec	71	72	72	72	71	72	73	72	72	71	70	68	65	65	65	70	76	76	75	75	75	75	76	74	71.8	76
27-Dec	74	74	74	73	74	74	73	73	73	73	72	69	67	66	66	70	73	73	73	74	74	74	75	75	72.3	75
28-Dec	75	76	76	77	77	76	77	76	74	74	71	68	65	64	64	67	71	74	73	73	72	73	72	71	72.2	77
29-Dec	72	71	71	71	71	70	70	71	71	70	67	66	64	64	63	66	71	73	73	72	73	72	72	71	69.7	73
30-Dec	71	71	71	71	71	70	71	71	71	70	66	61	61	60	59	65	75	75	74	75	75	73	73	74	69.8	75
31-Dec	73	73	73	73	72	73	73	72	72	71	66	58	58	57	56	61	68	72	72	74	67	67	68	69	68.2	74
	76.5	76.7	76.3	75.4	75.1	75.6	75.6	75.1	75.4	75.1	71.7	68.6	66.8	66.4	66.3	69.6	73.1	74.4	74.5	74.6	74.3	75.3	75.7	75.6	Diurnal Average	
	97	95	97	97	97	97	96	93	92	93	90	87	85	82	84	91	93	95	94	91	90	94	96	97	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Conklin - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Conklin - December 2017

Maximum Speed: 20 km/h on Dec 5 13:00	Maximum Daily Speed Average: 11.9 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 25 04:00	Minimum Daily Speed Average: 1.4 km/h on Dec 25	Hours of Data: 743
Maximum Diurnal Speed Average: 7.4 km/h at hour 13	Minimum Diurnal Speed Average: 3.8 km/h at hour 19	Hours of Missing Data: 1
Monthly Average Velocity: 4.9 km/h 281.0 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 13 P <sub>99</sub> = 18	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW11	SW11	SW10	SW11	SW9	SW8	SW8	SW7	SSW7	SW11	WSW12	SW8	WSW8	SW7	SSW6	S6	SSW4	S2	WNW3	S4	SW6	SW10	SW13	WSW13	SW7.7	WSW13
2-Dec	SW8	SW7	WSW10	SW7	SW9	SW8	S5	SSE4	SSW4	WSW6	WNW6	WNW6	WNW4	W5	W4	WNW4	SSW3	SW6	SSW7	SSW8	SW9	SSW7	SSW5	SW7	SW5.4	WSW10
3-Dec	WSW7	SW7	SSW6	SSW7	SW9	SW10	SW10	SW10	WSW8	WNW9	NW10	NW12	NW10	NW9	WNW8	WNW7	NW6	WNW5	NNW9	NNW8	NNW6	NNW8	NNW9	NW8	WNW5.5	NW12
4-Dec	NNW8	NNW8	NNE6	NNE6	NNW6	NNW2	N1	AF	SE0	SSE1	S3	SSW5	SSW7	SSW7	S6	S5	S4	SSE5	SSE6	S8	S7	SSW8	SSW6	SW6	SSW2.1	NNW8
5-Dec	SW8	W9	WNW10	WNW9	WNW11	WNW11	WNW14	NW14	NW14	NW16	NNW19	NNW17	NNW20	NNW19	NNW18	NNW12	N8	NNE6	NE7	NE8	NNE7	NNE5	N3	E2	WNW9.2	NNW20
6-Dec	SE3	SE2	SSE1	W1	WSW3	SW2	SSW4	WSW7	SW8	SW10	SW11	SW10	WSW9	WSW9	SW7	SSW6	SW6	SW6	SSW6	WSW4	NW8	NW6	NW6	NW7	WSW4.7	SW11
7-Dec	NW7	NW9	NW7	NW9	NW11	NW9	NW9	NW10	WNW10	WNW10	WNW11	WNW9	WNW10	WNW8	WNW7	WNW6	WNW8	NW6	NW6	NW7	WNW9	NW9	NW8	NW7	WNW8.4	WNW11
8-Dec	NW8	NW7	NW6	NNW4	NW4	NNW4	NNW6	NW6	WNW3	SW5	W5	WNW6	W6	W7	SW5	SSW6	SW7	SW10	SW9	SSW7	SSW7	SW8	WNW9	WNW9	W4.5	SW10
9-Dec	WNW10	WNW10	NW11	NW11	NW11	NW11	NW11	NW12	NW12	NW11	NW11	WNW13	WNW12	WNW12	WNW13	NW9	NW9	NW8	WNW8	WNW7	WNW9	WNW8	WNW8	W8	WNW10.1	WNW13
10-Dec	NW7	WNW9	NW6	WNW7	WNW7	WNW10	WNW9	WNW12	W16	SW7	WSW13	WNW18	WNW16	NW16	NW18	NW15	NNW16	NNW17	NW12	NW12	NNW10	NW5	NW2	SSE1	WNW9.8	NW18
11-Dec	W0	NW4	NW6	NW8	WNW10	WNW10	NW7	NNW4	WNW2	SSW1	W2	S5	SSW4	SW8	SSW9	SW8	SW9	SW12	SW12	SW13	WSW13	SW12	WSW11	WSW13	WSW6.2	WSW13
12-Dec	WSW15	WSW15	WSW11	WSW11	WNW7	WNW9	NW7	NW7	NW7	NW9	NW6	WNW7	WNW9	NW9	NW10	NW12	NW13	NW14	NW12	NW7	NW7	NW6	WNW6	WNW6	WNW8.0	WSW15
13-Dec	NW7	NW7	NW7	NW5	NW6	NW6	WNW8	WNW11	W12	WNW11	WNW11	NW11	NNW17	NNW19	NNW17	NNW17	NNW19	NNW13	NNW6	NW8	NW6	NW6	NW6	NW8	WNW9.6	NNW19
14-Dec	NW6	NW5	NW6	NW5	W6	SW4	SSE3	S5	S2	S6	SSW8	SW10	SW6	SW10	SW10	SW9	S7	SW7	SW11	SW12	SW7	SW7	W5	W2	SW5.3	SW12
15-Dec	S1	SW3	SE2	SSW4	SW6	SW5	W8	WNW14	WNW12	WNW11	WNW12	WNW11	NW11	NW11	NW13	NW11	WNW11	W12	W14	W15	W17	WNW13	W15	W13	WNW9.3	W17
16-Dec	WNW12	WNW11	WNW11	WNW11	WNW11	WNW12	WNW13	WNW10	NW7	NNW5	NW7	W7	W10	W12	W13	WSW11	WSW9	WSW8	WSW10	WSW11	WSW11	SW12	SW11	SSW11	W8.9	W13
17-Dec	SSW11	SW14	SSW13	SW15	SW17	SSW16	SW14	SW12	SW15	WSW14	WSW14	W19	WNW16	WNW13	WNW11	W14	W13	W12	WNW11	WNW9	WNW9	WNW9	WNW9	W11	WSW10.9	W19
18-Dec	W12	W12	W10	W10	W12	W11	WNW11	WNW12	WNW11	WNW11	WNW12	NW13	NNW18	NNW17	NNW15	NNW18	NNW16	NNW15	NNW15	NNW12	NNW12	NNW9	NNW15	NNW16	NW11.9	NNW18
19-Dec	NNW12	NNW12	NNW14	NNW13	NNW11	NNW10	NNW6	NNW3	N4	N3	NW5	NW5	NW4	NW4	NW5	WSW3	SSW2	S2	S2	S3	SSE3	SSW5	SSW4	S1	NW3.9	NNW14
20-Dec	SSW4	SSW4	S4	S4	SSW7	SSW8	SSW6	SSW8	SW7	SSW7	SW9	SW11	WSW10	SW9	SSW6	S6	SSW9	SSW14	SSW13	SSW15	SSW16	SW14	SW12	SW11	SSW8.8	SSW16
21-Dec	SW13	SW13	WSW9	W12	WNW9	NW6	NW8	NW8	NW7	NW8	NNW11	NNW11	NNW10	NNW12	NNW11	NNW10	NNW11	NNW9	NW9	WNW8	NW8	NW9	NW8	NW9	WNW8.0	SW13
22-Dec	NW7	WNW6	WNW7	WNW8	WNW9	WNW9	WNW7	NW7	WNW6	WNW8	WNW9	WNW10	NW11	NW10	NW10	NW9	WNW9	WNW7	NW7	NW7	NW7	NW7	NW6	NW7	WNW7.8	NW11
23-Dec	NNW8	NNE11	N11	NE8	NNE4	NNW2	SE1	ESE3	E1	NE2	ENE2	ENE3	NNE4	NNE5	NNW4	NNW2	NNW2	NNW2	SSW1	SSE2	NW5	NW6	NW7	NW7	N3.2	NNE11
24-Dec	NNW8	NNW9	N15	N17	N17	N14	NNW10	NNW8	NNW8	NNW5	NW8	NW10	NNW12	NNW10	NNW9	NNW7	NNW4	NNW1	N3	SSW0	N3	N2	SSE1	SSW3	NNW7.1	N17
25-Dec	SSW3	SSW3	SSW2	SSE0	WNW1	NNW1	NNW1	NNW2	NW1	SW0	NNW6	NW6	NW6	NW5	NW4	W3	NW2	WNW0	SSW1	SSW4	SSW3	SSW4	SSW3	S2	W1.4	NW6
26-Dec	SSW4	SSW3	S4	SSW6	SSW6	SSW7	SW7	SW8	SSW6	SSW6	SW7	SW7	WSW6	SW7	SW8	SW4	SSW2	SSW5	S3	WSW4	ESE1	SE2	WSW3	W5	SW4.7	SW8
27-Dec	W5	WSW6	WSW6	S2	SSW3	SSW3	SW2	S1	SSW2	SSW3	S2	WNW5	WNW6	WNW6	W7	WSW4	WSW5	W5	SW4	SW5	WSW6	SW5	SSW4	SW5	WSW3.7	W7
28-Dec	SW6	SW7	WSW6	SSW3	WNW5	NW5	NW4	NW5	NNW7	NNW5	NNW9	NNW12	NNW13	NNW10	NNW11	NNW8	NNW6	N2	N2	N3	NNW3	NW1	S2	SE1	NW4.3	NNW13
29-Dec	N3	NE0	N4	NNW4	NNW5	NW5	NNW3	WNW3	NNW2	WNW2	WNW5	NW5	NW5	NW5	WNW4	W5	WSW3	SSW2	SSW4	SSW4	SSW4	SSW4	SSW4	SSW5	WNW2.2	NW5
30-Dec	SSW5	SSW4	SSW2	SSW4	SSW5	SW5	SSW4	SW5	SSW5	SW6	SSW4	WSW2	WNW4	WNW3	NNW2	NW1	NW1	S2	S3	S2	SSW3	SW5	SSW4	SSW4	SW3.0	SW6
31-Dec	SSE3	SE4	SSE3	S3	ESE1	S2	S3	SSE2	S2	SSE1	ESE1	SSW7	SSW9	SSW11	SSW10	S9	SSE7	SSE7	SSE4	SSE6	SSW10	SSW10	SW7	SW7	S4.9	SSW11

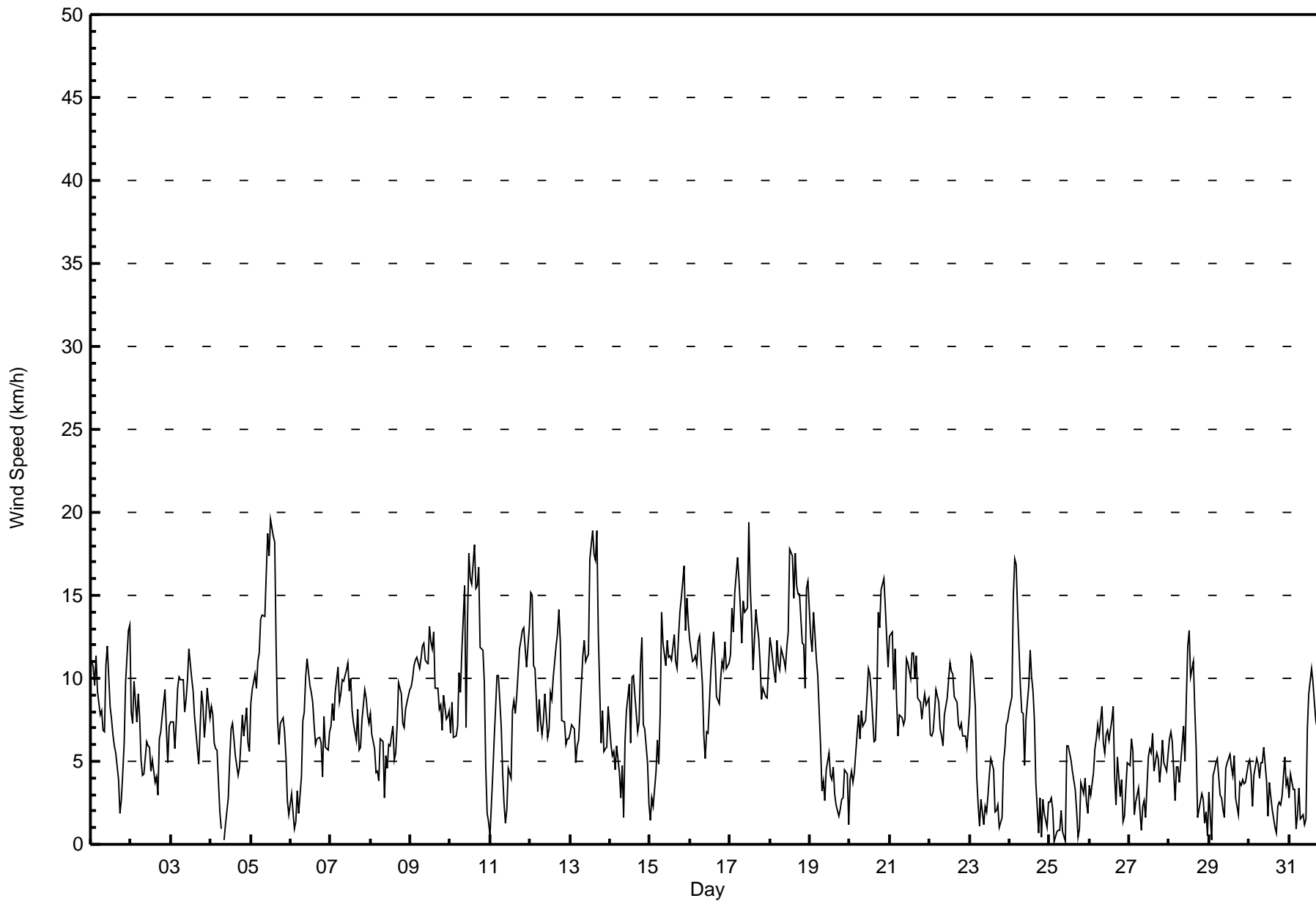
W4.7	W4.8	WNW4.2	WNW4.3	W5.2	W4.9	W4.5	W5.0	W4.9	W4.7	WNW5.9	WNW6.8	WNW7.4	WNW7.0	WNW6.4	WNW5.2	WNW4.3	W4.0	W3.8	W4.0	W4.6	W4.5	W4.6	W4.7	Diurnal Average	
WSW15	WSW15	N15	N17	SW17	SSW16	SW14	WNW14	WNW16	NW16	NNW19	W19	NNW20	NNW19	NNW18	NNW18	NNW19	NNW17	NNW15	SSW15	W17	SW14	NNW15	NNW16	Diurnal Maximum	

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 - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Conklin - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	237	31.90	31.90
6 - 11	383	51.55	83.45
12 - 19	122	16.42	99.87
20 - 28	1	0.13	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Conklin - December 2017**

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	5	2	2	2	4	8	15	30	53	16	9	13	16	27	24	237
6 - 11	2	5	3	0	0	0	0	4	8	38	69	25	13	81	97	38	383
12 - 19	4	0	0	0	0	0	0	0	0	7	16	9	16	21	17	32	122
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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
<b>Totals</b>	17	10	5	2	2	4	8	19	38	98	101	43	42	118	141	95	743

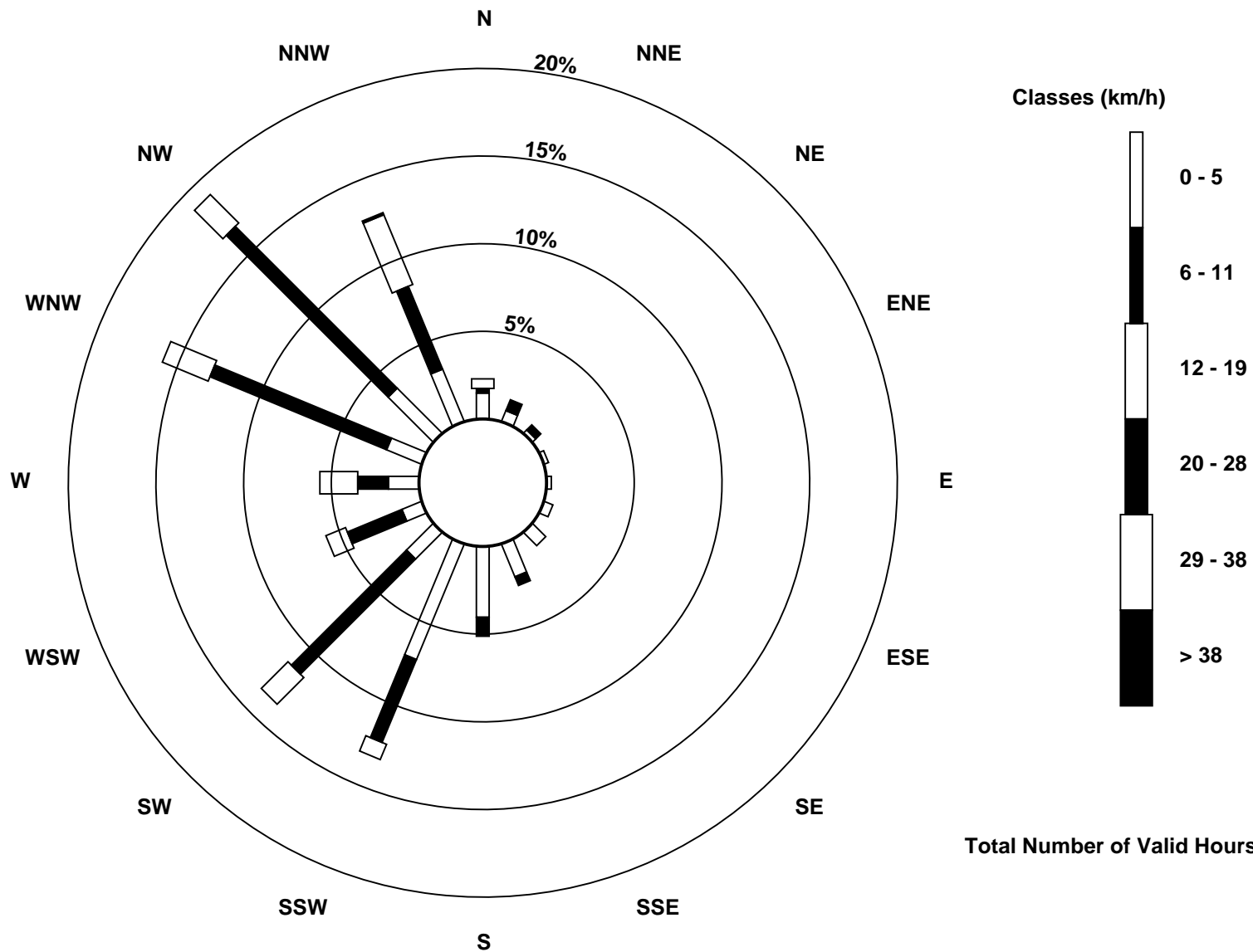
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Conklin (AMS 21)



Total Number of Valid Hours: 743



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Conklin - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 10 12:00 Minimum Value: 1 km/h on Dec 6 01:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 O <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	2	3	2	2	2	2	2	4	3	3	3	2	2	1	2	2	1	1	2	3	3	4	4
2-Dec	2	2	3	2	2	2	1	1	1	2	3	3	2	2	1	2	1	3	2	2	3	2	1	2	3
3-Dec	2	2	1	2	2	3	3	3	4	4	5	3	3	3	3	2	2	3	3	2	3	2	2	2	5
4-Dec	2	3	2	2	2	1	1	AF	1	1	1	1	2	2	2	1	1	1	1	2	2	3	2	2	3
5-Dec	2	4	4	4	4	4	5	5	5	6	6	6	6	6	6	3	3	2	2	3	3	1	1	1	6
6-Dec	1	1	1	1	1	1	1	2	2	2	3	3	2	3	2	1	1	1	1	3	3	2	2	3	3
7-Dec	3	3	3	4	4	3	4	4	4	4	4	4	4	3	3	2	3	2	2	3	3	3	3	2	4
8-Dec	3	2	2	1	1	1	2	2	1	2	2	2	2	3	2	1	2	2	2	2	2	3	4	4	4
9-Dec	4	4	4	4	4	4	4	5	4	4	4	5	5	4	5	4	3	3	3	3	4	3	3	3	5
10-Dec	3	4	2	3	3	4	3	5	6	3	5	8	6	6	7	5	4	5	4	4	3	2	1	1	8
11-Dec	1	2	2	3	4	4	3	2	2	1	1	1	2	3	3	2	3	3	3	4	4	4	3	5	5
12-Dec	4	4	3	4	3	4	3	2	3	4	2	3	4	3	4	5	5	4	4	2	2	2	2	3	5
13-Dec	2	2	2	2	2	3	3	5	4	5	4	5	6	6	5	5	5	4	2	2	2	2	2	3	6
14-Dec	2	2	2	2	2	1	1	1	2	2	2	3	3	3	3	3	2	3	4	4	3	2	2	1	4
15-Dec	1	1	1	1	2	1	4	5	5	4	5	4	4	4	5	4	4	4	5	5	5	5	5	5	5
16-Dec	5	4	4	4	4	5	5	4	2	2	3	2	3	4	4	3	3	3	3	3	3	3	2	3	5
17-Dec	3	4	3	4	5	4	4	3	4	4	4	5	7	5	4	5	4	4	5	3	4	4	3	3	7
18-Dec	4	4	4	3	3	3	4	4	4	4	5	6	6	6	5	6	5	5	4	3	3	3	6	4	6
19-Dec	4	3	4	4	3	3	2	2	1	1	2	1	1	1	1	2	1	1	1	1	1	2	1	1	4
20-Dec	1	2	1	1	2	2	2	2	2	2	2	3	3	3	2	2	3	4	3	4	4	3	3	2	4
21-Dec	3	4	3	4	4	3	3	3	2	3	3	3	3	3	3	3	4	3	4	3	3	4	3	3	4
22-Dec	3	3	3	3	3	3	3	3	2	3	4	4	4	4	4	3	3	3	2	3	3	2	2	2	4
23-Dec	3	4	3	3	1	1	1	1	1	1	1	2	1	2	2	1	1	1	1	1	2	2	3	3	4
24-Dec	3	3	4	5	6	5	3	2	2	1	3	3	3	3	3	2	2	1	1	1	1	1	1	1	6
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	2	1	1	1	1	2
26-Dec	1	1	2	2	2	2	3	2	2	2	2	2	2	2	2	2	1	1	2	2	1	1	2	2	3
27-Dec	2	2	2	1	1	1	2	1	1	1	1	2	2	2	2	1	2	2	2	1	2	1	1	2	2
28-Dec	2	2	1	2	2	1	1	2	2	2	3	3	3	3	3	3	2	1	1	1	1	1	1	1	3
29-Dec	1	1	1	1	2	2	1	2	1	2	2	2	2	2	1	2	1	1	1	1	1	1	1	2	2
30-Dec	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	3
31-Dec	1	1	1	1	1	1	1	1	1	1	1	4	3	3	3	3	2	1	2	2	4	4	2	2	4
Diurnal Maximum																								5	
AF - Analyzer Failure																									





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Conklin - December 2017**

Direction of Maximum Speed: 331 deg on Dec 5 13:00 Direction of Maximum Daily Speed Average: 313.1 deg on Dec 18	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1
Direction of Minimum Speed: 167 deg on Dec 25 04:00 Direction of Minimum Daily Speed Average: 1.4 deg on Dec 25	Percent Operational Time: 99.9
Monthly Average Direction: 283.4 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	223	225	231	239	226	219	216	214	213	235	239	224	245	230	201	189	193	177	290	191	214	226	230	243	225.4
2-Dec	234	232	242	228	228	227	175	162	198	249	287	291	292	271	273	287	199	232	207	206	217	209	213	231	231.7
3-Dec	241	218	200	202	215	218	225	235	247	288	317	321	325	322	301	297	313	283	332	330	334	335	335	325	286.0
4-Dec	331	346	28	25	347	335	6	AF	139	164	190	207	203	211	187	177	170	151	163	172	186	193	206	214	197.4
5-Dec	233	280	293	291	290	297	299	315	316	322	327	328	331	328	335	347	360	18	39	38	33	25	5	96	325.2
6-Dec	139	136	168	273	243	221	200	240	225	226	229	228	240	242	224	210	221	215	199	255	313	310	317	312	237.8
7-Dec	317	305	308	305	304	309	304	304	300	296	296	297	295	301	302	302	298	314	305	305	302	309	311	313	303.7
8-Dec	315	316	314	330	325	331	335	324	294	225	263	293	267	270	235	208	217	217	226	208	209	229	303	299	269.1
9-Dec	302	288	307	311	305	306	308	306	304	304	307	298	299	303	300	311	312	316	288	303	294	302	289	280	302.2
10-Dec	305	285	322	292	296	284	288	290	281	228	255	288	298	315	320	321	328	330	325	325	327	324	307	159	303.5
11-Dec	281	308	317	307	294	290	308	331	295	207	265	181	196	225	213	220	219	226	229	230	237	234	237	238	246.9
12-Dec	238	242	241	239	286	297	309	305	305	308	312	293	292	310	317	325	324	324	324	318	319	315	286	301	296.0
13-Dec	313	315	311	313	307	312	301	292	271	288	292	316	329	333	337	338	348	340	331	325	322	310	316	322	319.2
14-Dec	312	309	314	318	274	216	162	181	186	189	205	229	223	215	214	216	191	216	223	234	232	235	273	264	230.2
15-Dec	191	215	143	203	224	214	266	285	299	296	291	294	307	305	307	304	289	281	281	277	275	290	275	279	283.2
16-Dec	290	282	284	286	290	285	286	289	325	336	320	281	272	276	266	256	242	237	239	244	238	227	217	207	267.2
17-Dec	209	216	209	215	216	213	215	214	233	238	247	267	287	291	288	275	273	278	299	295	294	295	283	272	251.9
18-Dec	278	280	279	274	270	270	285	286	291	297	303	315	327	329	330	328	334	331	334	332	335	334	339	345	313.1
19-Dec	341	336	337	336	341	340	335	331	349	1	307	321	313	306	317	253	206	185	182	185	165	209	194	186	324.1
20-Dec	192	193	178	183	207	206	205	211	216	212	214	227	243	220	202	180	211	211	207	211	212	219	218	221	211.8
21-Dec	224	232	242	278	294	305	317	319	320	320	328	331	328	331	331	332	334	328	320	302	307	317	319	317	308.5
22-Dec	315	302	294	289	288	285	301	309	303	297	300	301	304	305	305	305	300	302	308	313	314	312	311	321	302.9
23-Dec	330	20	359	35	19	340	143	118	86	55	58	60	16	17	339	331	334	342	193	152	306	313	305	316	356.2
24-Dec	327	343	360	1	357	352	340	339	334	328	321	324	335	333	330	327	331	342	352	213	351	11	148	203	341.6
25-Dec	204	210	205	167	283	342	337	343	316	217	341	326	318	314	308	280	309	288	194	207	202	197	175	278.8	
26-Dec	200	192	189	205	202	205	219	217	203	204	217	234	246	233	231	223	194	208	184	248	122	132	254	266	217.0
27-Dec	262	257	238	191	199	212	218	187	205	207	188	303	287	297	277	248	243	264	235	232	243	225	213	226	245.7
28-Dec	233	231	237	213	300	312	320	324	330	328	336	342	344	342	330	332	333	353	359	357	332	318	191	143	321.1
29-Dec	5	54	357	342	327	325	329	295	334	282	303	308	312	308	297	272	254	210	206	200	206	207	199	204	288.0
30-Dec	200	201	212	205	208	214	210	214	209	214	201	258	293	296	334	309	318	190	182	188	198	215	207	192	214.3
31-Dec	161	146	156	182	120	175	171	154	183	150	115	198	196	202	206	186	168	158	165	159	208	211	221	214	188.1

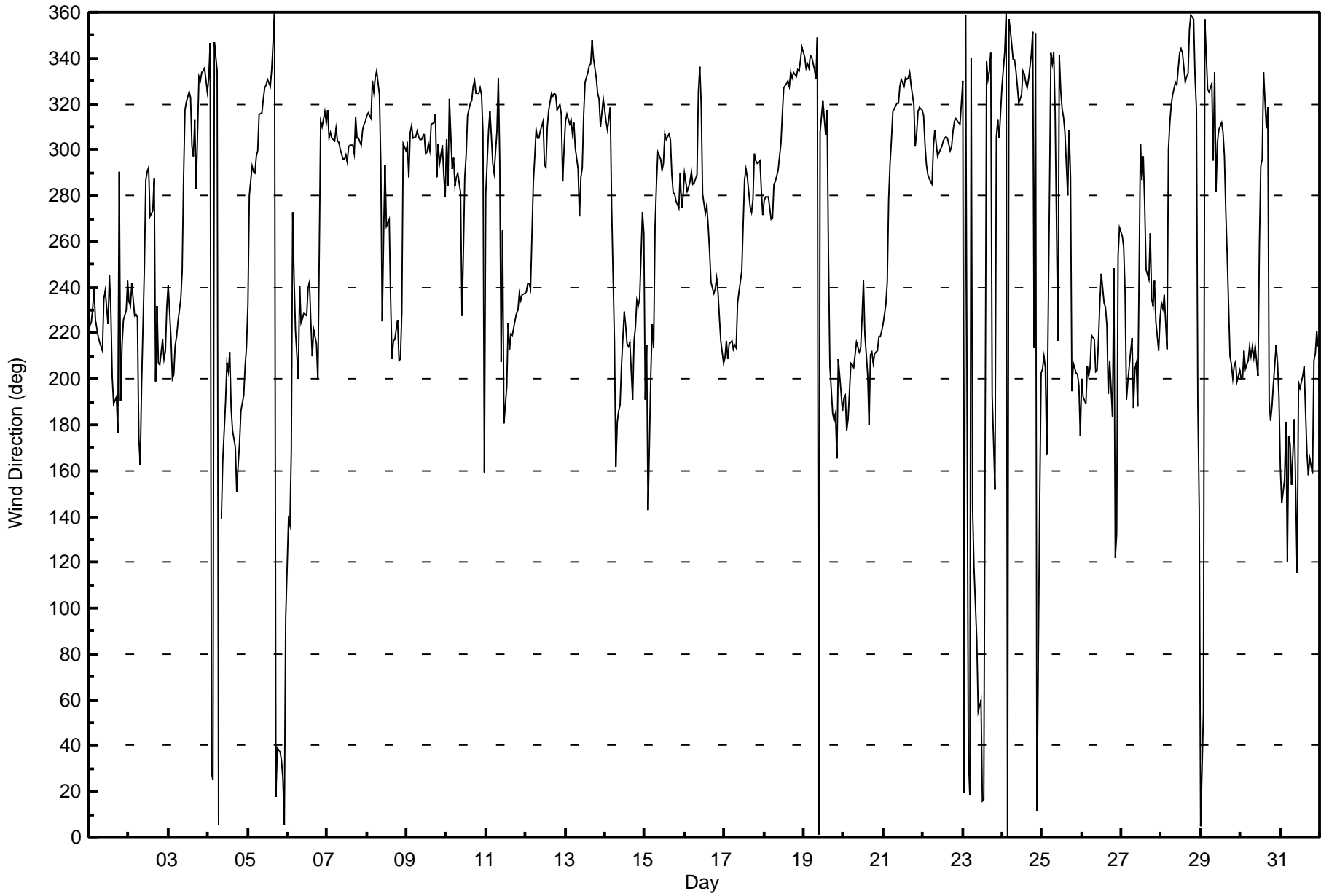
270.6 270.8 284.0 281.6 279.6 275.9 278.2 279.7 280.0 274.8 285.4 290.3 297.8 296.4 295.1 291.4 290.6 277.9 273.6 264.6 268.7 264.0 269.6 270.3  
 Diurnal Average

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**  
**Conklin - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Conklin - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 95 deg on Dec 4 09:00 Minimum Value: 10 deg on Dec 29 21:00 Percentiles: P <sub>1</sub> = 13 P <sub>10</sub> = 17 Q <sub>1</sub> = 20 Median = 24 Q <sub>3</sub> = 30 P <sub>90</sub> = 40 P <sub>99</sub> = 82																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	17	18	20	18	17	19	15	18	18	20	20	21	29	23	13	14	58	81	57	25	23	20	19	17	81
2-Dec	19	16	17	16	18	23	19	24	27	22	34	37	34	25	22	22	41	32	25	18	17	16	21	22	41
3-Dec	21	18	14	19	15	17	18	19	33	29	27	26	24	24	29	30	34	36	21	19	22	16	17	18	36
4-Dec	17	33	21	27	16	35	52	AF	95	60	49	20	20	20	25	21	25	18	18	17	29	25	31	29	95
5-Dec	22	34	28	26	26	29	29	27	25	24	21	19	20	20	19	19	18	21	24	24	28	25	36	51	51
6-Dec	13	35	73	73	23	37	17	21	20	20	20	22	21	20	20	22	17	23	17	68	31	30	30	34	73
7-Dec	32	31	30	30	30	30	29	30	29	28	30	32	28	30	27	24	29	24	24	28	28	27	28	26	32
8-Dec	28	23	26	35	25	22	19	23	57	23	39	31	28	29	23	15	19	17	21	24	22	35	37	31	57
9-Dec	33	31	31	28	28	30	30	28	28	30	30	29	28	29	30	29	28	26	32	30	30	31	27	25	33
10-Dec	31	29	25	32	31	25	26	31	25	22	21	27	29	26	23	22	18	17	20	19	19	18	37	74	74
11-Dec	86	34	26	29	30	27	30	50	65	63	56	25	44	23	24	26	25	19	22	21	21	23	23	21	86
12-Dec	19	18	20	27	37	30	28	29	29	28	31	32	29	28	25	21	23	21	20	22	22	24	28	31	37
13-Dec	28	25	27	34	32	32	29	28	25	28	29	27	22	19	19	19	20	18	18	17	20	27	24	19	34
14-Dec	26	27	26	34	28	23	30	19	82	20	22	23	30	20	18	22	25	30	22	20	23	22	37	63	82
15-Dec	80	50	32	18	16	22	28	25	29	27	27	30	30	31	28	30	27	23	23	21	20	27	21	24	80
16-Dec	28	25	24	24	25	24	26	27	29	32	25	28	21	22	18	17	19	20	22	19	20	19	15	16	32
17-Dec	17	16	16	17	16	16	18	18	21	20	20	19	27	30	31	20	21	22	30	29	28	27	25	18	31
18-Dec	22	20	24	20	18	23	27	24	29	29	30	29	23	18	19	20	19	18	18	18	18	16	19	19	30
19-Dec	19	18	19	18	19	17	16	17	21	26	31	16	45	38	24	47	41	63	25	18	44	31	21	68	68
20-Dec	24	37	25	30	20	14	15	17	22	17	17	19	20	19	26	21	23	16	16	15	15	16	16	16	37
21-Dec	18	21	17	26	29	29	25	24	21	22	17	18	22	17	17	17	22	18	24	29	30	27	24	23	30
22-Dec	25	28	28	26	26	23	29	26	30	28	31	29	29	30	29	28	26	30	30	27	26	26	29	24	31
23-Dec	20	24	20	27	17	33	73	27	61	37	67	50	49	25	22	23	41	52	70	83	51	30	29	27	83
24-Dec	20	18	19	20	20	17	13	17	22	22	22	18	18	17	18	26	62	20	81	33	62	63	23	81	
25-Dec	20	21	24	89	82	64	54	31	57	84	15	25	26	28	31	26	33	55	74	20	14	14	19	26	89
26-Dec	15	20	27	20	17	18	27	17	19	23	21	20	18	18	17	21	15	12	64	27	48	38	51	31	64
27-Dec	32	32	21	50	25	14	58	86	25	67	47	32	33	29	28	30	21	30	33	20	16	17	24	27	86
28-Dec	19	19	19	46	42	26	21	19	18	21	21	20	20	19	16	15	63	33	23	21	69	20	77	77	
29-Dec	39	88	14	19	24	19	30	25	53	81	35	28	29	34	30	18	44	69	12	10	10	16	23	18	88
30-Dec	26	36	33	21	19	15	24	17	18	14	18	61	35	39	51	61	72	32	26	37	31	25	24	21	72
31-Dec	22	16	22	19	57	76	17	31	26	40	57	28	20	17	20	18	13	10	31	27	24	23	25	26	76
86 88 73 89 82 76 73 86 95 84 67 61 49 39 51 61 72 81 74 83 51 69 63 77																								Diurnal Maximum	
AF - Analyzer Failure																									





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

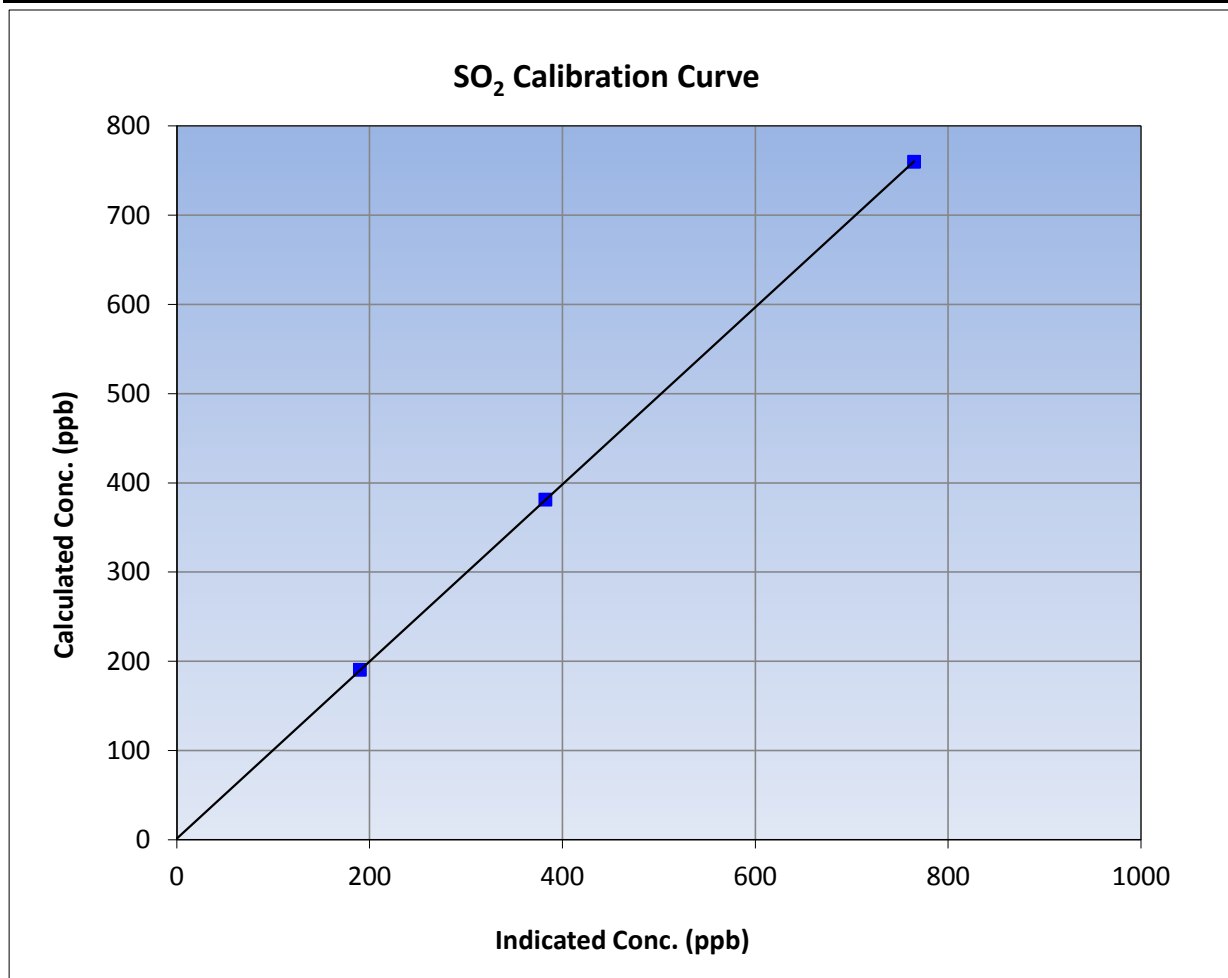
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	11:16	End Time (MST)	15:27
Analyzer make	Thermo 43i	Analyzer serial #	1428701363

### Calibration Data

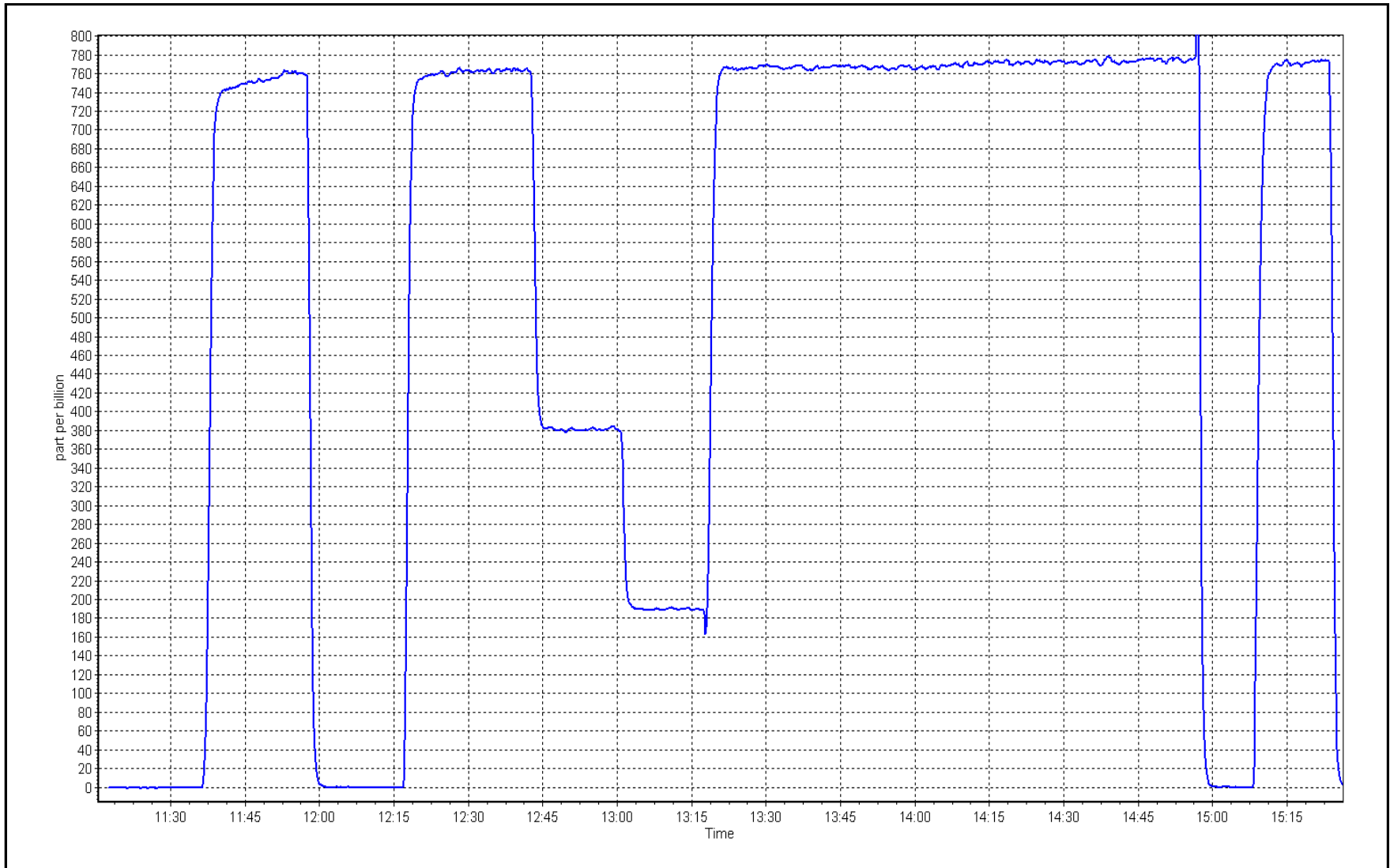
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.5	----	Correlation Coefficient	0.999995	≥0.995
759.5	764.2	0.9938			
380.9	381.8	0.9977	Slope	0.992720	0.90 - 1.10
190.2	189.6	1.0029			
			Intercept	1.290886	+/-30



SO2 Calibration Plot

Date: December 13, 2017

Location: Conklin







# Wood Buffalo Environmental Association

## TRS Calibration Summary

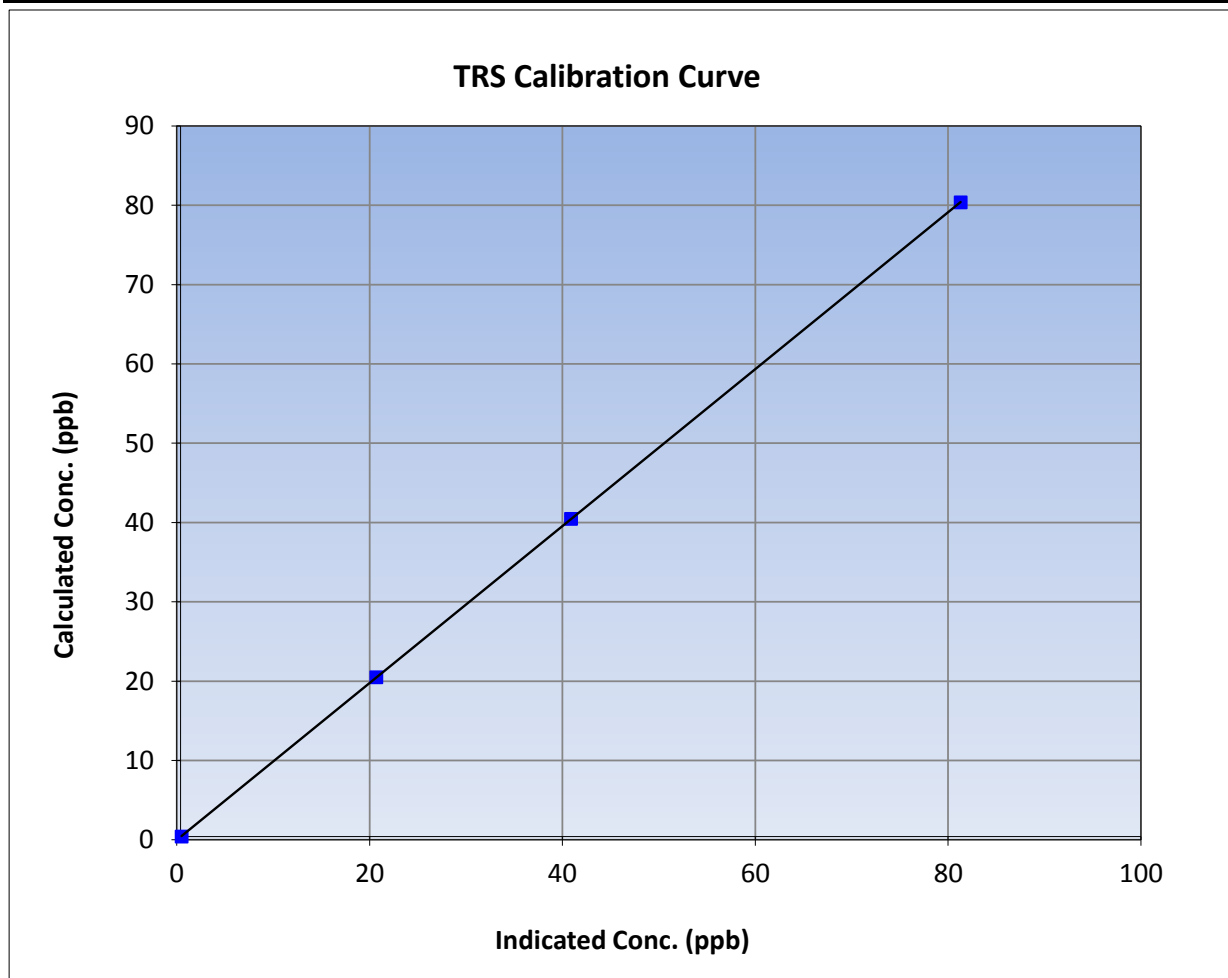
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 6, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	12:08	End Time (MST)	14:55
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1236656116

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999997	≥0.995
80.0	80.9	0.9886			
40.1	40.5	0.9897	Slope	0.989442	0.90 - 1.10
20.1	20.3	0.9906			
			Intercept	-0.033727	+/-3

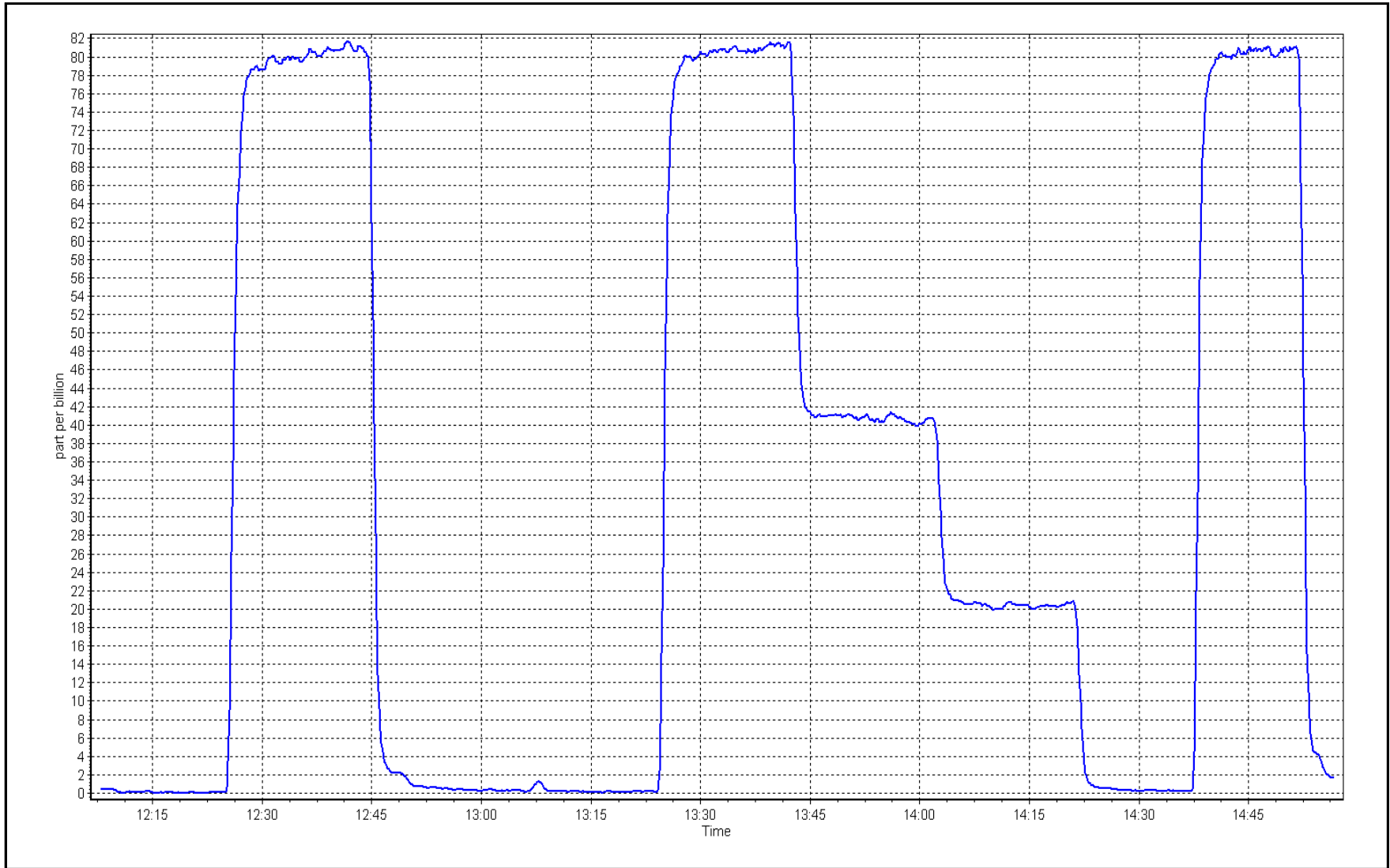




TRS Calibration Plot

Date: December 12, 2017

Location: Conklin





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Conklin	Station number:	AMS 21
Calibration Date:	December 20, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	12:55	End time (MST):	15:40
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL84669	Cal Gas Expiry Date	August 18, 2020
CH4 Cal Gas Conc.	<u>513.0</u> ppm	CH4 Equiv Conc.	1068.5 ppm
C3H8 Cal Gas Conc.	<u>202.0</u> ppm	Station temp.	22 Deg C
Calibrator Model	Teledyne API T700	Serial Number	2658
ZAG make/model	Teledyne API 701	Serial Number	263

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1152430011

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	74.9	74.9
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
CH4 SP Ratio	1.74E-04	1.77E-04	Flame Temp	405.0	405.0
CH4 Retention time	12.0	11.8	Carrier Pressure	37.0	37.0
NMHC SP Ratio	4.37E-05	4.73E-05	Fuel Pressure	49.7	49.7
NMHC Peak Area	196727	181764	Air Pressure	34.3	34.3

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	1.003744	0.998543
THC Cal Offset	0.042270	0.045135
CH4 Cal Slope	1.003987	0.999758
CH4 Cal Offset	0.031821	0.034340
NMHC Cal Slope	1.003446	0.997440
NMHC Cal Offset	0.010729	0.010512

Notes: Sample inlet filter replaced after as founds. Acknowledged NMHC channel being more than 5% out, not sure the cause for now. Will do some preventative maintenance next month to address the issue.  
Adjusted span.

Calibration Performed By:

Asad Hidayat



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5005	0.0	0.00	0.00	----
as found span	4933	77.5	16.53	15.82	1.044
calibrator zero	5005	0.0	0.00	0.00	----
high point	4933	77.5	16.53	16.53	1.000
second point	4975	38.9	8.29	8.22	1.009
third point	4992	19.5	4.16	4.09	1.018
as left zero	5005	0.0	0.00	0.00	----
as left span	4933	77.5	16.53	16.64	0.993
Average Correction Factor					1.009
Corrected As found	15.82	Prev response	16.42	*% change	3.8%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5005	0	0.00	0.00	----
as found span	4933	77.5	8.59	8.04	1.069
calibrator zero	5005	0	0.00	0.00	----
high point	4933	77.5	8.59	8.61	0.998
second point	4975	38.9	4.31	4.30	1.002
third point	4992	19.5	2.16	2.15	1.006
as left zero	5005	0	0.00	0.00	----
as left span	4933	77.5	8.59	8.69	0.988
Average Correction Factor					1.002
Corrected As found	8.04	Prev response	8.55	*% change	6.4%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5005	0.0	0.00	0.00	----
as found span	4933	77.5	7.93	7.79	1.019
calibrator zero	5005	0.0	0.00	0.00	----
high point	4933	77.5	7.93	7.92	1.001
second point	4975	38.9	3.98	3.92	1.017
third point	4992	19.5	2.00	1.94	1.030
as left zero	5005	0.0	0.00	0.00	----
as left span	4933	77.5	7.93	7.94	0.999
Average Correction Factor					1.016
Corrected As found	7.79	Prev response	7.87	*% change	1.1%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## THC Calibration Summary

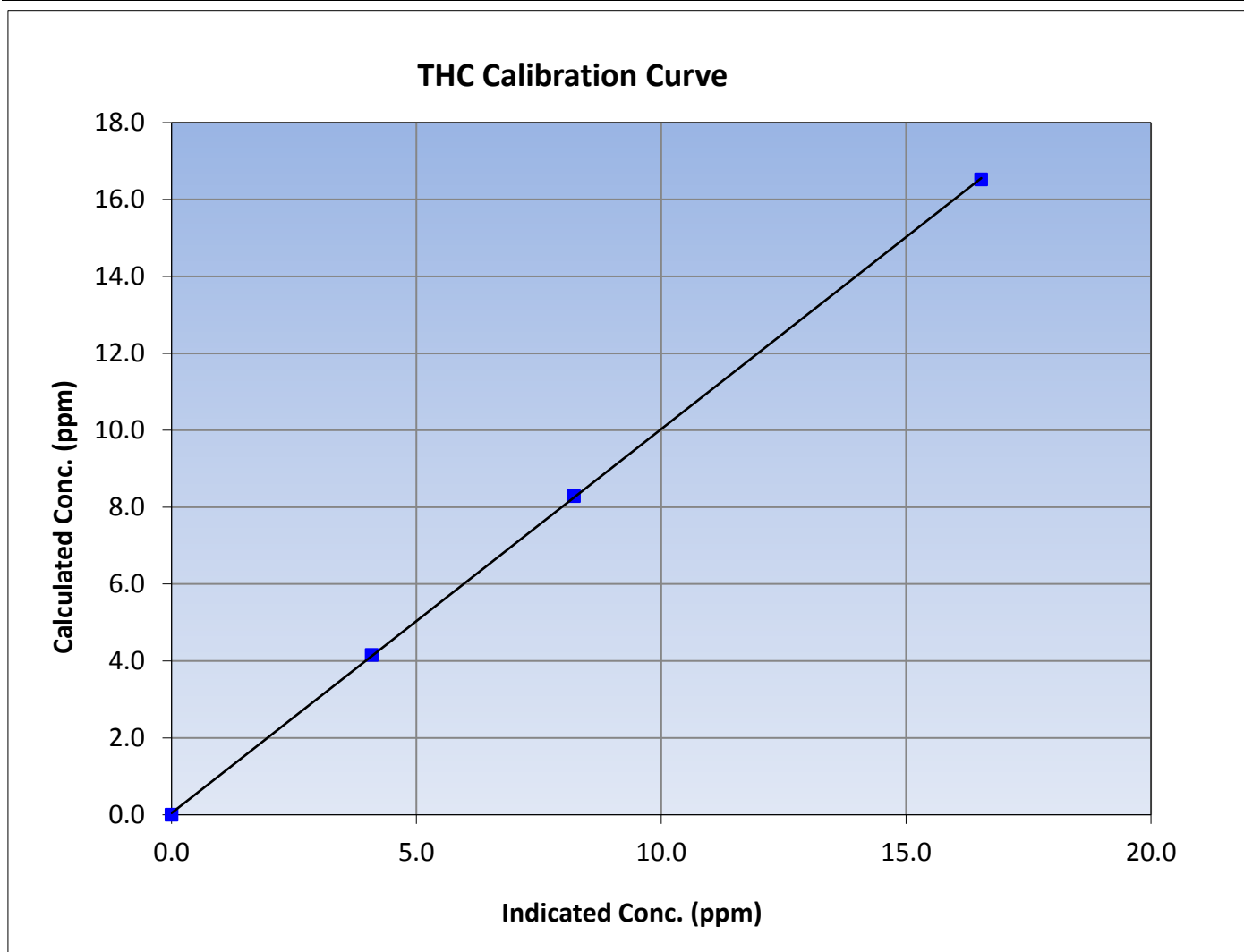
Version-02-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	12:55	End Time (MST)	15:40
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999963	$\geq 0.995$			
16.53	16.53	0.9996						
8.29	8.22	1.0089				Slope	0.998543	0.90 - 1.10
4.16	4.09	1.0178						
			Intercept	0.045135	$\pm 0.5$			





# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

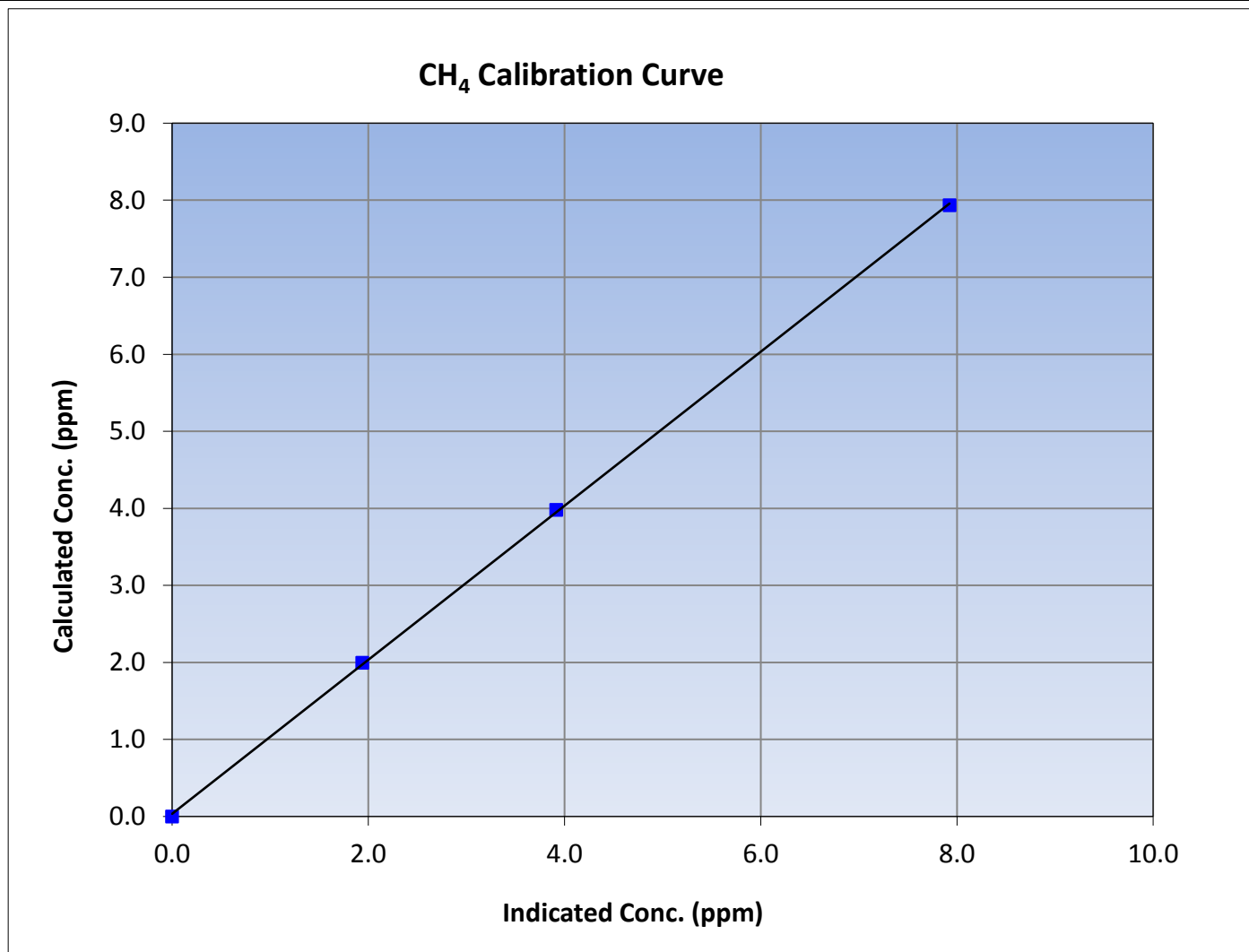
Version-02-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	12:55	End Time (MST)	15:40
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999906	$\geq 0.995$			
7.93	7.92	1.0014						
3.98	3.92	1.0166				Slope	0.999758	0.90 - 1.10
2.00	1.94	1.0300						
			Intercept	0.034340	$\pm 0.5$			





# Wood Buffalo Environmental Association

## NMHC Calibration Summary

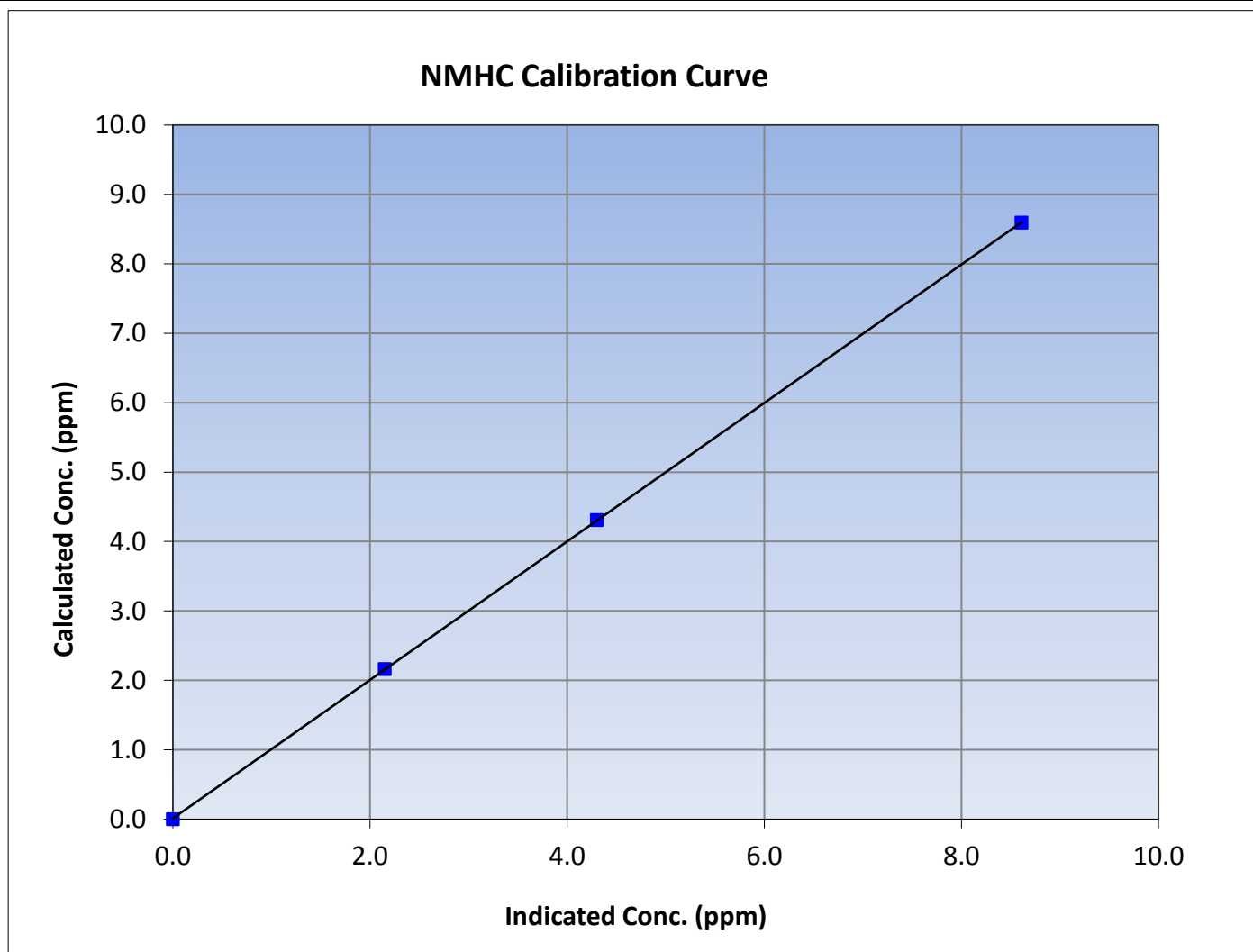
Version-02-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	12:55	End Time (MST)	15:40
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

### Calibration Data

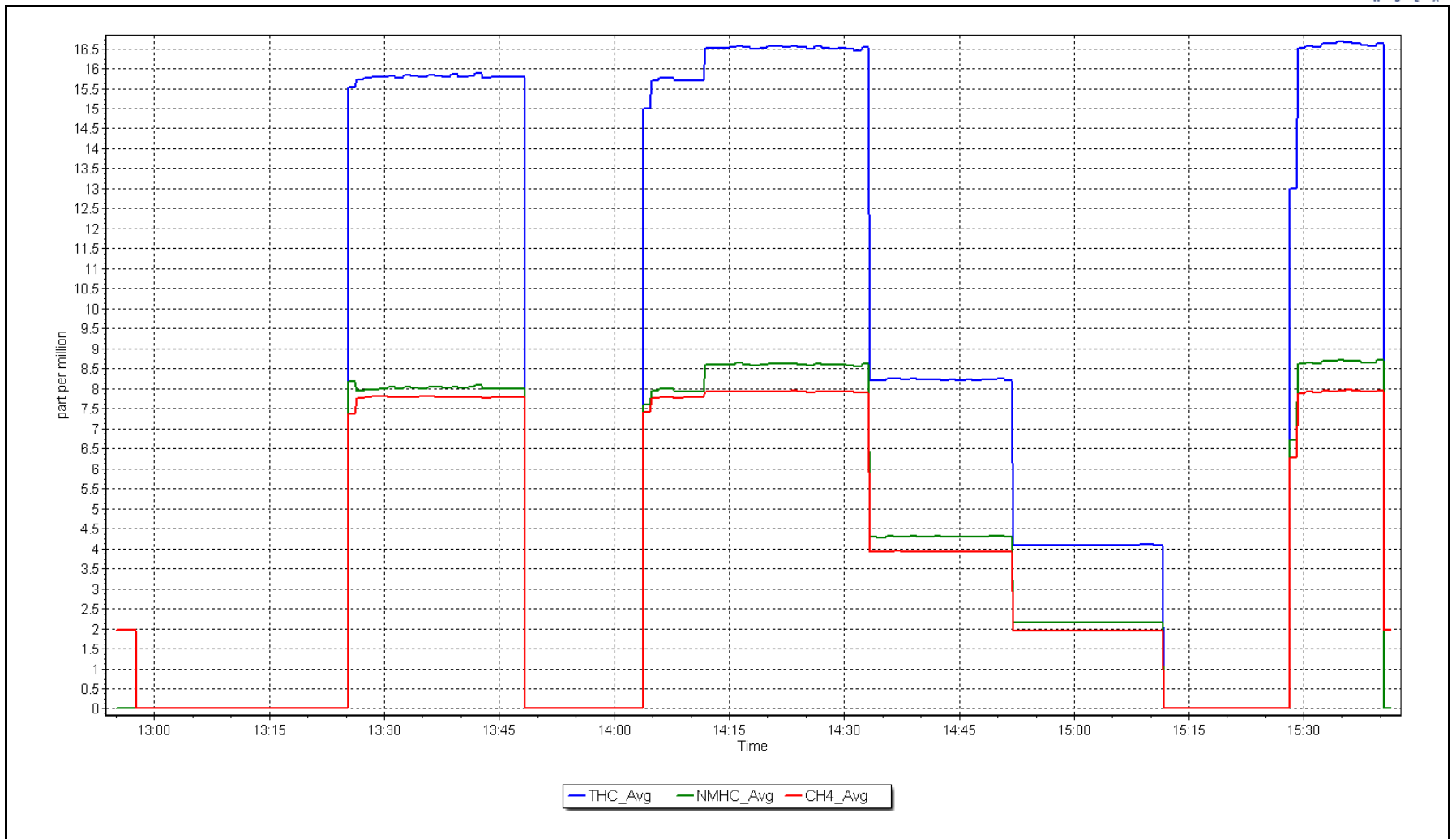
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999993	$\geq 0.995$			
8.59	8.61	0.9979						
4.31	4.30	1.0018				Slope	0.997440	0.90 - 1.10
2.16	2.15	1.0063						
			Intercept	0.010512	$\pm 0.5$			



NMHC Calibration Plot

Date: December 20, 2017

Location: Conklin









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

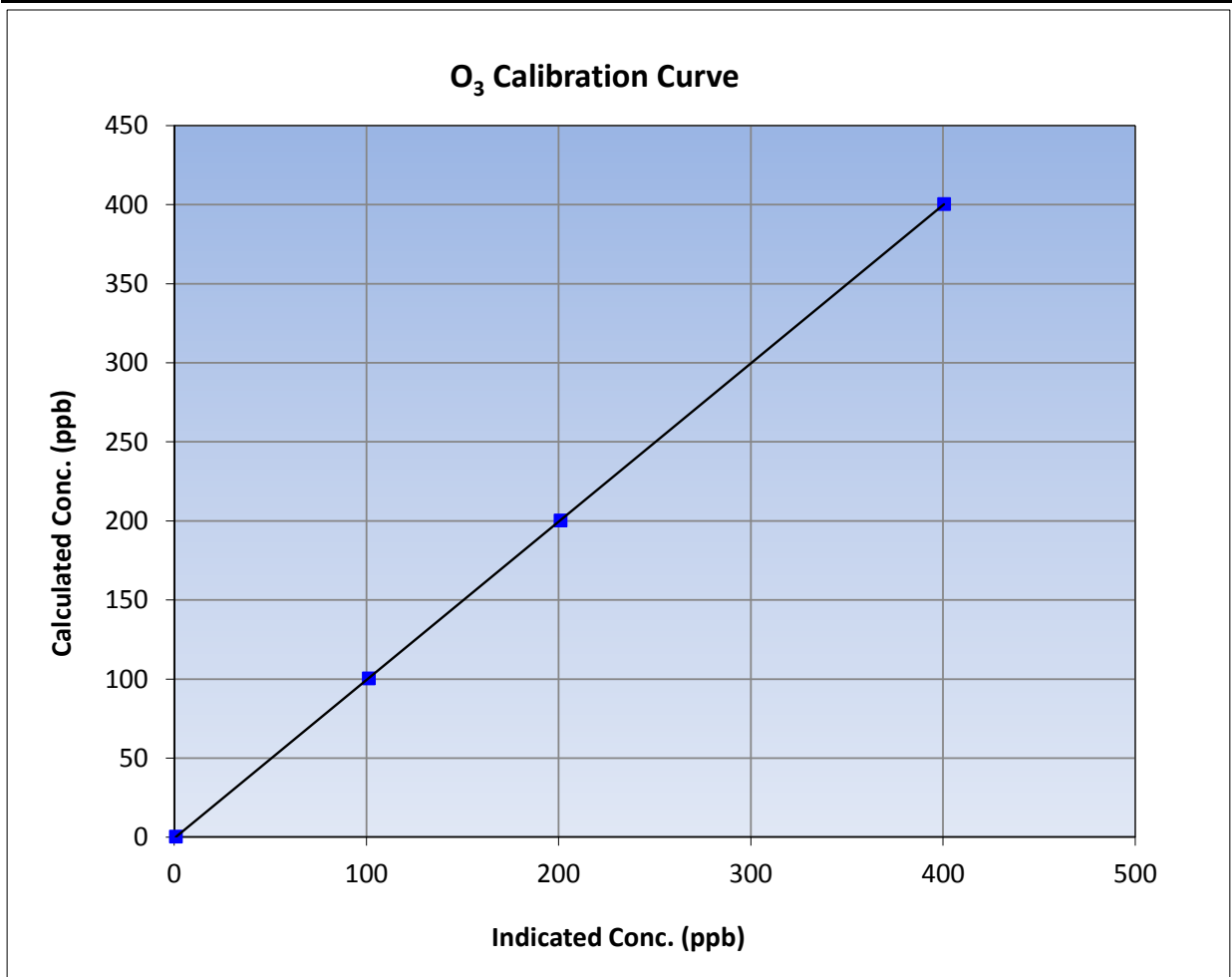
Version-03-2017

### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	11:36	End Time (MST)	14:20
Analyzer make	Thermo 49i	Analyzer serial #	1501663734

### Calibration Data

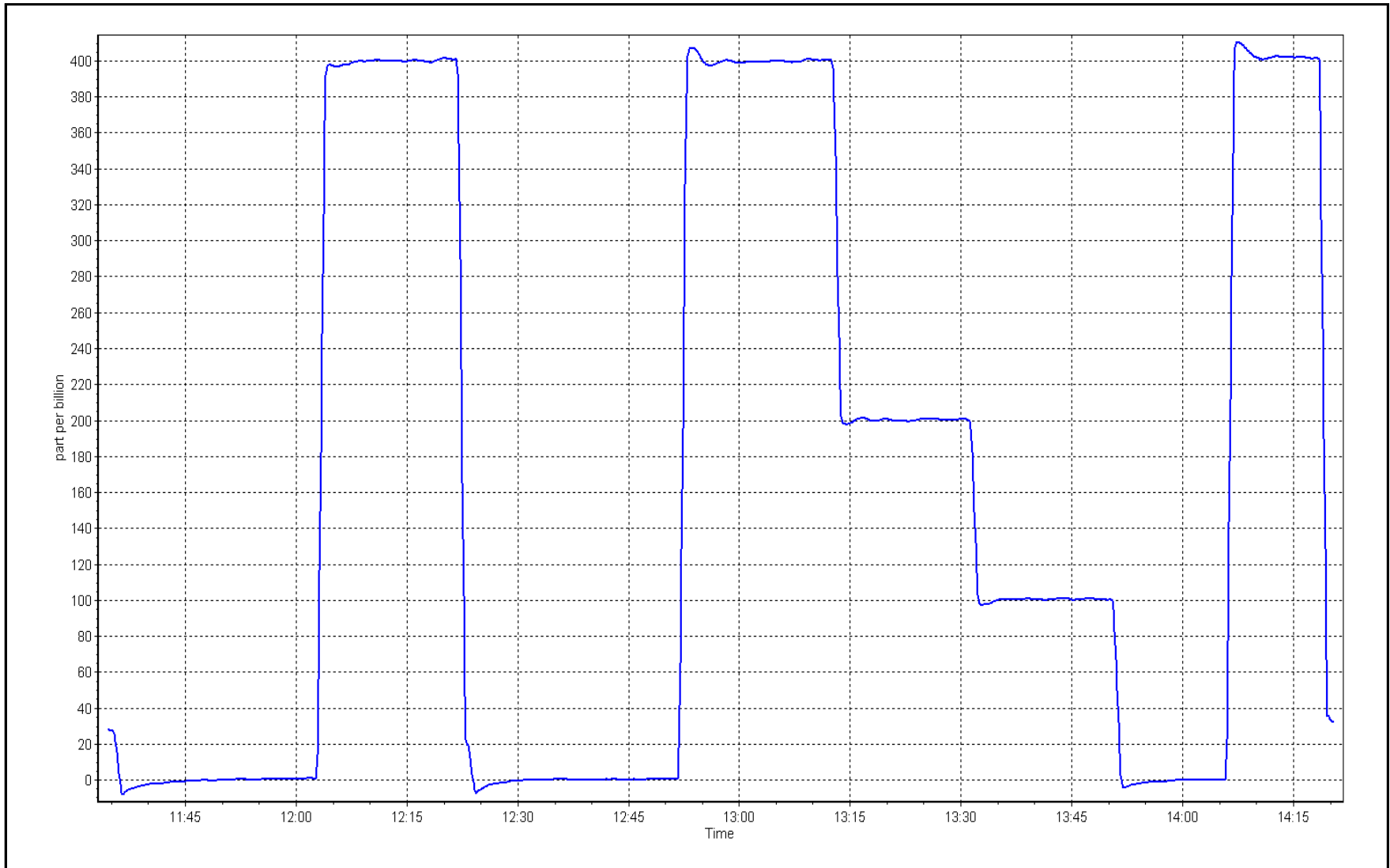
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>
0.0	0.5	----	Correlation Coefficient	≥0.995
400.0	400.1	0.9998		
200.0	200.7	0.9965	Slope	0.90 - 1.10
100.0	100.8	0.9921		
			Intercept	+/- 10



O<sub>3</sub> Calibration Plot

Date: December 15, 2017

Location: Conklin





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Conklin	Station number:	AMS 21
Calibration Date:	December 13, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	11:16	End time (MST):	15:27
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL84669	Cal Gas Expiry Date	August 18, 2020
NOX Cal Gas Conc.	<u>51.7</u> ppb	NO Cal Gas Conc.	<u>51.7</u> ppb
Calibrator Model	Teledyne API T700	Serial Number	2658
ZAG make/model	Teledyne API T701	Serial Number	263

### Analyzer Information

Analyzer make:	Thermo 42i	Analyzer serial #:	1501663731	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
NO coefficient	1.033	1.028	NOX Range (ppb)	0 - 1000 ppb
NOX coefficient	1.000	0.998	PMT Temperature	-3.0 -3.0
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	154.8 156.0
NO bkgrnd	10.0	10.0	Sample Flow	0.623 0.623
NOX bkgrnd	10.1	10.1	PMT Voltage	-892.4 -892.4

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.998872	1.002297
NO <sub>x</sub> Cal Offset	-0.124817	-0.124343
NO Cal Slope	1.000258	1.001628
NO Cal Offset	0.013894	0.034598
NO <sub>2</sub> Cal Slope	1.012661	1.018983
NO <sub>2</sub> Cal Offset	-0.959112	-0.466355



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5005	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
as found span	4933	77.6	800.7	800.7	0.0	806.1	804.5	1.6	0.9933	0.9953
calibrator zero	5005	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
high point	4933	77.6	800.7	800.7	0.0	798.4	799.0	-0.6	1.0029	1.0021
second point	4975	38.9	401.1	401.1	0.0	401.7	401.4	0.3	0.9985	0.9993
third point	4990	19.4	200.2	200.2	0.0	199.4	199.3	0.1	1.0041	1.0046
as left zero	5005	0.0	0.0	0.0	0.0	0.1	0.0	0.0	----	----
as left span	4933	77.5	799.7	396.5	403.2	814.3	402.6	411.7	0.9820	0.9848
<b>Average Correction Factor</b>									<b>1.0018</b>	<b>1.0020</b>

Corrected As found      NO<sub>x</sub> = 806.3 ppb                      NO = 804.6 ppb                      \*Percent Change                      NO<sub>x</sub> = -0.6%  
 Previous Response      NO<sub>x</sub> = 801.7 ppb                      NO = 800.5 ppb                      \*Percent Change                      NO = -0.5%  
 \* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	813.9	813.4	0.5	0.9838	0.9844	----	----
1st NO2 (400 ppb O3)	396.5	416.9	806.4	396.5	409.9	0.9929	----	1.0171	98.3%
2nd NO2 (200 ppb O3)	604.1	209.3	808.5	604.1	204.4	0.9903	----	1.0240	97.7%
3rd NO2 (100 ppb O3)	713.3	100.1	813.6	713.3	100.4	0.9841	----	0.9970	100.3%
2nd NO ref point	----	0.0	813.9	813.4	0.5	0.9838	0.9844	----	----
<b>Average Correction Factor</b>						<b>0.9878</b>	<b>0.9844</b>	<b>1.0127</b>	<b>98.8%</b>

Notes: Sample inlet filter replaced after as founds. Adjusted both zero and span. Used 2nd high NO ref point for GPT reference since NO had drifted.

Calibration Performed By: Asad Hidayat



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

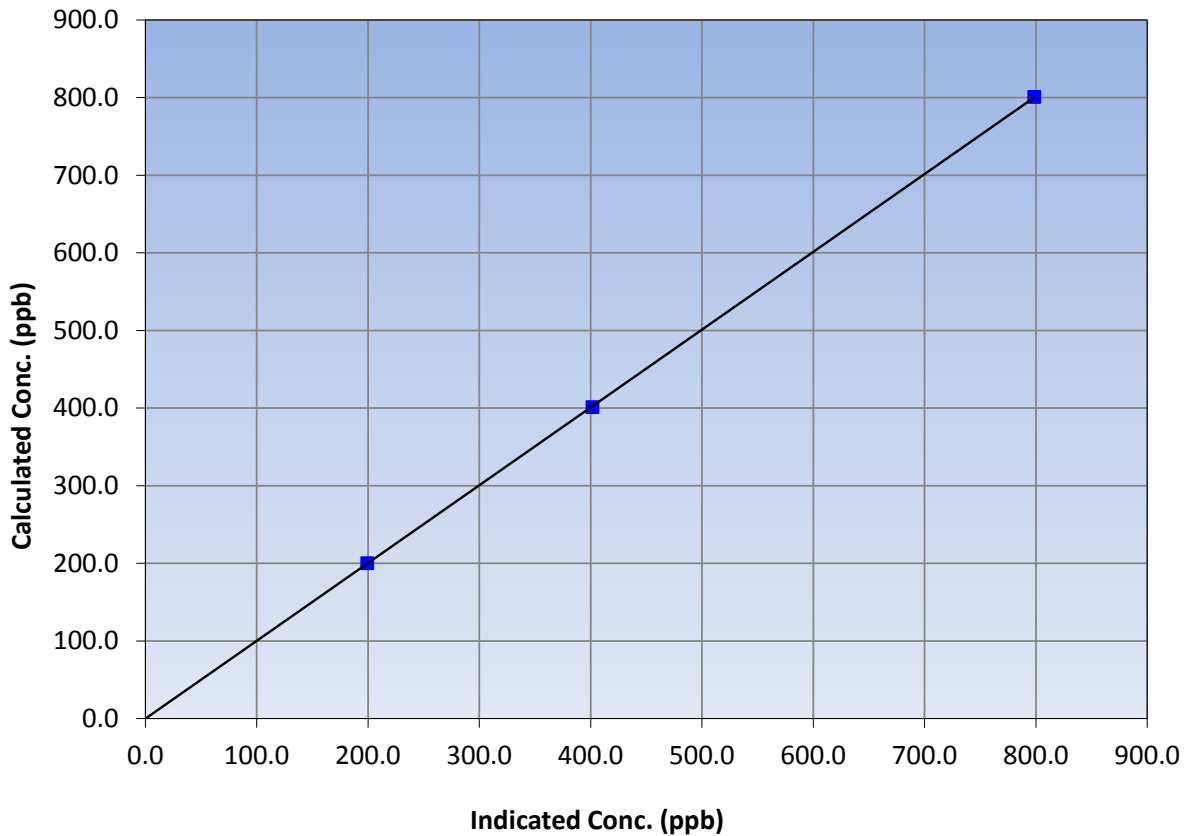
### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	11:16	End Time (MST)	15:27
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.2	----	Correlation Coefficient	≥0.995	
800.7	798.4	1.0029			
401.1	401.7	0.9985			
200.2	199.4	1.0041			
			Slope	1.002297	0.90 - 1.10
			Intercept	-0.124343	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

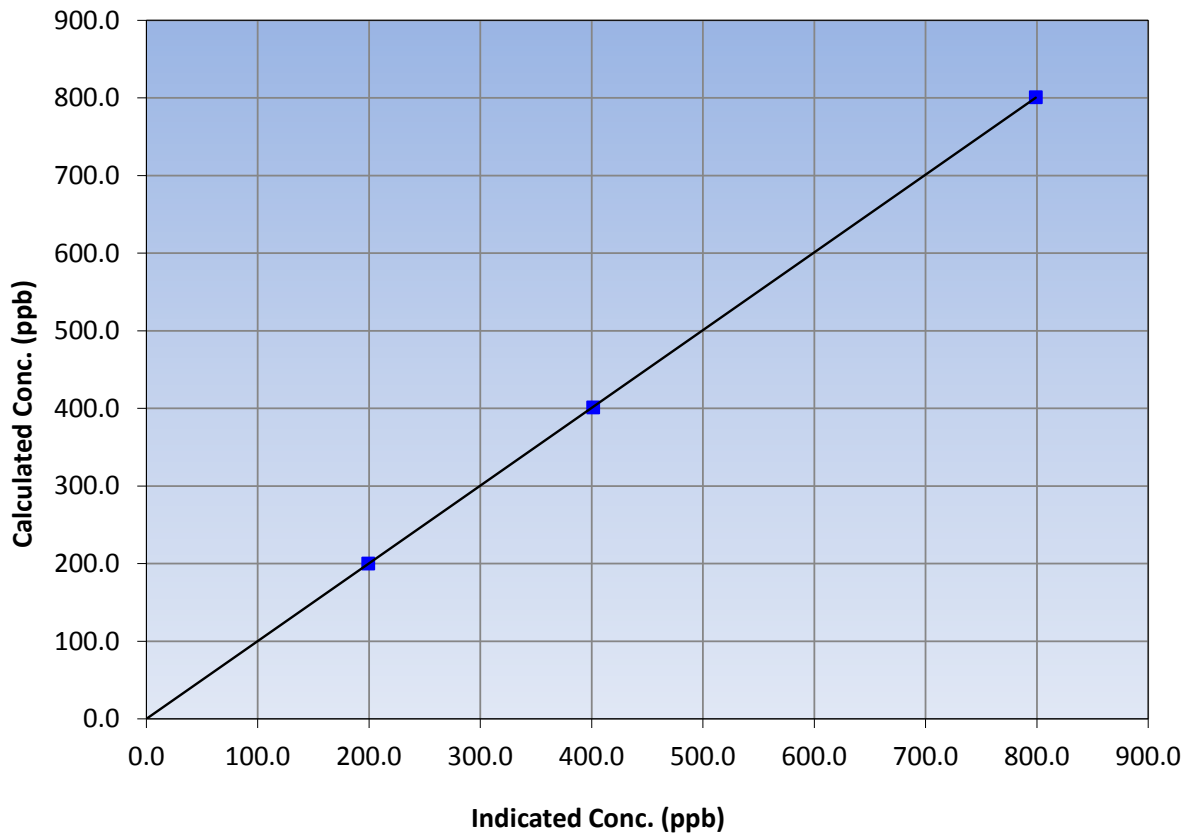
### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	11:16	End Time (MST)	15:27
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
800.7	799.0	1.0021			
401.1	401.4	0.9993			
200.2	199.3	1.0046			
			Slope	1.001628	0.90 - 1.10
			Intercept	0.034598	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

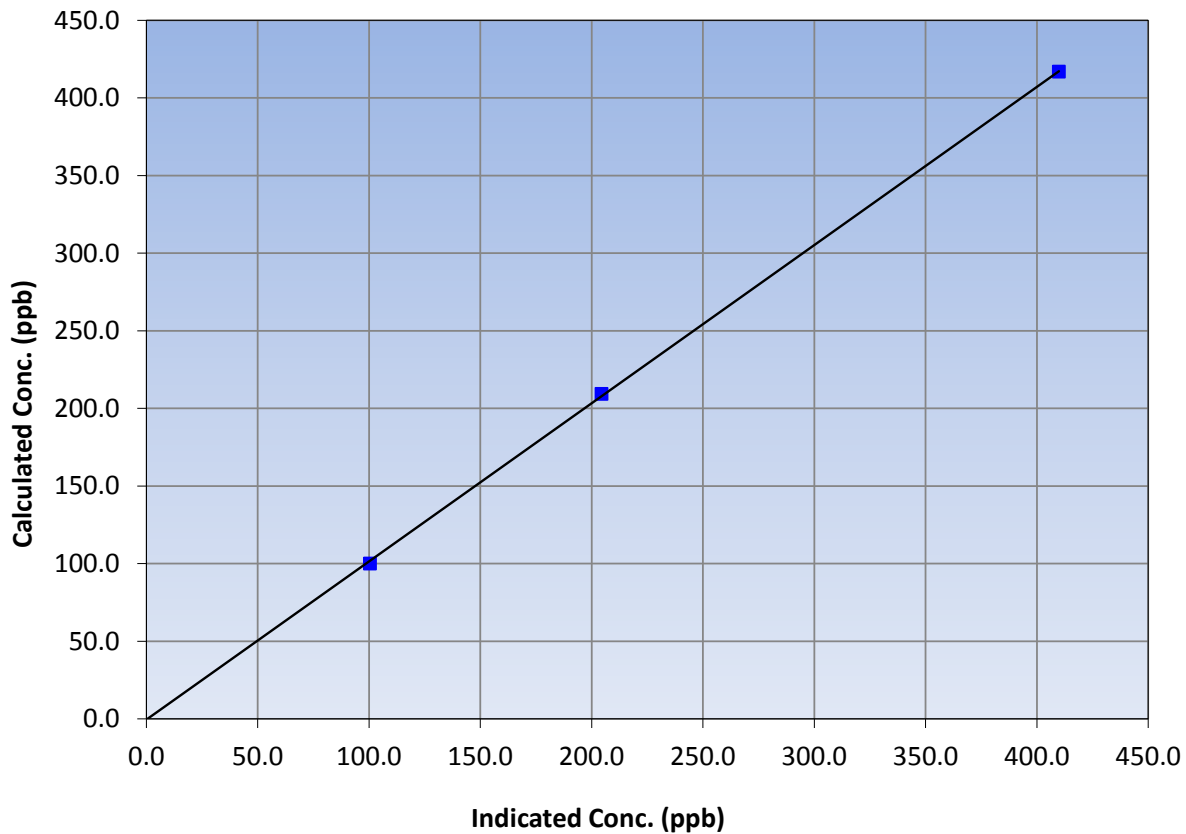
### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 7, 2017
Station Name	Conklin	Station Number	AMS 21
Start Time (MST)	11:16	End Time (MST)	15:27
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.1	----	Correlation Coefficient	≥0.995	
416.9	409.9	1.0171			
209.3	204.4	1.0240			
100.1	100.4	0.9970			
			Slope	1.018983	0.90 - 1.10
			Intercept	-0.466355	+/-20

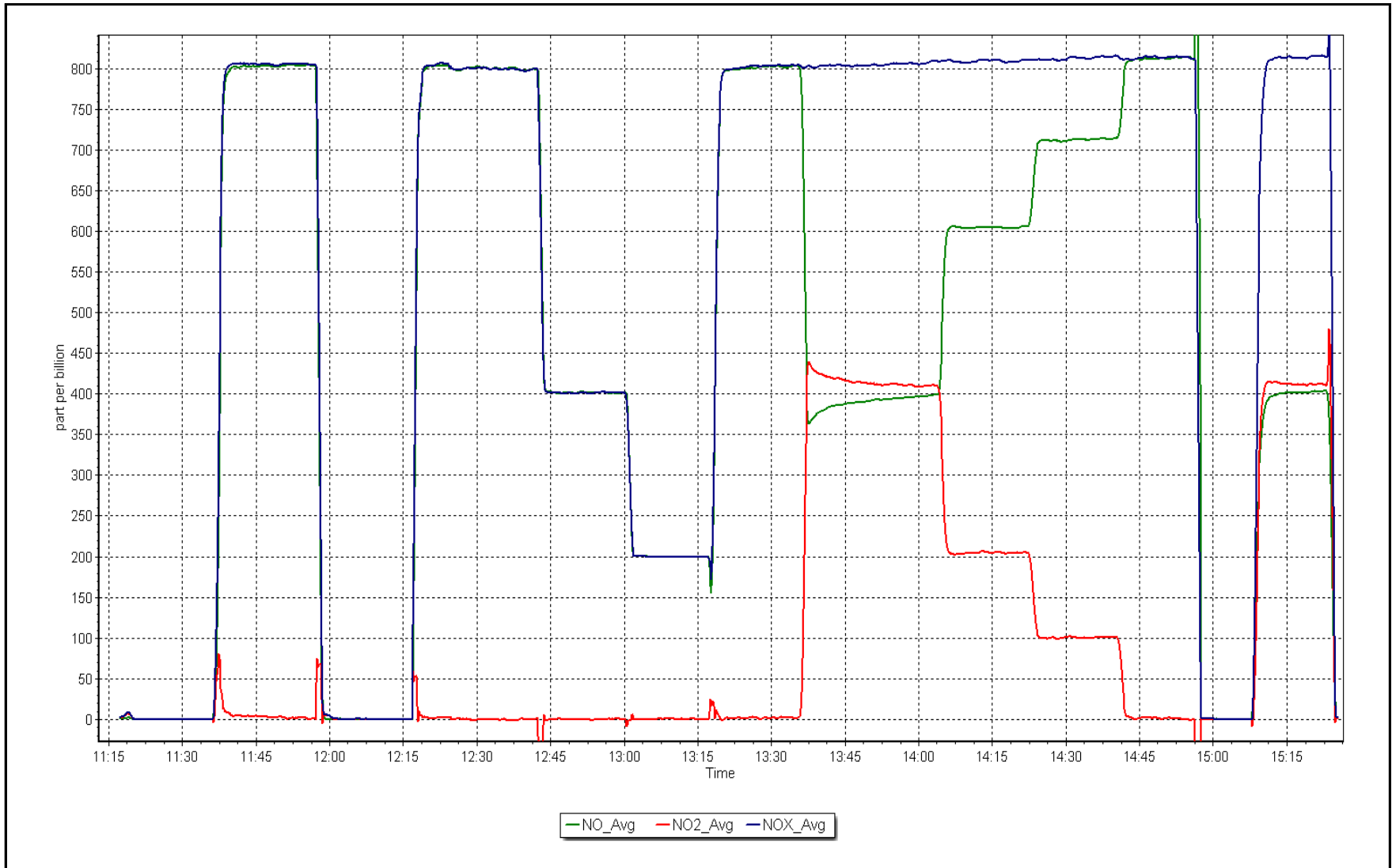
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 13, 2017

Location: Conklin







# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Conklin	Station number:	AMS 21
Calibration Date:	December 13, 2017	Last Cal Date:	November 7, 2017
Start time (MST):	12:50	End time (MST):	13:35
Sharp Model:	5030	S/N:	7494
Particulate Fraction:	PM2.5	C14 Source S/N:	CM-0404
Flow Meter Make/Model:	Delta Cal	S/N:	1019
Temp/RH standard:	Delta Cal	S/N:	1019

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	4	3	4	<input type="checkbox"/>	+/- 2 °C
P3 (hPa)	952	951	952	<input type="checkbox"/>	+/- 13 hPa
flow (LPH)	1000	1005	1000	<input type="checkbox"/>	+/- 50 LPH
Nephelometer zero	0.4	-----	0.4	<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"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test: Date of check: \_\_\_\_\_ Last Cal Date: October 18, 2017  
 Flow w/o adaptor: \_\_\_\_\_ Flow w/ adaptor: \_\_\_\_\_

**(Limit) 0.4 LPM**

<u>Adjusted</u>	<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
<input type="checkbox"/>	Foil S/N: _____	Foil S/N: <u>2598</u>	
Foil Calibration	Foil Mass: _____	Foil Mass: _____	
	Calibration Date: _____	Calibration Date: <u>October 18, 2017</u>	
<b>(Limit) +/- 5% of previous</b>	Correction Factor: _____	Correction Factor: _____	---

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
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%
Date Sample Tube Cleaned:		July 27, 2017			
Date Pump Rebuilt/Replaced:		June 16, 2016			

Notes: Cyclone head cleaned. No adjustments made.

Calibration by: Asad Hidayat



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 22  
JANVIER  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - JANVIER (AMS 22)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100	4	0	1	0
TRS(ppb) Average	709	35	35	100	0	0	0	0
THC(ppm) Average	704	36	40	99.46	2.1	-	2	-
NMHC(ppm) Average	704	36	40	99.46	0.096	-	0.005	-
CH4(ppm) Average	704	36	40	99.46	2.1	-	2	-
O3 (ppb) Average	709	35	35	100	49	0	46	-
NO2 (ppb) Average	708	36	36	100	22	0	9	-
NO (ppb) Average	708	36	36	100	12	-	4	-
NOX (ppb) Average	708	36	36	100	34	-	13	-
PM2.5 (ug/m3) Average	668	3	76	90.19	20.7	-	7.5	0
Wind Speed 10 m (km/h) Average	744	0	0	100	19	-	13	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100	8.3	-	4.9	-
Relative Humidity (%) Average	744	0	0	100	97	-	84.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - JANVIER (AMS 22)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.4	0	-	0	0	0	0	0	1	4
TRS (ppb) Average	709	0.2	0	-	0	0	0	0	0	0	0
THC (ppm) Average	704	1.91	0	-	1.8	1.9	1.9	1.9	1.9	2	2.1
NMHC(ppm) Average	704	0	0.004	-	0	0	0	0	0	0	0.096
CH4(ppm) Average	704	1.91	0	-	1.8	1.9	1.9	1.9	1.9	2	2.1
O3 (ppb) Average	709	34.1	6	-	19	27	30	34	38	42	49
NO2 (ppb) Average	708	2	2	-	0	0	1	1	3	4	22
NO (ppb) Average	708	1	1	-	0	0	0	1	1	2	12
NOX (ppb) Average	708	3	3	-	0	1	1	2	3	7	34
PM2.5 (ug/m3) Average	668	3.52	2.6	-	0	0.9	1.7	2.8	4.7	6.9	20.7
Wind Speed 10 m (km/h) Average	744	7.1	3	-	0	3	5	7	9	11	19
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-10.91	12.1	-	-35.9	-29.3	-23.3	-7.1	-0.4	2.2	8.3
Relative Humidity (%) Average	744	73.8	10	-	38	61	69	74	80	87	97

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - JANVIER (AMS 22)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	04 Dec 2017 14:00	04 Dec 2017 15:00	2	Maintenance - replaced hydrogen generator
NMHC, CH4, THC	10 Dec 2017 14:00	10 Dec 2017 15:00	2	Maintenance - replaced carrier gas
PM2.5	04 Dec 2017 14:00	04 Dec 2017 15:00	2	Maintenance - Station operator on site
PM2.5	17 Dec 2017 17:00	19 Dec 2017 13:00	45	Analyzer failure - Flat line in sensor output signal
PM2.5	20 Dec 2017 18:00	20 Dec 2017 19:00	2	Unstable operation - excessive baseline drift
PM2.5	21 Dec 2017 13:00	22 Dec 2017 07:00	19	Unstable operation - excessive baseline drift
PM2.5	22 Dec 2017 11:00	22 Dec 2017 15:00	5	Unstable operation - excessive baseline drift



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

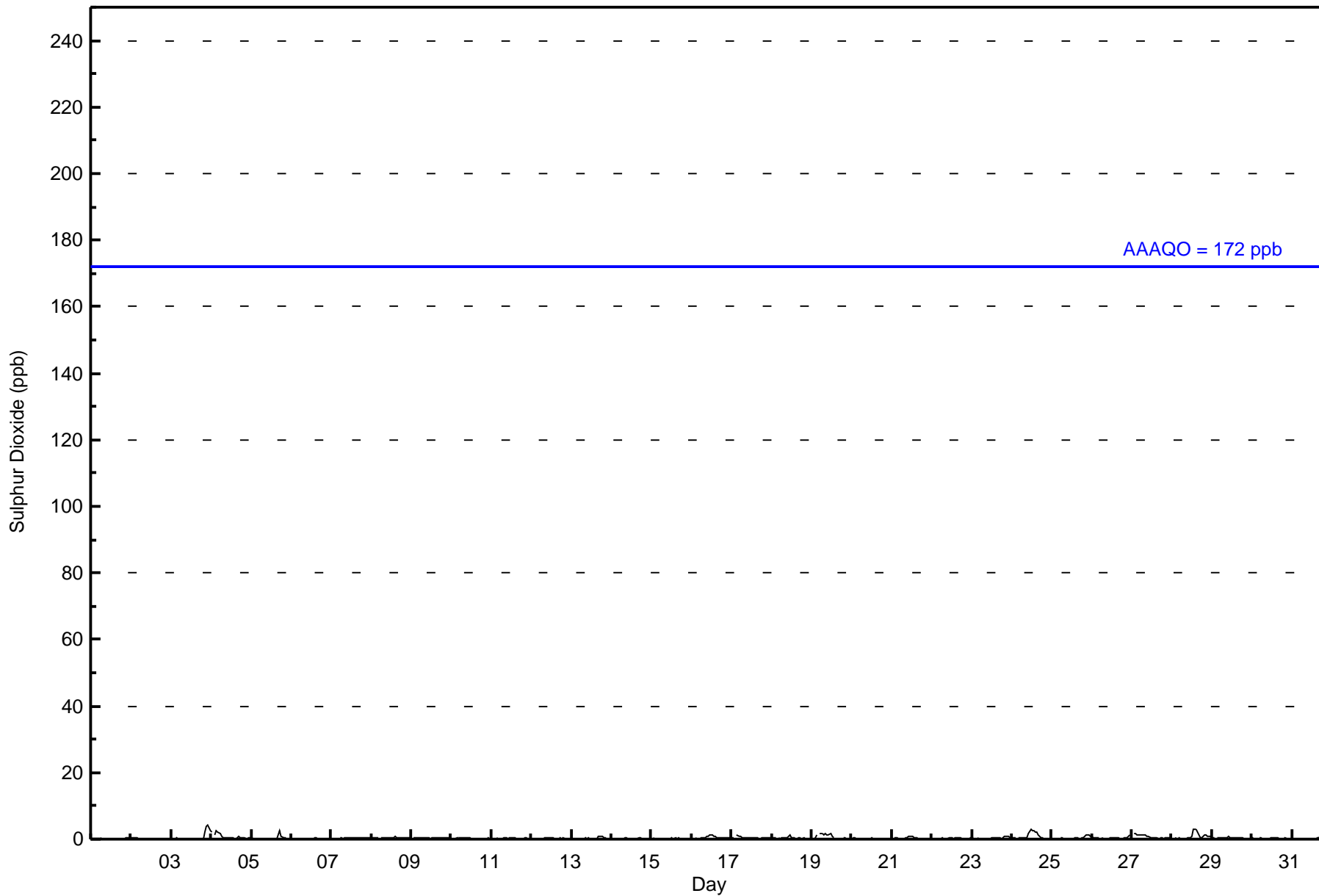
Janvier - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																						
Maximum Value: 4 ppb on Dec 3 23:00										Maximum Daily Average: 0.9 ppb on Dec 24										Hours of Data: 708																												
Minimum Value: 0 ppb on Dec 6 10:00										Minimum Daily Average: 0.1 ppb on Dec 20										Hours of Missing Data: 36																												
Maximum Diurnal Average: 0.5 ppb at hour 12										Minimum Diurnal Average: 0.3 ppb at hour 8										Hours of Calibration: 36																												
Monthly Average: 0.4 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 3										Percent Operational Time: 100.0																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	3	0.7	4																						
4-Dec	2	Z	1	3	2	2	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0.7	3																						
5-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0.3	2																						
6-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0.3	1																						
8-Dec	0	1	0	0	0	Z	1	0	1	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0.5	1																						
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
11-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.3	1																						
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
15-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
16-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1																						
17-Dec	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
18-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
19-Dec	0	0	0	1	Z	2	2	1	2	1	1	2	1	0	C	C	C	C	C	0	0	0	0	0	0.8	2																						
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
21-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1																						
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.3	1																						
24-Dec	0	1	0	Z	0	0	0	0	0	1	2	3	3	3	2	2	1	1	0	0	0	0	0	0	0.9	3																						
25-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1																						
26-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
27-Dec	Z	2	2	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.7	2																						
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	3	3	2	1	1	0	1	1	1	1	1	0.8	3																						
29-Dec	1	1	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0.3	1																						
																								0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	Diurnal Average
																								2	2	2	3	2	2	2	1	2	1	2	3	3	3	3	2	1	2	1	1	2	4	4	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 (SO<sub>2</sub>) - ppb  
Janvier - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Janvier - December 2017**

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

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 10	12	40	15	5	2	3	7	24	107	238	54	56	81	48	12	4	708
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
<b>Totals</b>	12	40	15	5	2	3	7	24	107	238	54	56	81	48	12	4	708

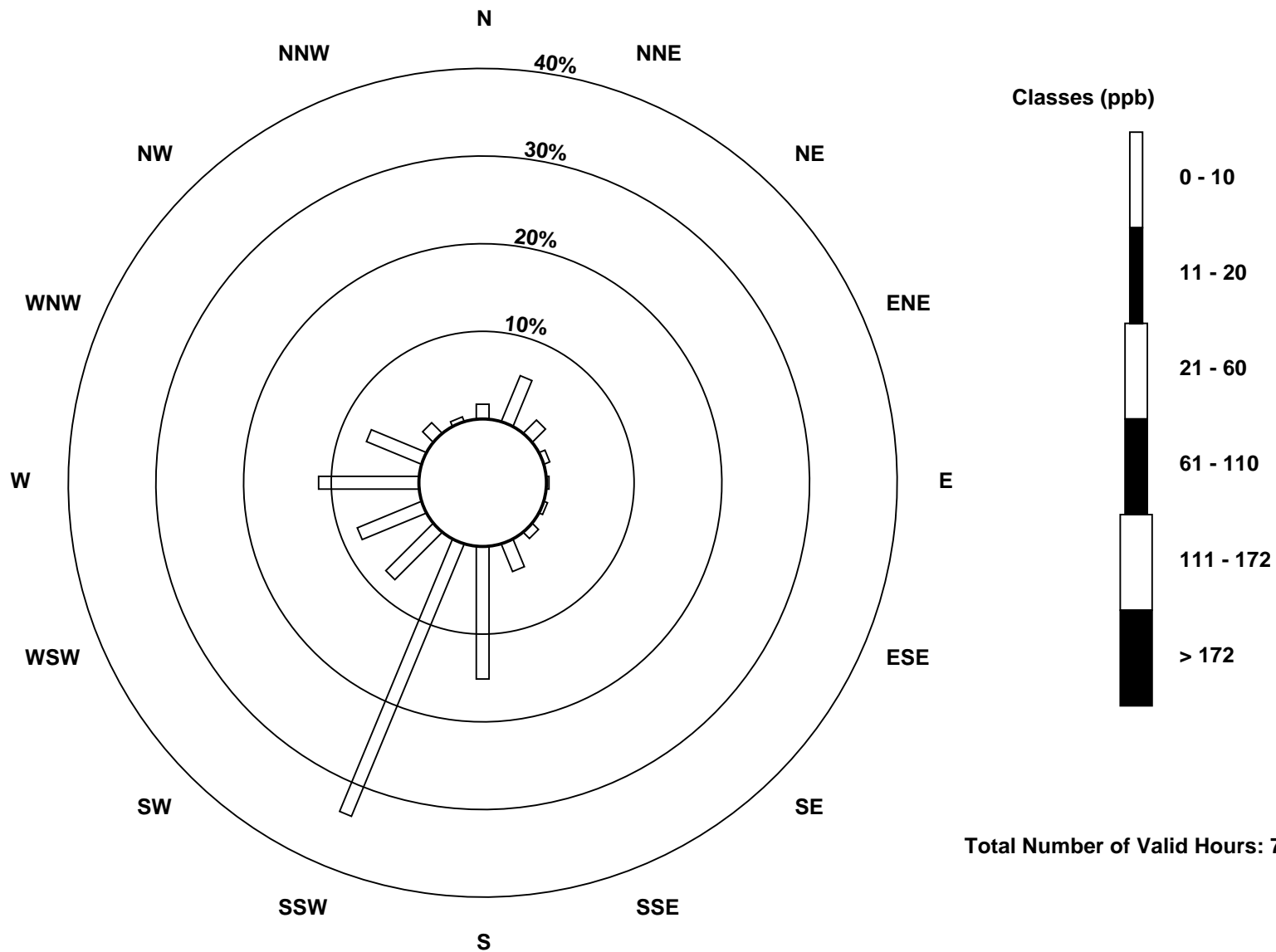
Total Number of Valid Hours: 708

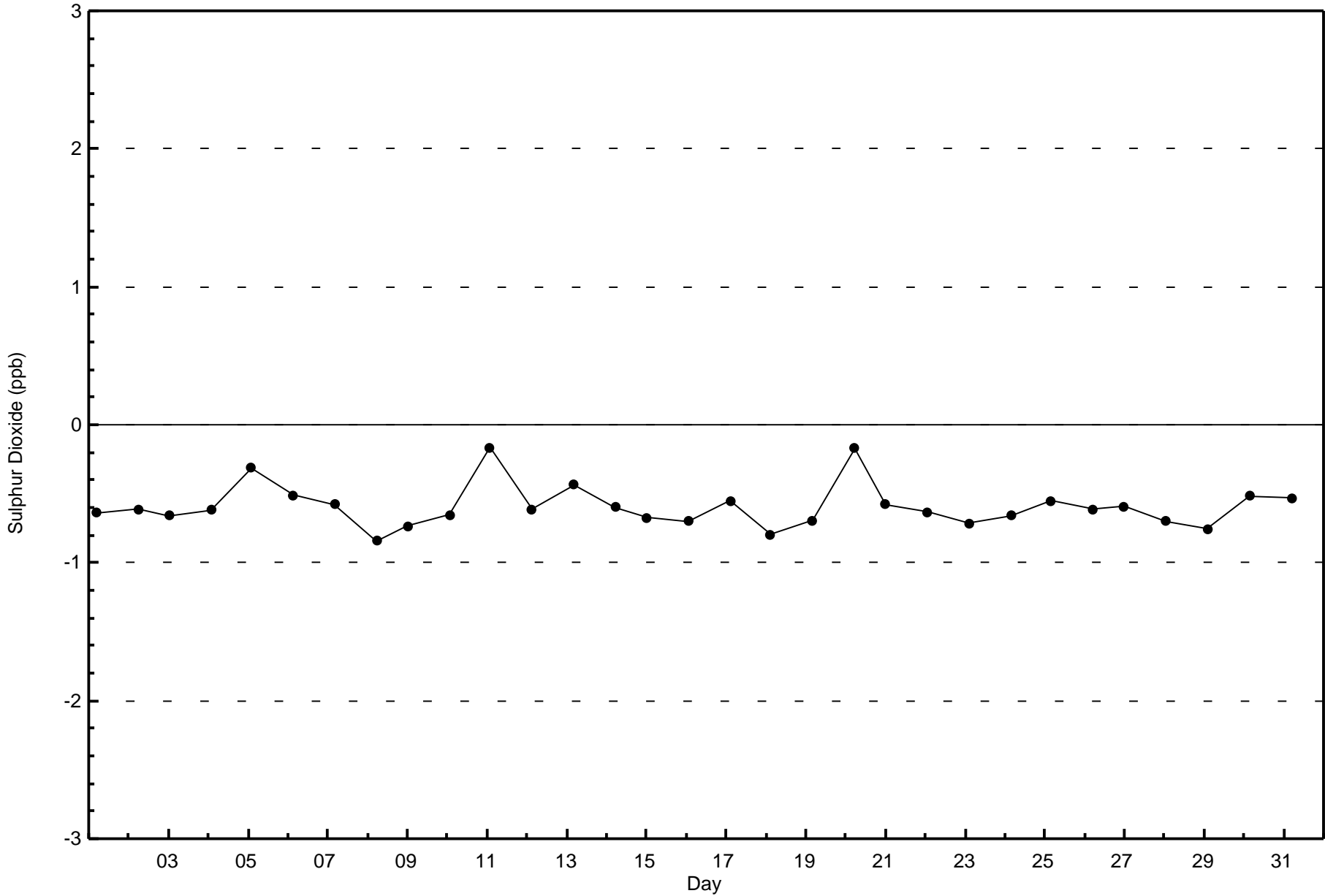
Total Number of Hours: 744

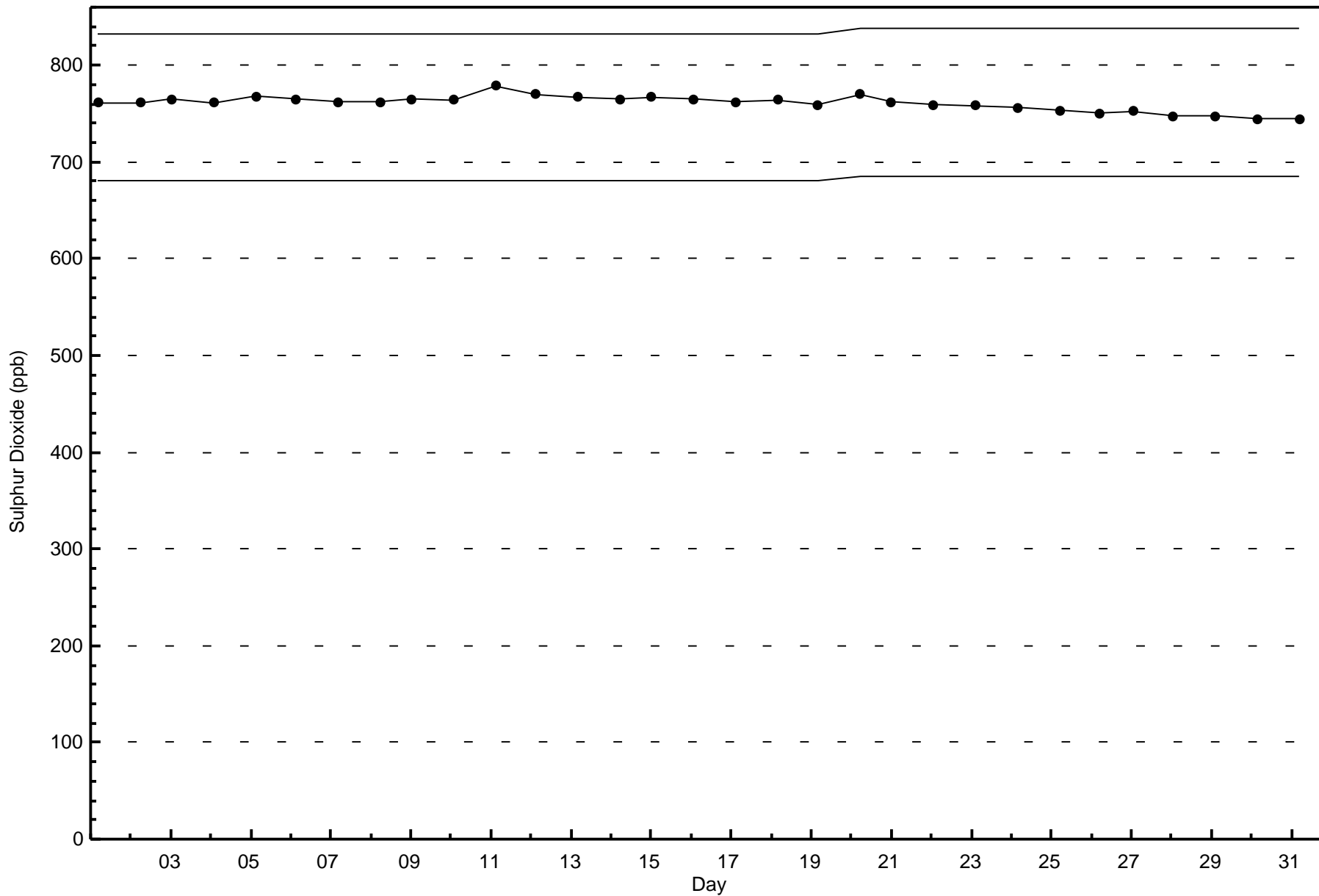


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Janvier (AMS 22)









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

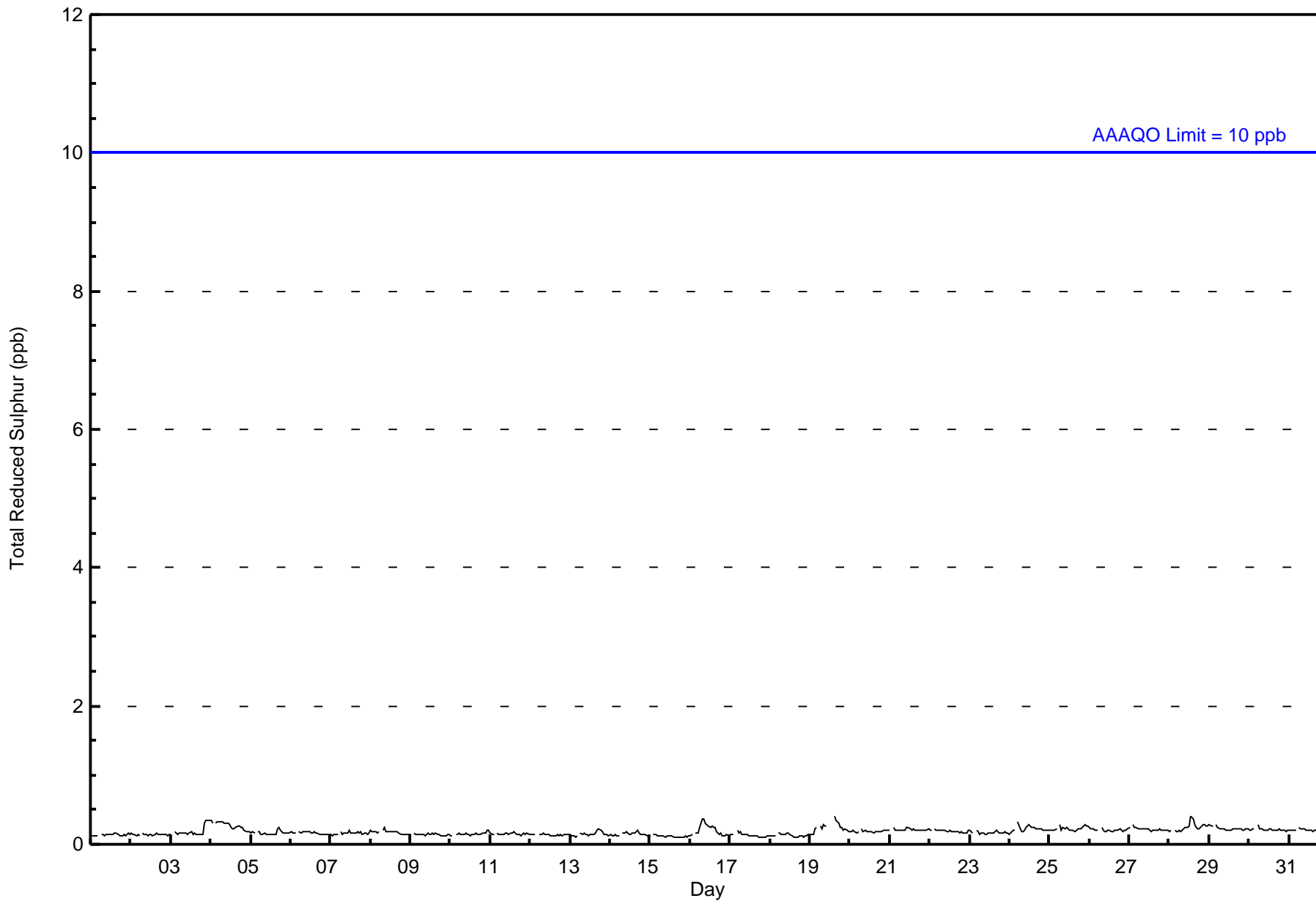
Janvier - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 0 ppb on Dec 19 16:00										Maximum Daily Average: 0.3 ppb on Dec 4										Hours of Data: 709							
Minimum Value: 0 ppb on Dec 15 17:00										Minimum Daily Average: 0.1 ppb on Dec 15										Hours of Missing Data: 35							
Maximum Diurnal Average: 0.2 ppb at hour 7										Minimum Diurnal Average: 0.2 ppb at hour 20										Hours of Calibration: 35							
Monthly Average: 0.2 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0										Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	0	0	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-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	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
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
0.2																								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**  
**Janvier - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Janvier - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	12	40	15	5	2	2	8	27	113	232	51	56	82	48	12	4	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	40	15	5	2	2	8	27	113	232	51	56	82	48	12	4	709

Total Number of Valid Hours: 709

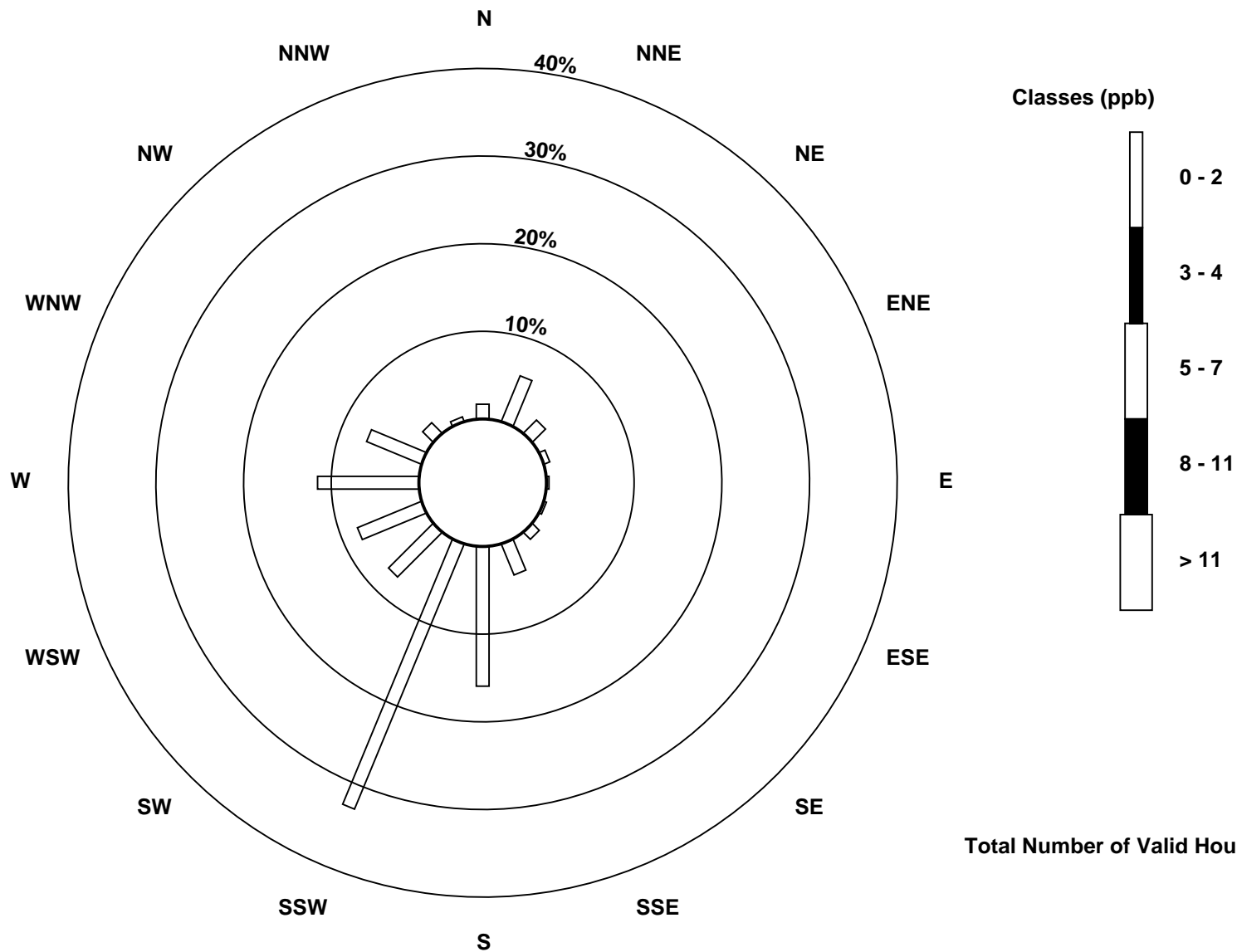
Total Number of Hours: 744



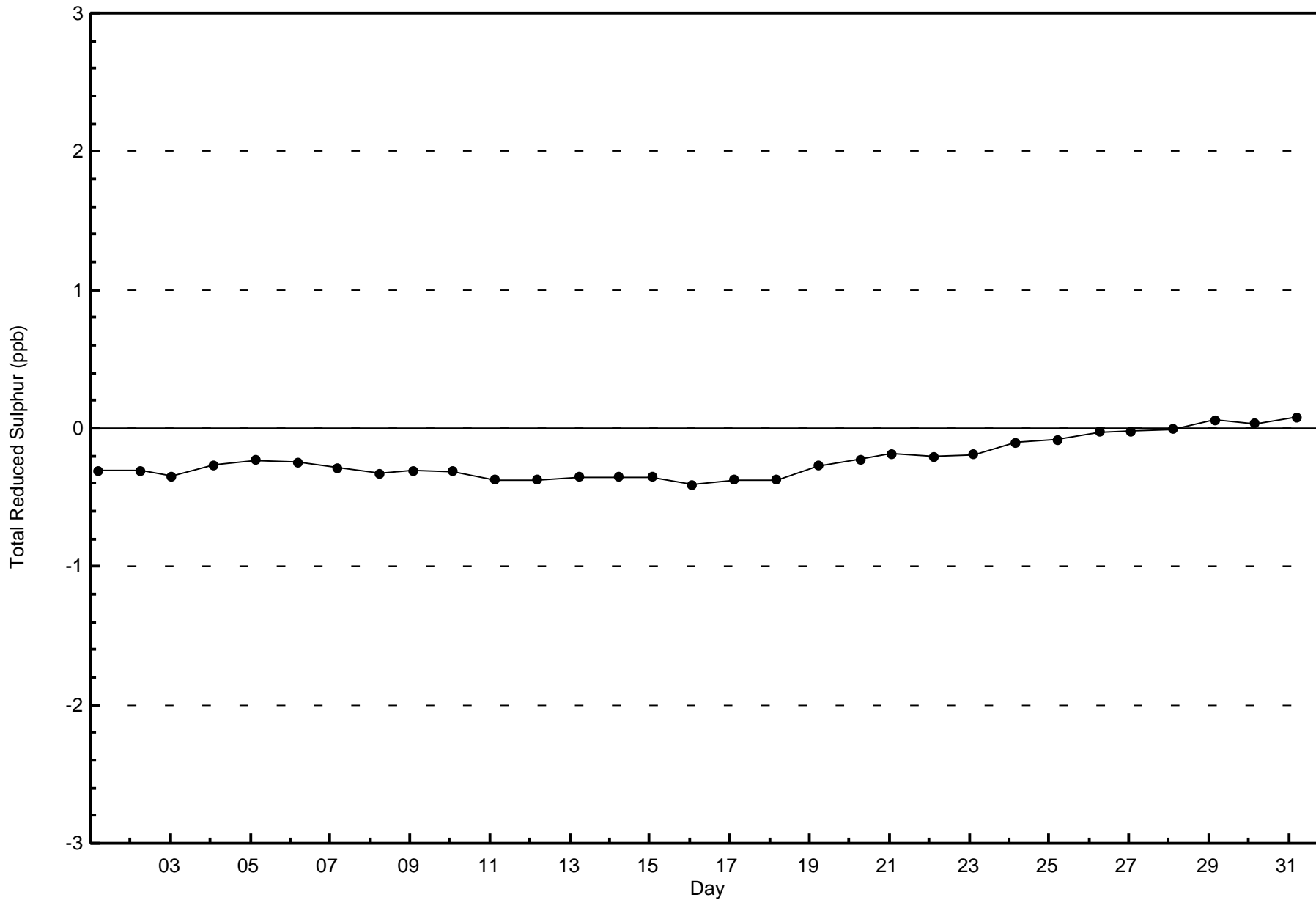


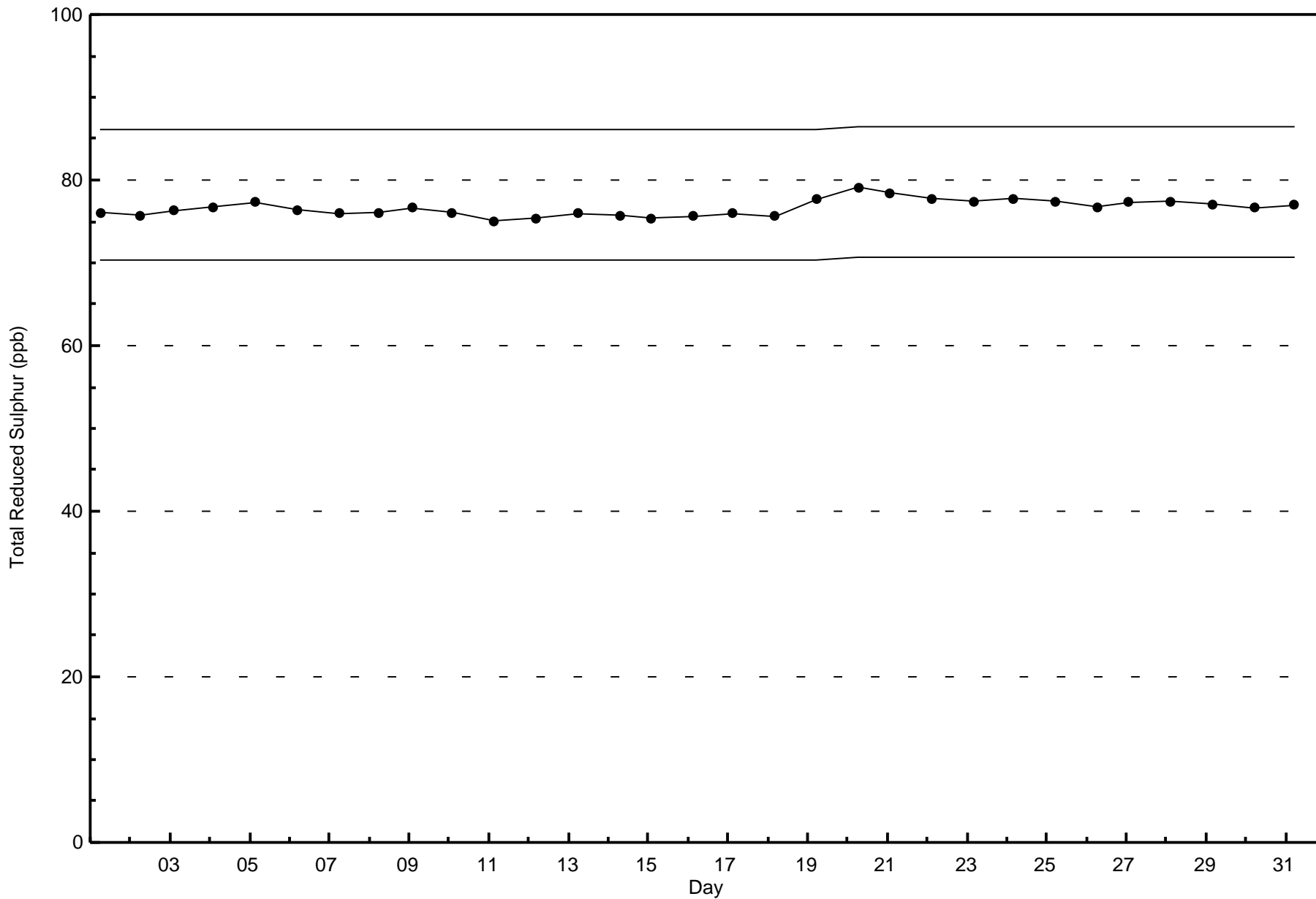
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Reduced Sulphur (TRS) - ppb  
Janvier (AMS 22)



Total Number of Valid Hours: 709





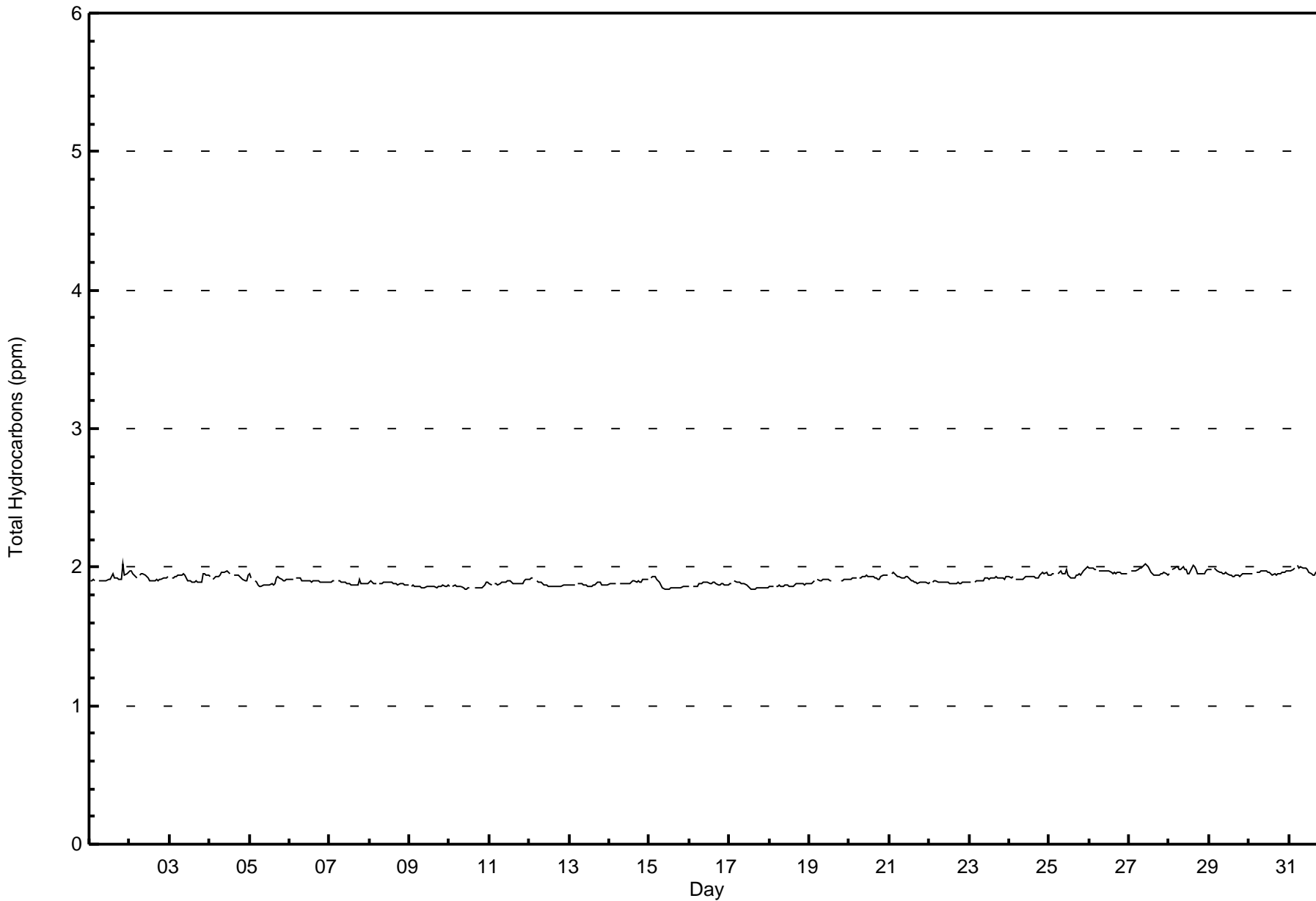


Maximum Value: 2.1 ppm on Jan 1 00:00      Maximum Daily Average: 2.0 ppm on Dec 31																				Hours in Service:	744					
Minimum Value: 1.8 ppm on Dec 10 10:00      Minimum Daily Average: 1.9 ppm on Dec 10																				Hours of Data:	704					
Maximum Diurnal Average: 1.9 ppm at hour 24      Minimum Diurnal Average: 1.9 ppm at hour 16																				Hours of Missing Data:	40					
Monthly Average: 1.91 ppm      Percentiles: P <sub>1</sub> = 1.8 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 1.9 Q <sub>3</sub> = 1.9 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.0																				Hours of Calibration:	36					
																				Percent Operational Time:	99.5					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	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	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	1.9	2.0
2-Dec	2.0	2.0	2.0	1.9	1.9	Z	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
3-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9
4-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	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
5-Dec	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
6-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
7-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
8-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
9-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
10-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	M	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
11-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
12-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
13-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
14-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
15-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
16-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
17-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.8	1.9	1.9	1.9	1.9	1.9
18-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
19-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9
20-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
21-Dec	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	2.0
22-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
23-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
24-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0
25-Dec	1.9	1.9	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
26-Dec	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
27-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0
28-Dec	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
29-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0
30-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0
31-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1
																								Diurnal Average	1.9	
																								Diurnal Maximum	2.1	
Z - zerospan      C - Calibration      M - Maintenance																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Janvier - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Janvier - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	700	99.43	99.43
2.1 - 3.0	4	0.57	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Janvier - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	12	40	15	5	2	3	7	24	105	234	54	56	80	47	12	4	700
2.1 - 3.0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	4
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
<b>Totals</b>	12	40	15	5	2	3	7	24	106	237	54	56	80	47	12	4	704

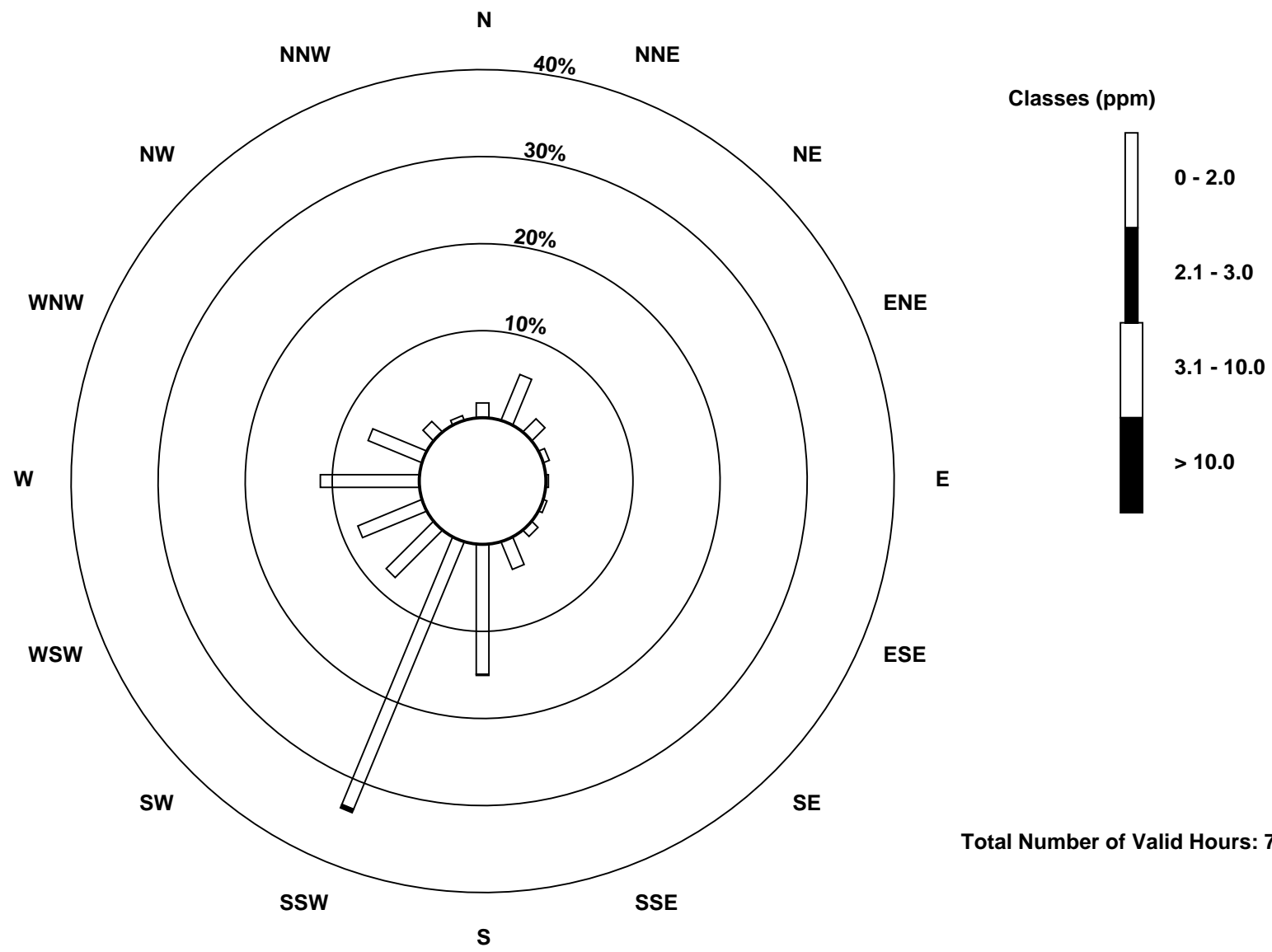
Total Number of Valid Hours: 704

Total Number of Hours: 744

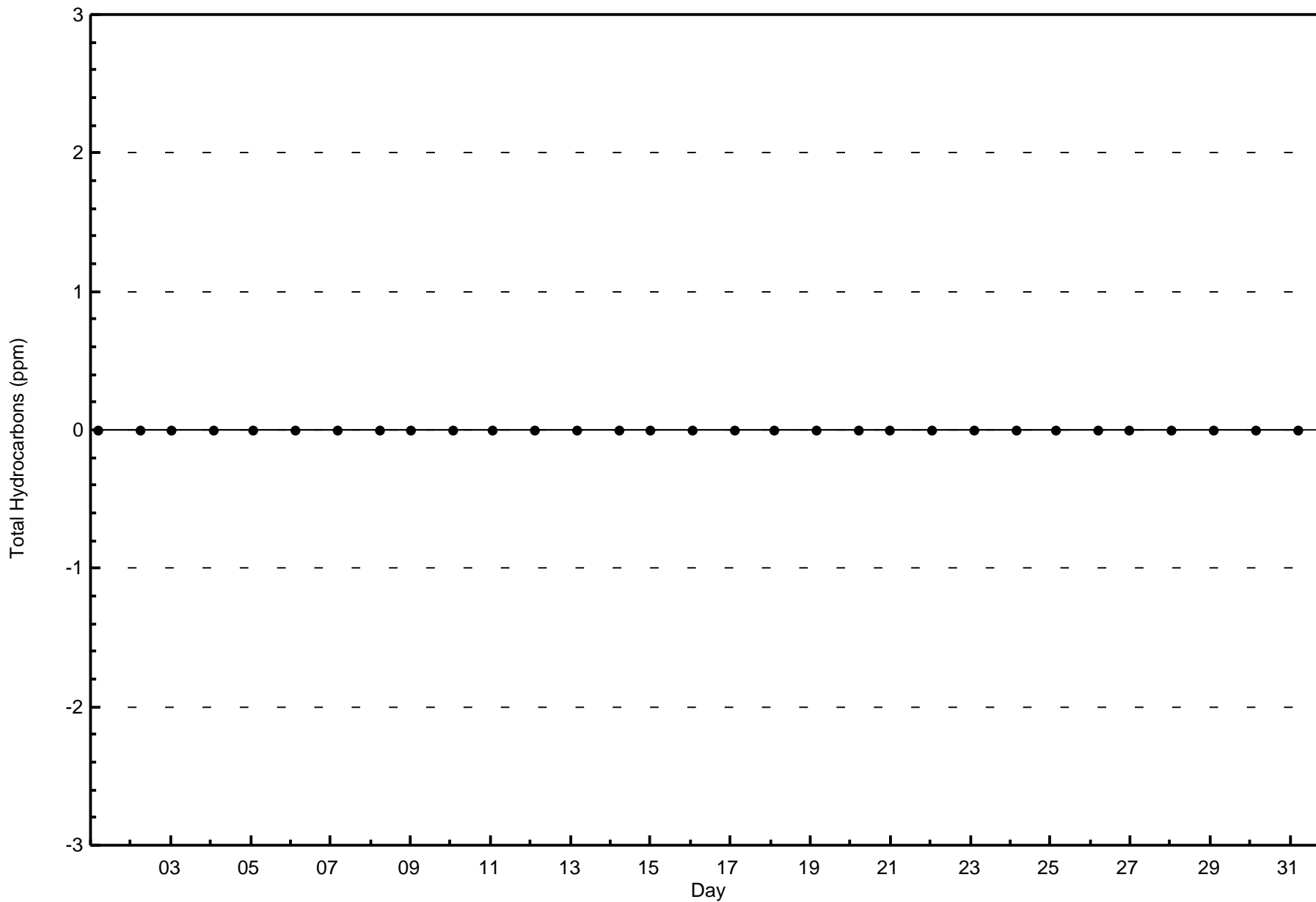


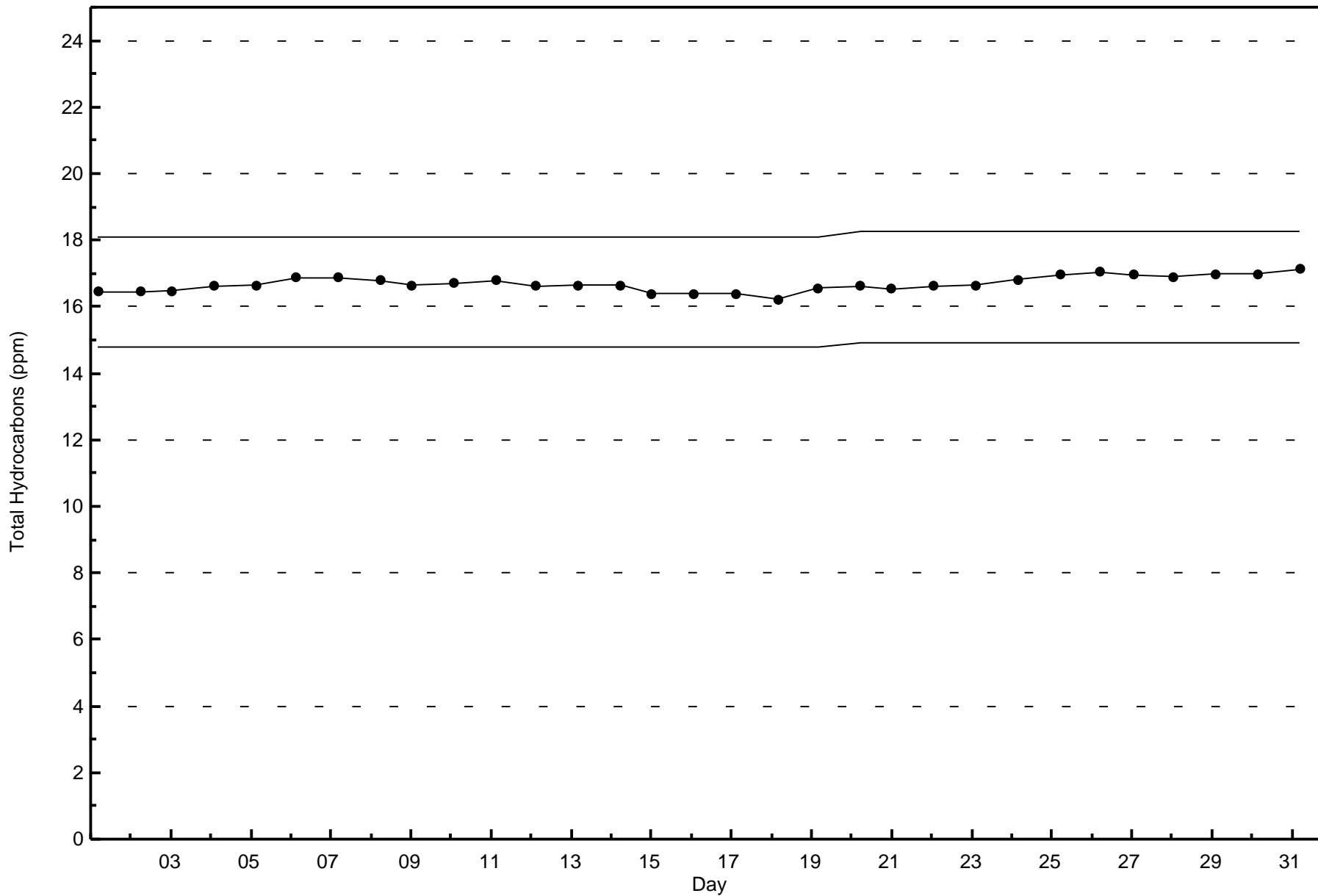
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Janvier (AMS 22)







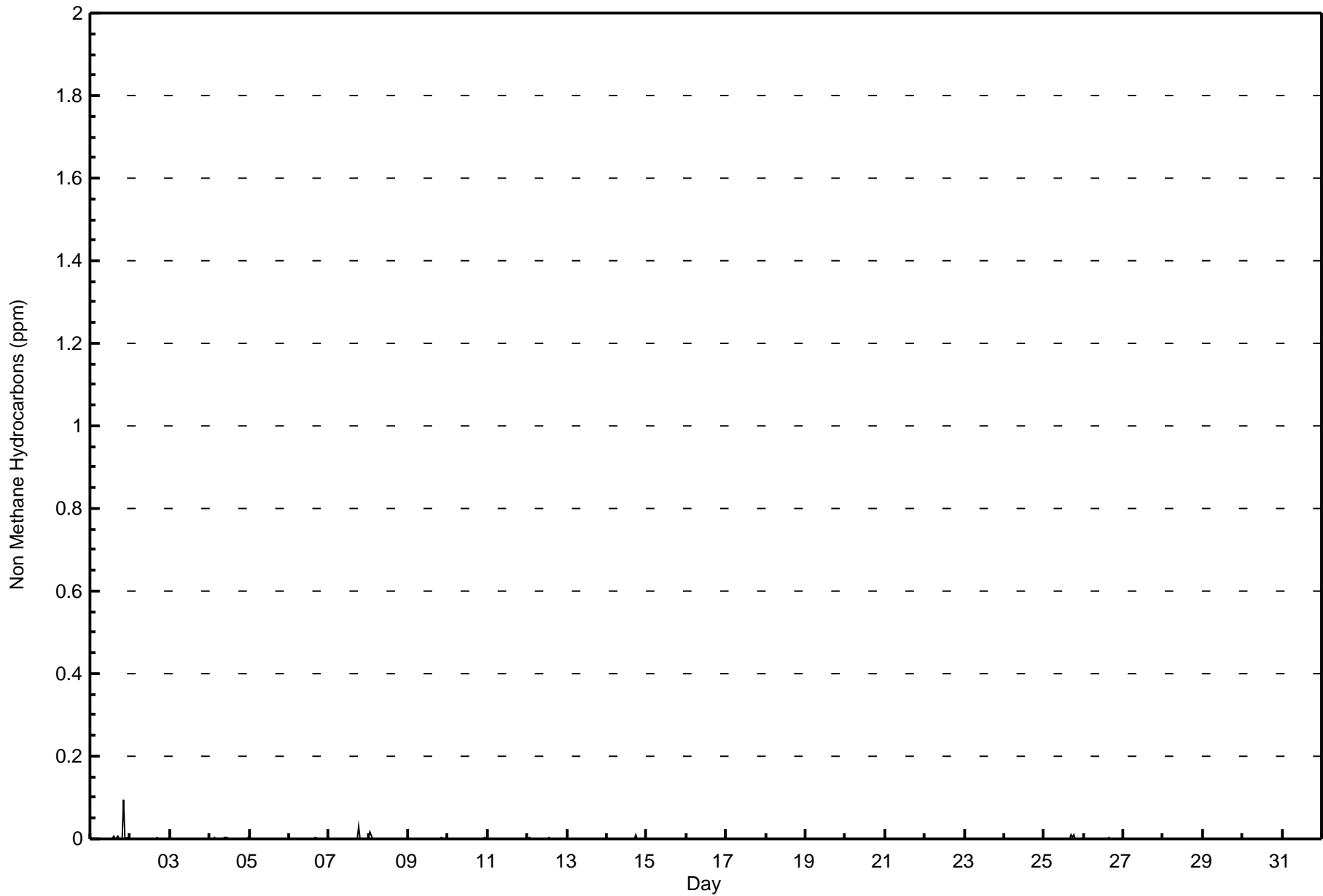




Summary of Hour Averages

Janvier - December 2017

Maximum Value: 0.096 ppm on Dec 1 21:00		Maximum Daily Average: 0.005 ppm on Dec 1		Hours in Service: 744																						
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 5		Hours of Data: 704																						
Maximum Diurnal Average: 0.003 ppm at hour 21		Minimum Diurnal Average: 0.000 ppm at hour 6		Hours of Missing Data: 40																						
Monthly Average: 0.000 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0		Hours of Calibration: 36																						
				Percent Operational Time: 99.5																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.000	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	0.006	0.000	0.008	0.000	0.000	0.000	0.096	0.000	0.003	0.000	0.005	0.096
2-Dec	0.000	0.000	0.002	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
3-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4-Dec	0.000	Z	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.000	0.000	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.001	0.005
5-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
7-Dec	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	0.000	0.000	0.000	0.000	0.000	0.032	0.000	0.000	0.000	0.000	0.000	0.001	0.032
8-Dec	0.002	0.018	0.001	0.000	0.000	Z	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.018
9-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.005
10-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	M	M	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.002
11-Dec	0.000	0.000	Z	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	0.001
12-Dec	0.000	0.002	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
13-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
15-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16-Dec	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	0.001
17-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
22-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001
25-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.004	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010
26-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.005	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.005
27-Dec	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	0.001
28-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29-Dec	0.000	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	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
30-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001
31-Dec	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan                      C - Calibration                      M - Maintenance																										





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Janvier - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	696	98.86	98.86
0.006 - 0.05	7	0.99	99.86
0.06 - 0.1	1	0.14	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Janvier - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	12	39	15	5	2	3	6	23	104	235	53	56	80	47	12	4	696
0.006 - 0.05	0	1	0	0	0	0	1	1	1	2	1	0	0	0	0	0	7
0.06 - 0.1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	40	15	5	2	3	7	24	106	237	54	56	80	47	12	4	704

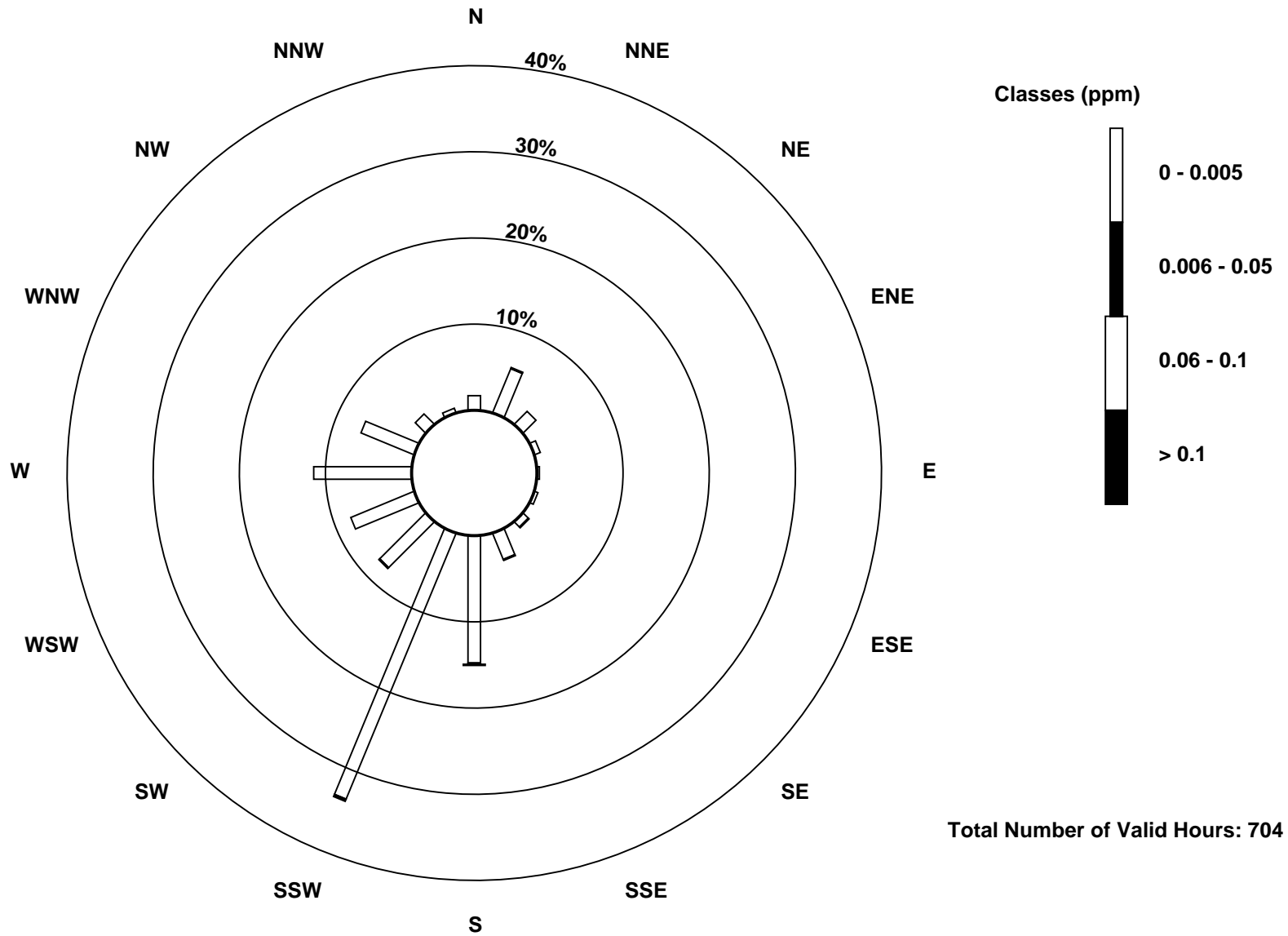
Total Number of Valid Hours: 704

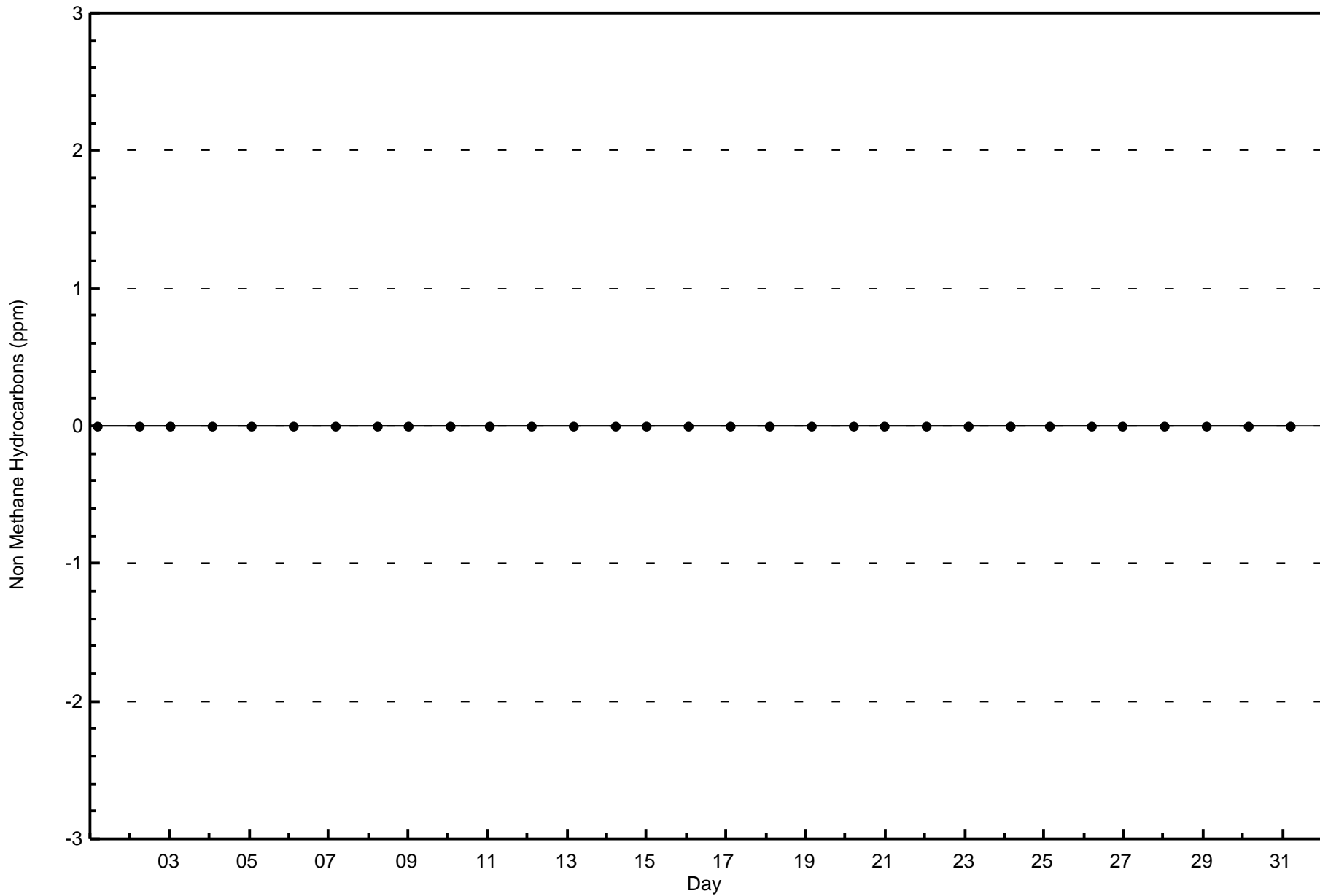
Total Number of Hours: 744



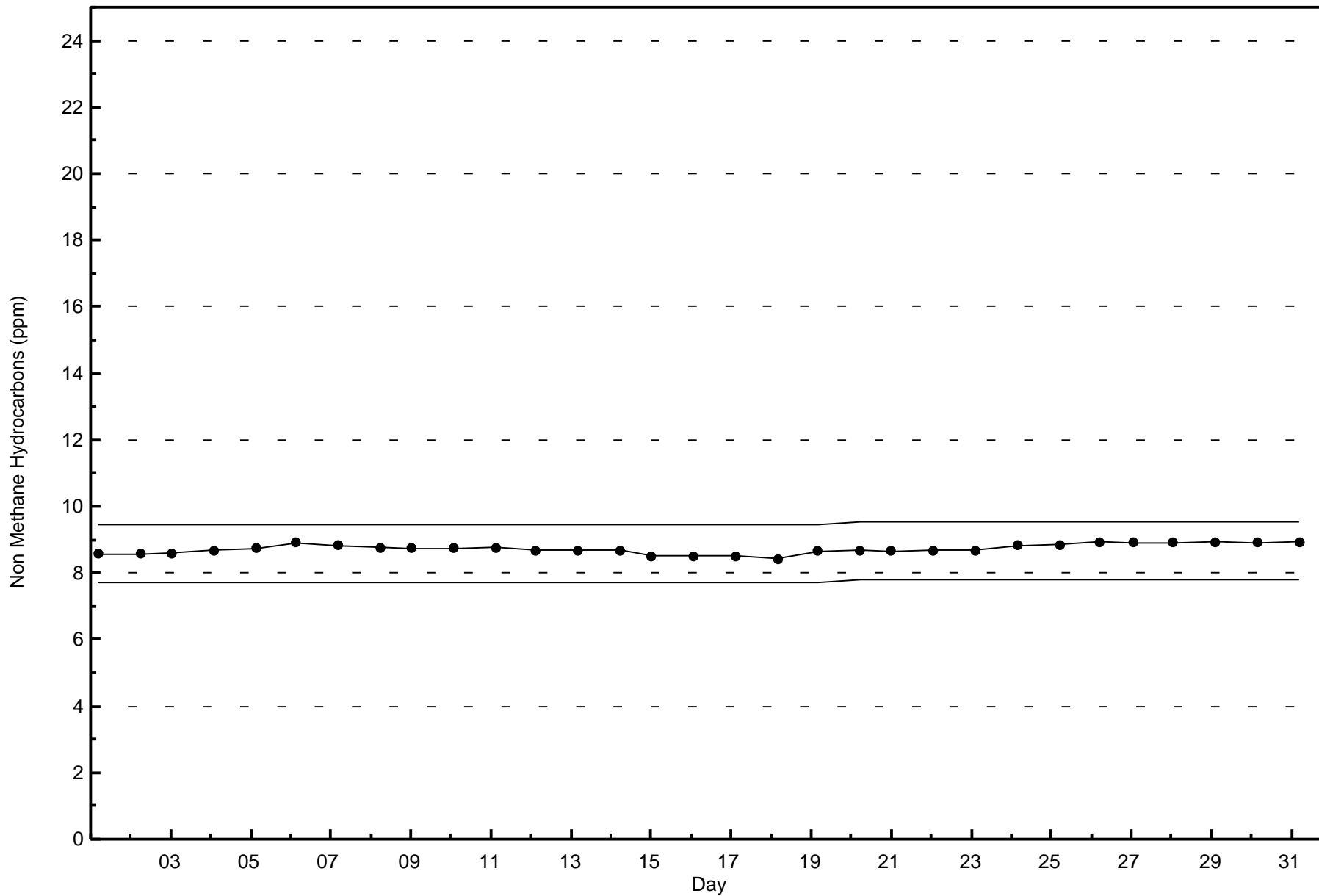
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Non Methane Hydrocarbons (NMHC) - ppm  
Janvier (AMS 22)











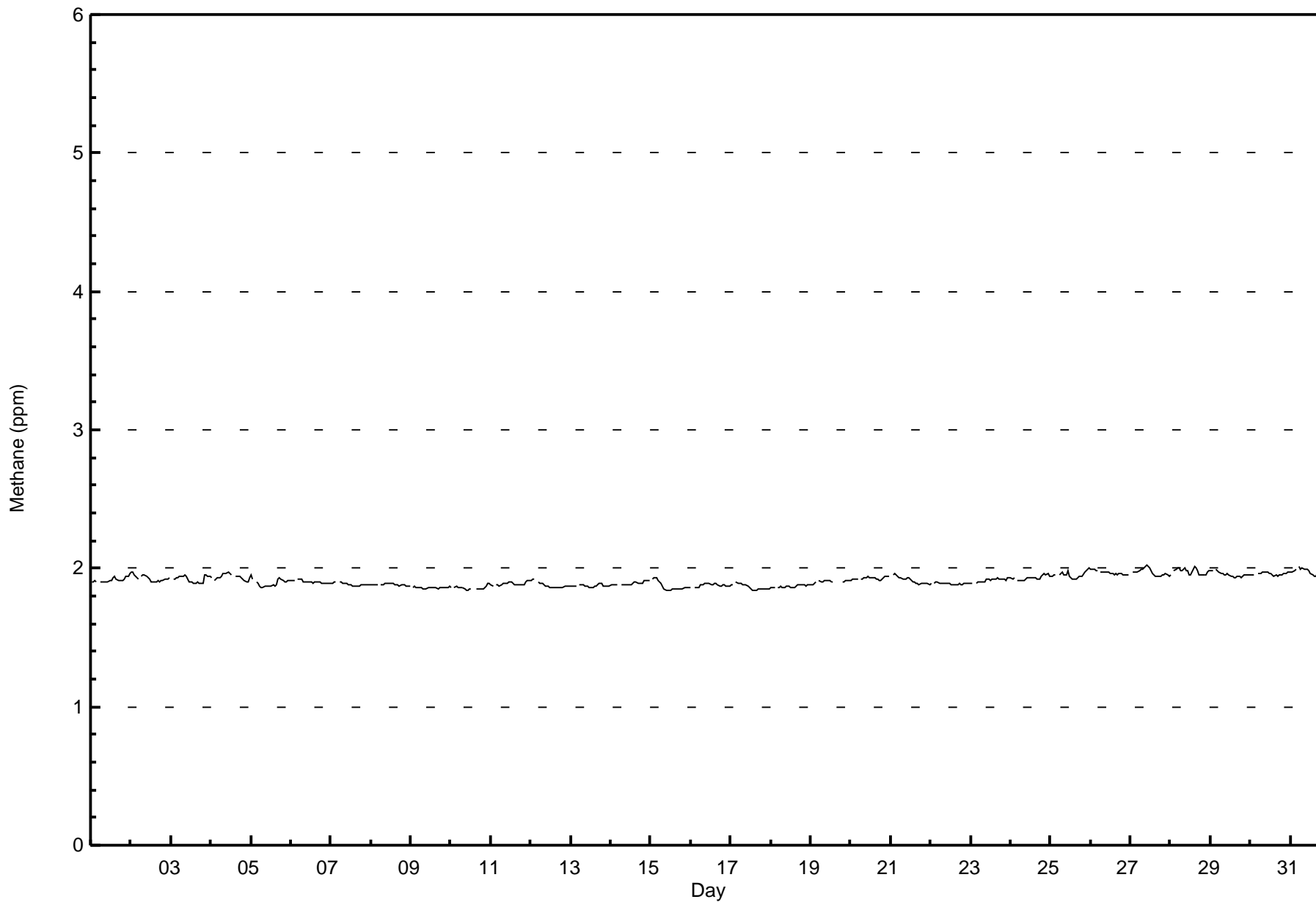
# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Methane (CH<sub>4</sub>) - ppm

## Janvier - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 2.1 ppm on Jan 1 00:00										Maximum Daily Average: 2.0 ppm on Dec 31										Hours of Data: 704							
Minimum Value: 1.8 ppm on Dec 10 10:00										Minimum Daily Average: 1.9 ppm on Dec 10										Hours of Missing Data: 40							
Maximum Diurnal Average: 1.9 ppm at hour 24										Minimum Diurnal Average: 1.9 ppm at hour 16										Hours of Calibration: 36							
Monthly Average: 1.91 ppm										Percentiles: P <sub>1</sub> = 1.8 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 1.9 Q <sub>3</sub> = 1.9 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.0										Percent Operational Time: 99.5							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	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	2.0	1.9	2.0	
2-Dec	2.0	2.0	2.0	1.9	1.9	Z	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	2.0
3-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.0	
4-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	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	
5-Dec	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
6-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
7-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
8-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
9-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
10-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	M	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
11-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
12-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
13-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
14-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
15-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
16-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
17-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.8	1.9	1.9	1.9	1.9	1.9	
18-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
19-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
20-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
21-Dec	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	2.0	
22-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
23-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
24-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0	
25-Dec	1.9	1.9	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
26-Dec	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	
27-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	
28-Dec	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
29-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	
30-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	
31-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan      C - Calibration      M - Maintenance																											





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Janvier - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	700	99.43	99.43
2.1 - 3.0	4	0.57	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Janvier - December 2017**

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	12	40	15	5	2	3	7	24	105	234	54	56	80	47	12	4	700
2.1 - 3.0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	4
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
<b>Totals</b>	12	40	15	5	2	3	7	24	106	237	54	56	80	47	12	4	704

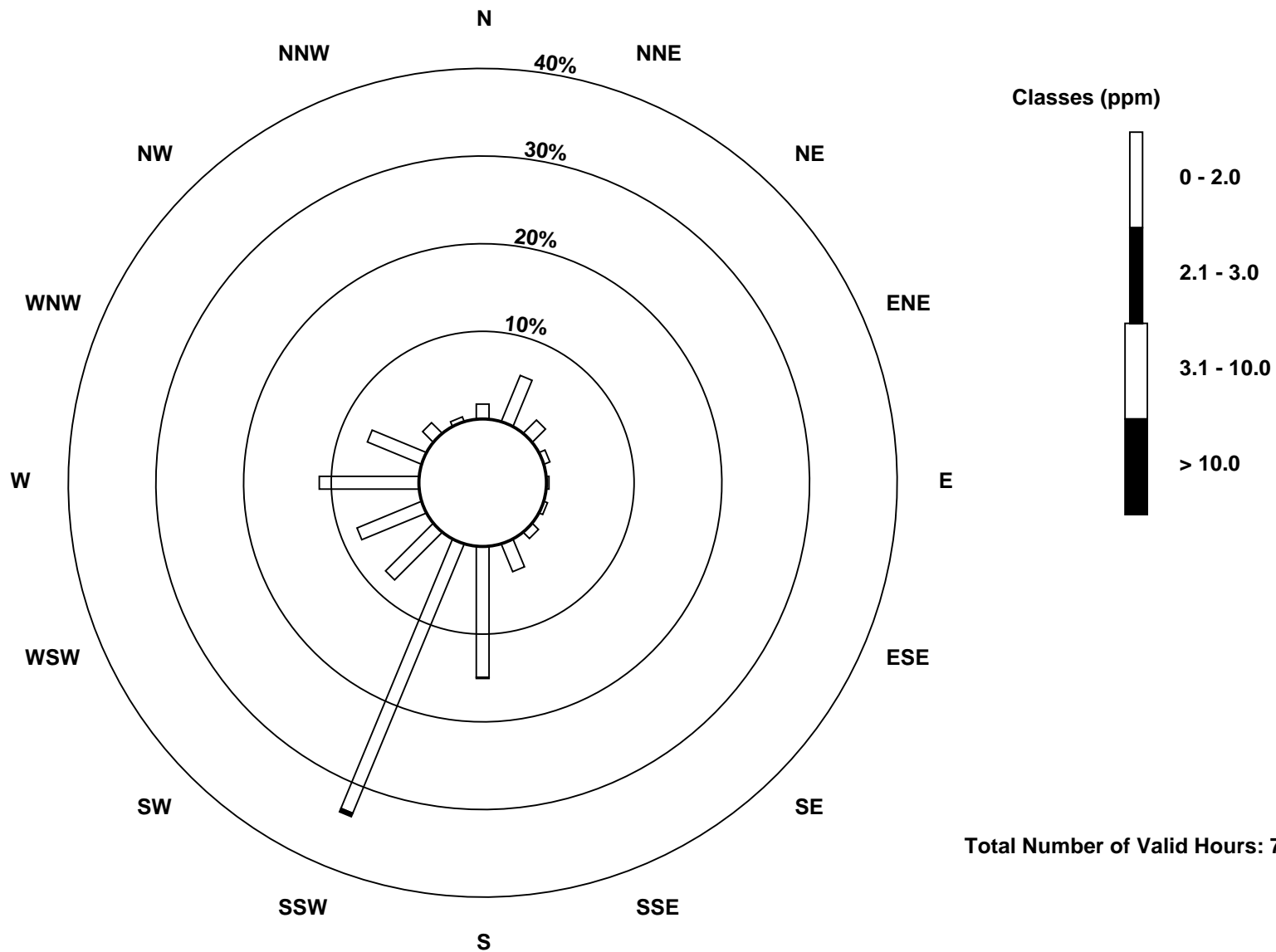
Total Number of Valid Hours: 704

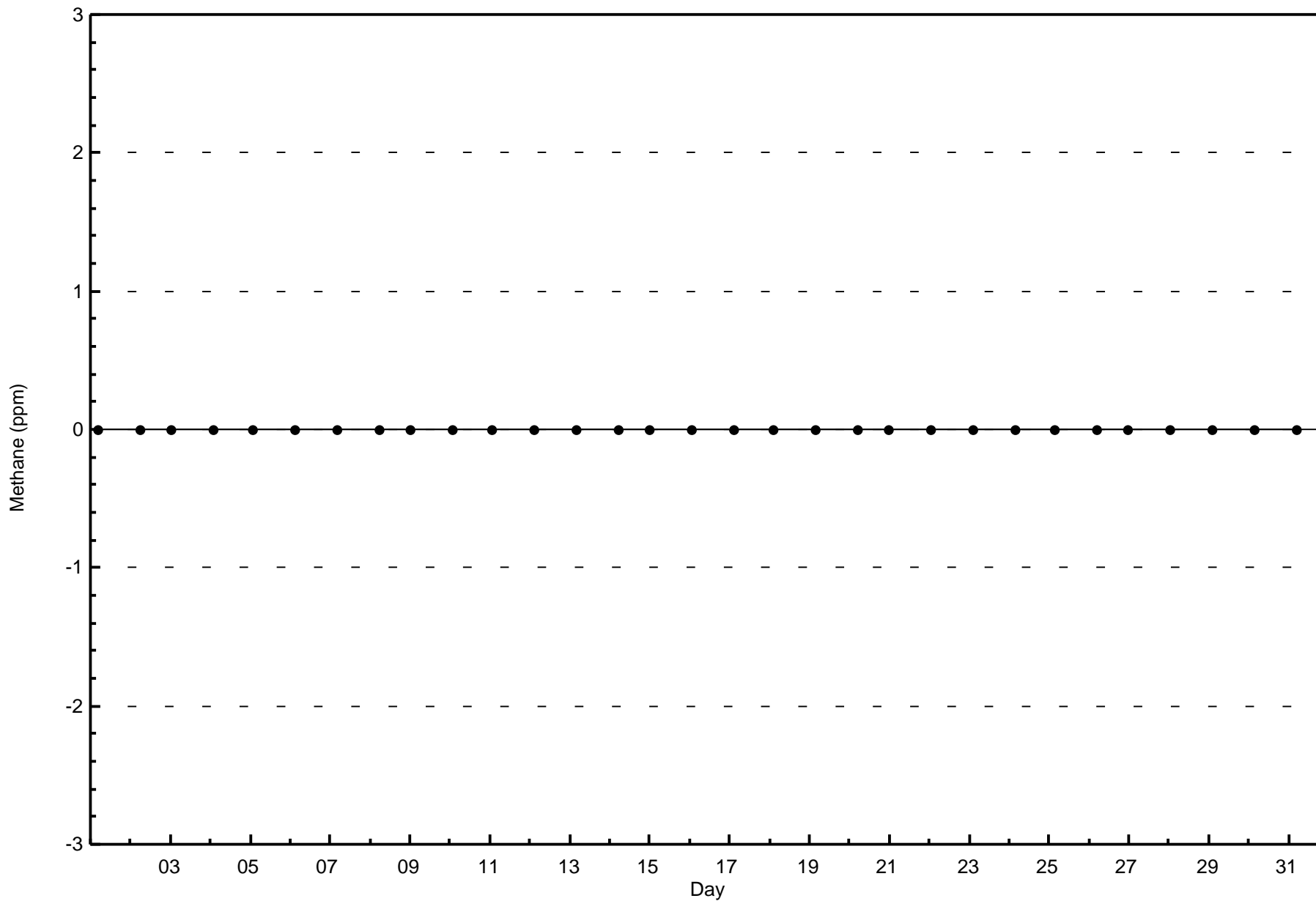
Total Number of Hours: 744

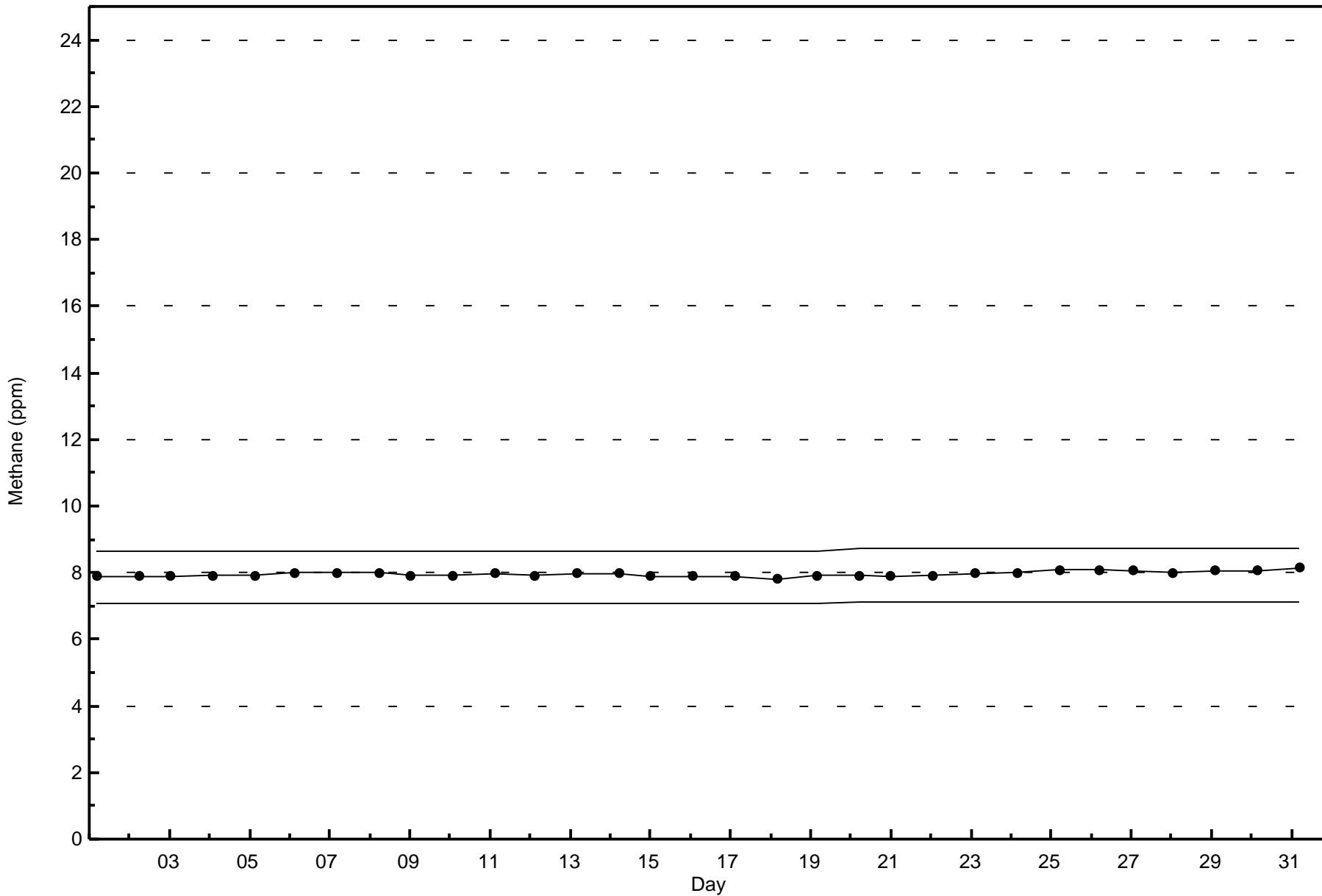


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Methane (CH<sub>4</sub>) - ppm  
Janvier (AMS 22)











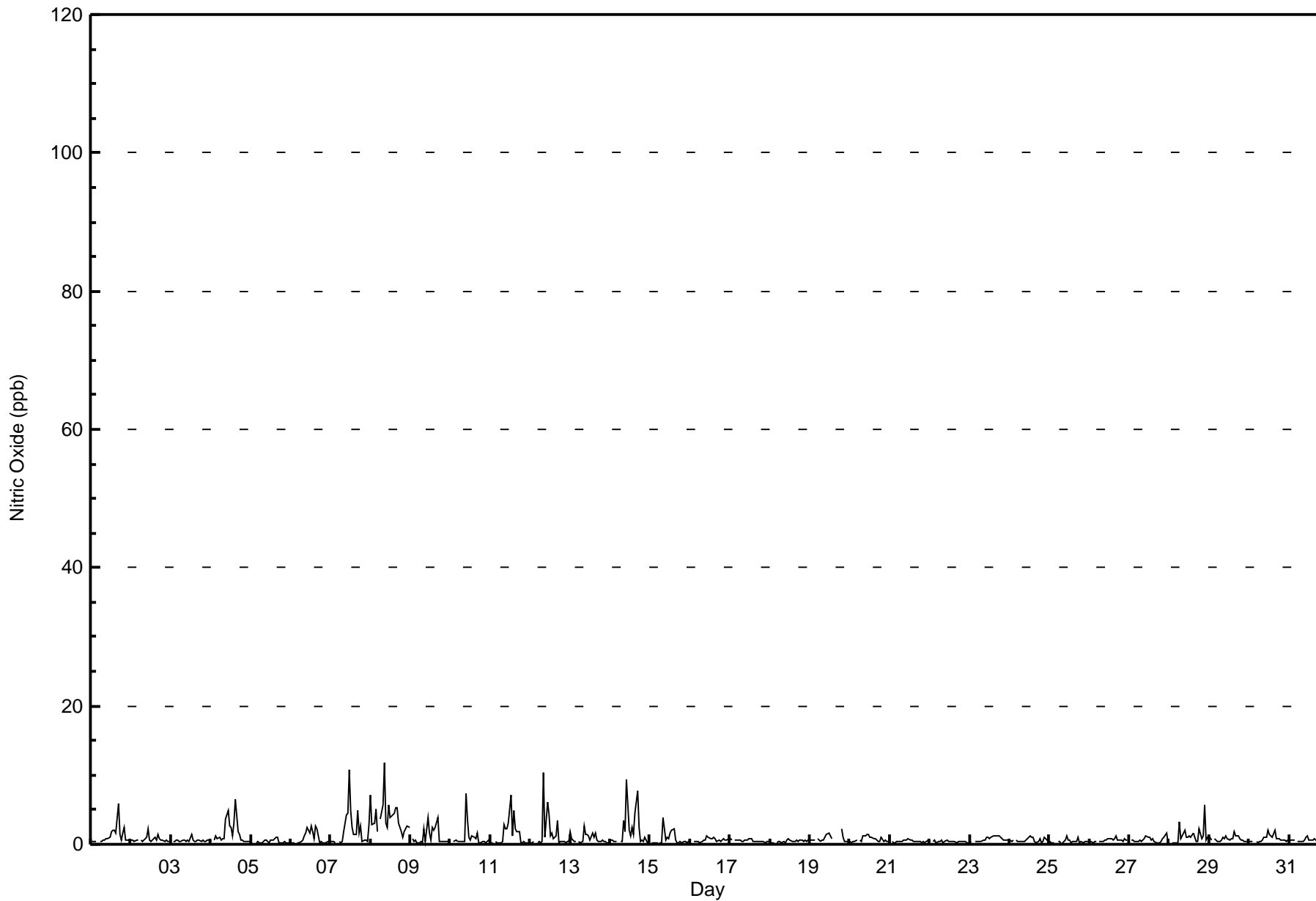
Maximum Value: 12 ppb on Dec 8 09:00																	Maximum Daily Average: 4.0 ppb on Dec 8																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 25 08:00																	Minimum Daily Average: 0.4 ppb on Dec 22																	Hours of Data: 708	
Maximum Diurnal Average: 2.0 ppb at hour 11																	Minimum Diurnal Average: 0.4 ppb at hour 6																	Hours of Missing Data: 36	
Monthly Average: 1.0 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 7																	Hours of Calibration: 36	
																	Percent Operational Time: 100.0																		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	0	0	0	0	Z	0	0	1	1	1	1	1	2	2	2	2	6	1	1	2	2	1	1	0	1.2	6									
2-Dec	1	1	0	1	1	Z	1	0	1	1	2	1	0	1	1	1	1	1	1	1	0	1	0	1	0.7	2									
3-Dec	Z	0	0	1	1	0	0	1	1	0	1	0	1	1	0	1	1	0	1	1	0	1	1	1	0.6	1									
4-Dec	1	Z	1	1	1	1	1	1	1	4	5	3	2	1	3	6	2	2	1	1	0	0	0	0	1.6	6									
5-Dec	0	0	Z	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1									
6-Dec	0	0	0	Z	0	0	0	1	1	2	2	2	3	2	1	3	2	0	0	0	0	0	0	0	0.9	3									
7-Dec	0	0	0	0	Z	0	0	0	2	4	4	11	5	3	1	1	5	2	3	0	1	1	0	3	2.1	11									
8-Dec	7	3	3	5	2	Z	4	6	12	3	3	6	4	4	4	5	5	3	2	1	2	2	3	2	4.0	12									
9-Dec	Z	1	0	1	0	0	0	0	2	0	4	2	1	3	2	3	4	0	0	0	0	0	0	1	1.1	4									
10-Dec	0	Z	0	1	0	0	0	0	0	7	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1.0	7									
11-Dec	0	0	Z	0	0	0	0	0	3	2	2	3	7	1	5	2	2	2	0	0	0	0	0	0	1.4	7									
12-Dec	0	0	0	Z	0	0	0	0	10	1	6	4	1	2	1	1	3	0	0	0	0	0	0	0	1.5	10									
13-Dec	2	1	0	0	Z	0	0	0	3	1	1	1	1	2	1	2	1	0	0	1	0	0	0	0	0.9	3									
14-Dec	1	1	0	0	0	Z	1	1	4	2	9	2	1	2	1	4	8	2	0	1	0	1	0	0	1.9	9									
15-Dec	Z	0	0	0	0	0	0	0	4	1	1	1	2	2	2	1	0	0	0	0	0	0	0	0	0.7	4									
16-Dec	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	0.6	1									
17-Dec	1	1	Z	1	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	1									
18-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	0	0	1	0	1	1	0	1	0	1	0.4	1									
19-Dec	1	1	1	1	Z	1	0	1	1	1	2	2	1	1	C	C	C	C	C	2	1	0	0	0	0.8	2									
20-Dec	0	0	0	0	1	Z	1	0	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0	0	0.7	1									
21-Dec	Z	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0.5	1									
22-Dec	0	Z	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1									
23-Dec	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1									
24-Dec	1	0	1	Z	1	0	0	0	0	0	1	1	1	1	1	0	0	0	1	0	0	1	1	0	0.6	1									
25-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0.4	1									
26-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.6	1								
27-Dec	Z	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	1	1	2	0	0.6	2									
28-Dec	0	Z	0	0	0	0	3	1	2	2	1	1	1	1	2	1	0	0	2	1	1	6	1	1	1.2	6									
29-Dec	1	1	Z	1	1	0	0	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	0	0	0	0.8	2								
30-Dec	0	0	0	Z	0	0	0	0	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	0.8	2									
31-Dec	0	1	1	1	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1									
																	Diurnal Average		Diurnal Maximum																
																	0.7		7																
																	0.5		3																
																	0.5		3																
																	0.7		5																
																	0.5		2																
																	0.4		1																
																	0.6		4																
																	0.6		6																
																	1.7		12																
																	1.4		7																
																	2.0		9																
																	1.7		11																
																	1.4		7																
																	1.3		4																
																	1.3		5																
																	1.5		6																
																	1.7		8																
																	0.8		3																
																	0.7		3																
																	0.6		2																
																	0.6		2																
																	0.7		6																
																	0.5		3																
																	0.6		3																

Z - zerospan C - Calibration



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Janvier - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Janvier - December 2017**

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	40	15	5	2	3	7	24	107	238	54	56	81	48	12	4	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	40	15	5	2	3	7	24	107	238	54	56	81	48	12	4	708

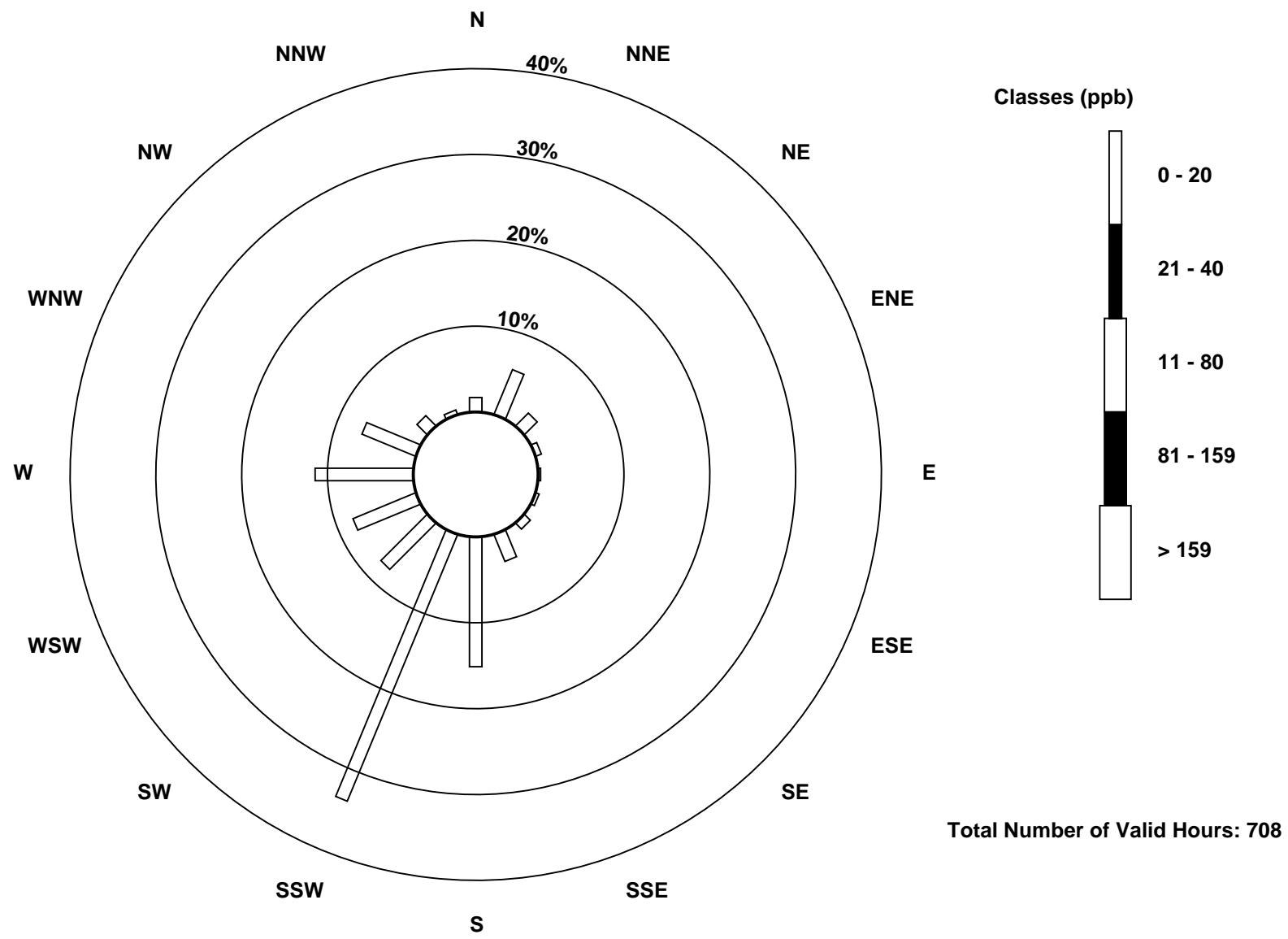
Total Number of Valid Hours: 708

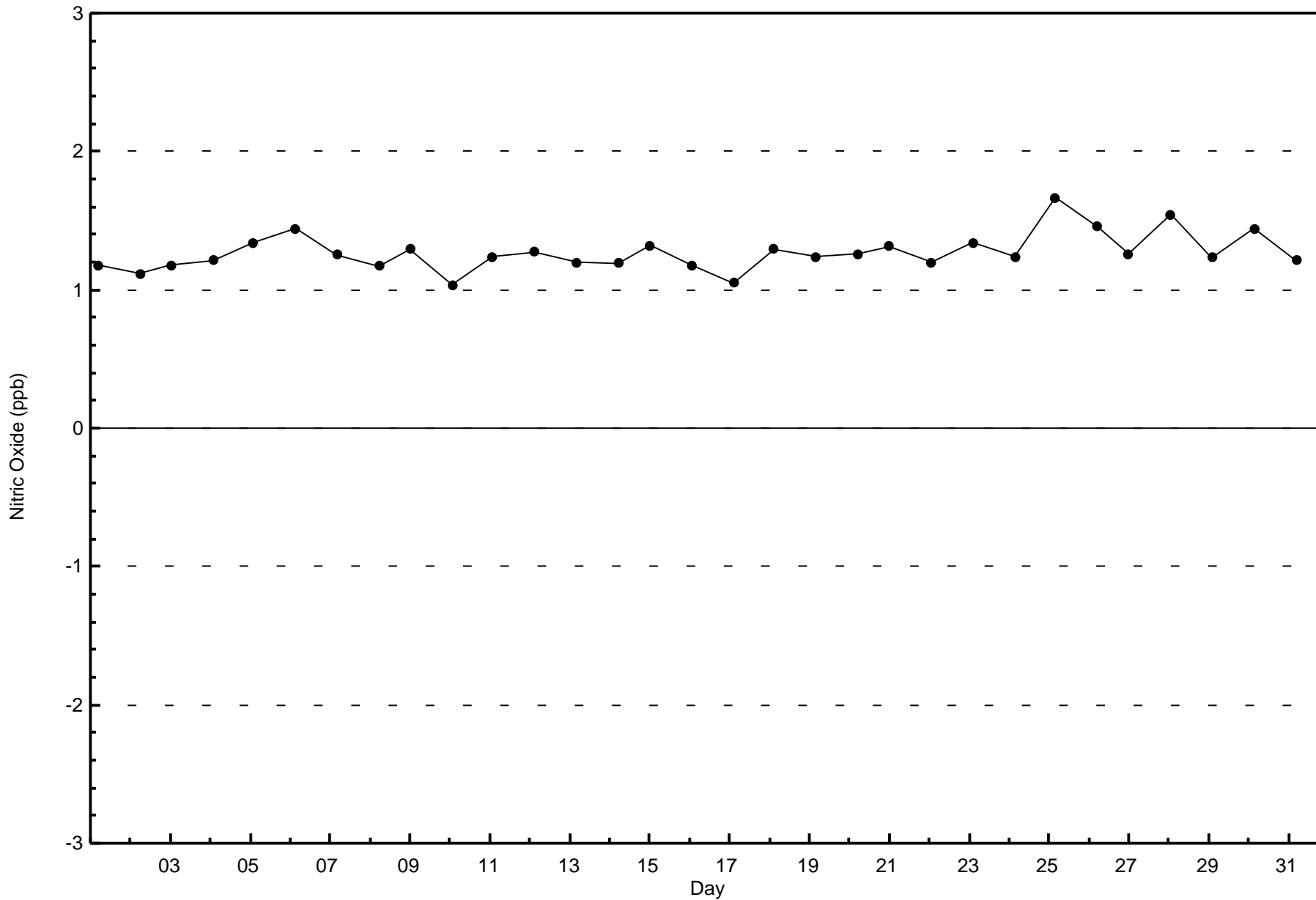
Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Janvier (AMS 22)

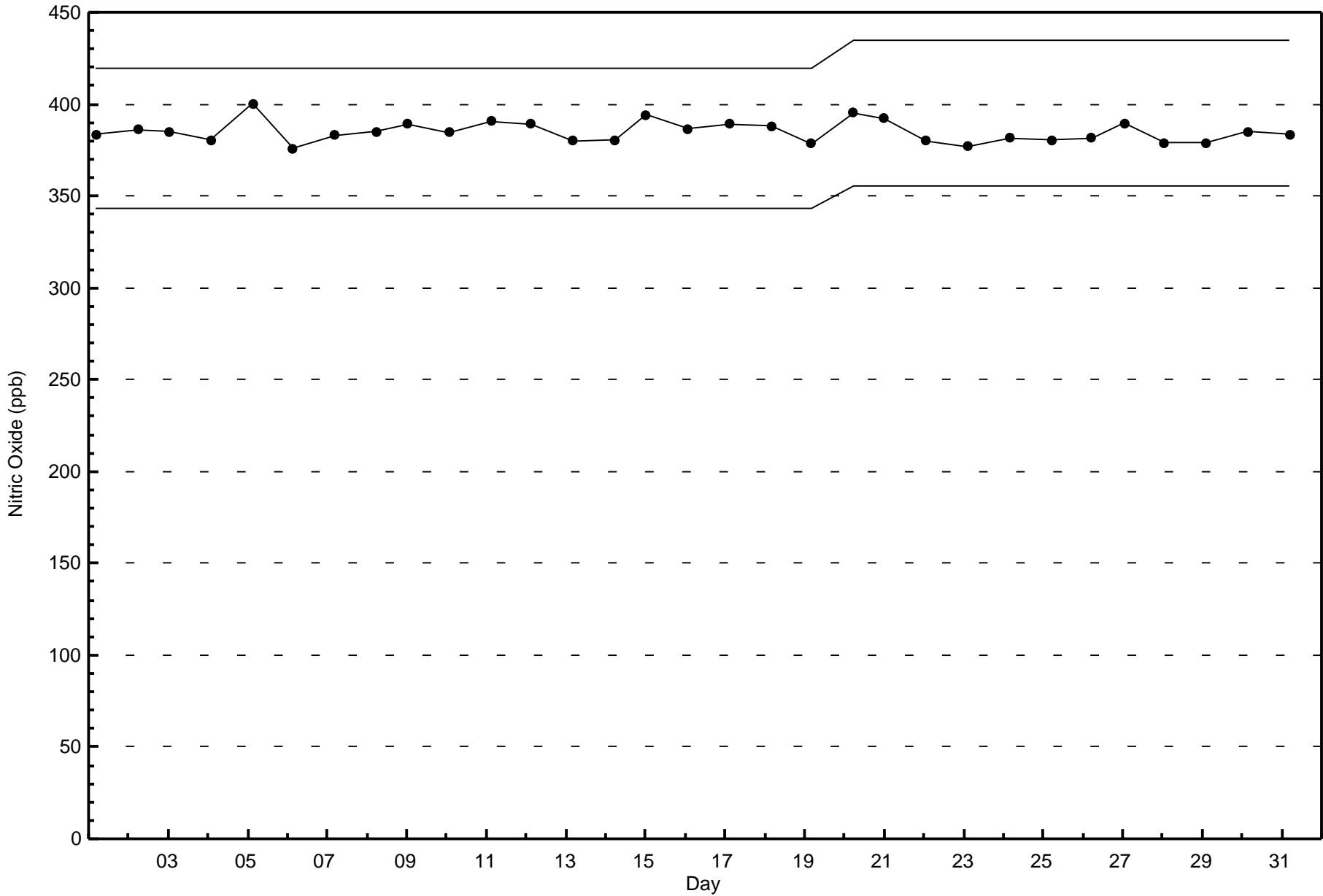






Wood Buffalo Environmental Association  
Span Responses

Nitric Oxide (NO) - ppb  
Janvier - December 2017





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Janvier - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 22 ppb on Dec 8 09:00	Maximum Daily Average: 9.4 ppb on Dec 8		Hours of Data:	708
Minimum Value: 0 ppb on Dec 2 13:00	Minimum Daily Average: 0.4 ppb on Dec 22		Hours of Missing Data:	36
Maximum Diurnal Average: 3.2 ppb at hour 9	Minimum Diurnal Average: 1.4 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 2.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 O <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 12		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	Z	1	1	1	1	1	1	2	3	5	7	6	8	3	4	8	8	3	4	4	3.2	8
2-Dec	4	3	2	1	1	Z	2	1	2	2	2	0	0	0	2	1	2	1	1	1	1	1	2	1	1.4	4
3-Dec	Z	1	1	1	1	1	1	2	2	1	0	0	1	0	0	0	0	0	0	0	8	10	9	7	1.9	10
4-Dec	4	Z	2	5	5	5	5	4	3	4	4	2	2	1	3	6	5	4	3	3	2	1	1	2	3.3	6
5-Dec	3	2	Z	1	0	0	0	0	0	0	0	0	0	0	0	1	6	7	4	1	0	0	0	1	1.2	7
6-Dec	1	1	1	Z	1	1	1	1	4	2	4	3	4	4	2	3	3	1	1	1	1	1	1	1	1.8	4
7-Dec	1	1	1	1	Z	1	1	1	2	5	6	14	7	5	1	1	6	5	8	1	1	1	1	8	3.3	14
8-Dec	17	8	8	12	5	Z	9	16	22	7	5	8	8	9	9	13	14	11	7	4	6	5	8	6	9.4	22
9-Dec	Z	2	1	1	0	0	0	0	1	0	4	2	1	3	2	3	4	0	0	0	1	0	1	0	1.2	4
10-Dec	0	Z	1	0	0	0	0	0	0	10	4	1	1	1	0	0	2	0	0	0	0	1	2	2	1.1	10
11-Dec	0	0	Z	0	0	0	0	1	6	3	2	4	5	2	7	3	5	3	1	1	1	2	1	1	2.1	7
12-Dec	1	1	1	Z	1	1	0	2	10	2	5	6	2	2	1	2	2	0	0	0	0	0	1	1	1.8	10
13-Dec	3	2	1	0	Z	1	1	1	3	2	2	1	0	2	1	2	3	3	3	2	0	1	0	1	1.5	3
14-Dec	1	1	0	0	1	Z	2	3	6	5	9	3	2	3	3	5	9	5	2	2	2	4	2	2	3.0	9
15-Dec	Z	2	2	2	1	1	1	1	3	1	1	1	2	2	2	0	0	0	0	0	0	0	0	0	1.0	3
16-Dec	0	Z	0	0	0	0	1	1	1	2	2	2	2	2	3	2	1	0	0	0	0	0	0	1	1.0	3
17-Dec	0	1	Z	2	2	2	2	1	2	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.8	2
18-Dec	0	0	1	Z	1	1	0	0	1	0	3	3	1	0	0	0	1	0	0	0	0	0	0	0	0.5	3
19-Dec	0	0	0	4	Z	5	3	3	4	4	4	3	2	1	C	C	C	C	C	4	2	1	1	0	2.3	5
20-Dec	1	1	1	0	1	Z	1	1	5	3	2	2	1	1	1	2	2	2	2	2	3	3	3	3	1.9	5
21-Dec	Z	5	5	4	2	2	1	1	1	2	3	2	1	1	1	1	0	0	0	0	0	0	0	0	1.5	5
22-Dec	0	Z	1	1	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0.4	1
23-Dec	1	1	Z	0	1	2	1	1	1	2	3	1	1	1	2	3	4	4	4	4	2	2	2	2	1.8	4
24-Dec	2	1	3	Z	1	1	1	1	0	1	2	3	3	3	4	2	2	1	2	1	1	2	2	0	1.7	4
25-Dec	1	0	1	1	Z	3	4	2	3	3	2	1	0	1	2	2	2	3	2	2	3	3	3	3	2.1	4
26-Dec	2	2	2	1	1	Z	1	1	1	1	0	1	1	1	1	1	2	1	1	1	1	3	1	2	1.1	3
27-Dec	Z	3	3	2	2	2	3	3	3	3	2	1	1	0	1	1	0	0	0	1	1	2	3	1	1.6	3
28-Dec	1	Z	1	1	1	2	4	4	9	6	2	2	2	2	5	5	2	1	3	3	4	7	4	7	3.3	9
29-Dec	4	3	Z	4	2	1	1	1	1	1	1	1	0	0	1	3	3	3	2	1	1	1	1	1	1.6	4
30-Dec	1	1	1	Z	2	2	1	1	2	2	2	3	2	2	2	3	2	1	1	1	2	1	1	1	1.6	3
31-Dec	1	1	1	1	Z	2	1	1	1	1	2	2	1	1	0	1	2	3	3	3	3	3	3	3	1.6	3
	1.9	1.6	1.5	1.9	1.4	1.4	1.6	1.8	3.2	2.4	2.6	2.4	1.8	1.8	2.1	2.4	3.0	2.1	1.8	1.5	1.7	1.8	1.8	1.9	Diurnal Average	
	17	8	8	12	5	5	9	16	22	10	9	14	8	9	9	13	14	11	8	8	8	10	9	8	Diurnal Maximum	

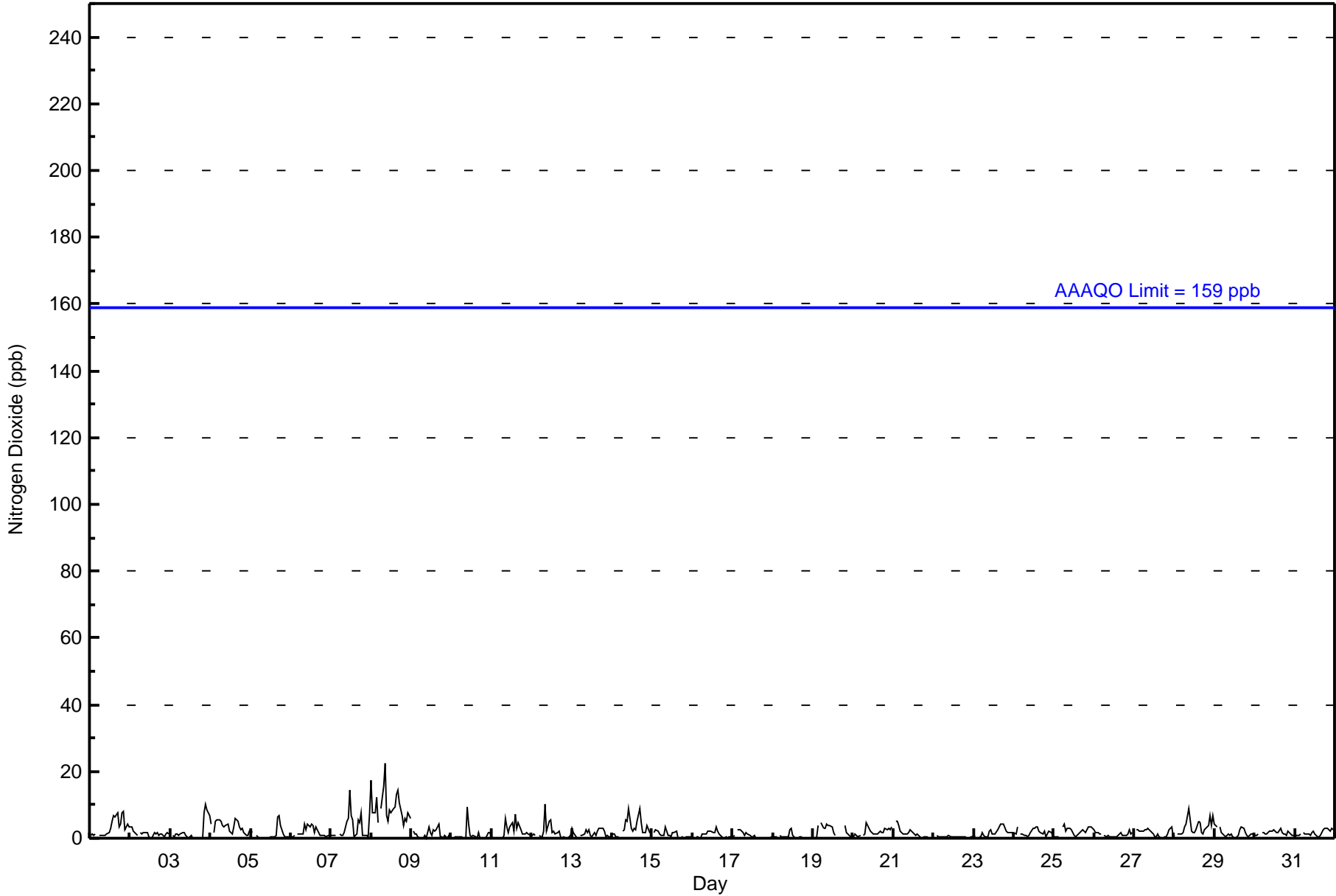
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Janvier - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	99.86	99.86
21 - 40	1	0.14	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Janvier - December 2017**

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	40	15	5	2	3	7	24	107	237	54	56	81	48	12	4	707
21 - 40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	40	15	5	2	3	7	24	107	238	54	56	81	48	12	4	708

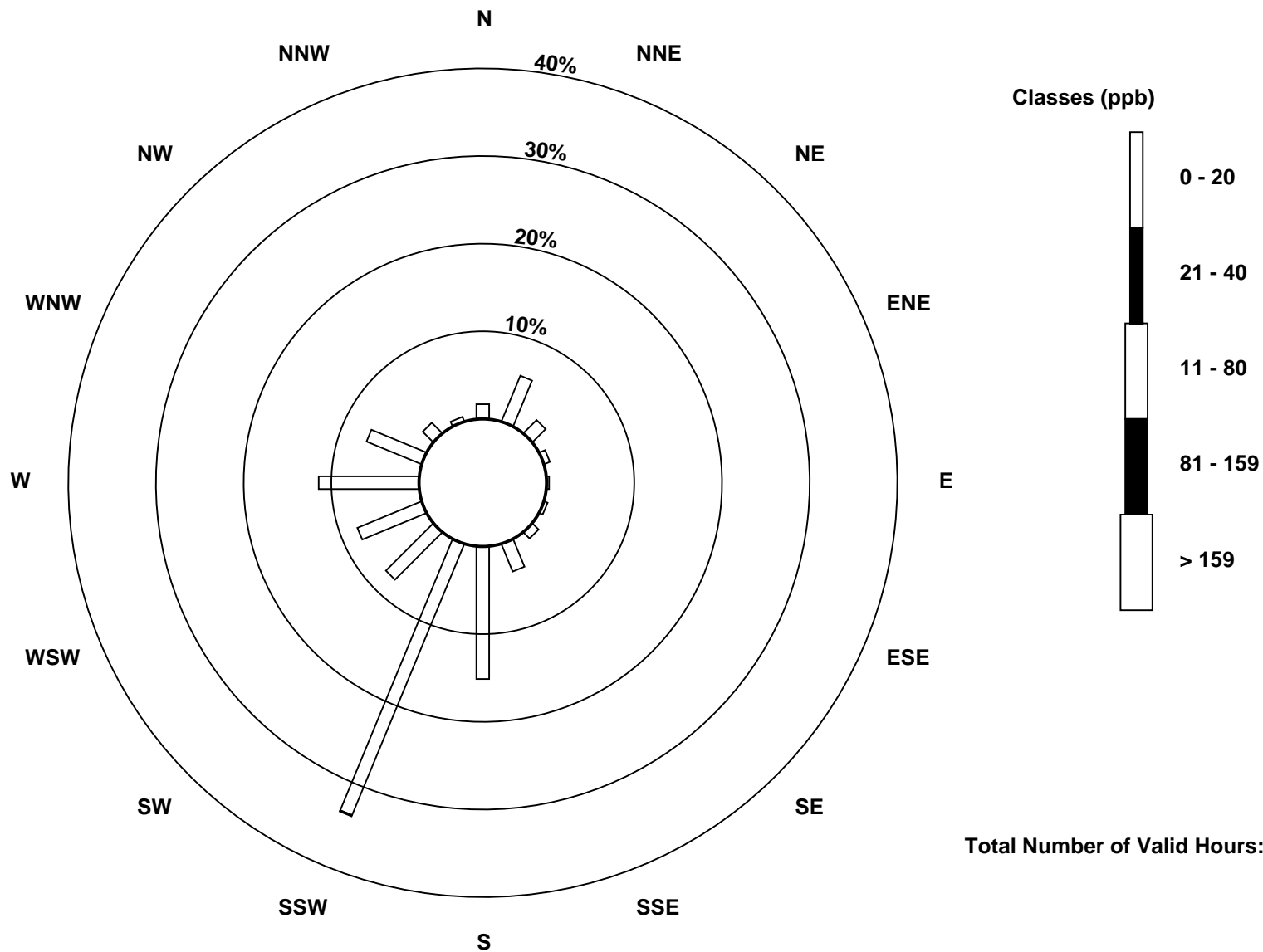
Total Number of Valid Hours: 708

Total Number of Hours: 744

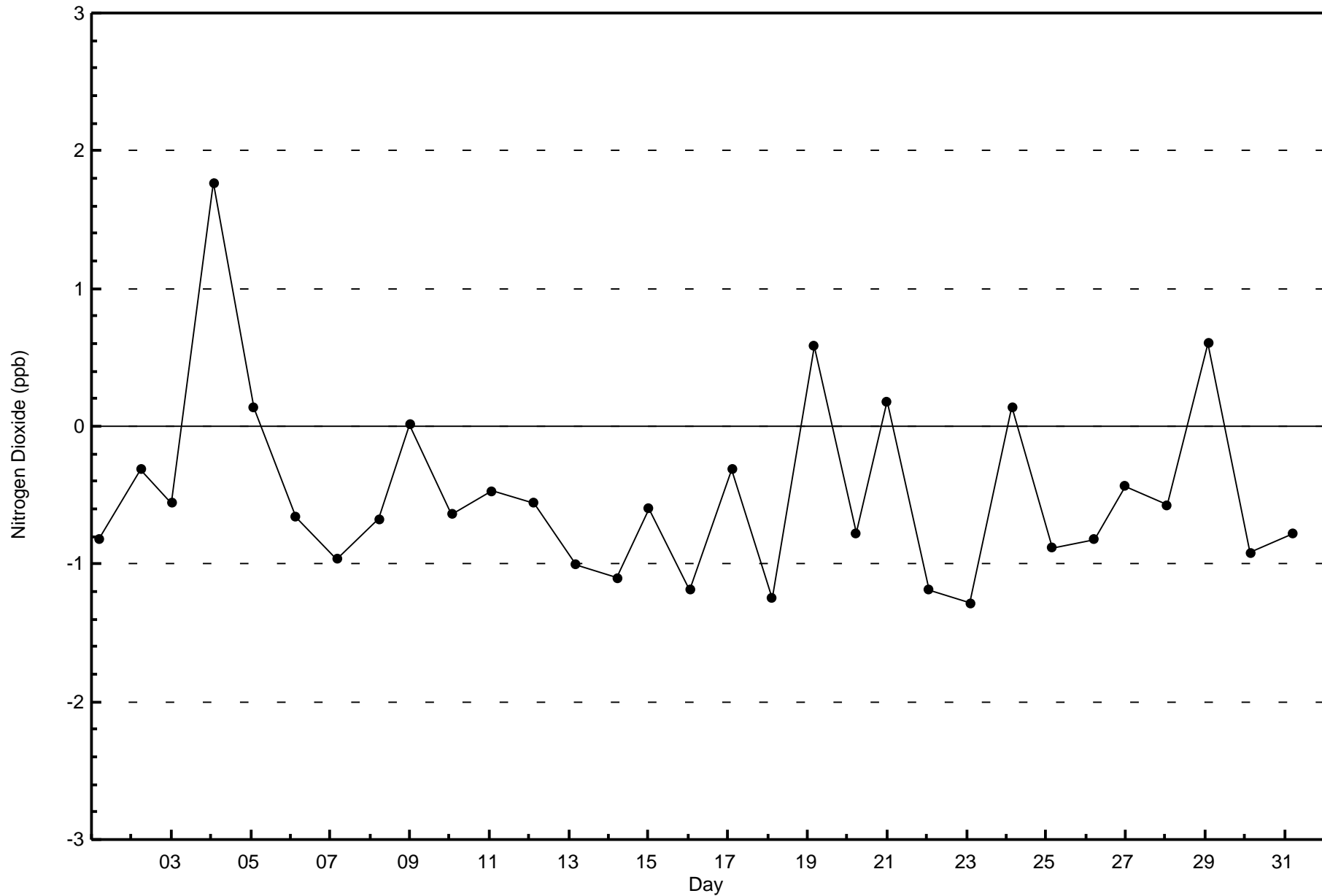


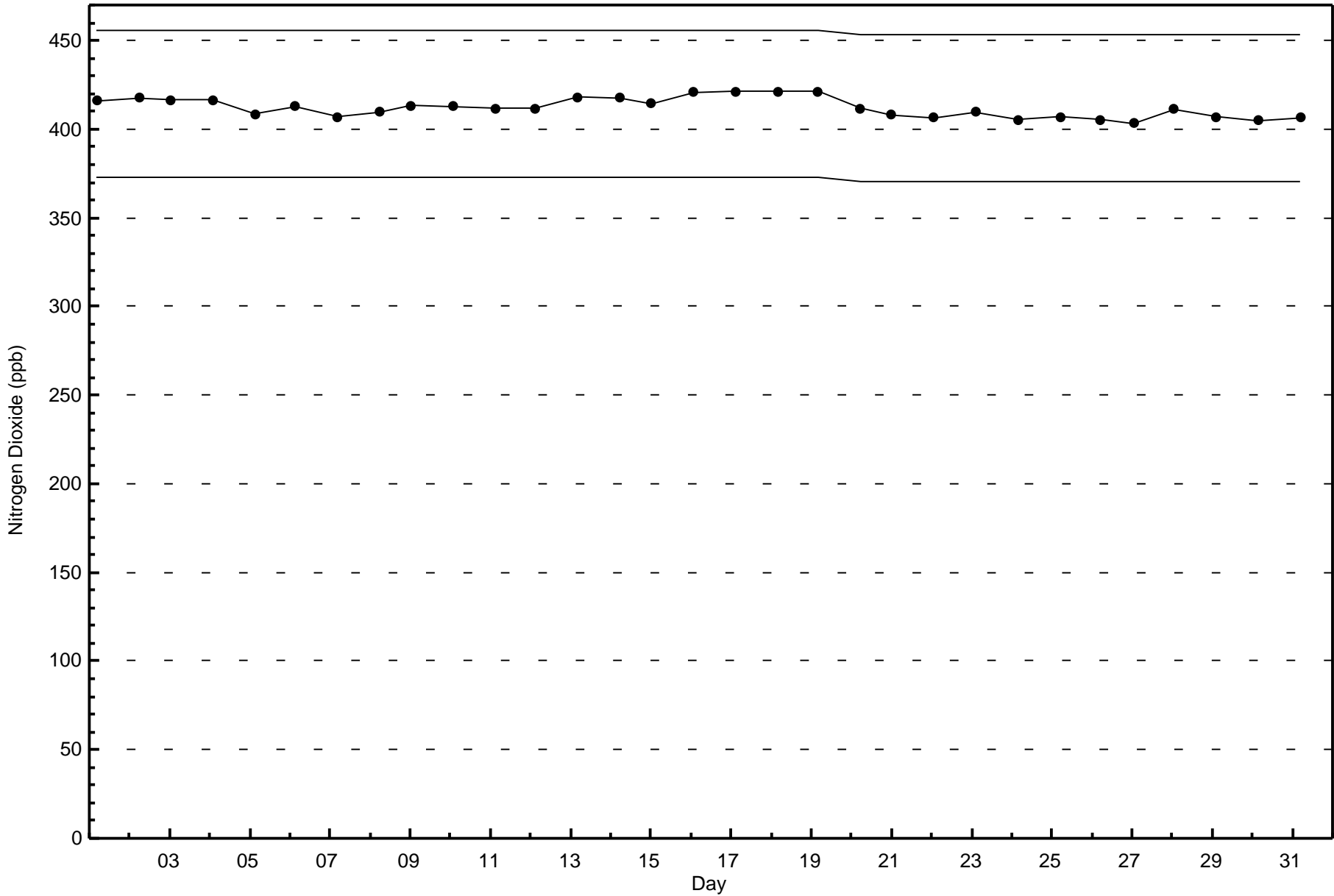
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Janvier (AMS 22)



Total Number of Valid Hours: 708







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

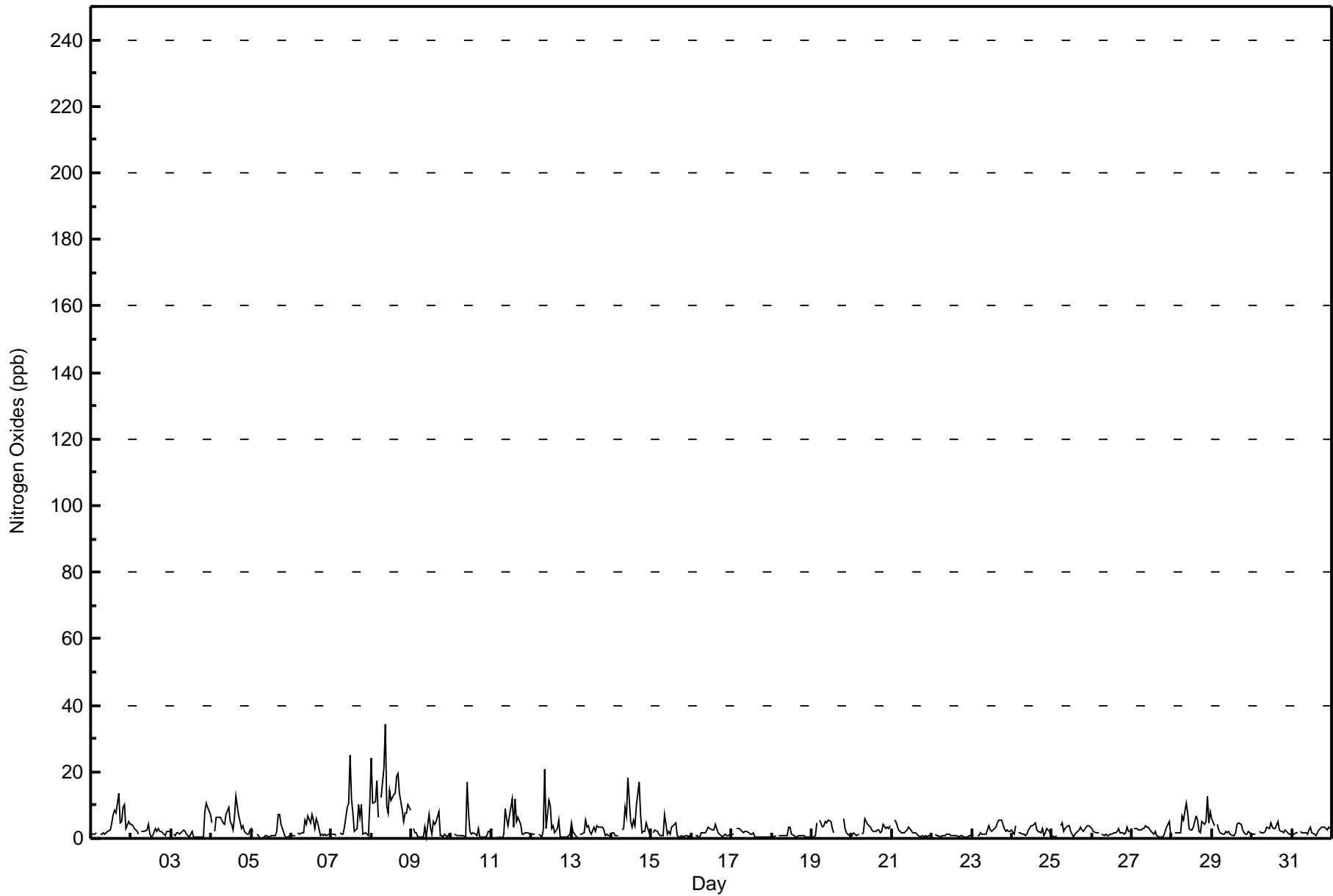
Janvier - December 2017

Maximum Value: 34 ppb on Dec 8 09:00																	Maximum Daily Average: 13.3 ppb on Dec 8																	Hours in Service: 744			
Minimum Value: 0 ppb on Dec 5 07:00																	Minimum Daily Average: 0.8 ppb on Dec 22																	Hours of Data: 708			
Maximum Diurnal Average: 4.9 ppb at hour 9																	Minimum Diurnal Average: 1.8 ppb at hour 6																	Hours of Missing Data: 36			
Monthly Average: 3.0 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 O <sub>3</sub> = 3 P <sub>90</sub> = 7 P <sub>99</sub> = 18																	Hours of Calibration: 36			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	2	Z	1	1	2	1	2	2	3	5	7	9	8	14	5	5	9	10	3	5	4	4.4	14											
2-Dec	4	4	3	2	1	Z	2	2	2	2	4	1	0	1	3	2	3	2	2	2	1	2	2	2	2.2	4											
3-Dec	Z	1	1	2	2	1	2	2	2	1	1	0	2	1	1	0	1	1	0	1	8	10	9	7	2.5	10											
4-Dec	5	Z	2	6	6	6	6	5	4	7	9	5	4	3	6	13	7	5	3	4	2	1	1	3	4.9	13											
5-Dec	3	2	Z	1	1	0	0	0	1	1	0	0	1	1	1	2	7	7	4	2	1	1	1	1	1.6	7											
6-Dec	1	1	1	Z	2	1	2	2	6	4	7	5	7	6	3	6	5	1	1	1	1	1	1	1	2.8	7											
7-Dec	1	1	1	1	Z	2	1	1	3	9	11	25	12	8	2	3	10	6	10	1	2	1	1	10	5.4	25											
8-Dec	24	10	11	17	6	Z	12	21	34	10	8	14	11	13	14	19	20	14	9	5	8	7	10	8	13.3	34											
9-Dec	Z	3	2	2	1	1	1	0	3	0	7	3	1	5	4	5	8	1	1	0	1	1	1	1	2.3	8											
10-Dec	1	Z	1	1	1	1	1	1	1	1	17	8	2	1	2	1	1	3	0	0	0	1	1	2	2	2.1	17										
11-Dec	1	0	Z	0	0	0	0	1	9	6	4	7	12	3	12	5	6	4	1	1	2	2	2	1	3.5	12											
12-Dec	1	1	1	Z	1	1	1	2	21	3	11	10	3	4	2	3	6	0	1	1	1	0	1	1	3.3	21											
13-Dec	5	2	1	1	Z	1	1	2	5	3	4	2	1	4	2	4	3	3	3	3	1	1	1	1	2.3	5											
14-Dec	2	2	1	1	1	Z	3	3	9	7	18	5	3	5	4	10	17	7	2	2	2	5	2	2	4.9	18											
15-Dec	Z	2	3	2	1	1	1	1	7	1	2	1	3	4	5	1	0	0	1	0	1	1	1	1	1.7	7											
16-Dec	1	Z	1	1	1	0	2	2	2	3	3	3	3	3	4	3	2	1	0	1	1	1	1	1	1.7	4											
17-Dec	1	1	Z	3	3	3	2	2	2	2	2	1	1	2	0	0	1	0	0	0	0	0	1	1	1.3	3											
18-Dec	1	1	1	Z	1	1	1	1	1	1	3	4	1	1	1	1	1	1	1	1	1	1	0	1	0.9	4											
19-Dec	1	1	1	5	Z	5	3	4	5	5	6	5	3	1	C	C	C	C	C	6	3	2	1	1	3.1	6											
20-Dec	1	2	1	1	1	Z	1	2	6	4	4	3	2	2	2	2	3	2	2	4	3	3	3	4	2.6	6											
21-Dec	Z	5	5	4	3	2	2	2	2	2	3	3	2	2	2	1	1	1	1	1	1	0	1	1	2.0	5											
22-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1											
23-Dec	1	1	Z	1	1	2	1	1	1	1	3	4	2	2	3	5	5	6	5	3	2	2	2	2	2.6	6											
24-Dec	2	1	4	Z	2	2	1	1	1	1	2	4	4	4	5	3	2	2	3	1	2	3	2	1	2.3	5											
25-Dec	1	0	1	1	Z	4	5	2	3	4	4	2	1	1	1	2	3	3	2	2	3	4	4	3	2.4	5											
26-Dec	3	2	2	2	2	Z	1	1	1	1	1	1	1	2	2	2	3	2	2	1	2	3	2	2	1.7	3											
27-Dec	Z	3	3	3	3	3	3	3	4	3	3	2	2	1	2	1	0	0	0	1	2	4	5	1	2.3	5											
28-Dec	1	Z	2	2	2	2	7	5	10	8	3	3	3	3	7	6	2	2	5	4	5	13	5	8	4.6	13											
29-Dec	6	4	Z	4	3	2	1	1	2	2	2	1	1	1	2	4	5	4	3	2	1	1	2	1	2.4	6											
30-Dec	1	1	1	Z	2	2	2	2	2	3	3	5	3	3	3	5	2	2	2	2	2	2	1	1	2.4	5											
31-Dec	1	1	2	2	Z	2	2	2	2	1	3	3	2	1	1	2	2	3	4	3	3	3	3	3	2.2	4											
2.7																	2.1																	Diurnal Average			
24																	10																	Diurnal Maximum			
2.0																	2.5																				
1.8																	1.8																				
2.2																	2.5																				
4.9																	3.8																				
4.6																	4.1																				
3.2																	3.1																				
3.4																	4.0																				
4.7																	2.9																				
2.5																	2.1																				
2.3																	2.6																				
2.4																	10																				
2.5																	13																				
2.4																	10																				
2.5																	10																				
Z - zerospan																	C - Calibration																				



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Janvier - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	703	99.29	99.29
21 - 40	5	0.71	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	12	40	15	5	2	3	7	24	107	233	54	56	81	48	12	4	703
21 - 40	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	40	15	5	2	3	7	24	107	238	54	56	81	48	12	4	708

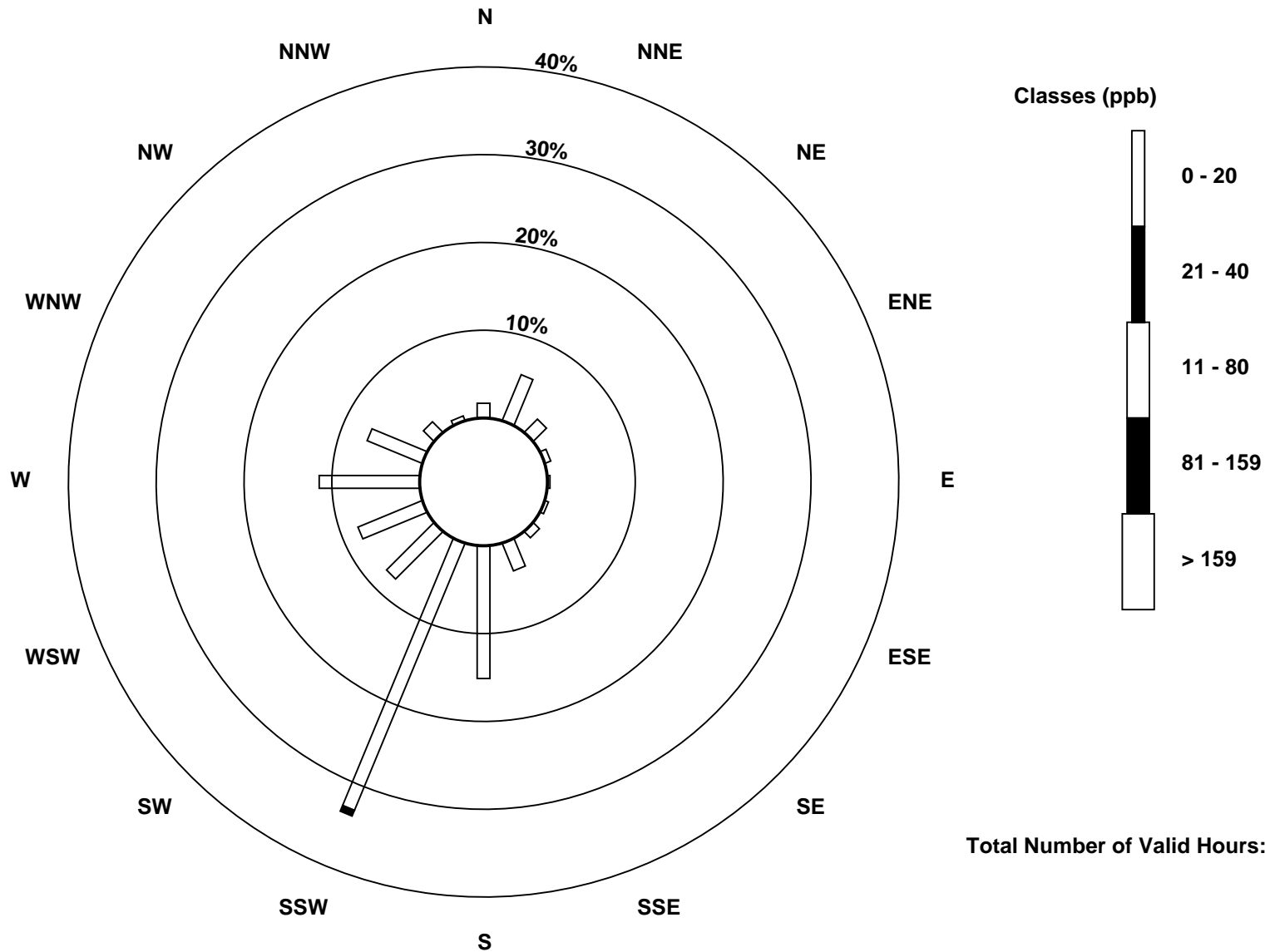
Total Number of Valid Hours: 708

Total Number of Hours: 744

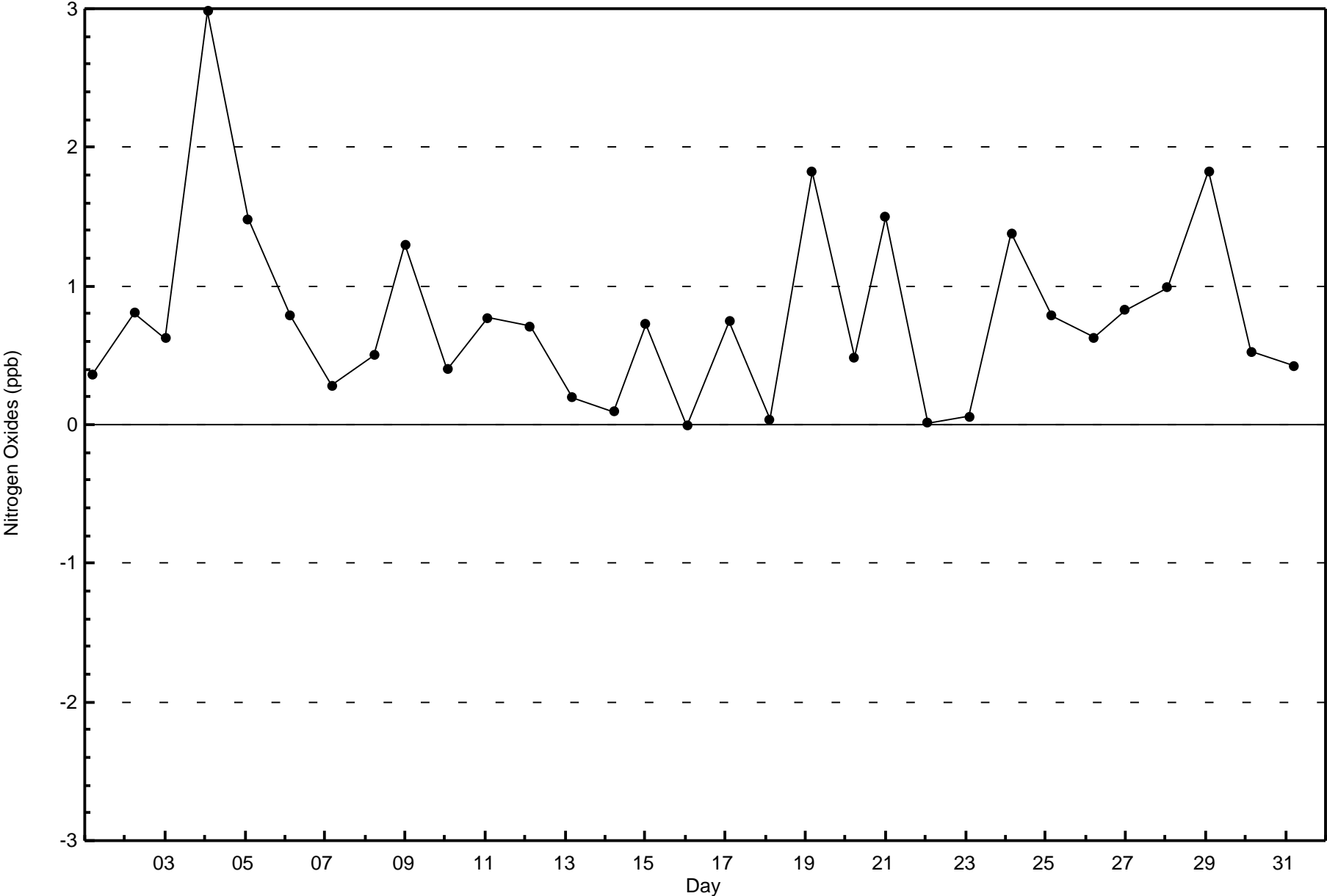


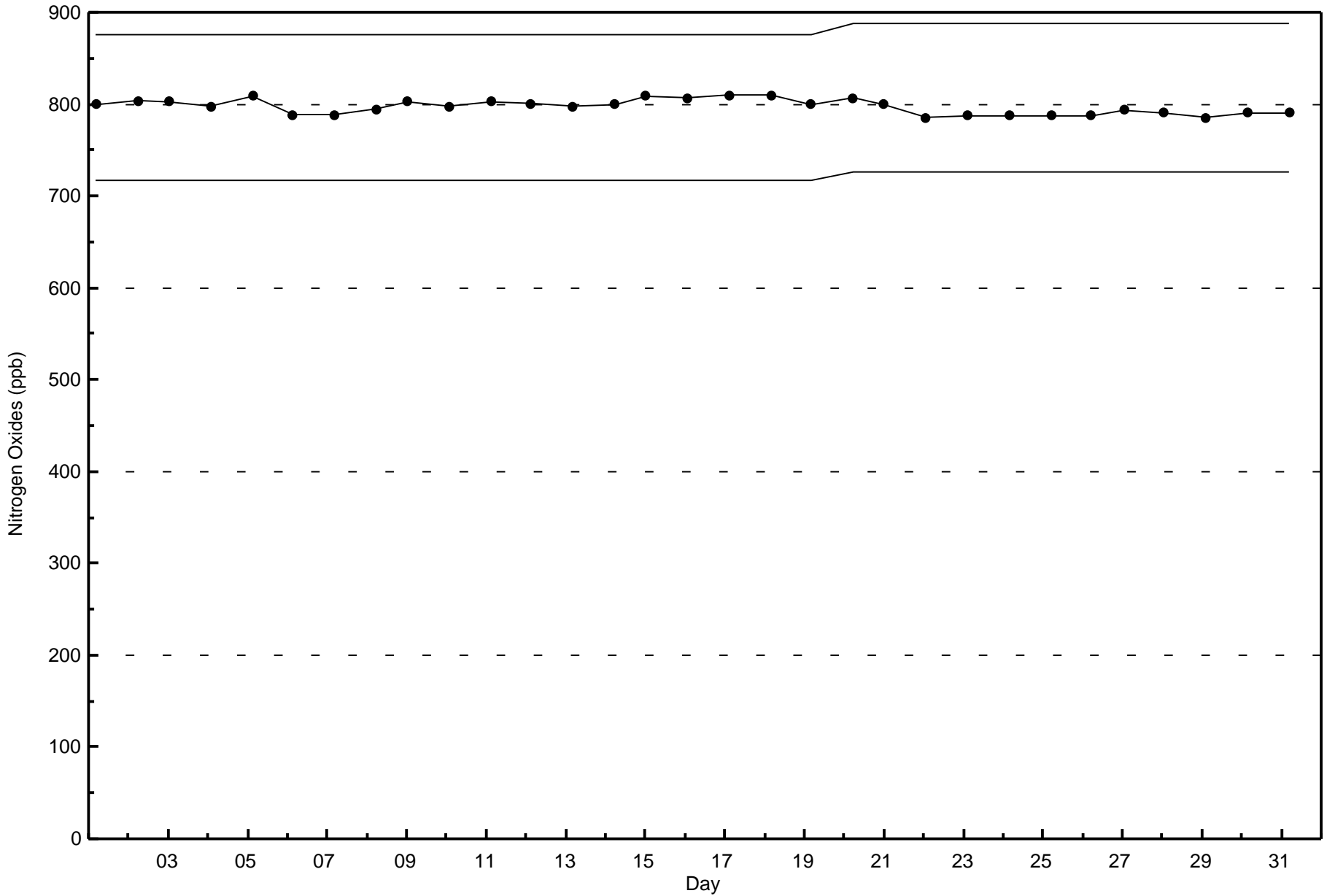
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Janvier (AMS 22)



Total Number of Valid Hours: 708







# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Ozone (O<sub>3</sub>) - ppb

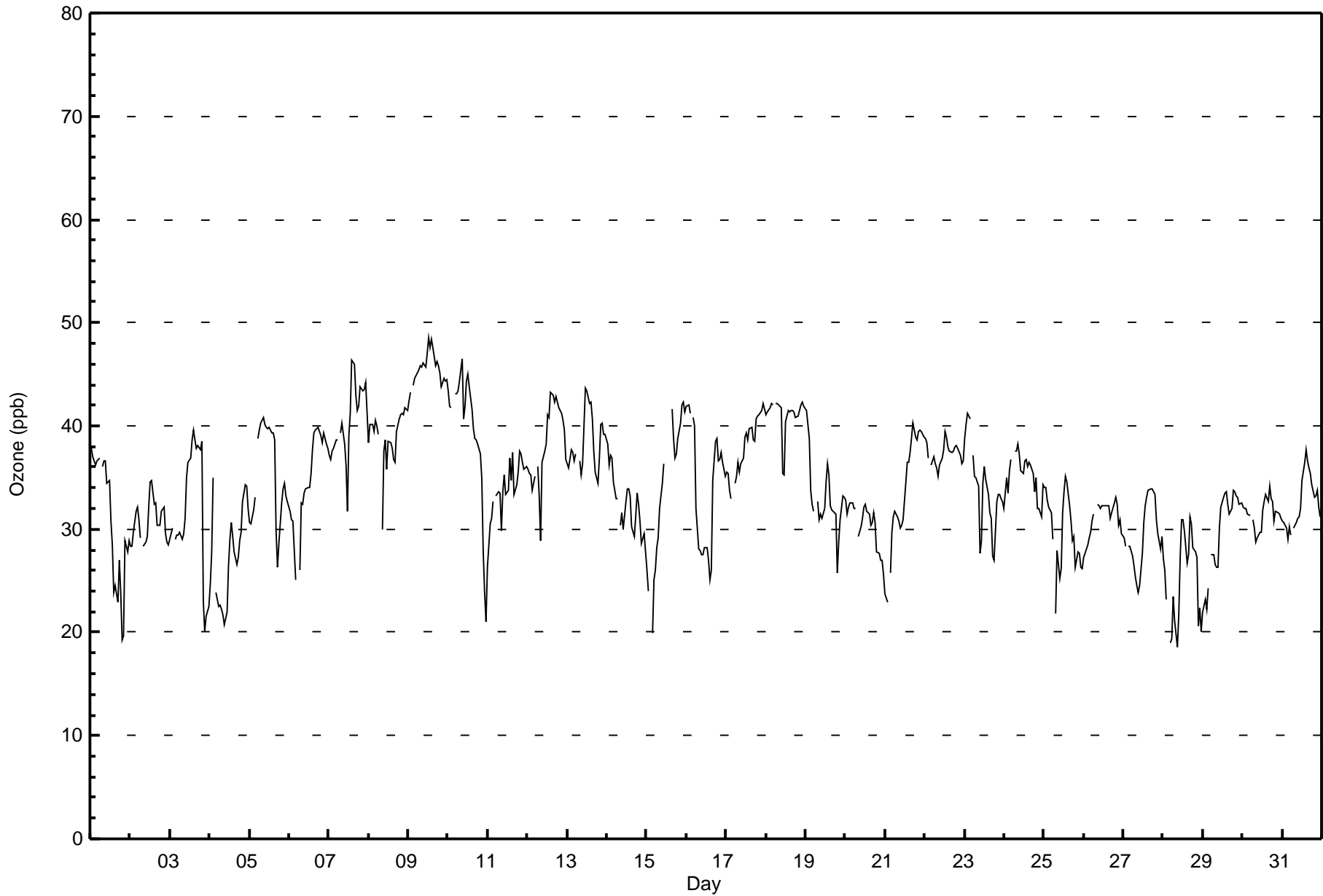
Janvier - December 2017

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																		Daily Average		Daily Maximum			
Maximum Value: 49 ppb on Dec 9 13:00		Maximum Daily Average: 45.6 ppb on Dec 9																		Hours of Data: 709		Hours of Missing Data: 35					
Minimum Value: 19 ppb on Dec 28 09:00		Minimum Daily Average: 25.2 ppb on Dec 28																		Hours of Calibration: 35		Percent Operational Time: 100.0					
Maximum Diurnal Average: 36.2 ppb at hour 14		Minimum Diurnal Average: 32.3 ppb at hour 9																									
Monthly Average: 34.1 ppb		Percentiles: P <sub>1</sub> = 20 P <sub>10</sub> = 27 Q <sub>1</sub> = 30 Median = 34 Q <sub>3</sub> = 38 P <sub>90</sub> = 42 P <sub>99</sub> = 46																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	38	37	37	36	37	37	Z	36	37	37	34	35	31	29	24	25	23	27	24	19	20	29	28	29	30.7	38	
2-Dec	28	28	30	32	32	31	29	Z	28	29	29	32	35	35	32	33	30	30	30	32	32	30	29	28	30.6	35	
3-Dec	29	30	Z	29	29	29	30	29	30	31	35	36	37	39	40	39	38	38	38	38	23	20	22	22	31.8	40	
4-Dec	25	28	35	Z	24	22	23	22	22	21	22	26	29	31	29	28	27	27	29	30	33	34	34	32	27.5	35	
5-Dec	31	31	32	33	Z	39	40	40	41	40	40	40	40	39	39	39	30	26	29	33	34	34	33	33	35.4	41	
6-Dec	32	31	31	28	25	Z	26	33	32	34	34	34	34	35	38	39	40	40	39	39	38	39	38	38	34.6	40	
7-Dec	37	37	38	38	39	39	Z	39	40	38	36	32	39	41	46	46	43	42	42	44	43	44	44	41	40.3	46	
8-Dec	38	40	40	39	40	40	39	Z	30	37	39	36	38	38	38	37	36	39	41	41	41	41	42	42	38.9	42	
9-Dec	42	43	Z	44	45	45	45	46	46	46	46	47	49	48	48	48	46	46	46	45	44	45	44	45	45.6	49	
10-Dec	43	42	42	Z	43	43	43	44	46	41	42	44	45	44	42	40	39	39	38	37	35	28	24	21	39.3	46	
11-Dec	26	31	31	33	Z	33	34	34	30	34	35	33	34	37	35	37	33	34	36	38	37	37	36	36	34.0	38	
12-Dec	36	35	35	34	35	Z	36	33	29	37	38	38	41	41	43	43	42	43	42	42	41	41	40	37	38.3	43	
13-Dec	36	36	38	37	37	37	Z	37	35	36	40	44	43	42	42	41	37	35	34	37	40	40	39	39	38.5	44	
14-Dec	38	36	37	37	35	33	33	Z	30	32	30	33	34	34	33	30	29	31	33	32	31	29	30	28	32.5	38	
15-Dec	26	24	Z	20	25	26	28	29	32	34	36	C	C	C	C	42	39	37	37	39	40	42	42	41	33.7	42	
16-Dec	42	42	41	Z	41	40	32	28	28	27	28	28	27	25	26	35	38	39	37	37	37	37	35	35	33.8	42	
17-Dec	35	35	34	33	Z	34	35	36	36	36	37	39	39	39	40	40	39	38	41	41	41	42	42	42	38.0	42	
18-Dec	41	41	42	42	42	Z	42	42	42	42	35	35	40	41	41	41	42	41	41	41	42	42	42	42	41.1	42	
19-Dec	42	40	39	34	32	32	Z	33	31	31	31	32	35	36	35	32	32	32	31	26	29	31	33	33	33.1	42	
20-Dec	33	31	32	33	32	32	32	Z	29	30	31	32	32	32	31	30	31	32	31	28	28	27	27	26	30.5	33	
21-Dec	24	23	Z	26	30	31	32	31	31	30	30	31	35	36	36	37	39	40	39	39	39	40	40	39	33.8	40	
22-Dec	39	38	37	Z	36	37	36	36	35	36	37	38	39	39	38	38	37	38	38	38	38	37	36	37	37.3	39	
23-Dec	39	40	41	41	Z	37	35	35	34	28	29	34	36	35	33	32	31	27	27	33	33	33	33	33	33.9	41	
24-Dec	32	35	33	36	37	Z	38	38	38	37	36	35	37	37	36	36	35	34	35	32	32	31	34	34	35.2	38	
25-Dec	34	34	33	32	32	29	Z	22	28	25	26	32	34	35	35	32	31	29	29	26	28	28	26	26	29.8	35	
26-Dec	27	28	29	29	30	31	31	Z	32	32	32	32	32	32	32	32	31	32	33	33	32	30	31	30	31.1	33	
27-Dec	29	28	Z	28	28	27	27	25	25	24	25	28	31	32	33	34	34	34	34	33	31	30	28	29	29.4	34	
28-Dec	27	26	23	Z	19	19	23	21	19	22	27	31	31	30	27	28	31	30	28	28	27	21	22	20	25.2	31	
29-Dec	22	23	22	24	Z	27	28	27	26	26	30	32	33	34	34	32	31	32	34	34	33	33	32	32	29.7	34	
30-Dec	32	32	32	31	31	Z	31	30	29	29	30	30	32	33	33	33	34	33	33	31	32	32	31	31	31.5	34	
31-Dec	31	31	30	29	30	29	Z	30	31	31	31	32	35	36	38	37	36	35	34	33	33	34	32	31	32.6	38	
33.4 33.5 34.3 33.0 33.3 33.1 33.1 32.9 32.3 32.7 33.2 34.4 35.9 36.2 35.9 35.7 34.9 34.9 34.9 34.9 34.8 34.4 34.2 33.8 33.3																								Diurnal Average			
43 43 42 44 45 45 45 46 46 46 46 47 49 48 48 48 46 46 46 46 45 44 45 44 45																								Diurnal Maximum			
Z - zerospan C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Janvier - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Janvier - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	8	1.13	1.13
21 - 50	701	98.87	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Janvier - December 2017**

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	1	1	0	0	0	0	2	4	0	0	0	0	0	0	0	8
21 - 50	12	40	12	5	2	3	9	24	108	233	56	55	78	48	12	4	701
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
<b>Totals</b>	12	41	13	5	2	3	9	26	112	233	56	55	78	48	12	4	709

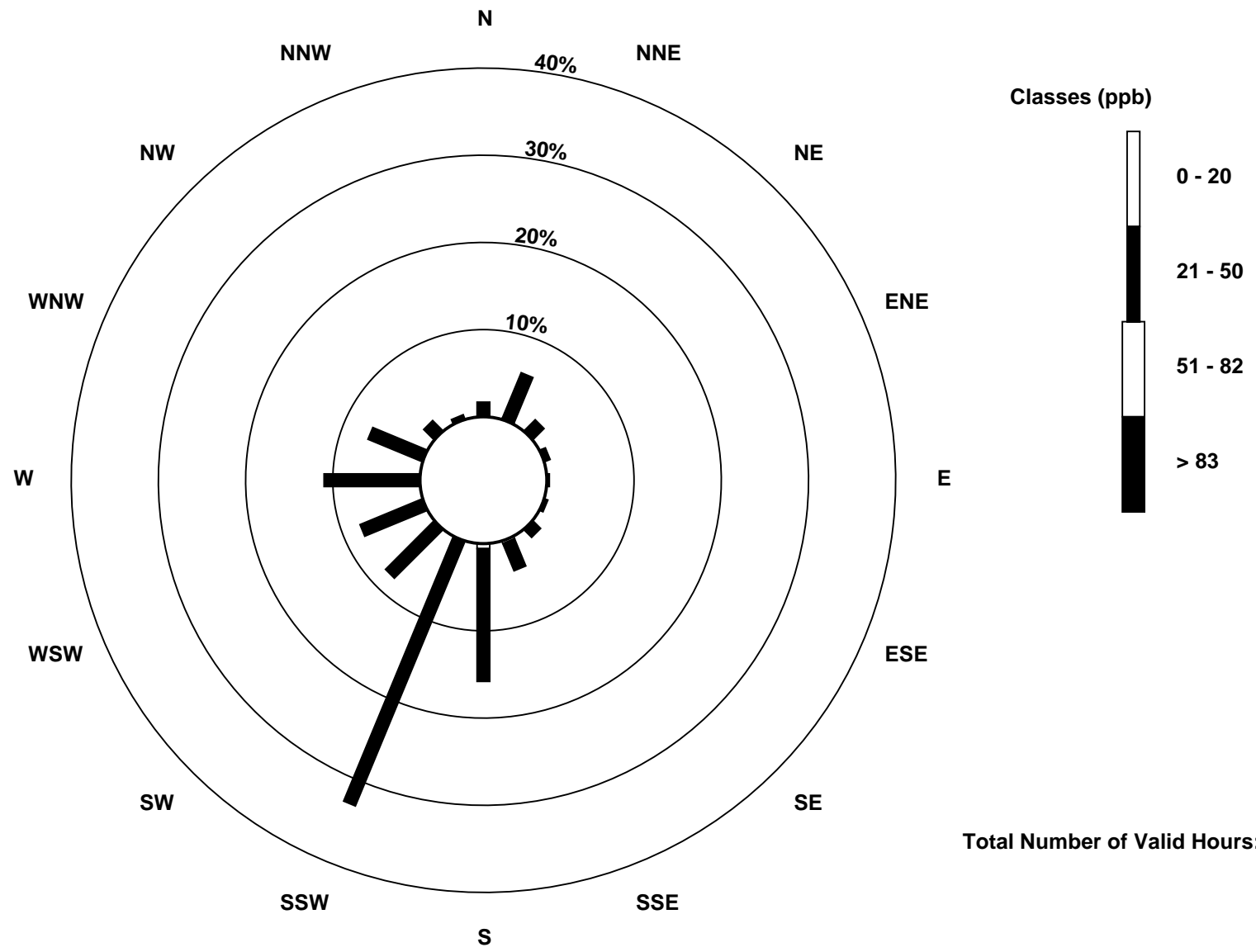
Total Number of Valid Hours: 709

Total Number of Hours: 744

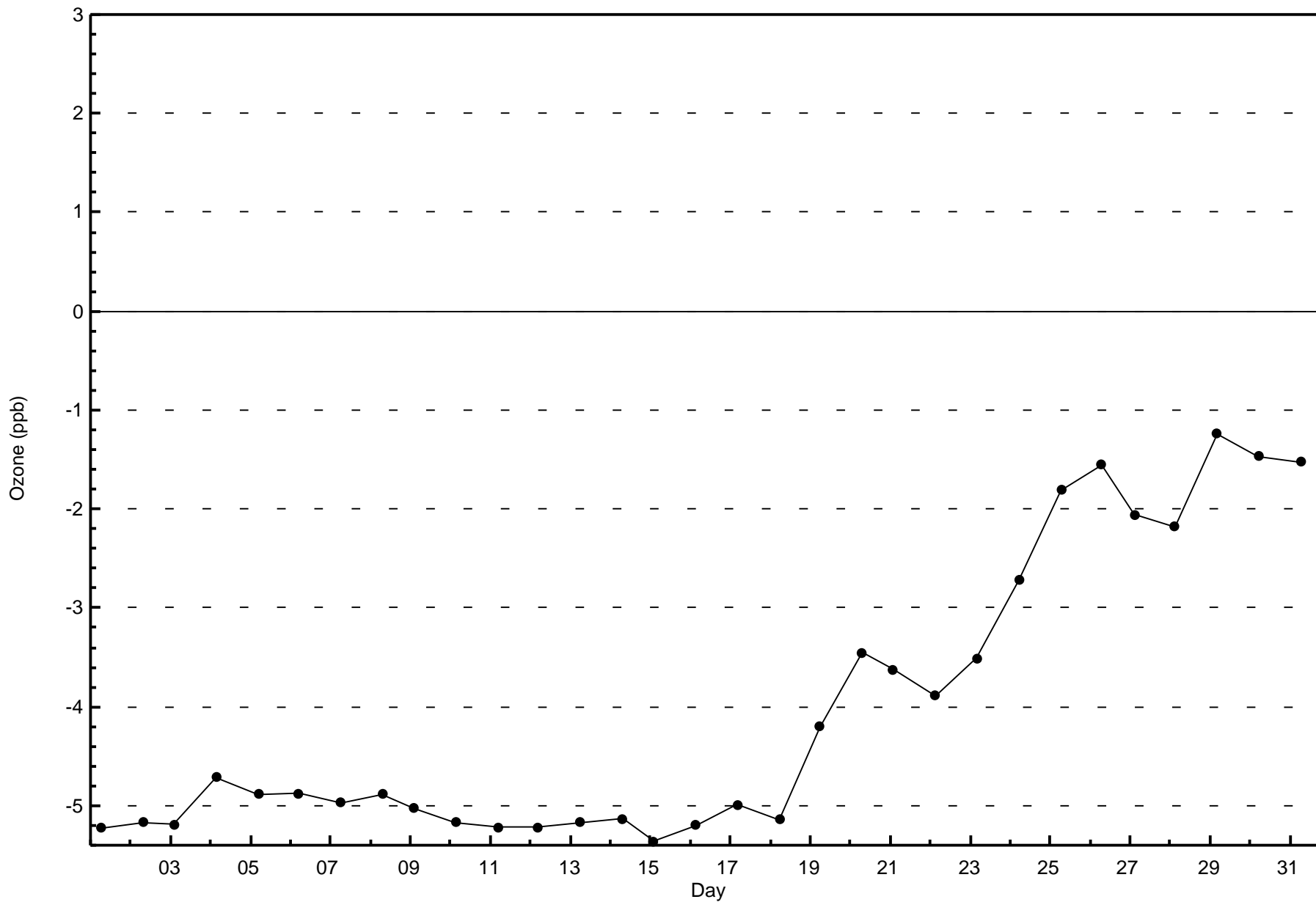


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Ozone (O<sub>3</sub>) - ppb  
Janvier (AMS 22)



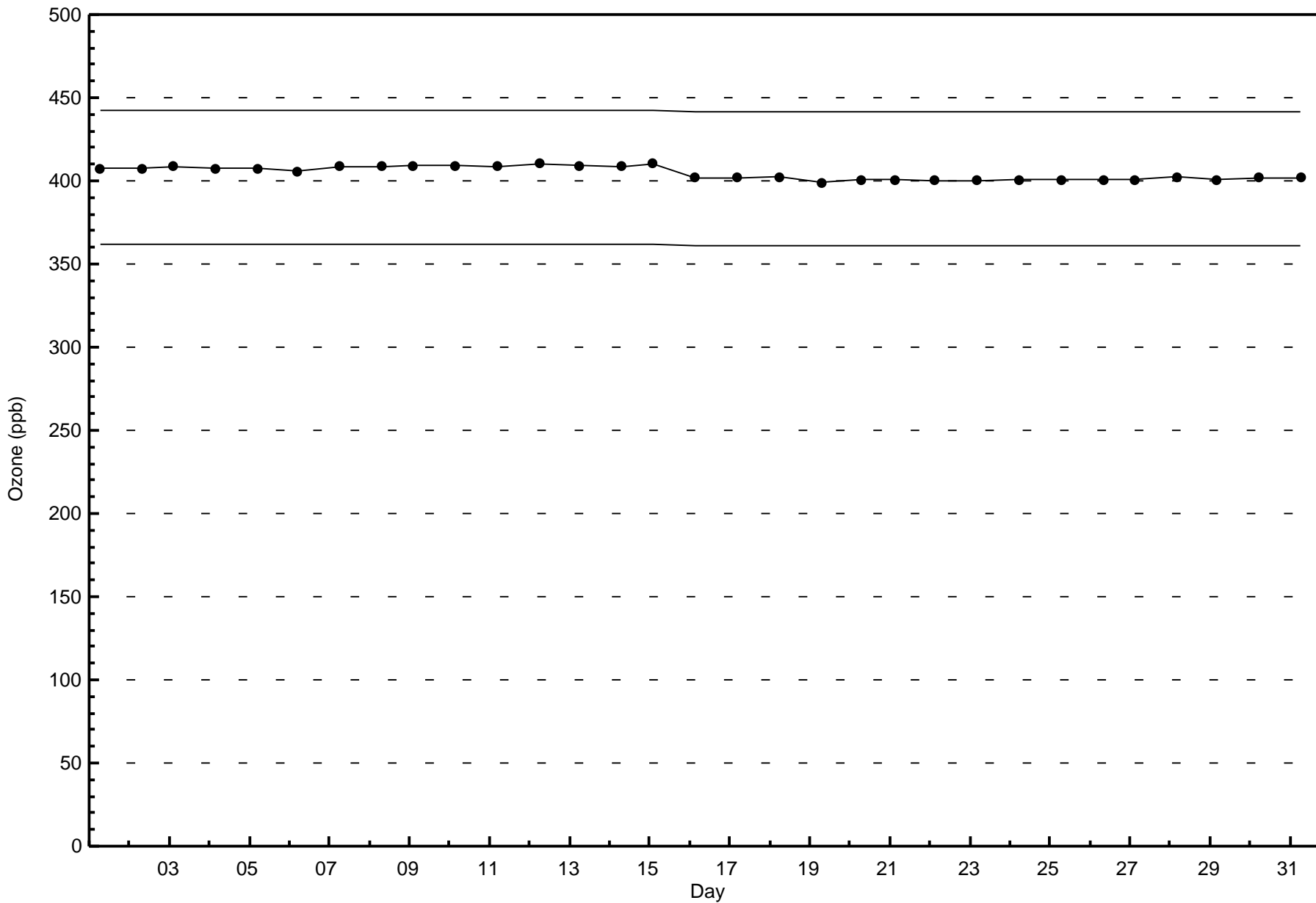
Total Number of Valid Hours: 709





Wood Buffalo Environmental Association  
Span Responses

Ozone (O<sub>3</sub>) - ppb  
Janvier - December 2017





Summary of Hour Averages

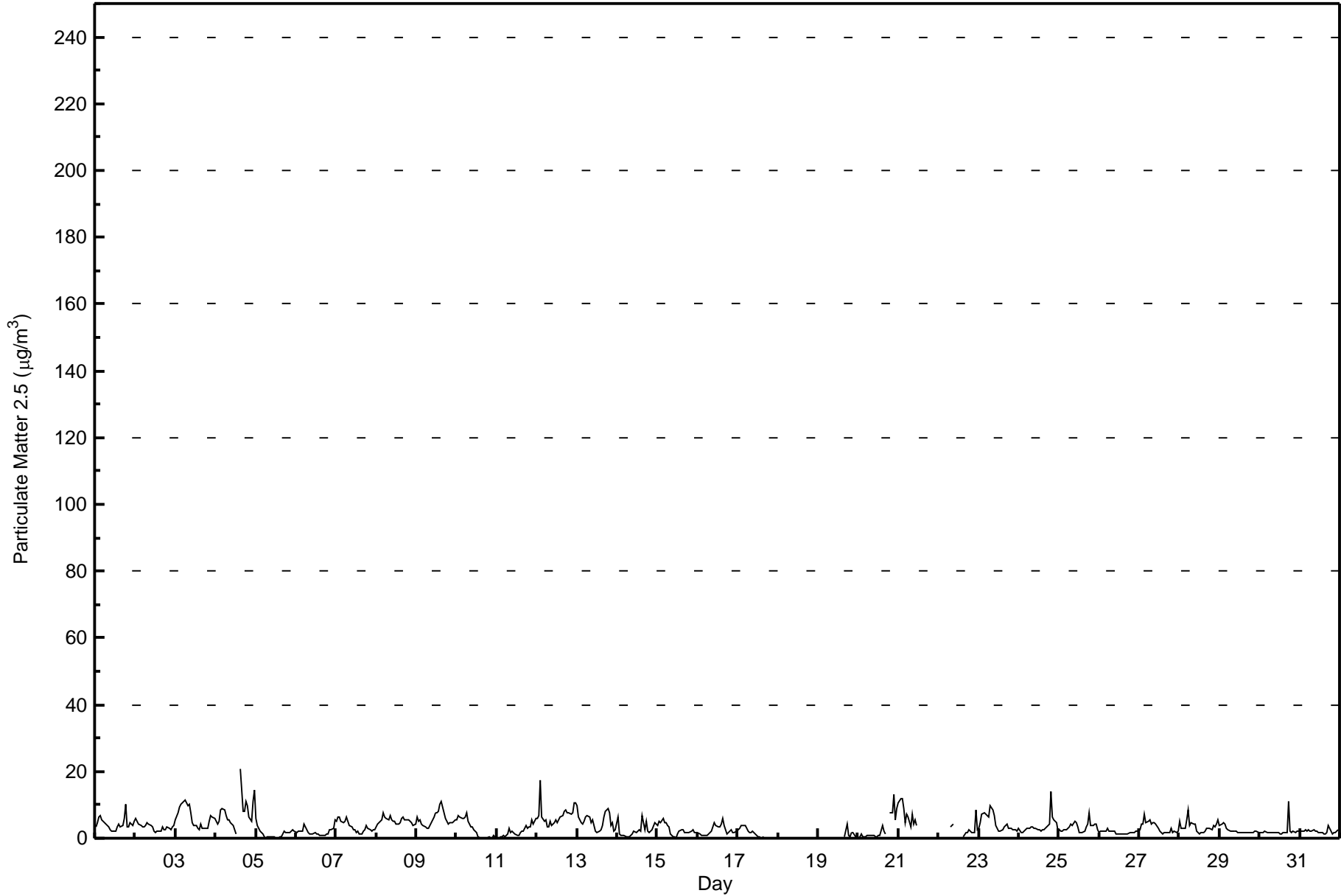
Janvier - December 2017

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 20.7 µg/m <sup>3</sup> on Dec 4 16:00 Minimum Value: 0.0 µg/m <sup>3</sup> on Dec 10 15:00 Maximum Diurnal Average: 4.5 µg/m <sup>3</sup> at hour 3 Monthly Average: 3.52 µg/m <sup>3</sup>		Maximum Daily Average: 7.5 µg/m <sup>3</sup> on Dec 4 Minimum Daily Average: 1.4 µg/m <sup>3</sup> on Dec 5 Minimum Diurnal Average: 2.1 µg/m <sup>3</sup> at hour 13 Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.9 Q <sub>1</sub> = 1.7 Median = 2.8 Q <sub>3</sub> = 4.7 P <sub>90</sub> = 6.9 P <sub>99</sub> = 11.6		Hours in Service: 744 Hours of Data: 668 Hours of Missing Data: 76 Hours of Calibration: 3 Percent Operational Time: 90.2																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	3.5	4.8	6.3	6.8	5.6	4.6	4.0	3.6	3.2	2.7	2.1	2.1	2.0	3.3	4.1	3.2	3.8	6.0	10.1	3.6	3.5	4.7	4.0	4.9	4.3	10.1	
2-Dec	5.9	4.9	4.3	4.0	3.5	3.5	3.7	4.5	4.2	3.9	3.2	2.2	1.7	2.2	2.0	2.3	3.6	2.4	2.4	3.3	2.9	2.5	3.4	3.8	3.3	5.9	
3-Dec	5.4	7.6	9.2	10.2	10.4	11.1	11.5	9.7	10.1	7.5	4.5	3.9	3.8	3.1	2.8	4.1	3.1	2.9	3.0	2.8	5.1	7.0	6.3	6.1	6.3	11.5	
4-Dec	5.3	4.4	5.2	8.5	9.0	8.3	6.9	5.6	5.5	4.8	4.0	2.3	1.4	M	M	20.7	8.3	7.8	10.9	9.8	6.5	5.2	11.0	14.3	7.5	20.7	
5-Dec	5.8	3.7	2.2	1.7	1.1	0.4	0.2	0.2	0.2	0.2	0.6	0.2	0.2	0.2	0.2	0.2	1.4	2.2	1.7	1.5	1.9	2.3	2.5	2.0	1.4	5.8	
6-Dec	1.7	2.0	2.1	1.9	2.1	4.2	2.5	1.7	1.3	1.4	1.4	1.5	1.1	1.4	0.9	0.9	1.0	1.0	1.1	1.3	2.3	2.4	3.1	5.4	1.9	5.4	
7-Dec	5.1	6.2	6.3	5.1	4.5	5.1	6.4	4.9	3.7	3.4	2.6	2.6	1.6	2.1	1.3	1.5	1.9	2.7	3.8	2.9	2.7	2.2	2.4	2.7	3.5	6.4	
8-Dec	3.6	4.3	5.1	5.5	7.8	6.6	6.1	5.6	6.8	5.4	5.0	4.9	4.2	4.4	4.8	6.0	6.4	5.5	5.5	5.4	5.2	4.6	3.7	4.1	5.3	7.8	
9-Dec	6.2	5.2	5.6	4.1	3.7	3.4	3.0	3.2	3.8	4.7	6.2	7.4	7.7	7.9	10.3	11.0	7.6	5.9	4.9	4.3	4.5	4.8	5.2	5.7	5.7	11.0	
10-Dec	5.6	6.9	6.2	6.1	6.0	6.4	7.5	4.9	3.4	3.3	2.7	2.3	1.6	0.6	0.0	0.2	0.1	0.0	0.0	0.3	0.1	0.1	0.8	0.3	2.7	7.5	
11-Dec	0.0	0.0	0.5	0.6	0.6	0.6	1.1	3.0	1.5	1.9	1.9	1.2	0.9	0.8	1.7	2.3	2.2	3.6	3.0	3.4	3.4	5.4	4.4	5.7	2.1	5.7	
12-Dec	5.9	7.0	17.3	6.2	4.9	5.3	3.3	3.5	5.0	3.8	4.5	5.6	4.7	5.6	6.4	6.9	8.0	8.5	7.6	7.6	7.3	7.8	10.5	10.8	6.8	17.3	
13-Dec	9.7	6.2	4.5	4.3	5.0	6.2	6.9	6.5	4.9	5.7	3.9	2.3	1.8	1.9	2.7	3.7	6.4	8.3	8.8	7.6	3.8	4.8	2.1	2.7	5.0	9.7	
14-Dec	6.5	1.4	0.9	0.9	0.9	0.6	0.6	0.6	0.8	1.1	2.2	1.7	2.1	2.4	2.2	6.8	2.5	5.0	2.1	1.9	2.2	2.7	4.6	4.3	2.4	6.8	
15-Dec	3.8	4.9	4.6	6.0	4.8	4.7	4.0	3.3	1.2	0.4	0.4	0.2	1.1	2.1	2.6	2.7	1.8	1.7	1.7	1.6	2.2	2.4	1.9	1.9	2.6	6.0	
16-Dec	1.8	1.3	1.0	0.7	0.9	0.7	1.0	1.7	2.1	3.6	4.5	3.9	3.5	3.3	4.3	6.1	3.8	1.3	1.6	2.0	2.7	1.9	1.5	2.0	2.4	6.1	
17-Dec	2.5	3.0	3.7	3.9	3.7	2.8	2.1	1.7	1.8	1.9	1.4	0.7	0.4	0.2	0.1	0.3	AF	AF	AF	AF	AF	AF	AF	AF	--	3.9	
18-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
19-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	0.5	4.4	1.0	0.5	1.6	1.5	0.4	0.8	--	4.4	
20-Dec	0.2	0.6	1.1	0.5	0.5	0.9	0.9	0.7	0.7	0.8	0.6	0.5	0.9	0.9	4.0	2.2	1.1	UO	UO	7.8	7.5	12.9	5.7	9.0	2.7	12.9	
21-Dec	10.4	12.0	11.7	8.9	4.8	7.1	6.3	3.2	7.1	4.1	5.5	3.7	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	12.0	
22-Dec	UO	UO	UO	UO	UO	UO	UO	3.3	3.9	4.4	UO	UO	UO	UO	UO	0.5	1.5	1.5	2.5	2.0	1.9	1.8	8.4	2.6	--	8.4	
23-Dec	2.9	4.8	7.2	7.7	7.0	6.6	6.5	9.7	8.4	6.9	4.0	3.1	2.2	2.1	2.4	3.2	3.7	4.2	3.1	2.9	2.6	2.4	2.4	1.9	4.5	9.7	
24-Dec	2.9	1.5	1.7	1.9	2.4	2.9	3.0	3.3	3.3	2.8	2.8	2.5	2.5	2.3	2.4	2.4	2.9	3.9	4.0	14.0	6.4	5.4	4.5	2.3	3.5	14.0	
25-Dec	2.3	2.0	2.3	2.3	2.6	3.0	3.4	4.0	3.9	5.1	4.6	3.2	1.7	1.7	1.8	2.0	3.5	4.1	7.7	3.8	4.0	4.3	4.1	2.6	3.3	7.7	
26-Dec	1.9	2.1	2.2	2.2	2.1	2.8	2.0	2.0	2.1	1.9	1.5	1.3	1.2	1.2	1.2	1.3	1.4	1.4	1.7	1.6	1.6	1.9	2.0	2.0	1.8	2.8	
27-Dec	2.6	4.0	4.4	7.1	4.7	5.1	5.6	4.3	4.6	4.5	4.3	3.1	2.0	1.6	1.4	1.5	1.7	1.5	1.9	3.0	1.7	2.2	1.8	2.3	3.2	7.1	
28-Dec	4.9	3.1	3.1	3.1	5.7	8.5	3.9	4.5	4.1	4.4	2.3	1.8	1.4	1.7	1.9	2.3	2.9	2.8	3.0	2.5	3.7	3.3	4.2	5.7	3.5	8.5	
29-Dec	3.9	4.3	4.5	4.1	3.1	2.4	2.2	1.9	2.2	2.0	2.0	1.6	1.5	1.6	1.6	1.6	1.9	1.5	1.9	1.7	1.6	2.1	2.2	1.8	2.3	4.5	
30-Dec	1.7	1.7	1.9	2.0	1.6	1.8	1.7	1.6	1.6	1.6	1.6	1.5	1.4	1.4	1.5	1.8	1.5	11.1	2.1	1.9	2.2	1.8	2.1	2.1	2.1	11.1	
31-Dec	2.2	2.1	2.1	2.4	2.3	2.7	2.3	2.3	2.6	2.3	2.1	1.9	1.6	1.6	1.4	1.5	1.6	3.7	2.8	1.3	1.5	1.5	2.0	2.6	2.1	3.7	
																								Diurnal Average			
																								Diurnal Maximum			
C - Calibration      M - Maintenance      AF - Analyzer Failure      UO - Unstable Operation Alberta Ambient Air Quality Objectives (AAAQO):      24-hr      30 µg/m <sup>3</sup>																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Janvier - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Janvier - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	475	71.11	71.11
6 - 15	120	17.96	89.07
16 - 25	2	0.30	89.37
26 - 80	0	0.00	89.37
> 81.0	0	0.00	89.37

Total Number of Valid Hours: 668

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

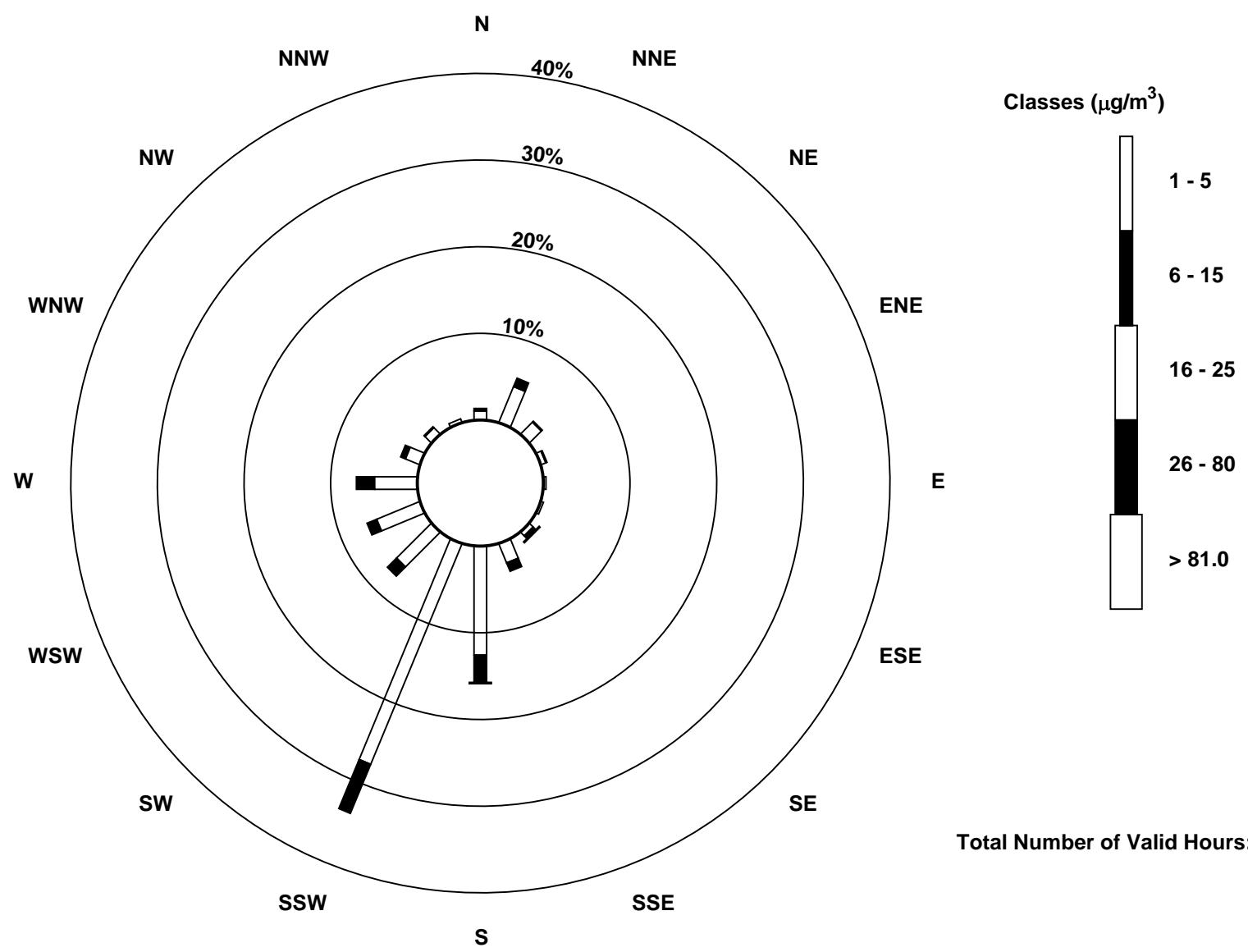
**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Janvier - December 2017**

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	7	30	13	4	2	2	4	16	84	184	38	36	33	12	7	3	475
6 - 15	2	7	1	1	0	0	3	7	21	41	10	8	14	4	1	0	120
16 - 25	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
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
<b>Totals</b>	9	37	14	5	2	2	8	23	106	225	48	44	47	16	8	3	597

Total Number of Valid Hours: 668

Total Number of Hours: 744







**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

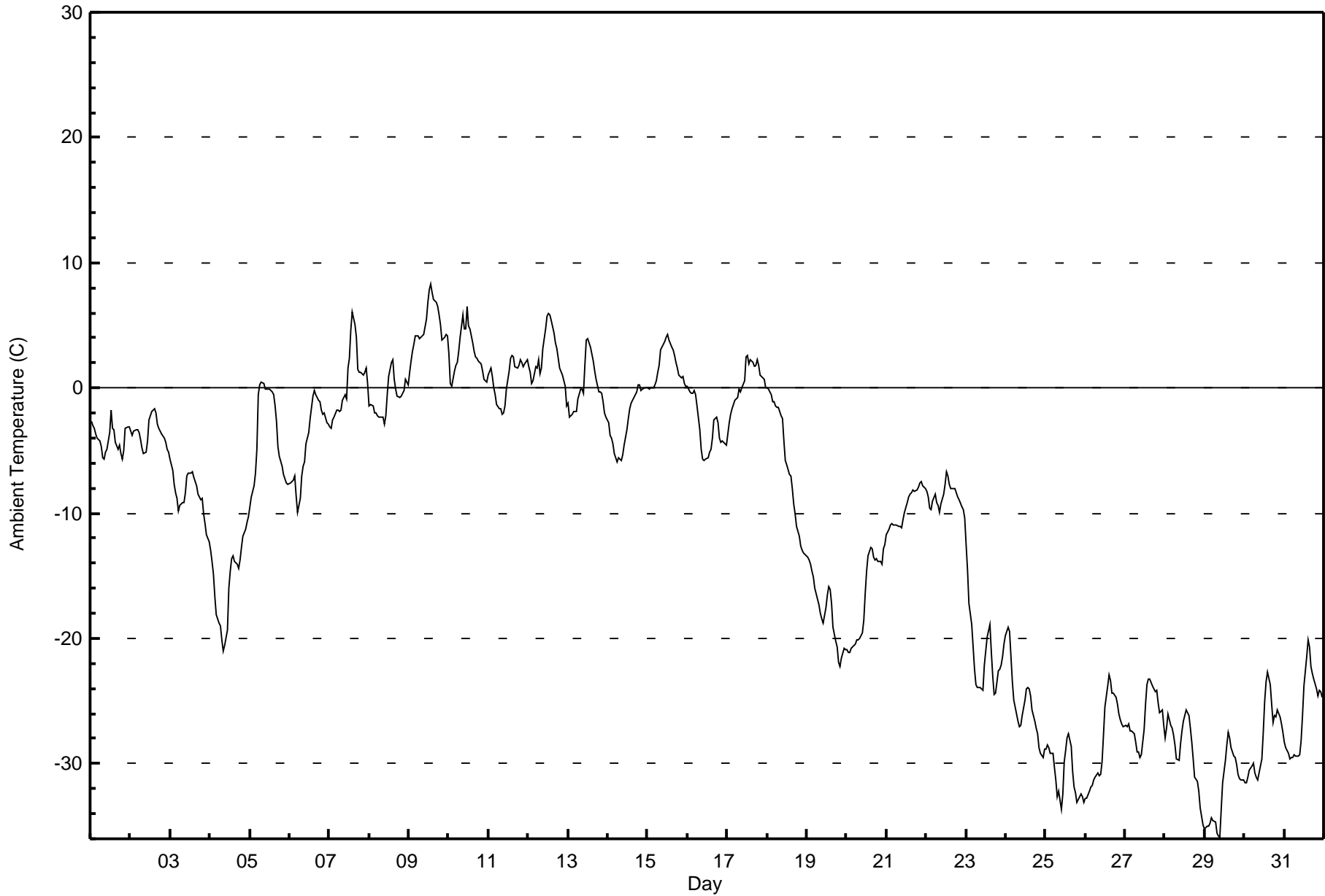
**Janvier - December 2017**

Maximum Value: 8.3 C on Dec 9 14:00		Maximum Daily Average: 4.9 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -35.9 C on Dec 29 10:00		Minimum Daily Average: -32.2 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -8.5 C at hour 15		Minimum Diurnal Average: -12.2 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -10.91 C		Percentiles: P <sub>1</sub> = -34.8 P <sub>10</sub> = -29.3 Q <sub>1</sub> = -23.3 Median = -7.1 Q <sub>3</sub> = -0.4 P <sub>90</sub> = 2.2 P <sub>99</sub> = 6.3		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-2.7	-3.0	-3.3	-3.7	-4.0	-4.2	-4.7	-5.6	-5.7	-5.1	-4.9	-3.6	-1.7	-3.3	-3.3	-4.4	-4.8	-4.6	-5.2	-5.6	-5.0	-3.2	-3.1	-3.1	-4.1	-1.7																						
2-Dec	-3.4	-3.8	-3.5	-3.3	-3.3	-3.6	-4.2	-4.8	-5.2	-5.1	-4.2	-2.6	-2.2	-1.9	-1.7	-2.0	-2.9	-3.3	-3.4	-3.7	-4.0	-4.3	-4.9	-5.2	-3.6	-1.7																						
3-Dec	-5.7	-6.5	-7.7	-8.4	-8.8	-9.8	-9.4	-9.2	-9.2	-8.4	-7.0	-6.8	-6.8	-6.7	-7.1	-7.5	-7.8	-8.5	-8.9	-8.9	-10.0	-10.8	-11.7	-12.3	-8.5	-5.7																						
4-Dec	-12.9	-13.9	-14.9	-16.7	-18.1	-18.8	-19.0	-20.2	-21.0	-20.6	-19.3	-15.9	-14.7	-13.6	-13.4	-13.9	-14.1	-14.4	-13.7	-12.7	-11.9	-11.3	-10.8	-10.2	-15.2	-10.2																						
5-Dec	-9.5	-8.7	-7.8	-6.8	-4.9	-0.5	0.2	0.4	0.3	-0.1	-0.1	-0.1	-0.1	-0.3	-0.6	-1.4	-2.7	-4.7	-5.5	-6.3	-6.9	-7.3	-7.6	-7.7	-3.7	0.4																						
6-Dec	-7.6	-7.5	-7.4	-7.0	-8.6	-10.0	-8.8	-7.1	-6.3	-5.9	-4.4	-3.6	-2.5	-1.5	-0.7	-0.2	-0.5	-0.9	-1.1	-1.7	-2.1	-1.9	-2.8	-2.8	-4.3	-0.2																						
7-Dec	-3.1	-3.2	-2.5	-2.3	-1.7	-1.8	-1.8	-1.8	-0.9	-0.5	-0.9	1.6	2.4	4.6	6.1	5.0	4.1	1.4	1.3	1.3	1.0	1.2	1.6	0.4	0.5	6.1																						
8-Dec	-1.4	-1.4	-1.4	-2.0	-2.0	-2.2	-2.3	-2.4	-2.4	-2.8	-2.3	-0.6	0.9	2.0	2.2	0.7	-0.1	-0.7	-0.8	-0.7	-0.4	-0.2	0.7	0.3	-0.8	2.2																						
9-Dec	1.3	2.2	2.9	3.5	4.1	4.2	3.9	4.0	4.2	4.3	5.5	6.8	7.9	8.3	7.6	7.0	6.9	6.6	5.9	5.1	3.8	4.1	4.3	4.1	4.9	8.3																						
10-Dec	2.7	0.3	0.2	1.4	1.8	2.0	2.9	4.1	5.8	4.7	4.7	6.5	4.9	4.7	3.6	2.9	2.4	2.3	2.2	1.9	1.4	0.7	0.6	0.5	2.7	6.5																						
11-Dec	1.0	1.6	1.0	0.1	-0.5	-1.3	-1.6	-1.6	-2.1	-2.0	-1.5	-0.1	1.4	2.4	2.6	2.4	1.7	1.6	1.8	2.2	2.0	1.7	1.9	2.3	0.7	2.6																						
12-Dec	1.7	1.3	0.3	0.5	1.7	1.5	2.2	1.2	1.6	3.1	4.7	5.7	5.9	5.8	5.4	4.4	3.6	3.1	2.3	1.6	1.0	0.5	0.1	-1.5	2.4	5.9																						
13-Dec	-1.2	-2.3	-2.1	-1.8	-1.9	-1.9	-0.9	-0.1	-0.1	-0.4	1.9	3.8	3.9	3.2	2.7	2.2	1.4	0.7	-0.3	-0.4	-0.4	-1.1	-1.9	-2.3	0.0	3.9																						
14-Dec	-2.8	-3.8	-4.0	-4.5	-5.2	-5.9	-5.6	-5.7	-5.8	-5.4	-4.6	-3.3	-2.5	-1.7	-1.2	-1.0	-0.5	-0.3	0.2	0.3	-0.2	-0.1	0.0	0.0	-2.7	0.3																						
15-Dec	0.0	-0.1	0.1	0.0	0.3	0.5	1.3	1.8	3.1	3.5	3.7	4.0	4.3	3.8	3.2	3.0	2.6	2.1	1.5	1.1	0.9	0.9	0.3	0.1	1.7	4.3																						
16-Dec	0.1	-0.3	-0.5	-0.4	-0.2	-0.6	-1.5	-3.4	-4.9	-5.7	-5.8	-5.7	-5.6	-5.1	-4.9	-4.0	-2.5	-2.3	-2.7	-4.1	-4.3	-4.2	-4.4	-4.6	-3.2	0.1																						
17-Dec	-3.7	-2.8	-2.1	-1.6	-1.0	-0.9	-0.7	-0.1	-0.3	0.0	0.6	2.5	2.6	1.9	2.2	2.1	1.7	1.8	2.2	1.9	1.0	0.8	0.6	0.0	0.4	2.6																						
18-Dec	0.0	-0.1	-0.5	-1.0	-1.1	-1.5	-1.6	-1.5	-2.3	-2.5	-4.3	-5.8	-6.1	-6.9	-7.0	-8.1	-9.2	-10.1	-11.1	-11.9	-12.6	-12.9	-13.1	-13.3	-6.0	0.0																						
19-Dec	-13.6	-13.8	-14.1	-14.6	-15.1	-15.9	-16.9	-17.3	-18.0	-18.4	-18.7	-17.5	-16.6	-15.9	-16.0	-17.2	-19.1	-20.2	-20.7	-21.9	-22.2	-21.5	-20.8	-20.9	-17.8	-13.6																						
20-Dec	-20.9	-21.1	-21.1	-20.8	-20.5	-20.4	-20.1	-20.1	-20.0	-19.6	-18.6	-16.4	-14.6	-13.4	-12.8	-12.9	-13.5	-13.7	-13.6	-13.8	-13.8	-14.1	-12.8	-12.5	-16.7	-12.5																						
21-Dec	-11.7	-11.2	-10.9	-10.8	-10.9	-10.9	-11.0	-11.0	-11.0	-11.1	-10.5	-9.9	-9.2	-8.7	-8.5	-8.3	-8.2	-8.3	-8.2	-7.9	-7.6	-7.5	-7.8	-8.0	-9.6	-7.5																						
22-Dec	-8.2	-8.7	-9.6	-9.7	-9.0	-8.5	-9.1	-9.3	-9.9	-9.3	-8.4	-7.7	-6.7	-7.1	-7.7	-8.1	-8.0	-8.0	-8.3	-8.7	-8.9	-9.5	-9.7	-10.4	-8.7	-6.7																						
23-Dec	-12.5	-14.5	-17.2	-18.9	-20.7	-22.5	-23.7	-24.0	-23.9	-24.0	-24.2	-22.1	-21.0	-19.9	-18.9	-21.1	-23.1	-24.4	-24.4	-22.6	-22.5	-22.1	-21.4	-20.4	-21.2	-12.5																						
24-Dec	-19.8	-19.1	-19.4	-21.4	-23.4	-24.9	-26.0	-26.6	-27.0	-27.0	-26.2	-25.0	-24.1	-23.9	-24.1	-24.6	-25.7	-26.6	-27.2	-27.6	-28.7	-29.1	-29.5	-28.9	-25.2	-19.1																						
25-Dec	-28.9	-28.5	-28.7	-29.2	-29.2	-30.3	-31.3	-32.6	-32.2	-33.7	-32.5	-29.8	-29.0	-27.9	-27.6	-28.7	-30.6	-31.9	-32.3	-33.1	-32.7	-32.4	-32.7	-33.0	-30.8	-27.6																						
26-Dec	-32.7	-32.7	-32.2	-31.9	-31.8	-31.3	-31.1	-30.8	-31.0	-30.8	-29.9	-27.7	-25.5	-23.8	-22.9	-23.3	-24.3	-24.3	-24.7	-25.3	-26.0	-26.5	-26.8	-27.1	-28.1	-22.9																						
27-Dec	-26.9	-27.1	-26.8	-27.3	-27.4	-27.6	-28.3	-29.0	-29.0	-29.5	-29.3	-27.3	-25.2	-23.7	-23.3	-23.2	-23.8	-24.0	-24.2	-24.2	-25.1	-25.9	-25.7	-27.0	-26.3	-23.2																						
28-Dec	-27.9	-27.1	-26.0	-27.0	-27.2	-27.7	-28.5	-29.6	-29.7	-28.4	-27.4	-26.7	-26.2	-25.8	-26.2	-27.2	-28.3	-29.7	-31.1	-31.4	-32.1	-33.5	-34.2	-34.9	-28.9	-25.8																						
29-Dec	-35.2	-35.0	-35.0	-34.8	-34.4	-34.6	-34.6	-35.5	-35.8	-35.9	-33.7	-31.5	-29.7	-28.5	-27.5	-28.0	-28.8	-29.4	-29.5	-30.1	-30.8	-31.1	-31.3	-31.3	-32.2	-27.5																						
30-Dec	-31.5	-31.5	-31.1	-30.5	-30.1	-29.9	-30.7	-31.0	-31.3	-30.7	-29.6	-27.5	-25.0	-23.4	-22.6	-23.7	-25.2	-26.7	-26.2	-26.3	-25.8	-26.3	-26.8	-27.4	-28.0	-22.6																						
31-Dec	-28.2	-28.7	-29.2	-29.6	-29.5	-29.5	-29.3	-29.4	-29.4	-29.3	-28.2	-26.1	-23.8	-21.5	-20.1	-20.7	-22.2	-22.8	-23.3	-24.0	-24.6	-24.1	-24.3	-24.7	-25.9	-20.1																						
																								-11.1	-11.3	-11.4	-11.6	-11.7	-11.9	-12.0	-12.2	-12.2	-12.1	-11.5	-10.1	-9.2	-8.6	-8.5	-9.0	-9.7	-10.3	-10.6	-10.9	-11.2	-11.3	-11.4	-11.7	Diurnal Average
																								2.7	2.2	2.9	3.5	4.1	4.2	3.9	4.1	5.8	4.7	5.5	6.8	7.9	8.3	7.6	7.0	6.9	6.6	5.9	5.1	3.8	4.1	4.3	4.1	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Janvier - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Janvier - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	225	30.24	30.24
-20 - 0	362	48.66	78.90
0 - 10	157	21.10	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) - %

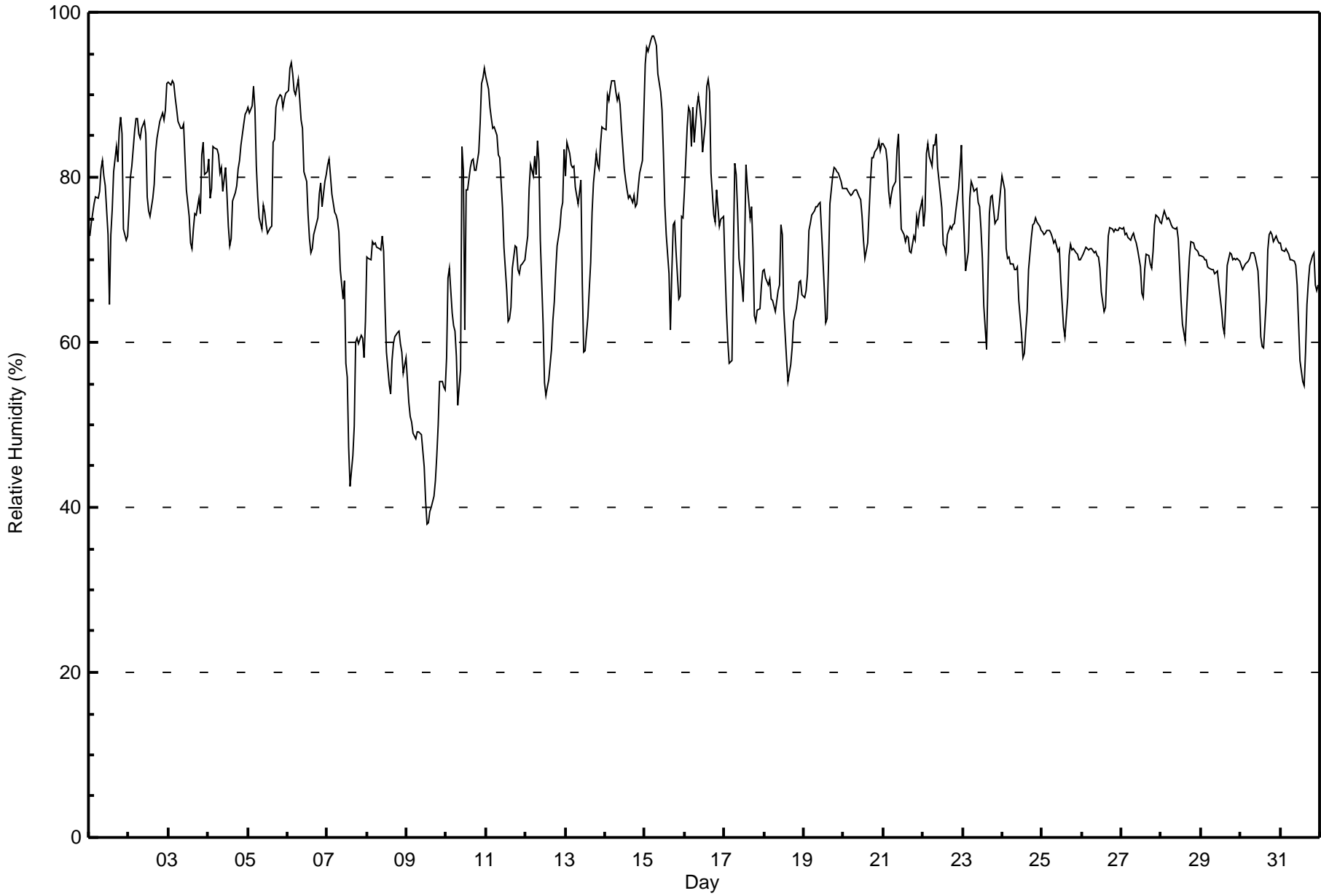
## Janvier - December 2017

Maximum Value: 97 % on Dec 15 05:00														Maximum Daily Average: 84.0 % on Dec 14														Hours in Service: 744	
Minimum Value: 38 % on Dec 9 13:00														Minimum Daily Average: 47.7 % on Dec 9														Hours of Data: 744	
Maximum Diurnal Average: 77.3 % at hour 4														Minimum Diurnal Average: 65.9 % at hour 15														Hours of Missing Data: 0	
Monthly Average: 73.8 %														Percentiles: P <sub>1</sub> = 43 P <sub>10</sub> = 61 Q <sub>1</sub> = 69 Median = 74 O <sub>3</sub> = 80 P <sub>90</sub> = 87 P <sub>99</sub> = 95														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	73	74	76	77	78	77	78	81	82	80	79	73	65	73	76	81	84	82	86	87	85	74	72	73	77.7	87			
2-Dec	76	80	81	86	87	87	85	85	86	87	85	78	76	75	77	79	83	85	86	87	88	87	88	91	83.5	91			
3-Dec	92	91	92	91	90	88	87	86	86	86	82	78	75	72	71	74	76	75	77	76	83	84	80	81	82.3	92			
4-Dec	82	77	79	84	84	83	83	80	81	78	81	78	74	72	73	77	78	79	81	82	84	86	88	88	80.5	88			
5-Dec	88	88	89	91	88	81	78	75	74	77	76	74	73	74	74	84	85	89	89	90	90	88	89	90	83.1	91			
6-Dec	91	93	94	93	90	90	92	90	87	86	81	79	75	73	71	71	73	74	75	78	79	76	80	80	82.1	94			
7-Dec	81	82	80	78	76	76	75	73	69	65	67	57	56	47	43	46	50	60	61	60	61	61	58	62	64.3	82			
8-Dec	70	70	70	72	72	72	72	71	71	73	71	64	59	55	54	58	60	61	61	61	60	59	56	58	64.6	73			
9-Dec	55	53	51	50	49	48	49	49	49	49	45	41	38	38	39	40	41	43	46	50	55	55	54	47.7	55				
10-Dec	58	68	69	64	62	61	58	52	57	84	81	62	78	78	81	82	82	81	81	83	87	91	92	93	74.4	93			
11-Dec	92	91	88	87	86	86	85	83	82	79	76	71	66	62	63	64	69	72	72	69	68	69	70	70	75.9	92			
12-Dec	72	73	79	81	80	82	80	84	82	72	62	55	54	55	55	59	63	65	69	72	74	76	77	83	71.0	84			
13-Dec	80	84	83	82	81	81	79	77	78	80	67	59	59	63	66	70	76	79	83	81	81	84	86	86	76.9	86			
14-Dec	86	90	89	91	92	92	90	89	90	89	86	81	80	78	77	78	77	78	76	77	79	80	82	88	84.0	92			
15-Dec	94	96	95	97	97	97	97	96	93	90	88	83	77	73	68	62	68	74	75	71	65	66	75	75	82.1	97			
16-Dec	78	86	88	88	84	89	84	89	90	88	87	83	87	91	92	90	80	75	75	79	76	74	75	75	83.5	92			
17-Dec	69	64	60	58	58	71	82	80	76	70	67	65	71	81	79	75	76	71	63	63	64	64	67	69	69.3	82			
18-Dec	69	68	67	68	65	65	64	64	66	67	74	73	64	58	55	56	57	59	63	64	66	67	67	66	64.7	74			
19-Dec	65	66	68	74	74	76	76	76	76	77	77	70	66	62	63	69	77	80	81	81	81	80	80	79	74.0	81			
20-Dec	79	79	79	78	78	78	78	79	78	78	77	75	72	70	72	76	79	82	82	83	84	84	83	84	78.7	84			
21-Dec	84	83	82	78	77	78	79	79	83	85	79	74	73	72	73	73	71	71	73	72	75	74	76	77	76.8	85			
22-Dec	74	76	83	84	83	81	84	84	85	81	78	76	72	71	71	73	74	74	74	74	76	79	81	84	78.0	85			
23-Dec	77	73	69	71	78	80	79	78	79	77	76	74	70	64	59	68	76	78	78	74	75	75	77	79	74.2	80			
24-Dec	80	79	71	70	70	69	69	69	69	65	61	58	59	61	64	69	73	74	74	74	75	75	74	73	69.6	80			
25-Dec	73	73	73	74	74	73	73	72	72	71	71	68	65	62	61	65	71	72	71	71	71	70	70	70	70.3	74			
26-Dec	70	71	72	71	71	71	71	71	71	71	70	69	66	64	64	69	73	74	74	73	74	74	74	74	70.9	74			
27-Dec	74	74	73	73	73	72	73	73	73	72	71	69	66	65	69	71	70	70	69	71	74	75	75	75	71.7	75			
28-Dec	74	75	76	75	75	75	74	74	74	74	72	69	65	62	60	64	67	70	72	72	71	71	71	71	71.0	76			
29-Dec	70	70	70	70	69	69	69	69	68	68	69	67	64	62	61	65	69	71	71	70	70	70	70	70	68.4	71			
30-Dec	69	69	69	70	70	70	71	71	71	70	69	65	61	59	59	65	71	73	73	73	72	73	72	72	69.1	73			
31-Dec	72	71	71	71	71	71	70	70	70	69	67	62	58	55	55	59	65	67	69	71	71	67	66	67	66.9	72			
																												Diurnal Average	
76.4														77.0														94	
77.0														77.3														95	
77.3														76.8														97	
77.2														76.9														97	
76.5														76.4														96	
76.4														76.2														93	
74.1														69.5														88	
69.5														67.2														83	
66.1														65.9														91	
65.9														68.6														92	
68.6														71.3														90	
71.3														72.8														85	
72.8														73.5														89	
73.5														73.9														89	
73.9														74.6														90	
74.6														74.5														90	
74.5														75.0														91	
75.0														76.0														92	
76.0																												93	
																												Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Janvier - December 2017**





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Janvier - December 2017

Maximum Speed: 19 km/h on Dec 10 14:00	Maximum Daily Speed Average: 11.3 km/h on Dec 17	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 28 03:00	Minimum Daily Speed Average: 0.5 km/h on Dec 19	Hours of Data: 744
Maximum Diurnal Speed Average: 5.3 km/h at hour 22	Minimum Diurnal Speed Average: 4.0 km/h at hour 17	Hours of Missing Data: 0
Monthly Average Velocity: 4.8 km/h 225.9 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 9 P <sub>90</sub> = 11 P <sub>99</sub> = 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-Dec	SSW12	SSW11	SSW10	SSW10	S11	S10	S9	S9	SSE6	SSE4	S6	S7	SW1	NE1	NNE1	SE1	S1	SSE2	S1	SSE3	S4	SSW7	SSW9	SSW10	S5.8	SSW12	
2-Dec	SSW8	SSW7	SSW9	SSW8	SSW8	SSW8	SSW9	SSW8	SSW7	SSW8	S8	SW7	SW7	SSW5	SSW7	SSW5	SSW4	S5	S7	SSW7	SSW8	SSW10	SW5	SSW5	SSW7.0	SSW10	
3-Dec	SSW6	SSW7	SSW7	SSW7	SSW9	S8	SSW10	SSW9	SSW8	SW6	W9	W10	W9	W8	W9	WSW8	W9	W12	WNW6	WNW5	NNE6	NNE6	NNE6	NNE8	WSW4.5	W12	
4-Dec	NNE7	NNE8	NNE6	N1	S2	SSW3	SSW3	SSE3	S3	SSE2	SSW4	SSW5	S6	SSW5	S3	SE4	SE5	SSE4	S4	S4	S4	SSE4	S4	SSE4	SSW2.2	NNE8	
5-Dec	S6	SSW7	SSW8	SSW6	WSW7	W13	W16	W15	WNW14	WNW12	WNW13	WNW9	WNW10	NW9	NW8	N8	NNE11	NNE11	NNE8	NNE10	NNE8	N5	NNE3	ENE3	WNW5.3	W16	
6-Dec	SSE2	SSE3	S3	S3	SE3	S3	SSW6	SSW8	SSW9	SSW10	SSW10	SSW12	SSW11	SSW9	SW9	SW11	SW10	WSW11	WSW11	WSW7	SW7	SW8	SW7	SW8	SSW7.0	SSW12	
7-Dec	SSW7	SW6	SW8	SSW7	SW8	SW10	SSW8	SW8	WSW10	SW6	S6	SSW6	S7	WSW6	W10	W10	W6	SSW5	SW6	WSW8	WSW7	WSW7	W7	SW5	SSW6.5	WSW10	
8-Dec	SSW7	SSW7	SSW7	SSW8	SSW9	SSW8	SSW9	SSW8	SSW8	S5	S4	SSW8	S8	SSW9	SSW10	S8	S7	S7	SSW12	SSW12	S10	S8	SSW8	SSW8	SSW8.1	SSW12	
9-Dec	SSW9	SW10	SW8	SW10	WSW14	W14	WSW13	WSW15	WSW14	WSW9	WSW9	SW5	W5	W7	WSW8	W9	W9	WSW10	WSW9	WSW10	SSW8	SW8	SSW7	SW8	WSW9.0	WSW15	
10-Dec	SSW7	SE2	S7	SSW7	S9	SSW8	SSW8	SW8	WSW13	SW7	SW10	W18	W16	W19	WNW14	WNW10	WNW10	WNW8	WNW6	WNW4	NNE1	ESE3	SSE2	S4	WSW6.2	W19	
11-Dec	S5	SW5	SW6	SSW6	SSW8	SSW7	SSW7	SW7	SSW8	SSW8	SSW7	SSW8	S7	SSW8	SSW8	SSW9	SSW9	SSW9	SSW10	SSW11	SSW12	SSW11	SSW12	SW11	SSW8.2	SSW12	
12-Dec	SSW12	SSW9	S5	S10	SSW9	SSW7	SSW8	S7	SSW8	WSW7	W6	WSW6	WSW7	W11	WNW10	W11	WNW8	NW8	W8	W6	W8	W6	W5	SSW5	WSW6.0	SSW12	
13-Dec	SSW5	S6	S5	S7	S7	SSW7	SSW7	SSW9	SSW9	SW8	W12	WNW15	WNW11	WNW10	WNW10	NNW6	N8	WNW4	WNW3	WSW4	W6	SW5	WSW4	WSW5	WSW4.8	WNW15	
14-Dec	WSW5	SW5	SSW5	SW5	SSW4	S7	SSW8	SSW8	SSW7	SSW8	SSW6	SSW9	SSW10	SSW9	S7	S4	S5	SSW6	SSW7	S6	S5	S5	SSW4	S5	SSW6.0	SSW10	
15-Dec	S3	SSW4	SSE3	S4	SSW5	S5	SSW8	SSW7	W10	W13	W12	W16	W15	W13	W13	W12	W10	WSW9	WSW9	WSW10	WSW10	WSW12	WSW10	WSW8.3	W16		
16-Dec	W13	WSW10	WSW9	WSW8	W11	W9	N6	NNE6	NNE9	NNE5	NNE4	E5	E3	SSW2	WSW2	SW4	SW5	SW7	SSW6	SSW9	SSW9	S8	SSW10	WSW3.5	W13		
17-Dec	S11	SSW10	SSW10	SSW10	SSW13	SSW13	SSW15	SSW12	SSW9	SSW10	SSW8	WSW12	W18	W15	W13	WSW13	WSW14	W16	W16	W17	W18	W15	W14	WSW9	WSW11.3	W18	
18-Dec	WSW12	W13	W12	WSW10	WSW10	WSW11	WSW10	W10	W12	W13	N9	NNW7	WNW10	WNW11	WNW8	WNW10	WNW9	WNW8	WNW5	WNW7	WNW8	WNW9	WNW7	WNW10	W8.6	W13	
19-Dec	WNW9	WNW7	NW5	N4	NNE5	NNE7	NNE7	NNE5	NNE6	NNE4	NE3	SW1	SSW3	SW3	SW4	SSE3	SE3	SSE2	SSE3	SSE2	S5	SSW7	SSW8	SSW8	WSW0.5	WNW9	
20-Dec	SSW8	SSW9	SSW8	SSW10	SSW10	S8	SSW9	SSW8	S8	S10	S9	SSW10	SSW9	SSW10	SSW9	S9	SSW9	SSW11	SSW11	SSW10	SSW8	SSW7	SSW9	SSW7	SSW9.0	SSW11	
21-Dec	SSW8	SW9	S3	WSW7	WSW7	W6	W6	W4	WSW4	WSW4	WNW5	NW4	WNW6	NW6	WNW5	WNW6	WNW7	W8	W7	W8	W12	WNW9	WNW9	WNW8	W5.8	W12	
22-Dec	W8	W6	SW5	SW5	WSW6	W7	W6	WSW5	SW5	SW6	WSW8	WSW9	W12	W14	W11	W10	W10	W10	W10	W9	W9	W7	W5	NNE8	W7.3	W14	
23-Dec	NNE13	NNE12	NNE10	NNE6	NNE4	NE1	SSE2	SE1	ENE1	NNE2	NNW1	NE3	NE6	NE4	NE2	ENE1	ENE2	S2	S5	SSW6	SSW8	SSW7	SSW6	SSW5	NE1.1	NNE13	
24-Dec	SSW2	NNE7	NNE8	N10	N8	NNE9	NNE8	NNE8	NNE7	N4	WNW5	NW4	NW5	NNE7	NNW3	W6	WSW3	SW3	SW3	SW2	SSW3	S4	S4	SSW6	NNW2.6	N10	
25-Dec	S6	S5	SSE2	ENE1	NNE3	NNE2	NE2	N1	NW1	S2	S2	NNE1	W3	WNW3	NNE4	NE1	SE1	SSE2	SSE2	S4	SSW6	SSW6	SSW8	SSW8	S1.5	SSW8	
26-Dec	SSW8	SSW8	SSW9	SSW9	SSW9	SSW9	SSW9	SSW8	SSW8	SSW7	SSW9	S9	S8	SSW7	SSW8	S7	SSW6	SSW7	SSW8	S9	S8	S8	S7	S7	SSW8.0	S9	
27-Dec	SSW7	SSW8	SSW7	SSW6	SSW8	SSW8	SSW6	SSW6	SSW6	SSW6	SSW8	SW7	SW6	SSW7	SSW7	SSW8	SSW8	SW8	WSW7	SW5	SSW6	S5	SSW3	S3	SSE2	SSW6.1	SSW8
28-Dec	S2	S3	ESE0	NE1	S2	SSE1	ESE1	NE1	NE2	NW1	NW3	N6	N6	NW4	WNW5	WNW4	WNW4	NE1	NE1	NNE2	NE1	S1	SSE1	S1	NNW0.9	N6	
29-Dec	S2	SW1	SW2	SSW3	SSW2	SSE2	SSE2	S3	SSE2	S3	SSW4	SSW6	SSW6	S7	S7	S6	SSW4	SSW5	SSW6	SSW8	SSW8	SSW8	SSW7	SSW8	SSW4.5	SSW8	
30-Dec	SSW9	SSW9	SSW8	SSW7	SSW7	SSW6	S6	S8	S6	S7	S6	S7	S6	S6	S5	S4	SE3	S4	S5	S6	SSW7	SSW8	SSW8	SSW8	SSW6.5	SSW9	
31-Dec	SSW7	S8	S7	S7	S7	SSW9	SSW10	SSW9	SSW8	SSW9	SSW9	SSW7	SW8	SW6	S8	S7	S5	S7	SSW8	SSW10	S9	SSW13	SSW11	SSW11	SSW8.2	SSW13	

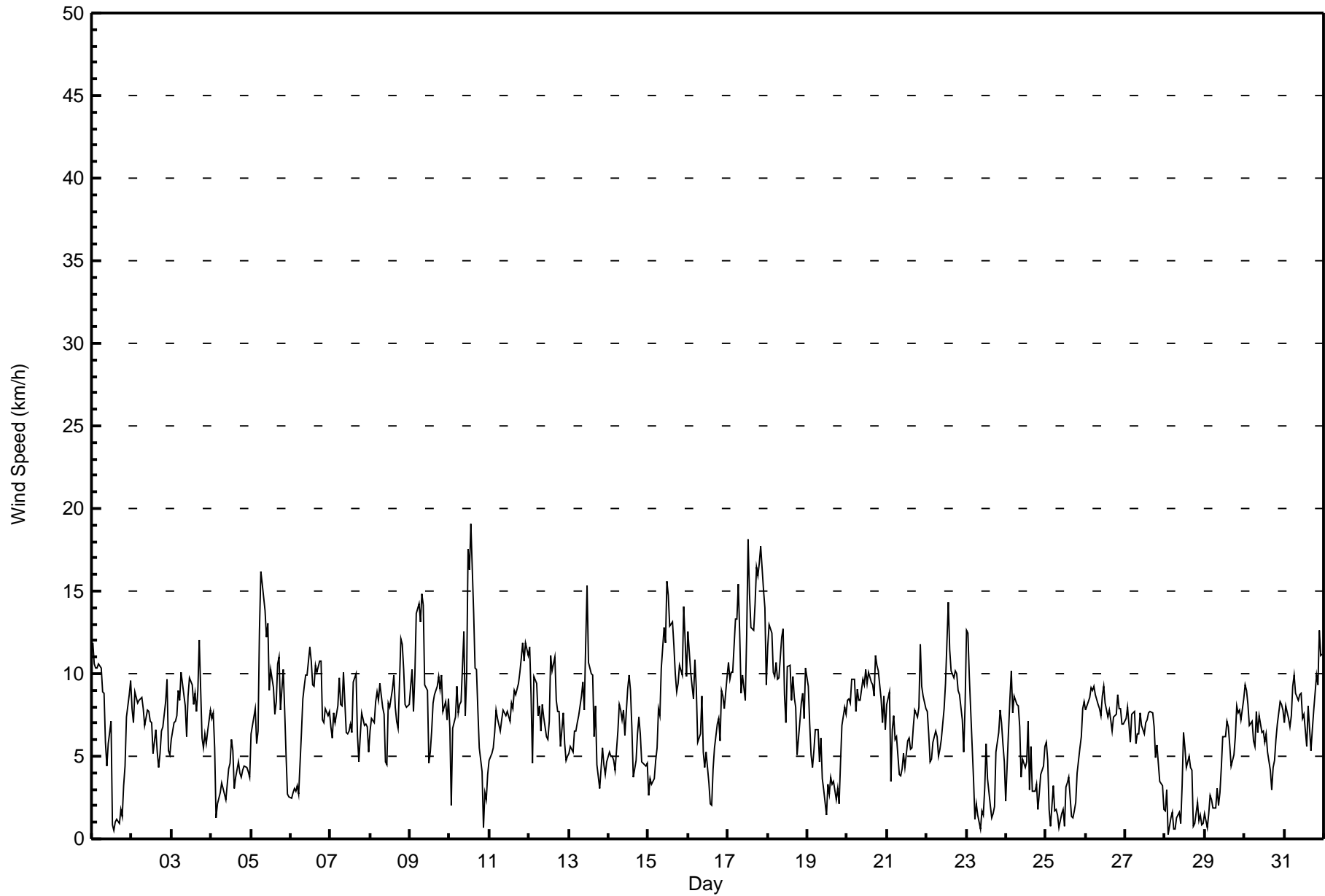
SSW5.1 SW4.7SSW4.2SSW4.7SSW5.3 SW5.2 SW5.3 SW5.0 SW4.8 SW4.8 SW4.5WSW5.0WSW5.1WSW5.2WSW4.9WSW4.5WSW4.0WSW4.5 SW4.9 SW5.0 SW5.0 SW5.3 SW5.0 SW4.8	Diurnal Average
NNE13 W13 W12 SSW10WSW14 W14 W16 W15WSW14 W13WNW13 W18 W18 W19WNW14WSW13WSW14 W16 W16 W17 W18 W15 W14 SSW11	Diurnal Maximum

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Janvier - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Janvier - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	218	29.30	29.30
6 - 11	463	62.23	91.53
12 - 19	63	8.47	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: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Janvier - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	15	14	5	2	3	9	26	52	30	21	9	5	12	8	2	218
6 - 11	8	27	1	0	0	0	0	1	63	207	37	38	44	31	4	2	463
12 - 19	0	2	0	0	0	0	0	0	0	12	0	11	33	5	0	0	63
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
<b>Totals</b>	13	44	15	5	2	3	9	27	115	249	58	58	82	48	12	4	744

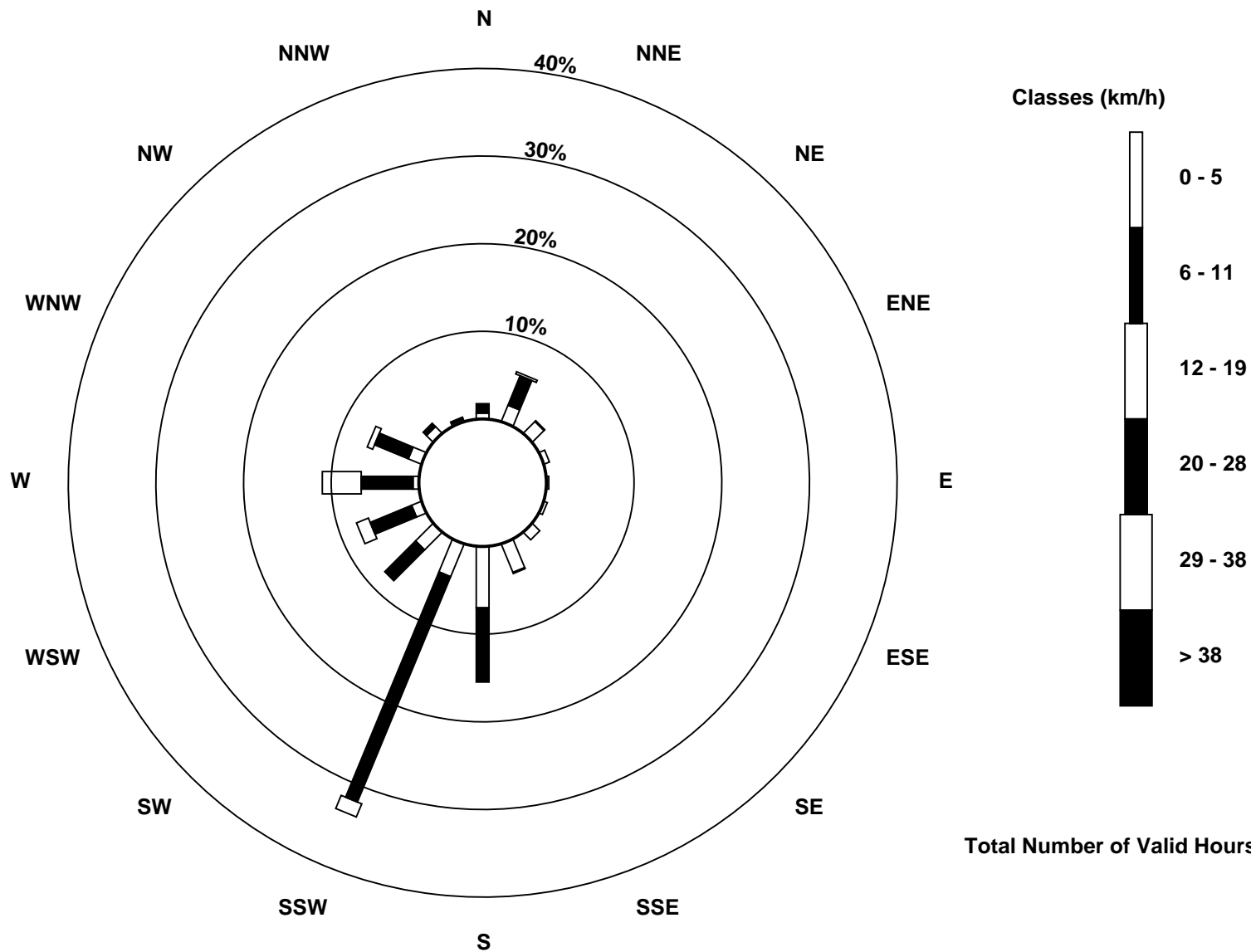
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Janvier (AMS 22)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Janvier - December 2017**

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Janvier - December 2017**

Direction of Maximum Speed: 276 deg on Dec 10 14:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 238.8 deg on Dec 17	Hours of Data: 744
Direction of Minimum Speed: 114 deg on Dec 28 03:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 0.5 deg on Dec 19	Percent Operational Time: 100.0
Monthly Average Direction: 225.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	202	203	205	198	191	190	188	185	164	148	173	183	220	45	29	138	181	148	186	163	186	199	200	204	190.3
2-Dec	207	204	202	198	203	207	213	213	199	194	191	220	225	206	194	192	192	177	183	193	199	195	215	209	201.6
3-Dec	192	197	192	192	199	191	194	197	199	220	273	274	279	276	268	257	267	272	289	290	18	15	14	23	246.1
4-Dec	17	19	21	353	172	205	208	147	173	166	192	201	186	200	189	141	143	155	172	170	173	155	171	164	165.4
5-Dec	179	210	210	200	242	268	276	276	284	283	292	293	302	308	326	9	16	18	15	18	14	8	14	63	303.2
6-Dec	165	162	186	171	143	183	197	202	199	202	198	202	196	203	227	233	233	240	243	239	231	227	220	221	213.1
7-Dec	204	217	217	208	221	221	212	219	239	229	175	193	175	252	270	268	262	203	221	238	240	253	265	235	228.4
8-Dec	198	206	203	195	202	193	193	199	193	180	178	194	191	194	192	185	186	191	193	195	188	180	193	195	192.7
9-Dec	201	226	235	233	257	259	252	248	246	244	247	236	280	264	258	260	271	252	251	255	203	221	209	233	244.4
10-Dec	200	129	189	202	191	204	207	233	251	223	221	264	267	276	291	290	286	293	302	293	21	104	152	177	248.7
11-Dec	189	216	222	206	194	193	205	214	197	203	206	193	190	192	196	201	200	205	212	202	195	204	192	215	201.5
12-Dec	205	207	176	186	193	210	196	191	196	240	266	239	253	267	285	278	294	305	279	271	271	264	259	210	240.1
13-Dec	211	184	177	180	191	200	211	207	211	216	267	284	298	297	296	333	3	303	284	243	262	235	247	257	250.7
14-Dec	252	215	210	222	196	191	198	196	205	202	196	204	197	193	181	185	173	199	192	187	169	178	198	186	196.9
15-Dec	181	209	151	187	192	177	195	199	265	269	267	269	274	275	275	271	259	256	250	252	249	256	251	248	252.2
16-Dec	264	254	257	258	262	263	350	18	24	21	31	85	85	206	245	214	221	228	220	197	204	209	185	197	241.0
17-Dec	190	192	193	204	201	205	204	208	203	208	212	255	265	262	262	242	245	260	270	268	268	268	271	257	238.8
18-Dec	253	262	265	251	246	249	252	263	269	275	358	346	292	300	300	292	289	289	298	285	294	291	302	286	279.8
19-Dec	288	290	314	7	14	23	28	26	26	25	49	215	211	221	221	167	146	154	166	159	190	193	194	192	251.4
20-Dec	192	192	194	194	195	190	195	192	189	191	188	194	205	205	204	191	197	199	199	199	198	192	193	193	195.3
21-Dec	206	217	183	237	255	265	273	279	237	245	290	305	295	317	293	290	284	274	263	267	272	282	282	284	267.9
22-Dec	277	261	236	217	246	267	261	256	236	235	242	256	274	272	270	272	273	276	277	276	274	263	273	15	266.6
23-Dec	20	20	20	16	29	49	157	130	72	25	332	46	38	44	50	67	77	171	188	212	196	198	209	193	47.6
24-Dec	206	17	12	6	2	12	12	17	12	350	289	315	324	19	347	280	258	233	224	218	203	190	186	194	345.4
25-Dec	191	181	158	75	27	19	48	5	325	172	171	28	265	300	24	48	142	166	155	187	205	205	199	192	191.1
26-Dec	201	199	203	200	201	199	200	203	208	199	192	190	186	192	192	188	196	196	200	189	187	189	187	191	195.5
27-Dec	193	197	204	206	206	207	205	205	205	210	219	221	195	193	194	204	222	237	228	207	189	210	187	160	205.9
28-Dec	184	185	114	45	190	152	102	38	43	326	312	6	1	311	285	284	292	41	37	31	48	174	151	171	329.1
29-Dec	182	220	227	205	195	157	153	181	156	171	194	207	206	191	189	187	206	212	206	199	195	198	203	198	196.1
30-Dec	200	199	200	199	198	200	190	189	189	191	190	185	183	187	191	190	132	179	184	190	196	193	196	195	191.8
31-Dec	193	191	188	188	190	195	192	194	198	195	197	194	227	219	191	191	186	190	204	193	191	196	204	205	196.5

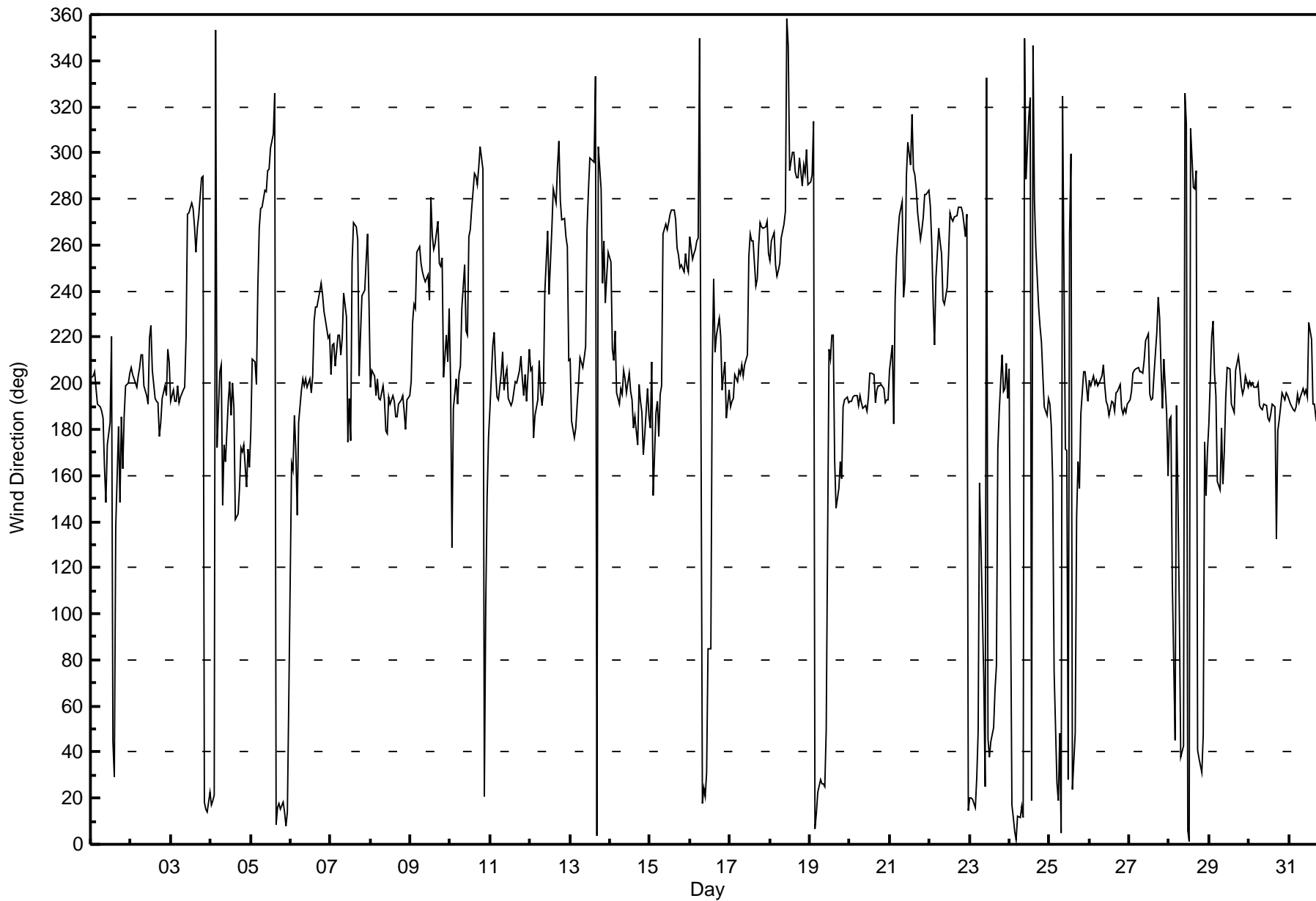
212.6 214.7 211.6 208.8 212.6 217.1 215.4 216.5 222.9 222.5 229.3 236.8 245.5 249.9 248.7 243.3 244.3 239.5 231.9 227.1 222.1 219.9 218.4 214.9  
 Diurnal Average

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Janvier - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Janvier - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 99 deg on Dec 25 12:00 Minimum Value: 8 deg on Dec 30 08:00 Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 12 Q <sub>1</sub> = 15 Median = 20 Q <sub>3</sub> = 29 P <sub>90</sub> = 52 P <sub>99</sub> = 82																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	16	17	17	15	13	12	11	12	19	21	21	15	67	86	46	70	78	57	63	23	19	16	16	17	86
2-Dec	17	17	16	15	18	18	18	19	19	12	12	22	19	21	14	13	16	18	18	16	15	14	22	22	22
3-Dec	22	19	10	8	17	12	14	15	14	24	20	28	29	27	20	20	17	21	43	43	17	26	22	16	43
4-Dec	22	21	28	54	27	29	26	20	22	26	19	26	20	22	51	22	23	29	28	34	22	24	22	20	54
5-Dec	26	27	17	23	38	18	20	25	32	33	36	50	53	69	75	48	24	20	25	22	25	51	58	27	75
6-Dec	25	30	26	28	15	34	15	17	16	17	17	19	16	18	21	20	19	19	22	19	19	18	16	18	34
7-Dec	16	20	21	24	22	22	19	24	21	33	16	21	19	30	19	22	30	38	23	17	18	20	25	28	38
8-Dec	13	14	13	10	15	12	10	12	13	13	19	13	12	13	12	13	14	13	11	12	12	21	16	17	21
9-Dec	18	27	40	33	26	22	25	23	22	33	44	69	57	36	23	22	28	21	18	21	15	20	22	23	69
10-Dec	54	69	12	11	11	18	18	31	24	29	22	21	20	27	43	39	36	48	60	64	95	36	57	18	95
11-Dec	11	19	21	18	13	11	14	17	10	15	17	15	14	14	14	18	17	19	18	16	14	17	15	19	21
12-Dec	20	25	31	10	11	15	29	20	13	25	29	29	21	23	36	26	50	63	35	35	24	27	32	21	63
13-Dec	22	16	15	13	12	14	18	21	21	18	33	34	54	54	55	72	61	60	42	25	29	19	29	21	72
14-Dec	20	15	16	18	15	10	13	11	13	16	17	20	17	15	15	27	26	19	17	21	25	27	24	19	27
15-Dec	39	28	25	34	19	22	16	17	22	18	18	18	22	29	26	27	18	21	21	21	21	22	21	23	39
16-Dec	20	20	19	21	20	22	52	20	15	21	25	28	36	60	46	26	22	24	23	19	17	18	15	14	60
17-Dec	15	14	15	19	18	20	19	21	17	23	20	25	20	20	18	21	21	20	20	19	17	18	20	20	25
18-Dec	20	20	19	19	19	19	19	20	19	24	48	55	53	56	63	50	43	41	56	35	45	48	64	35	64
19-Dec	44	48	57	46	29	13	14	18	16	22	30	84	71	47	31	26	19	21	24	24	18	10	13	12	84
20-Dec	8	8	12	11	13	11	13	13	13	12	10	15	20	18	17	16	13	13	14	15	15	15	16	18	20
21-Dec	21	19	59	46	22	18	24	28	24	25	36	60	51	69	54	46	37	21	19	19	21	34	34	33	69
22-Dec	26	18	17	18	21	19	15	23	22	20	22	21	23	21	21	20	21	22	26	20	22	16	24	63	63
23-Dec	18	20	20	23	18	35	35	69	73	40	49	43	9	18	37	60	45	64	8	17	11	14	18	14	73
24-Dec	63	36	42	48	59	46	46	38	48	76	51	67	62	29	60	38	41	23	23	40	20	14	11	11	76
25-Dec	10	15	39	71	29	40	30	60	98	51	49	99	70	57	38	53	65	27	15	11	17	15	13	9	99
26-Dec	13	14	15	14	15	14	15	15	14	14	13	12	12	15	11	13	11	9	14	9	9	10	11	9	15
27-Dec	10	11	14	13	16	16	16	15	17	17	19	19	21	18	16	20	21	19	22	14	9	26	23	17	26
28-Dec	36	13	85	50	51	74	76	88	41	84	71	58	53	54	59	41	61	71	64	25	32	51	68	47	88
29-Dec	23	61	34	35	30	32	24	16	23	23	18	19	21	19	11	10	17	14	13	13	11	11	13	14	61
30-Dec	14	14	13	14	14	16	11	8	9	9	11	8	8	8	9	12	18	19	9	8	11	10	12	11	19
31-Dec	11	9	10	11	10	14	12	12	13	13	17	21	21	28	13	16	17	20	16	10	11	15	19	18	28
63 69 85 71 59 74 76 88 98 84 71 99 71 86 75 72 78 71 64 64 95 51 68 63																									
Diurnal Maximum																									







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

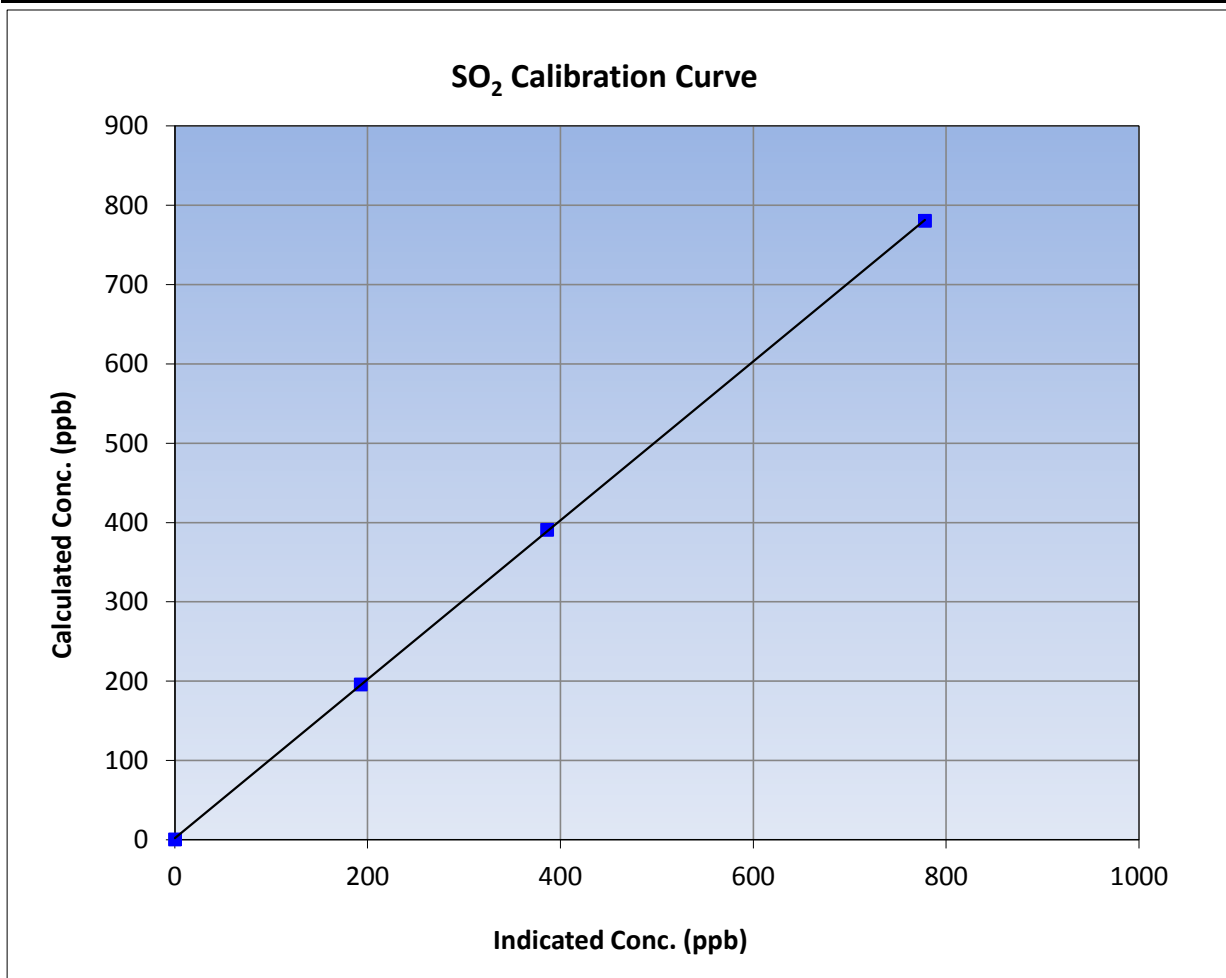
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 15, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	14:30	End Time (MST)	18:31
Analyzer make	Thermo 43i	Analyzer serial #	1152430006

### Calibration Data

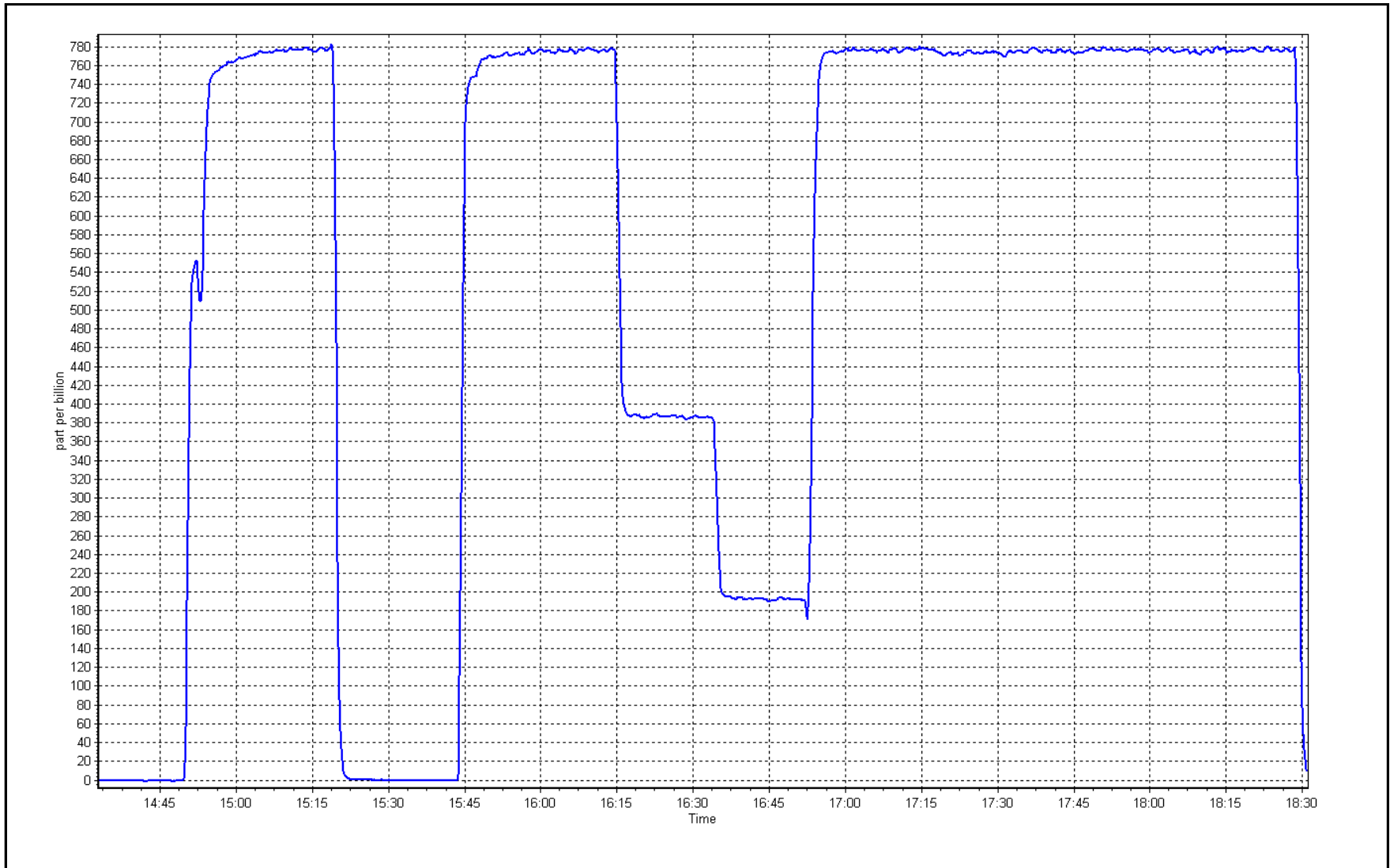
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.2	----	Correlation Coefficient	0.999975	≥0.995
780.1	777.8	1.0030			
390.4	385.8	1.0120	Slope	1.002303	0.90 - 1.10
195.3	192.5	1.0147			
			Intercept	1.718337	+/-30



SO2 Calibration Plot

Date: 19-Dec

Location: Janvier







# Wood Buffalo Environmental Association

## TRS Calibration Summary

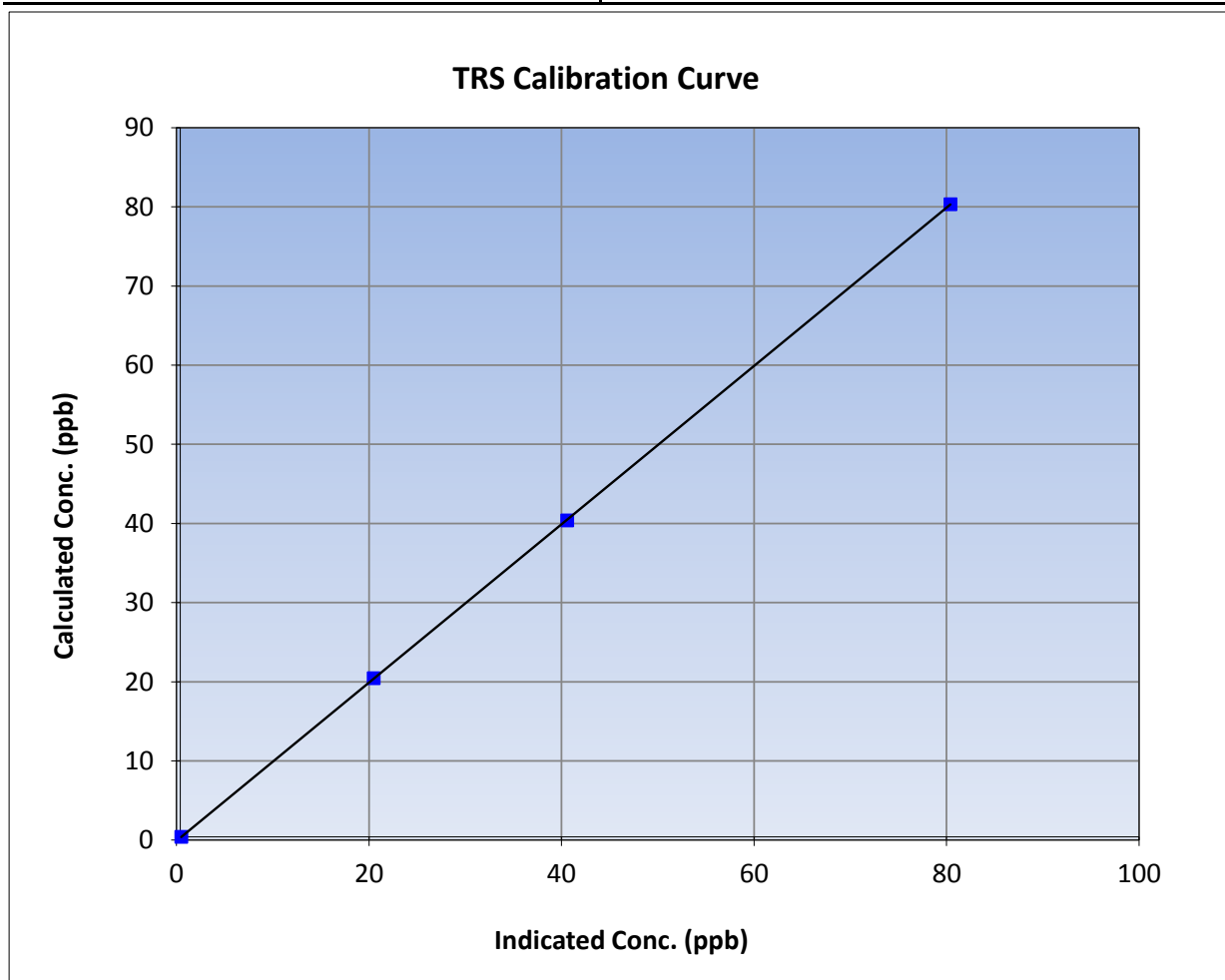
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 7, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	11:09	End Time (MST)	14:26
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1151680031

### Calibration Data

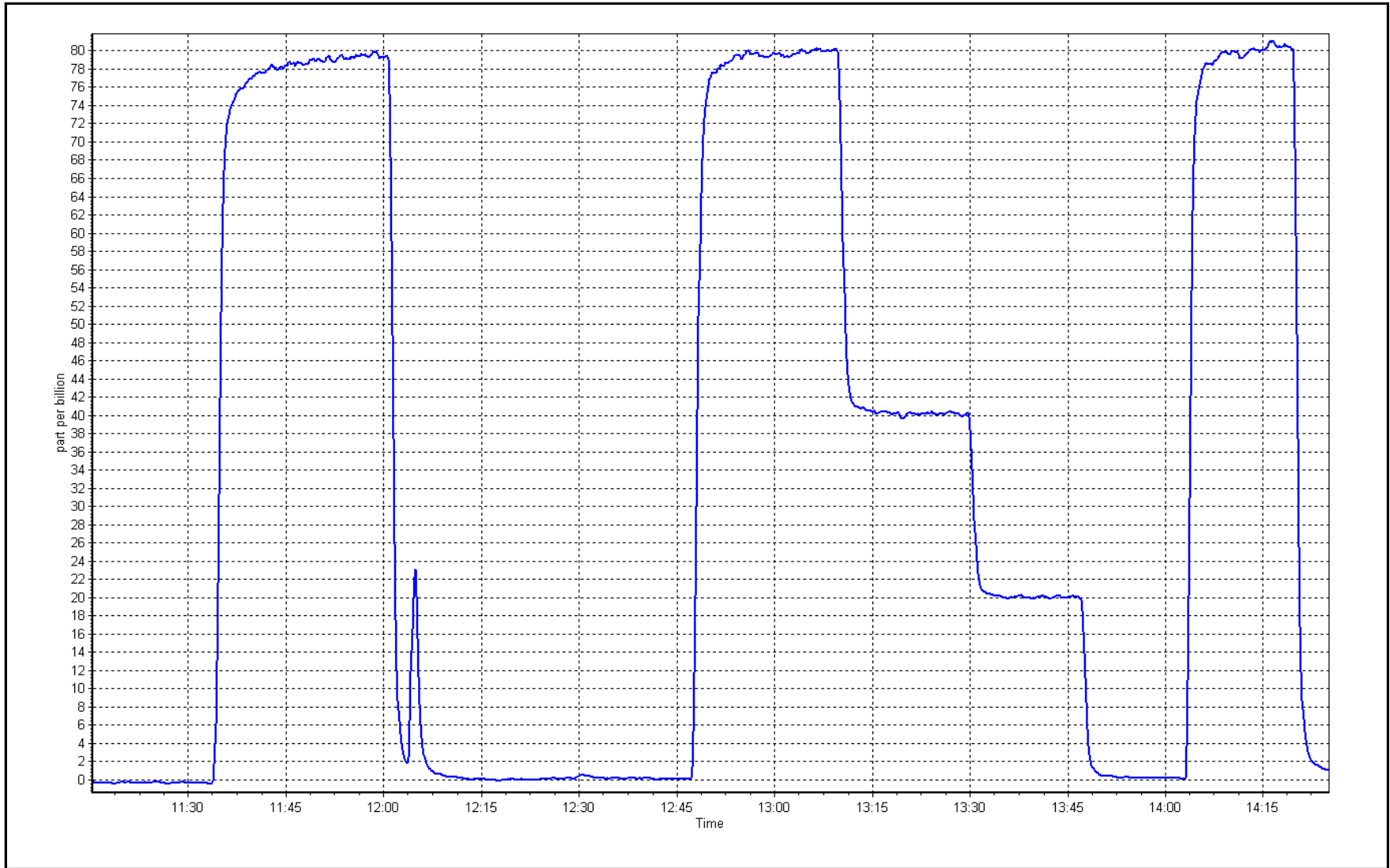
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.1	----	Correlation Coefficient	0.999995	≥0.995
79.9	80.0	0.9993			
40.0	40.2	0.9947	Slope	1.000281	0.90 - 1.10
20.0	20.1	0.9970			
			Intercept	-0.116242	+/-3



TRS Calibration Plot

Date: 19-Dec

Location: Janvier





# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-03-2017

### Station Information

Station Name:	Janvier	Station number:	AMS 22
Calibration Date:	December 19, 2017	Last Cal Date:	December 10, 2017
Start time (MST):	12:52	End time (MST):	18:31
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	LL107937	Cal Gas Expiry Date	September 8, 2018
CH4 Cal Gas Conc.	<u>509.0</u> ppm	CH4 Equiv Conc.	1056.3 ppm
C3H8 Cal Gas Conc.	<u>199.0</u> ppm	Station temp.	21 Deg C
Calibrator Model	Teledyne API 700	Serial Number	2447
ZAG make/model	Teledyne API 701	Serial Number	135

### Analyzer Information

Analyzer make: Thermo 55i

Analyzer serial #: 1501663728

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
CH4 SP Ratio	NA	NA	Flame Temp	405.0	405.0
CH4 Retention time	NA	NA	Carrier Pressure	36.7	36.7
NMHC SP Ratio	NA	NA	Fuel Pressure	44.9	44.9
NMHC Peak Area	NA	NA	Air Pressure	33.7	33.7

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
THC Cal Slope	0.998621	0.996760
THC Cal Offset	0.070854	0.069300
CH4 Cal Slope	1.006372	1.007319
CH4 Cal Offset	0.039041	0.032419
NMHC Cal Slope	0.991542	0.988219
NMHC Cal Offset	0.031300	0.035495

Notes:

No adjustments needed.

Calibration Performed By:

Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## THC / NMHC Calibration Report

Version-02-2017

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5009	0.0	0.00	0.00	----
as found span	4935	78.7	16.58	16.59	0.999
calibrator zero	5009	0.0	0.00	0.00	----
high point	4935	78.7	16.58	16.61	0.998
second point	4978	39.4	8.29	8.19	1.013
third point	4995	19.7	4.15	4.04	1.027
as left zero					
as left span					
Average Correction Factor					1.013
Corrected As found	16.59	Prev response	16.53	*% change	-0.3%

### NMHC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5009	0	0.00	0.00	----
as found span	4935	78.8	8.60	8.68	0.991
calibrator zero	5009	0	0.00	0.00	----
high point	4935	78.7	8.59	8.68	0.990
second point	4978	39.4	4.30	4.28	1.005
third point	4995	19.7	2.15	2.12	1.016
as left zero					
as left span					
Average Correction Factor					1.003
Corrected As found	8.68	Prev response	8.64	*% change	-0.4%

### CH4 Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit= 0.95-1.05</i>
as found zero	5009	0.0	0.00	0.00	----
as found span	4935	78.7	7.99	7.91	1.010
calibrator zero	5009	0.0	0.00	0.00	----
high point	4935	78.7	7.99	7.92	1.009
second point	4978	39.4	4.00	3.91	1.023
third point	4995	19.7	2.00	1.93	1.039
as left zero					
as left span					
Average Correction Factor					1.023
Corrected As found	7.91	Prev response	7.90	*% change	-0.1%

\* = > +/-5% change initiates investigation



# Wood Buffalo Environmental Association

## THC Calibration Summary

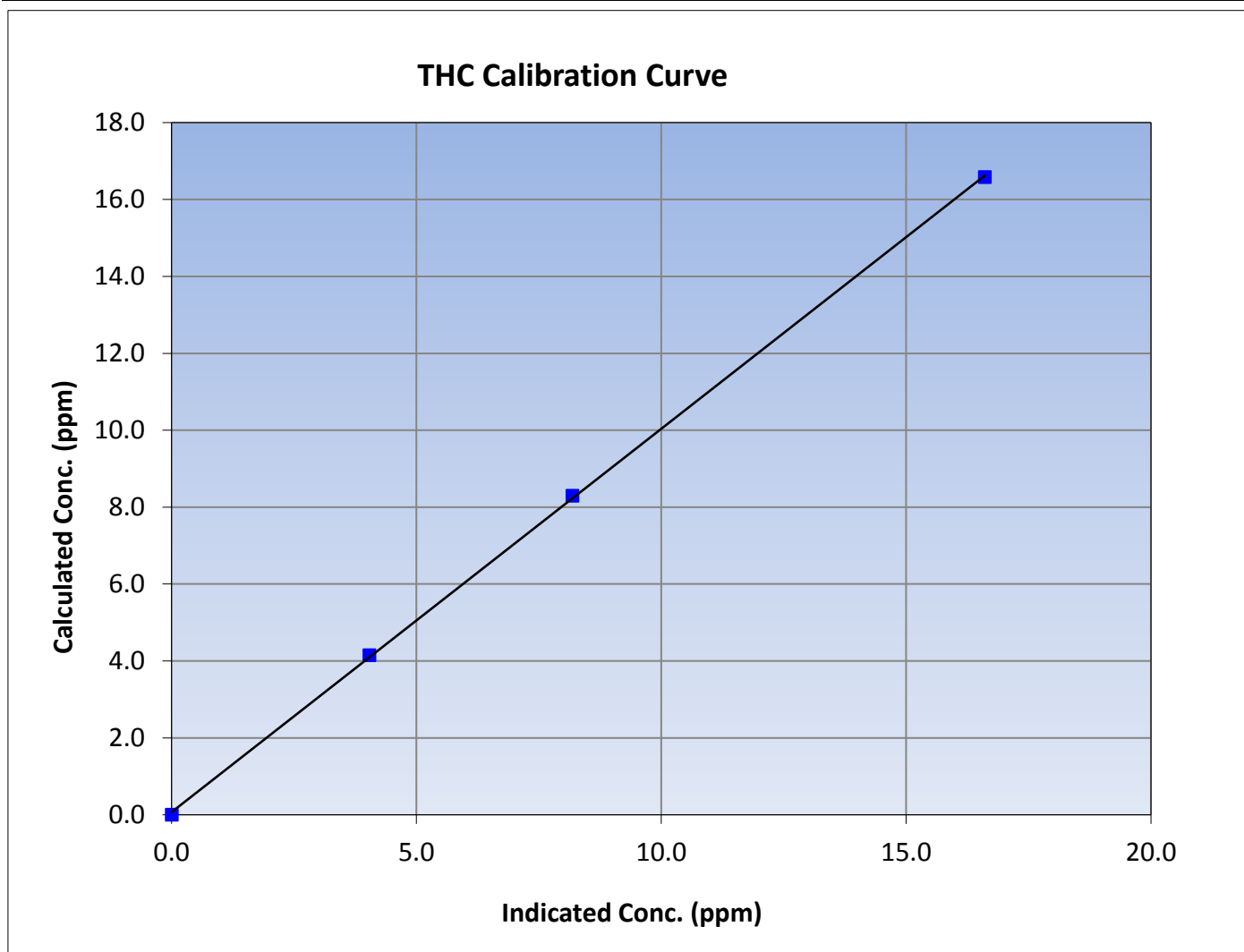
Version-02-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	December 10, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	12:52	End Time (MST)	18:31
Analyzer make	Thermo 55i	Analyzer serial #	1501663728

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999906	$\geq 0.995$			
16.58	16.61	0.9983						
8.29	8.19	1.0131				Slope	0.996760	0.90 - 1.10
4.15	4.04	1.0268						
			Intercept	0.069300	$\pm 0.5$			







# Wood Buffalo Environmental Association

## CH<sub>4</sub> Calibration Summary

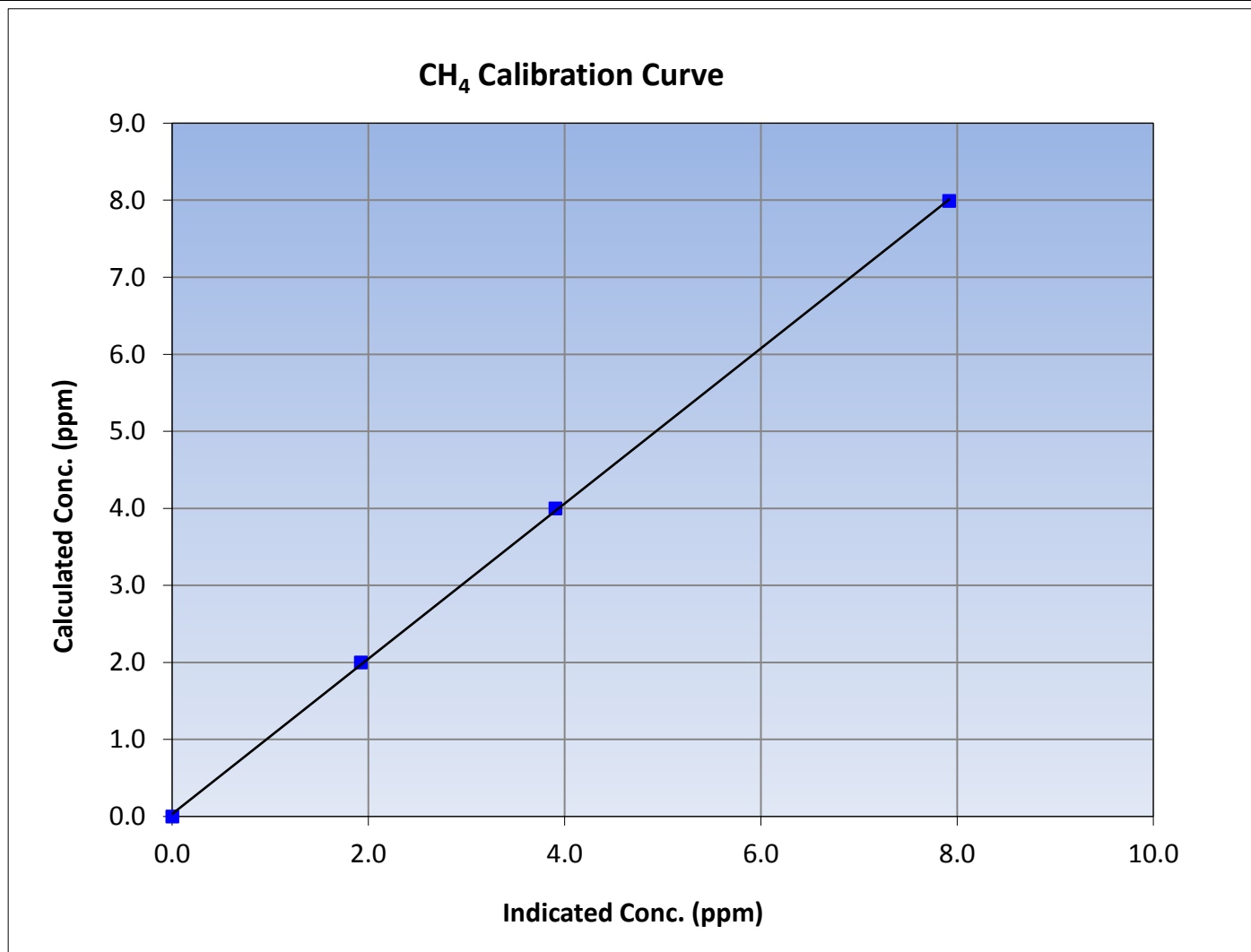
Version-02-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	December 10, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	12:52	End Time (MST)	18:31
Analyzer make	Thermo 55i	Analyzer serial #	1501663728

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999907	$\geq 0.995$			
7.99	7.92	1.0088						
4.00	3.91	1.0228				Slope	1.007319	0.90 - 1.10
2.00	1.93	1.0387						
			Intercept	0.032419	$\pm 0.5$			





# Wood Buffalo Environmental Association

## NMHC Calibration Summary

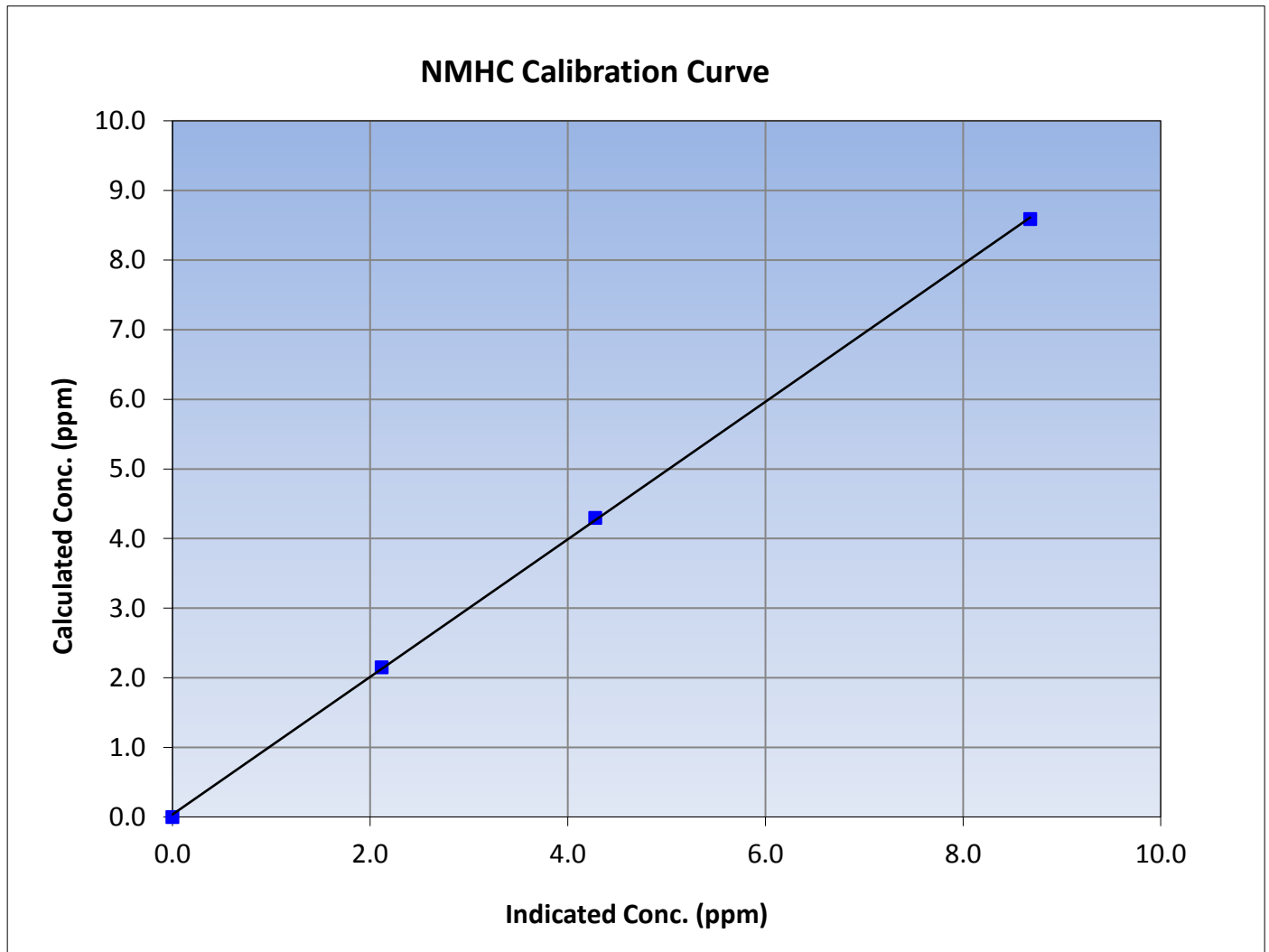
Version-02-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	December 10, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	12:52	End Time (MST)	18:31
Analyzer make	Thermo 55i	Analyzer serial #	1501663728

### Calibration Data

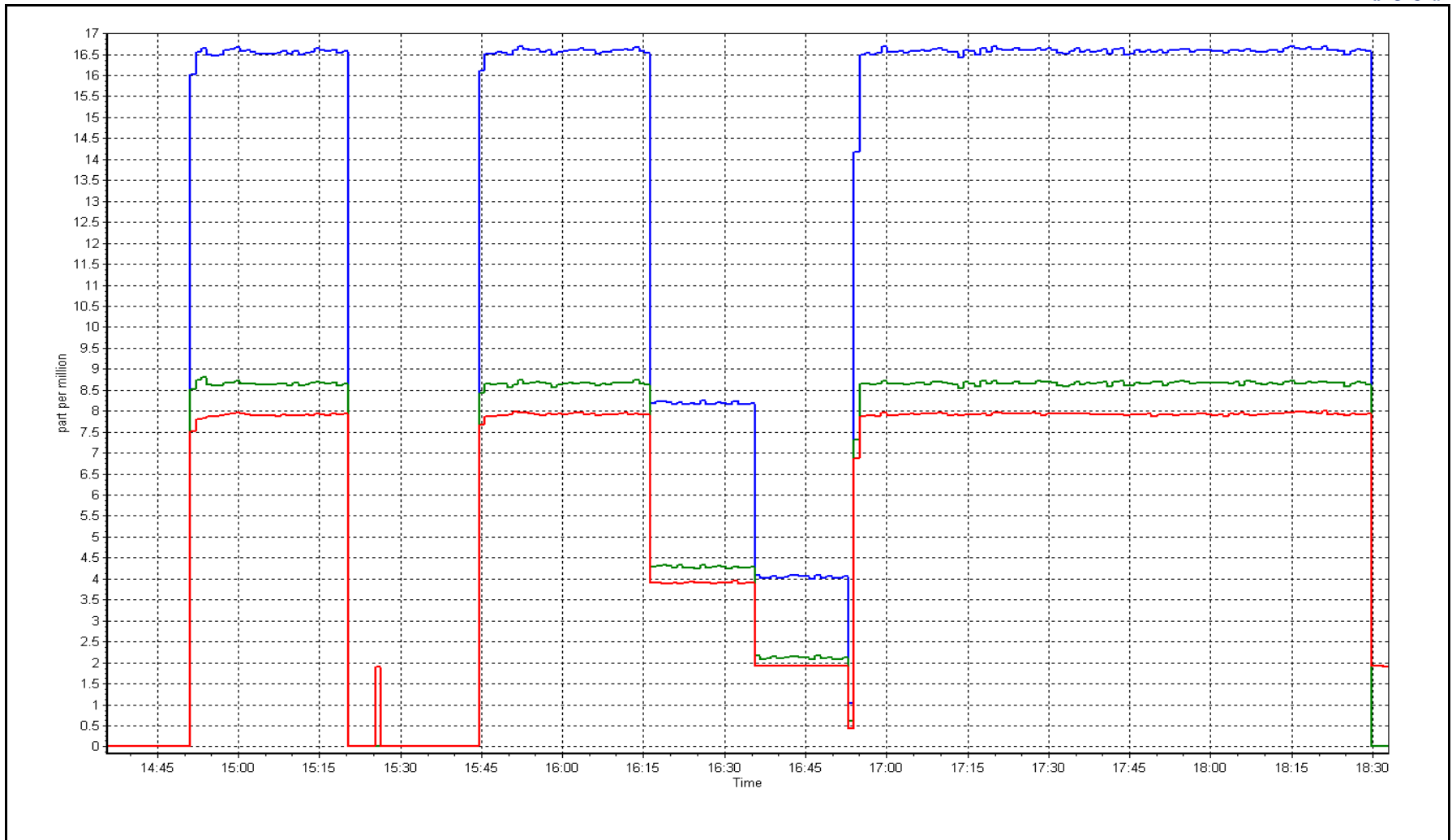
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation		<u>Limits</u>			
0.00	0.00	----	Correlation Coefficient	0.999911	$\geq 0.995$			
8.59	8.68	0.9897						
4.30	4.28	1.0048				Slope	0.988219	0.90 - 1.10
2.15	2.12	1.0160						
			Intercept	0.035495	$\pm 0.5$			



NMHC Calibration Plot

Date: December 19, 2017

Location: Janvier







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Summary

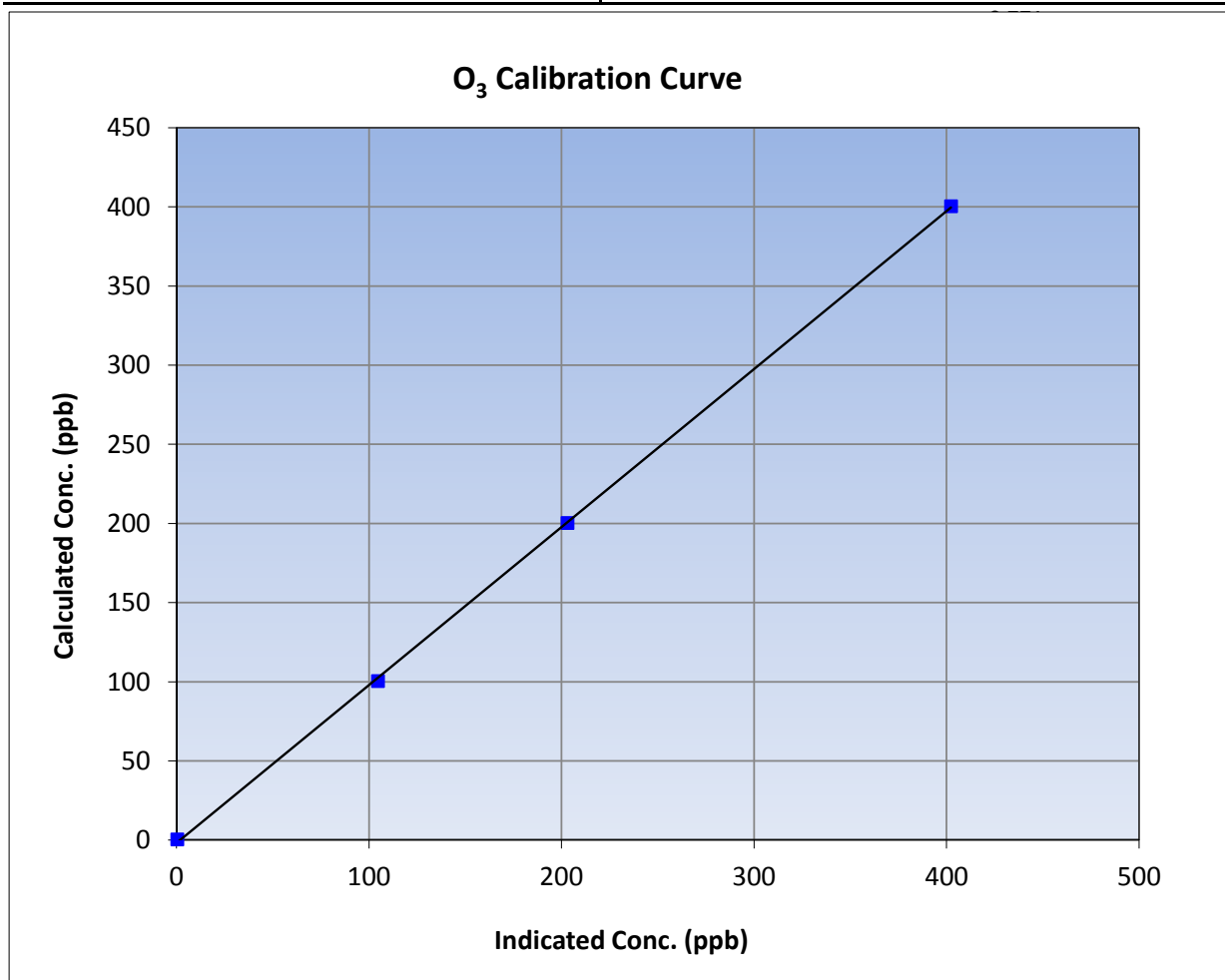
Version-03-2017

### Station Information

Calibration Date	December 15, 2017	Previous Calibration	November 2, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	11:38	End Time (MST)	15:02
Analyzer make	Thermo 49i	Analyzer serial #	1227254861

### Calibration Data

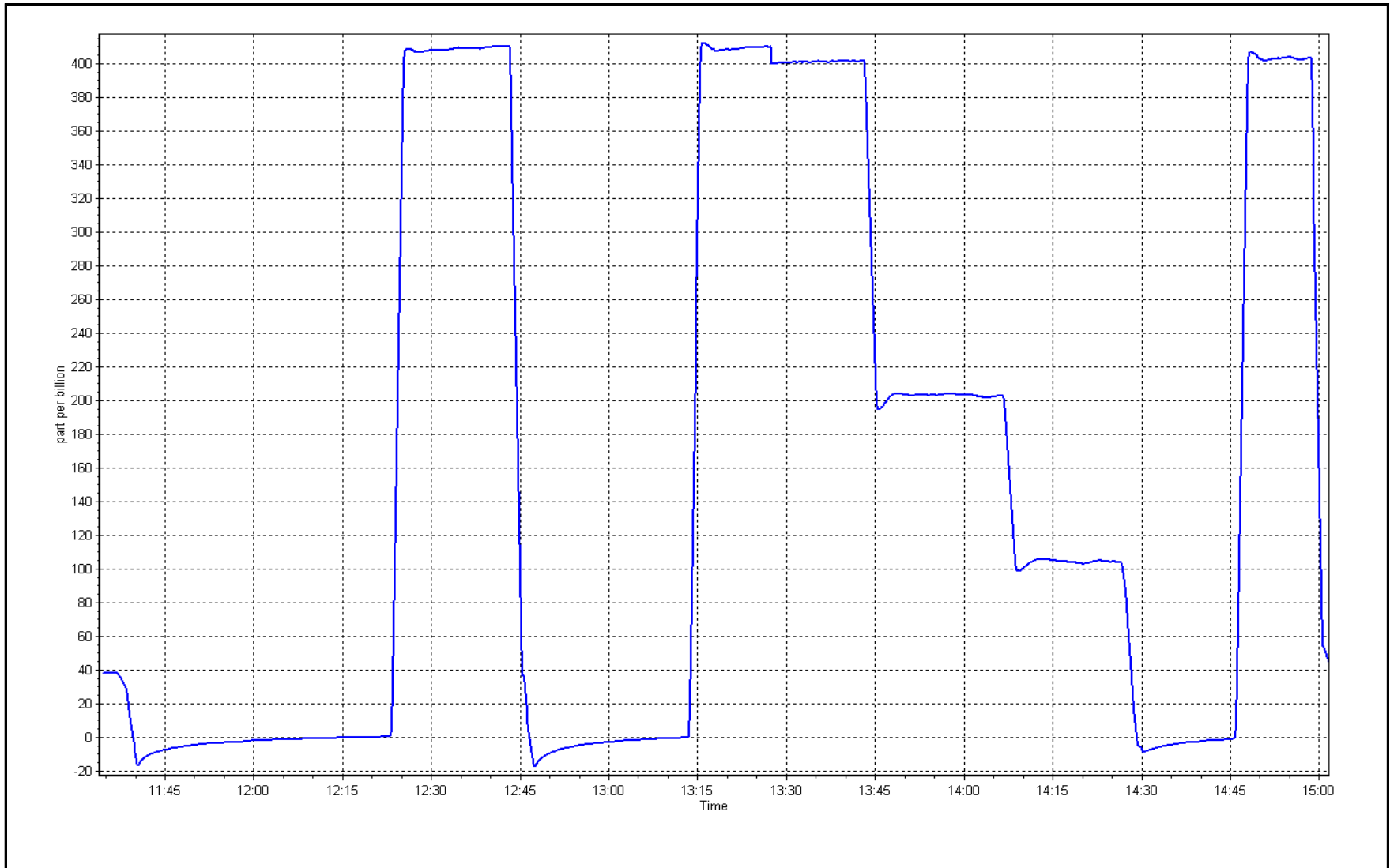
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	0.1	----	Correlation Coefficient	0.999899	<b>≥0.995</b>
400.0	401.9	0.9953	Slope	0.998131	<b>0.90 - 1.10</b>
200.0	202.7	0.9867	Intercept	-1.918687	<b>+/- 10</b>
100.0	104.3	0.9588			



O<sub>3</sub> Calibration Plot

Date: 15-Dec

Location: Janvier





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Janvier	Station number:	AMS 22
Calibration Date:	December 19, 2017	Last Cal Date:	November 15, 2017
Start time (MST):	14:30	End time (MST):	18:31
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL107937	Cal Gas Expiry Date	Saturday, September 08, 2018
NOX Cal Gas Conc.	<u>50.9</u> ppb	NO Cal Gas Conc.	<u>50.9</u> ppb
Calibrator Model	API T700	Serial Number	2447
ZAG make/model	Teledyne API T701	Serial Number	135

### Analyzer Information

Analyzer make: API T200		Analyzer serial #: 722	
	<u>Start</u>	<u>Finish</u>	
NO coefficient	0.948	0.948	NOX Range (ppb)
NOX coefficient	0.938	0.938	0 - 1000 ppb
NO2 coefficient	1.000	1.000	PMT Temperature
NO bkgrnd	-3.8	-3.8	6.8
NOX bkgrnd	-0.3	-0.3	6.8
			Reaction cell Press
			3.5
			Sample Flow
			466
			PMT Voltage
			798
			798

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.996070	0.991573
NO <sub>x</sub> Cal Offset	0.670964	1.205552
NO Cal Slope	0.992686	0.988007
NO Cal Offset	0.640850	0.656030
NO <sub>2</sub> Cal Slope	1.001863	1.006886
NO <sub>2</sub> Cal Offset	2.031769	1.768497



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.0	0.0	0.0	-0.4	1.1	-1.5	----	----
as found span	4935	78.7	799.0	799.0	0.0	805.7	803.3	2.4	0.9917	0.9946
calibrator zero	5009	0.0	0.0	0.0	0.0	-0.2	1.4	-1.6	----	----
high point	4935	78.7	799.0	799.0	0.0	805.2	809.2	-1.9	0.9923	0.9874
second point	4976	39.4	399.9	399.9	0.0	401.1	402.5	-1.5	0.9969	0.9934
third point	4993	19.7	200.0	200.0	0.0	199.8	200.1	-0.3	1.0012	0.9997
as left zero										
as left span										
<b>Average Correction Factor</b>									0.9968	0.9935

Corrected As found	NO <sub>x</sub> = 806.1 ppb	NO = 802.2 ppb		*Percent Change	NO <sub>x</sub> = -0.6%
Previous Response	NO <sub>x</sub> = 801.5 ppb	NO = 804.2 ppb		*Percent Change	NO = 0.3%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	804.1	805.8	-1.7	0.9936	0.9915	----	----
1st NO2 (400 ppb O3)	393.8	412.0	801.0	393.8	407.1	0.9975	----	1.0120	98.8%
2nd NO2 (200 ppb O3)	595.8	210.0	803.6	595.8	207.9	0.9942	----	1.0101	99.0%
3rd NO2 (100 ppb O3)	700.4	105.4	802.4	700.4	102.0	0.9957	----	1.0333	96.8%
2nd NO ref point	----	0.0	804.7	804.1	0.6	0.9929	0.9936	----	----
<b>Average Correction Factor</b>						0.9951	0.9926	1.0185	98.2%

Notes:

No adjustments made.

Calibration Performed By:

Aswin Sasi Kumar





# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

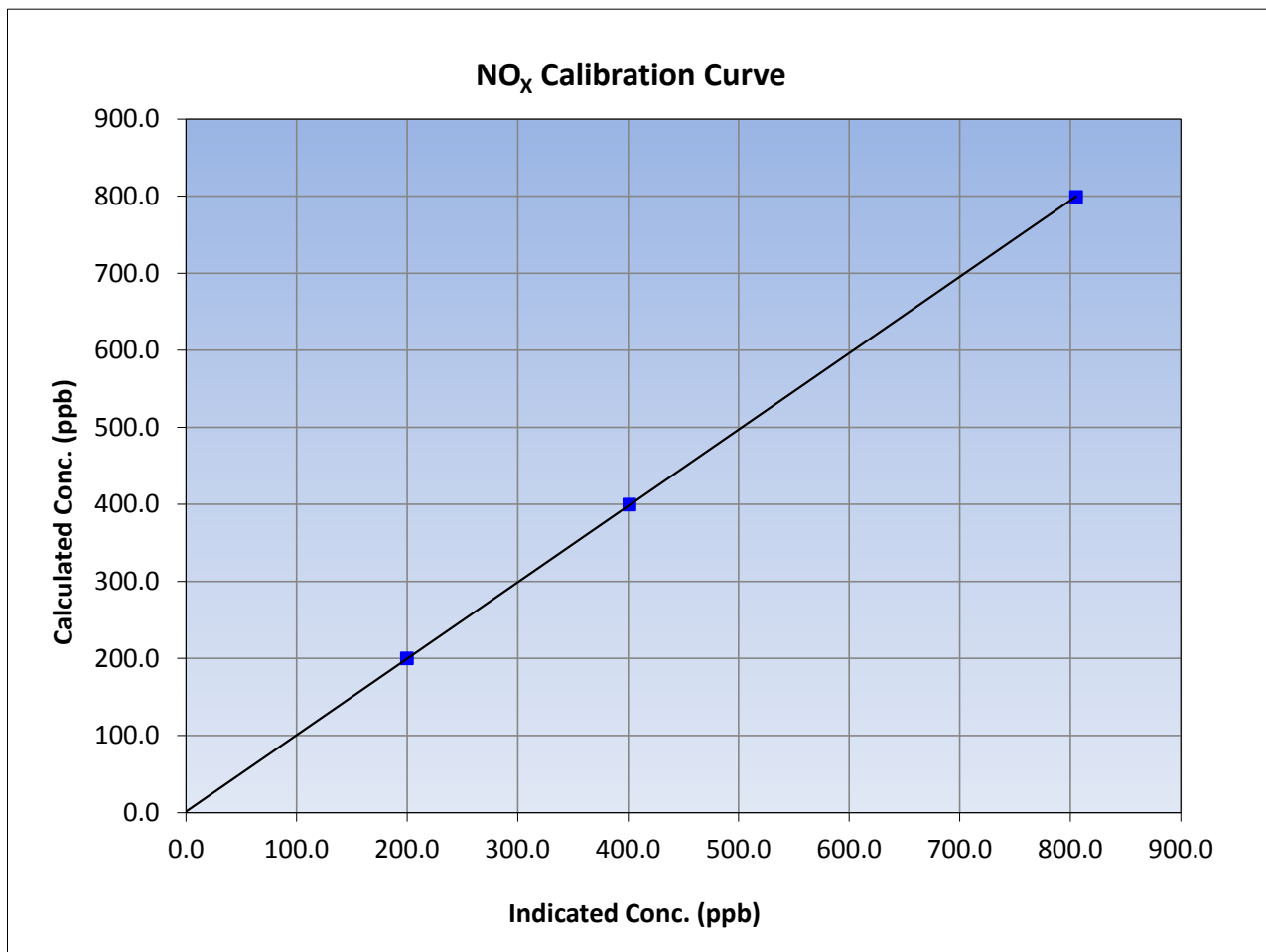
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 15, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	14:30	End Time (MST)	18:31
Analyzer make	API T200	Analyzer serial #	722

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.2	----	Correlation Coefficient	≥0.995	
799.0	805.2	0.9923			
399.9	401.1	0.9969			
200.0	199.8	1.0012			
			Slope	0.991573	0.90 - 1.10
			Intercept	1.205552	+/-20





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

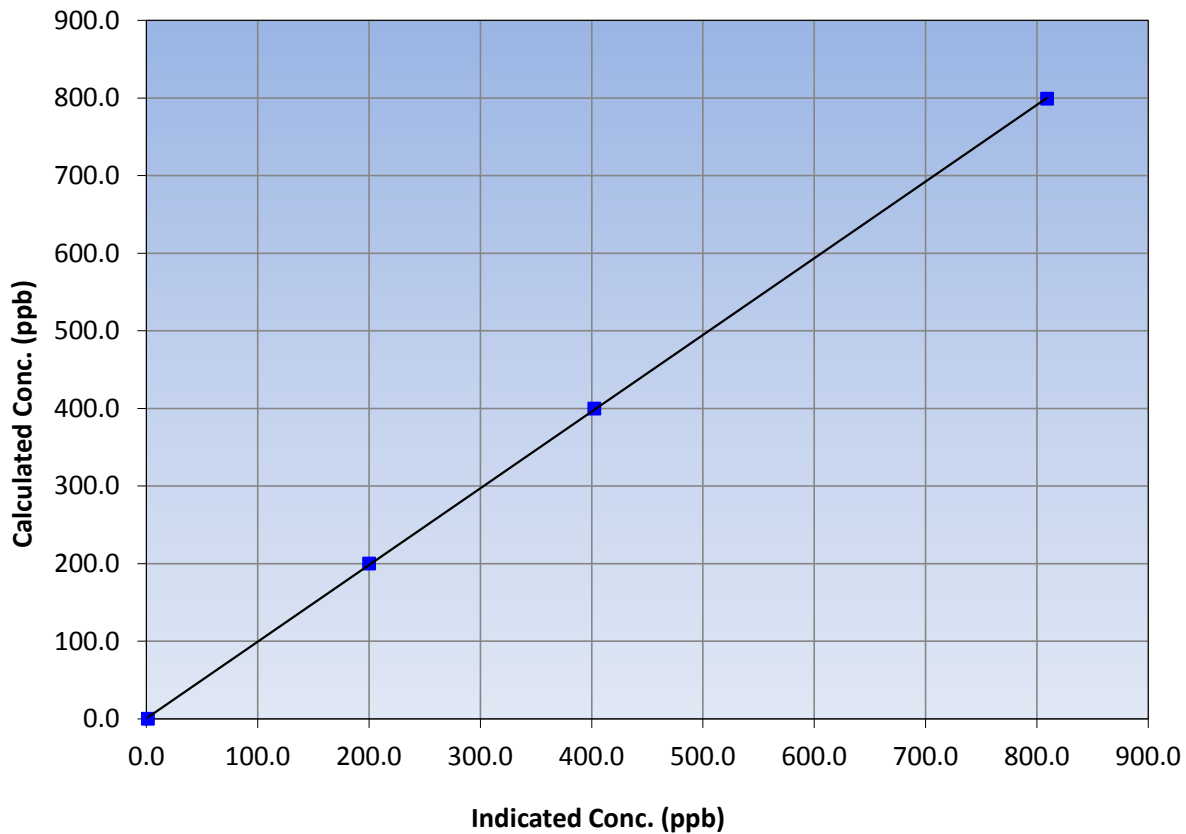
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 15, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	14:30	End Time (MST)	18:31
Analyzer make	API T200	Analyzer serial #	722

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	1.4	----	Correlation Coefficient	≥0.995	
799.0	809.2	0.9874			
399.9	402.5	0.9934			
200.0	200.1	0.9997			
			Slope	0.988007	0.90 - 1.10
			Intercept	0.656030	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

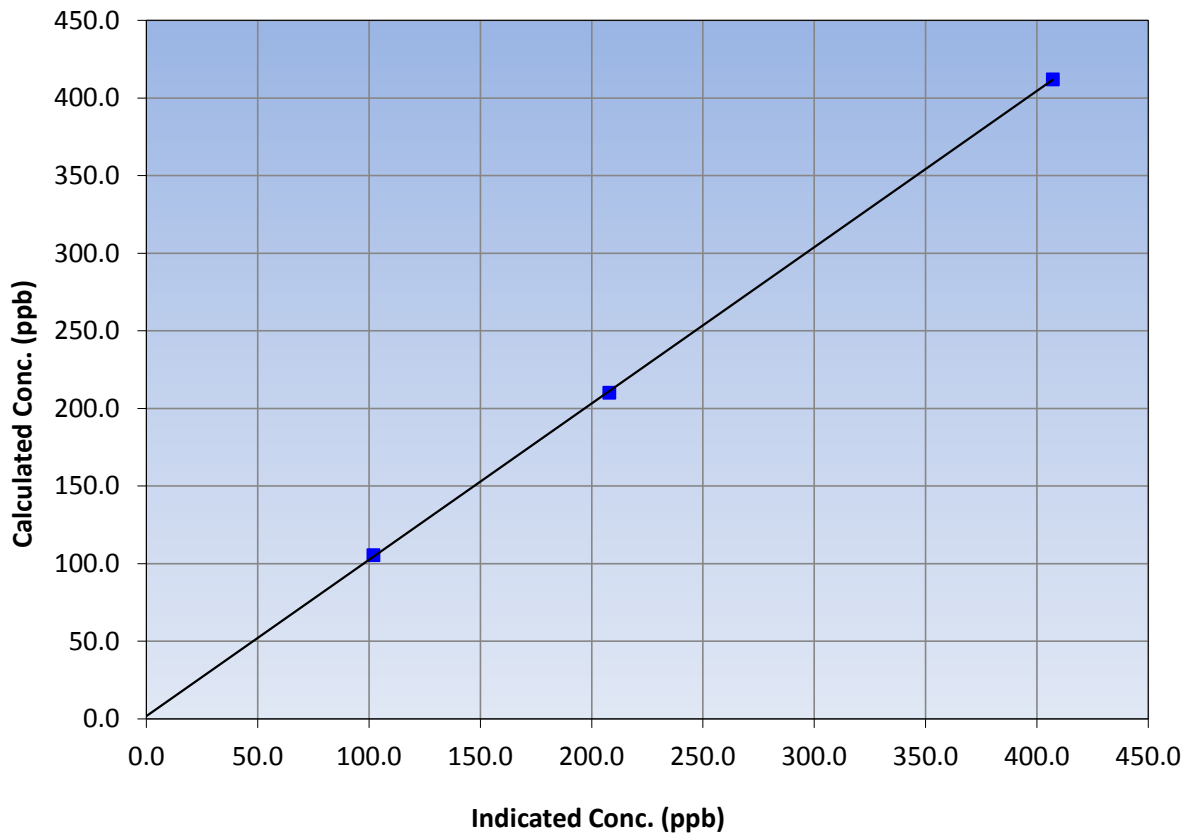
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 15, 2017
Station Name	Janvier	Station Number	AMS 22
Start Time (MST)	14:30	End Time (MST)	18:31
Analyzer make	API T200	Analyzer serial #	722

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-1.6	----	Correlation Coefficient	≥0.995	
412.0	407.1	1.0120			
210.0	207.9	1.0101			
105.4	102.0	1.0333			
			Slope	1.006886	0.90 - 1.10
			Intercept	1.768497	+/-20

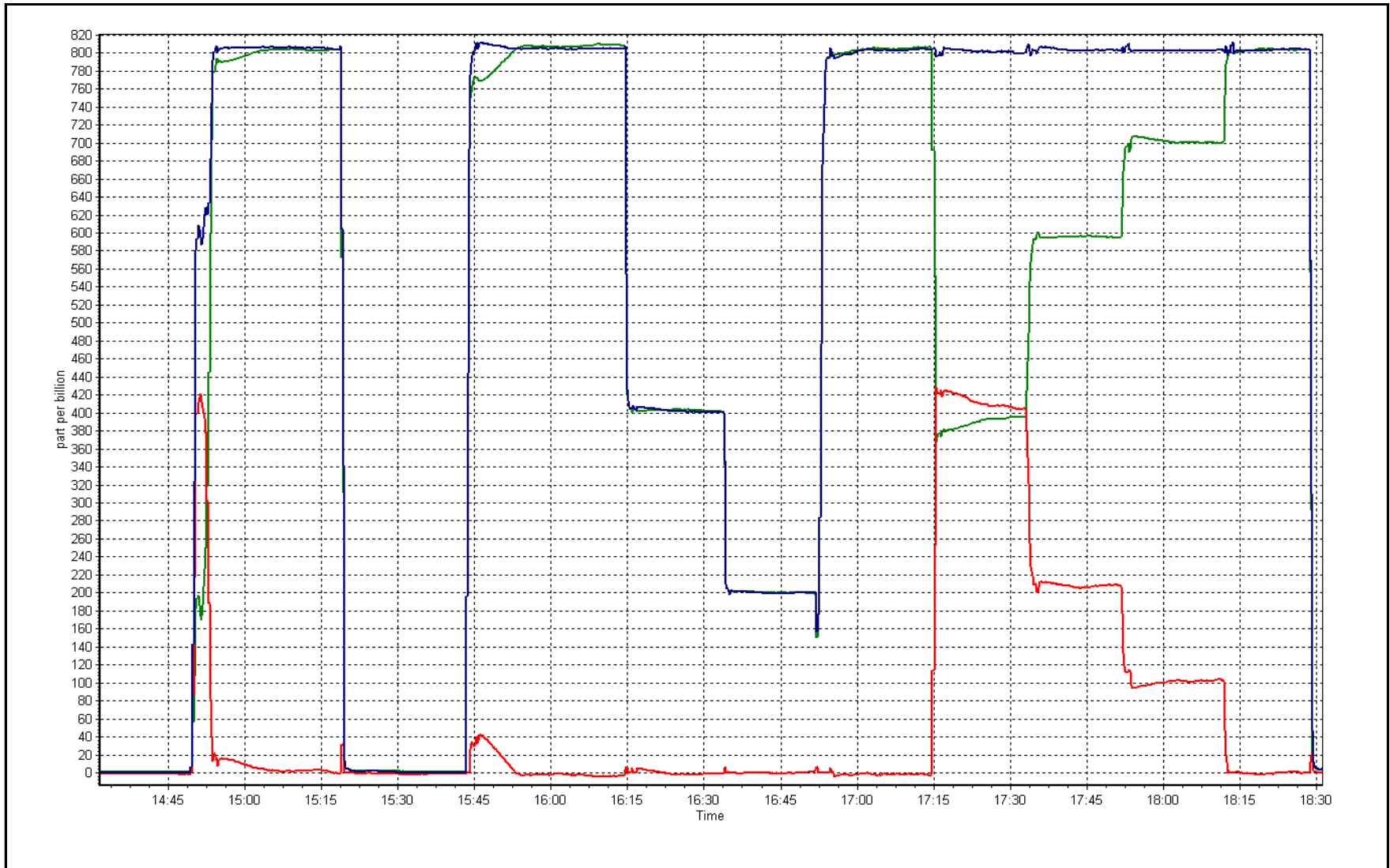
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: 19-Dec

Location: Janvier





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Janvier	Station number:	AMS 22
Calibration Date:	December 19, 2017	Last Cal Date:	November 15, 2017
Start time (MST):	12:24	End time (MST):	15:44
Sharp Model:	Thermo 5030 SHARP	S/N:	E-1333
Particulate Fraction:	PM2.5	C14 Source S/N:	5341
Flow Meter Make/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>	<b><i>(Limits)</i></b>
T1 (°C)	-14	-15.1	-14	<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
P3 (hPa)	962	957.7	962	<input type="checkbox"/>	<b><i>+/- 13 hPa</i></b>
flow (LPH)	1000	995.4	1000	<input type="checkbox"/>	<b><i>+/- 50 LPH</i></b>
Nephelometer zero	11.4	-----	0.1	<input checked="" type="checkbox"/>	<b><i>+/- 0.5 ug/m3</i></b>
Concentration zero	6.4	-----	0	<input checked="" type="checkbox"/>	<b><i>+/- 0.5 ug/m3</i></b>
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check: _____	Last Cal Date: <u>November 15, 2017</u>
	Flow w/o adaptor: _____	Flow w/ adaptor: <u>16.57</u>

***(Limit) 0.4 LPM***

<u>Adjusted</u>	<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
<input checked="" type="checkbox"/>	Foil S/N: _____	Foil S/N: <u>557</u>	
	Null Foil Mass: _____	Null Foil Mass: <u>NA</u>	
Foil Calibration	Foil Mass: _____	Foil Mass: <u>NA</u>	
	Calibration Date: _____	Calibration Date: <u>11/15/2017</u>	
<b><i>(Limit) +/- 5% of previous</i></b>	Correction Factor: _____	Correction Factor: <u>7009</u>	---

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b><i>(Limits)</i></b>
T2 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
T3 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
T4 (°C)				<input type="checkbox"/>	<b><i>+/- 2 °C</i></b>
RH (%)				<input type="checkbox"/>	<b><i>+/- 10%</i></b>
Date Sample Tube Cleaned:					
Date Pump Rebuilt/Replaced:					

Notes: Neph and Concentration zero adjusted.

Calibration by: Aswin Sasi Kumar



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 23  
FORT HILLS  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT HILLS (AMS 23)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100	12	0	3	0
TRS(ppb) Average	708	35	36	99.87	2	0	1	0
THC(ppm) Average	708	36	36	100	13	-	4	-
NO2 (ppb) Average	708	36	36	100	65	0	33	-
NO (ppb) Average	708	36	36	100	341	-	59	-
NOX (ppb) Average	708	36	36	100	405	-	88	-
PM2.5 (ug/m3) Average	742	2	2	100	76	-	16	0
Temperature 2 m (C) Average	744	0	0	100	4.7	-	1.6	-
Relative Humidity (%) Average	744	0	0	100	97	-	92	-
Wind Speed 10 m (km/h) Average	735	0	9	98.79	25	-	14	-
Wind Direction 10 m (deg) Average	735	0	9	98.79	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT HILLS (AMS 23)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.5	1	-	0	0	0	0	1	1	12
TRS (ppb) Average	708	0.5	0	-	0	0	0	0	1	1	2
THC (ppm) Average	708	2.5	1	-	2	2	2	2	3	3	13
NO2 (ppb) Average	708	19.8	12	-	0	3	10	20	28	35	65
NO (ppb) Average	708	15.6	33	-	0	0	1	5	15	41	341
NOX (ppb) Average	708	35.4	42	-	0	3	12	26	42	74	405
PM2.5 (ug/m3) Average	742	7.4	7	-	1	2	3	6	9	16	76
Temperature 2 m (C) Average	744	-14.42	12	-	-39.9	-31	-26.4	-11.1	-4.4	0.1	4.7
Relative Humidity (%) Average	744	79.4	9	-	49	69	73	79	87	91	97
Wind Speed 10 m (km/h) Average	735	8.4	5	-	0	3	5	8	11	14	25
Wind Direction 10 m (deg) Average	735	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT HILLS (AMS 23)  
 DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS	05 Dec 2017 14:00	05 Dec 2017 14:00	1	Maintenance - manifold cleaning
Wind Speed, Wind Direction	15 Dec 2017 06:00	15 Dec 2017 10:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	19 Dec 2017 09:00	19 Dec 2017 09:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	28 Dec 2017 20:00	28 Dec 2017 20:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	28 Dec 2017 22:00	28 Dec 2017 22:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	29 Dec 2017 02:00	29 Dec 2017 02:00	1	Flat line in sensor output signal - Sensor frozen



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Fort Hills - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 12 ppb on Dec 20 15:00	Maximum Daily Average: 2.8 ppb on Dec 20		Hours of Data:	708
Minimum Value: 0 ppb on Dec 6 17:00	Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Missing Data:	36
Maximum Diurnal Average: 0.9 ppb at hour 15	Minimum Diurnal Average: 0.4 ppb at hour 3		Hours of Calibration:	36
Monthly Average: 0.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 4		Percent Operational Time:	100.0

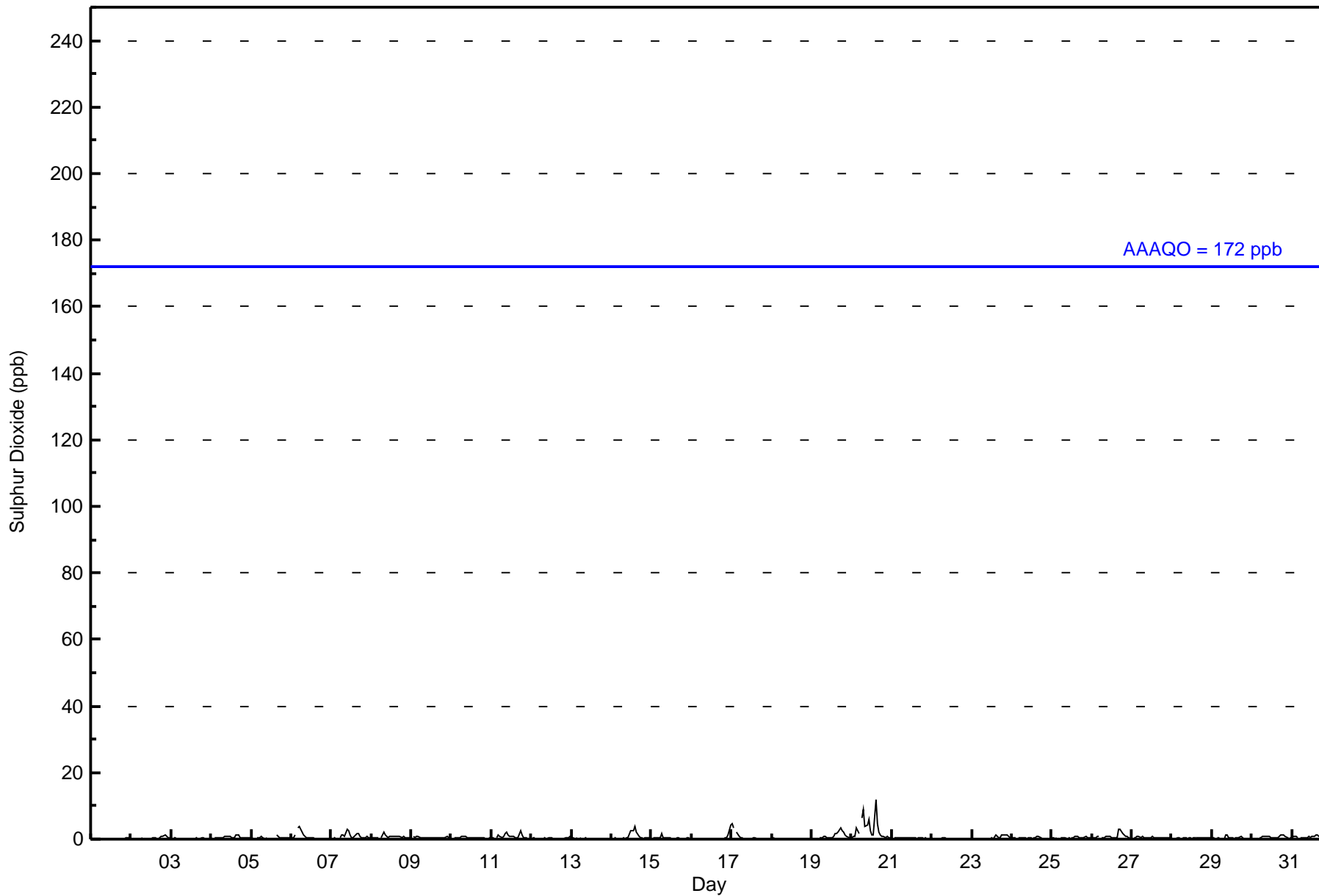
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.3	1
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	Z	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0.5	1
5-Dec	0	0	Z	0	0	0	1	0	0	1	C	C	C	C	C	1	1	1	0	0	0	0	0	0.5	1	
6-Dec	0	0	1	Z	3	4	2	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.7	4
7-Dec	0	0	0	0	Z	0	1	1	1	3	2	1	1	1	1	2	2	1	0	1	1	1	1	0	0.9	3
8-Dec	1	0	0	0	0	Z	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.7	2	
9-Dec	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.4	1
10-Dec	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
11-Dec	0	0	Z	1	1	1	1	1	2	2	1	1	1	0	0	1	3	1	0	0	0	0	0	0	0.9	3
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.2	1
13-Dec	1	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
14-Dec	0	0	0	0	0	Z	0	0	0	1	3	2	3	4	2	1	0	0	0	0	0	0	0	0	0.8	4
15-Dec	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1
16-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0.4	4
17-Dec	5	4	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5
18-Dec	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
19-Dec	0	0	0	0	Z	0	0	1	1	0	0	0	1	2	1	2	3	2	2	1	1	1	1	1	0.9	3
20-Dec	1	1	1	3	1	Z	6	9	4	4	6	3	1	1	12	5	2	1	1	1	1	1	1	0	2.8	12
21-Dec	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
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	0.5	1
24-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.3	1
25-Dec	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0.5	1
26-Dec	0	0	1	1	1	Z	1	1	1	1	1	1	1	0	1	3	3	2	1	1	1	0	0	0	0.9	3
27-Dec	Z	1	0	1	1	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0.5	1
28-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
29-Dec	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.4	1
30-Dec	0	0	0	Z	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0.6	1
31-Dec	0	1	1	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
	0.4	0.5	0.4	0.5	0.5	0.5	0.7	0.8	0.6	0.7	0.7	0.5	0.4	0.5	0.9	0.7	0.7	0.7	0.5	0.4	0.4	0.4	0.4	0.4	Diurnal Average	
	5	4	1	3	3	4	6	9	4	4	6	3	2	3	12	5	3	3	2	2	1	1	1	4	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 (SO<sub>2</sub>) - ppb**  
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort Hills - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	707	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort Hills - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	24	48	28	7	4	10	42	220	91	72	55	14	19	19	24	21	698
11 - 20	0	0	0	0	0	0	0	0	1	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
<b>Totals</b>	24	48	28	7	4	10	42	220	92	72	55	14	19	19	24	21	699

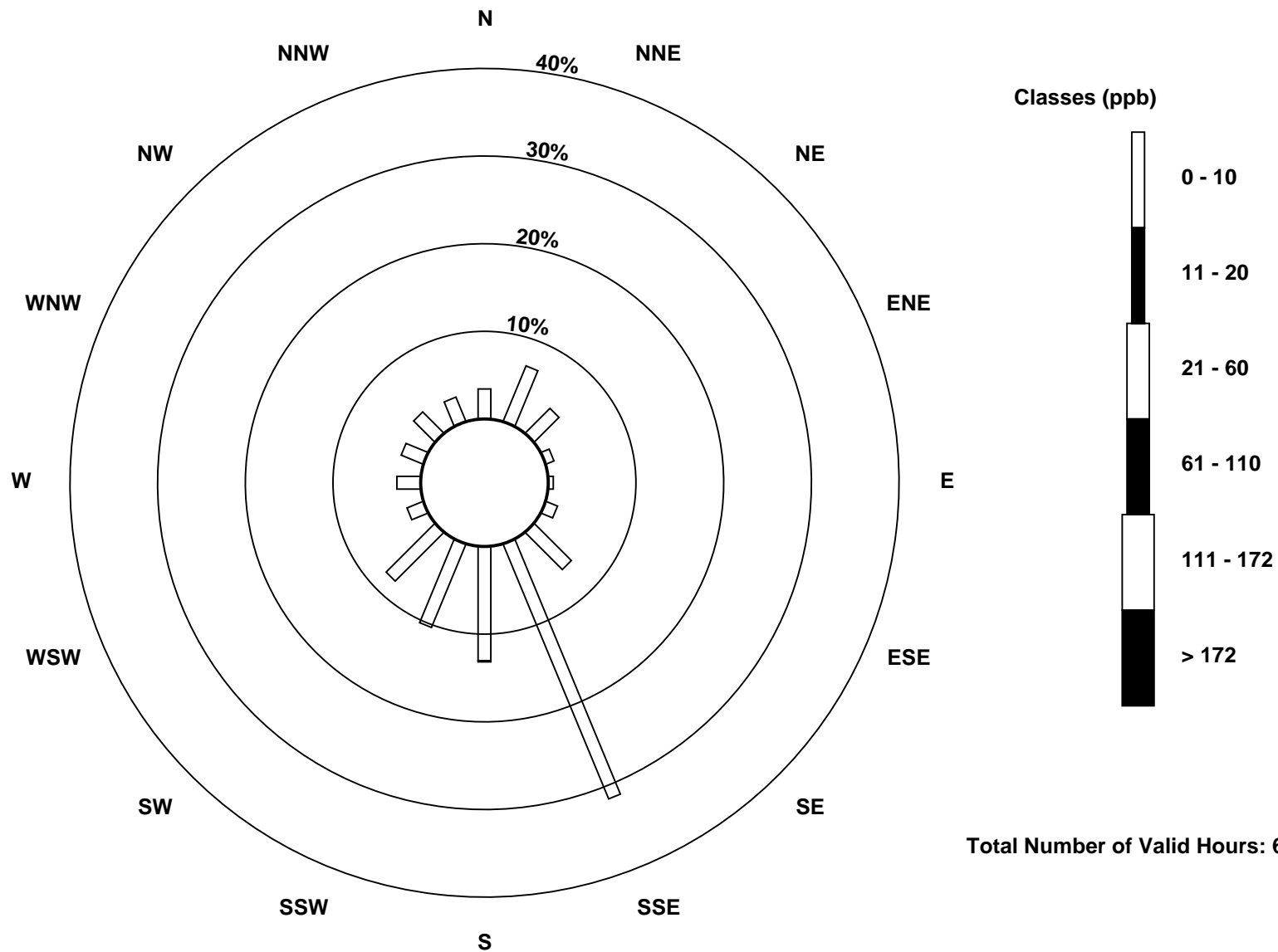
Total Number of Valid Hours: 699

Total Number of Hours: 744

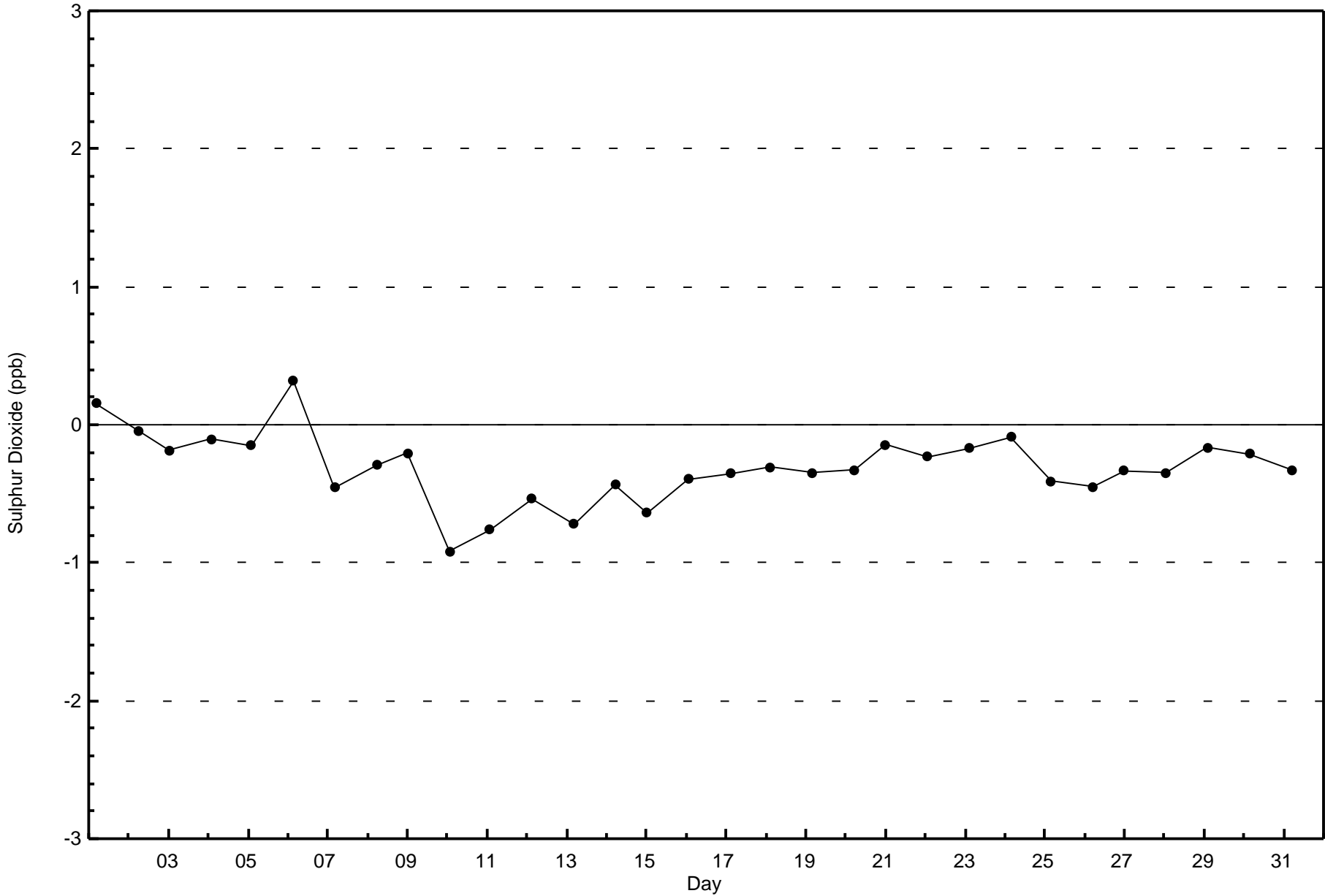


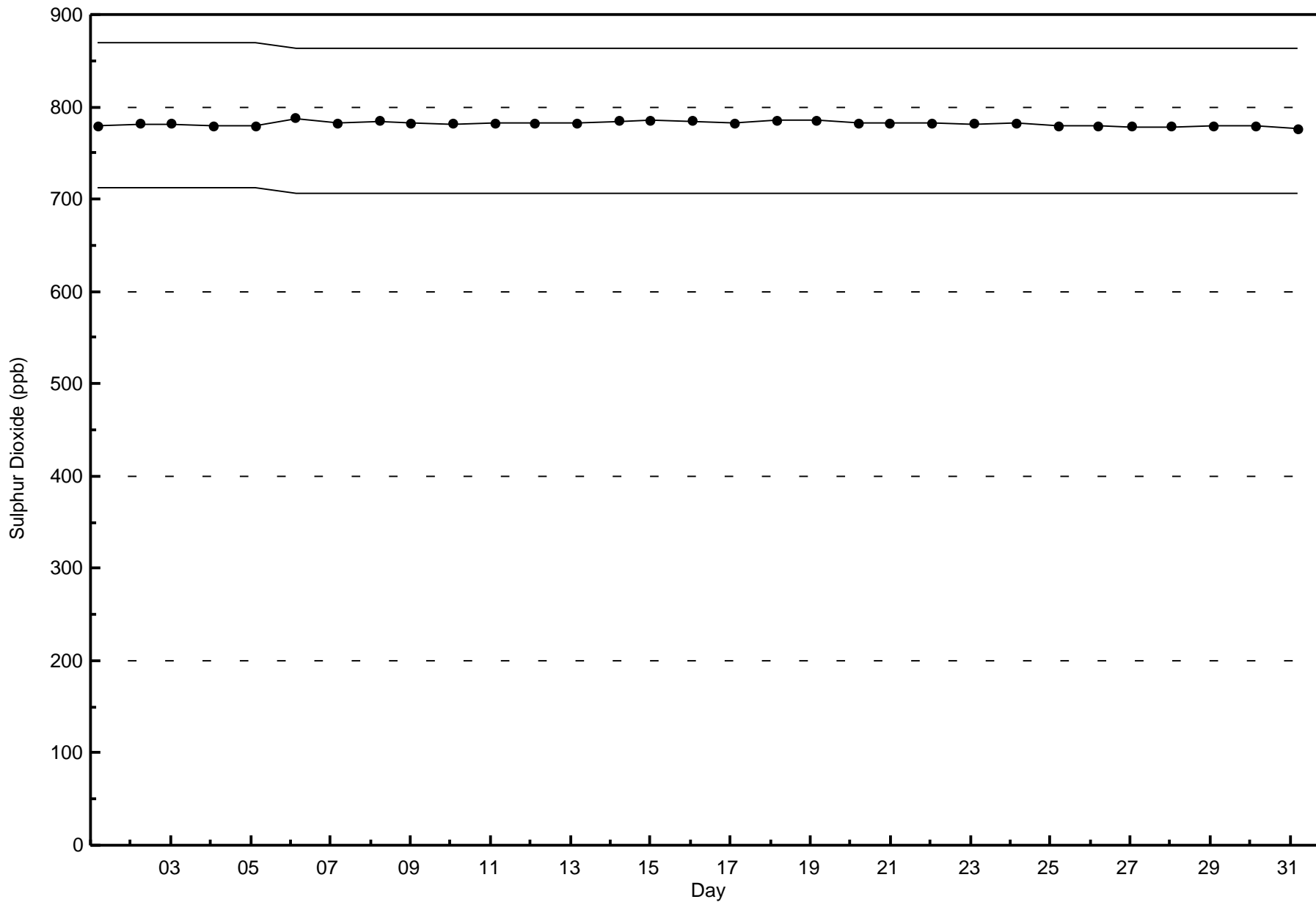
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort Hills (AMS 23)



Total Number of Valid Hours: 699









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

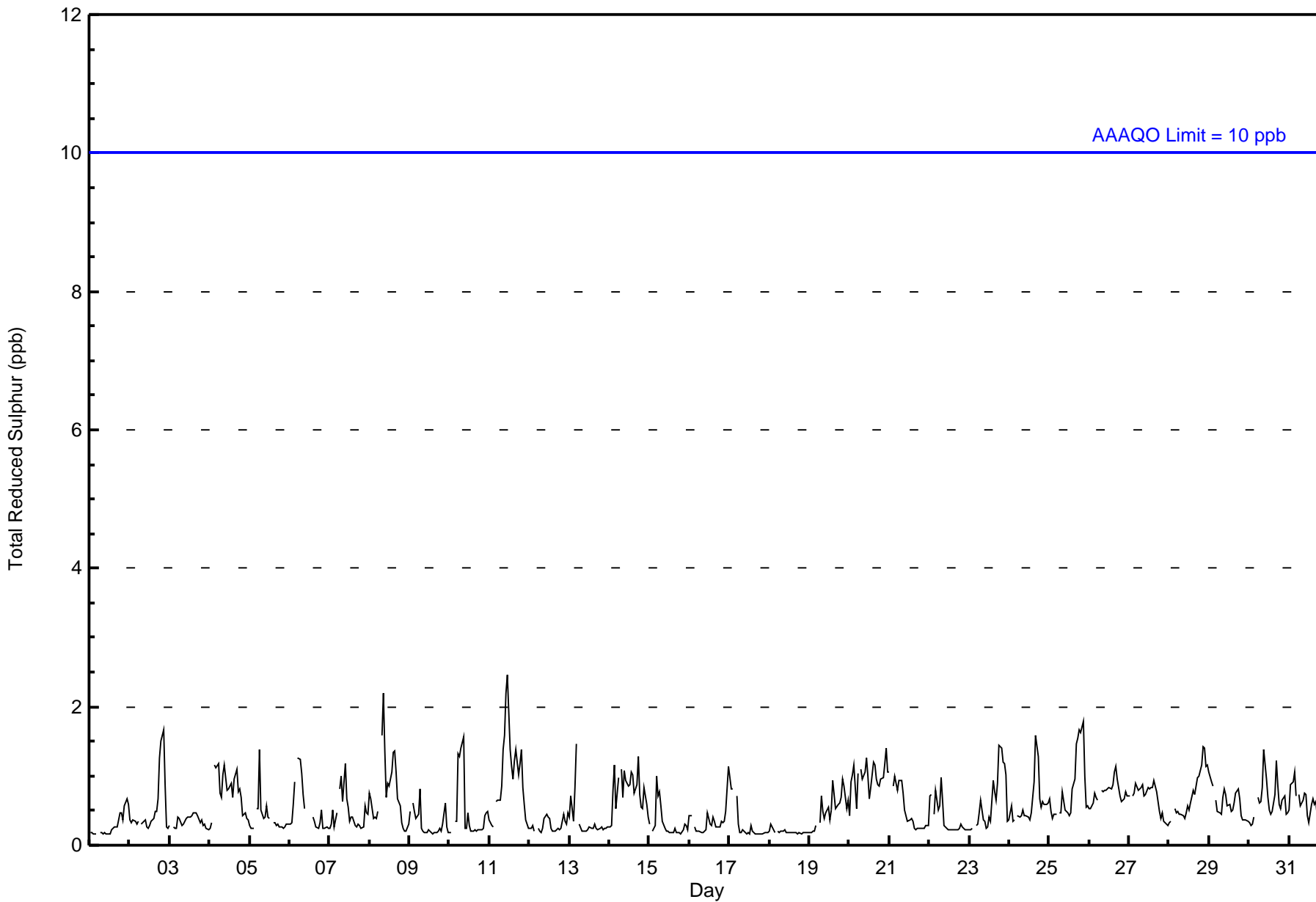
Fort Hills - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 2 ppb on Dec 11 12:00										Maximum Daily Average: 1.0 ppb on Dec 11										Hours of Data: 708						
Minimum Value: 0 ppb on Dec 17 16:00										Minimum Daily Average: 0.2 ppb on Dec 18										Hours of Missing Data: 36						
Maximum Diurnal Average: 0.6 ppb at hour 9										Minimum Diurnal Average: 0.4 ppb at hour 24										Hours of Calibration: 35						
Monthly Average: 0.5 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 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-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
2-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	0	0	0.5	2
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
4-Dec	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.8	1
5-Dec	0	0	0	Z	1	1	1	1	0	0	1	0	0	M	0	0	0	0	0	0	0	0	0	0	0.4	1
6-Dec	0	0	1	1	Z	1	1	1	1	1	C	C	C	C	0	0	0	0	0	1	0	0	0	0.5	1	
7-Dec	0	0	1	0	0	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0.5	1
8-Dec	1	1	0	0	0	0	Z	2	2	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.8	2	
9-Dec	0	Z	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1
10-Dec	0	0	Z	0	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
11-Dec	0	0	0	Z	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	0	0	1.0	2
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	1	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
14-Dec	0	0	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.8	1
15-Dec	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
17-Dec	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	Z	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0.5	1
20-Dec	0	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
21-Dec	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
22-Dec	1	1	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
23-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0.6	1
24-Dec	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1	1	1	1	1	0.6	2
25-Dec	1	0	0	0	0	Z	0	0	1	1	0	0	0	0	1	1	1	2	2	2	2	1	1	1	0.8	2
26-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
27-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.7	1
28-Dec	0	0	Z	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
29-Dec	1	1	1	Z	1	0	0	0	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0.6	1
30-Dec	0	0	0	0	Z	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0	0.6	1
31-Dec	1	1	1	1	1	Z	1	1	1	1	1	0	0	1	1	1	1	0	0	1	1	0	0	0	0.6	1
0.4 0.4 0.5 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.5 0.5 0.5 0.5 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.5 0.5 0.4																								Diurnal Average		
1 1 1 1 1 1 1 1 2 2 2 2 2 1 1 1 1 2 2 2 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 Hills - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort Hills - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort Hills - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	22	53	30	8	3	12	41	217	93	70	56	14	17	19	23	21	699
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
<b>Totals</b>	22	53	30	8	3	12	41	217	93	70	56	14	17	19	23	21	699

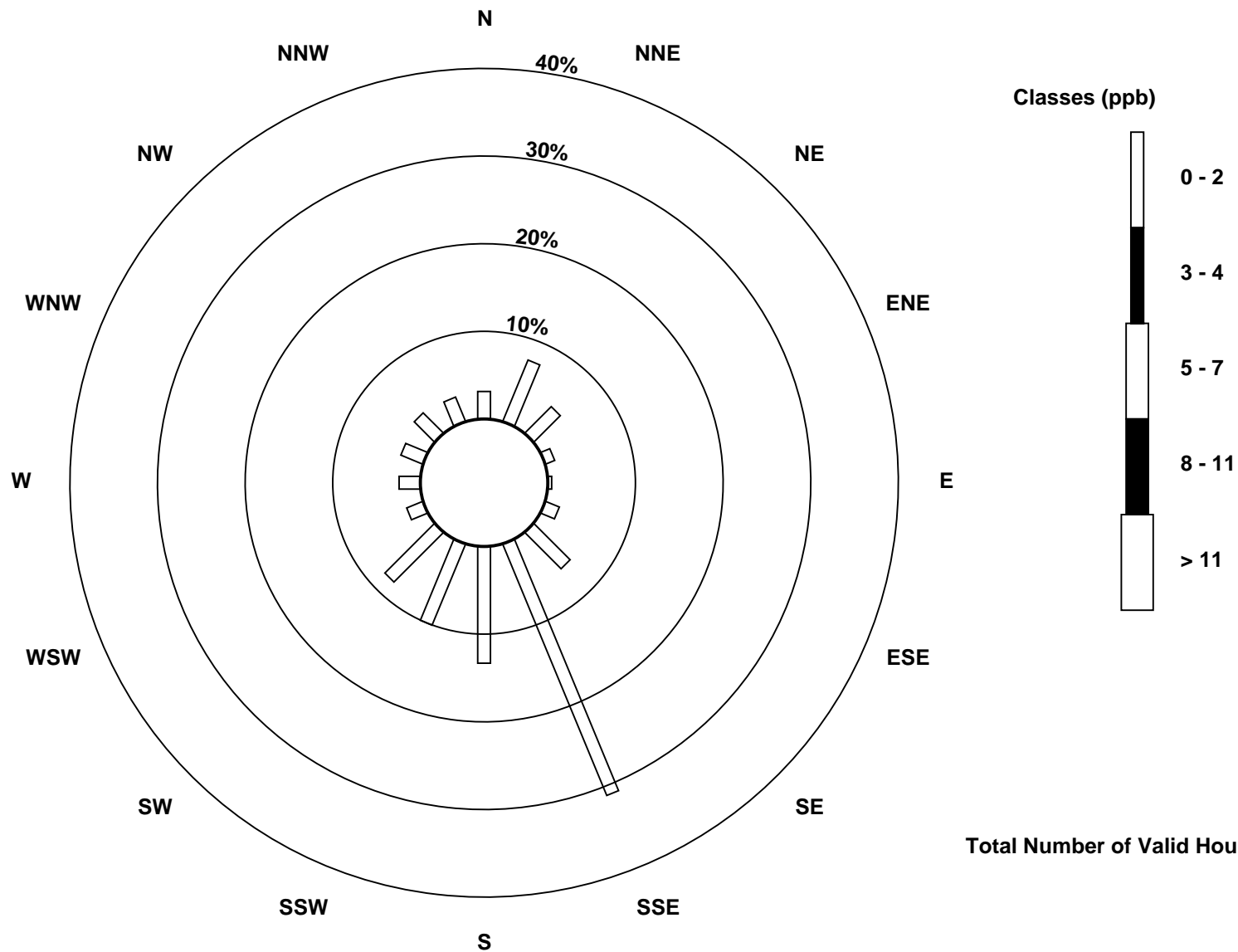
Total Number of Valid Hours: 699

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Reduced Sulphur (TRS) - ppb  
Fort Hills (AMS 23)



Total Number of Valid Hours: 699

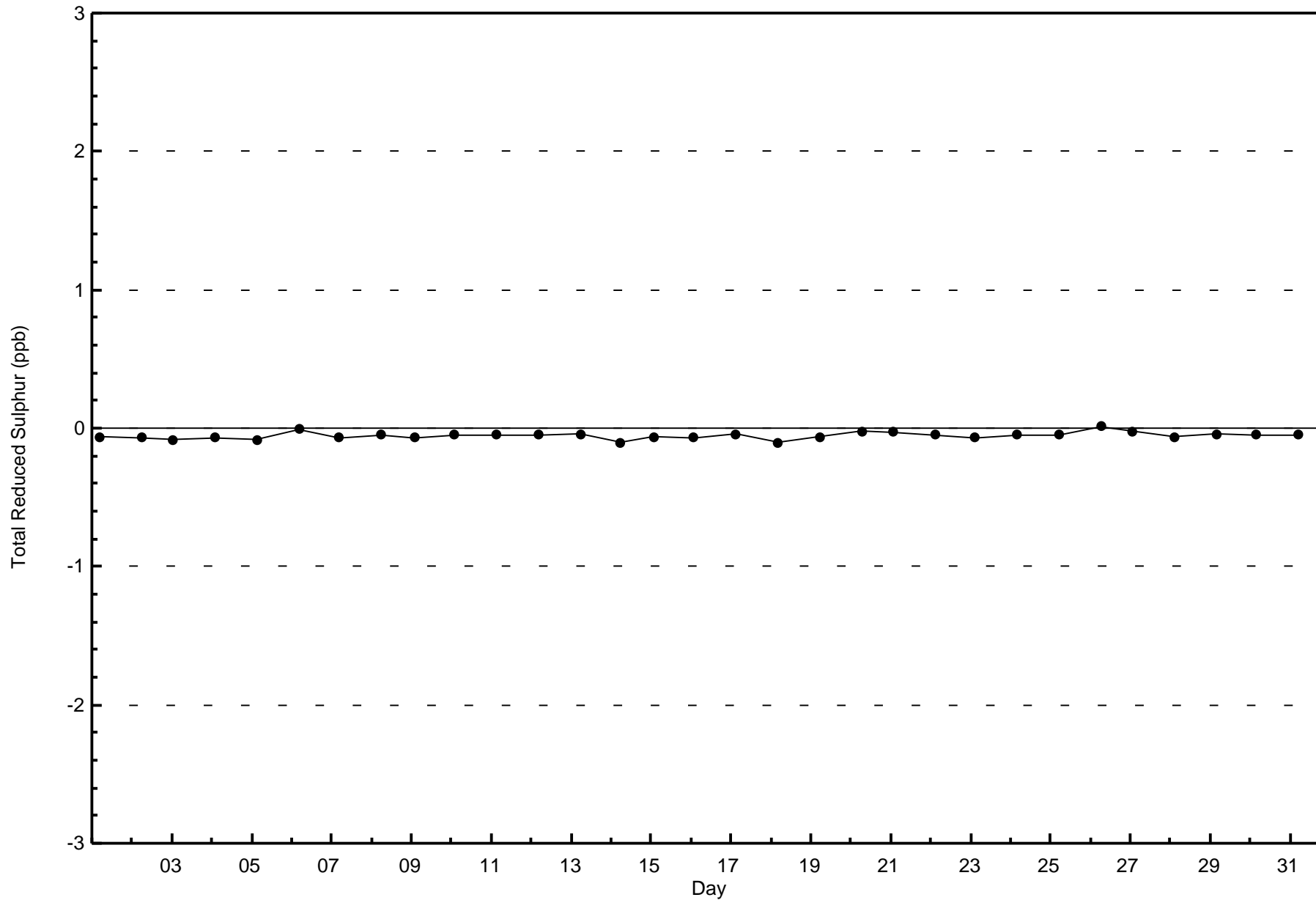


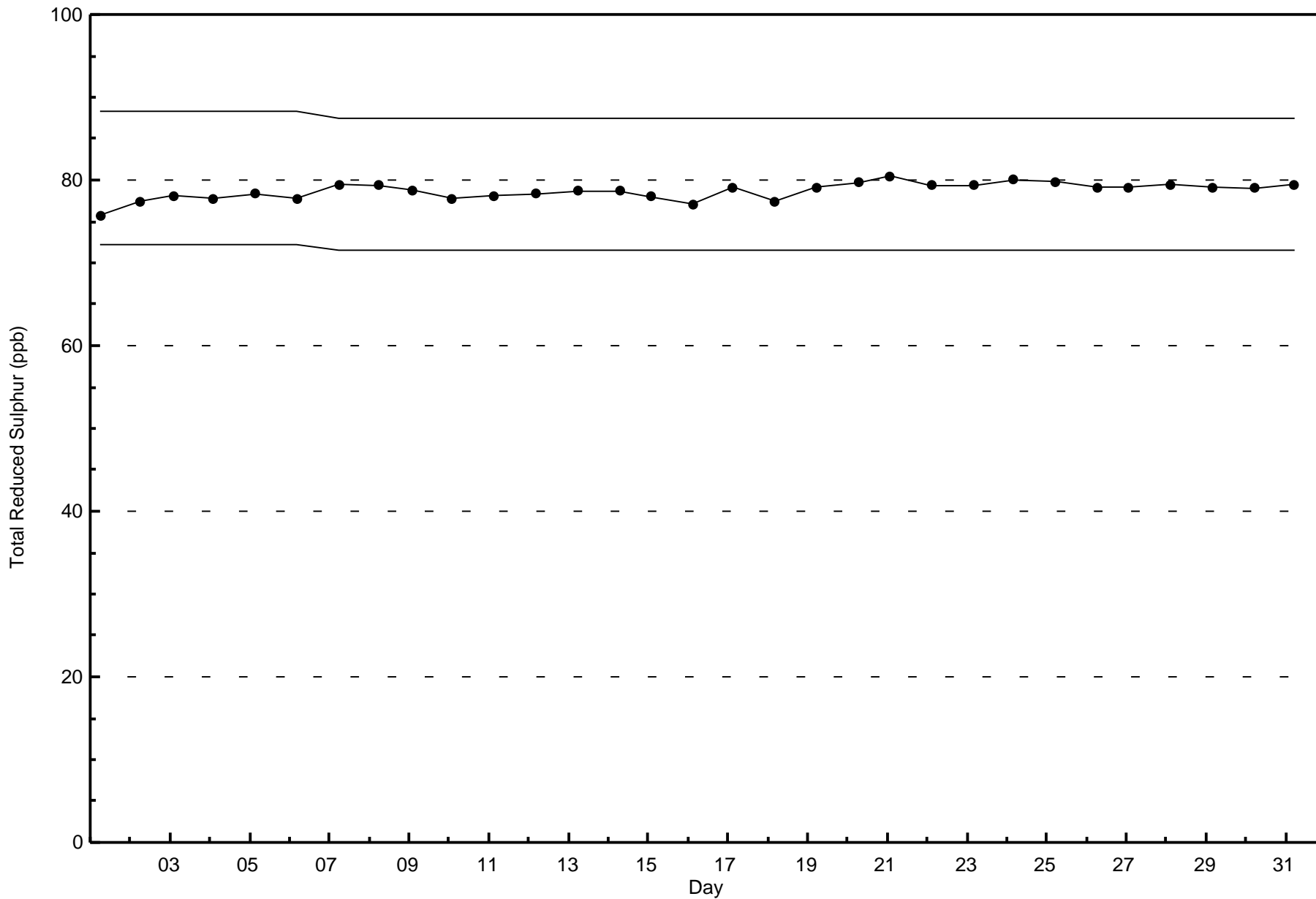
Wood Buffalo Environmental Association

Zero Responses

Total Reduced Sulphur (TRS) - ppb

Fort Hills - December 2017







Wood Buffalo Environmental Association

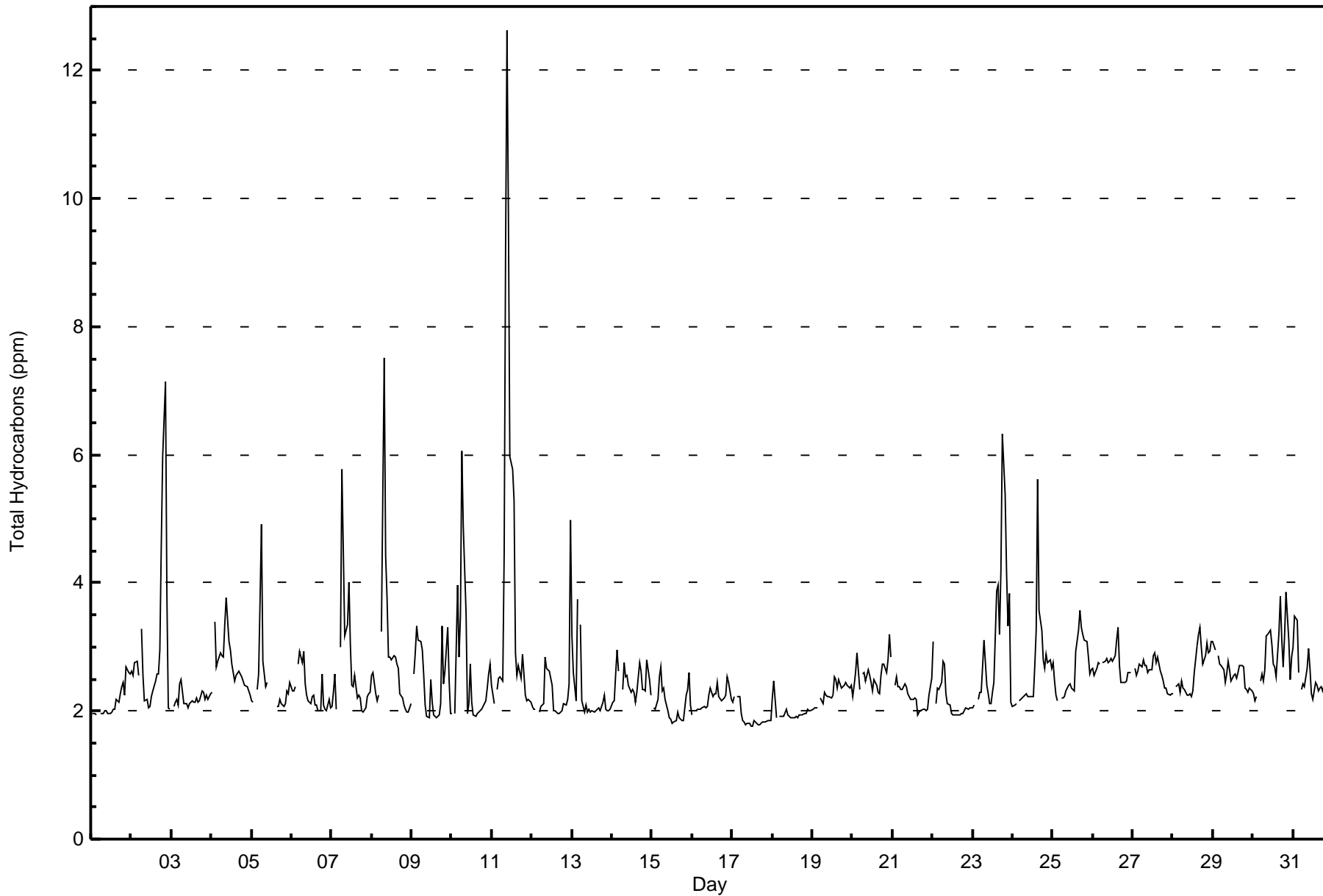
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Fort Hills - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 13 ppm on Dec 11 10:00										Maximum Daily Average: 4.0 ppm on Dec 11										Hours of Data: 708						
Minimum Value: 2 ppm on Dec 17 13:00										Minimum Daily Average: 1.9 ppm on Dec 17										Hours of Missing Data: 36						
Maximum Diurnal Average: 2.8 ppm at hour 8										Minimum Diurnal Average: 2.4 ppm at hour 2										Hours of Calibration: 36						
Monthly Average: 2.5 ppm										Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 3 P <sub>99</sub> = 6										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2.1	3
2-Dec	3	3	3	3	3	Z	3	3	2	2	2	2	2	2	3	3	3	3	5	6	7	4	2	2	3.0	7
3-Dec	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
4-Dec	2	Z	3	3	3	3	3	3	3	4	3	3	3	2	3	3	3	3	2	2	2	2	2	2	2.7	4
5-Dec	2	2	Z	2	3	4	5	3	2	2	C	C	C	C	C	2	2	2	2	2	2	2	2	2	2.5	5
6-Dec	2	2	2	Z	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2.3	3
7-Dec	2	2	3	2	Z	3	6	5	3	3	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2.7	6
8-Dec	3	3	2	2	2	Z	3	8	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2.8	8
9-Dec	Z	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2	3	3	2	2	2.5	3
10-Dec	2	Z	2	4	3	3	6	5	4	2	2	3	2	2	2	2	2	2	2	2	2	2	3	3	2.7	6
11-Dec	2	2	Z	2	3	3	2	4	9	13	10	6	6	5	3	3	3	3	3	3	2	2	2	2	4.0	13
12-Dec	2	2	2	Z	2	2	2	2	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	5	2.3	5
13-Dec	3	3	2	4	Z	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	4
14-Dec	2	2	3	3	3	Z	2	3	3	3	2	2	2	2	2	2	3	3	2	2	3	2	2	2	2.4	3
15-Dec	Z	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2.1	3
16-Dec	2	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	3
17-Dec	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.9	2
18-Dec	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	2
19-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2.3	3
20-Dec	2	2	3	3	2	Z	3	3	2	3	3	2	2	2	2	2	2	3	3	3	3	3	3	3	2.6	3
21-Dec	Z	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2.2	3
22-Dec	3	Z	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	3
23-Dec	2	2	Z	2	2	2	3	3	2	2	2	2	2	4	4	3	4	6	5	4	3	4	2	2	3.1	6
24-Dec	2	2	2	Z	2	2	2	2	2	2	2	2	3	3	6	4	3	3	3	3	3	3	3	3	2.7	6
25-Dec	3	2	2	2	Z	2	2	2	2	2	2	2	2	2	3	3	4	3	3	3	3	3	3	3	2.6	4
26-Dec	3	3	3	3	3	Z	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	2.7	3
27-Dec	Z	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2.6	3
28-Dec	2	Z	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	2.6	3
29-Dec	3	3	Z	3	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3	2	2	2	2	2	2.6	3
30-Dec	2	2	2	Z	2	3	2	3	3	3	3	3	3	3	3	3	4	3	3	3	4	3	2	3	2.9	4
31-Dec	3	3	3	3	Z	2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2.5	3
2.4 2.4 2.4 2.5 2.4 2.6 2.8 2.8 2.7 2.8 2.6 2.5 2.4 2.4 2.4 2.5 2.5 2.4 2.6 2.6 2.6 2.5 2.4 2.4																								Diurnal Average		
3 3 3 4 3 4 6 8 9 13 10 6 6 5 4 6 4 4 4 6 6 7 4 4 5																								Diurnal Maximum		
Z - zerospan		C - Calibration																								







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort Hills - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	145	20.48	20.48
2.1 - 3.0	482	68.08	88.56
3.1 - 10.0	80	11.30	99.86
> 10.0	1	0.14	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort Hills - December 2017**

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	19	13	4	0	0	1	4	13	16	22	3	1	14	17	12	144
2.1 - 3.0	18	28	13	3	4	7	26	173	72	55	29	8	17	5	7	9	474
3.1 - 10.0	1	1	2	0	0	3	14	43	7	1	4	3	1	0	0	0	80
> 10.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
<b>Totals</b>	24	48	28	7	4	10	42	220	92	72	55	14	19	19	24	21	699

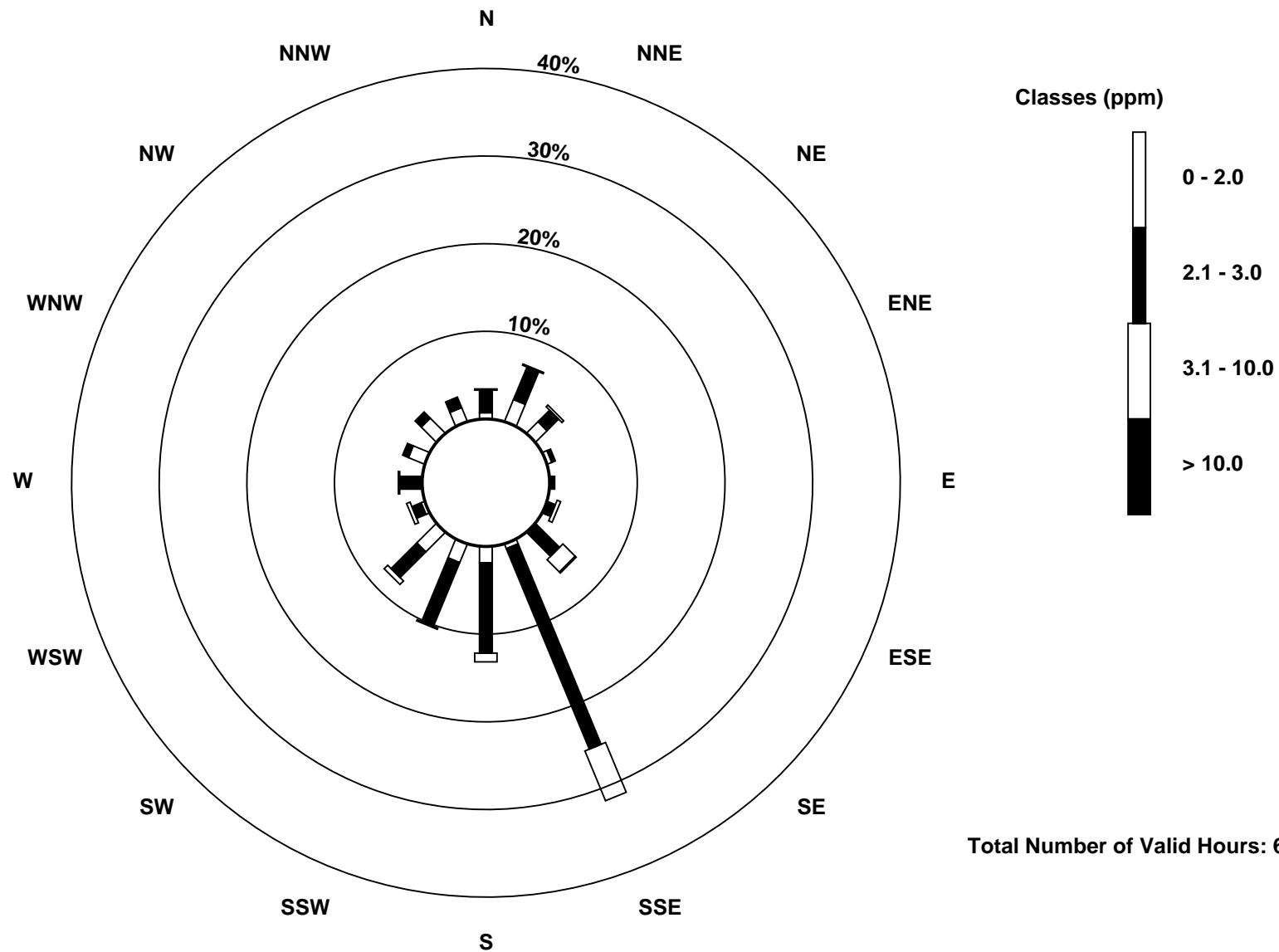
Total Number of Valid Hours: 699

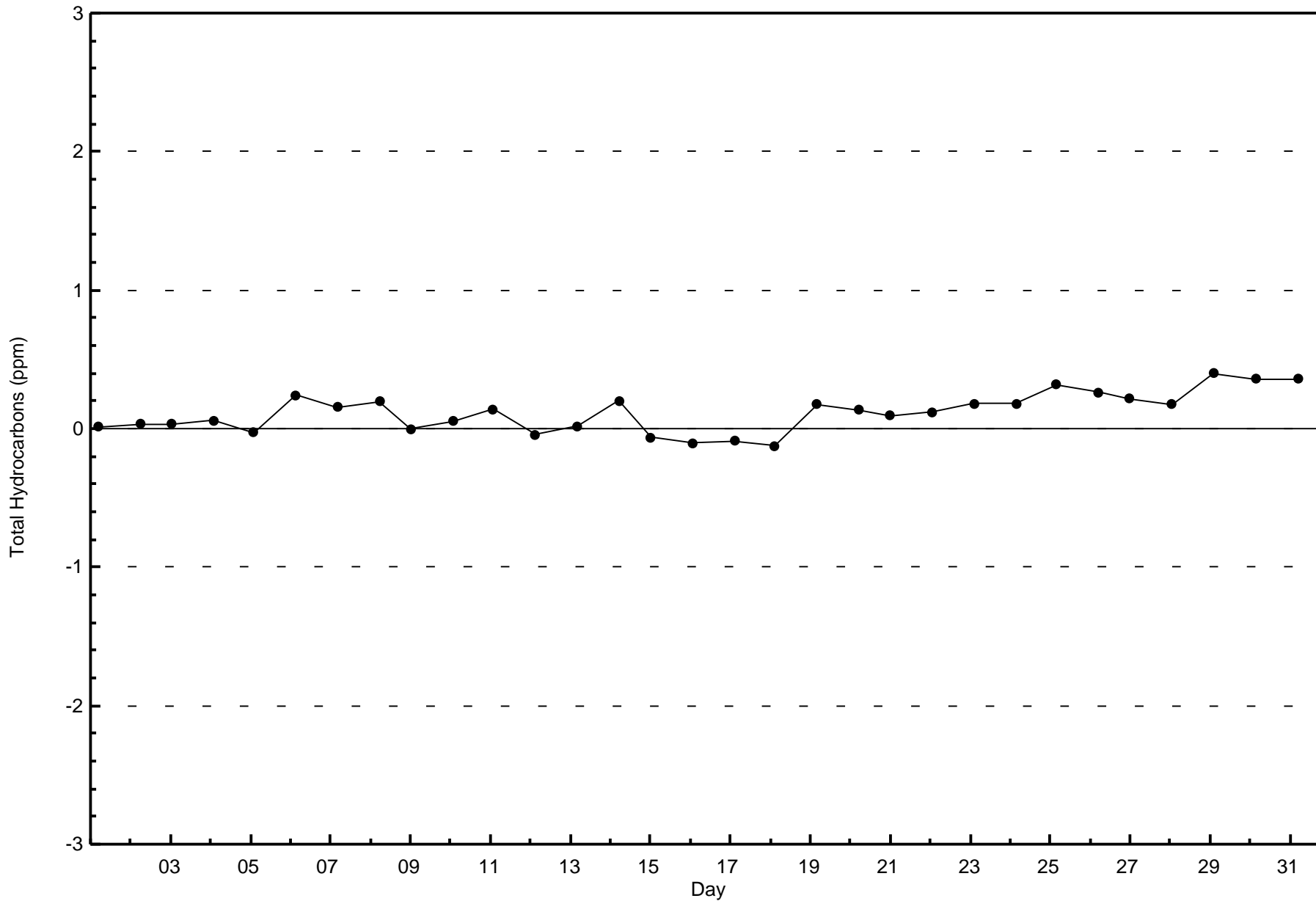
Total Number of Hours: 744

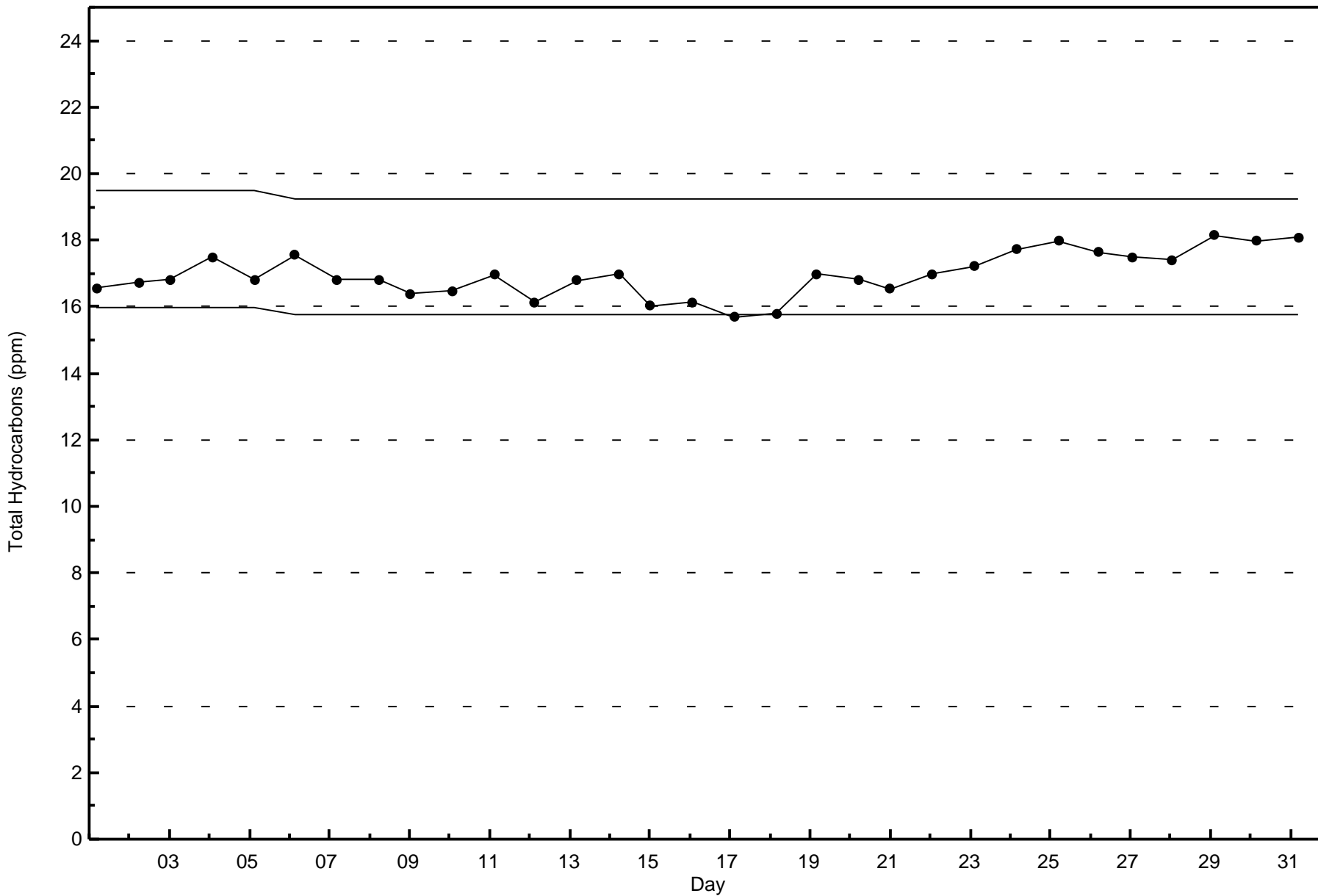


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Fort Hills (AMS 23)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitric Oxide (NO) - ppb

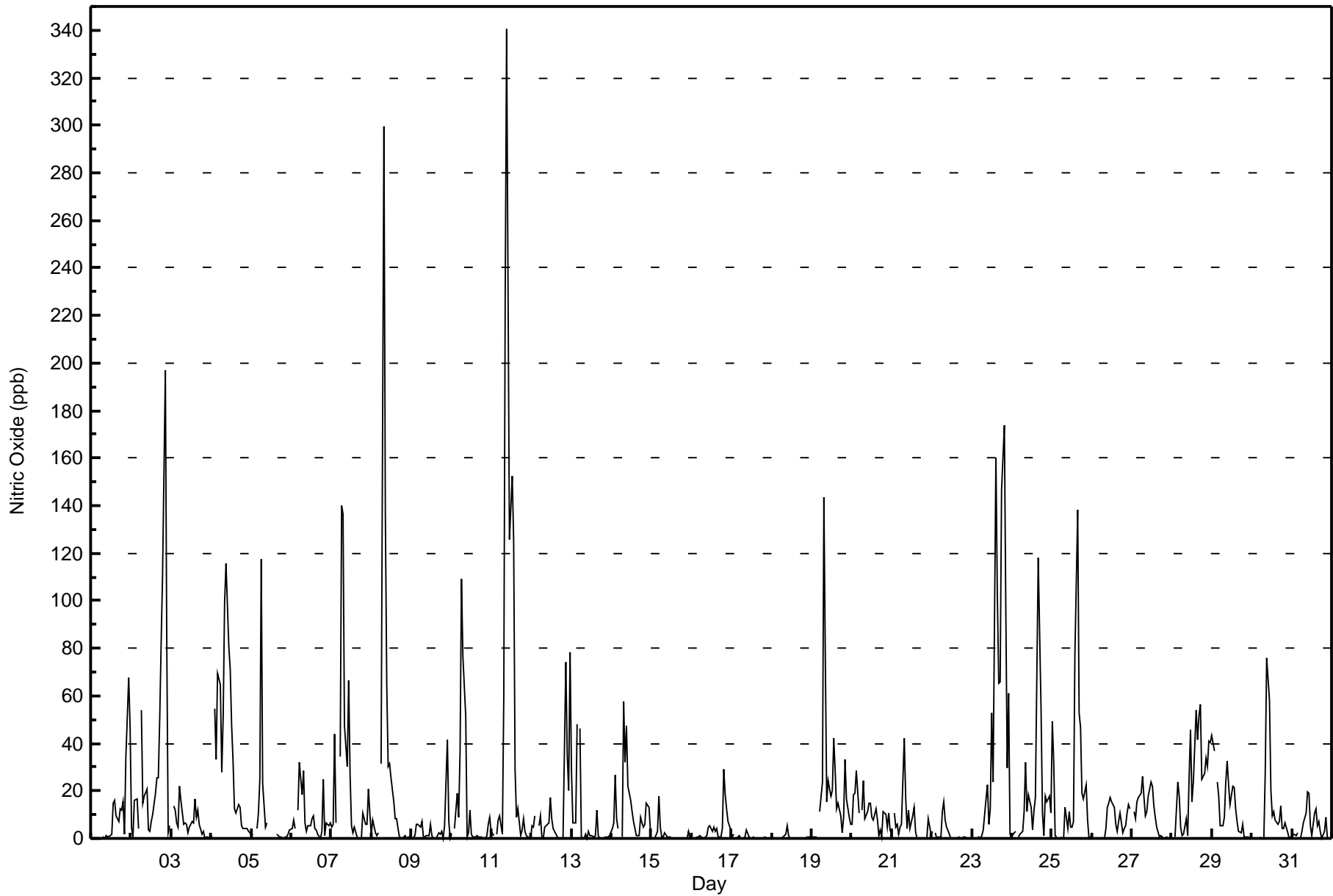
Fort Hills - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 341 ppb on Dec 11 10:00										Maximum Daily Average: 59.1 ppb on Dec 11										Hours of Data: 708						
Minimum Value: 0 ppb on Dec 21 17:00										Minimum Daily Average: 0.4 ppb on Dec 17										Hours of Missing Data: 36						
Maximum Diurnal Average: 33.3 ppb at hour 8										Minimum Diurnal Average: 6.4 ppb at hour 1										Hours of Calibration: 36						
Monthly Average: 15.6 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 5 Q <sub>3</sub> = 15 P <sub>90</sub> = 41 P <sub>99</sub> = 152										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	2	15	16	10	7	12	12	16	2	35	68	47	10.6	68
2-Dec	5	1	16	17	4	Z	54	15	18	21	4	3	7	10	19	25	26	50	82	110	197	82	2	5	33.6	197
3-Dec	Z	14	12	6	4	22	16	6	6	6	2	5	7	6	17	9	12	6	2	3	0	1	0	0	7.0	22
4-Dec	1	Z	54	33	69	64	28	51	99	116	81	71	48	32	13	11	14	13	5	4	4	4	3	2	35.7	116
5-Dec	1	2	Z	4	10	25	118	23	5	7	C	C	C	C	C	2	1	1	1	0	0	1	2	3	11.4	118
6-Dec	4	7	4	Z	12	32	18	29	6	3	5	5	8	9	4	4	2	0	3	25	1	7	5	7	8.8	32
7-Dec	5	6	44	7	Z	34	140	137	47	30	66	27	6	2	4	0	0	0	0	11	6	6	21	11	26.5	140
8-Dec	2	8	2	1	2	Z	31	299	137	64	30	31	25	16	8	8	4	1	0	1	1	0	0	1	29.3	299
9-Dec	Z	0	1	6	6	5	7	1	0	1	1	6	1	0	0	0	2	2	3	0	6	41	7	0	4.2	41
10-Dec	2	Z	4	19	9	37	109	76	51	1	2	12	2	1	0	1	0	1	0	0	0	1	6	9	14.9	109
11-Dec	3	1	Z	2	8	10	2	60	228	341	233	126	153	125	29	9	12	1	3	9	3	1	0	0	59.1	341
12-Dec	5	5	10	Z	5	10	1	0	4	5	7	17	8	4	3	1	0	0	0	0	74	35	20	78	12.7	78
13-Dec	28	6	6	48	Z	46	1	0	2	0	3	1	1	1	1	12	1	0	0	0	1	1	1	1	7.0	48
14-Dec	4	7	27	8	4	Z	1	58	32	48	22	16	11	7	4	1	1	9	7	5	6	15	13	3	13.4	58
15-Dec	Z	0	0	3	18	5	0	1	2	0	1	1	0	0	0	0	0	0	0	0	0	3	0	0	1.5	18
16-Dec	0	Z	0	0	0	1	0	0	1	1	5	5	3	5	3	4	1	0	4	29	19	12	7	4	4.6	29
17-Dec	1	1	Z	0	1	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
18-Dec	1	0	0	Z	0	0	0	0	2	5	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0.6	5
19-Dec	0	0	1	0	Z	11	24	144	76	15	24	18	20	42	29	12	15	10	2	9	33	17	9	6	22.5	144
20-Dec	6	19	19	29	11	Z	12	25	8	11	15	15	9	7	12	8	1	3	1	11	10	5	11	3	10.8	29
21-Dec	Z	11	5	6	2	5	6	42	17	4	12	4	10	13	3	0	0	0	0	0	0	0	8	2	6.5	42
22-Dec	3	Z	3	0	0	0	11	15	8	5	2	0	0	0	0	0	0	0	0	0	1	0	0	0	2.1	15
23-Dec	0	0	Z	1	1	0	1	4	16	22	6	13	53	24	160	102	65	66	147	174	97	30	61	2	45.5	174
24-Dec	1	2	3	Z	0	2	3	11	32	12	19	13	4	12	17	67	118	54	11	1	18	16	18	11	19.3	118
25-Dec	49	32	1	1	Z	0	0	0	13	4	11	4	5	7	77	138	53	47	19	17	22	7	0	1	22.2	138
26-Dec	0	0	0	0	0	Z	0	0	4	13	15	17	16	13	6	3	7	11	2	4	5	11	14	13	6.8	17
27-Dec	Z	11	8	16	17	19	26	17	9	11	18	24	22	14	9	5	1	1	1	0	0	0	0	0	9.9	26
28-Dec	0	Z	1	24	18	5	1	2	8	1	25	45	16	24	54	42	52	57	25	27	34	30	41	40	24.8	57
29-Dec	43	37	Z	24	18	5	5	9	24	33	22	14	22	22	13	7	3	2	6	1	1	0	0	0	13.5	43
30-Dec	0	0	0	Z	1	0	0	0	28	76	58	20	9	11	8	6	7	14	4	4	7	3	0	0	11.1	76
31-Dec	1	2	1	2	Z	0	3	6	11	20	19	5	1	11	13	5	7	3	0	3	9	0	0	0	5.3	20
6.4 6.7 8.5 9.9 8.9 13.0 20.0 33.3 28.9 28.4 23.7 17.4 15.6 14.4 17.4 15.8 13.4 11.8 11.0 15.0 17.9 11.7 10.4 8.0																								Diurnal Average		
49 37 54 48 69 64 140 299 228 341 233 126 153 125 160 138 118 66 147 174 197 82 68 78																								Diurnal Maximum		
Z - zerospan		C - Calibration																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Fort Hills - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Fort Hills - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	575	81.21	81.21
21 - 40	60	8.47	89.69
41 - 80	46	6.50	96.19
81 - 159	19	2.68	98.87
> 159	7	0.99	99.86

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort Hills - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	22	41	27	6	4	6	28	157	77	66	47	11	18	18	24	18	570
21 - 40	1	5	0	1	0	2	3	28	6	2	5	1	1	0	0	2	57
41 - 80	1	2	0	0	0	1	5	24	4	3	1	2	0	1	0	1	45
81 - 159	0	0	0	0	0	1	4	7	4	1	2	0	0	0	0	0	19
> 159	0	0	1	0	0	0	2	3	1	0	0	0	0	0	0	0	7
<b>Totals</b>	24	48	28	7	4	10	42	219	92	72	55	14	19	19	24	21	698

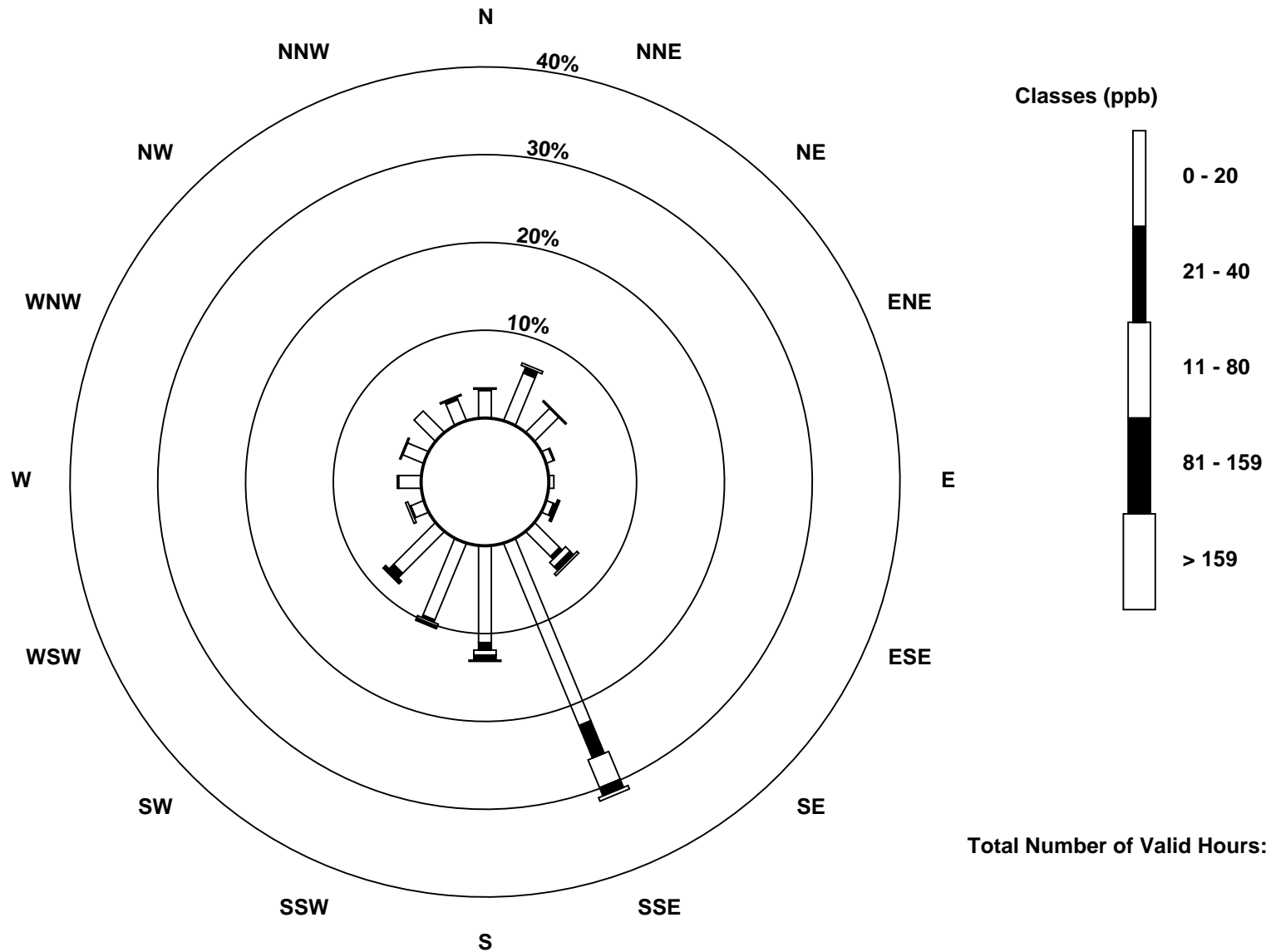
Total Number of Valid Hours: 699

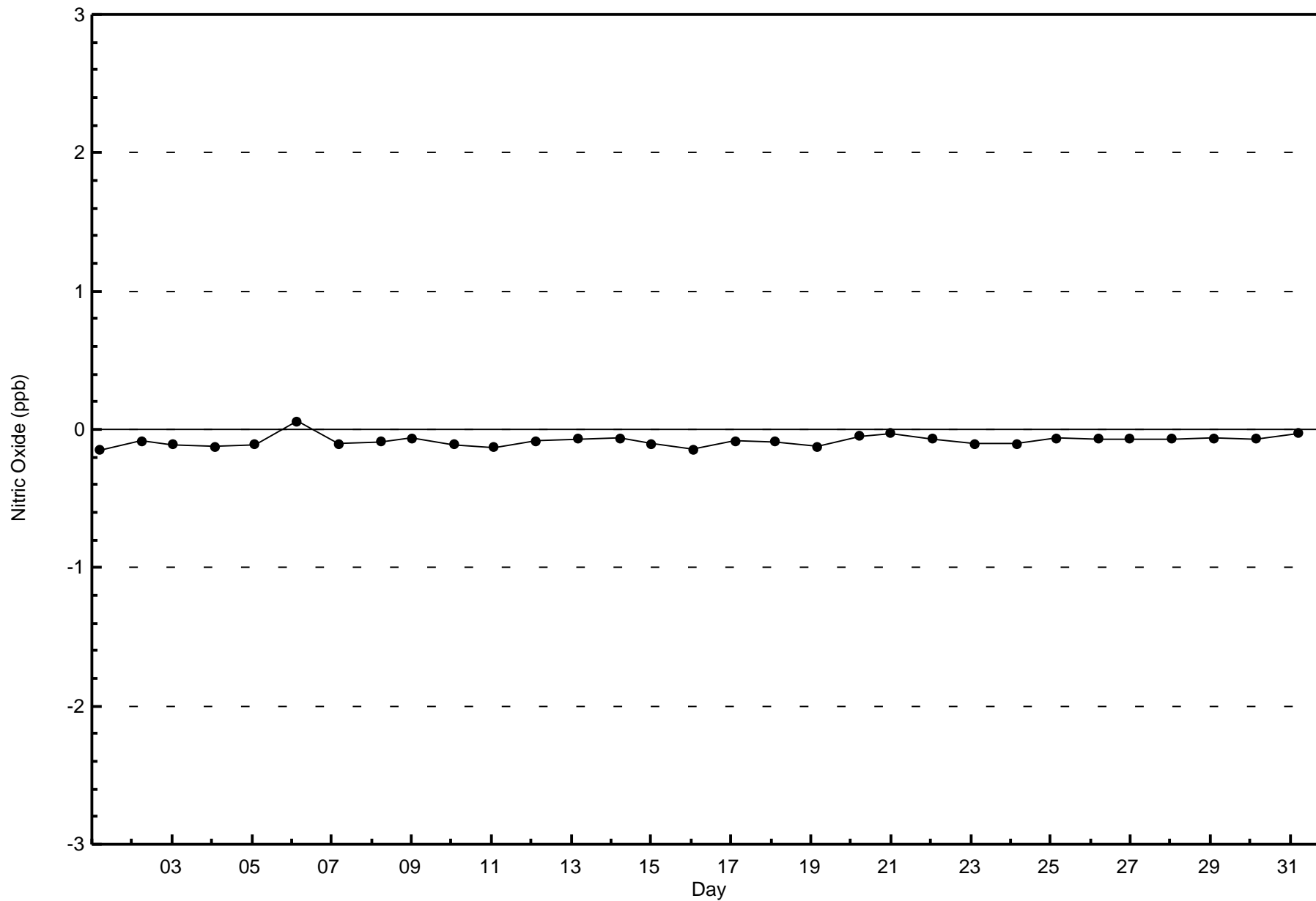
Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Fort Hills (AMS 23)

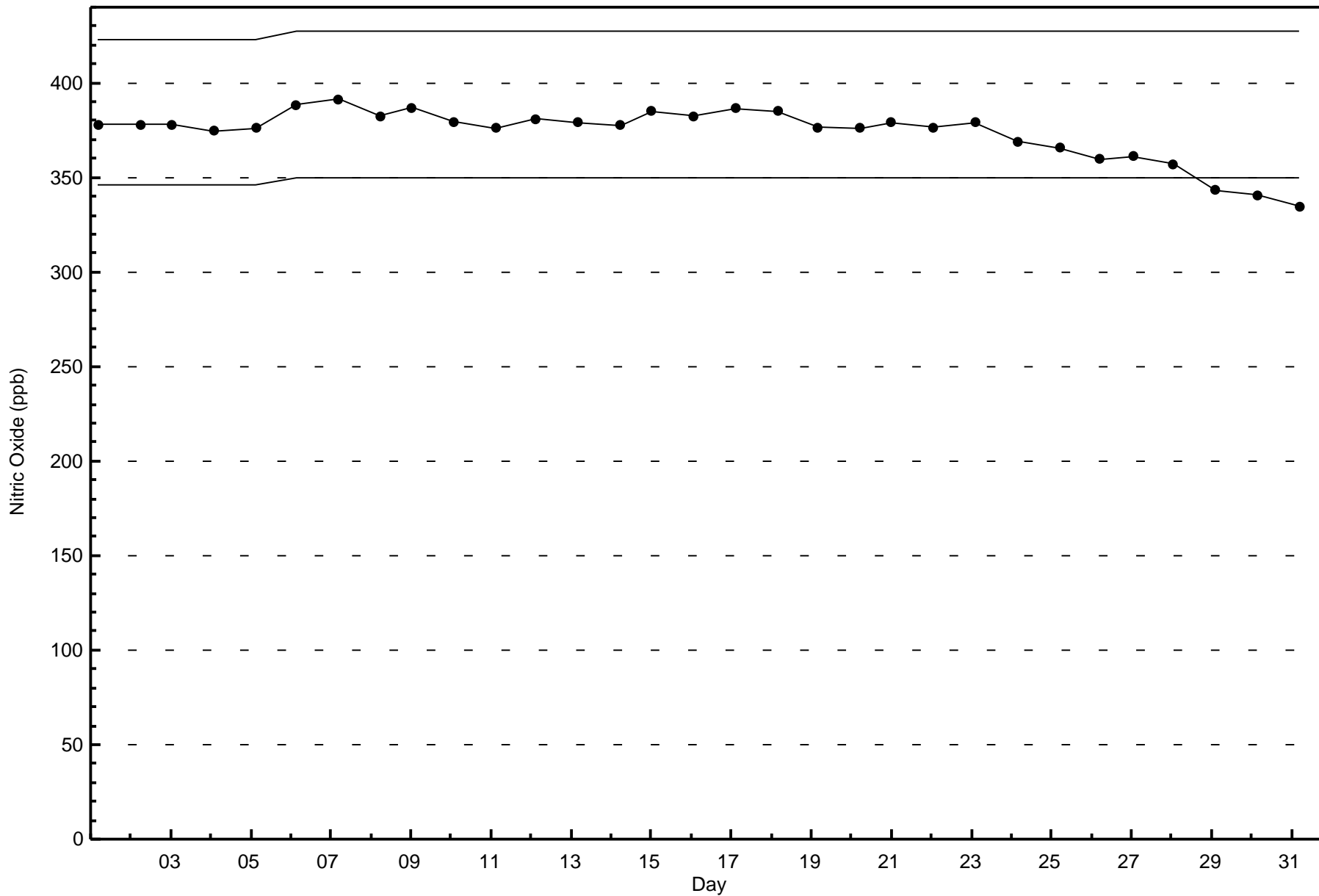






Wood Buffalo Environmental Association  
Span Responses

Nitric Oxide (NO) - ppb  
Fort Hills - December 2017





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

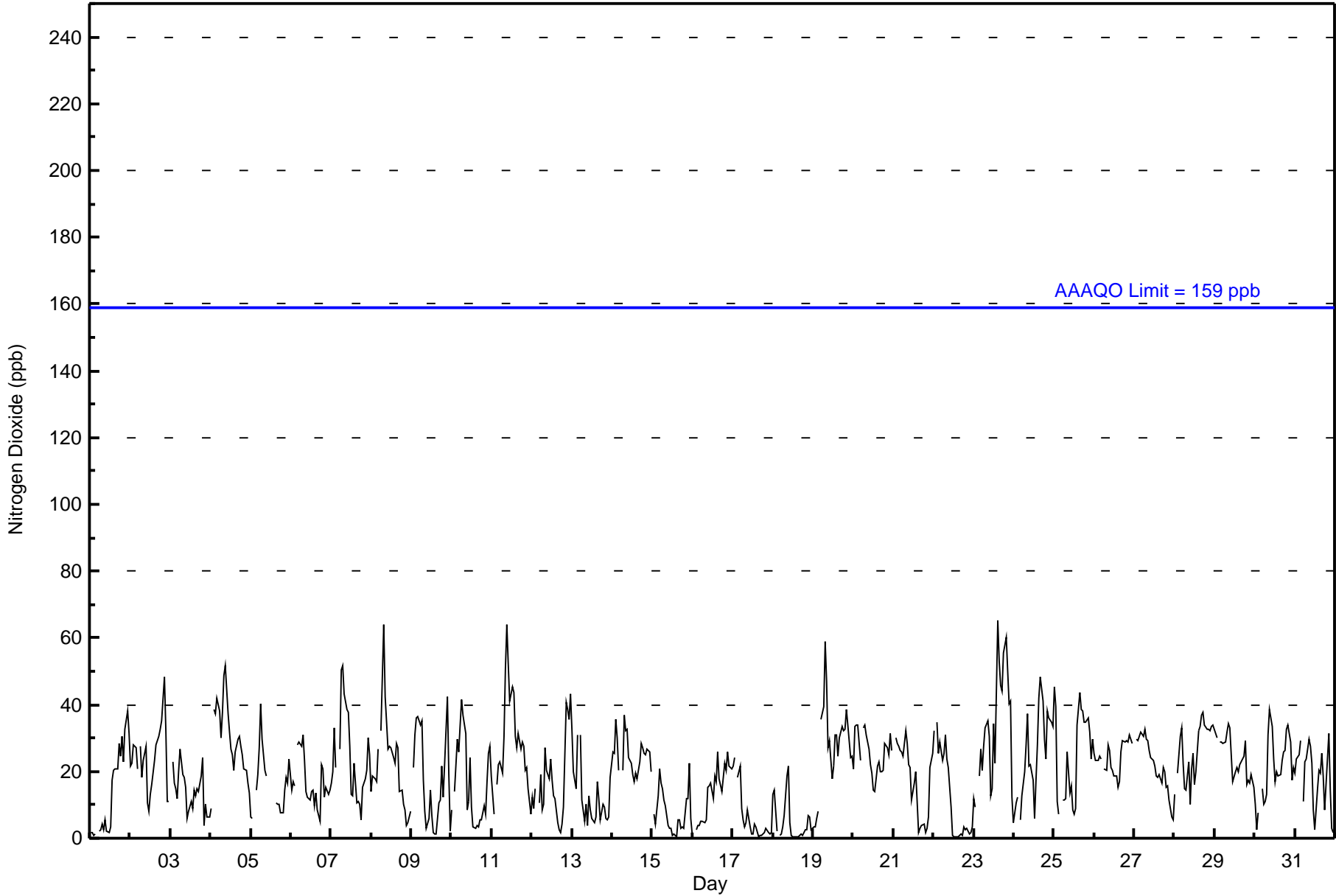
## Fort Hills - December 2017

Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																		Daily Average		Daily Maximum			
Maximum Value: 65 ppb on Dec 23 15:00		Maximum Daily Average: 33.2 ppb on Dec 23		Hours of Data: 708																							
Minimum Value: 0 ppb on Dec 18 13:00		Minimum Daily Average: 4.9 ppb on Dec 18		Hours of Missing Data: 36																							
Maximum Diurnal Average: 26.6 ppb at hour 9		Minimum Diurnal Average: 14.1 ppb at hour 13		Hours of Calibration: 36																							
Monthly Average: 19.8 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 3 Q <sub>1</sub> = 10 Median = 20 Q <sub>3</sub> = 28 P <sub>90</sub> = 35 P <sub>99</sub> = 51		Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2	2	1	1	Z	2	2	4	3	5	2	2	4	17	20	21	21	29	25	30	23	33	38	31	13.8	38	
2-Dec	22	22	28	27	21	Z	28	18	23	28	10	8	13	16	23	28	29	31	33	35	48	32	11	11	23.7	48	
3-Dec	Z	23	16	15	12	20	27	19	18	15	6	8	11	9	15	13	15	14	19	24	4	10	7	6	14.1	27	
4-Dec	9	Z	39	37	42	38	30	38	49	52	37	32	27	25	20	26	30	30	28	25	21	20	16	14	29.7	52	
5-Dec	6	6	Z	14	19	27	40	30	21	19	C	C	C	C	C	10	10	10	8	8	14	18	17	24	16.7	40	
6-Dec	14	17	16	Z	28	29	28	31	23	14	12	12	14	15	10	14	9	5	22	21	12	15	13	14	16.8	31	
7-Dec	16	20	33	21	Z	27	50	52	43	39	38	28	13	13	22	10	11	10	5	15	18	21	30	25	24.4	52	
8-Dec	14	19	18	17	27	Z	32	64	42	35	27	28	27	24	23	29	27	14	14	10	8	4	5	8	22.4	64	
9-Dec	Z	21	31	36	37	34	35	17	8	3	6	14	7	2	1	1	11	11	22	12	22	43	19	2	17.2	43	
10-Dec	9	Z	14	30	26	34	42	37	32	8	11	24	9	3	3	4	4	5	5	10	7	17	26	28	16.8	42	
11-Dec	19	7	Z	16	22	23	20	31	51	64	52	41	45	44	30	27	32	27	29	27	21	21	15	7	29.1	64	
12-Dec	12	9	15	Z	10	19	8	10	27	20	18	24	17	13	12	5	3	2	4	10	41	39	36	43	17.2	43	
13-Dec	33	20	15	31	Z	31	12	5	10	4	13	9	6	5	6	17	12	5	10	9	6	5	6	18	12.5	33	
14-Dec	26	26	36	30	21	Z	21	37	32	33	24	23	19	17	20	18	23	28	27	25	25	27	26	20	25.2	37	
15-Dec	Z	7	4	13	21	17	15	12	10	4	3	3	1	1	1	6	6	3	3	3	12	12	22	6	7.9	22	
16-Dec	1	Z	3	4	4	5	5	5	6	15	16	17	12	19	17	26	18	14	18	23	20	26	22	21	13.6	26	
17-Dec	21	24	Z	18	22	9	5	3	5	9	3	1	1	4	3	1	1	1	1	2	3	2	1	2	6.2	24	
18-Dec	13	15	2	Z	1	1	3	7	19	21	5	1	0	0	0	1	1	1	1	2	3	7	7	3	4.9	21	
19-Dec	3	3	6	8	Z	36	39	59	47	27	29	18	21	31	31	25	30	34	32	33	38	34	24	24	27.5	59	
20-Dec	21	34	34	34	24	Z	33	34	31	27	22	19	14	14	21	23	20	20	20	29	27	25	32	26	25.3	34	
21-Dec	Z	30	29	28	26	26	24	32	29	22	21	12	17	20	11	2	3	4	4	2	3	7	21	26	17.2	32	
22-Dec	32	Z	35	26	29	24	26	31	24	21	10	1	0	1	1	1	1	1	3	3	3	1	2	3	12.0	35	
23-Dec	12	9	Z	19	27	20	28	33	35	30	13	15	35	23	65	53	46	44	55	60	50	40	41	12	33.2	65	
24-Dec	5	11	12	Z	6	13	20	28	37	21	22	17	6	18	28	42	48	41	30	24	38	36	35	34	24.8	48	
25-Dec	45	40	11	7	Z	12	11	12	26	14	16	8	7	9	34	44	38	38	35	35	36	32	24	30	24.4	45	
26-Dec	26	23	23	25	24	Z	21	20	28	26	21	20	19	19	15	17	26	29	29	29	29	31	30	29	24.3	31	
27-Dec	Z	30	29	31	32	30	33	30	29	26	24	23	22	19	18	19	17	21	20	15	16	12	6	6	22.0	33	
28-Dec	13	Z	20	31	33	22	15	14	23	10	21	25	16	20	32	34	37	38	34	33	33	32	33	34	26.1	38	
29-Dec	33	30	Z	29	29	29	29	32	34	33	25	17	20	21	20	22	23	25	29	16	18	17	19	15	24.5	34	
30-Dec	10	2	8	Z	15	10	11	13	31	38	33	24	17	20	19	19	23	26	26	33	34	29	17	21	20.8	38	
31-Dec	19	24	25	29	Z	11	23	24	30	28	22	8	3	15	20	20	25	19	8	24	32	15	3	2	18.6	32	
16.8 18.2 19.3 22.1 22.2 21.1 23.0 25.2 26.6 22.9 18.7 16.0 14.1 15.1 18.1 18.5 19.2 18.7 19.4 20.2 21.4 21.3 19.4 17.5																								Diurnal Average			
45 40 39 37 42 38 50 64 51 64 52 41 45 44 65 53 48 44 55 60 50 43 41 43																								Diurnal Maximum			
Z - zerospan C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																											



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort Hills - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	370	52.26	52.26
21 - 40	304	42.94	95.20
41 - 80	34	4.80	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Hills - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	15	37	26	5	3	3	14	68	45	44	34	3	12	17	22	17	365
21 - 40	9	9	1	2	1	7	23	135	42	26	20	11	7	2	2	4	301
11 - 80	0	2	1	0	0	0	5	17	5	2	1	0	0	0	0	0	33
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
<b>Totals</b>	24	48	28	7	4	10	42	220	92	72	55	14	19	19	24	21	699

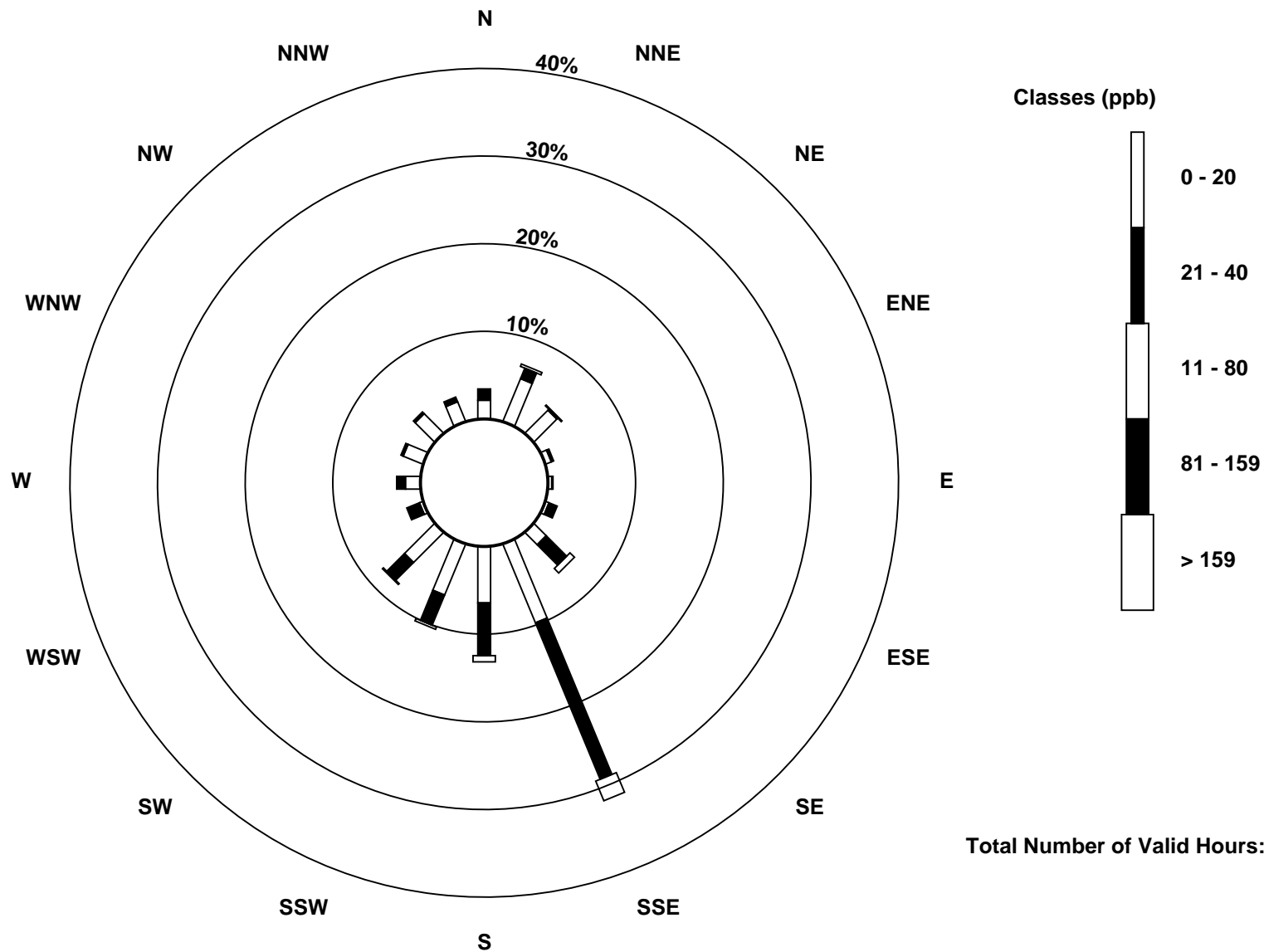
Total Number of Valid Hours: 699

Total Number of Hours: 744

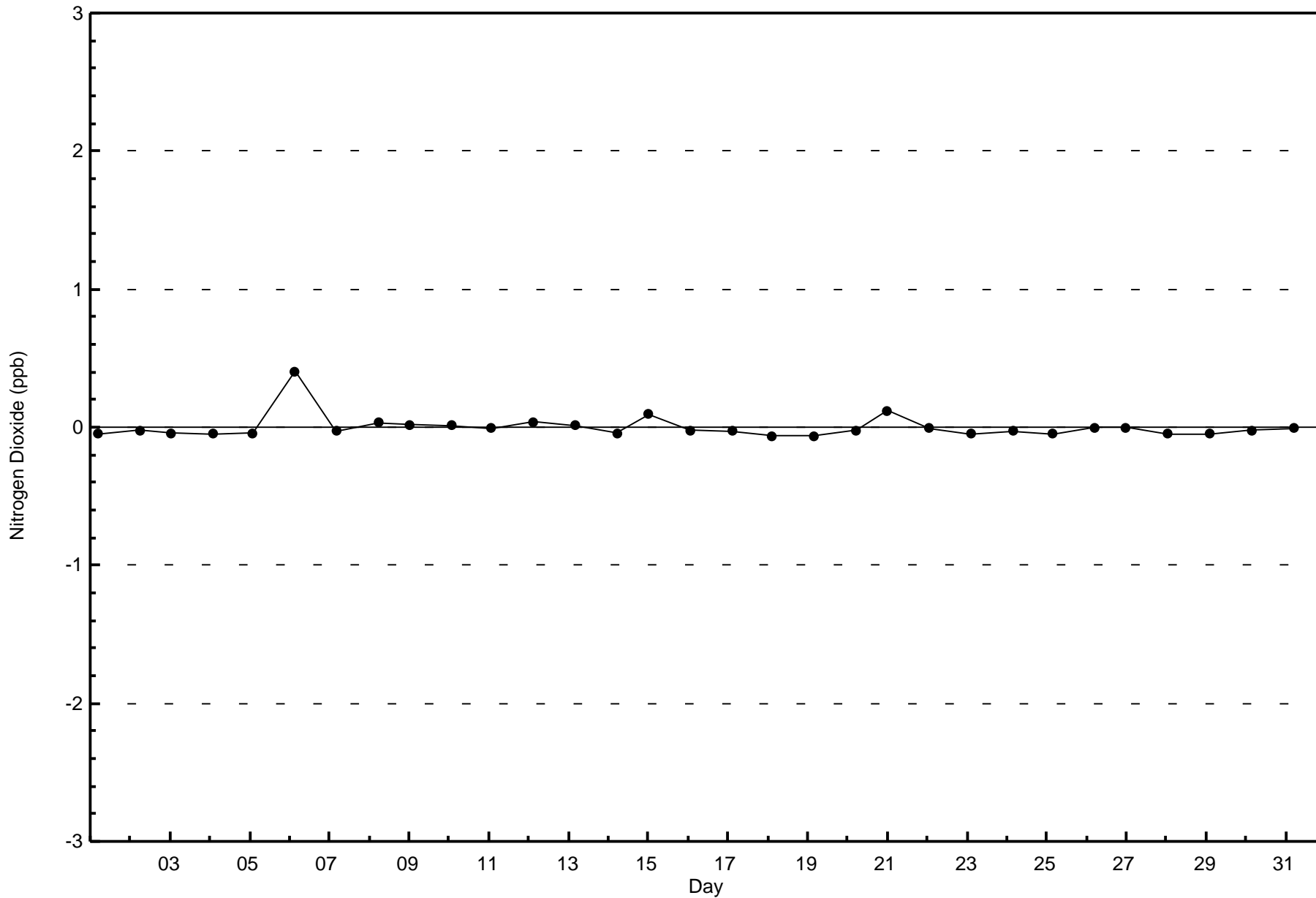


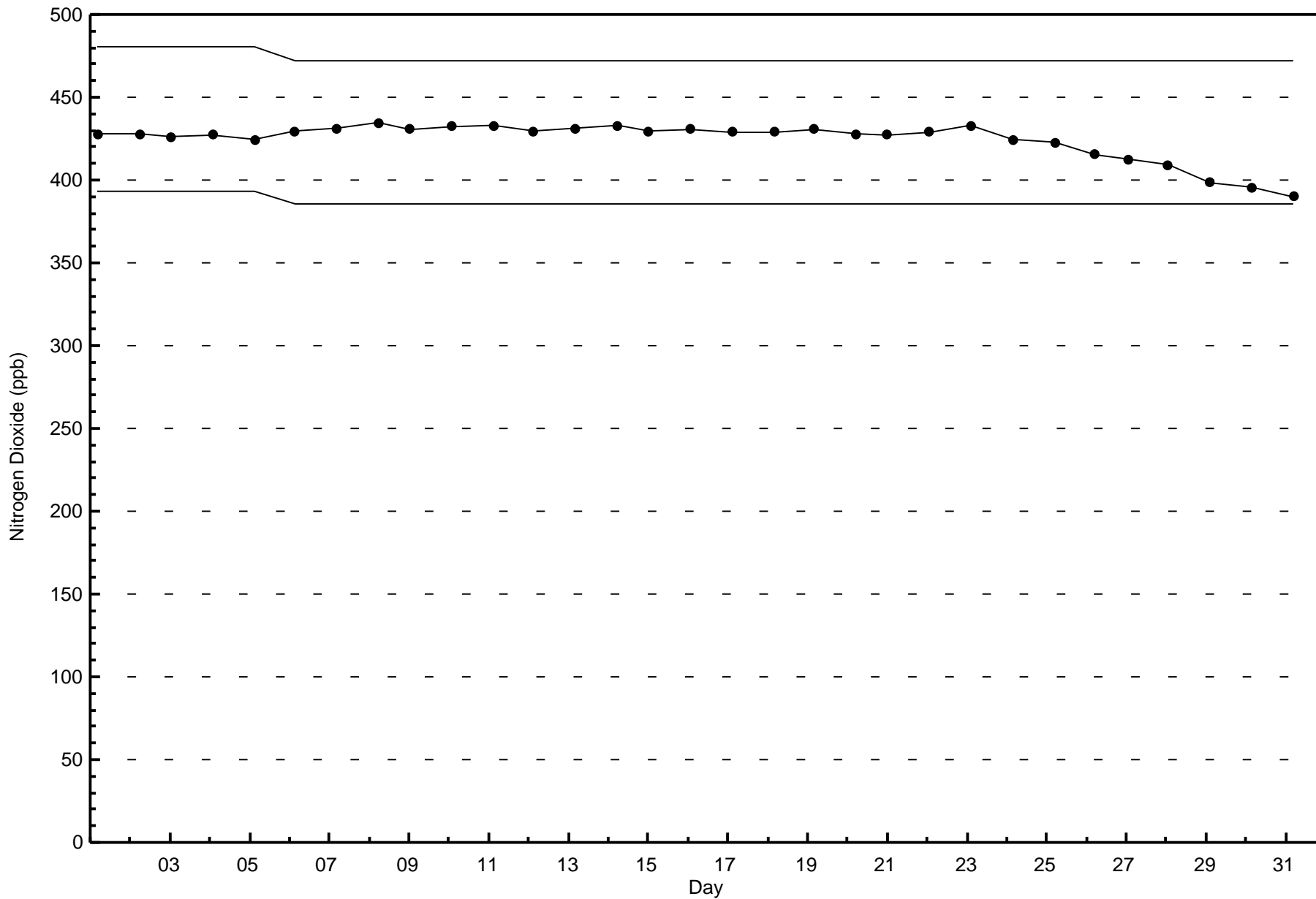
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Hills (AMS 23)



Total Number of Valid Hours: 699







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

Fort Hills - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 405 ppb on Dec 11 10:00	Maximum Daily Average: 88.2 ppb on Dec 11		Hours of Data:	708
Minimum Value: 0 ppb on Dec 18 14:00	Minimum Daily Average: 5.4 ppb on Dec 18		Hours of Missing Data:	36
Maximum Diurnal Average: 58.4 ppb at hour 8	Minimum Diurnal Average: 23.1 ppb at hour 1		Hours of Calibration:	36
Monthly Average: 35.4 ppb	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 12 Median = 26 O <sub>3</sub> = 42 P <sub>90</sub> = 74 P <sub>99</sub> = 220		Percent Operational Time:	100.0

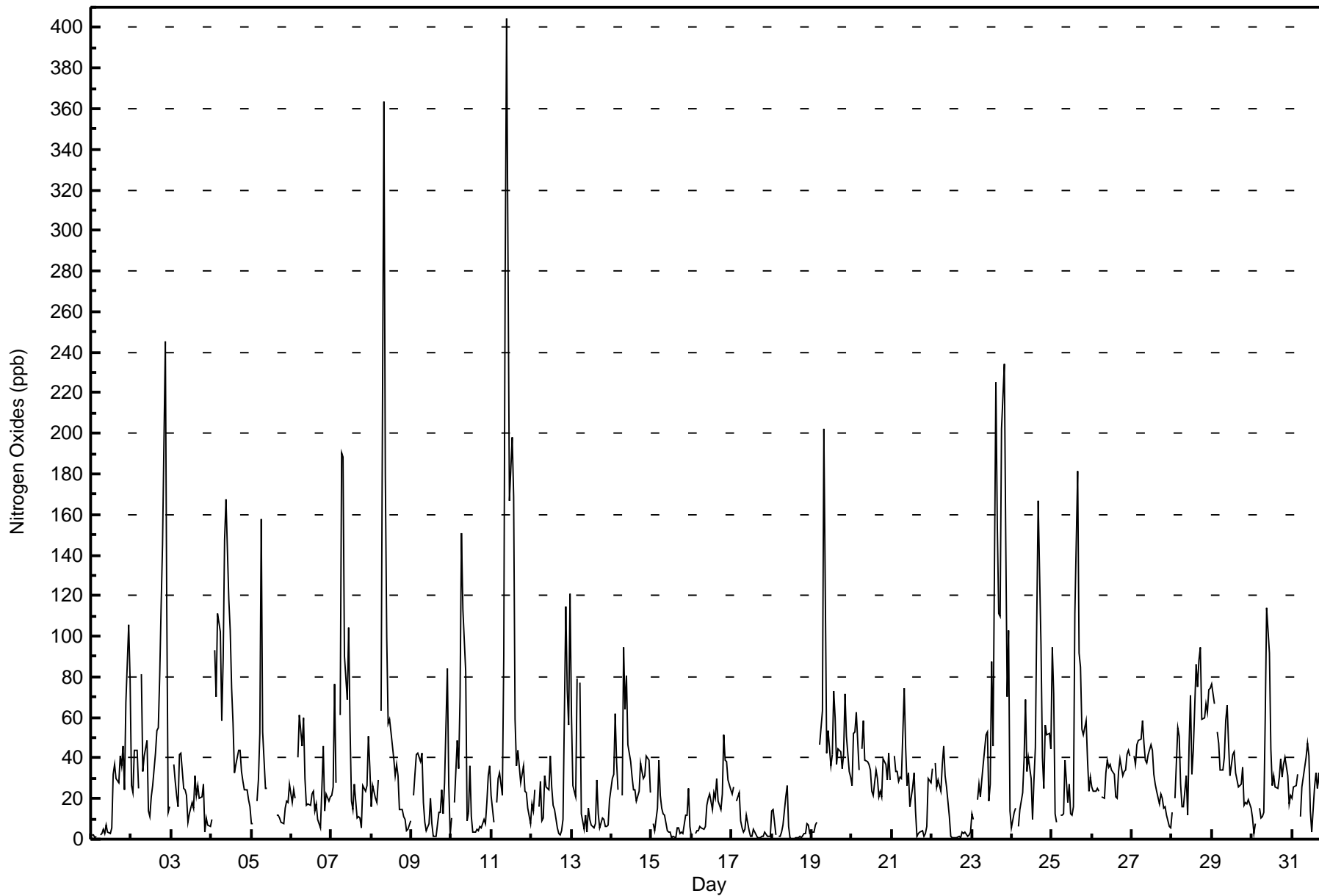
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	2	2	1	1	Z	2	2	5	3	7	3	3	6	32	37	30	28	41	36	46	25	67	106	78	24.4	106																							
2-Dec	27	23	44	44	25	Z	82	33	41	48	14	11	21	26	42	53	55	81	115	145	245	114	13	16	57.3	245																							
3-Dec	Z	37	28	21	16	42	43	25	25	21	8	13	18	15	31	22	26	20	21	27	4	11	7	6	21.2	43																							
4-Dec	10	Z	93	70	111	102	58	89	148	168	118	103	74	57	33	37	44	43	33	29	25	25	19	16	65.4	168																							
5-Dec	8	8	Z	19	29	52	158	53	25	25	C	C	C	C	C	12	12	11	8	8	15	19	18	27	28.1	158																							
6-Dec	18	24	20	Z	40	61	46	60	30	17	17	22	24	14	17	10	5	25	46	14	22	19	21	21	25.6	61																							
7-Dec	21	26	77	28	Z	61	191	188	91	69	104	55	19	15	27	11	11	10	5	26	24	26	51	35	50.9	191																							
8-Dec	16	27	20	18	29	Z	64	363	179	99	57	59	53	40	31	37	31	15	14	11	9	4	5	9	51.7	363																							
9-Dec	Z	22	32	42	43	38	42	18	8	4	7	20	8	2	1	1	13	13	25	12	27	84	26	2	21.4	84																							
10-Dec	10	Z	18	48	35	70	151	113	83	9	13	36	11	4	3	5	4	6	6	10	7	18	32	36	31.7	151																							
11-Dec	21	8	Z	18	30	33	22	91	279	405	285	167	198	169	59	36	44	28	32	36	23	23	15	7	88.2	405																							
12-Dec	17	14	24	Z	16	29	9	10	32	26	24	41	25	17	15	6	3	2	4	10	115	73	56	121	29.9	121																							
13-Dec	61	26	21	79	Z	77	12	5	12	4	15	10	7	5	8	29	13	5	10	9	6	6	7	20	19.5	79																							
14-Dec	30	32	62	38	25	Z	21	94	64	80	46	38	30	25	24	19	24	37	34	30	31	41	39	23	38.7	94																							
15-Dec	Z	7	5	15	39	21	15	12	12	4	4	3	1	1	1	6	6	3	3	3	12	12	25	6	9.4	39																							
16-Dec	1	Z	3	4	4	6	5	5	6	16	20	22	14	23	20	30	19	14	22	52	39	38	29	24	18.2	52																							
17-Dec	22	26	Z	19	23	9	5	3	5	12	4	1	1	5	3	1	1	1	1	1	4	2	1	2	6.6	26																							
18-Dec	14	15	2	Z	1	2	3	7	21	27	6	1	0	0	0	0	1	1	1	3	3	7	7	3	5.4	27																							
19-Dec	4	4	7	8	Z	47	63	202	123	42	53	36	41	73	60	37	45	43	34	42	71	50	33	31	50.0	202																							
20-Dec	26	52	53	62	34	Z	45	58	39	38	37	34	23	21	34	30	21	23	21	40	37	29	42	29	36.1	62																							
21-Dec	Z	41	33	33	28	31	30	74	45	26	33	16	26	33	14	2	3	4	4	2	3	6	30	28	23.7	74																							
22-Dec	35	Z	37	26	29	24	37	46	31	26	11	1	0	0	1	1	2	1	3	3	3	1	2	3	14.1	46																							
23-Dec	12	10	Z	19	27	21	29	37	52	53	19	27	87	46	225	155	111	110	202	234	147	70	103	14	78.7	234																							
24-Dec	5	13	15	Z	6	14	23	40	69	33	40	30	10	29	45	109	167	96	40	25	56	51	52	44	44.1	167																							
25-Dec	94	72	12	8	Z	12	11	12	39	18	27	13	12	16	111	182	91	85	54	52	59	39	24	30	46.7	182																							
26-Dec	26	23	23	25	24	Z	21	20	32	39	36	37	34	32	21	20	33	40	31	33	34	42	44	41	31.0	44																							
27-Dec	Z	41	37	46	49	50	59	47	39	37	42	47	44	32	27	24	17	22	20	15	16	12	6	6	32.0	59																							
28-Dec	13	Z	20	55	51	27	16	16	31	12	46	71	32	43	86	75	88	94	59	60	66	63	74	74	51.0	94																							
29-Dec	76	67	Z	53	47	34	34	41	58	66	47	31	42	43	33	29	26	27	35	17	18	17	20	15	38.1	76																							
30-Dec	10	2	8	Z	15	10	11	13	59	114	92	44	26	31	26	25	30	40	31	37	40	31	17	22	32.0	114																							
31-Dec	20	26	26	32	Z	11	26	30	40	47	41	14	4	26	33	25	33	22	8	27	40	15	3	2	23.9	47																							
																								23.1	24.9	27.8	32.0	31.1	34.1	43.0	58.4	55.5	51.4	42.4	33.3	29.7	29.5	35.5	34.3	32.6	30.4	30.3	35.2	39.3	32.9	29.8	25.6	Diurnal Average	
																								94	72	93	79	111	102	191	363	279	405	285	167	198	169	225	182	167	110	202	234	245	114	106	121	Diurnal Maximum	

Z - zerospan C - Calibration



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Hills - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	285	40.25	40.25
21 - 40	235	33.19	73.45
41 - 80	127	17.94	91.38
81 - 159	42	5.93	97.32
> 159	18	2.54	99.86

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort Hills - December 2017**

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	31	24	5	2	2	11	31	32	34	31	2	12	15	21	16	281
21 - 40	8	7	3	0	2	3	14	102	40	27	12	7	4	3	1	1	234
11 - 80	3	8	0	2	0	3	7	58	13	7	9	4	3	1	2	4	124
81 - 159	1	2	0	0	0	2	6	20	3	3	3	1	0	0	0	0	41
> 159	0	0	1	0	0	0	3	9	4	1	0	0	0	0	0	0	18
<b>Totals</b>	24	48	28	7	4	10	41	220	92	72	55	14	19	19	24	21	698

Total Number of Valid Hours: 699

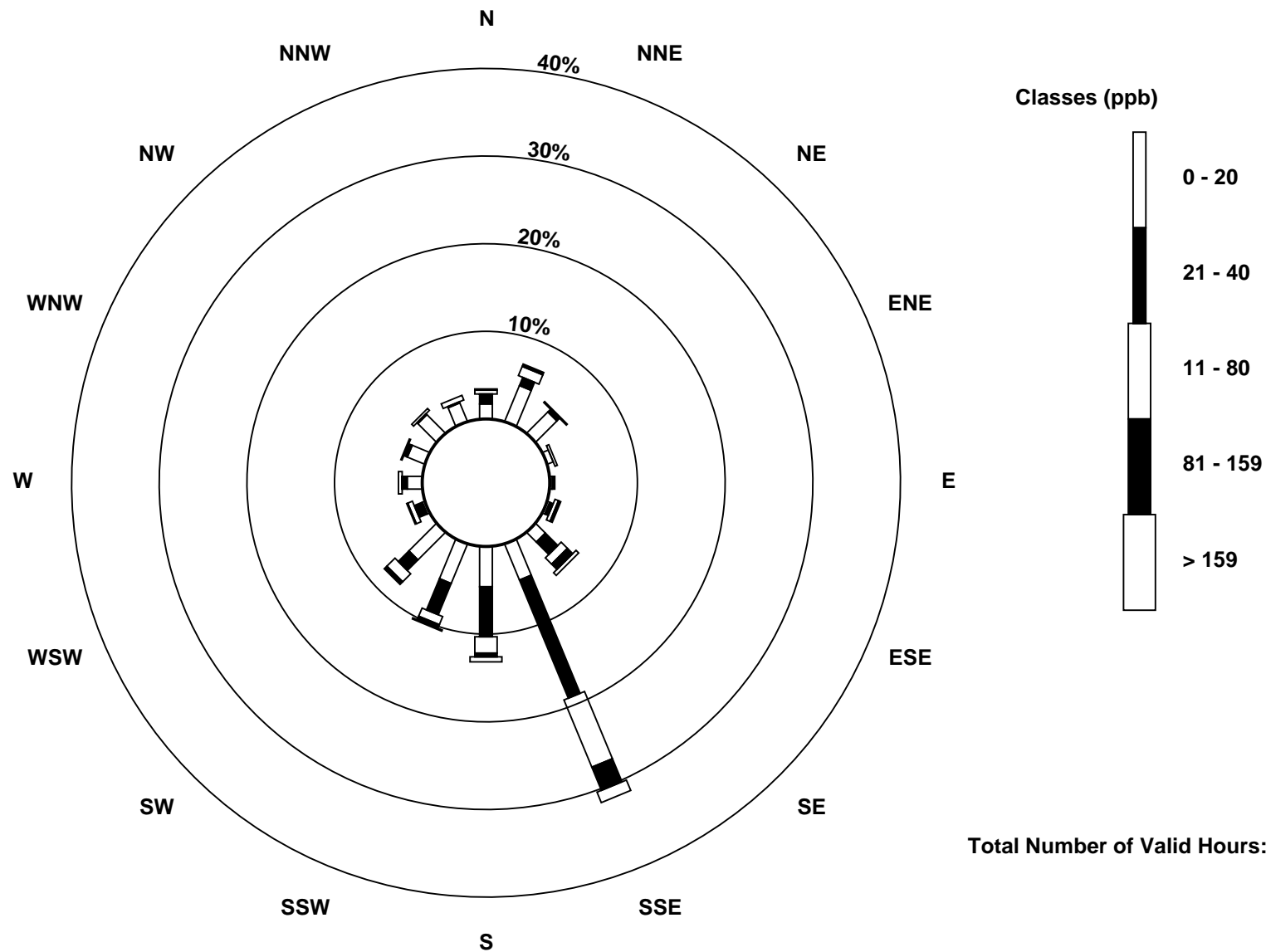
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Hills (AMS 23)

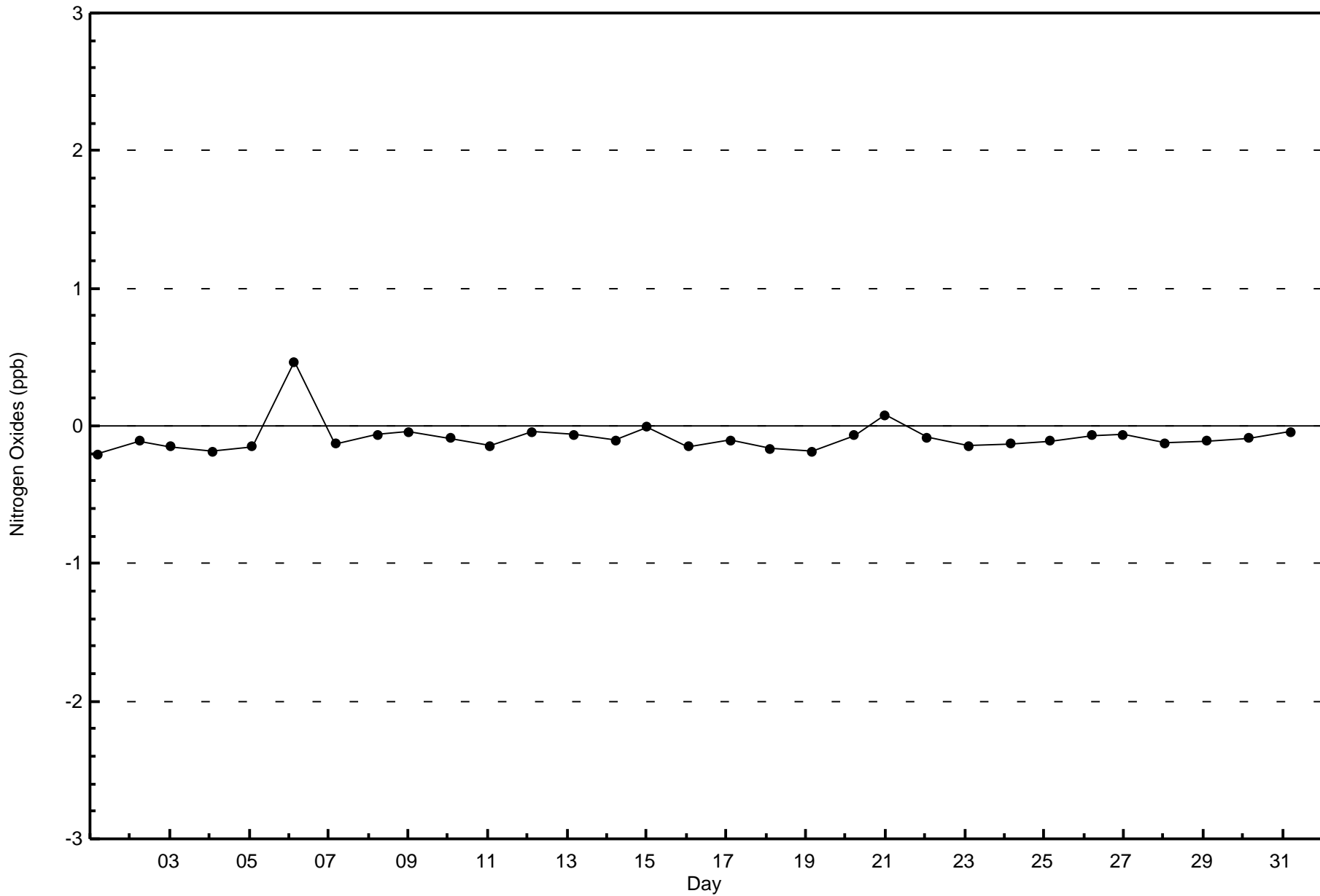


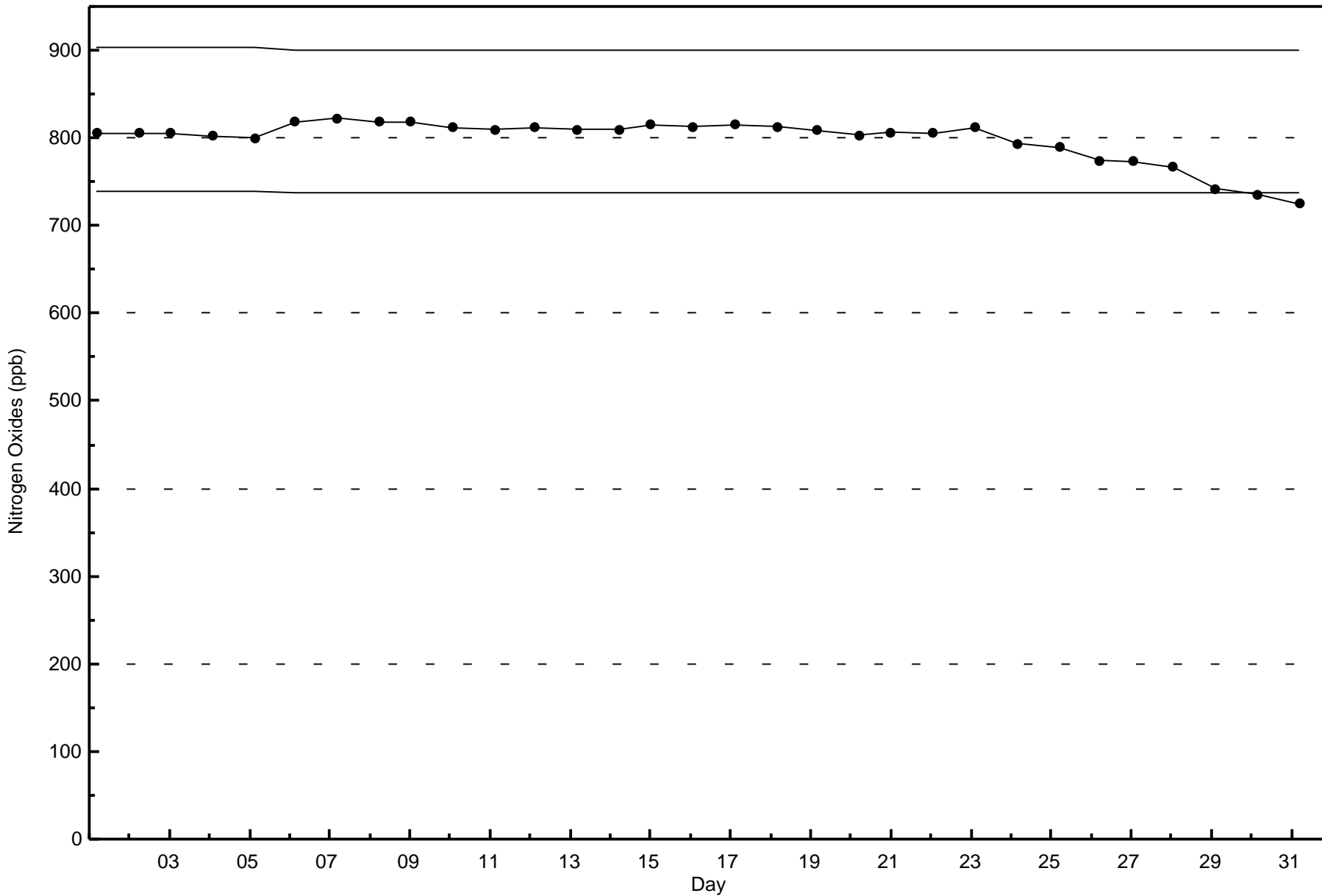
Total Number of Valid Hours: 699



Wood Buffalo Environmental Association  
Zero Responses

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Hills - December 2017







Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) - µg/m<sup>3</sup>

Fort Hills - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 76 µg/m <sup>3</sup> on Dec 19 08:00	Maximum Daily Average: 15.5 µg/m <sup>3</sup> on Dec 8		Hours of Data:	742
Minimum Value: 1 µg/m <sup>3</sup> on Dec 18 16:00	Minimum Daily Average: 1.7 µg/m <sup>3</sup> on Dec 22		Hours of Missing Data:	2
Maximum Diurnal Average: 11.6 µg/m <sup>3</sup> at hour 8	Minimum Diurnal Average: 5.8 µg/m <sup>3</sup> at hour 14		Hours of Calibration:	2
Monthly Average: 7.4 µg/m <sup>3</sup>	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 6 Q <sub>3</sub> = 9 P <sub>90</sub> = 16 P <sub>99</sub> = 34		Percent Operational Time:	100.0

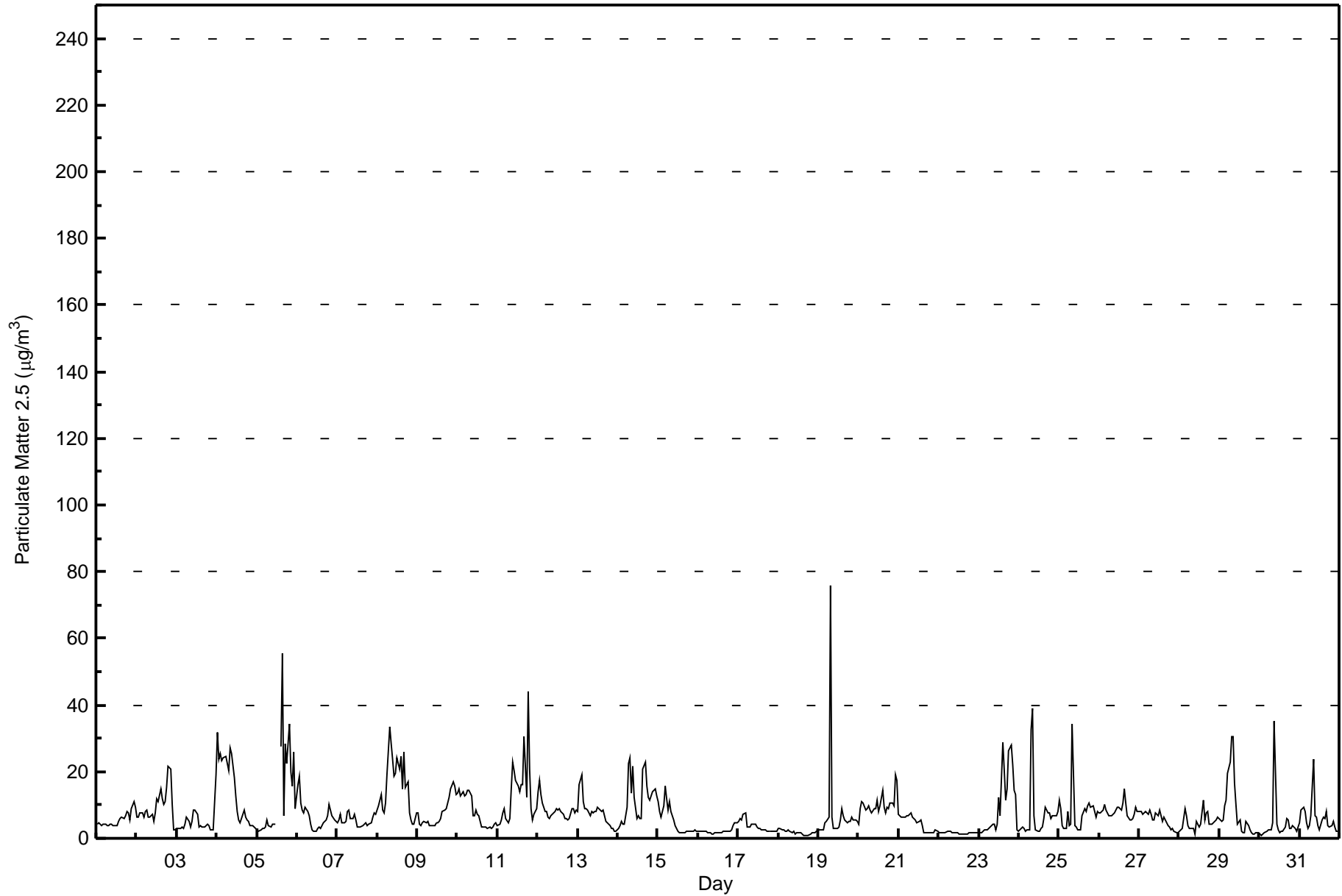
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	4	5	4	4	4	4	4	4	4	4	4	4	5	6	6	6	7	8	8	6	9	11	9	5.6	11	
2-Dec	6	6	7	8	6	8	9	6	6	7	5	8	12	11	15	12	10	11	15	22	21	10	2	2	9.4	22
3-Dec	3	3	3	3	3	4	6	5	3	5	8	8	7	3	4	3	4	4	4	3	3	3	19	4.8	19	
4-Dec	32	24	25	23	24	25	23	20	27	25	18	13	8	6	4	6	8	6	5	4	4	3	3	14.3	32	
5-Dec	2	2	2	3	3	3	6	4	3	4	4	4	C	C	28	55	7	28	22	34	20	16	26	9	13.0	55
6-Dec	16	19	11	9	8	9	8	7	4	3	2	2	3	4	3	4	5	6	7	10	8	7	6	5	6.8	19
7-Dec	5	6	7	5	5	5	8	9	6	6	7	6	4	3	3	4	4	4	4	4	5	6	8	7	5.4	9
8-Dec	8	10	13	9	7	11	19	34	28	24	19	20	24	21	25	15	26	15	17	8	5	4	4	8	15.5	34
9-Dec	8	4	4	5	5	5	5	4	4	4	4	5	5	5	6	8	8	9	11	12	15	17	16	13	7.5	17
10-Dec	14	15	13	14	13	13	14	14	13	7	7	8	7	7	3	3	3	3	3	3	3	3	4	5	8.0	15
11-Dec	4	4	5	8	9	6	5	6	15	23	20	17	16	14	16	16	30	12	44	21	9	5	7	9	13.5	44
12-Dec	14	17	13	11	8	8	6	6	7	7	8	9	8	9	8	7	6	6	6	6	9	9	7	9	8.5	17
13-Dec	8	16	19	11	9	9	8	7	8	7	8	8	10	8	8	8	7	5	4	4	3	3	2	2	7.6	19
14-Dec	3	4	5	4	4	9	23	24	14	22	12	6	7	6	6	21	23	16	12	12	13	14	15	13	11.9	24
15-Dec	11	8	7	10	16	12	8	11	8	6	4	3	2	2	2	2	2	2	2	2	2	3	2	2	5.3	16
16-Dec	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	3	4	5	5	2.2	5
17-Dec	5	6	5	7	7	3	3	3	4	4	4	4	3	3	3	2	2	2	2	2	2	2	2	2	3.6	7
18-Dec	3	3	3	2	2	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	2	2	2	2	1.8	3
19-Dec	2	2	3	3	5	5	6	76	7	3	3	3	3	6	9	7	6	5	5	5	6	6	5	5	7.7	76
20-Dec	4	9	11	11	8	9	10	9	8	9	9	11	8	10	14	9	8	9	9	11	11	10	19	17	10.1	19
21-Dec	7	6	6	6	6	7	7	8	6	6	6	5	5	5	4	2	2	2	2	2	2	2	2	2	4.4	8
22-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	1.7	2
23-Dec	2	2	2	3	3	2	3	3	4	4	2	4	12	7	29	21	12	15	26	28	22	15	13	3	9.8	29
24-Dec	2	3	3	3	2	2	3	33	39	7	3	2	2	3	3	6	9	7	8	6	7	7	7	8	7.3	39
25-Dec	11	9	4	3	3	8	4	4	34	4	3	3	3	2	7	9	8	10	11	9	10	8	6	8	7.5	34
26-Dec	8	7	9	10	9	8	7	7	7	8	9	9	9	9	11	15	10	7	6	6	6	7	9	8	8.3	15
27-Dec	8	8	7	8	8	7	9	7	5	6	8	7	8	7	5	6	5	4	3	3	3	2	2	2	5.7	9
28-Dec	2	2	3	9	7	4	3	3	3	1	5	4	3	4	11	6	7	8	4	4	5	5	6	7	4.9	11
29-Dec	6	5	6	10	11	20	23	31	31	17	10	4	6	2	2	2	5	4	2	2	1	1	2	2	8.5	31
30-Dec	1	1	1	2	2	3	2	3	5	35	4	3	2	2	2	3	6	5	3	3	4	3	2	3	4.2	35
31-Dec	5	8	9	8	5	3	4	7	24	7	6	4	3	6	6	6	8	4	3	4	5	3	2	2	5.9	24
	6.7	7.0	6.9	6.9	6.7	7.0	7.8	11.6	10.7	8.7	6.7	6.0	6.3	5.8	8.0	8.7	7.8	7.1	8.2	7.8	6.9	6.1	6.6	6.2	Diurnal Average	
	32	24	25	23	24	25	23	76	39	35	20	20	24	21	29	55	30	28	44	34	22	17	26	19	Diurnal Maximum	

C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m<sup>3</sup>



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Hills - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	361	48.65	48.65
6 - 15	303	40.84	89.49
16 - 25	52	7.01	96.50
26 - 80	22	2.96	99.46
> 81.0	0	0.00	99.46

Total Number of Valid Hours: 742

Total Number of Hours: 744



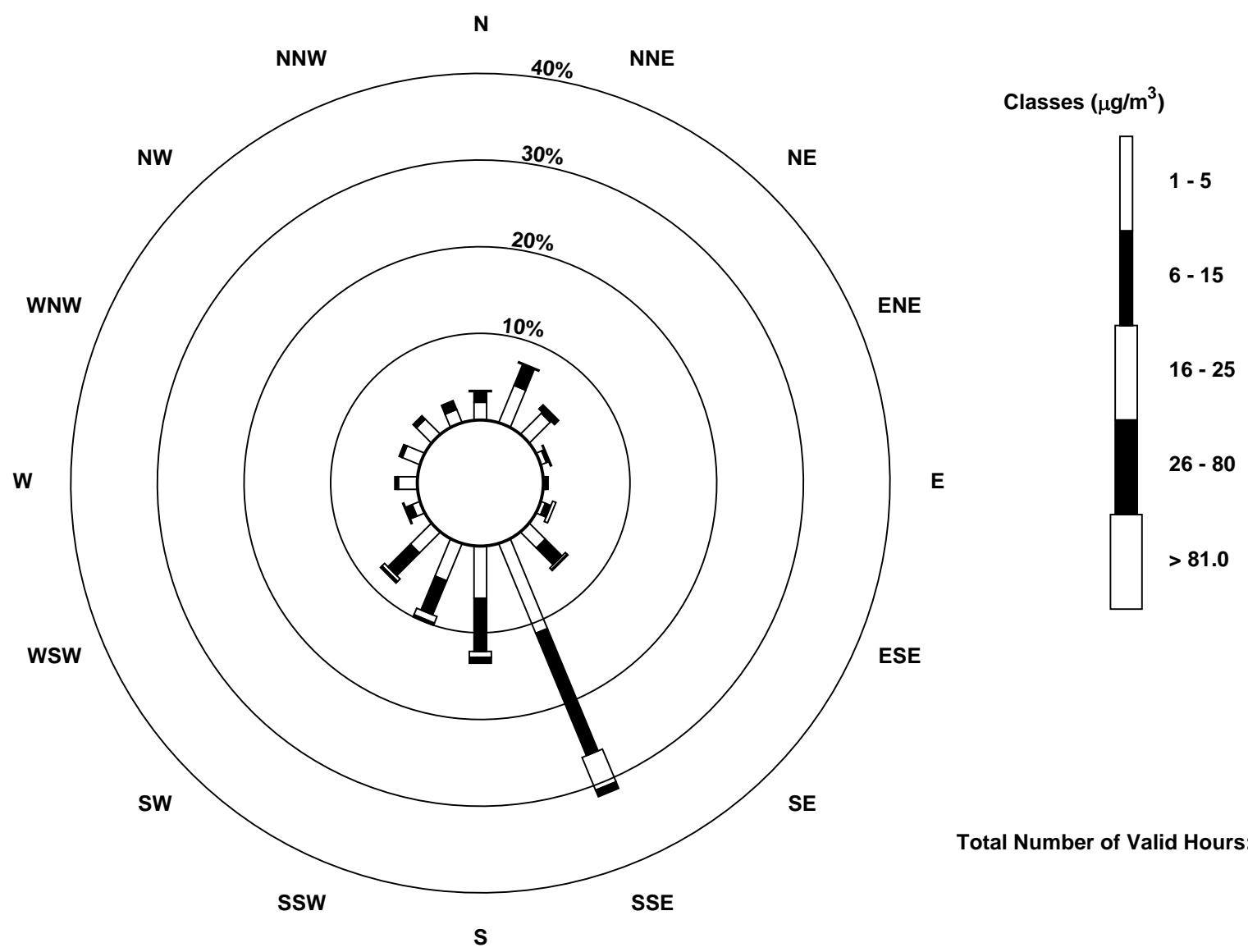
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Hills - December 2017**

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	15	34	25	5	2	4	19	82	44	34	25	7	16	16	18	12	358
6 - 15	9	19	1	2	2	5	20	112	45	31	27	6	3	3	4	8	297
16 - 25	0	1	1	0	0	3	2	30	5	6	3	1	0	0	0	0	52
26 - 80	1	0	4	1	0	0	1	6	5	2	2	0	0	0	0	0	22
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	25	54	31	8	4	12	42	230	99	73	57	14	19	19	22	20	729

Total Number of Valid Hours: 733

Total Number of Hours: 744







**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

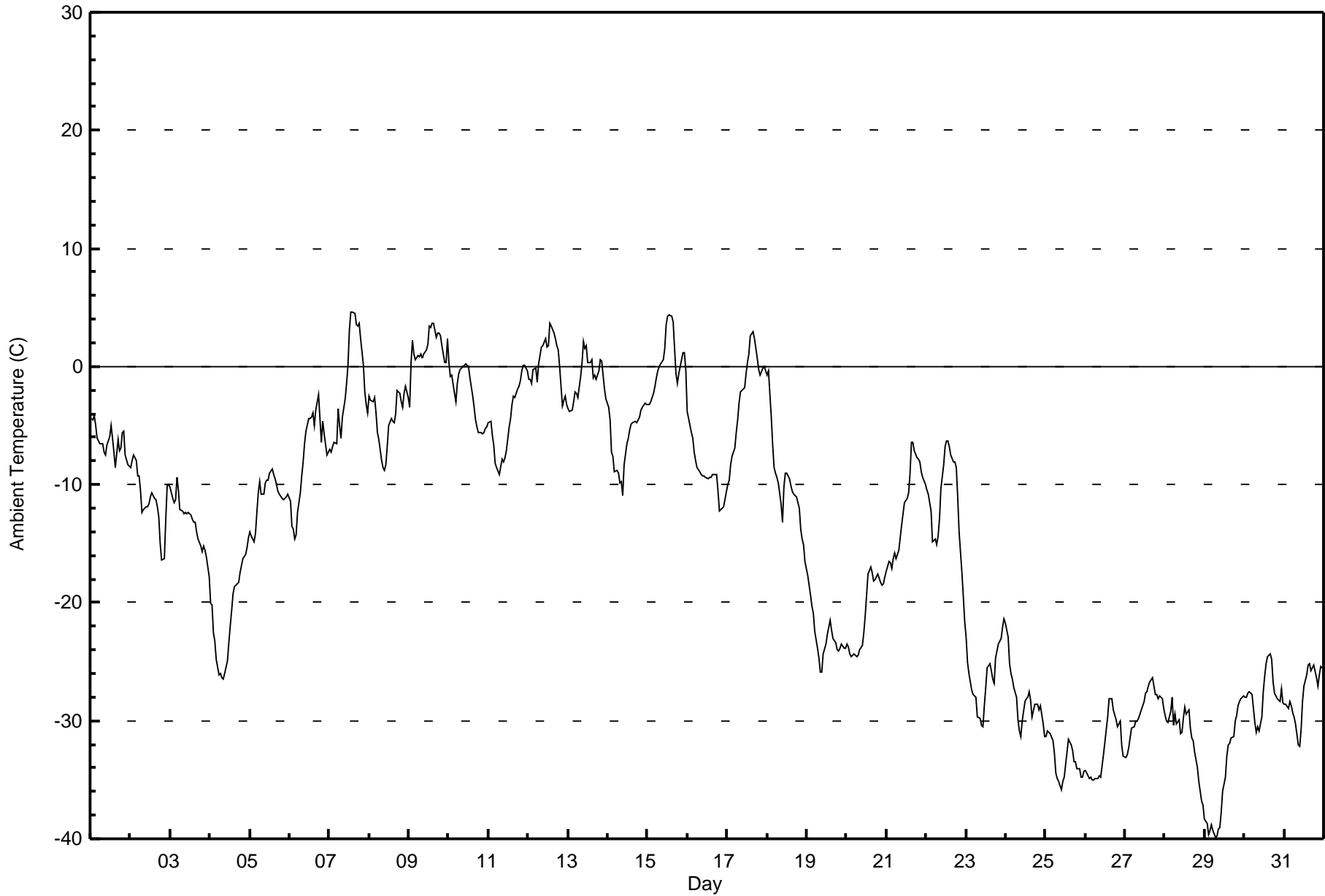
**Fort Hills - December 2017**

<b>Maximum Value: 4.7 C on Dec 7 14:00</b> <b>Maximum Daily Average: 1.6 C on Dec 9</b>																				<b>Hours in Service: 744</b> <b>Hours of Data: 744</b> <b>Hours of Missing Data: 0</b> <b>Hours of Calibration: 0</b> <b>Percent Operational Time: 100.0</b>						
<b>Minimum Value: -39.9 C on Dec 29 07:00</b> <b>Minimum Daily Average: -34.7 C on Dec 29</b> <b>Maximum Diurnal Average: -12.4 C at hour 15</b> <b>Minimum Diurnal Average: -16.2 C at hour 8</b> <b>Monthly Average: -14.42 C</b> <b>Percentiles: P<sub>1</sub> = -38.8 P<sub>10</sub> = -31.0 Q<sub>1</sub> = -26.4 Median = -11.1 Q<sub>3</sub> = -4.4 P<sub>90</sub> = 0.1 P<sub>99</sub> = 3.5</b>																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.4	-4.5	-4.2	-5.0	-6.1	-6.5	-6.6	-6.5	-7.2	-7.5	-6.6	-5.9	-5.0	-6.1	-7.2	-8.5	-6.2	-7.2	-6.9	-5.6	-5.5	-7.5	-8.3	-8.4	-6.4	-4.2
2-Dec	-8.6	-8.0	-7.5	-7.9	-9.3	-9.2	-10.6	-12.4	-12.1	-11.8	-11.9	-11.7	-11.1	-10.7	-11.2	-11.3	-11.9	-12.7	-15.0	-16.3	-16.3	-12.9	-10.1	-10.0	-11.3	-7.5
3-Dec	-10.3	-11.2	-11.5	-11.3	-9.4	-10.4	-12.2	-12.3	-12.5	-12.4	-12.4	-12.3	-12.6	-13.0	-13.1	-13.2	-14.0	-14.6	-15.2	-15.7	-15.3	-15.6	-16.1	-17.8	-13.1	-9.4
4-Dec	-20.1	-20.1	-22.6	-23.3	-24.9	-26.2	-26.0	-26.4	-26.4	-26.1	-25.0	-23.4	-22.0	-20.6	-19.3	-18.7	-18.4	-18.2	-17.5	-16.8	-16.2	-15.9	-15.4	-14.5	-21.0	-14.5
5-Dec	-14.1	-14.4	-14.9	-14.1	-12.3	-10.7	-9.7	-10.8	-10.8	-9.9	-9.7	-9.6	-9.1	-8.7	-9.1	-9.6	-9.9	-10.5	-10.8	-11.2	-11.3	-11.2	-11.0	-10.9	-11.0	-8.7
6-Dec	-11.4	-13.6	-13.8	-14.6	-14.2	-12.3	-10.7	-9.3	-8.1	-6.5	-5.5	-4.4	-4.4	-4.3	-4.0	-5.0	-3.7	-2.4	-4.4	-6.4	-4.7	-5.7	-7.5	-7.3	-7.7	-2.4
7-Dec	-7.0	-7.2	-6.8	-6.5	-6.5	-3.6	-5.0	-6.0	-4.3	-2.7	-1.4	0.1	3.1	4.7	4.6	4.5	3.6	3.4	3.7	2.3	0.1	-2.1	-3.3	-3.9	-1.5	4.7
8-Dec	-2.6	-2.8	-2.9	-2.6	-3.9	-5.6	-6.2	-8.0	-8.6	-8.8	-8.3	-6.8	-5.0	-4.4	-4.6	-4.8	-4.1	-2.0	-2.3	-2.9	-3.5	-2.3	-1.7	-2.6	-4.5	-1.7
9-Dec	-3.5	0.3	2.2	1.0	0.6	1.0	0.9	1.0	0.7	1.0	1.4	1.8	3.5	3.3	3.7	3.7	2.5	2.8	2.8	2.5	1.7	0.3	0.4	2.4	1.6	3.7
10-Dec	0.4	-0.9	-0.8	-2.3	-3.0	-1.5	-0.6	-0.2	-0.1	0.1	0.2	0.2	0.0	-1.0	-2.5	-3.4	-4.6	-5.1	-5.6	-5.5	-5.7	-5.6	-5.2	-5.1	-2.4	0.4
11-Dec	-4.8	-4.6	-5.8	-6.7	-8.2	-8.6	-9.2	-8.5	-7.8	-8.0	-7.7	-7.1	-5.1	-4.4	-3.2	-2.5	-2.6	-1.9	-1.7	-1.2	-0.4	0.1	0.1	-0.3	-4.6	0.1
12-Dec	-1.1	-1.1	-1.5	-0.3	-0.1	-1.3	0.2	0.9	1.7	1.8	2.3	1.7	1.8	3.6	3.4	2.9	2.3	1.8	1.4	0.0	-3.4	-2.9	-2.5	-3.3	0.4	3.6
13-Dec	-3.6	-3.8	-3.7	-3.0	-2.2	-2.2	-2.6	-0.9	0.3	2.1	1.6	1.8	0.3	0.4	0.5	-0.9	-0.7	-1.1	-0.4	0.6	0.4	-0.7	-1.9	-2.7	-0.9	2.1
14-Dec	-3.5	-4.6	-7.3	-7.6	-8.9	-8.8	-9.0	-9.8	-9.8	-10.9	-8.3	-6.5	-6.1	-5.3	-4.9	-4.7	-4.8	-4.5	-4.3	-3.7	-3.5	-3.1	-3.2	-3.2	-6.2	-3.1
15-Dec	-3.2	-3.2	-3.0	-2.3	-1.7	-1.0	-0.4	-0.1	0.2	0.6	1.5	3.5	4.3	4.4	4.2	3.8	1.6	-0.7	-1.4	-0.6	0.6	1.2	1.2	-0.3	0.4	4.4
16-Dec	-3.8	-5.0	-5.6	-6.1	-7.2	-8.0	-8.6	-8.9	-9.1	-9.3	-9.3	-9.4	-9.5	-9.4	-9.4	-9.2	-9.1	-9.2	-10.6	-12.3	-12.1	-12.0	-11.9	-10.6	-9.0	-3.8
17-Dec	-10.0	-9.6	-8.3	-7.6	-6.9	-5.6	-4.6	-3.1	-2.2	-2.1	-1.7	-0.6	0.4	1.0	2.6	3.0	2.3	1.5	0.6	-0.2	-0.7	-0.2	0.0	-0.3	-2.2	3.0
18-Dec	-0.7	-0.4	-4.3	-6.6	-8.6	-9.0	-9.4	-9.9	-11.7	-13.1	-10.2	-9.1	-9.0	-9.5	-10.1	-10.6	-10.8	-11.0	-11.0	-12.0	-13.8	-14.6	-15.0	-16.5	-9.9	-0.4
19-Dec	-17.7	-18.6	-19.4	-20.3	-20.9	-22.5	-23.8	-24.7	-25.8	-25.9	-24.4	-23.5	-22.7	-22.0	-21.5	-22.3	-23.0	-23.4	-24.0	-24.1	-23.9	-23.5	-23.9	-23.9	-22.7	-17.7
20-Dec	-23.6	-23.7	-24.4	-24.6	-24.3	-24.5	-24.6	-24.5	-24.0	-23.6	-22.5	-21.1	-19.3	-17.5	-17.0	-17.4	-18.1	-18.0	-17.8	-17.6	-18.3	-18.5	-18.4	-17.8	-20.9	-17.0
21-Dec	-17.3	-16.5	-16.6	-17.1	-16.3	-15.8	-16.2	-15.5	-14.5	-13.4	-12.4	-11.5	-11.1	-10.8	-9.0	-6.5	-6.4	-7.1	-7.8	-7.8	-8.1	-8.9	-9.4	-10.0	-11.9	-6.4
22-Dec	-10.5	-10.8	-11.6	-12.2	-14.8	-14.6	-15.0	-14.4	-13.0	-10.3	-8.3	-6.7	-6.3	-6.3	-6.8	-7.5	-8.0	-8.1	-8.6	-11.0	-14.1	-17.4	-19.4	-21.6	-11.6	-6.3
23-Dec	-23.0	-25.1	-26.0	-27.4	-27.8	-27.9	-28.0	-29.7	-29.8	-30.4	-30.5	-28.8	-27.2	-25.5	-25.1	-25.8	-26.5	-26.8	-24.7	-23.5	-23.2	-23.0	-22.0	-21.4	-26.2	-21.4
24-Dec	-21.7	-22.9	-25.2	-26.0	-26.5	-27.2	-28.1	-30.0	-30.8	-31.3	-30.0	-28.3	-28.1	-28.1	-27.5	-28.3	-29.7	-28.6	-28.6	-28.6	-29.1	-28.7	-30.3	-31.4	-28.1	-21.7
25-Dec	-31.4	-30.8	-31.0	-31.1	-31.7	-32.8	-34.4	-34.9	-35.2	-35.9	-35.2	-34.8	-33.7	-32.6	-31.6	-32.1	-32.5	-33.4	-33.5	-34.1	-34.0	-34.8	-34.7	-34.3	-33.3	-30.8
26-Dec	-34.2	-34.5	-34.9	-34.8	-35.0	-35.0	-34.9	-34.8	-34.7	-34.7	-33.8	-32.8	-31.8	-29.7	-28.1	-28.1	-28.2	-29.1	-29.9	-30.5	-30.3	-30.1	-32.1	-33.0	-32.3	-28.1
27-Dec	-33.1	-32.8	-32.2	-31.4	-30.6	-30.5	-30.1	-30.1	-29.8	-29.5	-29.1	-28.4	-27.7	-27.5	-27.1	-26.7	-26.4	-27.0	-27.8	-27.8	-28.2	-27.9	-28.1	-28.9	-29.1	-26.4
28-Dec	-29.6	-30.0	-30.1	-29.2	-28.0	-30.4	-29.5	-30.3	-30.0	-31.1	-31.0	-29.8	-28.9	-29.5	-29.1	-30.6	-31.4	-31.6	-32.7	-33.9	-35.2	-36.0	-36.8	-37.1	-31.3	-28.0
29-Dec	-38.3	-38.7	-39.6	-39.3	-38.8	-39.3	-39.9	-39.7	-39.1	-39.0	-37.7	-36.0	-34.8	-32.9	-32.0	-31.9	-31.4	-31.3	-30.0	-29.5	-28.8	-28.4	-28.1	-27.9	-34.7	-27.9
30-Dec	-28.0	-28.0	-27.6	-27.5	-27.8	-28.9	-30.2	-30.9	-30.6	-30.8	-29.6	-27.5	-26.3	-25.2	-24.6	-24.3	-24.9	-26.7	-27.7	-27.9	-28.2	-28.4	-27.4	-28.5	-27.8	-24.3
31-Dec	-28.6	-28.6	-29.0	-28.4	-28.8	-29.4	-29.7	-30.3	-32.0	-32.2	-30.8	-28.4	-27.1	-26.1	-25.3	-25.2	-25.8	-25.5	-25.3	-26.4	-27.0	-26.2	-25.4	-25.6	-27.8	-25.2
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Fort Hills - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	264	35.48	35.48
-20 - 0	397	53.36	88.84
0 - 10	83	11.16	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Relative Humidity (RH) - %

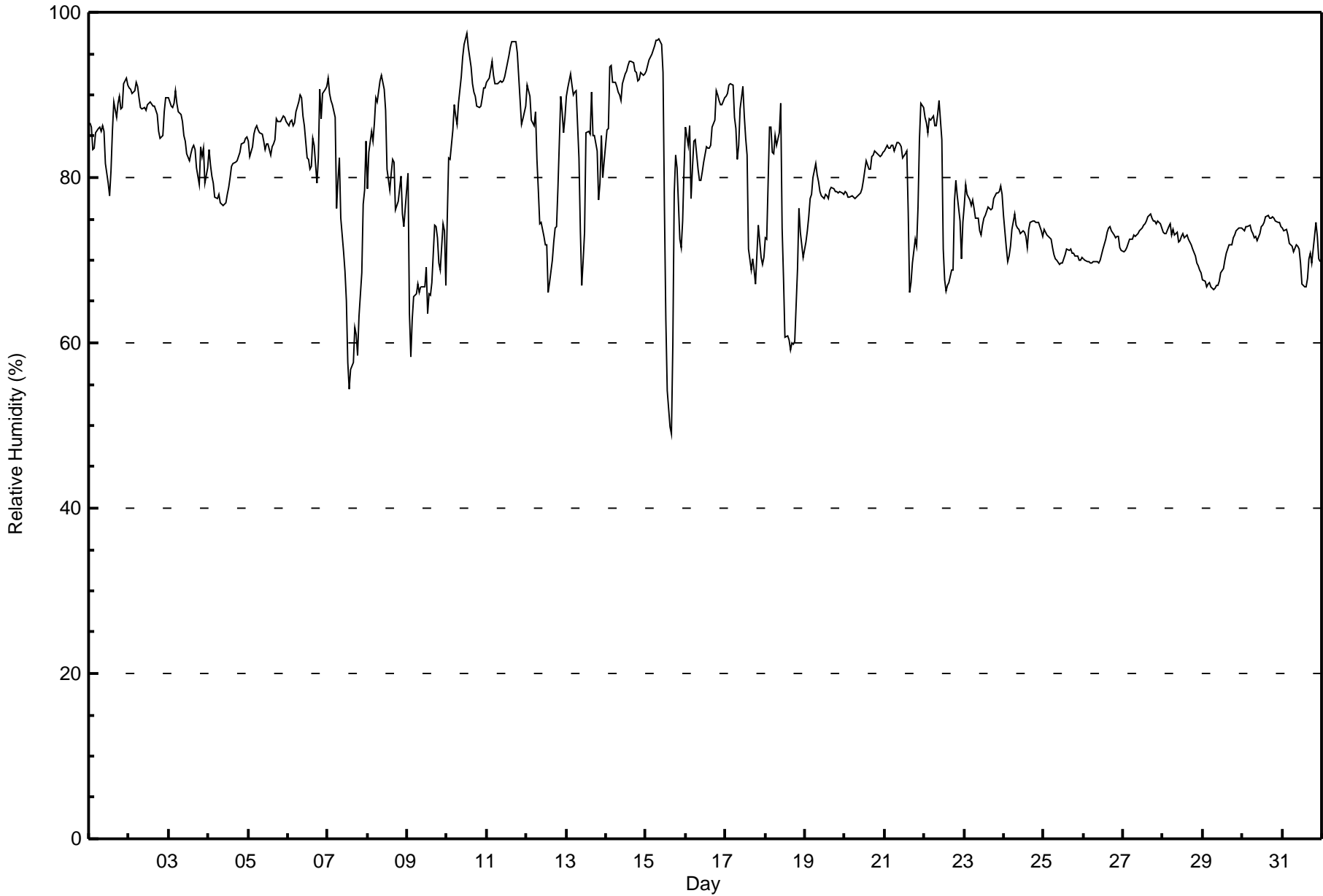
## Fort Hills - December 2017

Maximum Value: 97 % on Dec 10 13:00														Maximum Daily Average: 92.4 % on Dec 11														Hours in Service: 744	
Minimum Value: 49 % on Dec 15 16:00														Minimum Daily Average: 68.2 % on Dec 9														Hours of Data: 744	
Maximum Diurnal Average: 81.8 % at hour 5														Minimum Diurnal Average: 76.2 % at hour 15														Hours of Missing Data: 0	
Monthly Average: 79.4 %														Percentiles: P <sub>1</sub> = 58 P <sub>10</sub> = 69 Q <sub>1</sub> = 73 Median = 79 O <sub>3</sub> = 87 P <sub>90</sub> = 91 P <sub>99</sub> = 96														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	87	86	83	84	85	86	86	86	86	86	82	79	78	81	86	89	87	89	90	88	88	91	92	91	86.1	92			
2-Dec	91	91	90	91	92	91	90	88	88	88	88	89	89	89	89	89	88	88	86	85	85	88	90	90	88.8	92			
3-Dec	90	89	89	89	90	89	88	88	87	85	84	83	82	83	84	84	83	81	79	84	83	84	79	81	84.8	90			
4-Dec	83	81	80	79	78	77	78	77	77	77	78	79	80	81	82	82	82	83	83	83	84	84	85	85	80.5	85			
5-Dec	84	83	84	85	86	86	86	85	85	84	83	84	84	83	84	84	85	87	87	87	87	87	87	87	85.2	87			
6-Dec	86	87	87	86	87	88	89	90	90	87	86	82	82	81	81	85	84	79	82	91	87	90	91	91	86.3	91			
7-Dec	92	90	89	89	87	76	80	82	75	71	69	65	58	54	57	58	62	61	58	63	69	77	79	84	72.7	92			
8-Dec	79	83	86	84	87	90	89	92	92	92	91	88	81	79	80	82	82	76	77	79	80	76	74	78	83.1	92			
9-Dec	80	64	58	63	66	66	67	66	67	67	67	69	63	66	66	67	74	74	73	70	69	74	74	67	68.2	80			
10-Dec	75	82	82	86	89	88	87	89	92	95	96	97	97	96	93	91	90	90	89	89	89	90	91	91	89.7	97			
11-Dec	92	92	93	94	92	91	91	92	92	92	92	92	94	95	96	96	96	97	95	92	89	86	87	89	92.4	97			
12-Dec	91	90	90	87	86	88	82	78	74	75	73	72	72	66	67	70	72	74	74	79	90	88	86	87	79.7	91			
13-Dec	90	91	93	91	90	90	90	82	73	67	70	73	85	86	85	90	85	85	83	77	79	85	80	82	83.6	93			
14-Dec	86	86	93	93	91	91	91	90	90	89	91	93	93	94	94	94	94	93	93	92	92	93	92	93	91.7	94			
15-Dec	93	94	94	95	95	96	97	97	97	96	93	76	63	54	50	49	60	78	83	81	73	72	75	81	80.8	97			
16-Dec	86	84	86	77	81	84	85	81	80	80	81	82	84	84	83	84	86	87	90	90	89	89	89	90	84.6	90			
17-Dec	90	90	91	91	91	87	86	82	84	88	91	87	85	83	71	69	70	69	67	71	74	70	70	70	80.4	91			
18-Dec	73	73	86	86	83	83	85	84	85	89	74	68	61	61	60	59	60	60	60	69	76	73	72	70	73.0	89			
19-Dec	72	74	75	77	78	80	82	80	79	78	78	77	78	78	77	78	79	79	78	78	78	78	78	78	77.9	82			
20-Dec	78	78	78	78	78	78	77	78	78	78	79	80	81	82	81	81	83	83	83	83	83	83	83	83	80.2	83			
21-Dec	83	84	84	84	84	84	83	84	84	84	84	82	83	83	76	66	67	70	73	72	76	85	89	88	80.5	89			
22-Dec	87	87	86	87	87	87	86	86	88	89	85	71	68	66	67	67	69	69	77	80	78	75	70	75	78.6	89			
23-Dec	77	79	78	77	77	77	76	75	75	74	73	74	75	75	76	76	76	77	78	78	78	79	78	78	76.5	79			
24-Dec	75	72	70	70	72	74	76	74	74	74	73	74	73	73	71	74	75	75	75	74	75	75	74	73	73.4	76			
25-Dec	74	73	73	73	73	72	71	70	70	69	70	70	70	71	71	71	71	71	71	71	70	70	70	70	71.0	74			
26-Dec	70	70	70	70	70	70	70	70	70	70	70	71	71	73	73	74	74	74	73	73	73	73	71	71	71.3	74			
27-Dec	71	71	71	72	73	73	73	73	73	73	73	74	74	74	74	75	75	76	75	75	75	74	75	74	74	73.6	76		
28-Dec	73	73	73	74	74	73	74	73	73	72	72	73	73	73	73	73	72	72	71	71	70	69	69	68	72.2	74			
29-Dec	68	67	67	67	67	67	66	67	67	67	67	68	69	70	71	71	72	72	73	73	74	74	74	74	69.6	74			
30-Dec	74	74	74	74	74	74	73	73	73	72	73	74	74	75	75	75	75	75	75	75	75	75	75	74	74.1	75			
31-Dec	74	74	74	73	72	72	72	71	72	72	71	70	67	67	67	68	70	71	70	73	75	73	70	70	71.0	75			
														81.4 81.0 81.5 81.5 81.8 81.5 81.5 80.8 80.4 80.0 79.2 77.9 77.0 76.5 76.2 76.5 77.4 77.7 78.1 78.8 79.4 80.0 79.6 80.1														Diurnal Average	
														93 94 94 95 95 96 97 97 97 96 96 97 97 96 96 96 96 97 95 92 92 93 92 93														Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %  
Fort Hills - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	13	1.75	1.75
60 - 80	380	51.08	52.82
80 - 100	351	47.18	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Fort Hills - December 2017

Maximum Speed: 25 km/h on Dec 24 02:00	Maximum Daily Speed Average: 14.0 km/h on Dec 20	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 26 19:00	Minimum Daily Speed Average: 0.2 km/h on Dec 13	Hours of Data: 735
Maximum Diurnal Speed Average: 4.3 km/h at hour 11	Minimum Diurnal Speed Average: 2.6 km/h at hour 19	Hours of Missing Data: 9
Monthly Average Velocity: 3.4 km/h 174.1 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 8 Q <sub>3</sub> = 11 P <sub>90</sub> = 14 P <sub>99</sub> = 21	Percent Operational Time: 98.8

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	SW11	SSW13	SW13	SW18	SW15	SW18	SW21	SW18	SW9	SSW10	SW12	SSW12	SSW12	S10	S10	SSE11	S10	SSE11	S13	SSW10	SW4	N5	SSE1	NNW2	SSW9.8	SW21		
2-Dec	N4	NNW3	NNE3	W1	N3	NNE5	N4	NNE9	ENE7	NNE5	NNW4	WNW3	WNW2	SW1	SSE6	SSE4	SW2	SE3	SE3	ESE2	SSE4	SW5	SW7	SSW3	NNE0.6	NNE9		
3-Dec	S4	S5	SSE6	SSE7	S7	NNW3	NNE11	NNE15	NNE14	NNE12	NNE11	NNE10	NNE8	NE4	ESE1	NE6	NE5	NE6	N3	WNW3	NW2	N3	NE7	NNE6	NNE4.0	NNE15		
4-Dec	N4	ESE5	SSE4	SSE4	SSE3	SSW2	SSE4	SSW3	S4	SSE6	SSE9	SSE10	SSE11	SSE13	S14	S12	SSW7	SW6	SSW5	SW6	SSW6	SSW8	SW9	SSW10	S5.8	S14		
5-Dec	SSW16	S15	SSE11	SSE12	SSE11	SE8	SE1	NNE12	N8	NNE7	NNE8	N7	NNE7	NE10	NE11	NE10	NE10	NE12	NE8	ENE6	ESE4	S4	S8	SSE12	E3.3	SSW16		
6-Dec	S11	SSE12	SSE12	SSE12	SSE11	SSE12	SSE13	SSE15	SSE15	S12	S10	S16	S14	SSE14	SSE14	SSE12	SW9	SW10	SE3	SSW8	SSW7	SSE7	SSE10	SSE8	S10.6	S16		
7-Dec	S8	SE9	SSE12	S8	S8	SSW6	S6	S8	SSW4	SW4	SW8	SW11	SW6	W11	W9	W12	W9	W9	WNW10	WNW5	NW3	SE6	SSE5	S5	SW4.9	W12		
8-Dec	SE8	SSE9	SSE11	SSE10	SSE7	SSE7	SE8	SSE5	SSE6	SSE8	SSE10	SSE11	SSE13	SSE13	SSE14	SSE14	S17	SSW21	SSW18	SSW15	S13	SSW14	SSW15	S14	S11.0	SSW21		
9-Dec	S10	W12	WSW10	W12	WSW13	WSW21	WSW8	SW13	SSW11	SSW12	S8	SE10	SW12	SW12	SW11	SW10	S8	SSE5	SSE7	S6	SE3	SSE7	SW10	SW13	SW8.1	WSW21		
10-Dec	S7	SSW6	SSE5	SE7	SSE7	SE9	SE8	SSE11	S9	S7	E2	N9	NNE14	NNE16	NNE15	NE11	NE8	ENE7	ENE7	SE4	ESE4	SSE6	SSE8	SSE6	ESE3.4	NNE16		
11-Dec	S6	S8	SSE6	SE5	SE4	SSE5	SSE5	SSE6	SE5	SE6	SE5	SSE5	SSE7	SSE8	SSE8	S10	S9	S13	SSW12	SSW14	SSW16	SSW21	SSW16	SSW15	S8.1	SSW21		
12-Dec	S10	SSE12	SSE14	SSW14	SSW12	SSW8	SW14	SW11	W12	WSW6	SW5	ESE2	E2	NNW3	N5	NNW12	NW12	NW14	NNW9	NNE6	SSE2	ENE1	SE4	SSE5	SW2.9	SSW14		
13-Dec	SSE6	SSE8	S7	SE9	SSE11	SSE11	S10	SW13	SW3	NNW8	N5	N11	NNE12	NNW8	SW2	SSW5	NW6	WNW6	W7	NNW10	NNE7	ENE11	NE10	ENE2	N0.2	SW13		
14-Dec	S4	SE4	S4	SE6	SSE7	SSE5	SSE8	S7	SSE6	SSE9	SSE9	S10	S10	SSE9	SSW8	SSW6	WSW2	SW4	S5	SW9	S6	SSE9	S7	SSW5	S6.1	S10		
15-Dec	S4	SSW7	SSW7	S10	SSW9	AF	AF	AF	AF	AF	S8	WNW6	NW14	N11	WNW7	SW5	SSW8	S12	S10	SW11	W12	W6	W11	N12	WSW4.8	NW14		
16-Dec	NNE22	NNE19	NNE20	NNE19	NNE15	NE11	NE10	NNE8	NE6	E5	SE6	SSE9	SSE8	SSE8	S6	SSE5	SSW5	SE2	SSW4	S3	SSE5	SSE7	SSE6	S7	ENE3.7	NNE22		
17-Dec	SSW3	SSE5	SSE7	SSW7	SW5	SSW9	SSW9	S11	SW8	S10	SSW14	SW16	SW20	WSW12	WNW11	NW17	NW18	NW16	NW14	WNW4	SW4	W3	WSW9	WNW6	WSW6.5	SW20		
18-Dec	W10	W8	NNE17	NNE19	NE19	NE15	NNE13	NNE14	NNE5	WSW3	NNW9	NNW13	NW23	NNW19	NNW15	NW16	NW14	NW13	NNW20	N16	NNE15	NNE16	NE10	NE12	N11.3	NW23		
19-Dec	NE9	NE8	NE8	NNE8	NNE8	NW1	WSW3	SSW1	AF	SSE4	S5	SSE8	SSE9	SSE10	SSE12	SSE10	SSE9	SSE9	SSE11	SSE10	S7	SSE6	SSE8	SSE7	SE4.5	SSE12		
20-Dec	SSE11	SSE10	SSE10	SSE10	SSE11	SSE11	SSE12	SSE14	SSE15	SSE17	SSE18	SSE17	SSE19	S17	S18	SSE18	SSE18	SSE15	S11	S14	S16	SSE18	SSE8	SSE8	SSE14.0	SSE19		
21-Dec	S4	SSE2	WSW2	SSW2	SSE2	SW1	WSW2	S3	SW3	SSW3	S3	SSW5	SSE5	S2	NNW5	NW7	WNW8	WNW7	NW9	NNW8	NNW3	SE3	SE3	ESE4	WSW1.4	NW9		
22-Dec	SE5	ESE4	E2	S4	SSE3	SSE6	SSE7	SSE6	S5	SSW5	NW6	WNW10	NW12	WNW11	NW10	NW10	WNW10	WNW9	NNE12	NE19	NE21	NNE21	NE18	NNE14	N3.8	NE21		
23-Dec	NNE6	W2	NE0	S3	SSE3	SE3	SE3	NE0	N3	NNW2	NW2	N2	WSW2	NNE2	NE1	SW5	SSE4	SSE7	SE6	S7	SSE5	ESE3	NNE12	NNE21	E1.2	NNE21		
24-Dec	NNE20	NNE25	NNE25	NNE19	N12	N7	N3	SW2	SW3	SW3	SSE3	SSE3	SSE9	SE7	SE6	SE7	S5	SSE2	SE4	ESE1	N1	SSW0	NW1	NNW3	NE3.6	NNE25		
25-Dec	NNE7	NNE7	NE10	NE11	NE9	NNE5	NW4	WNW3	SW3	SSE6	S6	SE7	SE7	SE8	SE7	SSE7	SSE9	SSE9	SSE9	SSE9	SSE9	SSE8	SSE8	SSE8	SE4.0	NE11		
26-Dec	SSE9	SSE9	SSE10	SSE8	SSE9	SSE10	SSE9	SSE9	SSE9	SSE8	SSE9	SSE9	SSE9	SSE8	SSE8	SSE7	S8	S6	SE0	SSW2	SW2	S1	SW2	SSW3	SSE6.8	SSE10		
27-Dec	SSE5	SSE6	SSE5	S6	S7	SW4	S4	SSW5	SSW7	S6	S9	SSE10	S11	SSE9	SSE9	S7	S6	SSE6	SSE6	SE6	SE6	SSE6	SSE6	SSE6	SSE6.5	S11		
28-Dec	SSE3	ENE1	N2	NNE6	NNE10	N6	N6	NNW5	NNE5	W2	SW2	S1	SSE2	SSE5	SSE5	SSE4	SE3	ESE2	SSE1	AF	SSE0	AF	WNW2	ESE1	NE0.9	NNE10		
29-Dec	WSW1	AF	SW1	W0	SSE3	SSE5	S4	SSE7	SSE7	SSE8	SSE10	SSE9	SSE10	SSE10	SSE10	SSE10	SSE10	SSE11	SSE10	SSE11	SSE11	SSE11	SSE10	SSE11	S11	S10	SSE7.8	S11
30-Dec	S11	SSW9	S9	S11	S8	SSE8	SSE7	SSE7	SSE6	SSE6	SSE7	SSE9	SSE8	SSE9	SSE9	SSE10	SSE9	SSE9	S8	SSE10	SSE9	SSE12	SSE11	SSE12	SSE8.8	SSE12		
31-Dec	SSE11	SSE14	S10	S13	S15	S15	S16	S12	SSE14	SSE14	SSE14	SSW11	SSW14	SSW12	S12	SSW12	SSW11	SSW12	SSW13	SSW13	SSW13	SSW13	SSW15	SSW18	SSW20	S12.9	SSW20	

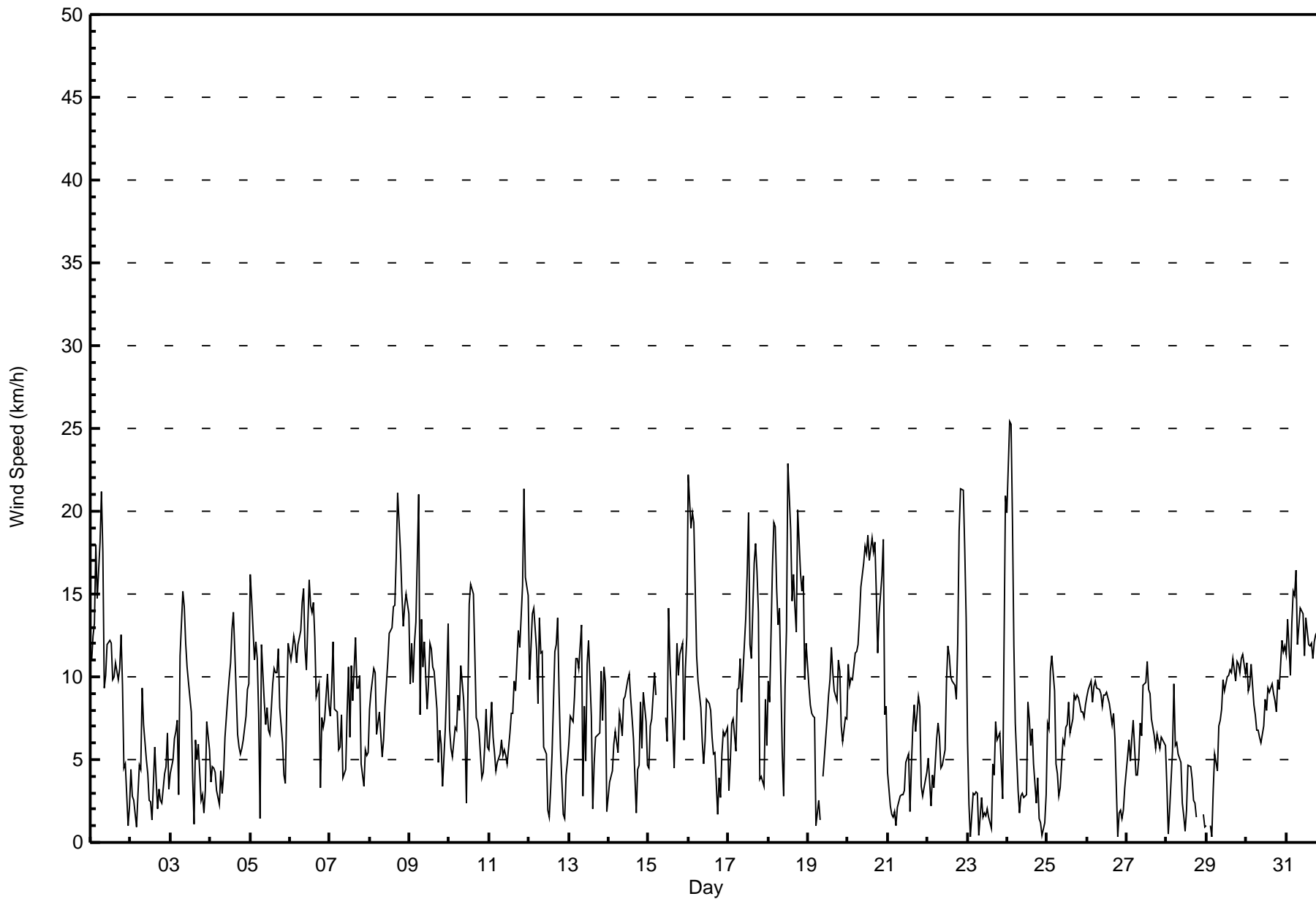
SSE3.1 SSE3.5 SE3.3 SSE3.5 SSE3.5 S3.6 S3.7 S3.3 S3.5 S4.2 S4.3 S3.8 S3.7 S3.4 S3.6 S3.6 SSW3.5 SSW3.3 S2.6 S3.1 S3.2 SSE4.0 S4.0 S3.1	Diurnal Average
NNE22 NNE25 NNE25 NNE19 NE19 WSW21 SW21 SW18 SSE15 SSE17 SSE18 SSE17 NW23 NNW19 S18 SSE18 SSE18 SSW21 NNW20 NE19 NE21 SSW21 SSW18 NNE21	Diurnal Maximum

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**  
**Fort Hills - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort Hills - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	209	28.44	28.44
6 - 11	359	48.84	77.28
12 - 19	151	20.54	97.82
20 - 28	16	2.18	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 735

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Fort Hills - December 2017**

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	14	7	5	3	4	12	19	46	22	19	23	7	5	7	6	10	209
6 - 11	8	19	21	5	0	0	23	146	57	24	19	4	9	12	6	6	359
12 - 19	3	22	5	0	0	0	0	38	20	28	13	2	5	0	11	4	151
20 - 28	0	7	1	0	0	0	0	0	0	3	2	1	0	0	1	1	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
<b>Totals</b>	25	55	32	8	4	12	42	230	99	74	57	14	19	19	24	21	735

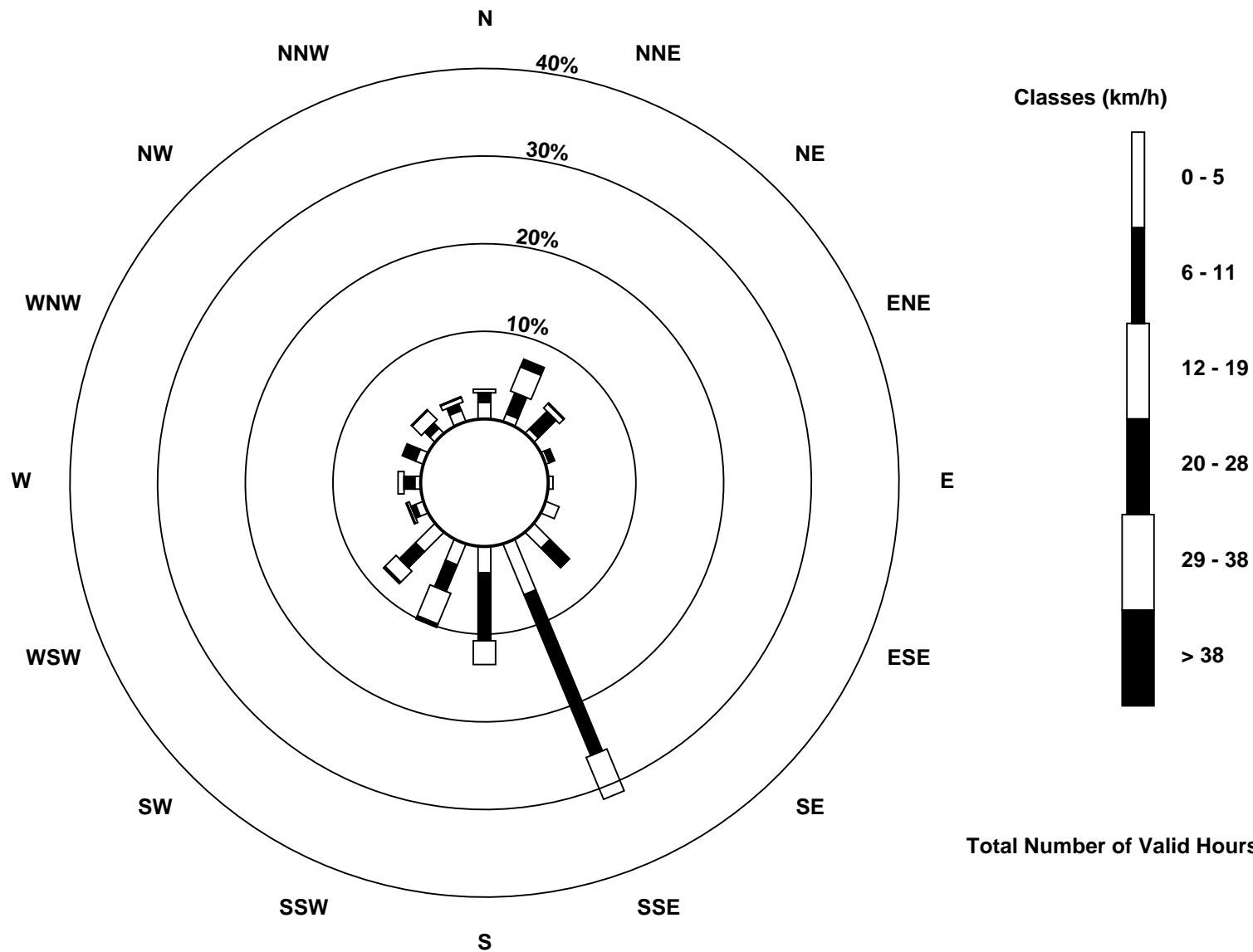
Total Number of Valid Hours: 735

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Fort Hills (AMS 23)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Fort Hills - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 22 19:00														Hours in Service: 744 Hours of Data: 735 Hours of Missing Data: 9 Hours of Calibration: 0 Percent Operational Time: 98.8											
Minimum Value: 0 km/h on Dec 30 19:00																									
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	1	2	2	3	4	2	2	3	4	2	2	2	2	1	1	2	1	1	2	3	1	1	2	4	
2-Dec	1	2	1	1	2	2	3	2	2	2	1	1	1	1	2	1	2	1	1	1	1	2	2	1	3
3-Dec	1	1	2	1	2	2	2	3	2	2	2	1	1	1	4	2	1	2	1	1	2	2	2	4	
4-Dec	2	2	2	1	1	1	1	1	1	2	1	1	2	1	3	1	1	1	1	1	1	1	1	3	
5-Dec	3	3	2	2	3	1	2	3	2	1	2	1	1	3	2	3	2	2	2	1	1	1	2	3	
6-Dec	1	1	1	1	1	1	2	2	3	2	1	2	1	1	1	2	2	4	3	2	2	1	2	4	
7-Dec	3	2	2	2	1	2	2	2	2	2	3	3	1	4	2	2	1	3	2	2	2	2	1	4	
8-Dec	2	2	1	2	2	1	1	1	2	1	1	1	1	2	2	2	3	3	4	3	3	3	3	4	
9-Dec	2	4	4	3	4	3	5	3	4	6	2	2	3	2	2	3	2	2	2	3	2	1	3	6	
10-Dec	2	1	1	1	2	2	1	2	2	2	1	3	3	3	4	3	3	1	2	1	1	1	1	4	
11-Dec	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	4	2	2	3	4	
12-Dec	2	3	2	2	4	3	2	2	3	3	2	2	2	3	3	4	1	2	3	1	1	2	3	4	
13-Dec	1	2	3	3	2	2	2	3	4	3	2	6	3	1	2	1	2	1	2	4	2	2	3	6	
14-Dec	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	2	1	2	2	1	2	1	3	
15-Dec	2	1	1	2	2	AF	AF	AF	AF	AF	3	6	5	5	6	4	3	3	2	2	3	2	2	7	
16-Dec	5	3	3	3	3	2	2	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	5	
17-Dec	2	2	2	2	2	1	1	1	2	2	2	2	2	4	4	4	6	5	4	2	2	2	2	6	
18-Dec	2	3	4	5	4	2	3	3	2	2	4	4	5	4	4	4	4	3	5	4	3	3	2	5	
19-Dec	2	2	2	1	1	2	1	1	AF	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	
20-Dec	1	1	2	2	1	1	1	2	1	2	2	2	2	2	2	2	1	3	3	2	3	2	4	4	
21-Dec	2	2	2	2	1	2	1	1	1	1	1	1	1	2	2	2	2	1	2	2	1	1	1	2	
22-Dec	1	1	2	1	2	1	1	1	1	1	3	2	3	2	2	3	2	2	8	4	3	4	3	8	
23-Dec	3	1	1	2	1	2	1	1	2	2	1	1	1	2	1	1	1	1	1	1	2	5	4	5	
24-Dec	4	4	5	5	2	1	1	1	2	1	1	1	1	1	2	1	2	2	2	1	1	1	1	5	
25-Dec	2	2	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	
26-Dec	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	
27-Dec	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	
28-Dec	2	1	1	2	2	1	1	2	2	1	1	1	2	1	1	1	1	1	1	AF	1	AF	1	2	
29-Dec	2	AF	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	
30-Dec	1	2	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	0	2	2	1	2	2	
31-Dec	1	1	2	2	1	1	2	1	1	1	1	2	2	1	1	1	1	1	2	1	2	2	3	3	
														5 4 5 5 4 3 5 3 4 6 4 6 5 5 6 4 6 5 8 4 4 4 5 7											
Diurnal Maximum																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Fort Hills - December 2017**

Direction of Maximum Speed: 24 deg on Dec 24 02:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 164.2 deg on Dec 20	Hours of Data: 735
Direction of Minimum Speed: 134 deg on Dec 26 19:00	Hours of Missing Data: 9
Direction of Minimum Daily Speed Average: 0.2 deg on Dec 13	Percent Operational Time: 98.8
Monthly Average Direction: 194.2 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	218	212	227	228	225	226	218	231	220	206	218	208	206	183	179	160	175	166	175	192	223	11	164	339	208.4
2-Dec	351	344	30	271	2	23	3	23	60	32	332	300	284	215	157	162	218	125	141	112	163	226	222	205	30.8
3-Dec	186	185	165	159	180	331	13	20	20	23	14	27	23	42	115	37	54	52	0	296	321	360	52	13	30.6
4-Dec	358	118	150	155	167	204	148	196	174	154	159	162	163	161	170	177	204	219	202	216	211	200	220	215	180.0
5-Dec	200	176	168	151	153	144	128	16	6	21	13	349	23	40	44	41	49	43	56	73	117	182	173	168	91.5
6-Dec	174	165	159	162	160	163	158	156	162	175	171	183	176	155	151	160	217	224	134	204	205	167	152	157	168.8
7-Dec	175	143	155	179	183	193	171	172	195	222	232	225	220	260	266	263	268	280	295	293	317	143	156	180	216.7
8-Dec	146	157	153	156	149	155	137	168	165	154	154	155	158	162	158	158	176	200	195	201	186	194	194	185	171.8
9-Dec	174	262	254	266	252	254	247	217	205	206	179	141	231	235	234	215	181	159	148	176	124	156	217	231	218.8
10-Dec	179	195	147	145	155	146	142	155	173	190	81	350	12	26	19	47	51	65	65	125	123	157	163	166	104.8
11-Dec	191	169	154	146	136	147	157	153	138	142	146	147	159	156	165	169	183	191	192	202	197	212	205	210	180.6
12-Dec	177	163	163	192	192	204	235	235	259	243	225	104	80	341	10	347	320	318	334	31	156	64	134	151	227.7
13-Dec	166	149	170	144	161	159	170	232	223	339	351	356	20	346	229	207	310	296	277	328	13	57	52	76	6.5
14-Dec	189	136	178	143	157	166	159	180	168	166	161	172	171	163	197	203	248	233	179	214	181	154	177	193	174.8
15-Dec	183	211	201	178	193	AF	AF	AF	AF	AF	191	303	312	350	303	235	202	185	189	223	264	270	260	7	238.4
16-Dec	27	33	24	19	28	46	43	31	47	83	146	156	163	167	176	164	208	131	212	190	167	167	166	191	66.6
17-Dec	213	167	167	212	222	206	200	187	216	182	204	228	231	250	302	306	308	321	323	299	225	275	242	293	246.7
18-Dec	277	281	31	32	34	37	33	26	27	253	331	334	326	333	327	326	324	323	331	8	31	23	41	37	357.8
19-Dec	37	34	39	31	18	318	254	205	AF	162	174	148	147	148	159	159	158	153	159	157	174	149	154	155	140.2
20-Dec	163	160	160	156	163	162	163	162	161	163	164	161	162	170	170	168	162	165	174	174	173	162	149	157	164.2
21-Dec	189	164	258	201	149	218	245	184	222	210	171	200	164	173	327	309	298	295	306	332	329	134	124	123	254.3
22-Dec	130	102	94	188	153	153	149	153	183	200	308	298	305	303	313	308	303	292	16	39	45	33	34	23	7.6
23-Dec	24	267	36	176	153	133	139	51	3	347	315	4	245	20	47	219	161	147	145	171	163	119	29	25	84.3
24-Dec	28	24	23	19	8	11	3	218	214	223	159	151	150	144	134	139	174	157	130	105	1	212	322	337	41.6
25-Dec	22	26	34	46	41	18	306	287	163	148	169	144	139	145	145	148	151	161	158	164	158	164	150	156	130.1
26-Dec	157	158	164	159	157	160	161	160	162	158	156	158	158	165	156	157	170	169	134	199	225	170	220	192	162.4
27-Dec	147	150	158	169	169	219	177	207	201	176	169	165	169	160	166	173	171	164	157	146	146	154	149	158	166.6
28-Dec	168	60	359	30	19	349	351	341	26	271	218	179	157	150	157	152	139	109	165	AF	162	AF	289	104	40.0
29-Dec	257	AF	227	260	161	154	169	158	154	155	160	154	157	155	158	159	162	153	160	165	167	164	169	178	161.6
30-Dec	187	192	172	170	169	163	156	155	153	158	160	165	166	168	163	166	167	165	169	164	156	162	166	157	165.9
31-Dec	161	168	174	188	188	182	190	172	162	165	159	192	211	196	191	206	198	204	210	210	195	192	210	211	189.8

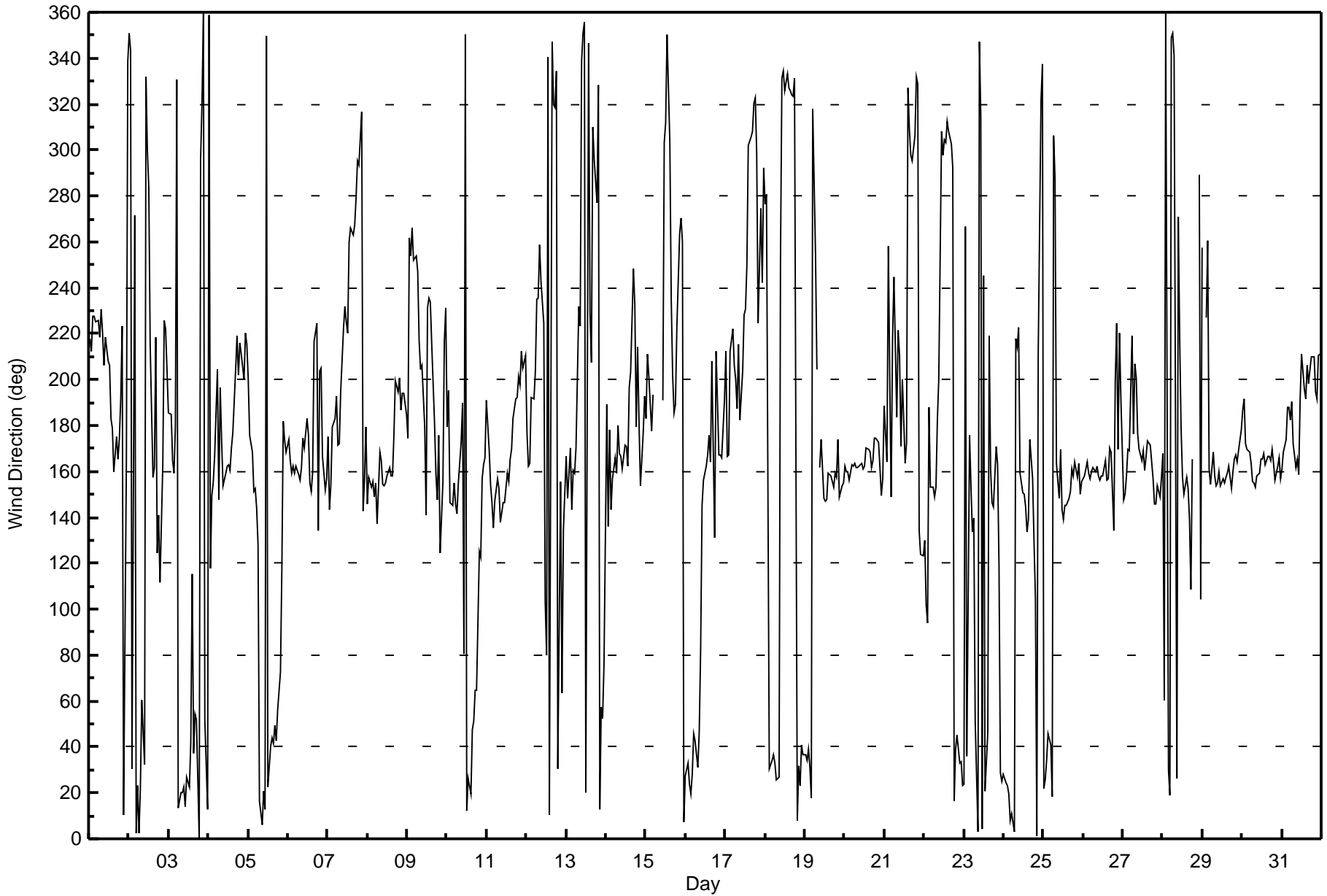
162.9 158.7 143.9 154.9 159.7 173.4 173.4 178.0 170.3 172.3 175.2 180.1 187.8 174.1 176.4 184.7 199.6 197.7 191.0 186.4 171.8 162.4 173.0 173.9  
 Diurnal Average

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**  
**Fort Hills - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Fort Hills - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Dec 24 22:00 Minimum Value: 4 deg on Dec 30 22:00 Percentiles: P <sub>1</sub> = 5 P <sub>10</sub> = 7 Q <sub>1</sub> = 9 Median = 14 Q <sub>3</sub> = 24 P <sub>90</sub> = 49 P <sub>99</sub> = 88		Hours in Service: 744 Hours of Data: 735 Hours of Missing Data: 9 Hours of Calibration: 0 Percent Operational Time: 98.8																							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	10	8	11	6	6	5	5	7	23	14	16	7	7	14	12	17	19	15	15	9	24	44	79	65	79
2-Dec	25	32	73	84	30	22	21	9	15	33	22	34	31	53	12	13	54	23	52	49	26	23	9	39	84
3-Dec	18	18	11	7	22	67	12	10	10	11	11	12	8	18	72	33	29	15	60	35	36	52	20	21	72
4-Dec	70	16	27	13	20	14	22	34	29	12	7	6	7	11	30	13	15	19	18	14	12	17	17	17	70
5-Dec	10	18	15	11	13	24	88	11	14	13	17	13	27	15	14	17	15	10	12	14	24	37	15	5	88
6-Dec	10	5	8	6	5	6	6	6	6	10	8	9	9	6	9	14	28	33	63	21	28	18	10	14	63
7-Dec	18	13	13	22	37	41	31	27	46	30	27	24	40	25	16	6	15	12	11	32	71	35	20	25	71
8-Dec	12	14	14	11	23	14	17	19	15	12	12	10	7	7	6	9	8	8	13	12	13	15	12	8	23
9-Dec	27	25	20	10	13	7	57	22	20	27	32	21	18	8	9	15	19	52	24	51	62	18	24	28	62
10-Dec	31	18	25	15	39	16	15	14	16	23	59	19	14	9	10	12	16	13	17	26	24	10	11	21	59
11-Dec	16	9	21	18	24	20	11	11	11	9	8	11	10	13	8	8	12	6	11	8	13	8	11	8	24
12-Dec	14	17	8	8	19	31	8	8	21	60	50	78	79	52	51	23	19	12	32	17	76	73	34	49	79
13-Dec	22	20	26	16	19	10	14	14	88	16	45	28	21	8	86	27	25	19	17	31	39	12	11	85	88
14-Dec	32	18	26	9	12	18	19	15	18	7	7	8	10	8	18	24	55	20	29	9	27	19	16	17	55
15-Dec	24	11	15	14	9	AF	AF	AF	AF	AF	27	83	21	44	67	59	30	12	22	8	14	13	13	62	83
16-Dec	12	10	8	8	11	11	11	12	17	26	16	8	8	10	9	12	18	95	33	34	16	12	13	18	95
17-Dec	33	41	11	11	31	10	8	8	13	12	10	8	7	26	11	11	15	13	14	36	39	45	14	21	45
18-Dec	10	42	17	11	11	11	11	9	21	61	24	17	14	13	16	13	12	12	11	27	10	11	19	11	61
19-Dec	9	10	8	11	10	74	37	54	AF	7	11	10	6	7	7	8	8	7	7	11	17	17	12	9	74
20-Dec	7	9	8	7	7	7	5	5	4	6	6	5	5	13	8	8	4	5	15	11	7	6	46	22	46
21-Dec	27	57	80	63	36	85	57	23	28	17	31	26	16	72	23	17	23	18	18	9	44	35	36	31	85
22-Dec	21	33	65	18	62	10	7	9	23	16	44	13	12	11	13	13	12	11	32	12	11	8	8	8	65
23-Dec	39	59	87	20	23	51	13	81	15	31	41	41	57	80	87	15	23	11	15	14	30	60	9	10	87
24-Dec	9	8	8	11	12	17	51	49	17	24	20	18	8	13	14	17	30	30	48	92	77	101	72	19	101
25-Dec	14	11	9	9	9	40	15	31	13	14	12	7	7	7	8	7	6	5	5	5	6	7	13	8	40
26-Dec	9	5	5	12	9	6	6	7	7	7	6	7	7	7	8	14	9	9	94	25	19	42	21	22	94
27-Dec	10	10	33	21	9	28	25	30	12	18	7	7	6	5	8	7	7	8	10	10	11	13	9	10	33
28-Dec	56	68	10	12	10	12	19	20	18	58	31	77	56	14	11	13	31	45	19	AF	85	AF	50	87	87
29-Dec	87	AF	41	91	13	13	21	9	14	11	6	6	5	6	6	5	8	10	8	6	6	7	7	7	91
30-Dec	8	18	9	5	6	6	10	8	8	10	24	13	16	9	9	10	11	7	7	10	9	4	16	7	24
31-Dec	7	5	13	6	7	6	8	13	4	5	5	21	7	10	9	6	6	6	7	5	8	8	12	6	21
	87	68	87	91	62	85	88	81	88	61	59	83	79	80	87	59	55	95	94	92	85	101	79	87	
	Diurnal Maximum																								
AF - Analyzer Failure																									







# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

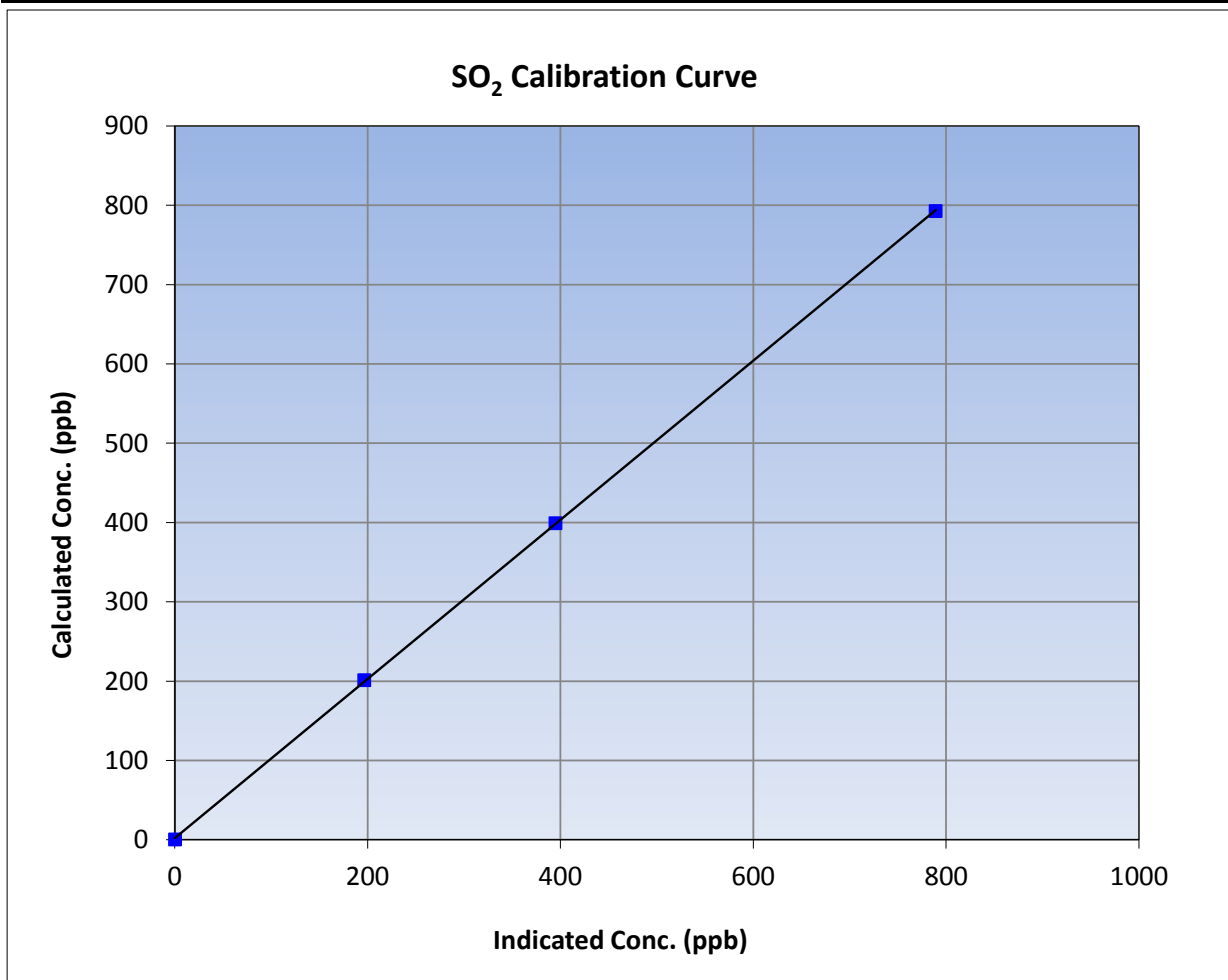
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort Hills	Station Number	AMS 23
Start Time (MST)	10:22	End Time (MST)	14:56
Analyzer make	Thermo 43i	Analyzer serial #	1160290012

### Calibration Data

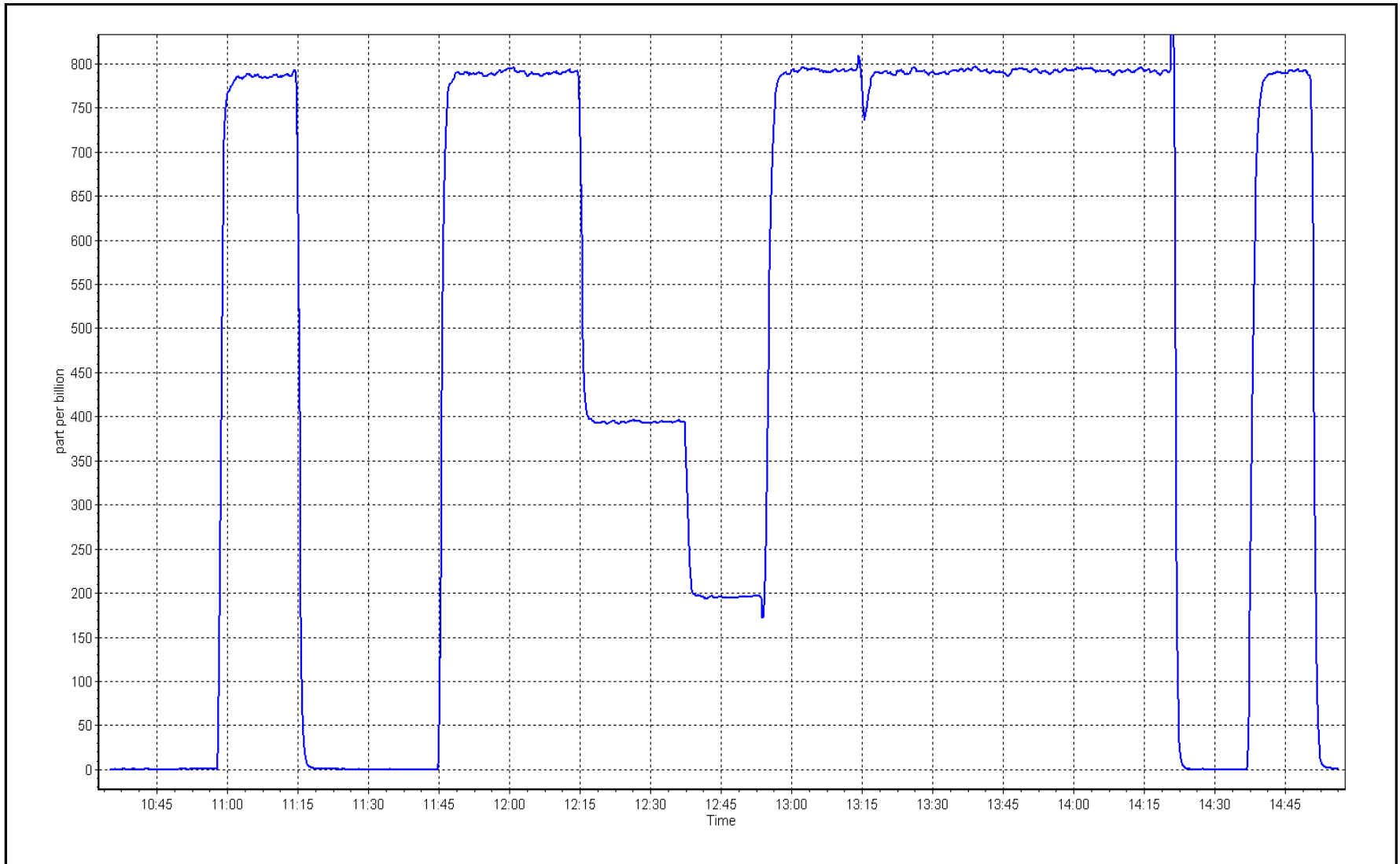
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999970	≥0.995
792.6	788.9	1.0046			
398.8	394.4	1.0112	Slope	1.003391	0.90 - 1.10
200.9	196.2	1.0237			
			Intercept	2.016313	+/-30



SO2 Calibration Plot

Date: December 5, 2017

Location: Fort Hills





# Wood Buffalo Environmental Association

## TRS Calibration Report

Version-11-2017

### Station Information

Station Name:	Fort Hills	Station number:	AMS 23
Calibration Date:	December 6, 2017	Last Cal Date:	November 8, 2017
Start time (MST):	10:29	End time (MST):	13:27
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.11</u>	ppm	Cal Gas Exp Date	December 17, 2019
Cal Gas Cylinder #	<u>DE0000390</u>			
Calibrator Make/Model	API T700		Serial Number	451
ZAG Make/Model	API 701		Serial Number	4522

### Analyzer Information

Analyzer make:	Thermo 43iTLE	Analyzer serial #:	1150840012
Converter Make:	CDN-101	Converter serial #:	517

	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-688
Calculated slope	0.993894	0.995311	Lamp voltage	949
Calculated intercept	0.247276	0.147719	Pressure	699.9
Analyzer Background	1.4	1.4	Flow	0.496
Analyzer Coefficient	1.051	1.075	Intensity	90
			Converter temp	800

### TRS Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5009	0.0	0.0	0.0	----
as found span	4940	78.7	80.1	78.2	1.025
calibrator zero	5009	0.0	0.0	0.0	----
high point	4940	78.7	80.1	80.4	0.997
second point	4978	39.5	40.2	40.3	0.998
third point	4997	20.0	20.4	20.1	1.013
as left zero	5009	0.0	0.0	0.0	----
as left span	4940	78.7	80.1	81.6	0.982
SO2 Scrubber Check	4936	81.4	811.2	0.1	----
Date of last scrubber change:			Average Correction Factor		1.003
Corrected As found	78.20	Previous response	80.38	*% change	2.8%

*\* = > +/-5% change initiates investigation*

#### Notes:

Changed inlet filter after as founds. Scrubber check was good. Adjusted the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## TRS Calibration Summary

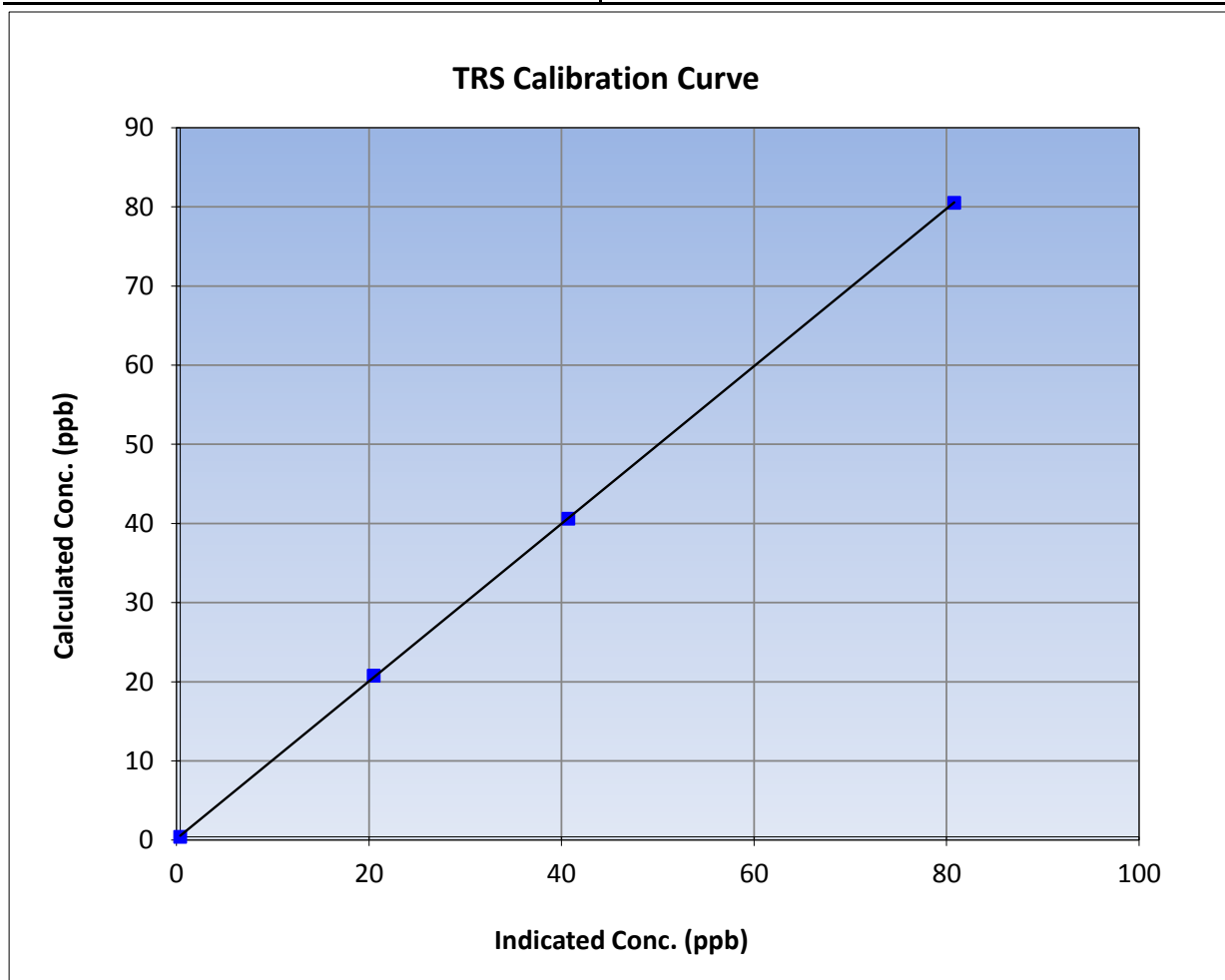
Version-03-2017

### Station Information

Calibration Date	December 6, 2017	Previous Calibration	November 8, 2017
Station Name	Fort Hills	Station Number	AMS 23
Start Time (MST)	10:29	End Time (MST)	13:27
Analyzer make	Thermo 43iTLE	Analyzer serial #	1150840012

### Calibration Data

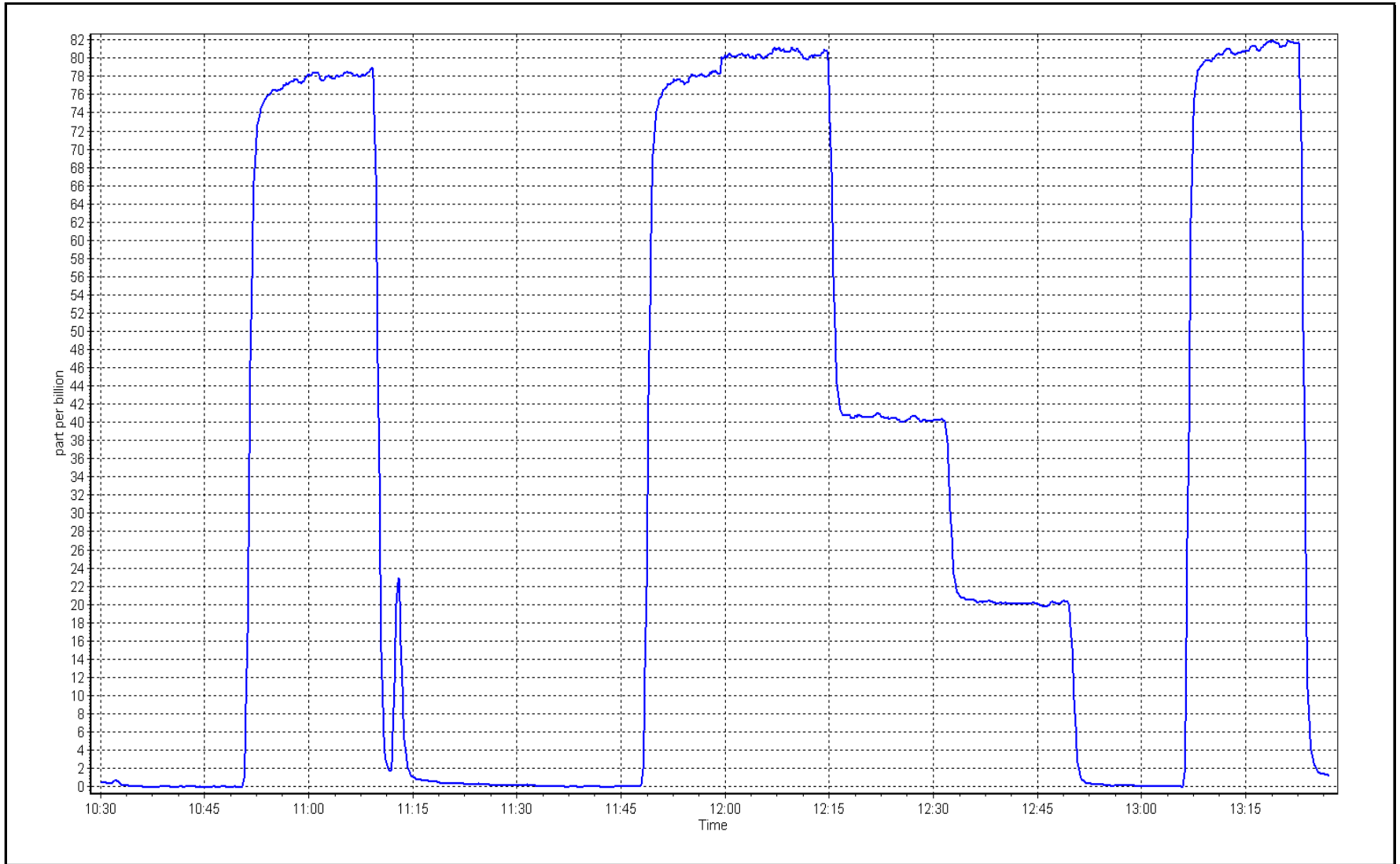
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999980	≥0.995
80.1	80.4	0.9967			
40.2	40.3	0.9982	Slope	0.995311	0.90 - 1.10
20.4	20.1	1.0135			
			Intercept	0.147719	+/-3



TRS Calibration Plot

Date: December 6, 2017

Location: Fort Hills





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort Hills	Station number:	AMS 23
Calibration Date:	December 5, 2017	Last Cal Date:	November 1, 2017
Start time (MST):	10:39	End time (MST):	14:52
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000688	Cal Gas Expiry Date	November 4, 2019
CH4 Cal Gas Conc.	<u>514.0</u> ppm	CH4 Equiv Conc.	1061.3 ppm
C3H8 Cal Gas Conc.	<u>199.0</u> ppm	Station temp.	24 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	451
ZAG Make/Model	Teledyne API 701	Serial Number	4522

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	1218153580
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-299
Calculated slope	0.990578	Sample pressure	8.2
Calculated intercept	0.069345	Fuel pressure	24.2
Analyzer Background	2.41	Air pressure	37.8
Analyzer Coefficient	4.910	Flame temperature	159.4

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5007	0.0	0.00	0.02	----
as found span	4936	80.5	17.03	17.44	0.976
calibrator zero	5011	0.0	0.00	0.05	----
high point	4937	80.5	17.03	17.29	0.985
second point	4977	40.5	8.57	8.67	0.988
third point	4997	20.4	4.31	4.32	0.998
as left zero	5009	0.0	0.00	0.11	----
as left span	4937	80.5	17.03	17.18	0.991
Average Correction Factor					0.990
Corrected As found	17.42	Previous response	17.12	*% change	-1.7%

\* = > +/-5% change initiates investigation

Notes: Changed inlet filter after asfound. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## THC Calibration Summary

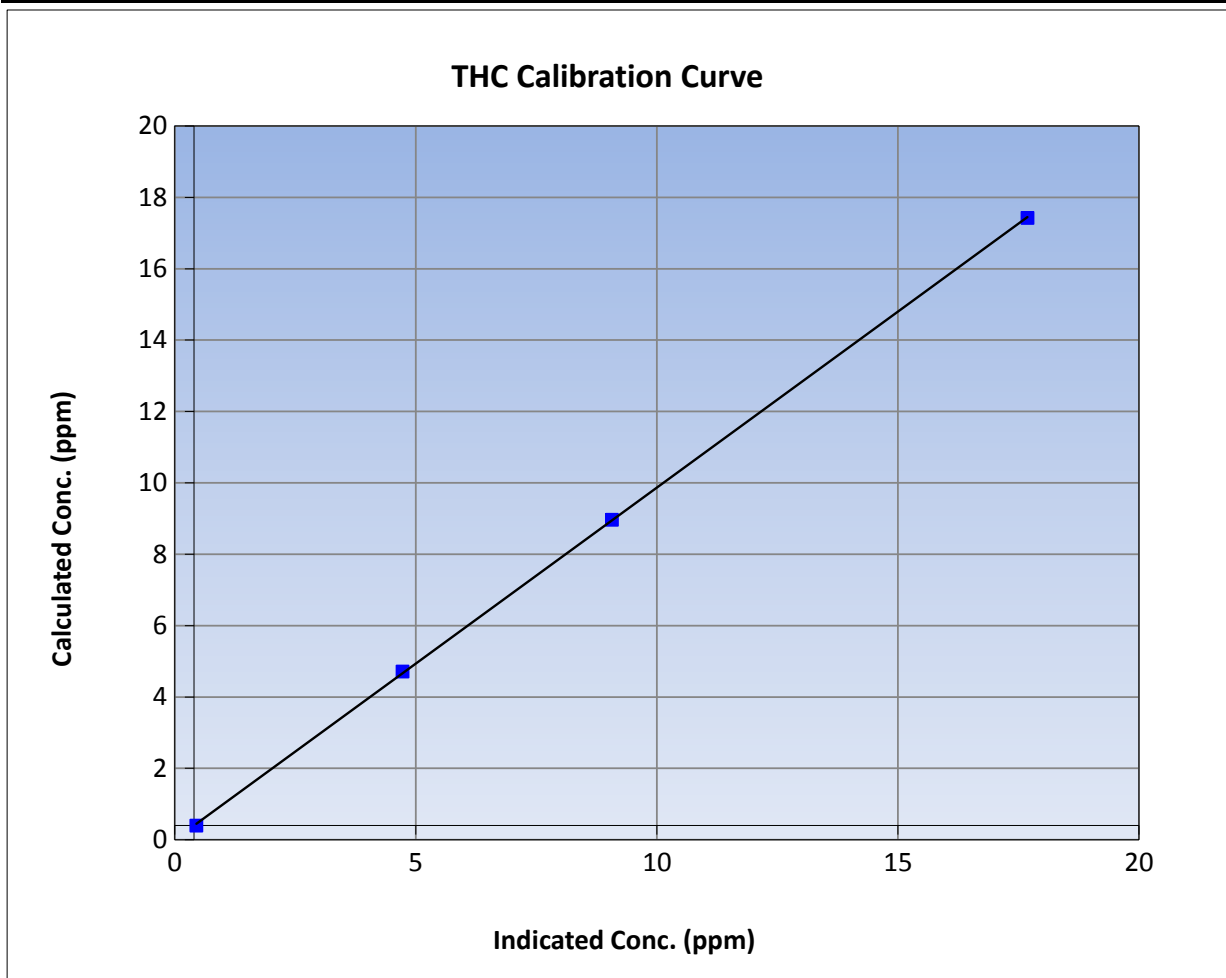
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort Hills	Station Number	AMS 23
Start Time (MST)	10:39	End Time (MST)	14:52
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153580

### Calibration Data

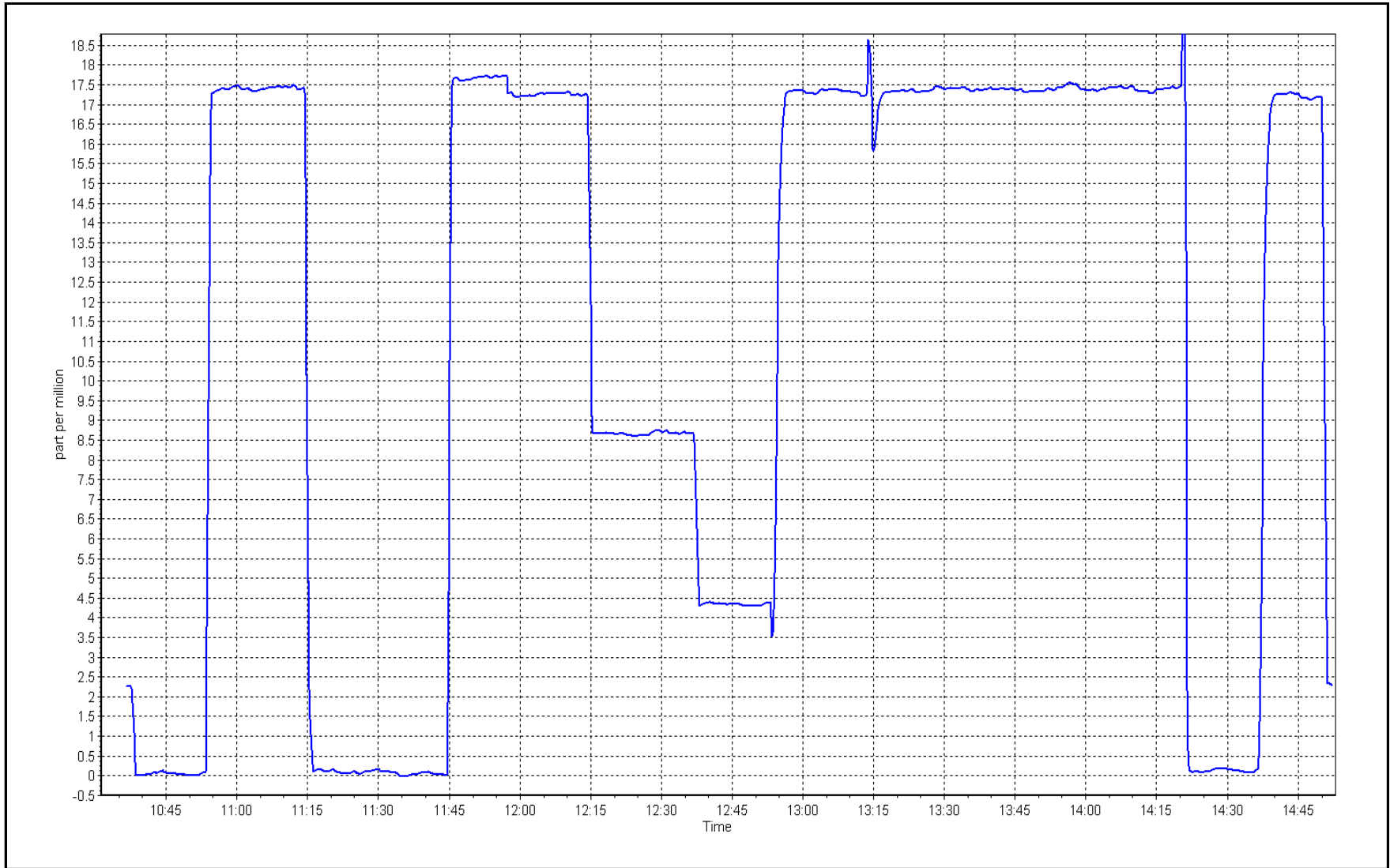
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.00	0.05	----	Correlation Coefficient	≥0.995	
17.03	17.29	0.9849			
8.57	8.67	0.9880	Slope	0.90 - 1.10	
4.31	4.32	0.9981			
			Intercept	-0.001344	+/-1.5



THC Calibration Plot

Date: December 5, 2017

Location: Fort Hills







# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Fort Hills	Station number:	AMS 23
Calibration Date:	December 5, 2017	Last Cal Date:	November 1, 2017
Start time (MST):	10:35	End time (MST):	14:53
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000688	Cal Gas Expiry Date	November 4, 2019
NOX Cal Gas Conc.	<u>49.9</u> ppb	NO Cal Gas Conc.	<u>49.9</u> ppb
Calibrator Model	Teledyne API T700	Serial Number	451
ZAG make/model	Teledyne API 701	Serial Number	4522

### Analyzer Information

Analyzer make:	Thermo 42i	Analyzer serial #:	115243007	
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
NO coefficient	1.043	1.053	NOX Range (ppb)	0 - 1000 ppb
NOX coefficient	1.000	1.000	PMT Temperature	-3.1 -2.8
NO <sub>2</sub> coefficient	1.001	1.001	Reaction cell Press	165.0 166.0
NO bkgrnd	1.6	1.7	Sample Flow	0.771 0.762
NOX bkgrnd	1.8	1.8	PMT Voltage	-802.5 -802.5

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.995918	0.997036
NO <sub>x</sub> Cal Offset	0.306260	-0.491730
NO Cal Slope	0.997051	0.998335
NO Cal Offset	0.225941	-0.531713
NO <sub>2</sub> Cal Slope	0.996188	1.001276
NO <sub>2</sub> Cal Offset	-1.518964	0.058368



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Total flow rate (sccm)	Total flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5008	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as found span	4937	80.5	813.6	813.6	0.0	806.4	804.7	1.6	1.0090	1.0111
calibrator zero	5008	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	4937	80.5	813.6	813.6	0.0	815.9	814.8	1.1	0.9972	0.9986
second point	4976	40.5	406.1	406.1	0.0	409.2	408.9	0.4	0.9925	0.9932
third point	4997	20.4	203.7	203.7	0.0	204.7	204.4	0.2	0.9952	0.9966
as left zero	5008	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	----	----
as left span	4936	80.4	812.8	396.0	416.8	821.8	393.8	427.9	0.9890	1.0056
Average Correction Factor									0.9950	0.9962

Corrected As found NO<sub>x</sub> = 806.5 ppb NO = 804.8 ppb \*Percent Change NO<sub>x</sub> = 1.3%  
 Previous Response NO<sub>x</sub> = 816.7 ppb NO = 815.8 ppb \*Percent Change NO = 1.4%  
 \* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	830.0	826.4	3.4	0.9803	0.9846	----	----
1st NO2 (400 ppb O3)	396.0	430.4	826.0	396.0	429.9	0.9850	----	1.0012	99.9%
2nd NO2 (200 ppb O3)	610.7	215.7	825.8	610.7	215.1	0.9853	----	1.0028	99.7%
3rd NO2 (100 ppb O3)	714.1	112.3	826.2	714.1	112.2	0.9848	----	1.0009	99.9%
2nd NO ref point	----	0.0	825.3	822.2	3.1	0.9859	0.9896	----	----
Average Correction Factor						0.9852	0.9871	1.0016	99.8%

Notes: Changed inlet filter after asfinds. Adjusted the span. Used second NO ref point due to drift

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

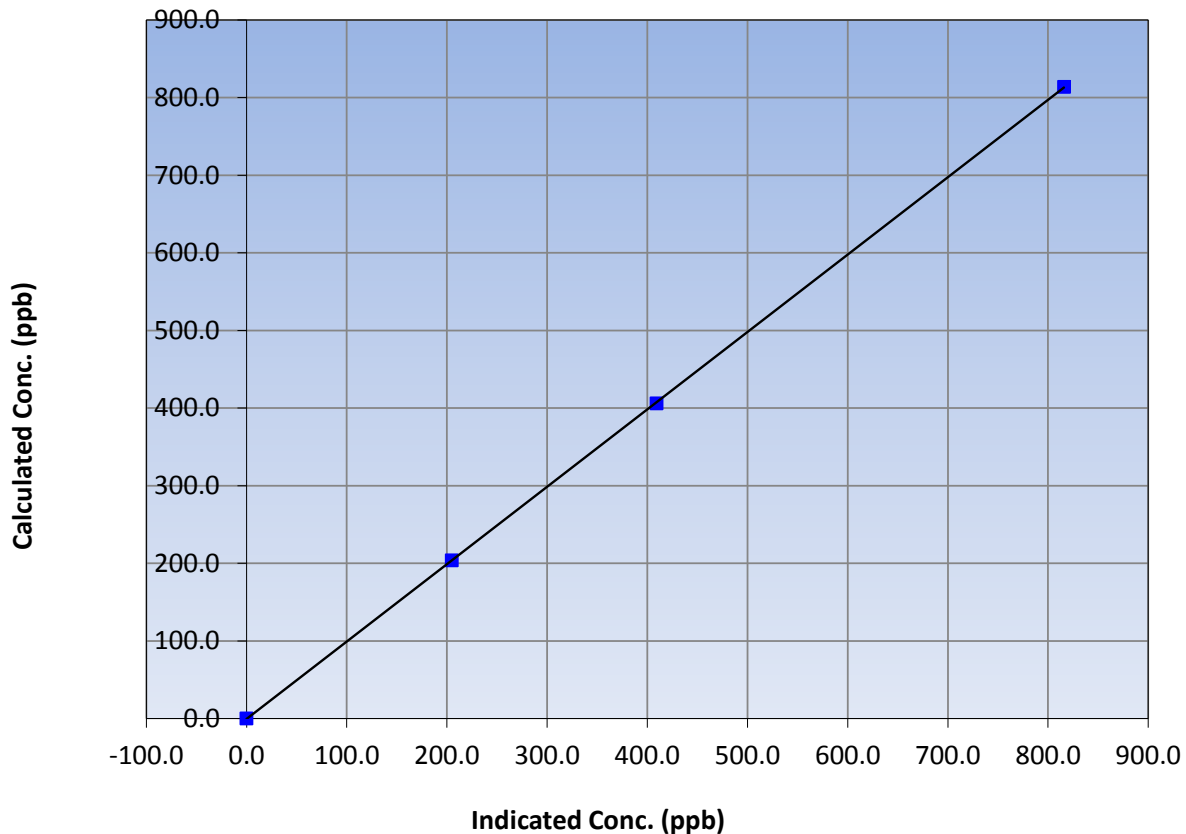
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort Hills	Station Number	AMS 23
Start Time (MST)	10:35	End Time (MST)	14:53
Analyzer make	Thermo 42i	Analyzer serial #	115243007

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>
0.0	-0.1	----	Correlation Coefficient Slope Intercept	≥0.995 0.90 - 1.10 +/-20
813.6	815.9	0.9972		
406.1	409.2	0.9925		
203.7	204.7	0.9952		
			0.999993	
			0.997036	
			-0.491730	

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

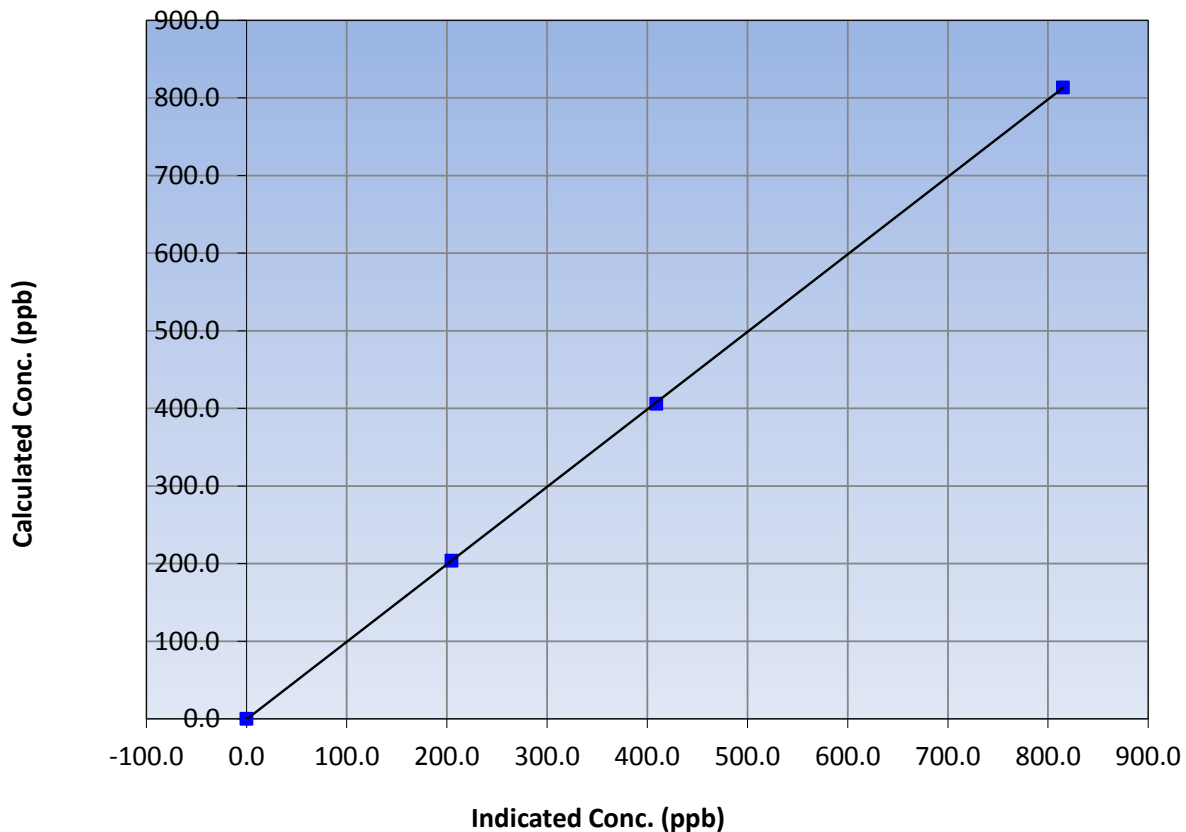
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort Hills	Station Number	AMS 23
Start Time (MST)	10:35	End Time (MST)	14:53
Analyzer make	Thermo 42i	Analyzer serial #	115243007

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.1	----	Correlation Coefficient	$\geq 0.995$	
813.6	814.8	0.9986			
406.1	408.9	0.9932			
203.7	204.4	0.9966			
			Slope	0.998335	0.90 - 1.10
			Intercept	-0.531713	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

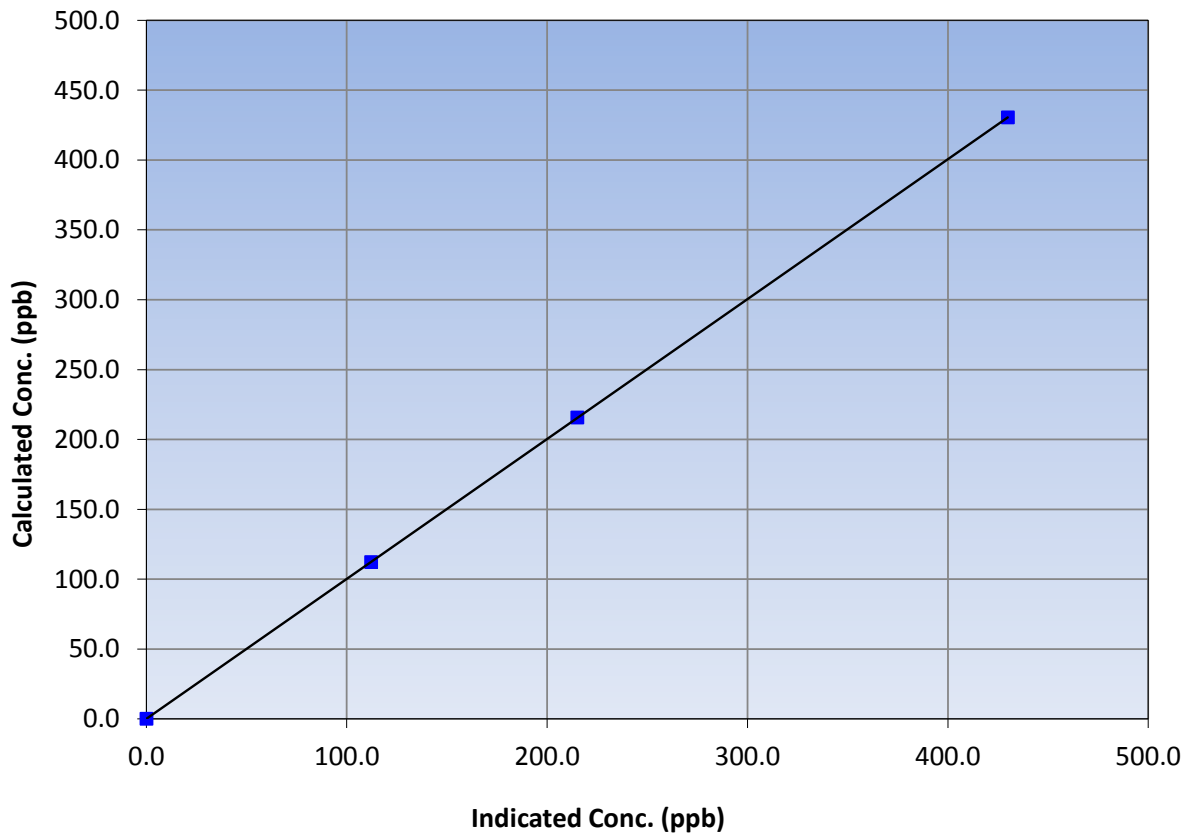
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 1, 2017
Station Name	Fort Hills	Station Number	AMS 23
Start Time (MST)	10:35	End Time (MST)	14:53
Analyzer make	Thermo 42i	Analyzer serial #	115243007

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
430.4	429.9	1.0012			
215.7	215.1	1.0028			
112.3	112.2	1.0009			
			Slope	1.001276	0.90 - 1.10
			Intercept	0.058368	+/-20

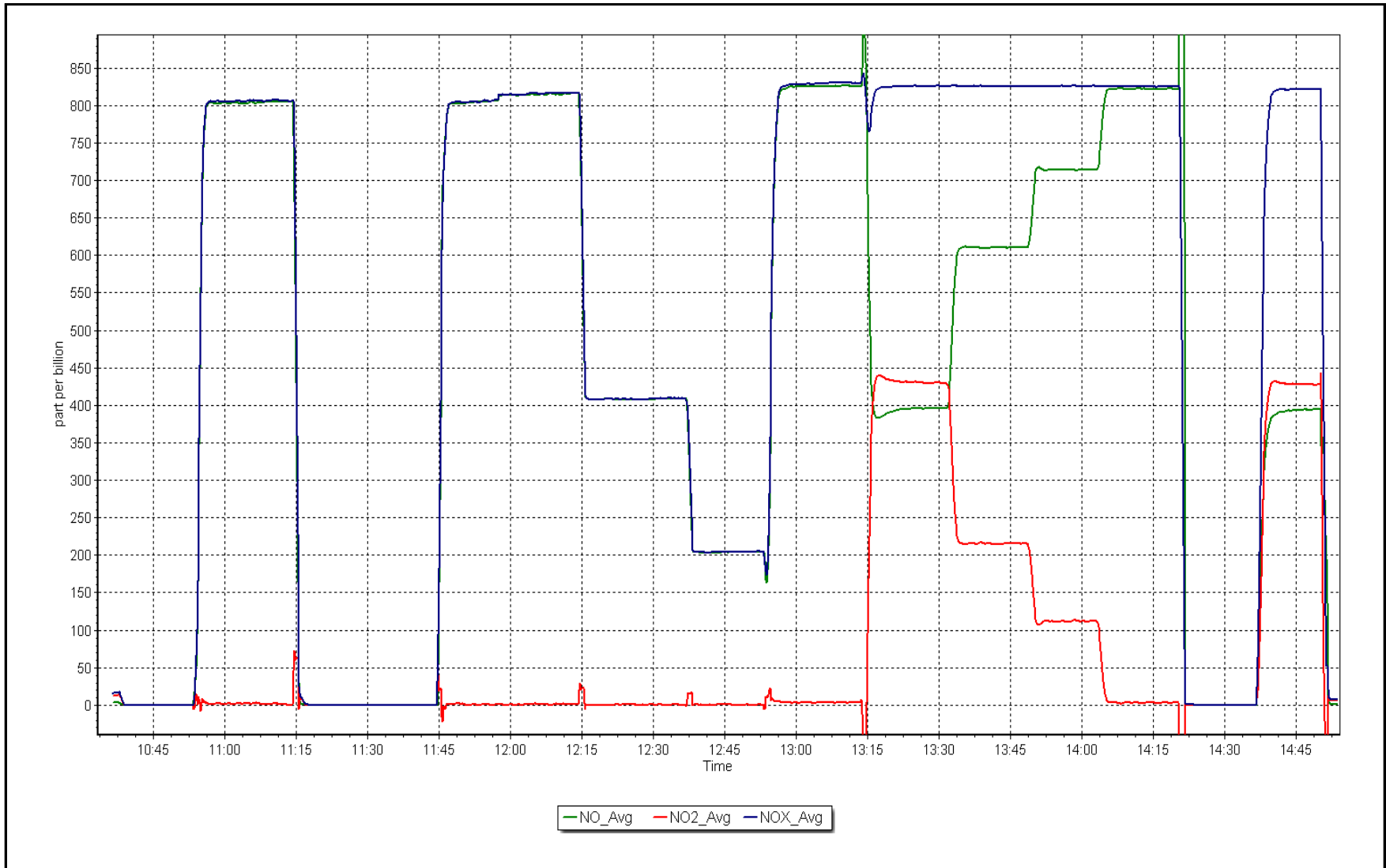
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 5, 2017

Location: Fort Hills





# Wood Buffalo Environmental Association

## SHARP PM<sub>2.5</sub> CALIBRATION

Version-02-2017

### Station Information

Station Name:	Fort Hills	Station number:	AMS 23
Calibration Date:	December 5, 2017	Last Cal Date:	November 8, 2017
Start time (MST):	12:01	End time (MST):	13:24
Sharp Model:	5030	S/N:	E-802
Particulate Fraction:	PM2.5	C14 Source S/N:	4153
Flow Meter Make/Model:	DeltaCal	S/N:	628
Temp/RH standard:	NA	S/N:	NA

### Monthly Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T1 (°C)	-7.7	-7	-7.7	<input type="checkbox"/>	<b>+/- 2 °C</b>
P3 (hPa)	984	981	984	<input type="checkbox"/>	<b>+/- 13 hPa</b>
flow (LPH)	1000	1017	1000	<input checked="" type="checkbox"/>	<b>+/- 50 LPH</b>
Nephelometer zero	0.5	-----	0	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Concentration zero	0.5	-----	0	<input checked="" type="checkbox"/>	<b>+/- 0.5 ug/m3</b>
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Cyclone cleaning :	PM10 Cyclone	<input checked="" type="checkbox"/>	PM2.5 Cyclone	<input checked="" type="checkbox"/>	
Date Filter Tape Installed:					

### Quarterly Calibration Test

Leak Test:	Date of check:	_____	Last Cal Date:	October 4, 2017
	Flow w/o adaptor:	16.67	Flow w/ adaptor:	16.55

**(Limit) 0.4 LPM**

Adjusted

Foil Calibration

**(Limit) +/- 5% of previous**

<u>Current Test</u>	<u>Previous Test</u>	<u>% Change</u>
Foil S/N: _____	Foil S/N: 5860	
Foil Mass: _____	Foil Mass: 1264	
Calibration Date: _____	Calibration Date: 4-Oct-17	
Correction Factor: _____	Correction Factor: 7009	---

### Annual Calibration Test

<u>Parameter</u>	<u>As found</u>	<u>Measured</u>	<u>As left</u>	<u>Adjusted</u>	<b>(Limits)</b>
T2 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T3 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
T4 (°C)				<input type="checkbox"/>	<b>+/- 2 °C</b>
RH (%)				<input type="checkbox"/>	<b>+/- 10%</b>
Date Sample Tube Cleaned:	Decemebr 5, 2017				
Date Pump Rebuilt/Replaced:					

Notes: Cleaned Cyclone head. Cleaned the Sample Tube, Adjsuted the flow, nephelometer and the concentration.

Calibration by: Jayme Marcoux



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 24  
SURMONT  
DECEMBER 2017**

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

January 30, 2018



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SURMONT (AMS 24)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	37	37	100	10	0	4	0
H2S (ppb) Average	668	36	76	94.62	1	0	0	0
THC(ppm) Average	505	29	239	71.77	3	-	2	-
NO2 (ppb) Average	707	37	37	100	17	0	7	-
NO (ppb) Average	707	37	37	100	17	-	7	-
NOX (ppb) Average	707	37	37	100	29	-	13	-
PM2.5 (ug/m3) Average	742	2	2	100	20	0	8	0
Temperature 2 m (C) Average	744	0	0	100	6.3	-	3.9	-
Relative Humidity (%) Average	744	0	0	100	98	-	86	-
Wind Speed 10 m (km/h) Average	744	0	0	100	36	-	28	-
Wind Direction 10 m (deg) Average	744	0	0	100	0	-	0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SURMONT (AMS 24)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.9	1	-	0	0	0	0	1	2	10
H2S (ppb) Average	668	0.2	0	-	0	0	0	0	0	0	1
THC (ppm) Average	505	2.2	0	-	2	2	2	2	2	2	3
NO2 (ppb) Average	707	2.4	3	-	0	1	1	1	3	6	17
NO (ppb) Average	707	1.1	2	-	0	0	0	0	1	3	17
NOX (ppb) Average	707	3.5	4	-	0	1	1	2	4	8	29
PM2.5 (ug/m3) Average	742	3.9	3	-	0	1	2	3	5	8	20
Temperature 2 m (C) Average	744	-10.5	11.4	-	-32.9	-27.1	-21.6	-7.9	-0.7	2	6.3
Relative Humidity (%) Average	744	74.4	10	-	44	62	70	75	82	87	98
Wind Speed 10 m (km/h) Average	744	17.2	8	-	2	7	11	17	23	28	36
Wind Direction 10 m (deg) Average	744	0	0	-	0						0

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SURMONT (AMS 24)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	10 Dec 2017 08:00	10 Dec 2017 10:00	3	Unstable operation - excessive baseline drift
H2S	15 Dec 2017 08:00	15 Dec 2017 08:00	1	Unstable operation - excessive baseline drift
H2S	17 Dec 2017 09:00	17 Dec 2017 10:00	2	Unstable operation - excessive baseline drift
H2S	18 Dec 2017 01:00	18 Dec 2017 01:00	1	Unstable operation - excessive baseline drift
H2S	18 Dec 2017 18:00	18 Dec 2017 18:00	1	Unstable operation - excessive baseline drift
H2S	19 Dec 2017 02:00	19 Dec 2017 02:00	1	Unstable operation - excessive baseline drift
H2S	19 Dec 2017 17:00	19 Dec 2017 21:00	5	Unstable operation - excessive baseline drift
H2S	24 Dec 2017 08:00	24 Dec 2017 08:00	1	Unstable operation - excessive baseline drift
H2S	24 Dec 2017 19:00	24 Dec 2017 19:00	1	Unstable operation - excessive baseline drift
H2S	25 Dec 2017 00:00	25 Dec 2017 00:00	1	Unstable operation - excessive baseline drift
H2S	25 Dec 2017 02:00	25 Dec 2017 02:00	1	Unstable operation - excessive baseline drift
H2S	26 Dec 2017 10:00	26 Dec 2017 12:00	3	Unstable operation - excessive baseline drift
H2S	27 Dec 2017 07:00	27 Dec 2017 09:00	3	Unstable operation - excessive baseline drift
H2S	29 Dec 2017 07:00	29 Dec 2017 07:00	1	Unstable operation - excessive baseline drift
H2S	29 Dec 2017 11:00	29 Dec 2017 11:00	1	Unstable operation - excessive baseline drift
H2S	29 Dec 2017 16:00	29 Dec 2017 16:00	1	Unstable operation - excessive baseline drift
H2S	29 Dec 2017 18:00	29 Dec 2017 20:00	3	Unstable operation - excessive baseline drift
H2S	29 Dec 2017 23:00	30 Dec 2017 02:00	4	Unstable operation - excessive baseline drift
H2S	30 Dec 2017 14:00	30 Dec 2017 15:00	2	Unstable operation - excessive baseline drift
H2S	30 Dec 2017 21:00	30 Dec 2017 22:00	2	Unstable operation - excessive baseline drift
H2S	31 Dec 2017 01:00	31 Dec 2017 02:00	2	Unstable operation - excessive baseline drift
NMHC, CH4, THC	23 Dec 2017 07:00	01 Jan 2018 00:00	210	Unstable Operation - station temperature fluctuations



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Surmont - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 10 ppb on Dec 24 11:00	Maximum Daily Average: 3.8 ppb on Dec 24		Hours of Data:	707
Minimum Value: 0 ppb on Dec 2 09:00	Minimum Daily Average: 0.2 ppb on Dec 2		Hours of Missing Data:	37
Maximum Diurnal Average: 1.2 ppb at hour 3	Minimum Diurnal Average: 0.6 ppb at hour 16		Hours of Calibration:	37
Monthly Average: 0.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 8		Percent Operational Time:	100.0

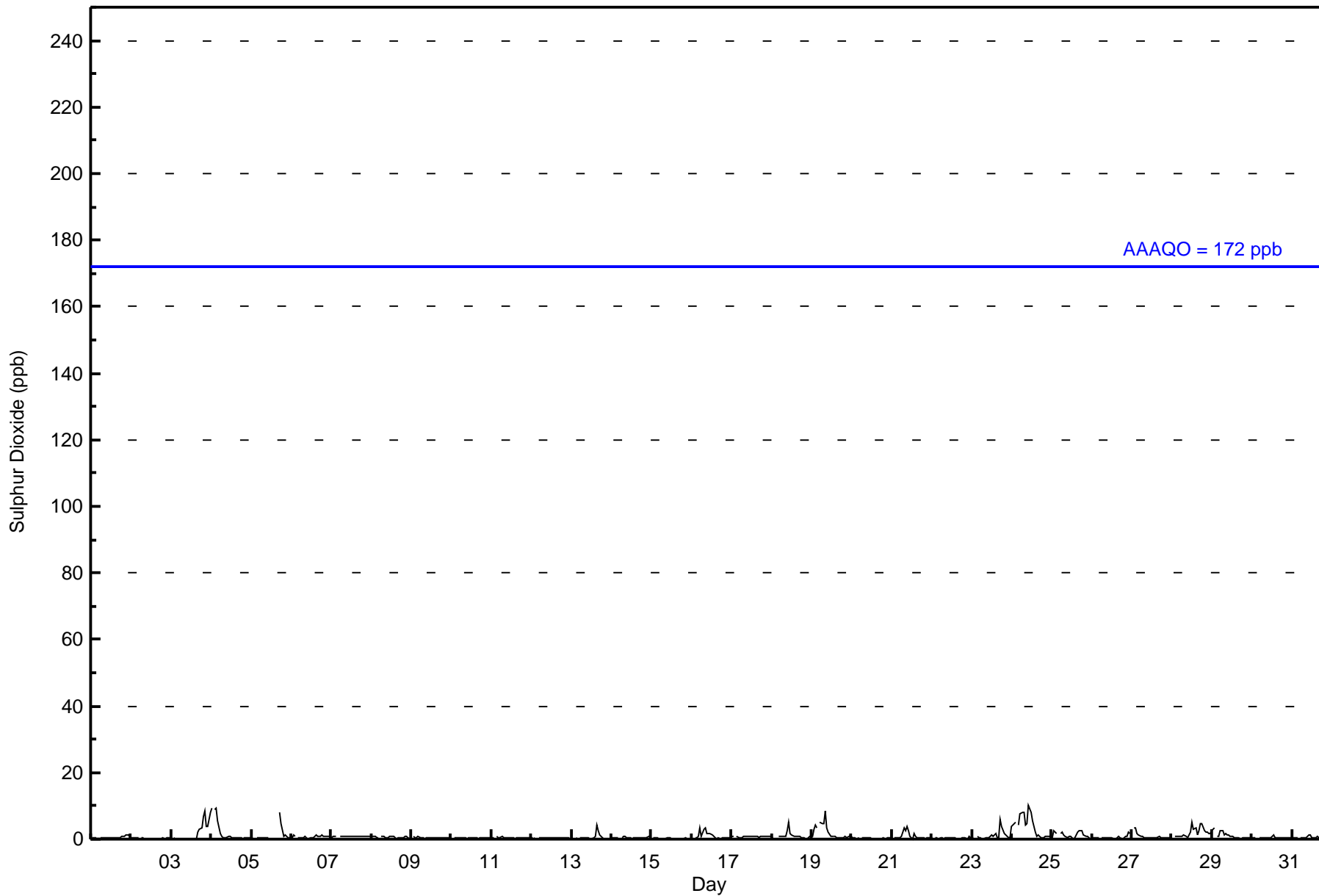
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0.5	1	
2-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	7	8	4	4	8	1.7	8	
4-Dec	9	Z	9	9	5	2	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1.9	9	
5-Dec	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	C	8	5	1	1	1	1	0	--	8	
6-Dec	1	1	1	Z	0	0	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0.7	1	
7-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
8-Dec	1	1	1	0	1	Z	1	1	1	0	1	1	1	1	1	0	0	1	1	0	1	1	0	0	0.6	1	
9-Dec	Z	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
11-Dec	0	0	Z	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0.5	1	
12-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
13-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	4	3	1	0	0	0	0	0	0	0.5	4	
14-Dec	0	0	0	0	0	Z	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0.5	1	
15-Dec	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
16-Dec	0	Z	0	0	1	3	1	3	3	2	2	2	1	1	0	0	0	0	0	0	0	0	0	1	1.0	3	
17-Dec	1	1	Z	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
18-Dec	1	0	0	Z	1	1	1	1	1	3	5	2	1	1	1	1	1	1	1	1	0	0	0	1	0.9	5	
19-Dec	1	3	4	3	Z	5	5	5	8	3	2	1	1	1	1	0	0	1	0	0	1	0	1	1	2.1	8	
20-Dec	0	0	0	0	0	Z	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
21-Dec	Z	0	0	0	0	1	1	3	3	4	3	1	0	2	1	1	0	0	0	0	0	1	0	0	1.0	4	
22-Dec	1	Z	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1	
23-Dec	0	0	Z	1	0	1	0	0	0	1	1	1	1	1	2	1	0	6	4	2	1	1	1	0	1.1	6	
24-Dec	4	4	5	Z	4	8	8	8	4	4	10	8	6	4	2	1	1	0	0	0	1	1	1	0	3.8	10	
25-Dec	1	2	2	2	Z	2	2	1	1	1	1	1	0	0	0	2	3	2	2	1	1	1	0	0	1.2	3	
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	2	2	0.5	2	
27-Dec	Z	4	3	2	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.8	4	
28-Dec	1	Z	1	1	1	1	1	1	1	1	2	5	3	4	1	2	5	5	3	2	2	2	2	2	1.9	5	
29-Dec	3	3	Z	1	1	2	3	1	2	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1.1	3	
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1	
31-Dec	0	0	0	0	Z	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	0.6	1	
	1.0	1.0	1.2	1.0	0.8	1.2	1.0	1.1	1.0	0.9	1.1	0.9	0.8	0.7	0.6	0.6	0.7	1.2	0.9	0.8	0.8	0.7	0.7	0.8		Diurnal Average	
	9	4	9	9	5	8	8	8	8	4	10	8	6	4	4	4	3	8	5	7	8	4	4	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 (SO<sub>2</sub>) - ppb  
Surmont - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Surmont - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	707	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Surmont - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707

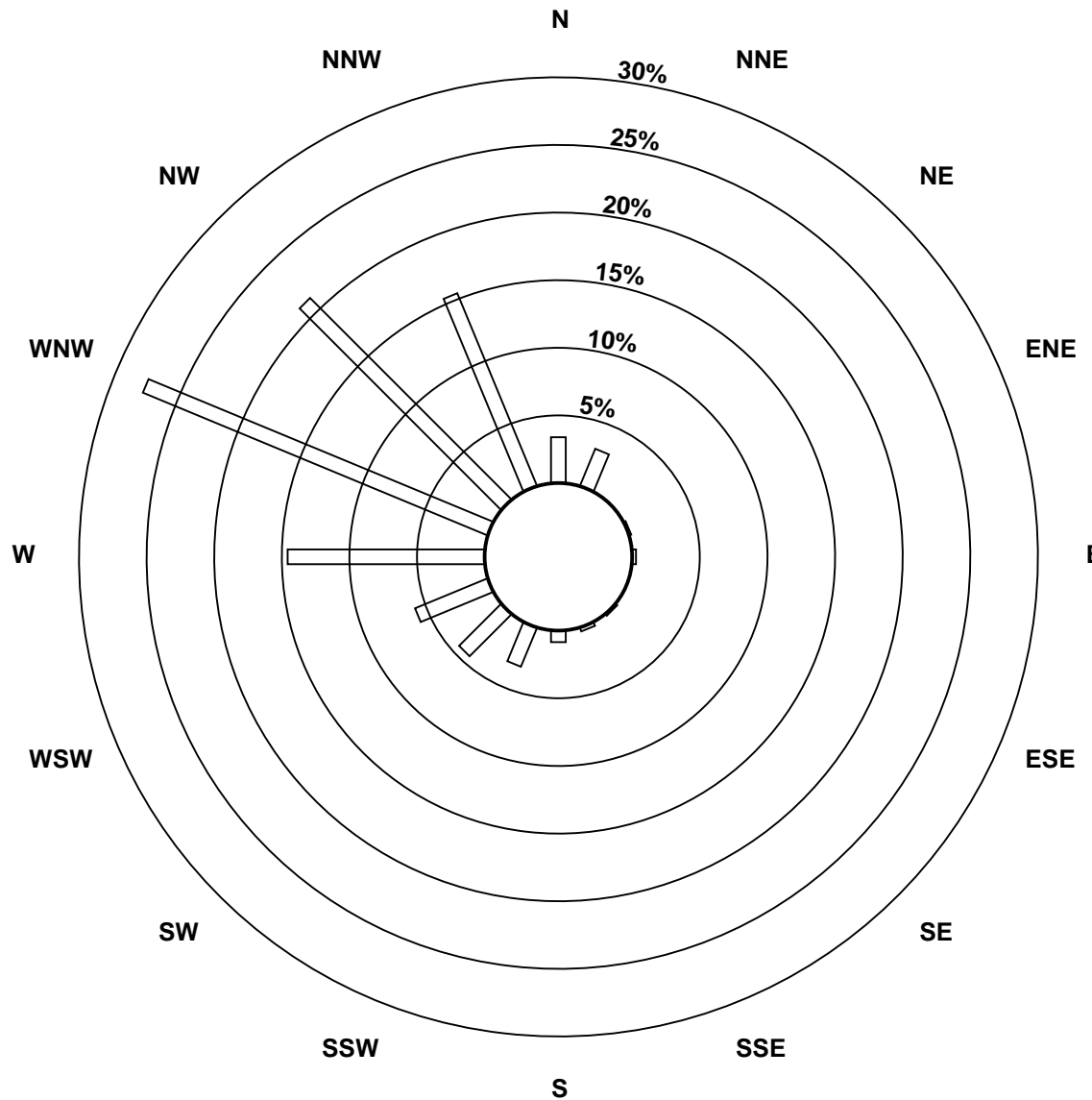
Total Number of Valid Hours: 707

Total Number of Hours: 744

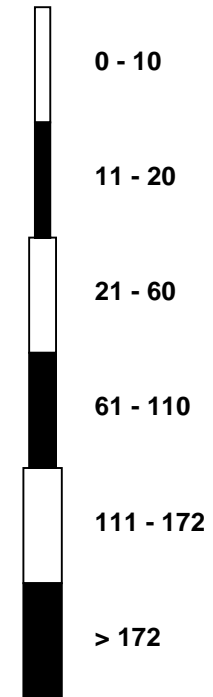


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Surmont (AMS 24)

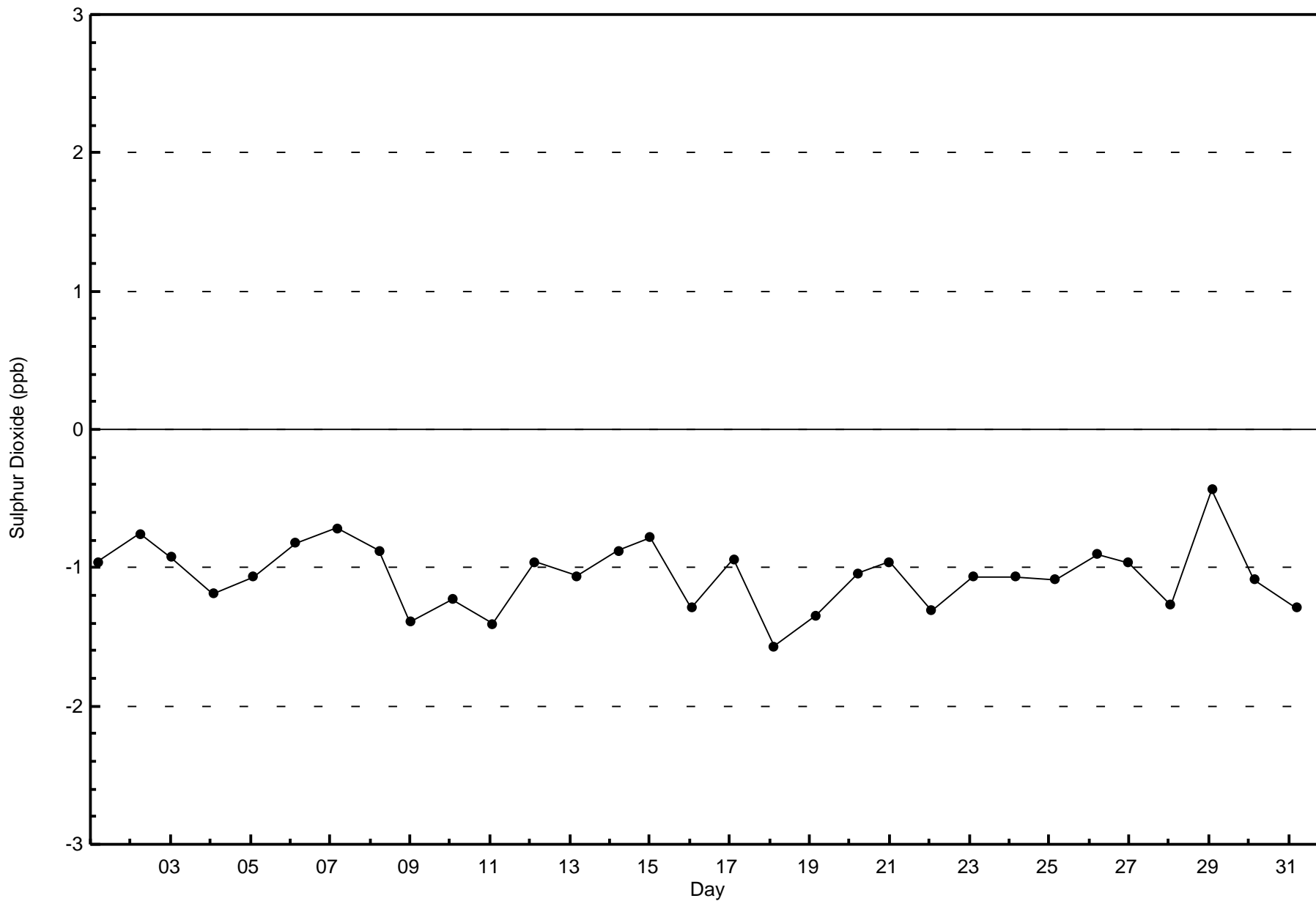


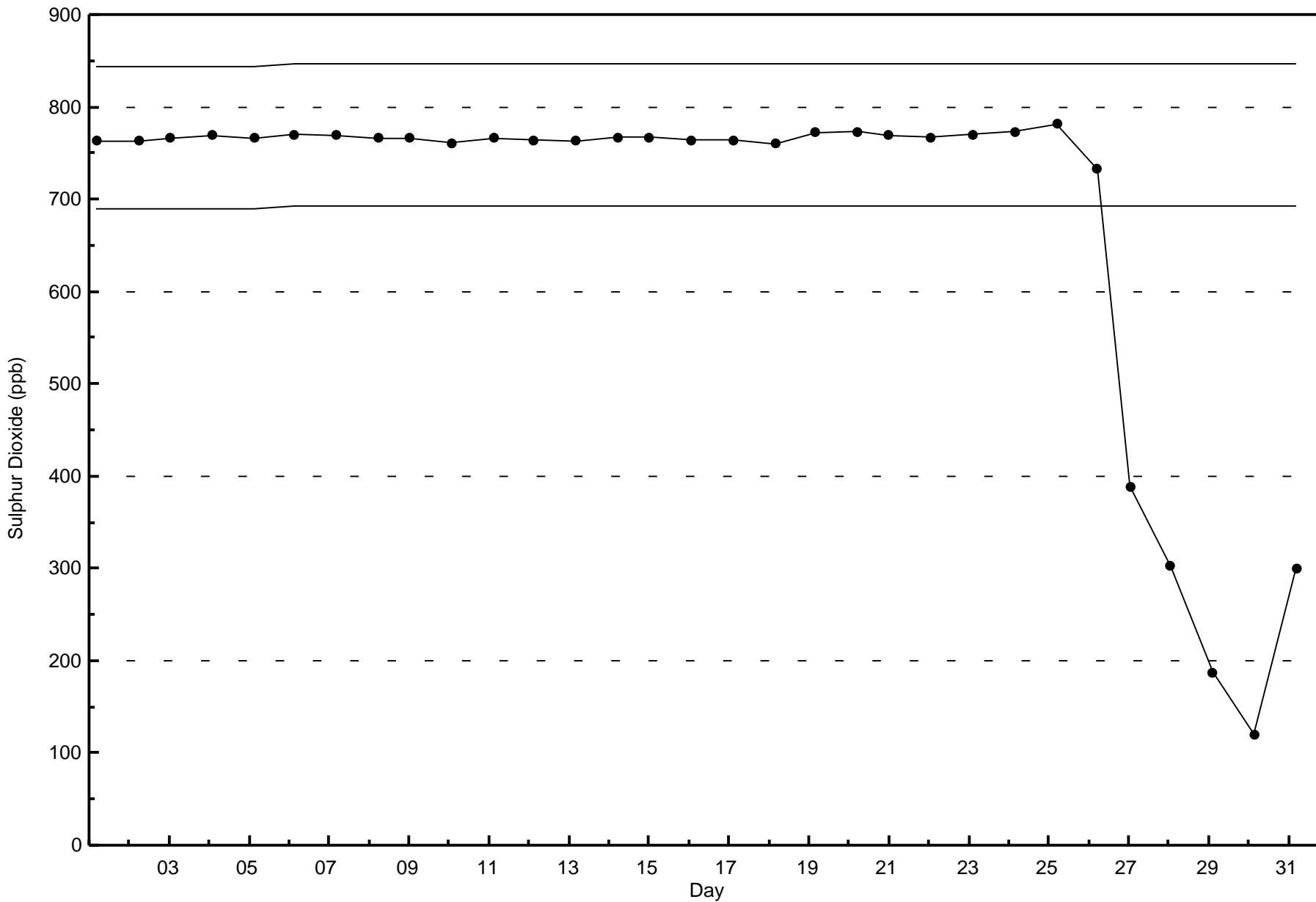
Classes (ppb)



Total Number of Valid Hours: 707







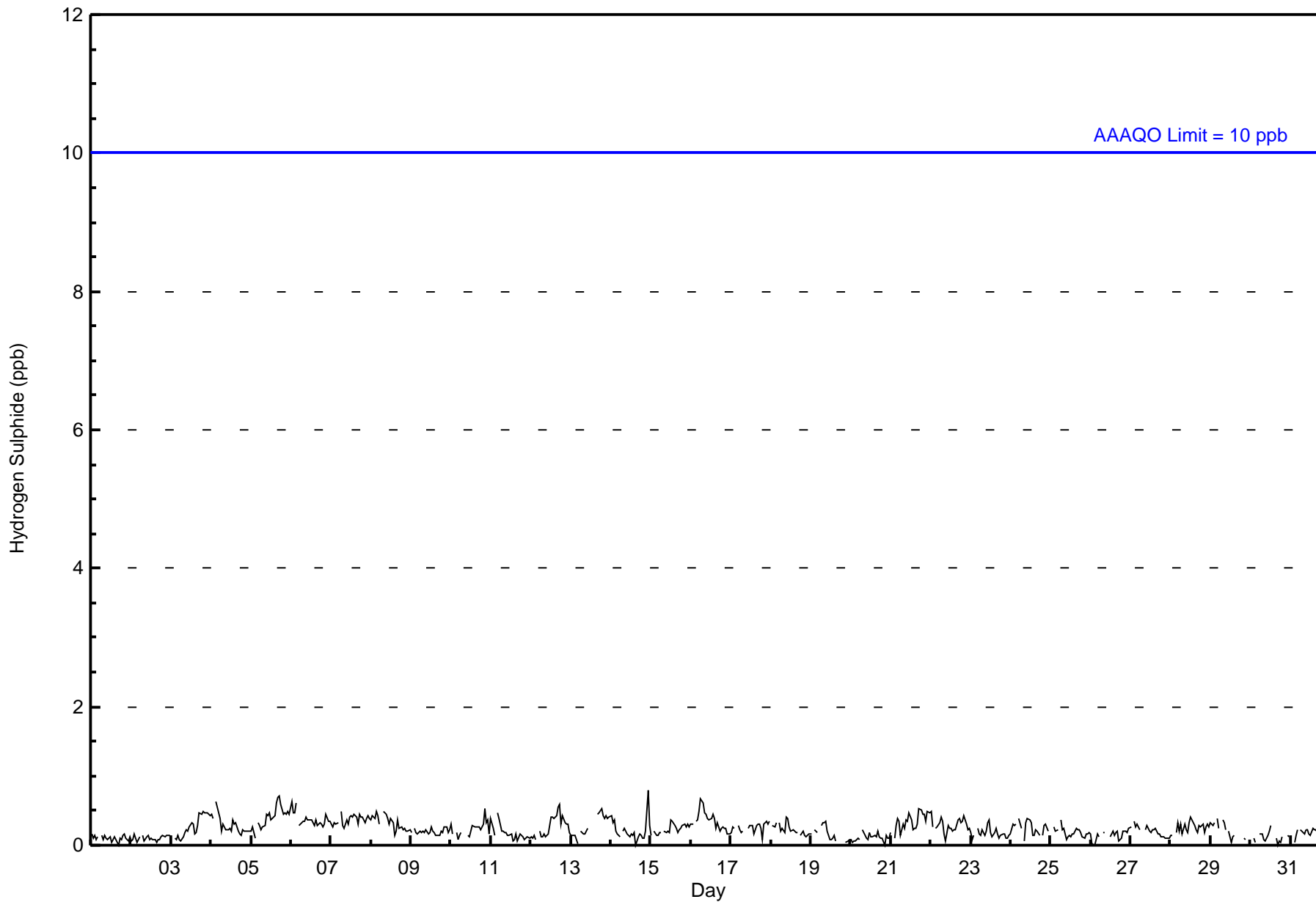


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 1 ppb on Dec 14 23:00										Maximum Daily Average: 0.4 ppb on Dec 5										Hours of Data: 668																													
Minimum Value: 0 ppb on Dec 1 17:00										Minimum Daily Average: 0.1 ppb on Dec 1										Hours of Missing Data: 76																													
Maximum Diurnal Average: 0.3 ppb at hour 18										Minimum Diurnal Average: 0.2 ppb at hour 3										Hours of Calibration: 36																													
Monthly Average: 0.2 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1										Percent Operational Time: 94.6																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
2-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
4-Dec	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0.4	1																						
6-Dec	1	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																						
8-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
10-Dec	0	0	Z	0	0	0	0	UO	UO	UO	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1																						
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.3	1																						
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	C	0	0	1	0	0	0	0	0	0.3	1																							
14-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1																						
15-Dec	0	Z	0	0	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
16-Dec	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
17-Dec	0	0	0	Z	0	0	0	0	UO	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
18-Dec	UO	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	UO	0	0	0	0	0	0	0.2	0																						
19-Dec	0	UO	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	UO	UO	UO	UO	UO	0	0	0	0	--	0																						
20-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1																						
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
24-Dec	0	0	0	0	Z	0	0	UO	0	0	0	0	0	0	0	0	0	0	UO	0	0	0	0	UO	0	0.2	0																						
25-Dec	0	UO	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																						
26-Dec	0	0	0	0	0	0	Z	0	0	UO	UO	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
27-Dec	0	Z	0	0	0	0	0	UO	UO	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
29-Dec	0	0	0	Z	0	0	0	UO	0	0	0	UO	0	0	0	UO	0	UO	UO	UO	0	0	UO	UO	0	--	0																						
30-Dec	UO	UO	0	0	Z	0	0	0	0	0	0	0	UO	UO	0	0	0	0	0	0	0	UO	UO	0	0	--	0																						
31-Dec	UO	UO	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																						
																								0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.2	Diurnal Average	
																								1	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	1	0	1	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 (H<sub>2</sub>S) - ppb**  
**Surmont - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Surmont - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	668	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: 668

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Surmont - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	23	21	0	1	1	0	1	2	6	23	29	37	95	180	144	105	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
<b>Totals</b>	23	21	0	1	1	0	1	2	6	23	29	37	95	180	144	105	668

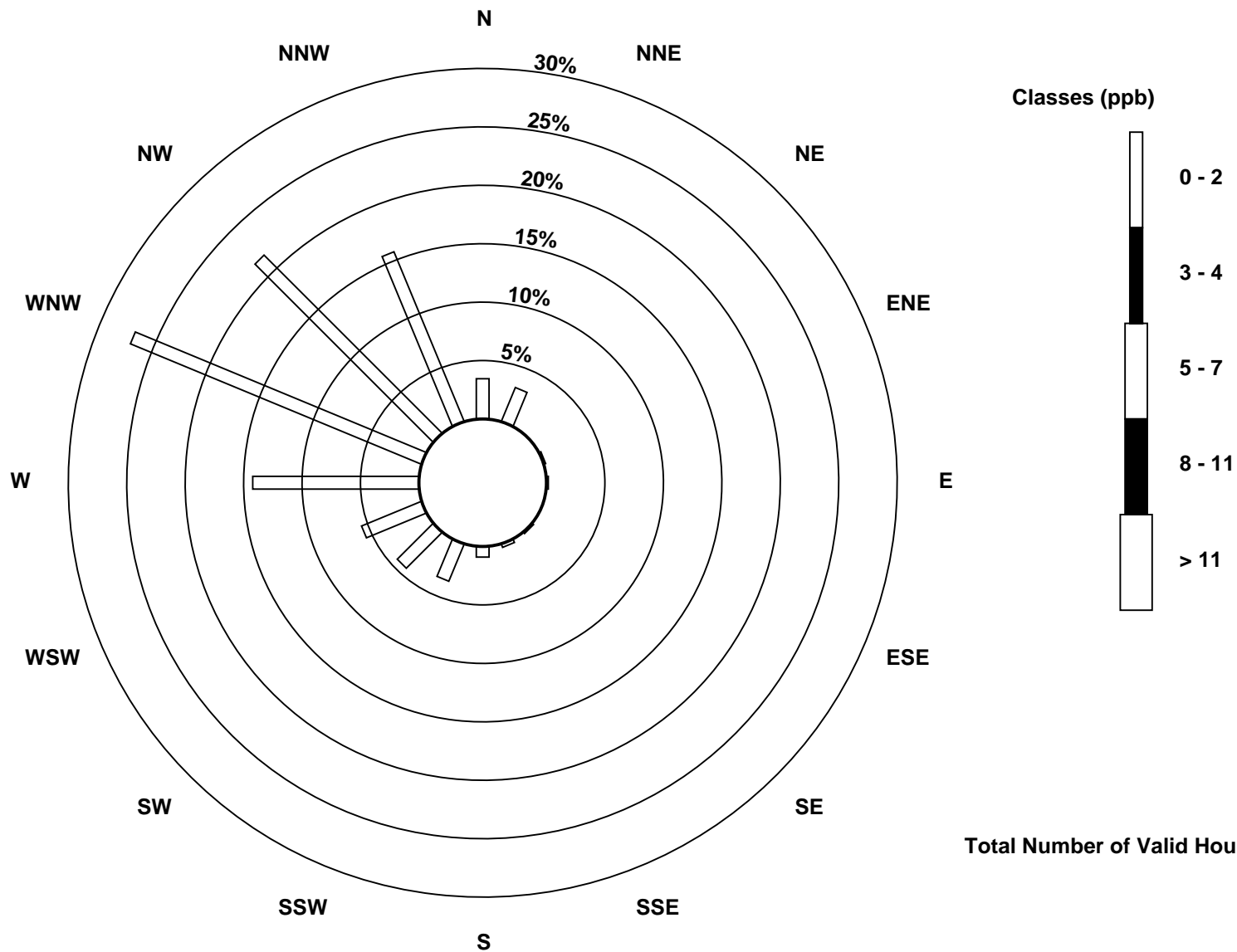
Total Number of Valid Hours: 668

Total Number of Hours: 744

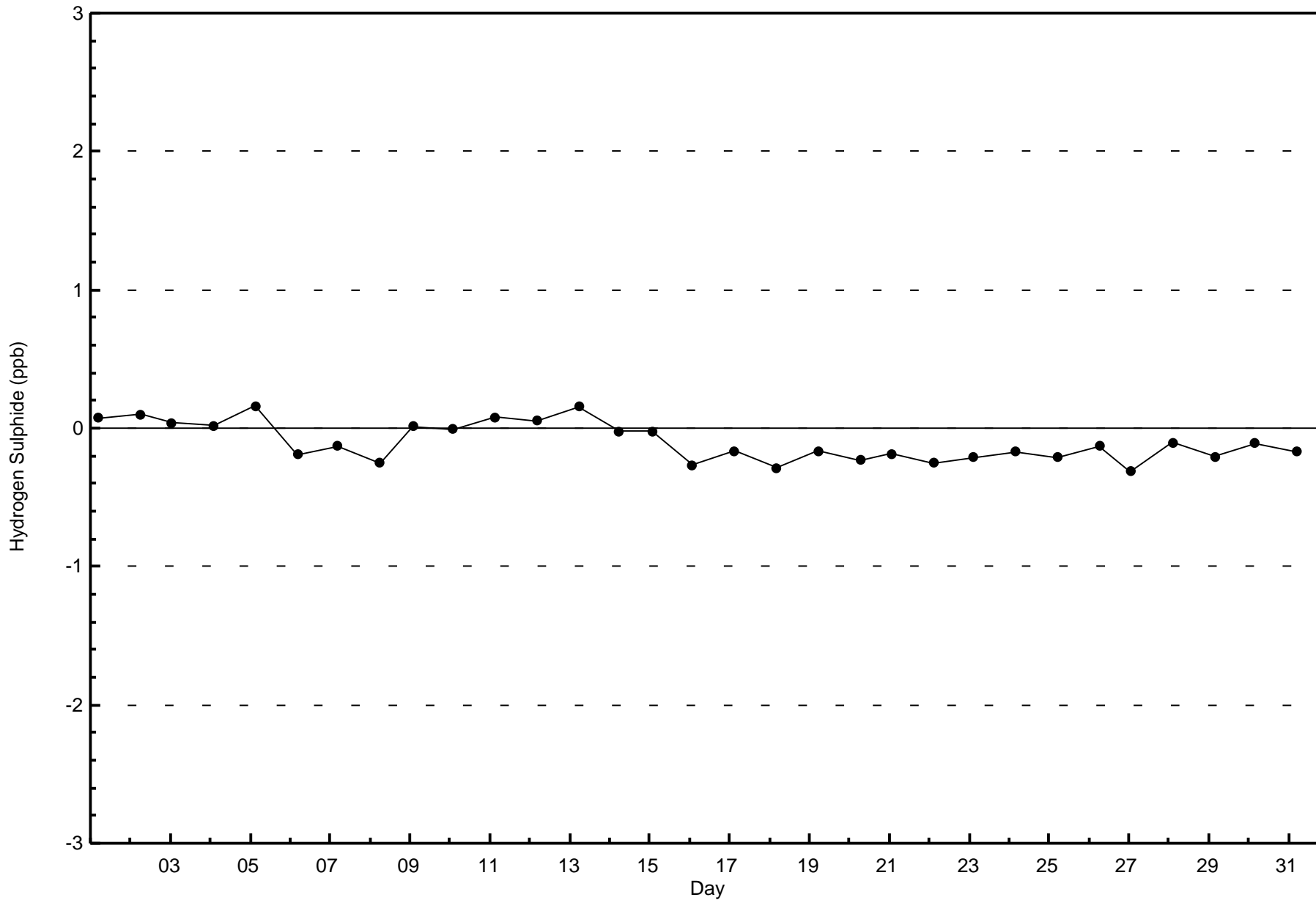


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

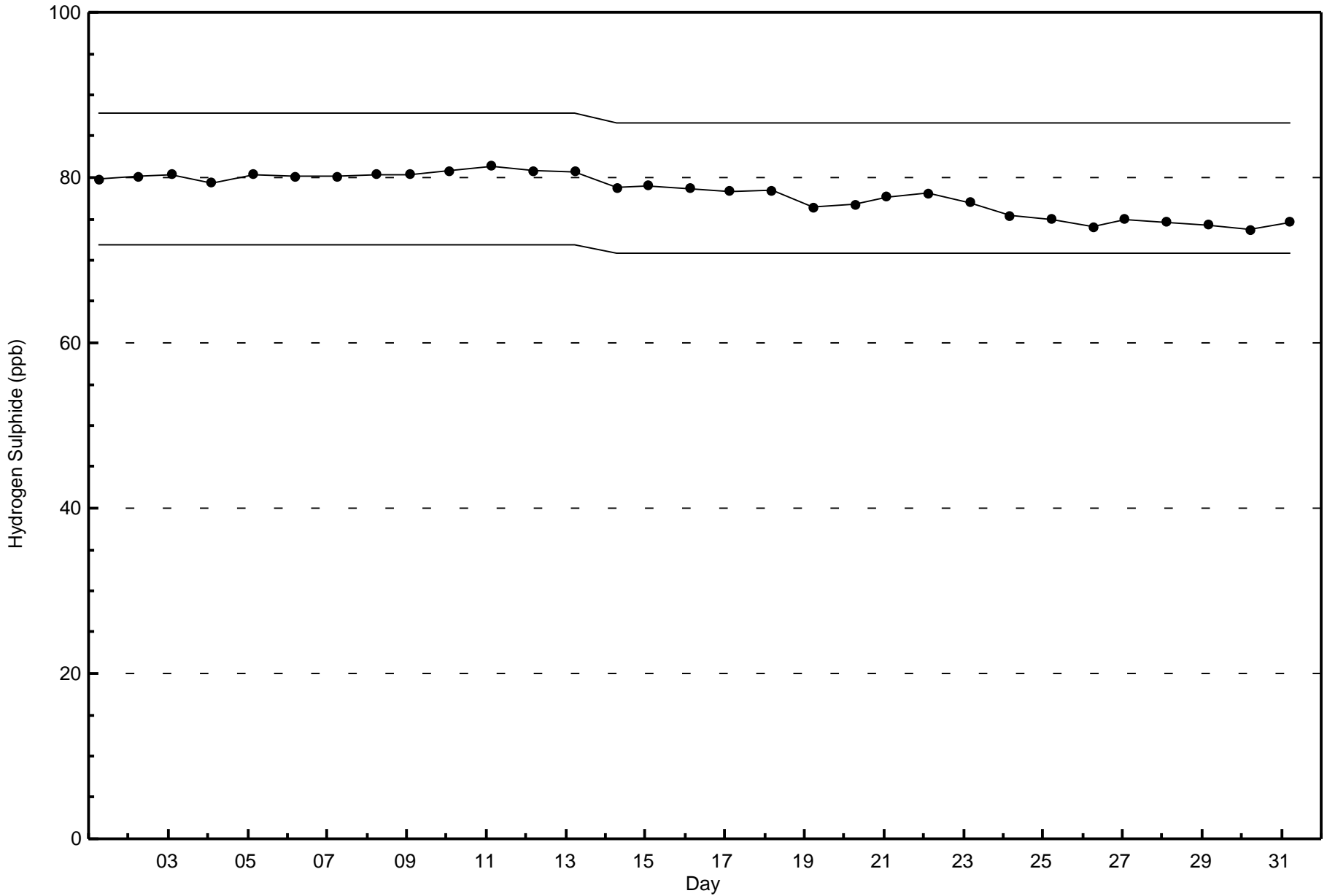
Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Surmont (AMS 24)



Total Number of Valid Hours: 668







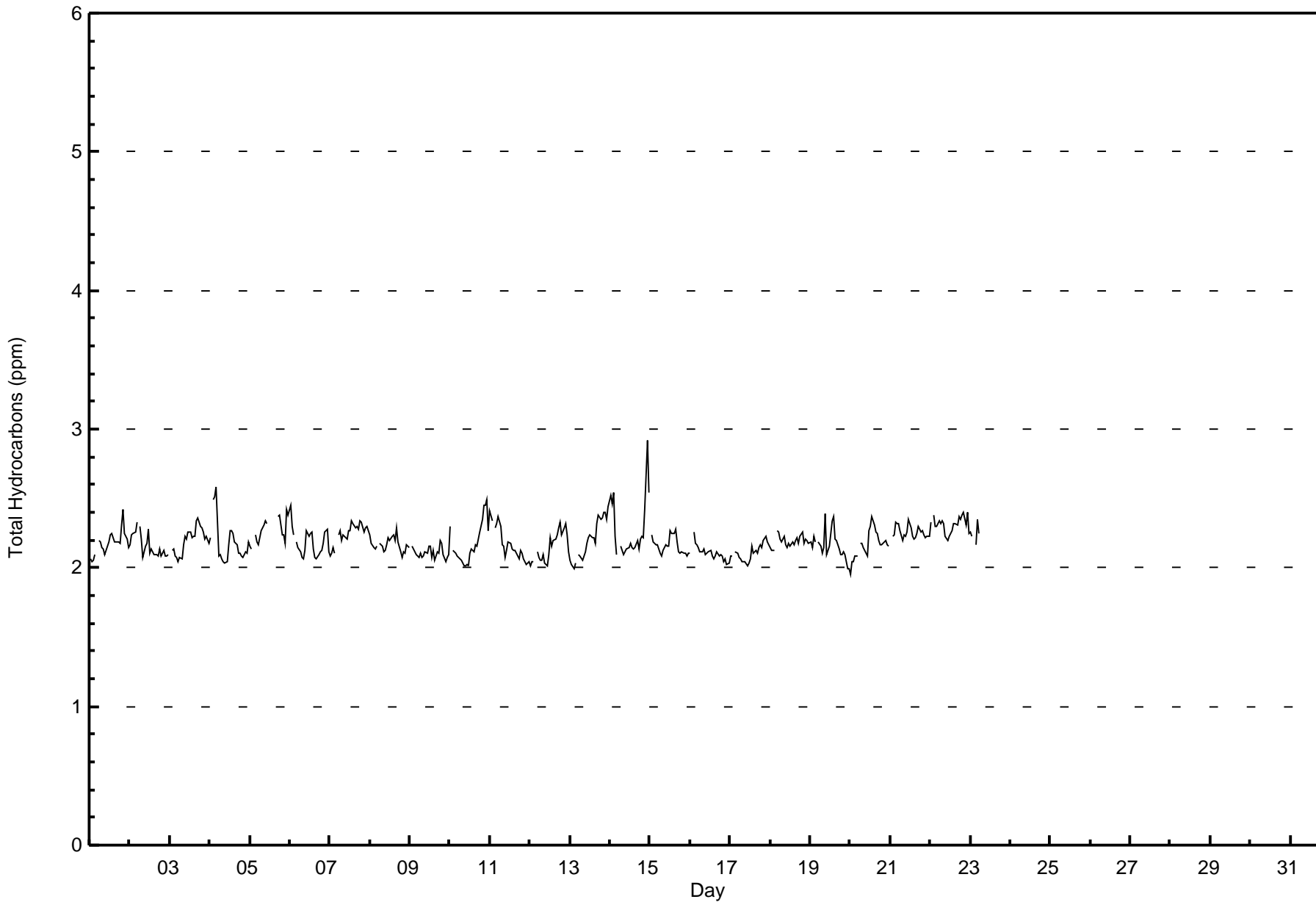


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 3 ppm on Dec 14 23:00										Maximum Daily Average: 2.3 ppm on Dec 22										Hours of Data: 505						
Minimum Value: 2 ppm on Dec 20 01:00										Minimum Daily Average: 2.1 ppm on Dec 16										Hours of Missing Data: 239						
Maximum Diurnal Average: 2.2 ppm at hour 23										Minimum Diurnal Average: 2.1 ppm at hour 8										Hours of Calibration: 29						
Monthly Average: 2.2 ppm										Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 2 P <sub>99</sub> = 3										Percent Operational Time: 71.8						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	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-Dec	2	2	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2
3-Dec	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
4-Dec	2	Z	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	3
5-Dec	2	2	Z	2	2	2	2	2	2	2	C	C	C	C	C	C	2	2	2	2	2	2	2	--	2	
6-Dec	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	
7-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2	
8-Dec	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	
9-Dec	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	
10-Dec	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	
11-Dec	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2	
12-Dec	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2	
13-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2	
14-Dec	3	2	3	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2.3	3	
15-Dec	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	
16-Dec	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2	
17-Dec	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2	
18-Dec	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	
19-Dec	2	2	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	2	
20-Dec	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	
21-Dec	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	
22-Dec	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2	
23-Dec	2	2	Z	2	2	2	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	2	
24-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
25-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
26-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
27-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
28-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
29-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
30-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
31-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
																								Diurnal Average		
																								Diurnal Maximum		
																								3 3		
Z - zerspan C - Calibration UO - Unstable Operation																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Surmont - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Surmont - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	34	6.73	6.73
2.1 - 3.0	471	93.27	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 505

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Surmont - December 2017**

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	4	11	19	0	0	34
2.1 - 3.0	9	18	0	1	0	0	1	1	6	18	18	27	67	115	124	66	471
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
<b>Totals</b>	9	18	0	1	0	0	1	1	6	18	18	31	78	134	124	66	505

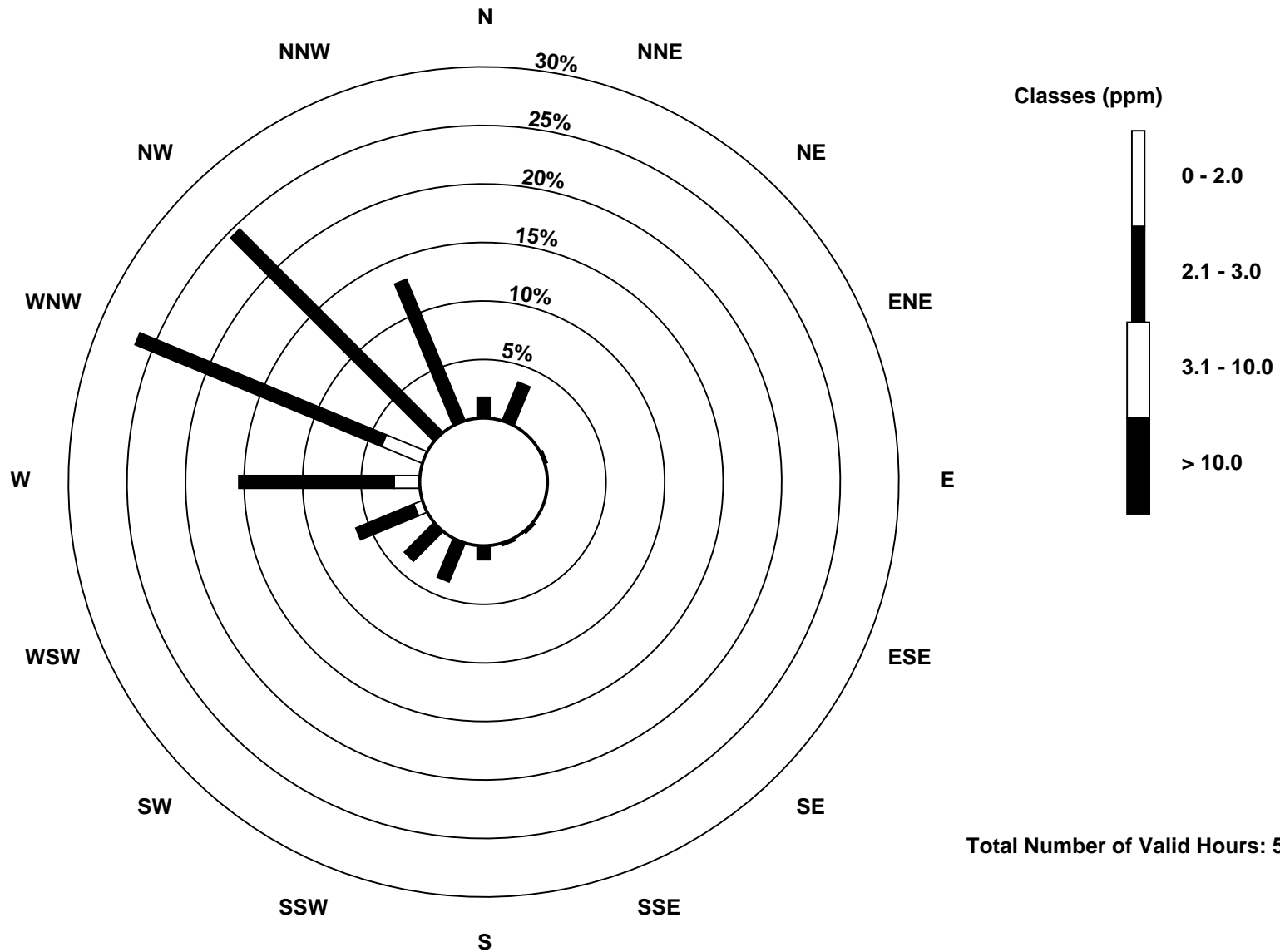
Total Number of Valid Hours: 505

Total Number of Hours: 744

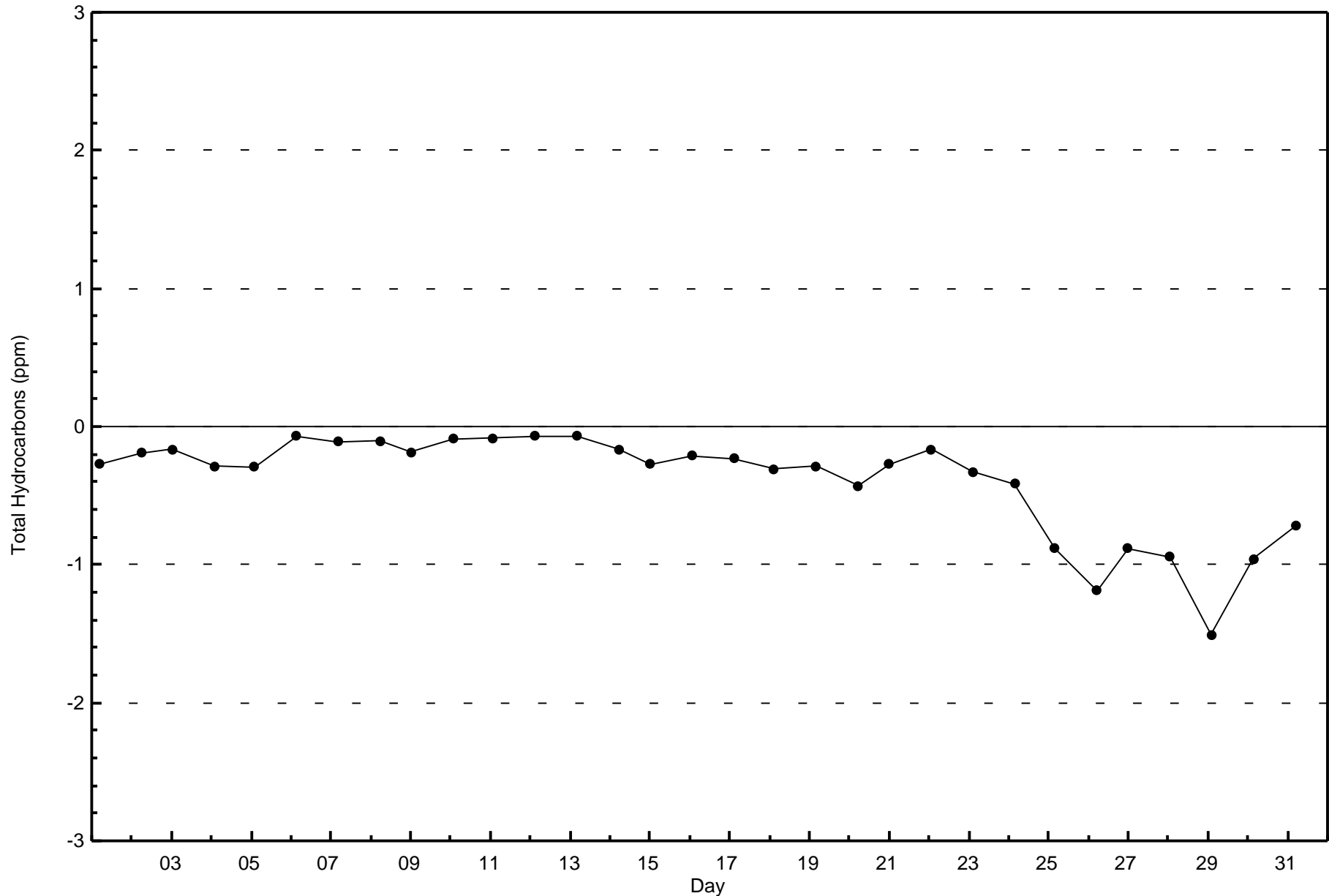


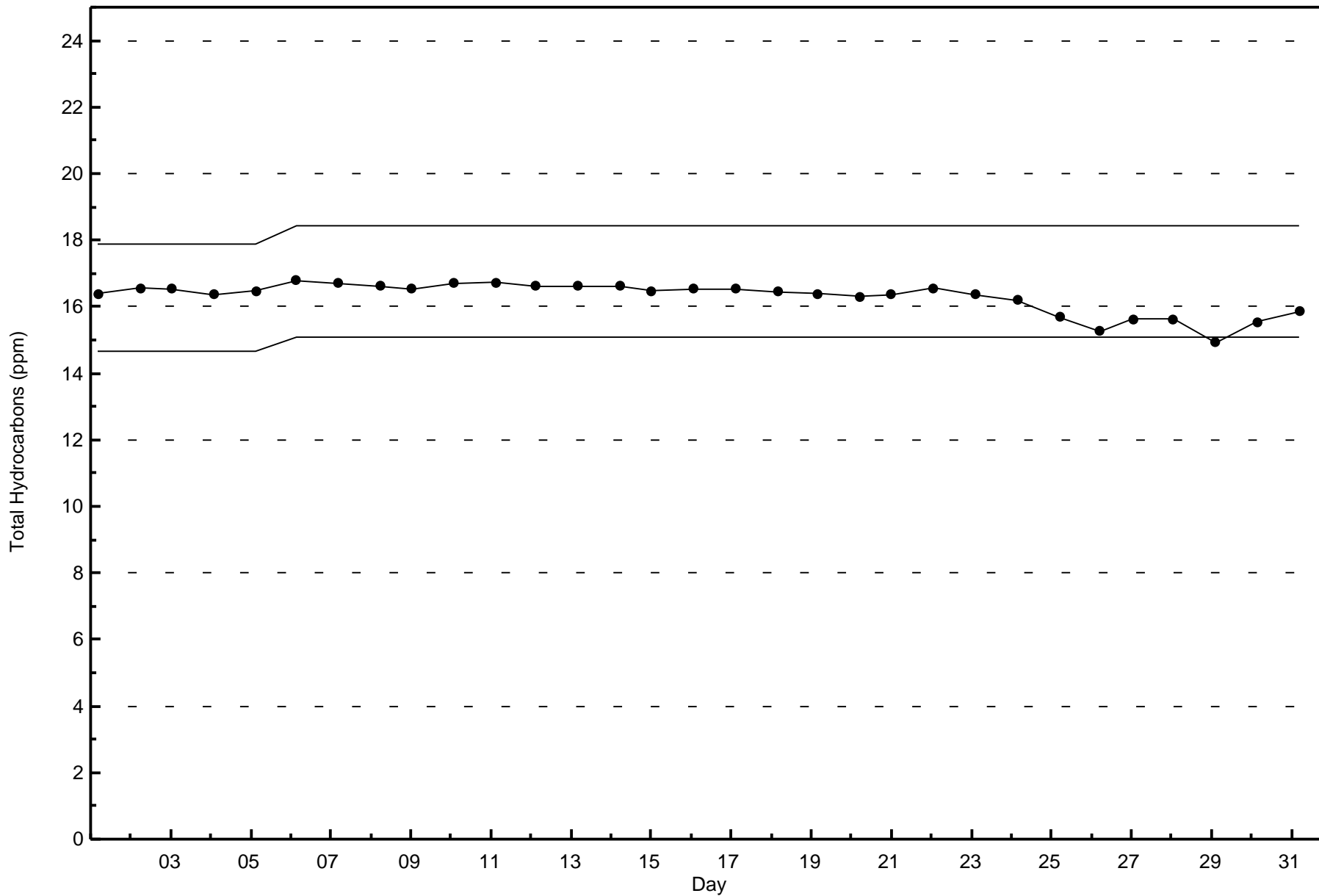
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Surmont (AMS 24)



Total Number of Valid Hours: 505









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

Surmont - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 17 ppb on Dec 24 11:00	Maximum Daily Average: 6.8 ppb on Dec 24		Hours of Data:	707
Minimum Value: 0 ppb on Dec 30 08:00	Minimum Daily Average: 0.1 ppb on Dec 31		Hours of Missing Data:	37
Maximum Diurnal Average: 2.1 ppb at hour 11	Minimum Diurnal Average: 0.3 ppb at hour 24		Hours of Calibration:	37
Monthly Average: 1.1 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 8		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	0	0	0	Z	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
2-Dec	0	1	2	1	0	Z	1	2	2	2	4	2	0	1	0	0	1	1	0	0	0	0	0	0	0.9	4
3-Dec	Z	0	0	0	0	0	0	0	4	2	1	1	1	1	1	1	2	3	2	5	2	1	1	1	1.3	5
4-Dec	1	Z	2	2	1	3	1	0	0	2	1	1	4	1	0	0	0	0	0	0	0	0	0	0	0.9	4
5-Dec	0	0	Z	1	0	0	3	2	1	1	1	C	C	C	C	C	C	3	2	2	3	2	2	0	--	3
6-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	Z	1	4	4	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1.0	4
8-Dec	1	0	0	0	0	Z	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
9-Dec	Z	0	0	0	1	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
10-Dec	1	Z	0	0	0	0	0	0	1	0	0	0	0	1	2	1	0	1	1	0	0	1	0	0	0.5	2
11-Dec	0	0	Z	0	0	0	2	6	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.6	6
12-Dec	0	0	0	Z	1	1	2	0	2	1	1	2	2	1	0	0	0	1	1	0	1	1	0	0	0.8	2
13-Dec	0	0	0	0	Z	0	0	0	0	0	1	0	1	1	3	15	4	1	1	0	0	0	0	0	1.2	15
14-Dec	0	0	1	1	1	Z	0	0	5	2	0	0	1	0	2	1	0	0	1	0	0	0	0	0	0.8	5
15-Dec	Z	0	0	0	0	0	0	0	2	2	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0.4	2
16-Dec	0	Z	0	0	2	8	2	3	2	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0.9	8
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0.3	1
18-Dec	0	0	1	Z	0	0	0	0	1	3	7	2	2	2	1	1	1	1	0	0	1	1	0	2	1.2	7
19-Dec	3	2	2	1	Z	2	2	1	4	3	1	1	1	1	4	1	2	1	0	1	1	0	0	0	1.5	4
20-Dec	1	0	0	0	1	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1
21-Dec	Z	0	1	1	0	0	0	4	2	2	2	1	1	2	1	1	0	0	1	1	1	1	0	0	0.9	4
22-Dec	0	Z	1	1	1	1	1	1	2	2	2	0	1	1	1	1	1	0	1	0	1	0	2	1	0.9	2
23-Dec	0	1	Z	1	0	1	0	0	0	1	1	3	4	1	4	1	1	1	3	1	1	2	1	1	1.3	4
24-Dec	5	10	10	Z	10	17	16	16	7	10	17	15	9	4	1	1	3	1	1	3	1	1	1	0	6.8	17
25-Dec	0	1	1	2	Z	2	3	3	2	2	2	2	1	1	1	3	0	1	1	0	0	0	0	0	1.2	3
26-Dec	3	0	2	3	5	Z	3	5	5	2	1	2	0	1	0	3	4	1	0	0	0	0	1	1	1.8	5
27-Dec	Z	1	1	1	1	0	3	9	2	3	4	0	2	1	0	1	2	3	1	0	0	1	0	0	1.5	9
28-Dec	0	Z	1	1	1	1	2	0	1	2	3	5	4	4	2	1	3	1	1	2	0	0	0	0	1.5	5
29-Dec	1	4	Z	1	1	1	1	3	11	8	8	6	4	1	3	1	4	2	1	1	1	0	1	0	2.8	11
30-Dec	1	0	2	Z	0	1	0	0	0	0	1	2	6	7	1	0	0	0	0	0	0	0	0	0	1.0	7
31-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

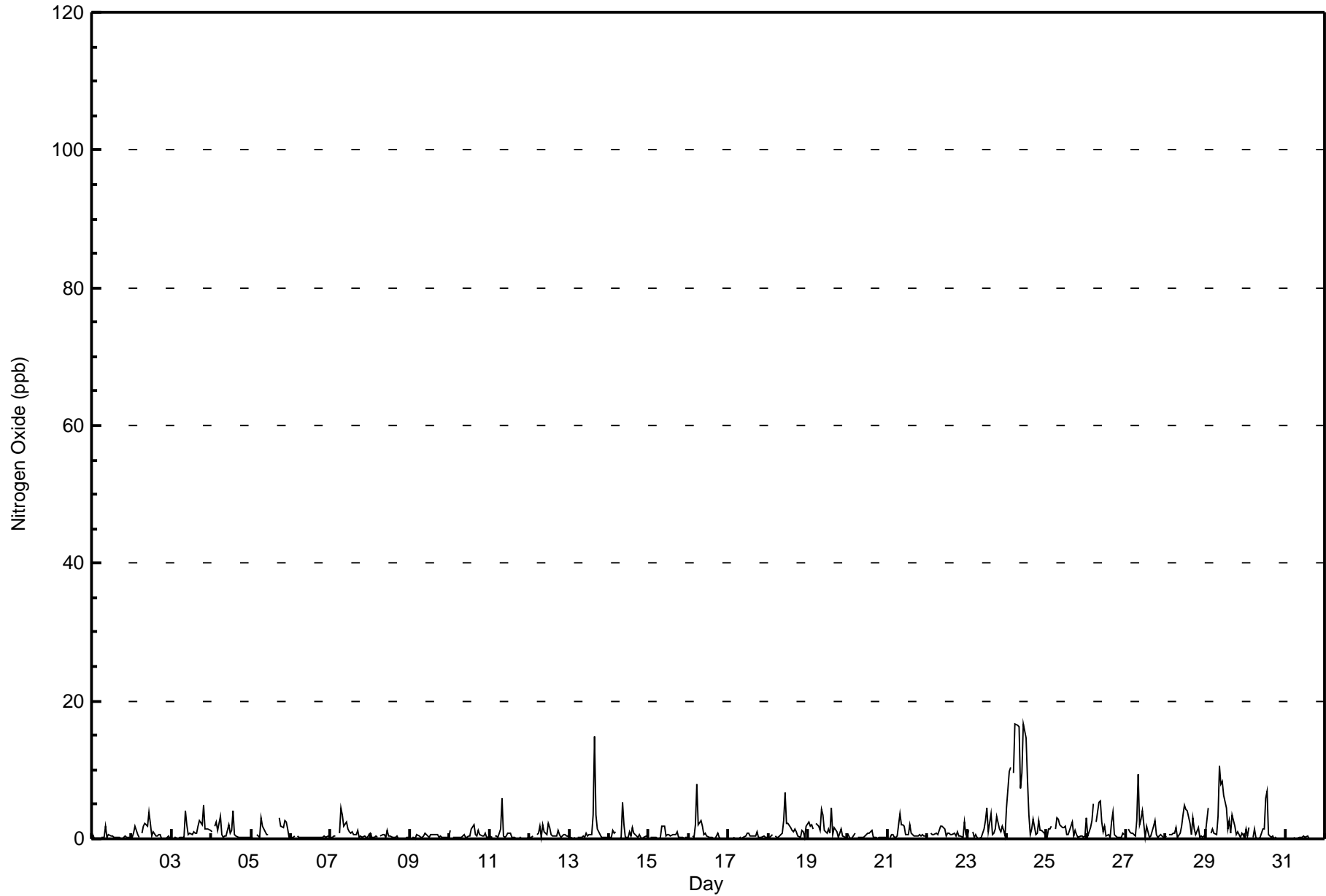
0.8	0.9	1.1	0.7	1.1	1.6	1.5	2.0	2.0	1.7	2.1	1.7	1.6	1.3	1.1	1.1	1.1	0.9	0.5	0.6	0.5	0.5	0.5	0.3	Diurnal Average	
5	10	10	3	10	17	16	16	11	10	17	15	9	7	4	15	4	3	3	5	3	2	2	2	Diurnal Maximum	

Z - zerospan      C - Calibration



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxide (NO) - ppb**  
**Surmont - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Surmont - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Surmont - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707

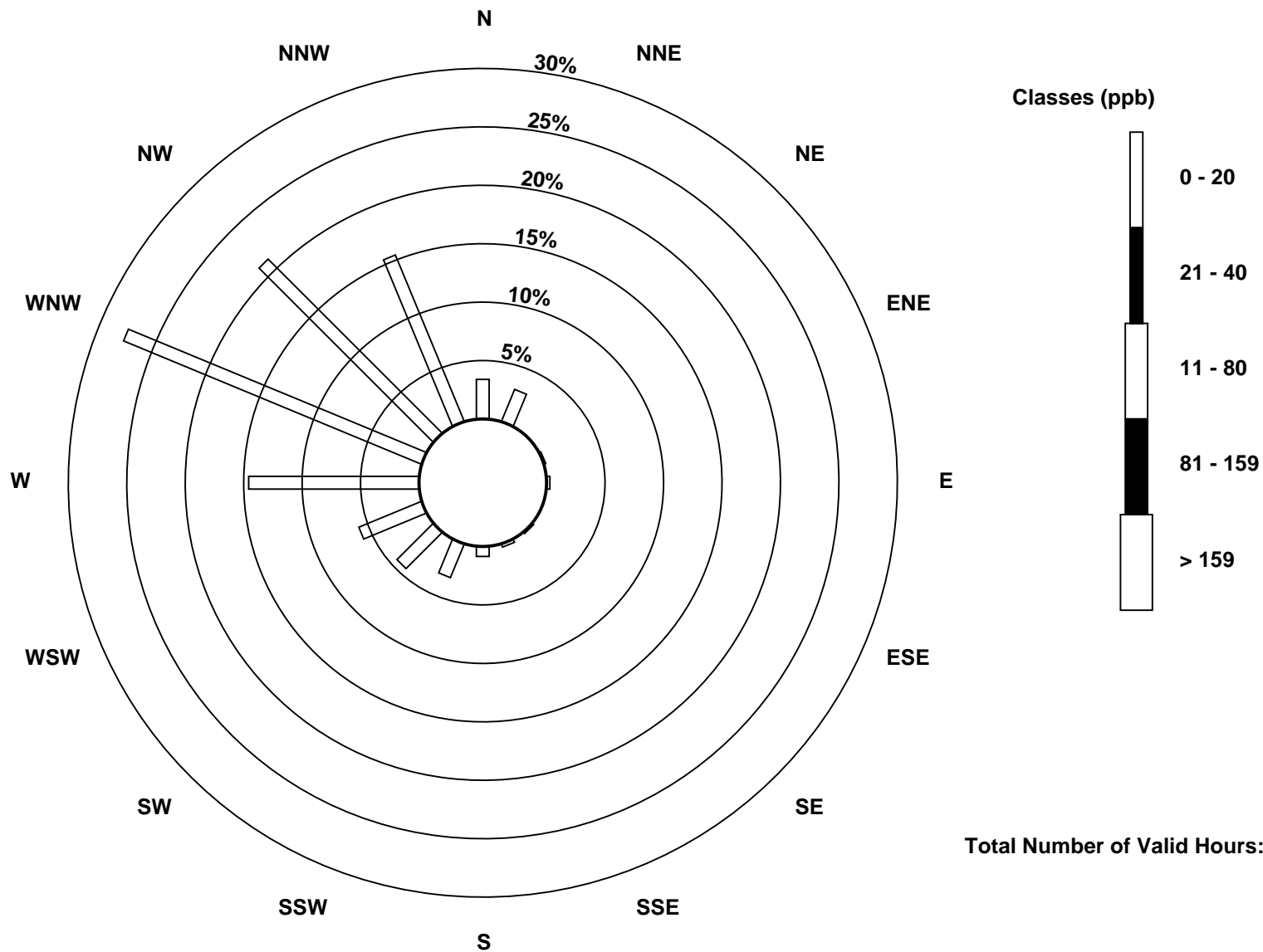
Total Number of Valid Hours: 707

Total Number of Hours: 744

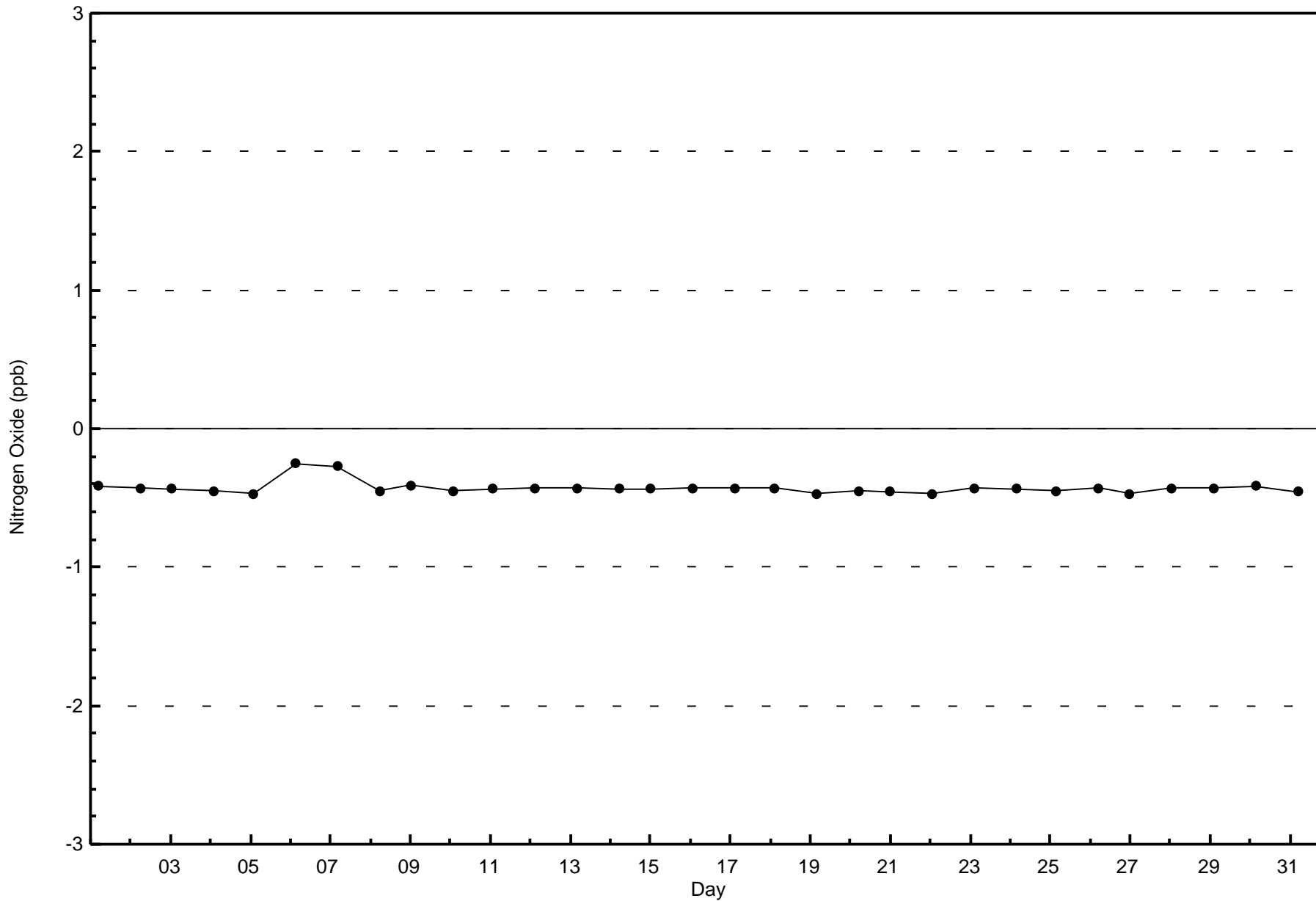


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxide (NO) - ppb  
Surmont (AMS 24)



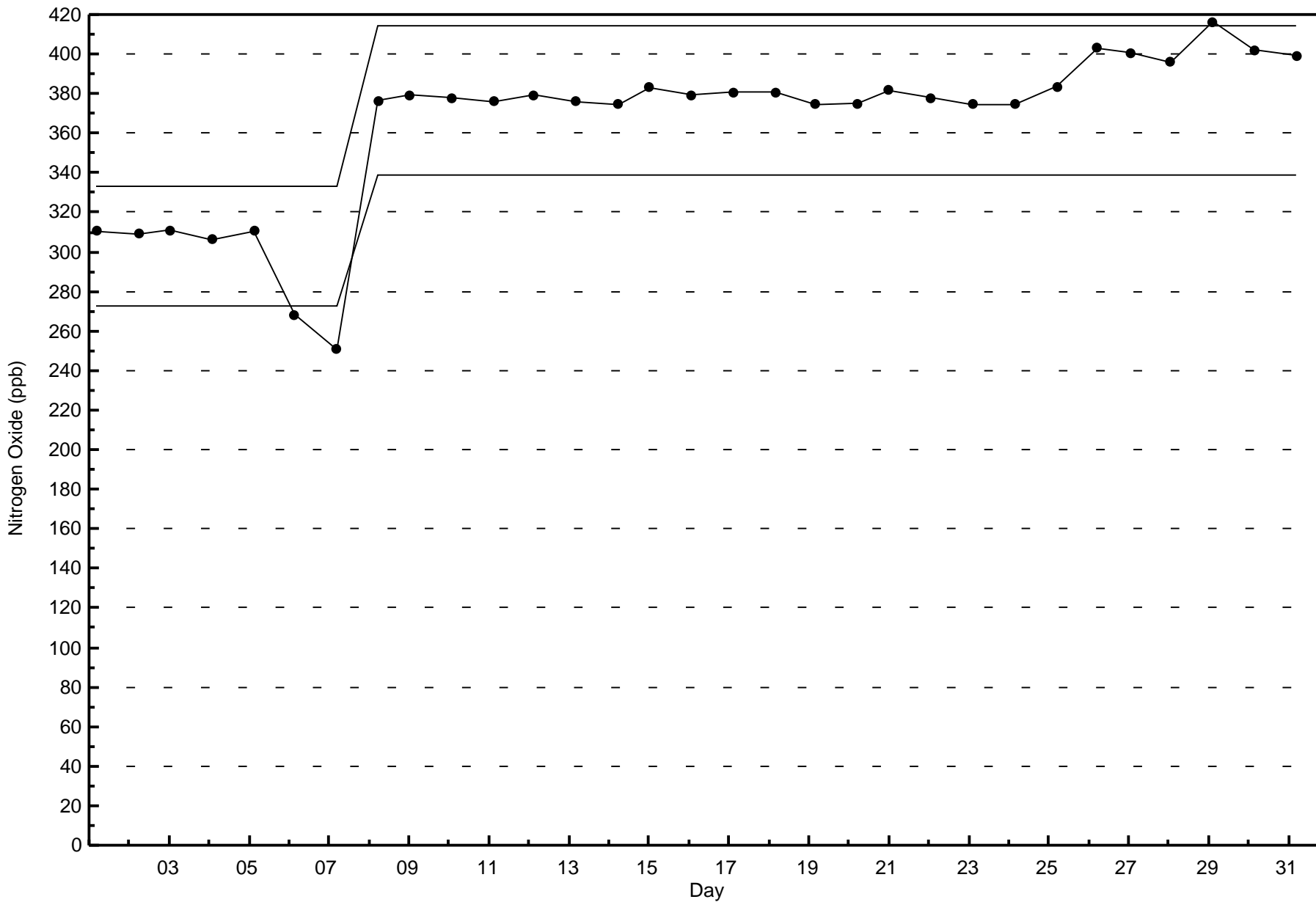
Total Number of Valid Hours: 707





Wood Buffalo Environmental Association  
Span Responses

Nitrogen Oxide (NO) - ppb  
Surmont - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Surmont - December 2017

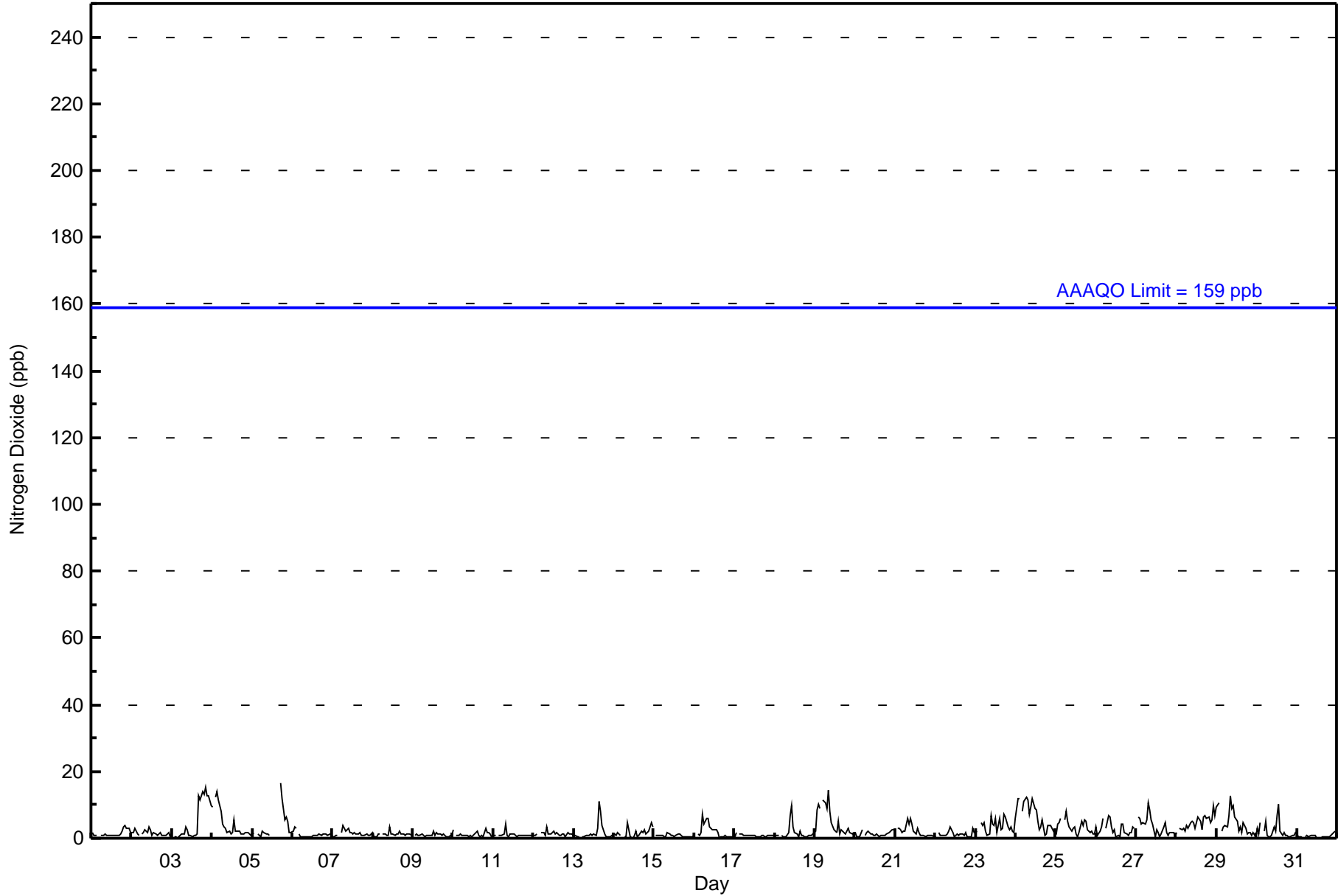
Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 17 ppb on Dec 5 18:00										Maximum Daily Average: 6.6 ppb on Dec 24										Hours of Data: 707						
Minimum Value: 0 ppb on Dec 3 04:00										Minimum Daily Average: 0.7 ppb on Dec 31										Hours of Missing Data: 37						
Maximum Diurnal Average: 3.4 ppb at hour 9										Minimum Diurnal Average: 1.7 ppb at hour 15										Hours of Calibration: 37						
Monthly Average: 2.4 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 O <sub>3</sub> = 3 P <sub>90</sub> = 6 P <sub>99</sub> = 12										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	3	3	2	1.4	4
2-Dec	2	2	3	1	1	Z	1	2	3	2	3	3	1	2	1	1	1	2	1	1	1	1	2	0	1.5	3
3-Dec	Z	0	0	0	1	1	1	1	3	2	1	1	1	1	1	1	13	12	14	13	15	13	13	10	5.1	15
4-Dec	10	Z	12	14	12	8	4	3	3	2	2	1	2	6	2	2	2	1	1	1	2	2	1	1	4.1	14
5-Dec	2	1	Z	1	1	1	2	2	1	1	1	C	C	C	C	C	C	17	12	5	7	5	2	2	--	17
6-Dec	2	3	3	Z	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	3
7-Dec	1	1	1	1	Z	2	4	3	2	3	2	2	1	2	1	1	2	1	1	1	1	1	1	1	1.5	4
8-Dec	2	1	1	1	1	Z	1	1	1	1	3	1	1	1	1	1	2	1	1	1	1	1	1	1	1.2	3
9-Dec	Z	1	1	1	1	1	1	0	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	0.9	2
10-Dec	3	Z	1	1	1	1	1	1	1	0	1	1	1	1	2	1	1	1	1	3	2	2	1	0	1.1	3
11-Dec	1	1	Z	1	1	1	1	4	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	4
12-Dec	1	1	1	Z	2	2	2	1	3	1	1	2	2	1	2	1	1	1	1	0	2	1	1	1	1.3	3
13-Dec	1	1	0	0	Z	0	1	1	1	1	1	1	1	3	11	8	4	1	0	1	0	1	1	1	1.7	11
14-Dec	1	1	2	1	1	Z	0	1	5	3	0	0	1	2	0	1	2	2	3	1	2	2	5	4	1.7	5
15-Dec	Z	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0.8	2
16-Dec	1	Z	1	1	2	7	4	6	6	3	3	3	3	3	2	0	1	0	1	1	0	1	1	0	2.0	7
17-Dec	1	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	2
18-Dec	1	1	1	Z	1	1	1	1	2	7	10	3	2	1	1	2	1	1	1	0	1	1	1	1	1.7	10
19-Dec	2	8	10	9	Z	11	11	9	15	8	5	3	2	2	5	1	3	2	1	2	3	2	1	2	5.1	15
20-Dec	2	1	1	1	3	Z	1	2	2	1	1	1	1	1	0	1	1	1	1	1	2	2	3	3	1.3	3
21-Dec	Z	3	3	3	2	2	2	6	4	6	4	2	1	3	2	1	1	1	1	1	1	1	1	1	2.2	6
22-Dec	1	Z	2	1	1	1	1	1	2	3	2	1	1	1	1	1	1	1	2	1	1	1	3	2	1.2	3
23-Dec	2	2	Z	5	4	5	2	1	1	7	4	4	6	2	6	2	3	7	7	3	3	3	2	2	3.5	7
24-Dec	6	12	12	Z	8	11	12	11	7	9	12	9	8	5	3	4	5	1	1	4	4	4	2	1	6.6	12
25-Dec	1	4	5	6	Z	6	8	5	4	2	3	3	1	0	2	5	4	5	5	3	2	2	1	1	3.4	8
26-Dec	3	1	2	4	6	Z	3	7	6	4	2	2	1	1	0	4	4	2	1	1	2	2	4	3	2.8	7
27-Dec	Z	6	6	4	5	4	6	11	9	5	4	1	2	2	1	1	4	5	2	1	2	2	2	1	3.6	11
28-Dec	2	Z	3	3	3	2	4	3	5	5	5	3	5	6	5	2	7	7	6	6	5	6	10	7	4.7	10
29-Dec	9	11	Z	2	3	4	3	7	13	9	10	6	5	2	3	2	5	3	1	2	2	1	2	0	4.5	13
30-Dec	3	1	5	Z	2	5	1	0	1	1	3	2	7	10	2	1	2	1	1	1	1	1	1	2	2.3	10
31-Dec	1	1	0	0	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	2	2	0.7	2
2.2 2.5 3.0 2.4 2.5 3.0 2.6 2.9 3.4 3.0 2.9 2.0 2.1 2.0 1.7 1.8 2.6 2.7 2.3 2.0 2.1 2.0 2.2 1.7																								Diurnal Average		
10 12 12 14 12 11 12 11 15 9 12 9 8 10 6 11 13 17 14 13 15 13 13 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 (NO<sub>2</sub>) - ppb**  
**Surmont - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Surmont - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Surmont - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707

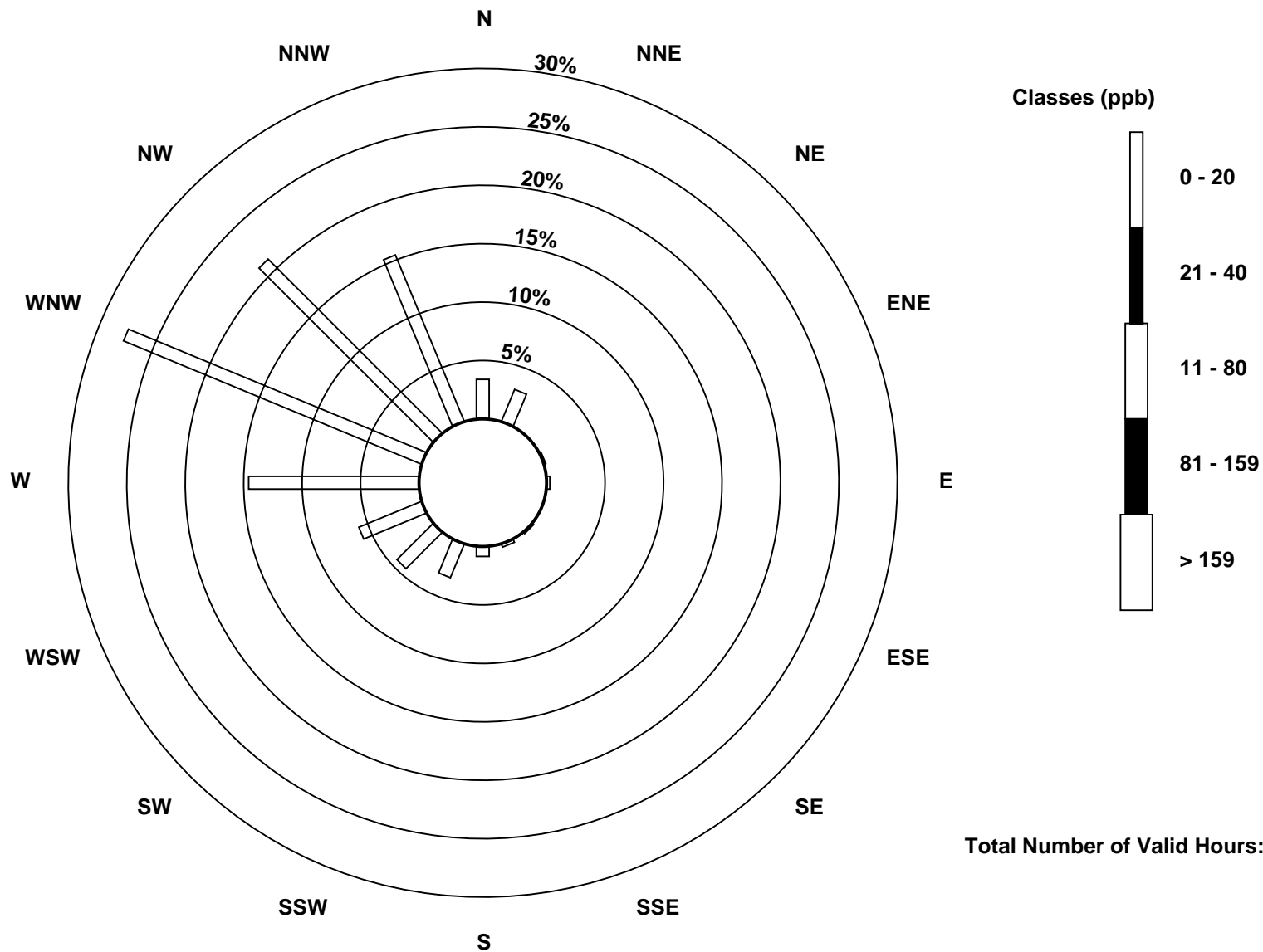
Total Number of Valid Hours: 707

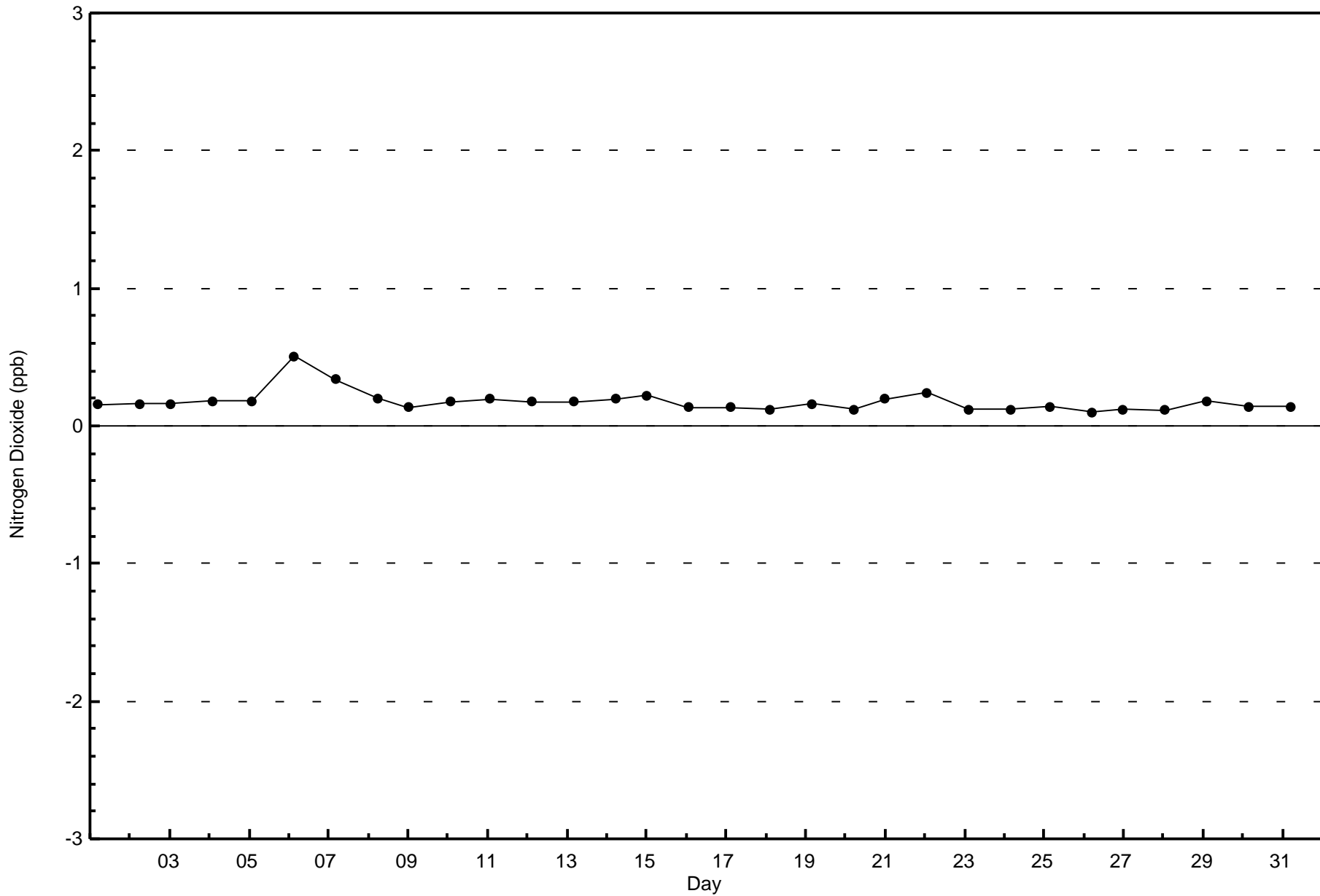
Total Number of Hours: 744

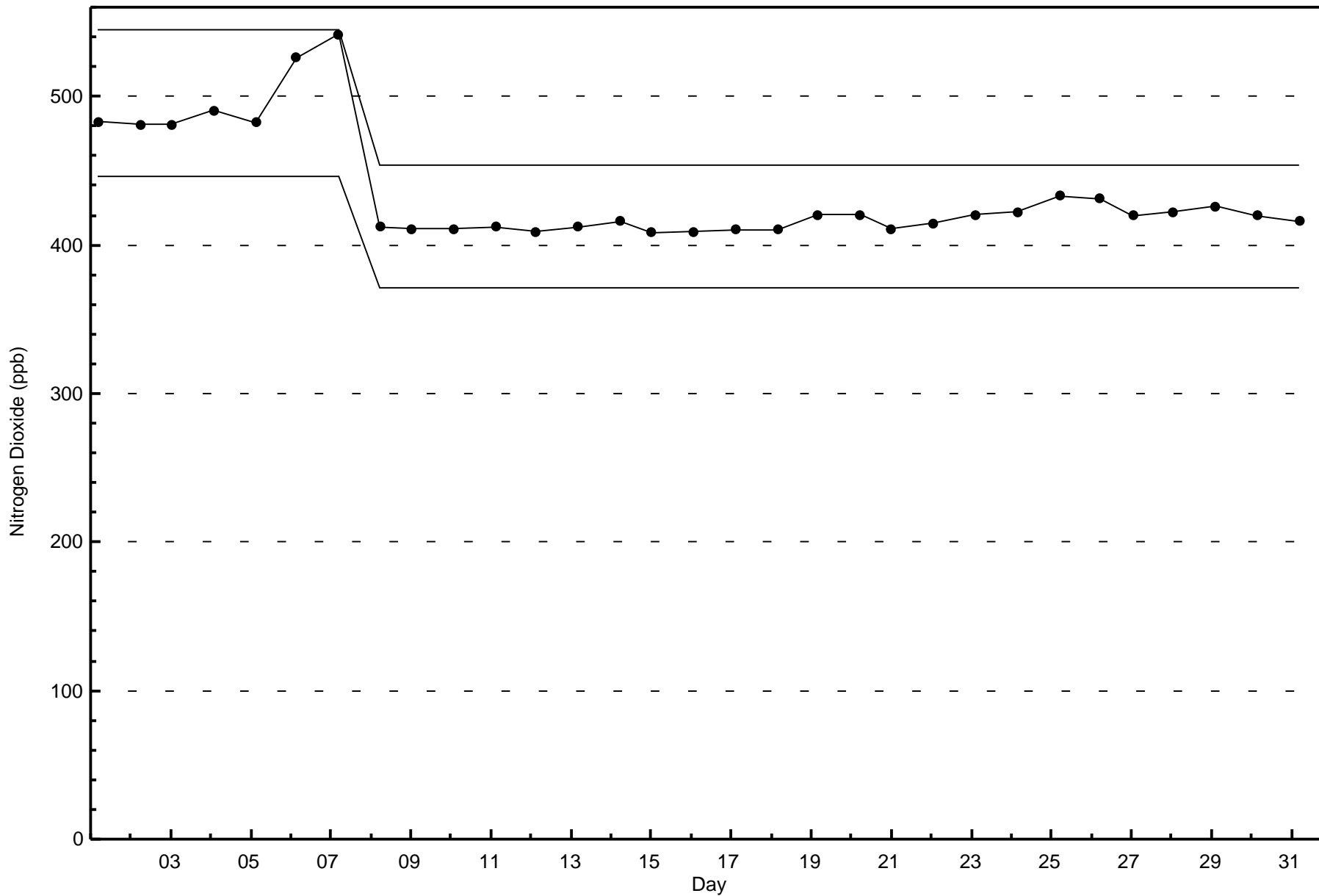


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Surmont (AMS 24)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

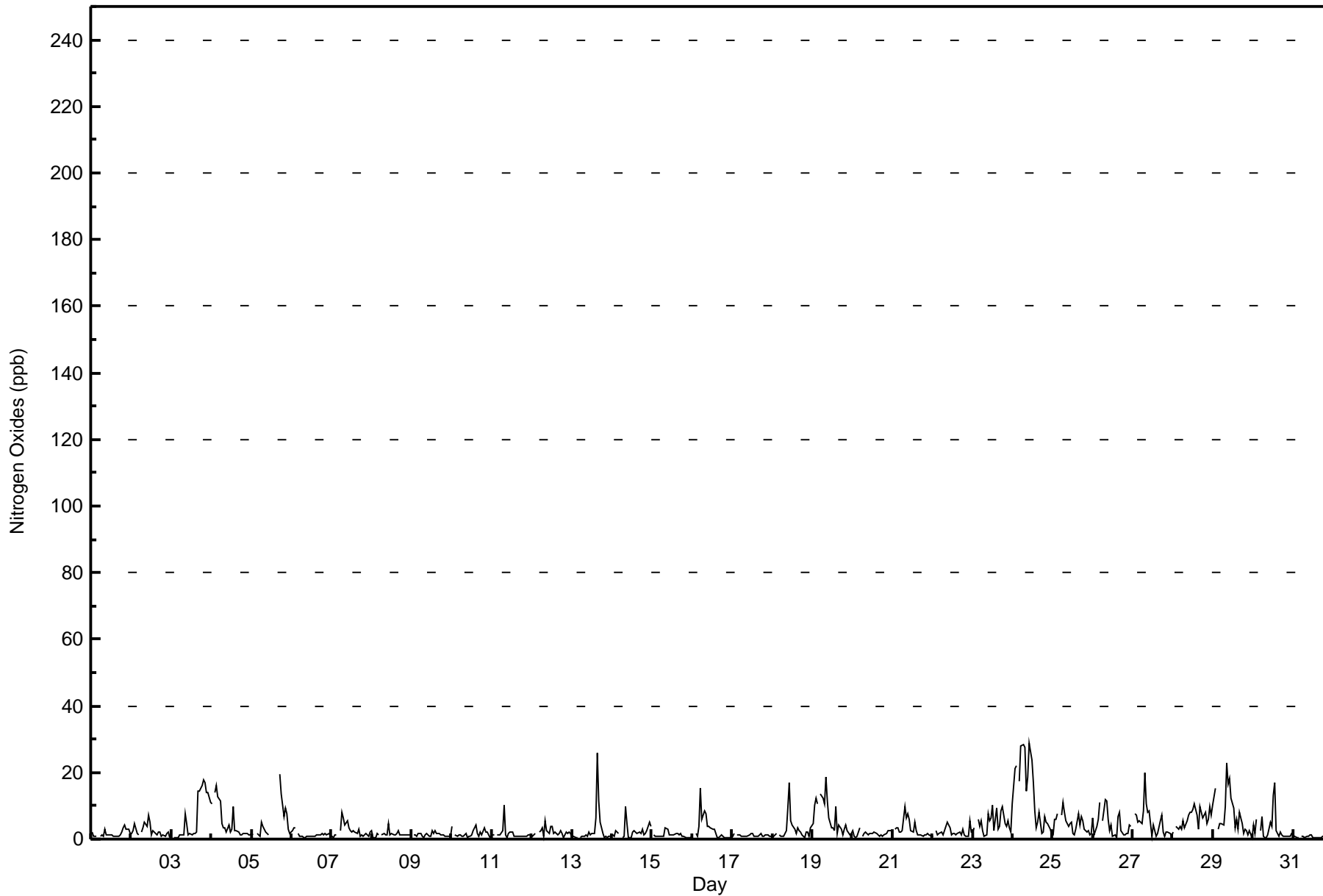
Surmont - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 29 ppb on Dec 24 11:00										Maximum Daily Average: 13.4 ppb on Dec 24										Hours of Data: 707						
Minimum Value: 0 ppb on Dec 16 16:00										Minimum Daily Average: 0.8 ppb on Dec 31										Hours of Missing Data: 37						
Maximum Diurnal Average: 5.4 ppb at hour 9										Minimum Diurnal Average: 2.0 ppb at hour 24										Hours of Calibration: 37						
Monthly Average: 3.5 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 8 P <sub>99</sub> = 23										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	1	1	1	Z	1	1	1	3	1	1	1	1	1	1	1	1	1	2	4	4	3	3	2	1.6	4
2-Dec	2	3	5	2	1	Z	2	3	5	4	7	5	1	3	2	1	2	2	1	1	1	2	2	1	2.4	7
3-Dec	Z	1	0	0	1	1	1	1	7	5	1	2	1	2	2	2	14	14	16	18	17	14	14	11	6.4	18
4-Dec	10	Z	14	16	13	11	5	3	2	4	2	3	10	3	3	2	1	1	2	2	2	1	1	1	5.0	16
5-Dec	2	1	Z	2	1	1	5	4	2	2	1	C	C	C	C	C	C	20	14	7	9	8	3	2	--	20
6-Dec	2	4	4	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	1.3	4
7-Dec	1	1	1	1	Z	3	8	7	4	5	3	3	2	2	2	3	1	1	1	2	1	1	2	1	2.5	8
8-Dec	3	1	1	2	1	Z	1	2	1	1	5	1	2	1	1	1	3	1	1	1	1	1	1	1	1.5	5
9-Dec	Z	1	1	1	2	1	1	1	1	2	1	1	3	2	2	2	2	2	1	1	1	1	1	1	1.3	3
10-Dec	4	Z	1	1	1	1	1	1	2	1	1	1	3	4	1	1	2	1	4	2	2	1	1	1	1.7	4
11-Dec	1	1	Z	1	1	1	3	10	1	0	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1.6	10
12-Dec	1	1	2	Z	2	2	3	1	5	2	2	4	4	2	2	1	2	3	2	1	2	2	2	2	2.1	5
13-Dec	1	1	0	1	Z	1	1	1	1	1	2	1	2	2	6	26	12	5	2	1	1	1	1	1	3.0	26
14-Dec	1	1	3	2	2	Z	0	1	10	5	1	1	2	3	2	2	2	2	3	1	2	3	5	4	2.4	10
15-Dec	Z	1	1	1	1	1	1	1	4	3	1	1	1	1	2	2	1	2	1	1	1	0	1	1	1.2	4
16-Dec	1	Z	2	1	4	15	6	8	8	4	4	3	3	3	2	0	1	1	1	1	1	1	1	0	3.0	15
17-Dec	1	2	Z	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1.1	2
18-Dec	1	1	2	Z	1	1	1	1	2	9	17	6	4	3	2	3	2	2	1	1	2	2	1	3	2.9	17
19-Dec	5	10	12	10	Z	13	12	10	19	11	6	3	3	3	10	2	4	3	1	3	4	2	1	2	6.6	19
20-Dec	2	1	1	1	3	Z	1	2	2	1	2	2	2	2	2	1	1	1	1	1	2	2	3	3	1.6	3
21-Dec	Z	3	3	3	2	2	2	10	6	8	6	3	2	5	2	1	1	1	1	1	1	2	1	1	3.0	10
22-Dec	1	Z	2	1	2	2	1	2	4	5	3	1	2	2	1	2	2	1	3	1	1	1	5	2	2.1	5
23-Dec	2	3	Z	6	4	5	3	1	1	7	6	6	10	3	9	3	4	8	10	5	4	5	3	2	4.8	10
24-Dec	10	21	22	Z	17	28	28	28	14	19	29	24	17	9	3	5	8	2	2	7	5	5	3	1	13.4	29
25-Dec	1	6	6	8	Z	7	11	8	6	4	5	5	2	1	3	8	4	7	6	3	2	2	1	2	4.6	11
26-Dec	6	1	4	6	11	Z	5	12	12	6	3	4	1	1	1	7	8	3	1	1	2	2	4	4	4.5	12
27-Dec	Z	8	7	5	5	5	8	20	11	8	8	1	4	3	1	2	5	7	2	1	2	2	2	1	5.1	20
28-Dec	2	Z	4	3	4	3	6	3	6	7	8	8	9	11	7	3	10	8	7	8	5	6	10	7	6.2	11
29-Dec	10	15	Z	3	5	5	4	10	23	17	18	12	9	4	6	3	8	5	2	3	3	1	3	0	7.3	23
30-Dec	4	2	6	Z	2	7	1	1	1	1	5	4	13	17	3	1	2	1	1	1	1	1	1	2	3.3	17
31-Dec	1	1	0	0	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	2	2	0.8	2
3.0 3.5 4.0 3.1 3.6 4.6 4.1 5.0 5.4 4.7 5.0 3.7 3.7 3.3 2.8 2.9 3.7 3.6 2.9 2.6 2.6 2.5 2.6 2.0																								Diurnal Average		
10 21 22 16 17 28 28 28 23 19 29 24 17 17 10 26 14 20 16 18 17 14 14 11																								Diurnal Maximum		
Z - zerospan C - Calibration																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Surmont - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Surmont - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	698	98.73	98.73
21 - 40	9	1.27	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Surmont - December 2017**

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	21	0	1	2	0	1	2	6	22	31	41	103	195	148	106	698
21 - 40	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	9
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	24	21	0	1	2	0	1	2	6	22	31	41	103	195	149	109	707

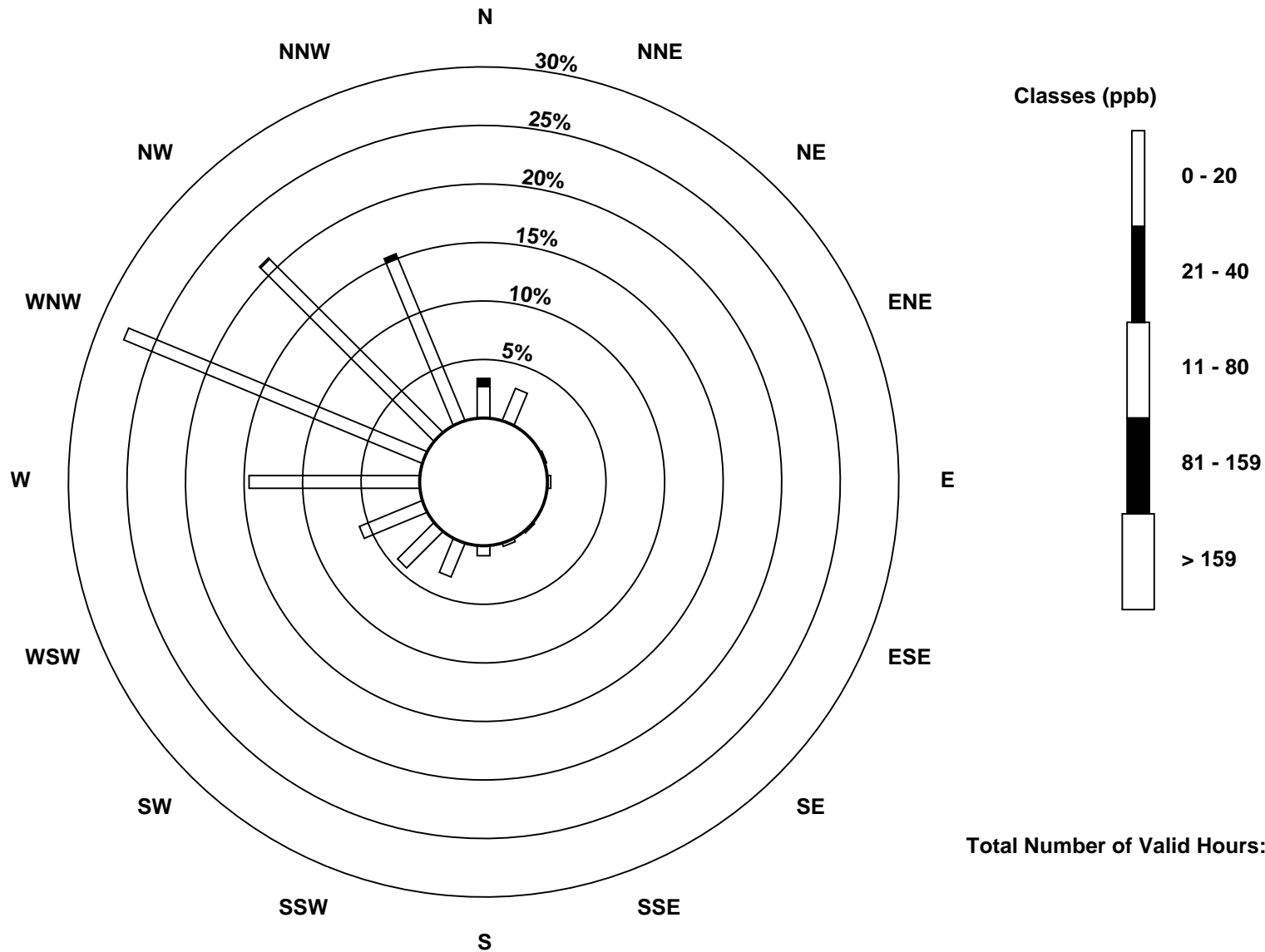
Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

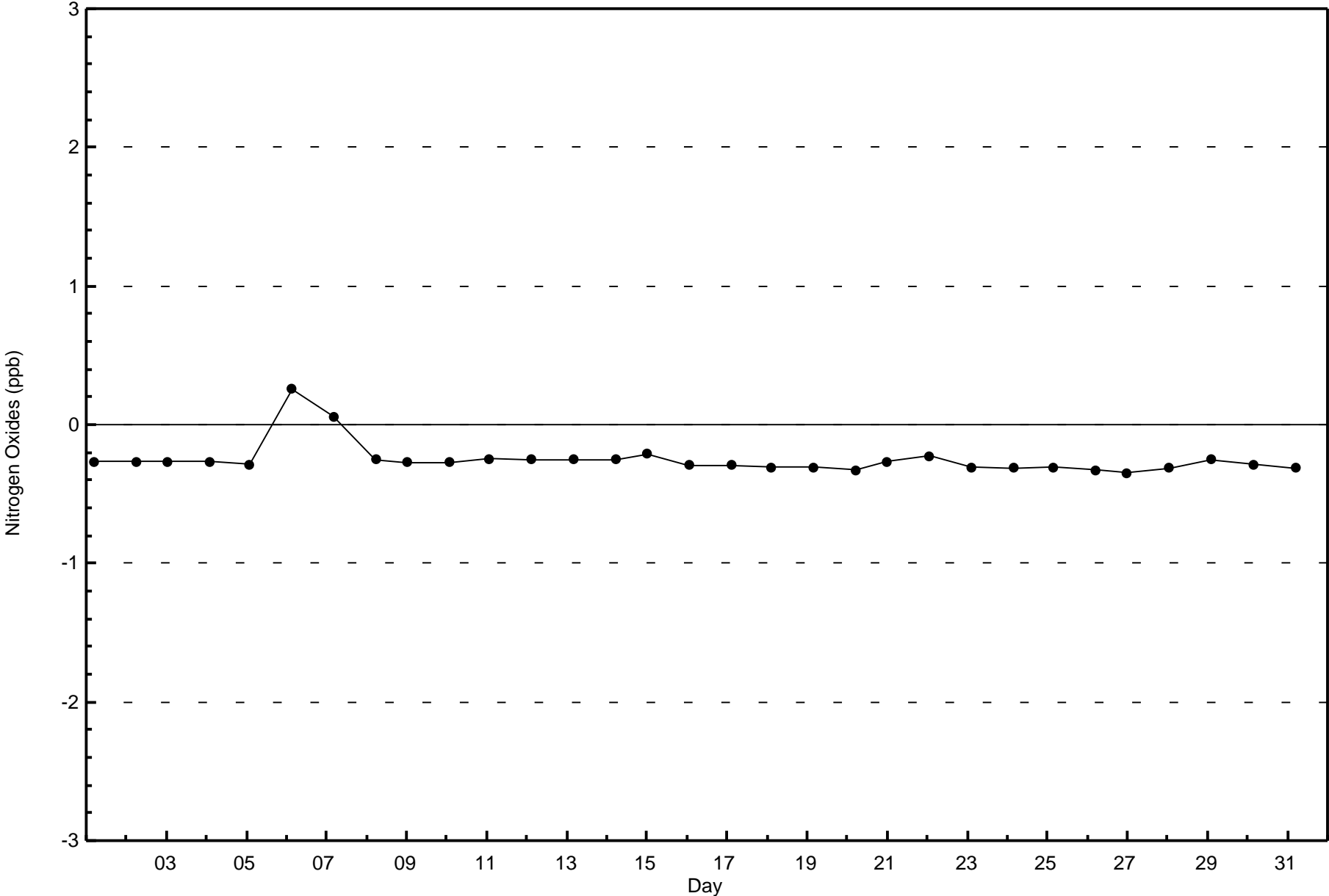
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Surmont (AMS 24)





Wood Buffalo Environmental Association  
Zero Responses

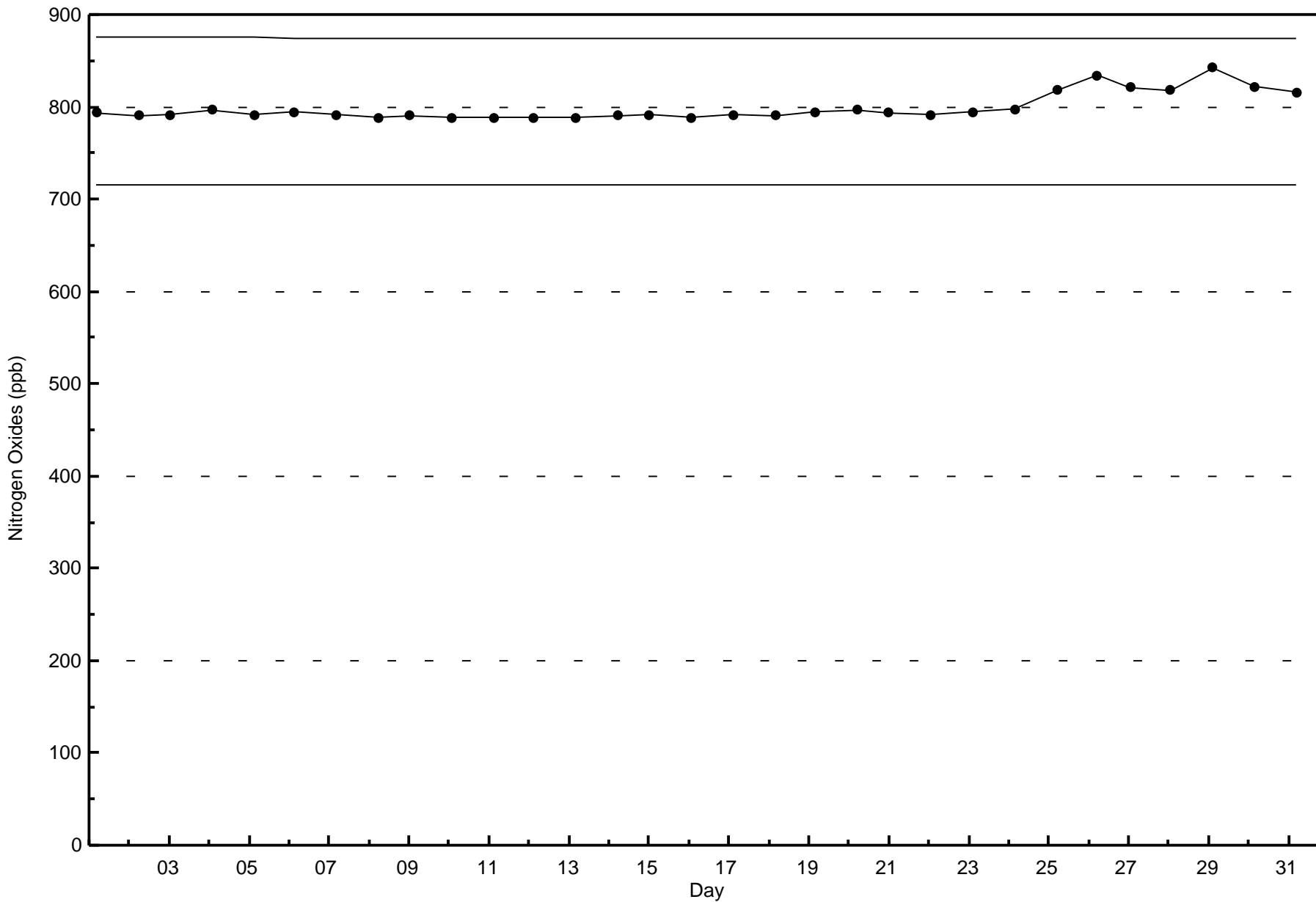
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Surmont - December 2017





Wood Buffalo Environmental Association  
Span Responses

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Surmont - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) - µg/m<sup>3</sup>

Surmont - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 20 µg/m <sup>3</sup> on Dec 14 21:00	Maximum Daily Average: 8.1 µg/m <sup>3</sup> on Dec 9		Hours of Data:	742
Minimum Value: 0 µg/m <sup>3</sup> on Dec 20 12:00	Minimum Daily Average: 1.3 µg/m <sup>3</sup> on Dec 22		Hours of Missing Data:	2
Maximum Diurnal Average: 4.3 µg/m <sup>3</sup> at hour 21	Minimum Diurnal Average: 3.1 µg/m <sup>3</sup> at hour 13		Hours of Calibration:	2
Monthly Average: 3.9 µg/m <sup>3</sup>	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 5 P <sub>90</sub> = 8 P <sub>99</sub> = 15		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2	2	3	3	2	3	3	3	3	2	2	2	2	2	2	2	2	3	4	5	5	5	5	4	3.0	5	
2-Dec	4	5	5	4	4	4	4	4	4	5	4	5	4	6	6	6	5	4	4	4	3	3	3	2	4.2	6	
3-Dec	2	2	1	1	4	6	6	6	7	8	7	6	5	4	4	4	5	5	6	8	10	6	6	9	5.3	10	
4-Dec	7	9	9	10	7	5	4	3	3	3	2	2	2	3	2	2	2	2	2	3	2	2	2	2	3.7	10	
5-Dec	3	4	3	3	3	2	2	2	2	2	1	1	1	1	2	4	6	6	5	3	3	3	3	3	2.9	6	
6-Dec	4	3	3	4	2	2	1	1	1	3	5	4	3	4	4	4	4	4	4	4	4	4	4	3	3.3	5	
7-Dec	3	3	4	4	4	6	6	5	4	4	3	2	1	3	3	3	4	4	4	4	4	4	4	3	3.7	6	
8-Dec	3	3	3	3	4	4	5	5	5	5	5	4	4	5	5	6	6	5	4	4	4	4	4	4	4.4	6	
9-Dec	5	5	6	6	5	4	4	5	5	5	5	6	5	9	16	17	15	12	12	12	10	9	9	8	8.1	17	
10-Dec	9	8	9	10	10	10	10	9	7	6	6	6	5	3	1	1	0	1	0	2	1	1	1	2	4.9	10	
11-Dec	3	2	2	1	1	1	1	1	2	2	2	2	1	1	2	3	4	4	4	5	5	5	5	5	2.8	5	
12-Dec	5	5	5	6	6	6	6	6	7	6	7	8	9	9	9	9	10	9	8	8	8	8	10	10	7.5	10	
13-Dec	15	8	6	6	7	8	10	10	8	7	7	6	5	C	C	9	12	10	6	5	4	3	2	2	7.0	15	
14-Dec	4	5	4	3	2	2	2	2	2	3	4	3	3	4	4	4	14	8	16	17	20	11	6	7	6.1	20	
15-Dec	7	8	7	8	8	7	6	4	4	3	3	2	2	3	4	5	2	2	3	1	1	1	1	1	3.9	8	
16-Dec	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	1.6	3	
17-Dec	2	3	4	4	4	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.9	4	
18-Dec	1	2	2	2	2	2	3	2	1	4	3	2	1	1	1	1	1	1	1	3	3	2	1	1	1.7	4	
19-Dec	1	2	3	3	2	3	3	3	4	6	3	2	1	2	3	3	3	3	3	1	1	2	1	2	3	2.6	6
20-Dec	3	4	3	3	4	6	9	16	19	12	6	0	0	0	4	9	6	6	5	7	10	13	12	11	7.0	19	
21-Dec	11	11	11	11	10	10	10	10	10	10	9	8	6	5	3	3	2	2	2	1	2	1	1	1	6.3	11	
22-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	2	2	1	1	1.3	2	
23-Dec	2	2	3	3	3	3	3	2	2	3	3	5	3	3	3	4	4	6	4	4	3	2	2	3	3.3	6	
24-Dec	4	4	4	3	3	4	4	5	4	5	6	4	5	5	4	3	2	1	3	0	5	2	2	4	3.6	6	
25-Dec	4	4	4	4	2	2	3	3	2	2	2	4	4	5	5	4	5	5	4	2	3	1	1	3	3.1	5	
26-Dec	3	3	3	3	3	2	2	2	2	2	1	1	1	1	1	1	2	2	3	3	3	3	3	3	2.2	3	
27-Dec	3	4	5	4	4	4	3	3	3	2	2	2	2	2	2	2	2	3	3	3	3	3	2	2	2.8	5	
28-Dec	3	3	3	4	5	4	4	4	5	3	3	3	5	6	4	3	2	4	5	6	4	6	4	4	4.1	6	
29-Dec	6	6	4	4	5	6	5	8	4	3	3	4	3	3	2	2	2	2	2	2	2	2	2	2	3.4	8	
30-Dec	2	2	2	2	2	2	2	2	2	2	4	5	5	4	3	3	3	2	2	2	2	2	2	2	2.6	5	
31-Dec	3	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	2	3	4	1.8	4

4.1	4.2	4.1	4.0	3.9	4.1	4.2	4.3	4.2	4.0	3.7	3.4	3.1	3.2	3.5	4.0	4.2	4.0	4.0	4.1	4.3	3.6	3.4	3.6	Diurnal Average
15	11	11	11	10	10	10	16	19	12	9	8	9	9	16	17	15	12	16	17	20	13	12	11	Diurnal Maximum

C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m<sup>3</sup>

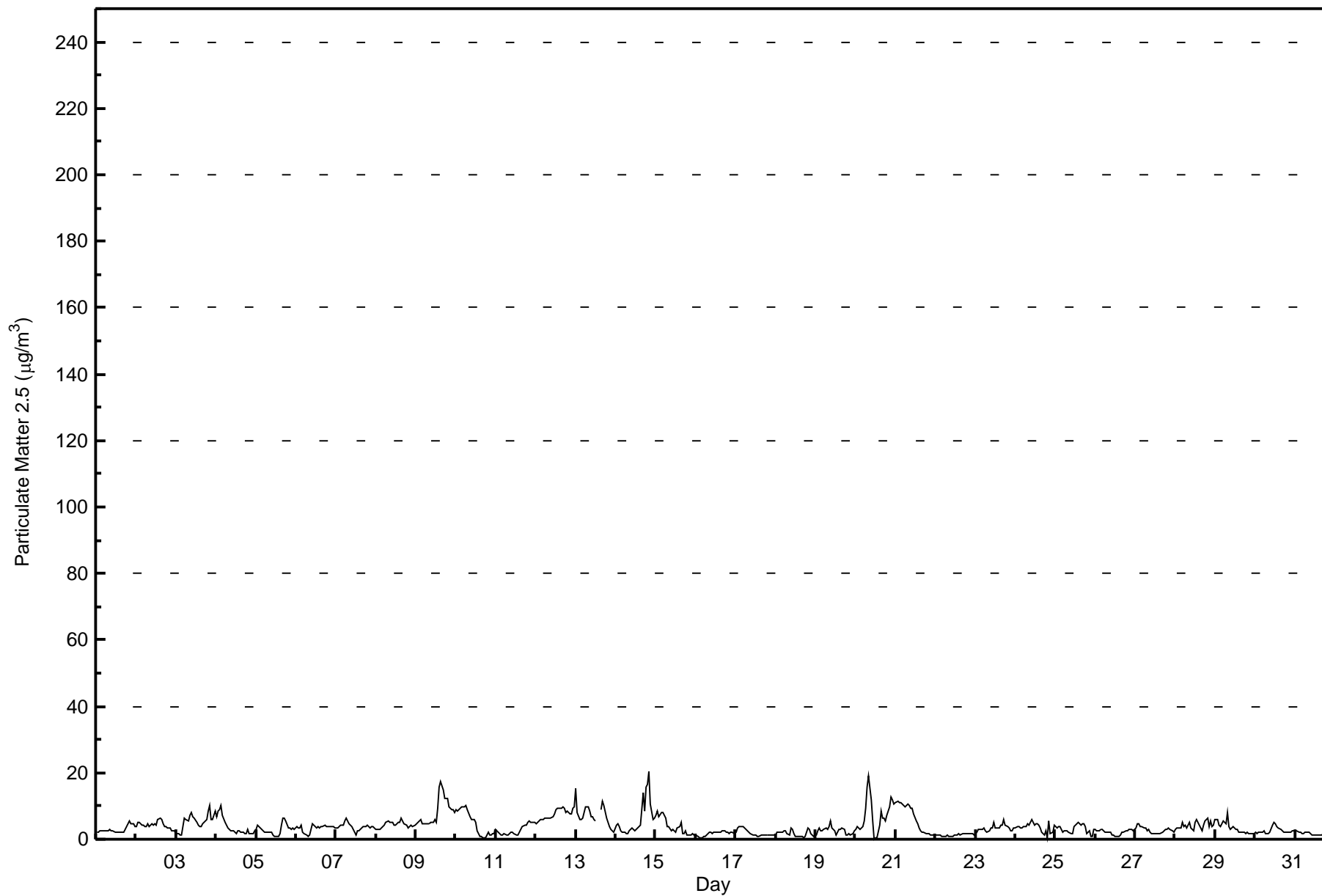


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Surmont - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Surmont - December 2017**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	566	76.28	76.28
6 - 15	135	18.19	94.47
16 - 25	7	0.94	95.42
26 - 80	0	0.00	95.42
> 81.0	0	0.00	95.42

Total Number of Valid Hours: 742

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Surmont - December 2017**

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	26	15	0	1	2	0	1	2	5	14	31	36	91	151	116	75	566
6 - 15	2	7	0	0	0	0	0	0	0	7	1	4	15	47	29	23	135
16 - 25	0	0	0	0	0	0	0	0	1	2	0	0	0	4	0	0	7
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	28	22	0	1	2	0	1	2	6	23	32	40	106	202	145	98	708

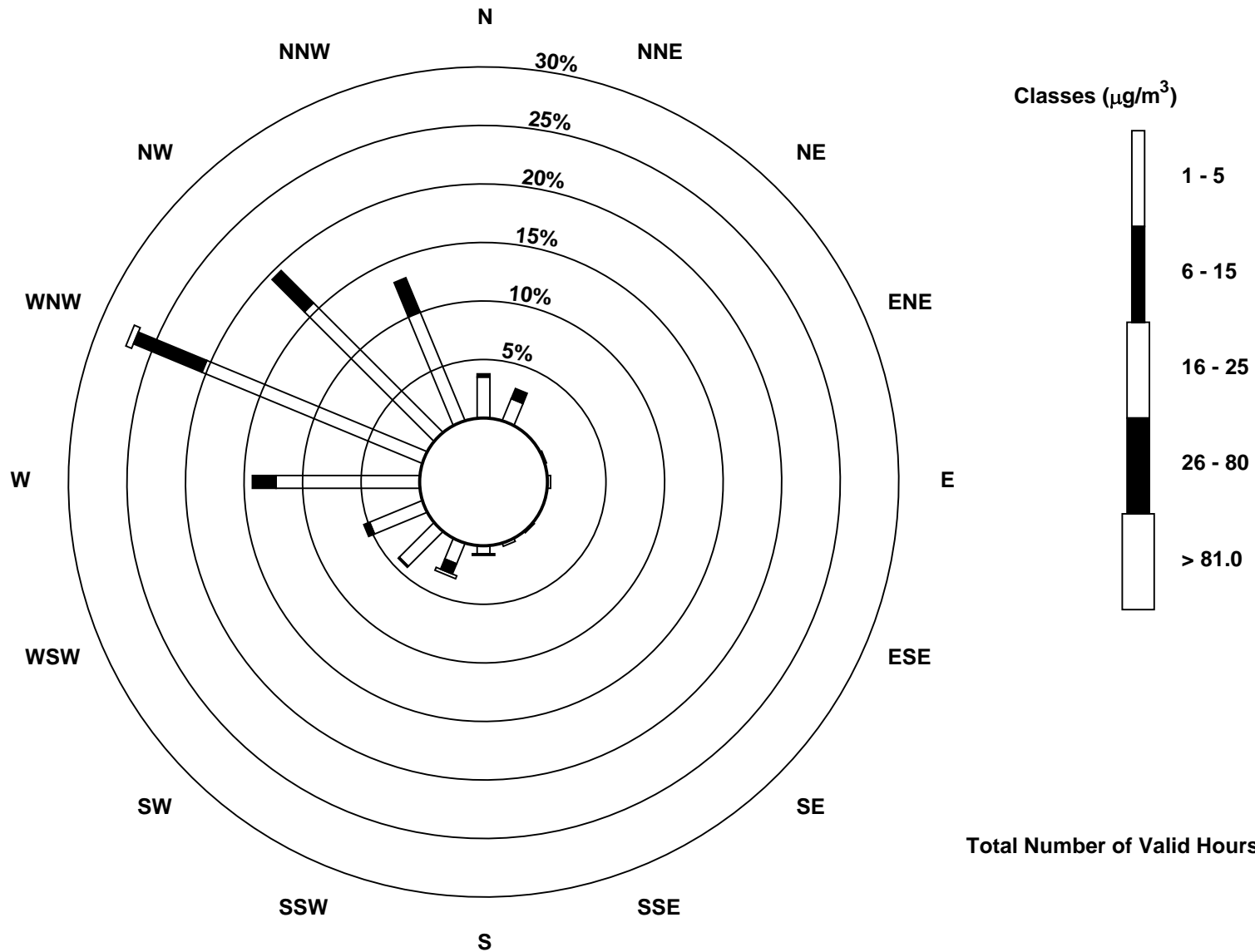
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Surmont (AMS 24)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

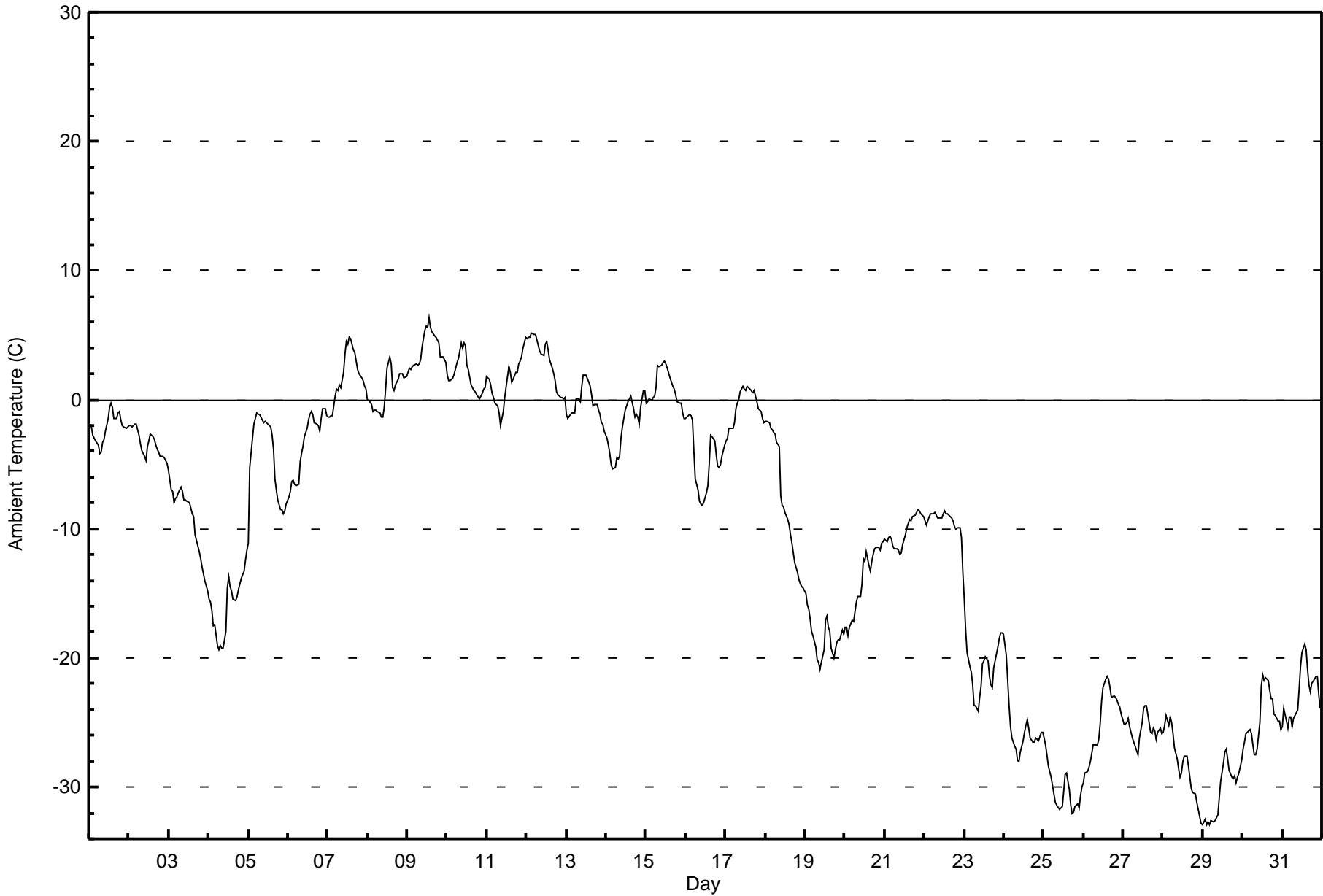
**Surmont - December 2017**

Maximum Value: 6.3 C on Dec 9 14:00		Maximum Daily Average: 3.9 C on Dec 9		Hours in Service: 744																																												
Minimum Value: -32.9 C on Dec 29 05:00		Minimum Daily Average: -30.4 C on Dec 29		Hours of Data: 744																																												
Maximum Diurnal Average: -9.0 C at hour 14		Minimum Diurnal Average: -11.3 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -10.50 C		Percentiles: P <sub>1</sub> = -32.6 P <sub>10</sub> = -27.1 Q <sub>1</sub> = -21.6 Median = -7.9 Q <sub>3</sub> = -0.7 P <sub>90</sub> = 2.0 P <sub>99</sub> = 5.0		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-1.9	-2.1	-2.8	-3.0	-3.1	-3.5	-4.2	-4.1	-3.4	-3.1	-2.5	-1.5	-0.5	-0.2	-0.6	-1.5	-1.4	-1.0	-0.9	-1.6	-2.0	-2.1	-2.2	-2.1	-2.1	-0.2																						
2-Dec	-2.0	-2.0	-2.1	-1.9	-1.9	-2.3	-2.8	-3.4	-4.0	-4.3	-4.7	-3.6	-3.2	-2.7	-2.9	-3.1	-3.5	-3.8	-4.1	-4.4	-4.4	-4.5	-4.7	-5.0	-3.4	-1.9																						
3-Dec	-5.4	-6.9	-7.1	-8.0	-7.7	-7.6	-7.2	-6.8	-7.1	-7.7	-7.8	-7.9	-8.0	-8.4	-8.8	-9.0	-10.5	-10.8	-11.8	-12.3	-13.0	-13.5	-14.0	-14.9	-9.3	-5.4																						
4-Dec	-15.4	-15.7	-16.3	-17.5	-17.4	-19.0	-19.4	-19.0	-19.3	-19.3	-17.9	-14.6	-13.7	-14.5	-14.8	-15.4	-15.5	-15.2	-14.7	-14.2	-13.8	-13.3	-12.4	-11.7	-15.8	-11.7																						
5-Dec	-11.1	-5.2	-3.0	-1.9	-1.4	-1.1	-1.2	-1.2	-1.6	-1.7	-1.7	-1.7	-1.8	-2.1	-2.8	-3.9	-6.2	-7.0	-7.7	-8.5	-8.5	-8.8	-8.6	-8.0	-4.4	-1.1																						
6-Dec	-7.5	-7.0	-6.4	-6.2	-6.6	-6.7	-6.6	-4.8	-4.1	-3.7	-2.9	-2.2	-1.5	-1.1	-0.9	-1.1	-1.7	-1.8	-2.0	-2.4	-1.5	-0.7	-0.7	-1.2	-3.4	-0.7																						
7-Dec	-1.4	-1.3	-1.3	-1.2	0.3	0.8	0.7	1.2	1.0	2.1	3.5	4.5	4.2	4.8	4.7	3.9	3.6	3.0	2.4	2.0	1.6	1.4	1.0	0.8	1.8	4.8																						
8-Dec	-0.1	-0.1	-0.3	-1.0	-0.8	-0.9	-0.9	-1.1	-1.3	-1.4	-0.6	0.9	2.4	3.3	2.7	1.0	0.7	1.1	1.5	2.0	2.1	2.0	1.7	1.7	0.6	3.3																						
9-Dec	2.1	2.5	2.3	2.5	2.7	2.8	2.7	2.7	3.1	4.1	5.4	5.7	5.6	6.3	5.6	5.2	5.0	4.8	4.7	4.4	3.3	3.3	3.2	2.8	3.9	6.3																						
10-Dec	1.9	1.4	1.5	1.7	2.0	2.5	2.9	3.2	4.4	4.0	4.4	4.2	2.7	2.4	1.1	0.9	0.7	0.6	0.4	0.1	0.3	0.5	0.8	0.9	1.9	4.4																						
11-Dec	1.8	1.6	1.1	0.5	0.2	-0.2	-0.5	-1.0	-2.0	-1.5	-1.0	0.1	1.8	2.5	2.1	1.4	1.6	2.1	2.1	2.8	3.0	3.3	4.0	4.9	1.3	4.9																						
12-Dec	4.7	4.8	4.8	5.1	5.1	5.0	4.7	4.2	3.8	3.6	3.4	4.3	4.5	3.8	3.1	2.5	2.0	1.4	0.6	0.4	0.2	0.2	0.1	0.2	3.0	5.1																						
13-Dec	-1.2	-1.5	-1.1	-1.0	-1.0	-1.0	0.0	0.1	-0.1	1.0	1.9	1.9	1.9	1.4	1.1	0.4	-0.5	-0.4	-0.4	-0.8	-1.1	-1.7	-1.9	-2.4	-0.3	1.9																						
14-Dec	-2.9	-3.5	-4.1	-5.0	-5.4	-5.2	-4.5	-4.6	-4.4	-3.0	-2.1	-0.8	-0.5	-0.2	0.1	0.3	-0.7	-1.4	-1.1	-1.3	-1.9	-0.6	0.7	0.7	-2.1	0.7																						
15-Dec	-0.2	-0.2	0.0	0.0	0.1	0.3	0.9	2.7	2.6	2.7	2.9	2.9	2.8	2.4	1.7	1.4	1.0	0.9	0.3	-0.1	-0.3	-0.3	-1.0	-1.4	0.9	2.9																						
16-Dec	-1.4	-1.3	-1.2	-1.2	-1.5	-4.0	-6.1	-7.0	-7.9	-8.1	-8.1	-8.0	-7.2	-6.7	-4.9	-2.7	-2.9	-3.2	-4.3	-5.2	-5.3	-5.0	-4.4	-3.6	-4.6	-1.2																						
17-Dec	-3.1	-2.9	-2.3	-2.2	-2.2	-1.7	-0.7	-0.2	0.0	0.6	1.0	0.8	0.8	1.0	1.0	0.8	0.5	0.7	0.2	-0.2	-0.7	-0.9	-1.4	-1.7	-0.5	1.0																						
18-Dec	-1.7	-1.7	-1.8	-2.2	-2.3	-2.5	-2.6	-3.3	-3.6	-7.5	-8.2	-8.3	-8.7	-9.3	-9.7	-10.4	-11.1	-11.8	-12.6	-13.4	-14.0	-14.3	-14.5	-14.6	-7.9	-1.7																						
19-Dec	-15.0	-15.8	-16.2	-17.0	-18.0	-18.3	-19.2	-20.1	-20.3	-20.8	-20.4	-19.4	-17.1	-16.8	-17.6	-17.9	-19.3	-20.0	-19.4	-18.8	-18.6	-18.6	-17.8	-18.2	-18.4	-15.0																						
20-Dec	-17.6	-17.7	-18.2	-17.6	-17.1	-17.1	-16.5	-15.7	-15.3	-15.3	-14.3	-12.3	-12.5	-11.7	-12.8	-13.3	-12.6	-12.0	-11.6	-11.4	-11.4	-11.7	-11.1	-11.0	-14.1	-11.0																						
21-Dec	-10.7	-11.0	-10.7	-10.6	-10.7	-11.3	-11.6	-11.5	-11.7	-11.9	-11.9	-11.2	-10.5	-10.0	-9.6	-9.3	-9.4	-9.1	-9.0	-8.8	-8.5	-8.6	-8.9	-9.0	-10.2	-8.5																						
22-Dec	-9.4	-9.7	-9.3	-9.0	-8.8	-8.9	-8.8	-8.9	-9.2	-9.2	-9.2	-8.8	-8.6	-8.8	-8.8	-9.0	-9.1	-9.4	-9.9	-10.0	-10.0	-9.9	-10.7	-13.4	-9.4	-8.6																						
23-Dec	-15.5	-17.8	-19.6	-20.6	-21.1	-22.1	-23.7	-23.6	-24.1	-23.0	-22.2	-20.5	-20.2	-19.9	-20.2	-21.5	-22.0	-22.3	-20.8	-19.7	-19.1	-18.5	-18.0	-18.0	-20.6	-15.5																						
24-Dec	-18.1	-19.8	-21.8	-23.7	-25.3	-26.1	-26.8	-27.1	-27.9	-28.0	-27.3	-26.4	-25.8	-25.2	-24.8	-25.4	-26.2	-26.5	-26.5	-26.2	-26.3	-26.4	-25.8	-25.8	-25.4	-18.1																						
25-Dec	-26.1	-26.7	-27.5	-28.4	-29.3	-30.5	-31.2	-31.4	-31.7	-31.6	-31.5	-30.3	-29.0	-28.9	-30.2	-31.3	-32.0	-32.0	-31.5	-31.3	-31.6	-30.6	-30.0	-30.2	-30.2	-26.1																						
26-Dec	-29.6	-28.9	-28.7	-28.5	-28.0	-27.4	-26.8	-26.8	-26.7	-26.3	-25.1	-23.4	-22.3	-21.7	-21.4	-21.6	-22.3	-23.1	-23.0	-23.1	-23.3	-23.5	-23.8	-24.4	-25.0	-21.4																						
27-Dec	-25.1	-25.1	-25.1	-24.7	-25.4	-26.2	-26.6	-26.8	-27.2	-27.5	-26.2	-25.0	-24.0	-23.7	-23.7	-24.3	-25.7	-25.8	-25.5	-25.6	-26.3	-25.7	-25.4	-25.8	-25.5	-23.7																						
28-Dec	-25.8	-25.2	-24.4	-25.2	-24.5	-25.0	-25.8	-26.9	-27.8	-28.5	-29.2	-28.9	-28.0	-27.6	-27.6	-28.4	-29.3	-30.1	-30.5	-30.5	-31.2	-31.7	-32.3	-32.8	-28.2	-24.4																						
29-Dec	-32.9	-32.5	-32.9	-32.7	-32.9	-32.6	-32.7	-32.6	-32.4	-32.1	-30.9	-29.6	-28.2	-27.2	-27.0	-27.8	-28.7	-29.2	-29.3	-29.1	-29.7	-29.3	-28.9	-27.9	-30.4	-27.0																						
30-Dec	-27.1	-26.5	-25.8	-25.7	-25.5	-25.8	-26.8	-27.5	-27.5	-27.0	-25.0	-22.2	-21.4	-21.8	-21.5	-21.8	-22.5	-23.2	-23.2	-24.3	-24.5	-24.8	-24.9	-25.5	-24.7	-21.4																						
31-Dec	-25.3	-23.9	-24.9	-25.4	-24.6	-24.6	-25.3	-24.7	-24.3	-24.0	-22.3	-20.6	-19.6	-18.9	-19.3	-20.8	-22.1	-22.7	-22.0	-21.6	-21.4	-21.5	-22.9	-23.9	-22.8	-18.9																						
																								-10.4	-10.4	-10.5	-10.7	-10.7	-11.0	-11.2	-11.2	-11.3	-11.2	-10.7	-9.8	-9.3	-9.0	-9.2	-9.7	-10.3	-10.6	-10.6	-10.8	-10.9	-10.9	-10.8	-11.0	Diurnal Average
																								4.7	4.8	4.8	5.1	5.1	5.0	4.7	4.2	4.4	4.1	5.4	5.7	5.6	6.3	5.6	5.2	5.0	4.8	4.7	4.4	3.3	3.3	4.0	4.9	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Surmont - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Surmont - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	206	27.69	27.69
-20 - 0	376	50.54	78.23
0 - 10	162	21.77	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) - %**

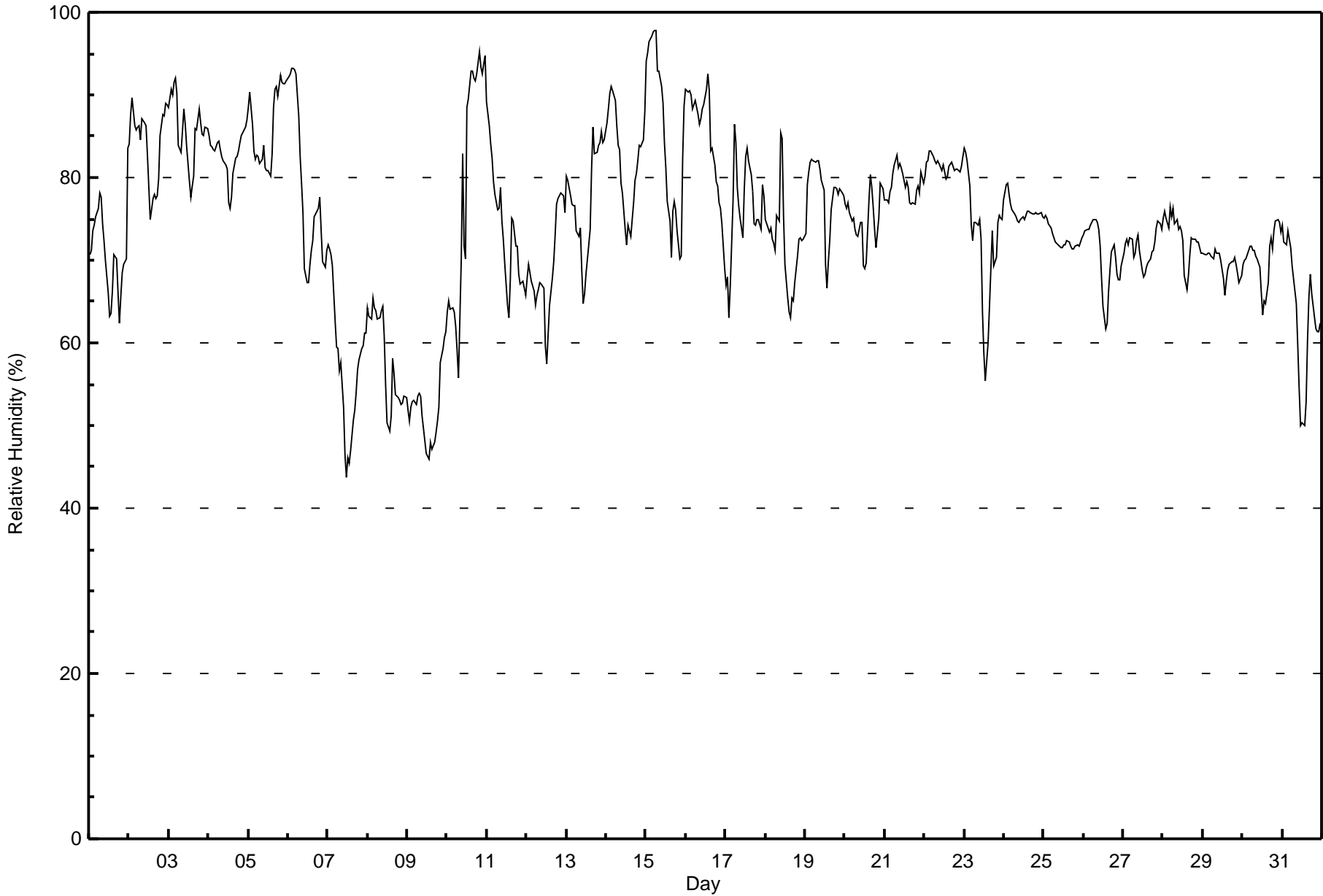
**Surmont - December 2017**

<b>Maximum Value: 98 % on Dec 15 06:00</b> <b>Maximum Daily Average: 86.1 % on Dec 5</b>																		<b>Hours in Service: 744</b> <b>Hours of Data: 744</b> <b>Hours of Missing Data: 0</b> <b>Hours of Calibration: 0</b> <b>Percent Operational Time: 100.0</b>								
<b>Minimum Value: 44 % on Dec 7 12:00</b> <b>Minimum Daily Average: 51.9 % on Dec 9</b> <b>Maximum Diurnal Average: 77.6 % at hour 2</b> <b>Minimum Diurnal Average: 69.0 % at hour 14</b> <b>Monthly Average: 74.4 %</b> <b>Percentiles: P<sub>1</sub> = 47 P<sub>10</sub> = 62 Q<sub>1</sub> = 70 Median = 75 O<sub>3</sub> = 82 P<sub>90</sub> = 87 P<sub>99</sub> = 95</b>																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	71	71	74	74	75	76	78	78	74	72	70	66	63	63	66	71	70	66	62	66	68	70	70	84	70.8	84
2-Dec	84	88	90	86	86	86	86	85	87	87	86	83	79	75	77	78	77	78	80	85	88	87	89	89	84.0	90
3-Dec	88	91	90	92	92	90	84	83	86	88	86	84	79	78	79	80	86	86	88	87	85	85	86	86	85.8	92
4-Dec	85	84	84	83	83	84	84	83	83	82	82	81	77	76	78	81	82	83	83	84	85	86	86	87	82.8	87
5-Dec	89	90	86	83	82	83	82	82	82	84	81	81	81	80	83	88	91	91	90	92	92	91	91	92	86.1	92
6-Dec	92	93	93	93	93	93	87	83	79	76	69	67	67	70	71	72	75	76	76	78	74	70	69	71	78.6	93
7-Dec	72	71	71	69	62	60	59	57	58	52	46	44	46	45	47	51	52	54	57	58	59	60	61	61	57.2	72
8-Dec	64	63	63	65	64	64	63	63	64	64	61	55	50	49	51	58	56	54	53	53	53	53	54	53	58.0	65
9-Dec	52	50	52	53	53	53	53	54	54	51	48	47	46	46	48	47	48	49	50	52	58	59	61	61	51.9	61
10-Dec	64	65	64	64	64	62	59	56	70	83	72	70	88	89	93	93	92	92	93	95	93	93	94	95	79.3	95
11-Dec	89	86	84	82	80	78	76	76	79	75	73	70	65	63	68	75	75	72	72	68	67	67	67	66	73.8	89
12-Dec	68	70	68	68	66	65	66	66	67	67	67	60	57	61	65	68	70	73	77	78	78	78	78	76	68.9	78
13-Dec	80	80	78	77	77	77	73	73	74	69	65	66	68	72	74	81	86	83	83	84	84	86	84	84	77.4	86
14-Dec	87	88	90	91	90	89	86	84	83	79	78	74	72	74	73	73	77	80	80	82	84	84	85	88	82.2	91
15-Dec	94	95	96	97	98	98	98	93	93	91	89	84	81	77	75	70	76	77	76	74	70	71	82	89	85.1	98
16-Dec	91	90	91	90	88	89	89	88	86	87	88	89	91	93	91	83	84	82	80	79	77	76	74	69	85.1	93
17-Dec	67	68	63	67	77	86	84	79	77	75	73	79	82	84	82	80	78	74	74	75	75	74	79	78	76.3	86
18-Dec	75	74	73	74	72	72	71	75	75	85	85	76	69	65	64	63	65	65	67	71	72	73	72	72	72.0	85
19-Dec	73	79	81	82	82	82	82	82	82	81	80	78	70	67	70	72	76	79	79	79	78	79	78	78	77.8	82
20-Dec	77	76	77	76	75	75	74	73	73	75	75	69	69	70	77	80	79	77	74	72	75	79	79	79	75.1	80
21-Dec	77	77	77	78	79	80	82	83	81	82	81	81	79	79	79	77	77	77	77	79	79	78	81	79	79.1	83
22-Dec	80	82	82	83	83	83	82	82	82	82	81	82	81	80	80	81	82	81	81	81	81	81	81	82	81.5	83
23-Dec	84	83	82	79	74	72	75	75	74	75	73	64	59	55	60	64	69	73	69	70	75	75	75	75	72.0	84
24-Dec	77	79	79	78	77	76	76	75	75	75	75	75	75	75	76	76	76	76	76	76	76	76	76	75	76.0	79
25-Dec	75	75	75	74	74	73	73	72	72	72	72	72	72	72	72	72	72	71	71	72	72	72	73	73	72.6	75
26-Dec	73	74	74	74	74	75	75	75	75	74	72	68	64	62	62	66	69	71	72	70	68	68	68	69	70.4	75
27-Dec	71	72	73	72	73	73	70	71	72	73	71	69	68	68	69	70	70	71	71	72	74	75	74	74	71.5	75
28-Dec	75	76	75	74	76	75	76	74	75	74	74	73	72	68	66	68	71	73	72	73	72	72	71	71	72.9	76
29-Dec	71	71	71	71	71	71	70	71	71	71	71	70	68	66	67	69	70	70	70	70	70	68	67	68	69.6	71
30-Dec	70	70	70	71	72	72	71	71	71	70	69	66	63	65	65	67	72	73	71	74	75	75	75	73	70.4	75
31-Dec	74	72	72	74	73	72	69	68	65	60	54	50	50	50	53	60	66	68	66	63	62	61	61	62	63.6	74
																		77.0 77.6 77.3 77.2 77.0 76.8 76.0 75.1 75.4 75.1 73.1 70.6 69.5 69.0 70.4 72.1 73.8 74.0 73.9 74.5 74.8 74.8 75.5 76.1						Diurnal Average		
																		94 95 96 97 98 98 98 93 93 91 89 89 91 93 93 93 92 92 93 95 93 93 94 95						Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Surmont - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %  
Surmont - December 2017**

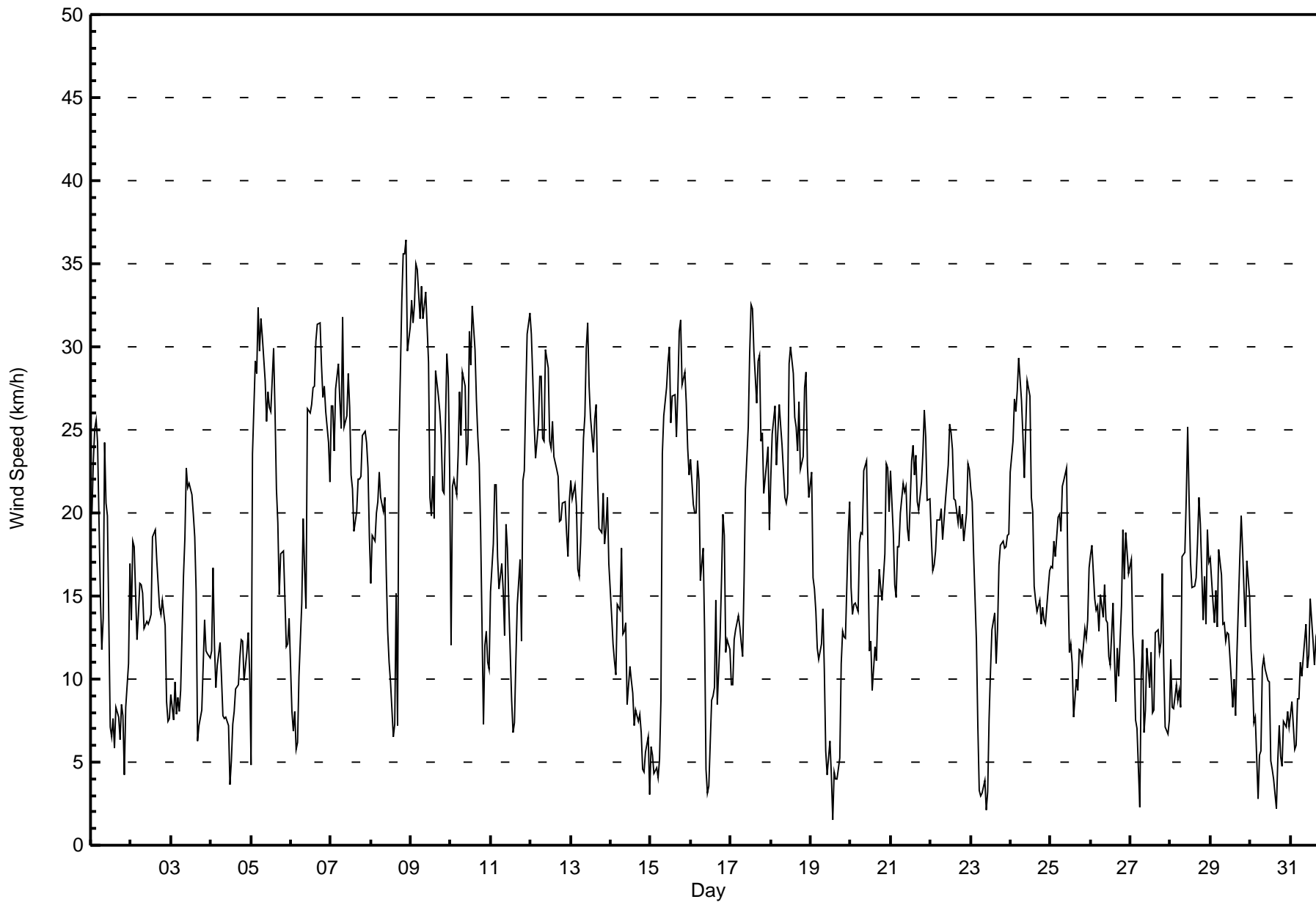
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	64	8.60	8.60
60 - 80	462	62.10	70.70
80 - 100	218	29.30	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744









**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Surmont - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	38	5.11	5.11
6 - 11	150	20.16	25.27
12 - 19	263	35.35	60.62
20 - 28	237	31.85	92.47
29 - 38	56	7.53	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Surmont - December 2017**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	0	3	0	1	2	0	1	2	2	6	6	4	6	4	0	1	38
6 - 11	4	4	0	0	0	0	0	0	4	10	15	26	32	37	10	8	150
12 - 19	13	12	0	0	0	0	0	0	0	7	9	12	35	77	59	39	263
20 - 28	10	4	0	0	0	0	0	0	0	0	2	0	26	60	74	61	237
29 - 38	1	0	0	0	0	0	0	0	0	0	0	0	8	29	13	5	56
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	28	23	0	1	2	0	1	2	6	23	32	42	107	207	156	114	744

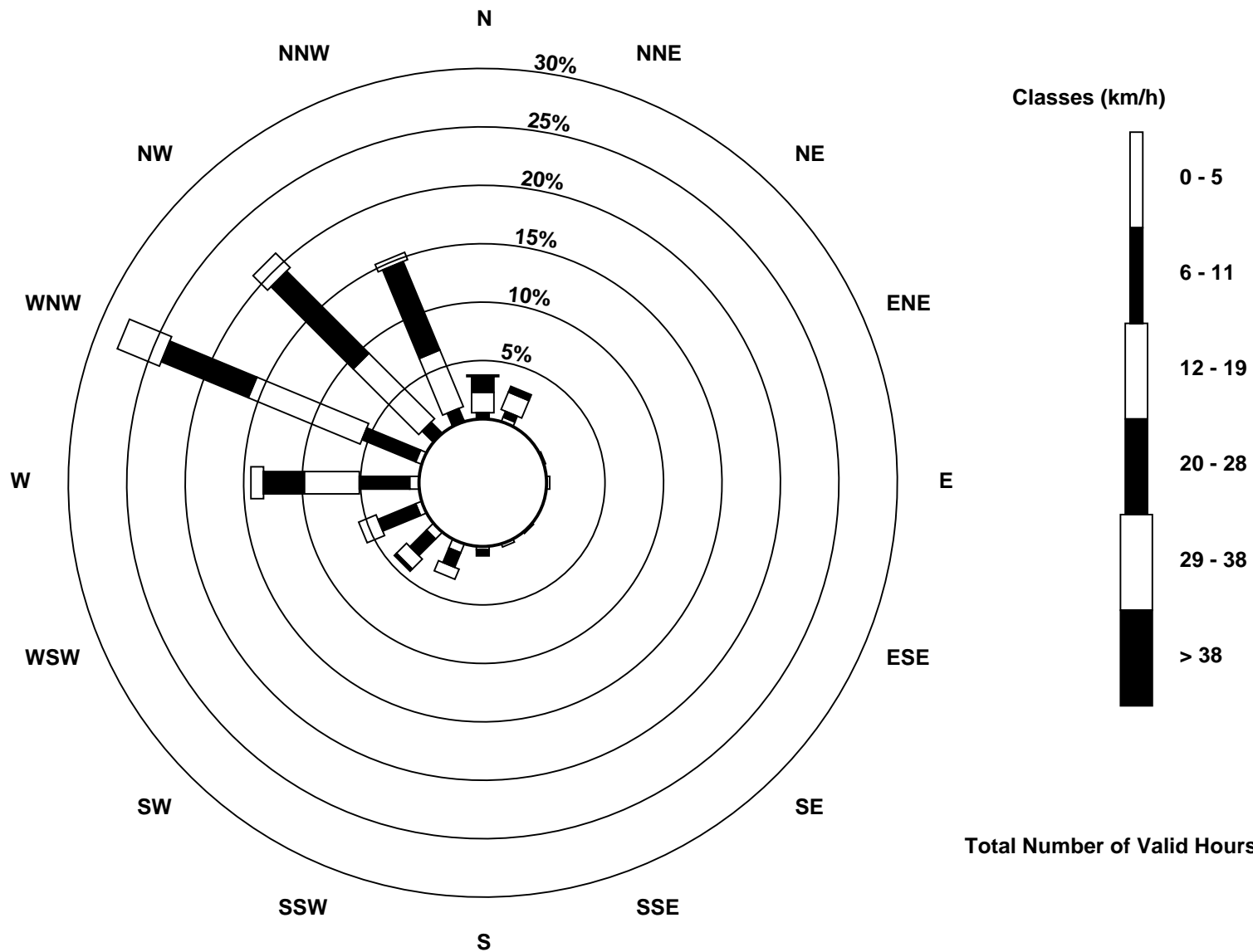
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Surmont (AMS 24)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Surmont - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 16 05:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 1 km/h on Dec 15 04:00																									
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 5 P <sub>90</sub> = 5 P <sub>99</sub> = 7																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	4	5	4	4	4	5	5	4	4	3	3	4	2	2	2	2	1	1	2	4	2	1	5	3	5
2-Dec	3	5	4	3	3	4	4	3	2	3	3	2	3	3	3	3	2	2	2	2	3	1	1	1	5
3-Dec	2	2	2	2	3	2	2	6	4	5	4	4	4	3	3	3	2	2	3	2	3	3	2	6	
4-Dec	2	3	4	1	2	1	1	1	1	1	1	1	1	2	2	2	2	2	3	2	2	2	2	2	4
5-Dec	3	5	5	5	6	7	6	6	6	6	5	6	6	6	7	6	4	3	3	3	4	3	2	2	7
6-Dec	2	1	2	2	2	3	2	3	4	7	5	5	4	4	5	5	5	5	4	4	5	6	5	3	7
7-Dec	4	4	4	5	5	5	5	5	7	5	5	6	5	4	4	4	4	5	4	4	4	5	5	5	7
8-Dec	3	3	4	3	4	3	3	3	2	2	3	2	4	2	3	3	3	7	5	5	5	5	5	5	7
9-Dec	5	5	5	5	5	5	5	5	4	5	6	5	4	4	7	7	5	4	4	4	4	4	4	4	7
10-Dec	4	3	3	3	4	4	4	4	6	5	5	6	6	6	6	6	5	4	3	7	3	2	2	5	7
11-Dec	3	4	4	4	3	3	3	3	2	4	3	2	4	2	3	4	3	3	4	6	5	4	5	5	6
12-Dec	6	6	4	4	5	5	5	4	4	5	5	5	5	5	5	5	5	4	4	4	4	5	3	3	6
13-Dec	4	3	3	3	3	3	4	4	6	5	6	6	6	5	6	6	5	3	4	5	4	4	4	4	6
14-Dec	3	2	3	2	2	2	3	3	3	3	2	2	3	3	2	2	2	3	2	1	1	3	1	1	3
15-Dec	2	2	1	1	1	1	4	5	6	5	6	6	6	6	6	5	5	5	6	5	5	4	4	4	6
16-Dec	4	4	4	4	7	5	5	4	4	2	1	1	2	1	3	3	2	4	3	4	4	3	4	3	7
17-Dec	3	3	3	4	4	4	4	4	3	5	5	5	6	7	6	5	5	6	5	4	5	5	6	3	7
18-Dec	4	4	5	4	5	5	5	5	5	4	5	6	6	6	6	7	5	5	4	4	6	6	5	5	7
19-Dec	5	4	4	3	4	3	3	2	3	2	1	1	1	1	2	1	1	1	3	3	2	3	3	3	5
20-Dec	3	2	2	3	3	2	3	3	3	3	5	3	3	3	4	3	3	3	3	4	4	4	4	5	5
21-Dec	5	5	4	3	3	3	3	4	4	4	4	4	4	5	4	5	4	4	5	5	6	5	4	5	6
22-Dec	4	3	3	4	4	4	5	4	3	4	4	4	5	5	4	4	4	4	4	4	4	4	6	4	6
23-Dec	4	4	5	3	4	2	1	2	2	2	2	2	4	3	4	3	4	4	3	3	3	3	3	4	5
24-Dec	6	6	7	6	6	7	6	6	5	4	6	5	5	4	3	3	2	2	3	3	2	2	3	3	7
25-Dec	3	4	4	4	4	4	4	4	3	3	5	3	2	2	2	2	1	1	2	1	2	2	2	2	5
26-Dec	2	2	3	2	2	2	3	2	3	3	2	2	2	2	2	2	2	2	4	3	2	3	3	3	4
27-Dec	2	2	2	3	2	1	4	2	2	2	3	2	2	2	2	3	3	2	4	2	2	1	2	2	4
28-Dec	1	1	1	1	2	2	3	3	3	4	4	4	3	3	3	3	4	4	4	3	2	3	4	3	4
29-Dec	3	4	2	3	3	4	4	2	2	2	2	2	2	2	2	2	2	3	2	2	3	2	3	3	4
30-Dec	2	2	2	1	2	1	1	1	1	1	1	3	2	2	1	1	2	1	1	1	1	1	2	2	3
31-Dec	1	2	2	1	2	2	2	2	3	3	3	4	4	3	3	3	3	3	4	4	5	4	5	5	5
																	Diurnal Maximum								



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Surmont - December 2017**

Direction of Maximum Speed: 280 deg on Dec 8 22:00 Direction of Maximum Daily Speed Average: 289.8 deg on Dec 9	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 268 deg on Dec 19 14:00 Direction of Minimum Daily Speed Average: 5.5 deg on Dec 4	Percent Operational Time: 100.0
Monthly Average Direction: 299.2 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	269	272	274	276	276	272	279	278	276	277	287	259	244	253	229	232	231	212	248	278	292	274	264	275	269.6
2-Dec	279	305	306	305	309	306	313	304	298	303	300	304	289	293	291	288	283	282	276	274	270	280	284	274	293.5
3-Dec	266	259	253	252	256	253	266	276	301	314	313	322	329	324	311	316	19	5	32	18	25	12	10	15	318.4
4-Dec	344	336	325	299	311	298	295	286	279	272	275	238	208	184	187	184	186	198	200	197	196	198	210	203	246.0
5-Dec	184	284	295	304	306	309	309	315	321	330	337	337	338	342	348	357	27	18	26	28	12	18	331	329	331.7
6-Dec	304	285	298	305	282	274	292	279	269	265	273	275	272	273	274	279	286	288	291	294	307	316	311	296	286.5
7-Dec	297	297	295	293	301	310	314	307	312	311	307	315	319	313	315	311	311	314	313	310	308	312	311	308	308.1
8-Dec	301	295	295	290	291	291	294	292	292	290	288	284	276	217	230	256	289	275	276	280	278	280	286	285	283.3
9-Dec	283	283	286	283	279	285	287	283	286	293	301	301	306	293	296	291	295	299	308	303	284	282	286	284	289.8
10-Dec	315	290	286	289	293	288	281	280	293	292	283	298	308	329	337	337	337	339	338	340	327	314	314	303	307.1
11-Dec	320	312	311	310	322	323	313	296	291	284	296	291	282	238	255	255	257	265	256	272	273	277	276	278	287.5
12-Dec	288	299	301	303	305	305	304	302	303	298	297	307	321	321	327	321	327	326	317	319	316	315	304	298	308.4
13-Dec	288	285	287	289	292	288	294	273	293	300	311	328	334	337	341	352	340	334	327	320	317	325	336	333	314.2
14-Dec	317	315	313	296	288	282	277	273	271	265	229	239	244	254	228	218	202	201	204	190	209	318	321	292	267.6
15-Dec	207	232	214	203	204	207	255	298	302	307	308	310	318	321	315	315	311	305	297	294	286	290	291	291	299.2
16-Dec	298	307	310	306	322	348	13	350	343	15	67	130	213	218	251	273	263	270	270	271	269	256	250	246	295.3
17-Dec	221	226	237	237	221	228	235	250	265	281	289	296	303	308	308	291	291	304	306	303	303	310	307	296	287.4
18-Dec	293	296	304	306	310	310	312	309	319	22	348	340	338	336	335	336	335	340	337	335	340	337	335	336	327.7
19-Dec	338	6	351	353	352	346	353	337	344	314	241	269	229	268	149	250	214	226	258	297	304	289	276	289	315.0
20-Dec	299	288	282	290	293	283	289	290	291	286	275	254	261	238	249	244	259	267	268	262	264	271	270	269	274.6
21-Dec	272	280	295	317	335	337	338	341	339	339	340	334	336	340	339	339	333	328	323	317	327	338	334	334	328.4
22-Dec	326	314	315	317	314	314	320	316	310	306	305	307	310	309	314	311	316	320	315	317	330	336	357	25	319.5
23-Dec	28	28	19	14	342	295	226	232	278	100	28	331	356	335	350	327	326	310	307	316	314	308	314	329	336.4
24-Dec	360	9	1	355	350	349	349	352	347	342	346	347	345	341	333	327	317	319	319	318	321	319	325	326	342.8
25-Dec	328	0	2	9	359	348	354	344	341	342	355	17	338	339	317	292	284	288	288	283	287	286	286	289	331.5
26-Dec	294	290	290	298	305	301	297	302	299	297	293	293	287	284	284	294	299	290	272	273	283	280	291	291	290.6
27-Dec	289	292	289	283	281	255	292	301	295	288	296	279	300	280	276	284	293	306	296	279	284	279	271	249	287.4
28-Dec	285	291	292	292	330	352	4	331	328	337	340	341	337	329	332	334	338	335	336	335	332	330	332	329	331.0
29-Dec	334	323	323	327	324	334	334	324	306	303	307	306	295	279	286	280	296	294	294	295	291	282	290	280	305.7
30-Dec	286	282	286	278	261	277	271	279	283	282	287	319	333	20	87	153	266	281	281	284	281	275	270	262	284.3
31-Dec	252	255	235	233	232	247	251	242	248	252	250	231	226	223	205	209	205	213	224	229	232	234	233	232	232.0

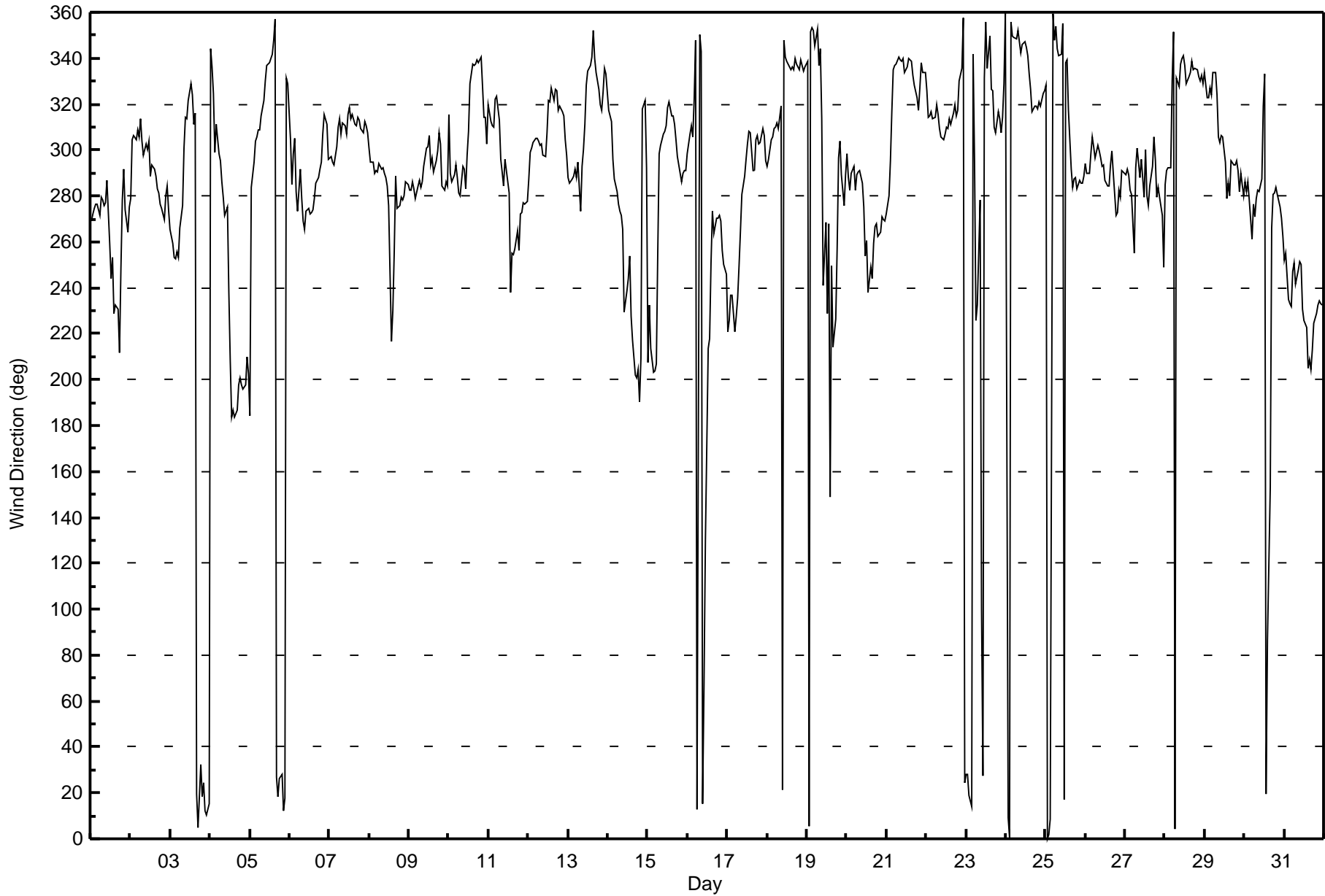
301.1 302.1 302.6 302.1 304.4 305.2 305.7 302.3 302.5 304.8 306.1 309.2 309.7 310.0 309.6 303.6 304.9 302.7 299.5 298.3 299.8 300.2 299.6 297.6  
 Diurnal Average

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



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Surmont - December 2017**







**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Surmont - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 84 deg on Dec 19 14:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 4 deg on Dec 30 09:00																									
Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 9 Q <sub>1</sub> = 10 Median = 12 Q <sub>3</sub> = 16 P <sub>90</sub> = 21 P <sub>99</sub> = 52																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	14	12	11	10	10	15	22	16	10	9	10	59	27	22	19	13	12	13	16	47	61	14	18	11	61
2-Dec	12	11	13	12	11	11	15	12	10	11	10	11	10	9	8	9	9	9	9	10	13	13	9	11	15
3-Dec	11	16	10	14	18	19	15	16	16	12	12	13	14	15	12	17	36	31	20	19	16	19	20	19	36
4-Dec	23	10	18	13	14	6	6	9	9	9	10	25	27	17	15	14	14	13	14	13	14	13	17	17	27
5-Dec	51	15	9	10	11	12	11	12	13	12	13	12	13	14	21	22	12	17	13	11	23	23	16	10	51
6-Dec	21	13	16	26	16	11	9	10	14	24	11	10	11	11	10	8	9	9	8	10	11	10	10	10	26
7-Dec	8	8	11	10	10	12	13	10	16	12	12	12	12	11	12	11	10	11	10	10	10	11	13	14	16
8-Dec	11	8	10	8	8	8	7	7	6	6	6	5	30	25	18	12	47	12	10	9	9	9	11	9	47
9-Dec	9	9	9	9	9	10	9	10	8	9	10	13	14	11	17	13	9	9	11	10	9	9	8	19	19
10-Dec	24	7	7	8	7	8	10	9	10	12	12	11	11	14	12	11	12	11	10	10	15	11	11	16	24
11-Dec	12	10	9	10	12	13	10	11	10	10	8	7	39	28	22	25	16	13	19	15	12	10	9	10	39
12-Dec	15	11	11	10	10	10	10	10	10	9	9	16	13	13	14	14	12	12	11	11	11	13	14	12	16
13-Dec	9	9	8	8	8	9	10	11	13	10	11	15	13	14	12	19	11	12	15	13	12	12	11	11	19
14-Dec	11	12	13	8	7	9	9	9	12	15	27	20	18	20	21	16	20	24	26	23	14	52	15	55	55
15-Dec	25	20	22	9	10	16	25	11	11	10	11	12	13	13	12	12	10	11	9	11	10	10	10	10	25
16-Dec	10	11	11	10	19	14	19	17	11	40	38	51	13	9	29	11	18	15	12	11	12	20	21	19	51
17-Dec	21	20	20	20	20	22	24	23	16	13	12	12	12	11	11	12	11	12	11	11	10	11	11	13	24
18-Dec	10	9	10	10	10	11	11	12	22	14	16	12	14	14	14	13	12	12	11	12	12	13	11	14	22
19-Dec	12	22	18	20	20	16	20	8	16	38	27	14	33	84	41	22	16	21	14	14	12	14	11	9	84
20-Dec	9	9	6	7	9	8	9	8	7	8	11	16	20	23	21	20	15	13	14	17	16	12	12	13	23
21-Dec	12	16	12	21	11	10	9	12	12	10	11	13	12	11	11	12	13	13	13	12	13	12	12	14	21
22-Dec	13	10	11	12	11	11	12	11	10	10	10	11	12	10	12	11	12	13	11	11	12	10	24	13	24
23-Dec	12	14	16	19	41	58	50	28	49	50	54	24	22	12	18	16	16	11	10	11	11	10	11	14	58
24-Dec	23	20	20	20	16	15	14	17	17	11	12	13	15	11	11	12	11	12	11	13	11	11	11	9	23
25-Dec	9	23	21	21	21	18	18	13	10	10	21	22	15	14	24	9	9	8	7	8	8	7	9	7	24
26-Dec	8	8	10	10	11	11	12	11	9	9	8	11	11	8	10	16	7	10	14	10	10	10	8	8	16
27-Dec	6	8	7	33	20	77	14	7	35	13	10	10	16	20	15	12	13	14	17	8	7	16	19	16	77
28-Dec	10	11	14	13	22	17	24	11	9	11	11	12	14	13	12	11	13	9	11	16	9	10	10	10	24
29-Dec	10	14	13	12	14	12	11	12	10	12	11	11	12	16	15	13	8	6	7	7	7	10	7	10	16
30-Dec	8	10	20	11	62	19	10	5	4	4	10	17	41	48	22	47	51	10	10	9	6	10	11	10	62
31-Dec	10	9	13	11	13	18	12	15	14	14	16	19	17	18	19	16	15	16	17	16	16	16	16	16	19
	51	23	22	33	62	77	50	28	49	50	54	59	41	84	41	47	51	31	26	47	61	52	24	55	
Diurnal Maximum																									





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

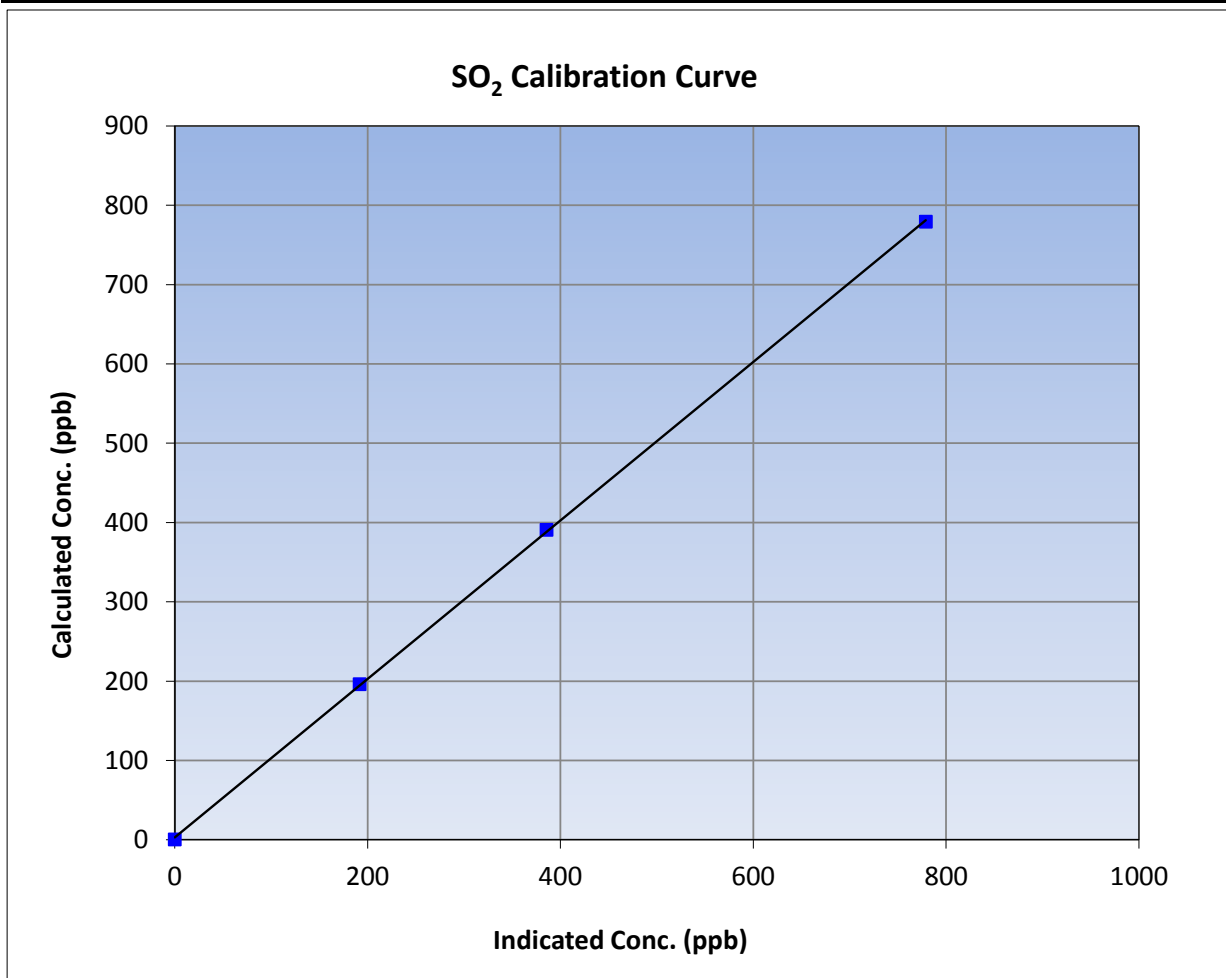
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 2, 2017
Station Name	Surmont	Station Number	AMS 24
Start Time (MST)	10:52	End Time (MST)	16:50
Analyzer make	Thermo 43i	Analyzer serial #	1170050150

### Calibration Data

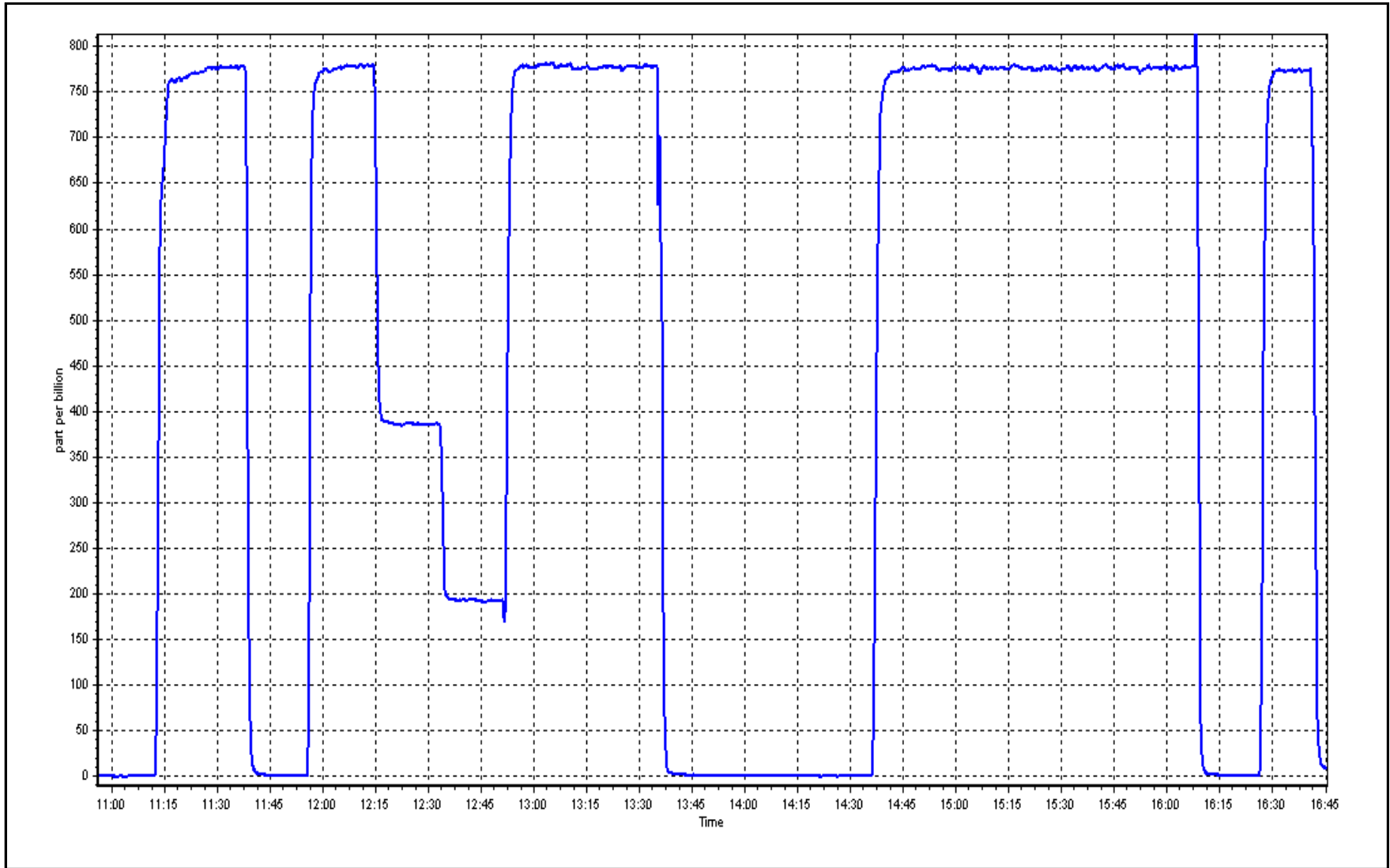
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	-0.3	----	Correlation Coefficient	≥0.995
779.1	778.5	1.0008		
390.3	385.1	1.0135	Slope	0.90 - 1.10
195.8	191.4	1.0227		
			Intercept	+/-30



SO2 Calibration Plot

Date: December 5, 2017

Location: Surmont







# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

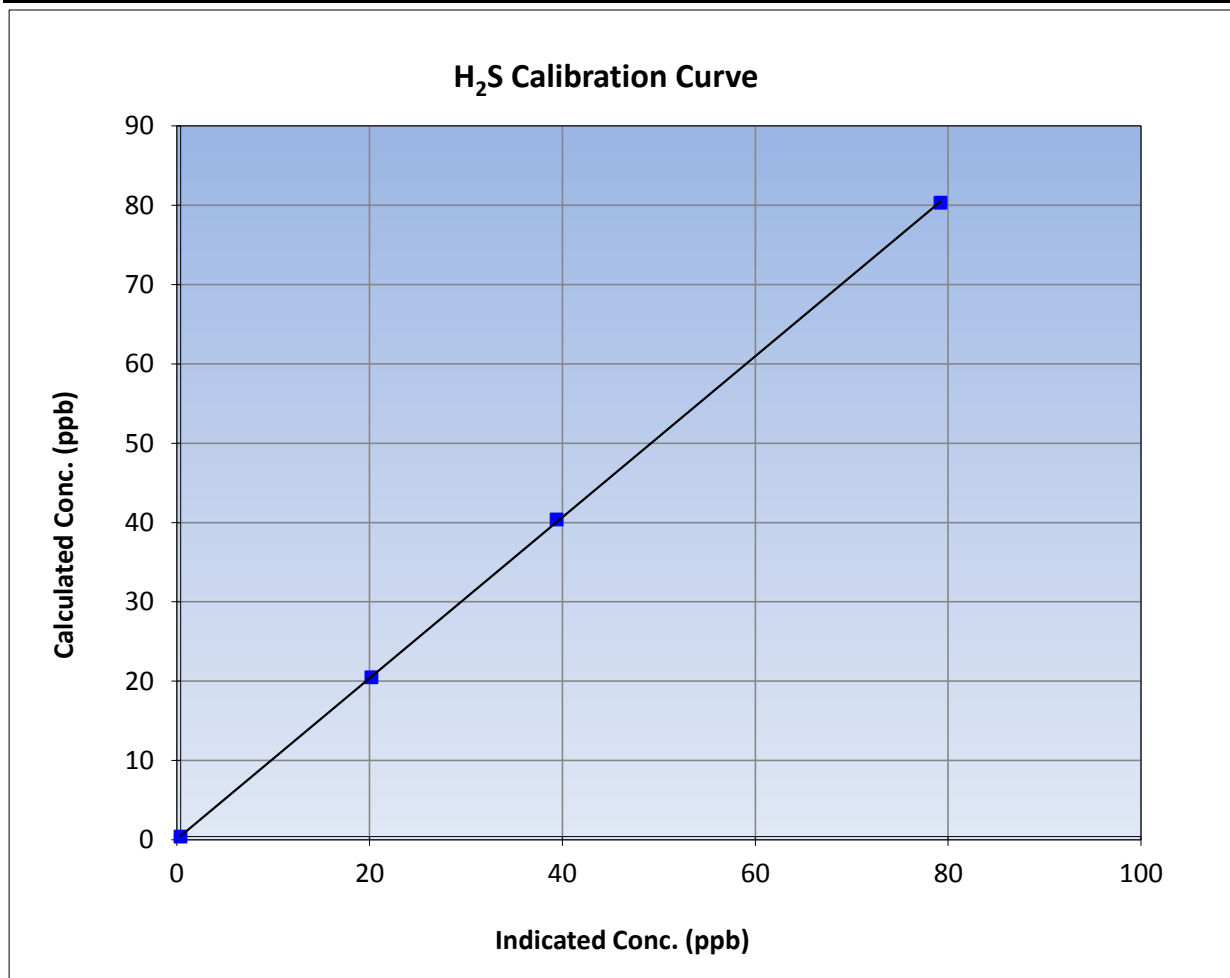
Version-03-2017

### Station Information

Calibration Date	December 13, 2017	Previous Calibration	November 3, 2017
Station Name	Surmont	Station Number	AMS 24
Start Time (MST)	10:59	End Time (MST)	15:16
Analyzer make	Thermo 450i	Analyzer serial #	1170050142

### Calibration Data

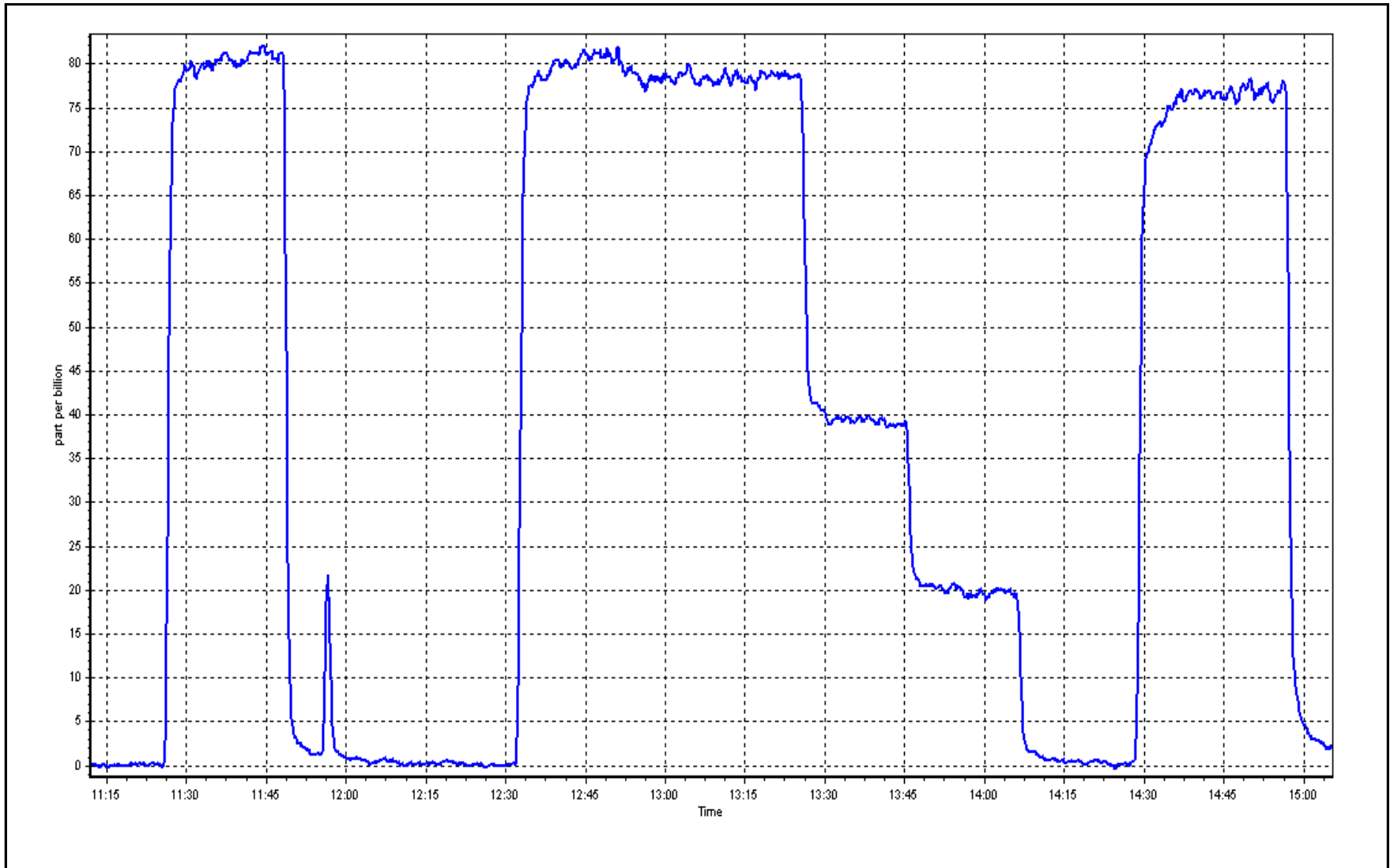
Calculated concentration (ppb) (Cc)	LL65044	Correction factor (Cc/lc)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999961	≥0.995
79.9	78.8	1.0143			
40.0	39.0	1.0255	Slope	1.014834	0.90 - 1.10
20.1	19.8	1.0154			
			Intercept	0.096837	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 13, 2017

Location: Surmont





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Surmont	Station number:	AMS 24
Calibration Date:	December 5, 2017	Last Cal Date:	November 2, 2017
Start time (MST):	10:52	End time (MST):	16:50
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000833	Cal Gas Expiry Date	February-22-20
CH4 Cal Gas Conc.	<u>506.0</u> ppm	CH4 Equiv Conc.	1056.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1845
ZAG Make/Model	API T701H	Serial Number	268

### Analyzer Information

Analyzer make:	Thermo 51i-LT	Analyzer serial #:	913935796
	<u>Start</u>	<u>Finish</u>	<u>Start</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-293.4
Calculated slope	1.012140	Sample pressure	9.6
Calculated intercept	0.003418	Fuel pressure	18.8
Analyzer Background	3.21	Air pressure	35.7
Analyzer Coefficient	5.772	Flame temperature	157.0
			<u>Finish</u>
			-293.3
			9.6
			18.8
			35.7
			157.5

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.00	-0.15	----
as found span	4933	78.4	16.52	16.53	0.999
calibrator zero	4900	0.0	0.00	-0.04	----
high point	4933	78.4	16.52	16.56	0.998
second point	4975	39.2	8.26	8.21	1.005
third point	4995	19.7	4.15	4.13	1.004
as left zero	5011	0.0	0.00	0.00	----
as left span	4824	78.4	16.89	16.60	1.017
Average Correction Factor					1.002
Corrected As found	16.68	Previous response	16.32	*% change	-2.2%

\* = > +/-5% change initiates investigation

Notes: No adjustments made.

Calibration Performed By: Aswin Sasi Kumar





# Wood Buffalo Environmental Association

## THC Calibration Summary

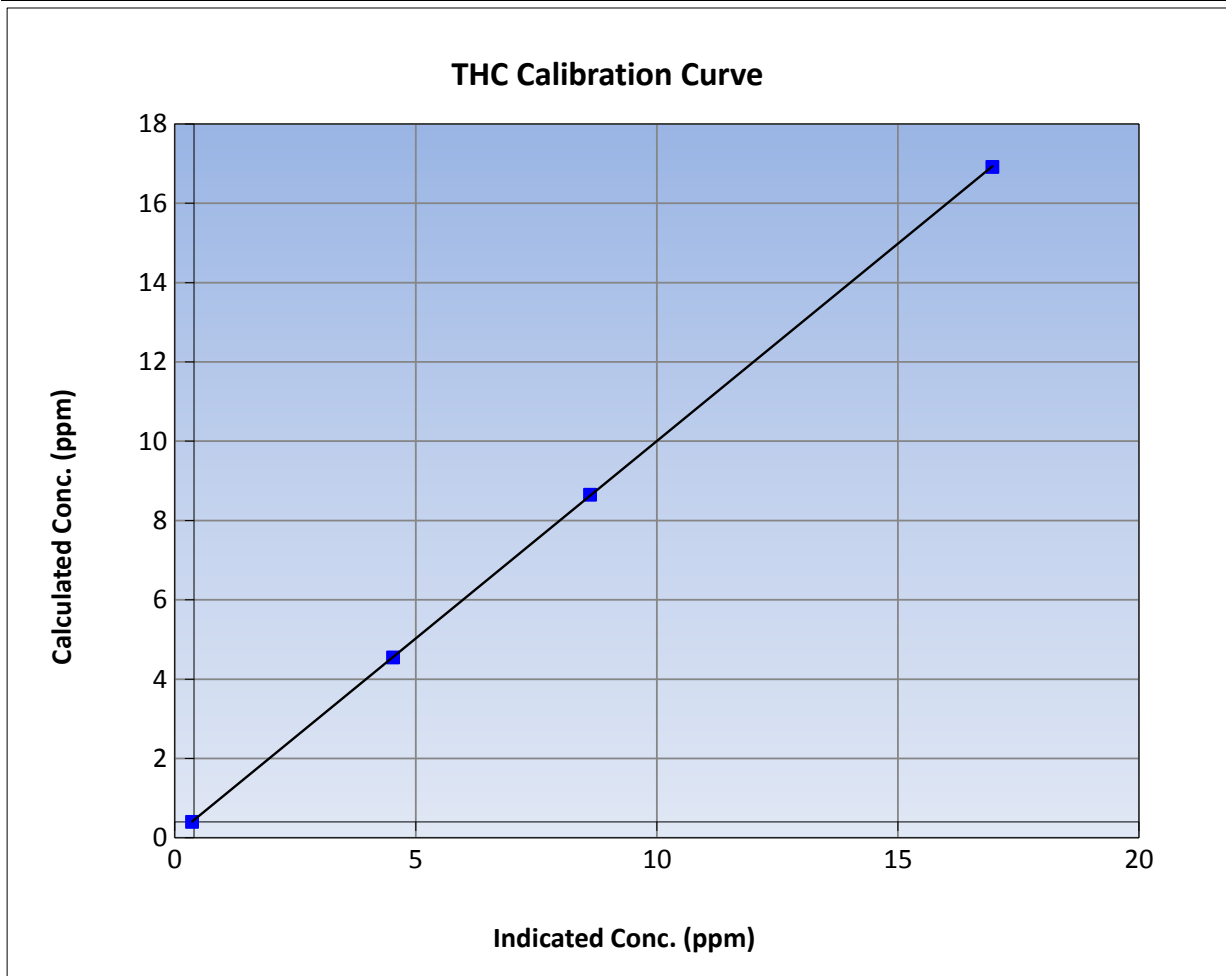
Version-03-2017

### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 2, 2017
Station Name	Surmont	Station Number	AMS 24
Start Time (MST)	10:52	End Time (MST)	15:55
Analyzer make	Thermo 51i-LT	Analyzer serial #	913935796

### Calibration Data

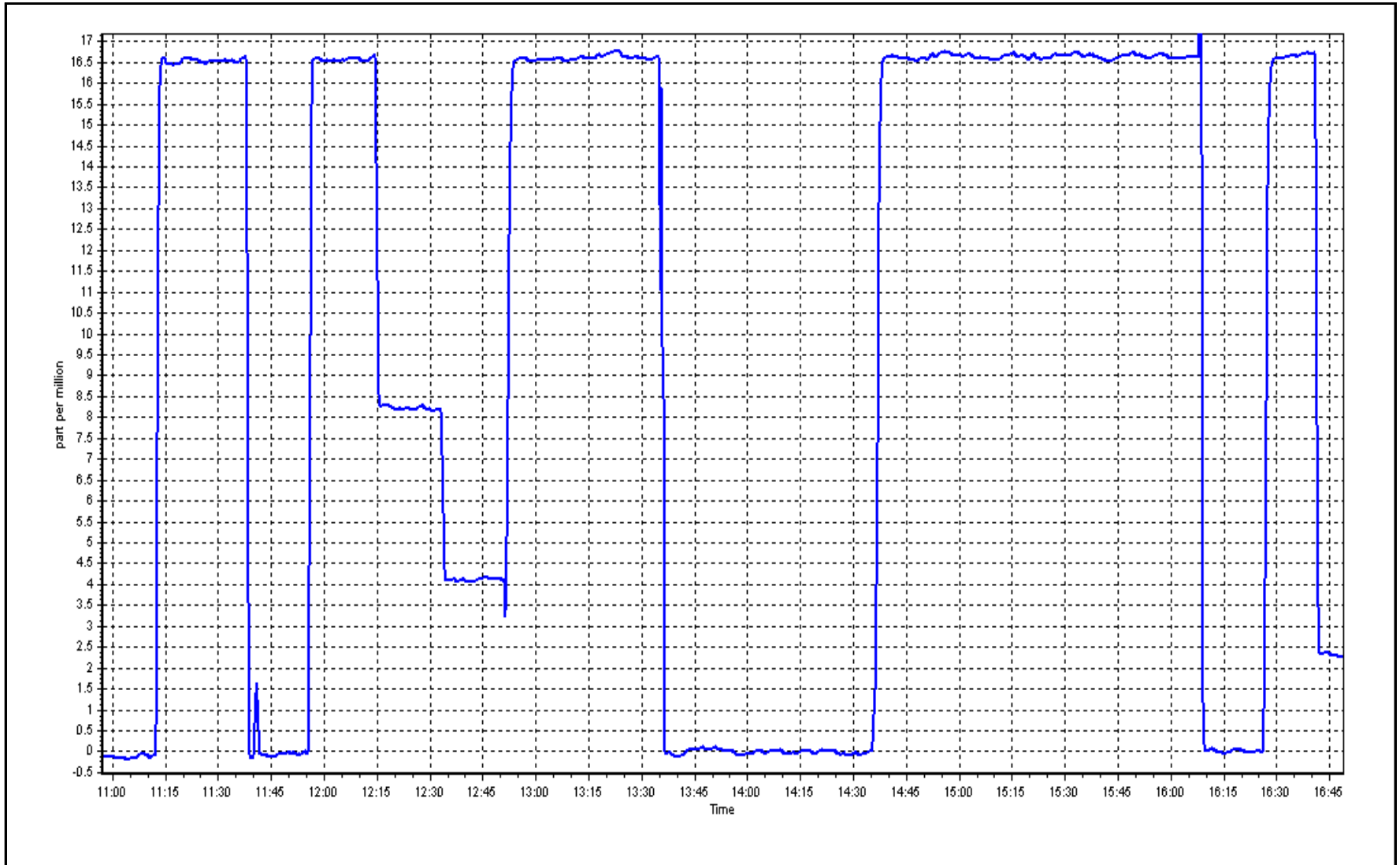
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.00	-0.04	----	Correlation Coefficient	0.999991	≥0.995
16.52	16.56	0.9975			
8.26	8.21	1.0052	Slope	0.995455	0.90 - 1.10
4.15	4.13	1.0045			
			Intercept	0.047908	+/-1.5



THC Calibration Plot

Date: December 5, 2017

Location: Surmont





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Surmont	Station number:	AMS 24
Calibration Date:	December 5, 2017	Last Cal Date:	November 2, 2017
Start time (MST):	10:52	End time (MST):	16:47
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000833	Cal Gas Expiry Date	February-22-20
NOX Cal Gas Conc.	<u>51.1</u> ppb	NO Cal Gas Conc.	<u>51.1</u> ppb
Calibrator Model	API T700	Serial Number	1845
ZAG make/model	API T701H	Serial Number	268

### Analyzer Information

Analyzer make: Thermo 42i		Analyzer serial #: 1170050148		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
NO coefficient	1.162	1.162	NOX Range (ppb)	0 - 1000 ppb
NOX coefficient	0.996	0.996	PMT Temperature	-3.1 -3.0
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	161.4 161.4
NO bkgrnd	1.5	1.5	Sample Flow	0.871 0.866
NOX bkgrnd	1.4	1.4	PMT Voltage	-794.4 -794.8

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.997755	1.004987
NO <sub>x</sub> Cal Offset	1.297477	0.779075
NO Cal Slope	0.997343	1.003659
NO Cal Offset	2.139718	1.968173
NO <sub>2</sub> Cal Slope	0.995282	0.998473
NO <sub>2</sub> Cal Offset	0.411191	-0.582704



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4900	0.0	0.0	0.0	0.0	-0.2	-0.5	0.2	----	----
as found span	4934	78.4	799.3	799.3	0.0	795.4	794.0	1.4	1.0049	1.0066
calibrator zero	4900	0.0	0.0	0.0	0.0	0.0	-0.3	0.2	----	----
high point	4934	78.4	799.3	799.3	0.0	795.2	795.6	-0.4	1.0051	1.0046
second point	4976	39.3	400.4	400.4	0.0	396.4	395.0	1.4	1.0101	1.0137
third point	4992	19.7	200.9	200.9	0.0	198.9	197.3	1.5	1.0099	1.0181
as left zero	5011	0.0	0.0	0.0	0.0	-0.1	-0.3	0.2	----	----
as left span	4824	78.4	817.2	346.8	470.4	790.6	331.8	458.7	1.0336	1.0452
<b>Average Correction Factor</b>									<b>1.0084</b>	<b>1.0121</b>

Corrected As found	NO <sub>x</sub> = 795.6 ppb	NO = 794.5 ppb		*Percent Change	NO <sub>x</sub> = 0.5%
Previous Response	NO <sub>x</sub> = 799.8 ppb	NO = 799.3 ppb		*Percent Change	NO = 0.6%
<i>* = &gt; +/-5% change initiates investigation</i>					

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	795.7	793.3	2.4	1.0045	1.0075	----	----
1st NO2 (400 ppb O3)	346.8	446.5	794.7	346.8	447.7	1.0057	----	0.9973	100.3%
2nd NO2 (200 ppb O3)	586.3	207.0	793.9	586.3	207.7	1.0068	----	0.9966	100.3%
3rd NO2 (100 ppb O3)	684.8	108.5	794.7	684.8	109.9	1.0057	----	0.9873	101.3%
2nd NO ref point	----	0.0	793.2	792.9	0.2	1.0076	1.0080	----	----
<b>Average Correction Factor</b>						<b>1.0065</b>	<b>1.0078</b>	<b>0.9937</b>	<b>100.6%</b>

**Notes:** No adjustments made. During GPT, the response was drifting. Did O3 gen cal through calibrator.

Calibration Performed By: Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

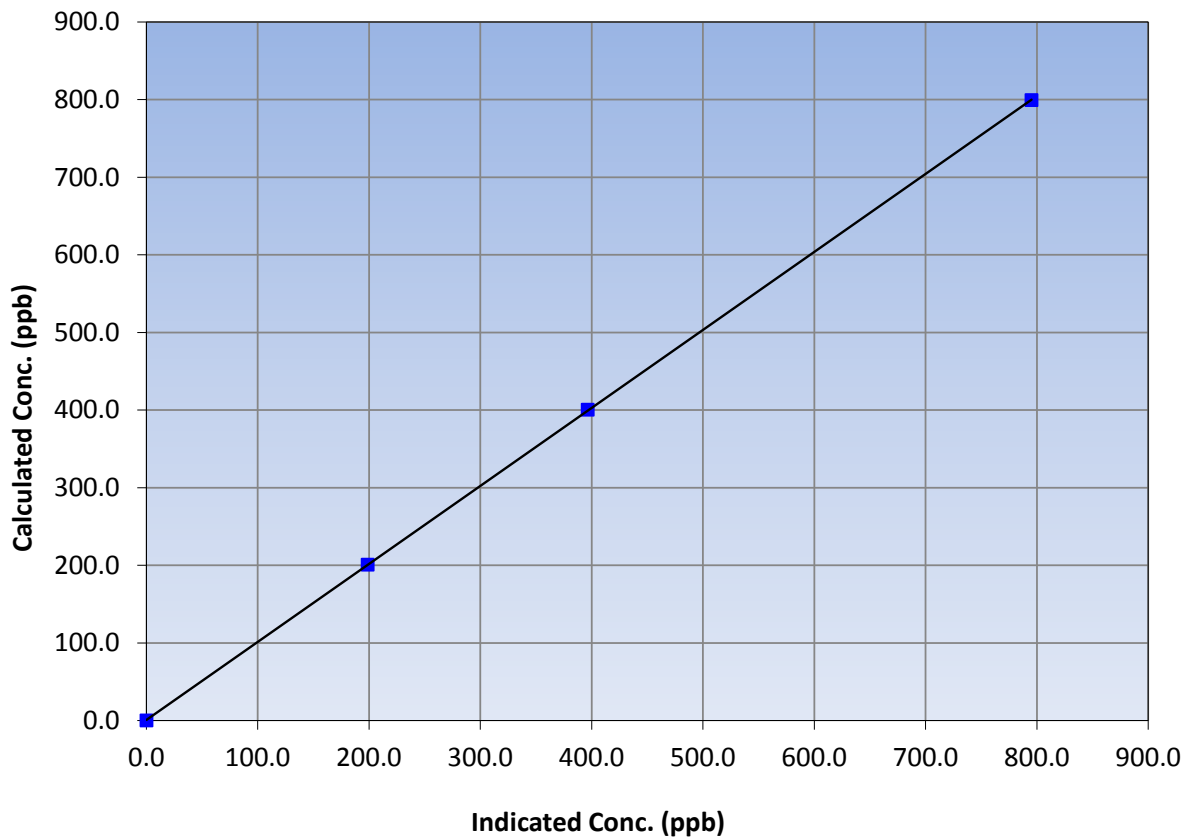
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 2, 2017
Station Name	Surmont	Station Number	AMS 24
Start Time (MST)	10:52	End Time (MST)	16:47
Analyzer make	Thermo 42i	Analyzer serial #	1170050148

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
799.3	795.2	1.0051			
400.4	396.4	1.0101			
200.9	198.9	1.0099			
			Slope	1.004987	0.90 - 1.10
			Intercept	0.779075	+/-20

**NO<sub>x</sub> Calibration Curve**





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

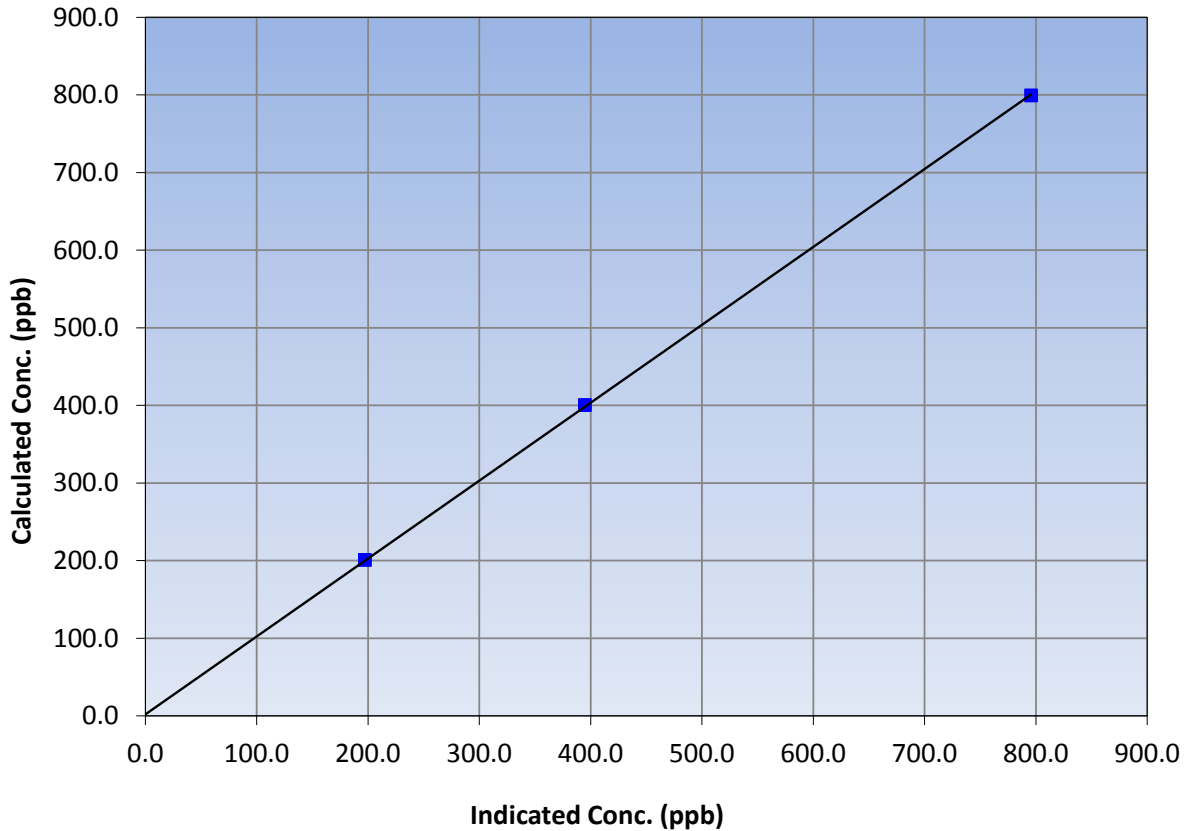
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 2, 2017
Station Name	Surmont	Station Number	AMS 24
Start Time (MST)	10:52	End Time (MST)	16:47
Analyzer make	Thermo 42i	Analyzer serial #	1170050148

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-0.3	----	Correlation Coefficient	0.999974	≥0.995
799.3	795.6	1.0046			
400.4	395.0	1.0137	Slope	1.003659	0.90 - 1.10
200.9	197.3	1.0181			
			Intercept	1.968173	+/-20

**NO Calibration Curve**





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

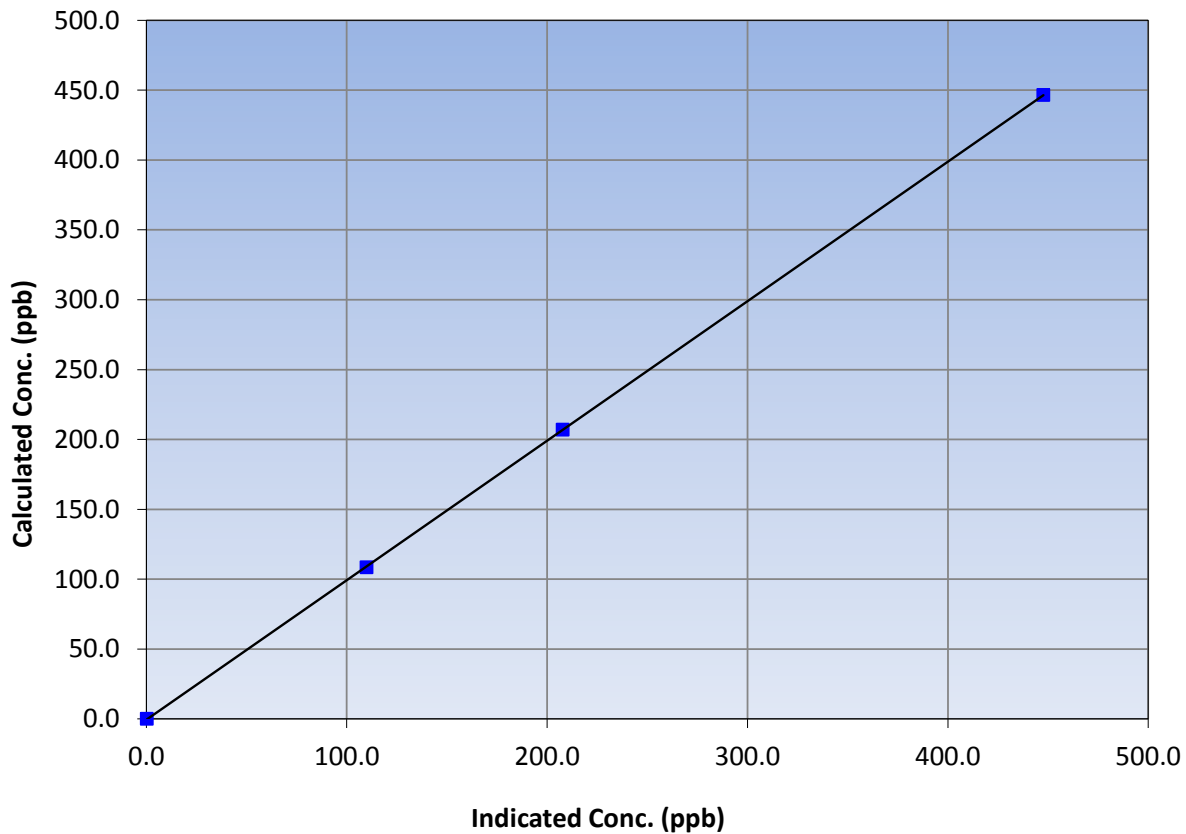
### Station Information

Calibration Date	December 5, 2017	Previous Calibration	November 2, 2017
Station Name	Surmont	Station Number	AMS 24
Start Time (MST)	10:52	End Time (MST)	16:47
Analyzer make	Thermo 42i	Analyzer serial #	1170050148

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.2	----	Correlation Coefficient	≥0.995	
446.5	447.7	0.9973			
207.0	207.7	0.9966			
108.5	109.9	0.9873			
			Slope	0.998473	0.90 - 1.10
			Intercept	-0.582704	+/-20

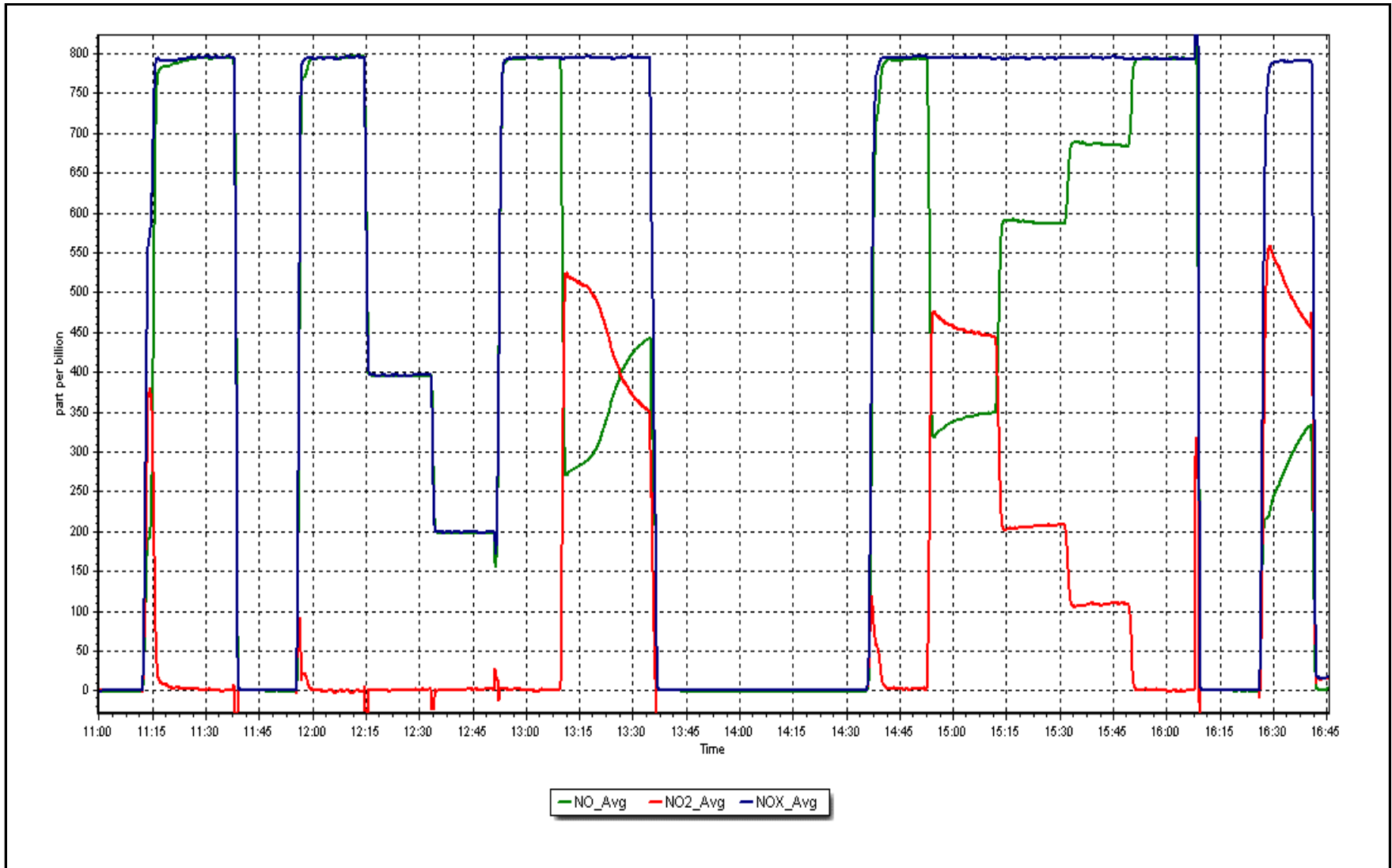
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: December 5, 2017

Location: Surmont







# Wood Buffalo Environmental Association

## T640 PM<sub>2.5</sub> CALIBRATION

Version-00-2017

### Station Information

Station Name: Surmont  
Calibration Date: December 13, 2017  
Start time (MST): 13:27  
Station number: AMS 24  
Last Cal Date: November 6, 2017  
End time (MST): 14:54  
Analyzer Make: API T640  
S/N: 209  
Particulate Fraction: PM2.5  
Flow Meter Make/Model: Delta Cal  
S/N: 954  
Temp/RH standard: Delta Cal  
S/N: 954

### Monthly Calibration Test

Parameter	As found	Measured	As left	Adjusted	(Limits)
T (°C)	NA	NA	NA	<input type="checkbox"/>	+/- 2 °C
P (kPa)	93.9	93.9	93.9	<input type="checkbox"/>	+/- 5 kPa
flow (LPM)	4.94	4.86	4.94	<input type="checkbox"/>	+/- 0.25 LPM
PMT Peak	11.2	-----	11.2	<input type="checkbox"/>	11.3 +/- 0.5
Instrument Clock:	Verified	<input checked="" type="checkbox"/>			
Inlet cleaning :	Inlet Head	<input checked="" type="checkbox"/>			

### Quarterly Calibration Test

Leak Test: Date of check: August 30, 2017 Last Cal Date: NA  
PM w/o HEPA: 6.1 PM w/ HEPA: 0

### Annual Maintenance

Date Optical Chamber Cleaned: New 8/30/2017  
Date Sample Tube Cleaned: New 8/30/2017  
Date RH/T Sensor Cleaned: New 8/30/2017  
Disposable Filter Changed: New 8/30/2017

Notes:

No adjustments needed

Calibration by: Aswin Sasi Kumar



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 25**  
**WASKŌW OHCI PIMÂTISIWIN**  
**DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WASKOW OCHI PIMATISIWIN (AMS 25)  
 DECEMBER 2017

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	696	34	48	98.12	9	0	3	0
H2S(ppb) Average	708	35	36	99.87	2	0	1	0
Temperature 2 m (C) Average	680	0	64	91.4	18	-	8	-
Relative Humidity (%) Average	680	0	64	91.4	0	-	0	-
Wind Speed 10 m (km/h) Average	744	0	0	100	4.1	-	1.3	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WASKOW OHCI PIMATISIWIN (AMS 25)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	696	0.8	1	-	0	0	0	1	1	1	9
H2S (ppb) Average	708	0.6	0	-	0	0	0	1	1	1	2
Wind Speed 10 m (km/h) Average	680	3.5	3	-	0	1	2	3	5	7	18
Wind Direction 10 m (deg) Average	680	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-14.9	12.3	-	-42.7	-32.5	-26.8	-10.8	-4.7	-0.2	4.1
Relative Humidity (%) Average	744	81	9	-	0	70	73	81	89	92	98

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WASKOW OHCI PIMATISIWIN (AMS 25)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	22 Dec 2017 13:00	22 Dec 2017 13:00	1	Maintenance - reinitiated daily QA check
SO2	21 Dec 2017 02:00	21 Dec 2017 13:00	12	Unstable operation - excessive baseline drift
SO2	22 Dec 2017 12:00	22 Dec 2017 13:00	2	Maintenance - reinitiated daily QA check
Wind Speed, Wind Direction	11 Dec 2017 04:00	12 Dec 2017 07:00	28	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	16 Dec 2017 01:00	17 Dec 2017 12:00	36	Flat line in sensor output signal - Sensor frozen



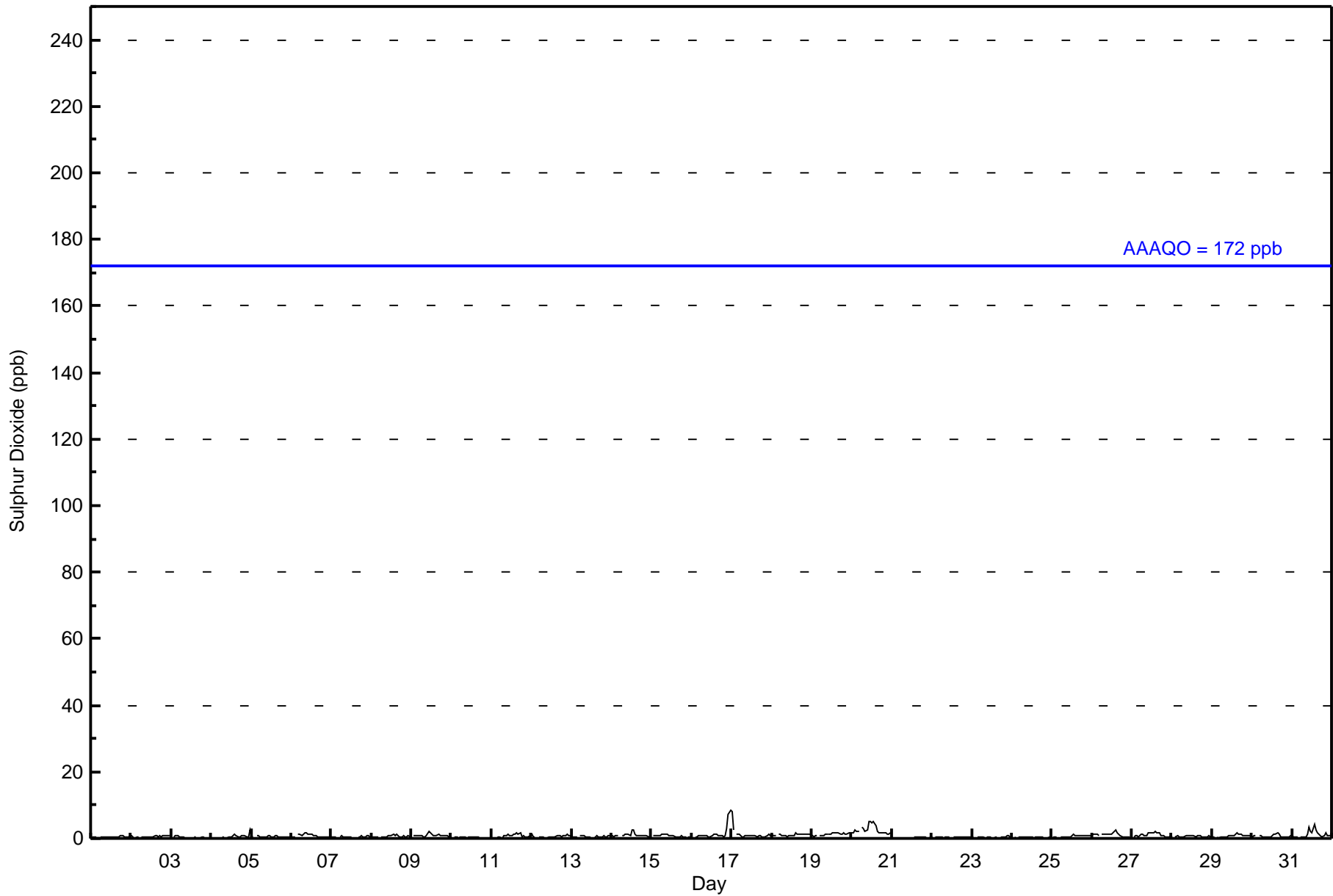
Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb

Waskow ohci Pimatisiwin - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 9 ppb on Dec 17 00:00										Maximum Daily Average: 2.6 ppb on Dec 20										Hours of Data: 696						
Minimum Value: 0 ppb on Dec 3 12:00										Minimum Daily Average: 0.3 ppb on Dec 10										Hours of Missing Data: 48						
Maximum Diurnal Average: 1.1 ppb at hour 14										Minimum Diurnal Average: 0.6 ppb at hour 2										Hours of Calibration: 34						
Monthly Average: 0.8 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 5										Percent Operational Time: 98.1						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	1	0.5	1
2-Dec	1	0	0	1	1	Z	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0.6	1
3-Dec	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	3	0.5	3
5-Dec	1	0	Z	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0.6	1
6-Dec	1	0	0	Z	1	1	1	1	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.8	2
7-Dec	0	0	1	1	Z	0	1	0	1	0	0	1	1	C	C	C	0	0	1	0	1	1	1	1	0.5	1
8-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0.6	1
9-Dec	Z	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0.9	2
10-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Dec	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	2	1	2	1	1	0	0	1	1	1	0.7	2
12-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	0.6	1
13-Dec	0	0	0	0	Z	1	1	1	1	0	1	1	0	0	1	1	0	0	0	1	1	1	1	1	0.5	1
14-Dec	1	0	1	1	1	Z	1	1	1	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1.0	3
15-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0.7	1
16-Dec	0	Z	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	3	7	9	1.5	9
17-Dec	8	3	Z	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1.1	8
18-Dec	1	1	1	Z	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1
19-Dec	1	1	1	1	Z	1	1	1	1	1	1	2	2	2	2	2	2	1	1	2	1	1	2	2	1.3	2
20-Dec	2	2	3	2	2	Z	3	3	2	3	5	5	5	5	4	2	2	2	2	2	2	2	1	2	2.6	5
21-Dec	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	0	0	0	0	0	1	0	0	0	0	0	--	1
22-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.3	1
24-Dec	0	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
25-Dec	0	0	0	0	Z	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
26-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	2	2	2	1	1	1	1	0	1	0	0	1.1	2
27-Dec	Z	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	0	1	1	1.0	2
28-Dec	1	Z	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.7	1
29-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	2	1	1	1	1	1	1	1	1	1	0.7	2
30-Dec	1	1	1	Z	1	1	0	0	0	0	0	1	1	1	1	2	1	1	1	0	0	0	0	1	0.7	2
31-Dec	1	0	1	1	Z	0	0	0	1	1	3	2	2	4	2	2	1	1	1	1	2	1	1	1	1.3	4
0.8 0.6 0.6 0.6 0.7 0.6 0.7 0.7 0.7 0.7 1.0 0.9 1.0 1.1 1.1 1.0 0.8 0.7 0.6 0.7 0.7 0.7 0.9 1.0																								Diurnal Average		
8 3 3 2 2 1 3 3 2 3 5 5 5 5 4 2 2 2 2 2 2 2 3 7 9																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Waskow ohci Pimatisiwin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	696	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: 696

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Waskow ohci Pimatisiwin - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	22	23	17	5	6	6	20	199	86	38	31	39	46	42	29	26	635
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
<b>Totals</b>	22	23	17	5	6	6	20	199	86	38	31	39	46	42	29	26	635

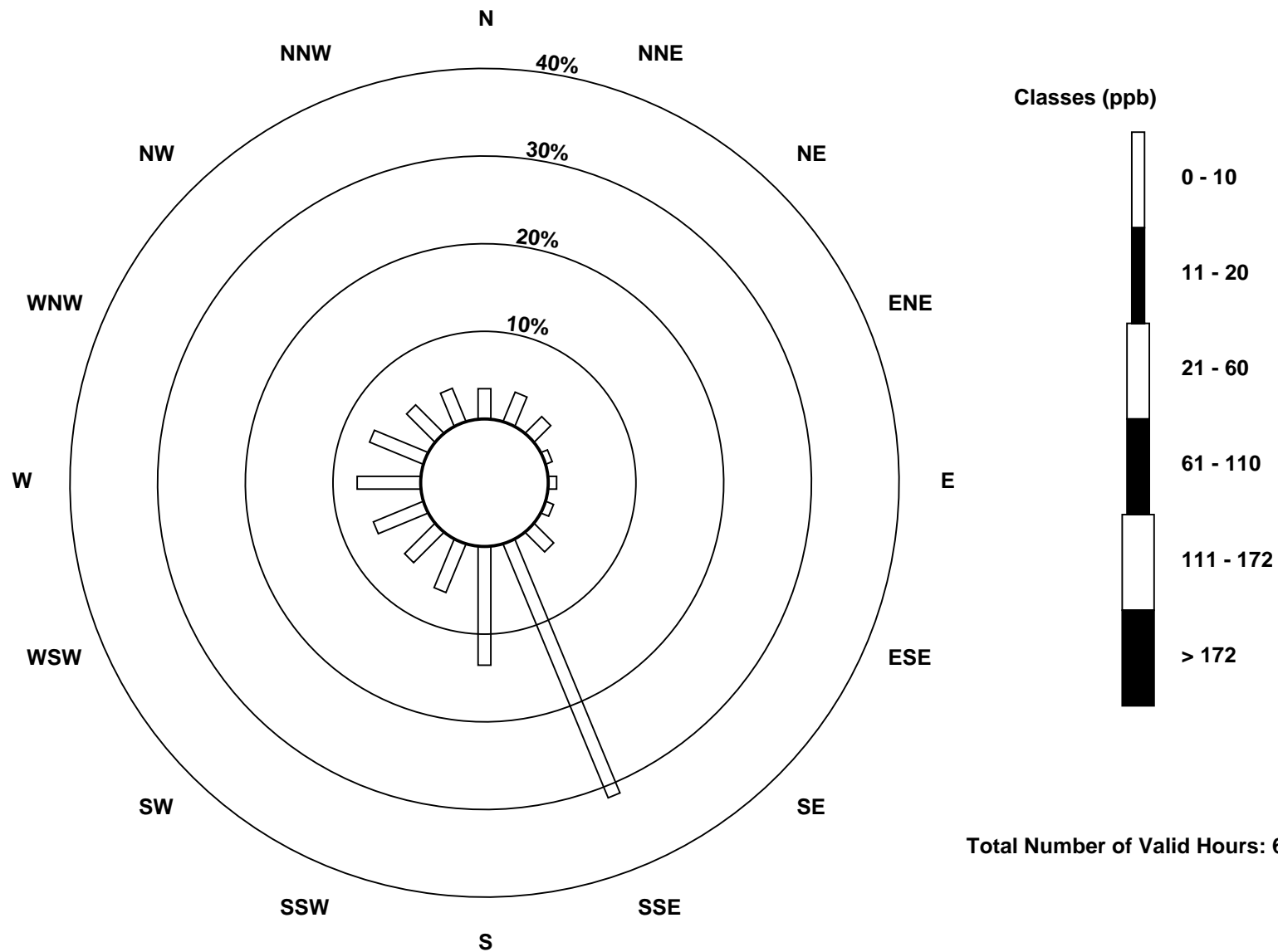
Total Number of Valid Hours: 635

Total Number of Hours: 744

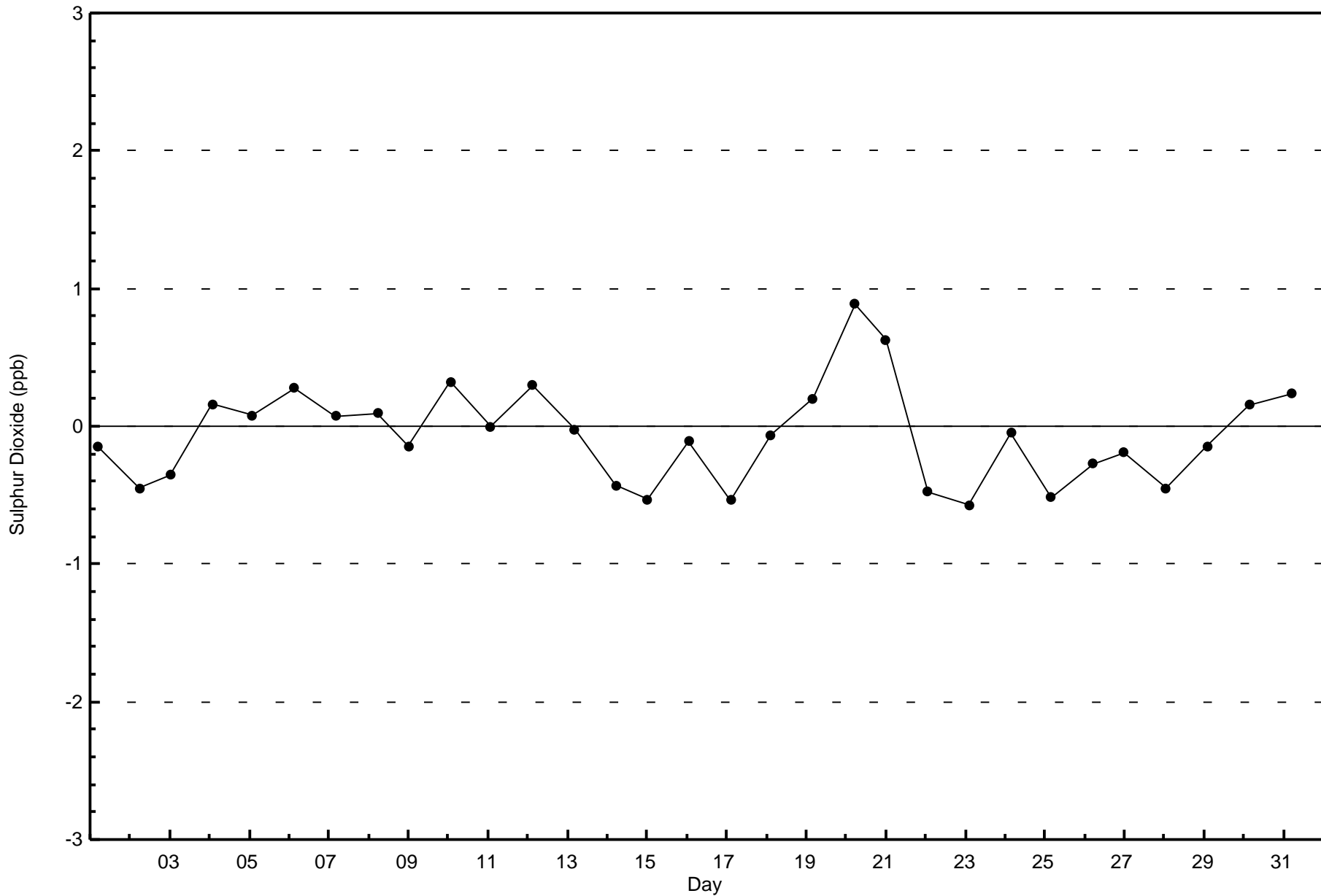


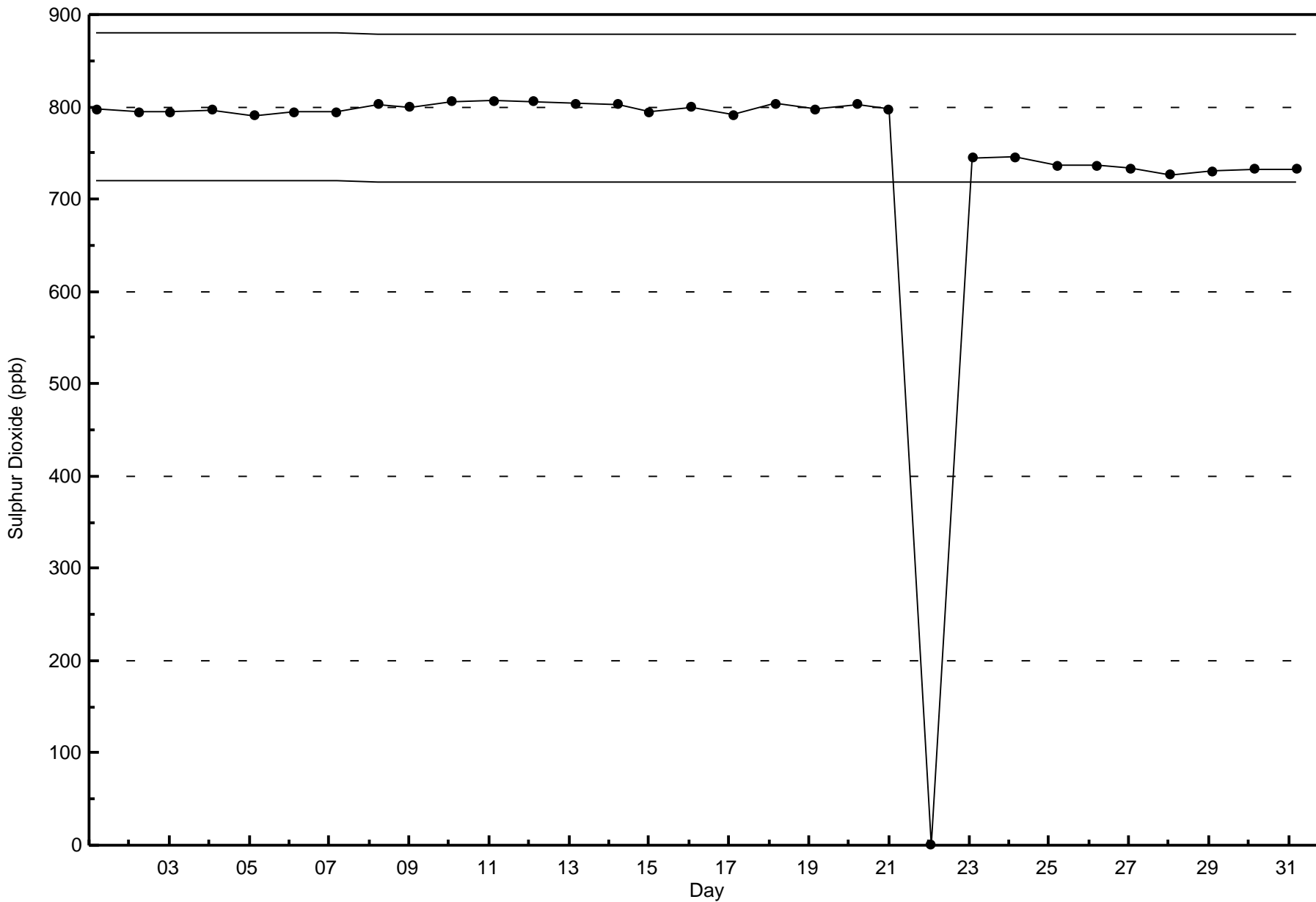
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Waskow ohci Pimatisiwin (AMS 25)

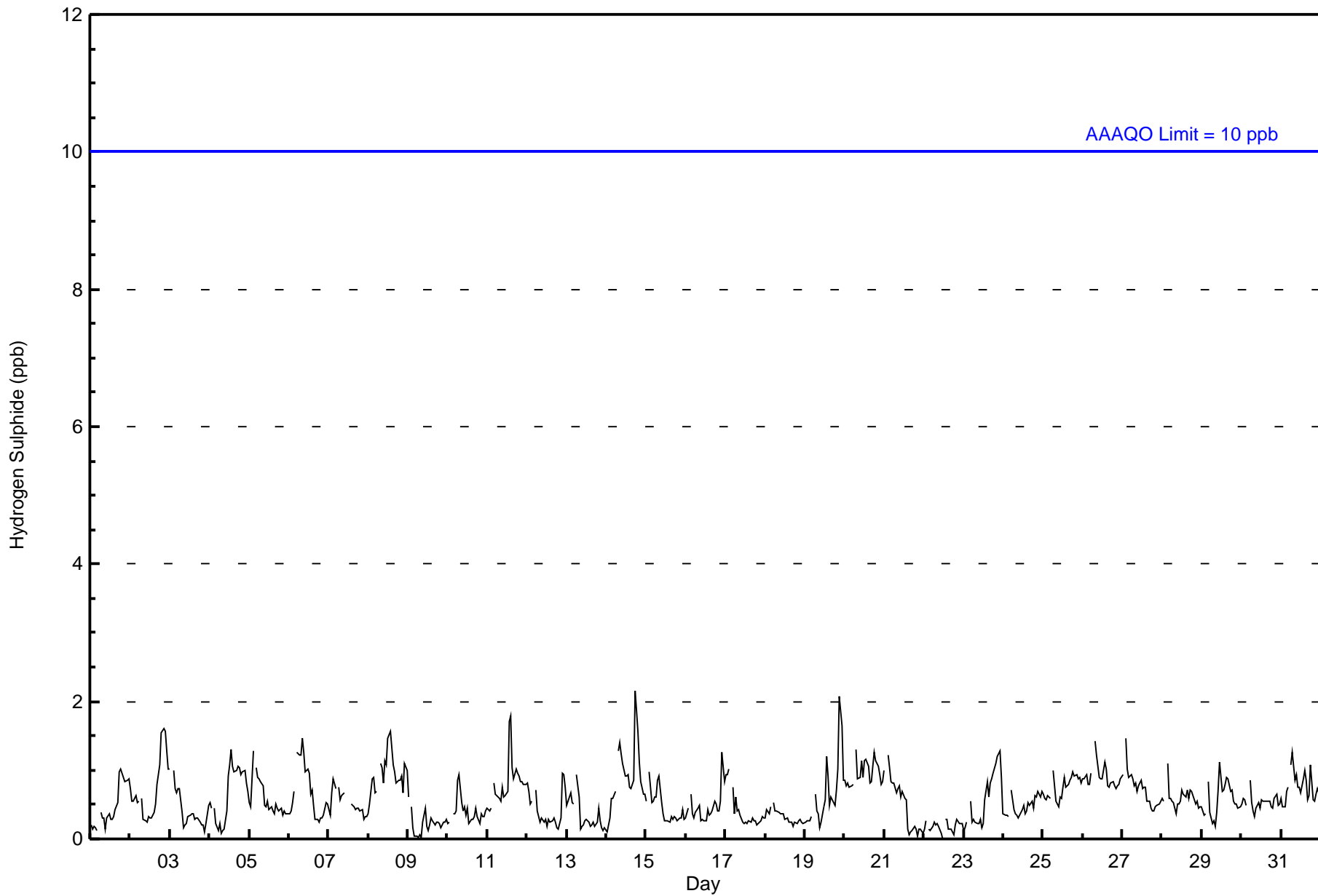


Total Number of Valid Hours: 635











**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Waskow ohci Pimatisiwin - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Waskow ohci Pimatisiwin - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	22	23	17	5	7	7	22	199	87	37	31	39	50	43	33	26	648
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	22	23	17	5	7	7	22	199	87	37	31	39	50	43	33	26	648

Total Number of Valid Hours: 648

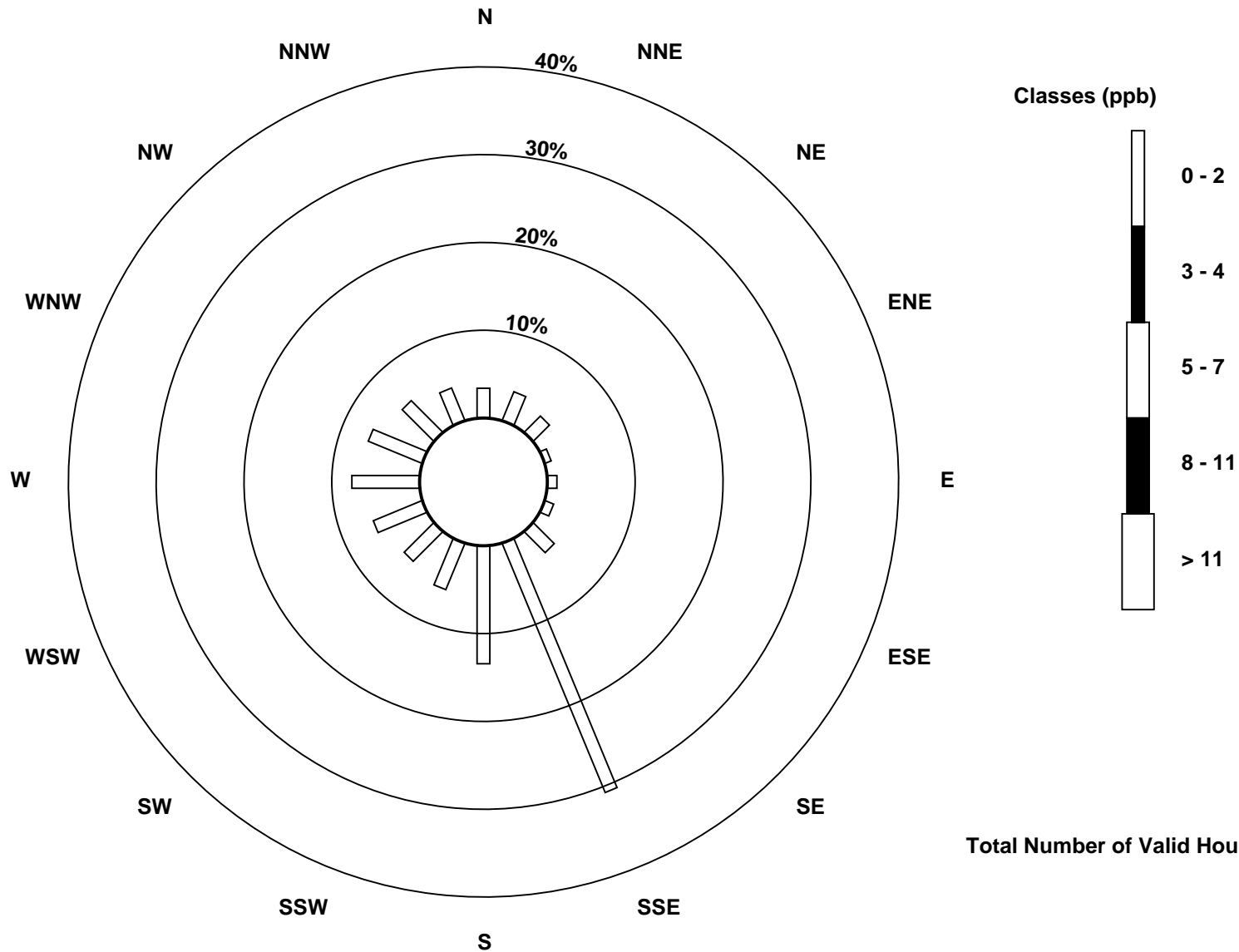
Total Number of Hours: 744



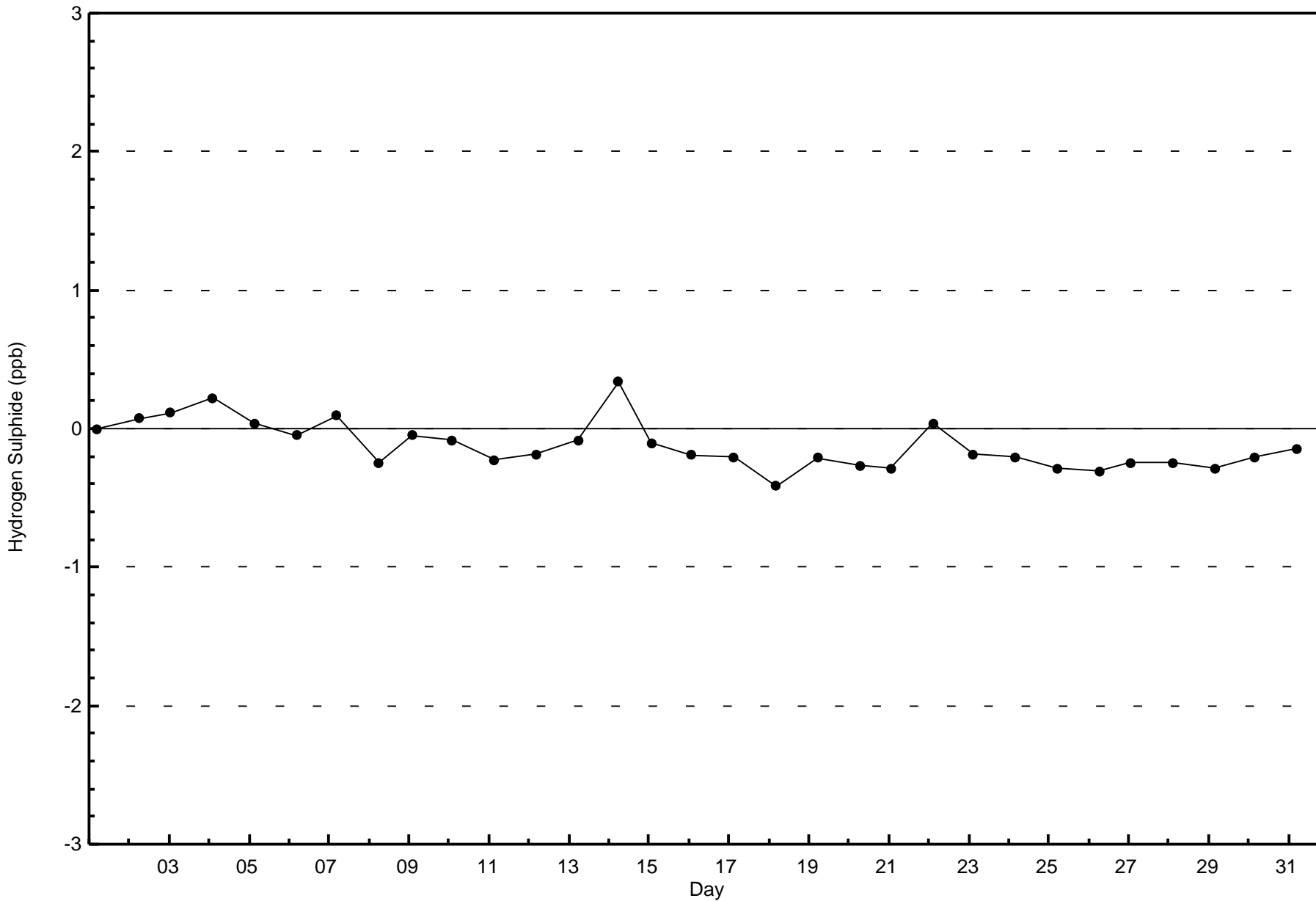


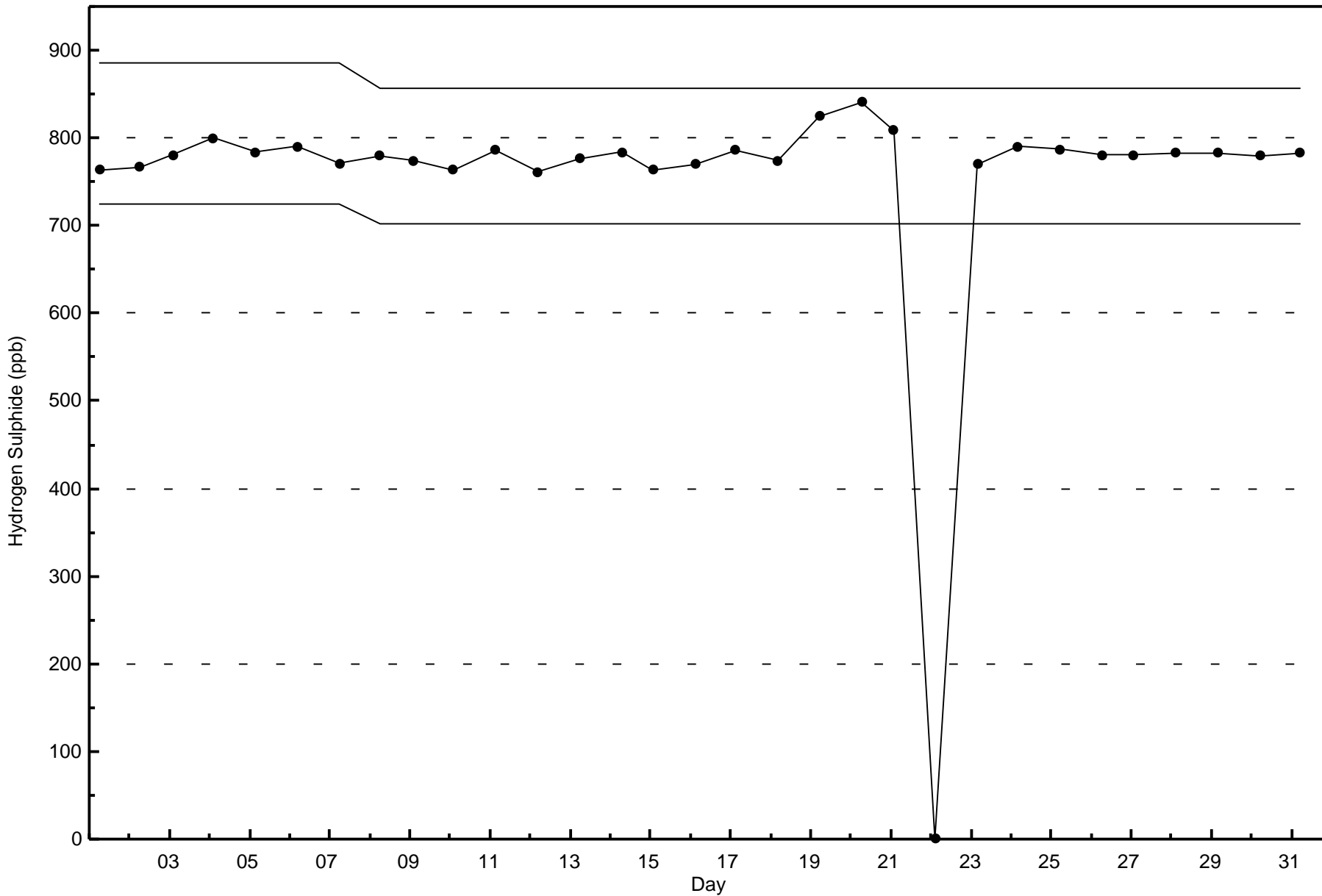
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Waskow ohci Pimatisiwin (AMS 25)



Total Number of Valid Hours: 648





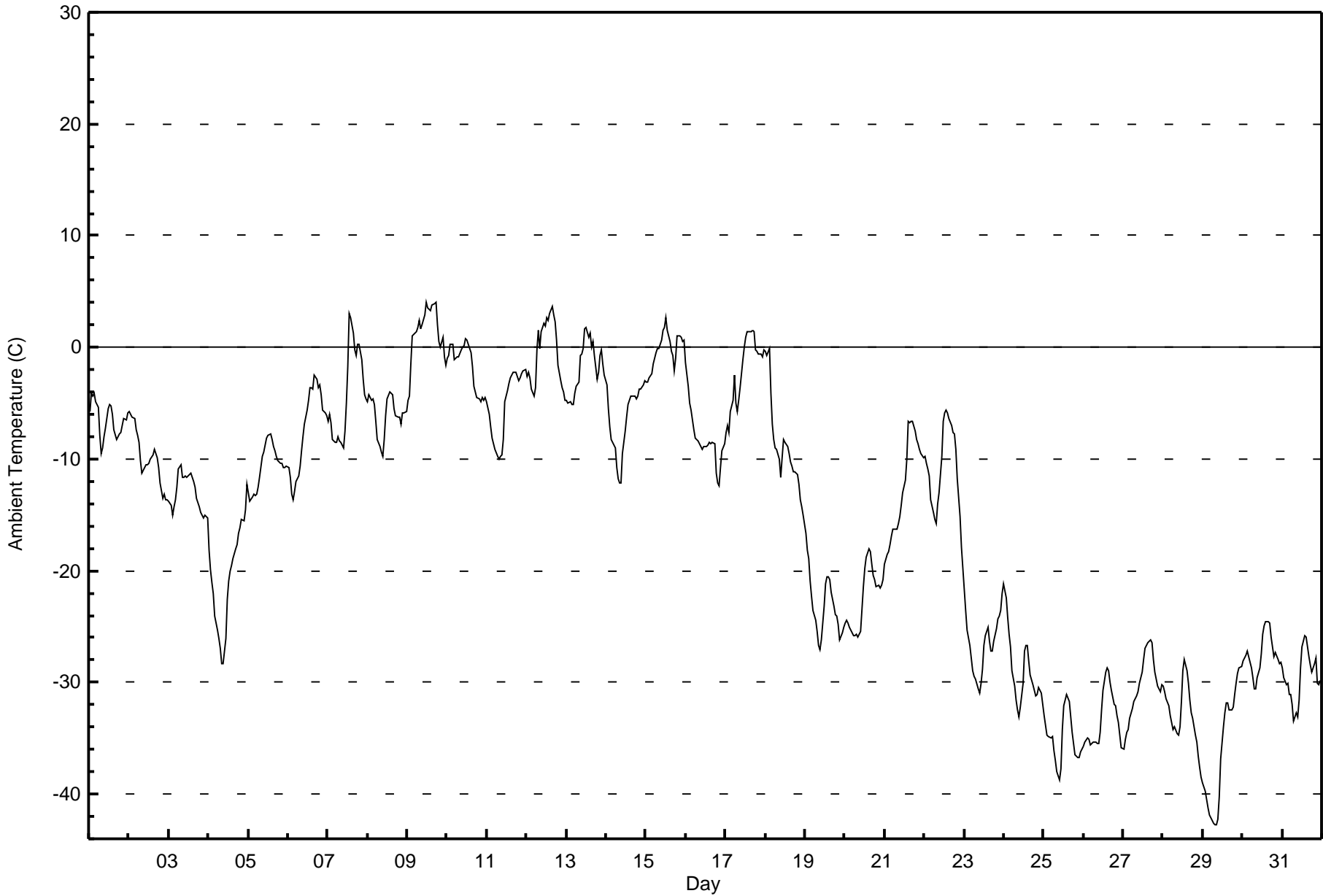


Maximum Value: 4.1 C on Dec 9 12:00		Maximum Daily Average: 1.3 C on Dec 9		Hours in Service: 744																						
Minimum Value: -42.7 C on Dec 29 08:00		Minimum Daily Average: -36.1 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -12.2 C at hour 15		Minimum Diurnal Average: -17.2 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -14.89 C		Percentiles: P <sub>1</sub> = -40.5 P <sub>10</sub> = -32.5 Q <sub>1</sub> = -26.8 Median = -10.8 Q <sub>3</sub> = -4.7 P <sub>90</sub> = -0.2 P <sub>99</sub> = 3.2		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.7	-4.2	-4.4	-4.1	-4.9	-5.3	-7.9	-9.5	-9.0	-8.0	-7.2	-5.5	-5.2	-5.3	-6.0	-7.4	-8.2	-8.1	-7.8	-7.6	-7.0	-6.4	-6.5	-5.8	-6.5	-4.1
2-Dec	-5.7	-5.9	-6.2	-6.3	-7.4	-7.8	-8.5	-10.2	-11.2	-10.8	-10.5	-10.5	-10.4	-10.0	-9.6	-9.2	-9.5	-9.8	-10.7	-12.1	-13.5	-13.2	-13.6	-13.6	-9.9	-5.7
3-Dec	-13.8	-14.1	-15.0	-14.3	-13.6	-12.5	-10.9	-10.6	-11.7	-11.6	-11.5	-11.6	-11.4	-11.3	-11.6	-12.0	-12.6	-13.6	-14.2	-14.8	-15.0	-15.2	-15.0	-15.2	-13.0	-10.6
4-Dec	-18.1	-19.9	-21.0	-22.1	-24.0	-25.4	-26.1	-26.9	-28.4	-28.3	-26.1	-22.5	-20.9	-20.1	-19.6	-18.9	-18.1	-17.7	-16.7	-16.1	-15.5	-15.6	-14.6	-12.3	-20.6	-12.3
5-Dec	-13.1	-13.7	-13.4	-13.2	-13.2	-13.2	-12.5	-11.7	-9.7	-9.4	-8.8	-8.2	-7.9	-7.7	-8.3	-8.9	-9.2	-9.7	-10.1	-10.4	-10.4	-10.8	-10.7	-10.7	-10.6	-7.7
6-Dec	-10.7	-11.7	-13.2	-13.6	-12.9	-12.0	-11.5	-10.6	-9.2	-8.0	-6.9	-5.7	-4.8	-3.6	-3.6	-3.8	-2.5	-2.9	-3.6	-3.3	-4.3	-5.7	-5.9	-6.1	-7.3	-2.5
7-Dec	-6.6	-6.0	-6.7	-8.2	-8.5	-8.5	-8.0	-8.4	-8.4	-9.0	-7.5	-5.0	-1.7	3.0	2.6	1.3	-0.3	-0.7	0.3	0.2	-1.1	-2.8	-4.2	-4.6	-4.1	3.0
8-Dec	-4.9	-4.2	-4.7	-4.6	-5.1	-6.7	-8.2	-8.9	-9.4	-9.7	-8.2	-6.1	-4.6	-4.0	-4.1	-4.2	-5.5	-6.1	-6.3	-6.3	-6.9	-5.9	-5.9	-5.7	-6.1	-4.0
9-Dec	-4.8	-4.4	-1.5	1.0	1.2	1.4	1.8	2.4	1.7	2.0	2.9	4.1	3.6	3.4	3.3	3.8	3.9	4.0	2.1	0.6	0.1	1.0	-0.9	-1.6	1.3	4.1
10-Dec	-0.9	-0.7	0.2	0.3	-1.1	-0.9	-0.9	-0.8	-0.2	0.0	0.2	0.8	0.6	0.3	-0.5	-1.7	-3.5	-4.0	-4.4	-4.6	-4.9	-4.5	-4.7	-4.4	-1.7	0.8
11-Dec	-4.8	-6.0	-7.1	-8.1	-8.6	-9.2	-9.8	-10.1	-9.7	-9.7	-8.3	-4.9	-3.9	-3.3	-2.8	-2.4	-2.3	-2.3	-2.6	-3.0	-2.8	-2.4	-2.1	-1.9	-5.3	-1.9
12-Dec	-2.7	-2.3	-2.7	-3.7	-4.3	-3.6	-0.2	1.5	-0.2	1.3	2.2	2.0	2.7	2.4	3.0	3.6	2.9	2.2	0.7	-1.6	-3.0	-3.6	-4.0	-4.7	-0.5	3.6
13-Dec	-4.8	-4.9	-4.8	-5.2	-5.1	-4.2	-3.5	-3.2	-0.8	-0.6	-0.1	1.6	1.7	0.8	1.3	0.0	0.6	-0.7	-2.9	-2.2	-0.7	-0.2	-1.4	-2.4	-1.7	1.7
14-Dec	-3.3	-5.4	-7.1	-8.3	-8.5	-9.0	-10.7	-11.8	-12.2	-12.1	-9.6	-7.6	-6.2	-5.1	-4.8	-4.3	-4.3	-4.4	-4.7	-4.3	-3.7	-3.7	-3.4	-3.0	-6.6	-3.0
15-Dec	-3.1	-3.1	-2.8	-2.4	-1.5	-1.0	-0.5	-0.1	0.0	0.6	1.5	1.8	2.7	1.6	0.6	-0.4	-0.8	-2.2	-1.0	1.0	1.1	1.0	0.5	0.7	-0.2	2.7
16-Dec	-1.4	-3.5	-4.9	-5.6	-6.6	-7.4	-8.1	-8.4	-8.6	-8.9	-9.1	-8.9	-8.9	-8.8	-8.5	-8.7	-8.5	-8.6	-11.3	-12.2	-12.4	-10.8	-9.2	-8.6	-8.2	-1.4
17-Dec	-7.6	-7.0	-7.7	-5.8	-4.7	-2.5	-5.0	-5.7	-4.7	-3.7	-1.2	0.0	0.8	1.4	1.4	1.4	1.6	1.4	-0.2	-0.3	-0.6	-0.6	-0.8	-0.2	-2.1	1.6
18-Dec	-0.3	-0.8	-0.1	-4.1	-6.9	-8.3	-9.0	-9.1	-10.0	-11.7	-9.9	-8.2	-8.5	-8.9	-9.4	-10.3	-10.7	-11.2	-11.1	-11.3	-12.2	-13.7	-14.3	-15.1	-9.0	-0.1
19-Dec	-16.6	-18.2	-19.0	-21.0	-22.3	-23.5	-24.5	-25.5	-26.6	-27.1	-26.2	-23.1	-21.2	-20.5	-20.6	-20.8	-22.0	-23.1	-24.0	-24.1	-24.8	-26.2	-25.6	-25.1	-23.0	-16.6
20-Dec	-24.7	-24.4	-24.6	-25.1	-25.6	-25.8	-25.9	-25.7	-25.9	-25.5	-23.5	-21.4	-19.8	-18.7	-18.0	-18.3	-19.4	-20.4	-20.8	-21.4	-21.3	-21.6	-21.3	-20.8	-22.5	-18.0
21-Dec	-19.5	-18.5	-18.3	-17.6	-17.0	-16.3	-16.3	-16.2	-15.8	-15.2	-14.2	-13.0	-11.8	-10.0	-6.7	-6.8	-6.6	-6.7	-7.5	-8.3	-8.6	-9.2	-9.5	-9.9	-12.5	-6.6
22-Dec	-9.7	-10.3	-10.9	-11.5	-13.7	-14.8	-15.4	-15.8	-14.1	-13.0	-9.8	-6.6	-5.9	-5.6	-5.9	-6.4	-7.0	-7.6	-7.7	-9.2	-11.8	-15.2	-17.9	-19.9	-11.1	-5.6
23-Dec	-21.7	-23.5	-25.3	-26.6	-27.9	-28.9	-29.4	-29.7	-30.6	-30.9	-30.1	-28.8	-26.6	-25.8	-25.0	-26.3	-27.2	-27.2	-26.3	-25.1	-24.4	-24.1	-23.6	-22.1	-26.6	-21.7
24-Dec	-21.1	-22.5	-24.2	-25.8	-26.8	-28.9	-30.3	-31.6	-32.5	-33.0	-32.3	-30.0	-27.3	-26.7	-26.7	-28.1	-29.4	-30.2	-30.7	-31.2	-31.1	-30.5	-30.9	-31.9	-28.9	-21.1
25-Dec	-32.9	-33.9	-34.7	-34.9	-35.0	-34.8	-36.0	-37.0	-38.0	-38.7	-37.8	-34.2	-32.1	-31.6	-31.0	-31.6	-33.1	-34.4	-35.5	-36.5	-36.7	-36.7	-36.3	-36.0	-35.0	-31.0
26-Dec	-35.7	-35.3	-35.0	-35.1	-35.6	-35.5	-35.4	-35.3	-35.4	-35.4	-34.5	-32.5	-30.7	-29.0	-28.7	-29.0	-30.0	-30.8	-32.0	-32.1	-33.0	-33.6	-34.8	-35.9	-33.3	-28.7
27-Dec	-36.0	-35.1	-34.4	-34.2	-33.2	-32.4	-31.7	-31.4	-31.2	-30.9	-30.1	-29.1	-28.0	-27.0	-26.6	-26.4	-26.2	-26.4	-27.9	-29.1	-29.7	-30.3	-30.8	-30.2	-30.3	-26.2
28-Dec	-30.3	-30.9	-31.4	-32.1	-32.9	-33.5	-34.2	-33.9	-34.6	-34.7	-33.9	-31.7	-28.9	-28.0	-28.9	-30.0	-31.6	-32.7	-33.3	-34.7	-35.4	-36.6	-37.6	-38.5	-32.9	-28.0
29-Dec	-39.0	-39.7	-40.5	-41.2	-41.9	-42.2	-42.7	-42.7	-42.7	-42.2	-40.3	-36.9	-33.9	-32.7	-31.8	-31.9	-32.5	-32.5	-32.2	-31.0	-30.0	-29.2	-28.7	-28.6	-36.1	-28.6
30-Dec	-28.1	-27.8	-27.6	-27.3	-28.2	-28.7	-29.6	-30.6	-30.5	-29.6	-28.7	-27.5	-25.7	-25.0	-24.6	-24.5	-24.7	-26.0	-26.8	-27.6	-27.3	-28.0	-28.3	-28.1	-27.5	-24.5
31-Dec	-28.7	-29.6	-30.2	-30.1	-31.1	-31.1	-32.0	-33.5	-32.7	-33.1	-31.6	-28.7	-26.9	-25.8	-25.9	-26.8	-27.7	-28.4	-29.1	-28.3	-27.9	-30.1	-30.2	-29.8	-29.6	-25.8
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Waskow ohci Pimatisiwin - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Waskow ohci Pimatisiwin - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	268	36.02	36.02
-20 - 0	412	55.38	91.40
0 - 10	64	8.60	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) - %**

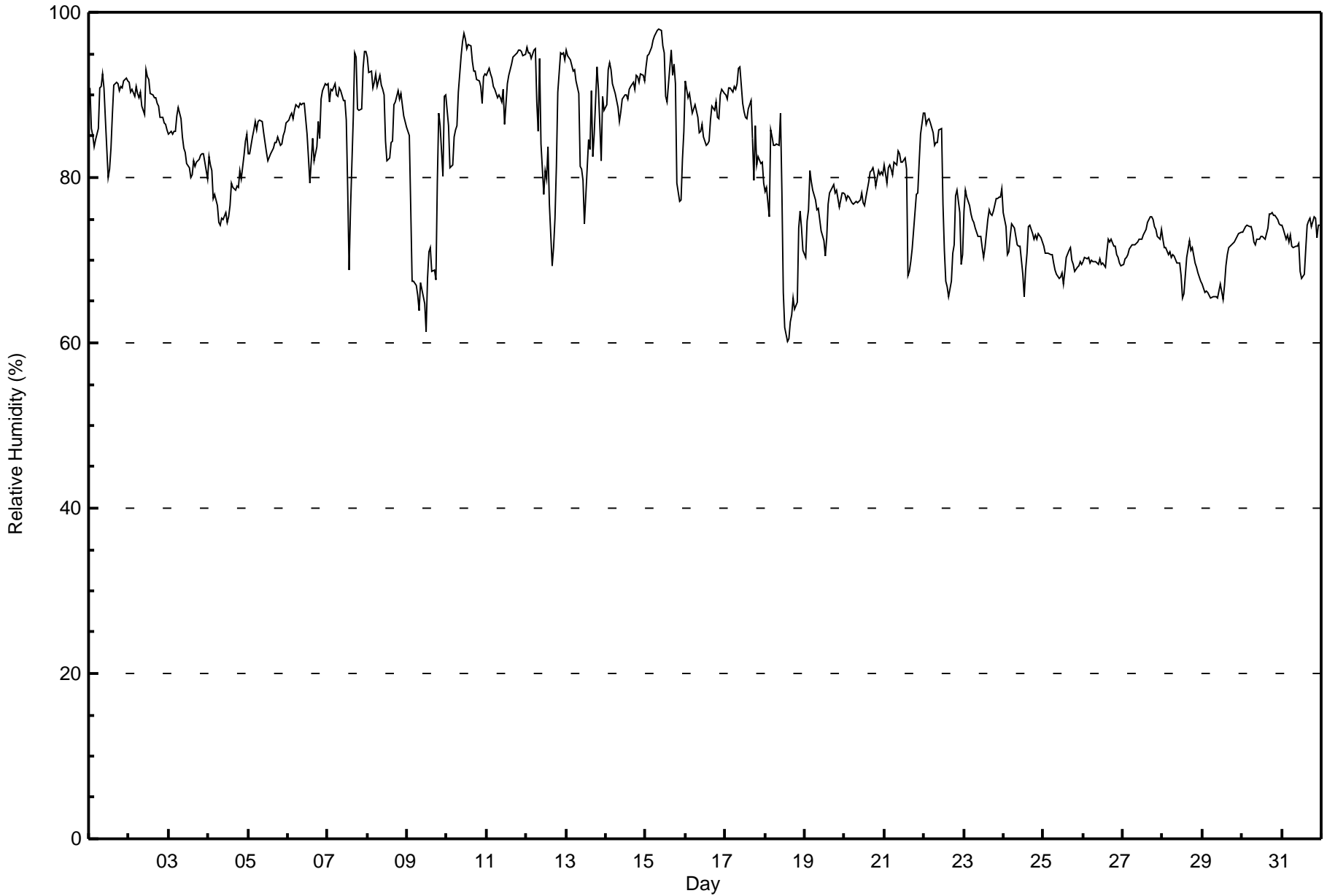
**Waskow ohci Pimatisiwin - December 2017**

Maximum Value: 98 % on Dec 15 09:00																			Maximum Daily Average: 92.4 % on Dec 11						Hours in Service: 744																				
Minimum Value: 60 % on Dec 18 14:00																			Minimum Daily Average: 68.5 % on Dec 29						Hours of Data: 744																				
Maximum Diurnal Average: 83.0 % at hour 1																			Minimum Diurnal Average: 77.3 % at hour 13						Hours of Missing Data: 0																				
Monthly Average: 81.0 %																			Percentiles: P <sub>1</sub> = 64 P <sub>10</sub> = 70 Q <sub>1</sub> = 73 Median = 81 O <sub>3</sub> = 89 P <sub>90</sub> = 92 P <sub>99</sub> = 96						Hours of Calibration: 0																				
																									Percent Operational Time: 100.0																				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																					
1-Dec	91	86	85	84	85	86	91	91	93	91	87	80	81	84	88	91	92	91	91	91	92	92	92	88.4	93																				
2-Dec	92	90	91	90	91	90	90	90	89	88	93	92	92	90	90	90	90	89	89	87	87	87	86	86	89.5	93																			
3-Dec	85	86	85	86	86	87	89	87	85	84	83	82	81	80	80	82	81	82	82	83	83	83	82	80	83.4	89																			
4-Dec	83	82	81	78	78	77	75	74	75	75	76	75	77	79	79	78	79	79	81	80	83	84	85	78.6	85																				
5-Dec	83	83	85	86	87	86	87	87	87	85	84	83	82	83	83	83	84	84	85	84	84	85	86	87	84.7	87																			
6-Dec	87	88	88	87	88	89	88	89	89	89	89	85	82	79	82	85	82	84	87	85	89	91	91	91	86.8	91																			
7-Dec	91	89	91	90	91	90	90	91	91	89	89	87	79	69	76	87	95	95	88	88	88	93	95	95	88.7	95																			
8-Dec	95	93	93	91	92	93	91	92	91	91	90	84	82	82	84	84	89	89	90	90	90	89	88	86	89.1	95																			
9-Dec	86	85	76	68	67	67	66	64	67	66	65	61	68	71	71	69	69	68	79	88	86	80	90	90	73.7	90																			
10-Dec	88	86	81	82	85	86	86	90	95	96	98	97	96	96	96	94	93	93	92	92	91	89	92	92	91.1	98																			
11-Dec	92	93	93	92	91	91	90	90	90	89	91	86	91	92	93	94	95	95	95	95	95	95	95	95	92.4	95																			
12-Dec	96	95	95	94	95	96	89	86	94	84	78	81	80	84	77	69	71	75	81	90	95	95	95	94	87.1	96																			
13-Dec	95	95	94	94	93	93	92	90	81	81	80	74	78	85	83	91	83	85	93	91	87	82	90	88	87.4	95																			
14-Dec	89	93	94	93	91	90	89	88	87	88	89	90	90	90	91	91	92	91	92	92	91	93	92	92	90.8	94																			
15-Dec	93	95	95	96	97	97	98	98	98	98	96	95	90	89	93	95	92	94	91	79	77	77	82	86	91.7	98																			
16-Dec	92	90	90	89	88	88	89	87	85	86	86	85	84	84	84	87	89	88	89	87	87	90	91	90	87.7	92																			
17-Dec	90	90	91	91	90	91	91	91	93	93	89	88	87	87	88	89	85	80	86	81	83	82	82	79	87.4	93																			
18-Dec	78	79	75	86	85	84	84	84	84	88	78	66	62	60	60	63	63	65	64	65	74	76	74	71	73.7	88																			
19-Dec	70	75	76	81	80	78	77	76	76	75	74	72	71	73	77	78	78	79	78	79	77	76	78	78	76.4	81																			
20-Dec	78	77	78	78	77	77	77	77	77	77	78	77	77	78	79	81	81	81	80	79	81	80	81	80	78.6	81																			
21-Dec	82	79	81	81	81	80	82	82	83	83	82	82	82	81	68	69	70	71	76	78	78	82	85	88	79.4	88																			
22-Dec	88	86	87	87	87	85	84	84	84	86	86	77	71	67	67	66	67	71	72	78	78	76	70	71	78.1	88																			
23-Dec	76	79	78	77	76	75	75	74	73	73	73	72	70	71	75	76	76	75	76	77	77	78	78	79	75.3	79																			
24-Dec	76	74	71	71	73	74	74	73	72	72	68	66	69	71	74	74	73	73	73	73	73	73	72	72	72.2	76																			
25-Dec	72	71	71	71	71	71	70	69	68	68	68	68	67	69	70	71	71	70	69	69	69	69	70	70	69.6	72																			
26-Dec	70	70	70	70	70	70	70	70	70	70	69	70	69	71	72	72	73	72	72	71	70	70	69	70.4	73																				
27-Dec	69	70	70	71	71	72	72	72	72	72	73	73	73	73	74	75	75	75	75	74	74	73	73	74	72.7	75																			
28-Dec	73	72	71	71	71	70	71	70	70	70	68	65	66	70	71	72	71	71	70	69	68	68	67	69.9	73																				
29-Dec	67	66	66	66	66	65	66	66	66	65	66	67	65	67	69	71	71	72	72	72	73	73	73	73	68.5	73																			
30-Dec	73	74	74	74	74	74	73	72	72	73	73	73	73	73	73	74	76	76	76	75	75	74	74	73.9	76																				
31-Dec	74	74	73	73	72	73	72	72	72	72	69	68	68	71	74	75	75	74	75	75	73	74	74	72.6	75																				
																			83.0	82.7	82.2	82.1	82.2	82.1	81.7	81.5	81.5	81.1	80.5	78.3	77.3	77.6	78.6	79.8	80.1	80.3	81.3	81.3	81.6	81.5	82.3	82.2	Diurnal Average		
																			96	95	95	96	97	97	98	98	98	98	98	97	96	96	96	95	95	95	95	95	95	95	95	95	95	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Waskow ohci Pimatisiwin - December 2017**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Waskow ohci Pimatisiwin - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	0	0.00	0.00
60 - 80	348	46.77	46.77
80 - 100	396	53.23	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

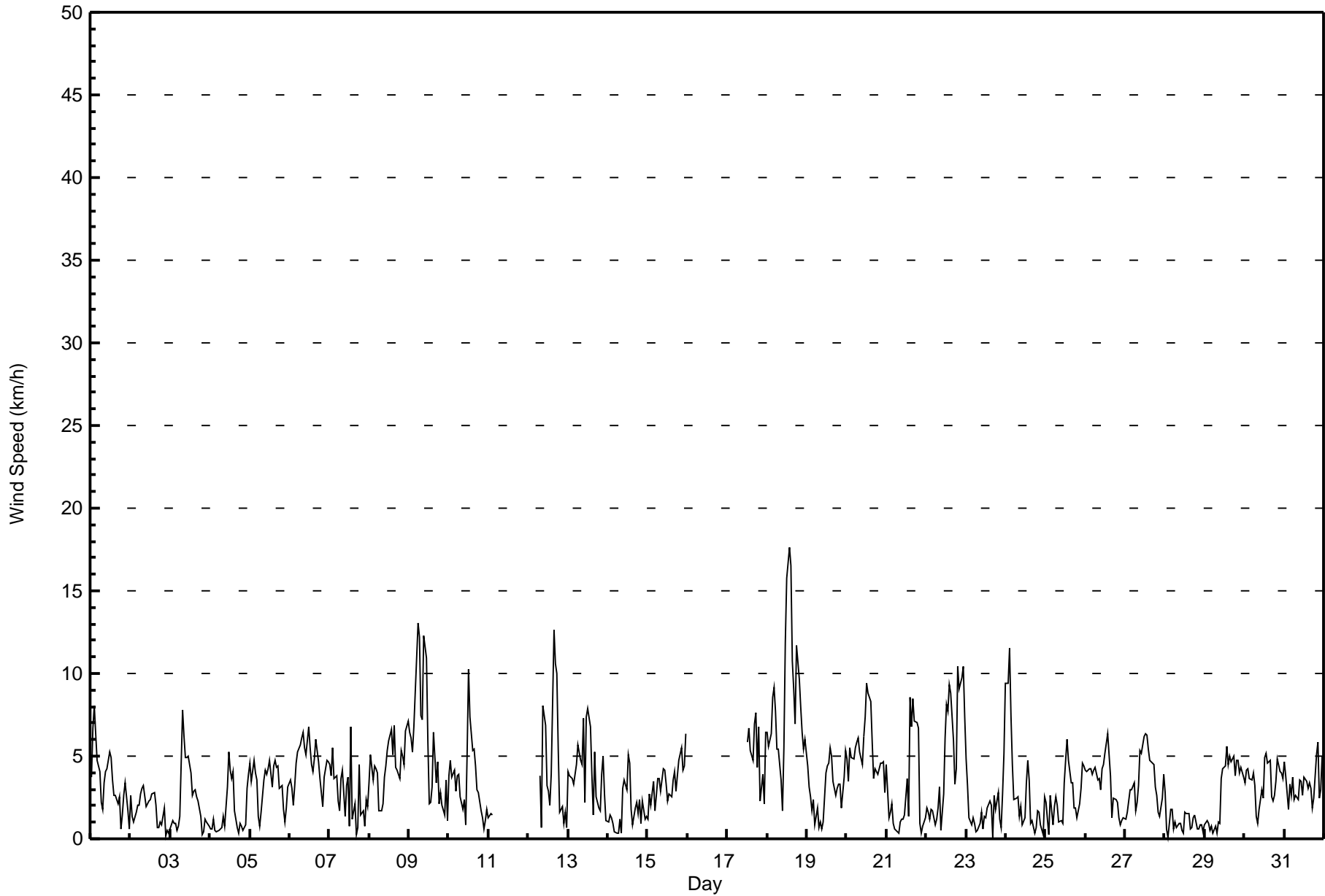


Maximum Speed: 18 km/h on Dec 18 14:00	Maximum Daily Speed Average: 6.8 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 23 17:00	Minimum Daily Speed Average: 0.3 km/h on Dec 28	Hours of Data: 680
Maximum Diurnal Speed Average: 1.5 km/h at hour 11	Minimum Diurnal Speed Average: 0.6 km/h at hour 21	Hours of Missing Data: 64
Monthly Average Velocity: 1.1 km/h 203.1 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 5 P <sub>90</sub> = 7 P <sub>99</sub> = 12	Percent Operational Time: 91.4

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SSW4	SW7	SW8	WSW6	SW5	SSW4	SSE2	SSE2	S3	SSE4	SSE4	SSE5	SSE5	SSE4	S3	S3	SSE2	S3	S1	SSW1	S3	S3	SSE2	NE1	SSW2.9	SW8	
2-Dec	NNW3	NNE1	WNW1	NW2	NNW2	NNW2	NNW3	N3	N3	N2	N2	N2	SSE2	SE3	SSE3	S2	SSE1	WNW1	WSW1	NW1	WSW2	WSW0	WSW1	WNW0	NNW0.7	N3	
3-Dec	NNW1	SSW1	NW1	SSW1	S1	SSW1	NNW1	NNW8	NNW6	N5	N5	N5	NNE4	NNE3	NNE3	N3	NE3	ENE2	ENE1	W0	ESE0	WNW1	NE1	NE1	N1.8	NNW8	
4-Dec	NNW1	WNW1	S1	W1	WSW0	SSW0	WSW1	SW1	SSW1	S1	SSE3	SSE5	SSE4	SSE4	SSE4	S2	SSE1	E0	NW1	SW1	NNE0	SE1	SSE3	SSW4	S1.3	SSE5	
5-Dec	WSW5	SW3	S5	SSE4	SSE4	SSW1	W1	N2	N4	N4	NNW4	NNW4	N5	NE3	NE4	NNE5	NE4	NE4	NE3	NE3	ENE2	SE1	S2	SSE3	NNE1.0	NNE5	
6-Dec	SSE4	SSE3	S2	SSE3	SSE5	SSE5	SSE6	SSE6	SSE6	S6	SSE5	SSE7	SSE6	SSE5	SSE4	SSE5	SSW6	SSW5	SW4	W3	SSW2	SSE4	S5	S5	S4.2	SSE7	
7-Dec	S4	S4	SSE5	SSE4	SE4	SE2	SE2	SSE4	SSE4	ESE1	SSE3	SSE4	S1	WNW7	W1	NW2	S0	SSW1	W4	WSW1	NNW2	WSW1	SW2	SSW2	S1.6	WNW7	
8-Dec	SSE3	SSE5	SSE4	SSE4	SSE4	SSE4	SE2	SW2	SSE2	S4	SSE4	SSE5	SSE6	SSE7	SSE5	SSE7	SSE4	SSE4	S4	SSE5	S5	S5	SSE7	SSE7	SSE4.4	SSE7	
9-Dec	S6	SSE6	W5	W7	W9	W13	W12	W7	WSW7	W12	WSW11	WSW6	SE2	SW2	WSW3	WSW6	SSW3	SSW5	SE2	SSE3	NNE2	WNW1	SSE4	SW1	WSW4.3	W13	
10-Dec	SSE4	WSW5	SW4	W4	SSE3	SSE4	SSE4	SSE3	SSE2	SSE2	NE1	NW5	NW10	NNW7	NNE5	NNE5	NE4	NE3	NNE3	ENE2	ESE1	E1	SE1	SSE2	N0.4	NNW10	
11-Dec	NW1	SSW1	SSE1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	SSW1	
12-Dec	AF	AF	AF	AF	AF	AF	AF	AF	WNW4	NW1	W8	WNW7	NW3	W3	SSW2	WNW4	WNW13	WNW11	NW10	WNW5	W2	SSW2	SSE1	S2	SE1	----	WNW13
13-Dec	S4	SSE4	SSE4	SSE3	SSE4	SSE4	SSE6	SW5	WNW5	W7	W2	NW7	NNW8	NNW7	NNW4	SW1	WNW5	WNW3	SSW2	W2	WNW4	WNW5	E3	E1	W1.6	NNW8	
14-Dec	S1	SSW1	S1	S1	SSW0	SSW0	SSE0	SW1	SSW0	SSE3	SSE4	SE3	SSE5	SSE5	S2	WNW1	NW2	NW2	SSE2	SW2	WSW1	S2	SSE1	NNE1	S1.2	SSE5	
15-Dec	NW1	S3	SE2	SSE3	S2	SSE3	S4	SSW4	SSE3	SW4	S4	WSW3	WSW2	W3	S3	S4	S4	SSW3	SSW4	SW5	W5	W4	W4	WSW6	SSW2.4	WSW6	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	----	
18-Dec	WNW6	W6	WNW6	NNE9	NNE9	NNE8	NE5	N5	N4	SW2	NW6	NW12	NW16	NW18	NW17	NW11	NW9	WNW7	NW12	WNW10	N8	N6	N5	NNE6	NW6.8	NW18	
19-Dec	NNE4	NNW3	NNW3	W2	W2	WSW1	W2	WSW1	WSW1	SW1	SSE1	SSE4	SSE4	SSE5	SSE5	SSE5	SSE3	S3	SSE3	S3	S3	S2	SSE4	S5	S1.7	SSE5	
20-Dec	SSE5	SSE4	SSE6	SSE5	SSE5	SSE5	SSE6	SSE6	S5	SSE4	SSE6	SSE7	SSE9	SSE9	SSE8	SSE6	SE4	SSE4	SSE4	SSE4	SSE5	S5	S5	S3	SSE5.3	SSE9	
21-Dec	SSE4	SSE1	SSE2	SSE2	SSE1	NW1	SE0	W0	S1	SE1	ESE1	SE1	SSE4	WSW1	NW9	WNW7	WNW8	WNW7	WNW7	WNW7	NW1	SW0	SSW1	E1	W1.4	NW9	
22-Dec	ESE2	E2	N1	SSW2	W2	S1	S1	SE2	SW3	SSE1	W3	WNW6	WNW8	WNW8	WNW9	WNW9	WNW6	WNW3	NW4	N10	NNE9	NNE10	N10	NNW7	NW3.1	N10	
23-Dec	N5	NW3	W1	SW1	W1	SW1	WSW0	NNW0	WNW1	NNW2	NE1	E1	N1	SE2	NNW2	SW2	SSW0	SSE3	SSE2	SSE3	SE1	NE1	N3	NNE5	NNW0.4	NNE5	
24-Dec	NNE9	NNE9	N12	N7	NNW5	W2	W2	W3	W1	WSW2	WSW1	ESE1	SSE3	SSE5	SSE4	SSW1	SSW1	W0	WSW1	W2	NW2	WSW1	W0	WNW3	N1.2	NNE12	
25-Dec	NW2	NNW1	NNW0	NW3	NW1	WNW2	W3	WNW2	WSW1	SW1	SSE1	SSE3	SSE5	SSE6	SSE5	SSE3	SSE3	SSE2	SSE2	S1	S2	S3	S5	SSE4	S1.6	SSE6	
26-Dec	SSE4	S4	S4	S4	SSE4	S4	SSE4	S4	S4	S3	SSE4	SSE4	SSE5	SSE6	SSE5	SSE4	S1	SSE2	SSE2	SSW2	SW1	WSW1	W1	SW1	S3.2	SSE6	
27-Dec	SSW1	SSE2	SSE2	SSE3	SSE3	SSE3	SSE2	S2	SSE3	SSE5	SSE5	SSE6	SSE6	SSE6	SSE5	SSE5	S5	S5	SSE3	S3	S2	S1	SSE2	S4	SSE3.5	SSE6	
28-Dec	S3	SE1	SE0	NNW2	W2	WSW1	W1	NNW1	W1	S1	SSW0	ESE0	SE2	NE2	NE2	SW1	SW1	NW1	WNW1	W1	WNW1	W1	WSW1	W0	W0.3	S3	
29-Dec	WSW1	WNW1	WSW1	SSW1	SW1	SW0	SSW1	SSW0	SSW1	SE1	SSE4	SSE4	SSE4	SSE6	SSE5	SSE5	SSE5	SSE5	S4	S5	S5	SSE4	SSE4	SSE4	SSE2.7	SSE6	
30-Dec	SSE3	SSE4	SSE4	SSE4	SSE4	SSE4	SSE3	S1	SSE1	S2	S3	SSE2	SSE5	SSE5	SSE5	SSE5	SE3	S2	SSE3	SSE3	SSE5	SSE4	SSE4	SSE4	SSE3.4	SSE5	
31-Dec	SSE5	SSE4	SSE2	SSE3	SSE3	SSE4	S2	SSW3	S2	S4	S3	S3	SSE4	SSE3	SSE3	SSE3	S3	SW2	S2	S5	S6	SSW2	S3	S5	S3.2	S6	

S1.1SSW1.4SSW1.2SSW1.0SSW1.2	S1.5SSW1.3	SW0.9SSW1.0	SW1.4SSW1.5SSW1.3	S1.5	S1.5SSW1.0	SW1.4WSW1.1	SW1.1WSW1.1	SW1.2SSW0.6SSW0.7	S1.1	S1.1	Diurnal Average											
NNE9	NNE9	NNE12	NNE9	NNE9	W13	W12	NNW8	WSW7	W12WSW11	NW12	NW16	NW18	NW17WNW13WNW11	NW10	NW12	N10	NNE9	NNE10	N10	NNW7	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**  
**Waskow ohci Pimatisiwin - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	575	84.56	84.56
6 - 11	95	13.97	98.53
12 - 19	10	1.47	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: 680

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Waskow ohci Pimatisiwin - December 2017**

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	18	15	17	5	7	7	25	185	87	39	30	33	40	24	22	21	575
6 - 11	5	8	0	0	0	0	0	27	3	1	2	8	7	21	6	7	95
12 - 19	0	1	0	0	0	0	0	0	0	0	0	0	3	1	5	0	10
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
<b>Totals</b>	23	24	17	5	7	7	25	212	90	40	32	41	50	46	33	28	680

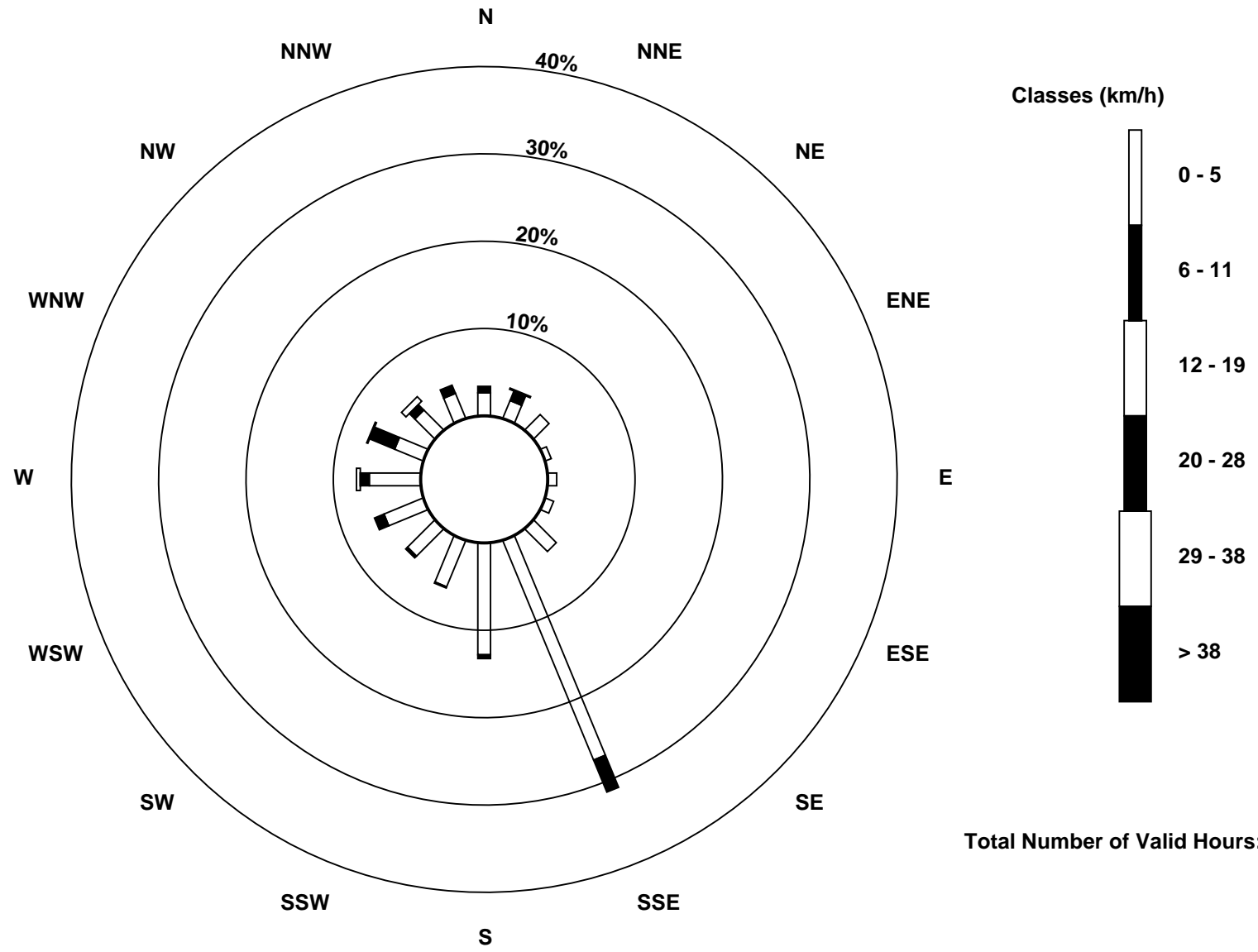
Total Number of Valid Hours: 680

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Waskow ohci Pimatisiwin (AMS 25)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**

**Waskow ohci Pimatisiwin - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 9 11:00 Minimum Value: 0 km/h on Dec 28 05:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5																	Hours in Service: 744 Hours of Data: 680 Hours of Missing Data: 64 Hours of Calibration: 0 Percent Operational Time: 91.4									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	
2-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3-Dec	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
4-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5-Dec	2	1	2	1	1	1	1	2	1	2	2	1	1	1	2	2	2	2	2	2	1	1	1	1	2	
6-Dec	1	1	1	1	1	1	1	2	2	2	1	3	2	1	1	1	3	2	1	1	1	1	1	1	3	
7-Dec	2	1	1	1	1	1	1	1	1	1	1	2	2	3	1	1	1	1	1	1	1	1	1	1	3	
8-Dec	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	2	1	1	2	3	3	
9-Dec	2	1	4	3	4	5	5	4	3	5	6	3	1	1	3	3	2	2	1	1	2	2	1	2	6	
10-Dec	1	2	2	2	1	1	1	1	1	1	1	3	3	2	2	2	2	1	1	1	1	1	1	1	3	
11-Dec	1	1	1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1	
12-Dec	AF	AF	AF	AF	AF	AF	AF	3	1	3	3	2	1	2	2	3	2	2	2	1	1	1	1	1	3	
13-Dec	1	1	1	1	2	2	1	3	2	3	3	4	3	2	2	1	3	2	1	1	1	1	1	1	4	
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	2	
15-Dec	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	2	1	3	3	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	2	3	2	2	3	3	2	2	2	2	1	2	3	
18-Dec	2	2	3	3	3	3	2	2	2	1	5	4	5	5	5	4	3	2	3	3	4	2	2	2	5	
19-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
20-Dec	1	1	1	1	1	1	2	1	1	1	2	2	3	3	2	2	1	1	1	1	1	1	1	1	3	
21-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	2	3	3	2	2	1	1	1	1	3	
22-Dec	1	1	1	1	1	1	1	1	1	1	2	2	3	2	3	3	3	1	1	3	4	4	4	2	4	
23-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	
24-Dec	4	4	4	3	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	4	
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1	1	0	1	1	1	2	
27-Dec	1	1	1	1	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	0	1	1	2	
28-Dec	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
29-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	
30-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	
31-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	
																	Diurnal Maximum									
																	4 4 4 3 4 5 5 4 3 5 6 4 5 5 5 4 3 3 3 3 4 4 4 3									
AF - Analyzer Failure																										

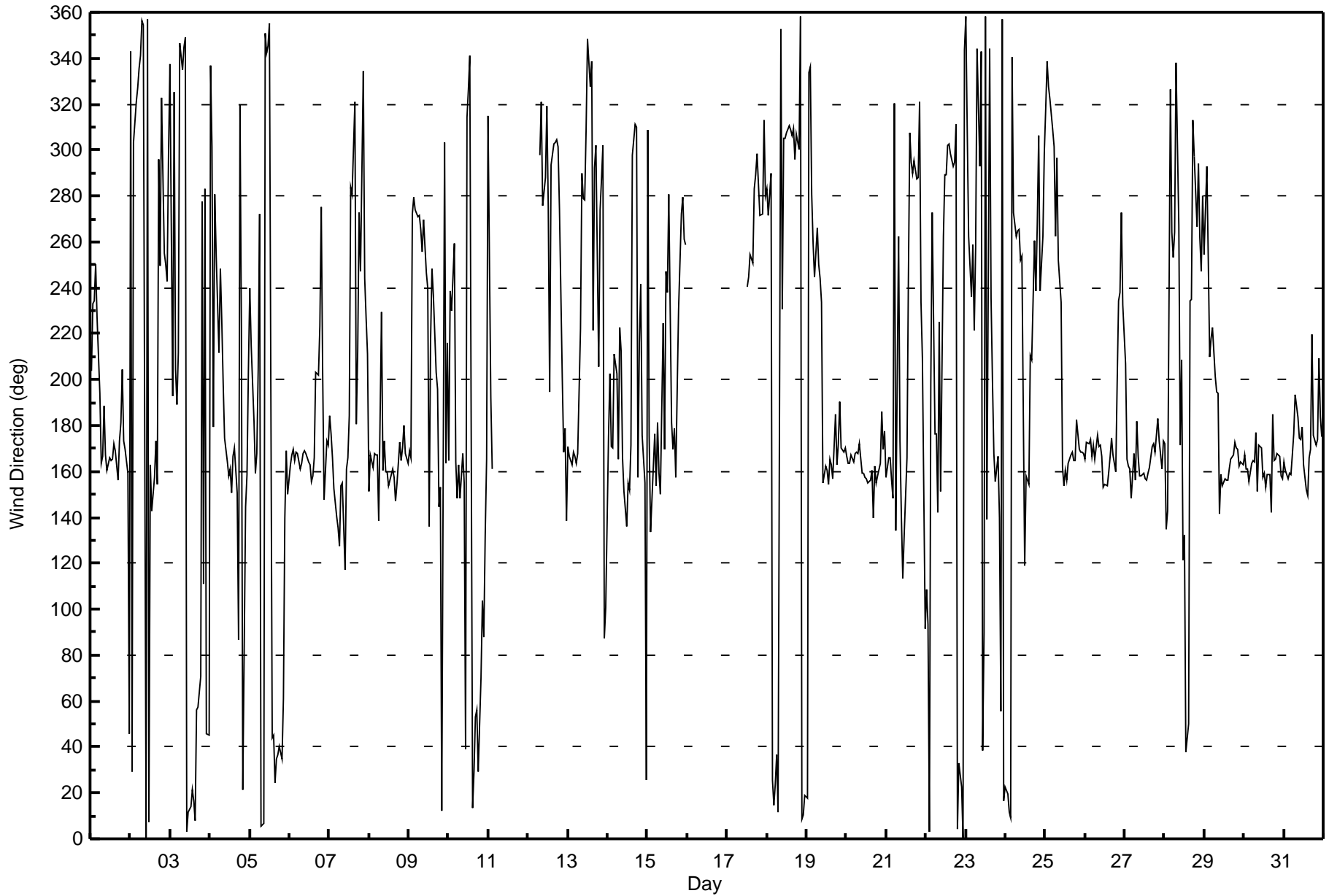


**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Waskow ohci Pimatisiwin - December 2017**

Direction of Maximum Speed: 311 deg on Dec 18 14:00																							Hours in Service: 744			
Direction of Maximum Daily Speed Average: 324.5 deg on Dec 18																							Hours of Data: 680			
Direction of Minimum Speed: 200 deg on Dec 23 17:00											Direction of Minimum Daily Speed Average: 0.3 deg on Dec 28												Hours of Missing Data: 64			
Monthly Average Direction: 223.2 deg																							Percent Operational Time: 91.4			
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-Dec	204	233	234	250	227	194	164	166	188	167	160	166	165	166	172	169	156	173	181	204	173	170	159	46	191.7	
2-Dec	343	29	303	321	327	336	341	356	355	1	357	8	163	143	158	173	155	296	249	323	255	250	243	298	337.7	
3-Dec	337	193	325	205	189	212	347	335	345	349	3	11	14	21	17	8	56	58	70	277	111	283	46	45	2.5	
4-Dec	337	302	180	281	255	212	248	226	198	174	164	158	161	151	166	170	151	87	320	222	21	144	159	204	173.2	
5-Dec	240	215	182	159	168	204	272	6	7	351	342	345	355	44	45	24	35	37	40	35	61	140	169	150	30.2	
6-Dec	163	167	169	165	168	168	161	163	168	169	168	164	163	156	158	166	203	202	223	275	203	148	173	171	172.5	
7-Dec	184	176	166	152	140	135	127	154	155	117	161	166	185	283	280	321	181	212	273	247	334	244	227	211	187.0	
8-Dec	151	167	162	168	167	167	138	230	160	173	160	160	154	159	161	158	147	154	173	165	170	180	168	164	163.4	
9-Dec	169	166	272	279	274	271	271	266	256	270	246	240	136	217	248	237	203	196	144	153	12	303	163	216	246.5	
10-Dec	165	239	230	260	164	148	163	148	168	155	39	314	326	341	13	29	53	56	30	70	103	88	132	166	8.7	
11-Dec	315	192	161	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
12-Dec	AF	AF	AF	AF	AF	AF	AF	298	321	276	288	319	275	195	294	303	303	304	302	274	201	168	179	138	--	
13-Dec	171	167	163	168	166	163	168	222	290	279	278	309	348	328	339	221	292	302	206	274	287	302	87	101	266.1	
14-Dec	175	203	171	170	211	202	165	223	212	166	152	136	155	152	171	298	311	310	157	216	241	176	155	25	172.7	
15-Dec	309	176	133	162	176	154	181	159	150	224	170	247	238	280	181	169	179	157	195	231	272	279	261	258	208.7	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	240	245	255	251	283	289	298	285	271	272	313	280	--
18-Dec	283	272	290	25	15	24	37	11	353	230	305	305	308	311	309	307	309	296	307	300	358	9	11	19	324.5	
19-Dec	18	334	336	281	259	245	266	250	244	234	155	162	160	154	165	163	157	185	163	172	190	170	168	170	177.0	
20-Dec	167	163	164	167	164	168	168	168	172	159	159	158	157	155	156	160	140	162	155	158	164	186	170	178	162.6	
21-Dec	157	166	166	156	148	320	134	262	173	140	114	132	166	244	308	295	290	296	287	288	321	234	209	92	271.8	
22-Dec	109	93	3	198	272	176	177	142	225	151	262	289	289	302	303	298	293	295	311	4	33	23	0	344	325.6	
23-Dec	358	308	263	236	259	221	257	344	293	343	38	90	358	139	344	236	200	168	156	166	140	55	357	16	340.3	
24-Dec	22	20	11	9	340	273	262	265	266	252	254	119	158	156	154	211	209	260	239	268	307	238	263	299	349.9	
25-Dec	318	339	328	322	309	301	262	296	252	234	161	154	160	156	163	167	168	165	165	183	169	169	169	168	180.0	
26-Dec	165	173	172	174	167	172	165	176	171	171	166	153	154	153	160	167	175	167	160	199	234	238	273	233	169.4	
27-Dec	207	165	162	161	148	168	156	182	167	158	158	159	157	156	159	162	171	172	168	176	183	173	161	173	164.0	
28-Dec	172	135	143	327	264	253	264	338	267	172	209	121	132	38	50	234	235	313	297	267	294	262	247	280	259.0	
29-Dec	255	293	253	210	218	223	202	195	194	141	159	154	157	156	156	161	165	167	172	170	170	162	164	163	166.9	
30-Dec	167	161	161	156	164	165	164	177	151	171	170	157	159	153	158	158	142	185	165	166	168	166	158	157	161.9	
31-Dec	164	160	157	159	159	167	177	193	184	175	174	179	163	152	150	166	170	220	176	172	174	209	184	175	171.5	
178.9	192.6	200.3	194.2	195.3	190.5	193.3	218.5	210.0	219.0	193.4	194.0	188.6	189.0	208.3	223.2	238.1	235.0	237.8	232.5	199.4	199.9	170.0	187.5			
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**  
**Waskow ohci Pimatisiwin - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Dec 7 17:00 Minimum Value: 12 deg on Dec 25 17:00 Percentiles: P <sub>1</sub> = 15 P <sub>10</sub> = 20 Q <sub>1</sub> = 24 Median = 33 Q <sub>3</sub> = 55 P <sub>90</sub> = 79 P <sub>99</sub> = 97		Hours in Service: 744 Hours of Data: 680 Hours of Missing Data: 64 Hours of Calibration: 0 Percent Operational Time: 91.4																								
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	43	37	36	45	51	50	55	69	26	22	21	19	19	21	24	24	32	25	85	53	36	29	77	89	89	
2-Dec	22	53	69	33	53	42	26	27	25	32	46	48	65	37	23	56	89	82	36	56	20	90	45	81	90	
3-Dec	90	67	94	66	83	85	81	19	18	27	27	28	30	45	25	24	31	50	53	95	64	40	41	47	95	
4-Dec	73	79	47	74	87	76	87	68	42	65	26	18	25	27	27	43	87	87	53	78	67	84	40	36	87	
5-Dec	38	39	35	28	25	66	94	87	30	30	27	29	26	40	32	36	32	33	41	38	56	61	59	24	94	
6-Dec	31	20	30	28	21	19	22	20	22	23	22	24	34	25	28	19	51	38	44	72	91	26	21	19	91	
7-Dec	27	33	19	30	27	64	62	31	24	72	40	34	100	45	101	61	104	95	29	85	67	83	41	48	104	
8-Dec	25	14	24	26	17	29	69	53	48	23	24	23	29	25	33	28	25	29	36	21	21	29	23	24	69	
9-Dec	23	16	69	54	45	33	36	75	48	33	62	64	57	74	99	39	81	53	58	36	79	95	36	92	99	
10-Dec	40	31	64	61	61	28	31	34	51	36	69	25	20	22	30	32	36	37	39	33	43	73	50	71	73	
11-Dec	68	77	63	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	77	
12-Dec	AF	AF	AF	AF	AF	AF	AF	65	97	36	47	90	67	72	35	16	15	15	24	50	57	94	61	83	97	
13-Dec	24	23	25	37	37	30	17	47	61	25	76	21	30	21	58	61	28	66	43	78	26	38	26	51	78	
14-Dec	65	56	40	65	93	91	91	87	89	25	26	36	24	26	55	88	54	80	44	70	73	49	34	41	93	
15-Dec	68	31	33	27	72	44	31	28	32	47	30	47	48	44	74	26	17	38	36	43	45	43	28	39	74	
16-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	
17-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	42	43	37	31	31	25	19	18	82	42	70	34	82
18-Dec	26	26	34	27	28	27	29	33	49	57	40	21	20	17	18	18	21	21	19	19	32	28	29	28	57	
19-Dec	33	26	25	37	17	47	41	51	38	59	50	20	23	24	20	21	27	25	23	23	32	59	30	15	59	
20-Dec	18	18	16	20	22	18	19	18	17	24	31	25	25	23	25	22	23	23	34	31	21	20	24	51	51	
21-Dec	25	81	51	44	49	90	92	82	55	62	68	49	26	67	18	21	23	20	18	15	80	86	98	85	98	
22-Dec	51	68	55	48	43	74	72	39	38	92	53	21	22	22	20	21	20	31	18	29	32	32	29	19	92	
23-Dec	31	31	72	92	18	63	63	57	42	41	56	35	74	57	45	23	87	25	61	32	68	71	49	39	92	
24-Dec	31	27	27	24	26	27	20	29	34	26	72	36	26	22	25	47	56	98	83	60	62	79	87	28	98	
25-Dec	38	71	71	32	94	41	28	36	84	74	62	20	19	18	12	12	17	24	45	23	22	15	19	94	94	
26-Dec	22	18	21	17	27	18	22	20	17	22	18	26	22	21	24	26	44	27	53	32	53	50	32	14	53	
27-Dec	53	78	22	27	42	21	50	41	20	21	21	22	22	22	20	18	15	12	12	18	36	60	32	16	78	
28-Dec	31	85	85	26	25	65	63	55	47	60	80	81	38	39	31	94	50	48	44	86	50	33	44	69	94	
29-Dec	78	52	33	38	44	89	53	78	52	44	20	32	22	21	27	20	18	17	33	19	24	24	27	28	89	
30-Dec	23	33	30	25	21	20	17	25	36	27	28	42	22	25	25	26	34	20	24	12	15	17	26	31	42	
31-Dec	24	33	45	29	35	20	23	23	42	15	27	35	35	34	30	23	34	50	27	24	22	43	26	22	50	
	90	85	94	92	94	91	94	87	97	92	80	90	100	74	101	94	104	98	85	95	91	95	98	92		
	Diurnal Maximum																									
AF - Analyzer Failure																										



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Waskow Ohci Pimatisiwin	Station number:	AMS 25
Calibration Date:	December 7, 2017	Last Cal Date:	November 6, 2017
Start time (MST):	13:06	End time (MST):	15:38
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>50.2</u>	ppm	Cal Gas Exp Date	April 19, 2021
Cal Gas Cylinder #	<u>EY0000817</u>			
Calibrator Make/Model	API T700		Serial Number	747
ZAG Make/Model	API 701		Serial Number	261

### Analyzer Information

Analyzer make:	Thermo 43i	Analyzer serial #:	1160290014		
	<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>	
Analyzer Range	0 - 1000 ppb	PMT voltage	-610	-610	
Calculated slope	0.997928	1.003169	Lamp voltage	877	876
Calculated intercept	0.184336	-0.271279	Pressure	725.2	734.5
Analyzer Background	17.0	17.0	Flow	0.453	0.459
Analyzer Coefficient	0.706	0.706	Intensity	89	93

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4999	0.0	0.0	-0.1	----
as found span	4931	79.8	799.5	796.3	1.004
calibrator zero	4999	0.0	0.0	-0.1	----
high point	4931	79.8	799.5	796.3	1.004
second point	4972	39.8	398.7	400.0	0.997
third point	4992	20.0	200.3	198.9	1.007
as left zero	4999	0.0	0.0	0.2	----
as left span	4931	79.8	799.5	801.6	0.997
Average Correction Factor					1.003
Corrected As found	796.40	Previous response	800.94	*% change	0.6%

\* = > +/-5% change initiates investigation

#### Notes:

Changed inlet filter after as founds. No adjustments made.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

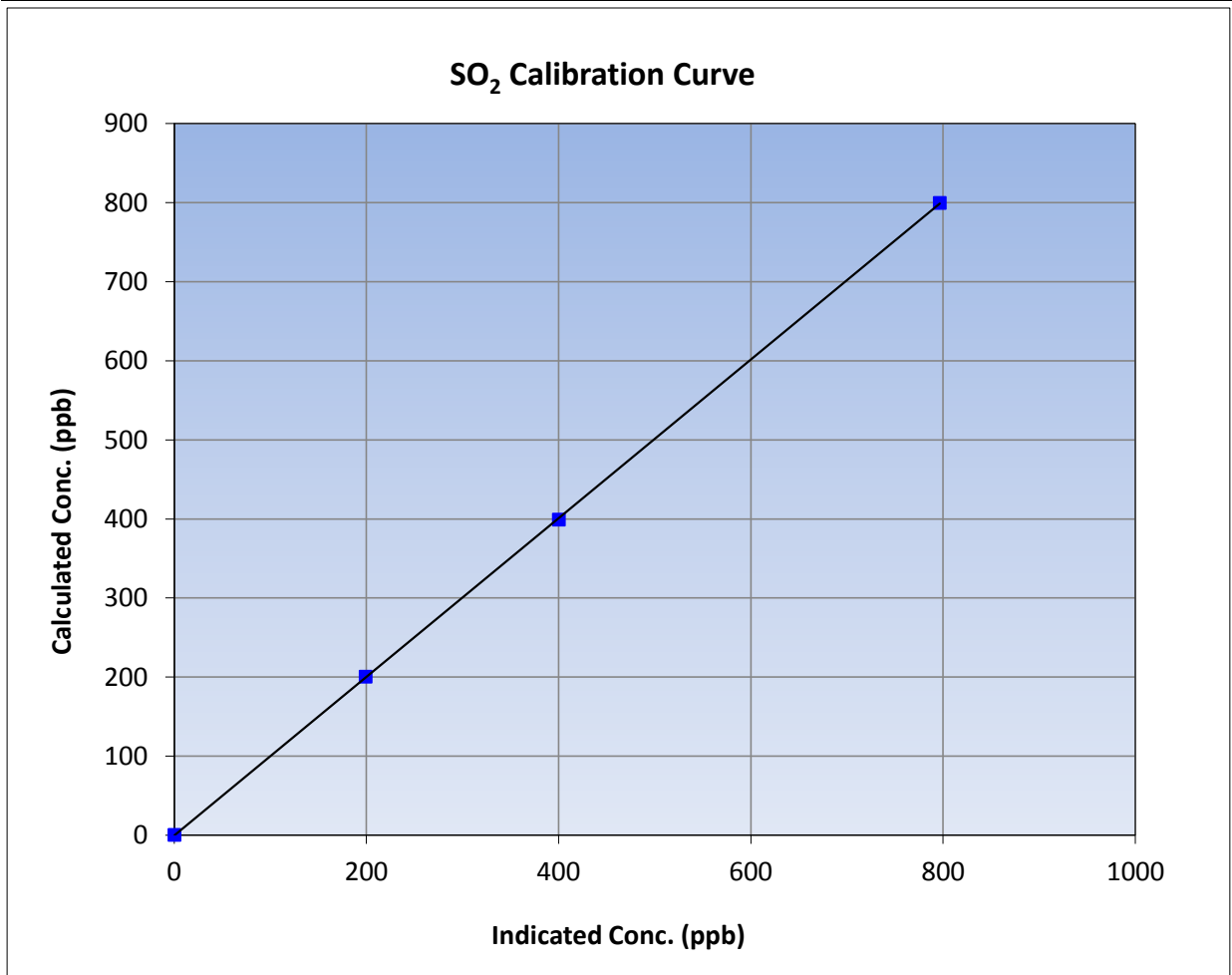
Version-03-2017

### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Waskow Ohci Pimatisiwin	Station Number	AMS 25
Start Time (MST)	13:06	End Time (MST)	15:38
Analyzer make	Thermo 43i	Analyzer serial #	1160290014

### Calibration Data

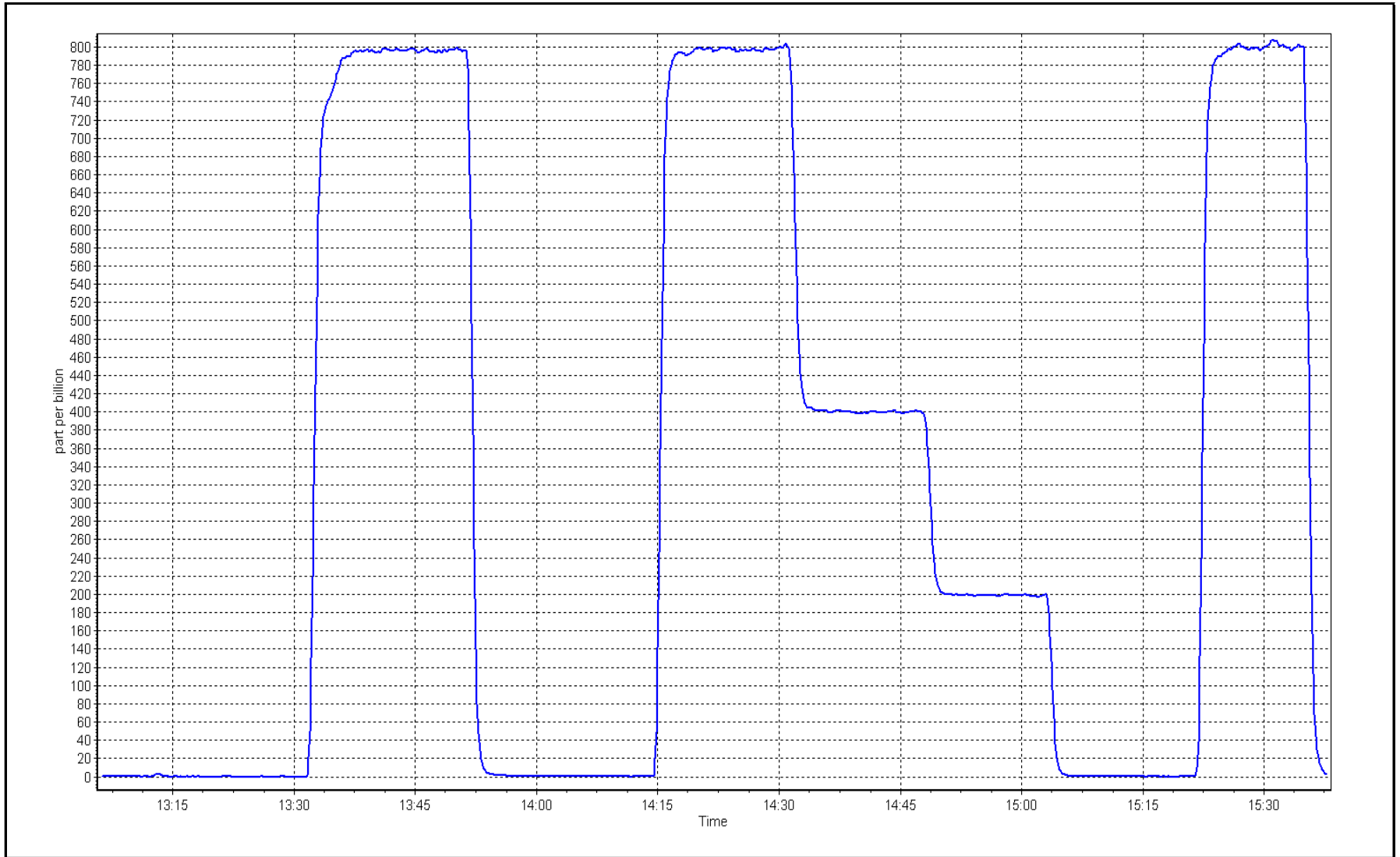
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	-0.1	----	Correlation Coefficient	0.999978	≥0.995
799.5	796.3	1.0040			
398.7	400.0	0.9966	Slope	1.003169	0.90 - 1.10
200.3	198.9	1.0071			
			Intercept	-0.271279	+/-30



SO2 Calibration Plot

Date: December 7, 2017

Location: Waskow Ohci Pimatisiwin





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-11-2017

### Station Information

Station Name:	Waskow Ohci Pimatisiwin	Station number:	AMS 25
Calibration Date:	December 7, 2017	Last Cal Date:	November 6, 2017
Start time (MST):	10:00	End time (MST):	13:31
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>50.50</u>	ppm	Cal Gas Exp Date	June 12, 2020
Cal Gas Cylinder #	<u>CC262665</u>			
Calibrator Make/Model	API T700		Serial Number	747
ZAG Make/Model	API 701		Serial Number	261

### Analyzer Information

Analyzer make: Thermo 450i

Analyzer serial #: 922436967

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	-665	-666
Calculated slope	0.997064	0.997896	Lamp voltage	903	903
Calculated intercept	-1.439911	-1.283822	Pressure	608.5	604.5
Analyzer Background	28.8	29.3	Flow	1.041	1.034
Analyzer Coefficient	1.020	1.030	Intensity	90	84
			Converter temp	323.1	327.8

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	4983	0.0	0.0	0.3	----
as found span	4931	79.3	799.3	784.6	1.019
calibrator zero	4983	0.0	0.0	-0.1	----
high point	4931	79.3	799.3	801.4	0.997
second point	4971	39.6	399.1	402.4	0.992
third point	4992	19.8	199.5	202.3	0.986
as left zero	4983	0.0	0.0	0.9	----
as left span	4931	79.3	799.3	805.6	0.992
SO2 Scrubber Check	4931	79.8	796.3	0.7	----
Date of last scrubber change:			Average Correction Factor		0.992
Corrected As found	784.30	Previous response	803.08	*% change	2.4%

\* = > +/-5% change initiates investigation

Notes:

Changed inlet filter after asfound. Adjusted the zero and the span.

Calibration Performed By: Jayme Marcoux



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

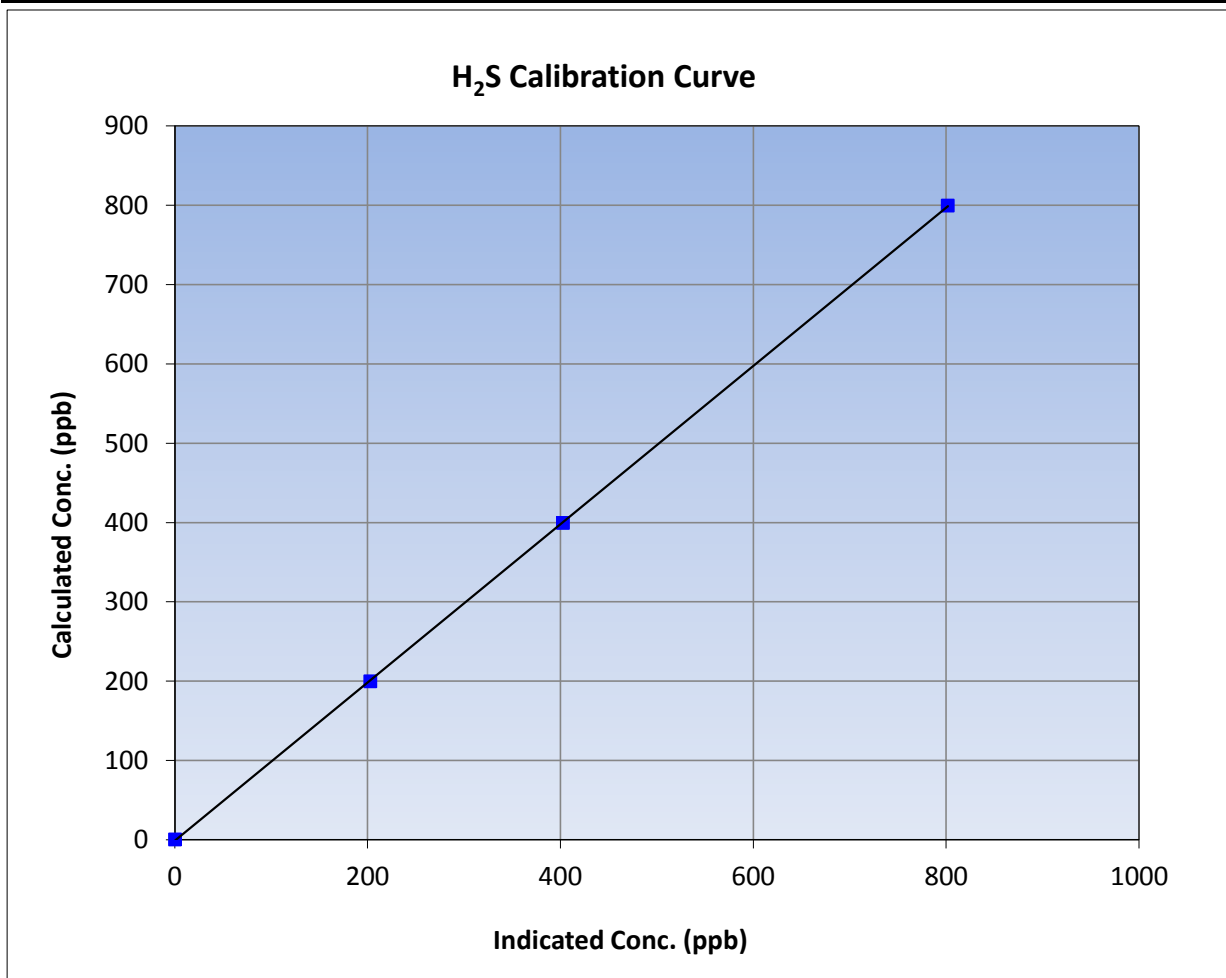
Version-03-2017

### Station Information

Calibration Date	December 7, 2017	Previous Calibration	November 6, 2017
Station Name	Waskow Ohci Pimatisiwin	Station Number	AMS 25
Start Time (MST)	10:00	End Time (MST)	13:31
Analyzer make	Thermo 450i	Analyzer serial #	922436967

### Calibration Data

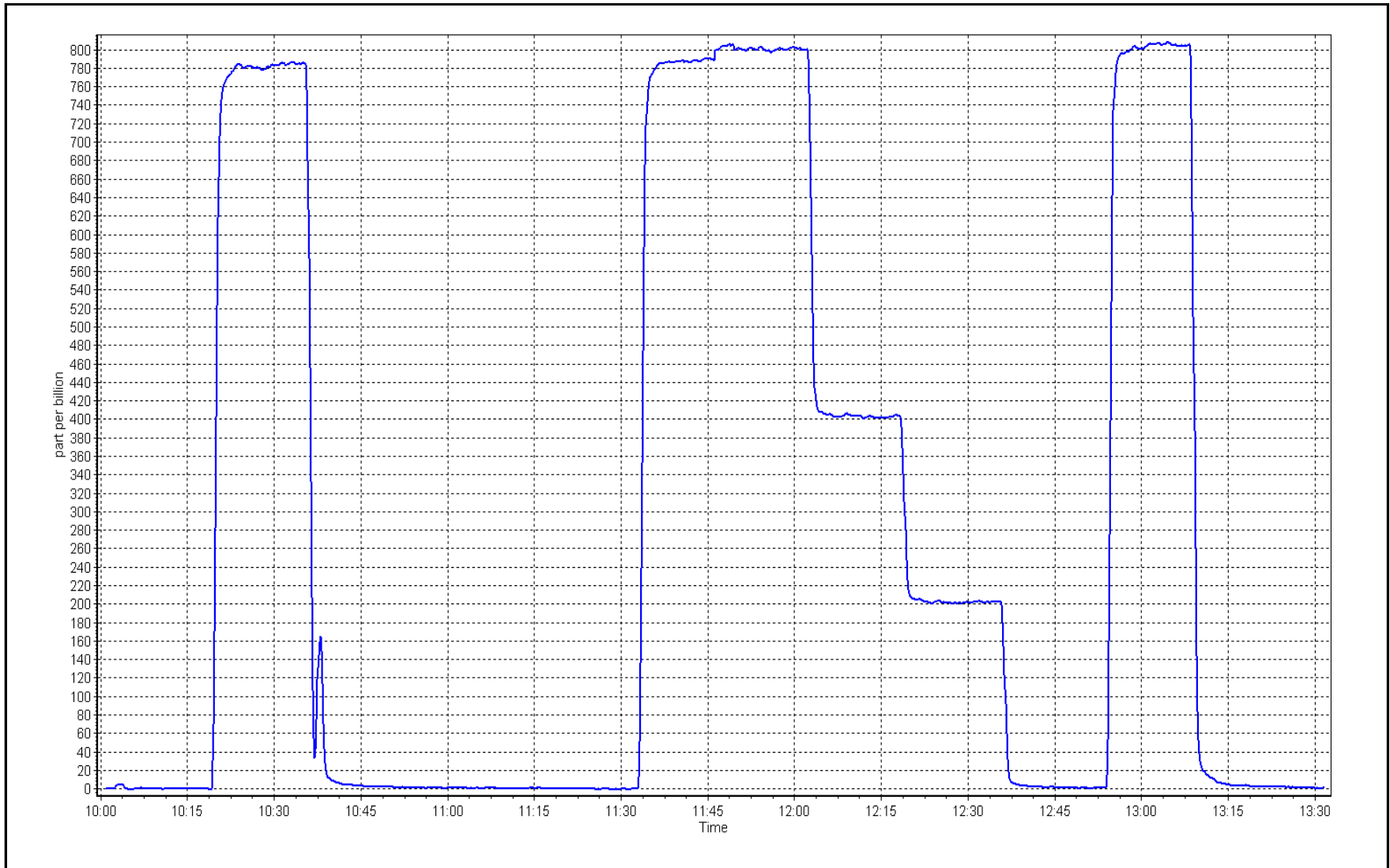
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	-0.1	----	Correlation Coefficient	≥0.995
799.3	801.4	0.9974		
399.1	402.4	0.9918	Slope	0.90 - 1.10
199.5	202.3	0.9862		
			Intercept	+/-3



# H<sub>2</sub>S Calibration Plot

Date: December 7, 2017

Location: Waskow Ohci Pimatisiwin







## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT**

#### **AMS 500 CHRISTINA LAKE DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CHRISTINA LAKE (AMS 500)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100	29	0	5	0
H2S (ppb) Average	710	34	34	100	1	0	0	0
NO2 (ppb) Average	708	36	36	100	19	0	7	-
NO (ppb) Average	708	36	36	100	14	-	3	-
NOX (ppb) Average	708	36	36	100	33	-	10	-
Temperature 2 m (C) Average	744	0	0	100	8.6	-	5.5	-
Relative Humidity (%) Average	744	0	0	100	96	-	84	-
Wind Speed 10 m (km/h) Average	744	0	0	100	34	-	21	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CHRISTINA LAKE (AMS 500)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	1.7	3	-	0	0	0	1	1	4	29
H2S (ppb) Average	710	0.2	0	-	0	0	0	0	0	0	1
NO2 (ppb) Average	708	4.9	3	-	0	2	3	4	6	9	19
NO (ppb) Average	708	1.1	2	-	0	0	0	0	1	3	14
NOX (ppb) Average	708	6	5	-	1	2	3	5	7	11	33
Temperature 2 m (C) Average	744	-10.14	12.1	-	-33.7	-29.2	-21.6	-6.7	0.1	2.7	8.6
Relative Humidity (%) Average	744	72.7	11	-	35	57	68	73	80	86	96
Wind Speed 10 m (km/h) Average	744	12.1	6	-	0	5	8	11	16	20	34
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CHRISTINA LAKE (AMS 500)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
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No operational issues to report this month.



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Christina Lake - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 29 ppb on Dec 10 15:00	Maximum Daily Average: 5.5 ppb on Dec 12		Hours of Data:	708
Minimum Value: 0 ppb on Dec 14 07:00	Minimum Daily Average: 0.3 ppb on Dec 2		Hours of Missing Data:	36
Maximum Diurnal Average: 3.4 ppb at hour 15	Minimum Diurnal Average: 0.6 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 1.7 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 4 P <sub>99</sub> = 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-Dec	Z	1	1	0	0	0	0	0	0	0	0	1	2	1	1	2	2	1	1	1	1	2	2	1	0.9	2																						
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.3	1																						
3-Dec	0	0	Z	1	1	1	1	1	0	0	1	6	5	3	4	0	2	2	1	1	1	1	0	1	1.4	6																						
4-Dec	3	5	3	Z	3	3	2	1	0	0	0	1	1	0	0	1	2	2	2	2	0	0	1	1	1.4	5																						
5-Dec	1	0	0	0	Z	1	5	16	26	15	11	4	3	4	5	3	1	0	2	1	1	0	0	4.3	26																							
6-Dec	0	0	0	8	1	Z	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.8	8																						
7-Dec	Z	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	4	2	1	1	2	2	3	1.1	4																						
8-Dec	1	Z	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	1	1	0	1	0	0	0	0.5	1																						
9-Dec	0	1	Z	0	1	1	1	1	2	2	2	1	1	1	1	2	1	1	1	1	0	0	0	1	0.9	2																						
10-Dec	1	0	0	Z	0	0	0	2	0	0	0	1	1	11	29	17	8	3	5	2	2	1	4	4	4.0	29																						
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0.4	1																						
12-Dec	0	0	0	0	0	Z	0	0	0	0	2	4	1	11	18	10	16	5	5	20	19	12	1	0	5.5	20																						
13-Dec	Z	0	0	0	0	0	0	0	0	0	1	8	7	3	3	3	3	1	1	5	1	0	0	5	1.8	8																						
14-Dec	7	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0.8	7																						
15-Dec	0	0	Z	0	0	0	0	0	0	1	1	1	3	3	8	2	0	0	0	0	0	0	0	0	0.9	8																						
16-Dec	0	0	0	Z	0	0	0	1	2	1	4	4	0	0	0	0	0	0	0	0	1	1	1	1	0.8	4																						
17-Dec	1	2	2	2	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0.7	2																						
18-Dec	0	0	0	0	0	Z	0	0	1	1	3	20	15	11	6	11	3	2	2	1	2	1	3	2	3.8	20																						
19-Dec	Z	2	2	1	1	1	0	0	0	0	1	0	0	C	C	C	C	C	0	0	0	0	0	0	0.6	2																						
20-Dec	0	Z	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0	1	1	2	1	0.6	2																						
21-Dec	1	1	Z	0	0	1	7	7	4	7	4	1	3	2	1	1	5	1	10	2	2	4	11	10	3.8	11																						
22-Dec	7	3	2	Z	1	1	1	2	1	0	1	1	5	5	10	5	1	1	3	2	5	7	4	8	3.2	10																						
23-Dec	6	0	0	0	Z	0	0	0	1	0	0	0	0	0	1	1	0	0	9	3	2	1	1	5	1.5	9																						
24-Dec	9	2	4	2	1	Z	1	2	3	3	7	6	5	4	3	2	4	6	5	1	5	7	8	1	4.0	9																						
25-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	0	1	2	1	1	2	3	1	1	1	1	0	1.0	3																						
26-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
27-Dec	0	0	Z	0	1	1	2	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.5	2																						
28-Dec	0	0	0	Z	0	1	2	1	1	2	3	1	1	4	4	1	1	1	0	1	2	3	5	3	1.6	5																						
29-Dec	1	1	1	9	Z	4	11	9	15	1	1	4	5	1	1	1	0	0	0	0	0	0	0	0	2.8	15																						
30-Dec	1	1	1	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1																						
31-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	1	0	1	1	2	1	1	0.6	2																						
																								1.6	0.9	0.8	1.1	0.6	0.7	1.2	1.6	2.1	1.3	1.6	2.2	2.1	2.4	3.4	2.3	1.8	1.4	1.9	1.7	1.7	1.6	1.6	1.7	Diurnal Average
																								9	5	4	9	3	4	11	16	26	15	11	20	15	11	29	17	16	6	10	20	19	12	11	10	Diurnal Maximum

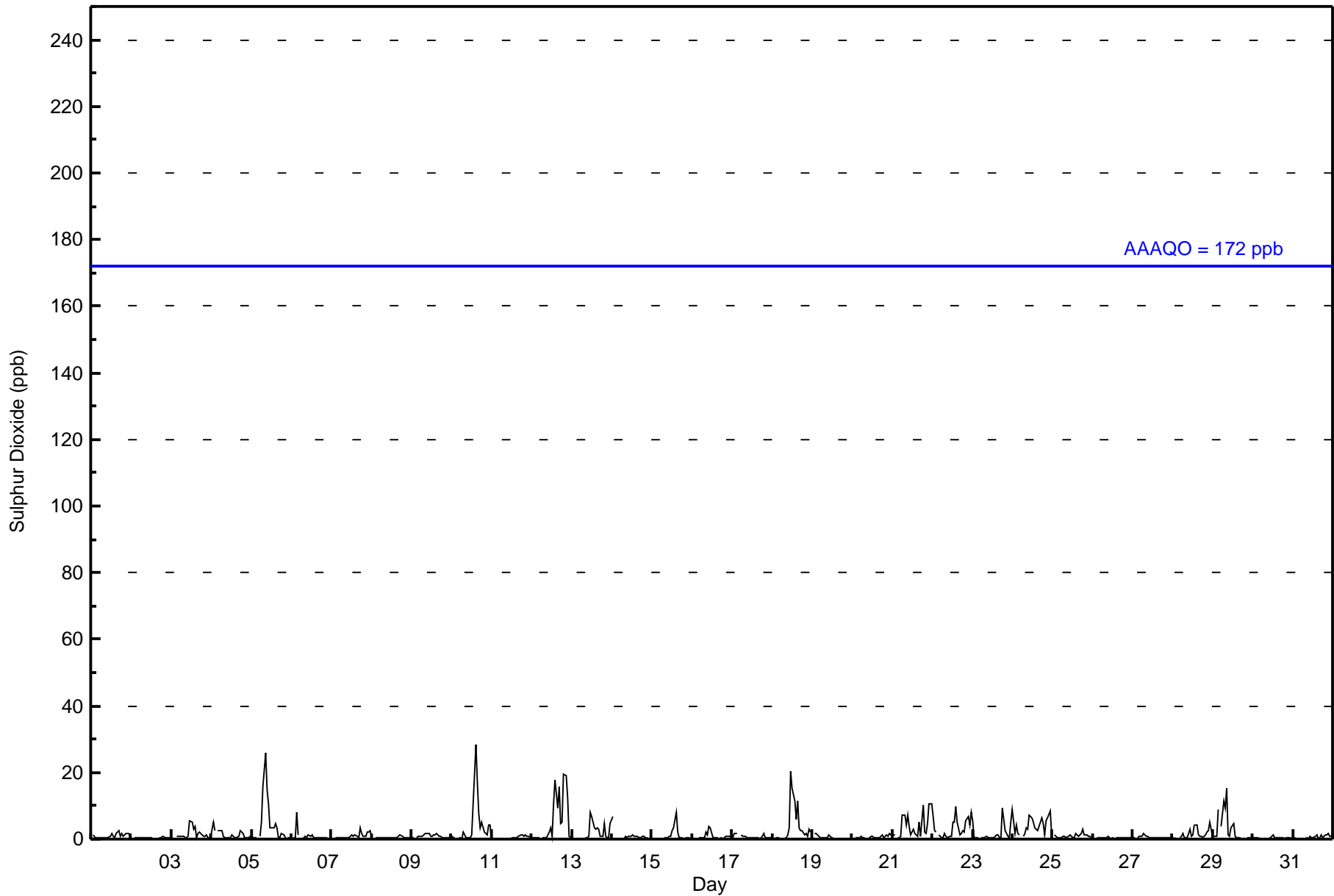
Z - zerospan C - Calibration

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



Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Christina Lake - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	688	97.18	97.18
11 - 20	18	2.54	99.72
21 - 60	2	0.28	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Christina Lake - December 2017**

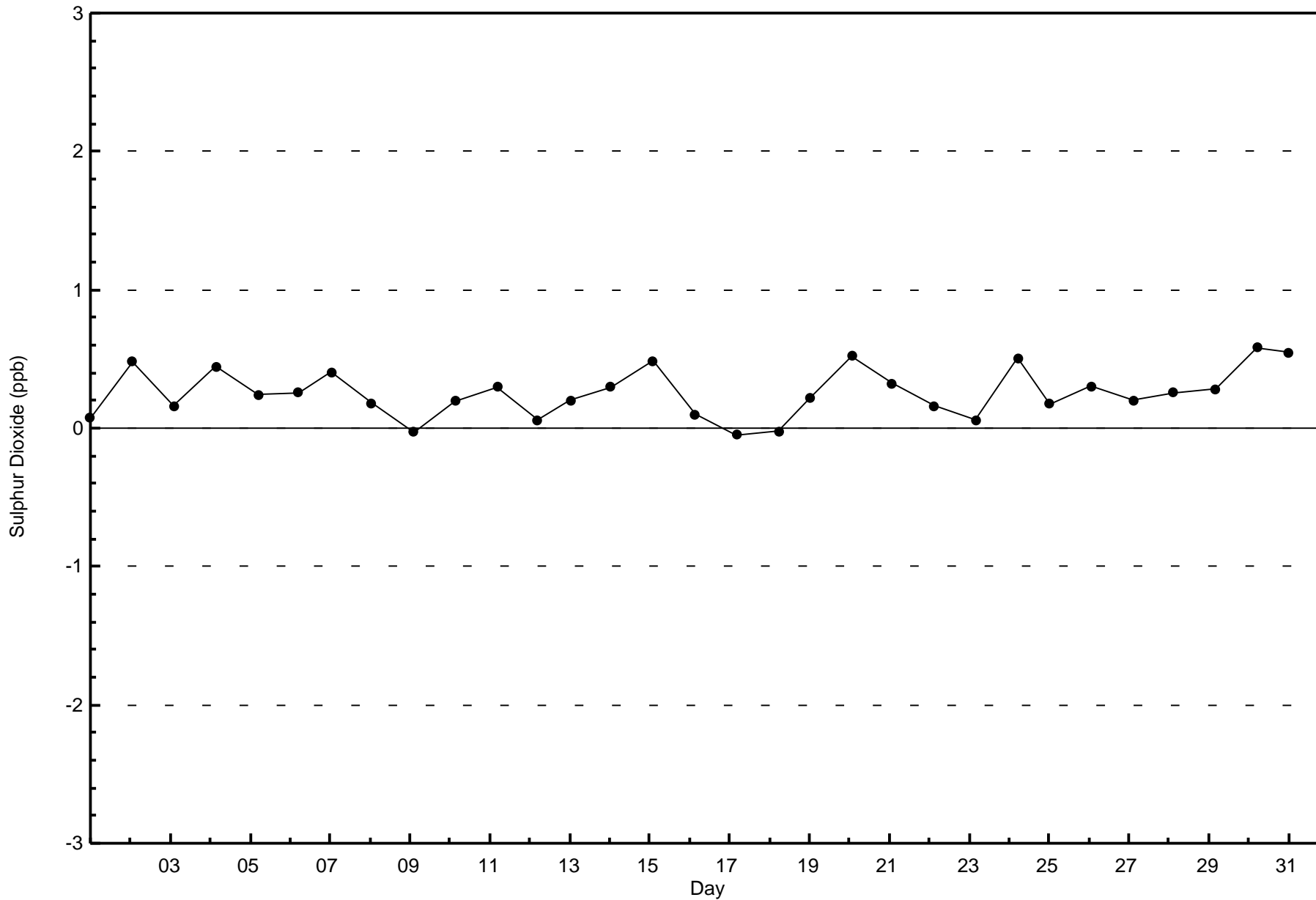
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	6	15	5	2	2	6	12	28	71	110	108	144	50	77	48	4	688
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	4	14	0	0	18
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
<b>Totals</b>	6	15	5	2	2	6	12	28	71	110	108	144	54	93	48	4	708

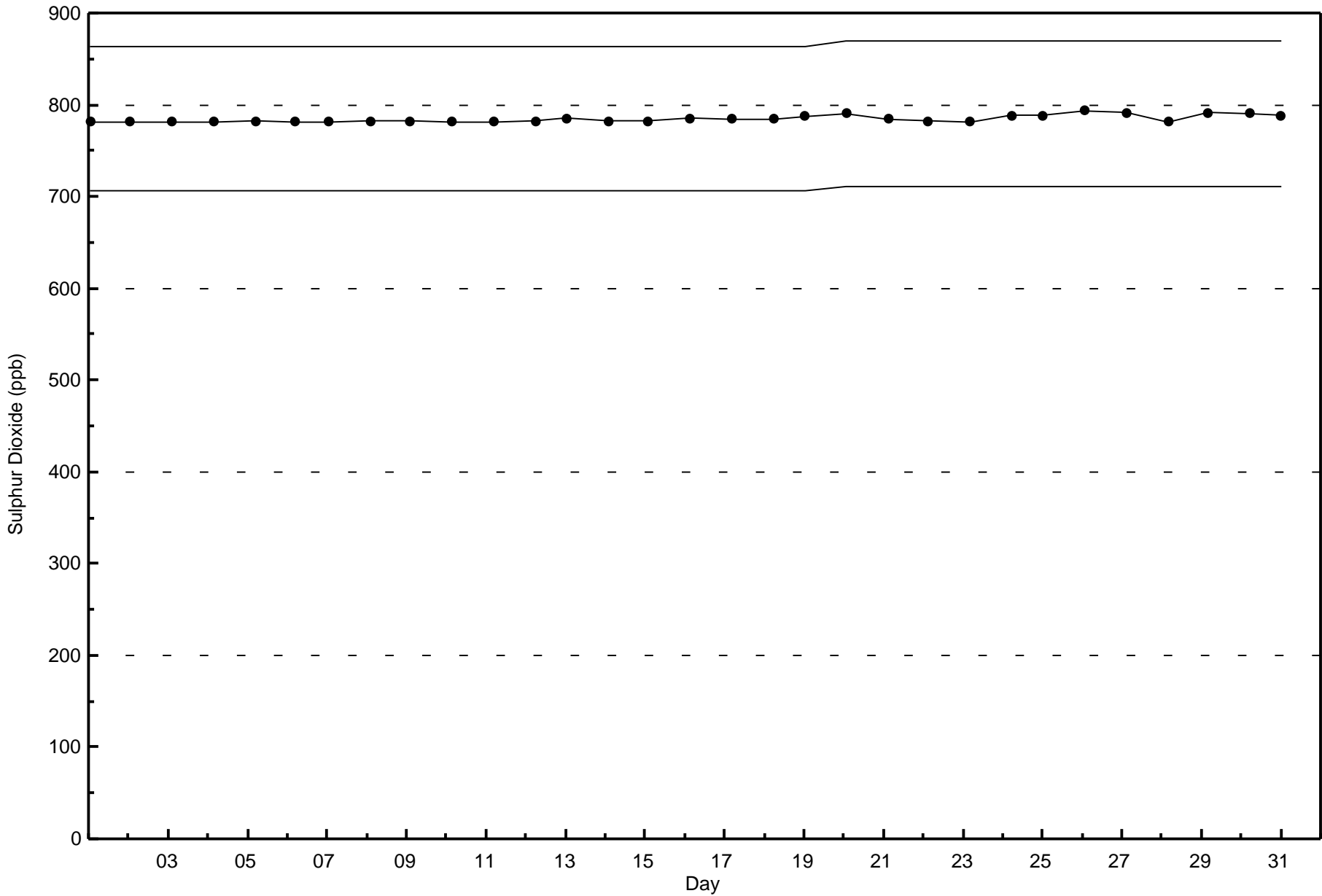
Total Number of Valid Hours: 708

Total Number of Hours: 744











Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb

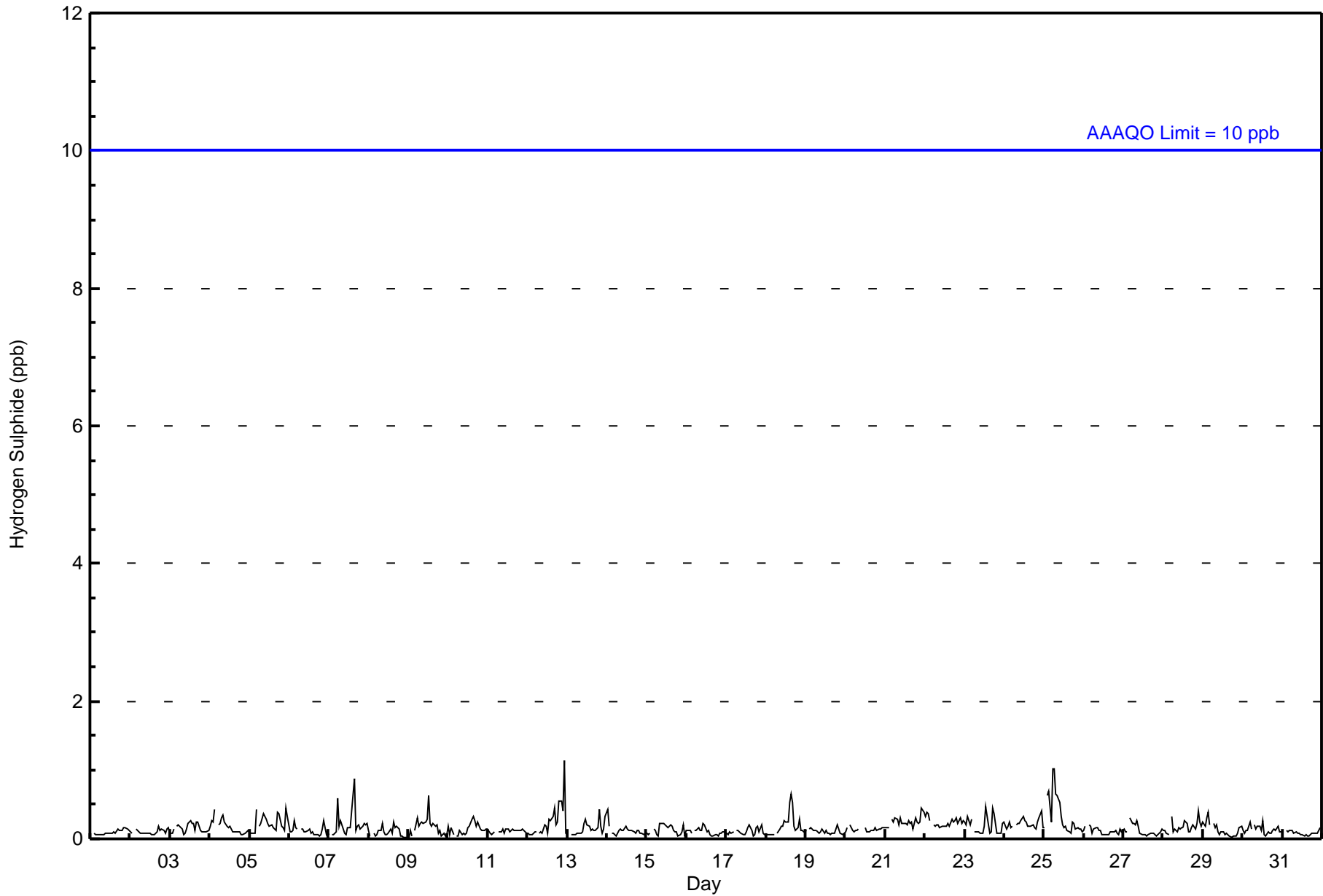
Christina Lake - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 1 ppb on Dec 12 23:00										Maximum Daily Average: 0.3 ppb on Dec 25										Hours of Data: 710						
Minimum Value: 0 ppb on Dec 9 00:00										Minimum Daily Average: 0.1 ppb on Dec 31										Hours of Missing Data: 34						
Maximum Diurnal Average: 0.2 ppb at hour 6										Minimum Diurnal Average: 0.1 ppb at hour 2										Hours of Calibration: 34						
Monthly Average: 0.2 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Dec	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1
8-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0.2	1
13-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.2	1
19-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	0	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	Z	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
26-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
27-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
28-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
30-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.1	Diurnal Average	
	0	0	1	1	0	1	1	1	1	1	0	0	1	0	1	1	1	0	0	1	1	0	1	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**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Christina Lake - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2	6	15	5	2	2	6	10	31	70	111	107	146	54	93	48	4	710
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
<b>Totals</b>	<b>6</b>	<b>15</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>10</b>	<b>31</b>	<b>70</b>	<b>111</b>	<b>107</b>	<b>146</b>	<b>54</b>	<b>93</b>	<b>48</b>	<b>4</b>	<b>710</b>

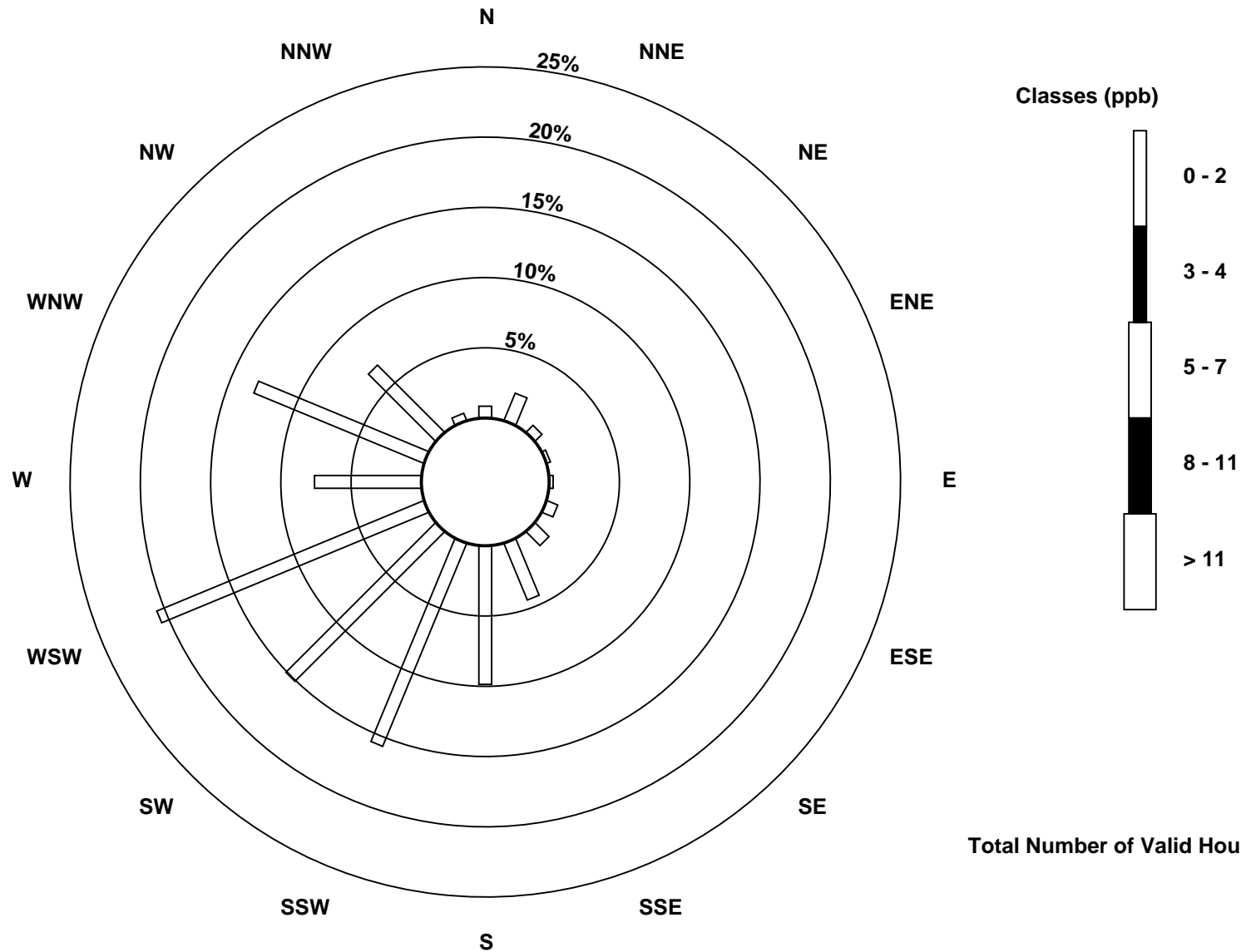
Total Number of Valid Hours: 710

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Christina Lake (AMS 500)



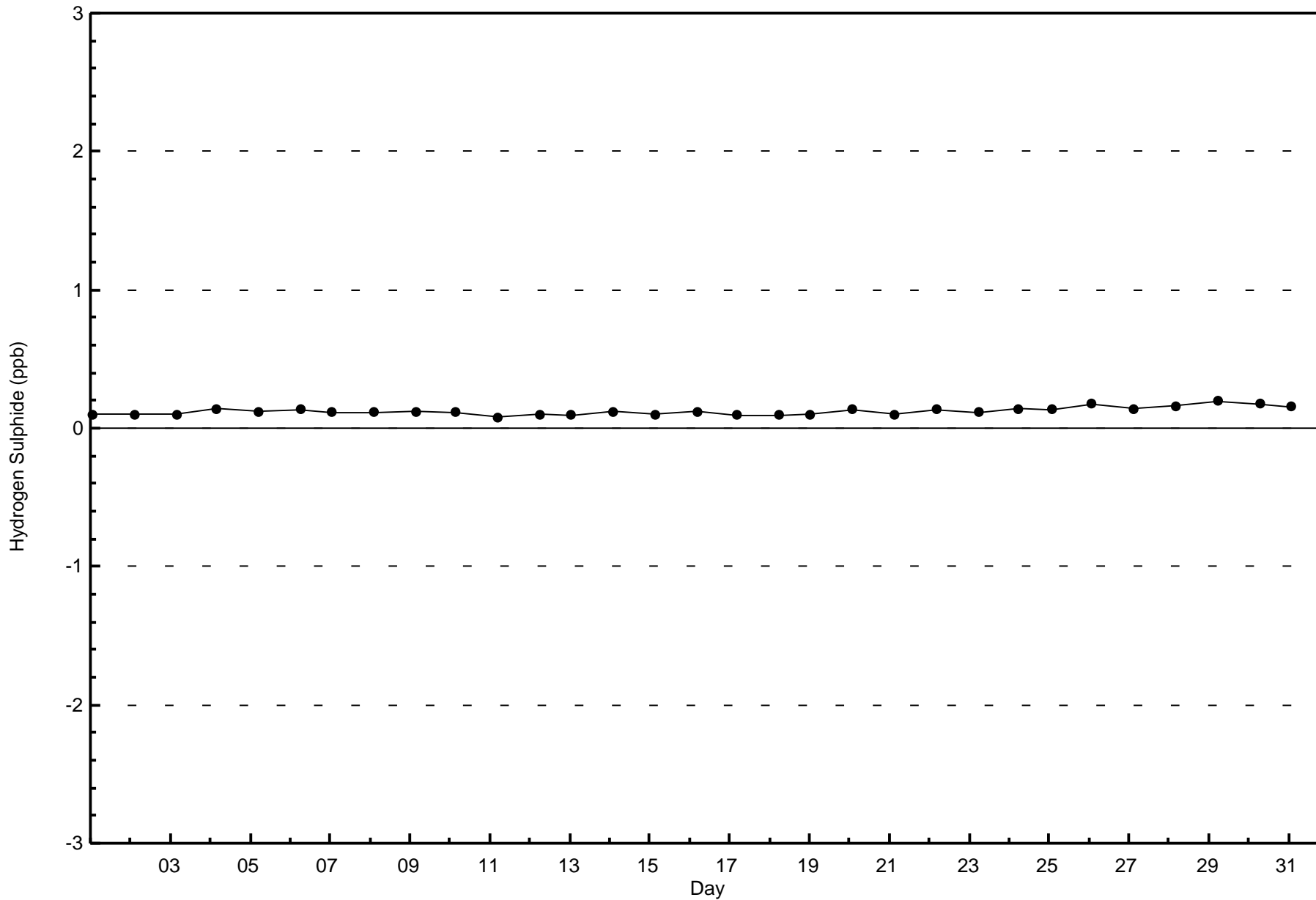
Total Number of Valid Hours: 710

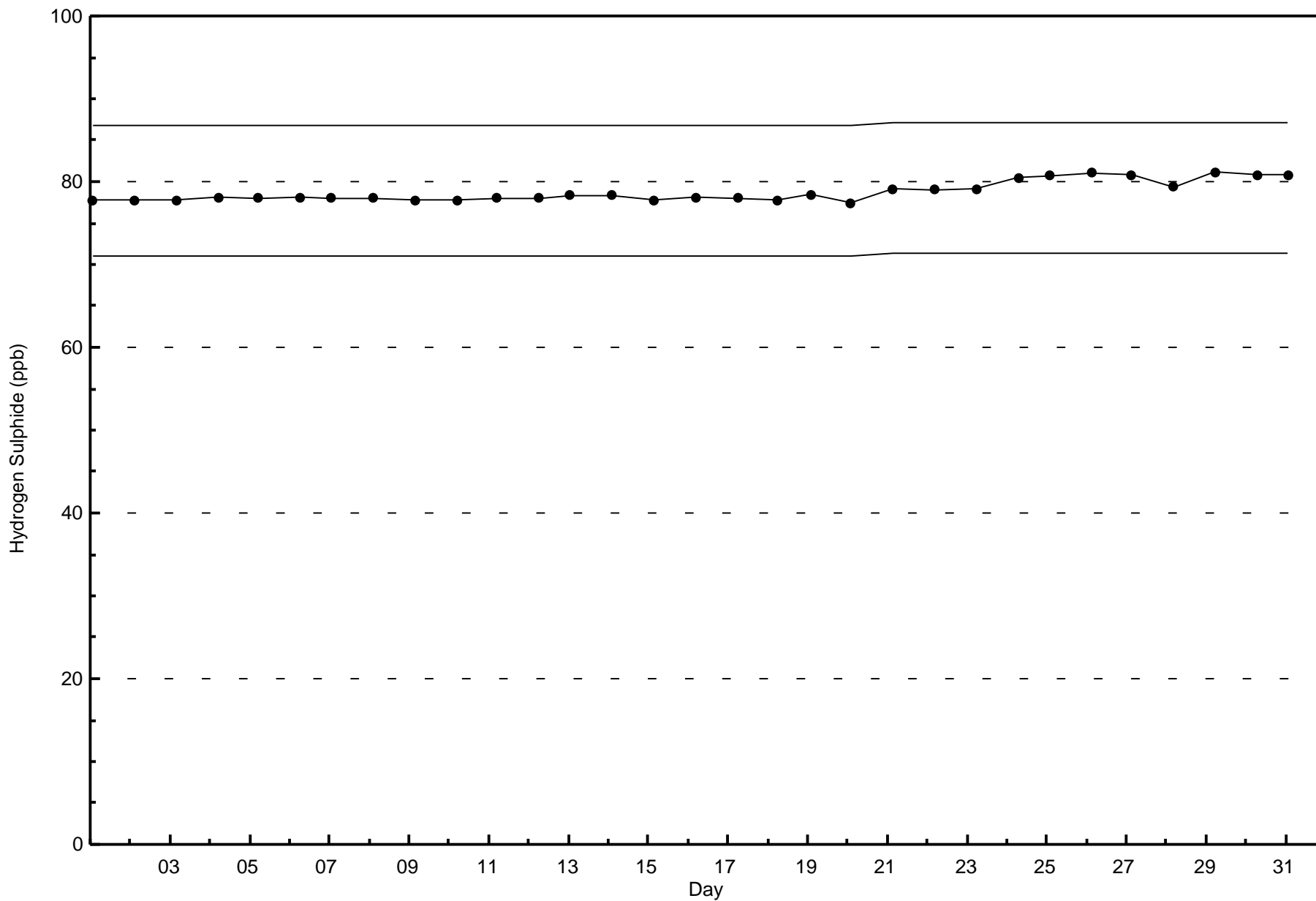




Wood Buffalo Environmental Association  
Zero Responses

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Christina Lake - December 2017







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

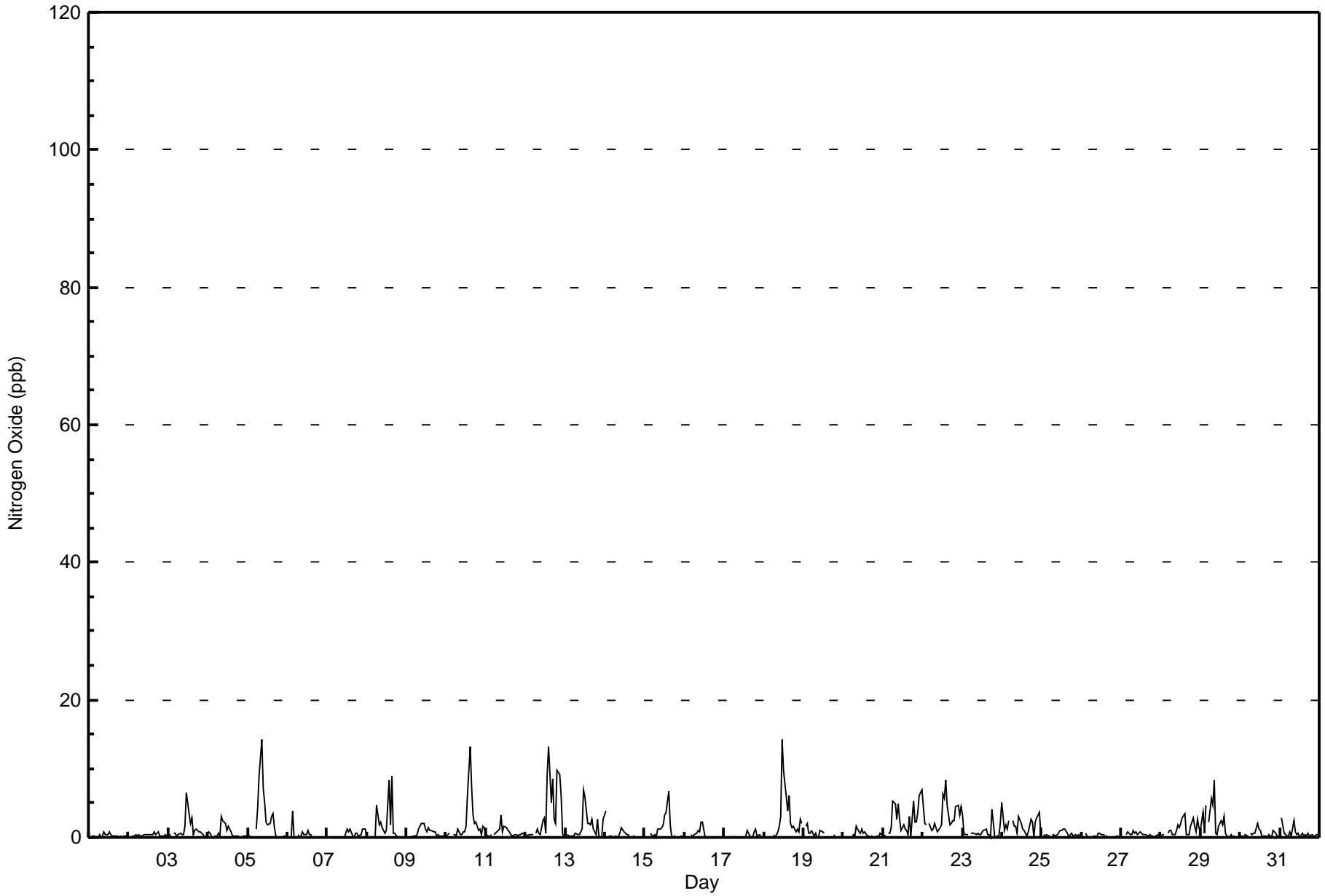
**Nitrogen Oxide (NO) - ppb**  
**Christina Lake - December 2017**

Maximum Value: 14 ppb on Dec 18 12:00		Maximum Daily Average: 3.4 ppb on Dec 12		Hours in Service: 744																																												
Minimum Value: 0 ppb on Dec 1 05:00		Minimum Daily Average: 0.2 ppb on Dec 26		Hours of Data: 708																																												
Maximum Diurnal Average: 2.4 ppb at hour 15		Minimum Diurnal Average: 0.4 ppb at hour 3		Hours of Missing Data: 36																																												
Monthly Average: 1.1 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 9		Hours of Calibration: 36																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	Z	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1																						
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0.4	1																						
3-Dec	0	0	Z	1	1	0	0	1	0	1	2	6	3	2	3	0	1	1	1	1	1	0	0	1.1	6																							
4-Dec	1	1	0	Z	0	0	1	0	3	2	2	1	2	1	0	0	0	0	0	0	0	0	0	0.7	3																							
5-Dec	0	0	0	0	Z	1	4	9	14	7	5	2	2	2	3	4	1	0	0	0	0	0	0	2.4	14																							
6-Dec	0	0	0	4	0	Z	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	4																							
7-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0	0	1	1	0.4	1																							
8-Dec	0	Z	0	0	0	0	5	2	2	1	1	1	1	8	2	9	1	1	0	0	0	0	0	1.4	9																							
9-Dec	0	0	Z	0	0	0	0	1	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0.7	2																							
10-Dec	0	0	1	Z	0	0	0	1	0	0	1	1	2	6	13	7	3	2	2	1	1	0	2	2.1	13																							
11-Dec	0	0	0	0	Z	0	1	1	1	3	1	2	2	1	1	0	0	0	0	0	0	0	1	0.8	3																							
12-Dec	0	0	0	0	0	Z	1	1	1	1	3	3	1	9	13	5	9	3	2	10	9	6	1	3.4	13																							
13-Dec	Z	0	0	0	0	0	1	0	0	1	1	7	6	2	2	2	3	1	0	3	0	0	3	1.5	7																							
14-Dec	4	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	4																							
15-Dec	0	0	Z	1	0	0	0	0	1	1	1	2	3	4	7	2	0	0	0	0	0	0	0	1.0	7																							
16-Dec	0	0	0	Z	0	0	0	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0.3	2																							
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0.2	1																							
18-Dec	0	0	0	0	0	Z	0	0	1	2	3	14	10	6	4	6	2	1	2	1	1	1	3	2.5	14																							
19-Dec	Z	2	2	1	1	1	0	1	0	0	1	1	1	C	C	C	C	C	0	0	0	0	0	0.5	2																							
20-Dec	0	Z	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0.4	2																							
21-Dec	0	0	Z	1	1	1	5	5	3	5	3	1	2	1	1	0	3	0	5	2	2	4	6	2.6	7																							
22-Dec	4	2	2	Z	2	1	1	2	1	1	1	2	6	6	8	5	2	2	3	3	4	5	3	3.1	8																							
23-Dec	3	1	0	0	Z	1	1	1	0	1	0	0	1	1	1	0	0	0	4	0	0	0	2	0.8	4																							
24-Dec	5	1	2	1	2	Z	2	2	2	1	3	2	1	1	1	0	1	3	2	0	2	3	4	1.8	5																							
25-Dec	Z	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0.5	1																							
26-Dec	0	Z	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1																							
27-Dec	0	0	Z	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1																							
28-Dec	0	0	0	Z	1	1	1	0	0	1	2	1	2	3	3	1	0	0	2	3	2	1	3	1.3	3																							
29-Dec	1	4	1	5	Z	2	6	5	8	1	0	2	2	2	3	1	0	0	0	0	0	0	0	1.9	8																							
30-Dec	0	0	0	0	0	Z	1	0	1	1	2	1	1	0	0	0	0	0	0	0	1	1	0	0.4	2																							
31-Dec	Z	3	1	0	0	0	1	0	2	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0.6	3																							
																								0.9	0.6	0.4	0.6	0.4	0.4	1.1	1.1	1.6	1.2	1.4	1.9	1.8	2.1	2.4	1.6	1.0	0.6	0.9	0.8	0.9	0.8	0.8	0.9	Diurnal Average
																								5	4	2	5	2	2	6	9	14	7	5	14	10	9	13	9	9	3	5	10	9	6	6	7	Diurnal Maximum
Z - zerospan		C - Calibration																																														



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxide (NO) - ppb**  
**Christina Lake - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	6	15	5	2	2	6	12	28	71	110	108	144	54	93	48	4	708
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
<b>Totals</b>	6	15	5	2	2	6	12	28	71	110	108	144	54	93	48	4	708

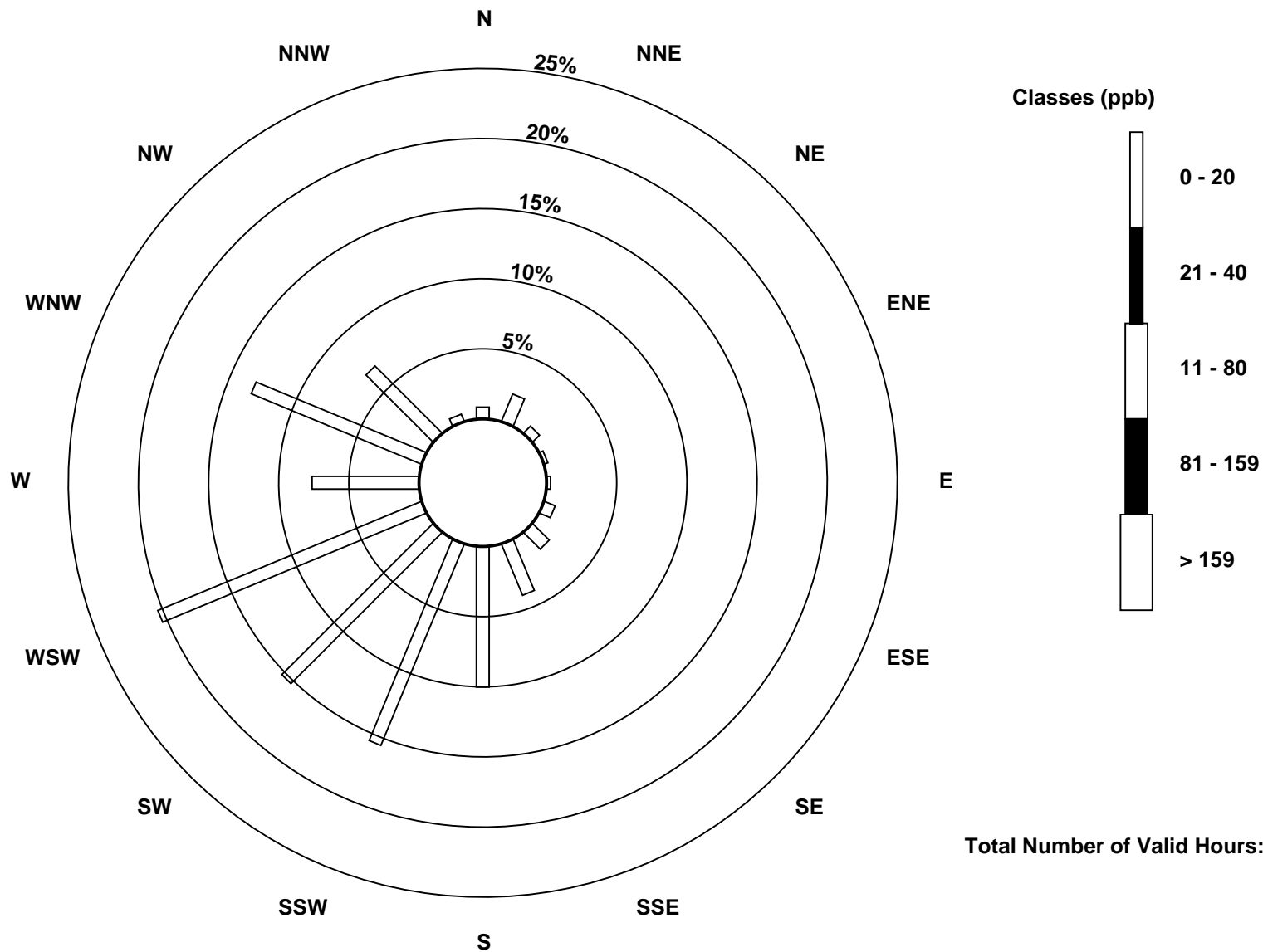
Total Number of Valid Hours: 708

Total Number of Hours: 744

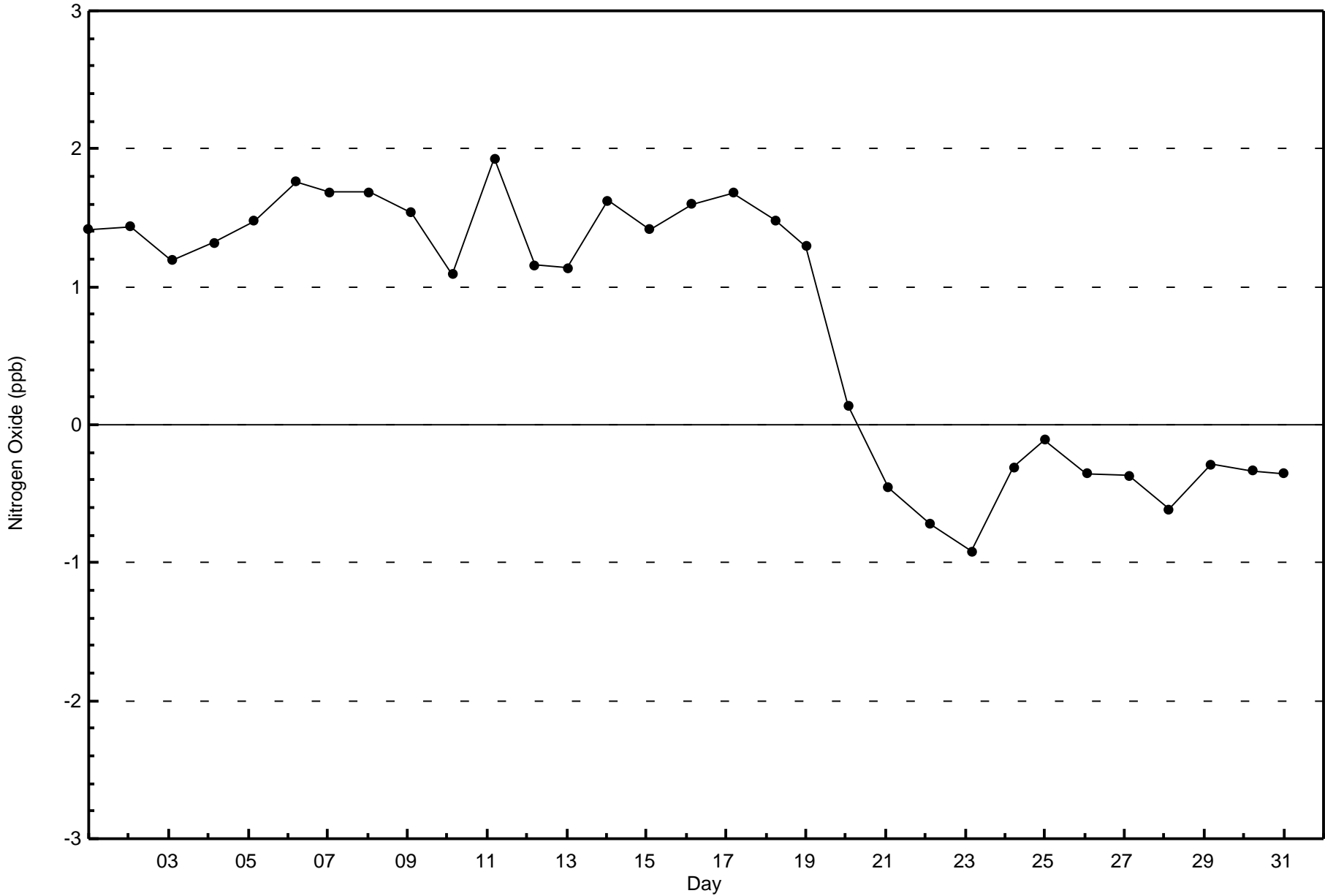


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

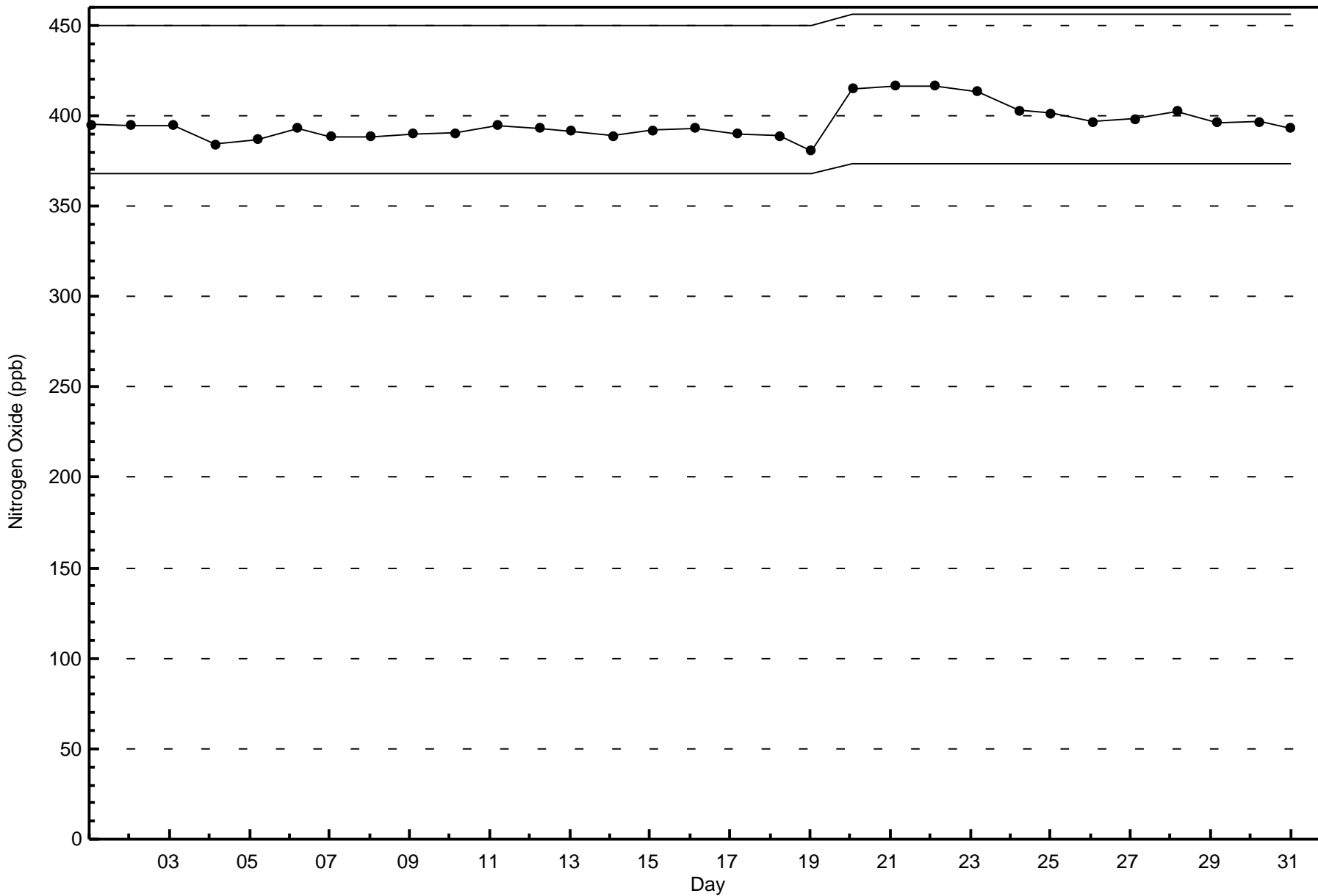
Nitrogen Oxide (NO) - ppb  
Christina Lake (AMS 500)



Total Number of Valid Hours: 708









# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

## Christina Lake - December 2017

Number of Exceedences (AAAQO):		1-hr: 0    24-hr: 0		Hours in Service:		744																																										
Maximum Value: 19 ppb on Dec 8 08:00		Maximum Daily Average: 7.4 ppb on Dec 21		Hours of Data:		708																																										
Minimum Value: 0 ppb on Dec 11 03:00		Minimum Daily Average: 3.1 ppb on Dec 16		Hours of Missing Data:		36																																										
Maximum Diurnal Average: 6.7 ppb at hour 9		Minimum Diurnal Average: 3.6 ppb at hour 3		Hours of Calibration:		36																																										
Monthly Average: 4.9 ppb		Percentiles: P <sub>1</sub> = 1    P <sub>10</sub> = 2    Q <sub>1</sub> = 3    Median = 4    O <sub>3</sub> = 6    P <sub>90</sub> = 9    P <sub>99</sub> = 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-Dec	Z	3	3	2	2	3	3	4	4	6	4	3	4	3	3	3	5	4	6	6	6	7	8	8	4.3	8																						
2-Dec	5	Z	4	5	7	8	5	4	4	3	2	2	2	4	6	6	7	6	5	3	3	3	3	3	4.3	8																						
3-Dec	3	3	Z	5	5	5	5	5	3	3	4	7	6	4	5	2	4	4	3	3	2	2	1	2	3.8	7																						
4-Dec	5	10	6	Z	4	5	6	4	11	8	6	3	4	3	4	3	4	4	3	2	2	3	4	4	4.6	11																						
5-Dec	5	3	2	2	Z	3	8	13	19	11	9	5	5	6	7	8	7	4	6	4	3	2	3	2	6.0	19																						
6-Dec	3	2	5	10	4	Z	7	6	7	8	5	6	6	6	6	4	5	3	2	3	3	2	3	3	4.6	10																						
7-Dec	Z	5	3	2	2	3	2	3	4	3	3	4	6	5	6	3	3	5	6	4	4	7	7	8	4.0	8																						
8-Dec	3	Z	2	2	2	4	14	19	17	12	5	5	5	9	7	12	7	8	6	3	2	2	2	2	6.4	19																						
9-Dec	2	2	Z	2	3	3	3	5	7	7	7	4	4	5	5	6	4	4	2	2	1	1	1	1	3.5	7																						
10-Dec	2	1	2	Z	1	1	2	5	1	4	2	2	4	9	16	11	7	4	4	2	3	1	3	6	4.0	16																						
11-Dec	5	2	0	3	Z	2	6	10	10	16	3	5	4	5	3	3	3	3	4	2	4	3	4	4	4.5	16																						
12-Dec	3	3	1	1	2	Z	3	7	5	3	7	7	2	13	17	10	17	5	4	18	17	12	3	1	7.0	18																						
13-Dec	Z	1	1	1	2	2	7	3	4	4	4	11	8	4	5	5	6	5	2	8	3	1	3	9	4.2	11																						
14-Dec	12	Z	2	10	7	2	6	4	6	5	6	4	4	2	4	4	4	3	3	4	5	4	3	4	4.6	12																						
15-Dec	2	4	Z	2	4	3	8	2	4	4	5	5	6	7	11	6	2	2	1	1	1	1	2	1	3.6	11																						
16-Dec	2	2	2	Z	3	2	3	4	5	4	7	6	2	1	1	3	3	4	3	3	3	2	3	4	3.1	7																						
17-Dec	2	3	4	3	Z	5	4	4	5	4	3	2	2	3	4	3	2	2	4	6	2	3	2	2	3.1	6																						
18-Dec	2	2	2	2	2	Z	2	2	5	6	8	17	12	10	7	12	6	5	5	3	4	4	6	6	5.5	17																						
19-Dec	Z	5	5	3	4	4	3	4	3	3	5	4	3	C	C	C	C	C	6	4	5	3	9	6	4.3	9																						
20-Dec	4	Z	3	3	5	6	6	6	15	10	6	5	5	5	4	3	C	4	5	6	4	6	9	10	5.9	15																						
21-Dec	10	10	Z	6	5	6	11	9	7	10	6	3	5	4	3	3	7	3	12	7	7	9	14	14	7.4	14																						
22-Dec	11	7	6	Z	6	3	4	7	5	2	4	4	8	9	12	9	6	6	6	7	9	9	8	9	6.8	12																						
23-Dec	7	1	1	1	Z	1	1	3	3	2	2	2	3	3	4	4	4	4	10	4	4	3	3	7	3.3	10																						
24-Dec	10	4	7	6	8	Z	7	6	8	4	8	7	5	5	5	4	5	8	7	8	8	10	11	6	6.8	11																						
25-Dec	Z	6	6	7	4	3	4	4	5	5	5	5	5	5	5	6	5	6	7	8	8	7	9	6	5.7	9																						
26-Dec	5	Z	4	4	3	3	3	3	3	4	4	4	3	3	3	5	4	3	3	3	3	3	3	3	3.4	5																						
27-Dec	3	3	Z	4	8	7	8	12	9	6	4	3	3	3	3	4	4	4	4	3	3	4	5	3	4.8	12																						
28-Dec	4	7	3	Z	3	4	4	3	3	4	5	5	5	7	9	4	3	3	6	8	7	6	10	6	5.2	10																						
29-Dec	6	9	5	12	Z	9	14	12	16	6	5	6	7	5	7	5	5	5	5	5	4	4	4	4	7.0	16																						
30-Dec	4	4	8	8	3	Z	5	8	7	5	8	6	5	4	4	4	5	7	6	5	7	12	5	5	5.8	12																						
31-Dec	Z	6	6	8	7	4	8	3	7	4	3	3	3	3	3	3	3	5	4	5	6	6	5	5	4.8	8																						
																								4.7	4.1	3.6	4.4	4.0	3.8	5.5	5.9	6.7	5.7	4.9	4.9	4.7	5.1	5.9	5.2	5.0	4.4	4.9	4.9	4.6	4.5	5.0	4.9	Diurnal Average
																								12	10	8	12	8	9	14	19	19	16	9	17	12	13	17	12	17	8	12	18	17	12	14	14	Diurnal Maximum

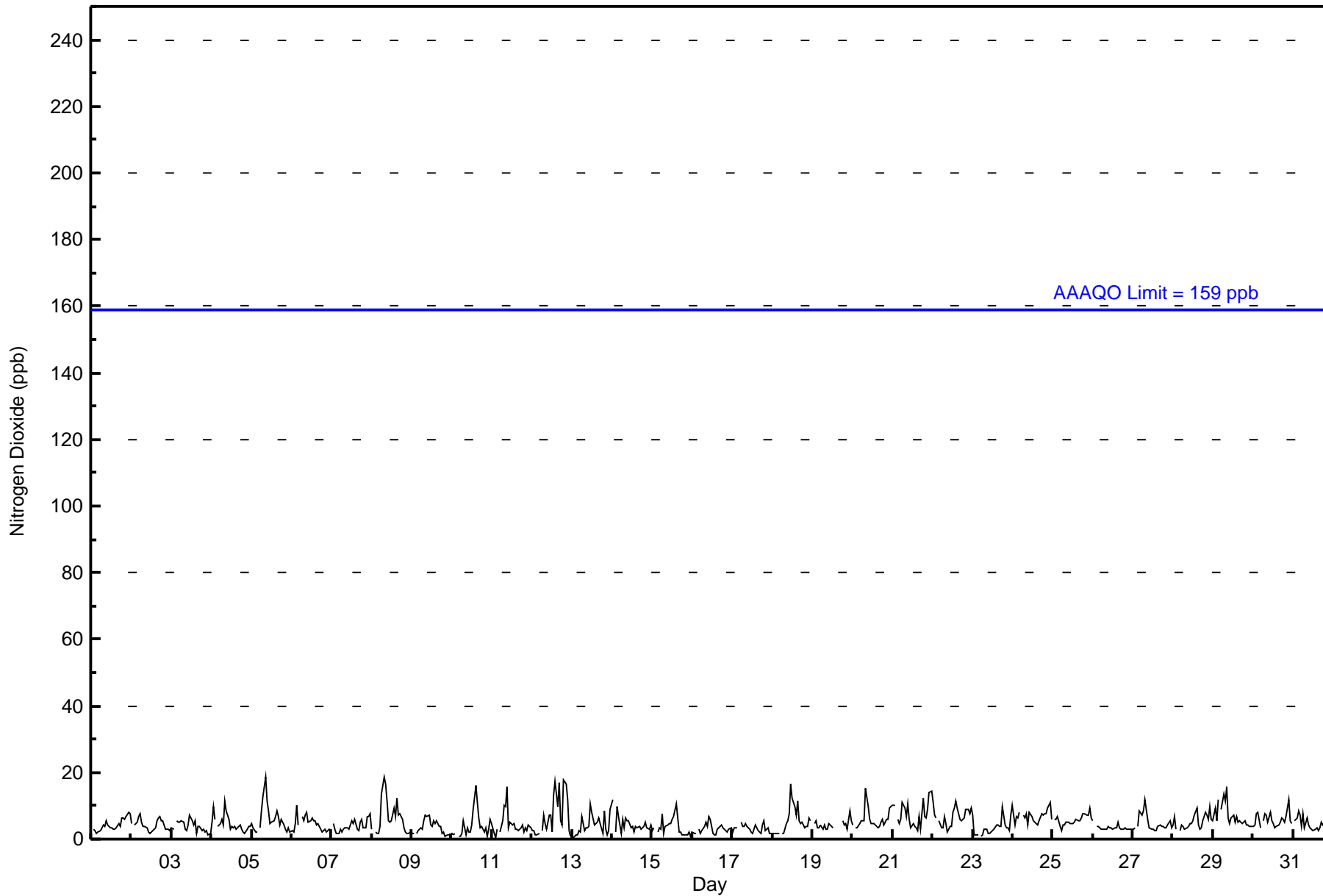
Z - zerospan    C - Calibration

Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Christina Lake - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	6	15	5	2	2	6	12	28	71	110	108	144	54	93	48	4	708
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
<b>Totals</b>	<b>6</b>	<b>15</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>12</b>	<b>28</b>	<b>71</b>	<b>110</b>	<b>108</b>	<b>144</b>	<b>54</b>	<b>93</b>	<b>48</b>	<b>4</b>	<b>708</b>

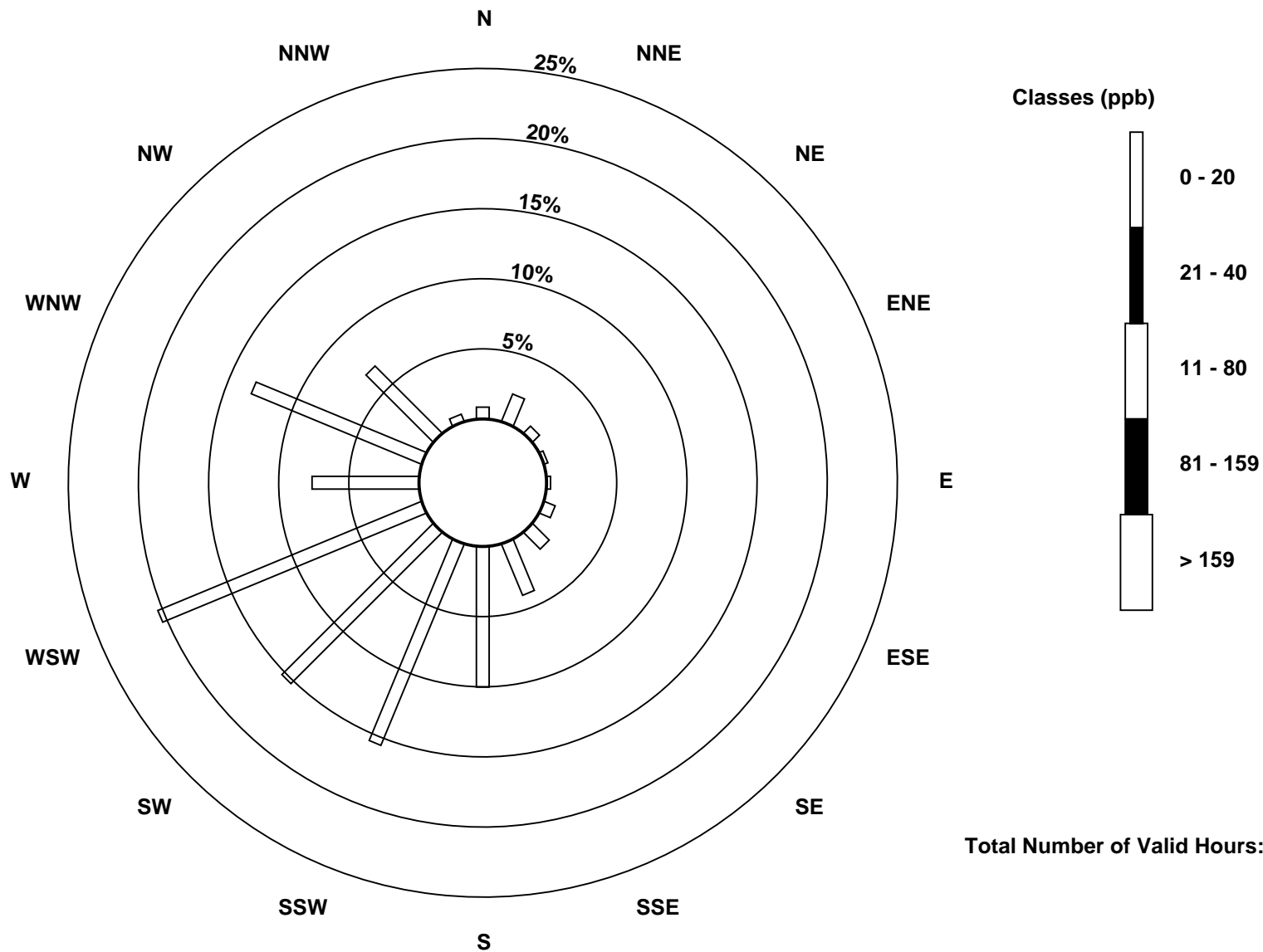
Total Number of Valid Hours: 708

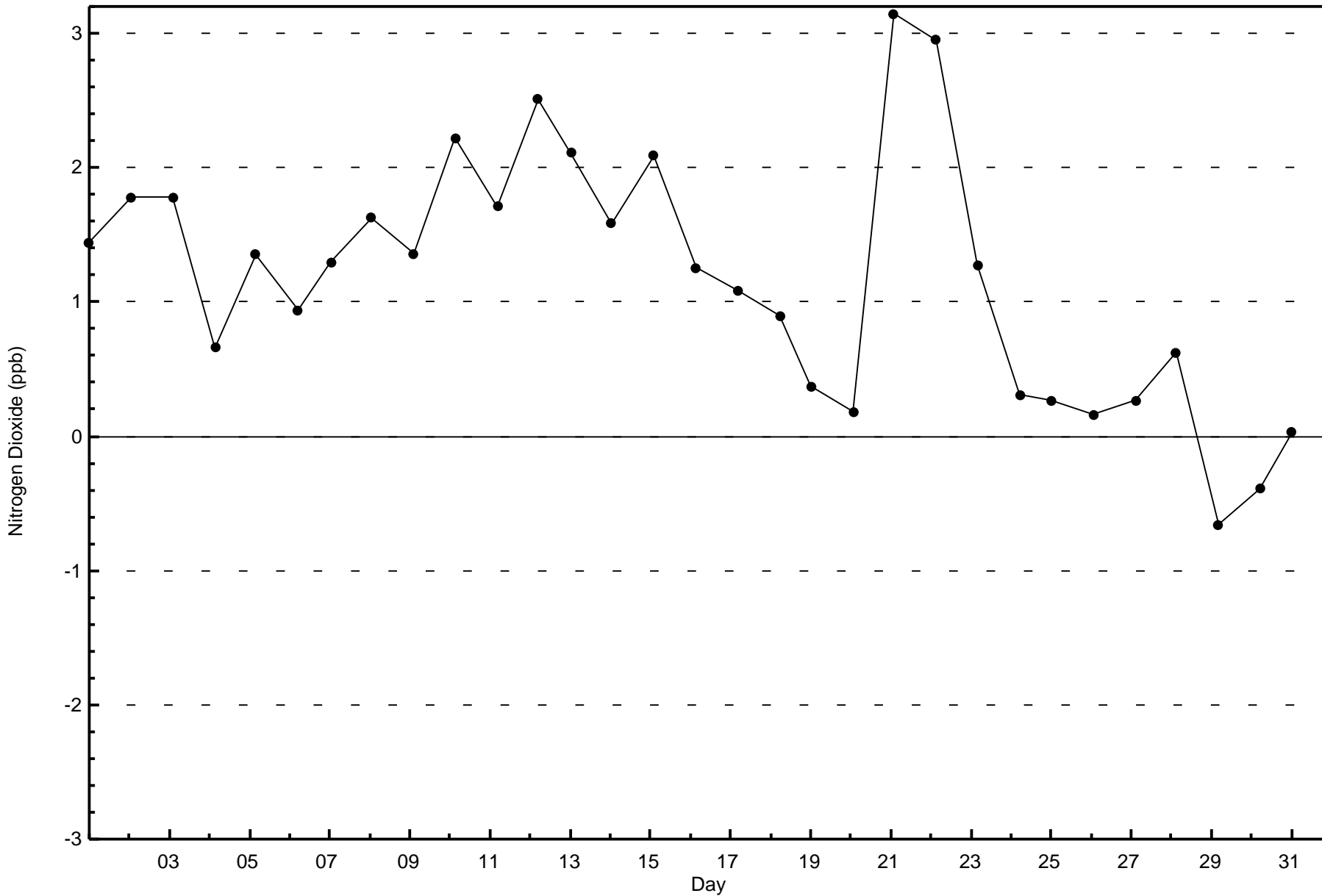
Total Number of Hours: 744

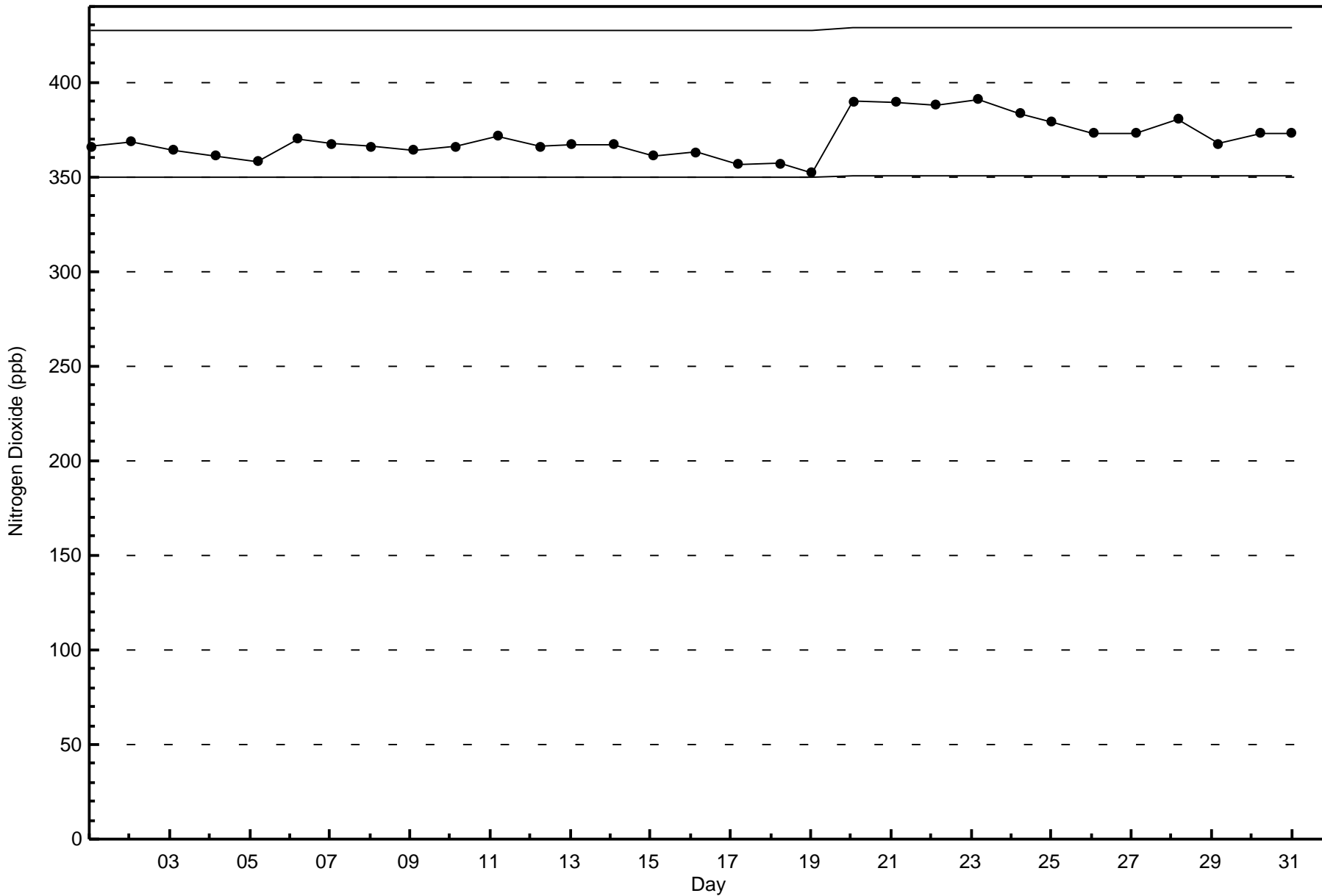


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Christina Lake (AMS 500)











**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

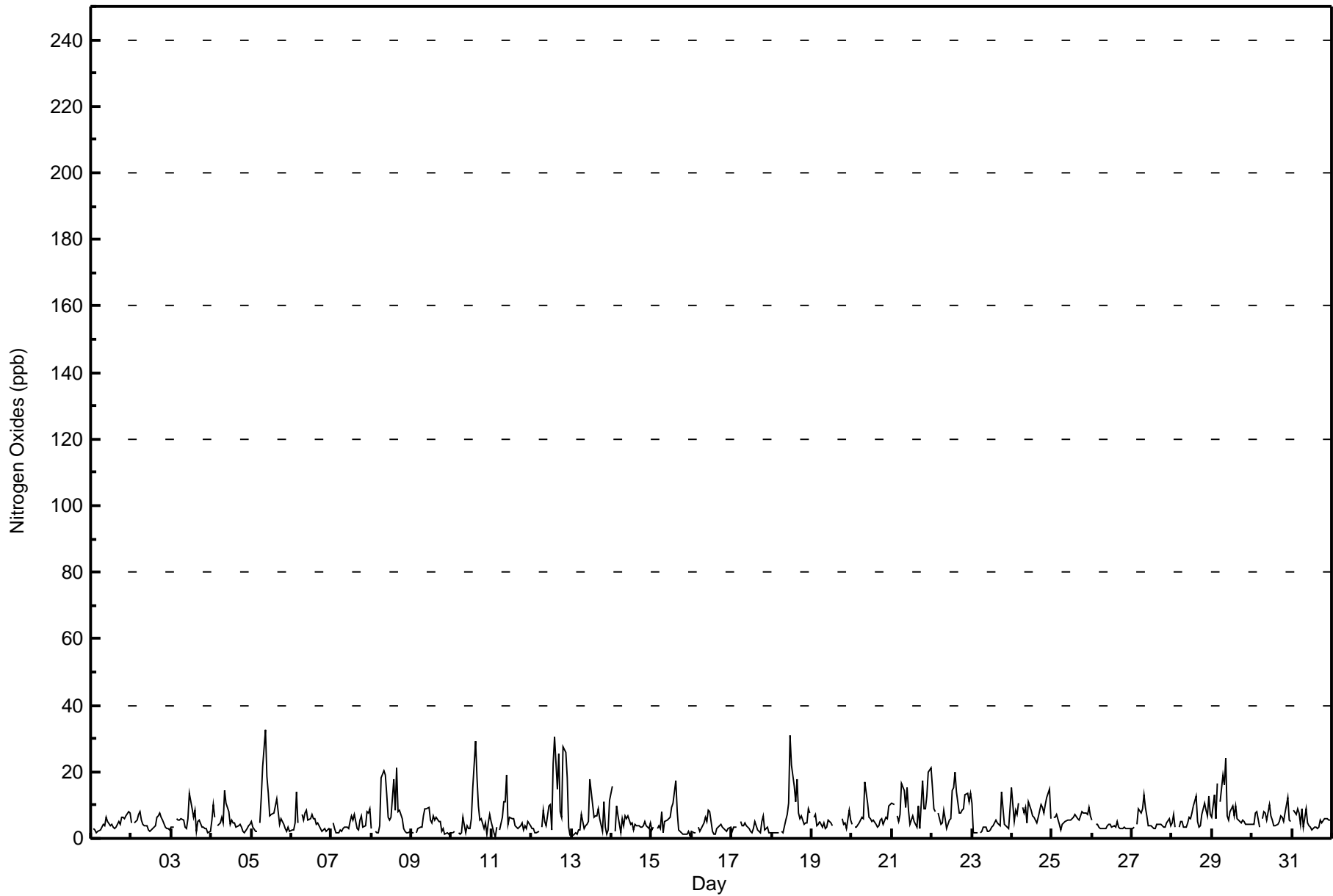
**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Christina Lake - December 2017**

Maximum Value: 33 ppb on Dec 5 09:00														Maximum Daily Average: 10.4 ppb on Dec 12														Hours in Service: 744	
Minimum Value: 1 ppb on Dec 11 03:00														Minimum Daily Average: 3.3 ppb on Dec 17														Hours of Data: 708	
Maximum Diurnal Average: 8.3 ppb at hour 15														Minimum Diurnal Average: 4.0 ppb at hour 3														Hours of Missing Data: 36	
Monthly Average: 6.0 ppb														Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 5 O <sub>3</sub> = 7 P <sub>90</sub> = 11 P <sub>99</sub> = 25														Hours of Calibration: 36	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	Z	3	3	2	2	3	3	4	4	6	5	4	4	3	3	4	5	4	6	7	6	7	8	8	4.5	8			
2-Dec	5	Z	4	5	7	8	5	4	4	4	3	2	3	3	4	6	7	7	6	6	3	3	3	3	4.6	8			
3-Dec	3	3	Z	6	6	5	6	6	3	3	6	14	9	6	8	2	5	5	3	4	3	3	2	2	4.9	14			
4-Dec	6	10	6	Z	4	5	6	4	14	11	8	4	5	5	3	4	4	3	2	2	3	4	4	4	5.4	14			
5-Dec	5	4	2	2	Z	5	12	22	33	19	14	7	7	7	10	12	8	4	6	4	3	2	4	2	8.4	33			
6-Dec	2	2	4	14	5	Z	7	5	8	9	6	6	7	6	6	4	5	3	2	3	3	2	3	3	5.0	14			
7-Dec	Z	5	3	2	2	3	2	3	4	3	3	5	7	6	7	3	2	6	7	4	4	8	8	9	4.5	9			
8-Dec	3	Z	2	2	2	4	18	20	19	13	6	6	7	18	8	21	8	8	6	3	2	2	2	2	7.9	21			
9-Dec	2	2	Z	2	3	3	3	7	9	9	9	5	4	7	6	7	5	5	2	3	1	2	1	2	4.2	9			
10-Dec	2	2	2	Z	2	1	2	6	2	4	3	3	6	15	29	18	10	6	6	3	4	1	5	7	6.1	29			
11-Dec	5	2	1	3	Z	2	6	11	11	19	4	7	6	6	4	3	3	4	5	2	4	3	5	4	5.2	19			
12-Dec	3	3	2	2	2	Z	3	8	5	4	10	10	3	23	30	15	25	8	7	27	26	18	3	1	10.4	30			
13-Dec	Z	1	2	1	3	2	7	3	4	4	5	18	14	6	7	7	9	6	2	11	3	1	3	12	5.7	18			
14-Dec	16	Z	2	10	7	2	6	4	7	6	7	4	4	3	4	4	3	3	4	5	4	3	5	5	5.0	16			
15-Dec	2	4	Z	3	4	3	8	2	5	5	6	6	9	10	17	8	3	2	2	1	1	1	2	1	4.6	17			
16-Dec	2	2	2	Z	3	2	3	5	6	5	9	8	2	1	1	3	3	4	3	3	3	2	3	3	3.4	9			
17-Dec	2	3	3	3	Z	5	4	4	5	4	3	2	2	3	5	3	2	2	5	7	3	4	2	2	3.3	7			
18-Dec	2	2	2	2	2	Z	2	2	6	7	11	31	22	16	11	18	7	6	7	4	5	5	9	8	8.0	31			
19-Dec	Z	6	7	4	4	5	3	5	3	3	6	5	4	C	C	C	C	C	6	4	5	3	8	6	4.8	8			
20-Dec	4	Z	3	3	5	6	6	6	17	11	7	6	5	5	4	4	4	5	6	4	6	6	10	10	6.2	17			
21-Dec	10	10	Z	7	5	7	16	14	9	15	9	4	7	5	4	3	10	3	18	9	9	13	20	21	10.0	21			
22-Dec	15	9	8	Z	8	4	5	9	6	3	5	6	14	15	20	14	8	8	9	9	13	13	11	14	9.8	20			
23-Dec	11	2	2	2	Z	2	2	3	4	2	2	3	3	4	5	5	4	4	14	4	4	4	3	9	4.2	14			
24-Dec	15	5	9	7	11	Z	9	8	9	5	11	9	7	6	5	5	6	10	9	8	10	12	15	6	8.6	15			
25-Dec	Z	6	6	7	4	3	4	5	5	6	5	6	6	6	7	6	6	7	8	8	8	7	10	7	6.2	10			
26-Dec	5	Z	4	4	3	3	3	3	3	4	4	4	3	4	3	5	3	3	3	3	3	3	3	3	3.5	5			
27-Dec	3	3	Z	4	9	8	9	13	9	7	4	4	3	3	3	4	4	4	4	3	3	5	6	4	5.2	13			
28-Dec	5	7	3	Z	3	5	5	3	4	5	7	6	8	10	13	5	3	4	7	11	9	7	13	7	6.4	13			
29-Dec	6	13	6	17	Z	11	19	16	24	7	5	8	10	7	10	6	6	5	5	5	4	4	4	4	8.8	24			
30-Dec	4	4	8	8	3	Z	6	8	8	5	10	7	6	4	4	4	5	7	6	5	8	12	5	5	6.2	12			
31-Dec	Z	9	7	9	7	4	9	3	9	5	4	3	3	3	3	3	3	5	5	6	6	6	5	6	5.4	9			
																												Diurnal Average	
5.6														4.7														4.0	
16														13														9	
																												Diurnal Maximum	
17														11														11	
																												19	
																												22	
																												33	
																												19	
																												14	
																												31	
																												6.4	
																												7.2	
																												8.3	
																												6.8	
																												5.9	
																												5.1	
																												5.8	
																												5.7	
																												5.4	
																												5.3	
																												5.9	
																												5.7	
																												20	
																												21	
Z - zerospan																								C - Calibration					



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Christina Lake - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	695	98.16	98.16
21 - 40	13	1.84	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Christina Lake - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	6	15	5	2	2	6	12	28	71	109	108	144	52	83	48	4	695
21 - 40	0	0	0	0	0	0	0	0	0	1	0	0	2	10	0	0	13
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
<b>Totals</b>	<b>6</b>	<b>15</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>12</b>	<b>28</b>	<b>71</b>	<b>110</b>	<b>108</b>	<b>144</b>	<b>54</b>	<b>93</b>	<b>48</b>	<b>4</b>	<b>708</b>

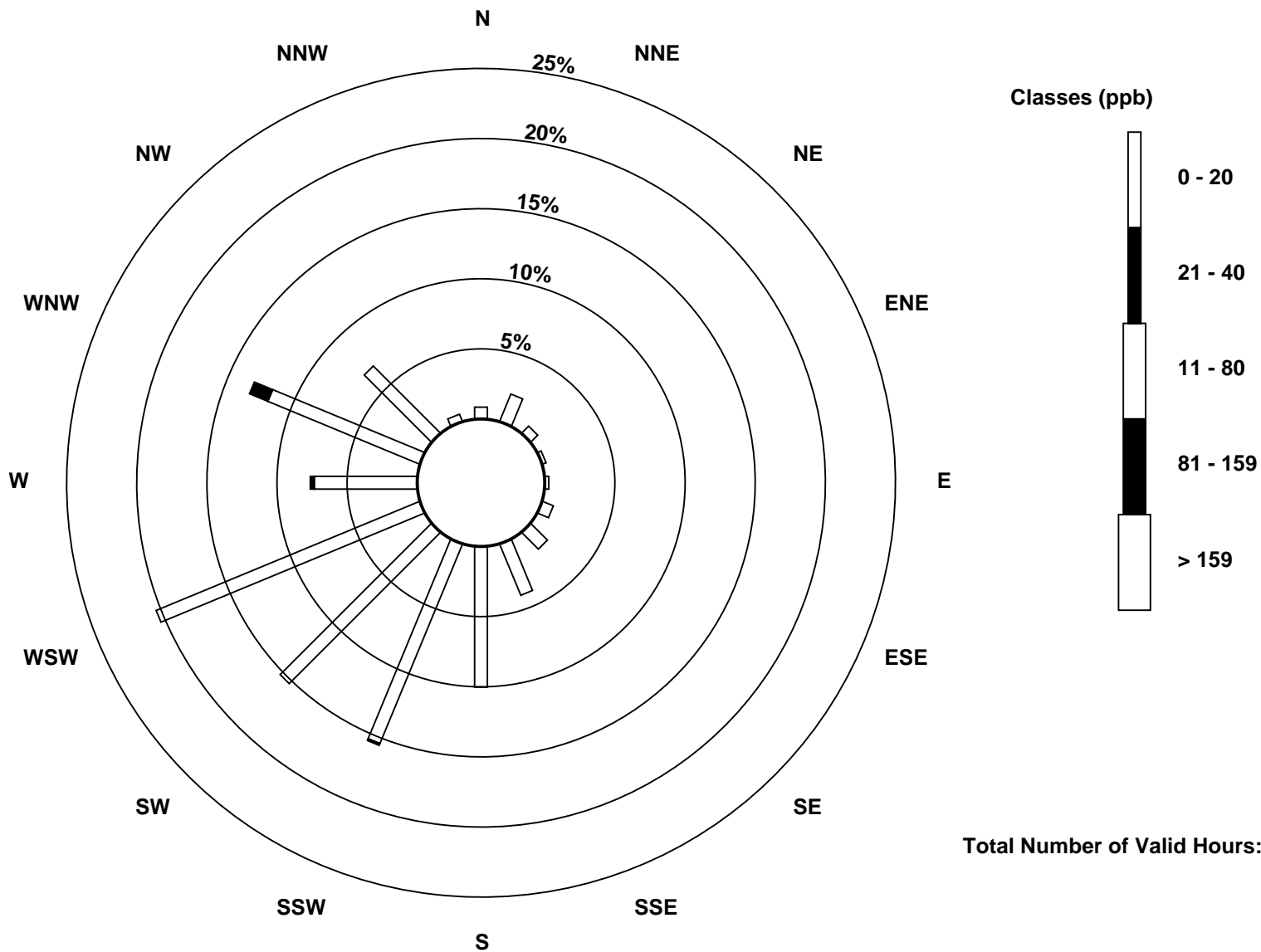
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Christina Lake (AMS 500)

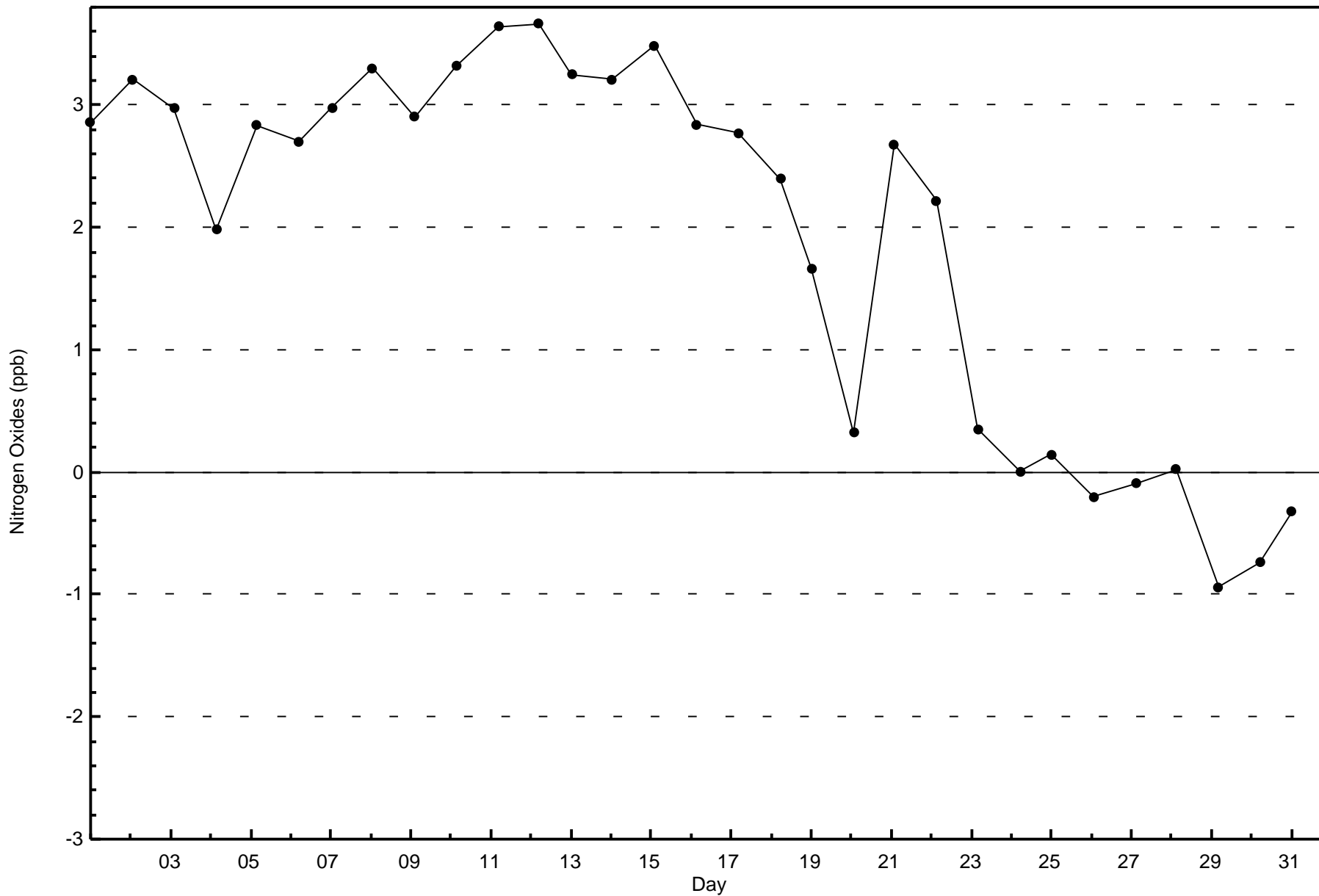


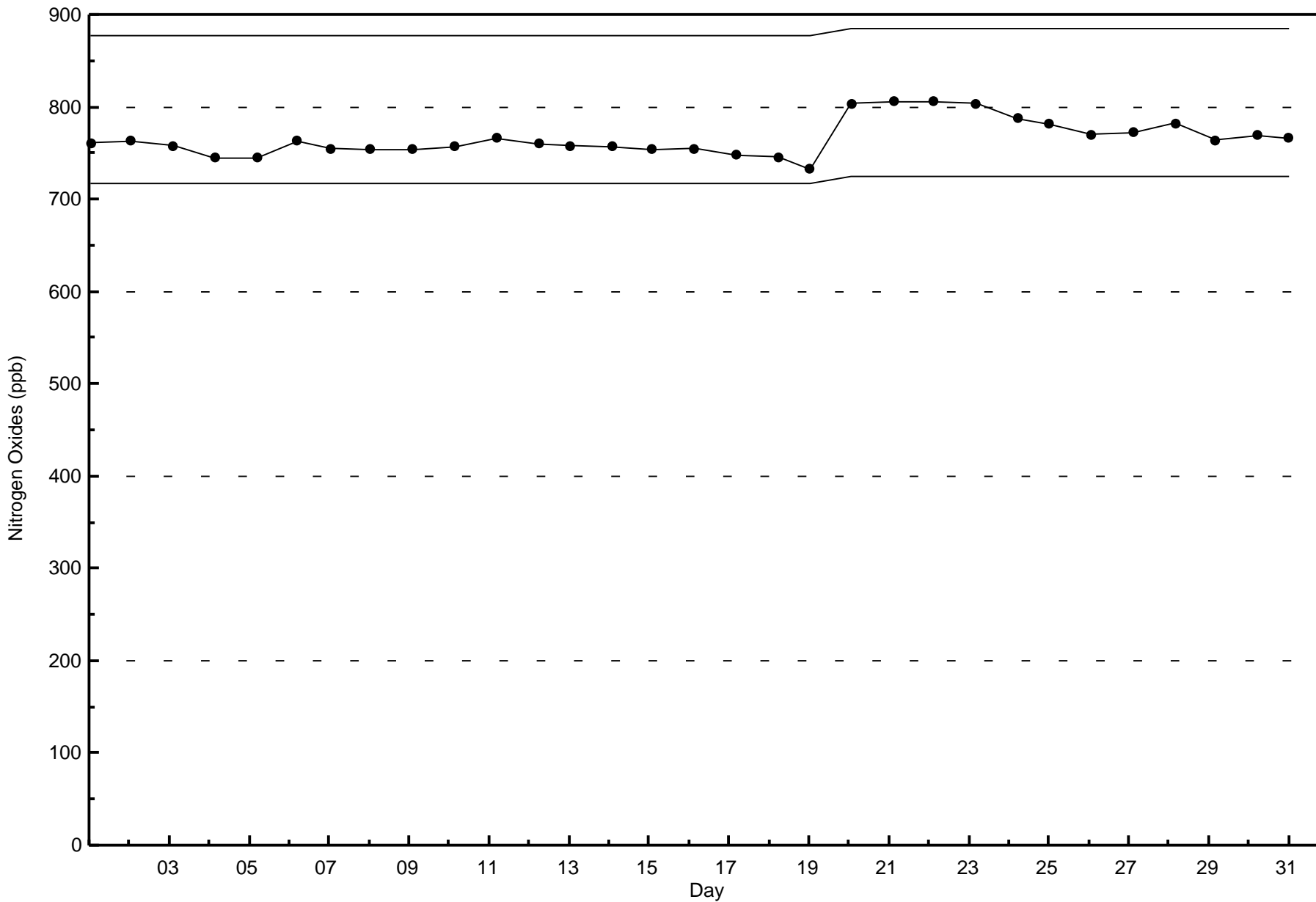
Total Number of Valid Hours: 708



Wood Buffalo Environmental Association  
Zero Responses

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Christina Lake - December 2017







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Ambient Temperature (AT) - C**  
**Christina Lake - December 2017**

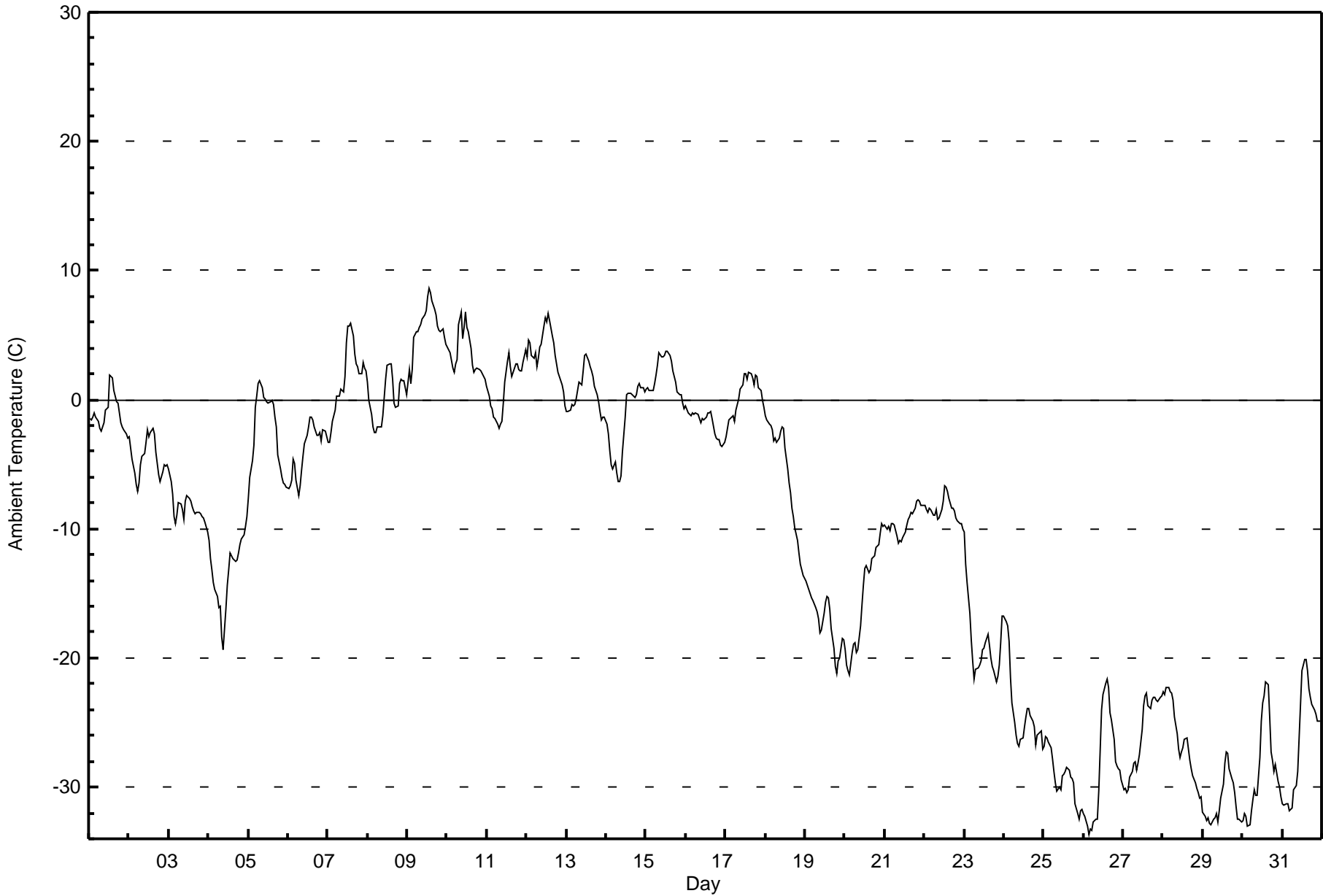
Maximum Value: 8.6 C on Dec 9 14:00		Maximum Daily Average: 5.5 C on Dec 9		Hours in Service: 744																						
Minimum Value: -33.7 C on Dec 26 04:00		Minimum Daily Average: -31.1 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -7.9 C at hour 14		Minimum Diurnal Average: -11.2 C at hour 7		Hours of Missing Data: 0																						
Monthly Average: -10.14 C		Percentiles: P <sub>1</sub> = -32.8 P <sub>10</sub> = -29.2 Q <sub>1</sub> = -21.6 Median = -6.7 Q <sub>3</sub> = 0.1 P <sub>90</sub> = 2.7 P <sub>99</sub> = 6.7		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-1.5	-1.6	-1.4	-1.0	-1.4	-1.7	-2.3	-2.5	-2.1	-1.8	-0.8	-0.6	1.9	1.8	1.7	0.7	-0.1	-0.3	-1.0	-1.7	-2.1	-2.3	-2.6	-2.9	-1.1	1.9
2-Dec	-2.9	-3.7	-4.6	-5.7	-6.5	-7.1	-6.4	-5.0	-4.4	-4.1	-3.3	-2.3	-2.9	-2.5	-2.2	-2.6	-4.1	-4.9	-5.8	-6.3	-5.6	-5.0	-5.1	-5.1	-4.5	-2.2
3-Dec	-5.4	-6.4	-7.3	-9.0	-9.6	-8.9	-8.0	-8.1	-8.5	-9.2	-7.9	-7.4	-7.6	-7.8	-8.2	-8.7	-8.8	-8.7	-8.7	-8.8	-9.0	-9.1	-9.5	-10.2	-8.4	-5.4
4-Dec	-10.9	-12.3	-13.1	-14.2	-14.7	-15.2	-16.2	-16.0	-18.3	-19.3	-16.2	-14.4	-13.2	-11.9	-12.0	-12.4	-12.5	-12.4	-11.8	-11.2	-10.8	-10.5	-9.8	-9.0	-13.3	-9.0
5-Dec	-7.6	-6.0	-4.7	-3.5	-0.6	0.3	1.3	1.4	0.9	0.2	0.0	-0.2	-0.2	-0.1	-0.1	-0.4	-1.4	-2.2	-4.3	-5.4	-6.0	-6.4	-6.5	-6.7	-2.4	1.4
6-Dec	-6.9	-6.7	-6.2	-4.6	-5.0	-6.2	-7.4	-6.6	-5.4	-4.4	-3.4	-2.8	-2.1	-1.3	-1.3	-1.6	-2.1	-2.7	-2.7	-2.6	-3.2	-2.3	-2.4	-2.9	-3.9	-1.3
7-Dec	-3.3	-3.3	-2.5	-1.6	-0.8	0.3	0.3	0.3	0.8	0.6	1.7	4.4	5.7	5.7	5.9	4.9	3.5	2.7	2.6	2.1	2.0	2.9	2.5	2.2	1.7	5.9
8-Dec	1.4	-0.1	-1.1	-2.1	-2.6	-2.6	-2.1	-2.1	-2.2	-1.3	0.1	1.5	2.6	2.8	2.8	1.6	-0.3	-0.6	-0.5	1.2	1.6	1.5	1.5	0.4	0.1	2.8
9-Dec	1.3	2.4	1.2	2.3	4.9	5.2	5.2	5.6	5.8	6.3	6.6	6.9	7.9	8.6	8.3	7.7	7.0	6.5	5.7	5.4	5.3	5.5	4.9	4.3	5.5	8.6
10-Dec	4.1	3.8	3.6	2.4	2.1	2.7	3.1	5.8	6.8	4.8	5.6	6.8	5.6	5.2	4.0	2.6	2.1	2.3	2.4	2.4	2.2	2.1	1.8	1.6	3.6	6.8
11-Dec	1.0	0.2	-0.5	-0.7	-1.3	-1.4	-1.9	-2.2	-1.9	-1.7	-0.3	1.3	2.9	3.6	2.5	1.8	2.1	2.7	2.8	2.3	2.2	2.2	2.9	3.8	0.9	3.8
12-Dec	3.3	4.6	4.4	3.4	3.2	3.6	2.5	3.2	4.0	4.2	5.7	6.3	6.0	6.7	6.2	5.0	4.4	3.5	2.8	2.1	1.4	1.1	0.6	-0.5	3.7	6.7
13-Dec	-0.9	-0.9	-0.9	-0.3	-0.5	-0.4	0.0	1.3	1.3	1.2	2.2	3.4	3.5	3.0	2.6	2.3	1.8	1.1	0.4	-0.2	-0.9	-1.5	-1.4	-1.4	0.6	3.5
14-Dec	-1.9	-2.6	-4.0	-5.1	-5.4	-4.8	-5.7	-6.3	-6.4	-5.9	-4.1	-1.4	0.4	0.5	0.5	0.5	0.2	0.2	0.4	1.0	1.3	1.0	1.0	0.6	-1.9	1.3
15-Dec	0.8	0.9	0.7	0.8	0.7	1.3	1.9	2.7	3.6	3.3	3.3	3.5	3.8	3.8	3.4	3.0	2.2	1.8	1.4	0.6	0.4	0.4	-0.2	-0.7	1.8	3.8
16-Dec	-0.5	-1.0	-1.2	-1.3	-1.0	-1.2	-1.0	-1.1	-1.4	-1.8	-1.5	-1.5	-1.4	-1.1	-1.0	-0.9	-1.5	-2.7	-3.0	-3.1	-3.1	-3.5	-3.6	-3.3	-1.8	-0.5
17-Dec	-2.9	-2.2	-1.5	-1.4	-1.3	-1.6	-0.8	-0.3	0.1	0.8	1.1	2.0	2.1	1.6	2.1	2.0	1.7	1.2	2.0	1.8	0.9	0.7	0.0	-0.6	0.3	2.1
18-Dec	-1.2	-1.5	-1.9	-2.0	-2.4	-3.2	-3.0	-3.3	-3.0	-2.4	-2.1	-2.2	-3.8	-5.4	-6.4	-7.2	-8.4	-9.0	-9.9	-10.9	-11.9	-12.8	-13.1	-13.6	-5.8	-1.2
19-Dec	-14.0	-14.4	-14.7	-15.0	-15.3	-15.6	-16.1	-16.4	-16.9	-18.1	-17.8	-16.6	-15.7	-15.3	-15.4	-16.3	-17.7	-19.3	-20.6	-21.2	-20.3	-20.0	-18.5	-18.6	-17.1	-14.0
20-Dec	-19.3	-20.6	-21.0	-21.3	-19.6	-19.0	-18.8	-19.6	-19.4	-17.5	-15.9	-14.4	-13.1	-12.9	-13.4	-13.1	-12.3	-12.2	-12.1	-11.5	-11.2	-10.4	-9.6	-9.8	-15.3	-9.6
21-Dec	-9.7	-10.0	-9.9	-10.2	-9.6	-9.6	-9.7	-10.6	-11.1	-10.9	-11.0	-10.7	-10.3	-9.7	-9.3	-9.1	-8.7	-8.9	-8.4	-7.9	-7.8	-7.9	-8.2	-8.2	-9.5	-7.8
22-Dec	-8.2	-8.5	-8.7	-8.4	-8.6	-9.0	-8.9	-8.5	-9.3	-9.2	-8.5	-7.8	-6.7	-6.7	-7.1	-7.6	-8.4	-8.4	-8.6	-9.2	-9.3	-9.6	-9.6	-10.0	-8.5	-6.7
23-Dec	-10.2	-12.8	-14.1	-16.5	-18.6	-20.3	-21.7	-20.9	-20.7	-20.6	-20.2	-19.4	-19.3	-18.9	-18.1	-19.0	-20.1	-20.6	-21.0	-21.9	-21.5	-20.5	-18.8	-16.7	-18.8	-10.2
24-Dec	-16.7	-17.2	-17.5	-18.7	-21.5	-23.5	-25.0	-26.0	-26.7	-26.9	-26.3	-26.2	-25.3	-24.6	-23.9	-23.9	-24.5	-24.9	-25.3	-26.7	-26.0	-25.8	-25.6	-27.0	-24.0	-16.7
25-Dec	-26.8	-26.1	-26.1	-26.5	-27.0	-27.8	-28.8	-29.7	-30.3	-30.0	-30.2	-29.2	-29.0	-28.8	-28.4	-28.7	-29.3	-29.4	-29.6	-31.3	-32.1	-32.5	-31.8	-31.7	-29.2	-26.1
26-Dec	-32.0	-32.3	-33.0	-33.7	-33.3	-33.3	-32.7	-32.5	-32.5	-30.3	-27.1	-24.1	-22.8	-21.9	-21.6	-22.3	-24.3	-24.8	-26.3	-28.1	-28.4	-28.6	-28.6	-29.5	-28.5	-21.6
27-Dec	-30.2	-30.1	-30.4	-30.2	-29.2	-28.8	-28.2	-28.0	-28.7	-28.1	-27.5	-25.5	-23.7	-23.0	-22.8	-23.7	-23.9	-23.3	-23.0	-23.1	-23.2	-23.4	-23.0	-22.9	-26.0	-22.8
28-Dec	-22.6	-22.8	-22.3	-22.3	-22.6	-22.8	-23.3	-24.5	-25.9	-27.1	-27.7	-27.3	-27.0	-26.2	-26.2	-27.0	-27.9	-28.5	-29.1	-29.7	-30.1	-30.4	-30.9	-30.7	-26.5	-22.3
29-Dec	-32.0	-32.3	-32.6	-32.3	-32.8	-32.9	-32.5	-32.4	-32.0	-32.7	-31.8	-30.9	-29.8	-28.1	-27.3	-27.4	-28.6	-29.3	-29.7	-30.4	-31.5	-32.5	-32.5	-32.7	-31.1	-27.3
30-Dec	-32.6	-32.0	-32.3	-33.0	-32.9	-31.8	-31.0	-30.2	-30.7	-30.7	-27.7	-24.9	-23.5	-23.0	-21.9	-22.1	-24.6	-27.3	-27.9	-28.8	-28.3	-29.5	-30.0	-30.7	-28.6	-21.9
31-Dec	-31.2	-31.4	-31.3	-31.3	-31.9	-31.7	-31.6	-30.2	-29.9	-28.8	-26.2	-23.6	-21.0	-20.1	-20.1	-20.9	-22.4	-23.1	-23.5	-24.1	-24.3	-24.9	-24.9	-24.8	-26.4	-20.1
	-10.3	-10.5	-10.8	-11.1	-11.1	-11.2	-11.2	-11.0	-11.1	-11.0	-10.0	-8.9	-8.3	-7.9	-8.0	-8.5	-9.2	-9.7	-10.1	-10.5	-10.6	-10.7	-10.7	-10.9		Diurnal Average
	4.1	4.6	4.4	3.4	4.9	5.2	5.2	5.8	6.8	6.3	6.6	6.9	7.9	8.6	8.3	7.7	7.0	6.5	5.7	5.4	5.3	5.5	4.9	4.3		Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Christina Lake - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Christina Lake - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	206	27.69	27.69
-20 - 0	350	47.04	74.73
0 - 10	188	25.27	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

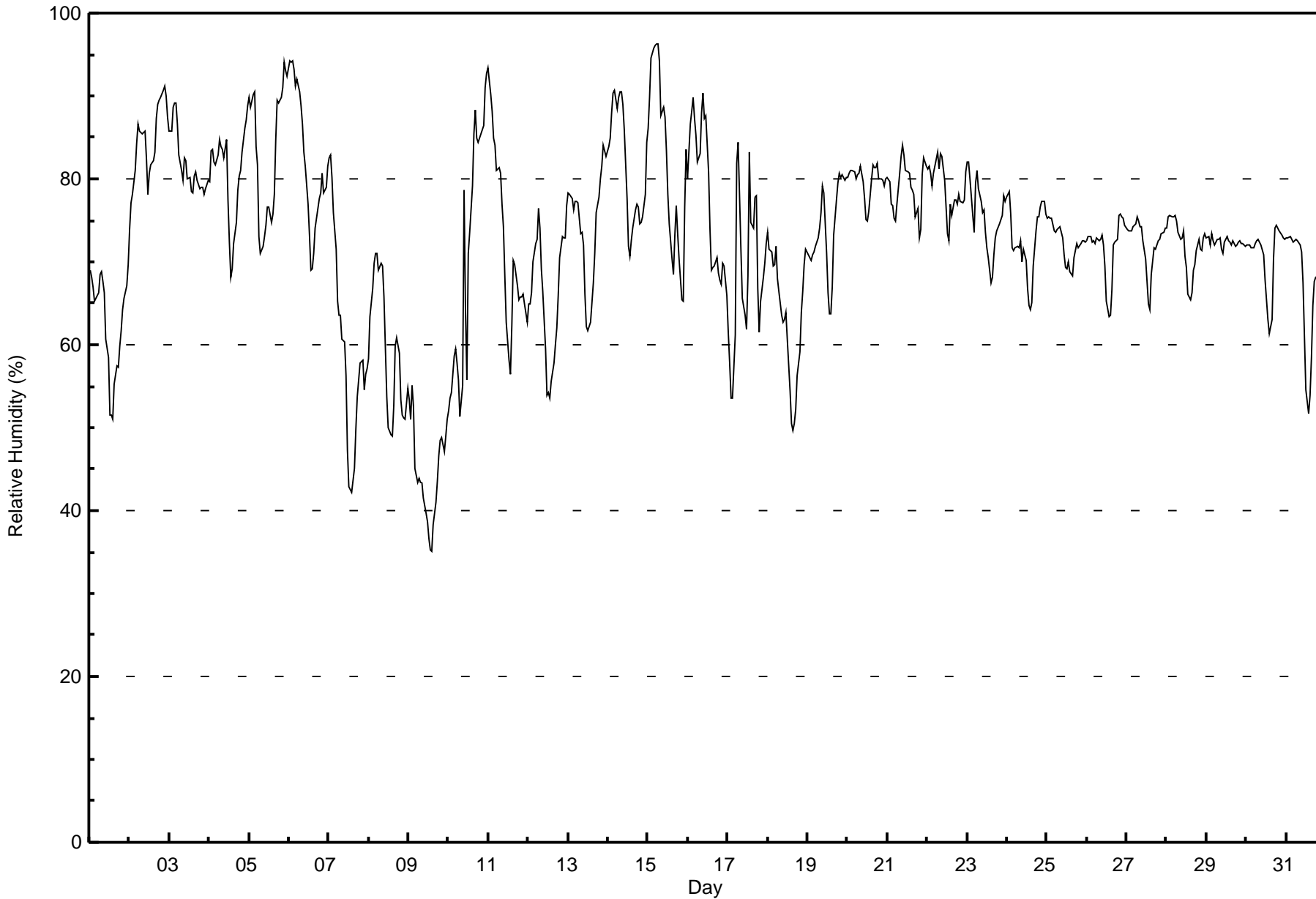


**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %  
Christina Lake - December 2017**

Maximum Value: 96 % on Dec 15 07:00      Maximum Daily Average: 84.4 % on Dec 2																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 35 % on Dec 9 15:00      Minimum Daily Average: 44.7 % on Dec 9 Maximum Diurnal Average: 76.3 % at hour 3      Minimum Diurnal Average: 65.6 % at hour 15 Monthly Average: 72.7 %      Percentiles: P <sub>1</sub> = 41 P <sub>10</sub> = 57 Q <sub>1</sub> = 68 Median = 73 O <sub>3</sub> = 80 P <sub>90</sub> = 86 P <sub>99</sub> = 94																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	69	68	67	65	66	66	68	69	68	66	61	58	52	51	51	55	57	57	60	62	64	66	67	70	62.7	70
2-Dec	74	77	78	81	84	87	86	86	85	86	82	78	81	82	82	83	87	89	89	90	91	91	90	87	84.4	91
3-Dec	86	86	89	89	89	87	83	81	80	83	82	80	80	79	78	80	81	80	79	79	79	78	79	80	81.9	89
4-Dec	80	83	84	82	82	83	85	84	83	83	85	78	72	68	69	72	75	79	80	81	83	86	87	89	80.5	89
5-Dec	90	89	90	90	84	82	73	71	72	73	74	77	77	75	76	78	85	90	89	90	91	94	93	92	83.1	94
6-Dec	94	94	94	93	91	92	91	89	87	83	82	77	73	69	69	71	74	76	78	78	81	78	79	81	82.3	94
7-Dec	83	83	80	76	71	65	64	63	61	60	56	47	43	43	42	45	50	54	56	58	58	55	57	57	59.4	83
8-Dec	58	63	67	70	71	71	69	70	69	66	60	54	50	49	49	53	60	61	59	53	51	51	51	55	59.6	71
9-Dec	53	51	55	53	45	43	44	43	43	42	40	39	37	35	35	38	41	44	47	48	49	47	49	51	44.7	55
10-Dec	52	54	54	59	60	58	56	51	55	79	64	56	71	74	79	85	88	85	84	85	86	86	91	93	71.0	93
11-Dec	93	90	88	85	84	81	81	81	77	74	68	63	58	56	62	70	70	67	66	66	66	66	65	63	72.5	93
12-Dec	65	65	66	70	72	73	76	74	69	66	59	54	54	54	56	58	60	62	66	70	73	73	73	77	66.0	77
13-Dec	78	78	78	76	77	77	77	73	74	72	66	62	62	63	65	68	71	76	78	80	82	84	83	83	74.3	84
14-Dec	84	85	88	90	91	88	90	90	91	89	86	78	72	71	72	74	76	77	77	75	75	75	78	84	81.5	91
15-Dec	86	90	95	96	96	96	96	94	88	89	87	83	78	75	70	68	73	77	73	70	65	65	77	83	82.2	96
16-Dec	80	87	88	90	87	85	82	83	88	90	87	88	81	74	69	69	70	70	69	68	67	70	70	66	78.2	90
17-Dec	62	58	54	54	61	82	84	78	71	66	64	62	68	83	75	74	78	78	67	62	65	68	70	72	68.9	84
18-Dec	74	72	71	69	70	72	68	66	64	63	63	64	61	54	51	50	50	52	56	59	64	66	70	71	63.3	74
19-Dec	71	71	70	71	71	72	73	74	76	79	78	71	66	64	64	67	73	77	80	81	80	80	80	80	73.7	81
20-Dec	80	81	81	81	81	80	80	81	81	80	78	75	75	76	80	82	81	81	82	80	80	80	79	80	79.8	82
21-Dec	80	80	77	77	75	75	77	81	83	84	83	81	81	81	79	79	78	75	76	73	74	80	82	81	78.9	84
22-Dec	81	81	81	79	81	82	83	81	83	83	80	77	73	72	77	76	77	77	77	78	77	77	78	81	78.9	83
23-Dec	82	82	80	76	74	80	81	79	77	76	76	74	72	71	67	68	71	73	74	75	75	76	78	77	75.5	82
24-Dec	78	78	76	72	71	72	72	72	73	70	71	70	67	65	64	65	69	74	75	75	77	77	77	76	72.3	78
25-Dec	75	75	75	75	74	74	74	74	74	73	71	69	69	70	69	68	70	71	72	72	72	73	73	72	72.3	75
26-Dec	73	73	73	72	73	72	73	73	73	73	72	70	65	63	64	67	72	72	73	76	76	76	75	74	71.7	76
27-Dec	74	74	74	74	74	75	75	75	74	74	73	70	68	65	64	68	72	72	72	73	73	73	74	74	72.2	75
28-Dec	74	75	76	75	75	76	75	73	73	73	74	71	69	66	65	66	69	70	71	73	72	71	73	73	72.0	76
29-Dec	73	73	72	73	73	72	73	73	73	71	71	72	73	73	72	72	72	72	72	72	73	72	72	72	72.4	73
30-Dec	72	72	72	72	72	72	73	73	72	72	71	68	65	63	61	63	70	74	74	74	74	73	73	73	70.8	74
31-Dec	73	73	73	73	72	72	73	73	72	71	67	61	55	52	54	59	65	68	68	68	69	68	67	66	67.2	73
																			75.7				Diurnal Average			
																			94				Diurnal Maximum			





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Christina Lake - December 2017**

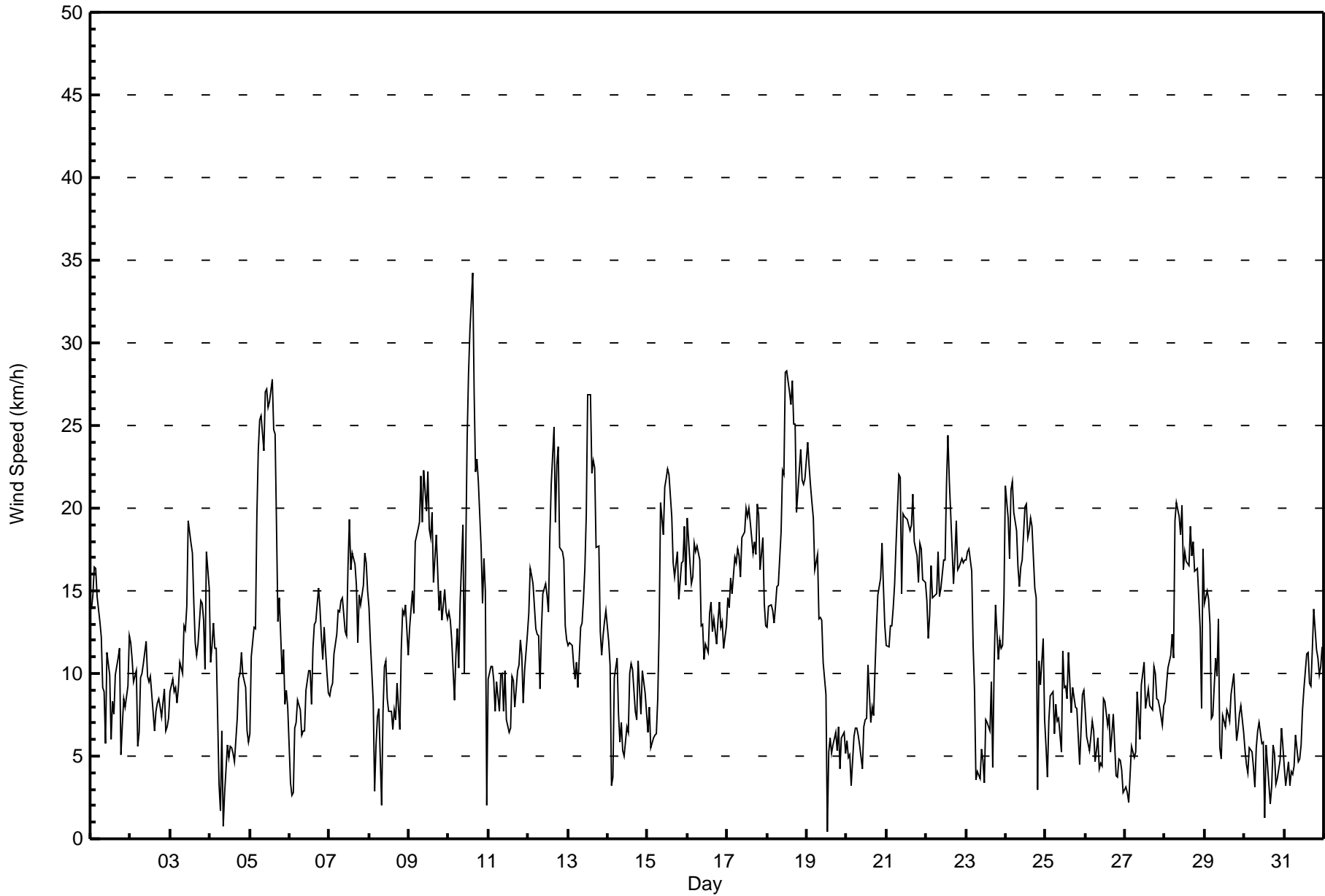
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	6	0.81	0.81
40 - 60	87	11.69	12.50
60 - 80	468	62.90	75.40
80 - 100	183	24.60	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 34 km/h on Dec 10 15:00 Minimum Speed Value: 0 km/h on Dec 19 13:00 Maximum Diurnal Speed Average: 11.4 km/h at hour 14 Monthly Average Velocity: 8.7 km/h 254.7 deg		Maximum Daily Speed Average: 18.7 km/h on Dec 18 Minimum Daily Speed Average: 2.1 km/h on Dec 4 Minimum Diurnal Speed Average: 6.5 km/h at hour 3 Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 5 Q <sub>1</sub> = 8 Median = 11 Q <sub>3</sub> = 16 P <sub>90</sub> = 20 P <sub>99</sub> = 28		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSW14	SW15	SW16	SW16	SW15	SW13	SW12	SW9	SW9	SSW6	SW11	SSW10	S6	S8	S8	S10	S11	S12	SSW5	SSW7	SSW8	SSW8	SSW9	SW12	SSW9.9	SW16
2-Dec	SW12	SW11	SW10	SW10	SSW6	SW6	SW10	SW10	WSW11	WSW12	WSW10	SW9	SW10	SW9	SW6	SW8	SSW8	S8	SSW8	S7	SSW9	S7	S7	SSW7	SW8.3	WSW12
3-Dec	SW9	SSW10	SSW9	S9	S8	S9	SSW11	SSW10	WSW13	WSW13	WSW14	W19	WNW18	WNW17	W14	WSW12	WSW11	WNW12	WNW14	NW14	WNW13	WNW10	WNW17	WNW15	W9.9	W19
4-Dec	NNW11	NNE12	NNE13	NNE12	NNE12	NE3	ESE2	WNW7	SSE1	E3	SW6	S5	SSE6	SSW5	S5	SSE5	SSE7	SSE10	SSE10	S11	S10	SSE9	SSE7	SSE6	SE2.1	NNE13
5-Dec	S6	SW11	WSW13	WSW13	WSW20	W23	W25	W26	WNW24	WNW27	WNW27	WNW26	WNW26	WNW28	NW25	NW25	NW19	N13	NNE15	NNE10	NNE11	NNE8	N9	NNE8	WNW13.9	WNW28
6-Dec	E3	ESE3	SE3	WNW7	SSW7	SSW8	S8	SSW6	SSW7	SSW7	S9	SSW10	SW10	SW8	WSW12	WSW13	WSW13	WSW15	WSW14	WSW12	SW11	WSW13	SW10	SSW9	SW7.9	WSW15
7-Dec	SW9	SW9	SW9	WSW11	WSW12	WSW14	WSW14	WSW14	WSW15	WSW13	WSW12	WSW16	WSW19	WSW16	WSW17	WSW17	WSW15	WSW12	WSW15	WSW14	WSW15	W17	WSW17	WSW15	WSW13.9	WSW19
8-Dec	WSW14	SW12	SW8	S3	SW6	SW7	SW8	S2	SW8	SW10	SW11	SW8	SW8	SW8	SW7	SSW8	S7	SSW9	SSW7	WSW11	WSW14	WSW14	WSW14	SW11	SW8.6	WSW14
9-Dec	WSW13	WSW14	WSW15	SW14	WSW18	WSW19	WSW19	WSW22	WSW19	W22	W20	WSW22	WSW19	WSW18	W20	WSW16	WSW18	WSW16	WSW14	WSW15	WSW13	WSW15	WSW14	WSW13	WSW16.8	W22
10-Dec	WSW14	WSW13	SW12	SW8	WSW11	WSW13	SW10	WSW14	WSW19	SSW10	SW17	WSW24	W28	W31	WNW34	WNW27	WNW22	WNW23	WNW22	NW18	NW14	WNW17	WNW15	WSW2	W15.3	WNW34
11-Dec	SSW10	SW10	SW10	SW10	SW8	SW9	SW8	SW10	SW10	SW8	SW10	SSW7	SSW6	SW7	SSW10	SSW10	SSW8	SSW10	SSW11	SSW12	SSW11	SSW8	SW10	SW12	SSW9.1	SW12
12-Dec	SW14	SW16	WSW16	WSW15	WSW13	WSW12	SW12	SW9	WSW13	WSW15	W15	W15	WSW14	W18	WNW21	WNW25	WNW19	NW23	WNW24	WNW18	WNW17	W17	WSW13	WSW12	W14.1	WNW25
13-Dec	SW12	SW12	SW12	SW10	SW10	SW11	SSW9	WSW13	WSW13	WSW14	WSW16	W20	WNW27	WNW27	NW22	WNW23	NW22	NW18	WNW18	WNW13	WSW11	SW12	WSW13	W14	W12.9	WNW27
14-Dec	WNW12	WSW11	SW3	SSW4	SW10	SW11	S8	S6	S7	SSE5	S5	SSW7	SSW6	SSW10	SSW11	SSW10	S8	S7	SSW11	SSW9	SW8	SW10	SW9	SSW8	SSW7.2	WNW12
15-Dec	S6	SW8	S6	SSW6	SSW6	SSW6	SW9	WSW13	W20	WSW18	WSW21	W22	W22	W22	W19	W17	WSW16	WSW17	WSW17	WSW14	WSW17	WSW17	WSW19	WSW15	WSW13.9	W22
16-Dec	WSW19	WSW17	WSW15	WSW16	WSW18	WSW17	WSW18	WSW17	WNW13	NW13	W11	WSW12	WSW11	WSW14	WSW14	SW13	SW13	SW12	SW13	SW14	SSW13	SSW13	SSW11	SSW13	WSW12.8	WSW19
17-Dec	S15	S14	SSW16	SSW15	SSW17	SSW17	SSW18	SSW17	SSW16	SW18	SW19	WSW20	WSW19	WSW20	WSW19	WSW17	WSW18	WSW17	W20	W20	WSW16	WSW18	WSW14	WSW13	WSW15.6	W20
18-Dec	WSW13	WSW14	WSW14	WSW14	WSW13	WSW14	WSW15	WSW15	WSW19	W22	W22	WNW28	WNW28	WNW27	WNW26	WNW28	WNW25	WNW25	WNW20	WNW22	WNW24	WNW22	NW21	NW22	WNW18.7	WNW28
19-Dec	NW24	NW23	NW21	WNW20	NW19	NW16	WNW17	NW13	WNW13	NW13	WNW11	SW9	NE0	WSW5	WSW6	SW5	SSW6	S6	S5	S7	S4	S6	SW6	SSW5	WNW7.9	NW24
20-Dec	S6	SSE5	SE5	S3	S6	S7	SSW7	S6	SSW6	SSW4	S7	SSW7	SSW7	SW10	SSW7	S8	S7	SSW10	SSW13	SSW15	SSW16	SSW18	SSW15	SSW13	SSW8.4	SSW18
21-Dec	SSW12	SSW12	SW13	WSW13	WSW14	WSW15	WNW18	NW22	NW22	WNW15	NW20	WNW20	NW19	WNW19	WNW19	WNW19	WNW21	WNW18	WNW17	W15	W18	W18	WNW16	WNW16	WNW14.9	NW22
22-Dec	W14	W12	W14	W17	WSW15	WSW15	WSW15	W17	WSW15	WSW15	WSW17	WSW17	W21	W24	W22	W20	WSW15	W17	W19	W16	W16	W17	W17	WNW17	W16.5	W24
23-Dec	NW17	NNE17	NNE18	NNE16	NNE12	NNE9	ESE4	SE4	SE4	E5	ENE5	NE3	NNE7	N7	NW7	WNW10	W4	WNW11	WNW14	SW11	SW12	SW12	SW12	WNW15	NNW4.2	NNE18
24-Dec	NW21	NW19	NNW17	NNW21	NW22	NW20	NW19	NW16	NW15	WNW16	WNW17	NW20	NW20	WNW18	WNW19	WNW19	NW19	NW15	WNW15	SSW3	W11	WNW9	WNW12	SSW7	NW15.5	NW22
25-Dec	SW6	WSW4	W7	WNW9	N9	N6	N8	NNE7	NNE7	NWS	WNW11	WNW9	NW9	NW8	WNW11	W8	SW9	W9	W8	SSW8	S4	SSW7	SSW9	SW9	WNW4.8	WNW11
26-Dec	SSW8	S6	S5	SSE6	SSE7	SSE7	SE5	S6	SSE4	SSE5	SSE4	SW8	SW8	SW7	SW8	SSW5	S6	SSW8	S4	SE4	SE5	SSE5	SSE4	SE3	S5.0	SW8
27-Dec	SSE3	ESE3	SSE2	S4	SSW6	S5	SSW5	SW9	SSW7	SSW6	SW9	SW11	SW8	SW8	SW9	SSW8	SSW8	WSW10	SW10	SW9	SW8	SSW8	SSW7	SSW8	SW6.7	SW11
28-Dec	SSW8	SSW9	SW10	SW11	SW12	W11	NW19	WNW20	WNW19	WNW18	NW20	WNW16	NW17	NW17	NW16	WNW19	WNW17	WNW18	NW16	NW16	NW15	NW13	W8	WNW18	WNW13.5	WNW20
29-Dec	NW14	NW15	NW14	NW13	W7	W7	WNW11	W10	WNW13	W6	WSW5	W7	W7	WSW8	SW8	SW7	SSW9	SW10	SSW8	SSW6	S7	S8	SSW8	SSW6	W6.5	NW15
30-Dec	S5	SSE4	ESE4	S5	S5	S4	S3	SSW6	SSW7	SSW7	SSW6	SW6	NNW1	NE6	NE4	ENE2	ESE3	SSW6	SSW5	S3	SE4	SSE5	SSE7	SSE6	S3.3	SSW7
31-Dec	SSE4	SE3	SE5	SSE3	S4	S4	SE4	S6	SSE5	S5	S6	SSE8	S9	S11	S11	S9	SSE9	S11	S14	S11	S11	S10	S10	SSW12	S7.6	S14
WSW7.8WSW7.0WSW6.5WSW6.9WSW7.6WSW8.1WSW8.1WSW8.8WSW9.2WSW8.1WSW10.1 W11.2 W10.7 W11.4 W11.2 W9.8 W8.7 W8.8 W8.8WSW8.0WSW8.2WSW8.5WSW8.5WSW7.8																								Diurnal Average		
NW24 NW23 NW21 NNW21 NW22 W23 W25 W26WNW24WNW27WNW27WNW28WNW28 W31WNW34WNW28WNW25WNW25WNW24WNW22WNW24WNW22 NW21 NW22																								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  
Christina Lake - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	83	11.16	11.16
6 - 11	290	38.98	50.13
12 - 19	291	39.11	89.25
20 - 28	78	10.48	99.73
29 - 38	2	0.27	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Christina Lake - December 2017**

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	4	2	2	6	12	17	21	10	2	4	1	0	1	1	83
6 - 11	5	8	1	0	0	0	0	14	50	85	83	15	13	12	3	1	290
12 - 19	1	9	0	0	0	0	0	0	4	21	32	124	23	48	28	1	291
20 - 28	0	0	0	0	0	0	0	0	0	0	0	9	18	32	18	1	78
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	6	17	5	2	2	6	12	31	75	116	117	152	56	93	50	4	744

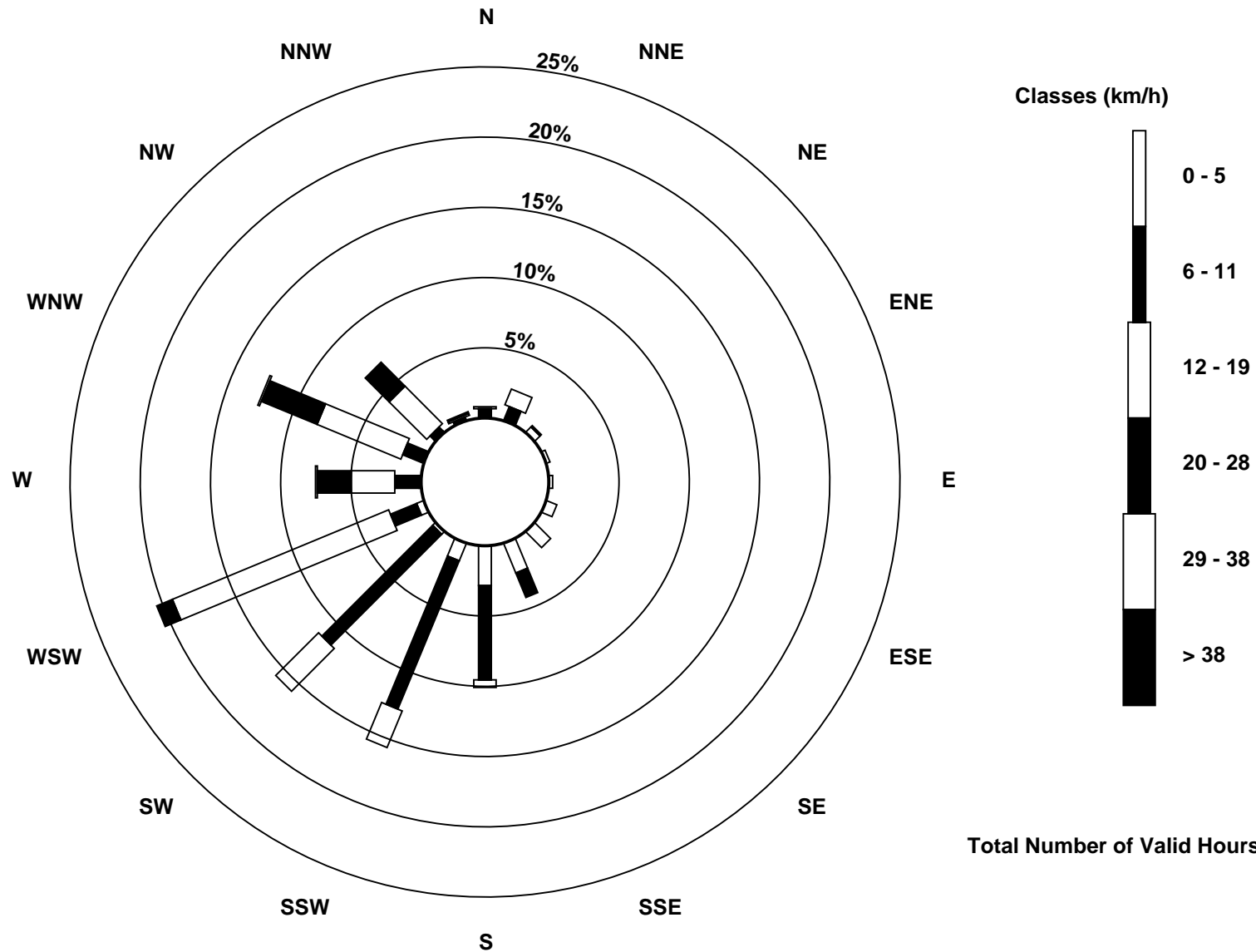
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Christina Lake (AMS 500)



Total Number of Valid Hours: 744



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Christina Lake - December 2017**

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



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

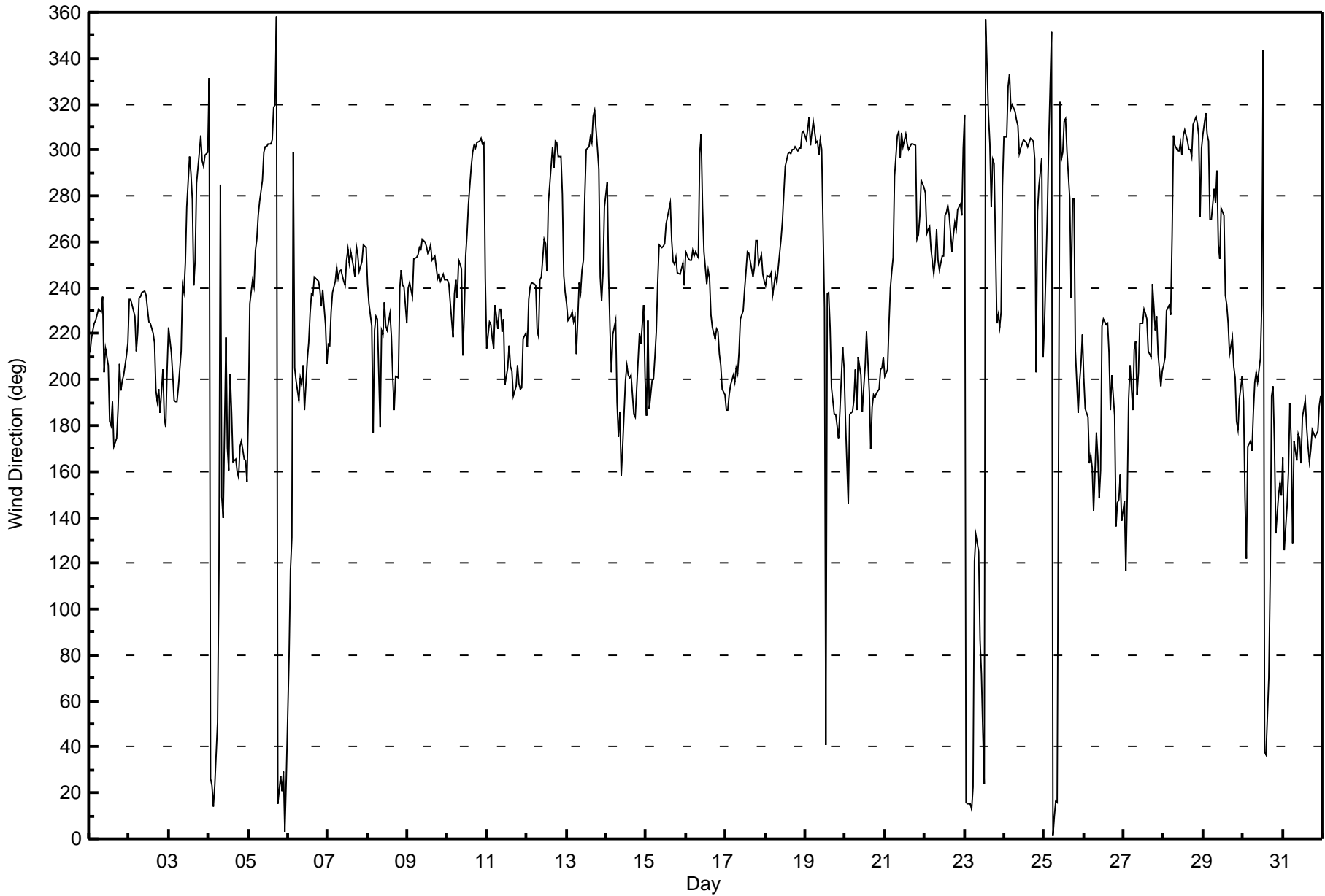
**Wind Direction (WD) - deg**  
**Christina Lake - December 2017**

Direction of Maximum Speed: 293 deg on Dec 10 15:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 281.9 deg on Dec 18	Hours of Data: 744
Direction of Minimum Speed: 41 deg on Dec 19 13:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 2.1 deg on Dec 4	Percent Operational Time: 100.0
Monthly Average Direction: 246.3 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-Dec	212	218	221	224	226	230	230	230	236	203	214	206	182	180	191	171	174	187	207	196	199	202	210	216	209.7
2-Dec	235	235	232	228	213	220	235	236	238	239	237	230	225	225	220	216	195	190	196	185	204	183	179	205	219.7
3-Dec	223	212	202	191	190	190	197	212	241	238	251	275	297	290	278	241	252	286	299	306	295	293	298	299	262.0
4-Dec	331	27	23	14	23	51	118	285	149	140	218	170	160	203	186	164	165	160	157	171	173	166	165	155	145.6
5-Dec	187	233	244	241	256	261	271	278	287	299	301	301	303	303	305	319	320	358	15	28	21	29	3	25	299.5
6-Dec	79	117	131	299	205	199	191	201	198	206	187	208	216	229	237	237	245	244	243	239	232	239	224	207	223.4
7-Dec	216	215	229	238	243	249	244	247	248	243	241	252	257	251	256	249	245	258	255	247	252	259	258	258	248.1
8-Dec	242	233	224	177	222	227	226	180	222	220	234	224	221	229	219	201	187	201	201	240	248	241	240	225	225.8
9-Dec	240	242	239	236	253	253	254	257	256	261	260	258	255	256	259	252	254	249	244	246	243	246	243	244	251.3
10-Dec	243	242	234	219	238	244	235	252	248	211	229	254	264	276	293	299	302	301	303	304	305	303	303	244	272.3
11-Dec	213	225	224	218	214	232	222	231	231	221	227	197	205	215	206	204	193	197	206	198	196	197	218	220	213.2
12-Dec	214	235	240	242	242	241	222	219	244	245	261	259	247	277	285	301	292	304	303	297	297	280	246	238	265.7
13-Dec	233	226	227	230	225	228	211	242	238	248	252	280	300	302	305	303	315	317	301	292	245	234	247	275	271.4
14-Dec	286	245	222	203	220	226	191	175	186	158	171	199	206	202	201	202	185	184	196	208	220	216	232	201	208.4
15-Dec	184	225	188	199	200	210	221	242	259	257	258	259	268	271	277	260	251	250	253	247	246	248	251	241	250.3
16-Dec	255	253	252	252	256	254	256	253	298	307	275	256	242	248	244	228	223	218	222	221	211	206	196	193	243.4
17-Dec	187	187	193	197	202	199	205	203	211	226	230	239	247	256	255	248	245	249	261	260	250	254	246	243	231.0
18-Dec	241	245	245	247	237	241	246	242	255	261	269	282	293	298	299	298	300	300	302	299	301	301	307	308	281.9
19-Dec	305	309	314	302	307	312	303	304	297	305	300	231	41	237	238	223	197	185	185	180	174	186	214	205	286.1
20-Dec	182	164	146	185	186	191	204	187	210	202	186	196	206	221	195	170	188	194	192	194	196	204	205	210	195.3
21-Dec	201	204	224	240	247	253	288	307	308	297	307	302	307	302	300	301	303	303	302	261	263	271	287	284	284.4
22-Dec	281	263	266	266	257	246	252	265	252	248	254	254	272	273	276	272	256	263	268	266	274	276	271	301	266.1
23-Dec	316	16	15	15	13	23	121	132	125	87	71	46	24	357	315	302	275	296	294	224	228	223	229	285	326.9
24-Dec	306	306	328	333	318	320	317	313	310	298	301	305	304	303	301	303	305	304	296	203	273	285	297	210	305.7
25-Dec	225	248	272	303	351	1	10	16	16	321	296	299	312	314	299	279	236	279	212	186	199	207	220	287.4	
26-Dec	201	188	183	164	167	162	143	177	167	148	160	223	226	224	224	211	187	202	184	136	146	147	158	139	183.7
27-Dec	147	117	149	191	206	187	213	216	194	203	224	224	231	229	227	212	210	241	232	222	228	211	197	204	214.3
28-Dec	206	210	230	233	228	263	306	302	299	299	304	297	306	309	304	300	300	297	311	314	312	307	271	301	292.8
29-Dec	307	316	307	304	270	270	283	277	291	259	253	275	272	237	233	224	211	218	206	201	182	178	192	202	259.7
30-Dec	190	149	122	171	173	169	186	199	203	199	209	233	343	38	36	70	114	193	197	173	133	150	155	149	171.6
31-Dec	166	126	145	159	190	173	129	173	165	177	175	164	184	191	179	171	164	169	178	175	176	177	188	193	174.4

245.4 243.4 245.2 249.1 244.7 244.1 248.3 252.9 257.1 255.0 256.7 259.2 268.9 270.3 270.5 266.9 259.1 260.0 262.1 247.1 246.5 244.2 245.0 244.8  
 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**  
**Christina Lake - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Dec 19 13:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 6 deg on Dec 29 23:00																									
Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 11 Q <sub>1</sub> = 13 Median = 16 Q <sub>3</sub> = 19 P <sub>90</sub> = 28 P <sub>99</sub> = 81																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	16	16	16	15	16	16	16	19	16	29	18	19	22	21	14	11	18	20	37	20	17	15	18	17	37
2-Dec	16	15	16	20	19	18	15	14	15	15	18	18	16	19	20	15	12	17	13	15	15	14	11	18	20
3-Dec	16	14	13	14	12	14	15	19	16	15	20	24	17	21	28	19	25	26	24	13	20	23	9	15	28
4-Dec	43	10	11	11	7	78	72	58	78	61	31	27	22	30	27	24	19	13	13	15	15	14	16	15	78
5-Dec	21	19	16	14	16	15	16	17	16	12	11	11	10	11	12	13	10	26	15	14	11	21	17	12	26
6-Dec	38	26	47	80	28	8	14	16	18	26	20	18	20	20	14	15	16	15	16	15	16	12	11	10	80
7-Dec	8	10	12	12	14	14	14	14	15	15	15	17	15	15	15	14	14	30	16	16	16	18	17	17	30
8-Dec	16	13	31	64	70	56	62	82	24	13	17	17	20	20	18	11	11	13	17	18	16	15	16	14	82
9-Dec	16	16	14	15	16	15	15	14	15	14	15	14	15	16	15	18	15	16	15	14	17	15	14	14	18
10-Dec	14	13	16	18	13	14	15	23	17	25	18	18	16	16	13	12	11	11	10	11	15	9	9	92	92
11-Dec	11	11	12	13	16	15	12	13	13	10	13	15	19	17	20	16	17	17	18	16	16	27	18	18	27
12-Dec	17	21	19	17	17	17	12	68	17	14	17	20	17	21	16	10	16	10	10	12	15	18	18	12	68
13-Dec	12	11	12	15	12	13	12	18	18	16	17	20	12	12	13	12	14	13	9	18	20	12	16	22	22
14-Dec	18	20	98	83	15	13	12	20	11	15	17	18	21	17	15	17	18	18	18	20	23	17	18	17	98
15-Dec	31	16	45	12	18	16	16	16	16	16	15	16	16	16	19	20	17	16	16	17	18	16	19	17	45
16-Dec	15	16	16	15	16	16	16	16	21	15	22	26	17	17	17	18	16	16	17	16	16	15	16	16	26
17-Dec	15	14	16	15	16	16	16	16	16	18	17	17	16	16	16	16	17	15	18	16	15	15	16	16	18
18-Dec	17	16	16	16	17	17	16	15	16	15	17	16	17	12	11	12	10	10	12	9	9	9	15	15	17
19-Dec	14	15	16	10	14	16	15	15	11	12	19	21	104	49	30	21	10	7	24	9	36	20	13	17	104
20-Dec	23	13	13	23	21	12	12	12	12	23	15	18	20	18	24	13	19	16	15	15	15	16	17	17	24
21-Dec	15	15	19	16	15	18	22	9	8	14	10	10	10	11	9	9	11	11	14	18	17	17	16	18	22
22-Dec	19	22	18	16	17	15	16	16	17	14	16	16	17	15	16	16	17	17	15	16	16	17	18	15	22
23-Dec	30	11	14	12	11	9	49	19	27	15	20	47	15	31	32	12	63	55	22	12	12	12	27	63	
24-Dec	11	12	17	19	13	11	13	14	15	10	15	11	10	13	9	9	9	14	30	94	31	31	25	23	94
25-Dec	38	68	31	29	13	12	13	13	17	49	7	16	22	27	14	36	28	19	26	32	72	17	13	16	72
26-Dec	17	17	17	12	11	8	28	8	31	16	34	20	21	23	20	17	9	10	44	28	14	18	10	26	44
27-Dec	31	21	39	56	8	15	18	11	7	20	14	15	28	23	19	16	16	17	15	18	18	15	15	14	56
28-Dec	15	13	15	14	11	34	9	8	8	9	10	12	14	16	13	8	8	7	13	11	10	9	34	9	34
29-Dec	12	11	10	14	20	19	20	26	16	31	45	25	29	27	18	16	13	14	14	16	10	7	6	9	45
30-Dec	19	33	29	15	16	24	52	31	17	12	25	34	84	9	11	29	29	14	23	28	23	27	6	20	84
31-Dec	20	39	24	19	28	36	18	10	15	14	18	12	19	17	18	12	11	11	13	12	13	13	14	17	39
	43	68	98	83	70	78	72	82	78	61	45	47	104	49	32	36	63	55	44	94	72	31	34	92	
	Diurnal Maximum																								





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

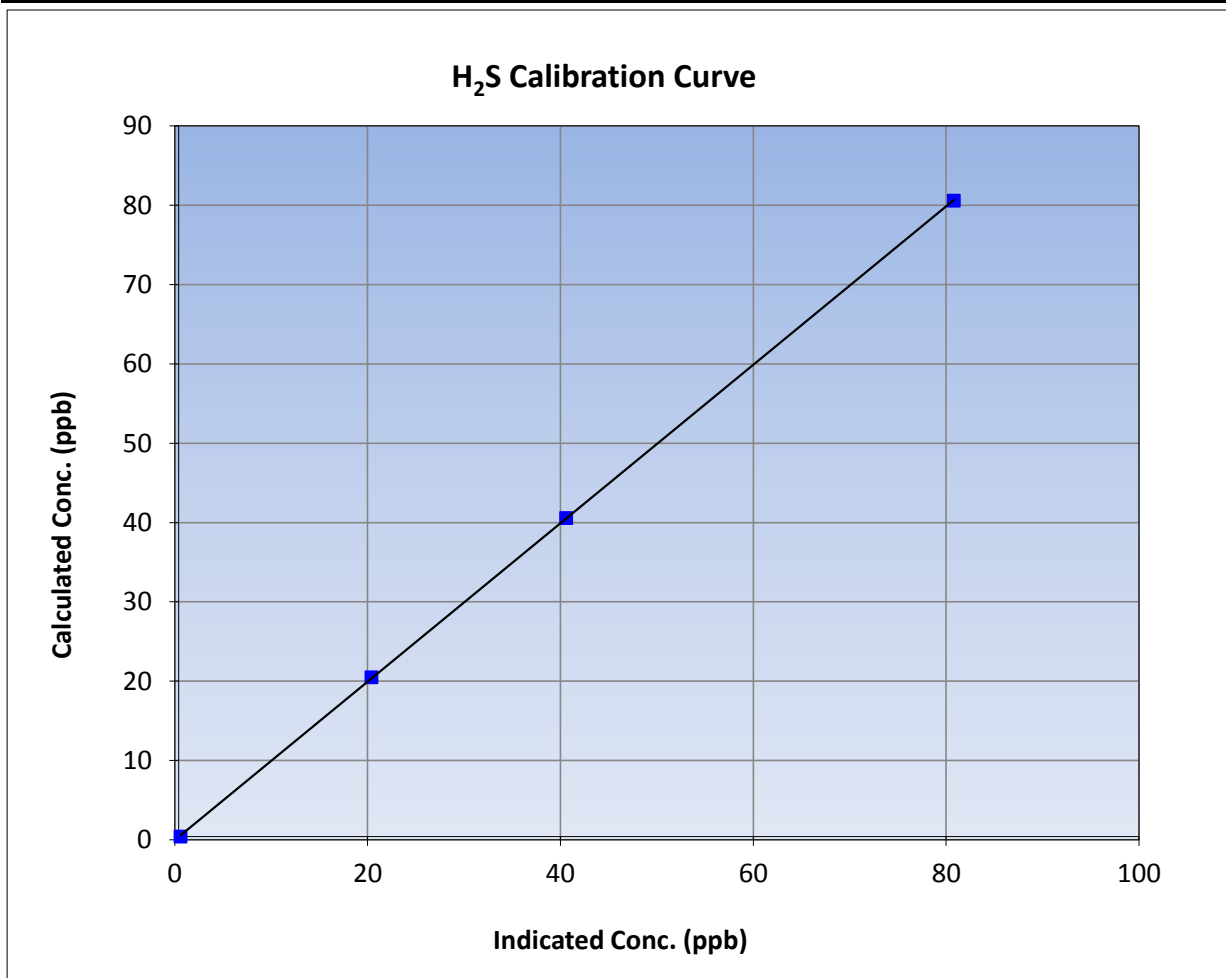
Version-03-2017

### Station Information

Calibration Date	December 20, 2017	Previous Calibration	November 8, 2017
Station Name	Christina Lake	Station Number	AMS 500
Start Time (MST)	9:00	End Time (MST)	11:40
Analyzer make	Thermo 43i- TLE	Analyzer serial #	1008841400

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits
0.0	0.2	----	Correlation Coefficient	≥0.995
80.2	80.4	0.9974		
40.2	40.2	0.9998	Slope	0.90 - 1.10
20.1	20.0	1.0048		
			Intercept	+/-3

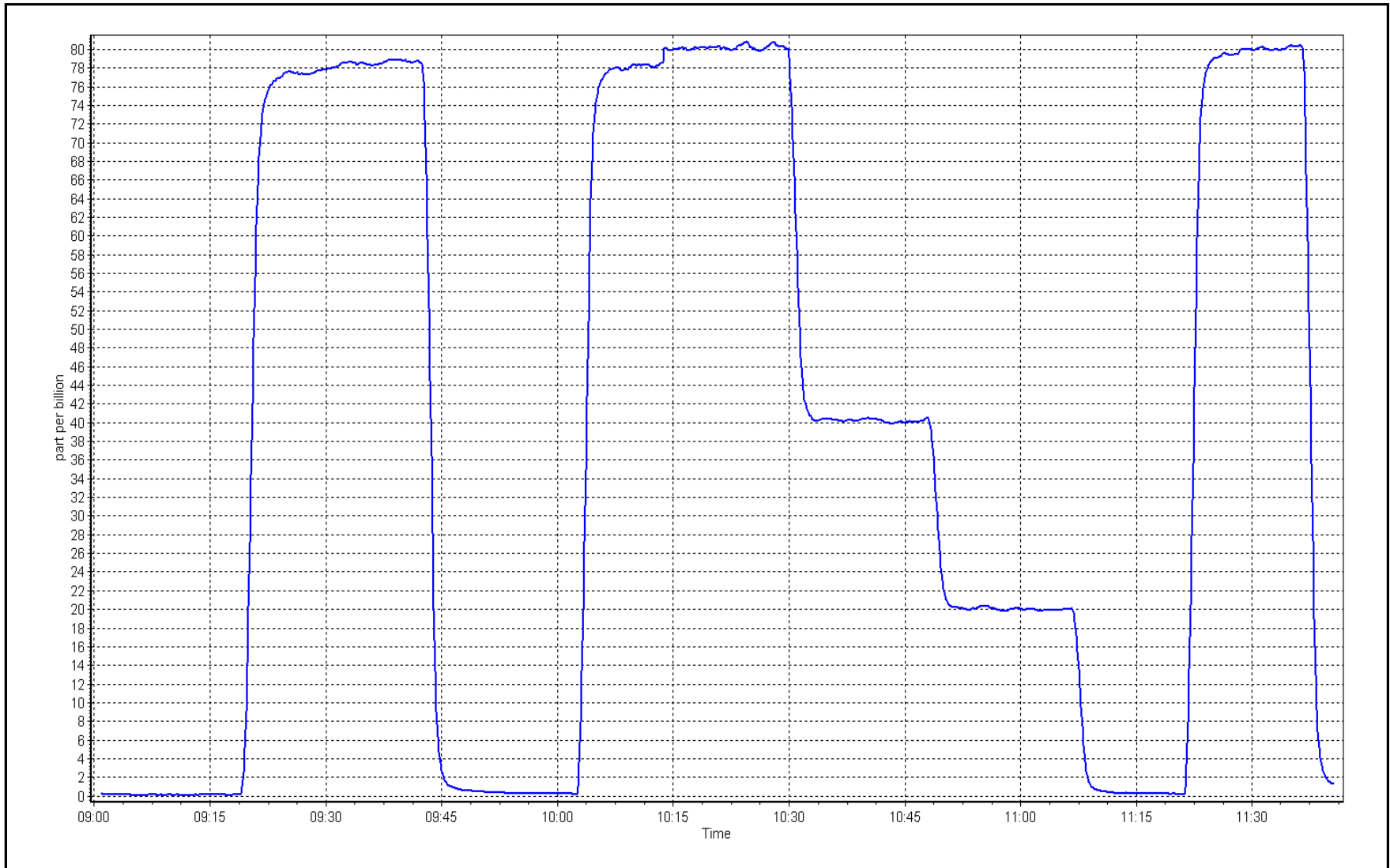




# H<sub>2</sub>S Calibration Plot

Date: December 20, 2017

Location: Christina Lake





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 501  
LEISMER  
DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STATOIL LEISMER (AMS 501)  
 DECEMBER 2017

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	36	36	100	21	0	9	0
H2S (ppb) Average	684	34	36	99.72	4	0	1	0
NO2 (ppb) Average	684	36	36	100	37	0	9	-
NO (ppb) Average	684	36	36	100	61	-	14	-
NOX (ppb) Average	684	36	36	100	98	-	23	-
Temperature 2 m (C) Average	720	0	0	100	2.8	-	-2	-
Relative Humidity (%) Average	720	0	0	100	96	-	90	-
Wind Speed 10 m (km/h) Average	719	0	1	99.86	33	-	21	-
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 - STATOIL LEISMER (AMS 501)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	1.8	4	-	0	0	0	0	1	6	28
H2S (ppb) Average	707	0.2	0	-	0	0	0	0	0	0	2
NO2 (ppb) Average	707	3.9	6	-	0	1	1	2	4	10	40
NO (ppb) Average	707	4	10	-	0	0	0	0	3	12	72
NOX (ppb) Average	707	7.9	15	-	0	1	1	2	7	22	108
Temperature 2 m (C) Average	744	-11.34	11.9	-	-35.2	-29.8	-22	-7.9	-1.4	1.7	6.5
Relative Humidity (%) Average	744	78.1	10	-	41	65	73	78	85	90	98
Wind Speed 10 m (km/h) Average	734	11.3	8	-	0	3	5	9	18	23	35
Wind Direction 10 m (deg) Average	734	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STATOIL LEISMER (AMS 501)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	26 Dec 2017 18:00	26 Dec 2017 19:00	2	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	11 Dec 2017 07:00	11 Dec 2017 11:00	5	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	21 Dec 2017 02:00	21 Dec 2017 02:00	1	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	26 Dec 2017 20:00	26 Dec 2017 20:00	1	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	31 Dec 2017 00:00	31 Dec 2017 02:00	3	Flat line in sensor output signal - sensor frozen



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Sulphur Dioxide (SO<sub>2</sub>) - ppb

## Leismer - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 28 ppb on Dec 11 01:00	Maximum Daily Average: 5.9 ppb on Dec 13		Hours of Data:	707
Minimum Value: 0 ppb on Dec 1 01:00	Minimum Daily Average: 0.1 ppb on Dec 20		Hours of Missing Data:	37
Maximum Diurnal Average: 3.1 ppb at hour 15	Minimum Diurnal Average: 0.6 ppb at hour 5		Hours of Calibration:	37
Monthly Average: 1.8 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 6 P <sub>99</sub> = 19		Percent Operational Time:	100.0

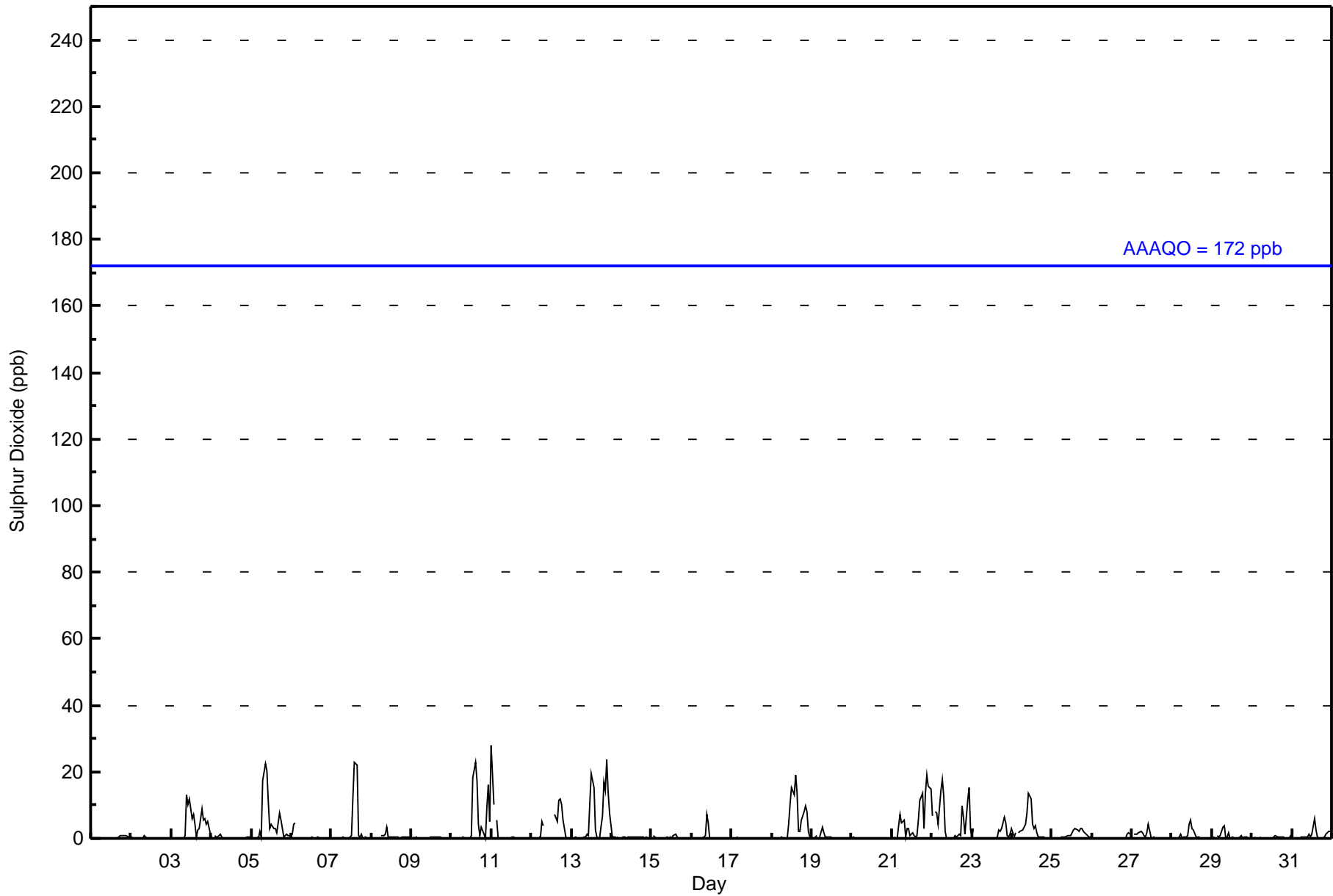
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0.2	1
2-Dec	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
3-Dec	Z	0	0	0	0	0	0	0	1	13	10	12	6	7	4	0	3	3	9	6	6	4	5	1	4.0	13
4-Dec	0	Z	1	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-Dec	0	0	Z	0	0	2	0	17	22	20	11	3	4	3	0	2	5	8	6	0	1	1	1	1	4.9	22
6-Dec	1	4	4	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	12	23	22	1	0	1	0	0	0	0	0	0	2.7	23
8-Dec	0	0	0	0	0	Z	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3
9-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	Z	0	0	0	0	0	1	0	0	0	0	1	18	23	17	4	1	3	1	0	9	16	5	4.4	23
11-Dec	28	10	Z	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.0	28
12-Dec	0	0	0	Z	0	0	5	4	C	C	C	C	C	C	7	5	12	12	10	6	0	0	0	0	--	12
13-Dec	0	0	0	0	Z	0	0	0	0	1	1	11	20	15	3	0	0	0	7	17	14	24	14	8	5.9	24
14-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	Z	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.2	1
16-Dec	0	Z	0	0	0	0	0	0	1	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	7
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	Z	0	0	0	0	0	0	4	10	15	13	19	14	2	2	6	8	10	8	2	0	5.0	19
19-Dec	0	0	0	1	Z	0	3	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
20-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Dec	Z	0	0	0	4	7	5	6	1	3	3	1	2	1	0	1	6	12	14	3	14	19	16	15	5.6	19
22-Dec	7	Z	8	8	4	14	18	13	2	0	0	0	0	0	1	0	1	1	10	6	1	12	15	3	5.4	18
23-Dec	1	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	6	5	1	0	1	1.1	6
24-Dec	3	1	2	Z	2	2	2	3	4	8	14	12	4	3	4	2	0	0	0	0	0	0	0	0	2.9	14
25-Dec	0	0	0	0	Z	0	0	1	0	1	1	1	2	3	3	2	2	3	3	2	1	1	0	0	1.2	3
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0.2	2
27-Dec	Z	1	1	1	2	2	2	1	0	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0.8	4
28-Dec	0	Z	0	0	0	1	0	0	0	1	4	6	3	2	0	0	0	0	0	0	0	0	0	0	0.9	6
29-Dec	0	0	Z	1	0	1	3	4	0	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0.7	4
30-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0.3	1
31-Dec	0	0	0	0	Z	0	0	0	0	1	1	0	1	6	2	1	0	0	0	1	1	2	2	2	1.0	6
1.6 0.9 0.7 0.7 0.6 1.3 1.4 1.8 1.2 2.1 2.1 1.9 2.1 2.9 3.1 2.2 1.3 1.5 2.4 1.9 1.8 2.7 2.5 1.3																								Diurnal Average		
28 10 8 8 4 14 18 17 22 20 14 12 20 18 23 22 12 12 14 17 14 24 16 15																								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 (SO<sub>2</sub>) - ppb  
Leismer - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Leismer - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	667	94.34	94.34
11 - 20	34	4.81	99.15
21 - 60	6	0.85	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Leismer - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	60	16	4	1	2	1	2	5	8	51	39	21	65	221	77	84	657
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	11	34
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	6
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	60	16	4	1	2	1	2	5	8	51	39	21	65	221	105	96	697

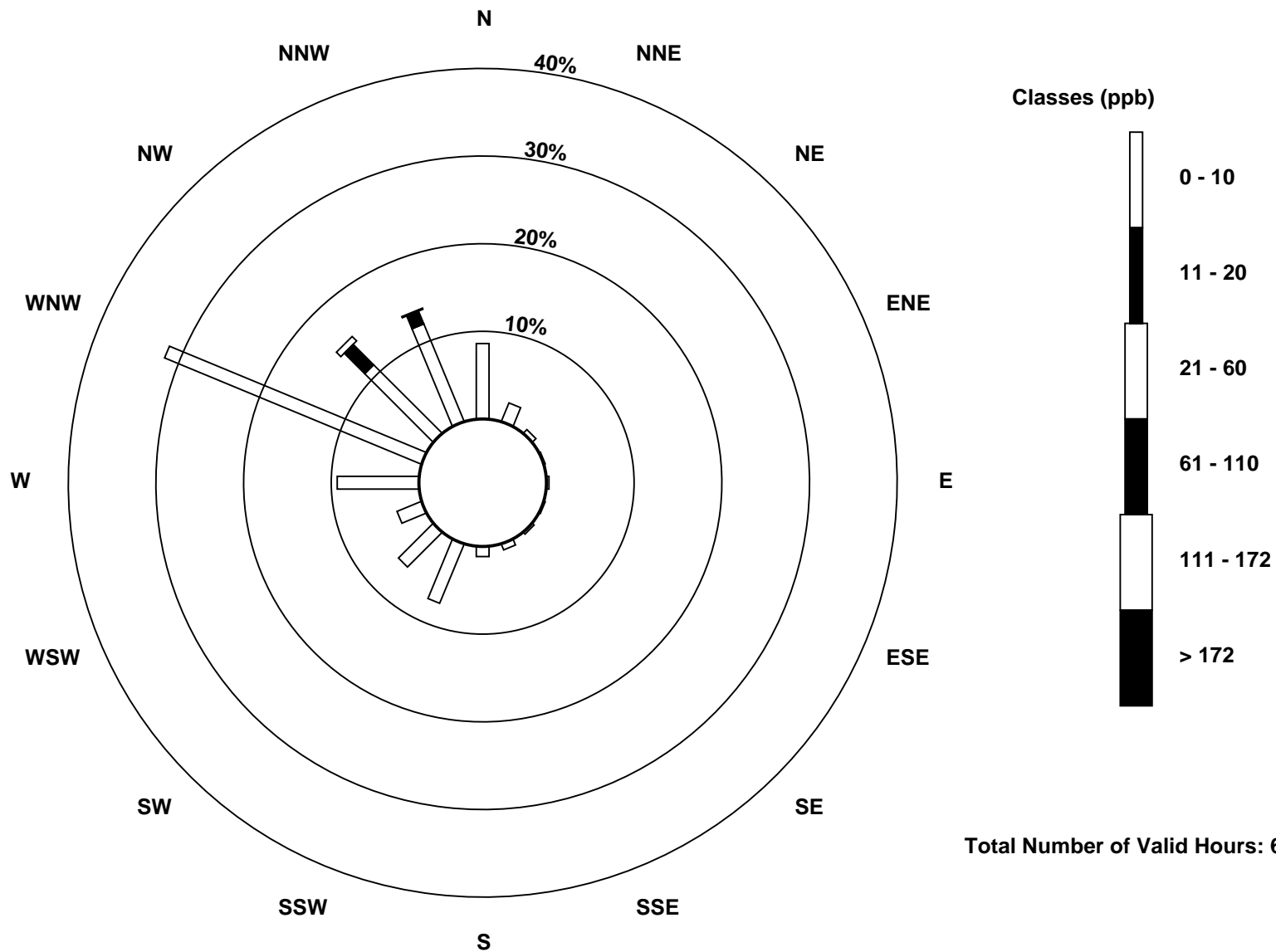
Total Number of Valid Hours: 697

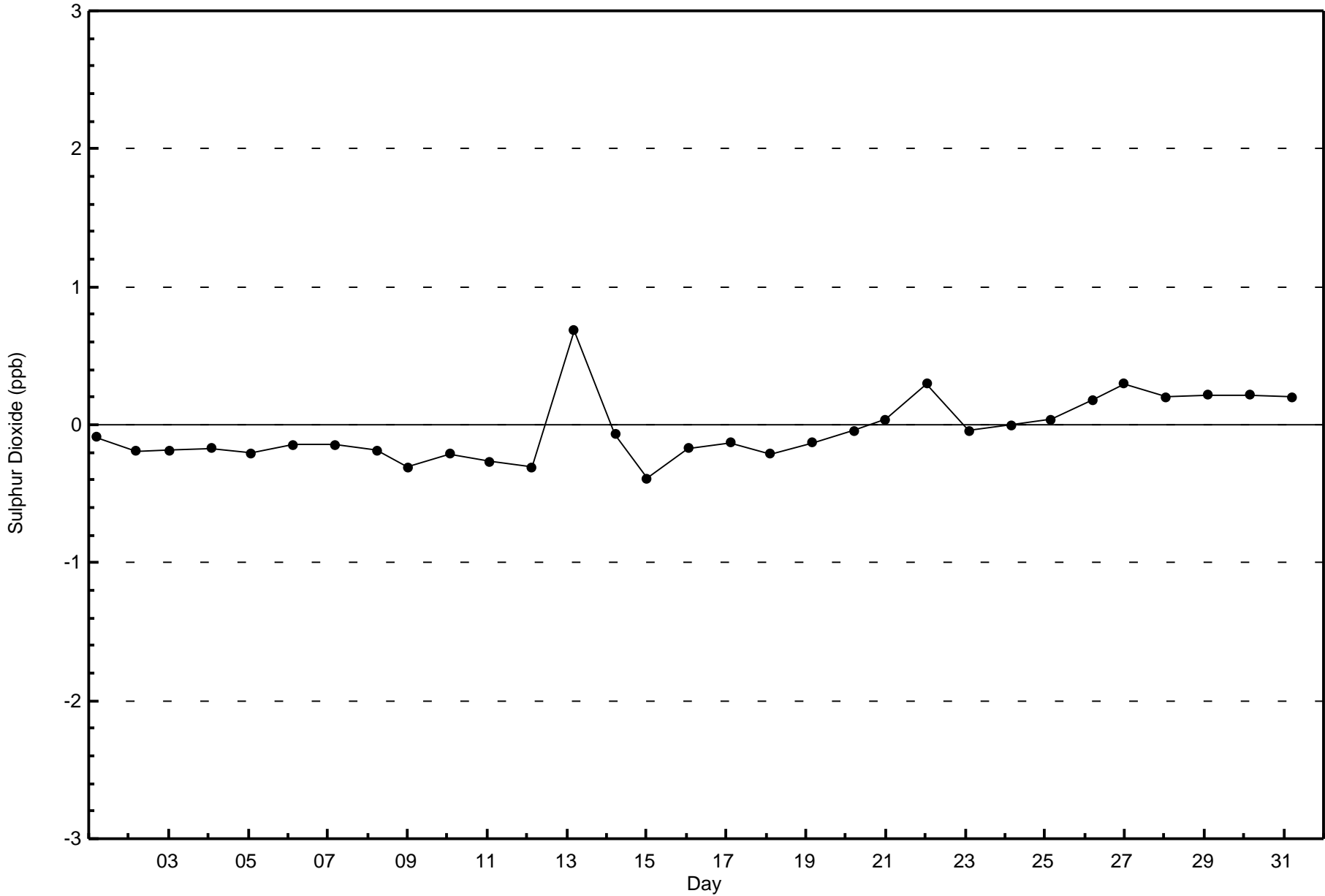
Total Number of Hours: 744

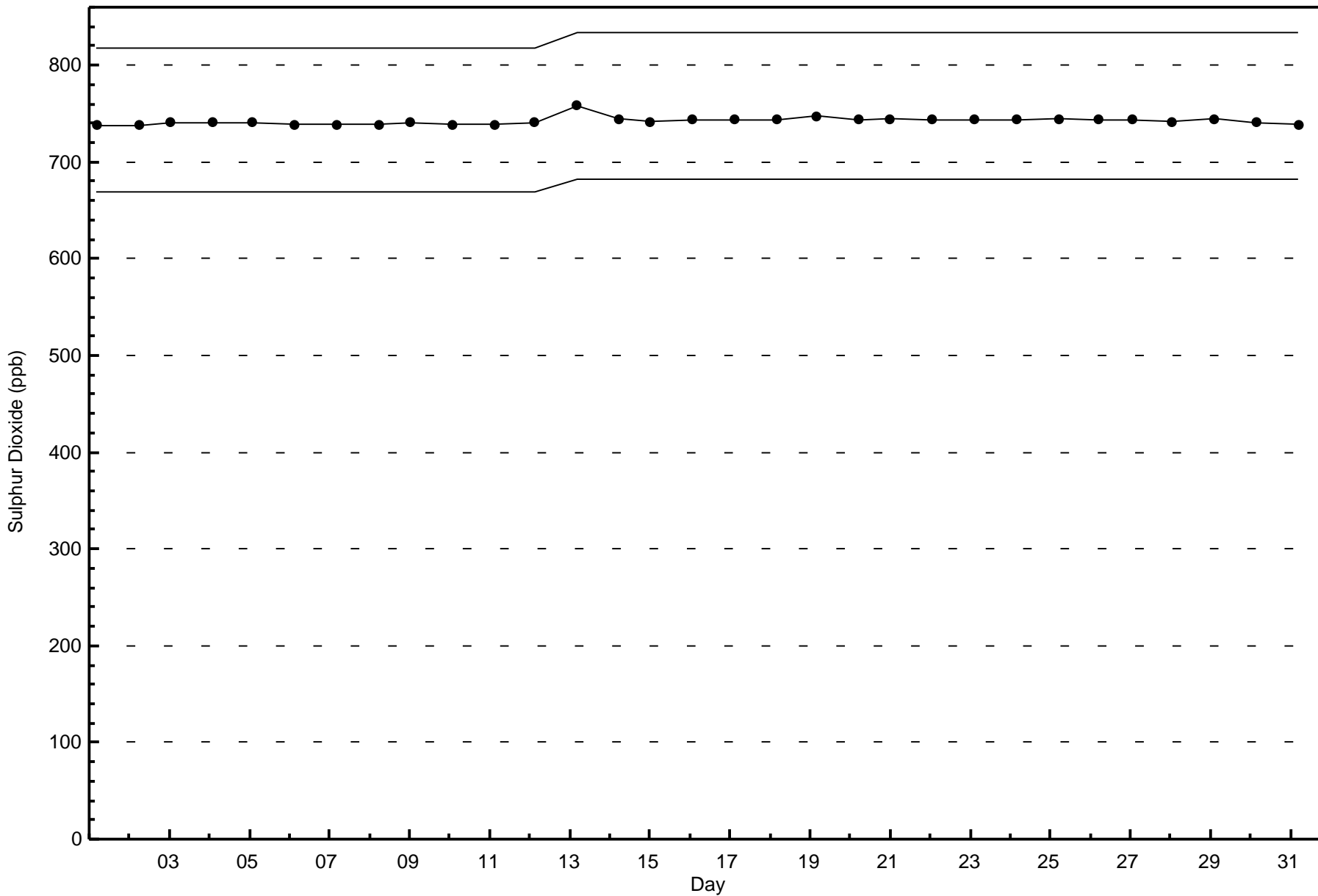


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

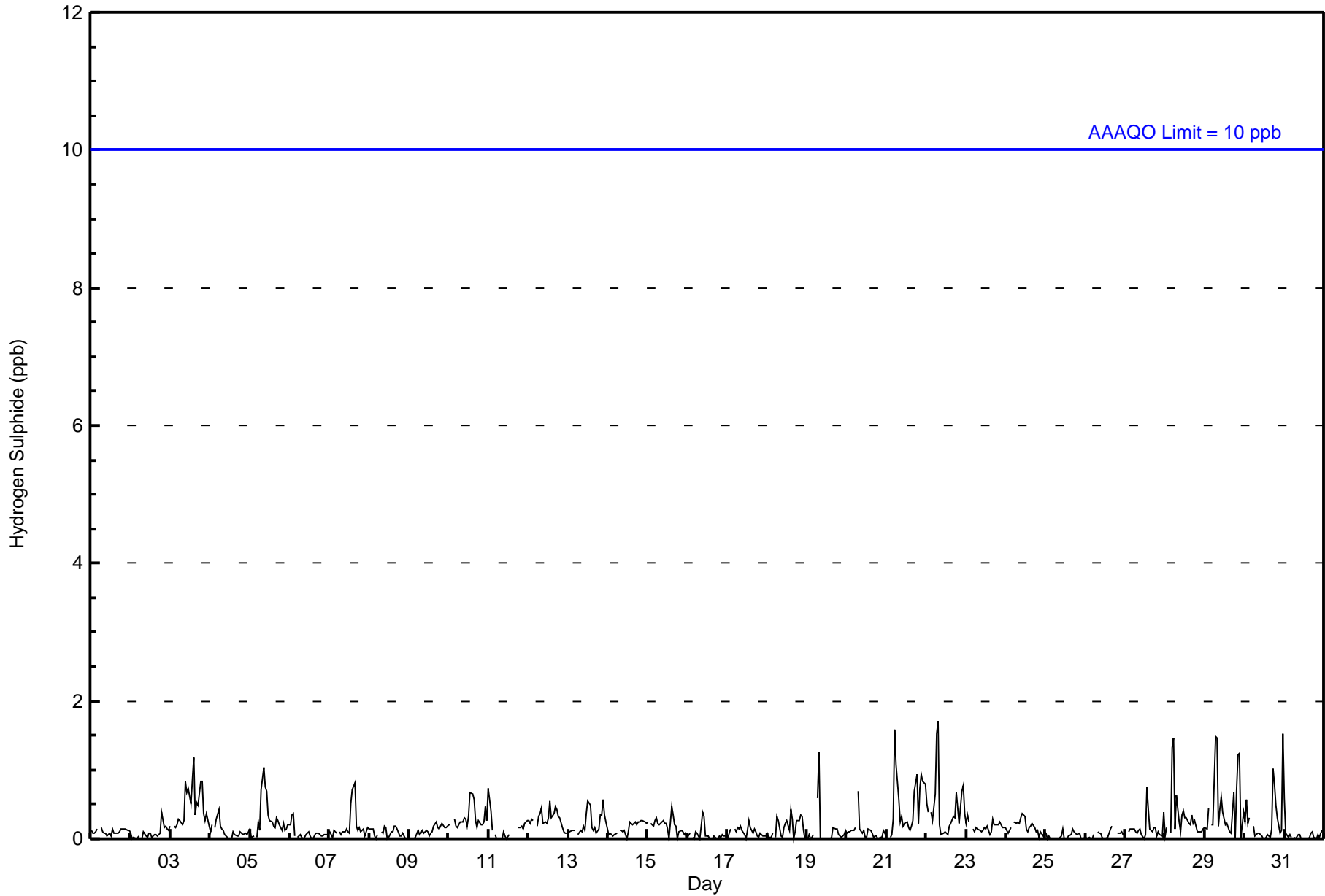
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Leismer (AMS 501)













**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Leismer - December 2017**

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

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Leismer - December 2017**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	59	16	4	1	2	1	2	5	8	49	39	18	68	224	105	97	698
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	59	16	4	1	2	1	2	5	8	49	39	18	68	224	105	97	698

Total Number of Valid Hours: 698

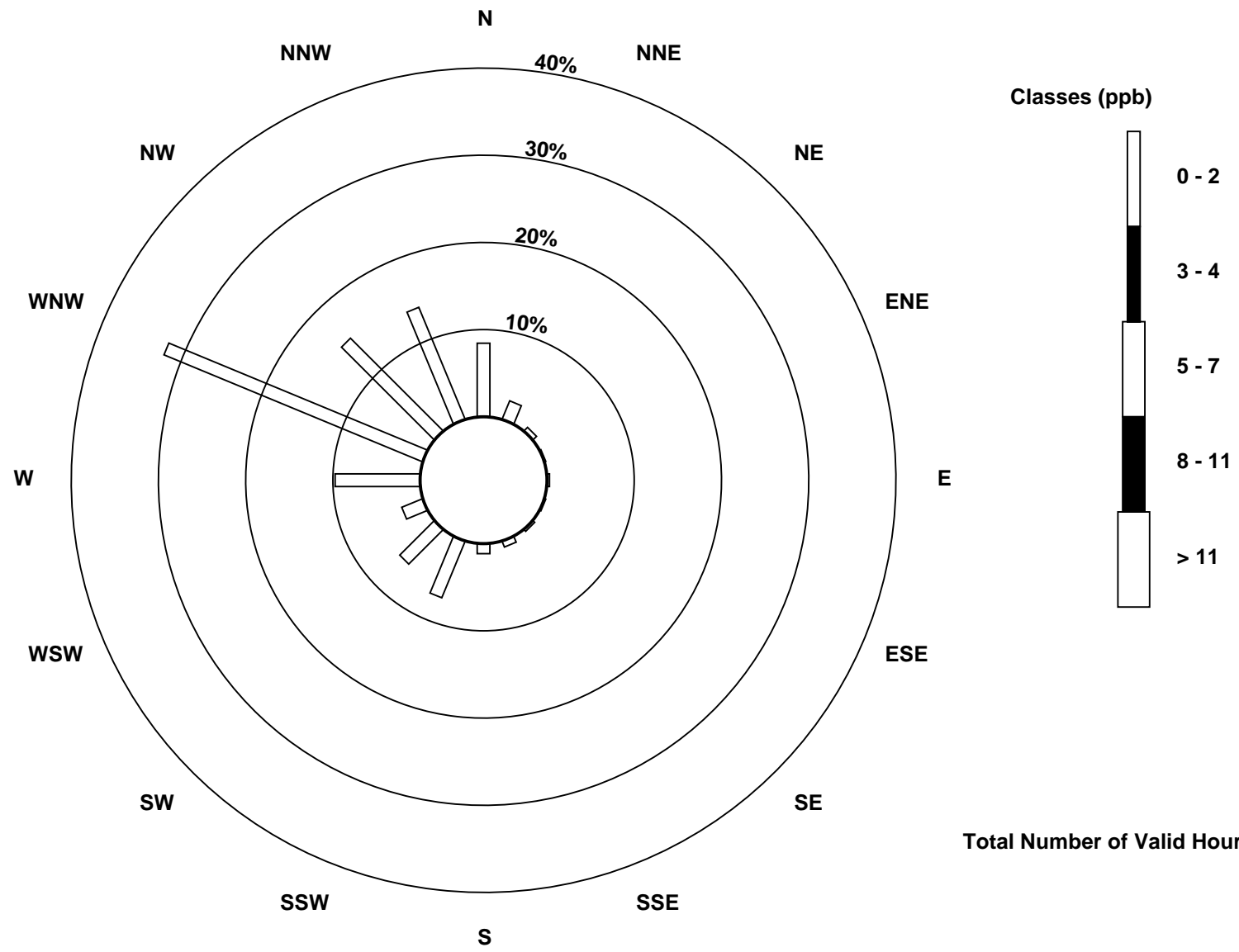
Total Number of Hours: 744

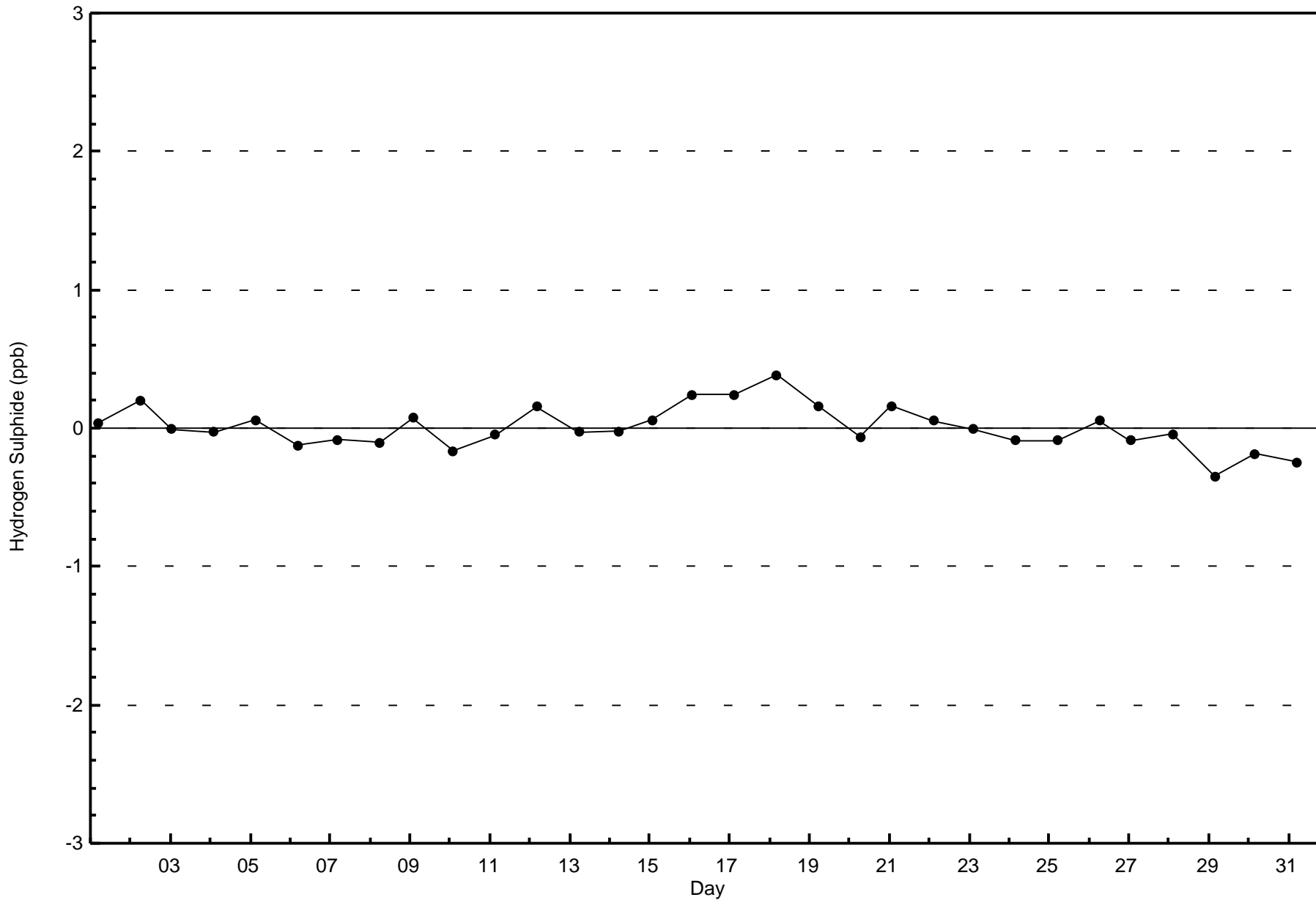


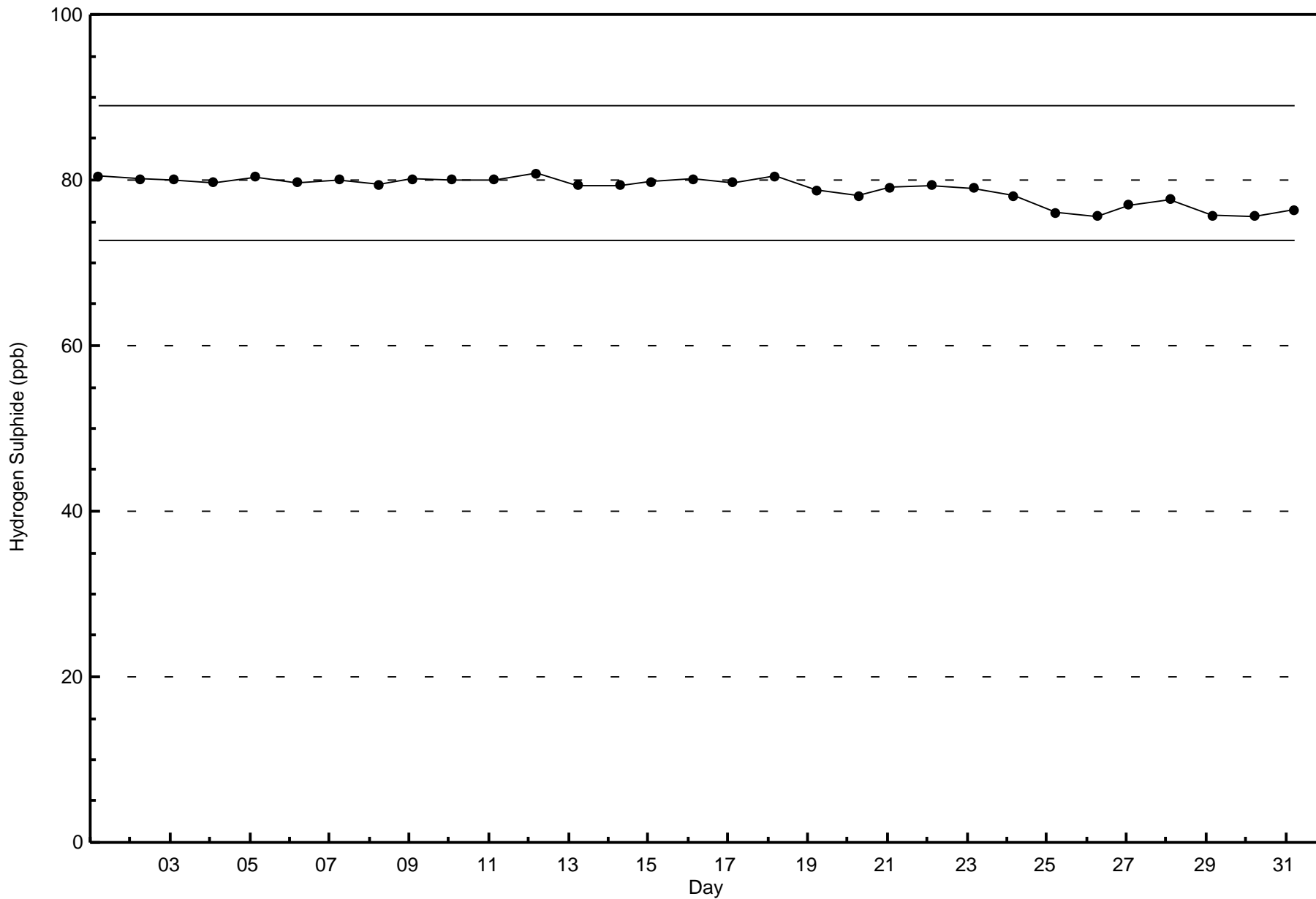


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Leismer (AMS 501)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

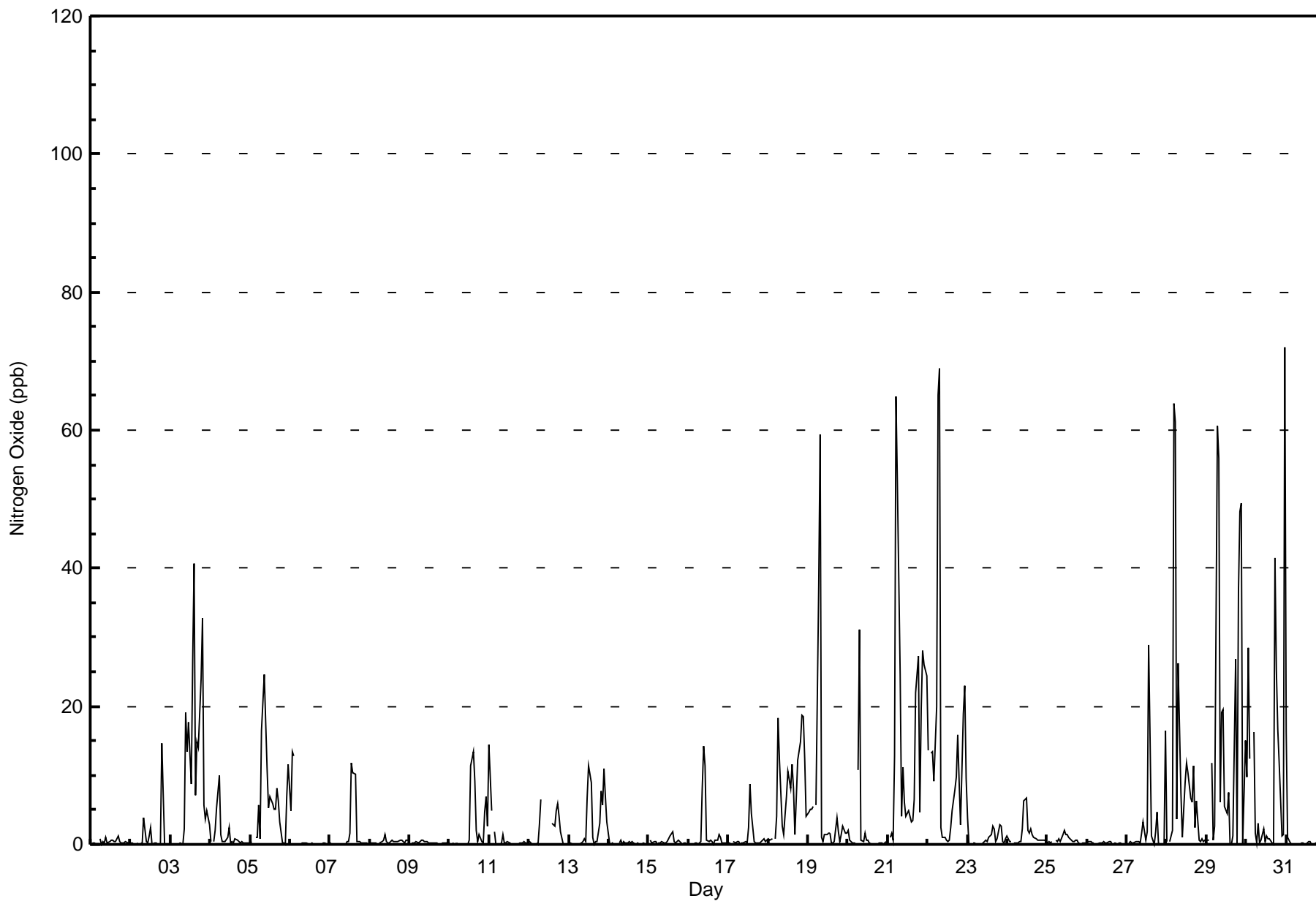
Leismer - December 2017

Maximum Value: 72 ppb on Dec 31 00:00																	Maximum Daily Average: 16.2 ppb on Dec 29																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 1 04:00																	Minimum Daily Average: 0.1 ppb on Dec 14																	Hours of Data: 707	
Maximum Diurnal Average: 10.0 ppb at hour 8																	Minimum Diurnal Average: 1.6 ppb at hour 4																	Hours of Missing Data: 37	
Monthly Average: 4.0 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 3 P <sub>90</sub> = 12 P <sub>99</sub> = 60																	Hours of Calibration: 37	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	0	0	0	0	Z	1	0	0	0	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0.3	1									
2-Dec	0	0	0	0	0	Z	0	0	4	0	0	1	2	0	0	0	0	0	0	15	0	0	0	0	1.0	15									
3-Dec	Z	0	0	0	0	0	0	0	2	19	13	18	9	27	41	7	15	14	24	33	6	4	5	3	10.4	41									
4-Dec	0	Z	0	2	5	10	2	0	0	1	2	0	0	0	1	1	0	0	0	0	0	0	0	0	1.2	10									
5-Dec	0	0	Z	1	1	6	1	16	25	18	11	5	7	6	5	5	8	6	3	0	0	0	7	12	6.3	25									
6-Dec	5	13	13	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	13									
7-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	2	12	10	10	0	0	0	0	0	0	0	0	1.6	12									
8-Dec	0	0	0	0	0	Z	0	0	1	1	0	0	1	0	0	0	0	0	1	1	0	0	1	1	0.4	1									
9-Dec	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
10-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	11	13	9	2	0	1	0	0	5	7	3	2.4	13									
11-Dec	14	5	Z	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	14									
12-Dec	0	0	0	Z	0	0	3	7	C	C	C	C	C	C	3	3	5	6	4	2	0	0	0	0	--	7									
13-Dec	0	0	0	0	Z	0	0	0	0	1	0	7	11	9	1	0	0	0	3	8	6	11	7	3	3.0	11									
14-Dec	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1									
15-Dec	Z	1	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	0	0	0	0	0	0.4	2									
16-Dec	0	Z	0	0	0	0	0	0	8	14	11	1	0	1	0	0	1	1	2	1	0	0	0	0	1.8	14									
17-Dec	0	0	Z	0	0	0	0	0	0	0	0	3	9	5	0	0	0	0	0	0	1	0	1	0	1.0	9									
18-Dec	1	1	1	Z	1	4	18	12	3	1	4	7	11	8	12	8	1	7	12	15	19	19	13	4	7.8	19									
19-Dec	5	5	5	5	Z	6	38	59	1	0	1	1	2	2	0	0	0	4	2	0	1	3	2	2	6.3	59									
20-Dec	2	1	0	0	0	Z	11	31	1	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	2.2	31									
21-Dec	Z	1	2	1	13	65	52	25	4	11	6	4	5	4	3	4	7	22	27	5	20	28	26	24	15.6	65									
22-Dec	14	Z	13	13	9	20	65	69	2	1	1	1	1	1	2	5	8	10	16	9	3	19	23	10	13.7	69									
23-Dec	4	0	Z	0	0	0	0	0	0	0	0	1	0	1	1	3	2	0	1	3	3	0	0	1	0.9	4									
24-Dec	1	0	0	Z	0	0	0	0	0	2	6	7	2	2	2	1	1	1	1	1	1	1	1	0	1.4	7									
25-Dec	0	0	0	0	Z	1	0	1	0	1	2	1	2	1	1	0	0	1	1	0	0	0	0	0	0.6	2									
26-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0									
27-Dec	Z	0	0	0	0	0	0	0	0	2	3	1	2	29	16	1	0	2	5	0	0	0	0	16	3.4	29									
28-Dec	0	Z	0	2	64	61	4	26	7	1	5	9	12	10	7	6	11	2	6	1	0	1	0	1	10.4	64									
29-Dec	1	1	Z	12	1	3	61	56	6	19	20	5	4	8	0	0	1	27	0	37	48	49	0	15	16.2	61									
30-Dec	10	29	12	Z	16	2	0	3	0	1	2	0	1	1	1	0	0	42	25	17	12	1	1	72	10.8	72									
31-Dec	16	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0.9	16									
																	2.9 2.3 1.9 1.6 4.5 6.9 8.3 10.0 2.3 3.2 3.1 2.5 2.6 4.8 4.1 2.1 2.2 4.7 4.4 4.8 3.9 4.6 3.1 5.4																	Diurnal Average	
																	16 29 13 13 64 65 65 69 25 19 20 18 12 29 41 10 15 42 27 37 48 49 26 72																	Diurnal Maximum	
Z - zerospan		C - Calibration																																	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxide (NO) - ppb**  
**Leismer - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Leismer - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	674	95.33	95.33
21 - 40	19	2.69	98.02
41 - 80	14	1.98	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb  
Leismer - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	59	16	4	1	2	1	2	5	8	51	39	21	65	217	87	87	665
21 - 40	1	0	0	0	0	0	0	0	0	0	0	0	0	2	12	4	19
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	5	13
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
<b>Totals</b>	60	16	4	1	2	1	2	5	8	51	39	21	65	221	105	96	697

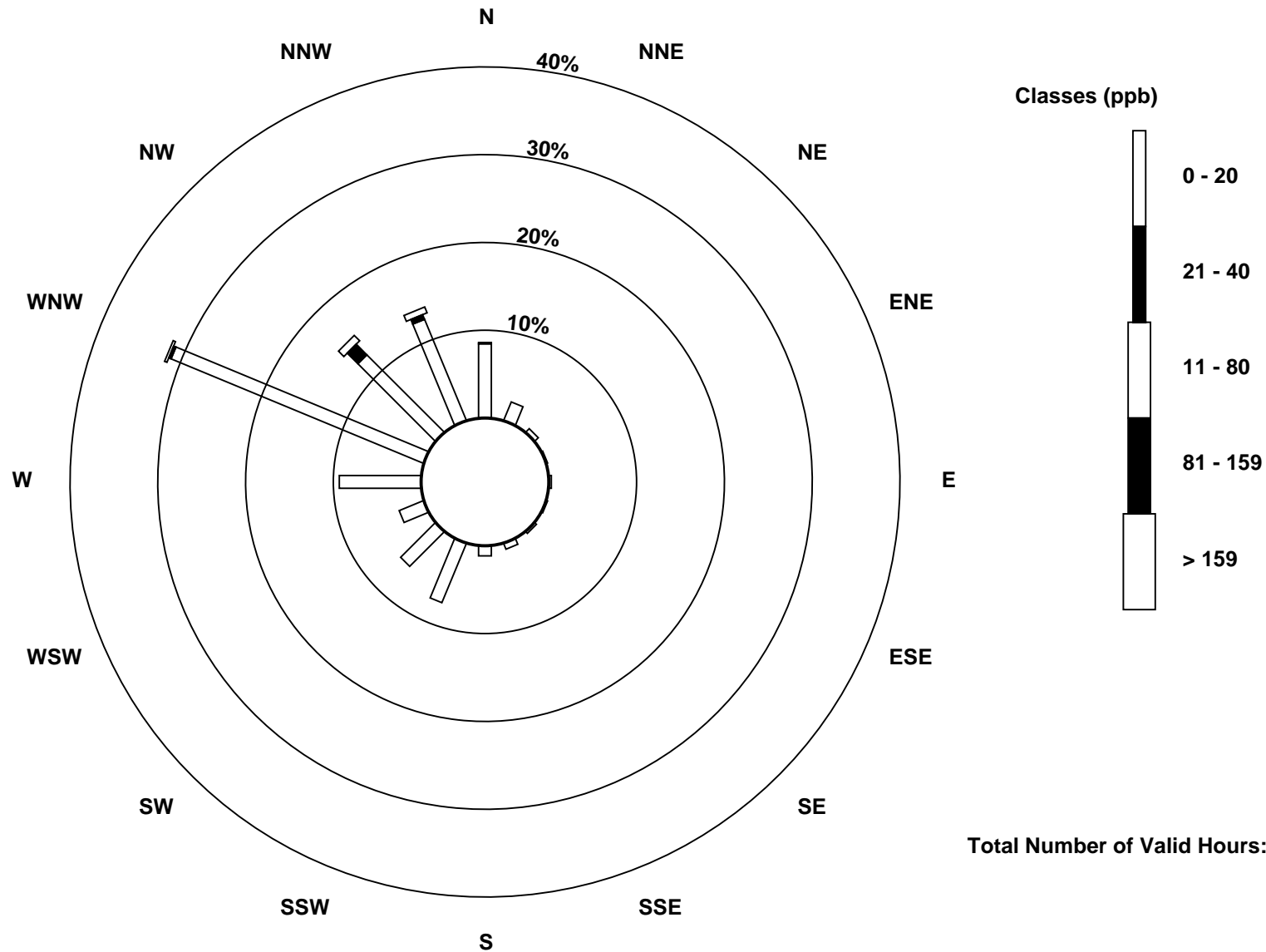
Total Number of Valid Hours: 697

Total Number of Hours: 744



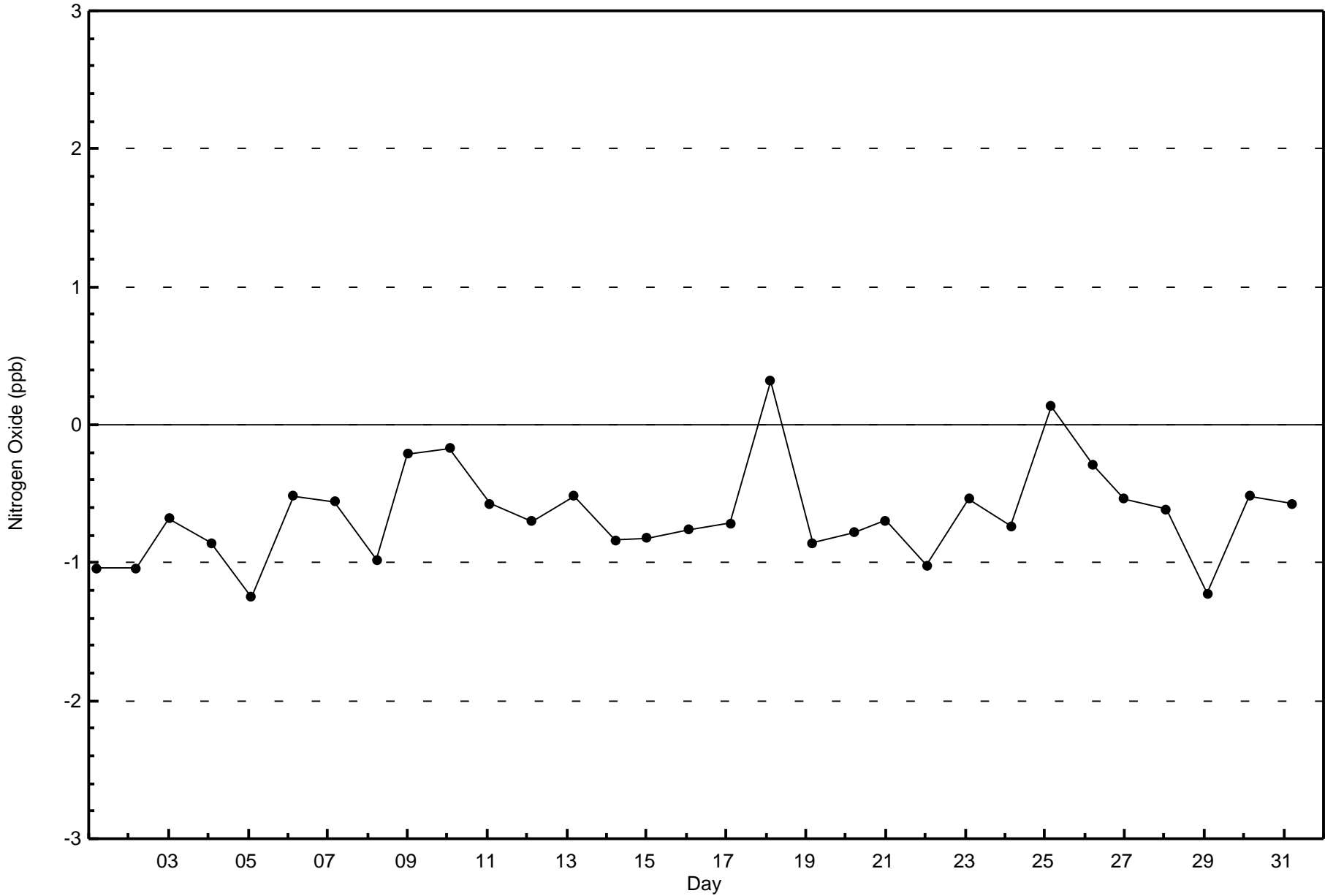
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxide (NO) - ppb  
Leismer (AMS 501)



Total Number of Valid Hours: 697

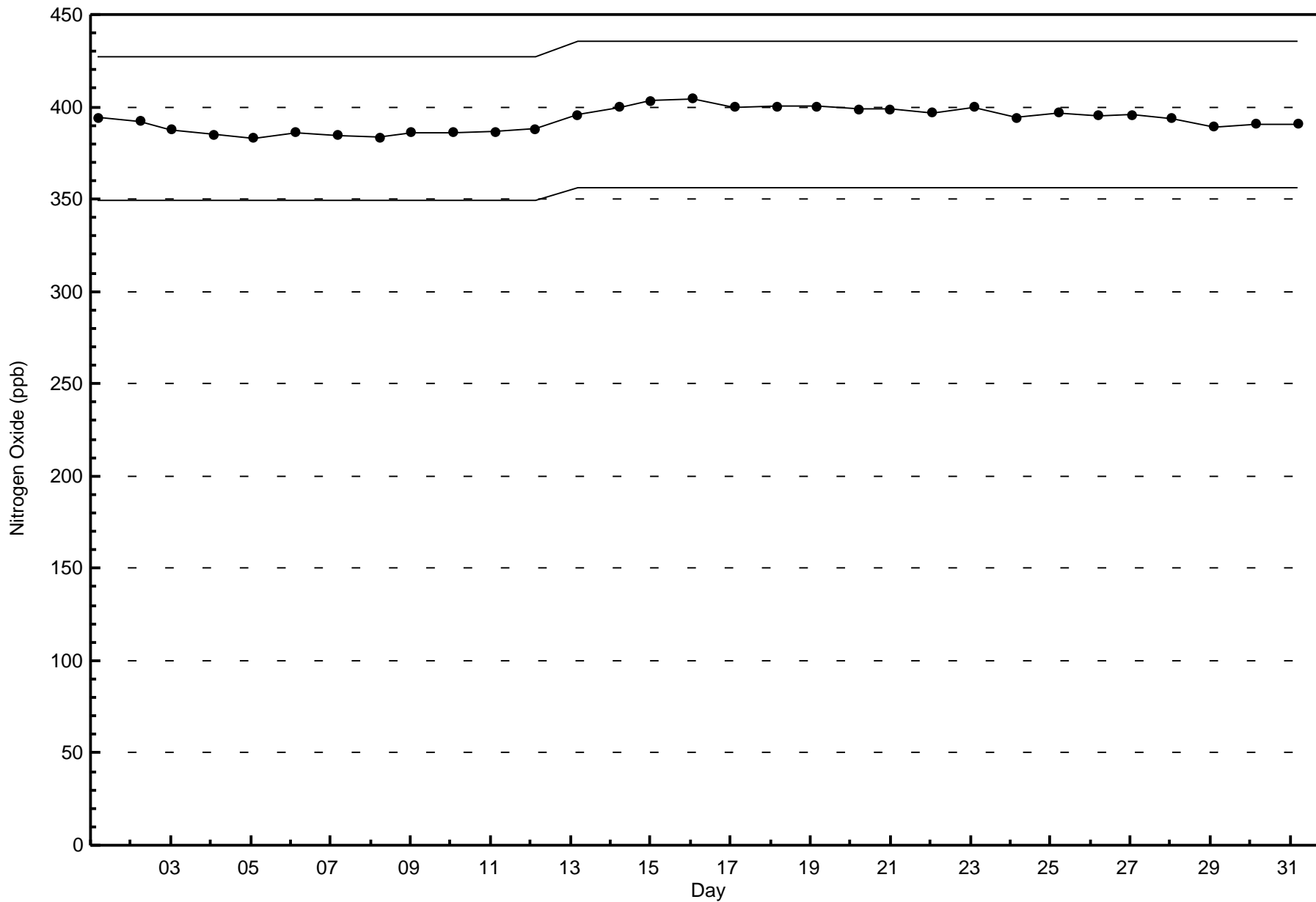






Wood Buffalo Environmental Association  
Span Responses

Nitrogen Oxide (NO) - ppb  
Leismer - December 2017





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Nitrogen Dioxide (NO<sub>2</sub>) - ppb

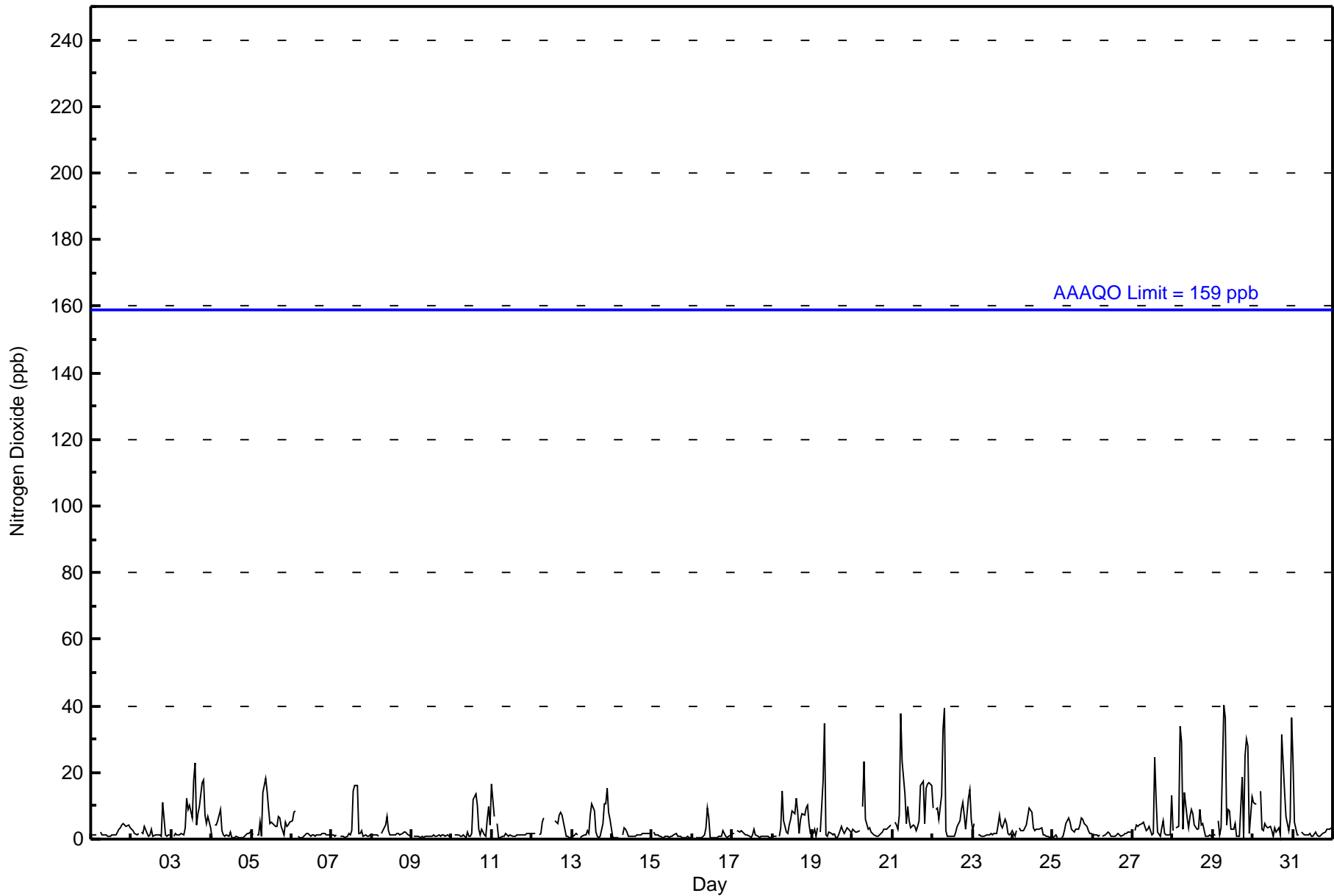
## Leismer - December 2017

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 40 ppb on Dec 29 07:00										Maximum Daily Average: 10.5 ppb on Dec 21																
Minimum Value: 0 ppb on Dec 16 13:00										Minimum Daily Average: 0.9 ppb on Dec 15																
Maximum Diurnal Average: 7.3 ppb at hour 8										Minimum Diurnal Average: 2.3 ppb at hour 4																
Monthly Average: 3.9 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 10 P <sub>99</sub> = 33																
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	3	3	4	5	4	4	4	4	2.2	5
2-Dec	3	2	2	1	2	Z	2	2	4	2	1	1	3	1	1	1	1	1	1	11	1	1	1	1	2.0	11
3-Dec	Z	1	2	1	1	1	2	1	3	12	9	10	6	18	23	4	8	10	17	18	7	5	7	3	7.3	23
4-Dec	1	Z	4	4	6	9	2	1	1	1	2	0	0	0	1	0	0	1	1	1	2	2	2	2	1.8	9
5-Dec	2	1	Z	1	1	5	1	14	18	14	9	5	5	4	4	4	7	6	4	1	5	4	4	5	5.4	18
6-Dec	6	8	8	Z	1	1	1	1	1	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	2.0	8
7-Dec	1	1	1	1	Z	1	1	1	1	1	2	1	3	14	16	16	2	2	2	1	1	1	1	1	3.1	16
8-Dec	1	1	1	1	1	Z	2	3	4	7	2	1	1	1	1	2	2	1	2	2	2	2	1	1	1.9	7
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
10-Dec	1	Z	1	1	1	1	1	1	1	2	1	1	2	12	13	10	3	1	3	1	1	6	10	4	3.4	13
11-Dec	16	7	Z	5	0	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2.2	16
12-Dec	2	2	2	Z	1	2	5	6	C	C	C	C	C	C	6	5	7	8	7	5	1	1	1	1	--	8
13-Dec	1	1	2	1	Z	1	1	1	1	3	2	7	11	8	2	1	0	1	5	10	11	15	8	6	4.3	15
14-Dec	1	0	0	1	1	Z	1	4	3	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.3	4
15-Dec	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	0.9	2
16-Dec	1	Z	1	0	0	0	0	1	3	10	6	0	0	0	1	1	1	1	2	2	1	1	1	1	1.5	10
17-Dec	2	2	Z	3	2	3	2	2	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1.3	3
18-Dec	1	1	1	Z	1	3	14	6	2	2	4	6	9	8	12	8	2	6	8	7	10	10	5	2	5.5	14
19-Dec	2	3	1	4	Z	2	18	35	1	1	2	2	1	2	0	0	1	4	3	2	3	4	3	2	4.0	35
20-Dec	3	3	2	2	3	Z	10	23	6	3	4	2	2	1	1	1	1	2	2	3	3	4	4	4	3.7	23
21-Dec	Z	5	4	3	7	38	24	14	5	10	6	3	4	4	3	4	5	16	17	5	15	17	17	16	10.5	38
22-Dec	9	Z	9	10	6	13	33	40	3	1	1	1	1	1	2	4	5	9	11	7	3	12	15	6	8.7	40
23-Dec	3	5	Z	1	1	1	1	1	1	1	1	2	1	2	2	4	7	4	3	6	5	2	1	2	2.4	7
24-Dec	2	1	3	Z	3	3	3	3	4	7	9	8	4	3	3	3	3	3	1	1	1	1	1	1	3.0	9
25-Dec	1	1	1	1	Z	1	1	3	5	6	5	3	3	2	3	3	4	6	6	5	4	3	2	2	3.0	6
26-Dec	1	1	1	1	1	Z	1	1	2	2	2	1	1	1	1	2	1	1	1	2	2	2	2	2	1.4	2
27-Dec	Z	3	4	4	4	5	5	4	3	3	4	1	2	25	12	2	1	3	6	2	1	1	1	13	4.7	25
28-Dec	3	Z	3	4	34	29	3	14	6	4	7	9	8	4	3	3	9	4	5	1	1	1	1	1	6.7	34
29-Dec	1	1	Z	6	1	3	40	37	4	9	9	3	3	5	1	1	1	19	1	25	30	28	2	13	10.4	40
30-Dec	11	11	11	Z	14	3	3	5	4	4	4	2	1	4	2	3	1	32	23	15	7	3	6	37	8.8	37
31-Dec	23	5	1	1	Z	2	2	1	1	1	2	1	1	2	1	1	1	1	2	2	3	3	3	3	2.8	23
3.7 2.7 2.6 2.3 3.8 5.0 5.8 7.3 3.1 3.7 3.3 2.6 2.6 4.3 3.9 2.9 2.7 4.9 4.6 4.7 4.1 4.4 3.5 4.5																								Diurnal Average		
23 11 11 10 34 38 40 40 18 14 9 10 11 25 23 16 9 32 23 25 30 28 17 37																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Leismer - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Leismer - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	688	97.31	97.31
21 - 40	19	2.69	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Leismer - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	60	16	4	1	2	1	2	5	8	51	39	21	65	217	97	91	680
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	5	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
<b>Totals</b>	60	16	4	1	2	1	2	5	8	51	39	21	65	221	105	96	697

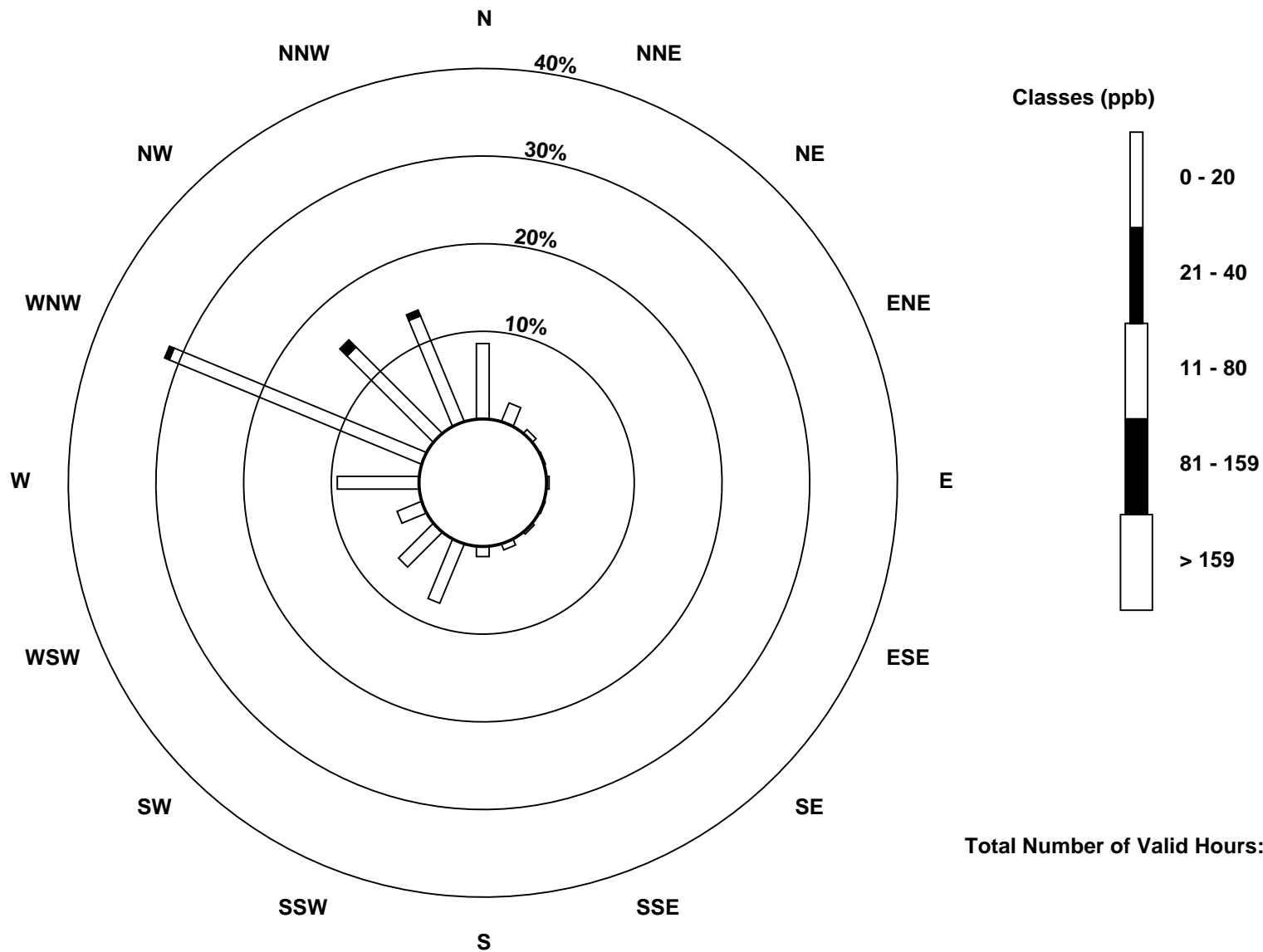
Total Number of Valid Hours: 697

Total Number of Hours: 744

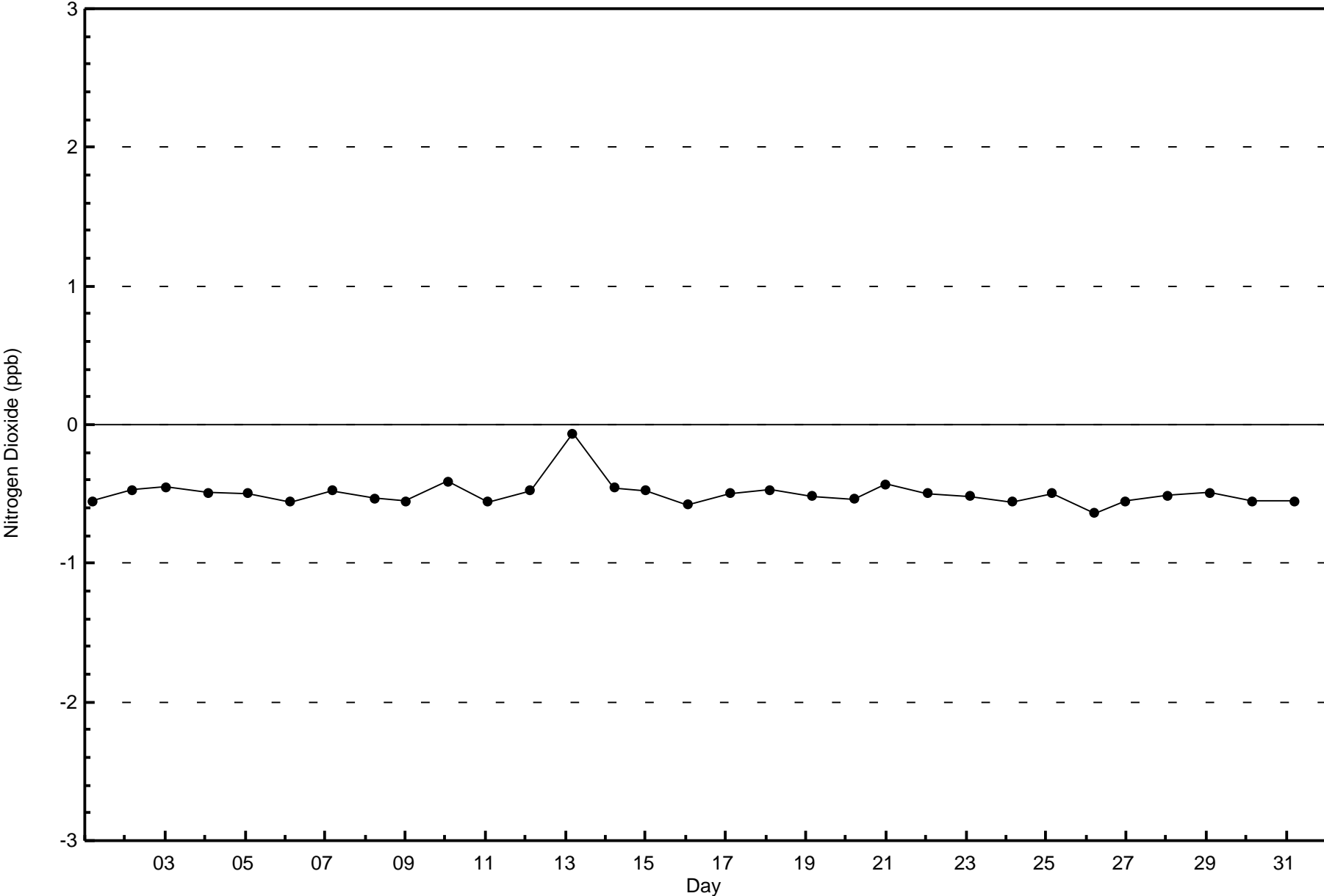


Wood Buffalo Environmental Association  
Wind Rose Dec 2017

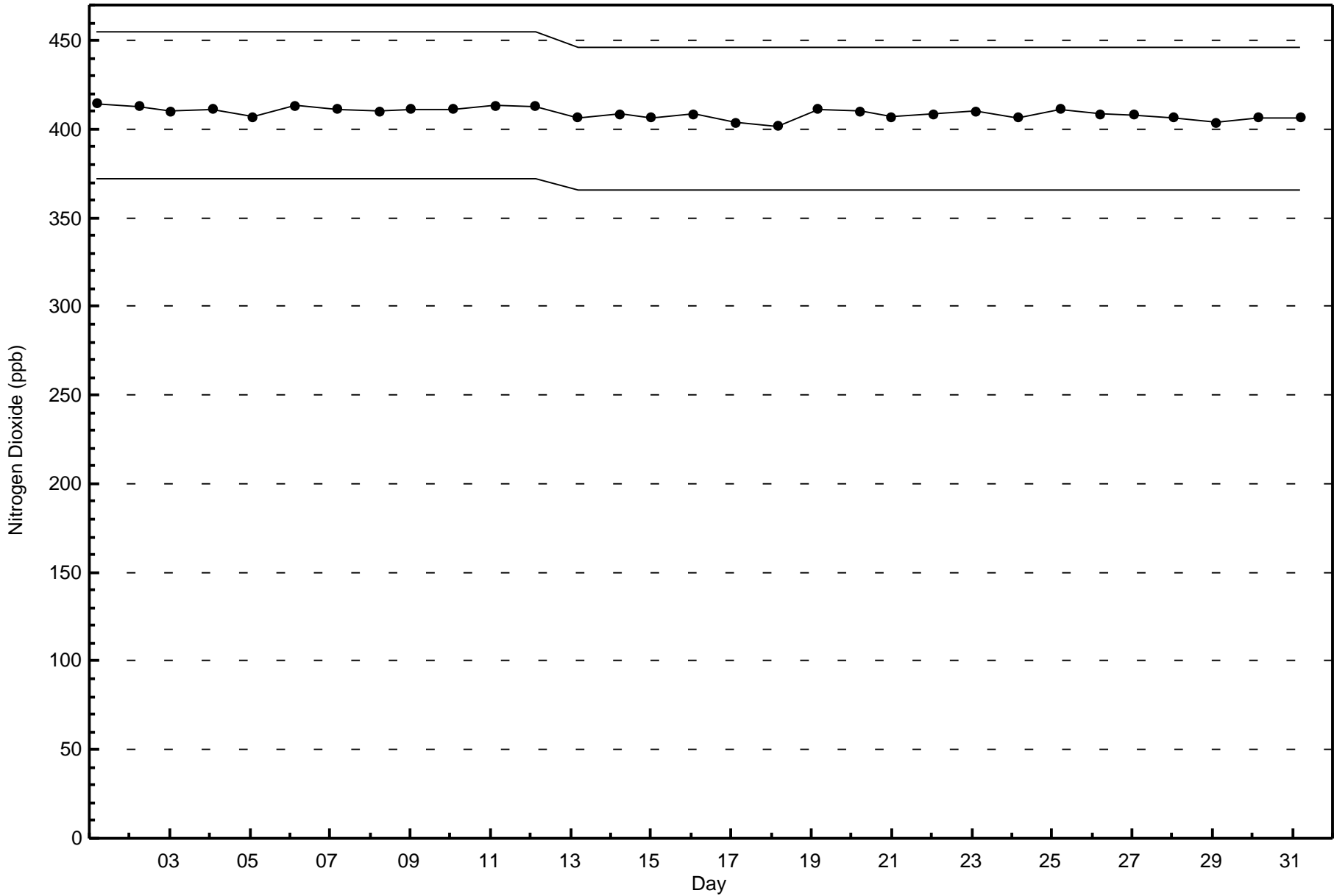
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Leismer (AMS 501)



Total Number of Valid Hours: 697







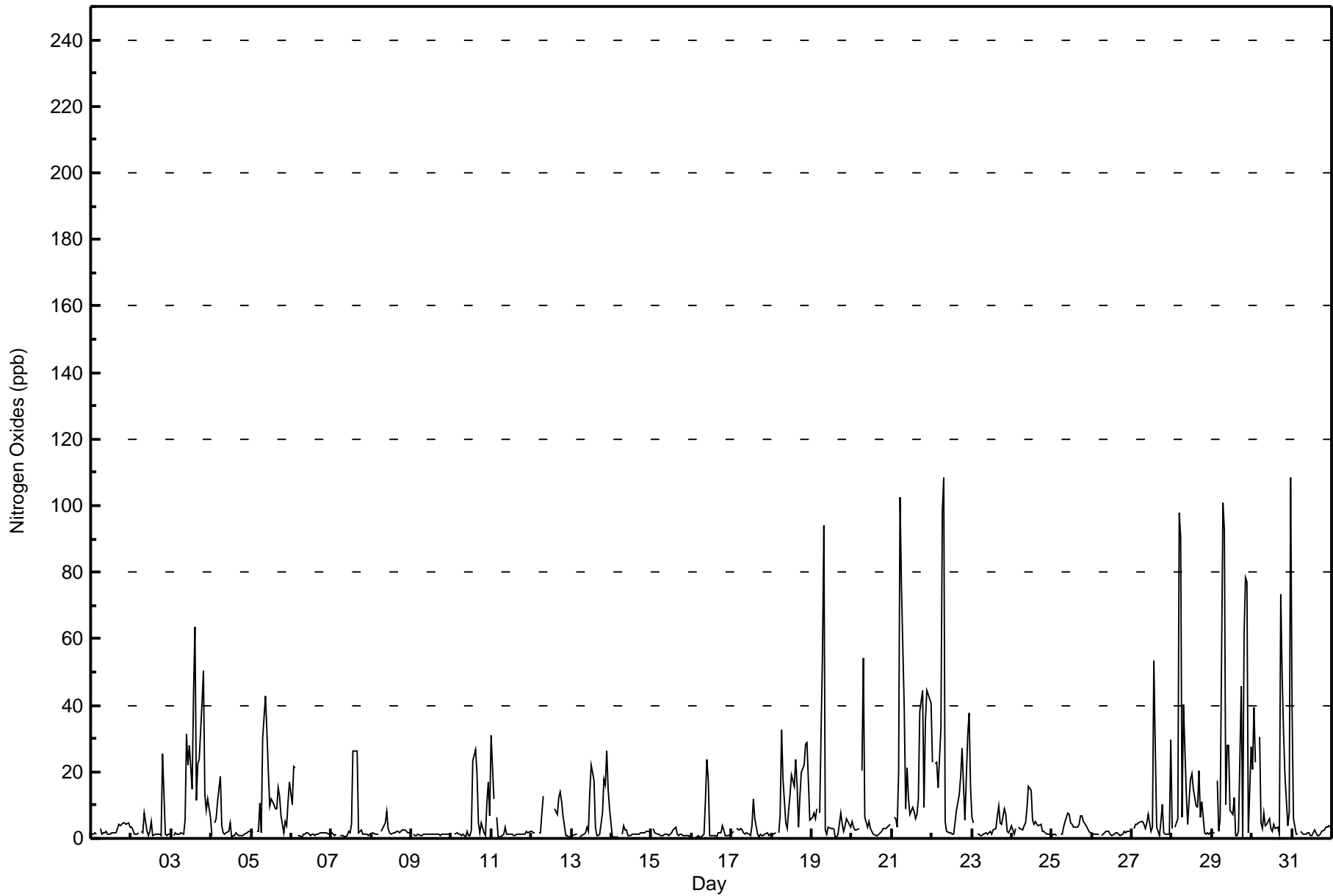


Maximum Value: 108 ppb on Dec 31 00:00		Maximum Daily Average: 26.7 ppb on Dec 29		Hours in Service: 744																						
Minimum Value: 0 ppb on Dec 11 05:00		Minimum Daily Average: 1.2 ppb on Dec 9		Hours of Data: 707																						
Maximum Diurnal Average: 17.3 ppb at hour 8		Minimum Diurnal Average: 3.8 ppb at hour 4		Hours of Missing Data: 37																						
Monthly Average: 7.9 ppb		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 7 P <sub>90</sub> = 22 P <sub>99</sub> = 62		Hours of Calibration: 37																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	2	1	Z	3	1	2	2	2	1	1	2	2	2	2	4	4	4	5	4	4	4	3	2.5	5
2-Dec	3	3	1	1	2	Z	2	2	8	2	1	2	5	1	1	1	1	1	1	26	1	1	1	1	3.0	26
3-Dec	Z	1	2	1	1	1	2	1	5	32	22	28	15	44	64	11	22	24	41	50	13	8	12	6	17.7	64
4-Dec	1	Z	4	6	11	19	4	2	1	2	2	5	1	1	1	2	1	1	1	1	1	2	2	2	3.1	19
5-Dec	2	2	Z	2	2	11	2	30	43	32	20	10	12	10	9	9	15	13	7	2	5	4	11	17	11.7	43
6-Dec	10	21	21	Z	1	1	1	1	1	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	3.4	21
7-Dec	2	1	1	1	Z	1	1	1	1	1	2	2	4	26	26	26	2	2	3	1	1	1	1	1	4.7	26
8-Dec	1	1	1	1	1	Z	2	4	5	8	3	2	1	2	2	2	2	2	2	3	3	2	2	1	2.3	8
9-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1
10-Dec	1	Z	1	2	1	1	1	1	1	2	1	1	2	23	27	19	5	2	5	2	1	11	17	7	5.8	27
11-Dec	31	12	Z	6	0	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3.3	31
12-Dec	2	2	2	Z	2	2	8	13	C	C	C	C	C	C	9	7	12	14	11	7	1	1	1	1	--	14
13-Dec	1	1	1	1	Z	1	1	1	2	3	2	14	22	17	3	1	1	1	8	18	16	26	15	9	7.2	26
14-Dec	1	0	1	1	1	Z	1	4	3	2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1.4	4
15-Dec	Z	3	2	1	1	1	1	1	1	1	1	2	2	2	4	1	1	1	1	1	1	1	1	1	1.3	4
16-Dec	1	Z	1	1	1	1	0	1	12	24	18	1	1	1	1	1	2	2	4	3	1	1	1	1	3.3	24
17-Dec	2	2	Z	3	3	3	3	2	1	1	1	1	4	12	6	1	1	1	1	1	1	2	1	1	2.3	12
18-Dec	1	1	2	Z	2	7	33	18	5	3	8	13	19	16	24	16	3	13	20	22	28	29	17	5	13.3	33
19-Dec	6	8	6	9	Z	8	55	94	2	1	4	3	3	3	1	0	1	8	4	2	4	6	4	3	10.3	94
20-Dec	5	3	2	2	3	Z	20	54	7	3	5	3	2	1	1	1	1	2	2	3	3	4	4	4	5.9	54
21-Dec	Z	6	6	4	20	103	76	38	9	21	12	7	9	8	6	7	12	38	45	9	35	45	43	41	26.1	103
22-Dec	23	Z	22	23	15	33	98	108	5	2	2	1	1	1	5	9	13	19	27	16	6	31	38	15	22.3	108
23-Dec	6	5	Z	1	1	1	1	1	1	1	2	2	1	3	3	7	10	5	4	9	7	2	2	2	3.4	10
24-Dec	4	1	3	Z	3	3	3	4	5	9	16	15	6	4	5	4	4	4	2	2	2	1	1	2	4.4	16
25-Dec	1	1	1	1	Z	1	1	3	5	8	7	4	4	3	4	3	4	7	7	5	4	3	2	2	3.6	8
26-Dec	1	1	1	1	1	Z	1	2	2	2	2	1	1	1	2	2	1	1	1	2	2	2	2	2	1.6	2
27-Dec	Z	3	4	4	5	5	5	4	3	5	7	2	3	54	28	4	1	5	10	2	1	1	1	30	8.1	54
28-Dec	3	Z	3	6	98	91	6	40	14	4	12	18	19	15	10	9	20	6	11	2	1	2	1	2	17.1	98
29-Dec	2	2	Z	17	2	6	101	93	10	28	28	9	7	12	1	1	2	46	1	61	78	77	2	28	26.7	101
30-Dec	21	39	23	Z	31	5	3	8	4	4	6	3	2	4	3	3	1	73	48	31	19	4	8	108	19.6	108
31-Dec	39	6	1	1	Z	2	2	1	1	2	2	1	1	3	2	1	1	1	2	3	3	3	4	3	3.7	39
6.6 5.0 4.5 3.8 8.3 11.8 14.1 17.3 5.4 7.0 6.4 5.1 5.2 9.2 8.1 5.0 4.8 9.6 9.0 9.5 8.0 9.0 6.6 9.9																								Diurnal Average		
39 39 23 23 98 103 101 108 43 32 28 28 22 54 64 26 22 73 48 61 78 77 43 108																								Diurnal Maximum		
Z - zerospan		C - Calibration																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Leismer - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Leismer - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	632	89.39	89.39
21 - 40	47	6.65	96.04
41 - 80	19	2.69	98.73
81 - 159	9	1.27	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Leismer - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	58	16	4	1	2	1	2	5	8	51	39	20	63	213	63	78	624
21 - 40	2	0	0	0	0	0	0	0	0	0	0	1	2	4	26	11	46
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	4	12	3	19
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	8
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	60	16	4	1	2	1	2	5	8	51	39	21	65	221	105	96	697

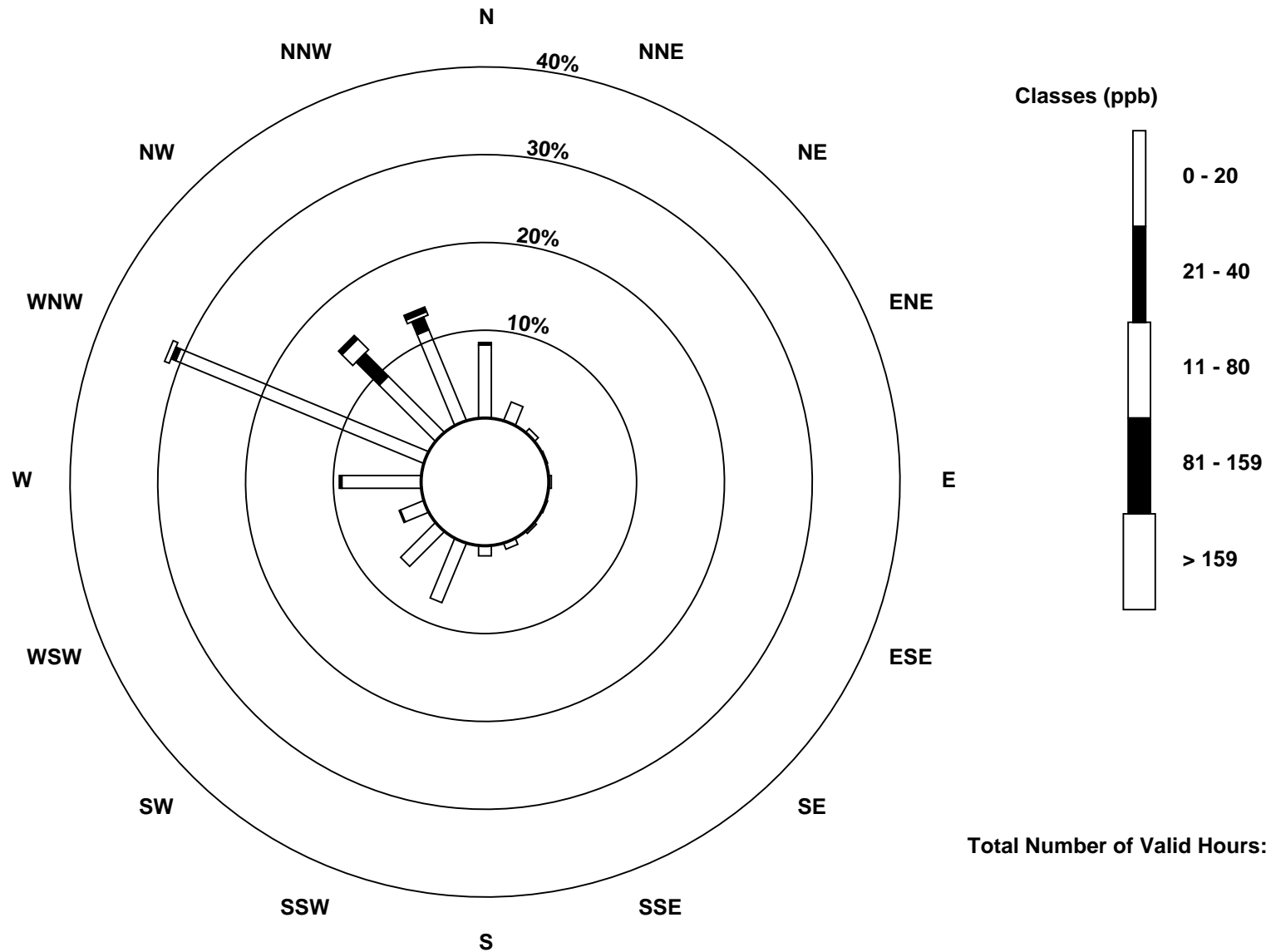
Total Number of Valid Hours: 697

Total Number of Hours: 744

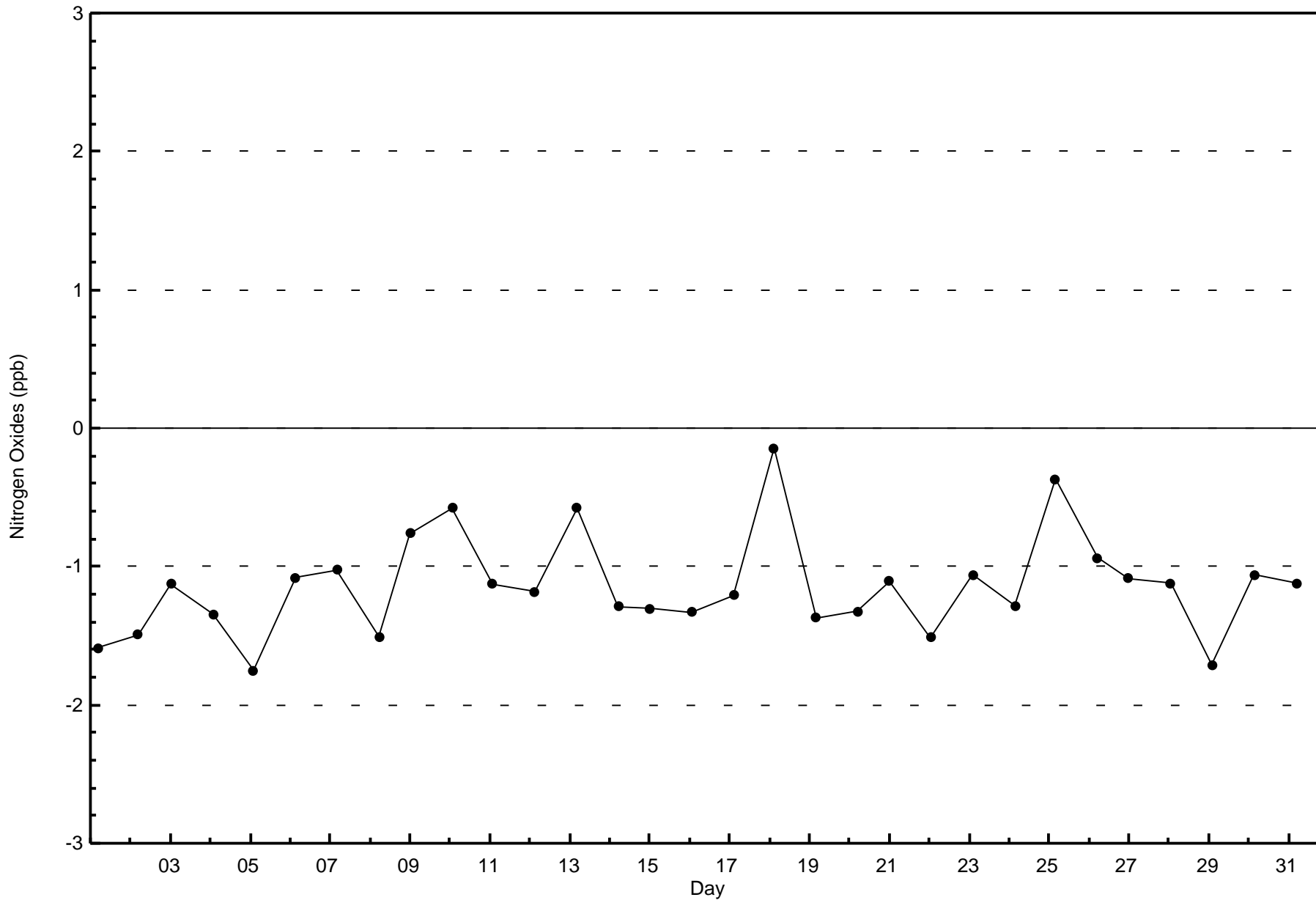


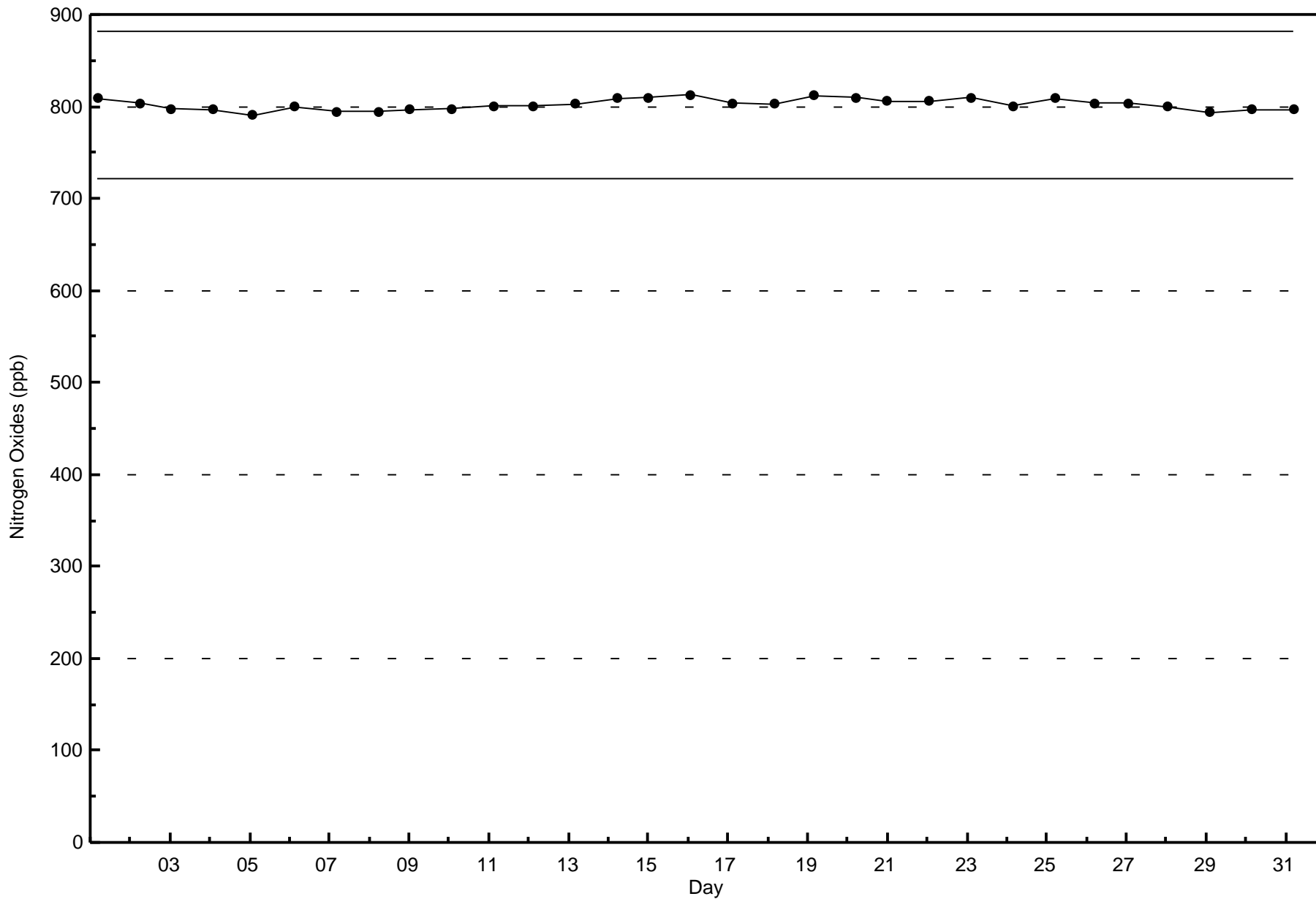
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Leismer (AMS 501)



Total Number of Valid Hours: 697









**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

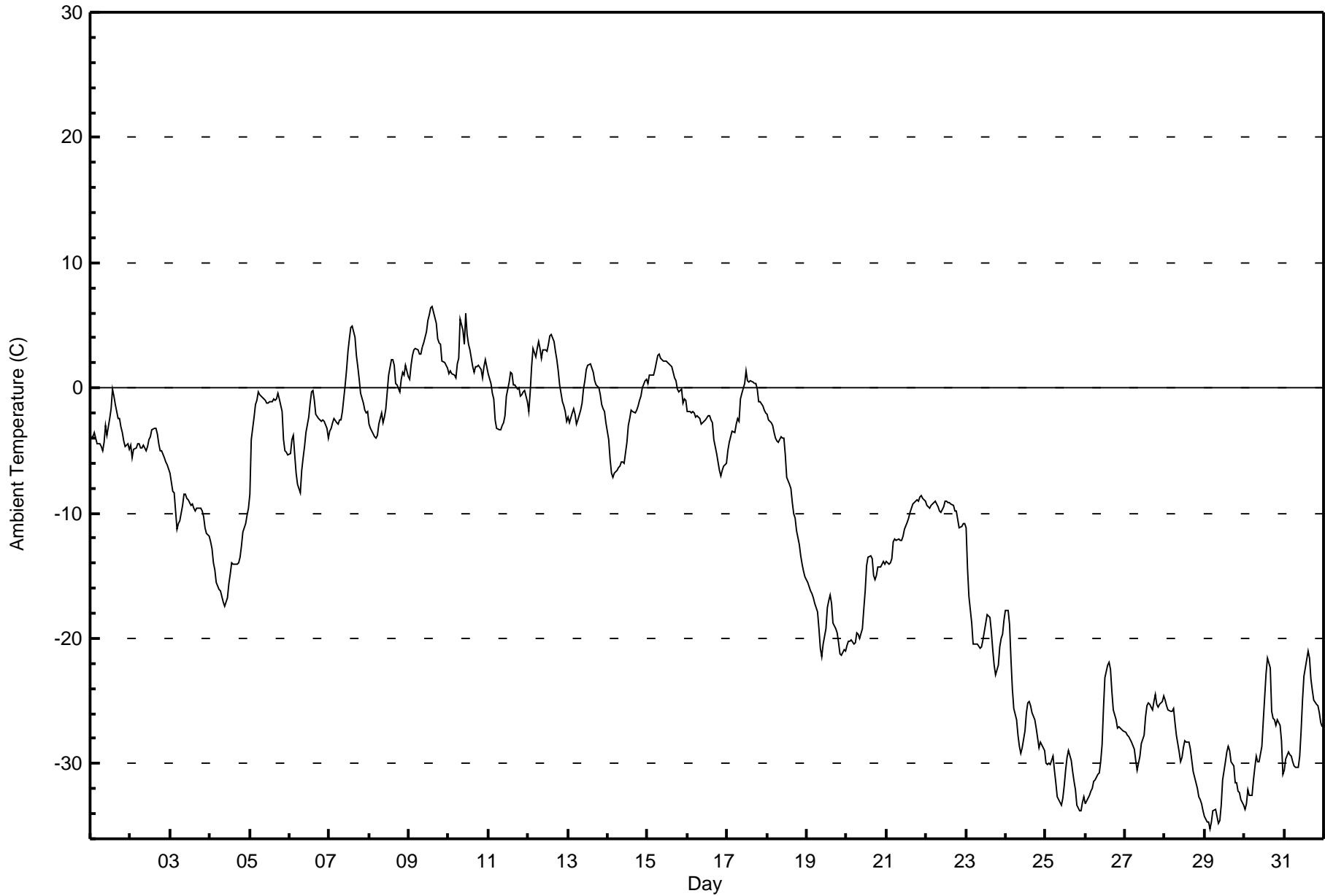
**Leismer - December 2017**

Maximum Value: 6.5 C on Dec 9 15:00		Maximum Daily Average: 3.5 C on Dec 9		Hours in Service: 744																							
Minimum Value: -35.2 C on Dec 29 04:00		Minimum Daily Average: -32.5 C on Dec 29		Hours of Data: 744																							
Maximum Diurnal Average: -9.2 C at hour 15		Minimum Diurnal Average: -12.3 C at hour 24		Hours of Missing Data: 0																							
Monthly Average: -11.34 C		Percentiles: P <sub>1</sub> = -34.2 P <sub>10</sub> = -29.8 Q <sub>1</sub> = -22.0 Median = -7.9 Q <sub>3</sub> = -1.4 P <sub>90</sub> = 1.7 P <sub>99</sub> = 5.3		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-3.8	-3.8	-3.6	-4.0	-4.4	-4.5	-4.6	-5.0	-4.3	-3.0	-3.8	-2.5	-1.6	-0.1	-0.7	-1.3	-2.4	-2.5	-3.1	-3.6	-4.3	-4.6	-4.5	-4.9	-3.4	-0.1	
2-Dec	-4.5	-5.6	-4.9	-4.8	-4.5	-4.4	-4.8	-4.8	-4.6	-5.0	-4.7	-4.2	-3.8	-3.3	-3.2	-3.3	-3.7	-4.4	-5.0	-5.0	-5.6	-5.9	-6.1	-6.5	-4.7	-3.2	
3-Dec	-6.8	-8.2	-8.3	-9.8	-11.3	-10.9	-10.6	-9.4	-8.4	-8.5	-8.8	-8.9	-9.4	-9.3	-9.6	-9.9	-9.6	-9.6	-9.6	-9.8	-10.3	-11.2	-11.6	-11.8	-9.6	-6.8	
4-Dec	-12.3	-12.8	-14.0	-14.5	-15.5	-16.1	-16.2	-16.6	-17.1	-17.4	-16.7	-15.6	-14.8	-14.0	-14.1	-14.0	-14.1	-14.0	-13.5	-12.7	-11.5	-10.8	-10.2	-9.6	-14.1	-9.6	
5-Dec	-8.4	-4.1	-2.3	-1.4	-1.0	-0.3	-0.5	-0.6	-0.9	-1.0	-1.2	-1.2	-1.1	-1.1	-0.9	-1.0	-0.9	-0.5	-0.8	-1.8	-4.1	-5.0	-5.1	-5.3	-2.1	-0.3	
6-Dec	-5.2	-4.2	-3.8	-5.4	-6.8	-7.7	-8.4	-6.5	-5.6	-4.7	-3.5	-2.3	-1.2	-0.4	-0.2	-1.0	-2.1	-2.4	-2.6	-2.7	-2.6	-2.7	-3.2	-4.0	-3.7	-0.2	
7-Dec	-3.4	-3.3	-2.8	-2.5	-2.8	-2.9	-2.6	-2.5	-1.9	0.2	1.4	2.9	4.0	4.8	5.0	4.0	2.6	1.7	0.7	-0.5	-1.3	-1.7	-2.0	-1.8	-0.2	5.0	
8-Dec	-2.9	-3.2	-3.6	-3.9	-4.0	-3.8	-2.8	-2.0	-2.7	-2.3	-1.7	-0.3	1.1	2.3	2.3	1.8	0.3	0.2	-0.3	0.7	1.3	1.1	1.8	0.9	-0.8	2.3	
9-Dec	0.7	1.8	2.5	3.1	3.2	3.0	2.7	2.8	3.3	3.5	4.4	5.4	5.9	6.4	6.5	6.0	5.2	4.0	3.6	3.5	2.1	2.1	1.8	1.6	3.5	6.5	
10-Dec	1.2	1.3	1.1	1.0	0.8	1.9	2.4	5.5	4.6	3.5	5.9	4.3	3.5	3.0	1.7	1.3	1.7	1.7	1.8	1.5	0.8	1.7	2.2	1.7	2.3	5.9	
11-Dec	1.2	0.4	-0.4	-0.9	-2.5	-3.3	-3.4	-3.3	-3.0	-2.8	-2.2	-0.7	0.4	1.2	1.1	0.3	0.3	-0.1	0.0	-0.6	-0.6	-0.3	-0.3	-1.1	-0.9	1.2	
12-Dec	-1.9	-0.4	1.7	3.2	2.5	3.1	3.7	3.2	2.4	3.1	3.1	2.9	3.5	4.2	4.3	3.7	3.0	2.3	1.4	0.2	-1.2	-1.4	-1.9	-2.7	1.7	4.3	
13-Dec	-2.4	-2.8	-2.0	-1.7	-2.1	-2.9	-2.5	-1.8	-1.2	-0.1	0.6	1.5	1.8	2.0	1.6	1.3	0.6	0.2	0.0	-0.5	-1.4	-1.6	-1.9	-2.7	-0.7	2.0	
14-Dec	-4.1	-5.7	-6.8	-7.1	-6.8	-6.5	-6.4	-6.2	-5.9	-5.9	-6.0	-4.4	-2.9	-2.4	-1.8	-1.8	-2.0	-1.8	-1.4	-1.0	-0.6	0.0	0.5	0.6	-3.6	0.6	
15-Dec	0.4	1.0	1.1	1.0	1.4	2.0	2.6	2.7	2.3	2.2	2.2	2.1	2.0	1.9	1.7	1.3	0.8	0.6	0.0	-0.3	-0.1	-1.2	-0.9	-1.0	1.1	2.7	
16-Dec	-1.9	-1.9	-1.9	-1.9	-2.0	-2.3	-2.2	-2.5	-2.9	-2.7	-2.6	-2.5	-2.2	-2.2	-2.6	-2.8	-4.1	-5.2	-5.9	-6.5	-7.1	-6.6	-6.3	-6.0	-3.5	-1.9	
17-Dec	-5.0	-4.4	-3.8	-3.5	-3.6	-2.9	-2.4	-2.6	-0.9	-0.4	0.4	1.3	0.6	0.5	0.6	0.5	0.3	0.4	0.0	-1.1	-1.1	-1.4	-1.8	-2.0	-1.4	1.3	
18-Dec	-2.1	-2.6	-2.8	-3.0	-3.6	-4.1	-4.2	-4.3	-3.9	-4.0	-4.1	-5.3	-7.2	-7.6	-8.0	-9.1	-10.0	-10.4	-11.4	-12.5	-13.3	-14.1	-14.6	-15.1	-7.4	-2.1	
19-Dec	-15.5	-15.9	-16.2	-16.4	-16.7	-17.2	-17.9	-19.2	-20.8	-21.5	-20.4	-19.2	-17.5	-17.0	-16.5	-17.2	-18.8	-19.2	-19.6	-20.3	-21.3	-21.3	-20.9	-21.0	-18.7	-15.5	
20-Dec	-20.5	-20.2	-20.2	-20.1	-20.5	-20.4	-19.5	-19.6	-20.0	-19.2	-17.6	-16.2	-14.2	-13.5	-13.4	-13.6	-14.9	-15.3	-15.0	-14.3	-14.3	-14.1	-13.8	-14.1	-16.9	-13.4	
21-Dec	-13.9	-14.1	-14.0	-13.6	-12.3	-12.1	-12.2	-12.1	-12.1	-12.1	-11.8	-11.2	-10.8	-10.4	-9.9	-9.6	-9.3	-9.2	-9.0	-9.0	-8.7	-8.5	-8.9	-9.1	-11.0	-8.5	
22-Dec	-9.4	-9.5	-9.6	-9.4	-9.2	-9.1	-9.3	-9.5	-9.8	-9.9	-9.4	-9.0	-9.0	-9.1	-9.2	-9.2	-9.4	-9.8	-9.9	-10.5	-11.1	-11.0	-10.8	-10.8	-9.7	-9.0	
23-Dec	-11.1	-14.4	-16.6	-18.8	-20.5	-20.5	-20.5	-20.5	-20.8	-20.7	-20.1	-19.5	-18.8	-18.1	-18.3	-19.4	-20.9	-22.1	-22.9	-22.1	-20.6	-20.0	-19.7	-18.6	-19.4	-11.1	
24-Dec	-17.7	-17.7	-18.9	-21.7	-24.0	-25.6	-26.5	-27.7	-28.6	-29.2	-28.7	-27.3	-25.9	-25.2	-25.1	-25.4	-25.9	-26.5	-27.1	-28.0	-28.7	-28.3	-28.7	-28.9	-25.7	-17.7	
25-Dec	-29.9	-30.1	-30.0	-30.0	-29.4	-30.5	-31.5	-32.7	-32.9	-33.3	-32.8	-31.7	-30.5	-29.5	-29.0	-29.7	-30.7	-31.4	-32.0	-33.3	-33.8	-33.8	-33.1	-32.6	-31.4	-29.0	
26-Dec	-33.2	-32.9	-32.6	-32.2	-32.0	-31.4	-31.3	-30.9	-30.8	-29.9	-28.6	-25.6	-23.2	-22.2	-21.9	-22.4	-24.2	-25.7	-26.5	-27.1	-27.1	-27.1	-27.2	-27.4	-28.1	-21.9	
27-Dec	-27.5	-27.8	-27.9	-28.1	-28.3	-28.9	-29.7	-30.5	-29.9	-29.4	-28.4	-27.7	-26.2	-25.3	-25.2	-25.3	-25.7	-25.0	-24.4	-27.3	-25.5	-25.3	-25.0	-24.6	-27.0	-24.4	
28-Dec	-24.9	-25.4	-25.7	-25.9	-25.8	-25.6	-26.7	-27.7	-29.0	-29.8	-29.5	-28.7	-28.2	-28.3	-28.3	-28.9	-29.8	-30.6	-31.1	-32.0	-32.6	-32.9	-33.2	-33.8	-28.9	-24.9	
29-Dec	-34.2	-34.7	-34.6	-35.2	-34.7	-33.8	-33.7	-34.2	-34.8	-34.5	-33.3	-31.3	-29.9	-29.0	-28.6	-28.9	-29.9	-30.2	-31.6	-31.5	-32.2	-32.3	-32.8	-33.3	-32.5	-28.6	
30-Dec	-33.6	-33.3	-32.1	-32.5	-32.5	-31.2	-30.3	-29.4	-29.9	-29.8	-28.6	-26.6	-24.7	-22.8	-21.6	-22.4	-25.8	-26.3	-26.5	-26.9	-26.5	-27.0	-28.1	-30.8	-28.3	-21.6	
31-Dec	-30.5	-29.7	-29.0	-29.3	-29.4	-29.9	-30.2	-30.3	-30.3	-29.4	-27.3	-24.9	-23.0	-21.7	-21.0	-21.6	-23.2	-24.1	-24.9	-25.2	-25.3	-26.0	-26.7	-27.1	-26.7	-21.0	
		-11.7	-11.7	-11.7	-11.9	-12.2	-12.2	-12.2	-12.2	-12.3	-12.1	-11.4	-10.5	-9.8	-9.2	-9.2	-9.6	-10.4	-10.8	-11.2	-11.6	-11.9	-12.0	-12.0	-12.3	Diurnal Average	
		1.2	1.8	2.5	3.2	3.2	3.1	3.7	5.5	4.6	3.5	5.9	5.4	5.9	6.4	6.5	6.0	5.2	4.0	3.6	3.5	2.1	2.1	2.2	1.7	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Leismer - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Leismer - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	217	29.17	29.17
-20 - 0	396	53.23	82.39
0 - 10	131	17.61	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

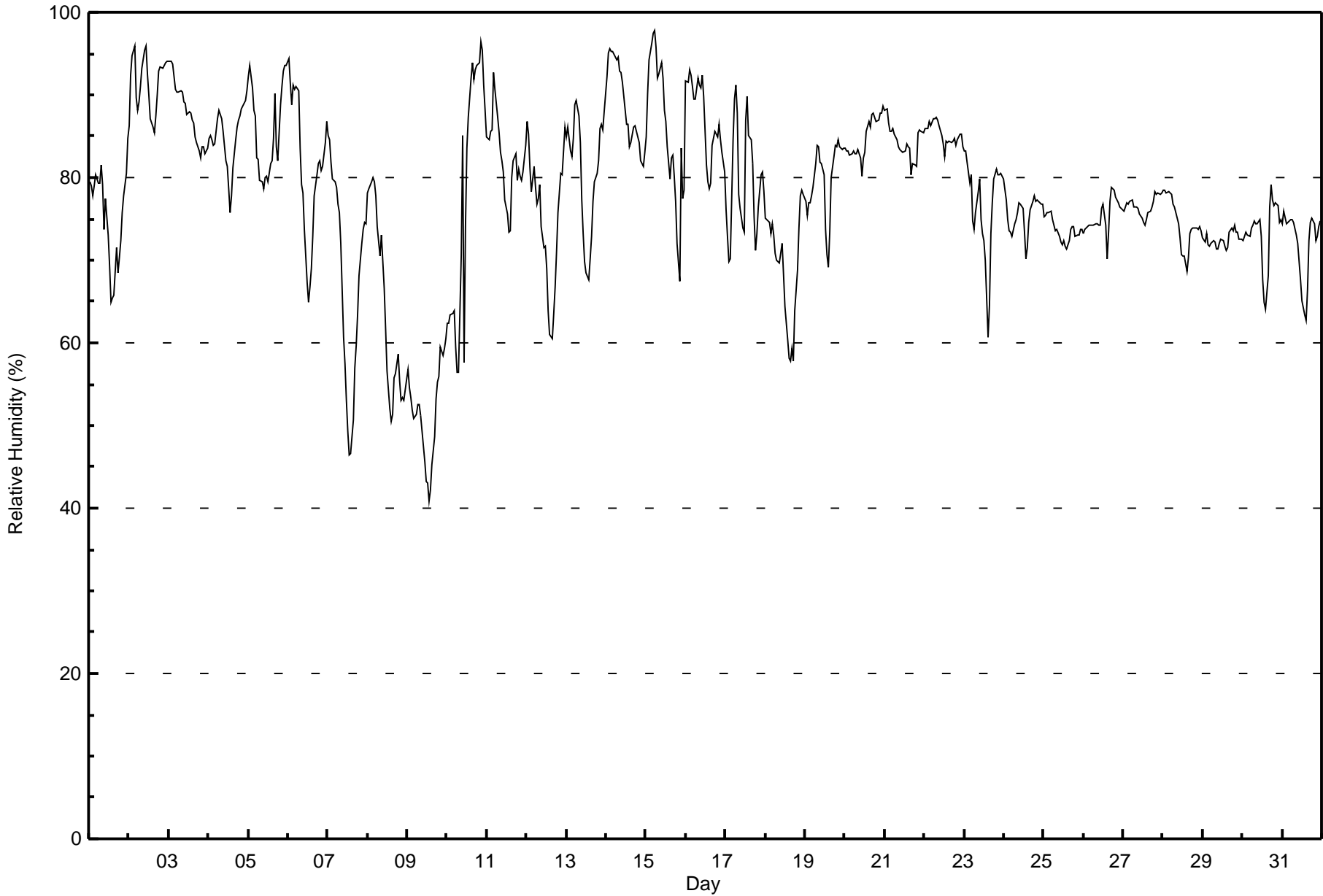
**Leismer - December 2017**

<b>Maximum Value: 98 % on Dec 15 06:00</b> <b>Maximum Daily Average: 91.3 % on Dec 2</b>																			<b>Hours in Service: 744</b>							
<b>Minimum Value: 41 % on Dec 9 14:00</b> <b>Minimum Daily Average: 51.5 % on Dec 9</b>																			<b>Hours of Data: 744</b>							
<b>Maximum Diurnal Average: 81.1 % at hour 2</b> <b>Minimum Diurnal Average: 71.9 % at hour 15</b>																			<b>Hours of Missing Data: 0</b>							
<b>Monthly Average: 78.1 %</b> <b>Percentiles: P<sub>1</sub> = 47 P<sub>10</sub> = 65 Q<sub>1</sub> = 73 Median = 78 O<sub>3</sub> = 85 P<sub>90</sub> = 90 P<sub>99</sub> = 96</b>																			<b>Hours of Calibration: 0</b>							
																			<b>Percent Operational Time: 100.0</b>							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	79	79	78	79	80	79	79	81	79	74	77	73	69	65	65	66	72	68	70	72	76	78	80	85	75.2	85
2-Dec	86	92	95	96	90	88	89	91	93	95	96	92	90	87	86	85	87	90	93	93	93	93	94	94	91.3	96
3-Dec	94	94	94	92	91	90	90	91	90	89	89	88	88	88	87	87	85	84	83	82	84	84	83	84	87.9	94
4-Dec	85	85	85	84	84	87	88	88	87	86	82	81	79	76	78	81	85	86	87	87	88	89	89	90	84.9	90
5-Dec	92	93	91	88	87	82	82	80	79	79	80	80	80	82	82	85	90	84	82	89	91	93	94	94	85.8	94
6-Dec	94	91	89	91	91	91	90	84	79	78	74	67	65	67	69	73	78	80	82	82	81	81	84	87	81.2	94
7-Dec	85	85	82	80	79	79	77	76	72	61	57	53	49	46	47	51	57	60	63	68	72	74	75	74	67.5	85
8-Dec	78	79	79	80	79	78	74	71	73	70	67	62	57	52	50	51	56	56	59	55	53	53	53	56	64.2	80
9-Dec	57	55	53	52	51	51	53	53	51	49	46	43	43	41	42	45	49	53	55	56	59	58	59	61	51.5	61
10-Dec	62	62	63	64	64	59	56	56	71	85	58	74	84	87	92	94	92	93	94	94	97	95	91	88	78.2	97
11-Dec	85	85	86	86	93	91	87	85	83	82	81	77	76	73	74	80	82	83	80	81	80	80	81	84	82.2	93
12-Dec	87	85	81	78	81	79	77	78	79	74	71	72	69	64	61	60	64	67	71	76	80	80	83	86	75.2	87
13-Dec	85	86	83	83	85	89	89	88	84	77	73	70	68	68	70	73	77	79	80	82	86	86	86	88	80.7	89
14-Dec	92	95	96	95	95	95	94	95	93	93	92	88	86	87	84	84	86	86	86	85	84	82	81	83	89.0	96
15-Dec	85	90	94	96	97	98	96	92	93	94	92	88	87	84	80	82	83	80	77	72	67	84	77	78	86.1	98
16-Dec	92	91	93	92	91	90	89	92	91	91	92	90	81	80	79	79	84	86	85	85	86	85	83	81	87.0	93
17-Dec	76	73	70	70	85	90	91	88	78	76	74	73	87	90	85	85	82	75	71	73	76	80	81	78	79.5	91
18-Dec	75	75	75	73	74	73	71	70	70	71	72	68	64	60	58	58	59	58	64	69	74	78	78	78	69.4	78
19-Dec	77	75	77	77	78	79	82	84	84	82	82	80	74	71	69	73	80	83	84	84	84	84	83	84	79.5	84
20-Dec	84	83	83	83	83	83	83	83	83	82	80	82	83	86	87	86	88	88	87	87	87	88	88	89	84.8	89
21-Dec	88	88	87	86	86	86	85	85	84	83	83	83	83	84	84	84	80	82	81	81	85	86	86	85	84.4	88
22-Dec	86	86	86	87	86	87	87	87	87	86	85	84	83	84	84	84	84	84	85	84	85	85	85	84	85.3	87
23-Dec	83	83	82	79	80	75	74	76	78	80	75	73	72	70	61	65	73	77	80	81	80	80	81	80	76.6	83
24-Dec	80	77	75	74	73	73	74	75	76	77	77	76	73	70	72	75	76	77	78	77	77	77	77	77	75.5	80
25-Dec	75	75	76	76	76	75	74	74	74	73	72	72	72	72	71	72	74	74	74	73	73	73	74	74	73.7	76
26-Dec	73	74	74	74	74	74	74	74	74	74	74	76	77	74	70	73	77	79	78	78	77	77	76	76	75.2	79
27-Dec	76	76	77	77	77	77	76	76	76	76	76	75	75	74	75	76	76	76	77	78	78	78	78	78	76.5	78
28-Dec	78	78	78	78	78	78	77	76	75	74	73	71	70	70	69	70	73	74	74	74	74	74	74	74	74.4	78
29-Dec	73	72	73	72	72	72	72	72	71	71	72	73	72	72	71	72	73	74	74	74	73	73	73	73	72.5	74
30-Dec	72	73	73	73	73	74	74	75	74	74	75	73	68	65	64	68	76	79	77	77	77	77	75	75	73.4	79
31-Dec	74	76	74	75	75	75	75	75	73	72	70	68	65	63	63	66	72	75	75	74	72	73	74	75	72.0	76
	81.0	81.1	80.7	80.3	80.9	80.5	80.1	79.6	79.2	78.4	76.3	75.1	73.9	72.6	71.9	73.7	76.4	77.1	77.6	78.2	79.1	80.0	79.9	80.4	Diurnal Average	
	94	95	96	96	97	98	96	95	93	95	96	92	90	90	92	94	92	93	94	94	97	95	94	94	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Leismer - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Leismer - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	51	6.85	6.85
60 - 80	359	48.25	55.11
80 - 100	334	44.89	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Leismer - December 2017

Maximum Speed: 35 km/h on Dec 10 14:00	Maximum Daily Speed Average: 23.5 km/h on Dec 18	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 31 03:00	Minimum Daily Speed Average: 2.1 km/h on Dec 4	Hours of Data: 734
Maximum Diurnal Speed Average: 12.5 km/h at hour 12	Minimum Diurnal Speed Average: 6.5 km/h at hour 1	Hours of Missing Data: 10
Monthly Average Velocity: 9.4 km/h 307.8 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 9 Q <sub>3</sub> = 18 P <sub>90</sub> = 23 P <sub>99</sub> = 30	Percent Operational Time: 98.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW5	WSW6	W7	W8	W8	W8	W6	W4	W6WNW11	SSW5	SSW5	SSW2	SSE3	SSE5	SE4	NNE0	SSW4	SW3	SW3	SW3	SSW3	SSW3	SSW3	WSW3.7	WNW11	
2-Dec	W6	W6	W4	W5WNW12	WNW15	WNW12	WNW11	WNW12	WNW12	WNW12	WNW10	WNW11	W9	W8WNW10	WSW3	W4	SSW2	WSW1	SSW4	SSW4	SSW3	SE1	W6.8	WNW15		
3-Dec	S2	SSW2	SW1	SSW3	SSW3	SSW2	SSW3	W5WNW18	NW18	NW21	NW20	WNW18	NW16	WNW16	WNW13	WNW15	NW14	NW16	NNW14	NNW16	NNW15	NNW13	NNW11	NW10.2	NW21	
4-Dec	N13	N12	N13	NNW10	NNW8	NW9	WNW9	WNW8	W6	W4	WSW2	WSW2	SW4	SSW5	S7	S7	S6	SSE7	SSE7	S7	SSW6	SSW6	SW3	W2.1	N13	
5-Dec	W4WNW18	WNW23	WNW26	WNW26	NW29	WNW28	NW25	NW23	NW26	NNW25	NNW26	NNW28	NNW25	NNW23	NNW21	NNW27	NNW26	N16	NNE12	N8	NNW10	NNW8	NW19.9	NW29		
6-Dec	N6	NNW13	NW13	WNW12	WNW11	W8	WNW8	WNW9	W5	W4	W4	W6	W11	WNW15	WNW16	WNW13	WNW13	WNW14	WNW16	WNW16	WNW18	WNW15	W10	W11	WNW10.6	WNW18
7-Dec	WNW14	W10	WNW15	W14	W11	WNW11	WNW13	WNW12	W8	WNW16	WNW16	WNW20	WNW20	NW18	NW19	NW18	WNW20	WNW15	WNW8	WNW9	W5	W6	WNW10	W7	WNW12.8	WNW20
8-Dec	W6	WNW9	WNW9	WNW7	WNW9	WNW8	WNW11	NNW11	NNW10	WNW11	WNW11	WNW11	WNW8	W6	W9	W6	WNW7	W6	W8	WNW11	WNW14	WNW16	WNW20	W8	WNW9.1	WNW20
9-Dec	W8	W11	WNW20	WNW22	WNW19	WNW19	WNW19	WNW14	WNW18	WNW18	WNW17	WNW24	WNW22	WNW20	WNW24	WNW20	WNW16	WNW15	WNW15	WNW10	W7	WNW9	WNW9	W9	WNW15.9	WNW24
10-Dec	WNW11	WNW11	WNW9	WNW10	WNW13	WNW15	WNW13	WNW24	WNW19	W5	WNW30	NW34	NW32	NW35	NNW31	NNW28	NNW30	NNW24	NNW22	NNW20	NNW15	NNW17	NW16	NW19	NW19.1	NW35
11-Dec	NW17	NW18	WNW13	NW8	WSW4	W7	AF	AF	AF	AF	AF	WNW8	WNW6	WSW4	SW5	SSW4	SSW4	SSW5	SW5	SSW5	SSW3	SSW3	S3	SSW5	W4.7	NW18
12-Dec	SW3	W7	WNW17	WNW23	WNW18	NW20	NW19	WNW12	WNW14	WNW20	WNW17	WNW13	WNW14	NW23	NNW21	NNW24	NNW27	NNW24	NNW21	NW13	WNW11	WNW12	W6	WNW7	NW15.2	NNW27
13-Dec	WNW9	WNW10	WNW14	WNW14	WNW10	WSW4	WSW4	W8	WNW17	NW26	WNW30	NW29	NW28	NW26	NNW22	NNW24	N23	NNW18	NNW19	NW20	NW15	NW19	NW24	NW13	NW16.7	WNW30
14-Dec	WSW5	WSW3	WSW3	W2	WNW3	WNW4	WNW3	WNW4	WNW4	SW2	S4	SSW4	SSW4	SSW5	SW6	SSW6	SSW5	SSW5	SSW6	WSW5	W5	W9	WNW12	W5	WSW3.8	WNW12
15-Dec	W4	WNW12	WNW9	W7	WNW10	WNW13	WNW18	WNW27	WNW28	WNW24	WNW24	WNW27	WNW28	WNW28	WNW26	WNW25	WNW22	WNW24	WNW22	WNW20	WNW20	WNW22	WNW17	WNW23	WNW19.8	WNW28
16-Dec	WNW23	WNW24	WNW23	WNW23	WNW24	WNW22	WNW21	NW14	NNW14	NW15	NW12	WNW10	WNW14	W8	W7	WSW2	WSW3	W3	WSW3	SSW4	SW6	SW6	SSW7	WNW11.3	WNW24	
17-Dec	SSW9	SW9	SW8	SW11	SW11	SW9	SW9	SW6	W8	W10	WNW17	WNW27	NW30	NW27	WNW23	WNW24	WNW23	NW26	NNW25	NNW20	NW20	WNW18	WNW17	WNW14.5	WNW30	
18-Dec	NW20	NW19	NW21	NW23	NW22	NW23	NW21	NW24	NW25	NW25	NW27	NNW30	NNW32	NNW26	NW26	NNW28	NNW23	NNW26	NNW24	NNW25	NNW22	NNW22	NNW22	NW23	NW23.5	NNW32
19-Dec	N22	NNW22	NNW18	NNW18	NNW18	N15	NNW11	NNW6	WNW4	WNW4	WNW6	WNW4	N3	WNW5	WNW5	W3	WSW1	WNW3	WNW3	WNW3	W2	WNW2	WNW4	WNW5	NNW7.0	NNW22
20-Dec	NW3	NW3	WNW4	WNW3	WSW2	SW1	WNW4	WNW2	WSW0	W1	WNW2	WNW5	W5	SW4	SSW4	SSW4	SSW4	SSW4	SSW5	SW5	SW5	SW5	SSW3	SSW3	WSW2.6	WNW5
21-Dec	SSW2	AF	WNW4	WNW5	WNW9	NW10	NNW12	NNW16	NNW15	NNW17	NNW18	NNW20	NNW18	NNW19	NNW19	NNW18	NNW21	NW16	NW18	NW21	NW21	NW21	NW18	NW18	NW15.1	NW21
22-Dec	NW18	NW18	NW19	NW20	NW21	NW21	NW22	NW22	NW20	NW20	NW23	NW24	WNW25	NW24	NW24	NW22	NW22	NW21	NW21	NW20	NW20	NW16	NNW16	NNW18	NW20.4	WNW25
23-Dec	N15	NE13	NNE12	NNE10	NNE5	NNE3	NE1	WSW0	ESE1	E1	E1	N1	N4	NNW5	N8	N9	N9	NNW8	NW8	NW10	NW13	WNW9	WNW11	NW13	NNW5.8	N15
24-Dec	NNW15	N18	NNE20	NNE22	NNE22	NNE19	N17	N14	N10	NNW9	NNW9	NNW13	NNW12	NNW14	NNW14	N13	N11	N8	N7	NNW4	NNW5	N8	NNE4	NNW2	N11.7	NNE22
25-Dec	ENE0	NW1	N2	NNE5	NNE5	NNE4	N2	NNE5	N4	NNW2	NNW4	NNW5	NNW7	N10	N8	NW7	NW6	NW7	NW5	WNW2	WNW4	WNW4	WNW8	WNW5	NNW4.1	N10
26-Dec	W2	WNW3	WNW6	WNW8	NW6	WNW4	WNW4	WNW2	WNW2	W1	WNW3	WNW7	WNW7	WNW9	WNW8	WNW4	SW2	SW2	WSW1	AF	WNW0	WNW2	WNW1	WNW3	WNW3.6	WNW9
27-Dec	WNW2	WNW2	NW3	NW5	WNW7	WNW4	WN8	NW12	NW11	NW13	NW15	NW11	NW12	WNW7	WNW7	WNW9	WNW11	WNW12	WNW7	W3	SW2	SSW0	W1	WNW6.8	NW15	
28-Dec	W1	W1	WNW4	WNW4	NW3	NNW8	N6	N7	N11	N12	N14	N12	NNW12	NNW15	N13	N10	N6	N6	N7	N8	N8	N9	N9	N9	N7.8	NNW15
29-Dec	N11	N12	NNW11	N10	N10	N10	NNW13	NNW16	N10	NNW7	NNW8	N9	N8	WNW7	WNW9	WNW10	WNW7	NW6	WNW3	NW7	WNW3	NW3	N3	WNW2	NNW7.4	NNW16
30-Dec	W1	NW2	N3	N2	NNW1	N3	NNE5	N5	NNE7	N5	N6	N5	NNE5	NNE4	N2	NE1	NE2	NW1	WNW3	WNW1	WNW4	WNW3	NNW2	AF	N2.7	NNE7
31-Dec	AF	AF	SSE0	S0	SW1	S1	SSW1	SSW1	SW3	SW3	SW4	SW8	SW8	SSW8	SW9	SSW6	SSW5	SSW7	SSW5	SW8	SW12	SW12	SW11	SW8	SW5.5	SW12

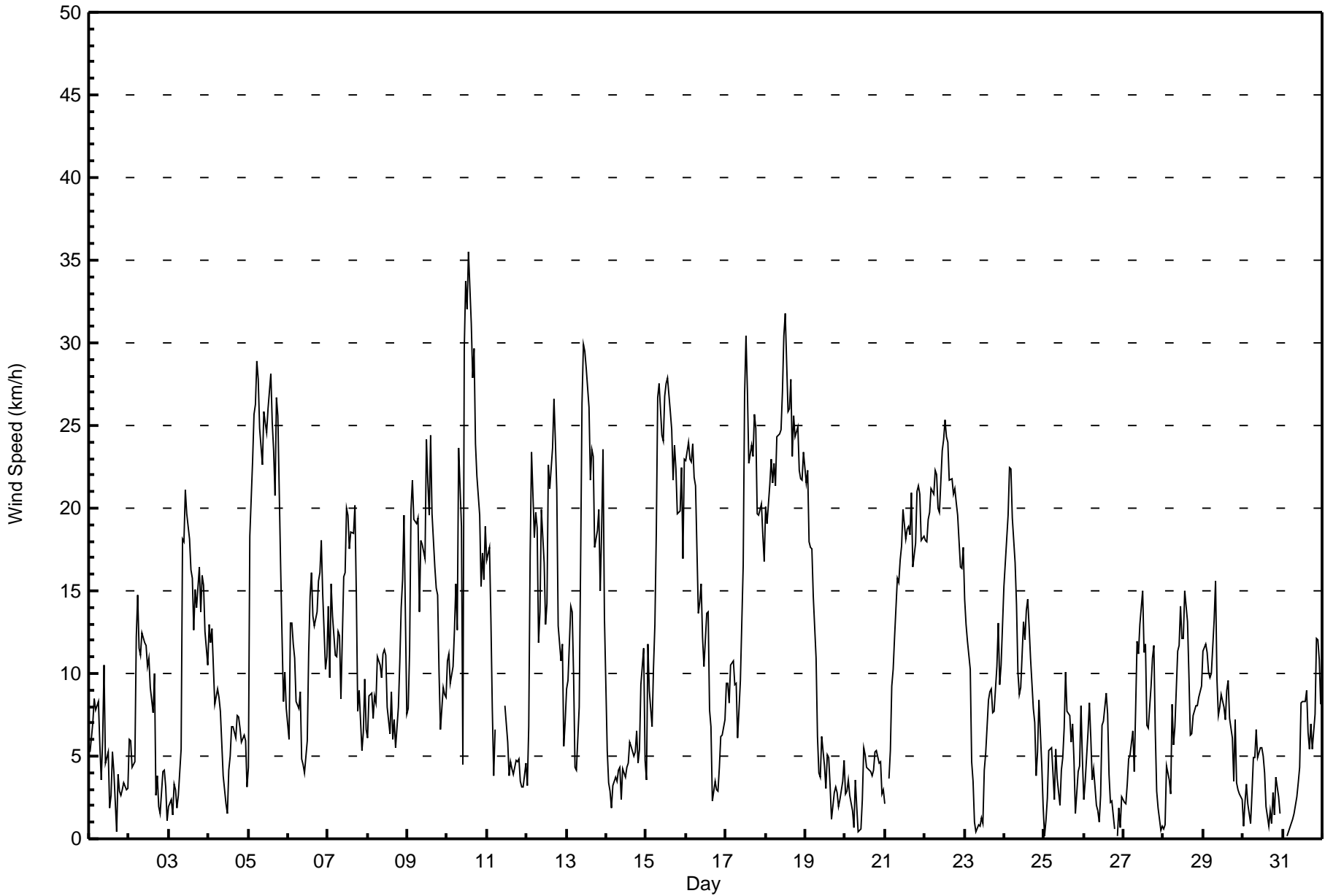
NW6.5	NW8.1	NW8.8	NW9.0	WNW8.7	NW9.0	NW9.1	NW9.4	NW9.8	NW10.3	NW11.5	NW12.5	NW12.5	NW12.3	NW11.3	NW10.4	NW9.6	NW9.3	NW9.2	NW8.5	WNW7.6	NW7.9	NW7.5	WNW7.0	Diurnal Average	
WNW23	WNW24	WNW23	WNW26	WNW26	NW29	WNW28	WNW27	WNW28	NW26	WNW30	NW34	NW32	NW35	NNW31	NNW28	NNW30	NNW27	NNW26	NNW25	NNW22	WNW22	NW24	NNW23	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**  
**Leismer - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Leismer - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	227	30.93	30.93
6 - 11	204	27.79	58.72
12 - 19	158	21.53	80.25
20 - 28	133	18.12	98.37
29 - 38	12	1.63	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 734

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Leismer - December 2017**

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	14	11	3	1	2	1	2	3	5	43	23	20	28	52	10	9	227
6 - 11	32	2	0	0	0	0	0	2	4	9	17	1	41	65	14	17	204
12 - 19	15	3	1	0	0	0	0	0	0	0	2	0	1	68	35	33	158
20 - 28	1	3	0	0	0	0	0	0	0	0	0	0	0	50	44	35	133
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	4	12
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	62	19	4	1	2	1	2	5	9	52	42	21	70	238	108	98	734

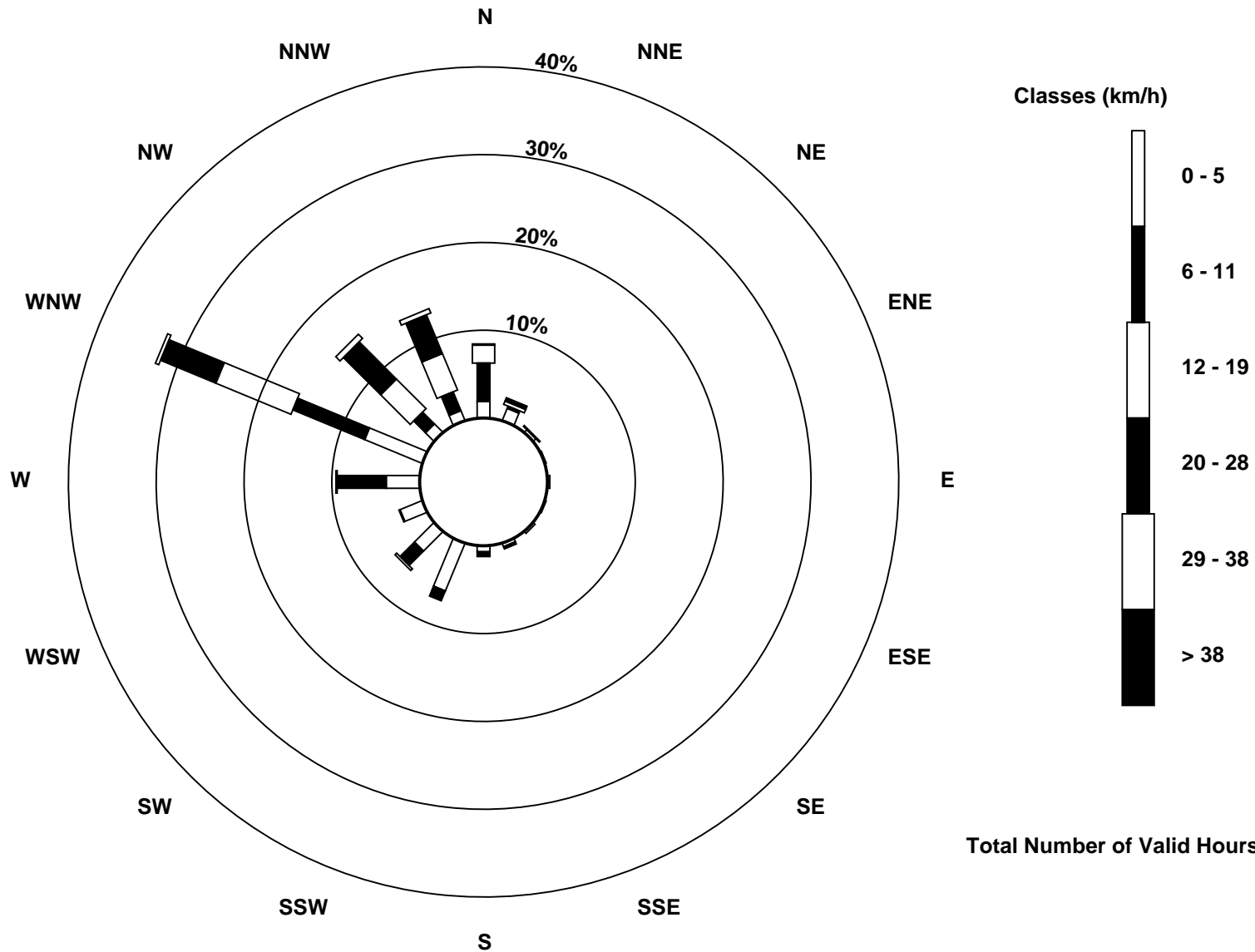
Total Number of Valid Hours: 734

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Leismer (AMS 501)





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Leismer - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 9 km/h on Dec 10 12:00	Hours of Data: 734
Minimum Value: 0 km/h on Dec 20 23:00	Hours of Missing Data: 10
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 7	Hours of Calibration: 0
	Percent Operational Time: 98.7

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

Diurnal Maximum

AF - Analyzer Failure



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

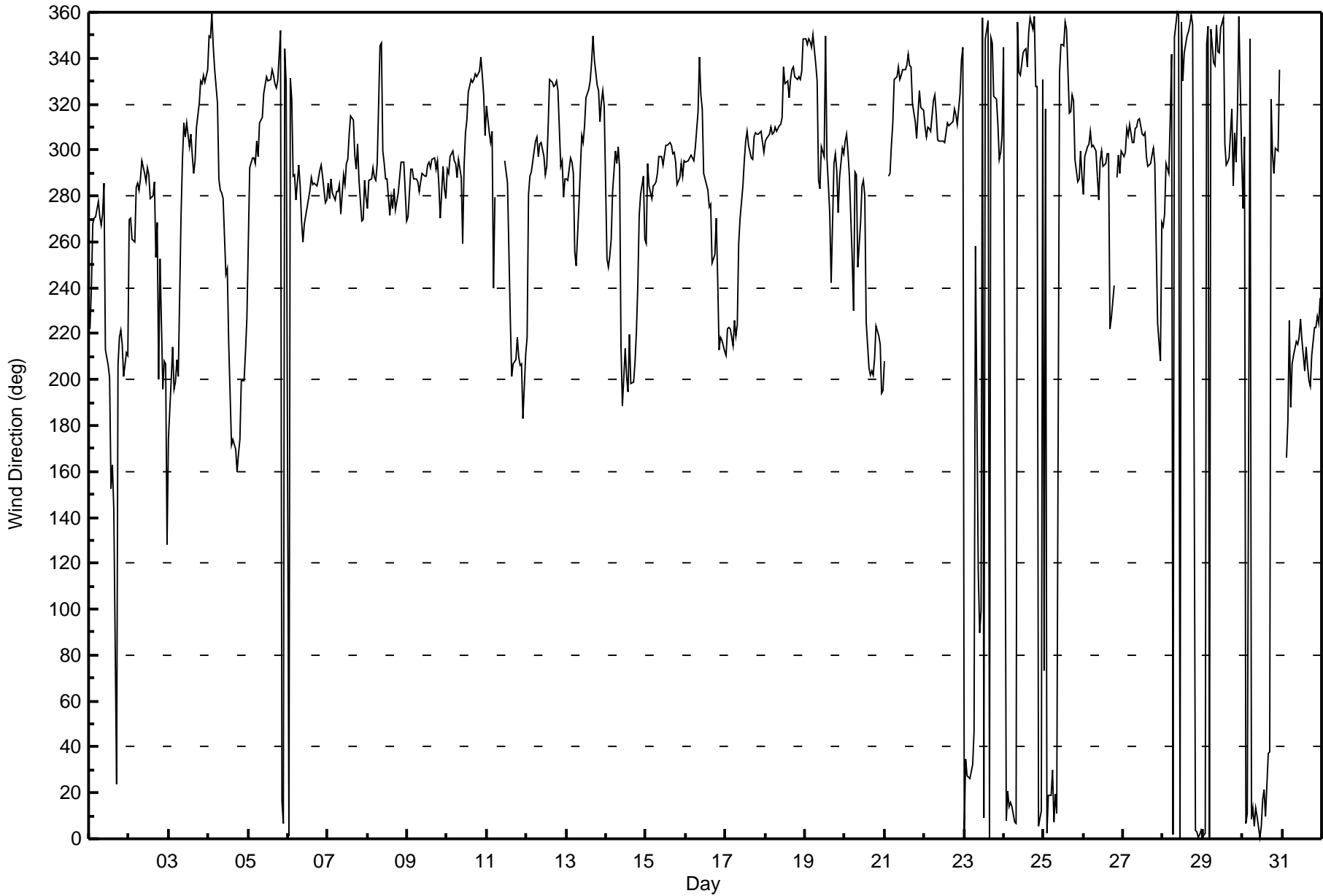
**Wind Direction (WD) - deg**  
**Leismer - December 2017**

Direction of Maximum Speed: 325 deg on Dec 10 14:00																						Hours in Service: 744			
Direction of Maximum Daily Speed Average: 322.4 deg on Dec 18																						Hours of Data: 734			
Direction of Minimum Speed: 166 deg on Dec 31 03:00											Direction of Minimum Daily Speed Average: 2.1 deg on Dec 4											Hours of Missing Data: 10			
Monthly Average Direction: 297.9 deg																						Percent Operational Time: 98.7			
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-Dec	222	240	268	270	271	278	271	267	272	286	213	206	200	153	163	144	24	206	218	221	215	202	211	211	241.4
2-Dec	270	270	261	260	284	286	282	288	295	290	286	292	289	279	280	286	253	268	200	253	196	208	207	128	278.1
3-Dec	174	200	214	196	199	209	201	272	296	312	306	312	302	307	297	290	295	310	320	330	329	333	330	335	307.5
4-Dec	350	349	359	344	335	320	287	283	281	279	246	248	216	194	171	174	169	160	168	174	199	199	212	227	268.5
5-Dec	259	292	297	296	294	304	297	312	315	324	328	332	330	331	335	332	329	327	330	352	16	7	344	329	320.6
6-Dec	1	331	322	289	289	278	293	284	269	260	268	275	279	282	288	285	286	284	288	291	293	289	277	278	289.9
7-Dec	286	279	287	281	279	282	282	285	272	289	285	294	296	307	315	313	298	292	303	287	269	270	287	279	291.1
8-Dec	274	287	287	292	288	287	294	345	347	299	294	288	288	271	280	274	283	274	281	288	295	295	295	269	292.3
9-Dec	271	281	291	292	287	287	286	282	286	290	288	289	293	295	292	296	296	291	295	285	270	293	283	279	289.0
10-Dec	291	290	297	300	296	294	288	296	288	259	293	307	313	325	330	329	331	333	332	334	341	333	324	306	314.3
11-Dec	319	307	303	308	240	279	AF	AF	AF	AF	AF	296	286	256	227	201	207	209	219	210	206	207	183	211	272.2
12-Dec	218	280	288	291	300	304	305	297	302	303	297	290	293	310	331	330	327	328	330	326	293	296	279	288	307.4
13-Dec	287	287	296	295	290	255	250	276	292	306	303	310	323	326	330	338	350	339	328	326	312	321	326	319	315.8
14-Dec	253	249	254	261	282	299	294	301	292	215	188	213	201	194	220	198	199	207	221	241	271	280	289	261	247.3
15-Dec	259	294	284	279	284	285	286	290	297	297	293	298	302	302	303	302	299	299	294	285	288	294	289	295	294.5
16-Dec	295	295	297	298	297	295	301	317	341	324	318	290	285	282	275	276	251	255	270	244	213	218	217	212	292.9
17-Dec	210	222	223	222	215	226	219	224	259	270	285	295	304	308	302	297	296	306	307	307	307	308	303	299	288.2
18-Dec	304	305	307	310	307	307	310	308	310	311	314	337	329	330	323	330	335	336	332	331	332	331	335	348	322.4
19-Dec	349	346	348	347	344	350	338	330	287	283	301	297	350	296	285	272	242	294	298	291	273	288	301	298	330.7
20-Dec	304	307	299	288	254	230	290	289	249	268	284	287	280	225	205	202	204	202	209	223	219	216	194	195	241.1
21-Dec	208	AF	289	290	302	312	331	332	336	331	332	335	335	337	341	337	336	320	312	305	316	326	319	317	325.1
22-Dec	310	306	310	310	308	321	324	315	305	304	304	304	303	308	312	311	312	312	318	315	311	325	339	345	313.0
23-Dec	5	35	27	27	30	32	47	258	116	90	99	358	9	348	356	0	349	347	324	322	311	296	299	307	348.7
24-Dec	345	8	21	14	16	14	7	7	356	334	333	342	344	344	336	351	358	353	358	328	327	6	12	331	358.3
25-Dec	73	318	3	19	19	30	7	20	11	334	346	346	346	356	353	316	317	324	322	296	286	288	300	289	338.4
26-Dec	280	297	301	303	308	301	302	299	289	278	295	299	293	294	298	298	222	227	241	AF	288	298	290	300	294.7
27-Dec	297	299	309	306	311	303	303	310	310	313	314	307	306	308	297	293	294	298	301	294	259	225	208	269	302.9
28-Dec	267	272	294	290	313	342	2	349	360	359	1	356	330	343	349	351	355	359	355	4	3	1	2	3	350.9
29-Dec	0	2	346	354	1	353	338	337	355	343	342	353	358	303	293	295	297	318	284	307	295	317	358	297	336.1
30-Dec	274	306	6	11	348	8	13	5	13	10	1	6	17	21	10	37	38	322	299	290	301	299	335	AF	357.4
31-Dec	AF	AF	166	182	226	188	207	211	217	215	219	226	217	204	214	207	200	197	210	223	223	227	224	235	217.1
307.2 308.3 309.2 306.4 303.7 305.9 304.2 307.9 308.0 306.7 305.1 308.0 308.9 311.4 311.2 312.2 313.3 310.4 309.9 307.4 302.5 304.7 305.3 303.5																									
Diurnal Average																									
AF - Analyzer Failure																									
All monthly, daily, and diurnal averages have been calculated using vector methods																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Leismer - December 2017**





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Leismer - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 92 deg on Dec 1 17:00	Hours of Data: 734
Minimum Value: 6 deg on Dec 26 03:00	Hours of Missing Data: 10
Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 10 Q <sub>1</sub> = 11 Median = 14 Q <sub>3</sub> = 19 P <sub>90</sub> = 30 P <sub>99</sub> = 60	Hours of Calibration: 0
	Percent Operational Time: 98.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	26	34	32	23	32	26	32	43	29	33	20	16	33	36	15	19	92	20	20	18	15	22	29	26	92
2-Dec	23	28	28	33	14	10	11	10	13	12	12	10	12	11	14	17	49	45	51	58	18	23	15	74	74
3-Dec	39	30	40	17	15	19	13	41	11	15	15	16	14	17	15	11	13	22	19	14	13	14	13	13	41
4-Dec	13	17	16	20	14	20	13	13	15	19	47	61	26	25	12	17	16	9	12	13	15	18	18	23	61
5-Dec	42	10	11	11	10	11	10	14	14	13	12	14	12	13	14	13	11	12	13	27	16	15	14	23	42
6-Dec	25	13	20	7	7	13	8	12	32	42	41	22	15	13	11	11	9	11	10	10	8	11	12	14	42
7-Dec	9	15	10	11	11	10	9	8	19	9	10	10	11	16	15	15	10	11	43	16	29	22	9	23	43
8-Dec	25	9	7	6	9	9	16	12	27	14	9	9	17	20	14	18	9	20	11	19	11	10	9	23	27
9-Dec	24	18	11	10	11	12	11	14	12	12	12	11	10	12	10	11	10	8	9	22	27	9	11	16	27
10-Dec	8	9	8	9	8	11	13	12	12	41	13	11	13	13	12	11	13	11	12	12	10	11	15	11	41
11-Dec	13	13	13	32	17	29	AF	AF	AF	AF	AF	9	13	29	19	15	16	14	18	16	18	28	20	19	32
12-Dec	41	30	11	10	10	9	13	16	13	10	10	9	12	13	12	12	11	11	10	21	9	9	28	14	41
13-Dec	12	9	10	8	16	25	28	38	11	10	10	14	14	13	12	13	17	14	11	11	15	13	10	21	38
14-Dec	19	21	42	34	20	12	12	20	23	21	16	23	16	20	17	18	17	14	18	31	23	15	10	38	42
15-Dec	40	13	11	12	13	12	11	10	10	10	11	12	10	11	10	10	10	10	10	12	13	16	14	11	40
16-Dec	10	10	10	10	10	10	9	26	13	19	26	11	13	17	23	29	55	34	49	56	19	15	13	16	56
17-Dec	17	18	20	17	14	18	16	19	33	26	15	11	11	10	12	10	11	10	10	9	10	9	8	9	33
18-Dec	11	9	9	9	9	9	10	10	11	11	13	15	14	14	15	12	13	13	12	11	11	11	14	17	17
19-Dec	17	16	17	18	16	17	13	26	39	50	23	18	36	15	19	24	35	17	14	18	40	39	14	8	50
20-Dec	20	21	13	31	27	29	15	25	54	62	30	14	29	27	22	15	10	12	12	19	14	14	12	14	62
21-Dec	26	AF	16	11	17	17	16	11	12	12	13	13	13	13	13	13	13	18	14	10	15	13	15	15	26
22-Dec	12	11	12	11	11	15	14	14	10	10	10	10	11	10	10	9	10	10	12	12	10	16	11	13	16
23-Dec	22	14	11	12	11	24	65	65	57	32	35	51	20	21	14	13	11	14	21	15	15	17	10	14	65
24-Dec	14	16	14	12	13	12	13	12	18	16	16	13	15	16	15	14	14	13	13	30	28	12	21	41	41
25-Dec	75	33	31	8	10	11	17	10	12	24	20	18	15	18	20	19	20	19	22	18	14	12	7	16	75
26-Dec	16	10	6	6	6	16	11	14	17	21	18	9	12	11	10	20	10	9	44	AF	53	14	35	13	53
27-Dec	11	13	10	9	9	10	15	9	9	15	15	10	11	12	19	15	10	10	10	12	29	39	31	25	39
28-Dec	22	25	10	17	31	18	15	22	14	13	16	16	23	15	16	16	17	11	15	13	11	13	11	12	31
29-Dec	14	13	14	17	14	13	11	9	14	14	14	15	19	18	10	10	9	22	17	12	20	27	52	13	52
30-Dec	43	39	24	24	36	19	12	27	11	11	15	12	9	10	22	24	16	39	14	26	6	10	43	AF	43
31-Dec	AF	AF	59	50	20	18	12	13	14	12	15	16	19	17	16	15	12	14	13	13	15	15	14	17	59
	75	39	59	50	36	29	65	65	57	62	47	61	36	36	23	29	92	45	51	58	53	39	52	74	
	Diurnal Maximum																								

AF - Analyzer Failure



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Leismer	Station number:	AMS 501
Calibration Date:	December 12, 2017	Last Cal Date:	November 21, 2017
Start time (MST):	8:37	End time (MST):	13:13
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>48.8</u>	ppm	Cal Gas Exp Date	August 18, 2020
Cal Gas Cylinder #	<u>LL34916</u>			
Calibrator Make/Model	API T700		Serial Number	622
ZAG Make/Model	API 701		Serial Number	196

### Analyzer Information

Analyzer make: Thermo 43i

Analyzer serial #: 1160290011

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-619
Calculated slope	1.001961	0.993109	Lamp voltage	771	770
Calculated intercept	1.283286	0.993862	Pressure	682.4	679.0
Analyzer Background	15.6	15.7	Flow	0.402	0.399
Analyzer Coefficient	0.970	0.970	Intensity	90	89

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5005	0.0	0.0	-0.4	----
as found span	4934	78.4	763.3	767.6	0.994
calibrator zero	5007	0.0	0.0	0.2	----
high point	4925	78.2	762.7	767.6	0.994
second point	4973	39.2	381.7	382.8	0.997
third point	4939	19.4	190.9	190.0	1.005
as left zero	5007	0.0	0.0	0.0	----
as left span	4820	78.3	780.1	770.6	1.012
Average Correction Factor					0.999
Corrected As found	768.00	Previous response	760.51	*% change	-1.0%

Notes:

No adjustments needed.

Calibration Performed By:

Aswin Sasi Kumar





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

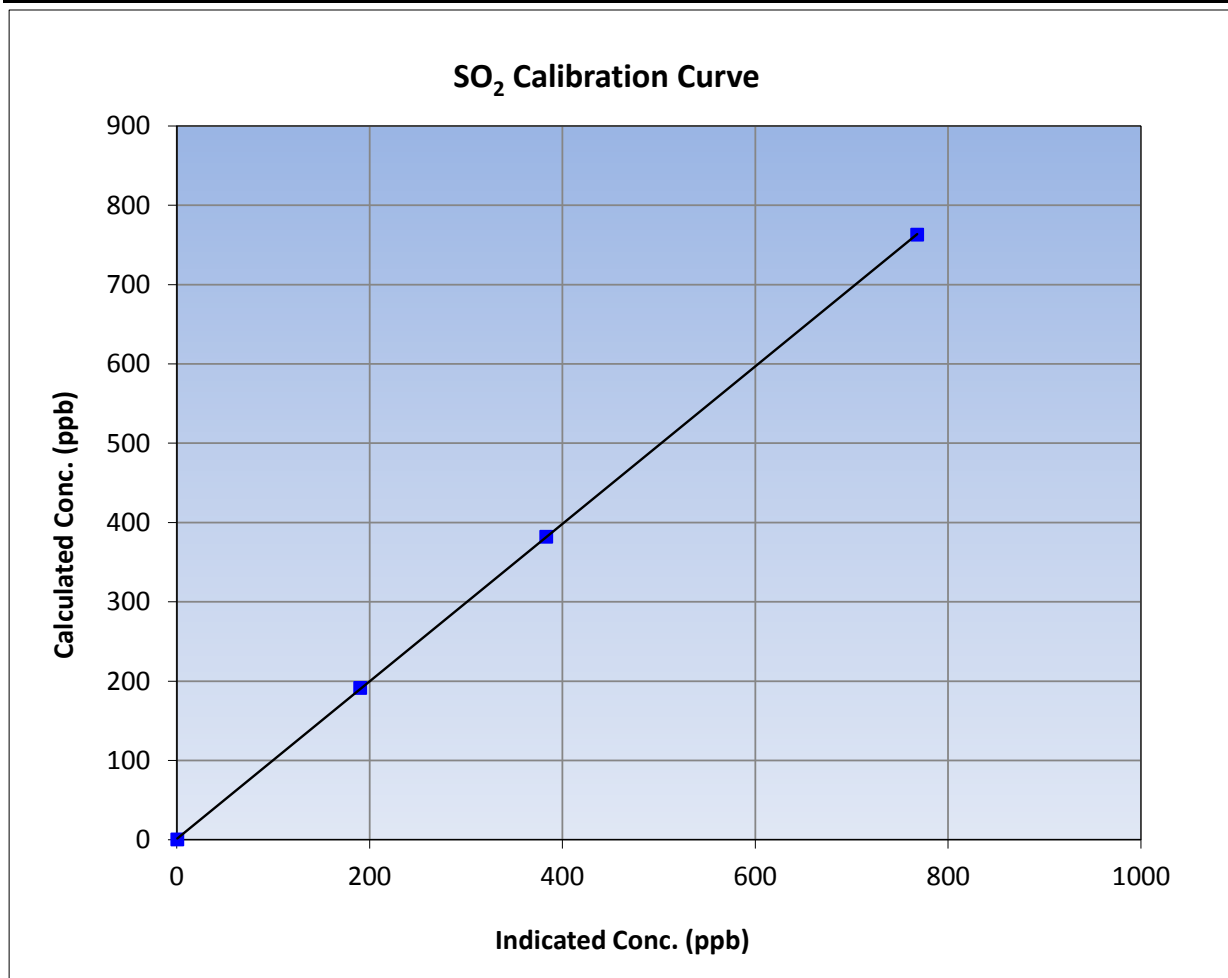
Version-03-2017

### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Leismer	Station Number	AMS 501
Start Time (MST)	8:37	End Time (MST)	13:13
Analyzer make	Thermo 43i	Analyzer serial #	1160290011

### Calibration Data

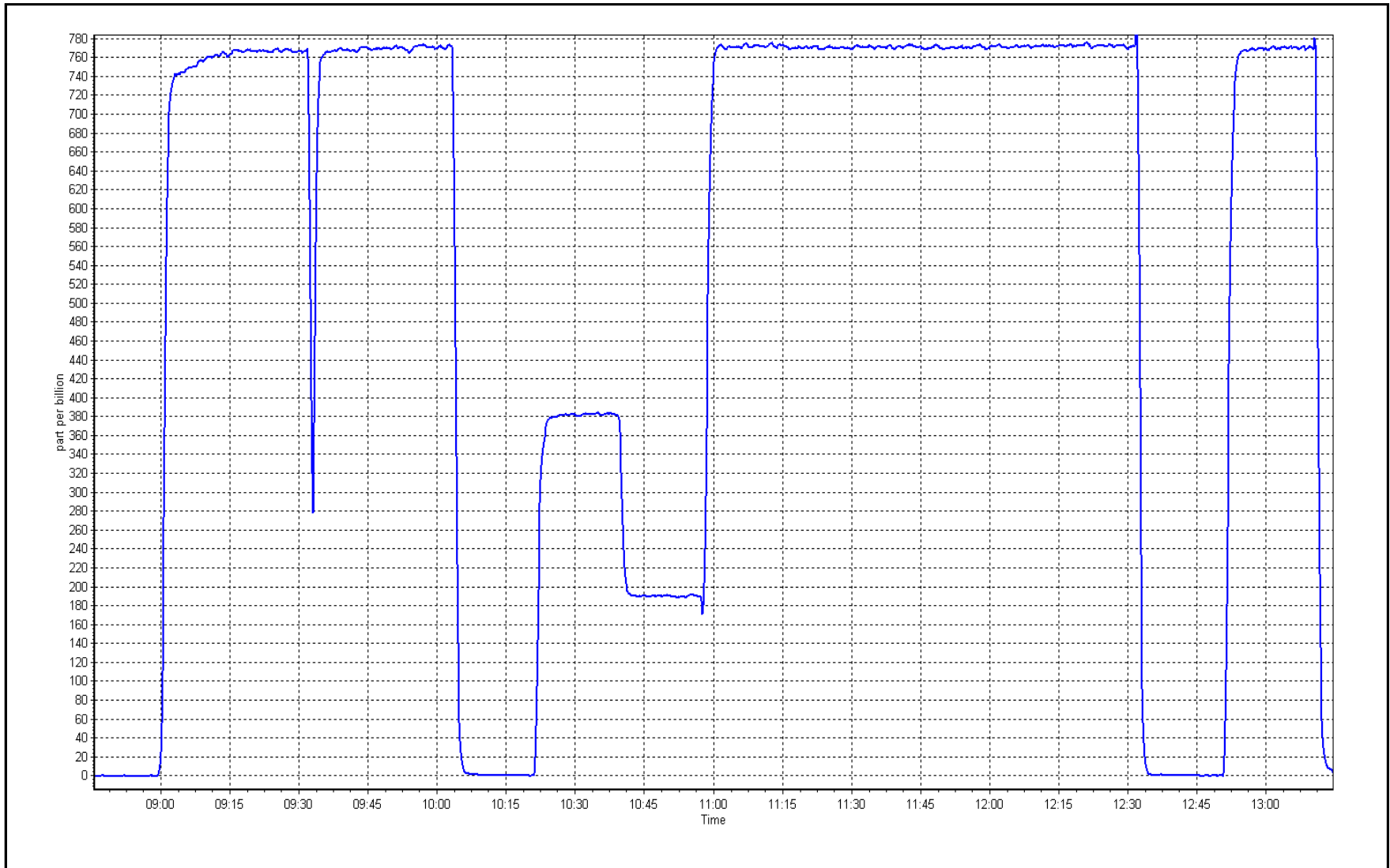
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.2	----	Correlation Coefficient	0.999989	≥0.995
762.7	767.6	0.9937			
381.7	382.8	0.9970	Slope	0.993109	0.90 - 1.10
190.9	190.0	1.0049			
			Intercept	0.993862	+/-30



SO2 Calibration Plot

Date: 12-Dec

Location: Leismer





# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Report

Version-06-2017

### Station Information

Station Name:	Leismer	Station number:	AMS 501
Calibration Date:	December 11, 2017	Last Cal Date:	November 22, 2017
Start time (MST):	13:19	End time (MST):	16:31
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>5.08</u>	ppm	Cal Gas Exp Date	July 12, 2019
Cal Gas Cylinder #	<u>DR0000407</u>			
Calibrator Make/Model	API T700		Serial Number	622
ZAG Make/Model	API 701		Serial Number	196

### Analyzer Information

Analyzer make: API T101

Analyzer serial #: 197

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 100 ppb		PMT voltage	497	497
Calculated slope	0.992473	0.995725	Lamp voltage	2006	2007
Calculated intercept	0.225067	0.086298	Pressure	23.3	23.1
Analyzer Background	25.0	25.0	Flow	0.617	0.603
Analyzer Coefficient	0.946	0.941	Intensity	45	45

### H<sub>2</sub>S Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5007	0.0	0.0	-0.1	----
as found span	4935	78.8	79.8	80.8	0.988
calibrator zero	5007	0.0	0.0	0.0	----
high point	4935	78.8	79.8	80.1	0.997
second point	4972	39.5	40.0	40.2	0.996
third point	4993	19.8	20.1	19.9	1.008
as left zero	5007	0.0	0.0	0.1	----
as left span	4935	78.8	79.8	79.9	0.999
SO2 Scrubber Check	4933	79.9	800.0	0.1	----
Average Correction Factor					1.000
Corrected As found	80.90	Previous response	80.22	*% change	-0.8%

\* = > +/-5% change initiates investigation

Notes:

Span adjusted.

Calibration Performed By:

Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## H<sub>2</sub>S Calibration Summary

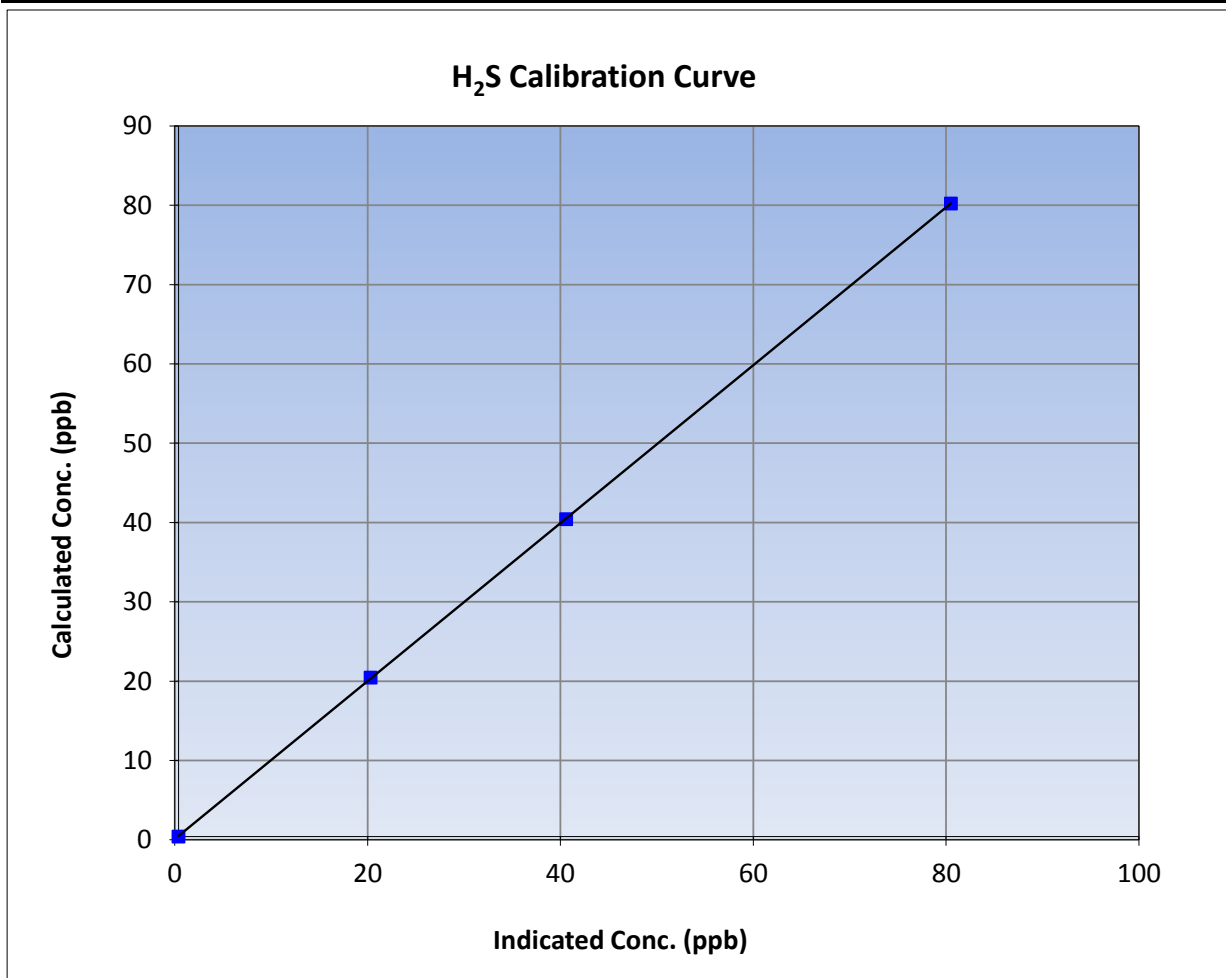
Version-03-2017

### Station Information

Calibration Date	December 11, 2017	Previous Calibration	November 22, 2017
Station Name	Leismer	Station Number	AMS 502
Start Time (MST)	13:19	End Time (MST)	16:31
Analyzer make	API T101	Analyzer serial #	197

### Calibration Data

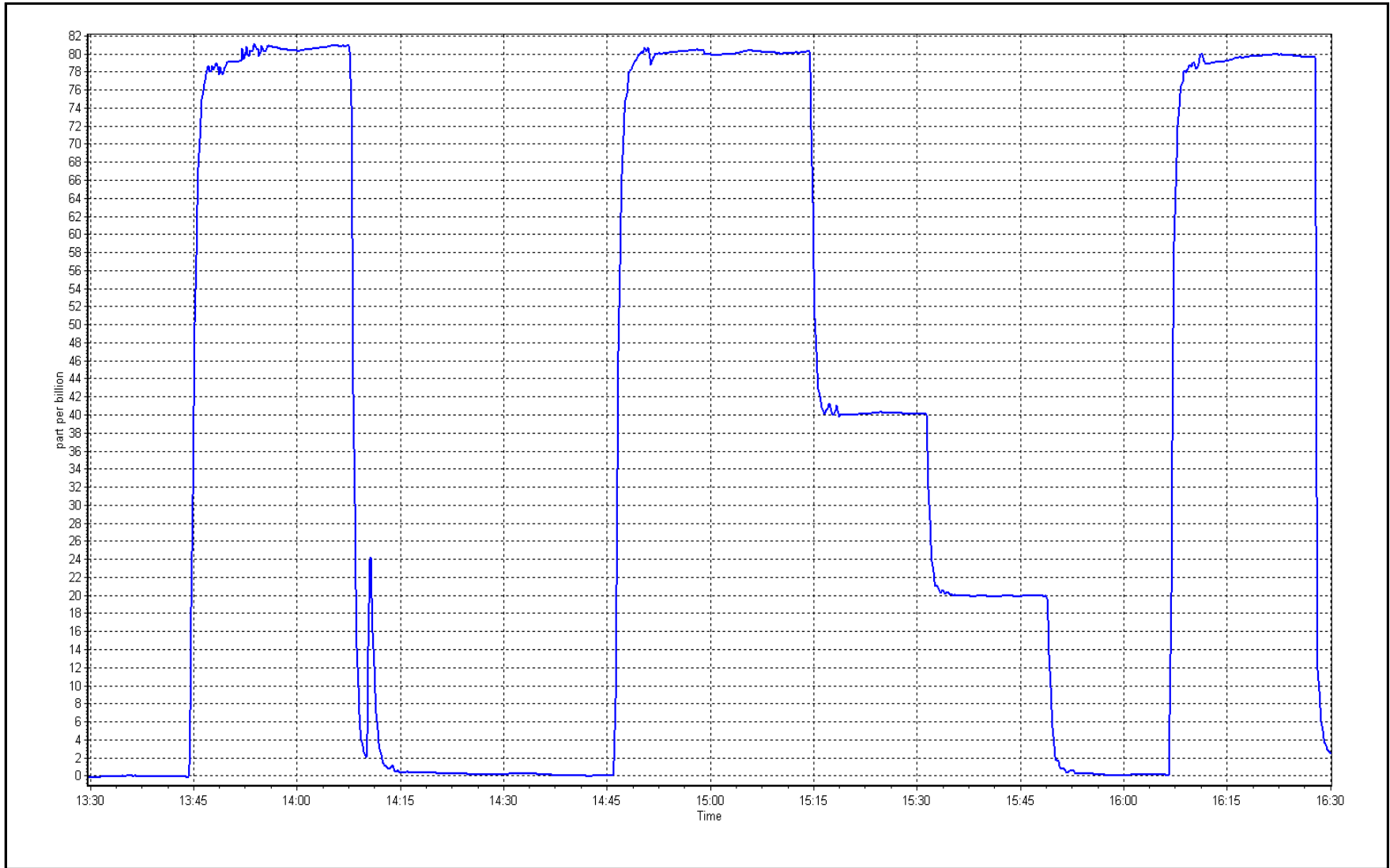
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	0.999989	≥0.995
79.8	80.1	0.9968			
40.0	40.2	0.9960	Slope	0.995725	0.90 - 1.10
20.1	19.9	1.0083			
			Intercept	0.086298	+/-3



# H<sub>2</sub>S Calibration Plot

Date: 11-Dec

Location: Leismer





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Leismer	Station number:	AMS 501
Calibration Date:	December 12, 2017	Last Cal Date:	November 21, 2017
Start time (MST):	8:37	End time (MST):	13:13
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	LL104215	Cal Gas Expiry Date	August 18, 2020
NOX Cal Gas Conc.	<u>51.1</u> ppm	NO Cal Gas Conc.	<u>51.1</u> ppm
Calibrator Model	API T700	Serial Number	622
ZAG make/model	Teledyne API T701	Serial Number	196

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 1218153356		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.023	1.035	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	1.000	1.000	PMT Temperature	-3.0	-3.0
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	161.5	160.0
NO bkgrnd	5.7	5.8	Sample Flow	0.655	0.649
NOX bkgrnd	6.2	6.3	PMT Voltage	-866.5	-866.2

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.997501	0.995835
NO <sub>x</sub> Cal Offset	2.684475	2.715607
NO Cal Slope	0.996987	0.994532
NO Cal Offset	2.264939	2.373528
NO <sub>2</sub> Cal Slope	1.000189	0.999231
NO <sub>2</sub> Cal Offset	0.190271	0.790535



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

Version-03-2017

### Dilution Calibration Data

Set Point	Dilution flow rate (sccm)	Source gas flow rate (sccm)	Calculated NOx concentration (ppb) (Cc)	Calculated NO concentration (ppb) (Cc)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5007	0.0	0.0	0.0	0.0	-1.2	-0.8	-0.4	----	----
as found span	4934	78.3	798.3	798.3	0.0	790.0	790.7	-0.7	1.0105	1.0096
calibrator zero	5007	0.0	0.0	0.0	0.0	-1.3	-1.0	-0.3	----	----
high point	4925	78.2	798.7	798.7	0.0	799.9	801.2	-1.2	0.9985	0.9969
second point	4964	39.0	398.3	398.3	0.0	396.9	398.0	-1.2	1.0036	1.0009
third point	4939	19.4	199.9	199.9	0.0	196.4	196.9	-0.6	1.0180	1.0154
as left zero	5007	0.0	0.0	0.0	0.0	-1.2	-0.8	-0.4	----	----
as left span	4820	78.3	816.8	394.1	422.7	799.9	394.1	405.8	1.0212	1.0000
Average Correction Factor									1.0067	1.0044

Corrected As found      NO<sub>x</sub> = 791.2 ppb                      NO = 791.5 ppb                      \*Percent Change                      NO<sub>x</sub> = 0.8%  
 Previous Response      NO<sub>x</sub> = 797.6 ppb                      NO = 798.4 ppb                      \*Percent Change                      NO = 0.9%  
 \* = > +/-5% change initiates investigation

### GPT Calibration Data

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 concentration (ppb) (Cc)	Indicated NOx concentration (ppb) (Ic)	Indicated NO concentration (ppb) (Ic)	Indicated NO2 concentration (ppb) (Ic)	NOx Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	NO2 Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>	Converter Efficiency <i>Limit = 96-104%</i>
1st NO ref point		0.0	800.5	800.9	-0.3	0.9977	0.9972	----	----
1st NO2 (400 ppb O3)	394.1	406.8	800.6	394.1	406.5	0.9976	----	1.0007	99.9%
2nd NO2 (200 ppb O3)	587.5	213.4	800.4	587.5	212.8	0.9979	----	1.0028	99.7%
3rd NO2 (100 ppb O3)	687.5	113.4	799.5	687.5	112.0	0.9990	----	1.0125	98.8%
2nd NO ref point	----	0.0	799.5	799.8	-0.2	0.9990	0.9986	----	----
Average Correction Factor						0.9984	0.9979	1.0054	99.5%

Notes:

Span adjusted.

Calibration Performed By:

Aswin Sasi Kumar



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

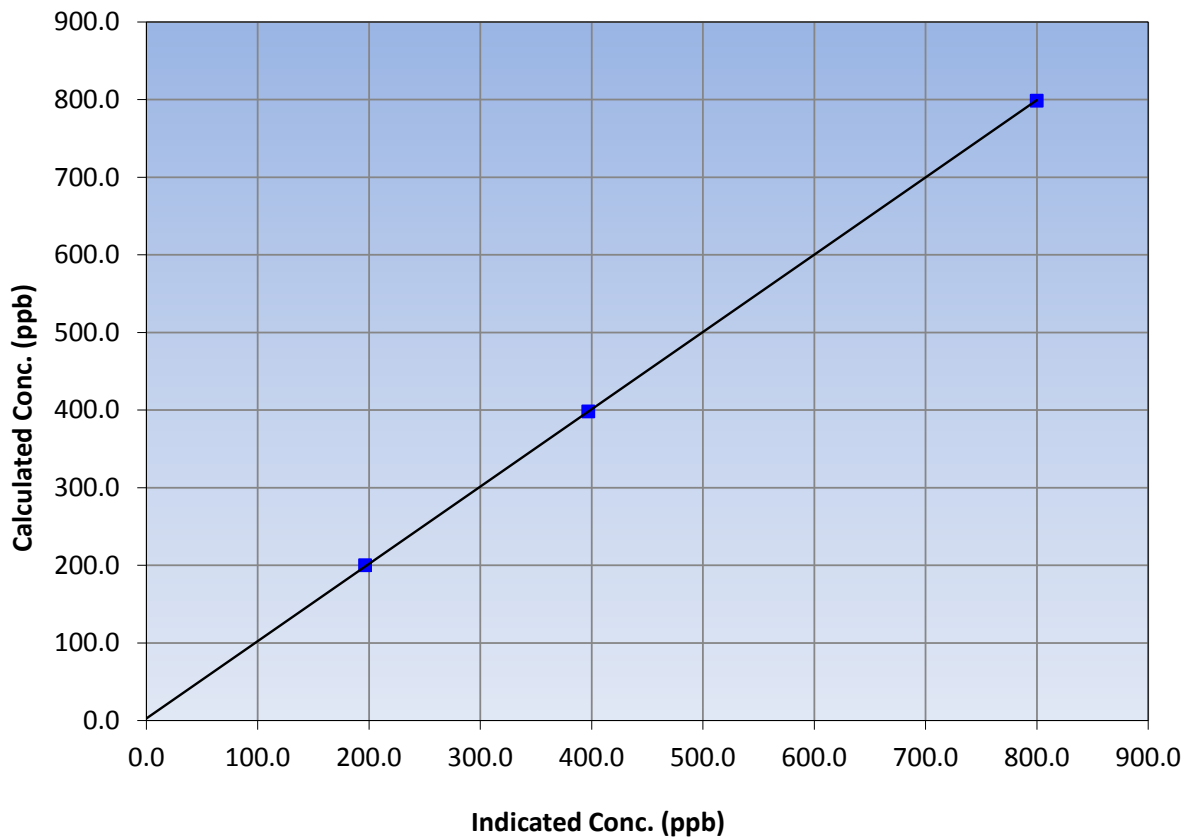
### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Leismer	Station Number	AMS 501
Start Time (MST)	8:37	End Time (MST)	13:13
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-1.3	----	Correlation Coefficient	≥0.995	
798.7	799.9	0.9985			
398.3	396.9	1.0036			
199.9	196.4	1.0180			
			Slope	0.995835	0.90 - 1.10
			Intercept	2.715607	+/-20

NO<sub>x</sub> Calibration Curve







# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

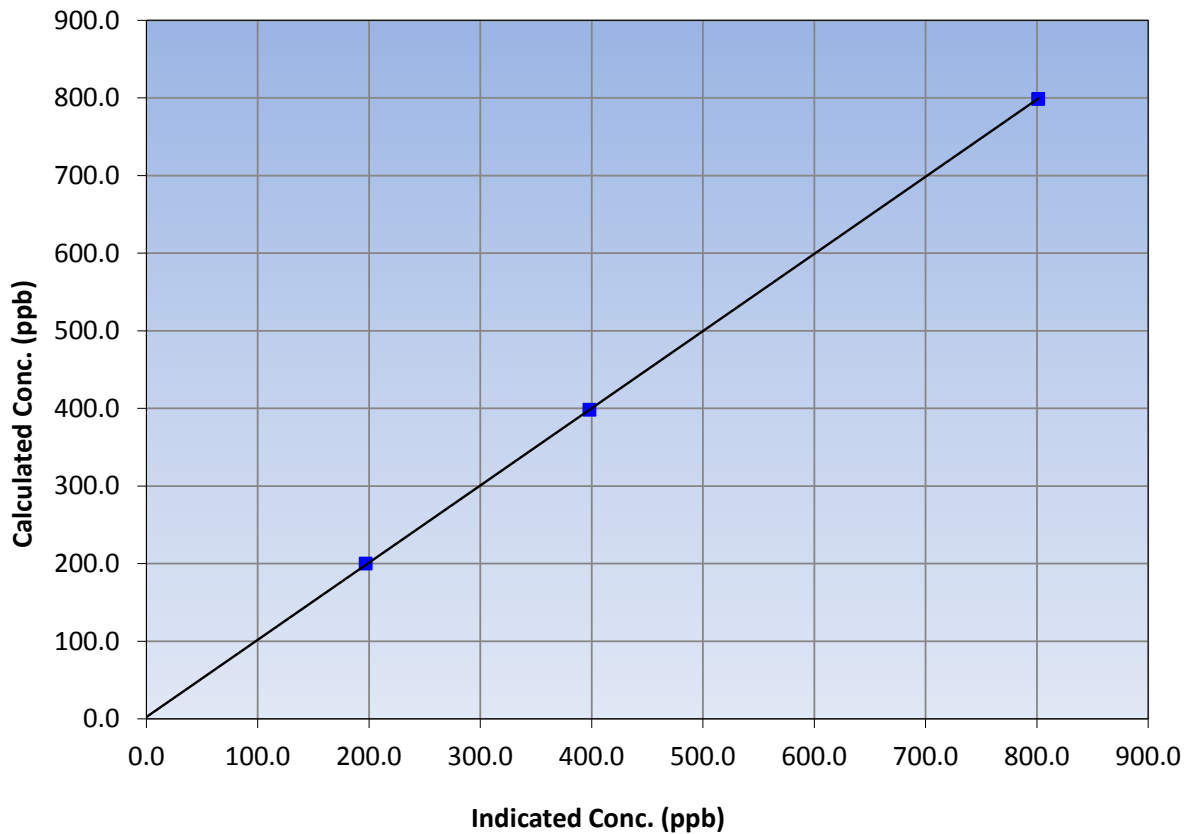
### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Leismer	Station Number	AMS 501
Start Time (MST)	8:37	End Time (MST)	13:13
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<u>Limits</u>	
0.0	-1.0	----	Correlation Coefficient	≥0.995	
798.7	801.2	0.9969			
398.3	398.0	1.0009			
199.9	196.9	1.0154			
			Slope	0.994532	0.90 - 1.10
			Intercept	2.373528	+/-20

**NO Calibration Curve**





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

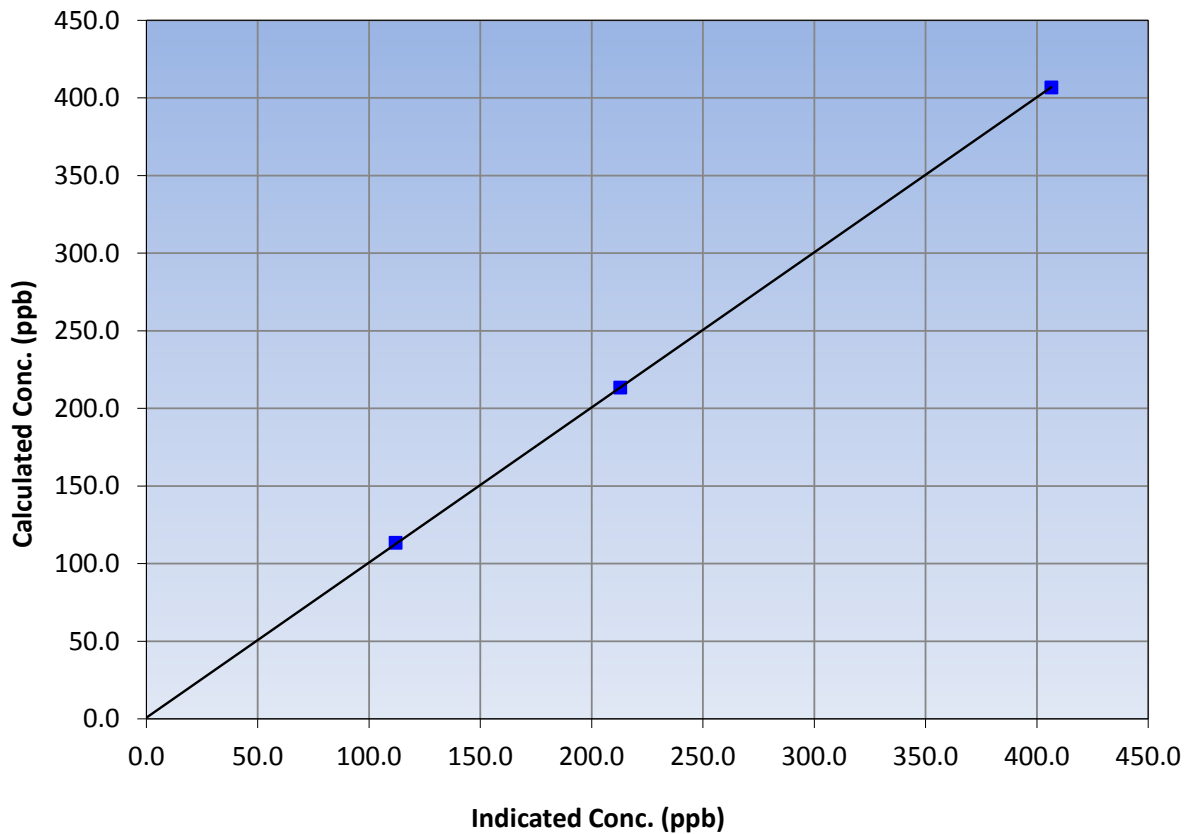
### Station Information

Calibration Date	December 12, 2017	Previous Calibration	November 21, 2017
Station Name	Leismer	Station Number	AMS 501
Start Time (MST)	8:37	End Time (MST)	13:13
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	-0.3	----	Correlation Coefficient	≥0.995	
406.8	406.5	1.0007			
213.4	212.8	1.0028			
113.4	112.0	1.0125			
			Slope	0.999231	0.90 - 1.10
			Intercept	0.790535	+/-20

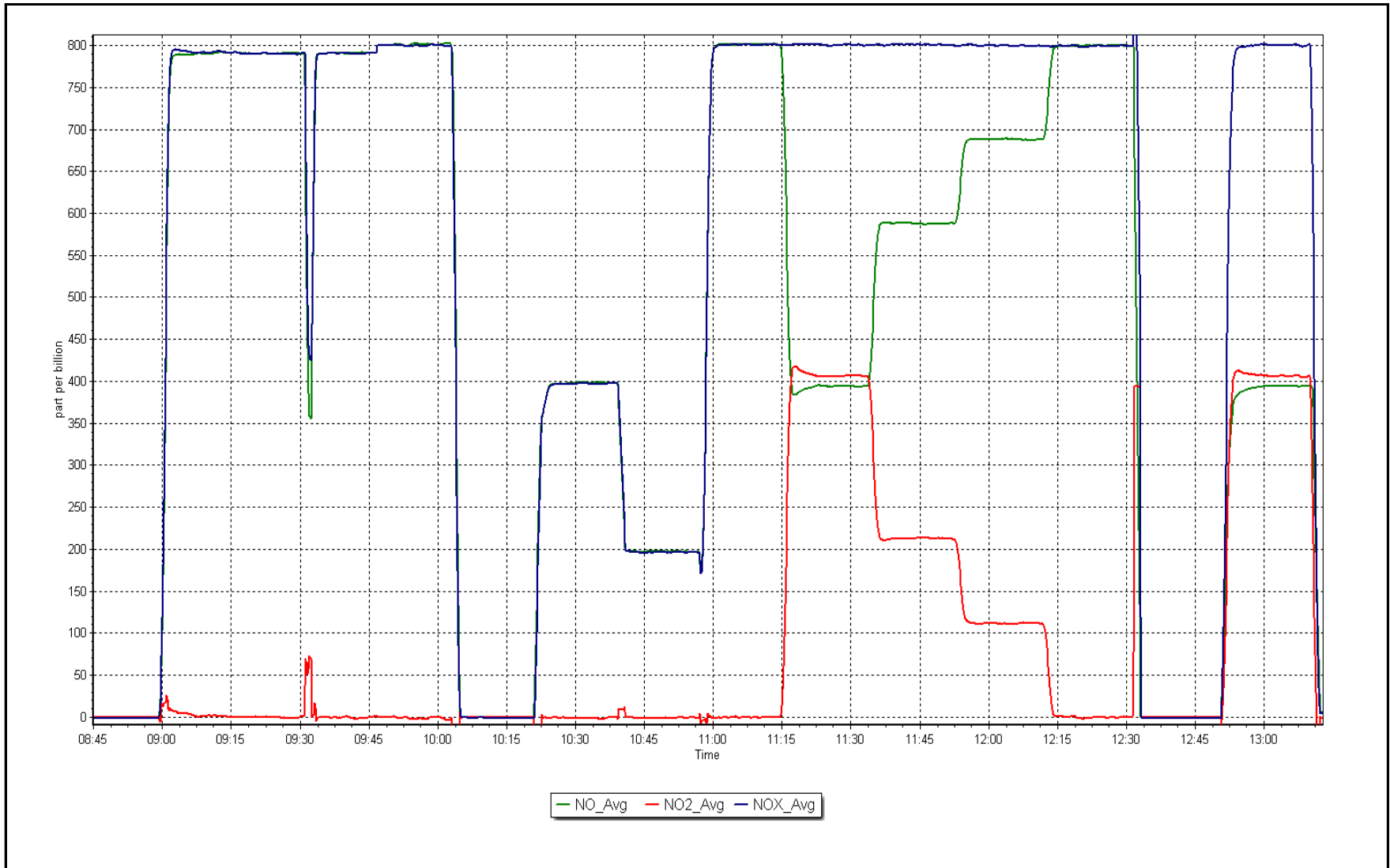
**NO<sub>2</sub> Calibration Curve**



NO<sub>x</sub> Calibration Plot

Date: 12-Dec

Location: Leismer





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT**

#### **AMS 505 SAWBONES BAY DECEMBER 2017**

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

January 30, 2018

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SAWBONES BAY (AMS 505)  
 DECEMBER 2017

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100	34	0	9	0
H2S (ppb) Average	709	35	35	100	1	0	1	0
THC(ppm) Average	700	35	44	98.79	3	-	2.4	-
NO2 (ppb) Average	709	35	35	100	29	0	11	-
NO (ppb) Average	709	35	35	100	35	-	7	-
NOX (ppb) Average	709	35	35	100	54	-	16	-
Temperature 2 m (C) Average	744	0	0	100	7.1	-	4.6	-
Relative Humidity (%) Average	744	0	0	100	96	-	85	-
Wind Speed 10 m (km/h) Average	744	0	0	100	34	-	21	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	-	0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SAWBONES BAY (AMS 505)  
 DECEMBER 2017

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	2.7	5	-	0	0	0	0	2	10	34
H2S (ppb) Average	709	0.2	0	-	0	0	0	0	0	1	1
THC(ppm) Average	700	2.2	0.1	-	1.9	2.1	2.1	2.2	2.3	2.3	3
NO2 (ppb) Average	709	5.2	4	-	0	1	2	4	7	11	29
NO (ppb) Average	709	1.8	3	-	0	0	0	0	2	5	35
NOX (ppb) Average	709	7	7	-	0	1	2	5	10	16	54
Temperature 2 m (C) Average	744	-10.66	12	-	-34.4	-29.2	-22.5	-7.2	-0.4	2.6	7.1
Relative Humidity (%) Average	744	72.4	10	-	39	60	67	72	79	86	96
Wind Speed 10 m (km/h) Average	744	12.9	6	-	1	6	8	12	17	22	34
Wind Direction 10 m (deg) Average	744	0	0	-	0	-	-	-	-	-	0

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SAWBONES BAY (AMS 505)  
DECEMBER 2017

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	24 Dec 2017 06:00	24 Dec 2017 14:00	9	Unstable operation - excessive baseline drift



# Wood Buffalo Environmental Association

## Summary of Hour Averages

## Sulphur Dioxide (SO<sub>2</sub>) - ppb Sawbones Bay - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 34 ppb on Dec 8 09:00	Maximum Daily Average: 9.3 ppb on Dec 8		Hours of Data:	709
Minimum Value: 0 ppb on Dec 3 19:00	Minimum Daily Average: 0.1 ppb on Dec 19		Hours of Missing Data:	35
Maximum Diurnal Average: 5.0 ppb at hour 4	Minimum Diurnal Average: 1.3 ppb at hour 14		Hours of Calibration:	35
Monthly Average: 2.7 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 2 P <sub>90</sub> = 10 P <sub>99</sub> = 22		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	0	0	0	Z	0	0	0	0	0	1	2	1	1	0	1	1	1	1	1	2	2	1	0.8	2
2-Dec	Z	7	7	14	1	0	9	26	25	9	13	8	1	4	0	6	7	0	0	1	1	1	0	0	6.2	26
3-Dec	9	Z	0	1	1	1	2	1	6	10	0	0	0	1	4	1	0	0	0	0	0	0	2	6	1.9	10
4-Dec	7	4	Z	2	2	3	3	1	1	0	2	1	1	3	3	1	0	0	0	0	0	0	0	1	1.6	7
5-Dec	1	4	20	Z	3	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1.5	20
6-Dec	0	0	0	1	Z	1	0	0	0	0	1	1	1	0	1	1	5	10	1	2	19	5	6	14	3.0	19
7-Dec	4	2	6	19	6	Z	4	5	2	18	20	4	3	2	0	0	0	5	17	0	0	0	0	0	5.3	20
8-Dec	Z	1	1	11	3	13	7	30	34	15	10	13	5	0	0	1	2	1	1	2	7	2	32	23	9.3	34
9-Dec	7	Z	12	8	3	0	1	4	3	3	9	6	5	1	0	0	0	0	0	5	11	0	0	0	3.5	12
10-Dec	4	2	Z	0	9	10	13	15	8	3	1	4	0	0	0	0	0	0	0	0	0	0	0	0	3.0	15
11-Dec	5	25	16	Z	22	13	11	3	9	2	11	12	0	2	2	2	1	1	1	1	1	1	1	0	6.2	25
12-Dec	0	1	2	7	Z	6	0	10	1	2	0	2	3	0	0	0	0	0	0	0	0	0	2	3	1.8	10
13-Dec	0	11	11	14	14	Z	4	19	11	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4.0	19
14-Dec	Z	0	0	0	15	6	6	12	0	1	1	1	1	1	1	1	1	0	0	1	1	0	6	17	3.1	17
15-Dec	1	Z	2	0	0	0	0	10	0	0	0	0	0	0	0	0	0	4	4	17	14	13	7	22	4.1	22
16-Dec	8	1	Z	4	0	0	0	0	0	0	0	1	7	6	20	14	0	0	0	0	0	1	1	1	2.8	20
17-Dec	0	1	2	Z	2	1	1	1	1	1	1	14	3	0	1	9	17	7	0	0	0	0	0	2	2.9	17
18-Dec	11	11	17	22	Z	18	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.0	22
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0.1	0
20-Dec	Z	1	0	0	0	0	0	0	0	0	0	1	2	2	2	1	0	0	0	0	0	1	1	2	0.6	2
21-Dec	2	Z	3	17	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1.2	17
22-Dec	0	0	Z	0	3	6	1	0	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	10
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	18	14	9	0	2.3	18
24-Dec	0	1	1	0	Z	0	0	0	1	0	1	2	3	3	2	2	2	1	0	0	4	0	0	0	1.1	4
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	2	3	11	13	18	6	2.5	18
26-Dec	Z	1	0	0	0	0	1	1	1	1	0	0	2	7	2	0	0	0	1	1	0	0	0	0	0.8	7
27-Dec	1	Z	1	1	2	5	10	9	18	11	8	13	3	4	4	0	3	15	0	0	1	9	2	0	5.2	18
28-Dec	0	1	Z	6	0	0	0	0	0	0	1	0	0	1	3	2	0	0	0	0	1	1	1	1	0.9	6
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	1	1	3	8	13	4	1	0	0	1.6	13
30-Dec	1	0	0	0	Z	0	1	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
	2.4	2.9	4.0	5.0	3.4	3.4	2.8	4.9	4.1	3.0	2.9	2.9	1.5	1.3	1.6	1.6	1.4	1.7	1.3	1.9	3.1	2.2	3.0	3.3	Diurnal Average	
	11	25	20	22	22	18	13	30	34	18	20	14	7	7	20	14	17	15	17	17	19	14	32	23	Diurnal Maximum	

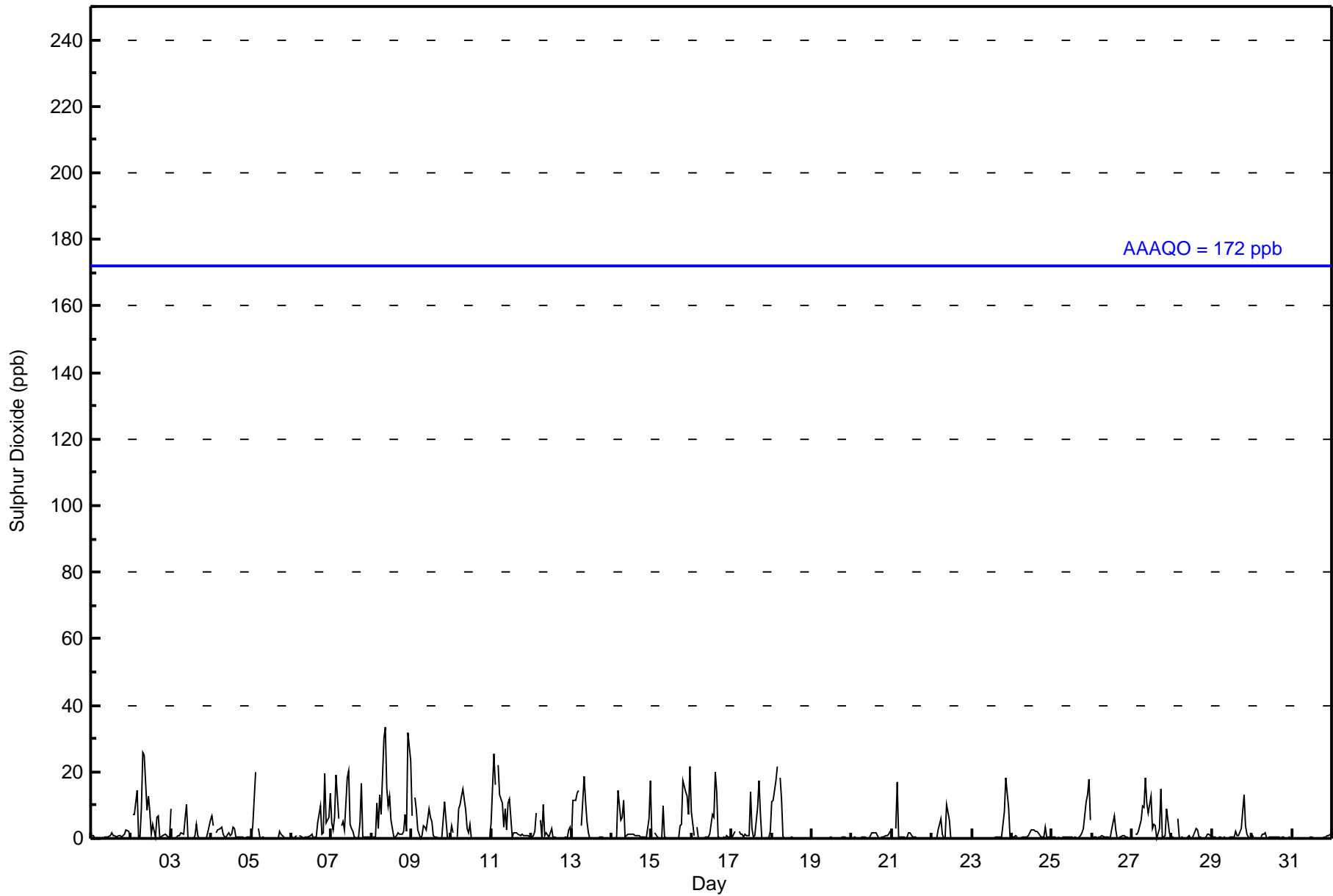
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Sawbones Bay - December 2017





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	645	90.97	90.97
11 - 20	54	7.62	98.59
21 - 60	10	1.41	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	16	16	1	0	2	2	4	11	54	79	68	48	62	144	92	46	645
11 - 20	0	0	0	0	0	0	0	0	0	0	1	4	49	0	0	0	54
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	10
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
<b>Totals</b>	16	16	1	0	2	2	4	11	54	79	69	52	121	144	92	46	709

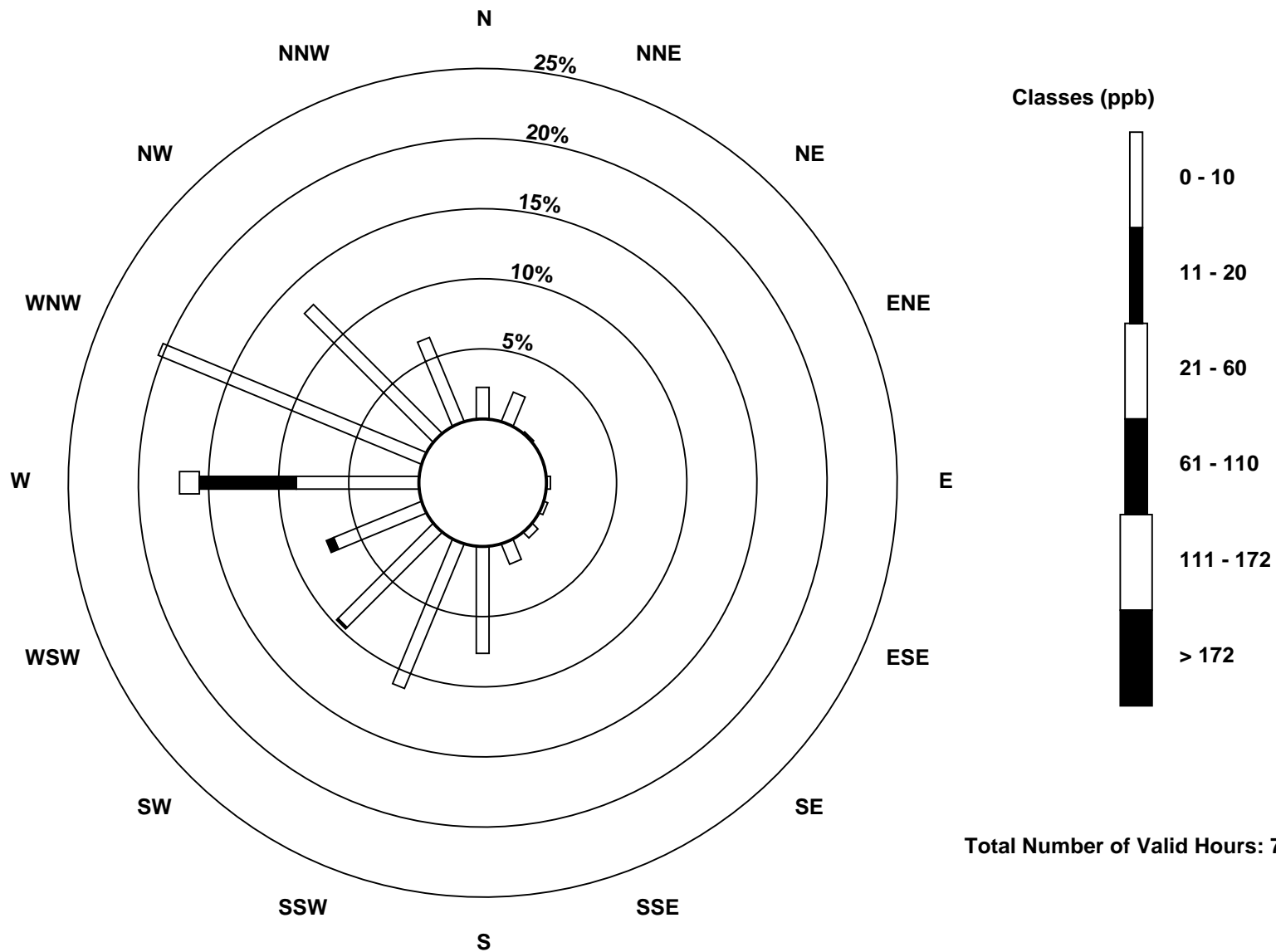
Total Number of Valid Hours: 709

Total Number of Hours: 744

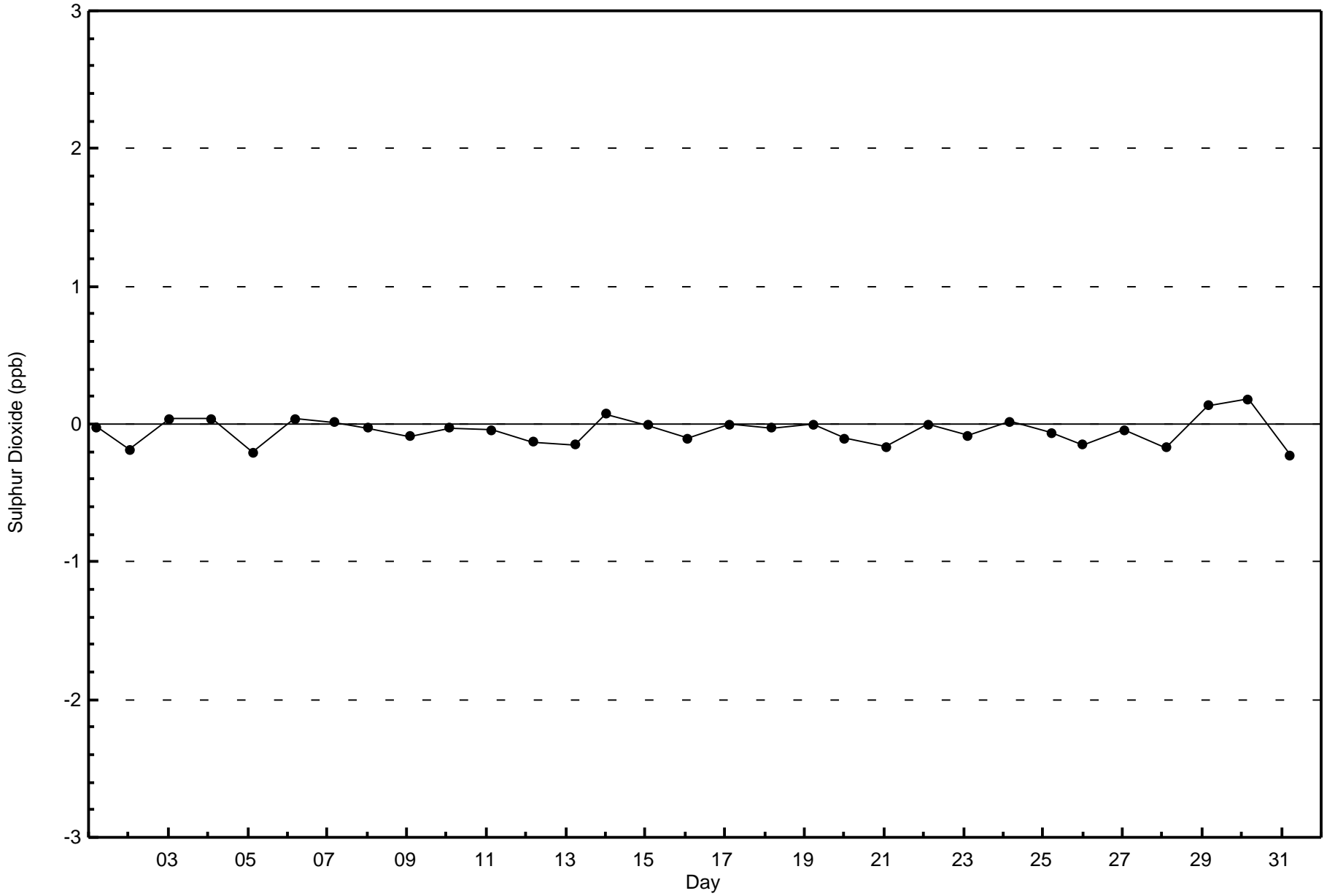


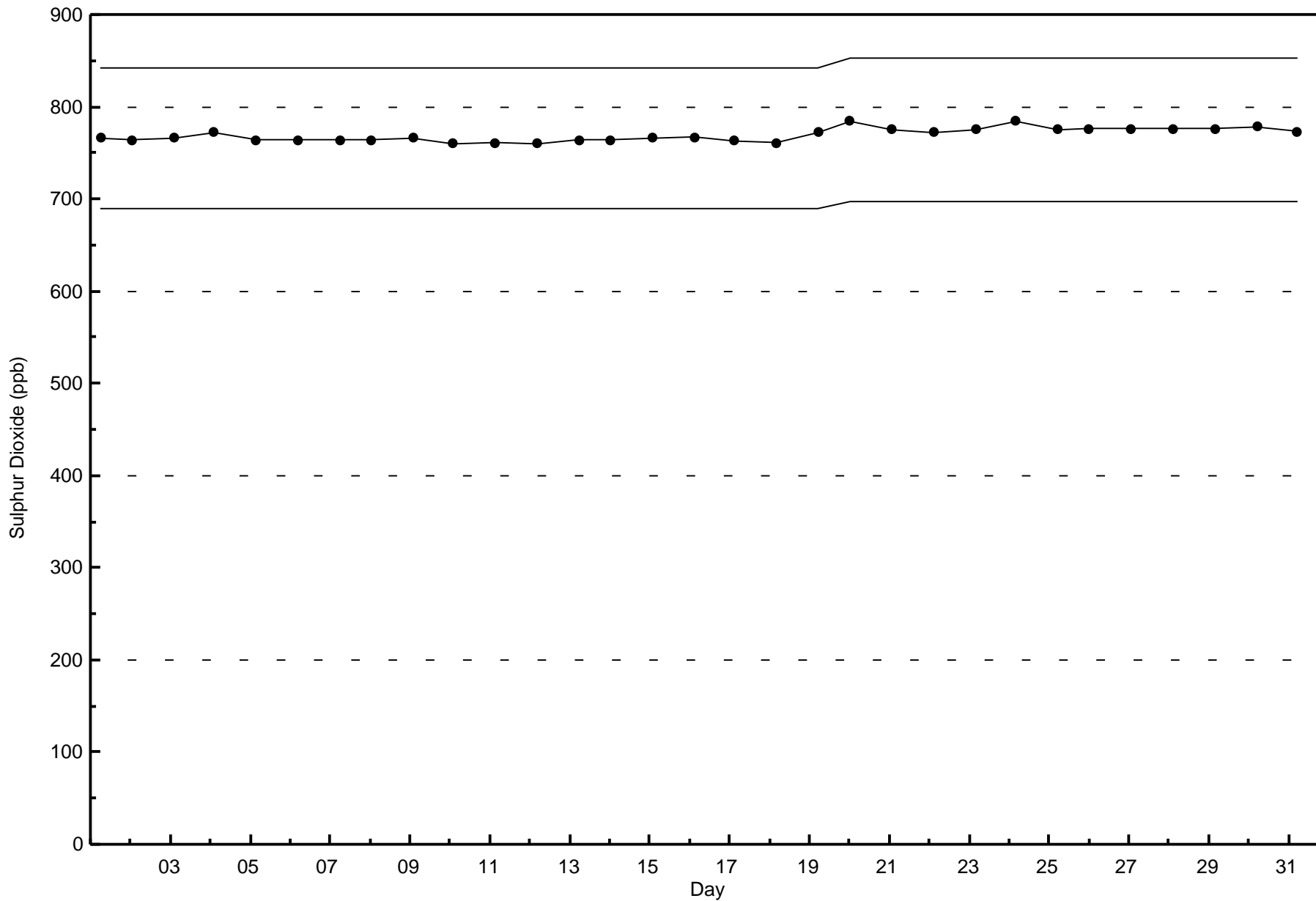
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Sawbones Bay (AMS 505)



Total Number of Valid Hours: 709



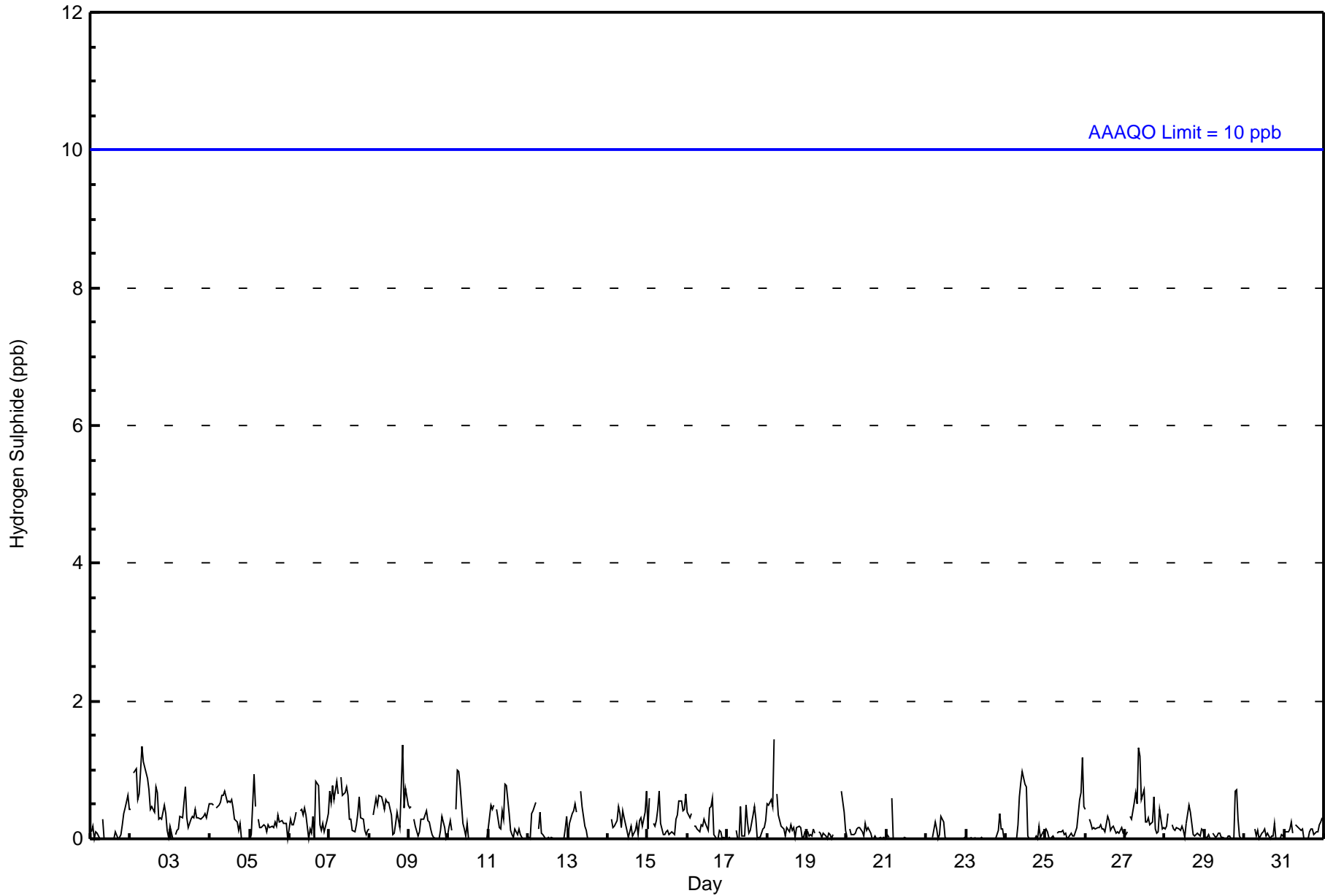






**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Sawbones Bay - December 2017**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	16	16	2	0	2	2	4	11	52	78	71	53	124	140	94	44	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	16	16	2	0	2	2	4	11	52	78	71	53	124	140	94	44	709

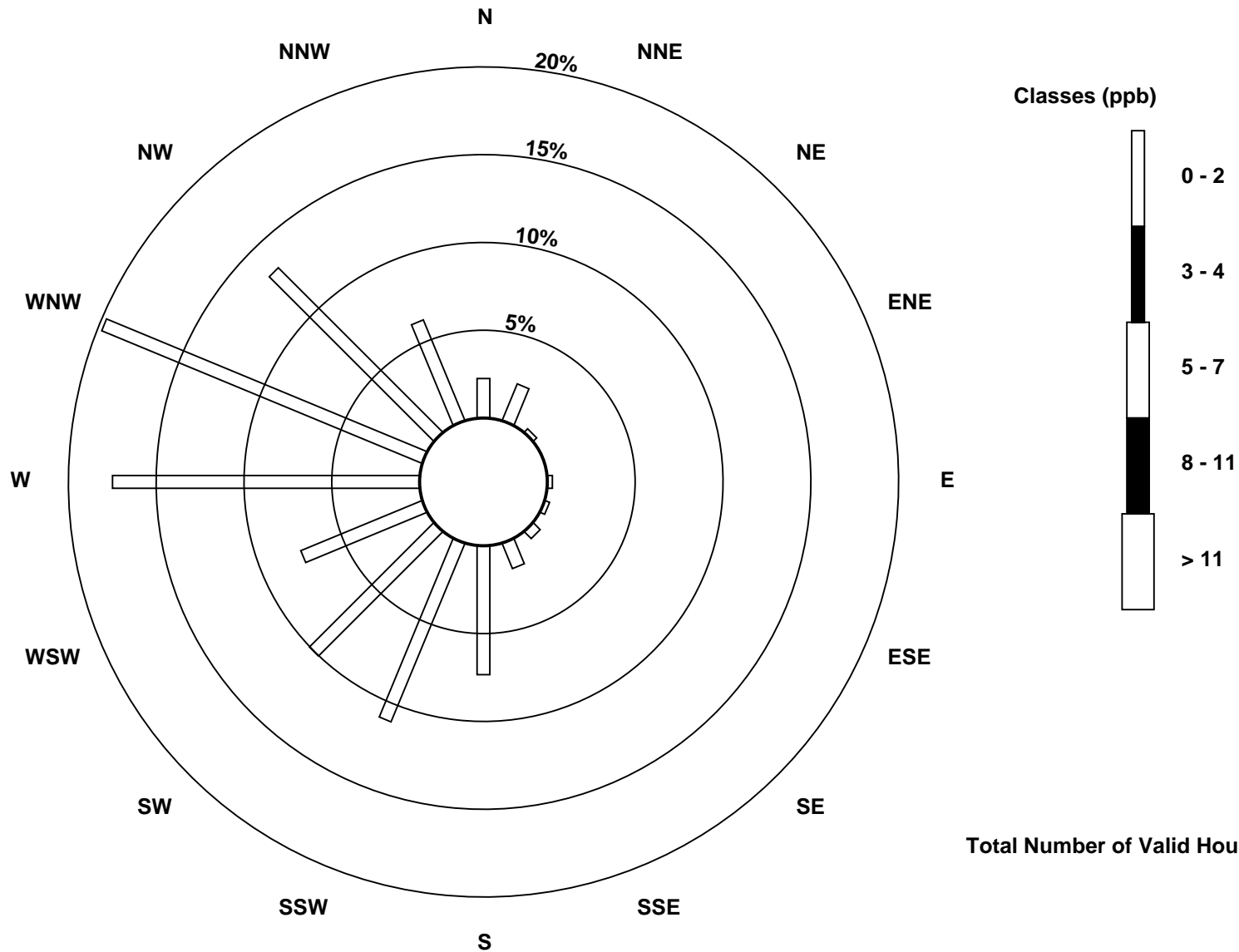
Total Number of Valid Hours: 709

Total Number of Hours: 744

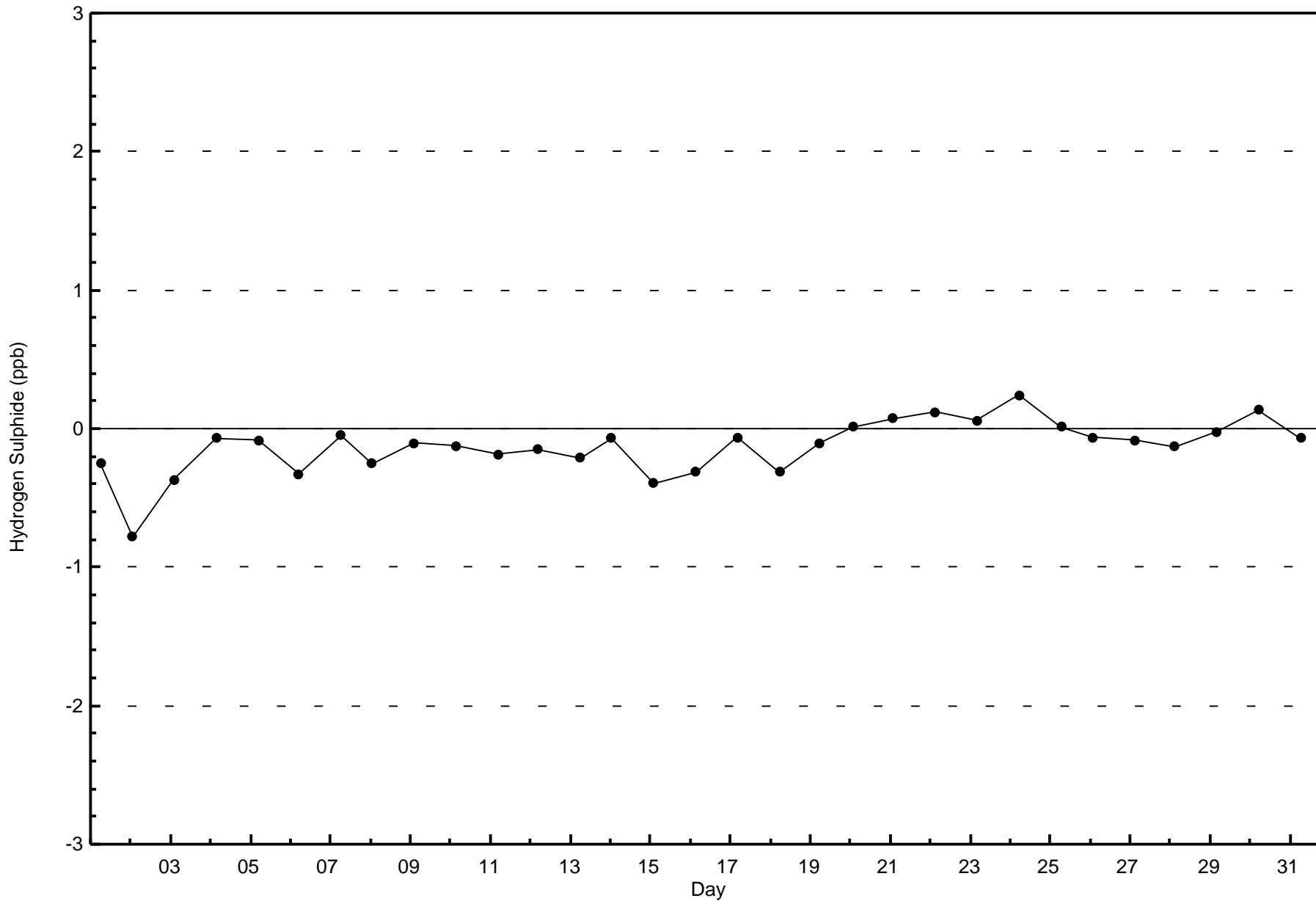


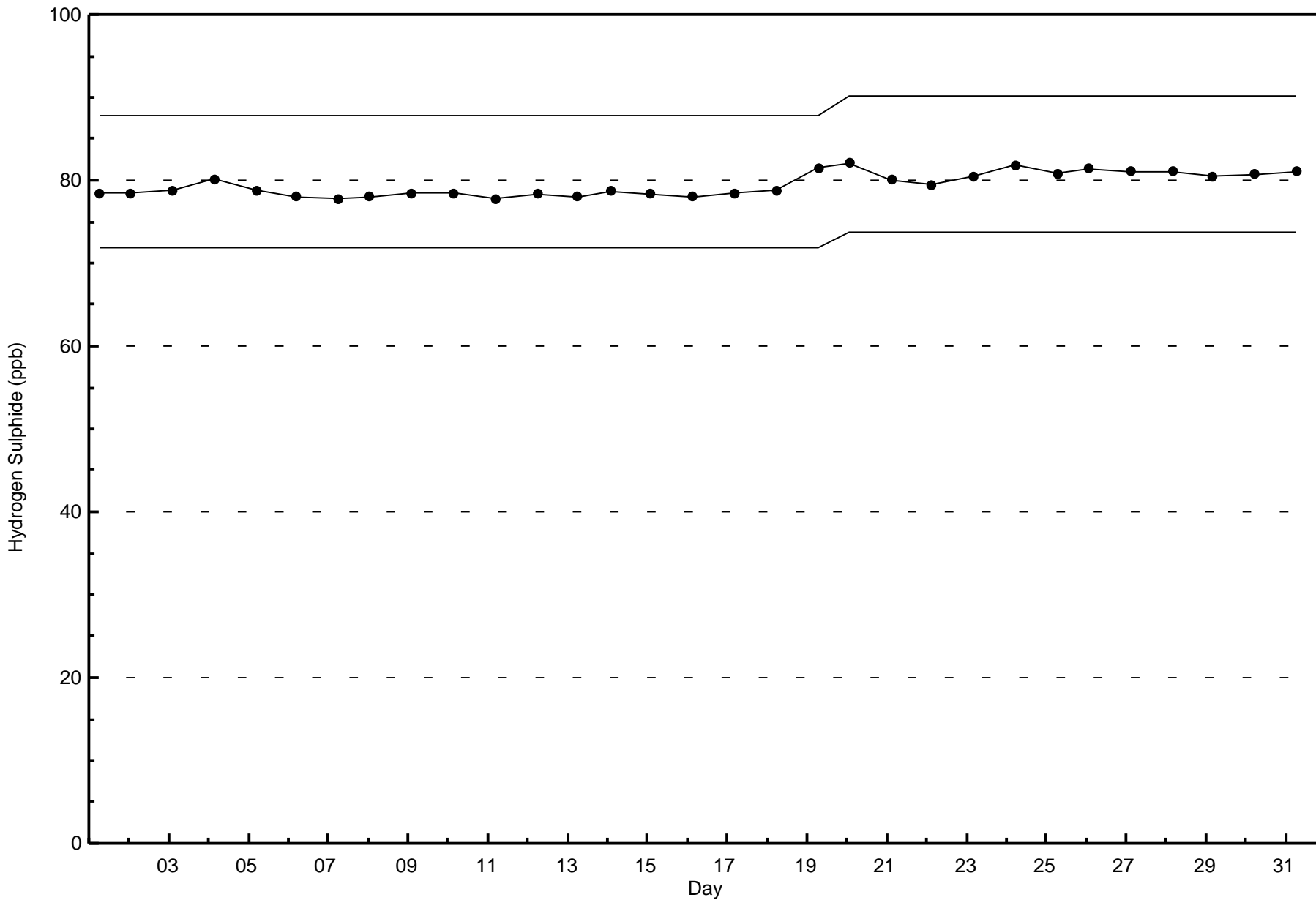
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Sawbones Bay (AMS 505)



Total Number of Valid Hours: 709







**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

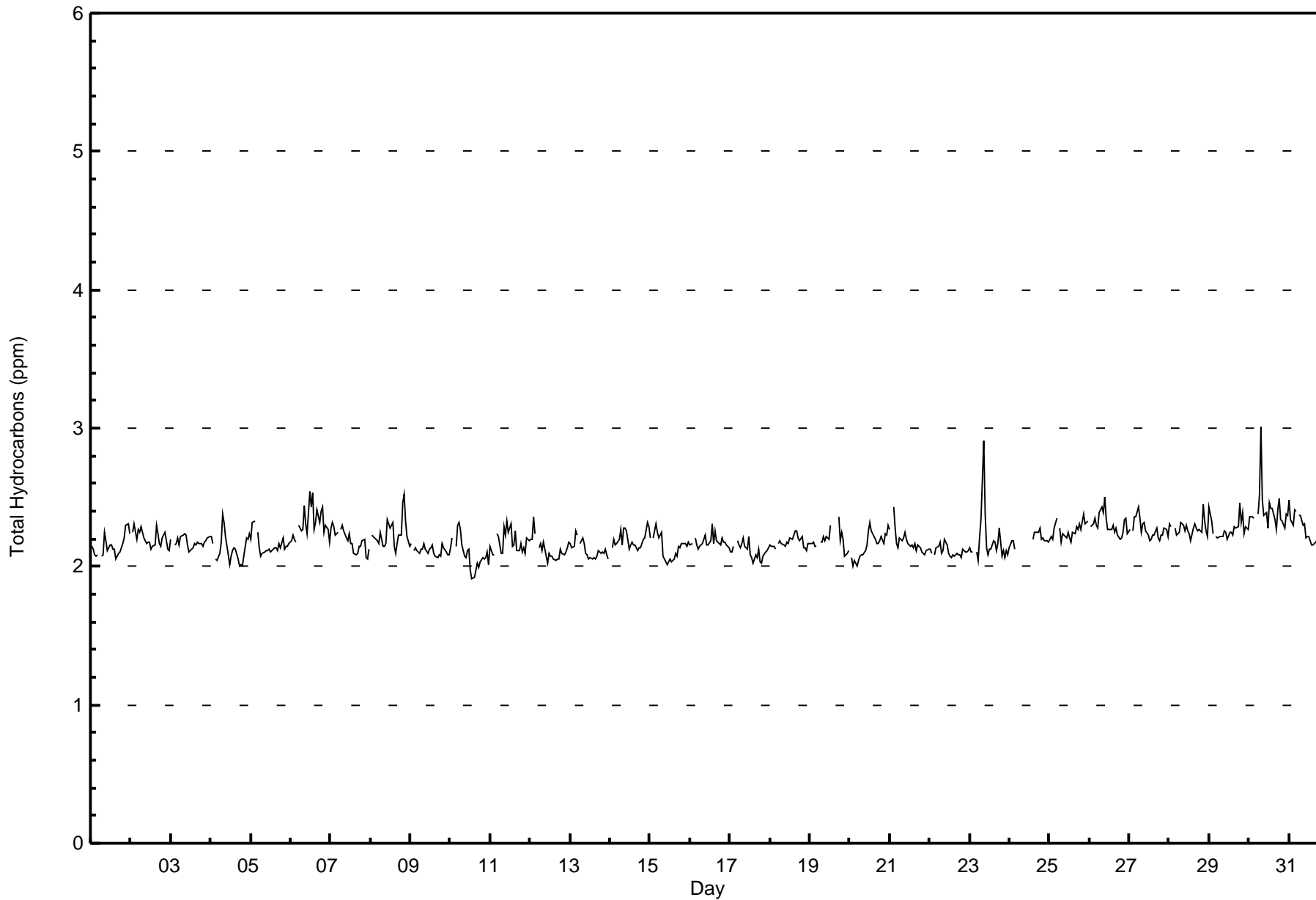
**Total Hydrocarbons (THC) - ppm**  
**Sawbones Bay - December 2017**

Maximum Value: 3.0 ppm on Dec 30 08:00		Maximum Daily Average: 2.4 ppm on Dec 30		Hours in Service: 744																						
Minimum Value: 1.9 ppm on Dec 10 14:00		Minimum Daily Average: 2.1 ppm on Dec 10		Hours of Data: 700																						
Maximum Diurnal Average: 2.3 ppm at hour 9		Minimum Diurnal Average: 2.2 ppm at hour 15		Hours of Missing Data: 44																						
Monthly Average: 2.20 ppm		Percentiles: P <sub>1</sub> = 2.0 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.1 Median = 2.2 Q <sub>3</sub> = 2.3 P <sub>90</sub> = 2.3 P <sub>99</sub> = 2.5		Hours of Calibration: 35																						
				Percent Operational Time: 98.8																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.2	2.1	2.3
2-Dec	Z	2.2	2.3	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.3
3-Dec	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
4-Dec	2.2	2.2	Z	2.1	2.0	2.1	2.2	2.4	2.3	2.2	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.1	2.4
5-Dec	2.2	2.3	2.3	Z	2.3	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	2.1	2.1	2.1	2.2	2.2	2.3
6-Dec	2.2	2.2	2.2	2.2	Z	2.3	2.3	2.3	2.4	2.3	2.2	2.5	2.4	2.5	2.3	2.3	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.2	2.3	2.5
7-Dec	2.3	2.3	2.3	2.2	2.2	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.3
8-Dec	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.1	2.1	2.2	2.3	2.3	2.3	2.3	2.2	2.1	2.2	2.2	2.2	2.5	2.5	2.3	2.2	2.1	2.2	2.5
9-Dec	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2
10-Dec	2.1	2.2	Z	2.1	2.3	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.0	2.1	2.3
11-Dec	2.1	2.1	2.1	Z	2.2	2.2	2.1	2.1	2.3	2.2	2.3	2.3	2.3	2.1	2.2	2.3	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.3
12-Dec	2.2	2.2	2.4	2.2	Z	2.1	2.2	2.1	2.2	2.1	2.0	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.4
13-Dec	2.2	2.1	2.1	2.3	2.2	Z	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	2.3
14-Dec	Z	2.1	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.2	2.3
15-Dec	2.2	Z	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.2	2.1	2.3
16-Dec	2.2	2.2	Z	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.3
17-Dec	2.1	2.1	2.1	Z	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.2	2.1	2.1	2.0	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2
18-Dec	2.2	2.1	2.1	2.1	Z	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.3
19-Dec	2.2	2.2	2.2	2.2	2.1	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	C	C	C	C	2.4	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.4
20-Dec	Z	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3
21-Dec	2.3	Z	2.4	2.3	2.2	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4
22-Dec	2.1	2.1	Z	2.1	2.1	2.1	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	2.1	2.1	2.1	2.2
23-Dec	2.1	2.1	2.1	Z	2.1	2.0	2.2	2.3	2.9	2.4	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.3	2.1	2.1	2.1	2.1	2.1	2.2	2.9
24-Dec	2.1	2.2	2.2	2.1	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
25-Dec	2.2	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	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.4
26-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.5
27-Dec	2.3	Z	2.3	2.4	2.4	2.4	2.3	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.4
28-Dec	2.3	2.3	Z	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.3	2.3	2.2	2.3	2.5
29-Dec	2.4	2.3	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	2.3	2.3	2.3	2.5	2.3	2.4	2.2	2.3	2.3	2.3	2.5
30-Dec	2.4	2.4	2.4	2.4	Z	2.4	2.5	3.0	2.5	2.4	2.4	2.3	2.5	2.4	2.4	2.3	2.3	2.4	2.5	2.3	2.3	2.3	2.4	2.4	3.0	
31-Dec	2.5	2.3	2.3	2.4	2.4	Z	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.5	2.5
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan                      C - Calibration                      UO - Unstable Operation																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Total Hydrocarbons (THC) - ppm**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Sawbones Bay - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	30	4.29	4.29
2.1 - 3.0	670	95.71	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	2	0	0	0	0	0	2	4	1	0	1	0	11	8	1	30
2.1 - 3.0	13	14	1	0	2	2	4	9	50	78	69	51	121	132	81	43	670
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
<b>Totals</b>	13	16	1	0	2	2	4	11	54	79	69	52	121	143	89	44	700

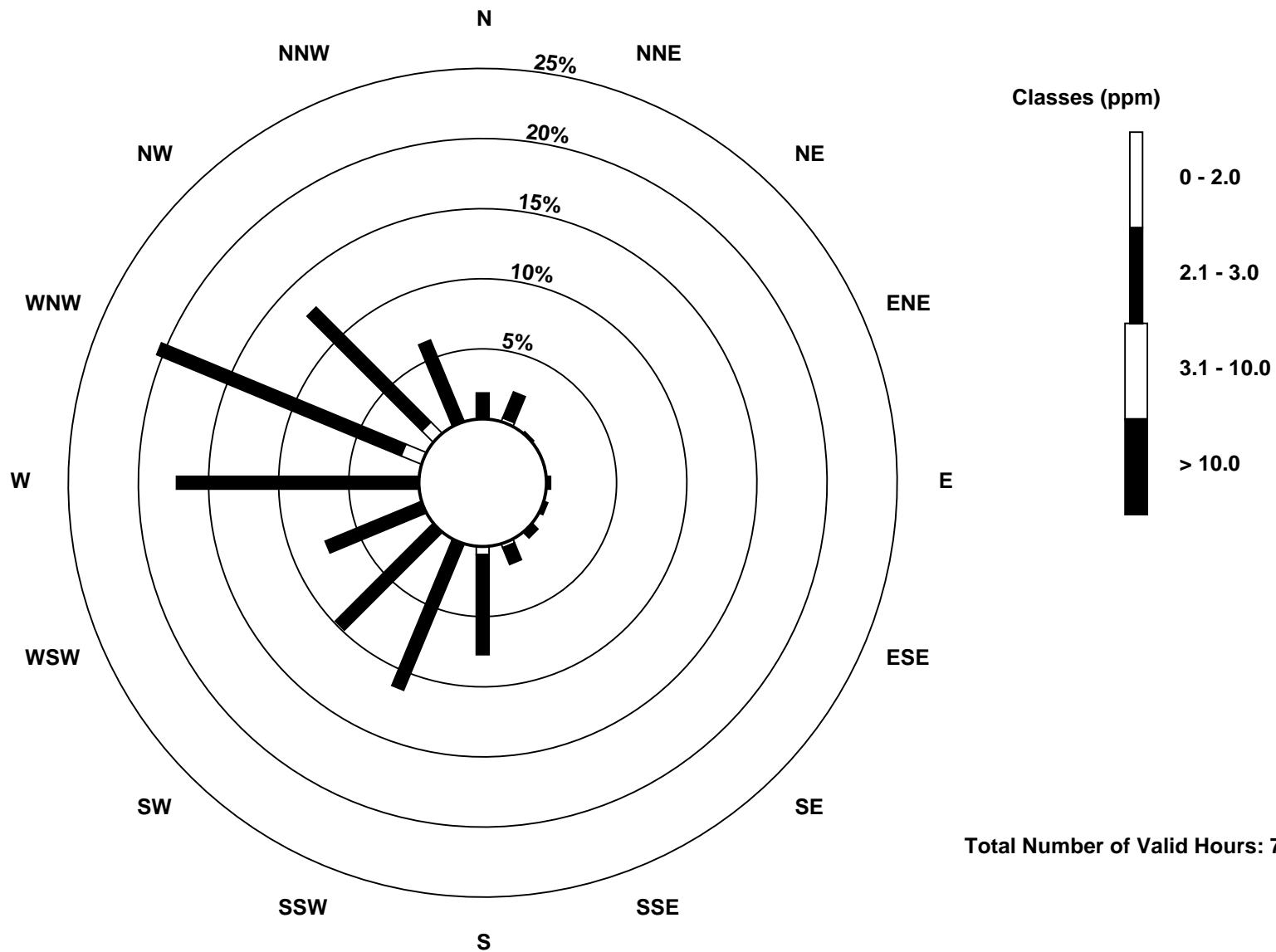
Total Number of Valid Hours: 700

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Total Hydrocarbons (THC) - ppm  
Sawbones Bay (AMS 505)

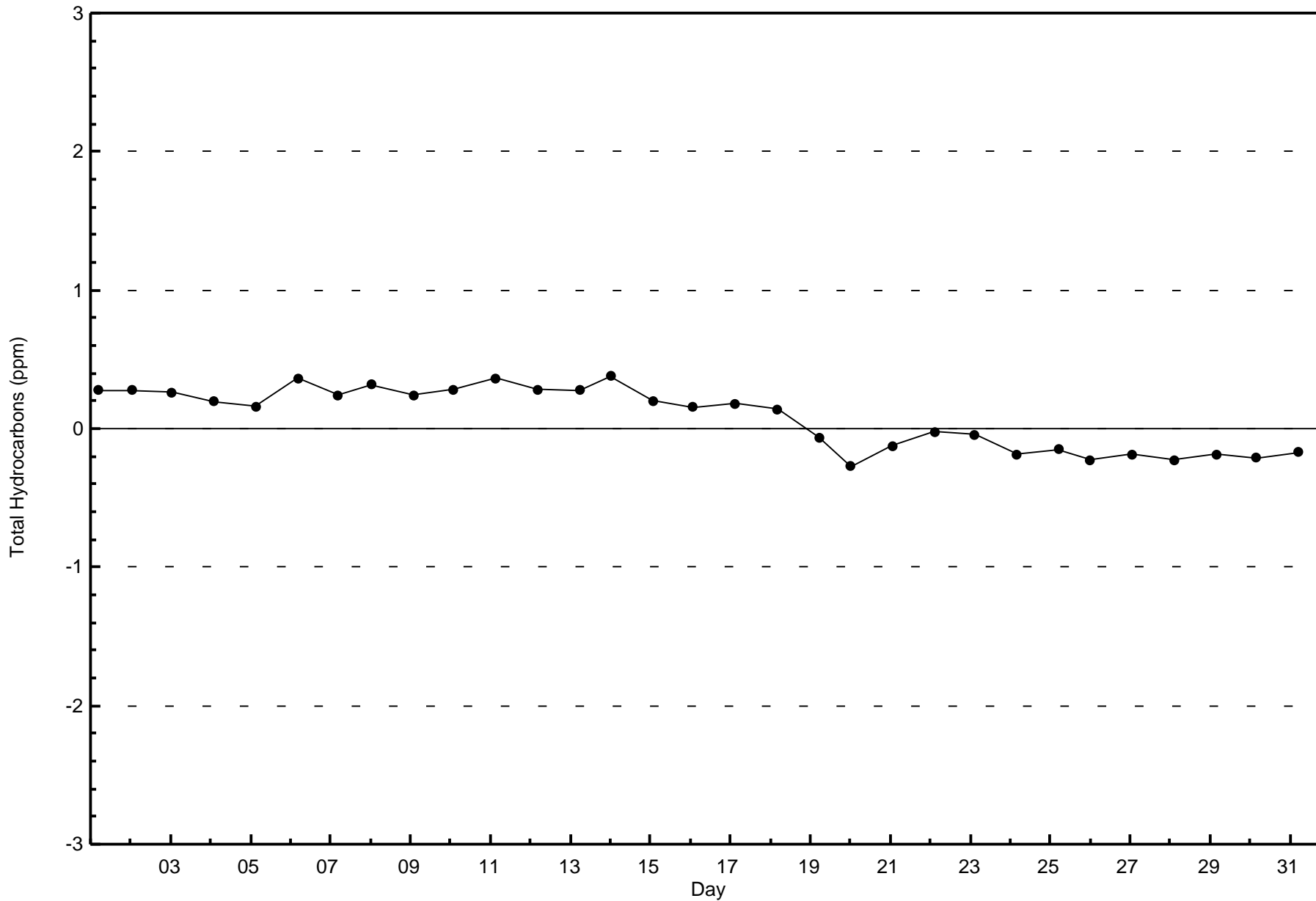


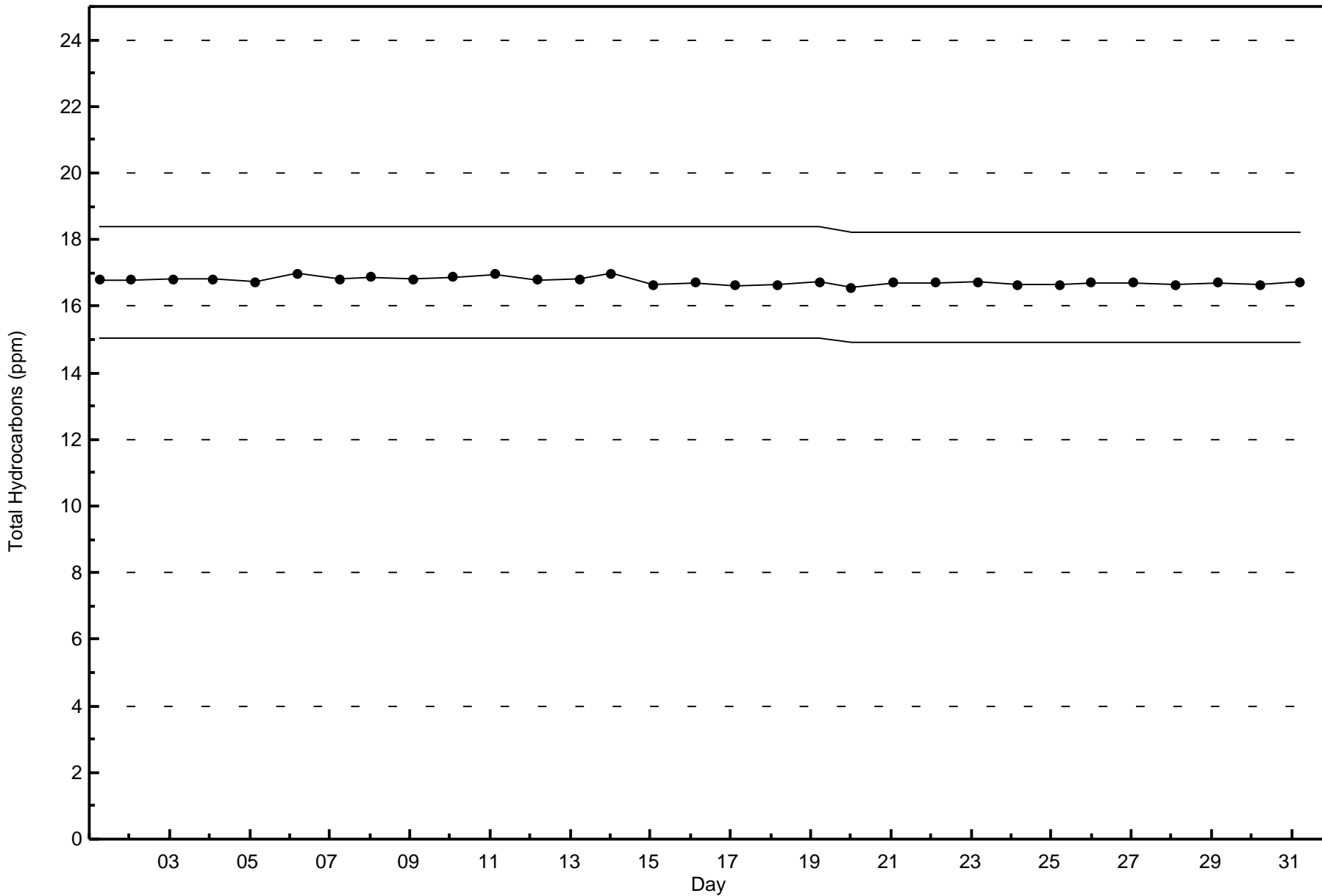
Total Number of Valid Hours: 700



Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Sawbones Bay - December 2017







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitric Oxide (NO) - ppb

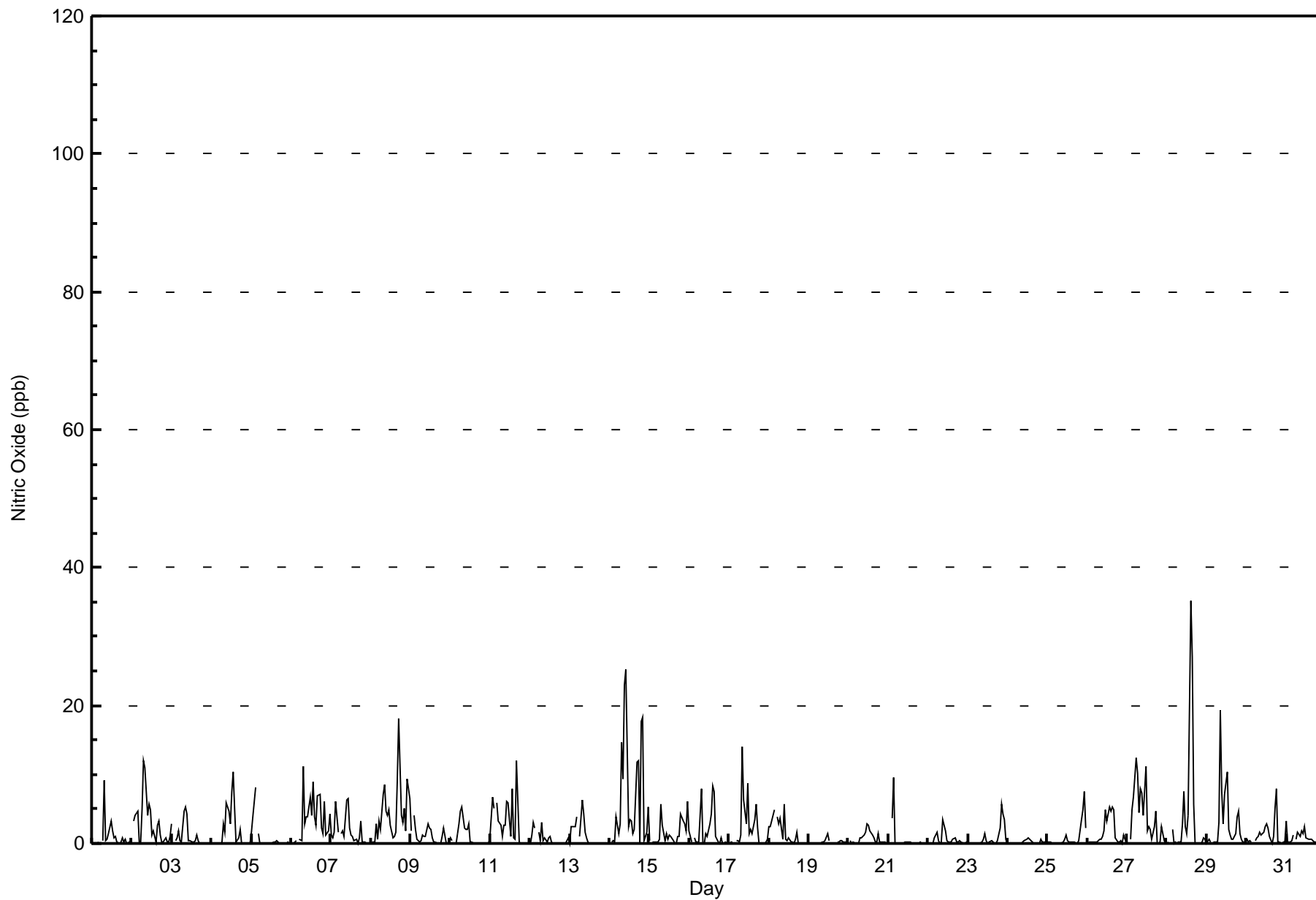
Sawbones Bay - December 2017

Maximum Value: 35 ppb on Dec 28 15:00		Maximum Daily Average: 7.0 ppb on Dec 14		Hours in Service: 744																						
Minimum Value: 0 ppb on Dec 4 23:00		Minimum Daily Average: 0.2 ppb on Dec 24		Hours of Data: 709																						
Maximum Diurnal Average: 3.6 ppb at hour 8		Minimum Diurnal Average: 0.7 ppb at hour 22		Hours of Missing Data: 35																						
Monthly Average: 1.8 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 2 P <sub>90</sub> = 5 P <sub>99</sub> = 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-Dec	0	0	0	0	0	Z	0	9	0	1	1	3	2	1	1	0	0	0	1	0	1	0	0	0	1.0	9
2-Dec	Z	3	4	5	0	0	5	12	11	4	6	5	1	2	0	3	3	1	0	0	1	0	0	1	3.0	12
3-Dec	3	Z	0	1	2	0	0	5	5	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1.1	5
4-Dec	0	0	Z	0	0	0	0	3	2	6	5	3	8	10	5	0	1	2	0	0	0	0	0	0	1.9	10
5-Dec	2	4	8	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	8
6-Dec	0	0	0	0	Z	1	0	11	3	4	4	7	4	9	4	3	7	7	2	1	6	1	2	4	3.5	11
7-Dec	1	1	2	6	2	Z	1	2	1	6	7	2	1	1	0	1	0	1	3	0	0	0	0	0	1.7	7
8-Dec	Z	0	0	3	1	3	2	7	8	5	4	5	3	1	1	2	9	18	4	3	5	2	9	7	4.4	18
9-Dec	2	Z	4	2	1	0	0	1	1	1	3	2	2	1	0	0	0	0	0	1	2	0	0	0	1.1	4
10-Dec	1	0	Z	0	1	3	5	5	2	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	1.1	5
11-Dec	1	7	5	Z	6	3	3	1	3	3	6	6	1	8	1	1	12	0	0	0	0	0	0	0	2.8	12
12-Dec	0	1	3	2	Z	2	1	3	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0.7	3
13-Dec	0	2	2	2	4	Z	1	6	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	6
14-Dec	Z	0	0	0	4	1	3	15	9	23	25	3	4	3	1	2	12	12	0	18	18	0	2	5	7.0	25
15-Dec	0	Z	0	0	0	0	1	6	3	0	1	1	1	1	0	0	0	1	1	4	3	3	2	6	1.5	6
16-Dec	2	0	Z	1	0	0	0	8	0	0	1	1	3	4	8	8	1	0	0	1	0	0	0	0	1.7	8
17-Dec	0	0	0	Z	0	0	0	1	14	6	3	9	2	2	1	3	6	2	0	0	0	0	0	1	2.2	14
18-Dec	2	3	4	5	Z	4	3	4	1	6	1	0	1	0	0	0	1	2	0	0	0	0	0	0	1.5	6
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	C	C	C	C	0	0	0	0	0	0	0	0.2	1
20-Dec	Z	0	0	0	0	0	0	1	1	1	2	3	3	2	1	1	0	0	1	0	0	0	0	0	0.8	3
21-Dec	0	Z	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	10
22-Dec	0	0	Z	0	1	2	0	0	0	3	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0.5	3
23-Dec	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	6	4	3	1	0.9	6
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0.2	1
25-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3	5	7	2	1.0	7
26-Dec	Z	0	0	0	0	0	0	1	1	1	2	5	3	5	5	5	5	1	0	0	0	0	1	1	1.6	5
27-Dec	0	Z	1	5	7	12	10	5	8	7	4	11	2	2	2	1	2	5	0	0	0	3	0	0	3.8	12
28-Dec	0	0	Z	2	0	0	0	0	0	3	8	2	1	4	35	27	6	0	0	0	0	0	1	1	4.0	35
29-Dec	0	1	0	Z	0	0	0	3	19	8	3	7	10	2	1	1	1	1	4	5	1	1	0	0	3.0	19
30-Dec	1	0	0	0	Z	0	1	1	2	1	2	2	3	2	1	0	1	5	8	0	0	0	0	0	1.4	8
31-Dec	3	0	0	0	1	Z	1	2	1	2	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0.8	3
		0.7	0.9	1.5	1.7	1.2	1.3	1.2	3.6	3.2	3.3	3.1	2.8	1.9	2.1	2.4	2.0	2.3	1.9	0.9	1.2	1.6	0.7	1.0	1.0	Diurnal Average
		3	7	8	10	7	12	10	15	19	23	25	11	10	10	35	27	12	18	8	18	18	5	9	7	Diurnal Maximum
Z - zerospan		C - Calibration																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	705	99.44	99.44
21 - 40	4	0.56	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Sawbones Bay - December 2017**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	16	16	1	0	2	2	4	11	52	79	69	52	121	144	91	45	705
21 - 40	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	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
<b>Totals</b>	16	16	1	0	2	2	4	11	54	79	69	52	121	144	92	46	709

Total Number of Valid Hours: 709

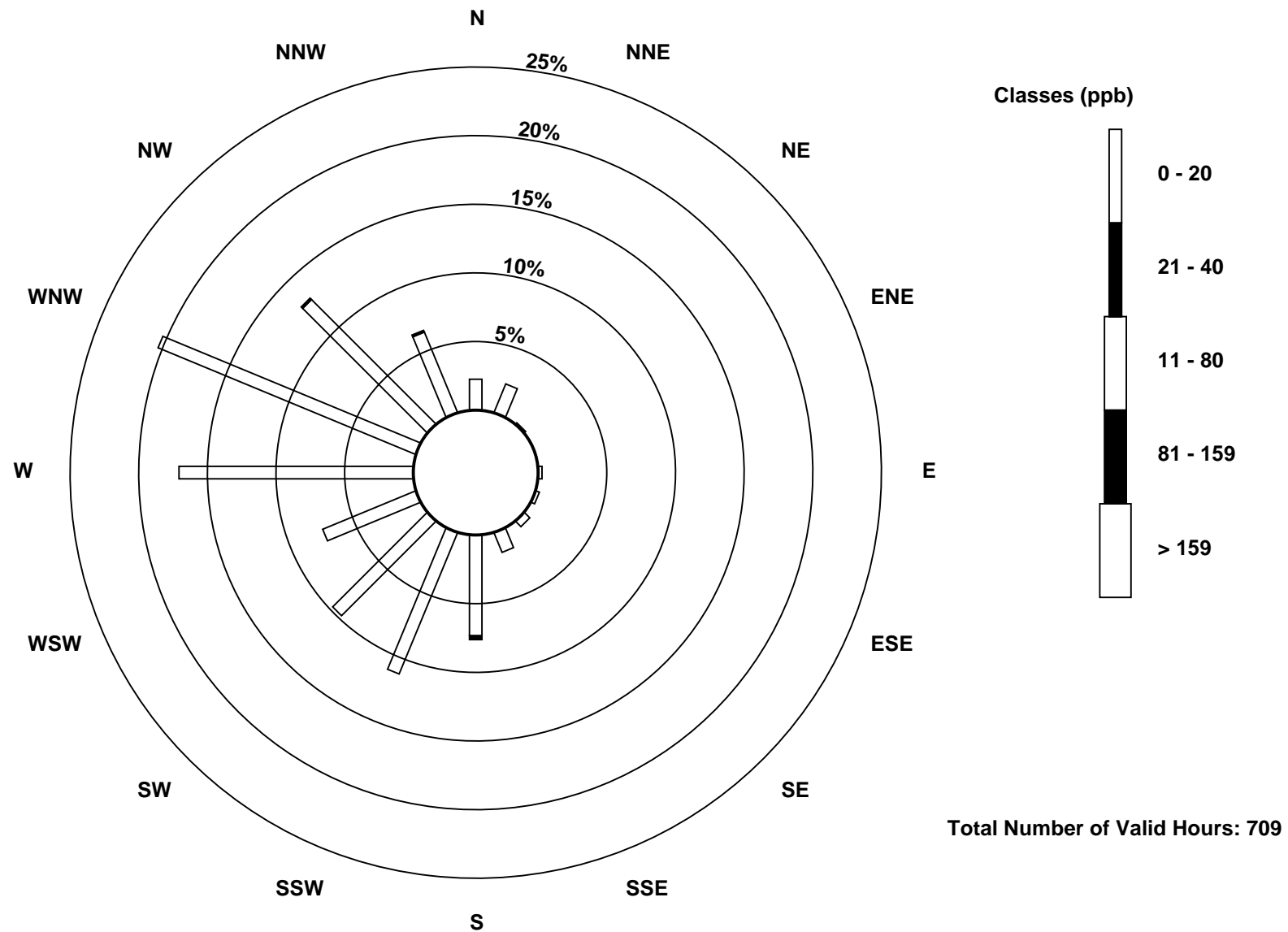
Total Number of Hours: 744

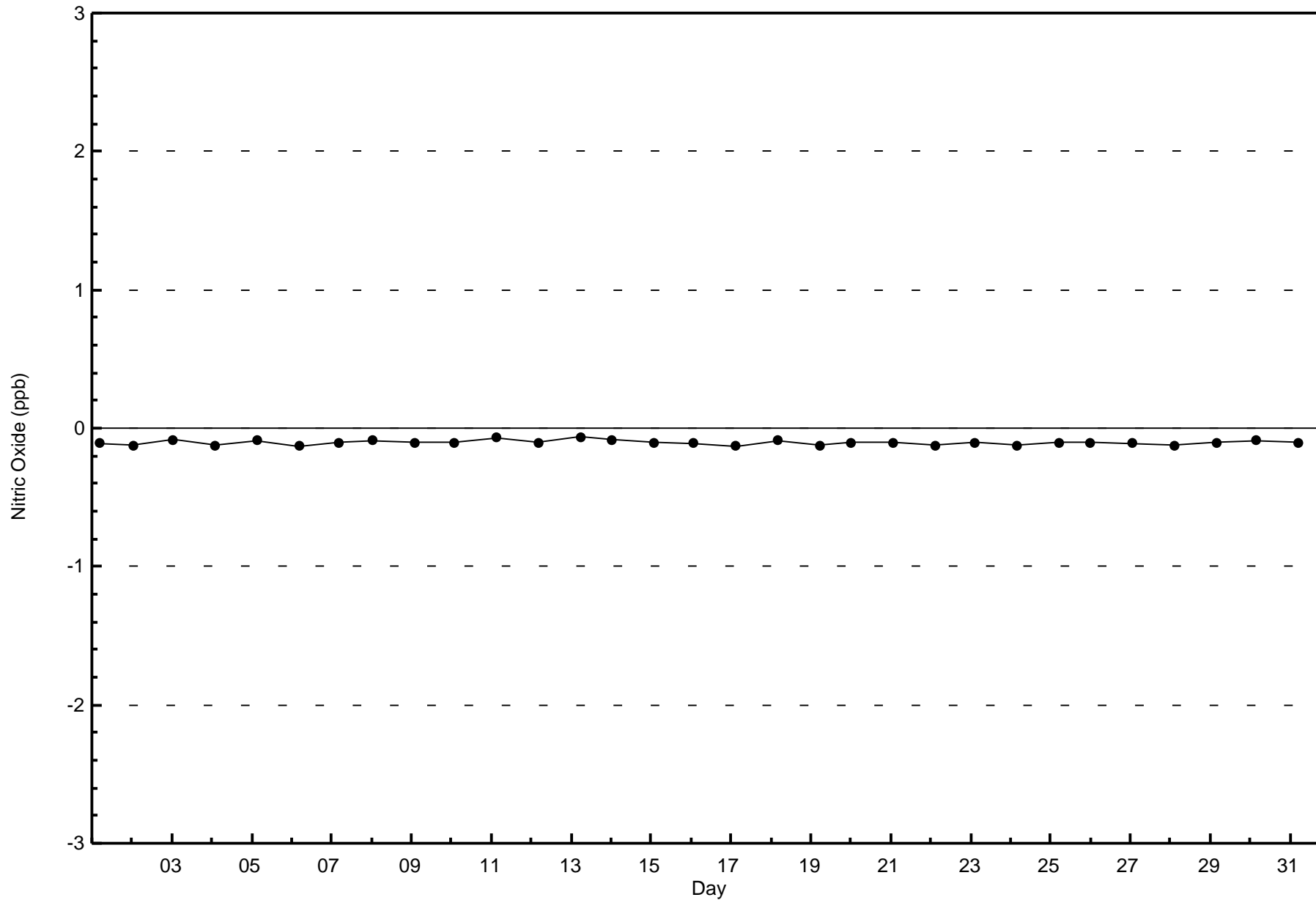




Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Nitric Oxide (NO) - ppb  
Sawbones Bay (AMS 505)





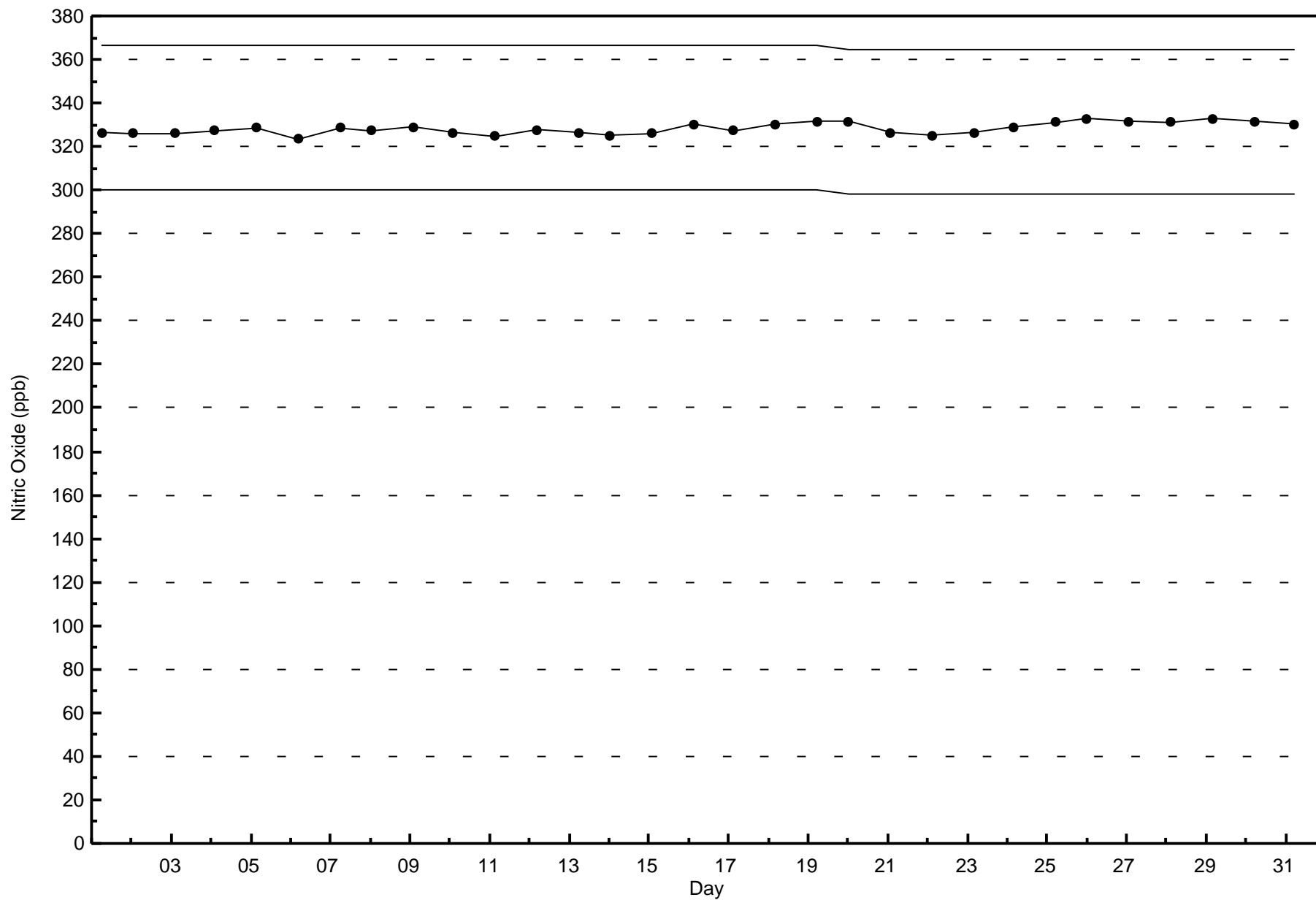


Wood Buffalo Environmental Association

Span Responses

Nitric Oxide (NO) - ppb

Sawbones Bay - December 2017





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Sawbones Bay - December 2017

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 29 ppb on Dec 30 19:00	Maximum Daily Average: 10.8 ppb on Dec 8		Hours of Data:	709
Minimum Value: 0 ppb on Dec 16 08:00	Minimum Daily Average: 1.6 ppb on Dec 22		Hours of Missing Data:	35
Maximum Diurnal Average: 8.1 ppb at hour 8	Minimum Diurnal Average: 3.5 ppb at hour 13		Hours of Calibration:	35
Monthly Average: 5.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 4 Q <sub>3</sub> = 7 P <sub>90</sub> = 11 P <sub>99</sub> = 21		Percent Operational Time:	100.0

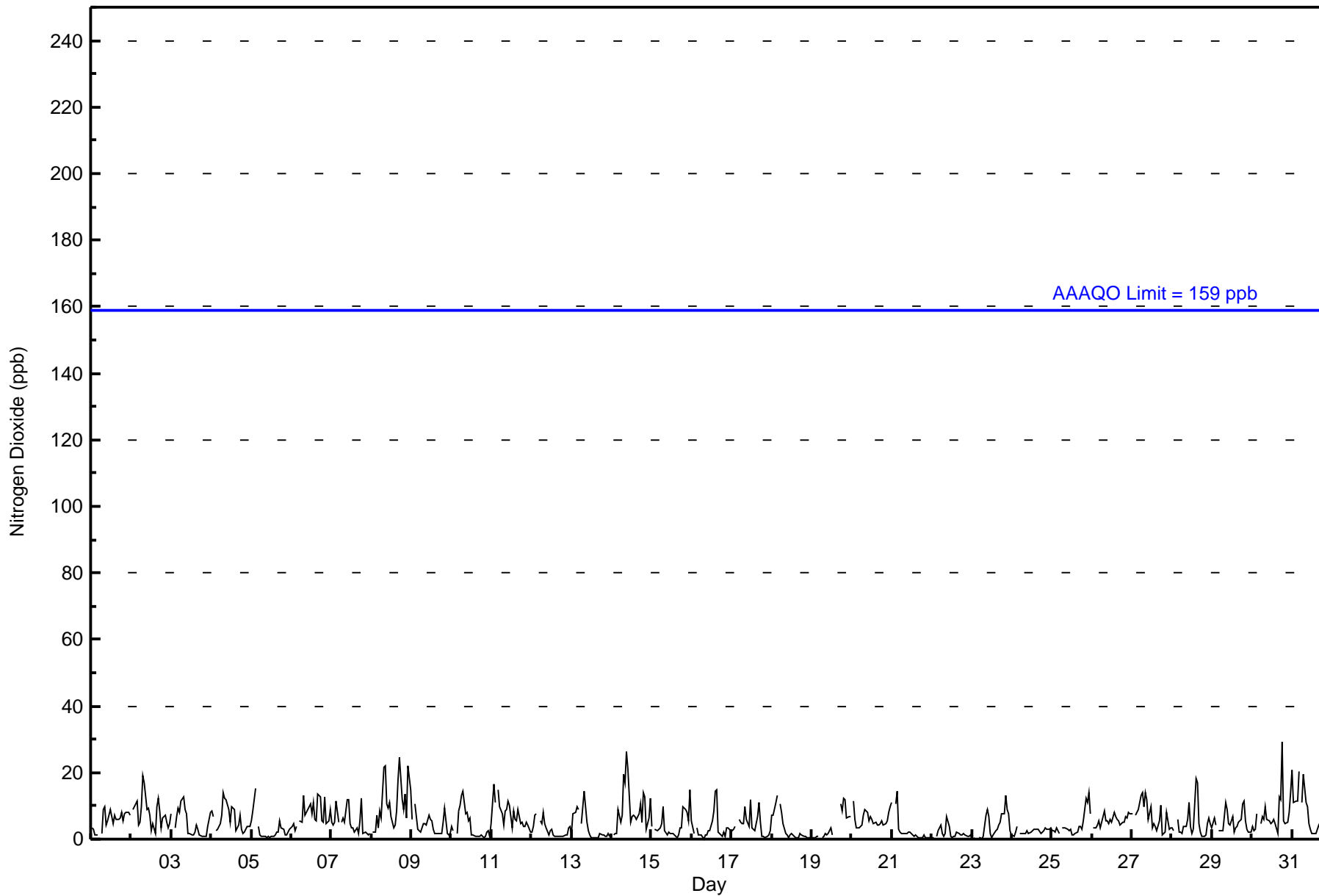
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	1	1	1	Z	2	9	10	4	6	9	7	5	7	6	6	7	8	6	8	8	8	7	5.7	10
2-Dec	Z	9	10	11	4	5	10	19	17	9	9	7	3	5	2	10	12	9	3	6	7	5	3	5	7.8	19
3-Dec	8	Z	3	7	9	8	11	13	9	8	2	2	1	1	2	4	3	1	1	1	1	1	4	8	4.7	13
4-Dec	9	7	Z	3	3	5	7	14	12	9	5	10	9	9	3	4	7	3	2	2	4	4	4	4	6.3	14
5-Dec	5	9	15	Z	4	1	1	1	1	1	1	1	1	1	2	2	6	4	3	1	1	2	3	2.8	15	
6-Dec	4	5	3	4	Z	6	5	13	7	8	9	11	8	11	6	6	14	13	6	5	13	5	6	9	7.5	14
7-Dec	5	4	5	11	5	Z	5	6	5	12	12	5	3	3	2	3	2	6	12	2	2	2	1	2	5.0	12
8-Dec	Z	2	2	7	4	9	6	22	22	11	9	11	7	4	4	8	18	25	12	9	14	6	22	15	10.8	25
9-Dec	6	Z	10	7	3	2	3	5	5	4	7	6	5	3	2	2	2	2	2	5	9	2	1	2	4.1	10
10-Dec	4	3	Z	2	9	10	13	15	8	8	5	6	1	1	1	1	1	1	1	1	1	2	3	1	4.1	15
11-Dec	5	17	11	Z	15	10	8	4	8	9	12	10	3	8	6	6	9	5	5	4	4	5	4	2	7.4	17
12-Dec	2	4	7	8	Z	6	5	8	5	4	1	3	3	1	1	1	1	1	1	1	1	1	3	4	3.1	8
13-Dec	2	8	8	10	9	Z	5	15	10	5	3	1	1	1	0	0	1	2	1	1	1	1	2	1	3.7	15
14-Dec	Z	1	2	2	9	5	7	19	17	26	21	5	7	7	7	6	8	11	5	14	13	3	6	12	9.3	26
15-Dec	4	Z	3	3	3	4	5	10	3	1	2	2	2	2	1	1	1	3	3	10	9	8	5	15	4.2	15
16-Dec	5	2	Z	3	1	1	1	0	1	1	2	3	5	9	15	15	2	1	1	2	1	3	4	3	3.5	15
17-Dec	3	3	4	Z	6	5	5	5	10	6	4	12	3	3	3	7	11	5	1	1	1	1	1	2	4.3	12
18-Dec	7	7	11	13	Z	10	8	5	2	1	1	1	2	1	1	1	0	2	1	1	1	1	1	0	3.3	13
19-Dec	1	0	1	1	1	Z	1	1	2	1	2	4	1	C	C	C	C	10	8	12	12	7	7	7	4.0	12
20-Dec	Z	11	6	4	4	4	4	7	9	8	6	7	6	5	5	4	4	5	6	4	5	5	8	10	5.9	11
21-Dec	11	Z	11	14	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	0	1	1	2.6	14
22-Dec	1	1	Z	1	2	4	2	1	2	7	4	1	1	1	1	2	2	1	1	2	1	1	1	1	1.6	7
23-Dec	0	0	0	Z	0	0	0	1	7	9	7	2	1	1	3	3	4	5	8	8	13	9	8	3	3.9	13
24-Dec	1	1	2	4	Z	2	2	2	2	2	2	3	3	3	3	3	2	2	2	2	3	3	3	3	2.3	4
25-Dec	3	3	2	3	2	Z	3	3	4	3	3	3	1	1	2	2	4	4	3	5	12	11	14	8	4.3	14
26-Dec	Z	3	3	4	5	3	5	8	6	5	5	6	5	8	7	6	5	4	5	5	7	6	8	8	5.6	8
27-Dec	8	Z	7	8	9	13	14	10	14	12	6	10	4	5	4	3	6	10	1	2	2	8	3	3	7.0	14
28-Dec	3	3	Z	6	2	2	2	4	4	6	11	4	2	3	18	17	5	2	1	1	1	5	7	5	4.8	18
29-Dec	3	6	4	Z	3	2	3	7	11	9	5	4	7	2	3	4	5	6	11	12	6	3	2	2	5.2	12
30-Dec	4	3	3	8	Z	5	7	6	10	6	5	5	5	6	5	2	13	12	29	5	5	5	8	14	7.3	29
31-Dec	21	11	11	12	21	Z	11	19	11	10	5	3	2	2	2	3	4	5	3	4	5	4	5	5	7.8	21
	4.9	4.8	5.7	6.0	5.2	4.9	5.2	8.1	7.5	6.8	5.7	4.9	3.5	3.7	4.0	4.3	5.0	5.5	4.8	4.4	5.1	4.0	5.0	5.3	Diurnal Average	
	21	17	15	14	21	13	14	22	22	26	21	12	10	11	18	17	18	25	29	14	14	11	22	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 (NO<sub>2</sub>) - ppb**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	700	98.73	98.73
21 - 40	9	1.27	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	16	16	1	0	2	2	4	11	50	78	68	52	118	144	92	46	700
21 - 40	0	0	0	0	0	0	0	0	4	1	1	0	3	0	0	0	9
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	16	16	1	0	2	2	4	11	54	79	69	52	121	144	92	46	709

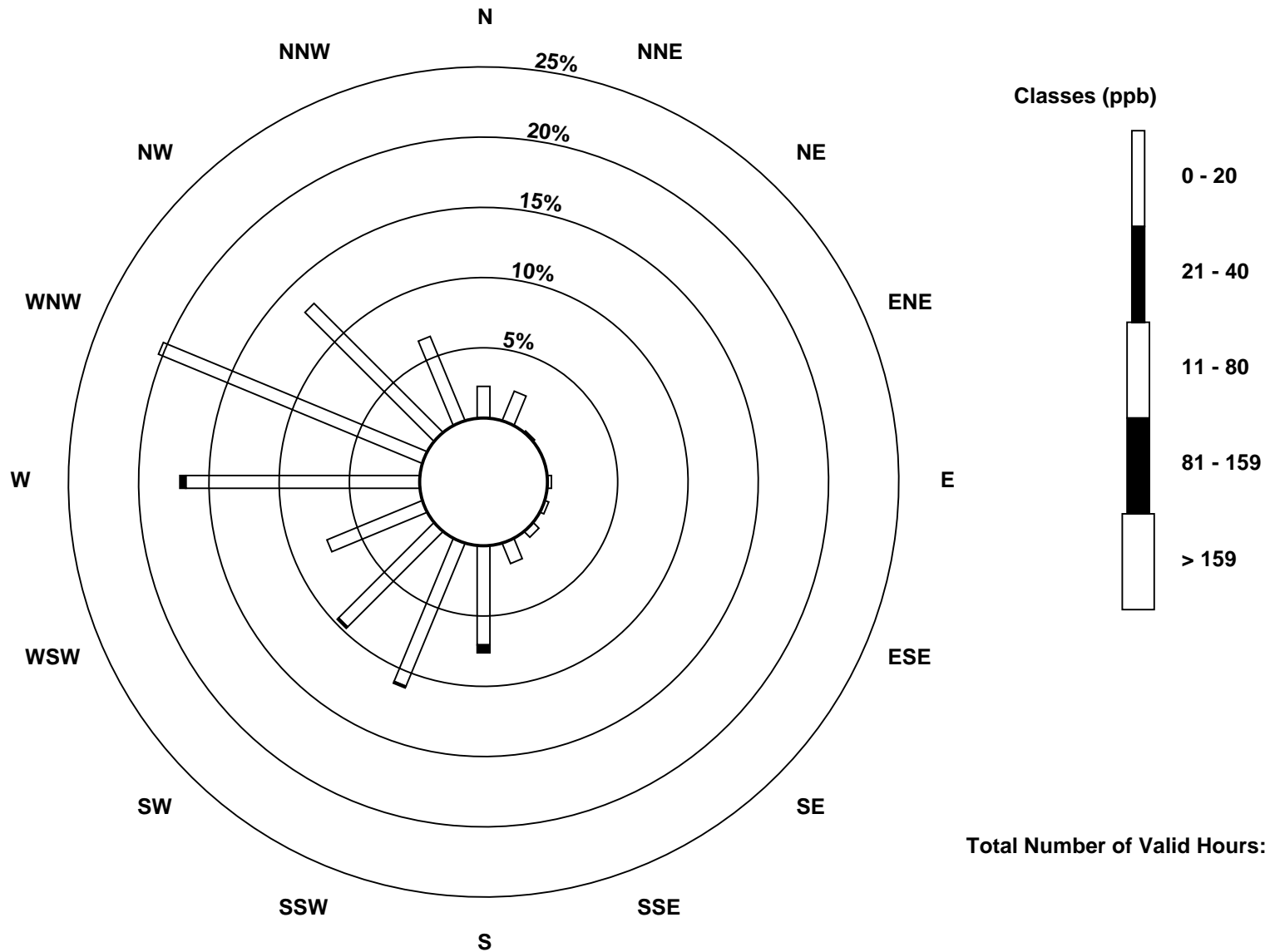
Total Number of Valid Hours: 709

Total Number of Hours: 744



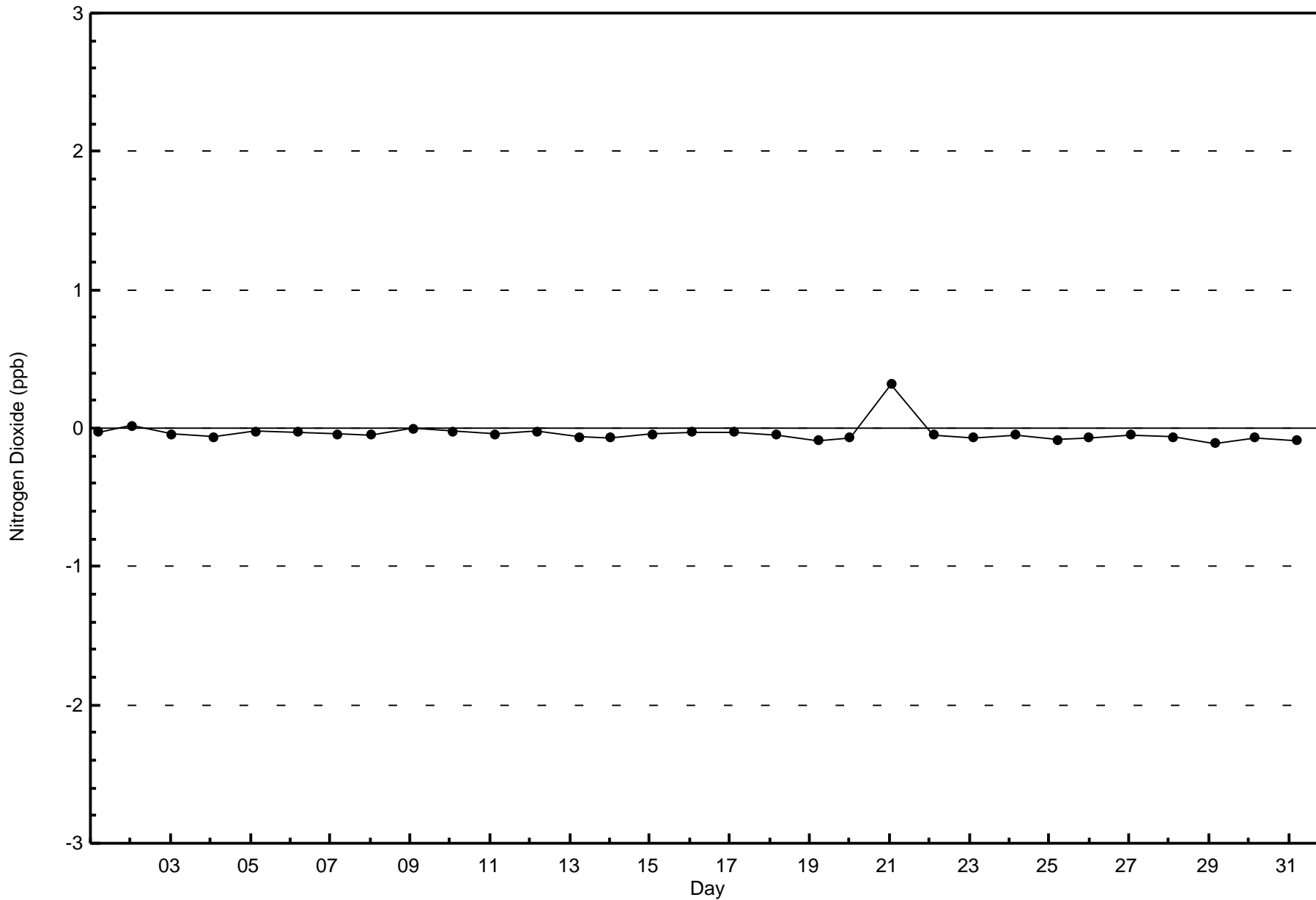
Wood Buffalo Environmental Association  
Wind Rose Dec 2017

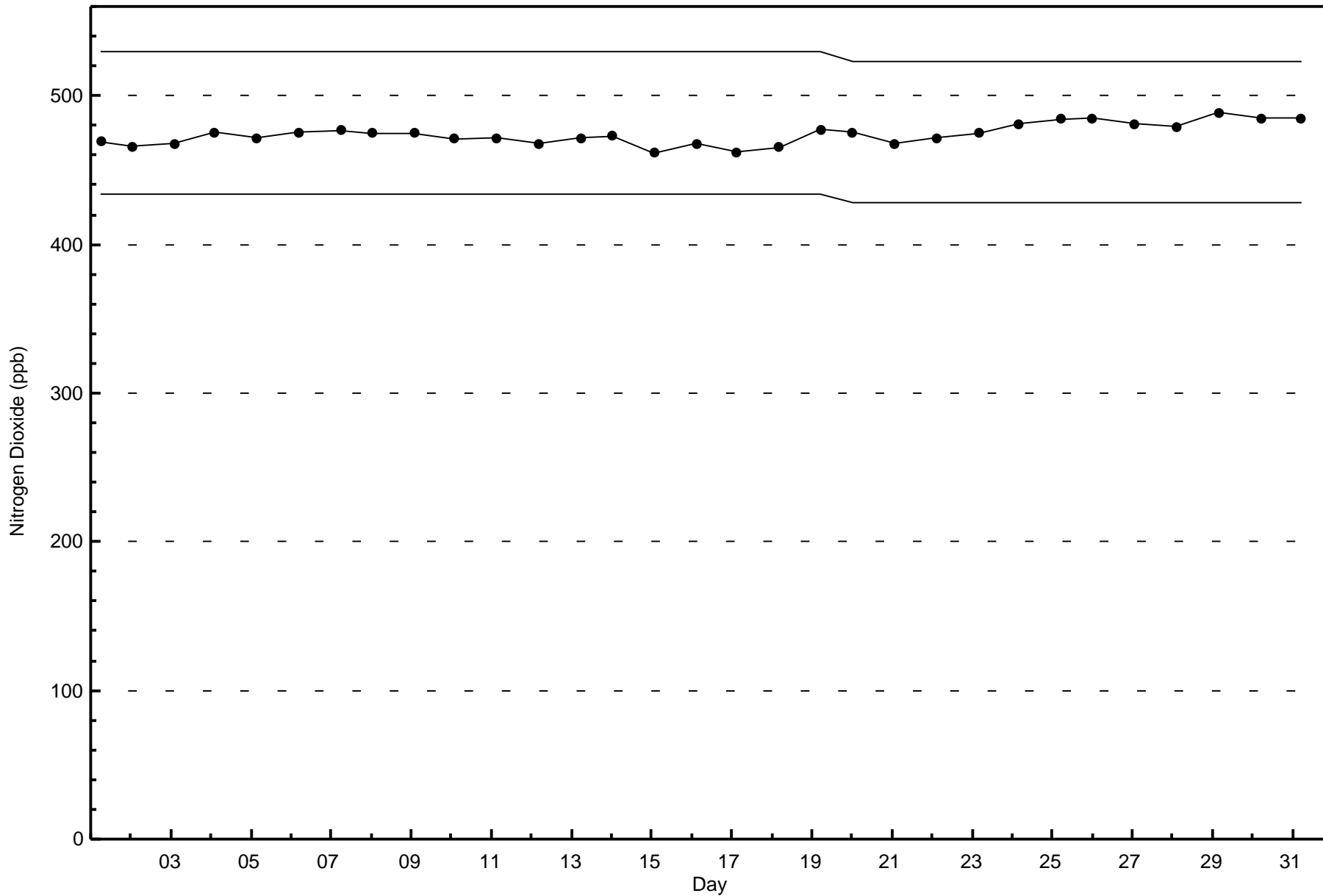
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Sawbones Bay (AMS 505)



Total Number of Valid Hours: 709









**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

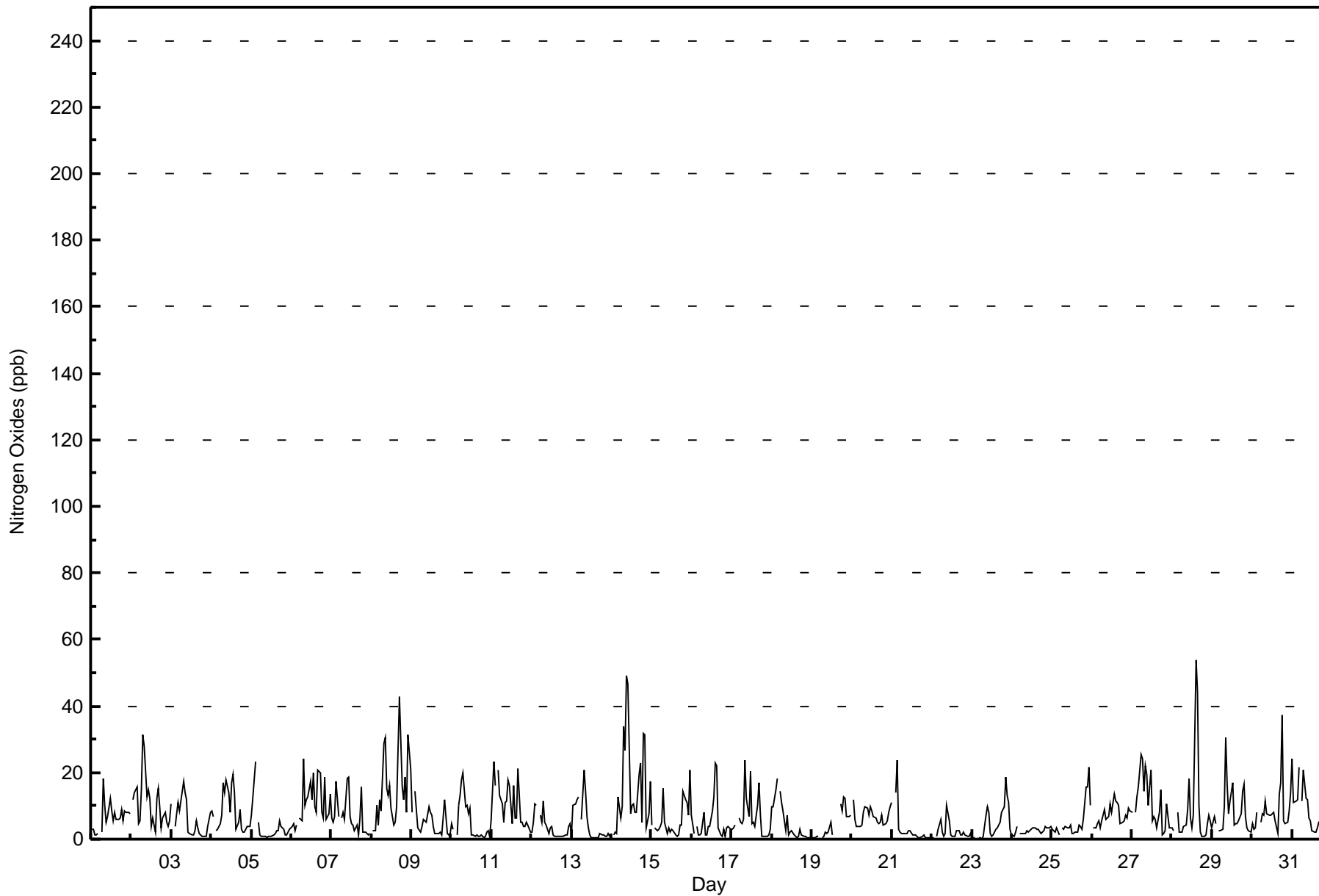
**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Sawbones Bay - December 2017**

Maximum Value: 54 ppb on Dec 28 15:00		Maximum Daily Average: 16.3 ppb on Dec 14		Hours in Service: 744																																												
Minimum Value: 0 ppb on Dec 23 07:00		Minimum Daily Average: 2.2 ppb on Dec 22		Hours of Data: 709																																												
Maximum Diurnal Average: 11.7 ppb at hour 8		Minimum Diurnal Average: 4.7 ppb at hour 22		Hours of Missing Data: 35																																												
Monthly Average: 7.0 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 5 Q <sub>3</sub> = 10 P <sub>90</sub> = 16 P <sub>99</sub> = 32		Hours of Calibration: 35																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	3	3	1	1	2	Z	2	18	10	5	7	12	9	6	8	6	6	7	9	6	8	8	8	7	6.6	18																						
2-Dec	Z	12	14	16	5	5	15	31	28	13	15	12	4	6	2	12	15	10	4	6	8	5	4	6	10.8	31																						
3-Dec	10	Z	4	8	11	8	12	17	14	12	2	2	1	1	2	6	3	2	1	1	1	1	4	8	5.7	17																						
4-Dec	9	7	Z	3	3	5	7	17	14	18	14	8	17	19	14	3	5	9	3	2	2	4	4	4	8.2	19																						
5-Dec	7	12	23	Z	5	1	1	1	1	1	1	1	1	1	2	2	2	6	4	3	1	1	2	3	3.6	23																						
6-Dec	4	5	3	4	Z	6	5	24	10	12	13	17	12	20	10	8	21	20	8	6	19	6	8	13	11.0	24																						
7-Dec	6	5	7	17	7	Z	6	8	6	18	18	7	5	4	3	4	1	6	16	2	2	2	1	2	6.7	18																						
8-Dec	Z	3	2	10	4	12	8	29	30	15	13	16	9	4	5	10	27	43	16	12	19	8	31	21	15.2	43																						
9-Dec	8	Z	14	9	3	2	4	6	6	5	10	8	7	4	2	2	2	2	1	6	12	2	1	2	5.1	14																						
10-Dec	5	3	Z	1	10	13	18	20	10	10	7	9	1	1	1	1	1	1	1	1	1	2	3	1	5.2	20																						
11-Dec	5	23	16	Z	21	13	11	5	11	11	18	16	4	16	6	6	21	5	5	4	4	5	4	2	10.2	23																						
12-Dec	2	5	10	10	Z	7	5	11	5	4	2	3	4	1	1	1	1	1	1	1	1	1	4	5	3.8	11																						
13-Dec	1	10	10	12	13	Z	6	21	14	7	3	1	1	1	0	0	1	2	1	1	1	1	2	1	4.8	21																						
14-Dec	Z	1	2	2	13	6	10	34	27	49	46	8	10	11	8	8	19	23	5	32	31	3	8	18	16.3	49																						
15-Dec	4	Z	3	3	3	4	5	15	5	2	3	2	3	3	1	1	1	4	4	14	12	11	7	21	5.8	21																						
16-Dec	7	2	Z	4	1	1	2	8	1	1	4	4	8	13	23	22	3	1	1	3	1	3	4	3	5.3	23																						
17-Dec	3	3	4	Z	6	5	5	6	24	12	7	20	5	5	4	10	17	7	1	1	1	1	1	3	6.5	24																						
18-Dec	10	10	15	18	Z	14	11	8	2	7	1	2	2	1	1	1	1	3	1	1	1	1	0	0	4.9	18																						
19-Dec	0	0	1	1	1	Z	1	1	2	2	2	5	1	C	C	C	C	11	9	13	12	7	7	7	4.3	13																						
20-Dec	Z	12	6	4	4	4	4	8	10	9	7	10	9	7	6	5	5	5	7	4	5	6	8	10	6.7	12																						
21-Dec	11	Z	14	24	3	2	2	2	2	2	3	3	1	1	1	1	1	1	1	1	0	0	0	0	3.3	24																						
22-Dec	0	1	Z	1	3	6	2	1	2	10	6	1	1	1	1	3	2	1	1	2	1	1	1	2	2.2	10																						
23-Dec	0	0	0	Z	0	0	0	1	7	10	8	2	1	1	3	3	4	5	8	10	19	13	11	3	4.8	19																						
24-Dec	1	1	2	4	Z	2	2	2	2	3	2	3	3	3	3	3	3	2	2	3	4	3	3	4	2.6	4																						
25-Dec	3	3	2	3	1	Z	3	3	4	3	3	4	2	2	2	2	4	4	3	6	16	16	22	10	5.3	22																						
26-Dec	Z	3	3	5	5	3	5	9	6	6	7	11	8	13	11	11	10	5	5	5	7	6	9	8	7.2	13																						
27-Dec	8	Z	8	13	16	25	24	14	22	19	10	21	5	7	6	3	8	15	1	2	2	11	3	3	10.8	25																						
28-Dec	3	3	Z	8	2	2	2	4	4	9	18	6	3	7	54	44	10	2	1	1	1	5	7	6	8.8	54																						
29-Dec	3	7	5	Z	3	3	3	10	30	16	8	11	17	4	5	4	6	8	14	16	7	4	2	2	8.1	30																						
30-Dec	5	3	3	8	Z	5	8	7	12	7	7	7	8	8	5	2	14	17	37	5	5	5	8	14	8.7	37																						
31-Dec	24	11	12	12	22	Z	11	21	12	12	6	5	3	2	2	3	5	5	3	4	5	5	5	5	8.6	24																						
																								5.6	5.7	7.2	7.7	6.4	6.3	6.4	11.7	10.7	10.1	8.8	7.7	5.3	5.8	6.4	6.3	7.3	7.4	5.6	5.6	6.7	4.7	5.9	6.3	Diurnal Average
																								24	23	23	24	22	25	24	34	30	49	46	21	17	20	54	44	27	43	37	32	31	16	31	21	Diurnal Maximum
Z - zerospan																								C - Calibration																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	670	94.50	94.50
21 - 40	34	4.80	99.29
41 - 80	5	0.71	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Sawbones Bay - December 2017**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	16	16	1	0	2	2	4	10	48	74	64	51	103	143	91	45	670
21 - 40	0	0	0	0	0	0	0	1	4	4	5	1	18	1	0	0	34
11 - 80	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	1	5
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	16	16	1	0	2	2	4	11	54	79	69	52	121	144	92	46	709

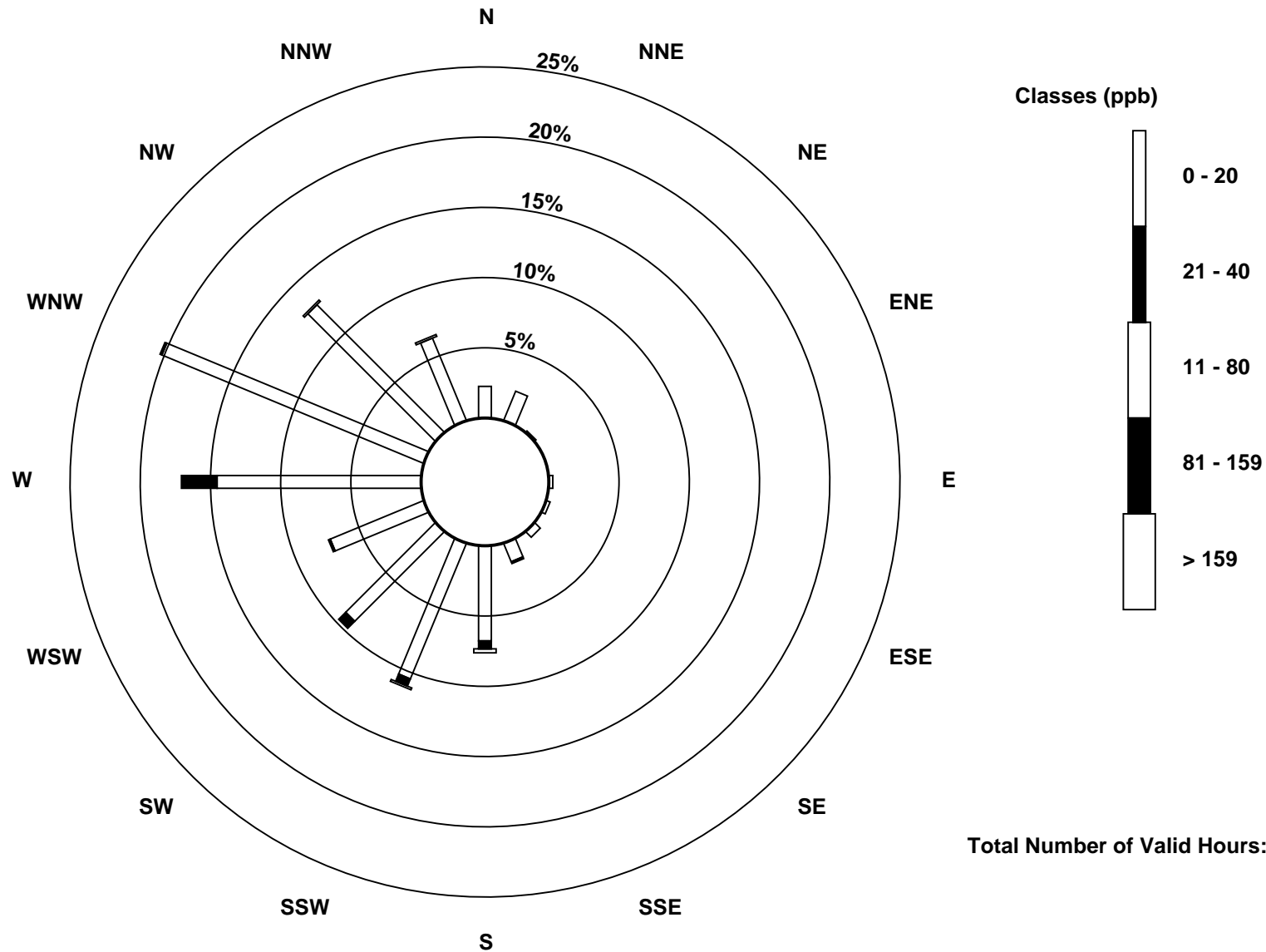
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

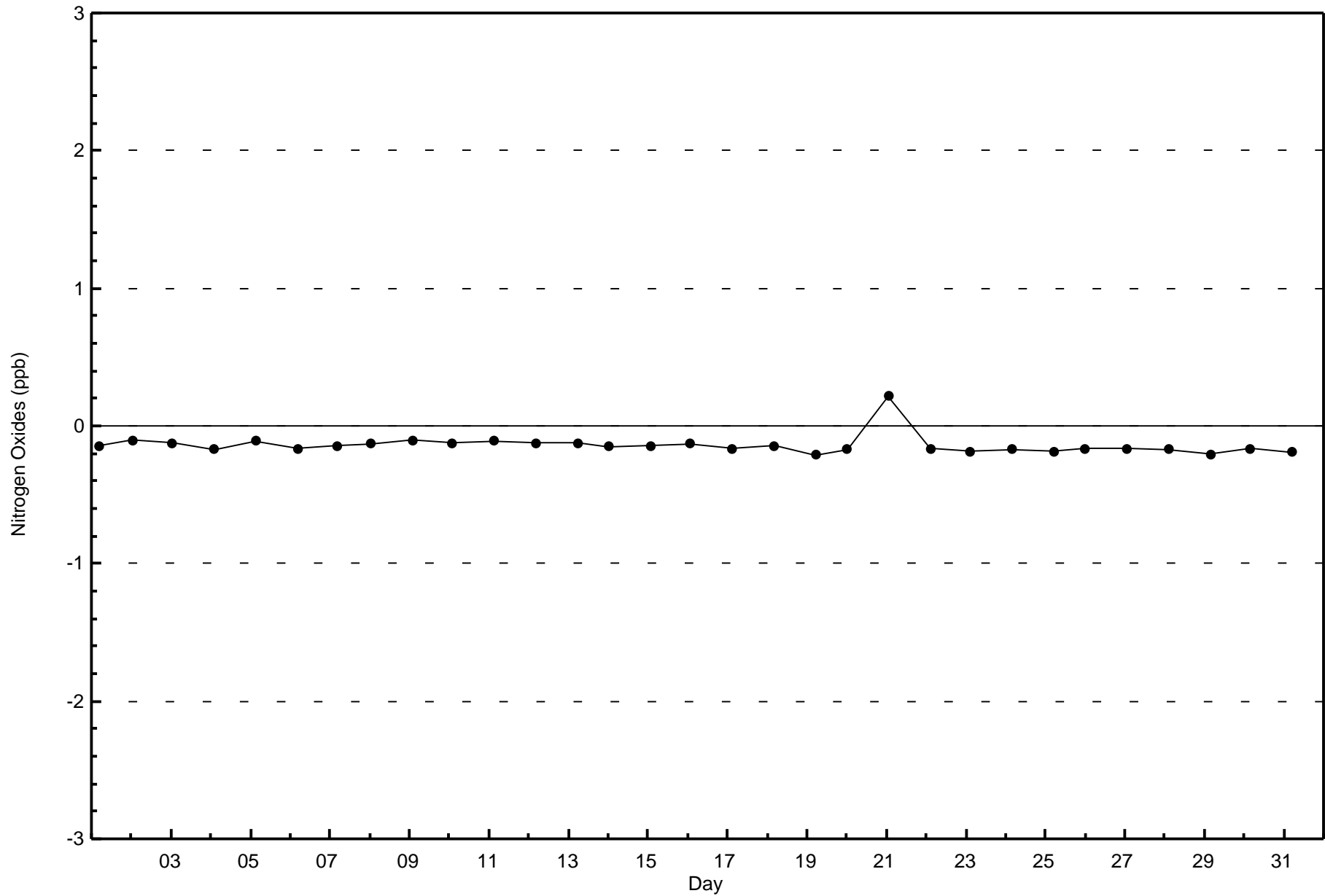
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Sawbones Bay (AMS 505)



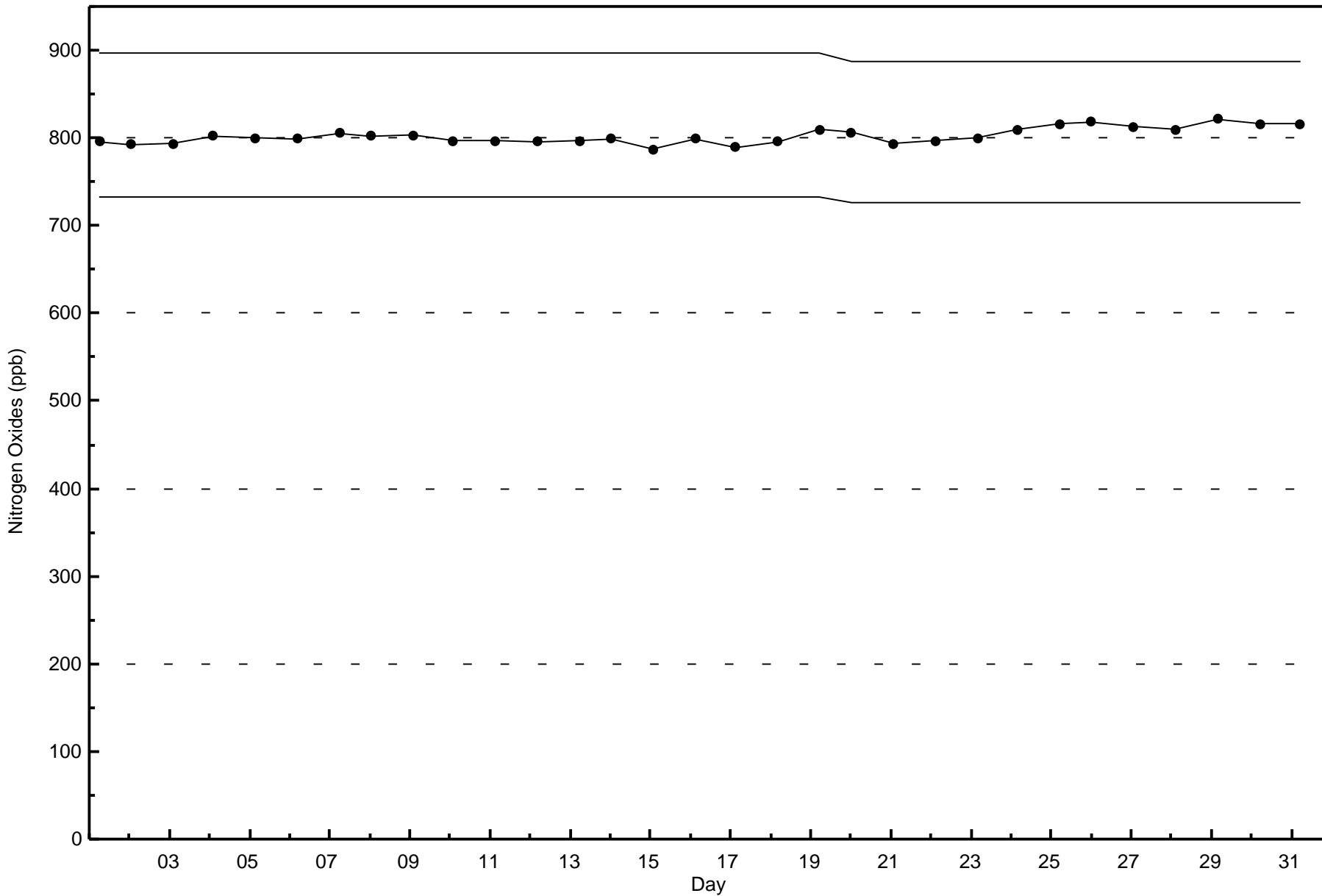


**Wood Buffalo Environmental Association**  
**Zero Responses**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Sawbones Bay - December 2017**









**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

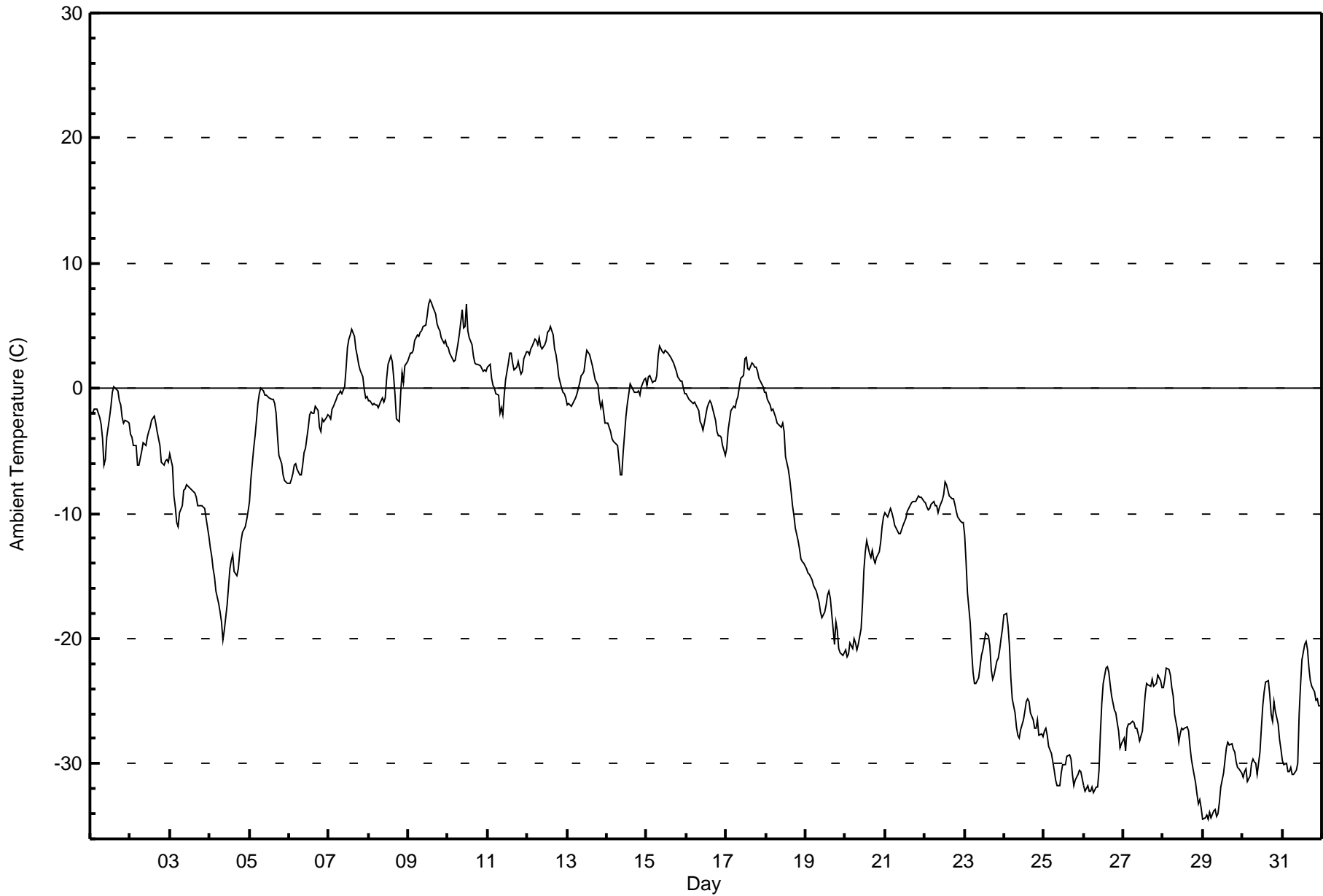
**Ambient Temperature (AT) - C**  
**Sawbones Bay - December 2017**

Maximum Value: 7.1 C on Dec 9 14:00		Maximum Daily Average: 4.6 C on Dec 9		Hours in Service: 744																						
Minimum Value: -34.4 C on Dec 29 04:00		Minimum Daily Average: -31.6 C on Dec 29		Hours of Data: 744																						
Maximum Diurnal Average: -8.7 C at hour 15		Minimum Diurnal Average: -11.8 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -10.66 C		Percentiles: P <sub>1</sub> = -33.9 P <sub>10</sub> = -29.2 Q <sub>1</sub> = -22.5 Median = -7.2 Q <sub>3</sub> = -0.4 P <sub>90</sub> = 2.6 P <sub>99</sub> = 5.6		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-1.9	-2.0	-1.7	-1.6	-1.7	-2.4	-2.9	-4.0	-6.1	-5.6	-3.8	-2.4	-1.4	-0.3	0.1	0.0	-0.2	-1.0	-1.3	-2.4	-2.7	-2.6	-2.7	-2.8	-2.2	0.1
2-Dec	-3.7	-3.9	-4.6	-4.6	-6.1	-6.2	-5.6	-5.0	-4.4	-4.5	-3.9	-3.4	-3.2	-2.6	-2.3	-2.7	-3.4	-4.0	-4.5	-5.9	-6.1	-5.8	-5.7	-5.9	-4.5	-2.3
3-Dec	-5.2	-6.2	-8.6	-9.5	-10.7	-11.1	-9.9	-9.4	-8.1	-8.0	-7.7	-7.8	-8.0	-8.1	-8.2	-8.4	-8.7	-9.4	-9.4	-9.4	-9.5	-9.6	-10.4	-11.9	-8.9	-5.2
4-Dec	-12.7	-13.4	-14.4	-15.1	-16.2	-17.2	-17.9	-18.6	-20.2	-19.3	-17.3	-15.8	-14.4	-13.8	-13.3	-14.7	-14.9	-14.4	-13.2	-12.1	-11.5	-11.0	-10.5	-9.8	-14.7	-9.8
5-Dec	-9.1	-7.2	-4.8	-3.8	-2.6	-1.2	-0.4	0.0	-0.2	-0.5	-0.6	-0.7	-0.8	-0.8	-0.9	-1.2	-2.0	-3.8	-5.3	-6.0	-6.9	-7.3	-7.4	-7.6	-3.4	0.0
6-Dec	-7.6	-7.2	-6.8	-6.1	-6.0	-6.4	-6.9	-6.9	-6.2	-5.1	-4.7	-3.1	-2.1	-1.9	-1.9	-2.0	-1.4	-1.8	-3.1	-3.5	-2.4	-2.6	-2.4	-2.1	-4.2	-1.4
7-Dec	-2.2	-2.4	-1.7	-1.5	-0.8	-0.5	-0.4	-0.2	-0.5	0.2	1.6	3.3	3.9	4.3	4.7	4.2	3.1	2.6	1.9	1.5	0.9	0.0	-0.7	-0.7	0.9	4.7
8-Dec	-1.0	-1.0	-1.3	-1.2	-1.3	-1.3	-1.6	-1.0	-0.8	-1.1	-0.8	0.8	2.0	2.6	2.1	1.0	-0.5	-2.5	-2.6	-0.4	1.2	0.4	1.8	2.2	-0.2	2.6
9-Dec	2.5	2.8	2.8	3.0	3.8	4.2	4.2	4.5	4.6	5.0	5.0	5.8	6.7	7.1	6.9	6.5	6.0	5.2	4.8	4.6	4.1	3.6	3.9	3.3	4.6	7.1
10-Dec	3.2	2.8	2.6	2.1	2.3	2.9	3.6	4.4	6.3	4.8	5.0	6.8	4.6	4.1	3.4	2.6	2.1	1.9	1.9	1.9	1.6	1.4	1.4	1.3	3.1	6.8
11-Dec	1.7	1.9	0.9	0.2	0.0	-0.4	-0.6	-2.0	-1.6	-2.1	-0.5	0.7	2.1	2.8	2.8	2.0	1.4	1.7	2.2	1.6	1.1	1.3	2.3	2.9	0.9	2.9
12-Dec	2.9	2.7	3.2	3.4	3.9	3.8	3.4	4.0	3.4	3.2	3.5	3.9	4.5	4.6	4.9	4.3	3.2	2.7	2.0	0.9	0.1	-0.3	-0.4	-0.7	2.8	4.9
13-Dec	-1.3	-1.2	-1.5	-1.2	-0.9	-0.7	-0.4	0.5	1.0	1.2	1.4	2.2	3.1	2.7	2.3	1.8	1.3	0.7	0.3	-0.9	-1.6	-1.1	-1.9	-2.8	0.1	3.1
14-Dec	-2.7	-3.1	-3.4	-4.0	-4.3	-4.4	-4.6	-5.6	-6.9	-6.9	-5.1	-2.2	-1.2	-0.5	0.4	0.2	-0.3	-0.3	-0.2	-0.5	0.2	0.7	0.8	0.8	-2.3	0.8
15-Dec	0.2	0.9	1.0	0.5	0.6	0.6	1.1	2.6	3.3	3.0	2.8	3.0	3.0	2.8	2.5	2.2	2.0	1.7	1.4	1.0	0.5	0.6	0.0	-0.4	1.5	3.3
16-Dec	-0.4	-0.9	-1.0	-1.1	-1.2	-1.1	-1.3	-1.8	-2.7	-2.9	-3.3	-2.8	-1.6	-1.2	-1.0	-1.2	-1.7	-2.5	-3.5	-3.8	-3.8	-3.9	-4.6	-5.3	-2.3	-0.4
17-Dec	-4.8	-3.4	-2.6	-1.8	-1.4	-1.6	-1.0	-0.6	0.2	0.8	1.0	2.4	2.5	1.6	1.5	2.0	2.0	1.7	1.7	1.4	0.8	0.3	0.1	-0.3	0.1	2.5
18-Dec	-0.3	-0.9	-1.3	-1.8	-1.7	-2.0	-2.3	-2.8	-3.0	-3.1	-2.8	-3.4	-5.5	-6.5	-7.2	-8.3	-9.4	-10.2	-11.2	-12.1	-12.8	-13.6	-13.8	-14.0	-6.2	-0.3
19-Dec	-14.4	-14.7	-14.8	-15.1	-15.3	-15.8	-16.2	-16.7	-17.1	-17.9	-18.3	-17.9	-17.3	-16.5	-16.1	-16.8	-18.0	-20.4	-18.7	-19.3	-20.8	-21.2	-21.4	-21.1	-17.6	-14.4
20-Dec	-20.9	-21.4	-21.2	-20.4	-20.7	-20.0	-20.3	-20.8	-20.5	-19.2	-17.2	-14.5	-13.0	-12.2	-13.2	-13.5	-13.0	-13.6	-14.0	-13.5	-13.1	-12.3	-11.0	-10.3	-16.2	-10.3
21-Dec	-9.9	-10.3	-9.9	-9.6	-9.9	-10.4	-11.0	-11.4	-11.6	-11.6	-11.3	-10.9	-10.4	-9.8	-9.5	-9.4	-9.2	-9.0	-9.1	-8.8	-8.6	-8.7	-8.7	-9.0	-9.9	-8.6
22-Dec	-9.2	-9.5	-9.7	-9.6	-9.3	-9.0	-9.3	-9.4	-10.0	-9.5	-9.0	-8.5	-7.5	-7.7	-8.2	-8.5	-8.8	-8.9	-9.3	-9.8	-10.3	-10.6	-10.8	-10.7	-9.3	-7.5
23-Dec	-11.8	-13.8	-16.3	-18.8	-21.0	-22.7	-23.6	-23.6	-23.2	-22.2	-21.4	-20.9	-20.2	-19.5	-19.8	-20.6	-22.5	-23.2	-22.9	-21.8	-21.6	-20.9	-20.0	-19.2	-20.5	-11.8
24-Dec	-18.1	-17.9	-19.0	-20.5	-23.1	-24.8	-25.9	-27.0	-27.7	-27.9	-27.3	-26.5	-25.9	-25.1	-24.8	-25.0	-26.0	-26.5	-27.1	-27.2	-26.5	-27.8	-27.6	-27.8	-25.1	-17.9
25-Dec	-27.4	-27.2	-27.7	-28.7	-29.2	-29.8	-30.6	-31.3	-31.7	-31.7	-30.7	-30.1	-30.1	-29.4	-29.3	-29.7	-30.9	-31.7	-31.3	-30.8	-30.5	-30.6	-31.2	-30.1	-27.2	-17.9
26-Dec	-31.8	-32.2	-31.7	-32.2	-32.2	-31.9	-32.3	-31.9	-31.8	-30.6	-27.5	-25.1	-23.5	-22.4	-22.2	-22.7	-23.7	-24.5	-25.7	-25.9	-26.8	-27.4	-28.8	-28.4	-28.1	-22.2
27-Dec	-28.0	-28.9	-27.2	-26.8	-26.8	-26.6	-26.7	-27.2	-27.2	-27.6	-28.2	-27.4	-25.9	-24.4	-23.6	-23.7	-23.8	-23.2	-23.8	-23.7	-23.6	-23.0	-23.4	-24.0	-25.6	-23.0
28-Dec	-23.9	-23.2	-22.3	-22.4	-22.9	-23.9	-24.6	-26.1	-27.3	-28.2	-27.6	-27.1	-27.3	-27.2	-27.1	-27.4	-28.7	-29.6	-30.3	-31.5	-32.4	-33.2	-32.9	-33.5	-27.5	-22.3
29-Dec	-34.4	-34.4	-34.1	-34.4	-33.9	-34.3	-33.8	-33.6	-34.3	-34.0	-33.1	-31.8	-30.8	-29.7	-28.7	-28.2	-28.5	-28.4	-28.8	-29.1	-29.9	-30.3	-30.5	-30.7	-31.6	-28.2
30-Dec	-31.1	-30.6	-30.4	-31.4	-31.0	-29.9	-29.6	-29.9	-29.9	-30.8	-29.1	-27.2	-25.3	-24.2	-23.5	-23.4	-24.5	-26.1	-26.6	-25.0	-25.9	-26.8	-28.1	-28.9	-27.9	-23.4
31-Dec	-29.7	-30.1	-29.9	-30.7	-30.6	-30.3	-30.8	-30.8	-30.5	-30.0	-26.0	-23.6	-21.6	-20.4	-20.3	-20.9	-22.3	-23.4	-23.8	-24.2	-24.9	-24.8	-25.3	-25.4	-26.3	-20.3
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Sawbones Bay - December 2017**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	220	29.57	29.57
-20 - 0	361	48.52	78.09
0 - 10	163	21.91	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**

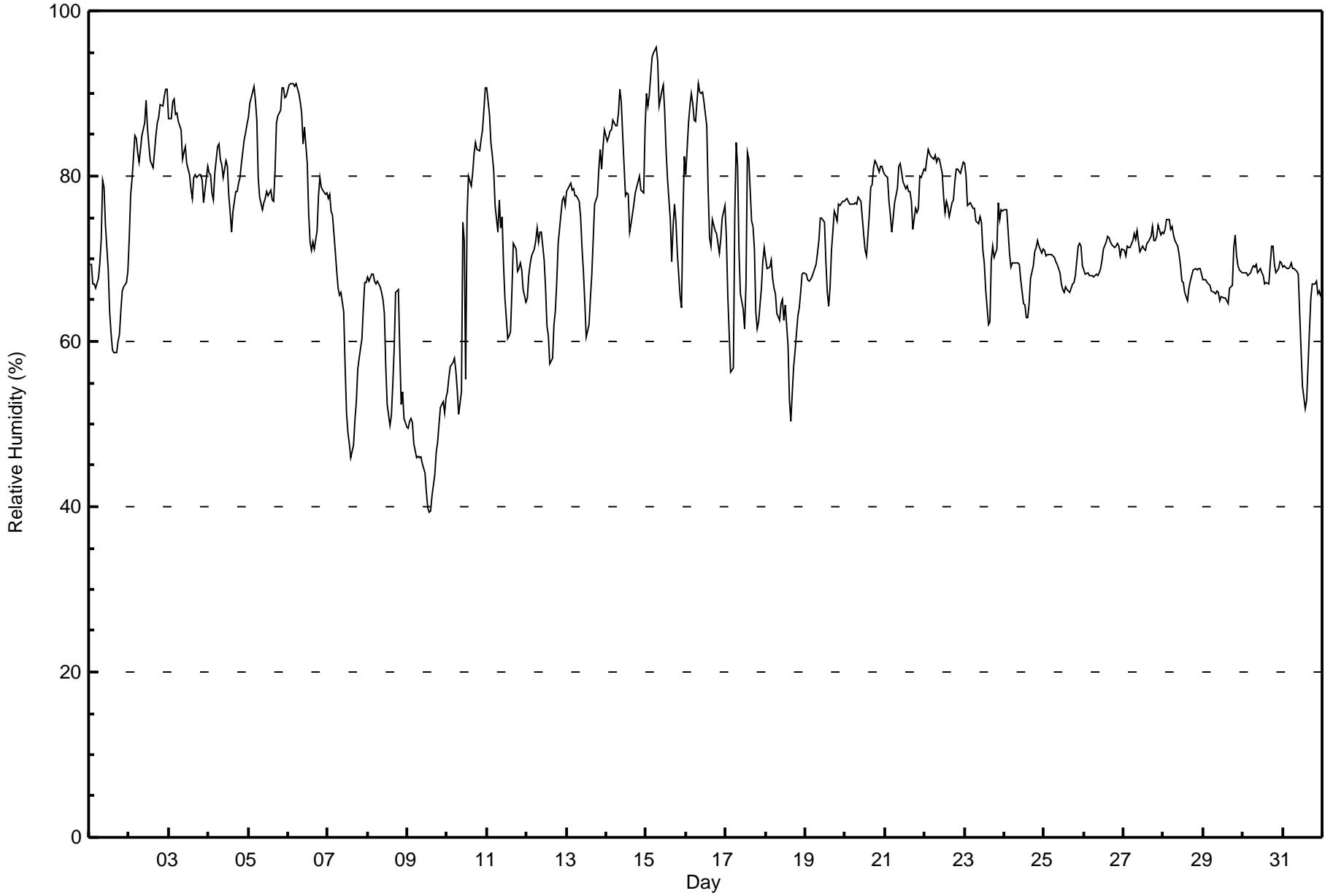
**Relative Humidity (RH) - %  
Sawbones Bay - December 2017**

<b>Maximum Value: 96 % on Dec 15 07:00</b> <b>Maximum Daily Average: 84.6 % on Dec 2</b>																			<b>Hours in Service: 744</b> <b>Hours of Data: 744</b> <b>Hours of Missing Data: 0</b> <b>Hours of Calibration: 0</b> <b>Percent Operational Time: 100.0</b>							
<b>Minimum Value: 39 % on Dec 9 14:00</b> <b>Minimum Daily Average: 46.7 % on Dec 9</b> <b>Maximum Diurnal Average: 74.9 % at hour 2</b> <b>Minimum Diurnal Average: 66.9 % at hour 15</b> <b>Monthly Average: 72.4 %</b> <b>Percentiles: P<sub>1</sub> = 45 P<sub>10</sub> = 60 Q<sub>1</sub> = 67 Median = 72 O<sub>3</sub> = 79 P<sub>90</sub> = 86 P<sub>99</sub> = 91</b>																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	69	69	67	67	66	68	69	72	79	79	74	69	64	61	59	59	59	60	61	64	66	67	67	68	66.8	79
2-Dec	73	78	80	85	85	83	82	83	85	86	89	86	84	82	81	83	85	86	87	89	88	90	90	91	84.6	91
3-Dec	87	87	89	89	87	88	87	86	82	83	84	82	80	79	77	80	80	80	80	80	79	77	78	81	82.6	89
4-Dec	80	80	78	77	80	83	84	82	81	80	82	81	78	76	73	76	78	78	79	80	82	84	85	86	80.2	86
5-Dec	87	89	90	91	89	87	80	77	76	77	77	78	78	78	77	77	81	87	87	88	91	91	89	90	83.8	91
6-Dec	91	91	91	91	91	91	90	89	88	84	86	82	75	72	71	72	71	73	78	80	79	78	78	78	82.1	91
7-Dec	77	78	76	75	71	68	66	66	66	64	57	51	49	48	46	47	51	53	57	58	60	64	67	67	61.7	78
8-Dec	68	67	68	68	67	67	67	67	66	65	63	57	52	50	51	55	59	66	66	59	52	54	51	50	60.7	68
9-Dec	49	50	51	50	48	46	46	46	46	45	44	42	40	39	40	41	44	47	48	50	52	53	51	53	46.7	53
10-Dec	54	56	57	57	58	56	54	51	54	74	72	55	75	80	79	80	83	84	83	83	84	86	88	91	70.6	91
11-Dec	91	88	84	83	81	77	73	77	74	75	69	65	60	61	61	66	72	71	68	69	70	69	66	65	72.2	91
12-Dec	65	68	69	70	71	72	74	72	73	73	70	66	62	61	57	58	62	64	67	72	75	77	77	76	68.9	77
13-Dec	78	78	79	78	78	78	78	77	75	71	69	65	61	62	65	68	72	77	78	81	83	81	84	86	75.0	86
14-Dec	84	85	85	86	87	86	86	88	91	89	85	78	78	78	73	74	77	78	79	79	80	78	78	86	81.9	91
15-Dec	90	88	90	94	95	95	96	94	89	90	91	88	83	80	75	70	74	77	75	71	65	64	75	82	82.9	96
16-Dec	80	86	88	90	89	87	87	91	90	90	90	89	86	78	73	72	75	73	73	72	71	72	75	76	81.4	91
17-Dec	72	66	61	56	57	75	84	81	71	66	64	62	67	83	82	75	74	71	64	61	62	67	70	71	69.2	84
18-Dec	70	69	69	70	68	66	66	63	63	65	65	63	64	60	53	50	54	57	59	63	64	66	68	68	63.4	70
19-Dec	68	67	67	68	68	68	69	71	72	75	75	74	70	66	64	67	71	76	75	75	77	77	77	77	71.4	77
20-Dec	77	77	77	77	77	77	77	77	78	77	75	73	71	70	75	79	79	81	82	82	80	81	81	80	77.5	82
21-Dec	80	80	77	75	73	75	77	79	81	82	81	79	78	79	78	78	77	73	76	76	76	80	80	81	77.9	82
22-Dec	81	82	83	83	82	82	82	82	82	82	80	77	76	77	76	75	77	77	79	81	81	80	81	82	80.0	83
23-Dec	82	80	76	77	77	76	76	75	74	75	74	71	69	66	62	62	70	72	70	71	77	75	76	76	73.3	82
24-Dec	76	76	73	71	69	69	69	70	69	69	67	65	64	63	63	65	68	69	71	71	72	72	71	71	69.3	76
25-Dec	71	70	70	70	70	70	70	70	69	68	67	66	66	67	66	66	66	67	67	68	72	72	72	69	68.8	72
26-Dec	69	68	68	68	68	68	68	68	68	68	69	70	71	72	73	73	72	72	71	72	72	72	70	71	70.0	73
27-Dec	71	70	72	71	71	72	73	72	73	72	71	71	71	71	72	72	73	74	72	72	73	74	73	73	72.1	74
28-Dec	73	74	75	75	74	74	73	72	72	71	69	67	67	66	65	66	67	68	69	69	69	69	69	68	69.9	75
29-Dec	67	68	67	67	67	66	66	66	66	66	65	65	65	65	65	65	66	67	71	73	70	69	69	68	67.1	73
30-Dec	68	68	68	68	68	69	69	69	69	68	69	68	68	67	67	67	69	71	71	69	68	69	70	70	68.7	71
31-Dec	69	69	69	69	69	69	69	69	68	68	64	59	55	52	53	57	61	65	67	67	67	66	66	65	64.7	69
	74.8	74.9	74.7	74.7	74.2	74.5	74.4	74.2	73.9	74.1	72.8	69.8	68.6	67.9	66.9	67.5	69.9	71.4	72.0	72.3	72.9	73.2	74.0	74.8	Diurnal Average	
	91	91	91	94	95	95	96	94	91	90	91	89	86	83	82	83	85	87	87	89	91	91	90	91	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Sawbones Bay - December 2017**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	3	0.40	0.40
40 - 60	70	9.41	9.81
60 - 80	501	67.34	77.15
80 - 100	170	22.85	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Sawbones Bay - December 2017

Maximum Speed: 34 km/h on Dec 10 13:00	Maximum Daily Speed Average: 20.1 km/h on Dec 9	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 30 16:00	Minimum Daily Speed Average: 1.7 km/h on Dec 4	Hours of Data: 744
Maximum Diurnal Speed Average: 11.5 km/h at hour 12	Minimum Diurnal Speed Average: 8.0 km/h at hour 18	Hours of Missing Data: 0
Monthly Average Velocity: 9.5 km/h 276.6 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 6 Q <sub>1</sub> = 8 Median = 12 Q <sub>3</sub> = 17 P <sub>90</sub> = 22 P <sub>99</sub> = 29	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	SW15	SW15	SW19	SW20	WSW21	WSW17	WSW16	SSW9	SSE4	SE5	SSE6	SSW8	S8	SE6	S7	SSE9	SSE12	S6	SSW8	S8	SSW10	SW11	SW11	SW14	SSW9.6	WSW21		
2-Dec	WSW13	WSW14	WSW15	W13	SW9	SW8	WSW13	W15	W16	W14	W15	W11	WNW12	W9	SW8	WSW7	WSW10	SW6	SW11	S8	SSW9	S8	S8	SSW8	WSW9.6	W16		
3-Dec	WSW10	SW9	SSW5	SSW10	SSW8	S7	S6	SSW8	WSW14	W19	WNW17	WNW20	NW18	NW15	WNW15	WNW13	WNW16	NW13	NNW9	NNW8	NW9	NNW12	N9	NNE10	WNW7.9	WNW20		
4-Dec	NNE9	NNE11	NNE12	N9	NNE5	NNW4	NW7	NNW4	NW4	WNW1	W6	WSW5	S5	S8	S5	ESE7	SE7	SSE8	SSE11	S13	S11	SSE9	S10	S10	SSE1.7	S13		
5-Dec	S10	WSW13	W18	W18	WNW15	WNW20	WNW23	NW25	NW24	NW21	NW23	NW24	NW23	NNW22	NNW23	NNW24	N17	NNE17	NNE16	NNE12	NNE11	N8	NNW10	NNW6	NW14.1	NW25		
6-Dec	NNW5	NNW3	SSW4	WSW4	SW3	SW7	SW7	SW9	SSW10	SW12	S8	SW11	SW12	SW14	WSW17	WSW19	W24	W26	WSW16	WSW14	W20	W17	W17	W20	WSW11.2	W26		
7-Dec	W17	W16	W20	W25	W23	W21	W22	W21	W18	W22	W24	W22	WNW20	WNW17	WNW16	WNW16	WNW14	WNW14	WNW14	WNW14	W16	WNW23	WNW22	WNW21	WNW18	WNW20	W19.3	W25
8-Dec	WNW19	WNW16	WNW14	W18	W16	W18	W17	W12	W16	W17	W13	W11	WSW8	SW10	SSW11	SSW11	SSW10	SSW8	SSW10	WSW15	WSW17	WSW14	W17	W24	W12.8	W24		
9-Dec	W23	W22	W21	W18	WNW21	WNW22	WNW20	W21	W23	W23	W27	W27	W21	WNW22	WNW17	WNW20	WNW20	WNW14	WNW17	W17	W16	WNW18	WNW22	WNW18	W20.1	W27		
10-Dec	W18	WNW14	W15	WNW13	WSW10	WSW14	WSW17	W18	W23	WSW11	SW18	W30	WNW34	WNW34	NW32	NW28	NW24	NW20	NW18	NNW15	NNW10	NW6	NW8	WNW5	WNW16.4	WNW34		
11-Dec	W6	W12	W13	W10	W13	W13	W14	WNW10	W12	SW7	WSW11	WSW10	SW7	S8	SSW9	SW11	SSW9	SSW11	SW11	SSW11	SW12	SW14	SW13	WSW17	WSW9.7	WSW17		
12-Dec	WSW19	WSW19	WSW18	W15	W17	W15	WNW18	W19	WNW16	WNW22	WNW17	WNW16	WNW18	WNW16	NW21	NW21	NW19	NW18	NW17	NW14	NW12	NW11	WNW13	W17	WNW15.6	WNW22		
13-Dec	WNW17	W14	W11	W10	W15	W17	WNW16	W16	W19	W22	WNW20	WNW21	NW26	NW25	NNW23	NNW21	NNW22	NNW15	NW12	NW8	WNW9	WNW17	WNW17	WNW11	WNW15.5	NW26		
14-Dec	WNW15	WNW16	WNW15	WNW14	W16	W15	W11	SW7	SSW6	S8	S8	SSW9	SSW9	SSW7	SSW8	SSW8	SSE8	S9	S9	S8	SSW9	SW11	WSW8	WSW10	SW7.3	WNW16		
15-Dec	S4	WSW9	W7	SW7	SW9	SW6	SW8	W18	WNW24	WNW25	WNW24	WNW27	WNW28	WNW25	WNW22	WNW17	WNW17	W15	WNW18	W23	W19	W22	W24	W20	W16.3	WNW28		
16-Dec	W21	WNW21	W19	W18	WNW23	WNW22	WNW19	NW11	NNW12	NNW8	NNE5	NNW4	W14	WSW17	W19	W15	SW14	SW19	SW17	WSW18	SW15	SW12	SSW11	SSW11	W12.3	WNW23		
17-Dec	S13	SSW15	SSW18	SSW18	SW17	SW14	SW16	SW19	SW19	WSW23	WSW20	W23	W27	WNW26	WNW24	W25	W24	WNW24	WNW29	WNW31	WNW25	WNW21	WNW21	W19	W17.9	WNW31		
18-Dec	W21	W21	W21	W19	W21	W22	W19	WNW20	WNW22	WNW17	NW25	NW29	NNW22	NW24	NW23	NW25	NW21	NW19	NW15	NW14	NW20	NW18	NNW19	NNW19	WNW18.9	NW29		
19-Dec	NNW17	NNW16	NW16	NW16	NW16	NW14	NNW13	NW11	NW9	NW8	NNW6	W5	NNW5	NW6	W5	WSW6	SSW7	S2	SW6	SSW5	SW5	SSW7	SSW6	SSW8	NW6.1	NNW17		
20-Dec	SSW7	SSW8	S5	SSW5	S7	S7	S8	S6	S6	SSW5	S7	SSW7	SW11	SW11	SW12	S9	SSW9	SSW8	SSW8	SSW11	SSW14	SSW10	SSW11	SSW10	SSW8.2	SSW14		
21-Dec	SW12	SW13	WSW19	W23	WNW22	WNW20	NW16	NW15	NW16	NW14	NW15	NW13	NW12	NW16	NW16	NW15	NW15	NW13	WNW15	WNW18	WNW20	WNW18	NW16	NW16	WNW14.4	W23		
22-Dec	NW13	WNW14	WNW18	WNW17	WNW15	W16	WNW16	WNW19	WNW16	W17	W17	WNW20	WNW24	WNW25	WNW24	WNW21	WNW19	WNW19	WNW17	WNW14	WNW17	WNW17	WNW15	WNW13	WNW17.6	WNW25		
23-Dec	NNE12	NNE14	NNE13	NE6	NNE6	NNE3	NE2	SSE2	SSE2	E2	SE2	N3	NNE5	NNW7	NNW6	N6	NNE4	N5	WNW9	WNW15	W13	W15	WNW17	WNW15	NNW4.7	WNW17		
24-Dec	NW12	NNW13	N18	N21	N21	N17	N14	N11	NNW11	NW9	WNW13	NW16	NW16	NNW14	NW13	NW11	NW9	NW11	NW5	WNW7	W11	WNW10	WNW12	WNW12	NNW11.7	N21		
25-Dec	WNW13	WNW11	NW7	NW5	N4	N6	NNW8	N7	NNW7	NNW6	NNW8	NNW5	NNW7	N6	NNW6	NW7	WNW11	NW8	NW6	WNW9	W9	W14	W12	W10	NW6.9	W14		
26-Dec	SW7	SSW8	SSW5	S7	SSW8	SSW7	S7	SSW8	SSW6	S7	SSW7	SW7	WSW7	WSW8	SW8	SW7	SW9	SSW7	SSW6	SSW7	SSW4	S5	SSW3	SSW6	SSW6.5	SW9		
27-Dec	S6	SSW5	SSW7	SW9	SW6	SW7	WSW8	W13	W11	W8	W14	W9	WNW8	WNW7	W8	SW9	WSW12	W14	NW12	NW8	SW5	W8	WSW3	S1	W7.1	W14		
28-Dec	SSW6	SW8	WSW9	WNW12	WNW12	WNW10	NW9	NW7	NW8	NW9	NW12	NNW17	NNW16	NNW14	NNW13	NW9	NW9	NW9	NW7	N5	NNW4	NW6	WNW10	WNW10	NW8.3	NNW17		
29-Dec	NW5	NW7	WNW10	WNW9	WNW10	WNW12	WNW14	WNW11	WNW9	WNW12	WNW12	WNW10	WNW10	WNW7	W7	WSW6	W7	WNW13	WSW11	W11	WSW7	SW9	SW8	SW9	W8.4	WNW14		
30-Dec	SW7	SW8	SW7	SSW6	SW7	WSW5	WSW6	SW7	WSW5	S4	W4	WSW5	WSW4	S1	ESE2	E1	SW3	SSW3	SW5	SW8	SW8	SSW8	SSW7	S5	SW4.7	SW8		
31-Dec	S5	SSW4	S4	S4	S3	SW4	S6	SSE6	S6	S6	SSW7	S8	SSW13	SSW15	SSW13	SSW11	S11	S12	SSW14	SSW13	S12	SSW15	SSW15	SSW18	SSW9.2	SSW18		

W8.4	W8.9	W9.4	W9.9	W9.9	W10.1	W10.1	W9.7	W10.2	W9.9	W10.2	WNW11	WNW11	WNW10	WNW10	WNW9.1	W8.7	WNW8.0	W8.0	W8.5	W8.8	W9.1	W9.3	W9.2	Diurnal Average
W23	W22	W21	W25	W23	WNW22	WNW23	NW25	WNW24	WNW25	W27	W30	WNW34	WNW34	NW32	NW28	W24	W26	WNW29	WNW31	WNW25	W22	W24	W24	Diurnal Maximum

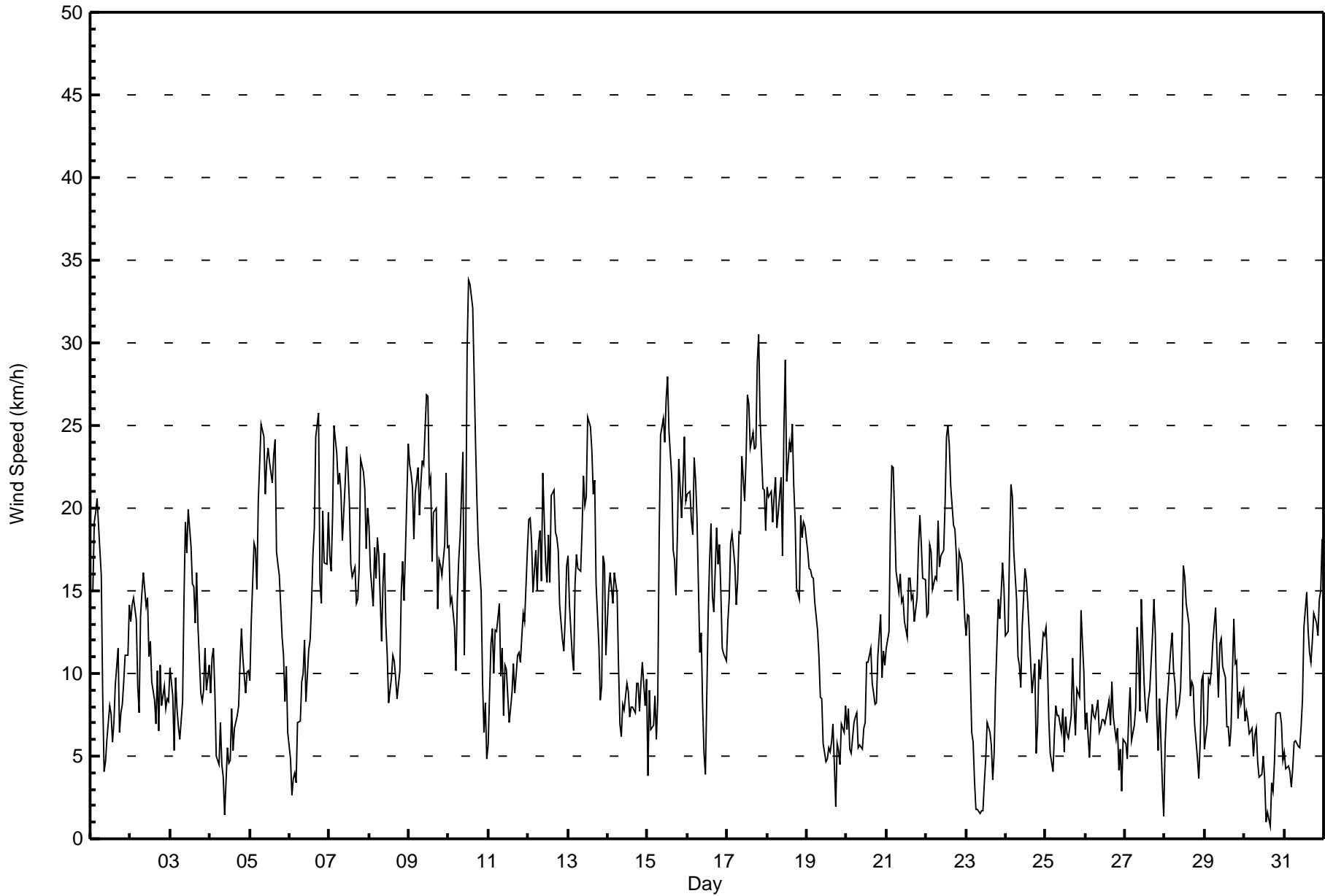
All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Sawbones Bay - December 2017**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h  
Sawbones Bay - December 2017**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	73	9.81	9.81
6 - 11	275	36.96	46.77
12 - 19	273	36.69	83.47
20 - 28	116	15.59	99.06
29 - 38	7	0.94	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Sawbones Bay - December 2017**

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	5	1	0	2	1	2	3	14	11	6	7	3	2	4	8	73
6 - 11	8	5	1	0	0	1	2	7	37	59	46	20	20	23	30	16	275
12 - 19	4	7	0	0	0	0	0	1	3	13	23	26	67	75	39	15	273
20 - 28	2	0	0	0	0	0	0	0	0	0	0	4	40	44	19	7	116
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	1	4	2	0	7
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	18	17	2	0	2	2	4	11	54	83	75	57	131	148	94	46	744

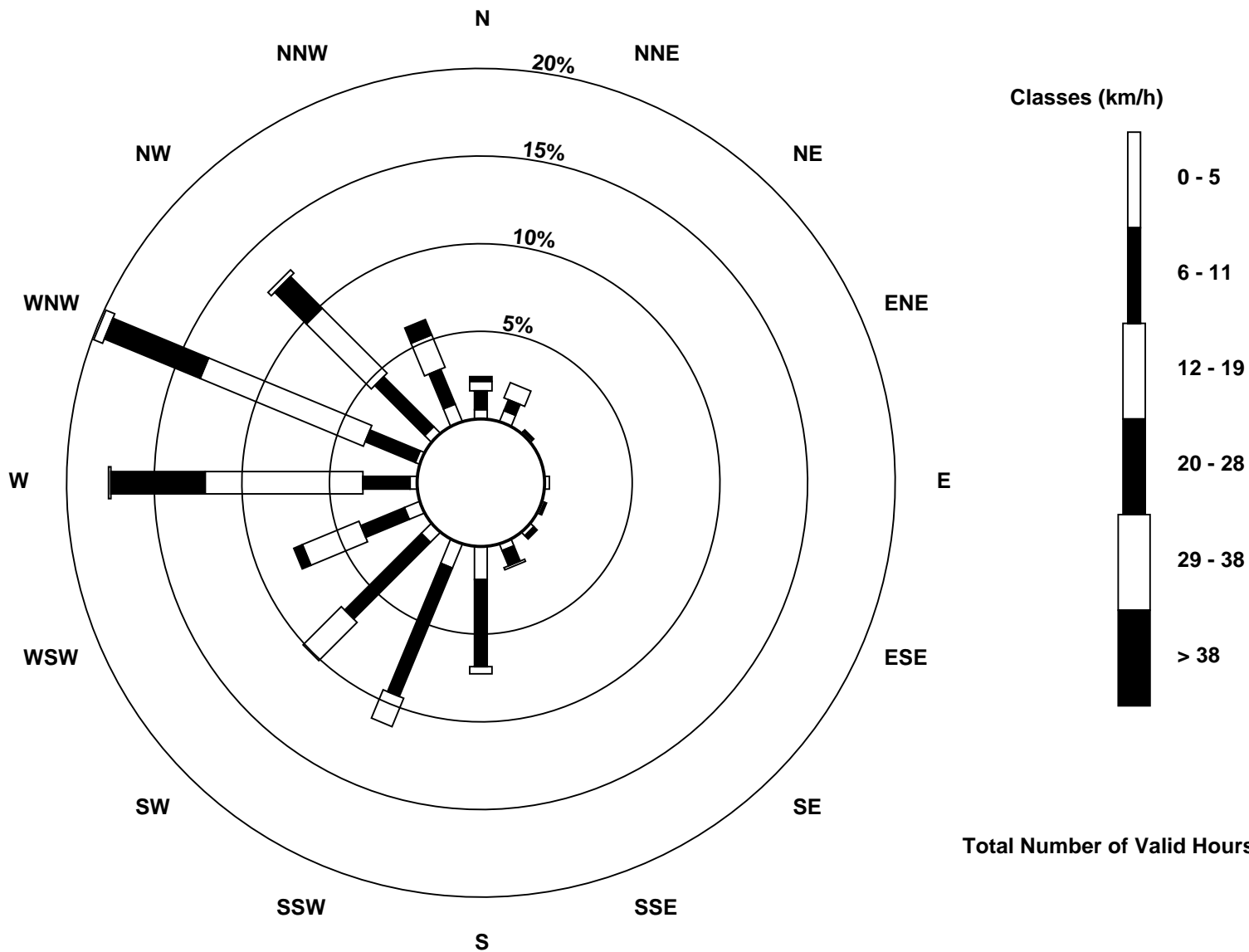
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2017

Wind Speed (WS) - km/h  
Sawbones Bay (AMS 505)



Total Number of Valid Hours: 744



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Sawbones Bay - December 2017**

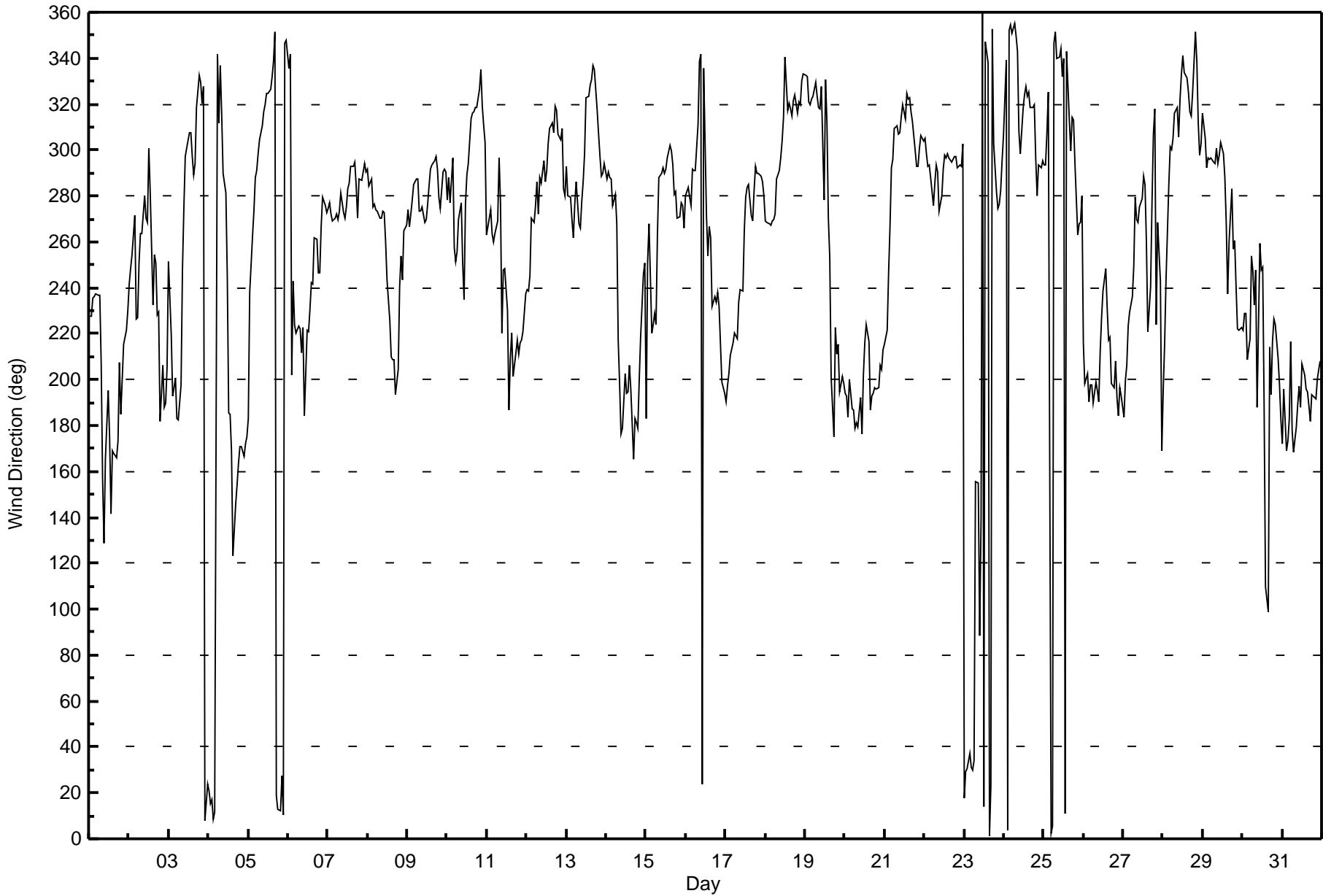
Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Dec 10 12:00 Minimum Value: 1 km/h on Dec 23 07:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	3	3	4	3	3	3	2	2	1	1	1	1	1	1	2	3	2	1	2	2	2	2	4
2-Dec	2	3	4	4	3	2	4	3	3	3	3	4	2	3	3	2	3	3	3	1	2	1	2	1	4
3-Dec	3	2	2	2	1	1	2	1	4	4	3	4	3	3	3	3	4	5	2	3	4	3	2	2	5
4-Dec	2	2	3	2	2	1	1	1	2	1	3	2	2	2	1	1	1	2	2	2	2	2	1	1	3
5-Dec	2	5	3	5	5	4	4	5	5	4	5	5	5	5	5	6	5	4	3	3	2	2	1	6	
6-Dec	1	1	1	2	2	4	2	3	2	2	1	3	3	3	3	3	6	4	3	3	3	4	5	5	6
7-Dec	4	4	4	4	4	5	4	4	4	4	4	4	4	3	4	3	3	3	3	3	4	3	3	4	5
8-Dec	3	3	2	4	5	4	4	3	3	3	3	4	2	3	2	2	2	1	1	4	6	4	3	4	6
9-Dec	5	4	5	4	4	4	4	5	5	4	4	5	5	4	4	4	4	3	3	3	4	5	3	3	5
10-Dec	4	4	4	3	3	4	5	5	6	5	5	11	7	6	7	7	5	4	4	3	4	1	2	2	11
11-Dec	3	2	2	3	3	4	4	3	3	2	4	2	2	2	2	2	2	2	2	2	2	2	3	3	4
12-Dec	4	3	4	4	4	4	5	5	4	4	4	4	4	3	4	5	3	3	3	2	2	2	3	3	5
13-Dec	3	3	3	3	6	3	3	4	4	4	4	6	5	5	5	5	5	3	2	1	2	3	3	4	6
14-Dec	2	3	3	3	3	3	4	3	2	1	1	2	2	1	1	2	1	1	2	1	2	2	3	3	4
15-Dec	2	3	4	2	2	3	2	6	4	4	4	5	5	5	5	4	3	3	4	4	5	6	5	5	6
16-Dec	5	4	3	4	4	4	3	3	3	2	1	3	4	4	4	3	3	3	3	4	3	2	2	2	5
17-Dec	2	3	3	3	3	3	3	4	4	5	4	6	6	5	5	5	4	6	5	6	4	4	4	4	6
18-Dec	4	4	4	4	4	4	4	4	4	4	5	7	6	6	6	6	4	4	4	4	4	3	5	4	7
19-Dec	4	4	3	3	3	3	3	2	2	1	2	3	2	2	2	1	1	2	3	3	3	2	2	2	4
20-Dec	1	1	1	1	1	1	1	2	1	1	1	2	2	3	2	2	2	1	2	2	2	2	2	2	3
21-Dec	3	2	4	4	3	4	3	3	3	2	3	3	2	4	3	3	3	3	2	3	3	3	3	3	4
22-Dec	2	2	3	3	3	3	3	2	3	3	3	4	5	4	5	4	3	3	3	2	2	3	3	2	5
23-Dec	3	3	3	2	1	1	1	1	1	1	1	2	1	2	1	1	2	1	3	3	3	3	3	2	3
24-Dec	2	3	5	5	5	4	4	3	3	2	3	3	3	2	2	2	2	2	2	1	3	2	2	2	5
25-Dec	2	2	1	1	1	1	1	1	1	2	2	2	2	1	1	2	2	1	1	3	4	3	3	3	4
26-Dec	2	2	2	2	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	2	1	1	2	2
27-Dec	2	2	2	2	2	2	3	2	3	2	3	2	2	2	3	2	4	3	2	2	3	2	3	1	4
28-Dec	2	1	3	3	2	2	2	1	1	2	3	3	3	3	3	2	2	1	1	1	1	2	1	1	3
29-Dec	1	1	2	1	3	2	2	2	1	3	1	2	2	2	2	2	4	3	3	3	2	2	2	2	4
30-Dec	3	2	2	1	1	2	1	1	2	1	2	2	2	1	1	1	1	1	1	2	1	2	2	3	3
31-Dec	3	2	1	1	1	2	1	1	1	1	1	2	4	3	3	3	2	2	2	2	2	2	3	3	4
Diurnal Maximum																									



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Sawbones Bay - December 2017**

Direction of Maximum Speed: 289 deg on Dec 10 13:00																				Hours in Service: 744					
Direction of Maximum Daily Speed Average: 281.1 deg on Dec 9																				Hours of Data: 744					
Direction of Minimum Speed: 99 deg on Dec 30 16:00										Direction of Minimum Daily Speed Average: 1.7 deg on Dec 4										Hours of Missing Data: 0					
Monthly Average Direction: 274.9 deg																				Percent Operational Time: 100.0					
Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	228	228	236	236	238	237	237	207	157	129	165	196	175	141	169	168	166	174	207	185	200	215	221	230	211.6
2-Dec	242	248	255	271	226	227	250	263	264	280	270	269	301	281	233	255	251	228	229	182	206	188	189	205	248.0
3-Dec	251	220	193	196	201	183	182	198	248	275	297	301	308	307	297	289	294	318	332	329	320	328	8	24	288.2
4-Dec	21	15	17	8	12	342	312	337	315	290	281	245	185	185	169	123	146	155	163	171	171	167	172	175	160.0
5-Dec	183	238	262	273	288	291	299	305	310	317	319	324	325	327	332	338	351	19	13	12	28	10	347	348	320.5
6-Dec	336	342	202	243	224	220	223	222	212	223	184	221	221	230	242	241	262	261	246	247	267	279	276	273	247.4
7-Dec	275	277	272	269	271	272	269	273	281	273	270	275	283	286	293	293	295	284	270	288	287	290	294	290	279.7
8-Dec	292	285	287	275	276	274	273	270	270	273	273	260	244	225	210	209	209	194	204	240	254	243	265	268	259.5
9-Dec	274	267	272	278	285	287	287	273	273	275	269	270	277	284	292	294	296	297	292	279	274	290	292	290	281.1
10-Dec	278	288	277	296	258	252	256	269	277	251	235	277	289	294	314	316	317	318	319	327	335	319	310	303	291.4
11-Dec	263	271	274	264	260	264	269	296	277	220	248	248	230	187	209	220	202	212	217	211	216	217	221	237	239.9
12-Dec	239	238	245	270	269	276	286	272	288	286	295	286	291	302	309	312	307	319	317	307	305	310	283	280	287.1
13-Dec	293	280	280	270	262	276	286	268	266	277	286	298	323	324	328	331	337	335	317	307	297	288	290	294	298.6
14-Dec	287	290	288	287	276	281	268	217	198	177	179	202	194	195	206	196	165	183	181	179	199	218	246	251	234.6
15-Dec	183	252	268	220	224	229	224	263	288	290	292	290	292	297	302	300	293	281	282	271	271	277	276	266	279.2
16-Dec	280	284	279	276	291	291	291	311	338	341	24	336	272	254	267	261	232	236	234	238	232	215	199	194	267.4
17-Dec	190	197	203	211	216	220	219	218	234	239	239	265	279	284	285	272	269	282	293	290	290	289	286	280	259.6
18-Dec	269	269	268	268	269	270	272	287	291	297	304	315	341	317	320	318	315	321	324	316	321	320	330	333	302.5
19-Dec	333	332	321	320	322	324	330	324	318	318	328	278	331	312	270	254	201	175	223	211	216	194	201	198	303.9
20-Dec	194	193	184	200	187	187	178	181	180	192	176	202	216	224	216	187	193	194	196	196	197	206	204	213	197.8
21-Dec	215	222	247	267	292	296	309	311	307	308	314	320	313	325	322	323	316	313	300	293	293	301	306	304	298.0
22-Dec	305	298	293	294	288	276	286	293	290	273	280	291	297	297	298	296	294	296	297	297	292	294	293	303	292.8
23-Dec	18	30	30	37	31	30	34	156	155	88	140	360	14	347	338	1	23	352	303	282	274	277	283	295	333.3
24-Dec	306	339	4	352	354	351	355	350	343	308	298	318	324	328	323	325	319	318	320	297	280	293	292	295	327.2
25-Dec	293	293	308	325	3	5	347	351	340	341	344	332	340	11	343	313	300	314	313	294	263	268	269	280	312.4
26-Dec	216	199	202	190	198	197	190	199	195	191	212	227	239	248	231	217	219	198	196	208	192	184	196	193	206.9
27-Dec	184	200	206	223	229	236	250	280	270	269	275	279	289	285	260	221	241	277	307	318	224	269	243	169	259.4
28-Dec	196	215	243	285	301	300	305	316	319	305	322	333	341	334	331	325	316	315	325	351	339	312	298	303	311.8
29-Dec	316	305	292	296	296	297	295	294	301	294	298	303	298	288	268	237	260	283	257	261	240	222	222	223	279.9
30-Dec	222	229	229	209	218	254	247	233	248	188	259	248	249	190	110	99	214	194	217	226	224	209	198	182	222.4
31-Dec	172	196	169	173	183	217	178	168	180	189	197	188	207	202	196	194	189	182	193	192	191	200	204	208	193.7
268.1 267.4 269.6 271.5 272.3 274.1 274.9 274.4 279.2 276.0 278.6 283.8 290.8 290.0 289.9 286.8 280.6 283.4 276.5 270.0 265.8 268.2 270.7 268.4																									
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**  
**Sawbones Bay - December 2017**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 93 deg on Dec 19 18:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 5 deg on Dec 28 23:00  Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 9 Q <sub>1</sub> = 10 Median = 12 Q <sub>3</sub> = 16 P <sub>90</sub> = 24 P <sub>99</sub> = 53																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	10	13	8	9	9	10	10	27	49	52	17	13	9	15	13	10	10	35	14	9	15	16	11	10	52
2-Dec	13	14	14	20	12	15	15	11	13	18	13	20	14	27	17	19	20	33	20	16	15	11	10	11	33
3-Dec	24	24	27	13	8	13	11	13	19	12	10	11	14	14	12	16	12	15	14	19	17	14	29	12	29
4-Dec	16	14	15	13	17	14	10	9	40	70	39	29	21	13	33	10	16	11	12	13	14	15	10	9	70
5-Dec	13	24	10	12	18	9	10	11	11	12	12	12	10	12	13	14	16	15	15	16	15	18	14	13	24
6-Dec	21	55	28	47	48	38	21	18	15	13	11	14	14	11	10	9	10	8	11	12	10	15	13	12	55
7-Dec	10	11	10	8	9	11	9	11	13	12	9	12	15	13	9	8	11	13	10	8	8	7	8	7	15
8-Dec	9	11	10	11	11	11	10	14	10	9	18	16	19	15	11	10	11	10	10	22	18	15	10	9	22
9-Dec	11	9	15	15	13	9	11	12	11	11	9	10	13	12	13	10	9	10	10	13	16	13	8	11	16
10-Dec	12	20	15	13	22	15	14	16	13	33	17	17	10	11	13	12	12	11	11	11	12	13	11	12	33
11-Dec	36	11	11	19	12	17	17	19	16	23	26	17	18	11	12	13	13	9	9	9	11	9	12	9	36
12-Dec	9	10	12	16	11	11	12	13	13	12	9	14	14	9	11	11	12	10	10	9	9	9	11	11	16
13-Dec	10	14	20	21	24	12	11	13	16	14	13	11	13	12	12	13	13	13	11	10	10	8	8	10	24
14-Dec	7	9	11	12	11	10	22	39	18	10	11	12	11	12	11	11	23	14	12	10	10	11	18	26	39
15-Dec	51	31	49	19	15	22	17	21	9	9	9	9	9	10	11	12	10	13	14	9	11	14	13	11	51
16-Dec	14	11	12	12	8	8	11	20	13	12	22	54	21	14	11	13	12	8	9	11	9	11	10	11	54
17-Dec	11	11	10	11	11	12	13	13	11	10	11	14	12	10	13	11	11	16	10	10	9	11	11	14	16
18-Dec	10	9	10	9	9	9	13	11	9	10	10	13	16	13	13	11	12	11	10	10	11	11	12	12	16
19-Dec	14	14	12	11	12	14	15	14	13	13	25	57	39	27	43	33	15	93	32	31	38	17	23	17	93
20-Dec	24	10	16	25	23	17	10	26	19	19	15	18	11	15	15	13	13	9	10	9	8	12	10	10	26
21-Dec	13	11	14	11	8	14	11	10	10	10	11	11	13	12	10	10	10	12	9	7	7	9	10	9	14
22-Dec	9	9	7	8	13	12	12	8	11	11	13	10	10	9	10	9	8	8	8	8	7	8	8	9	13
23-Dec	30	13	13	15	16	24	31	59	40	37	40	53	24	21	14	9	11	21	13	17	13	12	16	8	59
24-Dec	12	18	15	17	16	14	16	14	12	11	15	11	14	12	13	10	8	8	13	11	11	8	7	7	18
25-Dec	7	8	9	7	13	11	7	10	13	16	16	39	16	14	22	10	8	10	8	16	19	14	14	26	39
26-Dec	29	17	19	13	15	15	11	9	13	14	23	13	16	22	16	14	11	18	15	9	20	10	34	14	34
27-Dec	28	46	15	17	22	19	25	13	10	26	11	12	14	22	24	15	23	15	11	15	30	25	58	80	80
28-Dec	28	17	17	15	10	9	8	12	12	10	18	13	14	15	14	18	10	9	12	21	18	12	5	7	28
29-Dec	9	11	8	7	7	7	8	7	8	8	7	7	9	25	25	27	34	15	14	16	21	14	10	13	34
30-Dec	26	15	17	15	16	27	10	13	20	16	47	24	23	44	32	42	35	23	22	14	12	14	18	32	47
31-Dec	30	26	19	17	20	47	12	15	14	11	12	13	17	11	11	10	11	11	12	10	10	10	9	9	47
	51	55	49	47	48	47	31	59	49	70	47	57	39	44	43	42	35	93	32	31	38	25	58	80	
	Diurnal Maximum																								





# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Sawbones Bay	Station number:	AMS 505
Calibration Date:	December 19, 2017	Last Cal Date:	November 17, 2017
Start time (MST):	12:45	End time (MST):	17:06
Reason:	Routine		

### Calibration Standards

Cal Gas Concentration	<u>49.6</u>	ppm	Cal Gas Exp Date	February 22, 2020
Cal Gas Cylinder #	<u>EY0000793</u>			
Calibrator Make/Model	Teledyne API T700		Serial Number	621
ZAG Make/Model	Teledyne API 701		Serial Number	4428

### Analyzer Information

Analyzer make: Thermo 43i

Analyzer serial #: 710321323

	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
Analyzer Range	0 - 1000 ppb		PMT voltage	-628	-628
Calculated slope	1.002993	0.998334	Lamp voltage	787	789
Calculated intercept	0.547184	0.175432	Pressure	665.9	675.6
Analyzer Background	15.7	15.9	Flow	0.402	0.405
Analyzer Coefficient	1.015	1.029	Intensity	90	91

### SO<sub>2</sub> Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.0	-0.1	----
as found span	4928	78.9	781.6	772.3	1.012
calibrator zero	5000	0.0	0.0	0.2	----
high point	4929	78.8	780.5	782.0	0.998
second point	4967	39.5	391.3	391.0	1.001
third point	4988	19.8	196.1	196.3	0.999
as left zero	5000	0.0	0.0	0.0	----
as left span	4928	78.9	781.6	784.9	0.996
Average Correction Factor					0.999
Corrected As found	772.40	Previous response	778.73	*% change	0.8%

\* = > +/-5% change initiates investigation

#### Notes:

Sample inlet filter replaced after as founds. Span adjusted

Calibration Performed By:

Ryan Power



# Wood Buffalo Environmental Association

## SO<sub>2</sub> Calibration Summary

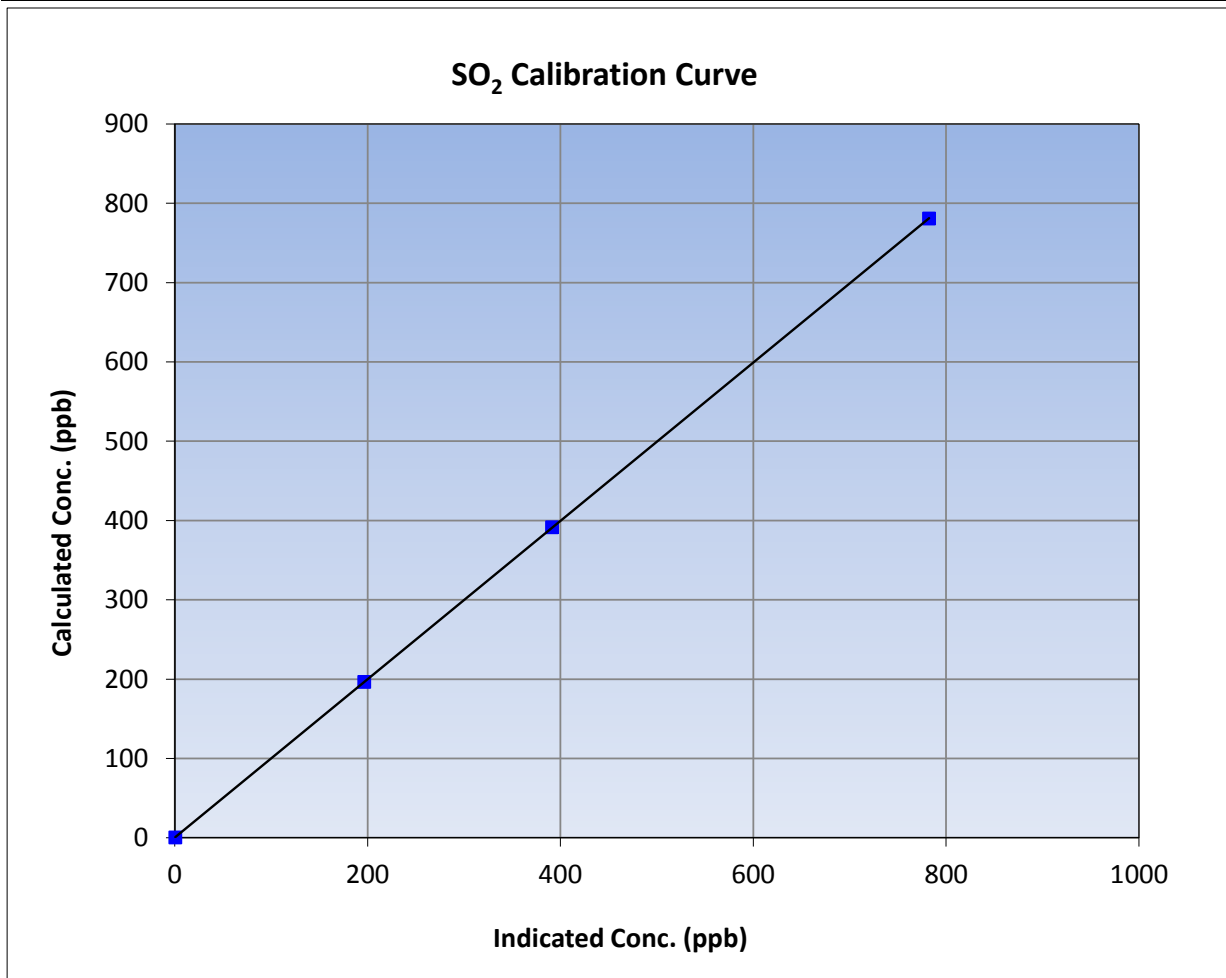
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 17, 2017
Station Name	Sawbones Bay	Station Number	AMS 505
Start Time (MST)	12:45	End Time (MST)	17:06
Analyzer make	Thermo 43i	Analyzer serial #	710321323

### Calibration Data

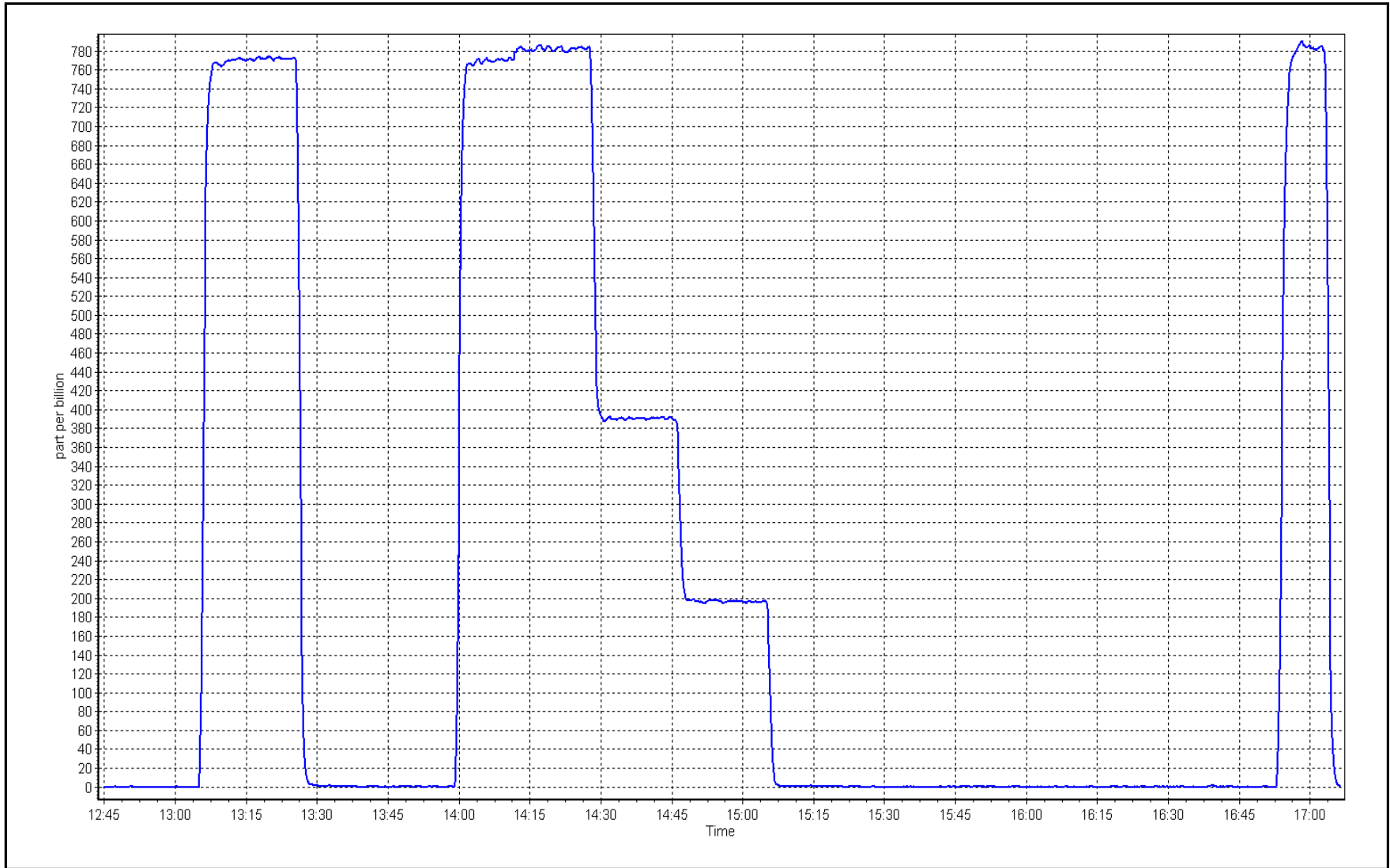
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.2	----	Correlation Coefficient	0.999997	≥0.995
780.5	782.0	0.9981			
391.3	391.0	1.0008	Slope	0.998334	0.90 - 1.10
196.1	196.3	0.9990			
			Intercept	0.175432	+/-30



SO2 Calibration Plot

Date: December 19, 2017

Location: Sawbones Bay





# Wood Buffalo Environmental Association

## THC Calibration Report

Version-03-2017

### Station Information

Station Name:	Sawbones Bay	Station number:	AMS 505
Calibration Date:	December 19, 2017	Last Cal Date:	November 17, 2017
Start time (MST):	12:45	End time (MST):	17:04
Reason:	Routine		

### Calibration Standards

Gas Cert Reference	EY0000793	Cal Gas Expiry Date	February 22, 2020
CH4 Cal Gas Conc.	<u>504.0</u> ppm	CH4 Equiv Conc.	1054.0 ppm
C3H8 Cal Gas Conc.	<u>200.0</u> ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	621
ZAG Make/Model	Teledyne API 701	Serial Number	4428

### Analyzer Information

Analyzer make:	Thermo 51i	Analyzer serial #:	1327059297
	<u>Start</u>	<u>Finish</u>	<u>Start</u> <u>Finish</u>
Analyzer Range	0 - 25 ppm	Bias voltage supply	-288      -288
Calculated slope	0.992645	Sample pressure	8.0      8.0
Calculated intercept	0.005298	Fuel pressure	23.3      23.3
Analyzer Background	2.320	Air pressure	34.5      34.5
Analyzer Coefficient	4.959	Flame temperature	152.4      152.9

### THC Calibration Data

Set Point	Dilution air flow rate (sccm)	Source gas flow rate (sccm)	Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (Ic)	Correction factor (Cc/Ic) <i>Limit = 0.95-1.05</i>
as found zero	5000	0.0	0.00	0.19	----
as found span	4928	78.9	16.61	16.89	0.983
calibrator zero	5000	0.0	0.00	-0.03	----
high point	4930	78.8	16.58	16.70	0.993
second point	4967	39.5	8.32	8.25	1.008
third point	4988	19.8	4.17	4.01	1.039
as left zero	5000	0.0	0.00	-0.09	----
as left span	4928	78.9	16.61	16.68	0.996
Average Correction Factor					1.013
Corrected As found	16.71	Previous response	16.73	*% change	0.1%

\* = > +/-5% change initiates investigation

Notes: Sample inlet filter was replaced after as founds. Adjusted zero and span

Calibration Performed By: Ryan Power



# Wood Buffalo Environmental Association

## THC Calibration Summary

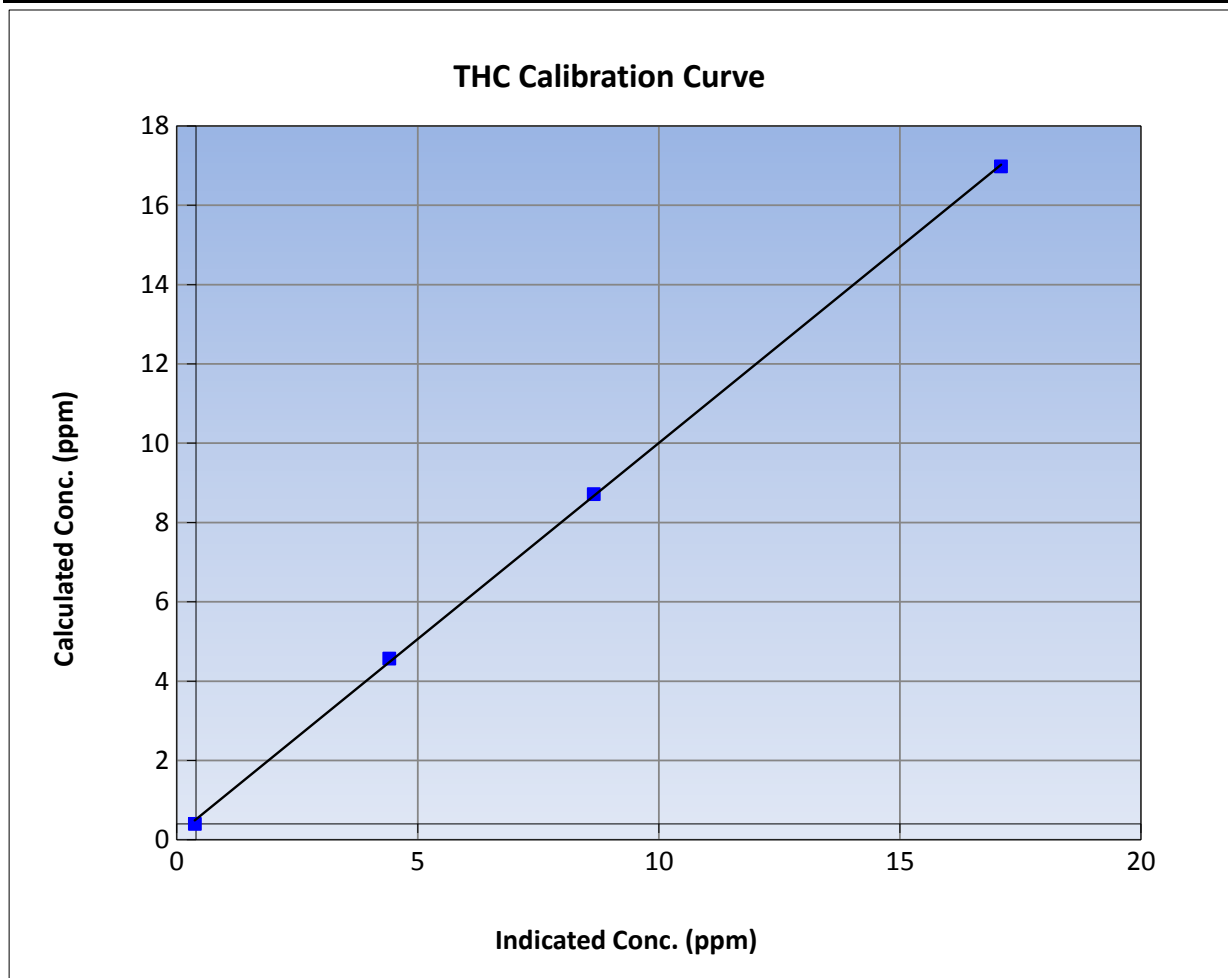
Version-03-2017

### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 17, 2017
Station Name	Sawbones Bay	Station Number	AMS 505
Start Time (MST)	12:45	End Time (MST)	17:04
Analyzer make	Thermo 51i	Analyzer serial #	1327059297

### Calibration Data

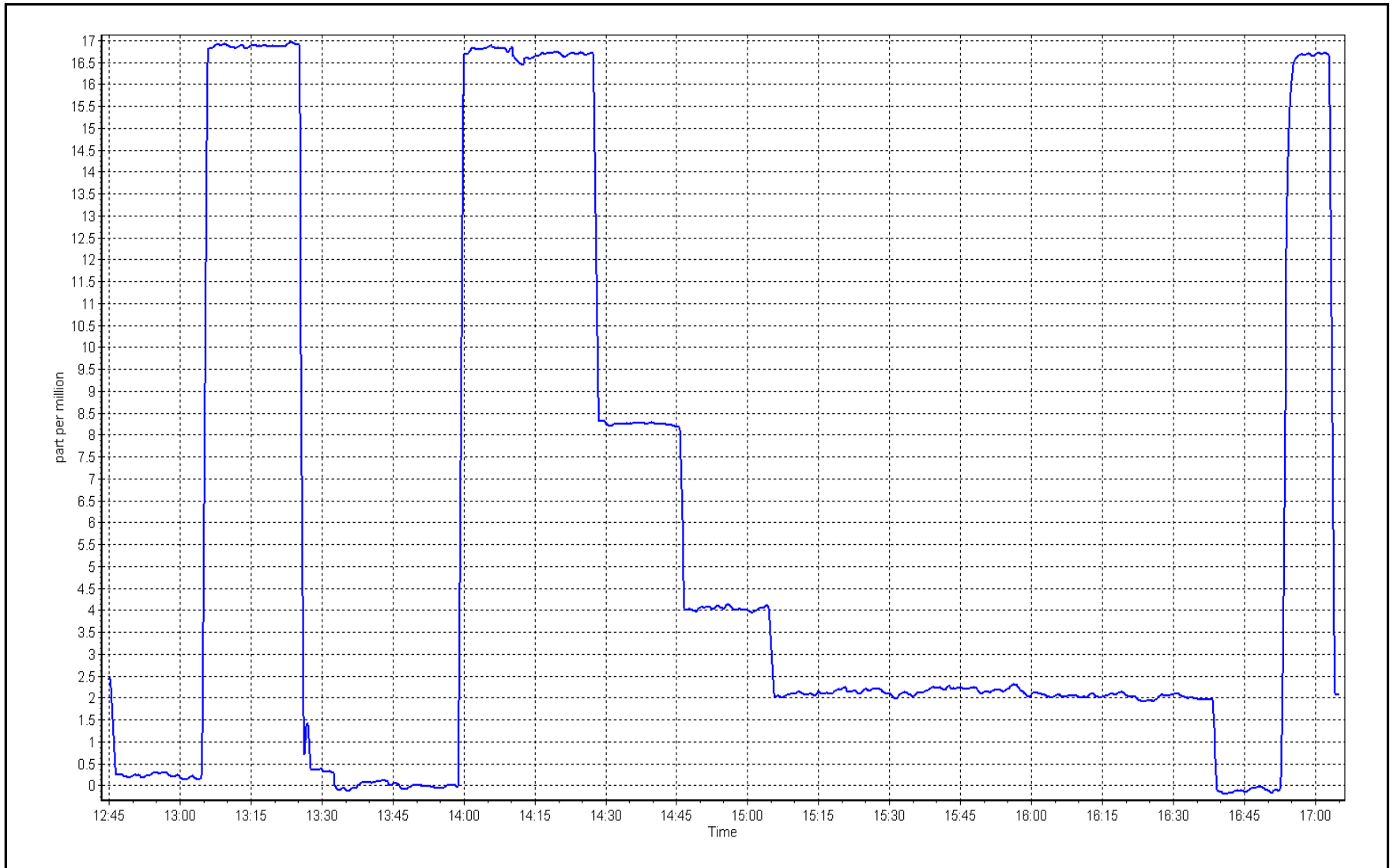
Calculated Concentration (ppm) (Cc)	Indicated Concentration (ppm) (lc)	Correction factor (Cc/lc)	Statistical Evaluation	<u>Limits</u>	
0.0	0.0	----	Correlation Coefficient	0.999869	
16.6	16.7	0.9929			≥0.995
8.3	8.3	1.0079	Slope	0.988606	
4.2	4.0	1.0395			0.90 - 1.10
			Intercept	0.115164	+/-1.5



THC Calibration Plot

Date: December 19, 2017

Location: Sawbones Bay





# Wood Buffalo Environmental Association

## NO<sub>x</sub> - NO - NO<sub>2</sub> Calibration Report

Version-03-2017

### Station Information

Station Name:	Sawbones Bay	Station number:	AMS 505
Calibration Date:	December 19, 2017	Last Cal Date:	November 17, 2017
Start time (MST):	12:45	End time (MST):	17:05
Reason:	Routine		

### Calibration Standards

NO Gas Cylinder #	EY0000793	Cal Gas Expiry Date	February 22, 2020
NOX Cal Gas Conc.	<u>50.8</u> ppm	NO Cal Gas Conc.	<u>50.8</u> ppm
Calibrator Model	Teledyne API T700	Serial Number	621
ZAG make/model	Teledyne API 701	Serial Number	4428

### Analyzer Information

Analyzer make: Thermo 42i			Analyzer serial #: 1152430008		
	<u>Start</u>	<u>Finish</u>		<u>Start</u>	<u>Finish</u>
NO coefficient	1.172	1.172	NOX Range (ppb)	0 - 1000 ppb	
NOX coefficient	1.001	1.001	PMT Temperature	-3.0	-3.1
NO <sub>2</sub> coefficient	1.000	1.000	Reaction cell Press	179.3	181.7
NO bkgrnd	3.1	3.1	Sample Flow	0.490	0.496
NOX bkgrnd	3.2	3.2	PMT Voltage	-761.1	-761.1
			Converter Temp		325.8

### Calibration Statistics

	<u>Start</u>	<u>Finish</u>
NO <sub>x</sub> Cal Slope	0.996133	0.999499
NO <sub>x</sub> Cal Offset	2.453747	2.277946
NO Cal Slope	0.997437	1.000914
NO Cal Offset	2.597103	2.361134
NO <sub>2</sub> Cal Slope	0.993918	0.994299
NO <sub>2</sub> Cal Offset	0.412941	-1.191003







# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

Version-03-2017

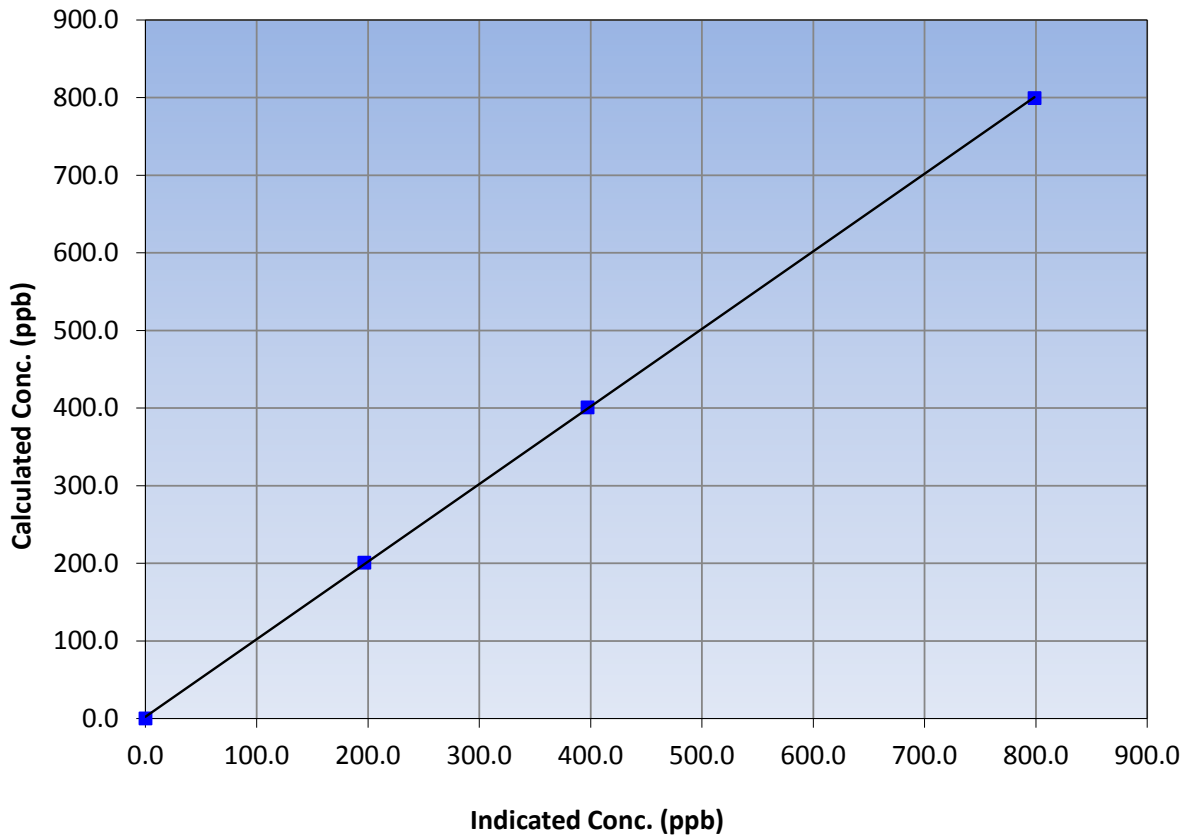
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 17, 2017
Station Name	Sawbones Bay	Station Number	AMS 505
Start Time (MST)	12:45	End Time (MST)	17:05
Analyzer make	Thermo 42i	Analyzer serial #	1152430008

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	≥0.995	
799.4	798.7	1.0008			
400.8	397.3	1.0088			
200.9	196.6	1.0216			
			Slope	0.999499	0.90 - 1.10
			Intercept	2.277946	+/-20

NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

Version-03-2017

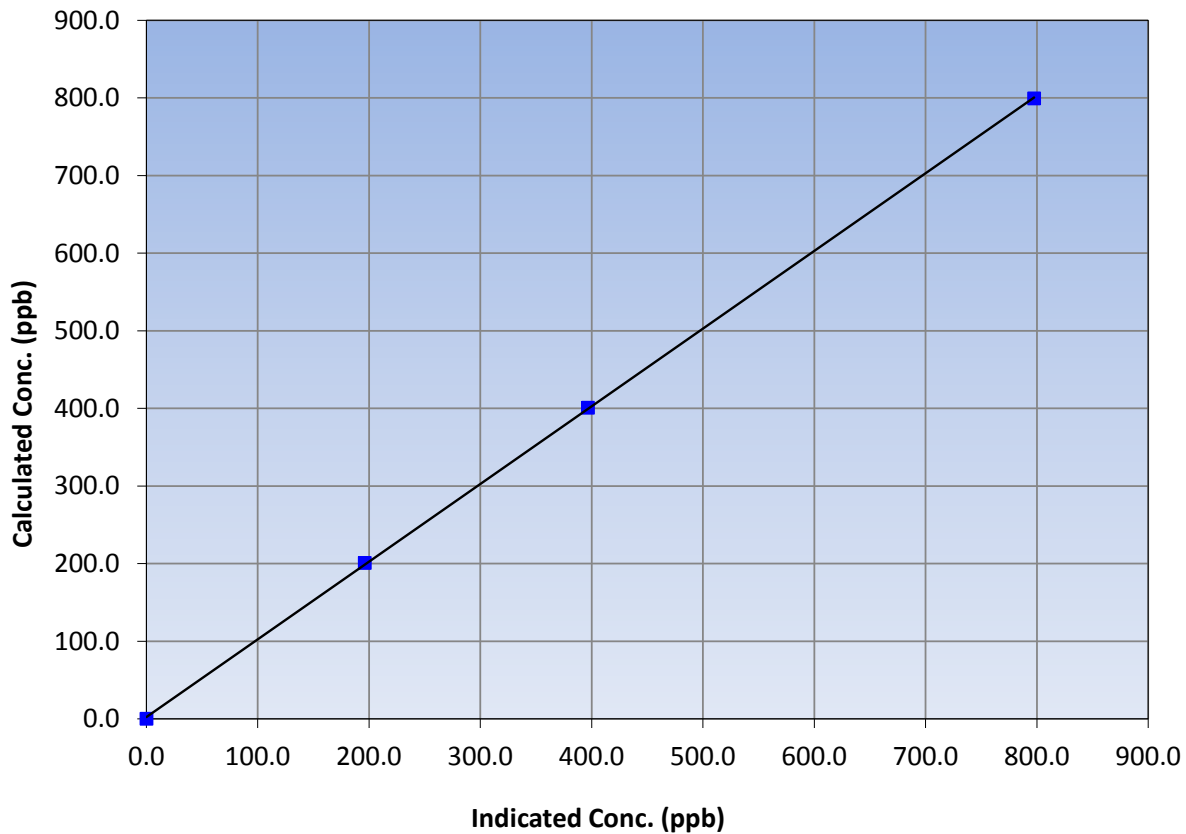
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 17, 2017
Station Name	Sawbones Bay	Station Number	AMS 505
Start Time (MST)	12:45	End Time (MST)	17:05
Analyzer make	Thermo 42i	Analyzer serial #	1152430008

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	Limits	
0.0	0.0	----	Correlation Coefficient	≥0.995	
799.4	797.5	1.0023			
400.8	396.7	1.0103			
200.9	196.1	1.0242			
			Slope	0.999960	0.90 - 1.10
			Intercept	1.000914	+/-20

NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

Version-03-2017

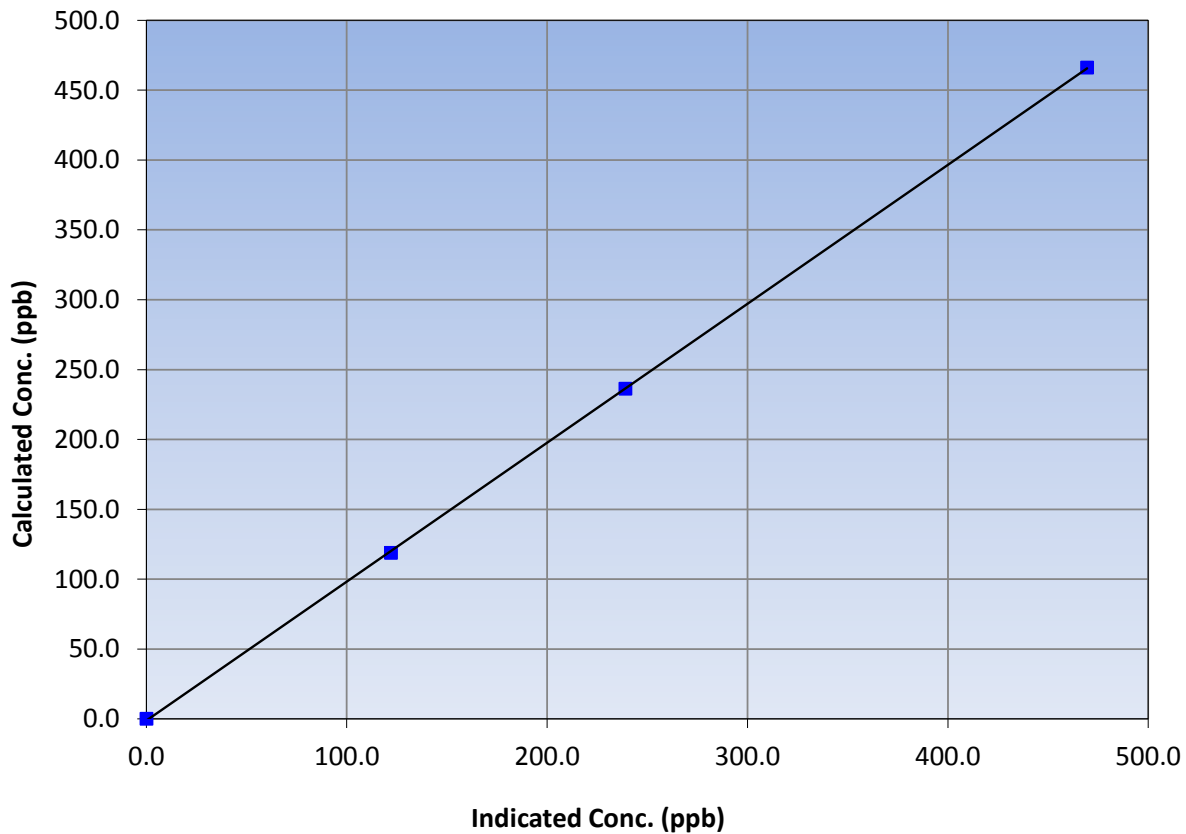
### Station Information

Calibration Date	December 19, 2017	Previous Calibration	November 17, 2017
Station Name	Sawbones Bay	Station Number	AMS 505
Start Time (MST)	12:45	End Time (MST)	17:05
Analyzer make	Thermo 42i	Analyzer serial #	1152430008

### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	<i>Limits</i>	
0.0	0.0	----	Correlation Coefficient	≥0.995	
466.1	469.5	0.9928			
236.4	239.1	0.9887			
118.7	122.1	0.9722			
			Slope	0.994299	0.90 - 1.10
			Intercept	-1.191003	+/-20

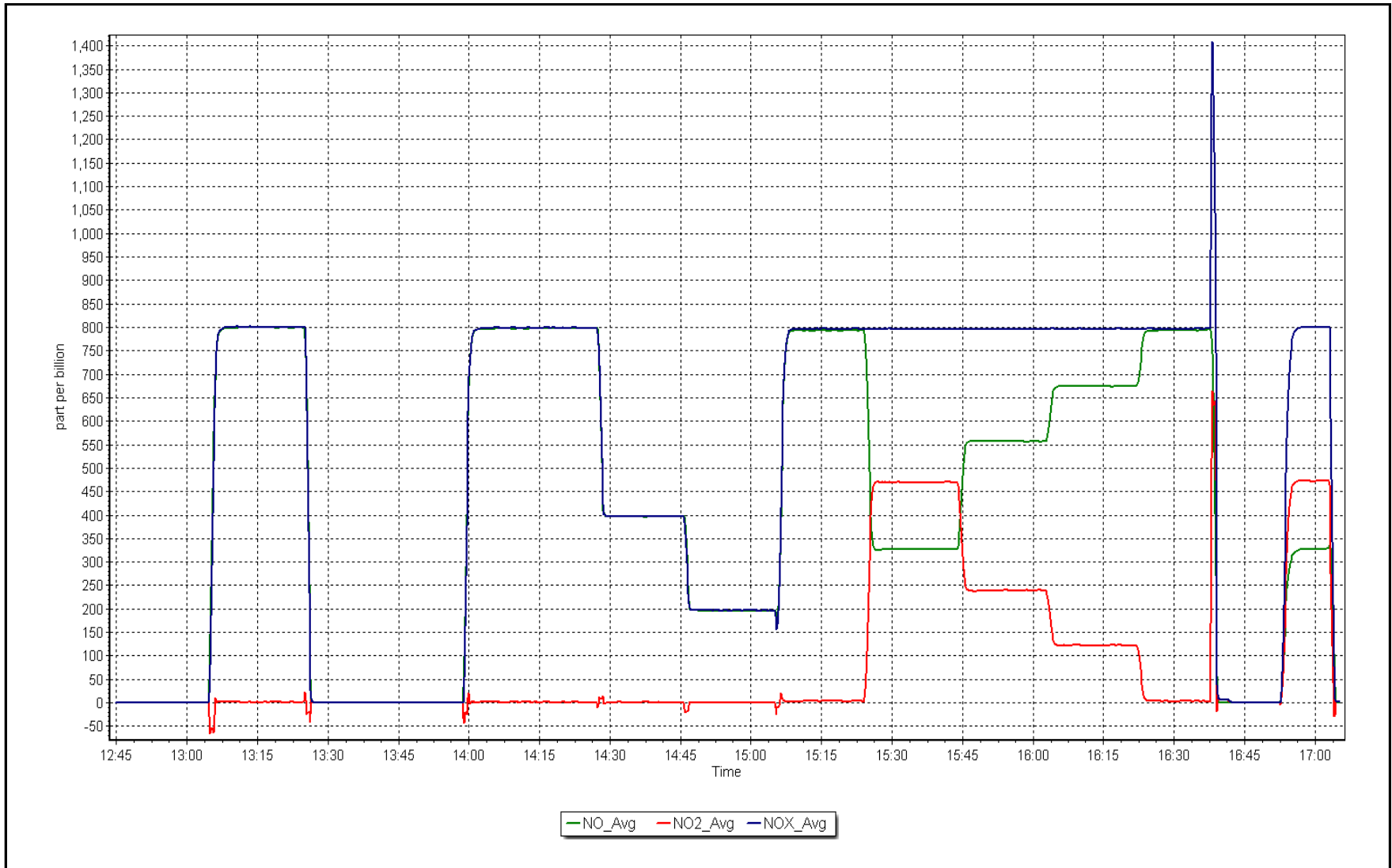
NO<sub>2</sub> Calibration Curve



NO<sub>x</sub> Calibration Plot

Date: December 19, 2017

Location: Sawbones Bay





## WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

### INTEGRATED MONITORING PROGRAM MONTHLY REPORT

#### **DATA SUMMARY NOVEMBER 2017**

Prepared January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

Passive Measurements: Maxxam Analytics Ltd  
Edmonton, Alberta

VOCs: InnoTech Alberta, Inc.  
Vegreville, Alberta

Particulate Matter: Atmospheric Research & Analysis, Inc.  
Morrisville, NC

PAHs: Airzone One Ltd  
Mississauga, Ontario

Precipitation: InnoTech Alberta, Inc.  
Vegreville, Alberta



**WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**INTEGRATED MONITORING PROGRAM  
MONTHLY REPORT**

**HNO<sub>3</sub>, NH<sub>3</sub>, NO<sub>2</sub>, O<sub>3</sub> AND SO<sub>2</sub> PASSIVE MEASUREMENTS  
DATA SUMMARY  
OCTOBER - NOVEMBER 2017**

Prepared  
January 30, 2018

**SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

**LABORATORY ANALYSIS BY:**

Passive measurements: Maxxam Analytics Ltd  
Edmonton, Alberta



FILE CONTENTS DESCRIPTION	Passive Measurements of SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub> , NH <sub>3</sub> and HNO <sub>3</sub>
SAMPLING INTERVAL	Bimonthly
SAMPLING FREQUENCY OF DATA	Bimonthly
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection
UNITS	ppbv or µg/m <sup>3</sup>
OBSERVATION TYPE	Gas
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	Diffusion
MEDIUM	Filter
ANALYTICAL METHODS	IONS by Ion Chromatography (IC)
SAMPLE PREPARATION	DI water extraction
ANALYTICAL LABORATORY	MAXXAM Analytics Inc
USER NOTE 1	Data are not blank corrected
USER NOTE 2	Concentrations are calculated by equations developed by lab
SAMPLING INSTRUMENT TYPE	SO <sub>2</sub> all-season SO <sub>2</sub> passive sampling system NO <sub>2</sub> all-season NO <sub>2</sub> passive sampling system O <sub>3</sub> all-season O <sub>3</sub> passive sampling system NH <sub>3</sub> Ogawa passive sampler HNO <sub>3</sub> Ogawa passive sampler
FLAGS USED	
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Wood Buffalo Environmental Association

Site ID	Site Name	Start Date	End Date	Passive Measurements									Local sites								
				Ammonia			Nitric Acid			Nitrogen Dioxide			Ozone			Sulfur Dioxide			RH	Temp	Wind Speed
				ppb	MDL	Flag	ppb	MDL	Flag	ppb	MDL	Flag	ppb	MDL	Flag	ppb	MDL	Flag	%	K	cm/sec
AMS01	Bertha Ganter	Sep-29-17	Nov-29-17	1.3	0.1	V0	0.35	0.02	V0	5.3	0.1	V4	19.3	0.1	V0	0.6	0.1	V0	79	269	130
AMS01	Bertha Ganter	Sep-29-17	Nov-29-17	1.3	0.1	V0	0.35	0.02	V0	4.5	0.1	V4	24.2	0.1	V0	0.7	0.1	V0	79	269	130
AMS01	Bertha Ganter	Sep-29-17	Nov-29-17	1.6	0.1	V0	0.35	0.02	V0	3.9	0.1	V4	21	0.1	V0	0.5	0.1	V0	79	269	130
AMS02	Mildred Lake	Oct-06-17	Nov-29-17	3.9	0.1	V0	0.35	0.02	V0	5	0.1	V4	21.3	0.1	V0	3	0.1	V0	79	269	130
AMS02	Mildred Lake	Oct-06-17	Nov-29-17	4.3	0.1	V0	0.7	0.02	V0	6.8	0.1	V4	21.3	0.1	V0	2.6	0.1	V0	79	269	130
AMS02	Mildred Lake	Oct-06-17	Nov-29-17	4.1	0.1	V0	0.35	0.02	V0	9.8	0.1	V4	19.3	0.1	V0	3	0.1	V0	79	269	130
BLANK-L	Field Blank Local	Oct-01-17	Nov-30-17	-9999	0.1	M1	0.03	0.02	V0	<0.1	0.1	V1	<0.1	0.1	V1	<0.1	0.1	V1	65	288	130





Wood Buffalo Environmental Association

Site ID	Start Date	End Date	Passive Measurements												Remote sites					
			Ammonia			Nitric Acid			Nitrogen Dioxide			Ozone			Sulfur Dioxide			RH	Temp	Wind Speed
			ppb	MDL	Flag	ppb	MDL	Flag	ppb	MDL	Flag	ppb	MDL	Flag	ppb	MDL	Flag	%	K	cm/sec
AS103	Oct-02-17	Dec-06-17	0.9	0.1	V0	0.18	0.02	V0	1.6	0.1	V4	24.4	0.1	V0	0.4	0.1	V0	79	269	130
AS103	Oct-02-17	Dec-06-17	0.9	0.1	V0	0.35	0.02	V0	1.2	0.1	V4	25.9	0.1	V0	0.6	0.1	V0	79	269	130
AS107	Oct-02-17	Dec-07-17	0.8	0.1	V0	0.35	0.02	V0	1.4	0.1	V4	29.9	0.1	V0	0.8	0.1	V0	79	269	130
AS107	Oct-02-17	Dec-07-17	0.9	0.1	V0	0.35	0.02	V0	1.1	0.1	V4	32.7	0.1	V0	0.9	0.1	V0	79	269	130
BM07	Sep-28-17	Dec-05-17	1.1	0.1	V0	0.35	0.02	V0	<0.1	0.1	V1	35.3	0.1	V0	0.2	0.1	V0	86	268	130
BM10	Sep-27-17	Dec-07-17	2.7	0.1	V0	0.32	0.02	V0	0.3	0.1	V4	22.4	0.1	V0	0.4	0.1	V0	76	271	130
BM11	Sep-28-17	Dec-05-17	0.7	0.1	V0	0.28	0.02	V0	0.2	0.1	V4	25.5	0.1	V0	0.3	0.1	V0	86	268	130
JE306	Sep-28-17	Dec-05-17	0.8	0.1	V0	0.35	0.02	V0	1.3	0.1	V4	21.3	0.1	V0	0.6	0.1	V0	86	268	130
JE308	Sep-27-17	Dec-07-17	1	0.1	V0	0.25	0.02	V0	0.3	0.1	V4	21.9	0.1	V0	0.3	0.1	V0	76	271	130
JE312	Sep-30-17	Dec-06-17	0.9	0.1	V0	0.28	0.02	V0	0.8	0.1	V4	28.9	0.1	V0	0.4	0.1	V0	79	270	130
JE316	Oct-01-17	Dec-06-17	0.7	0.1	V0	0.35	0.02	V0	0.3	0.1	V4	27.8	0.1	V0	0.3	0.1	V0	79	269	130
JE323	Oct-03-17	Dec-08-17	0.9	0.1	V0	0.31	0.02	V0	1.1	0.1	V4	22.7	0.1	V0	0.5	0.1	V0	80	268	130
JP101	Oct-02-17	Dec-04-17	0.9	0.1	V0	0.32	0.02	V0	0.6	0.1	V4	33	0.1	V0	0.5	0.1	V0	79	269	130
JP101	Oct-02-17	Dec-04-17	0.9	0.1	V0	0.35	0.02	V0	0.6	0.1	V4	31	0.1	V0	0.3	0.1	V0	79	269	130
JP102	Oct-04-17	Dec-07-17	0.8	0.1	V0	0.28	0.02	V0	2.2	0.1	V4	31.1	0.1	V0	0.8	0.1	V0	79	268	130
JP102	Oct-04-17	Dec-07-17	0.9	0.1	V0	0.35	0.02	V0	2.9	0.1	V4	24	0.1	V0	1	0.1	V0	79	268	130
JP104	Sep-29-17	Dec-02-17	2.4	0.1	V0	0.35	0.02	V0	4.8	0.1	V4	23.2	0.1	V0	1.3	0.1	V0	78	270	130
JP104	Sep-29-17	Dec-02-17	1	0.1	V0	0.35	0.02	V0	5	0.1	V4	24.2	0.1	V0	1.7	0.1	V0	78	270	130
JP107	Sep-28-17	Dec-05-17	0.7	0.1	V0	0.21	0.02	V0	1.7	0.1	V4	25.2	0.1	V0	0.6	0.1	V0	86	268	130
JP107	Sep-28-17	Dec-05-17	0.7	0.1	V0	0.35	0.02	V0	1.9	0.1	V4	23.8	0.1	V0	0.6	0.1	V0	86	268	130
JP108	Oct-01-17	Dec-06-17	1.2	0.1	V0	0.31	0.02	V0	0.6	0.1	V4	21.8	0.1	V0	0.4	0.1	V0	87	267	130
JP108	Oct-01-17	Dec-06-17	1	0.1	V0	0.28	0.02	V0	0.6	0.1	V4	23.1	0.1	V0	0.4	0.1	V0	87	267	130
JP201	Sep-27-17	Dec-07-17	0.6	0.1	V0	0.28	0.02	V0	0.3	0.1	V4	28.3	0.1	V0	0.2	0.1	V0	76	271	130
JP201	Sep-27-17	Dec-07-17	0.5	0.1	V0	0.32	0.02	V0	0.2	0.1	V4	30.7	0.1	V0	0.3	0.1	V0	76	271	130
JP205	Sep-28-17	Dec-05-17	1	0.1	V0	0.31	0.02	V0	0.9	0.1	V4	34	0.1	V0	0.7	0.1	V0	86	268	130
JP205	Sep-28-17	Dec-05-17	1.1	0.1	V0	0.28	0.02	V0	0.7	0.1	V4	34.5	0.1	V0	0.8	0.1	V0	86	268	130
JP210	Oct-01-17	Dec-06-17	0.7	0.1	V0	0.35	0.02	V0	0.5	0.1	V4	30.4	0.1	V0	0.3	0.1	V0	79	269	130
JP210	Oct-01-17	Dec-06-17	0.7	0.1	V0	0.28	0.02	V0	0.6	0.1	V4	28.6	0.1	V0	0.4	0.1	V0	79	269	130
JP212	Oct-04-17	Dec-07-17	1.5	0.1	V0	0.31	0.02	V0	5.5	0.1	V4	18.8	0.1	V0	0.7	0.1	V0	79	268	130
JP213	Sep-30-17	Dec-06-17	0.5	0.1	V0	0.28	0.02	V0	0.5	0.1	V4	28.8	0.1	V0	0.4	0.1	V0	87	268	130
JP213	Sep-30-17	Dec-06-17	0.6	0.1	V0	0.31	0.02	V0	0.4	0.1	V4	32.4	0.1	V0	0.4	0.1	V0	87	268	130
JP309	Oct-04-17	Dec-04-17	0.7	0.1	V0	0.31	0.02	V0	1.3	0.1	V4	23.9	0.1	V0	0.6	0.1	V0	78	268	130
JP309	Oct-04-17	Dec-04-17	0.2	0.1	V0	0.35	0.02	V0	1.2	0.1	V4	24.8	0.1	V0	0.5	0.1	V0	78	268	130
JP311	Oct-02-17	Dec-04-17	1.1	0.1	V0	0.32	0.02	V0	1.1	0.1	V4	32.9	0.1	V0	0.5	0.1	V0	79	269	130
JP311	Oct-02-17	Dec-04-17	1.6	0.1	V0	0.32	0.02	V0	0.8	0.1	V4	29	0.1	V0	0.6	0.1	V0	79	269	130
JP316	Oct-01-17	Dec-06-17	1	0.1	V0	0.18	0.02	V0	0.4	0.1	V4	29.8	0.1	V0	0.5	0.1	V0	79	269	130
JP316	Oct-01-17	Dec-06-17	0.5	0.1	V0	0.32	0.02	V0	0.5	0.1	V4	26.9	0.1	V0	0.3	0.1	V0	79	269	130
NE07	Oct-03-17	Dec-08-17	0.9	0.1	V0	0.35	0.02	V0	1.2	0.1	V4	27.5	0.1	V0	0.9	0.1	V0	79	268	130
NE10	Sep-30-17	Dec-06-17	0.6	0.1	V0	0.28	0.02	V0	0.4	0.1	V4	27.1	0.1	V0	0.5	0.1	V0	79	270	130
NE11	Oct-03-17	Dec-08-17	0.6	0.1	V0	0.35	0.02	V0	2	0.1	V4	18.8	0.1	V0	0.6	0.1	V0	79	268	130
R2	Sep-29-17	Dec-02-17	1.5	0.1	V0	0.32	0.02	V0	5.4	0.1	V4	15.6	0.1	V0	1.1	0.1	V0	78	270	130
SM07	Oct-03-17	Dec-04-17	0.7	0.1	V0	0.35	0.02	V0	0.5	0.1	V4	30.9	0.1	V0	0.4	0.1	V0	79	268	130
SM08	Oct-03-17	Dec-04-17	0.8	0.1	V0	0.35	0.02	V0	0.3	0.1	V4	31.8	0.1	V0	0.4	0.1	V0	79	268	130
WF04	Sep-27-17	Dec-04-17	0.7	0.1	V0	0.32	0.02	V0	1.1	0.1	V4	23.4	0.1	V0	0.5	0.1	V0	78	271	130
BLANK-R	Oct-01-17	Nov-30-17	0.8	0.1	V0	0.08	0.02	V0	<0.1	0.1	V1	<0.1	0.1	V1	<0.1	0.1	V1	74	288	130
BLANK-R	Oct-01-17	Nov-30-17	1	0.1	V0	0.03	0.02	V0	<0.1	0.1	V1	<0.1	0.1	V1	<0.1	0.1	V1	74	288	130
BLANK-R	Oct-01-17	Nov-30-17	1	0.1	V0	0.08	0.02	V0	<0.1	0.1	V1	0.2	0.1	V0	<0.1	0.1	V1	74	288	130



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **VOLATILE ORGANIC COMPOUNDS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

VOCs: InnoTech Alberta, Inc.  
Vegreville, Alberta




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FILE CONTENTS DESCRIPTION	VOC - Speciated Volatile Organic Compounds
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SAMPLING INTERVAL	24 hour
SAMPLING FREQUENCY OF DATA	Once every 6 days
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection - Method Detection Limits (MDL) are provided with each observation
UNITS	ppbv (parts per billion volume)
OBSERVATION TYPE	Gas
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	Evacuated canister
ANALYTICAL METHODS	GC/MS - Gas chromatography/mass spectrometer
ANALYTICAL LABORATORY	InnoTech Alberta Inc
USER NOTE 1	Data are not blank corrected
SAMPLING INSTRUMENT TYPE	Tisch TE123
FLOW RATE	10.0 cc/min (cubic centimeters per minute)

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FLAGS USED	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator

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Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 03-Nov			Patricia McInnes AMS 6 03-Nov	
	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.08	V0	0.03	V0
2,2-Dimethylbutane	0.01	0.02	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.05	V0	0	V1
2,3-Dimethylpentane	0.02	0.02	V0	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.02	V0	0	V1
2-Methylhexane	0.01	0.02	V0	0	V1
2-Methylpentane	0.01	0.01	V0	0.02	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.02	V0	0	V1
3-Methylpentane	0.01	0.02	V0	0.01	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	1	V0	0.8	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0	V1	0	V1
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	1.2	V0	0.4	V0
Ethylbenzene	0.01	0.01	V0	0.03	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.08	V0	0.06	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.13	V0	0.08	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0.05	V0
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.02	V0	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.07	V0	0.05	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.03	V0	0.02	V0
n-Hexane	0.01	0.01	V0	0.01	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0.02	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.07	V0	0.15	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Athabasca Valley AMS 7 03-Nov			Anzac AMS 14 03-Nov	
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0.03	V0
2,2-Dimethylbutane	0.01	0	V1	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.04	V0	0	V1
2,3-Dimethylpentane	0.02	0	V1	0.03	V0
2,4-Dimethylpentane	0.01	0	V1	0.01	V0
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0.01	V0	0	V1
2-Methylpentane	0.01	0.01	V0	0.01	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0	V1	0	V1
3-Methylpentane	0.01	0.01	V0	0.01	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	1.4	V0	1.1	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0	V1	0	V1
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.6	V0	0	V1
Ethylbenzene	0.01	0	V1	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.05	V0	0.05	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.07	V0	0.1	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0	V1	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.06	V0	0.09	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.02	V0	0.02	V0
n-Hexane	0.01	0.02	V0	0.02	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.03	V0	0.09	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Barge Landing AMS 9 03-Nov	Fort McKay South AMS 13 03-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0.02	V0	0.02	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.06	V0	0	V1
2,3-Dimethylpentane	0.02	0.03	V0	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.06	V0	0.04	V0
2-Methylhexane	0.01	0.05	V0	0	V1
2-Methylpentane	0.01	0.03	V0	0.01	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0.03	V0	0	V1
3-Methylhexane	0.02	0.07	V0	0	V1
3-Methylpentane	0.01	0.03	V0	0.02	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	1	V0	0.6	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.01	V0	0	V1
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.03	V0	0.03	V0
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0	V1
Ethylbenzene	0.01	0.02	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.12	V0	0.1	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.14	V0	0.11	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.04	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.08	V0	0.06	V0
Methylcyclopentane	0.02	0.05	V0	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.12	V0	0	V1
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.14	V0	0.04	V0
n-Hexane	0.01	0.07	V0	0.01	V0
n-Nonane	0.01	0.04	V0	0	V1
n-Octane	0.02	0.1	V0	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.02	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.11	V0	0.05	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Horizon AMS 15 03-Nov	Janvier AMS 22 03-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0.08	V0
2,2-Dimethylbutane	0.01	0	V1	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.02	V0	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0	V1	0	V1
2-Methylpentane	0.01	0	V1	0.01	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0	V1	0	V1
3-Methylpentane	0.01	0.02	V0	0	V1
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	1.1	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0	V1	0	V1
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0.5	V0
Ethylbenzene	0.01	0	V1	0.04	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.07	V0	0.05	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.12	V0	0.13	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0.04	V0
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0	V1	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.05	V0	0	V1
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.02	V0	0.01	V0
n-Hexane	0.01	0.01	V0	0.01	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0.1	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0.02	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.01	V0	0.17	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 09-Nov			Patricia McInnes AMS 6 09-Nov	
	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0.03	V0	0.03	V0
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.11	V0	0.03	V0
2,2-Dimethylbutane	0.01	0.02	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0.01	V0
2,3-Dimethylbutane	0.02	0.05	V0	0	V1
2,3-Dimethylpentane	0.02	0.08	V0	0.04	V0
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.19	V0	0	V1
2-Methylhexane	0.01	0.16	V0	0.03	V0
2-Methylpentane	0.01	0.12	V0	0.07	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0.08	V0	0	V1
3-Methylhexane	0.02	0.23	V0	0.03	V0
3-Methylpentane	0.01	0.08	V0	0.04	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	1	V0	1	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.09	V0	0.1	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.07	V0	0	V1
Cyclopentane	0.01	0.03	V0	0.02	V0
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.8	V0	1.5	V0
Ethylbenzene	0.01	0.05	V0	0.02	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.3	V0	0.53	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.32	V0	0.41	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.12	V0	0.06	V0
Methanol	3	0	V1	5	V0
Methylcyclohexane	0.01	0.26	V0	0.03	V0
Methylcyclopentane	0.02	0.14	V0	0.04	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.49	V0	0.67	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.57	V0	0.05	V0
n-Hexane	0.01	0.23	V0	0.06	V0
n-Nonane	0.01	0.12	V0	0	V1
n-Octane	0.02	0.28	V0	0	V1
n-Pentane	0.1	0.2	V0	0.2	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.06	V0	0.03	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.33	V0	0.11	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1





Station Name Station # Sample Date	Athabasca Valley AMS 7 09-Nov			Anzac AMS 14 09-Nov	
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.07	V0	0	V1
2,2-Dimethylbutane	0.01	0.01	V0	0.01	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.05	V0	0.03	V0
2,3-Dimethylpentane	0.02	0.03	V0	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.02	V0	0	V1
2-Methylhexane	0.01	0.04	V0	0.01	V0
2-Methylpentane	0.01	0.08	V0	0.05	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.04	V0	0	V1
3-Methylpentane	0.01	0.05	V0	0.03	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	1.2	V0	1.1	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.09	V0	0.06	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.02	V0	0	V1
Cyclopentane	0.01	0.02	V0	0.02	V0
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	1.4	V0	0.3	V0
Ethylbenzene	0.01	0.04	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.95	V0	0.29	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.55	V0	0.38	V0
Isoprene	0.01	0	V1	0.01	V0
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.07	V0	0	V1
Methanol	3	4	V0	0	V1
Methylcyclohexane	0.01	0.03	V0	0.02	V0
Methylcyclopentane	0.02	0.04	V0	0.03	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	1.47	V0	0.4	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.04	V0	0.01	V0
n-Hexane	0.01	0.06	V0	0.06	V0
n-Nonane	0.01	0.01	V0	0	V1
n-Octane	0.02	0.02	V0	0	V1
n-Pentane	0.1	0.2	V0	0.2	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.03	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.23	V0	0.09	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Barge Landing AMS 9 09-Nov	Fort McKay South AMS 13 09-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0.04	V0	0.01	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.08	V0	0.02	V0
2,3-Dimethylpentane	0.02	0.03	V0	0.04	V0
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.03	V0	0.08	V0
2-Methylhexane	0.01	0.04	V0	0.07	V0
2-Methylpentane	0.01	0.14	V0	0.07	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0.03	V0
3-Methylhexane	0.02	0.06	V0	0.1	V0
3-Methylpentane	0.01	0.08	V0	0.04	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	0.7	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.07	V0	0.05	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.03	V0	0.04	V0
Cyclopentane	0.01	0.03	V0	0.02	V0
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.5	V0	0.3	V0
Ethylbenzene	0.01	0.02	V0	0.02	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.42	V0	0.3	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.4	V0	0.24	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.04	V0	0.05	V0
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.07	V0	0.12	V0
Methylcyclopentane	0.02	0.05	V0	0.07	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.44	V0	0.43	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.11	V0	0.23	V0
n-Hexane	0.01	0.12	V0	0.13	V0
n-Nonane	0.01	0.03	V0	0.04	V0
n-Octane	0.02	0.04	V0	0.11	V0
n-Pentane	0.1	0.3	V0	0.2	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.02	V0	0.02	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.09	V0	0.12	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Horizon AMS 15 09-Nov	Janvier AMS 22 09-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.12	V0	0.11	V0
2,2-Dimethylbutane	0.01	0.03	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.05	V0	0	V1
2,3-Dimethylpentane	0.02	0.04	V0	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.1	V0	0	V1
2-Methylhexane	0.01	0.07	V0	0.03	V0
2-Methylpentane	0.01	0.07	V0	0.04	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0.04	V0	0	V1
3-Methylhexane	0.02	0.12	V0	0.03	V0
3-Methylpentane	0.01	0.04	V0	0.03	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	1	V0	0.8	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.06	V0	0.05	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.06	V0	0	V1
Cyclopentane	0.01	0.02	V0	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.5	V0	1.4	V0
Ethylbenzene	0.01	0.04	V0	0.01	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.31	V0	0.25	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.27	V0	0.23	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.07	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.14	V0	0.02	V0
Methylcyclopentane	0.02	0.08	V0	0.03	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.39	V0	0.33	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.23	V0	0.02	V0
n-Hexane	0.01	0.13	V0	0.07	V0
n-Nonane	0.01	0.03	V0	0	V1
n-Octane	0.02	0.12	V0	0	V1
n-Pentane	0.1	0.2	V0	0.2	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.03	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.34	V0	0.11	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 15-Nov			Patricia McInnes AMS 6 15-Nov	
	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
Compound Name					
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.02	V0	0.01	V0
2,2-Dimethylbutane	0.01	0	V1	0.01	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0	V1	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0	V1	0	V1
2-Methylpentane	0.01	0.03	V0	0.02	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0	V1	0	V1
3-Methylpentane	0.01	0.02	V0	0.01	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	0.8	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.04	V0	0.05	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0.5	V0
Ethylbenzene	0.01	0.02	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.12	V0	0.11	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.14	V0	0.09	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.04	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0	V1	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.24	V0	0.18	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0	V1	0	V1
n-Hexane	0.01	0.01	V0	0.01	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0.1	V0	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.02	V0	0.01	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.09	V0	0.05	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name	Athabasca Valley			Anzac	
Station #	AMS 7			AMS 14	
Sample Date	15-Nov			15-Nov	
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.05	V0	0	V1
2,2-Dimethylbutane	0.01	0	V1	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0	V1	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0	V1	0	V1
2-Methylpentane	0.01	0.03	V0	0.02	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0	V1	0	V1
3-Methylpentane	0.01	0.02	V0	0.01	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	0.8	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.07	V0	0.08	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.6	V0	0	V1
Ethylbenzene	0.01	0.02	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.2	V0	0.09	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.12	V0	0.11	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.03	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.01	V0	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.24	V0	0.12	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.02	V0	0	V1
n-Hexane	0.01	0.03	V0	0.02	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.02	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.11	V0	0.05	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Barge Landing AMS 9 15-Nov	Fort McKay South AMS 13 15-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.04	V0	0	V1
2,2-Dimethylbutane	0.01	0.02	V0	0.01	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0	V1	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0	V1	0	V1
2-Methylpentane	0.01	0.02	V0	0.04	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0	V1	0	V1
3-Methylpentane	0.01	0.01	V0	0.02	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.7	V0	0.5	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.04	V0	0.05	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0	V1
Ethylbenzene	0.01	0.02	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.07	V0	0.14	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.1	V0	0.15	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0	V1	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.12	V0	0.36	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0	V1	0	V1
n-Hexane	0.01	0	V1	0.02	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0.1	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.01	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.11	V0	0.03	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Horizon AMS 15 15-Nov	Janvier AMS 22 15-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0.05	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.07	V0	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0	V1	0	V1
2-Methylpentane	0.01	0.24	V0	0.05	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0	V1	0.02	V0
3-Methylpentane	0.01	0.12	V0	0.03	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	1	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.08	V0	0.09	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0.06	V0	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0.5	V0
Ethylbenzene	0.01	0	V1	0.02	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.1	V0	0.22	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.36	V0	0.19	V0
Isoprene	0.01	0	V1	0.01	V0
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0.05	V0
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0	V1	0.02	V0
Methylcyclopentane	0.02	0.03	V0	0.02	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.27	V0	0.29	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0	V1	0	V1
n-Hexane	0.01	0.11	V0	0.03	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0.5	V0	0.1	V0
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0.02	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.02	V0	0.1	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 21-Nov			Patricia McInnes AMS 6 21-Nov	
	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
	Compound Name				
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0.02	V0
2,2-Dimethylbutane	0.01	0.02	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0	V1	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.02	V0	0	V1
2-Methylhexane	0.01	0	V1	0	V1
2-Methylpentane	0.01	0.05	V0	0.03	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.02	V0	0	V1
3-Methylpentane	0.01	0.03	V0	0.02	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.6	V0	0.5	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.05	V0	0.06	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0.4	V0
Ethylbenzene	0.01	0	V1	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.09	V0	0.13	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.12	V0	0.11	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.02	V0	0	V1
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.1	V0	0.22	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.02	V0	0	V1
n-Hexane	0.01	0.03	V0	0.02	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0.01	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.05	V0	0.43	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1





Station Name Station # Sample Date	Athabasca Valley AMS 7 21-Nov			Anzac AMS 14 21-Nov	
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.02	V0	0.1	V0
2,2-Dimethylbutane	0.01	0	V1	0.01	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0	V1	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0	V1	0.03	V0
2-Methylpentane	0.01	0.03	V0	0.03	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.02	V0	0.02	V0
3-Methylpentane	0.01	0.02	V0	0.02	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.7	V0	0.7	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.06	V0	0.05	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0	V1
Cyclopentane	0.01	0	V1	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.4	V0	0.3	V0
Ethylbenzene	0.01	0	V1	0.01	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.19	V0	0.1	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.12	V0	0.13	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.01	V0	0.01	V0
Methylcyclopentane	0.02	0	V1	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.19	V0	0.14	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0	V1	0.01	V0
n-Hexane	0.01	0.03	V0	0.02	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.01	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.06	V0	0.15	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Barge Landing AMS 9 21-Nov	Fort McKay South AMS 13 21-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0.02	V0	0	V1
2,2-Dimethylbutane	0.01	0.01	V0	0.02	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0	V1	0	V1
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.03	V0	0.04	V0
2-Methylhexane	0.01	0	V1	0.02	V0
2-Methylpentane	0.01	0.03	V0	0.03	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.03	V0	0.04	V0
3-Methylpentane	0.01	0.02	V0	0.03	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.8	V0	0.6	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.05	V0	0.05	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0.02	V0
Cyclopentane	0.01	0	V1	0.02	V0
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.3	V0	0	V1
Ethylbenzene	0.01	0.04	V0	0.01	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.11	V0	0.07	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.09	V0	0.13	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.07	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.04	V0	0.05	V0
Methylcyclopentane	0.02	0.03	V0	0.03	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.13	V0	0.09	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.05	V0	0.05	V0
n-Hexane	0.01	0.03	V0	0.04	V0
n-Nonane	0.01	0	V1	0	V1
n-Octane	0.02	0.04	V0	0.04	V0
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.03	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.14	V0	0.07	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Horizon AMS 15 21-Nov		
Compound Name	MDL (ppbv)	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1
1,3-Butadiene	0.02	0	V1
1-Butene	0.02	0	V1
1-Pentene	0.01	0	V1
2,2,4-Trimethylpentane	0.01	0.07	V0
2,2-Dimethylbutane	0.01	0.05	V0
2,3,4-Trimethylpentane	0.01	0	V1
2,3-Dimethylbutane	0.02	0.12	V0
2,3-Dimethylpentane	0.02	0.05	V0
2,4-Dimethylpentane	0.01	0	V1
2-Methyl-1-pentene	0.3	0	V1
2-Methyl-2-butene	0.3	0	V1
2-Methylheptane	0.01	0	V1
2-Methylhexane	0.01	0	V1
2-Methylpentane	0.01	0.02	V0
3-Methyl-1-butene	0.3	0	V1
3-Methylheptane	0.02	0	V1
3-Methylhexane	0.02	0	V1
3-Methylpentane	0.01	0.17	V0
4-Methyl-1-pentene	0.3	0	V1
Acetaldehyde	3	0	V1
Acetone	0.4	1	V0
alpha-Pinene	0.3	0	V1
Benzene	0.01	0.04	V0
beta-Pinene	0.3	0	V1
cis-2-Butene	0.02	0	V1
cis-2-Hexene	0.3	0	V1
cis-2-Pentene	0.02	0	V1
Cyclohexane	0.02	0.13	V0
Cyclopentane	0.01	0	V1
Cyclopentene	0.3	0	V1
Ethanol	0.3	0.3	V0
Ethylbenzene	0.01	0	V1
Formaldehyde	3	0	V1
Isobutane	0.02	1.26	V0
Isobutylene	0.3	0	V1
Isopentane	0.03	1.18	V0
Isoprene	0.01	0	V1
Isopropylalcohol	0.4	0	V1
Isopropylbenzene	0.01	0	V1
m,p-Xylene	0.03	0	V1
Methanol	3	0	V1
Methylcyclohexane	0.01	0.09	V0
Methylcyclopentane	0.02	0.1	V0
Methylethylketone	0.3	0	V1
Methylisobutylketone	0.4	0	V1
Methylvinylketone	0.3	0	V1
n-Butane	0.03	0.23	V0
n-Decane	0.06	0	V1
n-Dodecane	0.4	0	V1
n-Heptane	0.01	0	V1
n-Hexane	0.01	0	V1
n-Nonane	0.01	0	V1
n-Octane	0.02	0	V1
n-Pentane	0.1	0	V1
n-Propylbenzene	0.05	0	V1
n-Undecane	0.5	0	V1
Naphthalene	0.5	0	V1
o-Xylene	0.01	0	V1
Styrene	0.04	0	V1
Toluene	0.01	0.11	V0
trans-2-Butene	0.01	0	V1
trans-2-Hexene	0.3	0	V1
trans-2-Pentene	0.02	0	V1



Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 27-Nov			Patricia McInnes AMS 6 27-Nov	
	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0	V1	0.02	V0
2,3,4-Trimethylpentane	0.01	0	V1	0.01	V0
2,3-Dimethylbutane	0.02	0.03	V0	0.03	V0
2,3-Dimethylpentane	0.02	0	V1	0.03	V0
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0.07	V0
2-Methylhexane	0.01	0	V1	0.03	V0
2-Methylpentane	0.01	0.03	V0	0.06	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0.03	V0
3-Methylhexane	0.02	0	V1	0.05	V0
3-Methylpentane	0.01	0.02	V0	0.06	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	0.6	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.07	V0	0.07	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0	V1	0.05	V0
Cyclopentane	0.01	0	V1	0.01	V0
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.4	V0	0	V1
Ethylbenzene	0.01	0	V1	0.02	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.14	V0	0.14	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.2	V0	0.22	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0.06	V0
Methanol	3	3	V0	0	V1
Methylcyclohexane	0.01	0	V1	0.1	V0
Methylcyclopentane	0.02	0	V1	0.05	V0
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.38	V0	0.1	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.02	V0	0.11	V0
n-Hexane	0.01	0.03	V0	0.04	V0
n-Nonane	0.01	0	V1	0.02	V0
n-Octane	0.02	0	V1	0.09	V0
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0.02	V0
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.03	V0	0.2	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name	Athabasca Valley			Anzac	
Station #	AMS 7			AMS 14	
Sample Date	27-Nov			27-Nov	
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0.02	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.06	V0	0	V1
2,3-Dimethylpentane	0.02	0.03	V0	0	V1
2,4-Dimethylpentane	0.01	0.01	V0	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.06	V0	0.02	V0
2-Methylhexane	0.01	0.03	V0	0.01	V0
2-Methylpentane	0.01	0.07	V0	0.04	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0.02	V0	0	V1
3-Methylhexane	0.02	0.04	V0	0	V1
3-Methylpentane	0.01	0.06	V0	0.03	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.7	V0	0.9	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.08	V0	0.08	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.05	V0	0	V1
Cyclopentane	0.01	0.02	V0	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0.3	V0	0	V1
Ethylbenzene	0.01	0.02	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.16	V0	0.08	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.21	V0	0.15	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.05	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.1	V0	0.02	V0
Methylcyclopentane	0.02	0.04	V0	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.1	V0	0.13	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.11	V0	0.03	V0
n-Hexane	0.01	0.05	V0	0.03	V0
n-Nonane	0.01	0.02	V0	0	V1
n-Octane	0.02	0.08	V0	0.02	V0
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.02	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.11	V0	0.06	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Barge Landing AMS 9 27-Nov	Fort McKay South AMS 13 27-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0.02	V0	0.02	V0
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.06	V0	0.02	V0
2,3-Dimethylpentane	0.02	0	V1	0	V1
2,4-Dimethylpentane	0.01	0	V1	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0.02	V0	0	V1
2-Methylhexane	0.01	0.02	V0	0	V1
2-Methylpentane	0.01	0.06	V0	0.07	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.03	V0	0	V1
3-Methylpentane	0.01	0.04	V0	0.04	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.8	V0	0.7	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.06	V0	0.07	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.02	V0	0.02	V0
Cyclopentane	0.01	0.01	V0	0.02	V0
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0	V1
Ethylbenzene	0.01	0.02	V0	0	V1
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	0.18	V0	0.13	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	0.27	V0	0.19	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0.03	V0	0	V1
Methanol	3	0	V1	0	V1
Methylcyclohexane	0.01	0.03	V0	0.01	V0
Methylcyclopentane	0.02	0.02	V0	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.32	V0	0.21	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.05	V0	0.02	V0
n-Hexane	0.01	0.03	V0	0.03	V0
n-Nonane	0.01	0.01	V0	0	V1
n-Octane	0.02	0.03	V0	0	V1
n-Pentane	0.1	0.1	V0	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0.01	V0	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.06	V0	0.05	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



Station Name Station # Sample Date	Horizon AMS 15 27-Nov	Janvier AMS 22 27-Nov			
Compound Name	MDL (ppbv)	Results (ppbv)	Flag	Results (ppbv)	Flag
1,2,4-Trimethylbenzene	0.03	0	V1	0	V1
1,3,5-Trimethylbenzene	0.02	0	V1	0	V1
1,3-Butadiene	0.02	0	V1	0	V1
1-Butene	0.02	0	V1	0	V1
1-Pentene	0.01	0	V1	0	V1
2,2,4-Trimethylpentane	0.01	0	V1	0	V1
2,2-Dimethylbutane	0.01	0.04	V0	0	V1
2,3,4-Trimethylpentane	0.01	0	V1	0	V1
2,3-Dimethylbutane	0.02	0.13	V0	0.02	V0
2,3-Dimethylpentane	0.02	0.05	V0	0	V1
2,4-Dimethylpentane	0.01	0.01	V0	0	V1
2-Methyl-1-pentene	0.3	0	V1	0	V1
2-Methyl-2-butene	0.3	0	V1	0	V1
2-Methylheptane	0.01	0	V1	0	V1
2-Methylhexane	0.01	0.02	V0	0.01	V0
2-Methylpentane	0.01	0.03	V0	0.04	V0
3-Methyl-1-butene	0.3	0	V1	0	V1
3-Methylheptane	0.02	0	V1	0	V1
3-Methylhexane	0.02	0.02	V0	0	V1
3-Methylpentane	0.01	0.16	V0	0.02	V0
4-Methyl-1-pentene	0.3	0	V1	0	V1
Acetaldehyde	3	0	V1	0	V1
Acetone	0.4	0.9	V0	0.6	V0
alpha-Pinene	0.3	0	V1	0	V1
Benzene	0.01	0.06	V0	0.07	V0
beta-Pinene	0.3	0	V1	0	V1
cis-2-Butene	0.02	0	V1	0	V1
cis-2-Hexene	0.3	0	V1	0	V1
cis-2-Pentene	0.02	0	V1	0	V1
Cyclohexane	0.02	0.16	V0	0	V1
Cyclopentane	0.01	0.05	V0	0	V1
Cyclopentene	0.3	0	V1	0	V1
Ethanol	0.3	0	V1	0	V1
Ethylbenzene	0.01	0	V1	0.01	V0
Formaldehyde	3	0	V1	0	V1
Isobutane	0.02	1.41	V0	0.06	V0
Isobutylene	0.3	0	V1	0	V1
Isopentane	0.03	1.15	V0	0.13	V0
Isoprene	0.01	0	V1	0	V1
Isopropylalcohol	0.4	0	V1	0	V1
Isopropylbenzene	0.01	0	V1	0	V1
m,p-Xylene	0.03	0	V1	0	V1
Methanol	3	0	V1	6	V0
Methylcyclohexane	0.01	0.11	V0	0.02	V0
Methylcyclopentane	0.02	0.12	V0	0	V1
Methylethylketone	0.3	0	V1	0	V1
Methylisobutylketone	0.4	0	V1	0	V1
Methylvinylketone	0.3	0	V1	0	V1
n-Butane	0.03	0.28	V0	0.11	V0
n-Decane	0.06	0	V1	0	V1
n-Dodecane	0.4	0	V1	0	V1
n-Heptane	0.01	0.03	V0	0.03	V0
n-Hexane	0.01	0.02	V0	0.05	V0
n-Nonane	0.01	0.01	V0	0	V1
n-Octane	0.02	0	V1	0	V1
n-Pentane	0.1	0	V1	0	V1
n-Propylbenzene	0.05	0	V1	0	V1
n-Undecane	0.5	0	V1	0	V1
Naphthalene	0.5	0	V1	0	V1
o-Xylene	0.01	0	V1	0	V1
Styrene	0.04	0	V1	0	V1
Toluene	0.01	0.04	V0	0.09	V0
trans-2-Butene	0.01	0	V1	0	V1
trans-2-Hexene	0.3	0	V1	0	V1
trans-2-Pentene	0.02	0	V1	0	V1



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION  
Volatile Organic Compounds (VOCs) - Summary

2017  
Indicated Sites and Dates

Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27 Average	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27 Std Dev	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27 Total Samples (#)	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.01	0.01	5	1
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.04	0.05	5	3
2,2-Dimethylbutane	0.01	0.01	5	3
2,3,4-Trimethylpentane	0.00	0.00	5	0
2,3-Dimethylbutane	0.03	0.03	5	3
2,3-Dimethylpentane	0.02	0.03	5	2
2,4-Dimethylpentane	0.00	0.00	5	0
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.05	0.08	5	3
2-Methylhexane	0.04	0.07	5	2
2-Methylpentane	0.05	0.04	5	5
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.02	0.04	5	1
3-Methylhexane	0.05	0.10	5	3
3-Methylpentane	0.03	0.03	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.88	0.16	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.05	0.03	5	4
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.01	0.03	5	1
Cyclopentane	0.01	0.01	5	1
Cyclopentene	0.00	0.00	5	0
Ethanol	0.48	0.52	5	3
Ethylbenzene	0.02	0.02	5	3
Formaldehyde	0.00	0.00	5	0
Isobutane	0.15	0.09	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.18	0.08	5	5
Isoprene	0.00	0.00	5	0
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.03	0.05	5	2
Methanol	0.60	1.34	5	1
Methylcyclohexane	0.06	0.11	5	3
Methylcyclopentane	0.03	0.06	5	1
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.26	0.18	5	5
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.13	0.25	5	4
n-Hexane	0.06	0.09	5	5
n-Nonane	0.02	0.05	5	1
n-Octane	0.06	0.13	5	1
n-Pentane	0.06	0.09	5	2
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.02	0.03	5	2
Styrene	0.00	0.00	5	0
Toluene	0.11	0.12	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0





Station Name Station # Sample Date	Patricia McInnes AMS 6 Nov 03 - Nov 27 Average	Patricia McInnes AMS 6 Nov 03 - Nov 27 Std Dev	Patricia McInnes AMS 6 Nov 03 - Nov 27 Total Samples (#)	Patricia McInnes AMS 6 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.01	0.01	5	1
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.02	0.01	5	4
2,2-Dimethylbutane	0.01	0.01	5	2
2,3,4-Trimethylpentane	0.00	0.01	5	2
2,3-Dimethylbutane	0.01	0.01	5	1
2,3-Dimethylpentane	0.01	0.02	5	2
2,4-Dimethylpentane	0.00	0.00	5	0
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.01	0.03	5	1
2-Methylhexane	0.01	0.02	5	2
2-Methylpentane	0.04	0.02	5	5
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.01	0.01	5	1
3-Methylhexane	0.02	0.02	5	2
3-Methylpentane	0.03	0.02	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.74	0.19	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.06	0.04	5	4
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.01	0.02	5	1
Cyclopentane	0.01	0.01	5	2
Cyclopentene	0.00	0.00	5	0
Ethanol	0.56	0.56	5	4
Ethylbenzene	0.01	0.01	5	3
Formaldehyde	0.00	0.00	5	0
Isobutane	0.19	0.19	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.18	0.14	5	5
Isoprene	0.00	0.00	5	0
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.03	0.03	5	3
Methanol	1.00	2.24	5	1
Methylcyclohexane	0.03	0.04	5	2
Methylcyclopentane	0.02	0.02	5	2
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.24	0.25	5	5
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.04	0.05	5	3
n-Hexane	0.03	0.02	5	5
n-Nonane	0.00	0.01	5	1
n-Octane	0.02	0.04	5	1
n-Pentane	0.04	0.09	5	1
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.02	0.01	5	5
Styrene	0.00	0.00	5	0
Toluene	0.19	0.15	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0



Station Name Station # Sample Date	Athabasca Valley AMS 7 Nov 03 - Nov 27 Average	Athabasca Valley AMS 7 Nov 03 - Nov 27 Std Dev	Athabasca Valley AMS 7 Nov 03 - Nov 27 Total Samples (#)	Athabasca Valley AMS 7 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.00	0.00	5	0
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.03	0.03	5	3
2,2-Dimethylbutane	0.01	0.01	5	2
2,3,4-Trimethylpentane	0.00	0.00	5	0
2,3-Dimethylbutane	0.03	0.03	5	3
2,3-Dimethylpentane	0.01	0.02	5	2
2,4-Dimethylpentane	0.00	0.00	5	1
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.02	0.03	5	2
2-Methylhexane	0.02	0.02	5	3
2-Methylpentane	0.04	0.03	5	5
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.00	0.01	5	1
3-Methylhexane	0.02	0.02	5	3
3-Methylpentane	0.03	0.02	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.98	0.31	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.06	0.04	5	4
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.01	0.02	5	2
Cyclopentane	0.01	0.01	5	2
Cyclopentene	0.00	0.00	5	0
Ethanol	0.66	0.43	5	5
Ethylbenzene	0.02	0.02	5	3
Formaldehyde	0.00	0.00	5	0
Isobutane	0.31	0.36	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.21	0.19	5	5
Isoprene	0.00	0.00	5	0
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.03	0.03	5	3
Methanol	0.80	1.79	5	1
Methylcyclohexane	0.03	0.04	5	4
Methylcyclopentane	0.02	0.02	5	2
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.41	0.60	5	5
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.04	0.04	5	4
n-Hexane	0.04	0.02	5	5
n-Nonane	0.01	0.01	5	2
n-Octane	0.02	0.03	5	2
n-Pentane	0.04	0.09	5	1
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.02	0.01	5	4
Styrene	0.00	0.00	5	0
Toluene	0.11	0.08	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0



Station Name Station # Sample Date	Anzac AMS 14 Nov 03 - Nov 27 Average	Anzac AMS 14 Nov 03 - Nov 27 Std Dev	Anzac AMS 14 Nov 03 - Nov 27 Total Samples (#)	Anzac AMS 14 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.00	0.00	5	0
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.03	0.04	5	2
2,2-Dimethylbutane	0.00	0.01	5	2
2,3,4-Trimethylpentane	0.00	0.00	5	0
2,3-Dimethylbutane	0.01	0.01	5	1
2,3-Dimethylpentane	0.01	0.01	5	1
2,4-Dimethylpentane	0.00	0.00	5	1
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.00	0.01	5	1
2-Methylhexane	0.01	0.01	5	3
2-Methylpentane	0.03	0.02	5	5
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.00	0.00	5	0
3-Methylhexane	0.00	0.01	5	1
3-Methylpentane	0.02	0.01	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.92	0.18	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.05	0.03	5	4
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.00	0.00	5	0
Cyclopentane	0.00	0.01	5	1
Cyclopentene	0.00	0.00	5	0
Ethanol	0.12	0.16	5	2
Ethylbenzene	0.00	0.00	5	1
Formaldehyde	0.00	0.00	5	0
Isobutane	0.12	0.10	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.17	0.12	5	5
Isoprene	0.00	0.00	5	1
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.00	0.00	5	0
Methanol	0.00	0.00	5	0
Methylcyclohexane	0.01	0.01	5	3
Methylcyclopentane	0.01	0.01	5	1
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.18	0.13	5	5
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.01	0.01	5	4
n-Hexane	0.03	0.02	5	5
n-Nonane	0.00	0.00	5	0
n-Octane	0.00	0.01	5	1
n-Pentane	0.04	0.09	5	1
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.00	0.00	5	0
Styrene	0.00	0.00	5	0
Toluene	0.09	0.04	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0



Station Name Station # Sample Date	Barge Landing AMS 9 Nov 03 - Nov 27 Average	Barge Landing AMS 9 Nov 03 - Nov 27 Std Dev	Barge Landing AMS 9 Nov 03 - Nov 27 Total Samples (#)	Barge Landing AMS 9 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.00	0.00	5	0
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.01	0.02	5	2
2,2-Dimethylbutane	0.02	0.01	5	5
2,3,4-Trimethylpentane	0.00	0.00	5	0
2,3-Dimethylbutane	0.04	0.04	5	3
2,3-Dimethylpentane	0.01	0.02	5	2
2,4-Dimethylpentane	0.00	0.00	5	0
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.03	0.02	5	4
2-Methylhexane	0.02	0.02	5	3
2-Methylpentane	0.06	0.05	5	5
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.01	0.01	5	1
3-Methylhexane	0.04	0.03	5	4
3-Methylpentane	0.04	0.03	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.84	0.11	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.05	0.02	5	5
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.02	0.02	5	3
Cyclopentane	0.01	0.01	5	2
Cyclopentene	0.00	0.00	5	0
Ethanol	0.16	0.23	5	2
Ethylbenzene	0.02	0.01	5	5
Formaldehyde	0.00	0.00	5	0
Isobutane	0.18	0.14	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.20	0.13	5	5
Isoprene	0.00	0.00	5	0
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.04	0.03	5	4
Methanol	0.00	0.00	5	0
Methylcyclohexane	0.04	0.03	5	4
Methylcyclopentane	0.03	0.02	5	4
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.23	0.15	5	5
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.07	0.06	5	4
n-Hexane	0.05	0.05	5	4
n-Nonane	0.02	0.02	5	3
n-Octane	0.04	0.04	5	4
n-Pentane	0.08	0.13	5	2
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.02	0.01	5	5
Styrene	0.00	0.00	5	0
Toluene	0.10	0.03	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0



Station Name Station # Sample Date	Fort McKay South AMS 13 Nov 03 - Nov 27 Average	Fort McKay South AMS 13 Nov 03 - Nov 27 Std Dev	Fort McKay South AMS 13 Nov 03 - Nov 27 Total Samples (#)	Fort McKay South AMS 13 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.00	0.00	5	0
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.00	0.00	5	0
2,2-Dimethylbutane	0.02	0.01	5	5
2,3,4-Trimethylpentane	0.00	0.00	5	0
2,3-Dimethylbutane	0.01	0.01	5	2
2,3-Dimethylpentane	0.01	0.02	5	1
2,4-Dimethylpentane	0.00	0.00	5	0
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.03	0.03	5	3
2-Methylhexane	0.02	0.03	5	2
2-Methylpentane	0.04	0.03	5	5
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.01	0.01	5	1
3-Methylhexane	0.03	0.04	5	2
3-Methylpentane	0.03	0.01	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.62	0.08	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.04	0.03	5	4
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.02	0.01	5	4
Cyclopentane	0.01	0.01	5	3
Cyclopentene	0.00	0.00	5	0
Ethanol	0.06	0.13	5	1
Ethylbenzene	0.01	0.01	5	2
Formaldehyde	0.00	0.00	5	0
Isobutane	0.15	0.09	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.16	0.05	5	5
Isoprene	0.00	0.00	5	0
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.01	0.02	5	1
Methanol	0.00	0.00	5	0
Methylcyclohexane	0.05	0.05	5	4
Methylcyclopentane	0.02	0.03	5	2
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.22	0.18	5	4
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.07	0.09	5	4
n-Hexane	0.05	0.05	5	5
n-Nonane	0.01	0.02	5	1
n-Octane	0.03	0.05	5	2
n-Pentane	0.06	0.09	5	2
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.00	0.01	5	1
Styrene	0.00	0.00	5	0
Toluene	0.06	0.03	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0



Station Name Station # Sample Date	Horizon AMS 15 Nov 03 - Nov 27 Average	Horizon AMS 15 Nov 03 - Nov 27 Std Dev	Horizon AMS 15 Nov 03 - Nov 27 Total Samples (#)	Horizon AMS 15 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.00	0.00	5	0
1,3,5-Trimethylbenzene	0.00	0.00	5	0
1,3-Butadiene	0.00	0.00	5	0
1-Butene	0.00	0.00	5	0
1-Pentene	0.00	0.00	5	0
2,2,4-Trimethylpentane	0.04	0.05	5	2
2,2-Dimethylbutane	0.03	0.02	5	4
2,3,4-Trimethylpentane	0.00	0.00	5	0
2,3-Dimethylbutane	0.08	0.05	5	5
2,3-Dimethylpentane	0.03	0.03	5	3
2,4-Dimethylpentane	0.00	0.00	5	1
2-Methyl-1-pentene	0.00	0.00	5	0
2-Methyl-2-butene	0.00	0.00	5	0
2-Methylheptane	0.02	0.04	5	1
2-Methylhexane	0.02	0.03	5	2
2-Methylpentane	0.07	0.10	5	4
3-Methyl-1-butene	0.00	0.00	5	0
3-Methylheptane	0.01	0.02	5	1
3-Methylhexane	0.03	0.05	5	2
3-Methylpentane	0.10	0.07	5	5
4-Methyl-1-pentene	0.00	0.00	5	0
Acetaldehyde	0.00	0.00	5	0
Acetone	0.94	0.05	5	5
alpha-Pinene	0.00	0.00	5	0
Benzene	0.05	0.03	5	4
beta-Pinene	0.00	0.00	5	0
cis-2-Butene	0.00	0.00	5	0
cis-2-Hexene	0.00	0.00	5	0
cis-2-Pentene	0.00	0.00	5	0
Cyclohexane	0.07	0.07	5	3
Cyclopentane	0.03	0.03	5	3
Cyclopentene	0.00	0.00	5	0
Ethanol	0.16	0.23	5	2
Ethylbenzene	0.01	0.02	5	1
Formaldehyde	0.00	0.00	5	0
Isobutane	0.63	0.65	5	5
Isobutylene	0.00	0.00	5	0
Isopentane	0.62	0.51	5	5
Isoprene	0.00	0.00	5	0
Isopropylalcohol	0.00	0.00	5	0
Isopropylbenzene	0.00	0.00	5	0
m,p-Xylene	0.01	0.03	5	1
Methanol	0.00	0.00	5	0
Methylcyclohexane	0.07	0.06	5	3
Methylcyclopentane	0.07	0.05	5	4
Methylethylketone	0.00	0.00	5	0
Methylisobutylketone	0.00	0.00	5	0
Methylvinylketone	0.00	0.00	5	0
n-Butane	0.24	0.12	5	5
n-Decane	0.00	0.00	5	0
n-Dodecane	0.00	0.00	5	0
n-Heptane	0.06	0.10	5	3
n-Hexane	0.05	0.06	5	4
n-Nonane	0.01	0.01	5	2
n-Octane	0.02	0.05	5	1
n-Pentane	0.14	0.22	5	2
n-Propylbenzene	0.00	0.00	5	0
n-Undecane	0.00	0.00	5	0
Naphthalene	0.00	0.00	5	0
o-Xylene	0.01	0.01	5	1
Styrene	0.00	0.00	5	0
Toluene	0.10	0.14	5	5
trans-2-Butene	0.00	0.00	5	0
trans-2-Hexene	0.00	0.00	5	0
trans-2-Pentene	0.00	0.00	5	0



Station Name Station # Sample Date	Janvier AMS 22 Nov 03 - Nov 27 Average	Janvier AMS 22 Nov 03 - Nov 27 Std Dev	Janvier AMS 22 Nov 03 - Nov 27 Total Samples (#)	Janvier AMS 22 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name	ppbv	ppbv		
1,2,4-Trimethylbenzene	0.00	0.00	4	0
1,3,5-Trimethylbenzene	0.00	0.00	4	0
1,3-Butadiene	0.00	0.00	4	0
1-Butene	0.00	0.00	4	0
1-Pentene	0.00	0.00	4	0
2,2,4-Trimethylpentane	0.05	0.06	4	2
2,2-Dimethylbutane	0.00	0.00	4	0
2,3,4-Trimethylpentane	0.00	0.00	4	0
2,3-Dimethylbutane	0.01	0.01	4	1
2,3-Dimethylpentane	0.00	0.00	4	0
2,4-Dimethylpentane	0.00	0.00	4	0
2-Methyl-1-pentene	0.00	0.00	4	0
2-Methyl-2-butene	0.00	0.00	4	0
2-Methylheptane	0.00	0.00	4	0
2-Methylhexane	0.01	0.01	4	2
2-Methylpentane	0.04	0.02	4	4
3-Methyl-1-butene	0.00	0.00	4	0
3-Methylheptane	0.00	0.00	4	0
3-Methylhexane	0.01	0.02	4	2
3-Methylpentane	0.02	0.01	4	3
4-Methyl-1-pentene	0.00	0.00	4	0
Acetaldehyde	0.00	0.00	4	0
Acetone	0.88	0.22	4	4
alpha-Pinene	0.00	0.00	4	0
Benzene	0.05	0.04	4	3
beta-Pinene	0.00	0.00	4	0
cis-2-Butene	0.00	0.00	4	0
cis-2-Hexene	0.00	0.00	4	0
cis-2-Pentene	0.00	0.00	4	0
Cyclohexane	0.00	0.00	4	0
Cyclopentane	0.00	0.00	4	0
Cyclopentene	0.00	0.00	4	0
Ethanol	0.60	0.58	4	3
Ethylbenzene	0.02	0.01	4	4
Formaldehyde	0.00	0.00	4	0
Isobutane	0.15	0.10	4	4
Isobutylene	0.00	0.00	4	0
Isopentane	0.17	0.05	4	4
Isoprene	0.00	0.01	4	1
Isopropylalcohol	0.00	0.00	4	0
Isopropylbenzene	0.00	0.00	4	0
m,p-Xylene	0.02	0.03	4	2
Methanol	1.50	3.00	4	1
Methylcyclohexane	0.02	0.01	4	3
Methylcyclopentane	0.01	0.02	4	2
Methylethylketone	0.00	0.00	4	0
Methylisobutylketone	0.00	0.00	4	0
Methylvinylketone	0.00	0.00	4	0
n-Butane	0.18	0.15	4	3
n-Decane	0.00	0.00	4	0
n-Dodecane	0.00	0.00	4	0
n-Heptane	0.02	0.01	4	3
n-Hexane	0.04	0.03	4	4
n-Nonane	0.00	0.00	4	0
n-Octane	0.00	0.00	4	0
n-Pentane	0.10	0.08	4	3
n-Propylbenzene	0.00	0.00	4	0
n-Undecane	0.00	0.00	4	0
Naphthalene	0.00	0.00	4	0
o-Xylene	0.01	0.01	4	2
Styrene	0.00	0.00	4	0
Toluene	0.12	0.04	4	4
trans-2-Butene	0.00	0.00	4	0
trans-2-Hexene	0.00	0.00	4	0
trans-2-Pentene	0.00	0.00	4	0



Wood Buffalo Environmental Association

VOC (ppb) summary

2017 November

Compound	% Det	N	N < Det.	Min.	10%	25%	50%	60%	75%	80%	90%	95%	99%	Max.	Mean	Std. Dev.	Median	Outlier	Test
1,2,4-Trimethylbenzene	5.1%	39	37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.01	0.00	0.04	
1,3,5-Trimethylbenzene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
1,3-Butadiene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
1-Butene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
1-Pentene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
2,2,4-Trimethylpentane	46.2%	39	21	0.00	0.00	0.00	0.02	0.04	0.07	0.10	0.11	0.12	0.12	0.12	0.03	0.04	0.00		
2,2-Dimethylbutane	59.0%	39	16	0.00	0.00	0.01	0.02	0.02	0.02	0.04	0.05	0.05	0.05	0.05	0.01	0.01	0.01	0.01	0.08
2,3,4-Trimethylpentane	5.1%	39	37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	
2,3-Dimethylbutane	48.7%	39	20	0.00	0.00	0.00	0.02	0.05	0.05	0.07	0.12	0.13	0.13	0.03	0.03	0.03	0.00	0.20	
2,3-Dimethylpentane	33.3%	39	26	0.00	0.00	0.00	0.03	0.03	0.04	0.05	0.08	0.08	0.08	0.01	0.02	0.00	0.00	0.11	
2,4-Dimethylpentane	7.7%	39	36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	
2-Methyl-1-pentene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
2-Methyl-2-butene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
2-Methylheptane	38.5%	39	24	0.00	0.00	0.00	0.00	0.03	0.04	0.07	0.10	0.19	0.19	0.02	0.04	0.00	0.00	0.21	
2-Methylhexane	48.7%	39	20	0.00	0.00	0.00	0.01	0.03	0.03	0.05	0.07	0.16	0.16	0.02	0.03	0.00	0.00	0.17	
2-Methylpentane	97.4%	39	1	0.00	0.01	0.02	0.03	0.04	0.06	0.07	0.08	0.14	0.24	0.24	0.05	0.04	0.03	0.26	
3-Methyl-1-butene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
3-Methylheptane	15.4%	39	33	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.08	0.08	0.01	0.02	0.00	0.00	0.09	
3-Methylhexane	48.7%	39	20	0.00	0.00	0.00	0.02	0.03	0.04	0.07	0.12	0.23	0.23	0.03	0.04	0.00	0.00	0.25	
3-Methylpentane	97.4%	39	1	0.00	0.01	0.02	0.03	0.04	0.05	0.08	0.16	0.17	0.17	0.04	0.04	0.03	0.03	0.23	
4-Methyl-1-pentene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Acetaldehyde	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Acetone	100.0%	39	0	0.50	0.60	0.70	0.90	0.90	1.00	1.00	1.10	1.20	1.40	1.40	0.85	0.20	0.90	1.84	
alpha-Pinene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Benzene	82.1%	39	7	0.00	0.00	0.04	0.06	0.06	0.07	0.08	0.09	0.09	0.10	0.10	0.05	0.03	0.06	0.20	
beta-Pinene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
cis-2-Butene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
cis-2-Hexene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
cis-2-Pentene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Cyclohexane	35.9%	39	25	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.05	0.06	0.06	0.01	0.01	0.01	0.00	0.08	
Cyclopentane	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Ethanol	56.4%	39	17	0.00	0.00	0.30	0.40	0.50	0.50	1.20	1.40	1.50	1.50	0.34	0.42	0.30	2.46		
Ethylbenzene	56.4%	39	17	0.00	0.00	0.01	0.02	0.02	0.02	0.04	0.04	0.05	0.05	0.01	0.01	0.01	0.09		
Formaldehyde	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Isobutane	100.0%	39	0	0.05	0.06	0.08	0.13	0.14	0.25	0.30	0.53	1.26	1.41	1.41	0.24	0.31	0.13	1.77	
Isobutylene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Isopentane	100.0%	39	0	0.07	0.09	0.12	0.14	0.19	0.27	0.32	0.41	1.15	1.18	1.18	0.24	0.24	0.14	1.46	
Isoprene	5.1%	39	37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	
Isopropylalcohol	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Isopropylbenzene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
m,p-Xylene	41.0%	39	23	0.00	0.00	0.00	0.03	0.05	0.05	0.07	0.07	0.12	0.12	0.02	0.03	0.00	0.00	0.17	
Methanol	10.3%	39	35	0.00	0.00	0.00	0.00	0.00	0.00	3.00	5.00	6.00	6.00	0.46	1.43	0.00	7.61		
Methylcyclohexane	66.7%	39	13	0.00	0.00	0.02	0.02	0.06	0.08	0.11	0.14	0.26	0.26	0.04	0.05	0.02	0.31		
Methylcyclopentane	46.2%	39	21	0.00	0.00	0.00	0.03	0.04	0.05	0.08	0.12	0.14	0.14	0.02	0.04	0.00	0.20		
Methylethylketone	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Methylisobutylketone	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Methylvinylketone	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
n-Butane	94.9%	39	2	0.00	0.05	0.10	0.19	0.24	0.33	0.38	0.44	0.67	1.47	1.47	0.25	0.25	0.19	1.50	
n-Decane	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
n-Dodecane	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
n-Heptane	74.4%	39	10	0.00	0.00	0.02	0.03	0.05	0.05	0.14	0.23	0.57	0.57	0.05	0.10	0.02	0.56		
n-Hexane	94.9%	39	2	0.00	0.01	0.02	0.03	0.03	0.06	0.06	0.12	0.13	0.23	0.23	0.04	0.05	0.03	0.27	
n-Nonane	25.6%	39	29	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.04	0.12	0.12	0.01	0.02	0.00	0.12		
n-Octane	30.8%	39	27	0.00	0.00	0.00	0.00	0.03	0.04	0.10	0.12	0.28	0.28	0.02	0.05	0.00	0.30		
n-Pentane	35.9%	39	25	0.00	0.00	0.00	0.00	0.10	0.20	0.20	0.30	0.50	0.50	0.07	0.11	0.00	0.63		
n-Propylbenzene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
n-Undecane	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Naphthalene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
o-Xylene	51.3%	39	19	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.06	0.06	0.01	0.01	0.01	0.08		
Styrene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
Toluene	100.0%	39	0	0.01	0.03	0.05	0.09	0.11	0.12	0.15	0.23	0.34	0.43	0.43	0.11	0.09	0.09	0.56	
trans-2-Butene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
trans-2-Hexene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		
trans-2-Pentene	0.0%	39	39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PARTICULATE MATTER - IONS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PM ions: Atmospheric Research & Analysis, Inc.  
Morrisville, NC



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PARTICULATE MATTER (PM<sub>2.5</sub>) - IONS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PM ions: Atmospheric Research & Analysis, Inc.  
Morrisville, NC



FILE CONTENTS DESCRIPTION	Partisol Sampler Measurements of Mass, Ions by IC and Metals by ICP-MS
SAMPLING INTERVAL	24 hour
SAMPLING FREQUENCY OF DATA	Once every 6 days
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection - Method Detection Limits (MDL) are provided with each observation
UNITS	$\mu\text{g}/\text{m}^3$ (microgram per cubic meter)
OBSERVATION TYPE	Particles
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	Filtration with $\text{PM}_{10}$ Inlet for $\text{PM}_{10}$ and with $\text{PM}_{10}$ Inlet/Very Sharp Cut Cyclone for $\text{PM}_{2.5}$
PARTICLE DIAMETER	$< 2.5 \mu\text{m}$ or $< 10 \mu\text{m}$
MEDIUM	47 mm Teflon Filter
ANALYTICAL METHODS	MASS by Microbalance ELEMENTS by Inductively Coupled Plasma Mass Spectrometry (ICP/MS) IONS by Ion Chromatography (IC)
SAMPLE PREPARATION	DI Water extraction for IC analysis and Acid Digestion for ICP/MS Analysis
ANALYTICAL LABORATORY	Atmospheric Research & Analysis Inc
USER NOTE 1	Data are not blank corrected
USER NOTE 2	Volume is given at actual conditions of temperature and pressure during sampling as measured by the sampler
USER NOTE 3	Blank sample concentration ( $\mu\text{g}/\text{m}^3$ ) is calculated using expected actual volume of sampler
VOLUME STANDARDIZATION	Actual Volume at Ambient Conditions (since 01-Jan-2011)
SAMPLING INSTRUMENT TYPE	For $\text{PM}_{10}$ FRM Partisol $\text{PM}_{10}$ sampler For $\text{PM}_{2.5}$ FRM Partisol $\text{PM}_{2.5}$ sampler
FLAGS USED	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	03-Nov			03-Nov		03-Nov	
Particulate Size	PM2.5			PM2.5			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	2.12	V4	1.25	V0	0.13	V0
Calcium	0.16	0.02	V0	0.01	V0	0.00	V1
Magnesium	0.03	0.00	V0	0.00	V0	0.00	V1
Potassium	0.09	0.01	V0	0.01	V0	0.00	V0
Sodium	0.05	0.01	V0	0.01	V0	0.00	V1
Chloride	0.12	0.00	V1	0.01	V0	0.01	V0
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.03	V0	0.01	V0	0.00	V1
Sulphate	0.25	0.13	V0	0.15	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.04	V0	0.05	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		03-Nov	
Sample Date	03-Nov			03-Nov		03-Nov	
Particulate Size	PM2.5			PM2.5		PM2.5	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.84	V0	1.45	V0	0.13	V0
Calcium	0.16	0.03	V0	0.01	V0	0.00	V1
Magnesium	0.03	0.00	V0	0.00	V0	0.00	V1
Potassium	0.09	0.01	V0	0.01	V0	0.00	V0
Sodium	0.05	0.13	V0	0.01	V0	0.00	V1
Chloride	0.12	0.19	V0	0.00	V1	0.01	V0
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.02	V0	0.00	V1	0.00	V1
Sulphate	0.25	0.18	V0	0.31	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.06	V0	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	09-Nov			09-Nov		09-Nov	
Particulate Size	PM2.5			PM2.5			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	7.81	V0	5.78	V0	0.22	V0
Calcium	0.16	0.08	V0	0.04	V0	0.00	V1
Magnesium	0.03	0.01	V0	0.01	V0	0.00	V1
Potassium	0.09	0.06	V0	0.06	V0	0.00	V1
Sodium	0.05	0.02	V0	0.03	V0	0.00	V1
Chloride	0.12	0.01	V0	0.01	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.55	V0	0.65	V0	0.00	V1
Sulphate	0.25	1.38	V0	0.89	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.52	V0	0.40	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		09-Nov	
Sample Date	09-Nov			09-Nov		09-Nov	
Particulate Size	PM2.5			PM2.5		PM2.5	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	6.34	V0	4.54	V0	0.22	V0
Calcium	0.16	0.05	V0	0.02	V0	0.00	V1
Magnesium	0.03	0.01	V0	0.00	V0	0.00	V1
Potassium	0.09	0.06	V0	0.05	V0	0.00	V1
Sodium	0.05	0.07	V0	0.01	V0	0.00	V1
Chloride	0.12	0.03	V0	0.00	V1	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.82	V0	0.29	V0	0.00	V1
Sulphate	0.25	1.10	V0	0.99	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.49	V0	0.38	V0	0.00	V1





Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	15-Nov			15-Nov		15-Nov	
Particulate Size	PM2.5			PM2.5			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.78	V4	1.80	V0	0.11	V0
Calcium	0.16	0.06	V0	0.03	V0	0.01	V0
Magnesium	0.03	0.01	V0	0.01	V0	0.00	V1
Potassium	0.09	0.01	V0	0.02	V0	0.00	V1
Sodium	0.05	0.08	V0	0.09	V0	0.00	V0
Chloride	0.12	0.07	V0	0.09	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.05	V0	0.06	V0	0.00	V1
Sulphate	0.25	0.22	V0	0.26	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.06	V0	0.07	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		15-Nov	
Sample Date	15-Nov			15-Nov		15-Nov	
Particulate Size	PM2.5			PM2.5		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	2.02	V0	1.42	V0	0.11	V0
Calcium	0.16	0.06	V0	0.02	V0	0.01	V0
Magnesium	0.03	0.01	V0	0.01	V0	0.00	V1
Potassium	0.09	0.01	V0	0.01	V0	0.00	V1
Sodium	0.05	0.11	V0	0.08	V0	0.00	V0
Chloride	0.12	0.12	V0	0.08	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.07	V0	0.04	V0	0.00	V1
Sulphate	0.25	0.27	V0	0.30	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.07	V0	0.08	V0	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	21-Nov			21-Nov		21-Nov	
Particulate Size	PM2.5			PM2.5			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.97	V4	2.64	V0	0.19	V0
Calcium	0.16	0.01	V0	0.01	V0	0.00	V1
Magnesium	0.03	0.02	V0	0.02	V0	0.00	V1
Potassium	0.09	0.01	V0	0.01	V0	0.00	V1
Sodium	0.05	0.11	V0	0.13	V0	0.00	V1
Chloride	0.12	0.09	V0	0.03	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.12	V0	0.27	V0	0.00	V1
Sulphate	0.25	0.34	V0	0.79	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.08	V0	0.20	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14			
Sample Date	21-Nov			21-Nov		21-Nov	
Particulate Size	PM2.5			PM2.5			
Total Air Volume (m <sup>3</sup> )	24			0		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	3.23	V0	-9999	M1	0.19	V0
Calcium	0.16	0.01	V0	-9999	M1	0.00	V1
Magnesium	0.03	0.02	V0	-9999	M1	0.00	V1
Potassium	0.09	0.02	V0	-9999	M1	0.00	V1
Sodium	0.05	0.14	V0	-9999	M1	0.00	V1
Chloride	0.12	0.04	V0	-9999	M1	0.00	V1
Fluoride	0.15	0.00	V1	-9999	M1	0.00	V1
Nitrate	0.20	0.40	V0	-9999	M1	0.00	V1
Sulphate	0.25	0.81	V0	-9999	M1	0.00	V1
Phosphate	0.26	0.00	V1	-9999	M1	0.00	V1
Ammonium (as N)	0.02	0.23	V0	-9999	M1	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	27-Nov			27-Nov		27-Nov	
Particulate Size	PM2.5			PM2.5			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.66	V0	-9999	M2	0.09	V0
Calcium	0.16	0.01	V0	-9999	M2	0.00	V1
Magnesium	0.03	0.00	V0	-9999	M2	0.00	V1
Potassium	0.09	0.01	V0	-9999	M2	0.00	V1
Sodium	0.05	0.01	V0	-9999	M2	0.00	V1
Chloride	0.12	0.01	V0	-9999	M2	0.00	V1
Fluoride	0.15	0.00	V1	-9999	M2	0.00	V1
Nitrate	0.20	0.02	V0	-9999	M2	0.00	V1
Sulphate	0.25	0.19	V0	-9999	M2	0.00	V1
Phosphate	0.26	0.00	V1	-9999	M2	0.00	V1
Ammonium (as N)	0.02	0.05	V0	-9999	M2	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		27-Nov	
Sample Date	27-Nov			27-Nov		27-Nov	
Particulate Size	PM2.5			PM2.5		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.80	V0	1.80	V0	0.09	V0
Calcium	0.16	0.02	V0	0.01	V0	0.00	V1
Magnesium	0.03	0.00	V0	0.00	V0	0.00	V1
Potassium	0.09	0.02	V0	0.01	V0	0.00	V1
Sodium	0.05	0.03	V0	0.01	V0	0.00	V1
Chloride	0.12	0.01	V0	0.01	V0	0.00	V1
Fluoride	0.15	-9999	M2	0.00	V1	0.00	V1
Nitrate	0.20	0.06	V0	0.02	V0	0.00	V1
Sulphate	0.25	0.39	V0	0.47	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.11	V0	0.13	V0	0.00	V1



Station Name	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay
Station #	AMS 1	AMS 1	AMS 1	AMS 1
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	3.07	2.66	5	5
Calcium	0.03	0.03	5	5
Magnesium	0.01	0.01	5	5
Potassium	0.02	0.02	5	5
Sodium	0.04	0.05	5	5
Chloride	0.03	0.04	5	4
Fluoride	0.00	0.00	5	0
Nitrate	0.15	0.22	5	5
Sulphate	0.45	0.52	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.15	0.21	5	5



<b>Station Name</b>	<b>Patricia McInnes</b>	<b>Patricia McInnes</b>	<b>Patricia McInnes</b>	<b>Patricia McInnes</b>
<b>Station #</b>	<b>AMS 6</b>	<b>AMS 6</b>	<b>AMS 6</b>	<b>AMS 6</b>
<b>Sample Date</b>	<b>Nov 03 - Nov 27</b>	<b>Nov 03 - Nov 27</b>	<b>Nov 03 - Nov 27</b>	<b>Nov 03 - Nov 27</b>
<b>Particulate Size</b>	<b>PM2.5</b>	<b>PM2.5</b>	<b>PM2.5</b>	<b>PM2.5</b>
<b>Compound Name</b>	<b>Average</b>	<b>Std Dev</b>	<b>Total Samples (#)</b>	<b>Total ≥ MDL (#)</b>
	<b>µg/m<sup>3</sup></b>	<b>µg/m<sup>3</sup></b>		
Particulate Matter	2.87	2.02	4	4
Calcium	0.02	0.01	4	4
Magnesium	0.01	0.01	4	4
Potassium	0.02	0.02	4	4
Sodium	0.06	0.06	4	4
Chloride	0.03	0.04	4	4
Fluoride	0.00	0.00	4	0
Nitrate	0.25	0.29	4	4
Sulphate	0.52	0.37	4	4
Phosphate	0.00	0.00	4	0
Ammonium (as N)	0.18	0.16	4	4





Station Name	Athabasca Valley	Athabasca Valley	Athabasca Valley	Athabasca Valley
Station #	AMS 7	AMS 7	AMS 7	AMS 7
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	3.05	1.93	5	5
Calcium	0.04	0.02	5	5
Magnesium	0.01	0.01	5	5
Potassium	0.02	0.02	5	5
Sodium	0.09	0.05	5	5
Chloride	0.08	0.08	5	5
Fluoride	0.00	0.00	4	0
Nitrate	0.27	0.34	5	5
Sulphate	0.55	0.39	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.19	0.18	5	5



Station Name	Anzac	Anzac	Anzac	Anzac
Station #	AMS 14	AMS 14	AMS 14	AMS 14
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	2.30	1.50	4	4
Calcium	0.01	0.00	4	4
Magnesium	0.00	0.01	4	4
Potassium	0.02	0.02	4	4
Sodium	0.03	0.04	4	4
Chloride	0.02	0.04	4	2
Fluoride	0.00	0.00	4	0
Nitrate	0.09	0.13	4	3
Sulphate	0.51	0.33	4	4
Phosphate	0.00	0.00	4	0
Ammonium (as N)	0.16	0.15	4	4



**Wood Buffalo Environmental Association**

**PM2.5 Ion ( $\mu\text{g}/\text{sample}$ ) Summary**

**2017 November**

Compound	% Det	N	N < Det.	Min.	10%	25%	50%	60%	75%	80%	90%	95%	99% Max.	Mean	Std. Dev.	Median	Outlier Test	
Particulate Matter	100.0%	18	0	30	34	43	47	48	78	109	152	187	187	187	68	47	47	301
Calcium	100.0%	18	0	0.18	0.18	0.27	0.42	0.51	0.84	1.20	1.47	1.92	1.92	1.92	0.64	0.51	0.42	3.20
Magnesium	100.0%	18	0	0.03	0.03	0.06	0.15	0.15	0.33	0.33	0.45	0.48	0.48	0.48	0.19	0.16	0.15	0.97
Potassium	100.0%	18	0	0.15	0.24	0.24	0.30	0.30	0.45	1.23	1.47	1.53	1.53	1.53	0.53	0.49	0.30	2.96
Sodium	100.0%	18	0	0.12	0.15	0.24	1.62	1.83	2.61	2.67	3.12	3.30	3.30	3.30	1.41	1.19	1.62	7.35
Chloride	83.3%	18	3	0.06	0.06	0.12	0.78	0.81	1.98	2.04	2.97	4.56	4.56	4.56	1.07	1.26	0.78	7.38
Fluoride	0.0%	17	17	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.06	0.06	0.06	0.06	0.03	0.01	0.03	
Nitrate	94.4%	18	1	0.15	0.24	0.54	1.44	1.74	6.87	9.51	15.54	19.68	19.68	19.68	4.62	6.01	1.44	34.68
Sulphate	100.0%	18	0	3.15	3.66	5.37	8.22	9.33	19.41	21.33	26.46	33.00	33.00	33.00	12.21	9.13	8.22	57.88
Phosphate	0.0%	18	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	
Ammonium (as N)	100.0%	18	0	1.07	1.19	1.40	1.98	2.75	5.40	9.08	11.76	12.44	12.44	12.44	4.11	3.90	1.98	23.61



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PARTICULATE MATTER (PM<sub>10</sub>) - IONS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PM ions: Atmospheric Research & Analysis, Inc.  
Morrisville, NC



FILE CONTENTS DESCRIPTION	Partisol Sampler Measurements of Mass, Ions by IC and Metals by ICP-MS
SAMPLING INTERVAL	24 hour
SAMPLING FREQUENCY OF DATA	Once every 6 days
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection - Method Detection Limits (MDL) are provided with each observation
UNITS	$\mu\text{g}/\text{m}^3$ (microgram per cubic meter)
OBSERVATION TYPE	Particles
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	Filtration with $\text{PM}_{10}$ Inlet for $\text{PM}_{10}$ and with $\text{PM}_{10}$ Inlet/Very Sharp Cut Cyclone for $\text{PM}_{2.5}$
PARTICLE DIAMETER MEDIUM	< 2.5 $\mu\text{m}$ or < 10 $\mu\text{m}$ 47 mm Teflon Filter
ANALYTICAL METHODS	MASS by Microbalance ELEMENTS by Inductively Coupled Plasma Mass Spectrometry (ICP/MS) IONS by Ion Chromatography (IC)
SAMPLE PREPARATION	DI Water extraction for IC analysis and Acid Digestion for ICP/MS Analysis
ANALYTICAL LABORATORY	Atmospheric Research & Analysis Inc
USER NOTE 1	Data are not blank corrected
USER NOTE 2	Volume is given at actual conditions of temperature and pressure during sampling as measured by the sampler
USER NOTE 3	Blank sample concentration ( $\mu\text{g}/\text{m}^3$ ) is calculated using expected actual volume of sampler
VOLUME STANDARDIZATION	Actual Volume at Ambient Conditions (since 01-Jan-2011)
SAMPLING INSTRUMENT TYPE	For $\text{PM}_{10}$ FRM Partisol $\text{PM}_{10}$ sampler For $\text{PM}_{2.5}$ FRM Partisol $\text{PM}_{2.5}$ sampler
<b>FLAGS USED</b>	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Compound Name	Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	MDL (µg/sample)	Horizon AMS 15 02-Nov PM10 24	Results (µg/m <sup>3</sup> )	QC Flag	Travel Blank	
						02-Nov	24
						Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter		1.00		1.60	V6	0.23	V0
Calcium		0.16		0.06	V6	0.00	V1
Magnesium		0.03		0.00	V6	0.00	V1
Potassium		0.09		0.01	V6	0.00	V1
Sodium		0.05		0.01	V6	0.00	V1
Chloride		0.12		0.00	V6	0.00	V1
Fluoride		0.15		0.00	V6	0.00	V1
Nitrate		0.20		0.01	V6	0.00	V1
Sulphate		0.25		0.09	V6	0.00	V1
Phosphate		0.26		0.00	V6	0.00	V1
Ammonium (as N)		0.02		0.03	V6	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	03-Nov			03-Nov		03-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	9.99	V0	2.75	V0	0.23	V0
Calcium	0.16	0.18	V0	0.06	V0	0.00	V1
Magnesium	0.03	0.02	V0	0.01	V0	0.00	V1
Potassium	0.09	0.02	V0	0.01	V0	0.00	V1
Sodium	0.05	0.09	V0	0.32	V0	0.00	V1
Chloride	0.12	0.09	V0	0.48	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.10	V0	0.03	V0	0.00	V1
Sulphate	0.25	0.19	V0	0.16	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.05	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		03-Nov	
Sample Date	03-Nov			03-Nov		03-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	14.45	V0	2.07	V0	0.23	V0
Calcium	0.16	0.44	V0	0.03	V0	0.00	V1
Magnesium	0.03	0.05	V0	0.00	V0	0.00	V1
Potassium	0.09	0.06	V0	0.01	V0	0.00	V1
Sodium	0.05	2.97	V0	0.03	V0	0.00	V1
Chloride	0.12	4.52	V0	0.04	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.06	V0	0.01	V0	0.00	V1
Sulphate	0.25	0.21	V0	0.31	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.04	V0	0.07	V0	0.00	V1





Station Name	Fort McKay South			Muskeg River		Travel Blank	
Station #	AMS 13			AMS 16		03-Nov	
Sample Date	03-Nov			03-Nov		03-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	9.52	V0	6.91	V0	0.23	V0
Calcium	0.16	0.18	V0	0.21	V0	0.00	V1
Magnesium	0.03	0.02	V0	0.01	V0	0.00	V1
Potassium	0.09	0.02	V0	0.01	V0	0.00	V1
Sodium	0.05	0.05	V0	0.06	V0	0.00	V1
Chloride	0.12	0.04	V0	0.05	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.06	V0	0.10	V0	0.00	V1
Sulphate	0.25	0.16	V0	0.57	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.03	V0	0.17	V0	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	09-Nov			09-Nov		09-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	28.55	V0	13.06	V0	0.06	V0
Calcium	0.16	1.44	V0	0.43	V0	0.01	V0
Magnesium	0.03	0.09	V0	0.07	V0	0.00	V1
Potassium	0.09	0.08	V0	0.08	V0	0.00	V1
Sodium	0.05	0.17	V0	0.63	V0	0.00	V1
Chloride	0.12	0.15	V0	0.89	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.86	V0	0.86	V0	0.00	V1
Sulphate	0.25	1.51	V0	0.90	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.46	V0	0.34	V0	0.00	V0



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		09-Nov	
Sample Date	09-Nov			09-Nov		09-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	20.61	V0	5.01	V0	0.06	V0
Calcium	0.16	0.86	V0	0.06	V0	0.01	V0
Magnesium	0.03	0.11	V0	0.01	V0	0.00	V1
Potassium	0.09	0.09	V0	0.05	V0	0.00	V1
Sodium	0.05	1.33	V0	0.02	V0	0.00	V1
Chloride	0.12	1.90	V0	0.00	V1	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	1.04	V0	0.31	V0	0.00	V1
Sulphate	0.25	1.14	V0	0.98	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.37	V0	0.35	V0	0.00	V0



Station Name	Fort McKay South			Horizon		Travel Blank	
Station #	AMS 13			AMS 15			
Sample Date	09-Nov			09-Nov		09-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	26.03	V0	20.53	V0	0.06	V0
Calcium	0.16	1.03	V0	0.86	V0	0.01	V0
Magnesium	0.03	0.09	V0	0.07	V0	0.00	V1
Potassium	0.09	0.07	V0	0.06	V0	0.00	V1
Sodium	0.05	0.17	V0	0.09	V0	0.00	V1
Chloride	0.12	0.14	V0	0.04	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.75	V0	0.75	V0	0.00	V1
Sulphate	0.25	1.43	V0	1.31	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.43	V0	0.41	V0	0.00	V0



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Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			09-Nov	
Sample Date	09-Nov			09-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	40.09	V0	0.06	V0
Calcium	0.16	2.86	V0	0.01	V0
Magnesium	0.03	0.10	V0	0.00	V1
Potassium	0.09	0.08	V0	0.00	V1
Sodium	0.05	0.13	V0	0.00	V1
Chloride	0.12	0.12	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1
Nitrate	0.20	0.78	V0	0.00	V1
Sulphate	0.25	1.34	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.32	V0	0.00	V0



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	15-Nov			15-Nov		15-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	11.53	V0	7.52	V0	0.11	V0
Calcium	0.16	0.93	V0	0.35	V0	0.01	V0
Magnesium	0.03	0.06	V0	0.06	V0	0.00	V1
Potassium	0.09	0.02	V0	0.03	V0	0.00	V1
Sodium	0.05	0.20	V0	0.61	V0	0.00	V1
Chloride	0.12	0.27	V0	0.90	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.01	V0	0.00	V1
Nitrate	0.20	0.10	V0	0.09	V0	0.00	V1
Sulphate	0.25	0.29	V0	0.29	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.06	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		15-Nov	
Sample Date	15-Nov			15-Nov		15-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	17.17	V0	2.69	V0	0.11	V0
Calcium	0.16	0.96	V0	0.10	V0	0.01	V0
Magnesium	0.03	0.11	V0	0.03	V0	0.00	V1
Potassium	0.09	0.05	V0	0.01	V0	0.00	V1
Sodium	0.05	1.23	V0	0.14	V0	0.00	V1
Chloride	0.12	1.80	V0	0.18	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.15	V0	0.05	V0	0.00	V1
Sulphate	0.25	0.34	V0	0.33	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.08	V0	0.00	V1



Station Name	Fort McKay South			Horizon		Travel Blank	
Station #	AMS 13			AMS 15		15-Nov	
Sample Date	15-Nov			15-Nov		15-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	10.87	V0	25.60	V0	0.11	V0
Calcium	0.16	0.66	V0	1.47	V0	0.01	V0
Magnesium	0.03	0.06	V0	0.13	V0	0.00	V1
Potassium	0.09	0.02	V0	0.02	V0	0.00	V1
Sodium	0.05	0.25	V0	0.17	V0	0.00	V1
Chloride	0.12	0.33	V0	0.21	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.09	V0	0.16	V0	0.00	V1
Sulphate	0.25	0.27	V0	0.35	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.06	V0	0.00	V1





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Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			15-Nov	
Sample Date	15-Nov			15-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	21.03	V0	0.11	V0
Calcium	0.16	1.60	V0	0.01	V0
Magnesium	0.03	0.12	V0	0.00	V1
Potassium	0.09	0.02	V0	0.00	V1
Sodium	0.05	0.18	V0	0.00	V1
Chloride	0.12	0.25	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1
Nitrate	0.20	0.09	V0	0.00	V1
Sulphate	0.25	0.30	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	21-Nov			21-Nov		21-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	3.95	V0	3.52	V0	0.14	V0
Calcium	0.16	0.07	V0	0.03	V0	0.01	V0
Magnesium	0.03	0.02	V0	0.03	V0	0.00	V1
Potassium	0.09	0.05	V0	0.02	V0	0.00	V1
Sodium	0.05	0.16	V0	0.22	V0	0.00	V1
Chloride	0.12	0.20	V0	0.09	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.16	V0	0.40	V0	0.00	V1
Sulphate	0.25	0.37	V0	0.96	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.08	V0	0.23	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14			
Sample Date	21-Nov			21-Nov		21-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			0		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	5.05	V0	-9999	M1	0.14	V0
Calcium	0.16	0.07	V0	-9999	M1	0.01	V0
Magnesium	0.03	0.03	V0	-9999	M1	0.00	V1
Potassium	0.09	0.05	V0	-9999	M1	0.00	V1
Sodium	0.05	0.29	V0	-9999	M1	0.00	V1
Chloride	0.12	0.21	V0	-9999	M1	0.00	V1
Fluoride	0.15	0.00	V1	-9999	M1	0.00	V1
Nitrate	0.20	0.55	V0	-9999	M1	0.00	V1
Sulphate	0.25	0.99	V0	-9999	M1	0.00	V1
Phosphate	0.26	0.00	V1	-9999	M1	0.00	V1
Ammonium (as N)	0.02	0.24	V0	-9999	M1	0.00	V1



Station Name	Fort McKay South			Horizon		Travel Blank	
Station #	AMS 13			AMS 15		21-Nov	
Sample Date	21-Nov			21-Nov		21-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	5.28	V0	5.29	V0	0.14	V0
Calcium	0.16	0.06	V0	0.05	V0	0.01	V0
Magnesium	0.03	0.03	V0	0.02	V0	0.00	V1
Potassium	0.09	0.01	V0	0.02	V0	0.00	V1
Sodium	0.05	0.15	V0	0.13	V0	0.00	V1
Chloride	0.12	0.14	V0	0.12	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.20	V0	0.13	V0	0.00	V1
Sulphate	0.25	0.39	V0	0.36	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.09	V0	0.06	V0	0.00	V1



Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			21-Nov	
Sample Date	21-Nov			21-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	7.57	V0	0.14	V0
Calcium	0.16	0.91	V0	0.01	V0
Magnesium	0.03	0.03	V0	0.00	V1
Potassium	0.09	0.02	V0	0.00	V1
Sodium	0.05	0.17	V0	0.00	V1
Chloride	0.12	0.18	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1
Nitrate	0.20	0.22	V0	0.00	V1
Sulphate	0.25	0.50	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.11	V0	0.00	V1



Bertha Ganter - Fort							
Station Name	McKay			Patricia McInnes		Travel Blank	
Station #	AMS 1			AMS 6			
Sample Date	27-Nov			27-Nov		27-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.56	V0	3.42	V0	0.05	V0
Calcium	0.16	0.03	V0	0.05	V0	0.01	V0
Magnesium	0.03	0.00	V0	0.01	V0	0.00	V1
Potassium	0.09	0.01	V0	0.02	V0	0.00	V1
Sodium	0.05	0.01	V0	0.02	V0	0.00	V1
Chloride	0.12	0.01	V0	0.01	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.02	V0	0.06	V0	0.00	V1
Sulphate	0.25	0.19	V0	0.47	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.05	V0	0.14	V0	0.00	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		27-Nov	
Sample Date	27-Nov			27-Nov		27-Nov	
Particulate Size	PM10			PM10		24	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	4.26	V0	5.07	V0	0.05	V0
Calcium	0.16	0.09	V0	0.14	V0	0.01	V0
Magnesium	0.03	0.01	V0	0.01	V0	0.00	V1
Potassium	0.09	0.02	V0	0.03	V0	0.00	V1
Sodium	0.05	0.08	V0	0.02	V0	0.00	V1
Chloride	0.12	0.10	V0	0.02	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.07	V0	0.06	V0	0.00	V1
Sulphate	0.25	0.46	V0	0.52	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.13	V0	0.13	V0	0.00	V1



Station Name	Fort McKay South			Horizon		Travel Blank	
Station #	AMS 13			AMS 15			
Sample Date	27-Nov			27-Nov		27-Nov	
Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	2.76	V0	7.16	V0	0.05	V0
Calcium	0.16	0.06	V0	0.15	V0	0.01	V0
Magnesium	0.03	0.01	V0	0.02	V0	0.00	V1
Potassium	0.09	0.01	V0	0.01	V0	0.00	V1
Sodium	0.05	0.02	V0	0.02	V0	0.00	V1
Chloride	0.12	0.01	V0	0.01	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1	0.00	V1
Nitrate	0.20	0.04	V0	0.05	V0	0.00	V1
Sulphate	0.25	0.29	V0	0.35	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.07	V0	0.07	V0	0.00	V1





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Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			27-Nov	
Sample Date	27-Nov			27-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	5.15	V0	0.05	V0
Calcium	0.16	0.11	V0	0.01	V0
Magnesium	0.03	0.01	V0	0.00	V1
Potassium	0.09	0.01	V0	0.00	V1
Sodium	0.05	0.02	V0	0.00	V1
Chloride	0.12	0.01	V0	0.00	V1
Fluoride	0.15	0.00	V1	0.00	V1
Nitrate	0.20	0.05	V0	0.00	V1
Sulphate	0.25	0.28	V0	0.00	V1
Phosphate	0.26	0.00	V1	0.00	V1
Ammonium (as N)	0.02	0.07	V0	0.00	V1



<b>Station Name</b>	<b>Bertha Ganter - Fort McKay</b>	<b>Bertha Ganter - Fort McKay</b>	<b>Bertha Ganter - Fort McKay</b>	<b>Bertha Ganter - Fort McKay</b>
<b>Station #</b>	<b>AMS 1</b>	<b>AMS 1</b>	<b>AMS 1</b>	<b>AMS 1</b>
<b>Sample Date</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>
<b>Particulate Size</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>
<b>Compound Name</b>	<b>Average µg/m<sup>3</sup></b>	<b>Std Dev µg/m<sup>3</sup></b>	<b>Total Samples (#)</b>	<b>Total ≥ MDL (#)</b>
Particulate Matter	11.12	10.58	5	5
Calcium	0.53	0.63	5	5
Magnesium	0.04	0.03	5	5
Potassium	0.03	0.03	5	5
Sodium	0.13	0.08	5	5
Chloride	0.14	0.10	5	5
Fluoride	0.00	0.00	5	0
Nitrate	0.25	0.34	5	5
Sulphate	0.51	0.56	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.14	0.18	5	5



<b>Station Name</b>	<b>Patricia McInnes</b>	<b>Patricia McInnes</b>	<b>Patricia McInnes</b>	<b>Patricia McInnes</b>
<b>Station #</b>	<b>AMS 6</b>	<b>AMS 6</b>	<b>AMS 6</b>	<b>AMS 6</b>
<b>Sample Date</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>
<b>Particulate Size</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>
<b>Compound Name</b>	<b>Average</b>	<b>Std Dev</b>	<b>Total Samples (#)</b>	<b>Total ≥ MDL (#)</b>
	<b>µg/m<sup>3</sup></b>	<b>µg/m<sup>3</sup></b>		
Particulate Matter	6.05	4.34	5	5
Calcium	0.18	0.19	5	5
Magnesium	0.03	0.03	5	5
Potassium	0.03	0.03	5	5
Sodium	0.36	0.26	5	5
Chloride	0.47	0.42	5	5
Fluoride	0.00	0.00	5	1
Nitrate	0.28	0.35	5	5
Sulphate	0.56	0.36	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.16	0.12	5	5



<b>Station Name</b>	<b>Athabasca Valley</b>	<b>Athabasca Valley</b>	<b>Athabasca Valley</b>	<b>Athabasca Valley</b>
<b>Station #</b>	<b>AMS 7</b>	<b>AMS 7</b>	<b>AMS 7</b>	<b>AMS 7</b>
<b>Sample Date</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>
<b>Particulate Size</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>
<b>Compound Name</b>	<b>Average</b>	<b>Std Dev</b>	<b>Total Samples (#)</b>	<b>Total ≥ MDL (#)</b>
	<b>µg/m<sup>3</sup></b>	<b>µg/m<sup>3</sup></b>		
Particulate Matter	12.31	7.33	5	5
Calcium	0.48	0.42	5	5
Magnesium	0.06	0.05	5	5
Potassium	0.05	0.02	5	5
Sodium	1.18	1.14	5	5
Chloride	1.70	1.79	5	5
Fluoride	0.00	0.00	5	0
Nitrate	0.37	0.42	5	5
Sulphate	0.63	0.41	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.17	0.14	5	5



Station Name	Anzac	Anzac	Anzac	Anzac
Station #	AMS 14	AMS 14	AMS 14	AMS 14
Sample Date	Nov 02 - Nov 27	Nov 02 - Nov 27	Nov 02 - Nov 27	Nov 02 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	3.71	1.56	4	4
Calcium	0.08	0.05	4	4
Magnesium	0.01	0.01	4	4
Potassium	0.03	0.02	4	4
Sodium	0.05	0.06	4	4
Chloride	0.06	0.08	4	3
Fluoride	0.00	0.00	4	0
Nitrate	0.11	0.13	4	4
Sulphate	0.53	0.31	4	4
Phosphate	0.00	0.00	4	0
Ammonium (as N)	0.16	0.13	4	4



Station Name	Fort McKay South	Fort McKay South	Fort McKay South	Fort McKay South
Station #	AMS 13	AMS 13	AMS 13	AMS 13
Sample Date	Nov 02 - Nov 27	Nov 02 - Nov 27	Nov 02 - Nov 27	Nov 02 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	10.89	9.06	5	5
Calcium	0.40	0.43	5	5
Magnesium	0.04	0.03	5	5
Potassium	0.03	0.02	5	5
Sodium	0.13	0.09	5	5
Chloride	0.13	0.13	5	5
Fluoride	0.00	0.00	5	0
Nitrate	0.23	0.30	5	5
Sulphate	0.51	0.52	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.14	0.17	5	5



Station Name	Horizon	Horizon	Horizon	Horizon
Station #	AMS 15	AMS 15	AMS 15	AMS 15
Sample Date	Nov 02 - Nov 27	Nov 02 - Nov 27	Nov 02 - Nov 27	Nov 02 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	12.03	10.42	5	5
Calcium	0.51	0.63	5	5
Magnesium	0.05	0.05	5	5
Potassium	0.02	0.02	5	5
Sodium	0.08	0.07	5	5
Chloride	0.07	0.09	5	4
Fluoride	0.00	0.00	5	0
Nitrate	0.22	0.30	5	5
Sulphate	0.49	0.47	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.12	0.16	5	5



<b>Station Name</b>	<b>Muskeg River</b>	<b>Muskeg River</b>	<b>Muskeg River</b>	<b>Muskeg River</b>
<b>Station #</b>	<b>AMS 16</b>	<b>AMS 16</b>	<b>AMS 16</b>	<b>AMS 16</b>
<b>Sample Date</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>	<b>Nov 02 - Nov 27</b>
<b>Particulate Size</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>	<b>PM10</b>
<b>Compound Name</b>	<b>Average</b>	<b>Std Dev</b>	<b>Total Samples (#)</b>	<b>Total ≥ MDL (#)</b>
	<b>µg/m<sup>3</sup></b>	<b>µg/m<sup>3</sup></b>		
Particulate Matter	16.15	14.81	5	5
Calcium	1.14	1.13	5	5
Magnesium	0.05	0.05	5	5
Potassium	0.03	0.03	5	5
Sodium	0.11	0.07	5	5
Chloride	0.12	0.10	5	5
Fluoride	0.00	0.00	5	0
Nitrate	0.25	0.31	5	5
Sulphate	0.60	0.43	5	5
Phosphate	0.00	0.00	5	0
Ammonium (as N)	0.14	0.11	5	5





**Wood Buffalo Environmental Association**

**PM10 Ion (µg/sample) Summary**

**2017 November**

Compound	% Det	N	N < Det.	Min.	10%	25%	50%	60%	75%	80%	90%	95%	99% Max.	Mean	Std. Dev.	Median	Outlier Test	
Particulate Matter	100.0%	34	0	38	65	95	172	229	347	493	614	685	962	962	252	223	172	1369
Calcium	100.0%	34	0	0.63	1.11	1.35	4.29	8.46	20.61	22.26	34.44	38.31	68.52	68.52	11.67	15.16	4.29	87.45
Magnesium	100.0%	34	0	0.06	0.15	0.27	0.63	0.78	1.59	2.10	2.70	2.76	3.03	3.03	1.01	0.92	0.63	5.62
Potassium	100.0%	34	0	0.15	0.24	0.33	0.48	0.57	1.17	1.35	1.83	2.01	2.13	2.13	0.76	0.59	0.48	3.73
Sodium	100.0%	34	0	0.12	0.42	0.81	3.66	4.11	5.28	6.99	15.00	31.86	71.16	71.16	7.15	13.49	3.66	74.59
Chloride	94.1%	34	2	0.09	0.21	0.90	3.33	4.20	6.00	7.92	21.60	45.54	108.39	108.39	9.51	20.58	3.33	112.43
Fluoride	2.9%	34	33	0.03	0.03	0.03	0.06	0.06	0.09	0.09	0.09	0.12	0.15	0.15	0.06	0.03	0.06	
Nitrate	100.0%	34	0	0.33	0.60	1.32	2.37	3.54	7.32	13.23	18.78	20.55	24.93	24.93	5.94	7.23	2.37	42.12
Sulphate	100.0%	34	0	2.13	4.59	6.93	8.58	11.10	21.69	23.49	31.47	34.38	36.12	36.12	13.12	9.85	8.58	62.34
Phosphate	0.0%	34	34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	
Ammonium (as N)	100.0%	34	0	0.68	1.09	1.30	1.86	2.56	5.43	7.66	8.90	10.37	11.09	11.09	3.51	3.22	1.86	19.60



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PARTICULATE MATTER - METALS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PM ions: Atmospheric Research & Analysis, Inc.  
Morrisville, NC



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PARTICULATE MATTER (PM<sub>2.5</sub>) - METALS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PM metals: Atmospheric Research & Analysis, Inc.  
Morrisville, NC



FILE CONTENTS DESCRIPTION	Partisol Sampler Measurements of Mass, Ions by IC and Metals by ICP-MS
SAMPLING INTERVAL	24 hour
SAMPLING FREQUENCY OF DATA	Once every 6 days
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection - Method Detection Limits (MDL) are provided with each observation
UNITS	$\mu\text{g}/\text{m}^3$ (microgram per cubic meter)
OBSERVATION TYPE	Particles
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	Filtration with $\text{PM}_{10}$ Inlet for $\text{PM}_{10}$ and with $\text{PM}_{10}$ Inlet/Very Sharp Cut Cyclone for $\text{PM}_{2.5}$
PARTICLE DIAMETER	$< 2.5 \mu\text{m}$ or $< 10 \mu\text{m}$
MEDIUM	47 mm Teflon Filter
ANALYTICAL METHODS	MASS by Microbalance ELEMENTS by Inductively Coupled Plasma Mass Spectrometry (ICP/MS) IONS by Ion Chromatography (IC)
SAMPLE PREPARATION	DI Water extraction for IC analysis and Acid Digestion for ICP/MS Analysis
ANALYTICAL LABORATORY	Atmospheric Research & Analysis Inc
USER NOTE 1	Data are not blank corrected
USER NOTE 2	Volume is given at actual conditions of temperature and pressure during sampling as measured by the sampler
USER NOTE 3	Blank sample concentration ( $\mu\text{g}/\text{m}^3$ ) is calculated using expected actual volume of sampler
VOLUME STANDARDIZATION	Actual Volume at Ambient Conditions (since 01-Jan-2011)
SAMPLING INSTRUMENT TYPE	For $\text{PM}_{10}$ FRM Partisol $\text{PM}_{10}$ sampler For $\text{PM}_{2.5}$ FRM Partisol $\text{PM}_{2.5}$ sampler
FLAGS USED	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay			Patricia McInnes		Travel Blank
	Station #	AMS 1		AMS 6			
	Sample Date	03-Nov		03-Nov			03-Nov
Particulate Size	PM2.5		PM2.5				
Total Air Volume (m <sup>3</sup> )	24		24			24	
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	QC Flag
Particulate Matter	1.00	2.23	V4	1.20	V0	0.17	V0
Aluminum	0.1380326	0.0225119	V0	0.0000000	V1	0.0000000	V1
Antimony	0.0001784	0.0000094	V0	0.0000173	V0	0.0000000	V1
Arsenic	0.0001060	0.0000310	V0	0.0000225	V0	0.0000000	V1
Barium	0.0092847	0.0000000	V1	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000015	V0	0.0000098	V0	0.0000000	V1
Cadmium	0.0000174	-9999	M2	0.0000067	V0	0.0000013	V0
Calcium	0.4112124	0.0176179	V0	0.0000000	V1	0.0000000	V1
Cerium	0.0000174	0.0000241	V0	0.0000052	V0	0.0000000	V1
Cesium	0.0000100	0.0000018	V0	0.0000005	V0	0.0000000	V1
Chromium	0.0022262	0.0001337	V0	0.0000000	V1	0.0000000	V1
Cobalt	0.0000273	0.0000090	V0	0.0000036	V0	0.0000015	V0
Copper	0.0017171	0.0001898	V0	0.0001808	V0	0.0000000	V1
Iron	0.0393063	0.0177001	V0	0.0047893	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000117	V0	0.0000025	V0	0.0000000	V1
Lead	0.0008577	0.0000653	V0	0.0000555	V0	0.0000000	V1
Lithium	0.0000374	0.0000211	V0	0.0000051	V0	0.0000035	V0
Magnesium	0.0091409	0.0045097	V0	0.0014988	V0	0.0000000	V1
Manganese	0.0006949	0.0002884	V0	0.0000777	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000773	V0	0.0000313	V0	0.0000000	V1
Neodymium	0.0000140	0.0000100	V0	0.0000019	V0	0.0000008	V0
Nickel	0.0005429	0.0002592	V0	0.0000765	V0	0.0000373	V0
Niobium	0.0000202	0.0000035	V0	0.0000013	V0	0.0000000	V1
Palladium	0.0000632	0.0000090	V0	0.0000000	V1	0.0000052	V0
Phosphorus	0.0459574	0.0062994	V0	0.0061156	V0	0.0055333	V0
Platinum	0.0000088	0.0000015	V0	0.0000018	V0	0.0000015	V0
Potassium	0.0061261	0.0165771	V0	0.0114594	V0	0.0002920	V0
Praseodymium	0.0000070	0.0000026	V0	0.0000004	V0	0.0000000	V1
Rubidium	0.0000184	0.0000357	V0	0.0000139	V0	0.0000000	V1
Samarium	0.0000133	0.0000019	V0	0.0000000	V1	0.0000000	V1
Selenium	0.0003366	0.0000295	V0	0.0000000	V1	0.0000000	V1
Silicon	0.7676322	0.0905229	V0	0.0359686	V0	0.0000000	V1
Silver	0.0000100	0.0000018	V0	0.0000007	V0	0.0000007	V0
Sodium	0.0169447	0.0099645	V0	0.0069250	V0	0.0029502	V0
Strontium	0.0003375	0.0000880	V0	0.0000304	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000007	V0	0.0000008	V0	0.0000000	V1
Thorium	0.0000059	0.0000030	V0	0.0000005	V0	0.0000003	V0
Tin	0.0004414	0.0000883	V0	0.0000851	V0	0.0000000	V1
Titanium	0.0015201	0.0017108	V0	0.0007292	V0	0.0002713	V0
Tungsten	0.0000938	0.0000048	V0	0.0000000	V1	0.0000000	V1
Uranium	0.0000048	0.0000007	V0	0.0000003	V0	0.0000000	V1
Vanadium	0.0007697	0.0000697	V0	0.0000000	V1	0.0000000	V1
Zinc	0.0055897	0.0016649	V0	0.0009971	V0	0.0000000	V1



Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
	AMS 7 03-Nov PM2.5 24	AMS 14 03-Nov PM2.5 24	AMS 7 03-Nov PM2.5 24	AMS 14 03-Nov PM2.5 24	AMS 14 03-Nov PM2.5 24	AMS 7 03-Nov PM2.5 24	AMS 14 03-Nov PM2.5 24
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.93	V0	2.02	V0	0.17	V0
Aluminum	0.1380326	0.0136523	V0	0.0061308	V0	0.0000000	V1
Antimony	0.0001784	0.0000551	V0	0.0000104	V0	0.0000000	V1
Arsenic	0.0001060	0.0000205	V0	0.0000267	V0	0.0000000	V1
Barium	0.0092847	0.0008086	V0	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000029	V0	0.0000013	V0	0.0000000	V1
Cadmium	0.0000174	0.0000049	V0	0.0000054	V0	0.0000013	V0
Calcium	0.4112124	0.0264901	V0	0.0000000	V1	0.0000000	V1
Cerium	0.0000174	0.0000209	V0	0.0000073	V0	0.0000000	V1
Cesium	0.0000100	0.0000013	V0	0.0000007	V0	0.0000000	V1
Chromium	0.0022262	0.0001439	V0	0.0001334	V0	0.0000000	V1
Cobalt	0.0000273	0.0000091	V0	0.0000031	V0	0.0000015	V0
Copper	0.0017171	0.0004521	V0	0.0001805	V0	0.0000000	V1
Iron	0.0393063	0.0254292	V0	0.0059597	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000085	V0	0.0000036	V0	0.0000000	V1
Lead	0.0008577	0.0000553	V0	0.0000736	V0	0.0000000	V1
Lithium	0.0000374	0.0000127	V0	0.0000086	V0	0.0000035	V0
Magnesium	0.0091409	0.0052509	V0	0.0020145	V0	0.0000000	V1
Manganese	0.0006949	0.0003325	V0	0.0001050	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000816	V0	0.0000421	V0	0.0000000	V1
Neodymium	0.0000140	0.0000079	V0	0.0000026	V0	0.0000008	V0
Nickel	0.0005429	0.0001157	V0	0.0000766	V0	0.0000373	V0
Niobium	0.0000202	0.0000029	V0	0.0000011	V0	0.0000000	V1
Palladium	0.0000632	0.0000051	V0	0.0000000	V1	0.0000052	V0
Phosphorus	0.0459574	0.0052842	V0	0.0044091	V0	0.0055333	V0
Platinum	0.0000088	0.0000012	V0	0.0000025	V0	0.0000015	V0
Potassium	0.0061261	0.0406905	V0	0.0127431	V0	0.0002920	V0
Praseodymium	0.0000070	0.0000024	V0	0.0000006	V0	0.0000000	V1
Rubidium	0.0000184	0.0000232	V0	0.0000162	V0	0.0000000	V1
Samarium	0.0000133	0.0000011	V0	0.0000000	V1	0.0000000	V1
Selenium	0.0003366	0.0000303	V0	0.0000219	V0	0.0000000	V1
Silicon	0.7676322	0.0699392	V0	0.0000000	V1	0.0000000	V1
Silver	0.0000100	0.0000019	V0	0.0000014	V0	0.0000007	V0
Sodium	0.0169447	0.1248758	V0	0.0074739	V0	0.0029502	V0
Strontium	0.0003375	0.0001306	V0	0.0000352	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000006	V0	0.0000007	V0	0.0000000	V1
Thorium	0.0000059	0.0000018	V0	0.0000010	V0	0.0000003	V0
Tin	0.0004414	0.0000923	V0	-9999	M2	0.0000000	V1
Titanium	0.0015201	0.0020948	V0	0.0009666	V0	0.0002713	V0
Tungsten	0.0000938	0.0000155	V0	0.0000000	V1	0.0000000	V1
Uranium	0.0000048	0.0000008	V0	0.0000004	V0	0.0000000	V1
Vanadium	0.0007697	0.0000460	V0	0.0000000	V1	0.0000000	V1
Zinc	0.0055897	0.0009106	V0	0.0006959	V0	0.0000000	V1



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay			Patricia McInnes		Travel Blank
	Station #	AMS 1		AMS 6			
	Sample Date	09-Nov		09-Nov		09-Nov	
Particulate Size	PM2.5		PM2.5				
Total Air Volume (m <sup>3</sup> )	24		24			24	
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	7.73	V0	5.94	V0	0.14	V0
Aluminum	0.1380326	0.0540504	V0	0.0155519	V0	0.0000000	V1
Antimony	0.0001784	0.0000498	V0	0.0000985	V0	0.0000000	V1
Arsenic	0.0001060	0.0001223	V0	0.0002268	V0	0.0000000	V1
Barium	0.0092847	0.0020039	V0	0.0009531	V0	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000049	V0	0.0000060	V0	0.0000000	V1
Cadmium	0.0000174	0.0000570	V0	0.0000585	V0	0.0000000	V1
Calcium	0.4112124	0.0700417	V0	0.0248369	V0	0.0000000	V1
Cerium	0.0000174	0.0000635	V0	0.0000268	V0	0.0000000	V1
Cesium	0.0000100	0.0000049	V0	0.0000024	V0	0.0000000	V1
Chromium	0.0022262	0.0001900	V0	0.0002000	V0	0.0000000	V1
Cobalt	0.0000273	0.0000226	V0	0.0000096	V0	0.0000000	V1
Copper	0.0017171	0.0004527	V0	0.0006028	V0	0.0001170	V0
Iron	0.0393063	0.0549656	V0	0.0237692	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000479	V0	0.0000266	V0	0.0000000	V1
Lead	0.0008577	0.0002571	V0	0.0002832	V0	0.0000000	V1
Lithium	0.0000374	0.0000485	V0	0.0000000	V1	0.0000000	V1
Magnesium	0.0091409	0.0117607	V0	0.0056441	V0	0.0000000	V1
Manganese	0.0006949	0.0011452	V0	0.0004824	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001240	V0	0.0000949	V0	0.0000000	V1
Neodymium	0.0000140	0.0000263	V0	0.0000074	V0	0.0000000	V1
Nickel	0.0005429	0.0002111	V0	0.0001165	V0	0.0000615	V0
Niobium	0.0000202	0.0000059	V0	0.0000032	V0	0.0000000	V1
Palladium	0.0000632	0.0000036	V0	0.0000107	V0	0.0000000	V1
Phosphorus	0.0459574	0.0097638	V0	0.0107260	V0	0.0103203	V0
Platinum	0.0000088	0.0000048	V0	0.0000025	V0	0.0000027	V0
Potassium	0.0061261	0.0728989	V0	0.0620300	V0	0.0000000	V1
Praseodymium	0.0000070	0.0000067	V0	0.0000022	V0	0.0000000	V1
Rubidium	0.0000184	0.0001347	V0	0.0000769	V0	0.0000000	V1
Samarium	0.0000133	0.0000046	V0	0.0000011	V0	0.0000000	V1
Selenium	0.0003366	0.0000983	V0	0.0000230	V0	0.0000000	V1
Silicon	0.7676322	0.0000000	V1	0.0000000	V1	0.0000000	V1
Silver	0.0000100	0.0000030	V0	0.0000042	V0	0.0000015	V0
Sodium	0.0169447	0.0241994	V0	0.0325332	V0	0.0013799	V0
Strontium	0.0003375	0.0002740	V0	0.0001375	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000025	V0	0.0000022	V0	0.0000000	V1
Thorium	0.0000059	0.0000072	V0	0.0000022	V0	0.0000000	V1
Tin	0.0004414	0.0001955	V0	0.0002139	V0	0.0000000	V1
Titanium	0.0015201	0.0022351	V0	0.0016395	V0	0.0004267	V0
Tungsten	0.0000938	0.0000226	V0	0.0000365	V0	0.0000000	V1
Uranium	0.0000048	0.0000023	V0	0.0000009	V0	0.0000000	V1
Vanadium	0.0007697	0.0006112	V0	0.0000828	V0	0.0000000	V1
Zinc	0.0055897	0.0059024	V0	0.0060080	V0	0.0000000	V1





Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
	AMS 7 09-Nov PM2.5 24	AMS 14 09-Nov PM2.5 24	QC Flag	AMS 7 09-Nov PM2.5 24	AMS 14 09-Nov PM2.5 24	QC Flag	QC Flag
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	6.53	V0	4.63	V0	0.14	V0
Aluminum	0.1380326	0.0254387	V0	0.0081181	V0	0.0000000	V1
Antimony	0.0001784	0.0001107	V0	0.0000375	V0	0.0000000	V1
Arsenic	0.0001060	0.0001425	V0	0.0001450	V0	0.0000000	V1
Barium	0.0092847	0.0017109	V0	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000063	V0	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000065	V0	0.0000040	V0	0.0000000	V1
Cadmium	0.0000174	0.0000519	V0	0.0000562	V0	0.0000000	V1
Calcium	0.4112124	0.0379726	V0	0.0000000	V1	0.0000000	V1
Cerium	0.0000174	0.0000400	V0	0.0000079	V0	0.0000000	V1
Cesium	0.0000100	0.0000028	V0	0.0000020	V0	0.0000000	V1
Chromium	0.0022262	0.0001818	V0	0.0001097	V0	0.0000000	V1
Cobalt	0.0000273	0.0000167	V0	0.0000050	V0	0.0000000	V1
Copper	0.0017171	0.0013533	V0	0.0003414	V0	0.0001170	V0
Iron	0.0393063	0.0405771	V0	0.0067368	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000389	V0	0.0000253	V0	0.0000000	V1
Lead	0.0008577	0.0003126	V0	0.0002507	V0	0.0000000	V1
Lithium	0.0000374	0.0000403	V0	0.0000000	V1	0.0000000	V1
Magnesium	0.0091409	0.0079908	V0	0.0024871	V0	0.0000000	V1
Manganese	0.0006949	0.0011616	V0	0.0002212	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001215	V0	0.0000369	V0	0.0000000	V1
Neodymium	0.0000140	0.0000114	V0	0.0000028	V0	0.0000000	V1
Nickel	0.0005429	0.0001396	V0	0.0001328	V0	0.0000615	V0
Niobium	0.0000202	0.0000035	V0	0.0000014	V0	0.0000000	V1
Palladium	0.0000632	0.0000000	V1	-9999	M2	0.0000000	V1
Phosphorus	0.0459574	0.0087981	V0	0.0111683	V0	0.0103203	V0
Platinum	0.0000088	0.0000017	V0	0.0000025	V0	0.0000027	V0
Potassium	0.0061261	0.0608564	V0	0.0574042	V0	0.0000000	V1
Praseodymium	0.0000070	0.0000035	V0	0.0000009	V0	0.0000000	V1
Rubidium	0.0000184	0.0000757	V0	0.0000561	V0	0.0000000	V1
Samarium	0.0000133	0.0000021	V0	0.0000000	V1	0.0000000	V1
Selenium	0.0003366	0.0000882	V0	0.0000199	V0	0.0000000	V1
Silicon	0.7676322	0.0489299	V0	0.0669729	V0	0.0000000	V1
Silver	0.0000100	0.0000056	V0	0.0000033	V0	0.0000015	V0
Sodium	0.0169447	0.0636382	V0	0.0109181	V0	0.0013799	V0
Strontium	0.0003375	0.0001975	V0	0.0000608	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	-9999	M2	0.0000000	V1
Thallium	0.0000090	0.0000021	V0	0.0000021	V0	0.0000000	V1
Thorium	0.0000059	0.0000030	V0	0.0000010	V0	0.0000000	V1
Tin	0.0004414	0.0002044	V0	-9999	M2	0.0000000	V1
Titanium	0.0015201	0.0018052	V0	0.0008756	V0	0.0004267	V0
Tungsten	0.0000938	0.0000320	V0	0.0000162	V0	0.0000000	V1
Uranium	0.0000048	0.0000013	V0	0.0000006	V0	0.0000000	V1
Vanadium	0.0007697	0.0003074	V0	0.0000393	V0	0.0000000	V1
Zinc	0.0055897	0.0059559	V0	0.0052142	V0	0.0000000	V1



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1		AMS 6			
	Sample Date	15-Nov		15-Nov			15-Nov
Particulate Size	PM2.5		PM2.5				
Total Air Volume (m <sup>3</sup> )	24		24			24	
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	2.16	V0	1.72	V0	0.20	V0
Aluminum	0.1380326	0.0247869	V0	0.0067789	V0	0.0000000	V1
Antimony	0.0001784	0.0000173	V0	0.0000288	V0	0.0000000	V1
Arsenic	0.0001060	0.0000368	V0	0.0000214	V0	0.0000000	V1
Barium	0.0092847	0.0000000	V1	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000109	V0	0.0000018	V0	0.0000000	V1
Cadmium	0.0000174	0.0000036	V0	0.0000079	V0	0.0000000	V1
Calcium	0.4112124	0.0552194	V0	0.0000000	V1	0.0000000	V1
Cerium	0.0000174	0.0000296	V0	0.0000107	V0	0.0000000	V1
Cesium	0.0000100	0.0000017	V0	0.0000008	V0	0.0000000	V1
Chromium	0.0022262	0.0002918	V0	0.0001514	V0	0.0000000	V1
Cobalt	0.0000273	0.0000137	V0	0.0000027	V0	0.0000000	V1
Copper	0.0017171	0.0004723	V0	0.0002576	V0	0.0000000	V1
Iron	0.0393063	0.0439120	V0	0.0099290	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000162	V0	0.0000046	V0	0.0000000	V1
Lead	0.0008577	0.0000599	V0	0.0000604	V0	0.0000000	V1
Lithium	0.0000374	0.0000239	V0	0.0000000	V1	0.0000017	V0
Magnesium	0.0091409	0.0134013	V0	0.0095150	V0	0.0000000	V1
Manganese	0.0006949	0.0011227	V0	0.0001833	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000442	V0	0.0000000	V1	0.0000000	V1
Neodymium	0.0000140	0.0000116	V0	0.0000030	V0	0.0000000	V1
Nickel	0.0005429	0.0001192	V0	0.0000913	V0	0.0000326	V0
Niobium	0.0000202	0.0000035	V0	0.0000014	V0	0.0000000	V1
Palladium	0.0000632	0.0000000	V1	0.0000000	V1	0.0000033	V0
Phosphorus	0.0459574	0.0077207	V0	0.0088408	V0	0.0063840	V0
Platinum	0.0000088	-9999	M2	0.0000032	V0	0.0000022	V0
Potassium	0.0061261	0.0161388	V0	0.0136839	V0	0.0005544	V0
Praseodymium	0.0000070	0.0000032	V0	0.0000009	V0	0.0000000	V1
Rubidium	0.0000184	0.0000369	V0	0.0000183	V0	0.0000010	V0
Samarium	0.0000133	0.0000020	V0	0.0000006	V0	0.0000000	V1
Selenium	0.0003366	0.0000389	V0	0.0000000	V1	0.0000162	V0
Silicon	0.7676322	0.1114503	V0	0.0000000	V1	0.0654830	V0
Silver	0.0000100	0.0000006	V0	0.0000005	V0	0.0000000	V1
Sodium	0.0169447	0.0671709	V0	0.0684562	V0	0.0014354	V0
Strontium	0.0003375	0.0001681	V0	0.0001066	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000008	V0	0.0000006	V0	0.0000000	V1
Thorium	0.0000059	0.0000036	V0	0.0000008	V0	0.0000000	V1
Tin	0.0004414	0.0000768	V0	0.0000929	V0	0.0000000	V1
Titanium	0.0015201	0.0011898	V0	0.0008340	V0	0.0004021	V0
Tungsten	0.0000938	0.0000068	V0	0.0000058	V0	0.0000000	V1
Uranium	0.0000048	0.0000053	V0	0.0000047	V0	0.0000000	V1
Vanadium	0.0007697	0.0000592	V0	0.0000000	V1	0.0000000	V1
Zinc	0.0055897	0.0021934	V0	0.0008610	V0	0.0000000	V1



Compound Name	Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
		AMS 7 15-Nov PM2.5 24	Results (µg/m <sup>3</sup> )	QC Flag	AMS 14 15-Nov PM2.5 24	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )
Particulate Matter	1.00	2.21	V0	-9999	M2	0.20	V0	
Aluminum	0.1380326	0.0178023	V0	-9999	M2	0.0000000	V1	
Antimony	0.0001784	0.0000368	V0	-9999	M2	0.0000000	V1	
Arsenic	0.0001060	0.0000196	V0	-9999	M2	0.0000000	V1	
Barium	0.0092847	0.0006763	V0	-9999	M2	0.0000000	V1	
Beryllium	0.0000946	0.0000000	V1	-9999	M2	0.0000000	V1	
Bismuth	0.0000093	0.0000024	V0	-9999	M2	0.0000000	V1	
Cadmium	0.0000174	0.0000056	V0	-9999	M2	0.0000000	V1	
Calcium	0.4112124	0.0387850	V0	-9999	M2	0.0000000	V1	
Cerium	0.0000174	0.0000279	V0	-9999	M2	0.0000000	V1	
Cesium	0.0000100	0.0000014	V0	-9999	M2	0.0000000	V1	
Chromium	0.0022262	0.0001287	V0	-9999	M2	0.0000000	V1	
Cobalt	0.0000273	0.0000076	V0	-9999	M2	0.0000000	V1	
Copper	0.0017171	0.0004402	V0	-9999	M2	0.0000000	V1	
Iron	0.0393063	0.0256338	V0	-9999	M2	0.0000000	V1	
Lanthanum	0.0000130	0.0000132	V0	-9999	M2	0.0000000	V1	
Lead	0.0008577	0.0000687	V0	-9999	M2	0.0000000	V1	
Lithium	0.0000374	0.0000000	V1	-9999	M2	0.0000017	V0	
Magnesium	0.0091409	0.0137317	V0	-9999	M2	0.0000000	V1	
Manganese	0.0006949	0.0004642	V0	-9999	M2	0.0000000	V1	
Molybdenum	0.0007116	0.0000582	V0	-9999	M2	0.0000000	V1	
Neodymium	0.0000140	0.0000091	V0	-9999	M2	0.0000000	V1	
Nickel	0.0005429	0.0001059	V0	-9999	M2	0.0000326	V0	
Niobium	0.0000202	0.0000033	V0	-9999	M2	0.0000000	V1	
Palladium	0.0000632	0.0000000	V1	-9999	M2	0.0000033	V0	
Phosphorus	0.0459574	0.0111196	V0	-9999	M2	0.0063840	V0	
Platinum	0.0000088	0.0000039	V0	-9999	M2	0.0000022	V0	
Potassium	0.0061261	0.0173972	V0	-9999	M2	0.0005544	V0	
Praseodymium	0.0000070	0.0000025	V0	-9999	M2	0.0000000	V1	
Rubidium	0.0000184	0.0000286	V0	-9999	M2	0.0000010	V0	
Samarium	0.0000133	0.0000015	V0	-9999	M2	0.0000000	V1	
Selenium	0.0003366	0.0000000	V1	-9999	M2	0.0000162	V0	
Silicon	0.7676322	0.1115280	V0	-9999	M2	0.0654830	V0	
Silver	0.0000100	0.0000010	V0	-9999	M2	0.0000000	V1	
Sodium	0.0169447	0.1018854	V0	-9999	M2	0.0014354	V0	
Strontium	0.0003375	0.0001827	V0	-9999	M2	0.0000000	V1	
Tantalum	0.0000394	0.0000000	V1	-9999	M2	0.0000000	V1	
Thallium	0.0000090	0.0000007	V0	-9999	M2	0.0000000	V1	
Thorium	0.0000059	0.0000029	V0	-9999	M2	0.0000000	V1	
Tin	0.0004414	0.0001412	V0	-9999	M2	0.0000000	V1	
Titanium	0.0015201	0.0016056	V0	-9999	M2	0.0004021	V0	
Tungsten	0.0000938	0.0000157	V0	-9999	M2	0.0000000	V1	
Uranium	0.0000048	0.0000052	V0	-9999	M2	0.0000000	V1	
Vanadium	0.0007697	0.0000464	V0	-9999	M2	0.0000000	V1	
Zinc	0.0055897	0.0014381	V0	-9999	M2	0.0000000	V1	



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1		AMS 6			
	Sample Date	21-Nov		21-Nov		21-Nov	
Particulate Size	PM2.5		PM2.5				
Total Air Volume (m <sup>3</sup> )	24		24			24	
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	QC Flag
Particulate Matter	1.00	1.87	V4	2.58	V0	0.11	V0
Aluminum	0.1380326	0.0000000	V1	0.0075488	V0	0.0000000	V1
Antimony	0.0001784	0.0000000	V1	0.0000199	V0	0.0000000	V1
Arsenic	0.0001060	0.0000061	V0	0.0000122	V0	0.0000000	V1
Barium	0.0092847	0.0004120	V0	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	-9999	M2	0.0000017	V0	0.0000000	V1
Cadmium	0.0000174	0.0000039	V0	0.0000059	V0	0.0000008	V0
Calcium	0.4112124	0.0250991	V0	0.0178961	V0	0.0000000	V1
Cerium	0.0000174	0.0000053	V0	0.0000077	V0	0.0000013	V0
Cesium	0.0000100	0.0000005	V0	0.0000006	V0	0.0000000	V1
Chromium	0.0022262	0.0000000	V1	0.0000000	V1	0.0000000	V1
Cobalt	0.0000273	0.0000037	V0	0.0000042	V0	0.0000045	V0
Copper	0.0017171	0.0001476	V0	0.0003435	V0	0.0000951	V0
Iron	0.0393063	0.0056486	V0	0.0067384	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000024	V0	0.0000085	V0	0.0000007	V0
Lead	0.0008577	0.0000364	V0	0.0000551	V0	0.0000000	V1
Lithium	0.0000374	0.0000053	V0	0.0000067	V0	0.0000032	V0
Magnesium	0.0091409	0.0148816	V0	0.0172532	V0	0.0006710	V0
Manganese	0.0006949	0.0001388	V0	0.0001124	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000000	V1	0.0000747	V0	0.0000000	V1
Neodymium	0.0000140	0.0000017	V0	0.0000026	V0	0.0000000	V1
Nickel	0.0005429	0.0001114	V0	0.0001090	V0	0.0000406	V0
Niobium	0.0000202	0.0000000	V1	0.0000009	V0	0.0000000	V1
Palladium	0.0000632	0.0000050	V0	0.0000000	V1	0.0000028	V0
Phosphorus	0.0459574	0.0113780	V0	0.0105586	V0	0.0099503	V0
Platinum	0.0000088	0.0000017	V0	0.0000021	V0	0.0000032	V0
Potassium	0.0061261	0.0135831	V0	0.0167273	V0	0.0012518	V0
Praseodymium	0.0000070	0.0000004	V0	0.0000006	V0	0.0000000	V1
Rubidium	0.0000184	0.0000178	V0	0.0000235	V0	0.0000017	V0
Samarium	0.0000133	0.0000000	V1	0.0000000	V1	0.0000000	V1
Selenium	0.0003366	0.0000258	V0	0.0000312	V0	0.0000000	V1
Silicon	0.7676322	0.0664685	V0	0.0571391	V0	0.0961290	V0
Silver	0.0000100	0.0000010	V0	0.0000007	V0	0.0000004	V0
Sodium	0.0169447	0.1020732	V0	0.1193453	V0	0.0021926	V0
Strontium	0.0003375	0.0001054	V0	0.0001231	V0	0.0000152	V0
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000000	V1	0.0000004	V0	0.0000000	V1
Thorium	0.0000059	0.0000006	V0	0.0000006	V0	0.0000000	V1
Tin	0.0004414	0.0001132	V0	0.0000830	V0	0.0000641	V0
Titanium	0.0015201	0.0004966	V0	0.0013182	V0	0.0004126	V0
Tungsten	0.0000938	0.0000000	V1	0.0000050	V0	0.0000000	V1
Uranium	0.0000048	0.0000003	V0	0.0000005	V0	0.0000000	V1
Vanadium	0.0007697	0.0000461	V0	0.0002229	V0	0.0000000	V1
Zinc	0.0055897	0.0015415	V0	0.0008960	V0	0.0000000	V1



Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley AMS 7 21-Nov PM2.5			Anzac AMS 14 21-Nov PM2.5		Travel Blank 21-Nov	
	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Compound Name							
Particulate Matter	1.00	3.31	V0	-9999	M1	0.11	V0
Aluminum	0.1380326	0.0072941	V0	-9999	M1	0.0000000	V1
Antimony	0.0001784	0.0000549	V0	-9999	M1	0.0000000	V1
Arsenic	0.0001060	0.0000154	V0	-9999	M1	0.0000000	V1
Barium	0.0092847	0.0007745	V0	-9999	M1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	-9999	M1	0.0000000	V1
Bismuth	0.0000093	0.0000025	V0	-9999	M1	0.0000000	V1
Cadmium	0.0000174	0.0000066	V0	-9999	M1	0.0000008	V0
Calcium	0.4112124	0.0000000	V1	-9999	M1	0.0000000	V1
Cerium	0.0000174	0.0000110	V0	-9999	M1	0.0000013	V0
Cesium	0.0000100	0.0000008	V0	-9999	M1	0.0000000	V1
Chromium	0.0022262	0.0001229	V0	-9999	M1	0.0000000	V1
Cobalt	0.0000273	0.0000061	V0	-9999	M1	0.0000045	V0
Copper	0.0017171	0.0004421	V0	-9999	M1	0.0000951	V0
Iron	0.0393063	0.0138770	V0	-9999	M1	0.0000000	V1
Lanthanum	0.0000130	0.0000073	V0	-9999	M1	0.0000007	V0
Lead	0.0008577	0.0000488	V0	-9999	M1	0.0000000	V1
Lithium	0.0000374	0.0000072	V0	-9999	M1	0.0000032	V0
Magnesium	0.0091409	0.0192634	V0	-9999	M1	0.0006710	V0
Manganese	0.0006949	0.0002587	V0	-9999	M1	0.0000000	V1
Molybdenum	0.0007116	0.0000589	V0	-9999	M1	0.0000000	V1
Neodymium	0.0000140	0.0000026	V0	-9999	M1	0.0000000	V1
Nickel	0.0005429	0.0001040	V0	-9999	M1	0.0000406	V0
Niobium	0.0000202	0.0000012	V0	-9999	M1	0.0000000	V1
Palladium	0.0000632	0.0000000	V1	-9999	M1	0.0000028	V0
Phosphorus	0.0459574	0.0108877	V0	-9999	M1	0.0099503	V0
Platinum	0.0000088	0.0000017	V0	-9999	M1	0.0000032	V0
Potassium	0.0061261	0.0229831	V0	-9999	M1	0.0012518	V0
Praseodymium	0.0000070	0.0000009	V0	-9999	M1	0.0000000	V1
Rubidium	0.0000184	0.0000353	V0	-9999	M1	0.0000017	V0
Samarium	0.0000133	0.0000000	V1	-9999	M1	0.0000000	V1
Selenium	0.0003366	0.0000317	V0	-9999	M1	0.0000000	V1
Silicon	0.7676322	0.1592512	V0	-9999	M1	0.0961290	V0
Silver	0.0000100	0.0000017	V0	-9999	M1	0.0000004	V0
Sodium	0.0169447	0.1429536	V0	-9999	M1	0.0021926	V0
Strontium	0.0003375	0.0001588	V0	-9999	M1	0.0000152	V0
Tantalum	0.0000394	0.0000000	V1	-9999	M1	0.0000000	V1
Thallium	0.0000090	0.0000007	V0	-9999	M1	0.0000000	V1
Thorium	0.0000059	0.0000005	V0	-9999	M1	0.0000000	V1
Tin	0.0004414	0.0001044	V0	-9999	M1	0.0000641	V0
Titanium	0.0015201	0.0008596	V0	-9999	M1	0.0004126	V0
Tungsten	0.0000938	0.0000168	V0	-9999	M1	0.0000000	V1
Uranium	0.0000048	0.0000005	V0	-9999	M1	0.0000000	V1
Vanadium	0.0007697	0.0001636	V0	-9999	M1	0.0000000	V1
Zinc	0.0055897	0.0016501	V0	-9999	M1	0.0000000	V1



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay			Patricia McInnes		Travel Blank
	Station #	AMS 1		AMS 6			
	Sample Date	27-Nov		27-Nov		27-Nov	
Particulate Size	PM2.5		PM2.5				
Total Air Volume (m <sup>3</sup> )	24		24				
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	1.28	V0	2.29	V0	0.04	V1
Aluminum	0.1380326	0.0095056	V0	0.0190436	V0	0.0000000	V1
Antimony	0.0001784	0.0000000	V1	0.0000000	V1	0.0000000	V1
Arsenic	0.0001060	0.0000188	V0	0.0000072	V0	0.0000000	V1
Barium	0.0092847	0.0000000	V1	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	-9999	M2	0.0000019	V0	0.0000000	V1
Cadmium	0.0000174	0.0000035	V0	0.0000028	V0	0.0000000	V1
Calcium	0.4112124	0.0190939	V0	0.0000000	V1	0.0000000	V1
Cerium	0.0000174	0.0000067	V0	0.0000140	V0	0.0000000	V1
Cesium	0.0000100	0.0000006	V0	0.0000008	V0	0.0000000	V1
Chromium	0.0022262	0.0001098	V0	0.0002793	V0	0.0000000	V1
Cobalt	0.0000273	0.0000050	V0	0.0000051	V0	0.0000014	V0
Copper	0.0017171	-9999	M2	-9999	M2	0.0000000	V1
Iron	0.0393063	0.0058971	V0	0.0190320	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000027	V0	0.0000087	V0	0.0000000	V1
Lead	0.0008577	0.0000620	V0	0.0000513	V0	0.0000000	V1
Lithium	0.0000374	0.0000050	V0	0.0000153	V0	0.0000000	V1
Magnesium	0.0091409	0.0030603	V0	0.0049184	V0	0.0006405	V0
Manganese	0.0006949	0.0001047	V0	0.0002376	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000000	V1	0.0000000	V1	0.0000000	V1
Neodymium	0.0000140	0.0000024	V0	0.0000056	V0	0.0000000	V1
Nickel	0.0005429	0.0001049	V0	0.0001344	V0	0.0000388	V0
Niobium	0.0000202	0.0000000	V1	0.0000019	V0	0.0000000	V1
Palladium	0.0000632	0.0000036	V0	0.0000000	V1	0.0000000	V1
Phosphorus	0.0459574	0.0101727	V0	0.0096024	V0	0.0092752	V0
Platinum	0.0000088	0.0000015	V0	0.0000021	V0	0.0000035	V0
Potassium	0.0061261	0.0149714	V0	0.0083274	V0	0.0006431	V0
Praseodymium	0.0000070	0.0000006	V0	0.0000014	V0	0.0000000	V1
Rubidium	0.0000184	0.0000121	V0	0.0000232	V0	0.0000012	V0
Samarium	0.0000133	0.0000000	V1	0.0000000	V1	0.0000000	V1
Selenium	0.0003366	0.0000183	V0	0.0000248	V0	0.0000210	V0
Silicon	0.7676322	0.1813795	V0	0.1186232	V0	0.2653588	V0
Silver	0.0000100	-9999	M2	0.0000014	V0	0.0000000	V1
Sodium	0.0169447	0.0123550	V0	0.0052135	V0	0.0020988	V0
Strontium	0.0003375	0.0000343	V0	0.0000753	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000004	V0	0.0000000	V1	0.0000000	V1
Thorium	0.0000059	0.0000005	V0	0.0000012	V0	0.0000000	V1
Tin	0.0004414	-9999	M2	0.0001101	V0	0.0000507	V0
Titanium	0.0015201	0.0005759	V0	0.0007910	V0	0.0006295	V0
Tungsten	0.0000938	0.0000044	V0	0.0000123	V0	0.0000000	V1
Uranium	0.0000048	0.0000002	V0	0.0000010	V0	0.0000000	V1
Vanadium	0.0007697	0.0000337	V0	0.0000537	V0	0.0000000	V1
Zinc	0.0055897	0.0011948	V0	0.0006501	V0	0.0000000	V1



Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
	AMS 7 27-Nov PM2.5 24	Results (µg/m <sup>3</sup> )	QC Flag	AMS 14 27-Nov PM2.5 24	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> ) 24
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	1.99	V0	2.06	V0	0.04	V1
Aluminum	0.1380326	0.0000000	V1	0.0075310	V0	0.0000000	V1
Antimony	0.0001784	0.0000161	V0	0.0000120	V0	0.0000000	V1
Arsenic	0.0001060	0.0000129	V0	0.0000233	V0	0.0000000	V1
Barium	0.0092847	0.0000000	V1	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000021	V0	0.0000020	V0	0.0000000	V1
Cadmium	0.0000174	0.0000070	V0	0.0000103	V0	0.0000000	V1
Calcium	0.4112124	0.0000000	V1	0.0000000	V1	0.0000000	V1
Cerium	0.0000174	0.0000063	V0	0.0000062	V0	0.0000000	V1
Cesium	0.0000100	0.0000008	V0	0.0000010	V0	0.0000000	V1
Chromium	0.0022262	0.0001054	V0	0.0001788	V0	0.0000000	V1
Cobalt	0.0000273	0.0000050	V0	0.0000092	V0	0.0000014	V0
Copper	0.0017171	0.0002083	V0	0.0003072	V0	0.0000000	V1
Iron	0.0393063	0.0067974	V0	0.0057201	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000036	V0	0.0000045	V0	0.0000000	V1
Lead	0.0008577	0.0000844	V0	0.0000878	V0	0.0000000	V1
Lithium	0.0000374	0.0000054	V0	0.0000055	V0	0.0000000	V1
Magnesium	0.0091409	0.0031606	V0	0.0039852	V0	0.0006405	V0
Manganese	0.0006949	0.0001671	V0	0.0002045	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000323	V0	0.0000480	V0	0.0000000	V1
Neodymium	0.0000140	0.0000018	V0	0.0000018	V0	0.0000000	V1
Nickel	0.0005429	0.0000820	V0	0.0001392	V0	0.0000388	V0
Niobium	0.0000202	0.0000011	V0	0.0000011	V0	0.0000000	V1
Palladium	0.0000632	0.0000000	V1	0.0000000	V1	0.0000000	V1
Phosphorus	0.0459574	0.0111684	V0	0.0086251	V0	0.0092752	V0
Platinum	0.0000088	0.0000012	V0	0.0000014	V0	0.0000035	V0
Potassium	0.0061261	0.0146957	V0	0.0162864	V0	0.0006431	V0
Praseodymium	0.0000070	0.0000005	V0	0.0000006	V0	0.0000000	V1
Rubidium	0.0000184	0.0000229	V0	0.0000244	V0	0.0000012	V0
Samarium	0.0000133	0.0000000	V1	0.0000000	V1	0.0000000	V1
Selenium	0.0003366	0.0000160	V0	0.0000219	V0	0.0000210	V0
Silicon	0.7676322	0.0622595	V0	0.1805064	V0	0.2653588	V0
Silver	0.0000100	0.0000008	V0	0.0000037	V0	0.0000000	V1
Sodium	0.0169447	0.0302726	V0	0.0139866	V0	0.0020988	V0
Strontium	0.0003375	0.0000417	V0	0.0000495	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000008	V0	0.0000009	V0	0.0000000	V1
Thorium	0.0000059	0.0000005	V0	0.0000006	V0	0.0000000	V1
Tin	0.0004414	0.0000867	V0	0.0000943	V0	0.0000507	V0
Titanium	0.0015201	0.0006362	V0	0.0013442	V0	0.0006295	V0
Tungsten	0.0000938	0.0000065	V0	0.0000000	V1	0.0000000	V1
Uranium	0.0000048	0.0000014	V0	0.0000036	V0	0.0000000	V1
Vanadium	0.0007697	0.0000452	V0	0.0000603	V0	0.0000000	V1
Zinc	0.0055897	0.0010052	V0	0.0012813	V0	0.0000000	V1



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

Particulate Matter (PM2.5) - METALS - Summary

2017

Indicated Sites and Dates

Station Name	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay
Station #	AMS 1	AMS 1	AMS 1	AMS 1
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	3.05	2.64	5	5
Aluminum	0.0221710	0.0204647	5	4
Antimony	0.0000153	0.0000206	5	3
Arsenic	0.0000430	0.0000459	5	5
Barium	0.0004832	0.0008686	5	2
Beryllium	0.0000000	0.0000000	5	0
Bismuth	0.0000058	0.0000047	3	3
Cadmium	0.0000170	0.0000267	4	4
Calcium	0.0374144	0.0237738	5	5
Cerium	0.0000258	0.0000236	5	5
Cesium	0.0000019	0.0000018	5	5
Chromium	0.0001451	0.0001072	5	4
Cobalt	0.0000108	0.0000077	5	5
Copper	0.0003156	0.0001707	4	4
Iron	0.0256247	0.0226182	5	5
Lanthanum	0.0000162	0.0000187	5	5
Lead	0.0000961	0.0000907	5	5
Lithium	0.0000207	0.0000178	5	5
Magnesium	0.0095227	0.0053773	5	5
Manganese	0.0005600	0.0005286	5	5
Molybdenum	0.0000491	0.0000530	5	3
Neodymium	0.0000104	0.0000099	5	5
Nickel	0.0001611	0.0000698	5	5
Niobium	0.0000026	0.0000025	5	3
Palladium	0.0000042	0.0000032	5	4
Phosphorus	0.0090669	0.0020323	5	5
Platinum	0.0000024	0.0000016	4	4
Potassium	0.0268339	0.0257773	5	5
Praseodymium	0.0000027	0.0000025	5	5
Rubidium	0.0000475	0.0000500	5	5
Samarium	0.0000017	0.0000019	5	3
Selenium	0.0000422	0.0000323	5	5
Silicon	0.0899642	0.0660763	5	4
Silver	0.0000016	0.0000011	4	4
Sodium	0.0431526	0.0401798	5	5
Strontium	0.0001339	0.0000917	5	5
Tantalum	0.0000000	0.0000000	5	0
Thallium	0.0000009	0.0000009	5	4
Thorium	0.0000030	0.0000027	5	5
Tin	0.0001185	0.0000536	4	4
Titanium	0.0012416	0.0007430	5	5
Tungsten	0.0000077	0.0000087	5	4
Uranium	0.0000018	0.0000021	5	5
Vanadium	0.0001640	0.0002504	5	5
Zinc	0.0024994	0.0019358	5	5





Station Name	Patricia McInnes	Patricia McInnes	Patricia McInnes	Patricia McInnes
Station #	AMS 6	AMS 6	AMS 6	AMS 6
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	2.75	1.86	5	5
Aluminum	0.0097846	0.0075624	5	4
Antimony	0.0000329	0.0000381	5	4
Arsenic	0.0000580	0.0000946	5	5
Barium	0.0001906	0.0004262	5	1
Beryllium	0.0000000	0.0000000	5	0
Bismuth	0.0000042	0.0000036	5	5
Cadmium	0.0000163	0.0000236	5	5
Calcium	0.0085466	0.0119574	5	2
Cerium	0.0000129	0.0000084	5	5
Cesium	0.0000011	0.0000008	5	5
Chromium	0.0001261	0.0001239	5	3
Cobalt	0.0000050	0.0000027	5	5
Copper	0.0003462	0.0001835	4	4
Iron	0.0128516	0.0081900	5	5
Lanthanum	0.0000102	0.0000095	5	5
Lead	0.0001011	0.0001018	5	5
Lithium	0.0000054	0.0000063	5	3
Magnesium	0.0077659	0.0060199	5	5
Manganese	0.0002187	0.0001600	5	5
Molybdenum	0.0000402	0.0000433	5	3
Neodymium	0.0000041	0.0000023	5	5
Nickel	0.0001055	0.0000224	5	5
Niobium	0.0000017	0.0000009	5	5
Palladium	0.0000021	0.0000048	5	1
Phosphorus	0.0091687	0.0018691	5	5
Platinum	0.0000023	0.0000005	5	5
Potassium	0.0224456	0.0223406	5	5
Praseodymium	0.0000011	0.0000007	5	5
Rubidium	0.0000312	0.0000259	5	5
Samarium	0.0000003	0.0000005	5	2
Selenium	0.0000158	0.0000147	5	3
Silicon	0.0423462	0.0491530	5	3
Silver	0.0000015	0.0000015	5	5
Sodium	0.0464946	0.0480997	5	5
Strontium	0.0000946	0.0000427	5	5
Tantalum	0.0000000	0.0000000	5	0
Thallium	0.0000008	0.0000008	5	4
Thorium	0.0000011	0.0000007	5	5
Tin	0.0001170	0.0000552	5	5
Titanium	0.0010624	0.0003985	5	5
Tungsten	0.0000119	0.0000144	5	4
Uranium	0.0000015	0.0000018	5	5
Vanadium	0.0000719	0.0000916	5	3
Zinc	0.0018824	0.0023097	5	5



Station Name	Athabasca Valley	Athabasca Valley	Athabasca Valley	Athabasca Valley
Station #	AMS 7	AMS 7	AMS 7	AMS 7
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	3.19	1.95	5	5
Aluminum	0.0128375	0.0097421	5	4
Antimony	0.0000547	0.0000352	5	5
Arsenic	0.0000422	0.0000562	5	5
Barium	0.0007940	0.0006094	5	4
Beryllium	0.0000013	0.0000028	5	1
Bismuth	0.0000033	0.0000018	5	5
Cadmium	0.0000152	0.0000205	5	5
Calcium	0.0206495	0.0194673	5	3
Cerium	0.0000212	0.0000135	5	5
Cesium	0.0000014	0.0000008	5	5
Chromium	0.0001365	0.0000288	5	5
Cobalt	0.0000089	0.0000046	5	5
Copper	0.0005792	0.0004447	5	5
Iron	0.0224629	0.0129045	5	5
Lanthanum	0.0000143	0.0000142	5	5
Lead	0.0001140	0.0001119	5	5
Lithium	0.0000131	0.0000159	5	4
Magnesium	0.0098795	0.0065771	5	5
Manganese	0.0004768	0.0003979	5	5
Molybdenum	0.0000705	0.0000334	5	5
Neodymium	0.0000066	0.0000042	5	5
Nickel	0.0001094	0.0000209	5	5
Niobium	0.0000024	0.0000011	5	5
Palladium	0.0000010	0.0000023	5	1
Phosphorus	0.0094516	0.0025291	5	5
Platinum	0.0000019	0.0000011	5	5
Potassium	0.0313246	0.0193644	5	5
Praseodymium	0.0000020	0.0000012	5	5
Rubidium	0.0000371	0.0000221	5	5
Samarium	0.0000009	0.0000009	5	3
Selenium	0.0000332	0.0000333	5	4
Silicon	0.0903815	0.0450477	5	5
Silver	0.0000022	0.0000019	5	5
Sodium	0.0927251	0.0457898	5	5
Strontium	0.0001423	0.0000617	5	5
Tantalum	0.0000000	0.0000000	5	0
Thallium	0.0000010	0.0000006	5	5
Thorium	0.0000017	0.0000012	5	5
Tin	0.0001258	0.0000488	5	5
Titanium	0.0014003	0.0006254	5	5
Tungsten	0.0000173	0.0000092	5	5
Uranium	0.0000018	0.0000019	5	5
Vanadium	0.0001217	0.0001157	5	5
Zinc	0.0021920	0.0021260	5	5



Station Name	Anzac	Anzac	Anzac	Anzac
Station #	AMS 14	AMS 14	AMS 14	AMS 14
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM2.5	PM2.5	PM2.5	PM2.5
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	2.90	1.49	3	3
Aluminum	0.0072600	0.0010210	3	3
Antimony	0.0000200	0.0000152	3	3
Arsenic	0.0000650	0.0000693	3	3
Barium	0.0000000	0.0000000	3	0
Beryllium	0.0000000	0.0000000	3	0
Bismuth	0.0000025	0.0000014	3	3
Cadmium	0.0000240	0.0000280	3	3
Calcium	0.0000000	0.0000000	3	0
Cerium	0.0000071	0.0000009	3	3
Cesium	0.0000012	0.0000007	3	3
Chromium	0.0001406	0.0000351	3	3
Cobalt	0.0000058	0.0000031	3	3
Copper	0.0002764	0.0000848	3	3
Iron	0.0061389	0.0005315	3	3
Lanthanum	0.0000111	0.0000123	3	3
Lead	0.0001374	0.0000984	3	3
Lithium	0.0000047	0.0000043	3	2
Magnesium	0.0028289	0.0010289	3	3
Manganese	0.0001769	0.0000629	3	3
Molybdenum	0.0000424	0.0000055	3	3
Neodymium	0.0000024	0.0000005	3	3
Nickel	0.0001162	0.0000344	3	3
Niobium	0.0000012	0.0000002	3	3
Palladium	0.0000000	0.0000000	2	0
Phosphorus	0.0080675	0.0034139	3	3
Platinum	0.0000021	0.0000006	3	3
Potassium	0.0288112	0.0248255	3	3
Praseodymium	0.0000007	0.0000002	3	3
Rubidium	0.0000322	0.0000211	3	3
Samarium	0.0000000	0.0000000	3	0
Selenium	0.0000212	0.0000012	3	3
Silicon	0.0824931	0.0912485	3	2
Silver	0.0000028	0.0000012	3	3
Sodium	0.0107929	0.0032582	3	3
Strontium	0.0000485	0.0000128	3	3
Tantalum	0.0000000	0.0000000	2	0
Thallium	0.0000013	0.0000008	3	3
Thorium	0.0000009	0.0000002	3	3
Tin	0.0000943	-9999.0000000	1	1
Titanium	0.0010621	0.0002485	3	3
Tungsten	0.0000054	0.0000093	3	1
Uranium	0.0000015	0.0000018	3	3
Vanadium	0.0000332	0.0000306	3	2
Zinc	0.0023971	0.0024571	3	3



Wood Buffalo Environmental Association

PM2.5 Metal (µg/sample) Summary

2017 November

Compound	% Det	N	N < Det.	Min.	10%	25%	50%	60%	75%	80%	90%	95%	99% Max.	Mean	Std. Dev.	Median	Outlier	Test
Particulate Matter	100.0%	18	0	29	31	46	53	54	80	111	157	185	185	185	72	46	53	301
Aluminium	83.3%	18	3	0.0820	0.1119	0.1627	0.2281	0.3277	0.4570	0.5403	0.6105	1.2972	1.2972	1.2972	0.3448	0.2937	0.2281	1.8131
Antimony	83.3%	18	3	0.0001	0.0001	0.0003	0.0005	0.0007	0.0012	0.0013	0.0024	0.0027	0.0027	0.0027	0.0008	0.0007	0.0005	0.0045
Arsenic	100.0%	18	0	0.0001	0.0002	0.0004	0.0005	0.0006	0.0009	0.0029	0.0035	0.0054	0.0054	0.0054	0.0012	0.0015	0.0005	0.0088
Barium	38.9%	18	11	0.0019	0.0023	0.0042	0.0073	0.0086	0.0186	0.0194	0.0411	0.0481	0.0481	0.0481	0.0128	0.0132	0.0073	0.0790
Beryllium	5.6%	18	17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0002	0.0002	0.0000	0.0000	0.0000	0.0002
Bismuth	100.0%	16	0	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0003	0.0003	0.0001	0.0001	0.0001	0.0005
Cadmium	100.0%	17	0	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0012	0.0014	0.0014	0.0014	0.0014	0.0004	0.0005	0.0002	0.0031
Calcium	55.6%	18	8	0.2287	0.2491	0.3699	0.4295	0.4583	0.6358	0.9113	1.3253	1.6810	1.6810	1.6810	0.5902	0.3917	0.4295	2.5487
Cerium	100.0%	18	0	0.0001	0.0001	0.0002	0.0003	0.0003	0.0006	0.0007	0.0010	0.0015	0.0015	0.0015	0.0004	0.0004	0.0003	0.0023
Cesium	100.0%	18	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0002
Chromium	83.3%	18	3	0.0019	0.0020	0.0026	0.0032	0.0035	0.0044	0.0046	0.0067	0.0070	0.0070	0.0070	0.0036	0.0015	0.0032	0.0109
Cobalt	100.0%	18	0	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0004	0.0005	0.0005	0.0005	0.0002	0.0001	0.0001	0.0008
Copper	100.0%	16	0	0.0035	0.0043	0.0050	0.0082	0.0106	0.0109	0.0109	0.0145	0.0325	0.0325	0.0325	0.0096	0.0069	0.0082	0.0441
Iron	100.0%	18	0	0.1149	0.1356	0.1430	0.3330	0.4248	0.6103	0.6152	1.0539	1.3192	1.3192	1.3192	0.4308	0.3647	0.3330	2.2545
Lanthanum	100.0%	18	0	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0006	0.0009	0.0011	0.0011	0.0011	0.0003	0.0003	0.0002	0.0019
Lead	100.0%	18	0	0.0009	0.0012	0.0013	0.0016	0.0016	0.0021	0.0060	0.0068	0.0075	0.0075	0.0075	0.0026	0.0022	0.0016	0.0138
Lithium	77.8%	18	4	0.0000	0.0000	0.0001	0.0002	0.0002	0.0004	0.0005	0.0010	0.0012	0.0012	0.0012	0.0003	0.0003	0.0002	0.0019
Magnesium	100.0%	18	0	0.0360	0.0483	0.0759	0.1355	0.1918	0.3216	0.3296	0.4141	0.4623	0.4623	0.4623	0.1924	0.1360	0.1355	0.8722
Manganese	100.0%	18	0	0.0019	0.0025	0.0033	0.0057	0.0062	0.0111	0.0116	0.0275	0.0279	0.0279	0.0279	0.0091	0.0089	0.0057	0.0534
Molybdenum	77.8%	18	4	0.0006	0.0006	0.0008	0.0012	0.0014	0.0019	0.0020	0.0029	0.0030	0.0030	0.0030	0.0014	0.0008	0.0012	0.0052
Neodymium	100.0%	18	0	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006	0.0006	0.0006	0.0002	0.0001	0.0001	0.0009
Nickel	100.0%	18	0	0.0018	0.0018	0.0025	0.0028	0.0028	0.0032	0.0033	0.0051	0.0062	0.0062	0.0062	0.0030	0.0011	0.0028	0.0085
Niobium	88.9%	18	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0002
Palladium	35.3%	17	11	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0003	0.0003	0.0001	0.0001	0.0001	0.0004
Phosphorus	100.0%	18	0	0.1058	0.1268	0.1853	0.2343	0.2441	0.2613	0.2669	0.2680	0.2731	0.2731	0.2731	0.2169	0.0531	0.2343	0.4823
Platinum	100.0%	17	0	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0002
Potassium	100.0%	18	0	0.1999	0.2750	0.3284	0.3979	0.4015	0.9766	1.3777	1.4887	1.7496	1.7496	1.7496	0.6526	0.5072	0.3979	3.1887
Praseodymium	100.0%	18	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0000	0.0000	0.0000	0.0002
Rubidium	100.0%	18	0	0.0003	0.0003	0.0004	0.0006	0.0007	0.0009	0.0013	0.0018	0.0032	0.0032	0.0032	0.0009	0.0007	0.0006	0.0046
Samarium	44.4%	18	10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0002
Selenium	83.3%	18	3	0.0000	0.0001	0.0004	0.0006	0.0006	0.0007	0.0008	0.0021	0.0024	0.0024	0.0024	0.0007	0.0006	0.0006	0.0037
Silicon	77.8%	18	4	0.0084	0.0863	0.8632	1.6073	1.6785	2.6767	2.8470	4.3322	4.3531	4.3531	4.3531	1.8730	1.3506	1.6073	8.6262
Silver	100.0%	17	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0002
Sodium	100.0%	18	0	0.1251	0.1662	0.2620	0.7808	1.5273	2.4453	2.4498	2.9970	3.4309	3.4309	3.4309	1.2590	1.1354	0.7808	6.9359
Strontium	100.0%	18	0	0.0007	0.0008	0.0012	0.0026	0.0030	0.0038	0.0040	0.0047	0.0066	0.0066	0.0066	0.0027	0.0016	0.0026	0.0107
Tantalum	0.0%	17	17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Thallium	88.9%	18	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0001
Thorium	100.0%	18	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0000	0.0000	0.0000	0.0002
Tin	100.0%	15	0	0.0018	0.0020	0.0021	0.0023	0.0026	0.0034	0.0047	0.0049	0.0051	0.0051	0.0051	0.0029	0.0011	0.0023	0.0085
Titanium	100.0%	18	0	0.0119	0.0138	0.0190	0.0286	0.0316	0.0393	0.0411	0.0503	0.0536	0.0536	0.0536	0.0289	0.0129	0.0286	0.0933
Tungsten	77.8%	18	4	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004	0.0004	0.0008	0.0009	0.0009	0.0009	0.0003	0.0002	0.0002	0.0015
Uranium	100.0%	18	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0003
Vanadium	83.3%	18	3	0.0004	0.0007	0.0009	0.0013	0.0014	0.0020	0.0039	0.0074	0.0147	0.0147	0.0147	0.0026	0.0035	0.0013	0.0202
Zinc	100.0%	18	0	0.0156	0.0167	0.0219	0.0345	0.0370	0.0526	0.1251	0.1429	0.1442	0.1442	0.1442	0.0534	0.0478	0.0345	0.2926



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PARTICULATE MATTER (PM<sub>10</sub>) - METALS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PM metals: Atmospheric Research & Analysis, Inc.  
Morrisville, NC



FILE CONTENTS DESCRIPTION	Partisol Sampler Measurements of Mass, Ions by IC and Metals by ICP-MS
SAMPLING INTERVAL	24 hour
SAMPLING FREQUENCY OF DATA	Once every 6 days
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection - Method Detection Limits (MDL) are provided with each observation
UNITS	$\mu\text{g}/\text{m}^3$ (microgram per cubic meter)
OBSERVATION TYPE	Particles
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	Filtration with $\text{PM}_{10}$ Inlet for $\text{PM}_{10}$ and with $\text{PM}_{10}$ Inlet/Very Sharp Cut Cyclone for $\text{PM}_{2.5}$
PARTICLE DIAMETER MEDIUM	< 2.5 $\mu\text{m}$ or < 10 $\mu\text{m}$ 47 mm Teflon Filter
ANALYTICAL METHODS	MASS by Microbalance ELEMENTS by Inductively Coupled Plasma Mass Spectrometry (ICP/MS) IONS by Ion Chromatography (IC)
SAMPLE PREPARATION	DI Water extraction for IC analysis and Acid Digestion for ICP/MS Analysis
ANALYTICAL LABORATORY	Atmospheric Research & Analysis Inc
USER NOTE 1	Data are not blank corrected
USER NOTE 2	Volume is given at actual conditions of temperature and pressure during sampling as measured by the sampler
USER NOTE 3	Blank sample concentration ( $\mu\text{g}/\text{m}^3$ ) is calculated using expected actual volume of sampler
VOLUME STANDARDIZATION	Actual Volume at Ambient Conditions (since 01-Jan-2011)
SAMPLING INSTRUMENT TYPE	For $\text{PM}_{10}$ FRM Partisol $\text{PM}_{10}$ sampler For $\text{PM}_{2.5}$ FRM Partisol $\text{PM}_{2.5}$ sampler
FLAGS USED	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay			Patricia McInnes		Travel Blank
	Station #	AMS 1		AMS 6			
	Sample Date	03-Nov		03-Nov			03-Nov
Particulate Size	PM10		PM10				
Total Air Volume (m <sup>3</sup> )	24		24			24	
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	QC Flag
Particulate Matter	1.00	10.47	V0	2.55	V0	0.11	V0
Aluminum	0.1380326	0.3772378	V0	0.0158728	V0	0.0000000	V1
Antimony	0.0001784	0.0000151	V0	0.0000409	V0	0.0000000	V1
Arsenic	0.0001060	0.0000806	V0	0.0000182	V0	0.0000000	V1
Barium	0.0092847	0.0029934	V0	0.0005230	V0	0.0000000	V1
Beryllium	0.0000946	0.0000109	V0	-9999	M2	0.0000000	V1
Bismuth	0.0000093	0.0000028	V0	0.0000118	V0	0.0000000	V1
Cadmium	0.0000174	0.0000066	V0	-9999	M2	0.0000000	V1
Calcium	0.4112124	0.1572115	V0	0.0292666	V0	0.0000000	V1
Cerium	0.0000174	0.0003734	V0	0.0000203	V0	0.0000000	V1
Cesium	0.0000100	0.0000275	V0	0.0000010	V0	0.0000000	V1
Chromium	0.0022262	0.0005249	V0	0.0001414	V0	0.0000000	V1
Cobalt	0.0000273	0.0001030	V0	0.0000068	V0	0.0000000	V1
Copper	0.0017171	0.0004659	V0	0.0003708	V0	0.0000826	V0
Iron	0.0393063	0.2366352	V0	0.0210952	V0	0.0000000	V1
Lanthanum	0.0000130	0.0001761	V0	0.0000091	V0	0.0000000	V1
Lead	0.0008577	0.0001409	V0	0.0000440	V0	0.0000000	V1
Lithium	0.0000374	0.0003539	V0	0.0000135	V0	0.0000024	V0
Magnesium	0.0091409	0.0623461	V0	0.0072723	V0	0.0007792	V0
Manganese	0.0006949	0.0036661	V0	0.0003175	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001750	V0	-9999	M2	0.0000000	V1
Neodymium	0.0000140	0.0001620	V0	0.0000077	V0	0.0000000	V1
Nickel	0.0005429	0.0006322	V0	0.0000767	V0	0.0000455	V0
Niobium	0.0000202	0.0000605	V0	0.0000026	V0	0.0000000	V1
Palladium	0.0000632	0.0000113	V0	0.0000028	V0	0.0000045	V0
Phosphorus	0.0459574	0.0081987	V0	0.0041868	V0	0.0039264	V0
Platinum	0.0000088	0.0000013	V0	0.0000036	V0	0.0000006	V0
Potassium	0.0061261	0.1132910	V0	0.0139444	V0	0.0018328	V0
Praseodymium	0.0000070	0.0000437	V0	0.0000021	V0	0.0000000	V1
Rubidium	0.0000184	0.0004269	V0	0.0000258	V0	0.0000000	V1
Samarium	0.0000133	0.0000311	V0	0.0000010	V0	0.0000000	V1
Selenium	0.0003366	0.0003186	V0	0.0000214	V0	0.0000000	V1
Silicon	0.7676322	1.4088697	V0	0.0934072	V0	0.0000000	V1
Silver	0.0000100	0.0000021	V0	-9999	M2	0.0000000	V1
Sodium	0.0169447	0.0808318	V0	0.2085250	V0	0.0047364	V0
Strontium	0.0003375	0.0010098	V0	0.0001263	V0	0.0000000	V1
Tantalum	0.0000394	0.0000036	V0	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000036	V0	-9999	M2	0.0000000	V1
Thorium	0.0000059	0.0000490	V0	0.0000022	V0	0.0000000	V1
Tin	0.0004414	0.0000925	V0	0.0001046	V0	0.0000000	V1
Titanium	0.0015201	0.0169975	V0	0.0010021	V0	0.0004716	V0
Tungsten	0.0000938	0.0000501	V0	0.0000141	V0	0.0000000	V1
Uranium	0.0000048	0.0000142	V0	0.0000009	V0	0.0000000	V1
Vanadium	0.0007697	0.0008646	V0	0.0000473	V0	0.0000000	V1
Zinc	0.0055897	0.0020892	V0	0.0007066	V0	0.0002497	V0



Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
	AMS 7 03-Nov PM10 24	Results (µg/m <sup>3</sup> )	QC Flag	AMS 14 03-Nov PM10 24	Results (µg/m <sup>3</sup> )	QC Flag	03-Nov 24
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	13.30	V0	2.27	V0	0.11	V0
Aluminum	0.1380326	0.1688025	V0	0.0227440	V0	0.0000000	V1
Antimony	0.0001784	0.0002281	V0	0.0000145	V0	0.0000000	V1
Arsenic	0.0001060	0.0000581	V0	0.0000297	V0	0.0000000	V1
Barium	0.0092847	0.0046118	V0	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000052	V0	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000110	V0	0.0000018	V0	0.0000000	V1
Cadmium	0.0000174	0.0000071	V0	0.0000055	V0	0.0000000	V1
Calcium	0.4112124	0.3642414	V0	0.0287481	V0	0.0000000	V1
Cerium	0.0000174	0.0002397	V0	0.0000254	V0	0.0000000	V1
Cesium	0.0000100	0.0000107	V0	0.0000019	V0	0.0000000	V1
Chromium	0.0022262	0.0005550	V0	0.0002117	V0	0.0000000	V1
Cobalt	0.0000273	0.0000732	V0	0.0000087	V0	0.0000000	V1
Copper	0.0017171	0.0017020	V0	0.0008439	V0	0.0000826	V0
Iron	0.0393063	0.2305330	V0	0.0218510	V0	0.0000000	V1
Lanthanum	0.0000130	0.0001067	V0	0.0000121	V0	0.0000000	V1
Lead	0.0008577	0.0001465	V0	0.0000774	V0	0.0000000	V1
Lithium	0.0000374	0.0001268	V0	0.0000225	V0	0.0000024	V0
Magnesium	0.0091409	0.0847288	V0	0.0059439	V0	0.0007792	V0
Manganese	0.0006949	0.0035064	V0	0.0003460	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001662	V0	0.0000496	V0	0.0000000	V1
Neodymium	0.0000140	0.0000953	V0	0.0000107	V0	0.0000000	V1
Nickel	0.0005429	0.0003212	V0	0.0001341	V0	0.0000455	V0
Niobium	0.0000202	0.0000264	V0	0.0000033	V0	0.0000000	V1
Palladium	0.0000632	0.0000137	V0	0.0000000	V1	0.0000045	V0
Phosphorus	0.0459574	0.0068870	V0	0.0059551	V0	0.0039264	V0
Platinum	0.0000088	0.0000583	V4	0.0000019	V0	0.0000006	V0
Potassium	0.0061261	0.1020134	V0	0.0176666	V0	0.0018328	V0
Praseodymium	0.0000070	0.0000265	V0	0.0000026	V0	0.0000000	V1
Rubidium	0.0000184	0.0002164	V0	0.0000352	V0	0.0000000	V1
Samarium	0.0000133	0.0000162	V0	0.0000023	V0	0.0000000	V1
Selenium	0.0003366	0.0002043	V0	0.0000285	V0	0.0000000	V1
Silicon	0.7676322	0.6903556	V0	0.1028481	V0	0.0000000	V1
Silver	0.0000100	0.0000030	V0	0.0000017	V0	0.0000000	V1
Sodium	0.0169447	2.4867478	V4	0.0409319	V0	0.0047364	V0
Strontium	0.0003375	0.0012899	V0	0.0000933	V0	0.0000000	V1
Tantalum	0.0000394	0.0000027	V0	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000029	V0	0.0000010	V0	0.0000000	V1
Thorium	0.0000059	0.0000270	V0	0.0000032	V0	0.0000000	V1
Tin	0.0004414	0.0002552	V0	0.0000559	V0	0.0000000	V1
Titanium	0.0015201	0.0102119	V0	0.0016359	V0	0.0004716	V0
Tungsten	0.0000938	0.0002026	V0	0.0000326	V0	0.0000000	V1
Uranium	0.0000048	0.0000076	V0	0.0000011	V0	0.0000000	V1
Vanadium	0.0007697	0.0004070	V0	0.0000610	V0	0.0000000	V1
Zinc	0.0055897	0.0033717	V0	0.0007511	V0	0.0002497	V0





Compound Name	Station Name	Fort McKay South		Horizon		Travel Blank	
	Station #	AMS 13	QC Flag	AMS 15	QC Flag	03-Nov	
Total Air Volume (m <sup>3</sup> )	Sample Date	PM10		PM10			
	MDL (µg/sample)	Results (µg/m <sup>3</sup> )		Results (µg/m <sup>3</sup> )			
		24		24			
						24	
						Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	8.17	V0	1.51	V0	0.11	V0
Aluminum	0.1380326	0.3075330	V0	0.0347426	V0	0.0000000	V1
Antimony	0.0001784	0.0000106	V0	0.0000078	V0	0.0000000	V1
Arsenic	0.0001060	0.0000710	V0	0.0000287	V0	0.0000000	V1
Barium	0.0092847	0.0023594	V0	0.0000000	V1	0.0000000	V1
Beryllium	0.0000946	0.0000083	V0	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000018	V0	0.0000017	V0	0.0000000	V1
Cadmium	0.0000174	0.0000056	V0	0.0000056	V0	0.0000000	V1
Calcium	0.4112124	0.1090959	V0	0.0439389	V0	0.0000000	V1
Cerium	0.0000174	0.0003142	V0	0.0000295	V0	0.0000000	V1
Cesium	0.0000100	0.0000233	V0	0.0000022	V0	0.0000000	V1
Chromium	0.0022262	0.0004039	V0	0.0003103	V0	0.0000000	V1
Cobalt	0.0000273	0.0000847	V0	0.0000097	V0	0.0000000	V1
Copper	0.0017171	0.0003358	V0	0.0001832	V0	0.0000826	V0
Iron	0.0393063	0.2013346	V0	0.0236801	V0	0.0000000	V1
Lanthanum	0.0000130	0.0001500	V0	0.0000139	V0	0.0000000	V1
Lead	0.0008577	0.0001192	V0	0.0000546	V0	0.0000000	V1
Lithium	0.0000374	0.0002904	V0	0.0000328	V0	0.0000024	V0
Magnesium	0.0091409	0.0472967	V0	0.0065176	V0	0.0007792	V0
Manganese	0.0006949	0.0030090	V0	0.0003747	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000735	V0	0.0000564	V0	0.0000000	V1
Neodymium	0.0000140	0.0001431	V0	0.0000133	V0	0.0000000	V1
Nickel	0.0005429	0.0003568	V0	0.0001577	V0	0.0000455	V0
Niobium	0.0000202	0.0000468	V0	0.0000044	V0	0.0000000	V1
Palladium	0.0000632	0.0000066	V0	0.0000000	V1	0.0000045	V0
Phosphorus	0.0459574	0.0077095	V0	0.0043533	V0	0.0039264	V0
Platinum	0.0000088	0.0000013	V0	0.0000012	V0	0.0000006	V0
Potassium	0.0061261	0.0889094	V0	0.0165673	V0	0.0018328	V0
Praseodymium	0.0000070	0.0000371	V0	0.0000032	V0	0.0000000	V1
Rubidium	0.0000184	0.0003668	V0	0.0000411	V0	0.0000000	V1
Samarium	0.0000133	0.0000267	V0	0.0000026	V0	0.0000000	V1
Selenium	0.0003366	0.0002163	V0	0.0000344	V0	0.0000000	V1
Silicon	0.7676322	1.1719671	V0	0.1434701	V0	0.0000000	V1
Silver	0.0000100	0.0000020	V0	0.0000000	V1	0.0000000	V1
Sodium	0.0169447	0.0468770	V0	0.0077970	V0	0.0047364	V0
Strontium	0.0003375	0.0007967	V0	0.0001467	V0	0.0000000	V1
Tantalum	0.0000394	0.0000031	V0	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000030	V0	0.0000005	V0	0.0000000	V1
Thorium	0.0000059	0.0000413	V0	0.0000040	V0	0.0000000	V1
Tin	0.0004414	0.0000525	V0	0.0000320	V0	0.0000000	V1
Titanium	0.0015201	0.0126337	V0	0.0021641	V0	0.0004716	V0
Tungsten	0.0000938	0.0000464	V0	0.0000080	V0	0.0000000	V1
Uranium	0.0000048	0.0000125	V0	0.0000014	V0	0.0000000	V1
Vanadium	0.0007697	0.0006670	V0	0.0000615	V0	0.0000000	V1
Zinc	0.0055897	0.0014049	V0	0.0011568	V0	0.0002497	V0



Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			03-Nov	
Sample Date	03-Nov			03-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	6.38	V0	0.11	V0
Aluminum	0.1380326	0.1480728	V0	0.0000000	V1
Antimony	0.0001784	0.0000102	V0	0.0000000	V1
Arsenic	0.0001060	0.0000493	V0	0.0000000	V1
Barium	0.0092847	0.0011739	V0	0.0000000	V1
Beryllium	0.0000946	0.0000042	V0	0.0000000	V1
Bismuth	0.0000093	0.0000019	V0	0.0000000	V1
Cadmium	0.0000174	0.0000079	V0	0.0000000	V1
Calcium	0.4112124	0.1365958	V0	0.0000000	V1
Cerium	0.0000174	0.0001600	V0	0.0000000	V1
Cesium	0.0000100	0.0000098	V0	0.0000000	V1
Chromium	0.0022262	0.0002791	V0	0.0000000	V1
Cobalt	0.0000273	0.0000456	V0	0.0000000	V1
Copper	0.0017171	0.0002454	V0	0.0000826	V0
Iron	0.0393063	0.1165451	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000741	V0	0.0000000	V1
Lead	0.0008577	0.0001036	V0	0.0000000	V1
Lithium	0.0000374	0.0001539	V0	0.0000024	V0
Magnesium	0.0091409	0.0261172	V0	0.0007792	V0
Manganese	0.0006949	0.0020628	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001219	V0	0.0000000	V1
Neodymium	0.0000140	0.0000684	V0	0.0000000	V1
Nickel	0.0005429	0.0004691	V0	0.0000455	V0
Niobium	0.0000202	0.0000211	V0	0.0000000	V1
Palladium	0.0000632	0.0000051	V0	0.0000045	V0
Phosphorus	0.0459574	0.0076937	V0	0.0039264	V0
Platinum	0.0000088	0.0000043	V0	0.0000006	V0
Potassium	0.0061261	0.0483396	V0	0.0018328	V0
Praseodymium	0.0000070	0.0000182	V0	0.0000000	V1
Rubidium	0.0000184	0.0001836	V0	0.0000000	V1
Samarium	0.0000133	0.0000133	V0	0.0000000	V1
Selenium	0.0003366	0.0001172	V0	0.0000000	V1
Silicon	0.7676322	0.5967370	V0	0.0000000	V1
Silver	0.0000100	0.0000012	V0	0.0000000	V1
Sodium	0.0169447	0.0483384	V0	0.0047364	V0
Strontium	0.0003375	0.0004697	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000016	V0	0.0000000	V1
Thorium	0.0000059	0.0000200	V0	0.0000000	V1
Tin	0.0004414	0.0001061	V0	0.0000000	V1
Titanium	0.0015201	0.0064819	V0	0.0004716	V0
Tungsten	0.0000938	0.0000273	V0	0.0000000	V1
Uranium	0.0000048	0.0000057	V0	0.0000000	V1
Vanadium	0.0007697	0.0009128	V0	0.0000000	V1
Zinc	0.0055897	0.0016394	V0	0.0002497	V0



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1	QC Flag	AMS 6	QC Flag	09-Nov	
	Sample Date	09-Nov		09-Nov			
Particulate Size	PM10		PM10				
Total Air Volume (m <sup>3</sup> )	24		24				
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	32.85	V0	11.36	V0	0.16	V0
Aluminum	0.1380326	0.9828512	V0	0.1371259	V0	0.0000000	V1
Antimony	0.0001784	0.0000994	V0	0.0003112	V0	0.0000000	V1
Arsenic	0.0001060	0.0003236	V0	0.0003202	V0	0.0000000	V1
Barium	0.0092847	0.0091618	V0	0.0041541	V0	0.0000000	V1
Beryllium	0.0000946	0.0000308	V0	0.0000060	V0	0.0000000	V1
Bismuth	0.0000093	0.0000088	V0	0.0000142	V0	0.0000000	V1
Cadmium	0.0000174	0.0000606	V0	0.0000618	V0	0.0000000	V1
Calcium	0.4112124	1.3413383	V0	0.3032325	V0	0.0000000	V1
Cerium	0.0000174	0.0011664	V0	0.0002033	V0	0.0000000	V1
Cesium	0.0000100	0.0000676	V0	0.0000099	V0	0.0000000	V1
Chromium	0.0022262	0.0011868	V0	0.0003605	V0	0.0000000	V1
Cobalt	0.0000273	0.0003065	V0	0.0000675	V0	0.0000000	V1
Copper	0.0017171	0.0009564	V0	0.0019164	V0	0.0000962	V0
Iron	0.0393063	0.8043080	V0	0.1969465	V0	0.0000000	V1
Lanthanum	0.0000130	0.0005849	V0	0.0001147	V0	0.0000000	V1
Lead	0.0008577	0.0005618	V0	0.0003797	V0	0.0000000	V1
Lithium	0.0000374	0.0008804	V0	0.0000778	V0	0.0000000	V1
Magnesium	0.0091409	0.2120010	V0	0.0637900	V0	0.0005262	V0
Manganese	0.0006949	0.0142037	V0	0.0033544	V0	0.0000000	V1
Molybdenum	0.0007116	0.0003092	V0	0.0001498	V0	0.0000000	V1
Neodymium	0.0000140	0.0005013	V0	0.0000780	V0	0.0000000	V1
Nickel	0.0005429	0.0015559	V0	0.0002840	V0	0.0000592	V0
Niobium	0.0000202	0.0001247	V0	0.0000197	V0	0.0000000	V1
Palladium	0.0000632	0.0000207	V0	0.0000109	V0	0.0000000	V1
Phosphorus	0.0459574	0.0208194	V0	0.0126711	V0	0.0101723	V0
Platinum	0.0000088	0.0000047	V0	0.0000052	V0	0.0000026	V0
Potassium	0.0061261	0.3506465	V0	0.1202012	V0	0.0009676	V0
Praseodymium	0.0000070	0.0001322	V0	0.0000218	V0	0.0000000	V1
Rubidium	0.0000184	0.0013160	V0	0.0002461	V0	0.0000000	V1
Samarium	0.0000133	0.0000930	V0	0.0000141	V0	0.0000000	V1
Selenium	0.0003366	0.0006761	V0	0.0001172	V0	0.0000000	V1
Silicon	0.7676322	3.0051604	V0	0.4836074	V0	0.0000000	V1
Silver	0.0000100	0.0000069	V0	0.0000056	V0	0.0000011	V0
Sodium	0.0169447	0.1973938	V0	0.4645008	V0	0.0029089	V0
Strontium	0.0003375	0.0038428	V0	0.0010659	V0	0.0000146	V0
Tantalum	0.0000394	0.0000096	V0	0.0000024	V0	0.0000000	V1
Thallium	0.0000090	0.0000115	V0	0.0000040	V0	0.0000000	V1
Thorium	0.0000059	0.0001490	V0	0.0000251	V0	0.0000000	V1
Tin	0.0004414	0.0001627	V0	0.0002827	V0	0.0000000	V1
Titanium	0.0015201	0.0387059	V0	0.0060136	V0	0.0002424	V0
Tungsten	0.0000938	0.0002077	V0	0.0002147	V0	0.0000167	V0
Uranium	0.0000048	0.0000418	V0	0.0000071	V0	0.0000000	V1
Vanadium	0.0007697	0.0036326	V0	0.0003885	V0	0.0000000	V1
Zinc	0.0055897	0.0079349	V0	0.0084293	V0	0.0000000	V1



Compound Name	Station Name	Athabasca Valley			Anzac		Travel Blank	
	Station #	AMS 7			AMS 14			
	Sample Date	09-Nov			09-Nov			
	Particulate Size	PM10			PM10			
Total Air Volume (m <sup>3</sup> )		24		24		24		
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag		
Particulate Matter	1.00	21.25	V0	5.45	V0	0.16	V0	
Aluminum	0.1380326	0.2163481	V0	0.0200387	V0	0.0000000	V1	
Antimony	0.0001784	0.0002445	V0	0.0000305	V0	0.0000000	V1	
Arsenic	0.0001060	0.0001608	V0	0.0001268	V0	0.0000000	V1	
Barium	0.0092847	0.0051955	V0	0.0006225	V0	0.0000000	V1	
Beryllium	0.0000946	0.0000071	V0	0.0000000	V1	0.0000000	V1	
Bismuth	0.0000093	0.0000096	V0	0.0000032	V0	0.0000000	V1	
Cadmium	0.0000174	-9999	M2	0.0000406	V0	0.0000000	V1	
Calcium	0.4112124	0.4832075	V0	0.0326117	V0	0.0000000	V1	
Cerium	0.0000174	0.0003023	V0	0.0000210	V0	0.0000000	V1	
Cesium	0.0000100	0.0000149	V0	0.0000021	V0	0.0000000	V1	
Chromium	0.0022262	0.0005393	V0	0.0001365	V0	0.0000000	V1	
Cobalt	0.0000273	0.0000940	V0	0.0000120	V0	0.0000000	V1	
Copper	0.0017171	0.0017439	V0	0.0002819	V0	0.0000962	V0	
Iron	0.0393063	0.3143900	V0	0.0169160	V0	0.0000000	V1	
Lanthanum	0.0000130	0.0001619	V0	0.0000329	V0	0.0000000	V1	
Lead	0.0008577	0.0003103	V0	0.0002028	V0	0.0000000	V1	
Lithium	0.0000374	0.0001562	V0	0.0000000	V1	0.0000000	V1	
Magnesium	0.0091409	0.0957677	V0	0.0066306	V0	0.0005262	V0	
Manganese	0.0006949	0.0055168	V0	0.0004351	V0	0.0000000	V1	
Molybdenum	0.0007116	0.0001210	V0	0.0000442	V0	0.0000000	V1	
Neodymium	0.0000140	0.0001207	V0	0.0000080	V0	0.0000000	V1	
Nickel	0.0005429	0.0004512	V0	0.0001069	V0	0.0000592	V0	
Niobium	0.0000202	0.0000283	V0	0.0000026	V0	0.0000000	V1	
Palladium	0.0000632	0.0000094	V0	0.0000000	V1	0.0000000	V1	
Phosphorus	0.0459574	0.0165636	V0	0.0105895	V0	0.0101723	V0	
Platinum	0.0000088	0.0000031	V0	0.0000017	V0	0.0000026	V0	
Potassium	0.0061261	0.1226917	V0	0.0499527	V0	0.0009676	V0	
Praseodymium	0.0000070	0.0000336	V0	0.0000024	V0	0.0000000	V1	
Rubidium	0.0000184	0.0003319	V0	0.0000557	V0	0.0000000	V1	
Samarium	0.0000133	0.0000217	V0	0.0000014	V0	0.0000000	V1	
Selenium	0.0003366	0.0001633	V0	0.0000207	V0	0.0000000	V1	
Silicon	0.7676322	1.2327383	V0	0.1432512	V0	0.0000000	V1	
Silver	0.0000100	0.0000062	V0	0.0000026	V0	0.0000011	V0	
Sodium	0.0169447	0.6685474	V0	0.0226570	V0	0.0029089	V0	
Strontium	0.0003375	0.0015604	V0	0.0001292	V0	0.0000146	V0	
Tantalum	0.0000394	0.0000029	V0	0.0000000	V1	0.0000000	V1	
Thallium	0.0000090	0.0000038	V0	0.0000018	V0	0.0000000	V1	
Thorium	0.0000059	0.0000400	V0	0.0000029	V0	0.0000000	V1	
Tin	0.0004414	0.0002510	V0	0.0001156	V0	0.0000000	V1	
Titanium	0.0015201	0.0093394	V0	0.0013964	V0	0.0002424	V0	
Tungsten	0.0000938	0.0002057	V0	0.0000268	V0	0.0000167	V0	
Uranium	0.0000048	0.0000104	V0	0.0000013	V0	0.0000000	V1	
Vanadium	0.0007697	0.0006087	V0	0.0000530	V0	0.0000000	V1	
Zinc	0.0055897	0.0068054	V0	0.0042673	V0	0.0000000	V1	



Compound Name	Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Fort McKay South			Horizon		Travel Blank	
		AMS 13 09-Nov PM10 24	Results (µg/m <sup>3</sup> )	QC Flag	AMS 15 09-Nov PM10 24	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	21.43	V0	14.97	V4	0.16	V0	
Aluminum	0.1380326	0.6466601	V0	0.3969540	V4	0.0000000	V1	
Antimony	0.0001784	0.0000932	V0	0.0000518	V4	0.0000000	V1	
Arsenic	0.0001060	0.0002028	V0	0.0001838	V4	0.0000000	V1	
Barium	0.0092847	0.0060846	V0	0.0038030	V4	0.0000000	V1	
Beryllium	0.0000946	0.0000187	V0	0.0000146	V4	0.0000000	V1	
Bismuth	0.0000093	0.0000061	V0	0.0000071	V4	0.0000000	V1	
Cadmium	0.0000174	0.0000518	V0	0.0000612	V4	0.0000000	V1	
Calcium	0.4112124	0.7021350	V0	0.5361621	V4	0.0000000	V1	
Cerium	0.0000174	0.0009069	V0	0.0004450	V4	0.0000000	V1	
Cesium	0.0000100	0.0000426	V0	0.0000286	V4	0.0000000	V1	
Chromium	0.0022262	0.0008639	V0	0.0006164	V4	0.0000000	V1	
Cobalt	0.0000273	0.0001986	V0	0.0001360	V4	0.0000000	V1	
Copper	0.0017171	0.0006912	V0	0.0005499	V4	0.0000962	V0	
Iron	0.0393063	0.4885492	V0	0.3510487	V4	0.0000000	V1	
Lanthanum	0.0000130	0.0003879	V0	0.0002326	V4	0.0000000	V1	
Lead	0.0008577	0.0004263	V0	0.0003742	V4	0.0000000	V1	
Lithium	0.0000374	0.0005756	V0	0.0003629	V4	0.0000000	V1	
Magnesium	0.0091409	0.1240753	V0	0.0878998	V4	0.0005262	V0	
Manganese	0.0006949	0.0092373	V0	0.0063348	V4	0.0000000	V1	
Molybdenum	0.0007116	0.0002429	V0	0.0001917	V4	0.0000000	V1	
Neodymium	0.0000140	0.0003297	V0	0.0001897	V4	0.0000000	V1	
Nickel	0.0005429	0.0011850	V0	0.0006791	V4	0.0000592	V0	
Niobium	0.0000202	0.0000796	V0	0.0000541	V4	0.0000000	V1	
Palladium	0.0000632	0.0000152	V0	0.0000075	V4	0.0000000	V1	
Phosphorus	0.0459574	0.0160556	V0	0.0143871	V4	0.0101723	V0	
Platinum	0.0000088	0.0000026	V0	0.0000020	V4	0.0000026	V0	
Potassium	0.0061261	0.2299599	V0	0.1647925	V4	0.0009676	V0	
Praseodymium	0.0000070	0.0000883	V0	0.0000507	V4	0.0000000	V1	
Rubidium	0.0000184	0.0008471	V0	0.0005450	V4	0.0000000	V1	
Samarium	0.0000133	0.0000620	V0	0.0000359	V4	0.0000000	V1	
Selenium	0.0003366	0.0004233	V0	0.0002777	V4	0.0000000	V1	
Silicon	0.7676322	1.9552472	V0	1.3539549	V4	0.0000000	V1	
Silver	0.0000100	0.0000064	V0	0.0000040	V4	0.0000011	V0	
Sodium	0.0169447	0.1435118	V0	0.0820939	V4	0.0029089	V0	
Strontium	0.0003375	0.0023632	V0	0.0016406	V4	0.0000146	V0	
Tantalum	0.0000394	0.0000063	V0	0.0000037	V4	0.0000000	V1	
Thallium	0.0000090	0.0000078	V0	0.0000062	V4	0.0000000	V1	
Thorium	0.0000059	0.0000945	V0	0.0000569	V4	0.0000000	V1	
Tin	0.0004414	0.0001787	V0	0.0001027	V4	0.0000000	V1	
Titanium	0.0015201	0.0240892	V0	0.0166899	V4	0.0002424	V0	
Tungsten	0.0000938	0.0001301	V0	0.0000912	V4	0.0000167	V0	
Uranium	0.0000048	0.0000261	V0	0.0000176	V4	0.0000000	V1	
Vanadium	0.0007697	0.0026892	V0	0.0016235	V4	0.0000000	V1	
Zinc	0.0055897	0.0064726	V0	0.0061576	V4	0.0000000	V1	



Compound Name	MDL (µg/sample)	Muskeg River		Travel Blank	
		Results (µg/m³)	QC Flag	Results (µg/m³)	QC Flag
Particulate Matter	1.00	40.47	V0	0.16	V0
Aluminum	0.1380326	1.3299352	V0	0.0000000	V1
Antimony	0.0001784	0.0000925	V0	0.0000000	V1
Arsenic	0.0001060	0.0004526	V0	0.0000000	V1
Barium	0.0092847	0.0124568	V0	0.0000000	V1
Beryllium	0.0000946	0.0000462	V0	0.0000000	V1
Bismuth	0.0000093	0.0000129	V0	0.0000000	V1
Cadmium	0.0000174	0.0000662	V0	0.0000000	V1
Calcium	0.4112124	2.6721215	V0	0.0000000	V1
Cerium	0.0000174	0.0016384	V0	0.0000000	V1
Cesium	0.0000100	0.0000940	V0	0.0000000	V1
Chromium	0.0022262	0.0017969	V0	0.0000000	V1
Cobalt	0.0000273	0.0004276	V0	0.0000000	V1
Copper	0.0017171	0.0012970	V0	0.0000962	V0
Iron	0.0393063	1.5540364	V0	0.0000000	V1
Lanthanum	0.0000130	0.0008213	V0	0.0000000	V1
Lead	0.0008577	0.0007319	V0	0.0000000	V1
Lithium	0.0000374	0.0014041	V0	0.0000000	V1
Magnesium	0.0091409	0.3338574	V0	0.0005262	V0
Manganese	0.0006949	0.0273300	V0	0.0000000	V1
Molybdenum	0.0007116	0.0005404	V0	0.0000000	V1
Neodymium	0.0000140	0.0007055	V0	0.0000000	V1
Nickel	0.0005429	0.0017495	V0	0.0000592	V0
Niobium	0.0000202	0.0001825	V0	0.0000000	V1
Palladium	0.0000632	0.0000275	V0	0.0000000	V1
Phosphorus	0.0459574	0.0269466	V0	0.0101723	V0
Platinum	0.0000088	0.0000044	V0	0.0000026	V0
Potassium	0.0061261	0.5045230	V0	0.0009676	V0
Praseodymium	0.0000070	0.0001863	V0	0.0000000	V1
Rubidium	0.0000184	0.0018579	V0	0.0000000	V1
Samarium	0.0000133	0.0001319	V0	0.0000000	V1
Selenium	0.0003366	0.0009791	V0	0.0000000	V1
Silicon	0.7676322	4.0048943	V0	0.0000000	V1
Silver	0.0000100	0.0000091	V0	0.0000011	V0
Sodium	0.0169447	0.1743192	V0	0.0029089	V0
Strontium	0.0003375	0.0059715	V0	0.0000146	V0
Tantalum	0.0000394	0.0000131	V0	0.0000000	V1
Thallium	0.0000090	0.0000174	V0	0.0000000	V1
Thorium	0.0000059	0.0002151	V0	0.0000000	V1
Tin	0.0004414	0.0003094	V0	0.0000000	V1
Titanium	0.0015201	0.0544616	V0	0.0002424	V0
Tungsten	0.0000938	0.0002933	V0	0.0000167	V0
Uranium	0.0000048	0.0000624	V0	0.0000000	V1
Vanadium	0.0007697	0.0042765	V0	0.0000000	V1
Zinc	0.0055897	0.0116150	V0	0.0000000	V1



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1	QC Flag	AMS 6	QC Flag	15-Nov	
	Sample Date	15-Nov		15-Nov			
Particulate Size	PM10		PM10				
Total Air Volume (m <sup>3</sup> )	24		24		24		
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	9.82	V0	6.92	V0	0.21	V0
Aluminum	0.1380326	0.3045745	V0	0.1232231	V0	0.0000000	V1
Antimony	0.0001784	0.0000451	V0	0.0001291	V0	0.0000000	V1
Arsenic	0.0001060	0.0001065	V0	0.0000543	V0	0.0000000	V1
Barium	0.0092847	0.0028083	V0	0.0024059	V0	0.0000000	V1
Beryllium	0.0000946	0.0000108	V0	0.0000081	V0	0.0000000	V1
Bismuth	0.0000093	0.0000133	V0	0.0000080	V0	0.0000000	V1
Cadmium	0.0000174	0.0000054	V0	0.0000070	V0	0.0000000	V1
Calcium	0.4112124	0.6325520	V0	0.2311753	V0	0.0000000	V1
Cerium	0.0000174	0.0003708	V0	0.0001410	V0	0.0000008	V0
Cesium	0.0000100	0.0000216	V0	0.0000079	V0	0.0000000	V1
Chromium	0.0022262	0.0007599	V0	0.0003426	V0	0.0000000	V1
Cobalt	0.0000273	0.0000919	V0	0.0000432	V0	0.0000000	V1
Copper	0.0017171	0.0007247	V0	0.0009822	V0	0.0000000	V1
Iron	0.0393063	0.3221943	V0	0.1405071	V0	0.0016733	V0
Lanthanum	0.0000130	0.0001801	V0	0.0000679	V0	0.0000000	V1
Lead	0.0008577	0.0001675	V0	0.0001216	V0	0.0000000	V1
Lithium	0.0000374	0.0002702	V0	0.0000785	V0	0.0000000	V1
Magnesium	0.0091409	0.0808168	V0	0.0577351	V0	0.0000000	V1
Manganese	0.0006949	0.0060369	V0	0.0023702	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001015	V0	0.0000576	V0	0.0000000	V1
Neodymium	0.0000140	0.0001564	V0	0.0000571	V0	0.0000000	V1
Nickel	0.0005429	0.0004950	V0	0.0002612	V0	0.0000423	V0
Niobium	0.0000202	0.0000457	V0	0.0000154	V0	0.0000000	V1
Palladium	0.0000632	0.0000120	V0	0.0000132	V0	0.0000039	V0
Phosphorus	0.0459574	0.0151717	V0	0.0135828	V0	0.0096004	V0
Platinum	0.0000088	0.0000035	V0	0.0000047	V0	0.0000029	V0
Potassium	0.0061261	0.1076752	V0	0.0665728	V0	0.0003673	V0
Praseodymium	0.0000070	0.0000413	V0	0.0000157	V0	0.0000000	V1
Rubidium	0.0000184	0.0004113	V0	0.0001703	V0	0.0000000	V1
Samarium	0.0000133	0.0000282	V0	0.0000107	V0	0.0000000	V1
Selenium	0.0003366	0.0002004	V0	0.0000645	V0	0.0000000	V1
Silicon	0.7676322	1.0776402	V0	0.5180377	V0	0.0467369	V0
Silver	0.0000100	0.0000023	V0	0.0000023	V0	0.0000000	V1
Sodium	0.0169447	0.1687274	V0	0.4072893	V0	0.0045926	V0
Strontium	0.0003375	0.0013677	V0	0.0008319	V0	0.0000000	V1
Tantalum	0.0000394	0.0000031	V0	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000037	V0	0.0000017	V0	0.0000000	V1
Thorium	0.0000059	0.0000474	V0	0.0000177	V0	0.0000000	V1
Tin	0.0004414	0.0000644	V0	0.0001705	V0	0.0000000	V1
Titanium	0.0015201	0.0135755	V0	0.0052755	V0	0.0006363	V0
Tungsten	0.0000938	0.0000434	V0	0.0000728	V0	0.0000000	V1
Uranium	0.0000048	0.0000186	V0	0.0000101	V0	0.0000000	V1
Vanadium	0.0007697	0.0006861	V0	0.0003453	V0	0.0000000	V1
Zinc	0.0055897	0.0023971	V0	0.0021914	V0	0.0000000	V1



Compound Name	MDL (µg/sample)	Athabasca Valley		Anzac		Travel Blank	
		AMS 7	AMS 14	AMS 14	AMS 14	AMS 14	AMS 14
Station Name	Station #	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date
Particulate Size	Particulate Size	Particulate Size	Particulate Size	Particulate Size	Particulate Size	Particulate Size	Particulate Size
Total Air Volume (m³)	Total Air Volume (m³)	Total Air Volume (m³)	Total Air Volume (m³)	Total Air Volume (m³)	Total Air Volume (m³)	Total Air Volume (m³)	Total Air Volume (m³)
Results (µg/m³)	Results (µg/m³)	Results (µg/m³)	Results (µg/m³)	Results (µg/m³)	Results (µg/m³)	Results (µg/m³)	Results (µg/m³)
QC Flag	QC Flag	QC Flag	QC Flag	QC Flag	QC Flag	QC Flag	QC Flag
Particulate Matter	1.00	17.09	V0	3.08	V0	0.21	V0
Aluminum	0.1380326	0.3721516	V0	0.0480379	V0	0.0000000	V1
Antimony	0.0001784	0.0001755	V0	0.0000231	V0	0.0000000	V1
Arsenic	0.0001060	0.0001126	V0	0.0000282	V0	0.0000000	V1
Barium	0.0092847	0.0058642	V0	0.0005958	V0	0.0000000	V1
Beryllium	0.0000946	0.0000123	V0	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000086	V0	0.0000018	V0	0.0000000	V1
Cadmium	0.0000174	0.0000067	V0	0.0000054	V0	0.0000000	V1
Calcium	0.4112124	0.8692948	V0	0.0993332	V0	0.0000000	V1
Cerium	0.0000174	0.0005088	V0	0.0000587	V0	0.0000008	V0
Cesium	0.0000100	0.0000248	V0	0.0000032	V0	0.0000000	V1
Chromium	0.0022262	0.0006188	V0	0.0002696	V0	0.0000000	V1
Cobalt	0.0000273	0.0001337	V0	0.0000163	V0	0.0000000	V1
Copper	0.0017171	0.0015435	V0	0.0003653	V0	0.0000000	V1
Iron	0.0393063	0.5104990	V0	0.0479531	V0	0.0016733	V0
Lanthanum	0.0000130	0.0002506	V0	0.0000285	V0	0.0000000	V1
Lead	0.0008577	0.0002774	V0	0.0000874	V0	0.0000000	V1
Lithium	0.0000374	0.0002988	V0	0.0000088	V0	0.0000000	V1
Magnesium	0.0091409	0.1714394	V0	0.0317465	V0	0.0000000	V1
Manganese	0.0006949	0.0087172	V0	0.0010995	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001931	V0	0.0000326	V0	0.0000000	V1
Neodymium	0.0000140	0.0002060	V0	0.0000246	V0	0.0000000	V1
Nickel	0.0005429	0.0005523	V0	0.0001768	V0	0.0000423	V0
Niobium	0.0000202	0.0000566	V0	0.0000093	V0	0.0000000	V1
Palladium	0.0000632	0.0000170	V0	0.0000033	V0	0.0000039	V0
Phosphorus	0.0459574	0.0164066	V0	0.0112224	V0	0.0096004	V0
Platinum	0.0000088	0.0000037	V0	0.0000039	V0	0.0000029	V0
Potassium	0.0061261	0.1663711	V0	0.0311294	V0	0.0003673	V0
Praseodymium	0.0000070	0.0000557	V0	0.0000063	V0	0.0000000	V1
Rubidium	0.0000184	0.0005351	V0	0.0000704	V0	0.0000000	V1
Samarium	0.0000133	0.0000378	V0	0.0000042	V0	0.0000000	V1
Selenium	0.0003366	0.0003033	V0	0.0000217	V0	0.0000000	V1
Silicon	0.7676322	1.3753731	V0	0.1795885	V0	0.0467369	V0
Silver	0.0000100	0.0000028	V0	0.0000007	V0	0.0000000	V1
Sodium	0.0169447	0.9899324	V0	0.1402660	V0	0.0045926	V0
Strontium	0.0003375	0.0024136	V0	0.0003232	V0	0.0000000	V1
Tantalum	0.0000394	0.0000051	V0	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000048	V0	0.0000013	V0	0.0000000	V1
Thorium	0.0000059	0.0000659	V0	0.0000076	V0	0.0000000	V1
Tin	0.0004414	0.0002442	V0	0.0000791	V0	0.0000000	V1
Titanium	0.0015201	0.0181249	V0	0.0022676	V0	0.0006363	V0
Tungsten	0.0000938	0.0002823	V0	0.0000190	V0	0.0000000	V1
Uranium	0.0000048	0.0000243	V0	0.0000066	V0	0.0000000	V1
Vanadium	0.0007697	0.0008871	V0	0.0001028	V0	0.0000000	V1
Zinc	0.0055897	0.0053995	V0	0.0030593	V0	0.0000000	V1





Station Name	Fort McKay South			Horizon		Travel Blank	
Station #	AMS 13			AMS 15		15-Nov	
Sample Date	15-Nov			15-Nov		15-Nov	
Particulate Size	PM10			PM10		PM10	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	13.32	V0	21.59	V0	0.21	V0
Aluminum	0.1380326	0.5680258	V0	0.8483341	V0	0.0000000	V1
Antimony	0.0001784	0.0000462	V0	0.0000305	V0	0.0000000	V1
Arsenic	0.0001060	0.0001221	V0	0.0001799	V0	0.0000000	V1
Barium	0.0092847	0.0046525	V0	0.0072217	V0	0.0000000	V1
Beryllium	0.0000946	0.0000165	V0	0.0000273	V0	0.0000000	V1
Bismuth	0.0000093	0.0000038	V0	0.0000048	V0	0.0000000	V1
Cadmium	0.0000174	0.0000066	V0	0.0000071	V0	0.0000000	V1
Calcium	0.4112124	0.6745759	V0	1.0283298	V0	0.0000000	V1
Cerium	0.0000174	0.0006391	V0	0.0010411	V0	0.0000008	V0
Cesium	0.0000100	0.0000409	V0	0.0000574	V0	0.0000000	V1
Chromium	0.0022262	0.0007698	V0	0.0010001	V0	0.0000000	V1
Cobalt	0.0000273	0.0001497	V0	0.0002315	V0	0.0000000	V1
Copper	0.0017171	0.0007014	V0	0.0006040	V0	0.0000000	V1
Iron	0.0393063	0.4288585	V0	0.9695311	V0	0.0016733	V0
Lanthanum	0.0000130	0.0003109	V0	0.0005027	V0	0.0000000	V1
Lead	0.0008577	0.0002288	V0	0.0003119	V0	0.0000000	V1
Lithium	0.0000374	0.0005057	V0	0.0009939	V0	0.0000000	V1
Magnesium	0.0091409	0.1282022	V0	0.1895977	V0	0.0000000	V1
Manganese	0.0006949	0.0073879	V0	0.0167091	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001074	V0	0.0001311	V0	0.0000000	V1
Neodymium	0.0000140	0.0002727	V0	0.0004324	V0	0.0000000	V1
Nickel	0.0005429	0.0007172	V0	0.0008668	V0	0.0000423	V0
Niobium	0.0000202	0.0000817	V0	0.0001190	V0	0.0000000	V1
Palladium	0.0000632	0.0000128	V0	0.0000188	V0	0.0000039	V0
Phosphorus	0.0459574	0.0180161	V0	0.0181340	V0	0.0096004	V0
Platinum	0.0000088	0.0000034	V0	0.0000091	V0	0.0000029	V0
Potassium	0.0061261	0.1798046	V0	0.2381961	V0	0.0003673	V0
Praseodymium	0.0000070	0.0000720	V0	0.0001149	V0	0.0000000	V1
Rubidium	0.0000184	0.0007320	V0	0.0010554	V0	0.0000000	V1
Samarium	0.0000133	0.0000536	V0	0.0000805	V0	0.0000000	V1
Selenium	0.0003366	0.0003536	V0	0.0005564	V0	0.0000000	V1
Silicon	0.7676322	1.7326506	V0	2.4422100	V0	0.0467369	V0
Silver	0.0000100	0.0000028	V0	0.0000052	V0	0.0000000	V1
Sodium	0.0169447	0.2619046	V0	0.1579806	V0	0.0045926	V0
Strontium	0.0003375	0.0019925	V0	0.0029773	V0	0.0000000	V1
Tantalum	0.0000394	0.0000051	V0	0.0000077	V0	0.0000000	V1
Thallium	0.0000090	0.0000054	V0	0.0000092	V0	0.0000000	V1
Thorium	0.0000059	0.0000845	V0	0.0001368	V0	0.0000000	V1
Tin	0.0004414	0.0001029	V0	0.0001524	V0	0.0000000	V1
Titanium	0.0015201	0.0267855	V0	0.0336228	V0	0.0006363	V0
Tungsten	0.0000938	0.0001016	V0	0.0000992	V0	0.0000000	V1
Uranium	0.0000048	0.0000280	V0	0.0000419	V0	0.0000000	V1
Vanadium	0.0007697	0.0013169	V0	0.0016268	V0	0.0000000	V1
Zinc	0.0055897	0.0032989	V0	0.0029283	V0	0.0000000	V1



Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			15-Nov	
Sample Date	15-Nov			15-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	14.14	V4	0.21	V0
Aluminum	0.1380326	0.4260499	V4	0.0000000	V1
Antimony	0.0001784	0.0000114	V4	0.0000000	V1
Arsenic	0.0001060	0.0000891	V4	0.0000000	V1
Barium	0.0092847	0.0038285	V4	0.0000000	V1
Beryllium	0.0000946	0.0000134	V4	0.0000000	V1
Bismuth	0.0000093	0.0000022	V4	0.0000000	V1
Cadmium	0.0000174	0.0000043	V4	0.0000000	V1
Calcium	0.4112124	0.7133322	V4	0.0000000	V1
Cerium	0.0000174	0.0005530	V4	0.0000008	V0
Cesium	0.0000100	0.0000264	V4	0.0000000	V1
Chromium	0.0022262	0.0005632	V4	0.0000000	V1
Cobalt	0.0000273	0.0001354	V4	0.0000000	V1
Copper	0.0017171	0.0003433	V4	0.0000000	V1
Iron	0.0393063	0.7016431	V4	0.0016733	V0
Lanthanum	0.0000130	0.0003868	V4	0.0000000	V1
Lead	0.0008577	0.0001754	V4	0.0000000	V1
Lithium	0.0000374	0.0004151	V4	0.0000000	V1
Magnesium	0.0091409	0.1159074	V4	0.0000000	V1
Manganese	0.0006949	0.0119112	V4	0.0000000	V1
Molybdenum	0.0007116	0.0000697	V4	0.0000000	V1
Neodymium	0.0000140	0.0002316	V4	0.0000000	V1
Nickel	0.0005429	0.0004964	V4	0.0000423	V0
Niobium	0.0000202	0.0000616	V4	0.0000000	V1
Palladium	0.0000632	0.0000128	V4	0.0000039	V0
Phosphorus	0.0459574	0.0148101	V4	0.0096004	V0
Platinum	0.0000088	0.0000031	V4	0.0000029	V0
Potassium	0.0061261	0.1218196	V4	0.0003673	V0
Praseodymium	0.0000070	0.0000624	V4	0.0000000	V1
Rubidium	0.0000184	0.0005411	V4	0.0000000	V1
Samarium	0.0000133	0.0000420	V4	0.0000000	V1
Selenium	0.0003366	0.0002720	V4	0.0000000	V1
Silicon	0.7676322	1.4050155	V4	0.0467369	V0
Silver	0.0000100	0.0000019	V4	0.0000000	V1
Sodium	0.0169447	0.1357050	V4	0.0045926	V0
Strontium	0.0003375	0.0017860	V4	0.0000000	V1
Tantalum	0.0000394	0.0000038	V4	0.0000000	V1
Thallium	0.0000090	0.0000051	V4	0.0000000	V1
Thorium	0.0000059	0.0000746	V4	0.0000000	V1
Tin	0.0004414	0.0000704	V4	0.0000000	V1
Titanium	0.0015201	0.0169999	V4	0.0006363	V0
Tungsten	0.0000938	0.0000634	V4	0.0000000	V1
Uranium	0.0000048	0.0000207	V4	0.0000000	V1
Vanadium	0.0007697	0.0008043	V4	0.0000000	V1
Zinc	0.0055897	0.0014440	V4	0.0000000	V1



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1	QC Flag	AMS 6	QC Flag	21-Nov	
	Sample Date	21-Nov		21-Nov			
Particulate Size	PM10		PM10				
Total Air Volume (m <sup>3</sup> )	24		24				
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	4.31	V0	3.65	V0	0.10	V0
Aluminum	0.1380326	0.1067915	V0	0.0138937	V0	0.0000000	V1
Antimony	0.0001784	0.0000109	V0	0.0000448	V0	0.0000000	V1
Arsenic	0.0001060	0.0000260	V0	0.0000170	V0	0.0000000	V1
Barium	0.0092847	0.0008495	V0	0.0006001	V0	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000021	V0	0.0000021	V0	0.0000000	V1
Cadmium	0.0000174	0.0000056	V0	0.0000056	V0	0.0000000	V1
Calcium	0.4112124	0.0656805	V0	0.0283965	V0	0.0000000	V1
Cerium	0.0000174	0.0001019	V0	0.0000189	V0	0.0000000	V1
Cesium	0.0000100	0.0000069	V0	0.0000010	V0	0.0000000	V1
Chromium	0.0022262	0.0002122	V0	0.0001306	V0	0.0000000	V1
Cobalt	0.0000273	0.0000316	V0	0.0000075	V0	0.0000027	V0
Copper	0.0017171	0.0003742	V0	0.0005062	V0	0.0000000	V1
Iron	0.0393063	0.0770503	V0	0.0186308	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000472	V0	0.0000153	V0	0.0000000	V1
Lead	0.0008577	0.0000631	V0	0.0000527	V0	0.0000000	V1
Lithium	0.0000374	0.0000974	V0	0.0000164	V0	0.0000000	V1
Magnesium	0.0091409	0.0343853	V0	0.0253906	V0	0.0000000	V1
Manganese	0.0006949	0.0011946	V0	0.0002757	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000676	V0	0.0000646	V0	0.0000000	V1
Neodymium	0.0000140	0.0000435	V0	0.0000058	V0	0.0000000	V1
Nickel	0.0005429	0.0001921	V0	0.0002010	V0	0.0000426	V0
Niobium	0.0000202	0.0000117	V0	0.0000022	V0	0.0000000	V1
Palladium	0.0000632	0.0000072	V0	0.0000058	V0	0.0000000	V1
Phosphorus	0.0459574	0.0111665	V0	0.0121871	V0	0.0102488	V0
Platinum	0.0000088	0.0000033	V0	0.0000024	V0	0.0000011	V0
Potassium	0.0061261	0.0613434	V0	0.0197890	V0	0.0006702	V0
Praseodymium	0.0000070	0.0000114	V0	0.0000016	V0	0.0000000	V1
Rubidium	0.0000184	0.0001380	V0	0.0000304	V0	0.0000000	V1
Samarium	0.0000133	0.0000073	V0	0.0000010	V0	0.0000000	V1
Selenium	0.0003366	0.0000857	V0	0.0000475	V0	0.0000000	V1
Silicon	0.7676322	0.3781328	V0	0.1975255	V0	0.0000000	V1
Silver	0.0000100	0.0000009	V0	0.0000034	V0	0.0000000	V1
Sodium	0.0169447	0.1632519	V0	0.1798165	V0	0.0009190	V0
Strontium	0.0003375	0.0003759	V0	0.0002107	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	-9999	M2	0.0000000	V1
Thallium	0.0000090	0.0000012	V0	0.0000005	V0	0.0000000	V1
Thorium	0.0000059	0.0000127	V0	0.0000016	V0	0.0000000	V1
Tin	0.0004414	0.0001076	V0	0.0000619	V0	0.0000302	V0
Titanium	0.0015201	0.0042862	V0	0.0009408	V0	0.0004160	V0
Tungsten	0.0000938	0.0000233	V0	0.0000111	V0	0.0000000	V1
Uranium	0.0000048	0.0000036	V0	0.0000009	V0	0.0000000	V1
Vanadium	0.0007697	0.0002382	V0	0.0002239	V0	0.0000514	V0
Zinc	0.0055897	0.0011874	V0	0.0009349	V0	0.0000000	V1



Compound Name	Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
		MDL (µg/sample)	AMS 7 21-Nov PM10 24	Results (µg/m <sup>3</sup> )	QC Flag	AMS 14 21-Nov PM10 0	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter		1.00	4.54	V0	-9999	M1	0.10	V0
Aluminum		0.1380326	0.0206115	V0	-9999	M1	0.0000000	V1
Antimony		0.0001784	0.0002292	V0	-9999	M1	0.0000000	V1
Arsenic		0.0001060	0.0000275	V0	-9999	M1	0.0000000	V1
Barium		0.0092847	0.0026118	V0	-9999	M1	0.0000000	V1
Beryllium		0.0000946	0.0000000	V1	-9999	M1	0.0000000	V1
Bismuth		0.0000093	0.0000070	V0	-9999	M1	0.0000000	V1
Cadmium		0.0000174	0.0000065	V0	-9999	M1	0.0000000	V1
Calcium		0.4112124	0.0572240	V0	-9999	M1	0.0000000	V1
Cerium		0.0000174	0.0000404	V0	-9999	M1	0.0000000	V1
Cesium		0.0000100	0.0000018	V0	-9999	M1	0.0000000	V1
Chromium		0.0022262	0.0002578	V0	-9999	M1	0.0000000	V1
Cobalt		0.0000273	0.0000195	V0	-9999	M1	0.0000027	V0
Copper		0.0017171	0.0015090	V0	-9999	M1	0.0000000	V1
Iron		0.0393063	0.0553976	V0	-9999	M1	0.0000000	V1
Lanthanum		0.0000130	0.0000212	V0	-9999	M1	0.0000000	V1
Lead		0.0008577	0.0000732	V0	-9999	M1	0.0000000	V1
Lithium		0.0000374	0.0000217	V0	-9999	M1	0.0000000	V1
Magnesium		0.0091409	0.0329751	V0	-9999	M1	0.0000000	V1
Manganese		0.0006949	0.0009413	V0	-9999	M1	0.0000000	V1
Molybdenum		0.0007116	0.0001366	V0	-9999	M1	0.0000000	V1
Neodymium		0.0000140	0.0000121	V0	-9999	M1	0.0000000	V1
Nickel		0.0005429	0.0002170	V0	-9999	M1	0.0000426	V0
Niobium		0.0000202	0.0000050	V0	-9999	M1	0.0000000	V1
Palladium		0.0000632	0.0000147	V0	-9999	M1	0.0000000	V1
Phosphorus		0.0459574	0.0116973	V0	-9999	M1	0.0102488	V0
Platinum		0.0000088	0.0000027	V0	-9999	M1	0.0000011	V0
Potassium		0.0061261	0.0385863	V0	-9999	M1	0.0006702	V0
Praseodymium		0.0000070	0.0000037	V0	-9999	M1	0.0000000	V1
Rubidium		0.0000184	0.0000564	V0	-9999	M1	0.0000000	V1
Samarium		0.0000133	0.0000011	V0	-9999	M1	0.0000000	V1
Selenium		0.0003366	0.0000636	V0	-9999	M1	0.0000000	V1
Silicon		0.7676322	0.1976758	V0	-9999	M1	0.0000000	V1
Silver		0.0000100	0.0000030	V0	-9999	M1	0.0000000	V1
Sodium		0.0169447	0.2422445	V0	-9999	M1	0.0009190	V0
Strontium		0.0003375	0.0003827	V0	-9999	M1	0.0000000	V1
Tantalum		0.0000394	0.0000000	V1	-9999	M1	0.0000000	V1
Thallium		0.0000090	0.0000007	V0	-9999	M1	0.0000000	V1
Thorium		0.0000059	0.0000029	V0	-9999	M1	0.0000000	V1
Tin		0.0004414	0.0001959	V0	-9999	M1	0.0000302	V0
Titanium		0.0015201	0.0026054	V0	-9999	M1	0.0004160	V0
Tungsten		0.0000938	0.0000438	V0	-9999	M1	0.0000000	V1
Uranium		0.0000048	0.0000014	V0	-9999	M1	0.0000000	V1
Vanadium		0.0007697	0.0002006	V0	-9999	M1	0.0000514	V0
Zinc		0.0055897	0.0022701	V0	-9999	M1	0.0000000	V1



Compound Name	Station Name	Fort McKay South		Horizon		Travel Blank	
	Station #	AMS 13		AMS 15		21-Nov	
	Sample Date	21-Nov		21-Nov		21-Nov	
	Particulate Size	PM10		PM10		24	
	Total Air Volume (m <sup>3</sup> )	24		24		24	
	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	4.21	V0	4.71	V0	0.10	V0
Aluminum	0.1380326	0.1328138	V0	0.1619874	V0	0.0000000	V1
Antimony	0.0001784	0.0000000	V1	0.0000108	V0	0.0000000	V1
Arsenic	0.0001060	0.0000261	V0	0.0000310	V0	0.0000000	V1
Barium	0.0092847	0.0009937	V0	0.0011093	V0	0.0000000	V1
Beryllium	0.0000946	0.0000057	V0	0.0000064	V0	0.0000000	V1
Bismuth	0.0000093	0.0000021	V0	0.0000016	V0	0.0000000	V1
Cadmium	0.0000174	0.0000050	V0	0.0000072	V0	0.0000000	V1
Calcium	0.4112124	0.0529202	V0	0.0462887	V0	0.0000000	V1
Cerium	0.0000174	0.0001341	V0	0.0001477	V0	0.0000000	V1
Cesium	0.0000100	0.0000089	V0	0.0000115	V0	0.0000000	V1
Chromium	0.0022262	0.0002488	V0	0.0002347	V0	0.0000000	V1
Cobalt	0.0000273	0.0000358	V0	0.0000408	V0	0.0000027	V0
Copper	0.0017171	0.0002317	V0	0.0003715	V0	0.0000000	V1
Iron	0.0393063	0.0836543	V0	0.0999195	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000632	V0	0.0000722	V0	0.0000000	V1
Lead	0.0008577	0.0000644	V0	0.0000697	V0	0.0000000	V1
Lithium	0.0000374	0.0001192	V0	0.0001590	V0	0.0000000	V1
Magnesium	0.0091409	0.0361334	V0	0.0355926	V0	0.0000000	V1
Manganese	0.0006949	0.0012871	V0	0.0015031	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000669	V0	0.0000935	V0	0.0000000	V1
Neodymium	0.0000140	0.0000593	V0	0.0000661	V0	0.0000000	V1
Nickel	0.0005429	0.0002259	V0	0.0002225	V0	0.0000426	V0
Niobium	0.0000202	0.0000169	V0	0.0000181	V0	0.0000000	V1
Palladium	0.0000632	0.0000051	V0	0.0000031	V0	0.0000000	V1
Phosphorus	0.0459574	0.0126544	V0	0.0128490	V0	0.0102488	V0
Platinum	0.0000088	0.0000014	V0	0.0000018	V0	0.0000011	V0
Potassium	0.0061261	0.0515189	V0	0.0574395	V0	0.0006702	V0
Praseodymium	0.0000070	0.0000153	V0	0.0000172	V0	0.0000000	V1
Rubidium	0.0000184	0.0001582	V0	0.0002077	V0	0.0000000	V1
Samarium	0.0000133	0.0000102	V0	0.0000132	V0	0.0000000	V1
Selenium	0.0003366	0.0001005	V0	0.0001087	V0	0.0000000	V1
Silicon	0.7676322	0.4304256	V0	0.5438805	V0	0.0000000	V1
Silver	0.0000100	0.0000007	V0	0.0000023	V0	0.0000000	V1
Sodium	0.0169447	0.1481436	V0	0.1262383	V0	0.0009190	V0
Strontium	0.0003375	0.0004055	V0	0.0004541	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000014	V0	0.0000016	V0	0.0000000	V1
Thorium	0.0000059	0.0000170	V0	0.0000209	V0	0.0000000	V1
Tin	0.0004414	0.0000656	V0	0.0000640	V0	0.0000302	V0
Titanium	0.0015201	0.0052387	V0	0.0069088	V0	0.0004160	V0
Tungsten	0.0000938	0.0000227	V0	0.0000189	V0	0.0000000	V1
Uranium	0.0000048	0.0000049	V0	0.0000058	V0	0.0000000	V1
Vanadium	0.0007697	0.0002775	V0	0.0003449	V0	0.0000514	V0
Zinc	0.0055897	0.0014673	V0	0.0013244	V0	0.0000000	V1



Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			21-Nov	
Sample Date	21-Nov			21-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	7.47	V0	0.10	V0
Aluminum	0.1380326	0.1102101	V0	0.0000000	V1
Antimony	0.0001784	0.0000137	V0	0.0000000	V1
Arsenic	0.0001060	0.0000358	V0	0.0000000	V1
Barium	0.0092847	0.0008095	V0	0.0000000	V1
Beryllium	0.0000946	0.0000054	V0	0.0000000	V1
Bismuth	0.0000093	0.0000020	V0	0.0000000	V1
Cadmium	0.0000174	0.0000038	V0	0.0000000	V1
Calcium	0.4112124	0.4513258	V0	0.0000000	V1
Cerium	0.0000174	0.0001206	V0	0.0000000	V1
Cesium	0.0000100	0.0000077	V0	0.0000000	V1
Chromium	0.0022262	0.0008538	V0	0.0000000	V1
Cobalt	0.0000273	0.0000431	V0	0.0000027	V0
Copper	0.0017171	0.0002838	V0	0.0000000	V1
Iron	0.0393063	0.1005003	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000559	V0	0.0000000	V1
Lead	0.0008577	0.0000741	V0	0.0000000	V1
Lithium	0.0000374	0.0001263	V0	0.0000000	V1
Magnesium	0.0091409	0.0381037	V0	0.0000000	V1
Manganese	0.0006949	0.0022953	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001412	V0	0.0000000	V1
Neodymium	0.0000140	0.0000487	V0	0.0000000	V1
Nickel	0.0005429	0.0005270	V0	0.0000426	V0
Niobium	0.0000202	0.0000150	V0	0.0000000	V1
Palladium	0.0000632	0.0000082	V0	0.0000000	V1
Phosphorus	0.0459574	0.0130762	V0	0.0102488	V0
Platinum	0.0000088	0.0000029	V0	0.0000011	V0
Potassium	0.0061261	0.0509904	V0	0.0006702	V0
Praseodymium	0.0000070	0.0000133	V0	0.0000000	V1
Rubidium	0.0000184	0.0001466	V0	0.0000000	V1
Samarium	0.0000133	0.0000093	V0	0.0000000	V1
Selenium	0.0003366	0.0000968	V0	0.0000000	V1
Silicon	0.7676322	0.4877850	V0	0.0000000	V1
Silver	0.0000100	0.0000034	V0	0.0000000	V1
Sodium	0.0169447	0.1433593	V0	0.0009190	V0
Strontium	0.0003375	0.0007199	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000013	V0	0.0000000	V1
Thorium	0.0000059	0.0000145	V0	0.0000000	V1
Tin	0.0004414	0.0000983	V0	0.0000302	V0
Titanium	0.0015201	0.0051288	V0	0.0004160	V0
Tungsten	0.0000938	0.0000181	V0	0.0000000	V1
Uranium	0.0000048	0.0000046	V0	0.0000000	V1
Vanadium	0.0007697	0.0010629	V0	0.0000514	V0
Zinc	0.0055897	0.0014626	V0	0.0000000	V1



Compound Name	Bertha Ganter - Fort						
	Station Name	McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1	QC Flag	AMS 6	QC Flag	27-Nov	
	Sample Date	27-Nov		27-Nov			
Particulate Size	PM10		PM10				
Total Air Volume (m <sup>3</sup> )	24		24				
MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	
Particulate Matter	1.00	2.34	V0	3.76	V0	0.05	V0
Aluminum	0.1380326	0.0456737	V0	0.0336591	V0	0.0000000	V1
Antimony	0.0001784	0.0000000	V1	0.0000151	V0	0.0000000	V1
Arsenic	0.0001060	0.0000518	V0	0.0000268	V0	0.0000000	V1
Barium	0.0092847	0.0004937	V0	0.0008246	V0	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000000	V1	0.0000000	V1
Bismuth	0.0000093	0.0000011	V0	0.0000069	V0	0.0000000	V1
Cadmium	0.0000174	0.0000049	V0	0.0000109	V0	0.0000000	V1
Calcium	0.4112124	0.0408870	V0	0.0514856	V0	0.0000000	V1
Cerium	0.0000174	0.0000411	V0	0.0000296	V0	0.0000000	V1
Cesium	0.0000100	0.0000032	V0	0.0000030	V0	0.0000000	V1
Chromium	0.0022262	0.0001338	V0	0.0002026	V0	0.0000000	V1
Cobalt	0.0000273	0.0000114	V0	0.0000137	V0	0.0000024	V0
Copper	0.0017171	0.0001894	V0	0.0003064	V0	0.0001126	V0
Iron	0.0393063	0.0344118	V0	0.0304725	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000196	V0	0.0000166	V0	0.0000000	V1
Lead	0.0008577	0.0000724	V0	0.0001022	V0	0.0000000	V1
Lithium	0.0000374	0.0000356	V0	0.0000244	V0	0.0000000	V1
Magnesium	0.0091409	0.0092823	V0	0.0115241	V0	0.0004485	V0
Manganese	0.0006949	0.0005858	V0	0.0009590	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000482	V0	0.0000491	V0	0.0000000	V1
Neodymium	0.0000140	0.0000175	V0	0.0000117	V0	0.0000000	V1
Nickel	0.0005429	0.0001725	V0	0.0001764	V0	0.0000367	V0
Niobium	0.0000202	0.0000041	V0	0.0000049	V0	0.0000000	V1
Palladium	0.0000632	0.0000032	V0	-9999	M2	0.0000031	V0
Phosphorus	0.0459574	0.0118221	V0	0.0123915	V0	0.0098949	V0
Platinum	0.0000088	0.0000018	V0	0.0000017	V0	0.0000018	V0
Potassium	0.0061261	0.0199894	V0	0.0299951	V0	0.0034530	V0
Praseodymium	0.0000070	0.0000048	V0	0.0000033	V0	0.0000000	V1
Rubidium	0.0000184	0.0000578	V0	0.0000699	V0	0.0000011	V0
Samarium	0.0000133	0.0000032	V0	0.0000019	V0	0.0000000	V1
Selenium	0.0003366	0.0000470	V0	0.0000397	V0	0.0000238	V0
Silicon	0.7676322	0.3435429	V0	0.3098359	V0	0.1832381	V0
Silver	0.0000100	0.0000000	V1	0.0000087	V0	0.0000000	V1
Sodium	0.0169447	0.0169857	V0	0.0226111	V0	0.0022080	V0
Strontium	0.0003375	0.0001367	V0	0.0002230	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000006	V0	0.0000012	V0	0.0000000	V1
Thorium	0.0000059	0.0000048	V0	0.0000036	V0	0.0000000	V1
Tin	0.0004414	0.0000431	V0	-9999	M2	0.0000396	V0
Titanium	0.0015201	0.0019520	V0	0.0014885	V0	0.0005854	V0
Tungsten	0.0000938	0.0000069	V0	0.0000096	V0	0.0000000	V1
Uranium	0.0000048	0.0000015	V0	0.0000028	V0	0.0000000	V1
Vanadium	0.0007697	0.0001086	V0	0.0001637	V0	0.0000000	V1
Zinc	0.0055897	0.0010792	V0	0.0022486	V0	0.0000000	V1



Compound Name	Station Name Station # Sample Date Particulate Size Total Air Volume (m <sup>3</sup> )	Athabasca Valley			Anzac		Travel Blank	
		MDL (µg/sample)	AMS 7 27-Nov PM10 24 Results (µg/m <sup>3</sup> )	QC Flag	AMS 14 27-Nov PM10 24 Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	3.35	V0	5.25	V0	0.05	V0	
Aluminum	0.1380326	0.0388059	V0	0.0770763	V0	0.0000000	V1	
Antimony	0.0001784	0.0000482	V0	0.0000209	V0	0.0000000	V1	
Arsenic	0.0001060	0.0000283	V0	0.0003083	V0	0.0000000	V1	
Barium	0.0092847	0.0008397	V0	0.0009673	V0	0.0000000	V1	
Beryllium	0.0000946	0.0000046	V0	0.0000000	V1	0.0000000	V1	
Bismuth	0.0000093	0.0000038	V0	0.0000025	V0	0.0000000	V1	
Cadmium	0.0000174	0.0000093	V0	0.0000125	V0	0.0000000	V1	
Calcium	0.4112124	0.0709818	V0	0.1016971	V0	0.0000000	V1	
Cerium	0.0000174	0.0000454	V0	0.0000757	V0	0.0000000	V1	
Cesium	0.0000100	0.0000034	V0	0.0000054	V0	0.0000000	V1	
Chromium	0.0022262	0.0002519	V0	0.0004659	V0	0.0000000	V1	
Cobalt	0.0000273	0.0000301	V0	0.0000197	V0	0.0000024	V0	
Copper	0.0017171	0.0007535	V0	0.0002728	V0	0.0001126	V0	
Iron	0.0393063	0.0446512	V0	0.0622069	V0	0.0000000	V1	
Lanthanum	0.0000130	0.0000223	V0	0.0000398	V0	0.0000000	V1	
Lead	0.0008577	0.0001179	V0	0.0001261	V0	0.0000000	V1	
Lithium	0.0000374	0.0000317	V0	0.0000723	V0	0.0000000	V1	
Magnesium	0.0091409	0.0151890	V0	0.0200915	V0	0.0004485	V0	
Manganese	0.0006949	0.0009228	V0	0.0019048	V0	0.0000000	V1	
Molybdenum	0.0007116	0.0001277	V0	0.0000683	V0	0.0000000	V1	
Neodymium	0.0000140	0.0000182	V0	0.0000312	V0	0.0000000	V1	
Nickel	0.0005429	0.0003118	V0	0.0001745	V0	0.0000367	V0	
Niobium	0.0000202	0.0000044	V0	0.0000343	V0	0.0000000	V1	
Palladium	0.0000632	0.0000030	V0	0.0000000	V1	0.0000031	V0	
Phosphorus	0.0459574	0.0200540	V0	0.0123772	V0	0.0098949	V0	
Platinum	0.0000088	0.0000019	V0	0.0000018	V0	0.0000018	V0	
Potassium	0.0061261	0.0417632	V0	0.0388544	V0	0.0034530	V0	
Praseodymium	0.0000070	0.0000048	V0	0.0000078	V0	0.0000000	V1	
Rubidium	0.0000184	0.0000684	V0	0.0001119	V0	0.0000011	V0	
Samarium	0.0000133	0.0000036	V0	0.0000056	V0	0.0000000	V1	
Selenium	0.0003366	0.0000616	V0	0.0000827	V0	0.0000238	V0	
Silicon	0.7676322	0.6083234	V0	0.3213810	V0	0.1832381	V0	
Silver	0.0000100	0.0000013	V0	0.0000035	V0	0.0000000	V1	
Sodium	0.0169447	0.0830571	V0	0.0257175	V0	0.0022080	V0	
Strontium	0.0003375	0.0002497	V0	0.0003232	V0	0.0000000	V1	
Tantalum	0.0000394	0.0000000	V1	0.0000068	V0	0.0000000	V1	
Thallium	0.0000090	0.0000012	V0	0.0000017	V0	0.0000000	V1	
Thorium	0.0000059	0.0000051	V0	0.0000114	V0	0.0000000	V1	
Tin	0.0004414	0.0001185	V0	0.0000761	V0	0.0000396	V0	
Titanium	0.0015201	0.0033904	V0	0.0048825	V0	0.0005854	V0	
Tungsten	0.0000938	0.0000305	V0	0.0000137	V0	0.0000000	V1	
Uranium	0.0000048	0.0000028	V0	0.0000068	V0	0.0000000	V1	
Vanadium	0.0007697	0.0001297	V0	0.0002134	V0	0.0000000	V1	
Zinc	0.0055897	0.0024569	V0	0.0021657	V0	0.0000000	V1	





Station Name	Fort McKay South			Horizon		Travel Blank	
Station #	AMS 13			AMS 15		27-Nov	
Sample Date	27-Nov			27-Nov		27-Nov	
Particulate Size	PM10			PM10		PM10	
Total Air Volume (m <sup>3</sup> )	24			24		24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	2.48	V0	5.75	V0	0.05	V0
Aluminum	0.1380326	0.0567959	V0	0.1962596	V0	0.0000000	V1
Antimony	0.0001784	0.0000104	V0	0.0000139	V0	0.0000000	V1
Arsenic	0.0001060	0.0000491	V0	0.0001118	V0	0.0000000	V1
Barium	0.0092847	0.0004560	V0	0.0014078	V0	0.0000000	V1
Beryllium	0.0000946	0.0000000	V1	0.0000074	V0	0.0000000	V1
Bismuth	0.0000093	0.0000015	V0	0.0000037	V0	0.0000000	V1
Cadmium	0.0000174	0.0000044	V0	0.0000064	V0	0.0000000	V1
Calcium	0.4112124	0.0432887	V0	0.0885697	V0	0.0000000	V1
Cerium	0.0000174	0.0000489	V0	0.0001635	V0	0.0000000	V1
Cesium	0.0000100	0.0000039	V0	0.0000129	V0	0.0000000	V1
Chromium	0.0022262	0.0001376	V0	0.0006338	V0	0.0000000	V1
Cobalt	0.0000273	0.0000141	V0	0.0000480	V0	0.0000024	V0
Copper	0.0017171	0.0001735	V0	0.0007567	V0	0.0001126	V0
Iron	0.0393063	0.0401564	V0	0.1257595	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000233	V0	0.0000793	V0	0.0000000	V1
Lead	0.0008577	0.0000718	V0	0.0001058	V0	0.0000000	V1
Lithium	0.0000374	0.0000506	V0	0.0001889	V0	0.0000000	V1
Magnesium	0.0091409	0.0107832	V0	0.0332876	V0	0.0004485	V0
Manganese	0.0006949	0.0007089	V0	0.0022602	V0	0.0000000	V1
Molybdenum	0.0007116	0.0000326	V0	0.0000682	V0	0.0000000	V1
Neodymium	0.0000140	0.0000201	V0	0.0000704	V0	0.0000000	V1
Nickel	0.0005429	0.0001157	V0	0.0003232	V0	0.0000367	V0
Niobium	0.0000202	0.0000059	V0	0.0000221	V0	0.0000000	V1
Palladium	0.0000632	0.0000000	V1	0.0000043	V0	0.0000031	V0
Phosphorus	0.0459574	0.0110330	V0	0.0121931	V0	0.0098949	V0
Platinum	0.0000088	0.0000014	V0	0.0000023	V0	0.0000018	V0
Potassium	0.0061261	0.0335527	V0	0.0591032	V0	0.0034530	V0
Praseodymium	0.0000070	0.0000061	V0	0.0000183	V0	0.0000000	V1
Rubidium	0.0000184	0.0000734	V0	0.0002254	V0	0.0000011	V0
Samarium	0.0000133	0.0000033	V0	0.0000134	V0	0.0000000	V1
Selenium	0.0003366	0.0000494	V0	0.0001199	V0	0.0000238	V0
Silicon	0.7676322	0.2408453	V0	0.6422705	V0	0.1832381	V0
Silver	0.0000100	0.0000000	V1	0.0000021	V0	0.0000000	V1
Sodium	0.0169447	0.0201008	V0	0.0301640	V0	0.0022080	V0
Strontium	0.0003375	0.0001650	V0	0.0004660	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000010	V0	0.0000020	V0	0.0000000	V1
Thorium	0.0000059	0.0000065	V0	0.0000228	V0	0.0000000	V1
Tin	0.0004414	0.0000587	V0	0.0000697	V0	0.0000396	V0
Titanium	0.0015201	0.0019999	V0	0.0073813	V0	0.0005854	V0
Tungsten	0.0000938	0.0000083	V0	0.0000177	V0	0.0000000	V1
Uranium	0.0000048	0.0000020	V0	0.0000064	V0	0.0000000	V1
Vanadium	0.0007697	0.0001394	V0	0.0003914	V0	0.0000000	V1
Zinc	0.0055897	0.0015708	V0	0.0179831	V0	0.0000000	V1



Station Name	Muskeg River			Travel Blank	
Station #	AMS 16			27-Nov	
Sample Date	27-Nov			27-Nov	
Particulate Size	PM10			24	
Total Air Volume (m <sup>3</sup> )	24			24	
Compound Name	MDL (µg/sample)	Results (µg/m <sup>3</sup> )	QC Flag	Results (µg/m <sup>3</sup> )	QC Flag
Particulate Matter	1.00	4.84	V0	0.05	V0
Aluminum	0.1380326	0.1142730	V0	0.0000000	V1
Antimony	0.0001784	0.0000110	V0	0.0000000	V1
Arsenic	0.0001060	0.0000581	V0	0.0000000	V1
Barium	0.0092847	0.0007912	V0	0.0000000	V1
Beryllium	0.0000946	0.0000052	V0	0.0000000	V1
Bismuth	0.0000093	0.0000026	V0	0.0000000	V1
Cadmium	0.0000174	0.0000046	V0	0.0000000	V1
Calcium	0.4112124	0.0806474	V0	0.0000000	V1
Cerium	0.0000174	0.0001205	V0	0.0000000	V1
Cesium	0.0000100	0.0000074	V0	0.0000000	V1
Chromium	0.0022262	0.0003171	V0	0.0000000	V1
Cobalt	0.0000273	0.0000275	V0	0.0000024	V0
Copper	0.0017171	0.0004525	V0	0.0001126	V0
Iron	0.0393063	0.0872554	V0	0.0000000	V1
Lanthanum	0.0000130	0.0000519	V0	0.0000000	V1
Lead	0.0008577	0.0001001	V0	0.0000000	V1
Lithium	0.0000374	0.0001295	V0	0.0000000	V1
Magnesium	0.0091409	0.0199339	V0	0.0004485	V0
Manganese	0.0006949	0.0018716	V0	0.0000000	V1
Molybdenum	0.0007116	0.0001079	V0	0.0000000	V1
Neodymium	0.0000140	0.0000466	V0	0.0000000	V1
Nickel	0.0005429	0.0003397	V0	0.0000367	V0
Niobium	0.0000202	0.0000167	V0	0.0000000	V1
Palladium	0.0000632	0.0000074	V0	0.0000031	V0
Phosphorus	0.0459574	0.0146353	V0	0.0098949	V0
Platinum	0.0000088	0.0000016	V0	0.0000018	V0
Potassium	0.0061261	0.0382118	V0	0.0034530	V0
Praseodymium	0.0000070	0.0000126	V0	0.0000000	V1
Rubidium	0.0000184	0.0001297	V0	0.0000011	V0
Samarium	0.0000133	0.0000079	V0	0.0000000	V1
Selenium	0.0003366	0.0000974	V0	0.0000238	V0
Silicon	0.7676322	0.5496276	V0	0.1832381	V0
Silver	0.0000100	0.0000016	V0	0.0000000	V1
Sodium	0.0169447	0.0250528	V0	0.0022080	V0
Strontium	0.0003375	0.0003119	V0	0.0000000	V1
Tantalum	0.0000394	0.0000000	V1	0.0000000	V1
Thallium	0.0000090	0.0000013	V0	0.0000000	V1
Thorium	0.0000059	0.0000132	V0	0.0000000	V1
Tin	0.0004414	0.0001445	V0	0.0000396	V0
Titanium	0.0015201	0.0052747	V0	0.0005854	V0
Tungsten	0.0000938	0.0000142	V0	0.0000000	V1
Uranium	0.0000048	0.0000044	V0	0.0000000	V1
Vanadium	0.0007697	0.0002209	V0	0.0000000	V1
Zinc	0.0055897	0.0029295	V0	0.0000000	V1



Station Name	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay	Bertha Ganter - Fort McKay
Station #	AMS 1	AMS 1	AMS 1	AMS 1
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	11.96	12.19	5	5
Aluminum	0.3634258	0.3722128	5	5
Antimony	0.0000341	0.0000401	5	4
Arsenic	0.0001177	0.0001190	5	5
Barium	0.0032614	0.0034846	5	5
Beryllium	0.0000105	0.0000126	5	3
Bismuth	0.0000056	0.0000052	5	5
Cadmium	0.0000166	0.0000246	5	5
Calcium	0.4475339	0.5542064	5	5
Cerium	0.0004107	0.0004489	5	5
Cesium	0.0000253	0.0000257	5	5
Chromium	0.0005635	0.0004291	5	5
Cobalt	0.0001089	0.0001171	5	5
Copper	0.0005421	0.0003014	5	5
Iron	0.2949199	0.3077941	5	5
Lanthanum	0.0002016	0.0002264	5	5
Lead	0.0002011	0.0002065	5	5
Lithium	0.0003275	0.0003346	5	5
Magnesium	0.0797663	0.0787686	5	5
Manganese	0.0051374	0.0055099	5	5
Molybdenum	0.0001403	0.0001061	5	5
Neodymium	0.0001761	0.0001931	5	5
Nickel	0.0006096	0.0005645	5	5
Niobium	0.0000493	0.0000482	5	5
Palladium	0.0000109	0.0000065	5	5
Phosphorus	0.0134357	0.0048144	5	5
Platinum	0.0000029	0.0000013	5	5
Potassium	0.1305891	0.1287214	5	5
Praseodymium	0.0000467	0.0000509	5	5
Rubidium	0.0004700	0.0005003	5	5
Samarium	0.0000325	0.0000360	5	5
Selenium	0.0002656	0.0002528	5	5
Silicon	1.2426692	1.0859424	5	5
Silver	0.0000024	0.0000027	5	4
Sodium	0.1254381	0.0745539	5	5
Strontium	0.0013466	0.0014791	5	5
Tantalum	0.0000033	0.0000039	5	3
Thallium	0.0000041	0.0000043	5	5
Thorium	0.0000526	0.0000574	5	5
Tin	0.0000941	0.0000458	5	5
Titanium	0.0151034	0.0146028	5	5
Tungsten	0.0000663	0.0000809	5	5
Uranium	0.0000159	0.0000161	5	5
Vanadium	0.0011060	0.0014462	5	5
Zinc	0.0029375	0.0028505	5	5



Station Name	Patricia McInnes	Patricia McInnes	Patricia McInnes	Patricia McInnes
Station #	AMS 6	AMS 6	AMS 6	AMS 6
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	5.65	3.59	5	5
Aluminum	0.0647549	0.0604139	5	5
Antimony	0.0001082	0.0001213	5	5
Arsenic	0.0000873	0.0001311	5	5
Barium	0.0017015	0.0015718	5	5
Beryllium	0.0000035	0.0000042	4	2
Bismuth	0.0000086	0.0000047	5	5
Cadmium	0.0000213	0.0000271	4	4
Calcium	0.1287113	0.1292987	5	5
Cerium	0.0000826	0.0000847	5	5
Cesium	0.0000045	0.0000041	5	5
Chromium	0.0002355	0.0001096	5	5
Cobalt	0.0000277	0.0000268	5	5
Copper	0.0008164	0.0006694	5	5
Iron	0.0815304	0.0821809	5	5
Lanthanum	0.0000447	0.0000457	5	5
Lead	0.0001400	0.0001379	5	5
Lithium	0.0000421	0.0000331	5	5
Magnesium	0.0331424	0.0261762	5	5
Manganese	0.0014553	0.0013579	5	5
Molybdenum	0.0000802	0.0000468	4	4
Neodymium	0.0000320	0.0000333	5	5
Nickel	0.0001999	0.0000815	5	5
Niobium	0.0000090	0.0000080	5	5
Palladium	0.0000082	0.0000047	4	4
Phosphorus	0.0110039	0.0038480	5	5
Platinum	0.0000035	0.0000015	5	5
Potassium	0.0501005	0.0442033	5	5
Praseodymium	0.0000089	0.0000093	5	5
Rubidium	0.0001085	0.0000964	5	5
Samarium	0.0000058	0.0000062	5	5
Selenium	0.0000581	0.0000365	5	5
Silicon	0.3204827	0.1819566	5	5
Silver	0.0000050	0.0000028	4	4
Sodium	0.2565485	0.1795047	5	5
Strontium	0.0004916	0.0004273	5	5
Tantalum	0.0000006	0.0000012	4	1
Thallium	0.0000018	0.0000015	4	4
Thorium	0.0000100	0.0000107	5	5
Tin	0.0001549	0.0000962	4	4
Titanium	0.0029441	0.0024880	5	5
Tungsten	0.0000645	0.0000881	5	5
Uranium	0.0000043	0.0000041	5	5
Vanadium	0.0002337	0.0001380	5	5
Zinc	0.0029022	0.0031691	5	5



Station Name	Athabasca Valley	Athabasca Valley	Athabasca Valley	Athabasca Valley
Station #	AMS 7	AMS 7	AMS 7	AMS 7
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	11.91	7.80	5	5
Aluminum	0.1633439	0.1434592	5	5
Antimony	0.0001851	0.0000809	5	5
Arsenic	0.0000775	0.0000580	5	5
Barium	0.0038246	0.0020639	5	5
Beryllium	0.0000058	0.0000044	5	4
Bismuth	0.0000080	0.0000028	5	5
Cadmium	0.0000074	0.0000013	4	4
Calcium	0.3689899	0.3351791	5	5
Cerium	0.0002273	0.0001956	5	5
Cesium	0.0000111	0.0000094	5	5
Chromium	0.0004446	0.0001757	5	5
Cobalt	0.0000701	0.0000469	5	5
Copper	0.0014504	0.0004023	5	5
Iron	0.2310941	0.1940591	5	5
Lanthanum	0.0001125	0.0000975	5	5
Lead	0.0001851	0.0001033	5	5
Lithium	0.0001270	0.0001124	5	5
Magnesium	0.0800200	0.0613269	5	5
Manganese	0.0039209	0.0033011	5	5
Molybdenum	0.0001489	0.0000301	5	5
Neodymium	0.0000904	0.0000801	5	5
Nickel	0.0003707	0.0001314	5	5
Niobium	0.0000241	0.0000214	5	5
Palladium	0.0000116	0.0000055	5	5
Phosphorus	0.0143217	0.0051087	5	5
Platinum	0.0000139	0.0000248	5	5
Potassium	0.0942852	0.0545984	5	5
Praseodymium	0.0000249	0.0000217	5	5
Rubidium	0.0002417	0.0001995	5	5
Samarium	0.0000161	0.0000148	5	5
Selenium	0.0001592	0.0001018	5	5
Silicon	0.8208933	0.4815834	5	5
Silver	0.0000033	0.0000018	5	5
Sodium	0.8941058	0.9590739	5	5
Strontium	0.0011792	0.0008916	5	5
Tantalum	0.0000021	0.0000022	5	3
Thallium	0.0000027	0.0000017	5	5
Thorium	0.0000282	0.0000262	5	5
Tin	0.0002130	0.0000579	5	5
Titanium	0.0087344	0.0062621	5	5
Tungsten	0.0001530	0.0001105	5	5
Uranium	0.0000093	0.0000091	5	5
Vanadium	0.0004466	0.0003093	5	5
Zinc	0.0040607	0.0019735	5	5



Station Name Station # Sample Date Particulate Size Compound Name	Anzac AMS 14 Nov 03 - Nov 27 PM10 Average µg/m <sup>3</sup>	Anzac AMS 14 Nov 03 - Nov 27 PM10 Std Dev µg/m <sup>3</sup>	Anzac AMS 14 Nov 03 - Nov 27 PM10 Total Samples (#)	Anzac AMS 14 Nov 03 - Nov 27 PM10 Total ≥ MDL (#)
Particulate Matter	4.01	1.58	4	4
Aluminum	0.0419742	0.0265825	4	4
Antimony	0.0000223	0.0000066	4	4
Arsenic	0.0001232	0.0001317	4	4
Barium	0.0005464	0.0004016	4	3
Beryllium	0.0000000	0.0000000	4	0
Bismuth	0.0000023	0.0000007	4	4
Cadmium	0.0000160	0.0000168	4	4
Calcium	0.0655975	0.0403618	4	4
Cerium	0.0000452	0.0000264	4	4
Cesium	0.0000031	0.0000016	4	4
Chromium	0.0002709	0.0001409	4	4
Cobalt	0.0000142	0.0000048	4	4
Copper	0.0004410	0.0002718	4	4
Iron	0.0372317	0.0215097	4	4
Lanthanum	0.0000283	0.0000118	4	4
Lead	0.0001234	0.0000569	4	4
Lithium	0.0000259	0.0000323	4	3
Magnesium	0.0161031	0.0122958	4	4
Manganese	0.0009464	0.0007220	4	4
Molybdenum	0.0000486	0.0000149	4	4
Neodymium	0.0000186	0.0000111	4	4
Nickel	0.0001481	0.0000337	4	4
Niobium	0.0000124	0.0000149	4	4
Palladium	0.0000008	0.0000017	4	1
Phosphorus	0.0100360	0.0028195	4	4
Platinum	0.0000023	0.0000010	4	4
Potassium	0.0344008	0.0135699	4	4
Praseodymium	0.0000048	0.0000027	4	4
Rubidium	0.0000683	0.0000324	4	4
Samarium	0.0000034	0.0000019	4	4
Selenium	0.0000384	0.0000297	4	4
Silicon	0.1867672	0.0950587	4	4
Silver	0.0000021	0.0000012	4	4
Sodium	0.0573931	0.058236	4	4
Strontium	0.0002172	0.0001232	4	4
Tantalum	0.0000017	0.0000034	4	1
Thallium	0.0000014	0.0000004	4	4
Thorium	0.0000063	0.0000041	4	4
Tin	0.0000817	0.0000249	4	4
Titanium	0.0025456	0.0016007	4	4
Tungsten	0.0000230	0.0000084	4	4
Uranium	0.0000040	0.0000032	4	4
Vanadium	0.0001075	0.0000739	4	4
Zinc	0.0025608	0.0014823	4	4



Station Name	Fort McKay South	Fort McKay South	Fort McKay South	Fort McKay South
Station #	AMS 13	AMS 13	AMS 13	AMS 13
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	9.92	7.66	5	5
Aluminum	0.3423657	0.2599005	5	5
Antimony	0.0000321	0.0000384	5	4
Arsenic	0.0000942	0.0000703	5	5
Barium	0.0029092	0.0024037	5	5
Beryllium	0.0000098	0.0000077	5	4
Bismuth	0.0000031	0.0000019	5	5
Cadmium	0.0000147	0.0000208	5	5
Calcium	0.3164031	0.3406127	5	5
Cerium	0.0004086	0.0003588	5	5
Cesium	0.0000239	0.0000178	5	5
Chromium	0.0004848	0.0003193	5	5
Cobalt	0.0000966	0.0000772	5	5
Copper	0.0004267	0.0002529	5	5
Iron	0.2485106	0.2018406	5	5
Lanthanum	0.0001871	0.0001575	5	5
Lead	0.0001821	0.0001515	5	5
Lithium	0.0003083	0.0002307	5	5
Magnesium	0.0692981	0.0535681	5	5
Manganese	0.0043260	0.0037931	5	5
Molybdenum	0.0001047	0.0000817	5	5
Neodymium	0.0001650	0.0001336	5	5
Nickel	0.0005201	0.0004352	5	5
Niobium	0.0000462	0.0000348	5	5
Palladium	0.0000079	0.0000061	5	4
Phosphorus	0.0130937	0.0040753	5	5
Platinum	0.0000020	0.0000009	5	5
Potassium	0.1167491	0.0847708	5	5
Praseodymium	0.0000438	0.0000355	5	5
Rubidium	0.0004355	0.0003428	5	5
Samarium	0.0000312	0.0000259	5	5
Selenium	0.0002286	0.0001599	5	5
Silicon	1.1062272	0.7620952	5	5
Silver	0.0000024	0.0000025	5	4
Sodium	0.1241076	0.0958178	5	5
Strontium	0.0011446	0.0009786	5	5
Tantalum	0.0000029	0.0000029	5	3
Thallium	0.0000037	0.0000028	5	5
Thorium	0.0000487	0.0000394	5	5
Tin	0.0000917	0.0000524	5	5
Titanium	0.0141494	0.0110429	5	5
Tungsten	0.0000618	0.0000521	5	5
Uranium	0.0000147	0.0000119	5	5
Vanadium	0.0010180	0.0010399	5	5
Zinc	0.0028429	0.0021772	5	5



Station Name Station # Sample Date Particulate Size Compound Name	Horizon AMS 15 Nov 03 - Nov 27 PM10 Average µg/m <sup>3</sup>	Horizon AMS 15 Nov 03 - Nov 27 PM10 Std Dev µg/m <sup>3</sup>	Horizon AMS 15 Nov 03 - Nov 27 PM10 Total Samples (#)	Horizon AMS 15 Nov 03 - Nov 27 PM10 Total ≥ MDL (#)
Particulate Matter	9.70	8.32	5	5
Aluminum	0.3276555	0.3187543	5	5
Antimony	0.0000230	0.0000184	5	5
Arsenic	0.0001071	0.0000761	5	5
Barium	0.0027084	0.0028789	5	4
Beryllium	0.0000111	0.0000104	5	4
Bismuth	0.0000038	0.0000023	5	5
Cadmium	0.0000175	0.0000244	5	5
Calcium	0.3486578	0.4327350	5	5
Cerium	0.0003653	0.0004074	5	5
Cesium	0.0000225	0.0000217	5	5
Chromium	0.0005590	0.0003043	5	5
Cobalt	0.0000932	0.0000905	5	5
Copper	0.0004930	0.0002213	5	5
Iron	0.3139878	0.3862137	5	5
Lanthanum	0.0001801	0.0001977	5	5
Lead	0.0001832	0.0001487	5	5
Lithium	0.0003475	0.0003801	5	5
Magnesium	0.0705791	0.0727737	5	5
Manganese	0.0054364	0.0066907	5	5
Molybdenum	0.0001082	0.0000548	5	5
Neodymium	0.0001544	0.0001683	5	5
Nickel	0.0004499	0.0003080	5	5
Niobium	0.0000436	0.0000460	5	5
Palladium	0.0000067	0.0000073	5	4
Phosphorus	0.0123833	0.0050453	5	5
Platinum	0.0000033	0.0000033	5	5
Potassium	0.1072197	0.0914885	5	5
Praseodymium	0.0000409	0.0000449	5	5
Rubidium	0.0004149	0.0004018	5	5
Samarium	0.0000291	0.0000312	5	5
Selenium	0.0002194	0.0002082	5	5
Silicon	1.0251572	0.9043987	5	5
Silver	0.0000027	0.0000020	5	4
Sodium	0.0808548	0.0630805	5	5
Strontium	0.0011369	0.0011766	5	5
Tantalum	0.0000023	0.0000034	5	2
Thallium	0.0000039	0.0000037	5	5
Thorium	0.0000483	0.0000531	5	5
Tin	0.0000842	0.0000457	5	5
Titanium	0.0133534	0.0124938	5	5
Tungsten	0.0000470	0.0000443	5	5
Uranium	0.0000146	0.0000164	5	5
Vanadium	0.0008096	0.0007551	5	5
Zinc	0.0059100	0.0070415	5	5





Station Name	Muskeg River	Muskeg River	Muskeg River	Muskeg River
Station #	AMS 16	AMS 16	AMS 16	AMS 16
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Particulate Size	PM10	PM10	PM10	PM10
Compound Name	Average µg/m <sup>3</sup>	Std Dev µg/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Particulate Matter	14.66	14.86	5	5
Aluminum	0.4257082	0.5223119	5	5
Antimony	0.0000278	0.0000362	5	5
Arsenic	0.0001370	0.0001775	5	5
Barium	0.0038120	0.0049958	5	5
Beryllium	0.0000148	0.0000179	5	5
Bismuth	0.0000043	0.0000048	5	5
Cadmium	0.0000174	0.0000274	5	5
Calcium	0.8108045	1.0713209	5	5
Cerium	0.0005185	0.0006520	5	5
Cesium	0.0000291	0.0000372	5	5
Chromium	0.0007620	0.0006225	5	5
Cobalt	0.0001359	0.0001685	5	5
Copper	0.0005244	0.0004389	5	5
Iron	0.5119961	0.6379516	5	5
Lanthanum	0.0002780	0.0003350	5	5
Lead	0.0002370	0.0002792	5	5
Lithium	0.0004458	0.0005493	5	5
Magnesium	0.1067839	0.1326769	5	5
Manganese	0.0090942	0.0110489	5	5
Molybdenum	0.0001962	0.0001942	5	5
Neodymium	0.0002202	0.0002821	5	5
Nickel	0.0007163	0.0005820	5	5
Niobium	0.0000594	0.0000715	5	5
Palladium	0.0000122	0.0000090	5	5
Phosphorus	0.0154324	0.0070541	5	5
Platinum	0.0000033	0.0000011	5	5
Potassium	0.1527769	0.1994220	5	5
Praseodymium	0.0000586	0.0000744	5	5
Rubidium	0.0005718	0.0007386	5	5
Samarium	0.0000409	0.0000527	5	5
Selenium	0.0003125	0.0003798	5	5
Silicon	1.4088119	1.4988005	5	5
Silver	0.0000034	0.0000033	5	5
Sodium	0.1053549	0.0648476	5	5
Strontium	0.0018518	0.0023738	5	5
Tantalum	0.0000034	0.0000057	5	2
Thallium	0.0000053	0.0000069	5	5
Thorium	0.0000675	0.0000864	5	5
Tin	0.0001458	0.0000952	5	5
Titanium	0.0176694	0.0211552	5	5
Tungsten	0.0000833	0.0001190	5	5
Uranium	0.0000196	0.0000249	5	5
Vanadium	0.0014555	0.0016090	5	5
Zinc	0.0038181	0.0044021	5	5



Wood Buffalo Environmental Association

PM10 Metal (µg/sample) Summary

2017 November

Compound	% Det	N	N < Det.	Min.	10%	25%	50%	60%	75%	80%	90%	95%	99% Max.	Mean	Std. Dev.	Median	Outlier Test	
Particulate Matter	100.0%	34	0	36	59	90	153	196	320	359	514	788	971	971	236	216	153	1317
Aluminum	100.0%	34	0	0.3334	0.4947	1.0962	3.2910	4.0513	8.9316	9.5269	15.5198	23.5884	31.9184	31.9184	6.0735	7.3493	3.2910	42.8201
Antimony	94.1%	34	2	0.0001	0.0002	0.0003	0.0007	0.0011	0.0022	0.0024	0.0055	0.0059	0.0075	0.0075	0.0015	0.0019	0.0007	0.0113
Arsenic	100.0%	34	0	0.0004	0.0006	0.0007	0.0014	0.0021	0.0030	0.0043	0.0074	0.0078	0.0109	0.0109	0.0025	0.0026	0.0014	0.0153
Barium	94.1%	34	2	0.0075	0.0118	0.0190	0.0338	0.0627	0.0997	0.1117	0.1460	0.2199	0.2990	0.2990	0.0663	0.0682	0.0338	0.4073
Beryllium	66.7%	33	11	0.0000	0.0000	0.0001	0.0001	0.0002	0.0003	0.0003	0.0004	0.0007	0.0011	0.0011	0.0002	0.0002	0.0001	0.0014
Bismuth	100.0%	34	0	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0001	0.0001	0.0001	0.0006
Cadmium	100.0%	32	0	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0015	0.0015	0.0016	0.0016	0.0004	0.0005	0.0002	0.0028
Calcium	100.0%	34	0	0.6815	0.7827	1.2357	2.6183	5.5482	12.8679	16.1898	20.8631	32.1921	64.1309	64.1309	8.7303	12.6944	2.6183	72.2022
Cerium	100.0%	34	0	0.0005	0.0006	0.0011	0.0035	0.0049	0.0090	0.0122	0.0218	0.0280	0.0393	0.0393	0.0072	0.0091	0.0035	0.0529
Cesium	100.0%	34	0	0.0000	0.0000	0.0001	0.0002	0.0003	0.0006	0.0007	0.0010	0.0016	0.0023	0.0023	0.0004	0.0005	0.0002	0.0030
Chromium	100.0%	34	0	0.0031	0.0033	0.0056	0.0087	0.0126	0.0149	0.0182	0.0207	0.0285	0.0431	0.0431	0.0115	0.0086	0.0087	0.0545
Cobalt	100.0%	34	0	0.0002	0.0002	0.0004	0.0010	0.0016	0.0025	0.0033	0.0048	0.0074	0.0103	0.0103	0.0019	0.0023	0.0010	0.0132
Copper	100.0%	34	0	0.0042	0.0056	0.0074	0.0121	0.0166	0.0203	0.0236	0.0370	0.0419	0.0460	0.0460	0.0163	0.0120	0.0121	0.0762
Iron	100.0%	34	0	0.4060	0.5244	1.0716	2.7971	4.7267	7.7327	10.2926	16.8394	23.2687	37.2969	37.2969	6.0417	7.9752	2.7971	45.9178
Lanthanum	100.0%	34	0	0.0002	0.0004	0.0006	0.0017	0.0026	0.0043	0.0060	0.0093	0.0140	0.0197	0.0197	0.0036	0.0045	0.0017	0.0264
Lead	100.0%	34	0	0.0011	0.0015	0.0018	0.0029	0.0034	0.0055	0.0074	0.0091	0.0135	0.0176	0.0176	0.0043	0.0038	0.0029	0.0234
Lithium	97.1%	34	1	0.0000	0.0004	0.0008	0.0030	0.0037	0.0072	0.0087	0.0138	0.0239	0.0337	0.0337	0.0057	0.0076	0.0030	0.0435
Magnesium	100.0%	34	0	0.1427	0.1745	0.4784	0.8672	1.3856	2.1096	2.7818	4.1145	5.0880	8.0126	8.0126	1.5970	1.7321	0.8672	10.2574
Manganese	100.0%	34	0	0.0066	0.0090	0.0226	0.0542	0.0722	0.1449	0.1773	0.2859	0.4010	0.6559	0.6559	0.1063	0.1392	0.0542	0.8021
Molybdenum	100.0%	33	0	0.0008	0.0012	0.0015	0.0024	0.0029	0.0034	0.0040	0.0046	0.0074	0.0130	0.0130	0.0029	0.0024	0.0024	0.0147
Neodymium	100.0%	34	0	0.0001	0.0003	0.0004	0.0016	0.0019	0.0039	0.0049	0.0079	0.0120	0.0169	0.0169	0.0030	0.0038	0.0016	0.0222
Nickel	100.0%	34	0	0.0018	0.0032	0.0042	0.0077	0.0086	0.0126	0.0152	0.0208	0.0373	0.0420	0.0420	0.0105	0.0094	0.0077	0.0576
Niobium	100.0%	34	0	0.0001	0.0001	0.0001	0.0005	0.0006	0.0013	0.0015	0.0020	0.0030	0.0044	0.0044	0.0009	0.0010	0.0005	0.0058
Palladium	84.8%	33	5	0.0000	0.0000	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0007	0.0007	0.0002	0.0002	0.0002	0.0010
Phosphorus	100.0%	34	0	0.1005	0.1653	0.2648	0.3037	0.3138	0.3641	0.3938	0.4352	0.4997	0.6467	0.6467	0.3095	0.1139	0.3037	0.8791
Platinum	100.0%	34	0	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0014	0.0014	0.0001	0.0002	0.0001	0.0013
Potassium	100.0%	34	0	0.3347	0.4749	0.9171	1.4185	2.1338	2.9237	3.9550	5.5190	8.4155	12.1086	12.1086	2.3973	2.4996	1.4185	14.8954
Praseodymium	100.0%	34	0	0.0000	0.0001	0.0001	0.0004	0.0005	0.0010	0.0013	0.0021	0.0032	0.0045	0.0045	0.0008	0.0010	0.0004	0.0059
Rubidium	100.0%	34	0	0.0006	0.0010	0.0017	0.0044	0.0054	0.0102	0.0130	0.0203	0.0316	0.0446	0.0446	0.0081	0.0098	0.0044	0.0573
Samarium	100.0%	34	0	0.0000	0.0000	0.0001	0.0003	0.0003	0.0007	0.0009	0.0015	0.0022	0.0032	0.0032	0.0006	0.0007	0.0003	0.0042
Selenium	100.0%	34	0	0.0005	0.0007	0.0012	0.0026	0.0029	0.0065	0.0073	0.0102	0.0162	0.0235	0.0235	0.0045	0.0050	0.0026	0.0297
Silicon	100.0%	34	0	2.2418	3.4433	7.4361	13.1911	15.4145	32.4949	33.7204	46.9259	72.1239	96.1175	96.1175	21.4364	21.4260	13.1911	128.5664
Silver	90.9%	33	3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0004
Sodium	100.0%	34	0	0.1871	0.5427	0.9824	3.4406	3.7915	4.7375	5.8139	11.1480	23.7584	59.6819	59.6819	5.7611	10.6788	3.4406	59.1549
Strontium	100.0%	34	0	0.0022	0.0033	0.0060	0.0113	0.0200	0.0374	0.0429	0.0579	0.0922	0.1433	0.1433	0.0259	0.0303	0.0113	0.1776
Tantalum	45.5%	33	18	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0001	0.0001	0.0000	0.0004
Thallium	100.0%	33	0	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004	0.0004	0.0001	0.0001	0.0000	0.0005
Thorium	100.0%	34	0	0.0000	0.0001	0.0001	0.0005	0.0006	0.0012	0.0016	0.0023	0.0036	0.0052	0.0052	0.0009	0.0012	0.0005	0.0068
Tin	100.0%	33	0	0.0008	0.0013	0.0016	0.0025	0.0026	0.0039	0.0043	0.0060	0.0068	0.0074	0.0074	0.0030	0.0018	0.0025	0.0119
Titanium	100.0%	34	0	0.0226	0.0357	0.0544	0.1443	0.1772	0.4006	0.4080	0.6429	0.9289	1.3071	1.3071	0.2611	0.2944	0.1443	1.7329
Tungsten	100.0%	34	0	0.0002	0.0002	0.0004	0.0008	0.0011	0.0024	0.0031	0.0050	0.0068	0.0070	0.0070	0.0017	0.0020	0.0008	0.0117
Uranium	100.0%	34	0	0.0000	0.0000	0.0001	0.0002	0.0002	0.0004	0.0005	0.0007	0.0010	0.0015	0.0015	0.0003	0.0003	0.0002	0.0020
Vanadium	100.0%	34	0	0.0011	0.0015	0.0039	0.0093	0.0146	0.0213	0.0255	0.0390	0.0872	0.1026	0.1026	0.0182	0.0239	0.0093	0.1377
Zinc	100.0%	34	0	0.0170	0.0259	0.0347	0.0545	0.0703	0.1024	0.1478	0.1904	0.2788	0.4316	0.4316	0.0865	0.0866	0.0545	0.5194



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **POLYCYCLIC AROMATIC HYDROCARBONS DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

PAHs: Airzone One Ltd  
Mississauga, Ontario



FILE CONTENTS DESCRIPTION	PAH - Speciated PAH Gas + Particle Phase Measurements
SAMPLING INTERVAL	24 hour
SAMPLING FREQUENCY OF DATA	Once every 6 days
UNITS	ng/m <sup>3</sup> (nanogram per cubic meter)
OBSERVATION TYPE	Particles + gas
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	filtration and adsorbent
PARTICLE DIAMETER	TSP (total suspended particle)
MEDIUM	a glass fiber filter + PUF/XAD-2/PUF
ANALYTICAL METHOD	Gas Chromatograph/Mass Spectrometer (GC/MS)
SAMPLE PREPARATION	Solvent Extraction
ANALYTICAL LABORATORY	AIRZONE One Inc.
USER NOTE 1	Data are recovery corrected
USER NOTE 2	Volume is given at actual conditions of temperature and pressure during sampling as measured by the sampler
USER NOTE 3	Blank sample concentration (ng/m <sup>3</sup> ) is calculated using expected actual volume of sampler
VOLUME STANDARDIZATION	Actual Volume at Ambient Conditions
SAMPLING INSTRUMENT TYPE	Tisch TE-1000 High-Volume Sampler
<b>FLAGS USED</b>	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Station Name	Bertha Ganter -						
	Station #	Fort McKay			Patricia McInnes		Travel Blank
Sample Date	AMS 1	AMS 6			AMS 6		
Total Air Volume (m <sup>3</sup> )	03-Nov	03-Nov			03-Nov		
	316	315.96			316		
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	6.198	V0	6.654	V0	0.150	V0
Acenaphthylene	0.011	1.404	V0	0.571	V0	0.082	V0
Acenaphthene	0.006	1.394	V0	0.924	V0	0.068	V0
Fluorene	0.007	0.520	V0	0.369	V0	0.033	V0
Phenanthrene	0.007	0.887	V0	0.741	V0	0.045	V0
Anthracene	0.017	0.083	V0	0.087	V0	0.014	V1
Acridine	0.019	0.016	V1	0.009	V1	0.001	V1
Fluoranthene	0.007	0.195	V0	0.205	V0	0.008	V0
Pyrene	0.008	0.202	V0	0.196	V0	0.012	V0
Benzo(c)phenanthrene	0.015	0.019	V0	0.012	V1	0.003	V1
Benz(a)anthracene	0.014	0.044	V0	0.010	V1	0.004	V1
Chrysene	0.013	0.115	V0	0.050	V0	0.002	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.022	V0	0.018	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.045	V0	0.036	V0	0.005	V1
Benzo(k)fluoranthene	0.013	0.045	V0	0.036	V0	0.005	V1
Benzo(a)pyrene	0.016	0.038	V0	0.022	V0	0.006	V1
3-Methylcholanthrene	0.022	0.018	V1	0.027	V0	0.004	V1
Indeno(123-cd)pyrene	0.017	0.022	V0	0.009	V1	0.003	V1
Dibenz(a,h)anthracene	0.020	0.023	V0	0.014	V1	0.003	V1
Benzo(ghi)perylene	0.020	0.021	V0	0.015	V1	0.002	V1
Dibenzo(a,l)pyrene	0.024	0.008	V1	0.009	V1	0.003	V1
Dibenzo(a,i)pyrene	0.025	0.011	V1	0.012	V1	0.002	V1
Dibenzo(a,h)pyrene	0.020	0.010	V1	0.010	V1	0.002	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		03-Nov	
Sample Date	03-Nov			03-Nov		03-Nov	
Total Air Volume (m <sup>3</sup> )	316.01			315.98		316	
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	5.180	V0	2.103	V0	0.150	V0
Acenaphthylene	0.011	1.391	V0	0.659	V0	0.082	V0
Acenaphthene	0.006	1.245	V0	0.915	V0	0.068	V0
Fluorene	0.007	0.511	V0	0.309	V0	0.033	V0
Phenanthrene	0.007	0.482	V0	0.348	V0	0.045	V0
Anthracene	0.017	0.048	V0	0.042	V0	0.014	V1
Acridine	0.019	0.008	V1	0.007	V1	0.001	V1
Fluoranthene	0.007	0.104	V0	0.070	V0	0.008	V0
Pyrene	0.008	0.145	V0	0.078	V0	0.012	V0
Benzo(c)phenanthrene	0.015	0.006	V1	0.007	V1	0.003	V1
Benz(a)anthracene	0.014	0.056	V0	0.024	V0	0.004	V1
Chrysene	0.013	0.055	V0	0.024	V0	0.002	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.019	V0	0.019	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.023	V0	0.016	V1	0.005	V1
Benzo(k)fluoranthene	0.013	0.023	V0	0.016	V0	0.005	V1
Benzo(a)pyrene	0.016	0.029	V0	0.013	V1	0.006	V1
3-Methylcholanthrene	0.022	0.022	V0	0.022	V1	0.004	V1
Indeno(123-cd)pyrene	0.017	0.017	V0	0.010	V1	0.003	V1
Dibenz(a,h)anthracene	0.020	0.017	V1	0.015	V1	0.003	V1
Benzo(ghi)perylene	0.020	0.019	V1	0.018	V1	0.002	V1
Dibenzo(a,l)pyrene	0.024	0.010	V1	0.010	V1	0.003	V1
Dibenzo(a,i)pyrene	0.025	0.012	V1	0.012	V1	0.002	V1
Dibenzo(a,h)pyrene	0.020	0.010	V1	0.011	V1	0.002	V1



Station Name	Bertha Ganter -						
	Station #	Fort McKay		Patricia McInnes		Travel Blank	
Sample Date	AMS 1	AMS 6		AMS 6		09-Nov	
Total Air Volume (m <sup>3</sup> )	09-Nov	09-Nov		09-Nov		09-Nov	
	315.97	315.98		315.98		316	
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	21.694	V0	10.418	V0	0.114	V0
Acenaphthylene	0.011	1.701	V0	1.590	V0	0.046	V0
Acenaphthene	0.006	1.368	V0	1.200	V0	0.054	V0
Fluorene	0.007	1.069	V0	1.391	V0	0.089	V0
Phenanthrene	0.007	2.654	V0	2.572	V0	0.026	V0
Anthracene	0.017	0.333	V0	0.412	V0	0.015	V1
Acridine	0.019	0.010	V1	0.009	V1	0.001	V1
Fluoranthene	0.007	1.079	V0	0.653	V0	0.012	V0
Pyrene	0.008	1.561	V0	0.746	V0	0.013	V0
Benzo(c)phenanthrene	0.015	0.017	V0	0.029	V0	0.002	V1
Benz(a)anthracene	0.014	0.310	V0	0.198	V0	0.004	V1
Chrysene	0.013	0.666	V0	0.209	V0	0.003	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.031	V0	0.025	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.132	V0	0.141	V0	0.002	V1
Benzo(k)fluoranthene	0.013	0.132	V0	0.141	V0	0.002	V1
Benzo(a)pyrene	0.016	0.060	V0	0.028	V0	0.002	V1
3-Methylcholanthrene	0.022	0.037	V0	0.042	V0	0.001	V1
Indeno(123-cd)pyrene	0.017	0.032	V0	0.045	V0	0.001	V1
Dibenz(a,h)anthracene	0.020	0.042	V0	0.022	V0	0.002	V1
Benzo(ghi)perylene	0.020	0.049	V0	0.042	V0	0.001	V1
Dibenzo(a,l)pyrene	0.024	0.009	V1	0.012	V1	0.001	V1
Dibenzo(a,i)pyrene	0.025	0.008	V1	0.014	V1	0.001	V1
Dibenzo(a,h)pyrene	0.020	0.007	V1	0.010	V1	0.001	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		09-Nov	
Sample Date	09-Nov			09-Nov		09-Nov	
Total Air Volume (m <sup>3</sup> )	316.01			316		316	
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	21.145	V0	9.630	V0	0.114	V0
Acenaphthylene	0.011	1.115	V0	1.620	V0	0.046	V0
Acenaphthene	0.006	1.376	V0	0.931	V0	0.054	V0
Fluorene	0.007	1.153	V0	0.854	V0	0.089	V0
Phenanthrene	0.007	2.767	V0	0.816	V0	0.026	V0
Anthracene	0.017	0.223	V0	0.066	V0	0.015	V1
Acridine	0.019	0.015	V1	0.008	V1	0.001	V1
Fluoranthene	0.007	0.688	V0	0.138	V0	0.012	V0
Pyrene	0.008	0.774	V0	0.110	V0	0.013	V0
Benzo(c)phenanthrene	0.015	0.017	V0	0.011	V1	0.002	V1
Benz(a)anthracene	0.014	0.084	V0	0.084	V0	0.004	V1
Chrysene	0.013	0.279	V0	0.079	V0	0.003	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.047	V0	0.046	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.109	V0	0.037	V0	0.002	V1
Benzo(k)fluoranthene	0.013	0.109	V0	0.037	V0	0.002	V1
Benzo(a)pyrene	0.016	0.058	V0	0.019	V0	0.002	V1
3-Methylcholanthrene	0.022	0.041	V0	0.019	V1	0.001	V1
Indeno(123-cd)pyrene	0.017	0.045	V0	0.019	V0	0.001	V1
Dibenz(a,h)anthracene	0.020	0.025	V0	0.008	V1	0.002	V1
Benzo(ghi)perylene	0.020	0.018	V1	0.011	V1	0.001	V1
Dibenzo(a,l)pyrene	0.024	0.012	V1	0.011	V1	0.001	V1
Dibenzo(a,i)pyrene	0.025	0.012	V1	0.012	V1	0.001	V1
Dibenzo(a,h)pyrene	0.020	0.010	V1	0.009	V1	0.001	V1





Station Name	Bertha Ganter -						
	Station #	Fort McKay			Patricia McInnes		Travel Blank
Sample Date	AMS 1	AMS 6			AMS 6		15-Nov
Total Air Volume (m <sup>3</sup> )	15-Nov	15-Nov			15-Nov		15-Nov
	316	315.97			316		316
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	8.423	V0	18.165	V0	0.095	V0
Acenaphthylene	0.011	1.564	V0	0.806	V0	0.075	V0
Acenaphthene	0.006	0.808	V0	1.176	V0	0.061	V0
Fluorene	0.007	0.547	V0	0.679	V0	0.073	V0
Phenanthrene	0.007	0.988	V0	1.814	V0	0.040	V0
Anthracene	0.017	0.059	V0	0.191	V0	0.016	V1
Acridine	0.019	0.012	V1	0.010	V1	0.002	V1
Fluoranthene	0.007	0.128	V0	0.531	V0	0.012	V0
Pyrene	0.008	0.189	V0	0.546	V0	0.015	V0
Benzo(c)phenanthrene	0.015	0.012	V1	0.023	V0	0.002	V1
Benz(a)anthracene	0.014	0.064	V0	0.048	V0	0.004	V1
Chrysene	0.013	0.087	V0	0.177	V0	0.004	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.054	V0	0.072	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.038	V0	0.096	V0	0.003	V1
Benzo(k)fluoranthene	0.013	0.038	V0	0.096	V0	0.003	V1
Benzo(a)pyrene	0.016	0.018	V0	0.038	V0	0.002	V1
3-Methylcholanthrene	0.022	0.027	V0	0.053	V0	0.002	V1
Indeno(123-cd)pyrene	0.017	0.019	V0	0.030	V0	0.001	V1
Dibenz(a,h)anthracene	0.020	0.015	V1	0.011	V1	0.002	V1
Benzo(ghi)perylene	0.020	0.028	V0	0.019	V1	0.001	V1
Dibenzo(a,l)pyrene	0.024	0.011	V1	0.010	V1	0.001	V1
Dibenzo(a,i)pyrene	0.025	0.013	V1	0.014	V1	0.002	V1
Dibenzo(a,h)pyrene	0.020	0.012	V1	0.014	V1	0.001	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		15-Nov	
Sample Date	15-Nov			15-Nov		15-Nov	
Total Air Volume (m <sup>3</sup> )	316.01			316		316	
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	14.013	V0	4.532	V0	0.095	V0
Acenaphthylene	0.011	2.580	V0	0.793	V0	0.075	V0
Acenaphthene	0.006	0.925	V0	0.488	V0	0.061	V0
Fluorene	0.007	0.504	V0	0.496	V0	0.073	V0
Phenanthrene	0.007	0.972	V0	0.574	V0	0.040	V0
Anthracene	0.017	0.107	V0	0.054	V0	0.016	V1
Acridine	0.019	0.011	V1	0.011	V1	0.002	V1
Fluoranthene	0.007	0.276	V0	0.134	V0	0.012	V0
Pyrene	0.008	0.424	V0	0.149	V0	0.015	V0
Benzo(c)phenanthrene	0.015	0.010	V1	0.014	V1	0.002	V1
Benz(a)anthracene	0.014	0.029	V0	0.025	V0	0.004	V1
Chrysene	0.013	0.084	V0	0.023	V0	0.004	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.039	V0	0.029	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.043	V0	0.026	V0	0.003	V1
Benzo(k)fluoranthene	0.013	0.043	V0	0.026	V0	0.003	V1
Benzo(a)pyrene	0.016	0.028	V0	0.022	V0	0.002	V1
3-Methylcholanthrene	0.022	0.041	V0	0.017	V1	0.002	V1
Indeno(123-cd)pyrene	0.017	0.028	V0	0.017	V0	0.001	V1
Dibenz(a,h)anthracene	0.020	0.016	V1	0.012	V1	0.002	V1
Benzo(ghi)perylene	0.020	0.036	V0	0.018	V1	0.001	V1
Dibenzo(a,l)pyrene	0.024	0.012	V1	0.013	V1	0.001	V1
Dibenzo(a,i)pyrene	0.025	0.008	V1	0.009	V1	0.002	V1
Dibenzo(a,h)pyrene	0.020	0.009	V1	0.015	V1	0.001	V1



Compound Name	Bertha Ganter -						
	Station Name	Fort McKay		Patricia McInnes		Travel Blank	
	Station #	AMS 1		AMS 6		21-Nov	
	Sample Date	21-Nov		21-Nov		316	
Total Air Volume (m <sup>3</sup> )	315.99		315.98		316		
	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	13.284	V0	15.398	V0	0.091	V0
Acenaphthylene	0.011	2.386	V0	2.421	V0	0.055	V0
Acenaphthene	0.006	1.409	V0	1.107	V0	0.085	V0
Fluorene	0.007	1.023	V0	1.078	V0	0.051	V0
Phenanthrene	0.007	1.522	V0	1.174	V0	0.047	V0
Anthracene	0.017	0.129	V0	0.096	V0	0.013	V1
Acridine	0.019	0.012	V1	0.011	V1	0.002	V1
Fluoranthene	0.007	0.253	V0	0.195	V0	0.010	V0
Pyrene	0.008	0.277	V0	0.213	V0	0.012	V0
Benzo(c)phenanthrene	0.015	0.018	V0	0.011	V1	0.002	V1
Benz(a)anthracene	0.014	0.025	V0	0.049	V0	0.004	V1
Chrysene	0.013	0.084	V0	0.047	V0	0.004	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.046	V0	0.054	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.036	V0	0.028	V0	0.003	V1
Benzo(k)fluoranthene	0.013	0.036	V0	0.028	V0	0.003	V1
Benzo(a)pyrene	0.016	0.024	V0	0.017	V0	0.002	V1
3-Methylcholanthrene	0.022	0.012	V1	0.014	V1	0.002	V1
Indeno(123-cd)pyrene	0.017	0.013	V1	0.012	V1	0.002	V1
Dibenz(a,h)anthracene	0.020	0.013	V1	0.020	V0	0.002	V1
Benzo(ghi)perylene	0.020	0.012	V1	0.015	V1	0.002	V1
Dibenzo(a,l)pyrene	0.024	0.008	V1	0.009	V1	0.001	V1
Dibenzo(a,i)pyrene	0.025	0.006	V1	0.008	V1	0.001	V1
Dibenzo(a,h)pyrene	0.020	0.010	V1	0.010	V1	0.002	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		21-Nov	
Sample Date	21-Nov			21-Nov		21-Nov	
Total Air Volume (m <sup>3</sup> )	316.01			315.98		316	
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	4.653	V0	7.003	V0	0.091	V0
Acenaphthylene	0.011	0.623	V0	0.582	V0	0.055	V0
Acenaphthene	0.006	0.774	V0	0.657	V0	0.085	V0
Fluorene	0.007	0.760	V0	0.554	V0	0.051	V0
Phenanthrene	0.007	1.539	V0	0.831	V0	0.047	V0
Anthracene	0.017	0.190	V0	0.088	V0	0.013	V1
Acridine	0.019	0.011	V1	0.013	V1	0.002	V1
Fluoranthene	0.007	0.288	V0	0.118	V0	0.010	V0
Pyrene	0.008	0.351	V0	0.099	V0	0.012	V0
Benzo(c)phenanthrene	0.015	0.015	V0	0.015	V0	0.002	V1
Benz(a)anthracene	0.014	0.038	V0	0.049	V0	0.004	V1
Chrysene	0.013	0.063	V0	0.046	V0	0.004	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.025	V0	0.030	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.040	V0	0.021	V0	0.003	V1
Benzo(k)fluoranthene	0.013	0.040	V0	0.021	V0	0.003	V1
Benzo(a)pyrene	0.016	0.027	V0	0.014	V1	0.002	V1
3-Methylcholanthrene	0.022	0.014	V1	0.025	V0	0.002	V1
Indeno(123-cd)pyrene	0.017	0.022	V0	0.016	V1	0.002	V1
Dibenz(a,h)anthracene	0.020	0.015	V1	0.018	V1	0.002	V1
Benzo(ghi)perylene	0.020	0.025	V0	0.027	V0	0.002	V1
Dibenzo(a,l)pyrene	0.024	0.011	V1	0.013	V1	0.001	V1
Dibenzo(a,i)pyrene	0.025	0.018	V1	0.012	V1	0.001	V1
Dibenzo(a,h)pyrene	0.020	0.013	V1	0.014	V1	0.002	V1



Station Name	Bertha Ganter -						
	Station #	Fort McKay			Patricia McInnes		Travel Blank
Sample Date	AMS 1	AMS 6			AMS 6		27-Nov
Total Air Volume (m <sup>3</sup> )	27-Nov	27-Nov			27-Nov		27-Nov
	316	315.98			316		316
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	11.079	V0	9.624	V0	0.124	V0
Acenaphthylene	0.011	1.018	V0	1.045	V0	0.075	V0
Acenaphthene	0.006	0.915	V0	1.283	V0	0.087	V0
Fluorene	0.007	0.889	V0	0.772	V0	0.036	V0
Phenanthrene	0.007	1.541	V0	1.347	V0	0.081	V0
Anthracene	0.017	0.153	V0	0.122	V0	0.016	V1
Acridine	0.019	0.011	V1	0.013	V1	0.003	V1
Fluoranthene	0.007	0.234	V0	0.192	V0	0.010	V0
Pyrene	0.008	0.219	V0	0.195	V0	0.012	V0
Benzo(c)phenanthrene	0.015	0.012	V1	0.011	V1	0.002	V1
Benz(a)anthracene	0.014	0.032	V0	0.069	V0	0.004	V1
Chrysene	0.013	0.082	V0	0.108	V0	0.005	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.052	V0	0.072	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.049	V0	0.035	V0	0.003	V1
Benzo(k)fluoranthene	0.013	0.049	V0	0.035	V0	0.003	V1
Benzo(a)pyrene	0.016	0.023	V0	0.047	V0	0.001	V1
3-Methylcholanthrene	0.022	0.020	V1	0.021	V1	0.003	V1
Indeno(123-cd)pyrene	0.017	0.019	V0	0.011	V1	0.001	V1
Dibenz(a,h)anthracene	0.020	0.020	V0	0.016	V1	0.002	V1
Benzo(ghi)perylene	0.020	0.022	V0	0.012	V1	0.002	V1
Dibenzo(a,l)pyrene	0.024	0.012	V1	0.012	V1	0.002	V1
Dibenzo(a,i)pyrene	0.025	0.009	V1	0.011	V1	0.002	V1
Dibenzo(a,h)pyrene	0.020	0.010	V1	0.008	V1	0.001	V1



Station Name	Athabasca Valley			Anzac		Travel Blank	
Station #	AMS 7			AMS 14		27-Nov	
Sample Date	27-Nov			27-Nov		27-Nov	
Total Air Volume (m <sup>3</sup> )	316.01			315.97		316	
Compound Name	MDL (ng/m <sup>3</sup> )	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag	Results (ng/m <sup>3</sup> )	QC Flag
Naphthalene	0.008	12.168	V0	11.355	V0	0.124	V0
Acenaphthylene	0.011	0.902	V0	2.219	V0	0.075	V0
Acenaphthene	0.006	1.090	V0	1.247	V0	0.087	V0
Fluorene	0.007	1.059	V0	0.945	V0	0.036	V0
Phenanthrene	0.007	1.768	V0	1.023	V0	0.081	V0
Anthracene	0.017	0.214	V0	0.083	V0	0.016	V1
Acridine	0.019	0.010	V1	0.012	V1	0.003	V1
Fluoranthene	0.007	0.264	V0	0.213	V0	0.010	V0
Pyrene	0.008	0.281	V0	0.188	V0	0.012	V0
Benzo(c)phenanthrene	0.015	0.012	V1	0.013	V1	0.002	V1
Benz(a)anthracene	0.014	0.090	V0	0.059	V0	0.004	V1
Chrysene	0.013	0.114	V0	0.072	V0	0.005	V1
7,12-Dimethylbenz(a)anthracene	0.013	0.031	V0	0.031	V0	0.002	V1
Benzo(b)fluoranthene	0.020	0.037	V0	0.037	V0	0.003	V1
Benzo(k)fluoranthene	0.013	0.037	V0	0.037	V0	0.003	V1
Benzo(a)pyrene	0.016	0.018	V0	0.020	V0	0.001	V1
3-Methylcholanthrene	0.022	0.014	V1	0.010	V1	0.003	V1
Indeno(123-cd)pyrene	0.017	0.012	V1	0.014	V1	0.001	V1
Dibenz(a,h)anthracene	0.020	0.012	V1	0.013	V1	0.002	V1
Benzo(ghi)perylene	0.020	0.015	V1	0.020	V0	0.002	V1
Dibenzo(a,l)pyrene	0.024	0.015	V1	0.015	V1	0.002	V1
Dibenzo(a,i)pyrene	0.025	0.010	V1	0.013	V1	0.002	V1
Dibenzo(a,h)pyrene	0.020	0.012	V1	0.011	V1	0.001	V1



Station Name Station # Sample Date	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27	Bertha Ganter - Fort McKay AMS 1 Nov 03 - Nov 27
	Average ng/m <sup>3</sup>	Std Dev ng/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Compound Name				
Naphthalene	12.135	5.976	5	5
Acenaphthylene	1.615	0.501	5	5
Acenaphthene	1.179	0.292	5	5
Fluorene	0.810	0.261	5	5
Phenanthrene	1.518	0.702	5	5
Anthracene	0.151	0.108	5	5
Acridine	0.012	0.002	5	0
Fluoranthene	0.378	0.395	5	5
Pyrene	0.490	0.600	5	5
Benzo(c)phenanthrene	0.016	0.004	5	3
Benz(a)anthracene	0.095	0.121	5	5
Chrysene	0.207	0.257	5	5
7,12-Dimethylbenz(a)anthracene	0.041	0.014	5	5
Benzo(b)fluoranthene	0.060	0.040	5	5
Benzo(k)fluoranthene	0.060	0.040	5	5
Benzo(a)pyrene	0.033	0.017	5	5
3-Methylcholanthrene	0.023	0.009	5	2
Indeno(123-cd)pyrene	0.021	0.007	5	4
Dibenz(a,h)anthracene	0.023	0.012	5	3
Benzo(ghi)perylene	0.026	0.014	5	4
Dibenzo(a,l)pyrene	0.010	0.002	5	0
Dibenzo(a,i)pyrene	0.010	0.003	5	0
Dibenzo(a,h)pyrene	0.010	0.002	5	0



Station Name	Patricia McInnes	Patricia McInnes	Patricia McInnes	Patricia McInnes
Station #	AMS 6	AMS 6	AMS 6	AMS 6
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Compound Name	Average ng/m <sup>3</sup>	Std Dev ng/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Naphthalene	12.052	4.644	5	5
Acenaphthylene	1.287	0.738	5	5
Acenaphthene	1.138	0.135	5	5
Fluorene	0.858	0.391	5	5
Phenanthrene	1.530	0.698	5	5
Anthracene	0.182	0.135	5	5
Acridine	0.010	0.002	5	0
Fluoranthene	0.355	0.220	5	5
Pyrene	0.379	0.254	5	5
Benzo(c)phenanthrene	0.017	0.008	5	2
Benz(a)anthracene	0.075	0.072	5	4
Chrysene	0.118	0.074	5	5
7,12-Dimethylbenz(a)anthracene	0.048	0.025	5	5
Benzo(b)fluoranthene	0.067	0.049	5	5
Benzo(k)fluoranthene	0.067	0.049	5	5
Benzo(a)pyrene	0.030	0.012	5	5
3-Methylcholanthrene	0.032	0.016	5	3
Indeno(123-cd)pyrene	0.021	0.016	5	2
Dibenz(a,h)anthracene	0.017	0.004	5	2
Benzo(ghi)perylene	0.020	0.012	5	1
Dibenzo(a,l)pyrene	0.010	0.001	5	0
Dibenzo(a,i)pyrene	0.012	0.002	5	0
Dibenzo(a,h)pyrene	0.010	0.002	5	0





Station Name	Athabasca Valley	Athabasca Valley	Athabasca Valley	Athabasca Valley
Station #	AMS 7	AMS 7	AMS 7	AMS 7
Sample Date	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27	Nov 03 - Nov 27
Compound Name	Average ng/m <sup>3</sup>	Std Dev ng/m <sup>3</sup>	Total Samples (#)	Total ≥ MDL (#)
Naphthalene	11.432	6.830	5	5
Acenaphthylene	1.322	0.757	5	5
Acenaphthene	1.082	0.241	5	5
Fluorene	0.797	0.302	5	5
Phenanthrene	1.506	0.865	5	5
Anthracene	0.156	0.076	5	5
Acridine	0.011	0.003	5	0
Fluoranthene	0.324	0.217	5	5
Pyrene	0.395	0.236	5	5
Benzo(c)phenanthrene	0.012	0.005	5	2
Benz(a)anthracene	0.060	0.027	5	5
Chrysene	0.119	0.092	5	5
7,12-Dimethylbenz(a)anthracene	0.032	0.011	5	5
Benzo(b)fluoranthene	0.050	0.034	5	5
Benzo(k)fluoranthene	0.050	0.034	5	5
Benzo(a)pyrene	0.032	0.015	5	5
3-Methylcholanthrene	0.026	0.014	5	3
Indeno(123-cd)pyrene	0.025	0.013	5	4
Dibenz(a,h)anthracene	0.017	0.005	5	1
Benzo(ghi)perylene	0.022	0.008	5	2
Dibenzo(a,l)pyrene	0.012	0.002	5	0
Dibenzo(a,i)pyrene	0.012	0.004	5	0
Dibenzo(a,h)pyrene	0.011	0.002	5	0



Station Name Station # Sample Date	Anzac AMS 14 Nov 03 - Nov 27 Average ng/m <sup>3</sup>	Anzac AMS 14 Nov 03 - Nov 27 Std Dev ng/m <sup>3</sup>	Anzac AMS 14 Nov 03 - Nov 27 Total Samples (#)	Anzac AMS 14 Nov 03 - Nov 27 Total ≥ MDL (#)
Compound Name				
Naphthalene	6.925	3.739	5	5
Acenaphthylene	1.175	0.716	5	5
Acenaphthene	0.848	0.290	5	5
Fluorene	0.631	0.263	5	5
Phenanthrene	0.718	0.261	5	5
Anthracene	0.066	0.019	5	5
Acridine	0.010	0.003	5	0
Fluoranthene	0.135	0.052	5	5
Pyrene	0.125	0.044	5	5
Benzo(c)phenanthrene	0.012	0.003	5	1
Benz(a)anthracene	0.048	0.025	5	5
Chrysene	0.049	0.026	5	5
7,12-Dimethylbenz(a)anthracene	0.031	0.010	5	5
Benzo(b)fluoranthene	0.027	0.009	5	4
Benzo(k)fluoranthene	0.027	0.009	5	5
Benzo(a)pyrene	0.018	0.004	5	3
3-Methylcholanthrene	0.019	0.006	5	1
Indeno(123-cd)pyrene	0.015	0.003	5	2
Dibenz(a,h)anthracene	0.013	0.004	5	0
Benzo(ghi)perylene	0.019	0.006	5	2
Dibenzo(a,l)pyrene	0.012	0.002	5	0
Dibenzo(a,i)pyrene	0.012	0.001	5	0
Dibenzo(a,h)pyrene	0.012	0.002	5	0



Wood Buffalo Environmental Association

PAH (ng/m<sup>3</sup>) Summary

2017 November

Compound	% Det	N	N < Det.	Min.	10%	25%	50%	60%	75%	80%	90%	95%	99%	Max.	Mean	Std. Dev.	Median	Outlier Test
Naphthalene	100.0%	20	0	2.1028	4.6527	6.6539	10.4180	11.3552	14.0132	15.3979	21.1446	21.6935	21.6935	21.6935	10.6358	5.4528	10.4180	37.8996
Acenaphthylene	100.0%	20	0	0.5712	0.6234	0.8059	1.3906	1.5643	1.7014	2.2187	2.4211	2.5804	2.5804	2.5804	1.3496	0.6513	1.3906	4.6062
Acenaphthene	100.0%	20	0	0.4880	0.7741	0.9151	1.1070	1.2001	1.2830	1.3680	1.3940	1.4086	1.4086	1.4086	1.0616	0.2628	1.1070	2.3758
Fluorene	100.0%	20	0	0.3088	0.4955	0.5203	0.7724	0.8894	1.0591	1.0688	1.1532	1.3908	1.3908	1.3908	0.7741	0.2965	0.7724	2.2565
Phenanthrene	100.0%	20	0	0.3476	0.5744	0.8308	1.1742	1.5223	1.7681	1.8144	2.6539	2.7669	2.7669	2.7669	1.3180	0.7103	1.1742	4.8697
Anthracene	100.0%	20	0	0.0423	0.0540	0.0826	0.1070	0.1285	0.1909	0.2136	0.3327	0.4122	0.4122	0.4122	0.1389	0.0978	0.1070	0.6277
Acridine	0.0%	20	20	0.0069	0.0077	0.0102	0.0113	0.0114	0.0125	0.0125	0.0152	0.0161	0.0161	0.0161	0.0109	0.0023	0.0113	
Fluoranthene	100.0%	20	0	0.0696	0.1175	0.1383	0.2131	0.2532	0.2878	0.5307	0.6883	1.0786	1.0786	1.0786	0.2980	0.2515	0.2131	1.5552
Pyrene	100.0%	20	0	0.0778	0.1104	0.1881	0.2128	0.2767	0.4244	0.5457	0.7744	1.5614	1.5614	1.5614	0.3472	0.3474	0.2128	2.0843
Benzo(c)phenanthrene	40.0%	20	12	0.0055	0.0104	0.0111	0.0131	0.0151	0.0175	0.0179	0.0234	0.0291	0.0291	0.0291	0.0142	0.0055	0.0131	0.0418
Benz(a)anthracene	95.0%	20	1	0.0103	0.0250	0.0317	0.0495	0.0595	0.0840	0.0843	0.1975	0.3096	0.3096	0.3096	0.0694	0.0691	0.0495	0.4148
Chrysene	100.0%	20	0	0.0230	0.0456	0.0546	0.0838	0.0865	0.1147	0.1775	0.2786	0.6659	0.6659	0.6659	0.1231	0.1424	0.0838	0.8353
7,12-Dimethylbenz(a)anthracene	100.0%	20	0	0.0179	0.0194	0.0253	0.0313	0.0459	0.0517	0.0535	0.0717	0.0723	0.0723	0.0723	0.0382	0.0165	0.0313	0.1206
Benzo(b)fluoranthene	95.0%	20	1	0.0163	0.0230	0.0352	0.0371	0.0396	0.0491	0.0957	0.1316	0.1411	0.1411	0.1411	0.0513	0.0368	0.0371	0.2351
Benzo(k)fluoranthene	100.0%	20	0	0.0163	0.0230	0.0352	0.0371	0.0396	0.0491	0.0957	0.1315	0.1411	0.1411	0.1411	0.0513	0.0367	0.0371	0.2350
Benzo(a)pyrene	90.0%	20	2	0.0133	0.0165	0.0190	0.0236	0.0276	0.0378	0.0384	0.0578	0.0602	0.0602	0.0602	0.0282	0.0136	0.0236	0.0961
3-Methylcholanthrene	45.0%	20	11	0.0103	0.0139	0.0173	0.0215	0.0253	0.0365	0.0408	0.0420	0.0534	0.0534	0.0534	0.0249	0.0119	0.0215	0.0843
Indeno(123-cd)pyrene	60.0%	20	8	0.0094	0.0106	0.0133	0.0185	0.0194	0.0278	0.0297	0.0447	0.0453	0.0453	0.0453	0.0205	0.0105	0.0185	0.0732
Dibenz(a,h)anthracene	30.0%	20	14	0.0078	0.0120	0.0134	0.0158	0.0165	0.0202	0.0219	0.0246	0.0422	0.0422	0.0422	0.0173	0.0072	0.0158	0.0534
Benzo(ghi)perylene	45.0%	20	11	0.0107	0.0124	0.0149	0.0191	0.0208	0.0266	0.0282	0.0417	0.0487	0.0487	0.0487	0.0220	0.0100	0.0191	0.0721
Dibenzo(a,l)pyrene	0.0%	20	20	0.0077	0.0087	0.0102	0.0114	0.0116	0.0123	0.0126	0.0150	0.0151	0.0151	0.0151	0.0111	0.0020	0.0114	
Dibenzo(a,i)pyrene	0.0%	20	20	0.0055	0.0082	0.0093	0.0121	0.0122	0.0129	0.0135	0.0138	0.0176	0.0176	0.0176	0.0112	0.0027	0.0121	
Dibenzo(a,h)pyrene	0.0%	20	20	0.0071	0.0090	0.0097	0.0104	0.0107	0.0121	0.0128	0.0139	0.0147	0.0147	0.0147	0.0107	0.0020	0.0104	



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

### **INTEGRATED MONITORING PROGRAM MONTHLY REPORT**

### **PRECIPITATION DATA SUMMARY NOVEMBER 2017**

Prepared  
January 30, 2018

#### **SAMPLE COLLECTION AND DATA COMPILATION BY:**

**Wood Buffalo Environmental Association**  
Fort McMurray, Alberta

#### **LABORATORY ANALYSIS BY:**

Precipitation: InnoTech Alberta, Inc.  
Vegreville, Alberta



FILE CONTENTS DESCRIPTION	Precipitation Measurement of ions, pH and conductivity
SAMPLING INTERVAL	A week
SAMPLING FREQUENCY OF DATA	A week
EXPLANATION OF ZERO VALUES	Zero values are contained in this file and should be treated as values below detection - Method Detection values (MDL.) are provided with each observation
UNITS	mg/L (milligram per liter)
OBSERVATION TYPE	Wet Precipitation
FIELD SAMPLING OR MEASUREMENT PRINCIPLE	moveable cover with precipitation sensors
MEDIUM	Polyethylene Collection bucket
ANALYTICALMETHODS	pH by pH meter Conductivity by Conductivity meter IONS by Ion Chromatography (IC)
ANALYTICAL LABORATORY	InnoTech Alberta Inc
USER NOTE 1	Data are not blank corrected
SAMPLING INSTRUMENT TYPE	Total Precipitation Collector (TPC-3000)
<b>FLAGS USED</b>	
V0	Valid value
V1	Valid value but comprised wholly or partially of below detection limit data
V4	Valid value despite failing to meet some QC or statistical criteria
V5	Valid value but qualified because of possible contamination
V6	Valid value but qualified due to non-standard sampling conditions
V8	Dry Week
V9	Insufficient sample collected for analyzes
V10	Insufficient data to conduct all quality control checks
M1	Missing value because no value is available
M2	Missing value because invalidated by Data Originator



Wood Buffalo Environmental Association  
Precipitation summary

November 2017

Fort McKay-Bertha Ganter AMS 1	Start Date End Date Dry Week Precip Volume(mL)	31-Oct-17 07-Nov-17			07-Nov-17 14-Nov-17			14-Nov-17 20-Nov-17			20-Nov-17 28-Nov-17		
		X			X			X			X		
		52.68			642			2			1860		
		Results	MDL	Flag	Results	MDL	Flag	Results	MDL	Flag	Results	MDL	Flag
Acidity	µeq/L	16.000	2	V0	18.000	2	V0	-9999	2	V9	20.000	2	V0
Ammonium	mg/L	0.162	0.009	V0	0.048	0.009	V0	-9999	0.009	V9	0.019	0.009	V0
Bicarbonate (calc)	µeq/L	154.0			30.0			150.5			9.3		
Calcium	mg/L	3.160	0.005	V0	0.871	0.005	V0	-9999	0.005	V9	0.293	0.005	V0
Chloride	mg/L	0.971	0.004	V0	0.168	0.004	V0	-9999	0.004	V9	0.068	0.004	V0
Conductivity (25°C)	µS/cm	-9999	1	V9	7.0	1	V0	-9999	1	V9	3.0	1	V0
Conductivity (calc)	µS/cm	25.2			6.9						3.0		
Conductivity Difference%		-9999		V10	-1.8		V0	-9999		V10	-1.1		V0
Magnesium	mg/L	0.422	0.009	V0	0.124	0.009	V0	-9999	0.009	V9	0.063	0.009	V0
Nitrate	mg/L	0.916	0.003	V0	0.807	0.003	V0	-9999	0.004	V9	0.376	0.003	V0
pH		7.48		V0	6.77		V0	7.47		V0	6.26		V0
Phosphate	mg/L	< 0.04	0.04	V1	< 0.04	0.04	V1	-9999	0.04	V9	< 0.04	0.04	V1
Potassium	mg/L	0.125	0.004	V0	0.078	0.004	V0	-9999	0.006	V9	0.052	0.004	V0
Sodium	mg/L	0.660	0.02	V0	0.110	0.02	V0	-9999	0.006	V9	0.050	0.02	V0
Sulfate	mg/L	0.992	0.006	V0	0.289	0.006	V0	-9999	0.004	V9	0.212	0.006	V0
Sum Anions	µeq/L	217			54						22		
Sum Cations	µeq/L	233			63						25		
Total Ions	µeq/L	450			117						47		
Ion Balance	%	3.7		V0	8.1		V0	-9999		V10	6.9		
Ion Difference	µeq/L	17			9			-9999		V10	3		V0



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